```
*DECK INPUT
      SUBROUTINE INPUT (OK)
C
C THIS ROUTINE CONTROLS THE PROCESSING OF ALL USER INPUT FOR THE MACCS MODULES
C AND SETS UP THE FRAMEWORK FOR THE "SIMULATE" PORTION OF THE CALCULATIONS
C
C THIS ROUTINE IS CALLED BY MAIN PROGRAM.
C
C GLOSSARY OF VARIABLES:
C
C ENDAT1 - LOGICAL FLAG SIGNIFYING THAT ONLY THE "ATMOS" MODULE IS TO BE RUN
C ENDAT2 - LOGICAL FLAG SIGNIFYING THAT ONLY "ATMOS"  AND "EARLY" ARE TO BE RUN
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C ISRCTM - LOOP COUNTER ON SOURCE TERMS USED BY "ATMOS"
C NSTRTG - TOTAL NUMBER OF EMERGENCY RESPONSE SCENARIOS USED BY "EARLY"
C NSRCTM - TOTAL NUMBER OF SOURCE TERMS USED BY "ATMOS"
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C OK1    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF ATMODL
C OK2    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF ATPROB
C
C GLOSSARY OF EXTERNALS:
C
C ATMODL - DEFINE THE ATMOSPHERIC MODEL
C ATPROB - DEFINE THE ATMOSPHERIC PROBLEM
C CHRINP - DEFINE THE USER INPUT FOR CHRONC
C EARINP - DEFINE THE USER INPUT FOR EARLY
C INPBEG - OPENS THE USER INPUT FILE ON A GIVEN UNIT NUMBER
C INPEND - CLOSES THE OPEN USER INPUT FILE DATABASE
C INPREL - LOADS THE SOURCE TERM DATA DEFINING THE RELEASES
C OUTCON - GENERATES THE RESULT LISTS USED BY "EARLY" AND "CHRONC"
C PUTSTG - STORES THE EMERGENCY RESPONSE STRATEGY AWAY ON LIST STORAGE
C PUTSTM - STORES THE SOURCE TERM DESCRIPTION AWAY ON LIST STORAGE
C
C DAVID CHANIN, DIV. 6415, 9 JAN 85.
C MODIFIED 10/17/89, D. CHANIN, #10/13/89-B, ADD OPEN STATEMENTS
C MODIFIED 7/30/91, D. CHANIN, #10/13/89-B, PUT ALL OPENS IN MXXOPN
C Modified 3/09/93, D.C., Added call to OUTCON for when ENDAT1=.TRUE.
C
      EXTERNAL ATMODL, ATPROB, EARINP, CHRINP, OUTCON,
     $         INPBEG, INPEND, INPREL, PUTSTG, PUTSTM
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      LOGICAL         ENDAT1, ENDAT2
      COMMON /STOPME/ ENDAT1, ENDAT2
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      LOGICAL OK, OK1, OK2
C
      OK = .FALSE.
C
C  INITIALIZE THE DATABASE BY PROCESSING USER INPUT ON UNIT 24
C
      NSRCTM = 0
      CALL INPBEG (24, NSRCTM)
      IF (NSRCTM .GT. 60) THEN
      CALL ERRLOC ('INPUT', 'SOURCE TERM CHANGE CARDS')
        WRITE(6,*) 'ONLY SIXTY SOURCE TERMS ARE ALLOWED'
        WRITE(6,*) 'YOU ARE TRYING TO RUN', NSRCTM
        WRITE(7,*) 'ONLY SIXTY SOURCE TERMS ARE ALLOWED'
        WRITE(7,*) 'YOU ARE TRYING TO RUN', NSRCTM
        CALL ABORT ('INPUT')
      ELSE
```

```
C
C  INITIALIZE THE SOURCE TERM COUNTER IN CASE WE ARE RUNNING A SINGLE CASE
C
      ISRCTM = 1
C
C  DEFINE THE "ATMOS" BASE CASE:
C  PROCESS THE MODEL DEFINITION DATA
C
      CALL ATMODL (OK1)
C
C  IF THERE WERE NO ERRORS IN DEFINING THE MODEL, THEN DEFINE THE PROBLEM
C
      IF (OK1) THEN
        CALL ATPROB (OK2)
        IF (OK2) OK = .TRUE.
      ENDIF
      IF (.NOT. OK) THEN
        WRITE(6,20)
        WRITE(7,20)
20      FORMAT(/' DUE TO ERRORS IN THE "ATMOS" USER INPUT FILE,',
     $          ' FURTHER INPUT PROCESSING IS BEING ABANDONED'/)
        CALL ABORT ('INPUT')
      ENDIF
    ENDIF
C
C  PROCESS A SET OF CHANGE CARDS FOR EACH SOURCE TERM
C
    IF (NSRCTM .GT. 1) THEN
    IFLAG = NSRCTM
    DO 100 ISRCTM = 1, NSRCTM
    IF (ISRCTM .GT. 1) THEN
C
C  PROCESS THE NEXT SET OF CHANGE CARDS ON THE "ATMOS" USER INPUT FILE
C
        CALL INPBEG (24, IFLAG)
      CALL INPREL (OK)
      IF (.NOT. OK) THEN
          WRITE(6,*)'ERROR IN "ATMOS" CHANGE CASE, CANNOT PROCEED'
          WRITE(7,*)'ERROR IN "ATMOS" CHANGE CASE, CANNOT PROCEED'
          CALL ABORT ('INPUT')
        ENDIF
    ENDIF
    CALL PUTSTM (OK)
    IF (.NOT. OK) THEN
        WRITE(6,*)'ERROR IN "ATMOS" CHANGE CASE, CANNOT PROCEED'
        WRITE(7,*)'ERROR IN "ATMOS" CHANGE CASE, CANNOT PROCEED'
        CALL ABORT ('INPUT')
      ENDIF
100   CONTINUE
    ENDIF
C
C  CLOSE THE ATMOS USER INPUT FILE DATABASE
C
    CALL INPEND
    CLOSE (24)
C
C  SKIP ANY FURTHER INPUT PROCESSING IF ATMOS IS THE LAST PROGRAM TO BE RUN
C
    IF (ENDAT1) GO TO 900
C
C  INITIALIZE THE EMERGENCY RESPONSE COUNTER
C  IN CASE WE ARE RUNNING A SINGLE STRATEGY
C
```

```
      ISTRTG = 1
C
C  PROCESS THE USER INPUT FOR EARLY FROM UNIT 25
C
      IF (OK) THEN
        NSTRTG = 0
        CALL INPBEG (25, NSTRTG)
        CALL EARINP (OK)
      ENDIF
      IF (.NOT. OK) THEN
        WRITE(6,*) 'ERROR IN "EARLY" USER INPUT, CANNOT PROCEED'
        WRITE(7,*) 'ERROR IN "EARLY" USER INPUT, CANNOT PROCEED'
        CALL ABORT ('INPUT')
      ENDIF
      IF (NSTRTG .GT. 3) THEN
      CALL ERRLOC('INPUT','EMERGENCY RESPONSE STRATEGY CHANGE CARDS')
        WRITE(6,*) 'ONLY THREE EVACUATION STRATEGIES ARE ALLOWED'
        WRITE(6,*) 'YOU ARE TRYING TO RUN', NSTRTG
        WRITE(7,*) 'ONLY THREE EVACUATION STRATEGIES ARE ALLOWED'
        WRITE(7,*) 'YOU ARE TRYING TO RUN', NSTRTG
        CALL ABORT ('INPUT')
      ELSE IF (NSTRTG .GT. 1) THEN
      IFLAG = NSTRTG
      DO 200 ISTRTG = 1, NSTRTG
      IF (ISTRTG .GT. 1) THEN
C
C  PROCESS THE NEXT SET OF CHANGE CARDS ON THE "EARLY" USER INPUT FILE
C
          CALL INPBEG (25, IFLAG)
        CALL REDSTG (OK)
        IF (.NOT. OK) THEN
            WRITE(6,*)'ERROR IN "EARLY" CHANGE CASE, CANNOT PROCEED'
            WRITE(7,*)'ERROR IN "EARLY" CHANGE CASE, CANNOT PROCEED'
            CALL ABORT ('INPUT')
          ENDIF
      ENDIF
      CALL PUTSTG (OK)
      IF (.NOT. OK) THEN
          WRITE(6,*)'ERROR IN "EARLY" CHANGE CASE, MACCS CANNOT BE RUN'
          WRITE(7,*)'ERROR IN "EARLY" CHANGE CASE, MACCS CANNOT BE RUN'
          CALL ABORT ('INPUT')
        ENDIF
  200   CONTINUE
      ENDIF
C
C  CLOSE THE EARLY USER INPUT FILE DATABASE
C
      CALL INPEND
      CLOSE (25)
C
C  SKIP ANY FURTHER INPUT PROCESSING IF EARLY IS THE LAST PROGRAM TO BE RUN
C
      IF (ENDAT2) GO TO 900
C
C  PROCESS THE USER INPUT FOR CHRONC FROM UNIT 26
C
      IF (OK) THEN
        IFLAG = 0
        CALL INPBEG (26, IFLAG)
        CALL CHRINP (OK)
      ENDIF
      IF (.NOT. OK) THEN
        WRITE(6,*)'ERROR IN "CHRONC" USER INPUT, MACCS CANNOT BE RUN'
```

```
        WRITE(7,*)'ERROR IN "CHRONC" USER INPUT, MACCS CANNOT BE RUN'
        CALL ABORT ('MAIN')
      ENDIF
C
C  CLOSE THE CHRONC USER INPUT FILE DATABASE
C
      CALL INPEND
      CLOSE (26)
C
C  CALL A ROUTINE WHICH GENERATES THE RESULT LISTS AND WRITES THEIR HEADERS
C
  900 CALL OUTCON
      RETURN
      END
*DECK INPBEG
      SUBROUTINE INPBEG (IUNIT, IFLAG)
C
C THIS ROUTINE SETS UP A DATABASE STORING THE USER INPUT DATA FOR A SINGLE FILE.
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C IT IS CALLED BY SUBROUTINE INPUT.
C
C DESCRIPTION OF ARGUMENT LIST:
C
C IUNIT -- UNIT NUMBER FROM WHICH TO READ THE USER INPUT FILE.
C
C IFLAG -- INTEGER CONTROL FLAG. THIS MUST BE AN INTEGER VARIABLE IN THE
C          CALLING ROUTINE BECAUSE ITS VALUE WILL BE CHANGED HERE.
C
C          ON THE FIRST CALL TO INITIALIZE THE DATABASE, SPECIFY A VALUE OF ZERO,
C          IFLAG WILL COME BACK WITH THE NUMBER OF TERMINATOR RECORDS THAT WERE
C          FOUND ON THE INPUT FILE. IN ORDER TO UPDATE THE DATABASE TO REFLECT
C          THE CHANGE CARD DATA SETS, THIS ROUTINE SHOULD BE CALLED IFLAG-1
C          ADDITIONAL TIMES IN ORDER TO PROCESS THE IFLAG-1 ADDITIONAL DATA SETS.
C
C MODIFIED 26 FEB 88, D. CHANIN.
C
C MODIFIED 7/11/89, LOG # 2/24/89-A, ELIMINATE THE ABILITY TO ADD CARDS
C   TO THE BASE CASE DATABASE THROUGH CHANGE CARDS.  IT DIDN'T WORK. D.C.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C MODIFIED 10/17/89, D. CHANIN, # 2/24/89-B, ELIMINATE INFINITE LOOPING
C
      EXTERNAL ABORT
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /INPRC3/ NBLANK, NCHANG, NCMMNT, NDPLCT, NREC, NRECT,
     1                NTRMNT
      DIMENSION ICREC(MAXREC)
      CHARACTER *1 CHAR1
C  CHECK FOR BASE CASE INPUT (IFLAG=0)
C
      IF (IFLAG .EQ. 0) THEN
C  INITIALLIZE NUMBER OF INPUT DATA SETS
C
         NTERM = 0
C  REWIND USER INPUT FILE
```

```
C
          REWIND (IUNIT)
C  COUNT NUMBER OF INPUT DATA SETS (BASE CASE PLUS CHANGE CASES)
C
  100     IC = 0
C  READ INPUT RECORD
C
          READ(IUNIT,1001,END=300) CARD(1)
  200     IC = IC + 1
C
C  COMPARE COLUMN POINTER TO MAXIMUM RECORD LENGTH
        IF (IC .GT. MAXLEN) GO TO 100
          CHAR1 = CARD(1)(IC:IC)
C
C  CHECK FOR BLANK AT CURRENT COLUMN POINTER
        IF (CHAR1 .EQ. ' ') THEN
             GO TO 200
C
C  CHECK FOR TERMINATOR RECORD (.)
C  INCREMENT NUMBER OF DATA SETS
        ELSE IF (CHAR1 .EQ. '.') THEN
             NTERM = NTERM + 1
          ENDIF
          GO TO 100
  300     CONTINUE
          IF (NTERM .EQ. 0) THEN
            WRITE(6,310) IUNIT
            WRITE(7,310) IUNIT
  310       FORMAT(/' UNEXPECTED EOF FOUND ON UNIT ', I2)
            CALL ABORT ('INPBEG')
          ENDIF
          REWIND (IUNIT)
C
C  INITIALLIZE NUMBER OF RECORDS FOR BASE CASE
        NREC = 1
C
C  INITIALLIZE TOTAL NUMBER OF ID RECORDS READ
        NRECT = 0
C
C  INITIALLIZE NUMBER OF COMMENT RECORDS
        NCMMNT = 0
C
C  INITIALLIZE NUMBER OF TERMINATOR RECORDS
        NTRMNT = 0
C
C  INITIALLIZE NUMBER OF BLANK RECORDS
        NBLANK = 0
C
C  INITIALLIZE INPUT RECORD ARRAYS
        DO 400 I = 1, MAXREC
C
C  POINTER ARRAY FOR SORTING RECORDS
           IPNT(I) = I
C
C  FLAG ARRAY FOR RECORDS ACCESSED FOR VALUES
           CRDFLG(I) = .FALSE.
  400     CONTINUE
C
C  SET NUMBER OF CHARACTERS USED IN PERFORMING SORT
        NCHAR = 11
C
C  INITIALLIZE NUMBER OF CHANGE CASES
        NCCASE = 0
```

```
C
C  PRINT DESCRIPTIVE INFORMATION ABOUT INPUT PROCESSING
       WRITE(6,2001) IUNIT, NCHAR, MAXLEN - 1, MAXREC
      ELSE
C
C  INCREMENT NUMBER OF CHANGE CASES
       NCCASE = NCCASE + 1
C
C  INITIALLIZE NUMBER OF INPUT RECORDS FOR CHANGE CASE
       NREC = NREC + 1
C
C  INITIALLIZE NUMBER OF CHANGE RECORDS FOR CHANGE CASE
       NCHANG = 0
C
C  INITIALLIZE NUMBER OF ADDED RECORDS FOR CHANGE CASE
       NADD = 0
C
C  PRINT MESSAGE FOR START OF CHANGE CASE USER INPUT
       WRITE(6,2011) NCCASE
      ENDIF
C
C  READ AND STORE MACCS INPUT RECORDS
C  BEGINNING OF LOOP TO READ INPUT RECORDS
 1000 CONTINUE
C
C  SET COLUMN POINTER
      IC = 0
C
C  READ INPUT RECORD
      READ(IUNIT,1001,END=9000) CARD(NREC)
C
C  LOCATE FIRST NON-BLANK CHARACTER
 2000 CONTINUE
      IC = IC + 1
C
C  CHECK FOR COLUMN POINTER BEYOND END OF RECORD
      IF (IC .GT. MAXLEN) THEN
C
C  INCREMENT NUMBER OF BLANK RECORDS
         NBLANK = NBLANK + 1
C
C  PRINT RECORD
         WRITE(6,2002) CARD(NREC)
C
C  CURRENT RECORD IS BLANK SO DO NOT SAVE
         GO TO 1000
      ENDIF
      CHAR1 = CARD(NREC)(IC:IC)
      IF (CHAR1 .EQ. ' ') THEN
         GO TO 2000
C
C  CHECK FOR TERMINATOR RECORD (. IN FIRST NON-BLANK COLUMN)
      ELSE IF (CHAR1 .EQ. '.') THEN
        GO TO 5000
C
C  CHECK FOR COMMENT RECORD (* IN FIRST NON-BLANK COLUMN)
      ELSE IF (CHAR1 .EQ. '*') THEN
C
C  INCREMENT NUMBER OF COMMENT RECORDS
         NCMMNT = NCMMNT + 1
C
C  PRINT RECORD
         WRITE(6,2002) CARD(NREC)(IC:MAXLEN)
```

```
C
C  CURRENT RECORD IS COMMENT SO DO NOT SAVE
         GO TO 1000
      ELSE
C
C  INCREMENT TOTAL NUMBER OF ID RECORDS
         NRECT = NRECT + 1
C
C  SHIFT INPUT RECORD TO REMOVE LEADING BLANKS
         CARD(NREC) = CARD(NREC)(IC:MAXLEN)
C
C  PRINT RECORD
         WRITE(6,2003) NRECT, CARD(NREC)
C
C  SAVE RECORD NUMBER
         ICREC(NREC) = NRECT
C
C  CHECK FOR CORRECT LENGTH OF ID
         IDLEN = INDEX(CARD(NREC), ' ') - 1
C
C  PRINT WARNING MESSAGE
         IF (IDLEN .NE. NCHAR) WRITE(6,2012) IDLEN, NCHAR
C
C  CHECK FOR BASE CASE OR CHANGE CASE INPUT
         IF (IFLAG .EQ. 0) THEN
C
C  SEQUENTIAL SEARCH FOR PREVIOUS OCCURRENCE OF ID
            NRECM1 = NREC - 1
            DO 3000 IREC = 1, NRECM1
C
C  COMPARE CURRENT ID WITH EACH PREVIOUSLY READ ID
             IF (CARD(NREC)(1:NCHAR) .EQ. CARD(IREC)(1:NCHAR)) THEN
C
C  PREVIOUSLY OCCURRING ID SO SUBSTITUTE
             CARD(IREC) = CARD(NREC)
C
C  PRINT DUPLICATE RECORD MESSAGE
             WRITE(6,2004) NREC + NDPLCT, ICREC(IREC)
C
C  INCREMENT NUMBER OF DUPLICATE RECORDS
             NDPLCT = NDPLCT + 1
             GO TO 4000
         ENDIF
 3000    CONTINUE
C
C  NEW RECORD ID SO INCREMENT RECORD COUNTER
          NREC = NREC + 1
 4000       CONTINUE
         ELSE
C
C  TRANSFER RECORD TO TEMPORARY STORAGE FOR SEARCH
          CLOC = CARD(NREC)
C
C  SEARCH FOR CURRENT ID IN BASE CASE
          CALL SEARCH (NCHAR, IPOINT)
C
C  IF LOCATED, SUBSTITUTE; OTHERWISE, ADD TO BASE CASE
          IF (IPOINT .GT. 0) THEN
C
C  RECORD FOUND IN BASE CASE SO SUBSTITUTE
             CARD(IPNT(IPOINT)) = CARD(NREC)
C
C  RESET ACCESS FLAG FOR SUBSTITUTED RECORD
```

```
              CRDFLG(IPNT(IPOINT)) = .FALSE.
C
C  PRINT DUPLICATE RECORD MESSAGE
              WRITE(6,2004) NRECT, ICREC(IPNT(IPOINT))
C
C  INCREMENT NUMBER OF CHANGE RECORDS
              NCHANG = NCHANG + 1
             ELSE
C
C  CARDS CANNOT BE ADDED TO THE DATABASE THROUGH CHANGE CARDS
              WRITE(6,2013) NRECT
             ENDIF
           ENDIF
        ENDIF
C
C  READ NEXT RECORD
        GO TO 1000
 5000 CONTINUE
C
C  PRINT TERMINATOR RECORD
        WRITE(6,2002) CARD(NREC)(IC:MAXLEN)
C
C  INCREMENT NUMBER OF TERMINATOR RECORDS
        NTRMNT = NTRMNT + 1
C
C  DECREMENT NUMBER OF RECORDS STORED (ELIMINATE TERMINATOR RECORD)
        NREC = NREC - 1
C
C  SORT POINTER ARRAY FOR RECORDS STORED ACCORDING TO FIRST NCHAR
C  CHARACTERS OF RECORD
        CALL SORT (NCHAR)
C
C  PRINT INPUT DATA TERMINATOR FOUND MESSAGE
        IF (IFLAG .EQ. 0) THEN
C
C  PRINT MESSAGE FOR BASE CASE INPUT
         WRITE(6,2005)
C
C  PRINT TOTAL NUMBER OF RECORDS READ
         WRITE(6,2006) NBLANK + NCMMNT + NTRMNT + NRECT
C
C  PRINT NUMBER OF BLANK OR COMMENT RECORDS READ
         WRITE(6,2007) NBLANK + NCMMNT
C
C  PRINT NUMBER OF TERMINATOR RECORDS READ, NUMBER OF RECORDS
C  PROCESSED, NUMBER OF DUPLICATE RECORDS, AND NUMBER OF RECORDS
C  SORTED
         WRITE(6,2008) NTRMNT, NRECT, NDPLCT, NREC
        ELSE
C
C  PRINT MESSAGE FOR CHANGE CASE INPUT
         WRITE(6,2009) NCCASE
C
C  PRINT NUMBER OF CHANGE RECORDS AND ADDED RECORDS
         WRITE(6,2010) NCCASE, NCHANG, NADD
        ENDIF
        IF (NREC .EQ. 0) THEN
          WRITE(6,5010) IUNIT
          WRITE(7,5010) IUNIT
 5010     FORMAT(/' NO DATA CARDS FOUND ON UNIT ', I2)
          CALL ABORT ('INPBEG')
        ENDIF
C
```

```
C  SET NUMBER OF INPUT DATA SET IF FIRST TIME TO THIS SUBROUTINE
      IF (IFLAG .EQ. 0) IFLAG = NTERM
      RETURN
 9000 CONTINUE
C
C  EOF ENCOUNTERED ON INPUT FILE SO SET IFLAG TO NEGATIVE VALUE
      IFLAG = -1
      RETURN
 1001 FORMAT(A)
 2001 FORMAT(//1X,'USER INPUT IS READ FROM UNIT ',I2,
     1       /1X,'RECORD IDENTIFIER FIELDS ',I3,' CHARACTERS ',
     2        'LONG ARE EXPECTED.',
     3       /1X,'THE FIRST ',I3,' COLUMNS OF EACH INPUT RECORD ARE ',
     4        'PROCESSED.',
     5       /1X,'THE MAXIMUM NUMBER OF IDENTIFIER RECORDS THAT MAY ',
     6        'BE SAVED AS THE BASE CASE IS ',I5,'.',
     7      //1X,'RECORD',
     8       /1X,'NUMBER',35X,'RECORD',/)
 2002 FORMAT(8X,A)
 2003 FORMAT(1X,I5,2X,A)
 2004 FORMAT(1X,'********   RECORD NUMBER ',I5,' REPLACES RECORD ',
     1        'NUMBER ',I5,'   ********')
 2005 FORMAT(1X,'******** TERMINATOR RECORD ENCOUNTERED -- END OF ',
     1        'BASE CASE USER INPUT ********')
 2006 FORMAT(//1X,'USER INPUT PROCESSING SUMMARY - BASE CASE',
     1        //1X,'NUMBER OF RECORDS READ',T50,'=',I5)
 2007 FORMAT(1X,'NUMBER OF BLANK OR COMMENT RECORDS READ',T50,'=',I5)
 2008 FORMAT(1X,'NUMBER OF TERMINATOR RECORDS',T50,'=',I5,
     1       /1X,'NUMBER OF RECORDS PROCESSED',T50,'=',I5,
     2       /6X,'NUMBER OF PROCESSED RECORDS DUPLICATED',T50,'=',I5,
     3       /6X,'NUMBER OF PROCESSED RECORDS SORTED',T50,'=',I5,
     4       /1X,100('*'),//)
 2009 FORMAT(1X,'******** TERMINATOR RECORD ENCOUNTERED -- END OF ',
     1        'CHANGE CASE ',I3,' USER INPUT ********')
 2010 FORMAT(/1X,'USER INPUT PROCESSING SUMMARY - CHANGE CASE ',I3,
     1        /1X,'NUMBER OF RECORDS CHANGED',T40,'=',I5,
     2        /1X,'NUMBER OF RECORDS ADDED',T40,'=',I5,
     3        /1X,100('*'),//)
 2011 FORMAT(//1X,'******** BEGINNING OF CHANGE CASE ',I3,
     1         USER INPUT ********')
 2012 FORMAT(1X,'******** WARNING -- RECORD IDENTIFIER HAS ',I3,
     1        CHARACTERS INSTEAD OF ',I2,' CHARACTERS ********')
 2013 FORMAT(1X,'********   RECORD NUMBER ',I5,' IS BEING IGNORED ',
     1        'BECAUSE CHANGE CARDS CAN ONLY REPLACE PREVIOUSLY ',
     2        'DEFINED RECORDS')
      END
*DECK INPEND
      SUBROUTINE INPEND
C
C THIS ROUTINE CLOSES A USER INPUT FILE DATABASE WHEN IT IS NO LONGER NEEDED.
C
C IT IS CALLED BY SUBROUTINE INPUT.
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  PRINT WARNING INFORMATION RELATING TO INPUT RECORDS
C
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
```

```
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /INPRC3/ NBLANK, NCHANG, NCMMNT, NDPLCT, NREC, NRECT,
     1                NTRMNT
      LOGICAL FIRST
C
C  INITIALLIZE FLAG FOR PRINTING WARNING HEADING
      FIRST = .TRUE.
C
C  LOOP OVER SAVED RECORDS
      DO 1000 IREC = 1, NREC
C
C  CHECK ACCESS FLAG FOR CURRENT RECORD
         IF (.NOT. CRDFLG(IREC)) THEN
C
C  PRINT WARNING HEADING WHEN FIRST UNACCESSED RECORD IS
C  ENCOUNTERED
            IF (FIRST) THEN
               WRITE(6,1001)
C
C  RESET FLAG
               FIRST = .FALSE.
            ENDIF
C
C  PRINT UNACCESSED RECORD
            WRITE(6,1002) CARD(IREC)
C
C  SET ACCESS FLAG SO WARNING IS NOT REPEATED FOR CHANGE CASES
            CRDFLG(IREC) = .TRUE.
         ENDIF
 1000 CONTINUE
C
C  INITIALLIZE FLAG FOR PRINTING WARNING HEADING
      FIRST = .TRUE.
C
C  LOOP OVER SAVED RECORDS
      DO 2000 IREC = 1, NREC
C
C  CHECK COLUMN MAXLEN FOR A NON-BLANK CHARACTER TO WARN OF RECORD
C  LENGTH THAT MAY BE TOO LONG FOR CURRENT DIMENSIONING OF INPUT PROCESSOR
         IF (CARD(IREC)(MAXLEN:MAXLEN) .NE. ' ') THEN
C
C  PRINT WARNING HEADING WHEN FIRST RECORD THAT MAY BE TOO LONG IS ENCOUNTERED
            IF (FIRST) THEN
               WRITE(6,1003) MAXLEN - 1
C
C  RESET FLAG
               FIRST = .FALSE.
            ENDIF
C
C  PRINT RECORD THAT MAY BE TOO LONG
            WRITE(6,1002) CARD(IREC)
         ENDIF
 2000 CONTINUE
      RETURN
 1001 FORMAT(///1X,'******** WARNING -- THE FOLLOWING RECORDS WERE ',
     1       'NEVER ACCESSED ********',/)
 1002 FORMAT(8X,A)
 1003 FORMAT(///1X,'******** WARNING -- THE FOLLOWING RECORDS MAY ',
     1       'EXCEED MAXIMUM RECORD LENGTH (',I3,' CHARACTERS) ',
     2       '********',/)
      END
*DECK CGET1
      FUNCTION CGET1 (RECNAM, ICOL, LENMIN, CINIT, LENMAX,
```

```
     1                 RANGE, FOUND, SUBNAM, VARNAM)
C
C THIS FUNCTION RETURNS A SINGLE CHARACTER VALUE FROM THE INPUT FILE DATABASE.
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C LENMIN - MINIMUM ACCEPTABLE LENGTH OF THE CHARACTER STRING BEING SOUGHT
C CINIT  - INITIAL VALUE, THIS VALUE IS RETURNED IF THE REQUEST CANNOT BE MET
C LENMAX - MAXIMUM ACCEPTABLE LENGTH OF THE CHARACTER STRING BEING SOUGHT
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C AN ATTEMPT TO EXPLAIN SOME OF WHAT IS GOING ON HERE FOLLOWS:
C
C IF THE RECORD IDENTIFIER RECNAM MATCHES THE CURRENT RECORD IDENTIFIER,
C THEN THE VALUE FOUND AT THE NEXT POINTER POSITION IS RETURNED.
C
C IF THE CURRENT RECORD IDENTIFIER DOES NOT MATCH ALL OF THE RESPECTIVE
C CHARACTERS IN RECNAM, THEN A SEARCH FOR AN EXACT MATCH IS PERFORMED
C STARTING AT THE BEGINNING OF THE DATABASE.
C
C A NON-ZERO VALUE OF ICOL INDICATES THAT THE VALUE WHICH IS FOUND
C AT THE ICOL POSITION IN THE FIELD IS TO BE RETURNED TO THE CALLER.
C
C IF (ICOL .GT. 0) THEN SUCCESSIVE VALUES IN A COLUMN OF DATA ARE
C ACCESSED SEQUENTIALLY IN THE SAME MANNER THAT ROWS OF DATA ARE
C ACCESSED WHEN (ICOL .EQ. 0).
C
C MODIFIED 26 FEB 88, D. CHANIN.
C MODIFIED 6/20/89/, DIC, LOG # 9/26/88-A,
C   FAILURE TO INITIALIZE FUNCTION VALUE FOR ERROR RETURN
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO FOR LOG # 9/14/89-A, CLEANUP OF THE STRUCTURE CHARTS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
C
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER *(*) CGET1
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) CINIT, RECNAM, SUBNAM, VARNAM
      LOGICAL EOR, FLAG(4), FOUND, LVAL, RANGE
C
C  DEFINE THE VALUE OF THE FUNCTION AND ERROR FLAGS
C
      CGET1 = CINIT
      RANGE = .FALSE.
      FOUND = .FALSE.
C
C  SET CHARACTER VARIABLE TYPE FLAG
      ITYPE = 1
```

```
C
C  VALIDATE ICOL
      IF (ICOL .LT. 0 .OR. ICOL .GT. 40) THEN
C
C  WRITE ERROR MESSAGE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         RETURN
      ENDIF
C
C  CHECK LENGTH OF ID
      L = LEN(RECNAM)
 2000 CONTINUE
C
C  CHECK FOR SEARCH OF RECORD ID RECNAM
      IF (L .EQ. 11) THEN
C
C  TRANSFER RECORD ID TO TEMPORARY STORAGE FOR SEARCH
         CLOC = RECNAM
C
C  SEARCH FOR RECORD ID RECNAM
         CALL SEARCH (L, IPOINT)
C
C  CHECK FOR RECORD ID NOT LOCATED
         IF (IPOINT .EQ. 0) THEN
C
C  RECORD ID NOT LOCATED
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>RECORD ID NOT LOCATED'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>RECORD ID NOT LOCATED'
            RETURN
         ENDIF
C
C  RESET LENGTH OF ID TO BE VERIFIED
         L = 8
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
         IC = 12
      ELSE
         IF (EOR .OR. ICOL .GT. 0) THEN
C
C  INCREMENT POINTER
            IPOINT = IPOINT + 1
C
C  VALIDATE ID
            IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) THEN
C
C  CURRENT ARRAY VALUE NOT FOUND
C  WRITE ERROR MESSAGE
               WRITE(6,1001) SUBNAM, VARNAM, RECNAM
               WRITE(7,1001) SUBNAM, VARNAM, RECNAM
               RETURN
            ENDIF
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
            IC = 12
         ENDIF
      ENDIF
C
C  SET USED FLAG FOR CURRENT RECORD
```

```
      CRDFLG(IPNT(IPOINT)) = .TRUE.
C
C  RETRIEVE VALUE FROM RECORD
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
C
C  CHECK FOR END-OF-RECORD WHILE READING A ROW OF DATA
      IF (EOR .AND. ICOL .EQ. 0) GO TO 2000
C
C  SET FOUND FLAG FOR DESIRED VALUE TYPE
      FOUND = FLAG(ITYPE)
C
C  LOOKING FOR CHARACTER VALUE
      IF (FOUND) THEN
C
C  VALIDATE CHARACTER STRING LENGTH
         IF (LENGTH .GE. LENMIN .AND. LENGTH .LE. LENMAX) THEN
C
C  CHARACTER VALUE FOUND SO SET RETRIEVED VALUE
            CGET1 = CLOC
C
C  VALID CHARACTER STRING LENGTH
            RANGE = .TRUE.
         ELSE
C
C  WRITE ERROR MESSAGE
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>CHARACTER STRING LENGTH OUT OF ',
     1                 'RANGE:',LENGTH
            WRITE(6,*) '>>>>>RANGE IS ',LENMIN,' TO ',LENMAX,
     1                 ', INCLUSIVE'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>CHARACTER STRING LENGTH OUT OF ',
     1                 'RANGE:',LENGTH
            WRITE(7,*) '>>>>>RANGE IS ',LENMIN,' TO ',LENMAX,
     1                 ', INCLUSIVE'
         ENDIF
      ELSE
C
C  CHARACTER VALUE NOT FOUND SO WRITE ERROR MESSAGE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>CHARACTER VALUE NOT FOUND'
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>CHARACTER VALUE NOT FOUND'
      ENDIF
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
      END
*DECK DOCCDF
      LOGICAL FUNCTION DOCCDF (RECNAM, ICOL)
C
C THIS FUNCTION RETURNS A LOGICAL VALUE INDICATING WHETHER THE
C VALUE 'CCDF' IS FOUND IN THE ICOL POSITION OF THE DATA CARD
C WITH RECORD IDENTIFIER, RECNAM.
C
C THIS ROUTINE IS A MODIFIED VERSION OF CGET1, DEVELOPED BY JAY JOHNSON
C MODIFIED 6/6/89 BY D. CHANIN IN ORDER TO ADD CCDF TABLE CAPABILITY
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
```

```
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA
C
C D. CHANIN, 6/8/89, ROUTINE ADDED TO MACCS TO FIX DEFECT # 6/6/89-A
C
      EXTERNAL ABORT
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /INPRC3/ NBLANK, NCHANG, NCMMNT, NDPLCT, NREC, NRECT,
     1                NTRMNT
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) RECNAM
      LOGICAL EOR, FLAG(4), LVAL
C
C  SET CHARACTER VARIABLE TYPE FLAG AND INITIALIZE THE FUNCTION VALUE
C
      ITYPE  = 1
      DOCCDF = .FALSE.
C
C  VALIDATE ICOL
      IF (ICOL .LT. 1 .OR. ICOL .GT. 40) THEN
         WRITE(6,*) 'INTERNAL ERROR IN FUNCTION DOCCDF'
         WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 1 AND 40, ICOL =', ICOL
         WRITE(7,*) 'INTERNAL ERROR IN FUNCTION DOCCDF'
         WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 1 AND 40, ICOL =', ICOL
         CALL ABORT ('DOCCDF')
      ENDIF
C
C  CHECK LENGTH OF ID
      L = LEN(RECNAM)
C
C  CHECK FOR SEARCH OF RECORD ID RECNAM
      IF (L .EQ. 11) THEN
C
C  TRANSFER RECORD ID TO TEMPORARY STORAGE FOR SEARCH
         CLOC = RECNAM
C
C  SEARCH FOR RECORD ID RECNAM
         CALL SEARCH (L, IPOINT)
C
C  CHECK FOR RECORD ID NOT LOCATED AND RETURN IF NOT FOUND
         IF (IPOINT .EQ. 0) RETURN
C
C  RESET LENGTH OF ID TO BE VERIFIED
         L = 8
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
         IC = 12
      ELSE
C
C  INCREMENT POINTER
         IPOINT = IPOINT + 1
C
C  IF RECORD IDENTIFIER CANNOT BE FOUND WE CAN RETURN
         IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) RETURN
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
         IC = 12
      ENDIF
C
```

```
C  SET USED FLAG FOR CURRENT RECORD
      CRDFLG(IPNT(IPOINT)) = .TRUE.
C
C  RETRIEVE VALUE FROM RECORD
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
C
C  CHECK FOR END-OF-RECORD
      IF (EOR) RETURN
C
C  IF A CHARACTER VALUE IS FOUND AND IT IS 'CCDF', RETURN .TRUE.
      IF (FLAG(ITYPE) .AND. CLOC .EQ. 'CCDF') DOCCDF = .TRUE.
      RETURN
      END
*DECK IGET1
      FUNCTION IGET1 (RECNAM, ICOL, IMIN, IINIT, IMAX, RANGE, FOUND,
     1                SUBNAM, VARNAM)
C
C THIS FUNCTION RETURNS A SINGLE INTEGER VALUE FROM THE INPUT FILE DATABASE.
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C IMIN   - MINIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C IINIT  - INITIAL VALUE, THIS VALUE IS RETURNED IF THE REQUEST CANNOT BE MET
C IMAX   - MAXIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C AN ATTEMPT TO EXPLAIN SOME OF WHAT IS GOING ON HERE FOLLOWS:
C
C IF THE RECORD IDENTIFIER RECNAM MATCHES THE CURRENT RECORD IDENTIFIER,
C THEN THE VALUE FOUND AT THE NEXT POINTER POSITION IS RETURNED.
C
C IF THE CURRENT RECORD IDENTIFIER DOES NOT MATCH ALL OF THE RESPECTIVE
C CHARACTERS IN RECNAM, THEN A SEARCH FOR AN EXACT MATCH IS PERFORMED
C STARTING AT THE BEGINNING OF THE DATABASE.
C
C A NON-ZERO VALUE OF ICOL INDICATES THAT THE VALUE WHICH IS FOUND
C AT THE ICOL POSITION IN THE FIELD IS TO BE RETURNED TO THE CALLER.
C
C IF (ICOL .GT. 0) THEN SUCCESSIVE VALUES IN A COLUMN OF DATA ARE
C ACCESSED SEQUENTIALLY IN THE SAME MANNER THAT ROWS OF DATA ARE
C ACCESSED WHEN (ICOL .EQ. 0).
C IF THE RECORD IDENTIFIER RECNAM MATCHES THE CURRENT RECORD IDENTIFIER,
C THEN THE VALUE FOUND AT THE NEXT POINTER POSITION IS RETURNED.
C
C IF THE CURRENT RECORD IDENTIFIER DOES NOT MATCH ALL OF THE RESPECTIVE
C CHARACTERS IN RECNAM, THEN A SEARCH FOR AN EXACT MATCH IS PERFORMED
C STARTING AT THE BEGINNING OF THE DATABASE.
C
C A NON-ZERO VALUE OF ICOL INDICATES THAT THE VALUE WHICH IS FOUND
C AT THE ICOL POSITION IN THE FIELD IS TO BE RETURNED TO THE CALLER.
C
C IF (ICOL .GT. 0) THEN SUCCESSIVE VALUES IN A COLUMN OF DATA ARE
C ACCESSED SEQUENTIALLY IN THE SAME MANNER THAT ROWS OF DATA ARE
C ACCESSED WHEN (ICOL .EQ. 0).
```

```
C
C MODIFIED 26 FEB 88, D. CHANIN.
C MODIFIED 6/20/89/, DIC, LOG # 9/26/88-A,
C   FAILURE TO INITIALIZE FUNCTION VALUE FOR ERROR RETURN
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO FOR LOG # 9/14/89-A, CLEANUP OF THE STRUCTURE CHARTS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
C
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      LOGICAL EOR, FLAG(4), FOUND, LVAL, RANGE
C
C  DEFINE THE VALUE OF THE FUNCTION AND ERROR FLAGS
C
      IGET1 = IINIT
      RANGE = .FALSE.
      FOUND = .FALSE.
C
C  SET INTEGER VARIABLE TYPE FLAG
      ITYPE = 3
C
C  VALIDATE ICOL
      IF (ICOL .LT. 0 .OR. ICOL .GT. 40) THEN
C
C  WRITE ERROR MESSAGE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         RETURN
      ENDIF
C
C  CHECK LENGTH OF ID
      L = LEN(RECNAM)
 2000 CONTINUE
C
C  CHECK FOR SEARCH OF RECORD ID RECNAM
      IF (L .EQ. 11) THEN
C
C  TRANSFER RECORD ID TO TEMPORARY STORAGE FOR SEARCH
         CLOC = RECNAM
C
C  SEARCH FOR RECORD ID RECNAM
         CALL SEARCH (L, IPOINT)
C
C  CHECK FOR RECORD ID NOT LOCATED
         IF (IPOINT .EQ. 0) THEN
C
C  RECORD ID NOT LOCATED
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>RECORD ID NOT LOCATED'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>RECORD ID NOT LOCATED'
            RETURN
         ENDIF
```

```
C
C  RESET LENGTH OF ID TO BE VERIFIED
         L = 8
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
         IC = 12
      ELSE
         IF (EOR .OR. ICOL .GT. 0) THEN
C
C  INCREMENT POINTER
            IPOINT = IPOINT + 1
C
C  VALIDATE ID
            IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) THEN
C
C  CURRENT ARRAY VALUE NOT FOUND
C  WRITE ERROR MESSAGE
               WRITE(6,1001) SUBNAM, VARNAM, RECNAM
               WRITE(7,1001) SUBNAM, VARNAM, RECNAM
               RETURN
            ENDIF
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
            IC = 12
         ENDIF
      ENDIF
C
C  SET USED FLAG FOR CURRENT RECORD
      CRDFLG(IPNT(IPOINT)) = .TRUE.
C
C  RETRIEVE VALUE FROM RECORD
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
C
C  CHECK FOR END-OF-RECORD WHILE READING A ROW OF DATA
      IF (EOR .AND. ICOL .EQ. 0) GO TO 2000
C
C  SET FOUND FLAG FOR DESIRED VALUE TYPE
      FOUND = FLAG(ITYPE)
C
C  LOOKING FOR INTEGER VALUE
      IF (FOUND) THEN
C
C  VALIDATE INTEGER RANGE
         IF (IVAL .GE. IMIN .AND. IVAL .LE. IMAX) THEN
C
C  INTEGER VALUE RANGE VALIDATED SO SET RETRIEVED VALUE
            IGET1 = IVAL
C
C  VALID RANGE
            RANGE = .TRUE.
         ELSE
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>INTEGER VALUE OUT OF RANGE:', IVAL
            WRITE(6,*) '>>>>>RANGE IS ',IMIN,' TO ',IMAX,', INCLUSIVE'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>INTEGER VALUE OUT OF RANGE:', IVAL
            WRITE(7,*) '>>>>>RANGE IS ',IMIN,' TO ',IMAX,', INCLUSIVE'
         ENDIF
      ELSE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>INTEGER VALUE NOT FOUND'
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
```

```
         WRITE(7,*) '>>>>>INTEGER VALUE NOT FOUND'
      ENDIF
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
      END
*DECK IGETN
      SUBROUTINE IGETN (RECNAM, ICOL, IRAY, NVALS, IMIN, IMAX,
     1                  RANGE, FOUND, SUBNAM, VARNAM)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR (MUST BE 11 CHARACTERS LONG)
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C IRAY   - INTEGER ARRAY IN WHICH TO STORE THE DATA
C NVALS  - NUMBER OF VALUES TO BE FOUND
C IMIN   - MINIMUM ACCEPTABLE VALUE OF THE ARRAY ELEMENTS
C IMAX   - MAXIMUM ACCEPTABLE VALUE OF THE ARRAY ELEMENTS
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C THIS ROUTINE FETCHES AN ARRAY OF INTEGER VALUES FROM THE DATABASE.
C AN EXACT MATCH AGAINST A 11 CHARACTER RECORD NAME MUST BE FOUND.
C SUCCEEDING CARDS ARE READ AS NEEDED TO FILL THE ARRAY AS LONG AS
C THEIR RECORD NAMES MATCH THE FIRST 8 CHARACTERS OF RECNAM.
C IF ALL GOES WELL (RANGE,FOUND .EQ. .TRUE.), THERE WILL BE NVALS VALUES IN
C ARRAY IRAY UPON RETURN TO THE CALLING ROUTINE. EACH VALUE MUST FALL
C WITHIN THE INCLUSIVE RANGE (IMIN,IMAX). IF AN ERROR OCCURS,
C THEN THE ORIGINAL VALUES IN THE ARRAY WILL BE RETURNED UNCHANGED.
C
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
      EXTERNAL IGET1
      CHARACTER *(*) RECNAM, SUBNAM, VARNAM
      DIMENSION IRAY(NVALS)
      LOGICAL FOUND, RANGE
      RANGE = .FALSE.
      FOUND = .FALSE.
C
C  VERIFY LENGTH OF INCOMING RECORD ID RECNAM
      IF (LEN(RECNAM) .NE. 11) THEN
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>VECTOR FETCH MUST SPECIFY 11 CHARACTER ',
     1              'RECORD NAME, RECNAM =', RECNAM
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>VECTOR FETCH MUST SPECIFY 11 CHARACTER ',
     1              'RECORD NAME, RECNAM =', RECNAM
         RETURN
      ENDIF
C
C  SET LENGTH OF ID TO VALIDATE
      L = 11
C
C  LOAD INTEGER ARRAY OF VALUES
      DO 1000 I = 1, NVALS
         IRAY(I) = IGET1(RECNAM(1:L), ICOL, IMIN, IRAY(I), IMAX,
     1                   RANGE, FOUND, SUBNAM, VARNAM)
```

```
         IF ((.NOT. FOUND) .OR. (.NOT. RANGE)) THEN
            WRITE(6,1002) I, NVALS
            WRITE(7,1002) I, NVALS
            RETURN
         ENDIF
C
C  RESET LENGTH OF ID TO VALIDATE AFTER FIRST CALL TO IGET1
         L = 8
 1000 CONTINUE
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
 1002 FORMAT(' >>>>>ERROR READING ELEMENT ',I4,' OF A ',I4,' ELEMENT ',
     1       'INTEGER ARRAY')
      END
*DECK LGET1
      FUNCTION LGET1 (RECNAM, ICOL, LINIT, FOUND, SUBNAM, VARNAM)
C
C THIS FUNCTION RETURNS A SINGLE LOGICAL VALUE FROM THE INPUT FILE DATABASE.
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C LINIT  - INITIAL VALUE, THIS VALUE IS RETURNED IF THE REQUEST CANNOT BE MET
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C MODIFIED 26 FEB 88, D. CHANIN.
C MODIFIED 6/20/89/, DIC, LOG # 9/26/88-A,
C   FAILURE TO INITIALIZE FUNCTION VALUE FOR ERROR RETURN
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO FOR LOG # 9/14/89-A, CLEANUP OF THE STRUCTURE CHARTS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      LOGICAL EOR, FLAG(4), FOUND, LGET1, LINIT, LVAL
C
C  DEFINE THE VALUE OF THE FUNCTION AND ERROR FLAG
      LGET1 = LINIT
      FOUND = .FALSE.
C
C  SET LOGICAL VARIABLE TYPE FLAG
      ITYPE = 2
C
C  VALIDATE ICOL
      IF (ICOL .LT. 0 .OR. ICOL .GT. 40) THEN
C
C  WRITE ERROR MESSAGE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
```

```
         WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         RETURN
      ENDIF
C
C  CHECK LENGTH OF ID
      L = LEN(RECNAM)
 2000 CONTINUE
C
C  CHECK FOR SEARCH OF RECORD ID RECNAM
      IF (L .EQ. 11) THEN
C
C  TRANSFER RECORD ID TO TEMPORARY STORAGE FOR SEARCH
         CLOC = RECNAM
C
C  SEARCH FOR RECORD ID RECNAM
         CALL SEARCH (L, IPOINT)
C
C  CHECK FOR RECORD ID NOT LOCATED
         IF (IPOINT .EQ. 0) THEN
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>RECORD ID NOT LOCATED'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>RECORD ID NOT LOCATED'
            RETURN
         ENDIF
         L = 8
         IC = 12
      ELSE
         IF (EOR .OR. ICOL .GT. 0) THEN
            IPOINT = IPOINT + 1
            IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) THEN
               WRITE(6,1001) SUBNAM, VARNAM, RECNAM
               WRITE(7,1001) SUBNAM, VARNAM, RECNAM
               RETURN
            ENDIF
            IC = 12
         ENDIF
      ENDIF
      CRDFLG(IPNT(IPOINT)) = .TRUE.
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
      IF (EOR .AND. ICOL .EQ. 0) GO TO 2000
      FOUND = FLAG(ITYPE)
      IF (FOUND) THEN
         LGET1 = LVAL
      ELSE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>LOGICAL VALUE NOT FOUND'
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>LOGICAL VALUE NOT FOUND'
      ENDIF
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
      END
*DECK LGETN
      SUBROUTINE LGETN (RECNAM, ICOL, LRAY, NVALS, FOUND,
     1                  SUBNAM, VARNAM)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
```

```
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR (MUST BE 11 CHARACTERS LONG)
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C LRAY   - LOGICAL ARRAY IN WHICH TO STORE THE DATA
C NVALS  - NUMBER OF VALUES TO BE FOUND
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
      EXTERNAL LGET1
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      LOGICAL FOUND, LGET1, LRAY(NVALS)
      FOUND = .FALSE.
      IF (LEN(RECNAM) .NE. 11) THEN
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>VECTOR FETCH MUST SPECIFY 11 CHARACTER ',
     1              'RECORD NAME, RECNAM =', RECNAM
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>VECTOR FETCH MUST SPECIFY 11 CHARACTER ',
     1              'RECORD NAME, RECNAM =', RECNAM
         RETURN
      ENDIF
      L = 11
      DO 1000 I = 1, NVALS
         LRAY(I) = LGET1(RECNAM(1:L), ICOL, .FALSE., FOUND, SUBNAM,
     1                   VARNAM)
         IF (.NOT. FOUND) THEN
            WRITE(6,1002) I, NVALS
            WRITE(7,1002) I, NVALS
            RETURN
         ENDIF
         L = 8
 1000 CONTINUE
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
 1002 FORMAT(' >>>>>ERROR READING ELEMENT ',I4,' OF A ',I4,' ELEMENT ',
     1       'LOGICAL ARRAY')
      END
*DECK RGET1
      FUNCTION RGET1 (RECNAM, ICOL, RMIN, RINIT, RMAX, RANGE, FOUND,
     1                SUBNAM, VARNAM)
C
C THIS FUNCTION RETURNS A SINGLE REAL VALUE FROM THE INPUT FILE DATABASE.
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C RMIN   - MINIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C RINIT  - INITIAL VALUE, THIS VALUE IS RETURNED IF THE REQUEST CANNOT BE MET
C RMAX   - MAXIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
```

```
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C MODIFIED 26 FEB 88, D. CHANIN.
C MODIFIED 6/20/89/, DIC, LOG # 9/26/88-A,
C   FAILURE TO INITIALIZE FUNCTION VALUE FOR ERROR RETURN
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO FOR LOG # 9/14/89-A, CLEANUP OF THE STRUCTURE CHARTS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      LOGICAL EOR, FLAG(4), FOUND, LVAL, RANGE
      RGET1 = RINIT
      RANGE = .FALSE.
      FOUND = .FALSE.
      ITYPE = 4
      IF (ICOL .LT. 0 .OR. ICOL .GT. 40) THEN
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
         RETURN
      ENDIF
      L = LEN(RECNAM)
 2000 CONTINUE
      IF (L .EQ. 11) THEN
         CLOC = RECNAM
         CALL SEARCH (L, IPOINT)
         IF (IPOINT .EQ. 0) THEN
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>RECORD ID NOT LOCATED'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>RECORD ID NOT LOCATED'
            RETURN
         ENDIF
         L = 8
         IC = 12
      ELSE
         IF (EOR .OR. ICOL .GT. 0) THEN
            IPOINT = IPOINT + 1
            IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) THEN
               WRITE(6,1001) SUBNAM, VARNAM, RECNAM
               WRITE(7,1001) SUBNAM, VARNAM, RECNAM
               RETURN
            ENDIF
            IC = 12
         ENDIF
      ENDIF
      CRDFLG(IPNT(IPOINT)) = .TRUE.
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
      IF (EOR .AND. ICOL .EQ. 0) GO TO 2000
      FOUND = FLAG(ITYPE)
      IF (FOUND) THEN
         IF (RVAL .GE. RMIN .AND. RVAL .LE. RMAX) THEN
```

```
            RGET1 = RVAL
            RANGE = .TRUE.
         ELSE
            WRITE(6,1001) SUBNAM, VARNAM, RECNAM
            WRITE(6,*) '>>>>>REAL VALUE OUT OF RANGE:', RVAL
            WRITE(6,*) '>>>>>RANGE IS ',RMIN,' TO ',RMAX,', INCLUSIVE'
            WRITE(7,1001) SUBNAM, VARNAM, RECNAM
            WRITE(7,*) '>>>>>REAL VALUE OUT OF RANGE:', RVAL
            WRITE(7,*) '>>>>>RANGE IS ',RMIN,' TO ',RMAX,', INCLUSIVE'
         ENDIF
      ELSE
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>REAL VALUE NOT FOUND'
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>REAL VALUE NOT FOUND'
      ENDIF
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
      END
*DECK RGETN
      SUBROUTINE RGETN (RECNAM, ICOL, RRAY, NVALS, RMIN, RMAX,
     1                  RANGE, FOUND, SUBNAM, VARNAM)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR (MUST BE 11 CHARACTERS LONG)
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C RRAY   - REAL ARRAY IN WHICH TO STORE THE DATA
C NVALS  - NUMBER OF VALUES TO BE FOUND
C RMIN   - MINIMUM ACCEPTABLE VALUE OF THE ARRAY ELEMENTS
C RMAX   - MAXIMUM ACCEPTABLE VALUE OF THE ARRAY ELEMENTS
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C
      EXTERNAL RGET1
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      DIMENSION RRAY(NVALS)
      LOGICAL FOUND, RANGE
      RANGE = .FALSE.
      FOUND = .FALSE.
      IF (LEN(RECNAM) .NE. 11) THEN
         WRITE(6,1001) SUBNAM, VARNAM, RECNAM
         WRITE(6,*) '>>>>>VECTOR FETCH MUST SPECIFY 11 CHARACTER ',
     1              'RECORD NAME, RECNAM =', RECNAM
         WRITE(7,1001) SUBNAM, VARNAM, RECNAM
         WRITE(7,*) '>>>>>VECTOR FETCH MUST SPECIFY 11 CHARACTER ',
     1              'RECORD NAME, RECNAM =', RECNAM
         RETURN
      ENDIF
      L = 11
      DO 1000 I = 1, NVALS
         RRAY(I) = RGET1(RECNAM(1:L), ICOL, RMIN, RRAY(I), RMAX,
     1                   RANGE, FOUND, SUBNAM, VARNAM)
         IF ((.NOT. FOUND) .OR. (.NOT. RANGE)) THEN
```

```
            WRITE(6,1002) I, NVALS
            WRITE(7,1002) I, NVALS
            RETURN
         ENDIF
         L = 8
 1000 CONTINUE
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
 1002 FORMAT(' >>>>>ERROR READING ELEMENT ',I4,' OF A ',I4,' ELEMENT ',
     1       'REAL ARRAY')
      END
*DECK RDSTRG
      SUBROUTINE RDSTRG(CARD, IC, NPOS, CVAL, LVAL, IVAL, RVAL,
     1                  LENGTH, FLAG, EOR)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C CONVERTS A RECORD STRING TO A CHARACTER VALUE, A LOGICAL VALUE,
C A REAL VALUE, AND AN INTEGER VALUE
C
      SAVE
      PARAMETER (IL=100)
      EXTERNAL IMLGCL, IMNTGR, IMREAL
      LOGICAL  IMLGCL, IMNTGR, IMREAL
      CHARACTER*(*) CARD, CVAL
      CHARACTER*(IL) TMPCRD
      CHARACTER*8 IFRMT, LFRMT, RFRMT
      LOGICAL EOR, FIRST, LVAL, FLAG(4)
      DATA FIRST / .TRUE. /
      IF (FIRST) THEN
         WRITE(IFRMT,1001) IL
         WRITE(RFRMT,1002) IL
         WRITE(LFRMT,1003) IL
         FIRST = .FALSE.
      ENDIF
      ILMAX = LEN(CARD)
      LENCVL = LEN(CVAL)
      IPOS = 0
      DO 1000 I = 1, 4
         FLAG(I) = .FALSE.
 1000 CONTINUE
      EOR = .FALSE.
      IC = IC - 1
 2000 CONTINUE
      IC = IC + 1
      IF (IC .GT. ILMAX) GO TO 9100
      IF (CARD(IC:IC) .EQ. ' ') GO TO 2000
      IF (CARD(IC:IC) .EQ. ',') GO TO 2000
      IF (CARD(IC:IC) .EQ. '''') THEN
         IS = IC + 1
         IC = INDEX(CARD(IS:ILMAX), '''')
         IF (IC .EQ. 0) THEN
            IC = IS - 1
         ELSE
            IC = IS + IC - 1
            GO TO 3100
         ENDIF
 3000    CONTINUE
         IC = IC + 1
         IF (IC .GT. ILMAX) GO TO 9100
```

```
         IF (CARD(IC:IC) .NE. ' ') GO TO 3000
 3100    CONTINUE
         IPOS = IPOS + 1
         IF (IPOS .LT. NPOS) GO TO 2000
         IE = IC - 1
         IC = IC + 1
         IF (IE - IS + 1 .GT. LENCVL) GO TO 9200
         CVAL = CARD(IS:IE)
         LENGTH = IE - IS + 1
         FLAG(1) = .TRUE.
      ELSE
         IS = IC
 4000    CONTINUE
         IC = IC + 1
         IF (IC .GT. ILMAX) GO TO 9100
         IF (CARD(IC:IC) .NE. ',' .AND. CARD(IC:IC) .NE. ' ')
     $     GO TO 4000
         IPOS = IPOS + 1
         IF (IPOS .LT. NPOS) GO TO 2000
         IE = IC - 1
         IF (IE - IS + 1 .GT. IL) GO TO 9200
         TMPCRD = ' '
         TMPCRD(IL+IS-IE:IL) = CARD(IS:IE)
         IF (IMLGCL(CARD(IS:IE))) THEN
            READ(TMPCRD,LFRMT,ERR=7000) LVAL
            FLAG(2) = .TRUE.
         ELSE IF (IMNTGR(CARD(IS:IE))) THEN
            READ(TMPCRD,IFRMT,ERR=7000) IVAL
            FLAG(3) = .TRUE.
         ELSE IF (IMREAL(CARD(IS:IE))) THEN
            READ(TMPCRD,RFRMT,ERR=7000) RVAL
            FLAG(4) = .TRUE.
         ELSE
            GO TO 7000
         ENDIF
         RETURN
 7000    CONTINUE
C
C  STRING IS NOT LOGIC, INTEG, OR REAL SO ASSUMED TO BE CHAR
C  COMPARE STRING LENGTH TO CHARACTER VARIABLE LENGTH
      IF (IE - IS + 1 .GT. LENCVL) GO TO 9200
C
C  TRANSFER CHARACTER STRING
      CVAL = CARD(IS:IE)
C
C  SET LENGTH OF CHARACTER STRING
      LENGTH = IE - IS + 1
C
C  SET VARIABLE TYPE FLAG FOR CHARACTER VARIABLE FOUND
      FLAG(1) = .TRUE.
     ENDIF
     RETURN
 9100 CONTINUE
C
C  END OF RECORD ENCOUNTERED SEARCHING FOR VALUE POSITION
C  SET END-OF-RECORD FLAG
     EOR = .TRUE.
     RETURN
 9200 CONTINUE
C
C  LENGTH OF STRING TOO LONG FOR EITHER CHARACTER STORAGE OR INTERNAL
C  FORMATTED READ
     WRITE(6,9201) IPOS + 1, CARD, IL
```

```
      WRITE(7,9201) IPOS + 1, CARD, IL
      RETURN
 1001 FORMAT('(I',I3,')')
 1002 FORMAT('(E',I3,'.0)')
 1003 FORMAT('(L',I3,')')
 9101 FORMAT(/' >>>>>END OF RECORD ENCOUNTERED SEARCHING FOR ',
     1        'VALUE AT POSITION ',I2,
     2       /' >>>>>',A,
     3       /' >>>>>RESET PARAMETER MAXLEN IN INPRE SUBROUTINES TO ',
     4       /' >>>>>A VALUE GREATER THAN ',I3,' TO ACCOUNT FOR ',
     5       /' >>>>>LARGER RECORD SIZE ON INPUT FILE')
 9201 FORMAT(/' >>>>>LENGTH OF STRING TOO LONG FOR EITHER CHARACTER ',
     1        'STORAGE OR INTERNAL FORMATTED READ AT ',
     2       /' >>>>>VALUE POSITION ',I2,
     3       /' >>>>>',A,
     4       /' >>>>>RESET PARAMETER IL IN SUBROUTINE RDSTRG TO ',
     5       /' >>>>>A VALUE GREATER THAN ',I3,' TO ACCOUNT FOR ',
     6       /' >>>>>LARGER STRING SIZE FOR VALUES ON INPUT FILE')
      END
*DECK IMLGCL
      LOGICAL FUNCTION IMLGCL (STRING)
C
C THIS FUNCTION DETERMINES WHETHER OR NOT A CHARACTER STRING IS OF
C TYPE LOGICAL AS DETERMINED BY THE ANSI STANDARD FOR FORTRAN 77
C
C D. CHANIN, DIV. 6415, 26 MAY 88.
C
      CHARACTER STRING *(*)

      IF (STRING .EQ. '.FALSE.' .OR. STRING .EQ. '.TRUE.') THEN
        IMLGCL = .TRUE.
      ELSE
        IMLGCL = .FALSE.
      ENDIF

      RETURN
      END
*DECK IMNTGR
      LOGICAL FUNCTION IMNTGR (STRING)
C
C THIS FUNCTION DETERMINES WHETHER OR NOT A CHARACTER STRING IS OF
C TYPE INTEGER AS DETERMINED BY THE ANSI STANDARD FOR FORTRAN 77
C
C D. CHANIN, DIV. 6415, 26 MAY 88.
C
      EXTERNAL IMDIGT
      LOGICAL  IMDIGT
      CHARACTER STRING *(*)
      IMNTGR = .FALSE.
      LENSTR = LEN (STRING)

C modified for WinMaccs, 4/12/01, D. Chanin, add CALL ABORT

C      IF (LENSTR .LT. 1) STOP 'STRING OF LENGTH 0 IN IMNTGR'

      IF (LENSTR .LT. 1) THEN
        WRITE(6,*) 'STRING OF LENGTH 0 IN IMNTGR'
        WRITE(7,*) 'STRING OF LENGTH 0 IN IMNTGR'
        CALL ABORT ('terminating')
      ENDIF

      IF ((STRING(1:1) .EQ. '+' .OR. STRING(1:1) .EQ. '-')
     1     .AND. LENSTR .GT. 1) THEN
```

```
        IMNTGR = IMDIGT(STRING(2:LENSTR))
      ELSE
        IMNTGR = IMDIGT(STRING)
      ENDIF
      RETURN
      END
*DECK IMDIGT
      LOGICAL FUNCTION IMDIGT (STRING)
C
C THIS FUNCTION DETERMINES WHETHER OR NOT A CHARACTER STRING IS COMPOSED
C OF ONLY NUMERIC DIGITS, IT IS CALLED BY FUNCTIONS IMNTGR AND IMREAL.
C
C D. CHANIN, DIV. 6415, 26 MAY 88.
C
      LOGICAL FOUND
      CHARACTER STRING *(*)
      CHARACTER *1 CHAR1, DIGITS(10)
      DATA DIGITS / '0', '1', '2', '3', '4', '5', '6', '7',
     1              '8', '9'/
      IMDIGT = .FALSE.
      LENSTR = LEN (STRING)

C modified for WinMaccs, 4/12/01, D. Chanin, add CALL ABORT

C      IF (LENSTR .LT. 1) STOP 'STRING OF LENGTH 0 IN IMDIGT'

      IF (LENSTR .LT. 1) THEN
        WRITE(6,*) 'STRING OF LENGTH 0 IN IMDIGT'
        WRITE(7,*) 'STRING OF LENGTH 0 IN IMDIGT'
        CALL ABORT ('terminating')
      ENDIF

      DO 20 ICHAR = 1, LENSTR
      FOUND  = .FALSE.
      CHAR1  = STRING(ICHAR:ICHAR)
      DO 10 IDIGI = 1, 10
   10 IF (CHAR1 .EQ. DIGITS(IDIGI)) FOUND = .TRUE.
   20 IF (.NOT. FOUND) RETURN
      IMDIGT = .TRUE.
      RETURN
      END
*DECK IMREAL
      LOGICAL FUNCTION IMREAL (DUMMY)
C
C THIS FUNCTION DETERMINES WHETHER OR NOT A CHARACTER STRING IS OF
C TYPE REAL AS DETERMINED BY THE ANSI STANDARD FOR FORTRAN 77
C
C D. CHANIN, DIV. 6415, 26 MAY 88.
C
C MODIFIED 6/20/89/, DIC, LOG # 9/26/88-A,
C   ELIMINATE A SIDE-EFFECT OF THIS FUNCTION (AVOID CHANGING ITS ARGUMENT)
C MODIFIED 2/12/92, DIC, # 10/21/91-B, CODE BOMBS WHEN EUROPIUM IS ADDED TO THE
C   LIST OF NUCLIDES DUE TO AN ERROR IN PARSING THE CHARACTER STRING
C
      EXTERNAL IMDIGT, IMNTGR
      PARAMETER (MAXREC=1000, MAXLEN=101)
      LOGICAL IMDIGT, IMNTGR, PERIOD, ELETTR
      CHARACTER DUMMY *(*)
      CHARACTER *(MAXLEN) STRING
      CHARACTER *1 CHAR1
      IAMATP = 0
      IAMATE = 0
      PERIOD = .FALSE.
```

```
      ELETTR = .FALSE.
      IMREAL = .FALSE.
      LENSTR = LEN (DUMMY)
      STRING = DUMMY
C
C  THE STRING MUST HAVE A LENGTH OF AT LEAST 2 CHARACTERS
C
      IF (LENSTR .LT. 2) RETURN

      DO 20 ICHAR = 1, LENSTR
      CHAR1 = STRING(ICHAR:ICHAR)
C
C  THE STRING MUST NOT HAVE MORE THAN ONE PERIOD OR 'E'
C
      IF (PERIOD .AND. CHAR1 .EQ. '.') RETURN
      IF (ELETTR .AND. CHAR1 .EQ. 'E') RETURN
      IF (CHAR1 .EQ. '.') THEN
        IAMATP = ICHAR
        PERIOD = .TRUE.
      ELSE IF (CHAR1 .EQ. 'E') THEN
        IAMATE = ICHAR
        ELETTR = .TRUE.
      ENDIF
   20 CONTINUE
C
C  STRIP OFF A LEADING PLUS OR MINUS SIGN
C
      IF (STRING(1:1) .EQ. '+' .OR. STRING(1:1) .EQ. '-') THEN
        STRING(1:LENSTR-1) = STRING(2:LENSTR)
        LENSTR = LENSTR - 1
        IF (PERIOD) IAMATP = IAMATP - 1
        IF (ELETTR) IAMATE = IAMATE - 1
      ENDIF
      IF (.NOT. PERIOD .AND. .NOT. ELETTR) THEN
C
C  A REAL MUST HAVE A PERIOD OR AN 'E'
C
        RETURN
      ELSE IF (ELETTR) THEN
C
C  IF IT HAS AN 'E', THE 'E' MUST BE AFTER POSITION 1
C
        IF (IAMATE .LE. 1) RETURN
C
C  IF IT HAS AN 'E' AND A PERIOD, THE 'E' MUST BE AFTER THE PERIOD
C
        IF (ELETTR .AND. PERIOD .AND. IAMATP .GT. IAMATE) RETURN
C
C  IF IT HAS AN 'E', THE 'E' CANNOT BE THE LAST CHARACTER
C
        IF (IAMATE .EQ. LENSTR) RETURN
      ENDIF
      IF (ELETTR) THEN
C
C  STRING CONTAINS THE LETTER 'E' AT POSITION IAMATE
C
        IF (IAMATP .EQ. 1) THEN
C
C  STRING BEGINS WITH A PERIOD SO WE ONLY CHECK THE PART AFTER THE PERIOD
C
          IMREAL = IMDIGT(STRING(2:IAMATE-1)) .AND.
     1             IMNTGR(STRING(IAMATE+1:LENSTR))
      ELSE IF (.NOT. PERIOD) THEN
```

```
C
C  THERE IS NO PERIOD IN THE STRING
C
          IMREAL = IMDIGT(STRING(1:IAMATE-1)) .AND.
     1             IMNTGR(STRING(IAMATE+1:LENSTR))
      ELSE
        IMREAL = IMDIGT(STRING(1:IAMATP-1)) .AND.
     1             IMNTGR(STRING(IAMATE+1:LENSTR))
      ENDIF
      ELSE
C
C  STRING DOES NOT CONTAIN THE LETTER 'E'
C
        IF (IAMATP .EQ. 1) THEN
C
C  STRING BEGINS WITH A PERIOD SO WE ONLY CHECK THE PART AFTER THE PERIOD
C
          IMREAL = IMDIGT(STRING(2:LENSTR))
      ELSE IF (IAMATP .LT. LENSTR) THEN
        IMREAL = IMDIGT(STRING(1:IAMATP-1)) .AND.
     1             IMDIGT(STRING(IAMATP+1:LENSTR))
      ELSE
        IMREAL = IMDIGT(STRING(1:LENSTR-1))
      ENDIF
      ENDIF
      RETURN
      END
*DECK SEARCH
      SUBROUTINE SEARCH (NCHAR, IPOINT)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C LOCATE RECORD WITH ID CLOC USING BINARY SEARCH
C
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C
      SAVE
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /INPRC3/ NBLANK, NCHANG, NCMMNT, NDPLCT, NREC, NRECT,
     1                NTRMNT
C
      IL = 1
      IH = NREC
      IM = IH / 2
 1000 CONTINUE
      IF (CLOC(1:NCHAR) .EQ. CARD(IPNT(IM))(1:NCHAR)) GO TO 2000
      IF (CLOC(1:NCHAR) .GT. CARD(IPNT(IM))(1:NCHAR)) THEN
         IL = IM
         IM = (IL + IH + 1) / 2
      ELSE
         IH = IM
         IM = (IL + IH) / 2
      ENDIF
      IF (IL + 1 .EQ. IH) THEN
         IF ((CLOC(1:NCHAR) .NE. CARD(IPNT(IL))(1:NCHAR)) .AND.
     1       (CLOC(1:NCHAR) .NE. CARD(IPNT(IH))(1:NCHAR))) THEN
            IPOINT = 0
```

```
            RETURN
          ENDIF
        ENDIF
        GO TO 1000
 2000   CONTINUE
        IPOINT = IM
        RETURN
        END
*DECK SORT
        SUBROUTINE SORT  (NCHAR)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C
C SORT N VALUES OF CHARACTER ARRAY CARD IN INCREASING ORDER OF
C FIRST NCHAR CHARACTERS OF CARD USING POINTER ARRAY IPNT
C
        SAVE
        PARAMETER (MAXREC=1000, MAXLEN=101)
        CHARACTER*(MAXLEN) CARD,          CLOC
        COMMON //          CARD(MAXREC), CLOC
        LOGICAL CRDFLG
        COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
        COMMON /INPRC3/ NBLANK, NCHANG, NCMMNT, NDPLCT, NREC, NRECT,
       1                NTRMNT
        N = NREC
        L = N / 2 + 1
        IR = N
  100   CONTINUE
        IF (L .LE. 1) GO TO 700
        L = L - 1
        LHOLD = IPNT(L)
  200   CONTINUE
        J = L
  300   CONTINUE
        I = J
        J = 2 * J
        IF (J-IR) 400, 500, 600
  400   CONTINUE
        IF (CARD(IPNT(J))(1:NCHAR) .LT. CARD(IPNT(J+1))(1:NCHAR)) J = J+1
  500   CONTINUE
        IF (CARD(LHOLD)(1:NCHAR) .GE. CARD(IPNT(J))(1:NCHAR)) GO TO 600
        IPNT(I) = IPNT(J)
        GO TO 300
  600   CONTINUE
        IPNT(I) = LHOLD
        GO TO 100
  700   CONTINUE
        LHOLD = IPNT(IR)
        IPNT(IR) = IPNT(1)
        IR = IR - 1
        IF (IR .GT. 1) GO TO 200
        IPNT(1) = LHOLD
        RETURN
        END
*DECK ERRFIL
        SUBROUTINE ERRFIL (SUBNAM, VARNAM)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
```

```
C
C IDENTIFY ERRORS ENCOUNTERED WITH THE AUXILIARY INPUT FILES
C IN A FORMAT THAT IS CONSISTENT WITH THE MESSAGES PRODUCED BY ERRLOC
C
      CHARACTER *(*) SUBNAM, VARNAM
      WRITE(6,1001) SUBNAM, VARNAM
      WRITE(7,1001) SUBNAM, VARNAM
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR',
     1       /' >>>>>CALLED FROM SUBROUTINE ', A, ', LOOKING FOR ', A)
      END
*DECK ERRLOC
      SUBROUTINE ERRLOC (SUBNAM, VARNAM)
C
C THIS ROUTINE IS PART OF THE FREE-FORMAT INPUT PROCESSOR FOR MACCS
C DEVELOPED BY JAY JOHNSON, NOV 87.
C
C IDENTIFY THE CALLING SUBROUTINE AND VARIABLE NAME
C IF AN ERROR OCCURS WHEN SEARCHING FOR INFORMATION IN THE DATABASE
C
      CHARACTER *(*) SUBNAM, VARNAM
      WRITE(6,1001) SUBNAM, VARNAM
      WRITE(7,1001) SUBNAM, VARNAM
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A)
      END
*DECK ATMODL
      SUBROUTINE ATMODL (OK)
C
C  DEFINE THE CHARACTERISTICS OF THE ATMOSPHERIC MODEL BY READING
C  FROM THE UNIT 1 INPUT FILE WITH THE INPRE INTERFACE.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INPUT.
C
C  GLOSSARY OF VARIABLES:
C
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  OK1    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPGEO
C  OK2    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPISO
C  OK3    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPWET
C  OK4    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPDRY
C  OK5    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPDIS
C  OK6    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPEXP
C  OK7    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPLRS
C
C  GLOSSARY OF EXTERNALS:
C
C  INPDIS - DEFINE THE DISPERSION PARAMETERS FOR SIGMA-Y AND SIGMA-Z
C  INPDRY - DEFINE THE PARTICLE SIZE GROUPS FOR DRY DEPOSITION
C  INPEXP - DEFINE THE RELEASE DURATION DEPENDENT EXPANSION FACTOR
C  INPGEO - DEFINE THE GEOMETRIC GRID
C  INPISO - DEFINE THE NUCLIDE DATA; NUCLIDE GROUP
C  INPLRS - DEFINE THE SCALING FACTORS FOR THE PLUME RISE MODELS
C  INPWET - DEFINE THE WET DEPOSITION MODEL
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
      EXTERNAL INPDIS, INPDRY, INPEXP, INPGEO, INPISO, INPLRS, INPWET
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, OK1, OK2, OK3, OK4, OK5, OK6, OK7
      OK = .FALSE.
      CALL INPGEO (OK1)
```

```
      IF (.NOT. OK1) RETURN
      CALL INPISO (OK2)
      CALL INPWET (OK3)
      CALL INPDRY (OK4)
      CALL INPDIS (OK5)
      CALL INPEXP (OK6)
      CALL INPLRS (OK7)
      OK = OK1 .AND. OK2 .AND. OK3 .AND. OK4 .AND. OK5 .AND. OK6
     $         .AND. OK7
      RETURN
      END
*DECK INPGEO
      SUBROUTINE INPGEO (OK)
C
C  THIS ROUTINE DEFINES THE GEOMETRIC GRID TO BE USED.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  I      - LOOP COUNTER ON SPATIAL INTERVALS
C  NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE IN THE REQUIRED RANGE WAS FOUND
C  SPACEN - ARRAY OF RADIAL DISTANCES TO SPATIAL ELEMENT CENTERS (METERS)
C  SPAEND - ARRAY OF RADIAL DISTANCES TO SPATIAL ELEMENT ENDPOINTS (METERS)
C  SPALEN - ARRAY OF RADIAL LENGTHS OF EACH SPATIAL INTERVAL (METERS)
C
C  GLOSSARY OF EXTERNALS:
C
C  ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 28 JUN 1984.
C
      EXTERNAL ERRLOC, IGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      OK = .TRUE.
C
C  NUMBER OF SPATIAL ELEMENTS IN THE RADIAL DIRECTION
C
      NUMRAD = IGET1('GENUMRAD001', 1, 2, 0, MAXRAD, RANGE, FOUND,
     $               'INPGEO', 'NUMRAD')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C
C  ENDPOINT DISTANCES TO RADIAL SPATIAL ELEMENTS
C
      CALL RGETN('GESPAEND001', 0, SPAEND(1), NUMRAD, 0.05, 9999.,
     $           RANGE, FOUND, 'INPGEO', 'SPAEND')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
```

```
      ENDIF
C
C  CONVERT SPAEND FROM KILOMETERS TO UNITS OF METERS FOR INTERNAL USE
C
      DO 100 IRAD = 1, NUMRAD
  100 SPAEND(IRAD) = SPAEND(IRAD) * 1000.
C
C  CALCULATE THE LENGTHS OF SPATIAL ELEMENTS IN THE RADIAL DIRECTION,
C  AND THE DISTANCES TO SPATIAL ELEMENT CENTERPOINTS.
C
      SPAEND(0) = 0.
      SPALEN(1) = SPAEND(1)
      SPACEN(1) = .5 * SPAEND(1)
      DO 300 I = 2, NUMRAD
      SPALEN(I) = SPAEND(I) - SPAEND(I - 1)
      SPACEN(I) = SPAEND(I) - .5 * SPALEN(I)
      IF (SPALEN(I) .LT. 100.0) THEN
        CALL ERRLOC ('INPGEO','SPAEND')
      WRITE(6,*)'Spatial endpoints must increase monotonically with',
     1            ' a minimum spacing of 0.1 km'
        WRITE(6,*)'NUMRAD,SPAEND=',NUMRAD,(SPAEND(J),J=1,NUMRAD)
      WRITE(7,*)'Spatial endpoints must increase monotonically with',
     1            ' a minimum spacing of 0.1 km'
        WRITE(7,*)'NUMRAD,SPAEND=',NUMRAD,(SPAEND(J),J=1,NUMRAD)
        OK = .FALSE.
        RETURN
      ENDIF
  300 CONTINUE
      RETURN
      END
*DECK INPISO
      SUBROUTINE INPISO (OK)
C
C  THIS ROUTINE DEFINES THE NUCLIDE DATA USED IN THE ATMOSPHERIC MODEL.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  I      - LOOP COUNTER
C  IGROUP - NUCLIDE GROUP NUMBERS OF ALL THE NUCLIDES
C  J      - LOOP COUNTER
C  L      - LOOP COUNTER
C  MAXGRP - MAXIMUM NUMBER OF NUCLIDE GROUPS ALLOWED
C  NUCNAM - NAMES OF ALL THE NUCLIDES
C  NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE IN THE REQUIRED RANGE WAS FOUND
C  RECNAM - IDENTIFIER OF THE CARD TO BE LOCATED IN THE INPUT DATABASE
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C MODIFIED 6/20/89/, DIC, LOG # 9/25/88-A,
C   LENGTH DISCREPANCY ON ORGNAM AND NUCNAM
C Modified 3/09/93, Added definition of pseudo-stable nuclides
C
      EXTERNAL CGET1, ERRLOC, IGETN, IGET1, LGETN, RGETN
      CHARACTER *80 CGET1
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
```

```
     $                 NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                 SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ISOGRP/ MAXGRP, IGROUP(MAXNUC)
      LOGICAL         WETDEP,     DRYDEP
      COMMON /WETDRY/ WETDEP(10), DRYDEP(10)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      CHARACTER *8    NAMSTB
      COMMON /NAMSTB/ NAMSTB(MAXNUC)
C
      COMMON /NUMSTB/ NUMSTB
C
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 RECNAM
C
      OK = .TRUE.
C Define the number of pseudo-stable nuclides
      NUMSTB = IGET1('ISNUMSTB001', 1, 0, 0, MAXNUC, RANGE, FOUND,
     $                 'INPISO', 'NUMSTB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C Define the list of pseudo-stable nuclides
      RECNAM = 'ISNAMSTB001'
      L = 11
      DO 100 I = 1, NUMSTB
      NAMSTB(I) = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     $                   'INPISO', 'NAMSTB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
      ENDIF
      IF (I .GT. 1) THEN
      DO 50 J = 1, I - 1
      IF (NAMSTB(I) .EQ. NAMSTB(J)) THEN
        CALL ERRLOC('INPISO','NAMSTB')
        WRITE(6,*)'NAME OF THIS NUCLIDE ALREADY SPECIFIED: ',NAMSTB(I)
        WRITE(7,*)'NAME OF THIS NUCLIDE ALREADY SPECIFIED: ',NAMSTB(I)
        OK = .FALSE.
        RETURN
      ENDIF
   50   CONTINUE
      ENDIF
  100 L = 8
C Define the number of radioactive nuclides to be considered
      NUMISO = IGET1('ISNUMISO001', 1, 1, 0, MAXNUC, RANGE, FOUND,
     $                 'INPISO', 'NUMISO')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
      ENDIF
C Define the number of chemical groups
      MAXGRP = IGET1 ('ISMAXGRP001', 1, 1, 0, 10, RANGE, FOUND,
     $                 'INPISO', 'MAXGRP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C Define flags signifying if each chemical group is subject to wet deposition
      CALL LGETN('ISDEPFLA001', 1, WETDEP, MAXGRP, FOUND, 'INPISO',
     $            'WETDEP')
      IF (.NOT. FOUND) OK = .FALSE.
```

```
C Define flags signifying if each chemical group is subject to dry deposition
      CALL LGETN('ISDEPFLA001', 2, DRYDEP, MAXGRP, FOUND, 'INPISO',
     $           'DRYDEP')
      IF (.NOT. FOUND) OK = .FALSE.
C Define the list of nuclide names
      RECNAM = 'ISOTPGRP001'
      L = 11
      DO 200 I = 1, NUMISO
      NUCNAM(I) = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     $                   'INPISO', 'NUCNAM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (I .GT. 1) THEN
      DO 150 J = 1, I - 1
      IF (NUCNAM(I) .EQ. NUCNAM(J)) THEN
        OK = .FALSE.
        CALL ERRLOC('INPISO','NUCNAM')
          WRITE(6,*)'NAME OF THIS NUCLIDE ALREADY SPECIFIED: ',NUCNAM(I)
          WRITE(7,*)'NAME OF THIS NUCLIDE ALREADY SPECIFIED: ',NUCNAM(I)
        ENDIF
  150   CONTINUE
      ENDIF
  200 L = 8
C Check to ensure that no nuclides appear in both NUCNAM and NAMSTB lists
      DO 300 I = 1, NUMISO
      DO 300 J = 1, NUMSTB
      IF (NUCNAM(I) .EQ. NAMSTB(J)) THEN
      OK = .FALSE.
      CALL ERRLOC ('INPISO', 'NUCNAM')
      WRITE(6,*) 'Nuclide with name ', NUCNAM(I),
     1           ' Cannot be in both lists:  NAMSTB and NUCNAM'
      WRITE(7,*) 'Nuclide with name ', NUCNAM(I),
     1           ' Cannot be in both lists:  NAMSTB and NUCNAM'
      ENDIF
  300 CONTINUE
      IF (.NOT. OK) RETURN
C Process the decay chain file, INDEXR.DAT, and store the decay chains
      CALL RDKCHN (OK)
      IF (.NOT. OK) RETURN
C Define the nuclide group to which each nuclide belongs.
      CALL IGETN('ISOTPGRP001', 2, IGROUP, NUMISO, 1, MAXGRP,
     $           RANGE, FOUND, 'INPISO', 'IGROUP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK RDKCHN
      SUBROUTINE RDKCHN (OK)
C This program tests the operation of a decay chain processor for MACCS.
C The calculations are divided into the following phases:
C (1) The decay chain database from Keith Eckerman is processed one record at
C     a time and the data on each record is stored in /INDEXR/ and /IDNTDK/,
C     this function is performed by Subroutine INPDKF;
C (2) The list of nuclides to be considered is defined by Subroutine INPISO;
C (3) The validity of the nuclide list is checked by Subroutine DFLIST;
C (4) Nuclides which are not progeny of any other nuclides are defined to be
C     "root nodes" of a tree structure.  These nuclides are identified by
C     Subroutine RUTLST.
C
C Modified 3/16/93, D.C., Fixed the code's handling of branching ratios
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
```

```
     $                 SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *8     NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      CHARACTER *7 IDNTDK
      COMMON /INDNDK/ IDNTDK(MXDKCN)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
      COMMON /STRCHN/ NMSTOR, VALSAV(500,3)
C
      LOGICAL OK
C
      NUMCHN = 0
      NMSTOR = 0
      DO 10 IGEN1 = 1, MAXGEN
      DO 10 ICHAN = 1, MAXCHN
      IBRNCH(ICHAN,IGEN1) = 0
   10 BRNRAT(ICHAN,IGEN1) = 0.
C
      DO 20 IGEN2 = 1, MAXGEN
      DO 20 IGEN1 = 1, MAXGEN
      DO 20 ICHAN = 1, MAXCHN
   20 CHNFRC(ICHAN,IGEN1,IGEN2) = 0.0
C
C Process the INDEXR.DAT file and store the database of decay chains
C
      CALL INPDKF (9, OK)
      IF (.NOT. OK) RETURN
C
C Obtain the list of nuclides which are to be considered by MACCS
      CALL DFLIST (OK)
      IF (.NOT. OK)  RETURN
C
C Examine list of nuclides and construct a list of root nodes
      CALL RUTLST
C
      DO 200 ICHAIN = 1, NUMCHN
      WRITE(6,40) ICHAIN,
     1   (IDNTDK(IBRNCH(ICHAIN,ISTEP)),ISTEP=1,LENCHN(ICHAIN))
   40 FORMAT(/' Decay Chain # ' ,I3, ':', (T17,(6(A,2X))))
      DO 60 IFROM = 1, LENCHN(ICHAIN)
      DO 60 IGOTO = IFROM, LENCHN(ICHAIN)
   60 IF (IFROM .NE. IGOTO .AND. CHNFRC(ICHAIN,IFROM,IGOTO) .NE. 0.0)
     1  WRITE(6,80) IDNTDK(IBRNCH(ICHAIN,IFROM)),
     2    IDNTDK(IBRNCH(ICHAIN,IGOTO)), CHNFRC(ICHAIN,IFROM,IGOTO)
   80 FORMAT(' Fraction of ', A, ' going to ', A, ' in this chain',
     1        ' = ', F8.6)
C
      DO 200 ISTEP  = 1, LENCHN(ICHAIN)
      DO 160 INUC   = 1, NUMISO
      IPOINT = IBRNCH(ICHAIN,ISTEP)
      IF (NUCNAM(INUC) .EQ. IDNTDK(IPOINT)) THEN
      IPNTDK(INUC) = IPOINT
      GO TO 200
      ENDIF
  160 CONTINUE
      OK = .FALSE.
      WRITE(6,180) IDNTDK(IBRNCH(ICHAIN,ISTEP))
      WRITE(7,180) IDNTDK(IBRNCH(ICHAIN,ISTEP))
  180 FORMAT(' ERROR: ', A, ' must be added to nuclide list NUCNAM')
  200 CONTINUE
      RETURN
      END
```

```
*DECK INPDKF
      SUBROUTINE INPDKF (IUNIT, OK)
C This routine reads Keith Eckerman's file INDEXR.DAT containing the
C decay chains used for his ICRP 30 dose calculations and stores them
C in /IDNTDK/ and /INDEXR/ while also checking its internal consistency.
C
      EXTERNAL ABORT
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      CHARACTER *7 IDNTDK
      COMMON /INDNDK/ IDNTDK(MXDKCN)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
C
      LOGICAL OK, EXIST
      CHARACTER NUKE*7, THALF*8, IU*2, D1*7, D2*7, D3*7
C
      OK = .TRUE.
C
      INQUIRE (FILE='INDEXR.DAT', EXIST = EXIST)
      IF (EXIST) THEN
      OPEN (IUNIT, FILE='INDEXR.DAT', STATUS='OLD')
      ELSE
      WRITE(6,*) 'ERROR, MISSING FILE: INDEXR.DAT'
      WRITE(7,*) 'ERROR, MISSING FILE: INDEXR.DAT'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
      NUMFND = 0
      DO 60 IPT = 1, MXDKCN
      READ (IUNIT,20,ERR=200,END=70) NUKE, THALF, IU, D1, F1,
     1                               D2, F2, D3, F3, ID1, ID2, ID3
      NUMFND = NUMFND + 1
   20 FORMAT (A7,A8,A2,6X,3(A7,E10.0),3I4)
C
C Eckerman uses the nuclide name SF to indicate decay to a stable form.
C When this is found, a blank daughter name (and a zero index pointer)
C are substituted for the pointers found on the INDEXR.DAT file.
C The SF flag only appears on the file for the third or second daughter.
C
      IF (D3 .EQ. 'SF') THEN
      D3 = ' '
      F3 = 0.0
      ELSE IF (D2 .EQ. 'SF') THEN
      D2 = ' '
      F2 = 0.0
      ENDIF
C
      IF (F1 + F2 + F3 .GT. 1.001) THEN
      WRITE(6,*) 'Branching ratios exceed 1.001 at record: ', IPT
      WRITE(7,*) 'Branching ratios exceed 1.001 at record: ', IPT
      GO TO 200
      ENDIF
C
C Check that the (presence/absence) of a daughter's name corresponds
C to (nonzero/zero) values of the daughter's pointer index on the file
C
      IF (D1 .EQ. ' ' .AND. ID1 .NE. 0 .OR.
     1    D2 .EQ. ' ' .AND. ID2 .NE. 0 .OR.
     2    D3 .EQ. ' ' .AND. ID3 .NE. 0) THEN
      WRITE(6,*) 'Daughter (NAME,INDEX) conflict at record: ', IPT
      WRITE(7,*) 'Daughter (NAME,INDEX) conflict at record: ', IPT
      GO TO 200
      ELSE IF (D1 .NE. ' ' .AND. ID1 .EQ. 0 .OR.
```

```
     1         D2 .NE. ' ' .AND. ID2 .EQ. 0 .OR.
     2         D3 .NE. ' ' .AND. ID3 .EQ. 0) THEN
      WRITE(6,*) 'Daughter (NAME,INDEX) conflict at record: ', IPT
      WRITE(7,*) 'Daughter (NAME,INDEX) conflict at record: ', IPT
      GO TO 200
      ENDIF
C
      IDNTDK(IPT) = NUKE
C
      READ(THALF,FMT='(F8.0)') RAWTIM
C
      IF (IU .EQ. 'us') THEN
       HAFLIF = RAWTIM * 1.0E-6
      ELSE IF (IU .EQ. 'ms') THEN
       HAFLIF = RAWTIM * 1.0E-3
      ELSE IF (IU .EQ. 's ') THEN
       HAFLIF = RAWTIM
      ELSE IF (IU .EQ. 'm ') THEN
       HAFLIF = RAWTIM * 60.0
      ELSE IF (IU .EQ. 'h ') THEN
       HAFLIF = RAWTIM * 3600.0
      ELSE IF (IU .EQ. 'd ') THEN
       HAFLIF = RAWTIM * 86400.0
      ELSE IF (IU .EQ. 'y ') THEN
       HAFLIF = RAWTIM * 365.25 * 86400.0
      ELSE
      WRITE(6,*) 'Internal error processing INDEXR.DAT'
      WRITE(7,*) 'Internal error processing INDEXR.DAT'

C modified for WinMaccs, 4/12/01, D. Chanin, add CALL ABORT
      CALL ABORT ('terminating')

C      STOP

      ENDIF
C
      DKRATE(IPT) = LOG (2.D0) / DBLE(HAFLIF)
      IDEKTO(1,IPT) = ID1
      IDEKTO(2,IPT) = ID2
      IDEKTO(3,IPT) = ID3
      DKFRAC(1,IPT) = F1
      DKFRAC(2,IPT) = F2
   60 DKFRAC(3,IPT) = F3
C
C Check all daughter indices to ensure they match up with nuclide names
C
   70 REWIND (IUNIT)
C
C      WRITE(8,*) 'Data for ', numfnd, ' nuclides found on INDEXR.DAT'
C
      DO 100 IPT = 1, NUMFND
      READ (IUNIT,80,ERR=200) NUKE, THALF, IU, D1, F1,
     1                        D2, F2, D3, F3, ID1, ID2, ID3
   80 FORMAT (A7,A8,A2,6X,3(A7,E10.0),3I4)
C
      IF (ID1 .NE. 0) THEN
      IF (D1 .NE. IDNTDK(ID1)) THEN
        WRITE(6,*) 'CONFLICT ON FIRST DAUGHTER INDEX FOR ', NUKE
        WRITE(7,*) 'CONFLICT ON FIRST DAUGHTER INDEX FOR ', NUKE
        GO TO 200
      ENDIF
      ENDIF
      IF (ID2 .NE. 0) THEN
```

```
      IF (D2 .NE. IDNTDK(ID2)) THEN
        WRITE(6,*) 'CONFLICT ON SECOND DAUGHTER INDEX FOR ', NUKE
        WRITE(7,*) 'CONFLICT ON SECOND DAUGHTER INDEX FOR ', NUKE
        GO TO 200
      ENDIF
      ENDIF
      IF (ID3 .NE. 0) THEN
      IF (D3 .NE. IDNTDK(ID3)) THEN
        WRITE(6,*) 'CONFLICT ON THIRD DAUGHTER INDEX FOR ', NUKE
        WRITE(7,*) 'CONFLICT ON THIRD DAUGHTER INDEX FOR ', NUKE
        GO TO 200
      ENDIF
      ENDIF
  100 CONTINUE
      CLOSE (IUNIT)
      RETURN
C
  200 OK = .FALSE.
      WRITE(6,*) 'Error reading from file INDEXR.DAT'
      WRITE(7,*) 'Error reading from file INDEXR.DAT'
C
      RETURN
      END
*DECK DFLIST
      SUBROUTINE DFLIST (OK)
C This routine validates user-supplied lists of nuclide names (NAMSTB,NUCNAM).
C All of these names are required to be found in the INDEXR.DAT database.
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      CHARACTER *7 IDNTDK
      COMMON /INDNDK/ IDNTDK(MXDKCN)
      LOGICAL MXNUCL
      COMMON /MXNUCL/ NMNUCL, MXNUCL(0:MXDKCN)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      CHARACTER *8    NAMSTB
      COMMON /NAMSTB/ NAMSTB(MAXNUC)
C
      COMMON /NUMSTB/ NUMSTB
C
      LOGICAL OK
C
      OK = .TRUE.
      NMNUCL = 0
C
      DO 20 INUC1 = 1, NUMFND
   20 MXNUCL(INUC1) = .FALSE.
C
      DO 80 INUC2 = 1, NUMSTB
      DO 40 INUC1 = 1, NUMFND
      IF (NAMSTB(INUC2) .EQ. IDNTDK(INUC1)) THEN
      DO 30 INUC0 = 1, NUMFND
      IF (IDEKTO(1,INUC0) .EQ. INUC1) THEN
        IDEKTO(1,INUC0) = IDEKTO(2,INUC0)
        DKFRAC(1,INUC0) = DKFRAC(2,INUC0)
        IDEKTO(2,INUC0) = IDEKTO(3,INUC0)
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```
          DKFRAC(2,INUC0) = DKFRAC(3,INUC0)
          IDEKTO(3,INUC0) = 0
          DKFRAC(3,INUC0) = 0.
        ELSE IF (IDEKTO(2,INUC0) .EQ. INUC1) THEN
          IDEKTO(2,INUC0) = IDEKTO(3,INUC0)
          DKFRAC(2,INUC0) = DKFRAC(3,INUC0)
          IDEKTO(3,INUC0) = 0
          DKFRAC(3,INUC0) = 0.
        ELSE IF (IDEKTO(3,INUC0) .EQ. INUC1) THEN
          IDEKTO(3,INUC0) = 0
          DKFRAC(3,INUC0) = 0.
        ENDIF
   30   CONTINUE
        GO TO 80
        ENDIF
   40 CONTINUE
        OK = .FALSE.
        WRITE(6,*) NAMSTB(INUC2), ' was not found in decay chain database'
        WRITE(7,*) NAMSTB(INUC2), ' was not found in decay chain database'
   80 CONTINUE
C
        DO 180 INUC2 = 1, NUMISO
        DO 140 INUC1 = 1, NUMFND
        IF (NUCNAM(INUC2) .EQ. IDNTDK(INUC1)) THEN
        MXNUCL(INUC1) = .TRUE.
        NMNUCL = NMNUCL + 1
        GO TO 180
        ENDIF
  140 CONTINUE
        OK = .FALSE.
        WRITE(6,*) NUCNAM(INUC2), ' was not found in decay chain database'
        WRITE(7,*) NUCNAM(INUC2), ' was not found in decay chain database'
  180 CONTINUE
        RETURN
        END
*DECK RUTLST
        SUBROUTINE RUTLST
C This routine goes through the list of nuclides to be considered and
C constructs a list of root nodes for the trees to be considered in MACCS.
C
        PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
        CHARACTER *7 IDNTDK
        COMMON /INDNDK/ IDNTDK(MXDKCN)
        LOGICAL MXNUCL
        COMMON /MXNUCL/ NMNUCL, MXNUCL(0:MXDKCN)
        COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
      1                 DKFRAC(3,MXDKCN)
C
        DO 80 INUC1 = 1, NUMFND
        IF (MXNUCL(INUC1)) THEN
        DO 60 INUC2 = 1, NUMFND
        IF (.NOT. MXNUCL(INUC2)) GO TO 60
        IF (INUC1 .EQ. IDEKTO(1,INUC2) .OR.
      1       INUC1 .EQ. IDEKTO(2,INUC2) .OR.
      2       INUC1 .EQ. IDEKTO(3,INUC2)) GO TO 80
   60   CONTINUE
C
C Process the tree starting with the given root node into linear chains
C
        CALL PRCTRE (INUC1)
        ENDIF
   80 CONTINUE
        RETURN
```

```
      END
*DECK PRCTRE
      SUBROUTINE PRCTRE (INUC)
C This routine processes the tree beginning at INUC into independent chains
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /LINCHN/ NSTEPS(MAXGEN), ISORCN(MAXGEN,MAXELS),
     1                IDESTN(MAXGEN,MAXELS), BRATIO(MAXGEN,MAXELS)
      CHARACTER *7 IDNTDK
      COMMON /INDNDK/ IDNTDK(MXDKCN)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
      COMMON /ISAVE/ ISAVE
C
      ISAVE = INUC
      CALL ZERCHN
      NUMLEV = 1
      CALL ADDSTP (INUC, NUMLEV)
      DO 60 ILEVEL = 2, MAXGEN
      DO 60 ISTEP = 1, NSTEPS(ILEVEL-1)
      IPOINT = IDESTN(ILEVEL-1,ISTEP)
      IF (IPOINT .GT. 0) THEN
      NUMLEV = ILEVEL
      CALL ADDSTP (IPOINT, ILEVEL)
      ENDIF
   60 CONTINUE
C
C Process the chain fragments into a set of chains tracing out all paths
C
      CALL FINDEM (INUC, NUMLEV)
      RETURN
      END
*DECK ZERCHN
      SUBROUTINE ZERCHN
C
C This routine resets the storage arrays to process a new tree
C
C Modified 3/10/93, D.C., Corrected treatment of branching ratios
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /LINCHN/ NSTEPS(MAXGEN), ISORCN(MAXGEN,MAXELS),
     1                IDESTN(MAXGEN,MAXELS), BRATIO(MAXGEN,MAXELS)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
      DO 10 ILEVEL = 1, MAXGEN
   10 NSTEPS(ILEVEL) = 0
      DO 20 ISTEP   = 1, MAXELS
      DO 20 ILEVEL  = 1, MAXGEN
      ISORCN(ILEVEL,ISTEP) = 0
      IDESTN(ILEVEL,ISTEP) = 0
   20 BRATIO(ILEVEL,ISTEP) = 0.0
      RETURN
      END
*DECK ADDSTP
      SUBROUTINE ADDSTP (INUC, ILEVEL)
C This routine adds a nuclide (INUC) to the list of chains at level (ILEVEL)
C
C Modified 3/10/93, D.C., Corrected treatment of branching ratios
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
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     1                DKFRAC(3,MXDKCN)
      COMMON /LINCHN/ NSTEPS(MAXGEN), ISORCN(MAXGEN,MAXELS),
     1                IDESTN(MAXGEN,MAXELS), BRATIO(MAXGEN,MAXELS)
      IF (IDEKTO(1,INUC) .EQ. 0) THEN
      DO 40 IST = 1, NSTEPS(ILEVEL)
   40   IF (ISORCN(ILEVEL,IST) .EQ. INUC .AND.
     1      IDESTN(ILEVEL,IST) .EQ. 0) GO TO 60
      I1 = NSTEPS(ILEVEL) + 1
      NSTEPS(ILEVEL) = I1
      ISORCN(ILEVEL,I1) = INUC
      IDESTN(ILEVEL,I1) = 0
      BRATIO(ILEVEL,I1) = 1.0
      ENDIF
   60 IF (IDEKTO(1,INUC) .NE. 0) THEN
      DO 80 IST = 1, NSTEPS(ILEVEL)
   80   IF (ISORCN(ILEVEL,IST) .EQ. INUC .AND.
     1      IDESTN(ILEVEL,IST) .EQ. IDEKTO(1,INUC)) GO TO 100
      I1 = NSTEPS(ILEVEL) + 1
      NSTEPS(ILEVEL) = I1
      ISORCN(ILEVEL,I1) = INUC
      IDESTN(ILEVEL,I1) = IDEKTO(1,INUC)
      BRATIO(ILEVEL,I1) = DKFRAC(1,INUC)
      ENDIF
  100 IF (IDEKTO(2,INUC) .NE. 0) THEN
      DO 120 IST = 1, NSTEPS(ILEVEL)
  120   IF (ISORCN(ILEVEL,IST) .EQ. INUC .AND.
     1      IDESTN(ILEVEL,IST) .EQ. IDEKTO(2,INUC)) GO TO 140
      I1 = NSTEPS(ILEVEL) + 1
      NSTEPS(ILEVEL) = I1
      ISORCN(ILEVEL,I1) = INUC
      IDESTN(ILEVEL,I1) = IDEKTO(2,INUC)
      BRATIO(ILEVEL,I1) = DKFRAC(2,INUC)
      ENDIF
  140 IF (IDEKTO(3,INUC) .NE. 0) THEN
      DO 160 IST = 1, NSTEPS(ILEVEL)
  160   IF (ISORCN(ILEVEL,IST) .EQ. INUC .AND.
     1      IDESTN(ILEVEL,IST) .EQ. IDEKTO(3,INUC)) RETURN
      I1 = NSTEPS(ILEVEL) + 1
      NSTEPS(ILEVEL) = I1
      ISORCN(ILEVEL,I1) = INUC
      IDESTN(ILEVEL,I1) = IDEKTO(3,INUC)
      BRATIO(ILEVEL,I1) = DKFRAC(3,INUC)
      ENDIF
      RETURN
      END
*DECK FINDEM
      SUBROUTINE FINDEM (INUC, NUMLEV)
C This routine traces all the linear chains that start at INUC and end
C at nuclides that have no radioactive daughter products
C
C Modified 3/10/93, D.C., Corrected treatment of branching ratios
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
C
      EXTERNAL ONLIST, ADLIST
      LOGICAL  ONLIST
C
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /LINCHN/ NSTEPS(MAXGEN), ISORCN(MAXGEN,MAXELS),
     1                IDESTN(MAXGEN,MAXELS), BRATIO(MAXGEN,MAXELS)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
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C
      DO 3000 ILEV = 1, NUMLEV
      GO TO (100,200,300,400,500,600) ILEV
  100 DO 150 I1 = 1, NSTEPS(1)
      IF (IDESTN(1,I1) .NE. 0) GO TO 150
      NUMCHN = NUMCHN + 1
      LENCHN(NUMCHN) = 1
      IBRNCH(NUMCHN,1) = INUC
      CALL TSTLST (NUMCHN, ISORCN(1,I1), ISORCN(1,I1), 1, 1, 1.0)
  150 CONTINUE
      GO TO 3000
  200 DO 250 I1 = 1, NSTEPS(1)
      DO 250 I2 = 1, NSTEPS(2)
      IF (IDESTN(1,I1) .NE. ISORCN(2,I2) .OR.
     1    IDESTN(2,I2) .NE. 0) GO TO 250
      NUMCHN = NUMCHN + 1
      LENCHN(NUMCHN) = ILEV
      CALL TSTLST (NUMCHN, ISORCN(1,I1), ISORCN(1,I1), 1, 1, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(2,I2), ISORCN(2,I2), 2, 2, 1.0)
      CALL TSTLST (NUMCHN,ISORCN(1,I1),IDESTN(1,I1),1,2,BRATIO(1,I1))
      IBRNCH(NUMCHN,1) = ISORCN(1,I1)
      IBRNCH(NUMCHN,2) = ISORCN(2,I2)
      BRNRAT(NUMCHN,1) = BRATIO(1,I1) * DKRATE(ISORCN(1,I1))
  250 CONTINUE
      GO TO 3000
  300 DO 350 I1 = 1, NSTEPS(1)
      DO 350 I2 = 1, NSTEPS(2)
      DO 350 I3 = 1, NSTEPS(3)
      IF (IDESTN(1,I1) .NE. ISORCN(2,I2) .OR.
     1    IDESTN(2,I2) .NE. ISORCN(3,I3) .OR.
     2    IDESTN(3,I3) .NE. 0) GO TO 350
      NUMCHN = NUMCHN + 1
      LENCHN(NUMCHN) = ILEV
      CALL TSTLST (NUMCHN, ISORCN(1,I1), ISORCN(1,I1), 1, 1, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(2,I2), ISORCN(2,I2), 2, 2, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(3,I3), ISORCN(3,I3), 3, 3, 1.0)
      CALL TSTLST (NUMCHN,ISORCN(1,I1),IDESTN(1,I1),1,2,BRATIO(1,I1))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),IDESTN(2,I2),2,3,BRATIO(2,I2))
C
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(3,I3),1,3,BRATIO(1,I1)
     1 *BRATIO(2,I2))
C
      IBRNCH(NUMCHN,1) = ISORCN(1,I1)
      IBRNCH(NUMCHN,2) = ISORCN(2,I2)
      IBRNCH(NUMCHN,3) = ISORCN(3,I3)
      BRNRAT(NUMCHN,1) = BRATIO(1,I1) * DKRATE(ISORCN(1,I1))
      BRNRAT(NUMCHN,2) = BRATIO(2,I2) * DKRATE(ISORCN(2,I2))
  350 CONTINUE
      GO TO 3000
  400 DO 450 I1 = 1, NSTEPS(1)
      DO 450 I2 = 1, NSTEPS(2)
      DO 450 I3 = 1, NSTEPS(3)
      DO 450 I4 = 1, NSTEPS(4)
      IF (IDESTN(1,I1) .NE. ISORCN(2,I2) .OR.
     1    IDESTN(2,I2) .NE. ISORCN(3,I3) .OR.
     2    IDESTN(3,I3) .NE. ISORCN(4,I4) .OR.
     3    IDESTN(4,I4) .NE. 0) GO TO 450
      NUMCHN = NUMCHN + 1
      LENCHN(NUMCHN) = ILEV
      CALL TSTLST (NUMCHN, ISORCN(1,I1), ISORCN(1,I1), 1, 1, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(2,I2), ISORCN(2,I2), 2, 2, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(3,I3), ISORCN(3,I3), 3, 3, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(4,I4), ISORCN(4,I4), 4, 4, 1.0)
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      CALL TSTLST (NUMCHN,ISORCN(1,I1),IDESTN(1,I1),1,2,BRATIO(1,I1))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),IDESTN(2,I2),2,3,BRATIO(2,I2))
      CALL TSTLST (NUMCHN,ISORCN(3,I3),IDESTN(3,I3),3,4,BRATIO(3,I3))
C
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(3,I3),1,3,BRATIO(1,I1)
     1 *BRATIO(2,I2))
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(4,I4),1,4,BRATIO(1,I1)
     1 *BRATIO(2,I2)*BRATIO(3,I3))
C
      CALL TSTLST (NUMCHN,ISORCN(2,I2),ISORCN(4,I4),2,4,BRATIO(2,I2)
     1 *BRATIO(3,I3))
C
      IBRNCH(NUMCHN,1) = ISORCN(1,I1)
      IBRNCH(NUMCHN,2) = ISORCN(2,I2)
      IBRNCH(NUMCHN,3) = ISORCN(3,I3)
      IBRNCH(NUMCHN,4) = ISORCN(4,I4)
      BRNRAT(NUMCHN,1) = BRATIO(1,I1) * DKRATE(ISORCN(1,I1))
      BRNRAT(NUMCHN,2) = BRATIO(2,I2) * DKRATE(ISORCN(2,I2))
      BRNRAT(NUMCHN,3) = BRATIO(3,I3) * DKRATE(ISORCN(3,I3))
  450 CONTINUE
      GO TO 3000
  500 DO 550 I1 = 1, NSTEPS(1)
      DO 550 I2 = 1, NSTEPS(2)
      DO 550 I3 = 1, NSTEPS(3)
      DO 550 I4 = 1, NSTEPS(4)
      DO 550 I5 = 1, NSTEPS(5)
      IF (IDESTN(1,I1) .NE. ISORCN(2,I2) .OR.
     1    IDESTN(2,I2) .NE. ISORCN(3,I3) .OR.
     2    IDESTN(3,I3) .NE. ISORCN(4,I4) .OR.
     3    IDESTN(4,I4) .NE. ISORCN(5,I5) .OR.
     4    IDESTN(5,I5) .NE. 0) GO TO 550
      NUMCHN = NUMCHN + 1
      LENCHN(NUMCHN) = ILEV
      CALL TSTLST (NUMCHN, ISORCN(1,I1), ISORCN(1,I1), 1, 1, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(2,I2), ISORCN(2,I2), 2, 2, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(3,I3), ISORCN(3,I3), 3, 3, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(4,I4), ISORCN(4,I4), 4, 4, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(5,I5), ISORCN(5,I5), 5, 5, 1.0)
      CALL TSTLST (NUMCHN,ISORCN(1,I1),IDESTN(1,I1),1,2,BRATIO(1,I1))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),IDESTN(2,I2),2,3,BRATIO(2,I2))
      CALL TSTLST (NUMCHN,ISORCN(3,I3),IDESTN(3,I3),3,4,BRATIO(3,I3))
      CALL TSTLST (NUMCHN,ISORCN(4,I4),IDESTN(4,I4),4,5,BRATIO(4,I4))
C
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(3,I3),1,3,BRATIO(1,I1)
     1 *BRATIO(2,I2))
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(4,I4),1,4,BRATIO(1,I1)
     1 *BRATIO(2,I2)*BRATIO(3,I3))
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(5,I5),1,5,BRATIO(1,I1)
     1 *BRATIO(2,I2)*BRATIO(3,I3)*BRATIO(4,I4))
C
      CALL TSTLST (NUMCHN,ISORCN(2,I2),ISORCN(4,I4),2,4,BRATIO(2,I2)
     1 *BRATIO(3,I3))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),ISORCN(5,I5),2,5,BRATIO(2,I2)
     1 *BRATIO(3,I3)*BRATIO(4,I4))
C
      CALL TSTLST (NUMCHN,ISORCN(3,I3),ISORCN(5,I5),3,5,BRATIO(3,I3)
     1 *BRATIO(4,I4))
C
      IBRNCH(NUMCHN,1) = ISORCN(1,I1)
      IBRNCH(NUMCHN,2) = ISORCN(2,I2)
      IBRNCH(NUMCHN,3) = ISORCN(3,I3)
      IBRNCH(NUMCHN,4) = ISORCN(4,I4)
      IBRNCH(NUMCHN,5) = ISORCN(5,I5)
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      BRNRAT(NUMCHN,1) = BRATIO(1,I1) * DKRATE(ISORCN(1,I1))
      BRNRAT(NUMCHN,2) = BRATIO(2,I2) * DKRATE(ISORCN(2,I2))
      BRNRAT(NUMCHN,3) = BRATIO(3,I3) * DKRATE(ISORCN(3,I3))
      BRNRAT(NUMCHN,4) = BRATIO(4,I4) * DKRATE(ISORCN(4,I4))
  550 CONTINUE
      GO TO 3000
  600 DO 650 I1 = 1, NSTEPS(1)
      DO 650 I2 = 1, NSTEPS(2)
      DO 650 I3 = 1, NSTEPS(3)
      DO 650 I4 = 1, NSTEPS(4)
      DO 650 I5 = 1, NSTEPS(5)
      DO 650 I6 = 1, NSTEPS(6)
      IF (IDESTN(1,I1) .NE. ISORCN(2,I2) .OR.
     1    IDESTN(2,I2) .NE. ISORCN(3,I3) .OR.
     2    IDESTN(3,I3) .NE. ISORCN(4,I4) .OR.
     3    IDESTN(4,I4) .NE. ISORCN(5,I5) .OR.
     4    IDESTN(5,I5) .NE. ISORCN(6,I6)) GO TO 650
      NUMCHN = NUMCHN + 1
      LENCHN(NUMCHN) = ILEV
      CALL TSTLST (NUMCHN, ISORCN(1,I1), ISORCN(1,I1), 1, 1, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(2,I2), ISORCN(2,I2), 2, 2, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(3,I3), ISORCN(3,I3), 3, 3, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(4,I4), ISORCN(4,I4), 4, 4, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(5,I5), ISORCN(5,I5), 5, 5, 1.0)
      CALL TSTLST (NUMCHN, ISORCN(6,I6), ISORCN(6,I6), 6, 6, 1.0)
C
      CALL TSTLST (NUMCHN,ISORCN(1,I1),IDESTN(1,I1),1,2,BRATIO(1,I1))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),IDESTN(2,I2),2,3,BRATIO(2,I2))
      CALL TSTLST (NUMCHN,ISORCN(3,I3),IDESTN(3,I3),3,4,BRATIO(3,I3))
      CALL TSTLST (NUMCHN,ISORCN(4,I4),IDESTN(4,I4),4,5,BRATIO(4,I4))
      CALL TSTLST (NUMCHN,ISORCN(5,I5),IDESTN(5,I5),5,6,BRATIO(5,I5))
C
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(3,I3),1,3,BRATIO(1,I1)
     1 *BRATIO(2,I2))
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(4,I4),1,4,BRATIO(1,I1)
     1 *BRATIO(2,I2)*BRATIO(3,I3))
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(5,I5),1,5,BRATIO(1,I1)
     1 *BRATIO(2,I2)*BRATIO(3,I3)*BRATIO(4,I4))
      CALL TSTLST (NUMCHN,ISORCN(1,I1),ISORCN(6,I6),1,6,BRATIO(1,I1)
     1 *BRATIO(2,I2)*BRATIO(3,I3)*BRATIO(4,I4)*BRATIO(5,I5))
C
      CALL TSTLST (NUMCHN,ISORCN(2,I2),ISORCN(4,I4),2,4,BRATIO(2,I2)
     1 *BRATIO(3,I3))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),ISORCN(5,I5),2,5,BRATIO(2,I2)
     1 *BRATIO(3,I3)*BRATIO(4,I4))
      CALL TSTLST (NUMCHN,ISORCN(2,I2),ISORCN(6,I6),2,6,BRATIO(2,I2)
     1 *BRATIO(3,I3)*BRATIO(4,I4)*BRATIO(5,I5))
C
      CALL TSTLST (NUMCHN,ISORCN(3,I3),ISORCN(5,I5),3,5,BRATIO(3,I3)
     1 *BRATIO(4,I4))
      CALL TSTLST (NUMCHN,ISORCN(3,I3),ISORCN(6,I6),3,6,BRATIO(3,I3)
     1 *BRATIO(4,I4)*BRATIO(5,I5))
C
      CALL TSTLST (NUMCHN,ISORCN(4,I4),ISORCN(6,I6),4,6,BRATIO(4,I4)
     1 *BRATIO(5,I5))
C
      IBRNCH(NUMCHN,1) = ISORCN(1,I1)
      IBRNCH(NUMCHN,2) = ISORCN(2,I2)
      IBRNCH(NUMCHN,3) = ISORCN(3,I3)
      IBRNCH(NUMCHN,4) = ISORCN(4,I4)
      IBRNCH(NUMCHN,5) = ISORCN(5,I5)
      IBRNCH(NUMCHN,6) = ISORCN(6,I6)
      BRNRAT(NUMCHN,1) = BRATIO(1,I1) * DKRATE(ISORCN(1,I1))
```

```
      BRNRAT(NUMCHN,2) = BRATIO(2,I2) * DKRATE(ISORCN(2,I2))
      BRNRAT(NUMCHN,3) = BRATIO(3,I3) * DKRATE(ISORCN(3,I3))
      BRNRAT(NUMCHN,4) = BRATIO(4,I4) * DKRATE(ISORCN(4,I4))
      BRNRAT(NUMCHN,5) = BRATIO(5,I5) * DKRATE(ISORCN(5,I5))
  650 CONTINUE
 3000 CONTINUE
      RETURN
      END
*DECK TSTLST
      SUBROUTINE TSTLST (ICHAIN, ISORCN, IDESTN, IFROM, IGOTO, FRAC)
C Written to fix an error in the treatment of branching ratios, D.C., 3/16/93
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      EXTERNAL ONLIST
      LOGICAL  ONLIST
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
C
      IF (.NOT. ONLIST (ISORCN, IDESTN, FRAC)) THEN
      CALL ADLIST (ISORCN, IDESTN, FRAC)
      CHNFRC(ICHAIN,IFROM,IGOTO) = FRAC
      ENDIF
      RETURN
      END
      LOGICAL FUNCTION ONLIST (ISORC, IDEST, FRAC)
C This routine checks a (source,destination) pair and adds it to the list if
C it is not already on the list of pairs.
C Written to fix an error in the treatment of branching ratios, D.C., 3/16/93
      COMMON /STRCHN/ NMSTOR, VALSAV(500,3)
      DO 100 I = 1, NMSTOR
      IF (VALSAV(I,1) .EQ. FLOAT(ISORC) .AND.
     1    VALSAV(I,2) .EQ. FLOAT(IDEST) .AND.
     2    VALSAV(I,3) .EQ. FRAC) THEN
          ONLIST = .TRUE.
          RETURN
      ENDIF
  100 CONTINUE
      ONLIST = .FALSE.
      RETURN
      END
*DECK ADLIST
      SUBROUTINE ADLIST (ISORC, IDEST, FRAC)
C This routine adds a single (source,destination) pair to the list of pairs
C Written to fix an error in the treatment of branching ratios, D.C., 3/16/93
      COMMON /STRCHN/ NMSTOR, VALSAV(500,3)
      NMSTOR = NMSTOR + 1
      IF (NMSTOR .LE. 500) THEN
      VALSAV(NMSTOR,1) = FLOAT(ISORC)
      VALSAV(NMSTOR,2) = FLOAT(IDEST)
      VALSAV(NMSTOR,3) = FRAC
      ELSE
      WRITE(6,*) 'Internal Error in Subroutine ADLIST'
      WRITE(6,*) 'Possible Correction is to Reduce Number of Nuclides'
      WRITE(7,*) 'Internal Error in Subroutine ADLIST'
      WRITE(7,*) 'Possible Correction is to Reduce Number of Nuclides'
      CALL ABORT ('Aborting Execution')
      ENDIF
      RETURN
      END
*DECK NEWAMT
      SUBROUTINE NEWAMT (RADIO1, RADIO2, DELTIM)
C
C This routine takes as input an array, RADIO1, representing the radioactive
C inventory in a compartment, and calculates the decay and daughter ingrowth
```

```
C which occurs over a period of DELTIM.  The resultant new inventory array is
C returned as RADIO2. The original values of RADIO1 and DELTIM are unchanged.
C
C This routine is called by INPREL, ATMOUT, and EPCALC.
C A variant of this routine incorporating weathering is named NEWAMX.
C
C This routine is based on closed-form solutions to the Bateman equations
C given by A. Birchall, "A Microcomputer Algorithm for Solving Compartmental
C Models Involving Radionuclide Transforamtions," Health Physics, Vol. 50,
C (March), pp. 545-553, (1986).  The same equations are given by Skrable et al.,
C "A General Equation for the Kinetics of Linear First Order Phenomena and
C Suggested Applications," Health Physics, Vol. 27 (July), pp. 155-157, (1974).
C
C Written 2/04/93, D.C., Expanded Nuclide Set for DOE
C Modified 3/17/93, D.C., CHNFRC is used as a flag--numeric value is not used
C Modified 11/10/95, D.C., For chains of length one, use the simplest formula
C Modified 12/03/95, D.C., Changed DKRATE from type DOUBLE PRECISION to REAL
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
C
      DIMENSION RADIO1(MXDKCN), RADIO2(MXDKCN)
      DOUBLE PRECISION AMOUNT, PROD, ABOVE, BELOW, SUM
C
      DO 40 INUC = 1, NUMFND
   40 RADIO2(INUC) = 0.0
C
      DO 420 ICHAIN = 1, NUMCHN
      IF (LENCHN(ICHAIN) .EQ. 1) THEN
      RADIO2(IBRNCH(ICHAIN,1)) = RADIO1(IBRNCH(ICHAIN,1)) /
     1    DKRATE(IBRNCH(ICHAIN,1)) *
     2    EXP(-DELTIM * DKRATE(IBRNCH(ICHAIN,1)))
      GO TO 420
      ENDIF

      DO 400 N = 1, LENCHN(ICHAIN)
      DO 400 I = 1, N
C
      IF (CHNFRC(ICHAIN,I,N) .LT. 1.E-6) GO TO 400
      AMOUNT = RADIO1(IBRNCH(ICHAIN,I)) / DKRATE(IBRNCH(ICHAIN,I))
      IF (AMOUNT .LT. 0.5D0) GO TO 400

      PROD = 1.0D0

      DO 100 J = I, N - 1
  100 PROD = PROD * DBLE(BRNRAT(ICHAIN,J))

      SUM = 0.0D0

      DO 200 J = I, N
      ABOVE = AMOUNT * EXP(-DELTIM * DKRATE(IBRNCH(ICHAIN,J)))
      BELOW = 1.0D0
      DO 150 IP = I, N
  150 IF (IP .NE. J) BELOW = BELOW *
     1  (DKRATE(IBRNCH(ICHAIN,IP)) - DKRATE(IBRNCH(ICHAIN,J)))
      SUM = SUM + ABOVE / BELOW
  200 CONTINUE

      RADIO2(IBRNCH(ICHAIN,N)) = RADIO2(IBRNCH(ICHAIN,N)) + (PROD * SUM)
```

```
  400 CONTINUE
  420 CONTINUE

C Convert number of atoms back to radioactivity

      DO 450 INUC = 1, NUMFND
  450 RADIO2(INUC) = RADIO2(INUC) * DKRATE(INUC)

      RETURN
      END
*DECK DISINT
      SUBROUTINE DISINT (RADIO1, RADIO2, DELTIM)
C
C This routine takes as input an array, RADIO1, representing the radioactive
C inventory in a compartment, and calculates the decay and daughter ingrowth
C which occurs over a period of DELTIM.  The resultant integrated radioactivity
C array (i.e., the number of disintegrations of each nuclide) is returned as
C RADIO2. The original values of RADIO1 and DELTIM are unchanged.
C
C This routine is called by EPCALC
C A variant of this routine incorporating weathering is named DISINX.
C
C This routine is based on closed-form solutions to the Bateman equations
C given by A. Birchall, "A Microcomputer Algorithm for Solving Compartmental
C Models Involving Radionuclide Transforamtions," Health Physics, Vol. 50,
C (March), pp. 545-553, (1986).  The same equations are given by Skrable et al.,
C "A General Equation for the Kinetics of Linear First Order Phenomena and
C Suggested Applications," Health Physics, Vol. 27 (July), pp. 155-157, (1974).
C
C Written 2/04/93, D.C., Expanded Nuclide Set for DOE
C Modified 3/17/93, D.C., CHNFRC is used as a flag--numeric value is not used
C Modified 9/27/93, D.C., Fixed typo in DISINT in EARLY post-passage groundshine
C Modified 11/10/95, D.C., For chains of length one, use the simplest formula
C Modified 12/03/95, D.C., Changed DKRATE from type DOUBLE PRECISION to REAL
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
C
      DIMENSION RADIO1(MXDKCN), RADIO2(MXDKCN)
      DOUBLE PRECISION AMOUNT, PROD, ABOVE, BELOW, SUM, TERM

      DO 40 INUC = 1, NUMFND
   40 RADIO2(INUC) = 0.0

      DO 420 ICHAIN = 1, NUMCHN
      IF (LENCHN(ICHAIN) .EQ. 1) THEN
      RADIO2(IBRNCH(ICHAIN,1)) =
     1    RADIO1(IBRNCH(ICHAIN,1)) / REAL(DKRATE(IBRNCH(ICHAIN,1))) *
     2    (1.0 - EXP(-DELTIM * REAL(DKRATE(IBRNCH(ICHAIN,1)))))
      GO TO 420
      ENDIF

      DO 400 N = 1, LENCHN(ICHAIN)
      DO 400 I = 1, N
      IF (CHNFRC(ICHAIN,I,N) .LT. 1.E-6) GO TO 400
      AMOUNT = RADIO1(IBRNCH(ICHAIN,I)) / DKRATE(IBRNCH(ICHAIN,I))
      IF (AMOUNT .LT. 0.5D0) GO TO 400

      PROD = 1.0D0
```

```
      DO 100 J = I, N - 1
  100 PROD = PROD * DBLE(BRNRAT(ICHAIN,J))

      SUM = 0.0D0

      DO 200 J = I, N
      TERM = DELTIM * DKRATE(IBRNCH(ICHAIN,J))
      IF (TERM .GE. 0.01D0) THEN
      ABOVE = AMOUNT * (1.D0 - EXP(-TERM)) /
     1          DKRATE(IBRNCH(ICHAIN,J))
      ELSE
      ABOVE = AMOUNT * (DBLE(DELTIM) - 0.5D0 * TERM * DBLE(DELTIM))
      ENDIF
      BELOW = 1.0D0
      DO 150 IP = I, N
  150 IF (IP .NE. J) BELOW = BELOW *
     1  (DKRATE(IBRNCH(ICHAIN,IP)) - DKRATE(IBRNCH(ICHAIN,J)))

      SUM = SUM + ABOVE / BELOW

  200 CONTINUE

      RADIO2(IBRNCH(ICHAIN,N)) = RADIO2(IBRNCH(ICHAIN,N)) +
     1 (PROD * SUM) * DKRATE(IBRNCH(ICHAIN,N))

  400 CONTINUE
  420 CONTINUE

      RETURN
      END
*DECK INPWET
      SUBROUTINE INPWET (OK)
C
C  THIS ROUTINE LOADS THE WET DEPOSITION DATA NEEDED FOR DEFINING
C  THE ATMOSPHERIC MODEL FROM THE MODEL DEFINITION DATABASE.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARIABLES:
C
C  CWASH1 - LINEAR WASHOUT COEFFICIENT
C  CWASH2 - EXPONENTIAL WASHOUT COEFFICIENT
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C
C  GLOSSARY OF EXTERNALS:
C
C  RGET1  - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
      EXTERNAL RGET1
      LOGICAL OK, RANGE, FOUND
      COMMON /WETCON/ CWASH1, CWASH2
      OK = .TRUE.
C
C  LINEAR WASHOUT COEFFICIENT
C
```

```
      CWASH1 = RGET1 ('WDCWASH1001', 1, 0., 0., 1.,
     $                RANGE, FOUND, 'INPWET', 'CWASH1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EXPONENTIAL WASHOUT COEFFICIENT
C
      CWASH2 = RGET1 ('WDCWASH2001', 1, 0., 0., 1.,
     $                RANGE, FOUND, 'INPWET', 'CWASH2')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INPDRY
      SUBROUTINE INPDRY (OK)
C
C  THIS ROUTINE LOADS THE DRY DEPOSITION DATA NEEDED FOR DEFINING
C  THE ATMOSPHERIC MODEL FROM THE MODEL DEFINITION DATABASE.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  I      - LOOP COUNTER ON AN IMPLIED DO LOOP
C  NPSGRP - NUMBER OF PARTICLE SIZE GROUPS DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C  VDEPOS - DEPOSITION VELOCITY OF EACH PARTICLE SIZE GROUP
C
C  GLOSSARY OF EXTERNALS:
C
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
      EXTERNAL IGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      COMMON /DRYCON/ NPSGRP, VDEPOS(10)
      OK = .TRUE.
C
C  NUMBER OF PARTICLE SIZE GROUPS
C
      NPSGRP = IGET1 ('DDNPSGRP001', 1, 1, 0, 10, RANGE, FOUND,
     $                'INPDRY', 'NPSGRP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  DEPOSITION VELOCITY OF EACH PARTICLE SIZE GROUP
C
      CALL RGETN('DDVDEPOS001', 0, VDEPOS, NPSGRP, 0., 10.,
     $           RANGE, FOUND, 'INPDRY', 'VDEPOS')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INPDIS
      SUBROUTINE INPDIS (OK)
C
C  THIS ROUTINE GETS THE DISPERSION PARAMETER DATA NEEDED FOR DEFINING
C  THE ATMOSPHERIC MODEL FROM THE MODEL DEFINITION DATABASE.
```

```
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARIABLES:
C
C  CYSIGA - LINEAR TERMS FOR SIGMA-Y
C  CYSIGB - EXPONENTIAL TERMS FOR SIGMA-Y
C  CZSIGA - LINEAR TERMS FOR SIGMA-Z
C  CZSIGB - EXPONENTIAL TERMS FOR SIGMA-Z
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  I      - LOOP COUNTER ON AN IMPLIED DO LOOP
C  NPSGRP - NUMBER OF PARTICLE SIZE GROUPS DEFINED IN THE MODEL
C NUM_DIST - # of distances at which sigmas are being supplied for table-lookup
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C  YSCALE - SCALING FACTOR FOR THE "A" TERM IN THE EXPRESSION FOR SIGMA-Y
C  ZSCALE - SCALING FACTOR FOR THE "A" TERM IN THE EXPRESSION FOR SIGMA-Z
C
C  GLOSSARY OF EXTERNALS:
C
C  RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C  RGET1  - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
C Modified 7/21/95, DIC  Plume-size table lookup feature implemented at v. 1.11
C Modified 6/05/96, D.C., misc. restrictions on code input parameters
C
      EXTERNAL RGETN, RGET1
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAX_DIST=50, MAX_STAB=6)
C
      COMMON /DISPY/ YSCALE, CYSIGA(6), CYSIGB(6)
      COMMON /DISPZ/ ZSCALE, CZSIGA(6), CZSIGB(6)
      COMMON /DISP_TABLES/ NUM_DIST, DISTANCE(MAX_DIST),
     1  SIGMA_Y(MAX_DIST,MAX_STAB), SIGMA_Z(MAX_DIST,MAX_STAB),
     2   D_SIGMA_Y(MAX_DIST,MAX_STAB), D_SIGMA_Z(MAX_DIST,MAX_STAB),
     3   D_INVRS_Y(MAX_DIST,MAX_STAB), D_INVRS_Z(MAX_DIST,MAX_STAB)
C
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
C
C  SCALING FACTOR FOR SIGMA-Y EXPRESSION
C
      YSCALE = RGET1 ('DPYSCALE001', 1, .01, 1., 100., RANGE, FOUND,
     $                'INPDIS', 'YSCALE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  SCALING FACTOR FOR SIGMA-Z EXPRESSION
C
      ZSCALE = RGET1 ('DPZSCALE001', 1, .01, 1., 100., RANGE, FOUND,
     $                'INPDIS', 'ZSCALE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      CALL INPUT_TABLES
C
C if NUM_DIST (used as a flag) equal to zero, then use the power-law formulas,
C else, read tables of sigma-y/sigma-z for NUM_DIST distances
```

```
C
      IF (NUM_DIST .GT. 0) THEN
C
C call a bunch of routines from Kahaner et al.'s Numerical Methods and Software
C seting up hermite cubic interpolantion, saving derivatives in a common block
C
       CALL SETUP
      ELSE
C
C lower limit of power-law expression changed to 1E-6 by D.C. on 6/05/96
C
       CALL RGETN('DPCYSIGA001', 0, CYSIGA, 6, 1.E-6, 10.,
     $                RANGE, FOUND, 'INPDIS', 'CYSIGA')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
       CALL RGETN('DPCYSIGB001', 0, CYSIGB, 6, 1.E-6, 10.,
     $                RANGE, FOUND, 'INPDIS', 'CYSIGB')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
       CALL RGETN('DPCZSIGA001', 0, CZSIGA, 6, 1.E-6, 10.,
     $                RANGE, FOUND, 'INPDIS', 'CZSIGA')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
       CALL RGETN('DPCZSIGB001', 0, CZSIGB, 6, 1.E-6, 10.,
     $                RANGE, FOUND, 'INPDIS', 'CZSIGB')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
      ENDIF
C
      RETURN
      END
      SUBROUTINE INPUT_TABLES
C
C Input routine to read user-supplied tables of sigma-y and sigma-z at
C at specified distances.  These tables are used as the basis of a hermite
C cubic interpolation scheme utilizing the canned routines PCHEZ and PCHEV
C obtained from Numerical Methods and Software by Kahaner, Moler, and Nash,
C Prentice Hall, 1989.
C
C This routine is called by SUBROUTINE INPDIS.
C
C Glossary of Variables:
C
C DISTANCE - array of downwind distances used for sigma-y/z lookup tables (m)
C SIGMA_Y - table-lookup sigma-y array at the corresponding values of DISTANCE
C SIGMA_Z - table-lookup sigma-z array at the corresponding values of DISTANCE
C
C Glossary of Externals:
C
C IGET_NUM_DIST - special purpose version of IGET1 that does not print an error
C                 message if it cannot locate the record identifier.  The need
C                 for this special routine is to maintain upward compatibilty
C                 with MACCS2 v. 1.10, which does not include the option for
C                 user specification of the sigma-y/z tables.  Input files used
C                 for the previous version of MACCS2 need not be modified for
C                 use with MACCS2 v. 1.11.  If MACCS2 does not find a record
C                 identifier NUM_DIST001, it will assume that no table-lookup
C                 is to be performed and sigma-y and sigma-z are to be
C                 calculated using the power-law model of MACCS.
C RGETN -- free-format input processor routine to fetch an array of real values
C
C D. Chanin, 8/29/95.  Plume-size table lookup feature implemented at v. 1.11
C revised 6/26/96 by D. Chanin to require monotone-increasing table values
C
      PARAMETER (MAX_DIST=50, MAX_STAB=6)
      SAVE DISTANCE0, LETTER
      CHARACTER *11 RECNAM
```

```
      LOGICAL RANGE, FOUND
      COMMON /DISP_TABLES/ NUM_DIST, DISTANCE(MAX_DIST),
     1  SIGMA_Y(MAX_DIST,MAX_STAB), SIGMA_Z(MAX_DIST,MAX_STAB),
     2   D_SIGMA_Y(MAX_DIST,MAX_STAB), D_SIGMA_Z(MAX_DIST,MAX_STAB),
     3   D_INVRS_Y(MAX_DIST,MAX_STAB), D_INVRS_Z(MAX_DIST,MAX_STAB)
      DIMENSION DISTANCE0(MAX_DIST)
      CHARACTER *1 LETTER(MAX_STAB)
      DATA LETTER /'A', 'B', 'C', 'D', 'E', 'F'/
C
      NUM_DIST = IGET_NUM_DIST('NUM_DIST001', 0, 0, 0, MAX_DIST,
     1                         RANGE, FOUND, 'INPUT_TABLES', 'NUM_DIST')
      IF (NUM_DIST .EQ. 0) THEN
        RETURN
      ELSE IF (NUM_DIST .GE. 3) THEN
        WRITE(6,10) 'Using new table-lookup scheme for sigma-y/sigma-z'
   10   FORMAT(/1X,A/)
      ELSE
        WRITE(6,*)'NUM_DIST, if supplied, must be either 0, or 3 to 50'
        WRITE(7,*)'NUM_DIST, if supplied, must be either 0, or 3 to 50'
        CALL ERRLOC ('NUM_DIST', 'number of table-lookup distances')
        CALL ABORT ('terminating execution')
      ENDIF
C
      DO 80 ISTAB = 1, MAX_STAB
      WRITE(RECNAM,20) LETTER(ISTAB), 01
   20 FORMAT(A, '-STB/DIS', I2.2)
      IF (ISTAB .EQ. 1) THEN
        CALL RGETN(RECNAM, 1, DISTANCE, NUM_DIST, 0.001E3, 1.0E8,
     1             RANGE, FOUND, 'INPUT_TABLES', 'DISTANCE')
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT('terminating')
      ELSE
        CALL RGETN(RECNAM, 1, DISTANCE0, NUM_DIST, 0.001E3, 1.0E8,
     1             RANGE, FOUND, 'INPUT_TABLES', 'DISTANCE')
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT('terminating')
        DO 40 IDIST = 1, NUM_DIST
        IF (DISTANCE(IDIST) .NE. DISTANCE0(IDIST)) THEN
          CALL ERRLOC ('INPUT_TABLES', 'DISTANCE')
          WRITE(6,*) 'Mismatched table values at Record Identifier: ',
     1               RECNAM
          WRITE(7,*) 'Mismatched table values at Record Identifier: ',
     1               RECNAM
          CALL ABORT ('terminating execution')
        ENDIF
   40   CONTINUE
      ENDIF
      CALL RGETN(RECNAM, 2, SIGMA_Y(1,ISTAB), NUM_DIST, 1.E-6, 1.E20,
     1           RANGE, FOUND, 'INPUT_TABLES', 'SIGMA_Y')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT('terminating')
      CALL RGETN(RECNAM, 3, SIGMA_Z(1,ISTAB), NUM_DIST, 1.E-6, 1.E20,
     1           RANGE, FOUND, 'INPUT_TABLES', 'SIGMA_Z')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT('terminating')
   80 CONTINUE
C
C Check to see that the tables are defined in a way that satisfies the
C requirements of the solver routine PCHEZ, namely, that successive values
C of DISTANCE and SIGMA are monotone increasing.  This condition is imposed
C because of the requirements of the interpolation solver, PCHEZ.  For details
C see page 134 of Kahaner, Moler, and Nash (1989), "Numerical Methods and
C Software," Prentice Hall.
C
C new test added 6/26/96 by D. Chanin to test for valid sigma tables.
C
      DO 100 IDIST = 2, NUM_DIST
```

```
      IF (DISTANCE(IDIST) .LE. DISTANCE(IDIST-1)) THEN
        CALL ERRLOC ('INPUT_TABLES', 'DISTANCE')
        WRITE(6,*) 'Successive distances must be increasing;'
        WRITE(6,*) 'Error found at IRAD = ', IDIST-1, IDIST
        WRITE(7,*) 'Successive distances must be increasing;'
        WRITE(7,*) 'Error found at IRAD = ', IDIST-1, IDIST
        CALL ABORT ('terminating execution')
      ENDIF
      DO 100 ISTAB = 1, 6
      IF (SIGMA_Y(IDIST,ISTAB) .LE. SIGMA_Y(IDIST-1,ISTAB)) THEN
        CALL ERRLOC ('INPUT_TABLES', 'SIGMA_Y')
        WRITE(6,*) 'Successive SIGMA-Y values must be increasing;'
        WRITE(6,*) 'Error found at IRAD = ', IDIST-1, IDIST
        WRITE(6,*) 'for stability class ', LETTER(ISTAB)
        WRITE(7,*) 'Successive SIGMA-Y values must be increasing;'
        WRITE(7,*) 'Error found at IRAD = ', IDIST-1, IDIST
        WRITE(7,*) 'for stability class ', LETTER(ISTAB)
        CALL ABORT ('terminating execution')
      ENDIF
      IF (SIGMA_Z(IDIST,ISTAB) .LE. SIGMA_Z(IDIST-1,ISTAB)) THEN
        CALL ERRLOC ('INPUT_TABLES', 'SIGMA_Z')
        WRITE(6,*) 'Successive SIGMA-Z values must be increasing;'
        WRITE(6,*) 'Error found at IRAD = ', IDIST-1, IDIST
        WRITE(6,*) 'for stability class ', LETTER(ISTAB)
        WRITE(7,*) 'Successive SIGMA-Z values must be increasing;'
        WRITE(7,*) 'Error found at IRAD = ', IDIST-1, IDIST
        WRITE(7,*) 'for stability class ', LETTER(ISTAB)
        CALL ABORT ('terminating execution')
      ENDIF
  100 CONTINUE
      RETURN
      END
      FUNCTION IGET_NUM_DIST (RECNAM, ICOL, IMIN, IINIT, IMAX,
     1                        RANGE, FOUND, SUBNAM, VARNAM)
C
C THIS FUNCTION is a special-purpose version of FUNCTION IGET1, differing
C in that it writes a different message if the record identifier is not found.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C IMIN   - MINIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C IINIT  - INITIAL VALUE, THIS VALUE IS RETURNED IF THE REQUEST CANNOT BE MET
C IMAX   - MAXIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
C AN ATTEMPT TO EXPLAIN SOME OF WHAT IS GOING ON HERE FOLLOWS:
C
C IF THE RECORD IDENTIFIER RECNAM MATCHES THE CURRENT RECORD IDENTIFIER,
C THEN THE VALUE FOUND AT THE NEXT POINTER POSITION IS RETURNED.
C
C IF THE CURRENT RECORD IDENTIFIER DOES NOT MATCH ALL OF THE RESPECTIVE
C CHARACTERS IN RECNAM, THEN A SEARCH FOR AN EXACT MATCH IS PERFORMED
C STARTING AT THE BEGINNING OF THE DATABASE.
C
C A NON-ZERO VALUE OF ICOL INDICATES THAT THE VALUE WHICH IS FOUND
C AT THE ICOL POSITION IN THE FIELD IS TO BE RETURNED TO THE CALLER.
C
C IF (ICOL .GT. 0) THEN SUCCESSIVE VALUES IN A COLUMN OF DATA ARE
```

```
C ACCESSED SEQUENTIALLY IN THE SAME MANNER THAT ROWS OF DATA ARE
C ACCESSED WHEN (ICOL .EQ. 0).
C IF THE RECORD IDENTIFIER RECNAM MATCHES THE CURRENT RECORD IDENTIFIER,
C THEN THE VALUE FOUND AT THE NEXT POINTER POSITION IS RETURNED.
C
C IF THE CURRENT RECORD IDENTIFIER DOES NOT MATCH ALL OF THE RESPECTIVE
C CHARACTERS IN RECNAM, THEN A SEARCH FOR AN EXACT MATCH IS PERFORMED
C STARTING AT THE BEGINNING OF THE DATABASE.
C
C A NON-ZERO VALUE OF ICOL INDICATES THAT THE VALUE WHICH IS FOUND
C AT THE ICOL POSITION IN THE FIELD IS TO BE RETURNED TO THE CALLER.
C
C IF (ICOL .GT. 0) THEN SUCCESSIVE VALUES IN A COLUMN OF DATA ARE
C ACCESSED SEQUENTIALLY IN THE SAME MANNER THAT ROWS OF DATA ARE
C ACCESSED WHEN (ICOL .EQ. 0).
C
C MODIFIED 26 FEB 88, D. CHANIN.
C MODIFIED 6/20/89/, DIC, LOG # 9/26/88-A,
C   FAILURE TO INITIALIZE FUNCTION VALUE FOR ERROR RETURN
C MODIFIED 9/13/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO FOR LOG # 9/14/89-A, CLEANUP OF THE STRUCTURE CHARTS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C MODIFIED 7/21/95, DIC, incorporate table-lookup option for sigma-y/z
C
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      LOGICAL EOR, FLAG(4), FOUND, LVAL, RANGE
C
C  DEFINE THE VALUE OF THE FUNCTION AND ERROR FLAGS
C
      IGET_NUM_DIST = IINIT
      RANGE = .FALSE.
      FOUND = .FALSE.
C
C  SET INTEGER VARIABLE TYPE FLAG
      ITYPE = 3
C
C  VALIDATE ICOL
      IF (ICOL .LT. 0 .OR. ICOL .GT. 40) THEN
C
C  WRITE ERROR MESSAGE
       WRITE(6,1001) SUBNAM, VARNAM, RECNAM
       WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
       WRITE(7,1001) SUBNAM, VARNAM, RECNAM
       WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
       RETURN
      ENDIF
C
C  CHECK LENGTH OF ID
      L = LEN(RECNAM)
 2000 CONTINUE
C
C  CHECK FOR SEARCH OF RECORD ID RECNAM
      IF (L .EQ. 11) THEN
C
C  TRANSFER RECORD ID TO TEMPORARY STORAGE FOR SEARCH
       CLOC = RECNAM
```

```
C
C  SEARCH FOR RECORD ID RECNAM
       CALL SEARCH (L, IPOINT)
C
C  CHECK FOR RECORD ID NOT LOCATED
       IF (IPOINT .EQ. 0) THEN
C
C  RECORD ID NOT LOCATED
          WRITE(6,1002)
          RETURN
       ENDIF
C
C  RESET LENGTH OF ID TO BE VERIFIED
       L = 8
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
       IC = 12
      ELSE
       IF (EOR .OR. ICOL .GT. 0) THEN
C
C  INCREMENT POINTER
          IPOINT = IPOINT + 1
C
C  VALIDATE ID
          IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) THEN
C
C  CURRENT ARRAY VALUE NOT FOUND
C  WRITE ERROR MESSAGE
             WRITE(6,1001) SUBNAM, VARNAM, RECNAM
             WRITE(7,1001) SUBNAM, VARNAM, RECNAM
             RETURN
          ENDIF
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
          IC = 12
       ENDIF
      ENDIF
C
C  SET USED FLAG FOR CURRENT RECORD
      CRDFLG(IPNT(IPOINT)) = .TRUE.
C
C  RETRIEVE VALUE FROM RECORD
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
C
C  CHECK FOR END-OF-RECORD WHILE READING A ROW OF DATA
      IF (EOR .AND. ICOL .EQ. 0) GO TO 2000
C
C  SET FOUND FLAG FOR DESIRED VALUE TYPE
      FOUND = FLAG(ITYPE)
C
C  LOOKING FOR INTEGER VALUE
      IF (FOUND) THEN
C
C  VALIDATE INTEGER RANGE
       IF (IVAL .GE. IMIN .AND. IVAL .LE. IMAX) THEN
C
C  INTEGER VALUE RANGE VALIDATED SO SET RETRIEVED VALUE
          IGET_NUM_DIST = IVAL
C
C  VALID RANGE
          RANGE = .TRUE.
       ELSE
```

```
          WRITE(6,1001) SUBNAM, VARNAM, RECNAM
          WRITE(6,*) '>>>>>INTEGER VALUE OUT OF RANGE:', IVAL
          WRITE(6,*) '>>>>>RANGE IS ',IMIN,' TO ',IMAX,', INCLUSIVE'
          WRITE(7,1001) SUBNAM, VARNAM, RECNAM
          WRITE(7,*) '>>>>>INTEGER VALUE OUT OF RANGE:', IVAL
          WRITE(7,*) '>>>>>RANGE IS ',IMIN,' TO ',IMAX,', INCLUSIVE'
        ENDIF
       ELSE
        WRITE(6,1001) SUBNAM, VARNAM, RECNAM
        WRITE(6,*) '>>>>>INTEGER VALUE NOT FOUND'
        WRITE(7,1001) SUBNAM, VARNAM, RECNAM
        WRITE(7,*) '>>>>>INTEGER VALUE NOT FOUND'
       ENDIF
       RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
 1002 FORMAT(/' >>The Record Identifier NUM_DIST001 was not found:',
     1       /' >>the sigma-y/sigma-z tables are not being processed'/)
       END
       SUBROUTINE SETUP
C
C Driver routine to set up interpolation tables for sigma-y/z table-lookup
C using a Hermite cubic interpolation scheme obtained from Numerical Methods
C and Software by D. Kahaner, C. Moler, and S. Nash, Prentice Hall, 1989.
C
C This routine is called by SUBROUTINE INPDIS.
C
C Glossary of Variables:
C
C DISTANCE - array of downwind distances used for sigma-y/z lookup tables (m)
C D_INVRS_Y(IDIST,ISTAB) - derivatives of sigma-y for each distance/stability
C D_INVRS_Z(IDIST,ISTAB) - derivatives of sigma-z for each distance/stability
C D_SIGMA_Y(IDIST,ISTAB) - derivatives of inverse sigma-y for each combination
C D_SIGMA_Z(IDIST,ISTAB) - derivatives of inverse sigma-z for each combination
C SIGMA_Y - table-lookup sigma-y array at the corresponding values of DISTANCE
C SIGMA_Z - table-lookup sigma-z array at the corresponding values of DISTANCE
C SPLINE - logical flag indicating use of spline (.FALSE.) or hermite (.TRUE.)
C WK - working storage array that needs to be dimensioned to twice MAX_DIST
C
C Glossary of Externals:
C
C PCHEZ - canned routine to set up hermite cubic interpolation obtained from
C         Numerical Methods and Software by Kahaner, Moler, and Nash,
C         Prentice Hall, 1989.
C
C D. Chanin, 7/21/95.  Plume-size table lookup feature implemented at v. 1.11
C
       PARAMETER (MAX_DIST=50, MAX_STAB=6)
       LOGICAL SPLINE
       COMMON /DISP_TABLES/ NUM_DIST, DISTANCE(MAX_DIST),
     1  SIGMA_Y(MAX_DIST,MAX_STAB), SIGMA_Z(MAX_DIST,MAX_STAB),
     2   D_SIGMA_Y(MAX_DIST,MAX_STAB), D_SIGMA_Z(MAX_DIST,MAX_STAB),
     3   D_INVRS_Y(MAX_DIST,MAX_STAB), D_INVRS_Z(MAX_DIST,MAX_STAB)
       REAL WK(100) ! dimensioned to twice the value of MAX_DIST
C
C Set to .FALSE. for hermite cubic interpolation and .TRUE. for cubic spline
C
       SPLINE = .FALSE.

       DO 20 ISTAB = 1, MAX_STAB
       CALL PCHEZ (NUM_DIST, DISTANCE, SIGMA_Y(1,ISTAB),
     1  D_SIGMA_Y(1,ISTAB), SPLINE, WK, 100, IERR)
```

```
      IF (IERR .LT. 0) THEN
      WRITE(6,*) 'ERROR CALLING PCHEZ, SIGMA-Y:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      WRITE(7,*) 'ERROR CALLING PCHEZ, SIGMA-Y:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      CALL ABORT ('terminating')
      ENDIF
      CALL PCHEZ (NUM_DIST, DISTANCE, SIGMA_Z(1,ISTAB),
     1  D_SIGMA_Z(1,ISTAB), SPLINE, WK, 100, IERR)
      IF (IERR .LT. 0) THEN
      WRITE(6,*) 'ERROR CALLING PCHEZ, SIGMA-Z:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      WRITE(7,*) 'ERROR CALLING PCHEZ, SIGMA-Z:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      CALL ABORT ('terminating')
      ENDIF
      CALL PCHEZ (NUM_DIST, SIGMA_Y(1,ISTAB), DISTANCE,
     1  D_INVRS_Y(1,ISTAB), SPLINE, WK, 100, IERR)
      IF (IERR .LT. 0) THEN
      WRITE(6,*) 'ERROR CALLING PCHEZ, INVERSE SIGMA-Y:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      WRITE(7,*) 'ERROR CALLING PCHEZ, INVERSE SIGMA-Y:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      CALL ABORT ('terminating')
      ENDIF
      CALL PCHEZ (NUM_DIST, SIGMA_Z(1,ISTAB), DISTANCE,
     1  D_INVRS_Z(1,ISTAB), SPLINE, WK, 100, IERR)
      IF (IERR .LT. 0) THEN
      WRITE(6,*) 'ERROR CALLING PCHEZ, INVERSE SIGMA-Z:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      WRITE(7,*) 'ERROR CALLING PCHEZ, INVERSE SIGMA-Z:',
     1             ' (IERR,ISTAB) = ', IERR, ISTAB
      CALL ABORT ('terminating')
      ENDIF
   20 CONTINUE

      RETURN
      END
      SUBROUTINE PCHEZ(N,X,F,D,SPLINE,WK,LWK,IERR)
C***BEGIN PROLOGUE  PCHEZ
C***DATE WRITTEN   870821   (YYMMDD)
C***REVISION DATE  870908   (YYMMDD)
C***CATEGORY NO.  E1B
C***KEYWORDS  CUBIC HERMITE MONOTONE INTERPOLATION, SPLINE
C             INTERPOLATION, EASY TO USE PIECEWISE CUBIC INTERPOLATION
C***AUTHOR  KAHANER, D.K., (NBS)
C             SCIENTIFIC COMPUTING DIVISION
C             NATIONAL BUREAU OF STANDARDS
C             GAITHERSBURG, MARYLAND 20899
C             (301) 975-3808
C***PURPOSE  Easy to use spline or cubic Hermite interpolation.
C***DESCRIPTION
C
C          PCHEZ:  Piecewise Cubic Interpolation, Easy to Use.
C
C     From the book "Numerical Methods and Software"
C          by  D. Kahaner, C. Moler, S. Nash
C               Prentice Hall 1988
C
C     Sets derivatives for spline (two continuous derivatives) or
C     Hermite cubic (one continuous derivative) interpolation.
C     Spline interpolation is smoother, but may not "look" right if the
C     data contains both "steep" and "flat" sections.  Hermite cubics
```

```
C     can produce a "visually pleasing" and monotone interpolant to
C     monotone data. This is an easy to use driver for the routines
C     by F. N. Fritsch in reference (4) below. Various boundary
C     conditions are set to default values by PCHEZ. Many other choices
C     are available in the subroutines PCHIC, PCHIM and PCHSP.
C
C     Use PCHEV to evaluate the resulting function and its derivative.
C
C ---------------------------------------------------------------------
C
C  Calling sequence:   CALL  PCHEZ (N, X, F, D, SPLINE, WK, LWK, IERR)
C
C     INTEGER  N, IERR,  LWK
C     REAL  X(N), F(N), D(N), WK(*)
C     LOGICAL SPLINE
C
C   Parameters:
C
C     N -- (input) number of data points.  (Error return if N.LT.2 .)
C           If N=2, simply does linear interpolation.
C
C     X -- (input) real array of independent variable values.  The
C           elements of X must be strictly increasing:
C                X(I-1) .LT. X(I),  I = 2(1)N.
C           (Error return if not.)
C
C     F -- (input) real array of dependent variable values to be inter-
C           polated.  F(I) is value corresponding to X(I).
C
C     D -- (output) real array of derivative values at the data points.
C
C     SPLINE -- (input) logical variable to specify if the interpolant
C           is to be a spline with two continuous derivaties
C           (set SPLINE=.TRUE.) or a Hermite cubic interpolant with one
C           continuous derivative (set SPLINE=.FALSE.).
C        Note: If SPLINE=.TRUE. the interpolating spline satisfies the
C           default "not-a-knot" boundary condition, with a continuous
C           third derivative at X(2) and X(N-1). See reference (3).
C              If SPLINE=.FALSE. the interpolating Hermite cubic will be
C           monotone if the input data is monotone. Boundary conditions are
C           computed from the derivative of a local quadratic unless this
C           alters monotonicity.
C
C     WK -- (scratch) real work array, which must be declared by the calling
C           program to be at least 2*N if SPLINE is .TRUE. and not used
C           otherwise.
C
C     LWK -- (input) length of work array WK. (Error return if
C           LWK.LT.2*N and SPLINE is .TRUE., not checked otherwise.)
C
C     IERR -- (output) error flag.
C           Normal return:
C              IERR = 0  (no errors).
C           Warning error:
C              IERR.GT.0  (can only occur when SPLINE=.FALSE.) means that
C                 IERR switches in the direction of monotonicity were detected.
C                 When SPLINE=.FALSE.,  PCHEZ guarantees that if the input
C                 data is monotone, the interpolant will be too. This warning
C                 is to alert you to the fact that the input data was not
C                 monotone.
C           "Recoverable" errors:
C              IERR = -1  if N.LT.2 .
C              IERR = -3  if the X-array is not strictly increasing.
```

```
C              IERR = -7  if LWK is less than 2*N and SPLINE is .TRUE.
C             (The D-array has not been changed in any of these cases.)
C               NOTE:  The above errors are checked in the order listed,
C                   and following arguments have **NOT** been validated.
C
C ---------------------------------------------------------------------
C***REFERENCES  1. F.N.FRITSCH AND R.E.CARLSON, 'MONOTONE PIECEWISE
C                  CUBIC INTERPOLATION,' SIAM J.NUMER.ANAL. 17, 2 (APRIL
C                  1980), 238-246.
C               2. F.N.FRITSCH AND J.BUTLAND, 'A METHOD FOR CONSTRUCTING
C                  LOCAL MONOTONE PIECEWISE CUBIC INTERPOLANTS,' LLNL
C                  PREPRINT UCRL-87559 (APRIL 1982).
C               3. CARL DE BOOR, A PRACTICAL GUIDE TO SPLINES, SPRINGER-
C                  VERLAG (NEW YORK, 1978).  (ESP. CHAPTER IV, PP.49-62.)
C               4. F.N.FRITSCH, 'PIECEWISE CUBIC HERMITE INTERPOLATION
C                  PACKAGE, FINAL SPECIFICATIONS', LAWRENCE LIVERMORE
C                  NATIONAL LABORATORY, COMPUTER DOCUMENTATION UCID-30194,
C                  AUGUST 1982.
C***ROUTINES CALLED  PCHIM,PCHSP
C***END PROLOGUE  PCHEZ
      INTEGER  N, LWK, IERR
      REAL  X(N), F(N), D(N), WK(LWK)
      LOGICAL SPLINE
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER IC(2), INCFD
      REAL  VC(2)
      DATA IC(1) /0/
      DATA IC(2) /0/
      DATA INCFD /1/
C
C
C***FIRST EXECUTABLE STATEMENT  PCHEZ
C
      IF ( SPLINE ) THEN
      CALL  PCHSP (IC, VC, N, X, F, D, INCFD, WK, LWK, IERR)
      ELSE
      CALL  PCHIM (N, X, F, D, INCFD, IERR)
      ENDIF
C
C  ERROR CONDITIONS ALREADY CHECKED IN PCHSP OR PCHIM

      RETURN
C------------- LAST LINE OF PCHEZ FOLLOWS -----------------------------
      END
      SUBROUTINE PCHIM(N,X,F,D,INCFD,IERR)
C***BEGIN PROLOGUE  PCHIM
C     THIS PROLOGUE HAS BEEN REMOVED FOR REASONS OF SPACE
C     FOR A COMPLETE COPY OF THIS ROUTINE CONTACT THE AUTHORS
C     From the book "Numerical Methods and Software"
C          by  D. Kahaner, C. Moler, S. Nash
C               Prentice Hall 1988
C***END PROLOGUE  PCHIM
C
C  DECLARE ARGUMENTS.
C
      INTEGER  N, INCFD, IERR
      REAL  X(N), F(INCFD,N), D(INCFD,N)
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER  I, NLESS1
```

```
      REAL  DEL1, DEL2, DMAX, DMIN, DRAT1, DRAT2, DSAVE,
     *      H1, H2, HSUM, HSUMT3, THREE, W1, W2, ZERO
      REAL  PCHST
      DATA  ZERO /0./,  THREE /3./
C
C  VALIDITY-CHECK ARGUMENTS.
C
C***FIRST EXECUTABLE STATEMENT  PCHIM
      IF ( N.LT.2 )  GO TO 5001
      IF ( INCFD.LT.1 )  GO TO 5002
      DO 1  I = 2, N
       IF ( X(I).LE.X(I-1) )  GO TO 5003
    1 CONTINUE
C
C  FUNCTION DEFINITION IS OK, GO ON.
C
      IERR = 0
      NLESS1 = N - 1
      H1 = X(2) - X(1)
      DEL1 = (F(1,2) - F(1,1))/H1
      DSAVE = DEL1
C
C  SPECIAL CASE N=2 -- USE LINEAR INTERPOLATION.
C
      IF (NLESS1 .GT. 1)  GO TO 10
      D(1,1) = DEL1
      D(1,N) = DEL1
      GO TO 5000
C
C  NORMAL CASE  (N .GE. 3).
C
   10 CONTINUE
      H2 = X(3) - X(2)
      DEL2 = (F(1,3) - F(1,2))/H2
C
C  SET D(1) VIA NON-CENTERED THREE-POINT FORMULA, ADJUSTED TO BE
C     SHAPE-PRESERVING.
C
      HSUM = H1 + H2
      W1 = (H1 + HSUM)/HSUM
      W2 = -H1/HSUM
      D(1,1) = W1*DEL1 + W2*DEL2
      IF ( PCHST(D(1,1),DEL1) .LE. ZERO)  THEN
       D(1,1) = ZERO
      ELSE IF ( PCHST(DEL1,DEL2) .LT. ZERO)  THEN
C        NEED DO THIS CHECK ONLY IF MONOTONICITY SWITCHES.
       DMAX = THREE*DEL1
       IF (ABS(D(1,1)) .GT. ABS(DMAX))  D(1,1) = DMAX
      ENDIF
C
C  LOOP THROUGH INTERIOR POINTS.
C
      DO 50  I = 2, NLESS1
       IF (I .EQ. 2)  GO TO 40
C
       H1 = H2
       H2 = X(I+1) - X(I)
       HSUM = H1 + H2
       DEL1 = DEL2
       DEL2 = (F(1,I+1) - F(1,I))/H2
   40    CONTINUE
C
C        SET D(I)=0 UNLESS DATA ARE STRICTLY MONOTONIC.
```

```
C
      D(1,I) = ZERO
      IF ( PCHST(DEL1,DEL2) )  42, 41, 45
C
C       COUNT NUMBER OF CHANGES IN DIRECTION OF MONOTONICITY.
C
   41   CONTINUE
      IF (DEL2 .EQ. ZERO)  GO TO 50
      IF ( PCHST(DSAVE,DEL2) .LT. ZERO)  IERR = IERR + 1
      DSAVE = DEL2
      GO TO 50
C
   42   CONTINUE
      IERR = IERR + 1
      DSAVE = DEL2
      GO TO 50
C
C       USE BRODLIE MODIFICATION OF BUTLAND FORMULA.
C
   45   CONTINUE
      HSUMT3 = HSUM+HSUM+HSUM
      W1 = (HSUM + H1)/HSUMT3
      W2 = (HSUM + H2)/HSUMT3
      DMAX = AMAX1( ABS(DEL1), ABS(DEL2) )
      DMIN = AMIN1( ABS(DEL1), ABS(DEL2) )
      DRAT1 = DEL1/DMAX
      DRAT2 = DEL2/DMAX
      D(1,I) = DMIN/(W1*DRAT1 + W2*DRAT2)
C
   50 CONTINUE
C
C  SET D(N) VIA NON-CENTERED THREE-POINT FORMULA, ADJUSTED TO BE
C     SHAPE-PRESERVING.
C
      W1 = -H2/HSUM
      W2 = (H2 + HSUM)/HSUM
      D(1,N) = W1*DEL1 + W2*DEL2
      IF ( PCHST(D(1,N),DEL2) .LE. ZERO)  THEN
       D(1,N) = ZERO
      ELSE IF ( PCHST(DEL1,DEL2) .LT. ZERO)  THEN
C        NEED DO THIS CHECK ONLY IF MONOTONICITY SWITCHES.
       DMAX = THREE*DEL2
       IF (ABS(D(1,N)) .GT. ABS(DMAX))  D(1,N) = DMAX
      ENDIF
C
C  NORMAL RETURN.
C
 5000 CONTINUE
      RETURN
C
C  ERROR RETURNS.
C
 5001 CONTINUE
C     N.LT.2 RETURN.
      IERR = -1
      CALL XERROR ('PCHIM -- NUMBER OF DATA POINTS LESS THAN TWO'
     *            , 44, IERR, 1)
      RETURN
C
 5002 CONTINUE
C     INCFD.LT.1 RETURN.
      IERR = -2
      CALL XERROR ('PCHIM -- INCREMENT LESS THAN ONE'
```

```
     *            , 32, IERR, 1)
      RETURN
C
 5003 CONTINUE
C     X-ARRAY NOT STRICTLY INCREASING.
      IERR = -3
      CALL XERROR ('PCHIM -- X-ARRAY NOT STRICTLY INCREASING'
     *            , 40, IERR, 1)
      RETURN
C------------- LAST LINE OF PCHIM FOLLOWS -----------------------------
      END
      REAL FUNCTION PCHST(ARG1,ARG2)
C***BEGIN PROLOGUE  PCHST
C***REFER TO  PCHCE,PCHCI,PCHCS,PCHIM
C***END PROLOGUE  PCHST
      REAL  ARG1, ARG2
C
C  DECLARE LOCAL VARIABLES.
C
      REAL  ONE, ZERO
      DATA  ZERO /0./,  ONE /1./
C
C  PERFORM THE TEST.
C
C***FIRST EXECUTABLE STATEMENT  PCHST
      PCHST = SIGN(ONE,ARG1) * SIGN(ONE,ARG2)
      IF ((ARG1.EQ.ZERO) .OR. (ARG2.EQ.ZERO))  PCHST = ZERO
C
      RETURN
C------------- LAST LINE OF PCHST FOLLOWS -----------------------------
      END
      SUBROUTINE PCHSP(IC,VC,N,X,F,D,INCFD,WK,NWK,IERR)
C***BEGIN PROLOGUE  PCHSP
C     THIS PROLOGUE HAS BEEN REMOVED FOR REASONS OF SPACE
C     FOR A COMPLETE COPY OF THIS ROUTINE CONTACT THE AUTHORS
C     From the book "Numerical Methods and Software"
C          by  D. Kahaner, C. Moler, S. Nash
C               Prentice Hall 1988
C***END PROLOGUE  PCHSP
C
C  DECLARE ARGUMENTS.
C
      INTEGER  IC(2), N, INCFD, NWK, IERR
      REAL  VC(2), X(N), F(INCFD,N), D(INCFD,N), WK(2,N)
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER  IBEG, IEND, INDEX, J, NM1
      REAL  G, HALF, ONE, STEMP(3), THREE, TWO, XTEMP(4), ZERO
      REAL  PCHDF
C
      DATA  ZERO /0./,  HALF /0.5/,  ONE /1./,  TWO /2./,  THREE /3./
C
C  VALIDITY-CHECK ARGUMENTS.
C
C***FIRST EXECUTABLE STATEMENT  PCHSP
      IF ( N.LT.2 )  GO TO 5001
      IF ( INCFD.LT.1 )  GO TO 5002
      DO 1  J = 2, N
       IF ( X(J).LE.X(J-1) )  GO TO 5003
    1 CONTINUE
C
      IBEG = IC(1)
```

```
      IEND = IC(2)
      IERR = 0
      IF ( (IBEG.LT.0).OR.(IBEG.GT.4) )  IERR = IERR - 1
      IF ( (IEND.LT.0).OR.(IEND.GT.4) )  IERR = IERR - 2
      IF ( IERR.LT.0 )  GO TO 5004
C
C  FUNCTION DEFINITION IS OK -- GO ON.
C
      IF ( NWK .LT. 2*N )  GO TO 5007
C
C  COMPUTE FIRST DIFFERENCES OF X SEQUENCE AND STORE IN WK(1,.). ALSO,
C  COMPUTE FIRST DIVIDED DIFFERENCE OF DATA AND STORE IN WK(2,.).
      DO 5  J=2,N
       WK(1,J) = X(J) - X(J-1)
       WK(2,J) = (F(1,J) - F(1,J-1))/WK(1,J)
    5 CONTINUE
C
C  SET TO DEFAULT BOUNDARY CONDITIONS IF N IS TOO SMALL.
C
      IF ( IBEG.GT.N )  IBEG = 0
      IF ( IEND.GT.N )  IEND = 0
C
C  SET UP FOR BOUNDARY CONDITIONS.
C
      IF ( (IBEG.EQ.1).OR.(IBEG.EQ.2) )  THEN
       D(1,1) = VC(1)
      ELSE IF (IBEG .GT. 2)  THEN
C        PICK UP FIRST IBEG POINTS, IN REVERSE ORDER.
       DO 10  J = 1, IBEG
          INDEX = IBEG-J+1
C           INDEX RUNS FROM IBEG DOWN TO 1.
          XTEMP(J) = X(INDEX)
          IF (J .LT. IBEG)  STEMP(J) = WK(2,INDEX)
   10    CONTINUE
C                 --------------------------------
       D(1,1) = PCHDF (IBEG, XTEMP, STEMP, IERR)
C                 --------------------------------
       IF (IERR .NE. 0)  GO TO 5009
       IBEG = 1
      ENDIF
C
      IF ( (IEND.EQ.1).OR.(IEND.EQ.2) )  THEN
       D(1,N) = VC(2)
      ELSE IF (IEND .GT. 2)  THEN
C        PICK UP LAST IEND POINTS.
       DO 15  J = 1, IEND
          INDEX = N-IEND+J
C           INDEX RUNS FROM N+1-IEND UP TO N.
          XTEMP(J) = X(INDEX)
          IF (J .LT. IEND)  STEMP(J) = WK(2,INDEX+1)
   15    CONTINUE
C                 --------------------------------
       D(1,N) = PCHDF (IEND, XTEMP, STEMP, IERR)
C                 --------------------------------
       IF (IERR .NE. 0)  GO TO 5009
       IEND = 1
      ENDIF
C
C --------------------( BEGIN CODING FROM CUBSPL )--------------------
C
C  **** A TRIDIAGONAL LINEAR SYSTEM FOR THE UNKNOWN SLOPES S(J) OF
C  F  AT X(J), J=1,...,N, IS GENERATED AND THEN SOLVED BY GAUSS ELIM-
C  INATION, WITH S(J) ENDING UP IN D(1,J), ALL J.
```

```
C     WK(1,.) AND WK(2,.) ARE USED FOR TEMPORARY STORAGE.
C
C  CONSTRUCT FIRST EQUATION FROM FIRST BOUNDARY CONDITION, OF THE FORM
C             WK(2,1)*S(1) + WK(1,1)*S(2) = D(1,1)
C
      IF (IBEG .EQ. 0)  THEN
       IF (N .EQ. 2)  THEN
C           NO CONDITION AT LEFT END AND N = 2.
          WK(2,1) = ONE
          WK(1,1) = ONE
          D(1,1) = TWO*WK(2,2)
       ELSE
C           NOT-A-KNOT CONDITION AT LEFT END AND N .GT. 2.
          WK(2,1) = WK(1,3)
          WK(1,1) = WK(1,2) + WK(1,3)
          D(1,1) =((WK(1,2) + TWO*WK(1,1))*WK(2,2)*WK(1,3)
     *                        + WK(1,2)**2*WK(2,3)) / WK(1,1)
       ENDIF
      ELSE IF (IBEG .EQ. 1)  THEN
C        SLOPE PRESCRIBED AT LEFT END.
       WK(2,1) = ONE
       WK(1,1) = ZERO
      ELSE
C        SECOND DERIVATIVE PRESCRIBED AT LEFT END.
       WK(2,1) = TWO
       WK(1,1) = ONE
       D(1,1) = THREE*WK(2,2) - HALF*WK(1,2)*D(1,1)
      ENDIF
C
C  IF THERE ARE INTERIOR KNOTS, GENERATE THE CORRESPONDING EQUATIONS AND
C  CARRY OUT THE FORWARD PASS OF GAUSS ELIMINATION, AFTER WHICH THE J-TH
C  EQUATION READS    WK(2,J)*S(J) + WK(1,J)*S(J+1) = D(1,J).
C
      NM1 = N-1
      IF (NM1 .GT. 1)  THEN
       DO 20 J=2,NM1
          IF (WK(2,J-1) .EQ. ZERO)  GO TO 5008
          G = -WK(1,J+1)/WK(2,J-1)
          D(1,J) = G*D(1,J-1)
     *                  + THREE*(WK(1,J)*WK(2,J+1) + WK(1,J+1)*WK(2,J))
          WK(2,J) = G*WK(1,J-1) + TWO*(WK(1,J) + WK(1,J+1))
   20    CONTINUE
      ENDIF
C
C  CONSTRUCT LAST EQUATION FROM SECOND BOUNDARY CONDITION, OF THE FORM
C           (-G*WK(2,N-1))*S(N-1) + WK(2,N)*S(N) = D(1,N)
C
C     IF SLOPE IS PRESCRIBED AT RIGHT END, ONE CAN GO DIRECTLY TO BACK-
C     SUBSTITUTION, SINCE ARRAYS HAPPEN TO BE SET UP JUST RIGHT FOR IT
C     AT THIS POINT.
      IF (IEND .EQ. 1)  GO TO 30
C
      IF (IEND .EQ. 0)  THEN
       IF (N.EQ.2 .AND. IBEG.EQ.0)  THEN
C           NOT-A-KNOT AT RIGHT ENDPOINT AND AT LEFT ENDPOINT AND N = 2.
          D(1,2) = WK(2,2)
          GO TO 30
       ELSE IF ((N.EQ.2) .OR. (N.EQ.3 .AND. IBEG.EQ.0))  THEN
C           EITHER (N=3 AND NOT-A-KNOT ALSO AT LEFT) OR (N=2 AND *NOT*
C           NOT-A-KNOT AT LEFT END POINT).
          D(1,N) = TWO*WK(2,N)
          WK(2,N) = ONE
          IF (WK(2,N-1) .EQ. ZERO)  GO TO 5008
```

```
         G = -ONE/WK(2,N-1)
       ELSE
C          NOT-A-KNOT AND N .GE. 3, AND EITHER N.GT.3 OR  ALSO NOT-A-
C          KNOT AT LEFT END POINT.
         G = WK(1,N-1) + WK(1,N)
C          DO NOT NEED TO CHECK FOLLOWING DENOMINATORS (X-DIFFERENCES).
         D(1,N) = ((WK(1,N)+TWO*G)*WK(2,N)*WK(1,N-1)
     *                 + WK(1,N)**2*(F(1,N-1)-F(1,N-2))/WK(1,N-1))/G
         IF (WK(2,N-1) .EQ. ZERO)  GO TO 5008
         G = -G/WK(2,N-1)
         WK(2,N) = WK(1,N-1)
       ENDIF
      ELSE
C        SECOND DERIVATIVE PRESCRIBED AT RIGHT ENDPOINT.
       D(1,N) = THREE*WK(2,N) + HALF*WK(1,N)*D(1,N)
       WK(2,N) = TWO
       IF (WK(2,N-1) .EQ. ZERO)  GO TO 5008
       G = -ONE/WK(2,N-1)
      ENDIF
C
C  COMPLETE FORWARD PASS OF GAUSS ELIMINATION.
C
      WK(2,N) = G*WK(1,N-1) + WK(2,N)
      IF (WK(2,N) .EQ. ZERO)   GO TO 5008
      D(1,N) = (G*D(1,N-1) + D(1,N))/WK(2,N)
C
C  CARRY OUT BACK SUBSTITUTION
C
   30 CONTINUE
      DO 40 J=NM1,1,-1
       IF (WK(2,J) .EQ. ZERO)  GO TO 5008
       D(1,J) = (D(1,J) - WK(1,J)*D(1,J+1))/WK(2,J)
   40 CONTINUE
C --------------------(  END  CODING FROM CUBSPL )--------------------
C
C  NORMAL RETURN.
C
      RETURN
C
C  ERROR RETURNS.
C
 5001 CONTINUE
C     N.LT.2 RETURN.
      IERR = -1
      CALL XERROR ('PCHSP -- NUMBER OF DATA POINTS LESS THAN TWO'
     *            , 44, IERR, 1)
      RETURN
C
 5002 CONTINUE
C     INCFD.LT.1 RETURN.
      IERR = -2
      CALL XERROR ('PCHSP -- INCREMENT LESS THAN ONE'
     *            , 32, IERR, 1)
      RETURN
C
 5003 CONTINUE
C     X-ARRAY NOT STRICTLY INCREASING.
      IERR = -3
      CALL XERROR ('PCHSP -- X-ARRAY NOT STRICTLY INCREASING'
     *            , 40, IERR, 1)
      RETURN
C
 5004 CONTINUE
```

```
C     IC OUT OF RANGE RETURN.
      IERR = IERR - 3
      CALL XERROR ('PCHSP -- IC OUT OF RANGE'
     *            , 24, IERR, 1)
      RETURN
C
 5007 CONTINUE
C     NWK TOO SMALL RETURN.
      IERR = -7
      CALL XERROR ('PCHSP -- WORK ARRAY TOO SMALL'
     *            , 29, IERR, 1)
      RETURN
C
 5008 CONTINUE
C     SINGULAR SYSTEM.
C   *** THEORETICALLY, THIS CAN ONLY OCCUR IF SUCCESSIVE X-VALUES   ***
C   *** ARE EQUAL, WHICH SHOULD ALREADY HAVE BEEN CAUGHT (IERR=-3). ***
      IERR = -8
      CALL XERROR ('PCHSP -- SINGULAR LINEAR SYSTEM'
     *            , 31, IERR, 1)
      RETURN
C
 5009 CONTINUE
C     ERROR RETURN FROM PCHDF.
C   *** THIS CASE SHOULD NEVER OCCUR ***
      IERR = -9
      CALL XERROR ('PCHSP -- ERROR RETURN FROM PCHDF'
     *            , 32, IERR, 1)
      RETURN
C------------- LAST LINE OF PCHSP FOLLOWS -----------------------------
      END
      REAL FUNCTION PCHDF(K,X,S,IERR)
C***BEGIN PROLOGUE  PCHDF
C***REFER TO  PCHCE,PCHSP
C***END PROLOGUE  PCHDF
      INTEGER  K, IERR
      REAL  X(K), S(K)
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER  I, J
      REAL  VALUE, ZERO
      DATA  ZERO /0./
C
C  CHECK FOR LEGAL VALUE OF K.
C
C***FIRST EXECUTABLE STATEMENT  PCHDF
      IF (K .LT. 3)  GO TO 5001
C
C  COMPUTE COEFFICIENTS OF INTERPOLATING POLYNOMIAL.
C
      DO 10  J = 2, K-1
       DO 9  I = 1, K-J
          S(I) = (S(I+1)-S(I))/(X(I+J)-X(I))
    9    CONTINUE
   10 CONTINUE
C
C  EVALUATE DERIVATIVE AT X(K).
C
      VALUE = S(1)
      DO 20  I = 2, K-1
       VALUE = S(I) + VALUE*(X(K)-X(I))
   20 CONTINUE
```

```
C
C  NORMAL RETURN.
C
      IERR = 0
      PCHDF = VALUE
      RETURN
C
C  ERROR RETURN.
C
 5001 CONTINUE
C     K.LT.3 RETURN.
      IERR = -1
      CALL XERROR ('PCHDF -- K LESS THAN THREE'
     *            , 26, IERR, 1)
      PCHDF = ZERO
      RETURN
C------------- LAST LINE OF PCHDF FOLLOWS ------------------------------
      END
      SUBROUTINE PCHEV(N,X,F,D,NVAL,XVAL,FVAL,DVAL,IERR)
C***BEGIN PROLOGUE  PCHEV
C***DATE WRITTEN   870828   (YYMMDD)
C***REVISION DATE  870828   (YYMMDD)
C***CATEGORY NO.  E3,H1
C***KEYWORDS  CUBIC HERMITE OR SPLINE DIFFERENTIATION,CUBIC HERMITE
C             EVALUATION,EASY TO USE SPLINE OR CUBIC HERMITE EVALUATOR
C***AUTHOR  KAHANER, D.K., (NBS)
C             SCIENTIFIC COMPUTING DIVISION
C             NATIONAL BUREAU OF STANDARDS
C             ROOM A161, TECHNOLOGY BUILDING
C             GAITHERSBURG, MARYLAND 20899
C             (301) 975-3808
C***PURPOSE  Evaluates the function and first derivative of a piecewise
C            cubic Hermite or spline function at an array of points XVAL,
C            easy to use.
C***DESCRIPTION
C
C          PCHEV:  Piecewise Cubic Hermite or Spline Derivative Evaluator,
C                  Easy to Use.
C
C     From the book "Numerical Methods and Software"
C          by  D. Kahaner, C. Moler, S. Nash
C                 Prentice Hall 1988
C
C     Evaluates the function and first derivative of the cubic Hermite
C     or spline function defined by  N, X, F, D, at the array of points XVAL.
C
C     This is an easy to use driver for the routines by F.N. Fritsch
C     described in reference (2) below. Those also have other capabilities.
C
C ----------------------------------------------------------------------
C
C  Calling sequence: CALL  PCHEV (N, X, F, D, NVAL, XVAL, FVAL, DVAL, IERR)
C
C     INTEGER  N, NVAL, IERR
C     REAL  X(N), F(N), D(N), XVAL(NVAL), FVAL(NVAL), DVAL(NVAL)
C
C   Parameters:
C
C     N -- (input) number of data points.  (Error return if N.LT.2 .)
C
C     X -- (input) real array of independent variable values.  The
C           elements of X must be strictly increasing:
C             X(I-1) .LT. X(I),  I = 2(1)N. (Error return if not.)
```

```
C
C     F -- (input) real array of function values.  F(I) is
C           the value corresponding to X(I).
C
C     D -- (input) real array of derivative values.  D(I) is
C           the value corresponding to X(I).
C
C  NVAL -- (input) number of points at which the functions are to be
C           evaluated. ( Error return if NVAL.LT.1 )
C
C  XVAL -- (input) real array of points at which the functions are to
C           be evaluated.
C
C          NOTES:
C           1. The evaluation will be most efficient if the elements
C              of XVAL are increasing relative to X;
C              that is,   XVAL(J) .GE. X(I)
C              implies    XVAL(K) .GE. X(I),  all K.GE.J .
C           2. If any of the XVAL are outside the interval [X(1),X(N)],
C              values are extrapolated from the nearest extreme cubic,
C              and a warning error is returned.
C
C  FVAL -- (output) real array of values of the cubic Hermite function
C           defined by  N, X, F, D  at the points  XVAL.
C
C  DVAL -- (output) real array of values of the first derivative of
C           the same function at the points  XVAL.
C
C  IERR -- (output) error flag.
C           Normal return:
C              IERR = 0  (no errors).
C           Warning error:
C              IERR.GT.0  means that extrapolation was performed at
C                 IERR points.
C           "Recoverable" errors:
C              IERR = -1  if N.LT.2 .
C              IERR = -3  if the X-array is not strictly increasing.
C              IERR = -4  if NVAL.LT.1 .
C           (Output arrays have not been changed in any of these cases.)
C               NOTE:  The above errors are checked in the order listed,
C                   and following arguments have **NOT** been validated.
C              IERR = -5  if an error has occurred in the lower-level
C                         routine CHFDV.  NB: this should never happen.
C                         Notify the author **IMMEDIATELY** if it does.
C
C -----------------------------------------------------------------------
C***REFERENCES  1. F.N.FRITSCH AND R.E.CARLSON, 'MONOTONE PIECEWISE
C                 CUBIC INTERPOLATION,' SIAM J.NUMER.ANAL. 17, 2 (APRIL
C                 1980), 238-246.
C               2. F.N.FRITSCH, 'PIECEWISE CUBIC HERMITE INTERPOLATION
C                 PACKAGE, FINAL SPECIFICATIONS', LAWRENCE LIVERMORE
C                 NATIONAL LABORATORY, COMPUTER DOCUMENTATION UCID-30194,
C                 AUGUST 1982.
C***ROUTINES CALLED  PCHFD
C***END PROLOGUE  PCHEV
      INTEGER  N, NVAL, IERR
      REAL  X(N), F(N), D(N), XVAL(NVAL), FVAL(NVAL), DVAL(NVAL)
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER INCFD
      LOGICAL SKIP
      DATA SKIP /.TRUE./
```

```
      DATA INCFD /1/
C
C
C***FIRST EXECUTABLE STATEMENT  PCHEV
C
      CALL PCHFD(N,X,F,D,INCFD,SKIP,NVAL,XVAL,FVAL,DVAL,IERR)
C
C
 5000 CONTINUE
      RETURN
C
C------------- LAST LINE OF PCHEV FOLLOWS -----------------------------
      END
      SUBROUTINE PCHFD(N,X,F,D,INCFD,SKIP,NE,XE,FE,DE,IERR)
C***BEGIN PROLOGUE  PCHFD
C     THIS PROLOGUE HAS BEEN REMOVED FOR REASONS OF SPACE
C     FOR A COMPLETE COPY OF THIS ROUTINE CONTACT THE AUTHORS
C     From the book "Numerical Methods and Software"
C          by  D. Kahaner, C. Moler, S. Nash
C               Prentice Hall 1988
C***END PROLOGUE  PCHFD
C
C  DECLARE ARGUMENTS.
C
      INTEGER  N, INCFD, NE, IERR
      REAL  X(N), F(INCFD,N), D(INCFD,N), XE(NE), FE(NE), DE(NE)
      LOGICAL  SKIP
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER  I, IERC, IR, J, JFIRST, NEXT(2), NJ
C
C  VALIDITY-CHECK ARGUMENTS.
C
C***FIRST EXECUTABLE STATEMENT  PCHFD
      IF (SKIP)  GO TO 5
C
      IF ( N.LT.2 )  GO TO 5001
      IF ( INCFD.LT.1 )  GO TO 5002
      DO 1  I = 2, N
       IF ( X(I).LE.X(I-1) )  GO TO 5003
    1 CONTINUE
C
C  FUNCTION DEFINITION IS OK, GO ON.
C
    5 CONTINUE
      IF ( NE.LT.1 )  GO TO 5004
      IERR = 0
      SKIP = .TRUE.
C
C  LOOP OVER INTERVALS.        (   INTERVAL INDEX IS  IL = IR-1  . )
C                              ( INTERVAL IS X(IL).LE.X.LT.X(IR) . )
      JFIRST = 1
      IR = 2
   10 CONTINUE
C
C     SKIP OUT OF LOOP IF HAVE PROCESSED ALL EVALUATION POINTS.
C
       IF (JFIRST .GT. NE)  GO TO 5000
C
C     LOCATE ALL POINTS IN INTERVAL.
C
```

```
      DO 20  J = JFIRST, NE
         IF (XE(J) .GE. X(IR))  GO TO 30
   20    CONTINUE
      J = NE + 1
      GO TO 40
C
C     HAVE LOCATED FIRST POINT BEYOND INTERVAL.
C
   30    CONTINUE
      IF (IR .EQ. N)  J = NE + 1
C
   40    CONTINUE
      NJ = J - JFIRST
C
C     SKIP EVALUATION IF NO POINTS IN INTERVAL.
C
      IF (NJ .EQ. 0)  GO TO 50
C
C     EVALUATE CUBIC AT XE(I),  I = JFIRST (1) J-1 .
C
C       ----------------------------------------------------------------
      CALL CHFDV (X(IR-1),X(IR), F(1,IR-1),F(1,IR), D(1,IR-1),D(1,IR),
     *              NJ, XE(JFIRST), FE(JFIRST), DE(JFIRST), NEXT, IERC)
C       ----------------------------------------------------------------
      IF (IERC .LT. 0)  GO TO 5005
C
      IF (NEXT(2) .EQ. 0)  GO TO 42
C       IF (NEXT(2) .GT. 0)  THEN
C          IN THE CURRENT SET OF XE-POINTS, THERE ARE NEXT(2) TO THE
C          RIGHT OF X(IR).
C
         IF (IR .LT. N)  GO TO 41
C          IF (IR .EQ. N)  THEN
C             THESE ARE ACTUALLY EXTRAPOLATION POINTS.
            IERR = IERR + NEXT(2)
            GO TO 42
   41       CONTINUE
C           ELSE
C             WE SHOULD NEVER HAVE GOTTEN HERE.
            GO TO 5005
C           ENDIF
C       ENDIF
   42    CONTINUE
C
      IF (NEXT(1) .EQ. 0)  GO TO 49
C       IF (NEXT(1) .GT. 0)  THEN
C          IN THE CURRENT SET OF XE-POINTS, THERE ARE NEXT(1) TO THE
C          LEFT OF X(IR-1).
C
         IF (IR .GT. 2)  GO TO 43
C          IF (IR .EQ. 2)  THEN
C             THESE ARE ACTUALLY EXTRAPOLATION POINTS.
            IERR = IERR + NEXT(1)
            GO TO 49
   43       CONTINUE
C           ELSE
C             XE IS NOT ORDERED RELATIVE TO X, SO MUST ADJUST
C             EVALUATION INTERVAL.
C
C             FIRST, LOCATE FIRST POINT TO LEFT OF X(IR-1).
            DO 44  I = JFIRST, J-1
            IF (XE(I) .LT. X(IR-1))  GO TO 45
   44         CONTINUE
```

```
C               NOTE-- CANNOT DROP THROUGH HERE UNLESS THERE IS AN ERROR
C                      IN CHFDV.
              GO TO 5005
C
   45           CONTINUE
C               RESET J.  (THIS WILL BE THE NEW JFIRST.)
              J = I
C
C               NOW FIND OUT HOW FAR TO BACK UP IN THE X-ARRAY.
              DO 46  I = 1, IR-1
               IF (XE(J) .LT. X(I)) GO TO 47
   46          CONTINUE
C              NB-- CAN NEVER DROP THROUGH HERE, SINCE XE(J).LT.X(IR-1).
C
   47          CONTINUE
C              AT THIS POINT, EITHER  XE(J) .LT. X(1)
C                 OR      X(I-1) .LE. XE(J) .LT. X(I) .
C              RESET IR, RECOGNIZING THAT IT WILL BE INCREMENTED BEFORE
C              CYCLING.
              IR = MAX0(1, I-1)
C            ENDIF
C         ENDIF
   49     CONTINUE
C
       JFIRST = J
C
C     END OF IR-LOOP.
C
   50 CONTINUE
      IR = IR + 1
      IF (IR .LE. N)  GO TO 10
C
C  NORMAL RETURN.
C
 5000 CONTINUE
      RETURN
C
C  ERROR RETURNS.
C
 5001 CONTINUE
C     N.LT.2 RETURN.
      IERR = -1
      CALL XERROR ('PCHFD -- NUMBER OF DATA POINTS LESS THAN TWO'
     *            , 44, IERR, 1)
      RETURN
C
 5002 CONTINUE
C     INCFD.LT.1 RETURN.
      IERR = -2
      CALL XERROR ('PCHFD -- INCREMENT LESS THAN ONE'
     *            , 32, IERR, 1)
      RETURN
C
 5003 CONTINUE
C     X-ARRAY NOT STRICTLY INCREASING.
      IERR = -3
      CALL XERROR ('PCHFD -- X-ARRAY NOT STRICTLY INCREASING'
     *            , 40, IERR, 1)
      RETURN
C
 5004 CONTINUE
C     NE.LT.1 RETURN.
      IERR = -4
```

```
      CALL XERROR ('PCHFD -- NUMBER OF EVALUATION POINTS LESS THAN ONE'
     *            , 50, IERR, 1)
      RETURN
C
 5005 CONTINUE
C     ERROR RETURN FROM CHFDV.
C   *** THIS CASE SHOULD NEVER OCCUR ***
      IERR = -5
      CALL XERROR ('PCHFD -- ERROR RETURN FROM CHFDV -- FATAL'
     *            , 41, IERR, 2)
      RETURN
C------------- LAST LINE OF PCHFD FOLLOWS -----------------------------
      END
      SUBROUTINE CHFDV(X1,X2,F1,F2,D1,D2,NE,XE,FE,DE,NEXT,IERR)
C***BEGIN PROLOGUE  CHFDV
C     THIS PROLOGUE HAS BEEN REMOVED FOR REASONS OF SPACE
C     FOR A COMPLETE COPY OF THIS ROUTINE CONTACT THE AUTHORS
C     From the book "Numerical Methods and Software"
C          by  D. Kahaner, C. Moler, S. Nash
C               Prentice Hall 1988
C***END PROLOGUE  CHFDV
C
C  DECLARE ARGUMENTS.
C
      INTEGER  NE, NEXT(2), IERR
      REAL  X1, X2, F1, F2, D1, D2, XE(NE), FE(NE), DE(NE)
C
C  DECLARE LOCAL VARIABLES.
C
      INTEGER  I
      REAL  C2, C2T2, C3, C3T3, DEL1, DEL2, DELTA, H, X, XMI, XMA, ZERO
      DATA  ZERO /0./
C
C  VALIDITY-CHECK ARGUMENTS.
C
C***FIRST EXECUTABLE STATEMENT  CHFDV
      IF (NE .LT. 1)  GO TO 5001
      H = X2 - X1
      IF (H .EQ. ZERO)  GO TO 5002
C
C  INITIALIZE.
C
      IERR = 0
      NEXT(1) = 0
      NEXT(2) = 0
      XMI = AMIN1(ZERO, H)
      XMA = AMAX1(ZERO, H)
C
C  COMPUTE CUBIC COEFFICIENTS (EXPANDED ABOUT X1).
C
      DELTA = (F2 - F1)/H
      DEL1 = (D1 - DELTA)/H
      DEL2 = (D2 - DELTA)/H
C                                          (DELTA IS NO LONGER NEEDED.)
      C2 = -(DEL1+DEL1 + DEL2)
      C2T2 = C2 + C2
      C3 = (DEL1 + DEL2)/H
C                                (H, DEL1 AND DEL2 ARE NO LONGER NEEDED.)
      C3T3 = C3+C3+C3
C
C  EVALUATION LOOP.
C
      DO 500  I = 1, NE
```

```
      X = XE(I) - X1
      FE(I) = F1 + X*(D1 + X*(C2 + X*C3))
      DE(I) = D1 + X*(C2T2 + X*C3T3)
C          COUNT EXTRAPOLATION POINTS.
      IF ( X.LT.XMI )  NEXT(1) = NEXT(1) + 1
      IF ( X.GT.XMA )  NEXT(2) = NEXT(2) + 1
C        (NOTE REDUNDANCY--IF EITHER CONDITION IS TRUE, OTHER IS FALSE.)
  500 CONTINUE
C
C  NORMAL RETURN.
C
      RETURN
C
C  ERROR RETURNS.
C
 5001 CONTINUE
C     NE.LT.1 RETURN.
      IERR = -1
      CALL XERROR ('CHFDV -- NUMBER OF EVALUATION POINTS LESS THAN ONE'
     *            , 50, IERR, 1)
      RETURN
C
 5002 CONTINUE
C     X1.EQ.X2 RETURN.
      IERR = -2
      CALL XERROR ('CHFDV -- INTERVAL ENDPOINTS EQUAL'
     *            , 33, IERR, 1)
      RETURN
C------------- LAST LINE OF CHFDV FOLLOWS -----------------------------
      END
      SUBROUTINE XERROR(MESSG,NMESSG,NERR,LEVEL)
C***BEGIN PROLOGUE  XERROR
C***DATE WRITTEN   790801   (YYMMDD)
C***REVISION DATE  870930   (YYMMDD)
C***CATEGORY NO.  R3C
C***KEYWORDS  ERROR,XERROR PACKAGE
C***AUTHOR  JONES, R. E., (SNLA)
C***PURPOSE  Processes an error (diagnostic) message.
C***DESCRIPTION
C    From the book "Numerical Methods and Software"
C       by  D. Kahaner, C. Moler, S. Nash
C           Prentice Hall 1988
C     Abstract
C        XERROR processes a diagnostic message. It is a stub routine
C        written for the book above. Actually, XERROR is a sophisticated
C        error handling package with many options, and is described
C        in the reference below. Our version has the same calling sequence
C        but only prints an error message and either returns (if the
C        input value of ABS(LEVEL) is less than 2) or stops (if the
C        input value of ABS(LEVEL) equals 2).
C
C     Description of Parameters
C      --Input--
C        MESSG - the Hollerith message to be processed.
C        NMESSG- the actual number of characters in MESSG.
C                (this is ignored in this stub routine)
C        NERR  - the error number associated with this message.
C                NERR must not be zero.
C                (this is ignored in this stub routine)
C        LEVEL - error category.
C                =2 means this is an unconditionally fatal error.
C                =1 means this is a recoverable error.  (I.e., it is
C                   non-fatal if XSETF has been appropriately called.)
```

```
C                =0 means this is a warning message only.
C                =-1 means this is a warning message which is to be
C                   printed at most once, regardless of how many
C                   times this call is executed.
C                 (in this stub routine
C                       LEVEL=2 causes a message to be printed and then a
C                                          stop.
C                       LEVEL<2 causes a message to be printed and then a
C                                          return.
C
C     Examples
C        CALL XERROR('SMOOTH -- NUM WAS ZERO.',23,1,2)
C        CALL XERROR('INTEG  -- LESS THAN FULL ACCURACY ACHIEVED.',
C                    43,2,1)
C        CALL XERROR('ROOTER -- ACTUAL ZERO OF F FOUND BEFORE INTERVAL F
C    1ULLY COLLAPSED.',65,3,0)
C        CALL XERROR('EXP    -- UNDERFLOWS BEING SET TO ZERO.',39,1,-1)
C
C***REFERENCES  JONES R.E., KAHANER D.K., "XERROR, THE SLATEC ERROR-
C                 HANDLING PACKAGE", SAND82-0800, SANDIA LABORATORIES,
C                 1982.
C***ROUTINES CALLED  XERRWV
C***END PROLOGUE  XERROR
      CHARACTER*(*) MESSG
C***FIRST EXECUTABLE STATEMENT  XERROR
      CALL XERRWV(MESSG,NMESSG,NERR,LEVEL,0,0,0,0,0.,0.)
      RETURN
      END
      SUBROUTINE XERRWV(MESSG,NMESSG,NERR,LEVEL,NI,I1,I2,NR,R1,R2)
C***BEGIN PROLOGUE  XERRWV
C***DATE WRITTEN   800319   (YYMMDD)
C***REVISION DATE  870930   (YYMMDD)
C***CATEGORY NO.  R3C
C***KEYWORDS  ERROR,XERROR PACKAGE
C***AUTHOR  JONES, R. E., (SNLA)
C***PURPOSE  Processes error message allowing 2 integer and two real
C            values to be included in the message.
C***DESCRIPTION
C    From the book "Numerical Methods and Software"
C       by  D. Kahaner, C. Moler, S. Nash
C           Prentice Hall 1988
C     Abstract
C        XERRWV prints a diagnostic error message.
C        In addition, up to two integer values and two real
C        values may be printed along with the message.
C        A stub routine for the book above. The actual XERRWV is described
C        in the reference below and contains many other options.
C
C     Description of Parameters
C      --Input--
C        MESSG - the Hollerith message to be processed.
C        NMESSG- the actual number of characters in MESSG.
C                (ignored in this stub)
C        NERR  - the error number associated with this message.
C                NERR must not be zero.
C                (ignored in this stub)
C        LEVEL - error category.
C                =2 means this is an unconditionally fatal error.
C                =1 means this is a recoverable error.  (I.e., it is
C                   non-fatal if XSETF has been appropriately called.)
C                =0 means this is a warning message only.
C                =-1 means this is a warning message which is to be
C                   printed at most once, regardless of how many
```

```
C                    times this call is executed.
C                   (in this stub LEVEL=2 causes an error message to be
C                                        printed followed by a stop,
C                                 LEVEL<2 causes an error message to be
C                                        printed followed by a return.)
C        NI    - number of integer values to be printed. (0 to 2)
C        I1    - first integer value.
C        I2    - second integer value.
C        NR    - number of real values to be printed. (0 to 2)
C        R1    - first real value.
C        R2    - second real value.
C
C     Examples
C        CALL XERRWV('SMOOTH -- NUM (=I1) WAS ZERO.',29,1,2,
C    1   1,NUM,0,0,0.,0.)
C        CALL XERRWV('QUADXY -- REQUESTED ERROR (R1) LESS THAN MINIMUM (
C    1R2).,54,77,1,0,0,0,2,ERRREQ,ERRMIN)
C
C***REFERENCES  JONES R.E., KAHANER D.K., "XERROR, THE SLATEC ERROR-
C                 HANDLING PACKAGE", SAND82-0800, SANDIA LABORATORIES,
C                 1982.
C***ROUTINES CALLED  (NONE)
C***END PROLOGUE  XERRWV
      CHARACTER*(*) MESSG
C***FIRST EXECUTABLE STATEMENT  XERRWV
      WRITE(6,*) MESSG
      IF(NI.EQ.2)THEN
      WRITE(6,*) I1,I2
      ELSEIF(NI.EQ.1) THEN
      WRITE(6,*) I1
      ENDIF
      IF(NR.EQ.2) THEN
      WRITE(6,*) R1,R2
      ELSEIF(NR.EQ.1) THEN
      WRITE(6,*) R1
      ENDIF
      IF(ABS(LEVEL).LT.2)RETURN

C modified for WinMaccs, 4/12/01, D. Chanin, add CALL ABORT
      WRITE(6,*) 'internal error in Subroutine XERROR'
      WRITE(7,*) 'internal error in Subroutine XERROR'
      CALL ABORT ('terminating')

C      STOP

      END
*DECK INPEXP
      SUBROUTINE INPEXP (OK)
C
C  THIS ROUTINE DEFINES THE PLUME EXPANSION FACTOR PARAMETERS
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARAIBLES:
C
C  BRKPNT - BREAKPOINT FOR EXPANSION FACTOR FORMULA CHANGE (SECONDS)
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C  TIMBAS - TIME BASE FOR EXPANSION FACTOR
C  XPFAC1 - EXPONENTIAL FACTOR FOR EXPANSION FACTOR
C  XPFAC2 - EXPONENTIAL FACTOR FOR EXPANSION FACTOR
C
```

```
C  GLOSSARY OF EXTERNALS:
C
C  RGET1  - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 30 MAR 1984.
C
      EXTERNAL RGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      COMMON /EXPAND/ TIMBAS, BRKPNT, XPFAC1, XPFAC2
      OK = .TRUE.
C
C  TIME BASE FOR DISPERSION PARAMETER FUNCTIONS
C
      TIMBAS = RGET1 ('PMTIMBAS001', 1, 60., 0., 86400., RANGE, FOUND,
     $                'INPEXP', 'TIMBAS')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  BREAK POINT FOR FORMULA CHANGE
C
      BRKPNT = RGET1 ('PMBRKPNT001', 1, 60., 0., 86400., RANGE, FOUND,
     $                'INPEXP', 'BRKPNT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EXPONENTIAL FACTOR FOR THE FIRST INTERVAL
C
      XPFAC1 = RGET1 ('PMXPFAC1001', 1, .01, 0., 1., RANGE, FOUND,
     $                'INPEXP', 'XPFAC1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EXPONENTIAL FACTOR FOR THE SECOND INTERVAL
C
      XPFAC2 = RGET1 ('PMXPFAC2001', 1, .01, 0., 1., RANGE, FOUND,
     $                'INPEXP', 'XPFAC2')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INPLRS
      SUBROUTINE INPLRS (OK)
C
C  THIS ROUTINE DEFINES SCALING FACTORS WHICH ALLOW THE USER TO MODIFY THE
C  PLUME RISE MODELS: CRITICAL WIND SPEED, A-D PLUME RISE, AND E-F PLUME RISE.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMODL.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C  SCLADP - SCALING FACTOR FOR A-D PLUME RISE FORMULA
C  SCLCRW - SCALING FACTOR FOR THE CRITICAL WIND SPEED FORMULA
C  SCLEFP - SCALING FACTOR FOR E-F PLUME RISE FORMULA
C
C  GLOSSARY OF EXTERNALS:
C
C  LGET1   - INTERFACE TO INPRE THAT RETURNS A LOGICAL VALUE
C  RGET1   - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C  MODIFIED 12 MAY 87, DIC, SER #59, MAKE SCALING FACTORS FOR PLUME RISE
C                                    SUBJECT TO USER MODIFICATION
```

```
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
      EXTERNAL LGET1, RGET1

      LOGICAL OK, RANGE, FOUND, LGET1
      COMMON /PLUMRS/ SCLCRW, SCLADP, SCLEFP
      OK = .TRUE.
C
C  SCALING FACTOR FOR CRITICAL WIND SPEED
C
      SCLCRW = RGET1 ('PRSCLCRW001', 1, 0.001, 1., 1.0E6, RANGE, FOUND,
     $                'INPLRS', 'SCLCRW')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  SCALING FACTOR FOR A-D PLUME RISE
C
      SCLADP = RGET1 ('PRSCLADP001', 1, .01, 1., 100., RANGE, FOUND,
     $                'INPLRS', 'SCLADP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  SCALING FACTOR FOR E-F PLUME RISE
C
      SCLEFP = RGET1 ('PRSCLEFP001', 1, .01, 1., 100., RANGE, FOUND,
     $                'INPLRS', 'SCLEFP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK ATPROB
      SUBROUTINE ATPROB (OK)
C
C  DEFINE THE CHARACTERISTICS OF THE ATMOSPHERIC PROBLEM BY READING
C  FROM THE UNIT 1 INPUT FILE DATABASE WITH THE INPRE FREE FORMAT READER.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INPUT.
C
C  GLOSSARY OF VARIABLES:
C
C  ATNAM1 - A DESCRIPTIVE TITLE DESCRIBING THIS SERIES OF CALCULATIONS
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C
C  GLOSSARY OF EXTERNALS:
C
C  INPMET - DEFINE THE METEOROLOGICAL SAMPLING, WEATHER CONDITIONS
C  INPOPT - DEFINE THE LIST OPTIONS FOR PRINTING ATMOSPHERIC RESULTS
C  INPREL - DEFINE THE RELEASE INVENTORY OF ALL THE NUCLIDES
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C Modified 11/30/95, D. Chanin, allow overlapping plumes and allow each plume
C  to have different initial dimensions, thus allowing use of the "stem and cap"
C  model of explosive releases used in the DAHRT EIS
C Modified 12/17/95, D. Chanin, allow NUCOUT to vary between source terms
C
      EXTERNAL INPMET, INPOPT, INPREL, CGET1
C  NO INTRINSIC FUNCTIONS
      CHARACTER *80   ATNAM1
      COMMON /ATNAM1/ ATNAM1
      CHARACTER *80 CGET1
      LOGICAL RANGE, FOUND, OK
C
C  PROVIDE A GENERAL DESCRIPTION OF THE PURPOSE OF THIS SERIES OF RUNS
C
```

```
      ATNAM1 = CGET1('RIATNAM1001', 1, 1, ' ', 80, RANGE, FOUND,
     $               'ATPROB', 'ATNAM1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  DEFINE THE OUTPUT OPTIONS
C
      CALL INPOPT (OK)
      IF (.NOT. OK) CALL ABORT ('terminating')
C
C  DEFINE THE RELEASE INVENTORY FROM THE REACTOR
C
      CALL INPREL (OK)
      IF (.NOT. OK) CALL ABORT ('terminating')
C
C  DEFINE THE WEATHER CONDITIONS, WEATHER SAMPLING
C
      CALL INPMET (OK)
      IF (.NOT. OK) CALL ABORT ('terminating')
      RETURN
      END
*DECK INPOPT
      SUBROUTINE INPOPT (OK)
C
C  THIS ROUTINE DEFINES THE OUTPUT OPTIONS FOR THE ATMOSPHERIC MODEL
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATPROB.
C
C  GLOSSARY OF VARIABLES:
C
C  ENDAT1 - LOGICAL FLAG SIGNIFYING THAT ONLY THE "ATMOS" MODULE IS TO BE RUN
C  ENDAT2 - LOGICAL FLAG SIGNIFYING THAT ONLY "ATMOS"  AND "EARLY" ARE TO BE RUN
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  J      - DO LOOP INDEX ON NUCLIDE
C  NUCNAM - LIST OF ALL THE NUCLIDES DEFINED IN THE MODEL
C  NUCOUT - INDEX TO THE DESIRED NUCLIDE
C  NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A CHARACTER STRING OF REQUIRED LENGTH FOUND
C  CCDF0  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS RESULT
C  NUM0   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C  RECNAM - RECORD IDENTIFIER TO BE USED FOR LOCATING CCDF FLAG
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGETN  - INTERFACE TO INPRE THAT FETCHES A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 17 AUG 1984.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C Modified 11/29/95, D. Chanin, allow (IDEBUG.eq.-1) as signal to skip printing
C   of the day and hour of each weather trial--intended for production runs
C   when using (METCOD.eq.5)--stratified random sampling.
C
      EXTERNAL IGET1, LGET1
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /ATMOPT/ IDEBUG, NUCOUT
      LOGICAL         ENDAT1, ENDAT2
      COMMON /STOPME/ ENDAT1, ENDAT2
```

```
C
      LOGICAL OK, RANGE, FOUND, LGET1

      OK = .TRUE.
C
C  DEFINE A FLAG INDICATING IF ATMOS IS THE ONLY MODULE TO BE EXECUTED
C
      ENDAT1 = LGET1 ('OCENDAT1001', 0, .FALSE.,
     $                FOUND, 'INPOPT', 'ENDAT1')
      IF (.NOT. FOUND) THEN
      OK = .FALSE.
      ELSE
      ENDAT2 = ENDAT1
      ENDIF
C
C  DEFINE THE LEVEL OF DEBUG OUTPUT THAT WILL BE PRODUCED
C
      IDEBUG = IGET1 ('OCIDEBUG001', 0, -1, 0, 8,
     $                RANGE, FOUND, 'INPOPT', 'IDEBUG')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INPREL
      SUBROUTINE INPREL (OK)
C
C  THIS ROUTINE DEFINES THE RELEASE DESCRIPTION OF THE PLUME.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATPROB.
C
C  GLOSSARY OF VARIABLES:
C
C ATNAM2 - A TITLE DESCRIBING THIS PARTICULAR SINGLE CHOICE OF ASSUMPTIONS
C BUILDH - BUILDING HEIGHT IN METERS, now used only to calculate critical
C          wind speed for entrainment of buoyant plumes in building wake
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C  I      - LOOP COUNTER
C  ISRCTM - LOOP COUNTER ON SOURCE TERMS USED BY "ATMOS"
C  J      - LOOP COUNTER
C  K      - LOOP COUNTER
C  L      - LOOP COUNTER
C  MAXGRP - NUMBER OF NUCLIDE GROUPS DEFINED IN THE MODEL
C  NAME   - NAME OF THE NUCLIDE RELEASE BEING SPECIFIED
C  NPSGRP - NUMBER OF PARTICLE SIZE GROUPS DEFINED IN THE MODEL
C  NUCNAM - ARRAY OF ALL THE NUCLIDES DEFINED IN THE MODEL
C  NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C  NUMREL - NUMBER OF RELEASES DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  PDELAY - ARRAY OF PLUME RELEASE DELAY TIMES
C  PLHEAT - ARRAY OF PLUME RELEASE HEAT CONTENTS
C  PLHITE - ARRAY OF PLUME RELEASE HEIGHTS
C  PLUDUR - ARRAY OF PLUME RELEASE DURATIONS
C  PSDIST - PARTICLE SIZE DISTRIBUTION OF ALL THE NUCLIDE GROUPS
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C  RECNAM - RECORD IDENTIFIER TEXT FIELD
C  RELINV - ARRAY OF RELEASE INVENTORIES FOR ALL NUCLIDES
C SIGYINIT - initial value of sigma-y, must be calculated by the user
C SIGZINIT - initial value of sigma-z, must be calculated by the user
C  SUM    - ACCUMULATED SUM OF THE PARTICLE SIZE DISTRIBUTION FOR A GROUP
C  TEMP1,2 - TEMPORARY ARRAY USED TO LOAD THE RELEASE INVENTORY ARRAY
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
```

```
C  DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C  ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  NEWAMT - DECAYS THE INVENTORY IN THE CORE UP TO THE TIME OF RELEASE
C  RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C  RGET1  - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C  MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C  MODIFIED 12 MAY 87, DIC, SER #57, APPLY RELEASE FRACTIONS TO SCRAM INVENTORY
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
C MODIFIED 6/20/89/, DIC, LOG # 9/25/88-A,
C   LENGTH DISCREPANCY ON ORGNAM AND NUCNAM
C MODIFIED 6/20/89/, DIC, LOG # 1/12/89-A,
C   INABILITY TO HANDLE A RELEASE SPANNING MORE THAN FOUR DAYS
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C MODIFIED 7/30/91, D. CHANIN, MEMO OF 2/14/91, UNINITIALIZED ARRAY REFERENCE
C Modified 3/09/93, D.C., Incorrect assignment of RELINV for PROGENY option
C Modified 3/17/93, D.C., Released inventory is now decayed to plume's REFTIM
C Modified 4/3/95, D.C., Added the DO 610 loop to initialize TEMP1 to zero
C Modified 12/01/95, D.C., The values of BUIDLH, SIGYINIT, and SIGZINIT must
C  now be supplied for each plume segment.  That is NUMREL values must be
C  specified on the data card in the same format as PLHITE, PLUDUR, etc.
C Modified 12/17/95, D. Chanin, allow NUCOUT to vary between source terms
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGET1, RGETN, RGET1, NEWAMT
      CHARACTER *80 CGET1
      LOGICAL DOCCDF
C  NO INTRINSIC FUNCTIONS
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      CHARACTER *80   ATNAM2
      COMMON /ATNAM2/ ATNAM2(60)
      COMMON /ISOGRP/ MAXGRP, IGROUP(MAXNUC)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /DRYCON/ NPSGRP, VDEPOS(10)
      COMMON /MULREL/ PLHEAT(4), PLHITE(4), PLUDUR(4), PDELAY(4),
     1                REFTIM(4), RELINV(MXDKCN,4), PSDIST(10,10),
     2                SIGYINIT(4), SIGZINIT(4), BUILDH(4)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
      LOGICAL CCDF0
      COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)
      COMMON /ATMOPT/ IDEBUG, NUCOUT
C
      DIMENSION RELFRC(10,4), CORINV(MAXNUC),
     1          TEMP1(MXDKCN), TEMP2(MXDKCN)
```

```
      CHARACTER NAME *8, RECNAM *11, APLFRC *7
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
C
      DO 10 I = 1, 4
      PLHEAT(I) = 0.
      PLHITE(I) = 0.
      PLUDUR(I) = 0.
      PDELAY(I) = 0.
      REFTIM(I) = 0.
      SIGYINIT(I) = 0.
      SIGZINIT(I) = 0.
   10 BUILDH(I) = 0.
C
      DO 12 J = 1, 10
      DO 12 I = 1, 10
   12 PSDIST(I,J) = 0.
C
      DO 14 J = 1, 4
      DO 14 I = 1, MAXNUC
   14 RELINV(I,J) = 0.
C
C  PROVIDE A DESCRIPTIVE NAME FOR THIS SOURCE TERM
C
      ATNAM2(ISRCTM) = CGET1('RDATNAM2001', 1, 1, ' ', 80,
     $                       RANGE, FOUND, 'INPREL', 'ATNAM2')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      NUMREL = IGET1 ('RDNUMREL001', 1, 1, 0, 4,
     $                RANGE, FOUND, 'INPREL', 'NUMREL')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      CALL RGETN ('RDPLHEAT001', 0, PLHEAT, NUMREL, 0., 1.E10,
     $            RANGE, FOUND, 'INPREL', 'PLHEAT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      CALL RGETN ('RDPLHITE001', 0, PLHITE, NUMREL, 0., 1000.,
     $            RANGE, FOUND,  'INPREL', 'PLHITE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      CALL RGETN ('RDPLUDUR001', 0, PLUDUR, NUMREL, 60., 86400.,
     $            RANGE, FOUND, 'INPREL', 'PLUDUR')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  LIMIT THE TIME OF RELEASE TO A MAXIMUM OF 4 DAYS AFTER SCRAM
C  IN ORDER TO AVOID RUNNING OUT OF WEATHER BEFORE RELEASE COMPLETION
C
      CALL RGETN ('RDPDELAY001', 0, PDELAY, NUMREL, 0., 345600.,
     $            RANGE, FOUND, 'INPREL', 'PDELAY')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C Prior to MACCS2 v. 1.11, the specification of plumes which ovelapped in time
C would be a fatal error.  Ovelapping plumes are now allowed for two reasons:
C (1) use of "step and cap" for explosive releases (such as in DARHT EIS), and
C (2) NUREG-1465 design basis accident source terms have overlapping segments.
C
      DO 40 I = 2, NUMREL
      IF (PDELAY(I) .LT. PDELAY(I-1) + PLUDUR(I-1)) THEN
      WRITE(6,30) I
   30   FORMAT(/' WARNING: plume #', I2, ' overlaps preceding plume'/)
      ENDIF
   40 CONTINUE
```

```
C
C Initial value of sigma-y (m): must now be calculated by the user, and now
C also must be specified separately for each plume, and plumes now may
C overlap each other in time (useful for setting up a "stem and cap" release)
C
      CALL RGETN ('SIGYINIT001', 0, SIGYINIT, NUMREL, 0.1, 1000.0,
     $             RANGE, FOUND, 'INPREL', 'SIGYINIT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C Initial value of sigma-z (m): must now be calculated by the user, and now
C also must be specified separately for each plume, and plumes now may
C overlap each other in time (useful for setting up a "stem and cap" release)
C
      CALL RGETN ('SIGZINIT001', 0, SIGZINIT, NUMREL, 0.1, 1000.0,
     $             RANGE, FOUND, 'INPREL', 'SIGZINIT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  BUILDING HEIGHT IN METERS
C
C (Note: with MACCS2 v. 1.10 and 1.11 this parameter is not used to initialize
C  the vertical dimensions of the plume, sigma-z; it is used only for the
C  entrainment model for trapping buouyant plumes in the buidling wake.)
C
C  As of MACCS2 v. 1.11, the user must supply a value of BUILDH separately
C  for each plume of a multi-plume release.  D. Chanin, 12/01/95
C
      CALL RGETN ('WEBUILDH001', 0, BUILDH, NUMREL, 1.0, 1000.0,
     $             RANGE, FOUND, 'INPREL', 'BUILDH')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      DO 100 I = 1, MAXGRP
      WRITE(RECNAM,50) I
   50 FORMAT('RDPSDIST',I3.3)
C
      CALL RGETN (RECNAM, 0, PSDIST(1,I), NPSGRP, 0., 1.,
     $             RANGE, FOUND, 'INPREL', 'PSDIST')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR IN READING PARTICLE SIZE DISTRIBUTION'
        WRITE(7,*)'ERROR IN READING PARTICLE SIZE DISTRIBUTION'
      CALL ABORT ('terminating')
      ENDIF
C
      SUM = 0.
      DO 60 J = 1, NPSGRP
   60 SUM = SUM + PSDIST(J,I)
C
      IF (SUM .LT. 0.95 .OR. SUM .GT. 1.05) THEN
        CALL ERRLOC('INPREL','PSDIST')
        WRITE(6,*)'SUM OF THE DISTRIBUTION FRACTIONS MUST EQUAL 1'
        WRITE(6,*)'ERROR IN READING PARTICLE SIZE DISTRIBUTION'
        WRITE(7,*)'SUM OF THE DISTRIBUTION FRACTIONS MUST EQUAL 1'
        WRITE(7,*)'ERROR IN READING PARTICLE SIZE DISTRIBUTION'
      CALL ABORT ('terminating')
      ENDIF
  100 CONTINUE
C
C  READ THE TIME IN THE ACCIDENT SEQUENCE AT WHICH THE OFFSITE ALARM IS SIGNALED
C
      OALARM = RGET1 ('RDOALARM001', 1, 0., 0., 604800.,
     $                RANGE, FOUND, 'INPREL', 'OALARM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  READ THE USER'S SELECTION OF THE RELEASE'S RISK DOMINANT PLUME SEGMENT
```

```
C
      MAXRIS = IGET1 ('RDMAXRIS001', 1, 1, 0, NUMREL,
     $                RANGE, FOUND, 'INPREL', 'MAXRIS')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  READ THE USER'S SELECTION OF EACH PLUME'S REFERENCE TIME POINT
C
      CALL RGETN ('RDREFTIM001', 0, REFTIM, NUMREL, 0., 1.,
     $            RANGE, FOUND, 'INPREL', 'REFTIM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  READ THE CORE INVENTORIES OF EACH NUCLIDE IN THE LIST.
C  IF AN NUCLIDE IS OMITTED, THERE IS NO INVENTORY OF THAT NUCLIDE.
C
      RECNAM = 'RDCORINV001'
      L = 11
C
      DO 300 I = 1, NUMISO
  300 CORINV(I) = -1.
C
      DO 400 K = 1, NUMISO
      NAME = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     $              'INPREL', 'CORINV')
      IF (RANGE .AND. FOUND) THEN
      L = 8
      DO 350 J = 1, NUMISO
      IF (NAME .EQ. NUCNAM(J)) THEN
        IF (CORINV(J) .EQ. -1.) THEN
            CORINV(J) = RGET1 ('RDCORINV', 0, 0., 0., 1.E20,
     $                         RANGE, FOUND, 'INPREL', 'CORINV')
          IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
            WRITE(6,320) NAME
            WRITE(7,320) NAME
  320         FORMAT(' Proper value not found when processing ', A)
            CALL ABORT ('terminating')
          ENDIF
        ELSE
            CALL ERRLOC ('INPREL', 'CORINV')
            WRITE(6,*)'RELEASE OF THIS NUCLIDE ALREADY SPECIFIED: ',NAME
            WRITE(7,*)'RELEASE OF THIS NUCLIDE ALREADY SPECIFIED: ',NAME
          CALL ABORT ('terminating')
          ENDIF
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
        GO TO 400
      ENDIF
  350   CONTINUE
        CALL ERRLOC ('INPREL', 'CORINV')
        WRITE(6,*)'NUCLIDE NAME NOT RECOGNIZED: ', NAME
        WRITE(7,*)'NUCLIDE NAME NOT RECOGNIZED: ', NAME
      CALL ABORT ('terminating')
      ELSE
        WRITE(6,*) 'ERROR IN READING CORE INVENTORY'
        WRITE(7,*) 'ERROR IN READING CORE INVENTORY'
      CALL ABORT ('terminating')
      ENDIF
  400 CONTINUE
C
C READ A SCALING FACTOR TO ADJUST THE RELEASE,
C changed 9/24/96 by D.C. per request by Jackie East (SRS) to allow
C CORSCA to take on values large enough for implicit conversion of doses
C from Sv/Bq to mrem/Ci
C
      CORSCA = RGET1 ('RDCORSCA001', 1, 2.7E-10, 1., 1.E16,
```

```
     $                    RANGE, FOUND, 'INPREL', 'CORSCA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
      DO 440 I = 1, NUMISO
      IF (CORINV(I) .EQ. -1.) THEN
        CALL ERRLOC ('INPREL', 'CORINV')
        WRITE(6,420) NUCNAM(I)
        WRITE(7,420) NUCNAM(I)
  420   FORMAT(1X, A, ' NOT FOUND IN CORINV LIST')
      CALL ABORT ('terminating')
      ENDIF
  440 CONTINUE
C
C  ADJUST THE CORE INVENTORY
C
      IF (CORSCA .NE. 1.0) THEN
        DO 480 I = 1, NUMISO
  480   CORINV(I) = CORINV(I) * CORSCA
      ENDIF
C
      APLFRC = CGET1 ('RDAPLFRC001', 1, 6, ' ', 7, RANGE, FOUND,
     $                 'INPREL', 'APLFRC')
C
      DO 600 I = 1, NUMREL
C
C  FOR RELEASE FRACTION, MAKE UP THE NAME OF THE RECORD TO BE SEARCHED FOR
C
      WRITE(RECNAM,510) I
  510 FORMAT('RDRELFRC',I3.3)
C
      CALL RGETN (RECNAM, 0, RELFRC(1,I), MAXGRP, 0., 1.,
     $            RANGE, FOUND, 'INPREL', 'RELFRC')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*) 'ERROR READING RELEASE FRACTIONS FOR RELEASE ',I
        WRITE(7,*) 'ERROR READING RELEASE FRACTIONS FOR RELEASE ',I
      CALL ABORT ('terminating')
      ENDIF
  600 CONTINUE
C
C Either (1) apply the release fractions to the initial inventory and have all
C progeny released in the same proportion as their parent at the top of the
C chain, or (2) apply the release fractions to the inventory at the time
C of release.   New Option added to code 11/19/92,  D. Chanin
C
      IF (APLFRC .EQ. 'PARENT') THEN
      DO 610 INUC = 1, MXDKCN
  610   TEMP1(INUC) = 0.
      DO 640 J = 1, NUMREL
      DO 620 I = 1, NUMISO
  620   TEMP1(IPNTDK(I)) = CORINV(I) * RELFRC(IGROUP(I),J)
  640   CALL NEWAMT (TEMP1, RELINV(1,J), PDELAY(J)+REFTIM(J)*PLUDUR(J))
      ELSE IF (APLFRC .EQ. 'PROGENY') THEN
      DO 650 INUC = 1, NUMFND
  650   TEMP1(INUC) = 0.
      DO 680 J = 1, NUMREL
      DO 660 I = 1, NUMISO
  660   TEMP1(IPNTDK(I)) = CORINV(I)
      CALL NEWAMT (TEMP1, TEMP2, PDELAY(J)+REFTIM(J)*PLUDUR(J))
      DO 680 I = 1, NUMISO
  680   RELINV(IPNTDK(I),J) = TEMP2(IPNTDK(I)) * RELFRC(IGROUP(I),J)
      ELSE
      WRITE(6,*)'APLFRC must be given either PARENT or PROGENY'
      WRITE(7,*)'APLFRC must be given either PARENT or PROGENY'
```

```
      CALL ABORT ('Illegal value for APLFRC')
      ENDIF
      WRITE(6,750)
  750 FORMAT(//' RELEASED INVENTORY OF ALL PLUMES')
C
C Eliminate negative or negligible inventory values that are due to
C roundoff and truncation errors
C
      DO 780 J   = 1, NUMREL
      DO 780 ISO = 1, NUMISO
  780 RELINV(IPNTDK(ISO),J) = MAX (RELINV(IPNTDK(ISO),J), 0.0)
C
      DO 800 ISO = 1, NUMISO
  800 IF (RELINV(IPNTDK(ISO),1) .GT. 1.E-3 .OR.
     1    RELINV(IPNTDK(ISO),2) .GT. 1.E-3 .OR.
     2    RELINV(IPNTDK(ISO),3) .GT. 1.E-3 .OR.
     3    RELINV(IPNTDK(ISO),4) .GT. 1.E-3)
     4      WRITE(6,810) NUCNAM(ISO),
     5                   (RELINV(IPNTDK(ISO),IREL), IREL=1,NUMREL)
  810 FORMAT(1X, A, 1P, 4E11.2)
C
C Define the number of atmospheric results that are to be produced
C
      NUMO = IGET1 ('TYPEONUMBER', 0, 0, 0, 35, RANGE, FOUND,
     $              'INPOPT', 'NUMO')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('TERMINATING')
C
      IF (NUMO .EQ. 0) RETURN
C
C Define the plume indices for reporting the atmospheric results
C (the atmospheric results are for individual plume segments)
C
      CALL IGETN ('TYPEOOUT001', 1, INDREL, NUMO, 1, NUMREL,
     $            RANGE, FOUND, 'INPOPT', 'INDREL')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
      ENDIF
C
C Define the radial distances for reporting the atmospheric results
C (a block of ten results is always produced for each request)
C
      CALL IGETN ('TYPEOOUT001', 2, INDRAD, NUMO, 1, MAXRAD,
     $            RANGE, FOUND, 'INPOPT', 'INDRAD')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
      ENDIF
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      RECNAM = 'TYPEOOUT001'
      DO 200 IOUT = 1, NUMO
      CCDFO(IOUT) = DOCCDF (RECNAM(1:L), 3)
  200 L = 8
C
C Only ask for the name of a nuclide when it's needed for debug output or CCDFs
C
      IF (IDEBUG .LE. 0 .AND. NUMO .EQ. 0) RETURN
      NAME = CGET1 ('OCNUCOUT001', 1, 3, ' ', 8, RANGE, FOUND,
     $              'INPREL', 'NUCOUT')
      NUCOUT = 0
```

```
      IF (RANGE .AND. FOUND) THEN
      DO 820 J = 1, NUMISO
      IF (NAME .EQ. NUCNAM(J)) THEN
        NUCOUT = J
        GO TO 840
      ENDIF
  820   CONTINUE
      ELSE
      CALL ABORT ('TERMINATING')
      RETURN
      ENDIF
  840 IF (NUCOUT .EQ. 0) THEN
      CALL ERRLOC('INPREL','NUCOUT')
      WRITE(6,*) 'NAME OF THE NUCLIDE NOT FOUND'
      WRITE(7,*) 'NAME OF THE NUCLIDE NOT FOUND'
      CALL ABORT ('TERMINATING')
      ENDIF
      RETURN
      END
*DECK PUTSTM
      SUBROUTINE PUTSTM (OK)
C
C THIS ROUTINE STORES AND FETCHES THE SOURCE TERM DATA TO
C AND FROM LIST STORAGE WHEN MORE THAN ONE SOURCE TERM IS BEING USED.
C
C THIS SUBROUTINE HAS AN ENTRY POINT NAMED GETSTM.
C
C GLOSSARY OF VARIABLES:
C
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C MATCH  - LOGICAL VARIABLE USED TO DETERMINE IF THE SCENARIO HAS BEEN CHANGED
C NSTRTG - TOTAL NUMBER OF EMERGENCY RESPONSE SCENARIOS TO BE MODELLED
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C
C D. CHANIN, 18 NOV 87
C
C MODIFIED 7/11/89, LOG # 7/6/89-A, D. CHANIN,
C   INABLITY TO HANDLE CHANGES IN OALARM AND MAXRIS ACROSS SOURCE TERMS
C Modified 3/30/93, D.C., Store change case data on a file instead of RAM
C Modified 11/30/95, D. Chanin, allow overlapping plumes and allow each plume
C  to have different initial dimensions, thus allowing use of the "stem and cap"
C  model of explosive releases used in the DAHRT EIS
C Modified 3/01/01, Log # 3/01/01-A, D. Chanin,
C   Changed A0/A1 dimensions from 3432 to 3732

      EXTERNAL ERRLOC
      SAVE
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /MULREL/ PLHEAT(4), PLHITE(4), PLUDUR(4), PDELAY(4),
     1                REFTIM(4), RELINV(MXDKCN,4), PSDIST(10,10),
     2                SIGYINIT(4), SIGZINIT(4), BUILDH(4)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $         AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $         TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $         HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      CHARACTER *80   ATNAM2
      COMMON /ATNAM2/ ATNAM2(60)
      COMMON /ATMOPT/ IDEBUG, NUCOUT
C
C Modified by D. Chanin, 3/01/01, Log # 3/01/01-A
C Changed A0/A1 dimensions from 3432 to 3732 to match length of COMMON /MULREL/
```

```
C
      DIMENSION A0(3732), A1(3732), ITEMP(60), ITEMP1(60), RTEMP(60)
      EQUIVALENCE (A0,PLHEAT)
      LOGICAL MATCH, OK
C
C  IF THE DIMENSIONS OF THE SOURCE TERM COMMON BLOCKS ARE CHANGED,
C  THEN THE FOLLOWING DATA STATEMENT MUST BE CHECKED TO ENSURE THAT THE
C  LENGTHS OF THE COMMON BLOCKS ARE CORRECTLY STATED.
C
c Modified by D. Chanin, 3/01/01
c Changed ILNTHA from 3432 to 3732 to reflect length of COMMON /MULREL/
c
      DATA ILNTHA / 3732/

      OK = .TRUE.
      IF (NSRCTM .EQ. 1) RETURN

C Modified for WinMaccs, 4/12/01, D. Chanin.  Compiler bug
C In Compaq Fortran 6.5 requires that user specify a filename
C for this scratch file.  As a workaround, the file was named temp99.
C
C      OPEN (22, STATUS='SCRATCH', FORM = 'UNFORMATTED')
      OPEN (22, FILE='temp99', FORM = 'UNFORMATTED')
C
C  TEST THE SOURCE TERM NAME TO SEE IF IT HAS BEEN CHANGED
C
      IF (ISRCTM .GT. 1) THEN
        IF (ATNAM2(ISRCTM-1) .EQ. ATNAM2(ISRCTM)) THEN
          OK = .FALSE.
          CALL ERRLOC ('PUTSTM', 'RECORD IDENTIFIER: RDATNAM2')
          WRITE(6,10)
          WRITE(7,10)
   10     FORMAT(/' A DIFFERENT IDENTIFIER IS REQUIRED FOR EACH',
     $      ' SOURCE TERM CHANGE CASE, '
     $    /' YOU MUST SUPPLY A DIFFERENT VALUE OF ATNAM2.')
          RETURN
        ENDIF
      ENDIF
      IF (ISRCTM .EQ. 1) THEN
C
C  STORE THE SOURCE TERM DATA INTO THE LIST STORAGE ARRAYS
C
        WRITE(22) A0
        RTEMP(1) = OALARM
        ITEMP(1) = MAXRIS
      ITEMP1(1) = NUCOUT
      ELSE
C
C  STORE THE SOURCE TERM DATA INTO THE LIST STORAGE ARRAYS
C  AND CHECK TO SEE THAT THERE HAS BEEN A CHANGE IN THE ASSUMPTIONS
C
        MATCH = .TRUE.
        DO 220 I = 1, ILNTHA
        IF (A0(I) .NE. A1(I)) MATCH = .FALSE.
  220   A1(I) = A0(I)
        WRITE(22) A1
        RTEMP(ISRCTM) = OALARM
        ITEMP(ISRCTM) = MAXRIS
      ITEMP1(ISRCTM) = NUCOUT
      IF (OALARM .NE. RTEMP(ISRCTM-1) .OR.
     1      MAXRIS .NE. ITEMP(ISRCTM-1)) MATCH = .FALSE.
        IF (MATCH) THEN
          OK = .FALSE.
```

```
          CALL ERRLOC ('PUTSTM','A NEW SOURCE TERM')
          WRITE(6,300) ISRCTM - 1
          WRITE(7,300) ISRCTM - 1
  300     FORMAT(/' SOURCE TERM CHANGE CASE ', I2,
     $            ' IS IDENTICAL TO THE SOURCE TERM PRECEDING IT')
          RETURN
        ENDIF
      ENDIF
      RETURN
      ENTRY GETSTM
C
C THIS ENTRY POINT LOADS THE SOURCE TERM INPUT PARAMETERS BACK FROM
C LIST STORAGE WHEN MORE THAN ONE SOURCE TERM IS BEING USED.
C
      IF (NSRCTM .EQ. 1) RETURN
      IF (ISRCTM .EQ. 1) REWIND (22)
c
c Note: when unit 22 was a scratch file, compiler bug caused EOF below
c Observation made by D. Chanin, 3/01/01
c
      READ(22) A0
      OALARM = RTEMP(ISRCTM)
      MAXRIS = ITEMP(ISRCTM)
      NUCOUT = ITEMP1(ISRCTM)
      RETURN
      END
*DECK INPMET
      SUBROUTINE INPMET (OK)
C
C DEFINE THE CHARACTERISTICS OF THE WEATHER SAMPLING BY READING
C FROM THE PROBLEM INPUT FILE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE ATPROB.
C
C GLOSSARY OF VARIABLES:
C
C METCOD - METEOROLOGICAL SAMPLING OPTION CODE, SEE BELOW
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C OK1    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPM1
C OK2    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPM2
C OK3    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPM2
C OK4    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPM3
C OK5    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPM4
C OK6    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPM5
C
C METCOD = 1- USER SPECIFIED DAY AND HOUR OF A SINGLE SEQUENCE ON THE METFIL,
C          2- WEATHER CATEGORY BIN SAMPLING SIMILAR TO CRAC2,
C          3- 120 HOURS OF WEATHER SPECIFIED ON THE ATMOS USER INPUT FILE,
C          4- CONSTANT WEATHER CONDITIONS SPECIFIED ON ATMOS USER INPUT FILE,
C          5- RANDOM SAMPLING STRATIFIED BY DAY OF THE YEAR.
C
C GLOSSARY OF EXTERNALS:
C
C INPM1  - DEFINES THE METEOROLOGICAL SAMPLING OPTION CODE
C INPM2  - DEFINE THE BOUNDARY WEATHER CONDITIONS (CONSTANT WEATHER)
C INPM3  - DEFINE THE ACCIDENT START TIME, DAY AND HOUR
C INPM4  - DEFINE THE LATIN HYPERCUBE SAMPLING PARAMETERS
C INPM5  - DEFINE 120 HOURS OF WEATHER SUPPLIED BY THE USER
C
C DAVID CHANIN, DIV. 6415, 21 MAR 1984.
C
C MODIFIED BY D. C., 11 FEB 86. METCOD=3 AND 4 NOW REQUIRE ISTRHR AND ISTRDY
C
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C MODIFIED BY D. C., 16 JUN 86. ADDED UNDOCUMENTED FEATURE, METCOD=6.
C
      COMMON /M1/ METCOD
      LOGICAL OK, OK1, OK2, OK3, OK4, OK5, OK6
C
      OK2 = .TRUE.
      OK3 = .TRUE.
      OK4 = .TRUE.
      OK5 = .TRUE.
      OK6 = .TRUE.
C
C  DEFINE THE METEOROLOGICAL SAMPLING OPTION CODE
C
      CALL INPM1 (OK1)
C
C  FIXED START TIME IN THE YEAR'S DATA SPECIFIED BY THE DAY AND HOUR
C
      IF (METCOD .EQ. 1) THEN
      CALL INPM2 (OK2)
        CALL INPM3 (OK3)
C
C  MULTIPLE WEATHER TRIAL SAMPLING,
C  EITHER BY WEATHER CATEGORY OR STRATIFIED RANDOM SAMPLING
C
      ELSE IF (METCOD .EQ. 2 .OR. METCOD .EQ. 5) THEN
      CALL INPM2 (OK2)
        CALL INPM4 (OK4)
C
C  120 HOURS OF WEATHER SPECIFIED BY THE USER
C
      ELSE IF (METCOD .EQ. 3) THEN
      CALL INPM2 (OK2)
        CALL INPM3 (OK3)
        CALL INPM5 (OK5)
C
C  SINGLE WEATHER TRIAL WITH CONSTANT CONDITIONS, BOUNDARY WEATHER FROM START
C
      ELSE IF (METCOD .EQ. 4) THEN
      CALL INPM2 (OK2)
        CALL INPM3 (OK3)
      ENDIF
      OK = OK1 .AND. OK2 .AND. OK3 .AND. OK4 .AND. OK5 .AND. OK6
      RETURN
      END
*DECK INPM1
      SUBROUTINE INPM1 (OK)
C
C THIS ROUTINE LOADS /M1/ FOR WEATHER SAMPLING
C
C THIS ROUTINE IS CALLED BY SUBROUTINE INPMET.
C
C GLOSSARY OF VARIABLES:
C
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C METBIN - LOOP COUNTER ON WEATHER BIN (CURRENTLY DIMENSIONED AT 41)
C METCOD - METEOROLOGICAL SAMPLING OPTION CODE, SEE BELOW
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C
C METCOD = 1- USER SPECIFIED DAY AND HOUR OF A SINGLE SEQUENCE ON THE METFIL,
C          2- WEATHER CATEGORY BIN SAMPLING SIMILAR TO CRAC2,
C          3- 120 HOURS OF WEATHER SPECIFIED ON THE ATMOS USER INPUT FILE,
C          4- CONSTANT WEATHER CONDITIONS SPECIFIED ON ATMOS USER INPUT FILE,
```

