Appendix B: Verification Benchmark Problem

Verification of DOSEMM involved comparison of radionuclide concentrations in environmental media and doses with a spreadsheet application that has been used at the Idaho National Laboratory (INL) to produce the Annual Site Environmental Report (ASER) (INL 2016). Releases from the INTEC facility were evaluated and include particulate radionuclides (transuranics and fission and activation products), noble gases, iodine isotopes, and tritium (as tritiated water) and [14]C. Environmental media concentrations and doses were calculated at a single receptor location where the maximum off-site dose was reported. In general, DOSEMM uses the same equations for calculating radionuclide transfer through the food chain, except for tritium and [14]C. The ASER model uses factors derived from CAP88 (Moore et al. 1979) modeling, where DOSEMM uses the specific activity models as described in NCRP (1996). Model parameters including concentration ratios, soil parameters, and dose coefficients were mostly taken from the ASER model. For tritium and ^{14}C, parameters from Moore et al. (1979) and NCRP (1996) were used.

Radionuclide concentrations in environmental media for the two models are provided in Table B-1, and effective doses are provided in Table B-2. Air concentrations were generally the same between the two models for all particulate radionuclides and iodine. DOSEMM concentrations for tritium, ^{14}C, and the noble gases were slightly higher because X/Q values used for these radionuclides did not include deposition. The ASER spreadsheet only allows for a single X/Q value representing a non-depositing radionuclide. Deposition is calculated in ASER by entering a deposition velocity for particles and iodine. Plume depletion is calculated outside the spreadsheet and only iodine is accounted for. To provide consistent X and ψ input to benchmark DOSEMM, the spreadsheet was modified to use a separate X/Q value for particles, tritium and ^{14}C, and noble gases, and another for iodine. The X/Q values used in DOSEMM and the ASER spreadsheet were derived from the CALPUFF model simulations described in Rood and Sondrup (2014). In DOSEMM, X/Q values for particles were based on a 1-μm particle, and for iodine on a 15-μm particle. Tritium, ^{14}C, and noble gases did not include deposition; thus, ψ/Q values were zero at all nodes, and X/Q values reflect no depletion. Because little depletion occurs for small particles, the X/Q values for particles from DOSEMM were used in the ASER spreadsheet for tritium, ^{14}C, and noble gases. The slightly higher predicted DOSEMM air concentration compared to ASER for tritium, ^{14}C, and noble gases reflects no plume depletion in DOSEMM. The X/Q value for iodine in DOSEMM was used in the ASER spreadsheet. Deposition velocities used in the ASER spreadsheets were calculated by taking the ratio of the ψ/Q to X/Q values used in DOSEMM.

Another difference was noted in the ground external exposure dose. For consistency with DOSEMM, the ground exposure dose in ASER was calculated assuming one year of deposition. However, DOSEMM accounts for decay, ingrowth, and leaching during the year while ASER does not. Thus, radionuclides that had any significant decay or leaching during the year as calculated by DOSEMM had lower doses compared to ASER. DOSEMM also accounts for ingrowth of radioactive progeny; [241]Am ingrowth from [241]Pu makes a substantial difference in the ground external exposure dose, which results in the DOSEMM dose being a factor of 2 higher than the ASER dose.

Finally, notable differences were observed for the tritium and ^{14}C doses. Tritium and ^{14}C doses calculated in DOSEMM are a function of only a few parameters, and model results were checked with hand calculations to assure that they were done correctly. These differences can be

attributed to differences in the implementation of the specific activity model in DOSEMM and ASER spreadsheets.

The DOSEMM input and output files are provided as an attachment to this appendix. Model runs were separated into four files: particulates, noble gases, iodine, and tritium and ^{14}C. Model parameters are printed to the output files except for the source term, which is provided also in four separate files.

Table B-1. Radionuclide Concentrations in Environmental Media for the DOSEMM Verification Problem

DOSEMM	Air concentration (pCi m^{-3})	Deposition (pCi m^{-2})	Leafy vegetable (pCi kg^{-1})	Produce (pCi kg^{-1})	Milk (pCi L^{-1})	Beef (pCi kg^{-1})
Pu-241	5.04E-06	3.25E-02	1.79E-04	1.79E-04	3.53E-08	3.52E-06
Am-241	7.65E-09	4.94E-05	2.88E-07	2.88E-07	1.09E-10	2.72E-09
Cs-137	2.59E-05	1.67E-01	2.12E-03	2.12E-03	1.61E-03	6.02E-03
Pu-238	1.66E-07	1.07E-03	6.13E-06	6.13E-06	1.17E-09	1.17E-07
Pu-239	3.12E-07	2.01E-03	1.18E-05	1.18E-05	2.22E-09	2.22E-07
Pu-240	1.64E-07	1.06E-03	6.23E-06	6.23E-06	1.17E-09	1.17E-07
Sr-90	1.98E-05	1.28E-01	7.43E-03	7.43E-03	4.88E-04	1.95E-03
Co-60	4.14E-08	2.67E-04	2.19E-06	2.19E-06	5.91E-07	5.87E-06
I-129	5.87E-06	2.26E+00	3.33E-02	3.33E-02	2.81E-02	1.97E-02
I-131	2.71E-02	1.05E+04	7.68E+00	7.68E+00	8.39E+00	1.24E+00
H-3	2.23E-01	a	3.75E+01	3.75E+01	4.56E+01	2.84E+01
C-14	1.48E-08	a	2.79E-05	2.79E-05	1.39E-05	1.89E-05
Kr-85	1.14E+00	a	b	b	b	b
Ar-41	4.58E-01	a	b	b	b	b

ASER spreadsheet	Air conc (pCi m^{-3})	Depostion (pCi m^{-2})	Leafy vegetable (pCi kg^{-1})	Produce (pCi kg^{-1})	Milk (pCi L^{-1})	Beef (pCi kg^{-1})
Pu-241	5.02E-06	3.23E-02	1.77E-04	1.77E-04	3.49E-08	3.49E-06
Am-241	7.64E-09	4.92E-05	2.87E-07	2.87E-07	1.08E-10	2.71E-09
Cs-137	2.58E-05	1.66E-01	2.10E-03	2.10E-03	1.60E-03	5.99E-03
Pu-238	1.65E-07	1.06E-03	6.09E-06	6.09E-06	1.17E-09	1.17E-07
Pu-239	3.11E-07	2.00E-03	1.18E-05	1.18E-05	2.21E-09	2.21E-07
Pu-240	1.64E-07	1.05E-03	6.19E-06	6.19E-06	1.16E-09	1.16E-07
Sr-90	1.98E-05	1.27E-01	7.19E-03	7.19E-03	4.79E-04	1.92E-03
Co-60	4.13E-08	2.66E-04	2.17E-06	2.17E-06	5.87E-07	5.87E-06
I-129	5.86E-06	2.29E+00	3.37E-02	3.37E-02	2.84E-02	1.99E-02
I-131	2.71E-14	1.06E+04	7.81E+00	7.81E+00	8.52E+00	1.27E+00
H-3	2.10E-01	a	c	c	c	c
C-14	1.40E-08	a	c	c	c	c
Kr-85	1.08E+00	a	b	b	b	b
Ar-41	4.29E-01	a	b	b	b	b

Ratios DOSEMM/ASER	Air	Deposition	Leafy vegetable	Produce	Milk	Beef

Table B-1. **Radionuclide Concentrations in Environmental Media for the DOSEMM Verification Problem**

Pu-241	1.00	1.01	1.01	1.01	1.01	1.01
Am-241	1.00	1.00	1.00	1.00	1.00	1.00
Cs-137	1.00	1.01	1.01	1.01	1.01	1.01
Pu-238	1.00	1.01	1.01	1.01	1.01	1.01
Pu-239	1.00	1.01	1.01	1.01	1.01	1.01
Pu-240	1.00	1.01	1.01	1.01	1.01	1.01
Sr-90	1.00	1.01	1.03	1.03	1.02	1.02
Co-60	1.00	1.01	1.01	1.01	1.01	1.00
I-129	1.00	0.99	0.99	0.99	0.99	0.99
I-131	1.00	0.99	0.98	0.98	0.99	0.98
H-3	1.06	a	c	c	c	c
C-14	1.06	a	c	c	c	c
Kr-85	1.06	a	b	b	b	b
Ar-41	1.07	a	b	b	b	b

[a] No deposition calculated for these radionuclides

[b] These radionuclides do not accumulate in the food chain

[c] Concentrations in food products were not explicitly calculated in ASER.

Table B-2. Effective Doses by Exposure Pathway for the DOSEMM Verification Problem

DOSEMM	Inhalation (rem)	Vegetables (rem)	Meat (rem)	Milk (rem)	Ground (rem)	Submersion (rem)	Total (rem)
Pu-241	3.45E-07	6.09E-10	5.26E-12	6.95E-14	6.39E-15	3.73E-17	3.45E-07
Am-241	2.23E-08	4.23E-11	1.75E-13	9.20E-15	2.71E-13	6.06E-16	2.24E-08
Cs-137	3.21E-08	2.06E-08	2.57E-08	9.03E-09	1.06E-08	7.72E-11	9.81E-08
Pu-238	5.42E-07	1.00E-09	8.42E-12	1.11E-13	7.79E-14	6.79E-17	5.43E-07
Pu-239	1.12E-06	2.13E-09	1.75E-11	2.31E-13	6.67E-14	1.27E-16	1.13E-06
Pu-240	5.91E-07	1.12E-09	9.21E-12	1.21E-13	7.46E-14	6.58E-17	5.92E-07
Sr-90	9.67E-08	1.47E-07	1.69E-08	5.58E-09	1.64E-09	2.28E-13	2.68E-07
Co-60	4.06E-11	5.34E-12	6.28E-12	8.33E-13	6.74E-11	5.75E-13	1.21E-10
I-129	1.88E-08	2.53E-06	6.53E-07	1.23E-06	3.29E-09	1.94E-13	4.43E-06
I-131	2.10E-05	1.20E-04	8.49E-06	7.57E-05	1.59E-05	5.35E-08	2.41E-04
H-3	1.28E-07	5.15E-07	1.71E-07	3.62E-07			1.18E-06
C-14	2.70E-12	1.16E-11	3.45E-12	3.34E-12			2.11E-11
Kr-85						3.20E-08	3.20E-08
Ar-41						3.29E-06	3.29E-06
Total	2.39E-05	1.23E-04	9.36E-06	7.73E-05	1.59E-05	3.38E-06	2.53E-04
ASER	Inhalation (rem)	Vegetables (rem)	Meat (rem)	Milk (rem)	Ground (rem)	Submersion (rem)	Total (rem)
Pu-241	3.43E-07	6.04E-10	5.23E-12	6.89E-14	6.32E-15	3.72E-17	3.43E-07
Am-241	2.23E-08	4.21E-11	1.74E-13	9.16E-15	1.34E-13	6.04E-16	2.23E-08
Cs-137	3.20E-08	2.05E-08	2.55E-08	8.98E-09	1.07E-08	7.70E-11	9.77E-08
Pu-238	5.40E-07	9.97E-10	8.37E-12	1.10E-13	7.74E-14	6.77E-17	5.41E-07

Table B-2. Effective Doses by Exposure Pathway for the DOSEMM Verification Problem

	Inhalation	Vegetables	Meat	Milk	Ground	Submersion	Total
Pu-239	1.12E-06	2.12E-09	1.74E-11	2.29E-13	6.65E-14	1.27E-16	1.12E-06
Pu-240	5.89E-07	1.11E-09	9.16E-12	1.21E-13	7.39E-14	6.57E-17	5.90E-07
Sr-90	9.63E-08	1.42E-07	1.66E-08	5.47E-09	1.65E-09	2.27E-13	2.62E-07
Co-60	4.05E-11	5.31E-12	6.29E-12	8.29E-13	6.70E-11	5.74E-13	1.21E-10
I-129	1.88E-08	2.56E-06	6.61E-07	1.24E-06	5.25E-09	1.94E-13	4.49E-06
I-131	2.10E-05	1.22E-04	8.66E-06	7.68E-05	1.43E-05	5.34E-08	2.43E-04
H-3	1.21E-07	5.61E-07	2.05E-07	3.44E-07			1.23E-06
C-14	2.55E-12	1.13E-11	1.43E-12	5.60E-12			2.08E-11
Kr-85						3.03E-08	3.03E-08
Ar-41						3.08E-06	3.08E-06
Total	2.39E-05	1.25E-04	9.57E-06	7.84E-05	1.44E-05	3.16E-06	2.55E-04

Ratios							
DOSEMM/ASER	Inhalation	Vegetables	Meat	Milk	Ground	Submersion	Total
Pu-241	1.00	1.01	1.01	1.01	0.98	1.00	1.00
Am-241	1.00	1.00	1.00	1.00	2.03	1.00	1.00
Cs-137	1.00	1.01	1.01	1.01	1.00	1.00	1.00
Pu-238	1.00	1.01	1.01	1.01	1.00	1.00	1.00
Pu-239	1.00	1.01	1.01	1.01	1.00	1.00	1.00
Pu-240	1.00	1.01	1.01	1.01	1.01	1.00	1.00
Sr-90	1.00	1.03	1.02	1.02	0.99	1.00	1.02
Co-60	1.00	1.01	1.00	1.01	1.01	1.00	1.00
I-129	1.00	0.99	0.99	0.99	0.63	1.00	0.99
	1.00	0.98	0.98	0.99	1.11	1.00	0.99
H-3	1.06	0.92	0.83	1.05			0.96
C-14	1.06	1.03	2.42	0.60			1.01
Kr-85						1.06	1.06
Ar-41						1.07	1.07
Total Dose	1.00	0.98	0.98	0.99			0.99

Verification and Benchmark of Resuspension Equation

The ASER spreadsheet does not include resuspension. Therefore, the formulation of the resuspension equation in DOSEMM was benchmarked with the resuspension equation published in Reg Guide 3.51 NRC (1982) for a constant deposition rate and using the ASER radionuclides and release rates (ignoring Am-241 because the NRC equation does not include progeny ingrowth). Assuming a constant deposition rate, the air concentration from resuspension (C_{arip}) is given in Reg Guide 3.51 as

$$C_{arip}(t) = 0.01 C_{adip} 10^{-5} \left[\frac{1 - \exp\left[-(\lambda R_i + \lambda)(t - a)\right]}{(\lambda R_i + \lambda)} + 10^{-4} \delta(t) \frac{\exp\left[-\lambda R_i (t - a)\right] - \exp(\lambda R_i t)}{\lambda R_i} \right] \tag{B-1}$$

where

λr	=	short-term resuspension decay constant (5.06 yr^{-1})
λR_i	=	effective removal rate constant from soil (yr^{-1})
$\delta(t)$	=	is zero if $t \le 1.82$ and is unity
$0.01 C_{adip}$	=	air concentration times the deposition velocity (Ci m^{-2} yr^{-1})
a	=	is equal to $(t - 1.82)$ if $t > 1.82$, otherwise $a = 0$.

The short and long-term resuspension factors were 10^{-5} and 10^{-9} m^{-1} respectively and the short-term resuspension decay constant was 5.06 yr^{-1} (50 d half time). Equation B-1 provides the concentration at time t. The 1-year time-integrated concentration was approximated by numeric integration using a time step of 0.02 yr (7.3 d). This value was compared to the DOSEMM value at one year using *nresol*=1, *nresol*=12 and *iflag* equal to true or false. The *nresol* variable defines the number of periods in a year the release and X/Q and ψ/Q values are discretized with a year. For this case, the release rate was the same for all periods, but the concentration and deposition factors (X/Q and ψ/Q) values varied by period. For nresol=1, weighted average X/Q and ψ/Q values were used in DOSEMM (Table B-3). For use in the NRC equation, the total deposition rate over the year was used and was the same regardless of the setting of nresol. When *iflag* is set to true and *nresol*=12, then integration limits for short-term resuspension are set incrementally within the year. The first integration limit for the first period is from the beginning of the year end of the year. The second limit is from the beginning of the second period to the end of the year (~0.91 yr). And the third limit is from the beginning of the third period to the end of the year (~0.83 yr) and so forth.

Table B-3. X/Q (s m^{-3}) and ψ/Q (m^{-2}) Values

	Period											
	1	2	3	4	5	6	7	8	9	10	11	12
X/Q	5.42E-08	3.86E-08	5.14E-08	3.46E-08	3.38E-08	3.86E-08	4.47E-08	4.89E-08	3.99E-08	4.70E-08	5.23E-08	7.45E-08
ψ/Q	6.20E-12	3.59E-12	1.14E-11	1.09E-11	1.75E-11	2.44E-12	6.73E-12	1.45E-11	1.73E-11	9.99E-12	6.30E-12	7.16E-12

The DOSEMM solution closest to the integrated NRC equation was with *nresol*=12 and *iflag*=true (Table B-4). DOSEMM still slightly overestimated time-integrated concentrations. When *nresol*=12 or 1 and *iflag*=false, then DOSE overestimated the time-integrated concentration by about a factor of 1.24. This difference is not considered significant considering to overall uncertainty and variability in the resuspension model.

Table B-4 Parameters and Resuspension Benchmark Results

Parameter	Pu-241	Cs-137	Pu-238	Pu-239	Pu-240	Sr-90	Co-60
Radioactive decay (1/yr)	4.83E-02	2.31E-02	7.90E-03	2.88E-05	1.06E-04	2.41E-02	1.32E-01
Leach rate constant(1/yr)	1.19E-04	5.18E-05	1.19E-04	1.19E-04	1.19E-04	7.90E-03	2.38E-04
Effective removal (1/yr)	4.84E-02	2.31E-02	8.02E-03	1.48E-04	2.25E-04	3.20E-02	1.32E-01
C_{adip} (pCi m^{-2}-yr^{-1})	3.25E-02	1.67E-01	1.07E-03	2.01E-03	1.06E-03	1.28E-01	2.67E-04
NRC Conc (pCi m^{-3})	6.32E-08	3.27E-07	2.10E-09	3.95E-09	2.08E-09	2.50E-07	5.12E-10
NRC TIC (pCi-yr m^{-3})	5.12E-08	2.64E-07	1.70E-09	3.20E-09	1.68E-09	2.02E-07	4.16E-10
DOSEMM (pCi-yr m^{-3})a	5.43E-08	2.79E-07	1.79E-09	3.37E-09	1.77E-09	2.14E-07	4.45E-10
DOSEMM (pCi-yr/m^3)b	6.34E-08	3.26E-07	2.09E-09	3.94E-09	2.07E-09	2.50E-07	5.20E-10
DOSEMM (pCi-yr/m^3)c	6.24E-08	3.25E-07	2.09E-09	3.96E-09	2.08E-09	2.47E-07	4.92E-10

a. nresol=12 and iflag=true
b. nresol=12 and iflag=false
c. nresol=1

To test the long-term resuspension factor, the source was turned off after one year and the resuspension concentration at 10 years was computed with DOSEMM. Recall that after the sufficient time, short-term resuspension is negligible and resuspension is governed by the long-term factor. Thus, the 1-yr time-integrated concentration from resuspension long after deposition has ceased is the surface soil concentration (Ci m^{-2}) times the long-term resuspension factor (10^{-9} m^{-1}) times 1-yr. Table B-5 shows DOSEMM correctly predicts the time-integrated resuspension concentration 10-years after deposition has ceased.

Table B-5. Long-Term Resuspension Benchmark Results

Quantity	Pu-241	Cs-137	Pu-238	Pu-239	Pu-240	Sr-90	Co-60
TIC DOSEMM (pCi-yr/m^3)	1.96E-11	1.31E-10	9.82E-13	2.01E-12	1.06E-12	9.15E-11	6.71E-14
Soil Conc, 2025 (pCi/m^2)	1.96E-02	1.31E-01	9.82E-04	2.01E-03	1.06E-03	9.15E-02	6.71E-05

Appendix B References

INL (Idaho National Laboratory). 2016. *Idaho National Laboratory Site Environmental Report*. DOE/ID-12082(15). Idaho National Laboratory, Environmental Surveillance, Education, and Research Program, Idaho Falls, Idaho.

Moore, R.E., C.F. Baes III, L.M. McDowell-Boyer, A.P. Watson, F.O. Hoffman, J.C. Pleasant, and C.W. Miller. 1979. *AIRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Dose to Man from Airborne Releases of Radionuclides*. EPA 520/1-79-009. EPA Office of Radiation Programs, Washington, D.C.

NCRP (National Council on Radiation Protection and Measurements). 1996. *Screening Models for Releases of Radionuclides to Atmosphere, Surface, Water, and Ground*. NCRP Report No 123. NCRP, Bethesda, Maryland.

NRC. 1982. "Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations." *Regulatory Guide 3.51*. Washington, D.C.

Rood, A.S. and A.J. Sondrup. 2014. *Development and Demonstration of a Methodology to Quantitatively Assess Ambient the INL Ambient Air Monitoring Network*. INL-EXT-33194. Idaho National Laboratory, Idaho Falls, Idaho.

Attachment to Appendix B: DOSEMM Input and Output Files

Particulate Parameter Definition File (Input)
```
$ Title
'DOSEMM run for 2015 ASER - Particulate releases from INTEC'   [title]
$ debug: turn on/off debug output
$ lgame: turn on/off lgame output
.FALSE.  .FALSE.  SFOOD                    [debug lgame]
$ Grid parameters
$ nx: number of nodes in EW direction
$ ny: number of nodes in NS direction
$ dx: node spacing
$ xsw: UTME coordinate of SW corner of domain
$ ysw: UTMN coordinate of SW corner of domain
$ ndiscrete: number of discrete receptors
120  100  2000  255000 4725000  36   [nx,ny,dx,xsw,ysw,ndiscrete]
$ repeat for each discrete receptor
341316, 4827515    1 BEA-TRA
343508, 4825927    2 BEA-CPP
335063, 4818552    3 BEA-RWMC
339762, 4822062    4 BEA-VAN B
416371, 4818571    5 BEA-IRC
391668, 4782760    6 BEA-BLKFT
360950, 4857752    7 BEA-SMC
358520, 4848894    8 BEA-GATE 4
352512, 4820235    9 BEA-ARA
337640, 4823710   10 BEA-REST
414380, 4818193   11 BEA-IF
345564, 4834399   12 BEA-NRF
341727, 4828168   13 BEA-RTC
337858, 4819578   14 BEA-EBR 1
366673, 4828121   15 BEA-MFC
440759, 4860651   16 BEA-SUGAR
348964, 4823312   17 BEA-PBF
344158, 4826806   18 BEA-INTEC
342602, 4821788   19 BEA-CFA
346110, 4829754   20 BEA-EFS
292750, 4815336   21 BEA-CRATERS
339764, 4822062   22 ESER-VAN
292751, 4815336   23 ESER-CRA
314683, 4832742   24 ESER-ARC
440759, 4860651   25 ESER-SUG
414376, 4818191   26 ESER-IDA
401640, 4892296   27 ESER-DUB
376885, 4874727   28 ESER-MON
375764, 4823554   29 ESER-FAA
346614, 4819341   30 ESER-MAI
346114, 4829751   31 ESER-EFS
353080, 4811691   32 ESER-ATO
391668, 4782752   33 ESER-MOU
352495, 4881840   34 ESER-BLU
381307, 4855031   35 ESER-TER
340891, 4849794   36 ESER-HOW

$ nsrcs: number of sources
$ nresol:number of subperiods in a year (1,2,3,4,6,12)
$ byear: begining year of simulation
$ npartsize: number of partile size classes
1  12  2015  1                  [nsrcs,nresol,byear,npartsize]
$ partsize(npartsize): AMAD particle size (um)
1          [partsize(npartsize)]
$ partmod(npartsize): particle size modifiers for resuspension
1.0        [partmod(npartsize)]
$ Source Block Variables Block- These varaibles are repeated for each source
$ srcname(nsrcs): Source name
$ srctype(nsrcs): Type of source (P= point A = Area)
$ partindx(nsrcs): Index to particle size released
$ (utms(nsrcs,j): UTME (j=1) and UTMN(j=2) of the source
$ filechiq(nsrcs): file name for chi/q file
$ filepsiq(nsrcs): file name for psi/q file
$ filerel(nsrcs): file name for releases
$ soption(nsrcs): plotting option: 0=exclude soure from plots, 1=include source in plot
$ End of Source Block
$ Repeat Source Block for Each Source

INTEC  P  1                                          [srcname(nsrcs)] srctype  partindx
343830.  4825807.                                    [utms(nsrcs,1) utms(nsrcs,2)]
$'../../chiqvalues/INTEC_con_PM10.out'                        [filechiq(nsrcs)]
$'../../chiqvalues/INTEC_dep_PM10.out'                        [filepsiq(nsrcs)]
'../../chiqvalues/INTEC_con3y-1um.out'                        [filechiq(nsrcs)]
'../../chiqvalues/INTEC_dep3y-1um.out'                        [filepsiq(nsrcs)]
'../../sourceterm/INTEC-Part.rel'                             [filerel(nsrcs)]
1                   soption - plotting option           [soption(nsrcs)]

$ ncontam: number of contaminants -FOR RADON SOURCES, NCONTAM MUST = 1
$ ctype: contaminant type, RA=radionuclide, NR=nonrad, RN=radon
$ norgans: number of organs
9    RA   1                           [ncontam ctype norgans]
$ READ ONLY IF CTYPE=RA
$ organ(norgan): organ names

'Effective'  [organ(norgan)]
```

```
$ READ ONLY IF CTYPE=RA
$ dcffile(1..4): dose conversion files for inhalation, ingestion, external, and submersion
'../../infiles/INH.txt'                                                          [dcffile(1)]
'../../infiles/ING.txt'                                                          [dcffile(2)]
'../../infiles/EXT.txt'                                                          [dcffile(3)]
'../../infiles/SUB.txt'                                                          [dcffile(4)]
'../../infiles/GRD.txt'                                                          [dcffile(5)]
8.3e-2  8.3e-2                                                  [intcut,extcit] half-life cutoff for
inclusion of progeny with parent dcf (years)
$ cname(ncontam): names of contaminants
Pu-241 Am-241 Np-237 Cs-137 Pu-238 Pu-239 Pu-240 Sr-90 Co-60                           [cname(ncontam)]
$ bratio(ncontam):  Branching ratio
1.0    1.    0.    0.    0.   0.    0.    0.   0.                [bratio(ncontam)]
$ READ ONLY IF CTYPE=RA
$ adtype(ncontam,nsrcs): inhalation absorption type
$ DCF
D   D   D   D    D    D  D  D   D              [adtype(ncontam,nsrcs)] CFA
'../../infiles/NuclideData.dat'              [filenuc]
'../../infiles/ElementData.dat'              [filelement]

$ READ ONLY IF CTYPE<>RN
$ rflt: long term resuspension factor (1.0e-9 from NRC 1975 and 1982 1/m)
$ rfst: short term resuspension factor (1-yr integrated value with intial value of 1e-5 (2.0E-6 1/m)
$ thkres: soil thickness for resuspension
$ thklch: soil thickness for leaching
$ infil: infiltration rate (m/yr)
$ theta: moisture content see RESRAD calculations
$ strc: short term resuspension time function (NRC half-time value of ~1-year yields 0.6769 1/yr)
$ rho: bulk density (g/cc)
$ aws: average wind speed (m/s)
1.0e-9    2.0e-6   0.03    0.15   0.010  0.2  0.6769  1.4  3.666
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
$ READ ONLY IF CTYPE<>RN and FMODEL=CAP88
$     dd1: Fraction of radioactivity retained on leafy vegetables and produce after washing. (0.50)
$     fsubg: Fraction of produce grown in garden of interest (1.00)
$     fsubl: Fraction of leafy vegetables grown in garden of interest (1.00)
$     fsubp: Fraction of year animals graze on pasture (0.40)
$     fsubs: Fraction of daily feed that is pasture grass when animal grazes on pasture (0.43)
$     lamw: Removal rate for weathering from plants, d-1 (10-d half life = 0.0029 hr-1 = 0.0696 d-1 [cap88 default])
$     p: Effective surface density of soil kg/m2 (215.00)
0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0        [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]

$     qsubf: Consumption rate of contaminated feed or forage by an animal (dry wt), kg/da (15.60)
$     r1: Fallout interception fraction (pasture) (0.57)
$     r2: Fallout interception fraction (vegetables) (0.2)
$     th1: Time delay-ingestion of pasture grass by animals, days (0.00)
$     th2: Time delay-ingestion of stored feed by animals, days (90 days, 2,160.00 hrs)
$     th3: Time delay-ingestion of leafy vegetables by man, days (14 days 336.00 hrs)
$     th4: Time delay-ingestion of produce by man, days (14 days, 336.00 hr)
15.6 0.57, 0.2, 0.0, 90, 14, 14                     [qsubf,r1,r2,th1,th2,th3,th4]
$  Note: CAP88 default parameters are in CAP88Def.FAC in the CAP88-3.0 directory
$     tsubB: Buildup time in soil, years (100 yrs, 876,000.00 hrs)
$     tsubE1: Period of exposure (grassy pasture), days (30 days, 720.00 hr)
$     tsubE2: Period of exposure (crops/leafy vegetables),  days (60 days, 1,440.00 hr)
$     tsubF: Transport time: animal feed-millk-man, d (2.00)
$     tsubS: Average time from slaughter of meat animal to consumption, d (20.00)
$     tsubW: Time over which wild game is consumed (days)
$     ysubV1: Productivity: agriculture (grass-cow-milk-man pathway), kg/m2 (0.28) dry wt
$     ysubV2: Productivity: produce and leafy vegetables (wet), kg/m2 (0.716)
$     ysubV3: Productivity: produce and other vegetables (wet), kg/m2 (0.57)
100. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.716        [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]

$     absH: absolute humidity, g/m3, (8 g/m3)
$     concC: atmospheric concentration of carbon, g/m3 (0.18 g/m3)
$     fw: fraction of veg that is water (0.97 -assumed)
$     fc fraction of veg that is carbon (0.105 - derived from Till and Meyer, Table 9.2)
$     fwb: fraction of beef that is water (0.97 - assumed)
$     fwm: fraction of milk that is water (1.0 - assumed)
$     fcb: fraction of beef that is carbon (0.25 - derived from Till and Meyer, Table 9.2)
$     fcm: fraction of milk that is carbon (0.07 - derived from Till and Meyer, Table 9.2)
8.0, 0.18, 0.97, 0.105 0.97, 1.0, 0.25, 0.07   [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
$ END READ ONLY IF CTYPE<>RN AND FMODEL=CAP88

$ READ ONLY IF CTYPE=RN
$ lambdaE: fractional air exchange of building with outdoors  (1/s)
$        Murry and Burmaster 1995 give a range of 0.14(5th p) - 1.38(95th p) with a median of 0.4 h-1
$        Killough used the median value ([0.4 1/h]/3600 s = 1.11E-4 1/s)
$ dbar: diameter corresponding to mean surface area of condensation nuclei (m)
$        NCRP (1984) gives Dbar - 0.125 um as a typical average
$ vbar: average velocity of unattached RaA ions (m/s)  NCRP 1984 gives a value of 1.38E2 m/s
$ cnuc: concentration of condensation nuclei indoors (nuclei/m**3)
$        NCRP 1984 gives typical range of 15000-120000 nucleu/cc. Killough uses 3E10 nuclei/m**3 (30000 nuclei/cc)
$ vunatt: deposition vel for plateout of unattached RaA on interior surfaces (m/s).
$        Knutson 1988 gives 8 m/hr (2.22E-3 m/s)
$ vatt:   deposition vel for plateout of attached RaA on interior surfaces
$        Knutson 1988 gives 0.2 m/hr (5.55E-5 1/s)
$ stvol: indoor surface to volume ratio (1.0 to 3.0 1/m. Killough used 2.0 1/m)
$ 1.11e-4  1.25E-7  138. 3.0E10  2.22E-3  5.55E-5  2.0                  [lambdaE Dbar vbar cnuc vunatt vatt
stvol]
$ END OF READ ONLUT IF CTYPE=RN

$ coption(ncontam): Contaminant plot option, 0= no plot, 1=plot
0  0   0   0    0    0  0 0  0                                          [coption(ncontam)]
$ Type of plot - Set to 0 to not plot, 1 to plot
```

```
$ poption(1) = plot tic
$ poption(2) = plot average concentration
$ poption(3) = plot deposition
0 0 0                                                              [poption(i),i=1,3]
$ cf(4):  conversion factors for output
$        cf(1) cf for tic and avg conc
$        cf(2) cf for deposition and soil concentration, set to 2.22E7 for pCi/g in 0-3 cm layer assuming rho=1.5 g/cc
$        cf(3) cf for vegtables
$        cf(4) df for milk
$        cf(5) cf for meat and wild game
$        cf(6) cf for deposition and subsurface soil concentration, set to 4.44e6 for pCi/g in 0-15 cm layer assuming
rho=1.5 g/cc

1.0e12   'pCi/m3'                                                  [cf(1)] air concentration
1.0e12   'pCi/m2'                                                    [cf(2)] annual deposition
converted to conc in 0-15 cm layer
1.0e12   'pCi/m2'                                                    [cf(3)] surface soil
concentration
1.0e12   'pCi/kg'                                                  [cf(4)] veg concentrations
1.0e12   'pCi/L'                                                   [cf(5)] milk concentrations
1.0e12   'pCi/kg'                                                  [cf(6)] beef and wild game
concentrations
1.0e12    'pCi/m2'                                                   [cf(7)] subsurface soil
concentrations


$ READ ONLY IF ORGAN(1)<=>NONE
$ fileexp: receptor intake rates
'../../infiles/refperson_intakes.dat'                                         [fileexp]
1                         nrecept
$ utmr(nrecept,1), utmr(nrecept,2): UTM East (1) and UTM North (2) coordinates of source
$ syr(nrecept): start year of exposure (year)
$ spr(nrecept): starting sub-period
$ eyr(nrecept): end year of exposure period (year)
$ epr(nrecept): ending sub-period
$ yob(nrecept): year of birth
$ fi(nrecept): fraction of time spent indoors
$ ef(nrecept): exposure frequency (h/d)
$ et(nrecept): exposure time (d/yr)
$ inhm(nrecept): inhalation rate modifying factor (inhalation rate in m**3/hr)
$ ingsm(nrecept): soil ingestion modification factor (soil ingestion in g/d)
$ ingvm(nrecept): vegetable ingestion modification factor
$ ingbm(nrecept): beef ingestion modification factor
$ ingmm(nrecept): milk ingestion modification factor
$ ingwm(nrecept): wild game ingestion modification factor
$ cindoor(nrecept): ratio of indoor to outdoor air
$ esf: external exposure indoor shielding factor
$ ssf: submersion indoor shielding factor


$MEI03  Frenchman's cabin
333528,4810277, 2015  1  2015  12   1957       [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
0.0  24.0  365 1.0   1.0  1.0  1.0  1.0 1.0 1.0 1.0 1.0         [fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i),
ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
$ nsim: number of Monte Carlo simulations - set nsim=0 for no monthe carlo sampling
$ srand: random number seed
0  -23432                  [nsim,srand]
$ fileu: uncertainty parameter definitions - Read only if nsim>0
$ fileu: uncertainty parameter definitions - Read only if nsim>0
'../distributions.par'                                          [fileu]
'../../dcfs/dcfuncert.dat'
$ END
```

