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**DOSEXPRT—A Bioassay Dosimetry
Code for Martin Marietta Energy
Systems, Inc.**

R. C. Ward
K. F. Eckerman

MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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for
Martin Marietta Energy Systems, Inc.**

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ABSTRACT

The bioassay code DOSEXPRT was developed for Martin Marietta Energy Systems, Inc., to provide compliance with Department of Energy (DOE) Order 5480, Chapter 11. DOSEXPRT computes the intake of a radionuclide in any year (considering both acute and chronic intakes) from *in vivo* measurements of the retained activity and/or measurements of the activity in excreta. The committed effective and organ doses for the intake are computed as well as the effective and organ doses expected to be received in each calendar year out to 50 years beyond the year of intake. The bioassay records used as input for DOSEXPRT are extracted from the Martin Marietta Energy Systems Occupational Health Information System (OHIS). DOSEXPRT implements a set of algorithms with parameters governing the translocation, retention, and excretion of the nuclide contained in data files specific to the nuclide. These files also contain dose-per-unit-intake coefficients used to compute the committed dose equivalent for the intakes in the year. Annual organ and effective doses are computed using additional dose-rate files that contain data on the dose rate at various times following a unit intake. If measurements are presented for more than one assay for a given nuclide, DOSEXPRT estimates the intake by applying weights assigned in the nuclide file for each assay. DOSEXPRT is accessed off the OHIS MENU No. 4 and designed to be run as a batch processor, but can also be run interactively for testing purposes.

1. INTRODUCTION

The general principle of monitoring for the radiation protection of workers has been set forth in various reports of the International Commission on Radiological Protection¹⁻⁴ and National Council on Radiation Protection and Measurement.⁵ Monitoring of individuals for internal exposure is based on measurements of radionuclides in the whole body (or in specific organs/regions) and on measurement of excreta. For quantitative assessment of internal exposure the results of these measurements must be translated into quantities that can be compared to the primary radiation protection guidance (limits on committed dose equivalent or annual dose equivalent) or to the secondary quantities (Annual Limits on Intake - ALI). The relationships between levels in the body or in excreta and the estimated intake and resulting dose can only be established through use of metabolic and dosimetric models describing the behavior of the material in the body.

Interpretation of bioassay measurements in terms of the primary and secondary radiation protection quantities often requires considerable computational effort, thus necessitating the use of computers. For radionuclides that are tenaciously retained in the body the interpretation of contemporary measurements requires the information of the complete exposure history of the individual to that nuclide. The management of large amounts of bioassay data necessitates the use of a computer program.

DOSEXPRT (shortened from "DOSE EXPERT") was developed by Richard C. Ward and Keith F. Eckerman for use by the Health Physics personnel at Martin Marietta Energy Systems, Inc. (MMES). The DOSEXPRT software is intended to serve as a tool in demonstrating compliance with the Department of Energy (DOE) occupational radiation protection order (DOE 5480.11).⁶ The principal use of DOSEXPRT will be to compute annual effective dose for workers for the Radiation Exposure Information Reporting System (REIRS) report, an annual report to DOE by its contractors. The input and output records used to produce the REIRS report are maintained in the MMES Occupational Health Information System (OHIS).

DOSEXPRT incorporates a set of algorithms for estimating the intake (acute incident) or intake rate (chronic exposure) of radionuclides based on measurement of their excretion rate or activity present in the body. The algorithms make use of contemporary dosimetric and biokinetic data in the interpretation of the bioassay measurements. In formulating the algorithms and developing the software, the needs of quality assurance and the desire to limit future maintenance costs were considered.

The present version, DOSEXPRT 4.2, was completed on March 17, 1992. DOSEXPRT 4.2 was used to analyze intake and dose for Energy Systems personnel for the year 1991. Ver. 4.1 of DOSEXPRT was used for analysis of 1990 bioassay data, and Ver. 3.0 of DOSEXPRT was used for analysis of 1989 bioassay data. The method for computing intake, committed dose, and annual dose has not been altered between Vers. 3.0 and 4.2, although a faster algorithm was developed for computation of annual dose with Ver. 4.1 of DOSEXPRT. Version 4.1 also introduced a post-processing program (REPORT) which sorted the output of DOSEXPRT by sum of committed effective dose, for ease of

interpretation. This program, renamed DOSREPORT, has been improved with Ver. 4.2 of DOSEXPRT. The new version sorts by both sum of committed effective dose and presence of any positive annual effective dose for a given individual. Other modifications between the present version of DOSEXPRT and earlier versions are detailed in the report.

Section 2 contains a general description of DOSEXPRT 4.2. This description is followed in Sect. 3 by a discussion of how to use DOSEXPRT. The fourth section discusses the operation of DOSEXPRT, while the fifth section states the assumptions made in DOSEXPRT. Section 6 describes how to create bioassay records using the GENREC utility. Section 7 describes how to modify the SITE default file using the MODSITE utility. The DOSEXPRT nuclide data files and dose-rate files are discussed in Sect. 8. Section 9 describes the algorithms used for estimating intake of radionuclides, and Sect. 10 delineates the contents of the nuclide data files. Appendices contain the format of the DOSEXPRT input and output files and example input and output results. Appendix H contains listings of all nuclide data files available for DOSEXPRT.

DOSEXPRT was written in FORTRAN 77 for the Occupational Health Information System (OHIS) VAX. A similar code, the Radiological Bioassay and Dosimetry (RBD)⁷ code, was developed for the U.S. Army for use on personal computers. The algorithms for computing intake and committed dose are identical in RBD and DOSEXPRT, although the assumption made when treating results less than the lower critical limit, as discussed in Sect. 5, varies between the two codes.

2. GENERAL DESCRIPTION OF DOSEXPRT

DOSEXPRT is accessed off the Occupational Health Information System (OHIS) menu HPIMS No. 4. On OHIS the DOSEXPRT programs are located in the directory EXE_DIR. The program can be run either interactively or as a batch processor. Designed to be used to process a large number of bioassay records, it is recommended that DOSEXPRT be run as a batch processor.

Table 1 on the following page lists the DOSEXPRT input and output files. As input, DOSEXPRT requires one or two bioassay records files. Each input file must have the extension DAT. Usually there will be two bioassay records files, one for *in vitro* analysis (S26.DAT) and one for *in vivo* analysis (S27.DAT). The format for the input records has been established to be consistent with the bioassay data on the Martin Marietta Energy Systems OHIS data base. A VAX COM file first concatenates and sorts the bioassay records files into a single file (DOSEXPRT.DAT) and then executes the DOSEXPRT program.

To compute intake and dose, the code uses separate data files for each radionuclide. One data file (with extension NUC) contains information for computing intake and committed dose, weighting factors with which to weight intake and committed dose for the different bioassays, and control information to determine the progress of the computations. The other data file (with extension DRS) contains dose rate per unit intake as a function of time for computing annual dose. Dose-rate files are not required for nuclides where the clearance from the body occurs within the year of exposure. For Ver. 4.2 of DOSEXPRT, 40 nuclide data files are available:

H-3	C-11/14	Na-22/24	P-32	Co-57/58/60
Sr-85/89/90		Tc-99/99M	Cs-134/137	I-125/129/131/135
Eu-152/154/155	Tl-201		Ra-226/228	Th-228/232
yU-234/235/236/238		Pu-238/239/241	Am-241	Cm-242/244

and TPU (same as AM-241).

Presently, 18 dose-rate files are available:

Co-57/60	Sr-89/90	Cs-134/137	I-125/129
U-234/235/236/238	Pu-238/239/241	Am-241	Cm-244

and TPU (same as AM-241).

The nuclide data files and dose-rate files for all but the Y-12 Plant are located in HS_DATA:[DX]. DOSEXPRT 4.2 has been set up to take advantage of special inhalation class Q for the uranium nuclides. These files are used presently by the Y-12 Plant. The user is asked by DOSEXPRT whether to use the special Y-12 uranium nuclide data and dose-rate files. The default response is NO. A special data area HS_DATA:[DX.Y12] contains the Y-12 uranium nuclide and dose-rate files.

Table 1. DOSEXPRT input and output filenames

DOSEXPRT INPUT FILES	
S26.DAT	In vitro bioassay records from Segment 26
S27.DAT	In vivo bioassay records from Segment 27
DOSEXPRT.DAT	Combined bioassay records
SITE.DFT	Site default file
*.NUC	Nuclide data files
NUCLIDE.BIN	Single, binary nuclide data file
*.DRS	Nuclide dose-rate files
*.BIN	Binary nuclide dose-rate files

DOSEXPRT OUTPUT FILES	
OUTNAME.S28	Output for Segment 28
OUTNAME.ANI	Effective annual dose by year for incidents
OUTNAME.ANR	Effective annual dose by year for routine

DOSREPORT OUTPUT FILES	
OUTNAME.OUT	Sorted output listing
OUTNAME.IX1	Index for cases with positive effective committed dose
OUTNAME.IX2	Index for cases with zero effective committed dose, positive effective annual dose
OUTNAME.IX3	Index for cases with error codes (no nuclide file, window or record errors)
OUTNAME.LOG	Log file generated if DOSEXPRT is run in batch mode.

With Ver. 4.1 of DOSEXPRT the nuclide data files were combined into a single binary, direct-access file, NUCLIDE.BIN, for faster execution of DOSEXPRT. In addition, a binary, direct-access dose-rate file (with extension BIN) was created for each of the nuclides with dose-rate files. The structure of the nuclide data files and the nuclide dose-rate files was unmodified for Ver. 4.2 of DOSEXPRT.

In addition to the bioassay records, nuclide data files, and nuclide dose-rate files, DOSEXPRT requires a plant site default file (SITE.DFT), which includes a table of nuclide data files, and a file (DRS.TAB) containing a table of nuclides with dose-rate files.

DOSEXPRT produces three output files: (1) an output listing (with extension S28) to be incorporated into Segment 28 of the OHIS data base; (2) a listing (with extension ANI) of annual dose (in mrem) by year up to 50 years for incident exposure; and (3) a listing (with extension ANR) of annual dose (in mrem) by year for routine exposure. In addition, if DOSEXPRT is submitted as a batch job, a listing (with extension LOG) containing the assumptions made during the run will be produced. The ANI and ANR output listings are discussed in Appendix L.

The DOSEXPRT post-processing program, DOSREPORT, sorts the DOSEXPRT output (S28) file by the sum of committed effective dose and presence of annual effective dose into a sorted output file (with extension OUT). DOSREPORT also produces three index files (with extensions IX1, IX2 and IX3), that facilitate reading the DOSEXPRT output. The first index file (extension IX1) lists all cases with positive committed effective dose. The second index file (extension IX2) lists all cases with zero committed effective dose but positive annual effective dose. The third index file (extension IX3) lists all cases where errors (no nuclide file, measurement window or record errors) occurred. The index files list the social security number and the information (badge, plant site, nuclide, class, pathway and reason code) that appears on the header for each case in the OUT file. The index files can be used for quickly cross referencing the other DOSEXPRT and DOSREPORT output files.

In this manual, the plant letter codes K, O, P, X and Y stand for K-25; Portsmouth, Ohio; Paducah, Kentucky; X-10; and Y-12 respectively. The plant letter code S and name SITE have been used in all example problems so that results will not be construed as coming from a particular MMES site. The plant site names are assigned to the plant letter codes in the SITE.DFT file. In addition, negative values were used for badge numbers so that they will not be construed as actual badge numbers. [Note: a badge number of -1 will not work because this number is the flag that indicates to DOSEXPRT the end of the BADGE list (i.e., the end of processing.)] The normal range for badge numbers is 1 to 999999.

Throughout this manual screen output is displayed in shaded boxes, and the user's responses to queries are shown in *italics*.

3. HOW TO USE DOSEXPRT

DOSEXPRT and associated utility programs (GENREC and MODSITE) are executed from OHIS menu HPIMS No. 4. The OHIS menu appears as follows:

H P I M S #4 M E N U	
XTRACT	Extract Bioassay Records from Data Base
INTERACTIVE	Run DOSEXPRT and Create Output Report
BATCH	Submit DOSEXPRT and Create Output Report
GENREC	Generate a Bioassay Records File
MODSITE	Modify SITE.DFT file
DIR	Directory Listing
LIST	List a DOSEXPRT output file
PRINT	Print a DOSEXPRT output file
HP-PRINT	Prints files on HP LaserJet
DBM	Data Base Manager
EXIT	Exit This Menu

DOSEXPRT is executed by selecting INTERACTIVE or BATCH from the menu. Selecting INTERACTIVE will run the DOSEXPRT program immediately; selecting BATCH will submit DOSEXPRT to be run after the time specified by the user. In either case, assuming the DOSEXPRT output files have the form *filename.ext* where *ext* is the extension, the user is first asked to enter *the filename*. The extension S28 is attached to create the file for segment 28 of the OHIS data base. The extension OUT is attached to create the sorted output file produced from the S28 file.

After entering the name of the output files, the user is asked for *the number of bioassay records files*. The response is either one or two bioassay records files. The user is then asked for *the name(s) of these bioassay records file(s)*. If there are two files (for instance: *in vitro* and an *in vivo* bioassay records files), the two bioassay records files will be concatenated together and then sorted.

The user is then asked for a *starting date*, in the form YYYY, and a duration (in years) for considering measurements for routine analysis. This period is referred to as the measurement window. The measurement window brackets the period of time during which routine measurements will be considered for computing intake rates.

Following this, the user is then asked for a *starting date*, in the form YYYY, and a duration (in years) for computing the intake. This period is referred to as the intake window. The intake window is the period of time over which the intake for routine assay is evaluated. Incident assays will be computed only if the incident date falls within the intake window. *The duration of the intake window must be 1 year when computing annual dose.*

The measurement window and intake window are illustrated in Fig. 1. Consider first a sequence of routine bioassay measurements for this individual. These values are shown by downward-pointing arrows at the top of the figure. For an analysis of radiation exposure in the calendar year 1990, the measurement window was taken to extend over the years 1989 and 1990. This is shown by the horizontal arrow in the middle of the figure. The measurements actually considered for determining the intake are shown below the measurement window. Note that measurements prior to the first of the year 1989 are not considered. Below the measurement window is a second horizontal arrow that indicates the intake window, the period over which the intake is computed for the routine measurements. Note that the measurements in the year 1989 are used to determine the intake rate at the beginning of the year 1990 and therefore will affect the computation of the intake in the year, 1990. The measurement window and the intake window must start at the beginning of a year, and their duration must be an integral number of years. *The duration of the intake window must be 1 year when computing annual dose.*

Now consider a set of incident measurements in the year 1990 as shown by upward-pointing arrows at the bottom of the figure. For DOSEXPRT to compute intake for this incident, the incident date must fall in the intake window, which it does.

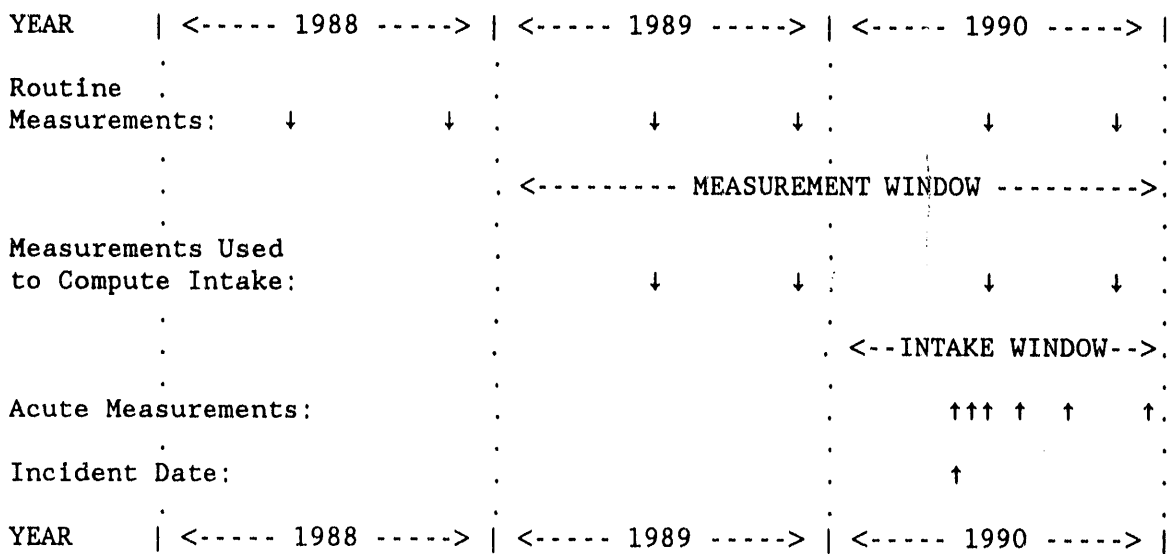


Fig. 1. Illustration of the measurement and intake windows.

After entering the measurement and intake windows, the user is asked *to enter a SITE filename (without extension), or to hit return to use the default SITE.DFT file.* The SITE.DFT file contains default values for parameters used by the DOSEXPRT program such as volume of urine sample, urinary excretion rate, etc. The user typically selects the default SITE.DFT file. To use a modified SITE.DFT file, see Sect. 7.

The user is then asked whether to use the special Y-12 uranium nuclide and dose-rate

files. *The default response is NO.* A special data area HS_DATA:[DX.Y12] contains the Y-12 uranium nuclide and dose-rate files. The regular nuclide and dose-rate files are located in HS_DATA:[DX].

Finally, the user can truncate the listing of the DOSREPORT program by removing the individuals who have only zero intake cases. Since these individuals appear at the end of the listing, the DOSREPORT program can be told not to print any information on them to the OUT file. Cases with error codes are printed to the OUT file. The OUT file header will indicate that the listing has been truncated. *The default response is NO - not to truncate printing of zero intake results.*

Assuming the user has selected INTERACTIVE from the DOSEXPRT menu and the example DOSEXPRT input file is DEMO.DAT, the output to the screen and the user responses are shown below:

```

DOSEXPRT V4.2
Enter OUTPUT filename (w/o extension): DEMO

Enter NUMBER of bioassay records files (1 or 2): 1

Enter RECORDS filename (w/o extension): DEMO
*****
*      Entering just the year [YYYY] implies      *
* Jan 01 (00:00) to Dec 31 (24:00) of that year. *
* Enter duration in years after entering year. *
*****

Enter Beginning MEASUREMENT YEAR [YYYY]: 1989
Enter DURATION in years : 2

Enter Beginning INTAKE YEAR [YYYY] : 1990
Enter DURATICN in years : 1

Enter SITE filename (w/o extension) or <CR> for default:

Default is NOT to use Y12 nuclide files.
Use Y12 nuclide files? (Y/[N]): N

Default is to keep zero intake output records.
Suppress zero intake output records in OUT listing? (Y/[N]): N

```

The VAX SORT utility is used to sort the bioassay records into the proper order required by DOSEXPRT. Following this, DOSEXPRT computes the intake, committed dose and annual dose for each case in the bioassay records. The example execution continues on the following page.

Sorting Bioassay Records

DOSEXPRT VERSION: 4.2 (DATE: 03/17/92)

Determination of Intake and Dose Using Bioassay Records

 Developed for Martin Marietta Energy Systems, Inc. by
 R. C. Ward and K. F. Eckerman of Oak Ridge National Laboratory

ANY PROBLEMS WITH DOSEXPRT SHOULD BE COMMUNICATED TO:
 RICHARD C. WARD, ORNL (Phone: 4-5449 e-mail: RWD)

Date of Computation: 3/17/92

Enter PATH for Bioassay and Output Files:

PRODUCING .CTL FILE

TOTAL NUMBER OF RECORDS IN BIOASSAY FILE: 10

NUCLIDE DATA FILES AVAILABLE TO THIS RUN:

H-3	C-11	C-14	NA-22	NA-24	P-32	CO-57	CO-58
CO-60	SR-85	SR-89	SR-90	TC-99	TC-99M	CS-134	CS-137
I-125	I-129	I-131	I-135	PM-147	EU-152	EU-154	EU-155
TL-201	RA-226	RA-228	TH-228	TH-232	U-234	U-235	U-236
U-238	PU-238	PU-239	PU-241	AM-241	TPU	CM-242	CM-244

NUCLIDES WITH DOSE-RATE FILES:

CO-60		SR-89	SR-90			CO-57	
I-125	I-129					CS-134	CS-137
					U-234	U-235	U-236
U-238	PU-238	PU-239	PU-241	AM-241	TPU		CM-244

BIOASSAY RECORDS FILENAME: FLGEM:[RWD.DOSEX42]DOSEXPRT.DAT

SITE PARAMETER FILENAME: FLGEM:[RWD.DOSEX41]SITE.DFT

PERIOD FOR CONSIDERING MEASUREMENTS: 19890101 --> 19910101

PERIOD FOR COMPUTING INTAKE: 19900101 --> 19910101

 AMAD 1.00 micron - DEPOSITION PARAMS D3 0.30 D4 0.08 D5 0.25
 URINE EXCRETION RATE (ml/day):1400.0 DEFAULT SAMPLE VOLUME(ml):20.0
 FECAL EXCRETION RATE (g/day): 135.0 DEFAULT SAMPLE MASS(g): 20.0
 BREATH EXCRETION RATE (l/day):20000.0 DEFAULT SAMPLE VOLUME(l): 20.0
 MEASUREMENTS < OR = LC ARE SET TO ZERO. LC IS DEFINED AS MDA/1.0

BADGE -20 SITE U-238 D INHALATION ROUTINE -19900101

BADGE -30 SITE U-238 MO INHALATION INCIDENT-19900201

DOSEXPRT VERSION: 4.2 (DATE: 03/17/92) DATE OF COMPUTATION: 3/17/92

FORTRAN STOP

Sorting Output Records

Writing DOSEXPRT Output to File: DEMO

FORTRAN STOP

After DOSEXPRT completes execution, the user is returned to the DOSEXPRT menu. To list the sorted output (OUT) file to the screen, the user selects LIST from the DOSEXPRT menu. The results are listed in order of total committed effective dose equivalent (CEDE) for each badge. For individuals with no committed effective dose, those with cases of positive annual effective dose are listed first.

To print the output file on the mainframe printer, the user selects PRINT from the DOSEXPRT menu. To print the output file on a laserjet printer attached to the users PC terminal, the user selects HP-PRINT from the DOSEXPRT menu. The listing of the DOSEXPRT output (OUT) file for the previous example is shown on the following page.

List DOSEXPR output file
Use <CTRL> Y to abort listing

Enter output filename (WITHOUT EXTENSION): DEMO

DOSEXPR OUTPUT FILE: DEMO.OUT DATE: 3/17/92 INTAKE AND DOSE ARE WEIGHTED OVER ALL ASSAYS

DOSEXPR VERSION: 4.2-031792 RUN DATE: 03/17/92 TIME: 09:19

MEASUREMENT PERIOD: 010189 ==> 010191 INTAKE PERIOD: 010190 ==> 010191

TOTAL CEDE(mrem): 1200

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-20 S	U-238	D	H	3-010190	4.89E-01	4.04E+01	4.04E+01	5.05E+02	1.19E+03	1.78E+04	4.02E+01	1.49E+03	1.20E+03
BRE0.00	U	0.00	F	0.00 WBC0.00 LUN1.00*ORG0.00	2.81E+01	2.81E+01	2.81E+01	5.04E+02	1.82E+02	2.40E+03	2.81E+01	9.60E+02	4.54E+02

TOTAL CEDE(mrem): 400

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-30 S	U-238	M	H	1-020190	0	8.15E-03	3.99E-01	4.03E-01	2.49E+03	1.17E+01	1.75E+02	4.00E-01	1.48E+01
BRE0.00	U	1.00*F	0.00	WBC0.00 LUN0.00 ORG0.00	6.50E-01	6.50E-01	6.51E-01	5.54E+02	3.15E+00	3.94E+01	6.50E-01	2.17E+01	7.49E+01

DOSEXPRT can be submitted to run as a VAX batch process after a specified time by selecting BATCH off the DOSEXPRT menu. In addition to the questions asked previously, the user will be asked for a time in the form HH:MM:SS after which the particular job should be run. If no time is entered, the job will be submitted to begin immediately. In addition to producing the output files discussed above, a batch run produces a LOG file that contains what would be directed to the screen when running interactively. The LOG file will have the same name as the S28 and OUT files.

2.1 DOSEXPRT VERSION 4.2 MODIFICATIONS

This section describes the specific modifications made to DOSEXPRT Ver. 4.1 (5/13/91) to produce DOSEXPRT Ver. 4.2 (3/17/92). DOSEXPRT 4.2 was used to analyze the 1991 bioassay data. Seven modifications and four corrections were made to DOSEXPRT 4.1 to produce DOSEXPRT 4.2. The corrections to produce Ver. 4.2 are as follows:

1. Version 4.1 could associate an incorrect social security number with a badge if errors (no nuclide file, measurement window or record errors) were detected for a given case. This situation did not occur for cases that did not have errors associated with them. This problem has been corrected with DOSEXPRT 4.2.

2. The sorting of input bioassay records has been corrected with Ver. 4.2 of DOSEXPRT. With past versions the records were sorted by reason code as a single, two-character field. The present version sorts first by the second character of the reason code (a blank, R, or S) and then by the first character (1 - 9). This change separates all routine records from all incident records.

3. The incident time field in the S28 output records contained leading blanks causing errors when the S28 output file was loaded into the Segment 28 data base. The leading blanks have been replaced with zeros in Ver. 4.2.

4. A field in the S28 output record contains the year when the annual effective dose is still above a specified threshold value. The threshold value is set to 1 mrem in the default site file (see Sect. 7). The year was being incorrectly specified in previous versions of DOSEXPRT for certain cases. This has been corrected with Ver. 4.2 of DOSEXPRT. In addition, the year cannot be earlier than the year of computation of intake (i.e., the intake window).

The modifications made to DOSEXPRT to produce Ver. 4.2 are as follows:

1. DOSEXPRT 4.1 would give an error message (NO NUC ERROR) when no nuclide data file existed for the specified nuclide. DOSEXPRT 4.2 has been modified to check all results relative to the lower critical limit (LC). For the past three years, LC has been set equal to the minimum detectable activity (MDA) for the bioassay calculations. For a given case, if all results for all assays are below LC, then a result of zero intake is printed to the S28 file even if there is no nuclide data file for the specified nuclide. The LOG file will

indicate that the nuclide data file was missing.

2. The name of the DOSEXPRT report program, which produces an output listing (with extension OUT), was changed from REPORT to DOSREPORT to avoid a potential name conflict in the directory where the program resides.

3. The DOSEXPRT 4.1 report program produces an output file (with extension OUT) from the S28 file which is sorted by committed effective dose in 100-mrem intervals. DOSEXPRT 4.2 has been modified to sort by presence of any positive annual effective dose in addition to sum of committed effective dose. The presence of any positive annual effective dose for an individual is determined in DOSEXPRT by setting a flag (IASWCH) which is written to the S28 file. The flag, IASWCH, will be 0 if there are no cases with positive annual effective dose for an individual and 1 if there is any case with positive annual effective dose. The flag is in column 430 of the S28 output record. The DOSREPORT program sorts by this flag, in addition to the sum of committed effective dose for an individual. Thus, of those individuals with zero sum of committed effective dose, those with positive annual effective dose will proceed those with no annual effective dose in the OUT listing.

4. Modification 3 allows for introducing a switch that will let the user forgo printing of output for individuals who have no cases of positive committed or annual effective doses (i.e., individuals having only zero intake cases). Since these individuals appear at the end of the listing, the DOSREPORT program can be told not to print any information on them to the OUT file. Cases with error codes are, however, printed to the OUT file. The OUT file header will indicate that the listing has been truncated. The default for this switch, which is read as input when the user executes DOSEXPRT off the MENU, is to print all results to the OUT file including those where all cases result in zero intake. This feature will greatly reduce the amount of paper used in printing DOSEXPRT output.

5. DOSEXPRT 4.2 report program (DOSREPORT) will also print three index files (with extensions IX1, IX2 and IX3) that should facilitate reading the DOSEXPRT output. The first index file (extension IX1) lists all cases with positive committed dose. The second index file (with extension IX2) lists all cases with zero committed dose but positive annual dose. The third index file (with extension IX3) lists all cases where errors (no nuclide file, measurement window or record errors) occurred. The index files list social security number and badge, plant site, nuclide, class, pathway and reason code - the information that also appears on the header for each case in the OUT file. The index files can be used for quickly cross referencing the DOSEXPRT output files.

6. DOSEXPRT 4.2 has been set up to take advantage of special inhalation class Q for the uranium nuclides. These files are used presently by the Y-12 Plant. The user is asked by DOSEXPRT whether to use the special Y-12 uranium nuclide data and dose-rate files. The default response is NO. A special data area HS_DATA:[DX.Y12] contains the Y-12 uranium nuclide data and dose-rate files. The regular nuclide data and dose-rate files are located in HS_DATA:[DX].

7. The year of computation of intake is written to the end of each S28 output record (columns 432 - 435), increasing the S28 record length to 435 bytes.

4. OPERATION OF DOSEXPRT

This section describes the operation of the DOSEXPRT program and its associated report program DOSREPORT. DOSEXPRT first produces a scratch file for controlling batch execution, which contains all unique combinations of badge number, plant, nuclide, pathway, class, reason code and incident date and time. Each unique combination is called a case. The number of records for each case is indicated in the middle of the control file (columns: 38-42). In addition, the number of records for each case at each site is indicated at the extreme right of the control file. This information can be used for determining the average intake and dose received for an individual who has worked at two or more plant sites during the period.

Two typical control files are shown below (with badge numbers replaced by negative numbers to protect the identity of the individuals). The first set is for the incident exposure examples discussed in Appendix E; the second set is for the routine examples discussed in Appendix F.

BADGE	E	NUCLIDE	H	S	C	REASON		DATE	TIME	RECORDS	RECORDS AT PLANT SITE											
						PL	AA				TS	1	2	3	4	5	6	7				

Column:																						
1 2 3 4 5 6 7																						
123456789012345678901234567890123456789012345678901234567890123																						

-10	S	H-3	H	V	1			19890101	0	33	K	O	P	O	X	O	Y	O	S	33	O	O
-20	S	I-131	H	D	1			19890201		14	K	O	P	O	X	O	Y	O	S	14	O	O
-31	S	U-238	H	D	1			19890201	0	4	K	O	P	O	X	O	Y	O	S	4	O	O
-32	S	U-238	H	D	1			19890201	0	4	K	O	P	O	X	O	Y	O	S	4	O	O
-33	S	U-238	H	D	1			19890201	0	5	K	O	P	O	X	O	Y	O	S	5	O	O
-41	S	CS-137	H	D	1			19890101	0	1	K	O	P	O	X	O	Y	O	S	1	O	O
-42	S	CS-137	H	D	1			19890101	0	1	K	O	P	O	X	O	Y	O	S	1	O	O
-50	S	I-131	H	D	1					14	K	O	P	O	X	O	Y	O	S	14	O	O
-60	S	TC-99	G	S	1			19890101		14	K	O	P	O	X	O	Y	O	S	14	O	O
-70	S	TC-99	J		1			19890101		10	K	O	P	O	X	O	Y	O	S	10	O	O
-90	S	SR-90	J		1			19890101		14	K	O	P	O	X	O	Y	O	S	14	O	O
-100	S	PU-241	H	W	1			19890101		15	K	O	P	O	X	O	Y	O	S	15	O	O
-110	S	PU-238	H	W	1			198909011100		2	K	O	P	O	X	O	Y	O	S	3	O	O

-1																						

-120	S	I-131	H	D	3					5	K	O	P	O	X	O	Y	O	S	5	O	O
-131	S	U-238	H	D	3			0	0	4	K	O	P	O	X	O	Y	O	S	4	O	O
-132	S	U-238	H	W	3			0	0	4	K	O	P	O	X	O	Y	O	S	4	O	O
-133	S	U-238	H	Y	3			0	0	4	K	O	P	O	X	O	Y	O	S	4	O	O
-141	S	U-238	H	D	3					4	K	O	P	O	X	O	Y	O	S	4	O	O
-142	S	U-238	H	W	3					4	K	O	P	O	X	O	Y	O	S	4	O	O
-143	S	U-238	H	Y	3					4	K	O	P	O	X	O	Y	O	S	4	O	O
-150	S	U-238	H	Y	3					8	K	O	P	O	X	O	Y	O	S	8	O	O

-1																						

The reason code is used to define whether the computations will use acute or chronic analysis. Reason code 1S (special incident) uses acute analysis. Reason codes 3 or 1R (routine incident) use chronic (routine) analysis. Reason code 2S is follow-up on an incident and uses acute analysis and reason code 2R is follow-up on routine and uses chronic (routine) analysis. Reason codes 4, 5, 6 are converted to 3 by the DOSEXPRT code and treated using chronic (routine) analysis. Reason codes 8 and 9 are used to bracket start and stop of

exposure to a given nuclide and class. Code 8 means start of exposure to given nuclide and class, and Code 9 means end of exposure to given nuclide and class.

Internally in DOSEXPRT and in DOSEXPRT output listings, acute analysis is designated with a reason code of 1 and chronic analysis with a reason code of 3.

The incident date and time field is used to uniquely sort the incident bioassay records. It is important that the user provide the incident date and time for incident records. Incident records which do not contain the incident date and time will be assigned an incident date of N days prior to the first measurement, where the number N is specified in the SITE.DFT file (see below). Incident records without an incident date and time may not be sorted properly. The incident date and time field is blank, or contains zeros, for routine records.

The program then reads site default information from the SITE.DFT file. The purpose of this file is to allow each plant to tailor the program to its needs. Character data must be surrounded by single quotes. A typical SITE.DFT file is shown in Appendix C.

The SITE.DFT file contains the following information:

1. Number of plant sites.
2. List of plant letter codes and plant names.
3. A list of all nuclide data files available.
4. The number of nuclides (with nuclide data files) expected at the site.
5. A list of the nuclide files (in form specified) that are used at the site, direct-access pointer, flag indicating presence of dose-rate file.
6. Default value of activity median aerodynamic diameter (AMAD) (microns).
7. Default value for urinary excretion (ml/d).
8. Default value for the volume of urine per aliquot sample (ml).
9. Default value for fecal excretion (g/d).
10. Default value for the mass of fecal sample analyzed (g).
11. Default value for breath excretion (l/d).
12. Default value for volume of breath sample (l).
13. Default value for the (integer) number of days between the occurrence of an incident and the first measurement. This value is used if the incident date is missing from the record.
14. Ratio of minimum detectable activity (MDA) to lower critical limit (LC).
15. Threshold value for intake. Parameter currently not used.
16. Threshold value for annual dose (mrem). The effective annual dose will be calculated until it falls below this threshold, and the year prior to falling below this threshold will be written to the S28 file.
17. Annual dose calculation control parameter. If parameter is *-1*, no annual doses are computed. If parameter is *0*, only annual effective dose is computed. If parameter is *1*, both annual organ and effective doses are computed.

After reading the SITE.DFT file, DOSEXPRT reads records from the combined and sorted records file (DOSEXPRT.DAT) using the control file.

The program then proceeds through the control file, doing the computations for a given

case (badge number, plant site, nuclide, nuclide class, pathway, and reason code) as listed. For this set of parameters, the program loops over all assays (breath, urine, fecal, whole body count, lung, and, if required, thyroid count) computing intake and committed dose for all records found for that assay. *If additional assays are defined in the future, modification of the code will be necessary to handle them.*

For example, for BADGE number XXXXX with nuclides U-235 and U-238, classes D and Y for U-235 and class Y for U-238, routine and incident records for each, the program loops through the assays - breath (BRE), urine (U), fecal (F), whole body (WBC) and lung (LUN). If a special organ assay is present for a given nuclide [e.g., thyroid count (THY) for radioactive iodine], the program does this organ assay after the lung assay. Note that the routine records are sorted ahead of any incident records, and the incidents are sorted by incident date. The assay designation (WBL) is reassigned to whole body count (WBC) or lung count (LUN), depending on assimilation pathway and nuclide as specified in the nuclide data file.

```

-----
Badge: XXXXX Nuclide: U-235 Class: D Reason: Routine Assay: BRE
Badge: XXXXX Nuclide: U-235 Class: D Reason: Routine Assay: U
Badge: XXXXX Nuclide: U-235 Class: D Reason: Routine Assay: F
Badge: XXXXX Nuclide: U-235 Class: D Reason: Routine Assay: WBC
Badge: XXXXX Nuclide: U-235 Class: D Reason: Routine Assay: LUN
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870608 Assay: BRE
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870608 Assay: U
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870608 Assay: F
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870608 Assay: WBC
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870608 Assay: LUN
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870908 Assay: BRE
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870908 Assay: U
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870908 Assay: F
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870908 Assay: WBC
Badge: XXXXX Nuclide: U-235 Class: D Reason: Incident-870908 Assay: LUN
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Routine Assay: BRE
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Routine Assay: U
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Routine Assay: F
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Routine Assay: WBC
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Routine Assay: LUN
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Incident-870304 Assay: BRE
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Incident-870304 Assay: U
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Incident-870304 Assay: F
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Incident-870304 Assay: WBC
Badge: XXXXX Nuclide: U-235 Class: Y Reason: Incident-870304 Assay: LUN
Badge: XXXXX Nuclide: U-238 Class: D Reason: Routine Assay: BRE
Badge: XXXXX Nuclide: U-238 Class: D Reason: Routine Assay: U
Badge: XXXXX Nuclide: U-238 Class: D Reason: Routine Assay: F
Badge: XXXXX Nuclide: U-238 Class: D Reason: Routine Assay: WBC
Badge: XXXXX Nuclide: U-238 Class: D Reason: Routine Assay: LUN
Badge: XXXXX Nuclide: U-238 Class: D Reason: Incident-870203 Assay: BRE
Badge: XXXXX Nuclide: U-238 Class: D Reason: Incident-870203 Assay: U
Badge: XXXXX Nuclide: U-238 Class: D Reason: Incident-870203 Assay: F
Badge: XXXXX Nuclide: U-238 Class: D Reason: Incident-870203 Assay: WBC
Badge: XXXXX Nuclide: U-238 Class: D Reason: Incident-870203 Assay: LUN
-----

```

After the intake and committed doses have been computed for all records for all assays, the weighted intake and dose are computed using the assay weights in the nuclide file.

The total assay weights are computed as the normalized product of the nuclide weight for each assay (specified in the nuclide file) and a numerical weight, defined as the ratio of the number of records for the assay divided by the total number of records for all assays.

For example, for iodine-bioassay with 12 urinalyses and 2 thyroid counts, the nuclide file weights are 0.3 for urine and 0.59 for thyroid, and the numerical weights are $12/14 = 0.857$ for urine and $2/14 = 0.143$ for thyroid. If the intake is zero for one of the assays (e.g., urinalysis) the numerical weight does not incorporate the number of samples or counts for that assay. The product of the nuclide file weight and numerical weight for each assay, before normalization, is 0.257 for urine and 0.0843 for thyroid. To obtain the total assay weights, the numbers are then normalized so that their sum is 1. The total weight for urine, W_u , is 0.753, and the total weight for thyroid, W_{thy} , is 0.247. The estimated intake is then computed from the intake obtained from urinalysis, I_u , and from thyroid count, I_{thy} , as

$$\text{Intake} = W_u * I_u + W_{thy} * I_{thy}$$

The same procedure applies for the committed doses. If results from only one assay are used (e.g., urinalysis), the total weight for that would be $W_u = 1$. *Note that assays that give zero intake are not included in the weighted results.*

After computing weighted intake and committed doses, the program will compute annual dose. For an acute exposure, weighted annual dose is computed using the weighted intake. For a chronic exposure, weighted annual dose is computed using, for each measurement period, the weighted intake rate for the assay with the greatest number of measurements in that year. The weighting for the intake rates is determined from the ratio of the weighted total intake for the entire measurement window divided by the total intake for the assay with the greatest number of measurements. The annual dose for 1990 is calculated when there are measurements above LC for 1989 even though there may be no measurements in 1990 or all measurements in 1990 are below LC. In this case the OUT file will show

ESTIMATED INTAKE FOR PERIOD 01011990 --> 01011991 IS ZERO

followed by the annual organ and effective doses computed from the 1989 measurements.

The program proceeds to the next case until the entire control file is finished.

The LOG file will contain a list of badge numbers and warnings when errors occur. The S28 file will contain the assay-weighted results of the run to be entered back into the OHIS data base. The OUT file contains assay-weighted results sorted by total committed effective dose to individuals in 100-mrem intervals.

5. ASSUMPTIONS MADE IN DOSEXPRT

The following assumptions are made in DOSEXPRT:

1. Presently, the OHIS bioassay data do not include the value of the activity median aerodynamic diameter (AMAD). The value of AMAD must therefore be set in the SITE.DFT file. The default value of AMAD is assumed to be 1 micron. AMAD can be controlled by the user only when the DOSEXPRT is run in debug/test mode (see Appendix N). *However, annual dose can only be computed for an AMAD of 1 micron as the regular nuclide dose-rate files have been derived with that assumption. The default value of AMAD in the Y-12 SITE.DFT file is 8 microns. The Y-12 uranium nuclide dose-rate files have been derived assuming an AMAD of 8 microns. Future modifications will remove the restriction on AMAD when using the dose-rate files.*

2. For routine computations the measurement window (between dates ISTART and IEND) is used to bracket selection of measurements to be evaluated in routine assay with ISTART used as the initial date for starting the routine analysis.

3. For routine computations, the analysis is carried out step-wise over the subsequent records encountered between the ISTART and IEND dates, inclusively. Beginning with DOSEXPRT Ver. 4.1, the intake rate derived from the last measurement is used to extrapolate from that date to the end date (IEND) or to an exposure history end code.

4. The protocol for analyzing routine records assumes that the person has been exposed to a constant amount of nuclide from the past measurement (or the ISTART date if the first measurement or an exposure history start code) up to the present measurement given by the measured result at the present measurement. For the present operation of DOSEXPRT, the individual is assumed not to have been exposed prior to the ISTART date. Exposure history start and end codes can be used to control the periods of time that the individual was known to be exposed to the nuclide/class.

5. The intake window (between the dates KSTART and KEND) is used to bracket computation of intake for routine assay. *The duration of the intake window must be 1 year when computing annual dose.* Incident assays will be computed only if the incident date is within the intake window. If no incident date is specified, the default incident date is NDAYs prior to the first measurement date where NDAYs is specified in the SITE.DFT file. The default incident date must fall in the intake window for the computation of intake and dose to proceed.

6. For routine or incident computations results are set to zero if they are equal to or less than the lower critical limit (LC) of detection.⁸ For treating the 1989, 1990, and 1991 bioassay records, LC is set equal to the minimum detectable activity (MDA). Beginning with DOSEXPRT Ver. 4.1, the ratio of MDA to LC (parameter RMDALC) is specified in the SITE.DFT file.

7. Beginning with Ver. 4.1, DOSEXPRT loops over five assays if no special organ is specified in the nuclide file: breath (BRE), urine (U), fecal (F), whole body count (WBC), and lung count (LUN). If a special organ is specified (e.g., thyroid for radioactive iodine), DOSEXPRT loops over six assays, the sixth one being the special organ assay (THY).

8. If start and stop exposure codes are used for routine analysis, the incident date and time fields in the routine measurement records and the start and stop exposure records must be consistent, either zeros or blanks, for proper sorting of the bioassay records.

6. CREATING BIOASSAY RECORDS USING THE GENREC UTILITY

Bioassay records files compatible with DOSEXPRT can be created using the GENREC utility on the DOSEXPRT menu. The user simply enters data into the fields as requested by the GENREC utility. GENREC is structured with two data entry forms, the first contains badge number, social security number, plant site, assimilation pathway, assay, reason code, nuclide and nuclide class. After all the entries are made to the first form, the user has a chance to modify the entries. The second form contains the information specific to a single bioassay measurement for the information in the first form [i.e., sample date, time, volume (for *in vitro* assay), result, MDA, and units for result and MDA]. After all the entries are made to the second form, the user has a chance to modify the entries. Additional entries in the second form are entered by typing 0 when completing each previous entry. To return to the first form, type 1 after entering information in the second form. When finished with all data type -1 to quit.

The records file can be given a unique name or defaulted to the name RECORDS.DAT.

The volume, result and MDA can be entered as integer, real number, or real number with exponential notation. The volume of the urine sample has units of ml. The mass of the fecal sample has units of grams. The volume of the breath sample has units of liters.

To enter mixed inhalation class, enter letter code M and a mixed-class identifier (0-9). The mixed-class identifier uniquely describes the set of mixed-class percentages to be used. It is required to properly sort records with mixed inhalation class. After the mixed-class identifier, enter the percentages (0-99) of D, W, and Y classes; entering zero for inhalation classes which are not allowed for the specified nuclide.

The GENREC utility now allows creation of exposure history records. To enter an exposure history record, proceed as usual, entering the badge number, social security number, and plant site. For assay, enter ZZZ to indicate exposure history record. Then enter assimilation pathway followed by a reason code of 8 to indicate start of exposure or 9 to indicate end of exposure. Following this, enter the date and time of the start or end of exposure. Finally, enter the nuclide and nuclide class. The program does not drop into the second form. At this point the user can select to add another bioassay record, another exposure history code, or to terminate the session.

Table 2, on the following page, contains the codes used in the bioassay records.

Table 2. DOSEXPRT Bioassay Records Codes

Assay	Code	Reason	Code	Pathway	Code
Urinalysis	U	Special Incident	1S	Inhalation	H
Breath	B	Routine Incident	1R	Ingestion	G
Fecal	F	Follow-up on 1S	2S	Injection	J
Whole Body Count	WBC	Follow-Up on 1R	2R		
Lung Count	LUN	Routine	3,4,5,6		
Thyroid Count	THY				
Start/Stop Code (Used only in GENREC)	ZZZ	Start Code	8		
		Stop Code	9		

Inhalation Class	Code	Ingestion Class	Code
Day	D	Soluble	S
Week	W	Insoluble	I
Year	Y	Very Insoluble	V
Mixed (D,W,Y)	M		
Special	O,P,Q,R		
Labelled Compound	L		
Vapor	V		

Units for Results and MDAs			
In vitro Unit	Code	In vivo Unit	Code
dpm/ml	1	μ Ci	M
dpm/day	2	nCi	N
dpm/sample	3	pCi	P
dpm/L	4	dpm	D
μ g/ml	5	Bq	B
Bq/L	6	μ B	U
Bq/day	7		

An example session of GENREC is shown below. First, an *in vitro* measurement for incident exposure is entered. This entry is followed by start and end exposure history records for routine exposure and an *in vivo* measurement for routine exposure.

GENREC Version 4.2 Date: 01-21-92

Utility to Generate Records for DOSEXPRT

Enter OUTPUT Filename (Default: RECORDS.DAT): TEST

Bioassay Data Entry

ENTER 6-DIGIT BADGE NUMBER:

999999

ENTER 9-DIGIT SOCIAL SECURITY NUMBER:

ENTER PLANT SITE (K,P,X,Y,etc):

S

ASSAYS ALLOWED: BRE, U, F, WBL, WBC, LUN, THY OR ZZZ

ENTERING ZZZ FOR ASSAY INDICATES START/END CODE

(Assay WBL (whole-body-lung) is replaced by WBC or LUN)

(in DOSEXPRT depending on Nuclide and Assimilation Pathway)

ENTER ASSAY TYPE OR ZZZ:

U

ENTER PATHWAY (H-inhalation, G-ingestion, J-injection):

H

REASON: 1S-SPECIAL INCIDENT, 1R-REGULAR INCIDENT

2S-SPECIAL FOLLOW-UP, 2R-REGULAR FOLLOW-UP

3,4,5,6,7-ROUTINE

ENTER REASON (incident-1S,2S,routine-1R,2R,3,4,5,6,7):

1S

ENTER INCIDENT DATE (in form YYYYMMDD):

YYYYMMDD

19900201

ENTER INCIDENT TIME (in form HHMM):

HHMM

ENTER NUCLIDE (in form U-238):

U-238

ENTER CLASS (D, W, Y, or

O, P, Q, or R (Special Classes)

M (Mixed Inhalation Class)

V (Vapor - used with H-3)

L (Labeled Cmpd - used with C-11/14):

D

CHECK DATA ENTERED...

BADGE: 999999 SSN: PLANT: S

PATH: H REASON: 1S ASSAY: U

INCIDENT DATE: 19900201 INCIDENT TIME:

NUCLIDE: U-238 CLASS: D

IS THIS INFORMATION CORRECT ([Y]/N)?:

Y

```
In-vitro Data Entry
ENTER SAMPLE DATE (in form YYYYMMDD):
YYYYMMDD
19900204
ENTER SAMPLE TIME (in form HHMM):
HHMM

ALLOWABLE UNITS FOR RESULT:
1-dpm/ml, 2-dpm/day, 3-dpm/sample, 4-dpm/L, 5-ug/ml, 6-Bq/L, 7-Bq/day

ENTER RESULT:
*****
3
ENTER UNITS OF RESULT:
3
ALLOWABLE UNITS FOR MDA:
1-dpm/ml, 2-dpm/day, 3-dpm/sample, 4-dpm/L, 5-ug/ml, 6-Bq/L, 7-Bq/day

ENTER MDA:
*****
1
ENTER UNITS OF MDA:
3
ENTER SAMPLE VOL (ml):
*****
1000.
CHECK DATA ENTERED...
SAMPLE DATE: 19900204 SAMPLE TIME:
SAMPLE VOLUME (ml): 1.000E+03
RESULT: 3.000E+00 UNITS: 3
MDA: 1.000E+00 UNITS: 3

IS THIS INFORMATION CORRECT ([Y]/N)?:
Y
QUIT(-1), ENTER MORE DATA (0), OR NEW INDIVIDUAL (1):
1
Bioassay Data Entry
BADGE IS: 999999
ENTER 6-DIGIT BADGE NUMBER:
*****

SOCIAL SECURITY NUMBER IS:
ENTER 9-DIGIT SOCIAL SECURITY NUMBER:
*****

PLANT IS: S
ENTER PLANT SITE (K,P,X,Y,etc):

ASSAY IS: U
ASSAYS ALLOWED: BRE, U, F, WBL, WBC, LUN, THY OR ZZZ
ENTERING ZZZ FOR ASSAY INDICATES START/END CODE
```

(Assay WBL (whole-body-lung) is replaced by WBC or LUN)
 ENTER ASSAY TYPE OR ZZZ:

ZZZ

PATHWAY IS: H

ENTER PATHWAY (H-inhalation, G-ingestion, J-injection):

H

REASON IS: 1S

REASON: 8-START OF EXPOSURE, 9-END OF EXPOSURE

ENTER REASON (8,9):

8

ENTER START OF EXPOSURE DATE(in form YYYYMMDD):

YYYYMMDD

19900101

ENTER START OF EXPOSURE TIME(in form HHMM):

HHMM

NUCLIDE IS: U-238

ENTER NUCLIDE (in form U-238):

CLASS IS: D

ENTER CLASS (D, W, Y, or

O, P, Q, or R (Special Classes)

M (Mixed Inhalation Class)

V (Vapor - used with H-3)

L (Labeled Cmpd - used with C-11/14):

CHECK DATA ENTERED...

BADGE: 999999 SSN: PLANT: S

PATH: H REASON: 8 ASSAY:

EXP/START DATE: 19900101 EXP/START TIME:

NUCLIDE: U-238 CLASS: D

IS THIS INFORMATION CORRECT ([Y]/N)?:

Y

QUIT(-1) OR NEW INDIVIDUAL (1):

1

Bioassay Data Entry

BADGE IS: 999999

ENTER 6-DIGIT BADGE NUMBER:

SOCIAL SECURITY NUMBER IS:

ENTER 9-DIGIT SOCIAL SECURITY NUMBER:

PLANT IS: S

ENTER PLANT SITE (K,P,X,Y,etc):

ASSAY IS: ZZZ

ASSAYS ALLOWED: BRE, U, F, WBL, WBC, LUN, THY OR ZZZ
 (Assay WBL (whole-body-lung) is replaced by WBC or LUN)
 (in DOSEXPRT depending on Nuclide and Assimilation Pathway)
 ENTER ASSAY TYPE OR ZZZ:

PATHWAY IS: H
 ENTER PATHWAY (H-inhalation, G-ingestion, J-injection):

REASON IS: 8
 REASON: 8-START OF EXPOSURE, 9-END OF EXPOSURE

ENTER REASON (8,9):

9
 ENTER END OF EXPOSURE DATE(in form YYYYMMDD):

YYYYMMDD

19900701

ENTER END OF EXPOSURE TIME(in form HHMM):

HHMM

NUCLIDE IS: U-238

ENTER NUCLIDE (in form U-238):

CLASS IS: D

ENTER CLASS (D, W, Y, or
 O, P, Q, or R (Special Classes)
 M (Mixed Inhalation Class)
 V (Vapor - used with H-3)
 L (Labeled Cmpd - used with C-11/14):

CHECK DATA ENTERED...

BADGE: 999999 SSN: PLANT: S

PATH: H REASON: 9 ASSAY:

EXP/END DATE: 19900701 EXP/END TIME:

NUCLIDE: U-238 CLASS: D

IS THIS INFORMATION CORRECT ([Y]/N)?:

QUIT(-1) OR NEW INDIVIDUAL (1):

1

Bioassay Data Entry

BADGE IS: 999999

ENTER 6-DIGIT BADGE NUMBER:

SOCIAL SECURITY NUMBER IS:

ENTER 9-DIGIT SOCIAL SECURITY NUMBER:

PLANT IS: S

ENTER PLANT SITE (K,P,X,Y,etc):

ASSAYS ALLOWED: BRE, U, F, WBL, WBC, LUN, THY OR ZZZ
 ENTERING ZZZ FOR ASSAY INDICATES START/END CODE
 (Assay WBL (whole-body-lung) is replaced by WBC or LUN)
 (in DOSEXPRT depending on Nuclide and Assimilation Pathway)
 ENTER ASSAY TYPE OR ZZZ:

WBC

PATHWAY IS: H

ENTER PATHWAY (H-inhalation, G-ingestion, J-injection):

H

REASON IS: 9

REASON: 1S-SPECIAL INCIDENT, 1R-REGULAR INCIDENT
 2S-SPECIAL FOLLOW-UP, 2R-REGULAR FOLLOW-UP
 3,4,5,6,7-ROUTINE

ENTER REASON (incident-1S,2S,routine-1R,2R,3,4,5,6,7):

3

NUCLIDE IS: U-238

ENTER NUCLIDE (in form U-238):

CLASS IS: D

ENTER CLASS (D, W, Y, or
 O, P, Q, or R (Special Classes)
 M (Mixed Inhalation Class)
 V (Vapor - used with H-3)
 L (Labeled Cmpd - used with C-11/14):

CHECK DATA ENTERED...

BADGE: 999999 SSN: PLANT: S

PATH: H REASON: 3 ASSAY: WBC

NUCLIDE: U-238 CLASS: D

IS THIS INFORMATION CORRECT ([Y]/N)?:

Y

In-vivo Data Entry

ENTER SAMPLE DATE (in form YYYYMMDD):

YYYYMMDD

19900403

ENTER SAMPLE TIME (in form HHMM):

HHMM

ALLOWABLE UNITS FOR RESULT:

M-uCi, N-nCi, P-pCi, D-dpm, B-Bq, U-ug

ENTER RESULT:

3

ENTER UNITS OF RESULT:

M

ALLOWABLE UNITS FOR MDA:

M-uCi, N-nCi, P-pCi, D-dpm, B-Bq, U-ug

ENTER MDA:

1

ENTER UNITS OF MDA:

M

CHECK DATA ENTERED...

