RIO TINTO
ENERGY AMERICA

Rio Tinto Energy America
Kennecott Uranium Company
PO Box 1500, 42 Miles NW of Rawlins
Rawlins, Wyoming 82301-1500
Tel: (307) 324-4924 Fax: (307) 324-4925

January 28, 2009

Mr. Keith McConnell
Deputy Director
Decommissioning & Uranium Recovery Licensing Directorate
U.S. Nuclear Regulatory Commission
Mail Stop T7-E18
Washington, DC 20555-0001

Subject: Source Material License No. SUA-1350; Docket Number 04008584
Response to Request for Additional Information (RAI) dated November 19, 2008

Enclosed please find "Response to the November 19, 2008 Request for Additional Information (RAI) Regarding the Sweetwater Mill Catchment Basin Excavation Completion Report". This response has been prepared to answer the questions regarding the report. A request for an extension of the deadline for submission of this response to January 30, 2009 was submitted on December 4, 2008 (ADAMS number ML083470485).

Given the amount of time that has elapsed between the initiation, conduct and completion of the Catchment Basin Excavation, the following summary regarding this successful excavation is being provided:

The Sweetwater Uranium Project's license (SUA-1350), specifically condition 9.10, modified the Decommissioning Plan to allow the Catchment Basin Excavation to proceed. This license amendment was granted after submission of the following (5) five documents:

- Request for Amendment to the Final Design Volume VI – Part 2 – Mill Decommissioning Addendum to the Existing Impoundment Reclamation Plan – dated May 12, 2004
- Response to Comments – dated July 22, 2004
- Response to Request for Additional Information – dated December 15, 2004
- Soil Remediation Criteria – Thorium-230 and Natural Uranium – dated January 18, 2005

and preparation of the following document by the Nuclear Regulatory Commission (NRC):

- An Environmental Assessment (EA) entitled *ENVIRONMENTAL ASSESSMENT FOR AMENDMENT OF SOURCE MATERIAL LICENSE SUA-1350 FOR THE CATCHMENT BASIN RECLAMATION* dated May 2005.

The excavation of the contaminated soils associated with the Catchment Basin was begun in December 2005 and completed in November 2007. The approximately 120,000 cubic yard planned excavation as shown in the original submittals was initially completed. The excavation was then continued north along the east wall of the Mill Building to remove additional soils contaminated with hydrocarbons discovered in the north wall of the planned excavation. This resulted in a forty (40) foot high wall along the east wall of the Mill Building and a final excavation with a volume of 233,268 cubic yards, almost twice the originally planned excavation size.

The removal of material in this area resulted in a growing separation crack between the Mill Building footing and slab. This situation was discussed with Stephen Cohen in a telephone conversation on November 3, 2006. In the conversation he stated that we *"... cannot allow possible amounts of residual contamination to hinder backfilling."* He was concerned about the widening separation crack and wanted that area backfilled as soon as possible even if small amounts of residual contamination were still present to prevent damage to the Mill Building. He requested that the situation be documented and that an e-mail with photographs be sent to him promptly. This was done on November 7, 2006. Backfilling was begun promptly to prevent further widening of the separation crack.

When the excavation was completed, the final excavated volume was 233,268 cubic yards which was almost double the planned 120,000 cubic yards. This occurred largely due to efforts to capture hydrocarbon contaminated soils found north of the originally planned excavation and east of the Mill Building. In the course of the excavation soils containing elevated concentrations of Ra-226, Th-230 and U-nat were discovered that clearly could not be contaminated from fluids in the Catchment Basin or any other site source but rather were naturally uraniferous soils. These soils and their potential impact on specific grid blocks are discussed in the attached report.

A comprehensive document entitled Catchment Basin Excavation Completion Report was submitted on May 6, 2008. Submittal of this document was required by License Condition 9.10, which states in part, "The verification results of this remediation are to be submitted to NRC for approval, as soon as reasonably possible." On November 19, 2008, the Request for Additional Information (RAI) regarding the above document was received. The November 19, 2008 Request for Additional Information (RAI) states in part:

> *In your report, Section IV, Excavation/Grid Release, pg. 5, it states that individual grids and release standards are discussed in the text and these release values for each grid are based upon the nine-point composite sample, as discussed in the pre-excavation submittals. In one of your pre-excavation submittals, dated May 12, 2004, pg. 3, you describe how the cleanup standard for Ra-226 was derived. Please identify the pre-excavation submittal that shows how the natural uranium (35 pCi/g) and Th-230 (15 pCi/g) release standards were derived. If you cannot identify the pre-excavation submittal, please show how these release values were determined.*

The pre-excavation submittal containing the natural uranium and Th-230 release standards is the document entitled *Soil Remediation Criteria – Thorium-230 and Natural Uranium* – dated January 18, 2005 (ADAMS number ML050350266). A November 19, 2008 e-mail to James Webb responded to this initial issue. The release values for natural uranium (35 pCi/g) and Th-230 (15 pCi/g) were submitted as Appendix 7 to the December 15, 2004 Response to Request for Additional Information dated Wednesday, October 28, 2004. Appendix 7 containing the U-nat and Th-230 release values was submitted under cover of letter dated January 18, 2005. The use of these values was discussed with Elaine Brummett in telephone conversations on Monday, January 10 and Tuesday, January 11, 2005. These conversations are documented in the cover letter to the January 18, 2005 submittal. The ADAMS Accession Number for the document is ML050350266. This document was included in the references in the Environmental Assessment for Amendment of Source Materials License SUA-1350 for the Catchment Basin Reclamation. (ADAMS number ML051220301)

Kennecott Uranium Company believes that the attached report will fully answer all of the Commission's questions regarding the Catchment Basin Excavation. Therefore, upon review of this submittal Kennecott Uranium Company requests approval of the excavation work completed to remediate the contamination related to the Catchment Basin and full release of the excavated area for unrestricted use.

If you have any questions please do not hesitate to contact me.

Sincerely yours,

Oscar A Paulson

Oscar A. Paulson
Facility Supervisor

cc: James Webb (2), NRC Project Manager
Director, DNMS, Region IV
M. Thiesse, WDEQ/WQD, Lander, Wyoming
Darryl Maunder, RTEA, Gillette, Wyoming

RESPONSE TO THE NOVEMBER 19, 2008
REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE
SWEETWATER MILL CATCHMENT BASIN
EXCAVATION COMPLETION REPORT

INTRODUCTION

This submittal is in response to the Request for Additional Information (RAI) dated November 19, 2008 from the Nuclear Regulatory commission (NRC) regarding the Catchment Basin Excavation Completion report dated May 6, 2008, The additional information requested (see Appendix A containing an e-mailed summary of two (2) telephone conversations and a reply) included:

- an analysis of subsurface background at the site,
- a listing of grid blocks that would be eliminated from consideration by application subsurface background levels or by virtue of being partially or completely behind the synthetic liner, and
- an assessment of dose based on residual levels and comparison to benchmark dose as per Appendix H to NUREG 1620.

Those concerns are addressed below.

ANALYSIS OF SUBSURFACE SOIL BACKGROUND DATA

An analysis of the available data indicates that the area that includes the Catchment Basin is heterogeneous and use of a single value would oversimplify the variability of the site radiation background. There are at least four different sub-surface background populations. Each of those is described below.

NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM) NEAR GRID BLOCK K-3

This data set is represented by two samples taken from grid block K-3, on the north end of the Catchment Basin excavation. The location is shown in Fig. 1, which is an excerpt from the figure entitled Catchment Basin Excavation Radium-226 Final Results. The two samples identified as NORM #1 and NORM #2 have the following characteristics:

Table 1. Characteristics of K-3 NORM area samples.

		pCi/g			
Location	**U (mg/kg)**	**U-238**	**Th-230**	**Ra-226**	**U-238 / Ra-226**
NORM #1	2550	851.70	393	396.0	2.15
NORM #2	2350	784.90	708	326.0	2.41
Average	**2450**	**818**	**551**	**361**	**2.28**

Both samples are enriched in U-238 relative to Ra-226 and have relatively high concentrations of all three measured radionuclides. The petrography report indicates that NORM #1 was a black material and NORM #2 had a sandy consistency and states that these are native materials. Details are included in Appendix C.

While the highlighted portion of the figure is arbitrary, it is probable that the NORM body extends beyond the specific locations of the two NORM samples as indicated by the relatively high composite results (red print) for grid blocks M-2, M-1 and L-1. This trend is also seen for the spot samples (marked

with blue crosses) on the western edge of grid block M-2 and in the center of grid blocks M-2, M-1, L-2 and L-1. Spot values represent the concentration in the 6" (15 cm) surface at the indicated spot.

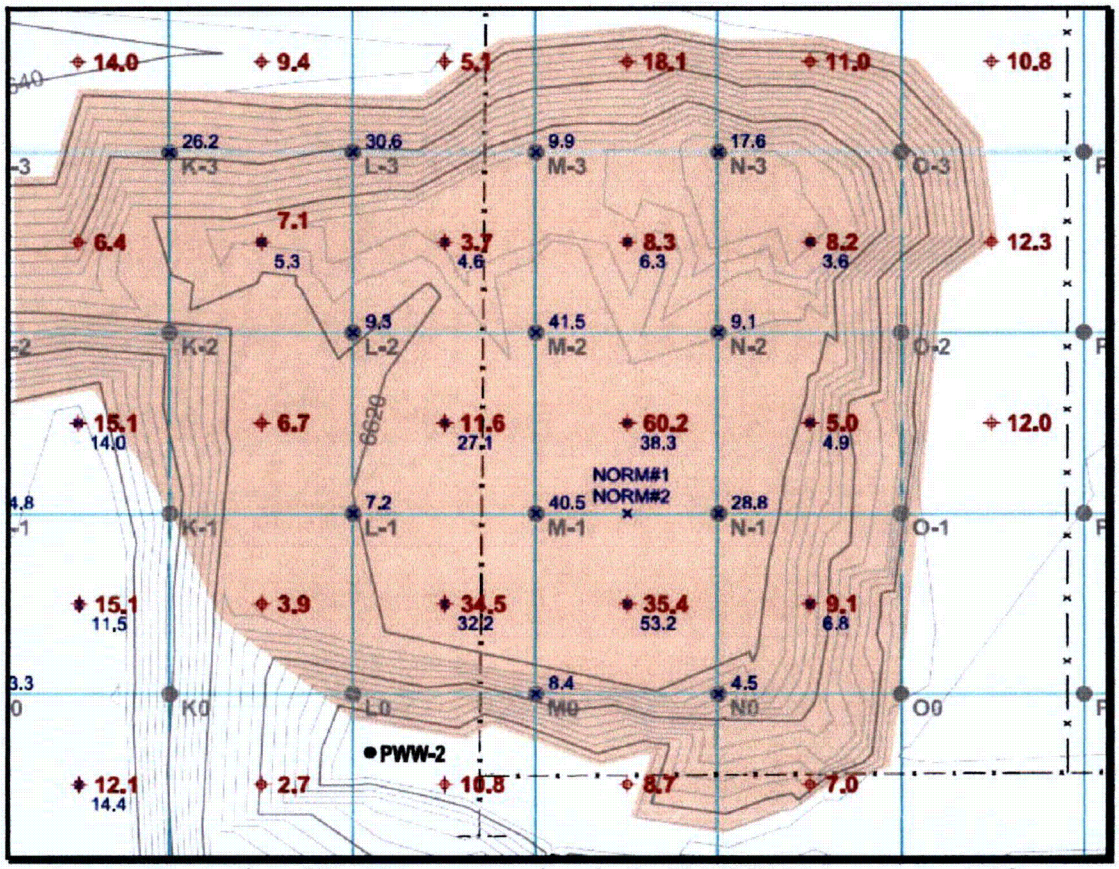


Figure 1. Illustration of Ra-226 concentrations in the K-3 NORM Area excerpted from Catchment Basin Excavation Completion Report.

NORM NEAR GRID BLOCK T-5

The Nuclear Regulatory Commission has agreed that grid blocks at or above the bottom of the Catchment Basin represent background. This is discussed in the e-mail dated October 6, 2006 from Stephen Cohen in which he states, *"I spoke with Robert Lukes, HP, and we both concur that the results for the grids I-2, S5, and S6 are acceptable, as long as you can make a case that the radium is naturally occurring. You have already done so for S5 and S6. "* An second e-mail dated October 10, 2006 stated, in part, *"The centers of the grids are at an elevation of roughly 6624 feet above Mean Sea Level (MSL) placing them two (2) feet below the bottom of the Catchment Basin at 6626 above Mean Sea Level (MSL). It is not conceivable given their distance from the Catchment Basin (370 feet East) and the fact that they are only two (2) feet below its bottom that they could be impacted by fluids from it."* These e-mails are included in Appendix B. The samples from this area were taken at an elevation above the bottom of the original Catchment Basin therefore could not have been influenced by process fluids. Figure 2 shows final concentrations of Ra-226 in and around gridblock T5. The composite sample (red) in grid block T5 shows a Ra-226 concentration of 36.6 pCi/g. Spot samples (blue) surrounding grid block T5 ranges from 6.5 to 70.1 pCi/g Ra-226. The spot sample in the center of grid block S6 had a Ra-226 concentration of 242 pCi/g.

Fig. 3 shows final concentrations of U-nat in and around grid block T5. The composite sample (red) in grid block T5 had a U-nat concentration of 38.1 pCi/g, that indicates near equilibrium with the radium concentrations shown in Fig. 2. Samples just below the bottom of the excavation, known as spot samples (shown in blue), surrounding grid block T5 had U-nat concentrations that range from 4.6 to 81.2 pCi/g The spot sample in the center of grid block S6 has a U-nat concentration of 59.6 pCi/g.

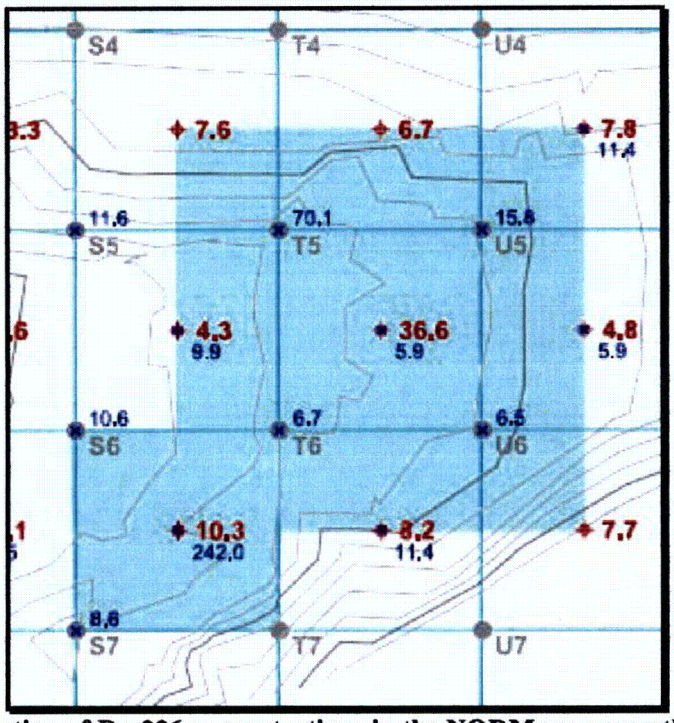


Figure 2. **Illustration of Ra-226 concentrations in the NORM area near the T5 grid block.**

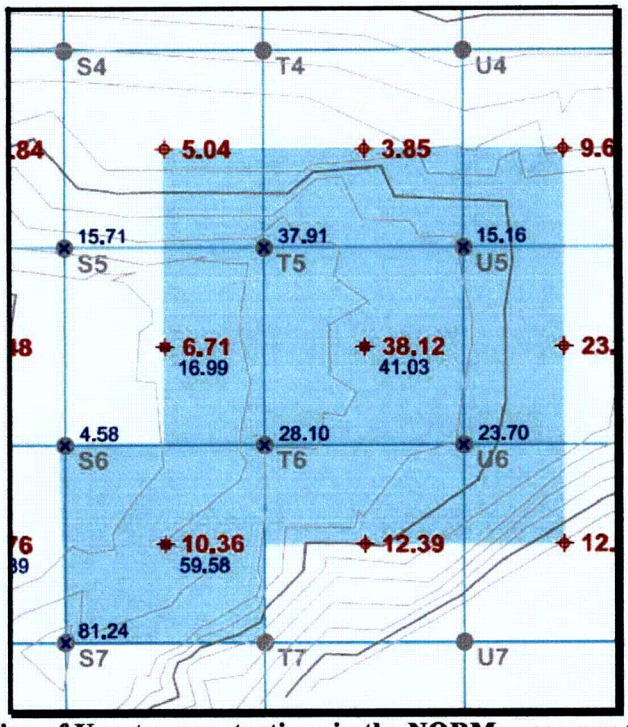


Figure 3. Illustration of U-nat concentrations in the NORM area near the T5 grid block.

