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BYR 2004-012

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Reference:
(a) License No. DPR-3 (Docket No. 50-29)
(b) YAEC Letter to USNRC, "Submittal of YNPS License Termination Plan and Proposed Revision to Possession Only License," dated November 24, 2003, BYR 2003-080.
(c) YAEC Letter to USNRC, "Derived Concentration Guidelines Level (DCGL) and Area Factor Calculations for License Termination Plan (LTP)", dated January 19, 2004, BYR 2004-004.
(d) YAEC Letter to USNRC, "RESRAD-BUILD Calculation for License Termination Plan (LTP)", dated December 10, 2003, BYR 2003-102.
(e) YAEC Letter to USNRC, "RESRAD Calculation for License Termination Plan (LTP)", dated December 16, 2003, BYR 2003-105.

Subject: License Termination Plan (LTP) Update – Section 6 Appendices (A – N)

In accordance with our commitment in Reference (b), this letter updates Section 6 of the LTP for the Yankee Nuclear Power Station. The attached Appendices (A – N) incorporate the results of the calculations which were submitted in References (c), (d) and (e).

The remaining Appendix, providing the volumetric concrete DCGLs, is expected to be submitted in late February following its completion at Brookhaven National Laboratories.

If you have any questions, please contact us.

Sincerely,

YANKEE ATOMIC ELECTRIC COMPANY

J. A. Kay

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Principal Licensing Engineer

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Appendix 6A

Basis Document for Site-Specific Parameter Value Assignment, Soil

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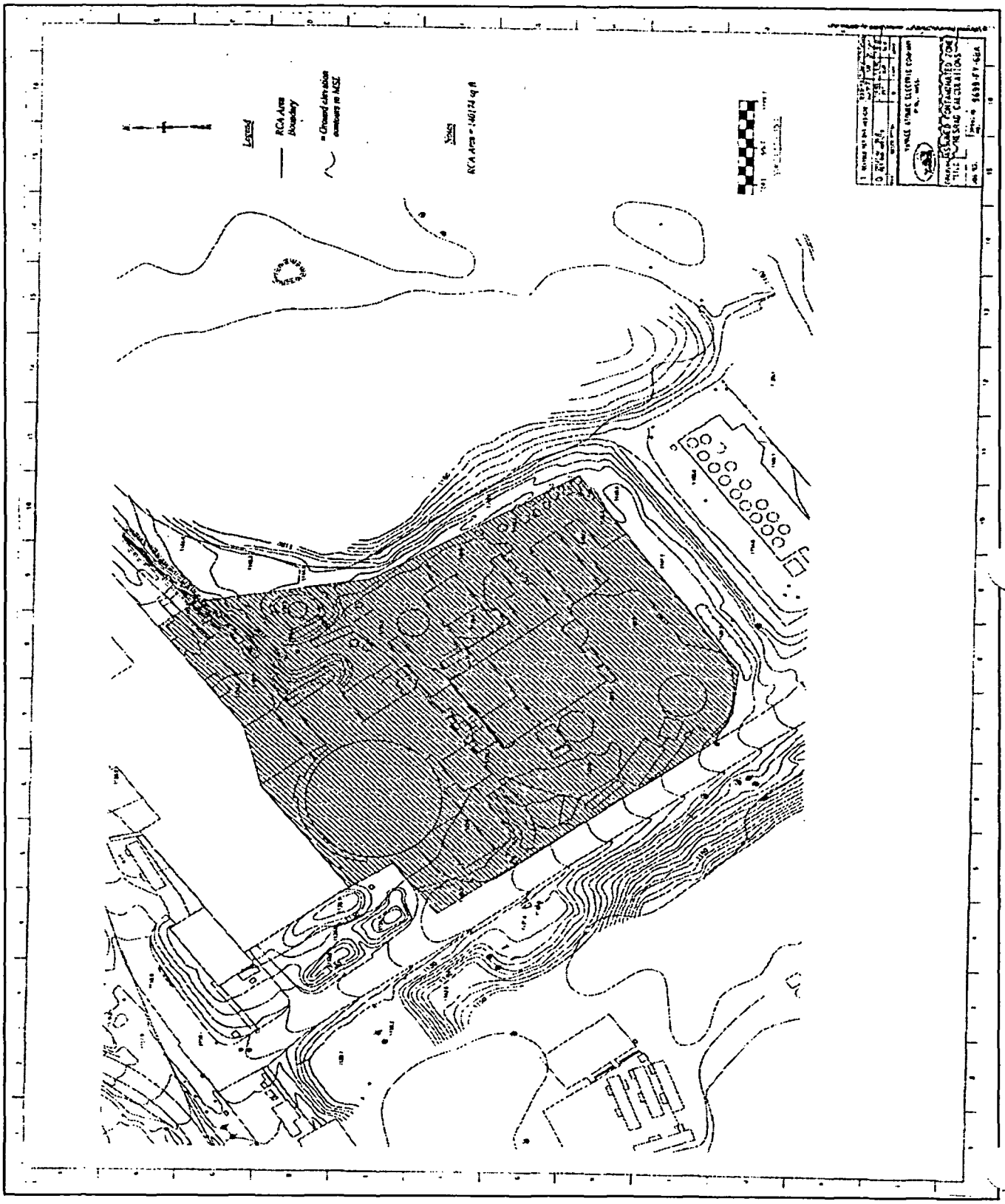
1. Area of the Contaminated Zone

Figure 1-1, (YR Drawing: 9699-FY-6BA Revision 1) was generated with AutoCAD Version 6. The area of the contaminated zone was drawn and calculated by the AutoCAD software and was found to be 140,174 ft^2. Converting this value into m^2: 140174 ft^2 x 9.29E-02 m^2/ft^2 = 13022m^2. Thus, the area of the contaminated zone was assigned a value of 13022m^2.

Figure 1-1


Legend
RCA Area Boundary
Ground elevation contours in MSL
Notes
RCA Area = 140734 sq ft

2. Contaminated Zone Erosion Rate

The slope of the contaminated zone was determined from the Rowe Site Closure Base Map (YR Drawing: 9699-FY-6BB, Revision 0) generated by AutoCAD Map Version 6. A line was extended from the contour line near Monitoring Well CB-2 to the contour line near Monitoring Well CB-3. The distance between the two wells is 700 feet, with a decreasing change in elevation from 1140 to 1120 feet. Thus, the slope at the Rowe site is 20' per 700', which corresponds to a 2.86% slope.

The following YR site drawing provides a transferable scale to the Vapor Containment
Reference: VC Site Drawing Number 9699-FV-1a
Scale: Outer Diameter of VC sphere = 125'

Data from NUREG/CR-6697, Attachment C, Section 3.8, 2nd paragraph of the section labeled "Discussion" were used to select the appropriate Erosion Rate that corresponds to the Rowe Site slope of 2.86%.

Table 2-1 provides values for Erosion Rate (m/y) corresponding to different percent slopes. The value for Erosion Rate representative of row-crop agriculture and a 2% slope (from NUREG/CR-6697, Att. C) is 6.0 E-4 m/y. Erosion Rates were then calculated for 5%, 10% and 15% slopes using the rate increase factors specified in Section 3.8 of NUREG/CR-6697.

Table 2-1 Erosion Rate

Percent Slope	Erosion Rate (m/y)
2	6.0E-4
5	1.8E-3
10	4.2E-3
15	9.0E-3

Using this Erosion Rate/percent slope data, the value for Erosion Rate corresponding to 2.86% is 8.5E-04 m/yr.

3. Humidity in Air

"Regional and Site-Specific Absolute Humidity Data for Use in Tritium Dose Calculations", Health Physics, Vol.39, pp. 318-320, 1980, provides a table of absolute humidity for selected locations in the United States. These values were calculated from data from the National Oceanic and Atmospheric Administration, 1977, Climatological Data, Annual Summary, Volume 28(13), United States Department of Commerce.

The value of 6.1 g/m^3 was chosen for the RESRAD humidity parameter corresponding to the Northeast region in the vicinity of Albany, NY, approximately 70 miles west of the YNPS.

4. Average Annual Wind Speed

The wind speed and direction, joint frequency distributions from Table 3.3-2 of the YNPS Environmental Decommissioning Report, dated December 1993, (Table 4-2) were used to calculate the average annual wind speed. The mid-range value was calculated for each of the ranges for which data were available. An average wind speed was calculated by summing the product of the mid-range value for each range and the percentage of time the wind was recorded to be within the range. A value of 2.03 m/s was assigned to this parameter.

Table 4- 1 Wind Speed

Min. Wind Speed (mph)	Max. Wind Speed (mph)	Mid-Range Wind Speed (mph)	Percent of Time in Range	Mid-Range (weighted by percentage of time)
0.00	0.95	0.48	0.00	0.00
0.95	3.00	1.98	47.11	0.93
4.00	7.00	5.50	38.98	2.14
8.00	12.00	10.00	12.72	1.27
13.00	18.00	15.50	1.16	0.18
19.00	24.00	21.50	0.02	0.00
			Average:	4.53 mph

Converting to m/s: 4.53 mi/h x 1 m/6.214-04 mi x 1h/3600 s = 2.03 m/s

Table 4-2
Joint Frequency Distribution Table Produced by YAEC METROSE Computer Code Using Meteorological Data Collected at Yankee Nuclear Power Station Met Tower

YNPS 35-Foot
Wind Speed and Direction Joint Frequency Distributions
1988-1992

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	570	1010	1351	1672	2941	3952	2556	1741	1284	942	763	385	283	221	169	297	0	20137
(1)	1.33	2.36	3.16	3.91	6.88	9.25	5.98	4.07	3.00	2.20	1.78	.90	.66	.52	.40	.69	.00	47.11
(2)	1.33	2.36	3.16	3.91	6.88	9.25	5.98	4.07	3.00	2.20	1.78	.90	.66	.52	.40	.69	.00	47.11
4-7	1468	1363	975	727	761	374	455	773	1230	2046	2570	1176	773	565	625	783	0	16664
(1)	3.43	3.19	2.28	1.70	1.78	.87	1.06	1.81	2.88	4.79	6.01	2.75	1.81	1.32	1.46	1.83	.00	38.98
(2)	3.43	3.19	2.28	1.70	1.78	.87	1.06	1.81	2.88	4.79	6.01	2.75	1.81	1.32	1.46	1.83	.00	38.98
8-12	1137	952	263	35	4	2	2	13	96	483	1159	481	179	137	188	308	0	5439
(1)	2.66	2.23	.62	.08	.01	.00	.00	.03	.22	1.13	2.71	1.13	.42	.32	.44	.72	.00	12.72
(2)	2.66	2.23	.62	.08	.01	.00	.00	.03	.22	1.13	2.71	1.13	.42	.32	.44	.72	.00	12.72
13-18	141	195	12	1	0	0	0	0	1	12	116	9	1	1	0	7	0	496
(1)	.33	.46	.03	.00	.00	.00	.00	.00	.00	.03	.27	.02	.00	.00	.00	.02	.00	1.16
(2)	.33	.46	.03	.00	.00	.00	.00	.00	.00	.03	.27	.02	.00	.00	.00	.02	.00	1.16
19-24	2	5	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	10
(1)	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
(2)	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	3318	3525	2602	2435	3706	4328	3013	2527	2611	3483	4610	2051	1236	924	982	1395	0	42746
(1)	7.76	8.25	6.09	5.70	8.67	10.12	7.05	5.91	6.11	8.15	10.78	4.80	2.89	2.16	2.30	3.26	.00	100.00
(2)	7.76	8.25	6.09	5.70	8.67	10.12	7.05	5.91	6.11	8.15	10.78	4.80	2.89	2.16	2.30	3.26	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

5. Precipitation

Table 3.3-4 of the YNPS Environmental Decommissioning Report (December 1993) provides monthly mean precipitation totals for Readsboro, Vt., located approximately 5 miles from the YNPS. This information is based on data from the National Oceanic and Atmospheric Administration.

Table 5- 1 Mean Precipitation Rate

Readsboro Monthly Mean Precipitation Totals (inches of water)	
Period:1961-1990	
Month	Precipitation (inches)
Jan	3.49
Feb	3.43
Mar	3.86
April	4.32
May	4.59
Jun	4.54
Jul	4.08
Aug	4.29
Sept	3.79
Oct	3.8
Nov	4.61
Dec	4.28
Year Total	49.08

Converting to meters/year: 49.08 in/y x 2.54 cm/in x m/100 cm = 1.2 m/y. The precipitation rate was assigned a value of 1.2 m/y.

6. Irrigation Rate (Evapotranspiration and Runoff Coefficients)

NUREG/CR-6697 Attachment C, Section 4.3 discusses the Irrigation Rate in terms of the Evapotranspiration Coefficient. Equation 4.3-1 of NUREG/CR-6697 expresses the Evapotranspiration Coefficient as:

$$Ce = \frac{ETr}{(1-Cr)(Pr) + IRr}$$

Where: ETr = the Evapotranspiration Rate (m/y)
Pr = the Precipitation Rate (m/y)
IRr = the Irrigation Rate (m/y) and
Cr = the Runoff Coefficient.

Based upon this equation, the Irrigation Rate can be expressed as:

$$IRr = \frac{ETr}{Ce} - (1-Cr)(Pr)$$

The input values for the variables in this equation:

- YA-REPT-00-002-03 (Ref. 1) cites a value for the average annual Evapotranspiration Rate, ETr, in the upper Housatonic River basin of 21.6 in/y or 0.549 m/y from 1931 to 1960.

- The Precipitation Rate, Pr, has been assigned a site-specific value of 1.2 m/y as discussed in Section 5 of this Attachment.

- Appendix E, Table E.1 of Ref. 2 provides the equation below to calculate the Runoff Coefficient, C_r, for an agricultural environment. Table E.1, Runoff Coefficient Values, also lists values for c_1, c_2 and c_3 for various environments:

$$C_r = 1 - c_1 - c_2 - c_3$$

c_1 = 0.1 for hilly land with an average slopes of 46 m/mi (Refer to section 2 of this Attachment for the site slope determination- 20' drop per 700' run or 46 m/mi).
c_2 = 0.2 for intermediate combinations of clay and loam as identified at the site in Ref. 3.
c_3 = 0.1 for cultivated lands which also fits the scenario for the site.

$$Cr = 1 - 0.1 - 0.2 - 0.1 = 0.6$$

- NUREG/CR-6697, Attachment C, Section 4.3-Evapotranspiration Coefficient, Ce, defines this parameter as the ratio of the total volume of water (a combination of evaporation from soil surfaces and transpiration from vegetation) transferred to the atmosphere to the total volume of water available within the root zone of the soil. The NUREG/CR recommends the use of a uniform distribution with minimum and maximum values of 0.5 and 0.75, respectively and with 0.625 as median. Any selected value for the irrigation rate should satisfy the Ce minimum to maximum range.

Substituting the minimum and maximum values of Ce into Equation 4.3-1 results in the following range for the Irrigation Rate, IRr:

Table 6- 1 Irrigation Rate

Variable	"Min" Value	"Max" Value	Units
ETr	0.549	0.549	m/y
Pr	1.2	1.2	m/y
Cr	0.6	0.6	--
Ce	0.5	0.75	--
IRr	0.252	0.618	m/y

Based on the calculated minimum and maximum IRr values, the median value is 0.435 m/y. A uniform distribution was assigned to this parameter and a positive input correlation to the Well Pumping Rate was assigned based upon guidance in NUREG/CR-6697 and NUREG/CR-6676.

7. Field Capacity: Contaminated Zone, Unsaturated Zone and Saturated Zone

The "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil," (Ref. 3) defines the relationship of field capacity (residual water content) to effective porosity. The field capacity is the ratio of the volume of water retained in the soil sample, after all drainage has ceased, to the total volume of the soil sample. Equation 4.4 of Ref. 3 relates Total and Effective Porosity to Field Capacity as follows:

Effective Porosity = Total Porosity - Field Capacity

Thus,

Field Capacity = Total Porosity - Effective Porosity

The total and effective porosity values for the various zones are the mean values of the NUREG/CR-6697 distributions for sand.

Table 7- 1 Field Capacity

Zone / Soil Type	Total Porosity	Effective Porosity	Field Capacity
Contaminated/sand	0.43	0.383	0.047
Unsaturated/sand	0.43	0.383	0.047
Saturated/sand	0.43	0.383	0.047

8. Saturated Zone Hydraulic Gradient

NUREG/CR-6697, Attachment C, Section 3.6, discusses this parameter's use in the determination of the groundwater flow rate, which effects the rise time and the dilution of radionuclides in the well water. The method for calculating the hydraulic gradient is given in NUREG/CR-6697, Attachment C, Equation 3.6-1:

$$J_x = \frac{h_1 - h_2}{\Delta_x}$$

Where h_1 and h_2 represent the hydraulic heads or the water level elevations at location 1 and 2, and Δ_x is the distance between the two locations. The water level elevations are referenced to mean sea level, msl. This methodology was followed in YA -REPT-00-002-03, "Hydrogeological Parameter Estimates for Radiation Dose Modeling" (Ref. 1) to determine the average hydraulic gradient across the site. An average value for the site was calculated from three separate hydraulic gradient determinations as follows in Table 8.1. LTP Figure 2-8 shows the well locations.

Table 8- 1 Hydraulic Gradient

Well / Location Designation	Water Level Elevation (msl), ft	Distance Between Wells, ft	Hydraulic Gradient, ft/ft
CB-3	1135		
Deerfield River below Sherman Dam	1020	1000	(1135-1020)/1000 = 0.115
CB-3	1135		
CB-2	1105	533	(1135-1105)/533 = 0.056
CW-3	1132		
CB-1	1114	118	(1132-1114)/118 = 0.152
			Average = 0.1

The hydraulic gradient was assigned a value of 0.1 feet/foot.

9. Well Pumping Rate

NUREG/CR-6697, Attachment C Section 3.10 states that "a site-specific input distribution for well pumping rate can be determined as the sum of individual water needs." The household use component is calculated from the Domestic Water Use discussed in YA-REPT-00-002-03, Ref. 1.

Based upon the most recent data available, (1997 Census of Agriculture Volume 1: Part 21, Chapter 1, Massachusetts State-Level Data), irrigation of pastureland is not a common practice in Massachusetts. This data indicates that in Massachusetts, while 24,269 total acres of crop land were irrigated, only 295 total acres of pastureland were irrigated. Furthermore, only one farm, in Franklin County, claimed irrigation of pasture.