SAMPLE DATE: 19900403 SAMPLE TIME:

RESULT: 3.000E+00 UNITS: M

MDA: 1.000E+00 UNITS: M

IS THIS INFORMATION CORRECT ([Y]/N)?:

QUIT(-1), ENTER MORE DATA (0), OR NEW INDIVIDUAL (1):

-1

7. MODIFYING SITE DEFAULT FILE USING THE MODSITE UTILITY

Default values for parameters of the DOSEXPRT program, such as volume of urine sample, urinary excretion rate, etc., are specified in the site default file (SITE.DFT). The purpose of this file is to allow each plant to tailor the program to its needs. Character data in the SITE.DFT file must be surrounded by single quotes. The original SITE.DFT file in HS_DATA:[DX] data area is shown in Appendix C.

The SITE.DFT also contains a list of the nuclide data files available to DOSEXPRT. Note that the name must be in quotes. Next to each nuclide name is a pointer to the location of the nuclide data file in the binary, direct access file NUCLIDE.BIN. If this value is set to 0, the program will use the ASCII nuclide data file with the nuclide name and extension NUC. Note, however, that DOSEXPRT assumes that the file NUCLIDE.BIN is in the data area. Finally, the direct access pointer is followed by a flag that indicates whether the dose-rate (DRS) file exists (1) or does not exist (0) for that nuclide.

The SITE.DFT file contains the following information:

1. Number of plant sites.
2. List of plant letter codes and plant names.
3. A list of all nuclide data files available.
4. The number of nuclides (with nuclide data files) expected at the site.
5. A list of the nuclide files (in form specified) that are used at the site, direct-access pointer, flag indicating presence of dose-rate file.
6. Default value of AMAD (microns).
7. Default value for urinary excretion (ml/d).
8. Default value for the volume of urine per aliquot sample (ml).
9. Default value for fecal excretion (g/d).
10. Default value for the mass of fecal sample analyzed (g).
11. Default value for breath excretion (l/d).
12. Default value for volume of breath sample (l).
13. Default value for the (integer) number of days between the occurrence of an incident and the first measurement. This value is used if the incident date is missing from the record.
14. Ratio of MDA to LC.
15. Threshold value for intake. Parameter currently not used.
16. Threshold value for annual dose (mrem). The effective annual dose will be calculated until it falls below this threshold, and the year prior to falling below this threshold will be written to the S28 file.
17. Annual dose calculation control parameter. If parameter is -1, no annual doses are computed. If parameter is 0, only annual effective dose is computed. If parameter is 1, both annual organ and effective doses are computed.

To create a modified SITE.DFT file, the user must copy the file from HS_DATA:[DX] to the user's root directory. This copy of the site default file can be modified using an editor if one is available or by using the MODSITE utility by selecting MODSITE from the DOSEXPRT menu. A SITE.DFT file must exist in the user's root directory before the

MODSITE utility is run. The user enters the name of the existing site file including the DFT extension (SITE.DFT) and the name of the new site file including the DFT extension (NEWSITE.DFT). MODSITE proceeds through the list of parameters, inquiring if the user wishes to make any changes.

An example run of MODSITE is shown below. When nuclides are added, as shown in the example, the user must enter the nuclide name, either a pointer to its position in the binary nuclide data file (NUCLIDE.BIN) or zero if using the ASCII nuclide file (with extension NUC), and a flag indicating the presence (1) or absence (0) of a dose-rate file.

```

MODSITE - UTILITY TO MODIFY SITE.DFT  DATE: 04-22-91
-----
      NO [N] IS DEFAULT RESPONSE AT Y/[N] PROMPT
-----
Enter name of existing SITE file: SITE.DFT
Enter name of new SITE file: NEWSITE.DFT

NUMBER OF SITES:      6 MODIFY?(Y/[N]):
SITE NAMES PRESENTLY ASSIGNED:
K  K-25
P  PADU
X  X-10
Y  Y-12
S  SITE
O  OHIO

NUCLIDE FILES PRESENTLY AVAILABLE AT THIS SITE:
H-3   C-11   C-14   NA-22   NA-24   P-32   CO-57
CO-58 CO-60   SR-85   SR-89   SR-90   TC-99   TC-99M
CS-134 CS-137   I-125   I-129   I-131   I-135   PM-147
EU-152 EU-154   EU-155   TL-201   RA-226   RA-228   TH-228
TH-232 U-234   U-235   U-236   U-238   PU-238   PU-239
PU-241 AM-241   TPU     CM-242   CM-244

ADD NUCLIDES?(Y/[N]): Y
NUMBER OF ADDITIONAL NUCLIDES: 1
  41 -          ENTER NUCLIDE NAME: CF-252
  41 -          ENTER POINTER: 0
  41 - DRS EXIST (1), NOT EXIST(0): 1

DEFAULT VALUE OF AMAD:      1.000000      micron
MODIFY AMAD?(Y/[N]):

VOLUME OF URINE PER DAY:      1400.000      ml./day
MODIFY VOLUME OF URINE PER DAY?(Y/[N]): Y
ENTER VURDAY: 1100.

```

```

VOLUME OF URINE PER SAMPLE (ALIQUT):    20.00000    ml/sample
MODIFY VOLUME OF URINE PER SAMPLE?(Y/[N]):

MASS OF FECAL EXCRETION PER DAY:    135.0000    grams/day
MODIFY MASS OF FECAL EXCRETION PER DAY?(Y/[N]):

MASS OF FECAL SAMPLE ANALYZED:    20.00000    grams/sample
MODIFY MASS OF FECAL SAMPLE ANALYZED?(Y/[N]):

VOLUME OF BREATH EXCRETION PER DAY:    20000.00    L/day
MODIFY VOLUME OF BREATH EXCRETION PER DAY?(Y/[N]):

BREATH VOLUME PER SAMPLE:    20.00000    L/sample
MODIFY BREATH VOLUME PER SAMPLE?(Y/[N]):

IF INCIDENT DATE (AND TIME) MISSING, INTEGER NUMBER OF DAYS SINCE
INCIDENT
NDAY:    1
MODIFY NDAY BETWEEN INCIDENT AND FIRST MEASUREMENT?(Y/[N]):

RMDALC - RATIO OF MDA TO LC (LOWER CRITICAL LIMIT)

RMDALC:    1.00
MODIFY RMDALC (RATIO OF MDA TO LC)?(Y/N):

TRESHOLD FOR INTAKE - IF INTAKE IS > 0.01 * TRESHI * ALI, SET FLAG

TRESHI:    2.00
MODIFY THRESHOLD (IN PERCENT OF ALI) FOR INTAKE?(Y/N):

TRESHOLD FOR AEDE - IF AEDE IS > TRESHAD (mrem), SET FLAG

TRESHAD:    1.00
MODIFY THRESHOLD FOR EFFECTIVE ANNUAL DOSE?(Y/[N]):

ANNUAL DOSE: NONE(-1), EFFECTIVE DOSE ONLY (0), EFFECTIVE AND ORGAN
DOSES (1)
IUNIT:    1
MODIFY ANNUAL DOSE CONTROL FLAG?(Y/[N]): Y
NO ANNUAL DOSE (-1), EFFECTIVE ANNUAL DOSE ONLY (0), ORGAN DOSES
(1): 0

Creating file: NEWSITE.DFT
FORTRAN STOP

```

The modified site file is listed below.

 NUMBER OF SITES

6

ASSIGN PLANT LETTER CODE TO PLANT NAME FOR SITES

'K' 'K-25'
 'P' 'PADU'
 'X' 'X-10'
 'Y' 'Y-12'
 'S' 'SITE'
 'O' 'OHIO'

NUCLIDES AVAILABLE:

H-3 C-11/14 NA-22/24 P-32 CO-57/58/60 SR-85/89/90 TC-99/99M CS-134/137
 I-125/129/131/135 PM-147 TL-201 EU-152/154/155 RA-226/228
 TH-228/232 U-234/235/236/238/ PU-238/239/241 AM-241 TPU CM-242/244

NUMBER OF NUCLIDES AT SITE

41

NUCLIDES (IN QUOTES) - DIRECT-ACCESS POINTER (OR 0) - DRS FILE EXISTS (1)

'H-3'	1	0
'C-11'	94	0
'C-14'	187	0
'NA-22'	280	0
'NA-24'	381	0
'P-32'	482	0
'CO-57'	616	1
'CO-58'	779	0
'CO-60'	942	1
'SR-85'	1105	0
'SR-89'	1261	1
'SR-90'	1417	1
'TC-99'	1573	0
'TC-99M'	1707	0
'CS-134'	1841	1
'CS-137'	1942	1
'I-125'	2043	1
'I-129'	2153	1
'I-131'	2263	0
'I-135'	2373	0
'PM-147'	2483	0
'EU-152'	2616	0
'EU-154'	2724	0
'EU-155'	2832	0
'TL-201'	2940	0
'RA-226'	3041	0
'RA-228'	3165	0
'TH-228'	3279	0
'TH-232'	3412	0
'U-234'	3545	1
'U-235'	3729	1

'U-236'	3913	1
'U-238'	4097	1
'PU-238'	4281	1
'PU-239'	4467	1
'PU-241'	4653	1
'AM-241'	4839	1
'TPU'	4975	1
'CM-242'	5111	0
'CM-244'	5247	1
'CF-252'	0	1

DEFAULT VALUE FOR AMAD

1.00

URINE EXCRETION (ml/day)

1100.00

VOLUME OF URINE ANALYZED (VOLUME OF ALIQUOT) (ml/sample)

20.00

FECAL EXCRETION (grams/day)

135.00

MASS OF FECAL SAMPLE ANALYZED (grams/sample)

20.00

BREATH EXCRETION (L/day)

20000.00

VOLUME OF BREATH SAMPLE ANALYZED (L/sample)

20.00

IF INCIDENT DATE (AND TIME) MISSING, INTEGER NUMBER OF DAYS SINCE INCIDENT

1

RMDALC - RATIO OF MDA TO LC (LOWER CRITICAL LIMIT)

1.00

TRESHOLD FOR INTAKE - IF INTAKE IS $> 0.01 * TRESHI * ALI$, SET FLAG

2.00

TRESHOLD FOR AEDE - IF AEDE IS $> TRESHAD$ (mrem), SET FLAG

1.00

ANNUAL DOSE: NONE(-1), EFFECTIVE DOSE ONLY (0), EFFECTIVE/ORGAN DOSES (1)

0

8. DOSEXPRT NUCLIDE DATA FILES AND DOSE-RATE FILES

Each radionuclide has a separate nuclide data file that contains information for computing the intake and dose, weighting factors with which to weight intake and dose for the different assays, and control information to determine the progress of the computations. Version 4.2 of DOSEXPRT has 40 nuclide data files. The nuclide data files are listed in Appendix H.

The number of inhalation classes and ingestion classes is specified at the top of each nuclide data file. For example, U-238 (U-238.NUC) has three inhalation classes (D,W,Y) and two ingestion classes (S-soluble, I-insoluble), I-131 (I-131.NUC) has one inhalation class (D) and one ingestion class (S), and tritium (H-3.NUC) has a single inhalation class, which we designate as V for vapor, and one ingestion class (S-soluble). Assays allowed for each nuclide are breath (BRE), urine (U), fecal (F), whole body count (WBC), and lung (LUN) count. For the radioiodines a systemic organ (thyroid) and corresponding assay (thyroid count (THY)) are specified.

Note that for each nuclide, the file (1) contains a default assimilation pathway to use if the pathway is not specified in the bioassay records and (2) assigns GI transfer classes to inhalation classes for use with the inhalation pathway. The file also assigns the assay designation WBL to either whole body count (WBC) or lung count (LUN), depending on assimilation pathway and nuclide.

Weights are assigned to each assay and pathway in each nuclide file to be used to determine estimated intake and committed and annual doses when results are present from more than one assay. The nuclide data file contains committed effective and organ dose per unit deposition (Sv/Bq) for inhalation pathway and committed effective and organ dose per unit intake for ingested activity.⁹ Dose conversion factors for inhalation and ingestion pathways are provided for the following organs: gonads, breasts, lungs, red marrow, bone surface, thyroid, and remaining tissue. The last item in each nuclide file is a flag to determine whether a dose-rate file exists for this nuclide. Those nuclides that do not have a dose-rate file are those for which the clearance from the body occurs within the year of exposure.

The information for the nuclide data files is taken from ICRP-30 (ref. 4), ICRP-54 (ref. 3) and other relevant publications. The nuclide files are listed in Appendix H.

Associated with some radionuclides is a file (with extension DRS) that contains the dose rate per unit intake as a function of time for each class allowed for that nuclide. The dose-rate file is read whenever the annual dose needs to be computed for that nuclide. Those nuclides that do not have a dose-rate file are those for which the elimination is fast enough that the entire dose will be delivered in the year of exposure. For those nuclides we set the annual dose to the committed dose. Nuclides with dose-rate files for Ver. 4.2 of DOSEXPRT are Co-57, Co-60, Sr-89, Sr-90, Cs-134, Cs-137, I-125, I-129, U-234, U-235, U-236, U-238, Pu-238, Pu-239, Pu-241, Am-241, Cm-244 and TPU (same as Am-241).

The dose rate per unit intake is listed as a function of time distributed over a time grid with four different time intervals:

Range (days)		Time Interval (days)
0	to 3	0.1
3	to 73	1
73	to 1825	73
1825	to 25550	365

The regular nuclide dose-rate files have been derived assuming an AMAD of 1 micron. The Y-12 uranium nuclide dose-rate files have been derived assuming an AMAD of 8 microns. Future modifications will remove the restriction on AMAD when using the dose-rate files.

The dose-rate file is read whenever the annual dose needs to be computed for that nuclide. Those nuclides that do not have a dose-rate file are those for which the decay is fast enough that the entire dose response will be contained in the year of exposure. For those nuclides we set the annual dose to the committed dose.

Beginning with Ver. 4.1 of DOSEXPRT, the following modifications were made to the nuclide data files and dose-rate files:

Breath excretion and retention functions were added to all the nuclide data files. In addition, a special inhalation class of L for labeled compound was defined for C-11 and C-14. The excretion functions for Am-241, Cm-242, and Cm-244 were modified. Some of the nuclide weights were modified in nuclide data files.

The nuclide files were combined into a single binary, direct-access nuclide file (NUCLIDE.BIN) for faster execution of DOSEXPRT. The pointers to each of the nuclide data files within the direct-access file are specified in the SITE.DFT file. If the pointer is set to zero, the corresponding ASCII nuclide data file will be read. The program that creates the binary, direct-access nuclide file, DIRBIN.EXE, is located in EXE_DIR.

A binary, direct-access dose-rate file (with extension BIN) was created for each of the nuclides with dose-rate files. This greatly increases the speed of execution of DOSEXPRT. The file DRS.TAB (see Appendix D) contains a table of inhalation and ingestion classes that are used to control reading of these binary, direct-access dose-rate files. If the parameter following the nuclide name in the DRS.TAB file is set to 0, DOSEXPRT will read the ASCII dose-rate file (with extension DRS) for that nuclide. The program that creates the binary, direct-access dose-rate files, MAKBIN.EXE, is located in EXE_DIR.

The structure of the nuclide data files and nuclide dose-rate files was unmodified with Ver. 4.2 of DOSEXPRT.

9. ALGORITHMS FOR ESTIMATING INTAKE OF RADIONUCLIDES

9.1 INTRODUCTION

We have developed a set of algorithms for estimating a worker's intake of a radionuclide based on measurements of activity within excreta or within the body at times post intake. In selecting and implementing the algorithms, the needs of quality assurance and the desire to limit future costs associated with maintenance of the resulting software were considered. The algorithms, their reduction to code, and the resulting software have been subjected to extensive testing and verification.

9.2 GENERAL APPROACH

It is intended that the software, entitled DOSEXPRT, serve as a tool in demonstrating compliance with the occupational radiation protection guidance presented in the 1988 DOE order 5480.11 (ref. 6). Even though some aspects of internal dosimetry will be further clarified in additional DOE guidance, the major thrust of the order deals with internal emitters, particularly the manner in which intakes and resultant doses are assessed and reported. Thus, we have focused our efforts towards estimating intakes, given measurements of the radionuclide in excreta and in the body.

We assumed that the biokinetics governing the behavior of radionuclides within the body are linear such that the response of the body to an intake scales directly with the magnitude of the intake, and the response to continuous intakes can be viewed as a superpositioning of a series of acute intakes. We describe the biokinetics by mathematical functions and thus do not limit DOSEXPRT to particular models or model structures. DOSEXPRT is independent of the biokinetic and mathematical details upon which the functions are based. The functions associated with each radionuclide are contained in data files, referred to as the nuclide files. To introduce new biokinetic information or to include a new bioassay procedure for a radionuclide one need alter only the nuclide file; very rarely should it be necessary to modify DOSEXPRT itself.

As an example, let $e_u(t)$ denote the urinary excretion rate at time t following an instantaneous input of a unit activity into *blood* at $t = 0$. If a unit intake into the body at $t = 0$ results in the activity entering blood at a rate $g(t)$, then the expected urinary excretion rate, $E_u(t)$, at time t is

$$E_u(t) = \int_0^t g(\tau) e_u(t-\tau) d\tau . \quad (1)$$

The above integral represents the convolution of two functions; the convolution is defined as $f * g = \int_0^t g(\tau) f(t-\tau) d\tau$. The function $g(t)$ is often referred to as the forcing function (or stimulus) and $f(t)$ as the unit response function. The latter gives the response of the system to a unit input at time zero, while the convolution integral represents the response of the system to the forcing function.

For continuous intake at a rate $\dot{I}(t)$ during a period of length T_e , the expected urinary excretion rate $E_u^c(t, T_e)$ at time t is given by

$$E_u^c(t, T_e) = \int_0^{T_e} \dot{I}(\tau) E_u(t-\tau) d\tau ; \quad (2a)$$

if the intake was at a constant rate, $\dot{I}(t) = \dot{I}$, then

$$\begin{aligned} E_u^c(t, T_e) &= \dot{I} \int_0^{T_e} E_u(t-\tau) d\tau \\ &= \dot{I} \int_{t-T_e}^t E_u(\tau) d\tau . \end{aligned} \quad (2b)$$

The above equation gives the excretion rate at any time t , including times beyond the intake period, that is, for $t > T_e$. Note that the lower limit of integration in Eq. (2b) is taken to be zero if $t < T_e$.

Some of the properties of the convolution integral are tabulated below.

Algebra of Convolution

Property	Definition
Commutative	$f * g = g * f$
Associative	$(f * g) * h = f * (g * h)$
Multiplication	$(k f) * g = k (f * g)$, k is a constant
Distributive	$(f_1 + f_2) * (g_1 + g_2) =$ $f_1 * g_1 + f_1 * g_2 + f_2 * g_1 + f_2 * g_2$

The functions describing the translocation of material within the body and the excretion rates can be derived from mathematical models of the biokinetics (e.g., the ICRP Task Group Lung Model) or obtained from mathematical fits to observations (e.g., radon breath analysis for determination of radium). We restricted the functions used in DOSEXPRT to be of the form

$$f(t) = \sum_{i=1}^n A_i e^{-a_i t} . \quad (3)$$

The functions as defined in the nuclide data files do not include radioactive decay.

In relating the rate of excretion (or activity retained in the body) to the amount of material initially inhaled or ingested we encounter convolutions of the form $f * g$ and $f * g * h$. We set out below the resulting expressions for the convolution integrals assuming $f(t) = \sum_l A_l e^{-a_l t}$, $g(t) = \sum_l B_l e^{-b_l t}$ and $h(t) = \sum_l C_l e^{-c_l t}$. The convolution $f * g$ yields

$$f * g = \sum_{l,j} \Delta_{l,j} [e^{-b_j t} - e^{-a_l t}], \quad (4a)$$

where $\Delta_{l,j} = \frac{A_l B_j}{a_l - b_j}$, and the convolution $f * g * h$ yields

$$f * g * h = \sum_{l,j,k} \Delta_{l,j} C_k \left[\frac{e^{-c_k t} - e^{-b_j t}}{b_j - c_k} - \frac{e^{-c_k t} - e^{-a_l t}}{a_l - c_k} \right]. \quad (4b)$$

For a radionuclide with decay constant λ the functions in the convolution must be modified to include radioactive decay. It can be shown that

$$f(t)e^{-\lambda t} * g(t)e^{-\lambda t} = (f * g)e^{-\lambda t}$$

$$\text{and } f(t)e^{-\lambda t} * g(t)e^{-\lambda t} * h(t)e^{-\lambda t} = (f * g * h)e^{-\lambda t}.$$

Consideration of chronic intakes involves a time integral of the response during the intake period [see Eqs. (2a) and (2b)], including radioactive decay as given by $e^{-\lambda t}$. Thus one needs to evaluate the integral of Eq. (4a):

$$\begin{aligned} & \int_{t-T_e}^t (f * g) e^{-\lambda t} dt \\ &= \sum_{l,j} \Delta_{l,j} \left[\frac{e^{-(b_j+\lambda)(t-T_e)} - e^{-(b_j+\lambda)t}}{b_j + \lambda} - \frac{e^{-(a_l+\lambda)(t-T_e)} - e^{-(a_l+\lambda)t}}{a_l + \lambda} \right], \end{aligned} \quad (5a)$$

where $\Delta_{i,j}$ is defined above and the summation is a double sum over the indices i and j . In some instances one needs to integrate Eq. (4b):

$$\begin{aligned}
 & \int_{t-T_d}^t (f * g * h) e^{-\lambda t} dt \\
 = & \sum_{i,j,k} \Delta_{i,j} C_k \left[\frac{e^{-(c_k+\lambda)(t-T_d)} - e^{-(c_k+\lambda)t}}{(b_j - c_k)(c_k + \lambda)} - \frac{e^{-(b_j+\lambda)(t-T_d)} - e^{-(b_j+\lambda)t}}{(b_j - c_k)(b_j + \lambda)} \right] \\
 - & \sum_{i,j,k} \Delta_{i,j} C_k \left[\frac{e^{-(c_k+\lambda)(t-T_d)} - e^{-(c_k+\lambda)t}}{(a_i - c_k)(c_k + \lambda)} - \frac{e^{-(a_i+\lambda)(t-T_d)} - e^{-(a_i+\lambda)t}}{(a_i - c_k)(a_i + \lambda)} \right],
 \end{aligned}
 \tag{5b}$$

where $\Delta_{i,j}$ is defined above and the summation is a triple sum over the indices i, j , and k . Equations (4) and (5) are the basic algorithms used by DOSEXPRT. As outlined below these equations are repeatedly applied to the various transfer and excretions functions included in nuclide files. The functions contained in the nuclide files are defined on the following page in Table 3. In all cases the functions are normalized to a unit activity at $t = 0$.

Table 3. Functions used in analysis of bioassay measurements

Notation	Definition
$f_{lung \rightarrow blood}$	Transfer rate from lung to blood
$f_{lung \rightarrow GI}$	Transfer rate from lung to GI Tract
$f_{GI \rightarrow blood}$	Transfer rate from GI tract to blood
$f_{GI \rightarrow fecal}$	Transfer rate from GI tract to fecal
$f_{wound \rightarrow blood}$	Transfer rate from wound to blood
e_u	Urinary excretion rate of systemic activity
e_f	Fecal excretion rate of systemic activity
e_b	Breath excretion rate of systemic activity
R_{lung}	Retention of activity in lung
$R_{systemic}$	Retention of systemic activity
R_{organ}	Retention of activity in organ (e.g., thyroid)
R_{wound}	Retention at wound site

9.3 EXCRETION AND RETENTION EQUATIONS

Radionuclides are assumed to enter the body via inhalation, ingestion, or through the skin via wounds. The latter intake is assumed to occur as an isolated incident (acute exposure); inhalation and ingestion intakes may be either acute or chronic (continuous) in time. This section details the algorithms for the expected values for each assay considered within DOSEXPRT; namely, urinary excretion, fecal excretion, *in vivo* measurements, and breath excretion.

9.3.1 Urinary Excretion

Inhalation:

Let $e_u(t)$ represent the urinary excretion rate at time t following introduction of a unit amount of the radionuclide into blood at $t = 0$ (i.e., unit response function without radioactive decay). In the case of inhalation the inputs to the blood are due to activity cleared directly from the lung to blood, at rates denoted by $f_{lung-blood}(t)$, and material cleared from the lung into the gastrointestinal tract, at rates denoted by $f_{lung-GI}(t)$, is translocated to blood from the GI-tract at rates denoted by $f_{GI-blood}(t)$. The expected excretion rate, $E_u^a(t)$, at time t following an acute intake of a *unit* activity by inhalation at $t = 0$ of a radionuclide with decay constant λ is

$$E_u^a(t) = e^{-\lambda t} [f_{lung-blood} + f_{lung-GI} * f_{GI-blood}] * e_u . \quad (6)$$

Equation (6) is evaluated using Eqs. (4a) and (4b).

If an individual chronically inhales activity at a uniform unit rate during a period of length T_e , then the excretion rate at time t per *unit intake rate*, $E_u^c(t)$, is

$$\begin{aligned} E_u^c(t) &= \int_{t-T_e}^t E_u^a(x) dx \\ &= \int_{t-T_e}^t e^{-\lambda x} [f_{lung-blood} + f_{lung-GI} * f_{GI-blood}] * e_u dx . \end{aligned} \quad (7)$$

Equation (7) is evaluated using Eqs. (5a) and (5b). Note that if $t < T_e$ then $t - T_e = 0$.

Ingestion:

For an acute intake by ingestion, the fractional rate at which activity enters blood from the gastrointestinal tract is denoted by $f_{GI \rightarrow blood}(t)$. The expected excretion rate, $E_u^a(t)$, at time t per unit intake at $t = 0$ for a radionuclide with decay constant λ is

$$E_u^a(t) = e^{-\lambda t} [f_{GI \rightarrow blood} * e_u] . \quad (8)$$

Equation (8) is evaluated using Eq. (4a).

If an individual chronically ingests activity at a uniform unit rate during a period of length T_e , then the urinary excretion rate at time t per *unit intake rate*, $E_u^c(t)$, is

$$\begin{aligned} E_u^c(t) &= \int_{t - T_e}^t E_u^a(x) dx \\ &= \int_{t - T_e}^t e^{-\lambda x} [f_{GI \rightarrow blood} * e_u] dx . \end{aligned} \quad (9)$$

Equation (9) is evaluated using Eq. (5a).

Wound intake:

Let $f_{wound \rightarrow blood}(t)$ denote the rate at which activity is absorbed into blood from the wound site. The rate of urinary excretion $E_u(t)$ per unit activity initially at the wound site is

$$E_u(t) = e^{-\lambda t} [f_{wound \rightarrow blood} * e_u] . \quad (10)$$

Equation (10) is evaluated using Eq. (4a).

9.3.2 Fecal Excretion

Inhalation:

Let $f_{lung \rightarrow blood}(t)$ denote the fractional rate at which activity inhaled at $t = 0$ is transferred to blood and e_f denote the fecal excretion rate following introduction of a unit activity into blood at $t = 0$. In addition to the fecal excretion of activity that has entered the systemic

pool, there will also be a component associated with material that has passed unabsorbed through the GI tract, which is denoted as $f_{GI-fecal}(t)$. The expected fecal excretion rate, $E_f^a(t)$, at time t following an acute intake of a unit activity by inhalation of a radionuclide with decay constant λ is

$$E_f^a(t) = e^{-\lambda t} [(f_{lung \rightarrow blood} + f_{lung \rightarrow GI} * f_{GI \rightarrow blood}) * e_f + f_{lung \rightarrow GI} * f_{GI \rightarrow fecal}] . \quad (11)$$

Equation (11) is evaluated using Eqs. (4a) and (4b).

If an individual chronically inhales activity at a uniform rate during a period of length T_e , then the excretion rate at time t per *unit intake rate*, $E_f^c(t)$, is given as

$$\begin{aligned} E_f^c(t) &= \int_{t-T_e}^t E_f^a(x) dx \\ &= \int_{t-T_e}^t e^{-\lambda x} [(f_{lung \rightarrow blood} + f_{lung \rightarrow GI} * f_{GI \rightarrow blood}) * e_f + f_{lung \rightarrow GI} * f_{GI \rightarrow fecal}] dx . \end{aligned} \quad (12)$$

Equation (12) is evaluated using Eqs. (5a) and (5b).

Ingestion:

Let $f_{GI-blood}(t)$ denote the fractional rate at which activity ingested at time $t = 0$ is transferred to blood. The expected fecal excretion rate, $E_f^a(t)$, following an acute intake of a unit activity by ingestion at $t = 0$ is

$$E_f^a(t) = e^{-\lambda t} [f_{GI \rightarrow blood} * e_f + f_{GI \rightarrow fecal}] . \quad (13)$$

Equation (13) is evaluated using Eq. (4a).

If an individual chronically ingests activity at a uniform rate during a period of length T_e , then the excretion rate at time t per *unit intake rate*, $E_f^c(t, T_e)$, is

$$\begin{aligned} E_f^c(t, T_e) &= \int_{t-T_e}^t E_u^a(x) dx \\ &= \int_{t-T_e}^t e^{-\lambda x} [f_{GI \rightarrow blood} * e_f + f_{GI \rightarrow fecal}] dx . \end{aligned} \quad (14)$$

Equation (14) is evaluated using Eq. (5a).

Wound Intake:

Let $f_{wound \rightarrow blood}(t)$ denote the fractional rate at which activity is absorbed into blood from the wound site. The rate of fecal excretion, $E_f(t)$, per unit activity initially at the wound site is given as

$$E_f(t) = e^{-\lambda t} [f_{wound \rightarrow blood} * e_f] . \quad (15)$$

Equation (15) is evaluated using Eq. (4a).

9.3.3 Breath Excretion

Inhalation Intake:

Let $f_{lung \rightarrow blood}(t)$ denote the fractional rate at which activity inhaled at $t = 0$ is transferred to blood and $e_b(t)$ the rate of elimination of the radionuclide in breath following introduction of a unit activity into blood at $t = 0$. The expected breath excretion rate, $E_b^a(t)$, at time t following an acute intake of a unit activity by inhalation of a radionuclide with decay constant λ is

$$E_b^a(t) = e^{-\lambda t} [(f_{lung \rightarrow blood} + f_{lung \rightarrow GI} * f_{GI \rightarrow blood}) * e_b] . \quad (16)$$

Equation (16) is evaluated using Eqs. (4a) and (4b).

If an individual chronically inhales activity at a uniform rate during a period of length T_e , then the excretion rate at time t per *unit intake rate*, $E_b^c(t, T_e)$, is given as

$$\begin{aligned}
E_b^o(t, T_e) &= \int_{t-T_e}^t E_b^a(x) dx \\
&= \int_{t-T_e}^t e^{-\lambda x} [(f_{lung-blood} + f_{lung-GI} * f_{GI-blood}) * e_b] dx .
\end{aligned} \tag{17}$$

Equation (17) is evaluated using Eqs. (5a) and (5b).

Ingestion Intake:

Let $f_{GI-blood}(t)$ denote the fractional rate at which a unit activity ingested at time $t = 0$ is transferred to blood. The expected elimination rate in breath, $E_b^a(t)$, at time t following an acute intake of a unit activity by ingestion at $t = 0$ is

$$E_b^a(t) = e^{-\lambda t} [f_{GI-blood} * e_b] . \tag{18}$$

Equation (18) is evaluated using Eq. (4a).

If an individual chronically ingests activity at a uniform rate during a period of length T_e , then the elimination rate at time t per *unit intake rate*, $E_b^c(t, T_e)$, is

$$\begin{aligned}
E_b^c(t, T_e) &= \int_{t-T_e}^t E_b^a(x) dx \\
&= \int_{t-T_e}^t e^{-\lambda x} [f_{GI-blood} * e_b] dx .
\end{aligned} \tag{19}$$

Equation (19) is evaluated using Eq. (5a).

Wound Intake:

Let $f_{wound-blood}(t)$ denote the fractional rate at which activity is absorbed into blood from the wound site. The rate of elimination in breath, $E_b(t)$, per unit activity initially at the wound site is given as

$$E_b(t) = e^{-\lambda t} [f_{wound-blood} * e_b] . \tag{20}$$

Equation (20) is evaluated using Eq. (4a).

9.3.4 Organ Burdens

Lung:

Let $R_{lung}(t)$ denote the fraction of the activity inhaled at $t = 0$ that is retained in the lung at later times without consideration of radioactive decay. If we assume that

$R_{lung}(t) = \sum_{i=1}^n A_i e^{-a_i t}$, the activity present in the lung at time t , $q_{lung}^a(t)$, following an acute intake of unit activity at $t = 0$ is

$$q_{lung}^a(t) = e^{-\lambda t} R_{lung}(t) = \sum_{i=1}^n A_i e^{-(a_i + \lambda)t} . \quad (21)$$

Equation (21) is also applicable to retention at the wound site with $R_{wound}(t)$ replacing $R_{lung}(t)$.

If the intake occurs at a constant rate during a period of length T_e , then the lung burden $q_{lung}^c(t)$ per unit intake rate is

$$\begin{aligned} q_{lung}^c(t) &= \int_{t-T_e}^t q_{lung}^a(x) dx \\ &= \sum_i \frac{A_i}{a_i + \lambda} [e^{-(a_i + \lambda)(t - T_e)} - e^{-(a_i + \lambda)t}] . \end{aligned} \quad (22)$$

Systemic organs (e.g, thyroid):

Let $R_{organ}(t)$ denote the activity present in a systemic organ following introduction of a unit activity into blood at time $t = 0$, without consideration of radioactive decay. The activity present in the organ, $q_{organ}^a(t)$, following an inhalation intake of a unit activity at $t = 0$ is

$$q_{organ}^a(t) = e^{-\lambda t} [f_{lung \rightarrow blood} + f_{lung \rightarrow GI} * f_{GI \rightarrow blood}] * R_{organ}(t) . \quad (23)$$

If the intake was by ingestion then the activity present in the organ is

$$q_{organ}^a(t) = e^{-\lambda t} [f_{GI \rightarrow blood} * R_{organ}(t)] . \quad (24)$$

If the intake occurred at a constant rate during a period of length T_e , then the organ burden $q_{organ}^c(t, T_e)$ at any time t per *unit intake rate* by inhalation is

$$\begin{aligned} q_{organ}^c(t, T_e) &= \int_{t-T_e}^t q_{organ}^a(x) dx \\ &= \int_{t-T_e}^t e^{-\lambda x} [f_{lung \rightarrow blood} + f_{lung \rightarrow GI} * f_{GI \rightarrow blood}] * R_{organ} dx , \end{aligned} \quad (25)$$

and by ingestion,

$$q_{organ}^c(t, T_e) = \int_{t-T_e}^t e^{-\lambda x} [f_{GI \rightarrow blood} * R_{organ}] dx . \quad (26)$$

These equations can be evaluated using Eqs. (5a) and (5b).

9.4 APPLICATION OF THE BIOASSAY ALGORITHMS

The above algorithms form the bases of the DOSEXPRT code. The majority of the numerical calculations center around evaluation of Eqs. (4) and (5) as required by the pathways of the nuclide within the body. DOSEXPRT considers two types of exposure. Acute or incident exposures are considered to be well defined in terms of the time of the exposure, and specific bioassay measurements are undertaken for the purpose of estimating the magnitude of the intake. Chronic or routine exposures arise from expected intake due to low-level contamination in the work environment (e.g., chronic airborne activity). Following is a brief outline of the final steps in these calculations.

Acute intake:

The estimated activity $\langle I \rangle$ of a radionuclide taken into the body in an incident (acute intake) is derived as

$$\langle I \rangle = \frac{1}{N} \sum_{t=1}^N \frac{Y(t)}{E^a(t)}, \quad (27)$$

where $Y(t)$ denotes the measured excretion rate (or body burden) at time t , $E^a(t)$ is the expected excretion rate (or body burden) at time t for a unit intake, and N is the total number of measurements. *Note that no weighting of the measurements is employed in estimating the intake.*

Chronic intake:

Consider n bioassay measurements $\{Y_1, Y_2, \dots, Y_n\}$ obtained at times $\{T_1, T_2, \dots, T_n\}$ during a period of chronic exposure. Assume that the exposure ended at T_f ($T_f > T_n$) and that m additional measurements $\{Y_{n+1}, Y_{n+2}, \dots, Y_{n+m}\}$ were obtained at times $\{T_{n+1}, T_{n+2}, \dots, T_{n+m}\}$ postexposure. The intake rate during the period T_{i-1} to T_i for $T_i < T_f$ is computed as

$$\dot{I}_i = \frac{Y_i(t) - \sum_{j=1}^{i-1} \dot{I}_j E^c(\Delta T_j, T_i - T_{j-1})}{E^c(\Delta T_i, \Delta T_i)}, \quad (28)$$

where $\Delta T_i = T_i - T_{i-1}$ and $E^c(x, y)$ is the expected excretion rate (or body burden) at time y

for uniform intake at a unit rate during a period of duration x . We assign the intake rate \dot{I}_n estimated for the period $(T_{n-1}$ to $T_n)$ to the period $(T_n$ to $T_f)$, that is, from the last measurement to the end of exposure. The estimated intake, $\langle I_T \rangle$, derived from the measurements for the exposure period is then

$$\langle I_T \rangle = \sum_i^n \dot{I}_i (T_i - T_{i-1}) + \dot{I}_n (T_f - T_n). \quad (29)$$

Each postexposure measurement provides additional information regarding the total intake. Using the intake rate vector $(\dot{I}_i, i = 1, n)$ estimated from Eq. (28), then the predicted excretion at time T_{i+n} beyond the exposure period is

$$\langle Y_{i+n} \rangle = \sum_{j=1}^n \dot{I}_j E^c(\Delta T_j, T_{i+n} - T_{j-1}). \quad (30)$$

Normalizing the intake rate vector to the current estimate of the total intake, we then obtain a new estimate of the total intake from the postexposure measurement Y_{i+n} as

$$\langle I_T \rangle_i = \frac{Y_{i+n}}{\sum_{j=1}^n \dot{I}_j E^c(\Delta T_j, T_{i+n} - T_{j-1})}, \quad (31)$$

where i_j is the j th component of the normalized intake rate vector and is given by $\dot{I}_j / \langle I_T \rangle$,

where $\langle I_T \rangle$ is the current estimate of the total intake and \dot{I}_j is the intake rate during the j th period. A new estimate of the total intake is obtained as the weighted average of the current estimate and the value derived from the i th postexposure measurement as

$$\langle I_T \rangle = \frac{1}{n+i} [(n+i-1)\langle I_T \rangle + \langle I_T \rangle_i]. \quad (32)$$

This procedure is repeated over all postexposure measurements. Note that the normalized intake rate vector derived from measurements during the exposure period is preserved; post exposure measurements only improve the estimate of the total intake.

9.5 ANNUAL DOSE

DOSEXPRT provides estimates of the annual dose, that is, the dose delivered to tissues in a year, for the current year and for each subsequent year (out to 50 years). The estimates are derived using dosimetric coefficients computed for this purpose using the metabolic models of ICRP-30 (ref. 4) and specific effective energy (SEE) values that are being used in the preparation of ICRP Publication 56 (ref. 10). By use of these coefficients DOSEXPRT avoids the numerically intense computation of organ dose.

Incident Intake:

The annual dose for tissue T in the year in which an incident occurred, $AD_{T,1}$, on Julian day t_0 is given as

$$AD_{T,1} = I \int_{t_0}^{t_1} \dot{D}_T^I(t) dt , \quad (33)$$

where

I is the estimated intake for the incident,

t_1 is the Julian day corresponding to the end of the first year, and

$\dot{D}_T^I(t)$ is the dose rate in organ T following a unit intake at $t = 0$.

The annual dose in any subsequent year i is

$$AD_{T,i} = I \int_{t_{i-1}}^{t_i} \dot{D}_T^I(t-t_0) dt , \quad (34)$$

where t_i is the Julian day for the end of year i .

Routine Intake:

The annual dose in any year from routine intakes of a radionuclide depends, not only on the magnitude of the intake, but also on its temporal pattern. For each year, the total intake

in the year is obtained by weighting the intake estimates of each bioassay by weights constructed from the assay weights specified in the nuclide file and by the frequency of measurements. The intake pattern for the most frequently employed assay is then normalized to the estimated total intake for the year. Thus each year of the exposure history is treated in isolation with regard to the type and frequency of the assays.

In computing the annual dose, it is necessary to have an estimate of the intake rate in the time period from the last measurement to the end of the year (EOY). The procedure used to estimate the EOY intake rate for the last year of the exposure history is different than that used for other years. For example, the EOY intake in calendar year (CY) 1989, given no measurements in CY 1990, is obtained by extending forward the intake rate of the preceding period in CY 1989. However, if measurements are present for CY 1990, then the 1989 EOY intake rate is based on the first measurement in CY 1990.

Mathematically, let $\langle I \rangle_{i,j}$ denote the estimated intake for assay j in year i . The intake in year i , $\langle I \rangle_i$, is computed as

$$\langle I \rangle_i = \sum_j w_j \frac{n_{i,j}}{N_i} \langle I \rangle_{i,j}, \quad (35)$$

where w_j is the weight assigned to assay j in the nuclide file (after normalization for the number of assays in the year), $n_{i,j}$ is the number of measurements in year i for assay j , and N_i is the total number of assays in year i . Equation (35) applies to both routine and incident measurements.

Let $\dot{I}_{i,j}$ denote the intake rate vector, of length $n_{i,j}$ for year i and assay j . Let k be the assay with the greatest frequency of measurements, that is, $n_{i,k} > n_{i,j}$, $j \neq k$. The intake rate vector for year i is then

$$\dot{I}_i = \frac{\langle I \rangle_i}{\langle I \rangle_{i,k}} \dot{I}_{i,k} \quad (36)$$

at each of the $n_{i,k}$ entries in the vector, defining the intake pattern for the selected assay in year i . The annual dose in any year is based on the intake rate vector for all preceding years and the year of interest.

The committed dose equivalent is computed from knowledge of the total intake; the

annual dose, however, must be computed from the intake rate vector \dot{I} . Dose-rate coefficients giving the dose-equivalent rate at various times following a unit intake are accessed by DOSEXPRT to compute the annual dose. Let $\dot{D}_T^I(t)$ denote the dose rate in organ T following an instantaneous intake of a unit activity at time zero. The dose rate at time t in organ T for the intake rate vector \dot{I} is given as

$$\dot{D}_T(t) = \int_0^t \dot{I}(\tau) \dot{D}_T^I(t-\tau) d\tau . \quad (37)$$

If vector \dot{I} is composed of n regions of uniform intake rate then Eq. (35) can be written as

$$\dot{D}_T(t) = \sum_n \dot{I}_n(t_n) \int_{t-t_{n+1}}^{t-t_n} \dot{D}_T^I(u) du , \quad (38)$$

where the summation extends for all n for which $t - t_{n+1} \geq 0$. Note that in this formulation \dot{I} is assumed to be constant during the period $t_n \rightarrow t_{n+1}$.

The annual dose is simply the integral of Eq. (38) over the year of interest. Thus the annual dose in year i for tissue T , $AD_{T,i}$, is

$$\begin{aligned} AD_{T,i} &= \int_{t_i} \dot{D}_T(t) dt \\ &= \int_{t_i} du \sum_n \dot{I}_n(t_n) \int_{t-t_{n+1}}^{t-t_n} \dot{D}_T^I(u) du . \end{aligned} \quad (39)$$

10. TECHNICAL DESCRIPTION OF NUCLIDE DATA FILES

10.1 INTRODUCTION

The general principles of monitoring for the radiation protection of workers has been set forth in various reports of the ICRP¹⁻⁴ and NCRP.⁵ Monitoring of individuals for internal exposure is based on measurement of radionuclides in the whole body (or specific organs/regions) and on measurement of radionuclides in excreta. For quantitative assessment of internal exposure the results of these measurements must be translated into quantities that can be compared with the primary radiation protection guidance (limits on annual effective dose equivalent, committed effective dose equivalent or committed dose equivalent for specific organs) or to the secondary quantities (Annual Limits on Intake - ALI).⁴ The relationships between levels in the body or in excreta and the estimated intake and resulting dose can only be established through use of metabolic and dosimetric models describing the behavior of the material in the body.

10.2 MODEL OF THE RESPIRATORY SYSTEM

This report uses the compartmental model of the respiratory system presented in ICRP Publication 30 (ref. 4) to describe the retention in the lung of inhaled aerosols and the rate of translocation of deposited material to other regions of the body.

The respiratory system is divided into three distinct regions - the nasal passages (*NP*), the trachea and bronchial tree (*TB*) and the pulmonary parenchyma (*P*). Deposition fraction in the three regions is assumed to vary with the aerodynamic properties of the aerosol and is described by three parameters; D_{NP} , D_{TB} , and D_P which represent the fraction of inhaled material initially deposited in the *NP*, *TB*, and *P* regions, respectively. The shortfall ($1 - D_{NP} - D_{TB} - D_P$) is not retained in the respiratory tract and is assumed to be exhaled. The deposition fractions as a function of the activity median aerodynamic diameter (AMAD) of an aerosol with a log-normal distribution of diameters is shown in Fig. 2.

Materials have been classified according to their rate of clearance from the pulmonary region of the respiratory tract; materials with a half-time of less than 10 days are classified as *D* (day); those with half-times between 10 and 100 days are classified as *W* (weeks); and those with greater half-times are classified as *Y* (year). The clearance model of the respiratory tract is shown in Fig. 3.

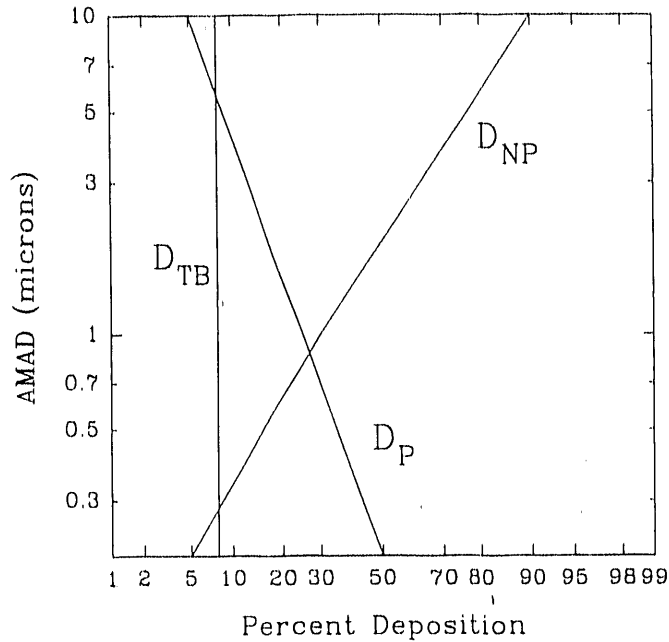


Fig. 2. Deposition of dust in the respiratory system. The percentage of activity or mass of an aerosol that is deposited in the nasal passages (D_{NP}), the trachea and bronchial tree (D_{TB}), and the pulmonary parenchyma (D_P) is given in relation to the activity median aerodynamic diameter (AMAD) of the aerosol distribution (in microns). The default value of AMAD in the normal SITE.DFT file is 1 micron. When DOSEXPRT is used in debug/test mode, AMAD can be modified but must be between 0.2 and 10 microns. However annual dose can only be computed for an AMAD of 1 micron.

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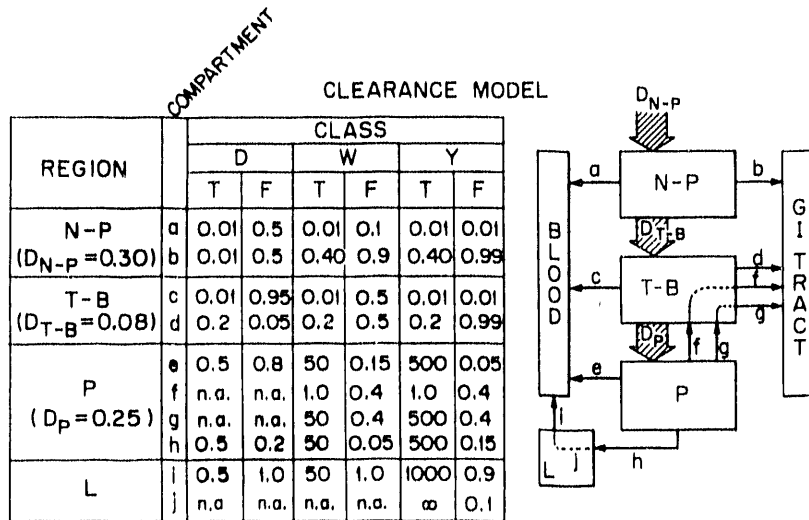


Fig. 3. The values for the removal half-times, T, and compartmental fractions, F, for the ICRP lung model for D, W, and Y class material. The fractional depositions are based on an AMAD of 1 micron. The entry n.a. indicates not applicable. The schematic diagram identifies the various clearance pathways (a-j) in the lung model.

Each compartment ($a - j$) is associated with a particular pathway of clearance with a half-time for biological clearance of T_i and associated pathway fraction F_i . The values of the parameters for the three clearance classes are given in Fig. 3. Deposited material is taken up by the body from the respiratory tract through compartments a, c, and e. Compartments b, d, f, and g are associated with mechanical transport of material into the gastrointestinal tract. The GI tract is discussed below.

The clearance of material from each compartment is assumed to be described by first-order kinetics at rates given by the rate constant λ_i , which is related to the half-time T_i as

$$\lambda_i = \frac{\ln(2)}{T_i}, \quad (40)$$

where $\ln(2)$ is the natural logarithm of 2 ($\sim 0.693\dots$). The half-times for each compartment are given in Fig. 3. The clearance of inhaled material from the lung is therefore described by a set of coupled first-order differential equations.

10.3 MODEL OF THE GASTROINTESTINAL TRACT

Radionuclides reach the gastrointestinal tract either directly by ingestion or indirectly by translocation from the respiratory tract, as described above. This report uses the compartmental model of the gastrointestinal tract described in ICRP Publication 30 (ref. 4).

The gastrointestinal tract is represented by four sections. Each section is considered as a single compartment, and translocation from one compartment to the next is assumed to be governed by first-order kinetics. Rate constants, λ_i , for transfer between compartments, are given in Fig. 4. We have assumed that the uptake of material from the GI tract to body fluids will occur from the small intestine (SI). The rate constant, λ_s , for the translocation of activity to the systemic pool (blood), can be estimated from f_i , the fraction of the stable element reaching body fluids following ingestion:

$$\lambda_s = \frac{f_1 \lambda_{SI}}{1 - f_1}. \quad (41)$$

If an f_i value of 1 is assigned then the singularity in the above equation can be avoided by assuming the material enters blood as it leaves the stomach. We have, however, here arbitrarily limited f_i to values less than or equal to 0.95. The f_i values are those assigned by the ICRP in Publication 30.

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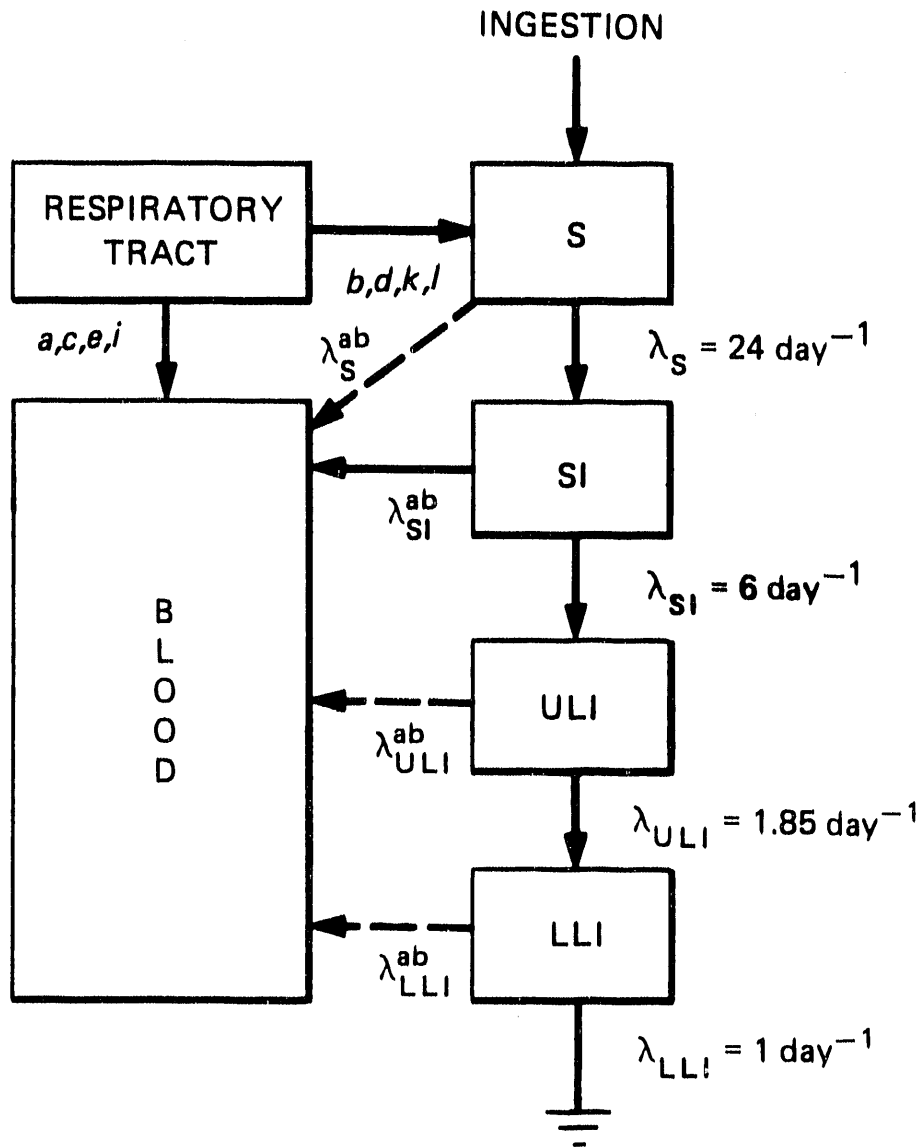


Fig. 4. Schematic representation of radioactivity movement among respiratory tract, GI tract, and blood with transfer coefficients between compartments, λ_i , shown.

10.4 DISTRIBUTION AND RETENTION MODELS

Following an intake by inhalation and ingestion, radionuclides will be translocated to body fluids at a rate determined by the rate constants for the relevant compartments of the respiratory and gastrointestinal tract. Subsequently, the radionuclide may be taken up by the organs and tissues of the body and retained in these regions as discussed in ICRP Publication 30 (ref. 4). The functions, which describe the retention of radionuclides in the organs/tissues of the body, can be expressed as sums of exponentials. These retention functions take into account implicitly all translocation of the radionuclide once it has entered into blood.

10.5 SYSTEMIC EXCRETION MODELS

Radionuclides are excreted from the systemic pool via urinary and fecal excretion. For most radionuclides we have used the excretion functions presented in ICRP Publication 54 (ref. 3). In some instances, for example Pu and Am, we have adopted functions given explicitly in the literature. All the excretion functions are expressed as sums of exponentials.