Fig. 4 shows concentrations of Th-230 after excavation in and around gridblock T5. The composite sample (red) in grid block T5 had a Th-230 concentration of 33 pCi/g. Spot samples (shown in blue), surrounding grid block T5 have Th-230 concentrations that range from 3.0 to 264 pCi/g The spot sample in the center of grid block S6 has a Th-230 concentration of only 3.0 pCi/g. These results indicate considerable variability in Th-230 concentrations.

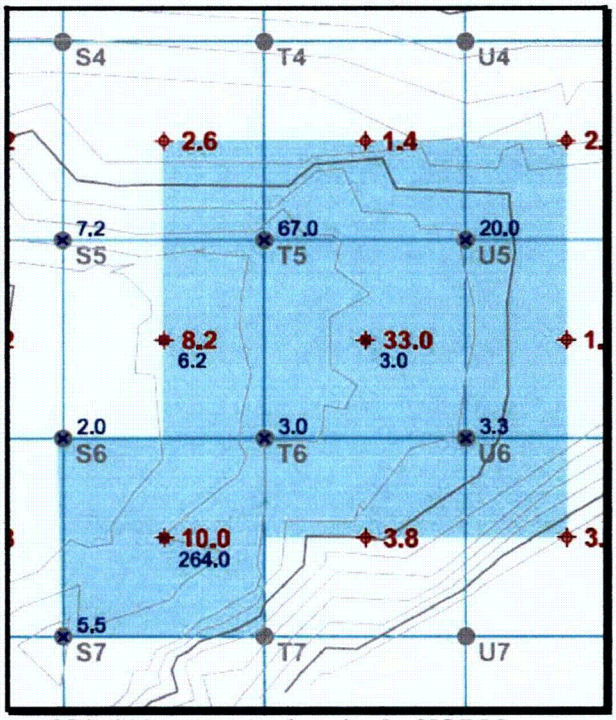


Figure 4. **Illustration of Th-230 concentrations in the NORM area near the T5 grid block.**

Table 2. **Summary of radionuclide concentrations associated with spot samples in grid block T5 NORM.**

	pCi/g		
	U-238	**Th-230**	**Ra-226**
NE corner T5	15.2	20	15.8
SE corner T5	23.7	3.3	6.5
SW corner T5	28.1	3	6.7
NW corner T5	37.9	67	70.1
Center T5	41	3	5.9
Average	**29.2**	**19.3**	**21.0**
N	**5**	**5**	**5**
Composite	**38.1**	**33.0**	**36.6**

WELL BORE HOLE SOIL SAMPLES

Soil samples taken from borings during installation of monitoring wells represent another population of background data. Table 3 lists samples taken between 15 feet and 55 feet. These depths exclude surface influences and represent the maximum depth of the Catchment Basin excavation. The average U-238 to Ra-226 ratio is nearly 1.0, although there is considerable variation in the U-238/Ra-226 from sample to sample.

Table 3. Monitoring well soil sample data.

			pCi/g			
Well	**Mid-pt depth (ft)**	**U (mg/kg)**	**U-238**	**Th-230**	**Ra-226**	**U-238 / Ra-226**
	17.5	6.05	2.02	7.3	9.2	0.22
	22.5	6.19	2.07	2.8	5.0	0.41
	27.5	11.3	3.77	0.6	3.0	1.26
	32.5	26.9	8.98	5.2	8.2	1.10
TMW 103	37.5	36	12.02	3.1	9.5	1.27
	42.5	62.3	20.81	5.1	15.6	1.33
	47.5	18.8	6.28	3.4	13.3	0.47
	52.5	67	22.38	8.7	18.6	1.20
	Well Average	**29.3**	**9.8**	**4.5**	**10.3**	**0.9**
	17.5	5.59	1.87	21	22.3	0.08
	22.5	3.49	1.17	7.4	11.8	0.10
	27.5	8.64	2.89	2.4	5.8	0.50
	32.5	44.4	14.83	4.4	9.0	1.65
TMW 106	37.5	31.7	10.59	1.3	5.7	1.86
	42.5	33.1	11.06	3.3	10.1	1.09
	47.5	80.5	26.89	5.6	16.2	1.66
	52.5	28.2	9.42	3.6	14.2	0.66
	Well Average	**29.5**	**9.8**	**6.1**	**11.9**	**1.0**
	17.5	200	66.80	11	13.8	4.84
	22.5	60	20.04	7.5	15.0	1.34
	27.5	21.3	7.11	3.4	7.7	0.92
	32.5	21.6	7.21	2.6	8.0	0.90
TMW 107	37.5	10.9	3.64	2.4	6.1	0.60
	42.5	9.87	3.30	1.4	5.0	0.66
	47.5	15.5	5.18	3.1	8.1	0.64
	52.5	5.07	1.69	1.5	7.1	0.24
	Well Average	**43.0**	**14.4**	**4.1**	**8.9**	**1.3**
	17.5	4.99	1.67	4.3	8.4	0.20
	22.5	6.35	2.12	7.2	9.2	0.23
	27.5	17.8	5.95	7	10.7	0.56
	32.5	63.8	21.31	6.6	11.4	1.87
TMW 108	37.5	5.82	1.94	5.4	5.2	0.37
	42.5	64.2	21.44	7.6	13.9	1.54
	47.5	11.3	3.77	1.3	3.6	1.05
	52.5	18.3	6.11	3.4	8.4	0.73
	Well Average	**24.1**	**8.0**	**5.4**	**8.9**	**0.8**
	17.5	45.5	15.20	11	14.5	1.05
	22.5	17.9	5.98	2.7	4.2	1.42
	27.5	55.1	18.40	4.5	11.1	1.66
	32.5	56.1	18.74	7.8	21.4	0.88
TMW 109	37.5	25	8.35	2.1	6.1	1.37
	42.5	42.2	14.09	8.3	16.7	0.84
	47.5	10.6	3.54	1.9	9.6	0.37
	52.5	8.31	2.78	1.2	6.9	0.40
	Well Average	**32.6**	**10.9**	**4.9**	**11.3**	**1.0**
	17.5	62.7	20.94	3.9	12.4	1.69
	22.5	59.4	19.84	7.7	24.4	0.81
	27.5	36.9	12.32	6.5	18.1	0.68
	32.5	18.1	6.05	3.6	11.2	0.54
TMW 110	37.5	10.8	3.61	2	8.2	0.44
	42.5	17.8	5.95	2.2	10.3	0.58
	47.5	22.9	7.65	5.8	12.0	0.64
	52.5	9.98	3.33	2.6	7.5	0.44
	Well Average	**29.8**	**10.0**	**4.3**	**13.0**	**0.7**
	Overall Average	**31.4**	**10.5**	**4.9**	**10.7**	**0.95**
	N	**48**	**48**	**48**	**48**	**48**

The locations of these wells were provided in the Catchment Basin Excavation Completion Report in Map C – Catchment Basin Post-Excavation (November 2007). Variations in concentrations with depth are shown in the Figures 5-10 below. There are no consistent trends in concentration with depth between wells. In well TMW 103 and 108, concentrations of U-238, Th-230 and Ra-226 appear to increase with depth. The concentrations of the three radionuclides in Well TMW107 tend to decrease with depth. The radionuclide concentrations in the remaining wells are mostly random with depth.

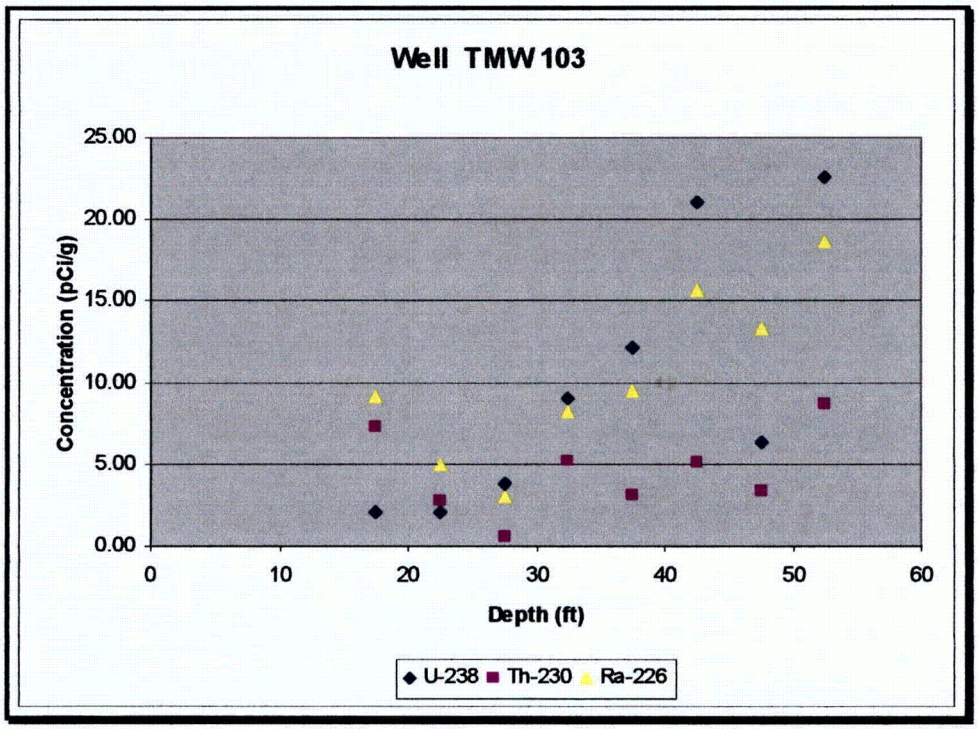


Figure 5. **Concentrations of U-238, Th-230 and Ra-226 vs. depth in soils during drilling of temporary monitoring well TMW 103.**

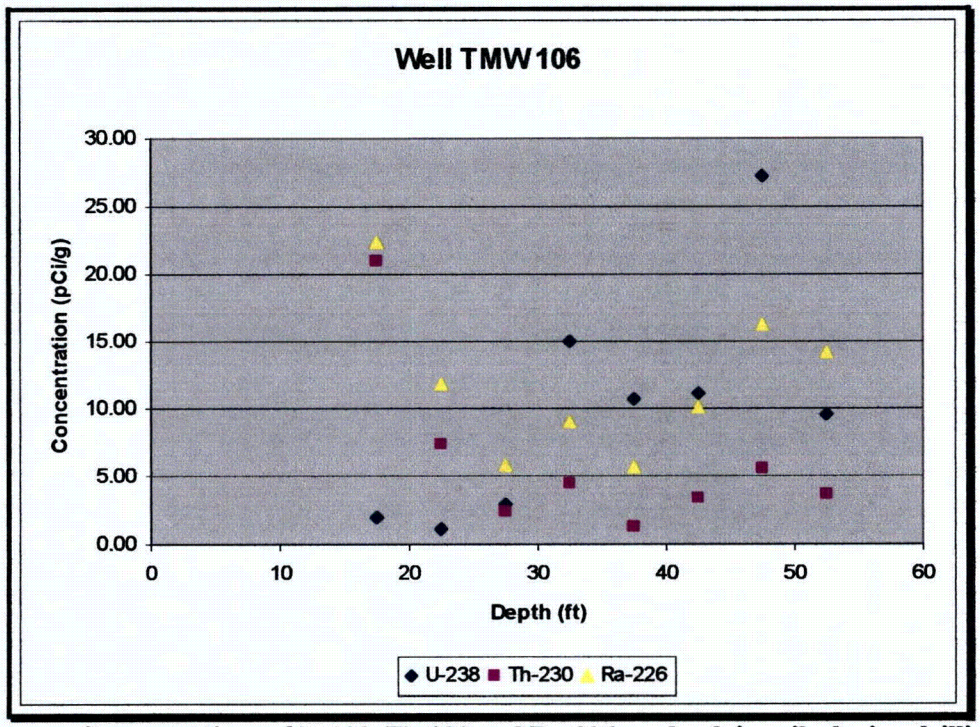


Figure 6. **Concentrations of U-238, Th-230 and Ra-226 vs. depth in soils during drilling of temporary monitoring well TMW 106.**

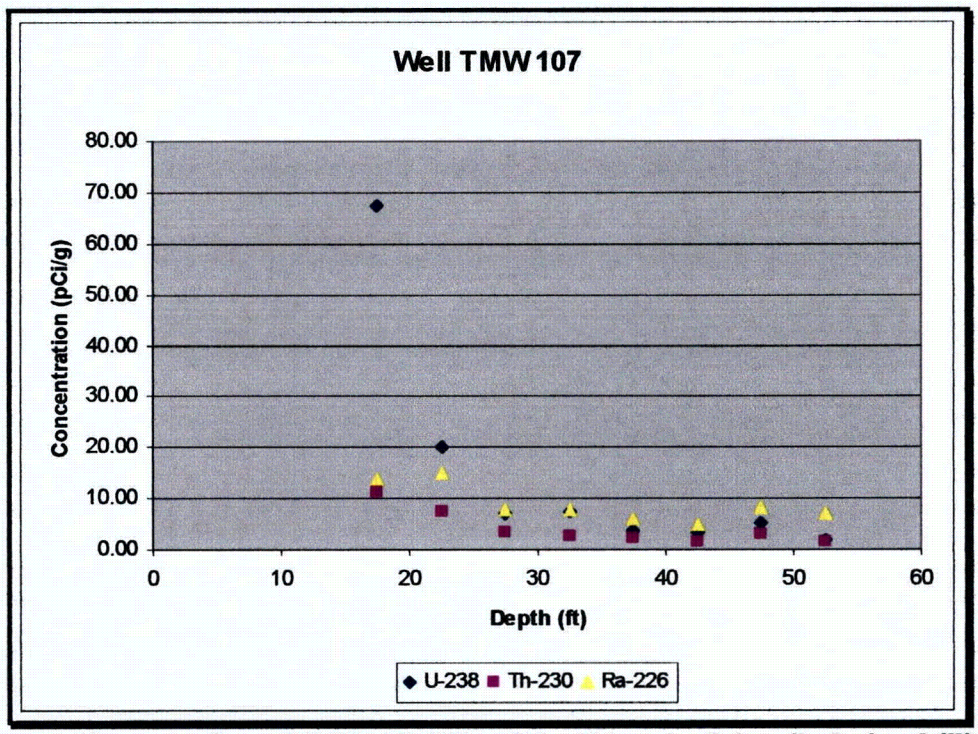


Figure 7. **Concentrations of U-238, Th-230 and Ra-226 vs. depth in soils during drilling of temporary monitoring well TMW 107.**