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C          5- RANDOM SAMPLING STRATIFIED BY DAY OF THE YEAR.
C
C GLOSSARY OF EXTERNALS:
C
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C WRDMET - READS FILE OF T-M-Y WEATHER FOR THE ENTIRE YEAR INTO PACKED ARRAYS
C
C DAVID CHANIN, DIV. 6415, 30 MAR 1984.
C
C MODIFIED 12 AUG 87, DIC, SER #71, TURN ON WIND SHIFT MODEL FOR RADIAL EVAC
C
C MODIFIED BY D. CHANIN, 15 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 9/16/88-A,
C   ADDED VALIDATION TO PROCESSING OF MIXING LAYER HEIGHT, MINOR CLEANUP
C MODIFIED 10/17/89, D. CHANIN, #10/13/89-B, ADD OPEN STATEMENTS
C MODIFIED 7/30/91, D. CHANIN, #10/13/89-B, PUT ALL OPENS IN MXXOPN
C
      EXTERNAL IGET1, WRDMET
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      COMMON /M1/ METCOD
      OK = .TRUE.
C
C  OPTION CODE FOR WEATHER SAMPLING
C
      METCOD = IGET1 ('M1METCOD001', 1, 1, 0, 5, RANGE, FOUND,
     $                'INPM1', 'METCOD')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (METCOD .EQ. 1 .OR. METCOD .EQ. 2 .OR. METCOD .EQ. 5) THEN
C
C  LOAD THE WEATHER FILE INTO A STORAGE ARRAY FOR LATER USE IF A METCOD
C  IS REQUESTED THAT USES THE FILE OF A YEAR'S WEATHER DATA
C
        CALL WRDMET (28, OK)
        CLOSE (28)
      ENDIF
      IF (.NOT. OK) THEN
        WRITE(6,*) 'ERRORS FOUND IN METEOROLOGICAL DATA FILE, ',
     1             'EXECUTION INHIBITED'
        WRITE(7,*) 'ERRORS FOUND IN METEOROLOGICAL DATA FILE, ',
     1             'EXECUTION INHIBITED'
        CALL ABORT ('INPM1')
      ENDIF
      RETURN
      END
*DECK WRDMET
      SUBROUTINE WRDMET (INMET, OK)
C
C READ THE AUGMENTED T-M-Y METEOROLOGICAL DATA TAPE FROM UNIT INMET
C
C THIS ROUTINE IS CALLED BY SUBROUTINE INPM1.
C
C Glossary of Variables:
C NUM_DIST - # of distances at which sigmas are being supplied for table-lookup
C
C CRAC2 CODING ADAPTED BY LYNN RITCHIE, DIV. 6415.
C
C MODIFIED BY D. CHANIN, 15 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 9/16/88-A,
C   ADDED VALIDATION TO PROCESSING OF MIXING LAYER HEIGHT, MINOR CLEANUP
```

