

## Soil Monitoring System

Throughput:

3" Dwg      .25'      max depth of materi-  
 24" width      2.0'      cation bar width  
 1.5 ft per sec      (0.45 m/sec)  
 max travel speed for cable  
 nec. sensitivity (w/ 1.5 pc/s)

$$\begin{aligned}
 &.25' \times 2.0' \times 1.5' \text{ sec} \times 60 \text{ min} \times 60 \text{ min/hr} \\
 &= 2700 \text{ CF/hr} \\
 &= 100 \text{ CY/hr Max}
 \end{aligned}$$

Correction factors allocated:

1. .8      3" is max depth at bottom of  
 concrete conveyor belt only. Depth  
 diminishes in both directions toward  
 the sides.
  2. .8      Throughput interruptions attributed  
 to position alarms and subsequent  
 material markings, sorting, and  
 restarts.
  3. .8      System start-up / shut down periods  
 QC - action & hr production  
 effort over 10 hr work day.
  4. .5      Weather related delays, system  
 obstruction, equipment failure.
- 100 CY/hr  $\times$  0.8  $\times$  0.8  $\times$  0.8  $\times$  0.5 = 25.6 CY/hr

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5

Case Title: Cesium point source

This case was run on Monday, November 23, 1998 at 12:51:49 PM

Dose Point # 3 - (6,6.57e+00,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.623e+003	2.385e-008	7.588e-010	6.321e-012
2	0.0322	6.685e+003	8.197e-008	2.639e-009	2.124e-011
3	0.0364	2.433e+003	6.391e-006	2.326e-007	1.322e-009
4	0.6616	1.575e+005	1.698e+001	1.123e+001	2.178e-002
TOTALS:		1.702e+005	1.698e+001	1.123e+001	2.178e-002

MicroShield v5.01 (5.01-01003)

11/23/98

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5

Case Title: Cesium point source

This case was run on Monday, November 23, 1998 at 12:51:49 PM

Dose Point # 4 - (6,0,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.623e+003	2.497e-005	7.945e-007	6.618e-009
2	0.0322	6.685e+003	7.046e-005	2.268e-006	1.826e-008
3	0.0364	2.433e+003	1.003e-003	3.652e-005	2.075e-007
4	0.6616	1.575e+005	4.436e+001	2.935e+001	5.690e-002
TOTALS:		1.702e+005	4.436e+001	2.935e+001	5.690e-002

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5

Case Title: Cesium point source

This case was run on Monday, November 23, 1998 at 12:51:49 PM

Dose Point # 1 - (6.5,1.97e+01,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.623e+003	1.092e-018	3.475e-020	2.895e-022
2	0.0322	6.685e+003	7.388e-018	2.378e-019	1.914e-021
3	0.0364	2.433e+003	1.979e-013	7.204e-015	4.093e-017
4	0.6616	1.575e+005	1.240e+000	8.203e-001	1.590e-003
TOTALS:		1.702e+005	1.240e+000	8.203e-001	1.590e-003

MicroShield v5.01 (5.01-01003)

11/23/98

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5

Case Title: Cesium point source

This case was run on Monday, November 23, 1998 at 12:51:49 PM

Dose Point # 2 - (6,1.30e+01,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.623e+003	8.047e-014	2.560e-015	2.133e-017
2	0.0322	6.685e+003	3.958e-013	1.274e-014	1.026e-016
3	0.0364	2.433e+003	6.913e-010	2.516e-011	1.430e-013
4	0.6616	1.575e+005	4.232e+000	2.800e+000	5.428e-003
TOTALS:		1.702e+005	4.232e+000	2.800e+000	5.428e-003

#### CASE 4

#### MICROSHIELD OUTPUT

5 uCi, Cs-137 point source

MicroShield v5.01 (5.01-01003)  
Allied Technology Group, Inc.  
Results With Buildup  
FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5  
Case Title: Cobalt point source

This case was run on Monday, November 23, 1998 at 11:41:43 AM  
Dose Point # 3 - (6,6.57e+00,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	3.018e+001	3.240e-003	2.248e-003	4.340e-006
2	1.1732	1.850e+005	1.971e+001	2.312e+001	4.131e-002
3	1.3325	1.850e+005	1.976e+001	2.633e+001	4.567e-002
TOTALS:		3.700e+005	3.947e+001	4.945e+001	8.699e-002

MicroShield v5.01 (5.01-01003)

11/23/9

MicroShield v5.01 (5.01-01003)  
Allied Technology Group, Inc.  
Results With Buildup  
FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5  
Case Title: Cobalt point source

This case was run on Monday, November 23, 1998 at 11:41:43 AM  
Dose Point # 4 - (6,0,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	3.018e+001	8.446e-003	5.860e-003	1.131e-005
2	1.1732	1.850e+005	5.041e+001	5.914e+001	1.057e-001
3	1.3325	1.850e+005	5.034e+001	6.707e+001	1.164e-001
TOTALS:		3.700e+005	1.008e+002	1.262e+002	2.221e-001

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5

Case Title: Cobalt point source

This case was run on Monday, November 23, 1998 at 11:41:43 AM

Dose Point # 1 - (6.5,1.97e+01,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	3.018e+001	2.408e-004	1.671e-004	3.226e-007
2	1.1732	1.850e+005	1.734e+000	2.035e+000	3.636e-003
3	1.3325	1.850e+005	1.809e+000	2.411e+000	4.183e-003
TOTALS:		3.700e+005	3.544e+000	4.446e+000	7.819e-003

MicroShield v5.01 (5.01-01003)

11/23/98

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO2VEYOR.MS5

Case Title: Cobalt point source

This case was run on Monday, November 23, 1998 at 11:41:43 AM

Dose Point # 2 - (6,1.30e+01,0) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	3.018e+001	8.136e-004	5.645e-004	1.090e-006
2	1.1732	1.850e+005	5.315e+000	6.236e+000	1.114e-002
3	1.3325	1.850e+005	5.430e+000	7.235e+000	1.255e-002
TOTALS:		3.700e+005	1.075e+001	1.347e+001	2.370e-002

CASE 3

MICROSHIELD OUTPUT

5 uCi, Co-60 point source

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO\_VEYOR.MS5

Case Title: Conveyor - Cesium

This case was run on Monday, November 23, 1998 at 11:31:07 AM

Dose Point # 3 - (6,19.5,6) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.001e+002	1.714e-003	5.453e-005	4.542e-007
2	0.0322	5.537e+002	3.278e-003	1.055e-004	8.492e-007
3	0.0364	2.015e+002	1.724e-003	6.277e-005	3.566e-007
4	0.6616	1.304e+004	1.035e+000	6.846e-001	1.327e-003
TOTALS:		1.410e+004	1.041e+000	6.848e-001	1.329e-003

MicroShield v5.01 (5.01-01003)

11/23/98

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO\_VEYOR.MS5

Case Title: Conveyor - Cesium

This case was run on Monday, November 23, 1998 at 11:31:07 AM

Dose Point # 4 - (6,19.5,3) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.001e+002	1.497e-003	4.763e-005	3.968e-007
2	0.0322	5.537e+002	2.863e-003	9.217e-005	7.418e-007
3	0.0364	2.015e+002	1.504e-003	5.475e-005	3.111e-007
4	0.6616	1.304e+004	8.913e-001	5.897e-001	1.143e-003
TOTALS:		1.410e+004	8.972e-001	5.899e-001	1.145e-003

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO\_VEYOR.MS5

Case Title: Conveyor - Cesium

This case was run on Monday, November 23, 1998 at 11:31:07 AM

Dose Point # 1 - (6,19.5,12) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.001e+002	1.816e-003	5.776e-005	4.812e-007
2	0.0322	5.537e+002	3.472e-003	1.118e-004	8.996e-007
3	0.0364	2.015e+002	1.828e-003	6.653e-005	3.780e-007
4	0.6616	1.304e+004	1.127e+000	7.458e-001	1.446e-003
TOTALS:		1.410e+004	1.134e+000	7.461e-001	1.448e-003

MicroShield v5.01 (5.01-01003)

11/23/9

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: C:\JOEL\MS5\DATA\CO\_VEYOR.MS5

Case Title: Conveyor - Cesium

This case was run on Monday, November 23, 1998 at 11:31:07 AM

Dose Point # 2 - (6,19.5,9) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.0318	3.001e+002	1.794e-003	5.709e-005	4.755e-007
2	0.0322	5.537e+002	3.432e-003	1.105e-004	8.891e-007
3	0.0364	2.015e+002	1.806e-003	6.574e-005	3.735e-007
4	0.6616	1.304e+004	1.106e+000	7.317e-001	1.418e-003
TOTALS:		1.410e+004	1.113e+000	7.319e-001	1.420e-003

CASE 2

MICROSHIELD OUTPUT

Soil with 5 pCi Cs-137 per gram.

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: Case 1

Case Title: Co-veyor

This case was run on Monday, November 23, 1998 at 11:19:41 AM

Dose Point # 3 - (6,19.5,6) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	4.999e-001	3.964e-005	2.751e-005	5.311e-008
2	1.1732	3.065e+003	2.455e-001	2.880e-001	5.146e-004
3	1.3325	3.065e+003	2.464e-001	3.283e-001	5.696e-004
TOTALS:		6.130e+003	4.919e-001	6.163e-001	1.084e-003

MicroShield v5.01 (5.01-01003)

11/23/98

MicroShield v5.01 (5.01-01003)

Allied Technology Group, Inc.

Results With Buildup

FILE: Case 1

Case Title: Co-veyor

This case was run on Monday, November 23, 1998 at 11:19:41 AM

Dose Point # 4 - (6,19.5,3) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	4.999e-001	3.416e-005	2.370e-005	4.576e-008
2	1.1732	3.065e+003	2.120e-001	2.487e-001	4.445e-004
3	1.3325	3.065e+003	2.130e-001	2.838e-001	4.923e-004
TOTALS:		6.130e+003	4.250e-001	5.325e-001	9.369e-004

MicroShield v5.01 (5.01-01003)  
Allied Technology Group, Inc.  
Results With Buildup  
FILE: Case 1

Case Title: Co-veyor-I

This case was run on Monday, November 23, 1998 at 11:19:41 AM  
Dose Point # 1 - (6,19.5,12) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	4.999e-001	4.319e-005	2.997e-005	5.785e-008
2	1.1732	3.065e+003	2.672e-001	3.135e-001	5.602e-004
3	1.3325	3.065e+003	2.681e-001	3.573e-001	6.199e-004
TOTALS:		6.130e+003	5.354e-001	6.708e-001	1.180e-003

MicroShield v5.01 (5.01-01003)

11/23/98

MicroShield v5.01 (5.01-01003)  
Allied Technology Group, Inc.  
Results With Buildup  
FILE: Case 1

Case Title: Co-veyor

This case was run on Monday, November 23, 1998 at 11:19:41 AM  
Dose Point # 2 - (6,19.5,9) in

<u>Group #</u>	<u>Energy</u> <u>(MeV)</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>photons/cm<sup>2</sup>/sec</u>	<u>Energy Fluence</u> <u>MeV/cm<sup>2</sup>/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>
1	0.6938	4.999e-001	4.237e-005	2.940e-005	5.676e-008
2	1.1732	3.065e+003	2.622e-001	3.076e-001	5.496e-004
3	1.3325	3.065e+003	2.631e-001	3.506e-001	6.082e-004
TOTALS:		6.130e+003	5.253e-001	6.582e-001	1.158e-003

## CASE 1

### MICROSHIELD OUTPUT

Soil with 1 pCi Co-60 per gram.

**Calculation MCAB-01****DETECTABILITY - MINIMUM DETECTABLE COUNT RATE (MDCR)**

The scanning MDCR applies both to a detector moving along the ground, as well as soil on a conveyor belt moving under a detector. This MDCR is a function of background count rate, observation interval and confidence level ( $d'$ ). As shown on the hand calculation sheet, MDCR is 676 cpm (net) for a background of 8,000 cpm and 2sec observation interval.

**SUMMARY**

Case	Calc'd Count Rate (net)	MDCR (net)	Detectable Amount*
1	464 cpm	676	1.5 pCi/g
2	1188	676	2.8 pCi/g
3	24,983	676	135 nCi
4	14,760	676	229 nCi

\* Concentration or source strength, ratioed to MDCR.

MDCR  
(MASSIM eqn. 6-9)

$$MDCR = S_i \times 60/i$$

$$S_i = d' \sqrt{b_i}$$

$$i = 2 \text{ sec obs. interval}$$

$$d' = 1.38 \text{ (per MASSIM)}$$

$$b_i = 8000 \text{ cpm} \times 2/60 = 267$$

$$S_i = \sqrt{b_i} \times 1.38 = 22.5$$

$$MDCR = 22.5 \times 60/2 = 676 \text{ cpm}$$

**Calculation MCAB-01****CASE 2:**

Same detector geometry.

Microshield results show dose rate fairly constant across width of belt. Average dose rate 1.32 uR/hr, from soil at 5 pCi-Cs-137/gram. Using a dose rate to count rate conversion of 900 cpm/uR/hr<sup>2</sup>, gives 1188 cpm (net.)

Results are scalable to other concentrations of Cs-137.

**CASE 3:**

In this case, a point source of Co-60 travels towards and under the detectors. Width of the belt is not considered, because the particle will pass directly under one of the detectors. It is assumed to be under the 3" of soil. Since Ludlum ratemeters integrate for 2 seconds, the particle will travel 1m (39") in that time.

Seven particle positions are modeled, from 19.7" in front of the detectors to 19.7" after the detectors. The average dose rate of the seven is 58.1 uR/hr, as shown; yielding a count rate of 24,983 cpm.

Distance from Detectors	Dose Rate uR/hr
±19.7"	7.8
±13.0	23.7
±6.6	87.0
0	222.1
Average	58.1

**CASE 4:**

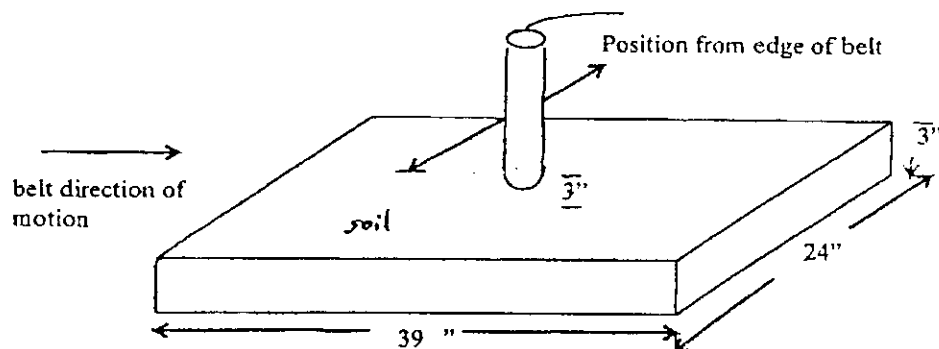
The geometry is the same as Case 3. The point source in this case is 5 uCi Cs-137.

The average dose rate is 16.4 uR/hr, as shown; yielding a count rate of 14,760 cpm.

Distance from Detectors	Dose Rate uR/hr
±19.7"	1.9
±13.0	5.4
±6.6	21.8
0	56.9
Average	16.4

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<sup>2</sup> MARSSIM Table 6-7.

**Calculation MCAB-01****CONVEYOR-MOUNTED DETECTOR MODEL****DIMENSIONS:**

24" wide

belt moves at 0.5 m/s; covers 1m (39") in 2sec. counting interval

soil 3" high on belt

detectors mounted 6" above belt

10 2x2 NaI detectors cover width of belt

**ASSUMPTIONS:**

Soil is uniformly contaminated at 1 pCi Co-60/gram soil (Case 1.)

Soil is uniformly contaminated at 5 pCi Cs-137/gram soil (Case 2.)

Soil covers a 5 uCi point source of Co-60 (Case 3.)

Soil covers a 5 uCi point source of Cs-137 (Case 4.)

Summary of four Cases shown below, followed by discussion of detectability.

**CASE 1:**

Four detector positions modeled with Microshield Ver. 5. 1) center of belt (12" from edge); 2) 9" from edge; 3) 6" from edge; and 4) 3" from edge.

Mirror-image positions are the same for distances from the other side of the belt. Ignore soil on belt, which is further than 19.5" from detectors.

Microshield results show dose rate fairly constant across width of belt. Average dose rate 1.08 uR/hr, from soil at 1 pCi-Co-60/gram. Using a dose rate to count rate conversion of 430 cpm/uR/hr<sup>1</sup>, gives 464 cpm (net.)

<sup>1</sup> MARSSIM Table 6-7.



# CALCULATION COVER SHEET

CALC. NO. MCAB-01  
No. of Sheets: 1 of 76

PROJECT: Fort McClellon Burial Mound Decommissioning

PURPOSE: Calculate the performance of a conveyor-mounted detector system, scanning soil with potential cobalt-60 and cesium-137 contamination.

SOURCES OF DATA: Preliminary design of conveyor system - Lake City Project Manager, Frank Whitaker

SOURCES OF FORMULAE & REFERENCES: Multi-Agency Radiation Survey and Site Investigation Manual, MARSSIM (NUREG-1575) December, 1997.

ATTACHMENT: Summary of hand calculations and output from Microshield™ runs.

CONCLUSION: System minimum detectable count rate (MDCR) is approx. 676 cpm (net). This will allow detection of Co-60 at 1.5 pCi/g or 135 nCi discrete source; or Cs-137 at 2.8 pCi/g or 80 nCi discrete source.

PRELIMINARY CALC. <input type="checkbox"/>		FINAL CALC. <input type="checkbox"/>		SUPERSEDES CALC. NO. _____	
REV. NO.	REVISION	BY:	DATE	CHECKED	DATE
				APPROVED	DATE

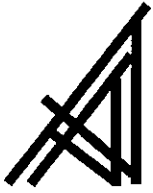
## **APPENDIX 5**

# **PRELIMINARY DESIGN OF CONVEYOR-MOUNTED DETECTION SYSTEM**

**'BURIAL MOUND DECOMMISSIONING PLAN  
FORT McCLELLAN**

**APPENDIX 6**

**DEVELOPMENT OF  
DERIVED CLEANUP GUIDELINES FOR  
THE PELHAM RANGE 'BURIAL MOUND'  
FORT McCLELLAN**



# **Development of Derived Cleanup Guidelines for the Pelham Range Burial Mound, Fort McClellan, Revision 1**

June 29, 1999

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## TABLE OF CONTENTS

1.0 Introduction.....	1
1.1 Background.....	1
1.2 Objective.....	1
1.3 Organization of the Report.....	1
2.0 Description of Approach.....	2
3.0 Exposure Assessment.....	3
3.1 Characterization of the Site.....	3
3.1.1 Physical Setting.....	3
3.1.2 Site History .....	3
3.1.3 Land Use .....	4
3.1.4 Conceptual Model of the Site .....	4
3.1.5 Sources and Release Mechanisms .....	5
3.1.6 Potential Transport Pathways .....	5
3.1.7 Potential Exposure Routes .....	5
3.1.8 Receptor Scenarios Considered .....	8
3.1.9 Receptors Selected.....	10
3.2 Application of RESRAD.....	12
3.3 Summary of Receptor Exposures.....	13
3.3.1 Guardsman .....	13
3.3.2 Resident Adult with Garden.....	13
3.3.3 Resident Child with Garden.....	13
4.0 Derived Cleanup Guidelines.....	15
4.1 Role of Dose Based Criteria .....	15
4.2 Dose Based Cleanup Guidelines.....	15
4.3 Influence of Multiple Contaminants on Cleanup Guidelines .....	15
4.4 Derived Cleanup Guidelines Based on Expected Land Use.....	18
4.5 Impact of DCGLs and Soil Sorting on Final Status of Burial Mound Soil .....	18
4.6 Health Protectiveness of Expected Residual Soil Contamination Levels.....	18
5.0 References.....	20
Attachment A RESRAD Output.....	21

## **1.0 Introduction**

### **1.1 Background**

Fort McClellan is an army base sited on 45,679 acres adjacent to Anniston, AL. A part of the base, known as Rideout Field, served as a radiological training area from the mid 1950's through May of 1972. The radiological training area was decommissioned and some contaminated soil was excavated and moved to a burial mound located in the northwest corner of the Pelham Range. This mound, called the Pelham Burial Mound in this report, contains elevated concentrations of Co-60 and Cs-137.

