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DESCRIPTION OF
LLNL AERIN CODE REVISION
TO INCLUDE ICRP30 CONCEPTS

William C. King

December 1, 1987

Lawrence
Livermore
National
Laboratory

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TO INCLUDE ICRP30 CONCEPTS**

by

William C. King

**SAFETY SERVICE DIVISION
HAZARDS CONTROL DEPARTMENT
LAWRENCE LIVERMORE NATIONAL LABORATORY**

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DESCRIPTION OF
LLNL AERIN CODE REVISION
TO INCLUDE ICRP 30 CONCEPTS

by

William C. King

I. DESCRIPTION

A. Origin

The AERIN code was written in 1976 at the Lawrence Livermore National Laboratory to calculate the internal dose to several organs of the body resulting from inhalation of transuranic radioactive materials. (P076). A major revision of the code was made in 1982 to incorporate the concepts of ICRP30 (IC81) and to expand the model to include additional body organs. The code was compiled to run on a CDC7600 computer. In 1987 the code was revised in order that it could be compiled to run on a CRAY-1 computer. This document will describe the AERIN code as it exists now.

The current version of the code will compute the time transport of a radioisotope from an initial site of deposition through the various organs of the body and calculate the dose equivalent to those organs using the ICRP30 concepts. The model described by the code can be used to study inhalation, ingestion and wounds either singly or in any combination of depositions.

B. Multiple Run Capabilities

The code can be run for an acute intake, for multiple acute intakes, and for chronic intakes. If the intake involves more than one isotope, the code will calculate the organ burden and dose equivalent for each isotope and keep a running total of the dose equivalent to the organs from all isotopes at any given time after initial intake. Multiple particle sizes may also be used

and the code will keep a running total of the dose equivalent contributed by the material of each particle size.

Certain input data is required which can be entered from the keyboard or from a disk file.

C. Particle Size and Deposition Fraction Adjustments

For inhalation cases, particle size can be adjusted from 0.01 μm AMAD to 50 μm AMAD in 13 graded steps. The default value is 1 μm AMAD. Default deposition fractions in the lung compartments are the values recommended in ICRP30. They also can be altered by the user to change to a wound or an ingestion model.

D. Solubility Class D, W, and Y

The three solubility classes, D, W, and Y, are available in the code and the user is prompted to select one during the input phase. The code also has ability to mix solubility classes.

E. Code Language

The code is written in LRLTRAN language, however the Los Alamos National Laboratory has translated the code into Fortran77 and are using it on a VAX computer in the VMS Operating System. (SC87) At this Laboratory the 1982 version of the code was compiled on a CDC7600 computer using the CHAT compiler and the ORDERLIB library. (CA78) In the 1987 version, the code will be compiled on a CRAY-1 computer using the CIVIC compiler and the FORTLIB library. (AT82).

F. Run Times

To calculate the dose for 50 y from date of intake, the computer time to run one isotope is approximately 1 minute on the CDC7600. It is my usual practice to run the calculations for the time period for which I have bioassay data until I have finished adjustments to the model. In the section following is a description of how I adjust the model to closely fit the observed in-vivo and

in-vitro bioassay data.

6. Data Output

The output consists of 16 pages of printed data for each isotope run. A typical print-out for an acute inhalation of ^{239}Pu of 1 μm AMAD particle size is illustrated in Appendix A. In this example, the code calculated only the first 10 years of data. The nomenclature for the columns of data are given in Appendix B. The first section of the print-out is the amount of activity in the various organs vs. time. The second section is the urine, fecal and blood activity vs. time. The third section is the integral and differential dose equivalents and the organ's contribution to the effective whole-body equivalent dose vs time. The final section is the sum of the effective whole-body dose equivalent vs. time.

It should be noted that on the right side of each page is the accumulative totals of the dose equivalents for multiple runs of the code. The example in appendix A was run for only 1 isotope and therefore the accumulative total dose equivalents are the same as the individual isotope dose equivalents.

II. INPUT DATA REQUIREMENTS

Input data for a run is entered from a disk file created by the user or by the keyboard. I prefer to enter the input data from the keyboard as the program prompts the user.

When the run is started, the program first asks two questions which are answered with a yes or no. The first asks, "Do you need help?". After supplying an answer, the program asks, "Is input data in a disk file?" If the answer is yes, the program asks for the file name and once it is entered, the program jumps to the "GO?END?EDIT?ALTER?HELP? prompt. (See below for a

description of these prompts). If the user answers no to the question, the program proceeds and asks for the name of the isotope. This should be answered with a hyphen between the element symbol and the isotope number. (e.g. ^{239}Pu). There are 13 isotopes in the program databank with the common isotopes of uranium, plutonium, americium and curium represented. If the isotope asked for is not in the databank then the user will be asked to provide additional information such as radiological half-life and later for the specific effective energies for source to target organs.

The user will be asked next to provide the aerosol index. Thirteen index values are available in the databank to choose from. The information contained in the data are the AMAD particle sizes and the respective respiratory tract deposition fractions. To view this databank in table form the user can type "help" at this point. Following the choice of an aerosol index number the user will be asked to select a solubility class. (viz. Y, W, or D)

After these preliminary data have been entered, the user is now prompted to enter the amount of intake, the time over which the intake occurred, and the time interval of the intake. The prompt symbol for this is a question mark, "?". All amounts are to be entered in picocurie and all times are to be entered in days. The data are to be entered in floating point format.

Fractional days are permitted (e.g. $365.25\text{d} = 1\text{ y}$). An example follows:

- ? 1000. 1. 1. (i.e. 1000 pci intake per day for 1 day)
- ? 500. 9. 1. (i.e. 500 pci per day for the next 9 days)
- ? 0. 20. 2. (i.e. no intake per 2d interval for next 20 days)
- ? 0. 70. 5. (i.e. no intake per 5d interval for next 70 days)

To end the intake data entry simply strike the return key at the prompt. Each time interval represents 1 printed line of output. Inorder to minimize the amount of printed data, I usually start out stepping one day at a time for the first 10 days, extending to 2 days per step from 10 to 30 days, and then 5 day steps from 30 to 100 days. If I am running my final iteration and want to carry the calculations out for 50 years, I will step from 100 to 365 days by 50 day steps and from 365 to 17897.25 days (49 more years) in 365.25 day steps, provided there are no further intakes to consider. It is important for accuracy of the calculations to make small time intervals immediately after an intake.

After intake data is entered the computer will respond with "GO?END?EDIT?ALTER?HELP?". GO means to start the computing. END means to exit the program. (there is no recovery after END). EDIT means to look at the values of the parameters chosen. For example if I typed EDIT AER, the computer would respond with a table of the Aerosol Index; or if I typed EDIT THLF, the computer would respond with a table of the biological half-life for the various pathways. If you use the ALTER command, it too must be followed by the parameter name such as ALTER F for changing any of the pathway fractions. Typing HELP will give information about the commands.

Once the user has made all the changes desired and types GO, the code proceeds to print on the TTY the name of the subroutine it is currently working in. This helps the user to track the progress of the computations. When the code moves to the urine subroutine, the user will be prompted to set-up the urine excretion equation. One may choose either a power function or a exponential series equation to describe the excretion. If one chooses the power function, the Langham equation, $0.002t^{-0.74}$ is the default equation. However, the user is asked if he wants to change the constant and fnum (the exponent). If

he answers "yes", he must type in the values he wants to use in place of the default values. If the user chooses the exponential series option, he must enter the constants and decay function in d^{-1} units associated with 5 elements of the equation. If the user wants to limit the equation to three elements, he must enter 0 for the constants in the remaining two.

When the code moves to the Dose subroutine, the user is again asked a question of whether or not the isotope tends to remain bound on the bone surface. The default value is the general criteria given in ICRP 30--That is, the code checks to see if the half-life is <15 d. In the case of plutonium which tends to remain bound on the bone surface, however, the user must answer yes to the question.

If the user has selected an isotope which does not reside in the data bank, he is prompted at this point to type in the specific effective energies for the various source and target organs. Data are to be entered in the E format (i.e. $2.1E-04$), and a comma must be placed after each entry or the program will have a fatal error.

When the code has finished the calculations, it will ask the user if he wants to run another problem. This option is used to repeat the run with a different isotope, a different solubility class, or a different particle size. If another problem is run, the accumulated dose for all runs is maintained by the code.

If the user answers no to the question on running another problem, the code will say "all done" The output file name if running on the CDC 7600 is assigned by the computer and the file name is printed on the TTY. If the code is run on the CRAY-1 the file name is called "OUTPUT". The file may be saved, edited on the TTY, or sent to the printer at the discretion of the user.

III. MODELING METHODS

A. Past Experience

I have studied over 70 incidents of inhalation and wound intakes of uranium and transuranic isotopes using the AERIN code. It has been a rare case when an inhalation intake followed the ICRP30 model. It was usually necessary to adjust the model to fit the observed bioassay and in-vivo count data. The process of adjusting the various parameters in the code to fit the model to the observed bioassay data and lung-count data is an iterative one. This section will describe how these adjustments are done. Also, I describe how to modify the code to model ingestion and wound intakes.

B. Inhalation Models

Figure 1 is a schematic of the AERIN inhalation model which can be recognized as an expansion of the ICRP lung model. The default parameters for deposition fractions, subcompartment fractions, transport fractions and residency half-times for the three solubility classes, D, W, and Y, are the values recommended in ICRP30.

For Plutonium inhalation cases, the best fit to observed bioassay data is generally obtained if both a W and a Y solubility class component is assumed for the inhaled material. In-vivo lung count data are needed to determine what fraction of the intake is W class and what fraction is Y class. It takes periodic lung counts spread over about a year to get a definitive value for these fractions. An alternate method which I have used in some cases is to assume a Y solubility class but reduce the residency half-times in the various lung compartments from 500d to a range between 200d and 300d.

Frequently, on studying inhalation of plutonium and americium oxide, I have observed that the activity in a 24h urine sample is not detected

until 2 or 3 days after the initial intake. The activity levels in the urine then begin to rise, reaching a maximum activity level anywhere between 30 and 200 days later. Such cases require repeated runs of the code with altered solubility fractions to obtain optimum fit to the observed measurements. Usually, I begin by assuming there is no solubility of plutonium or americium in the Naso-Pharynx and Tracheo-Bronchial regions. That is, mathematically I set $F(1)$ and $F(3)$ equal to 0 in the model.

Unless one has physical data on the particle size of the inhaled material, the particle size can be determined by examining the ratio of fecal sample activity to the 24h urine sample activity. The larger the ratio, the larger the particle size of the material inhaled. I usually make several iterative runs of the code using different particle sizes to determine the optimum size to use in the dose assessment.