```
C Modified 7/21/95, DIC, Allow stability class 7 (G) for table-lookup sigmas
C Modified 8/29/95, DIC, Disallow class 7 (G) because of weather-binning conflic
C  NO EXTERNAL FUNCTIONS
      PARAMETER (MAX_DIST=50, MAX_STAB=6)
      INTRINSIC MOD
      COMMON /IRAIN/ MRAIN(24,365)
      COMMON /METDTA/ ROSE(16,4), HEIGHT(4,2), MONTHS(12,24,31)
      COMMON /HGTMIX/ HGTMIX(4,6)
      CHARACTER *80 TITLE(2)
      LOGICAL OK
      DIMENSION    IDTA(24,365)
      EQUIVALENCE (IDTA(1,1),MONTHS(1,1,1))
C
      COMMON /DISP_TABLES/ NUM_DIST, DISTANCE(MAX_DIST),
     1  SIGMA_Y(MAX_DIST,MAX_STAB), SIGMA_Z(MAX_DIST,MAX_STAB),
     2   D_SIGMA_Y(MAX_DIST,MAX_STAB), D_SIGMA_Z(MAX_DIST,MAX_STAB),
     3   D_INVRS_Y(MAX_DIST,MAX_STAB), D_INVRS_Z(MAX_DIST,MAX_STAB)
C
C  NOT IS THE STANDARD OUTPUT UNIT
C
      DATA NOT /6/
C
C  READ IN METEOROLOGICAL DATA
C
      REWIND(INMET)
      READ(INMET,20,END=300,ERR=300) TITLE
   20 FORMAT(A)
      WRITE(NOT,40) TITLE
   40 FORMAT(/' READING FROM A WEATHER FILE WITH THE FOLLOWING HEADER:',
     $       / 1X, A/ 1X, A)
      IBAD   = 0
      IRNSM  = 0
      IRNCNT = 0
      DO 100 I = 1, 24
      DO 100 J = 1, 365
      READ(INMET,60) MDA, MHR, MWRD, MRN
   60 FORMAT(BZ,1X,I3,1X,I2,1X,I6,I3)
C
C  CHECK WINDSPEED AND STABILITY DATA
C
      IDGTS = MOD (MWRD,10000)
      IWND = IDGTS / 10
      ISTB = IDGTS - IWND * 10
C
C  WINDSPEED CANNOT EXCEED 30M/S NOR BE ZERO
C
      IF (IWND .EQ. 000 .OR. IWND .GT. 300) THEN
        OK = .FALSE.
        WRITE(6,*) ' WINDSPEED DATA BAD AT DAY ',MDA,' AND HOUR ',MHR
        WRITE(7,*) ' WINDSPEED DATA BAD AT DAY ',MDA,' AND HOUR ',MHR
        RETURN
C
C  STABILITY CLASS CANNOT BE 0 NOR EXCEED 7
C
      ELSE IF (ISTB .EQ. 0 .OR. ISTB .GT. 7) THEN
        OK = .FALSE.
        WRITE(6,*) ' STABILITY DATA BAD AT DAY ',MDA,' AND HOUR ',MHR
        WRITE(7,*) ' STABILITY DATA BAD AT DAY ',MDA,' AND HOUR ',MHR
        RETURN
      ENDIF
C
C  ALL NON-ZERO WINDSPEEDS THAT ARE LESS THAN .5M/S ARE SET TO .5 M/S
C
```

```
      IF (IWND .LT. 005) MWRD = MWRD - IDGTS + 0050 + ISTB
C
C stability class of 7 is set to 6
C Note: allowing G-stability leads to an out-of-bounds array reference at
C       line 6861, SUBROUTINE WBNMET, reference to ISTBX(KSTB)
C
C      IF (ISTB .EQ. 7 .AND. NUM_DIST .EQ. 0) MWRD = MWRD - 1
      IF (ISTB .EQ. 7) MWRD = MWRD - 1
      IDTA(MHR,MDA) = MWRD * 10
C
C  REMOVE TRACE RAIN SIGNALS
C
      IF (MRN .EQ. -1) MRN = 0
      IF (MRN .EQ. 999) THEN
C
C  COUNT THE NUMBER OF BAD HOURS AND SET THE RAIN AMOUNT TO ZERO
C
        IBAD = IBAD + 1
        MRN  = 0
      ENDIF
      IF (MRN .GT. 0) THEN
C
C  COUNT THE NUMBER OF HOURS OF RAIN AND ACCUMULATE THE RAINFALL
C
        IRNCNT = IRNCNT + 1
        IRNSM  = IRNSM + MRN
C
C  CONVERT RAIN TO TENTHS OF MILLIMETERS FROM HUNDREDTHS OF INCHES
C
        MRN = MRN * 2.54
        IF (MRN .GT. 999) MRN = 999
      ENDIF
      MRAIN(MHR,MDA) = MRN
  100 CONTINUE
      READ(INMET,120) HEIGHT
  120 FORMAT(8F10.0)
C
C  ENSURE THAT ALL VALUES OF MIXING LAYER HEIGHT ARE BETWEEN 0 AND 99900
C  AS SPECIFIED IN THE USER'S GUIDE
C
      DO 130 ISESON = 1, 4
      IF (HEIGHT(ISESON,1) .LT. 0.
     1    .OR. HEIGHT(ISESON,1) .GT. 99900.) THEN
        OK = .FALSE.
        CALL ERRFIL ('WRDMET', 'METEOROLOGICAL DATA FILE')
        WRITE(6,*) 'INVALID MORNING MIXING HEIGHT IN SEASON', ISESON
        WRITE(7,*) 'INVALID MORNING MIXING HEIGHT IN SEASON', ISESON
      ENDIF
      IF (HEIGHT(ISESON,2) .LT. 0.
     1    .OR. HEIGHT(ISESON,2) .GT. 99900.) THEN
        OK = .FALSE.
        CALL ERRFIL ('WRDMET', 'METEOROLOGICAL DATA FILE')
        WRITE(6,*) 'INVALID AFTERNOON MIXING HEIGHT IN SEASON', ISESON
        WRITE(7,*) 'INVALID AFTERNOON MIXING HEIGHT IN SEASON', ISESON
      ENDIF
  130 CONTINUE
      IF (.NOT. OK) RETURN
C
C  SET MIXING HEIGHTS BY STABILITY CLASS AND SEASON
C
C  THE CODE WILL USE THE HIGHER OF THE TWO VALUES OF LID HEIGHT
C  SO THAT THE ONLY VARIATION OF LID HEIGHT IS BY SEASON.
C  THE SAME LID HEIGHT IS USED FOR ALL OF THE STABILITY CLASSES.
```

```
C
      DO 140 ISESON = 1, 4
      HEIGHT(ISESON,1) = 100. * MAX (HEIGHT(ISESON,1),HEIGHT(ISESON,2))
      HEIGHT(ISESON,2) = HEIGHT(ISESON,1)
C
C  LOOP ON ALL SIX STABILITY CLASSES
C
      DO 140 JSTAB = 1, 6
  140 HGTMIX(ISESON,JSTAB) = HEIGHT(ISESON,1)
      RNSM = IRNSM / 100.
      WRITE(NOT,160) IRNCNT,RNSM
  160 FORMAT(' ',5X,'METEOROLOGICAL DATA FILE CONTAINS ',I4,
     1      ' HOURS OF OBSERVED RAIN DATA.'/
     2      ' ',12X,'ACCUMULATED RAIN MEASUREMENTS TOTALED ',F6.2,
     3      ' INCHES FOR THE YEAR.')
      WRITE(NOT,180) (NINT (HGTMIX(ISESON,1)), ISESON=1,4)
  180 FORMAT(13X,'CONSTANT LID HEIGHTS (M) FOR 4 SEASONS = ', 4I7)
      WRITE(NOT,200)
  200 FORMAT(' ',12X,'NON-ZERO WINDSPEEDS LESS THAN 0.5 M/S ARE SET ',
     1       'TO 0.5 M/S')
      RETURN
  300 CALL ERRFIL ('WRDMET', 'METEOROLOGICAL DATA FILE')
      WRITE(6,*) 'AN EMPTY FILE WAS FOUND UNIT', INMET
      WRITE(7,*) 'AN EMPTY FILE WAS FOUND UNIT', INMET
      OK = .FALSE.
      RETURN
      END
*DECK INPM2
      SUBROUTINE INPM2 (OK)
C
C  THIS ROUTINE LOADS /M2/ FOR WEATHER SAMPLING
C  BOUNDARY CONDITION WEATHER PARAMETERS
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INPMET.
C
C  GLOSSARY OF VARIABLES:
C
C  BNDMXH - BOUNDARY WEATHER MIXING LAYER HEIGHT (METERS)
C  BNDRAN - BOUNDARY WEATHER RAINFALL RATE (MM/HOUR)
C  BNDWND - BOUNDARY WEATHER WIND SPEED (M/S)
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C  IBDSTB - BOUNDARY WEATHER STABILITY CLASS
C  LIMSPA - LIMITING SPATIAL INTERVAL FOR USING MEASURED WEATHER
C  NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C
C  GLOSSARY OF EXTERNALS:
C
C  IGET1   - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGET1   - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 30 MAR 1984.
C
      EXTERNAL IGET1, RGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M2/ LIMSPA, BNDMXH, IBDSTB, BNDRAN, BNDWND
```

```
      OK = .TRUE.
C
C  LIMITING SPATIAL INTERVAL FOR MEASURED WEATHER
C  A ZERO MEANS THAT BOUNDARY WEATHER IS USED FROM THE BEGINNING
C
      LIMSPA = IGET1 ('M2LIMSPA001', 1, 0, 0, NUMRAD, RANGE, FOUND,
     $                'INPM2', 'LIMSPA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  BOUNDARY CONDITION MIXING LAYER HEIGHT
C
      BNDMXH = RGET1 ('M2BNDMXH001', 1, 100., 0., 1.E4, RANGE, FOUND,
     $                'INPM2', 'BNDMXH')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  BOUNDARY CONDITION STABILITY CLASS
C
      IBDSTB = IGET1 ('M2IBDSTB001', 1, 1, 0, 6, RANGE, FOUND,
     $                'INPM2', 'IBDSTB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  BOUNDARY CONDITION RAIN RATE
C
      BNDRAN = RGET1 ('M2BNDRAN001', 1, 0., 0., 99., RANGE, FOUND,
     $                'INPM2', 'BNDRAN')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  BOUNDARY WIND SPEED
C
      BNDWND = RGET1 ('M2BNDWND001', 1, .5, 0., 30., RANGE, FOUND,
     $                'INPM2', 'BNDWND')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INPM3
      SUBROUTINE INPM3 (OK)
C
C  THIS ROUTINE LOADS /M3/ FOR WEATHER SAMPLING
C  ACCIDENT START TIME; DAY AND HOUR
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INPMET.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C  ISTRDY - START TIME DAY IN THE YEAR
C  ISTRHR - START TIME HOUR IN THE DAY
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C
C  GLOSSARY OF EXTERNALS:
C
C  IGET1   - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGET1   - INTERFACE TO INPRE THAT RETURNS A REAL VALUE
C
C  DAVID CHANIN, DIV. 6415, 30 MAR 1984.
C
      EXTERNAL IGET1, RGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      COMMON /M3/ ISTRDY, ISTRHR
      OK = .TRUE.
C
```

```
C  DAY IN THE YEAR OF THE ACCIDENT START TIME
C
      ISTRDY = IGET1 ('M3ISTRDY001', 1, 1, 0, 365, RANGE, FOUND,
     $                'INPM3', 'ISTRDY')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  HOUR IN THE DAY OF THE ACCIDENT START TIME
C
      ISTRHR = IGET1 ('M3ISTRHR001', 1, 1, 0, 24, RANGE, FOUND,
     $                'INPM3', 'ISTRHR')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INPM4
      SUBROUTINE INPM4 (OK)
C
C THIS ROUTINE LOADS /M4/ FOR WEATHER SAMPLING
C
C THIS ROUTINE IS CALLED BY SUBROUTINE INPMET.
C
C GLOSSARY OF VARIABLES:
C
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C INDXBN - BIN NUMBER (INDEX)
C INWGHT - NUMBER OF WEATHER SEQUENCES REQUESTED FROM THE BIN
C IRNRAT - TABLE OF RAIN INTENSITY BREAKPOINTS (TENTHS OF MM/HR)
C METCOD - METEOROLOGICAL SAMPLING OPTION CODE, SEE BELOW
C NBIN   - NUMBER OF DEFINED WEATHER BINS
C NRINTN - NUMBER OF RAIN INTENSITY LEVELS FOR THE RAIN BINS
C NRNINT - NUMBER OF DISTANCE INTERVALS FOR THE RAIN BINS
C NSBINS - NUMBER OF BINS TO BE SAMPLED
C NSMPLS - NUMBER OF WEATHER SEQUENCES TO BE SELECTED FROM EACH OF THE BINS
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C RATIO  - RATIO SHOWING THE RELATIVE DIFFERENCE BETWEEN DISTANCES
C RDISTS - TABLE OF INTERVAL ENDPOINTS FOR RAIN IN TENTHS OF METERS PER SECOND
C RNDSTS - TABLE OF INTERVAL ENDPOINTS FOR THE RAIN DISTANCE INTERVALS (km)
C RNRATE - TABLE OF RAIN INTENSITY BREAKPOINTS FOR THE RAIN BINS (MM/HR)
C SPAEND - ARRAY OF RADIAL DISTANCES TO SPATIAL ELEMENT ENDPOINTS (METERS)
C
C METCOD = 1- USER SPECIFIED DAY AND HOUR OF A SINGLE SEQUENCE ON THE METFIL,
C          2- WEATHER CATEGORY BIN SAMPLING SIMILAR TO CRAC2,
C          3- 120 HOURS OF WEATHER SPECIFIED ON THE ATMOS USER INPUT FILE,
C          4- CONSTANT WEATHER CONDITIONS SPECIFIED ON ATMOS USER INPUT FILE,
C          5- RANDOM SAMPLING STRATIFIED BY DAY OF THE YEAR.
C
C GLOSSARY OF EXTERNALS:
C
C IGETN   - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
C IGET1   - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C RGETN   - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C WBNMET - FOR WEATHER CATEGORY SAMPLING, ASSIGNS EACH START TIME TO A BIN
C
C DAVID CHANIN, DIV. 6415, 30 MAR 1984.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 18 NOV 1987.
C MODIFIED 18 NOV 87, S.E.R. #73, LTR, TO READ AND CHECK THE DATA REQUIRED
C BY THE MACCS 1.5 WEATHER BINNING AND SEQUENCE SELECTION ALGORTIMS
C MODIFIED BY D. CHANIN, 13 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 11/08/88, D. CHANIN, LOG # 10/26/88-A, PART 2,
C   WE ARE INCREASING THE UPPER LIMIT ON THE DISTANCE TO WHICH
C   WE SEARCH FOR RAIN, RNDSTS, IN THE WEATHER BINNING FROM
C   32.2 TO 99.9 KILOMETERS.
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C   WHILE HERE, ALSO FIXED AN INCORRECT CONVERSION OF RNDSTS.
C Modified 3/8/96, Allow sampling of each hour of the year with METCOD=5
C
      EXTERNAL IGET1, IGETN, RGETN, WBNMET
      INTRINSIC NINT

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M1/ METCOD
      COMMON /M4/ NSMPLS, NSBINS, IRSEED, INDXBN(41), INWGHT(41),
     1            NRNINT, RDISTS(6), NRINTN, IRNRAT(3), RNRATE(3)
      COMMON /METB/ IDRBIN(41,17), IRAND(41),
     1              IWGHT(41), SPACE(41), NTOT, NBIN
      DIMENSION RNDSTS(6)
      LOGICAL OK, RANGE, FOUND
      OK = .TRUE.
C
C  IF (METCOD=2) NSMPLS IS THE NUMBER OF SAMPLES TAKEN FROM EACH
C  WEATHER CATEGORY BIN BY THE WEATHER BIN SAMPLING ROUTINE BINSAM,
C
C  IF (METCOD=5) NSMPLS IS THE NUMBER OF RANDOM SAMPLES TAKEN
C  PER DAY OF THE YEAR BY THE STRATIFIED RANDOM SAMPLING ROUTINE RANSAM.
C
      NSMPLS = IGET1 ('M4NSMPLS001', 1, 0, 0, 24, RANGE, FOUND,
     $                'INPM4', 'NSMPLS')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
C
C  INITIAL SEED FOR THE RANDOM NUMBER GENERATOR BETWEEN 0 AND 255
C
      IRSEED = IGET1 ('M4IRSEED001', 1, 0, 0, 255, RANGE, FOUND,
     $                'INPM4', 'IRSEED')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
C
C  NO OTHER M4 INPUT VARIABLES ARE NEEDED WHEN METCOD IS OTHER THAN 2
C
      IF (METCOD .NE. 2) RETURN
C
C  READ THE RAIN BIN DISTANCE INTERVAL DATA
C
      NRNINT = IGET1('M4NRNINT001', 1, 4, 4, 6, RANGE, FOUND,
     $               'INPM4', 'NRNINT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')

      CALL RGETN ('M4RNDSTS001', 0, RNDSTS, NRNINT, .001, 99.9,
     $            RANGE, FOUND, 'INPM4', 'RNDSTS')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
C
C  Apply a conversion factor appropriate for converting from km/hour
C  to tenths of meters per second, check that distances are increasing
C
      DO 100 I = 1, NRNINT
C
C  FOR SOME REASON, THE USER SUPPLIED VALUES ARE BEING DISCARDED HERE.
C  LATER ON IN SUBROUTINE WBNMET, THE VALUES OF RNDSTS WILL BE
C  RECONSTRUCTED IN THE DO-LOOP AT STATEMENT NUMBER 25.     D. CHANIN.
C
      RDISTS(I) = RNDSTS(I) * (1000. / 3600. * 10.)
      IF (I .GT. 1) THEN
        IF (RDISTS(I-1) .GE. RDISTS(I)) THEN
          CALL ERRLOC ('INPM4', 'RNDSTS')
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          WRITE(6,*) 'RAIN INTERVAL DISTANCES NOT INCREASING'
          WRITE(7,*) 'RAIN INTERVAL DISTANCES NOT INCREASING'
        CALL ABORT ('Input Error')
        ENDIF
      ENDIF
  100 CONTINUE
C
C  CHECK THAT THE DISTANCES CORRESPOND TO SPATIAL INTERVAL ENDPOINTS
C   (RELATIVE DIFFERENCE CANNOT EXCEED 10%)
C
C  NOTE THE UNIT CONVERSION BELOW; SPAEND IS IN METERS, RNDSTS IN KILOMETERS
C
      DO 220 I = 1, NRNINT
      DO 210 J = 1, NUMRAD
      RATIO = ABS ( (RNDSTS(I) - SPAEND(J) / 1000.) / RNDSTS(I) )
      IF (RATIO .LE. .1) GO TO 220
  210 CONTINUE
      OK = .FALSE.
      CALL ERRLOC ('INPM4', 'RNDSTS')
      WRITE(6,*)'RAIN INTERVAL ENDPOINTS ARE NOT SPATIAL DISTANCE ',
     1          'ENDPOINTS'
      WRITE(6,*) 'RNDSTS = ', (RNDSTS(K),K=1,NRNINT)
      WRITE(6,*) 'SPAEND = ', (SPAEND(K)/1000.,K=1,NUMRAD)
      WRITE(7,*)'RAIN INTERVAL ENDPOINTS ARE NOT SPATIAL DISTANCE ',
     1          'ENDPOINTS'
      WRITE(7,*) 'RNDSTS = ', (RNDSTS(K),K=1,NRNINT)
      WRITE(7,*) 'SPAEND = ', (SPAEND(K)/1000.,K=1,NUMRAD)
      CALL ABORT ('Input Error')
  220 CONTINUE
C
C  READ THE RAIN BIN INTENSITY DATA
C
      NRINTN = IGET1('M4NRINTN001', 1, 2, 2, 3, RANGE, FOUND,
     $               'INPM4', 'NRINTN')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
      CALL RGETN('M4RNRATE001', 0, RNRATE, NRINTN, .001, 1.0E2,
     $            RANGE, FOUND, 'INPM4', 'RNRATE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
C
C  CHECK THAT THE RAIN INTENSITIES WERE GIVEN IN ASCENDING ORDER
C
      DO 240 I = 2, NRINTN
      IF (RNRATE(I) .LE. RNRATE(I-1)) THEN
        CALL ERRLOC ('INPM4', 'RNRATE')
        WRITE(6,*)'RAIN INTENSITY BREAKPOINTS NOT INCREASING'
        WRITE(7,*)'RAIN INTENSITY BREAKPOINTS NOT INCREASING'
      CALL ABORT ('Input Error')
      ENDIF
  240 CONTINUE
C
C  CHANGE THE ORDER OF THE RAIN INTENSITY ARRAY BY REVERSING TOP-TO-BOTTOM.
C
C  THIS IS BEING DONE BECAUSE THE WEATHER BINNING ALGORITHM IN
C  SUBROUTINE WBNMET EXPECTS THE DATA IN THIS FORM BUT IT SEEMS
C  CONFUSING TO ASK THE USER TO SUPPLY IT THAT WAY.
C
C  D. CHANIN, 13 JAN 88.
C
      IF (NRINTN .EQ. 2) THEN
        TEMP = RNRATE(1)
        RNRATE(1) = RNRATE(2)
        RNRATE(2) = TEMP
      ELSE IF (NRINTN .EQ. 3) THEN
```

```
          TEMP = RNRATE(1)
          RNRATE(1) = RNRATE(3)
          RNRATE(3) = TEMP
        ELSE
          OK = .FALSE.
          CALL ERRLOC ('INPM4','NRINTN')
          WRITE(6,*) 'NRINTN MUST BE EITHER 2 OR 3'
          WRITE(7,*) 'NRINTN MUST BE EITHER 2 OR 3'
        CALL ABORT ('Input Error')
        ENDIF
C
C  CONVERT FROM MM/HR TO TENTHS OF MILLIMETERS PER HOUR FOR THE INTEGER ARRAY
C
        DO 260 I = 1, NRINTN
  260 IRNRAT(I) = NINT (RNRATE(I) * 10.)
C
C  ADD ONE TO THE VALUE OF NRINTN BECAUSE THAT IS WHAT IS EXPECTED IN WBNMET
C
        NRINTN = NRINTN + 1
C
C  SET THE NUMBER OF DEFINED WEATHER BINS AND CHECK NEED TO DEFINE
C  INDIVIDUAL BIN SAMPLING
C
  310 NBIN = 16 + NRINTN * NRNINT

        IF (NSMPLS .EQ. 0) THEN
C
C  DEFINE THE NUMBER OF BINS TO BE SAMPLED AND THEIR WEIGHTS
C
          NSBINS = IGET1 ('M4NSBINS001', 1, 1, 1, NBIN, RANGE, FOUND,
     $                    'INPM4', 'NSBINS')
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
C
C  READ THE BIN NUMBERS FROM WHICH SAMPLES ARE TO BE SELECTED,
C  AND THE NUMBER OF WEATHER SEQUENCES TO BE SAMPLED FROM THE BIN.
C
C  IF A BIN NUMBER IS OMITTED, THAT BIN IS NOT SAMPLED.
C  BIN NUMBERS ARE IN COLUMN 1, NUMBER OF SEQUENCES ARE IN COLUMN 2.
C
C   READ THE BIN NUMBERS (INDEX)
C
          CALL IGETN('M4SMPLDF001', 1, INDXBN, NSBINS, 1, NBIN,
     $                RANGE, FOUND, 'INPM4', 'INDXBN')
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
C
C   READ THE NUMBER OF WEATHER SEQUENCES REQUESTED FROM THE BINS
C
          CALL IGETN('M4SMPLDF001', 2, INWGHT, NSBINS, 1, 8760,
     $                RANGE, FOUND, 'INPM4', 'INWGHT')
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('Input Error')
        ENDIF
C
C  ASSIGN EACH HOUR OF THE YEAR TO A WEATHER CATEGORY SAMPLING BIN
C
        CALL WBNMET
        RETURN
        END
*DECK WBNMET
        SUBROUTINE WBNMET
C
C PROGRAM TO DETERMINE GROUPINGS (BINS) FOR 1 YEARS METEOROLOGICAL
C DATA BY SCANNING THE MET TAPE DATA
C
```

```
C THIS ROUTINE IS CALLED BY SUBROUTINE INPM4.
C
C GLOSSARY OF VARIABLES:
C
C NRNINT - NUMBER OF RAIN INTERVALS
C RDISTS - RAIN DISTANCE TABLE (VELOCITY IN TENTHS OF METERS PER SECOND)
C NRINTN - NUMBER OF RAIN INTENSITY LEVELS
C RNRATE - RAIN RATE TABLE (MILLIMETERS PER HOUR)
C IRNRAT - RAIN RATE TABLE (TENTHS OF MILLIMETERS PER HOUR)
C
C CRAC2 CODING ADAPTED BY LYNN RITCHIE, DIV. 6415.
C
C MODIFIED 18 NOV 87, LTR, SER #73, IMPLEMENT MACCS 1.5 WEATHER BINNING
C
C MODIFIED BY D. CHANIN, 15 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 11/08/88, D. CHANIN, LOG # 10/26/88-A, PART 1
C   THE NUMBER OF RAIN INTENSITIES, NRINTN, WAS CONFUSED WITH THE
C   NUMBER OF RAIN DISTANCE INTERVALS, NRNINT.
C   ALSO CORRECTED AN INCORRECT COMMENT AND CONVERSION CONSTANT.
C
C MODIFIED 2/9/89, J. ROLLSTIN, LOG# 01/30/89-A
C   THE NUMBER OF RAIN INTENSITIES, NRINTN, WAS CONFUSED WITH THE
C   NUMBER OF RAIN DISTANCE INTERVALS, NRNINT
C
      EXTERNAL WNDRZB
      INTRINSIC NINT

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      COMMON /IRAIN/ MRAIN(24,365)
      COMMON /METB/ IDRBIN(41,17), IRAND(41),
     1              IWGHT(41), SPACE(41), NTOT, NBIN
      COMMON /METDTA/ ROSE(16,4), HEIGHT(4,2), MONTHS(12,24,31)
      COMMON /DIRB/ IDRB(12,17)
      COMMON /CNTDTA/ DTACNT
      COMMON /M4/ NSMPLS, NSBINS, IRSEED, INDXBN(41), INWGHT(41),
     1            NRNINT, RDISTS(6), NRINTN, IRNRAT(3), RNRATE(3)
      DIMENSION PCNTBN(41),ICODE(41),ICOD(41),IBIN(6,7)
      DIMENSION IDTA(24,365)
      DIMENSION IWNDS(6)
      DIMENSION ISTBX(6)
      DIMENSION IVELCD(6,7)
      DIMENSION ISTBCD(6)
      DIMENSION NWND(6)
      DIMENSION IPCNT(8)
      DIMENSION CHRR(4)
      EQUIVALENCE (IDTA(1,1),MONTHS(1,1,1))
      CHARACTER*3 ISTBNM(6)
      CHARACTER*3 CHRR
      CHARACTER*3 ICODE,IALL
      DATA IALL /'ALL'/, ICODE /41*'   '/
      DATA CHRR /'R1 ','R2 ','R3 ','R4 '/
C
C  ILST IS THE NUMBER OF WEATHER BIN CATEGORIES + 1
C  ISMRY IS THE NUMBER OF WIND DIRECTIONS + 1
C  ISMW IS THE NUMBER OF WIND DIRECTIONS
C
      DATA ILST /33/, ISMRY /17/, ISMW /16/
```

```
C
C  NWNDS IS THE NUMBER OF SPECIFIED WINDSPEEDS
C
      DATA NWNDS /5/
C
C  NWINT IS THE NUMBER OF WIND INTERVALS
C
      DATA NWINT /6/
C
C  IWNDS IS THE ARRAY OF INITIAL WINDSPEEDS IN TENTHS OF M/S
C          ORDERED HIGH TO LOW
C
      DATA IWNDS /70,50,30,20,10,1*0/
C
C  ISTBX IS THE STABILITY CATEGORY INDEX TABLE
C
      DATA ISTBX /2,2,3,3,4,5/
C
C  IBIN IS THE ARRAY OF INDICES FOR THE INITIAL CONDITION BINS
C
      DATA IBIN/1,1,3,3,9,13,1,1,4,4,10,14,1,1,5,5,11,15,2,2,6,6,12,16,
     1     2,2,7,7,12,16,2,2,8,8,12,16,0,0,0,0,0,0/
C
C  IVELCD IS THE ARRAY OF WIND VELOCITY CODES BY STABILITY CLASS
C
      DATA IVELCD/3,1,1,1,1,0, 4,2,2,2,2,0, 0,3,3,3,3,0, 0,4,4,4,4,0,
     1     0,5,0,0,0,0, 0,6,0,0,0,0, 0,0,0,0,0,0/
C
C  ISTBCD IS THE ARRAY OF INDICIES TO THE INITIAL CONDITION  STABILITY
C    CLASS NAMES
C
      DATA ISTBCD /2,4,5,6,2*0/
C
C  ISTBNM IS THE ARRAY OF NAMES OF THE STABILITY CLASSES
C
      DATA ISTBNM /'A  ','B  ','C  ','D  ','E  ','F  '/
C
C  NWND IS THE ARRAY CONTAINING THE NUMBER OF WIND VELOCITY INTERVALS
C          IN EACH STABILITY CLASS
C
      DATA NWND /2,6,4,4,2*0/
C
C  NCLASS IS THE NUMBER OF STABILITY CLASSES IN THE CATEGORIZATION
C
      DATA NCLASS /4/
C
C  DEFINE STATEMENT FUNCTIONS
C
      ISTAB(I,J) = MOD (IDTA(I,J) / 10, 10)
      IWSPD(I,J) = MOD (IDTA(I,J) / 100, 1000)
      IWDIR(I,J) = MOD (IDTA(I,J) / 100000, 100)
      JRAIN(I,J) = MOD (MRAIN(I,J), 1000)
C
C  SET UP BIN WEIGHTS
C
      IF (NSMPLS .EQ. 0) THEN
        DO 5 I = 1, NSBINS
    5   IWGHT(INDXBN(I)) = INWGHT(I)
      ELSE
        DO 10 I = 1, NBIN
   10   IWGHT(I) = NSMPLS
      ENDIF
C
```

```
C  FOLLOWING DO LOOP ADDED TO INITIALIZE IDRB TO ZERO,
C
C  D. CHANIN, 13 JAN 88.
C
      DO 15 I = 1, ISMRY
      DO 15 J = 1, 1 + NWNDS + NWINT
   15 IDRB(J,I) = 0
      ILST = NBIN + 1
      DO 20 I = 1, ISMRY
      DO 20 J = 1, ILST
   20 IDRBIN(J,I) = 0
C
C  SET UP HEADING DATA FOR METEOROLOGICAL DATA SUMMARY
C  SET DISTANCE IN KILOMETERS FOR TABLE PRINT OUT
C
      DO 30 J = 1, NRINTN
      JINC = (J - 1) * NRNINT
      DO 25 I = 1, NRNINT
C
C  FOLLOWING STATEMENT CONVERTS DISTANCE BACK TO UNITS OF KILOMETERS.
C  SEE SUBROUTINE INPM4 FOR A BETTER UNDERSTANDING OF WHAT'S HAPPENING.
C
C  D. CHANIN, 13 JAN 88.
C
C  CONVERT BACK TO THE ORIGINAL UNITS OF THE USER-SPECIFIED VALUE
C  FOR RNDSTS, THIS IS VERY CONFUSING AND OUGHT TO BE FIXED!
C  PLEASE REFER TO SUBROUTINE INPM4.              D. CHANIN.
C
      DIS = RDISTS(I) / (1000. / 3600. * 10.)
      ICOD(I + ISMW + JINC)  = NINT (DIS)
      ICODE(I + ISMW + JINC) = CHRR(J)
   25 CONTINUE
   30 CONTINUE
C
C  SET WIND SPEEDS IN M/S FOR TABLE PRINT OUT
C  INITIALIZE THE INDEX TO THE IDENTIFICATION CODE TABLES
C
      ICNDX = 0
      DO 40 J = 1, NCLASS
C
C  SET THE NUMBER OF WIND INTERVALS IN THE INITIAL STABILITY CLASSES
C
      NWNDCL = NWND(J)
      DO 35 I = 1, NWNDCL
C
C  SET STABILITY CLASS CODE
C
      ICODE(ICNDX+I) = ISTBNM(ISTBCD(J))
C
C  SET WIND VELOCITY INTERVAL CODE
C
      ICOD(ICNDX+I) = IVELCD(J,I)
   35 CONTINUE
C
C  UPDATE THE INDEX TO THE IDENTIFICATION CODE TABLES
C
      ICNDX = ICNDX + NWNDCL
   40 CONTINUE
      DISTR = 0.0
C
C  DETERMINE DISTANCE FOR BEGINNING OF YEAR FROM LAST RAIN
C
      DO 45 I = 1, 365
```

```
      DO 45 J = 1, 24
      LRAIN = JRAIN(J,I)
      IF (LRAIN .GT. 0) GO TO 50
C
C  DISTR IS THE DISTANCE TO THE NEXT RAIN HOUR FROM THE START HOUR
C
      DISTR = DISTR + IWSPD(J,I)
      IF (DISTR .GE. RDISTS(NRNINT)) GO TO 50
   45 CONTINUE
   50 CONTINUE
C
C  LOOK BACKWARDS THROUGH YEARS MET DATA AND CHECK FOR RAIN
C
      DO 500 IDAY = 1, 365
      I = 366 - IDAY
      DO 500 JHOUR = 1, 24
      J = 25 - JHOUR
      MET = 0
      ICATX = 1
      KDIR = IWDIR(J,I)
C
C  WINDSPEED IS IN UNITS OF TENTHS OF M/S
C
      IF (JRAIN(J,I) .EQ. 0) GO TO 90
      LRAIN = JRAIN(J,I)
      DO 80 L = 1, NRINTN - 1
      IF (LRAIN .LT. IRNRAT(L)) GO TO 80
      IRTBN = NRINTN - L
      GO TO 85
   80 CONTINUE
      IRTBN = 0
   85 CONTINUE
      DISTR = 0.0
      MET = 1 + ISMW + IRTBN * NRNINT
      GO TO 400
   90 DISTR = DISTR + IWSPD(J,I)
      IF (DISTR .LE. RDISTS(NRNINT)) THEN
C
C    SET UP BINS FOR RAIN WITHIN VARIOUS DISTANCES
C
        DO 190 K = 1, NRNINT
      IF (DISTR .GT. RDISTS(K)) GO TO 190
      DO 180 L = 1, NRINTN - 1
        IF (LRAIN.LT.IRNRAT(L)) GO TO 180
        IRTBN = NRINTN - L
      GO TO 185
  180   CONTINUE
      IRTBN = 0
  185   CONTINUE
      MET = K + ISMW + IRTBN * NRNINT
      GO TO 400
  190   CONTINUE
      ENDIF
C
C  IF NO RAIN OR SLOWDOWNS WITHIN RDISTS(NRNINT) OR SDISTS(NSINT) THEN
C     USE THE START HOUR WINDSPEED AND STABILITY CATEGORIES FOR THE BINS
C
      KSTAB = ISTAB(J,I)
      ICATX = ISTBX(KSTAB)
      IWND  = IWSPD(J,I)
      DO 330 N = 1, NWNDS
      IF (IWND .LT. IWNDS(N)) GO TO 330
      KSPEED = NWINT - N + 1
```

```
      MET = IBIN(KSTAB,KSPEED)
      GO TO 395
  330 CONTINUE
      KSPEED = 1
      MET = IBIN(KSTAB,KSPEED)
  395 CONTINUE
C
C  WIND VELOCITY SUMMARY
C
      IWNDX = 1 + NCLASS + KSPEED
      IDRB(IWNDX,KDIR) = IDRB(IWNDX,KDIR) + 1
      IDRB(IWNDX,ISMRY) = IDRB(IWNDX,ISMRY) + 1
  400 CONTINUE
      MRAIN(J,I) = MET * 100000 + MRAIN(J,I)
C
C  STABILITY CATEGORY CLASS SUMMARIES
C
      IDRB(ICATX,KDIR) = IDRB(ICATX,KDIR) + 1
      IDRB(ICATX,ISMRY) = IDRB(ICATX,ISMRY) + 1
C
C  BIN SUMMARY
C
      IDRBIN(MET,KDIR) = IDRBIN(MET,KDIR) + 1
      IDRBIN(MET,ISMRY) = IDRBIN(MET,ISMRY) + 1
C
C  DATA FILE SUMMARY
C
      IDRBIN(ILST,KDIR) = IDRBIN(ILST,KDIR) + 1
      IDRBIN(ILST,ISMRY) = IDRBIN(ILST,ISMRY) + 1
  500 CONTINUE
      DO 480 I = 1, ILST
      PCNTBN(I) = IDRBIN(I,ISMRY) * 100. / 8760.
  480 CONTINUE
C
C  BIN WEIGHTS CANNOT EXCEED BIN COUNTS
C
      DTACNT = 0.
C
C  COUNT THE NUMBER OF TRIALS THAT WILL BE PERFORMED FOR /METOUT/
C
      NUMTRI = 0
      DO 490 I=1, NBIN
      IF (IWGHT(I) .GT. IDRBIN(I,ISMRY)) IWGHT(I) = IDRBIN(I,ISMRY)
      IF (IWGHT(I).GT.0) DTACNT = DTACNT + IDRBIN(I,ISMRY)
      NUMTRI = NUMTRI + IWGHT(I)
  490 CONTINUE
      WRITE(6,*) 'NUMTRI=', NUMTRI
C
C  WRITE AND PRINT RESULTS
C
      NRNBK = NRINTN - 1
      WRITE(6,530) NRNINT, (ICOD(K+ISMW),K=1,NRNINT)
      WRITE(6,531) NRNBK, (RNRATE(L),L=NRNBK,1,-1)
  530 FORMAT('0',/,35X,'* * * * METEOROLOGICAL BIN SUMMARY * * * *',/,
     1       3X,'BIN PRIORITIES ',/,5X,'RI XX - RAIN INTENSITY I ',
     2       'WITHIN THE INTERVAL ENDING AT XX',/,15X,'INTERVAL ',
     3       'ENDPOINTS ARE IN KILOMETERS FROM THE ACCIDENT SITE, ',
     4       'THE ',I1,' INTERVAL ENDPOINTS ARE', T106, 6I4)
  531 FORMAT(15X,'RAIN INTENSITIES ARE IN MILLIMETERS OF RAIN PER ',
     6       'HOUR, THE ',I1,' INTENSITY BREAKPOINTS ARE ',T108,3F5.1,
     7       /5X,'S   V - INITIAL WEATHER CONDITIONS ',
     8       'WITH STABILITY CLASS S AND WIND SPEED INTERVAL V',/,15X,
     9       'STABILITY CLASSES ARE B = A/B, D = C/D, E = E, AND ',
```

```
     A        'F = F',/,15X,'WIND SPEED INTERVALS ARE IN METERS PER ',
     B        'SECOND, 1 (0-1), 2 (1-2), 3 (2-3), 4 (3-5),',
     C        ' 5 (5-7), 6 (GT 7) ',//,
     1        49X,'WIND DIRECTION',/,
     2        '   METBIN    1     2     3     4     5     6     7     8',
     3        '     9    10    11    12    13    14    15    16  TOTAL ',
     4        '  PER CENT',/)
      DO 510 I = 1, NBIN
      DIVSR = IDRBIN(I,ISMRY)
      IF (DIVSR .EQ. 0.0) GO TO 510
      RDIVSR = 1.0 / DIVSR
      WRITE(6,540) I,ICODE(I),ICOD(I),(RDIVSR*IDRBIN(I,J),J=1,16),
     1                        IDRBIN(I,ISMRY),PCNTBN(I)
  540 FORMAT(1X,I2,1X,A2,1X,I2,1X,16(1X,F5.3),1X,I4,4X,F7.4)
  510 CONTINUE
      I = ILST
      DIVSR = IDRBIN(I,ISMRY)
      IF (DIVSR .EQ. 0.0) GO TO 520
      RDIVSR = 1.0 / DIVSR
      WRITE(6,541) I,IALL,(RDIVSR*IDRBIN(I,J),J=1,16),IDRBIN(I,ISMRY)
  541 FORMAT(1X,I2,1X,A3,3X,16(1X,F5.3),1X,I4,4X,F7.4)
  520 WRITE(6,550) NRNINT,(ICOD(K+ISMW),K=1,NRNINT)
      WRITE(6,551) NRNBK,(RNRATE(L),L=NRNBK,1,-1)
      WRITE(6,552) (I,ICODE(I),ICOD(I),(IDRBIN(I,J),J=1,ISMRY),
     1              PCNTBN(I),I=1,NBIN)
  550 FORMAT('1',/,30X,'* * * * METEOROLOGICAL BIN SUMMARY * * * *',/,
     1        3X,'BIN PRIORITIES ',/,5X,'RI XX - RAIN INTENSITY I ',
     2        'WITHIN THE INTERVAL ENDING AT XX',/,15X,'INTERVAL ',
     3        'ENDPOINTS ARE IN KILOMETERS FROM THE ACCIDENT SITE, ',
     4        'THE ',I1,' INTERVAL ENDPOINTS ARE', T106, 6I4)
  551 FORMAT(15X,'RAIN INTENSITIES ARE IN MILLIMETERS OF RAIN PER ',
     6        'HOUR, THE ',I1,' INTENSITY BREAKPOINTS ARE ',T108,3F5.1,
     7        /5X,'S   V - INITIAL WEATHER CONDITIONS ',
     8        'WITH STABILITY CLASS S AND WIND SPEED INTERVAL V',/,15X,
     9        'STABILITY CLASSES ARE B = A/B, D = C/D, E = E, AND ',
     A        'F = F',/,15X,'WIND SPEED INTERVALS ARE IN METERS PER ',
     B        'SECOND (M/S), 1 (0-1), 2 (1-2), 3 (2-3), 4 (3-5),',
     C        ' 5 (5-7), 6 (GT 7) ',//,
     1        42X,'WIND DIRECTION',/,
     2        '   METBIN    1    2    3    4    5    6    7    8    9  ',
     3        ' 10   11   12   13   14   15   16 TOTAL   PER CENT',/)
  552 FORMAT((1X,I2,1X,A2,1X,I2,1X,17(1X,I4),4X,F7.4))
C
C  SET THE SUMMARY
C
      IEND = 1 + NWINT + NCLASS
      DO 545 I = 1, IEND
C
C  TNWS IS THE TOTAL NUMBER OF WEATHER SEQUENCES
C
  545 PCNTBN(I) = IDRB(I,ISMRY) * 100. / 8760.
      WRITE(6,555)
C
C  SET POINTERS INTO IPCNT
C
      IPCNT(1) = 1 + ISMW
      IPNT = 1
      DO 495 N = 1, NCLASS
      IPCNT(N+1) = IPNT
      IPNT = IPNT + NWND(N)
  495 CONTINUE
C
C  PRINT SUMMARY
```

```
C
      NSMRY = 1 + NCLASS
      DO 600 N = 1, NSMRY
      ICDNDX = IPCNT(N)
      WRITE(6,560) ICODE(ICDNDX),(IDRB(N,J),J=1,ISMRY),PCNTBN(N)
  600 CONTINUE
      WRITE(6,570)(KSPEED,(IDRB(NSMRY+KSPEED,J),J=1,ISMRY),
     1             PCNTBN(NSMRY+KSPEED),KSPEED=1,NWINT)
  570 FORMAT(6(7X,I1,1X,17(1X,I4),3X,F7.4,/))
  555 FORMAT(//,15X,'* * * * SUMMARIES * * * *',/)
  560 FORMAT(4X,A1,4X,17(1X,I4),3X,F7.4)
  565 FORMAT('1',10X,'BIN TABLE')
      CALL WNDRZB (NRNINT,ISMW,ISMRY,NRINTN)
      RETURN
      END
*DECK WNDRZB
      SUBROUTINE WNDRZB (NRNINT,ISMW,ISMRY,NRINTN)
C
C COMPUTE THE WINDROSE FROM THE METEOROLOGICAL DATA IN THE BINS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE WBNMET.
C
C THIS ROUTINE SETS THE WINDROSE ARRAY FROM THE WEATHER BIN DATA FOR EACH OF
C THE INDIVIDUAL BINS.  THE WINDROSE FOR THE RAIN BINS IS COMPUTED FROM
C THE AGGREGATE DATA IN THE RAIN BINS.  THE WINDROSE FOR THE WIND
C SLOWDOWN BINS IS COMPUTED FROM THE AGGREGATE DATA IN THE WIND
C SLOWDOWN BINS.  THE WINDROSE FOR ALL OTHER BINS IS COMPUTED FROM
C THE DATA IN THAT BIN ALONE.
C
C GLOSSARY OF VARIABLE NAMES FOR DATA INPUT TO WNDRZB:
C
C IDRB(I,J) - WEATHER BIN DATA SUMMARIES FOR WEATHER CLASS I AND
C             DIRECTION J
C IDRBIN(I,J) - WEATHER BIN DATA SUMMARIES FOR WEATHER BIN I AND
C               DIRECTION J
C
C GLOSSARY OF VARIABLE NAMES FOR DATA OUTPUT FROM WNDRZB:
C
C  ROSEBI(I,J) - THE WINDROSE PROBBILITY FOR THE WIND BLOWING INTO
C                DIRECTION I FOR BIN J
C
C CRAC2 CODING ADAPTED BY LYNN RITCHIE, DIV. 6415, 7 FEB 85.
C MODIFIED 18 NOV 87, LTR, SER #73, IMPLEMENT MACCS 1.5 WEATHER BINNING
C MODIFIED BY D. CHANIN, 15 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 7/30/91, D. CHANIN, #8/2/91-A, CHANGE HOLLERITHS TO TYPE CHARACTER
C
      COMMON /DIRB/ IDRB(12,17)
      COMMON /METB/ IDRBIN(41,17), IRAND(41),
     1              IWGHT(41), SPACE(41), NTOT, NBIN
      COMMON /ROSEBI/ ROSEBI(16,41)
      DIMENSION WRK(16)
C
C  CLEAR THE WINDROSE ARRAY
C
      DO 2 J = 1, NBIN
      DO 1 I = 1, 16
    1 ROSEBI(I,J) = 0.0
    2 CONTINUE
C
C  SET THE WINDROSE FOR ALL RAIN BINS
C
      IF (IDRB(1,17) .NE. 0) THEN
      FCTR = 1.0 / IDRB(1,17)
```

```
      DO 10 I = 1, 16
   10   WRK(I) = IDRB(1,I) * FCTR
      DO 30 J = ISMRY, ISMW + NRNINT * NRINTN
      DO 20 I = 1, 16
   20   ROSEBI(I,J) = WRK(I)
   30   CONTINUE
      ENDIF
C
C  SET THE WINDROSE FOR ALL INITIAL CONDITION BINS
C
      DO 80 J = 1, ISMW
      IF (IDRBIN(J,17) .EQ. 0) GO TO 80
      FCTR = 1.0 / IDRBIN(J,17)
      DO 70 I = 1, 16
   70 ROSEBI(I,J) = IDRBIN(J,I) * FCTR
   80 CONTINUE
C
C  SET THE WINDROSE FOR THE YEARLY DATA
C
      J = ISMW + NRNINT * NRINTN + 1
      FCTR = 1.0 / IDRBIN(J,17)
      DO 81 I = 1, 16
   81 ROSEBI(I,J) = IDRBIN(J,I) * FCTR
C
C  PRINT WINDROSE SUMMARY
C
      WRITE(6,500) (I,I=1,16)
  500 FORMAT('1',15X,' * * * * * BIN WINDROSE SUMMARY * * * * * ',
     1       //,'    BIN',27X,'DIRECTION',T123,'TOTAL',/5X,16I7)

      DO 90 J = 1, NBIN + 1
      TOTROS = 0.
      DO 83 IDIR = 1, 16
   83 TOTROS = TOTROS + ROSEBI(IDIR,J)
      WRITE(6,501) J,(ROSEBI(I,J),I=1,16), TOTROS
  501 FORMAT(' ',I5, 16F7.3, F10.6)
   90 CONTINUE
      RETURN
      END
*DECK INPM5
      SUBROUTINE INPM5 (OK)
C
C  THIS ROUTINE LOADS /M5/ FOR WEATHER SAMPLING
C  120 HOURS OF WEATHER DATA
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INPMET.
C
C  GLOSSARY OF VARIABLES:
C
C  BNDMXH - BOUNDARY WEATHER MIXING LAYER HEIGHT (METERS)
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C  HRMXHT - ARRAY OF MIXING LAYER HEIGHTS FOR 120 HOURS (M)
C  HRRAIN - ARRAY OF RAINFALL RATES FOR 120 HOURS (MM/S)
C  HRWNDV - ARRAY OF WIND SPEEDS FOR 120 HOURS (M/S)
C  IHRDIR - ARRAY IF WIND DIRECTIONS FOR 120 HOURS (INTEGER)
C  IHRSTB - ARRAY OF STABILITY CLASS INDICES FOR 120 HOURS (INTEGER FOR A-F)
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE REQUIRED RANGE WAS FOUND
C  VALMAX - ACCUMULATOR FOR MAXIMUM MIXING LAYER HEIGHT
C
C  GLOSSARY OF EXTERNALS:
C
C  IGETN   - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
```

```
C
C  DAVID CHANIN, DIV. 6415, 30 MAR 1984.
C  MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C    AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C
      EXTERNAL IGETN
C  NO INTRINSIC FUNCTIONS
      LOGICAL OK, RANGE, FOUND
      COMMON /M2/ LIMSPA, BNDMXH, IBDSTB, BNDRAN, BNDWND
      COMMON /M5/ HRMXHT(120), IHRSTB(120), HRRAIN(120), HRWNDV(120),
     $            IHRDIR(120)
      OK = .TRUE.
C
C  MIXING LAYER HEIGHT FROM COLUMN 1
C
      CALL RGETN('M5METDAT001', 1, HRMXHT, 120, 100., 1.E4,
     $            RANGE, FOUND, 'INPM5', 'HRMXHT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
      ELSE
C
C  ADJUST ARRAY SO LID HEIGHT IS CONSTANT WITH TIME AT MAXIMUM VALUE FOUND.
C  AT SER #38, ATMOUT WAS MODIFIED FOR THE ASSUMPTION OF CONSTANT LID HEIGHT.
C  D. CHANIN, 24 OCT 86.
C
        VALMAX = BNDMXH
        DO 100 I = 1, 120
  100   VALMAX = MAX (VALMAX, HRMXHT(I))
        DO 120 I = 1, 120
  120   HRMXHT(I) = VALMAX
      ENDIF
C
C  STABILITY CLASS FROM COLUMN 2
C
      CALL IGETN ('M5METDAT001', 2, IHRSTB, 120, 1, 6, RANGE, FOUND,
     $            'INPM5', 'IHRSTB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  RAINFALL AMOUNT FROM COLUMN 3
C
      CALL RGETN ('M5METDAT001', 3, HRRAIN, 120, 0., 99., RANGE, FOUND,
     $            'INPM5', 'HRRAIN')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  WIND VELOCITY FROM COLUMN 4
C
      CALL RGETN ('M5METDAT001', 4, HRWNDV, 120, .5, 30., RANGE, FOUND,
     $            'INPM5', 'HRWNDV')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  WIND DIRECTION FROM COLUMN 5
C
      CALL IGETN ('M5METDAT001', 5, IHRDIR, 120, 1, 16, RANGE, FOUND,
     $            'INPM5', 'IHRDIR')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK EARINP
      SUBROUTINE EARINP (OK)
C
C  DEFINE THE CHARACTERISTICS OF THE EFFECTS MODEL BY READING
C  FROM THE UNIT 25 INPUT FILE. DATA IS FETCHED THROUGH INPRE.
C
```

```
C  THIS ROUTINE IS CALLED BY SUBROUTINE INPUT.
C
C  GLOSSARY OF EXTERNALS:
C
C  INACAN - INPUT ROUTINE FOR CANCER FROM ACUTE EXPOSURE
C  INEFAT - INPUT ROUTINE FOR EARLY FATALITY MODEL
C  INEINJ - INPUT ROUTINE FOR EARLY INJURY MODEL
C  INEVAC - INPUT ROUTINE FOR EVACUATION MODEL
C  INMISC - INPUT ROUTINE FOR MISCELLANEOUS INFORMATION
C  INORGA - INPUT ROUTINE FOR DEFINING THE LIST OF ORGANS
C  INPOPU - INPUT ROUTINE FOR POPULATION DATA
C
C  DAVID CHANIN, DIV. 6415, 11 JUNE 1984.
C MODIFIED 10/17/89, D. CHANIN, #10/13/89-B, ADD OPEN STATEMENTS
C MODIFIED 7/30/91, D. CHANIN, #10/13/89-B, PUT ALL OPENS IN MXXOPN
C
      EXTERNAL INMISC, INEVAC, INEINJ, INEFAT,
     $         INACAN, INOUT1, INOUT2, INOUT3, INOUT4, INOUT5,
     $         INOUT6, INOUT7, INOUT8, INOUTA, INPOPU
C  NO INTRINSIC FUNCTIONS
      CHARACTER *7    PATHNM
      COMMON /PATHNM/ PATHNM(8)
      CHARACTER *7 FGR_FLAG
      COMMON /FGR_FLAG/ FGR_FLAG
C
      LOGICAL OK, OKA, OK1, OK2, OK3, OK4, OK5, OK6, OK7, OK8,
     $        OK9, OK10, OK11, OK12, OK13, OK14, OK15, OK16, OK17
C
C  DEFINE THE NAMES TO BE ASSOCIATED WITH THE EIGHT PATHWAY CODES
C
      PATHNM(1) = 'CLD'
      PATHNM(2) = 'GRD'
      PATHNM(3) = 'INH ACU'
      PATHNM(4) = 'INH LIF'
      PATHNM(5) = 'TOT ACU'
      PATHNM(6) = 'TOT LIF'
      PATHNM(7) = 'RES LIF'
      PATHNM(8) = 'RES ACU'
C
C  DEFINE THE MISCELLANEOUS INFORMATION NEEDED FOR THIS RUN
C
      CALL INMISC (OKA)
      IF (.NOT. OKA) CALL ABORT ('terminating execution')
C
C  DEFINE THE LIST OF ORGANS THAT CAN BE TREATED
C
      OK1 = .TRUE.
      IF (FGR_FLAG .NE. 'FGRDCF') THEN
      CALL INORGA (OK1)
      IF (.NOT. OK1) CALL ABORT ('terminating execution')
C
C Process the DCF file
C
      write(6,*) 'Am using a DOSFAC/DOSFAC2/IDCF2 dose factor file'
      CALL EDCINP (9)
      ELSE
      write(6,*) 'Am using an FGRDCF dose factor file'
      CALL EDCINPX (9)
      ENDIF
C
C  DEFINE THE CHARACTERISTICS OF THE SHELTERING AND EVACUATION ZONE
C  AND STORE THE DATA IN /GLOBAL/ AND /NETWOR/.
C
```

```
      CALL INEVAC (OK2)
      IF (.NOT. OK2) CALL ABORT ('terminating execution')
C
C  DEFINE THE POPULATION DATA SURROUNDING THE SITE BY READING FROM UNIT 29
C  IF THE USER SPECIFIES THAT A SITE DATA FILE IS TO BE USED
C
      CALL INPOPU (29, OK3)
      IF (.NOT. OK3) CALL ABORT ('terminating execution')
C
C  DEFINE THE shielding factors and EARLY resuspension model
C  AND STORE THE DATA IN /EADFAC/
C
      CALL INPEMR (OK4)
      IF (.NOT. OK4) CALL ABORT ('terminating execution')
C
C  DEFINE THE EARLY FATALITY MODEL PARAMETERS
C
      CALL INEFAT (OK5)
      IF (.NOT. OK5) CALL ABORT ('terminating execution')
C
C  DEFINE THE EARLY INJURY MODEL PARAMETERS. STORE THE DATA IN /EINJUR/.
C
      CALL INEINJ (OK6)
      IF (.NOT. OK6) CALL ABORT ('terminating execution')
C
C  DEFINE THE MODELS FOR RISKS OF CANCER FROM ACUTE EXPOSURE
C
      CALL INACAN (OK7)
      IF (.NOT. OK7) CALL ABORT ('terminating execution')
C
C  Define the options for results numbers 1-8 and the new result A
C
      CALL INOUT1 (OK8)
      CALL INOUT2 (OK9)
      CALL INOUT3 (OK10)
      CALL INOUT4 (OK11)
      CALL INOUT5 (OK12)
      CALL INOUT6 (OK13)
      CALL INOUT7 (OK14)
      CALL INOUT8 (OK15)
      CALL INOUTA (OK16)
      CALL INOUTB (OK17)
      OK = OKA .AND. OK1 .AND. OK2 .AND. OK3 .AND. OK4 .AND.
     $     OK5 .AND. OK6 .AND. OK7 .AND. OK8 .AND. OK9 .AND.
     $     OK10 .AND. OK11 .AND. OK12 .AND. OK13 .AND. OK14 .AND. OK15
     $     .AND. OK16 .AND. OK17
      RETURN
      END
*DECK INMISC
      SUBROUTINE INMISC (OK)
C
C THIS ROUTINE DEFINES THE MISCELLANEOUS INFORMATION FOR THIS RUN
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C ENDAT2 - LOGICAL FLAG SIGNIFYING THAT ONLY "ATMOS"  AND "EARLY" ARE TO BE RUN
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C EANAM1 - A DESCRIPTIVE TITLE DESCRIBING THIS SERIES OF CALCULATIONS
C METBIN - LOOP COUNTER ON WEATHER BIN (CURRENTLY DIMENSIONED AT 41)
C METCOD - METEOROLOGICAL SAMPLING OPTION CODE, SEE BELOW
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
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C OVRRID - FLAG INDICATING THAT JUST A SINGLE WIND ROSE IS TO BE USED
C RISCAT - LOGICAL FLAG SAYING THAT RISK BREAKDOWN BY WEATHER BIN IS REQUESTED
C
C METCOD = 1- USER SPECIFIED DAY AND HOUR OF A SINGLE SEQUENCE ON THE METFIL,
C          2- WEATHER CATEGORY BIN SAMPLING SIMILAR TO CRAC2,
C          3- 120 HOURS OF WEATHER SPECIFIED ON THE ATMOS USER INPUT FILE,
C          4- CONSTANT WEATHER CONDITIONS SPECIFIED ON ATMOS USER INPUT FILE,
C          5- RANDOM SAMPLING STRATIFIED BY DAY OF THE YEAR.
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C LGET1  - INTERFACE TO INPRE THAT RETURNS A LOGICAL VALUE
C RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 7 JUNE 1984.
C
C MODIFIED 8 FEB 88, OVERRIDE WITH A UNIFORM WIND-ROSE IF NEEDED
C
      EXTERNAL CGET1, IGET1, ERRLOC, LGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M1/ METCOD
      COMMON /IPRINT/ IPRINT
      CHARACTER *80   EANAM1
      COMMON /EANAM1/ EANAM1
      LOGICAL         ENDAT1, ENDAT2
      COMMON /STOPME/ ENDAT1, ENDAT2
      LOGICAL         OVRRID
      COMMON /ROTATE/ OVRRID, WINROS(16)
      COMMON /ROSEBI/ ROSEBI(16,41)
      LOGICAL RISCAT
      COMMON /RISCAT/ RISCAT
      CHARACTER *7 FGR_FLAG
      COMMON /FGR_FLAG/ FGR_FLAG
C
      CHARACTER *80 CGET1
      CHARACTER *40 DCF_FILE
      LOGICAL OK, RANGE, FOUND, LGET1
C
      OK = .TRUE.
C
C  PROVIDE A GENERAL DESCRIPTION OF THE PURPOSE OF THIS "EARLY" SCENARIO
C
      EANAM1 = CGET1('MIEANAM1001', 1, 1, ' ', 80, RANGE, FOUND,
     $               'INMISC', 'EANAM1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
      DCF_FILE = CGET1 ('DCF_FILE001', 0, 4, ' ', 40, RANGE, FOUND,
     $                  'INPUT', 'DCF_FILE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('TERMINATING')
C
      CALL OPNFIL (DCF_FILE, 'DCF file', 9, 'FORMATTED')
      READ (9,FMT='(A7)') FGR_FLAG
      REWIND (9)
C
C  READ A FLAG INDICATING IF THE "CHRONC" MODULE IS TO BE SKIPPED
```

```
C
      ENDAT2 = LGET1 ('MIENDAT2001', 0, .FALSE., FOUND,
     $                'INMISC', 'ENDAT2')
      IF (.NOT. FOUND) OK = .FALSE.
C
C  READ A FLAG INDICATING THE TYPE OF ROTATAION TO BE PERFORMED
C    IPLUME = 1: STRAIGHT-LINE PLUME WITH ROTATION,
C           = 2: WIND-SHIFT PLUME WITH ROTATION,
C           = 3: WIND-SHIFT PLUME WITHOT ROTATION.
C
      IPLUME = IGET1 ('MIIPLUME001', 1, 1, 0, 3, RANGE, FOUND,
     $                'INMISC', 'IPLUME')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  READ THE NUMBER OF FINE GRID SUBDIVISIONS IN A COARSE GRID ELEMENT
C
C  AT PRESENT WE ARE LIMITED TO A VALUE BETWEEN 3 AND 7
C
      NUMFIN = IGET1 ('MINUMFIN001', 1, 3, 3, 7, RANGE, FOUND,
     $                'INMISC', 'NUMFIN')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  CHECK THAT NUMFIN IS AN ODD NUMBER
C
      IF (MOD(NUMFIN,2) .NE. 1) THEN
        OK = .FALSE.
        WRITE(6,*) 'NUMFIN MUST BE ODD'
        WRITE(7,*) 'NUMFIN MUST BE ODD'
        CALL ERRLOC ('INMISC', 'NUMFIN')
      ENDIF
C
C  READ THE FLAG INDICATING IF WIND-ROSE IS TO BE SUPPLIED BY USER
C
      OVRRID = LGET1 ('MIOVRRID001', 0, .FALSE., FOUND,
     $                'INMISC', 'OVRRID')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  IF REQUESTED, THEN DEFINE THE WIND ROSE ARRAY
C
      IF (OVRRID) THEN
      CALL RGETN ('MIWINROS001', 0, WINROS, NUMCOR, 0., 1.,
     $               RANGE, FOUND, 'INMISC', 'WINROS')
      IF (RANGE .AND. FOUND) THEN
          TOTPRB = 0.
        DO 100 I = 1, NUMCOR
  100     TOTPRB = TOTPRB + WINROS(I)
        IF (TOTPRB .LT. .95 .OR. TOTPRB .GT. 1.05) THEN
            OK = .FALSE.
            CALL ERRLOC ('INMISC', 'WINROS')
            WRITE(6,*)'WIND ROSE ARRAY DOES NOT ADD UP TO 1.'
            WRITE(6,*)'TOTPRB,WINROS=', TOTPRB, WINROS
            WRITE(7,*)'WIND ROSE ARRAY DOES NOT ADD UP TO 1.'
            WRITE(7,*)'TOTPRB,WINROS=', TOTPRB, WINROS
          ENDIF
      ELSE
          OK = .FALSE.
        ENDIF
C
C  CHECK TO SEE IF A WIND-ROSE HAS BEEN SUPPLIED FOR THE WEATHER OPTIONS
C  REQUIRING IT. IF IT HASN'T BEEN SUPPLIED, USE A UNIFORM WIND ROSE.
C
C  THIS CHANGE IS MADE 8 FEB 88, DIC.
C
```

```
      ELSE IF (METCOD .NE. 2) THEN
      OVRRID = .TRUE.
      DO 120 IROT = 1, NUMCOR
  120   WINROS(IROT) = 1. / NUMCOR
      ENDIF
C
C  IF THE WIND ROSE IS BEING OVERRIDEN, COPY IT OVER AND OVER ON
C  THE BIN WIND-ROSE ARRAY
C
      IF (OVRRID) THEN
        DO 40 METBIN = 1, 41
        DO 40 IROT = 1, NUMCOR
   40   ROSEBI(IROT,METBIN) = WINROS(IROT)
      ENDIF
C
C  IPRINT IS A FLAG CONTROLLING THE LEVEL OF DEBUG OUTPUT, NORMALLY ZERO
C
      IPRINT = IGET1 ('MIIPRINT001', 1, 0, 0, 10, RANGE, FOUND,
     $                'INMISC', 'IPRINT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  READ FLAG INDICATING IF THE OUTPUT WILL INCLUDE A BREAKDOWN OF
C  RELATIVE CONTRIBUTION TO THE MEAN FROM EACH WEATHER CATEGORY BIN
C
      RISCAT = LGET1 ('MIRISCAT001', 0, .FALSE., FOUND,
     $                'INMISC', 'RISCAT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INORGA
      SUBROUTINE INORGA (OK)
C
C This routine defines the user-specified list of organs used in the
C calculations for situations where a DCF file generated by DOSFAC, DOSFAC2,
C or IDCF2 is being utilized.  In those situations, this routine processes
C data cards on the EARLY user input file to define the list of organs for
C which doses are calculated and stored.
C
C However, if a DCF file generated by FGRDCF is utilized, the organ list is
C then hard-wired to the list of 9 organs used in FGR 11/12, preceded by the
C 'A-SKIN' organ--which is defined to be the same as used in MACCS 1.5.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  IORG   - LOOP COUNTER ON ORGANS
C  L      - LENGTH OF THE RECORD IDENTIFIER TO BE SEARCHED FOR
C  NUCNAM - NAMES OF THE NUCLIDES DEFINED IN THE MODEL
C  NUMISO - THE NUMBER OF NUCLIDES DEFINED IN THE MODEL
C  NUMORG - NUMBER OF ORGANS DEFINED FOR THE HEALTH EFFECTS MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  ORGNAM - LIST OF NAMES OF THE ORGANS DEFINED FOR HEALTH EFFECTS
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD BEING SEARCHED FOR
C
C  DAVID CHANIN, DIV. 6415, 7 JUNE 1984.
C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 6/05/96, D.C., move up the block because it did not work properly
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```
      EXTERNAL ERRLOC, CGET1, LGETN
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
C
      CHARACTER *10 FIXNAM
      COMMON /ORGLIST/ FIXNAM(MAXORG)

      CHARACTER *80 CGET1
      CHARACTER *11 RECNAM
      CHARACTER *10 NAME
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
C
      FIXNAM(1) = 'A-SKIN'
      FIXNAM(2) = 'A-RED MARR'
      FIXNAM(3) = 'A-LUNGS'
      FIXNAM(4) = 'A-THYROIDH'
      FIXNAM(5) = 'A-STOMACH'
      FIXNAM(6) = 'A-LOWER LI'
      FIXNAM(7) = 'L-EDEWBODY'
      FIXNAM(8) = 'L-RED MARR'
      FIXNAM(9) = 'L-BONE SUR'
      FIXNAM(10)= 'L-BREAST'
      FIXNAM(11)= 'L-LUNGS'
      FIXNAM(12)= 'L-THYROID'
      FIXNAM(13)= 'L-LOWER LI'
      FIXNAM(14)= 'L-BLAD WAL'
      FIXNAM(15)= 'L-LIVER'
      FIXNAM(16)= 'L-THYROIDH'
C Define the list of organs to be considered
      RECNAM = 'MIORGDEF001'
      L = 11
      DO 20 I = 1, MAXORG
      NAME = CGET1 (RECNAM(1:L), 1, 3, ' ', 10, RANGE, FOUND,
     $              'INORGA', 'ORGNAM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
      ENDIF
      IF (NAME .NE. FIXNAM(I)) THEN
        CALL ERRLOC('INORGA','ORGNAM')
        WRITE(6,*)'Expecting: ',FIXNAM(I),', Instead found: ',NAME
        WRITE(7,*)'Expecting: ',FIXNAM(I),', Instead found: ',NAME
        OK = .FALSE.
        RETURN
      ENDIF
   20 L = 8
C Define flags signifying which organs on the hard-wired list are to be used
      CALL LGETN('MIORGDEF001', 2, ORGFLG, MAXORG, FOUND, 'INORGA',
     $           'ORGFLG')
      IF (.NOT. FOUND) CALL ABORT ('INORGA')
C
      IF (.NOT. ORGFLG(1)) THEN
        ORGFLG(1) = .TRUE.
        WRITE(6,50)
   50   FORMAT(/' Due to a code limitation, A-SKIN is being enabled')
```

```
      ENDIF
C
      NUMORG = 0
      INICHR = 0
      DO 40 I = 1, MAXORG
      IF (ORGFLG(I)) THEN
        NUMORG = NUMORG + 1
        ORGNAM(NUMORG) = FIXNAM(I)
      ENDIF
   40 IF (INICHR .EQ. 0 .AND. ORGFLG(I) .AND. FIXNAM(I)(1:2) .EQ. 'L-')
     1  INICHR = NUMORG
C
      WRITE(6,60)
   60 FORMAT(/' The list of defined organs is as follows ',
     1 '(A- is ACUTE and L- is LIFETIME):')
      DO 80 I = 1, MAXORG
   80 IF (ORGFLG(I)) WRITE(6,FMT='(4X,A)') FIXNAM(I)
C
      IF (NUMORG .EQ. 0) THEN
      OK = .FALSE.
      CALL ERRLOC ('INORGA', 'List of Organs')
      WRITE(6,*)'At least one organ must be specified'
      WRITE(7,*)'At least one organ must be specified'
      RETURN
      ENDIF
      IF (INICHR .EQ. 0) THEN
      OK = .FALSE.
      CALL ERRLOC ('INORGA', 'List of Organs')
      WRITE(6,*)'At least one lifetime (L-) organ must be specified'
      WRITE(7,*)'At least one lifetime (L-) organ must be specified'
      RETURN
      ENDIF
      RETURN
      END
      SUBROUTINE EDCINP (IUNIT)
C
C This routine reads the dose conversion factors from IUNIT when a DCF file
C generated by one of pre-processors DOSFAC, DOSFAC2, or IDCF2 is being
C utilized.  DCF files generated by FGRDCF are processed by SUBROUTINE EDCINPX.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C CDCF  - CLOUDSHINE DOSE CONVERSION FACTOR (NUCLIDE,ORGAN)
C FILNUC- LIST OF NUCLIDE NAMES APPEARING ON THE FILE
C FILORG- LIST OF ORGAN NAMES APPEARING ON THE FILE
C GRDCF - GROUNDSHINE DOSE FACTOR DURING PASSAGE (NUCLIDE,ORGAN)
C I     - LOOP COUNTER
C IDCF  - INHALATION DOSE CONVERSION FACTOR (NUCLIDE,ORGAN,TIME INTERVAL)
C IGDCF - GROUNDSHINE AFTER PASSAGE DOSE CONV. FACTOR (NUCLIDE,ORGAN,TIME)
C INDEXF- LOOP COUNTER ON NAMES DEFINED IN THE FILE (ORGANS OR NUCLIDES)
C INDEXM- LOOP COUNTER ON NAMES DEFINED IN THE MODEL (ORGANS OR NUCLIDES)
C INDNUC- POINTERS TO THE CORRESPONDING MODEL NUCLIDE FOR EACH FILE NUCLIDE
C INDORG- POINTERS TO THE CORRESPONDING MODEL ORGAN FOR EACH FILE ORGAN
C INUCF - LOOP COUNTER ON NUCLIDES DEFINED ON THE FILE
C IORGF - LOOP COUNTER ON ORGANS DEFINED ON THE FILE
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C J     - TEMPORARY STORAGE FOR AN ARRAY INDEX
C LAMBDA - DECAY CONSTANTS PER SECOND FOR EACH NUCLIDE
C MATCH - LOGICAL FLAG INDICATING THE DESIRED NAME WAS FOUND (ORGAN OR NUCLIDE)
C NAME  - NAME OF THE ORGAN OR NUCLIDE THAT WAS READ FROM THE FILE
C NNUCF - NUMBER OF NUCLIDES DEFINED ON THE FILE
```

```
C NORGF - NUMBER OF ORGANS DEFINED ON THE FILE
C NUCNAM- LIST OF NAMES OF NUCLIDES DEFINED IN THE MODEL
C NUMISO- NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMORG- NUMBER OF ORGANS DEFINED IN THE MODEL
C OK    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM- LIST OF NAMES OF THE ORGANS DEFINED IN THE MODEL
C SDCF  - SKIN DOSE CONVERSION FACTOR
C SDV   - SKIN DOSE DEPOSITION VELOCITY
C TITDOS- 2 LINE HEADER DESCRIBING THIS VERSION OF THE DOSE CONVERSION FILE
C VALUES- DOSE CONVERSION VALUES FOR THIS (ORGAN,NUCLIDE) PAIR
C
C GLOSSARY OF EXTERNALS:
C
      EXTERNAL ERRFIL, ABORT, LOWCAS
      CHARACTER *1 LOWCAS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /DCFVAL/ DCFCLD(2:MAXORG,MAXNUC), DCFGRD(2:MAXORG,MAXNUC),
     1                DCFINH(2:MAXORG,MAXNUC), DCFING(2:MAXORG,MAXNUC)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
C
      CHARACTER *80 TITDOS
      COMMON /TITDOS/ TITDOS(2)
C
      CHARACTER *10 FIXNAM
      COMMON /ORGLIST/ FIXNAM(MAXORG)
C
      CHARACTER *7  DAUTER(MXDKCN,3)
      CHARACTER *8  FILNUC(MXDKCN)
      CHARACTER *10 NAME, FILORG0(20), FILORG1(20)
      LOGICAL MATCH
      DIMENSION VALUES(7,20), INDNUC(MXDKCN), IPOINT(MAXORG)

      DATA INDNUC / MXDKCN * 0/, IPOINT /MAXORG * 0/

      DO 10 ISOT = 1, MAXNUC
      DO 10 IORG = 2, MAXORG
      DCFCLD(IORG,ISOT) = 0.
      DCFGRD(IORG,ISOT) = 0.
      DCFINH(IORG,ISOT) = 0.
   10 DCFING(IORG,ISOT) = 0.
C
      READ(IUNIT,20,END=500) TITDOS
   20 FORMAT(A/A)
C
      WRITE(6,30) TITDOS
   30 FORMAT(/' READING FROM A DOSE CONVERSION FILE WITH',
     $        ' THE FOLLOWING HEADER:'/1X,A/1X,A/)
C
C  READ THE LIST OF ORGANS TO BE FOUND ON THE FILE
C
      READ(IUNIT,40) NORGF
   40 FORMAT(I10)
C
      IF (NORGF .GT. 20) THEN
      WRITE(6,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(6,*) NORGF, ' ORGANS DEFINED BUT CODE ALLOWS ONLY 20'
```

```
      WRITE(7,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(7,*) NORGF, ' ORGANS DEFINED BUT CODE ALLOWS ONLY 20'
      CALL ABORT ('EDCINP')
      ENDIF
C
      READ(IUNIT,50) (FILORGO(I),I=1,NORGF)
   50 FORMAT(A)
C
      DO 80 ILOOK = 2, MAXORG
      IF (ORGFLG(ILOOK)) THEN
      DO 60 IFIND = 1, NORGF
      IF (FILORGO(IFIND) .EQ. FIXNAM(ILOOK)(3:)) THEN
        IPOINT(ILOOK) = IFIND
        GO TO 80
      ENDIF
   60   CONTINUE
      WRITE(6,*) 'ERROR in DCF file list, missing ', FIXNAM(ILOOK)
      WRITE(7,*) 'ERROR in DCF file list, missing ', FIXNAM(ILOOK)
      CALL ABORT ('Terminating execution in EDCINP')
      ENDIF
   80 CONTINUE
C
C  READ THE LIST OF NUCLIDES TO BE FOUND ON THE FILE
C
      READ(IUNIT,40) NNUCF
C
      IF (NNUCF .GT. MXDKCN) THEN
      WRITE(6,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(6,*) NNUCF, ' Nuclides defined--code allows only', MXDKCN
      WRITE(7,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(7,*) NNUCF, ' Nuclides defined--code allows only', MXDKCN
      CALL ABORT ('EDCINP')
      ENDIF
C
      DO 160 I = 1, NNUCF
  160 READ(IUNIT,180) FILNUC(I), DAUTER(I,1), DAUTER(I,2), DAUTER(I,3)
  180 FORMAT(A,T27,A,T46,A,T65,A)
C
C  SKIP THE 2 LINE INTERMEDIATE HEADER
C
      READ(IUNIT,20)
C
C  CHECK TO SEE IF ALL THE NUCLIDES DEFINED IN THE MODEL APPEAR ON THE FILE.
C  MAKE A LIST OF POINTERS TO THE MODEL DEFINITION NUCLIDES.
C  IF A NUCLIDE ON THE FILE IS NOT USED IN THE MODEL, IT GETS A POINTER OF ZERO.
C
      DO 350 INDEXM = 1, NUMISO
      MATCH = .FALSE.
      DO 300 INDEXF = 1, NNUCF
      NAME = FILNUC(INDEXF)

      IF (TITDOS(1)(1:5) .NE. 'IDCF2') THEN
      IF (NAME(2:2) .NE. '-') NAME(2:2) = LOWCAS(NAME(2:2))
      IF (NAME(4:4) .EQ. 'M') NAME(4:4) = 'm'
      IF (NAME(5:5) .EQ. 'M') NAME(5:5) = 'm'
      IF (NAME(6:6) .EQ. 'M') NAME(6:6) = 'm'
      IF (NAME(7:7) .EQ. 'M') NAME(7:7) = 'm'
      ENDIF

      IF (NAME .EQ. NUCNAM(INDEXM)) THEN
      MATCH = .TRUE.
      INDNUC(INDEXF) = INDEXM
      ENDIF
```

```
  300 CONTINUE
      IF (.NOT. MATCH) THEN
      WRITE(6,*) 'ERROR: NUCLIDE ', NUCNAM(INDEXM),
     $              ' NOT FOUND ON UNIT', IUNIT
      WRITE(7,*) 'ERROR: NUCLIDE ', NUCNAM(INDEXM),
     $              ' NOT FOUND ON UNIT', IUNIT
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  350 CONTINUE
C
C  SKIP THE INTERMEDIATE HEADER IN THE FILE
C
      READ(IUNIT,50)
C
C  LOOP ON NUCLIDES DEFINED IN THE FILE
C
      DO 480 INUCF = 1, NNUCF
      READ(IUNIT,360) NAME
  360 FORMAT(A8)
C
      IF (NAME .NE. FILNUC(INUCF)) THEN
      WRITE(6,*) 'ERROR: EXPECTING NUCLIDE ', FILNUC(INUCF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      WRITE(7,*) 'ERROR: EXPECTING NUCLIDE ', FILNUC(INUCF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
      DO 400 IORGF = 1, NORGF
      READ(IUNIT,380) FILORG1(IORGF), (VALUES(I,IORGF),I=1,7)
  380 FORMAT(A10,7F10.0)
      IF (FILORG1(IORGF) .NE. FILORG0(IORGF)) THEN
      WRITE(6,*) 'ERROR: EXPECTING ORGAN ', FILORG0(IORGF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      WRITE(7,*) 'ERROR: EXPECTING ORGAN ', FILORG0(IORGF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  400 CONTINUE
C
C  IF THIS NUCLIDE IS DEFINED IN THE MODEL, LOAD ITS VALUES.
C
      IF (INDNUC(INUCF) .EQ. 0) GO TO 480
C
      INDEX = INDNUC(INUCF)
      IPT = 0

      DO 420 ILOOK = 1, NUMISO
      IF (DAUTER(INUCF,1) .EQ. NUCNAM(ILOOK)) IPT = 1
      IF (DAUTER(INUCF,2) .EQ. NUCNAM(ILOOK)) IPT = 2
  420 IF (DAUTER(INUCF,3) .EQ. NUCNAM(ILOOK)) IPT = 3
      IF (IPT .GT. 0) WRITE(6,440) DAUTER(INUCF,IPT)
  440 FORMAT(' Warning: ', A, ' is an implicit daughter which',
     1       ' is on the nuclide list!')
C
      IO = 1
C
C 'A-RED MARR' (ACUTE)
      IF (ORGFLG(2)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(2))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(2))
      DCFINH(IO,INDEX) = VALUES(5,IPOINT(2))
```

```
      ENDIF
C
C 'A-LUNGS'     (ACUTE)
      IF (ORGFLG(3)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(3))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(3))
      DCFINH(IO,INDEX) = VALUES(5,IPOINT(3))
      ENDIF
C
C 'A-THYROIDH'  (ACUTE)
      IF (ORGFLG(4)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(4))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(4))
      DCFINH(IO,INDEX) = VALUES(5,IPOINT(4))
      ENDIF
C
C 'A-STOMACH'   (ACUTE)
      IF (ORGFLG(5)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(5))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(5))
      DCFINH(IO,INDEX) = VALUES(5,IPOINT(5))
      ENDIF
C
C 'LOWER LI' (ACUTE)
      IF (ORGFLG(6)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(6))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(6))
      DCFINH(IO,INDEX) = VALUES(5,IPOINT(6))
      ENDIF
C
C 'L-EDEWBODY' (0-50 YEAR)
      IF (ORGFLG(7)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(7))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(7))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(7))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(7))
      ENDIF
C
C 'L-RED MARR' (0-50 YEAR)
      IF (ORGFLG(8)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(8))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(8))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(8))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(8))
      ENDIF
C
C 'L-BONE SUR' (0-50 YEAR)
      IF (ORGFLG(9)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(9))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(9))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(9))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(9))
      ENDIF
C
C 'L-BREAST'    (0-50 YEAR)
      IF (ORGFLG(10)) THEN
```

```
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(10))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(10))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(10))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(10))
      ENDIF
C
C 'L-LUNGS'    (0-50 YEAR)
      IF (ORGFLG(11)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(11))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(11))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(11))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(11))
      ENDIF
C
C 'L-THYROID'   (0-50 YEAR)
      IF (ORGFLG(12)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(12))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(12))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(12))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(12))
      ENDIF
C
C 'L-LOWER LI'  (0-50 YEAR)
      IF (ORGFLG(13)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(13))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(13))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(13))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(13))
      ENDIF
C
C 'L-BLADDER'   (0-50 YEAR)
      IF (ORGFLG(14)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(14))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(14))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(14))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(14))
      ENDIF
C
C 'L-LIVER'   (0-50 YEAR)
      IF (ORGFLG(15)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(15))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(15))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(15))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(15))
      ENDIF
C
C 'L-THYROIDH'(0-50 YEAR)
      IF (ORGFLG(16)) THEN
      IO = IO + 1
      DCFCLD(IO,INDEX) = VALUES(1,IPOINT(16))
      DCFGRD(IO,INDEX) = VALUES(4,IPOINT(16))
      DCFINH(IO,INDEX) = VALUES(6,IPOINT(16))
      DCFING(IO,INDEX) = VALUES(7,IPOINT(16))
      ENDIF
  480 CONTINUE
      CLOSE (IUNIT)
      RETURN
```

```
  500 CALL ERRFIL ('EDCINP', 'Dose Conversion Factor (DCF) File')
      WRITE(6,*) 'End-of-File found on unit', IUNIT
      WRITE(7,*) 'End-of-File found on unit', IUNIT
      CALL ABORT ('Terminating Execution')
      RETURN

      END
*DECK LOWCAS
      CHARACTER *1 FUNCTION LOWCAS (CHAR)
C THIS FUNCTION IS GIVEN AN UPPER CASE LETTER AS THE ARGUMENT AND RETURNS
C THE CORRESPONDING LOWER CASE LETTER AS THE VALUE OF THE FUNCTION

      INTRINSIC INDEX
      CHARACTER CHAR, UPPER *26, LOWER *26

      DATA UPPER /'ABCDEFGHIJKLMNOPQRSTUVWXYZ'/
      DATA LOWER /'abcdefghijklmnopqrstuvwxyz'/

      IPOINT = INDEX (UPPER, CHAR)

      IF (IPOINT .EQ. 0) THEN
      WRITE(6,*) 'LOWCAS CALLED WITHOUT AN UPPER CASE ARGUMENT'
      WRITE(7,*) 'LOWCAS CALLED WITHOUT AN UPPER CASE ARGUMENT'
      WRITE(6,*) 'internal error'
      WRITE(7,*) 'internal error'
      CALL ABORT ('terminating')
C      CALL EXIT (1)
      ELSE
      LOWCAS = LOWER(IPOINT:IPOINT)
      ENDIF

      RETURN
      END
      SUBROUTINE EDCINPX (IUNIT)
C
C This routine reads the dose conversion factors from IUNIT when a DCF file
C generated by FGRDCF is being utilized.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C CDCF  - CLOUDSHINE DOSE CONVERSION FACTOR (NUCLIDE,ORGAN)
C FILNUC- LIST OF NUCLIDE NAMES APPEARING ON THE FILE
C FILORG- LIST OF ORGAN NAMES APPEARING ON THE FILE
C GRDCF - GROUNDSHINE DOSE FACTOR DURING PASSAGE (NUCLIDE,ORGAN)
C I     - LOOP COUNTER
C IDCF  - INHALATION DOSE CONVERSION FACTOR (NUCLIDE,ORGAN,TIME INTERVAL)
C IGDCF - GROUNDSHINE AFTER PASSAGE DOSE CONV. FACTOR (NUCLIDE,ORGAN,TIME)
C INDEXF- LOOP COUNTER ON NAMES DEFINED IN THE FILE (ORGANS OR NUCLIDES)
C INDEXM- LOOP COUNTER ON NAMES DEFINED IN THE MODEL (ORGANS OR NUCLIDES)
C INDNUC- POINTERS TO THE CORRESPONDING MODEL NUCLIDE FOR EACH FILE NUCLIDE
C INDORG- POINTERS TO THE CORRESPONDING MODEL ORGAN FOR EACH FILE ORGAN
C INUCF - LOOP COUNTER ON NUCLIDES DEFINED ON THE FILE
C IORGF - LOOP COUNTER ON ORGANS DEFINED ON THE FILE
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C J     - TEMPORARY STORAGE FOR AN ARRAY INDEX
C LAMBDA - DECAY CONSTANTS PER SECOND FOR EACH NUCLIDE
C MATCH - LOGICAL FLAG INDICATING THE DESIRED NAME WAS FOUND (ORGAN OR NUCLIDE)
C NAME  - NAME OF THE ORGAN OR NUCLIDE THAT WAS READ FROM THE FILE
C NNUCF - NUMBER OF NUCLIDES DEFINED ON THE FILE
C NORGF - NUMBER OF ORGANS DEFINED ON THE FILE
```

```
C NUCNAM- LIST OF NAMES OF NUCLIDES DEFINED IN THE MODEL
C NUMISO- NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMORG- NUMBER OF ORGANS DEFINED IN THE MODEL
C OK    - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM- LIST OF NAMES OF THE ORGANS DEFINED IN THE MODEL
C SDCF  - SKIN DOSE CONVERSION FACTOR
C SDV   - SKIN DOSE DEPOSITION VELOCITY
C TITDOS- 2 LINE HEADER DESCRIBING THIS VERSION OF THE DOSE CONVERSION FILE
C VALUES- DOSE CONVERSION VALUES FOR THIS (ORGAN,NUCLIDE) PAIR
C
C GLOSSARY OF EXTERNALS:
C
      EXTERNAL ERRFIL, ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /DCFVAL/ DCFCLD(2:MAXORG,MAXNUC), DCFGRD(2:MAXORG,MAXNUC),
     1                DCFINH(2:MAXORG,MAXNUC), DCFING(2:MAXORG,MAXNUC)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
C
      CHARACTER *80 TITDOS
      COMMON /TITDOS/ TITDOS(2)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
C
      CHARACTER *7  DAUTER(MXDKCN,3)
      CHARACTER *10 NAME, FILORG0(9), FILORG1(9), FILNUC(MXDKCN)
      LOGICAL MATCH
      DIMENSION VALUES(7,9), INDNUC(MXDKCN)

      DATA INDNUC / MXDKCN * 0/

      DATA FILORG0 /'GONADS    ', 'BREAST    ', 'LUNGS     ',
     1              'RED MARR  ', 'BONE SUR  ', 'THYROID   ',
     2              'REMAINDER ', 'EFFECTIVE ', 'SKIN(FGR) '/
C
      ORGNAM(1) = 'A-SKIN'
      ORGNAM(2)=  'A-SKIN(FGR)'
      ORGNAM(3) = 'L-GONADS'
      ORGNAM(4) = 'L-BREAST'
      ORGNAM(5) = 'L-LUNGS'
      ORGNAM(6) = 'L-RED MARR'
      ORGNAM(7) = 'L-BONE SUR'
      ORGNAM(8) = 'L-THYROID'
      ORGNAM(9) = 'L-REMAINDER'
      ORGNAM(10)= 'L-EFFECTIVE'
C
      NUMORG = 10
      INICHR = 3
C
      DO 10 IORG = 1, NUMORG
   10 ORGFLG(IORG) = .TRUE.
C
      WRITE(6,20)
   20 FORMAT(/' The list of defined organs from FGRDCF is as follows ',
     1 '(A- is ACUTE and L- is LIFETIME):')
C
      DO 30 I = 1, 10
```