H-3 and C-14 Parameter Definition File (Input)

```
$ Title
'DOSEMM run for 2015 ASER - H-3 and C-14 releases from INTEC'   [title]
$ debug: turn on/off debug output
$ lgame: turn on/off lgame output
.FALSE.   .FALSE.  SFOOD                  [debug lgame]
$ Grid parameters
$ nx: number of nodes in EW direction
$ ny: number of nodes in NS direction
$ dx: node spacing
$ xsw: UTME coordinate of SW corner of domain
$ ysw: UTMN coordinate of SW corner of domain
$ ndiscrete: number of discrete receptors
120  100  2000  255000 4725000  36  [nx,ny,dx,xsw,ysw,ndiscrete]
$ repeat for each discrete receptor
341316 , 4827515    1 BEA-TRA
343508 , 4825927    2 BEA-CPP
335063 , 4818552    3 BEA-RWMC
339762 , 4822062    4 BEA-VAN B
416371 , 4818571    5 BEA-IRC
391668 , 4782760    6 BEA-BLKFT
360950 , 4857752    7 BEA-SMC
358520 , 4848894    8 BEA-GATE 4
352512 , 4820235    9 BEA-ARA
337640 , 4823710   10 BEA-REST
414380 , 4818193   11 BEA-IF
345564 , 4834399   12 BEA-NRF
341727 , 4828168   13 BEA-RTC
337858 , 4819578   14 BEA-EBR 1
366673 , 4828121   15 BEA-MFC
440759 , 4860651   16 BEA-SUGAR
348964 , 4823312   17 BEA-PBF
```

```
344158 , 4826806   18 BEA-INTEC
342602 , 4821788   19 BEA-CFA
346110 , 4829754   20 BEA-EFS
292750 , 4815336   21 BEA-CRATERS
339764 , 4822062   22 ESER-VAN
292751 , 4815336   23 ESER-CRA
314683 , 4832742   24 ESER-ARC
440759 , 4860651   25 ESER-SUG
414376 , 4818191   26 ESER-IDA
401640 , 4892296   27 ESER-DUB
376885 , 4874727   28 ESER-MON
375764 , 4823554   29 ESER-FAA
346614 , 4819341   30 ESER-MAI
346114 , 4829751   31 ESER-EFS
353080 , 4811691   32 ESER-ATO
391668 , 4782752   33 ESER-MOU
352495 , 4881840   34 ESER-BLU
381307 , 4855031   35 ESER-TER
340891 , 4849794   36 ESER-HOW


$ nsrcs: number of sources
$ nresol:number of subperiods in a year (1,2,3,4,6,12)
$ byear: begining year of simulation
$ npartsize: number of partile size classes
1  12  2015  1            [nsrcs,nresol,byear,npartsize]
$ partsize(npartsize): AMAD particle size (um)
1.0           [partsize(npartsize)]
$ partmod(npartsize): particle size modifiers for resuspension
1.0           [partmod(npartsize)]
$ Source Block Variables Block- These varaibles are repeated for each source
$ srcname(nsrcs): Source name
$ srctype(nsrcs): Type of source (P= point A = Area)
$ partindx(nsrcs): Index to particle size released
$ (utms(nsrcs,j): UTME (j=1) and UTMN(j=2) of the source
$ filechiq(nsrcs): file name for chi/q file
$ filepsiq(nsrcs): file name for psi/q file
$ filerel(nsrcs): file name for releases
$ soption(nsrcs): plotting option: 0=exclude soure from plots, 1=include source in plot
$ End of Source Block
$ Repeat Source Block for Each Source

INTEC     P   1                                           [srcname(nsrcs)] srctype  partindx
343830.  4825807.                                         [utms(nsrcs,1) utms(nsrcs,2)]
'../../chiqvalues/INTEC_con_PM0.out'                             [filechiq(nsrcs)]
'../../chiqvalues/INTEC_dep_PM0.out'                             [filepsiq(nsrcs)]
'../../sourceterm/INTEC-H3C14.rel'                               [filerel(nsrcs)]
1                 soption - plotting option                      [soption(nsrcs)]

$ ncontam: number of contaminants -FOR RADON SOURCES, NCONTAM MUST = 1
$ ctype: contaminant type, RA=radionuclide, NR=nonrad, RN=radon
$ norgans: number of organs
2    RA   1                              [ncontam ctype norgans]
$ READ ONLY IF CTYPE=RA
$ organ(norgan): organ names

'Effective'  [organ(norgan)]
$ READ ONLY IF CTYPE=RA
$ dcffile(1..4): dose conversion files for inhalation, ingestion, external, and submersion
'../../infiles/INH.txt'                          [dcffile(1)]
'../../infiles/ING.txt'                          [dcffile(2)]
'../../infiles/EXT.txt'                          [dcffile(3)]
'../../infiles/SUB.txt'                          [dcffile(4)]
'../../infiles/GRD.txt'                          [dcffile(5)]
8.3e-2  8.3e-2                    [intcut,extcit] half-life cutoff for inclusion of progeny with parent dcf
(years)
$ cname(ncontam): names of contaminants
H-3   C-14                               [cname(ncontam)]
$ bratio(ncontam):  Branching ratio
0.0   0.0                         [bratio(ncontam)]
$ READ ONLY IF CTYPE=RA
$ adtype(ncontam,nsrcs): inhalation absorption type
$ DCF
D    D                           [adtype(ncontam,nsrcs)] CFA
'../../infiles/NuclideData.dat'              [filenuc]
'../../infiles/ElementData.dat'              [filelement]

$ READ ONLY IF CTYPE<>RN
$ rflt: long term resuspension factor (1.0e-9 from NRC 1975 and 1982 1/m)
$ rfst: short term resuspension factor (1-yr integrated value with intial value of 1e-5 (2.0E-6 1/m)
$ thkres: soil thickness for resuspension
$ thklch: soil thickness for leaching
$ infil: infiltration rate (m/yr)
$ theta: moisture content see RESRAD calculations
$ strc: short term resuspension time function (NRC half-time value of ~1-year yields 0.6769 1/yr)
$ rho: bulk density (g/cc)
$ aws: average wind speed (m/s)
1.0e-9   2.0e-6   0.03    0.15   0.10  0.2  0.6769  1.4  4.0
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
$ READ ONLY IF CTYPE<>RN and FMODEL=CAP88
$     dd1: Fraction of radioactivity retained on leafy vegetables and produce after washing. (0.50)
$     fsubg: Fraction of produce grown in garden of interest (1.00)
$     fsubl: Fraction of leafy vegetables grown in garden of interest (1.00)
$     fsubp: Fraction of year animals graze on pasture (0.40)
$     fsubs: Fraction of daily feed that is pasture grass when animal grazes on pasture (0.43)
```

```
$     lamw: Removal rate for weathering from plants, d-1 (10-d half life = 0.0029 hr-1 = 0.0696 d-1 [cap88 default])
$     p: Effective surface density of soil kg/m2 (215.00)
0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0        [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]

$     qsubf: Consumption rate of contaminated feed or forage by an animal (dry wt), kg/da (15.60)
$     r1: Fallout interception fraction (pasture) (0.57)
$     r2: Fallout interception fraction (vegetables) (0.2)
$     th1: Time delay-ingestion of pasture grass by animals, days (0.00)
$     th2: Time delay-ingestion of stored feed by animals, days (90 days, 2,160.00 hrs)
$     th3: Time delay-ingestion of leafy vegetables by man, days (14 days 336.00 hrs)
$     th4: Time delay-ingestion of produce by man, days (14 days, 336.00 hr)
15.6 0.57, 0.2, 0.0, 90, 14, 14                [qsubf,r1,r2,th1,th2,th3,th4]
$ Note: CAP88 default parameters are in CAP88Def.FAC in the CAP88-3.0 directory
$     tsubB: Buildup time in soil, years (100 yrs, 876,000.00 hrs)
$     tsubE1: Period of exposure (grassy pasture), days (30 days, 720.00 hr)
$     tsubE2: Period of exposure (crops/leafy vegetables),  days (60 days, 1,440.00 hr)
$     tsubF: Transport time: animal feed-millk-man, d (2.00)
$     tsubS: Average time from slaughter of meat animal to consumption, d (20.00)
$     tsubW: Time over which wild game is consumed (days)
$     ysubV1: Productivity: agriculture (grass-cow-milk-man pathway), kg/m2 (0.28) dry wt
$     ysubV2: Productivity: produce and leafy vegetables (wet), kg/m2 (0.716)
$     ysubV3: Productivity: produce and other vegetables (wet), kg/m2 (0.57)
0. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.57       [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]

$     absH: absolute humidity, g/m3, (8 g/m3)
$     concC: atmospheric concentration of carbon, g/m3 (0.18 g/m3)
$     fw: fraction of veg that is water (0.97 -assumed, 0.824 in CAP88)
$     fc fraction of veg that is carbon (0.105 - derived from Till and Meyer, Table 9.2, 0.339 in CAP88)
$     fwb: fraction of beef that is water (0.97 - assumed, 0.623 in CAP88)
$     fwm: fraction of milk that is water (1.0 - assumed)
$     fcb: fraction of beef that is carbon (0.25 - derived from Till and Meyer, Table 9.2,0.491 in CAP88, 0.23 NCRP)
$     fcm: fraction of milk that is carbon (0.07 - derived from Till and Meyer, Table 9.2, 0.169 in CAP88)
4.9, 0.18, 0.824, 0.339 0.623, 1.0, 0.23, 0.169   [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
$ END READ ONLY IF CTYPE<>RN AND FMODEL=CAP88

$ READ ONLY IF CTYPE=RN
$ lambdaE: fractional air exchange of building with outdoors  (1/s)
$          Murry and Burmaster 1995 give a range of 0.14(5th p) - 1.38(95th p) with a median of 0.4 h-1
$          Killough used the median value ([0.4 1/h]/3600 s = 1.11E-4 1/s)
$ dbar: diameter corresponding to mean surface area of condensation nuclei (m)
$      NCRP (1984) gives Dbar - 0.125 um as a typical average
$ vbar: average velocity of unattached RaA ions (m/s)  NCRP 1984 gives a value of 1.38E2 m/s
$ cnuc: concentration of condensation nuclei indoors (nuclei/m**3)
$      NCRP 1984 gives typical range of 15000-120000 nucleu/cc. Killough uses 3E10 nuclei/m**3 (30000 nuclei/cc)
$ vunatt: deposition vel for plateout of unattached RaA on interior surfaces (m/s).
$       Knutson 1988 gives 8 m/hr (2.22E-3 m/s)
$ vatt:   deposition vel for plateout of attached RaA on interior surfaces
$       Knutson 1988 gives 0.2 m/hr (5.55E-5 1/s)
$ stvol: indoor surface to volume ratio (1.0 to 3.0 1/m. Killough used 2.0 1/m)
$ 1.11e-4  1.25E-7  138. 3.0E10  2.22E-3  5.55E-5  2.0                     [lambdaE Dbar vbar cnuc vunatt vatt
stvol]
$ END OF READ ONLUT IF CTYPE=RN

$ coption(ncontam): Contaminant plot option, 0= no plot, 1=plot
0   0                                          [coption(ncontam)]
$ Type of plot - Set to 0 to not plot, 1 to plot
$ poption(1) = plot tic
$ poption(2) = plot average concentration
$ poption(3) = plot deposition
0 0 0                                                       [poption(i),i=1,3]
$ cf(4):  conversion factors for output
$        cf(1) cf for tic and avg conc
$        cf(2) cf for deposition and soil concentration, set to 2.22E7 for pCi/g in 0-3 cm layer assuming rho=1.5 g/cc
$        cf(3) cf for vegtables
$        cf(4) df for milk
$        cf(5) cf for meat and wild game
$        cf(6) cf for deposition and subsurface soil concentration, set to 4.44e6 for pCi/g in 15 cm layer assuming
rho=1.5 g/cc

1.0e12  'pCi/m3'                               [cf(1)] air concentration
4.46e6  'pCi/g'                                 [cf(2)] annual deposition converted to conc in 0-15 cm
layer
1.0e12  'pCi/m2'                                [cf(3)] surface soil concentration
1.0e12  'pCi/kg'                               [cf(4)] veg concentrations
1.0e12  'pCi/L'                                [cf(5)] milk concentrations
1.0e12  'pCi/kg'                               [cf(6)] beef and wild game concentrations
1.0e12   'pCi/m2'                               [cf(7)] subsurface soil concentrations

$ READ ONLY IF ORGAN(1)<=>NONE
$ fileexp: receptor intake rates
'../../infiles/refperson_intakes.dat'                                         [fileexp]
1                          nrecept
$ utmr(nrecept,1), utmr(nrecept,2): UTM East (1) and UTM North (2) coordinates of source
$ syr(nrecept): start year of exposure (year)
$ spr(nrecept): starting sub-period
$ eyr(nrecept): end year of exposure period (year)
$ epr(nrecept): ending sub-period
$ yob(nrecept): year of birth
$ fi(nrecept): fraction of time spent indoors
$ ef(nrecept): exposure frequency (h/d)
$ et(nrecept): exposure time (d/yr)
$ inhm(nrecept): inhalation rate modifying factor (inhalation rate in m**3/hr)
$ ingsm(nrecept): soil ingestion modification factor (soil ingestion in g/d)
$ ingvm(nrecept): vegetable ingestion modification factor
```

```
$ ingbm(nrecept): beef ingestion modification factor
$ ingmm(nrecept): milk ingestion modification factor
$ ingwm(nrecept): wild game ingestion modification factor
$ cindoor(nrecept): ratio of indoor to outdoor air
$ esf: external exposure indoor shielding factor
$ ssf: submersion indoor shielding factor

$MEI03  Frenchman's cabin
333528,4810277, 2015  1  2015  12   1957        [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
0.0  24.0  365  1.0   1.0  1.0  1.0  1.0 1.0 1.0 1.0          [fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i),
ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
$ nsim: number of Monte Carlo simulations - set nsim=0 for no monthe carlo sampling
$ srand: random number seed
0  -23432               [nsim,srand]
$ fileu: uncertainty parameter definitions - Read only if nsim>0
$ fileu: uncertainty parameter definitions - Read only if nsim>0
'../distributions.par'                                      [fileu]
'../../dcfs/dcfuncert.dat'
$ END
```

Iodine Parameter Definition File (Input)
```
$ Title
'DOSEMM run for 2015 ASER - iodine releases from INTEC'   [title]
$ debug: turn on/off debug output
$ lgame: turn on/off lgame output
.FALSE.   .FALSE.  SFOOD              [debug lgame]
$ Grid parameters
$ nx: number of nodes in EW direction
$ ny: number of nodes in NS direction
$ dx: node spacing
$ xsw: UTME coordinate of SW corner of domain
$ ysw: UTMN coordinate of SW corner of domain
$ ndiscrete: number of discrete receptors
120  100  2000  255000 4725000  36  UTM  12  [nx,ny,dx,xsw,ysw,ndiscrete,gtype,utmzone]
$ repeat for each discrete receptor
341316 , 4827515    1 BEA-TRA
343508 , 4825927    2 BEA-CPP
335063 , 4818552    3 BEA-RWMC
339762 , 4822062    4 BEA-VAN B
416371 , 4818571    5 BEA-IRC
391668 , 4782760    6 BEA-BLKFT
360950 , 4857752    7 BEA-SMC
358520 , 4848894    8 BEA-GATE 4
352512 , 4820235    9 BEA-ARA
337640 , 4823710   10 BEA-REST
414380 , 4818193   11 BEA-IF
345564 , 4834399   12 BEA-NRF
341727 , 4828168   13 BEA-RTC
337858 , 4819578   14 BEA-EBR 1
366673 , 4828121   15 BEA-MFC
440759 , 4860651   16 BEA-SUGAR
348964 , 4823312   17 BEA-PBF
344158 , 4826806   18 BEA-INTEC
342602 , 4821788   19 BEA-CFA
346110 , 4829754   20 BEA-EFS
292750 , 4815336   21 BEA-CRATERS
339764 , 4822062   22 ESER-VAN
292751 , 4815336   23 ESER-CRA
314683 , 4832742   24 ESER-ARC
440759 , 4860651   25 ESER-SUG
414376 , 4818191   26 ESER-IDA
401640 , 4892296   27 ESER-DUB
376885 , 4874727   28 ESER-MON
375764 , 4823554   29 ESER-FAA
346614 , 4819341   30 ESER-MAI
346114 , 4829751   31 ESER-EFS
353080 , 4811691   32 ESER-ATO
391668 , 4782752   33 ESER-MOU
352495 , 4881840   34 ESER-BLU
381307 , 4855031   35 ESER-TER
340891 , 4849794   36 ESER-HOW

$ nsrcs: number of sources
$ nresol:number of subperiods in a year (1,2,3,4,6,12)
$ byear: begining year of simulation
$ npartsize: number of partile size classes
1  12  2015  1         [nsrcs,nresol,byear,npartsize]
$ partsize(npartsize): AMAD particle size (um)
1             [partsize(npartsize)]
$ partmod(npartsize): particle size modifiers for resuspension
1.0           [partmod(npartsize)]
$ Source Block Variables Block- These varaibles are repeated for each source
$ srcname(nsrcs): Source name
$ srctype(nsrcs): Type of source (P= point A = Area)
$ partindx(nsrcs): Index to particle size released
$ (utms(nsrcs,j): UTME (j=1) and UTMN(j=2) of the source
$ filechiq(nsrcs): file name for chi/q file
$ filepsiq(nsrcs): file name for psi/q file
$ filerel(nsrcs): file name for releases
$ soption(nsrcs): plotting option: 0=exclude soure from plots, 1=include source in plot
$ End of Source Block
$ Repeat Source Block for Each Source

INTEC  P  1                                            [srcname(nsrcs)] srctype  partindx
```

```
343830.  4825807.                                              [utms(nsrcs,1) utms(nsrcs,2)]
'../../chiqvalues/INTEC_con_PM15.out'                                    [filechiq(nsrcs)]
'../../chiqvalues/INTEC_dep_PM15.out'                                    [filepsiq(nsrcs)]
'../../sourceterm/INTEC-iodine.rel'                                      [filerel(nsrcs)]
1                     soption - plotting option                  [soption(nsrcs)]

$ ncontam: number of contaminants -FOR RADON SOURCES, NCONTAM MUST = 1
$ ctype: contaminant type, RA=radionuclide, NR=nonrad, RN=radon
$ norgans: number of organs
2    RA   1                              [ncontam ctype norgans]
$ READ ONLY IF CTYPE=RA
$ organ(norgan): organ names

'Effective'  [organ(norgan)]
$ READ ONLY IF CTYPE=RA
$ dcffile(1..4): dose conversion files for inhalation, ingestion, external, and submersion
'../../infiles/INH.txt'                                         [dcffile(1)]
'../../infiles/ING.txt'                                         [dcffile(2)]
'../../infiles/EXT.txt'                                         [dcffile(3)]
'../../infiles/SUB.txt'                                         [dcffile(4)]
'../../infiles/GRD.txt'                                         [dcffile(5)]
8.3e-2  8.3e-2                                         [intcut,extcit] half-life cutoff for
inclusion of progeny with parent dcf (years)
$ cname(ncontam): names of contaminants
I-129    I-131                         [cname(ncontam)]
$ bratio(ncontam):  Branching ratio
0.0      0.    0.     0.     0.                        [bratio(ncontam)]
$ READ ONLY IF CTYPE=RA
$ adtype(ncontam,nsrcs): inhalation absorption type
$ DCF
D    D    D      D      D            [adtype(ncontam,nsrcs)] CFA
'../../infiles/NuclideData.dat'           [filenuc]
'../../infiles/ElementData.dat'        [filelement]

$ READ ONLY IF CTYPE<>RN
$ rflt: long term resuspension factor (1.0e-9 from NRC 1975 and 1982 1/m)
$ rfst: short term resuspension factor (1-yr integrated value with intial value of 1e-5 (2.0E-6 1/m)
$ thkres: soil thickness for resuspension
$ thklch: soil thickness for leaching
$ infil: infiltration rate (m/yr)
$ theta: moisture content see RESRAD calculations
$ strc: short term resuspension time function (NRC half-time value of ~1-year yields 0.6769 1/yr)
$ rho: bulk density (g/cc)
$ aws: average wind speed (m/s)
1.0e-9   2.0e-6   0.03     0.15    0.010  0.2  0.6769  1.4  3.66
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
$ READ ONLY IF CTYPE<>RN and FMODEL=CAP88
$    dd1: Fraction of radioactivity retained on leafy vegetables and produce after washing. (0.50)
$    fsubg: Fraction of produce grown in garden of interest (1.00)
$    fsubl: Fraction of leafy vegetables grown in garden of interest (1.00)
$    fsubp: Fraction of year animals graze on pasture (0.40)
$    fsubs: Fraction of daily feed that is pasture grass when animal grazes on pasture (0.43)
$    lamw: Removal rate for weathering from plants, d-1 (10-d half life = 0.0029 hr-1 = 0.0696 d-1 [cap88 default])
$    p: Effective surface density of soil kg/m2 (215.00)
0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0          [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]

$    qsubf: Consumption rate of contaminated feed or forage by an animal (dry wt), kg/da (15.60)
$    r1: Fallout interception fraction (pasture) (0.57)
$    r2: Fallout interception fraction (vegetables) (0.2)
$    th1: Time delay-ingestion of pasture grass by animals, days (0.00)
$    th2: Time delay-ingestion of stored feed by animals, days (90 days, 2,160.00 hrs)
$    th3: Time delay-ingestion of leafy vegetables by man, days (14 days 336.00 hrs)
$    th4: Time delay-ingestion of produce by man, days (14 days, 336.00 hr)
15.6 0.57, 0.2, 0.0, 90, 14, 14                   [qsubf,r1,r2,th1,th2,th3,th4]
$ Note: CAP88 default parameters are in CAP88Def.FAC in the CAP88-3.0 directory
$    tsubB: Buildup time in soil, years (100 yrs, 876,000.00 hrs)
$    tsubE1: Period of exposure (grassy pasture), days (30 days, 720.00 hr)
$    tsubE2: Period of exposure (crops/leafy vegetables),  days (60 days, 1,440.00 hr)
$    tsubF: Transport time: animal feed-millk-man, d (2.00)
$    tsubS: Average time from slaughter of meat animal to consumption, d (20.00)
$    tsubW: Time over which wild game is consumed (days)
$    ysubV1: Productivity: agriculture (grass-cow-milk-man pathway), kg/m2 (0.28) dry wt
$    ysubV2: Productivity: produce and leafy vegetables (wet), kg/m2 (0.716)
$    ysubV3: Productivity: produce and other vegetables (wet), kg/m2 (0.57)
100. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.716      [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]

$    absH: absolute humidity, g/m3, (8 g/m3)
$    concC: atmospheric concentration of carbon, g/m3 (0.18 g/m3)
$    fw: fraction of veg that is water (0.97 -assumed)
$    fc fraction of veg that is carbon (0.105 - derived from Till and Meyer, Table 9.2)
$    fwb: fraction of beef that is water (0.97 - assumed)
$    fwm: fraction of milk that is water (1.0 - assumed)
$    fcb: fraction of beef that is carbon (0.25 - derived from Till and Meyer, Table 9.2)
$    fcm: fraction of milk that is carbon (0.07 - derived from Till and Meyer, Table 9.2)
8.0, 0.18, 0.97, 0.105 0.97, 1.0, 0.25, 0.07   [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
$ END READ ONLY IF CTYPE<>RN AND FMODEL=CAP88

$ READ ONLY IF CTYPE=RN
$ lambdaE: fractional air exchange of building with outdoors  (1/s)
$        Murry and Burmaster 1995 give a range of 0.14(5th p) - 1.38(95th p) with a median of 0.4 h-1
$        Killough used the median value ([0.4 1/h]/3600 s = 1.11E-4 1/s)
$ dbar: diameter corresponding to mean surface area of condensation nuclei (m)
$     NCRP (1984) gives Dbar - 0.125 um as a typical average
$ vbar: average velocity of unattached RaA ions (m/s)  NCRP 1984 gives a value of 1.38E2 m/s
```

```
$ cnuc: concentration of condensation nuclei indoors (nuclei/m**3)
$       NCRP 1984 gives typical range of 15000-120000 nucleu/cc. Killough uses 3E10 nuclei/m**3 (30000 nuclei/cc)
$ vunatt: deposition vel for plateout of unattached RaA on interior surfaces (m/s).
$       Knutson 1988 gives 8 m/hr (2.22E-3 m/s)
$ vatt:  deposition vel for plateout of attached RaA on interior surfaces
$       Knutson 1988 gives 0.2 m/hr (5.55E-5 1/s)
$ stvol: indoor surface to volume ratio (1.0 to 3.0 1/m. Killough used 2.0 1/m)
$ 1.11e-4  1.25E-7  138.  3.0E10  2.22E-3  5.55E-5  2.0                     [lambdaE Dbar vbar cnuc vunatt vatt
stvol]
$ END OF READ ONLUT IF CTYPE=RN

$ coption(ncontam): Contaminant plot option, 0= no plot, 1=plot
0   0    0    0    0                                                       [coption(ncontam)]
$ Type of plot - Set to 0 to not plot, 1 to plot
$ poption(1) = plot tic
$ poption(2) = plot average concentration
$ poption(3) = plot deposition
0 0 0                                                                      [poption(i),i=1,3]
$ cf(4):  conversion factors for output
$       cf(1) cf for tic and avg conc
$       cf(2) cf for deposition and soil concentration, set to 2.22E7 for pCi/g in 0-3 cm layer assuming rho=1.5 g/cc
$       cf(3) cf for vegtables
$       cf(4) df for milk
$       cf(5) cf for meat and wild game
$       cf(6) cf for deposition and subsurface soil concentration, set to 4.44e6 for pCi/g in 0-15 cm layer assuming
rho=1.5 g/cc

1.0e12   'pCi/m3'                                                          [cf(1)] air concentration
1.0e12   'pCi/m2'                                                          [cf(2)] annual deposition
converted to conc in 0-15 cm layer
1.0e12   'pCi/m2'                                                          [cf(3)] surface soil
concentration
1.0e12   'pCi/kg'                                                          [cf(4)] veg concentrations
1.0e12   'pCi/L'                                                           [cf(5)] milk concentrations
1.0e12   'pCi/kg'                                                          [cf(6)] beef and wild game
concentrations
1.0e12    'pCi/m2'                                                         [cf(7)] subsurface soil
concentrations

$ READ ONLY IF ORGAN(1)<=>NONE
$ fileexp: receptor intake rates
'../../infiles/refperson_intakes.dat'                                      [fileexp]
1                               nrecept
$ utmr(nrecept,1), utmr(nrecept,2): UTM East (1) and UTM North (2) coordinates of source
$ syr(nrecept): start year of exposure (year)
$ spr(nrecept): starting sub-period
$ eyr(nrecept): end year of exposure period (year)
$ epr(nrecept): ending sub-period
$ yob(nrecept): year of birth
$ fi(nrecept): fraction of time spent indoors
$ ef(nrecept): exposure frequency (h/d)
$ et(nrecept): exposure time (d/yr)
$ inhm(nrecept): inhalation rate modifying factor (inhalation rate in m**3/hr)
$ ingsm(nrecept): soil ingestion modification factor (soil ingestion in g/d)
$ ingvm(nrecept): vegetable ingestion modification factor
$ ingbm(nrecept): beef ingestion modification factor
$ ingmm(nrecept): milk ingestion modification factor
$ ingwm(nrecept): wild game ingestion modification factor
$ cindoor(nrecept): ratio of indoor to outdoor air
$ esf: external exposure indoor shielding factor
$ ssf: submersion indoor shielding factor

$MEI03  Frenchman's cabin
333528,4810277, 2015  1  2015  12   1957         [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
0.0  24.0  365  1.0  1.0  1.0  1.0  1.0 1.0 1.0 1.0         [fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i),
ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)

$ nsim: number of Monte Carlo simulations - set nsim=0 for no monthe carlo sampling
$ srand: random number seed
0  -23432         [nsim,srand]
$ fileu: uncertainty parameter definitions - Read only if nsim>0
$ fileu: uncertainty parameter definitions - Read only if nsim>0
'../distributions.par'                                      [fileu]
'../../dcfs/dcfuncert.dat'
$ END
```