The user is not limited to the organs listed in Figure 1. He may substitute other organs for the ones listed. When this is done however, he must change the transfer fractions, biological half-life and specific effective energies to correspond to the parameters of the new organ.

C. Wound Models

In modeling a wound, one proceeds to enter the preliminary intake data as is done in the inhalation case. When prompted by the program the user should select the particle size index to what ever is convenient. It makes little difference at this point as it will be necessary to alter it later. When the code asks for, "GO?END?EDIT?ALTER?HELP?", the user alters the deposition fractions ($D3$, $D4$ and $D5$), the pathway fractions ($F1$ through $F8$), and the corresponding biological half-lives ($T1$, $T3$, and $T5$) to develop a three compartment wound model. When I run the code for a wound case, I assume that the NP, TB and Lung compartment in the basic lung model, represent the three

compartments of the wound model. I set the pathway fractions to the GI Tract and to the Lymph to zero in and change the deposition and pathway fractions to the body fluid compartment to develop the model like Figure 2.

To alter the deposition fractions one should type "ALTER AER"; to alter the pathway fractions, type "ALTER F"; and to alter the biological half-lives, type "ALTER THLF". The code in each case will respond asking the user for an index number. The index code can be printed on the TTY by using the EDIT command. (i.e. EDIT AER). When altering the deposition fraction, the index number should be the same as the one entered earlier when the code asked for the particle size index.

D. Ingestion Models

Again, the user enters the preliminary intake data as is done in the inhalation case. When the code gets to the prompt, "GO?END?EDIT?ALTER?HELP?", the user alters the deposition fractions, the pathway fractions and the corresponding biological half-lives similar to what is done when modeling a wound. After making the required changes the model for ingestion cases should look like Figure 3.

I assume that the NP compartment in the basic lung model represents the esophagus in the Ingestion model. I set the deposition fractions D3 to 1.0 and D4 and D5 to 0. I change the half-life value of pathway 2 to 0.0001d to represent a rapid movement into the stomach. No ingestion cases have occurred at LLNL but I have used the Ingestion Model for Environmental Impact studies and Operational Safety Planning.

IV. ADVANTAGES OF THE AERIN CODE

The significant advantage of using the AERIN code for making internal dose assessments is that a time-related history of organ burdens and dose equivalents is obtained for six organs of the body. The annual effective whole-body dose equivalent which is calculated by the code can be added to the annual external radiation exposure to give the annual whole-body dose equivalent in accordance with the US Department of Energy's Manual Chapter 5484.1.

The major benefit the code has to the Health Physicist who is making the internal dose assessments is that the fractional deposition and biological half-lives of the material in the various organs can be altered to adjust the model to what is being observed in bioassay data collected from the exposed individual.

The ability of the code to keep a running sum of the organ doses when several isotopes of mixed solubility classes and particle sizes are involved saves considerable hand calculation in making dose assessments.

The multiple run capability also allows the user to add power functions together in the urine excretion equation when more than one function is required.

The user of the code will soon learn interesting "tricks" he can use to adjust the model to fit his circumstances.

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FIGURE 1. AERIN CODE MODEL.

FIGURE 2. WOUND MODEL.

FIGURE 3. GASTROINTESTINAL TRACT.

APPENDIX A
AERIN CODE PRINT-OUT
PU-239 RUN

page 1

Isotope = Pu-239
Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

Input Data
Isotope = Pu-239
Half-Life = 8.814e+06 days
Using ICRP30 Concepts

D3 = 0.300	D4 = 0.080	D5 = 0.250
f(1) = 0.01000	thlf(1) = 1.000e-02	
f(2) = 0.99000	thlf(2) = 4.000e-01	
f(3) = 0.01000	thlf(3) = 1.000e-02	
f(4) = 0.99000	thlf(4) = 2.000e-01	
f(5) = 0.05000	thlf(5) = 5.000e+02	
f(6) = 0.40000	thlf(6) = 1.000e+00	
f(7) = 0.40000	thlf(7) = 5.000e+02	
f(8) = 0.15000	thlf(8) = 5.000e+02	
f(9) = 0.90000	thlf(9) = 1.000e+03	
f(10) = 0.45000	thlf(10) = 1.460e+04	
f(11) = 0.45000	thlf(11) = 3.652e+04	
f(12) = 0.00035	thlf(12) = 0.	
f(13) = 0.00001	thlf(13) = 1.155e+04	

U24 = 2.000e-03*t**(-0.7400)

	Source	Target	mev/g dis
se(1)	lung	lung	=1.0e-01
se(2)	uli	uli	=2.3e-03
se(3)	lil	lil	=3.8e-03
se(4)	trab. bone	red marrow	=3.4e-02
se(5)	cort. bone	red marrow	=6.0e-08
se(6)	trab. bone	bone surf.	=2.1e-01
se(7)	cort. bone	bone surf.	=2.1e-01
se(8)	liver	liver	=5.8e-02
se(9)	gonad	gonad	=3.0e+00

Isotope = Pu-239

Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

I(k)	T(k)	TT	QNPA	QNPB	QNP	QTBC	QTBD	QTB
0.	0.	0.	0.	0.	0.	0.	0.	0.
1.000e+06	1.0	1.0	4.3281e+01	1.4109e+05	1.4114e+05	1.1542e+01	2.2138e+04	2.2150e+04
0.	1.0	2.0	3.4143e-29	2.4942e+04	2.4942e+04	9.1047e-30	6.9182e+02	6.9182e+02
0.	1.0	3.0	2.6934e-59	4.4092e+03	4.4092e+03	7.1823e-60	2.1619e+01	2.1619e+01
0.	1.0	4.0	2.1247e-89	7.7944e+02	7.7944e+02	5.6659e-90	6.7560e-01	6.7560e-01
0.	1.0	5.0	1.6761-119	1.3779e+02	1.3779e+02	4.4696-120	2.1113e-02	2.1113e-02
0.	1.0	6.0	1.3222-149	2.4358e+01	2.4358e+01	3.5259-150	6.5977e-04	6.5977e-04
0.	1.0	7.0	1.0430-179	4.3058e+00	4.3058e+00	2.7814-180	2.0618e-05	2.0618e-05
0.	1.0	8.0	8.2281-210	7.6117e-01	7.6117e-01	2.1942-210	6.4430e-07	6.4430e-07
0.	1.0	9.0	6.4908-240	1.3456e-01	1.3456e-01	1.7309-240	2.0135e-08	2.0135e-08
0.	1.0	10.0	5.1203-270	2.3787e-02	2.3787e-02	1.3654-270	6.2920e-10	6.2920e-10
0.	5.0	15.0	0.	4.1064e-06	4.1064e-06	0.	1.8752e-17	1.8752e-17
0.	5.0	20.0	0.	7.0890e-10	7.0890e-10	0.	5.5884e-25	5.5884e-25
0.	5.0	25.0	0.	1.2238e-13	1.2238e-13	0.	1.6655e-32	1.6655e-32
0.	5.0	30.0	0.	2.1127e-17	2.1127e-17	0.	4.9635e-40	4.9635e-40
0.	10.0	40.0	0.	6.2963e-25	6.2963e-25	0.	4.4085e-55	4.4085e-55
0.	10.0	50.0	0.	1.8764e-32	1.8764e-32	0.	3.9155e-70	3.9155e-70
0.	10.0	60.0	0.	5.5922e-40	5.5922e-40	0.	3.4777e-85	3.4777e-85
0.	10.0	70.0	0.	1.6666e-47	1.6666e-47	0.	3.0888-100	3.0888-100
0.	10.0	80.0	0.	4.9669e-55	4.9669e-55	0.	2.7434-115	2.7434-115
0.	10.0	90.0	0.	1.4802e-62	1.4802e-62	0.	2.4366-130	2.4366-130
0.	10.0	100.0	0.	4.4114e-70	4.4114e-70	0.	2.1642-145	2.1642-145
0.	50.0	150.0	0.	1.0371-107	1.0371-107	0.	1.1962-220	1.1962-220
0.	50.0	200.0	0.	2.4383-145	2.4383-145	0.	0.	0.
0.	50.0	250.0	0.	5.7323-183	5.7323-183	0.	0.	0.
0.	50.0	300.0	0.	1.3476-220	1.3476-220	0.	0.	0.
0.	50.0	350.0	0.	3.1683-258	3.1683-258	0.	0.	0.
0.	15.0	365.0	0.	1.6300-269	1.6300-269	0.	0.	0.
0.	365.2	730.2	0.	0.	0.	0.	0.	0.
0.	365.2	1095.5	0.	0.	0.	0.	0.	0.
0.	365.2	1460.7	0.	0.	0.	0.	0.	0.
0.	365.2	1826.0	0.	0.	0.	0.	0.	0.
0.	365.2	2191.2	0.	0.	0.	0.	0.	0.
0.	365.2	2556.5	0.	0.	0.	0.	0.	0.
0.	365.2	2921.7	0.	0.	0.	0.	0.	0.
0.	365.2	3287.0	0.	0.	0.	0.	0.	0.
0.	365.2	3652.2	0.	0.	0.	0.	0.	0.

Appendix A (cont.)