```
   30 WRITE(6,FMT='(4X,A)') ORGNAM(I)
C
      DO 40 ISOT = 1, MAXNUC
      DO 40 IORG = 2, MAXORG
      DCFCLD(IORG,ISOT) = 0.
      DCFGRD(IORG,ISOT) = 0.
      DCFINH(IORG,ISOT) = 0.
   40 DCFING(IORG,ISOT) = 0.
C
      READ(IUNIT,50,END=500) TITDOS
   50 FORMAT(A/A)
C
      WRITE(6,60) TITDOS
   60 FORMAT(/' READING FROM A DOSE CONVERSION FILE WITH',
     $         ' THE FOLLOWING HEADER:'/1X,A/1X,A/)
C
C  READ THE LIST OF ORGANS TO BE FOUND ON THE FILE
C
      READ(IUNIT,110) NORGF
  110 FORMAT(I10)
C
      IF (NORGF .NE. 9) THEN
      WRITE(6,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(6,*) NORGF, ' ORGANS DEFINED BUT SHOULD HAVE 9'
      WRITE(7,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(7,*) NORGF, ' ORGANS DEFINED BUT SHOULD HAVE 9'
      CALL ABORT ('EDCINPX')
      ENDIF
C
      READ(IUNIT,120) (FILORG1(I),I=1,NORGF)
  120 FORMAT(A)
C
      DO 140 I = 1, NORGF
      IF (FILORG0(I) .NE. FILORG1(I)) THEN
      WRITE(6,*) 'ERROR in DCF file organ list, missing ', FILORG1(I)
      WRITE(7,*) 'ERROR in DCF file organ list, missing ', FILORG1(I)
      CALL ABORT ('Terminating execution in EDCINPX')
      ENDIF
  140 CONTINUE
C
C  READ THE LIST OF NUCLIDES TO BE FOUND ON THE FILE
C
      READ(IUNIT,110) NNUCF
C
      IF (NNUCF .GT. MXDKCN) THEN
      WRITE(6,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(6,*) NNUCF, ' Nuclides defined--code allows only', MXDKCN
      WRITE(7,*) 'ERROR IN DOSE CONVERSION FACTOR DATA FILE'
      WRITE(7,*) NNUCF, ' Nuclides defined--code allows only', MXDKCN
      CALL ABORT ('EDCINPX')
      ENDIF
C
      DO 160 I = 1, NNUCF
  160 READ(IUNIT,180) FILNUC(I), DAUTER(I,1), DAUTER(I,2), DAUTER(I,3)
  180 FORMAT(A,T27,A,T46,A,T65,A)
C
C  SKIP THE 2 LINE INTERMEDIATE HEADER
C
      READ(IUNIT,50)
C
C  CHECK TO SEE IF ALL THE NUCLIDES DEFINED IN THE MODEL APPEAR ON THE FILE.
C  MAKE A LIST OF POINTERS TO THE MODEL DEFINITION NUCLIDES.
C  IF A NUCLIDE ON THE FILE IS NOT USED IN THE MODEL, IT GETS A POINTER OF ZERO.
```

```
C
      DO 350 INDEXM = 1, NUMISO
      MATCH = .FALSE.
      DO 300 INDEXF = 1, NNUCF
      NAME = FILNUC(INDEXF)
C
      IF (NAME .EQ. NUCNAM(INDEXM)) THEN
      MATCH = .TRUE.
      INDNUC(INDEXF) = INDEXM
      ENDIF
  300 CONTINUE
      IF (.NOT. MATCH) THEN
      WRITE(6,*) 'ERROR: NUCLIDE ', NUCNAM(INDEXM),
     $              ' NOT FOUND ON UNIT', IUNIT
      WRITE(7,*) 'ERROR: NUCLIDE ', NUCNAM(INDEXM),
     $              ' NOT FOUND ON UNIT', IUNIT
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  350 CONTINUE
C
C  SKIP THE INTERMEDIATE HEADER IN THE FILE
C
      READ(IUNIT,50)
C
C  LOOP ON NUCLIDES DEFINED IN THE FILE
C
      DO 480 INUCF = 1, NNUCF
      READ(IUNIT,360) NAME
  360 FORMAT(A8)
C
      IF (NAME .NE. FILNUC(INUCF)) THEN
      WRITE(6,*) 'ERROR: EXPECTING NUCLIDE ', FILNUC(INUCF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      WRITE(7,*) 'ERROR: EXPECTING NUCLIDE ', FILNUC(INUCF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
      DO 400 IORGF = 1, NORGF
      READ(IUNIT,380) FILORG1(IORGF), (VALUES(I,IORGF),I=1,7)
  380 FORMAT(A10,7F10.0)
      IF (FILORG1(IORGF) .NE. FILORG0(IORGF)) THEN
      WRITE(6,*) 'ERROR: EXPECTING ORGAN ', FILORG0(IORGF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      WRITE(7,*) 'ERROR: EXPECTING ORGAN ', FILORG0(IORGF),
     $              ', FOUND ', NAME, ' ON UNIT', IUNIT
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  400 CONTINUE
C
C  IF THIS NUCLIDE IS DEFINED IN THE MODEL, LOAD ITS VALUES.
C
      IF (INDNUC(INUCF) .EQ. 0) GO TO 480
      INDEX = INDNUC(INUCF)
      WRITE(6,*) 'Processing DCFs for ', NAME

      IPT = 0
      DO 420 ILOOK = 1, NUMISO
      IF (DAUTER(INUCF,1) .EQ. NUCNAM(ILOOK)) IPT = 1
      IF (DAUTER(INUCF,2) .EQ. NUCNAM(ILOOK)) IPT = 2
  420 IF (DAUTER(INUCF,3) .EQ. NUCNAM(ILOOK)) IPT = 3
      IF (IPT .GT. 0) WRITE(6,440) DAUTER(INUCF,IPT)
  440 FORMAT(' Warning: ', A, ' is an implicit daughter which',
```

```
     1        ' is on the nuclide list!')
C
      DCFCLD(2,INDEX) = VALUES(1,9)
      DCFGRD(2,INDEX) = VALUES(4,9)
      DCFINH(2,INDEX) = VALUES(6,9)
      DCFING(2,INDEX) = VALUES(7,9)
      DCFCLD(3,INDEX) = VALUES(1,1)
      DCFGRD(3,INDEX) = VALUES(4,1)
      DCFINH(3,INDEX) = VALUES(6,1)
      DCFING(3,INDEX) = VALUES(7,1)
      DCFCLD(4,INDEX) = VALUES(1,2)
      DCFGRD(4,INDEX) = VALUES(4,2)
      DCFINH(4,INDEX) = VALUES(6,2)
      DCFING(4,INDEX) = VALUES(7,2)
      DCFCLD(5,INDEX) = VALUES(1,3)
      DCFGRD(5,INDEX) = VALUES(4,3)
      DCFINH(5,INDEX) = VALUES(6,3)
      DCFING(5,INDEX) = VALUES(7,3)
      DCFCLD(6,INDEX) = VALUES(1,4)
      DCFGRD(6,INDEX) = VALUES(4,4)
      DCFINH(6,INDEX) = VALUES(6,4)
      DCFING(6,INDEX) = VALUES(7,4)
      DCFCLD(7,INDEX) = VALUES(1,5)
      DCFGRD(7,INDEX) = VALUES(4,5)
      DCFINH(7,INDEX) = VALUES(6,5)
      DCFING(7,INDEX) = VALUES(7,5)
      DCFCLD(8,INDEX) = VALUES(1,6)
      DCFGRD(8,INDEX) = VALUES(4,6)
      DCFINH(8,INDEX) = VALUES(6,6)
      DCFING(8,INDEX) = VALUES(7,6)
      DCFCLD(9,INDEX) = VALUES(1,7)
      DCFGRD(9,INDEX) = VALUES(4,7)
      DCFINH(9,INDEX) = VALUES(6,7)
      DCFING(9,INDEX) = VALUES(7,7)
      DCFCLD(10,INDEX)= VALUES(1,8)
      DCFGRD(10,INDEX)= VALUES(4,8)
      DCFINH(10,INDEX)= VALUES(6,8)
      DCFING(10,INDEX)= VALUES(7,8)
  480 CONTINUE
      CLOSE (IUNIT)
      RETURN

  500 CALL ERRFIL ('EDCINPX', 'Dose Conversion Factor (DCF) File')
      WRITE(6,*) 'End-of-File found on unit', IUNIT
      WRITE(7,*) 'End-of-File found on unit', IUNIT
      CALL ABORT ('Terminating Execution')
      RETURN

      END
*DECK INEVAC
      SUBROUTINE INEVAC (OK)
C
C THIS ROUTINE READS THE EVACUATION AND SHELTERING MODEL DATA
C AND STORES THE DATA IN /GLOBAL/ AND /NETWOR/.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C DLTEVA - Delay time to start evacuation measured from end of sheltering
C DLTSHL - Delay time to start sheltering measured from user-supplied REFPNT
C EANAM2 - A TITLE DESCRIBING THIS PARTICULAR SINGLE CHOICE OF ASSUMPTIONS
C ESPEED - Radial evacuation speed during three phases of evacuation (m/s)
```

```
C EVATYP - Character flag for evacuation type: 'RADIAL' or 'NETWORK'
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C FRSTEV - Time after accident start at which the first evacuee begins to move
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C LASMOV - RADIAL INDEX TO THE OUTERMOST RING OF THE EVACUATION NETWORK
C NEXTND - Destination of each shelter/evac node, defined in EVRADI and EVNETW
C NUMEVA - Last ring of the emergency response zone (shelter and evacuation)
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL EVACUATION NETWORK DEFINITION
C RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE ALLOWED RANGE WAS FOUND
C REFPNT - Reference time point for evacuation/sheltering: 'ALARM' or 'ARRIVAL'
C TOTPRB - TEMPORARY VARIABLE USED TO ADD UP WIND ROSE VALUES
C TRTIME - Traversal times for evacuees during initial, middle, and end phase
C WTFRAC - WEIGHTING FRACTIONS APPLICABLE TO EACH STRATEGY
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C GLOSSARY OF EXTERNALS:
C
C ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C EVNETW - INPUT ROUTINE FOR NETWORK EVACUATION
C EVRADI - INPUT ROUTINE FOR RADIAL EVACUATION
C
C D. CHANIN, DIV. 6415, 10 JULY 1984.
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C Modified 11/01/92, D. Chanin, New emergency response model for DOE
C Modified 4/16/96, D. Chanin, Network evacuation only allowed when IPLUME=3
C Modified 4/16/96, D.C., implement TRAVELPOINT (CENTERPOINT or BOUNDARY) option
C Modified 6/05/96, D.C., misc. restrictions on code input parameters
C
      EXTERNAL CGET1, ERRLOC, EVNETW, EVRADI, IGETN, IGET1, RGETN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      CHARACTER *80   EANAM2
      COMMON /EANAM2/ EANAM2(3)
      COMMON /WTFRAC/ WTFRAC(3)
      CHARACTER *6    WTNAME
      COMMON /WTNAME/ WTNAME
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      CHARACTER *7    POPFLG
      COMMON /POPFLG/ POPFLG
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
C
      LOGICAL OK, RANGE, FOUND
      CHARACTER *80 CGET1
C
      OK = .TRUE.
C
C  PROVIDE A DESCRIPTION OF THE EMERGENCY RESPONSE STRATEGY FOR THIS COHORT
```

```
C
      EANAM2(ISTRTG) = CGET1('EZEANAM2001', 1, 1, ' ', 80,
     $                        RANGE, FOUND, 'INEVAC', 'EANAM2')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C  SPECIFY WHAT TYPE OF WEIGHTING TO APPLY TO THE EMERGENCY RESPONSE STRATEGIES
C
      WTNAME = CGET1('EZWTNAME001', 1, 4, ' ', 6,
     $                RANGE, FOUND, 'INEVAC', 'WTNAME')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
      IF (WTNAME .NE. 'TIME' .AND. WTNAME .NE. 'PEOPLE'
     1                       .AND. WTNAME .NE. 'SUMPOP') THEN
        WRITE(6,*) 'ERROR:  WTNAME must be TIME, PEOPLE, or SUMPOP'
        WRITE(7,*) 'ERROR:  WTNAME must be TIME, PEOPLE, or SUMPOP'
        CALL ERRLOC ('INEVAC', 'WTNAME')
        CALL ABORT ('called by INEVAC')
      ELSE IF (WTNAME .EQ. 'SUMPOP' .AND. POPFLG .EQ. 'UNIFORM') THEN
        WRITE(6,*)'ERROR: You have specified that POPFLG=UNIFORM and'
        WRITE(6,*)'       WTNAME=SUMPOP, this combination not allowed'
        WRITE(7,*)'ERROR: You have specified that POPFLG=UNIFORM and'
        WRITE(7,*)'       WTNAME=SUMPOP, this combination not allowed'
        CALL ERRLOC ('INEVAC', 'WTNAME')
        CALL ABORT ('called by INEVAC')
      ENDIF
C
C  Obtain the weighting fraction only if TIME or PEOPLE is specified
C
      IF (WTNAME .NE. 'SUMPOP') THEN
      WTFRAC(ISTRTG) = RGET1('EZWTFRAC001', 1, 0., 0., 1.,
     1                       RANGE, FOUND, 'INEVAC', 'WTFRAC')
      IF (.NOT.RANGE .OR. .NOT.FOUND) CALL ABORT ('called by INEVAC')
      ENDIF
C
C  READ THE OUTERMOST RING THROUGH WHICH EVACUEES CAN TRAVEL.
C  A ZERO MEANS THERE IS TO BE NO EVACUATION ZONE.
C
      LASMOV = IGET1 ('EZLASMOV001', 1, 0, 0, NUMRAD - 1, RANGE, FOUND,
     $                'INEVAC', 'LASMOV')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C  IF THE USER SPECIFIES (LASMOV .EQ. 0) THEN DON'T ASK FOR ANY ADDITIONAL
C  EVACUATION DATA
C
      IF (LASMOV .EQ. 0) THEN
        NUMEVA = 0
        EVATYP = 'RADIAL'
        WRITE(6,*) 'NO EVACUATION REQUESTED'
        RETURN
      ENDIF
C
C Read a flag defining the type of evacuation to be performed
C
      EVATYP = CGET1 ('EZEVATYP001', 0, 6, ' ', 7, RANGE, FOUND,
     1                'INEVAC', 'EVATYP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')

      IF (EVATYP .NE. 'RADIAL' .AND. EVATYP .NE. 'NETWORK') THEN
        WRITE(6,*) 'EVATYP must be either RADIAL or NETWORK'
        WRITE(7,*) 'EVATYP must be either RADIAL or NETWORK'
        CALL ERRLOC ('INEVAC', 'EVATYP')
        CALL ABORT ('called by INEVAC')
      ELSE IF (EVATYP .EQ. 'NETWORK' .AND. IPLUME .NE. 3) THEN
        WRITE(6,*) 'ERROR: network evacuation is only allowed with ',
```

```
     1              'IPLUME=3 (wind-shift, no-rotation plume)'
        WRITE(7,*) 'ERROR: network evacuation is only allowed with ',
     1              'IPLUME=3 (wind-shift, no-rotation plume)'
        CALL ERRLOC ('INEVAC', 'EVATYP')
        CALL ABORT ('called by INEVAC')
      ENDIF
C
C Read a flag defining when evacuees are deemed to have "entered" the
C destination spatial element
C
      TRAVELPOINT = CGET1 ('TRAVELPOINT', 0, 8, ' ', 11, RANGE, FOUND,
     1                     'INEVAC', 'EVATYP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')

      IF (TRAVELPOINT .NE. 'BOUNDARY' .AND.
     1    TRAVELPOINT .NE. 'CENTERPOINT') THEN
        WRITE(6,*) 'TRAVELPOINT must be either BOUNDARY or CENTERPOINT'
        WRITE(7,*) 'TRAVELPOINT must be either BOUNDARY or CENTERPOINT'
        CALL ERRLOC ('INEVAC', 'TRAVELPOINT')
        CALL ABORT ('called by INEVAC')
      ENDIF
C
C RADIAL EVACUATION SPEED DURING THE BEGINNING, MIDDLE, AND END PHASES
C OF THE EVACUATION (M/S)
C
      CALL RGETN ('EZESPEED001', 0, ESPEED, 3, 1.E-6, 1.E6,
     $            RANGE, FOUND, 'INEVAC', 'ESPEED')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C When TRAVELPOINT='BOUNDARY', all three values of ESPEED must be identical
C D. Chanin, 6/05/96
C
      IF (TRAVELPOINT .EQ. 'BOUNDARY') THEN
        IF (ESPEED(1).NE.ESPEED(2) .OR. ESPEED(1).NE.ESPEED(3)) THEN
          WRITE(6,*) 'When TRAVELPOINT is set to "BOUNDARY",'
          WRITE(6,*) 'all three values of ESPEED must be identical'
          WRITE(7,*) 'When TRAVELPOINT is set to "BOUNDARY",'
          WRITE(7,*) 'all three values of ESPEED must be identical'
          CALL ERRLOC ('INEVAC', 'TRAVELPOINT')
          CALL ABORT ('called by INEVAC')
        ENDIF
      ENDIF
C
C Read a flag defining the reference time point for evacuation/sheltering
C
      REFPNT = CGET1 ('EZREFPNT001', 0, 5, ' ', 7, RANGE, FOUND,
     1                'INEVAC', 'REFPNT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')

      IF (REFPNT .NE. 'ALARM' .AND. REFPNT .NE. 'ARRIVAL') THEN
        WRITE(6,*) 'REFPNT must be either ALARM or ARRIVAL'
        WRITE(7,*) 'REFPNT must be either ALARM or ARRIVAL'
        CALL ERRLOC ('INEVAC', 'REFPNT')
        CALL ABORT ('called by INEVAC')
      ENDIF
C
C Read the duration of the "initial" evacuation phase
C
      DURBEG = RGET1 ('EZDURBEG001', 0, 0., 0., 86400.0, RANGE, FOUND,
     $                'INEVAC', 'DURBEG')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C Read the duration of the "middle" evacuation phase
```

```
C
      DURMID = RGET1 ('EZDURMID001', 0, 0., 0., 86400.0, RANGE, FOUND,
     $                'INEVAC', 'DURMID')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C Read the number of radial spatial elements in the evacuation/sheltering zone
C
      NUMEVA = IGET1 ('EZNUMEVA001', 1, 1, 0, LASMOV, RANGE, FOUND,
     $                'INEVAC', 'NUMEVA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C Read the delay time to take shelter at each distance (1..NUMEVA)
C
      CALL RGETN ('EZDLTSHL001', 0, DLTSHL, NUMEVA, 0.0, 86400.0,
     $            RANGE, FOUND, 'INEVAC', 'DLTSHL')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C Read the delay time to begin evacuation at each distance (1..NUMEVA)
C
      CALL RGETN ('EZDLTEVA001', 0, DLTEVA, NUMEVA, 0.0, 86400.0,
     $            RANGE, FOUND, 'INEVAC', 'DLTEVA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('called by INEVAC')
C
C EVRADI reads a description of radial evacuation
C and creates the equivalent evacuation network.
C EVNETW constructs the network based on user-supplied
C and then creates a list of root nodes to trace the paths.
C
      IF (EVATYP .EQ. 'RADIAL') THEN
        CALL EVRADI (OK)
      ELSE IF (EVATYP .EQ. 'NETWORK') THEN
        CALL EVNETW (OK)
      ENDIF
      RETURN
      END
*DECK INPOPU
      SUBROUTINE INPOPU (IUNIT, OK)
C
C THIS ROUTINE DEFINES THE POPULATION DISTRIBUTION SURROUNDING THE SITE.
C POPULATION CAN EITHER BE A UNIFORM DENSITY OR SUPPLIED ON FILE IUNIT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP AS PART OF THE "EARLY" MODULE.
C IT HAS A SISTER ROUTINE NAMED SDFINP WHICH IS USED BY THE "CHRONC" MODULE.
C DO NOT CHANGE ONE WITHOUT CHECKING THE OTHER ROUTINE!!!!!!!!!!!!!!!!!!!
C
C GLOSSARY OF VARIABLE NAMES:
C
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C I      - LOOP COUNTER
C IBEGIN - RADIAL INDEX TO THE ELEMENT AT WHICH POPULATION BEGINS
C IDNTFI - IDENTIFIER OF ONE SITE DATA CHARACTERISTIC
C IDUMMY -
C IANG   - LOOP COUNTER ON COARSE ANGULAR SUBDIVISIONS
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL INTERVALS
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C IUNIT  - UNIT NUMBER OF THE SITE DATA FILE
C MATCH  - LOGICAL FLAG INDICATING THE DESIRED NAME WAS FOUND
C NSPDTS - THE NUMBER OF SPATIAL DISTANCES DEFINED IN THE SITE DATA
C NSTRTG - The number of emergency response scenarios defined for EARLY
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NWNDIR - THE NUMBER OF WIND DIRECTIONS DEFINED IN THE SITE DATA FILE
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
```

```
C OK1    - LOGICAL FLAG INDICATING COMPATIBILITY OF THE SITE DATA
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C POP    - POPULATION IN THE ELEMENT IF THERE IS UNIFORM POPULATION
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C POPDEN - UNIFORM POPULATION DENSITY SUPPLIED BY THE USER
C POPFLG - CHARACTER FLAG INDICATING TYPE OF POPULATION DISTRIBUTION
C RADIUS - RADIUS TO THE ENDPOINT OF THE SPATIAL ELEMENT (KILOMETERS)
C RADNEW - ENDPOINT RADIUS TO THE OUTER BOUNDARY OF THE RING
C RADOLD - ENDPOINT RADIUS TO THE INNER BOUNDARY OF THE RING
C RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE ALLOWED RANGE WAS FOUND
C RELERR - RELATIVE MEASURE OF MISMATCH BETWEEN CENTERPOINT AND ENDPOINT DIST
C SEPRTR - Temporary variable used to identify the site data file data blocks
C SPACEN - AN ARRAY OF DISTANCES TO THE SPATIAL ELEMENT CENTERPOINTS
C SPDSTS - SPATIAL ENDPOINT DISTANCES AS FOUND ON THE SITE FILE (KILOMETERS)
C STRING - Temporary variable defining correct population data block identifier
C TITSDF - TWO LINE HEADER DESCRIBING THIS SITE DATA FILE
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C GLOSSARY OF EXTERNALS:
C
C ERRFIL - PRINTS OUT AN ERROR MESSAGE FOR ERRORS ON AUXILIARY FILES
C
C LYNN RITCHIE, DIV. 6415, 18 JUNE 1985.
C
C MODIFIED BY D. CHANIN FOR USE BY EARLY, 25 JUNE 1985.
C
C MODIFIED BY D. CHANIN FOR UNIFORM POPULATION, 24 JULY 1985.
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 2/19/96, D. Chanin, try to diagnose unprintable characters on input
C
      EXTERNAL CMPTBL, MATCH, CGET1, RGET1, ERRFIL
      INTRINSIC ABS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      CHARACTER *22   IDNTFI
      COMMON /IDNTFI/ IDNTFI
      CHARACTER *7    POPFLG
      COMMON /POPFLG/ POPFLG
      CHARACTER *6    WTNAME
      COMMON /WTNAME/ WTNAME
C
      CHARACTER *11 STRING
      CHARACTER *22 SEPRTR, CDUMMY
      CHARACTER *80 CGET1, LINE, TDUMMY(2)
      LOGICAL OK, OK1, RANGE, FOUND
      DIMENSION SPDSTS(MAXRAD)
      OK = .TRUE.
C
C  INPUT ROUTINE FOR SITE SPECIFIC DATA FILE
C
C  DETERMINE IF POPULATION IS TO BE SUPPLIED ON A FILE OR
C  OR IF THE UNIFORM POPULATION DISTRIBUTION IS TO BE USED.
C
      POPFLG = CGET1 ('PDPOPFLG001', 0, 4, ' ', 7, RANGE, FOUND,
     $                'INPOPU', 'POPFLG')
      IF (RANGE .AND. FOUND) THEN
```

```
          IF (POPFLG .NE. 'UNIFORM' .AND. POPFLG .NE. 'FILE') THEN
            WRITE(6,*) 'POPFLG MUST BE EITHER UNIFORM OR FILE'
            WRITE(7,*) 'POPFLG MUST BE EITHER UNIFORM OR FILE'
            CALL ERRLOC ('INPOPU', 'POPFLG')
            OK = .FALSE.
          ENDIF
        ELSE
          OK = .FALSE.
        ENDIF
        IF (.NOT. OK) RETURN
        IF (POPFLG .EQ. 'UNIFORM') THEN
        WRITE(6,20)
   20     FORMAT(/' CALCULATING A UNIFORM POPULATION DISTRIBUTION'/)
C
C  POPULATION DENSITY IS SUPPLIED AS PEOPLE PER SQUARE KILOMETER
C
          POPDEN = RGET1 ('PDPOPDEN001', 1, 0., 0., 1.E6,
     $                    RANGE, FOUND, 'INPOPU', 'POPDEN')
        IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
            OK = .FALSE.
            WRITE(6,*) 'POPULATION DISTRIBUTION CANNOT BE CALCULATED'
            WRITE(7,*) 'POPULATION DISTRIBUTION CANNOT BE CALCULATED'
            RETURN
          ENDIF
        IBEGIN = IGET1 ('PDIBEGIN001', 1, 1, 0, NUMRAD,
     $                    RANGE, FOUND, 'INPOPU', 'IBEGIN')
        IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
            OK = .FALSE.
            WRITE(6,*) 'POPULATION DISTRIBUTION CANNOT BE CALCULATED'
            WRITE(7,*) 'POPULATION DISTRIBUTION CANNOT BE CALCULATED'
            RETURN
          ENDIF
        RADOLD = 0.
        DO 40 IRAD = 1, NUMRAD
C
C  RADOLD AND RADNEW ARE THE ENPOINT DISTANCES TO THE PREVIOUS AND
C  CURRENT SPATIAL ELEMENTS
C
          RADNEW = 2. * SPACEN(IRAD) - RADOLD
        IF (IRAD .LT. IBEGIN) THEN
            POP = 0.
          ELSE
            POP = POPDEN * 1.E-6 * PI * (RADNEW ** 2 - RADOLD ** 2) / 16.
          ENDIF
        RADOLD = RADNEW
        DO 40 IPOP = 1, 4
          DO 40 IANG = 1, NUMCOR
   40     POPDAT(IRAD,IANG,IPOP) = POP
        RETURN
        ENDIF
        WRITE(6,60)
   60 FORMAT(//' USING THE FOLLOWING SITE DATA FILE:'/)
        REWIND (IUNIT)
        NUMLIN = 0
   80 READ(IUNIT,100,END=140) LINE
  100 FORMAT(A)
C
C SUBROUTINE TESTCHAR examines the data card for unprintable ASCII characters
C and if none are found it prints out the line to unit 6.  If unprintable
C characters are found, it writes a message to the monitor, diagnoses the
C finding on unit 6, and then terminates execution.
C
        NUMLIN = NUMLIN + 1
```

```
      CALL TESTCHAR (LINE, NUMLIN)
  120 FORMAT(1X,A)
      GO TO 80
  140 OK1 = .TRUE.
      REWIND (IUNIT)
      READ(IUNIT,160,END=600) TDUMMY
  160 FORMAT(A/A)
C
C  READ THE SITE DATA FILE DESCRIPTION AND CHECK COMPATIBILITY
C
C  NUMBER OF SPATIAL INTERVALS
C
      READ(IUNIT,180) NSPDTS, IDNTFI
  180 FORMAT(I4, 1X, A)
      CALL CMPTBL (NSPDTS, NUMRAD, OK1)
C
C  NUMBER OF WIND DIRECTIONS
C
      READ(IUNIT,180) NWNDIR, IDNTFI
      CALL CMPTBL (NWNDIR, NUMCOR, OK1)
C
C  NUMBER OF CROP/GROWING SEASONS
C
      READ(IUNIT,180) IDUMMY, CDUMMY
C
C  NUMBER OF WATER PATHWAY NUCLIDES
C
      READ(IUNIT,180) IDUMMY, CDUMMY
C
C  NUMBER OF WATERSHED DEFINITIONS
C
      READ(IUNIT,180) IDUMMY, CDUMMY
      IF (.NOT. OK1) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C
C  NUMBER OF ECONOMIC REGIONS
C
      READ(IUNIT,180) IDUMMY, CDUMMY
C
C  READ THE SET OF SPATIAL DISTANCES
C
      READ(IUNIT,120) SEPRTR
      CALL MATCH (OK, SEPRTR, 'SPATIAL DISTANCES')
      IF (.NOT. OK) RETURN
      READ(IUNIT,220) (SPDSTS(I),I=1,NSPDTS)
  220 FORMAT(8E10.2)
C
C  CHECK THAT THESE SPATIAL DISTANCES ARE COMPATIBLE WITH THE
C  CENTERPOINT DISTANCES DEFINED FOR THE ATMOS MODEL
C  (RELATIVE ERRORS OF LESS THAN 10% ARE ACCEPTABLE)
C
      DO 300 IRAD = 1, NUMRAD
C
C NEED TO CONVERT FROM METERS TO KILOMETERS FOR THE COMPARISON
C
      RADIUS = SPAEND(IRAD) / 1000.
      RELERR = ABS ((SPDSTS(IRAD) - RADIUS) / RADIUS)
      IF (RELERR .GT. .1) THEN
        OK = .FALSE.
      CALL ERRFIL ('INPOPU', 'SPATIAL ENDPOINT DISTANCES')
        WRITE(6,240)
```

```
      WRITE(7,240)
  240 FORMAT('0 THE SPATIAL INTERVALS SPECIFIED IN THE SITE DATA ',
     1        'FILE CONFLICT WITH THOSE DEFINED IN THE MODEL.')
      WRITE(6,*) '   AT INTERVAL ', IRAD, ' THE RELATIVE ERROR IS ',
     1            RELERR
      WRITE(7,*) '   AT INTERVAL ', IRAD, ' THE RELATIVE ERROR IS ',
     1            RELERR
      RETURN
     ENDIF
  300 CONTINUE
C
C For fraction of the people or fraction of the time weighting, read a single
C population distribution and copy it over to the other storage locations.
C For simple summation weighting, read a population distribution for each
C emergency response scenario defined in EARLY and sum them for use by CHRONC.
C
     IF (WTNAME .EQ. 'PEOPLE' .OR. WTNAME .EQ. 'TIME') THEN
     READ(IUNIT,120) SEPRTR
     CALL MATCH (OK, SEPRTR, 'POPULATION')
     IF (.NOT. OK) RETURN
     WRITE(6,120) SEPRTR
     DO 320 IANG = 1, NUMCOR
  320  READ(IUNIT,340) (POPDAT(IRAD,IANG,1),IRAD=1,NUMRAD)
  340  FORMAT(8F10.0)
C
C copy the population data into the other storage slots even if it's not needed
C
     DO 360 IPOP = 2, 4
     DO 360 IANG = 1, NUMCOR
     DO 360 IRAD = 1, NUMRAD
  360  POPDAT(IRAD,IANG,IPOP) = POPDAT(IRAD,IANG,1)
     ELSE IF (WTNAME .EQ. 'SUMPOP') THEN
C
C We expect to find a population data block with separator POPULATION1,
C POPULATION2, POPULATION3, defined for each emergency response scenario
C
     DO 480 IPOP = 1, NSTRTG
     WRITE(STRING,440) IPOP
  440  FORMAT('POPULATION', I1)
     READ(IUNIT,120) SEPRTR
     CALL MATCH (OK, SEPRTR, STRING)
     IF (.NOT. OK) THEN
       WRITE(6,*) 'Incorrect specification of population data'
       WRITE(7,*) 'Incorrect specification of population data'
       RETURN
     ENDIF
     DO 480 IANG = 1, NUMCOR
  480  READ(IUNIT,340) (POPDAT(IRAD,IANG,IPOP),IRAD=1,NUMRAD)
C
C Sum the population distributions for use by CHRONC
C
     IF (NSTRTG .EQ. 1) THEN
       DO 500 IANG = 1, NUMCOR
       DO 500 IRAD = 1, NUMRAD
  500    POPDAT(IRAD,IANG,4) = POPDAT(IRAD,IANG,1)
     ELSE IF (NSTRTG .EQ. 2) THEN
       DO 520 IANG = 1, NUMCOR
       DO 520 IRAD = 1, NUMRAD
  520    POPDAT(IRAD,IANG,4) = POPDAT(IRAD,IANG,1) +
    1    POPDAT(IRAD,IANG,2)
     ELSE IF (NSTRTG .EQ. 3) THEN
       DO 540 IANG = 1, NUMCOR
       DO 540 IRAD = 1, NUMRAD
```

```
  540     POPDAT(IRAD,IANG,4) = POPDAT(IRAD,IANG,1) +
     1    POPDAT(IRAD,IANG,2) + POPDAT(IRAD,IANG,3)
      ENDIF
      ENDIF
      RETURN
  600 OK = .FALSE.
      CALL ERRFIL ('INPOPU', 'SITE DATA FILE')
      WRITE(6,*) 'EMPTY FILE FOUND ON UNIT,', IUNIT
      WRITE(7,*) 'EMPTY FILE FOUND ON UNIT,', IUNIT
      RETURN
      END
*deck testchar
      SUBROUTINE TESTCHAR (LINE, NUMLIN)
c
c This program takes as input a string of type character and writes a message
c to the monitor and unit 6 if the string contains unprintable characters.
c
c It is intended to be helpful in diagnosing input errors resulting from the
c inadvertent insertion of unprintable characters into Site Data Files.
c
c  D. Chanin, 2/19/96
c
      character line *(*), xbar *132
      integer *2 ascii, ifound(132)
      if (len(line) .gt. 132) then
       call abort ('internal error in TESTCHAR')
      endif
      num_found = 0
      xbar = ' '
      do 40 icol = 1, len(line)
      ascii = ichar(line(icol:icol))
c
c Printable characters are the ASCII codes from decimal 32 (blank) to 126 (~)
c
c The TAB character (ASCII code 9) is not printable, and is commonly handled
c in an OK way by FORTRAN programs, but the method of handling a TAB is not
c specified in the ANSI standard for FORTRAN 77, and thus could be problematic
c
       if (ascii .lt. 32 .or. ascii .gt. 126) then
         if (num_found .eq. 0) then
           write(6,20)
           write(7,20)
         endif
   20  format(/' ERROR: Site Data File contains invalid character(s)')
       num_found = num_found + 1
       ifound(num_found) = ichar(line(icol:icol))
       xbar(icol:icol) = 'X'
      endif
   40 continue
      write(6,60) line
   60 format(1x,a)
      if (num_found .gt. 0) then
      write(6,60) xbar
      write(6,80)'WARNING: unprintable ASCII character found above X',
     1 ' while processing line number ', NUMLIN, ' of the file',
     2 'The first ten unprintable codes (in decimal) are as follows: ',
     3              (ifound(i),i=1,min(num_found,10))
      write(7,60) xbar
      write(7,80)'WARNING: unprintable ASCII character found above X',
     1 ' while processing line number ', NUMLIN, ' of the file',
     2 'The first ten unprintable codes (in decimal) are as follows: ',
     3              (ifound(i),i=1,min(num_found,10))
  80    format(/1x, a, a, i3, a //1x, a, 10I4)
```

```
      call abort ('terminating')
      endif
      return
      end
*DECK CMPTBL
      SUBROUTINE CMPTBL (NINPT, NMODL, OK)
C
C  CHECK THAT NINPT AND NMODL ARE IDENTICAL
C
C  GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO CMPTBL
C
C   IDNTFI - ITEM IDENTIFIATION
C   NINPT  - THE NUMBER OF ITEMS DEFINED ON THE SITE DATA FILE
C   NMODL  - THE NUMBER OF ITEMS DEFINED BY THE MODEL
C
C  GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM CMPTBL
C
C   OK     - LOGICAL FLAG INDICATING NINPT AND NMODL ARE IDENTICAL
C
      CHARACTER *22   IDNTFI
      COMMON /IDNTFI/ IDNTFI
      LOGICAL OK
      IF (NINPT .NE. NMODL) THEN
        OK = .FALSE.
        CALL ERRFIL ('INPOPU', 'POPULATION DISTRIBUTION')
        WRITE(6,50) NINPT,IDNTFI,NMODL
        WRITE(7,50) NINPT,IDNTFI,NMODL
   50   FORMAT('0 THERE ARE ',I3,1X,A,' ON THE SITE DATA FILE;',/,
     1          '     THIS NUMBER IS INCONSISTENT WITH THE ',I3,
     2         ' DEFINED BY THE MODEL.')
      ENDIF
      RETURN
      END
*DECK MATCH
      SUBROUTINE MATCH (OK, SEPRTR, SDFKEY)
C
C CHECK THAT SEPRTR AND SDFKEY MATCH
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO MATCH
C   SDFKEY - SITE DATA FILE KEY SEPARATOR
C   SEPRTR - SEPARATOR READ FROM THE SITE DATA FILE
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA FROM MATCH
C   OK     - LOGICAL FLAG INDICATING SEPRTR AND SDFKEY ARE IDENTICAL
C
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      CHARACTER *(*) SDFKEY, SEPRTR
      LOGICAL OK
      IF (SEPRTR .NE. SDFKEY) THEN
        OK = .FALSE.
      CALL ERRFIL ('INPOPU', 'Site Data File')
      WRITE(6,50) SDFKEY, SEPRTR
      WRITE(7,50) SDFKEY, SEPRTR
   50   FORMAT(/' Looking for the data separator: ', A,
     1         /'   But instead found the string: ', A/)
      ENDIF
      RETURN
      END
*DECK EVRADI
      SUBROUTINE EVRADI (OK)
C
C  THIS ROUTINE READS RADIAL EVACUATION DATA FROM THE INPUT DATABASE
```

```
C  AND CREATES AN EVACUATION NETWORK TO REPRESENT IT.
C  IT ALSO CREATES A LIST OF ROOT NODES. DATA IS STORED IN /ROOTS/.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INEVAC.
C
C  GLOSSARY OF VARIABLES:
C
C  ENDPT  - DISTANCE TO THE ENDPOINT OF THE SPATIAL ELEMENT
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORRECT TYPE WAS FOUND
C  IDIR   - LOOP COUNTER OVER ALL POSSIBLE WIND DIRECTIONS
C  IRAD   - LOOP COUNTER OVER RADIAL SPATIAL ELEMENTS
C  LASMOV - RADIAL INDEX TO THE LAST RING IN THE MOVEMENT ZONE
C NEXTND - Destination of each shelter/evac node, defined in EVRADI and EVNETW
C  NROOTS - THE NUMBER OF ROOT NODES IN THE NETWORK
C  NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN THE ALLOWED RANGE WAS FOUND
C  ROOT   - AN ARRAY CONTAINIING POINTERS TO THE ROOT NODES IN THE NETWORK
C  SPACEN - AN ARRAY OF DISTANCES TO THE SPATIAL ELEMENT CENTERPOINTS
C  TRDIS  - TRAVEL DISTANCE OVER THE LENGTH OF THE SPATIAL ELEMENT
C TRTIME - Traversal times for evacuees during initial, middle, and end phase
C
C  DAVID CHANIN, DIV. 6415, 25 JULY 1984.
C
C  MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C Modified 8/15/92, D. Chanin, new emergency response model for DOE
C Modified 4/16/96, D.C., implement TRAVELPOINT (CENTERPOINT or BOUNDARY) option
C
      EXTERNAL RGETN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      COMMON /ROOTS/ NROOTS, ROOT(2,376)
      CHARACTER      EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
C
      LOGICAL OK
C
      OK = .TRUE.
      NROOTS = NUMCOR
C
C  MAKE A LIST OF ROOT NODES
C
      DO 40 IDIR = 1, NROOTS
      ROOT(1,IDIR) = 1
   40 ROOT(2,IDIR) = IDIR
C
C  CALCULATE TRAVEL TIME THROUGH EACH RADIAL ELEMENT AND STORE THE NETWORK
C
      DO 80 IRAD = 1, LASMOV
      DO 80 IDIR = 1, NROOTS

c statements deleted 4/15/96 because travel time from "origination nodes"
c was being erroneously cut in half

c      IF (IRAD .GT. 1) THEN
c      TRTIME(1,IRAD,IDIR) = SPALEN(IRAD) / ESPEED(1)
c      TRTIME(2,IRAD,IDIR) = SPALEN(IRAD) / ESPEED(2)
```

```
c       TRTIME(3,IRAD,IDIR) = SPALEN(IRAD) / ESPEED(3)
c       ELSE
c       TRTIME(1,IRAD,IDIR) = 0.5 * SPALEN(IRAD) / ESPEED(1)
c       TRTIME(2,IRAD,IDIR) = 0.5 * SPALEN(IRAD) / ESPEED(2)
c       TRTIME(3,IRAD,IDIR) = 0.5 * SPALEN(IRAD) / ESPEED(3)
c       ENDIF  ! end of 4/15/96 changes

        IF (TRAVELPOINT .EQ. 'BOUNDARY') THEN
          TRTIME(1,IRAD,IDIR) = SPALEN(IRAD) / ESPEED(1)
          TRTIME(2,IRAD,IDIR) = SPALEN(IRAD) / ESPEED(2)
          TRTIME(3,IRAD,IDIR) = SPALEN(IRAD) / ESPEED(3)
        ELSE IF (TRAVELPOINT .EQ. 'CENTERPOINT') THEN
          TRTIME(1,IRAD,IDIR) = 0.5 * ( SPALEN(IRAD) + SPALEN(IRAD+1) ) /
     1                          ESPEED(1)
          TRTIME(2,IRAD,IDIR) = 0.5 * ( SPALEN(IRAD) + SPALEN(IRAD+1) ) /
     1                          ESPEED(2)
          TRTIME(3,IRAD,IDIR) = 0.5 * ( SPALEN(IRAD) + SPALEN(IRAD+1) ) /
     1                          ESPEED(3)
        ENDIF

        NEXTND(1,IRAD,IDIR) = IRAD + 1
   80   NEXTND(2,IRAD,IDIR) = IDIR
        RETURN
        END
*DECK EVNETW
        SUBROUTINE EVNETW (OK)
C
C  THIS ROUTINE READS EVACUATION NETWORK DATA FROM THE INPUT DATABASE.
C  IT CALLS SUBROUTINE EVROOT TO MAKE A LIST OF ROOT NODES.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE INEVAC.
C
C  GLOSSARY OF VARIABLES:
C
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF THE CORECT TYPE WAS FOUND
C I      - DO LOOP INDEX
C ICOUNT - ACCUMULATED PATH LENGTH OVER THE CURRENT PATH
C IDIREC - Local array storing a direction code (1-4) for each evacuation node
C INEXT  - RADIAL INDEX TO THE NEXT NODE ON THE PATH
C ISORC  - RADIAL INDEX TO THE SOURCE ELEMENT ON THE INPUT FILE
C ITEMP  - TEMPORARY STORAGE
C I1     - RADIAL INDEX TO THE CURRENT NODE
C I2     - RADIAL INDEX TO THE SUCCESSOR OF THE CURRENT NODE
C J      - LOOP COUNTER
C JNEXT  - ANGULAR INDEX TO THE SUCCESSOR OF THE CURRENT NODE
C JSORC  - ANGULAR INDEX TO THE SOURCE ELEMENT ON THE INPUT FILE
C J1     - ANGULAR INDEX TO THE CURRENT NODE
C J2     - ANGULAR INDEX TO THE SUCCESSOR OF THE CURRENT NODE
C LASMOV - RADIAL INDEX TO THE LAST RING IN THE MOVEMENT ZONE
C NEXTND - Destination of each shelter/evac node, defined in EVRADI and EVNETW
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C OK     - LOGICAL FLAG THAT INDICATES SUCCESSFUL COMPLETION OF THIS ROUTINE
C RANGE  - LOGICAL FLAG THAT INDICATES A VALUE IN THE REQUIRED RANGE WAS FOUND
C TRTIME - Traversal times for evacuees during initial, middle, and end phase
C
C  GLOSSARY OF EXTERNALS:
C
C ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C EVROOT - MAKES A LIST OF ROOT NODES IN THE NETWORK AND STORES IT IN /ROOTS/
C
C DAVID CHANIN, DIV. 6415, 25 JULY 1984.
C Modified 10/01/92, D. Chanin, new emergency response model for DOE
C Modified 4/16/96, D.C., implement TRAVELPOINT (CENTERPOINT or BOUNDARY) option
```

```
C
      EXTERNAL ABORT, ERRLOC, EVROOT, IGETN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
C
      LOGICAL OK, RANGE, FOUND
      DIMENSION IDIREC(MAXRAD,16)
      CHARACTER *11 NAME
C
      OK = .TRUE.
C
C Define travel direction codes, IDIREC, for each element in the movement zone.
C For a coordinate system where everyone is facing AWAY from the centerpoint,
C 1=forwards, 2=rightwards, 3=backwards, and 4=leftwards direction of travel.
C
      WRITE(6,100) 'Radial  ', '  N ', ' NNE', '  NE', ' ENE', '  E ',
     1     ' ESE', '  SE', ' SSE', '  S ', ' SSW', '  SW', ' WSW',
     2     '  W ', ' WNW', '  NW', ' NNW'
  100 FORMAT(//' With 1=forwards, 2=rightwards, 3=backwards, and ',
     1       '4=leftwards, '/
     2       ' The Evacuation Network For This Scenario Was Defined',
     3       ' As Follows:'/ 1X, 17A)

      DO 200 IRAD = 1, LASMOV
      WRITE(NAME,120) IRAD
  120 FORMAT('EZIDIREC', I3.3)
      DO 140 IANG = 1, NUMCOR
      IDIREC(IRAD,IANG) = IGET1 (NAME, IANG, 1, 0, 4,
     1                    RANGE, FOUND, 'EVNETW', 'IDIREC')
      IF (IRAD .EQ. 1 .AND. IDIREC(IRAD,IANG) .EQ. 3) THEN
        WRITE(6,160) IANG
        WRITE(7,160) IANG
        CALL ERRLOC ('EVNETW', 'IDIREC')
        CALL ABORT (' Caused by illegal input')
      ENDIF
  140 IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('from EVNETW')
  160 FORMAT(' ERROR: Backward travel not allowed across centerpoint'/
     1       '         IDIREC=3 was specified for direction number',I3)

  200 WRITE(6,220) IRAD, (IDIREC(IRAD,IANGLE), IANGLE= 1, NUMCOR)
  220 FORMAT(1X,I4,4X,16(I3,1X))
C
C Define the destination node for every element of the network.
C The destination of (I1,J1) is (NEXTND(1,I1,J1),NEXTND(2,I1,J1)),
C where I1 is the radial index and J1 is the angular index to the element.
C Also, within the same 700 loop, calculate travel times for each phase.
C
      DO 700 J1 = 1, NUMCOR
      DO 700 I1 = 1, LASMOV
      IF (IDIREC(I1,J1) .EQ. 1) THEN
        I2 = I1 + 1
        J2 = J1
        IF (TRAVELPOINT .EQ. 'BOUNDARY') THEN
          TRTIME(1,I1,J1) = SPALEN(I1) / ESPEED(1)
```

```
          TRTIME(2,I1,J1) = SPALEN(I1) / ESPEED(2)
          TRTIME(3,I1,J1) = SPALEN(I1) / ESPEED(3)
        ELSE IF (TRAVELPOINT .EQ. 'CENTERPOINT') THEN
          TRTIME(1,I1,J1) = 0.5 * ( SPALEN(I1) + SPALEN(I1+1) ) /
     1                      ESPEED(1)
          TRTIME(2,I1,J1) = 0.5 * ( SPALEN(I1) + SPALEN(I1+1) ) /
     1                      ESPEED(2)
          TRTIME(3,I1,J1) = 0.5 * ( SPALEN(I1) + SPALEN(I1+1) ) /
     1                      ESPEED(3)
        ENDIF
      ELSE IF (IDIREC(I1,J1) .EQ. 2) THEN
      I2 = I1
      J2 = J1 + 1
      IF (J2 .GT. NUMCOR) J2 = 1
      TRTIME(1,I1,J1) = 2.0 * PI * SPACEN(I1) / NUMCOR / ESPEED(1)
      TRTIME(2,I1,J1) = 2.0 * PI * SPACEN(I1) / NUMCOR / ESPEED(2)
      TRTIME(3,I1,J1) = 2.0 * PI * SPACEN(I1) / NUMCOR / ESPEED(3)
      ELSE IF (IDIREC(I1,J1) .EQ. 3) THEN
C
C Allow backward travel direction across the grid centerpoint unless
C it involves traversing the centerpoint of the spatial grid
C
        I2 = I1 - 1
        J2 = J1
        IF (TRAVELPOINT .EQ. 'BOUNDARY') THEN
          TRTIME(1,I1,J1) = SPALEN(I1) / ESPEED(1)
          TRTIME(2,I1,J1) = SPALEN(I1) / ESPEED(2)
          TRTIME(3,I1,J1) = SPALEN(I1) / ESPEED(3)
        ELSE IF (TRAVELPOINT .EQ. 'CENTERPOINT') THEN
          TRTIME(1,I1,J1) = 0.5 * ( SPALEN(I1) + SPALEN(I1+1) ) /
     1                      ESPEED(1)
          TRTIME(2,I1,J1) = 0.5 * ( SPALEN(I1) + SPALEN(I1+1) ) /
     1                      ESPEED(2)
          TRTIME(3,I1,J1) = 0.5 * ( SPALEN(I1) + SPALEN(I1+1) ) /
     1                      ESPEED(3)
        ENDIF
      ELSE IF (IDIREC(I1,J1) .EQ. 4) THEN
        I2 = I1
        J2 = J1 - 1
        IF (J2 .EQ. 0) J2 = NUMCOR
        TRTIME(1,I1,J1) = 2.0 * PI * SPACEN(I1) / NUMCOR / ESPEED(1)
        TRTIME(2,I1,J1) = 2.0 * PI * SPACEN(I1) / NUMCOR / ESPEED(2)
        TRTIME(3,I1,J1) = 2.0 * PI * SPACEN(I1) / NUMCOR / ESPEED(3)
      ELSE
        CALL ABORT ('Internal Error, Bad Value For IDIREC')
      ENDIF
      NEXTND(1,I1,J1) = I2
      NEXTND(2,I1,J1) = J2
  700 CONTINUE
C
C CHECK FOR CLOSED LOOPS BY FOLLOWING THE PATH FROM EACH ELEMENT TO
C SEE IF IT COVERS MORE ELEMENTS THAN ARE IN THE MOVEMENT ZONE.
C
      DO 900 J1 = 1, NUMCOR
      JNEXT = J1
      DO 900 I1 = 1, LASMOV
      INEXT = I1
      ICOUNT = 1
  800 ITEMP = NEXTND(1,INEXT,JNEXT)
      JNEXT = NEXTND(2,INEXT,JNEXT)
      INEXT = ITEMP
      IF (ICOUNT .GT. NUMCOR * LASMOV) THEN
        OK = .FALSE.
```

```
          CALL ERRLOC ('EVNETW', 'NEXTND')
          WRITE(6,850)
          WRITE(7,850)
  850     FORMAT(' ERROR: A closed cycle was found in the network')
          CALL ABORT (' Caused by illegal input')
        ELSE IF (INEXT .GT. 0 .AND. INEXT .LE. LASMOV) THEN
          ICOUNT = ICOUNT + 1
          GO TO 800
        ENDIF
  900 CONTINUE
C
C  MAKE A LIST OF ROOT NODES
C
      IF (OK) CALL EVROOT
      RETURN
      END
*DECK EVROOT
      SUBROUTINE EVROOT
C
C  THIS ROUTINE MAKES A LIST OF ROOT NODES WITHIN THE EVACUATION ZONE
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE EVNETW.
C
C  GLOSSARY OF VARIABLES:
C
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  I1     - LOOP COUNTER FOR RADIAL INDEX
C  J1     - LOOP COUNTER FOR ANGULAR INDEX
C  J2     - ANGULAR INDEX TO NEIGHBORS OF (I1,J1)
C  LASMOV - RADIAL INDEX TO THE LAST RING IN THE MOVEMENT ZONE
C NEXTND - Destination of each shelter/evac node, defined in EVRADI and EVNETW
C  NROOTS - THE NUMBER OF ROOT NODES STORED IN ROOT
C  NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMEVA - Last ring of the emergency response zone (shelter and evacuation)
C  ROOT   - A LIST OF ROOT NODES IN THE NETWORK
C TRTIME - Traversal times for evacuees during initial, middle, and end phase
C
C  DAVID CHANIN, DIV. 6415, 25 JULY 1984.
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 3/18/96, D. Chanin, Delete statements adjusting travel time for
C    root nodes because that function is applied in EMOVE to all nodes in
C    which evacuees originate travel
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      COMMON /ROOTS/ NROOTS, ROOT(2,376)
      LOGICAL FOUND

      NROOTS = 0
C
C Loop on all elements in the sheltering/evacuation origination zone
C
      DO 900 J1 = 1, NUMCOR
      DO 900 I1 = 1, NUMEVA
C
```

```
C Check to see if (I1,J1) is a root node by testing if it is a
C destination of its neighbors. If a root, add it to the list.
C
      FOUND = .TRUE.
C
C Check the inner neighbor (closer to centerpoint)
C
      IF (I1 .GT. 1) THEN
        IF (NEXTND(1,I1-1,J1).EQ.I1 .AND. NEXTND(2,I1-1,J1).EQ.J1)
     $      FOUND = .FALSE.
      ENDIF
C
C Check the outer neighbor (further from centerpoint)
C
      IF (FOUND .AND. I1 .LT. LASMOV) THEN
        IF (NEXTND(1,I1+1,J1).EQ.I1 .AND. NEXTND(2,I1+1,J1).EQ.J1)
     $      FOUND = .FALSE.
      ENDIF
C
C Calculate index to higher angle neighbor (rightward), and check that node
C
      IF (FOUND) THEN
        J2 = J1 + 1
        IF (J2 .EQ. NUMCOR + 1) J2 = 1
        IF (NEXTND(1,I1,J2) .EQ. I1 .AND. NEXTND(2,I1,J2) .EQ. J1)
     $      FOUND = .FALSE.
      ENDIF
C
C Calculate index to lower angle neighbor (leftward), and check that node
C
      IF (FOUND) THEN
        J2 = J1 - 1
        IF (J2 .EQ. 0) J2 = NUMCOR
        IF (NEXTND(1,I1,J2) .EQ. I1 .AND. NEXTND(2,I1,J2) .EQ. J1)
     $      FOUND = .FALSE.
      ENDIF
C
C If a root was found, add it to the list and cut the travel time in half
C
      IF (FOUND) THEN
        NROOTS = NROOTS + 1
        ROOT(1,NROOTS) = I1
        ROOT(2,NROOTS) = J1
        WRITE(6,550) I1, J1
  550   FORMAT(' FOUND A ROOT AT (', I3, ',', I3, ')')
C
C Following 3 statements deleted at v. 1.11d because the halving of travel time
C is being later applied for ALL spatial nodes in which evacuees originate
C movement.  This adjustment of travel time in the initial node of travel
C is performed in SUBROUTINE EMOVE.  The effect of the three deleted statements
C was to erroneously double the evacuees' travel speed from root nodes.
C D. Chanin, 3/18/96
C
C      TRTIME(1,I1,J1) = 0.5 * TRTIME(1,I1,J1)
C      TRTIME(2,I1,J1) = 0.5 * TRTIME(2,I1,J1)
C      TRTIME(3,I1,J1) = 0.5 * TRTIME(3,I1,J1)
C
      ENDIF
  900 CONTINUE
      RETURN
      END
*DECK INPEMR
      SUBROUTINE INPEMR (OK)
```

```
C
C THIS ROUTINE DEFINES THE EMERGENCY RESPONSE ZONE AND SHIELDING FACTORS
C IT STORES THE DATA IN /EADFAC/ AND /RELOCA/.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C BRRATE - BREATHING RATES FOR THE THREE ZONES (CUBIC METERS PER SECOND)
C CSFACT - CLOUD SHIELDING FACTORS FOR THE THREE ZONES
C CRIORG - CRITICAL ORGAN NAME FOR RELOCATION
C DOSHOT - HOT SPOT RELOCATION GROUNDSHINE DOSE THRESHOLD (SIEVERTS)
C DOSNRM - NORMAL RELOCATION CRITERIA DOSE THRESHOLD (SIEVERTS)
C ENDEMP - END OF THE EMERGENCY PHASE (SECONDS FROM PLUME FIRST ARRIVAL)
C FOUND  - LOGICAL FLAG THAT INDICATES A VALUE OF THE RIGHT TYPE WAS FOUND
C GSHFAC - GROUND SHIELDING FACTORS FOR THE THREE ZONES
C INDORG - INDEX TO THE CRITICAL ORGAN FOR RELOCATION
C IORG   - LOOP COUNTER ON ORGANS
C NUMORG - NUMBER OF ORGANS DEFINED FOR THE HEALTH EFFECTS MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C OK     - LOGICAL FLAG THAT INDICATES SUCCESFULL COMPLETION OF THIS ROUTINE
C ORGNAM - LIST OF ALL ORGANS DEFINED IN THE EARLY HEALTH EFFECTS MODEL
C PROTIN - PROTECTION FACTORS FOR INHALATION FOR THE THREE ZONES
C RANGE  - LOGICAL FLAG THAT INDICATES THE VALUE FOUND IS WITHIN ALLOWED RANGE
C RESCON - RESUSPENSION CONCENTRATION COEFFICIENT AT TIME ZERO
C RESHAF - RESUSPENSION CONCENTRATION COEFFICIENT HALF-LIFE (SECONDS)
C SKPFAC - SKIN PROTECTION FACTORS FOR THE THREE ZONES
C TIMHOT - HOT SPOT RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C TIMNRM - NORMAL RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C
C  THREE VALUES ARE REQUIRED FOR THE THREE DIFFERENT TYPES OF EXPOSURE:
C
C  1 - MOVING EVACUEES
C  2 - NORMAL ACTIVITY
C  3 - SHELTERING ACTIVITY
C
C DAVID CHANIN, DIV. 6415, 27 NOV 1984.
C
C MODIFIED 15 JUN 87, D.C., SER #62, INCORRECT DOSE CUTOFF, DOSE PROJECTIONS
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MOD 6 APR 88, D.C., ALLOW HOT SPOT TIME DOWN TO 1 HOUR, 100 SV THRESHOLDS
C MODIFIED 7/30/91, D. CHANIN, #12/20/90-A, FAILURE TO DIAGNOSE INPUT ERRORS
C Modified 8/15/92, D. Chanin, new emergency response model for DOE
C
      EXTERNAL CGET1, RGET1, RGETN, ERRLOC
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      CHARACTER *80 CGET1
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 CRIORG
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
      COMMON /EADFAC/ CSFACT(3), PROTIN(3), BRRATE(3),
     1                SKPFAC(3), GSHFAC(3), RESCON, RESHAF
```

```
      OK = .TRUE.
C
C  CLOUD SHIELDING FACTOR
C
      CALL RGETN ('SECSFACT001', 0, CSFACT, 3, 0., 1.,
     $            RANGE, FOUND, 'INPEMR', 'CSFACT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  PROTECTION FACTOR FOR INHALATION
C
      CALL RGETN ('SEPROTIN001', 0, PROTIN, 3, 0., 1.,
     $            RANGE, FOUND, 'INPEMR', 'PROTIN')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  BREATHING RATE (CUBIC METERS PER SECOND)
C
      CALL RGETN ('SEBRRATE001', 0, BRRATE, 3, 0., 1.,
     $            RANGE, FOUND, 'INPEMR', 'BRRATE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  SKIN PROTECTION FACTOR
C
      CALL RGETN ('SESKPFAC001', 0, SKPFAC, 3, 0., 1.,
     $            RANGE, FOUND, 'INPEMR', 'SKPFAC')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  GROUND SHIELDING FACTOR
C
      CALL RGETN ('SEGSHFAC001', 0, GSHFAC, 3, 0., 1.,
     $            RANGE, FOUND, 'INPEMR', 'GSHFAC')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  DURATION OF THE EMERGENCY PHASE (SECONDS FROM PLUME ARRIVAL)
C
      ENDEMP = RGET1 ('SRENDEMP001', 0, 86400., 604800., 604800.,
     $                RANGE, FOUND, 'INPEMR', 'ENDEMP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  HOT SPOT RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C
      TIMHOT = RGET1 ('SRTIMHOT001', 0, 0., 0., ENDEMP,
     $                RANGE, FOUND, 'INPEMR', 'TIMHOT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  NORMAL RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C
      TIMNRM = RGET1 ('SRTIMNRM001', 0, TIMHOT, 0., ENDEMP,
     $                RANGE, FOUND, 'INPEMR', 'TIMNRM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  HOT-SPOT RELOCATION CRITERIA DOSE THRESHOLD (SIEVERTS)
C
      DOSHOT = RGET1 ('SRDOSHOT001', 0, 0., 0., 1.E10, RANGE, FOUND,
     $               'INPEMR', 'DOSHOT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  NORMAL RELOCATION CRITERIA DOSE THRESHOLD (SIEVERTS)
C
      DOSNRM = RGET1 ('SRDOSNRM001', 0, 0., 0., DOSHOT, RANGE, FOUND,
     $               'INPEMR', 'DOSNRM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  NAME OF THE CRITICAL ORGAN FOR DETERMINING WHETHER TO RELOCATE PEOPLE
```

```
C
      CRIORG = CGET1 ('SRCRIORG001', 0, 2, ' ', 11, RANGE, FOUND,
     $                'INPEMR', 'CRIORG')
C
      IF (RANGE .AND. FOUND) THEN
      DO 100 IORG = 2, NUMORG
      IF (CRIORG .EQ. ORGNAM(IORG)) THEN
        INDORG = IORG
          GO TO 200
        ENDIF
  100   CONTINUE
        CALL ERRLOC('INPEMR', 'CRIORG')
      WRITE(6,*) CRIORG, ' NOT FOUND IN LIST OF ORGANS'
      WRITE(7,*) CRIORG, ' NOT FOUND IN LIST OF ORGANS'
      CALL ABORT ('INPEMR')
      ELSE
      OK = .FALSE.
      ENDIF
  200 CONTINUE
C
C  RESCON IS THE RESUSPENSION CONCENTRATION COEFFICIENT
C
      RESCON = RGET1 ('SERESCON001', 1, 0., 0., 1., RANGE, FOUND,
     $                'INPEMR', 'RESCON')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  RESHAF IS THE RESUSPENSION CONCENTRATION COEFFICIENT HALF-LIFE (SECONDS)
C
      RESHAF = RGET1 ('SERESHAF001', 1, 1., 1., 1.E10, RANGE, FOUND,
     $                'INPEMR', 'RESHAF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
      RETURN
      END
*DECK INEFAT
      SUBROUTINE INEFAT (OK)
C
C  THIS ROUTINE DEFINES THE EARLY FATALITY RISK MODEL PARAMETERS.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  EFFACA - EARLY FATALITY PARAMETER ALPHA FOR ALL EARLY FATALITIES
C  EFFACB - EARLY FATALITY PARAMETER BETA FOR ALL EARLY FATALITIES
C  EFFTHR - EARLY FATALITY THRESHOLD DOSE (Sv)
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  IEFF   - LOOP COUNTER ON EARLY FATALITY EFFECTS
C  INDXEF - INDEX TO THE EARLY FATALITY ORGANS
C  IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C  L      - LENGTH OF THE RECORD IDENTIFIER TO BE SEARCHED FOR
C  NAME   - NAME OF THE ORGAN USED FOR THIS EFFECT
C  NUMEFA - NUMBER OF EARLY FATALITY ORGANS DEFINED IN THE MODEL
C  NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
```

```
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 12 SEPT 84.
C
C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
      EXTERNAL CGET1, ERRLOC, IGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /EFATAL/ NUMEFA, INDXEF(5), EFFACA(5), EFFACB(5), EFFTHR(5)
      LOGICAL OK, RANGE, FOUND

      CHARACTER *80 CGET1
      CHARACTER *11 NAME
      CHARACTER *11 RECNAM

      OK = .TRUE.

      RECNAM = 'EFATAGRP001'
C
C  NUMBER OF EARLY FATALITY EFFECTS DEFINED IN THE MODEL
C
      NUMEFA = IGET1 ('EFNUMEFA001', 1, 0, 0, 5, RANGE, FOUND,
     $                'INEFAT', 'NUMEFA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUMEFA .EQ. 0) RETURN
C
C  NAME OF THE ORGAN DOSE THAT CAUSES THIS EARLY FATALITY EFFECT
C
      L = 11
      DO 400 IEFF = 1, NUMEFA
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'INEFAT', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 2, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          INDXEF(IEFF) = IORG
          GO TO 400
        ENDIF
  300   CONTINUE
      OK = .FALSE.
        WRITE(6,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        CALL ERRLOC('INEFAT','ORGNAM')
      ELSE
      OK = .FALSE.
      ENDIF
  400 L = 8
C
C  EARLY FATALITY FITTING PARAMETER ALPHA
```

```
C
      CALL RGETN (RECNAM, 2, EFFACA, NUMEFA, 1., 100.,
     $            RANGE, FOUND, 'INEFAT', 'EFFACA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EARLY FATALITY FITTING PARAMETER BETA
C
      CALL RGETN (RECNAM, 3, EFFACB, NUMEFA, 1., 100.,
     $            RANGE, FOUND, 'INEFAT', 'EFFACB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EARLY FATALITY THRESHOLD DOSE (Sv)
C
      CALL RGETN (RECNAM, 4, EFFTHR, NUMEFA, 0., 100.,
     $            RANGE, FOUND, 'INEFAT', 'EFFTHR')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INEINJ
      SUBROUTINE INEINJ (OK)
C
C  THIS ROUTINE DEFINES THE EARLY INJURY MODELS.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  EIFACA - EARLY INJURY PARAMETER ALPHA FOR ALL EARLY INJURIES
C  EIFACB - EARLY INJURY PARAMETER BETA FOR ALL EARLY INJURIES
C  EINAME - NAMES OF THE EARLY INJURIES DEFINED IN THE MODEL
C  EISUSC - FRACTION OF THE POPULATION THAT IS SUSCEPTIBLE TO THIS INJURY
C  EITHRE - THRESHOLD DOSE FOR EARLY INJURY EFFECTS
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  IEFF   - LOOP COUNTER ON EARLY INJURY EFFECTS
C  IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C  INDXEI - INDEX TO THE EARLY INJURY ORGANS
C  L      - LENGTH OF THE RECORD IDENTIFIER TO BE SEARCHED FOR
C  NAME   - NAME OF THE ORGAN USED FOR THIS EFFECT
C  NUMEIN - NUMBER OF EARLY INJURY EFFECTS
C  NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 12 SEPT 84.
C
C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
      EXTERNAL CGET1, ERRLOC, IGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
```

```
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *16   EINAME
      COMMON /EINAME/ EINAME(10)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      LOGICAL OK, RANGE, FOUND
      CHARACTER *80 CGET1
      CHARACTER *11 NAME, RECNAM
C
      OK = .TRUE.
      RECNAM = 'EINJUGRP001'
C
C  NUMBER OF EARLY INJURY EFFECTS DEFINED IN THE MODEL
C
      NUMEIN = IGET1 ('EINUMEIN001', 1, 0, 0, 10, RANGE, FOUND,
     $                'INEINJ', 'NUMEIN')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUMEIN .EQ. 0) RETURN
C
C  NAME OF THE EARLY INJURY
C
      L = 11
      DO 100 IEFF = 1, NUMEIN
      EINAME(IEFF) = CGET1 (RECNAM(1:L), 1, 1, ' ', 16, RANGE, FOUND,
     $                      'INPEIN', 'EINAME')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        GO TO 200
      ENDIF

  100 L = 8
  200 CONTINUE
C
C  NAME OF THE ORGAN DOSE THAT CAUSES THIS EARLY INJURY EFFECT
C
      L = 11
      DO 400 IEFF = 1, NUMEIN
      NAME = CGET1 (RECNAM(1:L), 2, 2, ' ', 11, RANGE, FOUND,
     $              'INPEIN', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 1, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          INDXEI(IEFF) = IORG
          GO TO 400
        ENDIF
  300   CONTINUE
      OK = .FALSE.
        WRITE(6,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        CALL ERRLOC('INEINJ','ORGNAM')
      ELSE
      OK = .FALSE.
      ENDIF
  400 L = 8
C
C  FRACTION OF THE POPULATION THAT IS SUSCEPTIBLE TO THE EFFECT
```

```
C
      CALL RGETN (RECNAM, 3, EISUSC, NUMEIN, 0., 1.,
     $            RANGE, FOUND, 'INPEIN', 'EISUSC')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EARLY INJURY DOSE THRESHOLD
C
      CALL RGETN (RECNAM, 4, EITHRE, NUMEIN, 0., 1000.,
     $            RANGE, FOUND, 'INPEIN', 'EITHRE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EARLY INJURY FITTING PARAMETER ALPHA
C
      CALL RGETN (RECNAM, 5, EIFACA, NUMEIN,  1., 1000.,
     $            RANGE, FOUND, 'INPEIN', 'EIFACA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  EARLY INJURY FITTING PARAMETER BETA
C
      CALL RGETN (RECNAM, 6, EIFACB, NUMEIN, 1., 100.,
     $            RANGE, FOUND, 'INPEIN', 'EIFACB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INACAN
      SUBROUTINE INACAN (OK)
C
C THIS ROUTINE DEFINES THE MODEL FOR RISK OF CANCER FROM ACUTE EXPOSURE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C ACNAME - NAMES OF THE CANCER EFFECTS DEFINED IN THE MODEL
C ACSUSC - FRACTION OF THE POPULATION THAT IS SUSCEPTIBLE TO THIS CANCER
C ACTHRE - THRESHOLD DOSE FOR USING LINEAR DOSE RESPONSE FORMULA
C CFRISK - CANCER DEATH RISK FACTOR (EFFECTS/SIEVERT)
C CIRISK - CANCER INJURY RISK FACTOR (EFFECTS/SIEVERT)
C DDREFA - DOSE DEPENDENT CANCER RISK REDUCTION FACTOR
C DDTHRE - THRESHOLD DOSE FOR DOSE DEPENDENT CANCER RISK REDUCTION FACTOR
C DOSEFA - DOSE EFFECTIVENESS FACTOR ALPHA FOR CANCER FROM ACUTE EXPOSURE
C DOSEFB - DOSE EFFECTIVENESS FACTOR BETA FOR CANCER FROM ACUTE EXPOSURE
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C IEFF   - LOOP COUNTER ON LATENT CANCER EFFECTS
C INDXAC - INDEX TO THE CANCER EFFECT ORGANS
C IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C L      - LENGTH OF THE RECORD IDENTIFIER TO BE SEARCHED FOR
C NAME   - NAME OF THE ORGAN DOSE USED FOR THIS CANCER EFFECT
C NUMACA - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM ACUTE EXPOSURE
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C DAVID CHANIN, DIV. 6415, 12 SEPT 84.
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C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED 2/12/92, D.C., # 2/12/92-A, APPLY A DOSE DEPENDENT REDUCTION FACTOR,
C   DDREFA, TO CANCER RISKS IF THE DOSE TO AN INDIVIDUAL TARGET ORGAN IS LESS
C   THAN DDTHRE

      EXTERNAL CGET1, ERRLOC, IGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      LOGICAL OK, RANGE, FOUND
      CHARACTER *80 CGET1
      CHARACTER *11 NAME, RECNAM
C
      OK = .TRUE.
      RECNAM = 'LCANCERS001'
C
C  NUMBER OF TYPES OF CANCER TO BE DEFINED
C
      NUMACA = IGET1 ('LCNUMACA001', 1, 0, 0, 10, RANGE, FOUND,
     $                'INACAN', 'NUMACA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUMACA .EQ. 0) RETURN
C
C  THRESHOLD DOSE FOR APPLYING THE DOSE AND DOSE-RATE REDUCTION FACTOR DDREFA
C
      DDTHRE = RGET1 ('LCDDTHRE001', 1, 0., 0.0, 1.0, RANGE, FOUND,
     $                'INACAN', 'DDTHRE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  THRESHOLD DOSE FOR USING LINEAR DOSE RESPONSE RELATIONSHIP
C
      ACTHRE = RGET1 ('LCACTHRE001', 1, 0., 0., 10., RANGE, FOUND,
     $                'INACAN', 'ACTHRE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  NAME OF THE CANCER EFFECT
C
      L = 11
      DO 100 IEFF = 1, NUMACA
      ACNAME(IEFF) = CGET1 (RECNAM(1:L), 1, 1, ' ', 10, RANGE, FOUND,
     $                      'INACAN', 'ACNAME')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        GO TO 200
      ENDIF
  100 L = 8
  200 CONTINUE
C
```

```
C  NAME OF THE ORGAN DOSE THAT CAUSES THIS EARLY INJURY EFFECT
C
      L = 11
      DO 400 IEFF = 1, NUMACA
      NAME = CGET1 (RECNAM(1:L), 2, 2, ' ', 11, RANGE, FOUND,
     $              'INACAN', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 2, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          INDXAC(IEFF) = IORG
          GO TO 400
        ENDIF
  300   CONTINUE
      OK = .FALSE.
        WRITE(6,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        CALL ERRLOC('INACAN','ORGNAM')
      ELSE
      OK = .FALSE.
      ENDIF
  400 L = 8
C
C  FRACTION OF THE POPULATION THAT IS SUSCEPTIBLE TO THE EFFECT
C
      CALL RGETN (RECNAM, 3, ACSUSC, NUMACA, 0., 1.,
     $            RANGE, FOUND, 'INACAN', 'ACSUSC')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  DOSE EFFECTIVENESS FACTOR ALPHA FOR CANCER FROM ACUTE EXPOSURE
C
      CALL RGETN (RECNAM, 4, DOSEFA, NUMACA,  0., 2.,
     $            RANGE, FOUND, 'INACAN', 'DOSEFA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  DOSE EFFECTIVENESS FACTOR BETA FOR CANCER FROM ACUTE EXPOSURE
C
      CALL RGETN (RECNAM, 5, DOSEFB, NUMACA, 0., 2.,
     $            RANGE, FOUND, 'INACAN', 'DOSEFB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  CANCER DEATH RISK FACTOR FROM ACUTE EXPOSURE (RISK/SIEVERT)
C
      CALL RGETN (RECNAM, 6, CFRISK, NUMACA, 0., 1.,
     $            RANGE, FOUND, 'INACAN', 'CFRISK')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  CANCER INJURY RISK FACTOR FROM ACUTE EXPOSURE (RISK/SIEVERT)
C
      CALL RGETN (RECNAM, 7, CIRISK, NUMACA, 0., 1.,
     $            RANGE, FOUND, 'INACAN', 'CIRISK')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  DOSE AND DOSE-RATE REDUCTION FACTOR (DDREF) FOR CANCER
C
      CALL RGETN (RECNAM, 8, DDREFA, NUMACA, 1., 10.,
     $            RANGE, FOUND, 'INACAN', 'DDREFA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK INOUT1
      SUBROUTINE INOUT1 (OK)
C
C  THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 1:
```

```
C
C  TOTAL NUMBER OF A GIVEN HEALTH EFFECT
C  (EARLY DEATHS AND INJURIES, LATENT CANCER DEATHS AND INJURIES)
C  WITHIN A RANGE OF DISTANCES
C
C  THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  ACNAME - NAMES OF THE CANCER EFFECTS DEFINED IN THE MODEL
C  CCDF1  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 1 RESULT
C  EFFNM1 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE1 RESULT
C  EINAME - NAMES OF THE EARLY INJURIES DEFINED IN THE MODEL
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  ICAN   - LOOP COUNTER ON TYPES OF CANCERS
C  IECOD1 - ARRAY OF HEALTH EFFECTS CODES, SEE BELOW
C  INJ    - LOOP COUNTER ON TYPES OF INJURIES
C  IOUT   - LOOP COUNTER ON RESULTS OF THIS TYPE
C  I1DIS1 - INNER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C  I2DIS1 - OUTER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C  L      - LENGTH OF THE RECORD IDENTIFIER BEING SENT TO INPRE
C  NAME   - NAME OF THE HEALTH EFFECT THAT WAS SPECIFIED BY THE USER
C  NUMACA - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM ACUTE EXPOSURE
C  NUMEFA - NUMBER OF EARLY FATALITY ORGANS DEFINED IN THE MODEL
C  NUMEIN - NUMBER OF EARLY INJURIES DEFINED IN THE MODEL
C  NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C  NUM1   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C  IECOD1 =  0, NUMBER OF EARLY DEATHS
C            I, (I IS BETWEEN 1 AND 10) NUMBER OF TYPE I EARLY INJURIES
C          100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM ACUTE EXPOSURE
C            I, (I IS BETWEEN 101 AND 110) NUMBER OF TYPE I-100 CANCER DEATHS
C          200, TOTAL NUMBER OF LATENT CANCER INJURIES FROM ACUTE EXPOSURE
C            I, (I IS BETWEEN 201 AND 210) NUMBER OF TYPE I-200 CANCER INJURIES
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C
C  DAVID CHANIN, DIV. 6415, 16 JAN 85.
C
C  MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF1
```

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      COMMON /RESLT1/ NUM1, IECOD1(40), I1DIS1(40), I2DIS1(40),
     1                CCDF1(40)
      CHARACTER *24   EFFNM1
      COMMON /EFFNM1/ EFFNM1(40)
      CHARACTER *16   EINAME
      COMMON /EINAME/ EINAME(10)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      COMMON /EFATAL/ NUMEFA, INDXEF(5), EFFACA(5), EFFACB(5), EFFTHR(5)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11 RECNAM
      CHARACTER *24 NAME
      LOGICAL OK, RANGE, FOUND
      OK = .TRUE.
      NUM1 = IGET1 ('TYPE1NUMBER', 0, 0, 0, 40, RANGE, FOUND,
     $              'INOUT1', 'NUM1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM1 .EQ. 0) RETURN
      L = 11
      RECNAM = 'TYPE1OUT001'
      DO 500 IOUT = 1, NUM1
      NAME = CGET1 (RECNAM(1:L), 1, 10, ' ', 24, RANGE, FOUND,
     $             'INOUT1','NAME OF THE HEALTH EFFECT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NAME(1:13) .EQ. 'ERL FAT/TOTAL') THEN
        IF (NUMEFA .GT. 0) THEN
          IECOD1(IOUT) = 0
        ELSE
          OK = .FALSE.
          CALL ERRLOC ('INOUT1', 'EARLY FATALITY RESULTS')
          WRITE(6,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
          WRITE(7,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'ERL INJ/') THEN
        DO 100 INJ = 1, NUMEIN
100     IF (NAME(9:24) .EQ. EINAME(INJ)) GO TO 120
        OK = .FALSE.
        CALL ERRLOC ('INOUT1', 'EARLY INJURY NAME')
        WRITE(6,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
        WRITE(7,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
        GO TO 500
120     IECOD1(IOUT) = INJ
      ELSE IF (NAME(1:8) .EQ. 'CAN FAT/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD1(IOUT) = 100
          ELSE
            OK = .FALSE.
            CALL ERRLOC ('INOUT1', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
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```
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 200 ICAN = 1, NUMACA
  200     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 220
          OK = .FALSE.
          CALL ERRLOC ('INOUT1', 'CANCER DEATH NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          GO TO 500
  220     IECOD1(IOUT) = ICAN + 100
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'CAN INJ/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD1(IOUT) = 200
          ELSE
            OK = .FALSE.
            CALL ERRLOC ('INOUT1', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 300 ICAN = 1, NUMACA
  300     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 320
          OK = .FALSE.
          CALL ERRLOC ('INOUT1', 'CANCER INJURY NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          GO TO 500
  320     IECOD1(IOUT) = ICAN + 200
        ENDIF
      ELSE
        OK = .FALSE.
        CALL ERRLOC ('INOUT1','NAME OF THIS EFFECT')
        WRITE(6,*) 'INVALID NAME: ', NAME
        WRITE(7,*) 'INVALID NAME: ', NAME
      ENDIF
      EFFNM1(IOUT) = NAME
  500 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I1DIS1, NUM1, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT1', 'I1DIS1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 3, I2DIS1, NUM1, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT1', 'I2DIS1')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 600 IOUT = 1, NUM1
      IF (I1DIS1(IOUT) .GT. I2DIS1(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('INOUT1', 'I1DIS1, I2DIS1')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
```

```
  600 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUM1
      CCDF1(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
*DECK INOUT2
      SUBROUTINE INOUT2 (OK)
C
C  THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 2:
C
C  FURTHEST DISTANCE AT WHICH A GIVEN PROBABILITY OF DEATH IS EXCEEDED.
C
C  THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  CCDF2  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 2 RESULT
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  NUM2   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C  RECNAM - RECORD IDENTIFIER TO BE USED FOR LOCATING CCDF FLAG
C  RISTHR - RISK THRESHOLD FOR EARLY DEATH (FATAL RADIUS DEFINITION)
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C
C  GLOSSARY OF EXTERNALS:
C
C  DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  RGETN  - INTERFACE TO INPRE THAT FETCHES A REAL ARRAY
C
C  DAVID CHANIN, DIV. 6415, 16 JAN 85.
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 11/15/92, Corrected inability to get multiple CCDFs
C
      EXTERNAL DOCCDF, ERRLOC, IGET1, RGETN
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      LOGICAL CCDF2
      COMMON /RESLT2/ NUM2, RISTHR(10), CCDF2(10)
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 RECNAM
      OK = .TRUE.
      NUM2 = IGET1 ('TYPE2NUMBER', 0, 0, 0, 10, RANGE, FOUND,
     $              'INOUT2', 'NUM2')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM2 .EQ. 0) RETURN
C
C  READ THE ARRAY OF THRESHOLD PROBABILITIES OF EARLY DEATH (FATAL RADIUS)
C
```

```
      CALL RGETN ('TYPE2OUT001', 1, RISTHR, NUM2, 0., 1.,
     $            RANGE, FOUND, 'INOUT2', 'RISTHR')

      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      RECNAM = 'TYPE2OUT001'
      DO 900 IOUT = 1, NUM2
      CCDF2(IOUT) = DOCCDF (RECNAM(1:L), 2)
  900 L = 8
      RETURN
      END
*DECK INOUT3
      SUBROUTINE INOUT3 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 3:
C
C NUMBER OF PEOPLE WHOSE DOSE TO A GIVEN ORGAN EXCEEDS A GIVEN THRESHOLD.
C
C THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C CCDF3  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE 3 RESULT
C DOSTH3 - LIST OF DOSE THRESHOLDS USED FOR THIS RESULT
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C INDEX3 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - LOOP COUNTER ON RESULTS OF THIS TYPE
C NAME   - NAME OF THE ORGAN DOSE USED FOR THIS CANCER EFFECT
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUM3   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C IGETN  - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
C RGETN  - INTERFACE TO INPRE THAT FETCHES A REAL ARRAY
C
C DAVID CHANIN, DIV. 6415, 16 JAN 85.
C
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-B, ADDED (ACUTE,LIFETIME) SWITCH
C                                          EVALUATION OF TYPE 3 RESULTS
C MODIFIED 12/13/91, DIC, # 11/27/91-B, ADD VALIDATION OF ACUTE/LIFETIME SWITCH
      EXTERNAL CGET1, DOCCDF, IGET1, IGETN, RGETN, ERRLOC
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
```

```
      LOGICAL CCDF3
      COMMON /RESLT3/ NUM3, INDEX3(10), DOSTH3(10), CCDF3(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *11  NAME, RECNAM
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
      NUM3 = IGET1 ('TYPE3NUMBER', 0, 0, 0, 10, RANGE, FOUND,
     $              'INOUT3', 'NUM3')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM3 .EQ. 0) RETURN
      L = 11
      RECNAM = 'TYPE3OUT001'
      DO 500 IOUT = 1, NUM3
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'INOUT3', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 1, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          INDEX3(IOUT) = IORG
          GO TO 500
        ENDIF
  300   CONTINUE
        OK = .FALSE.
        WRITE(6,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        CALL ERRLOC ('INOUT3', 'ORGNAM')
      ELSE
        OK = .FALSE.
      ENDIF
  500 L = 8
      CALL RGETN (RECNAM, 2, DOSTH3, NUM3, 0., 1000.,
     $            RANGE, FOUND, 'INOUT3', 'DOSTH3')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUM3
      CCDF3(IOUT) = DOCCDF (RECNAM(1:L), 3)
  900 L = 8
      RETURN
      END
*DECK INOUT4
      SUBROUTINE INOUT4 (OK)
C
C  THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 4:
C
C  AVERAGE INDIVIDUAL RISK OF A GIVEN EFFECT AT A GIVEN DISTANCE.
C
C  THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  ACNAME - NAMES OF THE CANCER EFFECTS DEFINED IN THE MODEL
```

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C  CCDF4  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 4 RESULT
C  EFFNM4 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE4 RESULT
C  EINAME - NAMES OF THE EARLY INJURIES DEFINED IN THE MODEL
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  ICAN   - LOOP COUNTER ON TYPES OF LATENT CANCER
C  IECOD4 - ARRAY OF EFFECTS CODES, SEE BELOW
C  INJ    - LOOP COUNTER ON TYPES OF EARLY INJURIES
C  IOUT   - LOOP COUNTER ON THE NUMBER OF RESULTS OF THIS TYPE
C  I1DIS4 - RADIAL SPATIAL INDEX TO THE DISTANCE OF INTEREST
C  L      - LENGTH OF THE RECORD IDENTIFIER BEING SENT TO INPRE
C  NAME   - NAME OF THE EFFECT THAT WAS SPECIFIED BY THE USER
C  NUMACA - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM ACUTE EXPOSURE
C  NUMEFA - NUMBER OF EARLY FATALITY ORGANS DEFINED IN THE MODEL
C  NUMEIN - NUMBER OF EARLY INJURIES DEFINED IN THE MODEL
C  NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C  NUM4   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C  IECOD4 =  0, NUMBER OF EARLY DEATHS
C            I, (I IS BETWEEN 1 AND 10) NUMBER OF TYPE I EARLY INJURIES
C          100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM ACUTE EXPOSURE
C            I, (I IS BETWEEN 101 AND 110) NUMBER OF TYPE I-100 CANCER DEATHS
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  IGETN  - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
C
C  DAVID CHANIN, DIV. 6415, 16 JAN 85.
C
C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL CGET1, DOCCDF, IGET1, IGETN, ERRLOC
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF4
      COMMON /RESLT4/ NUM4, IECOD4(20), I1DIS4(20), CCDF4(20)
      CHARACTER *24   EFFNM4
      COMMON /EFFNM4/ EFFNM4(20)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *16   EINAME
      COMMON /EINAME/ EINAME(10)
      COMMON /EFATAL/ NUMEFA, INDXEF(5), EFFACA(5), EFFACB(5), EFFTHR(5)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
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      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 RECNAM
      CHARACTER *24 NAME
      OK = .TRUE.
      NUM4 = IGET1 ('TYPE4NUMBER', 0, 0, 0, 20, RANGE, FOUND,
     $              'INOUT4', 'NUM4')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM4 .EQ. 0) RETURN
C
C  RADIAL SPATIAL INDEX TO THE DISTANCE OF INTEREST
C
      CALL IGETN ('TYPE4OUT001', 1, I1DIS4, NUM4, 1, NUMRAD,
     $              RANGE, FOUND, 'INOUT4', 'I1DIS4')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      L = 11
      RECNAM = 'TYPE4OUT001'
      DO 500 IOUT = 1, NUM4
      NAME = CGET1 (RECNAM(1:L), 2, 10, ' ', 24, RANGE, FOUND,
     $              'INOUT4','NAME OF THE HEALTH EFFECT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NAME(1:13) .EQ. 'ERL FAT/TOTAL') THEN
        IF (NUMEFA .GT. 0) THEN
          IECOD4(IOUT) = 0
        ELSE
          OK = .FALSE.
          CALL ERRLOC ('INOUT4', 'EARLY FATALITY RESULTS')
          WRITE(6,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
          WRITE(7,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'ERL INJ/') THEN
        DO 100 INJ = 1, NUMEIN
100     IF (NAME(9:24) .EQ. EINAME(INJ)) GO TO 120
        OK = .FALSE.
        CALL ERRLOC ('INOUT4', 'EARLY INJURY NAME')
        WRITE(6,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
        WRITE(7,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
        GO TO 500
120     IECOD4(IOUT) = INJ
      ELSE IF (NAME(1:8) .EQ. 'CAN FAT/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD4(IOUT) = 100
          ELSE
            OK = .FALSE.
            CALL ERRLOC ('INOUT4', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 200 ICAN = 1, NUMACA
200       IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 220
          OK = .FALSE.
          CALL ERRLOC ('INOUT4', 'CANCER DEATH NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
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          GO TO 500
  220     IECOD4(IOUT) = ICAN + 100
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'CAN INJ/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD4(IOUT) = 200
          ELSE
            OK = .FALSE.
            CALL ERRLOC ('INOUT4', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 300 ICAN = 1, NUMACA
  300     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 320
          OK = .FALSE.
          CALL ERRLOC ('INOUT4', 'CANCER INJURY NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          GO TO 500
  320     IECOD4(IOUT) = ICAN + 200
        ENDIF
      ELSE
        OK = .FALSE.
        CALL ERRLOC ('INOUT4','NAME OF THIS EFFECT')
        WRITE(6,*) 'INVALID NAME: ', NAME
        WRITE(7,*) 'INVALID NAME: ', NAME
      ENDIF
      EFFNM4(IOUT) = NAME
  500 L = 8
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUM4
      CCDF4(IOUT) = DOCCDF (RECNAM(1:L), 3)
  900 L = 8
      RETURN
      END
*DECK INOUT5
      SUBROUTINE INOUT5 (OK)
C
C  THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 5:
C
C  TOTAL POPULATION DOSE TO A GIVEN ORGAN BETWEEN TWO DISTANCES.
C
C  THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  CCDF5  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 5 RESULT
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  I      - LOOP COUNTER FOR IMPLIED DO LOOP
C  INDEX5 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C  IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C  IOUT   - LOOP COUNTER ON RESULTS OF THIS TYPE
C  I1DIS5 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C  I2DIS5 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C  L      - LENGTH OF THE RECORD IDENTIFIER BEING PASSED TO INPRE
C  NAME   - NAME OF THE ORGAN DOSE USED FOR THIS CANCER EFFECT
C  NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
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C  NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C  NUM5   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  IGETN  - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
C
C  DAVID CHANIN, DIV. 6415, 15 JAN 85.
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGET1, IGETN
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF5
      COMMON /RESLT5/ NUM5, INDEX5(10), I1DIS5(10), I2DIS5(10),
     1                CCDF5(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *11 NAME, RECNAM
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
      NUM5 = IGET1 ('TYPE5NUMBER', 0, 0, 0, 10, RANGE, FOUND,
     $              'INOUT5', 'NUM5')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM5 .EQ. 0) RETURN
      L = 11
      RECNAM = 'TYPE5OUT001'
      DO 400 IOUT = 1, NUM5
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'INOUT5', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 1, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          INDEX5(IOUT) = IORG
          GO TO 400
        ENDIF
  300   CONTINUE
        OK = .FALSE.
        WRITE(6,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*)'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        CALL ERRLOC ('INOUT5', 'ORGNAM')
      ELSE
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        OK = .FALSE.
      ENDIF
  400 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I1DIS5, NUM5, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT5', 'I1DIS5')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 3, I2DIS5, NUM5, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT5', 'I2DIS5')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 600 I = 1, NUM5
      IF (I1DIS5(I) .GT. I2DIS5(I)) THEN
        OK = .FALSE.
        CALL ERRLOC ('INOUT5', 'I1DIS5, I2DIS5')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  600 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      RECNAM = 'TYPE5OUT001'
      DO 900 IOUT = 1, NUM5
      CCDF5(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
*DECK INOUT6
      SUBROUTINE INOUT6 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 6:
C
C CENTERLINE DOSE BETWEEN A RANGE OF DISTANCES BY PATHWAY.
C
C THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C CCDF6  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE 6 RESULT
C EVATYP - Character flag for evacuation type: 'RADIAL' or 'NETWORK'
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C INDEX6 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C IOUT   - LOOP COUNTER ON THE NUMBER OF RESULTS OF THIS TYPE
C IPATHW - PATHWAY CODES, DEFINED BELOW
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C I1DIS6 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS6 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C L      - LENGTH OF THE RECORD IDENTIFIER BEING PASSED TO INPRE
C NAME   - NAME OF THE ORGAN DOSE REQUESTED FOR THIS EFFECT
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUM6   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
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C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C IPATHW = 1, CLOUDSHINE DOSE
C          2, GROUNDSHINE DOSE
C          3, ACUTE DIRECT INHALATION DOSE
C          4, LIFETIME DIRECT INHALATION DOSE
C          5, TOTAL ACUTE DOSE
C          6, TOTAL LONG TERM DOSE
C          7, LIFETIME RESUSPENSION INHALATION DOSE
C          8, ACUTE RESUSPENSION INHALATION DOSE
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C IGETN  - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
C
C  DAVID CHANIN, DIV. 6415, 5 JUNE 1985.
C  MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED 6/20/89/, DIC, LOG # 2/13/89-A,
C   ADD VALIDATION ENSURING THAT AN ACUTE DOSE CAN BE PRODUCED
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 2/14/96, DIC, prevent use of Type 6&7 results for network evacuation
C
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGETN, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF6
      COMMON /RESLT6/ NUM6, IPATHW(10), INDEX6(10),
     1                      I1DIS6(10), I2DIS6(10), CCDF6(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *7    PATHNM
      COMMON /PATHNM/ PATHNM(8)
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
      CHARACTER *11 NAME, RECNAM
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
      NUM6 = IGET1 ('TYPE6NUMBER', 1, 0, 0, 10, RANGE, FOUND,
     $              'INOUT6', 'NUM6')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM6 .EQ. 0) THEN
        RETURN
      ELSE IF (IPLUME .NE. 1) THEN
        OK = .FALSE.
        CALL ERRLOC ('INOUT6', 'NUM6')
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      WRITE(6,*) 'Type 6 results cannot be generated for this case'
      WRITE(6,*) 'Straight-line plume (IPLUME = 1), is required'
      WRITE(7,*) 'Type 6 results cannot be generated for this case'
      WRITE(7,*) 'Straight-line plume (IPLUME = 1), is required'
      CALL ABORT ('terminating')
      ELSE IF (EVATYP .NE. 'RADIAL') THEN
      OK = .FALSE.
      CALL ERRLOC ('INOUT6', 'NUM6')
      WRITE(6,*) 'Type 6 results cannot be generated for this case'
      WRITE(6,*) 'Radial evacuation (EVATYP = "RADIAL"), is required'
      WRITE(7,*) 'Type 6 results cannot be generated for this case'
      WRITE(7,*) 'Radial evacuation (EVATYP = "RADIAL"), is required'
      CALL ABORT ('terminating')
      ENDIF
      RECNAM = 'TYPE6OUT001'
      L = 11
      DO 500 IOUT = 1, NUM6
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'INOUT6', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 1, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          INDEX6(IOUT) = IORG
          GO TO 500
        ENDIF
  300   CONTINUE
        OK = .FALSE.
        CALL ERRLOC ('INOUT6', 'ORGNAM')
        WRITE(6,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
      ELSE
        OK = .FALSE.
      ENDIF
  500 L = 8
      IF (.NOT. OK) RETURN
      L = 11
      DO 700 IOUT = 1, NUM6
C
C  SKIP THE PATHWAY CODE IF THE ORGAN NAME IS SKIN, THERE IS ONLY 1 SKIN PATH
C
      IF (ORGNAM(INDEX6(IOUT)) .EQ. 'A-SKIN') THEN
        IPATHW(IOUT) = 0
        GO TO 700
      ENDIF
      NAME = CGET1 (RECNAM(1:L), 2, 3, ' ', 7, RANGE, FOUND,
     $              'INOUT6', 'PATHNM')
      IF (RANGE .AND. FOUND) THEN
        DO 600 IPATH = 1, 8
        IF (NAME .EQ. PATHNM(IPATH)) THEN
          IPATHW(IOUT) = IPATH
        GO TO 700
      ENDIF
  600   CONTINUE
        OK = .FALSE.
        CALL ERRLOC ('INOUT6', 'PATHNM')
        WRITE(6,*) 'PATHWAY NAME NOT FOUND IN LIST OF PATHWAYS: ', NAME
        WRITE(7,*) 'PATHWAY NAME NOT FOUND IN LIST OF PATHWAYS: ', NAME
      ELSE
        OK = .FALSE.
      ENDIF
  700 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
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C
      CALL IGETN (RECNAM, 3, I1DIS6, NUM6, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT6', 'I1DIS6')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 4, I2DIS6, NUM6, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT6', 'I2DIS6')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 800 IOUT = 1, NUM6
      IF (I1DIS6(IOUT) .GT. I2DIS6(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('INOUT6', 'I1DIS6, I2DIS6')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  800 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUM6
      CCDF6(IOUT) = DOCCDF (RECNAM(1:L), 5)
  900 L = 8
      RETURN
      END
*DECK INOUT7
      SUBROUTINE INOUT7 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 7:
C
C CENTERLINE RISK BETWEEN A RANGE OF DISTANCES OF A GIVEN EFFECT
C (EARLY DEATHS AND INJURIES, LATENT CANCER DEATHS, INJURIES).
C
C CENTERLINE RISK IS THE RISK SEEN BY AN INDIVIDUAL RECEIVING CENTERLINE DOSE.
C
C THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C ACNAME - NAMES OF THE CANCER EFFECTS DEFINED IN THE MODEL
C CCDF7  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE 7 RESULT
C EFFNM7 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE7 RESULT
C EINAME - NAMES OF THE EARLY INJURIES DEFINED IN THE MODEL
C EVATYP - Character flag for evacuation type: 'RADIAL' or 'NETWORK'
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C ICAN   - LOOP COUNTER ON TYPES OF CANCERS
C IECOD7 - ARRAY OF EFFECTS CODES, SEE BELOW
C INJ    - LOOP COUNTER ON TYPES OF INJURIES
C IOUT   - LOOP COUNTER ON THE NUMBER OF RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C I1DIS7 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS7 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C L      - LENGTH OF THE RECORD IDENTIFIER BEING SENT TO INPRE
C NAME   - NAME OF THE EFFECT THAT WAS SPECIFIED BY THE USER
C NUMACA - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM ACUTE EXPOSURE
C NUMEFA - NUMBER OF EARLY FATALITY ORGANS DEFINED IN THE MODEL
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C NUMEIN - NUMBER OF EARLY INJURIES DEFINED IN THE MODEL
C NUM7   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C IECOD7 =  0, RISK OF EARLY DEATH
C           I, (I IS BETWEEN 1 AND 10) RISK OF TYPE I EARLY INJURY
C         100, TOTAL RISK OF LATENT CANCER DEATH FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) RISK OF TYPE I-100 CANCER DEATH
C         200, TOTAL RISK OF LATENT CANCER INJURY FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 201 AND 210) RISK OF TYPE I-200 CANCER INJURY
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C
C  DAVID CHANIN, DIV. 6415, 5 JUNE 1985.
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 2/14/96, DIC, prevent use of Type 6&7 results for network evacuation
      EXTERNAL DOCCDF, IGET1, CGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL CCDF7
      COMMON /RESLT7/ NUM7, IECOD7(10), I1DIS7(10), I2DIS7(10),
     1                CCDF7(10)
      CHARACTER *24   EFFNM7
      COMMON /EFFNM7/ EFFNM7(10)
      CHARACTER *16   EINAME
      COMMON /EINAME/ EINAME(10)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      COMMON /EFATAL/ NUMEFA, INDXEF(5), EFFACA(5), EFFACB(5), EFFTHR(5)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
      CHARACTER *11 RECNAM
      CHARACTER *24 NAME
      LOGICAL OK, RANGE, FOUND
      OK = .TRUE.
      NUM7 = IGET1 ('TYPE7NUMBER', 1, 0, 0, 10, RANGE, FOUND,
     $              'INOUT7', 'NUM7')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM7 .EQ. 0) THEN
```

```
      RETURN
    ELSE IF (IPLUME .NE. 1) THEN
    OK = .FALSE.
    CALL ERRLOC ('INOUT7', 'NUM7')
    WRITE(6,*) 'Type 7 results cannot be generated for this case'
    WRITE(6,*) 'Straight-line plume (IPLUME = 1), is required'
    WRITE(7,*) 'Type 7 results cannot be generated for this case'
    WRITE(7,*) 'Straight-line plume (IPLUME = 1), is required'
    CALL ABORT ('terminating')
    ELSE IF (EVATYP .NE. 'RADIAL') THEN
    OK = .FALSE.
    CALL ERRLOC ('INOUT7', 'NUM7')
    WRITE(6,*) 'Type 7 results cannot be generated for this case'
    WRITE(6,*) 'Radial evacuation (EVATYP = "RADIAL"), is required'
    WRITE(7,*) 'Type 7 results cannot be generated for this case'
    WRITE(7,*) 'Radial evacuation (EVATYP = "RADIAL"), is required'
    CALL ABORT ('terminating')
    ENDIF
    L = 11
    RECNAM = 'TYPE7OUT001'
    DO 500 IOUT = 1, NUM7
    NAME = CGET1 (RECNAM(1:L), 1, 10, ' ', 24, RANGE, FOUND,
   $              'INOUT7','NAME OF THE HEALTH EFFECT')
    IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
    ENDIF
    IF (NAME(1:13) .EQ. 'ERL FAT/TOTAL') THEN
      IF (NUMEFA .GT. 0) THEN
        IECOD7(IOUT) = 0
      ELSE
        OK = .FALSE.
        CALL ERRLOC ('INOUT7', 'EARLY FATALITY RESULTS')
        WRITE(6,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
        WRITE(7,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
      ENDIF
    ELSE IF (NAME(1:8) .EQ. 'ERL INJ/') THEN
      DO 100 INJ = 1, NUMEIN
100   IF (NAME(9:24) .EQ. EINAME(INJ)) GO TO 120
      OK = .FALSE.
      CALL ERRLOC ('INOUT7', 'EARLY INJURY NAME')
      WRITE(6,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
      WRITE(7,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
      GO TO 500
120   IECOD7(IOUT) = INJ
    ELSE IF (NAME(1:8) .EQ. 'CAN FAT/') THEN
      IF (NAME(9:13) .EQ. 'TOTAL') THEN
        IF (NUMACA .GT. 0) THEN
          IECOD7(IOUT) = 100
        ELSE
          OK = .FALSE.
          CALL ERRLOC ('INOUT7', 'LATENT CANCER RESULTS')
          WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
        ENDIF
      ELSE
        DO 200 ICAN = 1, NUMACA
200     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 220
        OK = .FALSE.
        CALL ERRLOC ('INOUT7', 'CANCER DEATH NAME')
        WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
        WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
        GO TO 500
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```
  220     IECOD7(IOUT) = ICAN + 100
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'CAN INJ/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD7(IOUT) = 200
          ELSE
            OK = .FALSE.
            CALL ERRLOC ('INOUT7', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 300 ICAN = 1, NUMACA
  300     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 320
          OK = .FALSE.
          CALL ERRLOC ('INOUT7', 'CANCER INJURY NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          GO TO 500
  320     IECOD7(IOUT) = ICAN + 200
        ENDIF
      ELSE
        OK = .FALSE.
        CALL ERRLOC ('INOUT7','NAME OF THIS EFFECT')
        WRITE(6,*) 'INVALID NAME: ', NAME
        WRITE(7,*) 'INVALID NAME: ', NAME
      ENDIF
      EFFNM7(IOUT) = NAME
  500 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I1DIS7, NUM7, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT7', 'I1DIS7')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 3, I2DIS7, NUM7, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT7', 'I2DIS7')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 800 IOUT = 1, NUM7
      IF (I1DIS7(IOUT) .GT. I2DIS7(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('INOUT7', 'I1DIS7, I2DIS7')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  800 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUM7
      CCDF7(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
```

```
*DECK INOUT8
      SUBROUTINE INOUT8 (OK)
C
C  THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER 8:
C
C  POPULATION WEIGHTED RISK OF A GIVEN HEALTH EFFECT BETWEEN 2 DISTANCES
C
C  THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C  GLOSSARY OF VARIABLES:
C
C  ACNAME - NAMES OF THE CANCER EFFECTS DEFINED IN THE MODEL
C  CCDF8  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 8 RESULT
C  EFFNM8 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE8 RESULT
C  EINAME - NAMES OF THE EARLY INJURIES DEFINED IN THE MODEL
C  FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C  ICAN   - LOOP COUNTER ON TYPES OF CANCERS
C  IECOD8 - ARRAY OF HEALTH EFFECTS CODES, SEE BELOW
C  INJ    - LOOP COUNTER ON TYPES OF INJURIES
C  IOUT   - LOOP COUNTER ON RESULTS OF THIS TYPE
C  I1DIS8 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C  I2DIS8 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C  L      - LENGTH OF THE RECORD IDENTIFIER BEING SENT TO INPRE
C  NAME   - NAME OF THE HEALTH EFFECT THAT WAS SPECIFIED BY THE USER
C  NUMACA - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM ACUTE EXPOSURE
C  NUMEFA - NUMBER OF EARLY FATALITY ORGANS DEFINED IN THE MODEL
C  NUMEIN - NUMBER OF EARLY INJURIES DEFINED IN THE MODEL
C  NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C  NUM8   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C  OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C  RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C  RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C  IECOD8 =  0, POPULATION WEIGHTED RISK OF EARLY DEATH
C            I, (I IS BETWEEN 1 AND 10) RISK OF TYPE I EARLY INJURY
C          100, POP WTD RISK OF LATENT CANCER DEATH FROM ACUTE EXPOSURE
C            I, (I IS BETWEEN 101 AND 110) RISK OF TYPE I-100 CANCER DEATH
C          200, POP WTD RISK OF LATENT CANCER INJURY FROM ACUTE EXPOSURE
C            I, (I IS BETWEEN 201 AND 210) RISK OF TYPE I-200 CANCER INJURIES
C
C  GLOSSARY OF EXTERNALS:
C
C  CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C  DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C  ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C  IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C  IGETN  - INTERFACE TO INPRE THAT RETURNS AN INTEGER ARRAY
C
C  DAVID CHANIN, DIV. 6415, 5 JUNE 1985.
C
C  MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C  MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGETN, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
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      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF8
      COMMON /RESLT8/ NUM8, IECOD8(20), I1DIS8(20), I2DIS8(20),
     1                CCDF8(20)
      CHARACTER *24   EFFNM8
      COMMON /EFFNM8/ EFFNM8(20)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *16   EINAME
      COMMON /EINAME/ EINAME(10)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      COMMON /EFATAL/ NUMEFA, INDXEF(5), EFFACA(5), EFFACB(5), EFFTHR(5)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      CHARACTER *11 RECNAM
      CHARACTER *24 NAME
      LOGICAL OK, RANGE, FOUND
      OK = .TRUE.
      NUM8 = IGET1 ('TYPE8NUMBER', 0, 0, 0, 20, RANGE, FOUND,
     $              'INOUT8', 'NUM8')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NUM8 .EQ. 0) RETURN
      L = 11
      RECNAM = 'TYPE8OUT001'
      DO 500 IOUT = 1, NUM8
      NAME = CGET1 (RECNAM(1:L), 1, 10, ' ', 24, RANGE, FOUND,
     $              'INOUT8','NAME OF THE HEALTH EFFECT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NAME(1:13) .EQ. 'ERL FAT/TOTAL') THEN
        IF (NUMEFA .GT. 0) THEN
          IECOD8(IOUT) = 0
        ELSE
          OK = .FALSE.
          CALL ERRLOC ('INOUT8', 'EARLY FATALITY RESULTS')
          WRITE(6,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
          WRITE(7,*) 'NO EARLY FATALITY MODEL WAS DEFINED'
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'ERL INJ/') THEN
        DO 100 INJ = 1, NUMEIN
100     IF (NAME(9:24) .EQ. EINAME(INJ)) GO TO 120
        OK = .FALSE.
        CALL ERRLOC ('INOUT8', 'EARLY INJURY NAME')
        WRITE(6,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
        WRITE(7,*) 'NAME NOT FOUND ON LIST OF INJURIES:',NAME(9:24)
        GO TO 500
120     IECOD8(IOUT) = INJ
      ELSE IF (NAME(1:8) .EQ. 'CAN FAT/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD8(IOUT) = 100
          ELSE
```

```
            OK = .FALSE.
            CALL ERRLOC ('INOUT8', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 200 ICAN = 1, NUMACA
  200     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 220
          OK = .FALSE.
          CALL ERRLOC ('INOUT8', 'CANCER DEATH NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          GO TO 500
  220     IECOD8(IOUT) = ICAN + 100
        ENDIF
      ELSE IF (NAME(1:8) .EQ. 'CAN INJ/') THEN
        IF (NAME(9:13) .EQ. 'TOTAL') THEN
          IF (NUMACA .GT. 0) THEN
            IECOD8(IOUT) = 200
          ELSE
            OK = .FALSE.
            CALL ERRLOC ('INOUT8', 'LATENT CANCER RESULTS')
            WRITE(6,*) 'NO LATENT CANCER MODELS WERE DEFINED'
            WRITE(7,*) 'NO LATENT CANCER MODELS WERE DEFINED'
          ENDIF
        ELSE
          DO 300 ICAN = 1, NUMACA
  300     IF (NAME(9:18) .EQ. ACNAME(ICAN)) GO TO 320
          OK = .FALSE.
          CALL ERRLOC ('INOUT8', 'CANCER INJURY NAME')
          WRITE(6,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          WRITE(7,*) 'NAME NOT FOUND ON LIST OF CANCERS:',NAME(9:18)
          GO TO 500
  320     IECOD8(IOUT) = ICAN + 200
        ENDIF
      ELSE
        OK = .FALSE.
        CALL ERRLOC ('INOUT8','NAME OF THIS EFFECT')
        WRITE(6,*) 'INVALID NAME: ', NAME
        WRITE(7,*) 'INVALID NAME: ', NAME
      ENDIF
      EFFNM8(IOUT) = NAME
  500 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I1DIS8, NUM8, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT8', 'I1DIS8')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 3, I2DIS8, NUM8, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUT8', 'I2DIS8')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 600 IOUT = 1, NUM8
      IF (I1DIS8(IOUT) .GT. I2DIS8(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('INOUT8', 'I1DIS8, I2DIS8')
```

```
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  600 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11