Nobel Gas Parameter Definition File (Input)

```
$ Title
'DOSEMM run for 2015 ASER - nobel gas releases from INTEC'   [title]
$ debug: turn on/off debug output
$ lgame: turn on/off lgame output
.FALSE.    .FALSE.   NONE              [debug lgame]
$ Grid parameters
$ nx: number of nodes in EW direction
$ ny: number of nodes in NS direction
$ dx: node spacing
$ xsw: UTME coordinate of SW corner of domain
$ ysw: UTMN coordinate of SW corner of domain
$ ndiscrete: number of discrete receptors
120  100  2000  255000 4725000  36   [nx,ny,dx,xsw,ysw,ndiscrete]
$ repeat for each discrete receptor
341316 , 4827515    1 BEA-TRA
343508 , 4825927    2 BEA-CPP
335063 , 4818552    3 BEA-RWMC
```

```
339762 , 4822062    4 BEA-VAN B
416371 , 4818571    5 BEA-IRC
391668 , 4782760    6 BEA-BLKFT
360950 , 4857752    7 BEA-SMC
358520 , 4848894    8 BEA-GATE 4
352512 , 4820235    9 BEA-ARA
337640 , 4823710   10 BEA-REST
414380 , 4818193   11 BEA-IF
345564 , 4834399   12 BEA-NRF
341727 , 4828168   13 BEA-RTC
337858 , 4819578   14 BEA-EBR 1
366673 , 4828121   15 BEA-MFC
440759 , 4860651   16 BEA-SUGAR
348964 , 4823312   17 BEA-PBF
344158 , 4826806   18 BEA-INTEC
342602 , 4821788   19 BEA-CFA
346110 , 4829754   20 BEA-EFS
292750 , 4815336   21 BEA-CRATERS
339764 , 4822062   22 ESER-VAN
292751 , 4815336   23 ESER-CRA
314683 , 4832742   24 ESER-ARC
440759 , 4860651   25 ESER-SUG
414376 , 4818191   26 ESER-IDA
401640 , 4892296   27 ESER-DUB
376885 , 4874727   28 ESER-MON
375764 , 4823554   29 ESER-FAA
346614 , 4819341   30 ESER-MAI
346114 , 4829751   31 ESER-EFS
353080 , 4811691   32 ESER-ATO
391668 , 4782752   33 ESER-MOU
352495 , 4881840   34 ESER-BLU
381307 , 4855031   35 ESER-TER
340891 , 4849794   36 ESER-HOW

$ nsrcs: number of sources
$ nresol:number of subperiods in a year (1,2,3,4,6,12)
$ byear: begining year of simulation
$ npartsize: number of partile size classes
1  12  2015  1              [nsrcs,nresol,byear,npartsize]
$ partsize(npartsize): AMAD particle size (um)
1.0            [partsize(npartsize)]
$ partmod(npartsize): particle size modifiers for resuspension
1.0            [partmod(npartsize)]
$ Source Block Variables Block- These varaibles are repeated for each source
$ srcname(nsrcs): Source name
$ srctype(nsrcs): Type of source (P= point A = Area)
$ partindx(nsrcs): Index to particle size released
$ (utms(nsrcs,j): UTME (j=1) and UTMN(j=2) of the source
$ filechiq(nsrcs): file name for chi/q file
$ filepsiq(nsrcs): file name for psi/q file
$ filerel(nsrcs): file name for releases
$ soption(nsrcs): plotting option: 0=exclude soure from plots, 1=include source in plot
$ End of Source Block
$ Repeat Source Block for Each Source

INTEC    P   1                                          [srcname(nsrcs)] srctype  partindx
343830. 4825807.                                        [utms(nsrcs,1) utms(nsrcs,2)]
'../../chiqvalues/INTEC_con_PM0.out'                            [filechiq(nsrcs)]
'../../chiqvalues/INTEC_dep_PM0.out'                            [filepsiq(nsrcs)]
'../../sourceterm/INTEC-NG.rel'                                 [filerel(nsrcs)]
1                    soption - plotting option                  [soption(nsrcs)]

$ ncontam: number of contaminants -FOR RADON SOURCES, NCONTAM MUST = 1
$ ctype: contaminant type, RA=radionuclide, NR=nonrad, RN=radon
$ norgans: number of organs
2    RA   1                              [ncontam ctype norgans]
$ READ ONLY IF CTYPE=RA
$ organ(norgan): organ names

'Effective'  [organ(norgan)]
$ READ ONLY IF CTYPE=RA
$ dcffile(1..4): dose conversion files for inhalation, ingestion, external, and submersion
'../../infiles/INH.txt'                                 [dcffile(1)]
'../../infiles/ING.txt'                                 [dcffile(2)]
'../../infiles/EXT.txt'                                 [dcffile(3)]
'../../infiles/SUB.txt'                                 [dcffile(4)]
'../../infiles/GRD.txt'                                 [dcffile(5)]
8.3e-2 8.3e-2                   [intcut,extcit] half-life cutoff for inclusion of progeny with parent dcf (years)
$ cname(ncontam): names of contaminants
Kr-85   Ar-41                            [cname(ncontam)]
$ bratio(ncontam):  Branching ratio
0.0  0.0   0.0    0.0    0.0                 [bratio(ncontam)]
$ READ ONLY IF CTYPE=RA
$ adtype(ncontam,nsrcs): inhalation absorption type
$ DCF
D    D    D    D   D                     [adtype(ncontam,nsrcs)] CFA
'../../infiles/NuclideData.dat'          [filenuc]
'../../infiles/ElementData.dat'          [filelement]

$ READ ONLY IF CTYPE<>RN
$ rflt: long term resuspension factor (1.0e-9 from NRC 1975 and 1982 1/m)
$ rfst: short term resuspension factor (1-yr integrated value with intial value of 1e-5 (2.0E-6 1/m)
$ thkres: soil thickness for resuspension
$ thklch: soil thickness for leaching
```

```
$ infil: infiltration rate (m/yr)
$ theta: moisture content see RESRAD calculations
$ strc: short term resuspension time function (NRC half-time value of ~1-year yields 0.6769 1/yr)
$ rho: bulk density (g/cc)
$ aws: average wind speed (m/s)
1.0e-9    2.0e-6   0.03    0.15   0.10  0.2  0.6769  1.4  3.66
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
$ READ ONLY IF CTYPE<>RN and FMODEL=CAP88
$    dd1: Fraction of radioactivity retained on leafy vegetables and produce after washing. (0.50)
$    fsubg: Fraction of produce grown in garden of interest (1.00)
$    fsubl: Fraction of leafy vegetables grown in garden of interest (1.00)
$    fsubp: Fraction of year animals graze on pasture (0.40)
$    fsubs: Fraction of daily feed that is pasture grass when animal grazes on pasture (0.43)
$    lamw: Removal rate for weathering from plants, d-1 (10-d half life = 0.0029 hr-1 = 0.0696 d-1 [cap88 default])
$    p: Effective surface density of soil kg/m2 (215.00)
$ 0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0          [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]

$    qsubf: Consumption rate of contaminated feed or forage by an animal (dry wt), kg/da (15.60)
$    r1: Fallout interception fraction (pasture) (0.57)
$    r2: Fallout interception fraction (vegetables) (0.2)
$    th1: Time delay-ingestion of pasture grass by animals, days (0.00)
$    th2: Time delay-ingestion of stored feed by animals, days (90 days, 2,160.00 hrs)
$    th3: Time delay-ingestion of leafy vegetables by man, days (14 days 336.00 hrs)
$    th4: Time delay-ingestion of produce by man, days (14 days, 336.00 hr)
$ 15.6 0.57, 0.2, 0.0, 90, 14, 14          [qsubf,r1,r2,th1,th2,th3,th4]
$ Note: CAP88 default parameters are in CAP88Def.FAC in the CAP88-3.0 directory
$    tsubB: Buildup time in soil, years (100 yrs, 876,000.00 hrs)
$    tsubE1: Period of exposure (grassy pasture), days (30 days, 720.00 hr)
$    tsubE2: Period of exposure (crops/leafy vegetables),  days (60 days, 1,440.00 hr)
$    tsubF: Transport time: animal feed-millk-man, d (2.00)
$    tsubS: Average time from slaughter of meat animal to consumption, d (20.00)
$    tsubW: Time over which wild game is consumed (days)
$    ysubV1: Productivity: agriculture (grass-cow-milk-man pathway), kg/m2 (0.28) dry wt
$    ysubV2: Productivity: produce and leafy vegetables (wet), kg/m2 (0.716)
$    ysubV3: Productivity: produce and other vegetables (wet), kg/m2 (0.57)
$ 0. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.57          [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]

$    absH: absolute humidity, g/m3, (8 g/m3)
$    concC: atmospheric concentration of carbon, g/m3 (0.18 g/m3)
$    fw: fraction of veg that is water (0.97 -assumed)
$    fc fraction of veg that is carbon (0.105 - derived from Till and Meyer, Table 9.2)
$    fwb: fraction of beef that is water (0.97 - assumed)
$    fwm: fraction of milk that is water (1.0 - assumed)
$    fcb: fraction of beef that is carbon (0.25 - derived from Till and Meyer, Table 9.2)
$    fcm: fraction of milk that is carbon (0.07 - derived from Till and Meyer, Table 9.2)
$ 8.0, 0.18, 0.97, 0.105 0.97, 1.0, 0.25, 0.07   [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
$ END READ ONLY IF CTYPE<>RN AND FMODEL=CAP88

$ READ ONLY IF CTYPE=RN
$ lambdaE: fractional air exchange of building with outdoors  (1/s)
$         Murry and Burmaster 1995 give a range of 0.14(5th p) - 1.38(95th p) with a median of 0.4 h-1
$         Killough used the median value ([0.4 1/h]/3600 s = 1.11E-4 1/s)
$ dbar: diameter corresponding to mean surface area of condensation nuclei (m)
$       NCRP (1984) gives Dbar - 0.125 um as a typical average
$ vbar: average velocity of unattached RaA ions (m/s)  NCRP 1984 gives a value of 1.38E2 m/s
$ cnuc: concentration of condensation nuclei indoors (nuclei/m**3)
$       NCRP 1984 gives typical range of 15000-120000 nucleu/cc. Killough uses 3E10 nuclei/m**3 (30000 nuclei/cc)
$ vunatt: deposition vel for plateout of unattached RaA on interior surfaces (m/s).
$       Knutson 1988 gives 8 m/hr (2.22E-3 m/s)
$ vatt:   deposition vel for plateout of attached RaA on interior surfaces
$       Knutson 1988 gives 0.2 m/hr (5.55E-5 1/s)
$ stvol: indoor surface to volume ratio (1.0 to 3.0 1/m. Killough used 2.0 1/m)
$ 1.11e-4  1.25E-7  138. 3.0E10  2.22E-3  5.55E-5  2.0               [lambdaE Dbar vbar cnuc vunatt vatt
stvol]
$ END OF READ ONLUT IF CTYPE=RN

$ coption(ncontam): Contaminant plot option, 0= no plot, 1=plot
0   0  0 0 0                                    [coption(ncontam)]
$ Type of plot - Set to 0 to not plot, 1 to plot
$ poption(1) = plot tic
$ poption(2) = plot average concentration
$ poption(3) = plot deposition
0 0 0                                                  [poption(i),i=1,3]
$ cf(4):  conversion factors for output
$        cf(1) cf for tic and avg conc
$        cf(2) cf for deposition and soil concentration, set to 2.22E7 for pCi/g in 0-3 cm layer assuming rho=1.5 g/cc
$        cf(3) cf for vegtables
$        cf(4) df for milk
$        cf(5) cf for meat and wild game
$        cf(6) cf for deposition and subsurface soil concentration, set to 4.44e6 for pCi/g in 0-15 cm layer assuming
rho=1.5 g/cc

1.0e12  'pCi/m3'                                        [cf(1)] air concentration
4.46e6  'pCi/g'                                          [cf(2)] annual deposition
converted to conc in 0-15 cm layer
1.0e12  'pCi/m2'                                         [cf(3)] surface soil
concentration
1.0e12  'pCi/kg'                                        [cf(4)] veg concentrations
1.0e12  'pCi/L'                                         [cf(5)] milk concentrations
1.0e12  'pCi/kg'                                        [cf(6)] beef and wild game
concentrations
1.0e12  'pCi/m2'                                         [cf(7)] subsurface soil
concentrations
```

```
$ READ ONLY IF ORGAN(1)<=>NONE
$ fileexp: receptor intake rates
'../../infiles/refperson_intakes.dat'                                          [fileexp]
1                          nrecept
$ utmr(nrecept,1), utmr(nrecept,2): UTM East (1) and UTM North (2) coordinates of source
$ syr(nrecept): start year of exposure (year)
$ spr(nrecept): starting sub-period
$ eyr(nrecept): end year of exposure period (year)
$ epr(nrecept): ending sub-period
$ yob(nrecept): year of birth
$ fi(nrecept): fraction of time spent indoors
$ ef(nrecept): exposure frequency (h/d)
$ et(nrecept): exposure time (d/yr)
$ inhm(nrecept): inhalation rate modifying factor (inhalation rate in m**3/hr)
$ ingsm(nrecept): soil ingestion modification factor (soil ingestion in g/d)
$ ingvm(nrecept): vegetable ingestion modification factor
$ ingbm(nrecept): beef ingestion modification factor
$ ingmm(nrecept): milk ingestion modification factor
$ ingwm(nrecept): wild game ingestion modification factor
$ cindoor(nrecept): ratio of indoor to outdoor air
$ esf: external exposure indoor shielding factor
$ ssf: submersion indoor shielding factor


$MEI03  Frenchman's cabin
333528,4810277, 2015  1  2015  12   1957      [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
0.0  24.0  365  1.0    1.0  1.0  1.0  1.0 1.0 1.0 1.0 1.0        [fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i),
ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
$ nsim: number of Monte Carlo simulations - set nsim=0 for no monthe carlo sampling
$ srand: random number seed
0  -23432          [nsim,srand]
$ fileu: uncertainty parameter definitions - Read only if nsim>0
$ fileu: uncertainty parameter definitions - Read only if nsim>0
'../distributions.par'                            [fileu]
'../../dcfs/dcfuncert.dat'
$ END
```