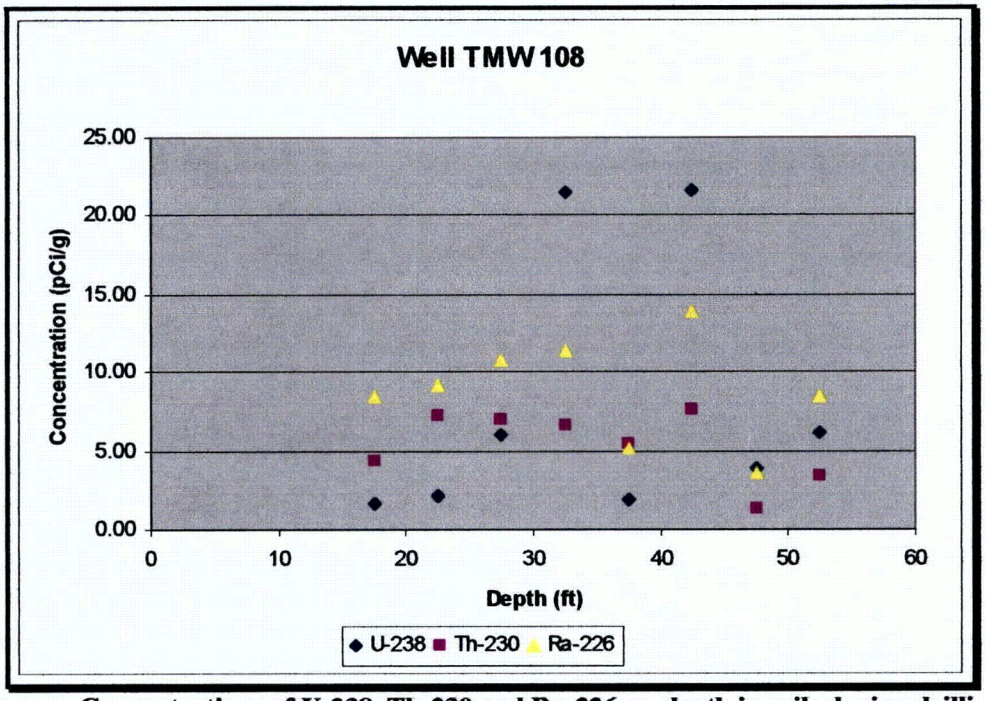


Figure 8. **Concentrations of U-238, Th-230 and Ra-226 vs. depth in soils during drilling of temporary monitoring well TMW 108.**

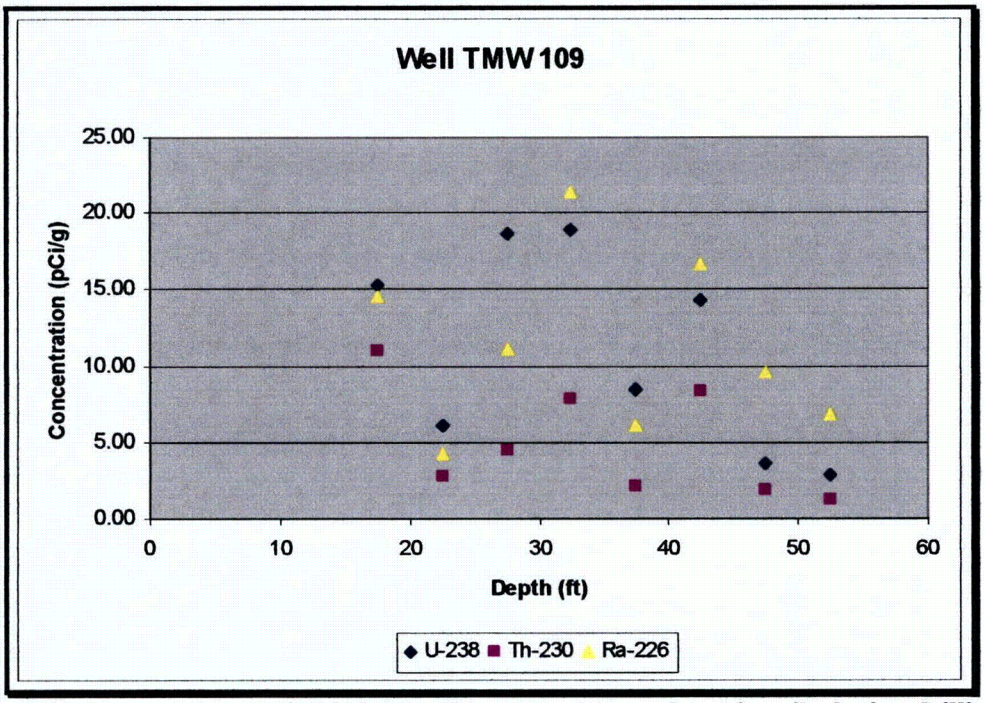


Figure 9. **Concentrations of U-238, Th-230 and Ra-226 vs. depth in soils during drilling of temporary monitoring well TMW 109.**

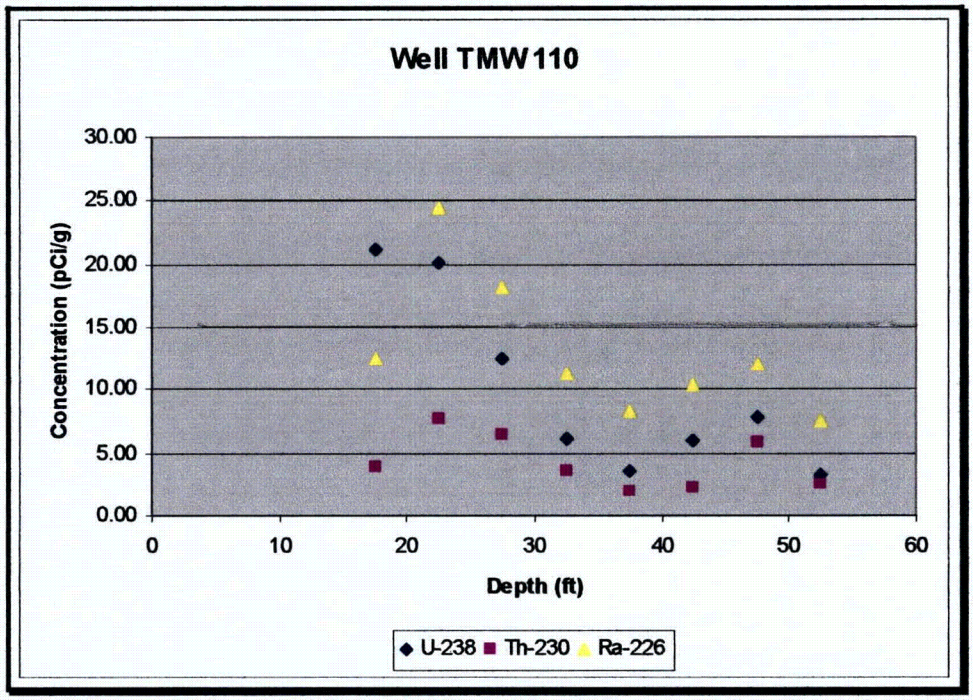


Figure 10. **Concentrations of U-238, Th-230 and Ra-226 vs. depth in soils during drilling of temporary monitoring well TMW 110.**

DIESEL CONTAMINATED SOIL EXCAVATION SAMPLES

Table 4 summarizes the results of analyses of soil samples associated with the excavation of the diesel contaminated soil area. This area was contaminated solely by diesel fuel leaking from piping associated with two (2) 200,000 gallon diesel fuel tanks related to operations in the adjacent open pit mine. This excavation, which is still open, provides a window into the subsurface conditions at the site. Some samples were taken as composites from the pit and others were taken at various depths in the bottom of the pit excavation. The samples from the bottom of the pit are depleted in U-nat relative to Ra-226, indicating that much of the uranium has been leached away. The Ra-226 concentrations in samples taken at the bottom of the pit are relatively high.

Two bulk samples of approximately 100 kg each were taken from the petroleum excavation pit at a depth of about 50' below ground surface (BGS). Data from the analysis of these samples were not included in the table below because the sampling method may have resulted in separation of the fines with a resulting bias in the results.

The location of TMW-10 in the bottom of the Diesel Contaminated Soil Excavation was provided in the Catchment Basin Completion Report in Map C – Catchment Basin Post-Excavation (November 2007) and the locations of four (4) of the other samples in the table below in the Diesel Contaminated Soil Excavation were provided in the Background Section (Section 1) of the Catchment Basin Completion Report in Appendix 10.

Table 4. Samples associated with diesel pit excavation.

Location	U (mg/kg)	pCi/g U-238	Th-230	Ra-226	U-238 / Ra-226
Pit NW of Mill Bldg - NW corner composite	98.8	33.00	5.9	16.4	2.01
Pit NW of Mill Bldg - SW corner composite	58.7	19.61	4.2	8.0	2.45
Diesel Pit North Wall -West End Bottom Redox - #2	17.5	5.85	5.9	4.6	1.27
Diesel Pit South Wall - Center bottom #4	16.4	5.48	0.7	6.0	0.91
Diesel Pit South Wall - Bottom #3	9.85	3.29	1.7	20.2	0.16
Diesel Pit SW corner - Bench #1	43.3	14.46	6.4	18.3	0.79
	51.7	17.27	no data	65	0.27
	14	4.68	no data	113	0.04
	13.1	4.38	no data	209	0.02
	33.3	11.12	no data	301	0.04
	14.8	4.94	no data	254	0.02
	16.1	5.38	no data	206	0.03
TMW 10 - bottom of diesel pit	18.8	6.28	no data	332	0.02
excavation	26.3	8.78	no data	224	0.04
	39.7	13.26	no data	379	0.03
	33	11.02	no data	265	0.04
	18.3	6.11	no data	306	0.02
	23.7	7.92	no data	309	0.03
	26.6	8.88	no data	44.1	0.20
	22	7.35	no data	58.7	0.13
Average	**29.8**	**10.0**	**4.1**	**157.0**	**0.4**
N	**20**	**20**	**6**	**20**	**20**

SUMMARY OF SUBSURFACE BACKGROUND DATA

As mentioned above, at least four populations of background material have been identified. Rather than specify a single value for each of the pertinent radionuclides, it is reasonable to apply a different value of background for different grid blocks depending on the location within the Catchment Basin excavation. The data detailed above are summarized in Table 5 along with the applicable region (grid blocks) of the site to which the background could reasonably be applied.

Table 5. Summary of subsurface background data.

		K-3 NORM Area	T-5 NORM Area	Site-wide subsurface average (well boreholes)	Diesel Contaminated Soil Excavation Area
No. of samples		2	5 (T5)	48	20
Applicable Grids		K-3, K-2, K-1, L-3, L-2, L-1, M-3, M-2, M-1	S5, S6, T5, T6	All grids unless specified otherwise	Outside catchment basin excavation
U-238	**Mean**	818	29.2	10.6	10.0
	SD	Na	10.5	11.1	7.0
Th-230	**Mean**	551	19.3	4.89	4.13
	SD	Na	27.7	3.5	2.4
Ra-226	**Mean**	361	21.0	10.7	157
	SD	Na	27.8	4.96	133
Proposed background levels (pCi/g)	**U-nat**	**1637**	**58.4**	**21.2**	**19.9**
	Th-230	**551**	**19.3**	**4.89**	**4.13**
	Ra-226	**361**	**21.0**	**10.7**	**157**

The proposed background for U-nat was calculated assuming equilibrium between U-238 and U-234 and 2.2% contribution to total activity for U-235. The lowest average background listed in Table 4 is that for the well boreholes. Applying the well boreholes background data to the majority of the excavation would be conservative.

EFFECTS OF APPLYING LOCALIZED BACKGROUND TO SPECIFIC GRID BLOCKS

Previously established release limits above background for the excavation are as follows: Ra-226 (15 pCi/g above background), Th-230 (15 pCi/g above background) and U-nat (35 pCi/g including background). The release limits for Th-230 and natural uranium were proposed in a submittal dated January 18, 2005 entitled *Soil Remediation Criteria – Thorium-230 and Natural Uranium* that resulted from telephone discussions with Elaine Brummett the site's NRC Project Manager on January 10 and 11, 2005. These conversations were documented in the cover letter for the submittal. The document containing the final limits for Th-230 and U-nat agreed upon in the telephone conversations and submitted on January 18, 2005 was referenced in the Environmental Assessment (EA) dated May 2005.

The fifteen (15) pCi/g above background Ra-226 standard was proposed in the *Request for Amendment to the Final Design Volume VI – Part 2 – Mill Decommissioning Addendum to the Existing Impoundment Reclamation Plan* – Dated May 12, 2004

Because of the 100 m^2 performance requirement, grid average concentrations as measured by composite sampling are the appropriate target for the release limits. Specific grid blocks that might have potential to exceed to release limits are discussed below in accordance with the background levels proposed in Table 5.

RADIUM-226

In the original completion report (table on page 7 of the completion report) a background of 1.4 pCi/g was applied to create a target release limit of 16.4 pCi/g. Grid blocks that exceed that target are shown in Ra-226 Final Results map of the Catchment Basin Excavation Completion Report include the following: D5, G-1, G0, G1, H-1, H0, I-3, J3, L-1, M-2, M-1, M-4, N4 (shown in Fig. 11) and T5 (Fig. 2).

Applying the appropriate localized background values given in Table 5 yields the following results: Except for the square area bounded by K-3, K-1, M-3 and M-1, a background value of 10.7 pCi/g would be applied to create a release criterion for Ra-226 of 25.7 pCi/g. This would remove grid blocks D5, G-1, G0, G1 H-1, H0, I-3, and M-4 from further consideration. Additionally grid blocks D5, G-1, G0, G1 H-1, and H0, completely or partially shaded in tan are covered by a synthetic curtain and are excluded on this basis as well. Grid blocks completely or partially shaded in tan are covered by a synthetic curtain and will be addressed at the time the structures are decommissioned as per License condition 9.10 which states in part, " *Residual contamination remaining under structural foundations after the catchment basin remediation shall be removed at the time the structures are decommissioned.*"

The remaining grid blocks in the salmon-colored area that exceed 16.4 pCi/g include L-1, M-2, M-1 and M-4. It is clear that the NORM samples taken in grid M-2 greatly influence the overall concentrations for these three blocks. Applying the proposed background value of 361 pCi/g to the K-3/K-1/M-3/M-1 square would remove all blocks within the square (L-1, M-2 and M-1) from further consideration.

Grid block T5 has a composite average of 36.6 pCi/g Ra-226. An average of the five corner samples for grid block T5 leads to an average of 21 pCi/g and a release criterion of 36 pCi/g. Hence, this grid block should be removed from further consideration.