Table 9-1 Water Use Components Used to Determine Well Pumping Rate

Water Use Components for a Family of Four	Median	Minimum	Maximum	Units
Household*	**374**	**374**	**374**	m^3/y
Livestock	**76.7**	**76.7**	**76.7**	m^3/y
Irrigation of vegetable plot				
Contaminated fraction f_p = min (Area/2000, 0.5)	1	1	1	
Irrigation rate I_r (m/y)	0.435	0.252	0.618	
Irrigation water $f_p \times I_r \times 2000$	**870**	**504**	**1236**	m^3/y
Irrigation of pasture (Not a New England practice.)				
Contaminated fraction f_m = Area/20,000 <= 1.	1	1	1	
Irrigation rate I_r (m/y)	0	0	0	m/y
Irrigation water $f_m \times I_r \times 20{,}000$	**0**	**0**	**0**	m^3/y
Drinking water **	**1.91**	**1.91**	**1.91**	m^3/y
TOTAL FOR A FAMILY OF FOUR				
(sum of water components in **Bold** type)	**1323**	**957**	**1689**	m^3/y

A uniform distribution was assigned to this parameter with a positive correlation to the Irrigation Rate.

* Household Use: Domestic Water Use for family of four of 272 gallons per day (Ref. 1) minus the drinking water component of 1.91m^3/y.

** 478 l/y per individual adjusted to family of four and converted to m^3/y.

conversion: 478 l/y-Ind x 4 Ind x 1m^3/1000l = 1.91 m^3/y

272 gal/day x 3.79E-3 gal/m^3 x 365.25day/y = 376 m^3/y

10. Watershed for Nearby Stream or Pond

The following figure is taken from a letter to the USNRC from Yankee Atomic Electric Co., FYR 82-59, June 16, 1982, that delineates the watersheds to Wheeler Brook and to the site. An evaluation of this topographic map and the drainage areas is also included in Ref. 1.

The watershed area to the site is 0.3 square miles. Converting to square meters yields a total watershed area of 0.3 mi^2 x $(1609.3\ m/mi)^2$ = 7.77E+05 m^2. This parameter was assigned a value of 7.77E+05 m^2.

Figure 10- 1 Local Site Drainage Area

Attachment J, Page 2 of 4

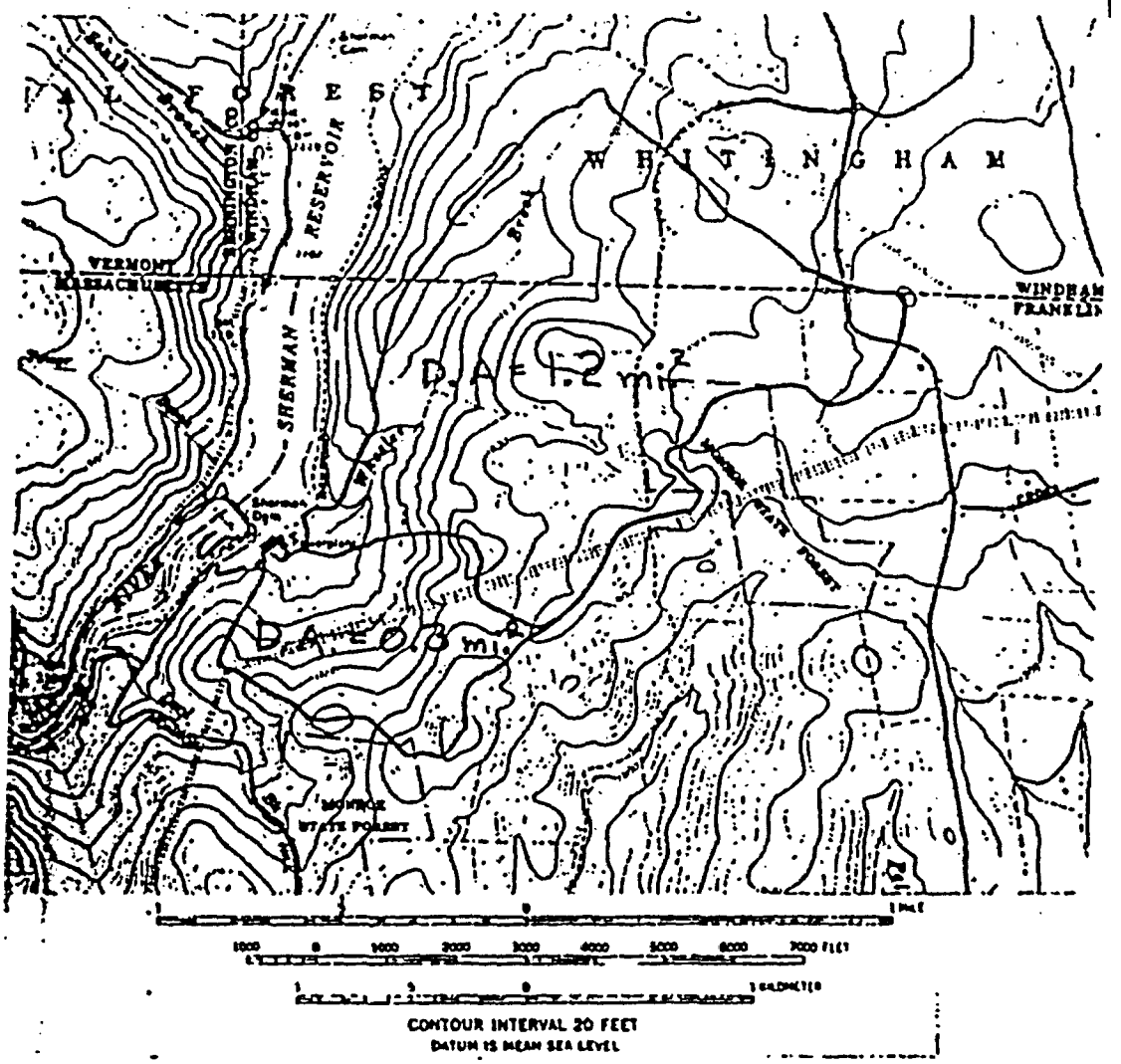


FIGURE 1

LOCAL SITE DRAINAGE AREAS

References:

1. YA-REPT-00-002-03, "Hydrogeological Parameter Estimates for Radiation Dose Modeling," May 2003.

2. ANL/EAD-4, "Users Manual for RESRAD Version 6.0," Yu, C. et al., July 2001.

3. Yu, C., et al., Argonne National Laboratory, "Data Collection Handbook to Support Modeling Impacts of Radioactive Material in Soil," April 1993.

Appendix 6B

Input Parameter Values for Sensitivity Analysis, Soil

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Soil Concentrations										
Basic radiation dose limit (mrem/yr)	P	3	D	25	10 CFR 20.1402 (Ref. 1)	NR	NR	NR	NR	
Initial principal radionuclide (pCi/g)	P	2	D	1	Assumed unit concentration	NR	NR	NR	NR	
Distribution coefficients (contam., unsat. and sat. zones) (cm^3/g)										
Ac-227+progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Ag-108m	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.38	2.1	0.001	0.999	216
Am-241	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.28	3.15	0.001	0.999	1445
Am-243+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.28	3.15	0.001	0.999	1445
C-14	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.4	3.22	0.001	0.999	11
Cm-243	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.82	1.82	0.001	0.999	6761
Co-60	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.46	2.53	0.001	0.999	235
Cs-134	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.1	2.33	0.001	0.999	446
Cs-137+progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.1	2.33	0.001	0.999	446
Eu-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Eu-154	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Eu-155	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Fe-55	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.34	2.67	0.001	0.999	209
Gd-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
H-3	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-2.81	0.5	0.001	0.999	0.06
Nb-94	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.94	3.22	0.001	0.999	380
Ni-63	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.05	1.46	0.001	0.999	424
Np-237+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.84	2.25	0.001	0.999	17
Pa-231	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.94	3.22	0.001	0.999	380
Pb-210+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.78	2.76	0.001	0.999	2392
Pu-238	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.86	1.89	0.001	0.999	953
Pu-239	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.86	1.89	0.001	0.999	953
Pu-241+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.86	1.89	0.001	0.999	953
Ra-226+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.17	1.7	0.001	0.999	3533
Sb-125	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.94	3.22	0.001	0.999	380
Sr-90+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.45	2.12	0.001	0.999	32
Tc-99	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-0.67	3.16	0.001	0.999	0.51
Th-229+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.68	3.62	0.001	0.999	5884
Th-230	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.68	3.62	0.001	0.999	5884
U-233	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.84	3.13	0.001	0.999	126
U-234	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.84	3.13	0.001	0.999	126

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
U-235+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.84	3.13	0.001	0.999	126
Initial concentration of radionuclides present in groundwater (pCi/l)	P	3	D	0	Ground water assumed uncontaminated	NR	NR	NR	NR	
Calculation Times										
Time since placement of material (yr)	P	3	D	0		NR	NR	NR	NR	
Time for calculations (yr)	P	3	D	0, 1, 3, 10, 30, 100, 300, 1000	RESRAD Default	NR	NR	NR	NR	
Contaminated Zone										
Area of contaminated zone (m^2)	P	2	D	13022	Site-specific- radiation control area (LTP App. 6A, Section 1)	NR	NR	NR	NR	
Thickness of contaminated zone (m)	P	2	S	Uniform	Minimum equal depth of soil mixing layer (0.15m); maximum equal depth to water table (3.8m) (Ref. 3)	0.15	3.8	NR	NR	1.975
Length parallel to aquifer flow (m)	P	2	D	129	Site-specific - diameter of circle with an area of 13022 m^2 (LTP App. 6A, Section 1)	NR	NR	NR	NR	
Cover and Contaminated Zone Hydrological Data										
Cover depth (m)	P	2	D	0	No cover assumed	NR	NR	NR	NR	
Density of contaminated zone (g/cm^3)	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	1.5105	0.159	1.019	2.002	1.5105
Contaminated zone erosion rate (m/yr)	P	2	D	8.5E-04	Calculated value based on site-specific slope of 2.9% (LTP App. 6A, Section 2)	NR	NR	NR	NR	
Contaminated zone total porosity	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	0.43	0.06	0.2446	0.6154	0.43
Contaminated zone field capacity	P	3	D	0.05	Site-specific value (LTP App. 6A, Section 7) calculated using Equation 4.4 from Ref. 4	NR	NR	NR	NR	0.05

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Median
Contaminated zone hydraulic conductivity (m/yr)	P	2	S	Beta	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	110	5870	1.398	1.842	2506
Contaminated zone b parameter	P	2	S	Bounded Lognormal-N	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	-0.0253	0.216	0.501	1.90	0.975
Humidity in air (g/m^3)	P	3	D	6.1	Regional value. (LTP App. 6A, Section 3).	NR	NR	NR	NR	
Evapotranspiration coefficient	P	2	S	Uniform	NUREG/CR-6697 Att. C, (Ref. 2)	0.5	0.75	NR	NR	0.625
Average annual wind speed (m/sec)	P	2	D	2.03	Site-specific value calc. from site meteorological data (LTP App. 6A, Section 4)	NR	NR	NR	NR	
Precipitation (m/yr)	P	2	D	1.2	Site-specific value calculated from site geographical area precip. (LTP App. 6A, Section 5)	NR	NR	NR	NR	
Irrigation (m/yr)	B	3	S	Uniform	NUREG/CR-6697, Att. C methodology(Ref. 2, Att. L)	0.252	0.618	NR	NR	0.435
Irrigation mode	B	3	D	Overhead	Site-specific - overhead vs. ditch irrigation is standard practice in Eastern U. S.	NR	NR	NR	NR	
Runoff coefficient	P	2	D	0.6	NUREG/CR-6697, Att. C Section 4.2 methodology (Ref. 2, App. 6A, Section 6)	NR	NR	NR	NR	
Watershed area for nearby stream or pond (m^2)	P	3	D	7.77E+05	Site-specific- drainage area (LTP App. 6A, Section 10)	NR	NR	NR	NR	
Accuracy for water/soil computations	-	3	D	1.00E-03	RESRAD Default	NR	NR	NR	NR	
Saturated Zone Hydrological Data										
Density of saturated zone (g/cm^3)	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	1.5105	0.159	1.019	2.002	1.5105
Saturated zone total porosity	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	0.43	0.06	0.2446	0.6154	0.43
Saturated zone effective porosity	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	0.383	0.0610	0.195	0.572	0.383

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Saturated zone field capacity	P	3	D	0.05	Site-specific value calculated using Equation 4.4 from Ref.4 (LTP App. 6A, Section 7)	NR	NR	NR	NR	0.05
Saturated zone hydraulic conductivity (m/yr)	P	1	S	Beta	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	110	5870	1.398	1.842	2506
Saturated zone hydraulic gradient	P	2	D	0.1	Site gradient (LTP App. 6A, Section 8)	NR	NR	NR	NR	
Saturated zone b parameter	P	2	S	Bounded Lognormal-N	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	- 0.0253	0.216	0.501	1.90	0.975
Water table drop rate (m/yr)	P	3	D	1.00E-03	RESRAD Default	NR	NR	NR	NR	
Well pump intake depth (m below water table)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	. 6	10	30		14.51
Model: Nondispersion (ND) or Mass-Balance (MB)	P	3	D	ND	ND model recommended for contaminant areas > 1,000 m^2 (Ref. 4)	NR	NR	NR	NR	
Well pumping rate (m^3/yr)	P	2	S	Uniform	Min, Max, median value based on site irrigation and area and calculated according to NUREG/CR-6697, Att. C section 3.10 method. (Ref. 2 and LTP App. 6A, Section 9)	957	1689	NR	NR	1323
Unsaturated Zone Hydrological Data										
Number of unsaturated zone strata	P	3	D	1	Site-specific value	NR	NR	NR	NR	
Unsat. zone 1, thickness (m)	P	1	S	Uniform	Assumes 0.15 to 3.8 m contaminated zone thickness and 3.8 m depth to water table (Ref. 3)	0.01	3.65			1.82
Unsat. zone 1, soil density (g/cm^3)	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	1.5105	0.159	1.019	2.002	1.5105
Unsat. zone 1, total porosity	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	0.43	0.06	0.2446	0.6154	0.43
Unsat. zone 1, effective porosity	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	0.383	0.0610	0.195	0.572	0.383

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Unsat. zone 1, field capacity	P	3	D	0.05	Site-specific value calculated using Equation 4.4 from Ref. 4 (LTP App. 6A, Section 7)	NR	NR	NR	NR	0.05
Unsat. zone 1, hydraulic conductivity (m/yr)	P	2	S	Beta	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	110	5870	1.398	1.842	2506
Unsat. zone 1, soil-specific b parameter	P	2	S	Bounded Lognormal-N	NUREG/CR-6697 dist. for site soil type: sand (Ref. 3)	-0.0253	0.216	0.501	1.90	0.975
Occupancy										
Inhalation rate (m^3/yr)	B	3	D	8400	NUREG/CR-6697, Att. C (Ref. 2)	NR	NR	NR	NR	
Mass loading for inhalation (g/m^3)	P	2	S	Continuous Linear	NUREG/CR-6697, Att. C (Ref. 2)	NR	NR	NR	NR	2.33E-05
Exposure duration	B	3	D	30	RESRAD Default	NR	NR	NR	NR	
Indoor dust filtration factor	P	2	S	Uniform	NUREG/CR-6697, Att. C (Ref. 2)	0.15	0.95	NR	NR	0.55
Shielding factor, external gamma	P	2	S	Bounded Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-1.3	0.59	0.044	1	0.2725
Fraction of time spent indoors	B	3	D	0.6571	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Fraction of time spent outdoors (on site)	B	3	D	0.1181	NUREG/CR-5512, Vol. 3 Table 6.87 (outdoors + gardening) (Ref. 5)	NR	NR	NR	NR	
Shape factor flag, external gamma	P	3	D	Circular	RESRAD Default - Circular contaminated zone assumed	NR	NR	NR	NR	
Ingestion, Dietary										
Fruits, vegetables, grain consumption (kg/yr)	B	2	D	112	NUREG/CR-5512, Vol. 3 (other vegetables + fruits + grain) (Ref. 5)	NR	NR	NR	NR	
Leafy vegetable consumption (kg/yr)	B	3	D	21.4	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Milk consumption (L/yr)	B	2	D	233	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Meat and poultry consumption (kg/yr)	B	3	D	65.1	NUREG/CR5512, Vol. 3 (beef + poultry) (Ref. 5)	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Fish consumption (kg/yr)	B	3	D	20.6	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Other seafood consumption (kg/yr)	B	3	D	0.9	RESRAD Default	NR	NR	NR	NR	
Soil ingestion rate (g/yr)	B	2	D	18.26	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Drinking water intake (L/yr)	B	2	D	478.5	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Contamination fraction of drinking water	P	3	D	1	RESRAD Default - all water assumed contaminated	NR	NR	NR	NR	
Contamination fraction of household water (if used)	P	3		NA						
Contamination fraction of livestock water	P	3	D	1	RESRAD Default - all water assumed contaminated	NR	NR	NR	NR	
Contamination fraction of irrigation water	P	3	D	1	RESRAD Default - all water assumed contaminate	NR	NR	NR	NR	
Contamination fraction of aquatic food	P	2	D	1	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Contamination fraction of plant food	P	3	D	1	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Contamination fraction of meat	P	3	D	1	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Contamination fraction of milk	P	3	D	1	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Ingestion, Non-Dietary										
Livestock fodder intake for meat (kg/day)	M	3	D	27.1	NUREG/CR5512, Vol. 3 Table 6.87, beef cattle + poultry + layer hen (Ref. 5)	NR	NR	NR	NR	
Livestock fodder intake for milk (kg/day)	M	3	D	63.2	NUREG/CR5512, Vol. 3 Table 6.87, forage + grain + hay (Ref. 5)	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil

Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Livestock water intake for meat (L/day)	M	3	D	50.6	NUREG/CR5512, Vol. 3 Table 6.87, beef cattle + poultry + layer hen (Ref. 5)	NR	NR	NR	NR	
Livestock water intake for milk (L/day)	M	3	D	60	NUREG/CR5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Livestock soil intake (kg/day)	M	3	D	0.5	RESRAD Default	NR	NR	NR	NR	
Mass loading for foliar deposition (g/m^3)	P	3	D	4.00E-04	NUREG/CR-5512, Vol. 3 Table 6.87, gardening (Ref. 5)	NR	NR	NR	NR	
Depth of soil mixing layer (m)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	0	0.15	0.6	NR	0.23
Depth of roots (m)	P	1	S	Uniform	Min. from NUREG/CR-6697, Att. C (Ref. 2) Max. is site specific depth to water table (Ref. 3)	0.3	3.8	NR	NR	2.05
Drinking water fraction from ground water	P	3	D	1	RESRAD Default - all water assumed to be supplied from groundwater	NR	NR	NR	NR	
Household water fraction from ground water (if used)	P	3		NA						
Livestock water fraction from ground water	P	3	D	1	RESRAD Default - all water assumed to be supplied from groundwater	NR	NR	NR	NR	
Irrigation fraction from ground water	P	3	D	1	RESRAD Default - all water assumed to be supplied from groundwater	NR	NR	NR	NR	
Wet weight crop yield for Non-Leafy (kg/m^2)	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	0.56	0.48	0.001	0.999	1.75
Wet weight crop yield for Leafy (kg/m^2)	P	3	D	2.88921	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Wet weight crop yield for Fodder (kg/m^2)	P	3	D	1.8868	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Growing Season for Non-Leafy (years)	P	3	D	0.246	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Growing Season for Leafy (years)	P	3	D	0.123	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Growing Season for Fodder (years)	P	3	D	0.082	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Translocation Factor for Non-Leafy	P	3	D	0.1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Translocation Factor for Leafy	P	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Translocation Factor for Fodder	P	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Weathering Removal Constant for Vegetation (1/yr)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	5.1	18	84	NR	33
Wet Foliar Interception Fraction for Non-Leafy	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Wet Foliar Interception Fraction for Leafy	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	0.06	0.67	0.95	NR	0.58
Wet Foliar Interception Fraction for Fodder	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Dry Foliar Interception Fraction for Non-Leafy	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Dry Foliar Interception Fraction for Leafy	P	3	D	0.35	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Dry Foliar Interception Fraction for Fodder	P	3	D	0.35	NUREG/CR-5512, Vol. 3 (Ref. 5)	NR	NR	NR	NR	
Storage times of contaminated foodstuffs (days):										
Fruits, non-leafy vegetables, and grain	B	3	D	14	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Leafy vegetables	B	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Milk	B	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 5)	NR	NR	NR	NR	
Meat and poultry	B	3	D	20	NUREG/CR-5512, Vol. 3 Table 6.87 (holdup period for beef) (Ref. 5)	NR	NR	NR	NR	
Fish	B	3	D	7	RESRAD Default	NR	NR	NR	NR	
Crustacea and mollusks	B	3	D	7	RESRAD Default	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Well water	B	3	D	1	RESRAD Default	NR	NR	NR	NR	
Surface water	B	3	D	1	RESRAD Default	NR	NR	NR	NR	
Livestock fodder	B	3	D	45	RESRAD Default	NR	NR	NR	NR	
Special Radionuclides (C-14)										
C-12 concentration in water (g/cm3)	P	3	D	2.00E-05	RESRAD Default	NR	NR	NR	NR	
C-12 concentration in contaminated soil (g of C-12/g of soil)	P	3	D	3.00E-02	RESRAD Default	NR	NR	NR	NR	
Fraction of vegetation carbon from soil	P	3	D	2.00E-02	RESRAD Default	NR	NR	NR	NR	
Fraction of vegetation carbon from air	P	3	D	9.80E-01	RESRAD Default	NR	NR	NR	NR	
C-14 evasion layer thickness in soil (m)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	0.2	0.3	0.6	NR	0.3
C-14 evasion flux rate from soil (1/sec)	P	3	D	7.00E-07	RESRAD Default	NR	NR	NR	NR	
C-12 evasion flux rate from soil (1/sec)	P	3	D	1.00E-10	RESRAD Default	NR	NR	NR	NR	
Fraction of grain in beef cattle feed	B	3	D	0.2500	NUREG/CR-6697, Att. B (Ref. 2)	NR	NR	NR	NR	
Fraction of grain in milk cow feed	B	3	D	0.1000	NUREG/CR-6697, Att. B (Ref. 2)	NR	NR	NR	NR	
Dose Conversion Factors (Inhalation mrem/pCi)										
Ac-227+ progeny	M	3	D	6.72E+00	FGR-11 (Ref. 6) (RESRAD Dose Conversion Library)	NR	NR	NR	NR	
Ag-108m	M	3	D	2.83E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Am-241	M	3	D	4.44E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Am-243+ progeny	M	3	D	4.40E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
C-14	M	3	D	2.09E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Cm-243	M	3	D	3.07E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Co-60	M	3	D	2.19E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Cs-134	M	3	D	4.63E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Cs-137+ progeny	M	3	D	3.19E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Eu-152	M	3	D	2.21E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Eu-154	M	3	D	2.86E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Eu-155	M	3	D	4.14E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Fe-55	M	3	D	2.69E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Gd-152	M	3	D	2.43E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
H-3	M	3	D	6.40E-08	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Nb-94	M	3	D	4.14E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Ni-63	M	3	D	6.29E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Np-237+ progeny	M	3	D	5.40E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pa-231	M	3	D	1.28E+00	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pb-210+ progeny	M	3	D	1.38E-02	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pu-238	M	3	D	3.92E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pu-239	M	3	D	4.29E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pu-241+ progeny	M	3	D	8.25E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Ra-226+ progeny	M	3	D	8.60E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Sb-125	M	3	D	1.22E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Sr-90+ progeny	M	3	D	1.31E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Tc-99	M	3	D	8.33E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Th-229+ progeny	M	3	D	2.16E+00	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Th-230	M	3	D	3.26E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
U-233	M	3	D	1.35E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
U-234	M	3	D	1.32E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
U-235+ progeny	M	3	D	1.23E-01	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Dose Conversion Factors (Ingestion mrem/pCi)										
Ac-227+ progeny	M	3	D	1.48E-02	FGR-11 (Ref. 6) (RESRAD Dose Conversion Library)	NR	NR	NR	NR	
Ag-108m	M	3	D	7.62E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Am-241	M	3	D	3.64E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Am-243+ progeny	M	3	D	3.63E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
C-14	M	3	D	2.09E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Cm-243	M	3	D	2.51E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Co-60	M	3	D	2.69E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Cs-134	M	3	D	7.33E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Cs-137+ progeny	M	3	D	5.00E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Eu-152	M	3	D	6.48E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Eu-154	M	3	D	9.55E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Eu-155	M	3	D	1.53E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Fe-55	M	3	D	6.07E-07	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Gd-152	M	3	D	1.61E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
H-3	M	3	D	6.40E-08	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Nb-94	M	3	D	7.14E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Ni-63	M	3	D	5.77E-07	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Np-237+ progeny	M	3	D	4.44E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pa-231	M	3	D	1.06E-02	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pb-210+ progeny	M	3	D	5.37E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pu-238	M	3	D	3.20E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pu-239	M	3	D	3.54E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Pu-241+ progeny	M	3	D	6.85E-05	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Ra-226+ progeny	M	3	D	1.33E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Sb-125	M	3	D	2.81E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Sr-90+ progeny	M	3	D	1.53E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Tc-99	M	3	D	1.46E-06	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Th-229+ progeny	M	3	D	4.03E-03	FGR-11 (Ref. 6)	NR	NR	NR	NR	
Th-230	M	3	D	5.48E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
U-233	M	3	D	2.89E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
U-234	M	3	D	2.83E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	
U-235+ progeny	M	3	D	2.67E-04	FGR-11 (Ref. 6)	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Plant Transfer Factors (pCi/g plant)/(pCi/g soil)										
Ac-227+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	1.1	0.001	0.999	1.0E-03
Ag-108m	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.52	0.9	0.001	0.999	4.0E-03
Am-241	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Am-243+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
C-14	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-0.36	0.9	0.001	0.999	7.0E-01
Cm-243	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Co-60	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-2.53	0.9	0.001	0.999	8.0E-02
Cs-134	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.22	1.0	0.001	0.999	4.0E-02
Cs-137+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.22	1.0	0.001	0.999	4.0E-02
Eu-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	2.0E-03
Eu-154	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	2.0E-03
Eu-155	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	2.0E-03
Fe-55	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Gd-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	2.0E-03
H-3	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	1.57	1.1	0.001	0.999	4.8E+00
Nb-94	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	1.1	0.001	0.999	1.0E-02
Ni-63	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.0	0.9	0.001	0.999	5.0E-02

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Np-237+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.91	0.9	0.001	0.999	2.0E-02
Pa-231	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	1.1	0.001	0.999	1.0E-02
Pb-210+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.52	0.9	0.001	0.999	4.0E-03
Pu-238	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Pu-239	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Pu-241+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Ra-226+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.22	0.9	0.001	0.999	4.0E-02
Sb-125	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	1.0	0.001	0.999	1.0E-02
Sr-90+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-1.20	1.0	0.001	0.999	3.0E-01
Tc-99	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	1.61	0.9	0.001	0.999	5.0E+00
Th-229+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Th-230	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
U-233	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.9	0.001	0.999	2.0E-03
U-234	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.9	0.001	0.999	2.0E-03
U-235+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.9	0.001	0.999	2.0E-03
Meat Transfer Factors (pCi/kg)/(pCi/d)										
Ac-227+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-10.82	1.0	0.001	0.999	2.0E-05
Ag-108m	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.7	0.001	0.999	2.0E-03

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Am-241	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.90	0.2	0.001	0.999	5.0E-05
Am-243+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.90	0.2	0.001	0.999	5.0E-05
C-14	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.47	1.0	0.001	0.999	3.1E-02
Cm-243	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-10.82	1.0	0.001	0.999	2.0E-05
Co-60	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.51	1.0	0.001	0.999	3.0E-02
Cs-134	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.00	0.4	0.001	0.999	5.0E-02
Cs-137+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.00	0.4	0.001	0.999	5.0E-02
Eu-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	2.0E-03
Eu-154	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	2.0E-03
Eu-155	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	2.0E-03
Fe-55	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.51	0.4	0.001	0.999	3.0E-02
Gd-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	2.0E-03
H-3	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.42	1.0	0.001	0.999	1.2E-02
Nb-94	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.9	0.001	0.999	1.0E-06
Ni-63	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.30	0.9	0.001	0.999	5.0E-03
Np-237+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.7	0.001	0.999	1.0E-03
Pa-231	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	1.0	0.001	0.999	5.0E-06
Pb-210+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	8.0E-04

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Pu-238	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.2	0.001	0.999	1.0E-04
Pu-239	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.2	0.001	0.999	1.0E-04
Pu-241+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.2	0.001	0.999	1.0E-04
Ra-226+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.7	0.001	0.999	1.0E-03
Sb-125	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	1.0E-03
Sr-90+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	0.4	0.001	0.999	1.0E-02
Tc-99	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.7	0.001	0.999	1.0E-04
Th-229+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	1.0	0.001	0.999	1.0E-04
Th-230	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	1.0	0.001	0.999	1.0E-04
U-233	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	8.0E-04
U-234	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	8.0E-04
U-235+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	8.0E-04
Milk Transfer Factors (pCi/l)/(pCi/d)										
Ac-227+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.9	0.001	0.999	2.0E-06
Ag-108m	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.12	0.7	0.001	0.999	6.0E-03
Am-241	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.7	0.001	0.999	2.0E-06
Am-243+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.7	0.001	0.999	2.0E-06
C-14	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.4	0.9	0.001	0.999	1.2E-02

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Cm-243	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.9	0.001	0.999	2.0E-06
Co-60	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.7	0.001	0.999	2.0E-03
Cs-134	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	0.5	0.001	0.999	1.0E-02
Cs-137+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	0.5	0.001	0.999	1.0E-02
Eu-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	6.0E-05
Eu-154	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	6.0E-05
Eu-155	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	6.0E-05
Fe-55	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-8.11	0.7	0.001	0.999	3.0E-04
Gd-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	6.0E-05
H-3	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.6	0.9	0.001	0.999	1.0E-02
Nb-94	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.7	0.001	0.999	2.0E-06
Ni-63	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.91	0.7	0.001	0.999	2.0E-02
Np-237+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-11.51	0.7	0.001	0.999	1.0E-05
Pa-231	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	0.9	0.001	0.999	5.0E-06
Pb-210+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-8.11	0.9	0.001	0.999	3.0E-04
Pu-238	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.5	0.001	0.999	1.0E-06
Pu-239	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.5	0.001	0.999	1.0E-06
Pu-241+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.5	0.001	0.999	1.0E-06

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Ra-226+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.5	0.001	0.999	1.0E-03
Sb-125	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	6.0E-05
Sr-90+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.5	0.001	0.999	2.0E-03
Tc-99	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.7	0.001	0.999	1.0E-03
Th-229+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	0.9	0.001	0.999	5.0E-06
Th-230	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	0.9	0.001	0.999	5.0E-06
U-233	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.82	0.6	0.001	0.999	4.0E-04
U-234	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.82	0.6	0.001	0.999	4.0E-04
U-235+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.82	0.6	0.001	0.999	4.0E-04
Bioaccumulation Factors for Fish ((pCi/kg)/(pCi/l))										
Ac-227+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.7	1.1	NR	NR	1.5E+01
Ag-108m	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	1.6	1.1	NR	NR	5.0E+00
Am-241	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Am-243+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
C-14	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	10.8	1.1	NR	NR	4.9E+04
Cm-243	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Co-60	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.7	1.1	NR	NR	3.0E+02
Cs-134	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.6	0.7	NR	NR	2.0E+03

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Cs-137+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.6	0.7	NR	NR	2.0E+03
Eu-152	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Eu-154	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Eu-155	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Fe-55	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.3	1.1	NR	NR	2.0E+02
Gd-152	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.2	1.1	NR	NR	2.5E+01
H-3	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	0	0.1	NR	NR	1.0E+00
Nb-94	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.7	1.1	NR	NR	3.0E+02
Ni-63	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
Np-237+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Pa-231	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
Pb-210+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.7	1.1	NR	NR	3.0E+02
Pu-238	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Pu-239	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Pu-241+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Ra-226+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Sb-125	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
Sr-90+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.1	1.1	NR	NR	6.0E+01

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Tc-99	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3	1.1	NR	NR	2.0E+01
Th-229+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
Th-230	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
U-233	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
U-234	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
U-235+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
Bioaccumulation Factors for Crustacea/ Mollusks ((pCi/kg)/(pCi/l))										
Ac-227+ progeny	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Ag-108m	P	3	D	7.70E+02	RESRAD Default	NR	NR	NR	NR	
Am-241	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Am-243+ progeny	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
C-14	P	3	D	9.10E+03	RESRAD Default	NR	NR	NR	NR	
Cm-243	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Co-60	P	3	D	2.00E+02	RESRAD Default	NR	NR	NR	NR	
Cs-134	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Cs-137+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Eu-152	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Eu-154	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Eu-155	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Fe-55	P	3	D	3.20E+03	RESRAD Default	NR	NR	NR	NR	
Gd-152	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
H-3	P	3	D	1.00E+00	RESRAD Default	NR	NR	NR	NR	
Nb-94	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Ni-63	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Np-237+ progeny	P	3	D	4.00E+02	RESRAD Default	NR	NR	NR	NR	

Input Parameters for Sensitivity Analysis, Soil
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Median
						1	2	3	4	
Pa-231	P	3	D	1.10E+02	RESRAD Default	NR	NR	NR	NR	
Pb-210+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Pu-238	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Pu-239	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Pu-241+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Ra-226+ progeny	P	3	D	2.50E+02	RESRAD Default	NR	NR	NR	NR	
Sr-90+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Sb-125	P	3	D	1.00E+01	RESRAD Default	NR	NR	NR	NR	
Tc-99	P	3	D	5.00E+00	RESRAD Default	NR	NR	NR	NR	
Th-229+ progeny	P	3	D	5.00E+02	RESRAD Default	NR	NR	NR	NR	
Th-230	P	3	D	5.00E+02	RESRAD Default	NR	NR	NR	NR	
U-233	P	3	D	6.00E+01	RESRAD Default	NR	NR	NR	NR	
U-234	P	3	D	6.00E+01	RESRAD Default	NR	NR	NR	NR	
U-235+ progeny	P	3	D	6.00E+01	RESRAD Default	NR	NR	NR	NR	
Graphics Parameters										
Number of points				32	RESRAD Default	NR	NR	NR	NR	
Spacing				log	RESRAD Default	NR	NR	NR	NR	
Time integration parameters										
Maximum number of points for dose				17	RESRAD Default	NR	NR	NR	NR	

Notes:

[a] P = physical, B = behavioral, M = metabolic; (see NUREG/CR-6697, Attachment B, Table 4.)
[b] 1 = high-priority parameter, 2 = medium-priority parameter, 3 = low-priority parameter (see NUREG/CR-6697, Attachment B, Table 4.1)
[c] D = deterministic, S = stochastic
[d] Distributions Statistical Parameters:
Lognormal-N: 1= mean, 2 = standard deviation
Bounded Lognormal-N: 1= mean, 2 = standard deviation, 3 = minimum, 4 = maximum
Truncated Lognormal-N: 1= mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Bounded Normal: 1 = mean, 2 = standard deviation, 3 = minimum, 4 = maximum
Beta: 1 = minimum, 2 = maximum, 3 = P-value, 4 = Q-value
Triangular: 1 = minimum, 2 = mode, 3 = maximum
Uniform: 1 = minimum, 2 = maximum
NR = Not required

Additional Sensitivity Analysis Data:
Sampling Technique = Latin Hypercube
Number of observations =2000
Number of repetitions = 1
Input Rank Correlation Coefficients:

Thickness of contaminated zone and unsaturated zone = - 0.99
Total porosity and bulk density = - 0.99 (contaminated zone, unsaturated and saturated zones)
Total porosity and effective porosity = 0.96 (unsaturated and saturated zones)
Effective porosity and bulk density = -0.99 (unsaturated and saturated zones)
Well Pumping Rate and Irrigation Rate = 0.96

References:

1. Code of Federal Regulations, Title10, Section 20.1402, "Radiological Criteria for Unrestricted Use".

2. NUREG/CR-6697, "Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes", December 2000.

3. YA-REPT-00-008-03, "Evaluation of GeoTesting Express Soil Testing and Determination of Depth to Groundwater," December 2003

4. Yu, C. et al., "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil"; US Department of Energy – Argonne National Laboratory, April 1993.

5. NUREG/CR-5512, Volume 3, "Residual Radioactive Contamination From Decommissioning: Parameter Analysis, Draft Report for Comment," October 1999.

6. Eckerman, K.F., et al., "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," EPA-520/1-88-020, Federal Guidance Report No. 11 (FGR-11), U.S. EPA, 1988.