      DO 900 IOUT = 1, NUM8
      CCDF8(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
      SUBROUTINE INOUTA (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER A:
C
C MAXIMUM OBSERVED (PEAK) DOSE BETWEEN A RANGE OF DISTANCES.
C
C THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C CCDFA  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE A RESULT
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C INDEXA - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C IOUT   - LOOP COUNTER ON THE NUMBER OF RESULTS OF THIS TYPE
C I1DISA - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DISA - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C L      - LENGTH OF THE RECORD IDENTIFIER BEING PASSED TO INPRE
C NAME   - NAME OF THE ORGAN DOSE REQUESTED FOR THIS EFFECT
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMA   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C
C David Chanin, 8/15/92, New routine adapted from INOUT6.
C
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGETN, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDFA
      COMMON /RESLTA/ NUMA, INDEXA(10),
     1                I1DISA(10), I2DISA(10), CCDFA(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
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      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *11 NAME, RECNAM
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
      NUMA = IGET1 ('TYPEANUMBER', 1, 0, 0, 10, RANGE, FOUND,
     $              'INOUTA', 'NUMA')
      OK = RANGE .AND. FOUND
      IF (.NOT. OK .OR. NUMA .EQ. 0) RETURN
      RECNAM = 'TYPEAOUT001'
      L = 11
      DO 500 IOUT = 1, NUMA
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'INOUTA', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 1, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
        INDEXA(IOUT) = IORG
        GO TO 500
      ENDIF
  300   CONTINUE
      OK = .FALSE.
      CALL ERRLOC ('INOUTA', 'ORGNAM')
      WRITE(6,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
      WRITE(7,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
      ELSE
      OK = .FALSE.
      ENDIF
  500 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I1DISA, NUMA, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUTA', 'I1DISA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 3, I2DISA, NUMA, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUTA', 'I2DISA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 800 IOUT = 1, NUMA
      IF (I1DISA(IOUT) .GT. I2DISA(IOUT)) THEN
      OK = .FALSE.
      CALL ERRLOC ('INOUTA', 'I1DISA, I2DISA')
      WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  800 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUMA
      CCDFA(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
      SUBROUTINE INOUTB (OK)
```

```
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT NUMBER B:
C
C Observed dose at particular (r,theta) locations
C
C THIS ROUTINE IS CALLED BY ROUTINE EARINP.
C
C GLOSSARY OF VARIABLES:
C
C CCDFB  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE B RESULT
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C INDEXB - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IORG   - LOOP COUNTER ON ORGANS DEFINED IN THE MODEL
C IOUT   - LOOP COUNTER ON THE NUMBER OF RESULTS OF THIS TYPE
C IRAD_B - Distance index to location of interest, (values between 1 and NUMRAD)
C IANG_B - Angular index to location of interest, (values between 1 and 16)
C L      - LENGTH OF THE RECORD IDENTIFIER BEING PASSED TO INPRE
C NAME   - NAME OF THE ORGAN DOSE REQUESTED FOR THIS EFFECT
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMB   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C ORGNAM - NAMES OF ALL THE ORGANS DEFINED IN THE RISKS MODEL
C RANGE  - LOGICAL FLAG INDICATING THAT A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RECNAM - NAME OF THE RECORD TO BE SEARCHED FOR IN THE DATABASE
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C ERRLOC - INTERFACE TO INPRE THAT PRINTS ERROR MESSAGES
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C
C David Chanin, 8/15/92, New routine adapted from INOUTA.
C
      EXTERNAL CGET1, DOCCDF, ERRLOC, IGETN, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDFB
      COMMON /RESLTB/ NUMB, INDEXB(32),
     1                IRAD_B(32), IANG_B(32), CCDFB(32)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *11 NAME, RECNAM
      LOGICAL OK, RANGE, FOUND
C
      OK = .TRUE.
      NUMB = IGET_NUMB ('TYPEBNUMBER', 1, 0, 0, 32, RANGE, FOUND,
     $                  'INOUTB', 'NUMB')
      IF (NUMB .EQ. 0) RETURN
      RECNAM = 'TYPEBOUT001'
      L = 11
      DO 500 IOUT = 1, NUMB
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'INOUTB', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = 1, NUMORG
```

```
      IF (NAME .EQ. ORGNAM(IORG)) THEN
        INDEXB(IOUT) = IORG
        GO TO 500
      ENDIF
  300   CONTINUE
      OK = .FALSE.
      CALL ERRLOC ('INOUTB', 'ORGNAM')
      WRITE(6,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
      WRITE(7,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
      CALL ABORT ('terminating')
      ELSE
      CALL ERRLOC ('INOUTB', 'ORGNAM')
      CALL ABORT ('terminating')
      ENDIF
  500 L = 8
C
C Distance index to location of interest
C
      CALL IGETN (RECNAM, 2, IRAD_B, NUMB, 1, NUMRAD,
     $            RANGE, FOUND, 'INOUTB', 'IRAD_B')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C Angular index to location of interest
C
      CALL IGETN (RECNAM, 3, IANG_B, NUMB, 1, NUMCOR,
     $            RANGE, FOUND, 'INOUTB', 'IANG_B')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NUMB
      CCDFB(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
      FUNCTION IGET_NUMB (RECNAM, ICOL, IMIN, IINIT, IMAX,
     1                    RANGE, FOUND, SUBNAM, VARNAM)
C
C THIS FUNCTION is a special-purpose version of FUNCTION IGET1, differing
C in that it writes a different message if the record identifier is not found.
C
C DESCRIPTION OF THE ARGUMENT LIST:
C
C RECNAM - RECORD IDENTIFIER TO BE SEARCHED FOR
C ICOL   - COLUMN NUMBER FROM WHICH TO OBTAIN THE DATA (0 MEANS READ BY ROW)
C IMIN   - MINIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C IINIT  - INITIAL VALUE, THIS VALUE IS RETURNED IF THE REQUEST CANNOT BE MET
C IMAX   - MAXIMUM ACCEPTABLE VALUE OF THE DATA ITEM BEING SOUGHT
C RANGE  - LOGICAL FLAG INDICATING THE LENGTH OF THE STRING WAS WITHIN LIMITS
C FOUND  - LOGICAL FLAG INDICATING IF A VALUE WAS FOUND ON THE DATABASE
C SUBNAM - NAME OF THE CALLING SUBROUTINE, USED FOR ERROR MESSAGE
C VARNAM - NAME OF THE VARIABLE BEING SOUGHT, USED FOR ERROR MESSAGE
C
      PARAMETER (MAXREC=1000, MAXLEN=101)
      CHARACTER*(MAXLEN) CARD,          CLOC
      COMMON //          CARD(MAXREC), CLOC
      LOGICAL CRDFLG
      COMMON /INPRC2/ IPNT(MAXREC), CRDFLG(MAXREC)
      COMMON /IPOINT/ IC, IPOINT
      CHARACTER*(*) RECNAM, SUBNAM, VARNAM
      LOGICAL EOR, FLAG(4), FOUND, LVAL, RANGE
C
```

```
C  DEFINE THE VALUE OF THE FUNCTION AND ERROR FLAGS
C
      IGET_NUMB = IINIT
      RANGE = .FALSE.
      FOUND = .FALSE.
C
C  SET INTEGER VARIABLE TYPE FLAG
      ITYPE = 3
C
C  VALIDATE ICOL
      IF (ICOL .LT. 0 .OR. ICOL .GT. 40) THEN
C
C  WRITE ERROR MESSAGE
       WRITE(6,1001) SUBNAM, VARNAM, RECNAM
       WRITE(6,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
       WRITE(7,1001) SUBNAM, VARNAM, RECNAM
       WRITE(7,*) '>>>>>ICOL MUST BE BETWEEN 0 AND 40, ICOL =', ICOL
       RETURN
      ENDIF
C
C  CHECK LENGTH OF ID
      L = LEN(RECNAM)
 2000 CONTINUE
C
C  CHECK FOR SEARCH OF RECORD ID RECNAM
      IF (L .EQ. 11) THEN
C
C  TRANSFER RECORD ID TO TEMPORARY STORAGE FOR SEARCH
       CLOC = RECNAM
C
C  SEARCH FOR RECORD ID RECNAM
       CALL SEARCH (L, IPOINT)
C
C  CHECK FOR RECORD ID NOT LOCATED
       IF (IPOINT .EQ. 0) THEN
C
C  RECORD ID NOT LOCATED
          WRITE(6,1002)
          RETURN
       ENDIF
C
C  RESET LENGTH OF ID TO BE VERIFIED
       L = 8
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
       IC = 12
      ELSE
       IF (EOR .OR. ICOL .GT. 0) THEN
C
C  INCREMENT POINTER
          IPOINT = IPOINT + 1
C
C  VALIDATE ID
          IF (CARD(IPNT(IPOINT))(1:L) .NE. RECNAM(1:L)) THEN
C
C  CURRENT ARRAY VALUE NOT FOUND
C  WRITE ERROR MESSAGE
             WRITE(6,1001) SUBNAM, VARNAM, RECNAM
             WRITE(7,1001) SUBNAM, VARNAM, RECNAM
             RETURN
          ENDIF
C
C  RESET STARTING CHARACTER FOR STRING SEARCH
```

```
          IC = 12
        ENDIF
       ENDIF
C
C  SET USED FLAG FOR CURRENT RECORD
      CRDFLG(IPNT(IPOINT)) = .TRUE.
C
C  RETRIEVE VALUE FROM RECORD
      CALL RDSTRG(CARD(IPNT(IPOINT)), IC, ICOL, CLOC, LVAL, IVAL, RVAL,
     1            LENGTH, FLAG, EOR)
C
C  CHECK FOR END-OF-RECORD WHILE READING A ROW OF DATA
      IF (EOR .AND. ICOL .EQ. 0) GO TO 2000
C
C  SET FOUND FLAG FOR DESIRED VALUE TYPE
      FOUND = FLAG(ITYPE)
C
C  LOOKING FOR INTEGER VALUE
      IF (FOUND) THEN
C
C  VALIDATE INTEGER RANGE
       IF (IVAL .GE. IMIN .AND. IVAL .LE. IMAX) THEN
C
C  INTEGER VALUE RANGE VALIDATED SO SET RETRIEVED VALUE
          IGET_NUMB = IVAL
C
C  VALID RANGE
          RANGE = .TRUE.
       ELSE
          WRITE(6,1001) SUBNAM, VARNAM, RECNAM
          WRITE(6,*) '>>>>>INTEGER VALUE OUT OF RANGE:', IVAL
          WRITE(6,*) '>>>>>RANGE IS ',IMIN,' TO ',IMAX,', INCLUSIVE'
          WRITE(7,1001) SUBNAM, VARNAM, RECNAM
          WRITE(7,*) '>>>>>INTEGER VALUE OUT OF RANGE:', IVAL
          WRITE(7,*) '>>>>>RANGE IS ',IMIN,' TO ',IMAX,', INCLUSIVE'
       ENDIF
      ELSE
       WRITE(6,1001) SUBNAM, VARNAM, RECNAM
       WRITE(6,*) '>>>>>INTEGER VALUE NOT FOUND'
       WRITE(7,1001) SUBNAM, VARNAM, RECNAM
       WRITE(7,*) '>>>>>INTEGER VALUE NOT FOUND'
      ENDIF
      RETURN
 1001 FORMAT(/' >>>>>INPUT ERROR>>>>>',
     1       /' >>>>>CALLED FROM SUBROUTINE ',A,', LOOKING FOR ',A,
     2        ' AT RECORD: ',A)
 1002 FORMAT(/' >>The Record Identifier TYPEBNUMBER was not found:',
     1       /' >>Type B results not being generated'/)
      END
*DECK REDSTG
      SUBROUTINE REDSTG (OK)
C
C  THIS ROUTINE LOADS ONLY A PART OF THE "EARLY" USER INPUT FILE
C  (THE COMMON BLOCKS USED TO DEFINE THE EMERGENCY RESPONSE STRATEGY.
C
C  IT IS CALLED IF THE USER IS REQUESTING MORE THAN ONE EVACUATION STRATEGY.
C
C  D. CHANIN, 18 NOV 87
C
      LOGICAL OK, OK1, OK2
C
C  LOAD THE EVACUATION DEFINITION DATA INTO /GLOBAL/ AND /NETWOR/
C
```

```
      CALL INEVAC (OK1)
C
C  LOAD THE SHELTER AND RELOCATION DATA INTO /RELOCA/
C
      CALL INPEMR (OK2)

      OK = OK1 .AND. OK2

      RETURN
      END
*DECK PUTSTG
      SUBROUTINE PUTSTG (OK)
C
C THIS ROUTINE STORES AND FETCHES THE EVACUATION STRATEGY INPUT PARAMETERS INTO
C AND FROM LIST STORAGE WHEN MORE THAN ONE EVACUATION STRATEGY IS BEING USED.
C
C THIS SUBROUTINE HAS AN ENTRY POINT NAMED GETSTG.
C
C GLOSSARY OF VARIABLES:
C
C EVATYP - Character flag for evacuation type: 'RADIAL' or 'NETWORK'
C REFPNT - Reference time point for evacuation/sheltering: 'ALARM' or 'ARRIVAL'
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C NSTRTG - TOTAL NUMBER OF EMERGENCY RESPONSE SCENARIOS TO BE MODELLED
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C WTFRAC - WEIGHTING FRACTIONS APPLICABLE TO EACH STRATEGY
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C D. CHANIN, 18 NOV 87
C
C MODIFIED 12/13/88, D. CHANIN, LOG # 12/08/88-A,
C   REMOVE THE VALIDATION STEP IN THIS ROUTINE WHICH ATTEMPTS
C   TO DETERMINE IF THE USER IS RUNNING THE SAME SCENARIO TWICE.
C   THE USER IS NOW RESPONSIBLE FOR ENSURING THAT EACH EMERGENCY
C   RESPONSE SCENARIO ON THE EARLY USER INPUT FILE IS UNIQUE.
C MODIFIED 12/22/88, D. CHANIN, LOG # 12/08/88-A,
C   CORRECT AN ERROR INTRODUCED WITH THE PREVIOUS CORRECTION DECK,
C   ALL EMERGENCY RESPONSE DATA WAS MISTAKENLY BEING LOADED INTO
C   THE SLOT FOR THE FIRST EMERGENCY RESPONSE STRATEGY.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 11/01/92, D. Chanin, new emergency response model for DOE
C Modified by D. Chanin, 3/01/01, Log # 3/01/01-B
C  ILNTHA of 15 changed to 17; ILNTHD of 2911 changed to 2914
C
      EXTERNAL ERRLOC
      SAVE
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
      COMMON /ROOTS/ NROOTS, ROOT(2,376)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      CHARACTER *80   EANAM2
      COMMON /EANAM2/ EANAM2(3)
      COMMON /WTFRAC/ WTFRAC(3)
      CHARACTER *6    WTNAME
      COMMON /WTNAME/ WTNAME
      COMMON /EADFAC/ CSFACT(3), PROTIN(3), BRRATE(3),
     1                SKPFAC(3), GSHFAC(3), RESCON, RESHAF
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
C
```

```
c Modified by D. Chanin, 3/01/01, Log # 3/01/01-A
c  ILNTHA of 15 changed to 17; ILNTHD of 2911 changed to 2914
c
      DIMENSION EVARAY(3), REFRAY(3),
     1          A0(17),   B0(6),   C0(753),   D0(2914),
     2          A1(17,3), B1(6,3), C1(753,3), D1(2914,3)
      EQUIVALENCE (A0,CSFACT), (B0,ENDEMP), (C0,NROOTS), (D0,LASMOV)
      CHARACTER *7 EVARAY, REFRAY
      LOGICAL OK
C
C  IF THE DIMENSIONS OF THE EMERGENCY RESPONSE COMMON BLOCKS ARE CHANGED,
C  THEN THE FOLLOWING DATA STATEMENT MUST BE CHECKED TO ENSURE THAT THE
C  LENGTHS OF THE COMMON BLOCKS ARE CORRECTLY STATED.
C
c Modified by D. Chanin, 3/01/01
c ILNTHA of 15 changed to 17; ILNTHD of 2911 changed to 2914
c
      DATA ILNTHA, ILNTHB, ILNTHC, ILNTHD / 17, 6, 753, 2914/

      OK = .TRUE.
      IF (NSTRTG .EQ. 1) RETURN

      IF (ISTRTG .GT. 1) THEN
      IF (EANAM2(ISTRTG-1) .EQ. EANAM2(ISTRTG)) THEN
        OK = .FALSE.
        CALL ERRLOC ('PUTSTG', 'RECORD IDENTIFIER: EZEANAM2')
        WRITE(6,10)
        WRITE(7,10)
   10     FORMAT(/' A DIFFERENT IDENTIFIER IS REQUIRED FOR EACH',
     $      ' EMERGENCY RESPONSE STRATEGY CHANGE CASE, '
     $     /' YOU MUST SUPPLY A DIFFERENT VALUE OF EANAM2.')
        RETURN
      ENDIF
      ENDIF
C
C  STORE THE EMERGENCY RESPONSE DATA INTO THE LIST STORAGE ARRAYS
C
      DO 20 I = 1, ILNTHA
   20 A1(I,ISTRTG) = A0(I)
      DO 40 I = 1, ILNTHB
   40 B1(I,ISTRTG) = B0(I)
      DO 60 I = 1, ILNTHC
   60 C1(I,ISTRTG) = C0(I)
      DO 80 I = 1, ILNTHD
   80 D1(I,ISTRTG) = D0(I)

      EVARAY(ISTRTG) = EVATYP
      REFRAY(ISTRTG) = REFPNT
C
C  CHECK TO SEE IF THE SUM OF THE WEIGHTING FRACTIONS SUMS TO 1.
C
      IF (WTNAME .NE. 'SUMPOP' .AND. ISTRTG .EQ. NSTRTG) THEN
      TOTAL = 0.
      DO 320 I = 1, NSTRTG
  320   TOTAL = TOTAL + WTFRAC(I)
      IF (ABS (TOTAL - 1.) .GT. .001) THEN
        OK = .FALSE.
        CALL ERRLOC ('PUTSTG', 'WTFRAC')
        WRITE(6,340) TOTAL, 'WTFRAC',
     $                (WTFRAC(I),I=1,NSTRTG)
        WRITE(7,340) TOTAL, 'WTFRAC',
     $                (WTFRAC(I),I=1,NSTRTG)
  340     FORMAT(' ERROR IN WEIGHTING FRACTIONS',
```

```
     $      /' SUM MUST BE BETWEEN .999 AND 1.001',
     $      /' INSTEAD IT EQUALS ', F8.4,
     $      /  A10/ (F10.3))
      ENDIF
      ENDIF

      RETURN

      ENTRY GETSTG
C
C THIS ENTRY POINT LOADS THE EVACUATION STRATEGY INPUT PARAMETERS BACK FROM
C LIST STORAGE WHEN MORE THAN ONE EVACUATION STRATEGY IS BEING USED.
C
      IF (NSTRTG .EQ. 1) RETURN

      DO 420 I = 1, ILNTHA
  420 A0(I) = A1(I,ISTRTG)
      DO 440 I = 1, ILNTHB
  440 B0(I) = B1(I,ISTRTG)
      DO 460 I = 1, ILNTHC
  460 C0(I) = C1(I,ISTRTG)
      DO 480 I = 1, ILNTHD
  480 D0(I) = D1(I,ISTRTG)

      EVATYP = EVARAY(ISTRTG)
      REFPNT = REFRAY(ISTRTG)

      RETURN
      END
*DECK CHRINP
      SUBROUTINE CHRINP (OK)
C
C DEFINITION OF INPUT DATA FILE REQUIREMENTS:
C
C TAPE 26 - CHRONC USER INPUT FILE
C TAPE 27 - DOSE CONVERSION FACTORS FILE
C TAPE 29 - SITE DATA FILE
C
C DEFINITION OF OUTPUT DATA FILE REQUIREMENTS:
C
C TAPE 6 - LIST OUTPUT FILE
C
C GLOSSARY OF VARIABLES THAT ARE INPUT TO CHRINP:
C
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION
C UNFSWT - UNIFORM SITE ENVIRONS DATA SWITCH (.FALSE. REQUIRES THE
C          USE OF A SITE DATA FILE)
C
C GLOSSARY OF VARIABLES THAT ARE DEFINED BY CHRINP:
C
C I      - LOOP COUNTER
C KTRPNT - CONTROL SWITCH FOR PRINT OF EACH TRIAL
C NEND   - NUMFIN - NINC
C NINC   - NUMFIN/2
C NINCM1 - NINC - 1
C NUMCOR - THE NUMBER OF COARSE GRID DIVISIONS IN THE PLANE
C NUMFIN - THE NUMBER OF FINE GRID DIVISIONS IN EACH COARSE GRID
C NUMFNT - THE TOTAL NUMBER OF FINE GRID DIVISIONS (NUMCOR*NUMFIN)
C
C GLOSSARY OF EXTERNALS:
C
C ABORT  - SUBROUTINE TO ABORT THE CHRONC MODULE AND PRINT A MESSAGE
C CRNRSK - SUBROUTINE TO COMPUTE THE CHRONIC RISKS FOR THE CURRENT TRIAL
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C INPCHR - SUBROUTINE TO CONTROL THE READING OF THE USER INPUT FILE
C OPNERL - ROUTINE THAT COPIES MODELLING DATA FROM "EARLY" TO "CHRONC"
C SDFINP - SUBROUTINE TO READ/CHECK THE SITE DATA FILE
C STGRDA - SUBROUTINE TO SET UNIFORM GRID DATA
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, D. CHANIN, LOG # 9/16/88-C,
C   ELIMINATE REDUNDANT CALL TO STPATH, CORRECT SOME ERRORS IN COMMENTS
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C
      EXTERNAL ABORT, CRNRSK, INPCHR, OPNERL, SDFINP, STGRDA
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /NUMGRD/ NINC, NINCM1, NEND, NUMFNT
      LOGICAL UNFSWT
      COMMON /UNFSWT/ UNFSWT
      LOGICAL OK
      OK  = .TRUE.
C
C  SET DATA ASSOCIATED WITH THE NUMBER OF FINE GRID DIVISIONS
C
      NUMFNT = NUMCOR * NUMFIN
      NINC   = NUMFIN / 2
      NINCM1 = NINC - 1
      NEND   = NUMFIN - NINC
C
C  CALL A ROUTINE THAT COPIES DATA FROM THE "EARLY" COMMON BLOCKS
C  TO THE COMMON BLOCKS USED BY "CHRONC" AND PRINTS THEM OUT ON THE LISTING
C
      CALL OPNERL
C
C  PROCESS THE CHRONC USER INPUT FILE
C
      CALL INPCHR (OK)
      IF (.NOT. OK) THEN
        WRITE(6,*) 'ERRORS FOUND IN THE CHRONC USER INPUT FILE, ',
     1             'EXECUTION CANNOT PROCEED.'
        WRITE(7,*) 'ERRORS FOUND IN THE CHRONC USER INPUT FILE, ',
     1             'EXECUTION CANNOT PROCEED.'
        CALL ABORT ('CHRINP')
      ENDIF
C
C  CALL A ROUTINE THAT PRINTS OUT THE TAKEN DATA FROM THE "EARLY" COMMON BLOCKS
C
      CALL MODLDF (OK)
      IF (.NOT. OK) THEN
        WRITE(6,*) 'INCONSISTENCY FOUND BETWEEN "EARLY" AND "CHRONC",',
     1          'LONG-TERM CRITICAL ORGAN NOT DEFINED ON THE "CHRONC"',
     2          'ORGAN LIST, EXECUTION CANNOT PROCEED.'
        WRITE(7,*) 'INCONSISTENCY FOUND BETWEEN "EARLY" AND "CHRONC",',
     1          'LONG-TERM CRITICAL ORGAN NOT DEFINED ON THE "CHRONC"',
     2          'ORGAN LIST, EXECUTION CANNOT PROCEED.'
        CALL ABORT ('CHRINP')
      ENDIF
C
C  READ THE SITE DATA FILE FROM UNIT 29
C
```

```
      IF (.NOT. UNFSWT) THEN
      CALL SDFINP (29, OK)
      IF (.NOT. OK) THEN
          WRITE(6,*) ' ERRORS FOUND IN THE SITE DATA FILE,',
     1               ' EXECUTION CANNOT PROCEED.'
          WRITE(7,*) ' ERRORS FOUND IN THE SITE DATA FILE,',
     1               ' EXECUTION CANNOT PROCEED.'
          CALL ABORT ('CHRINP')
        ENDIF
      ENDIF
C
C  SET GRID ELEMENT AREAS, LAND FRACTION AND INDICES TO ECONOMIC DATA
C  FOR THE CASE WHERE A SITE FILE IS NOT BEING USED
C
      CALL STGRDA
      RETURN
      END
*DECK OPNERL
      SUBROUTINE OPNERL
C
C THIS ROUTINE COPIES MODELLING DATA FROM THE COMMON BLOCKS USED BY "EARLY"
C INTO THE COMMON BLOCKS USED BY "CHRONC".
C
C THE COPYING OF RESULTS SHARED BY "EARLY" AND "CHRONC" IS DONE BY COPCHR.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHRINP.
C
C GLOSSARY OF VARIABLES THAT BELONG TO "EARLY":
C
C ACNAME - NAMES OF THE LATENT CANCERS THAT CAN RESULT FROM ACUTE EXPOSURE
C CFRISK - CANCER DEATH RISK FACTOR (EFFECTS/SIEVERT)
C CIRISK - CANCER INJURY RISK FACTOR (EFFECTS/SIEVERT)
C DDREFA - DOSE DEPENDENT CANCER RISK REDUCTION FACTOR
C DOSEFA - DOSE EFFECTIVENESS FACTOR ALPHA FOR CANCER FROM ACUTE EXPOSURE
C DOSEFB - DOSE EFFECTIVENESS FACTOR BETA FOR CANCER FROM ACUTE EXPOSURE
C ENDEMP - END OF THE EMERGENCY PHASE (SECONDS FROM PLUME FIRST ARRIVAL)
C GSF    - GROUNDSHINE SHIELDING FACTOR FOR THE SITE
C I      - LOOP COUNTER
C INDXAC - INDEX TO THE CANCER EFFECT ORGANS
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C NUMACA - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM ACUTE EXPOSURE
C NUMCOR - NUMBER OF WIND DIRECTIONS (COARSE GRID DIRECTIONS)
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMTRI - THE NUMBER OF WEATHER TRIALS IN THE RUN
C OVRRID - FLAG INDICATING THAT JUST A SINGLE WIND ROSE IS TO BE USED
C POPFLG - FLAG INDICATING HOW POPULATION IS TO BE SPECIFIED (FILE OR UNIFORM)
C ROSEBI - WINDROSE PROBABILITY FOR WIND BLOWING INTO DIRECTION I FOR BIN J
C RPF    - RESUSPENSION PROTECTION FACTOR
C RINHL  - INHALATION RATE FOR INDIVIDUALS
C TIMHOT - HOT SPOT RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C TIMNRM - NORMAL RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C WINROS - WIND ROSE PROBABILITY FOR WIND DIRECTION I
C
C GLOSSARY OF VARIABLES THAT BELONG TO "CHRONC":
C
C ACFRSK(I) - COMBINED ALPHA DOSE EFFECTIVENESS FACTORS AND CANCER
C             DEATH RISK FACTOR FOR CANCER EFFECT I
C ACIRSK(I) - COMBINED ALPHA DOSE EFFECTIVENESS FACTORS AND CANCER
C             INJURY RISK FACTOR FOR CANCER EFFECT I
C ACNAME(I) - NAME OF THE LATENT CANCER CORRESPONDING TO CANCER EFFECT I
C I         - LIST AND LOOP COUNTER
C INDXCA(I) - ORGAN INDEX FOR CANCER EFFECT I
C J         - LIST AND LOOP COUNTER
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C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C NORG      - LOOP COUNTER
C NUM       - COUNTER
C NUMCNC    - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM CHRONIC EXPOSURE
C NUMCOR    - THE NUMBER OF COARSE GRID DIVISIONS IN THE PLANE
C NUMTRI    - THE NUMBER OF METEOROLOGICAL TRIALS IN THE RUN
C OK        - LOGICAL ERROR FLAG
C TMEPND    - TIME AT WHICH EMERGENCY PHASE ENDS
C UNFSWT    - UNIFORM SITE ENVIRONS DATA SWITCH (.FALSE. REQUIRES THE
C             USE OF THE SITE DATA FILE)
C
C LYNN RITCHIE, DIV. 6415, 29 APRIL 1985
C                                          DOCUMENTATION CK - 18 NOV 85
C
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 2/12/92, # 1/2/92-A, CHRONC ORGAN LIST MISTAKENLY DEFINED AS THE LIST
C  OF CANCER ORGANS, THIS IS NOW CHANGED SO THAT THE CHRONC ORGAN LIST IS THE
C  SAME AS THE EARLY ORGAN LIST
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
      COMMON /EADFAC/ CSFACT(3), PROTIN(3), BRRATE(3),
     1                SKPFAC(3), GSHFAC(3), RESCON, RESHAF
      LOGICAL         OVRRID
      COMMON /ROTATE/ OVRRID, WINROS(16)
      LOGICAL UNFSWT
      COMMON /UNFSWT/ UNFSWT
      COMMON /CCANCR/ NUMCNC, INDXCA(10), ACFRSK(10), ACIRSK(10)
      COMMON /GSWTHR/ NGWTRM, GWCOEF(2), TGWHLF(2), GSF
      COMMON /REWTHR/ NRWTRM, RWCOEF(3), TRWHLF(3), RPF, RINHL
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      COMMON /ROSEBI/ ROSEBI(16,41)
      CHARACTER *7    POPFLG
      COMMON /POPFLG/ POPFLG
      LOGICAL OK
C
C  UNIFORM SITE ENVIRONS DATA SWITCH
C
      IF (POPFLG .EQ. 'FILE') THEN
        UNFSWT = .FALSE.
      ELSE IF (POPFLG .EQ. 'UNIFORM') THEN
        UNFSWT = .TRUE.
      ENDIF
      TMEPND = ENDEMP
C
```

```
C COPY OVER THE CANCER DEFINITION DATA FROM EARLY INTO THE CHRONC ARRAYS:
C   COMBINE DOSE EFFECTIVENESS ALPHA FACTORS WITH CANCER RISK FACTORS
C   AND SUSCEPTIBLE FRACTIONS FOR FATALITIES AND INJURIES WITH THE DOSE
C   DEPENDENT REDUCTION FACTOR, DDREFA, THAT WAS DEFINED IN EARLY
C
      NUMCNC = NUMACA
      DO 50 I = 1, NUMCNC
      INDXCA(I) = INDXAC(I)
      ACFRSK(I) = CFRISK(I) * DOSEFA(I) * ACSUSC(I) / DDREFA(I)
   50 ACIRSK(I) = CIRISK(I) * DOSEFA(I) * ACSUSC(I) / DDREFA(I)
C
C  COPY OVER THE NORMAL ACTIVITY GROUNDSHINE SHIELDING FACTOR
C
      GSF = GSHFAC(2)
C
C  COPY OVER THE NORMAL ACTIVITY INHALATION PROTECTION FACTOR
C
      RPF = PROTIN(2)
C
C  COPY OVER THE NORMAL ACTIVITY BREATHING RATE (CUBIC METERS/SECOND)
C  AND APPLY THE NORMAL ACTIVITY INHALATION PROTECTION FACTOR TO IT
C
      RINHL = RPF * BRRATE(2)
      RETURN
      ENTRY MODLDF (OK)
C
C  PRINT THE MODEL DEFINITIONS FROM THE EARLY RESULTS DATA FILE
C
      IF (POPFLG .EQ. 'FILE') THEN
        WRITE(6,200)
  200   FORMAT(/' A SITE DATA FILE IS BEING USED FOR BOTH "EARLY"',
     $          ' AND "CHRONC"')
      ELSE IF (POPFLG .EQ. 'UNIFORM') THEN
        WRITE(6,220)
  220   FORMAT(/' A UNIFORM POPULATION DISTRIBUTION IS BEING USED',
     $          ' BY BOTH "EARLY AND "CHRONC" AS SPECIFIED ON THE',
     $          ' "EARLY" USER INPUT FILE')
      ELSE
        CALL ERRLOC ('SITE DATA FILE SWITCH', 'OPNERL')
        WRITE(6,*) 'INVALID VALUE OF POPFLG,', POPFLG
        OK = .FALSE.
      ENDIF
C
C  CANCER EFFECTS DEFINED IN "CHRONC"
C
      WRITE(6,660) NUMCNC
  660 FORMAT(/I3,' CANCER EFFECTS ARE DEFINED IN THE MODEL.'
     1      /'     INDEX ',' CANCER EFFECT        ',10X,'  ORGAN  ',
     2       '     ALPHA  ','     BETA  ','   CFRISK  ','   CIRISK')
      WRITE(6,670) (I,ACNAME(I),ORGNAM(INDXCA(I)),DOSEFA(I),DOSEFB(I),
     1            CFRISK(I),CIRISK(I),I=1,NUMCNC)
  670 FORMAT(1X,I8,3X,A30,3X,A,1P,4E11.3)
C
C  MODELING TIMES FROM "EARLY" USED IN "CHRONC"
C
      WRITE(6,680) TIMHOT, TIMNRM, ENDEMP
  680 FORMAT(/'   TIME OF HOTSPOT RELOCATION IS ',1PE10.4,'.'
     1  /1X,'  TIME OF NORMAL RETURN IS ',E10.3,' AND THE EMERGENCY',
     2       ' PHASE ENDS AT ',E10.3,'.')
C
C  SHIELDING AND EXPOSURE DATA FROM "EARLY" USED IN "CHRONC"
C
      WRITE(6,720) 'GROUNDSHINE SHIELDING FACTOR   = ', GSF,
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     $              'RESUSPENSION PROTECTION FACTOR = ', RPF,
     $              'BREATHING RATE (CUBIC M/S) = ', BRRATE(2)
  720 FORMAT(2(//1X,A,F5.3)//1X,A,1PE11.3)
C
C  DISPERSION DATA FROM EARLY USED IN CHRONC
C
      WRITE(6,750) IPLUME
  750 FORMAT(/'   DISPERSION MODEL FLAG IS ', I2)
       IF (OVRRID) THEN
        WRITE(6,800) (I,I=1,NUMCOR)
  800   FORMAT(/'  WINDROSE PROBABILITIES BY WIND DIRECTION'
     1          / 5X, 16I7)
        WRITE(6,810) (WINROS(I),I=1,NUMCOR)
  810   FORMAT(6X, 16F7.4)
      ELSE
        WRITE(6,820) (I,I=1,NUMCOR)
  820   FORMAT(/'   WINDROSE PROBABILITIES BY WIND DIRECTION ',
     1          'AND MET BIN NUMBER'/ '  BIN', 1X, I5, 15I7)
        WRITE(6,830) (J,(ROSEBI(I,J),I=1,NUMCOR),J=1,41)
  830   FORMAT(1X, I5, 16F7.4)
      ENDIF
      RETURN
      END
*DECK INPCHR
      SUBROUTINE INPCHR (OK)
C
C CONTROL ROUTINE FOR READING THE USER INPUT DATABASE FOR CHRONC
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHRINP.
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM INPCHR:
C
C OK    - LOGICAL ERROR FLAG INDICATING SUCCESSFUL COMPLETION OF READ
C OKVR  - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INCHRN
C OK9   - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF IXOT9
C OK10  - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF IXOT10
C OK11  - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF IXOT11
C OK12  - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF IXOT12
C OK13  - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF IXOT13
C
C GLOSSARY OF EXTERNALS:
C
C INCHRN - INPUT ROUTINE FOR THE PROBLEM DEFINITION DATA TO CHRONC
C IXOT9  - INPUT ROUTINE FOR TYPE 9 OUTPUT REQUESTS
C IXOT10 - INPUT ROUTINE FOR TYPE 10 OUTPUT REQUESTS
C IXOT11 - INPUT ROUTINE FOR TYPE 11 OUTPUT REQUESTS
C IXOT12 - INPUT ROUTINE FOR TYPE 12 OUTPUT REQUESTS
C IXOT13 - INPUT ROUTINE FOR TYPE 13 OUTPUT REQUESTS
C STPATH - INPUT ROUTINE TO PROCESS THE INGESTION PATHWAY DATA
C
      EXTERNAL INCHRN, STPATH, IXOT9, IXOT10, IXOT11, IXOT12, IXOT13
C
C LYNN RITCHIE, DIV. 6415, 14 JUNE 85
C                                        DOCUMENTATION CK - 18 NOV 85
C
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, D. CHANIN, LOG # 9/16/88-C,
C   ELIMINATE REDUNDANT CALL TO STPATH, CORRECT SOME ERRORS IN COMMENTS
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
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C
      LOGICAL OK, OKA, OKB, OK9, OK10, OK11, OK12, OK13
C
C  DEFINE THE VARIABLES FROM THE USER INPUT FILE EXCEPT THE PATHWAYS DATA
C
      CALL INCHRN (OKA)
C
C  DEFINE THE VARIABLES FROM THE USER INPUT FILE FOR THE PATHWAYS DATA
C
      CALL STPATH (OKB)
      IF (OKA .AND. OKB) THEN
        CALL IXOT9 (OK9)
        CALL IXOT10 (OK10)
        CALL IXOT11 (OK11)
        CALL IXOT12 (OK12)
        IF (FDPATH .EQ. 'NEW') THEN
          CALL IXOT13 (OK13)
        OK = OK9 .AND. OK10 .AND. OK11 .AND. OK12 .AND. OK13
        ELSE
          OK = OK9 .AND. OK10 .AND. OK11 .AND. OK12
        ENDIF
        IF (.NOT. OK) THEN
          WRITE(6,*) 'ERROR IN OUTPUT REQUESTS IN CHRONC INPUT FILE'
          WRITE(7,*) 'ERROR IN OUTPUT REQUESTS IN CHRONC INPUT FILE'
        ENDIF
      ELSE
        OK = .FALSE.
        WRITE(6,*) 'ERROR IN CHRONC INPUT FILE PARAMETERS'
        WRITE(7,*) 'ERROR IN CHRONC INPUT FILE PARAMETERS'
      ENDIF
      RETURN
      END
*DECK INCHRN
      SUBROUTINE INCHRN (OK)
C
C THIS ROUTINE DEFINES THE USER INPUT FOR THE "CHRONC" CODE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHRINP.
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM INCHRN:
C
C CDFRM(I) - COST OF FARM DECONTAMINATION PER UNIT AREA
C            FOR DECONTAMINATION LEVEL I (DOLLARS / HECTARE)
C CDNFRM(I) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR
C             DECONTAMINATIOM LEVEL I (DOLLARS / PERSON)
C CHNAME    - TEXT DESCRIBING THE USER INPUT ASSUMPTIONS FOR "CHRONC"
C CRTOCR - CRITICAL ORGAN NAME FOR MITIGATIVE ACTIONS IN CHRONC
C DLBCST - LABOR COST OF DECONTAMINATION WORKER (DOLLARS / MAN-SECOND)
C DPRATE - DEPRECIATION RATE DURING THE INTERDICTION PERIOD (/ SEC)
C DSCRLT - DOSE CRITERION FOR LONG-TERM PHASE RELOCATION
C DSCRTI - DOSE CRITERION FOR INTERMEDIATE PHASE RELOCATION]
C DSRATE - SOCIETAL DISCOUNT RATE DURING THE INTERDICTION PERIOD (/ SEC)
C DSRFCT(I)- DOSE REDUCTION FACTOR FOR DECONTAMINATION LEVEL I
C EVACST - emergency phase relocation cost (dollars/person-day)
C EVCOST - emergency phase relocation cost (dollars/person-sec)
C EXPTIM - Longest exposure time for individuals in CHRONC calculations
C FOUND  - LOGICAL FLAG INDICATING A VALUE OF CORRECT TYPE WAS FOUND
C FRFDL(I) - FRACTION OF FARM LAND DECONTAMINATION COST DUE TO LABOR
C            AT DECONTAMINATION LEVEL I (UNITLESS)
C FRFIM  - FRACTION OF FARMLAND WEALTH IN IMPROVEMENTS
C FRMPRD - VALUE OF ANNUAL FARM PRODUCTION IN SITE ENVIRONS (DOLLARS/HECTARE)
C FRNFDL(I) - FRACTION OF NON-FARM DECONTAMINATION COST DUE TO LABOR
C             AT DECONTAMINATION LEVEL I (UNITLESS)
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C FRNFIM - FRACTION OF NON-FARMLAND WEALTH IN IMPROVEMENTS
C GWCOEF(I) - THE GROUNDSHINE WEATHERING COEFFICIENT FOR TERM I
C I       - LOOP COUNTER
C ICRTRO - INDEX OF THE CRITICAL ORGAN FOR THE CHRONC MODEL
C KSWDSC - PRINT CONTROL SWITCH FOR CHRONIC DOSES AND COSTS
C KSWTCH - PRINT CONTROL SWITCH FOR PRINT OPTION I
C LEVLN  - LOOP COUNTER FOR LEVEL NUMBERS
C LVLDEC - NUMBER OF LEVELS OF DECONTAMINATION
C NGWTRM - NUMBER OF TERMS IN THE GROUNDSHINE WEATHERING RELATIONSHIP
C NRWTRM - NUMBER OF TERMS IN THE RESUSPENSION WEATHERING RELATIONSHIP
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C OK1    - LOGICAL FLAG INDICATING VALUES ARE IN THE PROPER ORDER
C POPCST - COMPENSATION COST FOR LOST INCOME TO TEMPORARILY INTERDICTED
C          INDIVIDUALS AND THOSE WHOSE PROPERTY IS CONDEMNED ($ / PERSON)
C RANGE  - LOGICAL FLAG INDICATING A VALUE WITHIN REQUIRED RANGE WAS FOUND
C RELCST - intermediate phase relocation cost (dollars/person-day)
C RLCOST - intermediate phase relocation cost (dollars/person-sec)
C RWCOEF(I) - THE RESUSPENSION WEATHERING COEFFICIENT FOR TERM I
C TFWKF(I) - TIME FRACTION OF THE LEVEL I DECONTAMINATION PROCESS SPENT
C            IN THE DECONTAMINATION AREA FOR FARMS (UNITLESS)
C TFWKNF(I) - TIME FRACTION OF THE LEVEL I DECONTAMINATION PROCESS SPENT
C             IN THE CONTAMINATED AREA FOR NON-FARMS (UNITLESS)
C TGWHLF(I) - THE HALF-LIFE FOR GROUNDSHINE WEATHERING COEFFICIENT I
C TIMDEC(I) - TIME FROM START TO END OF THE DECONTAMINATION PROCESS
C             AT DECONTAMINATION LEVEL I (SECONDS ELAPSED)
C TMEPND - END OF THE EMERGENCY PHASE (SECONDS FROM PLUME FIRST ARRIVAL)
C TMIPND - THE TIME AT WHICH THE INTERMEDIATE PHASE ENDS
C TMPACT - DURATION OF THE LONG-TERM PHASE DOSE PROJECTION PERIOD
C TRWHLF(I) - THE HALF-LIFE FOR RESUSPENSION WEATHERING COEFFICIENT I
C VALWF  - VALUE OF THE TANGIBLE WEALTH IN FARMLAND AND IMPROVEMENTS
C VALWNF - VALUE OF THE TANGIBLE WEALTH IN NON-FARM LAND AND INPROVEMENTS
C
C DAVID CHANIN, DIV. 6415, 29 MAY 1985.
C
C MODIFIED 7 JULY 86, LTR, S.E.R. #67, DATA RANGE LIMITS OF THE
C  CHRONC INPUT DATA VARIABLES CORRECTED
C MODIFIED 14 MAR 86, S.E.R. #14, INCORRECT SCALING FACTORS FOR
C  DECONTAMINATION WORKER DOSES
C MODIFIED BY LYNN RITCHIE, DIV.6415, 14 JUNE 1985
C                                        DOCUMENTATION CK - 18 NOV 85
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 9/25/88-A,
C  LENGTH DISCREPANCY ON ORGNAM AND NUCNAM
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C Modified 11/27/95, D. Chanin: changed minimum allowable value of DLBCST from
C  0.0 to 1.0 in order to avoid a divide-by-zero error in SUBROUTINE CSTDCN
C Modified 2/13/96, D. Chanin: change lower bound on EXPTIM to zero
C Modified 3/8/96, D. Chanin: replace old user-input TMIPND with DUR_INTPHAS
C so that user now specifies duration of intermediate phase, not its endpoint.
C Modified 3/17/96 D. Chanin: required range for TMPACT changed in light of the
C                              change to the required range for EXPTIM
C Modified 6/05/96, D.C., misc. restrictions on code input parameters
C Modified 6/06/96, D.C., DFs must now be in ascending order, minimum of 1.01
      EXTERNAL CGET1, IGETN, IGET1, LGET1, RGETN, RGET1
      CHARACTER *80 CGET1
      LOGICAL LGET1
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
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      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /ICRTRO/ ICRTRO
      COMMON /DECMOD/ LVLDEC, CDFRM(3), CDNFRM(3), FRFDL(3), FRNFDL(3),
     1                DSRFCT(3), TFWKF(3), TFWKNF(3), TIMDEC(3), DLBCST
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      COMMON /FRACLD/ FRACLD
      COMMON /ERLCST/ EVCOST, RLCOST
      COMMON /FRCFRM/ FRCFRM, FRMPRD, DPFRCT
      COMMON /REWTHR/ NRWTRM, RWCOEF(3), TRWHLF(3), RPF, RINHL
      COMMON /GSWTHR/ NGWTRM, GWCOEF(2), TGWHLF(2), GSF
      COMMON /KOPRNT/ KSWDSC
      COMMON /SITEDT/ DPRATE,DSRATE,FRFIM,FRNFIM,VALWF,VALWNF,POPCST
      CHARACTER *80   CHNAME
      COMMON /CHNAME/ CHNAME
      COMMON /EXPTIM/ EXPTIM
C
      CHARACTER *11 CRTOCR
      LOGICAL OK, OK1, RANGE, FOUND
C
      OK = .TRUE.
C
C INDENTIFICATION OF THE "CHRONC" INPUT ASSUMPTIONS
C
      CHNAME = CGET1 ('CHCHNAME001', 1, 1, ' ', 80, RANGE, FOUND,
     1                'INCHRN', 'CHNAME')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C READ THE EMERGENCY RESPONSE COST DATA BLOCK
C
C  EVACUATION COST (DOLLARS/PERSON-DAY)
C
      EVACST = RGET1 ('CHEVACST001', 0, 0., 0., 1000.,
     1                RANGE, FOUND, 'INCHRN', 'EVACST')
      IF (RANGE .AND. FOUND) THEN
C
C  CONVERT TO COST PER SECOND
C
      EVCOST = EVACST / (24. * 3600.)
      ELSE
      CALL ABORT ('terminating')
      ENDIF
C
C  RELOCATION COST (DOLLARS/PERSON-DAY)
C
      RELCST = RGET1 ('CHRELCST001', 0, 0., 0., 1000.,
     1                RANGE, FOUND, 'INCHRN', 'RELCST')
      IF (RANGE .AND. FOUND) THEN
C
C  CONVERT TO COST PER SECOND
C
      RLCOST = RELCST / (24. * 3600.)
      ELSE
      CALL ABORT ('terminating')
      ENDIF
C
C READ THE LONG TERM PROTECTIVE ACTION DATA BLOCK
C
C  END OF THE INTERMEDIATE PHASE PERIOD (SECONDS FROM INITIAL PLUME
C  PASSAGE).  THE INTERMEDIATE PHASE PERIOD MUST FOLLOW THE EMERGENCY
C  PHASE PERIOD WHICH ENDS AT ENDEMP (TMEPND).
C
C      ENDEMP = TMEPND
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C       TMIPND = RGET1 ('CHTMIPND001', 0, ENDEMP, 0., 3.16E7,
C      $                  RANGE, FOUND, 'INCHRN', 'TMPIND')
       DUR_INTPHAS = RGET1 ('DUR_INTPHAS', 0, 0., 0., 3.16E7,
      1                RANGE, FOUND, 'INCHRN', 'DUR_INTPHAS')
       IF (.NOT. FOUND) THEN
          write(6,*)
      1   'WARNING: CHRONC input record CHTMIPND001 no longer used'
          write(6,*)
      1   'WARNING: The new input record DUR_INTPHAS is now required'
          write(7,*)
      1   'WARNING: CHRONC input record CHTMIPND001 no longer used'
          write(7,*)
      1   'WARNING: The new input record DUR_INTPHAS is now required'
          CALL ABORT ('terminating')
       ELSE IF (.NOT. RANGE) THEN
          CALL ABORT ('terminating')
       ENDIF
C
       TMIPND =  DUR_INTPHAS + TMEPND
C
C  DURATION OF THE LONG-TERM PHASE DOSE EXPOSURE PERIOD
C
       EXPTIM = RGET1 ('CHEXPTIM001', 0, 0., 0., 1.E10,
      $                  RANGE, FOUND, 'INCHRN', 'EXPTIM')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
       IF (.NOT. OK) CALL ABORT ('terminating')
C
C  DURATION OF THE LONG-TERM PHASE DOSE PROJECTION PERIOD
C
C       TMPACT = RGET1 ('CHTMPACT001', 0, TMIPND, 0., 1.E10,
C changed 3/17/96 in light of change to required range for EXPTIM
       TMPACT = RGET1 ('CHTMPACT001', 0, 0., 0., EXPTIM,
      $                  RANGE, FOUND, 'INCHRN', 'TMPACT')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  DOSE CRITERION FOR INTERMEDIATE PHASE RELOCATION (Sv)
C
       DSCRTI = RGET1 ('CHDSCRTI001', 0, 0., 0., 1.E5,
      $                  RANGE, FOUND, 'INCHRN', 'DSCRTI')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  DOSE CRITERION FOR LONG TERM PHASE RELOCATION (Sv)
C
       DSCRLT = RGET1 ('CHDSCRLT001', 0, 1.E-20, 0., 1.E5,
      $                  RANGE, FOUND, 'INCHRN', 'DSCRLT')
       IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  CRITICAL ORGAN NAME FOR THE CHRONC MODULE DOSE PROJECTION
C
       CRTOCR = CGET1 ('CHCRTOCR001', 0, 2, ' ', 11,
      1                  RANGE, FOUND, 'INCHRN', 'CRTOCR')
       IF (RANGE .AND. FOUND) THEN
       DO 100 IORG = 1, NUMORG
       IF (CRTOCR .EQ. ORGNAM(IORG)) THEN
         ICRTRO = IORG
         GO TO 200
       ENDIF
  100    CONTINUE
       OK = .FALSE.
       CALL ERRLOC('INPCHR', 'CRTOCR')
       WRITE(6,*) CRTOCR, 'NOT FOUND IN LIST OF ORGANS'
       WRITE(7,*) CRTOCR, 'NOT FOUND IN LIST OF ORGANS'
       CALL ABORT ('TERMINATING EXECUTION')
```

```
      ENDIF
  200 CONTINUE
C
C  READ THE DECONTAMINATION PLAN DATA BLOCK
C
C  NUMBER OF LEVELS OF DECONTAMINATION
C
      LVLDEC = IGET1 ('CHLVLDEC001', 0, 1, 0, 3,
     $                RANGE, FOUND, 'INCHRN', 'LVLDEC')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  DECONTAMINATION TIMES CORRESPONDING TO THE LVLDEC LEVELS OF DECONTAMINATION
C
      CALL RGETN ('CHTIMDEC001', 0, TIMDEC, LVLDEC, 1.E-6, 3.16E7,
     $            RANGE, FOUND, 'INCHRN', 'TIMDEC')
      IF (RANGE .AND. FOUND) THEN
      IF (LVLDEC .EQ. 1) THEN
        OK1 = .TRUE.
      ELSE IF (LVLDEC .EQ. 2) THEN
        OK1 = TIMDEC(1) .LE. TIMDEC(2)
      ELSE IF (LVLDEC .EQ. 3) THEN
        OK1 = TIMDEC(1) .LE. TIMDEC(2) .AND. TIMDEC(2) .LE. TIMDEC(3)
      ENDIF
      IF (.NOT. OK1) THEN
        OK = .FALSE.
        WRITE(6,*) 'TIMDEC VALUES ARE NOT IN ASCENDING ORDER'
        WRITE(7,*) 'TIMDEC VALUES ARE NOT IN ASCENDING ORDER'
      ENDIF
      ELSE
      OK = .FALSE.
      ENDIF
      IF (.NOT. OK) CALL ABORT ('terminating')
C
C  DOSE REDUCTION FACTORS CORRESPONDING TO THE LVLDEC LEVELS OF DECONTAMINATION
C
C changed 6/06/96, DFs must now be in ascending order, minimum allowed is 1.01
C
      CALL RGETN ('CHDSRFCT001', 0, DSRFCT, LVLDEC, 1.01, 1.E2,
     $            RANGE, FOUND, 'INCHRN', 'DSRFCT')
      IF (RANGE .AND. FOUND) THEN
      IF (LVLDEC .EQ. 1) THEN
        OK1 = .TRUE.
      ELSE IF (LVLDEC .EQ. 2) THEN
        OK1 = DSRFCT(1) .LT. DSRFCT(2)
      ELSE IF (LVLDEC .EQ. 3) THEN
        OK1 = DSRFCT(1) .LT. DSRFCT(2) .AND. DSRFCT(2) .LT. DSRFCT(3)
      ENDIF
      IF (.NOT. OK1) THEN
        OK = .FALSE.
        WRITE(6,*) 'DSRFCT VALUES ARE NOT IN ASCENDING ORDER'
        WRITE(7,*) 'DSRFCT VALUES ARE NOT IN ASCENDING ORDER'
      ENDIF
      ELSE
      OK = .FALSE.
      ENDIF
      IF (.NOT. OK) CALL ABORT ('terminating')
C
C  COST OF FARM DECONTAMINATION PER UNIT AREA (DOLLARS/HECTARE)
C  FOR THE VARIOUS LEVELS OF DECONTAMINATION
C
      CALL RGETN ('CHCDFRM0001', 0, CDFRM, LVLDEC, 1.0, 1.E5,
     $            RANGE, FOUND, 'INCHRN', 'CDFRM')
      IF (RANGE .AND. FOUND) THEN
```

```
      IF (LVLDEC .EQ. 1) THEN
        OK1 = .TRUE.
      ELSE IF (LVLDEC .EQ. 2) THEN
        OK1 = CDFRM(1) .LE. CDFRM(2)
      ELSE IF (LVLDEC .EQ. 3) THEN
        OK1 = CDFRM(1) .LE. CDFRM(2) .AND. CDFRM(2) .LE. CDFRM(3)
      ENDIF
      IF (.NOT. OK1) THEN
        OK = .FALSE.
        WRITE(6,*) 'CDFRM VALUES ARE NOT IN ASCENDING ORDER'
        WRITE(7,*) 'CDFRM VALUES ARE NOT IN ASCENDING ORDER'
      ENDIF
      ELSE
      OK = .FALSE.
      ENDIF
      IF (.NOT. OK) CALL ABORT ('terminating')
C
C  COST OF NONFARM DECONTAMINATION PER PERSON
C  FOR THE VARIOUS LEVELS OF DECONTAMINATION  (DOLLARS/PERSON)
C
      CALL RGETN ('CHCDNFRM001', 0, CDNFRM, LVLDEC, 1.0, 1.E5,
     $            RANGE, FOUND, 'INCHRN', 'CDNFRM')
      IF (RANGE .AND. FOUND) THEN
      IF (LVLDEC .EQ. 1) THEN
        OK1 = .TRUE.
      ELSE IF (LVLDEC .EQ. 2) THEN
        OK1 = CDNFRM(1) .LE. CDNFRM(2)
      ELSE IF (LVLDEC .EQ. 3) THEN
        OK1 = CDNFRM(1) .LE. CDNFRM(2) .AND. CDNFRM(2) .LE. CDNFRM(3)
      ENDIF
      IF (.NOT. OK1) THEN
        OK = .FALSE.
        WRITE(6,*) 'CDNFRM VALUES ARE NOT IN ASCENDING ORDER'
        WRITE(7,*) 'CDNFRM VALUES ARE NOT IN ASCENDING ORDER'
      ENDIF
      ELSE
      OK = .FALSE.
      ENDIF
      IF (.NOT. OK) CALL ABORT ('terminating')
C
C  FRACTION OF FARMLAND DECONTAMINATION COST DUE TO LABOR
C  FOR THE VARIOUS DECONTAMINATION LEVELS
C
      CALL RGETN ('CHFRFDL0001', 0, FRFDL, LVLDEC, 0., 1.,
     $            RANGE, FOUND, 'INCHRN', 'FRFDL')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF NON-FARM DECONTAMINATION COST DUE TO LABOR
C  FOR THE VARIOUS DECONTAMINATION LEVELS
C
      CALL RGETN ('CHFRNFDL001', 0, FRNFDL, LVLDEC, 0., 1.,
     $            RANGE, FOUND, 'INCHRN', 'FRNFDL')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF TIME WORKERS IN FARM AREAS SPEND DECONTAMINATING FARMLAND
C  FOR THE VARIOUS DECONTAMINATION LEVELS
C
      CALL RGETN ('CHTFWKF0001', 0, TFWKF, LVLDEC, 0., 1.,
     $            RANGE, FOUND, 'INCHRN', 'TFWKF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF TIME WORKERS IN NON-FARM AREAS SPEND DECONTAMINATING LAND
C  FOR THE VARIOUS DECONTAMINATION LEVELS
```

```
C
      CALL RGETN ('CHTFWKNF001', 0, TFWKNF, LVLDEC, 0., 1.,
     $            RANGE, FOUND, 'INCHRN', 'TFWKNF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  AVERAGE COST OF DECONTAMINATION LABOR (DOLLARS/MAN-YEAR)
C
      DLBCST = RGET1 ('CHDLBCST001', 0, 1.0, 1.0, 1.E6,
     $                RANGE, FOUND, 'INCHRN', 'DLBCST')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  CONVERT MAN-YEARS TO MAN-SECONDS
C
      DLBCST = DLBCST / (365.25 * 24. * 3600.)
C
C  DEPRECIATION RATE FOR PROPERTY IMPROVEMENTS DURING INTERDICTION PERIOD
C
      DPRATE = RGET1 ('CHDPRATE001', 0, 0., 0., 1.,
     $                RANGE, FOUND, 'INCHRN', 'DPRATE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  CONVERT DEPRECIATION RATE PER YEAR TO RATE PER SECOND
C
      DPRATE = DPRATE / (365.25 * 24. * 3600.)
C
C  MORTGAGE INTEREST RATE DURING INTERDICTION PERIOD
C
      DSRATE = RGET1 ('CHDSRATE001', 0, 0., 0., 1.,
     $                RANGE, FOUND, 'INCHRN', 'DSRATE')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  CONVERT MORTGAGE INTEREST RATE PER YEAR TO RATE PER SECOND
C
      DSRATE = DSRATE / (365.25 * 24. * 3600.)
C
C  COMPENSATION COST FOR TEMPORARILY OR PERMANENTLY INTERDICTED INDIVIDUALS
C  THAT ACCOUNTS FOR THE TEMPORARY LOSS OF INCOME AND MOVING COSTS
C  (DOLLARS/PERSON)
C
      POPCST = RGET1 ('CHPOPCST001', 0, 1.E-6, 0., 1.E6,
     $                RANGE, FOUND, 'INCHRN', 'POPCST')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C READ THE GROUNDSHINE WEATHERING DEFINITION DATA BLOCK
C
C  NUMBER OF TERMS IN THE GROUNDSHINE WEATHERING RELATIONSHIP (EITHER 1 OR 2)
C
      NGWTRM = IGET1 ('CHNGWTRM001', 0, 1, 0, 2,
     $                RANGE, FOUND, 'INCHRN', 'NGWTRM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  GROUNDSHINE WEATHERING COEFFICIENTS
C
      CALL RGETN ('CHGWCOEF001', 0, GWCOEF, NGWTRM, 1.E-20, 1.,
     $            RANGE, FOUND, 'INCHRN', 'GWCOEF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  HALF LIVES CORRESPONDING TO THE GROUNDSHINE WEATHERING COEFFICIENTS (S)
C
      CALL RGETN ('CHTGWHLF001', 0, TGWHLF, NGWTRM, 1.E-6, 1.E12,
     $            RANGE, FOUND, 'INCHRN', 'TGWHLF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
```

```
C SET THE RESUSPENSION WEATHERING DEFINITION DATA BLOCK
C
C  NUMBER OF TERMS IN THE RESUSPENSION WEATHERING RELATIONSHIP
C
      NRWTRM = IGET1 ('CHNRWTRM001', 0, 1, 0, 3,
     $                RANGE, FOUND, 'INCHRN', 'NRWTRM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  RESUSPENSION WEATHERING COEFFICIENTS
C
      CALL RGETN ('CHRWCOEF001', 0, RWCOEF, NRWTRM, 1.E-20, 1.,
     $            RANGE, FOUND, 'INCHRN', 'RWCOEF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  HALF-LIVES CORRESPONDING TO THE RESUSPENSION WEATHERING COEFFICIENTS (S)
C
      CALL RGETN ('CHTRWHLF001', 0, TRWHLF, NRWTRM, 1.E-6, 1.E12,
     $            RANGE, FOUND, 'INCHRN', 'TRWHLF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  READ THE SITE ENVIRONS DESCRIPTION DATA BLOCK
C
C  FRACTION OF SITE ENVIRONS AREA THAT IS LAND
C
      FRACLD = RGET1('CHFRACLD001', 0, 1.E-6, 0., 1.0,
     1               RANGE, FOUND, 'INCHRN', 'FRACLD')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF SITE ENVIRONS LAND DEVOTED TO FARMING
C
      FRCFRM = RGET1('CHFRCFRM001', 0, 1.E-6, 0., 1.0,
     1               RANGE, FOUND, 'INCHRN', 'FRCFRM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  VALUE OF ANNUAL FARM PRODUCTION IN SITE ENVIRONS (DOLLARS/HECTARE)
C
      FRMPRD = RGET1('CHFRMPRD001', 0, 0., 0., 1.E5,
     1               RANGE, FOUND, 'INCHRN', 'FRMPRD')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF FARM PRODUCTION RESULTING FROM DAIRY PRODUCTION IN THE
C   SITE ENVIRONS
C
      DPFRCT = RGET1('CHDPFRCT001', 0, 0., 0., 1.0,
     1               RANGE, FOUND, 'INCHRN', 'DPFRCT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  VALUE OF FARM WEALTH, FARMLAND AND IMPROVEMENTS (DOLLARS/HECTARE)
C
      VALWF = RGET1 ('CHVALWF0001', 0, 1.E-6, 0., 1.E6,
     $               RANGE, FOUND, 'INCHRN', 'VALWF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF FARM WEALTH IN IMPROVEMENTS
C
      FRFIM = RGET1 ('CHFRFIM0001', 0, 0., 0., 1.,
     $               RANGE, FOUND, 'INCHRN', 'FRFIM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  VALUE OF NON-FARM WEALTH, PROPERTY AND IMPROVEMENTS (DOLLARS/HECTARE)
C
      VALWNF = RGET1 ('CHVALWNF001', 0, 1.E-6, 0., 1.E6,
     $                RANGE, FOUND, 'INCHRN', 'VALWNF')
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      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C  FRACTION OF NON-FARM WEALTH IN IMPROVEMENTS
C
      FRNFIM = RGET1 ('CHFRNFIM001', 0, 0., 0., 1.,
     $                RANGE, FOUND, 'INCHRN', 'FRNFIM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
C
C READ SPECIAL OPTIONS DATA BLOCK
C
C  DETAILED PRINT OPTION CONTROL SWITCHES
C
      KSWTCH = IGET1 ('CHKSWTCH001', 0, 0, 0, 10, RANGE, FOUND,
     1                'INCHRN', 'KSWTCH')
      IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('terminating')
      KSWDSC = KSWTCH
C
      RETURN
      END
*DECK STPATH
      SUBROUTINE STPATH (OK)
C
C READ AND VALIDATE INGESTION PATHWAY DATA FOR FOOD AND WATER.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE INPCHR.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO STPATH:
C
C NUCNAM(I) - NAME OF THE RADIONUCLIDE WITH NUCLIDE INDEX I
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C
C GLOSSARY OF VARIABLE NAMES OF DATA DEFINED IN OR OUTPUT FROM STPATH:
C
C CNVRT     -  LOCAL CONVERSION FACTOR FOR PER YEAR TO PER SECOND
C CONVRT    -  LOCAL CONVERSION FACTOR FOR REMS TO SEIVERTS
C COUPLD - LOGICAL FLAG INDICATING LONG-TERM AND GROWING-SEASON ACTIONS
C          ARE TO BE PERFORMED IN A COUPLED FASHION (MUTUALLY DEPENDENT)
C CTCOEF(I,J,K) - CROP TRANSFER COEFFICIENT FOR NUCLIDE I DEPOSITED
C                 ON CROP J FOR CROP TRANSFER TERM K
C CTHALF(I,J,K) - CROP TRANSFER HALF-LIFE FOR NUCLIDE I DEPOSITED
C                 ON CROP J FOR CROP TRANSFER TERM K
C DCYPCH(I,J) - DECAY LOSS FACTOR FOR NUCLIDE I FROM PRODUCTION OF
C               CROP J TO HUMAN CONSUMPTION
C DCYPCM(I,J) - DECAY LOSS FACTOR FOR NUCLIDE I FROM PRODUCTION OF
C               CROP J TO CONSUMPTION BY MILK COWS
C DCYPCB(I,J) - DECAY LOSS FACTOR FOR NUCLIDE I FROM PRODUCTION OF
C               CROP J TO CONSUMPTION BY MEAT ANIMALS
C DCYPMH(I) -   DECAY LOSS FACTOR FOR NUCLIDE I FROM PRODUCTION OF
C               MILK TO CONSUMPTION BY HUMANS
C DCYPBH(I) -   DECAY LOSS FACTOR FOR NUCLIDE I FROM SLAUGHTER OF
C               MEAT TO HUMAN CONSUMPTION
C FDPATH - FLAG WITH VALUE OF 'OLD' OR 'NEW' TO INDICATE FOOD PATHWAY
C          MODEL BEING USED
C FPLSCH(I,J) - FOOD PROCESSING LOSS FACTOR FOR NUCLIDE I FROM
C               CROP J FOR HUMAN CONSUMPTION
C FRCTCB(I) - FRACTION OF CROP I FOR MEAT PRODUCTION IN OLD MODEL OR
C             BEEF PRODUCTION IN NEW MODEL
C FRCTCH(I) - FRACTION OF CROP I FOR HUMAN CONSUMPTION
C FRCTCM(I) - FRACTION OF CROP I FOR MILK PRODUCTION
C FRCTCO(I) - FRACTION OF CROP I FOR OTHER MEATS PRODUCTION IN NEW MODEL
C FRCTCP(I) - FRACTION OF CROP I FOR POULTRY PRODUCTION IN NEW MODEL
C FRCTFL(I) - FRACTION OF FARMLAND USED FOR CROP I
C GCMAXR(I) - THE MAXIMUM GROUND CONCENTRATION FOR ROOT UPTAKE BY
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C              NUCLIDE I IN THE FOOD INGESTION MODEL
C I       - LOOP INDEXING PARAMETER
C J       - LOOP INDEXING PARAMETER
C N       - LOOP INDEXING PARAMETER
C NAMCRP(I) - NAME OF FOOD INGESTION MODEL CROP I
C NAMIPI(I) - NAME OF THE INGESTION PATHWAY NUCLIDE I
C NAMWPI(I,M) - THE NAME OF WATER PATHWAY NUCLIDE MEMBER M OF CHAIN I
C NDXFII - POINTER ARRAY SHOWING LOCATION OF THE FOOD/WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE OLD FOOD MODEL
C NDXWII - POINTER ARRAY SHOWING LOCATION OF THE WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE NEW FOOD MODEL
C NFICRP - THE NUMBER OF FOOD INGESTION MODEL CROPS
C NFIISO - THE NUMBER OF FOOD INGESTION MODEL NUCLIDES
C NISO   - LOOP INDEXING PARAMETER
C NTTRM  - NUMBER OF TERMS IN THE CROP TRANSFER FUNCTION
C NUMWPA - THE NUMBER OF WATERSHEDS (WATER PATHWAYS)
C NUMWPI - THE NUMBER OF WATER PATHWAY NUCLIDES
C OK     - LOGICAL FLAG INDICATING THAT ALL THE INPUT DATA IS VALID
C OKI   - LOGICAL FLAG INDICATING THAT SOME OF THE INPUT DATA IS VALID
C PPLSBH(I) - PRODUCT PROCESSING LOSS FOR MEAT FOR NUCLIDE I
C PPLSMH(I) - PRODUCT PROCESSING LOSS FOR MILK FOR NUCLIDE I
C PSCMLK(I) - PERMISSIBLE SURFACE CONCENTRATION OF NUCLIDE I FOR MILK
C PSCOTH(I) - PERMISSIBLE SURFACE CONCENTRATION OF NUCLIDE I FOR CROPS
C QROOT(I) - THE ROOT UPTAKE DEPLETION FACTOR FOR NUCLIDE I IN THE
C            FOOD INGESTION MODEL
C TCROOT(I,J) - LONG-TERM ROOT UPTAKE TRANSFER COMPONENT FOR NUCLIDE I
C               BY CROP J
C TFBF(I)  - TRANSFER FACTOR (FRACTION) FOR NUCLIDE I IN MEAT
C TFMLK(I) - TRANSFER FACTOR (FRACTION) FOR NUCLIDE I IN MILK
C TGSBEG(I) - THE TIME (DAYS) THE GROWING SEASON BEGINS FOR CROP I
C THRVST - TIME (DAYS) OF THE HARVEST SEASON
C WINGF(I,J) - WATER PATHWAY INGESTION FACTOR OF WATER PATHWAY
C              NUCLIDE I DEPOSITED IN WATERSHED J
C WSHFRI(I) - INITIAL WASHOFF FRACTION FOR WATER PATHWAY NUCLIDE I
C WSHRTA(I) - ANNUAL WASHOFF RATE FOR WATER PATHWAY NUCLIDE I
C
C GLOSSARY OF EXTERNALS:
C
C CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C IGET1  - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C LGET1  - INTERFACE TO INPRE THAT RETURNS A LOGICAL VALUE
C RDISTB - READ A TABLE OF INGESTION PATHWAY NUCLIDE DATA
C RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C LYNN RITCHIE, DIV. 6415, 5 JANUARY 1988
C
C MODIFIED 5/16/89, DIC, LOG # 5/11/89-A, ADD A CONTROL FLAG, COUPLD,
C          WHICH DETERMINES WHETHER LONG-TERM AND GROWING-SEASON ACTIONS
C          ARE TO BE PERFORMED IN A COUPLED FASHION (MUTUALLY DEPENDENT)
C MODIFIED 6/20/89/, DIC, LOG # 9/16/88-C,
C   IMPROVE THE VALIDATION OF DATA PERFORMED BY SUBROUTINE STPATH
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C Modified 6/05/96, D.C., misc. restrictions on code input parameters
C Modified 6/25/96, ensure L-EDEWBODY and L-EFFECTIVE are defined when the
C   new COMIDA2-based food-chain model is being utilized
      EXTERNAL CGET1, ERRLOC, IGET1, RDISTB, RGETN
      INTRINSIC  MAX, MIN
      EXTERNAL LGET1
      LOGICAL  LGET1
      CHARACTER*80  CGET1
      PARAMETER (MXNUC=10,MXCRP=10)
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      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      LOGICAL COUPLD
      COMMON /COUPLD/ COUPLD
      CHARACTER*20 CRPTIT(MXCRP)
      COMMON /CROPS/ NFCRPS,CRPTIT
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      COMMON /CRPTRF/ NTTRM, CTCOEF(MXNUC,MXCRP,3),
     *                CTHALF(MXNUC,MXCRP,3)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ISOCRP/ DCYPCH(MXNUC,MXCRP), DCYPCM(MXNUC,MXCRP),
     *                DCYPCB(MXNUC,MXCRP), FPLSCH(MXNUC,MXCRP)
      CHARACTER*8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /ISOTDT/ TFMLK(MXNUC), TFBF(MXNUC), DCYPMH(MXNUC),
     *                DCYPBH(MXNUC)
      CHARACTER*20   NAMCRP
      COMMON /NAMCRP/ NAMCRP(MXCRP)
      COMMON /NAMWPI/ NAMWPI(MXNUC)
      CHARACTER*8    NAMWPI
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /PSCDIR/ PSCMLK(MXNUC), PSCOTH(MXNUC)
      COMMON /RTINTR/ GCMAXR(MXNUC), QROOT(MXNUC)
      COMMON /SITEDT/ DPRATE,DSRATE,FRFIM,FRNFIM,VALWF,VALWNF,POPCST
      COMMON /TRCMPL/ TCROOT(MXNUC,MXCRP)
      COMMON /WATRM/  NUMWPA, NUMWPI
      COMMON /WTRDTA/ WINGF(MXNUC,4), WSHFRI(MXNUC), WSHRTA(MXNUC),
     1                NDXWII(MXNUC)
      COMMON /CROPDT/ FRCTCH(MXCRP), FRCTCM(MXCRP), FRCTCB(MXCRP),
     *                FRCTFL(MXCRP), FRCTCP(MXCRP), FRCTCO(MXCRP)
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
      CHARACTER *7 FGR_FLAG
      COMMON /FGR_FLAG/ FGR_FLAG
C
      LOGICAL OK, OKI, FOUND, RANGE
      CHARACTER*11 RECNAM
      CHARACTER*8 NAMIPI
      DIMENSION    NAMIPI(MXNUC)
      CHARACTER*8  NAME8
      CHARACTER*20 NAME20
      CHARACTER*40 BIN_FILE
C
      OK = .TRUE.
C
C  DEFINE A FLAG INDICATING WHETHER TO USE THE NEW OR OLD FOOD PATHWAY MODEL
C
      RECNAM = 'CHFDPATH001'
      L = 11
      FDPATH = CGET1 (RECNAM(1:L), 1, 3, ' ', 3, RANGE, FOUND,
     1                'STPATH', 'FDPATH')
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      IF (.NOT. FOUND) THEN
      WRITE(6,*) 'NO VALUE FOR FOOD PATHWAY FLAG (FDPATH) FOUND'
      WRITE(7,*) 'NO VALUE FOR FOOD PATHWAY FLAG (FDPATH) FOUND'
      CALL ABORT ('terminating')
      ELSE
        IF (FDPATH .EQ. 'old') FDPATH = 'OLD'
        IF (FDPATH .EQ. 'new') FDPATH = 'NEW'
        IF (FDPATH .NE. 'OLD') THEN
          IF (FDPATH .NE. 'NEW') THEN
            WRITE(6,*) 'FOOD MODEL PATHWAY CODE (FDPATH)',FDPATH,
     1                 ' NOT VALID'
            WRITE(7,*) 'FOOD MODEL PATHWAY CODE (FDPATH)',FDPATH,
     1                 ' NOT VALID'
          CALL ABORT ('terminating')
          ENDIF
        ENDIF
      ENDIF

      IF (FDPATH .EQ. 'NEW') THEN
C make sure that L-EDEWBODY and L-EFFECTIVE are defined for NEW food model
        IF (FGR_FLAG .NE. 'FGRDCF' .AND. .NOT. ORGFLG(7)) THEN
          WRITE(6,*)'ERROR: you must set L-EDEWBODY to .TRUE. in the'
          WRITE(6,*)'EARLY file at record identifier MIORGDEF007'
          WRITE(7,*)'ERROR: you must set L-EDEWBODY to .TRUE. in the'
          WRITE(7,*)'EARLY file at record identifier MIORGDEF007'
          CALL ABORT ('terminating')
        ELSE IF (FGR_FLAG .NE. 'FGRDCF' .AND. .NOT. ORGFLG(12)) THEN
          WRITE(6,*)'ERROR: you must set L-THYROID to .TRUE. in the'
          WRITE(6,*)'EARLY file at record identifier MIORGDEF012'
          WRITE(7,*)'ERROR: you must set L-THYROID to .TRUE. in the'
          WRITE(7,*)'EARLY file at record identifier MIORGDEF012'
          CALL ABORT ('terminating')
        ENDIF
        BIN_FILE = CGET1 ('BIN_FILE001', 0, 1, ' ', 40, RANGE, FOUND,
     1                    'INPUT', 'BIN_FILE')
        IF (.NOT. RANGE .OR. .NOT. FOUND) CALL ABORT ('TERMINATING')
C
        CALL OPNFIL (BIN_FILE, 'COMIDA2 binary file', 20, 'UNFORMATTED')
C
C process the information on the COMIDA2 binary output file, UNIT 20
C
        CALL READ_IT
C
        CALL RGETN ('DOSEMILK001', 0, DOSEMILK, 2, 0., 1.E20,
     1              RANGE, FOUND, 'STPATH', 'DOSEMILK')
        IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
          WRITE(6,*)'ERROR READING INPUT PARAMETER DOSEMILK FROM',
     1              ' CHRONC INPUT FILE'
          WRITE(7,*)'ERROR READING INPUT PARAMETER DOSEMILK FROM',
     1              ' CHRONC INPUT FILE'
          CALL ABORT ('TERMINATING EXECUTION')
        ENDIF
        CALL RGETN ('DOSEOTHR001', 0, DOSEOTHR, 2, 0., 1.E20,
     1              RANGE, FOUND, 'STPATH', 'DOSEOTHR')
        IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
          WRITE(6,*)'ERROR READING INPUT PARAMETER DOSEMILK FROM',
     1              ' CHRONC INPUT FILE'
          WRITE(7,*)'ERROR READING INPUT PARAMETER DOSEMILK FROM',
     1              ' CHRONC INPUT FILE'
          CALL ABORT ('TERMINATING EXECUTION')
        ENDIF
        CALL RGETN ('DOSELONG001', 0, DOSELONG, 2, 0., 1.E20,
     1              RANGE, FOUND, 'STPATH', 'DOSLONG')
```

```
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER DOSELONG FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER DOSELONG FROM',
     1            ' CHRONC INPUT FILE'
        CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C Define the number of nuclides in the water ingestion model--
C
      NUMWPI = IGET1 ('CHNUMWPI001', 0, 1, 0, 10,
     1                RANGE, FOUND, 'STPATH', 'NUMWPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER NUMWPI FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER NUMWPI FROM',
     1            ' CHRONC INPUT FILE'
        CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
      NUMWPA = 1
      NFIISO = NUMWPI
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH NUCLIDE.  NAMES MUST HAVE A LENGTH BETWEEN 3 AND 8.
C   THE SET OF WATER INGESTION NUCLIDES MUST BE A SUBSET OF THE
C   FOOD INGESTION NUCLIDES
C
      RECNAM = 'CHWTRISO001'
      L = 11
      DO 20 I = 1, NUMWPI
      NAMWPI(I) = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     1                   'STPATH', 'NAMWPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,115)'ERROR READING NAMWPI ',I,' FROM CHRONC',
     1              ' INPUT FILE'
        WRITE(7,115)'ERROR READING NAMWPI ',I,' FROM CHRONC',
     1              ' INPUT FILE'
        CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      DO 10 J = 1, I - 1
      IF (NAMWPI(I) .EQ. NAMWPI(J)) THEN
        CALL ERRLOC ('STPATH', 'NAMWPI')
        WRITE(6,*)' THIS WATER PATHWAY NUCLIDE SPECIFIED TWICE: ',
     1            NAMWPI(I)
        WRITE(6,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1               RECNAM(1:8), I
        WRITE(7,*)' THIS WATER PATHWAY NUCLIDE SPECIFIED TWICE: ',
     1            NAMWPI(I)
        WRITE(7,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1               RECNAM(1:8), I
        CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
   10 CONTINUE
   20 L = 8
C
C  CHECK THAT THE NAMES OF THE WATER INGESTION NUCLIDES CAN BE FOUND
C
      DO 40 I = 1, NUMWPI
      DO 30 N = 1, NUMISO
      IF (NAMWPI(I) .EQ. NUCNAM(N)) GO TO 40
   30 CONTINUE
      CALL ERRLOC ('STPATH', 'NAMWPI')
```

```
         WRITE (6,*) ' WATER INGESTION NUCLIDE ',NAMWPI(I),
     1               ' NOT FOUND IN THE NUCLIDE NAME TABLE.'
         WRITE (7,*) ' WATER INGESTION NUCLIDE ',NAMWPI(I),
     1               ' NOT FOUND IN THE NUCLIDE NAME TABLE.'
         CALL ABORT ('TERMINATING EXECUTION')
   40    NDXWII(I) = N
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT INDICATES
C   THE INITIAL WASHOFF FRACTION FOR EACH WATER PATHWAY NUCLIDE.
C
         CALL RGETN ('CHWTRISO001', 2, WSHFRI, NUMWPI, 0.0, 1.0,
     1               RANGE, FOUND, 'STPATH', 'WSHFRI')
         IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
           WRITE(6,*)'ERROR READING INPUT PARAMETER WSHFRI FROM',
     1               ' CHRONC INPUT FILE'
           WRITE(7,*)'ERROR READING INPUT PARAMETER WSHFRI FROM',
     1               ' CHRONC INPUT FILE'
           CALL ABORT ('TERMINATING EXECUTION')
         ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT INDICATES
C   THE ANNUAL WASHOFF FRACTION FOR EACH WATER PATHWAY NUCLIDE.
C
         CALL RGETN ('CHWTRISO001', 3, WSHRTA, NUMWPI, 0.0, 1.0,
     1               RANGE, FOUND, 'STPATH', 'WSHRTA')
         IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
           WRITE(6,*)'ERROR READING INPUT PARAMETER WSHRTA FROM',
     1               ' CHRONC INPUT FILE'
           WRITE(7,*)'ERROR READING INPUT PARAMETER WSHRTA FROM',
     1               ' CHRONC INPUT FILE'
           CALL ABORT ('TERMINATING EXECUTION')
         ENDIF
C
C  CONVERT ANNUAL RATE TO PER SECOND RATE
C
         CNVRT = 1. / (365.25 * 24. * 3600.)
         DO 50 I = 1, NUMWPI
   50    WSHRTA(I) = WSHRTA(I) * CNVRT
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 4 THAT INDICATES
C   THE INGESTION FACTOR IN THE WATERSHED WITH INDEX 1.
C
         CALL RGETN ('CHWTRISO001', 4, WINGF, NUMWPI, 0.0, 1.0,
     1               RANGE, FOUND, 'STPATH', 'WINGF')
         IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
           WRITE(6,*)'ERROR READING INPUT PARAMETER WINGF FROM',
     1               ' CHRONC INPUT FILE'
           WRITE(7,*)'ERROR READING INPUT PARAMETER WINGF FROM',
     1               ' CHRONC INPUT FILE'
           CALL ABORT ('TERMINATING EXECUTION')
         ENDIF
         RETURN
       ENDIF
C
 115   FORMAT(1X,A,I2,A,A)
 116   FORMAT(1X,A,A,I1)
 811   FORMAT(1X,20X,6(4X,A6))
 812   FORMAT(1X,A20,6(2X,1PE10.2))
C
C  DEFINE A FLAG INDICATING WHETHER FOOD ACTIONS ARE COUPLED IN OLD MODEL
C
       COUPLD = LGET1 ('CHCOUPLD001', 0, .FALSE., FOUND,
     1                 'STPATH', 'COUPLD')
```

```
      IF (.NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER COUPLD FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER COUPLD FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE NUMBER OF DEFINED CROPS IN THE FOOD INGESTION MODEL
C
      NFICRP = IGET1 ('CHNFICRP001', 0, 1, 0, 10,
     1                RANGE, FOUND, 'STPATH', 'NFICRP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER NFICRP FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER NFICRP FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH CROP.  NAMES MUST HAVE A LENGTH BETWEEN 6 AND 20.
C   THE ORDER OF THE CROP NAMES MUST BE THE SAME AS THE ORDER OF THE
C   CROP NAMES IN THE TABLE OF CROP DEFINITIONS AND THE SAME AS ORDER
C   AS THEY WERE PREVIOUSLY DEFINED
C
      RECNAM = 'CHCRPTBL001'
      L = 11
      DO 150 I = 1, NFICRP
      NAMCRP(I) = CGET1 (RECNAM(1:L), 1, 6, ' ', 20, RANGE, FOUND,
     1                   'STPATH', 'NAMCRP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,115)'ERROR READING NAMCRP ',I,' FROM CHRONC',
     1              ' INPUT FILE'
        WRITE(7,115)'ERROR READING NAMCRP ',I,' FROM CHRONC',
     1              ' INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
      DO 140 J = 1, I - 1
      IF (NAMCRP(I) .EQ. NAMCRP(J)) THEN
        CALL ERRLOC ('STPATH', 'NAMCRP')
        WRITE(6,*) 'NAME OF THIS CROP SPECIFIED TWICE: ', NAMCRP(I)
        WRITE(6,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1               RECNAM(1:8), I
        WRITE(7,*) 'NAME OF THIS CROP SPECIFIED TWICE: ', NAMCRP(I)
        WRITE(7,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1               RECNAM(1:8), I
  120   FORMAT(A,A,I3.3)
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  140 CONTINUE
  150 L = 8
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT INDICATES
C   THE FRACTION OF EACH CROP CONSUMED BY HUMANS.
C
      CALL RGETN ('CHCRPTBL001', 2, FRCTCH, NFICRP, 0.0, 1.0,
     1            RANGE, FOUND, 'STPATH', 'FRCTCH')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER FRCTCH FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER FRCTCH FROM',
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     1              ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT INDICATES
C   THE FRACTION OF EACH CROP CONSUMED BY DAIRY COWS.
C
      CALL RGETN ('CHCRPTBL001', 3, FRCTCM, NFICRP, 0.0, 1.0,
     1              RANGE, FOUND, 'STPATH', 'FRCTCM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER FRCTCM FROM',
     1              ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER FRCTCM FROM',
     1              ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 4 THAT INDICATES
C   THE FRACTION OF EACH CROP CONSUMED BY MEAT ANIMALS IN OLD
C   FOOD MODEL OR BEEF ANIMALS IN NEW FOOD MODEL
C
      CALL RGETN ('CHCRPTBL001', 4, FRCTCB, NFICRP, 0.0, 1.0,
     1              RANGE, FOUND, 'STPATH', 'FRCTCB')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER FRCTCB FROM',
     1              ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER FRCTCB FROM',
     1              ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  DEFINE THE NUMBER OF NUCLIDES IN THE WATER INGESTION MODEL
C
      NUMWPI = IGET1 ('CHNUMWPI001', 0, 1, 0, 10,
     1                RANGE, FOUND, 'STPATH', 'NUMWPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER NUMWPI FROM',
     1              ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER NUMWPI FROM',
     1              ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH NUCLIDE.  NAMES MUST HAVE A LENGTH BETWEEN 3 AND 8.
C   THE SET OF WATER INGESTION NUCLIDES MUST BE A SUBSET OF THE
C   FOOD INGESTION NUCLIDES
C
      RECNAM = 'CHWTRISO001'
      L = 11
      DO 250 I = 1, NUMWPI
      NAMWPI(I) = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     1                   'STPATH', 'NAMWPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,115)'ERROR READING NAMWPI ',I,' FROM CHRONC',
     1              ' INPUT FILE'
        WRITE(7,115)'ERROR READING NAMWPI ',I,' FROM CHRONC',
     1              ' INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      DO 240 J = 1, I - 1
      IF (NAMWPI(I) .EQ. NAMWPI(J)) THEN
        CALL ERRLOC ('STPATH', 'NAMWPI')
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         WRITE(6,*)' THIS WATER PATHWAY NUCLIDE SPECIFIED TWICE: ',
     1              NAMWPI(I)
         WRITE(6,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1                RECNAM(1:8), I
         WRITE(7,*)' THIS WATER PATHWAY NUCLIDE SPECIFIED TWICE: ',
     1              NAMWPI(I)
         WRITE(7,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1                RECNAM(1:8), I
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  240 CONTINUE
  250 L = 8
C
C  CHECK THAT THE NAMES OF THE WATER INGESTION NUCLIDES CAN BE FOUND
C
      DO 270 I = 1, NUMWPI
      DO 260 N = 1, NUMISO
      IF (NAMWPI(I) .EQ. NUCNAM(N)) GO TO 270
  260 CONTINUE
      CALL ERRLOC ('STPATH', 'NAMWPI')
      WRITE (6,*) ' WATER INGESTION NUCLIDE ',NAMWPI(I),
     1            ' NOT FOUND IN THE NUCLIDE NAME TABLE.'
      WRITE (7,*) ' WATER INGESTION NUCLIDE ',NAMWPI(I),
     1            ' NOT FOUND IN THE NUCLIDE NAME TABLE.'
      CALL ABORT ('TERMINATING EXECUTION')
  270 NDXFII(I) = N
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT INDICATES
C   THE INITIAL WASHOFF FRACTION FOR EACH WATER PATHWAY NUCLIDE.
C
      CALL RGETN ('CHWTRISO001', 2, WSHFRI, NUMWPI, 0.0, 1.0,
     1            RANGE, FOUND, 'STPATH', 'WSHFRI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER WSHFRI FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER WSHFRI FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT INDICATES
C   THE ANNUAL WASHOFF FRACTION FOR EACH WATER PATHWAY NUCLIDE.
C
      CALL RGETN ('CHWTRISO001', 3, WSHRTA, NUMWPI, 0.0, 1.0,
     1            RANGE, FOUND, 'STPATH', 'WSHRTA')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER WSHRTA FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER WSHRTA FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  CONVERT ANNUAL RATE TO PER SECOND RATE
C
      CNVRT = 1. / (365.25 * 24. * 3600.)
      DO 280 I = 1, NUMWPI
  280 WSHRTA(I) = WSHRTA(I) * CNVRT
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 4 THAT INDICATES
C   THE INGESTION FACTOR IN THE WATERSHED WITH INDEX 1.
C
      CALL RGETN ('CHWTRISO001', 4, WINGF, NUMWPI, 0.0, 1.0,
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     1              RANGE, FOUND, 'STPATH', 'WINGF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER WINGF FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER WINGF FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  INITIALIZE THE NUMBER OF WATERSHEDS IN THE WATER INGESTION MODEL
C
      NUMWPA = 1
C
C  DEFINE THE NUMBER OF NUCLIDES IN THE CHRONC FOOD INGESTION MODEL
C
      IF (FDPATH .EQ. 'OLD') THEN
        NFIISO = IGET1 ('CHNFIISO001', 0, NUMWPI, 0, 10,
     1                  RANGE, FOUND, 'STPATH', 'NFIISO')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
          WRITE(6,*)'ERROR READING INPUT PARAMETER NFIISO FROM',
     1              ' CHRONC INPUT FILE'
          WRITE(7,*)'ERROR READING INPUT PARAMETER NFIISO FROM',
     1              ' CHRONC INPUT FILE'
        CALL ABORT ('TERMINATING EXECUTION')
        ENDIF
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH NUCLIDE.  NAMES MUST HAVE A LENGTH BETWEEN 3 AND 8.
C   THE SET OF WATER INGESTION NUCLIDES MUST REAPPEAR IN THE SAME
C   ORDERING AT THE BEGINNING OF THE FOOD INGESTION NUCLIDE LIST.
C
        RECNAM = 'CHISODEF001'
      L = 11
      DO 350 I = 1, NFIISO
        NAMIPI(I) = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     1                     'STPATH', 'NAMIPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
          WRITE(6,115)'ERROR READING NAMIPI ',I,' FROM CHRONC',
     1                ' INPUT FILE'
          WRITE(7,115)'ERROR READING NAMIPI ',I,' FROM CHRONC',
     1                ' INPUT FILE'
        CALL ABORT ('TERMINATING EXECUTION')
        ENDIF
      DO 340 J = 1, I - 1
          IF (NAMIPI(I) .EQ. NAMIPI(J)) THEN
            CALL ERRLOC ('STPATH', 'NAMIPI')
            WRITE(6,*)' THIS INGESTION PATHWAY NUCLIDE SPECIFIED',
     1                ' TWICE: ', NAMIPI(I)
            WRITE(6,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1                   RECNAM(1:8), I
            WRITE(7,*)' THIS INGESTION PATHWAY NUCLIDE SPECIFIED',
     1                ' TWICE: ', NAMIPI(I)
            WRITE(7,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
     1                   RECNAM(1:8), I
          CALL ABORT ('TERMINATING EXECUTION')
          ENDIF
  340   CONTINUE
  350   L = 8
C
C  CHECK THAT THE ORDER OF THE INGESTION PATHWAY MODEL NUCLIDE NAMES
C   CORRESPONDS TO THE ORDER OF THE WATER PATHWAY NUCLIDE NAMES
C
        DO 370 I = 1, NUMWPI
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      IF (NAMWPI(I) .NE. NAMIPI(I)) THEN
          CALL ERRLOC ('STPATH', 'NAMIPI')
          WRITE(6,120) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                 RECNAM(1:8), I
          WRITE(7,120) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                 RECNAM(1:8), I
        CALL ABORT ('TERMINATING EXECUTION')
        ENDIF
  370 CONTINUE
C
C  TRANSFER THE NON-WATER INGESTION NUCLIDES ONTO THE LIST.
C  IT IS VERY CONFUSING TO USE THE WATER INGESTION LIST, NAMWPI,
C  TO STORE THE NAMES OF THE FOOD INGESTION NUCLIDES, BUT THAT'S
C  THE WAY LYNN RITCHIE CHOSE TO DO IT.   D. CHANIN, 6/1/89
C
      DO 380 I = NUMWPI + 1, NFIISO
  380 NAMWPI(I) = NAMIPI(I)
    ENDIF
C
C  CHECK THAT THE FOOD INGESTION NUCLIDES WHICH ARE NOT ON THE
C  LIST OF WATER INGESTION NUCLIDES HAVE BEEN DEFINED BY THE MODEL
C
    DO 400 I = NUMWPI + 1, NFIISO
    DO 390 N = 1, NUMISO
    IF (NAMWPI(I) .EQ. NUCNAM(N)) GO TO 400
  390 CONTINUE
    CALL ERRLOC ('STPATH', 'NAMIPI')
    WRITE (6,*) ' FOOD INGESTION NUCLIDE ',NAMWPI(I),
   1            ' NOT FOUND IN THE NUCLIDE NAME TABLE.'
    WRITE(6,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
   1              RECNAM(1:8), I
    WRITE (7,*) ' FOOD INGESTION NUCLIDE ',NAMWPI(I),
   1            ' NOT FOUND IN THE NUCLIDE NAME TABLE.'
    WRITE(7,120) ' THE ERROR IS LOCATED AT RECORD IDENT: ',
   1              RECNAM(1:8), I
    CALL ABORT ('TERMINATING EXECUTION')
  400 NDXFII(I) = N
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT DEFINES THE
C   RETENTION FACTORS (FRACTION RETAINED) OF THE INGESTION PATHWAY
C   NUCLIDES IN MILK INGESTED BY MAN
C
    CALL RGETN ('CHISODEF001', 2, DCYPMH, NFIISO, 0.0, 1.0,
   1            RANGE, FOUND, 'STPATH', 'DCYPMH')
    IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
    WRITE(6,*)'ERROR READING INPUT PARAMETER DCYPMH FROM',
   1           ' CHRONC INPUT FILE'
    WRITE(7,*)'ERROR READING INPUT PARAMETER DCYPMH FROM',
   1           ' CHRONC INPUT FILE'
    CALL ABORT ('TERMINATING EXECUTION')
    ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT DEFINES THE
C   RETENTION FACTORS (FRACTION RETAINED) OF THE INGESTION PATHWAY
C   NUCLIDES IN MEAT INGESTED BY MAN
C
    CALL RGETN ('CHISODEF001', 3, DCYPBH, NFIISO, 0.0, 1.0,
   1            RANGE, FOUND, 'STPATH', 'DCYPBH')
    IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
    WRITE(6,*)'ERROR READING INPUT PARAMETER DCYPBH FROM',
   1           ' CHRONC INPUT FILE'
    WRITE(7,*)'ERROR READING INPUT PARAMETER DCYPBH FROM',
   1           ' CHRONC INPUT FILE'
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      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 4 THAT DEFINES THE
C   TRANSFER FACTORS (Bq TRANSFERED)/(Bq INGESTED) OF THE INGESTION
C   PATHWAY NUCLIDES IN MILK CONSUMED BY MAN
C
      CALL RGETN ('CHISODEF001', 4, TFMLK, NFIISO, 0.0, 1.0,
     1            RANGE, FOUND, 'STPATH', 'TFMLK')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER TFMLK FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER TFMLK FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 5 THAT DEFINES THE
C   TRANSFER FACTORS (Bq TRANSFERED)/(Bq INGESTED) OF THE INGESTION
C   PATHWAY NUCLIDES IN MEAT CONSUMED BY MAN
C
      CALL RGETN ('CHISODEF001', 5, TFBF, NFIISO, 0.0, 1.0,
     1            RANGE, FOUND, 'STPATH', 'TFBF')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER TFBF FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER TFBF FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE ROOT UPTAKE TRANSFER FACTORS FOR CROPS BY NUCLIDE FOR THE
C   LONG-TERM TRANSFER COMPONENT (Bq TRANSFERED)/(Bq DEPOSITED)
C
      OKI = .TRUE.
      CALL RDISTB (OKI, 'CHTCROOT001', 8, 0., 1.,
     1   TCROOT(1,1),'TCROOT',TCROOT(1,2),'TCROOT',TCROOT(1,3),'TCROOT',
     2   TCROOT(1,4),'TCROOT',TCROOT(1,5),'TCROOT',TCROOT(1,6),'TCROOT',
     3   TCROOT(1,7),'TCROOT',TCROOT(1,8),'TCROOT',TCROOT(1,9),'TCROOT',
     4   TCROOT(1,10),'TCROOT')
      IF (.NOT. OKI) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER TCROOT FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER TCROOT FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE RETENTION FACTORS (FRACTION RETAINED) FOR CROPS BY NUCLIDE,
C   CROP PRODUCTION TO CONSUMPTION BY HUMANS
C
      OKI = .TRUE.
      CALL RDISTB (OKI, 'CHDCYPCH001', 8, 0., 1.,
     1   DCYPCH(1,1),'DCYPCH',DCYPCH(1,2),'DCYPCH',DCYPCH(1,3),'DCYPCH',
     2   DCYPCH(1,4),'DCYPCH',DCYPCH(1,5),'DCYPCH',DCYPCH(1,6),'DCYPCH',
     3   DCYPCH(1,7),'DCYPCH',DCYPCH(1,8),'DCYPCH',DCYPCH(1,9),'DCYPCH',
     4   DCYPCH(1,10),'DCYPCH')
      IF (.NOT. OKI) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER DCYPCH FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER DCYPCH FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
```

```
      ENDIF
C
C  READ THE RETENTION FACTORS (FRACTION RETAINED) FOR CROPS BY NUCLIDE,
C   CROP PRODUCTION TO CONSUMPTION BY MILK ANIMALS
C
      OKI = .TRUE.
      CALL RDISTB (OKI, 'CHDCYPCM001', 8, 0., 1.,
     1 DCYPCM(1,1),'DCYPCM',DCYPCM(1,2),'DCYPCM',DCYPCM(1,3),'DCYPCM',
     2 DCYPCM(1,4),'DCYPCM',DCYPCM(1,5),'DCYPCM',DCYPCM(1,6),'DCYPCM',
     3 DCYPCM(1,7),'DCYPCM',DCYPCM(1,8),'DCYPCM',DCYPCM(1,9),'DCYPCM',
     4 DCYPCM(1,10),'DCYPCM')
      IF (.NOT. OKI) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER DCYPCM FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER DCYPCM FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE RETENTION FACTORS (FRACTION RETAINED) FOR CROPS BY NUCLIDE,
C   CROP PRODUCTION TO CONSUMPTION BY MEAT ANIMALS
C
      OKI = .TRUE.
      CALL RDISTB (OKI, 'CHDCYPCB001', 8, 0., 1.,
     1   DCYPCB(1,1),'DCYPCB',DCYPCB(1,2),'DCYPCB',DCYPCB(1,3),'DCYPCB',
     2   DCYPCB(1,4),'DCYPCB',DCYPCB(1,5),'DCYPCB',DCYPCB(1,6),'DCYPCB',
     3   DCYPCB(1,7),'DCYPCB',DCYPCB(1,8),'DCYPCB',DCYPCB(1,9),'DCYPCB',
     4   DCYPCB(1,10),'DCYPCB')
      IF (.NOT. OKI) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER DCYPCB FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER DCYPCB FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE CROP PREPARATION AND PROCESSING FACTORS (FRACTION RETAINED)
C   BY NUCLIDE FOR FOOD CROPS CONSUMED BY HUMANS
C
      OKI = .TRUE.
      CALL RDISTB (OKI, 'CHFPLSCH001', 8, 0., 1.,
     1   FPLSCH(1,1),'FPLSCH',FPLSCH(1,2),'FPLSCH',FPLSCH(1,3),'FPLSCH',
     2   FPLSCH(1,4),'FPLSCH',FPLSCH(1,5),'FPLSCH',FPLSCH(1,6),'FPLSCH',
     3   FPLSCH(1,7),'FPLSCH',FPLSCH(1,8),'FPLSCH',FPLSCH(1,9),'FPLSCH',
     4   FPLSCH(1,10),'FPLSCH')
      IF (.NOT. OKI) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER FPLSCH FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER FPLSCH FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE NUMBER OF TERMS IN THE CROP TRANSFER FUNCTION
C
      NTTRM = IGET1 ('CHNTRTRM001', 0, 1, 0, 3,
     1               RANGE, FOUND, 'STPATH', 'NTTRM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER NTTRM FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER NTTRM FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
```

```
      ENDIF
C
C  LOOP ON THE NUMBER OF TERMS IN THE CROP TRANSFER FUNCTION
C
      DO 420 I = 1, NTTRM
C
C  READ THE CROP TRANSFER COEFFICIENTS FOR TERM I OF THE TRANSFER
C   FUNCTION EQUATION BY NUCLIDE (Bq TRANSFERED)/(Bq DEPOSITED)
C
C  CONSTRUCT RECORD INDENTIFIER: CHCTCOEF101,CHCTCOEF201,CHCTCOEF301
C
      WRITE(RECNAM,410) 'CHCTCOEF', I, '01'
  410 FORMAT(A,I1,A)
      CALL RDISTB (OKI, RECNAM, 9, 0., 1.,
     1        CTCOEF(1,1,I), 'CTCOEF', CTCOEF(1,2,I), 'CTCOEF',
     2        CTCOEF(1,3,I), 'CTCOEF', CTCOEF(1,4,I), 'CTCOEF',
     3        CTCOEF(1,5,I), 'CTCOEF', CTCOEF(1,6,I), 'CTCOEF',
     4        CTCOEF(1,7,I), 'CTCOEF', CTCOEF(1,8,I), 'CTCOEF',
     5        CTCOEF(1,9,I), 'CTCOEF', CTCOEF(1,10,I),'CTCOEF')
      IF (.NOT. OKI) THEN
      WRITE(6,116)'ERROR READING INPUT PARAMETER CTCOEF FROM',
     1            ' CHRONC INPUT FILE FOR TERM',I
      WRITE(7,116)'ERROR READING INPUT PARAMETER CTCOEF FROM',
     1            ' CHRONC INPUT FILE FOR TERM',I
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE CROP TRANSFER HALF-LIVES FOR TERM I OF THE TRANSFER
C   FUNCTION EQUATION BY NUCLIDE (SECONDS)
C
      OKI = .TRUE.
C
C  CONSTRUCT RECORD INDENTIFIER: CHCTHALF101,CHCTHALF201,CHCTHALF301
C
      WRITE(RECNAM,410) 'CHCTHALF', I, '01'
      CALL RDISTB (OKI, RECNAM, 9, 1., 1.E14,
     1        CTHALF(1,1,I), 'CTHALF', CTHALF(1,2,I), 'CTHALF',
     2        CTHALF(1,3,I), 'CTHALF', CTHALF(1,4,I), 'CTHALF',
     3        CTHALF(1,5,I), 'CTHALF', CTHALF(1,6,I), 'CTHALF',
     4        CTHALF(1,7,I), 'CTHALF', CTHALF(1,8,I), 'CTHALF',
     5        CTHALF(1,9,I), 'CTHALF', CTHALF(1,10,I),'CTHALF')
      IF (.NOT. OKI) THEN
      WRITE(6,116)'ERROR READING INPUT PARAMETER CTHALF FROM',
     1            ' CHRONC INPUT FILE FOR TERM',I
      WRITE(7,116)'ERROR READING INPUT PARAMETER CTHALF FROM',
     1            ' CHRONC INPUT FILE FOR TERM',I
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  420 CONTINUE
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH CROP.  NAMES MUST HAVE A LENGTH BETWEEN 6 AND 20.
C   THE ORDER OF THE CROP NAMES MUST BE THE SAME AS THE ORDER OF THE
C   CROP NAMES IN THE TABLE OF CROP DEFINITIONS AND THE SAME AS ORDER
C   OF THE COLUMNS CONTAINING THE CROP DATA GIVEN FOR EACH CHRONIC
C   INGESTION MODEL NUCLIDE.
C
      RECNAM = 'CHCRPRGN001'
      L = 11
      DO 450 I = 1, NFICRP
      NAME20 = CGET1 (RECNAM(1:L), 1, 6, ' ', 20, RANGE, FOUND,
     1            'STPATH', 'NAMCRP')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
```