### **1.2 Objective**

The Army Base Closure and Realignment Committee has identified Fort McCellan as an installation for closure. Fort McCellan will therefore be closed, and the Pelham Range will be licensed to the Alabama Army National Guard (USACE, 1998). As part of this closure, the Fort's NRC radioactive materials licenses 01-02861-05 will be terminated. Termination of these licenses requires submission of a formal decontamination and decommissioning (D&D) plan. Cleanup levels form an integral part of this D&D plan. This report is intended to present the site-specific derived cleanup guidelines proposed for the Pelham Range Burial Mound and to document the method used to derive them.

### **1.3 Organization of the Report**

The remainder of this report is organized into four sections. Section 2, contains a description of the approach used to derive the cleanup goals. Section 3 contains the results of the exposure assessment performed on selected receptors. Section 4 presents the DCGL's and summarizes the report's recommendations. Appendix A contains the modeling parameters and results that form the basis for the DCGL's developed in this report.

## **2.0 Description of Approach**

In order to terminate a NRC radioactive materials license and release a site, a licensee must demonstrate that the site is suitable for release in accordance with the criteria for decommissioning in Subpart E, "Radiological Criteria for License Termination," of 10 CFR 20, "Standards of Protection Against Radiation." This report uses site-specific information to derive the release criteria that must be met before the license can be terminated and the site licensed to the Alabama Army National Guard. These criteria are based on an annual dose limit of 25 mrem/y to the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity, assuming reasonable and expected use of the land in the future.

Information on the site was assembled and analyzed to develop a conceptual model of the site. This model provided a basis to identify the important sources of contamination, principle means of release and environmental transport, and likely receptors, both now and in the future.

Once these were identified, site-specific derived cleanup guidelines (DCGLs) were calculated using RESRAD version 5.82 (ANL, 1995). RESRAD was developed partially under contract with the NRC and is widely used in the decommissioning industry for calculating doses and soil cleanup criteria.

After the site-specific DCGL's were determined, the philosophy of ALARA was then applied. The DCGLs were compared to the levels detectable by the survey method and the soil sorter equipment. The lowest of these limits was identified as the lowest practical site-specific soil cleanup criteria. These lowest levels are the cleanup criteria proposed for Burial Mound soils.

Because of the bimodal distribution of the radionuclide concentrations in the pile, it is expected that the average concentration of residual contamination in the pile will be much lower than the cleanup criteria. Using measured data, the expected residual concentrations that should result from the application of these cleanup criteria were then determined. These residual concentrations were then compared to the concentrations predicted to produce 25 mrem/y to the critical member of a resident family, assuming immediate occupancy of the site. This commonly applied standard default exposure scenario was selected to determine compliance with unconditional release of the property.

### **3.0 Exposure Assessment**

The purpose of an exposure assessment is to estimate the nature and magnitude of exposures from a site under current and plausible future conditions. This is accomplished by following a phased approach that involves the following tasks:

- Characterizing the exposure setting on and around the site,
- Identifying potentially complete human exposure pathways, and
- Quantifying the magnitude of plausible contaminant intakes by hypothetical receptors.

This section presents a description of the methods used to evaluate exposures from Pelham Mound, and the results of that assessment. The setting and physical characteristics of the Site are summarized below in Section 3.1. Section 3.2 presents the conceptual model describing the sources, contaminant migration, receptors, and exposure routes evaluated for the Mound. The methods used to quantify potential intakes by plausible receptors and the estimated intakes are presented in Section 3.3.

#### **3.1 Characterization of the Site**

The following sections summarize information on the physical setting of the site, its history, and its current and projected uses. For more detailed information on these and related subjects, see the Industrial Radiation Study No. 27-MH-0987-R2-97 (USCHPPM, Jan 1996).

##### **3.1.1 Physical Setting**

Fort McClellan is an army based sited on 45,679 acres adjacent to Anniston, AL. It is divided into three areas: the Main Post, the Choccolocco Corridor, and the Pelham Range. The Pelham Range Burial Mound is located at UTM coordinates 593300 E, 3732500 N, which is near the northwest corner of Pelham Range, on the northern end of the Battle Drill Area of Range 24C. The mound is oblong in shape and is approximately 25 meters long by 15 meters wide. It extends to three to four meters below grade, and is piled up to approximately two meters above grade in places.

##### **3.1.2 Site History**

Part of the area known as Rideout Field served as a radiological training area from the mid 1950's through May of 1972. The area was also used as an active radiological material burial

site as late as 1959. Best information indicates radioactive low-level laboratory waste and contaminated dirt were collected and placed in one burial mound located in the northwest corner of the Pelham Range.

### **3.1.3 Land Use**

The area surrounding the burial mound has historically been used as a maneuver training area for students at the U.S. Army Chemical and Military Police Schools, and by Active Duty, Reserve, and Alabama National Guard units. The area will continue to be used as a maneuver training area for the foreseeable future. The potential for unexploded munitions also exists in some areas of the Pelham Range<sup>1</sup>.

Because of its future use and the potential danger to the public from unexploded munitions, access will generally be restricted to authorized personnel only. This restriction will be enforced by limited access along controlled roads, and physical barriers like fences and gates.

### **3.1.4 Conceptual Model of the Site**

The conceptual model for the Pelham Range Burial Mound has been developed to provide the basis for identifying and evaluating the potential risks to human health from radioactive materials at this site. This model presents the relationships between the following elements necessary to construct a complete exposure pathway:

- Sources and contaminants
- Release mechanisms
- Transport pathways
- Exposure routes
- Receptors

Figure 3-1 presents the conceptual model for potential human exposure to the contaminants detected in the Burial Mound soil. The objective of this conceptual model development and the concurrent analysis of potential exposure routes and receptors is to focus subsequent efforts on those pathways and sources that drive the potential impacts on human health risk.

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<sup>1</sup> The Decommissioning Plan includes an OE Avoidance Plan to eliminate an unexpected encounter (with ordnance and explosives).

The conceptual model illustrated in Figure 3-1 of this appendix traces the exposure pathways and receptors for the Mound from the source through likely release mechanisms and exposure routes to potential receptors. The conceptual model also indicates which exposure routes are carried through the quantitative dose assessment for each receptor under current and far-future land-use scenarios.

### **3.1.5 Sources and Release Mechanisms**

The radionuclides of concern at this site are Co-60 and Cs-137. This material is mixed with soil and the soil has been collected into a discrete pile that extends both above and below grade level. This burial mound is the principle source of radioactive material at this site, and it is a relatively small, discrete area. A previous investigation (USCHPPM, 1996) collected data that indicate the majority of the pile does not contain measurable amounts of Co-60 or Cs-137 (Figures 3-2 and 3-3 of this appendix.)

The exposed surface of the pile is subject to limited water and wind erosion. In addition, rainwater percolating through the pile may mobilize one or both of the contaminants. The impact of these releases are expected to be minimal during the study duration, but they are included the conceptual model for completeness.

### **3.1.6 Potential Transport Pathways**

If released, these contaminants could be transported by wind, surface water, or groundwater to the vicinity of the receptor. In addition, plants may absorb some contaminants via root uptake. Each of these pathways has been included in the exposure assessment calculations made in this report.

### **3.1.7 Potential Exposure Routes**

A receptor can come into contact with the Co-60 and Cs-137 in the Mound in a variety of ways, generally as the result of a receptor's behavior or lifestyle that brings him/her into contact with a contaminated exposure medium. This assessment defines a route mechanism as a stylized description of the behavior that brings a receptor into contact with a contaminated medium.

An exposure route describes how a radionuclide may enter or affect humans. Exposures are divided into two types: internal exposures and external exposures. Internal exposures occur when contaminants enter the human body through inhalation and ingestion. External exposures do not require physical contact and occur when a receptor is close to a source of radiation. Proximity to such a source can result in the irradiation of an individual by penetrating radiation.

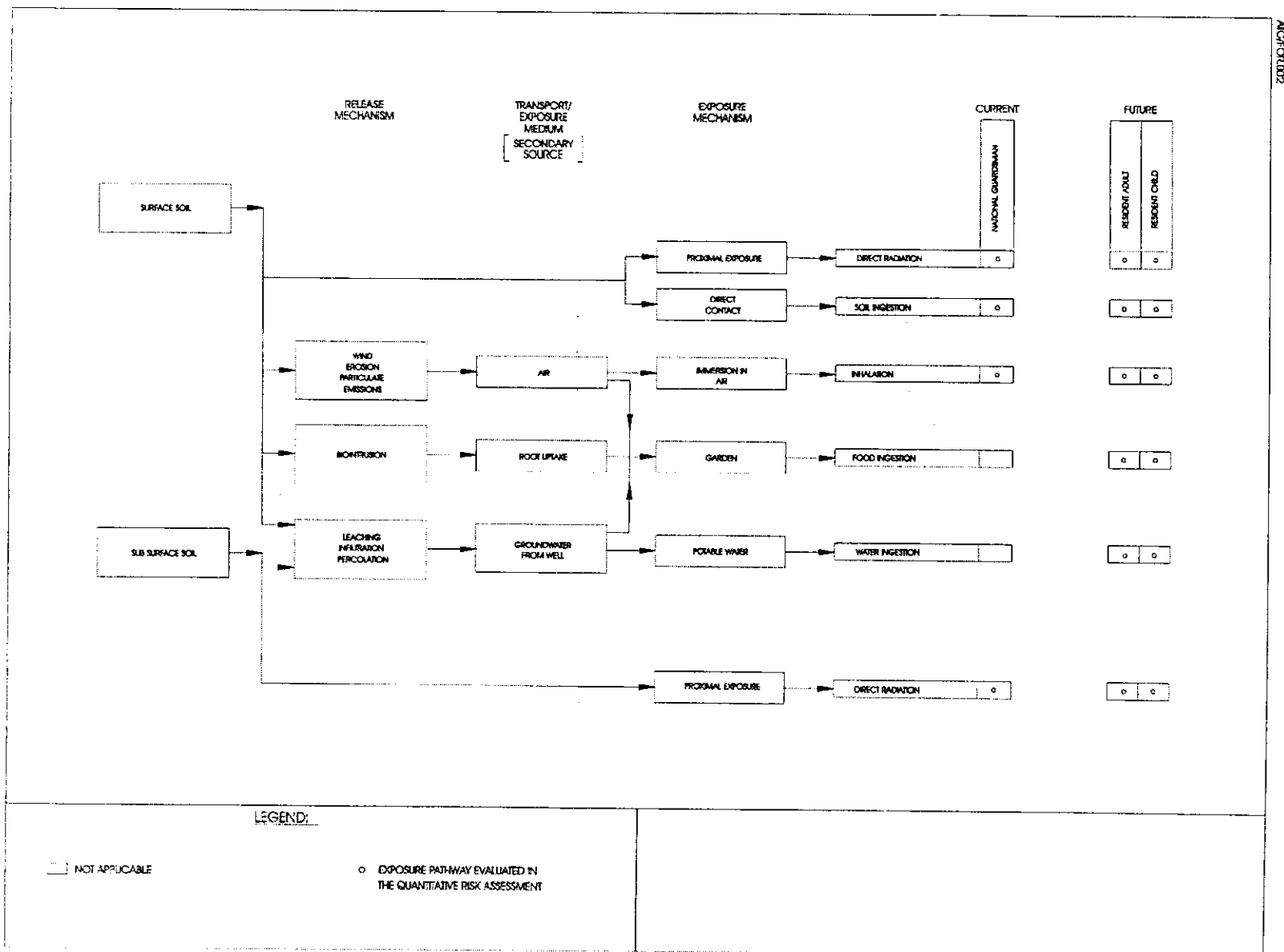


Figure 3-1 Conceptual Model of Exposures for Pelham Range Burial Ground

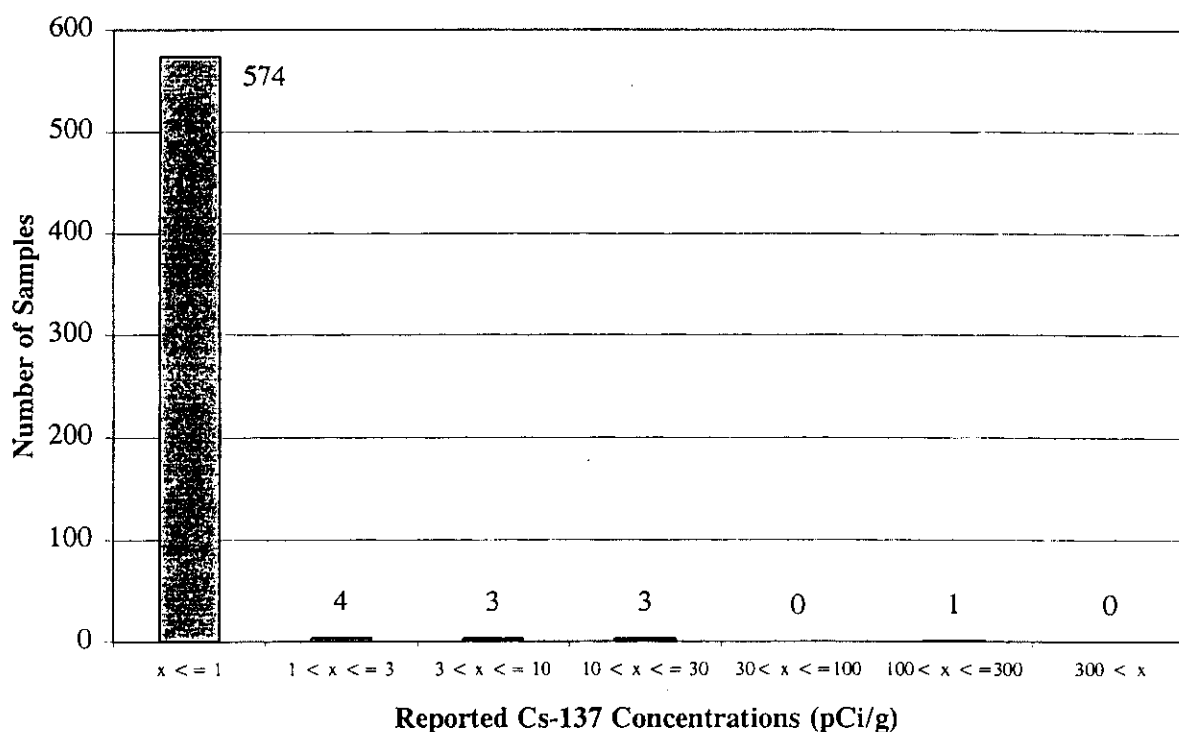
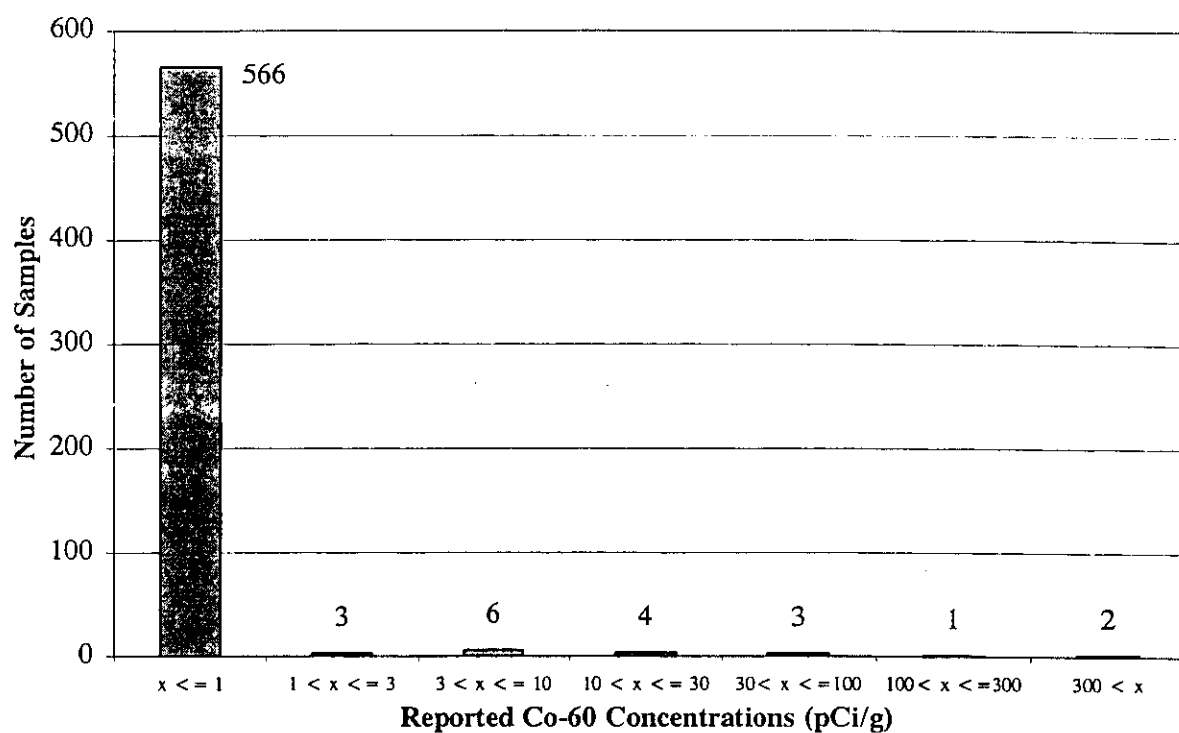


Figure 3.2 Frequency Distributions of Co-60 and Cs-137 Concentrations in Burial Mound Soil (Data from USCHPPM, 1996)

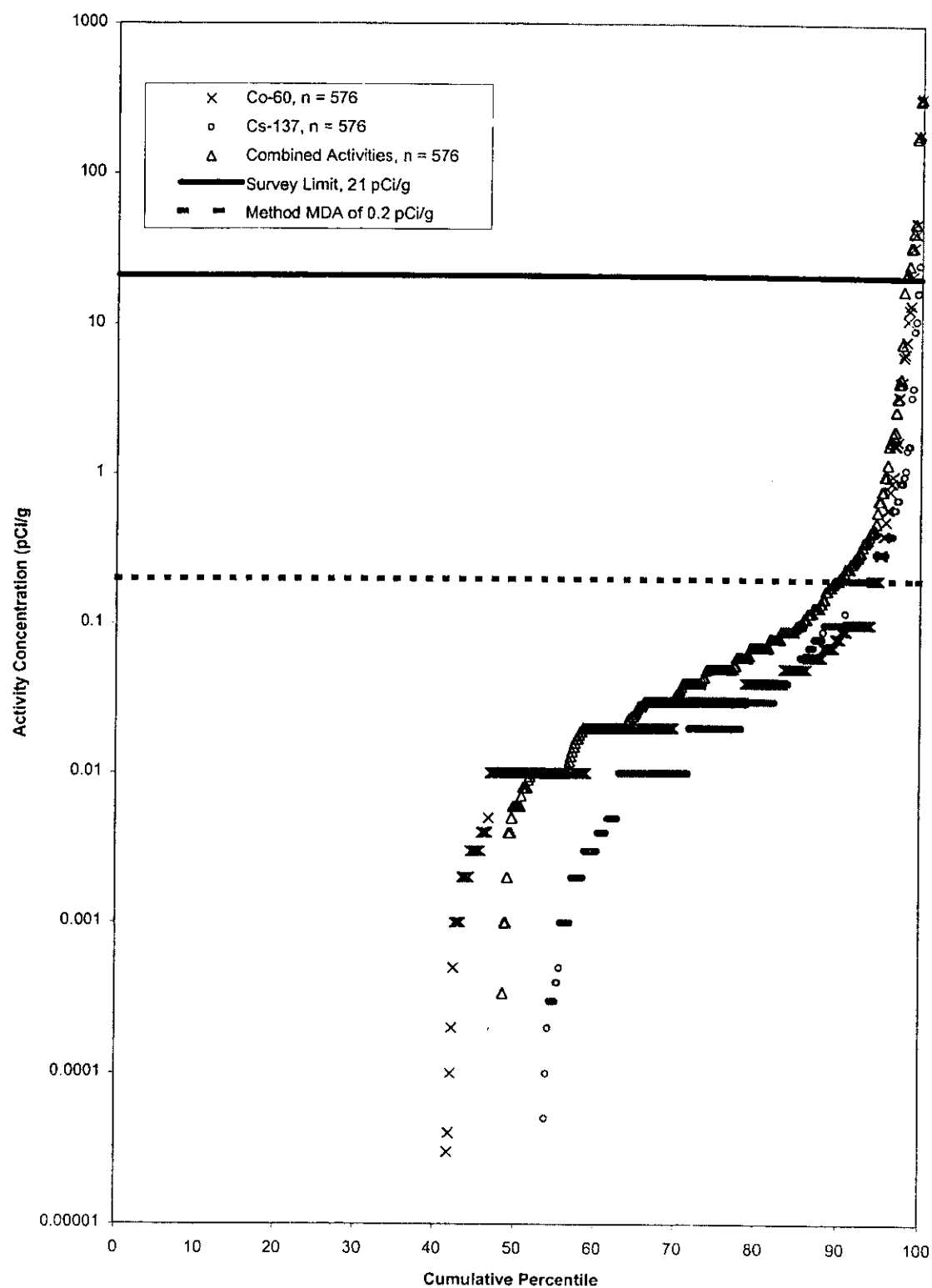


Figure 3-3 Cumulative Probability Plot of Co-60 and Cs-137 Concentrations in Soil

The remainder of this section describes the exposure routes evaluated in this assessment. The receptors evaluated for these exposure routes are described in Sections 3.2.4 and Section 3.2.5.