Particulate Output File

```
    **************************************************
    *      This output was produced by the model:    *
    *                                                 *
    *                  DOSEMM                          *
    *                                                 *
    *    Dose Multi Media. A numerical model for       *
    *    multi-media assessment of dose from           *
    *    atmospheric releases. Pathways include direct *
    *    inhalation, resuspension, soil ingestion,     *
    *    vegetable, milk, and meat ingestion, external,*
    *    and submersion doses. Fortran 95 Ver          *
    *              Version date:                       *
    *                190429                            *
    *              Arthur S. Rood                      *
    *        K-Spar Inc. 4835 W Foxtrail Lane          *
    *          Idaho Falls, ID 83402                   *
    *                asr@kspar.net                     *
    **************************************************
 Date: 05/22/2019 Time: 07:35:40.889
 Input File: particulate.par
----------------------------------------------------------------------
        START OF PARAMETER DEFINITION FILE
----------------------------------------------------------------------
'DOSEMM run for 2015 ASER - Particulate releases from INTEC'   [title]
.FALSE.   .FALSE.   SFOOD         [debug lgame]
120  100  2000  255000 4725000  36  UTM  12  [nx,ny,dx,xsw,ysw,ndiscrete,gtype,utmzone]
341316, 4827515    1 BEA-TRA
343508, 4825927    2 BEA-CPP
335063, 4818552    3 BEA-RWMC
339762, 4822062    4 BEA-VAN B
416371, 4818571    5 BEA-IRC
391668, 4782760    6 BEA-BLKFT
360950, 4857752    7 BEA-SMC
358520, 4848894    8 BEA-GATE 4
352512, 4820235    9 BEA-ARA
337640, 4823710   10 BEA-REST
414380, 4818193   11 BEA-IF
345564, 4834399   12 BEA-NRF
341727, 4828168   13 BEA-RTC
337858, 4819578   14 BEA-EBR 1
366673, 4828121   15 BEA-MFC
440759, 4860651   16 BEA-SUGAR
348964, 4823312   17 BEA-PBF
344158, 4826806   18 BEA-INTEC
342602, 4821788   19 BEA-CFA
346110, 4829754   20 BEA-EFS
292750, 4815336   21 BEA-CRATERS
339764, 4822062   22 ESER-VAN
292751, 4815336   23 ESER-CRA
314683, 4832742   24 ESER-ARC
440759, 4860651   25 ESER-SUG
414376, 4818191   26 ESER-IDA
401640, 4892296   27 ESER-DUB
376885, 4874727   28 ESER-MON
375764, 4823554   29 ESER-FAA
346614, 4819341   30 ESER-MAI
```

```
   346114, 4829751   31 ESER-EFS
   353080, 4811691   32 ESER-ATO
   391668, 4782752   33 ESER-MOU
   352495, 4881840   34 ESER-BLU
   381307, 4855031   35 ESER-TER
   340891, 4849794   36 ESER-HOW
 1  12  2015  1                       [nsrcs,nresol,byear,npartsize]
 1           [partsize(npartsize)]
 1.0             [partmod(npartsize)]
 INTEC   P  1                                              [srcname(nsrcs)] srctype  partindx
 343830.  4825807.                                         [utms(nsrcs,1) utms(nsrcs,2)]
 '../../chiqvalues/INTEC_con3y-1um.out'                                [filechiq(nsrcs)]
 '../../chiqvalues/INTEC_dep3y-1um.out'                                [filepsiq(nsrcs)]
 '../../sourceterm/INTEC-Part.rel'                                 [filerel(nsrcs)]
 1                   soption - plotting option              [soption(nsrcs)]
 9    RA   1                          [ncontam ctype norgans]
 'Effective'  [organ(norgan)]
 '../../infiles/INH.txt'                                           [dcffile(1)]
 '../../infiles/ING.txt'                                           [dcffile(2)]
 '../../infiles/EXT.txt'                                           [dcffile(3)]
 '../../infiles/SUB.txt'                                           [dcffile(4)]
 '../../infiles/GRD.txt'                                           [dcffile(5)]
 8.3e-2  8.3e-2                                            [intcut,extcit] half-life cutoff for
inclusion of progeny with parent dcf (years)
 Pu-241 Am-241 Np-237 Cs-137 Pu-238 Pu-239 Pu-240 Sr-90 Co-60                  [cname(ncontam)]
 1.0    1.    0.    0.    0.    0.    0.    0.    0.          [bratio(ncontam)]
 D    D    D    D      D    D  D  D  D      [adtype(ncontam,nsrcs)] CFA
 '../../infiles/NuclideData.dat'           [filenuc]
 '../../infiles/ElementData.dat'           [filelement]
 1.0e-9   2.0e-6   0.03   0.15  0.010  0.2  0.6769  1.4  3.666
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
 0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0      [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]
 15.6 0.57, 0.2, 0.0, 90, 14, 14              [qsubf,r1,r2,th1,th2,th3,th4]
 100. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.716  [tsubB, tsubE1,tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]
 8.0, 0.18, 0.97, 0.105 0.97, 1.0, 0.25, 0.07  [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
 0   0    0    0      0    0 0 0  0                        [coption(ncontam)]
 0 0 0                                               [poption(i),i=1,3]
 1.0e12  'pCi/m3'                                     [cf(1)] air concentration
 1.0e12  'pCi/m2'                                     [cf(2)] annual deposition
converted to conc in 0-15 cm layer
 1.0e12  'pCi/m2'                                     [cf(3)] surface soil
concentration
 1.0e12  'pCi/kg'                                     [cf(4)] veg concentrations
 1.0e12  'pCi/L'                                      [cf(5)] milk concentrations
 1.0e12  'pCi/kg'                                     [cf(6)] beef and wild game
concentrations
 1.0e12   'pCi/m2'                                    [cf(7)] subsurface soil
concentrations
 '../../infiles/refperson_intakes.dat'                                [fileexp]
 1                   nrecept
 333528,4810277, 2015  1  2015  12   1957      [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
 0.0  24.0  365  1.0    1.0  1.0  1.0  1.0 1.0 1.0 1.0 1.0
[fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i), ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
 0   -23432                   [nsim,srand]
------------------------------------------------------------------
        END OF PARAMETER DEFINITION FILE
------------------------------------------------------------------
-----------------------------------------------------------------------------------------------------
Contaminant Data
Radionuclide Half-Life(y)  Progeny     kd(mL/g)    Bv(dw)       Biv(dw)     TcMilk(d/L)  TcMeat(d/kg)
-----------------------------------------------------------------------------------------------------
Pu-241       1.435E+01     Am-241      2.000E+03   1.000E-03    1.000E-03   1.000E-06    1.000E-04
Am-241       4.322E+02     Np-237      2.000E+01   1.000E-03    1.000E-03   2.000E-06    5.000E-05
Np-237       2.144E+06     STABLE      8.000E+00   2.000E-02    2.000E-02   5.000E-06    1.000E-03
Cs-137       3.007E+01     Ba-137m     4.600E+03   4.000E-02    4.000E-02   8.000E-03    3.000E-02
Pu-238       8.770E+01     U-234       2.000E+03   1.000E-03    1.000E-03   1.000E-06    1.000E-04
Pu-239       2.411E+04     STABLE      2.000E+03   1.000E-03    1.000E-03   1.000E-06    1.000E-04
Pu-240       6.563E+03     STABLE      2.000E+03   1.000E-03    1.000E-03   1.000E-06    1.000E-04
Sr-90        2.879E+01     Y-90        3.000E+01   3.000E-01    3.000E-01   2.000E-03    8.000E-03
Co-60        5.270E+00     STABLE      1.000E+03   8.000E-02    8.000E-02   2.000E-03    2.000E-02
-----------------------------------------------------------------------------------------------------
Receptor Node Numbers and Coordinates
Rec  UTME (m) UTMN (m) Node Number
-----------------------------------------------------------------------------------------------------
  1   333528. 4810277. 5080
-----------------------------------------------------------------------------------------------------
 Age-Dependent Intake Rates
 Age (yr)    Inh (m**3/hr)  Soil (g/hr)  LVeg (kg/yr) OVeg (kg/yr) Milk (L/yr)  Meat (kg/yr) Game (kg/yr)
-----------------------------------------------------------------------------------------------------
   0.0        3.650E-01     2.500E-03    1.430E+01    1.773E+01    4.720E+01    3.580E+01    0.000E+00
   1.0        5.620E-01     4.170E-03    2.788E+01    3.246E+01    4.560E+01    3.460E+01    6.380E+01
   5.0        5.350E-01     6.960E-03    3.620E+01    3.516E+01    4.940E+01    3.750E+01    6.580E+01
  10.0        5.530E-01     5.000E-03    4.300E+01    2.938E+01    6.480E+01    4.920E+01    1.059E+02
  15.0        6.230E-01     4.170E-03    4.878E+01    2.231E+01    9.060E+01    6.880E+01    1.059E+02
  20.0        9.170E-01     0.000E+00    1.800E+01    1.760E+02    1.120E+02    8.500E+01    0.000E+00
 120.0        9.170E-01     0.000E+00    1.800E+01    1.760E+02    1.120E+02    8.500E+01    0.000E+00
-----------------------------------------------------------------------------------------------------
------------------------------
 Receptor Exposure Factors
RecNo  Frac_Indoors Exps_Freq   Exps_Time    Inhal_ModFact Soil_ModFact  Veg_ModFact   Meat_ModFact  Milk_ModFact
WGme_ModFact  Air I/O      Ext I/O Fac   Sub I/O Fa!!
       (unitless)   (h/d)       (d/yr)     (unitless)   (unitless)    (unitless)    (unitless)    (unitless)
 (unitless)   (unitless)   (unitless)   (unitless)
```

```
--------------------------------------------------------------------------------------------------
----------------------------------------------
  1    0.000E+00    2.400E+01    3.650E+02    1.000E+00    1.000E+00    1.000E+00    1.000E+00    1.000E+00
1.000E+00    1.000E+00    1.000E+00    1.000E+00
--------------------------------------------------------------------------------
Src   Description  Src_Type  Part_Size (um)  UTME(m)    UTMN(m)
--------------------------------------------------------------------------------
  1    INTEC         P          1.00  343830.0 4825807.0
--------------------------------------------------------------------------------------------------
----------------------------------------------
Chi/Q values for Receptors
Src Rec Dist(m) Bearing(deg) Node_Number Chi/Q (s/m*3) for point srcs, s/m for area sources (period 1..nresol)
--------------------------------------------------------------------------------------------------
----------------------------------------------
  1 1  18636.  213.56      5080     5.423E-08  3.862E-08  5.140E-08  3.456E-08  3.380E-08  3.855E-08  4.469E-08
4.889E-08  3.986E-08  4.695E-08  5.234E-08  7.453E-08
--------------------------------------------------------------------------------------------------
----------------------------
Psi/Q values for Receptors
Src# Rec# Node Number Psi/Q (1/m**2 for point srcs, unitless for area sources (period 1..nresol)
--------------------------------------------------------------------------------------------------
----------------------------
  1 1 5080  6.199E-12  3.591E-12  1.137E-11  1.086E-11  1.754E-11  2.437E-12  6.730E-12  1.446E-11  1.730E-11
9.992E-12  6.296E-12  7.160E-12
--------------------------------------------------------------------------------------------------
----------------------------
 Food Chain Parameters
 -------------------------------------------------------------------------------------------------
Fraction of radioactivity retained on leafy vegetables and produce after washing:  5.000E-01
Fraction of produce grown in garden of interest:                                   1.000E+00
Fraction of leafy vegetables grown in garden of interest:                          1.000E+00
Fraction of year animals graze on pasture:                                         4.000E-01
Fraction of daily feed that is pasture grass when animal grazes on pasture:        4.300E-01
Removal rate for weathering from plants, d-1:                                       6.960E-02
Effective surface density of soil, kg/m2:                                          2.150E+02
Consumption rate of contaminated feed or forage by an animal (dry wt), kg/day:     1.560E+01
Fallout interception fraction, pasture:                                            5.700E-01
Fallout interception fraction (vegetables):                                        2.000E-01
Time delay-ingestion of pasture grass by animals, days:                            0.000E+00
Time delay-ingestion of stored feed by animals, days:                              9.000E+01
Time delay-ingestion of leafy vegetables by man, days:                             1.400E+01
Time delay-ingestion of produce by man, days:                                      1.400E+01
Buildup time in soil, years:                                                       1.000E+02
Period of exposure (grass pasture), days:                                          3.000E+01
Period of exposure (crops/leafy vegetables),  days:                                6.000E+01
Transport time: animal feed-millk-man, days:                                       2.000E+00
Average time from slaughter of meat animal to consumption, days:                   2.000E+01
Time over which wild game is consumed, days:                                        6.000E+01
Productivity: agriculture (grass-cow-milk-man pathway), kg/m2                       2.800E-01
Productivity: produce and leafy vegetables (wet), kg/m2:                            7.160E-01
Productivity: produce and other vegetables (wet), kg/m2:                            7.160E-01
Absolute humidity, g/m3:                                                           8.000E+00
Atmospheric concentration of carbon, g/m3:                                         1.800E-01
Fraction of veg that is water:                                                     9.700E-01
Fraction of veg that is carbon:                                                    1.050E-01
Fraction of beef that is water:                                                    9.700E-01
Fraction of milk that is water:                                                    1.000E+00
Fraction of beef that is carbon:                                                   2.500E-01
Fraction of milk that is carbon:                                                   7.000E-02
----------------------------------------------------------------
Contaminant  Lambda (1/yr)  Surface LR (1/yr)  Subsurface LR (1/yr)
----------------------------------------------------------------
Pu-241      4.830E-02       1.190E-04          2.381E-05
Am-241      1.604E-03       1.182E-02          2.364E-03
Np-237      3.233E-07       2.924E-02          5.848E-03
Cs-137      2.305E-02       5.176E-05          1.035E-05
Pu-238      7.904E-03       1.190E-04          2.381E-05
Pu-239      2.875E-05       1.190E-04          2.381E-05
Pu-240      1.056E-04       1.190E-04          2.381E-05
Sr-90       2.408E-02       7.899E-03          1.580E-03
Co-60       1.315E-01       2.381E-04          4.761E-05
-------------------------------------------------------
Resuspension parameters
-------------------------------------------------------
Short-term resuspension factor (1/m):        2.000E-06
Long-term resuspension factor (1/m):         1.000E-09
Short-term resuspension decay constant (1/yr):  6.769E-01
------------------------------------------------------------------------------------
Ingrowth factors. Fraction of progeny that grow in from parent during dt (years):   8.4931507706642151E-002
 TO >>>>   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Pu-241   0.000E+00  1.359E-04  1.867E-12  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Am-241   0.000E+00  0.000E+00  2.746E-08  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Np-237   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Cs-137   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Pu-238   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Pu-239   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Pu-240   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Sr-90    0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Co-60    0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------------------------------------
Time-Integrated Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
-----------------------------------------------------------------------------------------
2015 1  1   5.039E-06  7.652E-09  2.426E-19  2.589E-05  1.656E-07  3.121E-07  1.642E-07  1.983E-05  4.143E-08
```

```
2015 ALL  1   5.039E-06  7.652E-09  2.426E-19  2.589E-05  1.656E-07  3.121E-07  1.642E-07  1.983E-05  4.143E-08
---------------------------------------------------------------------------------------------------------------
Annual Deposition (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   3.251E-02  4.937E-05  1.565E-15  1.671E-01  1.069E-03  2.014E-03  1.060E-03  1.279E-01  2.673E-04
2015 ALL  1   3.251E-02  4.937E-05  1.565E-15  1.671E-01  1.069E-03  2.014E-03  1.060E-03  1.279E-01  2.673E-04
---------------------------------------------------------------------------------------------------------------
Annual Accumulated Soil Concentration in surface layer (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   3.176E-02  9.958E-05  3.244E-11  1.652E-01  1.065E-03  2.014E-03  1.060E-03  1.260E-01  2.510E-04
2015 ALL  1   3.176E-02  9.958E-05  3.244E-11  1.652E-01  1.065E-03  2.014E-03  1.060E-03  1.260E-01  2.510E-04
---------------------------------------------------------------------------------------------------------------
Time-Integrated Resuspended Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   4.693E-08  1.465E-10  4.837E-17  2.414E-07  1.545E-09  2.913E-09  1.533E-09  1.848E-07  3.845E-10
2015 ALL  1   4.693E-08  1.465E-10  4.837E-17  2.414E-07  1.545E-09  2.913E-09  1.533E-09  1.848E-07  3.845E-10
---------------------------------------------------------------------------------------------------------------
Annual Accumulated Soil Concentration in subsurface layer Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   1.813E-06  5.570E-07  6.153E-13  4.115E-06  6.111E-08  1.157E-07  6.089E-08  4.792E-04  2.831E-08
2015 ALL  1   1.813E-06  5.570E-07  6.153E-13  4.115E-06  6.111E-08  1.157E-07  6.089E-08  4.792E-04  2.831E-08
---------------------------------------------------------------------------------------------------------------
Leafy Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
2015 ALL  1   1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
---------------------------------------------------------------------------------------------------------------
Other Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
2015 ALL  1   1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
---------------------------------------------------------------------------------------------------------------
Milk Concentrations (Ci/L) x cf pCi/L cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   3.525E-08  1.088E-10  9.708E-21  1.607E-03  1.174E-09  2.220E-09  1.168E-09  4.881E-04  5.905E-07
2015 ALL  1   3.525E-08  1.088E-10  9.708E-21  1.607E-03  1.174E-09  2.220E-09  1.168E-09  4.881E-04  5.905E-07
---------------------------------------------------------------------------------------------------------------
Beef Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
---------------------------------------------------------------------------------------------------------------
2015  1   1   3.516E-06  2.719E-09  1.942E-18  6.018E-03  1.173E-07  2.220E-07  1.168E-07  1.950E-03  5.867E-06
2015 ALL  1   3.516E-06  2.719E-09  1.942E-18  6.018E-03  1.173E-07  2.220E-07  1.168E-07  1.950E-03  5.867E-06
 ----------------------------------------------------------------------------------
Dose Conversion Factor Notes
External DCF for Cs-137   includes Ba-137m
External DCF for Sr-90    includes Y-90
Submersion DCF for Cs-137   includes Ba-137m
Ground DCF for Cs-137   includes Ba-137m
Ground DCF for Sr-90      includes Y-90
--------------------------------------------------------------
Inhalation Dose Conversion Factors (rem/Ci)
Rad       Sol AMAD(um) Age           Effective
--------------------------------------------------------------
Pu-241   D   1.0     0             8.510E+06
Pu-241   D   1.0     1             8.510E+06
Pu-241   D   1.0     5             8.510E+06
Pu-241   D   1.0    10             8.510E+06
Pu-241   D   1.0    15             8.510E+06
Pu-241   D   1.0    20             8.510E+06
Am-241   D   1.0     0             3.630E+08
Am-241   D   1.0     1             3.630E+08
Am-241   D   1.0     5             3.630E+08
Am-241   D   1.0    10             3.630E+08
Am-241   D   1.0    15             3.630E+08
Am-241   D   1.0    20             3.630E+08
Np-237   D   1.0     0             1.840E+08
Np-237   D   1.0     1             1.840E+08
Np-237   D   1.0     5             1.840E+08
Np-237   D   1.0    10             1.840E+08
Np-237   D   1.0    15             1.840E+08
Np-237   D   1.0    20             1.840E+08
Cs-137   D   1.0     0             1.543E+05
Cs-137   D   1.0     1             1.543E+05
Cs-137   D   1.0     5             1.543E+05
Cs-137   D   1.0    10             1.543E+05
Cs-137   D   1.0    15             1.543E+05
Cs-137   D   1.0    20             1.543E+05
Pu-238   D   1.0     0             4.070E+08
Pu-238   D   1.0     1             4.070E+08
Pu-238   D   1.0     5             4.070E+08
Pu-238   D   1.0    10             4.070E+08
Pu-238   D   1.0    15             4.070E+08
Pu-238   D   1.0    20             4.070E+08
Pu-239   D   1.0     0             4.477E+08
Pu-239   D   1.0     1             4.477E+08
Pu-239   D   1.0     5             4.477E+08
Pu-239   D   1.0    10             4.477E+08
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Pu-239   D   1.0    15          4.477E+08
Pu-239   D   1.0    20          4.477E+08
Pu-240   D   1.0     0          4.477E+08
Pu-240   D   1.0     1          4.477E+08
Pu-240   D   1.0     5          4.477E+08
Pu-240   D   1.0    10          4.477E+08
Pu-240   D   1.0    15          4.477E+08
Pu-240   D   1.0    20          4.477E+08
Sr-90    D   1.0     0          6.068E+05
Sr-90    D   1.0     1          6.068E+05
Sr-90    D   1.0     5          6.068E+05
Sr-90    D   1.0    10          6.068E+05
Sr-90    D   1.0    15          6.068E+05
Sr-90    D   1.0    20          6.068E+05
Co-60    D   1.0     0          1.229E+05
Co-60    D   1.0     1          1.229E+05
Co-60    D   1.0     5          1.221E+05
Co-60    D   1.0    10          1.221E+05
Co-60    D   1.0    15          1.221E+05
Co-60    D   1.0    20          1.221E+05
---------------------------------------
Ingestion Dose Conversion Factors (rem/Ci)
Rad            Age            Effective
---------------------------------------
Pu-241          0             1.760E+04
Pu-241          1             1.760E+04
Pu-241          5             1.760E+04
Pu-241         10             1.760E+04
Pu-241         15             1.760E+04
Pu-241         20             1.760E+04
Am-241          0             7.550E+05
Am-241          1             7.550E+05
Am-241          5             7.550E+05
Am-241         10             7.550E+05
Am-241         15             7.550E+05
Am-241         20             7.550E+05
Np-237          0             3.960E+05
Np-237          1             3.960E+05
Np-237          5             3.960E+05
Np-237         10             3.960E+05
Np-237         15             3.960E+05
Np-237         20             3.960E+05
Cs-137          0             5.020E+04
Cs-137          1             5.020E+04
Cs-137          5             5.020E+04
Cs-137         10             5.020E+04
Cs-137         15             5.020E+04
Cs-137         20             5.020E+04
Pu-238          0             8.440E+05
Pu-238          1             8.440E+05
Pu-238          5             8.440E+05
Pu-238         10             8.440E+05
Pu-238         15             8.440E+05
Pu-238         20             8.440E+05
Pu-239          0             9.280E+05
Pu-239          1             9.280E+05
Pu-239          5             9.280E+05
Pu-239         10             9.280E+05
Pu-239         15             9.280E+05
Pu-239         20             9.280E+05
Pu-240          0             9.280E+05
Pu-240          1             9.280E+05
Pu-240          5             9.280E+05
Pu-240         10             9.280E+05
Pu-240         15             9.280E+05
Pu-240         20             9.280E+05
Sr-90           0             1.020E+05
Sr-90           1             1.020E+05
Sr-90           5             1.020E+05
Sr-90          10             1.020E+05
Sr-90          15             1.020E+05
Sr-90          20             1.020E+05
Co-60           0             1.260E+04
Co-60           1             1.260E+04
Co-60           5             1.260E+04
Co-60          10             1.260E+04
Co-60          15             1.260E+04
Co-60          20             1.260E+04
---------------------------------------
External Dose Conversion Factors (rem-m**2/(Ci-s))
Rad            Age            Effective
---------------------------------------
Pu-241          0             6.370E-09
Pu-241          1             6.370E-09
Pu-241          5             6.370E-09
Pu-241         10             6.370E-09
Pu-241         15             6.370E-09
Pu-241         20             6.370E-09
Am-241          0             8.630E-05
Am-241          1             8.630E-05
Am-241          5             8.630E-05
Am-241         10             8.630E-05
Am-241         15             8.630E-05
Am-241         20             8.630E-05
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Np-237          0              9.320E-05
Np-237          1              9.320E-05
Np-237          5              9.320E-05
Np-237         10              9.320E-05
Np-237         15              9.320E-05
Np-237         20              9.320E-05
Cs-137          0              2.036E-03
Cs-137          1              2.036E-03
Cs-137          5              2.036E-03
Cs-137         10              2.036E-03
Cs-137         15              2.036E-03
Cs-137         20              2.036E-03
Pu-238          0              2.320E-06
Pu-238          1              2.320E-06
Pu-238          5              2.320E-06
Pu-238         10              2.320E-06
Pu-238         15              2.320E-06
Pu-238         20              2.320E-06
Pu-239          0              1.050E-06
Pu-239          1              1.050E-06
Pu-239          5              1.050E-06
Pu-239         10              1.050E-06
Pu-239         15              1.050E-06
Pu-239         20              1.050E-06
Pu-240          0              2.230E-06
Pu-240          1              2.230E-06
Pu-240          5              2.230E-06
Pu-240         10              2.230E-06
Pu-240         15              2.230E-06
Pu-240         20              2.230E-06
Sr-90           0              4.121E-04
Sr-90           1              4.121E-04
Sr-90           5              4.121E-04
Sr-90          10              4.121E-04
Sr-90          15              4.121E-04
Sr-90          20              4.121E-04
Co-60           0              8.510E-03
Co-60           1              8.510E-03
Co-60           5              8.510E-03
Co-60          10              8.510E-03
Co-60          15              8.510E-03
Co-60          20              8.510E-03
----------------------------------------
Submersion Dose Conversion Factors (rem-m**3/(Ci-s))
Rad             Age            Effective
----------------------------------------
Pu-241          0              2.350E-07
Pu-241          1              2.350E-07
Pu-241          5              2.350E-07
Pu-241         10              2.350E-07
Pu-241         15              2.350E-07
Pu-241         20              2.350E-07
Am-241          0              2.510E-03
Am-241          1              2.510E-03
Am-241          5              2.510E-03
Am-241         10              2.510E-03
Am-241         15              2.510E-03
Am-241         20              2.510E-03
Np-237          0              3.290E-03
Np-237          1              3.290E-03
Np-237          5              3.290E-03
Np-237         10              3.290E-03
Np-237         15              3.290E-03
Np-237         20              3.290E-03
Cs-137          0              9.456E-02
Cs-137          1              9.456E-02
Cs-137          5              9.456E-02
Cs-137         10              9.456E-02
Cs-137         15              9.456E-02
Cs-137         20              9.456E-02
Pu-238          0              1.300E-05
Pu-238          1              1.300E-05
Pu-238          5              1.300E-05
Pu-238         10              1.300E-05
Pu-238         15              1.300E-05
Pu-238         20              1.300E-05
Pu-239          0              1.290E-05
Pu-239          1              1.290E-05
Pu-239          5              1.290E-05
Pu-239         10              1.290E-05
Pu-239         15              1.290E-05
Pu-239         20              1.290E-05
Pu-240          0              1.270E-05
Pu-240          1              1.270E-05
Pu-240          5              1.270E-05
Pu-240         10              1.270E-05
Pu-240         15              1.270E-05
Pu-240         20              1.270E-05
Sr-90           0              3.650E-04
Sr-90           1              3.650E-04
Sr-90           5              3.650E-04
Sr-90          10              3.650E-04
Sr-90          15              3.650E-04
Sr-90          20              3.650E-04
```

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Co-60       0              4.400E-01
Co-60       1              4.400E-01
Co-60       5              4.400E-01
Co-60      10              4.400E-01
Co-60      15              4.400E-01
Co-60      20              4.400E-01
--------------------------------------
Soil Vol Dose Conversion Factors (rem-m**3/(Ci-s))
Rad          Age           Effective
--------------------------------------
Pu-241       0              1.050E-10
Pu-241       1              1.050E-10
Pu-241       5              1.050E-10
Pu-241      10              1.050E-10
Pu-241      15              1.050E-10
Pu-241      20              1.050E-10
Am-241       0              7.360E-07
Am-241       1              7.360E-07
Am-241       5              7.360E-07
Am-241      10              7.360E-07
Am-241      15              7.360E-07
Am-241      20              7.360E-07
Np-237       0              1.380E-06
Np-237       1              1.380E-06
Np-237       5              1.380E-06
Np-237      10              1.380E-06
Np-237      15              1.380E-06
Np-237      20              1.380E-06
Cs-137       0              6.340E-05
Cs-137       1              6.340E-05
Cs-137       5              6.340E-05
Cs-137      10              6.340E-05
Cs-137      15              6.340E-05
Cs-137      20              6.340E-05
Pu-238       0              2.310E-09
Pu-238       1              2.310E-09
Pu-238       5              2.310E-09
Pu-238      10              2.310E-09
Pu-238      15              2.310E-09
Pu-238      20              2.310E-09
Pu-239       0              5.220E-09
Pu-239       1              5.220E-09
Pu-239       5              5.220E-09
Pu-239      10              5.220E-09
Pu-239      15              5.220E-09
Pu-239      20              5.220E-09
Pu-240       0              2.230E-09
Pu-240       1              2.230E-09
Pu-240       5              2.230E-09
Pu-240      10              2.230E-09
Pu-240      15              2.230E-09
Pu-240      20              2.230E-09
Sr-90        0              8.088E-07
Sr-90        1              8.088E-07
Sr-90        5              8.088E-07
Sr-90       10              8.088E-07
Sr-90       15              8.088E-07
Sr-90       20              8.088E-07
Co-60        0              3.050E-04
Co-60        1              3.050E-04
Co-60        5              3.050E-04
Co-60       10              3.050E-04
Co-60       15              3.050E-04
Co-60       20              3.050E-04
------------------------------------------------------------------------------------------------------------
-----------
Inhalation Dose from direct emissions (rem)
Year     Organ     Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1   3.445E-07  2.231E-08  3.586E-19  3.210E-08  5.415E-07  1.123E-06  5.906E-07  9.665E-08
4.064E-11  2.750E-06
All  Effective      1   3.445E-07  2.231E-08  3.586E-19  3.210E-08  5.415E-07  1.123E-06  5.906E-07  9.665E-08
4.064E-11  2.750E-06
------------------------------------------------------------------------------------------------------------
-----------
Inhalation Dose from resuspension (rem)
Year     Organ     Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1   3.208E-09  4.271E-10  7.149E-17  2.992E-10  5.052E-09  1.048E-08  5.512E-09  9.008E-10
3.771E-13  2.587E-08
All  Effective      1   3.208E-09  4.271E-10  7.149E-17  2.992E-10  5.052E-09  1.048E-08  5.512E-09  9.008E-10
3.771E-13  2.587E-08
------------------------------------------------------------------------------------------------------------
-----------
Soil Ingestion Doses (rem)
Year     Organ     Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
------------------------------------------------------------------------------------------------------------
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2015 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
---------------------------------------------------------------------------------------------------------------
-----------
Leafy Vegetable Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  5.654E-11  3.920E-12  1.642E-22  1.912E-09  9.306E-11  1.977E-10  1.040E-10  1.365E-08
4.956E-13  1.601E-08
All  Effective      1  5.654E-11  3.920E-12  1.642E-22  1.912E-09  9.306E-11  1.977E-10  1.040E-10  1.365E-08
4.956E-13  1.601E-08
---------------------------------------------------------------------------------------------------------------
-----------
Other Vegetable Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  5.528E-10  3.833E-11  1.606E-21  1.869E-08  9.099E-10  1.933E-09  1.017E-09  1.334E-07
4.846E-12  1.566E-07
All  Effective      1  5.528E-10  3.833E-11  1.606E-21  1.869E-08  9.099E-10  1.933E-09  1.017E-09  1.334E-07
4.846E-12  1.566E-07
---------------------------------------------------------------------------------------------------------------
-----------
Beef Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  5.261E-12  1.745E-13  6.535E-23  2.568E-08  8.416E-12  1.751E-11  9.214E-12  1.691E-08
6.284E-12  4.263E-08
All  Effective      1  5.261E-12  1.745E-13  6.535E-23  2.568E-08  8.416E-12  1.751E-11  9.214E-12  1.691E-08
6.284E-12  4.263E-08
---------------------------------------------------------------------------------------------------------------
-----------
Milk Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  6.948E-14  9.197E-15  4.306E-25  9.033E-09  1.109E-13  2.308E-13  1.214E-13  5.576E-09
8.333E-13  1.461E-08
All  Effective      1  6.948E-14  9.197E-15  4.306E-25  9.033E-09  1.109E-13  2.308E-13  1.214E-13  5.576E-09
8.333E-13  1.461E-08
---------------------------------------------------------------------------------------------------------------
-----------
External Exposure Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  6.381E-15  2.711E-13  9.553E-20  1.061E-08  7.789E-14  6.668E-14  7.451E-14  1.637E-09
6.736E-11  1.231E-08
All  Effective      1  6.381E-15  2.711E-13  9.553E-20  1.061E-08  7.789E-14  6.668E-14  7.451E-14  1.637E-09
6.736E-11  1.231E-08
---------------------------------------------------------------------------------------------------------------
-----------
Submersion Exposure Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  3.734E-17  6.057E-16  2.517E-26  7.722E-11  6.790E-17  1.270E-16  6.578E-17  2.282E-13
5.749E-13  7.803E-11
All  Effective      1  3.734E-17  6.057E-16  2.517E-26  7.722E-11  6.790E-17  1.270E-16  6.578E-17  2.282E-13
5.749E-13  7.803E-11
---------------------------------------------------------------------------------------------------------------
-----------
All Pathway Doses (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
---------------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  3.483E-07  2.278E-08  7.194E-17  9.840E-08  5.476E-07  1.135E-06  5.973E-07  2.688E-07
1.214E-10  3.018E-06
All  Effective      1  3.483E-07  2.278E-08  7.194E-17  9.840E-08  5.476E-07  1.135E-06  5.973E-07  2.688E-07
1.214E-10  3.018E-06
 Successful Execution of DOSEMM
 Execution Time   0.34720499999999999        seconds
```

H-3 and C-14 Output File

```
 *************************************************
 *     This output was produced by the model:    *
 *                                                *
 *                  DOSEMM                         *
 *                                                *
 *    Dose Multi Media. A numerical model for      *
 *    multi-media assessment of dose from          *
 *    atmospheric releases. Pathways include direct *
 *    inhalation, resuspension, soil ingestion,    *
```

```
  *    vegetable, milk, and meat ingestion, external,*
  *    and submersion doses. Fortran 95 Ver          *
  *                    Version date:                  *
  *                       190429                      *
  *                   Arthur S. Rood                  *
  *           K-Spar Inc. 4835 W Foxtrail Lane        *
  *              Idaho Falls, ID 83402                *
  *                    asr@kspar.net                  *
  ***************************************************
 Date: 05/22/2019 Time: 07:35:17.594
 Input File: h3c14.par
 ----------------------------------------------------------------------
        START OF PARAMETER DEFINITION FILE
 ----------------------------------------------------------------------
 'DOSEMM run for 2015 ASER - H-3 and C-14 releases from INTEC'   [title]
 .FALSE.   .FALSE.  SFOOD              [debug lgame]
 120  100  2000  255000 4725000  36  UTM  12  [nx,ny,dx,xsw,ysw,ndiscrete,gtype,utmzone]
 341316 , 4827515    1 BEA-TRA
 343508 , 4825927    2 BEA-CPP
 335063 , 4818552    3 BEA-RWMC
 339762 , 4822062    4 BEA-VAN B
 416371 , 4818571    5 BEA-IRC
 391668 , 4782760    6 BEA-BLKFT
 360950 , 4857752    7 BEA-SMC
 358520 , 4848894    8 BEA-GATE 4
 352512 , 4820235    9 BEA-ARA
 337640 , 4823710   10 BEA-REST
 414380 , 4818193   11 BEA-IF
 345564 , 4834399   12 BEA-NRF
 341727 , 4828168   13 BEA-RTC
 337858 , 4819578   14 BEA-EBR 1
 366673 , 4828121   15 BEA-MFC
 440759 , 4860651   16 BEA-SUGAR
 348964 , 4823312   17 BEA-PBF
 344158 , 4826806   18 BEA-INTEC
 342602 , 4821788   19 BEA-CFA
 346110 , 4829754   20 BEA-EFS
 292750 , 4815336   21 BEA-CRATERS
 339764 , 4822062   22 ESER-VAN
 292751 , 4815336   23 ESER-CRA
 314683 , 4832742   24 ESER-ARC
 440759 , 4860651   25 ESER-SUG
 414376 , 4818191   26 ESER-IDA
 401640 , 4892296   27 ESER-DUB
 376885 , 4874727   28 ESER-MON
 375764 , 4823554   29 ESER-FAA
 346614 , 4819341   30 ESER-MAI
 346114 , 4829751   31 ESER-EFS
 353080 , 4811691   32 ESER-ATO
 391668 , 4782752   33 ESER-MOU
 352495 , 4881840   34 ESER-BLU
 381307 , 4855031   35 ESER-TER
 340891 , 4849794   36 ESER-HOW
 1  12  2015  1           [nsrcs,nresol,byear,npartsize]
 1.0             [partsize(npartsize)]
 1.0             [partmod(npartsize)]
 INTEC     P   1                                         [srcname(nsrcs)] srctype  partindx
 343830.  4825807.                               [utms(nsrcs,1) utms(nsrcs,2)]
 '../../chiqvalues/INTEC_con_PM0.out'                        [filechiq(nsrcs)]
 '../../chiqvalues/INTEC_dep_PM0.out'                        [filepsiq(nsrcs)]
 '../../sourceterm/INTEC-H3C14.rel'                          [filerel(nsrcs)]
 1                  soption - plotting option              [soption(nsrcs)]
 2    RA   1                        [ncontam ctype norgans]
 'Effective'  [organ(norgan)]
 '../../infiles/INH.txt'                             [dcffile(1)]
 '../../infiles/ING.txt'                             [dcffile(2)]
 '../../infiles/EXT.txt'                             [dcffile(3)]
 '../../infiles/SUB.txt'                             [dcffile(4)]
 '../../infiles/GRD.txt'                             [dcffile(5)]
 8.3e-2  8.3e-2                   [intcut,extcit] half-life cutoff for inclusion of progeny with parent dcf
 (years)
 H-3   C-14                            [cname(ncontam)]
 0.0   0.0            [bratio(ncontam)]
 D    D                  [adtype(ncontam,nsrcs)] CFA
 '../../infiles/NuclideData.dat'         [filenuc]
 '../../infiles/ElementData.dat'         [filelement]
 1.0e-9   2.0e-6   0.03   0.15   0.10  0.2  0.6769  1.4  4.0
 [rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
 0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0        [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]
 15.6 0.57, 0.2, 0.0, 90, 14, 14             [qsubf,r1,r2,th1,th2,th3,th4]
 0. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.57       [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]
 4.9, 0.18, 0.824, 0.339 0.623, 1.0, 0.23, 0.169   [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
 0   0                                   [coption(ncontam)]
 0 0 0                                              [poption(i),i=1,3]
 1.0e12  'pCi/m3'                               [cf(1)] air concentration
 4.46e6  'pCi/g'                                  [cf(2)] annual deposition converted to conc in 0-15 cm
 layer
 1.0e12  'pCi/m2'                               [cf(3)] surface soil concentration
 1.0e12  'pCi/kg'                              [cf(4)] veg concentrations
 1.0e12  'pCi/L'                               [cf(5)] milk concentrations
 1.0e12  'pCi/kg'                              [cf(6)] beef and wild game concentrations
 1.0e12  'pCi/m2'                               [cf(7)] subsurface soil concentrations
 '../../infiles/refperson_intakes.dat'                                [fileexp]
 1                          nrecept
```

```
 333528,4810277, 2015  1  2015  12    1957        [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
 0.0  24.0  365  1.0   1.0  1.0  1.0  1.0 1.0 1.0 1.0
[fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i), ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
 0  -23432              [nsim,srand]
 ----------------------------------------------------------------------
         END OF PARAMETER DEFINITION FILE
 ----------------------------------------------------------------------
 ----------------------------------------------------------------------------------------------------
Contaminant Data
Radionuclide Half-Life(y)  Progeny     kd(mL/g)    Bv(dw)       Biv(dw)      TcMilk(d/L) TcMeat(d/kg)
 ----------------------------------------------------------------------------------------------------

H-3           1.233E+01   STABLE      0.000E+00   0.000E+00   0.000E+00    0.000E+00   0.000E+00
C-14          5.730E+03   STABLE      0.000E+00   0.000E+00   0.000E+00    0.000E+00   0.000E+00
 ---------------------------------------------------------------------------------
 Receptor Node Numbers and Coordinates
 Rec  UTME (m) UTMN (m) Node Number
 ---------------------------------------------------------------------------------
  1  333528.  4810277.  5080
 -----------------------------------------------------------------------------------------
 Age-Dependent Intake Rates
 Age (yr)    Inh (m**3/hr)  Soil (g/hr)  LVeg (kg/yr) OVeg (kg/yr) Milk (L/yr)  Meat (kg/yr) Game (kg/yr)
 -----------------------------------------------------------------------------------------------------