Isotope = Pu-239

Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

page 3

TT	QPLE	QPLF	QPLG	QPLH	QTB	QLY	QPL
0.	0.	0.	0.	0.	0.	0.	0.
1.0	1.2491e+04	7.2135e+04	9.9931e+04	3.7474e+04	2.2150e+04	2.5976e+01	2.4421e+05
2.0	1.2474e+04	3.6067e+04	9.9792e+04	3.7422e+04	6.9182e+02	7.7857e+01	1.8653e+05
3.0	1.2457e+04	1.8034e+04	9.9654e+04	3.7370e+04	2.1619e+01	1.2963e+02	1.6767e+05
4.0	1.2439e+04	9.0168e+03	9.9516e+04	3.7318e+04	6.7560e-01	1.8131e+02	1.5847e+05
5.0	1.2422e+04	4.5084e+03	9.9378e+04	3.7267e+04	2.1113e-02	2.3288e+02	1.5381e+05
6.0	1.2405e+04	2.2542e+03	9.9240e+04	3.7215e+04	6.5977e-04	2.8434e+02	1.5140e+05
7.0	1.2388e+04	1.1271e+03	9.9103e+04	3.7164e+04	2.0618e-05	3.3570e+02	1.5012e+05
8.0	1.2371e+04	5.6355e+02	9.8966e+04	3.7112e+04	6.4430e-07	3.8696e+02	1.4940e+05
9.0	1.2354e+04	2.8178e+02	9.8829e+04	3.7061e+04	2.0135e-08	4.3812e+02	1.4896e+05
10.0	1.2336e+04	1.4089e+02	9.8692e+04	3.7009e+04	6.2920e-10	4.8917e+02	1.4867e+05
15.0	1.2251e+04	4.4028e+00	9.8010e+04	3.6754e+04	1.8752e-17	7.4289e+02	1.4776e+05
20.0	1.2167e+04	1.3759e-01	9.7333e+04	3.6500e+04	5.5884e-25	9.9406e+02	1.4699e+05
25.0	1.2083e+04	4.2996e-03	9.6660e+04	3.6248e+04	1.6655e-32	1.2427e+03	1.4623e+05
30.0	1.1999e+04	1.3436e-04	9.5993e+04	3.5997e+04	4.9635e-40	1.4888e+03	1.4548e+05
40.0	1.1834e+04	1.3121e-07	9.4671e+04	3.5502e+04	4.4085e-55	1.9736e+03	1.4398e+05
50.0	1.1671e+04	1.2814e-10	9.3368e+04	3.5013e+04	3.9155e-70	2.4486e+03	1.4250e+05
60.0	1.1510e+04	1.2513e-13	9.2082e+04	3.4531e+04	3.4777e-85	2.9139e+03	1.4104e+05
70.0	1.1352e+04	1.2220e-16	9.0814e+04	3.4055e+04	3.0888-100	3.3698e+03	1.3959e+05
80.0	1.1196e+04	1.1934e-19	8.9564e+04	3.3587e+04	2.7434-115	3.8162e+03	1.3816e+05
90.0	1.1041e+04	1.1654e-22	8.8331e+04	3.3124e+04	2.4366-130	4.2535e+03	1.3675e+05
100.0	1.0889e+04	1.1381e-25	8.7115e+04	3.2668e+04	2.1642-145	4.6818e+03	1.3535e+05
150.0	1.0160e+04	1.0108e-40	8.1281e+04	3.0480e+04	1.1962-220	6.6923e+03	1.2861e+05
200.0	9.4796e+03	8.9778e-56	7.5687e+04	2.8439e+04	0.	8.4976e+03	1.2225e+05
250.0	8.8448e+03	7.9738e-71	7.0758e+04	2.6534e+04	0.	1.0114e+04	1.1625e+05
300.0	8.2524e+03	7.0822e-86	6.6020e+04	2.4757e+04	0.	1.1556e+04	1.1059e+05
350.0	7.6998e+03	6.2902e-101	6.1598e+04	2.3099e+04	0.	1.2838e+04	1.0523e+05
365.0	7.5413e+03	1.9196e-105	6.0330e+04	2.2624e+04	0.	1.3193e+04	1.0369e+05
730.2	4.5450e+03	2.1478e-215	3.6360e+04	1.3635e+04	0.	1.8544e+04	7.3084e+04
1095.5	2.7392e+03	0.	2.1913e+04	8.2175e+03	0.	1.9733e+04	5.2603e+04
1460.7	1.6508e+03	0.	1.3207e+04	4.9525e+03	0.	1.8869e+04	3.8679e+04
1826.0	9.9492e+02	0.	7.9593e+03	2.9848e+03	0.	1.7121e+04	2.9060e+04
2191.2	5.9961e+02	0.	4.7969e+03	1.7988e+03	0.	1.5114e+04	2.2310e+04
2556.5	3.6137e+02	0.	2.8910e+03	1.0841e+03	0.	1.3165e+04	1.7502e+04
2921.7	2.1779e+02	0.	1.7423e+03	6.5338e+02	0.	1.1417e+04	1.4030e+04
3287.0	1.3126e+02	0.	1.0501e+03	3.9378e+02	0.	9.9170e+03	1.1492e+04
3652.2	7.9107e+01	0.	6.3285e+02	2.3732e+02	0.	8.6671e+03	9.6164e+03

Isotope = Pu-239

Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	QLYH	QLYHI	QLY	QSI	QLUI	QLLI
0.	0.	0.	0.	0.	0.	0.
1.0	2.5981e+00	2.3378e+01	2.5976e+01	5.5413e+04	1.0346e+05	5.2954e+04
2.0	7.7895e+00	7.0068e+01	7.7857e+01	1.6764e+04	1.0283e+05	1.6051e+05
3.0	1.2974e+01	1.1666e+02	1.2963e+02	4.4125e+03	3.7564e+04	1.2837e+05
4.0	1.8151e+01	1.6316e+02	1.8131e+02	1.5779e+03	1.2670e+04	7.0961e+04
5.0	2.3321e+01	2.0956e+02	2.3288e+02	6.8965e+02	4.7090e+03	3.4445e+04
6.0	2.8483e+01	2.5586e+02	2.8434e+02	3.3676e+02	2.0042e+03	1.5993e+04
7.0	3.3639e+01	3.0207e+02	3.3570e+02	1.7637e+02	9.5602e+02	7.3865e+03
8.0	3.8787e+01	3.4818e+02	3.8696e+02	9.8994e+01	4.9865e+02	3.4697e+03
9.0	4.3929e+01	3.9419e+02	4.3812e+02	6.0792e+01	2.8385e+02	1.6872e+03
10.0	4.9063e+01	4.4011e+02	4.8917e+02	4.1764e+01	1.7922e+02	8.6761e+02
15.0	7.4627e+01	6.6826e+02	7.4289e+02	2.3241e+01	7.8765e+01	1.5589e+02
20.0	1.0001e+02	8.9405e+02	9.9406e+02	2.2511e+01	7.5133e+01	1.3584e+02
25.0	1.2523e+02	1.1175e+03	1.2427e+03	2.2337e+01	7.4517e+01	1.3433e+02
30.0	1.5026e+02	1.3386e+03	1.4888e+03	2.2182e+01	7.3998e+01	1.3338e+02
40.0	1.9982e+02	1.7738e+03	1.9736e+03	2.1877e+01	7.2979e+01	1.3154e+02
50.0	2.4870e+02	2.1999e+03	2.4486e+03	2.1575e+01	7.1973e+01	1.2973e+02
60.0	2.9690e+02	2.6170e+03	2.9139e+03	2.1278e+01	7.0981e+01	1.2794e+02
70.0	3.4444e+02	3.0253e+03	3.3698e+03	2.0985e+01	7.0003e+01	1.2618e+02
80.0	3.9133e+02	3.4249e+03	3.8162e+03	2.0696e+01	6.9039e+01	1.2444e+02
90.0	4.3757e+02	3.8160e+03	4.2535e+03	2.0411e+01	6.8088e+01	1.2273e+02
100.0	4.8317e+02	4.1986e+03	4.6818e+03	2.0129e+01	6.7150e+01	1.2104e+02
150.0	7.0193e+02	5.9904e+03	6.6923e+03	1.8781e+01	6.2652e+01	1.1293e+02
200.0	9.0605e+02	7.5915e+03	8.4976e+03	1.7523e+01	5.8455e+01	1.0537e+02
250.0	1.0965e+03	9.0172e+03	1.0114e+04	1.6349e+01	5.4540e+01	9.8309e+01
300.0	1.2742e+03	1.0282e+04	1.1556e+04	1.5254e+01	5.0887e+01	9.1724e+01
350.0	1.4400e+03	1.1398e+04	1.2838e+04	1.4233e+01	4.7479e+01	8.5580e+01
365.0	1.4875e+03	1.1705e+04	1.3193e+04	1.3940e+01	4.6501e+01	8.3818e+01
730.2	2.3863e+03	1.6158e+04	1.8544e+04	8.4010e+00	2.8025e+01	5.0515e+01
1095.5	2.9280e+03	1.6805e+04	1.9733e+04	5.0630e+00	1.6890e+01	3.0444e+01
1460.7	3.2543e+03	1.5614e+04	1.8869e+04	3.0513e+00	1.0179e+01	1.8348e+01
1826.0	3.4510e+03	1.3670e+04	1.7121e+04	1.8390e+00	6.1346e+00	1.0588e+01
2191.2	3.5695e+03	1.1545e+04	1.5114e+04	1.1083e+00	3.6971e+00	6.6641e+00
2556.5	3.6409e+03	9.5245e+03	1.3165e+04	6.6793e-01	2.2282e+00	4.0163e+00
2921.7	3.6838e+03	7.7328e+03	1.1417e+04	4.0255e-01	1.3429e+00	2.4205e+00
3287.0	3.7097e+03	6.2073e+03	9.9170e+03	2.4260e-01	8.0930e-01	1.4588e+00
3652.2	3.7252e+03	4.9419e+03	8.6671e+03	1.4621e-01	4.8774e-01	8.7915e-01

Appendix A (cont.)