#### 3.1.7.1 Exposures from Inhalation

This route assumes a receptor is immersed in air containing suspended particulates from the Mound. Subsequent exposures occur via inhalation.

#### 3.1.7.2 Exposures from Ingestion

This route assumes a receptor eats or drinks contaminated soil, food, or water.

#### 3.1.7.3 Direct Exposure to Radiation

Direct exposures to radiation from radioactive material can occur when a receptor is near a radioactive source. Physical contact with a contaminated exposure medium is not necessary for exposure to external radiation to occur. The magnitude of exposure is directly related to the distance of the receptor from the source, the activity of the radionuclides present, and the amount of shielding between the source and the postulated receptor.

### 3.1.8 Receptor Scenarios Considered

#### 3.1.8.1 Role of Land Use in Receptor Selection

The release criteria for the Pelham Range "Burial Mound" and its surrounding area will be based, in part, on the projected land use of the site. This is because the land use of this site will dictate the types of receptors that may be exposed at the site. The land use will also influence their behavior, and their behavior will influence the types and durations of possible exposures.

This site is currently part of a military base. At decommissioning, it will be licensed to the Alabama Army National Guard for use as a battle drill training area. This land use is expected to continue for the foreseeable future in order to comply with the recommendations of the 1995 Defense Base Closure and Realignment Committee. Therefore public access to the site will be restricted by administrative controls and base security. This land use limits plausible human receptors to military personnel and transient members of the general public.

At some point in the future, the Pelham Range may be released to the general public for unrestricted use. It is not anticipated that this will occur in the near future, but to assess the potential doses from this possibility, hypothetical exposures are assessed from materials in the

Pelham Mound to a family living in a home built on the site after 30 years of use as a National Guard training facility.

#### 3.1.8.2 Receptor Scenarios Considered Under Planned Use Conditions

The possible receptors envisioned for the planned land use at Fort McClellan are military personnel and transient members of the general public. Two receptors have been selected to represent these two classes of exposure, a National Guard soldier on maneuvers and a hunter.

##### 3.1.8.2.1 National Guard Scenario

It is assumed that members of the National Guard spend 14 days a year training at Fort McClellan. This 14 days includes 1 day for mobilization, 1 day for demobilization, and 12 days for maneuvers and training. It was assumed an individual would spend no more than 12 hours a day at the site itself. It is felt that a daily exposure of 12 hours is a very conservative, health protective estimate, because it is unlikely that training activities would allow an individual to spend all their time at one location. These assumptions produce an annual exposure time of 144 hours, which is equivalent to 18 eight hour days. The guardsman is assumed to remain in the Guard for 20 years and receive annual exposures during that period.

##### 3.1.8.2.2 Hunter Scenario

It is assumed that transient exposures could occur to individuals who hunt on Ft. McClellan. A hunter could conceivably build a hunting blind on the site and spend part of each day waiting for game. This site is not as attractive as some surrounding terrain, and it is unlikely that these individuals would spend all of their time on this site, but overestimating the exposure duration in this manner is judged to be health protective.

It was assumed that a hunter will take 1 week of vacation to hunt. Assuming he spends one day building his blind during the weekend before hunting season, he could be present on the site for a total of ten days. If the hunter spends 10 hours a day on this site, the hunter will be in close proximity of the site for 100 hours each year. The hunter is assumed to hunt the site for 30 years.

#### 3.1.8.3 Receptor Scenarios Considered Under Far-Future Use Conditions

This scenario assumes governmental control of the site ceases at 30 years in the future. If administrative controls cease, many types of land use become plausible. In this case, it was judged that residential types of land use would produce the greatest exposure potential.

Therefore, a typical residential scenario has been used to evaluate the exposures from these conditions.

#### 3.1.8.3.1 Resident Adult Scenario

A typical residential adult was selected to represent exposures. This hypothetical resident lives on the property but works elsewhere. This adult spends most of the time indoors, but spends some time engaged in outdoor activities such as light gardening. The resident is assumed to grow his own vegetables and resides at the site for 30 years.

#### 3.1.8.3.2 Resident Child Scenario

A typical residential family consists of both adults and children. A hypothetical child, aged 1 to 6 years old, was selected for evaluation because children are a critical subpopulation that may ingest higher amounts of soil than an adult. The child's behavior pattern is similar to the adult described above, except that less time is spent off-site.

### 3.1.9 Receptors Selected

Four receptor scenarios were initially considered to be plausible representations of potential uses of this site. Three of these receptors were selected for quantitative evaluation in this study. These potential receptors are described in the Section 3.2.4. Because the radionuclides of potential concern are strong gamma emitters, their most important exposure pathway is external radiation from the ground surface. The total exposure via this pathway is directly proportional to the time exposed to the contaminated ground surface, which means the calculated doses attributed to the receptors will be roughly proportional to the their assumed exposure times.

#### 3.1.9.1 Receptor Selected for Evaluation of Planned Land Use

Two receptors are described in the section introducing potential receptors that were judged to be plausible under the planned use of the site. Table 3-1 presents the parameters describing the behavior of the two receptors. Because the radionuclides of potential concern are strong gamma emitters, their most important exposure pathway is external radiation from the ground surface. The total exposure via this pathway is directly proportional to the time exposed to the contaminated ground surface, which means the calculated doses attributed to the two receptors will be proportional to the their assumed exposure times.

**TABLE 3-1 PARAMETERS USED TO ESTIMATE POTENTIAL EXPOSURES FOR THE FORT MCELLAN PELHAM BURIAL MOUND**

Pathway Parameter (units)	Current Hypothetical Receptor				Future Hypothetical Receptors			
	National		Civilian		Resident		Resident	
	Guardsman		Hunter		Adult		Child	
	Age 19+		Age 19+		Age 19+		Age 1-6	
Time and duration of exposure								
ET indoors (hr/d)	0	a	0	b	16.4	c	20.2	d
ET outdoors (hr/d)	12	a	10	b	2	c	3.3	d
EF (d/yr)	12	a	10	b	350	e	350	f
ED (yr)	20	a	30	g	30	e	6	f
Inhalation of dust								
IR (m3/hr)	0.63	h	0.63	h	0.63	h	0.31	i
Incidental ingestion of soil								
IR (kg/d)	0.00005	j	0.00005	j	0.00005	j	0.00020	k
Ingestion of food and water								
IR <sub>veg</sub> (kg/d)	na	l	na	l	0.309	m	0.129	n
IR <sub>fruit</sub> (kg/d)	na	l	na	l	0.244	m	0.102	n
IR <sub>water</sub> (L/d)	na	l	na	l	2.3	o	1.3	p

a - The guardsman is assumed to spend 12 hours a day training outdoors in equipment or facilities located over the burial ground. The training lasts 2 weeks each year, with two days subtracted for mobilization and demobilization activities. The guardsman is assumed to remain in the Guard until eligible for a pension at 20 years.

b - The civilian hunter is assumed to spend 10 hours a day in a blind located on the burial ground site. The hunter is assumed to spend one day prior to hunting season building a blind, and spend 1 week of vacation (five days plus two weekends) each year actively hunting.

c - Recommended values for indoor residential and outdoor exposures from Table 5-176 in Exposure Factors Handbook, EPA 1997.

d - Time weighted average of mean values for indoor residential and outdoor exposures for 1-4 year old from Table 5-131 and Table 15-132 in Exposure Factors Handbook, EPA 1997. (Indoor = 1211 min/d, and Outdoor = 195 min/d).

e - The resident is assumed to spend 30 years living in a house built on the site, and take two weeks of vacation away from the home each year (EPA's 1991 OSWER Directive 9285.6-03.).

f - Reflects six years of life between birth and age 6.

g - The hunter is assumed to hunt the site each year he is in the area. Based on a 30 years residence time (Exposure Factors Handbook, EPA 1997).

h - Inhalation rate of adult. From Table 5-23 of Exposure Factors Handbook, EPA 1997 (15.2 m3/d x d/24 h).

i - Time weighted average of recommended values inhalation rate of children, ages 1-6. From Table 5-23 of Exposure Factors Handbook, EPA 1997. (1 y x 4.5 m3/d + 2 y x 6.8 m3/d + 2 y x 8.3 m3/d + 1 y x 10 m3/d) / 6 y x d/24 h.

j - Rate of incidental soil ingestion by adult (Exposure Factors Handbook, EPA 1997, Table 4-23).

k - Soil ingestion rate (Exposure Factors Handbook, EPA 1997, pg. 4-24).

l - These receptors are expected to bring their own packaged food and water.

m - 95%tile combined home produced fruit and vegetable ingestion rate by a 71.8 kg adult (Exposure Factors Handbook, EPA 1997, pg. 9-44).

n - 95%tile combined home produced fruit and vegetable ingestion rate by a 30.1 kg child (Exposure Factors Handbook, EPA 1997, pg. 9-44).

o - 90%tile Tap water ingestion rate by an adult (Exposure Factors Handbook, EPA 1997, pg. 3-26).

p - 90%tile Tap water ingestion rate by a 1-10 year old child (Exposure Factors Handbook, EPA 1997, pg. 3-26).

Since the Guardsman Scenario assumes receptor behavior that produces 144 hours of exposure each year, while the Hunter Scenario produces 100 hours a year, the calculated dose from the Hunter Scenario will be less than 70% of the calculated dose from the Guardsman Scenario. Remediating the site to levels which are safe for the Guardsman will therefore insure the safety of the Hunter as well. Therefore, the Guardsman was selected to evaluate the highest plausible exposures from the site's planned land use.

#### 3.1.9.2 Receptors Selected for Evaluation of Far Future Conditions

Two potential receptors, the resident adult and the resident child, are described in the section introducing potential receptors that were judged to be plausible in the unlikely event that the site is released to the public after 30 years. Therefore potential exposures to the resident adult and the resident child were both quantitatively evaluated in this study. Table 3-1 presents the parameters used to quantify the behavior of the two receptors.

### 3.2 Application of RESRAD

The guardsman and resident scenarios involve activities performed while on top of the burial mound soil. The computer code RESRAD 5.82 (ANL,1993) was used to assess the potential long-term doses from these activities. Default input parameters were used, except where otherwise noted in Table 3-1. Summary input files presented in Appendix A contain a detailed list of parameter values used in the RESRAD calculations for each receptor assessed.

Doses to a guardsman training on a uniform layer of the mound material during 30 years of institutional control were calculated for the following pathways using RESRAD default values:

- Soil ingestion
- Inhalation of resuspended soil, and
- Direct exposure to external radiation.

Doses to a resident living on a uniform layer of the mound material after 30 years of institutional control ends were calculated for the following pathways using RESRAD default values:

- Drinking water
- Food ingestion (home-grown vegetables)
- Soil ingestion
- Inhalation of resuspended soil, and
- Direct exposure to external radiation.

### 3.3 Summary of Receptor Exposures

The results of the RESRAD runs described in Section 3.3 are summarized in Table 3-2. The residual soil concentrations for the guardsman scenario yield a calculated dose of 25 mrem/y. The soil concentrations at for the residential scenarios will decay to concentrations that yield a calculated dose of 25 mrem/y after the site is used by the National Guard for 30 years.

**Table 3-2 Allowable Concentrations in Current Soil For  
Current and Far-Future Land Use**

<b>Guardsman Scenario</b>		<b>Resident Adult Scenario</b>		<b>Resident Child Scenario</b>	
<b>Co-60</b>	<b>Cs-137</b>	<b>Co-60</b>	<b>Cs-137</b>	<b>Co-60</b>	<b>Cs-137</b>
100	478	154	26	123	21

- <sup>a</sup> If a resident adult moves onto the site in 30 years, the Co-60 concentration listed here will have decayed to 3 pCi/g, and the Cs-137 concentration will have decayed to 13 pCi/g.
- <sup>b</sup> If a resident child moves onto the site in 30 years, the Co-60 concentration listed here will have decayed to 2 pCi/g, and the Cs-137 concentration will have decayed to 11 pCi/g.

#### 3.3.1 Guardsman

Exposures to the hypothetical guardsman evaluated in this study would be dominated by direct gamma radiation emitted directly by the soil. The soil concentrations are based on occupation of the Pelham Mound by a trainee for 144 hours per year. This exposure time is considered excessive, so the resulting derived guidelines calculated for this receptor are judged to be very conservative.

#### 3.3.2 Resident Adult with Garden

Exposures to a hypothetical adult with a garden evaluated in this study would be dominated by direct gamma radiation emitted directly by the soil (over 99% for Co-60 and almost 90% of the Cs-137). About 10% of the dose from Cs-137 is associated with consumption of food from a garden.

#### 3.3.3 Resident Child with Garden

Exposures to a hypothetical child with a garden evaluated in this study are very similar to those of the adult discussed earlier. They would be dominated by direct gamma radiation emitted directly by the soil (over 99% for Co-60 and almost 90% of the Cs-137). About 10% of the dose from Cs-137 would be attributable to consumption of food from a garden. The dose based

soil guidelines for the child are lower than for the parent because the child is assumed to spend more time per year on site exposed to the underlying soil.

## **4.0 Derived Cleanup Guidelines**

### **4.1 Role of Dose Based Criteria**

Potential radiation exposures from the Pelham Mound and surrounding areas must be limited to safe levels before the NRC license can be terminated. The NRC has determined that a dose limit of 25 mrem/y is health protective at NRC licensed sites (10CFR20). The Derived Cleanup Guidelines (DCGLs) developed in this document are judged to be meet this requirement under the planned and far future land use proposed for the site.

Application of these DCGLs to the soil pile will result in removal of soil with concentrations exceeding these guidelines. Because only a small percentage of soil samples contained Co-60 or Cs-137 concentrations exceeding the guidelines, it is anticipated that the average concentrations of these two radionuclides in the soil remaining on site will be much less than those required for unconditional release of the site.

### **4.2 Dose Based Cleanup Guidelines**

The dose based cleanup level for a nuclide is the smallest of the soil concentrations calculated for the three receptors (Table 3-2). This assures that final cleanup goals for individual radionuclides are health protective for all the receptors evaluated. The individual dose based Derived Cleanup Guidelines (DCGLs) are 100 pCi/g for Co-60 and 21 pCi/g Cs-137.

### **4.3 Influence of Multiple Contaminants on Cleanup Guidelines**

A multi pathway analysis was used to develop individual dose based DCGL's of 100 pCi/g Co-60 and 21 pCi/g Cs-137. Because Co-60 and Cs-137 are both present at the site, it is necessary to assure that their combined activities do not result in exposures that exceed 25 mrem/y. A simple way of achieving this is to set a combined cleanup standard to be equal to the smaller of the two cleanup criteria in soil. This approach protects human health and the environment at the site and provides one clear, reproducible soil cleanup objective for the proposed remedial activities.

The smaller of the two dose-based cleanup guidelines calculated in this report is the 21 pCi/g limit for Cs-137. This approach would yield a combined cleanup criteria of 21 pCi/g for soil containing both radionuclides.

#### **4.4 Derived Cleanup Guidelines Based on Expected Land Use**

The approach used in this report sets 21 pCi/g as the cleanup concentration for site soils containing a mixture of Cs-137 and C-60 at the site. The final set of DCGLs for this site is presented in Table 4-1. The limits for individual nuclides will be applied if it can be demonstrated that only one of these radionuclides is present in the soil. If the presence of both is suspected, the value of 21 pCi/g will be compared to the sum of their activities.

#### **4.5 Impact of DCGLs and Soil Sorting on Final Status of Burial Mound Soil**

The previous section presents DCGL's for the Burial Mound soil. For the purpose of this project these become the maximum residual soil concentrations allowed to remain, averaged over a 100 m<sup>2</sup> throughout the survey area. However, the philosophy of ALARA (As Low As Reasonably Achievable) acts as an incentive to reduce the residual concentrations to lower levels, if practical.

The soil sorter is capable of discerning Co-60 and Cs-137 at 9 pCi/g and 16 pCi/g, respectively. These levels are lower than the DCGLs and have been selected as the defacto delineation between soil that will remain on site and soil that will be packaged and transported to an off-site disposal facility.

Analysis of the soil data, collected from various locations and depths of the pile, indicates the bulk of the material in the pile does not contain appreciable levels of either Co-60 or Cs-137. In fact, less than 10% of the samples contain these radionuclides in concentrations exceeding the contract MDA (Figures 3-2 and 3-3 in this appendix). This implies that the pile is essentially clean dirt, with some limited areas of elevated concentration.

The intent of the remedial action is to remove soil containing more than 9 pCi/g Co-60 or 16 pCi/g Cs-137 from the site. If this is done, current sampling results indicate the average concentrations of each isotope in the remaining soil will be at or near 0.1 pCi/g (Table 4-2).

#### **4.6 Health Protectiveness of Expected Residual Soil Contamination Levels.**

Once the average expected residual concentration was determined, RESRAD was used to confirm the health-protectiveness of the remedy. This was done by calculating the soil concentrations predicted to produce 25 mrem/y to the critical member of a hypothetical residential family living on the site immediately after remediation.

Based on the results of the residential scenario at 30 years, it was determined that the small child was the critical member of the proposed receptor group. Attachment A of this Appendix

contains the results of these calculations. In summary, these calculations determined that the DCGL at t(0) for Co-60, would be 2.4 pCi/g, while for Cs-137 it would be 10.6 pCi/g. The average concentrations projected for the soil after remediation are well below these levels (Table 4-3).

After remediation, the health protectiveness of the site will be verified. Dose rates from external exposures will be measured throughout the site. The contribution to dose from soil, water, and on-property food sources will be investigated using the measured values of Co-60 and Cs-137 in soil and the RESRAD scenario for immediate occupation by a hypothetical farm family. These results will be used to determine the annual dose to the hypothetical receptor from the remediated site. The post-remediation dose (above background) meet the 25 mrem/y release limit to allow for unconditional release.

Table 4-1 DCGL's of Individual and Mixed Radionuclides at the Pelham Range Burial Mound for Expected Use

Radionuclide	Soil Limit
Co-60	100 pCi/g
Cs-137	21 pCi/g
Co-60 + Cs-137	21 pCi/g

Table 4-2 Summary Statistics for Pelham Field Burial Mound Assuming Various Soil Cleanup Levels

Summary Stats for Cs-137					Summary Stats for Co-60				
Statistic	No Action	DCGL 21 pCi/g	Scan Limit 21 pCi/g	Sorter Limit 16 pCi/g	Statistic	No Action	DCGL 100 pCi/g	Scan Limit 21 pCi/g	Sorter Limit 9 pCi/g
n	585	583	583	581	n	585	582	578	575
mean	0.46	0.11	0.11	0.06	mean	1.83	0.40	0.15	0.08
SD	7.53	0.96	0.96	0.48	SD	20.72	3.32	1.09	0.60
UCL <sub>95% mean</sub> *	0.97	0.18	0.18	0.09	UCL <sub>95% mean</sub> *	3.24	0.63	0.22	0.13
Max. value	179.0	17.0	17.0	9.5	Max. value	330.0	49.0	14.0	8.0
95 <sup>th</sup> Percntl	0.30	0.29	0.29	0.20	95 <sup>th</sup> Percntl	0.20	0.20	0.10	0.10
Iterated t <sub>calc</sub>	1.647508	1.647518	1.647518	1.647522	Iterated t <sub>calc</sub>	1.647508	1.647522	1.647541	1.647555
	0.0499958	0.0499957	0.0499957	0.0499962		0.0499958	0.0499957	0.0499957	0.0499956

\*The 95% UCL on the arithmetic mean (= ArithMean + (t<sub>score</sub> \* StDev / SQRT(n))

TABLE 4-3 Summary Comparison of Predicted Soil Concentrations After Remediation, and Concentrations of Soil Required to Produce 25 mrem/y to the Critical Member of a Hypothetical Resident Family

Radionuclide	Predicted Soil Concentrations Required to Produce 25 mrem/y to a Resident Child	Projected 95%UCL <sub>mean</sub> for Soil Concentration In Pile after Sorting
Co-60	2.4 pCi/g	0.13 pCi/g
Cs-137	10.6 pCi/g	0.09 pCi/g

## 5.0 References

- ANL, 1993      "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0., September 1993." ANL/EAD/LD-2. USDOE, Environmental Assessment Division, Argonne National Laboratory.
- ANL, 1998      RESRAD for Windows, 5.82. Environmental Assessment Division, Argonne National Laboratory.
- USACE, 1998      "Final Environmental Impact Statement, Disposal and Reuse of Fort McClellan, Alabama, August 1998." US Army Corps of Engineers, Mobile District.
- USCHPPM, 1996      "Industrial Radiation Study No 27-MH-0987-R2-97. Pelham Range Burial Mound, Fort McClellan, Alabama. 29 August – 15 September 1995 and 14-28 January 1996. US Army Center for Health Promotion and Preventive Medicine.
- USEPA, 1997      "Exposure Factors Handbook, Volumes 1, 2, and 3" August 1997, EPA/600/P-95/002Fa, b, & c. US Environmental Protection Agency.