```
         WRITE(6,115)'ERROR READING CROP NAME',I,'FROM REGIONAL CROP',
     1               ' DATA SECTION OF CHRONC INPUT FILE'
         WRITE(7,115)'ERROR READING CROP NAME',I,'FROM REGIONAL CROP',
     1               ' DATA SECTION OF CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      IF (NAME20 .NE. NAMCRP(I)) THEN
        CALL ERRLOC ('STPATH', 'NAMCRP')
        WRITE(6,120) ' MISMATCHED CROP NAME AT RECORD IDENT: ',
     1                RECNAM(1:8), I
        WRITE(7,120) ' MISMATCHED CROP NAME AT RECORD IDENT: ',
     1                RECNAM(1:8), I
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  450 L = 8
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT INDICATES
C   THE BEGINNING OF THE GROWING SEASON (IN DAYS) FOR EACH CROP.
C   ACCEPTABLE VALUES ARE BETWEEN 1. AND 365.
C
      CALL RGETN('CHCRPRGN001', 2, TGSBEG, NFICRP, 1., 365.,
     1           RANGE, FOUND, 'STPATH', 'TGSBEG')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER TGSBEG FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER TGSBEG FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      TSEEDG = TGSBEG(1)
      DO 480 I = 2, NFICRP
  480 TSEEDG = MIN (TSEEDG, TGSBEG(I))
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT INDICATES
C   THE END OF THE GROWING SEASON (IN DAYS) FOR EACH CROP.
C   ACCEPTABLE VALUES ARE BETWEEN TSEEDG AND 365.
C
      CALL RGETN('CHCRPRGN001', 3, TGSEND, NFICRP, TSEEDG, 365.,
     1           RANGE, FOUND, 'STPATH', 'TGSEND')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER TGSEND FROM',
     1            ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER TGSEND FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      THRVST = TGSEND(1)
      DO 490 I = 2, NFICRP
  490 THRVST = MAX (THRVST, TGSEND(I))
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 4 THAT INDICATES
C   THE SHARE OF THE FARMLAND USED TO GROW EACH CROP.
C   ACCEPTABLE VALUES ARE BETWEEN 0. AND 1.
C
      CALL RGETN('CHCRPRGN001', 4, FRCTFL, NFICRP, 0., 1.,
     1           RANGE, FOUND, 'STPATH', 'FRCTFL')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        WRITE(6,*)'ERROR READING INPUT PARAMETER TCROOT FROM',
     1            ' CHRONC INPUT FILE'
        WRITE(7,*)'ERROR READING INPUT PARAMETER TCROOT FROM',
     1            ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
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C
C  READ THE TABLE OF PROTECTIVE ACTION GUIDES FOR THE GROWING-SEASON
C   PATHWAY FOR BOTH MILK AND NON-MILK FOOD PRODUCTION
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH NUCLIDE.  NAMES MUST HAVE A LENGTH BETWEEN 3 AND 8.
C   THE SET OF NUCLIDE NAMES MUST BE IN THE SAME ORDER AS IN THE
C   TABLE OF NUCLIDE DEFINITIONS
C
      RECNAM = 'CHPAGMCP001'
      L = 11
      DO 650 I = 1, NFIISO
      NAME8 = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     1               'STPATH', 'NAMIPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING NUCLIDE NAME',I, 'FROM PROTECTIVE',
     1             ' ACTION SECTION OF CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING NUCLIDE NAME',I, 'FROM PROTECTIVE',
     1             ' ACTION SECTION OF CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      IF (NAME8 .NE. NAMWPI(I)) THEN
      CALL ERRLOC ('STPATH', 'NAMIPI')
      WRITE(6,120) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                RECNAM(1:8), I
      WRITE(7,120) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                RECNAM(1:8), I
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  650 L = 8
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT DEFINES THE
C   PROTECTIVE ACTION GUIDE (Bq/SQ METER) FOR MILK CROP PRODUCTION
C
      CALL RGETN ('CHPAGMCP001', 2, PSCMLK, NFIISO, 1.E-6, 1.E20,
     1             RANGE, FOUND, 'STPATH', 'PSCMLK')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER PSCMLK FROM',
     1             ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER PSCMLK FROM',
     1             ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT DEFINES THE
C   PROTECTIVE ACTION GUIDE (Bq/SQ METER) FOR NON-MILK CROP PRODUCTION
C
      CALL RGETN ('CHPAGMCP001', 3, PSCOTH, NFIISO, 1.E-6, 1.E20,
     1             RANGE, FOUND, 'STPATH', 'PSCOTH')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER PSCOTH FROM',
     1             ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER PSCOTH FROM',
     1             ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ THE TABLE OF PROTECTIVE ACTION GUIDES FOR LONG-TERM
C   TRANSFER TO FARM CROPS FROM ROOT AND SOIL UPTAKE
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH NUCLIDE.  NAMES MUST HAVE A LENGTH BETWEEN 3 AND 8.
C   THE SET OF NUCLIDE NAMES MUST BE IN THE SAME ORDER AS IN THE
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```
C   TABLE OF NUCLIDE DEFINITIONS
C
      RECNAM = 'CHPAGLTS001'
      L = 11
      DO 750 I = 1, NFIISO
      NAME8 = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     1                'STPATH', 'NAMIPI')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER NAMIPI',I,' FROM',
     1       ' PROTECTION ACTION GUIDE SECTION OF THE CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER NAMIPI',I,' FROM',
     1       ' PROTECTION ACTION GUIDE SECTION OF THE CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
      IF (NAME8 .NE. NAMWPI(I)) THEN
      CALL ERRLOC ('STPATH', 'NAMIPI')
      WRITE(6,120) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                 RECNAM(1:8), I
      WRITE(7,120) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                 RECNAM(1:8), I
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
  750 L = 8
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 2 THAT DEFINES THE
C  PERMISSIBLE SURFACE CONCENTRATION (Bq/SQ M) FOR LONG-TERM UPTAKE
C
      CALL RGETN ('CHPAGLTS001', 2, GCMAXR, NFIISO, 1.E-6, 1.E35,
     1              RANGE, FOUND, 'STPATH', 'GCMAXR')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER GCMAXR FROM',
     1             ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER GCMAXR FROM',
     1             ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT DEFINES THE
C  ANNUAL DEPLETION RATE FOR LONG-TERM UPTAKE
C
      CALL RGETN ('CHPAGLTS001', 3, QROOT, NFIISO, 0., 1.E35,
     1              RANGE, FOUND, 'STPATH', 'QROOT')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      WRITE(6,*)'ERROR READING INPUT PARAMETER QROOT FROM',
     1             ' CHRONC INPUT FILE'
      WRITE(7,*)'ERROR READING INPUT PARAMETER QROOT FROM',
     1             ' CHRONC INPUT FILE'
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
C
      RETURN
      END
*DECK READ_IT
      SUBROUTINE READ_IT
C
C ACCDATES - is the array of accident dates for which results were calculated
C IFALLOUT - pointer to the COMIDA2 fallout date closest to the MACCS accident
C FDNUCLID - is the list of nuclides for which food data is supplied
C IFPOINT - is a pointer array for the food nuclides giving location in the
C   overall MACCS2 list of nuclides, a zero indicates that the food
C   nuclide at that position in the list does not appear in the MACCS2 list
C LASTACUM - is the last exposure year for which ingestion results were
C   calculated in COMIDA2, the values can range from 9 to 50 years
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C NMFDNUCL - is the number of food nuclides for which data is found
C NUMDATES - is the number of accident dates (fallout time) for which COMIDA2
C   results were calaculated
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER*8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
C
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
C
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
C
      CHARACTER  *8 FDNUCLID
      CHARACTER *80 HEADER1, TITDOS1
      COMMON /FOODCHAR/ HEADER1, TITDOS1(2), FDNUCLID(MAX_NUC)
C
      CHARACTER *80 TITDOS
      COMMON /TITDOS/TITDOS(2)
C
      CHARACTER *10 ORGNAM(NACUM_ORG)
C
C The zero index for the accumulation period is a trick to force zero doses
C if permanent interdiction is required.
C
      DO 10 N = 1, MAX_NUC
      DO 10 M = 1, MAX_ACCDAT
      DO 10 L = 0, NACUM_TIM
      DO 10 J = 1, NCROP_TYP
      DO 10 I = 1, NACUM_ORG
   10 ACU_DOSE(I,J,L,M,N) = 0.
C
      DO 20 N = 1, MAX_NUC
      DO 20 M = 1, MAX_ACCDAT
      DO 20 L = 0, NACUM_TIM
      DO 20 J = 1, NCROP_TYP
      DO 20 I = 1, 2
   20 PRJ_DOSE(I,J,L,M,N) = 0.
C
      READ (20) HEADER1, TITDOS1, ORGNAM, NMFDNUCL, LASTACUM, LASTSTOR,
     1          NUMDATES, (ACCDATES(I),I=1,NUMDATES), CONCBASE
      WRITE(6,*) 'COMIDA2 binary file header = ', HEADER1
      WRITE(6,*) 'COMIDA2 descriptive title  = ', TITDOS1
C
      IF (TITDOS(1) .NE. TITDOS1(1)) THEN
      WRITE(6,60) TITDOS(1), TITDOS1(1)
      WRITE(7,60) TITDOS(1), TITDOS1(1)
   60 FORMAT(/' ERROR: mismatched headers on DCF files;',
     1 /' MACCS2 has to use the same file that was used by COMIDA2!',
     2//' Header of file presently being used for MACCS2:',/1X, A,
     3//' Header of file previously used for COMIDA2:',/1X, A)
      CALL ABORT ('TERMINATING EXECUTION')
      ENDIF
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C
      DO 100 N = 1, NMFDNUCL
      DO 100 M = 1, NUMDATES
      READ (20) INUC, FDNUCLID(N), ACCDATES(M),
     1 (((ACU_DOSE(I,J,L,M,N),I=1,NACUM_ORG),J=1,NCROP_TYP),
     2       L=1,LASTSTOR),
     2 (((PRJ_DOSE(I,J,L,M,N),I=1,NPROJ_ORG),J=1,NCROP_TYP),
     4       L=1,NACUM_TIM)
  100 CONTINUE
C
      CLOSE (20)
C
      DO 220 ILOOK = 1, NMFDNUCL
      IFPOINT(ILOOK) = 0
      DO 200 IFIND = 1, NUMISO
      IF (FDNUCLID(ILOOK) .EQ. NUCNAM(IFIND)) THEN
      IFPOINT(ILOOK) = IFIND
      GO TO 220
      ENDIF
  200 CONTINUE
      WRITE(6,210) FDNUCLID(ILOOK)
  210 FORMAT (1X, A, ' found on .BIN file from COMIDA2 but not in ',
     1        'MACCS2--ingestion ignored')
  220 CONTINUE
      RETURN
      END
*DECK RDISTB
      SUBROUTINE RDISTB (OK,CRDNAM,KYLNGT,VALMIN,VALMAX,CLM2VR,CLM2NM,
     1                   CLM3VR,CLM3NM,CLM4VR,CLM4NM,CLM5VR,CLM5NM,
     2                   CLM6VR,CLM6NM,CLM7VR,CLM7NM,CLM8VR,CLM8NM,
     3                   CLM9VR,CLM9NM,CLMAVR,CLMANM,CLMBVR,CLMBNM)
C
C  READ A TABLE OF INGESTION PATHWAY NUCLIDE DATA
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE STPATH.
C
C  EACH TABLE OF INGESTION PATHWAY NUCLIDE DATA CONSISTS OF NFIISO
C   CARDS AND (NFICRP + 1) COLUMNS.  THE COLUMN ORDER MUST COINCIDE
C   WITH THE ORDER OF THE CROP DEFINITIONS AND THE CARD ORDER MUST
C   COINCIDE WITH THE ORDER OF THE NUCLIDE DEFINITIONS.  THE
C   CARD ORDER IS CHECKED AGAINST THE ORDER OF THE NUCLIDE
C   DEFINITIONS.
C
C  GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO RDISTB
C
C   CLM2NM - NAME OF THE VARIABLE READ FROM COLUMN 2
C   CLM3NM - NAME OF THE VARIABLE READ FROM COLUMN 3
C   CLM4NM - NAME OF THE VARIABLE READ FROM COLUMN 4
C   CLM5NM - NAME OF THE VARIABLE READ FROM COLUMN 5
C   CLM6NM - NAME OF THE VARIABLE READ FROM COLUMN 6
C   CLM7NM - NAME OF THE VARIABLE READ FROM COLUMN 7
C   CLM8NM - NAME OF THE VARIABLE READ FROM COLUMN 8
C   CLM9NM - NAME OF THE VARIABLE READ FROM COLUMN 9
C   CLMANM - NAME OF THE VARIABLE READ FROM COLUMN 10
C   CLMBNM - NAME OF THE VARIABLE READ FROM COLUMN 11
C   CRDNAM - IDENTIFIER OF THE CARD BEING READ
C   KYLNGT - THE KEY LENGTH OF THE CARD IDENTIFIER
C   NAMWPI(I) - THE NAME OF THE INGESTION PATHWAY NUCLIDE MEMBER M
C                 OF DECAY CHAIN I
C   NFICRP - THE NUMBER OF FOOD INGESTION MODEL CROPS
C   NFIISO - THE NUMBER OF FOOD INGESTION MODEL NUCLIDES
C   VALMIN - THE MINIMUM VALUE OF THE DATA FROM THE NUCLIDE TABLE
C   VALMAX - THE MAXIMUM VALUE OF THE DATA FROM THE NUCLIDE TABLE
```

```
C
C  GLOSSARY OF VARIABLE NAMES OF DATA DEFINED IN OR OUTPUT FROM RDISTB
C
C   CLM2VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 2 DATA
C   CLM3VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 3 DATA
C   CLM4VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 4 DATA
C   CLM5VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 5 DATA
C   CLM6VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 6 DATA
C   CLM7VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 7 DATA
C   CLM8VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 8 DATA
C   CLM9VR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 9 DATA
C   CLMAVR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 10 DATA
C   CLMBVR - THE NAME OF THE VARIABLE USED TO STORE COLUMN 11 DATA
C   NAMISO(I) - NAME OF THE NUCLIDE DEFINED ON CARD I
C   OK      - LOGICAL FLAG TO SHOW THE SUCCESS OF READING THE TABLE
C   RECNAM - LOCAL NAME OF THE TABLE BEING READ
C
C  GLOSSARY OF EXTERNALS
C
C   CGET1  - INTERFACE TO INPRE THAT RETURNS A CHARACTER VALUE
C   ERRLOC - INTERFACE TO INPRE THAT LOCATES AN INPUT ERROR
C   RGETN  - INTERFACE TO INPRE THAT RETURNS A REAL ARRAY
C
C LYNN RITCHIE, DIV. 6415, 5 JAN 1988.
C
C MODIFIED 6/20/89/, DIC, LOG # 9/16/88-C,
C   MAKE THE VALIDATION OF NUCLIDE NAME HERE CONSISTENT WITH STPATH
C
      EXTERNAL CGET1, ERRLOC, RGETN
      CHARACTER *80 CGET1
      PARAMETER (MXNUC=10,MXCRP=10)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      COMMON /NAMWPI/ NAMWPI(MXNUC)
      CHARACTER *8    NAMWPI
      DIMENSION CLM2VR(*), CLM3VR(*), CLM4VR(*), CLM5VR(*),
     1          CLM6VR(*), CLM7VR(*), CLM8VR(*), CLM9VR(*),
     2          CLMAVR(*), CLMBVR(*)
      CHARACTER *8 NAMISO
      CHARACTER *6  CLM2NM, CLM3NM, CLM4NM, CLM5NM, CLM6NM, CLM7NM,
     1              CLM8NM, CLM9NM, CLMANM, CLMBNM
      CHARACTER *11 CRDNAM, RECNAM
      LOGICAL OK, RANGE, FOUND
C
C  READ AN ARRAY OF NAMES FROM COLUMN NUMBER 1 THAT INDICATES THE
C   NAME OF EACH NUCLIDE.  NAMES MUST HAVE A LENGTH BETWEEN 3 AND 8.
C   THE FOOD INGESTION NUCLIDES MUST BE A SUBSET OF THE WATER NUCLIDES.
C
      RECNAM = CRDNAM
      L = 11
      DO 350 I = 1, NFIISO
      NAMISO = CGET1 (RECNAM(1:L), 1, 3, ' ', 8, RANGE, FOUND,
     $               'RDISTB', 'NAMISO')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C
C  CHECK THAT THE ORDER OF THE NUCLIDE NAMES CORRESPONDS TO THE SAME
C   ORDER IN WHICH THEY WERE INITIALLY DEFINED
C
      IF (NAMISO .NE. NAMWPI(I)) THEN
        CALL ERRLOC ('RDISTB', 'NAMISO')
        WRITE(6,340) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
```

```
     1                    RECNAM(1:9), I
        WRITE(7,340) ' MISMATCHED NUCLIDE NAME AT RECORD IDENT: ',
     1                    RECNAM(1:9), I
  340   FORMAT(A,A,I2.2)
        OK = .FALSE.
        RETURN
      ENDIF
  350 L = KYLNGT
C
C  READ A COLUMN OF DATA FOR EACH FOOD INGESTION MODEL CROP
C
      IF (NFICRP .LT. 1) RETURN
C
C  READ THE ARRAY OF REALS FROM COLUMN NUMBER 2 THAT DEFINES THE
C   VARIABLE CLM2VR WITH THE NAME CLM2NM
C
      CALL RGETN (CRDNAM, 2, CLM2VR, NFIISO, VALMIN, VALMAX,
     $              RANGE, FOUND, 'RDISTB', CLM2NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 2) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 3 THAT DEFINES THE
C   VARIABLE CLM3VR WITH THE NAME CLM3NM
C
      CALL RGETN (CRDNAM, 3, CLM3VR, NFIISO, VALMIN, VALMAX,
     $              RANGE, FOUND, 'RDISTB', CLM3NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 3) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 4 THAT DEFINES THE
C   VARIABLE CLM4VR WITH THE NAME CLM4NM
C
      CALL RGETN (CRDNAM, 4, CLM4VR, NFIISO, VALMIN, VALMAX,
     $              RANGE, FOUND, 'RDISTB', CLM4NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 4) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 5 THAT DEFINES THE
C   VARIABLE CLM5VR WITH THE NAME CLM5NM
C
      CALL RGETN (CRDNAM, 5, CLM5VR, NFIISO, VALMIN, VALMAX,
     $              RANGE, FOUND, 'RDISTB', CLM5NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 5) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 6 THAT DEFINES THE
C   VARIABLE CLM6VR WITH THE NAME CLM6NM
C
      CALL RGETN (CRDNAM, 6, CLM6VR, NFIISO, VALMIN, VALMAX,
     $              RANGE, FOUND, 'RDISTB', CLM6NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 6) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 7 THAT DEFINES THE
C   VARIABLE CLM7VR WITH THE NAME CLM7NM
C
      CALL RGETN (CRDNAM, 7, CLM7VR, NFIISO, VALMIN, VALMAX,
     $              RANGE, FOUND, 'RDISTB', CLM7NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 7) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 7 THAT DEFINES THE
C   VARIABLE CLM7VR WITH THE NAME CLM7NM
```

```
C
      CALL RGETN (CRDNAM, 8, CLM8VR, NFIISO, VALMIN, VALMAX,
     $            RANGE, FOUND, 'RDISTB', CLM8NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 8) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 9 THAT DEFINES THE
C   VARIABLE CLM9VR WITH THE NAME CLM9NM
C
      CALL RGETN (CRDNAM, 9, CLM9VR, NFIISO, VALMIN, VALMAX,
     $            RANGE, FOUND, 'RDISTB', CLM9NM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 9) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 10 THAT DEFINES THE
C   VARIABLE CLMAVR WITH THE NAME CLMANM
C
      CALL RGETN (CRDNAM, 10, CLMAVR, NFIISO, VALMIN, VALMAX,
     $            RANGE, FOUND, 'RDISTB', CLMANM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (NFICRP .LT. 10) RETURN
C
C  READ AN ARRAY OF REALS FROM COLUMN NUMBER 11 THAT DEFINES THE
C   VARIABLE CLMBVR WITH THE NAME CLMBNM
C
      CALL RGETN (CRDNAM, 11, CLMBVR, NFIISO, VALMIN, VALMAX,
     $            RANGE, FOUND, 'RDISTB', CLMBNM)
      IF ( .NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      RETURN
      END
*DECK IXOT9
      SUBROUTINE IXOT9 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT TYPE 9
C
C LONG-TERM POPULATION DOSE BROKEN DOWN BY THE 12 LONG-TERM PATHWAYS.
C FOR EACH REQUEST ON THE "CHRONC" USER INPUT FILE, 12 RESULTS ARE PRODUCED.
C
C THIS ROUTINE IS CALLED BY ROUTINE INPCHR.
C
C GLOSSARY OF VARIABLE NAMES:
C
C CXDF9  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE 9 RESULT
C IXCOD9 - INDEX TO THE CHRONC ORGAN TO BE USED FOR THIS RESULT
C IX1DS9 - INNER SPATIAL ELEMENT OF THE REGION OF INTEREST FOR THIS RESULT
C IX2DS9 - OUTER SPATIAL ELEMENT OF THE REGION OF INTEREST FOR THIS RESULT
C NXUM9  - NUMBER OF PATHWAY POP. DOSE RESULTS THAT ARE TO BE PRODUCED
C
C GLOSSARY OF EXTERNALS:
C
C CGET1 -- INTERFACE TO INPRE THAT RETURNS AN CHARACTER VALUE
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C IGET1 -- INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C
C D. CHANIN, DIV. 6415, 12 NOV 87
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL CGET1, DOCCDF, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
      CHARACTER *80 CGET1
```

```
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CXDF9
      COMMON /RESLT9/ NXUM9, IXCOD9(10), IX1DS9(10), IX2DS9(10),
     1                CXDF9(10)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 NAME, RECNAM
C
      OK = .TRUE.
C
C  NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED,
C  FOR EACH REQUESTED RESULT EITHER A SET OF 12 (FOR THE OLD FOOD MODEL),
C  OR 17 (FOR THE NEW FOOD MODEL) IS ALWAYS PRODUCED.
C
      NXUM9 = IGET1 ('TYPE9NUMBER', 1, 0, 0, 10, RANGE, FOUND,
     $               'IXOT9', 'NXUM9')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NXUM9 .EQ. 0) THEN
        RETURN
      ELSE
        RECNAM = 'TYPE9OUT001'
      ENDIF
C
C  NAME OF THE ORGAN DOSE TO BE USED IN CALCULATING THIS RESULT
C
      L = 11
      DO 400 IOUT = 1, NXUM9
      NAME = CGET1 (RECNAM(1:L), 1, 2, ' ', 11, RANGE, FOUND,
     $              'IXOT9', 'ORGNAM')
      IF (RANGE .AND. FOUND) THEN
      DO 300 IORG = INICHR, NUMORG
      IF (NAME .EQ. ORGNAM(IORG)) THEN
          IXCOD9(IOUT) = IORG
          GO TO 400
        ENDIF
  300   CONTINUE
      OK = .FALSE.
        WRITE(6,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        WRITE(7,*) 'ORGAN NAME NOT FOUND IN LIST OF ORGANS: ', NAME
        CALL ERRLOC ('IXOT9', 'ORGNAM')
      ELSE
        OK = .FALSE.
      ENDIF
  400 L = 8
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, IX1DS9, NXUM9, 1, NUMRAD,
     $            RANGE, FOUND, 'IXOT9', 'IX1DS9')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 3, IX2DS9, NXUM9, 1, NUMRAD,
```

```
     $            RANGE, FOUND, 'IXOT9', 'IX2DS9')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 600 IOUT = 1, NXUM9
      IF (IX1DS9(IOUT) .GT. IX2DS9(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('IXOT9', 'IX1DS9, IX2DS9')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  600 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NXUM9
      CXDF9(IOUT) = DOCCDF (RECNAM(1:L), 4)
  900 L = 8
      RETURN
      END
*DECK IXOT10
      SUBROUTINE IXOT10 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT TYPE 10
C
C  ECONOMIC COST MEASURES:
C   TOTAL COSTS, DECONTAMINATION COSTS, INTERDICTION COSTS,
C   CONDEMNATION COSTS, MILK DISPOSAL, AND CROP DISPOSAL COSTS.
C
C THIS ROUTINE IS CALLED BY ROUTINE INPCHR.
C
C GLOSSARY OF VARIABLES NAMES OF INPUT DATA TO IXOT10:
C
C FLAG10 - SIGNIFIES WHETHER THE USER DESIRES THE ECONOMIC RESULTS PRODUCED
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM IXOT10:
C
C CXDF10  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 10 RESULT
C ICODE  - CODE NUMBERS THAT SIGNIFY THE VARIOUS TYPES OF ECONOMIC RESULTS
C I1DS10 - INNER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C I2DS10 - OUTER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C NXUM10 - NUMBER OF ECONOMIC RESULTS THAT ARE TO BE PRODUCED
C
C GLOSSARY OF EXTERNALS:
C
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF A CCDF TABLE IS REQUESTED
C IGET1 - INTERFACE TO INPRE THAT RETURNS AN INTEGER VALUE
C
C D. CHANIN, DIV. 6415, 12 NOV 87
C
C THIS ROUTINE CHANGED DRASTICALLY 12 NOV 87 FOR MACCS 1.5.
C
C PREVIOUS VERSION REQUIRED THE USER TO SPECIFY EACH RESULT ON THE INPUT FILE.
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL DOCCDF, IGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF
```

```
      PARAMETER (MAXRAD=35,MAXNUC=150, MAXORG=16, MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL CXDF10
      COMMON /RSLT10/ NXUM10, I1DS10(10), I2DS10(10), CXDF10(10)
C
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 RECNAM
C
      OK = .TRUE.
C
C  NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED,
C  FOR EACH REQUESTED RESULT A SET OF 13 IS ALWAYS PRODUCED.
C
      NXUM10 = IGET1 ('TYP10NUMBER', 1, 0, 0, 10, RANGE, FOUND,
     $                'IXOT10', 'NXUM10')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NXUM10 .EQ. 0) RETURN
      RECNAM = 'TYP10OUT001'
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 1, I1DS10, NXUM10, 1, NUMRAD,
     $            RANGE, FOUND, 'IXOT10', 'I1DS10')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I2DS10, NXUM10, 1, NUMRAD,
     $            RANGE, FOUND, 'IXOT10', 'I2DS10')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 600 IOUT = 1, NXUM10
      IF (I1DS10(IOUT) .GT. I2DS10(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('IXOT10', 'I1DS10, I2DS10')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  600 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NXUM10
      CXDF10(IOUT) = DOCCDF (RECNAM(1:L), 3)
  900 L = 8
      RETURN
      END
*DECK IXOT11
      SUBROUTINE IXOT11 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT TYPE 11
```

```
C
C MAXIMUM DISTANCE OF A SPECIFIED LONG TERM ACTION:
C DECONTAMINATION, INTERDICTION, CONDEMNATION, MILK DISPOSAL, OR CROP DISPOSAL.
C
C THIS ROUTINE IS CALLED BY ROUTINE INPCHR.
C
C GLOSSARY OF VARIABLES NAMES OF INPUT DATA TO IXOT11:
C
C FLAG11 - SIGNIFIES WHETHER THE USER DESIRES THE DISTANCE RESULTS PRODUCED
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM IXOT11:
C
C CXDF11 - LOGICAL FLAG INDICATING THAT CCDF TABLES ARE BEING REQUESTED
C NXUM11 - NUMBER OF DISTANCE RESULTS THAT ARE TO BE PRODUCED
C
C GLOSSARY OF EXTERNALS:
C
C DOCCDF - INTERFACE TO INPRE THAT FINDS IF CCDF TABLES ARE REQUESTED
C LGET1 -- INTERFACE TO INPRE THAT RETURNS A LOGICAL VALUE
C
C D. CHANIN, DIV. 6415, 12 NOV 87
C
C THIS ROUTINE CHANGED DRASTICALLY 12 NOV 87 FOR MACCS 1.5.
C
C PREVIOUS VERSION REQUIRED THE USER TO SPECIFY EACH RESULT ON THE INPUT FILE.
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/25/89-A,
C   MISSING LOGICAL DECLARATION FOR FUNCTION LGET1
C
      EXTERNAL DOCCDF, LGET1
C  NO INTRINSIC FUNCTIONS
      LOGICAL DOCCDF, LGET1
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL CXDF11
      COMMON /RSLT11/ NXUM11, CXDF11
C
      LOGICAL FLAG11, OK, FOUND
      CHARACTER *11 RECNAM
C
      OK     = .TRUE.
      RECNAM = 'TYP11FLAG11'
      FLAG11 = LGET1 (RECNAM, 0, .FALSE., FOUND, 'IXOT11', 'FLAG11')
      IF (.NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (FLAG11) THEN
        NXUM11 = 1
      ELSE
        NXUM11 = 0
        RETURN
      ENDIF
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      CXDF11 = DOCCDF (RECNAM, 2)
      RETURN
```

```
      END
*DECK IXOT12
      SUBROUTINE IXOT12 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT TYPE 12
C
C IMPACT OF A SPECIFIED LONG TERM ACTION:
C AREA OF DECONTAMINATION, INTERDICTION, CONDEMNATION,
C MILK DISPOSAL, CROP DISPOSAL,
C AND POPULATION RESIDING ON DECONTAMINATED, INTERDICTED OR CONDEMNED LAND.
C
C THIS ROUTINE IS CALLED BY ROUTINE INPCHR.
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM IXOT12:
C
C CXDF12 - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C          REQUESTED FOR THIS TYPE 12 RESULT
C NXUM12 - NUMBER OF ECONOMIC RESULTS THAT ARE TO BE PRODUCED
C
C D. CHANIN, DIV. 6415, 12 NOV 87
C
C THIS ROUTINE CHANGED DRASTICALLY 12 NOV 87 FOR MACCS 1.5.
C PREVIOUS VERSION REQUIRED THE USER TO SPECIFY EACH RESULT ON THE INPUT FILE.
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL DOCCDF, IGET1
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL DOCCDF
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(35), SPALEN(35), SPAEND(0:35)
      LOGICAL CXDF12
      COMMON /RSLT12/ NXUM12, I1DS12(10), I2DS12(10), CXDF12(10)
      LOGICAL OK, RANGE, FOUND
      CHARACTER *11 RECNAM
      OK = .TRUE.
C
C  NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED,
C  FOR EACH REQUESTED RESULT A SET OF 8 IS ALWAYS PRODUCED.
C
      NXUM12 = IGET1 ('TYP12NUMBER', 1, 0, 0, 10, RANGE, FOUND,
     $                'IXOT12', 'NXUM12')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
        RETURN
      ENDIF
      IF (NXUM12 .EQ. 0) RETURN
      RECNAM = 'TYP12OUT001'
C
C  INNER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 1, I1DS12, NXUM12, 1, NUMRAD,
     $            RANGE, FOUND, 'IXOT12', 'I1DS12')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
C
C  OUTER RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 2, I2DS12, NXUM12, 1, NUMRAD,
     $            RANGE, FOUND, 'IXOT12', 'I2DS12')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        OK = .FALSE.
```

```
        RETURN
      ENDIF
C
C  CHECK THAT THE SPECIFICATIONS OF INNER AND OUTER RINGS ARE CONCENTRIC
C
      DO 600 IOUT = 1, NXUM12
      IF (I1DS12(IOUT) .GT. I2DS12(IOUT)) THEN
        OK = .FALSE.
        CALL ERRLOC ('IXOT12', 'I1DS12, I2DS12')
        WRITE(6,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
        WRITE(7,*) 'INNER RING CANNOT BE OUTSIDE OF OUTER RING'
      ENDIF
  600 CONTINUE
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NXUM12
      CXDF12(IOUT) = DOCCDF (RECNAM(1:L), 3)
  900 L = 8
      RETURN
      END
*DECK IXOT13
      SUBROUTINE IXOT13 (OK)
C
C THIS ROUTINE DEFINES THE OPTIONS FOR RESULT TYPE 13
C
C Maximal individual food dose for a specified distance and organ
C
C THIS ROUTINE IS CALLED BY ROUTINE INPCHR.
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM IXOT10:
C
C CXDF13  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 10 RESULT
C IRAD13  - radial distance index
C IORG13  - organ index (1-effective, 2-thyroid)
C
C J.ROLLSTIN, DIV. 6415, 11 DEC 92
C
      EXTERNAL DOCCDF, IGET1, CGET1
C  NO INTRINSIC FUNCTIONS
C
      PARAMETER (MAXRAD=35,MAXNUC=150, MAXORG=16, MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL CXDF13
      COMMON /RSLT13/ NXUM13, IRAD13(40), IORG13(40), CXDF13(40)

      LOGICAL OK, RANGE, FOUND, DOCCDF
      CHARACTER*80  CGET1
      CHARACTER *11 RECNAM
      CHARACTER *9  ORGNAM

      OK = .TRUE.
C
      NXUM13 = IGET1 ('TYP13NUMBER', 1, 0, 0, 20, RANGE, FOUND,
     $                'IXOT13', 'NXUM13')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
      OK = .FALSE.
      RETURN
```

```
      ENDIF

      IF (NXUM13 .EQ. 0) RETURN
      RECNAM = 'TYP13OUT001'
C
C  DISTANCE RING OF THE REGION OF INTEREST
C
      CALL IGETN (RECNAM, 1, IRAD13, NXUM13, 1, NUMRAD,
     $            RANGE, FOUND, 'IXOT13', 'IRAD13')
      IF (.NOT. RANGE .OR. .NOT. FOUND) OK = .FALSE.
      IF (.NOT. OK) RETURN
C
C  ORGAN INDEX OF INTEREST  (1-EFFECTIVE, 2-THYROID),
C
      L = 11
      DO 750 I = 1, NXUM13
      ORGNAM = CGET1 (RECNAM(1:L), 2, 7, ' ', 9, RANGE, FOUND,
     $                'IXOT13', 'ORGNAM')
      IF (.NOT. RANGE .OR. .NOT. FOUND) THEN
        CALL ABORT ('input error detected by IXOT13')
      ELSE IF (ORGNAM .EQ. 'EFFECTIVE') THEN
        IORG13(I) = 1
      ELSE IF (ORGNAM .EQ. 'THYROID') THEN
        IORG13(I) = 2
      ELSE
        WRITE(6,*) 'Invalid organ name for Type 13 result'
        WRITE(6,*) 'Allowable values are EFFECTIVE or THYROID'
        WRITE(7,*) 'Invalid organ name for Type 13 result'
        WRITE(7,*) 'Allowable values are EFFECTIVE or THYROID'
        CALL ABORT ('input error detected by IXOT13')
      ENDIF
  750 L = 8
C
C  CHECK FOR A TEXT FIELD SIGNIFYING THAT A CCDF TABLE IS REQUESTED
C
      L = 11
      DO 900 IOUT = 1, NXUM13
      CXDF13(IOUT) = DOCCDF (RECNAM(1:L), 3)
  900 L = 8

      RETURN
      END
*DECK SDFINF
      SUBROUTINE SDFINP (IUNIT, OK)
C
C THIS ROUTINE READS AND CHECKS THE SITE DATA FILE FROM UNIT IUNIT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHRINP AS PART OF THE "CHRONC" MODULE.
C IT HAS A SISTER ROUTINE NAMED INPOPU WHICH IS USED BY THE "EARLY" MODULE.
C DO NOT CHANGE ONE WITHOUT CHECKING THE OTHER ROUTINE!!!!!!!!!!!!!!!!!!!
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO SDFINP:
C
C NAMCRP(I) - THE NAME OF THE FOOD INGESTION MODEL CROP I
C NAMWPI(I) - THE NAME OF THE WATER PATHWAY NUCLIDE MEMBER M OF DECAY
C                CHAIN I
C NFICRP - THE NUMBER OF FOOD INGESTION CROPS DEFINED IN THE MODEL
C NSTRTG - Total number of emergency response scenarios used by "EARLY"
C NUMCOR - THE DEFINED NUMBER OF COARSE GRID DIVISIONS
C NUMRAD - THE DEFINED NUMBER OF SPATIAL INTERVALS IN THE RADIAL DIRECTION
C NUMWPA - THE NUMBER OF WATERSHEDS DEFINED IN THE MODEL
C NUMWPI - THE NUMBER OF WATER PATHWAY NUCLIDES DEFINED IN THE MODEL
C SPAEND - ARRAY OF RADIAL DISTANCES TO SPATIAL ELEMENT ENDPOINTS (METERS)
```

```
C TGSBEG(I) - THE TIME (DAYS) THE GROWING SEASON BEGINS FOR CROP I
C TGSEND(I) - THE TIME (DAYS) THE GROWING SEASON ENDS FOR CROP I
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM SDFINP:
C
C ASFP(I) - AVERAGE ANNUAL FARM SALES FOR ECONOMIC REGION I
C CROP   - CROP NAME
C DPF(I) - FRACTION OF FARM SALES FROM DAIRY IN ECONOMIC REGION I
C FRCLCP - FRACTION OF LAND USED FOR THIS CROP
C FRCLND(I,J) - TOTAL LAND FRACTION OF GRID ELEMENT AT SPATIAL
C               DISTANCE I AND DIRECTION J
C FRCTFL(I) - FRACTION OF FARMLAND USED FOR CROP I
C FRMFRC(I) - FARM LAND FRACTION IN ECONOMIC REGION I
C GBEG   - TIME IN DAYS THE GROWING SEASON FOR CROP BEGINS
C GEND   - TIME IN DAYS THE GROWING SEASON FOR CROP ENDS
C I      - LOOP COUNTER
C ICHECK(I) - INDEX OF THE MODEL DATA CROP NAME IN THE SITE DATA
C IDNTFI - IDENTIFIER OF ONE SITE DATA CHARACTERISTIC
C INDREG(I,J) - ECONOMIC REGION INDEX OF GRID ELEMENT AT SPATIAL
C               DISTANCE I AND DIRECTION J
C INDWTR(I,J) - WATERSHED INDEX OF GRID ELEMENT AT SPATIAL DISTANCE I
C               AND DIRECTION J
C MAXRGN - MAXIMUM NUMBER OF ECONOMIC REGIONS
C MAXWPA - MAXIMUM NUMBER OF WATER PATHWAYS
C NCPGRN - THE NUMBER OF CROP GROWING SEASONS DEFINED IN SITE DATA
C NDXFII - POINTER ARRAY SHOWING LOCATION OF THE FOOD/WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE OLD FOOD MODEL
C NDXWII - POINTER ARRAY SHOWING LOCATION OF THE WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE NEW FOOD MODEL
C NECRGN - THE NUMBER OF ECONOMIC REGIONS DEFINED IN THE SITE DATA
C NMISO  - NUCLIDE NAME
C NMRGN(I) - NAME OF ECONOMIC REGION I
C NSPDTS - THE NUMBER OF SPATIAL DISTANCES DEFINED IN THE SITE DATA
C NWNDIR - THE NUMBER OF WIND DIRECTIONS DEFINED IN THE SITE DATA
C NWPISO - THE NUMBER OF WATER PATHWAY NUCLIDES DEFINED IN SITE DATA
C NWTRSH - THE NUMBER OF WATERSHED DEFINITIONS IN THE SITE DATA
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF THIS ROUTINE
C OK1    - LOGICAL FLAG INDICATING COMPATIBILITY OF THE SITE DATA
C TITSDF - TWO LINE HEADER DESCRIBING THIS SITE DATA FILE
C VFRM(I) - AVERAGE FARM VALUE FOR ECONOMIC REGION I ($ / HECTARE)
C VNFRM(I) - AVERAGE NON-FARM VALUE FOR ECONOMIC REGION I ($ / RESIDENT)
C WINGF(I,J) - WATER PATHWAY INGESTION FACTOR OF WATER PATHWAY
C              NUCLIDE I DEPOSITED IN WATERSHED J
C WTRINF(I) - WATER PATHWAY INGESTION FACTOR FOR WATERSHED I
C
C GLOSSARY OF EXTERNALS:
C
C CKINDX - CKECK THAT THE INDICES IN AN ARRAY DO NOT EXCEED A BOUND
C CXPTBL - CHECK THAT TWO NUMBERS ARE COMPATIBLE (EQUAL)
C KMPTBL - CHECKS THAT ARGUMENT #1 HAS VALUE BETWEEN 1 AND ARGUMENT #2
C MATCH  - CHECK THAT TWO VARIABLE NAMES MXTCH
C
C  LYNN RITCHIE, DIV. 6415, 18 JUNE 1985.
C MODIFIED 11 FEBRUARY 1988
C MODIFIED 6/20/89/, DIC, LOG # 11/18/88-A,
C   THERE IS INSUFFICIENT STORAGE ALLOCATED FOR STATE ECONOMIC DATA,
C   THE UPPER LIMIT ON NECRGN IS BEING CHANGED FROM 59 TO 99,
C   VALIDATION IS BEING ADDED TO ENSURE THAT A VALID VALUE IS SUPPLIED.
C MODIFIED 6/20/89/, DIC, LOG # 1/18/89-A,
C   INSUFFICIENT ARRAY DIMENSION FOR ICHECK
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C MODIFIED 7/30/91, D. CHANIN, #8/2/91-A, CHANGE HOLLERITHS TO TYPE CHARACTER
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C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL CKINDX, CXPTBL, KMPTBL, MATCH
      INTRINSIC ABS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      CHARACTER *10   NMRGN
      COMMON /NAMRGN/ NMRGN(99)
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      COMMON /FRCLND/ FRCLND(MAXRAD,16)
      CHARACTER *22   IDNTFI
      COMMON /IDNTFI/ IDNTFI
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /INDWTR/ INDWTR(MAXRAD,16)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *20   NAMCRP
      COMMON /NAMCRP/ NAMCRP(MXCRP)
      COMMON /NAMWPI/ NAMWPI(MXNUC)
      CHARACTER *8    NAMWPI
      COMMON /WATRM/  NUMWPA, NUMWPI
      COMMON /WTRDTA/ WINGF(MXNUC,4), WSHFRI(MXNUC), WSHRTA(MXNUC),
     1                NDXWII(MXNUC)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      CHARACTER *6    WTNAME
      COMMON /WTNAME/ WTNAME
      COMMON /CROPDT/ FRCTCH(MXCRP), FRCTCM(MXCRP), FRCTCB(MXCRP),
     *                FRCTFL(MXCRP), FRCTCP(MXCRP), FRCTCO(MXCRP)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH

      DIMENSION ICHECK(10), SPDSTS(35), WTRINF(4)
      CHARACTER CROP *22, NMISO *8, SEPRTR *22, TITSDF(2) *80
      LOGICAL OK, OK1
C
C  INPUT ROUTINE FOR SITE SPECIFIC DATA FILE
C
      OK = .TRUE.
      OK1 = .TRUE.

      REWIND (IUNIT)

      READ(IUNIT,50) TITSDF
   50 FORMAT(A/A)

      WRITE(6,51) TITSDF
   51 FORMAT(//' Processing a Site Data File with Header:'
     1       1X,A/2X,A/)
C
C  READ THE SITE DATA FILE DESCRIPTION AND CHECK COMPATIBILITY
C
C  NUMBER OF SPATIAL INTERVALS
C
      READ(IUNIT,52) NSPDTS,IDNTFI
   52 FORMAT(I4,1X,A)
      CALL CXPTBL (NSPDTS, NUMRAD, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
```

```
C
C  NUMBER OF WIND DIRECTIONS
C
      READ(IUNIT,52) NWNDIR, IDNTFI
      CALL CXPTBL (NWNDIR, NUMCOR, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
C
C READ THE NUMBER OF CROP/GROWING SEASONS
C NOTE: For both OLD and NEW food model the Site Data File is required to follow
C       the syntax described in NUREG/CR-4691, Vol. 1, Appendix B.
C       However, the # of crops defined on the file, NCPGZN, must be given
C       a value between 1 and 10.  This requiremnet is implemented to maintain,
C       for now, consistency of file formats between OLD and NEW food model.
C DIC, 4/7/95
C
      READ(IUNIT,52) NCPGZN, IDNTFI
      IF (FDPATH .EQ. 'OLD') THEN
      CALL CXPTBL (NCPGZN, NFICRP, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
      ELSE
      CALL KMPTBL (NCPGZN, 10, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
      ENDIF
C
C NUMBER OF WATER PATHWAY NUCLIDES
C (required to be at least 1 for both OLD and NEW food models)
C
      READ(IUNIT,52) NWPISO, IDNTFI
      CALL CXPTBL (NWPISO, NUMWPI, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
C
C NUMBER OF WATERSHED DEFINITIONS
C (required to be at least 1 for both OLD and NEW food models)
C
      READ(IUNIT,52) NWTRSH, IDNTFI
C
C  MAXIMUM NUMBER OF WATERSHEDS IS LIMITED TO FOUR
C
      MAXWPA = 4
      CALL KMPTBL (NWTRSH, MAXWPA, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
      NUMWPA = NWTRSH
C
C  NUMBER OF ECONOMIC REGIONS, TYPICALLY THE STATES OF THE UNTED STATES
C
      READ(IUNIT,52) NECRGN, IDNTFI
C
C  MAXIMUM NUMBER OF ECONOMIC REGIONS IS LIMITED TO MAXRGN
C
      MAXRGN = 99
      CALL KMPTBL (NECRGN, MAXRGN, OK1)
      IF (.NOT. OK1) CALL ABORT ('TERMINATING')
C
C  READ THE SET OF SPATIAL DISTANCES
C
      READ(IUNIT,100) SEPRTR
  100 FORMAT(1X,A)
      CALL MATCH (OK, SEPRTR, 'SPATIAL DISTANCES')
      IF (.NOT. OK) CALL ABORT ('TERMINATING')

      READ(IUNIT,120) (SPDSTS(I),I=1,NSPDTS)
  120 FORMAT(8E10.2)
C
```

```
C  CHECK THAT THESE SPATIAL DISTANCES ARE COMPATIBLE WITH THE
C  SPATIAL ENDPOINT DISTANCES DEFINED FOR THE ATMOS MODEL
C  (RELATIVE ERRORS OF LESS THAN 10% ARE ACCEPTABLE)
C
      DO 200 NRAD = 1, NUMRAD
C
C  CONVERT THE ENDPONT DISTANCE TO KILOMETERS FOR THE COMPARISON
C
      RADIUS = SPAEND(NRAD) / 1000.
      RELERR = ABS ( (SPDSTS(NRAD) - RADIUS) / RADIUS)
      IF (RELERR .GT. .1) THEN
        WRITE(6,53)
        WRITE(7,53)
   53   FORMAT(' THE SPATIAL INTERVALS SPECIFIED IN THE SITE DATA ',
     1         'FILE CONFLICT WITH THOSE DEFINED IN THE MODEL.')
        WRITE(6,*) '   AT INTERVAL ',NRAD,' THE RELATIVE ERROR IS ',
     1              RELERR
        WRITE(7,*) '   AT INTERVAL ',NRAD,' THE RELATIVE ERROR IS ',
     1              RELERR
      CALL ABORT ('TERMINATING')
      ENDIF
  200 CONTINUE
C
C Skip over the population data. It was already read by SUBROUTINE INPOPU.
C The code now allows different population distributions for each EARLY run.
c
      IF (WTNAME .EQ. 'SUMPOP') THEN
      NUMPOP = NSTRTG
      ELSE
      NUMPOP = 1
      ENDIF

      DO 300 IPOP = 1, NUMPOP
      READ(IUNIT,100) SEPRTR
      CALL MATCH (OK, SEPRTR(1:10), 'POPULATION')
      IF (.NOT. OK) CALL ABORT ('TERMINATING')

      DO 300 NCOR = 1, NUMCOR
  300 READ(IUNIT,130) (DUMMY,NRAD=1,NUMRAD)
  130 FORMAT(8F10.0)
C
C  READ THE ARRAY OF LAND FRACTIONS
C
      READ(IUNIT,100) SEPRTR
      CALL MATCH (OK, SEPRTR, 'LAND FRACTION')
      IF (.NOT. OK) CALL ABORT ('TERMINATING')

      DO 400 NCOR = 1, NUMCOR
  400 READ(IUNIT,140) (FRCLND(NRAD,NCOR),NRAD=1,NUMRAD)
  140 FORMAT(16F5.2)
C
C  READ THE ARRAY OF REGIONAL INDICES
C
      READ(IUNIT,100) SEPRTR
      CALL MATCH (OK, SEPRTR, 'REGION INDEX')
      IF (.NOT. OK) CALL ABORT ('TERMINATING')

      DO 500 NCOR = 1, NUMCOR
  500 READ(IUNIT,150) (INDREG(NRAD,NCOR),NRAD=1,NUMRAD)
  150 FORMAT(40I2)
C
C  CHECK THE INDICES IN ARRAY INDREG ARE BOUNDED BY NECRGN
C
```

```
      CALL CKINDX (INDREG, SEPRTR, NECRGN, OK)
      IF (.NOT. OK) CALL ABORT ('TERMINATING')
C
C  READ THE ARRAY OF WATERSHED INDICES
C
      READ(IUNIT,100) SEPRTR
      CALL MATCH (OK, SEPRTR, 'WATERSHED INDEX')
      IF (.NOT. OK) CALL ABORT ('TERMINATING')

      DO 600 NCOR = 1, NUMCOR
  600 READ(IUNIT,160) (INDWTR(NRAD,NCOR),NRAD=1,NUMRAD)
  160 FORMAT(40I2)
C
C  CHECK THE INDICES IN ARRAY INDWTR ARE BOUNDED BY NWTRSH
C
      CALL CKINDX (INDWTR, SEPRTR, NWTRSH, OK)
      IF (.NOT. OK) CALL ABORT ('TERMINATING')
C
C  READ THE GROWING SEASON LIMITS AND FRACTION OF FARMLAND USED FOR EACH CROP
C
      READ (IUNIT,100) SEPRTR
      CALL MATCH (OK, SEPRTR, 'CROP SEASON AND SHARE')
      IF (.NOT. OK) CALL ABORT ('TERMINATING')

      TSEEDG = 365.
      THRVST = 0.

      DO 705 NCRP = 1, NFICRP
  705 ICHECK(NCRP) = 0

      DO 720 NGZN = 1, NCPGZN
      READ(IUNIT,170) I, CROP, GBEG, GEND, FRCLCP
  170 FORMAT(I4,1X,A20,2F5.0,F10.0)

      IF (FDPATH .EQ. 'NEW') GO TO 720
      DO 710 NCRP = 1, NFICRP
      IF (NAMCRP(NCRP) .EQ. CROP) THEN
      ICHECK(NCRP) = I
        TGSBEG(NCRP) = GBEG
        TGSEND(NCRP) = GEND
        FRCTFL(NCRP) = FRCLCP
      IF (TSEEDG .GT. GBEG) TSEEDG = GBEG
        IF (THRVST .LT. GEND) THRVST = GEND
      IF (THRVST .LT. TSEEDG) THEN
          WRITE(6,59) CROP
          WRITE(7,59) CROP
        CALL ABORT ('TERMINATING')
   59     FORMAT(' GROWING SEASON ERROR FOR CROP ',A22)
        ENDIF
      GO TO 720
      ENDIF
  710 CONTINUE
      WRITE(6,54) CROP
      WRITE(7,54) CROP
   54 FORMAT(' THE CROP NAME ',A22,' IS UNRECOGNIZED')
      CALL ABORT ('TERMINATING')
  720 CONTINUE

      IF (FDPATH .EQ. 'NEW') GO TO 740
      DO 730 NCRP = 1, NFICRP
      IF (ICHECK(NCRP) .EQ. 0) THEN
        WRITE(6,55) NAMCRP(NCRP)
        WRITE(7,55) NAMCRP(NCRP)
```

```
   55   FORMAT(' THE CROP NAME ',A20,' NOT IN SITE DATA.')
        CALL ABORT ('TERMINATING')
        ENDIF
  730 CONTINUE
C
C  READ THE WATERSHED DEFINITION
C
  740 READ(IUNIT,100) SEPRTR
        CALL MATCH (OK, SEPRTR, 'WATERSHED DEFINITION')
        IF (.NOT. OK) CALL ABORT ('TERMINATING')

        DO 805 NWPI = 1, NUMWPI
  805 ICHECK(NWPI) = 0

        DO 820 NISO = 1, NWPISO
        READ(IUNIT,180) I,NMISO,DUMMY,DUMMY,(WTRINF(N),N=1,NWTRSH)
  180 FORMAT(I4,1X,A8,2X,6E10.1)

        DO 810 NWPI = 1, NUMWPI
        IF (NAMWPI(NWPI) .EQ. NMISO) THEN
          ICHECK(NWPI) = I
          DO 807 NWSH = 1, NWTRSH
  807     WINGF(NWPI,NWSH) = WTRINF(NWSH)
          GO TO 820
        ENDIF
  810 CONTINUE
        WRITE(6,56) NMISO
        WRITE(7,56) NMISO
   56 FORMAT(' THE NUCLIDE NAME ',A8,' IS UNRECOGNIZED.')
        CALL ABORT ('TERMINATING')
  820 CONTINUE

        DO 830 NWPI = 1, NUMWPI
        IF (ICHECK(NWPI) .EQ. 0) THEN
        WRITE (6,57) NAMWPI(NWPI)
        WRITE (7,57) NAMWPI(NWPI)
   57   FORMAT(' THE NUCLIDE NAME ',A8,' NOT IN SITE DATA.')
        CALL ABORT ('TERMINATING')
        ENDIF
  830 CONTINUE
C
C  READ THE REGIONAL ECONOMIC DATA
C
        READ(IUNIT,100) SEPRTR
        CALL MATCH (OK, SEPRTR, 'REGIONAL ECONOMIC DATA')
        IF (.NOT. OK) RETURN

        DO 920 NRGN = 1, NECRGN
        J = NRGN
        READ(IUNIT,190) I,NMRGN(J),FRMFRC(J),DPF(J),ASFP(J),
     1                  VFRM(J),VNFRM(J)
  190 FORMAT(I4,1X,A10,5X,F5.3,F5.3,F10.1,F10.1,F10.1)
        IF (I .NE. NRGN) THEN
          WRITE(6,58) NRGN
          WRITE(7,58) NRGN
   58     FORMAT(' REGIONAL ECONOMIC DATA WITH INDEX ',I2,' MISSING.')
        CALL ABORT ('TERMINATING')
        ENDIF
  920 CONTINUE
        RETURN
        END
*DECK CXPTBL
        SUBROUTINE CXPTBL (NINPT,NMODL,OK)
```

```
C
C  CHECK THAT NINPT AND NMODL ARE IDENTICAL
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE SDFINP.
C
C  GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO CXPTBL
C
C   IDNTFI - ITEM IDENTIFIATION
C   NINPT  - THE NUMBER OF ITEMS DEFINED ON THE SITE DATA FILE
C   NMODL  - THE NUMBER OF ITEMS DEFINED BY THE MODEL
C
C  GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM CXPTBL
C
C   OK     - LOGICAL FLAG INDICATING NINPT AND NMODL ARE IDENTICAL
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      CHARACTER *22   IDNTFI
      COMMON /IDNTFI/ IDNTFI
      LOGICAL OK

      IF (NINPT .NE. NMODL) THEN
        OK = .FALSE.
        WRITE(6,50) NINPT,IDNTFI,NMODL
        WRITE(7,50) NINPT,IDNTFI,NMODL
   50   FORMAT(' THERE ARE ',I3,1X,A,' ON THE SITE DATA FILE;',/,
     1          '     THIS NUMBER IS INCONSISTENT WITH THE ',I3,
     2         ' DEFINED BY THE MODEL.')
      ENDIF
      RETURN

      ENTRY KMPTBL (NINPT,NMODL,OK)
C
C  CHECK THAT NINPT DOES NOT EXCEED NMODL
C
      IF (NINPT .GT. NMODL .OR. NINPT .LT. 1) THEN
        OK = .FALSE.
        WRITE(6,50) NINPT,IDNTFI,NMODL
        WRITE(7,50) NINPT,IDNTFI,NMODL
      ENDIF
      RETURN
      END
*DECK CKINDX
      SUBROUTINE CKINDX (INTARR,SEPRTR,INTBND,OK)
C
C  CHECK THE INDICES IN THE INTEGER ARRAY INTARR DO NOT EXCEED THE
C   BOUND INTBND
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE SDFINP
C
C  GLOSSARY OF VARIABLES:
C
C   INTARR(I,J) - AN INTEGER ARRAY OF INDICIES FOR I SPATIAL INTERVALS
C               AND J WIND DIRECTIONS
C   INTBND - THE UPPER BOND ON THE INCICES IN INTARR
C   NUMCOR - THE DEFINED NUMBER OF WIND DIRECTIONS (COARSE GRID
C               SUBDIVISIONS)
C   NUMRAD - THE DEFINED NUMBER OF SPATIAL INTERVALS IN THE RADIAL
C               DIRECTION
C   OK     - THE LOGICAL FLAG INDICATING NO UNACCEPTABLE INDICES
C   SEPRTR - IDENTIFIER OF THE ARRAY INTARR
C
C  LYNN RITCHIE, DIV.6415, 13 FEB 1986
```

```
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      DIMENSION INTARR(35,16)

      CHARACTER *22 SEPRTR

      LOGICAL OK
C
C  CHECK THAT ALL INDICES IN INTARR ARE GREATER THAN ZERO AND NOT
C   GREATER THAN INTBND
C
      DO 10 I = 1,NUMCOR
      DO 10 J = 1,NUMRAD
      IF (INTARR(J,I) .LE. 0 .OR. INTARR(J,I) .GT. INTBND) THEN
        OK = .FALSE.
        WRITE(6,50) SEPRTR
        WRITE(7,50) SEPRTR
   50   FORMAT('O ILLEGAL ',A22)
        RETURN
      ENDIF
   10 CONTINUE

      RETURN
      END
*DECK STGRDA
      SUBROUTINE STGRDA
C
C DEFINE THE SITE REGION CHARACTERISTICS IN CASE A SITE DATA FILE IS NOT USED
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA USED IN STGRDA:
C
C FRMPRD - VALUE OF ANNUAL FARM PRODUCTION IN SITE ENVIRONS (DOLLARS/HECTARE)
C NUMCOR - THE NUMBER OF WIND DIRECTIONS (COARSE GRID DIVISIONS)
C NUMRAD - THE NUMBER OF SPATIAL INTERVALS IN THE RADIAL DIRECTION
C PI     - THE PHYSICAL CONSTANT PI
C SPACEN(I) - THE DISTANCE TO THE CENTERPOINT OF SPATIAL INTERVAL I
C UNFSWT - UNIFORM DATA SWITCH
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM STGRDA:
C
C AREA(I)    - AREA OF THE GRID ELEMENT AT DISTANCE INTERVAL I (SQ. METERS)
C ASFP(I)    - AVERAGE ANNUAL FARM SALES FOR ECONOMIC REGION I
C DPF(I)     - FRACTION OF FARM SALES FROM DAIRY IN ECONOMIC REGION
C FMAREA(I,J) - FARM AREA IN HECTARES OF THE GRID ELEMENT AT SPATIAL
C               DISTANCE I IN DIRECTION J
C FRCLND(I,J) - TOTAL LAND FRACTION OF GRID ELEMENT AT SPATIAL
C               DISTANCE I AND DIRECTION J
C FRMFRC(I) - FARM LAND FRACTION IN ECONOMIC REGION I
C INDREG(I,J) - ECONOMIC REGION INDEX OF GRID ELEMENT AT SPATIAL
C               DISTANCE I AND DIRECTION J
C INDWTR(I,J) - WATERSHED INDEX OF GRID ELEMENT AT SPATIAL DISTANCE I
C               AND DIRECTION J
C NMRGN(I) - NAME OF ECONOMIC REGION I
C VFRM(I) - AVERAGE FARM VALUE FOR ECONOMIC REGION I ($ / HECTARE)
C VNFRM(I) - AVERAGE NON-FARM VALUE FOR ECONOMIC REGION I ($ / RESIDENT)
C UNFSWT - UNIFORM SITE ENVIRONS DATA SWITCH (.FALSE. REQUIRES THE
C          USE OF THE SITE DATA FILE)
```

```
C
C MODIFIED 6/20/89/, DIC, LOG # 11/18/88-A,
C   THERE IS INSUFFICIENT STORAGE ALLOCATED FOR STATE ECONOMIC DATA,
C   THE UPPER LIMIT ON NECRGN IS BEING CHANGED FROM 59 TO 99,
C   VALIDATION IS BEING ADDED TO ENSURE THAT A VALID VALUE IS SUPPLIED.
C MODIFIED 7/30/91, D. CHANIN, #8/2/91-A, CHANGE HOLLERITHS TO TYPE CHARACTER
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /FRACLD/ FRACLD
      CHARACTER *10   NMRGN
      COMMON /NAMRGN/ NMRGN(99)
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      COMMON /GRDDTA/ AREA(MAXRAD)
      COMMON /FRCFRM/ FRCFRM, FRMPRD, DPFRCT
      COMMON /FRCLND/ FRCLND(MAXRAD,16)
      COMMON /FRMDAT/ FMAREA(MAXRAD,16)
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /INDWTR/ INDWTR(MAXRAD,16)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /SITEDT/ DPRATE,DSRATE,FRFIM,FRNFIM,VALWF,VALWNF,POPCST
      LOGICAL UNFSWT
      COMMON /UNFSWT/ UNFSWT
C
C  SET THE OUTER RADII OF THE SPATIAL INTERVALS
C
      AREA(1)   = (PI * SPAEND(1) ** 2) / NUMCOR

      DO 10 NRAD = 2, NUMRAD
   10 AREA(NRAD) =
     $  (PI * (SPAEND(NRAD) ** 2 - SPAEND(NRAD - 1) ** 2)) / NUMCOR

      IF (UNFSWT) THEN
C
C  UTILIZING THE SITE ENVIRONS DATA
C
        WRITE(6,520)
  520   FORMAT('0','UNIFORM SITE ENVIRONS DATA UTILIZED IN PLACE OF ',
     1          'THE SITE DATA FILE',/1X,' THE ENVIRONS DATA REFLECTS ',
     2          'AVERAGE DATA FOR THE AREA SURROUNDING THE SITE')

        DO 20 NCOR = 1, NUMCOR
        DO 20 NRAD = 1, NUMRAD
C
C   BUILD THE LAND FRACTION TABLE
C
        FRCLND(NRAD,NCOR) = FRACLD
C
C   BUILD THE WATERSHED INDEX TABLE
C
        INDWTR(NRAD,NCOR) = 1
C
C   BUILD THE REGION INDEX TABLE
C
   20   INDREG(NRAD,NCOR) = 1
C
C  SET THE UNIFORM ENVIRONS ECONOMIC DATA
C
        NMRGN(1) = 'SITE'
        FRMFRC(1) = FRCFRM
```

```
          DPF(1) = DPFRCT
          ASFP(1) = FRMPRD
          VFRM(1) = VALWF
          VNFRM(1) = VALWNF
        ENDIF
C
C BUILD FARM AREA TABLE (HECTARES)
C
        DO 30 NCOR = 1, NUMCOR
        DO 30 NRAD = 1, NUMRAD
        INDXRG = INDREG(NRAD,NCOR)
   30 FMAREA(NRAD,NCOR) = AREA(NRAD) * FRCLND(NRAD,NCOR) *
     1                    FRMFRC(INDXRG) / 10000.

        RETURN
        END
*DECK OUTCON
        SUBROUTINE OUTCON
C
C THIS ROUTINE PREPARES FOR WRITING RESULTS FROM ATMOS, EARLY, AND CHRONC
C AND WRITES HEADER RECORDS ON EACH FILE USED TO CONTROL THE OUTPUT MODULE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE INPUT.
C
C GLOSSARY OF VARIABLES:
C
C GLOSSARY OF EXTERNALS:
C
C COPCHR - SETS UP "CHRONC" SO THAT IT WILL GENERATE THE SAME RESULTS AS "EARLY"
C HEDCHR - PREPARES THE LIST OF "CHRONC" RESULTS
C HEDEAR - PREPARES THE LIST OF "EARLY" RESULTS
C
C D. CHANIN, DIV. 6415, 3 DEC 87.
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
        EXTERNAL COPCHR, HEDATM, HEDCHR, HEDEAR

        LOGICAL          ENDAT1, ENDAT2
        COMMON /STOPME/ ENDAT1, ENDAT2
        LOGICAL CCDF0
        COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)

        COMMON /NCHRFL/ NCHRFL

        IF (NUM0 .GT. 0) CALL HEDATM

        NCHRFL = 0

        IF (.NOT. ENDAT1) THEN

          CALL HEDEAR
          CALL COPCHR

          IF (.NOT. ENDAT2) THEN
            CALL HEDCHR
            NCHRFL = 1
          ENDIF

        ENDIF

        RETURN
```

```
      END
*DECK HEDATM
      SUBROUTINE HEDATM
C
C THIS ROUTINE PREPARES THE RESULT LIST FOR THE ATMOS MODULE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTCON.
C
C GLOSSARY OF VARIABLES:
C
C CATNAM - NAME OF THE CATEGORY FOR EACH OF THE 8 TYPES OF RESULTS
C CCDF   - LOGICAL FLAG INDICATING WHETHER TO PRODUCE A CCDF TABLE
C IOUT   - LOOP COUNTER ON THE VARIOUS TYPES OF RESULTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C NUMBER - NUMBER OF CONSEQUENCE VALUES TO BE WRITTEN FOR EACH TYPE OF RESULT
C NUMRES - TOTAL NUMBER OF RESULTS THAT WILL BE WRITTEN ON THE EARLY FILE
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM0   - Number of results of TYPE 0 that are requested
C RESNAM - ARRAY OF THE NAMES OF THE RESULTS
C
C GLOSSARY OF EXTERNALS:
C
C RESNM0 - Returns the names of results TYPE 0
C
C Modified 11/03/92, D. Chanin, Expanded nuclide set for DOE
C Modified 3/09/93, D.C., Moved UNIT 30 HEADER write to subroutine CONTRL
C  NO INTRINSIC FUNCTIONS
      EXTERNAL RESNM0
      CHARACTER *77 RESNM0
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL CCDF0
      COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)
      LOGICAL CCDFX
      COMMON /CCDFX/ CCDFX(MAXNRS)
      COMMON /NUMREX/ NUMREX
      COMMON /RESNAX/ RESNAX
      CHARACTER *77 RESNAX(350)
C
C RESULTS OF TYPE 0 ARE ALWAYS TURNED ON AS A SET OF 10 RESULTS
C
      IRESUL = 0
      DO 100 IOUT = 1, NUM0
      DO 100 IRES = 1, 10
      IRESUL = IRESUL + 1
      RESNAX(IRESUL) = RESNM0(IOUT,IRES)
 100   CCDFX(IRESUL) = CCDF0(IOUT)
      RETURN
      END
*DECK RESNM0
      CHARACTER *77 FUNCTION RESNM0 (IOUT,IRES)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 0 EFFECT:
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDATM
C
      EXTERNAL DISRAN
      CHARACTER *12 DISRAN
C NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
```

```
      LOGICAL CCDF0
      COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /ATMOPT/ IDEBUG, NUCOUT
C
      CHARACTER ATM1 *40, ATM2(10) *37, TEMP *12
C
      TEMP = DISRAN(INDRAD(IOUT),INDRAD(IOUT))
      WRITE(ATM1,20) INDREL(IOUT), TEMP
   20 FORMAT('Source Term 1: Plume ', I1, ', at ', A)
C
      ATM2(1) = NUCNAM(NUCOUT) // ' Center Air Conc. (Bq-s/m3)'
      ATM2(2) = NUCNAM(NUCOUT) // ' Ground Air Conc. (Bq-s/m3)'
      ATM2(3) = NUCNAM(NUCOUT) // ' Center Ground Conc. (Bq/m2)'
      ATM2(4) = 'Total    '     // ' Center Ground Conc. (Bq/m2)'
      ATM2(5) = 'Ground-Level Dilution, X/Q (s/m3)'
      ATM2(6) = NUCNAM(NUCOUT) // ' Adjusted Source, Q (Bq)'
      ATM2(7) = 'Plume Sigma-y (m)'
      ATM2(8) = 'Plume Sigma-z (m)'
      ATM2(9) = 'Plume Height  (m)'
      ATM2(10)= 'Plume Arrival Time (s)'
      RESNM0 = ATM1 // ATM2(IRES)
      RETURN
      END
*DECK HEDEAR
      SUBROUTINE HEDEAR
C
C THIS ROUTINE PREPARES THE RESULT LIST FOR THE "EARLY" MODULE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTCON.
C
C GLOSSARY OF VARIABLES:
C
C CATNAM - NAME OF THE CATEGORY FOR EACH OF THE 8 TYPES OF RESULTS
C CCDF   - LOGICAL FLAG INDICATING WHETHER TO PRODUCE A CCDF TABLE
C IOUT   - LOOP COUNTER ON THE VARIOUS TYPES OF RESULTS
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C NUMBER - NUMBER OF CONSEQUENCE VALUES TO BE WRITTEN FOR EACH TYPE OF RESULT
C NUMRES - TOTAL NUMBER OF RESULTS THAT WILL BE WRITTEN ON THE EARLY FILE
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM1-8 and NUMA - Number of results of TYPES 1-8 and A that are requested
C RESNAM - ARRAY OF THE NAMES OF THE RESULTS
C STOPIT - LOGICAL FLAG INDICATING TOO MANY RESULTS WERE REQUESTED
C
C GLOSSARY OF EXTERNALS:
C
C RESNM1-8 and RESNMA, RESNMB - Returns the names of results TYPE 1-8 and A, B
C
C DAVID CHANIN, DIV. 6415, 26 MAR 85.
C MODIFIED 4 AUG 86, D.C., SER #30, ADDED RESULT TYPE 9,
C   POPULATION WEIGHTED CANCER DEATH RISK WITHIN 10 MILES
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-B, ADDED (ACUTE,LIFETIME) SWITCH
C                                          EVALUATION OF TYPE 3 RESULTS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 11/27/95, D. Chanin: use standard abbreviation km for kilometers
C Modified 11/27/95, D. Chanin: use standard abbreviation Sv for sieverts
```

```
C  NO INTRINSIC FUNCTIONS
      EXTERNAL RESNM1, RESNM2, RESNM3, RESNM4, RESNM5, RESNM6,
     $         RESNM7, RESNM8, RESNMA, RESNMB
      EXTERNAL ABORT
      CHARACTER *37 RESNM1, RESNM2, RESNM3, RESNM4, RESNM5, RESNM6,
     $              RESNM7, RESNM8, RESNMA, RESNMB

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL CCDF1
      COMMON /RESLT1/ NUM1, IECOD1(40), I1DIS1(40), I2DIS1(40),
     1                CCDF1(40)
      LOGICAL CCDF2
      COMMON /RESLT2/ NUM2, RISTHR(10), CCDF2(10)
      LOGICAL CCDF3
      COMMON /RESLT3/ NUM3, INDEX3(10), DOSTH3(10), CCDF3(10)
      LOGICAL CCDF4
      COMMON /RESLT4/ NUM4, IECOD4(20), I1DIS4(20), CCDF4(20)
      LOGICAL CCDF5
      COMMON /RESLT5/ NUM5, INDEX5(10), I1DIS5(10), I2DIS5(10),
     1                CCDF5(10)
      LOGICAL CCDF6
      COMMON /RESLT6/ NUM6, IPATHW(10), INDEX6(10),
     1                      I1DIS6(10), I2DIS6(10), CCDF6(10)
      LOGICAL CCDF7
      COMMON /RESLT7/ NUM7, IECOD7(10), I1DIS7(10), I2DIS7(10),
     1                CCDF7(10)
      LOGICAL CCDF8
      COMMON /RESLT8/ NUM8, IECOD8(20), I1DIS8(20), I2DIS8(20),
     1                CCDF8(20)
      LOGICAL CCDFA
      COMMON /RESLTA/ NUMA, INDEXA(10),
     1                I1DISA(10), I2DISA(10), CCDFA(10)
      LOGICAL CCDFB
      COMMON /RESLTB/ NUMB, INDEXB(32),
     1                IRAD_B(32), IANG_B(32), CCDFB(32)
      CHARACTER *77   RESNAM
      COMMON /RESNAM/ RESNAM(MAXNRS)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      LOGICAL CCDF
      COMMON /CCDF/ CCDF(MAXNRS)
      COMMON /NUMRES/ NUMRES
      CHARACTER *40 CATNAM(10)

      LOGICAL STOPIT

      STOPIT = .FALSE.
C
C  DEFINE THE MAXIMUM NUMBER OF RESULTS THAT CAN BE CALCULATED
C
      WRITE(6,20) MAXNRS
   20 FORMAT('1 THIS PROGRAM CURRENTLY ALLOWS THE GENERATION OF',
     $        ' UP TO ', I4, ' RESULTS')
C
C  DEFINE HOW MANY CONSEQUENCE VALUES WILL BE WRITTEN FOR EACH TYPE OF RESULT
C
      IF (IPLUME .LT. 3) THEN
        NUMBER = NUMCOR
```

```
      ELSE
        NUMBER = 1
      ENDIF
C
C  DEFINE THE NAMES OF EACH OF THE EIGHT CATEGORIES OF RESULTS
C  WHICH CAN BE PRODUCED BY THE EARLY MODULE
C
      CATNAM(1) = 'HEALTH EFFECTS CASES'
      CATNAM(2) = 'EARLY FATALITY DISTANCE (km)'
      CATNAM(3) = 'POPULATION EXCEEDING DOSE'
      CATNAM(4) = 'AVERAGE INDIVIDUAL RISK'
      CATNAM(5) = 'POPULATION DOSE (Sv)'
      CATNAM(6) = 'CENTERLINE DOSE AT SOME DISTANCES (Sv)'
      CATNAM(7) = 'CENTERLINE RISK AT SOME DISTANCES'
      CATNAM(8) = 'POPULATION WEIGHTED RISK'
      CATNAM(9) = 'PEAK DOSE FOUND ON SPATIAL GRID (Sv)'
      CATNAM(10)= 'DOSE FOUND AT (R,THETA) LOCATION (Sv)'

      IRESUL = 0

      DO 100 IOUT = 1, NUM1
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(1) // RESNM1(IOUT)
        CCDF(IRESUL) = CCDF1(IOUT)
  100 NUMVAL(IRESUL) = NUMBER

      DO 200 IOUT = 1, NUM2
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(2) // RESNM2(IOUT)
        CCDF(IRESUL) = CCDF2(IOUT)
  200 NUMVAL(IRESUL) = 1

      DO 300 IOUT = 1, NUM3
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(3) // RESNM3(IOUT)
        CCDF(IRESUL) = CCDF3(IOUT)
  300 NUMVAL(IRESUL) = NUMBER

      DO 400 IOUT = 1, NUM4
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(4) // RESNM4(IOUT)
        CCDF(IRESUL) = CCDF4(IOUT)
  400 NUMVAL(IRESUL) = 1

      DO 500 IOUT = 1, NUM5
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(5) // RESNM5(IOUT)
        CCDF(IRESUL) = CCDF5(IOUT)
  500 NUMVAL(IRESUL) = NUMBER

      DO 600 IOUT = 1, NUM6
      DO 600 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(6) // RESNM6(IOUT,IRAD)
        CCDF(IRESUL) = CCDF6(IOUT)
  600 NUMVAL(IRESUL) = 1
```

```
      DO 700 IOUT = 1, NUM7
      DO 700 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(7) // RESNM7(IOUT,IRAD)
        CCDF(IRESUL) = CCDF7(IOUT)
  700 NUMVAL(IRESUL) = 1

      DO 800 IOUT = 1, NUM8
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(8) // RESNM8(IOUT)
        CCDF(IRESUL) = CCDF8(IOUT)
  800 NUMVAL(IRESUL) = NUMBER

      DO 900 IOUT = 1, NUMA
      DO 900 IRAD = I1DISA(IOUT), I2DISA(IOUT)
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(9) // RESNMA(IOUT,IRAD)
      CCDF(IRESUL) = CCDFA(IOUT)
  900 NUMVAL(IRESUL) = 1

      DO 1000 IOUT = 1, NUMB
      IRESUL = IRESUL + 1
      IF (IRESUL .GT. MAXNRS) GO TO 1300
      RESNAM(IRESUL) = CATNAM(10) // RESNMB(IOUT)
      CCDF(IRESUL) = CCDFB(IOUT)
 1000 NUMVAL(IRESUL) = NUMBER

      NUMRES = IRESUL

      GO TO 1420

 1300 STOPIT = .TRUE.

      WRITE(6,1400)
      WRITE(7,1400)
 1400 FORMAT(/' !! TOTAL NUMBER OF RESULTS REQUESTED FROM "EARLY"',
     1        ' EXCEEDS THE MAXIMUM ALLOWED VALUE  !!')

 1420 CONTINUE
C
C  COUNT UP THE NUMBER OF RESULTS OF TYPE 6 USED INTERNALLY BY THE CODE
C
      NUMB6 = 0

      DO 1440 IOUT = 1, NUM6
      DO 1440 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
 1440 NUMB6 = NUMB6 + 1
C
C  COUNT UP THE NUMBER OF RESULTS OF TYPE 7 USED INTERNALLY BY THE CODE
C
      NUMB7 = 0

      DO 1460 IOUT = 1, NUM7
      DO 1460 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
 1460 NUMB7 = NUMB7 + 1
C
C  COUNT UP THE NUMBER OF RESULTS OF TYPE A USED INTERNALLY BY THE CODE
C
      NUMBA = 0
```

```
      DO 1470 IOUT = 1, NUMA
      DO 1470 IRAD = I1DISA(IOUT), I2DISA(IOUT)
 1470 NUMBA = NUMBA + 1

      WRITE(6,1480) NUM1 + NUM2 + NUM3 + NUM4 + NUM5 +
     $              NUMB6 + NUMB7 + NUM8 + NUMBA + NUMB
 1480 FORMAT(/' YOU HAVE REQUESTED', I4, ' RESULTS FROM "EARLY"',
     $        ' COMPOSED OF:')

      WRITE(6,1500) NUM1, NUM2, NUM3, NUM4, NUM5, NUMB6, NUMB7, NUM8,
     1              NUMBA, NUMB
 1500 FORMAT(/1X,I4, ' RESULTS OF TYPE 1',
     1       /1X,I4, ' RESULTS OF TYPE 2',
     2       /1X,I4, ' RESULTS OF TYPE 3',
     3       /1X,I4, ' RESULTS OF TYPE 4',
     4       /1X,I4, ' RESULTS OF TYPE 5',
     5       /1X,I4, ' RESULTS OF TYPE 6',
     6       /1X,I4, ' RESULTS OF TYPE 7',
     7       /1X,I4, ' RESULTS OF TYPE 8',
     8       /1X,I4, ' RESULTS OF TYPE A',
     9       /1X,I4, ' RESULTS OF TYPE B')

      IF (STOPIT) THEN
        WRITE(6,1520)
        WRITE(7,1520)
 1520   FORMAT(/' !!!!! DECREASE THE NUMBER OF RESULTS !!!!!')
      CALL ABORT ('HEDEAR')
      ENDIF

      RETURN
      END
*DECK RESNM1
      FUNCTION RESNM1 (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 1 EFFECT:
C
C TOTAL CASES OF A GIVEN HEALTH EFFECT, I.E.,
C (EARLY DEATHS AND INJURIES, LATENT CANCER DEATHS AND INJURIES)
C WITHIN A RANGE OF DISTANCES
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C EFFNM1 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE 1 RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C I1DIS1 - INNER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C I2DIS1 - OUTER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C RESNM1 - RETURNED FUNCTION VALUE
C
C GLOSSARY OF EXTERNALS:
C
C DISRAN - FUNCTION WHICH RETURNS A TEXT FIELD DESCRIBING A DISTANCE RANGE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
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C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL DISRAN
C NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNM1

      LOGICAL CCDF1
      COMMON /RESLT1/ NUM1, IECOD1(40), I1DIS1(40), I2DIS1(40),
     1                CCDF1(40)
      CHARACTER *24   EFFNM1
      COMMON /EFFNM1/ EFFNM1(40)
      RESNM1 = EFFNM1(IOUT) // ' '
     $      // DISRAN (I1DIS1(IOUT), I2DIS1(IOUT))

      RETURN
      END
*DECK DISRAN
      CHARACTER *12 FUNCTION DISRAN (INTRV1, INTRV2)
C
C  THIS ROUTINE RETURNS A TEXT STRING DESCRIBING THE DISTANCE RANGE
C  FROM THE BEGINNING OF SPATIAL INTERVAL INTRV1 TO THE END OF SPATIAL
C  INTERVAL INTRV2.
C
C  THIS STRING IS RIGHT-JUSTIFIED WITH NO EMBEDDED BLANKS.
C
C  WRITTEN 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C Modified 11/27/95, D. Chanin: use standard abbreviation km for kilometers
C
      EXTERNAL DIST1

      CHARACTER *4 INNER, OUTER

      CALL DIST1 (INTRV1 - 1, LENINN, INNER)
      CALL DIST1 (INTRV2,     LENOUT, OUTER)

      DISRAN = ' '

      ISTART = 9 - LENINN - LENOUT
      ISTOP  = ISTART + LENINN

      DISRAN (ISTART:ISTOP) = INNER (1:LENINN) // '-'
      DISRAN (ISTOP+1:12)   = OUTER (1:LENOUT) // ' km'

      RETURN
      END
*DECK DIST1
      SUBROUTINE DIST1 (INTRVL, LENGTH, STRING)
C
C  THIS ROUTINE RETURNS A CHARACTER STRING DESCRIBING A DISTANCE
C
C  WRITTEN 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C  !!!!!!!!!!   NOTE: SPAEND IS IN METERS   !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
C
C MODIFIED 8 JUN 88, CHANGED ARITHMETIC TO ALWAYS ROUND UP ON ANY MACHINE
C Modified 11/27/95, D. Chanin: use standard abbreviation km for kilometers
C
      EXTERNAL ABORT
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
```

```
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *4 STRING

      IF (INTRVL .EQ. 0) THEN
        LENGTH = 1
        STRING = '0'
      ELSE IF (SPAEND(INTRVL) .LT. 9.95E3) THEN
        LENGTH = 3
        WRITE(STRING,20) SPAEND(INTRVL) / 999.9999
   20   FORMAT(F3.1)
      ELSE IF (SPAEND(INTRVL) .LT. 99.95E3) THEN
        LENGTH = 4
        WRITE(STRING,40) SPAEND(INTRVL) / 999.9999
   40   FORMAT(F4.1)
      ELSE IF (SPAEND(INTRVL) .LT. 999.5E3) THEN
        LENGTH = 3
        WRITE(STRING,60) NINT (SPAEND(INTRVL) / 999.9999)
   60   FORMAT(I3)
      ELSE IF (SPAEND(INTRVL) .LE. 9999.E3) THEN
        LENGTH = 4
        WRITE(STRING,80) NINT (SPAEND(INTRVL) / 999.9999)
   80   FORMAT(I4)
      ELSE
      WRITE(6,*) 'SPATIAL INTERVALS CANNOT EXCEED 9999. km'
      WRITE(7,*) 'SPATIAL INTERVALS CANNOT EXCEED 9999. km'
        CALL ABORT ('DIST1')
      ENDIF

      RETURN
      END
*DECK COMPRS
      SUBROUTINE COMPRS (STRING)
C
C THIS ROUTINE CHANGES MULTIPLE BLANKS IN A CHARACTER STRING TO A SINGLE BLANK.
C IT SEEMS VERY INEFFICIENT BUT IT WORKS.
C
C THIS ROUTINE IS NO LONGER USED BY MACCS.
C
C DAVID CHANIN, DIV. 6415, 24 JULY 1985
C
      EXTERNAL ABORT
      INTRINSIC LEN
      CHARACTER *(*) STRING
      CHARACTER *80  OLDSTR
      LOGICAL ILOST

      LENSTR = LEN(STRING)

      IF (LENSTR .GT. 80) THEN
        WRITE(6,*) 'ERROR: STRING TOO LONG; ', STRING
        WRITE(6,*) 'COMPRES CAN ONLY HANDLE STRINGS UP TO 80 CHARACTERS'
        WRITE(7,*) 'ERROR: STRING TOO LONG; ', STRING
        WRITE(7,*) 'COMPRES CAN ONLY HANDLE STRINGS UP TO 80 CHARACTERS'
        CALL ABORT ('COMPRS')
      ENDIF

   10 OLDSTR = STRING
      ILOST = .FALSE.

      DO 20 ICHAR = 1, LENSTR - 2
```

```
      IF(OLDSTR(ICHAR:ICHAR+1).EQ.' '.AND.OLDSTR(ICHAR+2:80).NE.' ')THEN
        ILOST = .TRUE.
        STRING(ICHAR+1:LENSTR) = OLDSTR(ICHAR+2:80)
      ENDIF

   20 CONTINUE

      IF (ILOST) GO TO 10

      RETURN
      END
*DECK RESNM2
      FUNCTION RESNM2 (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 2 EFFECT:
C
C FURTHEST DISTANCE AT WHICH A GIVEN PROBABILITY OF EARLY DEATH, RISTHR,
C IS EXCEEDED. THIS DISTANCE IS REPORTED IN KILOMETERS AS OF SER #34.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C RESNM2 - RETURNED FUNCTION VALUE
C RISTHR - RISK THRESHOLD FOR EARLY DEATH (FATAL RADIUS DEFINITION)
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      CHARACTER *37 RESNM2
      LOGICAL CCDF2
      COMMON /RESLT2/ NUM2, RISTHR(10), CCDF2(10)
      WRITE(RESNM2,10) RISTHR(IOUT)
   10 FORMAT('ERL FAT/TOTAL RISK >', F6.3)

      RETURN
      END
*DECK RESNM3
      FUNCTION RESNM3 (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 3 EFFECT:
C
C NUMBER OF PEOPLE WHOSE DOSE TO A GIVEN ORGAN EXCEEDS A THRESHOLD.
C THE DOSE USED FOR THIS TEST IS EITHER ACUTE OR LIFETIME DEPENDING
C ON A USER SPECIFIED OPTION.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C DOSTH3 - LIST OF DOSE THRESHOLDS USED FOR THIS RESULT
C INDEX3 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
```

```
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C RESNM3 - RETURNED FUNCTION VALUE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-B, ADDED (ACUTE,LIFETIME) SWITCH
C                                          EVALUATION OF TYPE 3 RESULTS
C Modified 11/27/95, D. Chanin: use standard abbreviation Sv for sieverts
C Modified 11/28/95, D. Chanin: change edit mask for dose threshold from F6.3
C to G10.3 to allow distinguishing between dose thresholds on order of 10 mrem
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      CHARACTER *37 RESNM3
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      LOGICAL CCDF3
      COMMON /RESLT3/ NUM3, INDEX3(10), DOSTH3(10), CCDF3(10)
C
      WRITE(RESNM3,10) 'EARLY dose ', ORGNAM(INDEX3(IOUT)),
     1                 DOSTH3(IOUT)
   10 FORMAT (A, A, ' >', 1P,G10.3, ' Sv')
C
C  COMPRESS OUT THE BLANKS IN THE RESULT NAME
C
      CALL COMPRS (RESNM3)

      RETURN
      END
*DECK RESNM4
      FUNCTION RESNM4 (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 4 EFFECT:
C
C 360 DEGREE AVERAGE RISK OF A GIVEN HEALTH EFFECT AT A GIVEN DISTANCE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C EFFNM4 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE 4 RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C I1DIS4 - INDEX TO THE RADIAL SPATIAL ELEMENT AT WHICH RESULTS ARE DESIRED
C RESNM4 - RETURNED FUNCTION VALUE
C
C GLOSSARY OF EXTERNALS:
C
C DISRAN - FUNCTION WHICH RETURNS A TEXT FIELD DESCRIBING A DISTANCE RANGE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
```

```
C
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNM4
      LOGICAL CCDF4
      COMMON /RESLT4/ NUM4, IECOD4(20), I1DIS4(20), CCDF4(20)
      CHARACTER *24   EFFNM4
      COMMON /EFFNM4/ EFFNM4(20)
      RESNM4 = EFFNM4(IOUT) // ' '
     $      // DISRAN (I1DIS4(IOUT), I1DIS4(IOUT))

      RETURN
      END
*DECK RESNM5
      FUNCTION RESNM5 (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 5 EFFECT:
C
C TOTAL LONG TERM POPULATION DOSE TO A GIVEN ORGAN BETWEEN TWO DISTANCES.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C INDEX5 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C I1DIS5 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS5 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C RESNM5 - RETURNED FUNCTION VALUE
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C
C GLOSSARY OF EXTERNALS:
C
C DISRAN - FUNCTION WHICH RETURNS A TEXT FIELD DESCRIBING A DISTANCE RANGE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNM5
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF5
      COMMON /RESLT5/ NUM5, INDEX5(10), I1DIS5(10), I2DIS5(10),
     1                CCDF5(10)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      RESNM5(1:25)  = ORGNAM(INDEX5(IOUT)) // ' TOT LIF'
      RESNM5(26:37) = DISRAN (I1DIS5(IOUT), I2DIS5(IOUT))

      RETURN
      END
*DECK RESNM6
      FUNCTION RESNM6 (IOUT,IRAD)
```

```
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 6 EFFECT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C INDEX6 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C IRAD   - INDEX TO THE SPATIAL INTERVAL OF INTEREST FOR THIS RESULT
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C PATHNM - ARRAY OF PATHWAY NAMES THAT CORRESPOND TO THE 6 VALUES OF IPATHW
C RESNM6 - RETURNED FUNCTION VALUE
C
C DAVID CHANIN, DIV. 6415, 7 JUNE 1985.
C
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 9/25/88-A,
C   LENGTH DISCREPANCY ON ORGNAM AND NUCNAM
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNM6
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF6
      COMMON /RESLT6/ NUM6, IPATHW(10), INDEX6(10),
     1                      I1DIS6(10), I2DIS6(10), CCDF6(10)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *7    PATHNM
      COMMON /PATHNM/ PATHNM(8)
      IF (INDEX6(IOUT) .GT. 1) THEN
        RESNM6 = ORGNAM(INDEX6(IOUT)) // ' ' // PATHNM(IPATHW(IOUT))
      ELSE
      RESNM6 = 'SKIN Deposition Dose'
      ENDIF

      RESNM6(26:37) = DISRAN(IRAD,IRAD)

      RETURN
      END
*DECK RESNM7
      FUNCTION RESNM7 (IOUT,IRAD)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 7 EFFECT:
C
C CENTERLINE RISK VERSUS DISTANCE OF A GIVEN EFFECT
C (I.E. EARLY DEATHS AND INJURIES, LATENT CANCER DEATHS AND INJURIES).
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C EFFNM7 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE 7 RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C IRAD   - INDEX TO THE SPATIAL INTERVAL OF INTEREST FOR THIS RESULT
C RESNM7 - RETURNED FUNCTION VALUE
```

```
C
C DAVID CHANIN, DIV. 6415, 7 JUNE 1985.
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNM7
      CHARACTER *24   EFFNM7
      COMMON /EFFNM7/ EFFNM7(10)
      RESNM7 = EFFNM7(IOUT)

      RESNM7(26:37) = DISRAN(IRAD,IRAD)

      RETURN
      END
*DECK RESNM8
      FUNCTION RESNM8 (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 8 EFFECT:
C
C POPULATION WEIGHTED RISK OF A GIVEN HEALTH EFFECT BETWEEN 2 DISTANCES
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C EFFNM8 - NAME OF THE HEALTH EFFECT ASSOCIATED WITH EACH TYPE 8 RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C I1DIS8 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS8 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C RESNM8 - RETURNED FUNCTION VALUE
C
C GLOSSARY OF EXTERNALS:
C
C DISRAN - FUNCTION WHICH RETURNS A TEXT FIELD DESCRIBING A DISTANCE RANGE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL DISRAN
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNM8
      LOGICAL CCDF8
      COMMON /RESLT8/ NUM8, IECOD8(20), I1DIS8(20), I2DIS8(20),
     1                CCDF8(20)
```

```
      CHARACTER *24   EFFNM8
      COMMON /EFFNM8/ EFFNM8(20)
      RESNM8 = EFFNM8(IOUT) // ' '
     $      // DISRAN (I1DIS8(IOUT), I2DIS8(IOUT))
       RETURN
      END
*DECK RESNMA
      FUNCTION RESNMA (IOUT,IRAD)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE A EFFECT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C INDEXA - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C IRAD   - INDEX TO THE SPATIAL INTERVAL OF INTEREST FOR THIS RESULT
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C RESNMA - RETURNED FUNCTION VALUE
C
C David Chanin, 8/15/92, New routine adapted from RESNM6.
C
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNMA
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDFA
      COMMON /RESLTA/ NUMA, INDEXA(10),
     1                I1DISA(10), I2DISA(10), CCDFA(10)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)

      IF (INDEXA(IOUT) .GT. 1) THEN
      RESNMA = ORGNAM(INDEXA(IOUT))
      ELSE
      RESNMA = 'SKIN'
      ENDIF

      RESNMA(26:37) = DISRAN(IRAD,IRAD)

      RETURN
      END
*DECK RESNMB
      FUNCTION RESNMB (IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE B EFFECT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDEAR.
C
C GLOSSARY OF VARIABLES:
C
C INDEXB - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C IRAD   - INDEX TO THE SPATIAL INTERVAL OF INTEREST FOR THIS RESULT
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C RESNMB - RETURNED FUNCTION VALUE
C
C David Chanin, 8/15/92, New routine adapted from RESNM6.
C
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
```

```
      CHARACTER *12 DISRAN
      CHARACTER *37 RESNMB
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDFB
      COMMON /RESLTB/ NUMB, INDEXB(32),
     1                IRAD_B(32), IANG_B(32), CCDFB(32)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
C
      CHARACTER *5 COMPASS(16)
      DATA COMPASS / '(N)', '(NNE)', '(NE)', '(ENE)',
     1               '(E)', '(ESE)', '(SE)', '(SSE)',
     2               '(S)', '(SSW)', '(SW)', '(WSW)',
     3               '(W)', '(WNW)', '(NW)', '(NNW)'/
C
      IF (INDEXB(IOUT) .GT. 1) THEN
      RESNMB = ORGNAM(INDEXB(IOUT))
      ELSE
      RESNMB = 'SKIN'
      ENDIF
C
      WRITE(RESNMB(1:24), 20) IANG_B(IOUT), COMPASS(IANG_B(IOUT))
   20 FORMAT('Compass Sector', I3, 1X, A)
C
      RESNMB(26:37) = DISRAN(IRAD_B(IOUT),IRAD_B(IOUT))
C
      RETURN
      END
*DECK COPCHR
      SUBROUTINE COPCHR
C
C THIS ROUTINE SETS UP THE "CHRONC" CODE TO PRODUCE THE RESULTS
C THAT ARE PRODUCED BY BOTH "EARLY" AND "CHRONC"
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTCON.
C
C ORIGINALLY A PART OF "CHRONC" WRITTEN BY LYNN RITCHIE.
C
C GLOSSARY OF VARIABLES:
C
C NUM1   - NUMBER OF RESULTS OF TYPE 1 THAT ARE DESIRED
C NUM2   - NUMBER OF RESULTS OF TYPE 2 THAT ARE DESIRED
C NUM3   - NUMBER OF RESULTS OF TYPE 3 THAT ARE DESIRED
C NUM4   - NUMBER OF RESULTS OF TYPE 4 THAT ARE DESIRED
C NUM5   - NUMBER OF RESULTS OF TYPE 5 THAT ARE DESIRED
C NUM6   - NUMBER OF RESULTS OF TYPE 6 THAT ARE DESIRED
C NUM7   - NUMBER OF RESULTS OF TYPE 7 THAT ARE DESIRED
C NUM8   - NUMBER OF RESULTS OF TYPE 8 THAT ARE DESIRED
C
C REWRITTEN BY D. CHANIN, DIV. 6415, 4 JAN 88.
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-B, ADDED (ACUTE,LIFETIME) SWITCH
C                                          EVALUATION OF TYPE 3 RESULTS
C
C THE FOLLOWING COMMON BLOCKS ARE SET UP BY "EARLY"
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF1
      COMMON /RESLT1/ NUM1, IECOD1(40), I1DIS1(40), I2DIS1(40),
     1                CCDF1(40)
      LOGICAL CCDF2
```

```
      COMMON /RESLT2/ NUM2, RISTHR(10), CCDF2(10)
      LOGICAL CCDF3
      COMMON /RESLT3/ NUM3, INDEX3(10), DOSTH3(10), CCDF3(10)
      LOGICAL CCDF4
      COMMON /RESLT4/ NUM4, IECOD4(20), I1DIS4(20), CCDF4(20)
      LOGICAL CCDF5
      COMMON /RESLT5/ NUM5, INDEX5(10), I1DIS5(10), I2DIS5(10),
     1                CCDF5(10)
      LOGICAL CCDF6
      COMMON /RESLT6/ NUM6, IPATHW(10), INDEX6(10),
     1                      I1DIS6(10), I2DIS6(10), CCDF6(10)
      LOGICAL CCDF7
      COMMON /RESLT7/ NUM7, IECOD7(10), I1DIS7(10), I2DIS7(10),
     1                CCDF7(10)
      LOGICAL CCDF8
      COMMON /RESLT8/ NUM8, IECOD8(20), I1DIS8(20), I2DIS8(20),
     1                CCDF8(20)
      LOGICAL CCDFA
      COMMON /RESLTA/ NUMA, INDEXA(10),
     1                I1DISA(10), I2DISA(10), CCDFA(10)
      LOGICAL CCDFB
      COMMON /RESLTB/ NUMB, INDEXB(32),
     1                IRAD_B(32), IANG_B(32), CCDFB(32)
      CHARACTER *77   RESNAM
      COMMON /RESNAM/ RESNAM(MAXNRS)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /IXOUT1/ NXUM1, IXCOD1(40), IX1DS1(40), IX2DS1(40)
      COMMON /IXOUT4/ NXUM4, IXCOD4(20), IX1DS4(20)
      COMMON /IXOUT5/ NXUM5, IXDEX5(10), IX1DS5(10), IX2DS5(10)
      COMMON /IXOUT6/ NXUM6, IXPATH(10), IXDEX6(10),
     $                       IX1DS6(10), IX2DS6(10)
      COMMON /IXOUT7/ NXUM7, IXCOD7(10), IX1DS7(10), IX2DS7(10)
      COMMON /IXOUT8/ NXUM8, IXCOD8(20), IX1DS8(20), IX2DS8(20)
      COMMON /IXOUTA/ NXUMA, IXDEXA(10), IX1DSA(10), IX2DSA(10)
      COMMON /IXOUTB/ NXUMB, IXDEXB(30), IXRAD_B(30), IXANG_B(30)
      CHARACTER  *77  RXSNAM
      COMMON /RXSNAM/ RXSNAM(MAXNRS)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      COMMON /NXMRES/ NXMRES
      IRESUL = 0
      NXMRES = 0
C
C  DEFINE THE TYPE 1 CHRONC RESULTS
C
      NXUM1 = 0
      DO 20 I = 1, NUM1
      IRESUL = IRESUL + 1
      IF (IECOD1(I) .GE. 100 .AND. IECOD1(I) .LT. 300) THEN
      NXUM1 = NXUM1 + 1
        NXMRES = NXMRES + 1
      IXCOD1(NXUM1) = IECOD1(I)
        IX1DS1(NXUM1) = I1DIS1(I)
        IX2DS1(NXUM1) = I2DIS1(I)
      RXSNAM(NXMRES) = RESNAM(IRESUL)
        NXMVAL(NXMRES) = NUMVAL(IRESUL)
      ENDIF
   20 CONTINUE
```

```
C
C  INCREMENT THE COUNTER ON THE RESULTS PRODUCED BY "EARLY" BUT NOT "CHRONC"
C
      IRESUL = IRESUL + NUM2 + NUM3
C
C  DEFINE THE TYPE 4 CHRONC RESULTS
C
      NXUM4 = 0
      DO 40 I = 1, NUM4
      IRESUL = IRESUL + 1
      IF (IECOD4(I) .GE. 100 .AND. IECOD4(I) .LT. 300) THEN
      NXUM4 = NXUM4 + 1
        NXMRES = NXMRES + 1
      IXCOD4(NXUM4) = IECOD4(I)
        IX1DS4(NXUM4) = I1DIS4(I)
      RXSNAM(NXMRES) = RESNAM(IRESUL)
        NXMVAL(NXMRES) = NUMVAL(IRESUL)
      ENDIF
   40 CONTINUE
C
C  DEFINE THE TYPE 5 CHRONC RESULTS
C
      NXUM5 = 0
      DO 80 I = 1, NUM5
      IRESUL = IRESUL + 1
      DO 60 NORG = INICHR, NUMORG
      IF (ORGNAM(INDEX5(I)) .NE. ORGNAM(NORG)) GO TO 60
      NXUM5 = NXUM5 + 1
      NXMRES = NXMRES + 1
      IXDEX5(NXUM5) = NORG
      IX1DS5(NXUM5) = I1DIS5(I)
      IX2DS5(NXUM5) = I2DIS5(I)
      RXSNAM(NXMRES) = RESNAM(IRESUL)
      NXMVAL(NXMRES) = NUMVAL(IRESUL)
      GO TO 80
   60 CONTINUE
   80 CONTINUE
C
C  DEFINE THE TYPE 6 CHRONC RESULTS
C
      NXUM6 = 0
      DO 140 I = 1, NUM6
      IF (IPATHW(I).EQ.1 .OR. IPATHW(I).EQ.3 .OR. IPATHW(I).EQ.4
     1 .OR. IPATHW(I).EQ.5 .OR. IPATHW(I).EQ.8 .OR. INDEX6(I).EQ.1) THEN
      IRESUL = IRESUL + I2DIS6(I) - I1DIS6(I) + 1
      GO TO 140
      ENDIF
      DO 120 NORG = INICHR, NUMORG
      IF (ORGNAM(INDEX6(I)) .NE. ORGNAM(NORG)) GO TO 120
      NXUM6 = NXUM6 + 1
      IXPATH(NXUM6) = IPATHW(I)
      IXDEX6(NXUM6) = NORG
      IX1DS6(NXUM6) = I1DIS6(I)
      IX2DS6(NXUM6) = I2DIS6(I)
      DO 100 IRAD = I1DIS6(I), I2DIS6(I)
      IRESUL = IRESUL + 1
      NXMRES = NXMRES + 1
      RXSNAM(NXMRES) = RESNAM(IRESUL)
  100 NXMVAL(NXMRES) = NUMVAL(IRESUL)
      GO TO 140
  120 CONTINUE
      IRESUL = IRESUL + I2DIS6(I) - I1DIS6(I) + 1
  140 CONTINUE
```

```
C
C  DEFINE THE TYPE 7 CHRONC RESULTS
C
      NXUM7 = 0
      DO 180 I = 1, NUM7
      IF (IECOD7(I) .GE. 100 .AND. IECOD7(I) .LT. 300) THEN
      NXUM7 = NXUM7 + 1
      IXCOD7(NXUM7) = IECOD7(I)
        IX1DS7(NXUM7) = I1DIS7(I)
        IX2DS7(NXUM7) = I2DIS7(I)
      DO 160 IRAD = I1DIS7(I), I2DIS7(I)
        IRESUL = IRESUL + 1
        NXMRES = NXMRES + 1
        RXSNAM(NXMRES) = RESNAM(IRESUL)
  160   NXMVAL(NXMRES) = NUMVAL(IRESUL)
      ELSE
      IRESUL = IRESUL + I2DIS7(I) - I1DIS7(I) + 1
      ENDIF
  180 CONTINUE
C
C  DEFINE THE TYPE 8 CHRONC RESULTS
C
      NXUM8 = 0
      DO 200 I = 1, NUM8
      IRESUL = IRESUL + 1
      IF (IECOD8(I) .GE. 100 .AND. IECOD8(I) .LT. 300) THEN
      NXUM8  = NXUM8 + 1
        NXMRES = NXMRES + 1
      IXCOD8(NXUM8) = IECOD8(I)
        IX1DS8(NXUM8) = I1DIS8(I)
        IX2DS8(NXUM8) = I2DIS8(I)
      RXSNAM(NXMRES) = RESNAM(IRESUL)
        NXMVAL(NXMRES) = NUMVAL(IRESUL)
      ENDIF
  200 CONTINUE
C
C  DEFINE THE TYPE A CHRONC RESULTS
C
      NXUMA = 0
      DO 240 I = 1, NUMA
      NXUMA = NXUMA + 1
      IXDEXA(NXUMA) = INDEXA(I)
      IX1DSA(NXUMA) = I1DISA(I)
      IX2DSA(NXUMA) = I2DISA(I)
      DO 240 IRAD = I1DISA(I), I2DISA(I)
      IRESUL = IRESUL + 1
      NXMRES = NXMRES + 1
      RXSNAM(NXMRES) = RESNAM(IRESUL)
  240 NXMVAL(NXMRES) = NUMVAL(IRESUL)
C
C  DEFINE THE TYPE B CHRONC RESULTS
C
      NXUMB = 0
      DO 300 I = 1, NUMB
      IRESUL = IRESUL + 1
      DO 260 NORG = INICHR, NUMORG
      IF (ORGNAM(INDEXB(I)) .NE. ORGNAM(NORG)) GO TO 260
      NXUMB  = NXUMB + 1
      NXMRES = NXMRES + 1
      IXDEXB(NXUMB) = INDEXB(I)
      IXRAD_B(NXUMB) = IRAD_B(I)
      IXANG_B(NXUMB) = IANG_B(I)
      RXSNAM(NXMRES) = RESNAM(IRESUL)
```

```
      NXMVAL(NXMRES) = NUMVAL(IRESUL)
      GO TO 300
  260 CONTINUE
  300 CONTINUE
      RETURN
      END
*DECK HEDCHR
      SUBROUTINE HEDCHR
C
C THIS ROUTINE LOADS THE DATA NECESSARY FOR "CHRONC" TO GENERATE RESULTS
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTCON.
C
C GLOSSARY OF VARIABLES:
C
C CCDF   - LOGICAL FLAG INDICATING WHETHER TO PRODUCE A CCDF TABLE
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN ADDED SO FAR
C LASRES - COUNTER ON THE TOTAL NUMBER OF RESULTS (EARLY AND CHRONC TOGETHER)
C NUMBER - NUMBER OF CONSEQUENCE VALUES THAT WILL BE WRITTEN FOR THIS RESULT
C NUMRES - NUMBER OF RESULTS TO BE PRODUCED BY THE "EARLY" MODULE
C NXMRES - TOTAL NUMBER OF RESULTS THAT WILL BE WRITTEN ON THE CHRONC FILE
C NXMVAL - NUMBER OF CONSEQUENCE VALUES WRITTEN FOR ALL THE CHRONC RESULTS
C NXUM9  - NUMBER OF RESULTS OF TYPE 9 THAT ARE DESIRED FROM CHRONC
C NXUM10 - NUMBER OF RESULTS OF TYPE 10 THAT ARE DESIRED FROM CHRONC
C NXUM11 - NUMBER OF RESULTS OF TYPE 11 THAT ARE DESIRED FROM CHRONC
C NXUM12 - NUMBER OF RESULTS OF TYPE 12 THAT ARE DESIRED FROM CHRONC
C NXUM13 - NUMBER OF RESULTS OF TYPE 13 THAT ARE DESIRED FROM CHRONC
C RXSNAM - ARRAY OF THE NAMES OF THE CHRONC RESULTS
C STOPIT - LOGICAL FLAG INDICATING TOO MANY RESULTS WERE REQUESTED
C
C GLOSSARY OF EXTERNALS:
C
C RXSNM9 - RETURNS THE NAME OF A TYPE 9 RESULT
C RXNM10 - RETURNS THE NAME OF A TYPE 10 RESULT
C RXNM11 - RETURNS THE NAME OF A TYPE 11 RESULT
C RXNM12 - RETURNS THE NAME OF A TYPE 12 RESULT
C RXNM13 - RETURNS THE NAME OF A TYPE 13 RESULT
C
C DAVID CHANIN, DIV. 6415, 26 MAR 85.
C
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 26 JULY 1985
C
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
C MODIFIED 12/11/92, JAR, INCLUSION OF NEW FOOD PATHWAY MODEL
C
C NO INTRINSIC FUNCTIONS
      EXTERNAL RXSNM9, RXNM10, RXNM11, RXNM12, RXNM13
      EXTERNAL ABORT
      CHARACTER *77 RXSNM9, RXNM10, RXNM11, RXNM12, RXNM13
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL CXDF9
```

```
      COMMON /RESLT9/ NXUM9, IXCOD9(10), IX1DS9(10), IX2DS9(10),
     1                CXDF9(10)
      LOGICAL CXDF10
      COMMON /RSLT10/ NXUM10, I1DS10(10), I2DS10(10), CXDF10(10)
      LOGICAL CXDF11
      COMMON /RSLT11/ NXUM11, CXDF11
      LOGICAL CXDF12
      COMMON /RSLT12/ NXUM12, I1DS12(10), I2DS12(10), CXDF12(10)
      LOGICAL CXDF13
      COMMON /RSLT13/ NXUM13, IRAD13(40), IORG13(40), CXDF13(40)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER  *77  RXSNAM
      COMMON /RXSNAM/ RXSNAM(MAXNRS)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      LOGICAL CCDF
      COMMON /CCDF/ CCDF(MAXNRS)
      COMMON /NUMRES/ NUMRES
      COMMON /NXMRES/ NXMRES
C
      LOGICAL STOPIT
C
      STOPIT = .FALSE.
C
C  DEFINE HOW MANY VALUES WILL BE WRITTEN FOR ROTATED RESULTS.
C  IPLUME IS A CONTROL FLAG WITH THE FOLLOWNG MEANING:
C
C    IPLUME = 1, STRAIGHT LINE PLUME WITH ROTATION,
C    IPLUME = 2, FAN SHAPED PLUME WITH ROTATION,
C    IPLUME = 3, FAN SHAPED PLUME WITHOUT ROTATION.
C
      IF (IPLUME .LE. 2) THEN
        NUMBER = NUMCOR
      ELSE
        NUMBER = 1
      ENDIF
C
C DATA FOR THE RESULTS REQUESTED BY "EARLY" ARE HANDLED BY SUBROUTINE COPCHR
C
      IRESUL = NXMRES
      LASRES = NUMRES
C
C RESULTS OF TYPE 9 ARE ALWAYS TURNED ON AS SETS OF 12 RESULTS FOR
C OLD FOOD PATHWAY AND 17 RESULTS FOR NEW FOOD PATHWAY
C
      DO 900 IOUT = 1, NXUM9
      IF (FDPATH .EQ. 'OLD') THEN
      NUM = 12
      ELSE
      NUM = 17
      ENDIF
      DO 900 IRES = 1, NUM
      IRESUL = IRESUL + 1
      LASRES = LASRES + 1
      IF (LASRES .GT. MAXNRS) GO TO 1300
      RXSNAM(IRESUL) = RXSNM9(IOUT,IRES)
        CCDF(LASRES) = CXDF9(IOUT)
  900 NXMVAL(IRESUL) = NUMBER
C
C RESULTS OF TYPE 10 ARE ALWAYS TURNED ON AS SETS OF 13 RESULTS
C
```

```
      DO 1000 IOUT = 1, NXUM10
      DO 1000 IRES = 1, 13
      IRESUL = IRESUL + 1
      LASRES = LASRES + 1
      IF (LASRES .GT. MAXNRS) GO TO 1300
      RXSNAM(IRESUL) = RXNM10(IOUT,IRES)
        CCDF(LASRES) = CXDF10(IOUT)
 1000 NXMVAL(IRESUL) = NUMBER
C
C RESULTS OF TYPE 11 ARE ALWAYS TURNED ON AS A SET OF 8 RESULTS
C
      DO 1100 IOUT = 1, NXUM11
      DO 1100 IRES = 1, 8
      IRESUL = IRESUL + 1
      LASRES = LASRES + 1
      IF (LASRES .GT. MAXNRS) GO TO 1300
      RXSNAM(IRESUL) = RXNM11(IRES)
        CCDF(LASRES) = CXDF11
 1100 NXMVAL(IRESUL) = NUMBER
C
C RESULTS OF TYPE 12 ARE ALWAYS TURNED ON AS SETS OF 8 RESULTS
C
      DO 1200 IOUT = 1, NXUM12
      DO 1200 IRES = 1, 8
      IRESUL = IRESUL + 1
      LASRES = LASRES + 1
      IF (LASRES .GT. MAXNRS) GO TO 1300
      RXSNAM(IRESUL) = RXNM12(IOUT,IRES)
        CCDF(LASRES) = CXDF12(IOUT)
 1200 NXMVAL(IRESUL) = NUMBER
C
C RESULTS OF TYPE 13
C
      DO 1210 IOUT = 1,NXUM13
        IRESUL = IRESUL + 1
        LASRES = LASRES + 1
        IF (LASRES .GT. MAXNRS) GO TO 1300
        RXSNAM(IRESUL) = RXNM13(IOUT)
        CCDF(LASRES) = CXDF13(IOUT)
        NXMVAL(IRESUL) = 1
 1210 CONTINUE
C
      NXMRES = IRESUL
      GO TO 1420
 1300 STOPIT = .TRUE.
      WRITE(6,1400)
      WRITE(7,1400)
 1400 FORMAT(/' TOTAL NUMBER OF RESULTS REQUESTED FROM BOTH "EARLY"',
     1        ' AND "CHRONC" EXCEEDS THE MAXIMUM ALLOWED VALUE')
 1420 CONTINUE
C
      IF (FDPATH .EQ. 'OLD') THEN
      NUMB9  = 12 * NXUM9
      ELSE
      NUMB9  = 17 * NXUM9
      ENDIF
C
      NUMB10 = 13 * NXUM10
      NUMB11 = 8 * NXUM11
      NUMB12 = 8 * NXUM12
      NUMB13 = NXUM13
C
      WRITE(6,1520) NUMB9 + NUMB10 + NUMB11 + NUMB12 + NUMB13
```

```
 1520 FORMAT(/' YOU HAVE REQUESTED ', I4, ' RESULTS FROM "CHRONC"',
     $        ' COMPOSED OF:')
C
      WRITE(6,1540) NUMB9, NUMB10, NUMB11, NUMB12, NUMB13
 1540 FORMAT(/1X,I4, ' RESULTS OF TYPE 9',
     1       /1X,I4, ' RESULTS OF TYPE 10',
     2       /1X,I4, ' RESULTS OF TYPE 11',
     3       /1X,I4, ' RESULTS OF TYPE 12',
     4       /1X,I4, ' RESULTS OF TYPE 13')
C
      IF (STOPIT) THEN
        WRITE(6,1560)
        WRITE(7,1560)
 1560   FORMAT(/' DECREASE THE NUMBER OF RESULTS')
      CALL ABORT ('HEDCHR')
      ENDIF
      RETURN
      END
*DECK RXSNM9
      FUNCTION RXSNM9 (IOUT, IRES)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 9 EFFECT:
C
C LONG-TERM POPULATION DOSE IN A GIVEN REGION BY PATHWAY.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDCHR.
C
C GLOSSARY OF VARIABLES:
C
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C RXSNM9 - THE NAME OF THE REQUESTED TYPE 9 EFFECT
C TEXT   - TEMPORARY VARIABLE USED TO CONSTRUCT THE TEXT FIELD
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 2 DEC 1985
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C Modified 11/27/95, D. Chanin: use standard abbreviation Sv for sieverts
C
      EXTERNAL ABORT
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      CHARACTER *77 RXSNM9, TEXT
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CXDF9
      COMMON /RESLT9/ NXUM9, IXCOD9(10), IX1DS9(10), IX2DS9(10),
     1                CXDF9(10)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
C
      CHARACTER *37 NAME(17)
C
      IF (FDPATH .EQ. 'OLD') THEN
C
      NAME(1) = 'TOTAL LONG-TERM PATHWAYS DOSE'
      NAME(2) = 'LONG-TERM DIRECT EXPOSURE PATHWAYS'
      NAME(3) = 'TOTAL INGESTION PATHWAYS DOSE'
```