Isotope = Pu-239

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Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	QBNAN	QBNAN	QBNAN	QBNAN	QBNAN	QBN
0.	0.	0.	0.	0.	0.	0.
1.0	1.3305e+03	3.5480e+02	3.8971e+00	2.4318e-03	7.6619e-01	1.6900e+03
2.0	1.3500e+03	3.5999e+02	1.1684e+01	1.7008e-02	1.7766e+00	1.7234e+03
3.0	1.3499e+03	3.5998e+02	1.9460e+01	4.6132e-02	2.0194e+00	1.7314e+03
4.0	1.3499e+03	3.5998e+02	2.7225e+01	8.9773e-02	2.0923e+00	1.7393e+03
5.0	1.3499e+03	3.5997e+02	3.4979e+01	1.4790e-01	2.1208e+00	1.7471e+03
6.0	1.3499e+03	3.5996e+02	4.2723e+01	2.2049e-01	2.1340e+00	1.7549e+03
7.0	1.3498e+03	3.5996e+02	5.0455e+01	3.0750e-01	2.1406e+00	1.7627e+03
8.0	1.3498e+03	3.5995e+02	5.8177e+01	4.0890e-01	2.1442e+00	1.7705e+03
9.0	1.3498e+03	3.5994e+02	6.5887e+01	5.2467e-01	2.1462e+00	1.7783e+03
10.0	1.3498e+03	3.5993e+02	7.3587e+01	6.5478e-01	2.1476e+00	1.7861e+03
15.0	1.3496e+03	3.5990e+02	1.1192e+02	1.5193e+00	2.1511e+00	1.8251e+03
20.0	1.3495e+03	3.5987e+02	1.4999e+02	2.7377e+00	2.1540e+00	1.8643e+03
25.0	1.3494e+03	3.5983e+02	1.8780e+02	4.3062e+00	2.1568e+00	1.9035e+03
30.0	1.3492e+03	3.5980e+02	2.2533e+02	6.2212e+00	2.1596e+00	1.9428e+03
40.0	1.3490e+03	3.5973e+02	2.9962e+02	1.1076e+01	2.1651e+00	2.0216e+03
50.0	1.3487e+03	3.5966e+02	3.7287e+02	1.7273e+01	2.1706e+00	2.1007e+03
60.0	1.3485e+03	3.5959e+02	4.4510e+02	2.4784e+01	2.1760e+00	2.1801e+03
70.0	1.3482e+03	3.5952e+02	5.1632e+02	3.3580e+01	2.1813e+00	2.2598e+03
80.0	1.3480e+03	3.5946e+02	5.8654e+02	4.3635e+01	2.1865e+00	2.3398e+03
90.0	1.3477e+03	3.5939e+02	6.5578e+02	5.4920e+01	2.1916e+00	2.4200e+03
100.0	1.3474e+03	3.5932e+02	7.2405e+02	6.7410e+01	2.1967e+00	2.5004e+03
150.0	1.3462e+03	3.5898e+02	1.0514e+03	1.4702e+02	2.2208e+00	2.9057e+03
200.0	1.3449e+03	3.5863e+02	1.3564e+03	2.5298e+02	2.2432e+00	3.3151e+03
250.0	1.3436e+03	3.5829e+02	1.6406e+03	3.8241e+02	2.2639e+00	3.7272e+03
300.0	1.3423e+03	3.5795e+02	1.9055e+03	5.3267e+02	2.2830e+00	4.1407e+03
350.0	1.3410e+03	3.5761e+02	2.1522e+03	7.0132e+02	2.3008e+00	4.5545e+03
365.0	1.3407e+03	3.5751e+02	2.2229e+03	7.5516e+02	2.3058e+00	4.6785e+03
730.2	1.3314e+03	3.5503e+02	3.5507e+03	2.3810e+03	2.3973e+00	7.6205e+03
1095.5	1.3221e+03	3.5257e+02	4.3356e+03	4.2605e+03	2.4454e+00	1.0273e+04
1460.7	1.3130e+03	3.5012e+02	4.7934e+03	6.0823e+03	2.4675e+00	1.2541e+04
1826.0	1.3038e+03	3.4769e+02	5.0542e+03	7.7061e+03	2.4739e+00	1.4414e+04
2191.2	1.2948e+03	3.4528e+02	5.1964e+03	9.0839e+03	2.4709e+00	1.5923e+04
2556.5	1.2858e+03	3.4289e+02	5.2671e+03	1.0215e+04	2.4623e+00	1.7113e+04
2921.7	1.2769e+03	3.4051e+02	5.2949e+03	1.1121e+04	2.4504e+00	1.8036e+04
3287.0	1.2680e+03	3.3815e+02	5.2970e+03	1.1833e+04	2.4365e+00	1.8738e+04
3652.2	1.2593e+03	3.3580e+02	5.2837e+03	1.2381e+04	2.4215e+00	1.9262e+04

Isotope = Pu-239

Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	QLVAN	QLVCN	QLVEN	QLVIN	QLVMN	QLV
O.	O.	O.	O.	O.	O.	O.
1.0	1.3305e+03	3.5480e+02	3.8971e+00	2.4315e-03	7.6619e-01	1.6900e+03
2.0	1.3499e+03	3.5997e+02	1.1684e+01	1.7007e-02	1.7765e+00	1.7234e+03
3.0	1.3498e+03	3.5996e+02	1.9459e+01	4.6130e-02	2.0193e+00	1.7313e+03
4.0	1.3498e+03	3.5994e+02	2.7224e+01	8.9769e-02	2.0921e+00	1.7391e+03
5.0	1.3497e+03	3.5992e+02	3.4977e+01	1.4789e-01	2.1206e+00	1.7469e+03
6.0	1.3496e+03	3.5991e+02	4.2719e+01	2.2047e-01	2.1337e+00	1.7546e+03
7.0	1.3496e+03	3.5989e+02	5.0450e+01	3.0748e-01	2.1403e+00	1.7624e+03
8.0	1.3495e+03	3.5987e+02	5.8170e+01	4.0887e-01	2.1438e+00	1.7701e+03
9.0	1.3495e+03	3.5985e+02	6.5879e+01	5.2463e-01	2.1458e+00	1.7779e+03
10.0	1.3494e+03	3.5984e+02	7.3577e+01	6.5472e-01	2.1470e+00	1.7856e+03
15.0	1.3491e+03	3.5975e+02	1.1190e+02	1.5191e+00	2.1503e+00	1.8244e+03
20.0	1.3487e+03	3.5967e+02	1.4995e+02	2.7372e+00	2.1529e+00	1.8633e+03
25.0	1.3484e+03	3.5958e+02	1.8773e+02	4.3052e+00	2.1554e+00	1.9022e+03
30.0	1.3481e+03	3.5950e+02	2.2524e+02	6.2194e+00	2.1579e+00	1.9412e+03
40.0	1.3475e+03	3.5932e+02	2.9945e+02	1.1072e+01	2.1628e+00	2.0195e+03
50.0	1.3468e+03	3.5915e+02	3.7261e+02	1.7265e+01	2.1676e+00	2.0980e+03
60.0	1.3462e+03	3.5898e+02	4.4472e+02	2.4769e+01	2.1724e+00	2.1768e+03
70.0	1.3455e+03	3.5881e+02	5.1580e+02	3.3558e+01	2.1770e+00	2.2559e+03
80.0	1.3449e+03	3.5864e+02	5.8586e+02	4.3601e+01	2.1816e+00	2.3352e+03
90.0	1.3443e+03	3.5847e+02	6.5493e+02	5.4873e+01	2.1861e+00	2.4147e+03
100.0	1.3436e+03	3.5830e+02	7.2300e+02	6.7345e+01	2.1906e+00	2.4945e+03
150.0	1.3404e+03	3.5745e+02	1.0490e+03	1.4681e+02	2.2116e+00	2.8960e+03
200.0	1.3373e+03	3.5660e+02	1.3524e+03	2.5249e+02	2.2308e+00	3.3009e+03
250.0	1.3341e+03	3.5575e+02	1.6345e+03	3.8147e+02	2.2483e+00	3.7080e+03
300.0	1.3309e+03	3.5491e+02	1.8968e+03	5.3108e+02	2.2643e+00	4.1160e+03
350.0	1.3277e+03	3.5407e+02	2.1407e+03	6.9886e+02	2.2788e+00	4.5236e+03
365.0	1.3268e+03	3.5381e+02	2.2105e+03	7.5239e+02	2.2829e+00	4.6457e+03
730.2	1.3040e+03	3.4772e+02	3.5081e+03	2.3625e+03	2.3504e+00	7.5246e+03
1095.5	1.2815e+03	3.4173e+02	4.2526e+03	4.2081e+03	2.3743e+00	1.0086e+04
1460.7	1.2594e+03	3.3585e+02	4.6646e+03	5.9773e+03	2.3723e+00	1.2239e+04
1826.0	1.2377e+03	3.3007e+02	4.8766e+03	7.5315e+03	2.3548e+00	1.3978e+04
2191.2	1.2164e+03	3.2438e+02	4.9689e+03	8.8254e+03	2.3284e+00	1.5337e+04
2556.5	1.1955e+03	3.1880e+02	4.9895e+03	9.8612e+03	2.2968e+00	1.6367e+04
2921.7	1.1749e+03	3.1331e+02	4.9676e+03	1.0663e+04	2.2623e+00	1.7121e+04
3287.0	1.1547e+03	3.0791e+02	4.9206e+03	1.1264e+04	2.2265e+00	1.7649e+04
3652.2	1.1348e+03	3.0261e+02	4.8591e+03	1.1697e+04	2.1900e+00	1.7996e+04

Appendix A (cont.)

Isotope = Pu-239

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Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	QGDN	QGCN	QGDEN	QGDIN	QGDIN	QGD
0.	0.	0.	0.	0.	0.	0.
1.0	1.0349e+00	2.7596e-01	3.0312e-03	2.0367e-06	5.9593e-04	1.3144e+00
2.0	1.0500e+00	2.8000e-01	9.0878e-03	1.3374e-05	1.3818e-03	1.3405e+00
3.0	1.0500e+00	2.8000e-01	1.5136e-02	3.6026e-05	1.5707e-03	1.3467e+00
4.0	1.0500e+00	2.8000e-01	2.1176e-02	6.9970e-05	1.6274e-03	1.3529e+00
5.0	1.0500e+00	2.8000e-01	2.7207e-02	1.1518e-04	1.6497e-03	1.3590e+00
6.0	1.0500e+00	2.8000e-01	3.3231e-02	1.7164e-04	1.6599e-03	1.3651e+00
7.0	1.0500e+00	2.8000e-01	3.9245e-02	2.3932e-04	1.6651e-03	1.3711e+00
8.0	1.0500e+00	2.8000e-01	4.5252e-02	3.1820e-04	1.6679e-03	1.3772e+00
9.0	1.0500e+00	2.8000e-01	5.1250e-02	4.0825e-04	1.6695e-03	1.3833e+00
10.0	1.0500e+00	2.8000e-01	5.7240e-02	5.0945e-04	1.6706e-03	1.3894e+00
15.0	1.0500e+00	2.8000e-01	8.7065e-02	1.1819e-03	1.6735e-03	1.4199e+00
20.0	1.0500e+00	2.8000e-01	1.1668e-01	2.1297e-03	1.6759e-03	1.4505e+00
25.0	1.0500e+00	2.8000e-01	1.4610e-01	3.3499e-03	1.6783e-03	1.4811e+00
30.0	1.0500e+00	2.8000e-01	1.7531e-01	4.8398e-03	1.6806e-03	1.5118e+00
40.0	1.0500e+00	2.8000e-01	2.3313e-01	8.6169e-03	1.6852e-03	1.5734e+00
50.0	1.0500e+00	2.8000e-01	2.9015e-01	1.3439e-02	1.6898e-03	1.6353e+00
60.0	1.0500e+00	2.8000e-01	3.4639e-01	1.9284e-02	1.6943e-03	1.6974e+00
70.0	1.0500e+00	2.8000e-01	4.0185e-01	2.6130e-02	1.6987e-03	1.7597e+00
80.0	1.0500e+00	2.8000e-01	4.5655e-01	3.3955e-02	1.7031e-03	1.8222e+00
90.0	1.0500e+00	2.8000e-01	5.1049e-01	4.2740e-02	1.7074e-03	1.8849e+00
100.0	1.0500e+00	2.8000e-01	5.6370e-01	5.2464e-02	1.7117e-03	1.9479e+00
150.0	1.0500e+00	2.8000e-01	8.1892e-01	1.1446e-01	1.7321e-03	2.2651e+00
200.0	1.0500e+00	2.8000e-01	1.0571e+00	1.9702e-01	1.7511e-03	2.5858e+00
250.0	1.0500e+00	2.7999e-01	1.2792e+00	2.9792e-01	1.7689e-03	2.9089e+00
300.0	1.0500e+00	2.7999e-01	1.4865e+00	4.1512e-01	1.7855e-03	3.2334e+00
350.0	1.0500e+00	2.7999e-01	1.6800e+00	5.4675e-01	1.8009e-03	3.5585e+00
365.0	1.0500e+00	2.7999e-01	1.7354e+00	5.8879e-01	1.8054e-03	3.6560e+00
730.2	1.0499e+00	2.7998e-01	2.7840e+00	1.8616e+00	1.8892e-03	5.9774e+00
1095.5	1.0499e+00	2.7998e-01	3.4159e+00	3.3413e+00	1.9397e-03	8.0890e+00
1460.7	1.0499e+00	2.7997e-01	3.7967e+00	4.7862e+00	1.9701e-03	9.9148e+00
1826.0	1.0498e+00	2.7996e-01	4.0262e+00	6.0864e+00	1.9885e-03	1.1444e+01
2191.2	1.0498e+00	2.7995e-01	4.1644e+00	7.2034e+00	1.9995e-03	1.2700e+01
2556.5	1.0498e+00	2.7994e-01	4.2477e+00	8.1352e+00	2.0061e-03	1.3715e+01
2921.7	1.0498e+00	2.7994e-01	4.2978e+00	8.8977e+00	2.0100e-03	1.4527e+01
3287.0	1.0497e+00	2.7993e-01	4.3280e+00	9.5131e+00	2.0124e-03	1.5173e+01
3652.2	1.0497e+00	2.7992e-01	4.3461e+00	1.0005e+01	2.0138e-03	1.5683e+01