## **Attachment A      RESRAD Output**

A.1 Results of RESRAD Calculations for Guardsman Scenario.....	A-1
A.1.1 Co-60: Guardsman Summary Output File .....	A-1
A.1.2 Cs-137: Guardsman Summary Output File.....	A-19
A.2 Results of RESRAD Calculations for Resident Adult Scenario.....	A-37
A.2.1 Co-60: Resident Adult Summary Output File .....	A-37
A.2.2 Cs-137: Resident Adult Summary Output File.....	A-55
A.3 Results of RESRAD Calculations for Resident Child Scenario .....	A-73
A.3.1 Co-60: Resident Child Summary Output File.....	A-73
A.3.2 Cs-137: Resident Child Summary Output File.....	A-92

## A.1 Results of RESRAD Calculations for Guardsman Scenario

### A.1.1 Co-60: Guardsman Summary Output File

RESRAD, Version 5.82 T½ Limit = 0.5 year 12/15/98 09:15 Page 1

Summary : Co 60, guardsman, 10000t2 File: C060G10K.RAD

#### Table of Contents

##### Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ...	2
Site-Specific Parameter Summary .....	3
Summary of Pathway Selections .....	6
Contaminated Zone and Total Dose Summary .....	7
Total Dose Components	
Time = 0.000E+00 .....	8
Time = 1.000E+00 .....	9
Time = 3.000E+00 .....	10
Time = 1.000E+01 .....	11
Time = 3.000E+01 .....	12
Time = 5.000E+01 .....	13
Time = 1.000E+02 .....	14
Time = 3.000E+02 .....	15
Time = 1.000E+03 .....	16
Dose/Source Ratios Summed Over All Pathways .....	17
Single Radionuclide Soil Guidelines .....	17
Dose Per Nuclide Summed Over All Pathways .....	18
Soil Concentration Per Nuclide .....	18

Dose Conversion Factor (and Related) Parameter Summary  
 File: D05FAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1 B-1	Dose conversion factors for inhalation, mrem/pCi: Co-60	2.190E-04	2.190E-04	DCF2( 1)
D-1 D-1	Dose conversion factors for ingestion, mrem/pCi: Co-60	2.690E-05	2.690E-05	DCF3( 1)
D-34 D-34	Food transfer factors: Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF( 1,1)
D-34 D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF( 1,2)
D-34 D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF( 1,3)
D-5 D-5	Biocaccumulation factors, fresh water, L/kg: Co-60 , fish	3.000E+02	3.000E+02	BIOFAC( 1,1)
D-5 D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC( 1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T( 2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T( 3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T( 4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T( 5)
R011	Times for calculations (yr)	5.000E+01	1.000E+02	---	T( 6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T( 7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T( 8)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T( 9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+02	0.000E+00	---	S1( 1)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1( 1)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAD
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nordispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	LW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Default	(if different from user input)	Used by RESRAD	Parameter Name
R015	Uhsat. zone 1, thickness (m)	not used	4.00E+00	---	---	HK(1)
R015	Uhsat. zone 1, soil density (g/cm**3)	not used	1.50E+00	---	---	DENSUZ(1)
R015	Uhsat. zone 1, total porosity	not used	4.00E-01	---	---	TPUZ(1)
R015	Uhsat. zone 1, effective porosity	not used	2.00E-01	---	---	EPUZ(1)
R015	Uhsat. zone 1, soil-specific b parameter	not used	5.30E+00	---	---	BLZ(1)
R015	Uhsat. zone 1, hydraulic conductivity (m/yr)	not used	1.00E+01	---	---	HOLZ(1)
R016	Distribution coefficients for Co-60					
R016	Contaminated zone (cm**3/g)	1.00E+03	1.00E+03	---	---	DDUUC( 1)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.00E+03	---	---	DDUUC( 1,1)
R016	Saturated zone (cm**3/g)	not used	1.00E+03	---	---	DDUUC( 1)
R016	Leach rate (/Yr)	0.00E+00	0.00E+00	1.66E-04	---	ALEACH( 1)
R016	Solubility constant	0.00E+00	0.00E+00	not used	---	STLEBK( 1)
R017	Inhalation rate (m**3/yr)	9.07E-01	8.40E+03	---	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.00E-04	1.00E-04	---	---	MLINH
R017	Exposure duration	2.00E+01	3.00E+01	---	---	ED
R017	Shielding factor, inhalation	4.00E-01	4.00E-01	---	---	SHFS
R017	Fraction of time spent indoors	7.00E-01	7.00E-01	---	---	SHF1
R017	Fraction of time spent outdoors (on site)	0.00E+00	5.00E-01	---	---	FIND
R017	Fraction of time spent outdoors (on site)	1.64E-02	2.50E-01	---	---	FOTD
R017	Shape factor flag, external gamma	1.00E+00	1.00E+00	>0 shows circular AREA.	---	FS
R017	Radii of shape factor array (used if FS = -1):					
R017	Outer annular radius (m), ring 1:	not used	5.00E+01	---	---	RAD_SHAPE( 1)
R017	Outer annular radius (m), ring 2:	not used	7.07E+01	---	---	RAD_SHAPE( 2)
R017	Outer annular radius (m), ring 3:	not used	0.00E+00	---	---	RAD_SHAPE( 3)
R017	Outer annular radius (m), ring 4:	not used	0.00E+00	---	---	RAD_SHAPE( 4)
R017	Outer annular radius (m), ring 5:	not used	0.00E+00	---	---	RAD_SHAPE( 5)
R017	Outer annular radius (m), ring 6:	not used	0.00E+00	---	---	RAD_SHAPE( 6)
R017	Outer annular radius (m), ring 7:	not used	0.00E+00	---	---	RAD_SHAPE( 7)
R017	Outer annular radius (m), ring 8:	not used	0.00E+00	---	---	RAD_SHAPE( 8)
R017	Outer annular radius (m), ring 9:	not used	0.00E+00	---	---	RAD_SHAPE( 9)
R017	Outer annular radius (m), ring 10:	not used	0.00E+00	---	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.00E+00	---	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.00E+00	---	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:					
R017	Ring 1	not used	1.00E+00	---	---	FRACA( 1)
R017	Ring 2	not used	2.73E-01	---	---	FRACA( 2)
R017	Ring 3	not used	0.00E+00	---	---	FRACA( 3)
R017	Ring 4	not used	0.00E+00	---	---	FRACA( 4)
R017	Ring 5	not used	0.00E+00	---	---	FRACA( 5)
R017	Ring 6	not used	0.00E+00	---	---	FRACA( 6)
R017	Ring 7	not used	0.00E+00	---	---	FRACA( 7)
R017	Ring 8	not used	0.00E+00	---	---	FRACA( 8)
R017	Ring 9	not used	0.00E+00	---	---	FRACA( 9)
R017	Ring 10	not used	0.00E+00	---	---	FRACA(10)
R017	Ring 11	not used	0.00E+00	---	---	FRACA(11)
R017	Ring 12	not used	0.00E+00	---	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.60E+02	---	---	DIET(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Used by RESRAD		Parameter Name
		Input	Default	(If different from user input)	
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	6.000E-01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FRF
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m <sup>2</sup> *3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DRDPT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R198	Wet weight crop yield for Non-Leafy (kg/m <sup>2</sup> *2)	not used	7.000E-01	---	YV(1)
R198	Wet weight crop yield for Leafy (kg/m <sup>2</sup> *2)	not used	1.500E+00	---	YV(2)
R198	Wet weight crop yield for Fodder (kg/m <sup>2</sup> *2)	not used	1.100E+00	---	YV(3)
R198	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R198	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R198	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R198	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R198	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R198	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R198	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R198	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R198	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R198	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R198	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R198	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R198	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm <sup>3</sup> *3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC

Site-Specific Parameter Summary (continued)					
Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
C14	C-14 exsion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 exsion flux rate from soil (1/sec)	not used	1.000E-10	---	REXSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	ANFC4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	ANFC5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_I(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_I(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_I(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_I(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_I(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_I(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_I(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_I(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_I(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm³)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Voluertric water content of the cover material	not used	5.000E-02	---	PH00V
R021	Voluertric water content of the foundation	not used	3.000E-02	---	PH00FL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimansion of mixing (m)	not used	2.000E+00	---	HMX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAT
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emmiting power of Rn-222 gas	not used	2.500E-01	---	EMNA(1)
R021	Emmiting power of Rn-220 gas	not used	1.500E-01	---	EMNA(2)

# Summary of Pathway Selections

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

Contaminated Zone Dimensions	Initial Soil Concentrations, pCi/g
100 ft x 100 ft	100
100 ft x 200 ft	100
100 ft x 300 ft	100
100 ft x 400 ft	100
100 ft x 500 ft	100
100 ft x 600 ft	100
100 ft x 700 ft	100
100 ft x 800 ft	100
100 ft x 900 ft	100
100 ft x 1000 ft	100
100 ft x 1100 ft	100
100 ft x 1200 ft	100
100 ft x 1300 ft	100
100 ft x 1400 ft	100
100 ft x 1500 ft	100
100 ft x 1600 ft	100
100 ft x 1700 ft	100
100 ft x 1800 ft	100
100 ft x 1900 ft	100
100 ft x 2000 ft	100
100 ft x 2100 ft	100
100 ft x 2200 ft	100
100 ft x 2300 ft	100
100 ft x 2400 ft	100
100 ft x 2500 ft	100
100 ft x 2600 ft	100
100 ft x 2700 ft	100
100 ft x 2800 ft	100
100 ft x 2900 ft	100
100 ft x 3000 ft	100
100 ft x 3100 ft	100
100 ft x 3200 ft	100
100 ft x 3300 ft	100
100 ft x 3400 ft	100
100 ft x 3500 ft	100
100 ft x 3600 ft	100
100 ft x 3700 ft	100
100 ft x 3800 ft	100
100 ft x 3900 ft	100
100 ft x 4000 ft	100
100 ft x 4100 ft	100
100 ft x 4200 ft	100
100 ft x 4300 ft	100
100 ft x 4400 ft	100
100 ft x 4500 ft	100
100 ft x 4600 ft	100
100 ft x 4700 ft	100
100 ft x 4800 ft	100
100 ft x 4900 ft	100
100 ft x 5000 ft	100
100 ft x 5100 ft	100
100 ft x 5200 ft	100
100 ft x 5300 ft	100
100 ft x 5400 ft	100
100 ft x 5500 ft	100
100 ft x 5600 ft	100
100 ft x 5700 ft	100
100 ft x 5800 ft	100
100 ft x 5900 ft	100
100 ft x 6000 ft	100
100 ft x 6100 ft	100
100 ft x 6200 ft	100
100 ft x 6300 ft	100
100 ft x 6400 ft	100
100 ft x 6500 ft	100
100 ft x 6600 ft	100
100 ft x 6700 ft	100
100 ft x 6800 ft	100
100 ft x 6900 ft	100
100 ft x 7000 ft	100
100 ft x 7100 ft	100
100 ft x 7200 ft	100
100 ft x 7300 ft	100
100 ft x 7400 ft	100
100 ft x 7500 ft	100
100 ft x 7600 ft	100
100 ft x 7700 ft	100
100 ft x 7800 ft	100
100 ft x 7900 ft	100
100 ft x 8000 ft	100
100 ft x 8100 ft	100
100 ft x 8200 ft	100
100 ft x 8300 ft	100
100 ft x 8400 ft	100
100 ft x 8500 ft	100
100 ft x 8600 ft	100
100 ft x 8700 ft	100
100 ft x 8800 ft	100
100 ft x 8900 ft	100
100 ft x 9000 ft	100
100 ft x 9100 ft	100
100 ft x 9200 ft	100
100 ft x 9300 ft	100
100 ft x 9400 ft	100
100 ft x 9500 ft	100
100 ft x 9600 ft	100
100 ft x 9700 ft	100
100 ft x 9800 ft	100
100 ft x 9900 ft	100
100 ft x 10000 ft	100

Area: 10000.00 square meters

Thickness: 2.00 meters

Cover Depth: 0.00 meters

Total Dose TD05E(t), mrem/yr  
Basic Radiation Dose Limit = 25 mrem/yr

Total Mixture Sum  $M(t)$  = Fraction of Basic Dose Limit Received at Time  $(t)$

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
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TD0SE(t): 2.500E+01 2.192E+01 1.684E+01 6.701E+00 4.813E-01 3.458E-02 4.782E-05 1.750E-16 0.000E+00

M(t):	1.000E+00	8.766E-01	6.737E-01	2.680E-01	1.925E-02	1.383E-03	1.913E-06	7.000E-18	0.000E+00
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Maximum TD05E(t): 2.50E+01 mrem/yr at t = 0.00E+00 years

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years  
Water Independent Pathways (Inhalation excludes radon)

Radionuclide	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Co-60	2.500E+01	5.514E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.647E-05
Total	2.500E+01	5.514E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.647E-05
mrem/yr fract.							

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radionuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.500E+01
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.500E+01
mrem/yr fract.							

\*Sum of all water independent and dependent pathways.

Summary : Co 60, guardmen, 10000m2

File: 0050510C.RAD

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1,000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Radionuclide	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
Co-60	2.192E+01	4.856E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.320E-05
Total	2.192E+01	4.856E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.320E-05

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1,000E+00 years

Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Radionuclide	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.192E+01
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.192E+01

\*Sum of all water independent and dependent pathways.

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.684E+01	1.0000	3.716E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0000
Total	1.684E+01	1.0000	3.716E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0000

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.684E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.684E+01	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years  
Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	6.701E+00	1.0000	1.472E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.094E-06	0.0000
Total	6.701E+00	1.0000	1.472E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.094E-06	0.0000

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years  
Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.701E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.701E+00	1.0000
*Sum of all water independent and dependant pathways.														

Summary : Co 60, gardeners, 10000r2 File: 0060G10K.RM0

## Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3,000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Radio- Nuclide	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Co-60	4.813E-01 1.0000	1.062E-08 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	5.096E-07 0.0000
Total	4.813E-01 1.0000	1.062E-08 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	5.096E-07 0.0000

## Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3,000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.813E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.813E-01	1.0000
*Sum of all water independent and dependent pathways.														

\*Sum of all water independent and dependent pathways.

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06/29/99

Summary : Co 60, guardsman, 10000h2

File: 0060G10K.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
 Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	3.458E-02	1.0000	7.630E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.661E-08	0.0000
Total	3.458E-02	1.0000	7.630E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.661E-08	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
 Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.458E-02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.458E-02	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.00E+02 years  
Water Independent Pathways (Inhalation excludes radn)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	4.782E-05	1.0000	1.055E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.063E-11	0.0000
Total	4.782E-05	1.0000	1.055E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.063E-11	0.0000

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.00E+02 years  
Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.782E-05	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.782E-05	1.0000

\*Sum of all water independent and dependent pathways.

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.750E-16	1.0000	3.861E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.853E-22	0.0000
Total	1.750E-16	1.0000	3.861E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.853E-22	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years  
Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.750E-16	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.750E-16	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Co 60, grandmean, 10000m2

File: 0060010K.RWD

## Total Dose Contributions IDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
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Water Independent Pathways (Inhalation excludes radon)

Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

## Total Dose Contributions IDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

\*Sum of all water independent and dependent pathways.

Summary : Co-60, gammaem, 10000m2 File: C060G10K.RND

Dose/Source Ratios Summed Over All Pathways  
Parent and Progeny Principal Radionuclide Contributions Indicated  
DSR(i,t) (mrem/yr)/(pci/g)

Parent	Product	Branch	(i)	(j)	Fraction*	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	2.500E-01	2.192E-01	1.684E-01	6.701E-02	4.813E-03	3.458E-04	4.782E-07	1.750E-18	0.000E+00			

\*Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter:  $DSR(i,t) = BRF(1)*BRF(2)*... BRF(j)$ .  
The DSR includes contributions from associated (half-life < 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pci/g  
Basic Radiation Dose Limit = 25 mrem/yr

Nuclide	(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60		1.000E+02	1.141E+02	1.484E+02	3.731E+02	5.194E+03	7.230E+04	5.227E+07	*1.131E+15	*1.131E+15

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

Co-60	1.000E+02	0.000E+00	2.500E-01	1.000E+02	2.500E-01	1.000E+02
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Individual Nuclide Dose Summed Over All Pathways  
Parent Nuclide and Branch Fraction Indicated  
DOSE(j,t), mrem/yr

Nuclide Parent	BRF(i)	DOSE(f,t), mrem/yr											
		(j)	(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03	
Co-60	Co-60	1.000E+00	2.500E+01	1.684E+01	6.701E+00	4.813E-01	3.458E-02	4.782E-05	1.750E-16	0.000E+00	BRF(i) is the branch fraction of the parent nuclide.		

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration  
Parent Nuclide and Branch Fraction Indicated  
SC(j,t), pCi/g

Nuclide Parent	BRF(i)	t= 0.000E+00 1.000E+00 3.000E+00 5.000E+01 1.000E+02 3.000E+02 1.000E+03	s(i), pci/g												
			(j)	Co-60	1.000E+00	1.000E+02	8.766E+01	6.737E+01	2.680E+01	1.925E+00	1.383E-01	1.913E-04	7.000E-16	0.000E+00	
BRF(i) is the branch fraction of the parent nuclide.															

BRF(i) is the branch fraction of the parent nuclide.