10.6. MATHEMATICAL SOLUTIONS TO UPTAKE MODELS

The system of coupled linear first-order differential equations that describe the behavior of material inhaled or ingested have solutions of the form

$$f(t) = \sum_i A_i e^{-a_i t} . \quad (42)$$

Functions describing the rate of transfer of material into blood are derived as $\lambda_{i \rightarrow \text{blood}} C_i$, where C_i is the content of compartment i which feeds blood with a rate constant $\lambda_{i \rightarrow \text{blood}}$. If C_i is given as $C_i(t) = \sum_j A_j e^{-a_j t}$, then the rate that material is translocated to blood from compartment i , $f_{i \rightarrow \text{blood}}$, is

$$f_{i \rightarrow \text{blood}}(t) = \lambda_{i \rightarrow \text{blood}} \sum_j A_j e^{-a_j t} . \quad (43)$$

For example, the rate material is translocated from compartments a, c, e, and i of the respiratory tract model to blood is

$$f_{i \rightarrow \text{blood}}(t) = \lambda_a C_a + \lambda_c C_c + \lambda_e C_e + \lambda_i C_i , \quad (44)$$

where C_v is the content of compartment v at time t .

10.7 RESPIRATORY TRACT

Functions describing the retention and rate of translocation of material from the respiratory tract to blood and to the gastrointestinal tract were derived in the manner given in ICRP-30. The solutions were checked using the DIFSOL code of Killough and Eckerman (ref. 11). The coupled systems of differential equations were solved for the initial condition of a unit activity deposited in the *NP*, *TB*, and *P* regions, respectively. These functions were calculated for material of clearance class *D*, *W*, and *Y*, assuming no radioactive decay.

10.8 GASTROINTESTINAL TRACT

Functions describing the retention and rate of translocation of ingested material to blood from the gastrointestinal tract were derived assuming a unit activity present in the stomach at $t = 0$. These functions were calculated for values of f_i considered to be applicable to the particular radionuclide.

10.9 CONTENT OF NUCLIDE SPECIFIC DATA FILES

The following briefly describes each set of data within the nuclide files and provides references, where possible, for the data presented. The functions describing retention in and translocation from the lung and gastrointestinal tract were derived from the ICRP models as discussed above.

Nuclide Name. Radionuclide name in standard notation (e.g., U-238). Metastable notation can be included. The comment on this line indicates the date of last revision of the nuclide file.

Atomic Mass. The atomic mass of the radionuclide. Data are taken from the 1983 atomic mass evaluation of Wapstra and Audi (ref. 12).

Half-life. The half-life of the radionuclide, in days, as given in ICRP Publication 38 (ref. 13)

Default Assimilation Pathway. If no route of intake is identified in the bioassay record then this entry provides an assumed route. *H* corresponds to inhalation, *G* to ingestion, and *J* to injection. The normal default is *H* (i.e., inhalation).

Number of Clearance Classes. The number of clearance classes considered for inhalation of the given radionuclide. As a minimum, the number of clearance classes considered in ICRP Publication 30 will be included in the file. For each clearance class, functions representing retention in the lung and translocation to blood and to the gastrointestinal tract are specified.

Number of GI-Transfer Functions. The number of different chemical forms considered for ingestion of material (i.e., different f_i values). For each form, functions representing retention within the GI tract and translocation to blood are specified.

Number of Systemic Organs. The number of systemic organs for which retention functions are specified. This value is generally zero since lung is specified separately. For radiiodines a value of 1 is assigned where the thyroid is the organ of interest.

Assign GI-Transfer Function to Inhalation Class (D, W, Y). For each clearance class, the corresponding GI-tract-transfer function is specified. For example, clearance class D and W of uranium use the same GI-tract-transfer functions (f_i values).

Weights for Results for Clearance Class (D, W, Y). Relative weights to apply when computing the inhalation intake if more than one type of assay was carried out. For each clearance class, weights are assigned to breath, urine, and fecal assays, and to *in vivo* measurements of whole body and lung. If a systemic organ is specified, a weight is assigned to the assay associated with that organ (e.g., *in vivo* measurements of thyroid for radioiodine). The weights are based on expert judgement and only become important if more than one assay was performed.

Weights for Results for Ingestion Class. Relative weights to apply when computing the ingestion intake if more than one type of assay was carried out.

Assign Classes T, N, U to D, W, or Y. Default old clearance class notation to current clearance classes.

Transfer rate per day from lung to blood. For each clearance class, the parameters of a function describing the rate of translocation of inhaled material from the lung to blood are specified. The data are presented in four columns; the first column gives the rate constants a_i , the second column shows the coefficients $A_{NP,i}$ for deposition in the *NP* region, the third column gives the coefficients $A_{TB,i}$ for deposition in the *TB* region, and the final column presents the coefficients $A_{P,i}$ for deposition in the *P* region. The function representing the rate of translocation to blood of inhaled activity $f_{lung \rightarrow blood}(t)$ is

$$f_{lung \rightarrow blood}(t) = \sum_i [D_{NP}A_{NP,i} + D_{TB}A_{TB,i} + D_P A_{P,i}] e^{-a_i t}, \quad (45)$$

where D_{NP} , D_{TB} , and D_P denote the deposition of the aerosol in the *NP*, *TB*, and *P* regions of the lung. An AMAD of 1 micron is assumed, thus D_{NP} , D_{TB} , and D_P correspond to 0.30, 0.08, and 0.25, respectively.

Transfer rate per day from lung to GI Tract. For each clearance class the parameters of the function describing the rate of translocation of inhaled material into the GI-tract are specified. The data are presented in four columns; the first column gives the rate constants a_i , the second column shows the coefficients $A_{NP,i}$ for deposition in the *NP* region, the third column gives the coefficients $A_{TB,i}$ for deposition in the *TB* region, and the final column presents the coefficients $A_{P,i}$ for deposition in the *P* region. The function representing the rate of translocation of inhaled material to blood from the lung is $f_{lung \rightarrow GI}(t)$

$$f_{lung \rightarrow GI}(t) = \sum_i [D_{NP} A_{NP,i} + D_{TB} A_{TB,i} + D_P A_{P,i}] e^{-a_i t}, \quad (46)$$

where D_{NP} , D_{TB} , and D_P denote the deposition of the aerosol in the NP , TB , and P regions of the lung; for an AMAD of 1 micron the values are 0.30, 0.08, and 0.25, respectively.

Transfer rate per day of ingested activity to blood. For each chemical form, the parameters of the function describing the rate of translocation of ingested material to blood are given. The data are presented in two columns: the first column gives the rate constants a_i , the second column shows the coefficients A_i . The function representing the rate of translocation to blood from the GI tract $f_{GI \rightarrow blood}(t)$ is

$$f_{GI \rightarrow blood}(t) = \sum_i A_i e^{-a_i t}. \quad (47)$$

Transfer rate per day of ingested activity to feces. For each chemical form the parameters of the function describing the rate of translocation of ingested material to feces are specified. The data are presented in two columns: the first column gives the rate constants a_i , the second column shows the coefficients A_i . The function representing the rate of translocation of ingested material to feces $f_{GI \rightarrow fecal}(t)$ is

$$f_{GI \rightarrow fecal}(t) = \sum_i A_i e^{-a_i t}. \quad (48)$$

Urinary Excretion function. The nuclide file contains the parameters of the function representing the rate of urinary excretion of systemic activity following a unit input into blood at time zero. The data are presented in two columns: the first column gives the rate constants a_i , and the second column, the corresponding coefficients A_i . The function representing the urinary excretion $f_u(t)$ is thus

$$f_u(t) = \sum_i A_i e^{-a_i t}. \quad (49)$$

For most radionuclides the urinary excretion function is that given in ICRP Publication 54 (ref. 3).

Fecal Excretion Function. The nuclide file contains the parameters of the function representing the rate of fecal excretion of systemic activity following a unit input into blood at time zero. The data are presented in two columns: the first column gives the rate constants a_i , and the second column the corresponding coefficients A_i . The function representing the fecal excretion $f_f(t)$ is thus

$$f_f(t) = \sum_i A_i e^{-a_i t} . \quad (50)$$

For most radionuclides the fecal excretion functions used are those presented in ICRP Publication 54 (ref. 3).

Retention of Inhaled Activity within the lungs. For each clearance class the parameters of the function describing the retention in the lungs of inhaled material are given. The data are presented in four columns: the first column gives the rate constants a_i , the second column shows the coefficients $A_{NP,i}$ for deposition in the *NP* region, the third column gives the coefficients $A_{TB,i}$ for deposition in the *TB* region, and the final column presents the coefficients $A_{P,i}$ for deposition in the *P* region. The function representing the retention in the lungs, $R_{lung}(t)$ of inhaled material is

$$R_{lung}(t) = \sum_i [D_{NP} A_{NP,i} + D_{TB} A_{TB,i} + D_P A_{P,i}] e^{-a_i t} , \quad (51)$$

where D_{NP} , D_{TB} , and D_P denote the deposition of the aerosol in the *NP*, *TB*, and *P* regions of the lung; for an AMAD of 1 micron the values are 0.30, 0.08, and 0.25, respectively.

Retention of Ingested activity within the GI tract. The nuclide file contains the parameters of the function representing the retention of ingested activity in the tract following a unit input at time zero. The data are presented in two columns: the first column gives the rate constants a_i , and the second column the corresponding coefficients A_i . The retention function $R_{GI}(t)$ is

$$R_{GI}(t) = \sum_i A_i e^{-a_i t} . \quad (52)$$

The functions are derived from the GI-Tract model of ICRP Publication 30 (ref. 4).

Retention of Systemic Activity. The nuclide file contains the parameters of the function representing the retention of a unit input into the systemic pool at time zero. The data are presented in two columns: the first column gives the rate constants a_i , and the second column the corresponding coefficients A_i . The function representing the systemic retention $R(t)$ is thus

$$R(t) = \sum_i A_i e^{-a_i t} . \quad (53)$$

The retention functions are derived from the metabolic models of ICRP Publications 30 (ref. 4) and 54 (ref. 3).

H/D Dose per unit deposition (Sv/Bq) for inhaled activity. For each clearance class the nuclide file contains the committed dose equivalent in tissue T per unit deposition in the three regions of the respiratory tract. The data are presented in three columns: the first column gives the coefficients $H_{NP,T}$ for deposition in the NP region, the second column shows the coefficients $H_{TB,T}$ for deposition in the TB region, and the third column presents the coefficients $H_{P,T}$ for deposition in the P region. The committed dose equivalent per unit intake H_T for tissue T is given as

$$H_T = D_{NP} H_{NP,T} + D_{TB} H_{TB,T} + D_P H_{P,T} , \quad (54)$$

where D_{NP} , D_{TB} , and D_P denote the deposition of the aerosol in the NP , TB , and P regions of the lung. For an AMAD of 1 micron the depositions are 0.30, 0.08, and 0.25 for these regions.

The dosimetric data in the nuclide files were compiled from NUREG/CR-1962 (ref. 14), which is an unabridged compilation of selected data developed during completion of ICRP Publication 30 (see also Federal Guidance Report 11 (ref. 9)). In that report values of H_T were tabulated for a AMAD of 1 micron with a triplet of numbers (F_{NP} , F_{TB} , F_P) representing the fraction of H_T due to deposition in the three regions of the lung. Values of $H_{NP,T}$, $H_{TB,T}$, and $H_{P,T}$ were computed for the nuclide files as

$$H_{r,T} = \frac{F_r}{D_r} H_T , \quad r = NP, TB, P , \quad (55)$$

where D_r is the deposition of a 1-micron aerosol in the various regions of the lung model; the values of D_r are 0.30, 0.08, and 0.25 for depositions in the NP , TB , and P regions, respectively.

H/D Dose per unit intake (Sv/Bq) for ingested activity. For each ingestion class the committed dose equivalent per unit intake is tabulated. The data are from NUREG/CR-1962 (ref. 14); see also Federal Guidance Report 11 (ref. 9).

ALI (Bq) from ICRP-30. For each inhalation and ingestion class the Annual Limit on Intake is tabulated from ICRP Publication 30.

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Appendix A

DOSEXPRT BIOASSAY RECORDS FORMAT

This section describes the format for the bioassay records files or input files to DOSEXPRT. The input files are ASCII files containing records with a length of 125 characters (bytes). The following information is common to both *in vivo* and *in vitro* records files:

REASON code indicates incident (1S, the S standing for special) or routine (3 or 1R, the R standing for regular) exposure.

Note that the bioassay RESULT and MDA along with their units codes are in different columns for *in vitro* [breath (BRE), urine (U), and fecal (F)] and *in vivo* [whole body count (WBC), lung count (LUN), and thyroid count (THY)] measurements. The pathways are inhalation (H), ingestion (G), or injection (J). Only weighted intake is computed for the injection pathway as dose-per-unit-intake conversion factors do not exist for most nuclides for this pathway.

The classes allowed for inhalation are day (D), week (W), year (Y), vapor (V) [e.g., Tritium], and labeled compound (L) [e.g., C-11 and C-14]. The classes allowed for ingestion are: very insoluble (V), insoluble (I) and soluble (S).

The social security number (SSN) is in columns 106-114 on the records. Mixed inhalation class information follows the SSN in columns 116-125.

Dates are in the form YYYYMMDD, where, YYYY is the year, MM is the month, and DD is the day. Times are in the form HHMM, where HH is the hour in 24-hour time and MM is the minutes. For example, if a measurement was made on April 10, 1991 at 3:45 PM, the DATE and TIME would be: 199104101545.

Units for *in vivo* records are: M - μ Ci, N - nCi, P - pCi, D - dpm, B - Bq and U - μ g. Units for urinalysis records are: 1 - dpm/ml, 2 - dpm/d, 3 - dpm/sample, 4 - dpm/l, 5 - ug/ml, 6 - Bq/l, and 7 - Bq/d. Units for fecal analysis records are: 3 - dpm/sample and 7 - Bq/day. Units for breath analysis records are: 2 - dpm/d, 3 - dpm/sample, 4 - dpm/l, 6 - Bq/l, 7 - Bq/d.

On the following page is an example of a DOSEXPRT input file using BADGE = -20 from DOSEXPRT example input INCIDENT.DAT.

TEMPLATE FOR IN VITRO MEASUREMENTS

BADGE SITE	MEASUREMENT		Y<Y>	NUCLIDESN	DATE	TIME<--VOL-->	<-RESULT-->S		<---MDA--->S	
	DATE	TIME					U	N	I	T
-20 S	19890211		HU	I-131	D1S19890201	20.00	1440.007	10.007		
-20 S	19890217		HU	I-131	D1S19890201	20.00	987.007	10.007		
-20 S	19890218		HU	I-131	D1S19890201	20.00	970.007	10.007		
-20 S	19890219		HU	I-131	D1S19890201	20.00	419.007	10.007		
-20 S	19890220		HU	I-131	D1S19890201	20.00	318.007	10.007		
-20 S	19890221		HU	I-131	D1S19890201	20.00	378.007	10.007		
-20 S	19890222		HU	I-131	D1S19890201	20.00	557.007	10.007		
-20 S	19890223		HU	I-131	D1S19890201	20.00	543.007	10.007		
-20 S	19890224		HU	I-131	D1S19890201	20.00	574.007	10.007		
-20 S	19890225		HU	I-131	D1S19890201	20.00	318.007	10.007		
-20 S	19890226		HU	I-131	D1S19890201	20.00	305.007	10.007		
-20 S	19890227		HU	I-131	D1S19890201	20.00	311.007	10.007		

TEMPLATE FOR IN VIVO MEASUREMENTS

BADGE SITE	MEASUREMENT		Y<Y>	NUCLIDESN	DATE	TIME <-RESULT-->	<---MDA--->S	
	DATE	TIME					U	N
-20 S	19890219		HTHY	I-131	D1S19890201	13.00M	1.00M	
-20 S	19890221		HTHY	I-131	D1S19890201	10.50M	1.00M	

The following is the format for the bioassay records files used with DOSEXPRT. The bioassay records files are created using the FLOW GEMINI data base program from the OHIS bioassay data base. Generally two files are created: S26.DAT, which contains *in vitro* (urinalysis) records, and S27.DAT, which contains *in vivo* records. DOSEXPRT concatenates these into a single file: DOSEXPRT.DAT.

ELEMENT	COLUMNS	LENGTH	DESCRIPTION

COMMON TO IN VIVO AND IN VITRO RECORDS:			
BADGE NUMBER	2-7	6	
PLANT	9	1	
COUNT-DATE*	23-30	8	Date and time that sample was taken
COUNT-TIME*	31-34	4	or count was made.
PATHWAY	39	1	'H'-inhalation, 'G'-ingestion
TYPE	40-42	3	Type of count (WBC, etc.)
ANALYSIS	43-48	6	
ISOTOPE	49-55	7	
CLASS	56-56	1	Lung retention or solubility class
REASON	57-58	2	1,1S,2S-incident,1R,2R-follow up,3-routine
INCIDENT-DATE*	59-66	8	If reason is 2(follow up of incident)
INCIDENT-TIME*	67-70	4	date must be present to be considered part of that incident
IN VIVO RECORDS:			
RESULT	72-81	10	Numeric value of result
UNITS ⁺	82	1	Units of result
MDA	84-93	10	Minimum detectable activity
M-UNITS ⁺	94	1	Units of MDA value
SSN	106-114	9	Social Security Number
MIXED CLASS IDENTIFIER	116	1	Single Digit (0-9) identifier for mixed class.
MIXED CLASS LABEL	117	1	"D"
PERCENTAGE OF CLASS D	118-119	2	PERCENT (0-99)
MIXED CLASS LABEL	120	1	"W"
PERCENTAGE OF CLASS W	121-122	2	PERCENT (0-99)
MIXED CLASS LABEL	123	1	"Y"
PERCENTAGE OF CLASS Y	124-125	2	PERCENT (0-99)
IN VITRO RECORDS:			
VOL	71-80	10	Volume (ml) of sample (aliquot) for urinalysis Mass (g) of sample analyzed for fecal analysis Volume (l) of sample analyzed for breath analysis.
RESULT	81-90	10	Numeric value of result
UNITS ⁺⁺	91	1	Units of result
MDA	93-102	10	Minimum detectable activity
M-UNITS ⁺⁺	103	1	Units of MDA value
SSN	106-114	9	Social Security Number
MIXED CLASS IDENTIFIER	116	1	Single Digit (0-9) identifier for mixed class.
MIXED CLASS LABEL	117	1	"D"
PERCENTAGE OF CLASS D	118-119	2	PERCENT (0-99)
MIXED CLASS LABEL	120	1	"W"
PERCENTAGE OF CLASS W	121-122	2	PERCENT (0-99)
MIXED CLASS LABEL	123	1	"Y"
PERCENTAGE OF CLASS Y	124-125	2	PERCENT (0-99)

*DATES are in the form YYYYMMDD and TIMES are in the form HHMM. For example if a measurement was made on Jan 5, 1989 at 3:45 PM, the DATE and TIME would be: 198901051545.

⁺Units for in vivo records:

'M' μ Ci, 'N' nCi, 'P' pCi, 'D' dpm (d/min), 'B' Bq and 'U' μ g.

⁺⁺Units for in vitro records:

Urine: 1 dpm/ml, 2 dpm/d, 3 dpm, 4 dpm/l, 5 ug/ml, 6 Bq/l, 7 Bq/d.

Fecal: 3 dpm/sample and 7 Bq/day.

Breath: 2 dpm/d, 3 dpm, 4 dpm/l, 6 Bq/l, 7 Bq/d.

Appendix B

DOSEXPRT OUTPUT FILE FORMAT

This is the format for the DOSEXPRT output file with extension S28. Each record of the output file contains a single result for each badge, plant, nuclide, class, and reason code. Each output record will be read, and the results inserted into Segment 28 of the OHIS data base. In addition, a DOSEXPRT report file (with extension OUT) can be created from the S28 file. The S28 file is an ASCII file containing records with a length of 435 characters (bytes). The format is as follows:

Column -----	Length -----	Field -----	Description -----
1-6	6	BADGE	Badge number
7	1	blank	
8	1	PLANT	Plant (K,P,X,Y) -- FINDER FIELD --
9	1	REASON	Reason code (1-acute incident,3-routine
10	1	CLASS	Nuclide Class
11-17	7	NUCLIDE	Nuclide
18-23	6	COMPDATE	DOSEXPRT Computational DATE [yyymmdd]
24-27	4	COMPTIME	DOSEXPRT Computational TIME [hhmm]
28	1	blank	-- FINDER FIELD --
29	1	PLANT	Plant (K,P,X,Y or S for TEST RUNS)
30-36	7	NUCLIDE	Nuclide
37	1	CLASS	Nuclide Class
38	1	PATH	Assimilation Pathway ('H' -inhalation, 'G' -ingestion, 'J' -injection)
39	1	REASON	Reason code (1-acute incident,3-routine
40	1	'-'	
41-46	6	INCIDENT DATE (If REASON CODE is '1') [mmdyy] blank (If REASON CODE is '1' or 'S')	
47-50	4	INCIDENT TIME (If REASON CODE is '1') [hhmm] blank (If REASON CODE is '3' or 'S')	
51	1	blank	
52-57	6	START DATE for ROUTINE calculations [mmdyy]	
58	1	blank	
59-64	6	END DATE for ROUTINE calculations [mmdyy]	
65-69	5	DOSEXPRT VERSION (XX.Xa)	
70-75	6	DATE OF DOSEXPRT VERSION [mmdyy]	
76-81	6	DATE OF NUCLIDE FILE USED [mmdyy]	
82-87	6	DATE OF COMPUTATION [mmdyy]	
88-96	9	INTAKE (micro Curies)	
97	1	UNITS OF INTAKE (M=micro curies)	
98-106	9	COMMITTED DOSE EQUIVALENT to GONADS (mrem)	
107-115	9	COMMITTED DOSE EQUIVALENT to BREAST (mrem)	
116-124	9	COMMITTED DOSE EQUIVALENT to LUNGS (mrem)	
125-133	9	COMMITTED DOSE EQUIVALENT to R. MARROW (mrem)	
134-142	9	COMMITTED DOSE EQUIVALENT to BONE SURFACE (mrem)	
143-151	9	COMMITTED DOSE EQUIVALENT to THYROID (mrem)	
151-160	9	COMMITTED DOSE EQUIVALENT to REMAINDER (mrem)	
161-169	9	COMMITTED EFFECTIVE DOSE (mrem)	
170-178	9	ANNUAL DOSE to GONADS (mrem)	
179-187	9	ANNUAL DOSE to BREAST (mrem)	
188-196	9	ANNUAL DOSE to LUNGS (mrem)	
197-205	9	ANNUAL DOSE to R. MARROW (mrem)	
206-214	9	ANNUAL DOSE to BONE SURFACE (mrem)	
215-223	9	ANNUAL DOSE to THYROID (mrem)	
224-232	9	ANNUAL DOSE to REMAINDER (mrem)	
233-241	9	ANNUAL EFFECTIVE DOSE (mrem)	
242-245	4	YEAR PRIOR TO YEAR IN WHICH ANNUAL DOSE DROPS BELOW TRESHOLD VALUE (1 mrem) [yyyy]	

Column	Length	Field	Description
246-254	9	AMAD	AMAD used in calculation (microns)
255-263	9	VURDAY	Volume of urine per day used in calculation (ml)
264-272	9	VURSAM	Value of volume of urine per sample (ml)
273-281	9	MFEDAY	Mass of fecal excretion per day used in calculation (grams)
282-290	9	MFESAM	Value of mass of fecal sample analyzed (grams)
291-301	11	DAYS	Number of days between first measurement and INCIDENT DATE - used only if INCIDENT DATE is missing from ACUTE INCIDENT RECORDS.
302	1	blank	
303-311	9	THRESHI	Threshold value for intake - if intake is $> 0.01 * THRESHI * ALI$, a flag is set.
312-320	9	THRESHAD	Threshold value for annual dose - if effective annual dose $> THRESHAD$ (in mrem), a flag is set.
321-329	9	RMDALC	Ratio of MDA to Lower Critical Limit (LC). This is used to determine LC. Results below LC are set to zero.
330-338	9	ASSAY NAME AND WEIGHT #1(combined field)	(example: BRE0.300)
339-347	9	ASSAY NAME AND WEIGHT #2(combined field)	(example: U 0.300)
348-356	9	ASSAY NAME AND WEIGHT #3(combined field)	(example: F 0.300)
357-365	9	ASSAY NAME AND WEIGHT #4(combined field)	(example: WBLO.300)
366-374	9	ASSAY NAME AND WEIGHT #5(combined field)	(example: LUNO.300)
375-383	9	ASSAY NAME AND WEIGHT #6(combined field)	(example: THYO.300)
384	1	blank	
385	1	MIXED CLASS IDENTIFIER	
386	1	MIXED CLASS LABEL "D"	
387-388	2	PERCENTAGE OF CLASS "D" IN MIXED CLASS	
389	1	MIXED CLASS LABEL "W"	
390-391	2	PERCENTAGE OF CLASS "W" IN MIXED CLASS	
392	1	MIXED CLASS LABEL "Y"	
393-394	2	PERCENTAGE OF CLASS "Y" IN MIXED CLASS	
395	1	blank	
396-404	9	SOCIAL SECURITY NUMBER (SSN)	
405	1	blank	
406-414	9	100 * SUM OF COMMITTED DOSES (SUM OVER NUCLIDE, CLASS, REASON) THIS NUMBER IS USED TO SORT THE OUTPUT FOR THE DOSEXPRT REPORT FILE.	
415	1	blank	
416-421	6	START DATE for INTAKE calculation [mmddyy]	
422	1	blank	
423-428	6	END DATE for INTAKE calculation [mmddyy]	
429	1	blank	
430	1	IASWCH	IASWCH is 0 if there are no cases with positive annual dose for an individual and 1 if there is any case with positive annual dose. (DOSEXPRT 4.2)
431	1	blank	
432-435	4	IKYEAR	IKYEAR is year of computation of intake. (DOSEXPRT 4.2)

Columns 39-50 will indicate errors if they have occurred. There are three types of errors noted: NO NUC FILE, RECORD ERROR, and WINDOW ERROR. NO NUC FILE indicates no nuclide data file for the specified nuclide and that bioassay results are greater than LC. RECORD ERROR indicates that information critical to the calculation, such as nuclide class, is missing from the bioassay record. Some missing information such as sample volume for urinalysis units dpm/sample, is replaced by default values from the SITE.DFT file. WINDOW ERROR occurs when an incident date is outside the intake window or when there are no measurements for a routine case inside the measurement window.

Appendix C

SITE-SPECIFIC FILE (SITE.DFT)

NUMBER OF SITES

6

ASSIGN PLANT LETTER CODE TO PLANT NAME FOR SITES

'K' 'K-25'
'P' 'PADU'
'X' 'X-10'
'Y' 'Y-12'
'S' 'SITE'
'O' 'OHIO'

NUCLIDES AVAILABLE:

H-3 C-11/14 NA-22/24 P-32 CO-57/58/60 SR-85/89/90 TC-99/99M CS-134/137
I-125/129/131/135 PM-147 TL-201 EU-152/154/155 RA-226/228
TH-228/232 U-234/235/236/238/ PU-238/239/241 AM-241 TPU CM-242/244

NUMBER OF NUCLIDES AT SITE

40

NUCLIDES (IN QUOTES) - DIRECT-ACCESS POINTER (OR 0) - DRS FILE EXISTS (1)

'H-3'	1	0
'C-11'	94	0
'C-14'	187	0
'NA-22'	280	0
'NA-24'	381	0
'P-32'	482	0
'CO-57'	616	1
'CO-58'	779	0
'CO-60'	842	1
'SR-85'	1105	0
'SR-89'	1261	1
'SR-90'	1417	1
'TC-99'	1573	0
'TC-99M'	1707	0
'CS-134'	1841	1
'CS-137'	1942	1
'I-125'	2043	1
'I-129'	2153	1
'I-131'	2263	0
'I-135'	2373	0
'PM-147'	2483	0
'EU-152'	2616	0
'EU-154'	2724	0
'EU-155'	2832	0
'TL-201'	2940	0
'RA-226'	3041	0
'RA-228'	3165	0
'TH-228'	3279	0
'TH-232'	3412	0
'U-234'	3545	1
'U-235'	3729	1
'U-236'	3913	1
'U-238'	4097	1
'PU-238'	4281	1
'PU-239'	4467	1
'PU-241'	4653	1
'AM-241'	4839	1
'TPU'	4975	1
'CM-242'	5111	0
'CM-244'	5247	1

DEFAULT VALUE FOR AMAD

1.00

URINE EXCRETION (ml/day)

1400.00

VOLUME OF URINE ANALYZED (VOLUME OF ALIQUOT) (ml/sample)

20.00

FECAL EXCRETION (grams/day)
135.00
MASS OF FECAL SAMPLE ANALYZED (grams/sample)
20.00
BREATH EXCRETION (L/day)
20000.00
VOLUME OF BREATH SAMPLE ANALYZED (L/sample)
20.00
IF INCIDENT DATE (AND TIME) MISSING, INTEGER NUMBER OF DAYS SINCE INCIDENT
1
RMDALC - RATIO OF MDA TO LC (LOWER CRITICAL LIMIT)
1.0
TRESHOLD FOR INTAKE - IF INTAKE IS $> 0.01 * TRESHI * ALI$, SET FLAG
2.00
TRESHOLD FOR AEDE - IF AEDE IS $> TRESHAD$ (mrem), SET FLAG
1.00
ANNUAL DOSE: NONE(-1), EFFECTIVE DOSE ONLY (0), EFFECTIVE/ORGAN DOSES (1)
1

Appendix D

DOSE-RATE FILE CONTROL TABLE (DRS.TAB)

```

DOSE-RATE BINARY FILE CONTROL TABLE - 05/03/81
ORGANS: OVARIES, BREAST, LUNGS, RED MAR, BONE SUR, THYROID, REMAIN, EFFECTIVE
18      NUMBER OF NUCLIDE DOSE-RATE FILES
'CO-57'      4
  2 2
'W' 'Y' 'S' 'I'
'CO-60'      4
  2 2
'W' 'Y' 'S' 'I'
'SR-89'      4
  2 2
'D' 'Y' 'S' 'I'
'SR-90'      4
  2 2
'D' 'Y' 'S' 'I'
'I-125'      2
  1 1
'D' 'S'
'I-129'      2
  1 1
'D' 'S'
'CS-134'     2
  1 1
'D' 'S'
'CS-137'     2
  1 1
'D' 'S'
'U-234'      5
  3 2
'D' 'W' 'Y' 'S' 'I'
'U-235'      5
  3 2
'D' 'W' 'Y' 'S' 'I'
'U-236'      5
  3 2
'D' 'W' 'Y' 'S' 'I'
'U-238'      5
  3 2
'D' 'W' 'Y' 'S' 'I'
'PU-238'     5
  2 3
'W' 'Y' 'S' 'I' 'V'
'PU-239'     5
  2 3
'W' 'Y' 'S' 'I' 'V'
'PU-241'     5
  2 3
'W' 'Y' 'S' 'I' 'V'
'AM-241'     2
  1 1
'W' 'S'
'TPU'        2
  1 1
'W' 'S'
'CM-244'     2
  1 1
'W' 'S'

```

Appendix E

DOSEXPRT EXAMPLES—INCIDENT EXPOSURE

The input file (INCIDENT.DAT) for the incident exposure examples is given in Appendix I. To run all these example problems, use the SITE.DFT file shown in Appendix C, but set NDAYS to 10 and set annual dose calculation parameter to *-1*. In all cases the incidents occurred in 1989. The user should use a measurement window and an intake window starting in 1989 with a duration of 1 year. The example output is listed in Appendices J and K.

The first example is inhalation exposure to tritium, taken from a publication of Snyder et al.¹⁵ Note that only the first 119 days of incident data are used in this example. The additional excretion data should increase the result by only a few percent.

Example 1 (BADGE = -10) Nuclide H-3	<u>Literature</u>	<u>DOSEXPRT Results</u>
Urinalysis	86 mCi	70 mCi

The next three incident exposure examples are taken from NUREG/CR-4884 (ref. 16). The intakes given for the examples in NUREG/CR-4884 are compared with our results in this table:

	NUREG/CR-4884	<u>DOSEXPRT Results</u>
Example 2 (BADGE = -20) Nuclide I-131		
Urinalysis	4.99 x 10 ⁶ Bq	5.15 x 10 ⁶ Bq
<i>In vivo</i> assay	1.34 x 10 ⁷ Bq	1.37 x 10 ⁷ Bq
Example 3 (BADGE = -31, -32, -33) Nuclide U-238		
Individual 1 (Urinalysis)	136 Bq	175 Bq
Individual 2 (Urinalysis)	260 Bq	289 Bq
Individual 3 (Urinalysis)	21 Bq	18 Bq
Example 4 (BADGE = -41, -42) Nuclide Cs-137		
Individual 1 (WBL assay)	878 Bq	939 Bq
Individual 2 (WBL assay)	2240 Bq	2400 Bq

(The results for Example 3 were converted from μg to Bq. Example 4 was also run as a routine case to compare the routine results with those obtained for the incident case above. For routine, we obtain 238 Bq for Individual 1 and 608 Bq for Individual 2. We would expect that the routine results would be less than the incident results and of the order of those obtained here.)

Differences between the DOSEXPRT results and those in NUREG/CR-4884 are probably because of weighting of the individual measurements in NUREG/CR-4884.

DOSEXPRT uses uniform weighting of the bioassay measurements.

EXAMPLE 5 (BADGE = -50) is the same as EXAMPLE 1 (an I-131 incident) except that some of the information is missing on the records. DOSEXPRT uses default values from the SITE.DFT file and from the nuclide files to fill in the missing information. Note that the time between the first measurement and the incident date (in the SITE.DFT file) must be set to 10 days to execute this example.

EXAMPLE 6 (BADGE = -60) is a Tc-99 ingestion incident (urinalysis) from ref. 17 (Table 2, page 1433). Because the table gives percent administered dose excreted per day, we assign units of Bq/day to percent values and obtain an estimated intake of 100 Bq.

	<u>Literature</u>	<u>DOSEXPRT Results</u>
Estimated intake:	100 Bq	130 Bq

EXAMPLE 7 (BADGE = -70) is a Tc-99 injection incident (fecal) from ref. 17 (Fig 10, page 1433). Because the figure shows percent injected dose excreted per day, we assign units of Bq/day to percent values and obtain an estimated intake of 100 Bq.

	<u>Literature</u>	<u>DOSEXPRT Results</u>
Estimated intake:	100 Bq	82 Bq

EXAMPLE 8 (BADGE = -90) is a Sr-90 injection incident (urinalysis and fecal assay) from ref. 18 (individual SSL, Table 3, page 53). Because results are expressed in percent injected activity excreted per day, we assign units of Bq/day to the values and obtain an estimated intake of 100 Bq in each case.

	<u>Literature</u>	<u>DOSEXPRT Results</u>
Estimated intake (urinalysis):	100 Bq	41 Bq
Estimated intake (fecal assay):	100 Bq	66 Bq

EXAMPLE 9 (BADGE = -100) is a Pu-241 injection incident (urinalysis) from ref. 19 (interval 5-19 of Table 2, page 343). In DOSEXPRT we treated this as a class W inhalation incident. Because results are expressed as percent of injected amount excreted per day, we assign units of Bq/day and have an estimated intake of 100 Bq if uptake had been by injection as shown in the reference. The transfer of material from the lungs to the blood is 12% for class W inhalation of Pu-241. Thus, we would expect a result of 12 Bq for class W inhalation, which is what we obtained.

	<u>Literature</u>	<u>DOSEXPRT Results</u>
Estimated intake (injection):	100 Bq	
Estimated intake (inhalation): class W	12 Bq	12 Bq

EXAMPLE 10 (BADGE = -110) is a Pu-238 inhalation (class W) incident, fecal bioassay. The hand calculation, which was done by ORNL internal dosimetrist E. Brackett, assumed that the two fecal samples contained the total activity excreted for the first 3 days post intake. The retention function from NUREG/CR-4884 was used.

	<u>Hand Calculation</u>	<u>DOSEXPRT Results</u>
Estimated intake:	20 Bq	18 Bq
Committed effective dose:	200 mrem	194 mrem

Appendix F

DOSEXPRT EXAMPLES—ROUTINE EXPOSURE

The input file (ROUTINE.DAT) for the routine exposure examples is given in Appendix I. The output is listed in Appendices J and K. The routine examples were generated using an IBM PC-AT BASIC routine, PANELS. PANELS uses the same algorithms as DOSEXPRT but was coded independently of DOSEXPRT by Keith Eckerman. To run this example, use the SITE.DFT file in Appendix C with the annual dose calculations parameter set to 1. The user should enter a starting date of 1989 and duration of 1 year for both the measurement and intake windows.

The first of the routine examples (BADGE = -120) is exposure to I-131 at a uniform rate of 2000 Bq/day. Since the duration of the intake window is 1 year, the total intake should be 2000 Bq/day * 365 days or 7.3×10^5 Bq. This example assumes that the assay is thyroid count (THY) to test the thyroid retention algorithms in the code. In the tables shown here, the EXACT result is the total intake used in the PANELS program to generate the measurement values.

EXAMPLE 11 Nuclide: I-131
RESULTS

	Exact	DOSEXPRT
Estimated intake:	7.3×10^5 Bq	7.29×10^5 Bq

The rest of the routine examples are in sets, one for each inhalation class, and are routine exposure to either uniform or nonuniform intake rate of U-238. For all of these examples, the user is asked the starting date (1989) and duration (1 year) for both the measurement and intake windows. Each example assumes that the assay is lung count (LUN) to test the lung retention algorithms in the code.

The first of these (BADGE = -131, -132, -133) is routine exposure to U-238 at a uniform rate of 100 Bq/day. The total intake for a period of 1 year will be 100 Bq/day * 365 days or 3.65×10^4 .

EXAMPLE 12 Nuclide: U-238

Time	Intake Rate(Bq/day)	Lung Burden (Bq)		
		Class D	Class W	Class Y
100	100	22.35	884.7	1462
200	100	22.35	1121	2649
300	100	22.35	1186	3911
365	100	22.35	1200	4607

RESULTS

	Exact	DOSEXPRT
Estimated intake (for all classes):	3.65×10^4 Bq	3.65×10^4 Bq

The second set of routine examples (BADGE = -141, -142, -143) was developed by assigning constant but differing intake rates in four panels through the year.

EXAMPLE 13 Nuclide: U-238 Total Intake: 1.52×10^4 Bq

Time	Intake Rate(Bq/day)	Lung Burden (Bq)		
		Class D	Class W	Class Y
100	100	22.35	884.7	1462
200	1	0.22	245.3	1301
300	50	11.17	509.8	1907
365	1	0.22	221.3	1778

RESULTS

Exact

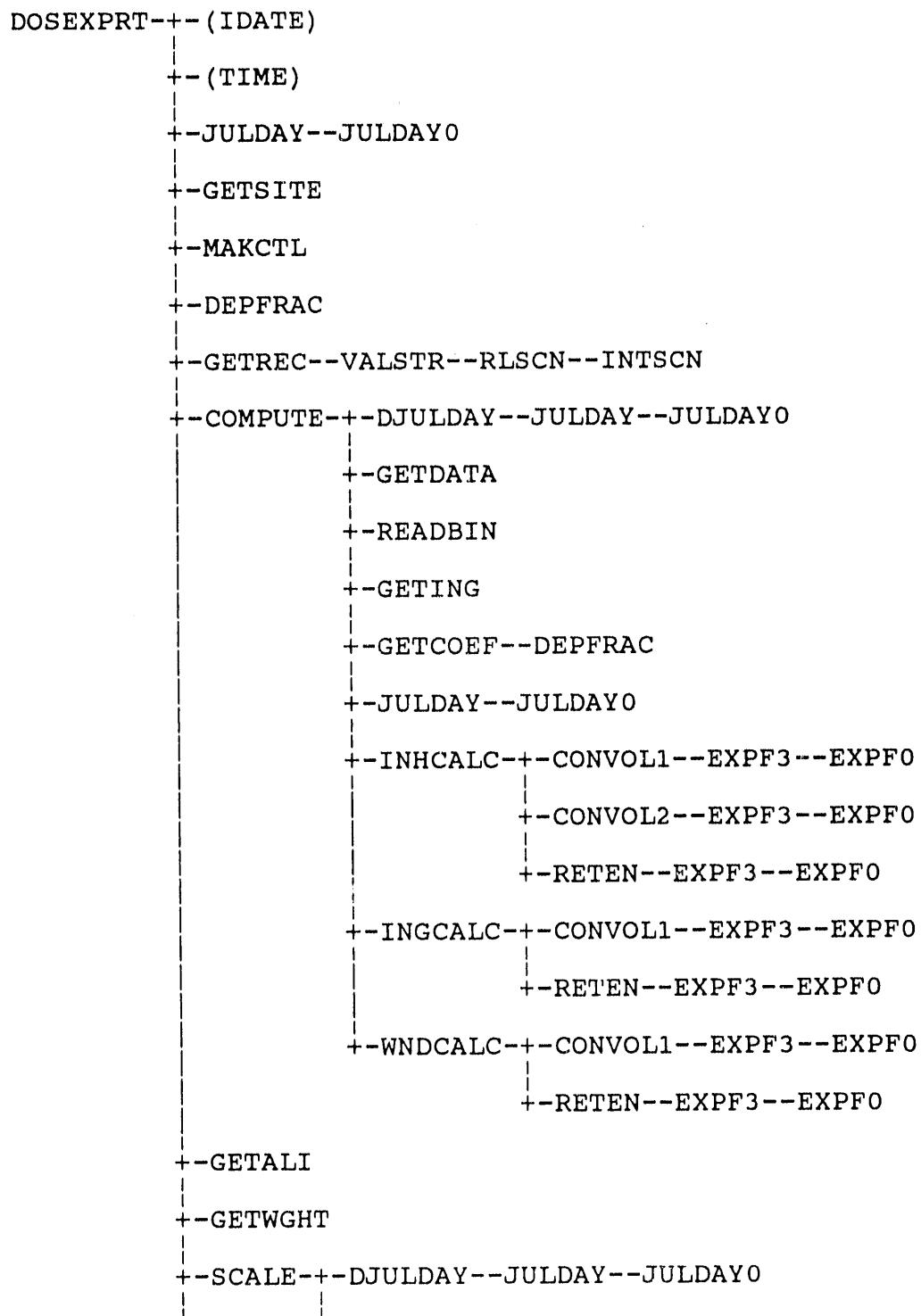
DOSEXPRT

Estimated intake (for all classes): 1.52×10^4 Bq 1.51×10^4 Bq

The last routine example (BADGE = -150) is exposure to U-238 with both a lung and whole body count. This example is provided to exhibit the assay averaging used to obtain the committed and annual effective dose (see report output listing).

Appendix G

FLOWCHART OF DOSEXPRT



```
+-JULDAY--JULDAYO
+-ANNUAL-+-DJULDAY--JULDAY--JULDAYO
+-JULDAYO
+-JULDAY--JULDAYO
+-SETUP
+-SPLIN
+-INTSPL--TERM
+-YEARS--JULDAY--JULDAYO
+-SIMPUN
+-INTSTR
```

Appendix H

LISTINGS OF NUCLIDE FILES

This appendix contains listings of the DOSEXPRT nuclide files. For evaluating 1990 and 1991 bioassay data, a total of 40 nuclide data files were used, which included the file TPU. The latter file was identical to the Am-241 nuclide data file. The nuclide data files all have extension NUC. The nuclide files are combined into the binary, direct-access file NUCLIDE.BIN.

3 H-3 File current as of: 05-18-90
 3.01604927 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 4.5108E+03 Half-life in days (from ICRP-38, 12.35 y x 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-Transfer function to inhalation class 'V' (VAPOR)
 'S'
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for inhalation
 'V' 0.0 1.0 0.0 0. 0.
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 1.0 0.0 0. 0.
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for injection (wound)
 0.0 1.0 0.0 0. 0.
 Assign classes T, N, U, to V (VAPOR)
 'V' 'V' 'V'
 Transfer rate per day from lung to blood; 0.9 with haltime of 0.01 d.
 'V' 1
 69.31472 62.383 0. 0.
 Transfer rate per day from lung to GI-Tract; 0.1 with haltime of 0.01 d.
 'V' 1
 69.31472 6.9315 0. 0.
 Transfer rate per day of ingested activity to blood (ICRP-30 GI Model)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI Model)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (Snyder et al, Phys. Med. Biol., 13, 547-559, 1968).
 2
 7.967E-2 0.03504
 2.039E-2 0.00055
 Fecal excretion function
 0
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'V' 1
 69.31472 1.0 0. 0.
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic burden (Snyder et al, Phys. Med. Biol., 13, 547-559, 1968)
 2
 7.967E-2 0.94256
 2.039E-2 0.05744
 Retention at wound site,
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30, NUREG/CR-1962)
 'V' 8
 1.73E-11 0. 0. 'Gonads'

1.73E-11	0.	0.	'Breast'
1.73E-11	0.	0.	'Lung'
1.73E-11	0.	0.	'R Marrow'
1.73E-11	0.	0.	'B Surface'
1.73E-11	0.	0.	'Thyroid'
1.73E-11	0.	0.	'Remainder'
1.73E-11	0.	0.	'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30,NUREG/CR-1962)

'S' 1.0 8

1.73E-11 Gonads

1.73E-11 Breast

1.73E-11 Lung

1.73E-11 R. Marrow

1.73E-11 B. Surface

1.73E-11 Thyroid

1.73E-11 Remainder

1.73E-11 Effective

ALI (Bq) (from ICRP-30)

Inhalation ALI

'V' 3.0E+09

Ingestion ALI

'S' 1.0 3.0E+09

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE RATE FILE FOR NUCLIDE

0

C-11 File current as of: 01-22-811
 11.0114333 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 0.01415278 Half-life in days (from ICRP-38, 20.38 m * d/1440 m)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-Transfer function to inhalation class 'L' (Labelled compounds)
 'S'
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for inhalation
 'L' 0.1 0.45 0.0 0.45 0.0
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for ingestion
 'S' 0.1 0.45 0.0 0.45 0.0
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for injection (wound)
 0.1 0.45 0.0 0.45 0.0
 Assign classes T, N, U, to L (Labelled compounds)
 'L' 'L' 'L'
 Transfer rate per day from lung to blood; 0.9 with halftime of 0.01 d.
 'L' 1
 69.31472 62.383 0. 0.
 Transfer rate per day from lung to GI-Tract; 0.1 with halftime of 0.01 d.
 'L' 1
 69.31472 6.9315 0. 0.
 Transfer rate per day of ingested activity to blood (ICRP-30 GI Model)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI Model)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function $E_u(t) = -0.45 d R(t)/dt$; $R(t) = \exp(-0.693 t/40)$
 1
 1.732868E-02 7.797906E-03
 Fecal excretion function
 1
 1.732868E-02 1.732868E-03
 Breath excretion function $E_b(t) = -0.45 d R(t)/dt$; $R(t) = \exp(-0.693 t/40)$
 1
 1.732868E-02 7.797906E-03
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'L' 1
 69.31472 1.0 0. 0.
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic burden: $R(t) = \exp(-0.693t/40)$
 1
 1.732868E-02 1.0
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)
 'L' 8
 3.41E-12 0. 0. 'Gonads'

2.98E-12	0.	0.	'Breast'
3.09E-12	0.	0.	'Lung'
3.18E-12	0.	0.	'R. Marrow'
2.56E-12	0.	0.	'B. Surface'
2.97E-12	0.	0.	'Thyroid'
3.54E-12	0.	0.	'Remainder'
3.28E-12	0.	0.	'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30, NUREG/CR-1962)

'S'	1.0	8
3.41E-12	'Gonads'	
2.98E-12	'Breast'	
3.09E-12	'Lung'	
3.18E-12	'R. Marrow'	
2.56E-12	'B. Surface'	
2.97E-12	'Thyroid'	
3.54E-12	'Remainder'	
3.28E-12	'Effective'	

ALI (Bq) (from ICRP-30)

Inhalation ALI

'C' 2.0E+10

Ingestion ALI

'S' 1.0 2.0E+10

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE RATE FILE FOR NUCLIDE

0

C-14 File current as of: 01-22-911
 14.003241982 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 2.0929E+06 Half-life in days (from ICRP-38, 5730 y x 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-Transfer function to inhalation class 'L' (Labelled compounds)
 'S'
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for inhalation
 'L' 0.5 0.5 0.0 0.0 0.0
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for ingestion
 'S' 0.5 0.5 0.0 0.0 0.0
 Weights for each assay (BRE,urine, fecal, WBC, LUN) for injection (wound)
 0.5 0.5 0.0 0.0 0.0
 Assign classes T, N, U, to L (Labelled compounds)
 'L' 'L' 'L'
 Transfer rate per day from lung to blood; 0.9 with halftime of 0.01 d.
 'L' 1
 69.31472 62.383 0. 0.
 Transfer rate per day from lung to GI-Tract; 0.1 with halftime of 0.01 d.
 'L' 1
 69.31472 6.9315 0. 0.
 Transfer rate per day of ingested activity to blood (ICRP-30 GI Model)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI Model)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function $E_u(t) = -0.45 \text{ d } R(t)/dt$; $R(t) = \exp(-0.693 t/40)$
 1
 1.732868E-02 7.797906E-03
 Fecal excretion function
 1
 1.732868E-02 1.732868E-03
 Breath excretion function $E_b(t) = -0.45 \text{ d } R(t)/dt$; $R(t) = \exp(-0.693 t/40)$
 1
 1.732868E-02 7.797906E-03
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'L' 1
 69.31472 1.0 0. 0.
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic burden; $R(t) = \exp(-0.693t/40)$
 1
 1.732868E-02 1.0
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30, NUREG/CR-1962)
 'L' 8
 5.64E-10 0. 0. 'Gonads'

5.64E-10	0.	0.	'Breast'
5.64E-10	0.	0.	'Lung'
5.64E-10	0.	0.	'R. Marrow'
5.64E-10	0.	0.	'B. Surface'
5.64E-10	0.	0.	'Thyroid'
5.64E-10	0.	0.	'Remainder'
5.64E-10	0.	0.	'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30, NUREG/CR-1862)

'S' 1.0 8

5.64E-10			'Gonads'
5.64E-10			'Breast'
5.64E-10			'Lung'
5.64E-10			'R. Marrow'
5.64E-10			'B. Surface'
5.64E-10			'Thyroid'
5.64E-10			'Remainder'
5.64E-10			'Effective'

ALI (Bq) (from ICRP-30)

Inhalation ALI

'C' 9.0E+07

Ingestion ALI

'S' 1.0 9.0E+07

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE RATE FILE FOR NUCLIDE

0

Na-22 File current as of: 01-04-91
 21.9944341 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-45)
 950.38 Half-life in days (ICRP-38, 2,602 y * 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation class 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.3 0.1 0.6 0.
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function = .75 * -dR(t)/dt
 2
 6.93147E-02 5.18301E-02
 1.38629E-03 3.11916E-06
 Fecal excretion function = .02 * -dR(t)/dt
 2
 6.93147E-02 1.38214E-03
 1.38629E-03 8.31777E-08
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic activity (ICRP-30
 2

6.95147E-02 9.97000E-01
 1.38628E-03 3.00000E-03

Retention at wound site

1

.25 1.