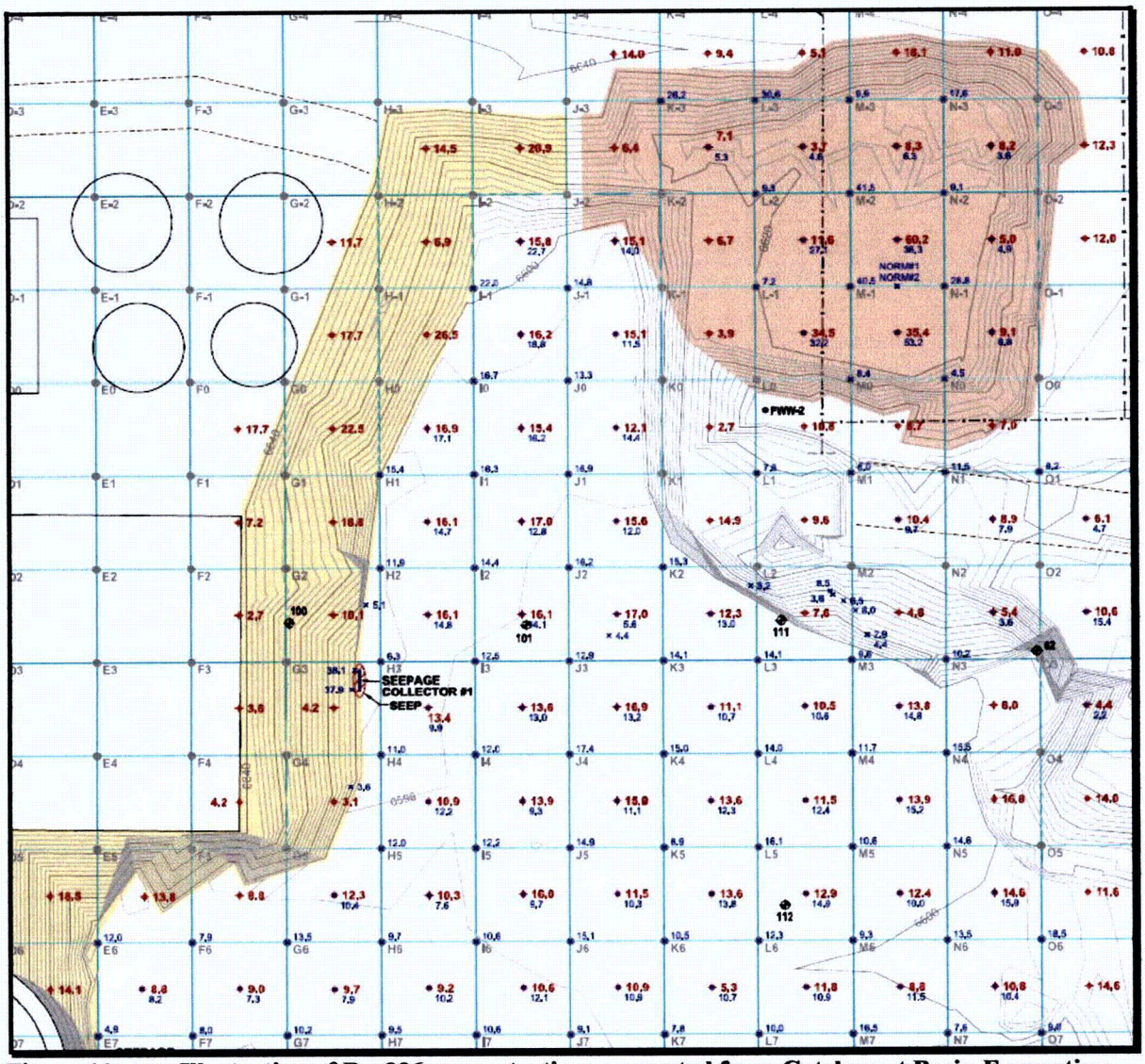


Figure 11. Illustration of Ra-226 concentrations excerpted from Catchment Basin Excavation Completion Report.

NATURAL URANIUM

The target release limit for U-nat was originally set at 35 pCi/g, inclusive of background. Grid blocks that exceed that limit as shown in U-nat Final Results map of the Catchment Basin Excavation Completion Report include the following: G0, G-1, I-3, M-2, (Fig. 12) and T5 (Fig. 3). Guidance to the U.S. NRC staff on the radium benchmark dose approach implies a U-nat release limit of 5 pCi/g above background, or a concentration of 26.2 pCi/g U-nat for the Catchment Basin.

Using the background values summarized in Table 5 results in the following grid blocks exceeding the release limit: G-1, G0, H-1, H-2, H-3, , I-3, M-2, M3 and T5. Of these G-1, G0, H-3, H-2 H-1 and I-3 are completely or partially overlain by the synthetic curtain hence are excluded. Grid blocks completely or partially shaded in tan are covered by a synthetic curtain and will be addressed at the time the structures are decommissioned as per License condition 9.10 which states in part, " *Residual*

contamination remaining under structural foundations after the catchment basin remediation shall be removed at the time the structures are decommissioned."

The concentration of grid block M-2 (47.4 pCi/g) is far below the proposed background value for U-nat in the K-3 NORM area. The same is true for grid block T5 if the proposed T5 background concentration (58.4 pCi/g) is applied. This leaves only grid block M3 at 28.7 pCi/g slightly exceeds 5 pCi/g above background. This grid block is below the originally proposed and accepted 35 picoCurie per gram release limit. NUREG-1620 states, "*If the plan indicates in situ ore is in the clean-up area, it should be characterized by Ra-226/U-238, visual criteria or other means.*" Clearly there is in-situ ore in the clean-up area so background may be characterized by isotopic ratios. The average U-238/Ra-226 ratio for the TMW-110 well samples is 0.70 (Table 3). The U-238/Ra-226 ratio for the M3 composite sample is also 0.70. Therefore, the M3 grid may be considered as having met the release criteria since the U-238/Ra-226 ratio falls at the bottom end of the range of naturally occurring materials on site as shown in the samples from the six (6) monitor wells.

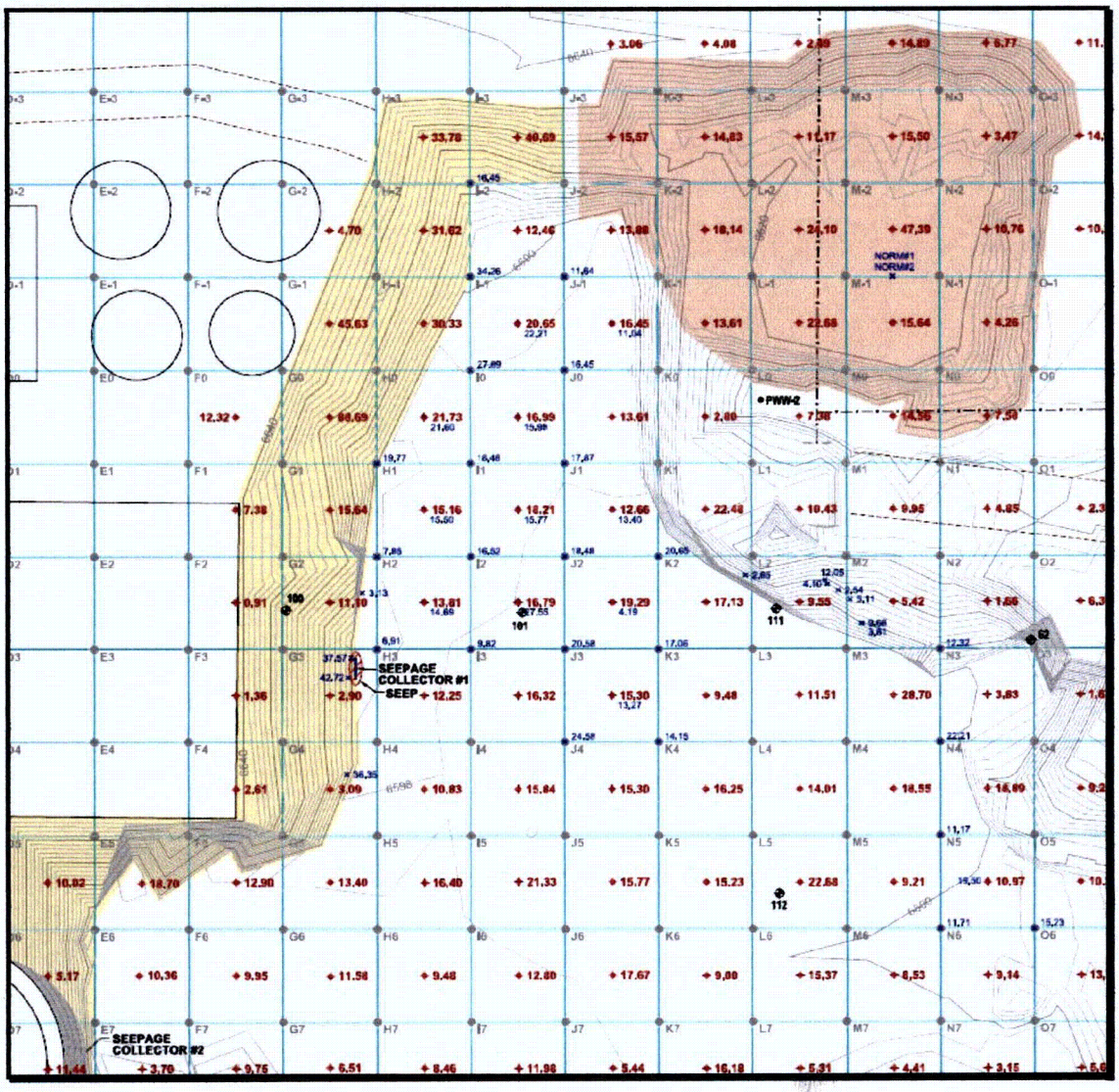


Figure 12. Illustration of U-nat concentrations excerpted from Catchment Basin Excavation Completion Report.

THORIUM-230

In the original completion report (table on completion report page 7) a background concentration of 1.57 pCi/g was applied to create a release criterion of 16.6 pCi/g for Th-230. Grid blocks that exceed that target, as shown in Th-230 Final Results map of the Catchment Basin Excavation Completion Report, include the following: D5, G0, I-3, L-1, M-4, M-2, M-1 (Fig. 13) and T5 (Fig. 4).

Applying the localized background values shown in Table 5 yields the following results: except for the square area bounded by K-3, K-1, M-3 and M-1, a background value of 4.89 pCi/g should be applied to create a release criterion of 19.9 pCi/g. Grid blocks D5, G0, and I-3 would still exceed the background value, but each of those is partially or completely covered by a synthetic curtain (tan-shaded area), hence excluded from further consideration. Grid blocks completely or partially shaded in tan are covered by a synthetic curtain and will be addressed at the time the structures are decommissioned as per License condition 9.10 which states in part, "*Residual contamination remaining under structural foundations after the catchment basin remediation shall be removed at the time the structures are decommissioned.*"

The remaining grid blocks in the salmon-colored area that exceed 16.6 pCi/g include L-1, M-2 and M-1. It is clear that the NORM in grid M-2, as demonstrated by the samples taken in that grid, greatly influence the overall radionuclide concentrations for these three blocks. Applying the proposed background value of 551 pCi/g to the K-3/K-1/M-3/M-1 square would remove all blocks within the square (L-1, M-2 and M-1) from further consideration.

Grid block T5 has a composite average Th-230 concentration of 33.0 pCi/g. The average of the five corner samples for grid block T5 (Fig. 4) leads to an average of 19.3 pCi/g and a release criterion of 34.3 pCi/g. Hence, this grid block should be removed from further consideration.

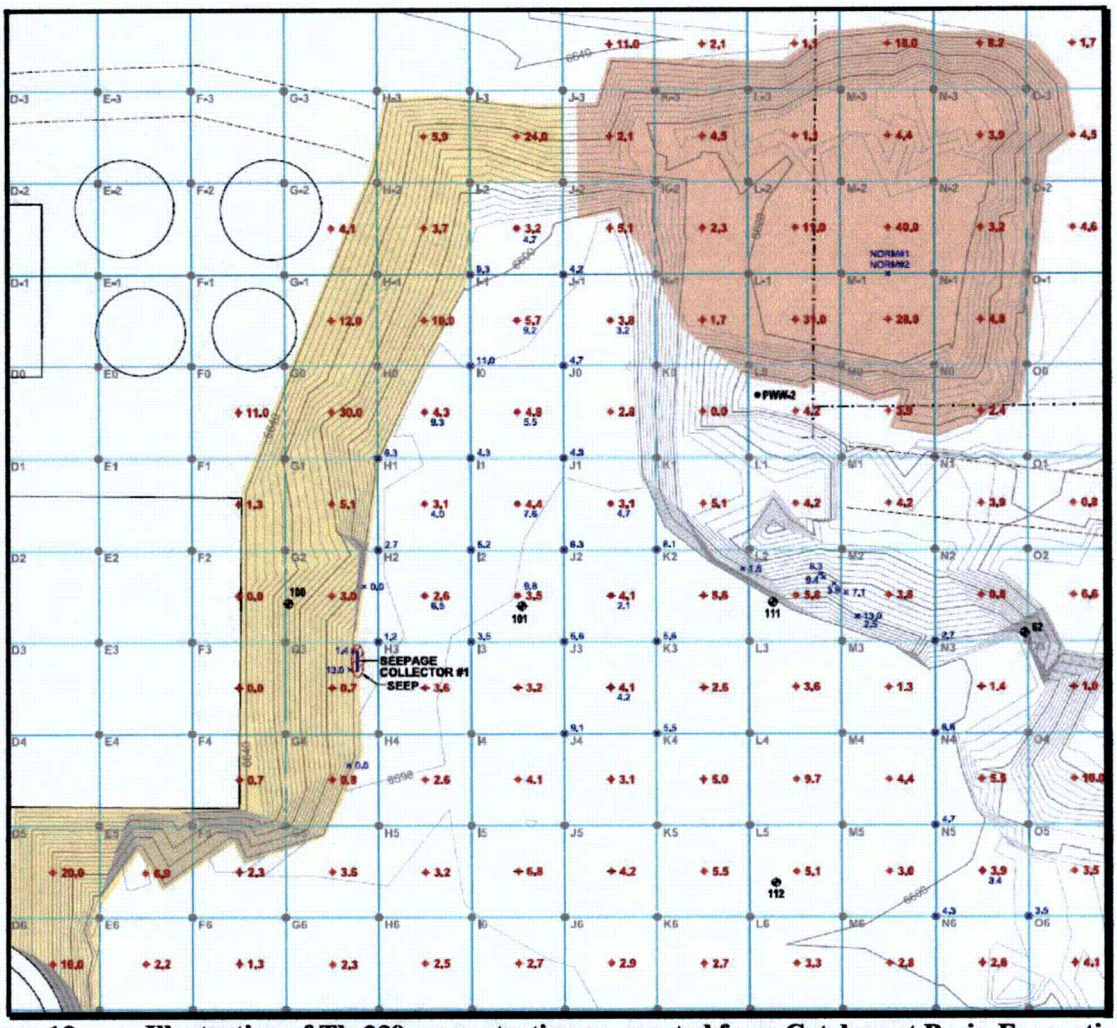


Figure 13. Illustration of Th-230 concentrations excerpted from Catchment Basin Excavation Completion Report.

BENCHMARK DOSE COMPARISON

The November 19, 2008 RAI requested a demonstration that the total effective dose equivalent (TEDE) from residual radionuclides at the base of the Catchment Basin excavation would not exceed the benchmark dose, as defined in 10 CFR 40, Appendix A, criterion 6(6). The benchmark dose is the projected dose from Ra-226 at the soil cleanup criteria of 5 pCi/g averaged over the top 15 cm of soil and 15 pCi/g averaged over15 cm layers at depths below 15 cm.

The method for calculating the benchmark dose and the dose from other radionuclides in residual soils is described in detail in Appendix H of NUREG 1620, *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978* (NRC, 2003). Appendix H is titled: *Guidance to the U. S. Nuclear Regulatory Commission Staff on the Radium Benchmark Approach.*

Appendix A to 10 CFR 40 states that "*Byproduct material containing concentrations of radionuclides other than radium in soil ... must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the ... standard (benchmark dose) and must be as low as is reasonably achievable.*" Appendix H to NUREG 1620 states that the benchmark dose need not be calculated if the residual Ra-226 and Th-230 concentrations in the top 15 cm of soil do not exceed 5 pCi/g above background and 15 pCi/g in subsurface soil and if the natural uranium (U-nat) concentration is less than 5 pCi/g. The Ra-226 criteria are specified in 10 CFR 40. The Th-230 criteria are based on the ingrowth of Ra-226 and are set such that the eventual Ra-226 concentration will not exceed the Ra-226 criteria at any time within 1000 years. The basis for the 5 pCi/g U-nat is not defined. It is not based on ingrowth of Ra-226 and is in conflict with previously accepted U-nat cleanup criteria (NRC, 1981) and the approved remediation plan for the Catchment Basin as approved via *Environmental Assessment For Amendment of Source Material License SUA-1350 for the Catchment Basin Reclamation* (Brummett and Cohen, 2005).