Isotope = Pu-239
 Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

DAY	AMT. IN URINE	AMT. IN FECEs	TOTAL AMT. IN URINE	TOTAL AMT. IN FECEs	AMT. IN BLOOD
0.	0.	0.	0.	0.	0.
1.0	7.5111e+00	1.3846e+04	7.5111e+00	1.3846e+04	3.7555e+03
2.0	4.6460e+00	1.1762e+05	4.6460e+00	1.1762e+05	7.4405e+01
3.0	3.4563e+00	1.5137e+05	3.4563e+00	1.5137e+05	1.7885e+01
4.0	2.8151e+00	9.8498e+04	2.8151e+00	9.8498e+04	1.7516e+01
5.0	2.4078e+00	5.0838e+04	2.4078e+00	5.0838e+04	1.7426e+01
6.0	2.1239e+00	2.4091e+04	2.1239e+00	2.4091e+04	1.7400e+01
7.0	1.9137e+00	1.1134e+04	1.9137e+00	1.1134e+04	1.7393e+01
8.0	1.7511e+00	5.1729e+03	1.7511e+00	5.1729e+03	1.7395e+01
9.0	1.6215e+00	2.4634e+03	1.6215e+00	2.4634e+03	1.7400e+01
10.0	1.5154e+00	1.2254e+03	1.5154e+00	1.2254e+03	1.7406e+01
15.0	1.1829e+00	1.6494e+02	1.1829e+00	1.6494e+02	1.7429e+01
20.0	1.0072e+00	1.3620e+02	1.0072e+00	1.3620e+02	1.7468e+01
25.0	8.9857e-01	1.3443e+02	8.9857e-01	1.3443e+02	1.7507e+01
30.0	8.2516e-01	1.3347e+02	8.2516e-01	1.3347e+02	1.7545e+01
40.0	7.3329e-01	1.3163e+02	7.3329e-01	1.3163e+02	1.7600e+01
50.0	6.7950e-01	1.2982e+02	6.7950e-01	1.2982e+02	1.7671e+01
60.0	6.4534e-01	1.2803e+02	6.4534e-01	1.2803e+02	1.7739e+01
70.0	6.2260e-01	1.2627e+02	6.2260e-01	1.2627e+02	1.7804e+01
80.0	6.0708e-01	1.2453e+02	6.0708e-01	1.2453e+02	1.7866e+01
90.0	5.9637e-01	1.2281e+02	5.9637e-01	1.2281e+02	1.7924e+01
100.0	5.8902e-01	1.2112e+02	5.8902e-01	1.2112e+02	1.7980e+01
150.0	5.7783e-01	1.1301e+02	5.7783e-01	1.1301e+02	1.8128e+01
200.0	5.8550e-01	1.0544e+02	5.8550e-01	1.0544e+02	1.8327e+01
250.0	5.9878e-01	9.8377e+01	5.9878e-01	9.8377e+01	1.8463e+01
300.0	6.1366e-01	9.1787e+01	6.1366e-01	9.1787e+01	1.8544e+01
350.0	6.2852e-01	8.5640e+01	6.2852e-01	8.5640e+01	1.8575e+01
365.0	6.3284e-01	8.3876e+01	6.3284e-01	8.3876e+01	1.8572e+01
730.2	7.0310e-01	5.0550e+01	7.0310e-01	5.0550e+01	1.8160e+01
1095.5	7.1866e-01	3.0465e+01	7.1866e-01	3.0465e+01	1.6519e+01
1460.7	6.9691e-01	1.8360e+01	6.9691e-01	1.8360e+01	1.4283e+01
1826.0	6.7916e-01	1.1065e+01	6.7916e-01	1.1065e+01	1.1968e+01
2191.2	6.2142e-01	6.6687e+00	6.2142e-01	6.6687e+00	9.8208e+00
2556.5	5.6388e-01	4.0190e+00	5.6388e-01	4.0190e+00	7.9435e+00
2921.7	5.0949e-01	2.4222e+00	5.0949e-01	2.4222e+00	6.3551e+00
3287.0	4.6982e-01	1.4598e+00	4.6982e-01	1.4598e+00	5.0527e+00
3652.2	4.2189e-01	8.7976e-01	4.2189e-01	8.7976e-01	3.9924e+00

Appendix A (cont.)

Isotope = Pu-239

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Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	DPL	DPLD	WDPL	WDPLD	TOTALS	TDPL	TDPLD	TWDPL	TWDPLD
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.626	0.626	0.075	0.075	0.626	0.626	0.075	0.075	0.075
2.0	1.729	1.104	0.208	0.132	1.729	1.104	0.208	0.132	0.132
3.0	2.637	0.907	0.316	0.109	2.637	0.907	0.316	0.109	0.109
4.0	3.472	0.836	0.417	0.100	3.472	0.836	0.417	0.100	0.100
5.0	4.272	0.800	0.513	0.096	4.272	0.800	0.513	0.096	0.096
6.0	5.054	0.782	0.607	0.094	5.054	0.782	0.607	0.094	0.094
7.0	5.827	0.773	0.699	0.093	5.827	0.773	0.699	0.093	0.093
8.0	6.594	0.767	0.791	0.092	6.594	0.767	0.791	0.092	0.092
9.0	7.359	0.764	0.883	0.092	7.359	0.764	0.883	0.092	0.092
10.0	8.121	0.763	0.975	0.092	8.121	0.763	0.975	0.092	0.092
15.0	11.919	3.797	1.430	0.456	11.919	3.797	1.430	0.456	0.456
20.0	15.695	3.776	1.883	0.453	15.695	3.776	1.883	0.453	0.453
25.0	19.451	3.756	2.334	0.451	19.451	3.756	2.334	0.451	0.451
30.0	23.188	3.737	2.783	0.448	23.188	3.737	2.783	0.448	0.448
40.0	30.604	7.416	3.673	0.890	30.604	7.416	3.673	0.890	0.890
50.0	37.944	7.340	4.553	0.881	37.944	7.340	4.553	0.881	0.881
60.0	45.209	7.265	5.425	0.872	45.209	7.265	5.425	0.872	0.872
70.0	52.399	7.190	6.288	0.863	52.399	7.190	6.288	0.863	0.863
80.0	59.515	7.116	7.142	0.854	59.515	7.116	7.142	0.854	0.854
90.0	66.558	7.044	7.987	0.845	66.558	7.044	7.987	0.845	0.845
100.0	73.530	6.972	8.824	0.837	73.530	6.972	8.824	0.837	0.837
150.0	107.346	33.816	12.881	4.058	107.346	33.816	12.881	4.058	4.058
200.0	139.483	32.137	16.738	3.856	139.483	32.137	16.738	3.856	3.856
250.0	170.036	30.554	20.404	3.666	170.036	30.554	20.404	3.666	3.666
300.0	199.095	29.059	23.891	3.487	199.095	29.059	23.891	3.487	3.487
350.0	226.743	27.648	27.209	3.318	226.743	27.648	27.209	3.318	3.318
365.0	234.772	8.029	28.173	0.964	234.772	8.029	28.173	0.964	0.964
730.2	400.197	165.425	48.024	19.851	400.197	165.425	48.024	19.851	19.851
1095.5	517.816	117.619	62.138	14.114	517.816	117.619	62.138	14.114	14.114
1460.7	603.238	85.422	72.389	10.251	603.238	85.422	72.389	10.251	10.251
1826.8	666.628	63.390	79.995	7.607	666.628	63.390	79.995	7.607	7.607
2191.2	714.699	48.072	85.764	5.769	714.699	48.072	85.764	5.769	5.769
2556.5	751.955	37.256	90.235	4.471	751.955	37.256	90.235	4.471	4.471
2921.7	781.463	29.508	93.776	3.541	781.463	29.508	93.776	3.541	3.541
3287.0	805.347	23.884	96.642	2.866	805.347	23.884	96.642	2.866	2.866
3652.2	825.100	19.753	99.012	2.370	825.100	19.753	99.012	2.370	2.370