  0.0        3.650E-01    2.500E-03    1.430E+01    1.773E+01    4.720E+01    3.580E+01    0.000E+00
  1.0        5.620E-01    4.170E-03    2.788E+01    3.246E+01    4.560E+01    3.460E+01    6.380E+01
  5.0        5.350E-01    6.960E-03    3.620E+01    3.516E+01    4.940E+01    3.750E+01    6.580E+01
 10.0        5.530E-01    5.000E-03    4.300E+01    2.938E+01    6.480E+01    4.920E+01    1.059E+02
 15.0        6.230E-01    4.170E-03    4.878E+01    2.231E+01    9.060E+01    6.880E+01    1.059E+02
 20.0        9.170E-01    0.000E+00    1.800E+01    1.760E+02    1.120E+02    8.500E+01    0.000E+00
120.0        9.170E-01    0.000E+00    1.800E+01    1.760E+02    1.120E+02    8.500E+01    0.000E+00
 ----------------------------------------------------------------------------------------------------
-----------------------------
Receptor Exposure Factors
RecNo  Frac_Indoors  Exps_Freq     Exps_Time    Inhal_ModFact Soil_ModFact  Veg_ModFact   Meat_ModFact  Milk_ModFact
WGme_ModFact  Air I/O      Ext I/O Fac   Sub I/O Fa!!
        (unitless)    (h/d)         (d/yr)       (unitless)    (unitless)    (unitless)    (unitless)    (unitless)
(unitless)   (unitless)    (unitless)    (unitless)
 ----------------------------------------------------------------------------------------------------
-----------------------------------------------------
  1   0.000E+00     2.400E+01    3.650E+02   1.000E+00    1.000E+00    1.000E+00    1.000E+00    1.000E+00
1.000E+00    1.000E+00    1.000E+00    1.000E+00
 ------------------------------------------------------------------------------------
 Src    Description  Src_Type  Part_Size (um)  UTME (m)    UTMN(m)
 ------------------------------------------------------------------------------------
  1    INTEC         P        1.00   343830.0 4825807.0
 ------------------------------------------------------------------------------------------------------
-----------------------------------------------
 Chi/Q values for Receptors
 Src Rec Dist(m) Bearing(deg) Node_Number Chi/Q (s/m*3) for point srcs, s/m for area sources (period 1..nresol)
 ------------------------------------------------------------------------------------------------------
-----------------------------------------------
  1 1  18636.  213.56        5080    2.917E-08  3.728E-08  1.019E-07  4.683E-08  3.368E-08  5.188E-08  4.307E-08
5.540E-08  4.003E-08  4.737E-08  2.023E-08  8.221E-08
 ------------------------------------------------------------------------------------------------------
-----------------------------------------------
 Psi/Q values for Receptors
 Src# Rec# Node Number Psi/Q (1/m**2 for point srcs, unitless for area sources (period 1..nresol)
 ------------------------------------------------------------------------------------------------------
-----------------------------
  1  1  5080  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00  0.000E+00
 ------------------------------------------------------------------------------------------------------
-----------------------------
 Food Chain Parameters
 ------------------------------------------------------------------------------------------------------
 Fraction of radioactivity retained on leafy vegetables and produce after washing:  5.000E-01
 Fraction of produce grown in garden of interest:                                   1.000E+00
 Fraction of leafy vegetables grown in garden of interest:                          1.000E+00
 Fraction of year animals graze on pasture:                                         4.000E-01
 Fraction of daily feed that is pasture grass when animal grazes on pasture:        4.300E-01
 Removal rate for weathering from plants, d-1:                                      6.960E-02
 Effective surface density of soil, kg/m2:                                          2.150E+02
 Consumption rate of contaminated feed or forage by an animal (dry wt), kg/day:     1.560E+01
 Fallout interception fraction, pasture:                                            5.700E-01
 Fallout interception fraction (vegetables):                                        2.000E-01
 Time delay-ingestion of pasture grass by animals, days:                            0.000E+00
 Time delay-ingestion of stored feed by animals, days:                              9.000E+00
 Time delay-ingestion of leafy vegetables by man, days:                             1.400E+01
 Time delay-ingestion of produce by man, days:                                      1.400E+01
 Buildup time in soil, years:                                                       0.000E+00
 Period of exposure (grass pasture), days:                                          3.000E+01
 Period of exposure (crops/leafy vegetables),  days:                                6.000E+01
 Transport time: animal feed-millk-man, days:                                       2.000E+00
 Average time from slaughter of meat animal to consumption, days:                   2.000E+01
 Time over which wild game is consumed, days:                                        6.000E+01
 Productivity: agriculture (grass-cow-milk-man pathway), kg/m2                       2.800E+00
 Productivity: produce and leafy vegetables (wet), kg/m2:                            7.160E-01
 Productivity: produce and other vegetables (wet), kg/m2:                            5.700E-01
 Absolute humidity, g/m3:                                                           4.900E+00
 Atmospheric concentration of carbon, g/m3:                                         1.800E-01
 Fraction of veg that is water:                                                     8.240E-01
 Fraction of veg that is carbon:                                                    3.390E-01
 Fraction of beef that is water:                                                    6.230E-01
 Fraction of milk that is water:                                                    1.000E+00
 Fraction of beef that is carbon:                                                   2.300E-01
```

```
Fraction of milk that is carbon:                                    1.690E-01
-----------------------------------------------------------------
Contaminant  Lambda (1/yr)  Surface LR (1/yr)  Subsurface LR (1/yr)
-----------------------------------------------------------------
H-3           5.622E-02       1.667E+01          3.333E+00
C-14          1.210E-04       1.667E+01          3.333E+00
-----------------------------------------------------------
Resuspension parameters
-----------------------------------------------------------
Short-term resuspension factor (1/m):        2.000E-06
Long-term resuspension factor (1/m):         1.000E-09
Short-term resuspension decay constant (1/yr): 6.769E-01
---------------------------------------------------------------------------------
Ingrowth factors. Fraction of progeny that grow in from parent during dt (years):   8.4931507706642151E-002
 TO >>>>  H-3        C-14
H-3      0.000E+00  0.000E+00
C-14     0.000E+00  0.000E+00
---------------------------------------
Time-Integrated Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  2.233E-01  1.479E-08
2015 ALL  1  2.233E-01  1.479E-08
---------------------------------------
Annual Deposition (Ci/m**2) x cf pCi/g cf= 4.460E+06
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
---------------------------------------
Annual Accumulated Soil Concentration in surface layer (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
---------------------------------------
Time-Integrated Resuspended Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
---------------------------------------
Annual Accumulated Soil Concentration in subsurface layer Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
---------------------------------------
Leafy Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  3.746E+01  2.785E-05
2015 ALL  1  3.746E+01  2.785E-05
---------------------------------------
Other Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  3.746E+01  2.785E-05
2015 ALL  1  3.746E+01  2.785E-05
---------------------------------------
Milk Concentrations (Ci/L) x cf pCi/L cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  4.556E+01  1.388E-05
2015 ALL  1  4.556E+01  1.388E-05
---------------------------------------
Beef Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   H-3        C-14
---------------------------------------
2015  1  1  2.839E+01  1.889E-05
2015 ALL  1  2.839E+01  1.889E-05
 -------------------------------------------------------------------
Dose Conversion Factor Notes
-----------------------------------------------------------
Inhalation Dose Conversion Factors (rem/Ci)
Rad      Sol AMAD(um) Age          Effective
-----------------------------------------------------------
H-3      D   1.0   0           7.141E+01
H-3      D   1.0   1           7.141E+01
H-3      D   1.0   5           7.141E+01
H-3      D   1.0  10           7.141E+01
H-3      D   1.0  15           7.141E+01
H-3      D   1.0  20           7.141E+01
C-14     D   1.0   0           2.276E+04
C-14     D   1.0   1           2.276E+04
C-14     D   1.0   5           2.276E+04
C-14     D   1.0  10           2.276E+04
C-14     D   1.0  15           2.276E+04
C-14     D   1.0  20           2.276E+04
---------------------------------------
Ingestion Dose Conversion Factors (rem/Ci)
Rad          Age          Effective
---------------------------------------
H-3           0          7.090E+01
```

```
H-3          1            7.090E+01
H-3          5            7.090E+01
H-3          10           7.090E+01
H-3          15           7.090E+01
H-3          20           7.090E+01
C-14         0            2.150E+03
C-14         1            2.150E+03
C-14         5            2.150E+03
C-14         10           2.150E+03
C-14         15           2.150E+03
C-14         20           2.150E+03
----------------------------------------
External Dose Conversion Factors (rem-m**2/(Ci-s))
Rad          Age              Effective
----------------------------------------
H-3          0            0.000E+00
H-3          1            0.000E+00
H-3          5            0.000E+00
H-3          10           0.000E+00
H-3          15           0.000E+00
H-3          20           0.000E+00
C-14         0            4.760E-08
C-14         1            4.760E-08
C-14         5            4.760E-08
C-14         10           4.760E-08
C-14         15           4.760E-08
C-14         20           4.760E-08
----------------------------------------
Submersion Dose Conversion Factors (rem-m**3/(Ci-s))
Rad          Age              Effective
----------------------------------------
H-3          0            0.000E+00
H-3          1            0.000E+00
H-3          5            0.000E+00
H-3          10           0.000E+00
H-3          15           0.000E+00
H-3          20           0.000E+00
C-14         0            9.640E-06
C-14         1            9.640E-06
C-14         5            9.640E-06
C-14         10           9.640E-06
C-14         15           9.640E-06
C-14         20           9.640E-06
----------------------------------------
Soil Vol Dose Conversion Factors (rem-m**3/(Ci-s))
Rad          Age              Effective
----------------------------------------
H-3          0            0.000E+00
H-3          1            0.000E+00
H-3          5            0.000E+00
H-3          10           0.000E+00
H-3          15           0.000E+00
H-3          20           0.000E+00
C-14         0            2.180E-10
C-14         1            2.180E-10
C-14         5            2.180E-10
C-14         10           2.180E-10
C-14         15           2.180E-10
C-14         20           2.180E-10
----------------------------------------------------------
Inhalation Dose from direct emissions (rem)
Year    Organ        Rec   H-3        C-14         Total
----------------------------------------------------------
2015 Effective        1   1.281E-07  2.703E-12  1.281E-07
All  Effective        1   1.281E-07  2.703E-12  1.281E-07
----------------------------------------------------------
Inhalation Dose from resuspension (rem)
Year    Organ        Rec   H-3        C-14         Total
----------------------------------------------------------
2015 Effective        1   0.000E+00  0.000E+00  0.000E+00
All  Effective        1   0.000E+00  0.000E+00  0.000E+00
----------------------------------------------------------
Soil Ingestion Doses (rem)
Year    Organ        Rec   H-3        C-14         Total
----------------------------------------------------------
2015 Effective        1   0.000E+00  0.000E+00  0.000E+00
All  Effective        1   0.000E+00  0.000E+00  0.000E+00
----------------------------------------------------------
Leafy Vegetable Ingestion Dose (rem)
Year    Organ        Rec   H-3        C-14         Total
----------------------------------------------------------
2015 Effective        1   4.781E-08  1.078E-12  4.781E-08
All  Effective        1   4.781E-08  1.078E-12  4.781E-08
----------------------------------------------------------
Other Vegetable Ingestion Dose (rem)
Year    Organ        Rec   H-3        C-14         Total
----------------------------------------------------------
2015 Effective        1   4.675E-07  1.054E-11  4.675E-07
All  Effective        1   4.675E-07  1.054E-11  4.675E-07
----------------------------------------------------------
Beef Ingestion Dose (rem)
Year    Organ        Rec   H-3        C-14         Total
----------------------------------------------------------
2015 Effective        1   1.711E-07  3.453E-12  1.711E-07
```

```
All  Effective      1  1.711E-07  3.453E-12  1.711E-07
----------------------------------------------------------
Milk Ingestion Dose (rem)
Year    Organ    Rec  H-3        C-14        Total
----------------------------------------------------------
2015 Effective     1  3.618E-07  3.343E-12  3.618E-07
All  Effective     1  3.618E-07  3.343E-12  3.618E-07
----------------------------------------------------------
External Exposure Dose (rem)
Year    Organ    Rec  H-3        C-14        Total
----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
----------------------------------------------------------
Submersion Exposure Dose (rem)
Year    Organ    Rec  H-3        C-14        Total
----------------------------------------------------------
2015 Effective     1  0.000E+00  4.495E-18  4.495E-18
All  Effective     1  0.000E+00  4.495E-18  4.495E-18
----------------------------------------------------------
All Pathway Doses (rem)
Year    Organ    Rec  H-3        C-14        Total
----------------------------------------------------------
2015 Effective     1  1.176E-06  2.111E-11  1.176E-06
All  Effective     1  1.176E-06  2.111E-11  1.176E-06
 Successful Execution of DOSEMM
 Execution Time   0.32562800000000003      seconds
```

Iodine Output File

```
   ***************************************************
   *      This output was produced by the model:     *
   *                                                  *
   *                    DOSEMM                        *
   *                                                  *
   *   Dose Multi Media. A numerical model for        *
   *   multi-media assessment of dose from            *
   *   atmospheric releases. Pathways include direct  *
   *   inhalation, resuspension, soil ingestion,      *
   *   vegetable, milk, and meat ingestion, external, *
   *   and submersion doses. Fortran 95 Ver           *
   *                Version date:                     *
   *                    190429                        *
   *                Arthur S. Rood                    *
   *        K-Spar Inc. 4835 W Foxtrail Lane          *
   *        Idaho Falls, ID 83402                     *
   *                 asr@kspar.net                    *
   ***************************************************
 Date: 05/22/2019 Time: 07:35:28.046
 Input File: iodine.par
-------------------------------------------------------------------
      START OF PARAMETER DEFINITION FILE
-------------------------------------------------------------------
'DOSEMM run for 2015 ASER - iodine releases from INTEC'  [title]
.FALSE.  .FALSE.  SFOOD            [debug lgame]
120  100  2000  255000 4725000  36  UTM  12  [nx,ny,dx,xsw,ysw,ndiscrete,gtype,utmzone]
341316 , 4827515    1 BEA-TRA
343508 , 4825927    2 BEA-CPP
335063 , 4818552    3 BEA-RWMC
339762 , 4822062    4 BEA-VAN B
416371 , 4818571    5 BEA-IRC
391668 , 4782760    6 BEA-BLKFT
360950 , 4857752    7 BEA-SMC
358520 , 4848894    8 BEA-GATE 4
352512 , 4820235    9 BEA-ARA
337640 , 4823710   10 BEA-REST
414380 , 4818193   11 BEA-IF
345564 , 4834399   12 BEA-NRF
341727 , 4828168   13 BEA-RTC
337858 , 4819578   14 BEA-EBR 1
366673 , 4828121   15 BEA-MFC
440759 , 4860651   16 BEA-SUGAR
348964 , 4823312   17 BEA-PBF
344158 , 4826806   18 BEA-INTEC
342602 , 4821788   19 BEA-CFA
346110 , 4829754   20 BEA-EFS
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292751 , 4815336   23 ESER-CRA
314683 , 4832742   24 ESER-ARC
440759 , 4860651   25 ESER-SUG
414376 , 4818191   26 ESER-IDA
401640 , 4892296   27 ESER-DUB
376885 , 4874727   28 ESER-MON
375764 , 4823554   29 ESER-FAA
346614 , 4819341   30 ESER-MAI
346114 , 4829751   31 ESER-EFS
353080 , 4811691   32 ESER-ATO
391668 , 4782752   33 ESER-MOU
352495 , 4881840   34 ESER-BLU
381307 , 4855031   35 ESER-TER
340891 , 4849794   36 ESER-HOW
1  12  2015  1                  [nsrcs,nresol,byear,npartsize]
1               [partsize(npartsize)]
```

```
 1.0           [partmod(npartsize)]
 INTEC  P  1                                                    [srcname(nsrcs)] srctype  partindx
 343830.  4825807.                                             [utms(nsrcs,1) utms(nsrcs,2)]
 '../../chiqvalues/INTEC_con_PM15.out'                                  [filechiq(nsrcs)]
 '../../chiqvalues/INTEC_dep_PM15.out'                                  [filepsiq(nsrcs)]
 '../../sourceterm/INTEC-iodine.rel'                                   [filerel(nsrcs)]
 1               soption - plotting option                   [soption(nsrcs)]
 2    RA   1                         [ncontam ctype norgans]
 'Effective'  [organ(norgan)]
 '../../infiles/INH.txt'                                       [dcffile(1)]
 '../../infiles/ING.txt'                                       [dcffile(2)]
 '../../infiles/EXT.txt'                                       [dcffile(3)]
 '../../infiles/SUB.txt'                                       [dcffile(4)]
 '../../infiles/GRD.txt'                                       [dcffile(5)]
 8.3e-2  8.3e-2                                        [intcut,extcit] half-life cutoff for
 inclusion of progeny with parent dcf (years)
 I-129   I-131                         [cname(ncontam)]
 0.0    0.    0.    0.    0.                               [bratio(ncontam)]
 D   D   D   D    D        [adtype(ncontam,nsrcs)] CFA
 '../../infiles/NuclideData.dat'          [filenuc]
 '../../infiles/ElementData.dat'          [filelement]
 1.0e-9    2.0e-6   0.03    0.15   0.010  0.2  0.6769  1.4  3.66
 [rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
 0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0      [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]
 15.6 0.57, 0.2, 0.0, 90, 14, 14        [qsubf,r1,r2,th1,th2,th3,th4]
 100. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.716      [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]
 8.0, 0.18, 0.97, 0.105 0.97, 1.0, 0.25, 0.07  [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
 0   0    0    0     0                            [coption(ncontam)]
 0 0 0                                            [poption(i),i=1,3]
 1.0e12  'pCi/m3'                                 [cf(1)] air concentration
 1.0e12  'pCi/m2'                                 [cf(2)] annual deposition
 converted to conc in 0-15 cm layer
 1.0e12  'pCi/m2'                                 [cf(3)] surface soil
 concentration
 1.0e12  'pCi/kg'                                 [cf(4)] veg concentrations
 1.0e12  'pCi/L'                                  [cf(5)] milk concentrations
 1.0e12  'pCi/kg'                                 [cf(6)] beef and wild game
 concentrations
 1.0e12   'pCi/m2'                                [cf(7)] subsurface soil
 concentrations
 '../../infiles/refperson_intakes.dat'                                     [fileexp]
 1                 nrecept
 333528,4810277, 2015  1  2015  12   1957     [utmr(1,1) utm(i,2)  syr spr  eyr epr yob]
 0.0  24.0  365  1.0    1.0  1.0  1.0  1.0 1.0 1.0 1.0 1.0
 [fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i), ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
 0  -23432        [nsim,srand]
 --------------------------------------------------------------------
         END OF PARAMETER DEFINITION FILE
 --------------------------------------------------------------------
 --------------------------------------------------------------------------------
 Contaminant Data
 Radionuclide Half-Life(y)  Progeny     kd(mL/g)    Bv(dw)      Biv(dw)     TcMilk(d/L) TcMeat(d/kg)
 --------------------------------------------------------------------------------
 I-129       1.570E+07   STABLE    1.000E-01   2.000E-02   2.000E-02   1.000E-02   7.000E-03
 I-131       2.199E-02   Xe-131m   1.000E-01   2.000E-02   2.000E-02   1.000E-02   7.000E-03
 --------------------------------------------------------------------------------
 Receptor Node Numbers and Coordinates
 Rec  UTME (m) UTMN (m) Node Number
 --------------------------------------------------------------------------------
  1  333528.  4810277.  5080
 --------------------------------------------------------------------------------
 Age-Dependent Intake Rates
 Age (yr)    Inh (m**3/hr) Soil (g/hr)  LVeg (kg/yr) OVeg (kg/yr) Milk (L/yr)  Meat (kg/yr) Game (kg/yr)
 --------------------------------------------------------------------------------
    0.0      3.650E-01   2.500E-03   1.430E+01   1.773E+01   4.720E+01   3.580E+01   0.000E+00
    1.0      5.620E-01   4.170E-03   2.788E+01   3.246E+01   4.560E+01   3.460E+01   6.380E+01
    5.0      5.350E-01   6.960E-03   3.620E+01   3.516E+01   4.940E+01   3.750E+01   6.580E+01
   10.0      5.530E-01   5.000E-03   4.300E+01   2.938E+01   6.480E+01   4.920E+01   1.059E+02
   15.0      6.230E-01   4.170E-03   4.878E+01   2.231E+01   9.060E+01   6.880E+01   1.059E+02
   20.0      9.170E-01   0.000E+00   1.800E+01   1.760E+02   1.120E+02   8.500E+01   0.000E+00
  120.0      9.170E-01   0.000E+00   1.800E+01   1.760E+02   1.120E+02   8.500E+01   0.000E+00
 --------------------------------------------------------------------------------
 --------------------------------
 Receptor Exposure Factors
 RecNo  Frac_Indoors  Exps_Freq    Exps_Time    Inhal_ModFact Soil_ModFact Veg_ModFact  Meat_ModFact Milk_ModFact
 WGme_ModFact  Air I/O    Ext I/O Fac  Sub I/O Fa!!
        (unitless)    (h/d)       (d/yr)      (unitless)   (unitless)   (unitless)   (unitless)   (unitless)
 (unitless)    (unitless)   (unitless)   (unitless)
 --------------------------------------------------------------------------------
 --------------------------------------------------
  1    0.000E+00    2.400E+01   3.650E+02   1.000E+00   1.000E+00   1.000E+00   1.000E+00   1.000E+00
 1.000E+00    1.000E+00    1.000E+00   1.000E+00
 --------------------------------------------------------------------------------
 Src   Description  Src_Type  Part_Size (um)  UTME(m)    UTMN(m)
 --------------------------------------------------------------------------------
  1    INTEC        P       1.00   343830.0 4825807.0
 --------------------------------------------------------------------------------
 --------------------------------------------------
 Chi/Q values for Receptors
 Src Rec Dist(m) Bearing(deg) Node_Number Chi/Q (s/m*3) for point srcs, s/m for area sources (period 1..nresol)
 --------------------------------------------------------------------------------
 --------------------------------------------------
  1  1  18636.  213.56     5080    3.740E-09 7.128E-09 1.748E-08  8.262E-09  6.962E-09  1.039E-08  9.930E-09
 1.019E-08  7.716E-09  7.770E-09  1.995E-09  1.129E-08
```

```
------------------------------------------------------------------------------------------------------
-----------------------------------------------------
 Psi/Q values for Receptors
 Src# Rec# Node Number Psi/Q (1/m**2 for point srcs, unitless for area sources (period 1..nresol)
------------------------------------------------------------------------------------------------------
-----------------------------------------------
  1  1  5080  4.552E-11  8.508E-11  2.007E-10  1.074E-10  1.021E-10  1.200E-10  1.229E-10  1.208E-10  1.085E-10
1.005E-10  2.426E-11  1.213E-10
------------------------------------------------------------------------------------------------------
-------------------------------
  Food Chain Parameters
------------------------------------------------------------------------------------------------------
 Fraction of radioactivity retained on leafy vegetables and produce after washing: 5.000E-01
 Fraction of produce grown in garden of interest:                                  1.000E+00
 Fraction of leafy vegetables grown in garden of interest:                         1.000E+00
 Fraction of year animals graze on pasture:                                        4.000E-01
 Fraction of daily feed that is pasture grass when animal grazes on pasture:        4.300E-01
 Removal rate for weathering from plants, d-1:                                     6.960E-02
 Effective surface density of soil, kg/m2:                                         2.150E+01
 Consumption rate of contaminated feed or forage by an animal (dry wt), kg/day:    1.560E+01
 Fallout interception fraction, pasture:                                           5.700E-01
 Fallout interception fraction (vegetables):                                       2.000E-01
 Time delay-ingestion of pasture grass by animals, days:                           0.000E+00
 Time delay-ingestion of stored feed by animals, days:                             9.000E+01
 Time delay-ingestion of leafy vegetables by man, days:                            1.400E+01
 Time delay-ingestion of produce by man, days:                                     1.400E+01
 Buildup time in soil, years:                                                      1.000E+02
 Period of exposure (grass pasture), days:                                         3.000E+01
 Period of exposure (crops/leafy vegetables),  days:                               6.000E+01
 Transport time: animal feed-millk-man, days:                                      2.000E+00
 Average time from slaughter of meat animal to consumption, days:                  2.000E+01
 Time over which wild game is consumed, days:                                      6.000E+01
 Productivity: agriculture (grass-cow-milk-man pathway), kg/m2                     2.800E-01
 Productivity: produce and leafy vegetables (wet), kg/m2:                          7.160E-01
 Productivity: produce and other vegetables (wet), kg/m2:                          7.160E-01
 Absolute humidity, g/m3:                                                          8.000E+00
 Atmospheric concentration of carbon, g/m3:                                        1.800E+00
 Fraction of veg that is water:                                                    9.700E-01
 Fraction of veg that is carbon:                                                   1.050E-01
 Fraction of beef that is water:                                                   9.700E-01
 Fraction of milk that is water:                                                   1.000E+00
 Fraction of beef that is carbon:                                                  2.500E-01
 Fraction of milk that is carbon:                                                  7.000E-02
 ----------------------------------------------------------------
 Contaminant  Lambda (1/yr)  Surface LR (1/yr)  Subsurface LR (1/yr)
 ----------------------------------------------------------------
 I-129         4.415E-08      9.804E-01           1.961E-01
 I-131         3.152E+01      9.804E-01           1.961E-01
 ----------------------------------------------------------
 Resuspension parameters
 ----------------------------------------------------------
 Short-term resuspension factor (1/m):          2.000E-06
 Long-term resuspension factor (1/m):           1.000E-09
 Short-term resuspension decay constant (1/yr): 6.769E-01
 ---------------------------------------------------------------------------------------
 Ingrowth factors. Fraction of progeny that grow in from parent during dt (years):   8.4931507706642151E-002
  TO >>>>   I-129      I-131
 I-129     0.000E+00  0.000E+00
 I-131     0.000E+00  0.000E+00
 --------------------------------------
 Time-Integrated Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
 Year Src Rec   I-129     I-131
 --------------------------------------
 2015  1   1   5.865E-06  2.712E-02
 2015 ALL  1   5.865E-06  2.712E-02
 --------------------------------------
 Annual Deposition (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
 Year Src Rec   I-129     I-131
 --------------------------------------
 2015  1   1   2.264E+00  1.047E+04
 2015 ALL  1   2.264E+00  1.047E+04
 --------------------------------------
 Annual Accumulated Soil Concentration in surface layer (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
 Year Src Rec   I-129     I-131
 --------------------------------------
 2015  1   1   1.419E+00  3.552E+02
 2015 ALL  1   1.419E+00  3.552E+02
 --------------------------------------
 Time-Integrated Resuspended Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
 Year Src Rec   I-129     I-131
 --------------------------------------
 2015  1   1   3.151E-06  5.229E-03
 2015 ALL  1   3.151E-06  5.229E-03
 --------------------------------------
 Annual Accumulated Soil Concentration in subsurface layer Ci/m**2) x cf pCi/m2 cf= 1.000E+12
 Year Src Rec   I-129     I-131
 --------------------------------------
 2015  1   1   7.892E-01  9.501E+00
 2015 ALL  1   7.892E-01  9.501E+00
 --------------------------------------
 Leafy Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
 Year Src Rec   I-129     I-131
 --------------------------------------
 2015  1   1   3.331E-02  7.675E+00
```

```
2015 ALL  1   3.331E-02  7.675E+00
----------------------------------------
Other Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   I-129      I-131
----------------------------------------
2015  1   1   3.331E-02  7.675E+00
2015 ALL  1   3.331E-02  7.675E+00
----------------------------------------
Milk Concentrations (Ci/L) x cf pCi/L cf= 1.000E+12
Year Src Rec   I-129      I-131
----------------------------------------
2015  1   1   2.808E-02  8.390E+00
2015 ALL  1   2.808E-02  8.390E+00
----------------------------------------
Beef Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   I-129      I-131
----------------------------------------
2015  1   1   1.965E-02  1.241E+00
2015 ALL  1   1.965E-02  1.241E+00
 -----------------------------------------------------------------
 Dose Conversion Factor Notes
 External DCF for I-131    includes Xe-131m
 Ground DCF for I-131    includes Xe-131m
 ---------------------------------------------------------
 Inhalation Dose Conversion Factors (rem/Ci)
 Rad     Sol AMAD(um) Age          Effective
 ---------------------------------------------------------
 I-129    D   1.0    0               3.996E+05
 I-129    D   1.0    1               3.996E+05
 I-129    D   1.0    5               3.996E+05
 I-129    D   1.0    10              3.996E+05
 I-129    D   1.0    15              3.996E+05
 I-129    D   1.0    20              3.996E+05
 I-131    D   1.0    0               9.657E+04
 I-131    D   1.0    1               9.657E+04
 I-131    D   1.0    5               9.657E+04
 I-131    D   1.0    10              9.657E+04
 I-131    D   1.0    15              9.657E+04
 I-131    D   1.0    20              9.657E+04
 ---------------------------------------
 Ingestion Dose Conversion Factors (rem/Ci)
 Rad          Age          Effective
 ---------------------------------------
 I-129         0            3.910E+05
 I-129         1            3.910E+05
 I-129         5            3.910E+05
 I-129         10           3.910E+05
 I-129         15           3.910E+05
 I-129         20           3.910E+05
 I-131         0            3.910E+05
 I-131         1            3.910E+05
 I-131         5            8.050E+04
 I-131         10           8.050E+04
 I-131         15           8.050E+04
 I-131         20           8.050E+04
 ---------------------------------------
 External Dose Conversion Factors (rem-m**2/(Ci-s))
 Rad          Age          Effective
 ---------------------------------------
 I-129         0            7.260E-05
 I-129         1            7.260E-05
 I-129         5            7.260E-05
 I-129         10           7.260E-05
 I-129         15           7.260E-05
 I-129         20           7.260E-05
 I-131         0            1.410E-03
 I-131         1            1.410E-03
 I-131         5            1.410E-03
 I-131         10           1.410E-03
 I-131         15           1.410E-03
 I-131         20           1.410E-03
 ---------------------------------------
 Submersion Dose Conversion Factors (rem-m**3/(Ci-s))
 Rad          Age          Effective
 ---------------------------------------
 I-129         0            1.050E-03
 I-129         1            1.050E-03
 I-129         5            1.050E-03
 I-129         10           1.050E-03
 I-129         15           1.050E-03
 I-129         20           1.050E-03
 I-131         0            6.250E-02
 I-131         1            6.250E-02
 I-131         5            6.250E-02
 I-131         10           6.250E-02
 I-131         15           6.250E-02
 I-131         20           6.250E-02
 ---------------------------------------
 Soil Vol Dose Conversion Factors (rem-m**3/(Ci-s))
 Rad          Age          Effective
 ---------------------------------------
 I-129         0            1.900E-07
 I-129         1            1.900E-07
 I-129         5            1.900E-07
```