```
      NAME(4) = 'LONG-TERM GROUNDSHINE DOSE'
      NAME(5) = 'LONG-TERM RESUSPENSION DOSE'
      NAME(6) = 'WATER INGESTION DOSE'
      NAME(7) = 'POP.-DEPENDENT DECONTAMINATION DOSE'
      NAME(8) = 'FARM-DEPENDENT DECONTAMINATION DOSE'
      NAME(9) = 'GROWING SEASON MILK DOSE'
      NAME(10)= 'GROWING SEASON CROP DOSE'
      NAME(11)= 'LONG-TERM MILK DOSE'
      NAME(12)= 'LONG-TERM CROP DOSE'
C
      IF (IRES .GE. 1 .AND. IRES .LE. 12) THEN
        TEXT(1:28)  = ORGNAM(IXCOD9(IOUT)) // ' POP. DOSE (Sv)'
        TEXT(29:40) = DISRAN(IX1DS9(IOUT),IX2DS9(IOUT))
        TEXT(41:77) = NAME(IRES)
        RXSNM9 = TEXT
      ELSE
        WRITE(6,*) 'INVALID VALUE OF IRES IN RXSNM9 ', IRES
        WRITE(7,*) 'INVALID VALUE OF IRES IN RXSNM9 ', IRES
        CALL ABORT ('RXSNM9')
      ENDIF
C
      ELSE
C
      NAME(1) = 'TOTAL LONG-TERM PATHWAYS DOSE'
      NAME(2) = 'LONG-TERM DIRECT EXPOSURE PATHWAYS'
      NAME(3) = 'TOTAL INGESTION PATHWAYS DOSE'
      NAME(4) = 'LONG-TERM GROUNDSHINE DOSE'
      NAME(5) = 'LONG-TERM RESUSPENSION DOSE'
      NAME(6) = 'WATER INGESTION DOSE'
      NAME(7) = 'POP.-DEPENDENT DECONTAMINATION DOSE'
      NAME(8) = 'FARM-DEPENDENT DECONTAMINATION DOSE'
      NAME(9) = 'INGESTION OF GRAINS'
      NAME(10)= 'INGESTION OF LEAF VEG'
      NAME(11)= 'INGESTION OF ROOT CROPS'
      NAME(12)= 'INGESTION OF FRUITS'
      NAME(13)= 'INGESTION OF LEGUMES'
      NAME(14)= 'INGESTION OF BEEF'
      NAME(15)= 'INGESTION OF MILK'
      NAME(16)= 'INGESTION OF POULTRY'
      NAME(17)= 'INGESTION OF OTHER MEAT CROPS'
C
      IF (IRES .GE. 1 .AND. IRES .LE. 17) THEN
        TEXT(1:28)  = ORGNAM(IXCOD9(IOUT)) // ' POP. DOSE (Sv)'
        TEXT(29:40) = DISRAN(IX1DS9(IOUT),IX2DS9(IOUT))
        TEXT(41:77) = NAME(IRES)
        RXSNM9 = TEXT
      ELSE
        WRITE(6,*) 'INVALID VALUE OF IRES IN RXSNM9 ', IRES
        WRITE(7,*) 'INVALID VALUE OF IRES IN RXSNM9 ', IRES
        CALL ABORT ('RXSNM9')
      ENDIF
C
      ENDIF
C
      RETURN
      END
*DECK RXNM10
      FUNCTION RXNM10 (IOUT, ICODE)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 10 EFFECT:
C   COST OF A GIVEN ECONOMIC EFFECT (TOTAL, DECONTAMINATION, ...)
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDCHR.
```

```
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO RXNM10:
C
C ICODE      - LOOP COUNTER ON TYPE OF RESULT DEFINED IN CALLING ROUTINE
C IOUT       - INDEX TO THE REQUESTED ECONOMIC RESULT NUMBER
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM RXNM10:
C
C RXNM10  - THE NAME OF THE REQUESTED TYPE 10 RESULT
C
C ECC1(1) = TOTAL ECONOMIC COSTS
C ECC1(2) = POP.-DEPENDENT COSTS
C ECC1(3) = FARM-DEPENDENT COSTS
C ECC1(4) = POP.-DEPENDENT DECONTAMINATION COST
C ECC1(5) = FARM-DEPENDENT DECONTAMINATION COST
C ECC1(6) = POP.-DEPENDENT INTERDICTION COST
C ECC1(7) = FARM-DEPENDENT INTERDICTION COST
C ECC1(8) = POP.-DEPENDENT CONDEMNATION COST
C ECC1(9) = FARM-DEPENDENT CONDEMNATION COST
C ECC1(10)= EMERGENCY PHASE COSTS
C ECC1(11)= INTERMEDATE PHASE COSTS
C ECC1(12)= MILK DISPOSAL COST
C ECC1(13)= CROP DISPOSAL COST
C
C LYNN RITCHIE, DIV. 6415, 22 AUG. 1985
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      EXTERNAL ABORT
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN
      LOGICAL CXDF10
      COMMON /RSLT10/ NXUM10, I1DS10(10), I2DS10(10), CXDF10(10)
      CHARACTER *37 NAME(13)

      CHARACTER *77 TEXT, RXNM10

      DATA NAME(1) / 'TOTAL ECONOMIC COSTS'/
      DATA NAME(2) / 'POP.-DEPENDENT COSTS'/
      DATA NAME(3) / 'FARM-DEPENDENT COSTS'/
      DATA NAME(4) / 'POP.-DEPENDENT DECONTAMINATION COST'/
      DATA NAME(5) / 'FARM-DEPENDENT DECONTAMINATION COST'/
      DATA NAME(6) / 'POP.-DEPENDENT INTERDICTION COST'/
      DATA NAME(7) / 'FARM-DEPENDENT INTERDICTION COST'/
      DATA NAME(8) / 'POP.-DEPENDENT CONDEMNATION COST'/
      DATA NAME(9) / 'FARM-DEPENDENT CONDEMNATION COST'/
      DATA NAME(10)/ 'EMERGENCY PHASE COST'/
      DATA NAME(11)/ 'INTERMEDIATE PHASE COST'/
      DATA NAME(12)/ 'MILK DISPOSAL COST'/
      DATA NAME(13)/ 'CROP DISPOSAL COST'/
C
      IF (ICODE .GE. 1 .AND. ICODE .LE. 13) THEN
        TEXT(1:28)  = 'ECONOMIC COST MEASURES ($)'
        TEXT(29:40) =  DISRAN (I1DS10(IOUT),I2DS10(IOUT))
        TEXT(41:77) =  NAME(ICODE)
        RXNM10 = TEXT
      ELSE
        WRITE(6,*) 'INVALID VALUE OF ICODE IN RXNM10', ICODE
        WRITE(7,*) 'INVALID VALUE OF ICODE IN RXNM10', ICODE
        CALL ABORT ('RXNM10')
```

```
      ENDIF

      RETURN
      END
*DECK RXNM11
      FUNCTION RXNM11 (ICODE)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 11 EFFECT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDCHR.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO RXNM11:
C
C CATNAM - CATEGORY NAME OF THIS TYPE OF RESULT
C ICODE  - RESULTS CODE FOR TYPE 11 RESULTS
C LTANAM - NAME OF THE LONG TERM ACTION FOR RESULT I
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM RXNM11
C
C RXNM11 - THE NAME OF THE REQUESTED TYPE 11 RESULT
C
C LYNN RITCHIE, DIV. 6415
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C Modified 11/27/95, D. Chanin: use standard abbreviation km for kilometers
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      CHARACTER *40 CATNAM
      CHARACTER *37 LTANAM(8)
      CHARACTER *77 RXNM11

      DATA CATNAM /'MAXIMUM LONG-TERM ACTION DISTANCE (km)'/

      DATA LTANAM
     1 /'FARM-DEPENDENT DECONTAMINATION DIST.',
     2  'POP.-DEPENDENT DECONTAMINATION DIST.',
     3  'FARM-DEPENDENT INTERDICTION DIST.',
     4  'POP.-DEPENDENT INTERDICTION DIST.',
     5  'FARM-DEPENDENT CONDEMNATION DIST.',
     6  'POP.-DEPENDENT CONDEMNATION DIST.',
     7  'MILK DISPOSAL DIST.',
     8  'CROP DISPOSAL DIST.'/

      IF (ICODE .GE. 1 .AND. ICODE .LE. 9) THEN
        RXNM11 = CATNAM // LTANAM(ICODE)
      ELSE
        WRITE(6,*) 'INVALID VALUE OF ICODE IN RXNM11 ', ICODE
        WRITE(7,*) 'INVALID VALUE OF ICODE IN RXNM11 ', ICODE
        CALL ABORT ('RXNM11')
      ENDIF

      RETURN
      END
*DECK RXNM12
      FUNCTION RXNM12 (IOUT, ICODE)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 12 RESULT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDCHR.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO RXNM12:
```

```
C
C ICODE  - RESULTS CODE FOR THE TYPE 12 RESULT
C IOUT   - INDEX TO THE REQUESTED LONG TERM ACTION CODE
C LTANAM - NAME OF THE LONG TERM ACTION FOR RESULT I
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM RXNM12:
C
C RXNM12 - THE NAME OF THE REQUESTED TYPE 12 RESULT
C
C LYNN RITCHIE, DIV. 6415
C
C MODIFIED 20 MAR 87, S.E.R. #47, TO CORRECT HEADINGS FOR
C  INTERDICTED FARM AREA AND POPULATION ON INTERDICTED LAND
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      EXTERNAL ABORT
      EXTERNAL DISRAN
C  NO INTRINSIC FUNCTIONS
      CHARACTER *12 DISRAN

      LOGICAL CXDF12
      COMMON /RSLT12/ NXUM12, I1DS12(10), I2DS12(10), CXDF12(10)
      CHARACTER *37 LTANAM(8)
      CHARACTER *77 TEXT, RXNM12

      DATA LTANAM
     1 /'FARM DECONTAMINATION (HECTARES)',
     2  'POP. DECONTAMINATION (INDIVIDUALS)',
     3  'FARM INTERDICTION (HECTARES)',
     4  'POP. INTERDICTION (INDIVIDUALS)',
     5  'FARM CONDEMNATION (HECTARES)',
     6  'POP. CONDEMNATION (INDIVIDUALS)',
     7  'MILK DISPOSAL AREA (HECTARES)',
     8  'CROP DISPOSAL AREA (HECTARES)'/

      IF (ICODE .GE. 1 .AND. ICODE .LE. 8) THEN
        TEXT(1:28)  = 'AFFECTED AREA/POPULATION'
        TEXT(29:40) =  DISRAN (I1DS12(IOUT),I2DS12(IOUT))
        TEXT(41:77) =  LTANAM(ICODE)
        RXNM12 = TEXT
      ELSE
        WRITE(6,*) 'INVALID VALUE OF ICODE IN RXNM12', ICODE
        WRITE(7,*) 'INVALID VALUE OF ICODE IN RXNM12', ICODE
        CALL ABORT ('RXNM12')
      ENDIF

      RETURN
      END
*DECK RXNM13
      FUNCTION RXNM13(IOUT)
C
C THIS FUNCTION RETURNS THE NAME OF THE REQUESTED TYPE 13 EFFECT:
C
C MAXIMAL INDIVIDUAL INGESTION DOSE AT A SPECIFIED DISTANCE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE HEDCHR.
C
C GLOSSARY OF VARIABLES:
C
C IOUT   - INDEX TO THE DESIRED RESULT OF THIS TYPE
C RXNM13 - THE NAME OF THE REQUESTED TYPE 13 EFFECT
```

```
C TEXT   - TEMPORARY VARIABLE USED TO CONSTRUCT THE TEXT FIELD
C
C WRITTEN 1/4/93 BY J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      EXTERNAL DISRAN
      CHARACTER *77 RXNM13
      CHARACTER *12 DISRAN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CXDF13
      COMMON /RSLT13/ NXUM13, IRAD13(40), IORG13(40), CXDF13(40)
C
      IF (IORG13(IOUT) .EQ. 1) THEN
      WRITE(RXNM13,10) 'MAXIMUM ANNUAL FOOD DOSE (EFFECTIVE)    ',
     *    'PROJECTED FOR INDIVIDUAL AT'
      ELSE
      WRITE(RXNM13,10) 'MAXIMUM ANNUAL FOOD DOSE (THYROID)      ',
     *    'PROJECTED FOR INDIVIDUAL AT'
      ENDIF
 10   FORMAT(A,A,I2)
      RXNM13(66:77) = DISRAN(IRAD13(IOUT),IRAD13(IOUT))
      RETURN
      END
*DECK DAYHOU
      SUBROUTINE DAYHOU
C
C SUBROUTINE TO SAMPLE A SPECIFIC WEATHER SEQUENCE FROM THE
C METEOROLOGICAL DATA FILE STARTING AT A USER SPECIFIED DAY AND HOUR
C
C THIS ROUTINE IS CALLED BY THE MAIN PROGRAM.
C
C LYNN RITCHIE, DIV. 6415.
C
C MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C   AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C   BOUNDARY WEATHER IS NOW DEFINED AFTER THE 120 HOURS INSTEAD OF BEFORE IT
C
C MODIFIED 4 JUN 87, DIC, SER #60, TURN ON RISK DOMINANT PLUME ADJUSTMENT
C                                  AND REMOVE CALCULATION OF MONTH
C
C MODIFIED 10 JUL 87, DIC, SER #68, FIX THE RISK DOMINANT PLUME MODEL AGAIN!
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      EXTERNAL ADJTIM, CONTRL, WSAMPL, WBNDRY

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M3/ ISTRDY, ISTRHR
      COMMON /CDATE/ KHOUR, KDAY
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      COMMON /ATMOPT/ IDEBUG, NUCOUT
      IDAY  = ISTRDY
      IHOUR = ISTRHR
C
C  PRINT OUT THE SELECTED START TIME BEFORE ADJUSTMENT
C
      IF (IDEBUG .GE. 3) WRITE(6,320) 'BEFORE', IDAY, IHOUR
  320 FORMAT(/1X, A, ' ADJUSTMENT, SELECTED START TIME DAY =', I4,
     $                ', HOUR =', I3: ', SECOND =', I5)
C
```

```
C  ADJUST THE START TIME IF THE RISK DOMINANT PLUME IS NOT THE FIRST PLUME
C
      CALL ADJTIM
C
C  PRINT OUT THE SELECTED START TIME AFTER ADJUSTMENT
C
      IF (IDEBUG .GE. 3) WRITE(6,320) ' AFTER', IDAY, IHOUR, ISECON

      KDAY  = IDAY
      KHOUR = IHOUR
C
C  SET THE WEATHER SAMPLE
C
      CALL WSAMPL
C
C  SET THE BOUNDARY DATA
C
      CALL WBNDRY
C
C  LOAD THE /METOUT/ RESULTS BLOCK
C
      ITRIAL = 1
      PRBMET = 1.
      IBINUM = 0
      NUMTRI = 1
C
C  CALL THE CONTROL ROUTINE TO PERFORM THE SIMULATION
C
      CALL CONTRL

      RETURN
      END
*DECK RANDOM
      SUBROUTINE RANDOM (XYZ)
C
C  THIS ROUTINE RETURNS A PSEUDO-RANDOM NUMBER ON THE UNIFORM INTERVAL
C  BETWEEN 0. AND 1. BY USING A SHUFFLED LINEAR-CONGRUENTIAL GENERATOR.
C
C  THIS ROUTINE IS CALLED BY SUBROUTINES BINSAM, RANSAM AND WRANBN.
C
C  THIS ROUTINE INITIALIZES THE RANDOM SEQUENCE WHEN IT IS CALLED WITH
C  A VALUE OF IFF=0.  THE VARIABLE IFF IS SET TO ZERO IN THE MAIN PROGRAM
C  BEFORE BEGINNING THE CALCULATION OF RESULTS FOR A NEW SOURCE TERM.
C
C  THE ALGORITHM USED HERE IS TAKEN FROM:
C    PRESS, FLANNERY, TEUKOLSKY, AND VETTERLING;
C    NUMERICAL RECIPES, THE ART OF SCIENTIFIC COMPUTING;
C    CAMBRIDGE UNIVERSITY PRESS, 1986, PP. 197-198.
C
C  WITH VAX/VMS FORTRAN, THIS ROUTINE WILL OCCASIONALLY RETURN A VALUE
C  OF EXACTLY ZERO, BUT IT DOES NOT APPEAR TO EVER RETURN AN EXACT ONE.
C
C  WRITTEN BY D. CHANIN, 12/22/88, LOG # 11/28/88-A,
C    THIS ROUTINE REPLACES A ROUTINE WHICH HAD A PERIOD OF LENGTH 255.
C    THE NEW VERSION HAS AN ESSENTIALLY INFINITE PERIOD BECAUSE OF
C    THE SHUFFLING METHOD IT UTILIZES.  THE COMMUNICATION BETWEEN
C    THIS ROUTINE AND THE REST OF THE CODE IS DIFFERENT IN THAT THE
C    VARIABLE IRSEED IS NOW REFERENCED HERE DIRECTLY.
C
C MODIFIED 5/16/89, DIC, LOG # 2/20/89-A,
C    ERROR IN MULTIPLE SOURCE TERM LOOPING FEATURE, SUBROUTINE RANDOM
C
C  NO EXTERNAL FUNCTIONS
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      SAVE
      INTRINSIC MOD
      COMMON /M4/ NSMPLS, NSBINS, IRSEED, INDXBN(41), INWGHT(41),
     1            NRNINT, RDISTS(6), NRINTN, IRNRAT(3), RNRATE(3)
      DIMENSION IR(97)
C
C  THE DATA CONSTANTS USED HERE SHOULD WORK PROPERLY ON MACHINES
C  WHICH CAN REPRESENT INTEGERS WITH VALUES AS LARGE AS 2 ** 30.
C
      PARAMETER (M=714025, IA=1366, IC=150889, RM=1./M)
C
C  USE A FLAG TO FORCE REINITIALIZATION BEFORE EACH NEW SOURCE TERM
C
      COMMON /IFF/ IFF

      IF (IFF .EQ. 0) THEN
C
C  INITIALIZE TO A UNIQUE SERIES DEPENDING ON THE VALUE OF IRSEED.
C  IRSEED CAN HAVE A USER-SPECIFIED VALUE BETWEEN 0 AND 255.
C
         IFF = 1
         IDUM = MOD (IC + IRSEED, M)

         DO 20 J = 1, 97
         IDUM = MOD (IA * IDUM + IC, M)
   20    IR(J)  = IDUM

         IDUM = MOD (IA * IDUM + IC, M)
         IY = IDUM

      ENDIF

      J = 1 + (97 * IY) / M

C modified for WinMaccs, 4/12/01, D. Chanin, add CALL ABORT

C      IF (J .LT. 1 .OR. J .GT. 97) STOP 'ILLEGAL J IN RANDOM'

      IF (J .LT. 1 .OR. J .GT. 97) THEN
        WRITE(6,*) 'ILLEGAL J IN RANDOM'
        WRITE(7,*) 'ILLEGAL J IN RANDOM'
        CALL ABORT ('terminating')
      ENDIF

      IY = IR(J)
      XYZ = IY * RM

      IDUM = MOD (IA * IDUM + IC, M)
      IR(J) = IDUM

      RETURN
      END
*DECK RANSAM
      SUBROUTINE RANSAM
C
C SUBROUTINE TO PERFORM STRATIFIED RANDOM SAMPLING.
C THE USER SPECIFIES HOW MANY STRATIFIED RANDOM SAMPLES ARE CHOSEN PER DAY.
C
C THIS ROUTINE IS CALLED BY THE MAIN PROGRAM.
C
C LYNN RITCHIE, DIV. 6415. THE ORIGINAL ROUTINE NAME WAS WSINGL.
C MODIFIED BY D. CHANIN, 20 NOV 1985 TO PERFORM RANDOM SAMPLING
C MODIFIED BY D. CHANIN, 17 JUN 1986 TO NOT CLOBBER DAY AND HOUR
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C MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C   AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C   BOUNDARY WEATHER IS NOW DEFINED AFTER THE 120 HOURS INSTEAD OF BEFORE IT
C MODIFIED 12 MAY 87, DIC, SER #59, MAKE SCALING FACTORS FOR PLUME RISE
C                                   SUBJECT TO USER MODIFICATION
C MODIFIED 4 JUN 87, DIC, SER #60, TURN ON RISK DOMINANT PLUME ADJUSTMENT
C                                  AND REMOVE CALCULATION OF MONTH
C MODIFIED 10 JUL 87, DIC, SER #68, FIX THE RISK DOMINANT PLUME MODEL AGAIN!
C MODIFIED 12 AUG 87, DIC, SER #71, TURN ON WIND SHIFT MODEL FOR RADIAL EVAC
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 12/22/88, D. CHANIN, LOG # 12/01/88-A,
C   REPLACE THE RANDOM NUMBER GENERATOR, REMOVE THE COMMON /IXSEED/
C Modified 3/8/96, Allow sampling of each hour of the year with METCOD=5
      EXTERNAL ADJTIM, CONTRL, RANDOM, WSAMPL, WBNDRY
      EXTERNAL ABORT

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M4/ NSMPLS, NSBINS, IRSEED, INDXBN(41), INWGHT(41),
     1            NRNINT, RDISTS(6), NRINTN, IRNRAT(3), RNRATE(3)
      COMMON /CDATE/ KHOUR, KDAY
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      COMMON /ATMOPT/ IDEBUG, NUCOUT
C
C  JDAY AND JHOUR ARE DIMENSIONED TO HANDLE 4 RANDOM SAMPLES PER DAY
C
      DIMENSION JDAY(8760), JHOUR(8760)
C
C  USE THE VALUE OF NSMPLS TO DECIDE HOW MANY TRIALS TO SAMPLE PER DAY
C
      IF (NSMPLS .LT. 1 .OR. NSMPLS .GT. 24) THEN
      WRITE(6,*) 'ERROR: NSMPLS MUST BE BETWEEN 1 AND 24'
        WRITE(6,*) 'IF YOU SPECIFY METCOD EQUAL TO 5'
      WRITE(7,*) 'ERROR: NSMPLS MUST BE BETWEEN 1 AND 24'
        WRITE(7,*) 'IF YOU SPECIFY METCOD EQUAL TO 5'
        CALL ABORT ('RANSAM')
      ENDIF

      NUMTRI = NSMPLS * 365

      DO 120 ITRI = 1, NUMTRI
      CALL RANDOM (RANVAL)
      JDAY(ITRI) = (ITRI + NSMPLS - 1) / NSMPLS
      IPARTI = MOD (ITRI + NSMPLS - 1, NSMPLS) + 1
      IPARLN = 24 / NSMPLS
  120 JHOUR(ITRI) = RANVAL * .999 * IPARLN + (IPARTI - 1) * IPARLN + 1
C
C  METEOROLOGICAL SAMPLE OCCURS AT KHOUR,KDAY
C
C  KHOUR AND KDAY ARE INDICES TO THE HOUR AND DAY OF THE START OF THIS TRIAL
C
C  BEWARE! THEY ARE INCREMENTED AS WEATHER IS READ FROM THE DATA ARRAYS
C
      DO 900 ITRIAL = 1, NUMTRI

      IDAY  = JDAY (ITRIAL)
      IHOUR = JHOUR(ITRIAL)
C
C  LOAD THE /METOUT/ RESULTS BLOCK
C
```

```
      PRBMET = 1. / NUMTRI
C
C  PRINT OUT THE SELECTED START TIME BEFORE ADJUSTMENT
C
      IF (IDEBUG .GE. 3) WRITE(6,320) 'BEFORE', IHOUR, IDAY
  320 FORMAT( 1X, A, ' ADJUSTMENT, SELECTED START TIME DAY =', I4,
     $                ', HOUR =', I3: ', ISECON =', I5/)
C
C  ADJUST THE START TIME IF THE RISK DOMINANT PLUME IS NOT THE FIRST PLUME
C
      CALL ADJTIM
C
C  PRINT OUT THE SELECTED START TIME AFTER ADJUSTMENT
C
      IF (IDEBUG .GE. 3) WRITE(6,320) ' AFTER', IHOUR, IDAY, ISECON
C
C  (KDAY,KHOUR) ARE USED TO LOAD THE WEATHER SEQUENCE ARRAYS FROM THE MET FILE
C  BY SUBROUTINES WSAMPL AND WINCTM, THEY ARE CHANGED BY THOSE ROUTINES !!!!!!
C
      KDAY  = IDAY
      KHOUR = IHOUR

      IBINUM = 0
C
C  SET THE WEATHER SAMPLE
C
      CALL WSAMPL
C
C  SET THE BOUNDARY DATA
C
      CALL WBNDRY
C
C  CALL THE CONTROL ROUTINE TO PERFORM SIMULATION
C
  900 CALL CONTRL

      RETURN
      END
*DECK USRSUP
      SUBROUTINE USRSUP
C
C SUBROUTINE TO USE THE FIVE DAYS OF USER SUPPLIED WEATHER DATA
C FOR A SINGLE WEATHER TRIAL
C
C THIS ROUTINE IS CALLED BY THE MAIN PROGRAM.
C
C LYNN RITCHIE, DIV. 6415.
C
C REWRITTEN BY D. CHANIN, 21 NOV 85.
C
C MODIFIED BY D. CHANIN, 11 FEB 86. USES NON-ZERO DAY AND HOUR FOR CHRONC
C
C MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C   AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C   BOUNDARY WEATHER IS NOW DEFINED AFTER THE 120 HOURS INSTEAD OF BEFORE IT
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      EXTERNAL CONTRL, WBNDRY

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
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```
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M3/ ISTRDY, ISTRHR
      COMMON /M5/ HRMXHT(120), IHRSTB(120), HRRAIN(120), HRWNDV(120),
     $            IHRDIR(120)
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      INTEGER WINDIR
      COMMON /METDAT/ LIMSP1, WINDSP(121), ISTAB(121), HTMXLR(121),
     $                RNMM(121), WINDIR(121)
C
C  SET THE WEATHER DATA INTO THE SAMPLE ARRAYS
C
      DO 100 I = 1, 120
      ISTAB(I)  = IHRSTB(I)
      WINDSP(I) = HRWNDV(I)
      RNMM(I)   = HRRAIN(I)
      HTMXLR(I) = HRMXHT(I)
  100 WINDIR(I) = IHRDIR(I)
C
C  SET THE BOUNDARY DATA
C
      CALL WBNDRY
C
C  LOAD THE /METOUT/ RESULTS BLOCK
C
      ITRIAL = 1
      IHOUR  = ISTRHR
      IDAY   = ISTRDY
      IBINUM = 0
      NUMTRI = 1
      PRBMET = 1.
C
C  CALL A CONTROL ROUTINE TO PERFORM THE SIMULATION
C
      CALL CONTRL

      RETURN
      END
*DECK CONMET
      SUBROUTINE CONMET
C
C SUBROUTINE TO RUN A SINGLE TRIAL OF CONSTANT WEATHER
C
C THIS ROUTINE IS CALLED BY THE MAIN PROGRAM.
C
C D. CHANIN, DIV. 6415, 10 JAN 1986.
C
C MODIFIED BY D. CHANIN, 11 FEB 86. USES NON-ZERO DAY AND HOUR FOR CHRONC
C
C MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C   AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C   BOUNDARY WEATHER IS NOW DEFINED AFTER THE 120 HOURS INSTEAD OF BEFORE IT
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      EXTERNAL CONTRL, WBNDRY

      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /M2/ LIMSPA, BNDMXH, IBDSTB, BNDRAN, BNDWND
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      COMMON /M3/ ISTRDY, ISTRHR
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      INTEGER WINDIR
      COMMON /METDAT/ LIMSP1, WINDSP(121), ISTAB(121), HTMXLR(121),
     $                RNMM(121), WINDIR(121)
      LIMSPA = 0
C
C  SET THE WEATHER DATA INTO THE SAMPLE ARRAYS
C
      DO 100 I = 1, 120
      ISTAB(I) = IBDSTB
      WINDSP(I) = BNDWND
      RNMM(I)   = BNDRAN
      HTMXLR(I) = BNDMXH
  100 WINDIR(I) = 0
C
C  SET THE BOUNDARY DATA
C
      CALL WBNDRY
C
C  LOAD THE /METOUT/ RESULTS BLOCK
C
      ITRIAL = 1
      IHOUR  = ISTRHR
      IDAY   = ISTRDY
      IBINUM = 0
      NUMTRI = 1
      PRBMET = 1.
C
C  CALL A CONTROL ROUTINE TO PERFORM THE SIMULATION
C
      CALL CONTRL

      RETURN
      END
*DECK WBNDRY
      SUBROUTINE WBNDRY
C
C  DEFINE THE BOUNDARY WEATHER CONDITIONS
C
C  BOUNDARY WEATHER IS USED FOR ALL INTERVALS BEYOND LIMSPA OR IF
C  THE RECORDED WEATHER DATA IS NOT SUFFICIENT FOR THE PLUME TO LEAVE OUR GRID
C
C  GLOSSARY OF VARIABLE NAMES FOR DATA INPUT TO WBNDRY
C
C   BNDMXH - BOUNDARY CONDITION MIXING LAYER HEIGHT
C   BNDRAN - BOUNDARY CONDITION RAIN RATE
C   BNDWND - BOUNDARY CONDITION WIND SPEED
C   IBDSTB - BOUNDARY CONDITION STABILITY CLASS
C   IDEBUG - DIAGNOSTIC OUTUT CONTROL VARIABLE
C   LIMSPA - LIMITING SPATIAL INTERVAL FOR MEASURED WEATHER DATA
C
C  GLOSSARY OF VARIABLE NAMES FOR DATA OUTPUT FROM WBNDRY
C
C   HTMXLR(I) - MIXING LAYER HEIGHT FOR HOUR I
C   IBND    - HOUR OF THE BOUNDARY WEATHER
C   ISTAB(I)  - STABILITY CLASS FOR HOUR I
C   LIMSP1 - LIMITING SPATIAL INTERVAL FOR MEASURED WEATHER DATA
C   RNMM(I)   - RAIN RATE IN MM FOR HOUR I
C   WINDSP(I) - WIND SPEED IN M/S FOR HOUR I
C   WINDIR(I) - WIND DIRECTION IN SECTOR NUMBER FOR HOUR I
C
C  LYNN RITCHIE, DIV. 6415.
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C
C  MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C    AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C    BOUNDARY WEATHER IS NOW DEFINED AFTER THE 120 HOURS INSTEAD OF BEFORE IT
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS

      INTEGER WINDIR
      COMMON /METDAT/ LIMSP1, WINDSP(121), ISTAB(121), HTMXLR(121),
     $                RNMM(121), WINDIR(121)
      COMMON /M2/ LIMSPA, BNDMXH, IBDSTB, BNDRAN, BNDWND
C
C  SET BOUNDARY WEATHER INTO DATA ARRAY
C
      LIMSP1=LIMSPA
      IBND=121
      ISTAB(IBND)=IBDSTB
C
C  WE MUST AVOID A SITUATION WHERE LID HEIGHT CHANGES
C  WHEN THE TRANSITION TO BOUNDARY WEATHER IS MADE, SEE SER #38.
C
      HTMXLR(IBND)=HTMXLR(IBND-1)
      RNMM(IBND)=BNDRAN
      WINDSP(IBND)=BNDWND
C
C  FOLLOWING CARD CHANGED BY D. CHANIN, DIV. 6415, 27 JUNE 1984.
C  BOUNDARY WEATHER SHOULD NOT HAVE AN ASSOCIATED WIND DIRECTION.
C
      WINDIR(IBND) = 0
      RETURN
      END
*DECK ADJTIM
      SUBROUTINE ADJTIM
C
C THIS ROUTINE CALCULATES A NEW VALUE FOR THE WEATHER SEQUENCE START
C TIME (IDAY,IHOUR), SO THAT THE RELEASE OF THE RISK DOMINANT PLUME
C WILL COINCIDE WITH THE START TIME SELECTED BT THE WEATHER SAMPLING ROUTINES.
C
C THIS ROUTINE IS CALLED BY SUBROUTINES: DAYHOU, BINSAM, RANSAM
C
C D. CHANIN, 13 FEB 87.
C
C MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C
C MODIFIED 10 JUL 87, DIC, SER #68, FIX THE RISK DOMINANT PLUME MODEL AGAIN!
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /MULREL/ PLHEAT(4), PLHITE(4), PLUDUR(4), PDELAY(4),
     1                REFTIM(4), RELINV(MXDKCN,4), PSDIST(10,10),
     2                SIGYINIT(4), SIGZINIT(4), BUILDH(4)
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      IF (MAXRIS .EQ. 1) RETURN
C
C  CALCULATE THE NUMBER OF SECONDS THE SELECTED START TIME IS TO BE
C  ADJUSTED BACKWARDS IN TIME
C
      IBACK = PDELAY(MAXRIS) - PDELAY(1)
C
C  CALCULATE THE HOUR IN THE YEAR OF THE SELECTED START TIME
C
```

```
      I8760 = 24 * IDAY + IHOUR - 24
C
C  CALCULATE THE HOUR IN THE YEAR OF THE NEW ADJUSTED START TIME
C
      J8760 = I8760 - (IBACK + 3599) / 3600
C
C  CALCULATE THE SECONDS IN THE HOUR OF THE NEW ADJUSTED START TIME
C
      ISECON = 3600 - MOD (IBACK,3600)

      IF (ISECON .EQ. 3600) ISECON = 0

      IF (J8760 .LT. 1) THEN
        IDAY = 1
        IHOUR = 1
        ISECON = 0
      ELSE
        IDAY = (J8760 - 1) / 24 + 1
        IHOUR = MOD (J8760 - 1, 24) + 1
      ENDIF

      RETURN
      END
*DECK WSAMPL
      SUBROUTINE WSAMPL
C
C  FILL DATA ARRAY WITH 120 CONSECUTIVE HOURS OF WEATHER DATA
C       FROM THE METEOROLOGICAL DATA FILE
C
C  LYNN RITCHIE, DIV. 6415.
C
C  MODIFIED 12 MAY 87, DIC, SER #59, MAKE SCALING FACTORS FOR PLUME RISE
C                                    SUBJECT TO USER MODIFICATION
C  MODIFIED 4 JUN 87, DIC, SER #60, TURN ON RISK DOMINANT PLUME ADJUSTMENT
C                                   AND REMOVE CALCULATION OF MONTH
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.

      EXTERNAL WGTMET, WINCTM

      INTEGER WINDIR
      COMMON /METDAT/ LIMSP1, WINDSP(121), ISTAB(121), HTMXLR(121),
     $                RNMM(121), WINDIR(121)
      COMMON /CDATE/ KHOUR, KDAY
      COMMON /ATMOPT/ IDEBUG, NUCOUT
      IF (IDEBUG .GE. 3)
     $ WRITE(6,20) 'DAY', 'HOUR', 'ISTAB', 'WINDSP', 'RNMM',
     $              'HTMXLR', 'WINDIR'
   20 FORMAT(7A11)

      DO 60 I = 1, 120

      IF (I .NE. 1) CALL WINCTM

      CALL WGTMET (ISTAB(I),HTMXLR(I),RNMM(I),WINDSP(I),WINDIR(I))

      IF (IDEBUG .GE. 3) THEN
        WRITE(6,40) KDAY, KHOUR, ISTAB(I), WINDSP(I), RNMM(I),
     1              HTMXLR(I), WINDIR(I)
   40   FORMAT(3I11, 1P, 3E11.2, I11)
      ENDIF
```

```
   60 CONTINUE

      RETURN
      END
*DECK WGTMET
      SUBROUTINE WGTMET (KSTAB, HGTMXL, RRAIN, SPEED, KWDIR)
C
C  THIS SUBROUTINE TAKES THE CURRENT METEOROLIGICAL HOUR
C     AND PREPARES THE STABILITY, WIND VELOCITY AND DIRECTION,
C     MIXING HEIGHT AND RATE OF PRECIPITATION FOR THE SPECIFIED HOUR
C     AS DEFINED BY THE SUPPLIED METEOROLOGICAL DATA.
C
C  INPUT DATA-- IDAY, IHOUR--THE CURRENT TIME OF THE
C     METEOROLOGICAL TRIAL FOR WHICH THE METEOROLOGICAL DATA BY SPATIAL
C     INTERVAL IS TO BE BE COMPUTED.
C
C  OUTPUT DATA--THE METEOROLOGICAL DATA TABLE FOR THE CURRENT HOUR
C     OF THE CURRENT TRIAL.  THE DATA TABLE CONTAINS  THE STABILITY,
C     MIXING HEIGHT, RAIN RATE, WIND SPEED AND WIND DIRECTION FOR THE
C     METEOROLOGICAL HOUR.
C
C  CRAC2 CODING ADAPTED BY LYNN RITCHIE, DIV. 6415.
C
C  MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C    AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C  MODIFIED 4 JUN 87, DIC, SER #60, TURN ON RISK DOMINANT PLUME ADJUSTMENT
C                                   AND REMOVE CALCULATION OF MONTH
      EXTERNAL ABORT
      COMMON /CDATE/ KHOUR, KDAY
      COMMON /METDTA/ ROSE(16,4), HEIGHT(4,2), MONTHS(12,24,31)
      COMMON /IRAIN/ MRAIN(24,365)
      COMMON /HGTMIX/ HGTMIX(4,6)
      DIMENSION ICMDY(13)
      DIMENSION ITAB(12)
      DIMENSION    IDTA(24,365)
      EQUIVALENCE (IDTA(1,1),MONTHS(1,1,1))
C
C ITAB(12)         SEASON INDICATOR FOR EACH MONTH
C
      DATA ITAB/1,1,2,2,2,3,3,3,4,4,4,1/
C
C ICMDY(13)        CUMULATIVE DAYS BY MONTH
C
      DATA ICMDY/0,31,59,90,120,151,181,212,243,273,304,334,365/

      ISTAB(I,J)=MOD(IDTA(I,J)/10,10)
      IWSPD(I,J)=MOD(IDTA(I,J)/100,1000)
      IWDIR(I,J)=MOD(IDTA(I,J)/100000,100)
      IRANE(I,J)=MOD(MRAIN(I,J),1000)
c      IMXHT(I,J)=MOD(MRAIN(I,J)/1000,100)
      IHUR = KHOUR
      KK   = KDAY
C
C  DETERMINE MONTH OF THE YEAR
C
      DO 10 I = 1, 12
   10 IF (KDAY .GT. ICMDY(I) .AND. KDAY .LE. ICMDY(I+1)) JMON = I
C
C  DETERMINE CURRENT SEASON
C
      ISESON = ITAB(JMON)
C
```

```
C  SET METEOROLOGICAL DATA FOR THE CURRENT HOUR
C
C  STABILITY INDEX
C
      KSTAB = ISTAB(IHUR,KK)
C
C  RAIN RATE IN MILLIMETERS PER HOUR
C
      RRAIN = IRANE(IHUR,KK) * .1
C
C  MIXING HEIGHT IN METERS
C
C FOR THE TIME BEING, ONLY USE SEASONAL MIXING LAYER HEIGHT!
C WE CAN ONLY HANDLE A LID HEIGHT THAT IS CONSTANT WITH TIME.
C  D. CHANIN, 24 OCT 86.
C
      HGTMXL = HGTMIX(ISESON,KSTAB)
      IF (HGTMXL .LT. 100.) THEN
        WRITE(6,*)'MIXING LAYER HT MUST BE AT LEAST 100 M'
        WRITE(7,*)'MIXING LAYER HT MUST BE AT LEAST 100 M'
        CALL ABORT('WGTMET')
      ENDIF
C
C  WIND SPEED IN METERS PER SECOND
C
      SPEED = IWSPD(IHUR,KK) / 10.
C
C  WIND DIRECTION INDEX
C
      KWDIR = IWDIR(IHUR,KK)

      RETURN
      END
*DECK WINCTM
      SUBROUTINE WINCTM
C
C  THIS SUBROUTINE INCREMENTS THE HOUR AND DAY
C
C CRAC2 CODING ADAPTED BY LYNN RITCHIE, DIV. 6415.
C
C  MODIFIED 4 JUN 87, DIC, SER #60, TURN ON RISK DOMINANT PLUME ADJUSTMENT
C                                   AND REMOVE CALCULATION OF MONTH
      COMMON /CDATE/ KHOUR, KDAY
      KHOUR = KHOUR + 1
      IF (KHOUR .LE. 24) RETURN

      KHOUR = 1
      KDAY = KDAY + 1
      IF (KDAY .GT. 365) KDAY = 1

      RETURN
      END
*DECK BINSAM
      SUBROUTINE BINSAM
C
C SUBROUTINE TO PERFORM WEATHER CATEGORY BIN SAMPLING LIKE CRAC2
C WITH THE ENHANCEMENT OF TREATING MORE THAN ONE LEVEL OF RAIN INTENSITY.
C
C THIS ROUTINE IS CALLED BY THE MAIN PROGRAM.
C
C CRAC2 CODING ADAPTED BY LYNN RITCHIE, DIV. 6415.
C
C MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
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```
C   AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C   BOUNDARY WEATHER IS NOW DEFINED AFTER THE 120 HOURS INSTEAD OF BEFORE IT
C MODIFIED 12 MAY 87, DIC, SER #59, MAKE SCALING FACTORS FOR PLUME RISE
C                                   SUBJECT TO USER MODIFICATION
C MODIFIED 4 JUN 87, DIC, SER #60, TURN ON RISK DOMINANT PLUME ADJUSTMENT
C                                  AND REMOVE CALCULATION OF MONTH
C MODIFIED 10 JUL 87, DIC, SER #68, FIX THE RISK DOMINANT PLUME MODEL AGAIN!
C MODIFIED 18 NOV 87, LTR, SER #73, IMPLEMENT MACCS 1.5 WEATHER BINNING
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 12/13/88, J. ROLLSTIN AND L. RITCHIE, LOG # 11/28/88-C,
C   ASSIGN SUBSEQUENT (AFTER THE INITIAL VALUE) VALUES OF IRAND(IMET) TO
C   BE INTEGERS BETWEEN [ INT (J * (N/K)) + 1 ] AND [ INT (J+1) * (N/K) ]
C   AS DESCRIBED IN NUREG/CR-2552 (THE CRAC2 MODEL DESCRIPTION).
C MODIFIED 12/22/88, D. CHANIN, LOG # 12/01/88-A,
C   REPLACE THE RANDOM NUMBER GENERATOR, REMOVE THE COMMON /IXSEED/
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/30/91, D. CHANIN, #1/14/91-A, AVOID CLOBBERING (IDAY,IHOUR)
C
      EXTERNAL ADJTIM, CONTRL, RANDOM, WRANBN, WSAMPL, WBNDRY

      COMMON /IRAIN/ MRAIN(24,365)
      COMMON /METB/ IDRBIN(41,17), IRAND(41),
     1              IWGHT(41), SPACE(41), NTOT, NBIN
      COMMON /CDATE/ KHOUR, KDAY
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      COMMON /ATMOPT/ IDEBUG, NUCOUT
      DIMENSION IBIN(41), IBIT(41)

      DTACNT = 8760.

      DO 1 I = 1, 41
      IBIN(I) = 0
    1 IBIT(I) = 0
C
C  INITIALIZE THE BINNING SELECTION ARRAYS
C
      CALL WRANBN
C
C  SET DAY AND HOUR OF FIRST POTENTIAL WEATHER SAMPLE STARTING AROUND THE
C  MIDDLE OF THE YEAR JUST AS IN CRAC2.  D. CHANIN, 4 JUN 87.
C
      IFIRST = 152
      IDAY0  = IFIRST
      IHOUR0 = 0
C
C  SELECT THE NEXT SAMPLE OF WEATHER BY THE LATIN HYPERCUBE SELECTION CRITERION
C
      NSAMPL = 0
      TOTMET = 0
  300 IHOUR0 = IHOUR0 + 1

      IF (IHOUR0 .GT. 24) THEN
        IHOUR0 = 1
        IDAY0 = IDAY0 + 1
        IF (IDAY0 .EQ. IFIRST .AND. NSAMPL .GT. 0) GO TO 1200
        IF (IDAY0 .GT. 365) IDAY0 = IDAY0 - 365
      ENDIF

      IMET = MRAIN(IHOUR0,IDAY0) / 100000
      IF (IWGHT(IMET) .EQ. 0) GO TO 300

      IBIN(IMET) = IBIN(IMET) + 1
      IF (IBIN(IMET) .LT. IRAND(IMET)) GO TO 300
```

```
      IF (IBIT(IMET) .EQ. IWGHT(IMET)) GO TO 300
      IBIT(IMET) = IBIT(IMET) + 1
C
C  CALL A RANDOM NUMBER GENERATOR WITHIN THE CODE SO WE CAN GET THE SAME
C  RESULTS ON DIFFERENT COMPUTERS.
C
      CALL RANDOM (XYZ)

      J = IBIT(IMET)
      ILEFT = INT (J * SPACE(IMET)) + 1
      IRGHT = INT ((J+1) * SPACE(IMET))
C
C  THE SELECTION ALGORITHM IN THE NEXT STATEMENT REQUIRES THE CONSTANT
C  .999999 IN ORDER TO ADJUST THE RANDOM NUMBER, XYZ, SO THAT IT WILL
C  ALWAYS BE LESS THAN ONE.  THE TERM, .999999 * XYZ, MUST BE A
C  UNIFORMLY DISTRIBUTED RANDOM NUMBER, X, SELECTED FROM THE INTERVAL
C  [0,1), THAT IS, (0 <= X < 1).
C
      IRAND(IMET) = ILEFT + (.999999 * XYZ) * (IRGHT - ILEFT + 1)
C
C  FOLLOWING STATEMENT FIXED BY D. CHANIN, FLOAT CALL ADDED TO AVOID TRUNCATION
C
      PRBMET = FLOAT (IDRBIN(IMET,17)) / IWGHT(IMET) / DTACNT
      TOTMET = TOTMET + PRBMET
      NSAMPL = NSAMPL + 1

      IF (IDEBUG .GE. 3) WRITE(6,310) NSAMPL, IMET, PRBMET
  310 FORMAT('1', 5X, 'SAMPLE ',I3,' BIN ',I3,' WITH PROBABILITY ',
     $            1PE10.4/)

      IDAY  = IDAY0
      IHOUR = IHOUR0
C
C  PRINT OUT THE SELECTED START TIME BEFORE ADJUSTMENT
C
      IF (IDEBUG .GE. 3) WRITE(6,320) 'BEFORE', IDAY, IHOUR
  320 FORMAT( 1X, A, ' ADJUSTMENT, SELECTED START TIME DAY =', I4,
     $                ', HOUR =', I3: ', SECOND =', I5/)
C
C  ADJUST THE START TIME IF THE RISK DOMINANT PLUME IS NOT THE FIRST PLUME
C
      CALL ADJTIM
C
C  PRINT OUT THE SELECTED START TIME AFTER ADJUSTMENT
C
      IF (IDEBUG .GE. 3) WRITE(6,320) ' AFTER', IDAY, IHOUR, ISECON
C
C  (KDAY,KHOUR) ARE USED TO LOAD THE WEATHER SEQUENCE ARRAYS FROM THE MET FILE
C  BY SUBROUTINES WSAMPL AND WINCTM, THEY ARE CHANGED BY THOSE ROUTINES !!!!!!
C
      KDAY  = IDAY
      KHOUR = IHOUR
C
C  SET THE WEATHER SAMPLE
C
      CALL WSAMPL
C
C  SET THE BOUNDARY DATA
C
      CALL WBNDRY
C
C  LOAD THE /METOUT/ RESULTS BLOCK
```

```
C
C  NUMTRI IS SET IN SUBROUTINE WBNMET
C
      ITRIAL = NSAMPL
      IBINUM = IMET
C
C  CALL A CONTROL ROUTINE TO PERFORM THE SIMULATION
C
      CALL CONTRL

      GO TO 300
C
C  END OF THE YEAR
C
 1200 CONTINUE

      RETURN
      END
*DECK WRANBN
      SUBROUTINE WRANBN
C
C THIS SUBROUTINE INITIALIZES THE WEATHER BIN CODES USED FOR
C WEATHER CATEGORY BIN SAMPLING. (SEE SUBROUTINES WBNMET AND BINSAM)
C
C THIS ROUTINE IS CALLED BY SUBROUTINE BINSAM.
C
C LYNN RITCHIE, DIV. 6415.
C
C MODIFIED BY D. CHANIN, 15 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 12/13/88, J. ROLLSTIN AND L. RITCHIE, LOG # 11/28/88-B,
C   ASSIGN AN INITIAL VALUE TO THE VARIABLE IRAND(I) IN SUCH A WAY AS
C   TO ASSURE THAT THE RANDOM NUMBER GENERATED WILL BE USED FROM THE
C   INTERVAL BETWEEN 1 AND THE GREATEST INTEGER LESS THAN (N/K).
C
      EXTERNAL RANDOM

      COMMON /METB/ IDRBIN(41,17), IRAND(41),
     1              IWGHT(41), SPACE(41), NTOT, NBIN
      DATA ISMRY /17/

      DO 10 I = 1, NBIN
C
C  LATIN HYPERCUBE RANDOM SAMPLING IS USED TO ASSURE EVENLY SPACED
C  (STRATIFIED) RANDOM SAMPLES FROM WITHIN EACH BIN
C
      DIRBI = IDRBIN(I,ISMRY)
      SPACE(I) = 0.
      IF (IWGHT(I) .GT. 0) SPACE(I) =  DIRBI / IWGHT(I)
C
C  CHOOSE THE FIRST RANDOM NUMBER FROM WITHIN EACH BIN
C
      CALL RANDOM (XYZ)
C
C  THE SELECTION ALGORITHM IN THE NEXT STATEMENT REQUIRES THE CONSTANT
C  .999999 IN ORDER TO ADJUST THE RANDOM NUMBER, XYZ, SO THAT IT WILL
C  ALWAYS BE LESS THAN ONE.  THE TERM, .999999 * XYZ, MUST BE A
C  UNIFORMLY DISTRIBUTED RANDOM NUMBER, X, SELECTED FROM THE INTERVAL
C  [0,1), THAT IS, (0 <= X < 1).
C
      IRAND(I) = 1 + (.999999 * XYZ) * INT (SPACE(I))

   10 CONTINUE
```

```
      RETURN
      END
*DECK CONTRL
      SUBROUTINE CONTRL
C
C THIS ROUTINE CONTROLS THE EXECUTION OF THE CONSEQUENCE MODELLING SIMULATION
C
C THIS ROUTINE IS CALLED BY THE FOLLOWING SUBROUTINES:
C   DAYHOU, BINSAM, USRSUP, CONMET, RANSAM.
C
C GLOSSARY OF VARIABLES:
C
C BRKPNT - BREAKPOINT FOR FORMULA CHANGE ON EXPANSION FACTOR
C DELAY  - TIME FROM SCRAM OF THIS PLUME SEGMENT (SECONDS)
C ENDAT1 - LOGICAL FLAG SIGNIFYING THAT ONLY THE "ATMOS" MODULE IS TO BE RUN
C ENDAT2 - LOGICAL FLAG SIGNIFYING THAT ONLY "ATMOS" AND "EARLY" ARE TO BE RUN
C EXPFAC - EXPANSION FACTOR FOR THIS PLUME SEGMENT
C IBINUM - BIN NUMBER OF THIS WEATHER TRIAL
C IDAY   - DAY IN THE YEAR OF THIS WEATHER TRIAL START TIME
C IDEBUG - DEBUG PRINT OPTION CONTROLLER, HIGHER VALUE MEANS MORE OUTPUT
C IDELAY - TIME FROM THE FIRST RELEASE TO THIS RELEASE
C IHOUR  - HOUR IN THE DAY OF THIS WEATHER TRIAL START TIME
C IMHOUR - INDEX TO HOUR IN THE MET SEQUENCE USED FOR DETERMINING WIND DIRECTION
C IREL   - LOOP COUNTER ON PLUME SEGMENTS
C ISRCTM - LOOP COUNTER ON SOURCE TERMS USED BY "ATMOS"
C ISTART - HOUR IN THE WEATHER SEQUENCE AT WHICH THE RELEASE STARTS
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C ITRIAL - SEQUENCE NUMBER OF THIS WEATHER TRIAL
C MAXRIS - SELECTION OF THE RISK DOMINANT PLUME
C METCOD - METEOROLOGICAL SAMPLING OPTION CODE, SEE BELOW
C NSMPLS - NUMBER OF WEATHER SEQUENCES TO BE SELECTED FROM EACH OF THE BINS
C NSTRTG - TOTAL NUMBER OF EMERGENCY RESPONSE SCENARIOS TO BE MODELLED
C NUMTRI - TOTAL NUMBER OF WEATHER TRIALS IN THE RUN
C PRBMET - PROBABILITY OF THIS WEATHER TRIAL
C SUMDUR - RELEASE DURATION USED FOR CALCULATING EXPANSION FACTOR
C TIMBAS - TIME BASE FOR THE EXPANSION FACTOR FORMULA
C TMTOGO - SECONDS REMAINING IN THE WEATHER HOUR
C WINDIR - ARRAY OF WIND DIRECTIONS IN THE WEATHER SEQUENCE
C XPFAC1 - EXPONENTIAL FACTOR FOR EXPANSION FACTOR
C XPFAC2 - EXPONENTIAL FACTOR FOR EXPANSION FACTOR
C
C GLOSSARY OF EXTERNALS:
C
C ATMOUT - MODELS THE DISPERSION AND DEPOSITION FOR ONE WEATHER SEQUENCE
C CHROUT - MODELS THE LONG-TERM EFFECTS FOR ONE WEATHER SEQUENCE
C EAROUT - MODELS THE EMERGENCY PHASE EFFECTS FOR ONE WEATHER SEQUENCE
C
C DAVID CHANIN, DIV. 6415, 3 JULY 1984.
C MODIFIED 16 JUN 86, DIC, SER #24, EXPANSION FACTOR CALCULATED SEPARATELY
C    FOR EACH PLUME SEGMENT WITH A 500 HOUR LIMIT.
C MODIFIED 12 FEB 87, DIC, SER #44, PARTICLE SIZE DISTRIBUTION ARRAY WAS
C    NOT BEING REINITIALIZED FOR SUBSEQUENT PLUMES.
C MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
C MODIFIED 10 SEP 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AS WELL AS 30,31
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 3/09/93, D.C., Moved UNIT 30 HEADER write to subroutine CONTRL
C Modified 11/29/95, D. Chanin, allow (IDEBUG.eq.-1) as signal to skip printing
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C   of the day and hour of each weather trial--intended for production runs
C   when using (METCOD.eq.5)--stratified random sampling.
C Modified 2/17/96, D. Chanin, better diagnostic messages for when METCOD=5
C Modified 3/18/01, D. Chanin, Log # 3/01/01-D:
C   Call a routine that will check sigma-y values (for all stability classes)
C   at the maximum downwind distance (SPAEND(NUMRAD)) to see if the plume is
C   so large as to "wrap around" back to the release point and thus cover
C   an area greater than a semicircle (going to 2.15 sigma-y, or the 10% level).

      EXTERNAL ATMOUT, CHROUT, EAROUT
      INTRINSIC MAX, MOD
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $         AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $         TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $         HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /EXPAND/ TIMBAS, BRKPNT, XPFAC1, XPFAC2
      COMMON /MULREL/ PLHEAT(4), PLHITE(4), PLUDUR(4), PDELAY(4),
     1                REFTIM(4), RELINV(MXDKCN,4), PSDIST(10,10),
     2                SIGYINIT(4), SIGZINIT(4), BUILDH(4)
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      INTEGER WINDIR
      COMMON /METDAT/ LIMSP1, WINDSP(121), ISTAB(121), HTMXLR(121),
     $                RNMM(121), WINDIR(121)
      COMMON /EXPFAC/ EXPFAC
      LOGICAL         ENDAT1, ENDAT2
      COMMON /STOPME/ ENDAT1, ENDAT2
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
      COMMON /ATMOPT/ IDEBUG, NUCOUT
      COMMON /M1/ METCOD
      COMMON /M4/ NSMPLS, NSBINS, IRSEED, INDXBN(41), INWGHT(41),
     1            NRNINT, RDISTS(6), NRINTN, IRNRAT(3), RNRATE(3)
C
      IF (ISRCTM .EQ. 1) THEN
C
C Write weather trial descriptor data on ATMOS results file
C
      IUNIT = 30
C
      IF (ITRIAL .EQ. 1) THEN
        REWIND (IUNIT)
        WRITE(IUNIT) HEADER
      ENDIF
C
      WRITE(IUNIT) ITRIAL, PRBMET, IBINUM, IDAY, IHOUR
C
C  PRINT OUT A DESCRIPTION OF 50 WEATHER TRIALS PER PAGE OF THE OUTPUT LISTING
C
      IF (IDEBUG .GE. 0 .AND. MOD (ITRIAL,50) .EQ. 1)
     $    WRITE(6,40) 'TRIAL', 'DAY', 'HOUR', 'BIN', 'PRBMET'
   40     FORMAT(//5A11)

      IF (IDEBUG .GE. 0) THEN
        WRITE(6,60) ITRIAL, IDAY, IHOUR, IBINUM, PRBMET
   60     FORMAT(1X, 4I11, 1PE11.2)
```

```
      ELSE IF (ITRIAL .EQ. 1 .AND. ISRCTM .EQ. 1) THEN
        WRITE(6,70) NUMTRI
   70     FORMAT(//' Warning: IDEBUG was set to -1 indicating that the',
     1           /' code is not to print out the weather start times.',
     2           /' This option is intended to be used to save paper.',
     3           //1X, I4, ' weather sequences are being utilized.'/)
      ENDIF
      ENDIF
C
      IF (METCOD .EQ. 5 .AND. ITRIAL .EQ. 1 .AND. ISRCTM .EQ. 1)
     1  WRITE(6,75) 1.0 / NUMTRI
   75   FORMAT(/' Each weather sequence has a probability of ', 1PE9.3/)
C
C  PRINT A MESSAGE TO THE TERMINAL SO WE KNOW HOW FAST IT'S GOING (OPTIONAL)
C
      WRITE(*,*) 'ITRIAL=',ITRIAL
C
C  WRITE A WARNING IF TOTAL RELEASE DURATION EXCEEDS 20 HOURS
C
      TOTDUR = PDELAY(NUMREL) + PLUDUR(NUMREL) - PDELAY(1)

      IF (ITRIAL .EQ. 1 .AND. TOTDUR .GT. 72000.)
     $  WRITE(6,80)
   80 FORMAT('1 WARNING!!  WARNING!!  WARNING!!  WARNING!!',
     $     //'  THE TOTAL RELEASE DURATION EXCEEDS 20 HOURS.',
     $     //'  THIS MAY CAUSE ERRONEOUS RESULTS TO BE PRODUCED.',
     $     //'  WARNING!!  WARNING!!  WARNING!!  WARNING!!'//)
C
C  LOOP ON RELEASES AND LOAD THE PLUME CHARACTERISTICS
C
      DO 300 IREL = 1, NUMREL
C
C  DETERMINE WHICH DIRECTION IS TRAVELED BY THE PLUME
C
      IMHOUR = INT (PDELAY(IREL) - PDELAY(1) + ISECON
     $              + REFTIM(IREL) * PLUDUR(IREL)) / 3600 + 1

      IDIREC(IREL) = WINDIR(IMHOUR)
C
C  CALCULATE THE EXPANSION FACTOR THAT ACCOUNTS FOR PLUME DURATION:
C
      SUMDUR = PLUDUR(IREL)
C
C  LIMIT THE EXPANSION FACTOR TO A 10 HOUR RELEASE EXPANSION FACTOR
C
      IF (SUMDUR .GT. 36000.) THEN

        IF (ITRIAL .EQ. 1)

     $    WRITE(6,100) IREL, SUMDUR / 3600.
  100     FORMAT('1 WARNING!!  WARNING!!  WARNING!!  WARNING!!',
     $    //' A 10 HOUR RELEASE DURATION IS BEING USED BY ATMOS',
     $      ' FOR CALCULATING',
     $     /' THE EXPANSION FACTOR OF PLUME #', I2, ' INSTEAD OF',
     $      ' THE USER-SUPPLIED', F7.2, ' HOURS',
     $    //'  WARNING!!  WARNING!!  WARNING!!  WARNING!!'//)

        SUMDUR = 36000.

      ENDIF

      IF (SUMDUR .LE. BRKPNT) THEN
        EXPFAC = (MAX (SUMDUR, TIMBAS) / TIMBAS) ** XPFAC1
```

```
      ELSE
        EXPFAC = (MAX (SUMDUR, TIMBAS) / TIMBAS) ** XPFAC2
      ENDIF
C
C  Call a routine that will check sigma-y values (for all stability classes)
C  at the maximum downwind distance (SPAEND(NUMRAD)) to see if the plume is
C  so large as to "wrap around" back to the release point and thus cover
C  an area greater than a semicircle (going to 2.15 sigma-y, or the 10% level).
C
C  New subroutine added 3/18/01, D. Chanin, Log # 3/01/01-D
C
      CALL CHECK_SIGMA_Y
C
C  CALCULATE THE TIMING INFORMATION FOR THIS PLUME
C
      IDELAY = PDELAY(IREL) - PDELAY(1) + ISECON
      ISTART = IDELAY / 3600 + 1
      TMTOGO = 3600 - MOD (IDELAY, 3600)
C
C  CALCULATE THE RESULTS FROM THE ATMOS MODULE FOR ONE TRIAL, ONE RELEASE,
C  AND SAVE THE RESULT ARRAYS IN COMMON BLOCKS
C
  300 CALL ATMOUT (ISTART, TMTOGO, IREL)
C
C  CALCULATE THE RESULTS FROM THE "EARLY" MODULE AND STORE THEM ON THE
C  NSTRTG RESULTS FILES NUMBERED FROM 31 TO (30+NSTRTG)
C
      IF (.NOT. ENDAT1) THEN

        DO 400 ISTRTG = 1, NSTRTG
        IF (NSTRTG .GT. 1) CALL GETSTG
  400   CALL EAROUT

      ENDIF
C
C  CALCULATE RESULTS FROM THE "CHRONC" MODULE AND STORE THEM ON ITS RESULT FILE
C
      IF (.NOT. ENDAT2) CALL CHROUT

      RETURN
      END
*DECK ATMOUT
      SUBROUTINE ATMOUT (ISTART, TMTOGO, IREL)
C
C THIS ROUTINE MODELS THE DISPERSION OF A SINGLE GAUSSIAN PLUME UNDER
C THE INFLUENCE OF CONSTANT DIRECTION WIND. THE FOLLOWING SUBMODELS
C ARE USED:
C
C 1) PASQUILL-GIFFORD-TURNER TYPE DISPERSION COEFFICIENTS
C 2) PLUME RISE DEPENDENT ON WIND SPEED, STABILITY CLASS, INVERSION LID
C 3) REFLECTION OF THE PLUME BY THE INVERSION LID, CONSTANT LID HEIGHT
C 4) RAIN RATE DEPENDENT WASHOUT
C 5) PARTICLE SIZE DEPENDENT DRY DEPOSITION
C 6) TWO MEMBER RADIOACTIVE DECAY CHAINS
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CONTRL.
C
C GLOSSARY OF VARIABLES:
C
C ACCUM  - TEMPORARY VARIABLE USED TO CALCULATE NORMALIZATION FACTOR
C AIRCON - TIME INTEGRATED AIR CONCENTRATION AT THE PLUME HEIGHT
C ANGCOV - HALF-WIDTH OF THE PLUME IN RADIANS TO THE 10 PERCENT LEVEL
C AVGHIT - AVERAGE HEIGHT OF THE PLUME OVER THIS INTERVAL
```

```
C BOUND  - FLAG THAT INDICATES THAT BOUNDARY WEATHER HAS BEEN REACHED
C CHIOQG - CHI OVER Q, RATIO OF AIR CONCENTRATION TO SOURCE AT GROUND
C CHIOQH - CHI OVER Q, RATIO OF AIR CONCENTRATION TO SOURCE AT HEIGHT
C CHIOQO - CHI OVER Q, CALCULATED ASSUMING UNIFORM MIXING UP TO LID HEIGHT
C DELHIT - AMOUNT OF PLUME RISE FROM THE RELEASE HEIGHT (METERS)
C DELTIM - TIME STEP USED FOR WET DEPOSITION
C DELVAL - INCREMENTAL CHANGE IN THE GROUND LEVEL REFLECTION TERM FOR CHI/Q
C DENOM  - DENOMINATOR OF THE GAUSSIAN PLUME EQUATION
C DIST   - DISTANCE COVERED BY REPRESENTATIVE TIME POINT IN THIS INTERVAL
C DISTX1 - DISTANCE COVERED BY HEAD OF PLUME IN THIS INTERVAL ALONE
C DISTX2 - DISTANCE COVERED BY TAIL OF PLUME IN THIS INTERVAL ALONE
C DRYDEP - FLAGS FOR EACH NUCLIDE TO INDICATE IF DRY DEPOSITION OCCURS
C DRYREM - FRACTION REMAINING AFTER DRY DEPOSITION FOR EACH DEPOSITION GROUP
C EFF_SIGZ - effective sigma-z: used only for reporting CCDFs of ATMOS results
C EFHGHT - SO CALLED EFFECTIVE HEIGHT, Z BAR
C FALOUT - MASS OF MATERIAL DROPPED ON GROUND BY DRY AND WET DEPOSITION
C GCDRY  - GROUND CONCENTRATION DUE TO DRY DEPOSITION
C GCWET  - GROUND CONCENTRATION DUE TO WET DEPOSITION
C GRNCON - GROUND CONCENTRATION IN THIS SPATIAL INTERVAL AT MIDPOINT
C HAFTIM - HALF THE TIME IT TOOK TO CROSS THE PREVIOUS INTERVAL
C HTFCTR - RATIO OF GROUND LEVEL TO CENTERLINE AIR CONCENTRATION
C HTMXLR - HEIGHT OF THE INVERSION LID (METERS)
C IDEBUG - DEBUG PRINT OPTION CONTROLLER, HIGHER VALUE MEANS MORE OUTPUT
C IGROUP - ARRAY STORING THE NUCLIDE GROUP OF EACH NUCLIDE
C IHOURF - INDEX TO WEATHER HOUR USED FOR TRACKING PLUME FRONT TO MIDPOINT
C IHOURT - INDEX TO WEATHER HOUR USED FOR TRACKING PLUME TAIL TO MIDPOINT
C IHOUR1 - INDEX TO WEATHER HOUR USED FOR TRACKING PLUME FRONT'S ARRIVAL
C IHOUR2 - INDEX TO WEATHER HOUR USED FOR TRACKING PLUME TAIL'S DEPARTURE
C ILAST  - THE STABILITY CLASS THAT WAS PREVIOUSLY IN EFFECT
C INHOUR - INDEX TO THE INITIAL HOUR OF WEATHER FOR THIS PLUME
C INTRVL - INDEX TO THE CURRENT SPATIAL INTERVAL
C IPSGRP - LOOP COUNTER OF DEPOSITION VELOCITY GROUP
C IREL   - LOOP COUNTER FOR RELEASE, SET IN SUBROUTINE CONTRL
C ISOTOP - LOOP COUNTER FOR NUCLIDE
C ISTAB  - STABILITY CLASS INDEX (A-F)
C ISTART - INDEX TO FIRST HOUR OF WEATHER COVERING SPATIAL INTERVAL
C ISTOP  - INDEX TO LAST HOUR OF WEATHER COVERING SPATIAL INTERVAL
C JGROUP - LOOP COUNTER FOR NUCLIDE GROUP
C LIMSPA - LAST SPATIAL INTERVAL THAT IS COVERED BY MEASURED WEATHER (0-35)
C NPSGRP - NUMBER OF DEPOSITION VELOCITY GROUPS
C NUCNAM - ARRAY OF NAMES OF THE NUCLIDES
C NUCOUT - INDEX TO THE NUCLIDE TO BE PRINTED ON THE LIST OUTPUT
C NUMISO - NUMBER OF NUCLIDES
C NUMRAD - NUMBER OF SPATIAL INTERVALS IN THE RADIAL DIRECTION
C PLDIST - TOTAL DISTANCE COVERED BY PLUME SO FAR (METERS)
C PLHEAT - HEAT CONTENT OF PLUME (WATTS)
C PLHITE - HEIGHT OF THE PLUME (METERS)
C PLMINV - ARRAY OF INVENTORIES OF EACH NUCLIDE (BECQUERELS)
C PLSIGY - PLUME SIGMA Y AT THE BEGINNING OF THE SPATIAL INTERVAL
C PLSIGZ - PLUME SIGMA Z AT THE BEGINNING OF THE SPATIAL INTERVAL
C PSDIST - DEPOSITION VELOCITY DISTRIBUTION OF EACH NUCLIDE
C REFLEC - LOGICAL FLAG INDICATING EXPLICIT MULTIPLE REFLECTIONS ARE USED
C REMINV - INVENTORY THAT REMAINS WHEN CROSSING THE CENTER OF THE ELEMENT
C RNMM   - RAINFALL IN THE CURRENT HOUR (MILLIMETERS)
C RNSECS - DURATION OF RAIN IN THE CURRENT HOUR (SECONDS)
C RISING - FLAG THAT INDICATES THE PLUME IS STILL RISING
C SIGBUF - TEXT BUFFER WHICH CONTAINS THE SIGMA-Z NUMERIC VALUE OR 'UNIFORM'
C SIGY1  - ACCUMULATOR FOR SIGMA Y GROWTH TO THE INTERVAL'S END
C SIGYM  - AVERAGE SIGMA Y OVER THE SPATIAL INTERVAL
C SIGZ1  - ACCUMULATOR FOR SIGMA Z GROWTH TO THE INTERVAL'S END
C SIGZM  - AVERAGE SIGMA Z OVER THE SPATIAL INTERVAL
C SPAEND - ARRAY STORING ENDPOINT DISTANCES TO SPATIAL INTERVALS
C SPALEN - ARRAY STORING THE LENGTH OF EACH SPATIAL INTERVAL
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C TIMCEN - TIME FROM SCRAM TO REACH THE CENTER OF THIS SPATIAL INTERVAL
C TIMOVH - DURATION THAT THE PLUME IS OVERHEAD AT THE INTERVAL CENTERPOINT
C TIMSCR - ACCUMULATED TIME FROM SCRAM (TIME ZERO)
C TIMTOT - ACCUMULATED TIME TO CROSS THIS SPATIAL INTERVAL
C TMACUF - TIME ACCUMULATED IN TRACKING PLUME FRONT TO MIDPOINT
C TMACUT - TIME ACCUMULATED IN TRACKING PLUME TAIL TO MIDPOINT
C TMREMF - TIME REMAINING IN WEATHER HOUR FOR TRACKING FRONT TO MIDPOINT
C TMREMT - TIME REMAINING IN WEATHER HOUR FOR TRACKING TAIL TO MIDPOINT
C TMREM1 - TIME REMAINING IN WEATHER HOUR FOR TRACKING FRONT'S ARRIVAL
C TMREM2 - TIME REMAINING IN WEATHER HOUR FOR TRACKING TAIL'S DEPARTURE
C TMTOGO - TIME REMAINING IN THE CURRENT HOUR OF WEATHER DATA
C VDEPOS - ARRAY OF DEPOSITION VELOCITIES TO TREAT PARTICLE SIZE
C VIRTY  - VIRTUAL SOURCE DISTANCE FOR SIGMA-Y
C VIRTZ  - VIRTUAL SOURCE DISTANCE FOR SIGMA-Z
C WETDEP - FLAGS FOR EACH NUCLIDE TO INDICATE IF WASHOUT OCCURS
C WETEND - FRACTION REMAINING AFTER WASHOUT OVER THE INTERVAL
C WETREM - FRACTION REMAINING AFTER WASHOUT, THIS INTERVAL, THIS NUCLIDE
C WINDSP - WIND SPEED (M/S)
C XPONG  - EXPONENTIAL FACTOR FOR GAUSSIAN PLUME AT GROUND LEVEL
C XPONH  - EXPONENTIAL FACTOR FOR GAUSSIAN PLUME AT THE PLUME CENTERLINE
C
C GLOSSARY OF EXTERNALS:
C
C CAUGHT - DETERMINES WHETHER THE PLUME IS TRAPPED IN THE BUILDING WAKE
C FSGY   - RETURNS SIGMA-Y AT A GIVEN DISTANCE AND STABILITY CLASS
C FSGYIN - RETURNS VIRTUAL SOURCE DISTANCE TO A PLUME OF GIVEN SIGMA-Y
C FSGZ   - RETURNS SIGMA-Z AT A GIVEN DISTANCE AND STABILITY CLASS
C FSGZIN - RETURNS VIRTUAL SOURCE DISTANCE TO A PLUME OF GIVEN SIGMA-Z
C NEWAMT - Adjusts the inventory array to account for 6 generation decay chains
C PLMRIS - RETURNS THE CHANGE IN PLUME HEIGHT OVER A GIVEN DISTANCE
C SIGTEX - RETURNS A NUMERIC TEXT VALUE FRO SIGMA-Z OR 'UNIFORM'
C WASHOU - CALCULATES FRACTION REMAINING IN THE PLUME AFTER WET DEPOSITION
C
C DAVID CHANIN, DIV. 6415, 24 OCT 84.
C
C MOD 17 MAR 86, SEE SER #7, D.C., TRUNCATION ERROR ON NOS SKIPS WEATHER HOURS
C MODIFIED 24 OCT 86, DIC, SER #38, CHANGED HANDLING OF HOW MIXING LAYER
C   AFFECTS THE GROWTH OF SIGMA-Z, NO MORE EXPLOSION!, HEURISTIC SWITCHOVER
C MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C MODIFIED 12 MAY 87, DIC, SER #58, CHANGE A-D PLUME RISE SO PLUME CAN RISE
C                                   ALL THE WAY UP TO THE LID HEIGHT
C MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 11/08/88, D. CHANIN, LOG # 9/30/88-B,
C   CHANGE THE MULTIPLE REFLECTION MODEL SO THAT 5 REFLECTIONS
C   BETWEEN THE GROUND AND THE MIXING LID ARE ALWAYS CONSIDERED.
C MODIFIED 6/20/89, D. CHANIN, LOG # 9/28/88-B, PART 2,
C   FIX THE DEAD CODE ON CALCULATION OF VIRTUAL SOURCE DISTANCE
C MODIFIED 6/20/89, D. CHANIN, LOG # 10/3/88-A,
C   CALCULATE DEPOSITION IN DOUBLE PRECISION TO AVOID TRUNCATION ERROR
C MODIFIED 7/11/89, D. CHANIN, LOG # 9/28/88-B, 9/30/88-C, 11/16/88-A,
C                                   1/18/89-B, FIX BOUNDARY WEATHER
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/30/91, D. CHANIN, #7/26/91-A, AVOID DIVIDE-BY-ZERO IN WASHOUT
C Modified 11/29/95, D. CHANIN, now adjusting the SAVEME variable for plume
C  inventory losses due to wet and dry deposition over the interval
C Modified 11/30/95, D. Chanin, allow overlapping plumes and allow each plume
C  to have different initial dimensions, thus allowing use of the "stem and cap"
C  model of explosive releases used in the DAHRT EIS
C Modified 12/01/95, D. Chanin, utilize EFF_SIGZ to generate the Type 0 results
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C  of CCDFs from ATMOS.  Previous coding generated the CCDF of sigma-z using a
C  "consequence" value of zero when uniform mixing was reached; the CCDF
C  summary for sigma-z was thus misleading.  Now, when uniform mixing is
C  reached, the sigma-z value used for CCDF generation is the height of the
C  mixing lid (HLID) divided by the "normalization factor" for the Gaussian
C  (the square root of two pi, i.e., 2.506628)
C
      EXTERNAL CAUGHT, FSGY, FSGYIN, FSGZ, FSGZIN, NEWAMT, PLMRIS,
     $         SIGTEX, WASHOU
      INTRINSIC ABS, DBLE, MIN, MOD
      CHARACTER *10 SIGTEX, SIGBUF
      LOGICAL  CAUGHT
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /ISOGRP/ MAXGRP, IGROUP(MAXNUC)
      LOGICAL         WETDEP,     DRYDEP
      COMMON /WETDRY/ WETDEP(10), DRYDEP(10)
      INTEGER WINDIR
      COMMON /METDAT/ LIMSP1, WINDSP(121), ISTAB(121), HTMXLR(121),
     $                RNMM(121), WINDIR(121)
      COMMON /DRYCON/ NPSGRP, VDEPOS(10)
      COMMON /MULREL/ PLHEAT(4), PLHITE(4), PLUDUR(4), PDELAY(4),
     1                REFTIM(4), RELINV(MXDKCN,4), PSDIST(10,10),
     2                SIGYINIT(4), SIGZINIT(4), BUILDH(4)
      COMMON /ATMOPT/ IDEBUG, NUCOUT
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $         AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $         TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $         HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      LOGICAL CCDF0
      COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
C
      LOGICAL BOUND, REFLEC, RISING
      DOUBLE PRECISION DRYREM, DRYTOT
      DIMENSION PSDIS1(10,10), DRYREM(10,10),
     1          PLMINV(MXDKCN), TMPINV(MXDKCN)
C
C  LOAD THE INVENTORY ARRAY
C
      DO 20 I = 1, NUMFND
   20 PLMINV(I) = RELINV(I,IREL)
C
C  LOAD THE PARTICLE SIZE DISTRIBUTION ARRAY
C
      DO 30 JGROUP = 1, MAXGRP
      DO 30 IPSGRP = 1, NPSGRP
   30 PSDIS1(IPSGRP,JGROUP) = PSDIST(IPSGRP,JGROUP)
C
C  ALLOW FOR DECAY UP TO THE REPRESENTATIVE TIME POINT OF THIS PLUME,
C  THE INVENTORY HAS BEEN DECAYED UP TO THE TIME OF THE RELEASE IN INPREL.
C
      HAFTIM = REFTIM(IREL) * PLUDUR(IREL)
```

```
C
C  CALCULATE THE PARAMETERS NEEDED FOR CALCULATING THE LENGTH OF THE PLUME
C
      DISCOL = 0.
      TMACUL = 0.
      TMREML = TMTOGO
      IHOURL = ISTART
C
C  CALCULATE THE LENGTH OF THE PLUME IN METERS
C
   40 DISCOL = DISCOL + TMREML * WINDSP(IHOURL)
      TMACUL = TMACUL + TMREML
      IF (TMACUL .LT. PLUDUR(IREL)) THEN
        TMREML = 3600.
        IF (IHOURL .LT. 121) IHOURL = IHOURL + 1
        GO TO 40
      ELSE
        DISCOL = DISCOL - (TMACUL - PLUDUR(IREL)) * WINDSP(IHOURL)
      ENDIF
C
C  CALCULATE THE PARAMETERS NEEDED FOR TRACKING THE PLUME FRONT TO MIDPOINT
C
      DISCOF = 0.
      TMACUF = PDELAY(IREL)
      TMREMF = TMTOGO
      IHOURF = ISTART
C
C  CALCULATE THE PARAMETERS NEEDED FOR TRACKING THE PLUME TAIL TO MIDPOINT
C
      DISCOT = 0.
      TMACUT = PDELAY(IREL) + PLUDUR(IREL)
      TMREMT = 3600. - MOD (INT (PLUDUR(IREL) - TMTOGO + 3600.), 3600)
      IHOURT = ISTART + INT (PLUDUR(IREL) - TMTOGO + 3600.) / 3600
C
C  INITIALIZE THE PARAMETERS NEEDED FOR TRACKING THE PLUME FRONT TO
C  BEGINNING OF THE SPATIAL INTERVAL
C
      DISCO1 = DISCOF
      TMACU1 = TMACUF
      TMREM1 = TMREMF
      IHOUR1 = IHOURF
C
C  INITIALIZE THE PARAMETERS NEEDED FOR TRACKING THE PLUME TAIL TO ENDPOINT
C
      DISCO2 = DISCOT
      TMACU2 = TMACUT
      TMREM2 = TMREMT
      IHOUR2 = IHOURT
C
C  FOR PURPOSES OF CALCULATING DISPERSION AND DRY DEPOSITION, USE A POINT
C  SOMEWHERE ALONG THE PLUME'S RELEASE PERIOD AS THE START OF ITS WEATHER
C
      ISTART = ISTART
     $  + INT (REFTIM(IREL) * PLUDUR(IREL) - TMTOGO + 3600.) / 3600

      TMTOGO = 3600.
     $ -MOD (INT (REFTIM(IREL) * PLUDUR(IREL) - TMTOGO + 3600.), 3600)
C
C  SAVE THE INDEX TO THE INITIAL HOUR OF WEATHER FOR THIS PLUME
C
      INHOUR = ISTART
C
C  DETERMINE WHETHER THERE WILL BE ANY PLUME RISE
```

```
C
      IF (PLHEAT(IREL) .GT. 0.) THEN
       RISING =.NOT. CAUGHT (WINDSP(INHOUR), PLHEAT(IREL), BUILDH(IREL))
      ELSE
       RISING = .FALSE.
      ENDIF
C
C initialize plume dimensions to the values specified directly by the user
C
      PLSIGY = SIGYINIT(IREL)
      PLSIGZ = SIGZINIT(IREL)
      REFLEC = .TRUE.
      BOUND  = .FALSE.
      ILAST  = 0
      ISTOP  = ISTART
      HEIGHT = PLHITE(IREL)

      IF (IDEBUG .GE. 1) THEN
        WRITE(6,50) NUCNAM(NUCOUT), 'DISTANCE', 'GL AIRCON', 'GRNCON',
     $      'GL X/Q', 'WETREM', 'DRYREM', 'REMINV', 'PLSIGY', 'PLSIGZ',
     $      'WEATHER', 'HTFCTR', 'AVGHIT', 'TIMCEN', 'TIMOVH'
   50   FORMAT('1'/' ATMOSPHERIC RESULTS FOR ', A7,
     $            / 3X, 4A10, 2A8, 3A10, A9, 2A8, A10, A8/)
      ENDIF
C
C  BEGIN LOOP ON SPATIAL INTERVALS, 900
C
      DO 900 IRAD = 1, NUMRAD
C
C  CALCULATE THE ARRIVAL HOUR OF THE PLUME FRONT AT THE BEGINNING OF
C  THE SPATIAL INTERVAL, IHOUR1
C
C  SKIP THIS CALCULATION FOR THE FIRST INTERVAL, PLUME FRONT IS ALREADY THERE
C
      IF (IRAD .EQ. 1) GO TO 90
   80 CONTINUE
      IF (IHOUR1 .EQ. 121 .OR. IRAD .GT. LIMSP1 + 1) THEN
        TMACU1 = TMACU1 + (SPAEND(IRAD-1) - DISCO1) / WINDSP(121)
        DISCO1 = SPAEND(IRAD-1)
      ELSE IF (DISCO1 + TMREM1*WINDSP(IHOUR1) .GT. SPAEND(IRAD-1)) THEN
        TMSTEP = (SPAEND(IRAD-1) - DISCO1) / WINDSP(IHOUR1)
        TMACU1 = TMACU1 + TMSTEP
        TMREM1 = TMREM1 - TMSTEP
        DISCO1 = SPAEND(IRAD-1)
      ELSE
        DISCO1 = DISCO1 + TMREM1 * WINDSP(IHOUR1)
        IF (IHOUR1 .LT. 121) IHOUR1 = IHOUR1 + 1
        TMACU1 = TMACU1 + TMREM1
        TMREM1 = 3600.
        GO TO 80
      ENDIF
   90 IF (IRAD .EQ. LIMSP1 + 1) IHOUR1 = 121
C
C  CALCULATE THE ARRIVAL TIME OF THE PLUME TAIL AT THE ENDPOINT OF
C  THE SPATIAL INTERVAL, TMACU2
C
      TMOLD2 = TMACU2
  100 CONTINUE
      IF (IRAD .GT. LIMSP1 .OR. IHOUR2 .EQ. 121) THEN
        TMACU2 = TMACU2 + (SPAEND(IRAD) - DISCO2) / WINDSP(121)
        DISCO2 = SPAEND(IRAD)
        IHOUR2 = 121
      ELSE IF (DISCO2 + TMREM2 * WINDSP(IHOUR2) .GT. SPAEND(IRAD)) THEN
```

```
          TMSTEP = (SPAEND(IRAD) - DISCO2) / WINDSP(IHOUR2)
          TMACU2 = TMACU2 + TMSTEP
          TMREM2 = TMREM2 - TMSTEP
          DISCO2 = SPAEND(IRAD)
        ELSE
          DISCO2 = DISCO2 + TMREM2 * WINDSP(IHOUR2)
          IF (IHOUR2 .LT. 121) IHOUR2 = IHOUR2 + 1
          TMACU2 = TMACU2 + TMREM2
          TMREM2 = 3600.
          GO TO 100
        ENDIF
C
C  CALCULATE THE ARRIVAL TIME OF THE PLUME FRONT AT THE CENTERPOINT OF
C  THE SPATIAL INTERVAL, TMACUF
C
  140 CONTINUE
        IF (IHOURF .EQ. 121) THEN
          TMACUF = TMACUF + (SPACEN(IRAD) - DISCOF) / WINDSP(121)
          DISCOF = SPACEN(IRAD)
        ELSE IF (IRAD .EQ. LIMSP1 + 1) THEN
          TMACUF = TMACU1 + .5 * SPALEN(IRAD) / WINDSP(121)
          DISCOF = SPACEN(IRAD)
          IHOURF = 121
        ELSE IF (DISCOF + TMREMF * WINDSP(IHOURF) .GT. SPACEN(IRAD)) THEN
          TMSTEP = (SPACEN(IRAD) - DISCOF) / WINDSP(IHOURF)
          TMACUF = TMACUF + TMSTEP
          TMREMF = TMREMF - TMSTEP
          DISCOF = SPACEN(IRAD)
        ELSE
          DISCOF = DISCOF + TMREMF * WINDSP(IHOURF)
          TMACUF = TMACUF + TMREMF
          IF (IHOURF .LT. 121) IHOURF = IHOURF + 1
          TMREMF = 3600.
          GO TO 140
        ENDIF
C
C  CALCULATE THE ARRIVAL TIME OF THE PLUME TAIL AT THE CENTERPOINT OF
C  THE SPATIAL INTERVAL, TMACUT
C
  160 CONTINUE
        IF (IHOURT .EQ. 121) THEN
          TMACUT = TMACUT + (SPACEN(IRAD) - DISCOT) / WINDSP(121)
          DISCOT = SPACEN(IRAD)
        ELSE IF (IRAD .EQ. LIMSP1 + 1) THEN
          TMACUT = TMOLD2 + .5 * SPALEN(IRAD) / WINDSP(121)
          DISCOT = SPACEN(IRAD)
          IHOURT = 121
        ELSE IF (DISCOT + TMREMT * WINDSP(IHOURT) .GT. SPACEN(IRAD)) THEN
          TMSTEP = (SPACEN(IRAD) - DISCOT) / WINDSP(IHOURT)
          TMACUT = TMACUT + TMSTEP
          TMREMT = TMREMT - TMSTEP
          DISCOT = SPACEN(IRAD)
        ELSE
          DISCOT = DISCOT + TMREMT * WINDSP(IHOURT)
          TMACUT = TMACUT + TMREMT
          IF (IHOURT .LT. 121) IHOURT = IHOURT + 1
          TMREMT = 3600.
          GO TO 160
        ENDIF
C
C  SAVE THE ARRIVAL TIME OF THE PLUME AT THE INTERVAL CENTERPOINT AND
C  THE DURATION OVERHEAD THERE
C
```

```
      TIMCEN(IRAD,IREL) = TMACUF
      TIMOVH(IRAD,IREL) = TMACUT - TMACUF
C
C  LOOP ON ALL HOURS OF WEATHER USED IN CROSSING THIS INTERVAL
C  FOR CALCULATING WASHOUT OVER THE INTERVAL
C
      WETEND = 1.
      DISTX2 = 0.
C
C  CALCULATE THE DISTANCES TO THE 3 POINTS USED IN PERFORMING THE INTEGRATION
C  OF COVERAGE FRACTION OVER THE TIME STEP
C
      D1 = .5 * (DISCOL + SPALEN(IRAD) - ABS(DISCOL - SPALEN(IRAD)))
      D2 = .5 * (DISCOL + SPALEN(IRAD))
      D3 = .5 * (DISCOL + SPALEN(IRAD) + ABS(DISCOL - SPALEN(IRAD)))
C
C  CALCULATE THE SLOPE OF THE COVERAGE FRACTION RAMP
C
      CSLOPE = MIN (DISCOL, SPALEN(IRAD)) / D1

      DO 180 INDHOU = IHOUR1, IHOUR2

      IF (INDHOU .EQ. 121) THEN
        DELTIM = (DISCOL + SPALEN(IRAD) - DISTX2) / WINDSP(INDHOU)
      ELSE IF (IHOUR1 .EQ. IHOUR2) THEN
        DELTIM = TMREM1 - TMREM2
      ELSE IF (INDHOU .EQ. IHOUR1) THEN
        DELTIM = TMREM1
      ELSE IF (INDHOU . EQ. IHOUR2) THEN
        DELTIM = 3600. - TMREM2
      ELSE
        DELTIM = 3600.
      ENDIF
C
C  CHECK FOR A SMALL TIME STEP THAT CAN RESULT FROM TRUNCATION ERROR
C
      IF (ABS (DELTIM) .LT. .001) GO TO 180

      DISTX1 = DISTX2
      DISTX2 = DISTX2 + DELTIM * WINDSP(INDHOU)

      IF (RNMM(INDHOU) .GT. 0.) THEN
C
C  CALCULATE THE 4 AREAS THAT ARE NEEDED FOR INTEGRATING THE PLUME TRACK LENGTH
C  OVER THE CURRENT ADVECTION STEP
C
        A1 = AREA (CSLOPE, DISTX1, DISTX2, D2)
        A2 = AREA (CSLOPE, DISTX1 - D1, DISTX2 - D1, D2 - D1)
        A3 = AREA (CSLOPE, 2. * D2 - DISTX2, 2. * D2 - DISTX1, D2)
        A4 = AREA (CSLOPE, D3 - DISTX2, D3 - DISTX1, D3 - D2)
C
C  CALCULATE THE FRACTION OF THE PLUME'S LENGTH WHICH LIES WITHIN THIS INTERVAL
C  DURING THE CURRENT WEATHER STEP (DISTANCE INTEGRATED AVERAGE FRACTION)
C
        AVGCOV = (A1 - A2 + A3 - A4)/(DELTIM * WINDSP(INDHOU))/DISCOL
C
C  CALCULATE THE FRACTION OF THE PLUME'S INVENTORY WHICH REMAINS AFTER
C  WASHOUT OVER THE CURRENT SPATIAL INTERVAL TAKING ACCOUNT OF PLUME LENGTH,
C  SPATIAL INTERVAL LENGTH, AND AVERAGE COVERAGE FRACTION OVER THIS STEP
C
C  FOLLOWING STATEMENT MODIFIED 3 FEB 88 TO CORRECT THE WASHOUT MODEL,
C  THE FACTOR AVGCOV IS NOW APPLIED TO DELTIM INSTEAD OF TO WASHOU. D.C.
C
```

```
        WETEND = WETEND * WASHOU (RNMM(INDHOU), AVGCOV * DELTIM)

      ENDIF

  180 CONTINUE
C
C  INITIALIZE PARAMETERS NEEDED FOR CALCULATING GROWTH OF THE PLUME ACCORDING
C  TO THE WEATHER ENCOUNTERED BY THE REPRESENTATIVE TIME POINT OF THE PLUME
C  AS IT TRAVERSES THE INTERVAL
C
      IF (IRAD .LE. LIMSP1 .AND. .NOT. BOUND) THEN
        DELTIM = MIN (TMTOGO, SPALEN(IRAD) / WINDSP(ISTOP))
      ELSE
        BOUND  = .TRUE.
        ISTOP  = 121
        DELTIM = SPALEN(IRAD) / WINDSP(ISTOP)
      ENDIF

      DIST   = 0.
      TIMTOT = 0.
      ISTART = ISTOP
      SIGY1  = PLSIGY
      SIGZ1  = PLSIGZ
C
C  BEGIN LOOP ON WEATHER DATA, 200
C
C  CALCULATE GROWTH OF THE PLUME IN Y AND Z DIRECTIONS AS IT TRAVERSES
C  THE SPATIAL INTERVAL.
C  THE EXPANSION FACTOR AND SCALING FACTORS ARE HANDLED WITHIN FSGY AND FSGZ.
C
  200 TIMTOT = TIMTOT + DELTIM
      TMTOGO = TMTOGO - DELTIM
      DIST   = DIST   + DELTIM * WINDSP(ISTOP)
C
C  CALCULATE BOTH SIGMA Y AND Z AT THE END OF THIS WEATHER IF REFLECTION IS ON,
C  WHEN UNIFORM MIXING IS REACHED, SIGMA-Z IS IRRELEVANT AND IT IS NO LONGER
C  CALCULATED.
C
      IF (REFLEC) THEN

        IF (ISTAB(ISTOP) .EQ. ILAST) THEN
          VIRTY = VIRTY + DELTIM * WINDSP(ISTOP)
          VIRTZ = VIRTZ + DELTIM * WINDSP(ISTOP)
        ELSE
          VIRTY = FSGYIN (ISTAB(ISTOP), SIGY1) + DELTIM * WINDSP(ISTOP)
          VIRTZ = FSGZIN (ISTAB(ISTOP), SIGZ1) + DELTIM * WINDSP(ISTOP)
        ENDIF

        SIGY1 = FSGY (ISTAB(ISTOP), VIRTY)
        SIGZ1 = FSGZ (ISTAB(ISTOP), VIRTZ)

      ELSE

        IF (ISTAB(ISTOP) .EQ. ILAST) THEN
          VIRTY = VIRTY + DELTIM * WINDSP(ISTOP)
        ELSE
          VIRTY = FSGYIN (ISTAB(ISTOP), SIGY1) + DELTIM * WINDSP(ISTOP)
        ENDIF

        SIGY1 = FSGY (ISTAB(ISTOP), VIRTY)

      ENDIF
C
```

```
C  CHECK TO SEE IF ANOTHER HOUR OF WEATHER DATA IS NEEDED
C  BY CHECKING TO SEE IF THE PLUME HAS TRAVELED THE LENGTH OF THE INTERVAL
C
      IF (.NOT. BOUND .AND.
     $ ABS (SPALEN(IRAD) - DIST) / SPALEN(IRAD) .GT. .001) THEN

        ILAST = ISTAB(ISTOP)
        ISTOP = ISTOP + 1

        IF (ISTOP .LT. 121) THEN
          TMTOGO = 3600.
          DELTIM = MIN (TMTOGO, (SPALEN(IRAD) - DIST) / WINDSP(ISTOP))
        ELSE
          BOUND = .TRUE.
          DELTIM = SPALEN(IRAD) / WINDSP(121)
          TMTOGO = DELTIM
        ENDIF

        GO TO 200
      ENDIF
C
C  END LOOP ON WEATHER DATA, 200
C
C  CALCULATE AVERAGE VALUES OF SIGMA-Y AND SIGMA-Z OVER THE INTERVAL
C
      SIGYM(IRAD,IREL)  = .5 * (PLSIGY + SIGY1)
      PLSIGY = SIGY1

      SIGZM(IRAD,IREL)  = .5 * (PLSIGZ + SIGZ1)
      PLSIGZ = SIGZ1
C
C  DECAY THE INVENTORY FROM THE LAST MIDPOINT TO THIS INTERVAL'S MIDPOINT
C
      CALL NEWAMT (PLMINV, TMPINV, HAFTIM + .5 * TIMTOT)
      DO 240 INUC = 1, NUMFND
  240 PLMINV(INUC) = TMPINV(INUC)

      HAFTIM = .5 * TIMTOT

      HLID = HTMXLR(INHOUR)
C
C  CALCULATE PLUME RISE FOR A PERIOD OF ONE HOUR USING THE WEATHER CONDITIONS
C  IN EFFECT AT THE START OF THIS PLUME SEGMENT RELEASE.
C  THERE IS NO SUBSEQUENT PLUME RISE.
C
      IF (RISING) THEN
C
C  LIMIT THE PATH OF THE PLUME TO ONE HOUR'S DISTANCE IN CALCULATING PLUME RISE
C
        PLDIST = MIN (SPAEND(IRAD), WINDSP(INHOUR) * 3600.)
C
C  CALCULATE THE CHANGE IN PLUME HEIGHT FROM RELEASE OVER THIS DISTANCE
C
        DELHIT = PLMRIS (PLHEAT(IREL), ISTAB(INHOUR), WINDSP(INHOUR),
     $                   HLID, PLHITE(IREL), RISING, PLDIST)
C
C  TURN OFF PLUME RISE IF ONE HOUR'S DISTANCE HAS BEEN COVERED
C
        IF (PLDIST .GE. WINDSP(INHOUR) * 3600.) RISING = .FALSE.
C
C  AVERAGE HEIGHT OF THE PLUME OVER THIS INTERVAL ASSUMING LINEAR CHANGE
C
        AVGHIT(IRAD,IREL) = .5 * (PLHITE(IREL) + DELHIT + HEIGHT)
```

```
          HEIGHT = PLHITE(IREL) + DELHIT
        ELSE
          AVGHIT(IRAD,IREL) = HEIGHT
        ENDIF
C
C  ONLY CALCULATE EXPLICIT MULTIPLE REFLECTIONS UNTIL A UNIFORM MIXING
C  ASSUMPTION WOULD GIVE HIGHER GROUND LEVEL CHI/Q VALUES.
C  FROM THEN ON USE UNIFORM MIXING UP TO LID HEIGHT.
C  THIS MODEL ASSUMES THAT LID HEIGHT IS CONSTANT WITH TIME.
C
        IF (REFLEC) THEN
C
C  CALCULATE THE EXPONENTIAL FACTORS AT THE GROUND AND AT PLUME HEIGHT,
C  XPONG AND XPONH.
C
          XPONG = EXP (-.5 *
     $          (AVGHIT(IRAD,IREL) / SIGZM(IRAD,IREL)) ** 2)

          XPONH = .5 + .5 *
     $          EXP (-2. * (AVGHIT(IRAD,IREL) / SIGZM(IRAD,IREL)) ** 2)
C
C  EXPLICIT MULTIPLE REFLECTIONS BETWEEN MIXING LAYER AND GROUND.
C
C  BEGIN LOOP ON REFLECTION TERMS, 300
C
        DO 300 N = 1, 5

          ARG1 = -.5 * ((AVGHIT(IRAD,IREL) - 2. * N * HLID)
     $         / SIGZM(IRAD,IREL)) ** 2

          ARG2 = -.5 * ((AVGHIT(IRAD,IREL) + 2. * N * HLID)
     $         / SIGZM(IRAD,IREL)) ** 2

          DELVAL = EXP (ARG1) + EXP (ARG2)

          XPONG = XPONG + DELVAL

          ARG11 = -2. * (N * HLID / SIGZM(IRAD,IREL)) ** 2

          ARG12 = -2. * ((AVGHIT(IRAD,IREL) - N * HLID)
     $          / SIGZM(IRAD,IREL)) ** 2

          ARG13 = -2. * ((AVGHIT(IRAD,IREL) + N * HLID)
     $          / SIGZM(IRAD,IREL)) ** 2

          XPONH = XPONH + EXP (ARG11) + .5 * EXP (ARG12)
     $                                + .5 * EXP (ARG13)

  300     CONTINUE
C
C  END LOOP ON REFLECTION TERMS, 300
C
  350     DENOM  = PI * SIGYM(IRAD,IREL) * SIGZM(IRAD,IREL)
     $          * SPALEN(IRAD) / TIMTOT

        CHIOQG = XPONG / DENOM
          CHIOQH = XPONH / DENOM

          IF (XPONG .GT. 1.E-35) EFHGHT = SQRHPI * SIGZM(IRAD,IREL)
     $                                  / XPONG
C
C  CALCULATE A PROSPECTIVE CHI/Q ASSUMING UNIFORM MIXING AND MAKE THE
C  TEST ONLY IF THE PLUME EXTENDS TO WITHIN 1 SIGMA OF THE GROUND.
```

```
C  THE TEST ON SIGMA-Z IS NECESSARY IN ORDER TO HANDLE ELEVATED PLUMES.
C
        CHIOQ0 = 1. / (SQR2PI * SIGYM(IRAD,IREL) * HLID * SPALEN(IRAD)
     $                        / TIMTOT)

      IF (CHIOQ0 .GE. CHIOQG
     $      .AND. SIGZM(IRAD,IREL) .GE. AVGHIT(IRAD,IREL)) THEN

          REFLEC = .FALSE.
        CHIOQG = CHIOQ0
          CHIOQH = CHIOQ0
          EFHGHT = HLID
C
C  SIGMA-Z IS REPORTED AS ZERO SINCE IT NO LONGER ENTERS INTO THE CALCULATIONS
C
          PLSIGZ = 0.
          SIGZ1  = 0.
          SIGZM(IRAD,IREL)  = 0.
        ENDIF
      ELSE
C
C  UNIFORM MIXING IS IN EFFECT
C
      CHIOQG = 1. / (SQR2PI * SIGYM(IRAD,IREL) * HLID
     $                        * SPALEN(IRAD) / TIMTOT)
      CHIOQH = CHIOQG
      ENDIF
C
C  ONLY CALCULATE DRY DEPOSITION IF THERE IS MATERIAL AT GROUND LEVEL
C  AND THE NUCLIDE GROUP IS SUBJECT TO DRY DEPOSITION.
C
      DO 500 JGROUP = 1, MAXGRP

      IF (XPONG .GT. 1.E-35 .AND. DRYDEP(JGROUP)) THEN
C
C  CALCULATE DRY DEPOSITION AND ADJUST THE PARTICLE SIZE DISTRIBUTION
C
C  BEGIN LOOP ON PARTICLE SIZE GROUP, 400
C
        DO 400 IPSGRP = 1, NPSGRP
  400   DRYREM(IPSGRP,JGROUP) =
     1    EXP ( DBLE (-TIMTOT * VDEPOS(IPSGRP) / EFHGHT ) )
C
C  END LOOP ON PARTICLE SIZE GROUP, 400
C
      ELSE

        DO 440 IPSGRP = 1, NPSGRP
  440   DRYREM(IPSGRP,JGROUP) = 1.D0

      ENDIF

  500 CONTINUE
C
C  BEGIN LOOP ON NUCLIDE, 800
C
      DO 800 ISOTOP = 1, NUMISO
      KGROUP = IGROUP(ISOTOP)
C
C  WASHOUT DOES NOT AFFECT SOME NUCLIDES (GASES)
C
      IF (WETDEP(KGROUP)) THEN
        WETTOT = WETEND
```

```
      ELSE
        WETTOT = 1.
      ENDIF
C
C  INITIALIZE THE LOSS FRACTION ACCUMULATOR FOR SIMULTANEOUS
C  DRY AND WET DEPOSITION, IT REPRESENTS FRACTION LOST FROM THE PLUME.
C
      FRALOS = 0.
C
C  CALCULATE AIR CONCENTRATIONS AND ACCUMULATE THE LOSSES DUE
C  TO SIMULTANEOUS DRY AND WET DEPOSITION
C
      DO 600 IPSGRP = 1, NPSGRP
C
C  DRY DEPOSITION DOES NOT AFFECT SOME NUCLIDES (GASES)
C
      IF (DRYDEP(KGROUP)) THEN
        DRYTOT = DRYREM(IPSGRP,KGROUP)
      ELSE
        DRYTOT = 1.
      ENDIF
C
C  ACCUMULATE A MEASURE OF THE FRACTION LOST AFTER BOTH WET AND DRY LOSSES
C
  600 FRALOS = FRALOS + PSDIS1(IPSGRP,KGROUP) * (1. - WETTOT * DRYTOT)
C
C  CALCULATE THE AMOUNT OF MATERIAL DROPPED ON THE GROUND OVER THIS INTERVAL
C
      FALOUT = FRALOS * PLMINV(IPNTDK(ISOTOP))
C
C If an output table is requested, store the inventory of the plume entering
C the spatial interval, diminished by half of the deposition which occurred
C D. Chanin, 11/29/95: previous coding did not subtract the 0.5 * FALOUT term
C
      IF ((NUMO .GT. 0 .OR. IDEBUG .GE. 1) .AND. ISOTOP .EQ. NUCOUT)
     $  SAVEME = PLMINV(IPNTDK(NUCOUT)) - 0.5 * FALOUT
C
C  CALCULATE THE INTEGRATED AIR CONCENTRATION REPRESENTATIVE OF THE ENTIRE
C  INTERVAL BY USING A SOURCE INVENTORY ADJUSTED FOR HALF THE DEPLETION
C  THAT HAS OCCURRED OVER THE ENTIRE SPATIAL INTERVAL
C
      AIRCON(ISOTOP,IRAD,IREL) = CHIOQH
     $                         * (PLMINV(IPNTDK(ISOTOP)) - .5 * FALOUT)
C
C  CALCULATE THE AVERAGE GROUND CONCENTRATION OVER THE INTERVAL DUE TO LOSSES
C
      GRNCON(ISOTOP,IRAD,IREL) = FALOUT
     $                         / (SQR2PI * SIGYM(IRAD,IREL) * SPALEN(IRAD))
C
C  DEPLETE THE INVENTORY BY THE AMOUNT DROPPED ON THE GROUND OVER THE INTERVAL
C
  800 PLMINV(IPNTDK(ISOTOP)) = PLMINV(IPNTDK(ISOTOP)) - FALOUT
C
C  END LOOP ON NUCLIDE, 800
C
C  ADJUST THE PARTICLE SIZE DISTRIBUTION ARRAY
C
      IF (NPSGRP .GT. 1) THEN
        DO 740 JGROUP = 1, MAXGRP
        ACCUM = 0.
        DO 700 IPSGRP = 1, NPSGRP
        PSDIS1(IPSGRP,JGROUP) = PSDIS1(IPSGRP,JGROUP)
     $                        * DRYREM(IPSGRP,JGROUP)
```

```
  700   ACCUM = ACCUM + PSDIS1(IPSGRP,JGROUP)
        IF (ACCUM .GT. 0.) THEN
          DO 720 IPSGRP = 1, NPSGRP
  720     PSDIS1(IPSGRP,JGROUP) = PSDIS1(IPSGRP,JGROUP) / ACCUM
        ENDIF
  740   CONTINUE
      ENDIF
C
C  HTFCTR IS THE RATIO OF THE AIR CONCENTRATION AT THE GROUND TO
C  THE AIR CONCENTRATION AT THE PLUME CENTERLINE HEIGHT.
C
      HTFCTR(IRAD,IREL) = CHIOQG / CHIOQH

      IF (IDEBUG .GE. 1) THEN
C
C  CALCULATE THE FRACTION OF THE PLUME REMAINING AT THE INTERVAL ENDPOINT
C  DUE TO DRY DEPOSITION TAKING ACCOUNT OF ALL DEPOSITION VELOCITY BINS
C
      IF (DRYDEP(IGROUP(NUCOUT))) THEN
        DRYFRA = 0.
        DO 820 IPSGRP = 1, NPSGRP
  820   DRYFRA = DRYFRA + PSDIS1(IPSGRP,IGROUP(NUCOUT))
     $                  * DRYREM(IPSGRP,IGROUP(NUCOUT))
      ELSE
        DRYFRA = 1.
      ENDIF
C
C  STORE THE WET DEPLETION FRACTION OVER THE ENTIRE INTERVAL FOR NUCLIDE,
C  YOU MUST REMEMBER THAT NOT ALL NUCLIDES ARE SUBJECT TO WET DEPOSITION.
C
      IF (WETDEP(IGROUP(NUCOUT))) THEN
        WETFRA = WETEND
      ELSE
        WETFRA = 1.
      ENDIF
C
C  LOAD A CHARACTER VARIABLE WITH EITHER SIGZM OR THE TEXT STRING 'UNIFORM'
C  WHICH SIGNIFIES THAT UNIFORM MIXING IS IN EFFECT AND SIGMA-Z IS IRRELEVANT
C
        SIGBUF = SIGTEX (SIGZM(IRAD,IREL))

        WRITE(6,850) IRAD, SPACEN(IRAD),
     1   AIRCON(NUCOUT,IRAD,IREL) * HTFCTR(IRAD,IREL),
     2   GRNCON(NUCOUT,IRAD,IREL), CHIOQG, WETFRA, DRYFRA, SAVEME,
     3   SIGYM(IRAD,IREL), SIGBUF, ISTART, ISTOP, HTFCTR(IRAD,IREL),
     4   AVGHIT(IRAD,IREL), TIMCEN(IRAD,IREL), TIMOVH(IRAD,IREL)
      ENDIF

  850 FORMAT(I3, 1P, 4E10.2, 0P, 2F8.4, 1P, 2E10.2, A10, 0P, 1X, 2I4,
     $       F8.3, F8.1, F10.0, F8.0)
C
C Check to see if ATMOS results are to be produced CCDF form
C
      DO 900 IOUT = 1, NUMO
C
      IF (ISRCTM .EQ. 1 .AND.
     1    IREL .EQ. INDREL(IOUT) .AND. IRAD .EQ. INDRAD(IOUT)) THEN
C
C Following implemented at v. 1.11, previous coding generated a CCDF utilizing
C "consequence values" of zero for sigam-z when uniform mixing was reached.
C
C That led to the PROB_NON_ZERO for sigma-z being reported as less than one on
C the summary output lines.  It also meant that the mean value of sigma-z could
```

```
C not be used to perform a hand calculation to obtain X/Q.  D. Chanin 12/01/95
C
      IF (SIGZM(INDRAD(IOUT),INDREL(IOUT)) .EQ. 0.) THEN
         EFF_SIGZ = HLID / SQR2PI
      ELSE
         EFF_SIGZ = SIGZM(INDRAD(IOUT),INDREL(IOUT))
      ENDIF
C
      GRNTOT = 0.0
      DO 860 INUC = 1, NUMISO
  860   GRNTOT = GRNTOT + GRNCON(INUC,INDRAD(IOUT),INDREL(IOUT))
C
      WRITE(30) AIRCON(NUCOUT,INDRAD(IOUT),INDREL(IOUT))
      WRITE(30) AIRCON(NUCOUT,INDRAD(IOUT),INDREL(IOUT)) *
     1            HTFCTR(INDRAD(IOUT),INDREL(IOUT))
      WRITE(30) GRNCON(NUCOUT,INDRAD(IOUT),INDREL(IOUT))
      WRITE(30) GRNTOT
      WRITE(30) CHIOQG
      WRITE(30) SAVEME
      WRITE(30) SIGYM(INDRAD(IOUT),INDREL(IOUT))
      WRITE(30) EFF_SIGZ
      WRITE(30) AVGHIT(INDRAD(IOUT),INDREL(IOUT))
      WRITE(30) TIMCEN(INDRAD(IOUT),INDREL(IOUT))
      ENDIF
  900 CONTINUE
      RETURN
      END
*DECK CHECK_SIGMA_Y
      SUBROUTINE CHECK_SIGMA_Y
C
C  Call a routine that will check sigma-y values (for all stability classes)
C  at the maximum downwind distance (SPAEND(NUMRAD)) to see if the plume is
C  so large as to "wrap around" back to the release point and thus cover
C  an area greater than a semicircle (going to 2.15 sigma-y, or the 10% level).
C
C  This routine is called by ATMOUT.
C
C  New subroutine added 3/18/01, D. Chanin, Log # 3/01/01-D:
C   Call a routine that will check sigma-y values (for all stability classes)
C   at the maximum downwind distance (SPAEND(NUMRAD)) to see if the plume is
C   so large as to "wrap around" back to the release point and thus cover
C   an area greater than a semicircle (going to 2.15 sigma-y, or the 10% level).
C
C  Previous fix (Log 3/01/01-D) was found to be incorrect in
C    using IPLUME as a pointer to a plume segment.  This mistake
C    is corrected per Log # 7/24/01-A.  IREL is the pointer to the
C    plume segment; IPLUME is a flag, not a pointer to a plume segment.