Isotope = Pu-239
 Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TI	DU1	DU1D	MDU1	MDU1D	TOTALS	TDU1	TDU1D	TMDU1	TMDU1D
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.006	0.006	0.000	0.000	0.006	0.006	0.000	0.000	0.000
2.0	0.018	0.012	0.001	0.001	0.018	0.012	0.001	0.001	0.001
3.0	0.027	0.008	0.002	0.000	0.027	0.008	0.002	0.000	0.000
4.0	0.029	0.003	0.002	0.000	0.029	0.003	0.002	0.000	0.000
5.0	0.031	0.001	0.002	0.000	0.031	0.001	0.002	0.000	0.000
6.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
7.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
8.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
9.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
10.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
15.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
20.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
25.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
30.0	0.031	0.000	0.002	0.000	0.031	0.000	0.002	0.000	0.000
40.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
50.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
60.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
70.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
80.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
90.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
100.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
150.0	0.032	0.000	0.002	0.000	0.032	0.000	0.002	0.000	0.000
200.0	0.033	0.000	0.002	0.000	0.033	0.000	0.002	0.000	0.000
250.0	0.033	0.000	0.002	0.000	0.033	0.000	0.002	0.000	0.000
300.0	0.033	0.000	0.002	0.000	0.033	0.000	0.002	0.000	0.000
350.0	0.034	0.000	0.002	0.000	0.034	0.000	0.002	0.000	0.000
365.0	0.034	0.000	0.002	0.000	0.034	0.000	0.002	0.000	0.000
730.2	0.036	0.001	0.002	0.000	0.036	0.001	0.002	0.000	0.000
1095.5	0.037	0.001	0.002	0.000	0.037	0.001	0.002	0.000	0.000
1460.7	0.037	0.001	0.002	0.000	0.037	0.001	0.002	0.000	0.000
1826.0	0.037	0.000	0.002	0.000	0.037	0.000	0.002	0.000	0.000
2191.2	0.038	0.000	0.002	0.000	0.038	0.000	0.002	0.000	0.000
2556.5	0.038	0.000	0.002	0.000	0.038	0.000	0.002	0.000	0.000
2921.7	0.038	0.000	0.002	0.000	0.038	0.000	0.002	0.000	0.000
3287.0	0.038	0.000	0.002	0.000	0.038	0.000	0.002	0.000	0.000
3652.2	0.038	0.000	0.002	0.000	0.038	0.000	0.002	0.000	0.000

Appendix A (cont.)

Isotope = Pu-239

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Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	DL1	DL1D	WDL1	WDL1D	TOTALS-TDL1	TDL1D	TWDL1	TWDL1D
0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.005	0.005	0.000	0.000	0.005	0.005	0.000	0.000
2.0	0.026	0.021	0.002	0.001	0.026	0.021	0.002	0.001
3.0	0.054	0.028	0.003	0.002	0.054	0.028	0.003	0.002
4.0	0.073	0.019	0.004	0.001	0.073	0.019	0.004	0.001
5.0	0.084	0.010	0.005	0.001	0.084	0.010	0.005	0.001
6.0	0.089	0.005	0.005	0.000	0.089	0.005	0.005	0.000
7.0	0.091	0.002	0.005	0.000	0.091	0.002	0.005	0.000
8.0	0.092	0.001	0.006	0.000	0.092	0.001	0.006	0.000
9.0	0.092	0.001	0.006	0.000	0.092	0.001	0.006	0.000
10.0	0.093	0.000	0.006	0.000	0.093	0.000	0.006	0.000
15.0	0.093	0.000	0.006	0.000	0.093	0.000	0.006	0.000
20.0	0.093	0.000	0.006	0.000	0.093	0.000	0.006	0.000
25.0	0.094	0.000	0.006	0.000	0.094	0.000	0.006	0.000
30.0	0.094	0.000	0.006	0.000	0.094	0.000	0.006	0.000
40.0	0.094	0.000	0.006	0.000	0.094	0.000	0.006	0.000
50.0	0.094	0.000	0.006	0.000	0.094	0.000	0.006	0.000
60.0	0.094	0.000	0.006	0.000	0.094	0.000	0.006	0.000
70.0	0.095	0.000	0.006	0.000	0.095	0.000	0.006	0.000
80.0	0.095	0.000	0.006	0.000	0.095	0.000	0.006	0.000
90.0	0.095	0.000	0.006	0.000	0.095	0.000	0.006	0.000
100.0	0.095	0.000	0.006	0.000	0.095	0.000	0.006	0.000
150.0	0.097	0.001	0.005	0.000	0.097	0.001	0.006	0.000
200.0	0.098	0.001	0.006	0.000	0.098	0.001	0.006	0.000
250.0	0.099	0.001	0.006	0.000	0.099	0.001	0.006	0.000
300.0	0.099	0.001	0.006	0.000	0.099	0.001	0.006	0.000
350.0	0.100	0.001	0.006	0.000	0.100	0.001	0.006	0.000
365.0	0.101	0.000	0.006	0.000	0.101	0.000	0.006	0.000
730.2	0.105	0.005	0.006	0.000	0.105	0.005	0.006	0.000
1095.5	0.108	0.003	0.006	0.000	0.108	0.003	0.006	0.000
1460.7	0.110	0.002	0.007	0.000	0.110	0.002	0.007	0.000
1826.0	0.111	0.001	0.007	0.000	0.111	0.001	0.007	0.000
2191.2	0.112	0.001	0.007	0.000	0.112	0.001	0.007	0.000
2556.5	0.112	0.000	0.007	0.000	0.112	0.000	0.007	0.000
2921.7	0.112	0.000	0.007	0.000	0.112	0.000	0.007	0.000
3287.0	0.112	0.000	0.007	0.000	0.112	0.000	0.007	0.000
3652.2	0.112	0.000	0.007	0.000	0.112	0.000	0.007	0.000

Isotope = Pu-239
Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	DRM	DRMD	MDRM	MDRMD	TOTALS	TDRM	TDRMD	THDRM	THDRMD
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000
2.0	0.002	0.001	0.000	0.000	0.002	0.001	0.000	0.000	0.000
3.0	0.004	0.002	0.000	0.000	0.004	0.002	0.000	0.000	0.000
4.0	0.005	0.002	0.001	0.000	0.005	0.002	0.001	0.000	0.000
5.0	0.007	0.002	0.001	0.000	0.007	0.002	0.001	0.000	0.000
6.0	0.008	0.002	0.001	0.000	0.008	0.002	0.001	0.000	0.000
7.0	0.010	0.002	0.001	0.000	0.010	0.002	0.001	0.000	0.000
8.0	0.011	0.002	0.001	0.000	0.011	0.002	0.001	0.000	0.000
9.0	0.013	0.002	0.002	0.000	0.013	0.002	0.002	0.000	0.000
10.0	0.014	0.002	0.002	0.000	0.014	0.002	0.002	0.000	0.000
15.0	0.022	0.008	0.003	0.001	0.022	0.008	0.003	0.001	0.001
20.0	0.030	0.008	0.004	0.001	0.030	0.008	0.004	0.001	0.001
25.0	0.039	0.008	0.005	0.001	0.039	0.008	0.005	0.001	0.001
30.0	0.047	0.008	0.006	0.001	0.047	0.008	0.006	0.001	0.001
40.0	0.064	0.017	0.008	0.002	0.064	0.017	0.008	0.002	0.002
50.0	0.082	0.018	0.010	0.002	0.082	0.018	0.010	0.002	0.002
60.0	0.101	0.019	0.012	0.002	0.101	0.019	0.012	0.002	0.002
70.0	0.120	0.019	0.014	0.002	0.120	0.019	0.014	0.002	0.002
80.0	0.140	0.020	0.017	0.002	0.140	0.020	0.017	0.002	0.002
90.0	0.161	0.021	0.019	0.002	0.161	0.021	0.019	0.002	0.002
100.0	0.182	0.021	0.022	0.003	0.182	0.021	0.022	0.003	0.003
150.0	0.300	0.118	0.036	0.014	0.300	0.118	0.036	0.014	0.014
200.0	0.436	0.135	0.052	0.016	0.436	0.135	0.052	0.016	0.016
250.0	0.589	0.153	0.071	0.018	0.589	0.153	0.071	0.018	0.018
300.0	0.760	0.171	0.091	0.021	0.760	0.171	0.091	0.021	0.021
350.0	0.950	0.189	0.114	0.023	0.950	0.189	0.114	0.023	0.023
365.0	1.010	0.060	0.136	0.007	1.010	0.060	0.121	0.007	0.007
730.12	2.367	1.957	0.356	0.235	2.967	1.957	0.356	0.235	0.235
1095.5	5.813	2.847	0.698	0.342	5.813	2.847	0.698	0.342	0.342
1460.7	9.443	3.630	1.133	0.515	9.443	3.630	1.133	0.515	0.515
1826.0	13.731	4.288	1.648	0.631	13.731	4.288	1.648	0.631	0.631
2191.2	18.557	4.826	2.227	0.579	18.557	4.826	2.227	0.579	0.579
2556.5	23.813	5.256	2.858	0.671	23.813	5.256	2.858	0.671	0.671
2921.7	29.405	5.592	3.529	0.702	29.405	5.592	3.529	0.702	0.702
3287.0	35.255	5.850	4.231	0.725	35.255	5.850	4.231	0.725	0.725
3652.2	41.301	6.045	4.956	0.725	41.301	6.045	4.956	0.725	0.725

Appendix A (cont.)