```
I-129        10            1.900E-07
I-129        15            1.900E-07
I-129        20            1.900E-07
I-131         0            4.038E-05
I-131         1            4.038E-05
I-131         5            4.038E-05
I-131        10            4.038E-05
I-131        15            4.038E-05
I-131        20            4.038E-05
-------------------------------------------------------------
Inhalation Dose from direct emissions (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  1.883E-08  2.104E-05  2.106E-05
All  Effective    1  1.883E-08  2.104E-05  2.106E-05
-------------------------------------------------------------
Inhalation Dose from resuspension (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  1.011E-08  4.057E-06  4.067E-06
All  Effective    1  1.011E-08  4.057E-06  4.067E-06
-------------------------------------------------------------
Soil Ingestion Doses (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  0.000E+00  0.000E+00  0.000E+00
All  Effective    1  0.000E+00  0.000E+00  0.000E+00
-------------------------------------------------------------
Leafy Vegetable Ingestion Dose (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  2.344E-07  1.112E-05  1.136E-05
All  Effective    1  2.344E-07  1.112E-05  1.136E-05
-------------------------------------------------------------
Other Vegetable Ingestion Dose (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  2.292E-06  1.087E-04  1.110E-04
All  Effective    1  2.292E-06  1.087E-04  1.110E-04
-------------------------------------------------------------
Beef Ingestion Dose (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  6.532E-07  8.492E-06  9.145E-06
All  Effective    1  6.532E-07  8.492E-06  9.145E-06
-------------------------------------------------------------
Milk Ingestion Dose (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  1.229E-06  7.565E-05  7.688E-05
All  Effective    1  1.229E-06  7.565E-05  7.688E-05
-------------------------------------------------------------
External Exposure Dose (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  3.280E-09  1.587E-05  1.588E-05
All  Effective    1  3.280E-09  1.587E-05  1.588E-05
-------------------------------------------------------------
Submersion Exposure Dose (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  1.942E-13  5.346E-08  5.346E-08
All  Effective    1  1.942E-13  5.346E-08  5.346E-08
-------------------------------------------------------------
All Pathway Doses (rem)
Year    Organ    Rec  I-129      I-131         Total
-------------------------------------------------------------
2015 Effective    1  4.442E-06  2.450E-04  2.495E-04
All  Effective    1  4.442E-06  2.450E-04  2.495E-04
 Successful Execution of DOSEMM
 Execution Time   0.35018499999999997       seconds
```

Nobel Gas Output File

```
   ***************************************************
   *     This output was produced by the model:      *
   *                                                 *
   *                 DOSEMM                          *
   *                                                 *
   *    Dose Multi Media. A numerical model for      *
   *   multi-media assessment of dose from           *
   *   atmospheric releases. Pathways include direct *
   *   inhalation, resuspension, soil ingestion,     *
   *   vegetable, milk, and meat ingestion, external,*
   *   and submersion doses. Fortran 95 Ver          *
   *               Version date:                     *
   *                 190429                          *
   *              Arthur S. Rood                     *
   *        K-Spar Inc. 4835 W Foxtrail Lane         *
   *        Idaho Falls, ID 83402                    *
   *               asr@kspar.net                     *
   ***************************************************
 Date: 05/19/2019 Time: 18:50:05.889
 Input File: ng.par
 -------------------------------------------------------------------
```

```
         START OF PARAMETER DEFINITION FILE
------------------------------------------------------------------
'DOSEMM run for 2015 ASER - nobel gas releases from INTEC'   [title]
.FALSE.   .FALSE.   NONE              [debug lgame]
120  100  2000  255000 4725000  36  UTM  12   [nx,ny,dx,xsw,ysw,ndiscrete,gtype,utmzone]
341316 , 4827515    1 BEA-TRA
343508 , 4825927    2 BEA-CPP
335063 , 4818552    3 BEA-RWMC
339762 , 4822062    4 BEA-VAN B
416371 , 4818571    5 BEA-IRC
391668 , 4782760    6 BEA-BLKFT
360950 , 4857752    7 BEA-SMC
358520 , 4848894    8 BEA-GATE 4
352512 , 4820235    9 BEA-ARA
337640 , 4823710   10 BEA-REST
414380 , 4818193   11 BEA-IF
345564 , 4834399   12 BEA-NRF
341727 , 4828168   13 BEA-RTC
337858 , 4819578   14 BEA-EBR 1
366673 , 4828121   15 BEA-MFC
440759 , 4860651   16 BEA-SUGAR
348964 , 4823312   17 BEA-PBF
344158 , 4826806   18 BEA-INTEC
342602 , 4821788   19 BEA-CFA
346110 , 4829754   20 BEA-EFS
292750 , 4815336   21 BEA-CRATERS
339764 , 4822062   22 ESER-VAN
292751 , 4815336   23 ESER-CRA
314683 , 4832742   24 ESER-ARC
440759 , 4860651   25 ESER-SUG
414376 , 4818191   26 ESER-IDA
401640 , 4892296   27 ESER-DUB
376885 , 4874727   28 ESER-MON
375764 , 4823554   29 ESER-FAA
346614 , 4819341   30 ESER-MAI
346114 , 4829751   31 ESER-EFS
353080 , 4811691   32 ESER-ATO
391668 , 4782752   33 ESER-MOU
352495 , 4881840   34 ESER-BLU
381307 , 4855031   35 ESER-TER
340891 , 4849794   36 ESER-HOW
1  12  2015  1         [nsrcs,nresol,byear,npartsize]
1.0              [partsize(npartsize)]
1.0              [partmod(npartsize)]
INTEC     P   1                                                [srcname(nsrcs)] srctype  partindx
343830. 4825807.                                      [utms(nsrcs,1) utms(nsrcs,2)]
'../../chiqvalues/INTEC_con_PM0.out'                          [filechiq(nsrcs)]
'../../chiqvalues/INTEC_dep_PM0.out'                          [filepsiq(nsrcs)]
'../../sourceterm/INTEC-NG.rel'                          [filerel(nsrcs)]
1                 soption - plotting option               [soption(nsrcs)]
2    RA   1                          [ncontam ctype norgans]
'Effective'  [organ(norgan)]
'../../infiles/INH.txt'                                  [dcffile(1)]
'../../infiles/ING.txt'                                  [dcffile(2)]
'../../infiles/EXT.txt'                                  [dcffile(3)]
'../../infiles/SUB.txt'                                  [dcffile(4)]
'../../infiles/GRD.txt'                                  [dcffile(5)]
8.3e-2  8.3e-2              [intcut,extcit] half-life cutoff for inclusion of progeny with parent dcf (years)
Kr-85    Ar-41                        [cname(ncontam)]
0.0  0.0    0.0     0.0     0.0               [bratio(ncontam)]
D    D    D    D    D          [adtype(ncontam,nsrcs)] CFA
'../../infiles/NuclideData.dat'      [filenuc]
'../../infiles/ElementData.dat'      [filelement]
1.0e-9   2.0e-6   0.03    0.15   0.10  0.2  0.6769  1.4  3.66
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
0  0  0 0 0                                   [coption(ncontam)]
0 0 0                                        [poption(i),i=1,3]
1.0e12  'pCi/m3'                                [cf(1)] air concentration
4.46e6  'pCi/g'                                 [cf(2)] annual deposition
converted to conc in 0-15 cm layer
1.0e12  'pCi/m2'                                [cf(3)] surface soil
concentration
1.0e12  'pCi/kg'                                [cf(4)] veg concentrations
1.0e12  'pCi/L'                                 [cf(5)] milk concentrations
1.0e12  'pCi/kg'                                [cf(6)] beef and wild game
concentrations
1.0e12   'pCi/m2'                               [cf(7)] subsurface soil
concentrations
'../../infiles/refperson_intakes.dat'                         [fileexp]
1                     nrecept
333528,4810277, 2015  1  2015 12   1957    [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
0.0  24.0  365  1.0   1.0  1.0  1.0  1.0 1.0 1.0 1.0
[fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i), ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
0  -23432              [nsim,srand]
------------------------------------------------------------------
          END OF PARAMETER DEFINITION FILE
------------------------------------------------------------------
------------------------------------------------------------------------------------------------
Contaminant Data
Radionuclide Half-Life(y)  Progeny    kd(mL/g)    Bv(dw)      Biv(dw)    TcMilk(d/L) TcMeat(d/kg)
------------------------------------------------------------------------------------------------
Kr-85       1.076E+01    STABLE     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
Ar-41       2.080E-04    STABLE     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
------------------------------------------------------------------------------------------------
```

```
 Receptor Node Numbers and Coordinates
 Rec  UTME (m) UTMN (m) Node Number
--------------------------------------------------------------------------------
  1   333528.  4810277.  5080
--------------------------------------------------------------------------------
 Age-Dependent Intake Rates
 Age (yr)    Inh (m**3/hr) Soil (g/hr)  LVeg (kg/yr) OVeg (kg/yr) Milk (L/yr)  Meat (kg/yr) Game (kg/yr)
--------------------------------------------------------------------------------
   0.0        3.650E-01    2.500E-03    1.430E+01    1.773E+01    4.720E+01    3.580E+01    0.000E+00
   1.0        5.620E-01    4.170E-03    2.788E+01    3.246E+01    4.560E+01    3.460E+01    6.380E+01
   5.0        5.350E-01    6.960E-03    3.620E+01    3.516E+01    4.940E+01    3.750E+01    6.580E+01
  10.0        5.530E-01    5.000E-03    4.300E+01    2.938E+01    6.480E+01    4.920E+01    1.059E+02
  15.0        6.230E-01    4.170E-03    4.878E+01    2.231E+01    9.060E+01    6.880E+01    1.059E+02
  20.0        9.170E-01    0.000E+00    1.800E+01    1.760E+02    1.120E+02    8.500E+01    0.000E+00
 120.0        9.170E-01    0.000E+00    1.800E+01    1.760E+02    1.120E+02    8.500E+01    0.000E+00
--------------------------------------------------------------------------------
--------------------------------
 Receptor Exposure Factors
 RecNo  Frac_Indoors  Exps_Freq    Exps_Time     Inhal_ModFact Soil_ModFact  Veg_ModFact   Meat_ModFact  Milk_ModFact
WGme_ModFact  Air I/O    Ext I/O Fac  Sub I/O Fa!!
        (unitless)    (h/d)        (d/yr)        (unitless)    (unitless)    (unitless)    (unitless)    (unitless)
(unitless)   (unitless)  (unitless)   (unitless)
--------------------------------------------------------------------------------
----------------------------------------------------
  1   0.000E+00     2.400E+01    3.650E+02     1.000E+00     1.000E+00     1.000E+00     1.000E+00     1.000E+00
1.000E+00    1.000E+00   1.000E+00    1.000E+00
--------------------------------------------------------------------------------
 Src    Description  Src_Type  Part_Size (um)  UTME(m)     UTMN(m)
--------------------------------------------------------------------------------
  1     INTEC           P         1.00     343830.0 4825807.0
--------------------------------------------------------------------------------
--------------------------------------------------
 Chi/Q values for Receptors
 Src Rec Dist(m) Bearing(deg) Node_Number Chi/Q (s/m*3) for point srcs, s/m for area sources (period 1..nresol)
--------------------------------------------------------------------------------
--------------------------------------------------
  1 1  18636.  213.56      5080    2.917E-08  3.728E-08  1.019E-07  4.683E-08  3.368E-08  5.188E-08  4.307E-08
5.540E-08  4.003E-08  4.737E-08  2.023E-08  8.221E-08
--------------------------------------------------------------------------------
--------------------------------------------------
 Psi/Q values for Receptors
 Src# Rec# Node Number Psi/Q (1/m**2 for point srcs, unitless for area sources (period 1..nresol)
--------------------------------------------------------------------------------
--------------------------------
  1 1 5080  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00  0.000E+00
--------------------------------------------------------------------------------
--------------------------------
 ---------------------------------------------------------------
 Contaminant  Lambda (1/yr)  Surface LR (1/yr)  Subsurface LR (1/yr)
 ---------------------------------------------------------------
 Kr-85        6.442E-02      1.667E+01          3.333E+00
 Ar-41        3.332E+03      1.667E+01          3.333E+00
 --------------------------------------------------------------------------------
 Ingrowth factors. Fraction of progeny that grow in from parent during dt (years):   8.4931507706642151E-002
  TO >>>>  Kr-85      Ar-41
 Kr-85     0.000E+00  0.000E+00
 Ar-41     0.000E+00  0.000E+00
--------------------------------------
Time-Integrated Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec  Kr-85     Ar-41
--------------------------------------
2015  1  1  1.143E+00  4.576E-01
2015 ALL  1  1.143E+00  4.576E-01
--------------------------------------
Annual Deposition (Ci/m**2) x cf pCi/g cf= 4.460E+06
Year Src Rec  Kr-85     Ar-41
--------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
--------------------------------------
Annual Accumulated Soil Concentration in surface layer (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec  Kr-85     Ar-41
--------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
--------------------------------------
Time-Integrated Resuspended Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec  Kr-85     Ar-41
--------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
--------------------------------------
Annual Accumulated Soil Concentration in subsurface layer Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec  Kr-85     Ar-41
--------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
--------------------------------------
Leafy Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec  Kr-85     Ar-41
--------------------------------------
2015  1  1  0.000E+00  0.000E+00
2015 ALL  1  0.000E+00  0.000E+00
```

```
----------------------------------------
Other Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   Kr-85      Ar-41
----------------------------------------
2015  1   1   0.000E+00  0.000E+00
2015 ALL  1   0.000E+00  0.000E+00
----------------------------------------
Milk Concentrations (Ci/L) x cf pCi/L cf= 1.000E+12
Year Src Rec   Kr-85      Ar-41
----------------------------------------
2015  1   1   0.000E+00  0.000E+00
2015 ALL  1   0.000E+00  0.000E+00
----------------------------------------
Beef Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   Kr-85      Ar-41
----------------------------------------
2015  1   1   0.000E+00  0.000E+00
2015 ALL  1   0.000E+00  0.000E+00
  ----------------------------------------------------------------------
  Dose Conversion Factor Notes
  ----------------------------------------------------------
  Inhalation Dose Conversion Factors (rem/Ci)
  Rad      Sol AMAD(um) Age           Effective
  ----------------------------------------------------------
  Kr-85    D   1.0    0               0.000E+00
  Kr-85    D   1.0    1               0.000E+00
  Kr-85    D   1.0    5               0.000E+00
  Kr-85    D   1.0    10              0.000E+00
  Kr-85    D   1.0    15              0.000E+00
  Kr-85    D   1.0    20              0.000E+00
  Ar-41    D   1.0    0               0.000E+00
  Ar-41    D   1.0    1               0.000E+00
  Ar-41    D   1.0    5               0.000E+00
  Ar-41    D   1.0    10              0.000E+00
  Ar-41    D   1.0    15              0.000E+00
  Ar-41    D   1.0    20              0.000E+00
----------------------------------------
Ingestion Dose Conversion Factors (rem/Ci)
Rad            Age           Effective
----------------------------------------
  Kr-85         0           0.000E+00
  Kr-85         1           0.000E+00
  Kr-85         5           0.000E+00
  Kr-85         10          0.000E+00
  Kr-85         15          0.000E+00
  Kr-85         20          0.000E+00
  Ar-41         0           0.000E+00
  Ar-41         1           0.000E+00
  Ar-41         5           0.000E+00
  Ar-41         10          0.000E+00
  Ar-41         15          0.000E+00
  Ar-41         20          0.000E+00
----------------------------------------
External Dose Conversion Factors (rem-m**2/(Ci-s))
Rad            Age           Effective
----------------------------------------
  Kr-85         0           3.900E-05
  Kr-85         1           3.900E-05
  Kr-85         5           3.900E-05
  Kr-85         10          3.900E-05
  Kr-85         15          3.900E-05
  Kr-85         20          3.900E-05
  Ar-41         0           4.500E-03
  Ar-41         1           4.500E-03
  Ar-41         5           4.500E-03
  Ar-41         10          4.500E-03
  Ar-41         15          4.500E-03
  Ar-41         20          4.500E-03
----------------------------------------
Submersion Dose Conversion Factors (rem-m**3/(Ci-s))
Rad            Age           Effective
----------------------------------------
  Kr-85         0           8.880E-04
  Kr-85         1           8.880E-04
  Kr-85         5           8.880E-04
  Kr-85         10          8.880E-04
  Kr-85         15          8.880E-04
  Kr-85         20          8.880E-04
  Ar-41         0           2.280E-01
  Ar-41         1           2.280E-01
  Ar-41         5           2.280E-01
  Ar-41         10          2.280E-01
  Ar-41         15          2.280E-01
  Ar-41         20          2.280E-01
----------------------------------------
Soil Vol Dose Conversion Factors (rem-m**3/(Ci-s))
Rad            Age           Effective
----------------------------------------
  Kr-85         0           2.680E-07
  Kr-85         1           2.680E-07
  Kr-85         5           2.680E-07
  Kr-85         10          2.680E-07
  Kr-85         15          2.680E-07
  Kr-85         20          2.680E-07
```

```
Ar-41        0           1.570E-04
Ar-41        1           1.570E-04
Ar-41        5           1.570E-04
Ar-41       10           1.570E-04
Ar-41       15           1.570E-04
Ar-41       20           1.570E-04
-----------------------------------------------------------
Inhalation Dose from direct emissions (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Inhalation Dose from resuspension (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Soil Ingestion Doses (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Leafy Vegetable Ingestion Dose (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Other Vegetable Ingestion Dose (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Beef Ingestion Dose (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Milk Ingestion Dose (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
External Exposure Dose (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  0.000E+00  0.000E+00  0.000E+00
All  Effective     1  0.000E+00  0.000E+00  0.000E+00
-----------------------------------------------------------
Submersion Exposure Dose (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  3.202E-08  3.290E-06  3.322E-06
All  Effective     1  3.202E-08  3.290E-06  3.322E-06
-----------------------------------------------------------
All Pathway Doses (rem)
Year    Organ    Rec  Kr-85      Ar-41       Total
-----------------------------------------------------------
2015 Effective     1  3.202E-08  3.290E-06  3.322E-06
All  Effective     1  3.202E-08  3.290E-06  3.322E-06
 Successful Execution of DOSEMM
 Execution Time  0.32613199999999998       seconds
```

Resuspension Output File
```
    ***************************************************
    *     This output was produced by the model:      *
    *                                                  *
    *                   DOSEMM                         *
    *                                                  *
    *   Dose Multi Media. A numerical model for        *
    *   multi-media assessment of dose from            *
    *   atmospheric releases. Pathways include direct  *
    *   inhalation, resuspension, soil ingestion,      *
    *   vegetable, milk, and meat ingestion, external, *
    *   and submersion doses. Fortran 95 Ver           *
    *                Version date:                     *
    *                   190429                         *
    *                Arthur S. Rood                    *
    *        K-Spar Inc. 4835 W Foxtrail Lane          *
    *          Idaho Falls, ID 83402                   *
    *                 asr@kspar.net                    *
    ***************************************************
 Date: 05/22/2019 Time: 07:34:29.898
 Input File: particulate.par
---------------------------------------------------------------------
        START OF PARAMETER DEFINITION FILE
---------------------------------------------------------------------
```

```
'DOSEMM run for 2015 ASER - Particulate releases from INTEC'    [title]
.FALSE.    .FALSE.   SFOOD                    [debug lgame]
120   100   2000   255000 4725000   36   UTM  12   [nx,ny,dx,xsw,ysw,ndiscrete,gtype,utmzone]
 341316, 4827515     1 BEA-TRA
 343508, 4825927     2 BEA-CPP
 335063, 4818552     3 BEA-RWMC
 339762, 4822062     4 BEA-VAN B
 416371, 4818571     5 BEA-IRC
 391668, 4782760     6 BEA-BLKFT
 360950, 4857752     7 BEA-SMC
 358520, 4848894     8 BEA-GATE 4
 352512, 4820235     9 BEA-ARA
 337640, 4823710    10 BEA-REST
 414380, 4818193    11 BEA-IF
 345564, 4834399    12 BEA-NRF
 341727, 4828168    13 BEA-RTC
 337858, 4819578    14 BEA-EBR 1
 366673, 4828121    15 BEA-MFC
 440759, 4860651    16 BEA-SUGAR
 348964, 4823312    17 BEA-PBF
 344158, 4826806    18 BEA-INTEC
 342602, 4821788    19 BEA-CFA
 346110, 4829754    20 BEA-EFS
 292750, 4815336    21 BEA-CRATERS
 339764, 4822062    22 ESER-VAN
 292751, 4815336    23 ESER-CRA
 314683, 4832742    24 ESER-ARC
 440759, 4860651    25 ESER-SUG
 414376, 4818191    26 ESER-IDA
 401640, 4892296    27 ESER-DUB
 376885, 4874727    28 ESER-MON
 375764, 4823554    29 ESER-FAA
 346614, 4819341    30 ESER-MAI
 346114, 4829751    31 ESER-EFS
 353080, 4811691    32 ESER-ATO
 391668, 4782752    33 ESER-MOU
 352495, 4881840    34 ESER-BLU
 381307, 4855031    35 ESER-TER
 340891, 4849794    36 ESER-HOW
1  12  2015  1                        [nsrcs,nresol,byear,npartsize]
1                [partsize(npartsize)]
1.0              [partmod(npartsize)]
INTEC  P  1                                                [srcname(nsrcs)] srctype  partindx
343830.  4825807.                                  [utms(nsrcs,1) utms(nsrcs,2)]
'../../chiqvalues/INTEC_con3y-1um.out'                      [filechiq(nsrcs)]
'../../chiqvalues/INTEC_dep3y-1um.out'                      [filepsiq(nsrcs)]
'../../sourceterm/INTEC-Part.rel'                           [filerel(nsrcs)]
1                 soption - plotting option          [soption(nsrcs)]
9    RA  1                                [ncontam ctype norgans]
'Effective'  [organ(norgan)]
'../../infiles/INH.txt'                                     [dcffile(1)]
'../../infiles/ING.txt'                                     [dcffile(2)]
'../../infiles/EXT.txt'                                     [dcffile(3)]
'../../infiles/SUB.txt'                                     [dcffile(4)]
'../../infiles/GRD.txt'                                     [dcffile(5)]
8.3e-2  8.3e-2                                  [intcut,extcit] half-life cutoff for
inclusion of progeny with parent dcf (years)
 Pu-241 Am-241 Np-237 Cs-137 Pu-238 Pu-239 Pu-240 Sr-90 Co-60            [cname(ncontam)]
 1.0     1.    0.    0.    0.    0.    0.    0.    0.            [bratio(ncontam)]
 D    D    D    D     D     D    D    D   D        [adtype(ncontam,nsrcs)] CFA
'../../infiles/NuclideData.dat'              [filenuc]
'../../infiles/ElementData.dat'              [filelement]
 1.0e-9   1.0e-5   0.03    0.15   0.010  0.2  5.06  1.4  3.666
[rflt,rfst,thkres,thklch,infil,theta,strc,rho,aws]
 0.50, 1.0, 1.0, 0.4, 0.43, 0.0696 215.0        [dd1,fsubg,fsubl,fsubp,fsubs,lamw,p]
 15.6 0.57, 0.2, 0.0, 90, 14, 14             [qsubf,r1,r2,th1,th2,th3,th4]
 100. 30. 60. 2.0 20.0 60.0 0.28 0.716 0.716      [tsubB, tsubE1, tsubE2,tsubF,tsubS,tsubW,ysubV1,ysubV2,ysubV3]
 8.0, 0.18, 0.97, 0.105 0.97, 1.0, 0.25, 0.07  [absH, concC, fw, fc, fwb, fwm, fcb, fcm]
 0  0   0   0    0   0 0 0 0                     [coption(ncontam)]
 0 0 0                            [poption(i),i=1,3]
 1.0e12  'pCi/m3'                                      [cf(1)] air concentration
 1.0e12  'pCi/m2'                                         [cf(2)] annual deposition
converted to conc in 0-15 cm layer
 1.0e12  'pCi/m2'                                         [cf(3)] surface soil
concentration
 1.0e12  'pCi/kg'                                      [cf(4)] veg concentrations
 1.0e12  'pCi/L'                                       [cf(5)] milk concentrations
 1.0e12  'pCi/kg'                                      [cf(6)] beef and wild game
concentrations
 1.0e12   'pCi/m2'                                        [cf(7)] subsurface soil
concentrations
'../../infiles/refperson_intakes.dat'                              [fileexp]
1                    nrecept
 333528,4810277, 2015  1  2025  12  1957    [utmr(1,1) utm(i,2)  syr spr  eyr  epr yob]
 0.0  24.0  365  1.0   1.0  1.0  1.0   1.0 1.0 1.0 1.0 1.0
[fi(i),ef(i),et(i),inhm(i),ingsm(i),ingvm(i),ingbm(i), ingmm(i), ingwm(i), cindoor(i)], esf(i), ssf(i)
 0  -23432                [nsim,srand]
-------------------------------------------------------------------
         END OF PARAMETER DEFINITION FILE
-------------------------------------------------------------------
 --------------------------------------------------------------------------------------------
Contaminant Data
Radionuclide Half-Life(y)  Progeny      kd(mL/g)    Bv(dw)     Biv(dw)    TcMilk(d/L) TcMeat(d/kg)
 --------------------------------------------------------------------------------------------
```