## A.1.2 Cs-137: Guardsman Summary Output File

RESRAD, Version 5.82 T½ Limit = 0.5 year 12/15/98 09:03 Page 1

Summary : Cs137, guardsman, 10000m2

File: C137G10K.RAD

### Table of Contents

#### Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ...	2
Site-Specific Parameter Summary .....	3
Summary of Pathway Selections .....	6
Contaminated Zone and Total Dose Summary .....	7
Total Dose Components	
Time = 0.000E+00 .....	8
Time = 1.000E+00 .....	9
Time = 3.000E+00 .....	10
Time = 1.000E+01 .....	11
Time = 3.000E+01 .....	12
Time = 5.000E+01 .....	13
Time = 1.000E+02 .....	14
Time = 3.000E+02 .....	15
Time = 1.000E+03 .....	16
Dose/Source Ratios Summed Over All Pathways .....	17
Single Radionuclide Soil Guidelines .....	17
Dose Per Nuclide Summed Over All Pathways .....	18
Soil Concentration Per Nuclide .....	18

Dose Conversion Factor (and Related) Parameter Summary  
 File: DOSFAC.BIN

Menu	Parameter	Current		Parameter	
		Value	Default	Name	
B-1	Dose conversion factors for inhalation, mrem/pCi:	3.190E-05	3.190E-05	DCF2( 1)	
B-1					
D-1	Dose conversion factors for ingestion, mrem/pCi:	5.000E-05	5.000E-05	DCF3( 1)	
D-1					
D-3A	Food transfer factors: Cs-137d, plant/soil concentration ratio, dimensionless Cs-137d, beef/livestock-intake ratio, (pCi/kg)/(pCi/d) Cs-137d, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	4.000E-02 3.000E-02 8.000E-03	4.000E-02 3.000E-02 8.000E-03	RTF( 1,1) RTF( 1,2) RTF( 1,3)	
D-3A					
D-3A					
D-3A					
D-5	Bioaccumulation factors, fresh water, L/kg: Cs-137d, fish Cs-137d, crustacea and mollusks	2.000E+03 1.000E+02	2.000E+03 1.000E+02	BIOFAC( 1,1) BIOFAC( 1,2)	
D-5					
D-5					

Site Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RES940 (If different from user input)	Parameter Name
R011	Area of contaminated zone (m <sup>2</sup> )	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	T1
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T1 (2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T1 (3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T1 (4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T1 (5)
R011	Times for calculations (yr)	5.000E+01	1.000E+02	---	T1 (6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T1 (7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T1 (8)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T1 (9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T1 (10)
R012	Initial principal radionuclide (dCi/g): Cs-137	4.775E+02	0.000E+00	---	SIC (1)
R012	Concentration in groundwater (dCi/L): Cs-137	not used	0.000E+00	---	WIC (1)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COABRO
R013	Density of cover material (g/cm <sup>3</sup> )	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E+03	---	WV
R013	Density of contaminated zone (g/cm <sup>3</sup> )	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E+03	---	VZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	PECZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	KCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m <sup>3</sup> )	not used	8.000E+00	---	HLMD
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m <sup>2</sup> )	not used	1.000E+05	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E+03	---	EPS
R014	Density of saturated zone (g/cm <sup>3</sup> )	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGAT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	WAT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DMIBAT
R014	Model: Nordispen (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m <sup>3</sup> /yr)	2.500E+02	2.500E+02	---	LM
R015	Number of unsaturated zone strata	not used	1	---	NS

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A-21

06/29/99

Site-Specific Parameter Summary (continued)

Menu	Parameter	Input	Default	(if different from user input)	Used by RES90	Parameter
R015	Ureat. zone 1, thickness (m)	not used	4.00E+00	---	---	H(1)
R015	Ureat. zone 1, soil density (g/cm <sup>3</sup> )	not used	1.50E+00	---	---	DENSIZ(1)
R015	Ureat. zone 1, total porosity	not used	4.00E-01	---	---	TRUZ(1)
R015	Ureat. zone 1, effective porosity	not used	2.00E-01	---	---	BRUZ(1)
R015	Ureat. zone 1, soil-specific b parameter	not used	5.30E+00	---	---	BLZ(1)
R015	Ureat. zone 1, hydraulic conductivity (m/yr)	not used	1.00E+01	---	---	HOLZ(1)
R016	Distribution coefficients for Cs-137					
R016	Contaminated zone (cm <sup>3</sup> /g)	1.00E+03	1.00E+03	---	---	DOUZC(1)
R016	Unsaturated zone 1 (cm <sup>3</sup> /g)	not used	1.00E+03	---	---	DOUZC(1,1)
R016	Saturated zone (cm <sup>3</sup> /g)	not used	1.00E+03	---	---	DOUZC(1)
R016	Leach rate (Yr)	0.00E+00	0.00E+00	1.66E-04	---	ALEND(1)
R016	Solubility constant	0.00E+00	0.00E+00	not used	---	SOLBK(1)
R017	Inhalation rate (m <sup>3</sup> /yr)	9.07E+01	8.40E+03	---	---	INHALR
R017	Mass loading for inhalation (g/m <sup>3</sup> )	1.00E-04	1.00E-04	---	---	MLINH
R017	Exposure duration	2.00E+01	3.00E+01	---	---	ED
R017	Shielding factor, inhalation	4.00E-01	4.00E-01	---	---	SHF3
R017	Shielding factor, external gamma	7.00E-01	7.00E-01	---	---	SHF1
R017	Fraction of time spent outdoors (on site)	0.00E+00	5.00E-01	---	---	FIND
R017	Fraction of time spent outdoors (on site)	1.64E-02	2.50E-01	---	---	FIND
R017	Shape factor flag, external gamma	1.00E+00	1.00E+00	---	---	F0D
R017	Rad1 of shape factor array (used if FS = -1):			>0 stops circular AREA.		FS
R017	Outer annular radius (m), ring 1:	not used	5.00E+01	---	---	RA0_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.07E+01	---	---	RA0_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.00E+00	---	---	RA0_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.00E+00	---	---	RA0_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.00E+00	---	---	RA0_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.00E+00	---	---	RA0_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.00E+00	---	---	RA0_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.00E+00	---	---	RA0_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.00E+00	---	---	RA0_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.00E+00	---	---	RA0_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.00E+00	---	---	RA0_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.00E+00	---	---	RA0_SHAPE(12)
R017	Fractions of annular areas within AREA:					
R017	Ring 1	not used	1.00E+00	---	---	FRACK(1)
R017	Ring 2	not used	2.73E-01	---	---	FRACK(2)
R017	Ring 3	not used	0.00E+00	---	---	FRACK(3)
R017	Ring 4	not used	0.00E+00	---	---	FRACK(4)
R017	Ring 5	not used	0.00E+00	---	---	FRACK(5)
R017	Ring 6	not used	0.00E+00	---	---	FRACK(6)
R017	Ring 7	not used	0.00E+00	---	---	FRACK(7)
R017	Ring 8	not used	0.00E+00	---	---	FRACK(8)
R017	Ring 9	not used	0.00E+00	---	---	FRACK(9)
R017	Ring 10	not used	0.00E+00	---	---	FRACK(10)
R017	Ring 11	not used	0.00E+00	---	---	FRACK(11)
R017	Ring 12	not used	0.00E+00	---	---	FRACK(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.60E+02	---	---	D1ET(1)

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A-22

06/29/99

Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Default	Used by RESRAD (If different from user input)	Parameter Name
		Input			
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	6.000E-01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m <sup>2</sup> *3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R198	Wet weight crop yield for Non-Leafy (kg/m <sup>2</sup> *2)	not used	7.000E-01	---	YV(1)
R198	Wet weight crop yield for Leafy (kg/m <sup>2</sup> *2)	not used	1.500E+00	---	YV(2)
R198	Wet weight crop yield for Fodder (kg/m <sup>2</sup> *2)	not used	1.100E+00	---	YV(3)
R198	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R198	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R198	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R198	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R198	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R198	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R198	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R198	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R198	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R198	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R198	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R198	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R198	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/m <sup>3</sup> *3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.00E-07	---	EVSX
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.00E-10	---	REVSX
C14	Fraction of grain in beef cattle feed	not used	8.00E-01	---	AMFG4
C14	Fraction of grain in milk cow feed	not used	2.00E-01	---	AMFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.40E+01	1.40E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.00E+00	1.00E+00	---	STOR_T(2)
STOR	Milk	1.00E+00	1.00E+00	---	STOR_T(3)
STOR	Meat and poultry	2.00E+01	2.00E+01	---	STOR_T(4)
STOR	Fish	7.00E+00	7.00E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.00E+00	7.00E+00	---	STOR_T(6)
STOR	Well water	1.00E+00	1.00E+00	---	STOR_T(7)
STOR	Surface water	1.00E+00	1.00E+00	---	STOR_T(8)
STOR	Livestock fodder	4.50E+01	4.50E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.50E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm <sup>3</sup> )	not used	2.40E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.00E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.00E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.00E-02	---	PH20CV
R021	Volumetric water content of the foundation	not used	3.00E-02	---	PH20FL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.00E-06	---	D1FCV
R021	in foundation material	not used	3.00E-07	---	D1FFL
R021	in contaminated zone soil	not used	2.00E-06	---	D1FCZ
R021	Radon vertical dimension of mixing (m)	not used	2.00E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.00E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.50E+00	---	HBM
R021	Building interior area factor	not used	0.00E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.00E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.50E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.50E-01	---	EMANA(2)

Summary of Pathway Selections

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

Contaminated Zone Dimensions

Initial Soil Concentrations, pCi/g

Area: 10000.00 square meters  
Thickness: 2.00 meters  
Cover Depth: 0.00 meters

Cs-137 4.77E+02

Total Dose TD0SE(t), mrem/yr  
Basic Radiation Dose Limit = 25 mrem/yr  
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years): 0.00E+00 1.00E+00 3.00E+00 1.00E+01 3.00E+01 5.00E+01 1.00E+02 3.00E+02 1.00E+03  
TD0SE(t): 2.500E+01 2.442E+01 2.331E+01 1.981E+01 1.244E+01 7.808E+00 2.439E+00 2.322E-02 1.955E-09  
M(t): 9.999E-01 9.769E-01 9.329E-01 7.922E-01 4.975E-01 3.123E-01 9.754E-02 9.289E-04 7.821E-11  
Maximum D0SE(t): 2.500E+01 mrem/yr at t = 0.00E+00 years

Summary : Cs137, guardsman, 10000m2

File: C137G10K.R40

## Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Radio- Nuclide	Ground	Inhalation	Water Independent Pathways (Inhalation excludes radon)				Soil	
	mrem/yr	fract.	mrem/yr	fract.	Plant	Meat	Milk	
Cs-137	2.500E+01	1.0000	3.837E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.500E+01	1.0000	3.837E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

## Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Radio- Nuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Cs-137	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.500E+01 1.0000
Total	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.500E+01 1.0000
*Sum of all water independent and dependant pathways.							

\*Sum of all water independent and dependent pathways.

Summary : Cs137, gardman, 10000h2

File: C137g10K.R40

## Total Dose Contributions MDSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radn)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.442E+01	1.0000	3.749E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.442E+01	1.0000	3.749E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

## Total Dose Contributions MDSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.442E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.442E+01	1.0000
*Sum of all water independent and dependant pathways.														

\*Sum of all water independent and dependent pathways.

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A-27

06/29/99

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Radio- Nuclide	Water Independent Pathways (Inhalation excludes radon)			Meat			Milk			Soil		
	Ground	Inhalation	Radon	Plant	meat/yr	fract.	meat/yr	fract.	meat/yr	fract.	meat/yr	fract.
Cs-137	2.331E+01 1.0000	3.578E-07 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.191E-04 0.0000			
Total	2.331E+01 1.0000	3.578E-07 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.191E-04 0.0000			

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Radio- Nuclide	Water Dependent Pathways			Meat			Milk			All Pathways*		
	Water	Fish	Radon	Plant	meat/yr	fract.	meat/yr	fract.	meat/yr	fract.	meat/yr	fract.
Cs-137	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.331E+01 1.0000			
Total	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.331E+01 1.0000			

\*Sum of all water independent and dependant pathways.

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.981E+01	1.0000	3.040E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.862E-04	0.0000
Total	1.981E+01	1.0000	3.040E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.862E-04	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.981E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.981E+01	1.0000

\*Sum of all water independent and dependent pathways.



Summary : Cs137, guardsman, 10000h2

File: C137G10K.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
 Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	7.808E+00	1.0000	1.199E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.339E-05	0.0000
Total	7.808E+00	1.0000	1.199E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.339E-05	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
 Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.808E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.808E+00	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years  
 Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.439E+00	1.0000	3.744E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.293E-05	0.0000
Total	2.439E+00	1.0000	3.744E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.293E-05	0.0000

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.439E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.439E+00	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions (mSv) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3,000E+02 years									
Water Independent Pathways (Inhalation excludes radon)									
Radionuclide	mrem/yr	fract.	Radon	mrem/yr	fract.	Plant	mrem/yr	fract.	Meat
Cs-137	2.322E-02	1.0000	3.565E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Total	2.322E-02	1.0000	3.565E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Soil									
	2.183E-07	0.0000							

Total Dose Contributions (mSv) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3,000E+02 years									
Water Dependent Pathways									
Radionuclide	mrem/yr	fract.	Water	mrem/yr	fract.	Plant	mrem/yr	fract.	Meat
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Milk									
	2.322E-02	1.0000							
All Pathways*									
	2.322E-02	1.0000							

\*Sum of all water independent and dependent pathways.

Summary : Cs137, garden, 10000r2 File: C:\37610K.RAD

Total Dose Contributions TDSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1,000E+05 years  
Water Independent Pathways (Inhalation excludes radn)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil	
Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.955E-09	1.0000	3.001E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.955E-09	1.0000	3.001E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1,000E+05 years  
Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*	
Radionuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.955E-09	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.955E-09	1.0000

\*Sum of all water independent and dependent pathways.

\*Sum of all water independent and dependent pathways.

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

(i)	(j)	Factor* (= 0.000E+00 1.000E+00 3.000E+00 1.000E+00 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03	Cs-137	Cs-137
Parent Product Branch		DSR(i,j,t) (mrem/yr)/(pci/g)		

\*Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter:  $DMRF(j) = BRF(1)*BRF(2)* \dots BRF(j)$ .  
The DSR includes contributions from associated (half-life < 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pci/g

Basic Radiation Dose Limit = 25 mrem/yr

Nuclide

(i)	t= 0.000E+00 1.000E+00 3.000E+00 1.000E+01 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03	Cs-137
-----	--	--------

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pci/g)

and Single Radionuclide Soil Guidelines G(i,t) in pci/g

at tmin = time of minimum single radionuclide soil guideline  
and at tmax = time of maximum total dose = 0.000E+00 years  
Nuclide Initial tmin DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)

(i)	pci/g	(years)	(pci/g)	(pci/g)	Cs-137

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

Nuclide Parent BRF(i)		DOSE(j,t), mrem/yr									
(j)	(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Cs-137	Cs-137	1.000E+00	2.500E+01	2.442E+01	2.331E+01	1.981E+01	1.244E+01	7.808E+00	2.439E+00	2.322E-02	1.955E-09

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration  
Parent Nuclide and Branch Fraction Indicated

Nuclide Parent BRF(i)		S(j,t), pCi/g									
(j)	(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Cs-137	Cs-137	1.000E+00	4.775E+02	4.666E+02	4.453E+02	3.784E+02	2.376E+02	1.492E+02	4.660E+01	4.436E-01	3.735E-08

BRF(i) is the branch fraction of the parent nuclide.

## A.2 Results of RESRAD Calculations for Resident Adult Scenario

### A.2.1 Co-60: Resident Adult Summary Output File

RESRAD, Version 5.82 T½ Limit = 0.5 year 12/14/98 17:38 Page 1

Summary : Co60, resident adult, 10000m2

File: 0060R10K.RAD

#### Table of Contents

##### Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ...	2
Site-Specific Parameter Summary .....	3
Summary of Pathway Selections .....	6
Contaminated Zone and Total Dose Summary .....	7
Total Dose Components	
Time = 0.000E+00 .....	8
Time = 1.000E+00 .....	9
Time = 3.000E+00 .....	10
Time = 1.000E+01 .....	11
Time = 3.000E+01 .....	12
Time = 5.000E+01 .....	13
Time = 1.000E+02 .....	14
Time = 3.000E+02 .....	15
Time = 1.000E+03 .....	16
Dose/Source Ratios Summed Over All Pathways .....	17
Single Radionuclide Soil Guidelines .....	17
Dose Per Nuclide Summed Over All Pathways .....	18
Soil Concentration Per Nuclide .....	18

Dose Conversion Factor (and Related) Parameter Summary  
File: DCSFAC.BIN

Menu	Parameter	Current	Value	Default	Parameter Name
B-1 B-1	Dose conversion factors for inhalation, mrem/pCi: Co-60	2.190E-04	2.190E-04	2.190E-04	DCF2( 1)
D-1 D-1	Dose conversion factors for ingestion, mrem/pCi: Co-60	2.690E-05	2.690E-05	2.690E-05	DCF3( 1)
D-34 D-34 D-34 D-34	Food transfer factors: Co-60 , plant/soil concentration ratio, dimensionless Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-02 2.000E-02 2.000E-03	8.000E-02 2.000E-02 2.000E-03	8.000E-02 2.000E-02 2.000E-03	RTF( 1,1) RTF( 1,2) RTF( 1,3)
D-5 D-5 D-5	Bioaccumulation factors, fresh water, L/kg: Co-60 , fish Co-60 , crustacea and mollusks	3.000E+02 2.000E+02	3.000E+02 2.000E+02	3.000E+02 2.000E+02	BIOFAC( 1,1) BIOFAC( 1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.00E+04	1.00E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.00E+00	2.00E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.00E+02	1.00E+02	---	LCZPA0
R011	Basic radiation dose limit (mrem/yr)	2.50E+01	3.00E+01	---	BSOL
R011	Time since placement of material (yr)	0.00E+00	0.00E+00	---	T1
R011	Times for calculations (yr)	1.00E+00	1.00E+00	---	T( 2)
R011	Times for calculations (yr)	3.00E+00	3.00E+00	---	T( 3)
R011	Times for calculations (yr)	1.00E+01	1.00E+01	---	T( 4)
R011	Times for calculations (yr)	3.00E+01	3.00E+01	---	T( 5)
R011	Times for calculations (yr)	5.00E+01	1.00E+02	---	T( 6)
R011	Times for calculations (yr)	1.00E+02	3.00E+02	---	T( 7)
R011	Times for calculations (yr)	3.00E+02	1.00E+03	---	T( 8)
R011	Times for calculations (yr)	1.00E+03	0.00E+00	---	T( 9)
R011	Times for calculations (yr)	not used	0.00E+00	---	T(10)
R012	Initial principal radionuclide (pci/g): Co-60	1.542E+02	0.00E+00	---	SI( 1)
R012	Concentration in groundwater (pci/L): Co-60	not used	0.00E+00	---	W( 1)
R013	Cover depth (m)	0.00E+00	0.00E+00	---	C06R0
R013	Density of cover material (g/cm**3)	not used	1.50E+00	---	D06R0V
R013	Cover depth erosion rate (m/yr)	not used	1.00E-05	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.50E+00	1.50E+00	---	D06R2Z
R013	Contaminated zone erosion rate (m/yr)	0.00E+00	1.00E-05	---	VCZ
R013	Contaminated zone total porosity	4.00E-01	4.00E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.00E-01	2.00E-01	---	BPZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.00E+01	1.00E+01	---	HCZ
R013	Contaminated zone b parameter	5.30E+00	5.30E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.00E+00	2.00E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.00E+00	---	HUMID
R013	Evapotranspiration coefficient	5.00E-01	5.00E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.00E+00	1.00E+00	---	PRECIP
R013	Irrigation (m/yr)	2.00E-01	2.00E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.00E-01	1.00E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.00E+06	1.00E+06	---	WAREA
R013	Accuracy for water/soil computations	1.00E-05	1.00E-05	---	EPS
R014	Density of saturated zone (g/cm**3)	1.50E+00	1.50E+00	---	D06R4Q
R014	Saturated zone total porosity	4.00E-01	4.00E-01	---	TPSZ
R014	Saturated zone effective porosity	2.00E-01	2.00E-01	---	BPZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.00E+02	1.00E+02	---	HCZ
R014	Saturated zone hydraulic gradient	2.00E-02	2.00E-02	---	HGAT
R014	Saturated zone b parameter	5.30E+00	5.30E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.00E-05	1.00E-05	---	WAT
R014	Well pump intake depth (m below water table)	1.00E+01	1.00E+01	---	DAIBAT
R014	Model: Nordisersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.50E+02	2.50E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	Input	Default	Used by RESRAD	Parameter
				(If different from user input)	Name
R015	Ureat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Ureat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Ureat. zone 1, total porosity	4.000E-01	4.000E-01	---	TRUZ(1)
R015	Ureat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Ureat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BLZ(1)
R015	Ureat. zone 1, hydraulic conductivity (m/yr)	1.000E-01	1.000E+01	---	HQUZ(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DOUZC( 1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DOUZC( 1,1)
R016	Saturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DOUZC( 1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.666E-04	ALEACH( 1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLBK( 1)
R017	Inhalation rate (m**3/yr)	4.057E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Fraction of time spent indoors	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent outdoors (on site)	6.500E-01	5.000E-01	---	FIND
R017	Shape factor flag, external gamma	8.000E-02	2.500E-01	---	R010
R017	Radius of shape factor array (used if FS = -1):	1.000E+00	1.000E+00	---	FS
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE( 1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE( 2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE( 3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE( 4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE( 5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE( 6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE( 7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE( 8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE( 9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA( 1)
R017	Ring 2	not used	2.732E-01	---	FRACA( 2)
R017	Ring 3	not used	0.000E+00	---	FRACA( 3)
R017	Ring 4	not used	0.000E+00	---	FRACA( 4)
R017	Ring 5	not used	0.000E+00	---	FRACA( 5)
R017	Ring 6	not used	0.000E+00	---	FRACA( 6)
R017	Ring 7	not used	0.000E+00	---	FRACA( 7)
R017	Ring 8	not used	0.000E+00	---	FRACA( 8)
R017	Ring 9	not used	0.000E+00	---	FRACA( 9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.956E+02	1.600E+02	---	DIET(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User		Used by RESRAD	Parameter
		Input	Default	(If different from user input)	
R018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.750E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	8.400E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DR00T
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R198	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R198	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R198	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R198	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R198	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R198	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R198	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R198	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R198	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R198	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R198	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R198	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R198	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R198	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R198	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R198	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
C14	C-14 exsion flux rate from soil (1/sec)	not used	7.00E-07	---	EVSN
C14	C-12 exsion flux rate from soil (1/sec)	not used	1.00E-10	---	RESN
C14	Fraction of grain in beef cattle feed	not used	8.00E-01	---	AVR64
C14	Fraction of grain in milk cow feed	not used	2.00E-01	---	AVR65
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.40E+01	1.40E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.00E+00	1.00E+00	---	STOR_T(2)
STOR	Milk	1.00E+00	1.00E+00	---	STOR_T(3)
STOR	Meat and poultry	2.00E+01	2.00E+01	---	STOR_T(4)
STOR	Fish	7.00E+00	7.00E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.00E+00	7.00E+00	---	STOR_T(6)
STOR	Well water	1.00E+00	1.00E+00	---	STOR_T(7)
STOR	Surface water	1.00E+00	1.00E+00	---	STOR_T(8)
STOR	Livestock fodder	4.50E+01	4.50E+01	---	STOR_T(9)
RC21	Thickness of building foundation (m)	not used	1.50E-01	---	FLOOR
RC21	Bulk density of building foundation (g/cm³)	not used	2.40E+00	---	DENSFL
RC21	Total porosity of the cover material	not used	4.00E-01	---	TPCV
RC21	Total porosity of the building foundation	not used	1.00E-01	---	TPFL
RC21	Volumeetric water content of the cover material	not used	5.00E-02	---	PH20CV
RC21	Volumeetric water content of the foundation	not used	3.00E-02	---	PH20FL
RC21	Diffusion coefficient for radon gas (m/sec):				
RC21	in cover material	not used	2.00E-06	---	DIFCV
RC21	in foundation material	not used	3.00E-07	---	DIFFL
RC21	in contaminated zone soil	not used	2.00E-06	---	DIFCZ
RC21	Radon vertical diffusion of mixing (m)	not used	2.00E+00	---	HMX
RC21	Average building air exchange rate (1/hr)	not used	5.00E-01	---	REXG
RC21	Height of the building (room) (m)	not used	2.50E+00	---	HRM
RC21	Building interior area factor	not used	0.00E+00	---	FAL
RC21	Building depth below ground surface (m)	not used	-1.00E+00	---	DMFL
RC21	Emitting power of Rn-222 gas	not used	2.50E-01	---	BMWA(1)
RC21	Emitting power of Rn-220 gas	not used	1.50E-01	---	BMWA(2)