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Isotope = Pu-239

Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	DBS	DBSD	WBBS	WBDS	TOTALS	TDBS	TDBSD	TWDBS	TWDBSD
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.009	0.009	0.000	0.000	0.009	0.009	0.000	0.000	0.000
2.0	0.027	0.018	0.001	0.001	0.027	0.018	0.001	0.001	0.001
3.0	0.046	0.019	0.001	0.001	0.046	0.019	0.001	0.001	0.001
4.0	0.065	0.019	0.002	0.001	0.065	0.019	0.002	0.001	0.001
5.0	0.083	0.019	0.003	0.001	0.083	0.019	0.003	0.001	0.001
6.0	0.102	0.019	0.003	0.001	0.102	0.019	0.003	0.001	0.001
7.0	0.121	0.019	0.004	0.001	0.121	0.019	0.004	0.001	0.001
8.0	0.140	0.019	0.004	0.001	0.140	0.019	0.004	0.001	0.001
9.0	0.159	0.019	0.005	0.001	0.159	0.019	0.005	0.001	0.001
10.0	0.179	0.019	0.005	0.001	0.179	0.019	0.005	0.001	0.001
15.0	0.276	0.097	0.008	0.003	0.276	0.097	0.008	0.003	0.003
20.0	0.375	0.099	0.011	0.003	0.375	0.099	0.011	0.003	0.003
25.0	0.476	0.101	0.014	0.003	0.476	0.101	0.014	0.003	0.003
30.0	0.580	0.103	0.017	0.003	0.580	0.103	0.017	0.003	0.003
40.0	0.793	0.213	0.024	0.006	0.793	0.213	0.024	0.006	0.006
50.0	1.015	0.222	0.030	0.007	1.015	0.222	0.030	0.007	0.007
60.0	1.245	0.230	0.037	0.007	1.245	0.230	0.037	0.007	0.007
70.0	1.484	0.239	0.045	0.007	1.484	0.239	0.045	0.007	0.007
80.0	1.732	0.247	0.052	0.007	1.732	0.247	0.052	0.007	0.007
90.0	1.988	0.256	0.060	0.008	1.988	0.256	0.060	0.008	0.008
100.0	2.252	0.265	0.068	0.008	2.252	0.265	0.068	0.008	0.008
150.0	3.707	1.454	0.111	0.044	3.707	1.454	0.111	0.044	0.044
200.0	5.380	1.674	0.161	0.050	5.380	1.674	0.161	0.050	0.050
250.0	7.275	1.895	0.218	0.057	7.275	1.895	0.218	0.057	0.057
300.0	9.391	2.117	0.282	0.063	9.391	2.117	0.282	0.063	0.063
350.0	11.731	2.339	0.352	0.070	11.731	2.339	0.352	0.070	0.070
365.0	12.476	0.745	0.374	0.022	12.476	0.745	0.374	0.022	0.022
730.2	36.646	24.170	1.099	0.725	36.646	24.170	1.099	0.725	0.725
1095.5	71.811	35.165	2.154	1.055	71.811	35.165	2.154	1.055	1.055
1460.7	116.646	44.835	3.499	1.345	116.646	44.835	3.499	1.345	1.345
1826.0	169.619	52.973	5.089	1.589	169.619	52.973	5.089	1.589	1.589
2191.2	229.237	59.618	6.877	1.789	229.237	59.618	6.877	1.789	1.789
2556.5	294.159	64.922	8.825	1.948	294.159	64.922	8.825	1.948	1.948
2921.7	363.235	69.075	10.897	2.072	363.235	69.075	10.897	2.072	2.072
3287.0	435.503	72.269	13.065	2.168	435.503	72.269	13.065	2.168	2.168
3652.2	510.182	74.679	15.305	2.240	510.182	74.679	15.305	2.240	2.240

Isotope = Pu-239

Aerosol class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	DLV	DLVD	WDLV	WDLVD	TOTALS	TLVD	TOLVD	TWDLV	TWDLVD
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.003	0.003	0.000	0.000	0.003	0.003	0.003	0.000	0.000
2.0	0.008	0.005	0.000	0.000	0.008	0.005	0.005	0.000	0.000
3.0	0.013	0.005	0.001	0.000	0.013	0.005	0.005	0.001	0.000
4.0	0.018	0.005	0.001	0.000	0.018	0.005	0.005	0.001	0.000
5.0	0.023	0.005	0.001	0.000	0.023	0.005	0.005	0.001	0.000
6.0	0.028	0.005	0.002	0.000	0.028	0.005	0.005	0.002	0.000
7.0	0.033	0.005	0.002	0.000	0.033	0.005	0.005	0.002	0.000
8.0	0.039	0.005	0.002	0.000	0.039	0.005	0.005	0.002	0.000
9.0	0.044	0.005	0.003	0.000	0.044	0.005	0.005	0.003	0.000
10.0	0.049	0.005	0.003	0.000	0.049	0.005	0.005	0.003	0.000
15.0	0.076	0.027	0.005	0.002	0.076	0.027	0.027	0.005	0.002
20.0	0.104	0.027	0.006	0.002	0.104	0.027	0.027	0.006	0.002
25.0	0.132	0.028	0.008	0.002	0.132	0.028	0.028	0.008	0.002
30.0	0.160	0.029	0.010	0.002	0.160	0.029	0.029	0.010	0.002
40.0	0.219	0.059	0.013	0.004	0.219	0.059	0.059	0.013	0.004
50.0	0.280	0.061	0.017	0.004	0.280	0.061	0.061	0.017	0.004
60.0	0.344	0.064	0.021	0.004	0.344	0.064	0.064	0.021	0.004
70.0	0.409	0.066	0.025	0.004	0.409	0.066	0.066	0.025	0.004
80.0	0.478	0.068	0.029	0.004	0.478	0.068	0.068	0.029	0.004
90.0	0.548	0.071	0.033	0.004	0.548	0.071	0.071	0.033	0.004
100.0	0.621	0.073	0.037	0.004	0.621	0.073	0.073	0.037	0.004
150.0	1.022	0.401	0.061	0.024	1.022	0.401	0.401	0.061	0.024
200.0	1.482	0.460	0.089	0.028	1.482	0.460	0.460	0.089	0.028
250.0	2.003	0.521	0.120	0.031	2.003	0.521	0.521	0.120	0.031
300.0	2.584	0.581	0.155	0.035	2.584	0.581	0.581	0.155	0.035
350.0	3.226	0.642	0.194	0.039	3.226	0.642	0.642	0.194	0.039
365.0	3.431	0.204	0.206	0.012	3.431	0.204	0.204	0.206	0.012
730.2	10.036	6.606	0.602	0.396	10.036	6.606	6.606	0.602	0.396
1095.5	19.595	9.559	1.176	0.574	19.595	9.559	9.559	1.176	0.574
1460.7	31.713	12.118	1.903	0.727	31.713	12.118	12.118	1.903	0.727
1826.0	45.943	14.230	2.757	0.854	45.943	14.230	14.230	2.757	0.854
2191.2	61.855	15.912	3.711	0.955	61.855	15.912	15.912	3.711	0.955
2556.5	79.063	17.208	4.744	1.032	79.063	17.208	17.208	4.744	1.032
2921.7	97.239	18.176	5.834	1.091	97.239	18.176	18.176	5.834	1.091
3287.0	116.112	18.872	6.967	1.132	116.112	18.872	18.872	6.967	1.132
3652.2	135.459	19.347	8.128	1.161	135.459	19.347	19.347	8.128	1.161

Appendix A (cont.)

Isotope = Pu-239

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Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	DGD	DGDD	WDGD	WDGDD	TOTALS	TGDD	TGDD	TWDGD	TWDGDD
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
4.0	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
5.0	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
6.0	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
7.0	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
8.0	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
9.0	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
10.0	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
15.0	0.003	0.001	0.001	0.000	0.003	0.001	0.001	0.000	0.000
20.0	0.004	0.001	0.001	0.000	0.004	0.001	0.001	0.000	0.000
25.0	0.005	0.001	0.001	0.000	0.005	0.001	0.001	0.000	0.000
30.0	0.006	0.001	0.002	0.000	0.006	0.001	0.002	0.000	0.000
40.0	0.009	0.002	0.002	0.001	0.009	0.002	0.002	0.001	0.001
50.0	0.011	0.002	0.003	0.001	0.011	0.002	0.003	0.001	0.001
60.0	0.014	0.003	0.003	0.001	0.014	0.003	0.003	0.001	0.001
70.0	0.016	0.003	0.004	0.001	0.016	0.003	0.004	0.001	0.001
80.0	0.019	0.003	0.005	0.001	0.019	0.003	0.005	0.001	0.001
90.0	0.022	0.003	0.006	0.001	0.022	0.003	0.006	0.001	0.001
100.0	0.025	0.003	0.006	0.001	0.025	0.003	0.006	0.001	0.001
150.0	0.041	0.016	0.010	0.004	0.041	0.016	0.010	0.004	0.004
200.0	0.060	0.019	0.015	0.005	0.060	0.019	0.015	0.005	0.005
250.0	0.081	0.021	0.020	0.005	0.081	0.021	0.020	0.005	0.005
300.0	0.105	0.024	0.026	0.006	0.105	0.024	0.026	0.006	0.006
350.0	0.131	0.026	0.033	0.007	0.131	0.026	0.033	0.007	0.007
365.0	0.139	0.008	0.035	0.002	0.139	0.008	0.035	0.002	0.002
730.2	0.409	0.270	0.102	0.068	0.409	0.270	0.102	0.068	0.068
1095.5	0.804	0.395	0.201	0.099	0.804	0.395	0.201	0.099	0.099
1460.7	1.310	0.505	0.327	0.126	1.310	0.505	0.327	0.126	0.126
1826.0	1.909	0.600	0.477	0.150	1.909	0.600	0.477	0.150	0.150
2191.2	2.587	0.678	0.647	0.169	2.587	0.678	0.647	0.169	0.169
2556.5	3.329	0.742	0.832	0.185	3.329	0.742	0.832	0.185	0.185
2921.7	4.122	0.793	1.030	0.198	4.122	0.793	1.030	0.198	0.198
3287.0	4.956	0.834	1.239	0.208	4.956	0.834	1.239	0.208	0.208
3652.2	5.822	0.866	1.455	0.217	5.822	0.866	1.455	0.217	0.217

Appendix A (cont.)

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Isotope = Pu-239

Aerosol Class = Y Index = 7 Particle size = 1.00 A.M.A.D.

TT	SUMWD	SUMWDD	TOTALS	TSUMWD	TSUMWDD
0.	0.	0.		0.	0.
1.0	0.076	0.076		0.076	0.076
2.0	0.212	0.135		0.212	0.135
3.0	0.324	0.112		0.324	0.112
4.0	0.427	0.103		0.427	0.103
5.0	0.524	0.098		0.524	0.098
6.0	0.620	0.095		0.620	0.095
7.0	0.714	0.094		0.714	0.094
8.0	0.807	0.093		0.807	0.093
9.0	0.900	0.093		0.900	0.093
10.0	0.993	0.093		0.993	0.093
15.0	1.454	0.461		1.454	0.461
20.0	1.913	0.459		1.913	0.459
25.0	2.370	0.457		2.370	0.457
30.0	2.824	0.455		2.824	0.455
40.0	3.727	0.903		3.727	0.903
50.0	4.621	0.894		4.621	0.894
60.0	5.506	0.885		5.506	0.885
70.0	6.383	0.877		6.383	0.877
80.0	7.252	0.869		7.252	0.869
90.0	8.112	0.860		8.112	0.860
100.0	8.964	0.852		8.964	0.852
150.0	13.108	4.144		13.108	4.144
200.0	17.063	3.955		17.063	3.955
250.0	20.842	3.778		20.842	3.778
300.0	24.454	3.612		24.454	3.612
350.0	27.909	3.456		27.909	3.456
365.0	28.917	1.007		28.917	1.007
730.2	50.192	21.275		50.192	21.275
1095.5	66.375	16.183		66.375	16.183
1460.7	79.260	12.885		79.260	12.885
1826.0	89.974	10.714		89.974	10.714
2191.2	99.235	9.260		99.235	9.260
2556.5	107.502	8.267		107.502	8.267
2921.7	115.075	7.573		115.075	7.573
3287.0	122.152	7.077		122.152	7.077
3652.2	128.866	6.714		128.866	6.714

APPENDIX B
AERIN CODE PRINT-OUT NOMENCLATURE

Page 1 (Run Input Parameters)

D3 = deposition fraction in naso-pharynx
D4 = deposition fraction in tracheal-bronchial
D5 = deposition fraction in lung
F(1),F(2),F(3), etc. = fraction of deposit in organ that translocates from the organ by pathway (1), (2), (3), etc., respectively.
THLF(1),THLF(2),THLF(3),etc. = biological half-life of material translocating by pathway (1),(2),(3),etc., respectively.
U24 = urine excretion fraction equation for a 24 hour specimen.
SE(1), SE(2), SE(3), etc. = specific effective energy of the isotope in source organs irradiating the target organs. (see ICRP30 Part 1)

Page 2

I(K) = intake rate. (pci/d)
T(K) = total time of intake at intake rate I(K).
TT = total time elapsed since start of run. (d)
QNPA = quantity in naso-pharynx compartment 1 at time TT. (pci)
QNPB = quantity in naso-pharynx compartment 2 at time TT. (pci)
QNP = QNPA + QNPB, total quantity in naso-pharynx compartment at time TT.
QTBC = quantity in tracheal-bronchi compartment 3 at time TT. (pci)
QTBD = quantity in tracheal-bronchi compartment 4 at time TT. (pci)
QTB = QTBC + QTBD, total quantity in tracheal-bronchi compartment at time TT.