```
Pu-241      1.435E+01   Am-241   2.000E+03   1.000E-03   1.000E-03   1.000E-06   1.000E-04
Am-241      4.322E+02   Np-237   2.000E+01   1.000E-03   1.000E-03   2.000E-06   5.000E-05
Np-237      2.144E+06   STABLE   8.000E+00   2.000E-02   2.000E-02   5.000E-06   1.000E-04
Cs-137      3.007E+01   Ba-137m  4.600E+03   4.000E-02   4.000E-02   8.000E-03   3.000E-02
Pu-238      8.770E+01   U-234    2.000E+03   1.000E-03   1.000E-03   1.000E-06   1.000E-04
Pu-239      2.411E+04   STABLE   2.000E+03   1.000E-03   1.000E-03   1.000E-06   1.000E-04
Pu-240      6.563E+03   STABLE   2.000E+03   1.000E-03   1.000E-03   1.000E-06   1.000E-04
Sr-90       2.879E+01   Y-90     3.000E+01   3.000E-01   3.000E-01   2.000E-03   8.000E-03
Co-60       5.270E+00   STABLE   1.000E+03   8.000E-02   8.000E-02   2.000E-03   2.000E-02
----------------------------------------------------------------------------------
Receptor Node Numbers and Coordinates
Rec  UTME (m) UTMN (m) Node Number
----------------------------------------------------------------------------------
  1  333528.  4810277.  5080
----------------------------------------------------------------------------------
 Age-Dependent Intake Rates
Age (yr)    Inh (m**3/hr) Soil (g/hr)  LVeg (kg/yr) OVeg (kg/yr) Milk (L/yr)  Meat (kg/yr) Game (kg/yr)
----------------------------------------------------------------------------------
   0.0      3.650E-01   2.500E-03   1.430E+01   1.773E+01   4.720E+01   3.580E+01   0.000E+00
   1.0      5.620E-01   4.170E-03   2.788E+01   3.246E+01   4.560E+01   3.460E+01   6.380E+01
   5.0      5.350E-01   6.960E-03   3.620E+01   3.516E+01   4.940E+01   3.750E+01   6.580E+01
  10.0      5.530E-01   5.000E-03   4.300E+01   2.938E+01   6.480E+01   4.920E+01   1.059E+02
  15.0      6.230E-01   4.170E-03   4.878E+01   2.231E+01   9.060E+01   6.880E+01   1.059E+02
  20.0      9.170E-01   0.000E+00   1.800E+01   1.760E+02   1.120E+02   8.500E+01   0.000E+00
 120.0      9.170E-01   0.000E+00   1.800E+01   1.760E+02   1.120E+02   8.500E+01   0.000E+00
----------------------------------------------------------------------------------
----------------------------
Receptor Exposure Factors
RecNo Frac_Indoors Exps_Freq    Exps_Time    Inhal_ModFact Soil_ModFact Veg_ModFact  Meat_ModFact Milk_ModFact
WGme_ModFact Air I/O   Ext I/O Fac  Sub I/O Fa!!
      (unitless)   (h/d)        (d/yr)       (unitless)   (unitless)   (unitless)   (unitless)   (unitless)
(unitless)   (unitless)  (unitless)   (unitless)
----------------------------------------------------------------------------------
----------------------------------------------
  1   0.000E+00    2.400E+01    3.650E+02    1.000E+00    1.000E+00    1.000E+00    1.000E+00    1.000E+00
1.000E+00    1.000E+00   1.000E+00    1.000E+00
----------------------------------------------------------------------------------
 Src   Description Src_Type  Part_Size (um)  UTME(m)   UTMN(m)
----------------------------------------------------------------------------------
  1    INTEC      P         1.00  343830.0 4825807.0
----------------------------------------------------------------------------------
----------------------------------------------------
Chi/Q values for Receptors
Src Rec Dist(m) Bearing(deg) Node_Number Chi/Q (s/m*3) for point srcs, s/m for area sources (period 1..nresol)
----------------------------------------------------------------------------------
----------------------------------------------
  1  1  18636.  213.56      5080    5.423E-08  3.862E-08  5.140E-08  3.456E-08  3.380E-08  3.855E-08  4.469E-08
4.889E-08  3.986E-08  4.695E-08  5.234E-08  7.453E-08
----------------------------------------------------------------------------------
----------------------------------------------
Psi/Q values for Receptors
Src# Rec# Node Number Psi/Q (1/m**2 for point srcs, unitless for area sources (period 1..nresol)
----------------------------------------------------------------------------------
----------------------------------------------
  1  1  5080  6.199E-12  3.591E-12  1.137E-11  1.086E-11  1.754E-11  2.437E-12  6.730E-12  1.446E-11  1.730E-11
9.992E-12  6.296E-12  7.160E-12
----------------------------------------------------------------------------------
----------------------------------------------
 Food Chain Parameters
----------------------------------------------------------------------------------
Fraction of radioactivity retained on leafy vegetables and produce after washing: 5.000E-01
Fraction of produce grown in garden of interest:                                  1.000E+00
Fraction of leafy vegetables grown in garden of interest:                         1.000E+00
Fraction of year animals graze on pasture:                                        4.000E-01
Fraction of daily feed that is pasture grass when animal grazes on pasture:       4.300E-01
Removal rate for weathering from plants, d-1:                                     6.960E-02
Effective surface density of soil, kg/m2:                                         2.150E+02
Consumption rate of contaminated feed or forage by an animal (dry wt), kg/day:    1.560E+01
Fallout interception fraction, pasture:                                           5.700E-01
Fallout interception fraction (vegetables):                                       2.000E-01
Time delay-ingestion of pasture grass by animals, days:                           0.000E+00
Time delay-ingestion of stored feed by animals, days:                             9.000E+01
Time delay-ingestion of leafy vegetables by man, days:                            1.400E+01
Time delay-ingestion of produce by man, days:                                     1.400E+01
Buildup time in soil, years:                                                      1.000E+02
Period of exposure (grass pasture), days:                                         3.000E+01
Period of exposure (crops/leafy vegetables),  days:                               6.000E+01
Transport time: animal feed-millk-man, days:                                      2.000E+00
Average time from slaughter of meat animal to consumption, days:                  2.000E+00
Time over which wild game is consumed, days:                                       6.000E+01
Productivity: agriculture (grass-cow-milk-man pathway), kg/m2                     2.800E-01
Productivity: produce and leafy vegetables (wet), kg/m2:                          7.160E-01
Productivity: produce and other vegetables (wet), kg/m2:                          7.160E-01
Absolute humidity, g/m3:                                                          8.000E+00
Atmospheric concentration of carbon, g/m3:                                        1.800E-01
Fraction of veg that is water:                                                    9.700E-01
Fraction of veg that is carbon:                                                   1.050E-01
Fraction of beef that is water:                                                   9.700E-01
Fraction of milk that is water:                                                   1.000E+00
Fraction of beef that is carbon:                                                  2.500E-01
Fraction of milk that is carbon:                                                  7.000E-02
----------------------------------------------------------------
Contaminant  Lambda (1/yr)  Surface LR (1/yr)  Subsurface LR (1/yr)
----------------------------------------------------------------
```

```
Pu-241          4.830E-02       1.190E-04       2.381E-05
Am-241          1.604E-03       1.182E-02       2.364E-03
Np-237          3.233E-07       2.924E-02       5.848E-03
Cs-137          2.305E-02       5.176E-05       1.035E-05
Pu-238          7.904E-03       1.190E-04       2.381E-05
Pu-239          2.875E-05       1.190E-04       2.381E-05
Pu-240          1.056E-04       1.190E-04       2.381E-05
Sr-90           2.408E-02       7.899E-03       1.580E-03
Co-60           1.315E-01       2.381E-04       4.761E-05
-----------------------------------------------------------
Resuspension parameters
-----------------------------------------------------------
Short-term resuspension factor (1/m):           1.000E-05
Long-term resuspension factor (1/m):            1.000E-09
Short-term resuspension decay constant (1/yr):  5.060E+00
-------------------------------------------------------------------------------------------------
Ingrowth factors. Fraction of progeny that grow in from parent during dt (years):   8.4931507706642151E-002
  TO >>>>   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Pu-241     0.000E+00  1.359E-04  1.867E-12  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Am-241     0.000E+00  0.000E+00  2.746E-08  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Np-237     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Cs-137     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Pu-238     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Pu-239     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Pu-240     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Sr-90      0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
Co-60      0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
-------------------------------------------------------------------------------------------------
Time-Integrated Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
-------------------------------------------------------------------------------------------------
2015  1   1  5.039E-06  7.652E-09  2.426E-19  2.589E-05  1.656E-07  3.121E-07  1.642E-07  1.983E-05  4.143E-08
2016  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2015 ALL  1  5.039E-06  7.652E-09  2.426E-19  2.589E-05  1.656E-07  3.121E-07  1.642E-07  1.983E-05  4.143E-08
2016 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
-------------------------------------------------------------------------------------------------
Annual Deposition (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
-------------------------------------------------------------------------------------------------
2015  1   1  3.251E-02  4.937E-05  1.565E-15  1.671E-01  1.069E-03  2.014E-03  1.060E-03  1.279E-01  2.673E-04
2016  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2015 ALL  1  3.251E-02  4.937E-05  1.565E-15  1.671E-01  1.069E-03  2.014E-03  1.060E-03  1.279E-01  2.673E-04
2016 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
-------------------------------------------------------------------------------------------------
Annual Accumulated Soil Concentration in surface layer (Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
-------------------------------------------------------------------------------------------------
2015  1   1  3.176E-02  9.958E-05  3.244E-11  1.652E-01  1.065E-03  2.014E-03  1.060E-03  1.260E-01  2.510E-04
2016  1   1  3.026E-02  1.464E-04  7.885E-11  1.615E-01  1.056E-03  2.014E-03  1.059E-03  1.220E-01  2.200E-04
2017  1   1  2.883E-02  1.903E-04  1.379E-10  1.578E-01  1.048E-03  2.013E-03  1.059E-03  1.182E-01  1.929E-04
2018  1   1  2.747E-02  2.315E-04  2.083E-10  1.542E-01  1.039E-03  2.013E-03  1.059E-03  1.145E-01  1.690E-04
2019  1   1  2.617E-02  2.700E-04  2.890E-10  1.506E-01  1.031E-03  2.013E-03  1.059E-03  1.109E-01  1.482E-04
2020  1   1  2.493E-02  3.061E-04  3.788E-10  1.472E-01  1.023E-03  2.012E-03  1.058E-03  1.074E-01  1.299E-04
2021  1   1  2.376E-02  3.398E-04  4.768E-10  1.438E-01  1.015E-03  2.012E-03  1.058E-03  1.040E-01  1.138E-04
2022  1   1  2.263E-02  3.712E-04  5.820E-10  1.406E-01  1.006E-03  2.012E-03  1.058E-03  1.007E-01  9.979E-05
2023  1   1  2.156E-02  4.006E-04  6.934E-10  1.373E-01  9.984E-04  2.011E-03  1.058E-03  9.755E-02  8.747E-05
2024  1   1  2.054E-02  4.279E-04  8.104E-10  1.342E-01  9.904E-04  2.011E-03  1.057E-03  9.448E-02  7.668E-05
2025  1   1  1.957E-02  4.533E-04  9.321E-10  1.311E-01  9.825E-04  2.011E-03  1.057E-03  9.151E-02  6.721E-05
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2015 ALL  1  3.176E-02  9.958E-05  3.244E-11  1.652E-01  1.065E-03  2.014E-03  1.060E-03  1.260E-01  2.510E-04
2016 ALL  1  3.026E-02  1.464E-04  7.885E-11  1.615E-01  1.056E-03  2.014E-03  1.059E-03  1.220E-01  2.200E-04
2017 ALL  1  2.883E-02  1.903E-04  1.379E-10  1.578E-01  1.048E-03  2.013E-03  1.059E-03  1.182E-01  1.929E-04
2018 ALL  1  2.747E-02  2.315E-04  2.083E-10  1.542E-01  1.039E-03  2.013E-03  1.059E-03  1.145E-01  1.690E-04
2019 ALL  1  2.617E-02  2.700E-04  2.890E-10  1.506E-01  1.031E-03  2.013E-03  1.059E-03  1.109E-01  1.482E-04
2020 ALL  1  2.493E-02  3.061E-04  3.788E-10  1.472E-01  1.023E-03  2.012E-03  1.058E-03  1.074E-01  1.299E-04
2021 ALL  1  2.376E-02  3.398E-04  4.768E-10  1.438E-01  1.015E-03  2.012E-03  1.058E-03  1.040E-01  1.138E-04
2022 ALL  1  2.263E-02  3.712E-04  5.820E-10  1.406E-01  1.006E-03  2.012E-03  1.058E-03  1.007E-01  9.979E-05
2023 ALL  1  2.156E-02  4.006E-04  6.934E-10  1.373E-01  9.984E-04  2.011E-03  1.058E-03  9.755E-02  8.747E-05
2024 ALL  1  2.054E-02  4.279E-04  8.104E-10  1.342E-01  9.904E-04  2.011E-03  1.057E-03  9.448E-02  7.668E-05
2025 ALL  1  1.957E-02  4.533E-04  9.321E-10  1.311E-01  9.825E-04  2.011E-03  1.057E-03  9.151E-02  6.721E-05
----------------------------------------------------------------------------------------------------------------
Time-Integrated Resuspended Concentration (Ci-yr/m**3) x cf pCi/m3 cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
----------------------------------------------------------------------------------------------------------------
2015  1   1  6.341E-08  1.979E-10  6.535E-17  3.262E-07  2.088E-09  3.936E-09  2.071E-09  2.497E-07  5.195E-10
2016  1   1  4.139E-10  1.314E-12  4.338E-19  2.184E-09  1.419E-11  2.696E-11  1.418E-11  1.657E-09  3.120E-12
2017  1   1  3.161E-11  1.021E-13  3.370E-20  1.711E-10  1.128E-12  2.161E-12  1.137E-12  1.286E-10  2.192E-13
2018  1   1  2.792E-11  9.185E-14  3.030E-20  1.550E-10  1.038E-12  2.003E-12  1.054E-12  1.155E-10  1.782E-13
2019  1   1  2.659E-11  8.907E-14  2.937E-20  1.514E-10  1.029E-12  2.002E-12  1.053E-12  1.118E-10  1.561E-13
2020  1   1  2.533E-11  8.643E-14  2.849E-20  1.479E-10  1.021E-12  2.002E-12  1.053E-12  1.083E-10  1.368E-13
2021  1   1  2.414E-11  8.391E-14  2.765E-20  1.445E-10  1.013E-12  2.001E-12  1.053E-12  1.049E-10  1.199E-13
2022  1   1  2.299E-11  8.148E-14  2.684E-20  1.412E-10  1.005E-12  2.001E-12  1.052E-12  1.016E-10  1.051E-13
2023  1   1  2.191E-11  7.914E-14  2.606E-20  1.380E-10  9.965E-13  2.001E-12  1.052E-12  9.840E-11  9.215E-14
2024  1   1  2.087E-11  7.690E-14  2.531E-20  1.349E-10  9.886E-13  2.000E-12  1.052E-12  9.530E-11  8.078E-14
2025  1   1  1.989E-11  7.474E-14  2.459E-20  1.318E-10  9.807E-13  2.000E-12  1.052E-12  9.231E-11  7.080E-14
2015 ALL  1  6.341E-08  1.979E-10  6.535E-17  3.262E-07  2.088E-09  3.936E-09  2.071E-09  2.497E-07  5.195E-10
2016 ALL  1  4.139E-10  1.314E-12  4.338E-19  2.184E-09  1.419E-11  2.696E-11  1.418E-11  1.657E-09  3.120E-12
2017 ALL  1  3.161E-11  1.021E-13  3.370E-20  1.711E-10  1.128E-12  2.161E-12  1.137E-12  1.286E-10  2.192E-13
2018 ALL  1  2.792E-11  9.185E-14  3.030E-20  1.550E-10  1.038E-12  2.003E-12  1.054E-12  1.155E-10  1.782E-13
2019 ALL  1  2.659E-11  8.907E-14  2.937E-20  1.514E-10  1.029E-12  2.002E-12  1.053E-12  1.118E-10  1.561E-13
2020 ALL  1  2.533E-11  8.643E-14  2.849E-20  1.479E-10  1.021E-12  2.002E-12  1.053E-12  1.083E-10  1.368E-13
2021 ALL  1  2.414E-11  8.391E-14  2.765E-20  1.445E-10  1.013E-12  2.001E-12  1.053E-12  1.049E-10  1.199E-13
2022 ALL  1  2.299E-11  8.148E-14  2.684E-20  1.412E-10  1.005E-12  2.001E-12  1.052E-12  1.016E-10  1.051E-13
2023 ALL  1  2.191E-11  7.914E-14  2.606E-20  1.380E-10  9.965E-13  2.001E-12  1.052E-12  9.840E-11  9.215E-14
2024 ALL  1  2.087E-11  7.690E-14  2.531E-20  1.349E-10  9.886E-13  2.000E-12  1.052E-12  9.530E-11  8.078E-14
2025 ALL  1  1.989E-11  7.474E-14  2.459E-20  1.318E-10  9.807E-13  2.000E-12  1.052E-12  9.231E-11  7.080E-14
----------------------------------------------------------------------------------------------------------------
Annual Accumulated Soil Concentration in subsurface layer Ci/m**2) x cf pCi/m2 cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
----------------------------------------------------------------------------------------------------------------
2015  1   1  1.813E-06  5.570E-07  6.153E-13  4.115E-06  6.111E-08  1.157E-07  6.089E-08  4.792E-04  2.831E-08
2016  1   1  5.330E-06  1.991E-06  2.822E-12  1.238E-05  1.863E-07  3.554E-07  1.870E-07  1.434E-03  7.720E-08
2017  1   1  8.511E-06  3.961E-06  7.171E-12  2.026E-05  3.096E-07  5.951E-07  3.130E-07  2.334E-03  1.136E-07
2018  1   1  1.138E-05  6.430E-06  1.416E-11  2.778E-05  4.309E-07  8.347E-07  4.391E-07  3.182E-03  1.398E-07
2019  1   1  1.396E-05  9.365E-06  2.425E-11  3.494E-05  5.502E-07  1.074E-06  5.650E-07  3.980E-03  1.579E-07
2020  1   1  1.627E-05  1.273E-05  3.784E-11  4.177E-05  6.676E-07  1.314E-06  6.909E-07  4.730E-03  1.693E-07
2021  1   1  1.833E-05  1.650E-05  5.528E-11  4.826E-05  7.831E-07  1.553E-06  8.168E-07  5.434E-03  1.756E-07
2022  1   1  2.016E-05  2.065E-05  7.691E-11  5.443E-05  8.967E-07  1.793E-06  9.426E-07  6.095E-03  1.777E-07
2023  1   1  2.177E-05  2.513E-05  1.030E-10  6.030E-05  1.009E-06  2.032E-06  1.068E-06  6.713E-03  1.766E-07
2024  1   1  2.319E-05  2.994E-05  1.338E-10  6.587E-05  1.118E-06  2.271E-06  1.194E-06  7.292E-03  1.731E-07
2025  1   1  2.443E-05  3.505E-05  1.696E-10  7.116E-05  1.227E-06  2.511E-06  1.320E-06  7.832E-03  1.677E-07
2015 ALL  1  1.813E-06  5.570E-07  6.153E-13  4.115E-06  6.111E-08  1.157E-07  6.089E-08  4.792E-04  2.831E-08
2016 ALL  1  5.330E-06  1.991E-06  2.822E-12  1.238E-05  1.863E-07  3.554E-07  1.870E-07  1.434E-03  7.720E-08
2017 ALL  1  8.511E-06  3.961E-06  7.171E-12  2.026E-05  3.096E-07  5.951E-07  3.130E-07  2.334E-03  1.136E-07
2018 ALL  1  1.138E-05  6.430E-06  1.416E-11  2.778E-05  4.309E-07  8.347E-07  4.391E-07  3.182E-03  1.398E-07
2019 ALL  1  1.396E-05  9.365E-06  2.425E-11  3.494E-05  5.502E-07  1.074E-06  5.650E-07  3.980E-03  1.579E-07
2020 ALL  1  1.627E-05  1.273E-05  3.784E-11  4.177E-05  6.676E-07  1.314E-06  6.909E-07  4.730E-03  1.693E-07
2021 ALL  1  1.833E-05  1.650E-05  5.528E-11  4.826E-05  7.831E-07  1.553E-06  8.168E-07  5.434E-03  1.756E-07
2022 ALL  1  2.016E-05  2.065E-05  7.691E-11  5.443E-05  8.967E-07  1.793E-06  9.426E-07  6.095E-03  1.777E-07
2023 ALL  1  2.177E-05  2.513E-05  1.030E-10  6.030E-05  1.009E-06  2.032E-06  1.068E-06  6.713E-03  1.766E-07
2024 ALL  1  2.319E-05  2.994E-05  1.338E-10  6.587E-05  1.118E-06  2.271E-06  1.194E-06  7.292E-03  1.731E-07
2025 ALL  1  2.443E-05  3.505E-05  1.696E-10  7.116E-05  1.227E-06  2.511E-06  1.320E-06  7.832E-03  1.677E-07
----------------------------------------------------------------------------------------------------------------
Leafy Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
----------------------------------------------------------------------------------------------------------------
2015  1   1  1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
2016  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025  1   1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2015 ALL  1  1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
2016 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025 ALL  1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
----------------------------------------------------------------------------------------------------------------
Other Vegetable Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
----------------------------------------------------------------------------------------------------------------
2015  1   1  1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
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2016  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2015 ALL  1   1.785E-04  2.884E-07  2.304E-17  2.116E-03  6.125E-06  1.184E-05  6.227E-06  7.433E-03  2.185E-06
2016 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
--------------------------------------------------------------------------------------------------------
Milk Concentrations (Ci/L) x cf pCi/L cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
--------------------------------------------------------------------------------------------------------
2015  1   1   3.525E-08  1.088E-10  9.708E-21  1.607E-03  1.174E-09  2.220E-09  1.168E-09  4.881E-04  5.905E-07
2016  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2015 ALL  1   3.525E-08  1.088E-10  9.708E-21  1.607E-03  1.174E-09  2.220E-09  1.168E-09  4.881E-04  5.905E-07
2016 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
--------------------------------------------------------------------------------------------------------
Beef Concentrations (Ci/kg) x cf pCi/kg cf= 1.000E+12
Year Src Rec   Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
--------------------------------------------------------------------------------------------------------
2015  1   1   3.516E-06  2.719E-09  1.942E-18  6.018E-03  1.173E-07  2.220E-07  1.168E-07  1.950E-03  5.867E-06
2016  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025  1   1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2015 ALL  1   3.516E-06  2.719E-09  1.942E-18  6.018E-03  1.173E-07  2.220E-07  1.168E-07  1.950E-03  5.867E-06
2016 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2017 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2018 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2019 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2020 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2021 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2022 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2023 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2024 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2025 ALL  1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
----------------------------------------------------------------------------
Dose Conversion Factor Notes
External DCF for Cs-137   includes Ba-137m
External DCF for Sr-90    includes Y-90
Submersion DCF for Cs-137   includes Ba-137m
Ground DCF for Cs-137   includes Ba-137m
Ground DCF for Sr-90    includes Y-90
----------------------------------------------------------
Inhalation Dose Conversion Factors (rem/Ci)
Rad     Sol AMAD(um) Age          Effective
----------------------------------------------------------
Pu-241  D   1.0    0            8.510E+06
Pu-241  D   1.0    1            8.510E+06
Pu-241  D   1.0    5            8.510E+06
Pu-241  D   1.0   10            8.510E+06
Pu-241  D   1.0   15            8.510E+06
Pu-241  D   1.0   20            8.510E+06
Am-241  D   1.0    0            3.630E+08
Am-241  D   1.0    1            3.630E+08
Am-241  D   1.0    5            3.630E+08
Am-241  D   1.0   10            3.630E+08
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Am-241   D   1.0   15          3.630E+08
Am-241   D   1.0   20          3.630E+08
Np-237   D   1.0    0          1.840E+08
Np-237   D   1.0    1          1.840E+08
Np-237   D   1.0    5          1.840E+08
Np-237   D   1.0   10          1.840E+08
Np-237   D   1.0   15          1.840E+08
Np-237   D   1.0   20          1.840E+08
Cs-137   D   1.0    0          1.543E+05
Cs-137   D   1.0    1          1.543E+05
Cs-137   D   1.0    5          1.543E+05
Cs-137   D   1.0   10          1.543E+05
Cs-137   D   1.0   15          1.543E+05
Cs-137   D   1.0   20          1.543E+05
Pu-238   D   1.0    0          4.070E+08
Pu-238   D   1.0    1          4.070E+08
Pu-238   D   1.0    5          4.070E+08
Pu-238   D   1.0   10          4.070E+08
Pu-238   D   1.0   15          4.070E+08
Pu-238   D   1.0   20          4.070E+08
Pu-239   D   1.0    0          4.477E+08
Pu-239   D   1.0    1          4.477E+08
Pu-239   D   1.0    5          4.477E+08
Pu-239   D   1.0   10          4.477E+08
Pu-239   D   1.0   15          4.477E+08
Pu-239   D   1.0   20          4.477E+08
Pu-240   D   1.0    0          4.477E+08
Pu-240   D   1.0    1          4.477E+08
Pu-240   D   1.0    5          4.477E+08
Pu-240   D   1.0   10          4.477E+08
Pu-240   D   1.0   15          4.477E+08
Pu-240   D   1.0   20          4.477E+08
Sr-90    D   1.0    0          6.068E+05
Sr-90    D   1.0    1          6.068E+05
Sr-90    D   1.0    5          6.068E+05
Sr-90    D   1.0   10          6.068E+05
Sr-90    D   1.0   15          6.068E+05
Sr-90    D   1.0   20          6.068E+05
Co-60    D   1.0    0          1.229E+05
Co-60    D   1.0    1          1.229E+05
Co-60    D   1.0    5          1.221E+05
Co-60    D   1.0   10          1.221E+05
Co-60    D   1.0   15          1.221E+05
Co-60    D   1.0   20          1.221E+05
----------------------------------------
Ingestion Dose Conversion Factors (rem/Ci)
Rad          Age             Effective
----------------------------------------
Pu-241        0             1.760E+04
Pu-241        1             1.760E+04
Pu-241        5             1.760E+04
Pu-241       10             1.760E+04
Pu-241       15             1.760E+04
Pu-241       20             1.760E+04
Am-241        0             7.550E+05
Am-241        1             7.550E+05
Am-241        5             7.550E+05
Am-241       10             7.550E+05
Am-241       15             7.550E+05
Am-241       20             7.550E+05
Np-237        0             3.960E+05
Np-237        1             3.960E+05
Np-237        5             3.960E+05
Np-237       10             3.960E+05
Np-237       15             3.960E+05
Np-237       20             3.960E+05
Cs-137        0             5.020E+04
Cs-137        1             5.020E+04
Cs-137        5             5.020E+04
Cs-137       10             5.020E+04
Cs-137       15             5.020E+04
Cs-137       20             5.020E+04
Pu-238        0             8.440E+05
Pu-238        1             8.440E+05
Pu-238        5             8.440E+05
Pu-238       10             8.440E+05
Pu-238       15             8.440E+05
Pu-238       20             8.440E+05
Pu-239        0             9.280E+05
Pu-239        1             9.280E+05
Pu-239        5             9.280E+05
Pu-239       10             9.280E+05
Pu-239       15             9.280E+05
Pu-239       20             9.280E+05
Pu-240        0             9.280E+05
Pu-240        1             9.280E+05
Pu-240        5             9.280E+05
Pu-240       10             9.280E+05
Pu-240       15             9.280E+05
Pu-240       20             9.280E+05
Sr-90         0             1.020E+05
Sr-90         1             1.020E+05
Sr-90         5             1.020E+05
Sr-90        10             1.020E+05
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Sr-90          15             1.020E+05
Sr-90          20             1.020E+05
Co-60           0             1.260E+04
Co-60           1             1.260E+04
Co-60           5             1.260E+04
Co-60          10             1.260E+04
Co-60          15             1.260E+04
Co-60          20             1.260E+04
----------------------------------------
External Dose Conversion Factors (rem-m**2/(Ci-s))
Rad            Age            Effective
----------------------------------------
Pu-241          0             6.370E-09
Pu-241          1             6.370E-09
Pu-241          5             6.370E-09
Pu-241         10             6.370E-09
Pu-241         15             6.370E-09
Pu-241         20             6.370E-09
Am-241          0             8.630E-05
Am-241          1             8.630E-05
Am-241          5             8.630E-05
Am-241         10             8.630E-05
Am-241         15             8.630E-05
Am-241         20             8.630E-05
Np-237          0             9.320E-05
Np-237          1             9.320E-05
Np-237          5             9.320E-05
Np-237         10             9.320E-05
Np-237         15             9.320E-05
Np-237         20             9.320E-05
Cs-137          0             2.036E-03
Cs-137          1             2.036E-03
Cs-137          5             2.036E-03
Cs-137         10             2.036E-03
Cs-137         15             2.036E-03
Cs-137         20             2.036E-03
Pu-238          0             2.320E-06
Pu-238          1             2.320E-06
Pu-238          5             2.320E-06
Pu-238         10             2.320E-06
Pu-238         15             2.320E-06
Pu-238         20             2.320E-06
Pu-239          0             1.050E-06
Pu-239          1             1.050E-06
Pu-239          5             1.050E-06
Pu-239         10             1.050E-06
Pu-239         15             1.050E-06
Pu-239         20             1.050E-06
Pu-240          0             2.230E-06
Pu-240          1             2.230E-06
Pu-240          5             2.230E-06
Pu-240         10             2.230E-06
Pu-240         15             2.230E-06
Pu-240         20             2.230E-06
Sr-90           0             4.121E-04
Sr-90           1             4.121E-04
Sr-90           5             4.121E-04
Sr-90          10             4.121E-04
Sr-90          15             4.121E-04
Sr-90          20             4.121E-04
Co-60           0             8.510E-03
Co-60           1             8.510E-03
Co-60           5             8.510E-03
Co-60          10             8.510E-03
Co-60          15             8.510E-03
Co-60          20             8.510E-03
----------------------------------------
Submersion Dose Conversion Factors (rem-m**3/(Ci-s))
Rad            Age            Effective
----------------------------------------
Pu-241          0             2.350E-07
Pu-241          1             2.350E-07
Pu-241          5             2.350E-07
Pu-241         10             2.350E-07
Pu-241         15             2.350E-07
Pu-241         20             2.350E-07
Am-241          0             2.510E-03
Am-241          1             2.510E-03
Am-241          5             2.510E-03
Am-241         10             2.510E-03
Am-241         15             2.510E-03
Am-241         20             2.510E-03
Np-237          0             3.290E-03
Np-237          1             3.290E-03
Np-237          5             3.290E-03
Np-237         10             3.290E-03
Np-237         15             3.290E-03
Np-237         20             3.290E-03
Cs-137          0             9.456E-02
Cs-137          1             9.456E-02
Cs-137          5             9.456E-02
Cs-137         10             9.456E-02
Cs-137         15             9.456E-02
Cs-137         20             9.456E-02
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Pu-238      0           1.300E-05
Pu-238      1           1.300E-05
Pu-238      5           1.300E-05
Pu-238     10           1.300E-05
Pu-238     15           1.300E-05
Pu-238     20           1.300E-05
Pu-239      0           1.290E-05
Pu-239      1           1.290E-05
Pu-239      5           1.290E-05
Pu-239     10           1.290E-05
Pu-239     15           1.290E-05
Pu-239     20           1.290E-05
Pu-240      0           1.270E-05
Pu-240      1           1.270E-05
Pu-240      5           1.270E-05
Pu-240     10           1.270E-05
Pu-240     15           1.270E-05
Pu-240     20           1.270E-05
Sr-90       0           3.650E-04
Sr-90       1           3.650E-04
Sr-90       5           3.650E-04
Sr-90      10           3.650E-04
Sr-90      15           3.650E-04
Sr-90      20           3.650E-04
Co-60       0           4.400E-01
Co-60       1           4.400E-01
Co-60       5           4.400E-01
Co-60      10           4.400E-01
Co-60      15           4.400E-01
Co-60      20           4.400E-01
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Soil Vol Dose Conversion Factors (rem-m**3/(Ci-s))
Rad         Age           Effective
--------------------------------------
Pu-241      0           1.050E-10
Pu-241      1           1.050E-10
Pu-241      5           1.050E-10
Pu-241     10           1.050E-10
Pu-241     15           1.050E-10
Pu-241     20           1.050E-10
Am-241      0           7.360E-07
Am-241      1           7.360E-07
Am-241      5           7.360E-07
Am-241     10           7.360E-07
Am-241     15           7.360E-07
Am-241     20           7.360E-07
Np-237      0           1.380E-06
Np-237      1           1.380E-06
Np-237      5           1.380E-06
Np-237     10           1.380E-06
Np-237     15           1.380E-06
Np-237     20           1.380E-06
Cs-137      0           6.340E-05
Cs-137      1           6.340E-05
Cs-137      5           6.340E-05
Cs-137     10           6.340E-05
Cs-137     15           6.340E-05
Cs-137     20           6.340E-05
Pu-238      0           2.310E-09
Pu-238      1           2.310E-09
Pu-238      5           2.310E-09
Pu-238     10           2.310E-09
Pu-238     15           2.310E-09
Pu-238     20           2.310E-09
Pu-239      0           5.220E-09
Pu-239      1           5.220E-09
Pu-239      5           5.220E-09
Pu-239     10           5.220E-09
Pu-239     15           5.220E-09
Pu-239     20           5.220E-09
Pu-240      0           2.230E-09
Pu-240      1           2.230E-09
Pu-240      5           2.230E-09
Pu-240     10           2.230E-09
Pu-240     15           2.230E-09
Pu-240     20           2.230E-09
Sr-90       0           8.088E-07
Sr-90       1           8.088E-07
Sr-90       5           8.088E-07
Sr-90      10           8.088E-07
Sr-90      15           8.088E-07
Sr-90      20           8.088E-07
Co-60       0           3.050E-04
Co-60       1           3.050E-04
Co-60       5           3.050E-04
Co-60      10           3.050E-04
Co-60      15           3.050E-04
Co-60      20           3.050E-04
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Inhalation Dose from direct emissions (rem)
Year    Organ    Rec   Pu-241    Am-241    Np-237    Cs-137    Pu-238    Pu-239    Pu-240    Sr-90    Co-60
Total
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2015 Effective      1  3.445E-07  2.231E-08  3.586E-19  3.210E-08  5.415E-07  1.123E-06  5.906E-07  9.665E-08
4.064E-11  2.750E-06
2016 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective      1  3.445E-07  2.231E-08  3.586E-19  3.210E-08  5.415E-07  1.123E-06  5.906E-07  9.665E-08
4.064E-11  2.750E-06
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Inhalation Dose from resuspension (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
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2015 Effective      1  4.334E-09  5.771E-10  9.659E-17  4.043E-10  6.826E-09  1.415E-08  7.447E-09  1.217E-09
5.096E-13  3.496E-08
2016 Effective      1  2.829E-11  3.832E-12  6.412E-19  2.707E-12  4.639E-11  9.696E-11  5.101E-11  8.076E-12
3.060E-15  2.373E-10
2017 Effective      1  2.161E-12  2.978E-13  4.982E-20  2.120E-13  3.689E-12  7.771E-12  4.088E-12  6.270E-13
2.150E-16  1.885E-11
2018 Effective      1  1.909E-12  2.678E-13  4.478E-20  1.921E-13  3.393E-12  7.204E-12  3.790E-12  5.631E-13
1.748E-16  1.732E-11
2019 Effective      1  1.818E-12  2.597E-13  4.341E-20  1.876E-13  3.364E-12  7.200E-12  3.787E-12  5.451E-13
1.531E-16  1.716E-11
2020 Effective      1  1.732E-12  2.520E-13  4.211E-20  1.833E-13  3.337E-12  7.199E-12  3.786E-12  5.279E-13
1.342E-16  1.702E-11
2021 Effective      1  1.650E-12  2.447E-13  4.086E-20  1.791E-13  3.311E-12  7.197E-12  3.785E-12  5.113E-13
1.176E-16  1.688E-11
2022 Effective      1  1.572E-12  2.376E-13  3.967E-20  1.750E-13  3.284E-12  7.196E-12  3.784E-12  4.952E-13
1.031E-16  1.675E-11
2023 Effective      1  1.498E-12  2.308E-13  3.852E-20  1.711E-13  3.258E-12  7.195E-12  3.784E-12  4.796E-13
9.038E-17  1.662E-11
2024 Effective      1  1.427E-12  2.242E-13  3.741E-20  1.671E-13  3.232E-12  7.194E-12  3.783E-12  4.645E-13
7.923E-17  1.649E-11
2025 Effective      1  1.359E-12  2.179E-13  3.635E-20  1.633E-13  3.206E-12  7.193E-12  3.782E-12  4.499E-13
6.945E-17  1.637E-11
All  Effective      1  4.378E-09  5.831E-10  9.760E-17  4.086E-10  6.902E-09  1.432E-08  7.532E-09  1.230E-09
5.138E-13  3.535E-08
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Soil Ingestion Doses (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
-------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2016 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective      1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
-------------------------------------------------------------------------------------------------------
-----------
Leafy Vegetable Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
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--------------------------------------------------------------------------------------------------
-----------
2015 Effective     1  5.654E-11  3.920E-12  1.642E-22  1.912E-09  9.306E-11  1.977E-10  1.040E-10  1.365E-08
4.956E-13  1.601E-08
2016 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective     1  5.654E-11  3.920E-12  1.642E-22  1.912E-09  9.306E-11  1.977E-10  1.040E-10  1.365E-08
4.956E-13  1.601E-08
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Other Vegetable Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
--------------------------------------------------------------------------------------------------
-----------
2015 Effective     1  5.528E-10  3.833E-11  1.606E-21  1.869E-08  9.099E-10  1.933E-09  1.017E-09  1.334E-07
4.846E-12  1.566E-07
2016 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective     1  5.528E-10  3.833E-11  1.606E-21  1.869E-08  9.099E-10  1.933E-09  1.017E-09  1.334E-07
4.846E-12  1.566E-07
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Beef Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
--------------------------------------------------------------------------------------------------
-----------
2015 Effective     1  5.261E-12  1.745E-13  6.535E-23  2.568E-08  8.416E-12  1.751E-11  9.214E-12  1.691E-08
6.284E-12  4.263E-08
2016 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective     1  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective     1  5.261E-12  1.745E-13  6.535E-23  2.568E-08  8.416E-12  1.751E-11  9.214E-12  1.691E-08
6.284E-12  4.263E-08
--------------------------------------------------------------------------------------------------
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Milk Ingestion Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
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2015 Effective      1   6.948E-14  9.197E-15  4.306E-25  9.033E-09  1.109E-13  2.308E-13  1.214E-13  5.576E-09
8.333E-13  1.461E-08
2016 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective      1   6.948E-14  9.197E-15  4.306E-25  9.033E-09  1.109E-13  2.308E-13  1.214E-13  5.576E-09
8.333E-13  1.461E-08
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-----------
External Exposure Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
----------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1   6.381E-15  2.711E-13  9.553E-20  1.061E-08  7.789E-14  6.668E-14  7.451E-14  1.637E-09
6.736E-11  1.231E-08
2016 Effective      1   6.079E-15  3.987E-13  2.326E-19  1.036E-08  7.727E-14  6.667E-14  7.450E-14  1.586E-09
5.905E-11  1.201E-08
2017 Effective      1   5.792E-15  5.185E-13  4.074E-19  1.013E-08  7.665E-14  6.667E-14  7.448E-14  1.536E-09
5.176E-11  1.172E-08
2018 Effective      1   5.518E-15  6.309E-13  6.164E-19  9.897E-09  7.604E-14  6.666E-14  7.446E-14  1.488E-09
4.538E-11  1.143E-08
2019 Effective      1   5.258E-15  7.363E-13  8.565E-19  9.671E-09  7.543E-14  6.665E-14  7.445E-14  1.441E-09
3.978E-11  1.115E-08
2020 Effective      1   5.009E-15  8.349E-13  1.124E-18  9.450E-09  7.483E-14  6.664E-14  7.443E-14  1.396E-09
3.487E-11  1.088E-08
2021 Effective      1   4.772E-15  9.272E-13  1.417E-18  9.234E-09  7.423E-14  6.663E-14  7.441E-14  1.352E-09
3.057E-11  1.062E-08
2022 Effective      1   4.547E-15  1.014E-12  1.733E-18  9.024E-09  7.364E-14  6.662E-14  7.440E-14  1.310E-09
2.679E-11  1.036E-08
2023 Effective      1   4.332E-15  1.094E-12  2.068E-18  8.818E-09  7.305E-14  6.661E-14  7.438E-14  1.269E-09
2.349E-11  1.011E-08
2024 Effective      1   4.127E-15  1.169E-12  2.421E-18  8.616E-09  7.246E-14  6.660E-14  7.436E-14  1.229E-09
2.059E-11  9.867E-09
2025 Effective      1   3.932E-15  1.239E-12  2.789E-18  8.420E-09  7.188E-14  6.659E-14  7.435E-14  1.191E-09
1.805E-11  9.630E-09
All  Effective      1   5.575E-14  8.834E-12  1.376E-17  1.042E-07  8.234E-13  7.330E-13  8.187E-13  1.544E-08
4.177E-10  1.201E-07
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Submersion Exposure Dose (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
----------------------------------------------------------------------------------------------------------
-----------
2015 Effective      1   3.734E-17  6.057E-16  2.517E-26  7.722E-11  6.790E-17  1.270E-16  6.578E-17  2.282E-13
5.749E-13  7.803E-11
2016 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2017 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2018 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2019 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2020 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2021 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2022 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2023 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2024 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
2025 Effective      1   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.000E+00  0.000E+00
All  Effective      1   3.734E-17  6.057E-16  2.517E-26  7.722E-11  6.790E-17  1.270E-16  6.578E-17  2.282E-13
5.749E-13  7.803E-11
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All Pathway Doses (rem)
Year    Organ    Rec  Pu-241     Am-241     Np-237     Cs-137     Pu-238     Pu-239     Pu-240     Sr-90      Co-60
Total
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2015 Effective     1  3.494E-07  2.293E-08  9.705E-17  9.850E-08  5.494E-07  1.139E-06  5.992E-07  2.691E-07
1.215E-10  3.027E-06
2016 Effective     1  2.830E-11  4.231E-12  8.738E-19  1.037E-08  4.647E-11  9.702E-11  5.109E-11  1.594E-09
5.905E-11  1.225E-08
2017 Effective     1  2.167E-12  8.164E-13  4.572E-19  1.013E-08  3.766E-12  7.838E-12  4.163E-12  1.537E-09
5.176E-11  1.174E-08
2018 Effective     1  1.914E-12  8.987E-13  6.612E-19  9.897E-09  3.469E-12  7.271E-12  3.864E-12  1.489E-09
4.538E-11  1.145E-08
2019 Effective     1  1.823E-12  9.960E-13  8.999E-19  9.671E-09  3.440E-12  7.266E-12  3.861E-12  1.442E-09
3.978E-11  1.117E-08
2020 Effective     1  1.737E-12  1.087E-12  1.167E-18  9.450E-09  3.412E-12  7.265E-12  3.861E-12  1.397E-09
3.487E-11  1.090E-08
2021 Effective     1  1.655E-12  1.172E-12  1.458E-18  9.234E-09  3.385E-12  7.264E-12  3.860E-12  1.353E-09
3.057E-11  1.064E-08
2022 Effective     1  1.576E-12  1.251E-12  1.772E-18  9.024E-09  3.358E-12  7.263E-12  3.859E-12  1.310E-09
2.679E-11  1.038E-08
2023 Effective     1  1.502E-12  1.325E-12  2.107E-18  8.818E-09  3.331E-12  7.262E-12  3.858E-12  1.269E-09
2.349E-11  1.013E-08
2024 Effective     1  1.431E-12  1.393E-12  2.458E-18  8.616E-09  3.304E-12  7.261E-12  3.857E-12  1.230E-09
2.059E-11  9.884E-09
2025 Effective     1  1.363E-12  1.457E-12  2.825E-18  8.420E-09  3.278E-12  7.260E-12  3.856E-12  1.191E-09
1.805E-11  9.646E-09
All  Effective     1  3.495E-07  2.295E-08  1.117E-16  1.921E-07  5.494E-07  1.139E-06  5.993E-07  2.829E-07
4.719E-10  3.136E-06
 Successful Execution of DOSEMM
 Execution Time   0.33856799999999998        seconds
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Source Term Files