Appendix 6C

Results of Sensitivity Analysis, Soil

Results of Sensitivity Analysis, Soil (Based on the Partial Rank Correlation Coefficient [PRCC])			
Radionuclide	**Sensitive Parameter**	**Units**	**PRCC**
H-3	Depth of roots	m	-0.59
	Kd of H-3 in contaminated zone	cm^3/g	-0.54
	Thickness of contaminated zone	m	0.45
C-14	Depth of roots	m	-0.59
	Thickness of contaminated zone	m	0.48
	Thickness of evasion layer of C	m	0.35
Fe-55	Meat transfer factor for Fe	pCi/kg per pCi/day	0.92
	Plant transfer factor for Fe	pCi/g plant per pCi/g soil	0.68
Ni-63	Plant transfer factor for Ni	pCi/g plant per pCi/g soil	0.90
	Milk transfer factor for Ni	pCi/l per pCi/day	0.80
	Depth of roots	m	-0.49
Co-60	External gamma shielding factor	Unit-less	0.95
	Plant transfer factor for Co	pCi/g plant per pCi/g soil	0.67
	Meat transfer factor for Co	pCi/g plant per pCi/day	0.36
Sr-90	Plant transfer factor for Sr	pCi/g plant per pCi/g soil	0.93
	Depth of roots	m	-0.53
Nb-94	External gamma shielding factor	Unit-less	0.99
	Kd of Nb in contaminated zone	cm^3/g	0.30
Tc-99	Plant transfer factor for Tc	pCi/g plant per pCi/g soil	0.88
	Depth of roots	m	-0.44
	Kd of Tc in contaminated zone	cm^3/g	0.49
Ag-108m	External gamma shielding factor	Unit-less	1.00
Sb-125	External gamma shielding factor	Unit-less	0.99
	Kd of Sb in contaminated zone	cm^3/g	0.29
Cs-134	External gamma shielding factor	Unit-less	0.84
	Plant transfer factor for Cs	pCi/g plant per pCi/g soil	0.84
	Depth of roots	m	-0.33
	Milk transfer factor for Cs	pCi/l per pCi/day	0.32
	Meat transfer factor for Cs	pCi/kg per pCi/day	0.25

Results of Sensitivity Analysis, Soil (Based on the Partial Rank Correlation Coefficient [PRCC])			
Radionuclide	**Sensitive Parameter**	**Units**	**PRCC**
Cs-137	Plant transfer factor for Cs	pCi/g plant per pCi/g soil	0.88
	External gamma shielding factor	Unit-less	0.75
	Depth of roots	m	-0.39
	Milk transfer factor for Cs	pCi/l per pCi/day	0.39
	Meat transfer factor for Cs	pCi/kg per pCi/day	0.31
Eu-152	External gamma shielding factor	Unit-less	0.99
Eu-154	External gamma shielding factor	Unit-less	0.99
Eu-155	External gamma shielding factor	Unit-less	0.99
	Plant transfer factor for Eu	pCi/g plant per pCi/g soil	0.29
Pu-238	Plant transfer factor for Pu	pCi/g plant per pCi/g soil	0.92
	Depth of roots	m	-0.54
Pu-239	Plant transfer factor for Pu	pCi/g plant per pCi/g soil	0.92
	Depth of roots	m	-0.53
Pu-241	Plant transfer factor for Am	pCi/g plant per pCi/g soil	0.85
	Depth of roots	m	-0.44
	Kd of Am-241 (parent radionuclide) in contaminated zone	cm^3/g	0.28
Am-241	Plant transfer factor for Am	pCi/g plant per pCi/g soil	0.92
	Depth of roots	m	-0.54
Cm-243	Plant transfer factor for Cm	pCi/g plant per pCi/g soil	0.91
	External gamma shielding factor	Unit-less	0.58
	Depth of roots	m	-0.50

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Appendix 6D

Input Parameter Values for Soil DCGL Determination

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Soil Concentrations										
Basic radiation dose limit (mrem/y)		3	D	25	10 CFR 20.1402 (Ref. 1)	NR	NR	NR	NR	
Initial principal radionuclide (pCi/g)	P	2	D	1	Unit Value	NR	NR	NR	NR	
Distribution coefficients (cm^3/g) applied to contaminated, unsaturated, and saturated zone, unless otherwise noted										
Ac-227+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Ag-108m	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.38	2.1	0.001	0.999	216
Am-241	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2) – applied to saturated & unsaturated zones	7.28	3.15	0.001	0.999	
			D	1.20E+04	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) – applied only to contaminated zone in Pu-241 RESRAD run	NR	NR	NR	NR	1.45E+03
Am-243+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.28	3.15	0.001	0.999	1445
C-14	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.4	3.22	0.001	0.999	11
Cm-243	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.82	1.82	0.001	0.999	6761
Co-60	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.46	2.53	0.001	0.999	235
Cs-134	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.1	2.33	0.001	0.999	446
Cs-137+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.1	2.33	0.001	0.999	446
Eu-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Eu-154	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Eu-155	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825
Fe-55	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.34	2.67	0.001	0.999	209
Gd-152	P	1	S	Truncafted Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.72	3.22	0.001	0.999	825

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
H-3	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2) – applied to saturated and unsaturated zones.	-2.81	0.5	0.001	0.999	6.00E-02
			D	4.30E-02	25th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) – applied to contaminated zone only	NR	NR	NR	NR	
Nb-94	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2) – applied to saturated and unsaturated zones.	5.94	3.22	0.001	0.999	
			D	3.31E+03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) – applied to contaminated zone only	NR	NR	NR	NR	3.80E+02
Ni-63	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.05	1.46	0.001	0.999	424
Np-237+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.84	2.25	0.001	0.999	17
Pa-231	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.94	3.22	0.001	0.999	380
Pb-210+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.78	2.76	0.001	0.999	2392
Pu-238	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.86	1.89	0.001	0.999	953
Pu-239	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.86	1.89	0.001	0.999	953
Pu-241+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	6.86	1.89	0.001	0.999	953
Ra-226+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.17	1.7	0.001	0.999	3533
Sb-125	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2) – applied to saturated and unsaturated zones.	5.94	3.22	0.001	0.999	
			D	3.31E+03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) – applied to contaminated zone only	NR	NR	NR	NR	3.80E+02
Sr-90+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.45	2.12	0.001	0.999	32

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Tc-99	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2) – applied to saturated and unsaturated zones.	-0.67	3.16	0.001	0.999	
			D	4.28E+00	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) – applied to contaminated zone only	NR	NR	NR	NR	5.10E-01
Th-229+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.68	3.62	0.001	0.999	5884
Th-230	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	8.68	3.62	0.001	0.999	5884
U-233	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.84	3.13	0.001	0.999	126
U-234	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.84	3.13	0.001	0.999	126
U-235+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.84	3.13	0.001	0.999	126
Initial concentration of radionuclides present in groundwater (pCi/l)	P	3	D	0	Assumed ground water uncontaminated	NR	NR	NR	NR	
Calculation Times										
Time since placement of material (y)	P	3	D	0		NR	NR	NR	NR	
Time for calculations (y)	P	3	D	0, 1, 3, 10, 30, 100, 300, 1000	RESRAD Default	NR	NR	NR	NR	
Contaminated Zone										
Area of contaminated zone (m^2)	P	2	D	13022	Site-specific- radiation control area (LTP App. 6A, Section 1)	NR	NR	NR	NR	
Thickness of contaminated zone (m)	P	2	S	Uniform	Minimum equal depth of soil mixing layer (0.15m) ; maximum equal to depth to water table (3.8m) (Ref. 4) – applied to all nuclides except C-14 and H-3	0.15	3.8	NR	NR	
			D	2.89E+00	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) – applied to C-14 and H-3 only	NR	NR	NR	NR	1.98E+00

Input Parameter Values for Soil DCGL Determination

Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Length parallel to aquifer flow (m)	P	2	D	129	Site-specific - diameter of circle with an area of 13022 m^2 (LTP App. 6A, Section 1)	NR	NR	NR	NR	
Cover and Contaminated Zone Hydrological Data										
Cover depth (m)	P	2	D	0	Site-specific - no cover assumed	NR	NR	NR	NR	
Density of contaminated zone (g/cm^3)	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	1.5105	0.159	1.019	2.002	1.5105
Contaminated zone erosion rate (m/y)	P	2	D	8.5E-04	Calculated value based on site-specific slope of 2.9% (LTP App. 6A, Section 2)	NR	NR	NR	NR	
Contaminated zone total porosity	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	0.43	0.06	0.2446	0.6154	0.43
Contaminated zone field capacity	P	3	D	0.05	Site-specific value calculated (LTP App. 6A, Section 7) using Equation 4.4 in Ref. 5	NR	NR	NR	NR	0.05
Contaminated zone hydraulic conductivity (m/y)	P	2	S	Beta	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	110	5870	1.398	1.842	2506
Contaminated zone b parameter	P	2	S	Bounded Lognormal-N	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	-0.0253	0.216	0.501	1.90	0.975
Humidity in air (g/m^3)	P	3	D	6.1	Regional value. (LTP App. 6A, Section 3)	NR	NR	NR	NR	
Evapotranspiration coefficient	P	2	S	Uniform	NUREG/CR-6697, Att. C (Ref. 2)	0.5	0.75	NR	NR	0.625
Average annual wind speed (m/sec)	P	2	D	2.03	Site-specific value calc. from site meteorological data (LTP App. 6A, Section 4)	NR	NR	NR	NR	
Precipitation (m/y)	P	2	D	1.2	Site-specific value calculated from site geographical area precip. (LTP App. 6A, Section 5)	NR	NR	NR	NR	
Irrigation (m/y)	B	3	S	Uniform	NUREG/CR-6697, Att. C methodology (Ref. 2)	0.252	0.618	NR	NR	0.435

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Irrigation mode	B	3	D	Overhead	Site-specific – overhead vs. ditch irrigation is standard practice in Eastern U. S.	NR	NR	NR	NR	
Runoff coefficient	P	2	D	0.6	NUREG/CR-6697, Att. C Section 4.2 methodology (Ref. 2, App. 6A, Section 6)	NR	NR	NR	NR	
Watershed area for nearby stream or pond (m^2)	P	3	D	7.77E+05	Site-specific- drainage area (LTP App. 6A, Section 10)	NR	NR	NR	NR	
Accuracy for water/soil computations	-	3	D	1.00E-03	RESRAD Default	NR	NR	NR	NR	
Saturated Zone Hydrological Data										
Density of saturated zone (g/cm^3)	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	1.5105	0.159	1.019	2.002	1.5105
Saturated zone total porosity	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	0.43	0.06	0.2446	0.6154	0.43
Saturated zone effective porosity	P	1	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	0.383	0.0610	0.195	0.572	0.383
Saturated zone field capacity	P	3	D	0.05	Calculated site-specific value LTP App. 6A, Section 7) using Equation 4.4 from Ref. 5	NR	NR	NR	NR	0.05
Saturated zone hydraulic conductivity (m/y)	P	1	S	Beta	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	110	5870	1.398	1.842	2506
Saturated zone hydraulic gradient	P	2	D	0.1	Site gradient (LTP App. 6A, Section 8)	NR	NR	NR	NR	
Saturated zone b parameter	P	2	S	Bounded Lognormal-N	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	- 0.0253	0.216	0.501	1.90	0.975
Water table drop rate (m/y)	P	3	D	1.00E-03	RESRAD Default	NR	NR	NR	NR	
Well pump intake depth (m below water table)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	6	10	30	NR	14.51
Model: Nondispersion (ND) or Mass-Balance (MB)	P	3	D	ND	ND model recommended for contaminant areas > 1,000 m^2 (Ref. 5)	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination

Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Well pumping rate (m^3/y)	P	2	S	Uniform	Min, Max, median value based on site irrigation and area and calculated according to NUREG/CR-6697, Att. C section 3.10 method (Ref.. 2 and LTP App. 6A, Section 9)	957	1689	NR	NR	1323
Unsaturated Zone Hydrological Data										
Number of unsaturated zone strata	P	3	D	1	Site-specific value	NR	NR	NR	NR	
Unsat. zone 1, thickness (m)	P	1	S	Uniform	Assumes 0.15 to 3.8 m contaminated zone thickness and 3.8 m depth to water table (Ref. 4)	0.01	3.65	NR	NR	1.82
Unsat. zone 1, soil density (g/cm^3)	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for6site soil type: sand (Ref. 4)	1.5105	0.159	1.019	2.002	1.5105
Unsat. zone 1, total porosity	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	0.43	0.06	0.2446	0.6154	0.43
Unsat. zone 1, effective porosity	P	2	S	Bounded Normal	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	0.383	0.0610	0.195	0.572	0.383
Unsat. zone 1, field capacity	P	3	D	0.05	Calculated site-specific value LTP App. 6A, Section 7, using Equation 4.4 from Ref. 5	NR	NR	NR	NR	0.05
Unsat. zone 1, hydraulic conductivity (m/y)	P	2	S	Beta	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	110	5870	1.398	1.842	2506
Unsat. zone 1, soil-specific b parameter	P	2	S	Bounded Lognormal-N	NUREG/CR-6697 dist. for site soil type: sand (Ref. 4)	- 0.0253	0.216	0.501	1.90	0.975
Occupancy										
Inhalation rate (m^3/y)	B	3	D	8400	NUREG/CR-6697, Att. C (Ref. 2)	NR	NR	NR	NR	
Mass loading for inhalation (g/m^3)	P	2	S	Continuous Linear	NUREG/CR-6697, Att. C (Ref. 2)	NR	NR	NR	NR	2.33E-05
Exposure duration	B	3	D	30	RESRAD Default	NR	NR	NR	NR	
Indoor dust filtration factor	P	2	S	Uniform	NUREG/CR-6697, Att. C (Ref. 2)	0.15	0.95	NR	NR	0.55

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean {Median}
						1	2	3	4	
Shielding factor, external gamma	P	2	S	Bounded Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-1.3	0.59	0.044	1	{0.2725}
			D	3.98E-01	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) Applied to Ag-108m, Cm-243, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Eu-155, Nb-94, and Sb-125.	NR	NR	NR	NR	3.12E-01
Fraction of time spent indoors	B	3	D	0.6571	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Fraction of time spent outdoors (on site)	B	3	D	0.1181	NUREG/CR-5512, Vol. 3 Table 6.87 (outdoors + gardening) (Ref. 6)	NR	NR	NR	NR	
Shape factor flag, external gamma	P	3	D	Circular	RESRAD Default - Circular contaminated zone assumed	NR	NR	NR	NR	
Ingestion, Dietary										
Fruits, vegetables, grain consumption (kg/y)	B	2	D	112	NUREG/CR-5512, Vol. 3 (other vegetables + fruits + grain) (Ref. 6)	NR	NR	NR	NR	
Leafy vegetable consumption (kg/y)	B	3	D	21.4	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Milk consumption (L/y)	B	2	D	233	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Meat and poultry consumption (kg/y)	B	3	D	65.1	NUREG/CR5512, Vol. 3 (beef + poultry) (Ref. 6)	NR	NR	NR	NR	
Fish consumption (kg/y)	B	3	D	20.6	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Other seafood consumption (kg/y)	B	3	D	0.9	RESRAD Default	NR	NR	NR	NR	
Soil ingestion rate (g/y)	B	2	D	18.26	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Drinking water intake (L/y)	B	2	D	478.5	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Contamination fraction of drinking water	P	3	D	1	RESRAD Default - all water assumed contaminated	NR	NR	NR	NR	
Contamination fraction of household water (if used)	P	3	-	NA	-					
Contamination fraction of livestock water	P	3	D	1	RESRAD Default - all water assumed contaminated	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Contamination fraction of irrigation water	P	3	D	1	RESRAD Default - all water assumed contaminated	NR	NR	NR	NR	
Contamination fraction of aquatic food	P	2	D	1	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Contamination fraction of plant food	P	3	D	1	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Contamination fraction of meat	P	3	D	1	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Contamination fraction of milk	P	3	D	1	NUREG/CR-5512, Vol. 3 (Ref. 6)	NR	NR	NR	NR	
Ingestion, Non-Dietary										
Livestock fodder intake for meat (kg/day)	M	3	D	27.1	NUREG/CR5512, Vol. 3 Table 6.87, beef cattle + poultry + layer hen (Ref. 6)	NR	NR	NR	NR	
Livestock fodder intake for milk (kg/day)	M	3	D	63.2	NUREG/CR5512, Vol. 3 Table 6.87, forage + grain + hay. (Ref. 6)	NR	NR	NR	NR	
Livestock water intake for meat (L/day)	M	3	D	50.6	NUREG/CR5512, Vol. 3 Table 6.87, beef cattle + poultry + layer hen (Ref. 6)	NR	NR	NR	NR	
Livestock water intake for milk (L/day)	M	3	D	60	NUREG/CR5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Livestock soil intake (kg/day)	M	3	D	0.5	RESRAD Default	NR	NR	NR	NR	
Mass loading for foliar deposition (g/m^3)	P	3	D	4.00E-04	NUREG/CR-5512, Vol. 3 Table 6.87, gardening (Ref. 6)	NR	NR	NR	NR	
Depth of soil mixing layer (m)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	0	0.15	0.6	NR	0.23
Depth of roots (m)	P	1	S	uniform	Min from NUREG/CR-6697,Att. C (Ref. 2). Max is site specific depth to water table	0.3	3.8	NR	NR	2.05E+00
			D	1.17E+00	25th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) Applied to Am-241, C-14, Cm-243, Cs-134, Cs137, H-3, Ni-63, Pu-238, Pu239, Pu-241, Sr-90, and Tc-99	NR	NR	NR	NR	
Drinking water fraction from ground water	P	3	D	1	RESRAD Default - all water assumed to be supplied from groundwater	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Household water fraction from ground water (if used)	P	3		NA						
Livestock water fraction from ground water	P	3	D	1	RESRAD Default - all water assumed to be supplied from groundwater	NR	NR	NR	NR	
Irrigation fraction from ground water	P	3	D	1	RESRAD Default - all water assumed to be supplied from groundwater	NR	NR	NR	NR	
Wet weight crop yield for Non-Leafy (kg/m^2)	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	0.56	0.48	0.001	0.999	1.75
Wet weight crop yield for Leafy (kg/m^2)	P	3	D	2.88921	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Wet weight crop yield for Fodder (kg/m^2)	P	3	D	1.8868	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Growing Season for Non-Leafy (years)	P	3	D	0.246	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Growing Season for Leafy (years)	P	3	D	0.123	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Growing Season for Fodder (years)	P	3	D	0.082	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Translocation Factor for Non-Leafy	P	3	D	0.1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Translocation Factor for Leafy	P	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Translocation Factor for Fodder	P	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Weathering Removal Constant for Vegetation (1/y)	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	5.1	18	84	NR	33
Wet Foliar Interception Fraction for Non-Leafy	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Wet Foliar Interception Fraction for Leafy	P	2	S	Triangular	NUREG/CR-6697, Att. C (Ref. 2)	0.06	0.67	0.95	NR	0.58
Wet Foliar Interception Fraction for Fodder	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Dry Foliar Interception Fraction for Non-Leafy	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Dry Foliar Interception Fraction for Leafy	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Dry Foliar Interception Fraction for Fodder	P	3	D	0.35	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Storage times of contaminated foodstuffs (days):										
Fruits, non-leafy vegetables, and grain	B	3	D	14	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Leafy vegetables	B	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Milk	B	3	D	1	NUREG/CR-5512, Vol. 3 Table 6.87 (Ref. 6)	NR	NR	NR	NR	
Meat and poultry	B	3	D	20	NUREG/CR-5512, Vol. 3 Table 6.87 (holdup period for beef) (Ref. 6)	NR	NR	NR	NR	
Fish	B	3	D	7	RESRAD Default	NR	NR	NR	NR	
Crustacea and mollusks	B	3	D	7	RESRAD Default	NR	NR	NR	NR	
Well water	B	3	D	1	RESRAD Default	NR	NR	NR	NR	
Surface water	B	3	D	1	RESRAD Default	NR	NR	NR	NR	
Livestock fodder	B	3	D	45	RESRAD Default	NR	NR	NR	NR	
Special Radionuclides (C-14)										
C-12 concentration in water (g/cm^3)	P	3	D	2.00E-05	RESRAD Default	NR	NR	NR	NR	
C-12 concentration in contaminated soil (g/g)	P	3	D	3.00E-02	RESRAD Default	NR	NR	NR	NR	
Fraction of vegetation carbon from soil	P	3	D	2.00E-02	RESRAD Default	NR	NR	NR	NR	
Fraction of vegetation carbon from air	P	3	D	9.80E-01	RESRAD Default	NR	NR	NR	NR	
C-14 evasion layer thickness in soil (m)	P	2	D	4.27E-01	75th percentile value (from RESRAD (.mco) file created in SA (Ref. 3)) Applied only to C-14	NR	NR	NR	NR	(3.00E-01)
C-14 evasion flux rate from soil (1/sec)	P	3	D	7.00E-07	RESRAD Default	NR	NR	NR	NR	
C-12 evasion flux rate from soil (1/sec)	P	3	D	1.00E-10	RESRAD Default	NR	NR	NR	NR	
Fraction of grain in beef cattle feed	B	3	D	0.2500	NUREG/CR-6697, Att. B (Ref. 2)	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean {Median}
						1	2	3	4	
Fraction of grain in milk cow feed	B	3	D	0.1000	NUREG/CR-6697, Att. B (Ref. 2)	NR	NR	NR	NR	
Inhalation Exposure Dose Conversion Factors (mrem/pCi)										
Ac-227+ progeny	M	3	D	6.72E+00	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ag-108m	M	3	D	2.83E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Am-241	M	3	D	4.44E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Am-243+ progeny	M	3	D	4.40E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
C-14	M	3	D	2.09E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Cm-243	M	3	D	3.07E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Co-60	M	3	D	2.19E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Cs-134	M	3	D	4.63E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Cs-137+ progeny	M	3	D	3.19E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Eu-152	M	3	D	2.21E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Eu-154	M	3	D	2.86E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Eu-155	M	3	D	4.14E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Fe-55	M	3	D	2.69E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Gd-152	M	3	D	2.43E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
H-3	M	3	D	6.40E-08	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Nb-94	M	3	D	4.14E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ni-63	M	3	D	6.29E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Np-237+ progeny	M	3	D	5.40E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pa-231	M	3	D	1.28E+00	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pb-210+ progeny	M	3	D	1.38E-02	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pu-238	M	3	D	3.92E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pu-239	M	3	D	4.29E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pu-241+ progeny	M	3	D	8.25E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ra-226+ progeny	M	3	D	8.60E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Sb-125	M	3	D	1.22E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination

Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Sr-90+ progeny	M	3	D	1.31E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Tc-99	M	3	D	8.33E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Th-229+ progeny	M	3	D	2.16E+00	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Th-230	M	3	D	3.26E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
U-233	M	3	D	1.35E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
U-234	M	3	D	1.32E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
U-235+ progeny	M	3	D	1.23E-01	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ingestion Exposure Dose Conversion Factors (mrem/pCi)										
Ac-227+ progeny	M	3	D	1.48E-02	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ag-108m	M	3	D	7.62E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Am-241	M	3	D	3.64E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Am-243+ progeny	M	3	D	3.63E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
C-14	M	3	D	2.09E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Cm-243	M	3	D	2.51E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Co-60	M	3	D	2.69E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Cs-134	M	3	D	7.33E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Cs-137+ progeny	M	3	D	5.00E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Eu-152	M	3	D	6.48E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Eu-154	M	3	D	9.55E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Eu-155	M	3	D	1.53E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Fe-55	M	3	D	6.07E-07	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Gd-152	M	3	D	1.61E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
H-3	M	3	D	6.40E-08	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Nb-94	M	3	D	7.14E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ni-63	M	3	D	5.77E-07	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Np-237+ progeny	M	3	D	4.44E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pa-231	M	3	D	1.06E-02	FGR-11 (Ref. 7)	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination

Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean {Median}
						1	2	3	4	
Pb-210+ progeny	M	3	D	5.37E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pu-238	M	3	D	3.20E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pu-239	M	3	D	3.54E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Pu-241+ progeny	M	3	D	6.85E-05	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Ra-226+ progeny	M	3	D	1.33E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Sb-125	M	3	D	2.81E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Sr-90+ progeny	M	3	D	1.53E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Tc-99	M	3	D	1.46E-06	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Th-229+ progeny	M	3	D	4.03E-03	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Th-230	M	3	D	5.48E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
U-233	M	3	D	2.89E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
U-234	M	3	D	2.83E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
U-235+ progeny	M	3	D	2.67E-04	FGR-11 (Ref. 7)	NR	NR	NR	NR	
Plant Transfer Factors (pCi/g plant per pCi/g soil)										
Ac-227+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	1.1	0.001	0.999	{1.0E-03}
Ag-108m	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.52	0.9	0.001	0.999	{4.0E-03}
Am-241	P	1	D	1.83E-03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3)) Applied also in the Pu-241 RESRAD run	NR	NR	NR	NR	1.48E-03
Am-243+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	{1.0E-03}
C-14	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-0.36	0.9	0.001	0.999	{7.0E-01}
Cm-243	P	1	D	1.83E-03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.48E-03
Co-60	P	1	D	1.46E-01	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.18E-01

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Cs-134	P	1	D	7.82E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	6.48E-02
Cs-137+ progeny	P	1	D	7.82E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	6.48E-02
Eu-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	(2.0E-03)
Eu-154	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	(2.0E-03)
Eu-155	P	1	D	4.21E-03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	3.60E-3
Fe-55	P	1	D	1.83E-03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.48E-03
Gd-152	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.1	0.001	0.999	(2.0E-03)
H-3	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	1.57	1.1	0.001	0.999	(4.8E+00)
Nb-94	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	1.1	0.001	0.999	(1.0E-02)
Ni-63	P	1	D	9.11E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	7.37E-02
Np-237+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.91	0.9	0.001	0.999	(2.0E-02)
Pa-231	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	1.1	0.001	0.999	(1.0E-02)
Pb-210+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.52	0.9	0.001	0.999	(4.0E-03)
Pu-238	P	1	D	1.83E-03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.48E-03
Pu-239	P	1	D	1.83E-03	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.48E-03
Pu-241+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	(1.0E-03)
Ra-226+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.22	0.9	0.001	0.999	(4.0E-02)
Sb-125	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	1.0	0.001	0.999	(1.0E-02)

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Sr-90+ progeny	P	1	D	5.90E-01	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	4.88E-01
Tc-99	P	1	D	9.16E+00	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	7.41E+00
Th-229+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	{1.0E-03}
Th-230	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	{1.0E-03}
U-233	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.9	0.001	0.999	{2.0E-03}
U-234	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.9	0.001	0.999	{2.0E-03}
U-235+ progeny	P	1	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.9	0.001	0.999	{2.0E-03}
Meat Transfer Factors (pCi/kg per pCi/d)										
Ac-227+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-10.82	1.0	0.001	0.999	{2.0E-05}
Ag-108m	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.7	0.001	0.999	{2.0E-03}
Am-241	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.90	0.2	0.001	0.999	{5.0E-05}
Am-243+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.90	0.2	0.001	0.999	{5.0E-05}
C-14	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-3.47	1.0	0.001	0.999	{3.1E-02}
Cm-243	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-10.82	1.0	0.001	0.999	{2.0E-05}
Co-60	P	2	D	5.86E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	4.85E-02
Cs-134	P	2	D	6.51E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	5.38E-02
Cs-137+ progeny	P	2	D	6.51E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	5.38E-02
Eu-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	{2.0E-03}
Eu-154	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	{2.0E-03}
Eu-155	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	{2.0E-03}

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Fe-55	P	2	D	3.91E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	3.23E-02
Gd-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	1.0	0.001	0.999	(2.0E-03)
H-3	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.42	1.0	0.001	0.999	(1.2E-02)
Nb-94	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.9	0.001	0.999	(1.0E-06)
Ni-63	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.30	0.9	0.001	0.999	(5.0E-03)
Np-237+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.7	0.001	0.999	(1.0E-03)
Pa-231	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	1.0	0.001	0.999	(5.0E-06)
Pb-210+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	(8.0E-04)
Pu-238	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.2	0.001	0.999	(1.0E-04)
Pu-239	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.2	0.001	0.999	(1.0E-04)
Pu-241+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.2	0.001	0.999	(1.0E-04)
Ra-226+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.7	0.001	0.999	(1.0E-03)
Sb-125	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.9	0.001	0.999	(1.0E-03)
Sr-90+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.61	0.4	0.001	0.999	(1.0E-02)
Tc-99	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	0.7	0.001	0.999	(1.0E-04)
Th-229+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	1.0	0.001	0.999	(1.0E-04)
Th-230	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.21	1.0	0.001	0.999	(1.0E-04)
U-233	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	(8.0E-04)
U-234	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	(8.0E-04)
U-235+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.13	0.7	0.001	0.999	(8.0E-04)
Milk Transfer Factors (pCi/l per pCi/d)										
Ac-227+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.9	0.001	0.999	(2.0E-06)
Ag-108m	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-5.12	0.7	0.001	0.999	(6.0E-03)
Am-241	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.7	0.001	0.999	(2.0E-06)
Am-243+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.7	0.001	0.999	(2.0E-06)

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean {Median}
						1	2	3	4	
C-14	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.4	0.9	0.001	0.999	{1.2E-02}
Cm-243	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.9	0.001	0.999	{2.0E-06}
Co-60	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.7	0.001	0.999	{2.0E-03}
Cs-134	P	2	D	1.39E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.12E-02
Cs-137+ progeny	P	2	D	1.39E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	1.12E-02
Eu-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	{6.0E-05}
Eu-154	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	{6.0E-05}
Eu-155	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	{6.0E-05}
Fe-55	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-8.11	0.7	0.001	0.999	{3.0E-04}
Gd-152	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	{6.0E-05}
H-3	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-4.6	0.9	0.001	0.999	{1.0E-02}
Nb-94	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.12	0.7	0.001	0.999	{2.0E-06}
Ni-63	P	2	D	3.21E-02	75th percentile value (from RESRAD (.mco) file created in the sensitivity analysis (Ref. 3))	NR	NR	NR	NR	2.54E-02
Np-237+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-11.51	0.7	0.001	0.999	{1.0E-05}
Pa-231	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	0.9	0.001	0.999	{5.0E-06}
Pb-210+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-8.11	0.9	0.001	0.999	{3.0E-04}
Pu-238	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.5	0.001	0.999	{1.0E-06}
Pu-239	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.5	0.001	0.999	{1.0E-06}
Pu-241+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-13.82	0.5	0.001	0.999	{1.0E-06}
Ra-226+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.5	0.001	0.999	{1.0E-03}
Sb-125	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-9.72	0.9	0.001	0.999	{6.0E-05}
Sr-90+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.21	0.5	0.001	0.999	{2.0E-03}
Tc-99	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-6.91	0.7	0.001	0.999	{1.0E-03}

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d] 1	2	3	4	Mean (Median)
Th-229+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	0.9	0.001	0.999	(5.0E-06)
Th-230	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-12.21	0.9	0.001	0.999	(5.0E-06)
U-233	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.82	0.6	0.001	0.999	(4.0E-04)
U-234	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.82	0.6	0.001	0.999	(4.0E-04)
U-235+ progeny	P	2	S	Truncated Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	-7.82	0.6	0.001	0.999	(4.0E-04)
Bioaccumulation Factors for Fish (pCi/kg per pCi/l)										
Ac-227+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.7	1.1	NR	NR	1.5E+01
Ag-108m	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	1.6	1.1	NR	NR	5.0E+00
Am-241	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Am-243+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
C-14	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	10.8	1.1	NR	NR	4.9E+04
Cm-243	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Co-60	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.7	1.1	NR	NR	3.0E+02
Cs-134	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.6	0.7	NR	NR	2.0E+03
Cs-137+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	7.6	0.7	NR	NR	2.0E+03
Eu-152	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Eu-154	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Eu-155	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Fe-55	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.3	1.1	NR	NR	2.0E+02
Gd-152	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.2	1.1	NR	NR	2.5E+01
H-3	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	0	0.1	NR	NR	1.0E+00
Nb-94	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.7	1.1	NR	NR	3.0E+02
Ni-63	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
Np-237+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Pa-231	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
Pb-210+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	5.7	1.1	NR	NR	3.0E+02
Pu-238	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Pu-239	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Pu-241+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.4	1.1	NR	NR	3.0E+01
Ra-226+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3.9	1.1	NR	NR	4.9E+01
Sb-125	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
Sr-90+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.1	1.1	NR	NR	6.0E+01
Tc-99	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	3	1.1	NR	NR	2.0E+01
Th-229+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
Th-230	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	4.6	1.1	NR	NR	9.9E+01
U-233	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
U-234	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
U-235+ progeny	P	2	S	Lognormal-N	NUREG/CR-6697, Att. C (Ref. 2)	2.3	1.1	NR	NR	1.0E+01
Bioaccumulation Factors for Crustacea/ Mollusks (pCi/kg per pCi/l)										
Ac-227+ progeny	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Ag-108m	P	3	D	7.70E+02	RESRAD Default	NR	NR	NR	NR	
Am-241	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Am-243+ progeny	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
C-14	P	3	D	9.10E+03	RESRAD Default	NR	NR	NR	NR	
Cm-243	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Co-60	P	3	D	2.00E+02	RESRAD Default	NR	NR	NR	NR	
Cs-134	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Cs-137+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Eu-152	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Eu-154	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Eu-155	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
Fe-55	P	3	D	3.20E+03	RESRAD Default	NR	NR	NR	NR	
Gd-152	P	3	D	1.00E+03	RESRAD Default	NR	NR	NR	NR	
H-3	P	3	D	1.00E+00	RESRAD Default	NR	NR	NR	NR	

Input Parameter Values for Soil DCGL Determination
Resident Farmer Scenario

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Parameters[d]				Mean (Median)
						1	2	3	4	
Nb-94	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Ni-63	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Np-237+ progeny	P	3	D	4.00E+02	RESRAD Default	NR	NR	NR	NR	
Pa-231	P	3	D	1.10E+02	RESRAD Default	NR	NR	NR	NR	
Pb-210+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Pu-238	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Pu-239	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Pu-241+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Ra-226+ progeny	P	3	D	2.50E+02	RESRAD Default	NR	NR	NR	NR	
Sr-90+ progeny	P	3	D	1.00E+02	RESRAD Default	NR	NR	NR	NR	
Sb-125	P	3	D	1.00E+01	RESRAD Default	NR	NR	NR	NR	
Tc-99	P	3	D	5.00E+00	RESRAD Default	NR	NR	NR	NR	
Th-229+ progeny	P	3	D	5.00E+02	RESRAD Default	NR	NR	NR	NR	
Th-230	P	3	D	5.00E+02	RESRAD Default	NR	NR	NR	NR	
U-233	P	3	D	6.00E+01	RESRAD Default	NR	NR	NR	NR	
U-234	P	3	D	6.00E+01	RESRAD Default	NR	NR	NR	NR	
U-235+ progeny	P	3	D	6.00E+01	RESRAD Default	NR	NR	NR	NR	
Graphics Parameters										
Number of points				32	RESRAD Default	NR	NR	NR	NR	
Spacing				log	RESRAD Default	NR	NR	NR	NR	
Time Integration Parameter										
Maximum number of points for dose				17	RESRAD Default	NR	NR	NR	NR	

Notes:

[a] P = physical, B = behavioral, M = metabolic; (see NUREG/CR-6697, Attachment B, Table 4.)
[b] 1 = high-priority parameter, 2 = medium-priority parameter, 3 = low-priority parameter (see NUREG/CR-6697, Attachment B, Table 4.1)
[c] D = deterministic, S = stochastic

[d] Distributions Statistical Parameters:

Lognormal-N: 1= mean, 2 = standard deviation
Bounded Lognormal-N: 1= mean, 2 = standard deviation, 3 = minimum, 4 = maximum
Truncated Lognormal-N: 1= mean, 2 = standard deviation, 3 = lower quantile, 4 = upper quantile
Bounded normal: 1 = mean, 2 = standard deviation, 3 = minimum, 4 = maximum
Beta: 1 = minimum, 2 = maximum, 3 = P-value, 4 = Q-value
Triangular: 1 = minimum, 2 = mode, 3 = maximum
Uniform: 1 = minimum, 2 = maximum
NR = Not required

Additional Sensitivity Analysis Data:
Sampling technique = Latin Hypercube
Number of observations =2000
Number of repetitions = 1

Input Rank Correlation Coefficients for situation where distributions remain for both parameters:
Thickness of contaminated zone and unsaturated zone = - 0.99
Total porosity and bulk density = - 0.99 (contaminated zone, unsaturated and saturated zones)
Total porosity and effective porosity = 0.96 (unsaturated and saturated zones)
Effective porosity and bulk density = -0.99 (unsaturated and saturated zones)
Well Pumping Rate and Irrigation Rate = 0.96

References

1. Code of Federal Regulations, Title10, Section 20.1402, "Radiological Criteria for Unrestricted Use".

2. NUREG/CR-6697, "Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes", Yu, C. et al., US Department of Energy-Argonne National Laboratory, November 2000.