As requested by Mr. Webb, the benchmark dose and the potential doses from hypothetical concentrations of U-nat, Th-230, and Ra-226 in soil were calculated to establish release criteria for the excavated and backfilled Catchment Basin Excavation. The RESRAD Code was used to calculate radiation doses.

RESRAD ANALYSIS

The RESRAD Code was developed by DOE to evaluate the radiation doses and risks to members of the public from residual radioactive materials (RESidual RADioactive). It was first issued in 1989. The version used in this analysis, RESRAD 6.3, was issued in August 2005. RESRAD is part of a family of codes that are designed to evaluate doses to individuals and ecological receptors. RESRAD v 6.3 deals with soil contamination and calculates doses to individuals after remediation. Further information on the RESRAD codes can be obtained from the User's Manual for RESRAD, Version 6 (Yu, 2001).

The potential future land use must be identified for the RESRAD code. Appendix H requires consideration of ranching, mining, home-based business, light industry and resident farmer scenarios. While the most likely land use scenario is non-resident rancher or recreational user, the most conservative potential future land use is the resident farmer. Therefore, the resident farmer scenario was used in the RESRAD analysis.

Appendix H provides guidance in establishing potential exposure routes for input into the RESRAD code. The radon inhalation pathway is specifically excluded. The milk and fish ingestion pathways were excluded for the reasons expressed in Appendix H. The exposure scenario for the benchmark (Ra-226) dose calculations was identical to the scenario for calculation of doses from other residual radionuclides. While it is unlikely that any domestic use water wells will be installed in the Catchment Basin area since it on land owned by the licensee and probably will be deeded to the Department of Energy at the time of license termination, the groundwater ingestion pathway was not excluded from the analysis.

As per Appendix H, the benchmark dose includes Pb-210 at the same concentration as the Ra-226. The doses were calculated for the default time periods in RESRAD: time equals 0, 1, 3, 10, 30, 100, 300, and 1000 years after closure. The maximum annual dose over the 1000 year period and the time at which it occurred was calculated. The dose from residual radionuclides other than Ra-226 was compared to the benchmark dose at each of the default time periods.

The concentrations of radionuclides in the Catchment Basin area at the base of the excavation meet the criteria specified in Appendix H for which no benchmark dose modeling would be required. However, in order to evaluate a "worst case" scenario, the residual concentrations above background of U-238, U-234, Th-230, Ra-226 and Pb-210 were all set at a nominal value of 100 pCi/g. The concentrations of U-235,

Pa-231, and Ac-227 were set at 4.5 pCi/g in accordance with the natural abundance of U-235. At a mass abundance of 0.72 percent, the activity concentration of U-235 is 0.045 times the U-238 activity concentration (2.2% of the U-nat concentration). The assumed U-nat concentration was then 204.5 pCi/g. RESRAD reports the calculated annual dose by pathway and by nuclide so there was no need to run the code separately for each nuclide.

Site-specific parameter values were used where they were available. Otherwise, RESRAD default values or values suggested in Appendix H were used. Where default values were used, a sensitivity analysis was performed. The input parameter values are given in Table 6. Because RESRAD can handle only one contaminated zone at a time, the code was run twice for the benchmark dose; once for the surface Ra-226 concentration (5 pCi/g) with no cover, and once for the subsurface Ra-226 concentration (15 pCi/g) with 0.15 meters of cover. The calculated Ra-226 doses were added to obtain the benchmark dose.

Table 6. RESRAD Input Parameter Values

Parameter	Ra-226 surface	Ra-226 subsurface	Ra, U, Th	Source of Parameter Value
Contaminated zone thickness	0.15 m	2.0 m	2.0 m	Default and benchmark
Cover depth	0 m	0.15 m		Default and benchmark
Cover depth			12.2 m	Site-specific
Erosion rate	0.001 m/y	0.001 m/y	0.001 m/y	Default
Evapotranspiration rate	0.6	0.6	0.6	Appendix H
Annual precip.	0.138 m/y	0.138 m/y	0.138 m/y	Site-specific
Average wind speed	4.4 m/s	4.4 m/s	4.4 m/s	Site-specific
SZ[1] Porosity	0.3	0.3	0.3	Technical Evaluation
SZ Effective Porosity	0.2	0.2	0.2	Default
SZ Hydraulic conductivity	6000 m/y	6000 m/y	6000 m/y	Site Specific – Technical Evaluation
SZ Hydraulic Gradient	0.003	0.003	0.003	Site Specific – technical Evaluation
SZ Zone b parameter	5.3	5.3	5.3	Default
Water Table Drop Rate	0.001	0.001	0.001	Default
USZ[2] Thickness	31.4 m	31.4 m	31.4 m	Site specific
USZ Density	1.5 g/cc	1.5 g/cc	1.5 g/cc	Default
USZ Total Porosity	0.3	0.3	0.3	Site specific – Technical Evaluation
USZ Effective Porosity	0.2	0.2	0.2	Default
USZ Field Capacity	0.2	0.2	0.2	Default
USZ Zone b parameter	5.3	5.3	5.3	Default
USZ Hydrologic conductivity	6000	6000	6000	Site Specific – Technical Evaluation

[1]SZ = saturated zone
[2]USZ = unsaturated zone

The occupancy and ingestion factors for the resident farmer scenario were adopted from Appendix H, where applicable. The default RESRAD values were used for parameters not addressed in Appendix H as shown in Table 7.

Table 7. Occupancy and Ingestion Factors

Exposure Parameter	Parameter Value	Source of Information
Fruit, vegetable and grain consumption	160 kg/y	Default
Leafy vegetable consumption	14 kg/y	Default
Meat and Poultry consumption	63 kg/y	Default
Soil ingestion rate	36.5 g/y	Default
Drinking water intake	510 L/y	Default
Contaminated fraction of drinking water	1.0	1.0
Contaminated fraction of plant food	0.25	Appendix H
Contaminated fraction of meat	0.25	Appendix H

Other input parameter values are given in Table 8. Ground water use parameters were included in the RESRAD analysis even though it is highly unlikely that wells would be installed for domestic use. Agricultural groundwater use in the area of the backfilled catchment basin is also unlikely. Such uses were included in the RESRAD analyses for completeness. In fact, however, the doses from groundwater pathways were zero in all cases for all time periods because of the site characteristics and the depth of cover over the Catchment Basin Excavation.

Table 8. Other Input Parameters

Parameter	Value	Source
Depth of soil mixing layer	0.15 m	Default
Root depth	0.9 m	Default
Drinking water fraction from groundwater	1.0	Default
Livestock water fraction from groundwater	1.0	Default
Irrigation fraction from groundwater	1.0	Default

RESULTS

The RESRAD-calculated doses for the benchmark and for the residual radionuclides remaining at the base of the backfilled catchment basin excavation are given in Table 9. The RESRAD output summaries are included as Appendix D.

Table 9. Benchmark and Residual Radionuclide Doses by Time Period

Time (years)	Ra-226 surf. (mrem/y)	Ra-226 subsurf. (mrem/y)	Total Ra-226 (mrem/y)	Other nuclides (mrem/y)
0	26.8	81.9	108.7	0
1	26.5	82.1	108.6	0
3	25.9	82.5	108.4	0
10	23.9	83.9	107.8	0
30	18.8	88.3	107.1	0
100	6.2	109.7	115.9	0
300	0	118.4	118.4	0
1000	0	57.9	57.9	0

The calculated dose due to surface residual contamination decreases with time due to erosion of the contaminated layer. The maximum calculated annual dose from Ra-226 in sub-surface soil was 138.3 mrem per year at 148 years after covering the material. The dose increases for the first 148 years as the 0.15 meter cover (surface Ra-226) erodes exposing the higher activity concentration sub-surface layer, then decreases as the original sub-surface layer erodes and leaches into deeper layers of soil. Groundwater dependent pathway doses were zero for all time periods.

The doses for all pathways and all time periods for the U-nat, Ra-226, and Th-230 residual soil activity concentrations were zero. As noted above, for the purpose of the RESRAD analysis, the concentrations assumed to be 100 pCi/g for Ra-226 and Th-230, and 204.5 pCi/g for U-nat. The 40 foot (12.2 meter) cover thickness ensured that the cover would not erode over a period of 1000 years. Therefore, the contaminated zone would not be exposed. There are no potential pathways of exposure with the material at a depth of 40 feet BGS.

SENSITIVITY ANALYSIS

Site-specific parameter values or values suggested in Appendix H of NUREG 1620 were used where they were known or available. Default values were used for parameters with no site-specific or Appendix H recommended values. A sensitivity analysis was performed for parameters where RESRAD default values were used. The sensitivity analyses were performed on the Ra-226 benchmark dose because the RESRAD calculated doses for the residual radionuclides in at the bottom of the Catchment Basin Excavation were zero for all pathways and time periods. It would not have been possible to identify any impact of the individual parameters using the default residual radionuclide concentrations at the Catchment Basin Excavation floor.

The sensitivity analysis was performed by modifying the parameters one at a time. The parameters used in the sensitivity analysis and the range of values for which RESRAD analyses were performed was given in Table 10. The calculated benchmark doses are also given in Table 10.

Table 10. Sensitivity Analysis for Default Parameters

Parameter	Minimum parameter Value	Maximum parameter Value	Year	Annual Dose at Min. Value (mrem/y)	Annual Dose at Max. Value (mrem/y)
Cover Erosion	0.0 m/y	0.001 m/y	0	108.6	108.7
			100	86.4	115.9
			300	63.0	118.4
Density	1.4 g/cc	1.6 g/cc	0	109.6	107.8
			100	116.3	115.4
			300	117.0	119.7
Effective Porosity	0.1	0.3	0	108.7	108.7
			100	115.9	115.9
			300	118.5	118.5
Field Capacity	0.1	0.3	0	108.7	108.7
			100	115.9	115.9
			300	118.5	118.5
Zone b parameter	1.0	10.0	0	108.7	108.7
			100	115.9	115.9
			300	118.5	118.5

The results of the sensitivity analysis indicate that, except for cover erosion, the default parameters used in the analysis do not impact the calculated dose. Density has a slight, but insignificant impact on the total dose. The lack of impact from hydrological parameters is as expected due to the depth of cover and the depth to groundwater. The dose from the groundwater pathways is zero for all RESRAD analyses.

Erosion has a significant impact since it results in loss of the surface contaminated layer with Ra-226 activity concentration of 5 pCi/g exposing the sub-surface contamination at an activity concentration of 15 pCi/g. The decrease in dose over time with zero erosion is due only to leaching of the Ra-226 into deeper soil layers. With the default erosion rate of 0.001 meters per year, the sub-surface contamination is exposed at a rate greater than the loss of contamination through leaching.

CONCLUSIONS

The annual radiation doses from residual radionuclides at the bottom of the backfilled Catchment Basin Excavation will not exceed the benchmark dose at any time over a thousand years post-reclamation. The maximum residual radionuclide concentrations, above background, in any grid are 88.7 pCi/g (grid block G0), 40.0 pCi/g (M-2), and 60.2 pCi/g (M-2) for U-nat, Th-230, and Ra-226, respectively In order to represent a worst case, the nominal residual concentrations assumed for the RESRAD analysis were 100 pCi/g each for Ra-226 and Th-230 204.5 pCi/g for U-nat (100 pCi/g U-238, 100 pCi/g U-234, and 4.5 pCi/g U-235). The U-238 and U-235 decay series were assumed to be in equilibrium. The maximum calculated doses from the radionuclides at the bottom of the back-filled Catchment Basin Excavation are zero for all time periods and all nuclides. Therefore, the completed Catchment Basin Excavation meets the requirements of the 10 CFR 40, Appendix A, Criterion 6(6) (Benchmark Criterion) and may be released for unrestricted use. Since all calculated doses are zero, there are, by definition, as low as reasonably achievable.

REFERENCES

U. S. Nuclear Regulatory Commission. 2003. NUREG 1620. *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*. Office of Nuclear Regulatory Research. Rockville, MD.

Yu. C., A. J. Zielen, J.J. Cheng, D. J. LePoire, E. Gnanapragasam, S. Kamboj, J. Amish, A. Wallo III, W. A. Williams, and H. Peterson. 2001. User's Manual for RESRAD Version 6. ANL/EAD-4. Jul

APPENDIX A

From: Paulson, Oscar (RTEA)
Sent: Tuesday, November 25, 2008 4:29 PM
To: 'James Webb'
Cc: Schutterle, Shelley (RTEA)
Subject: Request for Additional Information (RAI)
James Webb:

Based upon our telephone conversations on Thursday, November 20 and Tuesday, November 25, 2008, Kennecott Uranium Company is planning to do the following in response to the Request for Additional Information (RAI):

- Submit a request for an extension of the response time to sixty (60) days to allow additional time to prepare an adequate response.
    - This request will be mailed during the week of December 1, 2008.
- Prepare a response that will include the following elements:
    - A re-evaluation of site subsurface soil background data for natural uranium, Radium-226 and Thorium-230 that will include available subsurface background soil data collected around the facility. This data will only include data from samples collected above the water table since the Catchment Basin excavation was entirely above the water table.
- Prepare a listing of the grids eliminating those from consideration that:
    - Are wholly or partially behind the synthetic liner curtain that will be remediated at final site decommissioning and reclamation.
    - Clearly contains only natural radionuclides based on:
        - Their proximity to identified natural ore grade material discovered in the excavation
        - The fact that their position precludes tem from becoming contaminated by fluids from the Catchment Basin generally due to the fact that they are at or above the elevation of the bottom of the concrete side/open bottomed basin.
        - Other criteria including the following one form NUREG-1620:
            - *If the plan indicates that in situ ore is in the clean-up area, it should be characterized by Ra-226/U-238 ratios, visual criteria, and/or other means.*
- Apply the following criteria from NUREG-1620 to the remaining grids:
    - *However, if a subject licensee can demonstrate that no contaminated buildings will remain, and that soil thorium-230 (Th-230) does not exceed 5 pCi/g (above background) in the surface and 15 pCi/g in subsurface soil in any 100-square-meter area that meets the radium standard, and the natural uranium (U-nat, that is, U-238, U-234, and U-235) level is less than 5 pCi/g above background, radium benchmark dose modeling is not required. If future modeling with site-specific parameters for uranium recovery sites indicates that this is not a protective approach, the guidance will be revised. Therefore, it would be prudent for a uranium recovery licensee to consider the potential dose from any residual thorium and uranium.*
- Calculate using RESRAD the following:
    - Radium benchmark dose for the facility
    - The dose from any remaining natural uranium, radium-226 and thorium-230 above background in the now covered excavation bottom.
    - The dose from any remaining natural uranium, and thorium-230 above background in the now covered excavation bottom. Compare it to the radium benchmark dose as per NUREG-1620 which states:

        - *Alternatively, the licensee can derive the estimated dose from the uranium or thorium contamination (as discussed in Section 2.1.3) and compare this to the radium benchmark dose.*
    - The activities for residual natural uranium and Thorium-230 based upon the calculated radium benchmark dose
- Prepare an evaluation of the dose form the remediated area to demonstrate that it is As Low As Reasonably Achievable (ALARA). This should also if required account for the fact that the excavation had to be backfilled beginning in October 2006 due to the risks to the structures (Mill Building and Tank Slab) due to the proximity of the excavation and the observed widening of cracks between the Mill Building slab and the footer as discussed in the report.

Please reply if the above is not to your understanding regarding our two (2) telephone conversations.