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Year  Month Pu-241  Am-241  Np-237  Cs-137  Pu-238  Pu-239  Pu-240  Sr-90 Co-60 Ci/s
2015 1 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 2 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 3 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 4 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 5 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 6 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 7 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 8 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 9 1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 10  1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 11  1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13
2015 12  1.08E-10  1.64E-13  5.20E-24  5.55E-10  3.55E-12  6.69E-12  3.52E-12  4.25E-10  8.88E-13


Year  Month H-3 C-14  Ci/s
2015  1 4.53E-06  3.00E-13
2015  2 4.53E-06  3.00E-13
2015  3 4.53E-06  3.00E-13
2015  4 4.53E-06  3.00E-13
2015  5 4.53E-06  3.00E-13
2015  6 4.53E-06  3.00E-13
2015  7 4.53E-06  3.00E-13
2015  8 4.53E-06  3.00E-13
2015  9 4.53E-06  3.00E-13
2015  10  4.53E-06  3.00E-13
2015  11  4.53E-06  3.00E-13
2015  12  4.53E-06  3.00E-13

Year  Month   I-129     I-131  Ci/s
2015  1 6.82E-10        3.17E-06
2015  2 6.82E-10        3.17E-06
2015  3 6.82E-10        3.17E-06
2015  4 6.82E-10        3.17E-06
2015  5 6.82E-10        3.17E-06
2015  6 6.82E-10        3.17E-06
2015  7 6.82E-10        3.17E-06
2015  8 6.82E-10        3.17E-06
2015  9 6.82E-10        3.17E-06
2015  10  6.82E-10        3.17E-06
2015  11  6.82E-10        3.17E-06
2015  12  6.82E-10        3.17E-06


Year  Month Kr-85 Ar-41 Ci/s
2015  1 2.32E-05  1.59E-05
2015  2 2.32E-05  1.59E-05
2015  3 2.32E-05  1.59E-05
2015  4 2.32E-05  1.59E-05
2015  5 2.32E-05  1.59E-05
2015  6 2.32E-05  1.59E-05
2015  7 2.32E-05  1.59E-05
2015  8 2.32E-05  1.59E-05
2015  9 2.32E-05  1.59E-05
2015  10  2.32E-05  1.59E-05
2015  11  2.32E-05  1.59E-05
2015  12  2.32E-05  1.59E-05
```

Element File

```
$ Struture of file
```

```
$Element
$Kd_value  dist_type p1 p2 p3 p4
$CRveg_value  dist_type p1 p2 p3 p4
$CRforg_value  dist_type p1 p2 p3 p4
$TCmilk_value  dist_type p1 p2 p3 p4
$TCmeat_value  dist_type p1 p2 p3 p4
$ CRveg, CRforg in wet weight, TCMilk, TCMeat  from  ANL/EAS/TM-103, DOE, August 1993
$ Kd values from the default values in RESRAD onsite Ver 7.0
$ Uncertainty is assumed to be lognormal with a GSD of 1.5 and min and max = 1/10 and 10x the nominal value
Ac     Element
2.00E+01  LNORM 2.00E+01  1.5 2.00E+00  2.00E+02    Kd (mL/g)
2.50E-03  LNORM 2.50E-03  1.5 2.50E-04  2.50E-02    CRveg (fw)
1.00E-01  LNORM 1.00E-01  1.5 1.00E-02  1.00E+00    CRforg (fw)
2.00E-05  LNORM 2.00E-05  1.5 2.00E-06  2.00E-04    TCmilk
2.00E-05  LNORM 2.00E-05  1.5 2.00E-06  2.00E-04    TCmeat
Am     Element
2.00E+01  LNORM 2.00E+01  1.5 2.00E+00  2.00E+02    Kd (mL/g)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02    CRveg (fw)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02    CRforg (fw)
2.00E-06  LNORM 2.00E-06  1.5 2.00E-07  2.00E-05    TCmilk
5.00E-05  LNORM 5.00E-05  1.5 5.00E-06  5.00E-04    TCmeat
Ar     Element
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    Kd (mL/g)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRveg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRforg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmilk
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmeat
Ba     Element
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    Kd (mL/g)
5.00E-03  LNORM 5.00E-03  1.5 5.00E-04  5.00E-02    CRveg (fw)
5.00E-03  LNORM 5.00E-03  1.5 5.00E-04  5.00E-02    CRforg (fw)
5.00E-04  LNORM 5.00E-04  1.5 5.00E-05  5.00E-03    TCmilk
2.00E-04  LNORM 2.00E-04  1.5 2.00E-05  2.00E-03    TCmeat
Bi
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    Kd (mL/g)
1.00E-01  LNORM 1.00E-01  1.5 1.00E-02  1.00E+00    CRveg (fw)
1.00E-01  LNORM 1.00E-01  1.5 1.00E-02  1.00E+00    CRforg (fw)
5.00E-04  LNORM 5.00E-04  1.5 5.00E-05  5.00E-03    TCmilk
2.00E-03  LNORM 2.00E-03  1.5 2.00E-04  2.00E-02    TCmeat
C
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    Kd (mL/g)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRveg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRforg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmilk
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmeat
Co
1.00E+03 LNORM 1.00E+03 1.5 1.00E+02 1.00E+04    Kd (mL/g)
8.00E-02 LNORM 8.00E-02 1.5 8.00E-03 8.00E-01    CRveg (fw)
8.00E-02 LNORM 8.00E-02 1.5 8.00E-03 8.00E-01    CRforg (fw)
2.00E-03 LNORM 2.00E-03 1.5 2.00E-04 2.00E-02    TCmilk
2.00E-02 LNORM 2.00E-02 1.5 2.00E-03 2.00E-01    TCmeat
Cs
4.60E+03  LNORM 4.60E+03  1.5 4.60E+02  4.60E+04    Kd (mL/g)
4.00E-02  LNORM 4.00E-02  1.5 4.00E-03  4.00E-01    CRveg (fw)
4.00E-02  LNORM 4.00E-02  1.5 4.00E-03  4.00E-01    CRforg (fw)
8.00E-03  LNORM 8.00E-03  1.5 8.00E-04  8.00E-02    TCmilk
3.00E-02  LNORM 3.00E-02  1.5 3.00E-03  3.00E-01    TCmeat
H
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    Kd (mL/g)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRveg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRforg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmilk
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmeat
I
1.00E-01  LNORM 1.00E-01  1.5 1.00E-02  1.00E+00    Kd (mL/g)
2.00E-02  LNORM 2.00E-02  1.5 2.00E-03  2.00E-01    CRveg (fw)
2.00E-02  LNORM 2.00E-02  1.5 2.00E-03  2.00E-01    CRforg (fw)
1.00E-02  LNORM 1.00E-02  1.5 1.00E-03  1.00E-01    TCmilk
7.00E-03  LNORM 7.00E-03  1.5 7.00E-04  7.00E-02    TCmeat
Kr     Element
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    Kd (mL/g)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRveg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    CRforg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmilk
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00    TCmeat
Np
8.00E+00  LNORM 8.00E+00  1.5 8.00E-01  8.00E+01    Kd (mL/g)
2.00E-02  LNORM 2.00E-02  1.5 2.00E-03  2.00E-01    CRveg (fw)
2.00E-02  LNORM 2.00E-02  1.5 2.00E-03  2.00E-01    CRforg (fw)
5.00E-06  LNORM 5.00E-06  1.5 5.00E-07  5.00E-05    TCmilk
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02    TCmeat
Pa
5.00E+01  LNORM 5.00E+01  1.5 5.00E+00  5.00E+02    Kd (mL/g)
2.50E-03  LNORM 2.50E-03  1.5 2.50E-04  2.50E-02    CRveg (fw)
1.00E-01  LNORM 1.00E-01  1.5 1.00E-02  1.00E+00    CRforg (fw)
5.00E-06  LNORM 5.00E-06  1.5 5.00E-07  5.00E-05    TCmilk
5.00E-03  LNORM 5.00E-03  1.5 5.00E-04  5.00E-02    TCmeat
Pb
1.00E+02  LNORM 1.00E+02  1.5 1.00E+01  1.00E+03    Kd (mL/g)
1.00E-02  LNORM 1.00E-02  1.5 1.00E-03  1.00E-01    CRveg (fw)
1.00E-02  LNORM 1.00E-02  1.5 1.00E-03  1.00E-01    CRforg (fw)
3.00E-04  LNORM 3.00E-04  1.5 3.00E-05  3.00E-03    TCmilk
8.00E-04  LNORM 8.00E-04  1.5 8.00E-05  8.00E-03    TCmeat
Po
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1.00E+01  LNORM 1.00E+01  1.5 1.00E+00  1.00E+02     Kd (mL/g)
9.00E-03  LNORM 9.00E-03  1.5 9.00E-04  9.00E-02     CRveg (fw)
1.00E-01  LNORM 1.00E-01  1.5 1.00E-02  1.00E+00     CRforg (fw)
3.00E-04  LNORM 3.00E-04  1.5 3.00E-05  3.00E-03     TCmilk
5.00E-03  LNORM 5.00E-03  1.5 5.00E-04  5.00E-02     TCmeat
Pu
2.00E+03  LNORM 2.00E+03  1.5 2.00E+02  2.00E+04     Kd (mL/g)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     CRveg (fw)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     CRforg (fw)
1.00E-06  LNORM 1.00E-06  1.5 1.00E-07  1.00E-05     TCmilk
1.00E-04  LNORM 1.00E-04  1.5 1.00E-05  1.00E-03     TCmeat
Ra
7.00E+01  LNORM 7.00E+01  1.5 7.00E+00  7.00E+02     Kd (mL/g)
4.00E-02  LNORM 4.00E-02  1.5 4.00E-03  4.00E-01     CRveg (fw)
4.00E-02  LNORM 4.00E-02  1.5 4.00E-03  4.00E-01     CRforg (fw)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     TCmilk
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     TCmeat
Rn
0.00E+00  LNORM 0.00E+00  1.5 0.00E+00  0.00E+00     Kd (mL/g)
0.00E+00  LNORM 0.00E+00  1.5 0.00E+00  0.00E+00     CRveg (fw)
0.00E+00  LNORM 0.00E+00  1.5 0.00E+00  0.00E+00     CRforg (fw)
0.00E+00  LNORM 0.00E+00  1.5 0.00E+00  0.00E+00     TCmilk
0.00E+00  LNORM 0.00E+00  1.5 0.00E+00  0.00E+00     TCmeat
Sr
3.00E+01  LNORM 3.00E+01  1.5 3.00E+00  3.00E+02     Kd (mL/g)
3.00E-01  LNORM 3.00E-01  1.5 3.00E-02  3.00E+00     CRveg (fw)
3.00E-01  LNORM 3.00E-01  1.5 3.00E-02  3.00E+00     CRforg (fw)
2.00E-03  LNORM 2.00E-03  1.5 2.00E-04  2.00E-02     TCmilk
8.00E-03  LNORM 8.00E-03  1.5 8.00E-04  8.00E-02     TCmeat
Th
6.00E+04  LNORM 6.00E+04  1.5 6.00E+03  6.00E+05     Kd (mL/g)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     CRveg (fw)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     CRforg (fw)
5.00E-04  LNORM 5.00E-04  1.5 5.00E-05  5.00E-03     TCmilk
7.00E-03  LNORM 7.00E-03  1.5 7.00E-04  7.00E-02     TCmeat
Tl
6.00E+04  LNORM 6.00E+04  1.5 6.00E+03  6.00E+05     Kd (mL/g)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     CRveg (fw)
1.00E-03  LNORM 1.00E-03  1.5 1.00E-04  1.00E-02     CRforg (fw)
5.00E-04  LNORM 5.00E-04  1.5 5.00E-05  5.00E-03     TCmilk
7.00E-03  LNORM 7.00E-03  1.5 7.00E-04  7.00E-02     TCmeat
U
5.00E+01  LNORM 5.00E+01  1.5 5.00E+00  5.00E+02     Kd (mL/g)
2.50E-03  LNORM 2.50E-03  1.5 2.50E-04  2.50E-02     CRveg (fw)
2.50E-03  LNORM 2.50E-03  1.5 2.50E-04  2.50E-02     CRforg (fw)
5.00E-04  LNORM 5.00E-04  1.5 5.00E-05  5.00E-03     TCmilk
7.00E-03  LNORM 7.00E-03  1.5 7.00E-04  7.00E-02     TCmeat
Y
0.00E+00  LNORM 0.00E+00  1.5 0.00E+00  0.00E+00     Kd (mL/g)
2.50E-03  LNORM 2.50E-03  1.5 2.50E-04  2.50E-02     CRveg (fw)
2.50E-03  LNORM 2.50E-03  1.5 2.50E-04  2.50E-02     CRforg (fw)
2.00E-05  LNORM 2.00E-05  1.5 2.00E-06  2.00E-04     TCmilk
2.00E-03  LNORM 2.00E-03  1.5 2.00E-04  2.00E-02     TCmeat
Xe    Element
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00     Kd (mL/g)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00     CRveg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00     CRforg (fw)
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00     TCmilk
0.00E+00  NONE  0.00E+00  1.5 0.00E+00  0.00E+00     TCmeat
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Nuclide File

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Nuclide       Element  T1/2(years)  Progeny     DecayFrac
Ac-227        Ac   2.177E+01 Th-227  1
Ac-228        Ac   7.020E-04 Th-228  1
Am-241        Am   4.322E+02 Np-237  1
Am-243        Am   7.370E+03 Np-239  1
Ar-41         Ar   2.080E-04 STABLE  1
Ba-137m       Ba   4.860E-06 STABLE  1
Bi-210        Bi   1.373E-02 Po-210  1
Bi-214        Bi   3.786E-05 Po-214  0.99979
C-14          C    5.730E+03 STABLE  1
Co-60         Co   5.270E+00 STABLE  1
Cs-137        Cs   3.007E+01 Ba-137m 0.946
Cs-138        Cs   6.356E-05 STABLE  1
H-3           H    1.233E+01 STABLE  1
I-129         I    1.570E+07 STABLE  1
I-131         I    2.199E-02 Xe-131m 1
Kr-85         Kr   1.076E+01 STABLE  1
Kr-87         Kr   2.419E-06 STABLE  1
Np-237        Np   2.144E+06 STABLE  1
Np-239        Np   6.455E-03 Pu-239  1
Pa-231        Pa   3.276E+04 Ac-227  1
Pa-234m       Pa   2.226E-07 U-234 0.9984
Pb-210        Pb   2.230E+01 Bi-210  1
Pb-214        Pb   5.098E-05 Bi-214  1
Po-210        Po   3.791E-01 STABLE  1
Po-214        Po   5.200E-12 Pb-210  1
Po-218        Po   5.898E-06 Pb-214  0.998
Pu-238        Pu   8.770E+01 U-234 1
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Pu-239      Pu  2.411E+04 STABLE 1
Pu-240      Pu  6.563E+03 STABLE 1
Pu-241      Pu  1.435E+01 Am-241  1
Pu-242      Pu  3.733E+05 U-238 1
Ra-226      Ra  1.600E+03 Rn-222  1
Ra-228      Ra  5.750E+00 Ac-228  1
Rn-222      Rn  1.047E-02 Po-218  1
Sb-125      Sb  2.758E+00 Te-125m 1
Sr-90       Sr  2.879E+01 Y-90   1
Te-125m     Te  1.573E-01 STABLE  1
Th-227      Th  5.128E-02 STABLE  1
Th-228      Th  1.912E+00 Tl-208  0.35
Th-230      Th  7.538E+04 Ra-226  1
Th-232      Th  1.400E+10 Ra-228  1
Th-234      Th  6.570E-02 Pa-234m 1
Tl-208      Tl  5.808E-06 STABLE  1
U-233       U   1.592E+05 Th-229  1
U-234       U   2.455E+05 Th-230  1
U-238       U   4.469E+09 Th-234  1
Xe-131m     Xe  3.244E-02 STABLE  1
Xe-135      Xe  1.040E-03 STABLE  1
Xe-135m     Xe  2.900E-05 Xe-135  1
Xe-138      Xe  2.769E-05 Cs-138  1
Y-90        Y   7.31E-03  STABLE  1
```

Media Intake File

```
Age (yr)  InH(m**3/hr)  IngSoil(g/hr) IngLVeg(kg/yr) IngProd(kg/yr) IngMilk(L/yr)  IngMeat (kg/yr)   IngWG(kg/yr)
Values for adult from ASER are used as reference individual
0.0       0.365         0.00250       14.30          17.73          47.2           35.8              0.0
1.0       0.562         0.00417       27.88          32.46          45.6           34.6              63.8
5.0       0.535         0.00696       36.20          35.16          49.4           37.5              65.8
10.       0.553         0.00500       43.00          29.38          64.8           49.2              105.9
15.       0.623         0.00417       48.78          22.31          90.6           68.8              105.9
20.       0.917         0.00          18.00          176.00         112.0          85.0              0.0
120       0.917         0.00          18.00          176.00         112.0          85.0              0.0
```

T 803.536.4883   F 803.534.1995   417 Till Road   Neeses, South Carolina 29107   www.racteam.com