3. YA-CALC-01-001-03, "RESRAD 6.21 Sensitivity Analysis for Resident Farmer Scenario - Soil," December 2003

4. YA-REPT-00-008-03, "Evaluation of GeoTesting Express Soil Testing and Determination of Depth to Groundwater," December 2003.

5. Yu, C., et al, Argonne National Laboratory, "Data Collection Handbook to Support Modeling Impacts of Radioactive Material in Soil," April 1993.

6. NUREG/CR-5512, "Residual Radioactive Contamination From Decommissioning," Volume 3: "Parameter Analysis, Draft Report for Comment," October 1999.

7. Eckerman, K.F., et al., "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," EPA-520/1-88-020, Federal Guidance Report No. 11 (FGR-11), U.S. EPA, 1988.

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Appendix 6E

Soil DCGL Results

Soil DCGL Results

Nuclide	Dose Conversion Factor (DCF) (mrem/y per pCi/g)	DCGL (pCi/g)
H-3	6.79E-02	3.7E+02
C-14	4.52E+00	5.5E+00
Fe-55	8.57E-04	2.9E+04
Co-60	6.21E+00	4.0E+00
Ni-63	3.07E-02	8.1E+02
Sr-90	1.45E+01	1.7E+00
Nb-94	3.46E+00	7.2E+00
Tc-99	1.76E+00	1.4E+01
Ag-108m	3.44E+00	7.3E+00
Sb-125	7.82E-01	3.2E+01
Cs-134	5.02E+00	5.0E+00
Cs-137	2.92E+00	8.6E+00
Eu-152	2.43E+00	1.0E+01
Eu-154	2.63E+00	9.5E+00
Eu-155	6.29E-02	4.0E+02
Pu-238	7.48E-01	3.3E+01
Pu-239	8.30E-01	3.0E+01
Pu-241	2.54E-02	9.8E+02
Am-241	8.59E-01	2.9E+01
Cm-243	7.85E-01	3.2E+01

Appendix 6F

Basis Document for Site-Specific Parameter Value Assignment, Building Occupancy

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1. Room Dimensions 6F-3
2. Source Configuration 6F-6
3. Direct Ingestion Rate 6F-7

1. Room Dimension

An inventory of the rooms and partial rooms that would remain on site following Phase I of the DEMCO demolition project (Ref. 1) was used to determine room dimensions. Wall dimensions were determined from site drawings showing the building locations, building elevations and dimensions. Ceilings were not included in the model, as partial rooms remaining at the time of license termination will either have no ceiling or will be covered with a ceiling constructed of new, uncontaminated building material.

The average wall dimensions (wall length and height) were calculated using data describing the walls expected to remain at the time of final status survey. One wall was excluded from the data set: the 40.5 m long Primary Auxiliary Building (PAB) south wall. This wall extends the entire length of the PAB and was excluded from the data set because it is atypical of a standard room. The data on the walls expected to remain at the time of final status survey and the calculated average wall dimensions are shown in Table 1-1. The portion of the room expected to remain at the time of final status survey is highlighted. The resulting average wall length is 4.44 m, and the average wall height is 3.51 m.

These average wall dimensions were used to calculate the floor surface area (meters^2) for the modeled room:

Floor surface area = (4.44 m) x (4.44 m) = 19.71 m^2

The wall surface area in square meters was calculated from the average wall length and height in meters for the modeled room:

Wall area = (4.44 m) x (3.51 m) = 15.58 m^2

The floor and wall surface areas and the average wall length and height were used as inputs to the RESRAD-BUILD v 3.21 code to define the room model and to locate the receptor.

Tab;e 1- 1
Remaining Room/Walls Dimensions

Building	Area	Width		Length		Height	
		Ft/in	Meters	Ft/in	Meters	Ft/in	Meters
PAB	TK-30 in (PAB Basement) Room	12'-6"	3.81E+00	15'-6"	4.72E+00	18'-6"	5.64E+00
PAB	TK-27 (PAB Basement) Room	10'-2"	3.10E+00	15'-6"	4.72E+00	18'-6"	5.64E+00
PAB	South Wall (G-Line)			133'-0"*	4.05E+01	13'-0"	3.96E+00
PAB	East Wall (2-Line to Fa)			17'-0"	5.18E+00	13'-0"	3.96E+00
I-X PIT	Southernmost Wall			33'-0"	1.01E+01	14'-8"	4.47E+00
I-X PIT	Easternmost Wall (Total Length)			31'-10"	9.70E+00	14'-8"	4.47E+00
SFP	Spent Fuel Pool	16'-6"	5.03E+00	33'-8"	1.03E+01	14'-8"	4.47E+00
New Fuel Vault	New Fuel Storage (South Wall)			15'-0"	4.57E+00	13'-6"	4.11E+00
Safe Shutdown	Pipe Chase Cubicle	4'-0"	1.22E+00	4'-0"	1.22E+00	8'-0"	2.44E+00
Waste Vault	Waste Transfer Pit Cubicle	9'-0"	2.74E+00	14'-0"	4.27E+00	9'-10"	3.00E+00
Elevator Pit	Elevator Pit Cubicle	7'-10"	2.39E+00	9'-0"	2.74E+00	6'-6"	1.98E+00
Waste Disposal	Pipe Chase Cubicle	5'-0"	1.52E+00	11'-10"	3.61E+00	10'-1"	3.07E+00
Waste Disposal	Distillate Heat Exchanger Cubicle	9'-0"	2.74E+00	16'-0"	4.88E+00	7'-0"	2.13E+00
Waste Disposal	Evaporator Cubicle	10'-6"	3.20E+00	16'-0"	4.88E+00	7'-0"	2.13E+00
Waste Disposal	Drumming Pit Cubicle	10'-4"	3.15E+00	27'-0"	8.23E+00	7'-0"	2.13E+00
PAB	PAB Back Stairwell Pit Cubicle	11'-4"	3.45E+00	13'-0"	3.96E+00	8'-2"	2.49E+00
Average Wall Length (meters) = 4.44E+00							
Average Wall Height (meters) = 3.51E+00							

* As previously noted, the south (G-Line) wall of the PAB is excluded from the calculation of average wall length.

Table 1- 2

Remaining Structures and Drawing Reference

Building	Room/Wall/Pit	Room/Wall Width	Drawing Reference	Wall Length	Drawing Reference	Wall Height (Note 1)	Drawing Reference
PAB	Drain Collecting Tank Room (TK-30)	12' 6"	PAB 9699-FC-40D	15' 6"	PAB 9699-RC-40A	1022' 8"-1004' 2"=18' 6"	PAB 9699-FM-57A
PAB	Gravity Drain Tank Room (TK-27)	10' 2"	PAB 9699-FC-40D	15' 6"	PAB 9699-RC-40A	1022' 8"-1004' 2"=18' 6"	PAB 9699-FM-57A
PAB	South Wall (G-Line)			133' 0"	PAB 9699-FR-16A	1035' 8" - 1022' 8' =13' 0"	PAB 9699-FM-57A
PAB	East Wall (2-Line to Fa)			17' 0"	PAB 9699-FR-16A	1035' 8" - 1022' 8' =13' 0"	PAB 9699-FM-57A
I-X PIT	Southernmost Wall			33' 0"	I-X Pit 9699-FM-35B	1035' 8" - 1021' 0" =14' 8"	I-X Pit 9699-FM-35B
I-X PIT	Easternmost Wall F to E			25' 6"	PAB 9699-FM-57A	1035' 8" - 1021' 0" =14' 8"	I-X Pit 9699-FM-35B
I-X PIT	Easternmost Wall E to Wall End			6'4"	I-X Pit 9699-FM-35B		
I-X PIT	Easternmost Wall (Total Length)			31' 10"			
SFP	Spent Fuel Pool	16' 6"	Fuel Pit 9699-FM-21A	33' 8"	Fuel Pit 9699-FM-21A	1022' 8" - 1008' 0" =14' 8"	Fuel Pit 9699-FC-45B
New Fuel Vault	New Fuel Storage (South Wall)			15' 0"	PAB 9699-FM-57A	1035' 0" - 1021' 6" =13' 6"	Fuel Pit 9699-FM-21A
Safe Shutdown	Pipe Chase (555)	4' 0"	CES Rev.1 85005-F-1001	4' 0"	CES Rev.1 85005-F-1001	1034' 0" - 1026' 0" = 8' 0"	CES Rev.1 85005-F-1001
Waste Vault	Waste Transfer Pump Pit (underground)	9' 0"	9699-FC-50C	14' 0"	9699-FC-50C	1020' 6" - 1010' 8" =9' 10"	9699-FC-50C
Elevator Pit	Elevator Pit	7' 10"	PAB 9699-FC-43A	9' 0"	PAB 9699-FC-43A	1022' 8' - 1016' 2" =6' 6"	PAB 9699-FC-43A
Waste Disposal	Pipe Chase Cubicle	5' 0"	Waste Disp.9699-FA-17A	11' 10"	Waste Disp.9699-FA-17A	1035' 8" - 1025' 7" = 10' 1"	Waste Disp.9699-FA-17A
Waste Disposal	Distillate Heat Exchanger Cubicle	9' 0"	Waste Disp.9699-FA-17A	16' 0"	Waste Disp.9699-FA-17A	1035' 8" - 1028' 8" = 7' 0"	Waste Disp.9699-FA-17A
Waste Disposal	Evaporator Cubicle	10' 6"	Waste Disp.9699-FA-17A	16' 0'	Waste Disp.9699-FA-17A	1035' 8" - 1028' 8" = 7' 0"	Waste Disp.9699-FA-17A
Waste Disposal	Drumming Pit Cubicle	10' 4"	Waste Disp.9699-FA-17A	27' 0"	Waste Disp.9699-FA-17A	1035' 8" - 1028' 8" = 7' 0"	Waste Disp.9699-FA-17A
PAB	Back of PAB Stairwell Pit Cubicle	11' 4"	PAB 9699 RC-40B	13' 0"	PAB 9699 RC-40B	1035' 8" - 1027' 6' = 8' 2"	PAB 9699-FM-57B

Note 1: Top/ceiling height elevation is from DEMCO work scope Ref. 1

2. Source Configuration

NUREG/CR-6755 (Ref. 2), Section 4.1, describes three principal assumptions inherent in the Building Occupancy scenario: a fixed room area, uniform surface contamination, and the receptor location at the center of the floor at a height of 1 m. The configuration of the receptor and sources is illustrated in Figure 2-1. The RESRAD- BUILD input parameters, receptor location and center of source coordinates, are provided in Table 2-1.

Figure 2-1
Configuration of Source and Receptor Locations
for RESRAD-BUILD Model

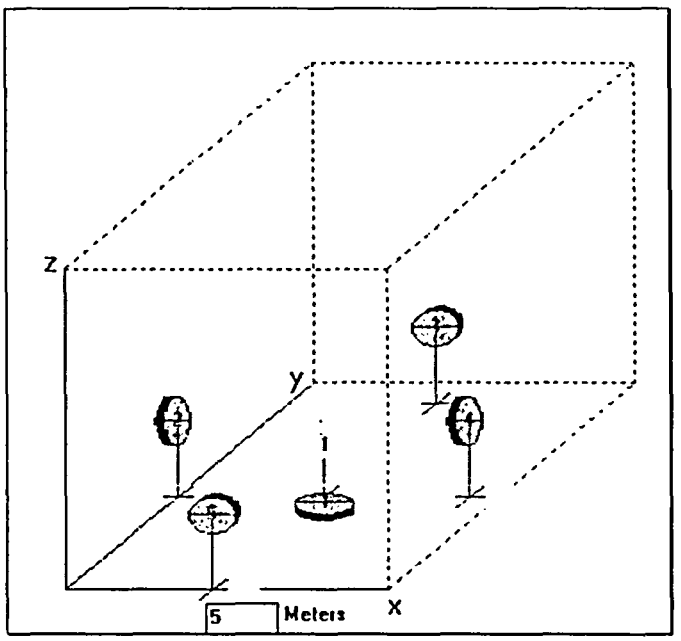

Table 2-1
Receptor and Center of Source Locations, meters

Source #	Source Description	Axis		
		X	Y	Z
1	Floor	2.22	2.22	0
2	West Wall	0	2.22	1.76
3	North Wall	2.22	4.44	1.76
4	East Wall	4.44	2.22	1.76
5	South Wall	2.22	0	1.76
	Receptor Location	2.22	2.22	1

3. Direct Ingestion Rate

The source specific input parameter, Direct Ingestion Rate, is described in RESRAD-BUILD as the direct ingestion rate of the source by any receptor in the room. Direct ingestion is possible only if the receptor and the source are in the same room and represents the fraction of the source ingested per hour.

NUREG/CR-5512, Volume 3, (Ref. 3) defines the average ingestion rate of 1.1E-4 m^2/hr as representative for the average individual in an industrial setting. The Direct Ingestion Rate for use in the Building Occupancy Scenario is calculated based upon the total room surface area (source area). The surface area is equal to sum of the surface area of four walls (15.58 m^2 per wall, as discussed in Section 1) plus the surface area of the floor (19.71 m^2, as discussed in Section 1).

$$\begin{aligned}\text{Direct Ingestion Rate} &= \text{Average Ingestion Rate / Source Area}\\ &= (1.1\text{E-04 m}^2\text{/hr}) / ((4 \times 15.58\text{ m}^2) + 19.71\text{ m}^2)\\ &= (1.1\text{E-04 m}^2\text{/hr}) / (82.03\text{ m}^2)\\ &= 1.34\text{E-06 hr}^{-1}\end{aligned}$$

The direct ingestion defined in this manner used in conjunction with an indirect ingestion rate set to zero, adequately models the Building Occupancy Ingestion pathway.

References:

1 Attachment E to the "Contract for the Performance of Demolition and Disposal and Related Services, By and Between DEMCO, Inc. and Yankee Atomic Electric Company," dated February 28, 2003.

2. NUREG/CR-6755, "Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario Using the Probabilistic RESRAD-BUILD 3.0 Code," February. 2002 (ANL/EAD/TM/02-1).

3. NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning," Volume 3: "Parameter Analysis, Draft Report for Comment," October 1999 (SAND99-2148).

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Appendix 6G

Input Parameter Values for Sensitivity Analysis, Building Occupancy

Input Parameter Values for Sensitivity Analysis, Building Occupancy

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Paramters[d]				Median
						1	2	3	4	
General										
Exposure Duration (days)	B	3	D	365.25	NUREG/CR-5512 (Ref. 1), Vol.3, Section 5.2.1	NR	NR	NR	NR	NR
Indoor Fraction	B	2	D	0.267	NUREG/CR-5512 (Ref. 1), Vol. 3, Section 5.2.2	NR	NR	NR	NR	NR
Evaluation Time (year)	P	3	D	0	t=0 corresponds maximum dose over the first year	NR	NR	NR	NR	NR
Number of Rooms	P	3	D	1	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Deposition Velocity (m/sec)	P	2	S	Loguniform	NUREG/CR-6755 (Ref. 2), Section 3.3	2.70E-06	2.70E-03	-	-	-
Resuspension Rate (sec^{-1})	P	1	S	Loguniform	NUREG/CR-6755 (Ref. 2), Section 3.1	2.5E-11	1.35E-5	-	-	-
Air exchange rate for room (1/ h)	B	2	D	1.52	NUREG/CR-6697 (Ref. 3), Att. C, 7.4 and NUREG/CR-6755 (Ref. 2), Section 3.2	NR	NR	NR	NR	NR
Room area (m^2)	P	2	D	19.71	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Room height (m)	P	2	D	3.51	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Time fraction	B	3	D	1	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Breathing rate (m^3/day)	B	2	D	33.6	NUREG/CR-5512 (Ref. 1) Vol. 3 Section 5.3	NR	NR	NR	NR	NR
Indirect ingestion rate (m^2/hr)	B	2	D	0	NUREG/CR-5512 (Ref. 1) Vol. 3 Section 5.2.3 Indirect ingestion is not modeled	NR	NR	NR	NR	NR
Receptor location: x,y,z (m)	B	3	D	2.22, 2.22, 1	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Shielding thickness (cm)	P	2	D	0	No shielding assumed	NR	NR	NR	NR	NR
Shielding density (g/cc)	P	1	D	0	No shielding assumed	NR	NR	NR	NR	NR
Shielding material	P	3	D	None	No shielding assumed	NR	NR	NR	NR	NR
Number of sources	P	3	D	5	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
External dose conversion factor ((mrem/yr)/(dpm/m^2))	M	3	D	RESRAD-BUILD default	FGR-12 (Ref. 4)	NR	NR	NR	NR	NR
Air submersion dose conversion factor ((mrem/yr)/(pCi/m^3))	M	3	D	RESRAD-BUILD default	FGR-12 (Ref. 4)	NR	NR	NR	NR	NR
Inhalation dose conversion factor (mrem/pCi/g)	M	3	D	RESRAD-BUILD default	FGR-11 (Ref. 5)	NR	NR	NR	NR	NR

Input Parameter Values for Sensitivity Analysis, Building Occupancy

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Paramters[d]				Median
						1	2	3	4	
Ingestion dose conversion factor (mrem/pCi/g)	M	3	D	RESRAD-BUILD default	FGR-11 (Ref. 5)	NR	NR	NR	NR	NR
Source 1. Floor										
Type	P	3	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	3	D	Z	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	3	D	2.22, 2.22, 0	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m2)	P	2	D	19.71	Site-specific model, LTP App.6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	2	D	1	NUREG/CR-6697 (Ref. 3), Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	2	D	0.07	NUREG/CR-6697 (Ref. 3), Att. C, Section 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr^{-1})	B	2	D	1.34E-6	NUREG/CR-5512 (Ref. 1), Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m^2/h / 82.03 m^2)	NR	NR	NR	NR	NR
Removable fraction	P	1	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), Section 3.5	NR	NR	NR	NR	NR
Time for source removal (days)	P	2	S	Triangular	NUREG/CR-6755 (Ref. 2), Section 3.6	1000	100000	10000	-	-
Radionuclide concentration (pCi/m^2)	P	2	D	1	Assumes unit concentration	NR	NR	NR	NR	NR
Source 2. West Wall										
Type	P	3	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	3	D	X	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	3	D	0, 2.22, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m2)	P	2	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	2	D	1	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	2	D	0.07	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR

Input Parameter Values for Sensitivity Analysis, Building Occupancy

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Paramters[d]				Median
						1	2	3	4	
Direct ingestion (hr-1)	B	2	D	1.34E-6	NUREG/CR-5512 (Ref. 1) Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m²/h / 82.03 m²)	NR	NR	NR	NR	NR
Removable fraction	P	1	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), 3.5	NR	NR	NR	NR	NR
Time for source removal (days)	P	2	S	Triangular	NUREG/CR-6755 (Ref. 2), 3.6 and NUREG/CR- 6697 (Ref. 3)	1000	100000	10000	-	-
Radionuclide concentration (pCi/m²)	P	2	D	1	Allows for proportional DCGL calculation	NR	NR	NR	NR	NR
Source 3. North Wall										
Type	P	3	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	3	D	Y	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	3	D	2.22, 4.44, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m2)	P	2	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	2	D	1	NUREG/CR-6697 (Ref. 3) Att. C, 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	2	D	0.07	NUREG/CR-6697 (Ref. 3) Att. C, 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr-1)	B	2	D	1.34E-6	NUREG/CR-5512 (Ref. 1) Vol. 3,5.2.3 1.1E-04m²/h / 82.03m²	NR	NR	NR	NR	NR
Removable fraction	P	1	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), 3.5	NR	NR	NR	NR	NR
Time for source removal (days)	P	2	S	Triangular	NUREG/CR-6755 (Ref. 2), 3.6 and NUREG/CR- 6697 (Ref. 3)	1000	100000	10000	-	-
Radionuclide concentration (pCi/m²)	P	2	D	1	Allows for proportional DCGL calculation	NR	NR	NR	NR	NR
Source 4. East Wall										
Type	P	3	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	3	D	X	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	3	D	4.44, 2.22, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR

Input Parameter Values for Sensitivity Analysis, Building Occupancy

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Paramters[d]				Median
						1	2	3	4	
Area (m2)	P	2	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	2	D	1	NUREG/CR-6697 (Ref. 3), Att. C, 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	2	D	0.07	NUREG/CR-6697 (Ref. 3), Att. C, 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr-1)	B	2	D	1.34E-6	NUREG/CR-5512 (Ref. 1),Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m²/h / 82.03m²)	NR	NR	NR	NR	NR
Removable fraction	P	1	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), 3.5	NR	NR	NR	NR	NR
Time for source removal (days)	P	2	S	Triangular	NUREG/CR-6755 (Ref. 2), 3.6 and NUREG/CR- 6697	1000	100000	10000	-	-
Radionuclide concentration (pCi/m²)	P	2	D	1	Allows for proportional DCGL calculation	NR	NR	NR	NR	NR
Source 5. South Wall										
Type	P	3	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	3	D	Y	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	3	D	2.22, 0, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m2)	P	2	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	2	D	1	NUREG/CR-6697 (Ref. 3) Att. C, 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	2	D	0.07	NUREG/CR-6697 (Ref. 3) Att. C, 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr-1)	B	2	D	1.34E-6	NUREG/CR-5512 (Ref. 1), Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m²/h / 82.03m²)	NR	NR	NR	NR	NR
Removable fraction	P	1	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), 3.5	NR	NR	NR	NR	NR
Time for source removal (days)	P	2	S	Triangular	NUREG/CR-6755 (Ref. 2). 3.6 and NUREG/CR- 6697 (Ref. 3)	1000	100000	10000	-	-

Input Parameter Values for Sensitivity Analysis, Building Occupancy

Parameter (unit)	Type[a]	Priority[b]	Treatment[c]	Value/Distribution	Basis	Distribution's Statistical Paramters[d]				Median
						1	2	3	4	
Radionuclide concentration (pCi/m^2)	P	2	D	1	Allows for proportional DCGL calculation	NR	NR	NR	NR	NR

Notes:

[a] P = physical, B = behavioral, M = metabolic (NUREG/CR-6697, Att. B, Table 4.3)
[b] 1 = high priority parameter, 2 = medium priority parameter, 3 = low priority parameter (NUREG/CR-6697, Att. B, Table 4.3)
[c] D = deterministic, S = stochastic
[d] Statistical Parameters
Loguniform 1 = minimum, 2 = maximum
Triangular 1 = minimum, 2 = maximum, 3 = most likely
NR = Not required

Input Correlations: Resuspension Rate and Deposition Velocity = 0.9
Time to Source Removal = 0.9 (correlation set between sources)

Run Specifications: Random seed = 1000
Number of observations = 300
Number of repetitions = 1
Dose integrations = 5

References:

1. NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning," Volume 3: "Parameter Analysis, Draft Report for Comment," October 1999 (SAND99-2148).

2. NUREG/CR-6755, "Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario Using the Probabilistic RESRAD-BUILD 3.0 Code," February. 2002 (ANL/EAD/TM/02-1).

3. NUREG/CR-6697,"Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes," November 2000, (ANL/EAD/TM-98).

4. Eckerman, K.F., et al, "External Exposure to Radionuclides In Air, Water, And Soil," EPA 402-R-93-081, Federal Guidance Report No. 12 (FGR-12), U.S. EPA, 1993.

5. Eckerman, K.F., et al., "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," EPA-520/1-88-020, Federal Guidance Report No. 11 (FGR-11), U.S. EPA, 1988.

6. NUREG-1727, "NMSS Decommissioning Standard Review Plan," September 2000.

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Appendix 6H

Results of Sensitivity Analysis, Building Occupancy

Results of Sensitivity Analysis, Building Occupancy
(Based on the Partial Rank Correlation Coefficient)

Radionuclide	Rank 1 parameter	Rank 2 parameter	Rank 3 parameter	Rank 4 parameter	Rank 5 parameter	Rank 6 parameter	Rank 7 parameter
H-3	RFO(1) -0.85	RFO(2) -0.78	RFO(4) -0.78	RFO(5) -0.76	RFO(3) -0.76	DKSUS 0.35	UD -0.31
C-14	RFO(1) 0.89	RFO(4) 0.85	RFO(3) 0.84	RFO(5) 0.82	RFO(2) 0.82	--	--
Fe-55	RFO(3) 0.28	RFO(1) 0.28	RFO(4) 0.27	RFO(5) 0.23	DKSUS 0.23	UD -0.21	RFO(2) 0.15
Co-60	RFO(1) 0.45	RFO(5) 0.16	DKSUS -0.14	RFO(2) 0.13	UD 0.13	RFO(4) 0.10	--
Ni-63	RFO(1) - 0.64	RFO(3) -0.58	RFO(5) -0.58	RFO(2) -0.58	RFO(4) -0.58	DKSUS 0.12	--
Sr-90	RFO(1) - 0.71	RFO(4) -0.59	RFO(2) -0.56	RFO(5) -0.56	RFO(3) -0.52	DKSUS 0.37	UD -0.30
Nb-94	DKSUS -0.38	UD 0.25	RFO(1) 0.24	--	--	--	--
Tc-99	RFO(1) 0.40	RFO(4) 0.34	RFO(2) 0.29	RFO(3) 0.27	RFO(5) 0.26	--	--
Ag-108m	RFO(1) 0.50	DKSUS -0.49	UD 0.41	RFO(4) 0.13	RFO(5) -0.10	--	--
Sb-125	RFO(1) 0.65	RFO(4) 0.38	RFO(3) 0.32	UD 0.26	DKSUS -0.25	RFO(2) 0.20	RFO(5) 0.16
Cs-134	RFO(1) 0.37	RFO(4) 0.20	RFO(2) 0.16	RFO(5) 0.15	RFO(3) 0.14	UD 0.12	DKSUS -0.11
Cs-137	RFO(1) 0.81	RFO(5) 0.59	RFO(3) 0.59	RFO(4) 0.57	RFO(2) 0.54	DKSUS -0.48	UD 0.43
Eu-152	RFO(1) 0.24	RFO(5) 0.11	--	--	--	--	--
Eu-154	RFO(1) 0.42	DKSUS -0.20	UD 0.17	RFO(2) 0.13	--	--	--
Eu-155	RFO(4) -0.48	RFO(5) -0.46	RFO(3) -0.44	RFO(2) -0.43	RFO(1) 0.19	--	--
Pu-238	RFO(1) -0.91	RFO(4) -0.87	RFO(3) -0.86	RFO(5) -0.85	RFO(2) -0.85	DKSUS 0.11	--
Pu-239	RFO(1) -0.91	RFO(4) -0.87	RFO(3) -0.86	RFO(5) -0.85	RFO(2) -0.85	--	--
Pu-241	DKSUS 0.60	UD -0.54	RFO(2) -0.14	RFO(1) -0.13	RFO(4) -0.13	--	--
Am-241	RFO(1) -0.91	RFO(4) -0.87	RFO(3) -0.86	RFO(5) -0.85	RFO(2) -0.85	--	--
Cm-243	RFO(1) -0.91	RFO(4) -0.86	RFO(3) -0.85	RFO(5) -0.85	RFO(2) -0.84	DKSUS 0.22	UD -0.17

Parameter Definition:

DKSUS = Resuspension Rate

UD = Deposition Velocity

RFO(#) = Time for Source Removal, where # represents the source number delineated as follow: 1=floor, 2=-west wall, 3=north wall, 4=east wall, 5=south wall

Appendix 6I

Input Parameter Values for Building Occupancy DCGL Determination

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
General										
Exposure Duration (days)	B	All	D	365.25	NUREG/CR-5512 (Ref. 1), Vol.3, 5.2.1	NR	NR	NR	NR	NR
Indoor Fraction	B	All	D	0.267	NUREG/CR-5512 (Ref. 1), Vol. 3, 5.2.2	NR	NR	NR	NR	NR
Evaluation Time (year)	P	All	D	0	t=0 corresponds maximum dose over the first year (year 9 for Pu-241)	NR	NR	NR	NR	NR
Number of Rooms	P	All	D	1	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Deposition Velocity (m/sec)	P	H-3	D	1.51E-05	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Fe-55	D	1.51E-05	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Co-60	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Sr-90	D	1.51E-05	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Nb-94	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Ag-108m	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Sb-125	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Cs-134	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Cs-137	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Eu-154	D	4.79E-04	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Pu-241	D	1.51E-05	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Cm-243	D	1.51E-05	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	All others	S	Loguniform	NUREG/CR-6755 (Ref. 2), Section 3.3	2.70E-06	2.70E-03	-	-	8.53E-05
Resuspension Rate (sec^{-1})	P	H-3	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Fe-55	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Co-60	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Ni-63	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Sr-90	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Nb-94	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Ag-108	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Sb-125	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Cs-134	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Cs-137	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Eu-154	D	6.75E-10	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Pu-238	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	Pu-241	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Cm-243	D	1.02E-06	Mean value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	-	-	-
	P	All others	S	Loguniform	NUREG/CR-6755 (Ref. 2), 3.1	2.5E-11	1.3E-5	-	-	1.83E-08
Air exchange rate for room (hr^{-1})	B	All	D	1.52	NUREG/CR-6697 (Ref. 3), Att.C, Section 7.4 and NUREG/CR-6755 (Ref. 2), Section 3.2	NR	NR	NR	NR	NR
Room area (m^2)	P	All	D	19.71	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Room height (m)	P	All	D	3.51	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Time fraction	B	All	D	1	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Breathing rate (m^3/day)	B	All	D	33.6	NUREG/CR-5512 (Ref. 1) Vol. 3 Section 5.3	NR	NR	NR	NR	NR
Indirect ingestion rate (m^2/hr)	B	All	D	0	NUREG/CR-5512 (Ref. 1) Vol. 3 Section 5.2.3 Indirect ingestion is not modeled	NR	NR	NR	NR	NR
Receptor location: x,y,z (m)	B	All	D	2.22, 2.22, 1	NUREG/CR-5512 (Ref. 1) and LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Shielding thickness (cm)	P	All	D	0	No shielding assumed	NR	NR	NR	NR	NR
Shielding density (g/cc)	P	All	D	0	No shielding assumed	NR	NR	NR	NR	NR
Shielding material	P	All	D	None	No shielding assumed	NR	NR	NR	NR	NR
Number of sources	P	All	D	5	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
External dose conversion factor ((mrem/yr)/(dpm/m^2))	M	All	D	RESRAD-BUILD default	FGR-12 (Ref. 4)	NR	NR	NR	NR	NR
Air submersion dose conversion factor ((mrem/yr)/(pCi/m^3))	M	All	D	RESRAD-BUILD default	FGR-12 (Ref. 4)	NR	NR	NR	NR	NR
Inhalation dose conversion factor (mrem/pCi/g)	M	All	D	RESRAD-BUILD default	FGR-11 (Ref. 5)	NR	NR	NR	NR	NR
Ingestion dose conversion factor (mrem/pCi/g)	M	All	D	RESRAD-BUILD default	FGR-11 (Ref. 5)	NR	NR	NR	NR	NR
Source 1. Floor										
Type	P	All	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	All	D	Z	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	All	D	2.22, 2.22, 0	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
Area (m^2)	P	All	D	19.71	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	All	D	1	NUREG/CR-6697 (Ref. 3), Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	All	D	0.07	NUREG/CR-6697 (Ref. 3), Att. C, Section 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr^{-1})	B	All	D	1.34E-6	NUREG/CR-5512 (Ref. 1), Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m^2/h / 82.03 m^2)	NR	NR	NR	NR	NR
Removable fraction	P	All	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), Section 3.5	NR	NR	NR	NR	NR
Time for source removal (days)	P	H-3	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	C-14	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Fe-55	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Co-60	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ni-63	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sr-90	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Nb-94	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Tc-99	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Ag-108m	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sb-125	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-134	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-137	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-152	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-154	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-155	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-238	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-239	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Am-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cm-243	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
Radionuclide concentration (pCi/m^2)	P	All	D	1	Assumed unit concentration	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c] 1	2	3	4	Median
Source 2. West Wall										
Type	P	All	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	All	D	X	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	All	D	0, 2.22, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m^2)	P	All	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	All	D	1	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	All	D	0.07	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr^{-1})	B	All	D	1.34E-6	NUREG/CR-5512 (Ref. 1) Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m^2/h / 82.03m^2)	NR	NR	NR	NR	NR
Removable fraction	P	All	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), Section 3.5	NR	NR	NR	NR	NR
Time for source removal (d)	P	H-3	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	C-14	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Fe-55	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Co-60	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ni-63	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sr-90	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Nb-94	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Tc-99	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ag-108m	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sb-125	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-134	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-137	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-152	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-154	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-155	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-238	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-239	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Am-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c] 1	2	3	4	Median
	P	Cm-243	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
Radionuclide concentration (pCi/m²)	P	All	D	1	Assumed unit concentration	NR	NR	NR	NR	NR
Source 3: North Wall										
Type	P	All	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	All	D	Y	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	All	D	2.22, 4.44, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m2)	P	All	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	All	D	1	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	All	D	0.07	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr⁻¹)	B	All	D	1.34E-6	NUREG/CR-5512 (Ref. 1) Vol. 3, Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m²/h / 82.03m²)	NR	NR	NR	NR	NR
Removable fraction	P	All	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), Section 3.5	NR	NR	NR	NR	NR
Time for source removal (d)	P	H-3	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	C-14	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Fe-55	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Co-60	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ni-63	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Sr-90	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Nb-94	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Tc-99	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ag-108m	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sb-125	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-134	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-137	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-152	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-154	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-155	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-238	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-239	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c] 1	2	3	4	Median
	P	Am-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cm-243	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
Radionuclide concentration (pCi/m²)	P	All	D	1	Assumed unit concentration	NR	NR	NR	NR	NR
Source 4. East Wall										
Type	P	All	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	All	D	X	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	All	D	4.44, 2.22, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m²)	P	All	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	All	D	1	NUREG/CR-6697 (Ref. 3), Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	All	D	0.07	NUREG/CR-6697 (Ref. 3), Att. C, Section 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr⁻¹)	B	All	D	1.34E-6	NUREG/CR-5512 (Ref. 1), Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m²/h / 82.03m²)	NR	NR	NR	NR	NR
Removable fraction	P	All	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), Section 3.5	NR	NR	NR	NR	NR
Time for source removal (d)	P	H-3	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	C-14	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Fe-55	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Co-60	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Ni-63	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sr-90	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Nb-94	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Tc-99	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ag-108m	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sb-125	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-134	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-137	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-152	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-154	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-155	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-238	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-239	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Pu-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Am-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cm-243	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
Radionuclide concentration (pCi/m^2)	P	All	D	1	Assumed unit concentration	NR	NR	NR	NR	NR
Source 5. South Wall										
Type	P	All	D	Area	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Direction	P	All	D	Y	NUREG/CR-5512 (Ref. 1)	NR	NR	NR	NR	NR
Location of center of source: x,y,z (m)	P	All	D	2.22, 0, 1.76	Site-specific model, LTP App. 6F, Section 2	NR	NR	NR	NR	NR
Area (m^2)	P	All	D	15.58	Site-specific model, LTP App. 6F, Section 1	NR	NR	NR	NR	NR
Air fraction for H-3	B	All	D	1	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Air fraction (for all nuclides except H-3)	B	All	D	0.07	NUREG/CR-6697 (Ref. 3) Att. C, Section 8.6	NR	NR	NR	NR	NR
Direct ingestion (hr^{-1})	B	All	D	1.34E-6	NUREG/CR-5512 (Ref. 1), Section 5.2.3 and LTP App. 6F, Section 3 (1.1E-04m^2/h / 82.03m^2)	NR	NR	NR	NR	NR
Removable fraction	P	All	D	0.1	NUREG-1727 (Ref. 6) Table C7.1 and NUREG/CR-6755 (Ref. 2), Section 3.5	NR	NR	NR	NR	NR
Time for source removal (d)	P	H-3	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	C-14	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Fe-55	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination

Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Co-60	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ni-63	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sr-90	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Nb-94	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Tc-99	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Ag-108m	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Sb-125	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-134	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cs-137	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-152	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-154	D	52777	75th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Eu-155	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-238	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR

Input Parameters for Building Occupancy DCGL Determination										
Parameter (unit)	Type[a]	Radionuclide	Treatment[b]	Value or Distribution	Basis	Distribution's Statistical Parameters[c]				Median
						1	2	3	4	
	P	Pu-239	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Pu-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Am-241	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
	P	Cm-243	D	18240	25th percentile value of distribution in NUREG/CR-6755 (Ref. 2)	NR	NR	NR	NR	NR
Radionuclide concentration (pCi/m²)	P	All	D	1	Assumed unit concentration	NR	NR	NR	NR	NR

Notes:

[a] P = physical, B = behavioral, M = metabolic (NUREG/CR-6697 (Ref. 3) Att. B, Table 4.3)
[b] D = deterministic, S = stochastic
[c] Statistical Parameters
Loguniform 1 = minimum, 2 = maximum
NR = Not Required
Input Correlations (used only if both input parameters use distributions): resuspension rate and deposition velocity = 0.9
Run Specifications:
Random seed = 1000
Number of Observations = 300
Number of Repetitions = 1
Dose Integrations = 5

References:

1. NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning," Volume 3: "Parameter Analysis, Draft Report for Comment," October 1999 (SAND99-2148).