Oscar Paulson

Facility Supervisor
Kennecott Uranium Company
Sweetwater Uranium Project
P.O. Box 1500
42 Miles Northwest of Rawlins
Rawlins, Wyoming 82301-1500

Telephone: (307)-324-4924
Fax: (307)-324-4925
Cellular: (307)-320-8758

E-mail: oscar.paulson@riotinto.com

From: James Webb [James.Webb@nrc.gov]
Sent: Wednesday, December 03, 2008 10:51 AM
To: Paulson, Oscar (RTEA)
Subject: Catchment Basin
Oscar,

I got your voice message. Unfortunately, I am tied up with meetings today. Your 11/26/2008 email regarding the path forward for the Catchment Basin RAIs was forwarded to ADAMS. Your email adequately captured the major points of our phone conversation last month. Please proceed accordingly.

Jim

James Webb
Health Physicist
USNRC
DWMEP Uranium Recovery Section
Mail Spot T8-F5
11545 Rockville Pike
Rockville, MD
(301) 415-6252

APPENDIX B

From: Stephen Cohen [SJC7@nrc.gov]
Sent: Tuesday, October 10, 2006 11:31 AM
To: Oscar Paulson
Cc: Bill VonTill
Subject: Re: Excavation Sample Data
Oscar:

I spoke with Robert Lukes, HP, and we both concur that the results for the grids I-2, S5, and S6 are acceptable, as long as you can make a case that the radium is naturally occurring. You have already done so for S5 and S6. Grid N4 is close enough to 16.4 pCi/g that it's acceptable. This whole issue should be explained in detail in your construction completion report. If you have any questions, please call me.

Sincerely:

Stephen J. Cohen, PG
Hydrogeologist
US Nuclear Regulatory Commission
Office of Federal and State Materials and
Environmental Management Programs
Mailspot T7E18
Washington, DC 20555-0001
301-415-7182
sjc7@nrc.gov

>>> "Oscar Paulson" <paulson@tribcsp.com> 10/10/2006 1:17 PM >>>
Stephen Cohen:

Attached please find the Microsoft Excel (*.xls) file CB_Samples_10_09_06.xls that contains sample results for the excavation. The following pertains:

1. Sampling

As per the submittals a nine (9) point composite from 0 to 6 inches below surface was collected from each grid. In addition, spot samples (each from 0 to 6 inches below surface) at the corners of grids and at the center points of grids were collected. The different sample types are denoted:

D6 Composite - Nine (9) point composite sample collected within a grid
D6 Center/Spot - Spot sample of the grid center
D6 Spot - Spot sample of a grid corner

A grid for purposes of identification is named after the letter/number designation of its Northwest corner.

The contours on the map are one (1) foot contours.

Location data in Northings and Eastings are shown for all samples. Samples collected from the pit floor do not have elevations since they come from the bottom. Elevations for these samples can be derived from the contour map. Other samples have elevations associated with them.

In addition the following other groups of samples were collected:

CB - 21 Series

These were collected around the excavated bore hole CB-21 as committed to in Appendix 7 of the excavation submittal submitted on January 18, 2005.

Hot Spot #2 to #4 Series

These were collected in the West highwall beneath the clarifier slab. This area will be covered by the liner curtain.

Hot Spot #1/SE Corner of Mill Bldg.Series

These were collected on the Northern highwall of the original excavation. This material was removed when the Northern extension to the excavation was completed.

TMW-90 Series

These were collected in the excavation dug to remove the remains of the casing for TMW-90 the perched fluid collection well. This entire area was dug deeper once the contamination in the sample collected four (4) feet above the casing bottom was discovered. Sampling following this additional excavation is reflected in the composite and composite samples in the area. The well was in Grid E8.

Wall Series (#1 to #5)

These were collected in the excavation highwall around TMW-11 to investigate sands with an organic odor. None exceeded any limits.

15' N of SE Corner Mill Bldg
45' N of SE Corner Mill Bldg
Under Tails Line Pit Bottom

These were collected around points in the highwall beneath the East wall of the Mill Building identified as seeps on the map that will be covered by the liner curtain.

Ore Pad Fill

The Ore Pad material for use as fill was sampled to determine that it is suitable for use as backfill which it is since it is below 16.4 picoCuries per gram Radium-226.

If you require any additional information on other samples that are not discussed please e-mail me.

Analysis

All samples were analyzed for Radium-226 via the closed can method. The samples were canned and sealed in the filed and a preliminary count conducted upon their arrival in the laboratory. The can was then unsealed the contents dried, moisture content determined resealed and allowed to ingrow for a final count. The preliminary count was corrected for the determined moisture content and provided for use a immediate guidance.

All composite samples in addition to Radium-226 were analyzed for natural uranium, thorium-230, pH, sulphate, and Diesel Range Organics (DRO). The samples were analyzed for pH and sulphate since low pH and high sulphate content are considered indicators of process fluids.

Gamma Radiation Measurements

In the submittal Kennecott Uranium Company stated that composite sampling and analysis of each grid would be conducted. However, in addition direct gamma radiation measurements were collected in the excavation bottom at various surveyed points including grid corners, grid centers, monitor well locations and other locations that were surveyed as the readings were collected. The readings were collected using a Ludlum Model 44-10 probe equipped

with a forty-four (44) pound "shine shield" and a Model 2350-1 rate meter. One (1) minute counts were used. The probes used were calibrated by Energy Laboratories, Inc. using a 110 microCurie Radium-226 source. A conversion factor in CPM/microR per hour was generated for each probe used.

Given the fact that the samples collected in the bottom of the Northern extension of the excavation have high pHs, low sulphate concentration and no detectable Diesel Range Organics (DRO) it appears that the elevated Radium-226 concentrations are natural. The unambiguous contamination in the highwall beneath the East wall of the Mill Building had detectable Diesel Range Organics (DRO) associated with it. The grids on the excavation floor do not. In addition, the grid (I minus 2) most contaminated with Radium-226 (35.5 picoCuries per gram - preliminary) is the furthest from the Catchment Basin and the contamination in the highwall beneath the East wall of the Mill Building. This does not make sense. It is likely that the Radium-226 in these grids is natural given the fact that the elevation of the pit floor is 6598 above Mean Sea Level (MSL) approximately forty (40) feet below surface. The background radium-226 value used for the site was determined from surface samples. This value may not apply to samples collected at depth.

Oscar Paulson
Facility Supervisor

From: Oscar Paulson - Bresnan - Proxy [oscar.paulson@bresnan.net]
Sent: Friday, October 06, 2006 1:02 PM
To: Stephen Cohen
Cc: shelley@tribcsp.com; Oscar Paulson
Subject: Excavation Grid Sampling

Attachments: excavation_contours_03.ppt
Stephen Cohen:

The following pertains to grids exceeding the 16.4 picoCurie per gram Radium-226 (15 picoCuries per gram plus background) threshold and grids with preliminary (partially ingrown) results approaching that threshold:

1. Grid R6

The initial sample was 21.8 picoCuries per gram. The grid was excavated an additional two (2) feet and a second composite sample was collected. The preliminary (partially ingrown) result for the second sample is 5.6 picoCuries per gram. It appears as if this grid has been addressed.

2. Grid N5

The initial sample was 17.9 picoCuries per gram. The grid was excavated an additional two (2) feet and a second composite sample was collected. The preliminary (partially ingrown) result for the second sample is 12.4 picoCuries per gram.

2. Grids S5 and S6

The sample data for these grids is as follows:

		S5	S6
Radium-226 (Preliminary)	**(pCi/gr)**	19.7	33.1
Natural uranium	**(pCi/gr)**	17	23.6
Natural uranium	**(mg/kg)**	25.1	35
Uranium-238 Activity	**(pCi/gr)**	8.5	11.8
Thorium-230	**(pCi/gr)**	12	73
pH		8.83	7.84
Sulphate	**(mg/kg)**	168	331
Diesel Range Organics (DRO)	**(mg/kg)**	ND	ND

These two (2) grids are outside of the planned excavation and are located in an access ramp dug to access contaminated material within the main excavation. Please see that attached PowerPoint (*.ppt) file excavation_contours_03.ppt that shows the September 22, 2006 excavation contours, the outline of the originally planned excavation, grids exceeding 16.4 picoCuries per gram radium-226 in purple herringbone hatch and grids approaching (on preliminary analysis) 16.4 picocuries per gram Radium-226

in blue dash hatch.The centers of the grids are at an elevation of roughly 6624 feet above Mean Sea Level (MSL) placing them two (2) feet below the bottom of the Catchment Basin at 6626 above Mean Sea Level (MSL). It is not conceivable given their distance from the Catchment Basin (370 feet East) and the fact that they are only two (2) feet below its bottom that they could be impacted by fluids from it. They contain no Diesel Range Organics (DRO). The Uranium-238 activity is roughly one-half to one-third of the Radium-226 activity which roughly fits with the state of equilibrium of the uranium resource present in the area.

Regardless, an additional two (2) feet was excavated from each of the above two (2) grids and they were resampled on Wednesday, October 4, 2006. In addition, three (3) other grids (T5, X4 and Y4) were also excavated an additional two (2) feet since their preliminary (partially ingrown) results for Radium-226 were high but did not yet exceed the 16.4 picoCurie per gram limit.

All five (S5, S6, T5, X4 and Y4) of these grids were peculiar in appearance in that they contained patches of light gray sand and patched of oxidized brown/tan sand. They may be located within a near surface oxidation/reduction front in which case the contamination would be natural.

3. Grids in the Northern Extension of the Excavation East of the Mill Building

3.1. Grids with Preliminary Radium-226 Values Exceeding 16.4 PicoCuries per gram

I - 2 Composite - 35.5 picoCuries per gram

3.2. Grids with Preliminary Radium-226 Values Sufficiently High that the Final Analysis Will Probably Exceed 16.4 PicoCuries per gram

H2 Composite - 13.4 picoCuries per gram
H1 Composite - 13.8 picoCuries per gram
J3 Composite - 14.2 picoCuries per gram
I4 Composite - 13.0 picoCuries per gram
I2 Composite - 16.3 picoCuries per gram
J1 Composite - 14.8 picoCuries per gram
J - 1 Composite - 14.0 picoCuries per gram
I0 Composite - 13.9 picoCuries per gram
H0 Composite - 13.6 picoCuries per gram
I-1 Composite - 15.5 picoCuries per gram
I1 composite - 14.7 picoCuries per gram

Please note that the sample collected from a wet area beneath the tailings line in the base of the highwall below the East Wall of the Mill Building in Grid G3 had a preliminary Radium-226 concentration of 35.0 picoCuries per gram. The elevation of the wet area is 6599.43 above Mean Sea Level (MSL). This wet area had a Diesel Range Organics (DRO) concentration of 4420 milligrams per kilogram. The sample collected North of that location in a hole excavated in the pit bottom on the Eastern side of Grid G2 had a preliminary Radium-226 concentration of 4.3 picoCuries per gram and a Diesel Range Organics (DRO) concentration of Non-Detect. That sample was collected at 6594.48 feet above Mean Sea Level (MSL). The Eastern part of that hole also extends into the H2 grid which had a composite preliminary Radium-226 concentration of 13.4 picoCuries per gram. The H2 grid has an elevation of 6598 feet above Mean Sea Level (MSL).

Based upon the above information, it appears that Radium-226 bearing fluids may have spread out on top of the clay at 6598 feet above Mean Sea Level (MSL). A sample collected four (4) feet below that elevation, as was done in the bottom of the test pit straddling the border between the G2 and H2 grids had a preliminary Radium-226 concentration of 4.3 picoCuries per gram .

At this point, given the above information the only solution is to excavate the above listed grids down an additional four (4) feet to the elevation of the clean sample in the hole straddling the border of the G2 and and H2 grids and resample them.

Oscar Paulson
Facility Supervisor

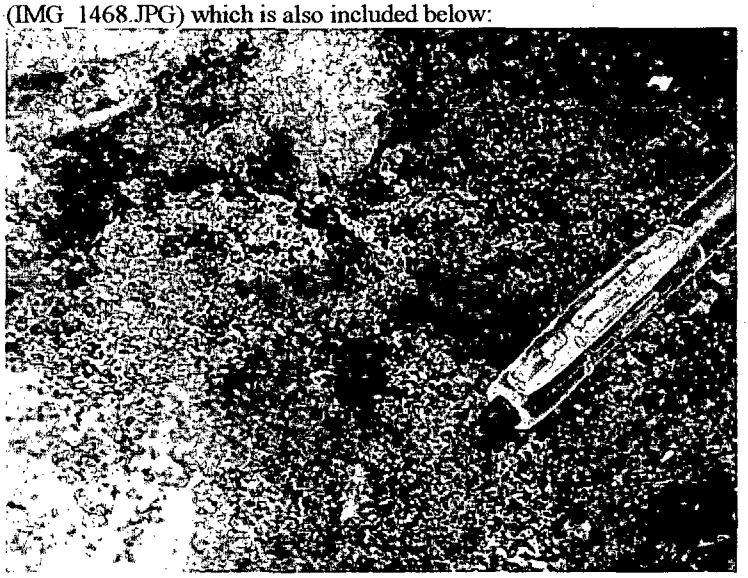
APPENDIX C

From: Paulson, Oscar (RTEA)
Sent: Sunday, June 24, 2007 1:29 PM
To: (SJC7@nrc.gov)
Cc: Schutterle, Shelley (RTEA)
Subject: Catchment Basin excavation - Kminus3 Area (northeast Corner)

Attachments: IMG_1468.JPG; ELI1845.doc

Stephen Cohen:

The following information is being provided as documentation that the radium-226 and the associated organic materials found in the Kminus3 grid and the Northeast corner of the Catchment Basin Excavation are in fact naturally occurring and as such that area of the excavation is being backfilled and the excavation is being completed:

- **Discovery of black organic material in the Northeast corner of the excavation**
  - While excavating radium-226 in excess of 15 picoCuries per gram above accepted background in the Northeast corner of the excavation in and around and east of the Kminus3 grid, sand containing black organic material was discovered as shown in the attached image (IMG_1468.JPG) which is also included below:
  - 
- **Analysis of this material and the surrounding sand**
  - Analysis results for this material and the surrounding sand are included below:

Sample	Uranium	Thorium-230		Radium-226		Organic Characteristics			
		Activity	Precision	Activity	Precision	DRO	ORH	THE	TOC
	(mg/kg)	(pci/gr)	(pci/gr)	(pci/gr)	(pci/gr)	(mg/kg)	(mg/kg)	(mg/kg)	(percent)
Black material	2550	393	17	396	9	226	804	1000	22
Sand with Black material	2350	708	29	326	6.4	211	650	834	5

  - This material exhibits high concentration of organics, 22 percent for the black material shown in the image and 5 percent for the surrounding sands.
  - The material also contains high concentrations of uranium, thorium and radium-226
  - The black material was analyzed by Energy Laboratories, Inc who also had it examined by:

Gareth D. Mitchell
Consulting Geologist

- He concluded his examination by stating:

  These observations demonstrate that the organic matter contained in sample #C07051289-001A were derived from terrestrial plants with secondary woody tissues that have gone through at least the initial stage of coalification. Depending upon stratigraphy and sample location in the field, the type and condition of organic matter and mineralization observed suggests that it is naturally occurring.

  His report is attached as the Microsoft word (*.doc) file ELI845.doc

Based on the above report it is concluded that the anomalous radium-226 concentration discovered in the Kminus3 grid and in surrounding areas including some grids remaining in the excavation in this area at present, are natural and are derived from naturally occurring uranium in the sands concentrated by localized naturally occurring organic materials. The probability (pending receipt of analytical results) that the contamination in the Kminus3 area was natural was briefly discussed with you in a telephone conversation on Wednesday, May 23, 2007.

If you have any questions please do not hesitate to contact me.