H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)

'D' 8

2.77E-09	2.88E-09	2.83E-09	'Gonads'
2.58E-09	2.47E-09	2.71E-09	'Breast'
2.47E-09	2.47E-09	6.13E-09	'Lung'
4.28E-09	4.44E-09	4.37E-09	'R. Marrow'
5.50E-09	5.70E-09	5.62E-09	'B. Surface'
2.45E-09	2.80E-09	2.62E-09	'Thyroid'
3.14E-09	3.19E-09	3.23E-09	'Remainder'
3.07E-09	3.13E-09	3.59E-09	'Effective'

H/I Dose per unit intake for ingested activity, f1=0.95, (ICRP-30,NUREG/CR-1962)

'S' 0.95 8

2.81E-09	Gonads
2.58E-09	Breast
2.51E-09	Lung
4.28E-09	R. Marrow
5.54E-09	B. Surface
2.50E-09	Thyroid
3.18E-09	Remainder
3.10E-09	Effective

ALI (Bq) (from ICRP-30)

Inhalation ALI

'D' 2.0E+07

Ingestion ALI

'S' 0.95 2.0E+07

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

Na-24 File current as of: 01-04-91
 23.9909614 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-45)
 0.625 Half-life in days (ICRP-30, 15 h * d/24 h)
 If assimilation path is unknown assign this other pathway ('H', 'G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation class 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound),
 0.0 0.3 0.1 0.6 0.
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function = .75 * -dR(t)/dt
 2
 6.93147E-02 5.18301E-02
 1.38629E-03 3.11916E-06
 Fecal excretion function = .02 * -dR(t)/dt
 2
 6.93147E-02 1.38214E-03
 1.38629E-03 8.31777E-08
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic activity (ICRP-30
 2

6.93147E-02 9.97000E-01
 1.38629E-03 3.00000E-03
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NURFG/CR-1962)
 'D' 8
 3.44E-10 3.34E-10 1.92E-10 'Gonads '
 2.68E-10 2.82E-10 2.32E-10 'Breast '
 2.50E-10 4.69E-10 4.55E-09 'Lung '
 3.76E-10 3.73E-10 2.81E-10 'R. Marrow '
 4.64E-10 4.84E-10 3.20E-10 'B. Surface '
 2.60E-10 2.68E-10 2.14E-10 'Thyroid '
 4.14E-10 3.27E-10 3.39E-10 'Remainder '
 3.47E-10 3.47E-10 7.80E-10 'Effective '
 H/I Dose per unit intake for ingested activity, f1=0.95, (ICRP-30,NUREG/CR-1962)
 'S' 0.95 8
 3.43E-10 Gonads
 2.71E-10 Breast
 2.60E-10 Lung
 3.74E-10 R. Marrow
 4.68E-10 B. Surface
 2.60E-10 Thyroid
 5.31E-10 Remainder
 3.84E-10 Effective
 ALI (Bq) (from ICRP-30)
 Inhalation ALI
 'D' 2.0E+08
 Ingestion ALI
 'S' 0.95 1.0E+08
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

P-32 File current as of: 05-18-90
 31.9739068 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 14. Half-life in days (ICRP-38)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 2
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (D & W)
 'S' 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.7 0.1 0.19 0.01
 'W' 0.0 0.6 0.2 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.7 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.7 0.1 0.19 0.01
 Assign classes T, N, U, to D
 'D' 'W' 'D'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -1.3752040D+02
 1.3835D+00 0.000000D+00 0.000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.000000D+00
 1.3863D-02 0.000000D+00 0.000000D+00 -3.4449415D-01
 1.3835D-02 0.000000D+00 0.000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.000000D+00 0.000000D+00
 3.4657D+00 0.000000D+00 1.7328680D-01 0.000000D+00
 'W' 4
 3.4657D+00 0.000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 3.4657359D-01
 1.3863D-02 0.000000D+00 0.000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI Model)
 'S' 0.800000 2
 2.400000D+01 9.600000D+01
 3.000000D+01 -9.600000D+01
 Transfer rate per day of ingested activity to feces. (ICRP-30 GI Model)
 'S' 0.800000 4
 2.400000D+01 8.460635D-02
 3.000000D+01 -5.282465D-02
 1.800000D+00 -5.175388D-01
 1.000000D+00 4.857571D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ($f_u=0.9 \times$ Differential of R(t) of ICRP-30)
 4
 1.386294D+00 1.871497E-01
 3.465736E-01 4.678744E-02
 3.648143E-02 1.313331E-02
 6.931472E-07 1.882750E-07
 Fecal excretion function ($f_f=0.1 \times$ Differential of R(t) of ICRP-30)
 4
 1.386294D+00 2.079441E-02
 3.465736E-01 5.198604E-03
 3.648143E-02 1.459257E-03
 6.931472E-07 2.079442E-08
 Breath elimination
 0

Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02

'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

Retention of ingested activity within GI-Tract (ICRP-30 GI Model)

'S' 0.800000 4
 2.400000D+01 4.003525D+00
 3.000000D+01 -3.201761D+00
 1.800000D+00 -2.875216D-01
 1.000000D+00 4.857571D-01

Retention of systemic activity (R(t) from ICRP-30, Part 2)

4
 1.386294D+00 0.15
 3.465736E-01 0.15
 3.648143E-02 0.40
 6.931472E-07 0.30

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (Sv/Bq) FOR INHALATION (ICRP-30, EPA-520/1-88-020)

'D' 8
 7.41E-10 7.85E-10 7.92E-10 'Gonads'
 7.41E-10 7.85E-10 7.92E-10 'Breast'
 7.50E-10 9.37E-10 8.80E-09 'Lung'
 9.15E-09 9.70E-09 9.79E-09 'R Marrow'
 8.91E-09 9.44E-09 9.53E-09 'B Surface'
 7.41E-10 7.85E-10 7.92E-10 'Thyroid'
 1.75E-09 9.00E-10 7.92E-10 'Remainder'
 2.30E-09 2.17E-09 3.09E-09 'Effective'

'W' 8
 6.63E-10 7.16E-10 3.24E-10 'Gonads'
 6.63E-10 7.16E-10 3.24E-10 'Breast'
 8.53E-10 3.20E-09 1.00E-07 'Lung'
 8.20E-09 8.86E-09 4.00E-09 'R Marrow'
 7.96E-09 8.61E-09 3.89E-09 'B Surface'
 6.63E-10 7.16E-10 3.24E-10 'Thyroid'
 2.42E-09 1.71E-09 1.25E-09 'Remainder'
 2.34E-09 2.53E-09 1.32E-08 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.8 (ICRP-30, EPA-520/1-88-020)

'S' 0.8 8
 6.55E-10 Gonads
 6.55E-10 Breast
 6.55E-10 Lung
 8.09E-09 R. Marrow
 7.87E-09 B. Surface
 6.55E-10 Thyroid
 2.67E-09 Remainder
 2.37E-09 Effective

ALI(Bq) (from ICRP 30, Part 2)

Inhalation
 'D' 3.0E+7
 'W' 1.0E+7

Ingestion
 'S' 0.80 2.0E+7

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

Co-57 File current as of: 05-18-90
56.9362937 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
270.9 Half-life in days (from ICRP-38)
IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
'H'
ASSIGN ASSAY WBL TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
'WBC' 'WBC' 'WBC'
NUMBER OF CLEARANCE CLASSES
2
NUMBER OF GI TRANSFER FUNCTIONS
2
Number of specific organs for systemic activity
0
ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
'I' 'I'
WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
'W' 0.0 0.30 0.10 0.40 0.20
'Y' 0.0 0.10 0.30 0.20 0.40
WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
'S' 0.0 0.39 0.10 0.50 0.01
'I' 0.0 0.39 0.10 0.50 0.01
WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
0.0 0.39 0.10 0.50 0.01
ASSIGN CLASSES T,N,U TO D,W,OR Y
'W' 'Y' 'Y'
Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
'W' 3
6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
'Y' 3
6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
'W' 4
3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
'Y' 4
3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
'S' 0.300000 2
2.400000D+01 -4.000000D+00
8.571429D+00 4.000000D+00
'I' 0.050000 2
2.400000D+01 -4.285714D-01
6.315789D+00 4.285714D-01
Transfer rate per day of ingested activity to feces
'S' 0.300000 4
2.400000D+01 -3.290247D-02
8.571429D+00 3.768099D-01
1.800000D+00 -2.155320D+00
1.000000D+00 1.860541D+00
'I' 0.050000 4
2.400000D+01 -2.870572D-02
6.315789D+00 6.105874D-01
1.800000D+00 -3.231903D+00
1.000000D+00 2.650022D+00
Transfer rate per day from wound to blood
1
.25 .25
Urinary excretion function (ICRP-54, p. 59)
4
1.386294 0.49

0.1155245 0.024
 0.01155245 0.00081
 8.664339E-04 6.1E-5

Fecal excretion function (ICRP-54, p. 60)

4
 1.386294 0.21
 0.1155245 0.01
 0.01155245 0.00035
 8.664339E-04 2.6E-5

Breath excretion function

0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)

'S' 0.300000 4
 2.400000D+01 -1.680376D-01
 8.571429D+00 5.048961D-01
 1.800000D+00 -1.197400D+00
 1.000000D+00 1.860541D+00

'I' 0.050000 4
 2.400000D+01 -1.905321D-02
 6.315789D+00 1.645335D-01
 1.800000D+00 -1.795502D+00
 1.000000D+00 2.650022D+00

Retention of systemic activity (ICRP-54 p. 59)

4
 1.386294 0.5
 0.1155245 0.3
 0.01155245 0.1
 8.664339E-04 0.1

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)

'W' 8 5.0E-02
 2.28E-10 3.87E-10 2.54E-10 'Gonads'
 8.32E-11 2.73E-10 4.37E-10 'Breast'
 1.35E-10 5.06E-10 1.59E-08 'Lung'
 1.52E-10 4.44E-10 6.91E-10 'R Marrow'
 1.12E-10 3.69E-10 5.36E-10 'B Surface'
 5.65E-11 1.98E-10 3.21E-10 'Thyroid'
 4.27E-10 6.12E-10 9.13E-10 'Remainder'
 2.37E-10 4.52E-10 2.42E-09 'Effective'

'Y' 8 5.0E-02
 1.86E-10 1.86E-10 2.13E-10 'Gonads'
 5.00E-11 4.69E-11 1.43E-09 'Breast'
 0.00E+00 0.00E+00 6.76E-08 'Lung'
 9.80E-11 7.35E-11 2.21E-09 'R Marrow'
 6.03E-11 5.65E-11 1.72E-09 'B Surface'
 2.71E-11 3.39E-11 1.04E-09 'Thyroid'
 2.96E-10 3.05E-10 2.84E-09 'Remainder'
 1.57E-10 1.57E-10 9.58E-09 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.3 & 0.05 (ICRP-30, NUREG/CR-1962)

'S' 0.300 8
 2.94E-10 Gonads

1.58E-10	Breast
1.63E-10	Lung
2.67E-10	R. Marrow
2.12E-10	B. Surface
1.15E-10	Thyroid
5.39E-10	Remainder
3.20E-10	Effective
'I' 0.05	8
1.83E-10	Gonads
4.10E-11	Breast
2.89E-11	Lung
8.84E-11	R. Marrow
4.92E-11	B. Surface
1.93E-11	Thyroid
4.42E-10	Remainder
2.01E-10	Effective

ALI(Bq) (from ICRP-30)

Inhalation

'W' 1.0E+8

'Y' 2.0E+7

Ingestion

'S' 0.30 2.0E+8

'I' 0.05 3.0E+8

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

1

Co-58File current as of: 05-18-90
57.9357550 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
71. Half-life in days (from ICRP-38)
IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
'H'
ASSIGN ASSAY WBL TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
'WBC' 'WBC' 'WBC'
NUMBER OF CLEARANCE CLASSES
2
NUMBER OF GI TRANSFER FUNCTIONS
2
Number of specific organs for systemic activity
0
ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
'f' 'I'
WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
'W' 0.0 0.30 0.10 0.40 0.20
'Y' 0.0 0.10 0.30 0.20 0.40
WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
'S' 0.0 0.39 0.10 0.50 0.01
'I' 0.0 0.39 0.10 0.50 0.01
WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
0.0 0.39 0.10 0.50 0.01
ASSIGN CLASSES T,N,U TO D,W,OR Y
'W' 'Y' 'Y'
Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
'W' 3
6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
'Y' 3
6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
'W' 4
3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
'Y' 4
3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
'S' 0.300000 2
2.400000D+01 -4.000000D+00
8.571429D+00 4.000000D+00
'I' 0.050000 2
2.400000D+01 -4.285714D-01
6.315789D+00 4.285714D-01
Transfer rate per day of ingested activity to feces
'S' 0.300000 4
2.400000D+01 -3.290247D-02
8.571429D+00 3.276809D-01
1.800000D+00 -2.155320D+00
1.000000D+00 1.860541D+00
'I' 0.050000 4
2.400000D+01 -2.870572D-02
6.315789D+00 6.105874D-01
1.800000D+00 -3.231903D+00
1.000000D+00 2.650022D+00
Transfer rate per day from wound to blood
1
.25 .25
Urinary excretion function (ICRP-54, p. 59)
4
1.386294 0.49

0.1155245 0.024
 0.01155245 0.00081
 8.664339E-04 6.1E-5

Fecal excretion function (ICRP-54, p. 60)

4
 1.386294 0.21
 0.1155245 0.01
 0.01155245 0.00035
 8.664339E-04 2.6E-5

Breath excretion function

0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)

'S' 0.300000 4
 2.400000D+01 -1.680376D-01
 8.571429D+00 5.048961D-01
 1.800000D+00 -1.197400D+00
 1.000000D+00 1.860541D+00

'I' 0.050000 4
 2.400000D+01 -1.905321D-02
 6.315789D+00 1.645335D-01
 1.800000D+00 -1.795502D+00
 1.000000D+00 2.650022D+00

Retention of systemic activity (ICRP-54 p. 59)

4
 1.386294 0.5
 0.1155245 0.3
 0.01155245 0.1
 8.664339E-04 0.1

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)

'W' 8 5.0E-02
 1.04E-09 1.14E-09 9.91E-10 'Gonads'
 2.85E-10 6.87E-10 1.88E-09 'Breast'
 2.65E-10 9.92E-10 3.11E-08 'Lung'
 3.59E-10 7.91E-10 1.85E-09 'R Marrow'
 2.39E-10 6.57E-10 1.41E-09 'B Surface'
 1.84E-10 6.21E-10 1.79E-09 'Thyroid'
 1.33E-09 1.57E-09 3.28E-09 'Remainder'
 7.91E-10 1.11E-09 5.57E-09 'Effective'

'Y' 8 5.0E-02
 1.03E-09 1.08E-09 8.88E-10 'Gonads'
 1.87E-10 2.34E-10 3.45E-09 'Breast'
 0.00E+00 0.00E+00 6.40E-08 'Lung'
 2.77E-10 2.31E-10 3.29E-09 'R Marrow'
 1.39E-10 1.73E-10 2.55E-09 'B Surface'
 8.72E-11 1.09E-10 3.35E-09 'Thyroid'
 9.31E-10 9.19E-10 6.13E-09 'Remainder'
 6.04E-10 6.17E-10 1.08E-08 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.3 & 0.05 (ICRP-30, NUREG/CR-1962)

'S' 3.0E-01 8
 1.08E-09 Gonads

4.50E-10 Breast
4.05E-10 Lung
5.40E-10 R. Marrow
4.07E-10 B. Surface
3.64E-10 Thyroid
1.65E-09 Remainder
9.68E-10 Effective
'I' 0.050 8
1.04E-09 Gonads
1.79E-10 Breast
8.53E-11 Lung
2.60E-10 R. Marrow
1.25E-10 B. Surface
6.31E-11 Thyroid
1.58E-09 Remainder
8.09E-10 Effective
ALI(Bq) (from ICRP-30)
Inhalation
'W' 4.0E+7
'Y' 3.0E+7
Ingestion
'S' 0.30 5.0E+7
'I' 0.05 6.0E+7
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
0

Co-60 File current as of: 05-18-90
59.9338196 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
1.925232E+03 Half-life in days (from ICRP-38 365.25 d/y)
IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
'H'
ASSIGN ASSAY WBL TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
'WBC' 'WBC' 'WBC'
NUMBER OF CLEARANCE CLASSES
2
NUMBER OF GI TRANSFER FUNCTIONS
2
Number of specific organs for systemic activity
0
ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
'I' 'I'
WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
'W' 0.0 0.30 0.10 0.40 0.20
'Y' 0.0 0.10 0.30 0.20 0.40
WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
'S' 0.0 0.39 0.10 0.50 0.01
'I' 0.0 0.39 0.10 0.50 0.01
WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
0.0 0.39 0.10 0.50 0.01
ASSIGN CLASSES T,N,U TO D,W,OR Y
'W' 'Y' 'Y'
Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
'W' 3
6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
'Y' 3
6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
'W' 4
3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
'Y' 4
3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
'S' 0.300000 2
2.400000D+01 -4.000000D+00
8.571429D+00 4.000000D+00
'I' 0.050000 2
2.400000D+01 -4.285714D-01
6.315789D+00 4.285714D-01
Transfer rate per day of ingested activity to feces
'S' 0.300000 4
2.400000D+01 -3.290247D-02
8.571429D+00 3.276809D-01
1.800000D+00 -2.155320D+00
1.000000D+00 1.860541D+00
'I' 0.050000 4
2.400000D+01 -2.870572D-02
6.315789D+00 6.105874D-01
1.800000D+00 -3.231903D+00
1.000000D+00 2.650022D+00
Transfer rate per day from wound to blood
1
.25 .25
Urinary excretion function (ICRP-54, p. 59)
4
1.386294 0.49

0.1155245 0.024
 0.01155245 0.00081
 8.664339E-04 6.1E-5

Fecal excretion function (ICRP-54, p. 60)

4
 1.386294 0.21
 0.1155245 0.01
 0.01155245 0.00035
 8.664339E-04 2.6E-5

Breath excretion function

0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)

'S' 0.300000 4
 2.400000D+J1 -1.680376D-01
 8.571429D+00 5.048961D-01
 1.800000D+00 -1.197400D+00
 1.000000D+00 1.860541D+00
 'I' 0.050000 4
 2.400000D+01 -1.905321D-02
 6.315789D+00 1.645335D-01
 1.800000D+00 -1.795502D+00
 1.000000D+00 2.650022D+00

Retention of systemic activity (ICRP-54 p. 59)

4
 1.386294 0.5
 0.1155245 0.3
 0.01155245 0.1
 8.664339E-04 0.1

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)

'W' 8 5.0E-02
 4.72E-09 1.06E-08 7.13E-09 'Gonads'
 2.63E-09 8.84E-09 1.06E-08 'Breast'
 2.38E-09 8.93E-09 1.37E-07 'Lung'
 2.83E-09 9.03E-09 1.07E-08 'R Marrow'
 2.36E-09 8.41E-09 8.64E-09 'B Surface'
 2.23E-09 8.37E-09 9.52E-09 'Thyroid'
 5.78E-09 1.44E-08 1.90E-08 'Remainder'
 4.07E-09 1.10E-08 2.74E-08 'Effective'
 'Y' 8 5.0E-02
 3.33E-09 3.57E-09 1.39E-08 'Gonads'
 1.23E-09 2.30E-09 7.14E-08 'Breast'
 0.00E+00 0.00E+00 1.38E-06 'Lung'
 1.72E-09 2.15E-09 6.60E-08 'R Marrow'
 9.00E-10 1.69E-09 5.24E-08 'B Surface'
 1.08E-09 0.00E+00 6.35E-08 'Thyroid'
 1.81E-09 2.27E-09 1.41E-07 'Remainder'
 1.82E-09 2.23E-09 2.34E-07 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.3 & 0.05 (ICRP-30, NUREG/CR-1962)

'S' 0.300 8
 7.23E-09 Gonads

5.08E-09 Breast
4.96E-09 Lung
5.49E-09 R. Marrow
4.81E-09 B. Surface
4.68E-09 Thyroid
1.06E-08 Remainder
7.28E-09 Effective
'I' 0.05 8
3.19E-09 Gonads
1.10E-09 Breast
8.77E-10 Lung
1.32E-09 R. Marrow
9.39E-10 B. Surface
7.88E-10 Thyroid
4.97E-09 Remainder
2.77E-09 Effective
ALI(Bq) (from ICRP-30)
Inhalation
'W' 6.0E+6
'Y' 1.0E+6
Ingestion
'S' 0.30 7.0E+6
'I' 0.05 2.0E+7
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
1

Sr-85 File current as of: 05-18-90
 84.912937 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A462 (1985), 1-54)
 65. Half-life in days (ICRP-38)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 2
 Number of GI transfer functions
 2
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (D & Y)
 'S' 'I'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.7 0.1 0.19 0.01
 'Y' 0.0 0.5 0.3 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.7 0.1 0.19 0.01
 'I' 0.0 0.5 0.2 0.29 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.7 0.1 0.19 0.01
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood (GI Model ICRP-30)
 'S' 0.300000 2
 2.400000D+01 -4.000000D+00
 8.571429D+00 4.000000D+00
 'I' 0.010000 2
 2.400000D+01 -8.108108D-02
 6.060606D+00 8.108108D-02
 Transfer rate per day of ingested activity to feces (GI Model ICRP-30)
 'S' 0.300000 4
 2.400000D+01 -3.290247D-02
 8.571429D+00 3.276809D-01
 1.800000D+00 -2.155320D+00
 1.000000D+00 1.860541D+00
 'I' 0.010000 4
 2.400000D+01 -2.829739D-02
 6.060606D+00 6.701211D-01
 1.800000D+00 -3.425474D+00
 1.000000D+00 2.783650D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 0.23105 0.13
 0.015753 0.0013
 0.00017329 0.000024

Fecal excretion function ICRP-54.

3
 0.23105 0.034
 0.015753 0.00032
 0.00017329 5.9E-6

Breath excretion function ICRP-54.

0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)

'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02
 'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.001800D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.151600D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI Tract (ICRP-30 GI Model)

'S' 0.300000 4
 2.400000D+01 -1.680376D-01
 8.571429D+00 5.048961D-01
 1.800000D+00 -1.197400D+00
 1.000000D+00 1.860541D+00
 'I' 0.010000 4
 2.400000D+01 -4.557436D-03
 6.060606D+00 1.239484D-01
 1.800000D+00 -1.903041D+00
 1.000000D+00 2.783650D+00

Retention of systemic activity (ICRP-30/54)

3
 0.23105 0.73
 0.015753 0.10
 0.000173 0.17

Retention at wound site

1
 .25 1.

H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30, NUREG/CR-1962)

'D' 8
 6.81E-10 7.22E-10 7.28E-10 'Gonads'
 4.71E-10 6.51E-10 7.14E-10 'Breast'
 4.35E-10 6.41E-10 1.14E-09 'Lung'
 1.17E-09 1.73E-09 1.73E-09 'R Marrow'
 1.29E-09 1.91E-09 1.92E-09 'B Surface'
 4.48E-10 6.81E-10 6.97E-10 'Thyroid'
 7.35E-10 7.58E-10 7.81E-10 'Remainder'
 7.06E-10 8.67E-10 9.46E-10 'Effective'

'Y' 8
 5.79E-10 5.85E-10 4.54E-10 'Gonads'
 7.75E-11 1.16E-10 1.73E-09 'Breast'
 0.00E+00 0.00E+00 2.86E-08 'Lung'
 1.39E-10 1.74E-10 1.64E-09 'R Marrow'
 7.00E-11 8.75E-11 1.29E-09 'B Surface'
 1.28E-11 0.00E+00 1.52E-09 'Thyroid'
 3.98E-10 4.26E-10 3.00E-09 'Remainder'
 2.95E-10 3.15E-10 4.99E-09 'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30, NUREG/CR-1962)

'S' 0.3 8
 6.25E-10 Gonads
 2.53E-10 Breast
 2.06E-10 Lung
 5.97E-10 R. Marrow
 6.06E-10 B. Surface
 2.05E-10 Thyroid
 7.31E-10 Remainder
 5.34E-10 Effective

'I' 0.01 8
5.82E-10 Gonads
7.34E-11 Breast
1.67E-11 Lung
1.30E-10 R. Marrow
5.69E-11 B. Surface
8.14E-12 Thyroid
7.56E-10 Remainder
4.03E-10 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 1.0E+08
'Y' 6.0E+07
Ingestion ALI
'S' 0.3 9.0E+07
'I' 0.01 1.0E+08
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
0

Sr-89 File current as of: 05-18-90
 88.907450 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 50.5 Half-life in days (ICRP-38)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 2
 Number of GI transfer functions
 2
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (D & Y)
 'S' 'I'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.7 0.1 0.19 0.01
 'Y' 0.0 0.5 0.3 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.7 0.1 0.19 0.01
 'I' 0.0 0.5 0.2 0.29 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.7 0.1 0.19 0.01
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood (GI Model ICRP-30)
 'S' 0.300000 2
 2.400000D+01 -4.000000D+00
 8.571429D+00 4.000000D+00
 'I' 0.010000 2
 2.400000D+01 -8.108108D-02
 6.060606D+00 8.108108D-02
 Transfer rate per day of ingested activity to feces (GI Model ICRP-30)
 'S' 0.300000 4
 2.400000D+01 -3.290247D-02
 8.571429D+00 3.276809D-01
 1.800000D+00 -2.155320D+00
 1.000000D+00 1.860541D+00
 'I' 0.010000 4
 2.400000D+01 -2.829739D-02
 6.060606D+00 6.701211D-01
 1.800000D+00 -3.425474D+00
 1.000000D+00 2.783650D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 0.23105 0.13
 0.015753 0.0013
 0.00017329 0.000024

Fecal excretion function ICRP-54.

3
 0.23105 0.034
 0.015753 0.00032
 0.0001/329 5.9E-6

Breath excretion function

0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)

'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02

'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.001600D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.151600D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract (ICRP-30 GI Model)

'S' 0.300000 4
 2.400000D+01 -1.680376D-01
 8.571429D+00 5.048961D-01
 1.800000D+00 -1.187400D+00
 1.000000D+00 1.860541D+00

'I' 0.310000 4
 2.400000D+01 -4.557436D-03
 6.060606D+00 1.239484D-01
 1.800000D+00 -1.903041D+00
 1.000000D+00 2.783650D+00

Retention of systemic activity (ICRP-30/54)

3
 0.23105 0.73
 0.015753 0.10
 0.000173 0.17

Retention at wound site

1
 .25 1.

H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)

'D' 8
 5.27E-10 7.80E-10 7.82E-10 'Gonads'
 5.27E-10 7.80E-10 7.82E-10 'Breast'
 5.04E-10 1.08E-09 7.69E-09 'Lung'
 7.13E-09 1.06E-08 1.06E-08 'R Marrow'
 1.06E-08 1.57E-08 1.57E-08 'B Surface'
 5.27E-10 7.80E-10 7.82E-10 'Thyroid'
 3.45E-09 1.06E-09 7.99E-10 'Remainder'
 2.50E-09 2.52E-09 3.24E-09 'Effective'

'Y' 8
 1.59E-11 1.59E-11 7.63E-12 'Gonads'
 1.59E-11 1.59E-11 7.64E-12 'Breast'
 0.00E+00 0.00E+00 3.34E-07 'Lung'
 2.14E-10 2.14E-10 1.03E-10 'R Marrow'
 3.18E-10 3.18E-10 1.53E-10 'B Surface'
 1.59E-11 1.59E-11 7.64E-12 'Thyroid'
 8.20E-09 7.93E-09 3.49E-09 'Remainder'
 2.50E-09 2.42E-09 4.11E-08 'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30,NUREG/CR-1962)

'S' 0.3 8
 2.40E-10 Gonads
 2.40E-10 Breast
 2.40E-10 Lung
 3.23E-09 R. Marrow
 4.81E-09 B. Surface
 2.40E-10 Thyroid
 6.11E-09 Remainder
 2.50E-09 Effective

'I' 0.01 8
8.05E-12 Gonads
7.98E-12 Breast
7.97E-12 Lung
1.08E-10 R. Marrow
1.61E-10 B. Surface
7.97E-12 Thyroid
8.25E-09 Remainder
2.50E-09 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 3.0E+07
'Y' 5.0E+06
Ingestion ALI
'S' 0.3 2.0E+07
'I' 0.01 2.0E+07
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
1

Sr-90File current as of: 05-18-90
 89.907738 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 1.0636E4 Half-life in days (ICRP-38, 29.12 y x 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 2
 Number of GI transfer functions
 2
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (D & Y)
 'S' 'I'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.7 0.1 0.19 0.01
 'Y' 0.0 0.5 0.3 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.7 0.1 0.19 0.01
 'I' 0.0 0.5 0.2 0.29 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.7 0.1 0.19 0.01
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood (GI Model ICRP-30)
 'S' 0.300000 2
 2.400000D+01 -4.000000D+00
 8.571429D+00 4.000000D+00
 'I' 0.010000 2
 2.400000D+01 -8.108108D-02
 6.060606D+00 8.108108D-02
 Transfer rate per day of ingested activity to feces (GI Model ICRP-30)
 'S' 0.300000 4
 2.400000D+01 -3.290247D-02
 8.571429D+00 3.276809D-01
 1.800000D+00 -2.155320D+00
 1.000000D+00 1.860541D+00
 'I' 0.010000 4
 2.400000D+01 -2.829739D-02
 6.060606D+00 6.701211D-01
 1.800000D+00 -3.425474D+00
 1.000000D+00 2.783650D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 0.23105 0.13
 0.015753 0.0013
 0.00017329 0.000024

Fecal excretion function ICRP-54.

3
 0.23105 0.034
 0.015753 0.00032
 0.00017329 5.8E-6

Breath excretion function ICRP-54.

0

Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)

'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02
 'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.001600D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.151800D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract (ICRP-30 GI Model)

'S' 0.300000 4
 2.400000D+01 -1.680376D-01
 8.571428D+00 5.048961D-01
 1.800000D+00 -1.197400D+00
 1.000000D+00 1.880541D+00
 'I' 0.010000 4
 2.400000D+01 -4.557436D-03
 6.060606D+00 1.239484D-01
 1.800000D+00 -1.903041D+00
 1.000000D+00 2.783650D+00

Retention of systemic activity (ICRP-30/54)

3
 0.23105 0.73
 0.015753 0.10
 0.000173 0.17

Retention at wound site

1
 .25 1.

H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30, NUREG/CR-1962)

'D' 8
 3.26E-09 4.95E-09 5.07E-09 'Gonads'
 3.26E-09 4.95E-09 5.07E-09 'Breast'
 3.23E-09 5.13E-09 9.40E-09 'Lung'
 4.14E-07 6.30E-07 6.45E-07 'R Marrow'
 8.97E-07 1.36E-06 1.40E-06 'B Surface'
 3.20E-09 4.95E-09 5.07E-09 'Thyroid'
 5.59E-09 5.09E-09 5.10E-09 'Remainder'
 8.01E-08 1.21E-07 1.24E-07 'Effective'
 'Y' 8
 9.86E-11 1.01E-10 9.25E-10 'Gonads'
 9.86E-11 1.01E-10 9.25E-10 'Breast'
 0.00E+00 0.00E+00 1.14E-05 'Lung'
 1.31E-08 1.23E-08 1.12E-07 'R Marrow'
 2.84E-08 2.66E-08 2.41E-07 'B Surface'
 9.86E-11 1.01E-10 9.25E-10 'Thyroid'
 7.95E-09 7.33E-09 1.10E-08 'Remainder'
 4.85E-09 4.52E-09 1.40E-06 'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30, NUREG/CR-1962)

'S' 0.3 8
 1.51E-09 Gonads
 1.51E-09 Breast
 1.51E-09 Lung
 1.94E-07 R. Marrow
 4.19E-07 B. Surface
 1.51E-09 Thyroid
 6.14E-09 Remainder
 3.85E-08 Effective

'I' 0.01 8
5.04E-11 Gonads
5.04E-11 Breast
5.04E-11 Lung
6.45E-09 R. Marrow
1.39E-08 B. Surface
5.04E-11 Thyroid
6.70E-09 Remainder
3.23E-09 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 7.0E+05
'Y' 1.0E+05
Ingestion ALI
'S' 0.3 1.0E+06
'I' 0.01 2.0E+07
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
1

To-99 File current as of: 05-18-90
 98.9062541 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 7.78E7 Half-life in days (ICRP-38, 2.13E+05 y x 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 2
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (D & W)
 'S' 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.7 0.1 0.19 0.01
 'W' 0.0 0.6 0.2 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.7 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.7 0.1 0.19 0.01
 Assign classes T, N, U, to D
 'D' 'W' 'W'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 8.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI Model)
 'S' 0.800000 2
 2.400000D+01 9.600000D+01
 3.000000D+01 -9.600000D+01
 Transfer rate per day of ingested activity to feces. (ICRP-30 GI Model)
 'S' 0.800000 4
 2.400000D+01 8.460635D-02
 3.000000D+01 -5.282465D-02
 1.800000D+00 -5.175388D-01
 1.000000D+00 4.857571D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ($f_u=0.3 \times$ Differential of R(t) of ICRP-30)
 4
 1.386294D+00 1.663553D-02
 4.332170D-01 2.357487D-02
 1.873371D-01 1.079062D-02
 3.150699D-02 4.538963D-04
 Fecal excretion function ($f_f=0.7 \times$ Differential of R(t) of ICRP-30)
 4
 1.386294D+00 3.881623D-02
 4.332170D-01 2.183414D-01
 1.873371D-01 2.517811D-02
 3.150699D-02 1.058625D-03
 Breath excretion function
 0

Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02

'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-01 -1.0160643D-01
 1.7329D+00 9.0000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 -2.4448394D+01
 1.3835D-02 0.0000000D+00 0.0000000D+00 2.5050000D+01

Retention of ingested activity within GI-Tract (ICRP-30 GI Model)

'S' 0.800000 4
 2.400000D+01 4.003525D+00
 3.000000D+01 -3.201761D+00
 1.800000D+00 -2.875216D-01
 1.000000D+00 4.857571D-01

Retention of systemic activity (R(t) from ICRP-30, Part 2)

4
 1.386294D+00 0.040
 4.332170D-01 0.720
 1.873371D-01 0.192
 3.150699D-02 0.048

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (Sv/Bq) FOR INHALATION (ICRP-30, EPA-520/1-88-020)

'D' 8
 6.78E-11 7.34E-11 7.59E-11 'Gonads'
 6.78E-11 7.34E-11 7.59E-11 'Breast'
 7.02E-11 1.32E-10 1.28E-09 'Lung'
 6.78E-11 7.34E-11 7.59E-11 'R Marrow'
 6.78E-11 7.34E-11 7.59E-11 'B Surface'
 1.81E-09 1.97E-09 2.03E-09 'Thyroid'
 9.62E-10 8.81E-10 8.76E-10 'Remainder'
 3.89E-10 3.79E-10 5.19E-10 'Effective'

'W' 8
 6.12E-11 6.98E-11 6.38E-11 'Gonads'
 6.12E-11 6.98E-11 6.38E-11 'Breast'
 0.00E+00 0.00E+00 6.68E-08 'Lung'
 6.12E-11 6.98E-11 6.38E-11 'R Marrow'
 6.12E-11 6.98E-11 6.38E-11 'B Surface'
 1.64E-09 1.87E-09 1.71E-09 'Thyroid'
 1.01E-09 9.22E-10 9.95E-10 'Remainder'
 3.86E-10 3.71E-10 8.40E-09 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.8 (ICRP-30, EPA-520/1-88-020)

'S' 0.8 8
 6.04E-11 Gonads
 6.04E-11 Breast
 6.04E-11 Lung
 6.04E-11 R. Marrow
 6.04E-11 B. Surface
 1.62E-09 Thyroid
 1.02E-09 Remainder
 3.95E-10 Effective

ALI(Bq) (from ICRP 30, Part 2)

Inhalation
 'D' 2.0E+8
 'W' 2.0E+7

Ingestion
 'S' 0.80 1.0E+8

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

To-99M File current as of: 05-18-90
 98.9062541 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 0.2508 Half-life in days (ICRP-38, 6.02 h x d/24h)
 If assimilation path is unknown assign this other pathway ('H', 'G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 2
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (D & W)
 'S' 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.7 0.1 0.19 0.01
 'W' 0.0 0.6 0.2 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.7 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.7 0.1 0.19 0.01
 Assign classes T, N, U, to D
 'D' 'W' 'W'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI Model)
 'S' 0.800000 2
 2.400000D+01 9.600000D+01
 3.000000D+01 -9.800000D+01
 Transfer rate per day of ingested activity to feces. (ICRP-30 GI Model)
 'S' 0.800000 4
 2.400000D+01 8.460635D-02
 3.000000D+01 -5.282465D-02
 1.800000D+00 -5.175388D-01
 1.000000D+00 4.857571D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ($f_u=0.3 \times$ Differential of R(t) of ICRP-30)
 4
 1.386294D+00 1.663553D-02
 4.332170D-01 9.357487D-02
 1.873371D-01 1.079062D-02
 3.150699D-02 4.536963D-04
 Fecal excretion function ($f_f=0.7 \times$ Differential of R(t) of ICRP-30)
 4
 1.386294D+00 3.881623D-02
 4.332170D-01 2.183414D-01
 1.873371D-01 2.517811D-02
 3.150699D-02 1.058625D-03
 Breath excretion function
 0

Retention of inhaled activity within lungs, (ICRP-30 LUNG MODEL)

'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02

'W' 8
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160843D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

Retention of ingested activity within GI-Tract (ICRP-30 GI Model)

'S' 0.800000 4
 2.400000D+01 4.003525D+00
 3.000000D+01 -3.201761D+00
 1.800000D+00 -2.875216D-01
 1.000000D+00 4.857571D-01

Retention of systemic activity (R(t) from ICRP-30, Part 2)

4
 1.386294D+00 0.040
 4.332170D-01 0.720
 1.873371D-01 0.192
 3.150699D-02 0.048

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (Sv/Bq) FOR INHALATION (ICRP-30, EPA-520/1-88-020)

'D' 8
 6.83E-12 4.50E-12 1.44E-12 'Gonads'
 3.44E-12 3.76E-12 3.27E-12 'Breast'
 3.04E-12 1.14E-11 8.39E-11 'Lung'
 5.71E-12 5.46E-12 4.84E-12 'R Marrow'
 4.28E-12 4.58E-12 3.88E-12 'B Surface'
 1.0'E-10 1.19E-10 3.81E-11 'Thyroid'
 2.42E-11 1.65E-11 6.54E-12 'Remainder'
 1.38E-11 1.24E-11 1.47E-11 'Effective'

'W' 8
 3.80E-12 4.89E-12 6.80E-13 'Gonads'
 1.57E-12 3.42E-12 3.10E-12 'Breast'
 1.02E-12 3.07E-11 1.12E-10 'Lung'
 2.71E-12 5.38E-12 4.59E-12 'R Marrow'
 1.84E-12 4.23E-12 3.56E-12 'B Surface'
 4.18E-11 8.62E-11 5.85E-12 'Thyroid'
 1.32E-11 1.80E-11 3.76E-12 'Remainder'
 6.91E-12 1.42E-11 1.60E-11 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.8 (ICRP-30, EPA-520/1-88-020)

'S' 0.8 8
 9.75E-12 Gonads
 3.57E-12 Breast
 3.14E-12 Lung
 6.29E-12 R. Marrow
 4.06E-12 B. Surface
 8.46E-11 Thyroid
 3.34E-11 Remainder
 1.68E-11 Effective

ALI(Bq) (from ICRP 30, Part 2)

Inhalation
 'D' 6.0E+9
 'W' 9.0E+9

Ingestion
 'S' 0.80 3.0E+9

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

Cs-134 File current as of: 05-18-90
 133.906696 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 7.531E+02 Half-life in days (ICRP-38, 2.062 y * 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, IGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.3 0.1 0.6 0.
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.918550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 2
 0.3465736 0.0280
 6.30134E-3 0.0045
 Fecal excretion function ICRP-54.
 2
 0.3465736 0.0069
 6.30134E-3 0.0011
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic activity (ICRP-30/54)
 2

0.3465736 0.1
 6.30134E-3 0.9
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)
 'D' 8
 2.04E-03 2.11E-08 2.08E-08 'Gonads'
 1.69E-08 1.76E-08 1.73E-08 'Breast'
 1.77E-08 1.77E-08 2.03E-08 'Lungs'
 1.85E-08 1.92E-08 1.89E-08 'R Marrow'
 1.72E-08 1.79E-08 1.76E-08 'B Surface'
 1.74E-08 1.80E-08 1.78E-08 'Thyroid'
 2.18E-08 2.26E-08 2.23E-08 'Remainder'
 1.96E-08 2.02E-08 2.02E-08 'Effective'
 H/I Dose per unit intake for ingested activity, f1=0.95, (ICRP-30,NUREG/CR-1962)
 'S' 0.95 8
 2.06E-08 Gonads
 1.72E-08 Breast
 1.76E-08 Lung
 1.87E-08 R.Marrow
 1.74E-08 B.Surface
 1.76E-08 Thyroid
 2.21E-08 Remainder
 1.98E-08 Effective
 ALI (Bq) (from ICRP-30)
 Inhalation ALI
 'D' 4.0E+06
 Ingestion ALI
 'S' 0.95 3.0E+06
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 1

Cs-137 File current as of: 05-18-90
 136.907073 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-45)
 1.095E+04 Half-life in days (ICRP-38, 30.0 y * 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation class 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.3 0.1 0.6 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.3 0.1 0.6 0.
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 2
 0.3465736 0.0280
 6.30134E-3 0.0045
 Fecal excretion function ICRP-54.
 2
 0.3465736 0.0069
 6.30134E-3 0.0011
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic activity (ICRP-30/54)
 2

0.3465736 0.1
6.30134E-3 0.9
Retention at wound site
1
.25 1.
H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)
'D' 8
1.37E-08 1.42E-08 1.40E-08 'Gonads'
1.23E-08 1.27E-08 1.25E-08 'Bre-st'
1.26E-08 1.32E-08 1.59E-08 'Lungs'
1.30E-08 1.35E-08 1.33E-08 'R Marrow'
1.24E-08 1.29E-08 1.27E-08 'B Surface'
1.24E-08 1.29E-08 1.27E-08 'Thyroid'
1.43E-08 1.48E-08 1.46E-08 'Remainder'
1.34E-08 1.39E-08 1.40E-08 'Effective'
H/I Dose per unit intake for ingested activity, f1=0.95, (ICRP-30,NUREG/CR-1962)
'S' 0.95 8
1.39E-08 Gonads
1.24E-08 Breast
1.27E-08 Lung
1.32E-08 R.Marrow
1.26E-08 B.Surface
1.26E-08 Thyroid
1.45E-08 Remainder
1.35E-08 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 6.0E+06
Ingestion ALI
'S' 0.95 4.0E+06
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
1

I-125 File current as of: 03-12-91
 124.9046197 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 60.14 Half-life in days (from ICRP-38)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 1
 'THY'
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for inhalation
 'D' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for ingestion
 'S' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for injection (wound)
 0.0 0.3 0.1 0.01 0.01 0.58
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 2.772539 1.840882
 0.060431 -0.001817643
 0.006046 0.001746955
 Fecal excretion function ICRP-54.
 3
 2.772539 5.548171E-6
 0.060431 -2.822127E-4
 0.006046 2.766891E-4
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02

1.000000D+00 1.183778D-01
Retention of systemic activity (ICRP-30/54)
3
2.772539 0.70004
0.060431 -0.034749
0.006046 0.334709
Retention of systemic activity within Thyroid (ICRP-30/54)
3
2.772539 -0.300957
0.060431 0.015048
0.006046 0.285909
Retention at wound site
1
.25 1.
H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)
'D' 8
2.94E-11 2.99E-11 2.87E-11 'Gonads'
1.45E-10 1.50E-10 1.48E-10 'Breast'
3.97E-11 5.95E-11 4.09E-10 'Lung'
6.91E-11 6.62E-11 7.23E-11 'R Marrow'
6.69E-11 6.41E-11 7.00E-11 'B Surface'
3.46E-07 3.51E-07 3.37E-07 'Thyroid'
5.34E-11 4.88E-11 5.37E-11 'Remainder'
1.04E-08 1.06E-08 1.02E-08 'Effective'
H/I Dose per unit intake for ingested activity; (ICRP-30,NUREG/CR-1962)
'S' 0.95 8
2.93E-11 Gonads
1.45E-10 Breast
4.08E-11 Lung
6.82E-11 R. Marrow
6.63E-11 B. Surface
3.44E-07 Thyroid
5.80E-11 Remainder
1.04E-08 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 2.0E+06
Ingestion
'S' 0.95 1.0E+06
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
1

I-129 File current as of: 03-12-91
 128.904886 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 5.73E09 Half-life in days (ICRP-38, 15.7 E8 y * 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 1
 'THY'
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for inhalation
 'D' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for ingestion
 'S' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for injection
 0.0 0.3 0.1 0.01 0.01 0.58
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.375204D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 2.772539 1.940882
 0.060431 -0.001817643
 0.006046 0.001746955
 Fecal excretion function ICRP-54.
 3
 2.772539 5.548171E-6
 0.060431 -2.822127E-4
 0.006046 2.766891E-4
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02

1.000000D+00 1.183778D-01
 Retention of systemic activity (ICRP-30/54)
 3
 2.772539 0.70004
 0.060431 -0.034749
 0.006046 0.334709
 Retention of systemic activity within Thyroid (ICRP-30/54)
 3
 2.772539 -0.300957
 0.060431 0.015048
 0.006046 0.285909
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1982)
 'D' 8
 1.36E-10 1.41E-10 1.39E-10 'Gonads'
 3.27E-10 3.40E-10 3.34E-10 'Breast'
 1.67E-10 1.96E-10 9.92E-10 'Lungs'
 2.19E-10 2.27E-10 2.24E-10 'R Marrow'
 2.16E-10 2.24E-10 2.21E-10 'B Surface'
 2.44E-06 2.54E-06 2.50E-06 'Thyroid'
 1.89E-10 1.86E-10 1.84E-10 'Remainder'
 7.35E-08 7.62E-08 7.52E-08 'Effective'
 H/I Dose per unit intake for ingested activity; f1=0.95, (ICRP-30,NUREG/CR-1982)
 'S' 0.95 8
 1.38E-10 Gonads
 3.31E-10 Breast
 1.65E-10 Lung
 2.21E-10 R.Marrow
 2.17E-10 B.Surface
 2.48E-06 Thyroid
 1.99E-10 Remainder
 7.46E-08 Effective
 ALI (Bq) (from ICRP-30)
 Inhalation ALI
 'D' 3.0E+05
 Ingestion
 'S' 0.95 2.0E+05
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 1

I-131 File current as of: 03-12-91
 130.906114 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 8.04 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 1
 'THY'
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for inhalation
 'D' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for ingestion
 'S' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for injection (wound)
 0.0 0.3 0.1 0.01 0.01 0.58
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 2.772539 1.940882
 0.060431 -0.001817643
 0.006046 0.001746955
 Fecal excretion function ICRP-54.
 3
 2.772539 5.548171E-6
 0.060431 -2.822127E-4
 0.006046 2.766891E-4
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02

1.000000D+00 1.183778D-01
Retention of systemic activity (ICRP-30/54)
3
2.772539 0.70004
0.060431 -0.034749
0.006046 0.334709
Retention of systemic activity within Thyroid (ICRP-30/54)
3
2.772539 -0.300957
0.060431 0.015048
0.006046 0.285909
Retention at wound site
1
.25 1.
H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1982)
'D' 8
4.05E-11 4.11E-11 3.95E-11 'Gonads'
1.21E-10 1.18E-10 1.32E-10 'Breast'
1.09E-10 1.64E-10 2.44E-09 'Lungs'
9.39E-11 9.39E-11 1.08E-10 'R Marrow'
8.79E-11 8.59E-11 9.63E-11 'B Surface'
4.77E-07 4.75E-07 4.44E-07 'Thyroid'
1.30E-10 1.03E-10 1.33E-10 'Remainder'
1.44E-08 1.43E-08 1.37E-08 'Effective'
H/I Dose per unit intake for ingested activity, f1=0.95. (ICRP-30,NUREG/CR-1982)
'S' 0.95 8
4.07E-11 Gonads
1.21E-10 Breast
1.02E-10 Lung
9.44E-11 R.Marrow
8.72E-11 B.Surface
4.76E-07 Thyroid
1.57E-10 Remainder
1.44E-08 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 2.0E+06
Ingestion
'S' 0.95 1.0E+06
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
0

I-135 File current as of: 03-12-91
 134.910023 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS A432 (1985),1-54)
 0.2754 Half-life in days (6.81 h per ICRP-38)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 1
 'THY'
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for inhalation
 'D' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for ingestion
 'S' 0.0 0.3 0.1 0.01 0.01 0.58
 Weights for each assay (BRE, urine, fecal, WBC, LUN, THY) for injection (wound)
 0.0 0.3 0.1 0.01 0.01 0.58
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function ICRP-54.
 3
 2.772539 1.940882
 0.060431 -0.001817643
 0.006046 0.001746855
 Fecal excretion function ICRP-54.
 3
 2.772539 5.548171E-6
 0.060431 -2.822127E-4
 0.006046 2.766891E-4
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02

1.000000D+00 1.183778D-01
Retention of systemic activity (ICRP-30/54)
3
2.772539 0.70004
0.080431 -0.034749
0.006046 0.334709
Retention of systemic activity within Thyroid (ICRP-30/54)
3
2.772539 -0.300957
0.080431 0.015048
0.006046 0.285909
Retention at wound site
1
.25 1.
H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1982)
'D' 8
3.51E-11 3.40E-11 1.50E-11 'Gonads'
3.74E-11 3.80E-11 3.65E-11 'Breast'
2.94E-11 1.85E-10 1.68E-09 'Lung'
3.58E-11 3.64E-11 3.49E-11 'R Marrow'
3.35E-11 3.52E-11 2.89E-11 'B Surface'
1.80E-08 1.90E-08 6.09E-09 'Thyroid'
9.47E-11 4.54E-11 8.00E-11 'Remainder'
5.93E-10 5.24E-10 4.16E-10 'Effective'
H/I Dose per unit intake for ingested activity; (ICRP-30,NUREG/CR-1982)
'S' 0.95 8
3.61E-11 Gonads
3.85E-11 Breast
3.75E-11 Lung
3.65E-11 R. Marrow
3.36E-11 B. Surface
1.79E-08 Thyroid
1.54E-10 Remainder
6.08E-10 Effective
ALI (Bq) (from ICRP-30)
Inhalation ALI
'D' 6.0E+07
Ingestion
'S' 0.95 3.0E+07
FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
0

Eu-152 File current as of: 01-22-91
 151.9217424 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 4888.783 Half-life in days (from ICRP-38, 13.33 y * 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 1
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS W
 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE, URINE, FECAL, WBC, LUN)
 'W' 0.0 0.33 0.33 0.33 0.01
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE, URINE, FECAL, WBC, LUN)
 'S' 0.0 0.33 0.33 0.33 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE, URINE, FECAL, WBC, LUN)
 0.0 0.33 0.33 0.33 0.01
 ASSIGN CLASSES T, N, U TO D, W, OR Y
 'W' 'W' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 8.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion: $E_u(t) = -0.5 \frac{d}{dt} R(t)$, where $R(t) = \text{ICRP-30}$.
 3
 2.772589 0.1940812
 6.931472E-02 2.079442E-03
 1.980421E-04 7.921682E-05
 Fecal excretion: $E_f(t) = E_u(t)$
 3
 2.772589 0.1940812
 6.931472E-02 2.079442E-03
 1.980421E-04 7.921682E-05
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-01 -1.0160643D-01
 1.7329D+00 9.0000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 -2.4448394D+01
 1.3835D-02 0.0000000D+00 0.0000000D+00 2.5050000D+01
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4

2.400000D+01 -1.509259D-03
 6.008006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00
 Retention of systemic activity (ICRP-30)
 3
 2.772589 0.14
 6.831472E-02 0.08
 1.980421E-04 0.80
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
 'W' 8
 1.14E-08 5.24E-08 2.20E-08 'Gonads'
 1.39E-08 6.96E-08 3.06E-08 'Breast'
 2.11E-08 1.08E-07 1.70E-07 'Lung'
 6.59E-08 3.26E-07 1.33E-07 'R Marrow'
 2.00E-07 9.90E-07 4.03E-07 'B Surface'
 6.32E-09 3.09E-08 1.55E-08 'Thyroid'
 6.33E-08 4.08E-07 1.69E-07 'Remainder'
 4.86E-08 2.29E-07 1.10E-07 'Effective'
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3, (EPA-520/1-88-020)
 'S' 0.001 8
 1.33E-09 Gonads
 2.85E-10 Breast
 2.40E-10 Lung
 9.19E-10 R. Marrow
 2.09E-09 B. Surface
 6.66E-11 Thyroid
 3.92E-09 Remainder
 1.75E-09 Effective
 ALI(Bq) (from ICRP 30)
 Inhalation
 'W' 9.0E+5
 Ingestion
 'S' 0.001 3.0E+07
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

Eu-154 File current as of: 01-22-91
 153.922975 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 3214.2 Half-life in days (from ICRP-38, 8.8 y * 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 1
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE, URINE, FECAL, WBC, LUN)
 'W' 0.0 0.33 0.33 0.33 0.01
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE, URINE, FECAL, WBC, LUN)
 'S' 0.0 0.33 0.33 0.33 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE, URINE, FECAL, WBC, LUN)
 0.0 0.33 0.33 0.33 0.01
 ASSIGN CLASSES T, N, U TO D, W, OR Y
 'W' 'W' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion: $E_u(t) = -0.5 \frac{d}{dt} R(t)$, where $R(t) = \text{ICRP-30}$.
 3
 2.772589 0.1940812
 6.931472E-02 2.079442E-03
 1.980421E-04 7.921682E-05
 Fecal excretion: $E_f(t) = E_u(t)$
 3
 2.772589 0.1940812
 6.931472E-02 2.079442E-03
 1.980421E-04 7.921682E-05
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-01 -1.0160643D-01
 1.7329D+00 9.0000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 -2.4448394D+01
 1.3835D-02 0.0000000D+00 0.0000000D+00 2.5050000D+01
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4

2.400000D+01 -1.509259D-03
 6.006006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00
 Retention of systemic activity (ICRP-30)
 3
 2.772589 0.14
 6.931472E-02 0.06
 1.980421E-04 0.80
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
 'W' 8
 1.05E-08 4.68E-08 1.92E-08 'Gonads '
 1.24E-08 6.01E-08 2.79E-08 'Breast '
 1.85E-08 9.90E-08 2.63E-07 'Lung '
 8.83E-08 4.37E-07 1.78E-07 'R. Marrow '
 4.36E-07 2.16E-06 8.79E-07 'B. Surface '
 5.24E-09 2.68E-08 1.37E-08 'Thyroid '
 9.43E-08 4.62E-07 1.91E-07 'Remainder '
 5.88E-08 2.89E-07 1.46E-07 'Effective '
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3, (EPA-520/1-88-020)
 'S' 0.001 8
 1.37E-09 Gonads
 2.79E-10 Breast
 2.16E-10 Lung
 1.15E-09 R. Marrow
 4.46E-09 B. Surface
 5.71E-11 Thyroid
 6.32E-09 Remainder
 2.58E-09 Effective
 ALI(Bq) (from ICRP 30)
 Inhalation
 'W' 7.0E+5
 Ingestion
 'S' 0.001 2.0E+07
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

Eu-155 File current as of: 01-22-91
 154.9222889 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 1811.64 Half-life in days (from ICRP-38, 4.96 y * 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 1
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS W
 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE, URINE, FECAL, WBC, LUN)
 'W' 0.0 0.33 0.33 0.33 0.01
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE, URINE, FECAL, WBC, LUN)
 'S' 0.0 0.33 0.33 0.33 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE, URINE, FECAL, WBC, LUN)
 0.0 0.33 0.33 0.33 0.01
 ASSIGN CLASSES T, N, U TO D, W, OR Y
 'W' 'W' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 8.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion: $Eu(t) = -0.5 \frac{d}{dt} R(t)$, where $R(t) = \text{ICRP-30}$.
 3
 2.772589 0.1940812
 6.931472E-02 2.079442E-03
 1.980421E-04 7.921682E-05
 Fecal excretion: $Ef(t) = Eu(t)$
 3
 2.772589 0.1940812
 6.931472E-02 2.079442E-03
 1.980421E-04 7.921682E-05
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-01 -1.0160643D-01
 1.7329D+00 9.0000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 -2.4448394D+01
 1.3835D-02 0.0000000D+00 0.0000000D+00 2.5050000D+01
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4

2.400000D+01 -1.509259D-03
 6.006006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00

Retention of systemic activity (ICRP-30)

3
 2.772589 0.14
 6.931472E-02 0.06
 1.980421E-04 0.80

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)

'W' 8
 3.44E-10 1.33E-09 5.84E-10 'Gonads '
 4.71E-10 2.30E-09 1.15E-09 'Breast '
 7.93E-10 4.46E-09 4.52E-08 'Lung '
 1.19E-08 5.80E-08 2.40E-08 'R. Marrow '
 1.27E-07 6.46E-07 2.49E-07 'B. Surface '
 1.76E-10 8.70E-10 4.70E-10 'Thyroid '
 9.54E-09 4.57E-08 1.82E-08 'Remainder '
 8.35E-09 4.14E-08 2.16E-08 'Effective '

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3, (EPA-520/1-88-020)

'S' 0.001 8
 9.83E-11 Gonads
 1.44E-11 Breast
 9.64E-12 Lung
 1.56E-10 R. Marrow
 1.29E-09 B. Surface
 1.78E-12 Thyroid
 1.09E-09 Remainder
 4.13E-10 Effective

ALI(Bq) (from ICRP 30)

Inhalation

'W' 3.0E+6

Ingestion

'S' 0.001 1.0E+08

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

Tl-201 File current as of: 01-03-91
 200.970794 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-45)
 3.044 Half-life in days (ICRP-38)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation class 'D'
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'D' 0.0 0.6 0.1 0.3 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.0 0.6 0.1 0.3 0.
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.0 0.6 0.1 0.3 0.
 Assign classes T, N, U, to D
 'D' 'D' 'D'
 Transfer rate per day from lung to blood class D (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 Transfer rate per day from lung into GI-Tract Class D. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 Transfer rate per day of ingested activity to blood (ICRP-30 GI MODEL)
 'S' 0.950000 2
 2.400000D+01 2.850000D+01
 1.200000D+02 -2.850000D+01
 Transfer rate per day of ingested activity to feces (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 5.287897D-03
 1.200000D+02 -1.919550D-04
 1.800000D+00 -1.234737D-01
 1.000000D+00 1.183778D-01
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function $0.2 * -dR(t)/dt$
 2
 9.90210E-02 1.24766E-02
 2.47553E-02 1.83189E-03
 Fecal excretion function $0.8 * -dR(t)/dt$
 2
 9.90210E-02 4.99066E-02
 2.47553E-02 7.32756E-03
 Breath excretion function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.0000000D+00 9.5000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-02 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -9.9200000D+01
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.0020000D+02
 Retention of ingested activity within GI-Tract (ICRP-30 GI MODEL)
 'S' 0.950000 4
 2.400000D+01 1.187720D+00
 1.200000D+02 -2.375016D-01
 1.800000D+00 -6.859652D-02
 1.000000D+00 1.183778D-01
 Retention of systemic activity (ICRP-53, p 371)
 2

9.90210E-02 6.30000E-01
 2.47553E-02 3.70000E-01
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30)
 'D' 8
 6.10E-11 6.41E-11 5.27E-11 'Gonads '
 5.42E-11 5.39E-11 5.05E-11 'Breast '
 5.63E-11 8.45E-11 5.81E-10 'Lung '
 8.77E-11 8.73E-11 8.16E-11 'R. Marrow '
 7.79E-11 7.75E-11 7.25E-11 'B. Surface '
 5.23E-11 5.10E-11 4.65E-11 'Thyroid '
 1.12E-10 1.10E-10 9.87E-11 'Remainder '
 7.82E-11 8.15E-11 1.33E-10 'Effective '
 H/I Dose per unit intake for ingested activity, f1=0.95 (ICRP-30)
 'S' 0.95 8
 6.19E-11 Gonads
 5.41E-11 Breast
 5.78E-11 Lung
 8.71E-11 R. Marrow
 7.76E-11 B. Surface
 5.19E-11 Thyroid
 1.21E-10 Remainder
 8.11E-11 Effective
 ALI (Bq) (from ICRP-30)
 Inhalation ALI
 'D' 8.0E+08
 Ingestion ALI
 'S' 0.95 8.0E+08
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

Ra-226 _._._.File current as of: 05-18-90
 226.025403 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 5.8E5 Half-life in days (ICRP-38, 1600 y x 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (W)
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'W' 0.3 0.4 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.3 0.4 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.3 0.4 0.1 0.19 0.01
 Assign classes T, N, U, to W
 'W' 'W' 'W'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood (GI Model ICRP-30)
 'S' 0.200000 2
 2.400000D+01 -2.181818D+00
 7.500000D+00 2.181818D+00
 Transfer rate per day of ingested activity to feces (GI Model ICRP-30)
 'S' 0.200000 4
 2.400000D+01 -3.076594D-02
 7.500000D+00 4.239971D-01
 1.800000D+00 -2.560455D+00
 1.000000D+00 2.167224D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (ICRP-54, p. 183).
 5
 1.732868 4.7E-02
 1.386294E-01 2.0E-03
 1.155245E-02 6.6E-05
 9.902103E-04 2.0E-06
 1.386294E-04 1.4E-07
 Fecal excretion function ICRP-54, p. 183).
 5
 1.732868 8.9E-01
 1.386294E-01 3.9E-02
 1.155245E-02 1.3E-03
 9.902103E-04 3.8E-05
 1.386294E-04 2.7E-06
 Breath elimination function; based on systemic excretion w 30% retention
 10
 1.732868 6.852E-02
 1.386294E-01 3.680E-02
 1.155245E-02 1.396E-02
 9.902103E-04 5.076E-03
 1.386294E-04 2.538E-03
 1.914154 -6.852E-02

3.199154E-01 -3.680E-02
 1.928385E-01 -1.398E-02
 1.822763E-01 -5.076E-03
 1.814247E-01 -2.538E-03

Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'W' 8

6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160843D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

Retention of ingested activity within GI-Tract (ICRP-30 GI Model)

'S' 0.200000 4
 2.400000D+01 -9.219101D-02
 7.500000D+00 3.474420D-01
 1.800000D+00 -1.422475D+00
 1.000000D+00 2.167224D+00

Retention of systemic activity (ICRP-54, p. 183)

5
 1.732868 0.54
 1.386294E-01 0.29
 1.155245E-02 0.11
 9.902103E-04 0.04
 1.386294E-04 0.02

Retention at wound site

1
 .25 1.