Page 3

QPLE = quantity in pulmonary compartment 5 at time TT. (pci)
QPLF = quantity in pulmonary compartment 6 at time TT. (pci)
QPLG = quantity in pulmonary compartment 7 at time TT. (pci)
QPLH = quantity in pulmonary compartment 8 at time TT. (pci)
QTB = total quantity in tracheal-bronchi at time TT. (pci) (same value as QTB on page 2)
QLY = total quantity in pulmonary lymph at time TT. (pci) (same value as QLY on page 4)
QPL = QPLE + QPLF + QPLG + QPLH + QTB + QLY, total quantity in pulmonary compartment including tracheal-bronchial tree and the pulmonary lymph.

Page 4

QLYH = quantity retained indefinitely in the pulmonary lymph. (pci)
QLYI = quantity in the pulmonary lymph compartment 9 at time TT. (pci)
QLY = QLYN + QLYI, total quantity in pulmonary lymph at time TT. (pci)
QSI = quantity in small intestines at time TT. (pci)
QLUI = quantity in large intestines at time TT. (pci)
QLLI = quantity in lower large intestines at time TT. (pci)

Page 5

QBNAN = quantity in mineral bone at time TT arriving by pathway 1. (pci)
QBNCN = quantity in mineral bone at time TT arriving by pathway 3. (pci)
QBNECN = quantity in mineral bone at time TT arriving by pathway 5. (pci)
QBNIN = quantity in mineral bone at time TT arriving by pathway 9. (pci)
QBNMN = quantity in mineral bone at time TT arriving by pathway 13. (pci)
QBN = QBNAN + QBNCN + QBNECN + QBNIN + QBNMN, total quantity in mineral bone at time TT.

Page 6

QLVAN = quantity in liver at time TT arriving by pathway 1. (pci)
QLVCN = quantity in liver at time TT arriving by pathway 3. (pci)
QLVEN = quantity in liver at time TT arriving by pathway 5. (pci)
QLVIN = quantity in liver at time TT arriving by pathway 9. (pci)
QLVMN = quantity in liver at time TT arriving by pathway 13. (pci)
QLV = QLVAN + QLVCN + QLVEN + QLVIN + QLVMN, total quantity in liver at time TT.

Page 7

QGDAN = quantity in gonads at time TT arriving by pathway 1. (pci)
QGDCN = quantity in gonads at time TT arriving by pathway 3. (pci)
QGDECN = quantity in gonads at time TT arriving by pathway 5. (pci)
QGDIN = quantity in gonads at time TT arriving by pathway 9. (pci)
QGD MN = quantity in gonads at time TT arriving by pathway 13. (pci)
QGD = QGDAN + QGDCN + QGDECN + QGDIN + QGD MN, total quantity in gonads at time TT.

Page 8

AMT.IN URINE = urine activity for a 24 hour specimen at time TT. (pci/d)
AMT.IN FECES = fecal activity for a 24 hour specimen at time TT. (pci/d)
TOTAL AMT.IN URINE = running total of urine activity for multiple code runs. (used only when several isotopes are run in sequence).
TOTAL AMT.IN FECES = running total of fecal activity for multiple code runs. (used only when several isotopes are run in sequence)
AMT.IN BLOOD = rate at which activity enters blood compartment at time TT. (pci/d)

Page 9

DPL = accumulated dose equivalent to lungs integrated to time TT. (rem)
DPLD = differential dose equivalent between TT and the previous TT. (rem)
WDPL = weighted dose equivalent for lung $[0.12 * DPL]$. (rem)
WDPLD = weighted differential dose equivalent to lung between TT and the previous TT. $[0.12 * WDPL]$. (rem)
TDPL = sum dose equivalent to lung for all isotopes run in sequence. (rem)
TDPLD = sum differential dose equivalent to lung for all run in sequence. (rem)

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TWDPL = sum of weighted dose equivalent to lung for all isotopes run in sequence. (rem)
TWDPLD = sum of differential weighted dose equivalent to lung for all isotopes run in sequence. (rem)

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DULI = accumulated dose equivalent to upper large intestines integrated to time TT. (rem)
DULID = differential dose equivalent to upper large intestines between TT and previous TT. (rem)
WDULI = weighted accumulated dose equivalent to upper large intestines $[0.06 * DULI]$. (rem)
WDULID = weighted differential dose equivalent to upper large intestines $[0.06 * WDULI]$. (rem)
TDULI = sum of all dose equivalents to upper large intestines integrate to time TT for all isotopes run in sequence. (rem)
TWDULI = sum of all differential dose equivalents to upper large intestines for all isotopes run in sequence. (rem)
TWDULI = sum of all weighted dose equivalents to upper large intestines integrated to time TT for all isotopes run in sequence. (rem)
TWDULID = sum of all differential dose equivalents to upper large intestines for all isotopes run in sequence. (rem)

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DLLI = accumulated dose equivalent to lower large intestines integrated to time TT. (rem)
DLLID = differential dose equivalent between time TT and previous TT. (rem)
WDLLI = weighted dose equivalent for lower large intestines $[0.06 * DLLI]$. (rem)
WDLLID = weighted differential dose equivalent for lower large intestines $[0.06 * DLLID]$. (rem)
TDLLI = sum of all dose equivalents to lower large intestines integrated to time TT for all isotopes run in sequence. (rem)
TDLLID = sum of all differential dose equivalents to lower large intestines integrated to time TT for all isotopes run in sequence. (rem)
TWDLLI = sum of all weighted dose equivalents to lower large intestines integrated to time TT for all isotopes run in sequence. (rem)
TWDLLID = sum of all weighted differential dose equivalents to lower large intestines for all isotopes run in sequence. (rem)

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DRM = accumulated dose equivalent to red bone marrow integrated to time TT. (rem)
DRMD = differential dose equivalent to red bone marrow between TT and previous TT. (rem)
WDRM = weighted accumulated dose equivalent to red bone marrow $[0.12 * DRM]$. (rem)
WDRMD = weighted differential dose equivalent to red bone marrow $[0.12 * drmd]$. (rem)

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Print-Out Nomenclature

TDRM = sum of the accumulated dose equivalent to red bone marrow for all isotopes run in sequence. (rem)
TDRMD = sum of the differential dose equivalents to red bone marrow for all isotopes run in sequence. (rem)
TWDRM = sum of the weighted accumulated dose equivalents to red bone marrow for all isotopes run in sequence. (rem)
TWDRMD = sum of the differential dose equivalents to red bone marrow for all isotopes run in sequence. (rem)

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DBS = accumulated dose equivalent to bone surface integrate to time TT. (rem)
DBSD = differential dose equivalent to bone surface between TT and previous TT. (rem)
WDBS = weighted dose equivalent to bone surface $[0.03 * DBS]$. (rem)
WDBSD = weighted differential dose equivalent to bone surface $[0.03 * DBSD]$. (rem)
TDBS = sum of the accumulated dose equivalent to bone surface for all isotopes run in sequence. (rem)
TDBSD = sum of the differential dose equivalent to bone surface for all isotopes run in sequence. (rem)
TWDBS = sum of the weighted dose equivalent to bone surface for all isotopes run in sequence. (rem)
TWDBSD = sum of the weighted differential dose equivalent to bone surface for all isotopes run in sequence. (rem)

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DLV = accumulated dose equivalent to liver integrated to time TT. (rem)
DLVD = differential dose equivalent to liver between TT and the previous TT. (rem)
WDLV = weighted dose equivalent to liver $[0.06 * dlV]$. (rem)
WDLVD = weighted differential dose equivalent to liver $[0.06 * WDLV]$. (rem)
TLVD = sum of the accumulated dose equivalent to liver for all isotopes included in the code run. (rem)
TDLVD = sum of the differential dose equivalent to liver for all isotopes included in the code run. (rem)
TWDLV = sum of the weighted dose equivalent to liver for all isotopes run in sequence. (rem)
TWDLVD = sum of the weighted differential dose equivalent to liver for all isotopes run in sequence. (rem)

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DGD = accumulated dose equivalent to gonads integrated to time TT. (rem)
DGDD = differential dose equivalent to gonads between TT and previous TT.
WDGD = weighted dose equivalent to gonads $[0.25 * DGD]$. (rem)
WDGDD = weighted differential dose equivalent to gonads $[0.25 * DGDD]$. (rem)
TDGD = sum of the accumulated dose equivalent to gonads for all isotopes included in the code run. (rem)

Appendix B
Print-Out Nomenclature

TDGDD = sum of the differential dose equivalent to gonads for all isotopes included in the code run. (rem)
TWDGD = sum of the weighted dose equivalent to gonads for all isotopes included in the code run. (rem)
TWDGDD = sum of the weighted differential dose equivalent to gonads for all isotopes included in the code run. (rem)

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SUMWD = sum of the weighted effective whole body dose equivalent. (rem)
SUMWDD = sum of the differential weighted effective whole body dose equivalent. (rem)
TSUMWD = total sum of the weighted effective whole body dose equivalent for all isotopes run in sequence. (rem)
TSUMWDD = total sum of the differential effective whole body dose equivalent for all isotopes run in sequence. (rem)