Summary of Pathway Selections

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

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Contaminated Zone Dimensions

Initial Soil Concentrations, pci/g

Area:	10000.00 square meters	Co-60	1.542E+02
Thickness:	2.00 meters		
Cover Depth:	0.00 meters		

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   Total Dose TDOSE(t), mrem/yr  
Total Mixture Sum W(t) = Fraction of Basic Dose Limit Received at Time (t)  
Basic Radiation Dose Limit = 25 mrem/yr

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	1.290E+03	1.130E+03	8.74E+02	3.480E+02	2.500E+01	1.796E+00	2.483E-03	9.089E-15	0.000E+00
W(t):	5.192E+01	4.552E+01	3.490E+01	1.392E+01	9.990E-01	7.182E-02	9.934E-05	3.655E-16	0.000E+00
Maximum TDOSE(t):	1.290E+03 mrem/yr	at t = 0.000E+00 years							

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Summary: Co60, resident adult, 10000m2

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.266E+03	0.9752	7.935E-04	0.0000	0.000E+00	0.0000	3.212E+01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	5.336E-02	0.0000
Total	1.266E+03	0.9752	7.935E-04	0.0000	0.000E+00	0.0000	3.212E+01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	5.336E-02	0.0000

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.298E+03	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.298E+03	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Co-60, resident adult, 10000h2

File: 0060R10K.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.110E+03	0.9752	6.956E-04	0.0000	0.000E+00	0.0000	2.816E+01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	4.678E-02	0.0000
Total	1.110E+03	0.9752	6.956E-04	0.0000	0.000E+00	0.0000	2.816E+01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	4.678E-02	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.138E+03	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.138E+03	1.0000

\*Sum of all water independent and dependent pathways.

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	8.529E+02	0.9752	5.345E-04	0.0000	0.000E+00	0.0000	2.164E+01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	3.595E-02	0.0000
Total	8.529E+02	0.9752	5.345E-04	0.0000	0.000E+00	0.0000	2.164E+01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	3.595E-02	0.0000

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.746E+02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.746E+02	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years  
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	3.393E+02	0.9752	2.127E-04	0.0000	8.609E+00	0.0247	0.000E+00	0.0000
Total	3.393E+02	0.9752	2.127E-04	0.0000	8.609E+00	0.0247	0.000E+00	0.0000

As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

As mrem/yr and Fraction of Total Dose At t = 1,000E+01 years										
Radio- Nuclide	Water		Fish		Radon		Water Dependent Pathways		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.		
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.440E+02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.440E+02	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Co60, resident adult, 10000m2

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	2.438E+01	0.9752	1.528E-05	0.0000	0.000E+00	0.0000	6.184E-01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	1.027E-03	0.0000
Total	2.438E+01	0.9752	1.528E-05	0.0000	0.000E+00	0.0000	6.184E-01	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	1.027E-03	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.500E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.500E+01	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Co-60, resident adult, 10000m2

File: 0060R10K.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
 Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.751E+00	0.9752	1.097E-06	0.0000	0.000E+00	0.0000	4.443E-02	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	7.381E-05	0.0000
Total	1.751E+00	0.9752	1.097E-06	0.0000	0.000E+00	0.0000	4.443E-02	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	7.381E-05	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
 Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.796E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.796E+00	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As men/yr and Fraction of Total Dose At t = 1.000E+02 years  
Water Independent Pathways (Inhalation excludes radn)

Radio- Nuclide	men/yr	fract.	Ground Inhalation	men/yr	fract.	Radon	men/yr	fract.	Plant	men/yr	fract.	Meat	men/yr	fract.	Milk	men/yr	fract.	Soil
Co-60	2.422E-03	0.9752	1.518E-09	0.0000	0.000E+00	0.0000	6.144E-05	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	1.021E-07	0.0000				
Total	2.422E-03	0.9752	1.518E-09	0.0000	0.000E+00	0.0000	6.144E-05	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	1.021E-07	0.0000				

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	men/yr	fract.	men/yr	fract.	men/yr	fract.	men/yr	fract.	men/yr	fract.	men/yr	fract.		
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.483E-03	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.483E-03	1.0000

\*Sum of all water independent and dependant pathways.

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

Radio- Nuclide	Ground mrem/yr	fract.	Inhalation mrem/yr	fract.	Radon mrem/yr	fract.	Plant mrem/yr	fract.	Meat mrem/yr	fract.	Milk mrem/yr	fract.	Soil mrem/yr	fract.
Co-60	8.863E-15	0.9752	5.554E-21	0.0000	0.000E+00	0.0000	2.248E-16	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	3.736E-19	0.0000
Total	8.863E-15	0.9752	5.554E-21	0.0000	0.000E+00	0.0000	2.248E-16	0.0247	0.000E+00	0.0000	0.000E+00	0.0000	3.736E-19	0.0000

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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways													
Water				Fish				Radon				Plant	
Radio- Nuclide	Water mrem/yr	fract.	mrem/yr	Fish mrem/yr	fract.	mrem/yr	fract.	Radon mrem/yr	fract.	mrem/yr	fract.	Meat mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

\*Sum of all water independent and dependent pathways.

■ ■

Summary : Co60, resident adult, 10000m2

File: 0060R10K.RAD

## Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

## Total Dose Contributions TDCSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

\*Sum of all water independent and dependent pathways.

## Dose/Source Ratios Summed Over All Pathways

Parent and Progeny Principal Radionuclide Contributions Indicated

Parent Product Branch

DSR(i,j,t) (mrem/yr)/(pci/g)

Fraction\* t = 0.000E+00 1.000E+00 3.000E+00 3.000E+01 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03

Co-60 1.000E+00 8.418E+00 7.379E+00 5.671E+00 2.256E+00 1.621E-01 1.164E-02 5.892E-17 0.000E+00

\*Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter:  $DRBFR(j) = BRF(1)*BRF(2)* \dots BRF(j)$ .  
 The DSR includes contributions from associated (half-life < 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pci/g

Basic Radiation Dose Limit = 25 mrem/yr

Nuclide

(i) t = 0.000E+00 1.000E+00 3.000E+00 1.000E+01 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03

Co-60 2.970E+00 3.388E+00 4.409E+00 1.108E+01 1.543E+02 2.147E+03 1.553E+06 \*1.131E+15 \*1.131E+15

\*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pci/g)

and Single Radionuclide Soil Guidelines G(i,t) in pci/g  
 at tmin = time of minimum single radionuclide soil guideline  
 and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide Initial pci/g  
 tmin (years)  
 DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)  
 (pci/g)

Co-60 1.542E+02 0.000E+00 8.418E+00 2.970E+00 8.418E+00 2.970E+00

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

Nuclide Parent BRF(i)		DOSE(j,t), mrem/yr									
(j)	(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.298E+03	1.138E+03	8.746E+02	3.480E+02	2.500E+01	1.796E+00	2.483E-03	9.088E-15	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration  
Parent Nuclide and Branch Fraction Indicated

Nuclide Parent BRF(i)		S(j,t), pCi/g									
(j)	(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.542E+02	1.352E+02	1.039E+02	4.134E+01	2.969E+00	2.133E-01	2.950E-04	1.080E-15	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

A.2.2 Cs-137: Resident Adult Summary Output File

RESRAD, Version 5.82 T½ Limit = 0.5 year 12/14/98 17:26 Page 1

Summary : Cs137, resident, 1000m2 File: C137R10K.RAD

Table of Contents

Part 1: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2

Site-Specific Parameter Summary ..... 3

Summary of Pathway Selections ..... 6

Contaminated Zone and Total Dose Summary ..... 7

Total Dose Components

Time = 0.00E+00 ..... 8

Time = 1.00E+00 ..... 9

Time = 3.00E+00 ..... 10

Time = 1.00E+01 ..... 11

Time = 3.00E+01 ..... 12

Time = 5.00E+01 ..... 13

Time = 1.00E+02 ..... 14

Time = 3.00E+02 ..... 15

Time = 1.00E+03 ..... 16

Dose/Source Ratios Summed Over All Pathways ..... 17

Single Radionuclide Soil Guidelines ..... 17

Dose Per Nuclide Summed Over All Pathways ..... 18

Soil Concentration Per Nuclide ..... 18

Dose Conversion Factor (and Related) Parameter Summary  
 File: DOSFAC.BIN

Menu	Parameter	Current	Value	Default	Parameter Name
B-1 B-1	Dose conversion factors for inhalation, mrem/pCi: Cs-137+0		3.190E-05	3.190E-05	DCF2( 1)
D-1 D-1	Dose conversion factors for ingestion, mrem/pCi: Cs-137+0		5.000E-05	5.000E-05	DCF3( 1)
D-34 D-34	Food transfer factors: Cs-137+0 , plant/soil concentration ratio, dimensionless		4.000E-02	4.000E-02	RTF( 1,1)
D-34 D-34	Cs-137+0 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)		3.000E-02	3.000E-02	RTF( 1,2)
D-34 D-34	Cs-137+0 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)		8.000E-03	8.000E-03	RTF( 1,3)
D-5 D-5	Bioaccumulation factors, fresh water, L/kg: Cs-137+0 , fish		2.000E+03	2.000E+03	BIOfAC( 1,1)
D-5 D-5	Cs-137+0 , crustacea and mollusks		1.000E+02	1.000E+02	BIOfAC( 1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.00E+04	1.00E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.00E+00	2.00E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.00E+02	1.00E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.50E+01	3.00E+01	---	BSOL
R011	Time since placement of material (yr)	0.00E+00	0.00E+00	---	T1
R011	Times for calculations (yr)	1.00E+00	1.00E+00	---	T( 2)
R011	Times for calculations (yr)	3.00E+00	3.00E+00	---	T( 3)
R011	Times for calculations (yr)	1.00E+01	1.00E+01	---	T( 4)
R011	Times for calculations (yr)	3.00E+01	3.00E+01	---	T( 5)
R011	Times for calculations (yr)	5.00E+01	1.00E+02	---	T( 6)
R011	Times for calculations (yr)	1.00E+02	3.00E+02	---	T( 7)
R011	Times for calculations (yr)	3.00E+02	1.00E+03	---	T( 8)
R011	Times for calculations (yr)	1.00E+03	0.00E+00	---	T( 9)
R011	Times for calculations (yr)	not used	0.00E+00	---	T(10)
R012	Initial principal radionuclide (pci/g): Cs-137	2.627E+01	0.00E+00	---	S1( 1)
R012	Concentration in groundwater (pci/L): Cs-137	not used	0.00E+00	---	W1( 1)
R013	Cover depth (m)	0.00E+00	0.00E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.50E+00	---	DENS0V
R013	Cover depth erosion rate (m/yr)	not used	1.00E+05	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.50E+00	1.50E+00	---	DENSZ
R013	Contaminated zone erosion rate (m/yr)	0.00E+00	1.00E+05	---	VZ
R013	Contaminated zone total porosity	4.00E-01	4.00E-01	---	TPZ
R013	Contaminated zone effective porosity	2.00E-01	2.00E-01	---	EPZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.00E+01	1.00E+01	---	HCZ
R013	Contaminated zone b parameter	5.30E+00	5.30E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.00E+00	2.00E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.00E+00	---	HUMID
R013	Evapotranspiration coefficient	5.00E-01	5.00E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.00E+00	1.00E+00	---	PRECIP
R013	Irrigation (m/yr)	2.00E-01	2.00E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.00E-01	2.00E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.00E+06	1.00E+06	---	WAREA
R013	Accuracy for water/soil computations	1.00E-03	1.00E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.50E+00	1.50E+00	---	DENSAQ
R014	Saturated zone total porosity	4.00E-01	4.00E-01	---	TPSZ
R014	Saturated zone effective porosity	2.00E-01	2.00E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.00E+02	1.00E+02	---	HC SZ
R014	Saturated zone hydraulic gradient	2.00E-02	2.00E-02	---	HGJT
R014	Saturated zone b parameter	5.30E+00	5.30E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.00E-03	1.00E-03	---	WJT
R014	Well pump intake depth (m below water table)	1.00E+01	1.00E+01	---	WBTBT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.50E+02	2.50E+02	---	WU
R015	Number of unsaturated zone strata	1	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Default	Used by RESRAD	Parameter
		Input	Default	(If different from user input)	Name
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm³)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(?)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BLUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HLUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm³/g)	1.000E+03	1.000E+03	---	DONUC( 1)
R016	Unsaturated zone 1 (cm³/g)	1.000E+03	1.000E+03	---	DONUC( 1,1)
R016	Saturated zone (cm³/g)	1.000E+03	1.000E+03	---	DONUC( 1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.666E-04	ALEACH( 1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK( 1)
R017	Inhalation rate (m³/yr)	4.057E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m³)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.550E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	8.000E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE( 1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE( 2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE( 3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE( 4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE( 5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE( 6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE( 7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE( 8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE( 9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA( 1)
R017	Ring 2	not used	2.732E-01	---	FRACA( 2)
R017	Ring 3	not used	0.000E+00	---	FRACA( 3)
R017	Ring 4	not used	0.000E+00	---	FRACA( 4)
R017	Ring 5	not used	0.000E+00	---	FRACA( 5)
R017	Ring 6	not used	0.000E+00	---	FRACA( 6)
R017	Ring 7	not used	0.000E+00	---	FRACA( 7)
R017	Ring 8	not used	0.000E+00	---	FRACA( 8)
R017	Ring 9	not used	0.000E+00	---	FRACA( 9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.936E+02	1.600E+02	---	DIET(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User		Used by RESRAD	Parameter Name
		Input	Default	(If different from user input)	
R018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.750E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	8.400E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m <sup>2</sup> *3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGHHW
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R198	Wet weight crop yield for Non-Leafy (kg/m <sup>2</sup> *2)	7.000E-01	7.000E-01	---	YV(1)
R198	Wet weight crop yield for Leafy (kg/m <sup>2</sup> *2)	1.500E+00	1.500E+00	---	YV(2)
R198	Wet weight crop yield for Fodder (kg/m <sup>2</sup> *2)	not used	1.100E+00	---	YV(3)
R198	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R198	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R198	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R198	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R198	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R198	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R198	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R198	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R198	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R198	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R198	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R198	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R198	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm <sup>3</sup> )	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC

Site-Specific Parameter Summary (continued)

Matu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.00E-07	---	ESN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.00E-10	---	REVS
C14	Fraction of grain in beef cattle feed	not used	8.00E-01	---	AWG4
C14	Fraction of grain in milk cow feed	not used	2.00E-01	---	AWG5
STOR	Storage times of contaminated foodstuffs (days):	1.40E+01	1.40E+01	---	STOR_I(1)
STOR	Fruits, non-leafy vegetables, and grain	1.00E+00	1.00E+00	---	STOR_I(2)
STOR	Leafy vegetables	1.00E+00	1.00E+00	---	STOR_I(3)
STOR	Milk	2.00E+01	2.00E+01	---	STOR_I(4)
STOR	Meat and poultry	7.00E+00	7.00E+00	---	STOR_I(5)
STOR	Fish	7.00E+00	7.00E+00	---	STOR_I(6)
STOR	Crustacea and mollusks	1.00E+00	1.00E+00	---	STOR_I(7)
STOR	Well water	1.00E+00	1.00E+00	---	STOR_I(8)
STOR	Surface water	1.00E+00	1.00E+00	---	STOR_I(9)
STOR	Livestock fodder	4.50E+01	4.50E+01	---	
R021	Thickness of building foundation (m)	not used	1.50E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm <sup>3</sup> )	not used	2.40E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.00E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.00E-01	---	TPFL
R021	Volume/ric water content of the cover material	not used	5.00E-02	---	PH20CV
R021	Volume/ric water content of the foundation	not used	3.00E-02	---	PH20FL
R021	Diffusion coefficient for radon gas (m/sec):	not used	2.00E-06	---	DIFCV
R021	in cover material	not used	3.00E-07	---	DIFFL
R021	in foundation material	not used	2.00E-06	---	DIFCZ
R021	in contaminated zone soil	not used	2.00E+00	---	MUX
R021	Radon vertical dimension of mixing (m)	not used	5.00E-01	---	RENG
R021	Average building air exchange rate (1/hr)	not used	2.50E+00	---	HM
R021	Height of the building (room) (m)	not used	0.00E+00	---	FAL
R021	Building interior area factor	not used	-1.00E+00	---	DIFL
R021	Building depth below ground surface (m)	not used	2.50E-01	---	BMWA(1)
R021	Emitting power of Rn-222 gas	not used	1.50E-01	---	BMWA(2)
R021	Emitting power of Rn-220 gas	not used		---	

Summary of Pathway Selections

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

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area: 10000.00 square meters		Cs-137	2.627E+01
Thickness: 2.00 meters			
Cover Depth: 0.00 meters			

		Total Dose TD0SE(t), mrem/yr	
		Basic Radiation Dose Limit = 25 mrem/yr	
		Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)	
t (years):	0.000E+00 1.000E+00 3.000E+00 1.000E+01 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03		
TD0SE(t):	5.025E+01 4.910E+01 4.687E+01 3.982E+01 2.500E+01 1.570E+01 4.903E+00 4.668E-02 3.931E-09		
M(t):	2.010E+00 1.964E+00 1.875E+00 1.593E+00 1.000E+00 6.279E-01 1.961E-01 1.867E-03 1.572E-10		
Maximum TD0SE(t): 5.025E+01 mrem/yr		at t = 0.000E+00 years	

Summary : Cs137, resident, 10000m2  
File: C137R10C.RAD

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years  
(Water Independent Pathways (Inhalation excludes radon))

Radionuclide	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Cs-137	4.515E+01	1.969E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.689E-02
Total	4.515E+01	1.969E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.689E-02

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

Radionuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.025E+01
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.025E+01

\*Sum of all water independent and dependent pathways.

Summary : Cs137, resident, 10000m2

File: C137R10K.RAD

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years Water Independent Pathways (Inhalation excludes radon)									
Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years Water Dependent Pathways									
Radionuclide	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil		
Cs-137	4.411E+01	1.923E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.651E-02	0.0003
Total	4.411E+01	1.923E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.651E-02	0.0003
Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years									
Radionuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*		
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.910E+01	1.0000
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.910E+01	1.0000

\*Sum of all water independent and dependent pathways.