H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30, NUREG/CR-1962)

'W' 8
 1.29E-07 2.80E-07 1.63E-07 'Gonads'
 1.29E-07 2.80E-07 1.63E-07 'Breast'
 0.00E+00 0.00E+00 6.44E-05 'Lung'
 8.41E-07 1.83E-06 1.06E-06 'R Marrow'
 9.61E-06 2.09E-05 1.21E-05 'B Surface'
 1.29E-07 2.80E-07 1.63E-07 'Thyroid'
 1.39E-07 2.81E-07 1.74E-07 'Remainder'
 4.87E-07 1.05E-06 8.34E-06 'Effective'

H/I Dose per unit intake for ingested activity (ICRP-30, NUREG/CR-1962)

'S' 0.2 8
 9.16E-08 Gonads
 9.17E-08 Breast
 9.16E-08 Lung
 5.98E-07 R. Marrow
 6.83E-06 B. Surface
 9.15E-08 Thyroid
 1.03E-07 Remainder
 3.58E-07 Effective

ALI (Bq) (from ICRP-30)

Inhalation ALI

'W' 2.0E+04

Ingestion ALI

'S' 0.2 7.0E+04

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

Ra-228 File current as of: 05-18-90
 228.031084 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985), 1-54)
 2.1E+03 Half-life in days (ICRP-30, 5.8 y x 365.25 d/y)
 If assimilation path is unknown assign this other pathway ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'WBC' 'WBC' 'WBC'
 Number of clearance classes
 1
 Number of GI transfer functions
 1
 Number and name of specific organs for systemic activity
 0
 Assign GI-transfer function to inhalation classes (W)
 'S'
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for clearance class
 'W' 0.3 0.4 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for ingestion
 'S' 0.3 0.4 0.1 0.19 0.01
 Weights for each assay (BRE, urine, fecal, WBC, LUN) for injection (wound)
 0.3 0.4 0.1 0.19 0.01
 Assign classes T, N, U, to W
 'W' 'W' 'W'
 Transfer rate per day from lung to blood (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.732868D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood (GI Model ICRP-30)
 'S' 0.200000 2
 2.400000D+01 -2.181818D+00
 7.500000D+00 2.181818D+00
 Transfer rate per day of ingested activity to feces (GI Model ICRP-30)
 'S' 0.200000 4
 2.400000D+01 -3.076594D-02
 7.500000D+00 4.239971D-01
 1.800000D+00 -2.560455D+00
 1.000000D+00 2.167224D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (ICRP-54, p. 183).
 5
 1.732868 4.7E-02
 1.386294E-01 2.0E-03
 1.155245E-02 6.6E-05
 9.902103E-04 2.0E-06
 1.386294E-04 1.4E-07
 Fecal excretion function ICRP-54, p. 183).
 5
 1.732868 8.9E-01
 1.386294E-01 3.9E-02
 1.155245E-02 1.3E-03
 9.902103E-04 3.8E-05
 1.386294E-04 2.7E-06
 Breath elimination function
 0
 Retention of inhaled activity within lungs (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00
 3.4657D+00 0.0000000D+00 5.0000000D-01 -1.0160643D-01
 1.7329D+00 9.0000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01

1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 Retention of ingested activity within GI-Tract (ICRP-30 GI Model)
 'S' 0.200000 4
 2.400000D+01 -9.219101D-02
 7.500000D+00 3.474420D-01
 1.800000D+00 -1.422475D+00
 1.000000D+00 2.187224D+00
 Retention of systemic activity (ICRP-54, p. 183)
 5
 1.732868 0.54
 1.386294E-01 0.29
 1.155245E-02 0.11
 9.902103E-04 0.04
 1.386294E-04 0.02
 Retention at wound site
 1
 .25 1.
 H/D Dose per unit deposition (Sv/Bq) for INHALATION (ICRP-30,NUREG/CR-1962)
 'W' 8
 2.20E-07 4.80E-07 3.15E-07 'Gonads'
 2.21E-07 4.83E-07 3.16E-07 'Breast'
 2.41E-07 9.02E-07 2.83E-05 'Lung'
 9.10E-07 1.94E-06 1.24E-06 'R Marrow'
 8.25E-06 1.71E-05 1.07E-05 'B Surface'
 2.20E-07 4.80E-07 3.15E-07 'Thyroid'
 2.26E-07 4.73E-07 3.27E-07 'Remainder'
 5.48E-07 1.20E-06 4.10E-06 'Effective'
 H/I Dose per unit intake for ingested activity (ICRP-30,NUREG/CR-1962)
 'S' 0.2 8
 1.58E-07 Gonads
 1.57E-07 Breast
 1.57E-07 Lung
 6.53E-07 R. Marrow
 5.82E-06 B. Surface
 1.57E-07 Thyroid
 1.83E-07 Remainder
 3.88E-07 Effective
 ALI (Bq) (from ICRP-30)
 Inhalation ALI
 'W' 4.0E+04
 Ingestion ALI
 'S' 0.2 9.0E+04
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

Th-228 File current as of: 05-18-90
 228.028715 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 690. Half-life in days (ICRP-38 1.9 y, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN ASSAY WBL TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 2
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
 'S' 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE, URINE, FECAL, WBC, LUN)
 'W' 0. 0.33 0.33 0.01 0.33
 'Y' 0. 0.05 0.25 0.01 0.69
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE, URINE, FECAL, WBC, LUN)
 'S' 0. 0.7 0.25 0.04 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE, URINE, FECAL, WBC, LUN)
 0. 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T, N, U TO W OR Y
 'W' 'Y' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.000200 2
 2.400000D+01 -1.600427D-03
 6.001200D+00 1.600427D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.000200 4
 2.400000D+01 -2.820400D-02
 6.001200D+00 6.853996D-01
 1.800000D+00 -3.473911D+00
 1.000000D+00 2.816715D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (ICRP-54)
 3
 1.386294 0.14
 9.902103E-04 2.0E-04
 8.664340E-05 6.1E-05
 Fecal excretion function
 0
 Breath Elimination
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00

3.4657D+00 0.0000000D+00 5.0000000D-01 -1.0160843D-01
 1.7329D+00 9.0000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01
 1.3883D-02 0.0000000D+00 0.0000000D+00 -2.4448394D+01
 1.3835D-02 0.0000000D+00 0.0000000D+00 2.5050000D+01
 'Y' 7
 6.9315D+01 1.0000000D-02 1.0000000D-02 0.0000000D+00
 3.4657D+00 0.0000000D+00 9.9000000D-01 -1.0016006D-01
 1.7329D+00 9.9000000D-01 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 5.0000000D-01
 1.3883D-03 0.0000000D+00 0.0000000D+00 3.1518006D-01
 6.9315D-04 0.0000000D+00 0.0000000D+00 2.7000000D-01
 6.9315D-06 0.0000000D+00 0.0000000D+00 1.5000000D-02
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.000200 4
 2.400000D+01 -1.241851D-03
 6.001200D+00 1.144771D-01
 1.800000D+00 -1.929950D+00
 1.000000D+00 2.818715D+00
 Retention of systemic activity (ICRP-30/54)
 3
 1.386294 0.1
 9.902103E-04 0.2
 8.664340E-05 0.7
 Retention at wound site
 1
 .25 1,
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)
 'W' 8
 1.17E-06 5.74E-06 2.16E-06 'Gonads'
 1.17E-06 5.74E-06 2.16E-06 'Breast'
 0.00E+00 1.19E-05 3.75E-04 'Lung'
 9.71E-05 4.76E-04 1.79E-04 'R Marrow'
 1.19E-03 5.82E-03 2.19E-03 'B Surface'
 1.16E-06 5.70E-06 2.14E-06 'Thyroid'
 2.99E-06 1.48E-05 5.52E-06 'Remainder'
 4.87E-05 2.40E-04 1.35E-04 'Effective'
 'Y' 8
 1.21E-07 1.13E-07 7.23E-07 'Gonads'
 1.16E-07 1.16E-07 7.52E-07 'Breast'
 0.00E+00 0.00E+00 2.76E-03 'Lung'
 9.97E-06 9.35E-06 5.98E-05 'R Marrow'
 1.22E-04 1.14E-04 7.33E-04 'B Surface'
 1.15E-07 1.15E-07 7.45E-07 'Thyroid'
 3.41E-07 3.25E-07 1.91E-06 'Remainder'
 5.01E-06 4.70E-06 3.62E-04 'Effective'
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1= 0.0002 (ICRP-30, NUREG/CR-1962)
 'S' 2.E-04 8
 2.53E-09 Gonads
 2.33E-09 Breast
 2.31E-09 Lung
 1.93E-07 R. Marrow
 2.37E-06 B. Surface
 2.30E-09 Thyroid
 3.86E-08 Remainder
 1.07E-07 Effective
 ALI(Bq) (from ICRP-30)
 Inhalation
 'W' 4.0E+2
 'Y' 6.0E+2
 Ingestion
 'S' 0.0002 2.0E+5
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

Th-232 File current as of: 05-28-90
 232.0380508 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 5.1E12 Half-life in days (ICRP-38 1.4E10 y, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN ASSAY WBL TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 2
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
 'S' 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE, URINE, FECAL, WBC, LUN)
 'W' 0. 0.33 0.33 0.01 0.33
 'Y' 0. 0.05 0.25 0.01 0.89
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE, URINE, FECAL, WBC, LUN)
 'S' 0. 0.7 0.25 0.04 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE, URINE, FECAL, WBC, LUN)
 0. 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T, N, U TO W OR Y
 'W' 'Y' 'W'
 Transfer rate per day from lung to blood, (ICRP-30 LUNG MODEL)
 'W' 3
 8.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract, (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood, (ICRP-30 GI MODEL)
 'S' 0.000200 2
 2.400000D+01 -1.600427D-03
 6.001200D+00 1.600427D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.000200 4
 2.400000D+01 -2.820400D-02
 6.001200D+00 6.853996D-01
 1.800000D+00 -3.473911D+00
 1.000000D+00 2.816715D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (ICRP-54)
 3
 1.386294 0.14
 9.902103E-04 2.0E-04
 8.664340E-05 6.1E-05
 Fecal excretion function
 0
 Breath Elimination function
 0
 Retention of inhaled activity within lungs, (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.0000000D-01 5.0000000D-01 0.0000000D+00

3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-08 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI Tract. (ICRP-30 GI MODEL)

'S' 0.000200 4
 2.400000D+01 -1.241851D-03
 6.001200D+00 1.144771D-01
 1.800000D+00 -1.929950D+00
 1.000000D+00 2.816715D+00

Retention of systemic activity (ICRP-30/54)

3
 1.386294 0.1
 9.902103E-04 0.2
 8.664340E-05 0.7

Retention at wound site

1
 .25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)

'W' 8
 6.35E-07 3.14E-06 1.28E-06 'Gonads'
 6.43E-07 3.18E-06 1.30E-06 'Breast'
 4.80E-07 3.60E-06 5.59E-05 'Lung'
 7.44E-04 3.68E-03 1.50E-03 'R Marrow'
 9.25E-03 4.58E-02 1.86E-02 'B Surface'
 6.20E-07 3.07E-06 1.25E-06 'Thyroid'
 1.56E-06 7.69E-06 3.15E-06 'Remainder'
 3.68E-04 1.82E-03 7.48E-04 'Effective'

'Y' 8
 5.98E-08 7.47E-08 2.30E-06 'Gonads'
 6.14E-08 7.67E-08 2.36E-06 'Breast'
 0.00E+00 0.00E+00 3.76E-03 'Lung'
 8.02E-05 1.00E-04 1.48E-03 'R Marrow'
 9.98E-04 1.25E-03 1.84E-02 'B Surface'
 5.99E-08 7.49E-08 2.30E-06 'Thyroid'
 1.59E-07 1.89E-07 5.79E-06 'Remainder'
 3.96E-05 4.95E-05 1.18E-03 'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1= 0.0002 (ICRP-30, NUREG/CR-1962)

'S' 2.E-04 8
 1.25E-09 Gonads
 1.26E-09 Breast
 1.25E-09 Lung
 1.48E-06 R. Marrow
 1.85E-05 B. Surface
 1.21E-09 Thyroid
 1.47E-08 Remainder
 7.38E-07 Effective

ALI(Bq) (from ICRP-30)

Inhalation

'W' 4.0E+1

'Y' 1.0E+2

Ingestion

'S' 0.0002 3.0E+4

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

0

U-234 File current as of: 05-18-90
 234.0409466 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 8.930363E7 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H', 'G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 3
 NUMBER OF GI TRANSFER FUNCTIONS
 2
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS (D,W,Y)
 'S' 'S' 'I'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE, URINE, FECAL, WBC, LUN)
 'D' 0.0 0.7 0.25 0.01 0.04
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE, URINE, FECAL, WBC, LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.05 0.25 0.69 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE, URINE, FECAL, WBC, LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'D' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D+01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.050000 2
 2.400000D+01 -4.285714D-01
 6.315789D+00 4.285714D-01
 'I' 0.002000 2
 2.400000D+01 -1.604278D-02
 6.012024D+00 1.604278D-02
 Transfer rate per day of ingested activity to feces
 'S' 0.050000 4
 2.400000D+01 -2.870572D-02
 6.315789D+00 6.105874D-01
 1.800000D+00 -3.231903D+00
 1.000000D+00 2.650022D+00
 'I' 0.002000 4
 2.400000D+01 -2.822097D-02
 6.012024D+00 6.825724D-01

1.800000D+00 -3.464984D+00
1.000000D+00 2.810632D+00
Transfer rate per day from wound to blood
1
.25 .25
Urinary excretion function (ICRP-54)
5
2.77259D+00 1.5
1.15525D-01 0.028
3.46574D-02 6.9D-03
4.62098D-04 4.8D-07
1.38629D-04 3.2D-06
Fecal excretion function
0
Breath excretion function
0
Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
'D' 4
6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02
'W' 6
6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
'Y' 7
6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02
Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
'S' 0.050000 4
2.400000D+01 -1.905321D-02
6.315789D+00 1.645335D-01
1.800000D+00 -1.795502D+00
1.000000D+00 2.650022D+00
'I' 0.002000 4
2.400000D+01 -1.844323D-03
6.012024D+00 1.162030D-01
1.800000D+00 -1.924991D+00
1.000000D+00 2.810632D+00
Retention of systemic activity (ICRP-30/54)
5
2.77259E+00 5.37849E-01
1.15525E-01 2.39044E-01
3.46574E-02 1.99203E-01
4.62098E-04 9.96016E-04
1.38629E-04 2.29084E-02
Retention at wound site
1
.25 1.
H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)
'D' 8
2.75E-8 5.00E-8 5.10E-8 'Gonads'
2.75E-8 5.00E-8 5.10E-8 'Breast'
3.18E-8 7.95E-8 1.21E-6 'Lungs'
7.68E-7 1.40E-6 1.42E-6 'R Marrow'
1.20E-5 2.18E-5 2.22E-5 'B Surface'
2.75E-8 5.00E-6 5.10E-8 'Thyroid'
1.02E-6 1.85E-6 1.89E-6 'Remainder'
7.74E-7 1.41E-6 1.57E-6 'Effective'
'W' 8

7.52E-9	2.73E-8	1.23E-8	'Gonads'
7.52E-9	2.73E-8	1.23E-8	'Breast'
0.	0.	6.40E-5	'Lungs'
2.10E-7	7.61E-7	3.44E-7	'R Marrow'
3.29E-6	1.19E-5	5.40E-6	'B Surface'
7.52E-9	2.73E-8	1.23E-8	'Thyroid'
2.90E-7	1.01E-6	4.67E-7	'Remainder'
2.14E-7	7.65E-7	8.03E-6	'Effective'

'Y' 8			
6.18E-10	6.62E-10	9.65E-9	'Gonads'
6.25E-10	6.70E-10	9.76E-9	'Breast'
0.	0.	1.19E-3	'Lungs'
1.68E-8	1.81E-8	2.63E-7	'R Marrow'
2.64E-7	2.82E-7	4.11E-6	'B Surface'
6.18E-10	6.62E-10	9.65E-9	'Thyroid'
3.65E-8	3.83E-8	3.68E-7	'Remainder'
2.11E-8	2.24E-8	1.43E-4	'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.05 & 0.002 (ICRP-30, NUREG/CR-1862)

'S' 0.050	8		
2.59E-09	GONAD		
2.58E-09	BREAST		
2.58E-09	LUNG		
7.21E-08	R. MARROW		
1.13E-06	BONE SURFACE		
2.58E-09	THYROID		
1.09E-07	REMAINDER		
7.66E-08	EFFECTIVE		
'I' 0.002	8		
1.06E-10	GONAD		
1.03E-10	BREAST		
1.03E-10	LUNG		
2.88E-09	R. MARROW		
4.52E-08	BONE SURFACE		
1.03E-10	THYROID		
1.77E-08	REMAINDER		
7.06E-09	EFFECTIVE		

ALI(Bq) (from ICRP 30)

Inhalation
 'D' 5.0E+4
 'W' 3.0E+4
 'Y' 1.0E+3

Ingestion
 'S' 0.05 4.0E+5
 'I' 0.002 7.0E+6

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

1

U-235 File current as of: 05-18-90
 235.0439242 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 2.570630E11 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 3
 NUMBER OF GI TRANSFER FUNCTIONS
 2
 Number of specific organs for systemic activity
 0
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (D,W,Y)
 'S' 'S' 'I'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'D' 0.0 0.7 0.25 0.01 0.04
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.05 0.25 0.69 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'D' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.050000 2
 2.400000D+01 -4.285714D-01
 6.315789D+00 4.285714D-01
 'I' 0.002000 2
 2.400000D+01 -1.604278D-02
 6.012024D+00 1.604278D-02
 Transfer rate per day of ingested activity to feces
 'S' 0.050000 4
 2.400000D+01 -2.870572D-02
 6.315789D+00 6.105874D-01
 1.800000D+00 -3.231903D+00
 1.000000D+00 2.650022D+00
 'I' 0.002000 4
 2.400000D+01 -2.822097D-02
 6.012024D+00 6.825724D-01

1.800000D+00 -3.464984D+00
 1.000000D+00 2.810632D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (ICRP-54)
 5
 2.77259D+00 1.5
 1.15525D-01 0.028
 3.46574D-02 6.9D-03
 4.62098D-04 4.8D-07
 1.38629D-04 3.2D-06
 Fecal excretion function
 0
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02
 'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.050000 4
 2.400000D+01 -1.905321D-02
 6.315789D+00 1.645335D-01
 1.800000D+00 -1.795502D+00
 1.000000D+00 2.650022D+00
 'I' 0.002000 4
 2.400000D+01 -1.844323D-03
 6.012024D+00 1.162030D-01
 1.800000D+00 -1.924991D+00
 1.000000D+00 2.810632D+00
 Retention of systemic activity (ICRP-30/54)
 5
 2.77259E+00 5.37849E-01
 1.15525E-01 2.39044E-01
 3.46574E-02 1.99203E-01
 4.62098E-04 9.96016E-04
 1.38629E-04 2.29084E-02
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)
 'D' 8
 2.61E-8 4.74E-8 4.83E-8 'Gonads'
 2.62E-8 4.76E-8 4.86E-8 'Breast'
 2.95E-8 7.38E-8 1.12E-6 'Lungs'
 7.24E-7 1.32E-6 1.34E-6 'R Marrow'
 1.11E-5 2.02E-5 2.06E-5 'B Surface'
 2.61E-8 4.74E-8 4.83E-8 'Thyroid'
 9.49E-7 1.72E-6 1.75E-6 'Remainder'
 7.20E-7 1.31E-6 1.46E-6 'Effective'
 'W' 8

7.24E-9	2.53E-8	1.22E-8	'Gonads'
7.09E-9	2.57E-8	1.26E-8	'Breast'
0.	0.	5.92E-5	'Lungs'
1.98E-7	7.18E-7	3.25E-7	'R Marrow'
3.05E-6	1.11E-5	5.00E-6	'B Surface'
7.22E-9	2.62E-8	1.18E-8	'Thyroid'
2.71E-7	9.41E-7	4.35E-7	'Remainder'
2.00E-7	7.11E-7	7.43E-6	'Effective'
'Y' 8			
8.52E-10	7.10E-10	1.01E-8	'Gonads'
5.37E-10	6.71E-10	2.06E-8	'Breast'
0.	0.	1.10E-3	'Lungs'
1.67E-8	1.79E-8	2.60E-7	'R Marrow'
2.45E-7	2.63E-7	3.82E-6	'B Surface'
5.48E-10	5.14E-10	1.56E-8	'Thyroid'
3.53E-8	3.72E-8	3.54E-7	'Remainder'
2.03E-8	2.15E-8	1.33E-4	'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.05 & 0.002 (ICRP-30, NUREG/CR-1962)

'S' 0.050	8
2.67E-09	GONAD
2.49E-09	BREAST
2.46E-09	LUNG
6.81E-08	R. MARROW
1.05E-06	BONE SURFACE
2.45E-09	THYROID
1.03E-07	REMAINDER
7.19E-08	EFFECTIVE
'I' 0.002	8
3.34E-10	GONAD
1.21E-10	BREAST
1.01E-10	LUNG
2.78E-09	R. MARROW
4.20E-08	BONE SURFACE
9.82E-11	THYROID
1.84E-08	REMAINDER
7.22E-09	EFFECTIVE

ALI (Bq) (from ICRP-30)

Inhalation

'D' 5.0E+04	
'W' 3.0E+04	
'Y' 2.0E+03	

Ingestion

'S' 0.05	5.0E+05
'I' 0.002	7.0E+06

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

1

U-236 File current as of: 05-18-90
 236.0455627 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 8.552328E09 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 3
 NUMBER OF GI TRANSFER FUNCTIONS
 2
 Number of specific organs for systemic activity
 0
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (D,W,Y)
 'S' 'S' 'I'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'D' 0.0 0.7 0.25 0.01 0.04
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.05 0.25 0.69 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'D' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473984D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.050000 2
 2.400000D+01 -4.285714D-01
 6.315789D+00 4.285714D-01
 'I' 0.002000 2
 2.400000D+01 -1.604278D-02
 6.012024D+00 1.604278D-02
 Transfer rate per day of ingested activity to feces
 'S' 0.050000 4
 2.400000D+01 -2.870572D-02
 6.315789D+00 6.105874D-01
 1.800000D+00 -3.231903D+00
 1.000000D+00 2.650022D+00
 'I' 0.002000 4
 2.400000D+01 -2.822097D-02
 6.012024D+00 6.825724D-01

1.800000D+00 -3.464984D+00
 1.000000D+00 2.810632D+00
 Transfer rate per day from wound to blood

1

.25 .25

Urinary excretion function (ICRP-54)

5

2.77259D+00 1.5
 1.15525D-01 0.028
 3.46574D-02 6.9D-03
 4.62098D-04 4.8D-07
 1.38629D-04 3.2D-06

Fecal excretion function

0

Breath excretion function

0

Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'D' 4

6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02

'W' 6

6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

'Y' 7

6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)

'S' 0.050000 4

2.400000D+01 -1.905321D-02
 6.315789D+00 1.645335D-01
 1.800000D+00 -1.795502D+00
 1.000000D+00 2.650022D+00

'I' 0.002000 4

2.400000D+01 -1.844323D-03
 6.012024D+00 1.162030D-01
 1.800000D+00 -1.924991D+00
 1.000000D+00 2.810632D+00

Retention of systemic activity (ICRP-30/54)

5

2.77259E+00 5.37849E-01
 1.15525E-01 2.39044E-01
 3.46574E-02 1.99203E-01
 4.62098E-04 9.96016E-04
 1.38629E-04 2.29084E-02

Retention at wound site

1

.25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1982)

'D' 8

2.61E-8 4.74E-8 4.83E-8 'Gonads'
 2.61E-8 4.74E-8 4.83E-8 'Breast'
 3.01E-8 7.53E-8 1.14E-6 'Lungs'
 7.26E-7 1.32E-6 1.35E-6 'R Marrow'
 1.14E-5 2.08E-5 2.12E-5 'B Surface'
 2.61E-8 4.74E-8 4.83E-8 'Thyroid'
 9.68E-7 1.75E-6 1.79E-6 'Remainder'
 7.36E-7 1.34E-6 1.49E-6 'Effective'

'W' 8

7.12E-9	2.58E-8	1.17E-8	'Gonads'
7.12E-9	2.58E-8	1.17E-8	'Breast'
0.	0.	8.04E-5	'Lungs'
1.99E-7	7.21E-7	3.26E-7	'R Marrow'
3.12E-6	1.13E-5	5.12E-6	'B Surface'
7.12E-9	2.58E-8	1.17E-8	'Thyroid'
2.75E-7	9.62E-7	4.43E-7	'Remainder'
2.03E-7	7.26E-7	7.56E-8	'Effective'
'Y' 8			
5.86E-10	6.27E-10	9.14E-9	'Gonads'
5.93E-10	6.35E-10	9.25E-9	'Breast'
0.	0.	1.13E-3	'Lungs'
1.59E-8	1.71E-8	2.49E-7	'R Marrow'
2.50E-7	2.68E-7	3.89E-6	'B Surface'
5.86E-10	6.27E-10	9.14E-9	'Thyroid'
3.45E-8	3.62E-8	3.46E-7	'Remainder'
2.00E-8	2.12E-8	1.36E-4	'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.05,0.002 (ICRP-30,NUREG/CR-1962)

'S' 0.050	8		
2.45E-09	GONAD		
2.45E-09	BREAST		
2.45E-09	LUNG		
6.83E-08	R. MARROW		
1.07E-06	BONE SURFACE		
2.45E-09	THYROID		
1.03E-07	REMAINDER		
7.26E-08	EFFECTIVE		
'I' 0.002	8		
1.00E-10	GONAD		
9.79E-11	BREAST		
9.79E-11	LUNG		
2.73E-09	R. MARROW		
4.28E-08	BONE SURFACE		
9.79E-11	THYROID		
1.67E-08	REMAINDER		
6.68E-09	EFFECTIVE		

ALI (Bq) from ICRP-30

Inhalation

'D' 5.0E+04			
'W' 3.0E+04			
'Y' 1.0E+03			

Ingestion

'S' 0.05	5.0E+05		
'I' 0.002	8.0E+06		

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

1

U-238 File current as of: 05-18-90
 238.0507847 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 1.631937E+12 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN ASSAY WBL TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 3
 NUMBER OF GI TRANSFER FUNCTIONS
 2
 Number of specific organs for systemic activity
 0
 ASSIGN GI-TRANSFER FUNCTION TO INHALATION CLASS (D,W,Y)
 'S' 'S' 'I'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'D' 0.0 0.7 0.25 0.01 0.04
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.05 0.25 0.69 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'D' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'D' 3
 6.9315D+01 3.4657359D+01 6.5848982D+01 0.0000000D+00
 1.3863D+00 0.0000000D+00 0.0000000D+00 -1.3752040D+02
 1.3835D+00 0.0000000D+00 0.0000000D+00 1.3862944D+02
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'D' 2
 6.9315D+01 3.4657359D+01 0.0000000D+00 0.0000000D+00
 3.4657D+00 0.0000000D+00 1.7328680D-01 0.0000000D+00
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.050000 2
 2.400000D+01 -4.285714D-01
 6.315789D+00 4.285714D-01
 'I' 0.002000 2
 2.400000D+01 -1.604278D-02
 6.012024D+00 1.604278D-02
 Transfer rate per day of ingested activity to feces
 'S' 0.050000 4
 2.400000D+01 -2.870572D-02
 6.315789D+00 6.105874D-01
 1.800000D+00 -3.231903D+00
 1.000000D+00 2.650022D+00
 'I' 0.002000 4
 2.400000D+01 -2.822097D-02
 6.012024D+00 6.825724D-01

1.800000D+00 -3.464984D+00
 1.000000D+00 2.810632D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion function (ICRP-54)
 5
 2.77259D+00 1.5
 1.15525D-01 0.028
 3.46574D-02 6.9D-03
 4.62098D-04 4.8D-07
 1.38629D-04 3.2D-08
 Fecal excretion function
 0
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'D' 4
 6.9315D+01 1.000000D+00 9.500000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-02 0.000000D+00
 1.3863D+00 0.000000D+00 0.000000D+00 -9.920000D+01
 1.3835D+00 0.000000D+00 0.000000D+00 1.002000D+02
 'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.050000 4
 2.400000D+01 -1.905321D-02
 6.315789D+00 1.645335D-01
 1.800000D+00 -1.795502D+00
 1.000000D+00 2.650022D+00
 'I' 0.002000 4
 2.400000D+01 -1.844323D-03
 6.012024D+00 1.162030D-01
 1.800000D+00 -1.924991D+00
 1.000000D+00 2.810632D+00
 Retention of systemic activity (ICRP-30/54)
 5
 2.77259E+00 5.37849E-01
 1.15525E-01 2.39044E-01
 3.46574E-02 1.99203E-01
 4.62098E-04 9.96016E-04
 1.38629E-04 2.29084E-02
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (ICRP-30, NUREG/CR-1962)
 'D' 8
 2.45E-8 4.46E-8 4.55E-8 'Gonads'
 2.45E-8 4.46E-8 4.55E-8 'Breast'
 2.80E-8 7.00E-8 1.06E-6 'Lungs'
 7.24E-7 1.32E-6 1.34E-6 'R Marrow'
 1.08E-5 1.96E-5 2.00E-5 'B Surface'
 2.44E-8 4.44E-8 4.53E-8 'Thyroid'
 9.08E-7 1.64E-6 1.67E-6 'Remainder'
 6.96E-7 1.26E-6 1.41E-6 'Effective'
 'W' 8

6.71E-9	2.43E-8	1.10E-8	'Gonads'
6.74E-9	2.44E-8	1.11E-8	'Breast'
0.	0.	5.68E-5	'Lungs'
1.98E-7	7.18E-7	3.25E-7	'R Marrow'
2.94E-6	1.07E-5	4.82E-6	'B Surface'
6.71E-9	2.43E-8	1.10E-8	'Thyroid'
2.58E-7	9.03E-7	4.19E-7	'Remainder'
1.92E-7	6.87E-7	7.13E-6	'Effective'
'Y' 8			
5.65E-10	6.05E-10	8.81E-9	'Gonads'
5.82E-10	7.28E-10	1.07E-8	'Breast'
0.	0.	1.06E-3	'Lungs'
1.61E-8	1.72E-8	2.50E-7	'R Marrow'
2.36E-7	2.53E-7	3.68E-6	'B Surface'
5.46E-10	6.63E-10	1.00E-8	'Thyroid'
3.30E-8	3.43E-8	3.34E-7	'Remainder'
1.91E-8	2.02E-8	1.28E-4	'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=0.05 & 0.002 (ICRP-30, NUREG/CR-1962)

'S' 0.050	8
2.31E-09	GONAD
2.31E-09	BREAST
2.30E-09	LUNG
6.80E-08	R. MARROW
1.01E-06	BONE SURFACE
2.30E-09	THYROID
9.69E-08	REMAINDER
6.88E-08	EFFECTIVE
'I' 0.002	8
1.02E-10	GONAD
9.33E-11	BREAST
9.22E-11	LUNG
2.72E-09	R. MARROW
4.04E-08	BONE SURFACE
9.20E-11	THYROID
1.61E-08	REMAINDER
6.42E-09	EFFECTIVE

ALI(Bq) (from ICRP-30)

Inhalation

'D' 5.0E+4
'W' 3.0E+4
'Y' 2.0E+3

Ingestion

'S' 0.05 5.0E+5
'I' 0.002 8.0E+6

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

1

PU-238 File current as of: 05-18-89
 238.0495546 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 3.209E04 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 2
 NUMBER OF GI TRANSFER FUNCTIONS
 3
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
 'S' 'Y'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.5 0.48 0.01 0.01
 'V' 0.0 0.3 0.68 0.01 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'W' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.715393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 'I' 0.000100 2
 2.400000D+01 -8.001067D-04
 6.000600D+00 8.001067D-04
 'V' 0.000010 2
 2.400000D+01 -8.000107D-05
 6.000060D+00 8.000107D-05
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 'I' 0.000100 4
 2.400000D+01 -2.820306D-02
 6.000600D+00 6.85569D-01
 1.800000D+00 -3.474407D+00
 1.000000D+00 2.817053D+00
 'V' 0.000010 4
 2.400000D+01 -2.820221D-02

6.000060D+00 6.858985D-01
 1.800000D+00 -3.474854D+00
 1.000000D+00 2.817357D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion (Adapted from Leggett & Eckerman Health Phys. 337-346, 1987)
 4
 0.8836899 4.705162E-03
 9.342865E-02 6.819504E-04
 2.084024E-02 7.649270E-05
 1.652537E-05 1.655162E-05
 Fecal excretion (Adapted from Leggett & Eckerman, Health Phys. 337-346, 1987)
 3
 0.2310 3.5E-03
 0.1155 1.0E-03
 1.9E-05 5.0E-06
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 6
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 'Y' 7
 6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4
 2.400000D+01 -1.509259D-03
 6.006006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00
 'I' 0.000100 4
 2.400000D+01 -1.208465D-03
 6.006000D+00 1.143814D-01
 1.800000D+00 -1.930226D+00
 1.000000D+00 2.817053D+00
 'V' 0.000010 4
 2.400000D+01 -1.178425D-03
 6.00060D+00 1.142953D-01
 1.800000D+00 -1.930474D+00
 1.000000D+00 2.817357D+00
 Retention of systemic activity (R.W. Leggett, Health Phys 49, pp 1133, 1985)
 4
 0.693E+00 0.012
 0.030E+00 0.020
 2.800E-03 0.042
 2.160E-05 0.926
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
 'W' 8
 2.33E-05 1.15E-04 4.70E-05 'Gonads'
 8.33E-10 4.12E-09 1.68E-09 'Breast'
 0.00E+00 0.00E+00 7.36E-05 'Lung'
 1.27E-04 6.27E-04 2.55E-04 'R Marrow'
 1.58E-03 7.84E-03 3.19E-03 'B Surface'
 8.02E-10 3.97E-09 1.62E-09 'Thyroid'
 5.85E-05 2.90E-04 1.18E-04 'Remainder'

8.61E-05	4.26E-04	1.82E-04	'Effective'
'Y'	8		
2.43E-08	2.60E-08	3.79E-05	'Gonads'
8.80E-11	1.10E-10	1.62E-09	'Breast'
0.00E+00	0.00E+00	1.28E-03	'Lung'
1.35E-05	1.45E-05	2.11E-04	'R Marrow'
1.69E-04	1.81E-04	2.64E-03	'B Surface'
7.72E-11	9.65E-11	1.42E-09	'Thyroid'
5.50E-08	6.87E-08	1.01E-04	'Remainder'
8.95E-08	9.89E-08	2.98E-04	'Effective'

H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3, 1E-4, 1E-5 (EPA-520/1-88-020)

'S'	0.001	8	
2.33E-07	Gonads		
8.41E-12	Breast		
8.49E-12	Lung		
1.27E-08	R. Marrow		
1.58E-05	B. Surface		
7.99E-12	Thyroid		
6.00E-07	Remainder		
8.65E-07	Effective		
'I'	0.0001	8	
2.33E-08	Gonads		
9.28E-13	Breast		
8.50E-13	Lung		
1.27E-07	R. Marrow		
1.58E-08	B. Surface		
7.99E-13	Thyroid		
7.44E-08	Remainder		
9.08E-08	Effective		
'V'	0.00001	8	
2.33E-09	Gonads		
1.80E-13	Breast		
8.64E-14	Lung		
1.27E-08	R. Marrow		
1.58E-07	B. Surface		
7.99E-14	Thyroid		
2.18E-08	Remainder		
1.34E-08	Effective		

ALI(Bq) (from ICRP 30)

Inhalation

'W'	3.0E+2
'Y'	7.0E+2

Ingestion

'S'	0.001	3.0E+04
'I'	0.0001	3.0E+05
'V'	0.00001	3.0E+06

FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE

1

PU-239 File current as of: 05-18-90
 239.0521576 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 8.7897E+06 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 2
 NUMBER OF GI TRANSFER FUNCTIONS
 3
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
 'S' 'V'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.5 0.48 0.01 0.01
 'V' 0.0 0.3 0.68 0.01 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'W' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 'I' 0.000100 2
 2.400000D+01 -8.001067D-04
 6.000600D+00 8.001067D-04
 'V' 0.000010 2
 2.400000D+01 -8.000107D-05
 6.000060D+00 8.000107D-05
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 'I' 0.000100 4
 2.400000D+01 -2.820306D-02
 6.000600D+00 6.855569D-01
 1.800000D+00 -3.474407D+00
 1.000000D+00 2.817053D+00
 'V' 0.000010 4
 2.400000D+01 -2.820221D-02

6.000060D+00 6.856985D-01
1.800000D+00 -3.474854D+00
1.000000D+00 2.817357D+00
Transfer rate per day from wound to blood
1
.25 .25
Urinary excretion (Adapted from Leggett & Eckerman Health Phys. 337-346, 1987)
4
0.8836899 4.705162E-03
9.342865E-02 6.819504E-04
2.084024E-02 7.649270E-05
1.652537E-05 1.655162E-05
Fecal excretion (Adapted from Leggett & Eckerman, Health Phys. 337-346, 1987)
3
0.2310 3.5E-03
0.1155 1.0E-03
1.9E-05 5.0E-06
Breath excretion function
0
Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
'W' 6
6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
'Y' 7
6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02
Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
'S' 0.001000 4
2.400000D+01 -1.509259D-03
6.006006D+00 1.152434D-01
1.800000D+00 -1.927745D+00
1.000000D+00 2.814011D+00
'I' 0.000100 4
2.400000D+01 -1.208465D-03
6.006006D+00 1.143814D-01
1.800000D+00 -1.930226D+00
1.000000D+00 2.817053D+00
'V' 0.000010 4
2.400000D+01 -1.178425D-03
6.000060D+00 1.142953D-01
1.800000D+00 -1.930474D+00
1.000000D+00 2.817357D+00
Retention of systemic activity (R.W. Leggett, Health Phys 49, pp 1133, 1985)
4
0.693E+00 0.012
0.030E+00 0.020
2.800E-03 0.042
2.160E-05 0.926
Retention at wound site
1
.25 1.
H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
'W' 8
2.65E-05 1.31E-04 5.34E-05 'Gonads'
7.68E-10 3.80E-09 1.55E-09 'Breast'
0.00E+00 0.00E+00 6.92E-05 'Lung'
1.41E-04 6.97E-04 2.84E-04 'R Marrow'
1.76E-03 8.70E-03 3.54E-03 'B Surface'
7.52E-10 3.72E-09 1.52E-09 'Thyroid'
6.30E-05 3.12E-04 1.27E-04 'Remainder'

9.52E-05 4.71E-04 2.00E-04 'Effective'
 'Y' 8
 2.80E-06 3.00E-06 4.37E-05 'Gonads'
 7.98E-11 9.97E-11 1.47E-09 'Breast'
 0.00E+00 0.00E+00 1.29E-03 'Lung'
 1.31E-05 1.64E-05 2.42E-04 'R Marrow'
 1.64E-04 2.05E-04 3.02E-03 'B Surface'
 7.50E-11 9.38E-11 1.38E-09 'Thyroid'
 6.05E-06 7.57E-06 1.11E-04 'Remainder'
 9.02E-06 1.11E-05 3.19E-04 'Effective'
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3, 1E-4, 1E-5 (EPA-520/1-88-020)
 'S' 0.001 8
 2.64E-07 Gonads
 7.69E-12 Breast
 7.74E-12 Lung
 1.41E-06 R. Marrow
 1.76E-05 B. Surface
 7.49E-12 Thyroid
 6.43E-07 Remainder
 9.56E-07 Effective
 'I' 0.0001 8
 2.64E-08 Gonads
 8.09E-13 Breast
 7.75E-13 Lung
 1.41E-07 R. Marrow
 1.76E-06 B. Surface
 7.49E-13 Thyroid
 7.77E-08 Remainder
 9.96E-08 Effective
 'V' 0.0001 8
 2.64E-09 Gonads
 1.21E-13 Breast
 7.89E-14 Lung
 1.41E-08 R. Marrow
 1.76E-07 B. Surface
 7.50E-14 Thyroid
 2.12E-08 Remainder
 1.40E-08 Effective
 ALI(Bq) (from ICRP 30, Part 4, pp 7.)
 Inhalation
 'W' 2.0E+2
 'Y' 6.0E+2
 Ingestion
 'S' 0.001 3.0E+04
 'I' 0.0001 3.0E+05
 'V' 0.00001 3.0E+06
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 1

PU-241 _._._.File current as of: 04-25-90
 241.0568459 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 5.26E+03 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 2
 NUMBER OF GI TRANSFER FUNCTIONS
 3
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS (W & Y)
 'S' 'V'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'W' 0.0 0.33 0.33 0.01 0.33
 'Y' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 'I' 0.0 0.5 0.48 0.01 0.01
 'V' 0.0 0.3 0.68 0.01 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'W' 'Y' 'Y'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 'Y' 3
 6.9315D+01 6.9314718D-01 6.9314718D-01 0.0000000D+00
 1.3863D-03 0.0000000D+00 0.0000000D+00 -1.1783502D-04
 6.9315D-04 0.0000000D+00 0.0000000D+00 1.8714974D-04
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 'Y' 4
 3.4657D+00 0.0000000D+00 3.4310785D+00 -3.4712833D-01
 1.7329D+00 1.7155393D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-03 0.0000000D+00 0.0000000D+00 5.5473964D-04
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 'I' 0.000100 2
 2.400000D+01 -8.001067D-04
 6.000600D+00 8.001067D-04
 'V' 0.000010 2
 2.400000D+01 -8.000107D-05
 6.000060D+00 8.000107D-05
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 'I' 0.000100 4
 2.400000D+01 -2.820306D-02
 6.000600D+00 6.855569D-01
 1.800000D+00 -3.474407D+00
 1.000000D+00 2.817053D+00
 'V' 0.000010 4
 2.400000D+01 -2.820221D-02

6.000060D+00 6.856985D-01
 1.800000D+00 -3.474854D+00
 1.000000D+00 2.817357D+00

Transfer rate per day from wound to blood

1

.25 .25

Urinary excretion (Adapted from Leggett & Eckerman Health Phys. 337-346, 1987)

4

0.8836899 4.705162E-03
 9.342865E-02 6.819504E-04
 2.084024E-02 7.649270E-05
 1.652537E-05 1.655162E-05

Fecal excretion (Adapted from Leggett & Eckerman, Health Phys. 337-346, 1987)

3

0.2310 3.5E-03
 0.1155 1.0E-03
 1.9E-05 5.0E-06

Breath excretion function

0

Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)

'W' 6

6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01

'Y' 7

6.9315D+01 1.000000D-02 1.000000D-02 0.000000D+00
 3.4657D+00 0.000000D+00 9.900000D-01 -1.0016006D-01
 1.7329D+00 9.900000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-03 0.000000D+00 0.000000D+00 3.1516006D-01
 6.9315D-04 0.000000D+00 0.000000D+00 2.700000D-01
 6.9315D-06 0.000000D+00 0.000000D+00 1.500000D-02

Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)

'S' 0.001000 4

2.400000D+01 -1.509259D-03
 6.006006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00

'I' 0.000100 4

2.400000D+01 -1.208465D-03
 6.006006D+00 1.143814D-01
 1.800000D+00 -1.930226D+00
 1.000000D+00 2.817053D+00

'V' 0.000010 4

2.400000D+01 -1.178425D-03
 6.000060D+00 1.142953D-01
 1.800000D+00 -1.930474D+00
 1.000000D+00 2.817357D+00

Retention of systemic activity (R.W. Leggett, Health Phys 49, pp 1133, 1985)

4

0.693E+00 0.012
 0.030E+00 0.020
 2.800E-03 0.042
 2.160E-05 0.926

Retention at wound site

1

.25 1.

H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)

'W' 8

5.68E-07 2.81E-06 1.15E-06 'Gonads'
 2.55E-11 1.26E-10 5.14E-11 'Breast'
 0.00E+00 0.00E+00 2.97E-08 'Lung'
 2.80E-06 1.39E-05 5.64E-06 'R Marrow'
 3.50E-05 1.73E-04 7.06E-05 'B Surface'
 1.03E-11 5.12E-11 2.08E-11 'Thyroid'
 1.10E-06 5.42E-06 2.21E-06 'Remainder'

1.86E-06 9.19E-06 3.75E-06 'Effective'
 'Y' 8
 5.52E-08 6.90E-08 1.02E-06 'Gonads'
 2.85E-12 2.67E-12 8.13E-11 'Breast'
 0.00E+00 0.00E+00 1.27E-05 'Lung'
 2.86E-07 3.57E-07 5.26E-06 'R Marrow'
 3.56E-06 4.45E-06 6.55E-05 'B Surface'
 9.15E-13 1.14E-12 3.51E-11 'Thyroid'
 1.00E-07 7.53E-08 2.26E-06 'Remainder'
 1.85E-07 2.16E-07 5.06E-06 'Effective'
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3, 1E-4, 1E-5 (EPA-520/1-88-020)
 'S' 0.001 8
 5.66E-09 Gonads
 2.52E-13 Breast
 4.45E-13 Lung
 2.78E-08 R. Marrow
 3.48E-07 B. Surface
 1.01E-13 Thyroid
 1.10E-08 Remainder
 1.85E-08 Effective
 'I' 0.0001 8
 5.66E-10 Gonads
 2.54E-14 Breast
 4.45E-14 Lung
 2.78E-09 R. Marrow
 3.48E-08 B. Surface
 1.01E-14 Thyroid
 1.16E-09 Remainder
 1.87E-09 Effective
 'V' 0.0001 8
 5.66E-11 Gonads
 2.79E-15 Breast
 4.48E-15 Lung
 2.78E-10 R. Marrow
 3.48E-09 B. Surface
 1.01E-15 Thyroid
 1.85E-10 Remainder
 2.07E-10 Effective
 ALI(Bq) (from ICRP 30, Part 4, pp 7.)
 Inhalation
 'W' 1.0E+04
 'Y' 3.0E+04
 Ingestion
 'S' 0.001 1.0E+06
 'I' 0.0001 1.0E+07
 'V' 0.00001 1.0E+08
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 1

AM-241 _._._.File current as of: 01-22-91
 241.0568235 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A472 (1985),1-54)
 1.5786E+05 Half-life in days (from ICRP-38, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 1
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS W
 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'W' 0.0' 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'W' 'W' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion (Leggett's Am excretion model)
 12
 4.159000E+00 1.826425E-01
 9.900000E-02 3.510045E-03
 3.636911E+01 -2.090496E-01
 9.882260E-01 2.276378E-02
 2.296900E-02 1.297749E-05
 6.646000E-03 2.375280E-05
 1.395000E-03 9.778950E-07
 9.810000E-04 8.065193E-05
 6.320000E-04 1.877040E-07
 1.830000E-04 8.315886E-06
 1.939208E-05 1.017264E-05
 1.060000E-04 5.069556E-06
 Fecal excretion (Leggett's Am excretion model)
 11
 3.300000E-01 5.100810E-03
 3.636911E+01 -3.168476E-03
 9.882260E-01 -1.971511E-03
 2.296900E-02 1.621457E-06
 6.646000E-03 2.259640E-06
 1.395000E-03 5.342850E-07

9.810000E-04 2.923478E-05
 6.320000E-04 5.642984E-08
 1.830000E-04 2.150799E-06
 1.939208E-05 2.525120E-06
 1.060000E-04 1.285144E-06
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 8
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4657D+00 0.000000D+00 5.000000D-01 -1.0160843D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4
 2.400000D+01 -1.509259D-03
 6.006006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00
 Retention of systemic activity (Leggett's Am model)
 14
 36.36911 4.443147E-02
 0.988226 1.556546E-02
 0.33 0.015457
 0.099 0.034611
 0.022969 6.332862E-04
 0.006646 3.907999E-03
 0.001395 1.083446E-03
 0.000981 0.1119944
 0.000632 3.861542E-04
 0.00037 1.399568E-13
 0.000183 5.719352E-02
 0.000106 5.994815E-02
 1.939208E-05 0.6547877
 7.39726E-05 2.534002E-13
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
 'W' 8
 2.71E-05 1.34E-04 5.46E-05 'Gonads'
 2.22E-09 1.10E-08 4.49E-09 'Breast'
 0.00E+00 0.00E+00 7.36E-05 'Lung'
 1.45E-04 7.18E-04 2.92E-04 'R Marrow'
 1.81E-03 8.95E-03 3.65E-03 'B Surface'
 1.33E-09 6.60E-09 2.69E-09 'Thyroid'
 6.52E-05 3.23E-04 1.31E-04 'Remainder'
 9.80E-05 4.85E-04 2.06E-04 'Effective'
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3 (EPA-520/1-88-020)
 'S' 0.001 8
 2.70E-07 Gonads
 2.62E-11 Breast
 3.36E-11 Lung
 1.45E-06 R. Marrow
 1.81E-05 B. Surface
 1.32E-11 Thyroid
 6.66E-07 Remainder
 9.84E-07 Effective
 ALI(Bq) (from ICRP 30, Part 4, pp 7.)
 Inhalation
 'W' 2.0E+2
 Ingestion
 'S' 0.001 3.0E+04
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 1

CM-242 File current as of: 01-22-91
 242.0588305 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 162.8 Half-life in days (from ICRP-38)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 1
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS W
 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'W' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 0.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'W' 'W' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7328D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.006006D+00 8.010681D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.006006D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion (Leggett's Am excretion model)
 12
 4.159000E+00 1.826425E-01
 9.900000E-02 3.510045E-03
 3.636911E+01 -2.090496E-01
 9.882260E-01 2.276378E-02
 2.296900E-02 1.297749E-05
 6.646000E-03 2.375280E-05
 1.395000E-03 9.778950E-07
 9.810000E-04 8.065193E-05
 6.320000E-04 1.877040E-07
 1.830000E-04 8.315886E-06
 1.939208E-05 1.017264E-05
 1.060000E-04 5.069556E-06
 Fecal excretion (Leggett's Am excretion model)
 11
 3.300000E-01 5.100810E-03
 3.636911E+01 -3.168476E-03
 9.882260E-01 -1.971511E-03
 2.296900E-02 1.621457E-06
 6.646000E-03 2.259640E-06
 1.395000E-03 5.342850E-07

9.810000E-04 2.923478E-05
 6.320000E-04 5.842984E-08
 1.830000E-04 2.150799E-06
 1.939208E-05 2.525120E-06
 1.060000E-04 1.285144E-06
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 8
 6.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4857D+00 0.000000D+00 5.000000D-01 -1.0160643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 6.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3863D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4
 2.400000D+01 -1.509259D-03
 6.006006D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00
 Retention of systemic activity (Leggett's Am model)
 14
 36.36911 4.443147E-02
 0.988226 1.56546E-02
 0.33 0.015457
 0.099 0.034611
 0.022969 6.332862E-04
 0.006646 3.907999E-03
 0.001395 1.083446E-03
 0.000981 0.1119944
 0.000632 3.861542E-04
 0.00037 1.399568E-13
 0.000183 5.719352E-02
 0.000106 5.994815E-02
 1.939208E-05 0.6547877
 7.39726E-05 2.534002E-13
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
 'W' 8
 5.32E-07 2.57E-06 8.21E-07 'Gonads '
 8.81E-10 4.48E-09 1.28E-09 'Breast '
 0.00E+00 0.00E+00 6.20E-05 'Lung '
 3.64E-06 1.80E-05 5.46E-06 'R. Marrow '
 4.55E-05 2.25E-04 6.82E-05 'B. Surface '
 8.78E-10 4.47E-09 1.28E-09 'Thyroid '
 2.29E-06 1.13E-05 3.43E-06 'Remainder '
 2.62E-06 1.30E-05 1.14E-05 'Effective '
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3 (EPA-520/1-88-020)
 'S' 0.001 8
 5.20E-09 Gonads
 8.95E-12 Breast
 8.84E-12 Lung
 3.57E-08 R. Marrow
 4.46E-07 B. Surface
 8.82E-12 Thyroid
 4.02E-08 Remainder
 3.10E-08 Effective
 ALI(Bq) (from ICRP 30, Part 4, pp 13.)
 Inhalation
 'W' 1.0E+4
 Ingestion
 'S' 0.001 1.0E+06
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 0