2. NUREG/CR-6755, "Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario Using the Probabilistic RESRAD-BUILD 3.0 Code," February. 2002 (ANL/EAD/TM/02-1).

3. NUREG/CR-6697, "Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes," November 2000, (ANL/EAD/TM-98).

4. Eckerman, K.F., et al, "External Exposure to Radionuclides In Air, Water, And Soil," EPA 402-R-93-081, Federal Guidance Report No. 12 (FGR-12), U.S. EPA, 1993.

5. Eckerman, K.F., et al., "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," EPA-520/1-88-020, Federal Guidance Report No. 11 (FGR-11), U.S. EPA, 1988.

6. NUREG-1727, "NMSS Decommissioning Standard Review Plan," September 2000.

Appendix 6J

Building Surface Area DCGL Results

Building Surface DCGL Results

Nuclide	Dose Conversion Factor (DCF) (mrem/yr per pCi/m^2)	DCGL (pCi/m^2)	DCGL (dpm/100cm^2)
H-3	1.6E-09	1.5E+10	3.4E+08
C-14	5.4E-08	4.6E+08	1.0E+07
Fe-55	1.4E-08	1.8E+09	4.0E+07
Co-60	3.1E-05	8.1E+05	1.8E+04
Ni-63	1.5E-08	1.7E+09	3.7E+07
Sr-90	4.0E-06	6.3E+06	1.4E+05
Nb-94	2.1E-05	1.2E+06	2.6E+04
Tc-99	3.9E-08	6.5E+08	1.4E+07
Ag-108m	2.2E-05	1.1E+06	2.5E+04
Sb-125	5.5E-06	4.5E+06	1.0E+05
Cs-134	1.9E-05	1.3E+06	2.9E+04
Cs-137	8.8E-06	2.8E+06	6.3E+04
Eu-152	1.5E-05	1.7E+06	3.7E+04
Eu-154	1.6E-05	1.6E+06	3.4E+04
Eu-155	8.5E-07	2.9E+07	6.5E+05
Pu-238	9.7E-05	2.6E+05	5.7E+03
Pu-239	1.1E-04	2.3E+05	5.1E+03
Pu-241	2.3E-06	1.1E+07	2.5E+05
Am-241	1.1E-04	2.2E+05	5.0E+03
Cm-243	7.7E-05	3.2E+05	7.2E+03

Appendix 6K

Input Parameter Values for Area Factors, Soil

1. General Information

The input parameters for the soil area factor calculations are, in general, the same as those in LTP Appendix 6D. Areas of difference in input parameter values are highlighted in the sections to follow.

2. Conceptual Model, Scenario, and Dose Pathways

The resident farmer scenario, as described in Volume 1 of NUREG/CR-5512 (Ref. 1), assumes a reasonably conservative scenario for establishing DCGL values for residual radioactivity in soil. The same scenario is assumed for the area factor (AF) calculations.

The conceptual model used in the code is based on the site characteristics expected at the time of release of the site. The model is comprised of a contaminated zone underlain by an unsaturated zone underlain by a saturated zone. The contaminated zone is assumed to be at the ground surface with no cover material and the ground water is initially uncontaminated.

The potential exposure pathways that apply to the resident farmer are listed below and are based upon those in NUREG/CR-5512, Volume 1:

- Direct exposure to external radiation from residual radioactivity;
- Internal dose from inhalation of airborne radionuclides; and
- Internal dose from ingestion of
  - Plant foods grown in media containing residual radioactivity and irrigated with water containing residual radioactivity,
  - Meat and milk from livestock fed with fodder grown in soil containing residual radioactivity and water containing residual radioactivity,
  - Drinking water (containing residual radioactivity) from a well,
  - Fish from a pond containing residual radioactivity, and
  - Soil containing residual radioactivity.

3. Contaminated Fractions — Food Pathways

As the size of the contaminated area (A) varies, the fraction of the total food consumed by the receptor grown in the contaminated area will also vary. The fraction of the food supply grown in the contaminated is referred to as a "contaminated fraction." Accordingly, with the decrease in the size of the contaminated area, a decrease in the values for the contaminated fraction of plant food ingested (FPLANT), the contaminated fraction of meat ingested (FMEAT), and contaminated fraction of milk ingested (FMILK) will also result.

The variation in the contaminated fraction of plant food ingested, with the variation in the size of the contaminated area, is described by Equation D.5 of the RESRAD User Manual (Ref. 2):

$$FPLANT = A/2000, \text{ when } A \leq 1000 \text{ m}^2$$

$$FPLANT = 0.5, \text{ when } A \geq 1000 \text{ m}^2$$

However, the assumption used in calculating soil DCGLs is that 100% of the plant food consumed is grown in the contaminated area (equivalent to a contaminated fraction = 1.0), when the size of the contaminated area is 13,022 m^2. Thus, Equation D.5 of the RESRAD User Manual has been adjusted, as follows, to match that assumption, and this adjusted relationship is used in the calculation of area factors:

FPLANT = A/1000, when $A < 1000\ m^2$
FPLANT = 1.0, when $A \geq 1000\ m^2$

The variation in the contaminated fraction of meat and milk ingested, with the variation in the size of the contaminated area, is also described by Equation D.5 of the RESRAD User Manual (Ref. 2):

FA = A/20000, when $A \leq 20000\ m^2$
FA = 1.0, when $A \geq 20000\ m^2$

Where FA = FMEAT or FMILK

Again the assumption used in calculating soil DCGLs is that 100% of the meat food and milk consumed are grown in the contaminated area (equivalent to a contaminated fraction = 1.0 for meat and milk), when the size of the contaminated area is 13,022 m^2. Equation D.5 of the RESRAD User Manual has been adjusted, as follows, to match that assumption, and this adjusted relationship is used in the calculation of area factors:

FA = A/13,022 $A < 13022\ m^2$
FA = 1 $A = 13022\ m^2$

Where FA = FMEAT or FMILK

Table 1 shows the values for FPLANT, FMEAT, and FMILK as a function of the size of the contaminated zone.

4. Contaminated Fraction – Water Pathways

Unlike the contaminated fractions of food described above, the contaminated fractions for drinking water (FDW), livestock water (FLW), irrigation water (FIRW), and aquatic food (FR9) are assumed not to decrease as the size of the contaminated zone decreases. Setting the values for these input parameters to 1.0 maintains the assumption that all water used by the resident farmer comes from a well on site, regardless of the size of the contaminated area.

5. Size of the Contaminated Zone

Another input parameter that is influenced by changes in the size of the contaminated zone is the length parallel to aquifer flow (LCZPAQ). As the area of the contaminated zone decreases, the value of LCZPAQ will also decrease. As the contaminated zone is assumed to be circular, the value for LCZPAQ is equal to the diameter of the circle:

$$LCZPAQ(m) = 2\sqrt{\frac{A(m^2)}{\pi}}$$

Table 1 shows the values for LCZPAQ as a function of the size of the contaminated zone.

Table 1
Contaminated Fractions Versus Size of Contaminated Zone

RESRAD Parameter	Input Value						
Contaminated Zone Area (m^2)	**13022**	**11500**	**10000**	**7500**	**5000**	**2500**	**1000**
LCZPAQ (m)	129	121	113	98	80	56	36
FPLANT	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
FMEAT	1.0E+00	8.8E-01	7.7E-01	5.8E-01	3.8E-01	1.9E-01	7.7E-02
FMILK	1.0E+00	8.8E-01	7.7E-01	5.8E-01	3.8E-01	1.9E-01	7.7E-02
Contaminated Zone Area (m^2)	**750**	**500**	**250**	**100**	**75**	**50**	**25**
LCZPAQ (m)	31	25	18	11	9.8	8.0	5.6
FPLANT	7.5E-01	5.0E-01	2.5E-01	1.0E-01	7.5E-02	5.0E-02	2.5E-02
FMEAT	5.8E-02	3.8E-02	1.9E-02	7.7E-03	5.8E-03	3.8E-03	1.9E-03
FMILK	5.8E-02	3.8E-02	1.9E-02	7.7E-03	5.8E-03	3.8E-03	1.9E-03
Contaminated Zone Area (m^2)	**10**	**8**	**6**	**4**	**2**	**1**	--
LCZPAQ (m)	3.6	3.2	2.8	2.3	1.6	1.1	--
FPLANT	1.0E-02	8.0E-03	6.0E-03	4.0E-03	2.0E-03	1.0E-03	--
FMEAT	7.7E-04	6.1E-04	4.6E-04	3.1E-04	1.5E-04	7.7E-05	--
FMILK	7.7E-04	6.1E-04	4.6E-04	3.1E-04	1.5E-04	7.7E-05	--

6. Year of Maximum Dose

The year in which the maximum dose occurs may vary depending on the nuclide. The concentration delivering the maximum dose is selected for the basis of the AF without regard to year of occurrence.

7. Initial Concentration

An initial soil concentration of 1 pCi/g is assumed for each nuclide.

References:

1. NUREG/CR-5512, "Residual Radioactive Contamination From Decommissioning," Volume 1: "Technical Basis for Translating Contamination Levels to Annual TEDE," October 1992.

2. Yu, C. et al., "Users Manual for RESRAD Version 6," ANL/EAD-4, July 2001.

Appendix 6L

Area Factors for Soil

Area Factors for Soil

Nuclide	Area of Source (m^2)									
	13022	11500	10000	7500	5000	2500	1000	750	500	250
H-3	1.0E+00	1.1E+00	1.1E+00	1.3E+00	1.5E+00	1.8E+00	2.0E+00	2.7E+00	4.0E+00	8.0E+00
C-14	1.0E+00	1.1E+00	1.3E+00	1.6E+00	2.3E+00	3.7E+00	6.4E+00	9.7E+00	1.7E+01	4.5E+01
Fe-55	1.0E+00	1.1E+00	1.3E+00	1.6E+00	2.2E+00	3.4E+00	5.2E+00	7.0E+00	1.1E+01	2.1E+01
Co-60	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.2E+00	1.2E+00	1.3E+00
Ni-63	1.0E+00	1.1E+00	1.2E+00	1.5E+00	2.0E+00	2.8E+00	3.8E+00	5.1E+00	7.7E+00	1.5E+01
Sr-90	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.2E+00	1.3E+00	1.4E+00	1.8E+00	2.7E+00	5.4E+00
Nb-94	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Tc-99	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00	1.5E+00	2.3E+00	4.5E+00
Ag-108m	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Sb-125	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Cs-134	1.0E+00	1.0E+00	1.1E+00	1.2E+00	1.3E+00	1.4E+00	1.5E+00	1.6E+00	1.7E+00	1.8E+00
Cs-137	1.0E+00	1.1E+00	1.1E+00	1.2E+00	1.4E+00	1.6E+00	1.7E+00	1.9E+00	2.1E+00	2.4E+00
Eu-152	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Eu-154	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Eu-155	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Pu-238	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.4E+00	2.0E+00	4.0E+00
Pu239	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.4E+00	2.0E+00	4.0E+00
Pu241	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.3E+00	2.0E+00	3.8E+00
Am-241	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.3E+00	2.0E+00	3.8E+00
Cm-243	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.2E+00	1.6E+00	2.3E+00

Nuclide	Area of Source (m^2)									
	100	75	50	25	10	8	6	4	2	1
H-3	2.0E+01	2.6E+01	3.9E+01	7.5E+01	1.8E+02	2.2E+02	2.9E+02	4.2E+02	8.0E+02	1.5E+03
C-14	1.5E+02	2.2E+02	3.7E+02	8.6E+02	2.4E+03	3.1E+03	4.1E+03	6.0E+03	1.2E+04	2.4E+04
Fe-55	5.2E+01	7.0E+01	1.0E+02	2.1E+02	5.2E+02	6.5E+02	8.5E+02	1.3E+03	2.5E+03	4.7E+03
Co-60	1.4E+00	1.4E+00	1.5E+00	1.8E+00	2.4E+00	2.7E+00	3.2E+00	4.1E+00	6.5E+00	1.1E+01
Ni-63	3.8E+01	5.1E+01	7.7E+01	1.5E+02	3.8E+02	4.8E+02	6.4E+02	9.5E+02	1.9E+03	3.8E+03
Sr-90	1.4E+01	1.8E+01	2.7E+01	5.4E+01	1.3E+02	1.6E+02	2.2E+02	3.2E+02	6.4E+02	1.3E+03
Nb-94	1.2E+00	1.2E+00	1.3E+00	1.5E+00	2.0E+00	2.3E+00	2.8E+00	3.5E+00	5.5E+00	9.3E+00
Tc-99	1.1E+01	1.5E+01	2.3E+01	4.5E+01	1.1E+02	1.4E+02	1.9E+02	2.8E+02	5.6E+02	1.1E+03
Ag-108m	1.2E+00	1.2E+00	1.3E+00	1.5E+00	2.0E+00	2.3E+00	2.7E+00	3.5E+00	5.5E+00	9.2E+00
Sb-125	1.2E+00	1.2E+00	1.3E+00	1.5E+00	2.0E+00	2.3E+00	2.7E+00	3.5E+00	5.4E+00	9.1E+00
Cs-134	2.0E+00	2.1E+00	2.3E+00	2.7E+00	3.6E+00	4.0E+00	4.8E+00	6.1E+00	9.7E+00	1.6E+01
Cs-137	2.8E+00	2.9E+00	3.1E+00	3.7E+00	4.9E+00	5.6E+00	6.6E+00	8.5E+00	1.3E+01	2.2E+01
Eu-152	1.2E+00	1.2E+00	1.3E+00	1.5E+00	2.1E+00	2.3E+00	2.8E+00	3.5E+00	5.6E+00	9.4E+00
Eu-154	1.2E+00	1.3E+00	1.3E+00	1.5E+00	2.1E+00	2.4E+00	2.8E+00	3.6E+00	5.6E+00	9.6E+00
Eu-155	1.2E+00	1.2E+00	1.3E+00	1.5E+00	1.9E+00	2.2E+00	2.6E+00	3.2E+00	5.0E+00	8.0E+00
Pu-238	9.7E+00	1.3E+01	1.9E+01	3.4E+01	7.2E+01	8.4E+01	1.0E+02	1.3E+02	1.8E+02	2.4E+02
Pu239	9.7E+00	1.3E+01	1.9E+01	3.4E+01	7.2E+01	8.4E+01	1.0E+02	1.3E+02	1.8E+02	2.4E+02
Pu241	8.7E+00	1.1E+01	1.5E+01	2.5E+01	4.5E+01	5.2E+01	6.3E+01	8.0E+01	1.2E+02	1.6E+02
Am-241	8.7E+00	1.1E+01	1.5E+01	2.5E+01	4.5E+01	5.2E+01	6.2E+01	7.9E+01	1.2E+02	1.6E+02
Cm-243	3.3E+00	3.6E+00	4.0E+00	4.9E+00	6.8E+00	7.7E+00	9.1E+00	1.2E+01	1.8E+01	3.0E+01

Appendix 6M

Input Parameter Values for Area Factors, Building Occupancy

1. Changes to Input Parameter Set for Building Occupancy DCGLs.

In calculating area factors (AF) for building surfaces, RESRAD-BUILD (v 3.21) was used with the building occupancy scenario to determine the annual dose from 1pCi/m2 for various size sources. A modification of the input assumptions, used for calculating building occupancy DCGLs, was made to consider that only the specified area of the floor as contaminated. The size of this contaminated area is varied from the value of the entire floor surface area (19.7 m^2) to a value of 1 m^2. In calculating the AFs, the contamination of the entire floor is considered as the base case and a specific derived concentration guideline is defined. This specific DCGL is designated $DCGL_{wl}$ to differentiate it from the $DCGL_w$ determined for the entire room. The remaining parameters are those described in LTP Appendix 6G.

Appendix 6N

Area Factors for Building Surface Areas

Area Factors for Building Surfaces

Nuclide	Area of Source (m^2)								
	19.7	15	12	10	8	6	4	2	1
H-3	1.0	1.3	1.6	2.0	2.5	3.3	4.9	9.9	19.7
C-14	1.0	1.3	1.6	2.0	2.4	3.3	4.9	9.7	19.4
Fe-55	1.0	1.3	1.6	2.0	2.5	3.3	4.9	9.9	19.7
Co-60	1.0	1.1	1.3	1.4	1.6	1.9	2.4	4.1	7.3
Ni-63	1.0	1.3	1.6	2.0	2.5	3.3	4.9	9.9	19.7
Sr-90	1.0	1.3	1.6	1.9	2.4	3.2	4.8	9.4	18.6
Nb-94	1.0	1.1	1.3	1.4	1.6	1.9	2.4	4.0	7.2
Tc-99	1.0	1.3	1.6	1.9	2.4	3.2	4.7	9.2	18.2
Ag-108m	1.0	1.1	1.3	1.4	1.6	1.9	2.4	4.0	7.2
Sb-125	1.0	1.1	1.3	1.4	1.6	1.9	2.4	4.1	7.2
Cs-134	1.0	1.1	1.3	1.4	1.6	1.9	2.5	4.2	7.4
Cs-137	1.0	1.1	1.3	1.4	1.6	1.9	2.5	4.2	7.6
Eu-152	1.0	1.1	1.3	1.4	1.6	1.9	2.4	4.0	7.2
Eu-154	1.0	1.1	1.3	1.4	1.6	1.9	2.4	4.0	7.2
Eu-155	1.0	1.1	1.3	1.4	1.6	1.9	2.5	4.1	7.4
Pu-238	1.0	1.3	1.6	2.0	2.5	3.3	4.9	9.9	19.7
Pu-239	1.0	1.3	1.6	2.0	2.5	3.3	4.9	9.8	19.8
Pu-241	1.0	1.3	1.6	2.0	2.5	3.3	4.9	9.8	19.5
Am-241	1.0	1.3	1.6	2.0	2.4	3.3	4.9	9.7	19.5
Cm-243	1.0	1.3	1.6	1.9	2.4	3.2	4.7	9.3	18.5