Oscar Paulson

Facility Supervisor
Kennecott Uranium Company
Sweetwater Uranium Project
P.O. Box 1500
42 Miles Northwest of Rawlins
Rawlins, Wyoming 82301-1500

Telephone: (307)-324-4924
Fax: (307)-324-4925
Cellular: (307)-320-8758

E-mail: oscar.paulson@riotinto.com

APPENDIX D
RESRAD SUMMARY OUTPUT FILES

Summary : Kennecott CB Ra 5 cm
File : C:\RESRAD_FAMILY\RESRAD\KENNECOTT RA 5 CM 1-10.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+01 12
Time = 3.000E+01 13
Time = 1.000E+02 14
Time = 3.000E+02 15
Time = 1.000E+03 16
Dose/Source Ratios Summed Over All Pathways 17
Single Radionuclide Soil Guidelines 17
Dose Per Nuclide Summed Over All Pathways 18
Soil Concentration Per Nuclide 18

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

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)

#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.

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.270E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.000E+02	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): Pb-210	5.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E+00	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
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	3.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	6.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	6.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.380E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	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)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	6.000E+03	1.000E+02	---	HCSZ

R014	Saturated zone hydraulic gradient	3.000E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

0

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	3.140E+01	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	6.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.511E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.868E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	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)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	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)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.500E-01	-1	---	FPLANT
R018	Contamination fraction of meat	2.500E-01	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	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)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR

R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	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
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

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	22700.00 square meters	Pb-210	5.000E+00
Thickness:	0.15 meters	Ra-226	5.000E+00
Cover Depth:	0.00 meters		

0

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):	2.678E+01	2.648E+01	2.590E+01	2.392E+01	1.881E+01	6.212E+00	0.000E+00	0.000E+00
M(t):	1.071E+00	1.059E+00	1.036E+00	9.566E-01	7.523E-01	2.485E-01	0.000E+00	0.000E+00

0Maximum TDOSE(t): 2.678E+01 mrem/yr at t = 0.000E+00 years

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.290E-02	0.0005	3.579E-03	0.0001	0.000E+00	0.0000	2.583E+00	0.0965	2.755E-01	0.0103	0.000E+00	0.0000	9.747E-01	0.0364
Ra-226	2.068E+01	0.7722	1.400E-03	0.0001	0.000E+00	0.0000	1.950E+00	0.0728	1.038E-01	0.0039	0.000E+00	0.0000	1.946E-01	0.0073
Total	2.069E+01	0.7727	4.979E-03	0.0002	0.000E+00	0.0000	4.533E+00	0.1693	3.792E-01	0.0142	0.000E+00	0.0000	1.169E+00	0.0437

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.850E+00	0.1438
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	2.293E+01	0.8562
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	2.678E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.243E-02	0.0005	3.427E-03	0.0001	0.000E+00	0.0000	2.474E+00	0.0934	2.638E-01	0.0100	0.000E+00	0.0000	9.334E-01	0.0352
Ra-226	2.046E+01	0.7727	1.488E-03	0.0001	0.000E+00	0.0000	2.000E+00	0.0755	1.107E-01	0.0042	0.000E+00	0.0000	2.212E-01	0.0084
Total	2.047E+01	0.7731	4.915E-03	0.0002	0.000E+00	0.0000	4.474E+00	0.1689	3.745E-01	0.0141	0.000E+00	0.0000	1.155E+00	0.0436

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.687E+00	0.1392
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	2.280E+01	0.8608
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	2.648E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.154E-02	0.0004	3.142E-03	0.0001	0.000E+00	0.0000	2.268E+00	0.0876	2.419E-01	0.0093	0.000E+00	0.0000	8.558E-01	0.0330
Ra-226	2.004E+01	0.7737	1.644E-03	0.0001	0.000E+00	0.0000	2.086E+00	0.0805	1.229E-01	0.0047	0.000E+00	0.0000	2.693E-01	0.0104
Total	2.005E+01	0.7742	4.787E-03	0.0002	0.000E+00	0.0000	4.354E+00	0.1681	3.648E-01	0.0141	0.000E+00	0.0000	1.125E+00	0.0434

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.381E+00	0.1305
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	2.252E+01	0.8695
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	2.590E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	8.897E-03	0.0004	2.316E-03	0.0001	0.000E+00	0.0000	1.672E+00	0.0699	1.783E-01	0.0075	0.000E+00	0.0000	6.308E-01	0.0264
Ra-226	1.860E+01	0.7777	2.035E-03	0.0001	0.000E+00	0.0000	2.276E+00	0.0952	1.533E-01	0.0064	0.000E+00	0.0000	3.938E-01	0.0165
Total	1.861E+01	0.7780	4.351E-03	0.0002	0.000E+00	0.0000	3.948E+00	0.1651	3.316E-01	0.0139	0.000E+00	0.0000	1.025E+00	0.0428

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.492E+00	0.1042
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	2.142E+01	0.8958
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	2.392E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0 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.
Pb-210	4.214E-03	0.0002	9.543E-04	0.0001	0.000E+00	0.0000	6.889E-01	0.0366	7.347E-02	0.0039	0.000E+00	0.0000	2.599E-01	0.0138
Ra-226	1.487E+01	0.7909	2.274E-03	0.0001	0.000E+00	0.0000	2.228E+00	0.1184	1.727E-01	0.0092	0.000E+00	0.0000	5.030E-01	0.0267
Total	1.488E+01	0.7911	3.228E-03	0.0002	0.000E+00	0.0000	2.917E+00	0.1551	2.462E-01	0.0131	0.000E+00	0.0000	7.629E-01	0.0406

0

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
0 Water Dependent Pathways

0 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.
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	1.028E+00	0.0546
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	1.778E+01	0.9454
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	1.881E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0 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.
Pb-210	2.734E-04	0.0000	3.051E-05	0.0000	0.000E+00	0.0000	2.204E-02	0.0035	2.351E-03	0.0004	0.000E+00	0.0000	8.310E-03	0.0013
Ra-226	5.281E+00	0.8501	7.362E-04	0.0001	0.000E+00	0.0000	6.675E-01	0.1075	5.618E-02	0.0090	0.000E+00	0.0000	1.736E-01	0.0279
Total	5.281E+00	0.8502	7.667E-04	0.0001	0.000E+00	0.0000	6.895E-01	0.1110	5.853E-02	0.0094	0.000E+00	0.0000	1.819E-01	0.0293

0

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
0 Water Dependent Pathways

0 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.
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	3.300E-02	0.0053
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	6.179E+00	0.9947
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	6.212E+00	1.0000

0*Sum of all water independent and dependent pathways.

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
0 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.
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
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
0 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.
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
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

0*Sum of all water independent and dependent pathways.

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
0 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.
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
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
0 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.
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
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

0*Sum of all water independent and dependent pathways.

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

0 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
Pb-210+D	Pb-210+D	1.000E+00	7.700E-01	7.374E-01	6.762E-01	4.984E-01	2.055E-01	6.600E-03	0.000E+00	0.000E+00
0Ra-226+D	Ra-226+D	1.000E+00	4.572E+00	4.522E+00	4.424E+00	4.094E+00	3.245E+00	1.118E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.365E-02	3.697E-02	7.912E-02	1.910E-01	3.105E-01	1.176E-01	0.000E+00	0.000E+00
Ra-226+D	-DSR(j)		4.585E+00	4.559E+00	4.503E+00	4.285E+00	3.556E+00	1.236E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.
0

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

0Nuclide (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
Pb-210	3.247E+01	3.390E+01	3.697E+01	5.016E+01	1.217E+02	3.788E+03	*7.634E+13	*7.634E+13
Ra-226	5.452E+00	5.483E+00	5.551E+00	5.835E+00	7.031E+00	2.023E+01	*9.885E+11	*9.885E+11

*At specific activity limit
0

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

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	5.000E+00	0.000E+00	7.700E-01	3.247E+01	7.700E-01	3.247E+01
Ra-226	5.000E+00	0.000E+00	4.585E+00	5.452E+00	4.585E+00	5.452E+00

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

0Nuclide (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
Pb-210	Pb-210	1.000E+00	3.850E+00	3.687E+00	3.381E+00	2.492E+00	1.028E+00	3.300E-02	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	6.824E-02	1.849E-01	3.956E-01	9.552E-01	1.552E+00	5.878E-01	0.000E+00	0.000E+00
Pb-210	-DOSE(j)		3.918E+00	3.872E+00	3.776E+00	3.447E+00	2.580E+00	6.208E-01	0.000E+00	0.000E+00
0Ra-226	Ra-226	1.000E+00	2.286E+01	2.261E+01	2.212E+01	2.047E+01	1.623E+01	5.591E+00	0.000E+00	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (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
Pb-210	Pb-210	1.000E+00	5.000E+00	4.820E+00	4.480E+00	3.468E+00	1.668E+00	1.287E-01	8.536E-05	6.405E-16
Pb-210	Ra-226	1.000E+00	0.000E+00	1.520E-01	4.360E-01	1.246E+00	2.450E+00	2.254E+00	4.552E-01	1.363E-03
Pb-210	-S(j):		5.000E+00	4.972E+00	4.916E+00	4.714E+00	4.118E+00	2.382E+00	4.552E-01	1.363E-03
0Ra-226	Ra-226	1.000E+00	5.000E+00	4.959E+00	4.877E+00	4.602E+00	3.898E+00	2.180E+00	4.144E-01	1.241E-03

THF(i) is the thread fraction of the parent nuclide.
RESCALC.EXE execution time = 0.45 seconds

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+01 12
Time = 3.000E+01 13
Time = 1.000E+02 14
Time = 3.000E+02 15
Time = 1.000E+03 16
Dose/Source Ratios Summed Over All Pathways 17
Single Radionuclide Soil Guidelines 17
Dose Per Nuclide Summed Over All Pathways 18
Soil Concentration Per Nuclide 18

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

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)

#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.

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.270E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.000E+02	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): Pb-210	1.500E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.500E+01	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R013	Cover depth (m)	1.500E-01	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	3.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	6.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	6.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.380E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	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)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	6.000E+03	1.000E+02	---	HCSZ

R014	Saturated zone hydraulic gradient	3.000E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

0

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	3.140E+01	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	6.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.133E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.901E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	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)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	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)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.500E-01	-1	---	FPLANT
R018	Contamination fraction of meat	2.500E-01	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	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)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR

R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	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
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

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	22700.00 square meters	Pb-210	1.500E+01
Thickness:	2.00 meters	Ra-226	1.500E+01
Cover Depth:	0.15 meters		

0

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):	8.188E+01	8.211E+01	8.251E+01	8.395E+01	8.830E+01	1.097E+02	1.184E+02	5.787E+01
M(t):	3.275E+00	3.284E+00	3.300E+00	3.358E+00	3.532E+00	4.386E+00	4.738E+00	2.315E+00

0Maximum TDOSE(t): 1.383E+02 mrem/yr at t = 148.8 ñ 0.3 years

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.488E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	3.446E-04	0.0000	9.896E-05	0.0000	0.000E+00	0.0000	4.299E-01	0.0031	1.467E-02	0.0001	0.000E+00	0.0000	2.695E-02	0.0002
Ra-226	6.169E+01	0.4461	1.293E-02	0.0001	0.000E+00	0.0000	7.080E+01	0.5119	2.279E+00	0.0165	0.000E+00	0.0000	3.040E+00	0.0220
Total	6.169E+01	0.4461	1.303E-02	0.0001	0.000E+00	0.0000	7.123E+01	0.5151	2.293E+00	0.0166	0.000E+00	0.0000	3.067E+00	0.0222

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.488E+02 years

0 Water Dependent Pathways

0

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	4.720E-01	0.0034
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	1.378E+02	0.9966
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	1.383E+02	1.0000

0*Sum of all water independent and dependent pathways.

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
0 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.
Pb-210	1.097E-03	0.0000	3.581E-05	0.0000	0.000E+00	0.0000	3.897E+01	0.4760	7.696E-01	0.0094	0.000E+00	0.0000	9.753E-03	0.0001
Ra-226	1.194E+01	0.1458	1.429E-05	0.0000	0.000E+00	0.0000	2.945E+01	0.3597	7.320E-01	0.0089	0.000E+00	0.0000	2.011E-03	0.0000
Total	1.194E+01	0.1458	5.010E-05	0.0000	0.000E+00	0.0000	6.843E+01	0.8357	1.502E+00	0.0183	0.000E+00	0.0000	1.176E-02	0.0001

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
0 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.
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	3.975E+01	0.4855
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	4.213E+01	0.5145
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	8.188E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 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.
Pb-210	1.084E-03	0.0000	1.045E-04	0.0000	0.000E+00	0.0000	3.782E+01	0.4606	7.510E-01	0.0091	0.000E+00	0.0000	2.845E-02	0.0003
Ra-226	1.207E+01	0.1470	4.575E-05	0.0000	0.000E+00	0.0000	3.068E+01	0.3736	7.591E-01	0.0092	0.000E+00	0.0000	6.823E-03	0.0001
Total	1.207E+01	0.1470	1.502E-04	0.0000	0.000E+00	0.0000	6.849E+01	0.8342	1.510E+00	0.0184	0.000E+00	0.0000	3.527E-02	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
0 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.
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	3.860E+01	0.4701
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	4.351E+01	0.5299
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	8.211E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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.
Pb-210	1.059E-03	0.0000	2.291E-04	0.0000	0.000E+00	0.0000	3.560E+01	0.4315	7.153E-01	0.0087	0.000E+00	0.0000	6.240E-02	0.0008
Ra-226	1.233E+01	0.1494	1.210E-04	0.0000	0.000E+00	0.0000	3.298E+01	0.3997	8.079E-01	0.0098	0.000E+00	0.0000	1.982E-02	0.0002
Total	1.233E+01	0.1494	3.501E-04	0.0000	0.000E+00	0.0000	6.858E+01	0.8311	1.523E+00	0.0185	0.000E+00	0.0000	8.222E-02	0.0010

0

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
0 Water Dependent Pathways
0

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.
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	3.638E+01	0.4409
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	4.613E+01	0.5591
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	8.251E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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.
Pb-210	9.749E-04	0.0000	5.516E-04	0.0000	0.000E+00	0.0000	2.882E+01	0.3434	6.020E-01	0.0072	0.000E+00	0.0000	1.502E-01	0.0018
Ra-226	1.327E+01	0.1581	4.938E-04	0.0000	0.000E+00	0.0000	4.004E+01	0.4769	9.661E-01	0.0115	0.000E+00	0.0000	9.539E-02	0.0011
Total	1.327E+01	0.1581	1.045E-03	0.0000	0.000E+00	0.0000	6.886E+01	0.8203	1.568E+00	0.0187	0.000E+00	0.0000	2.456E-01	0.0029

0

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
0 Water Dependent Pathways
0

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.
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	2.958E+01	0.3523
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	5.437E+01	0.6477
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	8.395E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	7.709E-04	0.0000	8.535E-04	0.0000	0.000E+00	0.0000	1.576E+01	0.1784	3.637E-01	0.0041	0.000E+00	0.0000	2.325E-01	0.0026
Ra-226	1.640E+01	0.1857	2.136E-03	0.0000	0.000E+00	0.0000	5.375E+01	0.6087	1.327E+00	0.0150	0.000E+00	0.0000	4.704E-01	0.0053
Total	1.640E+01	0.1857	2.989E-03	0.0000	0.000E+00	0.0000	6.950E+01	0.7871	1.691E+00	0.0191	0.000E+00	0.0000	7.029E-01	0.0080

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.635E+01	0.1852
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	7.195E+01	0.8148
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	8.830E+01	1.0000

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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.
Pb-210	3.536E-04	0.0000	3.102E-04	0.0000	0.000E+00	0.0000	1.893E+00	0.0173	5.673E-02	0.0005	0.000E+00	0.0000	8.448E-02	0.0008
Ra-226	3.463E+01	0.3158	8.905E-03	0.0001	0.000E+00	0.0000	6.889E+01	0.6282	2.012E+00	0.0183	0.000E+00	0.0000	2.084E+00	0.0190
Total	3.463E+01	0.3158	9.215E-03	0.0001	0.000E+00	0.0000	7.078E+01	0.6455	2.069E+00	0.0189	0.000E+00	0.0000	2.169E+00	0.0198

0

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
0 Water Dependent Pathways
0

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.
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	2.035E+00	0.0186
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	1.076E+02	0.9814
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	1.097E+02	1.0000

0*Sum of all water independent and dependent pathways.