CM-244 File current as of: 01-22-91
 244.0627471 Mass (from WAPSTRA & AUDI, NUCLEAR PHYSICS, A432 (1985),1-54)
 6.615E+03 Half-life in days (from ICRP-30, 1 year = 365.25 days)
 IF ASSIMILATION PATH IS UNKNOWN ASSIGN THIS OTHER PATHWAY ('H','G')
 'H'
 ASSIGN WBL ASSAY TO 'WBC' OR 'LUN' FOR INHALATION, INGESTION, INJECTION
 'LUN' 'WBC' 'WBC'
 NUMBER OF CLEARANCE CLASSES
 1
 NUMBER OF GI TRANSFER FUNCTIONS
 1
 Number of specific organs for systemic activity
 0
 ASSIGN GI TRANSFER FUNCTION TO INHALATION CLASS W
 'S'
 WEIGHTS FOR RESULTS FOR EACH CLEARANCE CLASS (BRE,URINE,FECAL,WBC,LUN)
 'W' 0.0 0.33 0.33 0.01 0.33
 WEIGHTS FOR RESULTS FOR INGESTION CLASS (BRE,URINE,FECAL,WBC,LUN)
 'S' 0.0 0.7 0.25 0.04 0.01
 WEIGHTS FOR RESULTS FOR INJECTION (BRE,URINE,FECAL,WBC,LUN)
 U.0 0.7 0.25 0.04 0.01
 ASSIGN CLASSES T,N,U TO D,W,OR Y
 'W' 'W' 'W'
 Transfer rate per day from lung to blood. (ICRP-30 LUNG MODEL)
 'W' 3
 6.9315D+01 6.9314718D+00 3.4657359D+01 0.0000000D+00
 1.3863D-02 0.0000000D+00 0.0000000D+00 -3.4449415D-01
 1.3835D-02 0.0000000D+00 0.0000000D+00 3.4657359D-01
 Transfer rate per day from lung into GI-Tract. (ICRP-30 LUNG MODEL)
 'W' 4
 3.4657D+00 0.0000000D+00 1.7328680D+00 -3.5214104D-01
 1.7329D+00 1.5595812D+00 0.0000000D+00 0.0000000D+00
 6.9315D-01 0.0000000D+00 0.0000000D+00 3.4657359D-01
 1.3863D-02 0.0000000D+00 0.0000000D+00 5.5674472D-03
 Transfer rate per day of ingested activity to blood. (ICRP-30 GI MODEL)
 'S' 0.001000 2
 2.400000D+01 -8.010681D-03
 6.008000D+00 8.010681D-03
 Transfer rate per day of ingested activity to feces
 'S' 0.001000 4
 2.400000D+01 -2.821153D-02
 6.008000D+00 6.841419D-01
 1.800000D+00 -3.469941D+00
 1.000000D+00 2.814011D+00
 Transfer rate per day from wound to blood
 1
 .25 .25
 Urinary excretion (Leggett's Am excretion model)
 12
 4.159000E+00 1.826425E-01
 9.900000E-02 3.510045E-03
 3.636911E+01 -2.090496E-01
 9.882260E-01 2.276378E-02
 2.296900E-02 1.297749E-05
 6.646000E-03 2.375280E-05
 1.395000E-03 9.778950E-07
 9.810000E-04 8.065193E-05
 6.320000E-04 1.877040E-07
 1.830000E-04 8.315886E-06
 1.939208E-05 1.017264E-05
 1.060000E-04 5.069556E-06
 Fecal excretion (Leggett's Am excretion model)
 11
 3.300000E-01 5.100810E-03
 3.636911E+01 -3.168476E-03
 9.882260E-01 -1.971511E-03
 2.296900E-02 1.621457E-06
 6.646000E-03 2.259840E-06
 1.395000E-03 5.342850E-07

9.810000E-04 2.923478E-05
 8.320000E-04 5.642984E-08
 1.830000E-04 2.150799E-08
 1.939208E-05 2.525120E-06
 1.080000E-04 1.285144E-06
 Breath excretion function
 0
 Retention of inhaled activity within lungs. (ICRP-30 LUNG MODEL)
 'W' 8
 8.9315D+01 1.000000D-01 5.000000D-01 0.000000D+00
 3.4857D+00 0.000000D+00 5.000000D-01 -1.0180643D-01
 1.7329D+00 9.000000D-01 0.000000D+00 0.000000D+00
 8.9315D-01 0.000000D+00 0.000000D+00 5.000000D-01
 1.3883D-02 0.000000D+00 0.000000D+00 -2.4448394D+01
 1.3835D-02 0.000000D+00 0.000000D+00 2.505000D+01
 Retention of ingested activity within GI-Tract. (ICRP-30 GI MODEL)
 'S' 0.001000 4
 2.400000D+01 -1.509259D-03
 6.006008D+00 1.152434D-01
 1.800000D+00 -1.927745D+00
 1.000000D+00 2.814011D+00
 Retention of systemic activity (Leggett's Am model)
 14
 36.36911 4.443147E-02
 0.988226 1.556546E-02
 0.33 0.015457
 0.098 0.034611
 0.022969 6.332862E-04
 0.006646 3.907999E-03
 0.001395 1.083446E-03
 0.000981 0.1119944
 0.000632 3.861542E-04
 0.00037 1.399568E-13
 0.000183 5.719352E-02
 0.000106 5.994815E-02
 1.939208E-05 0.6547877
 7.39726E-05 2.534002E-13
 Retention at wound site
 1
 .25 1.
 H/D DOSE per unit deposition (SV/BQ) FOR INHALATION (EPA-520/1-88-020)
 'W' 8
 1.32E-05 6.56E-05 2.67E-05 'Gonads'
 8.67E-10 4.29E-09 1.75E-09 'Breast'
 0.00E+00 0.00E+00 7.72E-05 'Lung'
 7.82E-05 3.87E-04 1.58E-04 'R Marrow'
 9.75E-04 4.83E-03 1.97E-03 'B Surface'
 8.42E-10 4.17E-09 1.70E-09 'Thyroid'
 3.98E-05 1.97E-04 8.03E-05 'Remainder'
 5.39E-05 2.67E-04 1.18E-04 'Effective'
 H/I DOSE/INTAKE (SV/BQ) FOR INGESTION, F1=1E-3 (EPA-520/1-88-020)
 'S' 0.001 8
 1.33E-07 Gonads
 8.82E-12 Breast
 8.81E-12 Lung
 7.82E-07 R. Marrow
 9.77E-06 B. Surface
 8.44E-12 Thyroid
 4.15E-07 Remainder
 5.45E-07 Effective
 ALI(Bq) (from ICRP 30, Part 4, pp 13.)
 Inhalation
 'W' 4.0E+2
 Ingestion
 'S' 0.001 5.0E+04
 FLAG INDICATING PRESENCE (1) OR ABSENCE (0) OF DOSE-RATE FILE FOR NUCLIDE
 1

Appendix I

INPUT DATA FOR EXAMPLE PROBLEMS

INCIDENT.DAT:

-10 S	19890102	0	HU	H-3	V1S19890101	0	20.004900000.001	1.001
-10 S	19890103	0	HU	H-3	V1S19890101	0	20.004500000.001	1.001
-10 S	19890104	0	HU	H-3	V1S19890101	0	20.004200000.001	1.001
-10 S	19890105	0	HU	H-3	V1S19890101	0	20.003700000.001	1.001
-10 S	19890106	0	HU	H-3	V1S19890101	0	20.003800000.001	1.001
-10 S	19890107	0	HU	H-3	V1S19890101	0	20.003600000.001	1.001
-10 S	19890108	0	HU	H-3	V1S19890101	0	20.003100000.001	1.001
-10 S	19890109	0	HU	H-3	V1S19890101	0	20.002900000.001	1.001
-10 S	19890110	0	HU	H-3	V1S19890101	0	20.002600000.001	1.001
-10 S	19890111	0	HU	H-3	V1S19890101	0	20.002400000.001	1.001
-10 S	19890112	0	HU	H-3	V1S19890101	0	20.002100000.001	1.001
-10 S	19890114	0	HU	H-3	V1S19890101	0	20.001900000.001	1.001
-10 S	19890119	0	HU	H-3	V1S19890101	0	20.001000000.001	1.001
-10 S	19890125	0	HU	H-3	V1S19890101	0	20.00 790000.001	1.001
-10 S	19890130	0	HU	H-3	V1S19890101	0	20.00 540000.001	1.001
-10 S	19890206	0	HU	H-3	V1S19890101	0	20.00 320000.001	1.001
-10 S	19890212	0	HU	H-3	V1S19890101	0	20.00 190000.001	1.001
-10 S	19890223	0	HU	H-3	V1S19890101	0	20.00 94000.001	1.001
-10 S	19890306	0	HU	H-3	V1S19890101	0	20.00 46000.001	1.001
-10 S	19890312	0	HU	H-3	V1S19890101	0	20.00 30000.001	1.001
-10 S	19890315	0	HU	H-3	V1S19890101	0	20.00 23000.001	1.001
-10 S	19890319	0	HU	H-3	V1S19890101	0	20.00 18000.001	1.001
-10 S	19890322	0	HU	H-3	V1S19890101	0	20.00 15000.001	1.001
-10 S	19890326	0	HU	H-3	V1S19890101	0	20.00 11000.001	1.001
-10 S	19890329	0	HU	H-3	V1S19890101	0	20.00 9200.001	1.001
-10 S	19890402	0	HU	H-3	V1S19890101	0	20.00 6700.001	1.001
-10 S	19890409	0	HU	H-3	V1S19890101	0	20.00 4600.001	1.001
-10 S	19890412	0	HU	H-3	V1S19890101	0	20.00 4200.001	1.001
-10 S	19890415	0	HU	H-3	V1S19890101	0	20.00 3500.001	1.001
-10 S	19890419	0	HU	H-3	V1S19890101	0	20.00 3000.001	1.001
-10 S	19890423	0	HU	H-3	V1S19890101	0	20.00 2300.001	1.001
-10 S	19890426	0	HU	H-3	V1S19890101	0	20.00 2200.001	1.001
-10 S	19890430	0	HU	H-3	V1S19890101	0	20.00 2100.001	1.001
-20 S	19890211		HU	I-131	D1S19890201		20.00 1440.007	10.007
-20 S	19890217		HU	I-131	D1S19890201		20.00 987.007	10.007
-20 S	19890218		HU	I-131	D1S19890201		20.00 970.007	10.007
-20 S	19890219		HU	I-131	D1S19890201		20.00 419.007	10.007
-20 S	19890220		HU	I-131	D1S19890201		20.00 318.007	10.007
-20 S	19890219		HTHY	I-131	D1S19890201	13.00M	1.00M	
-20 S	19890221		HTHY	I-131	D1S19890201	10.50M	1.00M	
-20 S	19890221		HU	I-131	D1S19890201		20.00 378.007	10.007
-20 S	19890222		HU	I-131	D1S19890201		20.00 557.007	10.007
-20 S	19890223		HU	I-131	D1S19890201		20.00 543.007	10.007
-20 S	19890224		HU	I-131	D1S19890201		20.00 574.007	10.007
-20 S	19890225		HU	I-131	D1S19890201		20.00 318.007	10.007
-20 S	19890226		HU	I-131	D1S19890201		20.00 305.007	10.007
-20 S	19890227		HU	I-131	D1S19890201		20.00 311.007	10.007
-31 S	19890201 448		HU	U-238	D1S19890201	0	20.00 6.105	.055
-31 S	198902011424		HU	U-238	D1S19890201	0	20.00 .995	.055
-31 S	19890203 0		HU	U-238	D1S19890201	0	20.00 .095	.055
-31 S	19890204 0		HU	U-238	D1S19890201	0	20.00 .215	.055
-32 S	19890201 448		HU	U-238	D1S19890201	0	20.00 9.605	.105
-32 S	19890201 936		HU	U-238	D1S19890201	0	20.00 2.605	.105
-32 S	198902011912		HU	U-238	D1S19890201	0	20.00 1.305	.105
-32 S	198902031912		HU	U-238	D1S19890201	0	20.00 .225	.105
-33 S	19890201 838		HU	U-238	D1S19890201	0	20.00 .545	.105
-33 S	198902011200		HU	U-238	D1S19890201	0	20.00 .315	.105
-33 S	198902011536		HU	U-238	D1S19890201	0	20.00 .115	.105
-33 S	19890203 0		HU	U-238	D1S19890201	0	20.00 .005	.005

-33 S	198902031912	HU	U-238	D1S19890201	0	20.00	.015	.005
-41 S	19891231 0	HWBL	CS-137	D1S19890101	0	52.00B	10.00B	
-42 S	19891231 0	HWBL	CS-137	D1S19890101	0	133.00B	10.00B	
-50 S	19890211	HU	I-131	D1S		20.00	1440.007	10.007
-50 S	19890217	HU	I-131	D1S		20.00	987.007	10.007
-50 S	19890218	HU	I-131	D1S		20.00	970.007	10.007
-50 S	19890219	HU	I-131	D1S		20.00	419.007	10.007
-50 S	19890220	HU	I-131	D1S		20.00	318.007	10.007
-50 S	19890219	HTHY	I-131	D1S		13.00M	1.00M	
-50 S	19890221	HTHY	I-131	D1S		10.50M	1.00M	
-50 S	19890221	HU	I-131	D1S		20.00	378.007	10.007
-50 S	19890222	HU	I-131	D1S		20.00	557.007	10.007
-50 S	19890223	HU	I-131	D1S		20.00	543.007	10.007
-50 S	19890224	HU	I-131	D1S		20.00	574.007	10.007
-50 S	19890225	HU	I-131	D1S		20.00	318.007	10.007
-50 S	19890226	HU	I-131	D1S		20.00	305.007	10.007
-50 S	19890227	HU	I-131	D1S		20.00	311.007	10.007
-60 S	19890105	GU	TC-99	S1S19890101		20.000.84	7 .01	7
-60 S	19890106	GU	TC-99	S1S19890101		20.000.63	7 .01	7
-60 S	19890107	GU	TC-99	S1S19890101		20.00.52	7 .01	7
-60 S	19890108	GU	TC-99	S1S19890101		20.00.41	7 .01	7
-60 S	19890109	GU	TC-99	S1S19890101		20.000.35	7 .01	7
-60 S	19890110	GU	TC-99	S1S19890101		20.000.37	7 .01	7
-60 S	19890111	GU	TC-99	S1S19890101		20.000.25	7 .01	7
-60 S	19890112	GU	TC-99	S1S19890101		20.00.23	7 .01	7
-60 S	19890115	GU	TC-99	S1S19890101		20.000.16	7 .01	7
-60 S	19890117	GU	TC-99	S1S19890101		20.000.13	7 .01	7
-60 S	19890119	GU	TC-99	S1S19890101		20.000.11	7 .01	7
-60 S	19890121	GU	TC-99	S1S19890101		20.000.09	7 .01	7
-60 S	19890123	GU	TC-99	S1S19890101		20.000.07	7 0.01	7
-60 S	19890126	GU	TC-99	S1S19890101		20.000.06	7 0.01	7
-70 S	19890102	JF	TC-99	1S19890101		.85	7 .01	7
-70 S	19890103	JF	TC-99	1S19890101		9.5	7 .01	7
-70 S	19890105	JF	TC-99	1S19890101		19.0	7 .01	7
-70 S	19890107	JF	TC-99	1S19890101		3.	7 .01	7
-70 S	19890109	JF	TC-99	1S19890101		5.	7 .01	7
-70 S	19890110	JF	TC-99	1S19890101		1.8	7 .01	7
-70 S	19890111	JF	TC-99	1S19890101		1.7	7 .01	7
-70 S	19890113	JF	TC-99	1S19890101		.35	7 .01	7
-70 S	19890114	JF	TC-99	1S19890101		.21	7 .01	7
-70 S	19890125	JF	TC-99	1S19890101		.18	7 .01	7
-90 S	198901012000	JU	SR-90	1S19390101		1.4	7 .01	7
-90 S	198901020400	JU	SR-90	1S19890101		0.93	7 0.01	7
-90 S	198901020800	JU	SR-90	1S19890101		2.05	7 0.01	7
-90 S	198901022000	JU	SR-90	1S19890101		1.62	7 0.01	7
-90 S	198901030200	JU	SR-90	1S19890101		1.58	7 0.01	7
-90 S	198901032200	JU	SR-90	1S19890101		1.60	7 0.01	7
-90 S	198901040200	JU	SR-90	1S19890101		1.34	7 0.01	7
-90 S	198901042200	JU	SR-90	1S19890101		1.30	7 0.01	7
-90 S	198901020600	JF	SR-90	1S19890101		1.30	7 0.01	7
-90 S	198901022000	JF	SR-90	1S19890101		0.64	7 0.01	7
-90 S	198901030200	JF	SR-90	1S19890101		0.65	7 0.01	7
-90 S	198901032200	JF	SR-90	1S19890101		0.43	7 0.01	7
-90 S	198901040200	JF	SR-90	1S19890101		0.42	7 0.01	7
-90 S	198901042200	JF	SR-90	1S19890101		0.59	7 0.01	7
-100 S	19890105	HU	PU-241	W1S1989J101		.0007	7 .00001	7
-100 S	19890106	HU	PU-241	W1S19890101		0.0006	7 .00001	7
-100 S	19890107	HU	PU-241	W1S19890101		0.0005	7 .00001	7
-100 S	19890108	HU	PU-241	W1S19890101		0.00045	7 0.00001	7
-100 S	19890109	HU	PU-241	W1S19890101		4.E-4	7 1.E-5	7
-100 S	19890110	HU	PU-241	W1S19890101		3.5E-4	7 1.E-5	7
-100 S	19890112	HU	PU-241	W1S19890101		3.E-4	7 1.E-5	7
-100 S	19890114	HU	PU-241	W1S19890101		2.8E-4	7 1.E-5	7
-100 S	19890116	HU	PU-241	W1S19890101		2.6E-4	7 1.E-5	7
-100 S	19890118	HU	PU-241	W1S19890101		2.3E-4	7 1.E-5	7
-100 S	19890120	HU	PU-241	W1S19890101		2.E-4	7 1.E-5	7
-100 S	19890125	HU	PU-241	W1S19890101		1.8E-4	7 1.E-5	7
-100 S	19890130	HU	PU-241	W1S19890101		1.6E-4	7 1.E-5	7
-100 S	19890204	HU	PU-241	W1S19890101		1.5E-4	7 1.E-5	7

-100 S	19890218	HU	PU-241 W1S19890101	1.3E-4	7 1.E-5	7
-110 S	198909030900	HF	PU-238 W1S198909011100114	244.	3 1	3
-110 S	198909041100	HF	PU-238 W1S198909011100103	5.74	3 1	3

ROUTINE.DAT:

-120 S	19890102	HTHY	I-131 D3			163.00B	10.00B
-120 S	19890201 0	HTHY	I-131 D3			3500.00B	10.00B
-120 S	19890301 0	HTHY	I-131 D3			3700.00B	10.00B
-120 S	19891124 0	HTHY	I-131 D3			3738.00B	10.00B
-120 S	198912312400	HTHY	I-131 D3			3738.00B	10.00B
-131 S	19890410 0	HLUN	U-238 D3	0 0		22.35B	.10B
-131 S	19890719 0	HLUN	U-238 D3	0 0		22.35B	.10B
-131 S	19891027 0	HLUN	U-238 D3	0 0		22.35B	.10B
-131 S	198912312400	HLUN	U-238 D3	0 0		22.35B	.10B
-132 S	19890410 0	HLUN	U-238 W3	0 0		884.70B	.10B
-132 S	19890719 0	HLUN	U-238 W3	0 0		1121.00B	.10B
-132 S	19891027 0	HLUN	U-238 W3	0 0		1186.00B	.10B
-132 S	198912312400	HLUN	U-238 W3	0 0		1200.00B	.10B
-133 S	19890410 0	HLUN	U-238 Y3	0 0		1462.00B	.10B
-133 S	19890719 0	HLUN	U-238 Y3	0 0		2749.00B	.10B
-133 S	19891027 0	HLUN	U-238 Y3	0 0		3911.00B	.10B
-133 S	198912312400	HLUN	U-238 Y3	0 0		4607.00B	.10B
-141 S	19890410	HLUN	U-238 D3		22.35	B .1	B
-141 S	19890719	HLUN	U-238 D3		0.22	B .1	B
-141 S	19891027	HLUN	U-238 D3		11.17	B .1	B
-141 S	198912312400	HLUN	U-238 D3		0.22	B .1	B
-142 S	19890410	HLUN	U-238 W3		884.7	B 1	B
-142 S	19890719	HLUN	U-238 W3		245.3	B 1	B
-142 S	19891027	HLUN	U-238 W3		509.8	B 1	B
-142 S	198912312400	HLUN	U-238 W3		221.3	B 1	B
-143 S	19890410	HLUN	U-238 Y3		1462.	B 1	B
-143 S	19890719	HLUN	U-238 Y3		1301.	B 1	B
-143 S	19891027	HLUN	U-238 Y3		1907.	B 1	B
-143 S	198912312400	HLUN	U-238 Y3		1778.	B 1	B
-150 S	198903300000	HLUN	U-238 Y3		13.26B		1B 1.000
-150 S	198903300000	HWBC	U-238 Y3		26.64B		1B 1.000
-150 S	198906280000	HLUN	U-238 Y3		25.02B		1B 1.000
-150 S	198906280000	HWBC	U-238 Y3		50.20B		1B 1.000
-150 S	198909260000	HLUN	U-238 Y3		35.75B		1B 1.000
-150 S	198909260000	HWBC	U-238 Y3		71.74B		1B 1.000
-150 S	198912300000	HLUN	U-238 Y3		46.07B		1B 1.000
-150 S	198912300000	HWBC	U-238 Y3		92.46B		1B 1.000

Appendix J

LISTINGS OF DOSEXPRT SCREEN OUTPUT FOR EXAMPLE PROBLEMS

INCIDENT.DAT screen output listing when DOSEXPRT is run in debug/test mode with long listing option:

```
KOHIS$ RUN [RWD.DOSEX41]DOSEXPRT
=====
DOSEXPRT VERSION: 4.2 (DATE: 03/17/92)
Determination of Intake and Dose Using Bioassay Records
-----
Developed for Martin Marietta Energy Systems, Inc. by
R. C. Ward and K. F. Eckerman of Oak Ridge National Laboratory
-----
ANY PROBLEMS WITH DOSEXPRT SHOULD BE COMMUNICATED TO:
RICHARD C. WARD, ORNL (Phone: 4-5449 e-mail: RWD)
=====
Date of Computation: 3/17/92

Enter PATH for Bioassay and Output Files:
Enter Output Filename (NO EXTENSION): INCIDENT
Enter PATH for Nuclide Files:
Enter Bioassay Records Filename (WITHOUT .DAT EXTENSION): INCIDENT
Enter SITE Filename (WITHOUT .DFT EXTENSION): SITE
Enter Display Option: Trace(-1), Long list(1), None(2): 1
User Control AMAD? (Y/[N]):
Save CTL file? (Y/[N]): Y

PRODUCING .CTL FILE
TOTAL NUMBER OF RECORDS IN BIOASSAY FILE: 131

Enter Beginning MEASUREMENT Date [YYYY]: 1989
Enter Duration (years): 1

Enter Beginning INTAKE Date [YYYY]: 1989
Enter Duration (years): 1
-----
NUCLIDE DATA FILES AVAILABLE TO THIS RUN:
H-3 C-11 C-14 NA-22 NA-24 P-32 CO-57 CO-58
CO-60 SR-85 SR-89 SR-90 TC-99 TC-99M CS-134 CS-137
I-125 I-129 I-131 I-135 PM-147 EU-152 EU-154 EU-155
TL-201 RA-226 RA-228 TH-232 U-234 U-235 U-236
U-238 PU-238 PU-239 PU-241 AM-241 TPU CM-242 CM-244
-----
NUCLIDES WITH DOSE-RATE FILES:
CO-60 SR-89 SR-90 CO-57
I-125 I-129 CS-134 CS-137
U-238 PU-238 PU-239 PU-241 AM-241 TPU U-234 U-235 U-236
CM-244
-----
BIOASSAY RECORDS FILENAME: INCIDENT.DAT
SITE PARAMETER FILENAME: SITE.DFT
PERIOD FOR CONSIDERING MEASUREMENTS: 19890101 --> 19900101
PERIOD FOR COMPUTING INTAKE: 19890101 --> 19900101
-----
*** NO ANNUAL DOSES COMPUTED ***
AMAD 1.00 micron - DEPOSITION PARAMS D3 0.30 D4 0.08 D5 0.25
URINE EXCRETION RATE (ml/day): 1400.0 DEFAULT SAMPLE VOLUME(ml): 20.0
FECAL EXCRETION RATE (g/day): 125.0 DEFAULT SAMPLE MASS(g): 20.0
BREATH EXCRETION RATE (l/day): 20000.0 DEFAULT SAMPLE VOLUME(l): 20.0
MEASUREMENTS < OR = LC ARE SET TO ZERO. LC IS DEFINED AS MDA/1.0
=====
```

BADGE -10 SITE H-3 V8 INHALATION BRE INCIDENT-19890101

BADGE -10 SITE H-3 V8 INHALATION URINE INCIDENT-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890102	0	20.0	4.900E+06	dpm/ml	1.00	dpm/ml	V8
2	19890103	0	20.0	4.500E+06	dpm/ml	1.00	dpm/ml	V8
3	19890104	0	20.0	4.200E+06	dpm/ml	1.00	dpm/ml	V8
4	19890105	0	20.0	3.700E+06	dpm/ml	1.00	dpm/ml	V8
5	19890106	0	20.0	3.800E+06	dpm/ml	1.00	dpm/ml	V8
6	19890107	0	20.0	3.600E+06	dpm/ml	1.00	dpm/ml	V8
7	19890108	0	20.0	3.100E+06	dpm/ml	1.00	dpm/ml	V8
8	19890109	0	20.0	2.900E+06	dpm/ml	1.00	dpm/ml	V8
9	19890110	0	20.0	2.600E+06	dpm/ml	1.00	dpm/ml	V8
10	19890111	0	20.0	2.400E+06	dpm/ml	1.00	dpm/ml	V8
11	19890112	0	20.0	2.100E+06	dpm/ml	1.00	dpm/ml	V8
12	19890114	0	20.0	1.900E+06	dpm/ml	1.00	dpm/ml	V8
13	19890119	0	20.0	1.000E+06	dpm/ml	1.00	dpm/ml	V8
14	19890125	0	20.0	7.900E+05	dpm/ml	1.00	dpm/ml	V8
15	19890130	0	20.0	5.400E+05	dpm/ml	1.00	dpm/ml	V8
16	19890206	0	20.0	3.200E+05	dpm/ml	1.00	dpm/ml	V8
17	19890212	0	20.0	1.900E+05	dpm/ml	1.00	dpm/ml	V8
18	19890223	0	20.0	9.400E+04	dpm/ml	1.00	dpm/ml	V8
19	19890306	0	20.0	4.600E+04	dpm/ml	1.00	dpm/ml	V8
20	19890312	0	20.0	3.000E+04	dpm/ml	1.00	dpm/ml	V8
21	19890315	0	20.0	2.300E+04	dpm/ml	1.00	dpm/ml	V8
22	19890319	0	20.0	1.800E+04	dpm/ml	1.00	dpm/ml	V8
23	19890322	0	20.0	1.500E+04	dpm/ml	1.00	dpm/ml	V8
24	19890326	0	20.0	1.100E+04	dpm/ml	1.00	dpm/ml	V8
25	19890329	0	20.0	9.200E+03	dpm/ml	1.00	dpm/ml	V8
26	19890402	0	20.0	6.700E+03	dpm/ml	1.00	dpm/ml	V8
27	19890409	0	20.0	4.600E+03	dpm/ml	1.00	dpm/ml	V8
28	19890412	0	20.0	4.200E+03	dpm/ml	1.00	dpm/ml	V8
29	19890415	0	20.0	3.500E+03	dpm/ml	1.00	dpm/ml	V8
30	19890419	0	20.0	3.000E+03	dpm/ml	1.00	dpm/ml	V8
31	19890423	0	20.0	2.300E+03	dpm/ml	1.00	dpm/ml	V8
32	19890426	0	20.0	2.200E+03	dpm/ml	1.00	dpm/ml	V8
33	19890430	0	20.0	2.100E+03	dpm/ml	1.00	dpm/ml	V8

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME				
1	19890102	0	1.143E+08	Bq/day	23.3	Bq/day	V8
2	19890103	0	1.050E+08	Bq/day	23.3	Bq/day	V8
3	19890104	0	9.800E+07	Bq/day	23.3	Bq/day	V8
4	19890105	0	8.633E+07	Bq/day	23.3	Bq/day	V8
5	19890106	0	8.867E+07	Bq/day	23.3	Bq/day	V8
6	19890107	0	8.400E+07	Bq/day	23.3	Bq/day	V8
7	19890108	0	7.233E+07	Bq/day	23.3	Bq/day	V8
8	19890109	0	6.767E+07	Bq/day	23.3	Bq/day	V8
9	19890110	0	6.067E+07	Bq/day	23.3	Bq/day	V8
10	19890111	0	5.600E+07	Bq/day	23.3	Bq/day	V8
11	19890112	0	4.900E+07	Bq/day	23.3	Bq/day	V8
12	19890114	0	4.433E+07	Bq/day	23.3	Bq/day	V8
13	19890119	0	2.333E+07	Bq/day	23.3	Bq/day	V8
14	19890125	0	1.843E+07	Bq/day	23.3	Bq/day	V8
15	19890130	0	1.260E+07	Bq/day	23.3	Bq/day	V8
16	19890206	0	7.467E+06	Bq/day	23.3	Bq/day	V8
17	19890212	0	4.433E+06	Bq/day	23.3	Bq/day	V8
18	19890223	0	2.193E+06	Bq/day	23.3	Bq/day	V8
19	19890306	0	1.073E+06	Bq/day	23.3	Bq/day	V8

20	19890312	0	7.000E+05 Bq/day	23.3	Bq/day	V8
21	19890315	0	5.367E+05 Bq/day	23.3	Bq/day	V8
22	19890319	0	4.200E+05 Bq/day	23.3	Bq/day	V8
23	19890322	0	3.500E+05 Bq/day	23.3	Bq/day	V8
24	19890326	0	2.567E+05 Bq/day	23.3	Bq/day	V8
25	19890329	0	2.147E+05 Bq/day	23.3	Bq/day	V8
26	19890402	0	1.563E+05 Bq/day	23.3	Bq/day	V8
27	19890409	0	1.073E+05 Bq/day	23.3	Bq/day	V8
28	19890412	0	9.800E+04 Bq/day	23.3	Bq/day	V8
29	19890415	0	8.167E+04 Bq/day	23.3	Bq/day	V8
30	19890419	0	7.000E+04 Bq/day	23.3	Bq/day	V8
31	19890423	0	5.367E+04 Bq/day	23.3	Bq/day	V8
32	19890426	0	5.133E+04 Bq/day	23.3	Bq/day	V8
33	19890430	0	4.900E+04 Bq/day	23.3	Bq/day	V8

ESTIMATED INTAKE: 2.60E+09 Bq or 7.04E+04 uCi
ALI: (3.00E+09 Bq) or (8.11E+04 uCi)
MEAN FRACTIONAL DEVIATION: 0.34 FOR 33 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	mrem
GONADS	4.51E+04	4.51E+03
BREAST	4.51E+04	4.51E+03
LUNG	4.51E+04	4.51E+03
R. MARROW	4.51E+04	4.51E+03
BONE SURFACE	4.51E+04	4.51E+03
THYROID	4.51E+04	4.51E+03
REMAINDER	4.51E+04	4.51E+03
EFFECTIVE	4.51E+04	4.51E+03

**** HIT RETURN TO CONTINUE ****

BADGE -10 SITE H-3 V8 INHALATION FECAL INCIDENT-19890101

BADGE -10 SITE H-3 V8 INHALATION WBC INCIDENT-19890101

BADGE -10 SITE H-3 V8 INHALATION LUN INCIDENT-19890101

WEIGHTED INTAKE (Bq): 2.60E+09 OVER MEASUREMENT PERIOD
WEIGHTED INTAKE (Bq): 2.60E+09 OVER INTAKE PERIOD
WEIGHTED CEDE (uSv): 4.51E+04 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

BADGE -20 SITE I-131 D INHALATION BRE INCIDENT-19890201

BADGE -20 SITE I-131 D INHALATION URINE INCIDENT-19890201

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS	
	19890201	0	<=== INCIDENT DATE AND TIME						
1	19890211	0	20.0	1.440E+03	Bq/day	10.0	Bq/day	D	
2	19890217	0	20.0	987.	Bq/day	10.0	Bq/day	D	
3	19890218	0	20.0	970.	Bq/day	10.0	Bq/day	D	
4	19890219	0	20.0	419.	Bq/day	10.0	Bq/day	D	
5	19890220	0	20.0	318.	Bq/day	10.0	Bq/day	D	
6	19890221	0	20.0	378.	Bq/day	10.0	Bq/day	D	
7	19890222	0	20.0	557.	Bq/day	10.0	Bq/day	D	
8	19890223	0	20.0	543.	Bq/day	10.0	Bq/day	D	
9	19890224	0	20.0	574.	Bq/day	10.0	Bq/day	D	
10	19890225	0	20.0	318.	Bq/day	10.0	Bq/day	D	
11	19890226	0	20.0	305.	Bq/day	10.0	Bq/day	D	
12	19890227	0	20.0	311.	Bq/day	10.0	Bq/day	D	

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890211	0	1.440E+03	Bq/day	10.0	Bq/day	D	
2	19890217	0	987.	Bq/day	10.0	Bq/day	D	
3	19890218	0	970.	Bq/day	10.0	Bq/day	D	
4	19890219	0	419.	Bq/day	10.0	Bq/day	D	
5	19890220	0	318.	Bq/day	10.0	Bq/day	D	
6	19890221	0	378.	Bq/day	10.0	Bq/day	D	
7	19890222	0	557.	Bq/day	10.0	Bq/day	D	
8	19890223	0	543.	Bq/day	10.0	Bq/day	D	
9	19890224	0	574.	Bq/day	10.0	Bq/day	D	
10	19890225	0	318.	Bq/day	10.0	Bq/day	D	
11	19890226	0	305.	Bq/day	10.0	Bq/day	D	
12	19890227	0	311.	Bq/day	10.0	Bq/day	D	

ESTIMATED INTAKE: 5.15E+06 Bq or 1.39E+02 uCi
ALI: (2.00E+06 Bq) or (54. uCi)
MEAN FRACTIONAL DEVIATION: 0.31 FOR 12 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	1.30E+02	13.
BREAST	4.05E+02	41.
LUNG	3.37E+03	3.37E+02
R. MARROW	3.23E+02	32.
BONE SURFACE	2.95E+02	29.
THYROID	1.50E+06	1.50E+05
REMAINDER	4.14E+02	41.
EFFECTIVE	4.57E+04	4.57E+03

**** HIT RETURN TO CONTINUE ****

BADGE -20 SITE I-131 D INHALATION FECAL INCIDENT-19890201

BADGE -20 SITE I-131 D INHALATION WBC INCIDENT-19890201

BADGE -20 SITE I-131 D INHALATION LUN INCIDENT-19890201

BADGE -20 SITE I-131 D INHALATION THY INCIDENT-19890201

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890219	0	13.	M	1.0	M	D	
2	19890221	0	11.	M	1.0	M	D	

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890219	0	4.810E+05	Bq	3.700E+04	Bq	D	
2	19890221	0	3.885E+05	Bq	3.700E+04	Bq	D	

ESTIMATED INTAKE: 1.37E+07 Bq or 3.71E+02 uCi
ALI: (2.00E+06 Bq) or (54. uCi)
MEAN FRACTIONAL DEVIATION: 1.35E-02 FOR 2 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	3.47E+02	35.
BREAST	1.08E+03	1.08E+02
LUNG	9.00E+03	9.00E+02
R. MARROW	8.60E+02	86.
BONE SURFACE	7.86E+02	79.

THYROID	4.01E+06	4.01E+05
REMAINDER	1.10E+03	1.10E+02
EFFECTIVE	1.22E+05	1.22E+04

 **** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE AND COMMITTED DOSE COMPUTED USING TOTAL WEIGHTS SHOWN BELOW:

ASSAY:	BRE	URINE	FECAL	WBC	LUN	THY
INTAKE (Bq):	0.00E+00	5.15E+06	0.00E+00	0.00E+00	0.00E+00	1.37E+07
NUCLIDE WGT:	0.00E+00	3.00E-01	0.00E+00	0.00E+00	0.00E+00	5.80E-01
NUMERIC WGT:	0.00E+00	8.57E-01	0.00E+00	0.00E+00	0.00E+00	1.43E-01
TOTAL WGT:	0.00E+00	7.56E-01	0.00E+00	0.00E+00	0.00E+00	2.44E-01

WEIGHTED INTAKE (Bq): 7.23E+06 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 7.23E+06 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 6.43E+04 FROM INTAKE PERIOD

 **** HIT RETURN TO CONTINUE ****

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

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BADGE -31 SITE U-238 D INHALATION BRE INCIDENT-19890201

BADGE -31 SITE U-238 D INHALATION URINE INCIDENT-19890201

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890201	448	20.0	6.10	ug/ml	5.000E-02	ug/ml	D
2	19890201	1424	20.0	0.990	ug/ml	5.000E-02	ug/ml	D
3	19890203	0	20.0	9.000E-02	ug/ml	5.000E-02	ug/ml	D
4	19890204	0	20.0	0.210	ug/ml	5.000E-02	ug/ml	D

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890201	0	<===INCIDENT DATE AND TIME				
1	19890201	448	106.	Bq/day	0.871	Bq/day	D
2	19890201	1424	17.2	Bq/day	0.871	Bq/day	D
3	19890203	0	1.57	Bq/day	0.871	Bq/day	D
4	19890204	0	3.66	Bq/day	0.871	Bq/day	D

ESTIMATED INTAKE: 1.75E+02 Bq or 4.73E-03 uCi
 ALI: (5.00E+04 Bq) or (1.4 uCi)
 MEAN FRACTIONAL DEVIATION: 0.61 FOR 4 RESULTS

 **** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	3.9	0.39
BREAST	3.9	0.39
LUNG	49.	4.9
R. MARROW	1.15E+02	12.
BONE SURFACE	1.72E+03	1.72E+02
THYROID	3.9	0.39
REMAINDER	1.44E+02	14.
EFFECTIVE	1.16E+02	12.

 **** HIT RETURN TO CONTINUE ****

BADGE -31 SITE U-238 D INHALATION FECAL INCIDENT-19890201

BADGE -31 SITE U-238 D INHALATION WBC INCIDENT-19890201

BADGE -31 SITE U-238 D INHALATION LUN INCIDENT-19890201

WEIGHTED INTAKE (Bq): 1.75E+02 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.75E+02 OVER INTAKE PERIOD

WEIGHTED CEDE (USV): 1.16E+02 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

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BADGE -32 SITE U-238 D INHALATION BRE INCIDENT-19890201

BADGE -32 SITE U-238 D INHALATION URINE INCIDENT-19890201
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890201	448	20.0	9.60	ug/ml	0.100	ug/ml	D
2	19890201	936	20.0	2.60	ug/ml	0.100	ug/ml	D
3	19890201	1912	20.0	1.30	ug/ml	0.100	ug/ml	D
4	19890203	1912	20.0	0.220	ug/ml	0.100	ug/ml	D

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890201	0	<===INCIDENT DATE AND TIME				
1	19890201	448	167.	Bq/day	1.74	Bq/day	D
2	19890201	936	45.3	Bq/day	1.74	Bq/day	D
3	19890201	1912	22.6	Bq/day	1.74	Bq/day	D
4	19890203	1912	3.83	Bq/day	1.74	Bq/day	D

ESTIMATED INTAKE: 2.89E+02 Bq or 7.81E-03 uCi

ALI: (5.00E+04 Bq) or (1.4 uCi)

MEAN FRACTIONAL DEVIATION: 0.55 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	6.4	0.64
BREAST	6.4	0.64
LUNG	81.	8.1
R. MARROW	1.90E+02	19.
BONE SURFACE	2.83E+03	2.83E+02
THYROID	6.4	0.64
REMAINDER	2.37E+02	24.
EFFECTIVE	1.91E+02	19.

**** HIT RETURN TO CONTINUE ****

BADGE -32 SITE U-238 D INHALATION FECAL INCIDENT-19890201

BADGE -32 SITE U-238 D INHALATION WBC INCIDENT-19890201

BADGE -32 SITE U-238 D INHALATION LUN INCIDENT-19890201

WEIGHTED INTAKE (Bq): 2.89E+02 OVER MEASUREMENT PERIOD

WEIGHTED INTAKE (Bq): 2.89E+02 OVER INTAKE PERIOD

WEIGHTED CEDE (USV): 1.91E+02 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

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BADGE -33 SITE U-238 D INHALATION BRE INCIDENT-19890201

BADGE -33 SITE U-238 D INHALATION URINE INCIDENT-19890201
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890201	838	20.0	0.540	ug/ml	0.100	ug/ml	D
2	19890201	1200	20.0	0.310	ug/ml	0.100	ug/ml	D
3	19890201	1536	20.0	0.110	ug/ml	0.100	ug/ml	D

4	19890203	0	20.0	0.000E+00	ug/ml	0.000E+00	ug/ml	D
5	19890203	1912	20.0	1.000E-02	ug/ml	0.000E+00	ug/ml	D

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890201	0	<===INCIDENT DATE AND TIME					
1	19890201	838	9.40	Bq/day	1.74	Bq/day	D	
2	19890201	1200	5.40	Bq/day	1.74	Bq/day	D	
3	19890201	1536	1.92	Bq/day	1.74	Bq/day	D	
4	19890203	0	0.000E+00	Bq/day	0.000E+00	Bq/day	D	
5	19890203	1912	0.174	Bq/day	0.000E+00	Bq/day	D	

ESTIMATED INTAKE: 18. Bq or 4.90E-04 uCi
 ALI: (5.00E+04 Bq) or (1.4 uCi)
 MEAN FRACTIONAL DEVIATION: 0.77 FOR 5 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	0.40	4.04E-02
BREAST	0.40	4.04E-02
LUNG	5.1	0.51
R. MARROW	12.	1.2
BONE SURFACE	1.78E+02	18.
THYROID	0.40	4.02E-02
REMAINDER	15.	1.5
EFFECTIVE	12.	1.2

**** HIT RETURN TO CONTINUE ****

BADGE -33 SITE U-238 D INHALATION FECAL INCIDENT-19890201

BADGE -33 SITE U-238 D INHALATION WBC INCIDENT-19890201

BADGE -33 SITE U-238 D INHALATION LUN INCIDENT-19890201

WEIGHTED INTAKE (Bq): 1.81E+01 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.81E+01 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 1.20E+01 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

BADGE -41 SITE CS-137 D INHALATION BRE INCIDENT-19890101

BADGE -41 SITE CS-137 D INHALATION URINE INCIDENT-19890101

BADGE -41 SITE CS-137 D INHALATION FECAL INCIDENT-19890101

BADGE -41 SITE CS-137 D INHALATION WBC INCIDENT-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101	0	<===INCIDENT DATE AND TIME					
1	19891231	0	52.	B	10.	B	D	

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101	0	<===INCIDENT DATE AND TIME					
1	19891231	0	52.0	Bq	10.0	Bq	D	

*** WARNING *** WBL-->WBC

ESTIMATED INTAKE: 9.39E+02 Bq or 2.54E-02 uCi
 ALI: (6.00E+06 Bq) or (1.62E+02 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 1 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	8.2	0.82
BREAST	7.3	0.73
LUNG	8.3	0.83
R. MARROW	7.8	0.78
BONE SURFACE	7.4	0.74
THYROID	7.4	0.74
REMAINDER	8.6	0.86
EFFECTIVE	8.1	0.81

**** HIT RETURN TO CONTINUE ****

BADGE -41 SITE CS-137 D INHALATION LUN INCIDENT-19890101

WEIGHTED INTAKE (Bq): 9.39E+02 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 9.39E+02 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 8.10E+00 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

BADGE -42 SITE CS-137 D INHALATION BRE INCIDENT-19890101

BADGE -42 SITE CS-137 D INHALATION URINE INCIDENT-19890101

BADGE -42 SITE CS-137 D INHALATION FECAL INCIDENT-19890101

BADGE -42 SITE CS-137 D INHALATION WBC INCIDENT-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME				
1	19891231	0	1.33E+02	B	10.	B	D

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME				
1	19891231	0	133.	Bq	10.0	Bq	D

*** WARNING *** WBL-->WBC

ESTIMATED INTAKE: 2.40E+03 Bq or 6.49E-02 uCi
 ALI: (6.00E+06 Bq) or (1.62E+02 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 1 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	21.	2.1
BREAST	19.	1.9
LUNG	21.	2.1
R. MARROW	20.	2.0
BONE SURFACE	19.	1.9
THYROID	19.	1.9
REMAINDER	22.	2.2
EFFECTIVE	21.	2.1

**** HIT RETURN TO CONTINUE ****

BADGE -42 SITE CS-137 D INHALATION LUN INCIDENT-19890101

WEIGHTED INTAKE (Bq): 2.40E+03 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 2.40E+03 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 2.07E+01 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

 BADGE -50 SITE I-131 D INHALATION BRE INCIDENT-

 BADGE -50 SITE I-131 D INHALATION URINE INCIDENT-
 CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

 RECORD DATE TIME VOL(ml) RESULT UNITS MDA UNITS CLASS

 0 0 <===INCIDENT DATE AND TIME
 ** WARNING ** INCIDENT DATE AND TIME MISSING
 1 19890211 0 20.0 1.440E+03 Bq/day 10.0 Bq/day D
 2 19890217 0 20.0 987. Bq/day 10.0 Bq/day D
 3 19890218 0 20.0 970. Bq/day 10.0 Bq/day D
 4 19890219 0 20.0 419. Bq/day 10.0 Bq/day D
 5 19890220 0 20.0 318. Bq/day 10.0 Bq/day D
 6 19890221 0 20.0 378. Bq/day 10.0 Bq/day D
 7 19890222 0 20.0 557. Bq/day 10.0 Bq/day D
 8 19890223 0 20.0 543. Bq/day 10.0 Bq/day D
 9 19890224 0 20.0 574. Bq/day 10.0 Bq/day D
 10 19890225 0 20.0 318. Bq/day 10.0 Bq/day D
 11 19890226 0 20.0 305. Bq/day 10.0 Bq/day D
 12 19890227 0 20.0 311. Bq/day 10.0 Bq/day D

 RESULTS SELECTED FOR INCIDENT ANALYSIS:

 RECORD DATE TIME RESULT UNITS MDA UNITS CLASS

 0 0 <===INCIDENT DATE AND TIME
 1 19890211 0 1.440E+03 Bq/day 10.0 Bq/day D
 2 19890217 0 987. Bq/day 10.0 Bq/day D
 3 19890218 0 970. Bq/day 10.0 Bq/day D
 4 19890219 0 419. Bq/day 10.0 Bq/day D
 5 19890220 0 318. Bq/day 10.0 Bq/day D
 6 19890221 0 378. Bq/day 10.0 Bq/day D
 7 19890222 0 557. Bq/day 10.0 Bq/day D
 8 19890223 0 543. Bq/day 10.0 Bq/day D
 9 19890224 0 574. Bq/day 10.0 Bq/day D
 10 19890225 0 318. Bq/day 10.0 Bq/day D
 11 19890226 0 305. Bq/day 10.0 Bq/day D
 12 19890227 0 311. Bq/day 10.0 Bq/day D

 ** WARNING ** INCIDENT DATE AND TIME MISSING - ASSUME 10.00 DAYS EARLIER
 ESTIMATED INTAKE: 5.15E+06 Bq or 1.39E+02 uCi
 ALI: (2.00E+06 Bq) or (54. uCi)
 MEAN FRACTIONAL DEVIATION: 0.31 FOR 12 RESULTS

 **** HIT RETURN TO CONTINUE ****

 ORGAN COMMITTED DOSE EQUIVALENT

	USV	or	mrem
GONADS	1.30E+02		13.
BREAST	4.05E+02		41.
LUNG	3.37E+03		3.37E+02
R. MARROW	3.23E+02		32.
BONE SURFACE	2.95E+02		29.
THYROID	1.50E+06		1.50E+05
REMAINDER	4.14E+02		41.
EFFECTIVE	4.57E+04		4.57E+03

 **** HIT RETURN TO CONTINUE ****

 BADGE -50 SITE I-131 D INHALATION FECAL INCIDENT-

 BADGE -50 SITE I-131 D INHALATION WBC INCIDENT-

 BADGE -50 SITE I-131 D INHALATION LUN INCIDENT-

 BADGE -50 SITE I-131 D INHALATION THY INCIDENT-
 CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

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RECORD   DATE TIME   RESULT   UNITS   MDA   UNITS   CLASS
-----
          0      0   <===INCIDENT DATE AND TIME
** WARNING ** INCIDENT DATE AND TIME MISSING
  1 19890219  0   13.      M    1.0     M    D
  2 19890221  0   11.      M    1.0     M    D
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RESULTS SELECTED FOR INCIDENT ANALYSIS:

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RECORD   DATE TIME   RESULT   UNITS   MDA   UNITS   CLASS
-----
          0      0   <===INCIDENT DATE AND TIME
  1 19890219  0   4.810E+05 Bq   3.700E+04 Bq   D
  2 19890221  0   3.885E+05 Bq   3.700E+04 Bq   D
** WARNING ** INCIDENT DATE AND TIME MISSING - ASSUME 18.00 DAYS EARLIER
ESTIMATED INTAKE: 1.37E+07 Bq or 3.71E+02 uCi
ALI: (2.00E+06 Bq) or ( 54. uCi)
MEAN FRACTIONAL DEVIATION: 1.35E-02 FOR 2 RESULTS
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**** HIT RETURN TO CONTINUE ****

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ORGAN          COMMITTED DOSE EQUIVALENT
              USv or mrem
GONADS        3.47E+02 35.
BREAST        1.08E+03 1.08E+02
LUNG          9.00E+03 9.00E+02
R. MARROW    8.60E+02 86.
BONE SURFACE 7.86E+02 79.
THYROID      4.01E+06 4.01E+05
REMAINDER    1.10E+03 1.10E+02
EFFECTIVE    1.22E+05 1.22E+04
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**** HIT RETURN TO CONTINUE ****

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WEIGHTED INTAKE AND COMMITTED DOSE COMPUTED USING TOTAL WEIGHTS SHOWN BELOW:
ASSAY:      BRE      URINE      FECAL      WBC      LUN      THY
INTAKE (Bq): 0.00E+00 5.15E+06 0.00E+00 0.00E+00 0.00E+00 1.37E+07
NUCLIDE WGHT: 0.00E+00 3.00E-01 0.00E+00 0.00E+00 0.00E+00 5.80E-01
NUMERIC WGHT: 0.00E+00 8.57E-01 0.00E+00 0.00E+00 0.00E+00 1.43E-01
TOTAL WGHT: 0.00E+00 7.56E-01 0.00E+00 0.00E+00 0.00E+00 2.44E-01
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WEIGHTED INTAKE (Bq): 7.23E+06 OVER MEASUREMENT PERIOD
WEIGHTED INTAKE (Bq): 7.23E+06 OVER INTAKE PERIOD
WEIGHTED CEDE (USV): 6.43E+04 FROM INTAKE PERIOD
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**** HIT RETURN TO CONTINUE ****

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

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BADGE -60 SITE TC-99 S INGESTION BRE INCIDENT-19890101
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BADGE -60 SITE TC-99 S INGESTION URINE INCIDENT-19890101
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day
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RECORD   DATE TIME   VOL(ml) RESULT   UNITS   MDA   UNITS   CLASS
-----
          0      0   <===INCIDENT DATE AND TIME
  1 19890105  0  20.0   0.840   Bq/day 1.000E-02 Bq/day S
  2 19890106  0  20.0   0.630   Bq/day 1.000E-02 Bq/day S
  3 19890107  0  20.0   0.520   Bq/day 1.000E-02 Bq/day S
  4 19890108  0  20.0   0.410   Bq/day 1.000E-02 Bq/day S
  5 19890109  0  20.0   0.350   Bq/day 1.000E-02 Bq/day S
  6 19890110  0  20.0   0.370   Bq/day 1.000E-02 Bq/day S
  7 19890111  0  20.0   0.250   Bq/day 1.000E-02 Bq/day S
  8 19890112  0  20.0   0.230   Bq/day 1.000E-02 Bq/day S
  9 19890115  0  20.0   0.160   Bq/day 1.000E-02 Bq/day S
 10 19890117  0  20.0   0.130   Bq/day 1.000E-02 Bq/day S
 11 19890119  0  20.0   0.110   Bq/day 1.000E-02 Bq/day S
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12	19890121	0	20.0	9.000E-02	Bq/day	1.000E-02	Bq/day	S
13	19890123	0	20.0	7.000E-02	Bq/day	1.000E-02	Bq/day	S
14	19890126	0	20.0	6.000E-02	Bq/day	1.000E-02	Bq/day	S

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890105	0	0.840	Bq/day	1.000E-02	Bq/day	S	
2	19890106	0	0.630	Bq/day	1.000E-02	Bq/day	S	
3	19890107	0	0.520	Bq/day	1.000E-02	Bq/day	S	
4	19890108	0	0.410	Bq/day	1.000E-02	Bq/day	S	
5	19890109	0	0.350	Bq/day	1.000E-02	Bq/day	S	
6	19890110	0	0.370	Bq/day	1.000E-02	Bq/day	S	
7	19890111	0	0.250	Bq/day	1.000E-02	Bq/day	S	
8	19890112	0	0.230	Bq/day	1.000E-02	Bq/day	S	
9	19890115	0	0.160	Bq/day	1.000E-02	Bq/day	S	
10	19890117	0	0.130	Bq/day	1.000E-02	Bq/day	S	
11	19890119	0	0.110	Bq/day	1.000E-02	Bq/day	S	
12	19890121	0	9.000E-02	Bq/day	1.000E-02	Bq/day	S	
13	19890123	0	7.000E-02	Bq/day	1.000E-02	Bq/day	S	
14	19890126	0	6.000E-02	Bq/day	1.000E-02	Bq/day	S	

ESTIMATED INTAKE: 1.30E+02 Bq or 3.50E-03 uCi
 ALI: (1.00E+08 Bq) or (2.70E+03 uCi)
 MEAN FRACTIONAL DEVIATION: 0.47 FOR 14 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT		
	uSv	or	mrem
GONADS	7.83E-03		7.83E-04
BREAST	7.83E-03		7.83E-04
LUNG	7.83E-03		7.83E-04
R. MARROW	7.83E-03		7.83E-04
BONE SURFACE	7.83E-03		7.83E-04
THYROID	0.21		2.10E-02
REMAINDER	0.13		1.32E-02
EFFECTIVE	5.12E-02		5.12E-03

**** HIT RETURN TO CONTINUE ****

BADGE -60 SITE TC-99 S INGESTION FECAL INCIDENT-19890101

BADGE -60 SITE TC-99 S INGESTION WBC INCIDENT-19890101

BADGE -60 SITE TC-99 S INGESTION LUN INCIDENT-19890101

WEIGHTED INTAKE (Bq): 1.30E+02 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.30E+02 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 5.12E-02 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

BADGE -70 SITE TC-99 INJECTION BRE INCIDENT-19890101

BADGE -70 SITE TC-99 INJECTION URINE INCIDENT-19890101

BADGE -70 SITE TC-99 INJECTION FECAL INCIDENT-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 3 = dpm/sample 7 = Bq/day

RECORD	DATE	TIME	MASS(gm)	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890102	0	0.000E+00	0.850	Bq/day	1.000E-02	Bq/day	
2	19890103	0	0.000E+00	9.50	Bq/day	1.000E-02	Bq/day	
3	19890105	0	0.000E+00	19.0	Bq/day	1.000E-02	Bq/day	
4	19890107	0	0.000E+00	3.00	Bq/day	1.000E-02	Bq/day	
5	19890109	0	0.000E+00	5.00	Bq/day	1.000E-02	Bq/day	

6	19890110	0	0.000E+00	1.80	Bq/day	1.000E-02	Bq/day
7	19890111	0	0.000E+00	1.70	Bq/day	1.000E-02	Bq/day
8	19890113	0	0.000E+00	0.350	Bq/day	1.000E-02	Bq/day
9	19890114	0	0.000E+00	0.210	Bq/day	1.000E-02	Bq/day
10	19890125	0	0.000E+00	0.180	Bq/day	1.000E-02	Bq/day