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	4.211E+01	0.8985	1.836E-05	0.0000	0.000E+00	0.0000	4.742E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	1.576E-02	0.0003
Total	4.211E+01	0.8985	1.836E-05	0.0000	0.000E+00	0.0000	4.742E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	1.576E-02	0.0003

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.687E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.687E+01	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years  
Water Independent Pathways (Inhalation excludes radon)

Radionuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	3.578E+01	0.8985	1.560E-05	0.0000	0.000E+00	0.0000	4.029E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	1.539E-02	0.0003
Total	3.578E+01	0.8985	1.560E-05	0.0000	0.000E+00	0.0000	4.029E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	1.539E-02	0.0003

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years  
Water Dependent Pathways

Radionuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.982E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.982E+01	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Cs137, resident, 10000m2

File: C137R10K.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.246E+01	0.8985	9.794E-06	0.0000	0.000E+00	0.0000	2.530E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	8.405E-03	0.0003
Total	2.246E+01	0.8985	9.794E-06	0.0000	0.000E+00	0.0000	2.530E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	8.405E-03	0.0003

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.500E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.500E+01	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
--	--------	------------	-------	-------	------	------	------

Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.410E+01	0.8985	6.149E-06	0.0000	0.000E+00	0.0000	1.588E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	5.277E-03	0.0003
Total	1.410E+01	0.8985	6.149E-06	0.0000	0.000E+00	0.0000	1.588E+00	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	5.277E-03	0.0003

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years  
Water Dependent Pathways

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

Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.570E+01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.570E+01	1.0000

\*Sum of all water independent and dependent pathways.

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

Radio- Nuclide	Water Independent Pathways (Inhalation excludes radon)			Water Dependent Pathways			All Pathways*		
	Ground	Inhalation	Radon	Water	Plant	Meat	Milk	Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Cs-137	4.406E+00	0.8985	1.921E-06	0.0000	0.000E+00	0.0000	4.961E-01	0.1012	0.000E+00
Total	4.406E+00	0.8985	1.921E-06	0.0000	0.000E+00	0.0000	4.961E-01	0.1012	0.000E+00

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

Radio- Nuclide	Water Independent Pathways			Water Dependent Pathways			All Pathways*		
	Water	Fish	Radon	Water	Plant	Meat	Milk	Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.903E+00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.903E+00

\*Sum of all water independent and dependent pathways.

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

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Radio- Nuclide	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Cs-137	4.194E-02 0.8985	1.829E-08 0.0000	0.000E+00 0.0000	4.723E-03 0.1012	0.000E+00 0.0000	0.000E+00 0.0000	1.569E-05 0.0003
Total	4.194E-02 0.8985	1.829E-08 0.0000	0.000E+00 0.0000	4.723E-03 0.1012	0.000E+00 0.0000	0.000E+00 0.0000	1.569E-05 0.0003

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years  
Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Radio- Nuclide	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Cs-137	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	4.668E-02 1.0000
Total	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	4.668E-02 1.0000

\*Sum of all water independent and dependent pathways.

Summary : Cs137, resident, 10000r2

File: C137R10K.RAD

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	3.532E-09	0.8985	1.540E-15	0.0000	0.000E+00	0.0000	3.977E-10	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	1.321E-12	0.0003
Total	3.532E-09	0.8985	1.540E-15	0.0000	0.000E+00	0.0000	3.977E-10	0.1012	0.000E+00	0.0000	0.000E+00	0.0000	1.321E-12	0.0003

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years  
 Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.931E-09	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.931E-09	1.0000

\*Sum of all water independent and dependent pathways.



Individual Nuclide Dose Summed Over All Pathways  
Parent Nuclide and Branch Fraction Indicated  
DOSE(I,t), mrem/yr

Nuclide Parent		BRF(I)	Individual Nuclide Soil Concentration									
(j)	(i)	t=	Cs-137	Cs-137	1.000E+00	5.025E+01	4.910E+01	4.687E+01	3.982E+01	2.500E+01	1.570E+01	4.903E+00
			3.931E-09	3.000E+02	1.00E+03	1.000E+00	1.000E+00	3.000E+00	1.000E+00	3.000E+01	5.000E+01	1.000E+02

BRF(I) is the branch fraction of the parent nuclide.

Individual Nuclide and Branch Fraction Indicated  
Parent Nuclide and Branch Fraction Indicated  
S(I,t), pCi/g

Nuclide Parent		BRF(I)	Individual Nuclide Soil Concentration									
(j)	(i)	t=	Cs-137	Cs-137	1.000E+00	2.627E+01	2.567E+01	2.450E+01	2.082E+01	1.307E+01	8.206E+00	2.563E+00
			2.055E-09	2.440E-02	3.000E+02	1.000E+03	3.000E+00	1.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02

BRF(I) is the branch fraction of the parent nuclide.

## A.3 Results of RESRAD Calculations for Resident Child Scenario

### A.3.1 Co-60: Resident Child Summary Output File

RESRAD, Version 5.82 T½ Limit = 0.5 year 06/29/99 11:28 Page 1  
Summary : Co60, resident child, 10000m2  
File : 00600000.RAD

#### Table of Contents

##### Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ...	2
Site-Specific Parameter Summary .....	3
Summary of Pathway Selections .....	7
Contaminated Zone and Total Dose Summary .....	8
Total Dose Components	
Time = 0.000E+00 .....	9
Time = 1.000E+00 .....	10
Time = 3.000E+00 .....	11
Time = 1.000E+01 .....	12
Time = 3.000E+01 .....	13
Time = 5.000E+01 .....	14
Time = 1.000E+02 .....	15
Time = 3.000E+02 .....	16
Time = 1.000E+03 .....	17
Dose/Source Ratios Summed Over All Pathways .....	18
Single Radionuclide Soil Guidelines .....	18
Dose Per Nuclide Summed Over All Pathways .....	19
Soil Concentration Per Nuclide .....	19

Dose Conversion Factor (and Related) Parameter Summary  
 File: DCSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1 B-1	Dose conversion factors for inhalation, mrem/pCi: Co-60	2.190E-04	2.190E-04	DCF2( 1)
D-1 D-1	Dose conversion factors for ingestion, mrem/pCi: Co-60	2.690E-05	2.690E-05	DCF3( 1)
D-34 D-34	Food transfer factors: Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF( 1,1)
D-34 D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF( 1,2)
D-34 D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF( 1,3)
D-5 D-5	Bioaccumulation factors, fresh water, L/kg: Co-60 , fish	3.000E+02	3.000E+02	BIOfAC( 1,1)
D-5 D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOfAC( 1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICKD
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R01*	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	T1
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T( 2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T( 3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T( 4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T( 5)
R01*	Times for calculations (yr)	5.000E+01	1.000E+02	---	T( 6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T( 7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T( 8)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T( 9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1( 1)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1( 1)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVERD
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENS0V
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VOV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E-03	---	VZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	H0Z
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HLMD
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation mode	2.000E-01	2.000E-01	---	R1
R013	Runoff coefficient	overhead	overhead	---	ID1TCH
R013	Watershed area for nearby stream or pond (m**2)	2.000E-01	2.000E-01	---	RUNOFF
R013	Accuracy for water/soil computations	1.000E+06	1.000E+06	---	WAREA
		1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENS40
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGMT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	WIT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DATBMT
R014	Model: Nordisersion (NO) or Mass-Balance (MB)	NO	NO	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UM
R015	Number of unsaturated zone strata	1	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User		Used by RESRAD	Parameter
		Input	Default	(If different from user input)	Name
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HOUZ(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC( 1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCJ( 1,1)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS( 1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.666E-04	ALEACH( 1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUEK( 1)
R017	Inhalation rate (m**3/yr)	2.720E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	6.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	8.390E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	8.990E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE( 1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE( 2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE( 3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE( 4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE( 5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE( 6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE( 7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE( 8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE( 9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA( 1)
R017	Ring 2	not used	2.732E-01	---	FRACA( 2)
R017	Ring 3	not used	0.000E+00	---	FRACA( 3)
R017	Ring 4	not used	0.000E+00	---	FRACA( 4)
R017	Ring 5	not used	0.000E+00	---	FRACA( 5)
R017	Ring 6	not used	0.000E+00	---	FRACA( 6)
R017	Ring 7	not used	0.000E+00	---	FRACA( 7)
R017	Ring 8	not used	0.000E+00	---	FRACA( 8)
R017	Ring 9	not used	0.000E+00	---	FRACA( 9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)



Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Default	(If different from user input)	Used by RESRAD	Parameter
R018	Fruits, vegetables and grain consumption (kg/yr)	1.90E+02	1.60E+02	---	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	0.00E+00	1.40E+01	---	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.20E+01	---	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.30E+01	---	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.40E+00	---	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.00E-01	---	---	DIET(6)
R018	Soil ingestion rate (g/yr)	7.30E+01	3.60E+01	---	---	SOIL
R018	Drinking water intake (L/yr)	4.745E+02	5.10E+02	---	---	DW
R018	Contamination fraction of drinking water	1.00E+00	1.00E+00	---	---	FW
R018	Contamination fraction of household water	not used	1.00E+00	---	---	FWH
R018	Contamination fraction of livestock water	not used	1.00E+00	---	---	FLW
R018	Contamination fraction of irrigation water	1.00E+00	1.00E+00	---	---	FLRW
R018	Contamination fraction of aquatic food	not used	5.00E-01	---	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.50E+00	---	PLANT
R018	Contamination fraction of meat	not used	-1	---	---	PMET
R018	Contamination fraction of milk	not used	-1	---	---	PMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.80E+01	---	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.50E+01	---	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.00E+01	---	---	LIW5
R019	Livestock water intake for milk (L/day)	not used	1.60E+02	---	---	LIW6
R019	Livestock soil intake (kg/day)	not used	5.00E-01	---	---	LSI
R019	Mass loading for foliar deposition (g/m <sup>2</sup> /yr)	1.00E-04	1.00E-04	---	---	MLFD
R019	Depth of soil mixing layer (m)	1.50E-01	1.50E-01	---	---	DM
R019	Drinking water fraction from ground water	9.00E-01	9.00E-01	---	---	DRGT
R019	Household water fraction from ground water	1.00E+00	1.00E+00	---	---	FGDW
R019	Livestock water fraction from ground water	1.00E+00	1.00E+00	---	---	FGWH
R019	Irrigation fraction from ground water	not used	1.00E+00	---	---	FGJW
R198	Wet weight crop yield for Non-Leafy (kg/m <sup>2</sup> /yr)	7.00E-01	7.00E-01	---	---	FW(1)
R198	Wet weight crop yield for Leafy (kg/m <sup>2</sup> /yr)	1.50E+00	1.50E+00	---	---	FW(2)
R198	Wet weight crop yield for Fodder (kg/m <sup>2</sup> /yr)	not used	1.10E+00	---	---	FW(3)
R198	Growing Season for Non-Leafy (years)	1.70E-01	1.70E-01	---	---	TE(1)
R198	Growing Season for Leafy (years)	2.50E-01	2.50E-01	---	---	TE(2)
R198	Growing Season for Fodder (years)	not used	8.00E-02	---	---	TE(3)
R198	Translocation Factor for Non-Leafy	1.00E-01	1.00E-01	---	---	TIV(1)
R198	Translocation Factor for Leafy	1.00E+00	1.00E+00	---	---	TIV(2)
R198	Translocation Factor for Fodder	not used	1.00E+00	---	---	TIV(3)
R198	Dry Foliar Interception Fraction for Non-Leafy	2.50E-01	2.50E-01	---	---	RDRI(1)
R198	Dry Foliar Interception Fraction for Leafy	2.50E-01	2.50E-01	---	---	RDRI(2)
R198	Dry Foliar Interception Fraction for Fodder	not used	2.50E-01	---	---	RDRI(3)
R198	Wet Foliar Interception Fraction for Non-Leafy	2.50E-01	2.50E-01	---	---	RAET(1)
R198	Wet Foliar Interception Fraction for Leafy	2.50E-01	2.50E-01	---	---	RAET(2)
R198	Wet Foliar Interception Fraction for Fodder	not used	2.50E-01	---	---	RAET(3)
R198	Weathering Removal Constant for Vegetation	2.00E+01	2.00E+01	---	---	WJW
C14	C-12 concentration in water (g/gm <sup>3</sup> )	not used	2.00E-05	---	---	C12WR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.00E-02	---	---	C12Z
C14	Fraction of vegetation carbon from soil	not used	2.00E-02	---	---	CSOIL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Default	Used by RESRAD	Parameter
		Input		(if different from user input)	Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REASN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_I(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_I(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_I(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_I(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_I(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_I(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_I(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_I(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_I(9)
RD21	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
RD21	Bulk density of building foundation (g/cm³)	not used	2.400E+00	---	DENSFL
RD21	Total porosity of the cover material	not used	4.000E-01	---	TPCV
RD21	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
RD21	Volurmetric water content of the cover material	not used	5.000E-02	---	PH2CV
RD21	Volurmetric water content of the foundation	not used	3.000E-02	---	PH2OFL
RD21	Diffusion coefficient for radon gas (m/sec):				
RD21	in cover material	not used	2.000E-06	---	DIFCV
RD21	in foundation material	not used	3.000E-07	---	DIFFL
RD21	in contaminated zone soil	not used	2.000E-06	---	DIFRZ
RD21	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMLX
RD21	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REGS
RD21	Height of the building (room) (m)	not used	2.500E+00	---	HWM
RD21	Building interior area factor	not used	0.000E+00	---	FAL
RD21	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
RD21	Emerating power of Rn-222 gas	not used	2.500E-01	---	EMWMA(1)
RD21	Emerating power of Rn-220 gas	not used	1.500E-01	---	EMWMA(2)

Summary of Pathway Selections

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

Contaminated Zone Dimensions

Area:	10000.00 square meters	Initial Soil Concentrations, pci/g
Thickness:	2.00 meters	Cs-60      1.000E+00
Cover Depth:	0.00 meters	

-----  
Total Dose TDose(t), mrem/yr

-----  
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
TDose(t):	1.053E+01	9.233E+00	7.096E+00	2.823E+00	2.028E-01	1.457E-02	2.015E-05	7.379E-17	0.000E+00
M(t):	4.213E-01	3.693E-01	2.839E-01	1.129E-01	8.112E-03	5.827E-04	8.060E-07	2.949E-18	0.000E+00
Maximum TDose(t):	1.053E+01 mrem/yr	at t = 0.000E+00 years							

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years  
 Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	mrem/yr	fract.	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Co-60	1.032E+01	0.9901	4.291E-06	0.0000	0.000E+00	0.0000	2.077E-01	0.0197	0.000E+00
Total	1.032E+01	0.9901	4.291E-06	0.0000	0.000E+00	0.0000	2.077E-01	0.0197	0.000E+00
									1.824E-03
									0.0002

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

Radio- Nuclide	mrem/yr	fract.	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
*Sum of all water independent and dependent pathways.									
									1.053E+01
									1.0000

Summary : Co60, resident child, 10000m2  
 File : 00600000.RAD

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Radio- Nuclide	Water Independent Pathways (Inhalation excludes radon)			Water Dependent Pathways			All Pathways*		
	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil		
	mrem/yr	mrem/yr	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Co-60	9.050E+00 0.9801	3.762E-06 0.0000	0.000E+00 0.0000	1.821E-01 0.0197	0.000E+00 0.0000	0.000E+00 0.0000	1.599E-03 0.0002		
Total	9.050E+00 0.9801	3.762E-06 0.0000	0.000E+00 0.0000	1.821E-01 0.0197	0.000E+00 0.0000	0.000E+00 0.0000	1.599E-03 0.0002		

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Radio- Nuclide	Water Dependent Pathways			All Pathways*		
	Water	Fish	Radon	Plant	Meat	Milk
	mrem/yr	mrem/yr	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000
Total	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000

\*Sum of all water independent and dependant pathways.

Total Dose Contributions TOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 3.00E+00 years  
Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Co-60	6.955E+00	0.9801	2.897E-06	0.0000	0.000E+00	0.0000	1.399E-01	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	1.229E-03	0.0002
Total	6.955E+00	0.9801	2.897E-06	0.0000	0.000E+00	0.0000	1.399E-01	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	1.229E-03	0.0002

Total Dose Contributions TOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.00E+00 years

Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.098E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.098E+00	1.0000
*Sum of all water independent and dependant pathways.														

Summary : Co60, resident child, 10000m2  
 File : 00600000.RAD

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	2.767E+00	0.9801	1.150E-06	0.0000	0.000E+00	0.0000	5.566E-02	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	4.889E-04	0.0002
Total	2.767E+00	0.9801	1.150E-06	0.0000	0.000E+00	0.0000	5.566E-02	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	4.889E-04	0.0002

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.823E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.823E+00	1.0000

\*Sum of all water independent and dependent pathways.

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.988E-01	0.9801	8.262E-08	0.0000	0.000E+00	0.0000	3.998E-03	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	3.512E-05	0.0002
Total	1.988E-01	0.9801	8.262E-08	0.0000	0.000E+00	0.0000	3.998E-03	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	3.512E-05	0.0002

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.028E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.028E-01	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions DDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 5,000E+01 Years

Water Independent Pathways (Inhalation excludes radn)

Radionuclide	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
<sup>241</sup> -00	1.42E-02 0.9801	5.92E-09 0.0000	0.000E+00 0.0000	2.87E-04 0.0197	0.000E+00 0.0000	0.000E+00 0.0000	2.52E-06 0.0002
Total	1.42E-02 0.9801	5.95E-09 0.0000	0.000E+00 0.0000	2.87E-04 0.0197	0.000E+00 0.0000	0.000E+00 0.0000	2.52E-06 0.0002

Total Dose Contributions DDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 5,000E+01 Years

Water Dependent Pathways

Radionuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
*Sum of all water independent and dependent pathways.								

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

Radionuclide	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Co-60	1.975E-05	8.209E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.489E-09
	1.975E-05	8.209E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.489E-09
	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Total	1.975E-05	8.209E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.489E-09

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

Radionuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.015E-05
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.015E-05
	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.015E-05

\*Sum of all water independent and dependent pathways.

Summary : Co60, resident child, 10000h2  
File : 00600000.RAD

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	7.227E-17	0.9801	3.004E-23	0.0000	0.000E+00	0.0000	1.454E-18	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	1.277E-20	0.0002
Total	7.227E-17	0.9801	3.004E-23	0.0000	0.000E+00	0.0000	1.454E-18	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	1.277E-20	0.0002

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.373E-17	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.373E-17	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Co-60, resident child, 10000h2  
 File : 00600000.RAD

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

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

\*Sum of all water independent and dependent pathways.

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

Parent (1)	Product (j)	Branch Fraction*	DSR(i,t) (mrem/yr)/(pci/g)	DSR(j,t) (mrem/yr)/(pci/g)
Co-60	Co-60	1.000E+00	1.053E+01	9.233E+00

\*Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter:  $DSRBF(i) = BRF(1)*BRF(2)* \dots BRF(j)$ .  
The DSR includes contributions from associated (half-life < 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pci/g

Basic Radiation Dose Limit = 25 mrem/yr

Nuclide (1)	t = 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	2.374E+00	2.708E+00	3.523E+00	8.852E+00	1.233E+02	1.714E+03	1.241E+06	*1.131E+15	*1.131E+15

\*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pci/g)

and Single Radionuclide Soil Guidelines G(i,t) in pci/g  
at tmin = time of minimum single radionuclide soil guideline  
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (1)	Initial pci/g	tmin (years)	DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)	(pci/g)	(pci/g)
Co-60	1.000E+00	0.000E+00	1.053E+01	2.374E+00	1.053E+01

Individual Nuclide Dose Summed Over All Pathways  
Parent Nuclide and Branch Fraction Indicated  
DOSE(I, t), mrem/yr

Nuclide Parent      BRf(i)											
(j)	(i)	t= 0.000E+00 1.000E+00 3.000E+00 1.000E+01 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03									
Co-60	Co-60	1.000E+00	1.053E+01	9.233E+00	7.096E+00	2.823E+00	2.028E-01	1.457E-02	2.015E-05	7.373E-17	0.000E+00
BRf(i) is the branch fraction of the parent nuclide.											

Nuclide Parent      BRf(i)		Individual Nuclide Soil Concentration Parent Nuclide and Branch Fraction Indicated S(I, t), pCi/g									
(j)	(i)	t= 0.000E+00 1.000E+00 3.000E+00 1.000E+01 3.000E+01 5.000E+01 1.000E+02 3.000E+02 1.000E+03									
Co-60	Co-60	1.000E+00	1.000E+00	8.766E-01	6.737E-01	2.690E-01	1.925E-02	1.380E-03	1.913E-06	7.000E-18	0.000E+00
BRf(i) is the branch fraction of the parent nuclide.											