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
0 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.
Pb-210	3.091E-06	0.0000	8.508E-07	0.0000	0.000E+00	0.0000	3.682E-03	0.0000	1.259E-04	0.0000	0.000E+00	0.0000	2.317E-04	0.0000
Ra-226	5.275E+01	0.4453	1.122E-02	0.0001	0.000E+00	0.0000	6.107E+01	0.5156	1.969E+00	0.0166	0.000E+00	0.0000	2.639E+00	0.0223
Total	5.275E+01	0.4453	1.122E-02	0.0001	0.000E+00	0.0000	6.108E+01	0.5157	1.969E+00	0.0166	0.000E+00	0.0000	2.640E+00	0.0223

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
0 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.
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	4.044E-03	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	1.184E+02	1.0000
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	1.184E+02	1.0000

0*Sum of all water independent and dependent pathways.

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
0 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.
Pb-210	8.223E-16	0.0000	2.264E-16	0.0000	0.000E+00	0.0000	9.797E-13	0.0000	3.349E-14	0.0000	0.000E+00	0.0000	6.165E-14	0.0000
Ra-226	2.577E+01	0.4453	5.479E-03	0.0001	0.000E+00	0.0000	2.984E+01	0.5157	9.619E-01	0.0166	0.000E+00	0.0000	1.290E+00	0.0223
Total	2.577E+01	0.4453	5.479E-03	0.0001	0.000E+00	0.0000	2.984E+01	0.5157	9.619E-01	0.0166	0.000E+00	0.0000	1.290E+00	0.0223

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
0 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.
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	1.076E-12	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	5.787E+01	1.0000
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	5.787E+01	1.0000

0*Sum of all water independent and dependent pathways.

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

0 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
Pb-210+D	Pb-210+D	1.000E+00	2.650E+00	2.573E+00	2.425E+00	1.972E+00	1.090E+00	1.357E-01	2.696E-04	7.173E-14
0Ra-226+D	Ra-226+D	1.000E+00	2.759E+00	2.768E+00	2.787E+00	2.857E+00	3.082E+00	4.344E+00	5.281E+00	2.580E+00
Ra-226+D	Pb-210+D	1.000E+00	4.966E-02	1.323E-01	2.880E-01	7.680E-01	1.714E+00	2.831E+00	2.615E+00	1.278E+00
Ra-226+D	-DSR(j)		2.809E+00	2.901E+00	3.075E+00	3.625E+00	4.796E+00	7.175E+00	7.896E+00	3.858E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.
0

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

0Nuclide (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
Pb-210	9.433E+00	9.716E+00	1.031E+01	1.268E+01	2.293E+01	1.842E+02	9.273E+04	*7.634E+13
Ra-226	8.901E+00	8.619E+00	8.129E+00	6.897E+00	5.212E+00	3.484E+00	3.166E+00	6.481E+00

*At specific activity limit
0

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 = 148.8 ñ 0.3 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	1.500E+01	0.000E+00	2.650E+00	9.433E+00	3.146E-02	7.946E+02
Ra-226	1.500E+01	148.7 ñ 0.3	9.188E+00	2.721E+00	9.188E+00	2.721E+00

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

0Nuclide (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
Pb-210	Pb-210	1.000E+00	3.975E+01	3.860E+01	3.638E+01	2.958E+01	1.635E+01	2.035E+00	4.044E-03	1.076E-12
Pb-210	Ra-226	1.000E+00	7.449E-01	1.985E+00	4.320E+00	1.152E+01	2.572E+01	4.246E+01	3.923E+01	1.917E+01
Pb-210	-DOSE(j)		4.050E+01	4.058E+01	4.070E+01	4.110E+01	4.207E+01	4.449E+01	3.924E+01	1.917E+01
0Ra-226	Ra-226	1.000E+00	4.138E+01	4.152E+01	4.181E+01	4.285E+01	4.623E+01	6.517E+01	7.921E+01	3.870E+01

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (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
Pb-210	Pb-210	1.000E+00	1.500E+01	1.453E+01	1.365E+01	1.095E+01	5.831E+00	6.430E-01	1.182E-03	3.144E-13
Pb-210	Ra-226	1.000E+00	0.000E+00	4.587E-01	1.333E+00	3.978E+00	8.890E+00	1.316E+01	1.125E+01	5.499E+00
Pb-210	-S(j):		1.500E+01	1.499E+01	1.498E+01	1.493E+01	1.472E+01	1.380E+01	1.126E+01	5.499E+00
0Ra-226	Ra-226	1.000E+00	1.500E+01	1.498E+01	1.495E+01	1.485E+01	1.455E+01	1.354E+01	1.103E+01	5.391E+00

THF(i) is the thread fraction of the parent nuclide.
RESCALC.EXE execution time = 0.50 seconds

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 5
Summary of Pathway Selections 10
Contaminated Zone and Total Dose Summary 11
Total Dose Components
Time = 0.000E+00 12
Time = 1.000E+00 13
Time = 3.000E+00 14
Time = 1.000E+01 15
Time = 3.000E+01 16
Time = 1.000E+02 17
Time = 3.000E+02 18
Time = 1.000E+03 19
Dose/Source Ratios Summed Over All Pathways 20
Single Radionuclide Soil Guidelines 21
Dose Per Nuclide Summed Over All Pathways 22
Soil Concentration Per Nuclide 23

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: 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	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(6)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(7)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(8)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(9)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(10)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(11)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(12)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(13)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(14)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(15)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(16)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(17)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(18)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(19)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(20)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(21)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(22)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(23)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(24)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(25)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(26)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(27)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(28)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(29)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(30)
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	2.320E-02	1.360E-02	DCF2(3)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(4)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(5)
B-1	U-234	1.320E-01	1.320E-01	DCF2(6)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(7)
B-1	U-238	1.180E-01	1.180E-01	DCF2(8)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(9)

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	7.276E-03	5.370E-03	DCF3(3)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(4)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(5)
D-1	U-234	2.830E-04	2.830E-04	DCF3(6)

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

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(7)
D-1	U-238	2.550E-04	2.550E-04	DCF3(8)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(9)
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	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
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)
```

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

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

#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.

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.270E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.000E+02	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	4.500E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pa-231	4.500E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+02	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+02	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+02	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+02	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): U-235	4.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+02	0.000E+00	---	S1(8)
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(4)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(8)
R013	Cover depth (m)	1.220E+01	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	3.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	6.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	6.000E-01	5.000E-01	---	EVAPTR

R013	Precipitation (m/yr)	1.380E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	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)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	6.000E+03	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	3.000E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	3.140E+01	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	6.000E+03	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)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.056E-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)	5.000E+01	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.255E-04	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)	1.000E+02	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.133E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)

R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.901E-04	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.898E-07	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.255E-04	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.255E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.255E-04	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	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)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	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)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.500E-01	-1	---	FPLANT
R018	Contamination fraction of meat	2.500E-01	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	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)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR

R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	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
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

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	22700.00 square meters	Ac-227	4.500E+00
Thickness:	2.00 meters	Pa-231	4.500E+00
Cover Depth:	12.20 meters	Pb-210	1.000E+02
		Ra-226	1.000E+02
		Th-230	1.000E+02
		U-234	1.000E+02
		U-235	4.500E+00
		U-238	1.000E+02

0

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):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
M(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0Maximum TDOSE(t): 0.000E+00 mrem/yr at t = 0.000E+00 years

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- 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
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
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

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- 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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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
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
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

0

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
0 Water Dependent Pathways
0

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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-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
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
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

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- 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
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
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

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- 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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- 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
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
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

0

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
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- 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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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
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
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

0

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
0 Water Dependent Pathways
0

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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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
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
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

0

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
0 Water Dependent Pathways
0

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
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
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

0*Sum of all water independent and dependent pathways.

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
0 Water Independent Pathways (Inhalation excludes radon)
0

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
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
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

0

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
0 Water Dependent Pathways
0

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
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
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

0*Sum of all water independent and dependent pathways.

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

0 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	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0Pa-231	Pa-231	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
Pa-231	Ac-227+D	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
Pa-231	-DSR(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
0Pb-210+D	Pb-210+D	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
0Ra-226+D	Ra-226+D	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
Ra-226+D	Pb-210+D	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
Ra-226+D	-DSR(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
0Th-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	0.000E+00
Th-230	Ra-226+D	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	Pb-210+D	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	-DSR(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
0U-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	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	0.000E+00
U-234	Ra-226+D	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	Pb-210+D	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	-DSR(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
0U-235+D	U-235+D	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-235+D	Pa-231	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-235+D	Ac-227+D	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-235+D	-DSR(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
0U-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
0U-238+D	U-238+D	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-238+D	U-234	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-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	0.000E+00	0.000E+00
U-238+D	Ra-226+D	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-238+D	Pb-210+D	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-238+D	-DSR(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

The DSR includes contributions from associated (half-life ó 180 days) daughters.

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

0Nuclide (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
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
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

0

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

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	4.500E+00	0.000E+00	0.000E+00	*7.232E+13	0.000E+00	*7.232E+13
Pa-231	4.500E+00	0.000E+00	0.000E+00	*4.723E+10	0.000E+00	*4.723E+10
Pb-210	1.000E+02	0.000E+00	0.000E+00	*7.634E+13	0.000E+00	*7.634E+13
Ra-226	1.000E+02	0.000E+00	0.000E+00	*9.885E+11	0.000E+00	*9.885E+11
Th-230	1.000E+02	0.000E+00	0.000E+00	*2.018E+10	0.000E+00	*2.018E+10
U-234	1.000E+02	0.000E+00	0.000E+00	*6.247E+09	0.000E+00	*6.247E+09
U-235	4.500E+00	0.000E+00	0.000E+00	*2.161E+06	0.000E+00	*2.161E+06
U-238	1.000E+02	0.000E+00	0.000E+00	*3.361E+05	0.000E+00	*3.361E+05

*At specific activity limit

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

0Nuclide (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	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ac-227	Pa-231	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
Ac-227	U-235	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
Ac-227	-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
0Pa-231	Pa-231	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
Pa-231	U-235	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
Pa-231	-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
0Pb-210	Pb-210	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
Pb-210	Ra-226	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
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	0.000E+00	0.000E+00
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	0.000E+00
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	0.000E+00
Pb-210	-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
0Ra-226	Ra-226	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
Ra-226	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	0.000E+00
Ra-226	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
Ra-226	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
Ra-226	-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
0Th-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	0.000E+00
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	0.000E+00
0U-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
0U-235	U-235	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
0U-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	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	-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

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (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	4.500E+00	4.350E+00	4.065E+00	3.206E+00	1.628E+00	1.518E-01	1.728E-04	8.603E-15
Ac-227	Pa-231	1.000E+00	0.000E+00	1.408E-01	4.081E-01	1.210E+00	2.658E+00	3.837E+00	3.363E+00	1.859E+00
Ac-227	U-235	1.000E+00	0.000E+00	1.498E-06	1.317E-05	1.350E-04	9.810E-04	5.976E-03	1.925E-02	3.854E-02
Ac-227	-S(j):		4.500E+00	4.491E+00	4.473E+00	4.416E+00	4.287E+00	3.995E+00	3.382E+00	1.898E+00
0Pa-231	Pa-231	1.000E+00	4.500E+00	4.496E+00	4.489E+00	4.462E+00	4.387E+00	4.135E+00	3.491E+00	1.930E+00
Pa-231	U-235	1.000E+00	0.000E+00	9.513E-05	2.849E-04	9.442E-04	2.786E-03	8.758E-03	2.223E-02	4.127E-02
Pa-231	-S(j):		4.500E+00	4.496E+00	4.489E+00	4.463E+00	4.390E+00	4.143E+00	3.513E+00	1.971E+00
0Pb-210	Pb-210	1.000E+00	1.000E+02	9.690E+01	9.098E+01	7.298E+01	3.887E+01	4.287E+00	7.878E-03	2.096E-12
Pb-210	Ra-226	1.000E+00	0.000E+00	3.058E+00	8.884E+00	2.652E+01	5.927E+01	8.771E+01	7.503E+01	3.666E+01
Pb-210	Th-230	1.000E+00	0.000E+00	6.660E-04	5.867E-03	6.057E-02	4.479E-01	2.856E+00	9.998E+00	2.612E+01
Pb-210	U-234	1.000E+00	0.000E+00	2.004E-09	5.321E-08	1.862E-06	4.313E-05	1.019E-03	1.186E-02	1.013E-01
Pb-210	U-238	9.999E-01	0.000E+00	1.422E-15	1.136E-13	1.339E-11	9.550E-10	8.040E-08	3.031E-06	8.755E-05
Pb-210	-S(j):		1.000E+02	9.996E+01	9.987E+01	9.956E+01	9.859E+01	9.485E+01	8.505E+01	6.288E+01
0Ra-226	Ra-226	1.000E+00	1.000E+02	9.990E+01	9.969E+01	9.898E+01	9.698E+01	9.027E+01	7.357E+01	3.594E+01
Ra-226	Th-230	1.000E+00	0.000E+00	4.330E-02	1.298E-01	4.310E-01	1.280E+00	4.116E+00	1.117E+01	2.697E+01
Ra-226	U-234	1.000E+00	0.000E+00	1.949E-07	1.752E-06	1.938E-05	1.723E-04	1.833E-03	1.460E-02	1.075E-01
Ra-226	U-238	9.999E-01	0.000E+00	1.841E-13	4.965E-12	1.830E-10	4.876E-09	1.723E-07	4.073E-06	9.563E-05
Ra-226	-S(j):		1.000E+02	9.994E+01	9.982E+01	9.941E+01	9.826E+01	9.439E+01	8.475E+01	6.301E+01
0Th-230	Th-230	1.000E+00	1.000E+02	1.000E+02	1.000E+02	9.999E+01	9.997E+01	9.990E+01	9.971E+01	9.904E+01
Th-230	U-234	1.000E+00	0.000E+00	8.998E-04	2.697E-03	8.964E-03	2.667E-02	8.635E-02	2.388E-01	6.087E-01
Th-230	U-238	9.999E-01	0.000E+00	1.275E-09	1.146E-08	1.269E-07	1.129E-06	1.207E-05	9.740E-05	7.470E-04
Th-230	-S(j):		1.000E+02	1.000E+02	1.000E+02	1.000E+02	1.000E+02	9.999E+01	9.995E+01	9.964E+01
0U-234	U-234	1.000E+00	1.000E+02	9.992E+01	9.975E+01	9.918E+01	9.755E+01	9.205E+01	7.800E+01	4.368E+01
U-234	U-238	9.999E-01	0.000E+00	2.832E-04	8.483E-04	2.811E-03	8.296E-03	2.610E-02	6.636E-02	1.240E-01
U-234	-S(j):		1.000E+02	9.992E+01	9.975E+01	9.918E+01	9.755E+01	9.208E+01	7.806E+01	4.380E+01
0U-235	U-235	1.000E+00	4.500E+00	4.496E+00	4.489E+00	4.463E+00	4.390E+00	4.143E+00	3.513E+00	1.971E+00
0U-238	U-238	5.400E-05	5.400E-03	5.396E-03	5.387E-03	5.356E-03	5.268E-03	4.972E-03	4.215E-03	2.365E-03
U-238	U-238	9.999E-01	9.999E+01	9.991E+01	9.975E+01	9.917E+01	9.755E+01	9.207E+01	7.806E+01	4.380E+01
U-238	-S(j):		1.000E+02	9.992E+01	9.975E+01	9.918E+01	9.755E+01	9.208E+01	7.806E+01	4.380E+01

THF(i) is the thread fraction of the parent nuclide.
RESCALC.EXE execution time = 0.83 seconds