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890102	0	0.850	Bq/day	1.000E-02	Bq/day		
2	19890103	0	9.50	Bq/day	1.000E-02	Bq/day		
3	19890105	0	19.0	Bq/day	1.000E-02	Bq/day		
4	19890107	0	3.00	Bq/day	1.000E-02	Bq/day		
5	19890109	0	5.00	Bq/day	1.000E-02	Bq/day		
6	19890110	0	1.80	Bq/day	1.000E-02	Bq/day		
7	19890111	0	1.70	Bq/day	1.000E-02	Bq/day		
8	19890113	0	0.350	Bq/day	1.000E-02	Bq/day		
9	19890114	0	0.210	Bq/day	1.000E-02	Bq/day		
10	19890125	0	0.180	Bq/day	1.000E-02	Bq/day		

ESTIMATED INTAKE: 82. Bq or 2.21E-03 uCi
 ALI: (1.00E+08 Bq) or (2.70E+03 uCi)
 MEAN FRACTIONAL DEVIATION: 0.69 FOR 10 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN COMMITTED DOSE EQUIVALENT

uSv or mrem

*** PRESENTLY DOSEXPT DOES NOT COMPUTE DOSE FOR INJECTION PATHWAY ***

**** HIT RETURN TO CONTINUE ****

BADGE -70 SITE TC-99 INJECTION WBC INCIDENT-19890101

BADGE -70 SITE TC-99 INJECTION LUN INCIDENT-19890101

WEIGHTED INTAKE (Bq): 8.17E+01 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 8.17E+01 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 0.00E+00 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

*** PRESENTLY DOSEXPT DOES NOT COMPUTE ANNUAL DOSE FOR INJECTION PATHWAY ***

BADGE -90 SITE SR-90 INJECTION BRE INCIDENT-19890101

BADGE -90 SITE SR-90 INJECTION URINE INCIDENT-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890101	2000	0.000E+00	1.40	Bq/day	1.000E-02	Bq/day	
2	19890102	400	0.000E+00	0.930	Bq/day	1.000E-02	Bq/day	
3	19890102	800	0.000E+00	2.05	Bq/day	1.000E-02	Bq/day	
4	19890102	2000	0.000E+00	1.62	Bq/day	1.000E-02	Bq/day	
5	19890103	200	0.000E+00	1.58	Bq/day	1.000E-02	Bq/day	
6	19890103	2200	0.000E+00	1.60	Bq/day	1.000E-02	Bq/day	
7	19890104	200	0.000E+00	1.34	Bq/day	1.000E-02	Bq/day	
8	19890104	2200	0.000E+00	1.30	Bq/day	1.000E-02	Bq/day	

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890101	2000	1.40	Bq/day	1.000E-02	Bq/day		
2	19890102	400	0.930	Bq/day	1.000E-02	Bq/day		
3	19890102	800	2.05	Bq/day	1.000E-02	Bq/day		

4	19890102	2000	1.62	Bq/day	1.000E-02	Bq/day
5	19890103	200	1.58	Bq/day	1.000E-02	Bq/day
6	19890103	2200	1.60	Bq/day	1.000E-02	Bq/day
7	19890104	200	1.34	Bq/day	1.000E-02	Bq/day
8	19890104	2200	1.30	Bq/day	1.000E-02	Bq/day

ESTIMATED INTAKE: 41. Bq or 1.10E+03 uCi
 ALI: (1.00E+08 Bq) or (2.70E+03 uCi)
 MEAN FRACTIONAL DEVIATION: 0.29 FOR 8 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN COMMITTED DOSE EQUIVALENT
 usv or mrem
 *** PRESENTLY DOSEXPRT DOES NOT COMPUTE DOSE FOR INJECTION PATHWAY ***

**** HIT RETURN TO CONTINUE ****
 BADGE -90 SITE SR-90 INJECTION FECAL INCIDENT-19890101
 CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 3 = dpm/sample 7 = Bq/day

RECORD	DATE	TIME	MASS(gm)	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<==INCIDENT DATE AND TIME					
1	19890102	600	0.000E+00	1.30	Bq/day	1.000E-02	Bq/day	
2	19890102	2000	0.000E+00	0.640	Bq/day	1.000E-02	Bq/day	
3	19890103	200	0.000E+00	0.650	Bq/day	1.000E-02	Bq/day	
4	19890103	2200	0.000E+00	0.430	Bq/day	1.000E-02	Bq/day	
5	19890104	200	0.000E+00	0.420	Bq/day	1.000E-02	Bq/day	
6	19890104	2200	0.000E+00	0.590	Bq/day	1.000E-02	Bq/day	

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<==INCIDENT DATE AND TIME				
1	19890102	600	1.30	Bq/day	1.000E-02	Bq/day	
2	19890102	2000	0.640	Bq/day	1.000E-02	Bq/day	
3	19890103	200	0.650	Bq/day	1.000E-02	Bq/day	
4	19890103	2200	0.430	Bq/day	1.000E-02	Bq/day	
5	19890104	200	0.420	Bq/day	1.000E-02	Bq/day	
6	19890104	2200	0.590	Bq/day	1.000E-02	Bq/day	

ESTIMATED INTAKE: 66. Bq or 1.80E+03 uCi
 ALI: (1.00E+08 Bq) or (2.70E+03 uCi)
 MEAN FRACTIONAL DEVIATION: 0.49 FOR 6 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN COMMITTED DOSE EQUIVALENT
 usv or mrem
 *** PRESENTLY DOSEXPRT DOES NOT COMPUTE DOSE FOR INJECTION PATHWAY ***

**** HIT RETURN TO CONTINUE ****
 BADGE -90 SITE SR-90 INJECTION WBC INCIDENT-19890101
 BADGE -90 SITE SR-90 INJECTION LUN INCIDENT-19890101

WEIGHTED INTAKE AND COMMITTED DOSE COMPUTED USING TOTAL WEIGHTS SHOWN BELOW:

ASSAY:	BRE	URINE	FECAL	WBC	LUN
INTAKE (Bq):	0.00E+00	4.07E+01	6.65E+01	0.00E+00	0.00E+00
NUCLIDE WGT:	0.00E+00	7.00E-01	1.00E-01	1.90E-01	1.00E-02
NUMERIC WGT:	0.00E+00	5.71E-01	4.29E-01	0.00E+00	0.00E+00
TOTAL WGT:	0.00E+00	9.03E-01	9.68E-02	0.00E+00	0.00E+00

WEIGHTED INTAKE (Bq): 4.32E+01 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 4.32E+01 OVER INTAKE PERIOD
 WEIGHTED CEDE (usv): 0.00E+00 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

*** PRESENTLY DOSEXPRT DOES NOT COMPUTE ANNUAL DOSE FOR INJECTION PATHWAY ***

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BADGE -100 SITE PU-241 W INHALATION BRE INCIDENT-19890101

BADGE -100 SITE PU-241 W INHALATION URINE INCIDENT-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
1 = dpm/ml 2 = dpm/day 3 = dpm/sample 4 = dpm/L 5 = ug/ml 6 = Bq/L 7 = Bq/day

RECORD	DATE	TIME	VOL(ml)	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME					
1	19890105	0	0.000E+00	7.000E-04	Bq/day	1.000E-05	Bq/day	W
2	19890106	0	0.000E+00	6.000E-04	Bq/day	1.000E-05	Bq/day	W
3	19890107	0	0.000E+00	5.000E-04	Bq/day	1.000E-05	Bq/day	W
4	19890108	0	0.000E+00	4.500E-04	Bq/day	1.000E-05	Bq/day	W
5	19890109	0	0.000E+00	4.000E-04	Bq/day	1.000E-05	Bq/day	W
6	19890110	0	0.000E+00	3.500E-04	Bq/day	1.000E-05	Bq/day	W
7	19890112	0	0.000E+00	3.000E-04	Bq/day	1.000E-05	Bq/day	W
8	19890114	0	0.000E+00	2.800E-04	Bq/day	1.000E-05	Bq/day	W
9	19890116	0	0.000E+00	2.600E-04	Bq/day	1.000E-05	Bq/day	W
10	19890118	0	0.000E+00	2.300E-04	Bq/day	1.000E-05	Bq/day	W
11	19890120	0	0.000E+00	2.000E-04	Bq/day	1.000E-05	Bq/day	W
12	19890125	0	0.000E+00	1.800E-04	Bq/day	1.000E-05	Bq/day	W
13	19890130	0	0.000E+00	1.600E-04	Bq/day	1.000E-05	Bq/day	W
14	19890204	0	0.000E+00	1.500E-04	Bq/day	1.000E-05	Bq/day	W
15	19890218	0	0.000E+00	1.300E-04	Bq/day	1.000E-05	Bq/day	W

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	0	<===INCIDENT DATE AND TIME				
1	19890105	0	7.000E-04	Bq/day	1.000E-05	Bq/day	W
2	19890106	0	6.000E-04	Bq/day	1.000E-05	Bq/day	W
3	19890107	0	5.000E-04	Bq/day	1.000E-05	Bq/day	W
4	19890108	0	4.500E-04	Bq/day	1.000E-05	Bq/day	W
5	19890109	0	4.000E-04	Bq/day	1.000E-05	Bq/day	W
6	19890110	0	3.500E-04	Bq/day	1.000E-05	Bq/day	W
7	19890112	0	3.000E-04	Bq/day	1.000E-05	Bq/day	W
8	19890114	0	2.800E-04	Bq/day	1.000E-05	Bq/day	W
9	19890116	0	2.600E-04	Bq/day	1.000E-05	Bq/day	W
10	19890118	0	2.300E-04	Bq/day	1.000E-05	Bq/day	W
11	19890120	0	2.000E-04	Bq/day	1.000E-05	Bq/day	W
12	19890125	0	1.800E-04	Bq/day	1.000E-05	Bq/day	W
13	19890130	0	1.600E-04	Bq/day	1.000E-05	Bq/day	W
14	19890204	0	1.500E-04	Bq/day	1.000E-05	Bq/day	W
15	19890218	0	1.300E-04	Bq/day	1.000E-05	Bq/day	W

ESTIMATED INTAKE: 12. Bq or 3.25E-04 uCi
ALI: (1.00E+04 Bq) or (0.27 uCi)
MEAN FRACTIONAL DEVIATION: 7.01E-02 FOR 15 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	8.2	0.82
BREAST	3.68E-04	3.68E-05
LUNG	8.93E-02	8.93E-03
R. MARROW	40.	4.0
BONE SURFACE	5.05E+02	51.
THYROID	1.49E-04	1.49E-05
REMAINDER	16.	1.6
EFFECTIVE	27.	2.7

**** HIT RETURN TO CONTINUE ****

BADGE -100 SITE PU-241 W INHALATION FECAL INCIDENT-19890101

BADGE -100 SITE PU-241 W INHALATION WBC INCIDENT-19890101

BADGE -100 SITE PU-241 W INHALATION LUN INCIDENT-19890101

WEIGHTED INTAKE (Bq): 1.20E+01 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.20E+01 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 2.68E+01 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

BADGE -110 SITE PU-238 W INHALATION BRE INCIDENT-19890901

BADGE -110 SITE PU-238 W INHALATION URINE INCIDENT-19890901

BADGE -110 SITE PU-238 W INHALATION FECAL INCIDENT-19890901

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 3 = dpm/sample 7 = Bq/day

RECORD	DATE	TIME	MASS(gm)	RESULT	UNITS	MDA	UNITS	CLASS
	19890901	1100	<===INCIDENT DATE AND TIME					
1	19890903	900	114.	244.	dpm/samp	1.00	dpm/samp	W
2	19890904	1100	103.	5.74	dpm/samp	1.00	dpm/samp	W

RESULTS SELECTED FOR INCIDENT ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890901	1100	<===INCIDENT DATE AND TIME				
1	19890903	900	4.82	Bq/day	1.974E-02	Bq/day	W
2	19890904	1100	0.125	Bq/day	2.184E-02	Bq/day	W

ESTIMATED INTAKE: 18. Bq or 4.97E-04 uCi
 ALI: (3.00E+02 Bq) or (8.11E-03 uCi)
 MEAN FRACTIONAL DEVIATION: 0.92 FOR 2 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	5.14E+02	51.
BREAST	1.84E-02	1.84E-03
LUNG	3.39E+02	34.
R. MARROW	2.80E+03	2.80E+02
BONE SURFACE	3.49E+04	3.49E+03
THYROID	1.77E-02	1.77E-03
REMAINDER	1.29E+03	1.29E+02
EFFECTIVE	1.94E+03	1.94E+02

**** HIT RETURN TO CONTINUE ****

BADGE -110 SITE PU-238 W INHALATION WBC INCIDENT-19890901

BADGE -110 SITE PU-238 W INHALATION LUN INCIDENT-19890901

WEIGHTED INTAKE (Bq): 1.84E+01 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.84E+01 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 1.94E+03 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

DOSEXPRT VERSION: 4.2 (DATE: 03/17/92) DATE OF COMPUTATION: 3/17/92
 FORTRAN STOP

ROUTINE.DAT screen output listing when DOSEXPRT is run in debug/test mode with long listing option:

RUN DOSEXPRT

=====

DOSEXPRT VERSION: 4.2 (DATE: 03/17/92)

Determination of Intake and Dose Using Bioassay Records

Developed for Martin Marietta Energy Systems, Inc. by
R. C. Ward and K. F. Eckerman of Oak Ridge National Laboratory

ANY PROBLEMS WITH DOSEXPRT SHOULD BE COMMUNICATED TO:
RICHARD C. WARD, ORNL (Phone: 4-5449 e-mail: RWD)

=====

Date of Computation: 3/17/92

Enter PATH for Bioassay and Output Files:
Enter Output Filename (NO EXTENSION): ROUTINE
Enter PATH for Nuclide Files:
Enter Bioassay Records Filename (WITHOUT .DAT EXTENSION): ROUTINE
Enter SITE Filename (WITHOUT .DFT EXTENSION): SITE
Enter Display Option: Trace(-1), Long list(1), None(2): 1
User Control AMAD? (Y/[N]):
Save CTL file? (Y/[N]): Y

PRODUCING .CTL FILE

TOTAL NUMBER OF RECORDS IN BIOASSAY FILE: 37

Enter Beginning MEASUREMENT Date [YYYY]: 1989
Enter Duration (years): 1

Enter Beginning INTAKE Date [YYYY]: 1989
Enter Duration (years): 1

NUCLIDE DATA FILES AVAILABLE

H-3	C-11	C-14	NA-22	NA-24	P-32	CO-57	CO-58
CO-60	SR-85	SR-89	SR-90	TC-99	TC-99M	CS-134	CS-137
I-125	I-129	I-131	I-135	PM-147	EU-152	EU-154	EU-155
TL-201	RA-226	RA-228	TH-228	TH-232	U-234	U-235	U-236
U-238	PU-238	PU-239	PU-241	AM-241	TPU	CM-242	CM-244

NUCLIDES WITH DOSE-RATE FILES:

CO-60	SR-89	SR-90			CO-57	CS-134	CS-137
I-125	I-129						
U-238	PU-238	PU-239	PU-241	AM-241	U-234	U-235	U-236
					TPU		CM-244

BIOASSAY RECORDS FILENAME: ROUTINE.DAT

SITE PARAMETER FILENAME: SITE.DFT

PERIOD FOR CONSIDERING MEASUREMENTS: 19890101 --> 19900101

PERIOD FOR COMPUTING INTAKE: 19890101 --> 19900101

AMAD 1.00 micron - DEPOSITION PARAMS D3 0.30 D4 0.08 D5 0.25
URINE EXCRETION RATE (ml/day): 1400.0 DEFAULT SAMPLE VOLUME(ml): 20.0
FECAL EXCRETION RATE (g/day): 135.0 DEFAULT SAMPLE MASS(g): 20.0
BREATH EXCRETION RATE (l/day): 20000.0 DEFAULT SAMPLE VOLUME(l): 20.0
MEASUREMENTS < OR = LC ARE SET TO ZERO. LC IS DEFINED AS MDA/1.0

BADGE -120 SITE I-131 D INHALATION BRE ROUTINE -19890101

BADGE -120 SITE I-131 D INHALATION URINE ROUTINE -19890101

BADGE -120 SITE I-131 D INHALATION FECAL ROUTINE -19890101

BADGE -120 SITE I-131 D INHALATION WBC ROUTINE -19890101

BADGE -120 SITE I-131 D INHALATION LUN ROUTINE -19890101

 BADGE -120 SITE I-131 D INHALATION THY ROUTINE -19890101
 CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<==I	START	-	Starting date for routine analysis	
1	19890102	0	1.63E+02	B	10.	B	D
2	19890201	0	3.50E+03	B	10.	B	D
3	19890301	0	3.70E+03	B	10.	B	D
4	19891124	0	3.74E+03	B	10.	B	D
5	19891231	2400	3.74E+03	B	10.	B	D
	19900101		<==I	END	-	Ending date for routine analysis	

 RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<==I	START	-	Starting date for routine analysis	
1	19890102	0	163.	Bq	10.0	Bq	D
2	19890201	0	3.500E+03	Bq	10.0	Bq	D
3	19890301	0	3.700E+03	Bq	10.0	Bq	D
4	19891124	0	3.738E+03	Bq	10.0	Bq	D
5	19891231	2400	3.738E+03	Bq	10.0	Bq	D
	19900101		<==I	END	-	Ending date for routine analysis	

 INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

ESTIMATED INTAKE: 7.29E+05 Bq or 20. uCi
 ALI: (2.00E+06 Bq) or (54. uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 5 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	18.	1.8
BREAST	57.	5.7
LUNG	4.78E+02	48.
R. MARROW	46.	4.6
BONE SURFACE	42.	4.2
THYROID	2.13E+05	2.13E+04
REMAINDER	59.	5.9
EFFECTIVE	6.48E+03	6.48E+02

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE (Bq): 7.29E+05 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 7.29E+05 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 6.48E+03 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****
 +++++ ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM +++++
 =====

BADGE -131 SITE U-238 D INHALATION BRE ROUTINE -19890101

BADGE -131 SITE U-238 D INHALATION URINE ROUTINE -19890101

BADGE -131 SITE U-238 D INHALATION FECAL ROUTINE -19890101

BADGE -131 SITE U-238 D INHALATION WBC ROUTINE -19890101

BADGE -131 SITE U-238 D INHALATION LUN ROUTINE -19890101
 CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
--------	------	------	--------	-------	-----	-------	-------

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19890101 <===ISTART - Starting date for routine analysis
1 19890410 0 22. B 0.10 B D
2 19890719 0 22. B 0.10 B D
3 19891027 0 22. B 0.10 B D
4 19891231 2400 22. B 0.10 B D
19900101 <===IEND - Ending date for routine analysis
-----

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RESULTS SELECTED FOR ROUTINE ANALYSIS:

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-----
RECORD DATE TIME RESULT UNITS MDA UNITS CLASS
-----
19890101 <===ISTART - Starting date for routine analysis
1 19890410 0 22.4 Bq 0.100 Bq D
2 19890719 0 22.4 Bq 0.100 Bq D
3 19891027 0 22.4 Bq 0.100 Bq D
4 19891231 2400 22.4 Bq 0.100 Bq D
19900101 <===IEND - Ending date for routine analysis
-----

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INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

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-----
ESTIMATED INTAKE: 3.65E+04 Bq or 0.99 uCi
ALI: (5.00E+04 Bq) or (1.4 uCi)
MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS
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**** HIT RETURN TO CONTINUE ****

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-----
ORGAN COMMITTED DOSE EQUIVALENT
      uSv or mrem
GONADS 8.14E+02 81.
BREAST 8.14E+02 81.
LUNG 1.02E+04 1.02E+03
R. MARROW 2.40E+04 2.40E+03
BONE SURFACE 3.58E+05 3.58E+04
THYROID 8.10E+02 81.
REMAINDER 3.00E+04 3.00E+03
EFFECTIVE 2.42E+04 2.42E+03
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**** HIT RETURN TO CONTINUE ****

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-----
WEIGHTED INTAKE (Bq): 3.65E+04 OVER MEASUREMENT PERIOD
WEIGHTED INTAKE (Bq): 3.65E+04 OVER INTAKE PERIOD
WEIGHTED CEDE (uSv): 2.42E+04 FROM INTAKE PERIOD
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**** HIT RETURN TO CONTINUE ****

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Year: 1 Organ: EFFECTIVE AEDE (Sv): 6.86E-03
Year: 2 Organ: EFFECTIVE AEDE (Sv): 1.55E-03
Year: 3 Organ: EFFECTIVE AEDE (Sv): 1.25E-03
Year: 4 Organ: EFFECTIVE AEDE (Sv): 1.13E-03
Year: 5 Organ: EFFECTIVE AEDE (Sv): 1.02E-03
Year: 6 Organ: EFFECTIVE AEDE (Sv): 9.22E-04
Year: 7 Organ: EFFECTIVE AEDE (Sv): 8.39E-04
Year: 8 Organ: EFFECTIVE AEDE (Sv): 7.68E-04
Year: 9 Organ: EFFECTIVE AEDE (Sv): 7.01E-04
Year: 10 Organ: EFFECTIVE AEDE (Sv): 6.43E-04
Year: 11 Organ: EFFECTIVE AEDE (Sv): 5.92E-04
Year: 12 Organ: EFFECTIVE AEDE (Sv): 5.48E-04
Year: 13 Organ: EFFECTIVE AEDE (Sv): 5.06E-04
Year: 14 Organ: EFFECTIVE AEDE (Sv): 4.69E-04
Year: 15 Organ: EFFECTIVE AEDE (Sv): 4.36E-04
Year: 16 Organ: EFFECTIVE AEDE (Sv): 4.07E-04
Year: 17 Organ: EFFECTIVE AEDE (Sv): 3.79E-04
Year: 18 Organ: EFFECTIVE AEDE (Sv): 3.55E-04
Year: 19 Organ: EFFECTIVE AEDE (Sv): 3.32E-04
Year: 20 Organ: EFFECTIVE AEDE (Sv): 3.12E-04
Year: 21 Organ: EFFECTIVE AEDE (Sv): 2.92E-04
Year: 22 Organ: EFFECTIVE AEDE (Sv): 2.75E-04
Year: 23 Organ: EFFECTIVE AEDE (Sv): 2.59E-04
Year: 24 Organ: EFFECTIVE AEDE (Sv): 2.45E-04
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Year: 25 Organ: EFFECTIVE AEDE (Sv): 2.30E-04
 Year: 26 Organ: EFFECTIVE AEDE (Sv): 2.17E-04
 Year: 27 Organ: EFFECTIVE AEDE (Sv): 2.05E-04
 Year: 28 Organ: EFFECTIVE AEDE (Sv): 1.95E-04
 Year: 29 Organ: EFFECTIVE AEDE (Sv): 1.83E-04
 Year: 30 Organ: EFFECTIVE AEDE (Sv): 1.74E-04
 Year: 31 Organ: EFFECTIVE AEDE (Sv): 1.64E-04
 Year: 32 Organ: EFFECTIVE AEDE (Sv): 1.56E-04
 Year: 33 Organ: EFFECTIVE AEDE (Sv): 1.48E-04
 Year: 34 Organ: EFFECTIVE AEDE (Sv): 1.40E-04
 Year: 35 Organ: EFFECTIVE AEDE (Sv): 1.33E-04
 Year: 36 Organ: EFFECTIVE AEDE (Sv): 1.26E-04
 Year: 37 Organ: EFFECTIVE AEDE (Sv): 1.19E-04
 Year: 38 Organ: EFFECTIVE AEDE (Sv): 1.13E-04
 Year: 39 Organ: EFFECTIVE AEDE (Sv): 1.07E-04
 Year: 40 Organ: EFFECTIVE AEDE (Sv): 1.02E-04
 Year: 41 Organ: EFFECTIVE AEDE (Sv): 9.69E-05
 Year: 42 Organ: EFFECTIVE AEDE (Sv): 9.20E-05
 Year: 43 Organ: EFFECTIVE AEDE (Sv): 8.74E-05
 Year: 44 Organ: EFFECTIVE AEDE (Sv): 8.32E-05
 Year: 45 Organ: EFFECTIVE AEDE (Sv): 7.88E-05
 Year: 46 Organ: EFFECTIVE AEDE (Sv): 7.49E-05
 Year: 47 Organ: EFFECTIVE AEDE (Sv): 7.11E-05
 Year: 48 Organ: EFFECTIVE AEDE (Sv): 6.78E-05
 Year: 49 Organ: EFFECTIVE AEDE (Sv): 6.42E-05
 Year: 50 Organ: EFFECTIVE AEDE (Sv): 6.10E-05
 Year: 1 Organ: REMAINDER AEDE (Sv): 1.53E-02
 Year: 1 Organ: THYROID AEDE (Sv): 4.69E-04
 Year: 1 Organ: BONE SURFACE AEDE (Sv): 2.17E-02
 Year: 1 Organ: R. MARROW AEDE (Sv): 1.83E-03
 Year: 1 Organ: LUNG AEDE (Sv): 1.00E-02
 Year: 1 Organ: BREAST AEDE (Sv): 4.69E-04
 Year: 1 Organ: GONADS AEDE (Sv): 4.69E-04

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****
 +++++ ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM +++++

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=====
BADGE -132 SITE U-238 W INHALATION BRE ROUTINE -19890101
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BADGE -132 SITE U-238 W INHALATION URINE ROUTINE -19890101
-----
BADGE -132 SITE U-238 W INHALATION FECAL ROUTINE -19890101
-----
BADGE -132 SITE U-238 W INHALATION WBC ROUTINE -19890101
-----
BADGE -132 SITE U-238 W INHALATION LUN ROUTINE -19890101
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams
-----
```

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<==ISTART	- Starting date for routine analysis			
1	19890410	0	8.85E+02	B	0.10	B	W
2	19890719	0	1.12E+03	B	0.10	B	W
3	19891027	0	1.19E+03	B	0.10	B	W
4	19891231	2400	1.20E+03	B	0.10	B	W
	19900101		<==IEND	- Ending date for routine analysis			

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<==ISTART	- Starting date for routine analysis			
1	19890410	0	885.	Bq	0.100	Bq	W
2	19890719	0	1.121E+03	Bq	0.100	Bq	W
3	19891027	0	1.186E+03	Bq	0.100	Bq	W
4	19891231	2400	1.200E+03	Bq	0.100	Bq	W
	19900101		<==IEND	- Ending date for routine analysis			

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

ESTIMATED INTAKE: 3.65E+04 Bq or 0.99 uCi
 ALI: (3.00E+04 Bq) or (0.81 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	mrem
GONADS	2.45E+02	25.
BREAST	2.47E+02	25.
LUNG	5.19E+05	5.19E+04
R. MARROW	7.24E+03	7.24E+02
BONE SURFACE	1.08E+05	1.08E+04
THYROID	2.45E+02	25.
REMAINDER	9.30E+03	9.30E+02
EFFECTIVE	6.93E+04	6.93E+03

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE (Bq): 3.65E+04 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 3.65E+04 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 6.93E+04 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

Year: 1	Organ: EFFECTIVE	AEDE (Sv): 5.08E-02
Year: 2	Organ: EFFECTIVE	AEDE (Sv): 1.34E-02
Year: 3	Organ: EFFECTIVE	AEDE (Sv): 4.96E-04
Year: 4	Organ: EFFECTIVE	AEDE (Sv): 3.44E-04
Year: 5	Organ: EFFECTIVE	AEDE (Sv): 3.09E-04
Year: 6	Organ: EFFECTIVE	AEDE (Sv): 2.80E-04
Year: 7	Organ: EFFECTIVE	AEDE (Sv): 2.55E-04
Year: 8	Organ: EFFECTIVE	AEDE (Sv): 2.33E-04
Year: 9	Organ: EFFECTIVE	AEDE (Sv): 2.13E-04
Year: 10	Organ: EFFECTIVE	AEDE (Sv): 1.95E-04
Year: 11	Organ: EFFECTIVE	AEDE (Sv): 1.80E-04
Year: 12	Organ: EFFECTIVE	AEDE (Sv): 1.66E-04
Year: 13	Organ: EFFECTIVE	AEDE (Sv): 1.53E-04
Year: 14	Organ: EFFECTIVE	AEDE (Sv): 1.42E-04
Year: 15	Organ: EFFECTIVE	AEDE (Sv): 1.32E-04
Year: 16	Organ: EFFECTIVE	AEDE (Sv): 1.24E-04
Year: 17	Organ: EFFECTIVE	AEDE (Sv): 1.15E-04
Year: 18	Organ: EFFECTIVE	AEDE (Sv): 1.07E-04
Year: 19	Organ: EFFECTIVE	AEDE (Sv): 1.01E-04
Year: 20	Organ: EFFECTIVE	AEDE (Sv): 9.46E-05
Year: 21	Organ: EFFECTIVE	AEDE (Sv): 8.86E-05
Year: 22	Organ: EFFECTIVE	AEDE (Sv): 8.33E-05
Year: 23	Organ: EFFECTIVE	AEDE (Sv): 7.84E-05
Year: 24	Organ: EFFECTIVE	AEDE (Sv): 7.41E-05
Year: 25	Organ: EFFECTIVE	AEDE (Sv): 6.97E-05
Year: 26	Organ: EFFECTIVE	AEDE (Sv): 6.58E-05
Year: 27	Organ: EFFECTIVE	AEDE (Sv): 6.21E-05
Year: 28	Organ: EFFECTIVE	AEDE (Sv): 5.89E-05
Year: 29	Organ: EFFECTIVE	AEDE (Sv): 5.55E-05
Year: 30	Organ: EFFECTIVE	AEDE (Sv): 5.26E-05
Year: 31	Organ: EFFECTIVE	AEDE (Sv): 4.98E-05
Year: 32	Organ: EFFECTIVE	AEDE (Sv): 4.73E-05
Year: 33	Organ: EFFECTIVE	AEDE (Sv): 4.47E-05
Year: 34	Organ: EFFECTIVE	AEDE (Sv): 4.23E-05
Year: 35	Organ: EFFECTIVE	AEDE (Sv): 4.01E-05
Year: 36	Organ: EFFECTIVE	AEDE (Sv): 3.82E-05
Year: 37	Organ: EFFECTIVE	AEDF (Sv): 3.61E-05
Year: 38	Organ: EFFECTIVE	AEDE (Sv): 3.43E-05
Year: 39	Organ: EFFECTIVE	AEDE (Sv): 3.25E-05
Year: 40	Organ: EFFECTIVE	AEDE (Sv): 3.10E-05
Year: 41	Organ: EFFECTIVE	AEDE (Sv): 2.93E-05
Year: 42	Organ: EFFECTIVE	AEDE (Sv): 2.78E-05
Year: 43	Organ: EFFECTIVE	AEDE (Sv): 2.64E-05
Year: 44	Organ: EFFECTIVE	AEDE (Sv): 2.52E-05

Year: 45 Organ: EFFECTIVE AEDE (Sv): 2.39E-05
 Year: 46 Organ: EFFECTIVE AEDE (Sv): 2.27E-05
 Year: 47 Organ: EFFECTIVE AEDE (Sv): 2.15E-05
 Year: 48 Organ: EFFECTIVE AEDE (Sv): 2.05E-05
 Year: 49 Organ: EFFECTIVE AEDE (Sv): 1.94E-05
 Year: 50 Organ: EFFECTIVE AEDE (Sv): 1.85E-05
 Year: 1 Organ: REMAINDER AEDE (Sv): 4.50E-03
 Year: 1 Organ: THYROID AEDE (Sv): 1.32E-04
 Year: 1 Organ: BONE SURFACE AEDE (Sv): 5.84E-03
 Year: 1 Organ: R. MARROW AEDE (Sv): 5.01E-04
 Year: 1 Organ: LUNG AEDE (Sv): 4.10E-01
 Year: 1 Organ: BREAST AEDE (Sv): 1.32E-04
 Year: 1 Organ: GONADS AEDE (Sv): 1.31E-04

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****
 +++++ ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM +++++

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BADGE -133 SITE U-238 Y INHALATION BRE ROUTINE -19890101
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BADGE -133 SITE U-238 Y INHALATION URINE ROUTINE -19890101
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BADGE -133 SITE U-238 Y INHALATION FECAL ROUTINE -19890101
-----
BADGE -133 SITE U-238 Y INHALATION WBC ROUTINE -19890101
-----
BADGE -133 SITE U-238 Y INHALATION LUN ROUTINE -19890101
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams
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RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART	- Starting date for routine analysis			
1	19890410	0	1.46E+03	B	0.10	B	Y
2	19890719	0	2.75E+03	B	0.10	B	Y
3	19891027	0	3.91E+03	B	0.10	B	Y
4	19891231	2400	4.61E+03	B	0.10	B	Y
	19900101		<===IEND	- Ending date for routine analysis			

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART	- Starting date for routine analysis			
1	19890410	0	1.462E+03	Bq	0.100	Bq	Y
2	19890719	0	2.749E+03	Bq	0.100	Bq	Y
3	19891027	0	3.911E+03	Bq	0.100	Bq	Y
4	19891231	2400	4.607E+03	Bq	0.100	Bq	Y
	19900101		<===IEND	- Ending date for routine analysis			

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

ESTIMATED INTAKE: 3.65E+04 Bq or 0.99 uCi
 ALI: (2.00E+03 Bq) or (5.41E-02 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	88.	8.8
BREAST	1.06E+02	11.
LUNG	9.68E+06	9.68E+05
R. MARROW	2.51E+03	2.51E+02
BONE SURFACE	3.69E+04	3.69E+03
THYROID	99.	9.9
REMAINDER	3.51E+03	3.51E+02
EFFECTIVE	1.17E+06	1.17E+05

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE (Bq): 3.65E+04 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 3.65E+04 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 1.17E+06 FROM INTAKE PERIOD

 **** HIT RETURN TO CONTINUE ****

Year: 1	Organ: EFFECTIVE	AEDE (Sv): 1.28E-01
Year: 2	Organ: EFFECTIVE	AEDE (Sv): 1.99E-01
Year: 3	Organ: EFFECTIVE	AEDE (Sv): 1.40E-01
Year: 4	Organ: EFFECTIVE	AEDE (Sv): 1.01E-01
Year: 5	Organ: EFFECTIVE	AEDE (Sv): 7.42E-02
Year: 6	Organ: EFFECTIVE	AEDE (Sv): 5.57E-02
Year: 7	Organ: EFFECTIVE	AEDE (Sv): 4.28E-02
Year: 8	Organ: EFFECTIVE	AEDE (Sv): 3.37E-02
Year: 9	Organ: EFFECTIVE	AEDE (Sv): 2.69E-02
Year: 10	Organ: EFFECTIVE	AEDE (Sv): 2.20E-02
Year: 11	Organ: EFFECTIVE	AEDE (Sv): 1.84E-02
Year: 12	Organ: EFFECTIVE	AEDE (Sv): 1.58E-02
Year: 13	Organ: EFFECTIVE	AEDE (Sv): 1.37E-02
Year: 14	Organ: EFFECTIVE	AEDE (Sv): 1.22E-02
Year: 15	Organ: EFFECTIVE	AEDE (Sv): 1.10E-02
Year: 16	Organ: EFFECTIVE	AEDE (Sv): 1.01E-02
Year: 17	Organ: EFFECTIVE	AEDE (Sv): 9.41E-03
Year: 18	Organ: EFFECTIVE	AEDE (Sv): 8.88E-03
Year: 19	Organ: EFFECTIVE	AEDE (Sv): 8.47E-03
Year: 20	Organ: EFFECTIVE	AEDE (Sv): 8.17E-03
Year: 21	Organ: EFFECTIVE	AEDE (Sv): 7.90E-03
Year: 22	Organ: EFFECTIVE	AEDE (Sv): 7.71E-03
Year: 23	Organ: EFFECTIVE	AEDE (Sv): 7.56E-03
Year: 24	Organ: EFFECTIVE	AEDE (Sv): 7.46E-03
Year: 25	Organ: EFFECTIVE	AEDE (Sv): 7.35E-03
Year: 26	Organ: EFFECTIVE	AEDE (Sv): 7.27E-03
Year: 27	Organ: EFFECTIVE	AEDE (Sv): 7.21E-03
Year: 28	Organ: EFFECTIVE	AEDE (Sv): 7.19E-03
Year: 29	Organ: EFFECTIVE	AEDE (Sv): 7.13E-03
Year: 30	Organ: EFFECTIVE	AEDE (Sv): 7.10E-03
Year: 31	Organ: EFFECTIVE	AEDE (Sv): 7.07E-03
Year: 32	Organ: EFFECTIVE	AEDE (Sv): 7.07E-03
Year: 33	Organ: EFFECTIVE	AEDE (Sv): 7.04E-03
Year: 34	Organ: EFFECTIVE	AEDE (Sv): 7.02E-03
Year: 35	Organ: EFFECTIVE	AEDE (Sv): 7.01E-03
Year: 36	Organ: EFFECTIVE	AEDE (Sv): 7.02E-03
Year: 37	Organ: EFFECTIVE	AEDE (Sv): 6.99E-03
Year: 38	Organ: EFFECTIVE	AEDE (Sv): 6.98E-03
Year: 39	Organ: EFFECTIVE	AEDE (Sv): 6.97E-03
Year: 40	Organ: EFFECTIVE	AEDE (Sv): 6.98E-03
Year: 41	Organ: EFFECTIVE	AEDE (Sv): 6.96E-03
Year: 42	Organ: EFFECTIVE	AEDE (Sv): 6.95E-03
Year: 43	Organ: EFFECTIVE	AEDE (Sv): 6.94E-03
Year: 44	Organ: EFFECTIVE	AEDE (Sv): 6.96E-03
Year: 45	Organ: EFFECTIVE	AEDE (Sv): 6.93E-03
Year: 46	Organ: EFFECTIVE	AEDE (Sv): 6.93E-03
Year: 47	Organ: EFFECTIVE	AEDE (Sv): 6.92E-03
Year: 48	Organ: EFFECTIVE	AEDE (Sv): 6.93E-03
Year: 49	Organ: EFFECTIVE	AEDE (Sv): 6.91E-03
Year: 50	Organ: EFFECTIVE	AEDE (Sv): 6.90E-03
Year: 1	Organ: REMAINDER	AEDE (Sv): 4.96E-04
Year: 1	Organ: THYROID	AEDE (Sv): 8.82E-06
Year: 1	Organ: BONE SURFACE	AEDE (Sv): 3.38E-04
Year: 1	Organ: R. MARROW	AEDE (Sv): 3.05E-05
Year: 1	Organ: LUNG	AEDE (Sv): 1.06E+00
Year: 1	Organ: BREAST	AEDE (Sv): 1.07E-05
Year: 1	Organ: GONADS	AEDE (Sv): 7.93E-06

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

***** ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM *****

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BADGE -141 SITE U-238 D INHALATION BRE ROUTINE -19890101

BADGE -141 SITE U-238 D INHALATION URINE ROUTINE -19890101

BADGE -141 SITE U-238 D INHALATION FECAL ROUTINE -19890101

BADGE -141 SITE U-238 D INHALATION WBC ROUTINE -19890101

BADGE -141 SITE U-238 D INHALATION LUN ROUTINE -19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101		<===ISTART - Starting date for routine analysis					
1	19890410	0	22.	B	0.10	B	D	
2	19890719	0	0.22	B	0.10	B	D	
3	19891027	0	11.	B	0.10	B	D	
4	19891231	2400	0.22	B	0.10	B	D	
	19900101		<===IEND - Ending date for routine analysis					

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS	
	19890101		<===ISTART - Starting date for routine analysis					
1	19890410	0	22.4	Bq	0.100	Bq	D	
2	19890719	0	0.220	Bq	0.100	Bq	D	
3	19891027	0	11.2	Bq	0.100	Bq	D	
4	19891231	2400	0.220	Bq	0.100	Bq	D	
	19900101		<===IEND - Ending date for routine analysis					

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

ESTIMATED INTAKE: 1.51E+04 Bq or 0.41 uCi
ALI: (5.00E+04 Bq) or (1.4 uCi)
MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	USv	or mrem
GONADS	3.36E+02	34.
BREAST	3.36E+02	34.
LUNG	4.20E+03	4.20E+02
R. MARROW	9.91E+03	9.91E+02
BONE SURFACE	1.48E+05	1.48E+04
THYROID	3.34E+02	33.
REMAINDER	1.24E+04	1.24E+03
EFFECTIVE	9.97E+03	9.97E+02

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE (Bq): 1.51E+04 OVER MEASUREMENT PERIOD
WEIGHTED INTAKE (Bq): 1.51E+04 OVER INTAKE PERIOD
WEIGHTED CEDE (USv): 9.97E+03 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

Year: 1	Organ: EFFECTIVE	AEDE (Sv): 3.38E-03
Year: 2	Organ: EFFECTIVE	AEDE (Sv): 5.67E-04
Year: 3	Organ: EFFECTIVE	AEDE (Sv): 5.07E-04
Year: 4	Organ: EFFECTIVE	AEDE (Sv): 4.58E-04
Year: 5	Organ: EFFECTIVE	AEDE (Sv): 4.12E-04
Year: 6	Organ: EFFECTIVE	AEDE (Sv): 3.74E-04
Year: 7	Organ: EFFECTIVE	AEDE (Sv): 3.40E-04
Year: 8	Organ: EFFECTIVE	AEDE (Sv): 3.12E-04
Year: 9	Organ: EFFECTIVE	AEDE (Sv): 2.85E-04
Year: 10	Organ: EFFECTIVE	AEDE (Sv): 2.61E-04
Year: 11	Organ: EFFECTIVE	AEDE (Sv): 2.41E-04
Year: 12	Organ: EFFECTIVE	AEDE (Sv): 2.23E-04
Year: 13	Organ: EFFECTIVE	AEDE (Sv): 2.06E-04
Year: 14	Organ: EFFECTIVE	AEDE (Sv): 1.91E-04
Year: 15	Organ: EFFECTIVE	AEDE (Sv): 1.78E-04

Year: 16	Organ: EFFECTIVE	AEDE (Sv): 1.66E-04
Year: 17	Organ: EFFECTIVE	AEDE (Sv): 1.55E-04
Year: 18	Organ: EFFECTIVE	AEDE (Sv): 1.45E-04
Year: 19	Organ: EFFECTIVE	AEDE (Sv): 1.35E-04
Year: 20	Organ: EFFECTIVE	AEDE (Sv): 1.27E-04
Year: 21	Organ: EFFECTIVE	AEDE (Sv): 1.19E-04
Year: 22	Organ: EFFECTIVE	AEDE (Sv): 1.12E-04
Year: 23	Organ: EFFECTIVE	AEDE (Sv): 1.06E-04
Year: 24	Organ: EFFECTIVE	AEDE (Sv): 9.99E-05
Year: 25	Organ: EFFECTIVE	AEDE (Sv): 9.40E-05
Year: 26	Organ: EFFECTIVE	AEDE (Sv): 8.87E-05
Year: 27	Organ: EFFECTIVE	AEDE (Sv): 8.38E-05
Year: 28	Organ: EFFECTIVE	AEDE (Sv): 7.95E-05
Year: 29	Organ: EFFECTIVE	AEDE (Sv): 7.50E-05
Year: 30	Organ: EFFECTIVE	AEDE (Sv): 7.09E-05
Year: 31	Organ: EFFECTIVE	AEDE (Sv): 6.72E-05
Year: 32	Organ: EFFECTIVE	AEDE (Sv): 6.38E-05
Year: 33	Organ: EFFECTIVE	AEDE (Sv): 6.03E-05
Year: 34	Organ: EFFECTIVE	AEDE (Sv): 5.72E-05
Year: 35	Organ: EFFECTIVE	AEDE (Sv): 5.42E-05
Year: 36	Organ: EFFECTIVE	AEDE (Sv): 5.16E-05
Year: 37	Organ: EFFECTIVE	AEDE (Sv): 4.88E-05
Year: 38	Organ: EFFECTIVE	AEDE (Sv): 4.63E-05
Year: 39	Organ: EFFECTIVE	AEDE (Sv): 4.39E-05
Year: 40	Organ: EFFECTIVE	AEDE (Sv): 4.18E-05
Year: 41	Organ: EFFECTIVE	AEDE (Sv): 3.96E-05
Year: 42	Organ: EFFECTIVE	AEDE (Sv): 3.76E-05
Year: 43	Organ: EFFECTIVE	AEDE (Sv): 3.57E-05
Year: 44	Organ: EFFECTIVE	AEDE (Sv): 3.40E-05
Year: 45	Organ: EFFECTIVE	AEDE (Sv): 3.22E-05
Year: 46	Organ: EFFECTIVE	AEDE (Sv): 3.06E-05
Year: 47	Organ: EFFECTIVE	AEDE (Sv): 2.91E-05
Year: 48	Organ: EFFECTIVE	AEDE (Sv): 2.77E-05
Year: 49	Organ: EFFECTIVE	AEDE (Sv): 2.63E-05
Year: 50	Organ: EFFECTIVE	AEDE (Sv): 2.49E-05
Year: 1	Organ: REMAINDER	AEDE (Sv): 6.68E-03
Year: 1	Organ: THYROID	AEDE (Sv): 2.23E-04
Year: 1	Organ: BONE SURFACE	AEDE (Sv): 1.07E-02
Year: 1	Organ: R. MARROW	AEDE (Sv): 9.02E-04
Year: 1	Organ: LUNG	AEDE (Sv): 7.08E-03
Year: 1	Organ: BREAST	AEDE (Sv): 2.23E-04
Year: 1	Organ: GONADS	AEDE (Sv): 2.23E-04

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

+++++ ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM +++++

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BADGE -142 SITE U-238 W INHALATION BRE ROUTINE -19890101

BADGE -142 SITE U-238 W INHALATION URINE ROUTINE -19890101

BADGE -142 SITE U-238 W INHALATION FECAL ROUTINE -19890101

BADGE -142 SITE U-238 W INHALATION WBC ROUTINE -19890101

BADGE -142 SITE U-238 W INHALATION LUN ROUTINE -19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<==I START	-	Starting date for routine analysis		
1	19890410	0	8.85E+02	B	1.0	B	W
2	19890719	0	2.45E+02	B	1.0	B	W
3	19891027	0	5.10E+02	B	1.0	B	W
4	19891231	2400	2.21E+02	B	1.0	B	W
	19900101		<==I END	-	Ending date for routine analysis		

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART	Starting date for routine analysis			
1	19890410	0	885.	Bq	1.00	Bq	W
2	19890719	0	245.	Bq	1.00	Bq	W
3	19891027	0	510.	Bq	1.00	Bq	W
4	19891231	2400	221.	Bq	1.00	Bq	W
	19900101		<===IEND	Ending date for routine analysis			

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

ESTIMATED INTAKE: 1.51E+04 Bq or 0.41 uCi
 ALI: (3.00E+04 Bq) or (0.81 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	1.02E+02	10.
BREAST	1.02E+02	10.
LUNG	2.15E+05	2.15E+04
R. MARROW	3.00E+03	3.00E+02
BONE SURFACE	4.46E+04	4.46E+03
THYROID	1.02E+02	10.
REMAINDER	3.85E+03	3.85E+02
EFFECTIVE	2.87E+04	2.87E+03

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE (Bq): 1.51E+04 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.51E+04 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 2.87E+04 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

Year: 1	Organ: EFFECTIVE	AEDE (Sv): 2.44E-02
Year: 2	Organ: EFFECTIVE	AEDE (Sv): 2.63E-03
Year: 3	Organ: EFFECTIVE	AEDE (Sv): 1.76E-04
Year: 4	Organ: EFFECTIVE	AEDE (Sv): 1.40E-04
Year: 5	Organ: EFFECTIVE	AEDE (Sv): 1.26E-04
Year: 6	Organ: EFFECTIVE	AEDE (Sv): 1.14E-04
Year: 7	Organ: EFFECTIVE	AEDE (Sv): 1.04E-04
Year: 8	Organ: EFFECTIVE	AEDE (Sv): 9.51E-05
Year: 9	Organ: EFFECTIVE	AEDE (Sv): 8.68E-05
Year: 10	Organ: EFFECTIVE	AEDE (Sv): 7.97E-05
Year: 11	Organ: EFFECTIVE	AEDE (Sv): 7.34E-05
Year: 12	Organ: EFFECTIVE	AEDE (Sv): 6.79E-05
Year: 13	Organ: EFFECTIVE	AEDE (Sv): 6.27E-05
Year: 14	Organ: EFFECTIVE	AEDE (Sv): 5.82E-05
Year: 15	Organ: EFFECTIVE	AEDE (Sv): 5.41E-05
Year: 16	Organ: EFFECTIVE	AEDE (Sv): 5.05E-05
Year: 17	Organ: EFFECTIVE	AEDE (Sv): 4.70E-05
Year: 18	Organ: EFFECTIVE	AEDE (Sv): 4.40E-05
Year: 19	Organ: EFFECTIVE	AEDE (Sv): 4.12E-05
Year: 20	Organ: EFFECTIVE	AEDE (Sv): 3.88E-05
Year: 21	Organ: EFFECTIVE	AEDE (Sv): 3.63E-05
Year: 22	Organ: EFFECTIVE	AEDE (Sv): 3.41E-05
Year: 23	Organ: EFFECTIVE	AEDE (Sv): 3.21E-05
Year: 24	Organ: EFFECTIVE	AEDE (Sv): 3.04E-05
Year: 25	Organ: EFFECTIVE	AEDE (Sv): 2.86E-05
Year: 26	Organ: EFFECTIVE	AEDE (Sv): 2.70E-05
Year: 27	Organ: EFFECTIVE	AEDE (Sv): 2.55E-05
Year: 28	Organ: EFFECTIVE	AEDE (Sv): 2.42E-05
Year: 29	Organ: EFFECTIVE	AEDE (Sv): 2.28E-05
Year: 30	Organ: EFFECTIVE	AEDE (Sv): 2.16E-05
Year: 31	Organ: EFFECTIVE	AEDE (Sv): 2.04E-05
Year: 32	Organ: EFFECTIVE	AEDE (Sv): 1.94E-05
Year: 33	Organ: EFFECTIVE	AEDE (Sv): 1.83E-05
Year: 34	Organ: EFFECTIVE	AEDE (Sv): 1.74E-05
Year: 35	Organ: EFFECTIVE	AEDE (Sv): 1.65E-05

Year: 36 Organ: EFFECTIVE AEDE (Sv): 1.57E-05
 Year: 37 Organ: EFFECTIVE AEDE (Sv): 1.48E-05
 Year: 38 Organ: EFFECTIVE AEDE (Sv): 1.41E-05
 Year: 39 Organ: EFFECTIVE AEDE (Sv): 1.34E-05
 Year: 40 Organ: EFFECTIVE AEDE (Sv): 1.27E-05
 Year: 41 Organ: EFFECTIVE AEDE (Sv): 1.20E-05
 Year: 42 Organ: EFFECTIVE AEDE (Sv): 1.14E-05
 Year: 43 Organ: EFFECTIVE AEDE (Sv): 1.09E-05
 Year: 44 Organ: EFFECTIVE AEDE (Sv): 1.03E-05
 Year: 45 Organ: EFFECTIVE AEDE (Sv): 9.79E-06
 Year: 46 Organ: EFFECTIVE AEDE (Sv): 9.30E-06
 Year: 47 Organ: EFFECTIVE AEDE (Sv): 8.84E-06
 Year: 48 Organ: EFFECTIVE AEDE (Sv): 8.42E-06
 Year: 49 Organ: EFFECTIVE AEDE (Sv): 7.98E-06
 Year: 50 Organ: EFFECTIVE AEDE (Sv): 7.58E-06
 Year: 1 Organ: REMAINDER AEDE (Sv): 2.06E-03
 Year: 1 Organ: THYROID AEDE (Sv): 6.59E-05
 Year: 1 Organ: BONE SURFACE AEDE (Sv): 2.98E-03
 Year: 1 Organ: R. MARROW AEDE (Sv): 2.55E-04
 Year: 1 Organ: LUNG AEDE (Sv): 1.97E-01
 Year: 1 Organ: BREAST AEDE (Sv): 6.62E-05
 Year: 1 Organ: GONADS AEDE (Sv): 6.58E-05

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****
 ***** ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM *****

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BADGE	-143	SITE U-238	Y	INHALATION	BRE	ROUTINE	-19890101
BADGE	-143	SITE U-238	Y	INHALATION	URINE	ROUTINE	-1989u101
BADGE	-143	SITE U-238	Y	INHALATION	FECAL	ROUTINE	-19890101
BADGE	-143	SITE U-238	Y	INHALATION	WBC	ROUTINE	-19890101
BADGE	-143	SITE U-238	Y	INHALATION	LUN	ROUTINE	-19890101

CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
 M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART	- Starting date for routine analysis			
1	19890410	0	1.46E+03	B	1.0	B	Y
2	19890719	0	1.30E+03	B	1.0	B	Y
3	19891027	0	1.91E+03	B	1.0	B	Y
4	19891231	2400	1.78E+03	B	1.0	B	Y
	19900101		<===IEND	- Ending date for routine analysis			

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART	- Starting date for routine analysis			
1	19890410	0	1.462E+03	Bq	1.00	Bq	Y
2	19890719	0	1.301E+03	Bq	1.00	Bq	Y
3	19891027	0	1.907E+03	Bq	1.00	Bq	Y
4	19891231	2400	1.778E+03	Bq	1.00	Bq	Y
	19900101		<===IEND	- Ending date for routine analysis			

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 0.000E+00

ESTIMATED INTAKE: 1.52E+04 Bq or 0.41 uCi
 ALI: (2.00E+03 Bq) or (5.41E-02 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT
	uSv or mrem
GONADS	37. 3.7

BREAST	44.	4.4
LUNG	4.02E+06	4.02E+05
R. MARROW	1.04E+03	1.04E+02
BONE SURFACE	1.53E+04	1.53E+03
THYROID	41.	4.1
REMAINDER	1.46E+03	1.46E+02
EFFECTIVE	4.86E+05	4.86E+04

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE (Bq): 1.52E+04 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 1.52E+04 OVER INTAKE PERIOD
 WEIGHTED CEDE (USV): 4.86E+05 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

Year: 1	Organ: EFFECTIVE	AEDE (Sv): 7.04E-02
Year: 2	Organ: EFFECTIVE	AEDE (Sv): 7.77E-02
Year: 3	Organ: EFFECTIVE	AEDE (Sv): 5.49E-02
Year: 4	Organ: EFFECTIVE	AEDE (Sv): 3.98E-02
Year: 5	Organ: EFFECTIVE	AEDE (Sv): 2.92E-02
Year: 6	Organ: EFFECTIVE	AEDE (Sv): 2.20E-02
Year: 7	Organ: EFFECTIVE	AEDE (Sv): 1.70E-02
Year: 8	Organ: EFFECTIVE	AEDE (Sv): 1.34E-02
Year: 9	Organ: EFFECTIVE	AEDE (Sv): 1.08E-02
Year: 10	Organ: EFFECTIVE	AEDE (Sv): 8.85E-03
Year: 11	Organ: EFFECTIVE	AEDE (Sv): 7.43E-03
Year: 12	Organ: EFFECTIVE	AEDE (Sv): 6.38E-03
Year: 13	Organ: EFFECTIVE	AEDE (Sv): 5.56E-03
Year: 14	Organ: EFFECTIVE	AEDE (Sv): 4.96E-03
Year: 15	Organ: EFFECTIVE	AEDE (Sv): 4.49E-03
Year: 16	Organ: EFFECTIVE	AEDE (Sv): 4.15E-03
Year: 17	Organ: EFFECTIVE	AEDE (Sv): 3.86E-03
Year: 18	Organ: EFFECTIVE	AEDE (Sv): 3.65E-03
Year: 19	Organ: EFFECTIVE	AEDE (Sv): 3.49E-03
Year: 20	Organ: EFFECTIVE	AEDE (Sv): 3.37E-03
Year: 21	Organ: EFFECTIVE	AEDE (Sv): 3.27E-03
Year: 22	Organ: EFFECTIVE	AEDE (Sv): 3.19E-03
Year: 23	Organ: EFFECTIVE	AEDE (Sv): 3.13E-03
Year: 24	Organ: EFFECTIVE	AEDE (Sv): 3.09E-03
Year: 25	Organ: EFFECTIVE	AEDE (Sv): 3.05E-03
Year: 26	Organ: EFFECTIVE	AEDE (Sv): 3.02E-03
Year: 27	Organ: EFFECTIVE	AEDE (Sv): 2.99E-03
Year: 28	Organ: EFFECTIVE	AEDE (Sv): 2.98E-03
Year: 29	Organ: EFFECTIVE	AEDE (Sv): 2.96E-03
Year: 30	Organ: EFFECTIVE	AEDE (Sv): 2.95E-03
Year: 31	Organ: EFFECTIVE	AEDE (Sv): 2.94E-03
Year: 32	Organ: EFFECTIVE	AEDE (Sv): 2.94E-03
Year: 33	Organ: EFFECTIVE	AEDE (Sv): 2.92E-03
Year: 34	Organ: EFFECTIVE	AEDE (Sv): 2.92E-03
Year: 35	Organ: EFFECTIVE	AEDE (Sv): 2.91E-03
Year: 36	Organ: EFFECTIVE	AEDE (Sv): 2.91E-03
Year: 37	Organ: EFFECTIVE	AEDE (Sv): 2.90E-03
Year: 38	Organ: EFFECTIVE	AEDE (Sv): 2.90E-03
Year: 39	Organ: EFFECTIVE	AEDE (Sv): 2.89E-03
Year: 40	Organ: EFFECTIVE	AEDE (Sv): 2.90E-03
Year: 41	Organ: EFFECTIVE	AEDE (Sv): 2.89E-03
Year: 42	Organ: EFFECTIVE	AEDE (Sv): 2.89E-03
Year: 43	Organ: EFFECTIVE	AEDE (Sv): 2.88E-03
Year: 44	Organ: EFFECTIVE	AEDE (Sv): 2.89E-03
Year: 45	Organ: EFFECTIVE	AEDE (Sv): 2.88E-03
Year: 46	Organ: EFFECTIVE	AEDE (Sv): 2.88E-03
Year: 47	Organ: EFFECTIVE	AEDE (Sv): 2.87E-03
Year: 48	Organ: EFFECTIVE	AEDE (Sv): 2.88E-03
Year: 49	Organ: EFFECTIVE	AEDE (Sv): 2.87E-03
Year: 50	Organ: EFFECTIVE	AEDE (Sv): 2.87E-03
Year: 1	Organ: REMAINDER	AEDE (Sv): 2.30E-04
Year: 1	Organ: THYROID	AEDE (Sv): 4.74E-06
Year: 1	Organ: BONE SURFACE	AEDE (Sv): 1.83E-04
Year: 1	Organ: R. MARROW	AEDE (Sv): 1.65E-05
Year: 1	Organ: LUNG	AEDE (Sv): 5.86E-01

Year: 1 Organ: BREAST AEDE (Sv): 5.79E-06
 Year: 1 Organ: GONADS AEDE (Sv): 4.22E-06
 ***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****
 +++++ ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM +++++

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=====
BADGE -150 SITE U-238 Y INHALATION BRE ROUTINE -19890101
-----
BADGE -150 SITE U-238 Y INHALATION URINE ROUTINE -19890101
-----
BADGE -150 SITE U-238 Y INHALATION FECAL ROUTINE -19890101
-----
BADGE -150 SITE U-238 Y INHALATION WBC ROUTINE -19890101
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams
-----
```