## A.3.2 Cs-137: Resident Child Summary Output File

RESRAD, Version 5.82      1% Limit = 0.5 year      06/29/99      11:19      Page    1  
Summary : CS137, resident child, 10000m2  
File     : C:\37000.RAD

### Table of Contents

#### Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ...	2
Site-Specific Parameter Summary .....	3
Summary of Pathway Selections .....	7
Contaminated Zone and Total Dose Summary .....	8
Total Dose Components	
Time = 0.000E+00 .....	9
Time = 1.000E+00 .....	10
Time = 3.000E+00 .....	11
Time = 1.000E+01 .....	12
Time = 3.000E+01 .....	13
Time = 5.000E+01 .....	14
Time = 1.000E+02 .....	15
Time = 3.000E+02 .....	16
Time = 1.000E+03 .....	17
Dose/Source Ratios Summed Over All Pathways .....	18
Single Radionuclide Soil Guidelines .....	18
Dose Per Nuclide Summed Over All Pathways .....	19
Soil Concentration Per Nuclide .....	19

Dose Conversion Factor (and Related) Parameter Summary  
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:	3.190E-05	3.190E-05	DCF2( 1)
B-1				
D-1	Dose conversion factors for ingestion, mrem/pCi:	5.000E-05	5.000E-05	DCF3( 1)
D-1				
D-3A	Food transfer factors: Cs-137+0 , plant/soil concentration ratio, dimensionless Cs-137+0 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) Cs-137+0 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	4.000E-02	4.000E-02	RTF( 1,1)
D-3A		3.000E-02	3.000E-02	RTF( 1,2)
D-3A		8.000E-03	8.000E-03	RTF( 1,3)
D-5		2.000E-03	2.000E-03	BIOFAC( 1,1)
D-5	Bioaccumulation factors, fresh water, L/kg: Cs-137+0 , fish Cs-137+0 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC( 1,2)
D-5				

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RES940 (If different from user input)	Parameter Name
R011	Area of contaminated zone (m <sup>2</sup> )	1.00E+04	1.00E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.00E+00	2.00E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.00E+02	1.00E+02	---	LCZ940
R011	Basic radiation dose limit (mrem/yr)	2.50E+01	3.00E+01	---	BDL
R011	Time since placement of material (yr)	0.00E+00	0.00E+00	---	T1
R011	Times for calculations (yr)	1.00E+00	1.00E+00	---	T(2)
R011	Times for calculations (yr)	3.00E+00	3.00E+00	---	T(3)
R011	Times for calculations (yr)	1.00E+01	1.00E+01	---	T(4)
R011	Times for calculations (yr)	3.00E+01	3.00E+01	---	T(5)
R011	Times for calculations (yr)	5.00E+01	1.00E+02	---	T(6)
R011	Times for calculations (yr)	1.00E+02	3.00E+02	---	T(7)
R011	Times for calculations (yr)	3.00E+02	1.00E+03	---	T(8)
R011	Times for calculations (yr)	1.00E+03	0.00E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.00E+00	---	T(10)
R012	Initial principal radionuclide (pci/g): Cs-137	1.00E+00	0.00E+00	---	SIC 1)
R012	Concentration in groundwater (pci/L): Cs-137	not used	0.00E+00	---	WIC 1)
R013	Cover depth (m)	0.00E+00	0.00E+00	---	COVER0
R013	Density of cover material (g/cm <sup>3</sup> )	not used	1.50E+00	---	DENS0
R013	Cover depth erosion rate (m/yr)	not used	1.00E-03	---	DENSCV
R013	Density of contaminated zone (g/cm <sup>3</sup> )	1.50E+00	1.50E+00	---	DV0
R013	Contaminated zone erosion rate (m/yr)	0.00E+00	1.00E-03	---	DENSZ
R013	Contaminated zone total porosity	4.00E-01	4.00E-01	---	VZ2
R013	Contaminated zone effective porosity	2.00E-01	2.00E-01	---	TPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.00E+01	1.00E+01	---	ERCZ
R013	Contaminated zone b parameter	5.30E+00	5.30E+00	---	HCCZ
R013	Average annual wind speed (m/sec)	2.00E+00	2.00E+00	---	BZ2
R013	Humidity in air (g/m <sup>3</sup> )	not used	8.00E+00	---	WIND
R013	Evapotranspiration coefficient	5.00E-01	5.00E-01	---	HMID
R013	Precipitation (m/yr)	1.00E+00	1.00E+00	---	EWATR
R013	Irrigation (m/yr)	2.00E-01	2.00E-01	---	PRECIP
R013	Irrigation mode	overhead	overhead	---	RI
R013	Runoff coefficient	2.00E-01	2.00E-01	---	IDITCH
R013	Watershed area for nearby stream or pond (m <sup>2</sup> )	1.00E+05	1.00E+05	---	RUNOFF
R013	Accuracy for water/soil computations	1.00E-05	1.00E-05	---	WREA
R014	Density of saturated zone (g/cm <sup>3</sup> )	1.50E+00	1.50E+00	---	DENS0
R014	Saturated zone total porosity	4.00E-01	4.00E-01	---	TPS2
R014	Saturated zone effective porosity	2.00E-01	2.00E-01	---	EPS2
R014	Saturated zone hydraulic conductivity (m/yr)	1.00E+02	1.00E+02	---	HCS2
R014	Saturated zone hydraulic gradient	2.00E-02	2.00E-02	---	HGAT
R014	Saturated zone b parameter	5.30E+00	5.30E+00	---	BS2
R014	Water table drop rate (m/yr)	1.00E-03	1.00E-03	---	WAT
R014	Well pump intake depth (m below water table)	1.00E+01	1.00E+03	---	DAUBAT
R014	Model: Nordispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m <sup>3</sup> /yr)	2.50E+02	2.50E+02	---	LM
R015	Number of unsaturated zone strata	1	1	---	NS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User	Default	Used by RESRAD	Parameter
R015	Unsat. zone 1, thickness (m)	4.00E+00	4.00E+00	---	HK(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.50E+00	1.50E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.00E-01	4.00E-01	---	TRUZ(1)
R015	Unsat. zone 1, effective porosity	2.00E-01	2.00E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.30E+00	5.30E+00	---	BLZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.00E+01	1.00E+01	---	HOLZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone 1 (cm**3/g)	1.00E+03	1.00E+03	---	DONUC( 1)
R016	Unsat. zone 1 (cm**3/g)	1.00E+03	1.00E+03	---	DONUD( 1,1)
R016	Saturated zone (cm**3/g)	1.00E+03	1.00E+03	---	DONUC( 1)
R016	Leach rate (/yr)	0.00E+00	0.00E+00	1.66E-04	ALEACH( 1)
R016	Solubility constant	0.00E+00	0.00E+00	not used	SOLLEK( 1)
R017	Inhalation rate (m**3/yr)	2.72E+03	8.40E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.00E-04	1.00E-04	---	MLINH
R017	Exposure duration	6.00E+00	3.00E+01	---	ED
R017	Shielding factor, inhalation	4.00E-01	4.00E-01	---	SIF3
R017	Shielding factor, external gamma	7.00E-01	7.00E-01	---	SIF1
R017	Fraction of time spent indoors	8.30E-01	5.00E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	8.90E-02	2.50E-01	---	FOTD
R017	Shape factor flag, external gamma	1.00E+00	1.00E+00	---	FS
R017	Rad ii of shape factor array (used if FS = -1):			>0 shows circular AREA.	
R017	Outer annular radius (m), ring 1:	not used	5.00E+01	---	RAD_SHAPE( 1)
R017	Outer annular radius (m), ring 2:	not used	7.07E+01	---	RAD_SHAPE( 2)
R017	Outer annular radius (m), ring 3:	not used	0.00E+00	---	RAD_SHAPE( 3)
R017	Outer annular radius (m), ring 4:	not used	0.00E+00	---	RAD_SHAPE( 4)
R017	Outer annular radius (m), ring 5:	not used	0.00E+00	---	RAD_SHAPE( 5)
R017	Outer annular radius (m), ring 6:	not used	0.00E+00	---	RAD_SHAPE( 6)
R017	Outer annular radius (m), ring 7:	not used	0.00E+00	---	RAD_SHAPE( 7)
R017	Outer annular radius (m), ring 8:	not used	0.00E+00	---	RAD_SHAPE( 8)
R017	Outer annular radius (m), ring 9:	not used	0.00E+00	---	RAD_SHAPE( 9)
R017	Outer annular radius (m), ring 10:	not used	0.00E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.00E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.00E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.00E+00	---	FRACA( 1)
R017	Ring 2	not used	2.73E-01	---	FRACA( 2)
R017	Ring 3	not used	0.00E+00	---	FRACA( 3)
R017	Ring 4	not used	0.00E+00	---	FRACA( 4)
R017	Ring 5	not used	0.00E+00	---	FRACA( 5)
R017	Ring 6	not used	0.00E+00	---	FRACA( 6)
R017	Ring 7	not used	0.00E+00	---	FRACA( 7)
R017	Ring 8	not used	0.00E+00	---	FRACA( 8)
R017	Ring 9	not used	0.00E+00	---	FRACA( 9)
R017	Ring 10	not used	0.00E+00	---	FRACA(10)
R017	Ring 11	not used	0.00E+00	---	FRACA(11)
R017	Ring 12	not used	0.00E+00	---	FRACA(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input.)	Parameter Name
R018	Fruits, vegetables and grain consumption (kg/yr)	1.95E+02	1.60E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	0.00E+00	1.40E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.20E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.30E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.40E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.00E+01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	7.30E+01	3.65E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.745E+02	5.10E+02	---	DW
R018	Contamination fraction of drinking water	1.00E+00	1.00E+00	---	FW
R018	Contamination fraction of household water	not used	1.00E+00	---	FHW
R018	Contamination fraction of livestock water	not used	1.00E+00	---	FLW
R018	Contamination fraction of irrigation water	1.00E+00	1.00E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.00E+01	---	FR
R018	Contamination fraction of plant food	-1	-1	0.50E+00	PLANT
R018	Contamination fraction of meat	not used	-1	---	PMAT
R018	Contamination fraction of milk	not used	-1	---	PMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.80E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.50E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.00E+01	---	LM15
R019	Livestock water intake for milk (L/day)	not used	1.60E+02	---	LM16
R019	Livestock soil intake (kg/day)	not used	5.00E+01	---	LSI
R019	Mass loading for foliar deposition (g/m <sup>2</sup> /5)	1.00E+04	1.00E+04	---	MLD
R019	Depth of soil mixing layer (m)	1.50E+01	1.50E+01	---	DN
R019	Drinking water fraction from ground water	1.00E+00	1.00E+00	---	DRGT
R019	Household water fraction from ground water	1.00E+00	1.00E+00	---	FGDW
R019	Livestock water fraction from ground water	not used	1.00E+00	---	FGWH
R019	Irrigation fraction from ground water	not used	1.00E+00	---	FGIW
R198	Wet weight crop yield for Non-Leafy (kg/m <sup>2</sup> )	7.00E+01	7.00E+01	---	W(1)
R198	Wet weight crop yield for Leafy (kg/m <sup>2</sup> )	1.50E+00	1.50E+00	---	W(2)
R198	Wet weight crop yield for Fodder (kg/m <sup>2</sup> )	not used	1.10E+00	---	W(3)
R198	Growing Season for Non-Leafy (years)	1.70E+01	1.70E+01	---	TE(1)
R198	Growing Season for Leafy (years)	2.50E+01	2.50E+01	---	TE(2)
R198	Growing Season for Fodder (years)	not used	8.00E+02	---	TE(3)
R198	Translocation Factor for Non-Leafy	1.00E+01	1.00E+01	---	TIV(1)
R198	Translocation Factor for Leafy	1.00E+00	1.00E+00	---	TIV(2)
R198	Translocation Factor for Fodder	not used	1.00E+00	---	TIV(3)
R198	Dry Foliar Interception Fraction for Non-Leafy	2.50E+01	2.50E+01	---	RDRY(1)
R198	Dry Foliar Interception Fraction for Leafy	2.50E+01	2.50E+01	---	RDRY(2)
R198	Dry Foliar Interception Fraction for Fodder	not used	2.50E+01	---	RDRY(3)
R198	Wet Foliar Interception Fraction for Non-Leafy	2.50E+01	2.50E+01	---	RMET(1)
R198	Wet Foliar Interception Fraction for Leafy	2.50E+01	2.50E+01	---	RMET(2)
R198	Wet Foliar Interception Fraction for Fodder	not used	2.50E+01	---	RMET(3)
R198	Weathering Removal Constant for Vegetation	2.00E+01	2.00E+01	---	WLM
C14	C-12 concentration in water (g/cm <sup>3</sup> )	not used	2.00E+05	---	C12WR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.00E+02	---	C12Z
C14	Fraction of vegetation carbon from soil	not used	2.00E+02	---	CSOIL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESP4D (if different from user input)	Parameter Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DWC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EISN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-19	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
RO21	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
RO21	Bulk density of building foundation (g/cm <sup>3</sup> )	not used	2.400E+00	---	DENSFL
RO21	Total porosity of the cover material	not used	4.000E-01	---	TPCV
RO21	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
RO21	Volumetric water content of the cover material	not used	5.000E-02	---	PH2COV
RO21	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
RO21	Diffusion coefficient for radon gas (m <sup>2</sup> /sec):				
RO21	in cover material	not used	2.000E-06	---	DIFCV
RO21	in foundation material	not used	3.000E-07	---	DIFFL
RO21	Radon vertical dimension of mixing (m)	not used	2.000E-06	---	DIFCZ
RO21	Average building air exchange rate (1/hr)	not used	2.000E+00	---	IMIX
RO21	Height of the building (room) (m)	not used	5.000E-01	---	REXG
RO21	Building interior area factor	not used	2.500E+00	---	IM4
RO21	Building depth below ground surface (m)	not used	0.000E+00	---	FAL
RO21	Emerging power of Rn-222 gas	not used	-1.000E+00	---	DPMFL
RO21	Emerging power of Rn-220 gas	not used	2.500E-01	---	BPMNA(1)
RO21		not used	1.500E-01	---	BPMNA(2)

Summary of Pathway Selections

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



Summary : CS137, resident child, 10000h2  
File : C1370000.RAD

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.161E+00	0.9167	6.250E-07	0.0000	0.000E+00	0.0000	1.930E-01	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	3.390E-03	0.0014
Total	2.161E+00	0.9167	6.250E-07	0.0000	0.000E+00	0.0000	1.930E-01	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	3.390E-03	0.0014

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.358E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.358E+00	1.0000

\*Sum of all water independent and dependent pathways.

Summary : CS137, resident child, 10000m2  
 File : C1370000.RAD

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.112E+00	0.9167	6.107E-07	0.0000	0.000E+00	0.0000	1.886E-01	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	3.312E-03	0.0014
Total	2.112E+00	0.9167	6.107E-07	0.0000	0.000E+00	0.0000	1.886E-01	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	3.312E-03	0.0014

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.304E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.304E+00	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 3,000E+00 years  
Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Radio- Nuclide	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Cs-137	2.016E+00 0.9167	5.829E-07 0.0000	0.000E+00 0.0000	1.800E-01 0.0819	0.000E+00 0.0000	0.000E+00 0.0000	3.162E-03 0.0014
Total	2.016E+00 0.9167	5.829E-07 0.0000	0.000E+00 0.0000	1.800E-01 0.0819	0.000E+00 0.0000	0.000E+00 0.0000	3.162E-03 0.0014

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 3,000E+00 years  
Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Radio- Nuclide	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Cs-137	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.199E+00 1.0000
Total	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	2.199E+00 1.0000

\*Sum of all water independent and dependent pathways.

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

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.713E+00	0.9167	4.953E-07	0.0000	0.000E+00	0.0000	1.529E-01	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	2.687E-03	0.0014
Total	1.713E+00	0.9167	4.953E-07	0.0000	0.000E+00	0.0000	1.529E-01	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	2.687E-03	0.0014

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.868E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.868E+00	1.0000

\*Sum of all water independent and dependent pathways.

Summary : Cs137, resident child, 10000h2  
File : c1370000.R40

Total Dose Contributions IDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radn)

Radionuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.075E+00	0.9167	3.110E-07	0.0000	0.000E+00	0.0000	9.600E-02	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	1.687E-03	0.0014
Total	1.075E+00	0.9167	3.110E-07	0.0000	0.000E+00	0.0000	9.600E-02	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	1.687E-03	0.0014

Total Dose Contributions IDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radionuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.173E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.173E+00	1.0000

\*Sum of all water independent and dependent pathways.

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Summary : Cs137, resident child, 10000m2  
File : C137C000.R00

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 5,000E+01 years  
Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Muclide														
Cs-137	6.752E-01	0.9167	1.952E-07	0.0000	0.000E+00	0.0000	6.029E-02	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	1.059E-03	0.0014
Total	6.752E-01	0.9167	1.952E-07	0.0000	0.000E+00	0.0000	6.029E-02	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	1.059E-03	0.0014

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 5,000E+01 years  
Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Muclide														
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.345E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.345E-01	1.0000

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.00E+02 years  
Water Independent Pathways (Inhalation excludes radon)

Radionuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.109E-01	0.9167	6.099E-08	0.0000	0.000E+00	0.0000	1.883E-02	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	3.306E-04	0.0014
Total	2.109E-01	0.9167	6.099E-08	0.0000	0.000E+00	0.0000	1.883E-02	0.0819	0.000E+00	0.0000	0.000E+00	0.0000	3.306E-04	0.0014

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
As mrem/yr and Fraction of Total Dose At t = 1.00E+02 years  
Water Dependent Pathways

Radionuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.301E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.301E-01	1.0000
*Sum of all water independent and dependent pathways.														

Total Dose Contributions TDose(i,p,t) for Individual Radionuclides (i) and Pathways (p)  
 As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years  
 Water Independent Pathways (Inhalation excludes radn)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Radio- Nuclide	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
Cs-137	2.008E-03 0.9167	5.806E-10 0.0000	0.000E+00 0.0000	1.773E-04 0.0819	0.000E+00 0.0000	0.000E+00 0.0000	3.150E-06 0.0014
Total	2.008E-03 0.9167	5.806E-10 0.0000	0.000E+00 0.0000	1.793E-04 0.0819	0.000E+00 0.0000	0.000E+00 0.0000	3.150E-06 0.0014

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

Radio- Nuclide	Water		Fish		Water Radon		Dependent Pathways Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.190E-03	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.190E-03	1.0000

\*Sum of all water independent and dependent pathways.

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

Radionuclide	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
Cs-137	1.597E-10	0.9167	4.899E-17	0.0000	0.000E+00	0.000E+00	2.652E-13
	0.9167	0.0000	0.000E+00	0.0000	0.000E+00	0.000E+00	0.0014
Total	1.697E-10	0.9167	4.899E-17	0.0000	0.000E+00	0.000E+00	2.652E-13
	0.9167	0.0000	0.000E+00	0.0000	0.000E+00	0.000E+00	0.0014

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radionuclide	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.844E-10
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.0000
Total	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.844E-10
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.0000

\*Sum of all water independent and dependent pathways.

Summary : CS137, resident child, 10000m2  
 File : C137C000.RAD

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

Parent	Product	Branch	DSR(j,t) (mrem/yr)/(pCi/g)									
(i)	(j)	Fraction*	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03	
Cs-137	Cs-137	1.000E+00	2.358E+00	2.304E+00	2.199E+00	1.868E+00	1.173E+00	7.365E-01	2.301E-01	2.170E-02	1.944E-03	

\*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)\*BRF(2)\* ... BRF(j).  
 The DSR includes contributions from associated (half-life < 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g  
 Basic Radiation Dose Limit = 25 mrem/yr

Nuclide	(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Cs-137		1.060E+01	1.085E+01	1.137E+01	1.338E+01	2.131E+01	3.394E+01	1.087E+02	1.141E+04	1.356E+11

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

Nuclide	Initial	tmin	DSR(i,tmin)	G(i,tmin)	DSR(i,tmax)	G(i,tmax)
(i)	pCi/g	(years)		(pCi/g)		(pCi/g)
Cs-137	1.000E+00	0.000E+00	2.358E+00	1.060E+01	2.358E+00	1.060E+01

Individual Nuclide Dose Summed Over All Pathways

Parent Nuclide and Branch Fraction Indicated

DOSE(j,t), mrem/yr

Nuclide Parent (j)	BRF(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Cs-137	Cs-137	1.000E+00	2.352E+00	2.304E+00	2.197E+00	1.863E+00	1.172E+00	7.365E-01	2.301E-01	2.190E-03
										1.844E-10

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration  
Parent Nuclide and Branch Fraction Indicated

SK(j,t), pCi/g

Nuclide Parent (j)	BRF(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	1.000E+03
Cs-137	Cs-137	1.000E+00	1.000E+00	9.770E-01	9.326E-01	7.924E-01	4.975E-01	3.124E-01	9.757E-02	9.289E-04
										7.822E-11

BRF(i) is the branch fraction of the parent nuclide.