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART - Starting date for routine analysis				
1	19890330	0	27.	B	1.0	B	Y
2	19890628	0	50.	B	1.0	B	Y
3	19890926	0	72.	B	1.0	B	Y
4	19891230	0	92.	B	1.0	B	Y
	19900101		<===IEND - Ending date for routine analysis				

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART - Starting date for routine analysis				
1	19890330	0	26.6	Bq	1.00	Bq	Y
2	19890628	0	50.2	Bq	1.00	Bq	Y
3	19890926	0	71.7	Bq	1.00	Bq	Y
4	19891230	0	92.5	Bq	1.00	Bq	Y
	19900101		<===IEND - Ending date for routine analysis				

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 2.000E+00

ESTIMATED INTAKE: 7.34E+02 Bq or 1.98E-02 uCi
 A.I.: (2.00E+03 Bq) or (5.41E-02 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	1.8	0.18
BREAST	2.1	0.21
LUNG	1.94E+05	1.94E+04
R. MARROW	50.	5.0
BONE SURFACE	7.42E+02	74.
THYROID	2.0	0.20
REMAINDER	71.	7.1
EFFECTIVE	2.35E+04	2.35E+03

**** HIT RETURN TO CONTINUE ****

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=====
BADGE -150 SITE U-238 Y INHALATION LUN ROUTINE -19890101
CLASSES: D=DAY W=WEEK Y=YEAR V=VERY INSOLUBLE I=INSOLUBLE S=SOLUBLE UNITS:
M = uCi N = nCi P = pCi D = dpm/sample, B = Becquerel, U = micro grams
-----
```

RECORD	DATE	TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101		<===ISTART - Starting date for routine analysis				
1	19890330	0	13.	B	1.0	B	Y
2	19890628	0	25.	B	1.0	B	Y
3	19890926	0	36.	B	1.0	B	Y
4	19891230	0	46.	B	1.0	B	Y
	19900101		<===IEND - Ending date for routine analysis				

RESULTS SELECTED FOR ROUTINE ANALYSIS:

RECORD	DATE TIME	RESULT	UNITS	MDA	UNITS	CLASS
	19890101	<==ISTART - Starting date for routine analysis				
1	19890330	0 13.3	Bq	1.00	Bq	Y
2	19890628	0 25.0	Bq	1.00	Bq	Y
3	19890926	0 35.8	Bq	1.00	Bq	Y
4	19891230	0 46.1	Bq	1.00	Bq	Y
	19900101	<==IEND - Ending date for routine analysis				

INTAKE RATE (Bq/d) USED TO EXTRAPOLATE BEYOND LAST MEASUREMENT: 9.996E-01

ESTIMATED INTAKE: 3.67E+02 Bq or 9.92E-03 uCi
 ALI: (2.00E+03 Bq) or (5.41E-02 uCi)
 MEAN FRACTIONAL DEVIATION: 0.00E+00 FOR 4 RESULTS

**** HIT RETURN TO CONTINUE ****

ORGAN	COMMITTED DOSE EQUIVALENT	
	uSv	or mrem
GONADS	0.89	8.88E-02
BREAST	1.1	0.11
LUNG	9.72E+04	9.72E+03
R. MARROW	25.	2.5
BONE SURFACE	3.71E+02	37.
THYROID	1.0	9.97E-02
REMAINDER	35.	3.5
EFFECTIVE	1.17E+04	1.17E+03

**** HIT RETURN TO CONTINUE ****

WEIGHTED INTAKE AND COMMITTED DOSE COMPUTED USING TOTAL WEIGHTS SHOWN BELOW:

ASSAY:	BRE	URINE	FECAL	WBC	LUN
INTAKE (Bq):	0.00E+00	0.00E+00	0.00E+00	7.34E+02	3.67E+02
NUCLIDE WGHT:	0.00E+00	0.00E+00	0.00E+00	1.00E-02	3.30E-01
NUMERIC WGHT:	0.00E+00	0.00E+00	0.00E+00	5.00E-01	5.00E-01
TOTAL WGHT:	0.00E+00	0.00E+00	0.00E+00	2.94E-02	9.71E-01

WEIGHTED INTAKE (Bq): 3.78E+02 OVER MEASUREMENT PERIOD
 WEIGHTED INTAKE (Bq): 3.78E+02 OVER INTAKE PERIOD
 WEIGHTED CEDE (uSv): 1.21E+04 FROM INTAKE PERIOD

**** HIT RETURN TO CONTINUE ****

Year: 1	Organ: EFFECTIVE	AEDE (Sv): 1.32E-03
Year: 2	Organ: EFFECTIVE	AEDE (Sv): 2.06E-03
Year: 3	Organ: EFFECTIVE	AEDE (Sv): 1.45E-03
Year: 4	Organ: EFFECTIVE	AEDE (Sv): 1.05E-03
Year: 5	Organ: EFFECTIVE	AEDE (Sv): 7.67E-04
Year: 6	Organ: EFFECTIVE	AEDE (Sv): 5.76E-04
Year: 7	Organ: EFFECTIVE	AEDE (Sv): 4.42E-04
Year: 8	Organ: EFFECTIVE	AEDE (Sv): 3.48E-04
Year: 9	Organ: EFFECTIVE	AEDE (Sv): 2.78E-04
Year: 10	Organ: EFFECTIVE	AEDE (Sv): 2.28E-04
Year: 11	Organ: EFFECTIVE	AEDE (Sv): 1.90E-04
Year: 12	Organ: EFFECTIVE	AEDE (Sv): 1.63E-04
Year: 13	Organ: EFFECTIVE	AEDE (Sv): 1.42E-04
Year: 14	Organ: EFFECTIVE	AEDE (Sv): 1.26E-04
Year: 15	Organ: EFFECTIVE	AEDE (Sv): 1.14E-04
Year: 16	Organ: EFFECTIVE	AEDE (Sv): 1.05E-04
Year: 17	Organ: EFFECTIVE	AEDE (Sv): 9.73E-05
Year: 18	Organ: EFFECTIVE	AEDE (Sv): 9.18E-05
Year: 19	Organ: EFFECTIVE	AEDE (Sv): 8.76E-05
Year: 20	Organ: EFFECTIVE	AEDE (Sv): 8.45E-05
Year: 21	Organ: EFFECTIVE	AEDE (Sv): 8.17E-05
Year: 22	Organ: EFFECTIVE	AEDE (Sv): 7.97E-05
Year: 23	Organ: EFFECTIVE	AEDE (Sv): 7.82E-05
Year: 24	Organ: EFFECTIVE	AEDE (Sv): 7.71E-05

Year: 25	Organ: EFFECTIVE	AEDE (Sv): 7.60E-05
Year: 26	Organ: EFFECTIVE	AEDE (Sv): 7.52E-05
Year: 27	Organ: EFFECTIVE	AEDE (Sv): 7.46E-05
Year: 28	Organ: EFFECTIVE	AEDE (Sv): 7.43E-05
Year: 29	Organ: EFFECTIVE	AEDE (Sv): 7.37E-05
Year: 30	Organ: EFFECTIVE	AEDE (Sv): 7.34E-05
Year: 31	Organ: EFFECTIVE	AEDE (Sv): 7.32E-05
Year: 32	Organ: EFFECTIVE	AEDE (Sv): 7.31E-05
Year: 33	Organ: EFFECTIVE	AEDE (Sv): 7.28E-05
Year: 34	Organ: EFFECTIVE	AEDE (Sv): 7.26E-05
Year: 35	Organ: EFFECTIVE	AEDE (Sv): 7.25E-05
Year: 36	Organ: EFFECTIVE	AEDE (Sv): 7.26E-05
Year: 37	Organ: EFFECTIVE	AEDE (Sv): 7.23E-05
Year: 38	Organ: EFFECTIVE	AEDE (Sv): 7.22E-05
Year: 39	Organ: EFFECTIVE	AEDE (Sv): 7.21E-05
Year: 40	Organ: EFFECTIVE	AEDE (Sv): 7.22E-05
Year: 41	Organ: EFFECTIVE	AEDE (Sv): 7.19E-05
Year: 42	Organ: EFFECTIVE	AEDE (Sv): 7.19E-05
Year: 43	Organ: EFFECTIVE	AEDE (Sv): 7.18E-05
Year: 44	Organ: EFFECTIVE	AEDE (Sv): 7.19E-05
Year: 45	Organ: EFFECTIVE	AEDE (Sv): 7.17E-05
Year: 46	Organ: EFFECTIVE	AEDE (Sv): 7.16E-05
Year: 47	Organ: EFFECTIVE	AEDE (Sv): 7.16E-05
Year: 48	Organ: EFFECTIVE	AEDE (Sv): 7.17E-05
Year: 49	Organ: EFFECTIVE	AEDE (Sv): 7.14E-05
Year: 50	Organ: EFFECTIVE	AEDE (Sv): 7.14E-05
Year: 1	Organ: REMAINDER	AEDE (Sv): 5.13E-06
Year: 1	Organ: THYROID	AEDE (Sv): 9.11E-08
Year: 1	Organ: BONE SURFACE	AEDE (Sv): 3.50E-06
Year: 1	Organ: R. MARROW	AEDE (Sv): 3.15E-07
Year: 1	Organ: LUNG	AEDE (Sv): 1.10E-02
Year: 1	Organ: BREAST	AEDE (Sv): 1.10E-07
Year: 1	Organ: GONADS	AEDE (Sv): 8.19E-08

***** WEIGHTED INTAKE EXCEEDS 2.0 % OF ALI *****

***** ANNUAL EFFECTIVE DOSE EXCEEDS 10.0 MREM *****

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DOSEXPRT VERSION: 4.2 (DATE: 03/17/92)      DATE OF COMPUTATION: 3/17/92
FORTRAN STOP
STC10::RWD>
STC10::RWD>

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Appendix K

LISTINGS OF DOSEXPRT OUTPUT FILES FOR EXAMPLE PROBLEMS

This appendix contains the DOSEXPRT S28 output listings for the INCIDENT and ROUTINE examples discussed in the text. In addition, it contains the output listings from DOSREPORT.

INCIDENT.S28

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-10 S1VH-3 9203161609 SH-3 VH1-010189 010189 010190 4.2-031792051890031692 7.04E+04M
4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+03
4.51E+03 4.51E+03 4.51E+03 4.51E+03 4.51E+031989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 1.000*F 0.000 WBC0.000 LUN0.000 ORG0.000
4600 010189 010190 1 1989

-20 S1D1-131 9203161609 SI-131 DH1-020189 010189 010190 4.2-031792031291031692 1.96E+02M
1.83E+01 5.70E+01 4.74E+02 4.53E+01 4.15E+01 2.11E+05 5.82E+01 6.43E+03 1.83E+01 5.70E+01 4.74E+02
4.53E+01 4.15E+01 2.11E+05 5.82E+01 6.43E+031989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.756*F 0.000 WBC0.000 LUN0.000 THY0.244*
6500 010189 010190 1 1989

-31 S1DU-238 9203161609 SU-238 DH1-020189 010189 010190 4.2-031792051890031692 4.73E-03M
3.90E-01 3.90E-01 4.88E+00 1.15E+01 1.72E+02 3.88E-01 1.44E+01 1.16E+01 2.40E-01 2.40E-01 4.82E+00
1.17E+00 1.46E+01 2.40E-01 7.97E+00 3.65E+001989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 1.000*F 0.000 WBC0.000 LUN0.000 ORG0.000
100 010189 010190 1 1989

-32 S1DU-238 9203161609 SU-238 DH1-020189 010189 010190 4.2-031792051890031692 7.81E-03M
6.44E-01 6.44E-01 8.06E+00 1.90E+01 2.83E+02 6.41E-01 2.37E+01 1.91E+01 3.97E-01 3.97E-01 7.96E+00
1.93E+00 2.41E+01 3.97E-01 1.32E+01 6.03E+001990 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 1.000*F 0.000 WBC0.000 LUN0.000 ORG0.000
100 010189 010190 1 1989

-33 S1DU-238 9203161609 SU-238 DH1-020189 010189 010190 4.2-031792051890031692 4.90E-04M
4.04E-02 4.04E-02 5.06E-01 1.19E+00 1.78E+01 4.02E-02 1.49E+00 1.20E+00 2.49E-02 2.49E-02 5.00E-01
1.21E-01 1.51E+00 2.49E-02 8.26E-01 3.79E-011989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 1.000*F 0.000 WBC0.000 LUN0.000 ORG0.000
100 010189 010190 1 1989

-41 S1DCS-137 9203161609 SCS-137 DH1-010189 010189 010190 4.2-031792051890031692 2.54E-02M
8.21E-01 7.35E-01 8.27E-01 7.79E-01 7.44E-01 7.44E-01 8.56E-01 8.10E-01 7.46E-01 5.94E-01 7.45E-01
7.76E-01 8.01E-01 6.86E-01 7.16E-01 7.17E-011989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC1.000*LUN0.000 ORG0.000
100 010189 010190 1 1989

-42 S1DCS-137 9203161609 SCS-137 DH1-010189 010189 010190 4.2-031792051890031692 6.49E-02M
2.10E+00 1.88E+00 2.12E+00 1.99E+00 1.90E+00 1.90E+00 2.19E+00 2.07E+00 1.91E+00 1.52E+00 1.91E+00
1.98E+00 2.05E+00 1.75E+00 1.83E+00 1.83E+001989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC1.000*LUN0.000 ORG0.000
100 010189 010190 1 1989

-50 S1D1-131 9203161609 SI-131 DH1-021189 010189 010190 4.2-031792031291031692 9.81E+01M
9.19E+00 2.86E+01 2.38E+02 2.28E+01 2.08E+01 1.06E+05 2.92E+01 3.23E+03 9.19E+00 2.86E+01 2.38E+02
2.28E+01 2.08E+01 1.06E+05 2.92E+01 3.23E+031989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.756*F 0.000 WBC0.000 LUN0.000 THY0.244*
3300 010189 010190 1 1989

60 S1STC-99 9203161609 STC-99 SG1-010189 010189 010190 4.2-031792051890031692 3.50E-03M
7.83E-04 7.83E-04 7.83E-04 7.83E-04 7.83E-04 2.10E-02 1.32E-02 5.12E-03 7.83E-04 7.83E-04 7.83E-04
7.83E-04 7.83E-04 2.10E-02 1.32E-02 5.12E-031989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 1.000*F 0.000 WBC0.000 LUN0.000 ORG0.000
100 010189 010190 1 1989

-70 S1 TC-99 9203161609 STC-99 J1-010189 010189 010190 4.2-031792051890031692 2.21E-03M
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+001989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 1.000*WBC0.000 LUN0.000 ORG0.000
0 010189 010190 0 1989
```

-90 S1 SR-90 9203161609 SSR-90 J1-010189 010189 010190 4.2-031792051890031692 1.17E-03M
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.903*F 0.097*WBC0.000 LUN0.000 ORGO.000
0 010189 010190 0 1989

-100 S1WPU-241 9203161609 SPU-241 WH1-010189 010189 010190 4.2-031792042590031692 3.25E-04M
8.21E-01 3.68E-05 8.93E-03 4.04E+00 5.05E+01 1.49E-05 1.58E+00 2.68E+00 6.60E-04 3.31E-07 8.54E-03
4.91E-03 6.14E-02 3.00E-07 3.28E-03 4.61E-031989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 1.000*F 0.000 WBC0.000 LUN0.000 ORGO.000
100 010189 010190 1 1989

-110 S1WPU-238 9203161609 SPU-238 WH1-0901891100 010189 010190 4.2-031792051889031692 4.97E-04M
5.14E+01 1.84E-03 3.39E+01 2.80E+02 3.49E+03 1.77E-03 1.29E+02 1.94E+02 3.22E-01 1.54E-03 2.69E+01
2.38E+00 2.98E+01 1.54E-03 1.60E+00 4.97E+002039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 1.000*WBC0.000 LUN0.000 ORGO.000
200 010189 010190 1 1989

ROUTINE.S28

-120 S3DI-131 9203161608 S1-131 DH3-010189 010189 010190 4.2-031792031291031692 1.97E+01M
1.84E+00 5.74E+00 4.78E+01 4.57E+00 4.18E+00 2.13E+04 5.86E+00 6.48E+02 1.84E+00 5.74E+00 4.78E+01
4.57E+00 4.18E+00 2.13E+04 5.86E+00 6.48E+021989 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN0.000 THY1.000*
700 010189 010190 1 1989

-131 S3DI-238 9203161608 SU-238 DH3-010189 010189 010190 4.2-031792051890031692 9.87E-01M
8.14E+01 8.14E+01 1.02E+03 2.40E+03 3.58E+04 8.10E+01 3.00E+03 2.42E+03 4.69E+01 4.69E+01 1.00E+03
1.83E+02 2.17E+03 4.69E+01 1.53E+03 6.86E+022039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN1.000*ORGO.000
2500 010189 010190 1 1989

-132 S3WU-238 9203161608 SU-238 WH3-010189 010189 010190 4.2-031792051890031692 9.88E-01M
2.45E+01 2.47E+01 5.19E+04 7.24E+02 1.08E+04 2.45E+01 9.30E+02 6.93E+03 1.31E+01 1.32E+01 4.10E+04
5.01E+01 5.84E+02 1.32E+01 4.50E+02 5.08E+032039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN1.000*ORGO.000
7000 010189 010190 1 1989

-133 S3YU-238 9203161608 SU-238 YH3-010189 010189 010190 4.2-031792051890031692 9.87E-01M
8.84E+00 1.06E+01 9.68E+05 2.51E+02 3.69E+03 9.93E+00 3.51E+02 1.17E+05 7.93E-01 1.07E+00 1.06E+05
3.05E+00 3.38E+01 8.82E-01 4.96E+01 1.28E+042039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN1.000*ORGO.000
117000 010189 010190 1 1989

-141 S3DU-238 9203161608 SU-238 DH3-010189 010189 010190 4.2-031792051890031692 4.07E-01M
3.36E+01 3.36E+01 4.20E+02 9.91E+02 1.48E+04 3.34E+01 1.24E+03 9.97E+02 2.23E+01 2.23E+01 7.08E+02
9.02E+01 1.07E+03 2.23E+01 6.68E+02 3.38E+022039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN1.000*ORGO.000
1000 010189 010190 1 1989

-142 S3WU-238 9203161608 SU-238 WH3-010189 010189 010190 4.2-031792051890031692 4.09E-01M
1.02E+01 1.02E+01 2.15E+04 3.00E+02 4.46E+03 1.02E+01 3.85E+02 2.87E+03 6.58E+00 6.62E+00 1.97E+04
2.55E+01 2.98E+02 6.59E+00 2.06E+02 2.44E+032032 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN1.000*ORGO.000
2900 010189 010190 1 1989

-143 S3YU-238 9203161608 SU-238 YH3-010189 010189 010190 4.2-031792051890031692 4.10E-01M
3.67E+00 4.41E+00 4.02E+05 1.04E+02 1.53E+03 4.12E+00 1.46E+02 4.86E+04 4.22E-01 5.79E-01 5.86E+04
1.65E+00 1.83E+01 4.74E-01 2.30E+01 7.04E+032039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.000 LUN1.000*ORGO.000
48600 010189 010190 1 1989

-150 S3YU-238 9203161608 SU-238 YH3-010189 010189 010190 4.2-031792051890031692 1.02E-02M
9.14E-02 1.10E-01 1.00E+04 2.59E+00 3.82E+01 1.03E-01 3.63E+00 1.21E+03 8.19E-03 1.10E-02 1.10E+03
3.15E-02 3.30E-01 9.11E-03 5.13E-01 1.32E+022039 1.00E+00 1.40E+03 2.00E+01 1.35E+02 2.00E+01
1 2.00E+00 1.00E+00 1.00E+00BREQ.000 U 0.000 F 0.000 WBC0.029*LUN0.971*ORGO.000
1300 010189 010190 1 1989

INCIDENT.OUT Output File Listing:

DOSEXPRT OUTPUT FILE: INCIDENT.OUT DATE: 3/17/92 INTAKE AND DOSE ARE WEIGHTED OVER ALL ASSAYS

DOSEXPRT VERSION: 4.2-031792 RUN DATE: 03/17/92 TIME: 12:44

MEASUREMENT PERIOD: 010189 ==> 010190 INTAKE PERIOD: 010189 ==> 010190

TOTAL CEDE(mrem): 6500

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(ucî)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-20 S	I-131	D	H	1-020189	1.96E+02	1.83E+01	5.70E+01	4.74E+02	4.53E+01	4.15E+01	2.11E+05	5.82E+01	6.43E+03
BRE0.00	J	0.76	F	0.00	WBC0.00	LUN0.00	THYO.24*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
-50 S	I-131	D	H	1-021189	1.96E+02	1.83E+01	5.70E+01	4.74E+02	4.53E+01	4.15E+01	2.11E+05	5.82E+01	6.43E+03
BRE0.00	U	0.76	F	0.00	WBC0.00	LUN0.00	THYO.24*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL CEDE(mrem): 4600

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(ucî)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-10 S	H-3	V	H	1-010189	7.04E+04	4.51E+03	4.51E+03	4.51E+03	4.51E+03	4.51E+03	4.51E+03	4.51E+03	4.51E+03
BRE0.00	U	1.00	F	0.00	WBC0.00	LUN0.00	ORGO.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL CEDE(mrem): 200

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(ucî)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-110 S	PU-238	W	H	1-090189	1100	4.97E-04	5.14E+01	1.84E-03	2.80E+02	3.49E+03	1.77E-03	1.29E+02	1.94E+02
BRE0.00	U	0.00	F	1.00	WBC0.00	LUN0.00	ORGO.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TOTAL CEDE(mrem): 100

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(ucî)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-31 S	U-238	D	H	1-020189	4.75E-03	3.90E-01	3.90E-01	4.88E+00	1.15E+01	1.72E+02	3.88E-01	1.44E+01	1.16E+01
BRE0.00	U	1.00	F	0.00	WBC0.00	LUN0.00	ORGO.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
-32 S	U-238	D	H	1-020189	7.81E-03	6.44E-01	6.44E-01	8.06E+00	1.90E+01	2.83E+02	6.51E-01	2.37E+01	1.91E+01
BRE0.00	U	1.00	F	0.00	WBC0.00	LUN0.00	ORGO.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
-33 S	U-238	D	H	1-020189	4.90E-04	4.04E-02	4.04E-02	5.06E-01	1.19E+00	1.78E+01	4.02E-02	1.49E+00	1.20E+00
BRE0.00	U	1.00	F	0.00	WBC0.00	LUN0.00	ORGO.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
-41 S	CS-137	D	H	1-010189	2.54E-02	8.21E-01	7.35E-01	8.27E-01	7.79E-01	7.44E-01	7.44E-01	8.56E-01	8.10E-01

ROUTINE.OUT Output File Listing:

DOSEXPRT OUTPUT FILE: ROUTINE.OUT DATE: 3/17/92 INTAKE AND DOSE ARE WEIGHTED OVER ALL ASSAYS

DOSEXPRT VERSION: 4.2-031792 RUN DATE: 03/17/92 TIME: 17:13

MEASUREMENT PERIOD: 010189 ==> 010190 INTAKE PERIOD: 010189 ==> 010190

TOTAL CEDE(mrem): 117000

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-133 S	U-238	Y	H	3-010189	9.87E-01	8.84E+00	1.06E+01	9.68E+05	2.51E+02	3.69E+03	9.93E+00	3.51E+02	1.17E+05
BRE0.00	U	0.00	F	0.00	WBC0.00	LUN1.00*ORG0.00	7.93E-01	1.07E+00	3.05E+00	3.78E+01	8.82E-01	4.96E+01	1.28E+04

TOTAL CEDE(mrem): 48600

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-143 S	U-238	Y	H	3-010189	4.10E-01	3.67E+00	4.41E+00	4.02E+05	1.04E+02	1.53E+03	4.12E+00	1.46E+02	4.86E+04
BRE0.00	U	0.00	F	0.00	WBC0.00	LUN1.00*ORG0.00	4.22E-01	5.79E-01	1.65E+00	1.83E+01	4.74E-01	2.30E+01	7.04E+03

TOTAL CEDE(mrem): 7000

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-132 S	U-238	W	H	3-010189	9.88E-01	2.45E+01	2.47E+01	5.19E+04	7.24E+02	1.08E+04	2.45E+01	9.30E+02	6.93E+03
BRE0.00	U	0.00	F	0.00	WBC0.00	LUN1.00*ORG0.00	1.31E+01	4.10E+04	5.01E+01	5.84E+02	1.32E+01	4.50E+02	5.08E+03

TOTAL CEDE(mrem): 2900

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-142 S	U-238	W	H	3-010189	4.09E-01	1.02E+01	1.02E+01	2.15E+04	3.00E+02	4.46E+03	1.02E+01	3.85E+02	2.87E+03
BRE0.00	U	0.00	F	0.00	WBC0.00	LUN1.00*ORG0.00	6.58E+00	6.62E+00	2.55E+01	2.98E+02	6.59E+00	2.06E+02	2.44E+03

TOTAL CEDE(mrem): 2500

BADGE SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE SURF	THYROID	REMAINDER	EFFECTIVE
-131 S	U-238	D	H	3-010189	9.87E-01	8.14E+01	8.14E+01	1.02E+03	2.40E+03	3.58E+04	8.10E+01	3.00E+03	2.42E+03
BRE0.00	U	0.00	F	0.00	WBC0.00	LUN1.00*ORG0.00	4.69E+01	1.00E+03	1.83E+02	2.17E+03	4.69E+01	1.53E+03	6.86E+02

TOTAL CEDE(mrem): 1300

BADGE	SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE	SURF	THYROID	REMAINDER	EFFECTIVE
-150	S	U-238	Y	H	3-010189	1.02E-02	9.14E-02	1.10E-01	1.00E+04	2.59E+00	3.82E+01	1.03E-01	1.03E-03	3.63E+00	1.21E+03
BRE0.00	U	0.00	F	0.00	WBC0.03*LUN0.97*ORG0.00	8.19E-03	1.10E-02	1.10E+03	3.15E-02	3.50E-01	9.11E-03	5.13E-01	1.32E+02		

TOTAL CEDE(mrem): 1000

BADGE	SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE	SURF	THYROID	REMAINDER	EFFECTIVE
-141	S	U-238	D	H	3-010189	4.07E-01	3.36E+01	3.36E+01	4.20E+02	9.91E+02	1.48E+04	3.34E+01	1.24E+03	9.97E+02	
BRE0.00	U	0.00	F	0.00	WBC0.00 LUN1.00*ORG0.00	2.23E+01	2.23E+01	7.08E+02	9.02E+01	1.07E+03	2.23E+01	6.68E+02	3.38E+02		

TOTAL CEDE(mrem): 700

BADGE	SITE	NUCLIDE	CLASS	PATH	REASON	INTAKE(UCi)	GONADS	BREAST	LUNG	R. MARROW	BONE	SURF	THYROID	REMAINDER	EFFECTIVE
-120	S	I-131	D	H	3-010189	1.97E+01	1.84E+00	5.74E+00	4.78E+01	4.57E+00	4.18E+00	2.13E+04	5.86E+00	6.48E+02	
BRE0.00	U	0.00	F	0.00	WBC0.00 LUN0.00 THY1.00*	1.84E+00	1.84E+00	5.74E+00	4.78E+01	4.57E+00	4.18E+00	2.13E+04	5.86E+00	6.48E+02	

Appendix L

LISTINGS OF DOSEXPRT AUXILIARY OUTPUT FILES FOR EXAMPLE PROBLEMS

DOSEXPRT 4.2 produces some auxiliary output files which are discussed in this appendix. The first two such files were added with Ver. 4.1 of DOSEXPRT. The first file (with extension ANI) lists the annual effective dose (in mrem) by year, projecting out 50 years, for incident exposure to nuclides that have dose-rate files. The format for the ANI file is as follows: 30 lines of text followed by, for each case, a header line and five lines containing the annual effective dose by year using exponential format with each number occupying ten spaces separated by a single space. The ANI file is uploaded into a data base on OHIS. The INCIDENT.ANI file produced from the INCIDENT data file is shown on the following page.

The second file (with extension ANR) lists the annual effective dose (in mrem) by year, projecting out 50 years, for routine exposure to nuclides that have dose-rate files. The format for the ANR file is the same as the ANI file, except that the annual effective dose is listed until it drops below zero. The ANR file is not uploaded into a data base on OHIS. The ROUTINE.ANR file produced from the ROUTINE data file is shown following the INCIDENT.ANI listing.

7.17E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BADGE	-42	SITE	CS-137	D	INHALATION	1-010189								
1.83E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BADGE	-100	SITE	PU-241	W	INHALATION	1-010189								
4.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BADGE	-110	SITE	PU-238	W	INHALATION	1-0901891100								
4.97E+00	7.36E+00	6.53E+00	6.37E+00	6.18E+00	6.02E+00	5.87E+00	5.73E+00	5.57E+00	5.42E+00	5.28E+00	5.16E+00	4.89E+00	4.77E+00	4.66E+00
5.28E+00	5.16E+00	5.02E+00	4.89E+00	4.77E+00	4.66E+00	4.53E+00	4.42E+00	4.31E+00	4.21E+00	4.10E+00	4.00E+00	3.90E+00	3.71E+00	3.62E+00
4.10E+00	4.00E+00	3.90E+00	3.82E+00	3.71E+00	3.62E+00	3.53E+00	3.46E+00	3.37E+00	3.29E+00	3.21E+00	3.14E+00	3.06E+00	2.91E+00	2.85E+00
3.21E+00	3.14E+00	3.06E+00	2.98E+00	2.91E+00	2.85E+00	2.78E+00	2.71E+00	2.65E+00	2.60E+00	2.53E+00	2.47E+00	2.41E+00	2.37E+00	2.35E+00
2.53E+00	2.47E+00	2.41E+00	2.37E+00	2.35E+00	2.25E+00	2.20E+00	2.16E+00	2.10E+00	2.06E+00	2.00E+00	1.94E+00	1.88E+00	1.82E+00	1.76E+00

7.07E+02	7.07E+02	7.04E+02	7.02E+02	7.01E+02	7.02E+02	6.99E+02	6.98E+02	6.97E+02	6.98E+02
6.96E+02	6.95E+02	6.94E+02	6.96E+02	6.93E+02	6.93E+02	6.92E+02	6.93E+02	6.91E+02	6.90E+02
BADGE -141	SITE U-238	D	INHALATION	3-010189					
3.38E+02	5.67E+01	5.07E+01	4.58E+01	4.12E+01	3.74E+01	3.40E+01	3.12E+01	2.85E+01	2.61E+01
2.41E+01	2.23E+01	2.06E+01	1.91E+01	1.78E+01	1.66E+01	1.55E+01	1.45E+01	1.35E+01	1.27E+01
1.19E+01	1.12E+01	1.06E+01	9.99E+00	9.40E+00	8.87E+00	8.38E+00	7.95E+00	7.50E+00	7.09E+00
6.72E+00	6.38E+00	6.03E+00	5.72E+00	5.42E+00	5.16E+00	4.88E+00	4.63E+00	4.39E+00	4.18E+00
3.96E+00	3.76E+00	3.57E+00	3.40E+00	3.22E+00	3.06E+00	2.91E+00	2.77E+00	2.63E+00	2.49E+00
BADGE -142	SITE U-238	W	INHALATION	3-010189					
2.44E+03	2.63E+02	1.76E+01	1.40E+01	1.26E+01	1.14E+01	1.04E+01	9.51E+00	8.68E+00	7.97E+00
7.34E+00	6.79E+00	6.27E+00	5.82E+00	5.41E+00	5.05E+00	4.70E+00	4.40E+00	4.12E+00	3.88E+00
3.63E+00	3.41E+00	3.21E+00	3.04E+00	2.86E+00	2.70E+00	2.55E+00	2.42E+00	2.28E+00	2.16E+00
2.04E+00	1.94E+00	1.83E+00	1.74E+00	1.65E+00	1.57E+00	1.48E+00	1.41E+00	1.34E+00	1.27E+00
1.20E+00	1.14E+00	1.09E+00	1.03E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BADGE -143	SITE U-238	Y	INHALATION	3-010189					
7.04E+03	7.77E+03	5.49E+03	3.98E+03	2.92E+03	2.20E+03	1.70E+03	1.34E+03	1.08E+03	8.85E+02
7.43E+02	6.38E+02	5.56E+02	4.96E+02	4.49E+02	4.15E+02	3.86E+02	3.65E+02	3.49E+02	3.37E+02
3.27E+02	3.19E+02	3.13E+02	3.09E+02	3.05E+02	3.02E+02	2.99E+02	2.98E+02	2.96E+02	2.95E+02
2.94E+02	2.94E+02	2.92E+02	2.92E+02	2.91E+02	2.91E+02	2.90E+02	2.90E+02	2.89E+02	2.90E+02
2.89E+02	2.89E+02	2.88E+02	2.89E+02	2.88E+02	2.88E+02	2.87E+02	2.87E+02	2.87E+02	2.87E+02
BADGE -150	SITE U-238	Y	INHALATION	3-010189					
1.32E+02	2.06E+02	1.45E+02	1.05E+02	7.67E+01	5.76E+01	4.42E+01	3.48E+01	2.78E+01	2.28E+01
1.90E+01	1.63E+01	1.42E+01	1.26E+01	1.14E+01	1.05E+01	9.73E+00	9.18E+00	8.76E+00	8.45E+00
8.17E+00	7.97E+00	7.82E+00	7.71E+00	7.60E+00	7.52E+00	7.46E+00	7.43E+00	7.37E+00	7.34E+00
7.32E+00	7.31E+00	7.28E+00	7.26E+00	7.25E+00	7.26E+00	7.23E+00	7.22E+00	7.21E+00	7.22E+00
7.19E+00	7.19E+00	7.18E+00	7.19E+00	7.17E+00	7.16E+00	7.16E+00	7.17E+00	7.14E+00	7.14E+00

The DOSEXPRT 4.2 report program, DOSEREPRT, has been modified to produce three index files. These index files list the badge number and social security number for the selected cases in the same order as the sorted output (OUT) file. The first of these (with extension IX1) lists all cases with positive committed effective dose. The second (with extension IX2) lists all cases with zero committed effective dose but positive annual effective dose. The third (with extension IX3) lists all cases where errors (no nuclide file, measurement window or record errors) occurred. For the INCIDENT and ROUTINE example data files, only the first index file contains any information, as there are no cases with record errors and no cases with zero committed effective dose and positive annual effective dose. The IX1 index files for the INCIDENT and ROUTINE examples are shown below:

```
=====
DOSEXPRT OUTPUT FILE: INCIDENT.IX1                      DATE: 3/17/92
DOSEXPRT VERSION: 4.2-031792 RUN DATE: 03/17/92 TIME: 12:44
=====
MEASUREMENT PERIOD: 010189 ==> 010190      INTAKE PERIOD: 010189 ==>> 010190
=====
```

BADGE	SSN	Cases with positive committed dose:			
-20	S	I-131	D	H 1-020189	
-10	S	H-3	V	H 1-010189	
-50	S	I-131	D	H 1+021189	
-110	S	PU-238	W	H 1-0901891100	
-31	S	U-238	D	H 1-020189	
-32	S	U-238	D	H 1-020189	
-33	S	U-238	D	H 1-020189	
-41	S	CS-137	D	H 1-010189	
-42	S	CS-137	D	H 1-010189	
-60	S	TC-99	S	G 1-010189	
-100	S	PU-241	W	H 1-010189	

```
=====
DOSEXPRT OUTPUT FILE: ROUTINE.IX1                      DATE: 3/17/92
DOSEXPRT VERSION: 4.2-031792 RUN DATE: 03/17/92 TIME: 17:13
=====
MEASUREMENT PERIOD: 010189 ==> 010190      INTAKE PERIOD: 010189 ==>> 010190
=====
```

BADGE	SSN	Cases with positive committed dose:			
-133	S	U-238	Y	H 3-010189	
-143	S	U-238	Y	H 3-010189	
-132	S	U-238	W	H 3-010189	
-142	S	U-238	W	H 3-010189	
-131	S	U-238	D	H 3-010189	
-150	S	U-238	Y	H 3-010189	
-141	S	U-238	D	H 3-010189	
-120	S	I-131	D	H 3-010189	

Appendix M

DOSEXPRT VAX COM FILES

When the user executes DOSEXPRT interactively from the HPIMS No. 4 menu, the VAX COM file DXINTER is executed. When the user executes DOSEXPRT as a batch process from the HPIMS No. 4 menu, the VAX COM file DXBATCH is executed. Each of these COM files sorts the input bioassay records using the VAX SORT utility. DXINTER then executes DOSEXPRT, sorts the resulting S28 output file and executes DOSREPORT. DXBATCH submits the VAX COM file DXRUN as a VAX batch process. DXRUN executes DOSEXPRT, sorts the resulting S28 output file and executes DOSREPORT. This appendix contains listings of these three VAX COM files, which are located in directory COM_DIR on the OHIS VAX.

DXINTER.COM:

```
$! DXINTER.COM DATE: 03-10-92
$ PATH = F$ENVIRONMENT("DEFAULT")
$ SET DEFAULT 'PATH'
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT "DOSEXPRT V4.2"
$
$ INQUIRE outfile "Enter OUTPUT filename (w/o extension)"
$ WRITE SYS$OUTPUT " "
$
$ INQUIRE ANS "Enter NUMBER of bioassay records files (1 or 2)"
$ IF ANS .EQS. 1 THEN GOTO ONEREC
$ IF ANS .EQS. 2 THEN GOTO TWOREC
$
$ ONEREC:
$ WRITE SYS$OUTPUT " "
$ INQUIRE invitro "Enter RECORDS filename (w/o extension)"
$ invivo = " "
$ GOTO CONT
$
$ TWOREC:
$ WRITE SYS$OUTPUT " "
$ INQUIRE invitro "Enter FIRST RECORDS filename (w/o extension)"
$ WRITE SYS$OUTPUT " "
$ INQUIRE invivo "Enter SECOND RECORDS filename (w/o extension)"
$
$ CONT:
$ WRITE SYS$OUTPUT " *****"
$ WRITE SYS$OUTPUT " *          Entering the year [YYYY] implies          *"
$ WRITE SYS$OUTPUT " * Jan 01 (00:00) to Dec 31 (24:00) of that year.  *"
$ WRITE SYS$OUTPUT " * Enter duration in years after entering year.  *"
$ WRITE SYS$OUTPUT " *****"
$ WRITE SYS$OUTPUT " "
$ INQUIRE istart "Enter Beginning MEASUREMENT YEAR [YYYY]"
$ INQUIRE iend  "Enter DURATION in years          "
$ WRITE SYS$OUTPUT " "
$ INQUIRE kstart "Enter Beginning INTAKE YEAR [YYYY]  "
$ INQUIRE kend  "Enter DURATION in years          "
$ WRITE SYS$OUTPUT " "
$ INQUIRE site  "Enter SITE filename (w/o extension) or <CR> for default"
$ WRITE SYS$OUTPUT " "
$ IF site .EQS. "" THEN $ site="SITE"
$
$ WRITE SYS$OUTPUT "Default is NOT to use Y12 nuclide files."
```

```

$ INQUIRE y12 "Use Y12 nuclide files? (Y/[N])"
$ IF y12 .EQS. "" THEN $ y12="N"
$
$! Get flag to control OUT listing. 1/15/92
$ WRITE SYSS$OUTPUT " "
$ WRITE SYSS$OUTPUT "Default is to keep zero intake output records."
$ INQUIRE YESNO "Suppress zero intake output records in OUT listing? (Y/[N])"
$ IF YESNO .EQS. "" THEN $ YESNO="N"
$ WRITE SYSS$OUTPUT " "
$
$ GETREC:
$ COPY 'invitro'.DAT RECORDS.TMP
$ IF invivo .EQS. " " THEN GOTO SORTDAT
$
$WRITE SYSS$OUTPUT "Appending Urinalysis and In-Vivo Records"
$APPEND 'invivo'.DAT RECORDS.TMP
$
$SORTDAT:
$WRITE SYSS$OUTPUT "Sorting Bioassay Records"
$SORT/KEY=(POS:2,SIZ:6)/KEY=(POS:49,SIZ:7) -
  /KEY=(POS:39,SIZ:1)/KEY=(POS:56,SIZ:1)/KEY=(POS:116,SIZ:1) -
  /KEY=(POS:59,SIZ:12)/KEY=(POS:58,SIZ:1)/KEY=(POS:57,SIZ:1) -
  /KEY=(POS:23,SIZ:12)/KEY=(POS:40,SIZ:3) -
  /KEY=(POS:9,SIZ:1) RECORDS.TMP DOSEXPRT.DAT
$DEL RECORDS.TMP;*
$
$! WRITE DOSEXPRT INPUT INFORMATION TO FILE "INPUT.TMP"
$OPEN/WRITE OUTPUT INPUT.TMP
$! PATH FOR DOSEXPRT OUTPUT, THAT IS THE USER'S DIRECTORY
$ WRITE OUTPUT path
$
$! outfile IS OUTPUT FILENAME
$ WRITE OUTPUT outfile
$
$! PATH FOR NUCLIDE, DRS AND SITE.DFT FILES
$! WRITE OUTPUT "EXE_DIR:"
$ IF y12 .EQS. "Y" THEN WRITE OUTPUT "HS_DATA:[DX.Y12]"
$ IF y12 .EQS. "N" THEN WRITE OUTPUT "HS_DATA:[DX]"
$
$! APPENDED AND SORTED DOSEXPRT RECORDS FILE
$ WRITE OUTPUT "DOSEXPRT"
$
$! SITE FILE NAME (W/O PATH OR EXTENSION)
$ WRITE OUTPUT site
$
$! MEASUREMENT BRACKETING TIMES
$ WRITE OUTPUT istart
$ WRITE OUTPUT iend
$
$! INTAKE BRACKETING TIMES
$ WRITE OUTPUT kstart
$ WRITE OUTPUT kend
$CLOSE OUTPUT
$
$RUN EXE_DIR:DOSEXPRT.EXE
&&FILE
$DEL INPUT.TMP;*
$
$! SORT the DOSEXPRT .S28 output file.
$OPEN/WRITE OUTPUT FILE.TMP
$ WRITE OUTPUT outfile
$! Pass flag to control OUT listing
$ WRITE OUTPUT YESNO
$ CLOSE OUTPUT
$! Sorting of S28 output records modified 1/15/92
$WRITE SYSS$OUTPUT "Sorting output records"
$SORT/KEY=(POS:406,SIZ:9,DESCENDING)/KEY=(POS:430,SIZ:1,DESCENDING) -
  /KEY=(POS:1,SIZ:6) -
  /KEY=(POS:11,SIZ:7)/KEY=(POS:10,SIZ:1)/KEY=(POS:39,SIZ:1) -

```

```

'outfile'.s28 sort.tmp
$I Run report program on sorted output file
$RUN EXE_DIR:DOSREPORT.EXE
$ del sort.tmp;*
$ del file.tmp;*
$
$ EXIT

```

DXBATCH.COM:

```

$I DXBATCH.COM DATE: 03-10-92
$ PATH = F$ENVIRONMENT("DEFAULT")
$ SET DEFAULT 'PATH'
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT "DOSEXPRT V4.2"
$
$ INQUIRE outfile "Enter OUTPUT filename (w/o extension)"
$ WRITE SYS$OUTPUT " "
$
$ INQUIRE ANS "Enter NUMBER of bioassay records files (1 or 2)"
$ IF ANS .EQS. 1 THEN GOTO ONEREC
$ IF ANS .EQS. 2 THEN GOTO TWOREC
$
$ ONEREC:
$ WRITE SYS$OUTPUT " "
$ INQUIRE invitro "Enter RECORDS filename (w/o extension)"
$ invivo = " "
$ GOTO CONT
$
$ TWOREC:
$ WRITE SYS$OUTPUT " "
$ INQUIRE invitro "Enter FIRST RECORDS filename (w/o extension)"
$ WRITE SYS$OUTPUT " "
$ INQUIRE invivo "Enter SECOND RECORDS filename (w/o extension)"
$
$ CONT:
$ WRITE SYS$OUTPUT " *****"
$ WRITE SYS$OUTPUT " *           Entering the year [YYYY] implies      *"
$ WRITE SYS$OUTPUT " * Jan 01 (00:00) to Dec 31 (24:00) of that year.  *"
$ WRITE SYS$OUTPUT " * Enter duration in years after entering year.  *"
$ WRITE SYS$OUTPUT " *****"
$ WRITE SYS$OUTPUT " "
$ INQUIRE istart "Enter Beginning MEASUREMENT YEAR [YYYY]"
$ INQUIRE iend  "Enter DURATION in years          "
$ WRITE SYS$OUTPUT " "
$ INQUIRE kstart "Enter Beginning INTAKE YEAR [YYYY]  "
$ INQUIRE kend  "Enter DURATION in years          "
$ WRITE SYS$OUTPUT " "
$ INQUIRE site  "Enter SITE filename (w/o extension) or <CR> for default"
$ WRITE SYS$OUTPUT " "
$ IF site .EQS. "" THEN $ site="SITE"
$
$ WRITE SYS$OUTPUT "Default is NOT to use Y12 nuclide files."
$ INQUIRE y12 "Use Y12 nuclide files? (Y/[N])"
$ IF y12 .EQS. "" THEN $ y12="N"
$
$I Get flag to control OUT listing. 1/15/92
$ WRITE SYS$OUTPUT " "
$ WRITE SYS$OUTPUT "Default is to keep zero intake output records."
$ INQUIRE YESNO "Suppress zero intake output records in OUT listing? (Y/[N])"
$ IF YESNO .EQS. "" THEN $ YESNO="N"
$ WRITE SYS$OUTPUT " "
$
$ WRITE SYS$OUTPUT " "
$ INQUIRE time "Execute DOSEXPRT after this time (24 hour) (HH:MM:SS)"

```



```

$
$ GETREC:
$ COPY 'invitro'.DAT RECORDS.TMP
$ IF invivo .EQS. " " THEN GOTO SORTDAT
$
$I Move this question before VAX SORT of bioassay records 1/15/92
$WRITE SYS$OUTPUT "Appending Urinalysis and In-Vivo Records"
$APPEND 'invivo'.DAT RECORDS.TMP
$
$SORTDAT:
$WRITE SYS$OUTPUT "Sorting Bioassay Records"
$SORT/KEY=(POS:2,SIZ:6)/KEY=(POS:49,SIZ:7) -
  /KEY=(POS:39,SIZ:1)/KEY=(POS:56,SIZ:1)/KEY=(POS:116,SIZ:1) -
  /KEY=(POS:59,SIZ:12)/KEY=(POS:58,SIZ:1)/KEY=(POS:57,SIZ:1) -
  /KEY=(POS:23,SIZ:12)/KEY=(POS:40,SIZ:3) -
  /KEY=(POS:9,SIZ:1) RECORDS.TMP DOSEXPRT.DAT
$DEL RECORDS.TMP;*
$
$I WRITE DOSEXPRT INPUT INFORMATION TO FILE "INPUT.TMP"
$OPEN/WRITE OUTPUT INPUT.TMP
$I path IS PATH FOR DOSEXPRT OUTPUT, THAT IS THE USER'S DIRECTORY
$ WRITE OUTPUT path
$
$I outfile IS OUTPUT FILENAME
$ WRITE OUTPUT outfile
$
$I THIS IS PATH FOR NUCLIDE, DRS AND SITE.DFT FILES
$I WRITE OUTPUT "EXE_DIR:"
$ IF y12 .EQS. "Y" THEN WRITE OUTPUT "HS_DATA:[DX.Y12]"
$ IF y12 .EQS. "N" THEN WRITE OUTPUT "HS_DATA:[DX]"
$
$I APPENDED AND SORTED DOSEXPRT RECORDS FILE
$ WRITE OUTPUT "DOSEXPRT"
$
$I SITE FILE NAME (W/O PATH OR EXTENSION)
$ WRITE OUTPUT site
$
$I MEASUREMENT BRACKETING TIMES
$ WRITE OUTPUT istart
$ WRITE OUTPUT iend
$
$I INTAKE BRACKETING TIMES
$ WRITE OUTPUT kstart
$ WRITE OUTPUT kend
$CLOSE OUTPUT
$
$I Pass YESNO as third parameter to DXRUN.COM 1/15/92
$SUBMIT/KEEP/NOTIFY/NOPRINTER/AFTER="TODAY+'time'"/LOG_NAME='PATH'outfile'.LOG/PARAMETER=('path','
outfile','YESNO') COM_DIR:DXRUN
$
$ EXIT

```

DXRUN.COM:

```

$I DXRUN.COM DATE: 01-31-92
$SET DEFAULT 'P1'
$SHOW DEFAULT
$I EXECUTE DOSEXPRT PROGRAM - INPUT IS IN FILE INPUT.TMP
$ RUN EXE_DIR:DOSEXPRT.EXE
&&FILE
$DEL INPUT.TMP;*
$
$I SORT the DOSEXPRT .S28 output file.
$OPEN/WRITE OUTPUT FILE.TMP
$ WRITE OUTPUT P2

```

```
$! Pass flag to control OUT listing 1/15/92
$ WRITE OUTPUT P3
$ CLOSE OUTPUT
$WRITE SYS$OUTPUT "Sorting output records"
$I Sorting of S28 output records modified 1/15/92
$SORT/KEY=(POS:406,SIZ:9,DESCENDING)/KEY=(POS:430,SIZ:1,DESCENDING) -
  /KEY=(POS:1,SIZ:6) -
  /KEY=(POS:11,SIZ:7)/KEY=(POS:10,,SIZ:1)/KEY=(POS:39,SIZ:1) -
  'P2'.s28 sort.tmp
$I Run report program on sorted output file
$ RUN EXE_DIR:DOSREPORT.EXE
$ del sort.tmp;*
$ del file.tmp;*
$
$ EXIT
```

Appendix N

EXECUTING DOSEXPRT IN DEBUG/TEST MODE

DOSEXPRT can be executed directly, bypassing the HPIMS No. 4 menu, for purposes of debugging or testing. This appendix describes how this is done. Testing of DOSEXPRT in the manner described here is done only by those who have authorization to perform tests or by the DOSEXPRT program developers.

At the prompt the user types: RUN EXE_DIR:DOSEXPRT. This will run Ver. 4.2 of DOSEXPRT. The user must enter the same information as when running the program off the HPIMS No. 4 menu, except for the following items:

- ▶ The user must specify the location (path) of the nuclide files, HS_DATA:[DX], and the location and name (without extension) of the default site file, HS_DATA:[DX]SITE, or a user-modified site file. The path for the Y-12 uranium nuclide files and corresponding site file is HS_DATA:[DX.Y12].

- ▶ The user must respond to three additional questions which control
 - The display option, which can take the following values:
 - 2 no display (header line only as when executed off the HPIMS NO. 4 menu),
 - 1 long list (lists bioassay records, intake and dose),
 - 1 trace (lists trace information for debugging in addition to information listed in long listing);

 - The value of AMAD used in computing the intake; and

 - Whether to save or scratch the DOSEXPRT control file.

If the user selects either the long listing or the trace listing, in addition to the estimated intake, the user will see the mean-fractional deviation of the model predictions, based on the computed intake or intake rates, from the actual measurements. The mean-fractional deviation is computed as the sum, over all measurements, of the absolute value of the difference between the measurement and the predicted value divided by the prediction. The sum is then divided by the number of measurements to obtain the mean-fractional deviation.

To run the DOSREPORT program, the user must copy the file DOSREPORT.COM from FLGEM:[RWD] and type at the prompt: @DOSREPORT. The only input to the DOSREPORT program is the name of the DOSEXPRT S28 output file. DOSREPORT produces the corresponding OUT file in the user's area.

Those needing to run the DOSEXPRT code in the debug/test mode should contact the code developers.

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