      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)

      EXTERNAL FSGY, FSGYIN

      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI

      COMMON /MULREL/ PLHEAT(4), PLHITE(4), PLUDUR(4), PDELAY(4),
     1                REFTIM(4), RELINV(MXDKCN,4), PSDIST(10,10),
     2                SIGYINIT(4), SIGZINIT(4), BUILDH(4)

      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
```

```
      REAL SIGMA_Y_END(6)

      CHARACTER *1 STABILITY_NAMES(6)
      DATA STABILITY_NAMES / 'A', 'B', 'C', 'D', 'E', 'F'/

C Following code block (DO 40) deactivated due to a coding
C error introduced with the 3/18/01 "fix" of Log # 3/01/01-D.
C The reference to SIGYINIT(IPLUME) was causing an out-of-bounds
C array reference at that location when ENDAT1 is .TRUE. (thereby
C skipping EARLY), and thus IPLUME is undefined in that case.
C
C The correction of this problem (Log # 7/24/01-A) is to add
C a new (DO 20) loop at the beginning of this routine to
C calculate the maximum value of SIGYINIT (over all possible
C plumes).  This requires calculating a new variable, SIGY_MAX0.
C The variable IPLUME is not an index to a plume segment (which
C can vary between 1 and 4, depending on the value of NUMREL).
C Rather, IPLUME is a numeric flag (having values of 1, 2, or 3)
C specifying what type of windrose rotation is to be performed
C in EARLY and CHRONC.  IREL is commonly used as a DO LOOP index
C within the code referring to a plume segment between 1 and NUMREL.
C The cause of this coding error was a confusion between IPLUME
C (a flag) and IREL (a counter).

C*********
C Begin old errroneous code introduced with Log # 3/01/01-A
C*********
C      DO 40 ISTAB = 1, 6
C
C calculate the virtual source distance due to building wake
C
C      VIRT_Y = FSGYIN (ISTAB, SIGYINIT(IPLUME))
C   40 SIGMA_Y_END(ISTAB) = FSGY (ISTAB, VIRT_Y + SPAEND(NUMRAD) )
C*********
C End old errroneous code introduced with Log # 3/01/01-A
C*********

      SIGY_MAX0 = SIGYINIT(1)
      DO 20 IREL = 2, NUMREL
   20 SIGY_MAX0 = MAX (SIGY_MAX0, SIGYINIT(IREL))

      DO 40 ISTAB = 1, 6
C
C Calculate the virtual source distance due to building wake
C for the plume segment (1:NUMREL) that has the largest initial
C value of sigma-y, SIGYINIT.  Code changed per Log # 7/24/01-A
C
      VIRT_Y = FSGYIN (ISTAB, SIGY_MAX0)
   40 SIGMA_Y_END(ISTAB) = FSGY (ISTAB, VIRT_Y + SPAEND(NUMRAD) )

      MAX_STAB = 1
      SIGMA_Y_MAX = SIGMA_Y_END(1)

      DO 60 ISTAB = 2, 6
      IF (SIGMA_Y_END(ISTAB) .GT. SIGMA_Y_MAX) THEN
        MAX_STAB = ISTAB
        SIGMA_Y_MAX = SIGMA_Y_END(ISTAB)
      ENDIF
   60 CONTINUE
C
C calculate the arc distance to the 10% level of the Gaussian,
C which occurs at a distance of 2.15 sigma
```

```
C
      SIGMA_MAX = 2.15 * SIGMA_Y_MAX
C
C calculate the arc distance to the half-circle point at
C the end of the outermost grid element
C
      SIGMA_LIMIT = 0.5 * PI * SPAEND(NUMRAD)

      IF (SIGMA_MAX .GT. SIGMA_LIMIT) THEN
        CALL ERRLOC ('CHECK_SIGMA_Y:', ' Sigma-y is too large!')
        WRITE (6,80) IPLUME, STABILITY_NAMES(MAX_STAB), SPAEND(NUMRAD),
     1    SIGMA_Y_MAX, SIGMA_MAX, SIGMA_LIMIT, SIGMA_MAX/SIGMA_LIMIT
        WRITE (7,80) IPLUME, STABILITY_NAMES(MAX_STAB), SPAEND(NUMRAD),
     1    SIGMA_Y_MAX, SIGMA_MAX, SIGMA_LIMIT, SIGMA_MAX/SIGMA_LIMIT

   80   FORMAT(/' Please reduce the sigma-y parameterization because',
     1   ' plume number ', I1 /' is too large (covering more',
     2   ' than a half circle) under ', A, ' stability' /' at the'
     3   ' maximum grid distance of ', 1PE12.6, ' meters.  At that',
     4   /' distance, the calculated value of sigma-y is ', E12.6,
     5   ' meters.'
     6   //' The 10% level (2.15 sigma-y) lies at an arc length of ',
     7   1PE12.6, ' meters,' /' while the half-circle-point arc',
     8   ' length (max bound) is ', E12.6, ' meters' //' To avoid',
     9   ' this problem, please reduce the sigma-y parameterization'/
     A   ' by at least a factor of ', E12.6)
        CALL ABORT ('terminating')
      ENDIF

      RETURN
      END
*DECK AREA
      FUNCTION AREA  (CSLOPE, X1PARM, X2PARM, XF)
C
C  CALCULATES THE AREA UNDER A LINE SEGMENT WHICH STARTS AT THE ORIGIN AND
C  HAS SLOPE, CSLOPE. THE EQUATION OF THE LINE IS:  Y = CSLOPE * X.
C  INTEGRATION BOUNDS ON THE CURVE ARE X = X1PARM  AND X = X2PARM.
C  THE UPPER BOUND ON THE INTEGRATION LIMIT IS X = XF.
C
C  D. CHANIN, DIV. 6415, 12 JAN 87.
C  MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C
      X1 = MIN (X1PARM, XF)
      X2 = MIN (X2PARM, XF)
      X1 = MAX (X1, 0.)
      X2 = MAX (X2, 0.)

      AREA = .5 * CSLOPE * (X2 ** 2 - X1 ** 2)

      RETURN
      END
*DECK CAUGHT
      LOGICAL FUNCTION CAUGHT (VEL, PLHEAT, BUILDH)
C
C  DETERMINE WHETHER PLUME IS CAUGHT IN THE BUILDING WAKE
C
C  THIS MODEL CAN BE TURNED OFF BY SETTING LIFMOD=.FALSE. TO PREVENT ENTRAINMENT
C
C  THIS FUNCTION IS CALLED BY SUBROUTINE ATMOUT.
C
C  GLOSSARY OF VARIABLES:
C
C  BUILDH - BUILDING HEIGHT (METERS)
```

```
C  CAUGHT - RETURNED FUNCTION VALUE INDICATING WHETHER THE PLUME WAS ENTRAINED
C IREL - index to the current plume release segment
C  PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C  PLHEAT - HEAT CONTENT OF THE PLUME (WATTS)
C  SCLCRW - SCALING FACTOR FOR THE CRITICAL WIND SPEED FORMULA
C  VEL    - WIND SPEED (M/S)
C  VELCRT - CRITICAL WIND SPEED FOR ENTRAINMENT (M/S)
C
C  DAVID CHANIN, DIV. 6415, 24 FEB 1984.
C
C  MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C  MODIFIED 12 MAY 87, DIC, SER #58, CHANGE A-D PLUME RISE SO PLUME CAN RISE
C                                    ALL THE WAY UP TO THE LID HEIGHT
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 11/30/95, D. Chanin, allow overlapping plumes and allow each plume
C  to have different initial dimensions, thus allowing use of the "stem and cap"
C  model of explosive releases used in the DAHRT EIS
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      COMMON /PLUMRS/ SCLCRW, SCLADP, SCLEFP
C
      VELCRT = SCLCRW * (9.09 * 8.79E-6 * PLHEAT / BUILDH) ** .33333

      IF (VEL .GT. VELCRT) THEN
        CAUGHT = .TRUE.
      ELSE
        CAUGHT = .FALSE.
      ENDIF

      RETURN
      END
*DECK VELADJ
      FUNCTION VELADJ (VEL, IST, HEIGHT)
C
C ADJUSTS THE WIND SPEED TO TAKE ACCOUNT OF HEIGHT
C
C TAKEN FROM PAGE 32 OF HANNA, BRIGGS, AND HOSKER
C "HANDBOOK ON ATMOSPHERIC DIFFUSION", DOE/TIC 11223, U.S. DOE, 1982.
C
C THIS FUNCTION IS CALLED BY FUNCTION PLMRIS.
C
C GLOSSARY OF VARIABLES:
C
C HEIGHT - HEIGHT AT WHICH THE WIND SPEED IS DESIRED
C IST    - STABILITY CLASS INDEX (A-F)
C VEL    - WIND SPEED AT GROUND LEVEL
C VELADJ - RETURNED FUNCTION VALUE, WIND SPEED AT THE DESIRED HEIGHT
C WCOEF  - COEFFICIENTS IN THE WIND SPEED FORMULA
C
C DAVID CHANIN, DIV. 6415, 24 FEB 1984.
C
C MOD 24 MAR 88, D.C., LIMIT FACTOR TO THAT FOR A HEIGHT OF 200 METERS
C
C  NO EXTERNAL FUNCTIONS
      INTRINSIC MIN
      DIMENSION WCOEF(6)

      DATA WCOEF / .07, .07, .10, .15, .35, .55/
```

```
      IF (HEIGHT .GT. 10.) THEN
        VELADJ = VEL * (MIN (HEIGHT, 200.) / 10.) ** WCOEF(IST)
      ELSE
        VELADJ = VEL
      ENDIF

      RETURN
      END
*DECK WASHOU
      FUNCTION WASHOU (RNMM, RNSECS)
C
C  CALCULATE THE FRACTION REMAINING AFTER WET DEPOSITION
C
C  GLOSSARY OF VARIABLES:
C
C  RNMM   - AVERAGE RAIN RATE IN MILLIMETERS PER HOUR
C  RNSECS - DURATION OF THE RAIN IN SECONDS
C
C  THIS ROUTINE IS CALLED BY SUBROUTINE ATMOUT.
C
C  DAVID CHANIN, DIV. 6415, 24 FEB 1984.
C
C  NO EXTERNAL FUNCTIONS
      INTRINSIC EXP
      COMMON /WETCON/ CWASH1, CWASH2
      WASHOU = EXP (-CWASH1 * RNSECS * RNMM ** CWASH2)

      RETURN
      END
      FUNCTION FSGY  (IST, DIST)
C
C  PASQUILL-GIFFORD FORMULA FOR SIGMA Y AS A FUNCTION OF STABILITY
C  AND ALONG-WIND DISTANCE.
C
C  THIS FUNCTION IS CALLED BY SUBROUTINE ATMOUT.
C
C  GLOSSARY OF VARIABLES:
C
C  CYSIGA - LINEAR TERM IN THE SIGMA-Y DISPERSION FORMULA (A*X**B)
C  CYSIGB - EXPONENTIAL TERM IN THE SIGMA-Y DISPERSION FORMULA (A*X**B)
C  DIST   - DISTANCE TRAVELED BY THE PLUME (METERS)
C  D_INVRS_Z(IDIST,ISTAB) - derivatives of sigma-z for each distance/stability
C  D_SIGMA_Z(IDIST,ISTAB) - derivatives of inverse sigma-z for each combination
C  FE(1)  - value of dependent varaiable returned by the interpolation routine
C  EXPFAC - EXPANSION FACTOR FOR PLUME DURATION
C  FSGY   - RETURNED FUNCTION VALUE OF SIGMA-Y (METERS)
C  FSGYIN - RETURNED FUNCTION VALUE OF INVERSE SIGMA-Y, VIRTUAL SOURCE DISTANCE
C  IST    - STABILITY CLASS INDEX (A-F)
C  NE     - number of data points for which interpolation is to be performed
C  SIGY   - SIGMA-Y IN METERS
C  SIGMA_Z(IDIST,ISTAB) - tables of plume size for each distance and stability
C  XE(1)  - value of independent varaiable returned by the interpolation routine
C  YSCALE - SCALING FACTOR FOR THE "A" TERM IN THE EXPRESSION FOR SIGMA-Y
C
C GLOSSARY OF EXTERNALS:
C
C PCHEV - canned routine to perform hermite cubic interpolation obtained from
C         Numerical Methods and Software by Kahaner, Moler, and Nash,
C         Prentice Hall, 1989.
C
C  DAVID CHANIN, DIV. 6415, 24 FEB 1984.
C
```

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C  MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C MODIFIED 7/21/95, DIC.  Plume-size table lookup feature newly implemented
C
C  NO INTRINSIC FUNCTIONS
      EXTERNAL PCHEV
      PARAMETER (MAX_DIST=50, MAX_STAB=6)
C
      COMMON /DISPY/ YSCALE, CYSIGA(6), CYSIGB(6)
      COMMON /EXPFAC/ EXPFAC
      COMMON /DISP_TABLES/ NUM_DIST, DISTANCE(MAX_DIST),
     1  SIGMA_Y(MAX_DIST,MAX_STAB), SIGMA_Z(MAX_DIST,MAX_STAB),
     2   D_SIGMA_Y(MAX_DIST,MAX_STAB), D_SIGMA_Z(MAX_DIST,MAX_STAB),
     3   D_INVRS_Y(MAX_DIST,MAX_STAB), D_INVRS_Z(MAX_DIST,MAX_STAB)
C
      DIMENSION XE(1), FE(1)
C
      IF (NUM_DIST .EQ. 0) THEN
      FSGY = YSCALE * EXPFAC * CYSIGA(IST) * DIST ** CYSIGB(IST)
      ELSE
      NE = 1
      XE(1) = DIST
      CALL PCHEV (NUM_DIST, DISTANCE, SIGMA_Y(1,IST),
     1    D_SIGMA_Y(1,IST), NE, XE, FE, FD, IERR)
      IF (IERR .LT. 0) THEN
        WRITE(6,*)'ERROR CALLING PCHEV FOR SIGMA-Z:',
     1              ' (IERR,IST) = ', IERR, IST
        WRITE(7,*)'ERROR CALLING PCHEV FOR SIGMA-Z:',
     1              ' (IERR,IST) = ', IERR, IST
        CALL ABORT ('terminating')
      ENDIF
      FSGY = YSCALE * EXPFAC * FE(1)
      ENDIF
      RETURN

      ENTRY FSGYIN (IST, SIGY)
C
C  PASQUILL-GIFFORD FORMULA FOR VIRTUAL SOURCE DISTANCE AS A
C  FUNCTION OF STABILITY AND SIGMA Y, THE INVERSE FUNCTION OF FSGY0.
C
      IF (NUM_DIST .EQ. 0) THEN
      FSGYIN = (SIGY / (YSCALE * EXPFAC * CYSIGA(IST)))
     $            ** (1. / CYSIGB(IST))
      ELSE
      NE = 1
      XE(1) = SIGY / (YSCALE * EXPFAC)
      CALL PCHEV (NUM_DIST, SIGMA_Y(1,IST), DISTANCE,
     1    D_INVRS_Y(1,IST), NE, XE, FE, FD, IERR)
      IF (IERR .LT. 0) THEN
        WRITE(6,*)'ERROR CALLING PCHEV FOR INVERSE SIGMA-Z:',
     1              ' (IERR,IST) = ', IERR, IST
        WRITE(7,*)'ERROR CALLING PCHEV FOR INVERSE SIGMA-Z:',
     1              ' (IERR,IST) = ', IERR, IST
        CALL ABORT ('terminating')
      ENDIF
C ensure that the virtual source distance is not less than the first table value
      FSGYIN = MAX (DISTANCE(1), FE(1))
      ENDIF
      RETURN
      END
      FUNCTION FSGZ  (IST, DIST)
C
C  PASQUILL-GIFFORD FORMULA FOR SIGMA Z AS A FUNCTION OF STABILITY
C  CLASS AND ALONG-WIND DISTANCE
```

```
C
C  THIS FUNCTION IS CALLED BY SUBROUTINE ATMOUT.
C
C  GLOSSARY OF VARIABLES:
C
C  CZSIGA - LINEAR TERM IN THE SIGMA-Z DISPERSION FORMULA (A*X**B)
C  CZSIGB - EXPONENTIAL TERM IN THE SIGMA-Z DISPERSION FORMULA (A*X**B)
C  DIST   - DISTANCE TRAVELED BY THE PLUME (METERS)
C  DISTANCE - table of distances defined in the plume-size input tables
C  D_INVRS_Z(IDIST,ISTAB) - derivatives of sigma-z for each distance/stability
C  D_SIGMA_Z(IDIST,ISTAB) - derivatives of inverse sigma-z for each combination
C  FE(1)  - value of dependent varaiable returned by the interpolation routine
C  FSGZ   - RETURNED FUNCTION VALUE OF SIGMA-Z (METERS)
C  FSGZIN - RETURNED FUNCTION VALUE OF INVERSE SIGMA-Z, VIRTUAL SOURCE DISTANCE
C  IST    - STABILITY CLASS INDEX (A-F)
C  NE     - number of data points for which interpolation is to be performed
C  SIGMA_Z(IDIST,ISTAB) - tables of plume size for each distance and stability
C  SIGZ   - SIGMA-Z IN METERS
C  XE(1)  - value of independent varaiable returned by the interpolation routine
C  ZSCALE - SCALING FACTOR FOR THE "A" TERM IN THE EXPRESSION FOR SIGMA-Z
C
C  DAVID CHANIN, DIV. 6415, 24 FEB 1984.
C
C  MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C MODIFIED 7/21/95, DIC, incorporate table-lookup option for sigma-y/z
C
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAX_DIST=50, MAX_STAB=6)
C
      COMMON /DISPZ/ ZSCALE, CZSIGA(6), CZSIGB(6)
      COMMON /DISP_TABLES/ NUM_DIST, DISTANCE(MAX_DIST),
     1  SIGMA_Y(MAX_DIST,MAX_STAB), SIGMA_Z(MAX_DIST,MAX_STAB),
     2   D_SIGMA_Y(MAX_DIST,MAX_STAB), D_SIGMA_Z(MAX_DIST,MAX_STAB),
     3   D_INVRS_Y(MAX_DIST,MAX_STAB), D_INVRS_Z(MAX_DIST,MAX_STAB)
C
      DIMENSION XE(1), FE(1)
C
      IF (NUM_DIST .EQ. 0) THEN
      FSGZ = ZSCALE * CZSIGA(IST) * DIST ** CZSIGB(IST)
      ELSE
      NE = 1
      XE(1) = DIST
      CALL PCHEV(NUM_DIST, DISTANCE, SIGMA_Z(1,IST),
     1    D_SIGMA_Z(1,IST), NE, XE, FE, FD, IERR)
      IF (IERR .LT. 0) THEN
        WRITE(6,*)'ERROR CALLING PCHEV FOR SIGMA-Z:',
     1                ' (IERR,IST) = ', IERR, IST
        WRITE(7,*)'ERROR CALLING PCHEV FOR SIGMA-Z:',
     1                ' (IERR,IST) = ', IERR, IST
        CALL ABORT ('terminating')
      ENDIF
      FSGZ = ZSCALE * FE(1)
      ENDIF
      RETURN
      ENTRY FSGZIN (IST, SIGZ)
C
C PASQUILL-GIFFORD FORMULA FOR DISTANCE AS A FUNCTION OF STABILITY
C  CLASS AND SIGMA Z, THE INVERSE FUNCTION OF FSGZ
C
      IF (NUM_DIST .EQ. 0) THEN
      FSGZIN = (SIGZ / (ZSCALE * CZSIGA(IST))) ** (1. / CZSIGB(IST))
      ELSE
      NE = 1
```

```
      XE(1) = SIGZ / ZSCALE
      CALL PCHEV (NUM_DIST, SIGMA_Z(1,IST), DISTANCE,
     1    D_INVRS_Z(1,IST), NE, XE, FE, FD, IERR)
      IF (IERR .LT. 0) THEN
        WRITE(6,*)'ERROR CALLING PCHEV FOR INVERSE SIGMA-Z:',
     1              ' (IERR,IST) = ', IERR, IST
        WRITE(7,*)'ERROR CALLING PCHEV FOR INVERSE SIGMA-Z:',
     1              ' (IERR,IST) = ', IERR, IST
        CALL ABORT ('terminating')
      ENDIF
C ensure that the virtual source distance is not less than the first table value
      FSGZIN = MAX (DISTANCE(1), FE(1))
      ENDIF
      RETURN
      END
*DECK PLMRIS
      FUNCTION PLMRIS (PLHEAT, ISTAB0, WINDS0, HTMXLR, RELHIT, RISING,
     $                 PLDIST)
C
C  CALCULATES DELTA IN HEIGHT DUE TO PLUME RISE.
C
C  FOR A,B,C,D STABILITY:
C    PLUME RISE FORMULA TAKEN FROM PAGE 14 OF HANNA, BRIGGS, AND HOSKER
C    "HANDBOOK ON ATMOSPHERIC DIFFUSION", DOE/TIC 11223, U.S. D.O.E., 1982.
C
C    BOUYANCY TERMINATION CRITERIA TAKEN
C    FROM BRIGGS' "LECTURES ON AIR POLLUTION AND ENVIRONMENTAL IMPACT
C    ANALYSES", AMS, 1975.
C
C  FOR E, AND F STABILITY:
C    PLUME RISE FORMULA TAKEN FROM PAGE 14 OF HANNA, BRIGGS, AND HOSKER
C    "HANDBOOK ON ATMOSPHERIC DIFFUSION", DOE/TIC 11223, U.S. D.O.E., 1982.
C
C  THIS FUNCTION IS CALLED BY SUBROUTINE ATMOUT.
C
C  GLOSSARY OF VARIABLES:
C
C  AVGVEL - AVERAGE WIND SPEED OVER THE HEIGHT OF THE PLUME RISE
C  ESTHIT - ESTIMATED FINAL HEIGHT OF THE PLUME
C  F      - BRIGG'S BOUYANCY FLUX PARAMETER FOR PLUME RISE FORMULAS
C  HTMXLR - HEIGHT OF THE MIXING LAYER (METERS)
C  ISTAB0 - STABILITY CLASS INDEX (A-F)
C  PLDIST - DISTANCE TRAVELED BY THE PLUME SO FAR (METERS)
C  PLHEAT - HEAT CONTENT OF THE PLUME (WATTS)
C  PLMCAP - MAXIMUM AMOUMT OF PLUME RISE ALLOWED BY THE MODEL
C  PLMRIS - RETURNED FUNCTION VALUE, CHANGE IN PLUME HEIGHT OVER THIS DISTANCE
C  RELHIT - HEIGHT OF THE PLUME RELEASE (METERS)
C  RISING - LOGICAL FLAG INDICATING PLUME RISE IS STILL OCCURRING
C  SCLADP - SCALING FACTOR FOR A-D PLUME RISE FORMULA
C  SCLEFP - SCALING FACTOR FOR E-F PLUME RISE FORMULA
C  SCON   - TABULATED COEFFICIENTS FOR THE PLUME RISE FORMULA
C  VEL1   - WIND SPEED AT RELEASE HEIGHT (M/S)
C  VEL2   - APPROXIMATE WIND SPEED AT PLUME HEIGHT (M/S)
C  WINDS0 - GROUND LEVEL WIND SPEED (M/S)
C
C  GLOSSARY OF EXTERNALS:
C
C  VELADJ - ADJUSTS A GIVEN WIND SPEED TO TAKE ACCOUNT OF HEIGHT
C
C  DAVID CHANIN, DIV. 6415, 24 OCT 1984.
C
C  MODIFIED 23 MAR 87, DIC, SER #46, IMPLEMENT BRAND NEW ATMOSPHERIC MODEL
C  MODIFIED 12 MAY 87, DIC, SER #58, CHANGE A-D PLUME RISE SO PLUME CAN RISE
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```
C                                       ALL THE WAY UP TO THE LID HEIGHT
C  MODIFIED 25 JUN 87, DIC, SER #63, RESTRICT ALLOWABLE INPUT VALUES TO
C           PLAUSIBLE VALUES CONSISTENT WITH THOSE IN THE USER'S GUIDE.
C           CORRECT AN IMPLEMENTATION ERROR IN SER #60,
C           AVOID ZERO TIME STEP IN WET DEPOSITION CALCULATION.
C
C  MODIFIED 1 AUG 88, D.C., ERROR IN THE ESTIMATION OF FINAL PLUME HEIGHT
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
      EXTERNAL VELADJ
      INTRINSIC MIN
      COMMON /PLUMRS/ SCLCRW, SCLADP, SCLEFP
      LOGICAL RISING

      DIMENSION SCON(2)
      DATA SCON / 5.04E-4, 1.27E-3/
C
C  CONVERT FROM UNITS OF WATTS TO BRIGGS' BOUYANCY FLUX PARAMETER, F
C
      F = PLHEAT * 8.79E-6
      IF (ISTAB0 .LE. 4) THEN
C
C  A TO D STABILITY, PLUME RISE IS A FUNCTION OF DISTANCE,
C  PLUME RISE STOPS WHEN THE PLUME HEIGHT REACHES THE MIXING LID
C
C  ESTIMATE THE FINAL HEIGHT OF THE PLUME
C
C  FOLLOWING STATEMENT MODIFIED 1 AUG 88, D.C.
C  BECAUSE IT WAS INCORRECTLY REFERENCING AN UNDEFINED
C  VARIABLE WHICH COULD CAUSE A DIVIDE BY ZERO ERROR, VEL1.
C
C  ESTHIT = MIN (RELHIT + 300. * F / VEL1 ** 3, HTMXLR)
C
        ESTHIT = MIN (RELHIT + 300. * F / WINDS0 ** 3, HTMXLR)
C
C  CALCULATE AVG. WIND SPEED BETWEEN RELEASE HEIGHT AND ESTIMATED FINAL HEIGHT
C
        VEL1 = VELADJ (WINDS0, ISTAB0, RELHIT)
        VEL2 = VELADJ (WINDS0, ISTAB0, ESTHIT)
        AVGVEL = .5 * (VEL1 + VEL2)
C
C  CALCULATE THE UNBOUNDED PLUME RISE OVER THIS DISTANCE
C
        PLMRIS = SCLADP * 1.6 * F ** .3333 * PLDIST ** .6667 / AVGVEL
C
C PLUME RISE IS BOUNDED EITHER BY MIXING LAYER OR (300*F/U**3)
C
        PLMCAP = MIN (HTMXLR - RELHIT, 300. * F / AVGVEL ** 3)
        IF (PLMRIS .GE. PLMCAP) THEN
          PLMRIS = PLMCAP
          RISING = .FALSE.
        ENDIF
      ELSE
C
C  E OR F STABILITY, PLUME RISE IS INSTANTANEOUS
C
C  CALCULATE AVG. WIND SPEED BETWEEN RELEASE HEIGHT AND ESTIMATED FINAL HEIGHT
C
        VEL1 = VELADJ (WINDS0, ISTAB0, RELHIT)
        VEL2 = VELADJ (WINDS0, ISTAB0, RELHIT +
     $          2.6 * (F / VEL1 / SCON(ISTAB0 - 4)) ** .3333)
        AVGVEL = .5 * (VEL1 + VEL2)
        PLMRIS = SCLEFP * 2.6 * (F / AVGVEL / SCON(ISTAB0 - 4)) ** .3333
```

```
C
C  LIMIT PLUME RISE TO THE LID HEIGHT
C
         PLMRIS = MIN (PLMRIS, HTMXLR - RELHIT)
         RISING = .FALSE.
       ENDIF
       RETURN
       END
*DECK SIGTEX
       FUNCTION SIGTEX (SIGZM)
C
C  THIS ROUTINE RETURNS THE CHARACTER STRING '   UNIFORM' IF (VALUE .EQ. 0.)
C  OTHERWISE, IT RETURNS A STRING WITH THE NUMERIC VALUE IN 1PE10.2 FORMAT.
C
C  DAVID CHANIN, DIV. 6415, 23 OCT 86.
C
       CHARACTER *10 SIGTEX
       IF (SIGZM .EQ. 0.) THEN
         SIGTEX = '   UNIFORM'
       ELSE
         WRITE(SIGTEX,10) SIGZM
   10    FORMAT(1PE10.2)
       ENDIF

       RETURN
       END
*DECK EAROUT
       SUBROUTINE EAROUT
C
C CALCULATES RESULTS FROM THE EARLY MODULE FOR A SINGLE WEATHER TRIAL
C AND A SINGLE EMERGENCY RESPONSE STRATEGY
C
C THE RESULTS FROM THIS MODULE ARE THEN STORED ON THE
C NSTRTG RESULTS FILES NUMBERED FROM 31 TO (30+NSTRTG)
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CONTRL.
C
C GLOSSARY OF VARIABLES:
C
C AIRCON - AIR CONCENTRATION AT THE PLUME CENTERLINE OF EACH NUCLIDE
C ANGCOV - HALFWIDTH IN RADIANS OF THE PLUME
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C AVGHIT - AVERAGE HEIGHT OF THE PLUME AT THE SPATIAL ELEMENT
C CENCD  - CENTERLINE CLOUDSHINE DOSE (INTRVL,ORGAN)
C CENGD  - CENTERLINE GROUNDSHINE DOSE (INTRVL,ORGAN)
C CENPID - CENTERLINE PLUME INHALATION CLOUDSHINE DOSE (INTRVL,ORGAN)
C GRNCON - AN ARRAY OF GROUND CONCENTRATIONS OF EACH NUCLIDE
C HTFCTR - RATIO OF GROUND LEVEL AIR CONCENTRATION TO CENTERLINE CONCENTRATION
C I      - DO LOOP INDEX
C IFIN   - DO LOOP COUNTER ON FINE GRID
C ILAST  - UPPER BOUND ON DIAGNOSTIC OUTPUT PRINT LOOPS
C INTERV - LOOP COUNTER ON RADIAL SPATIAL ELEMENTS
C IORG   - DO LOOP INDEX ON ORGAN
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C IWIND  - WIND DIRECTION PICKED UP FROM TAPE30
C JRAD   - DO LOOP INDEX ON RADIAL SPATIAL INDEX
C KANG   - DO LOOP INDEX ON ANGULAR SPATIAL INDEX
C LASANG - LAST ANGULAR DIRECTION TO BE CONSIDERED IN THE CALCULATION
C NTRIAL - LOOP COUNTER ON TRIALS
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMFIN - NUMBER OF FINE GRID SUBELEMENTS IN A COARSE ELEMENT (ODD)
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C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMREL - THE NUMBER OF PLUME SEGMENTS IN THE RELEASE
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C RISFAT - RISK OF EARLY DEATH IN EACH FINE SPATIAL ELEMENT(FIN,RADIAL,ANGULAR)
C SIGYM  - PLUME SIGMA-Y AT THE ELEMENT CENTER
C SIGZM  - PLUME SIGMA-Z AT THE ELEMENT CENTER
C SPACEN - RADIAL DISTANCES TO THE SPATIAL ELEMENT CENTERPOINTS
C TIMCEN - TIME FROM RELEASE THAT THE PLUME ARRIVES AT THE ELEMENT CENTER
C TIMOVH - TIME THAT THE PLUME IS OVERHEAD AT THE ELEMENT CENTER
C T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C GLOSSARY OF EXTERNALS:
C
C CANRIS - CALCULATES THE RISK OF CANCER FROM ACUTE EXPOSURE
C CENZER - ZEROES OUT THE CENTERLINE DOSE ARRAYS
C EGEOM  - CALCULATES GEOMETRIC FACTORS: GAUSSIAN HEIGHT,CLOUDSHINE CORRECTION
C EMOVE  - ACCUMULATES DOSES TO MOVING INDIVIDUALS
C EPCALC - PRECALCULATES THE EARLY DOSIMETRY FACTORS, STORED IN /DOSFAC/
C ESTAT  - ACCUMULATES DOSE, STATIONARY INDIVIDUALS
C FATRIS - CALCULATES THE RISK OF EARLY FATALITY
C INJRIS - CALCULATES THE RISK OF EARLY INJURIES
C RELZON - CALCULATE THE DOSES THAT ARE INDEPENDENT OF EMERGENCY RESPONSE
C STOEAR - CALCULATE REQUESTED RESULTS AND STORE ON THE "EARLY RESULT FILES
C
C DAVID CHANIN, DIV. 6415, 3 JULY 1984.
C
C MODIFIED 7 APRIL 87, D.C., SER #51, AVOID DOUBLE-COUNTING GROUNDSHINE
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 11/08/88, D. CHANIN, LOG # 9/16/88-A,
C   USING A NEW ROUTINE, CENZER, TO ZERO THE CENTERLINE DOSE ARRAYS
C
      EXTERNAL CENZER, EGEOM, EMOVE, EPCALC, ESTAT, FATRIS, INJRIS,
     1         STOEAR, RELZON
C
C  EARLY DOSIMETRY DIMENSION DATA
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /CENDOS/ CENCD(MAXRAD,2:MAXORG), CENGD(MAXRAD,2:MAXORG),
     1 CENSKI(MAXRAD), CENPID(MAXRAD,2:MAXORG), CENRID(MAXRAD,2:MAXORG)
      COMMON /RISFAT/ RISFAT(7,MAXRAD,16), FATAVG(MAXRAD,16)
      COMMON /IPRINT/ IPRINT
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      IF (IPLUME .EQ. 1) THEN
        LASANG = NUMCOR / 4 + 1
      ELSE
        LASANG = NUMCOR
      ENDIF
C
C  ZERO THE CENTERLINE AND FINE GRID DOSE ACCUMULATION ARRAYS
```

```
C  WE ONLY NEED TO COVER AS MANY ANGULAR DIRECTIONS AS CAN BE USED
C
      CALL CENZER (1, NUMRAD)

      DO 200 KANG = 1, LASANG
      DO 200 JRAD = 1, NUMRAD

      FATAVG(JRAD,KANG) = 0.

      DO 200 IFIN = 1, NUMFIN

      RISFAT(IFIN,JRAD,KANG) = 0.

      DO 200 IORG = 1, NUMORG
  200 T1DOSE(IORG,IFIN,JRAD,KANG) = 0.

      IF (ISTRTG .EQ. 1) THEN
C
C  CALCULATE THE GEOMETRIC FACTORS; GAUSSIAN HEIGHT AND CLOUDSHINE CORRECTION,
C  RESULTS STORED IN /DOSFAC/.
C
        CALL EGEOM
C
C  PRECALCULATE THE DOSIMETRY FACTORS FOR EARLY EXPOSURE,
C  RESULTS STORED IN /DOSFAC/.
C
        CALL EPCALC

      ENDIF
C
C  CALCULATE THE RELZON DOSES THAT ARE INDEPENDENT OF EMERGENCY RESPONSE
C
      CALL RELZON
C
C  PRINT THE DOSE ARRAY FOR THE SECOND AND THIRD ORGANS
C  DOSE ARRAY FOR ACUTE EFFECTS AFTER THE RELZON DOSES HAVE BEEN CALCULATED.
C
      IF (IPRINT .GE. 8) THEN

        WRITE(6,440)

        WRITE(6,440)

        DO 370 KANG = 1, LASANG
        DO 370 JRAD = 1, NUMRAD

        WRITE(6,360) JRAD, KANG, SPACEN(JRAD)

  360   FORMAT(/' (',I2,',',I2,') AT',F9.0,' METERS, AFTER RELZON:')

        DO 370 IORG = 2, 3

  370   WRITE(6,510) ORGNAM(IORG),
     $               (T1DOSE(IORG,IFIN,JRAD,KANG),IFIN=1,NUMFIN)
      ENDIF
C
C  ACCUMULATE DOSES TO STATIONARY INDIVIDUALS
C
      CALL ESTAT
C
C  PRINT THE DOSE ARRAY FOR THE SECOND AND THIRD ORGANS
C  DOSE ARRAY FOR ACUTE EFFECTS AFTER THE STATIONARY DOSES HAVE BEEN CALCULATED.
C
```

```
      IF (IPRINT .GE. 8) THEN

        WRITE(6,440)

        DO 380 KANG = 1, LASANG
        DO 380 JRAD = 1, NUMRAD

        WRITE(6,372) JRAD, KANG, SPACEN(JRAD)

  372   FORMAT(/' (',I2,',',I2,') AT',F9.0,' METERS, AFTER ESTAT:')

        DO 380 IORG = 2, 3

  380   WRITE(6,510) ORGNAM(IORG),
     $               (T1DOSE(IORG,IFIN,JRAD,KANG),IFIN=1,NUMFIN)
      ENDIF
C
C  ACCUMULATE DOSES TO MOVING INDIVIDUALS
C
      CALL EMOVE
C
C  PRINT THE DOSE ARRAY FOR THE SECOND AND THIRD ORGANS
C  ACUTE TOTAL DOSES AFTER ALL PATHWAY DOSES HAVE BEEN ACCUMULATED.
C
      IF (IPRINT .GE. 4) THEN

        WRITE(6,440)
  440   FORMAT('1')

        DO 500 KANG = 1, LASANG
        DO 500 JRAD = 1, NUMRAD

        WRITE(6,450) JRAD, KANG, SPACEN(JRAD)
  450   FORMAT(/' (',I2,',',I2,') AT',F9.0,' METERS,',
     $           ' TOTAL ACUTE EARLY DOSES:')

        DO 500 IORG = 2, 3

  500   WRITE(6,510) ORGNAM(IORG),
     $               (T1DOSE(IORG,IFIN,JRAD,KANG),IFIN=1,NUMFIN)
  510   FORMAT(1X,A,20X,1P,7E9.2)
      ENDIF
C
C  PRINT OUT THE CENTERLINE DOSE ARRAYS FOR ALL ORGANS
C
      IF (IPLUME .EQ. 1 .AND. IPRINT .GE. 1) THEN

      WRITE(6,514) (' ',I=1,3), ORGNAM(1)
  514   FORMAT('1',3(1X,A/)/
     1          '  Centerline Dose to ', A, ' vs Distance',
     2       //'  Distance (km)     Deposition')

      DO 516 JRAD = 1, NUMRAD
  516   WRITE(6,540) JRAD, SPACEN(JRAD) / 1000., CENSKI(JRAD)

      DO 530 IORG = 2, NUMORG

      WRITE(6,520) (' ',I=1,3), ORGNAM(IORG)
  520   FORMAT('1',3(1X,A/)/
     1          '  Centerline Dose to ', A, ' vs Distance',
     2       //'  Distance (km)',
     3          '    Cloudshine   Groundshine',
     4          '    Inhalation  Resuspension    Total Dose ')
```

```
         DO 530 JRAD = 1, NUMRAD
  530    WRITE(6,540) JRAD, SPACEN(JRAD) / 1000., CENCD(JRAD,IORG),
     1     CENGD(JRAD,IORG), CENPID(JRAD,IORG), CENRID(JRAD,IORG),
     2     CENCD(JRAD,IORG) + CENGD(JRAD,IORG) + CENPID(JRAD,IORG) +
     3     CENRID(JRAD,IORG)
  540      FORMAT(I3, F12.1, 1P, 5E14.3)
       ENDIF
C
C  CALCULATE THE RISK OF EARLY FATALITY, STORE IN /RISFAT/
C
       CALL FATRIS
C
C  CALCULATE THE RISKS OF EARLY INJURY, STORE IN /RISINJ/
C
       CALL INJRIS
C
C  CALCULATE THE RISKS OF CANCER FROM ACUTE EXPOSURE, STORE IN /RISCAN/
C
       CALL CANRIS
C
C  CALCULATE THE RESULTING EFFECTS OF THIS TRIAL AND THIS EMERGENCY RESPONSE
C  STRATEGY AND STORE ON THE APPROPRIATE RESULT FILE
C
       CALL STOEAR

       RETURN
       END
*DECK EGEOM
       SUBROUTINE EGEOM
C
C THIS ROUTINE CALCULATES THE GEOMETRIC FACTORS FOR EARLY DOSES:
C GAUVAL (AVERAGE HEIGHT OF THE GAUSSIAN OVER THE FINE GRID ELEMENTS) AND
C CLDFAC (CLOUDSHINE CORRECTION FACTORS FOR THE FINE GRID ELEMENTS).
C THESE FACTORS DEPEND ONLY ON THE GEOMETRIC CHARACTERISTICS OF THE PLUME.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C AREA    - AREA OF THE FINE GRID ELEMENT
C AVGHIT_CENTER - average height of the Gaussian histogram that is used to
C    calculate the average ground concentration (averaged over the central
C    22.5 degree compass sector in the CHRONC calculations
C CLDFAC - CLOUDSHINE CORRECTION FACTOR ARRAY (FINE,RADIAL)
C DIMMAX - UPPER BOUND ON THE FIRST SUBSCRIPT OF ARRAYS GAULEV AND CLDFAC
C EFFSIZ - EFFECTIVE SIZE OF THE PLUME USED FOR CLOUDSHINE CORRECTION FACTOR
C FINANG - ANGULAR WIDTH OF A FINE GRID ELEMENT IN RADIANS
C GAULEV - AVERAGE HEIGHT OF THE GAUSSIAN OVER ALL FINE ELEMENTS (FINE,RADIAL)
C GAUVAL - TABULATED FUNCTION VALUES FOR AREA UNDER THE NORMAL CURVE
C GRNTOT - ACCUMULATOR FOR TOTAL DEPOSITED MATERIAL OVER ALL FINE GRID ELEMENTS
C I      - IMPLIED DO LOOP COUNTER
C IDEBUG - DEBUG OUTPUT CONTROL FLAG FOR THE ATMOS MODULE
C IFINE  - LOOP COUNTER TO THE CURRENT FINE GRID ELEMENT FROM CENTERLINE
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IRAD   - RADIAL INDEX TO THE SPATIAL ELEMENT BEING CONSIDERED
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C MAXFIN - NUMBER OF FINE GRID ELEMENTS FROM CENTERLINE FALLING UNDER PLUME
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMFIN - NUMBER OF FINE GRID SUBELEMENTS IN A COARSE ELEMENT (ODD)
C SIGMAC - DISTANCE TO CLOUD USED FOR CLOUDSHINE FACTOR IN STANDARD DEVIATIONS
C SIGMA0 - DISTANCE TO START OF FINE GRID ELEMENT IN Y STANDARD DEVIATIONS
C SIGMA2 - DISTANCE TO END OF FINE GRID ELEMENT IN Y STANDARD DEVIATIONS
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C SIGYM  - AVERAGE SIGMA-Y FOR THIS SPATIAL ELEMENT (METERS)
C SPACEN - RADIAL DISTANCES TO THE CENTERS OF SPATIAL ELEMENTS (METERS)
C SQR2PI - SQUARE ROOT OF TWO PI
C TERM   - INTERMEDIATE TERM USED TO ACCUMULATE TOTAL GROUND CONTAMINATION
C TWOPI  - TWO TIMES PI
C YDIST1 - CROSSWIND DISTANCE TO THE FINE GRID MIDPOINT FROM ELEMENT CENTER
C YDIST2 - CROSSWIND DISTANCE TO THE FINE GRID ENDPOINT FROM ELEMENT CENTER
C
C GLOSSARY OF EXTERNALS:
C
C CLSHIN - FUNCTION THAT CALCULATES THE CLOUDSHINE CORRECTION FACTOR
C
C DAVID CHANIN, DIV. 6415, 18 MAY 1984.
C
C MODIFIED 10 MARCH 87, D. CHANIN, SER #45, REVISED THE CLOUDSHINE DOSE MODEL
C   TO CONFORM WITH OSTMEYER'S "EXPOSURE PATHWAYS" REPORT
C MODIFIED 7 APRIL 87, D.C., SER #51, AVOID DOUBLE-COUNTING GROUNDSHINE
C MODIFIED 4 MAY 87, D.C., SER #56, USE "EFFECTIVE" SIGMA FOR SIZE OF THE
C   PLUME WHEN CALCULATING THE CLOUDSHINE CORRECTION FACTOR
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 7/30/91, LOG #4/18/90, NO LONGER USE A TRIANGLE TO CALCULATE OFFSET,
C   REPLACE GAUSSIAN INTEGRATION METHOD WITH A MORE ACCURATE POLYNOMIAL FIT
C Modified 11/29/95, D. Chanin, Only print "Total Deposited" when IDEBUG.GE.0
C Modified 3/17/96, D. Chanin, Add new debug print for IPRINT>3 to print out
C   the average height of the Gaussian under the central compass sector that
C   is used for the calculation of the Type 6 centerline dose from CHRONC
C
      EXTERNAL CLSHIN
      INTRINSIC MIN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /IPRINT/ IPRINT
      COMMON /ATMOPT/ IDEBUG, NUCOUT

      PARAMETER (D1=0.0498673470, D2=0.0211410061,
     1           D3=0.0032776263, D4=0.0000380036,
     2           D5=0.0000488906, D6=0.0000053830)
C
C  STATEMENT FUNCTION GAUINT RETURNS A VALUE FOR THE AREA UNDER THE
C  THE NORMAL DISTRIBUTION FROM -INFINITY TO X.  OBTAINED FROM THE
C  HANDBOOK OF MATHEMATICAL FUNCTIONS, BY ABRAMOVITZ AND STEGUN,
C  DOVER PUBLICATIONS, NEW YORK, NINTH PRINTING, EQUATION 26.2.19.
C
      GAUINT(X) = 1.0 - 0.5 / (1.0 +
     1  D1*X + D2*X**2 + D3*X**3 + D4*X**4 + D5*X**5 + D6*X**6) ** 16
C
C  STATEMENT FUNCTION GAUHIT RETURNS THE AVERAGE HEIGHT OF THE GAUSSIAN
C  DISTRIBUTION BETWEEN A RANGE OF SIGMAS (X0,X1) FROM CENTERLINE.
C
```

```
      GAUHIT(X0,X1) = SQR2PI * (GAUINT(X1) - GAUINT(X0)) / (X1 - X0)
C
C  DIMMAX IS THE UPPER BOUND ON FIRST SUBSCRIPTS OF ARRAYS GAULEV, AND CLDFAC
C  IT REPRESENTS THE LARGEST NUMBER OF FINE GRID ELEMENTS THAT CAN BE COVERED
C  GOING IN ONE DIRECTION FROM CENTERLINE.
C
      DATA DIMMAX / 30./

      ANGMAX = 0.
      FINANG = TWOPI / (NUMCOR * NUMFIN)

      DO 600 IREL = 1, NUMREL
      DO 600 IRAD = 1, NUMRAD
C
C  THE PLUME EXTENDS OUT TO THE 2.15 SIGMA LEVEL (10 PERCENT OF PEAK).
C  DETERMINE HOW MANY FINE GRID ELEMENTS HAVE ANY OF THEIR AREA UNDER THE PLUME
C  AND KEEP TRACK OF THE MAXIMUM COVERAGE ANGLE OF THE PLUME.
C
      SIGMA0 = 0.
      CIRCUM = TWOPI * SPACEN(IRAD)
      ANGCOV = TWOPI * (2.15 * SIGYM(IRAD,IREL)) / CIRCUM
      ANGMAX = MAX (ANGMAX, ANGCOV)
      MAXFIN(IRAD,IREL) = MIN (ANGCOV / FINANG + 1.5, DIMMAX)

      DO 100 IFINE = 1, MAXFIN(IRAD,IREL)

      YDIST1 = FINANG * (IFINE - 1.) * CIRCUM / TWOPI
      YDIST2 = FINANG * (IFINE - .5) * CIRCUM / TWOPI
      SIGMA2 = YDIST2 / SIGYM(IRAD,IREL)
      GAULEV(IFINE,IRAD,IREL) = GAUHIT (SIGMA0, SIGMA2)
C
C  IF LAST FINE GRID, ADD IN THE TAIL MATERIAL FROM OUTSIDE THIS ELEMENT
C
      IF (IFINE .EQ. MAXFIN(IRAD,IREL))
     1 GAULEV(IFINE,IRAD,IREL) = GAULEV(IFINE,IRAD,IREL) +
     2 (1.0 - GAUINT(SIGMA2)) / (SIGMA2 - SIGMA0)
C
C  CALCULATE A MEASURE OF DISTANCE FROM THE CLOUD (UNITS OF STANDARD DEVIATIONS)
C  CLOUD SIZE IS CALCULATED AS THE ROOT MEAN SQUARE OF SIGMA-Y AND SIGMA-Z
C
      IF (SIGZM(IRAD,IREL) .NE. 0.) THEN
        EFFSIZ = SQRT (SIGYM(IRAD,IREL) * SIGZM(IRAD,IREL))
        SIGMAC = SQRT (AVGHIT(IRAD,IREL) ** 2 + YDIST1 ** 2) / EFFSIZ
C
C  CALL A FUNCTION TO CALCULATE THE CLOUDSHINE CORRECTION FACTOR
C
        CLDFAC(IFINE,IRAD,IREL) = CLSHIN (SIGMAC, EFFSIZ)

      ELSE
C
C  WHEN UNIFORM MIXING IS REACHED IN THE VERTICAL, ASSUME A SEMI-INFINITE CLOUD,
C  THIS MEANS THAT THE DOSE IS ADJUSTED BY THE GAUSSIAN STEP FUNCTION.
C
        CLDFAC(IFINE,IRAD,IREL) = GAULEV(IFINE,IRAD,IREL)
      ENDIF

  100 SIGMA0 = SIGMA2

      IF (IPRINT .GE. 4) THEN
        WRITE(6,240) IRAD, IREL,
     $               (GAULEV(I,IRAD,IREL),I=1,MAXFIN(IRAD,IREL))
  240   FORMAT(' FOR INTRVL', I3, ' AND RELEASE', I2, ', GAULEV =',
     $           12F6.3: (/12F6.3))
```

```
      WRITE(6,260) IRAD, IREL,
     $              (CLDFAC(I,IRAD,IREL),I=1,MAXFIN(IRAD,IREL))
  260 FORMAT(' FOR INTRVL', I3, ' AND RELEASE', I2, ', CLDFAC =',
     $           12F6.3: (/12F6.3))
      ENDIF
C
C GAULEV is the "height" of the Gaussian histogram steps, starting at the
C fine-grid element directly under plume centerline, and extending out in
C one direction from centerline.  That's why values other than the first are
C doubled in the summation--there is only one fine-grid element under the
C plume centerline.  New print added to facilitate hand calculations of the
C CHRONC results per 3/14/96 findings of Ken Summa (UNM).  D. Chanin 3/17/96
C
      IF (IPRINT .GE. 2) THEN
        AVGHIT_CENTER = GAULEV(1,IRAD,IREL)
        DO 300 IFIN = 2, 1 + NUMFIN / 2
  300   AVGHIT_CENTER = AVGHIT_CENTER + 2.0 * GAULEV(IFIN,IRAD,IREL)
        WRITE(6,320) IRAD, IREL, AVGHIT_CENTER / NUMFIN
  320   FORMAT(' For IRAD =', I3, ', IREL =', I3, ':', F10.7, ' is '
     1  'average Gaussian "height" (as used for all CHRONC dose calcs)')
      ENDIF

  600 CONTINUE

      IF (IDEBUG .LE. 0) RETURN

      GRNTOT = 0.0
C
C  CALCULATE THE TOTAL AMOUNT OF NUCLIDE NUCOUT DEPOSITED ON THE GRID
C
      DO 900 IREL = 1, NUMREL
      DO 900 IRAD = 1, NUMRAD

      AREA = PI * (SPAEND(IRAD)**2 - SPAEND(IRAD-1)**2) /
     1            (NUMCOR * NUMFIN)

      TERM = AREA * GRNCON(NUCOUT,IRAD,IREL)

      GRNTOT = GRNTOT + GAULEV(1,IRAD,IREL) * TERM

      DO 900 IFINE = 2, MAXFIN(IRAD,IREL)
  900 GRNTOT = GRNTOT + 2.0 * GAULEV(IFINE,IRAD,IREL) * TERM

      WRITE(6,910) GRNTOT
  910 FORMAT(' IN EGEOM, TOTAL DEPOSITED= ',1PE11.4)

      RETURN
      END
*DECK CLSHIN
      FUNCTION CLSHIN (DIST, SIZE)
C
C  THIS FUNCTION RETURNS THE CLOUDSHINE CORRECTION FACTOR FOR A GIVEN
C  DISTANCE (IN STANDARD DEVIATIONS) FROM A PLUME OF A GIVEN SIZE
C  (IN METERS OF SIGMA-Y).
C  THE DATA IS TAKEN FROM PAGE 8-4 OF THE REACTOR SAFETY STUDY, APPENDIX 6.
C  HERE WE USE SIGMA-Y AS THE PLUME SIZE INSTEAD OF SIGMA-Z.
C  THE TABLE IS PADDED SO THAT THE INTERPOLATION DOES NOT GO OFF THE EDGE.
C
C  THIS FUNCTION IS CALLED BY SUBROUTINE EGEOM.
C
C  GLOSSARY OF VARIABLES:
C
C  CLSHIN - THE RETURNED FUNCTION VALUE
```

```
C  DIST   - NUMBER OF SIGMAS AWAY FROM THE PLUME CENTERLINE
C  I      - IMPLIED DO LOOP INDEX
C  J      - IMPLIED DO LOOP INDEX
C  SIZE   - SIGMA-Y WIDTH OF THE PLUME
C  VDIST  - ORDINATE VALUES FOR DIST
C  VSIZE  - ORDINATE VALUES FOR SIZE
C  VTABLE - TABULATED VALUES FROM THE REACTOR SAFETY STUDY
C
C  GLOSSARY OF EXTERNALS:
C
C  POL2   - FUNCTION THAT PERFORMS BILINEAR INTERPOLATION FROM A TABLE
C
C  DAVID CHANIN, DIV. 6415, 18 MAY 1984.
C
C  MODIFIED 10 MARCH 87, D. CHANIN, SER #45, REVISED THE CLOUDSHINE DOSE MODEL
C    TO CONFORM WITH OSTMEYER'S "EXPOSURE PATHWAYS" REPORT
C
C MODIFIED 11/08/88, D. CHANIN, LOG # 9/19/88-A,
C   CLOUDSHINE CORRECTION FACTORS OBTAINED FROM WASH-1400 HAD
C   AN ERROR IN THE FIRST ROW OF DATA
C
      EXTERNAL POL2
      DIMENSION VDIST(7), VSIZE(11), VTABLE(11,7)

      DATA VSIZE / 0., 3., 10., 20., 30., 50., 100., 200., 400., 1000.,
     $             1.E10/

      DATA VDIST / 0., 1., 2., 3., 4., 5., 1.E10/

      DATA ((VTABLE(I,J),J=1,7),I=1,11)
     1             /.020, .018, .011, .007, .005, .004, .004,
     2              .020, .018, .011, .007, .005, .004, .004,
     3              .074, .060, .036, .020, .015, .011, .011,
     4              .150, .120, .065, .035, .024, .016, .016,
     5              .220, .170, .088, .046, .029, .017, .017,
     6              .350, .250, .130, .054, .028, .013, .013,
     7              .560, .380, .150, .045, .016, .004, .004,
     8              .760, .511, .150, .024, .004, .001, .001,
     9              .899, .600, .140, .014, .001, .001, .001,
     X              .951, .600, .130, .011, .001, .001, .001,
     X              .951, .600, .130, .011, .001, .001, .001/
C
C  THERE IS NO SPECIAL HANDLING NEEDED FOR PLUMES WITH SIGMA-Y EXCEEDING
C  1000 METERS BECAUSE THE CLOUDSHINE CORRECTION FACTOR FOR LARGE PLUMES
C  IS THE SAME AS THE ADJUSTMENT FOR THE GAUSSIAN CROSSWIND DISTRIBUTION
C
      CLSHIN = POL2 (VSIZE, VDIST, VTABLE, 11, 7, SIZE, DIST)

      RETURN
      END
*DECK POL2
      FUNCTION POL2  (X, Y, TABLE, NUMX, NUMY, XVAL, YVAL)
C
C  THIS FUNCTION PERFORMS BILINEAR INTERPOLATION FROM A TABLE.
C  IF THE VALUE LIES OUTSIDE OF THE TABLE EXECUTION IS ABORTED.
C
C  THIS FUNCTION IS CALLED BY FUNCTION CLSHIN.
C
C  GLOSSARY OF VARIABLES:
C
C  IX     - LOOP COUNTER ON THE X DIMENSION IN THE TABLE
C  IY     - LOOP COUNTER ON THE Y DIMENSION IN THE TABLE
C  NUMX   - DIMENSION OF THE TABEL IN THE X DIRECTION
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C  NUMY   - DIMENSION OF THE TABEL IN THE Y DIRECTION
C  POL2   - THE RETURNED FUNCTION VALUE
C  TABLE  - THE TWO DIMENSIONAL ARRAY OF DATA
C  X      - ARRAY OF ORDINATE VALUES IN THE X DIMENSION
C  XRATIO - RATIO BETWEEN ORDINATE VALUES IN THE X DIMENSION
C  XVAL   - DESIRED VALUE IN THE X DIMENSION
C  Y      - ARRAY OF ORDINATE VALUES IN THE Y DIMENSION
C  YRATIO - RATIO BETWEEN ORDINATE VALUES IN THE Y DIMENSION
C  YVAL   - DESIRED VALUE IN THE Y DIMENSION
C
C  DAVID CHANIN, DIV. 6415, 18 MAY 1984.
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      DIMENSION X(NUMX), Y(NUMY), TABLE(NUMX, NUMY)

      DO 100 IX = 1, NUMX - 1
  100 IF (XVAL .GE. X(IX) .AND. XVAL .LE. X(IX + 1)) GO TO 200
      CALL ABORT ('POL2')

  200 DO 300 IY = 1, NUMY - 1
  300 IF (YVAL .GE. Y(IY) .AND. YVAL .LE. Y(IY + 1)) GO TO 400
      CALL ABORT ('POL2')

  400 XRATIO = (XVAL - X(IX)) / (X(IX + 1) - X(IX))
      YRATIO = (YVAL - Y(IY)) / (Y(IY + 1) - Y(IY))

      POL2 = (1. - XRATIO) * (1. - YRATIO) * TABLE(IX,IY)
     1     + (1. - XRATIO) * YRATIO * TABLE(IX,IY+1)
     2     + XRATIO * (1. - YRATIO) * TABLE(IX+1,IY)
     3     + XRATIO * YRATIO * TABLE(IX+1,IY+1)

      RETURN
      END
*DECK EPCALC
      SUBROUTINE EPCALC
C
C THIS ROUTINE PRECALCULATES THE EARLY DOSE CONVERSION FACTORS
C FOR ALL SPATIAL INTERVALS, ALL PLUME SEGMENTS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C AIRCON-- AIR CONCENTRATION AT THE PLUME CENTERLINE OF EACH NUCLIDE
C CDCF  -- CLOUDSHINE DOSE CONVERSION FACTOR (NUCLIDE,ORGAN,TIME INTERVAL)
C EVATYP - Character flag for evacuation type: 'RADIAL' or 'NETWORK'
C GRDCF -- GROUNDSHINE DURING PASSAGE DOSE CONVERSION FACTOR (NUCLIDE,ORGAN)
C GRDTIM-- Groundshine integration periods used after each plume's passage
C GRNCON-- GROUND CONCENTRATION OF EACH NUCLIDE
C GSHFAC-- GROUNDSHINE SHIELDING FACTORS
C HTFCTR-- RATIO OF GROUND LEVEL AIR CONCENTRATION TO CENTERLINE CONCENTRATION
C I     -- DO LOOP INDEX
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDORG-- INDEX TO THE CRITICAL ORGAN FOR RELOCATION
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD  -- DO LOOP COUNTER OVER SPATIAL INTERVALS (RADIAL)
C IREL  -- INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C IWIND -- WIND DIRECTION FOUND ON THE ATMOS RESULTS
C IWINDT-- TRANSFORMED WIND DIRECTION USED IN THE DOSIMETRY CALCULATIONS
C J     -- DO LOOP INDEX
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C K      - DO LOOP INDEX
C NUMISO- NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMORG- NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMREL - THE NUMBER OF PLUME SEGMENTS IN THE RELEASE
C OALARM - The off-site alarm time as defined in the ATMOS source term
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C PIF    - PRECALCULATED DIRECT INHALATION DOSE FACTOR
C SIGMAY- SIGMA-Y AT EACH ELEMENT CENTERPOINT
C SIGYM - SIGMA-Y AT THE ELEMENT CENTERPOINT
C SPACEN- AN ARRAY OF DISTANCES TO THE SPATIAL ELEMENT CENTERPOINTS
C TIMCEN- TIME OF PLUME ARRIVAL AT THE ELEMENT CENTERPOINT
C TIMOVH- DURATION FOR WHICH THE PLUME IS OVERHEAD AT THE ELEMENT CENTERPOINT
C TOOHOT- LOGICAL FLAG SAYING DOSE THRESHOLD WAS EXCEEDED (WARM OR HOT SPOT)
C TSTART- TIME THAT THE EXPOSURE STARTS AT EACH ELEMENT CENTERPOINT
C TSTOP - TIME THAT THE EXPOSURE STOPS AT EACH ELEMENT CENETRPOINT
C
C  DAVID CHANIN, DIV. 6415, 7 JUNE 1984.
C
C MODIFIED 31 MAR 86, D.C., SER #14, INCORRECT FORMULA FOR CALCULATING
C   A ZERO GROUNDSHINE DOSE
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C MODIFIED 7 APRIL 87, D.C., SER #51, AVOID DOUBLE-COUNTING GROUNDSHINE
C MODIFIED 16 JUN 87, D.C., SER #65, PRINT OUT FINAL GROUNDSHINE DOSE RATE
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 11/0/88, D. CHANIN, LOG # 10/26/88-A, PART 3
C   WE WERE USING A REAL INDEX TO THE ARRAY AVLINT AND WHILE WE
C   WERE HERE DECIDED TO ELIMINATE SOME MIXED MODE ARITHMETIC.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 12/13/91, D. CHANIN, LOG# 11/27/91-A, SKIN DOSE INCORRECTLY
C   CALCULATED USING AIR CONCENTRATION AT PLUME HEIGHT, NOT AT GROUND LEVEL
C Modified 11/07/92, D. Chanin, New emergency response model for DOE
C Modified 6/3/93, D. Chanin, Changed GOTCHA to use both air and ground conc.
      EXTERNAL ABORT
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
      COMMON /EADFAC/ CSFACT(3), PROTIN(3), BRRATE(3),
     1                SKPFAC(3), GSHFAC(3), RESCON, RESHAF
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /IPRINT/ IPRINT
      COMMON /DCFVAL/ DCFCLD(2:MAXORG,MAXNUC), DCFGRD(2:MAXORG,MAXNUC),
     1                DCFINH(2:MAXORG,MAXNUC), DCFING(2:MAXORG,MAXNUC)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
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      CHARACTER        EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
      LOGICAL GOTCHA
      COMMON /GOTCHA/ GOTCHA(MAXNUC)
      CHARACTER *8     NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
C
      DIMENSION RADIO0(MXDKCN), RADIO1(MXDKCN), DISRAY(MXDKCN),
     1 SDV(MAXNUC), SDCF(MAXNUC)
C
C Calculate skin dose exactly the same as in MACCS 1.5.11 and 1.5.11.1
      DO 10 I = 1, NUMISO
      IF (NUCNAM(I)(1:2) .EQ. 'Xe' .OR. NUCNAM(I)(1:2) .EQ. 'Kr') THEN
      SDV(I) = 0.
      ELSE
      SDV(I) = .01
      ENDIF
   10 CONTINUE
      WASHOU = 8.
      WASHTM = 3600. * WASHOU
      RADSEC = .2
      GRASEC = RADSEC / 3.7E12
      DO 20 I = 1, NUMISO
   20 SDCF(I) = GRASEC *
     1 (1.D0 - EXP(-DKRATE(IPNTDK(I)) * WASHTM))
     2                / DKRATE(IPNTDK(I))
      IF (IPRINT .GE. 1) THEN
      WRITE(6,24) ' ', 'NAME', 'HALF-LIFE', 'LAMBDA', 'SDCF', 'SDV'
   24   FORMAT(6A12)
      DO 30 I = 1, NUMISO
   30   WRITE(6,34) I, NUCNAM(I), LOG(2.) / DKRATE(IPNTDK(I)),
     1              DKRATE(IPNTDK(I)), SDCF(I), SDV(I)
   34   FORMAT(I12, A12, 1P, 4E12.3)
      ENDIF
C
      GRDTIM(0) =      0.
      GRDTIM(1) =   1000.
      GRDTIM(2) =   3000.
      GRDTIM(3) =   9000.
      GRDTIM(4) =  27000.
      GRDTIM(5) =  60000.
      GRDTIM(6) = 150000.
      GRDTIM(7) = 360000.
      GRDTIM(8) = 604800.
C
C Define a LOGICAL flag to be used in EDOSIN and GNDRES to skip calcs for
C nuclides that had zero air and ground conc. everywhere in all plumes
C
      DO 50 INUC = 1, NUMISO
      GOTCHA(INUC) = .FALSE.
      DO 40 IREL = 1, NUMREL
      DO 40 IRAD = 1, NUMRAD
      IF (GRNCON(INUC,IRAD,IREL) .GT. 0.0 .OR.
     1    AIRCON(INUC,IRAD,IREL) .GT. 0.0) THEN
      GOTCHA(INUC) = .TRUE.
      GO TO 50
      ENDIF
   40 CONTINUE
   50 CONTINUE
C
C Initialize the array used to store flags signifying ground contamination,
```

```
C These flags are not utilized when the network evacuation model is operative.
C
      IF (EVATYP .EQ. 'RADIAL') THEN
      DO 60 IANG = 1, NUMCOR
      DO 60 IRAD = 1, NUMRAD
   60   IHITIT(IRAD,IANG) = .FALSE.
      ELSE IF (EVATYP .EQ. 'NETWORK') THEN
      DO 70 IANG = 1, NUMCOR
      DO 70 IRAD = 1, NUMRAD
   70   IHITIT(IRAD,IANG) = .TRUE.
      ELSE
      CALL ABORT ('Internal error in EPCALC: Illegal EVATYP')
      ENDIF
C
C  LOOP ON RELEASE SEGMENTS
C
      DO 600 IREL = 1, NUMREL
      IF (IPLUME .EQ. 1) THEN
C
C  ALL PLUMES BLOW NORTH
C
      IWINDT(IREL) = 1
      ELSE IF (IPLUME .EQ. 2) THEN
C
C  PERFORM A ROTATION SO THAT THE RISK DOMINANT PLUME TRAVELS NORTH
C
      IF (IDIREC(IREL) .GT. 0) THEN
        IWINDT(IREL) = IDIREC(IREL) - IDIREC(MAXRIS) + 1
        IF (IWINDT(IREL) .LT. 1) IWINDT(IREL) = IWINDT(IREL) + NUMCOR
      ELSE
        IWINDT(IREL) = 1
      ENDIF
      ELSE IF (IPLUME. EQ. 3) THEN
C
C  LET THE WIND BLOW WHEREVER IT BLEW
C
      IF (IDIREC(IREL) .GT. 0) THEN
        IWINDT(IREL) = IDIREC(IREL)
      ELSE
        IWINDT(IREL) = 1
      ENDIF
      ELSE
      CALL ABORT ('Internal error in EPCALC: Illegal IPLUME')
      ENDIF
C
      DO 600 IRAD = 1, NUMRAD
C
C  SET FLAG FOR ELEMENT DIRECTLY UNDER THE PLUME
C
      IHITIT(IRAD,IWINDT(IREL)) = .TRUE.
C
C  CALCULATE THE NUMBER OF FINE GRID ELEMENTS FALLING OUTSIDE OF CENTRAL
C
      IOUTFI = MAXFIN(IRAD,IREL) - NUMFIN / 2 - 1
C
C  CALCULATE THE NUMBER OF COARSE GRID ELEMENTS FALLING OUTSIDE OF CENTRAL
C
      IOUTCO = (IOUTFI + NUMFIN - 1) / NUMFIN
C
C  SET FLAGS FOR THE WING ELEMENTS ON BOTH SIDES
C
      DO 80 IWING = 1, IOUTCO
      IANGP = IWINDT(IREL) + IWING
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      IANGM = IWINDT(IREL) - IWING
      IF (IANGP .GT. NUMCOR) IANGP = IANGP - NUMCOR
      IF (IANGM .LT. 1) IANGM = IANGM + NUMCOR
      IHITIT(IRAD,IANGP) = .TRUE.
   80 IHITIT(IRAD,IANGM) = .TRUE.
C
C  LOAD THE EARLY DOSE COMMON BLOCK WITH TIMING AND DISPERSION DATA
C  FROM THE ATMOSPHERIC RESULTS FILE.
C
      TSTART(IRAD,IREL) = TIMCEN(IRAD,IREL)
      TSTOP(IRAD,IREL)  = TIMCEN(IRAD,IREL) + TIMOVH(IRAD,IREL)
      SIGMAY(IRAD,IREL) = SIGYM(IRAD,IREL)

      PSF(IRAD,IREL) = 0.
      DO 100 I = 1, NUMISO
  100 PSF(IRAD,IREL) = PSF(IRAD,IREL) + AIRCON(I,IRAD,IREL) *
     1  HTFCTR(IRAD,IREL) * SDV(I) * SDCF(I) / TIMOVH(IRAD,IREL)

      DO 120 J = 2, NUMORG
      PIF(J,IRAD,IREL)  = 0.
      DO 120 I = 1, NUMISO
  120 IF (GOTCHA(I)) PIF(J,IRAD,IREL) = PIF(J,IRAD,IREL) +
     1 AIRCON(I,IRAD,IREL) * HTFCTR(IRAD,IREL) * DCFINH(J,I) /
     2 TIMOVH(IRAD,IREL)

      DO 200 J = 2, NUMORG

      CLDRAT(J,IRAD,IREL) = 0.
      GRDRAT(J,IRAD,IREL) = 0.

      DO 200 I = 1, NUMISO
      IF (GOTCHA(I)) CLDRAT(J,IRAD,IREL)  = CLDRAT(J,IRAD,IREL) +
     1  AIRCON(I,IRAD,IREL) * DCFCLD(J,I) / TIMOVH(IRAD,IREL)

  200 IF (GOTCHA(I)) GRDRAT(J,IRAD,IREL) = GRDRAT(J,IRAD,IREL) +
     1  0.5 * GRNCON(I,IRAD,IREL) * DCFGRD(J,I) / TIMOVH(IRAD,IREL)

      DO 220 INUC = 1, NUMFND
  220 RADIO0(INUC) = 0.0

      DO 240 I = 1, NUMISO
  240 RADIO0(IPNTDK(I)) = GRNCON(I,IRAD,IREL)

      DO 260 ITIM = 1, 8
      IF (ITIM .EQ. 1) THEN
      CALL DISINT (RADIO0, DISRAY, GRDTIM(1))
      ELSE
      CALL NEWAMT (RADIO0, RADIO1, GRDTIM(ITIM-1))
      CALL DISINT (RADIO1, DISRAY, GRDTIM(ITIM) - GRDTIM(ITIM-1))
      ENDIF

      DO 260 J = 2, NUMORG
      GRDINT(J,IRAD,IREL,ITIM) = 0.
      DO 260 I = 1, NUMISO
  260 IF (GOTCHA(I)) GRDINT(J,IRAD,IREL,ITIM) =
     1 GRDINT(J,IRAD,IREL,ITIM) + DISRAY(IPNTDK(I)) * DCFGRD(J,I)

      IF (RESCON .GT. 0.0) THEN

      DO 360 ITIM = 1, 8
      IF (ITIM .EQ. 1) THEN
        CALL DISINX (RADIO0, DISRAY, GRDTIM(1), 1, RESCON, RESHAF)
      ELSE
```

```
         CALL NEWAMX (RADIO0, RADIO1, GRDTIM(ITIM-1), 1, RESCON,RESHAF)
         CALL DISINX (RADIO1, DISRAY, GRDTIM(ITIM) - GRDTIM(ITIM-1),
     1                  1, RESCON, RESHAF)
      ENDIF

      DO 360 J = 2, NUMORG
      RESINT(J,IRAD,IREL,ITIM) = 0.
      DO 360 I = 1, NUMISO
  360   IF (GOTCHA(I)) RESINT(J,IRAD,IREL,ITIM) =
     1      RESINT(J,IRAD,IREL,ITIM) + DISRAY(IPNTDK(I)) * DCFINH(J,I)
      ENDIF
C
  600 CONTINUE
      RETURN
      END
*DECK RELZON
      SUBROUTINE RELZON
C
C CALCULATES THE DOSES RECEIVED BY ALL INDIVIDUALS WHO ARE EXPOSED
C OUTSIDE OF THE EMERGENCY RESPONSE ZONE TAKING ACCOUNT OF RELOCATION.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C ENDEMP - END OF THE EMERGENCY PHASE (SECONDS FROM FIRST PLUME ARRIVAL)
C DOSHOT - HOT SPOT RELOCATION GROUNDSHINE DOSE THRESHOLD (SIEVERTS)
C DOSNRM - NORMAL RELOCATION CRITERIA DOSE THRESHOLD (SIEVERTS)
C I      - LOOP COUNTER
C IFINE  - LOOP COUNTER ON FINE GRID DIVISIONS FROM THE CENTERLINE
C INDORG - INDEX TO THE CRITICAL ORGAN FOR EARLY RELOCATION
C IRAD   - DO LOOP COUNTER OVER SPATIAL INTERVALS (RADIAL)
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C IWINDT - TRANSFORMED WIND DIRECTION USED IN THE DOSIMETRY CALCULATIONS
C IZONE  - FLAG INDICATING THE TYPE OF EXPOSURE TO AN INDIVIDUAL -
C          A VALUE OF 2 INDICATES NORMAL ACTIVITY SHIELDING FACTORS
C J      - LOOP COUNTER
C JANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C K      - LOOP COUNTER
C MAXFIN - FURTHEST FINE GRID DIVISION TO WHICH THE PLUME EXTENDS
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMEVA - Last ring of the emergency response zone (shelter and evacuation)
C NUMFIN - NUMBER OF FINE GRID SUBELEMENTS IN A COARSE ELEMENT (ODD)
C RETCOD - RETURN CODES FOR EACH COARSE GRID ELEMENT, SEE BELOW
C TIMHOT - HOT SPOT RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C TIMNRM - NORMAL RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C
C INTERPRETATION OF THE THIRTEEN POSSIBLE VALUES OF RETCOD:
C
C  1. - PEOPLE IN INNER SHELTER ZONE, MOVED BACK IN AT TIMNRM
C  2. - PEOPLE IN INNER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
C 11. - PEOPLE IN RELOCATION ZONE, CAN REMAIN UNTIL ENDEMP
C 12. - PEOPLE IN RELOCATION ZONE, NORMAL RELOCATION OCCURS AT TIMNRM
C 13. - PEOPLE IN RELOCATION ZONE, HOT SPOT RELOCATION OCCURS AT TIMHOT
C
C GLOSSARY OF EXTERNALS:
C
C CENACU - UPDATES THE CENTERLINE DOSE ARRAYS FOR ACCUMULATED DOSE
C EDOSIN - CALCULATES AN INDIVIDUAL'S DOSE IN A SPATIAL INTERVAL, /EDOSES/
C INCDOS - ACCUMULATES DOSE TO ALL THE FINE GRID ELEMENTS AT A GIVEN DISTANCE
C INCREM - UPDATES THE DOSE ARRAYS AT A SINGLE COARSE GRID ELEMENT
C ZERREM - ZEROES THE DOSE ARRAYS AT A SINGLE COARSE GRID ELEMENT
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C
C  DAVID CHANIN, DIV. 6415, 26 NOV 1984.
C
C REWRITTEN 24 JUN 88, D.C.
C MODIFIED 11/08/88, D. CHANIN, LOG # 9/16/88-A,
C   USING A NEW ROUTINE, CENACU, TO UPDATE THE CENTERLINE DOSE ARRAYS
C MODIFIED 12/13/88, J. ROLLSTIN AND D. CHANIN, LOG # 12/01/88-A,
C   WHEN RELOCATION IS NEEDED IN A PARTICULAR GRID ELEMENT THE DOSE
C   WILL BE RECALCULATED FOR THAT ELEMENT BY SUBROUTINE INCREM.
C   THE NEWLY WRITTEN SUBROUTINE ZERREM WILL BE USED TO ZERO OUT THE
C   THE DOSE ARRAYS FOR THE SPATIAL ELEMENT BEFORE THE DOSES ARE
C   RECALCULATED.  THE ZEROING AND ACCUMULATION WERE PREVIOUSLY
C   PERFORMED IN A SINGLE OPERATION AND IT WAS INCORRECT.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 8/15/92, D. Chanin, new emergency response model for DOE
C
      EXTERNAL CENACU, EDOSIN, INCDOS, INCREM, ZERREM
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /RETCOD/ RETCOD(MAXRAD,16)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
C
      LOGICAL TOOHOT
C
      STREXP = 0.
C
C  USE GROUNDSHINE SHIELDING FACTOR FOR NORMAL ACTIVITY
C
      IZONE = 2
C
C  Loop on spatial intervals outside of sheltering/evacuation zone
C  and accumulate everybody's dose assuming they stayed for entire
C  emergency phase
C
      DO 100 IRAD = NUMEVA + 1, NUMRAD

      ENDEXP = TSTART(IRAD,1) + ENDEMP

      DO 60  IANG = 1, NUMCOR
   60 RETCOD(IRAD,IANG) = 11.
C
C  LOOP ON RELEASE SEGMENT
C
      DO 100 IREL = 1, NUMREL
C
C  LOAD THE WIND DIRECTION FOR THIS RELEASE
C
      IDIR = IWINDT(IREL)
C
C  CALL THE SAME ROUTINE USED BY ESTAT AND EMOVE TO CALCULATE
C  THE CENTERLINE DOSES FROM ALL PATHWAYS
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C
      CALL EDOSIN (STREXP, ENDEXP, IRAD, IZONE, IREL)
      CALL INCDOS (IRAD,IDIR,IREL)

      IF (IPLUME. EQ. 1) CALL CENACU (IRAD, IREL)

  100 CONTINUE
C
C  Loop on spatial intervals outside of sheltering/evacuation zone and
C  test everybody's previously calculated dose to see if either
C  normal relocation or hot-spot relocation is needed
C
      DO 200 JANG = 1, NUMCOR
      DO 200 IRAD = NUMEVA + 1, NUMRAD
      DO 200 IFIN = 1, NUMFIN

      IF (T1DOSE(INDORG,IFIN,IRAD,JANG) .GT. DOSHOT) THEN
        RETCOD(IRAD,JANG) = 13.
      ELSE IF (T1DOSE(INDORG,IFIN,IRAD,JANG) .GT. DOSNRM
     1          .AND. RETCOD(IRAD,JANG) .EQ. 11.) THEN
        RETCOD(IRAD,JANG) = 12.
      ENDIF

  200 CONTINUE
C
C  Recalculate the dose for all elements subject to normal relocation
C
      DO 300 IRAD = NUMEVA + 1, NUMRAD

      TOOHOT = .FALSE.

      DO 240 JANG = 1, NUMCOR

      IF (RETCOD(IRAD,JANG) .EQ. 12.) THEN
         TOOHOT = .TRUE.
         CALL ZERREM (IRAD, JANG)
      ENDIF

  240 CONTINUE

      IF (TOOHOT) THEN

         ENDEXP = TSTART(IRAD,1) + TIMNRM

         DO 280 IREL = 1, NUMREL

         CALL EDOSIN (STREXP, ENDEXP, IRAD, IZONE, IREL)

         DO 280 JANG = 1, NUMCOR

  280    IF (RETCOD(IRAD,JANG) .EQ. 12.) CALL INCREM (IRAD, JANG, IREL)

      ENDIF

  300 CONTINUE
C
C  Recalculate the dose for all elements subject to hot-spot relocation
C
      DO 500 IRAD = NUMEVA + 1, NUMRAD

      TOOHOT = .FALSE.

      DO 440 JANG = 1, NUMCOR
```

```
      IF (RETCOD(IRAD,JANG). EQ. 13.) THEN
         TOOHOT = .TRUE.
         CALL ZERREM (IRAD, JANG)
      ENDIF

  440 CONTINUE

      IF (TOOHOT) THEN

         ENDEXP = TSTART(IRAD,1) + TIMHOT

         DO 480 IREL = 1, NUMREL

         CALL EDOSIN (STREXP, ENDEXP, IRAD, IZONE, IREL)

         DO 480 JANG = 1, NUMCOR

  480    IF (RETCOD(IRAD,JANG) .EQ. 13.) CALL INCREM (IRAD, JANG, IREL)

      ENDIF

  500 CONTINUE

      RETURN
      END
*DECK ESTAT
      SUBROUTINE ESTAT
C
C THIS ROUTINE ACCUMULATES THE DOSES TO STATIONARY INDIVIDUALS
C IN THE SHELTERING AND EVACUATION RINGS OF (EMERGENCY RESPONSE ZONE).
C THE FINE GRID DOSES ARE STORED BY INCDOS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C DLTEVA - Delay time to start evacuation measured from end of sheltering
C DLTSHL - Delay time to start sheltering measured from user-supplied REFPNT
C DURBEG - Duration of the beginning phase of the evacuation period
C DURMID - Duration of the middle phase of the evacuation period
C ENDEXP - END OF THE EXPOSURE TIME TO THE PLUME
C IDIR   - DIRECTION OF THE PLUME CENTERLINE
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IRAD   - LOOP COUNTER TO SPATIAL INTERVAL
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C IWINDT - TRANSFORMED WIND DIRECTION USED IN THE DOSIMETRY CALCULATIONS
C IZONE  - FLAG INDICATING THE TYPE OF EXPOSURE TO AN INDIVIDUAL, SEE BELOW
C NUMEVA - Last ring of the emergency response zone (shelter and evacuation)
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMREL - NUMBER OF PLUME SEGMENTS IN THE RELEASE
C OALARM - THE TIME AT WHICH OFF-SITE ALARM IS TRIGGERED FOR EMERGENCY RESPONSE
C REFPNT - Reference time point for evacuation/sheltering: 'ALARM' or 'ARRIVAL'
C STREXP - START TIME FOR EXPOSURE TO THE PLUME
C TSTART - TIME OF PLUME ARRIVAL AT THE ELEMENT CENTERPOINT
C TSTOP  - TIME OF PLUME DEPARTURE FROM THE ELEMENT CENTERPOINT
C TZERO  - Time after accident initiation that sheltering/evacuation begins
C
C INTERPRETATION OF THE THREE POSSIBLE VALUES OF IZONE:
C
C  1 - MOVING EVACUEES
C  2 - NORMAL ACTIVITY
C  3 - SHELTERING ACTIVITY
```

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C
C RETCOD - RETURN CODES FOR EACH COARSE GRID ELEMENT, SEE BELOW
C
C INTERPRETATION OF THE THIRTEEN POSSIBLE VALUES OF RETCOD:
C
C  1. - PEOPLE IN EVACUATION/SHELTER ZONE, MOVED BACK IN AT TIMNRM
C  2. - PEOPLE IN EVACUATION/SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
C 11. - PEOPLE IN RELOCATION ZONE, CAN REMAIN UNTIL ENDEMP
C 12. - PEOPLE IN RELOCATION ZONE, NORMAL RELOCATION OCCURS AT TIMNRM
C 13. - PEOPLE IN RELOCATION ZONE, HOT SPOT RELOCATION OCCURS AT TIMHOT
C
C GLOSSARY OF EXTERNALS:
C
C CENACU - UPDATES THE CENTERLINE DOSE ARRAYS FOR ACCUMULATED DOSE
C EDOSIN - CALCULATES AN INDIVIDUAL'S DOSE IN A SPATIAL INTERVAL, /EDOSES/
C INCDOS - ACCUMULATES DOSE TO ALL THE FINE GRID ELEMENTS AT A GIVEN DISTANCE
C
C  DAVID CHANIN, DIV. 6415, 24 OCT 1984.

C MODIFIED BY D. CHANIN, 21 FEB 86, RELOCATION ZONE DOSES WERE NOT CUT OFF
C  AT THE END OF THE EMERGENCY PHASE, ENDEMP. SEE SER # 2
C  MODIFIED BY D. CHANIN, 22 JUL 86, DOSES CALCULATED IN EDOSIN ARE NOW
C  BEING CUT OFF AT ENDEMP WITHIN THAT ROUTINE ITSELF INSTEAD OF IN THE
C  CALLING ROUTINES ESTAT AND EMOVE. DOSES TO EVACUEES ARE NOW BEING
C  TRUNCATED AT ENDEMP EVEN IF THE PEOPLE HAVE NOT FINISHED MOVING.
C  SEE SER #28.
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 11/08/88, D. CHANIN, LOG # 9/16/88-A,
C   CORRECT AN ERROR IN CALCULATING THE CENTERLINE DOSE TO SHELTEREES.
C   WE NOW ACCOUNT FOR THE DOSE THEY RECEIVE BEFORE TAKING SHELTER.
C   CREATED A NEW HELPER ROUTINE CENACU WITH ENTRY POINT CENZER.
C MODIFIED 7/11/89, D. CHANIN, LOG # 4/13/89-A,
C  INCORRECT VALUES OF RETCOD FOR THE OUTER SHELTER ZONE
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL CENACU, EDOSIN, INCDOS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /RETCOD/ RETCOD(MAXRAD,16)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /IPRINT/ IPRINT
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT

      IF (REFPNT .EQ. 'ALARM') THEN
```

```
      DO 20 IRAD = 1, NUMEVA
   20    TZERO(IRAD) = OALARM
      ELSE IF (REFPNT .EQ. 'ARRIVAL') THEN
      DO 40 IRAD = 1, NUMEVA
   40    TZERO(IRAD) = TSTART(IRAD,1)
      ELSE IF (NUMEVA .GT. 0) THEN
       CALL ABORT ('Internal error, undefined REFPNT in ESTAT')
      ENDIF
C
C  LOOP ON RELEASE SEGMENTS
C
      DO 400 IREL = 1, NUMREL
C
C  LOAD THE WIND DIRECTION OF THIS RELEASE
C
      IDIR = IWINDT(IREL)
C
C  CALCULATE DOSES FOR DIFFERENT TYPES OF ACTIVITY
C  ONLY IN THE EVACUATION AND SHELTERING REGION
C
      DO 400 IRAD = 1, NUMEVA

      STREXP = 0.
      ENDEXP = TZERO(IRAD) + DLTSHL(IRAD)

      IF (ENDEXP .GT. TSTART(IRAD,IREL) .AND. ENDEXP .GT. STREXP) THEN
C
C  PEOPLE GET NORMAL ACTIVITY EXPOSURE BEFORE SHELTERING
C
      IZONE = 2
      CALL EDOSIN (STREXP, ENDEXP, IRAD, IZONE, IREL)
      CALL INCDOS (IRAD, IDIR, IREL)
      IF (IPLUME .EQ. 1) CALL CENACU (IRAD, IREL)
      ENDIF

      STREXP = ENDEXP
      ENDEXP = ENDEXP + DLTEVA(IRAD)

      IF (ENDEXP .GT. TSTART(IRAD,IREL) .AND. ENDEXP .GT. STREXP) THEN
C
C  PEOPLE GET SHELTER ACTIVITY EXPOSURE
C
      IZONE = 3
      CALL EDOSIN (STREXP, ENDEXP, IRAD, IZONE, IREL)
      CALL INCDOS (IRAD, IDIR, IREL)
      IF (IPLUME .EQ. 1) CALL CENACU (IRAD, IREL)
      ENDIF

      DO 120 JANG = 1, NUMCOR
      IF (IHITIT(IRAD,JANG)) THEN
      RETCOD(IRAD,JANG) = 2.
      ELSE
      RETCOD(IRAD,JANG) = 1.
      ENDIF
  120 CONTINUE

  400 CONTINUE

      IF (IPRINT .GE. 1) THEN
        WRITE(6,950) (I,(RETCOD(I,J),J=1,NUMCOR),I=1,NUMRAD)
  950   FORMAT('1VALUES OF RETCOD ='/50(/I3,16F4.0))
      ENDIF
```

```
      RETURN
      END
*DECK CENACU
      SUBROUTINE CENACU (IRADX, IREL)
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EDOSIN.
C
C IT INCREMENTS THE CENTERLINE DOSE ARRAYS FOR ACCUMULATED DOSE.
C
C IT HAS AN ENTRY POINT NAMED CENZER, CALLED BY SUBROUTINE EAROUT,
C WHICH IS USED TO ZERO OUT THE CENTERLINE DOSE ARRAYS.
C
C GLOSSARY OF VARIABLES:
C
C CD     - CENTERLINE CLOUDSHINE DOSE FROM SUBROUTINE EDOSIN
C CENCD  - CENTERLINE CLOUDSHINE DOSE (IRAD,ORGAN)
C CENGD  - CENTERLINE GROUNDSHINE DOSE (IRAD,ORGAN)
C CENPID - CENTERLINE PLUME DIRECT INHALATION DOSE (IRAD,ORGAN)
C CENRID - CENTERLINE RESUSPENSION INHALATION DOSE (IRAD,ORGAN)
C CLDFAC - FINITE CLOUD CORRECTION FACTOR
C GD     - CENTERLINE GROUNDSHINE DOSE FROM SUBROUTINE EDOSIN
C IRAD   - LOOP COUNTER TO RADIAL SPATIAL INTERVALS USED IN CENZER
C IRADX  - POINTER TO RADIAL SPATIAL ELEMENT IN CENACU
C IRAD1  - LOWER BOUND ON RADIAL SPATIAL INTERVAL LOOP IN CENZER
C IRAD2  - UPPER BOUND ON RADIAL SPATIAL INTERVAL LOOP IN CENZER
C IREL   - INDEX TO THE PLUME NUMBER OF OF THIS RELESE SEGMENT
C IORG   - LOOP COUNTER ON ORGANS
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C PID    - CENTERLINE PLUME INHALATION DOSE (ORGAN) FROM SUB EDOSIN
C
C MODIFIED 11/08/88, D. CHANIN, NEW ROUTINE WRITTEN, LOG # 9/16/88-A,
C   THIS ROUTINE WAS NECESSARY FOR SUBROUTINE ESTAT IN ORDER TO
C   AVOID CLUTTERING IT UP WITH MULTIPLE DO-LOOPS TO HANDLE THE
C   PROPER ACCUMULATION OF CENTERLINE DOSES.
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /EDOSES/SDD,CD(MAXORG),PID(MAXORG),GD(MAXORG),RESID(MAXORG)
      COMMON /CENDOS/ CENCD(MAXRAD,2:MAXORG), CENGD(MAXRAD,2:MAXORG),
     1 CENSKI(MAXRAD), CENPID(MAXRAD,2:MAXORG), CENRID(MAXRAD,2:MAXORG)
C
C  ACCUMULATE THE CENTERLINE DOSES BY THE VARIOUS PATHWAYS
C
      CENSKI(IRADX) = CENSKI(IRADX) + SDD
C
      DO 300 IORG = 2, NUMORG
      CENCD(IRADX,IORG) = CENCD(IRADX,IORG) + CLDFAC(1,IRADX,IREL) *
     1                    CD(IORG)
      CENGD(IRADX,IORG) = CENGD(IRADX,IORG) + GD(IORG)
      CENPID(IRADX,IORG) = CENPID(IRADX,IORG) + PID(IORG)
  300 CENRID(IRADX,IORG) = CENRID(IRADX,IORG) + RESID(IORG)
      RETURN
C
C  ENTRY POINT
C
```

```
      ENTRY CENZER (IRAD1, IRAD2)
C
      DO 40 IRAD = IRAD1, IRAD2
      CENSKI(IRAD) = 0.
      DO 40 IORG = 2, NUMORG
      CENCD(IRAD,IORG) = 0.
      CENGD(IRAD,IORG) = 0.
      CENPID(IRAD,IORG) = 0.
   40 CENRID(IRAD,IORG) = 0.
      RETURN
      END
*DECK EDOSIN
      SUBROUTINE EDOSIN (TEE, TLE, IRAD, IZONE, IREL)
C
C THIS ROUTINE CALCULATES THE DOSES RECEIVED AT THE CENTERLINE OF
C SPATIAL ELEMENT IRAD FOR A PERSON THAT ENTERS AT TIME TEE
C AND LEAVES AT TIME TLE. THE DOSES ARE STORED IN /EDOSES/.
C
C THIS ROUTINE IS CALLED BY SUBROUTINES RELZON, ESTAT AND EMOVE.
C
C GLOSSARY OF VARIABLES:
C
C BRRATE - BREATHING RATES FOR THE THREE ZONES (CUBIC METERS PER SECOND)
C CALC   - LOGICAL FLAG INDICATING THE PLUME REACHED THE INTERVAL
C CD     - CLOUDSHINE DOSE
C CSFACT - CLOUD SHIELDING FACTORS
C ENDEMP - END OF THE EMERGENCY PHASE (SECONDS FROM PLUME FIRST ARRIVAL)
C GD     - GROUNDSHINE DOSE
C GSHFAC - GROUND SHIELDING FACTORS
C IRAD - RADIAL INDEX TO SPATIAL INTERVAL
C IORG   - LOOP COUNTER ON ORGANS
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C IZONE  - FLAG INDICATING THE TYPE OF EXPOSURE TO AN INDIVIDUAL, SEE BELOW
C JTIM   - LOOP COUNTER ON TIME INTERVALS
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C PCF    - PRECALCULATED CLOUDSHINE FACTOR
C PID    - PLUME INHALATION DOSE
C PIF    - PRECALCULATED DIRECT INHALATION DOSE FACTOR
C PROTIN - INHALATION PROTECTION FACTORS
C TEE    - TIME PEOPLE ENTER THE ELEMENT
C TEXP   - DURATION OF DIRECT EXPOSURE TO PLUME
C TLE    - TIME PEOPLE LEAVE ELEMENT
C TPE    - TIME PLUME ENTERS THE ELEMENT
C TPL    - TIME PLUME LEAVES THE ELEMENT
C TSQU   - TIME SQUARED TERM
C TSTART - TIME OF PLUME ARRIVAL AT THE ELEMENT CENTERPOINT
C TSTOP  - TIME OF PLUME DEPARTURE FROM THE ELEMENT CENTERPOINT
C
C  INTERPRETATION OF THE THREE POSSIBLE VALUES OF IZONE:
C
C  1 - MOVING EVACUEES
C  2 - NORMAL ACTIVITY
C  3 - SHELTERING ACTIVITY
C
C DAVID CHANIN, DIV. 6415, 19 JULY 1984.
C Modified 11/09/92, New emergency response model for DOE
C  NO EXTERNAL FUNCTIONS
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
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```
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /EADFAC/ CSFACT(3), PROTIN(3), BRRATE(3),
     1                SKPFAC(3), GSHFAC(3), RESCON, RESHAF
      COMMON /EDOSES/SDD,CD(MAXORG),PID(MAXORG),GD(MAXORG),RESID(MAXORG)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
C
      LOGICAL CALC
C
      TPE = TSTART(IRAD,IREL)
      TPL = TSTOP(IRAD,IREL)
C
C Cut off doses at ENDEMP by forcing people to leave at end of emergency phase
C
      TLE = MIN (TLE, TSTART(IRAD,1) + ENDEMP)
      CALC = .TRUE.
C
      IF (TLE .LE. TPE .OR. TPE .GE. TPL) THEN
C People leave before plume enters or endemp is over before its arrival
      CALC = .FALSE.
C
      ELSE IF (TEE .LE. TPE .AND. TLE .GT. TPE .AND. TLE .LE. TPL) THEN
C People enter before plume enters and people leave while plume is there
        TEXP   = TLE - TPE
        TSQU   = TEXP ** 2
C
      ELSE IF (TEE .LE. TPE .AND. TLE .GT. TPL) THEN
C People enter before plume enters and people leave after the plume leaves
      TEXP   = TPL - TPE
        TSQU   = TEXP ** 2
C
      ELSE IF (TEE .GT. TPE .AND. TEE .LE. TPL .AND. TLE .GT. TPL) THEN
C People enter while the plume is there and people leave after the plume leaves
        TEXP   = TPL - TEE
        TSQU   = (TPL - TPE) ** 2 - (TEE - TPE) ** 2
C
      ELSE IF (TEE .GT. TPE .AND. TLE .LE. TPL) THEN
C People enter while the plume is there and people leave while plume is there
        TEXP   = TLE - TEE
        TSQU   = (TLE - TPE) ** 2 - (TEE - TPE) ** 2
C
      ELSE IF (TEE .GT. TPL) THEN
C People enter after the plume left
        TEXP   = 0.
        TSQU   = 0.
      ENDIF
C
      IF (CALC) THEN
C
      SDD = SKPFAC(IZONE) * TEXP * PSF(IRAD,IREL)
C
C Calculate cloudshine dose and groundshine dose received during plume passage
C
      DO 40 IORG = 2, NUMORG
      RESID(IORG) = 0.0
      CD(IORG) = CSFACT(IZONE) * TEXP * CLDRAT(IORG,IRAD,IREL)
   40   GD(IORG) = GSHFAC(IZONE) * GRDRAT(IORG,IRAD,IREL) * TSQU
C
      DO 80 ITIM = 1, 8
C
```

```
C Perform dose calculations if and only if the people entered the element
C before the end of the period and left it after the beginning of the period.
C
      IF (TEE .LT. TPL + GRDTIM(ITIM) .AND.
     1      TLE .GT. TPL + GRDTIM(ITIM-1)) THEN
C
C The exposure duration in this period is limited to its start and end times
C
        TIMTHR = MIN (TPL + GRDTIM(ITIM), TLE) -
     1             MAX (TPL + GRDTIM(ITIM-1), TEE)
C
        FRCDOS = TIMTHR / (GRDTIM(ITIM) - GRDTIM(ITIM-1))
C
        DO 60 IORG = 2, NUMORG
        GD(IORG) = GD(IORG) + FRCDOS * GRDINT(IORG,IRAD,IREL,ITIM) *
     1                              GSHFAC(IZONE)
   60     RESID(IORG) = RESID(IORG) + FRCDOS *
     1      RESINT(IORG,IRAD,IREL,ITIM) * PROTIN(IZONE) * BRRATE(IZONE)
      ENDIF
   80 CONTINUE
C
C Calculate direct inhalation from the plume
C
      DO 100 IORG = 2, NUMORG
  100   PID(IORG) = PROTIN(IZONE) * BRRATE(IZONE) * TEXP *
     1                              PIF(IORG,IRAD,IREL)
      ELSE
      SDD = 0.
      DO 200 IORG = 2, NUMORG
      CD(IORG)    = 0.
      GD(IORG)    = 0.
      PID(IORG)   = 0.
  200   RESID(IORG) = 0.
      ENDIF
      RETURN
      END
*DECK INCDOS
      SUBROUTINE INCDOS (IRAD, IDIR, IREL)
C
C  THIS ROUTINE ACCUMULATES THE DOSES TO STATIONARY INDIVIDUALS OVER FINE GRID.
C
C THIS ROUTINE IS CALLED BY SUBROUTINES RELZON AND ESTAT.
C
C  GLOSSARY OF VARIABLES:
C
C  CD     - CENTERLINE CLOUDSHINE DOSE FROM SUBROUTINE EDOSIN
C  CLDFAC - FINITE CLOUD CORRECTION FACTOR
C  GAULEV - AVERAGE HEIGHT OF THE GAUSSIAN PLUME DISTRIBUTION IN THE CROSSWIND
C  GD     - CENTERLINE GROUNDSHINE DOSE FROM SUBROUTINE EDOSIN
C  IDIR   - DIRECTION OF THE PLUME CENTERLINE
C  IDIRM  - A DIRECTION OFFSET FROM THE PLUME IN THE COUNTER CLOCKWISE DIRECTION
C  IDIRP  - A DIRECTION OFFSET FROM THE PLUME IN THE CLOCKWISE DIRECTION
C  IFINE  - LOOP COUNTER ON FINE GRID DIVISIONS FROM THE CENTERLINE
C  INDORG - INDEX TO THE CRITICAL ORGAN FOR EARLY RELOCATION
C  INDXM  - FINE GRID INDEX IN THE COUNTERCLOCKWISE DIRECTION
C  INDXP  - FINE GRID INDEX IN THE CLOCKWISE DIRECTION
C  IRAD   - LOOP COUNTER TO SPATIAL INTERVAL
C  IORG   - LOOP COUNTER ON ORGANS
C  IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C  MAXFIN - FURTHEST FINE GRID DIVISION TO WHICH THE PLUME EXTENDS
C  NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C  NUMFIN - NUMBER OF FINE GRID SUBELEMENTS IN A COARSE ELEMENT (ODD)
C  NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
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C  PID    - CENTERLINE PLUME INHALATION DOSE (ORGAN) FROM SUB EDOSIN
C  TERM1  - SHORT TERM DOSE FOR ACUTE EFFECTS, ALL ORGANS, ALL PATHWAYS
C  TERM2  - LONG TERM DOSE FOR LATENT EFFECTS, ALL ORGANS, ALL PATHWAYS
C  T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C  DAVID CHANIN, DIV. 6415, 24 OCT 1984.
C
C  MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL

C  MODIFIED 10 MARCH 87, D. CHANIN, SER #45, REVISED THE CLOUDSHINE DOSE MODEL
C    TO CONFORM WITH OSTMEYER'S "EXPOSURE PATHWAYS" REPORT

C  MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS

C MODIFIED 11/08/88, D. CHANIN, LOG # 10/10/88-A,
C   THE CALCULATION OF INDICES TO THE FINE GRID ELEMENTS TO THE
C   LEFT OF THE CENTERLINE DIRECTION WERE CALCULATED INCORRECTLY.
C   THE NEW ALGORITHM GIVES THE CORRECT RESULT ON BOTH SIDES.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /EDOSES/SDD,CD(MAXORG),PID(MAXORG),GD(MAXORG),RESID(MAXORG)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
C
C  INITIALIZE THE FINE GRID LOOP COUNTERS
C
      INDXP = (NUMFIN + 1) / 2
      INDXM = INDXP
      IDIRP = IDIR
      IDIRM = IDIR
C
C  ACCUMULATE THE DOSE TO ALL ORGANS AT THE CENTRAL FINE GRID ELEMENT
C
      T1DOSE(1,INDXP,IRAD,IDIR) = T1DOSE(1,INDXP,IRAD,IDIR) +
     1                            GAULEV(1,IRAD,IREL) * SDD
C
      DO 100 IORG = 2, NUMORG
  100 T1DOSE(IORG,INDXP,IRAD,IDIR) = T1DOSE(IORG,INDXP,IRAD,IDIR) +
     1 GAULEV(1,IRAD,IREL) * (PID(IORG) + GD(IORG) + RESID(IORG)) +
     2 CLDFAC(1,IRAD,IREL) * CD(IORG)
C
C  LOOP OVER THE OUTER FINE GRID ELEMENTS
C
      DO 300 IFINE = 2, MAXFIN(IRAD,IREL)
C
C  CALCULATE INDICES TO THE FINE ELEMENTS ON BOTH SIDES OF CENTERLINE
C
      INDXP = INDXP + 1
      INDXM = INDXM - 1
C
C  CORRECT THE COUNT WHEN CROSSING A COARSE GRID BOUNDARY
```

```
C
      IF (INDXP .GT. NUMFIN) THEN
C
C  CALCULATE INDICES TO FINE GRID ELEMENTS ON THE RIGHT AND LEFT
C
        INDXP = 1
        INDXM = NUMFIN
C
C  CALCULATE COARSE ANGULAR DIRECTION TO CLOCKWISE ELEMENT
C
        IDIRP = IDIRP + 1
        IF (IDIRP .GT. NUMCOR) IDIRP = 1
C
C  CALCULATE COARSE ANGULAR DIRECTION TO COUNTERCLOCKWISE ELEMENT
C
        IDIRM = IDIRM - 1
        IF (IDIRM .LT. 1) IDIRM = NUMCOR
      ENDIF
C
C  ACCUMULATE THE DOSE TO ALL ORGANS AT THE OUTER FINE GRID ELEMENTS
C
      TERM1 = GAULEV(IFINE,IRAD,IREL) * SDD
      T1DOSE(1,INDXP,IRAD,IDIRP) = T1DOSE(1,INDXP,IRAD,IDIRP) + TERM1
      T1DOSE(1,INDXM,IRAD,IDIRM) = T1DOSE(1,INDXM,IRAD,IDIRM) + TERM1
C
      DO 200 IORG = 2, NUMORG
      TERM1 = GAULEV(IFINE,IRAD,IREL) *
     1 (GD(IORG) + PID(IORG) + RESID(IORG)) +
     2  CLDFAC(IFINE,IRAD,IREL) * CD(IORG)
      T1DOSE(IORG,INDXP,IRAD,IDIRP) =
     1   T1DOSE(IORG,INDXP,IRAD,IDIRP) + TERM1
  200 T1DOSE(IORG,INDXM,IRAD,IDIRM) =
     1   T1DOSE(IORG,INDXM,IRAD,IDIRM) + TERM1
  300 CONTINUE
C
      RETURN
      END
*DECK EMOVE
      SUBROUTINE EMOVE
C
C THIS ROUTINE ACCUMULATES THE DOSES TO MOVING INDIVIDUALS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C ANG    - HALF ANGLE OF PLUME COVERAGE OVER THE SPATIAL INTERVAL
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C CD     - CENTERLINE CLOUDSHINE DOSE FROM SUBROUTINE EDOSIN
C CLDFAC - FINITE CLOUD CORRECTION FACTOR
C DIST   - CROSSWIND DISTANCE TO THE FINE GRID ELEMENT CENTER
C DLTEVA - Delay time to start evacuation measured from end of sheltering
C DLTSHL - Delay time to start sheltering measured from user-supplied REFPNT
C DOSE1  - SHORT TERM DOSE FOR ACUTE EFFECTS, ALL ORGANS, ALL PATHWAYS
C DURBEG - Duration of the beginning phase of the evacuation period
C DURMID - Duration of the middle phase of the evacuation period
C EVATYP - Character flag for evacuation type: 'RADIAL' or 'NETWORK'
C FRSTEV - Time after accident start at which the first evacuee begins to move
C GAUHIT - HEIGHT OF THE GAUSSIAN TOP HAT AS A FRACTION OF THE PEAK
C GAUWID - WIDTH OF THE GAUSSIAN TOP HAT IN SIGMA-Y
C I      - LOOP COUNTER
C ICURR  - RADIAL INDEX TO THE CURRENT SPATIAL ELEMENT
C IFINE  - LOOP COUNTER ON FINE GRID DIVISIONS FROM THE CENTERLINE
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C IORG   - LOOP COUNTER ON ORGANS
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C IROOT  - LOOP COUNTER OVER ROOT NODES
C ISORC  - RADIAL INDEX TO THE COHORT BEING TRACKED
C ITEMP  - TEMPORARY VARIABLE
C IWINDT - TRANSFORMED WIND DIRECTION USED IN THE DOSIMETRY CALCULATIONS
C J      - LOOP COUNTER
C JCURR  - ANGULAR INDEX TO THE CURRENT SPATIAL ELEMENT
C JSORC  - ANGUALR INDEX TO THE COHORT BEING TRACKED
C LASMOV - LAST RING OF THE MOVEMENT ZONE
C LASORI - LAST RING IN WHICH EVACUEES CAN ORIGINATE
C NEXTND - Destination of each shelter/evac node, defined in EVRADI and EVNETW
C NROOTS - NUMBER OF ROOT NODES IN THE NETWORK
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMEVA - Last ring of the emergency response zone (shelter and evacuation)
C NUMFIN - NUMBER OF FINE GRID SUBELEMENTS IN A COARSE ELEMENT (ODD)
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMREL - NUMBER OF PLUME SEGMENTS IN THE RELEASE
C OALARM - THE TIME AT WHICH OFF-SITE ALARM IS TRIGGERED FOR EMERGENCY RESPONSE
C ORIG   - FLAGS THAT INDICATE WHICH SPATIAL ELEMENTS HAVE ORIGINATED MOVEMENT
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C PID    - CENTERLINE PLUME INHALATION DOSE (ORGAN,TIME PERIOD) FROM SUB EDOSIN
C REFPNT- Reference time point for evacuation/sheltering: 'ALARM' or 'ARRIVAL'
C ROOT   - ARRAY OF ROOT NODES
C SIGMAY - SIGMA-Y OF THE PLUME AT THE SPATIAL ELEMENT CENTRPOINT
C SPACEN - ARRAY OF DISTANCES TO SPATIAL ELEMENT CENTERPOINTS
C SQR2PI - SQUARE ROOT OF TWO PI
C TBEG   - TIME THAT PEOPLE ENTERED THE ELEMENT
C TEND   - TIME THAT PEOPLE LEFT THE ELEMENT
C TWOPI  - TWO TIMES PI
C T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C GLOSSARY OF EXTERNALS:
C
C CENACU - UPDATES THE CENTERLINE DOSE ARRAYS FOR ACCUMULATED DOSE
C EDOSIN - CALCULATES AN INDIVIDUAL'S DOSE IN A SPATIAL INTERVAL, /EDOSES/
C HOWLNG - CALCULATES HOW LONG AN EVACUEE SPENDS TRAVERSING A GIVEN ELEMENT
C
C DAVID CHANIN, DIV. 6415, 24 JULY 1984.
C
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C MODIFIED 10 MARCH 87, D. CHANIN, SER #45, REVISED THE CLOUDSHINE DOSE MODEL
C    TO CONFORM WITH OSTMEYER'S "EXPOSURE PATHWAYS" REPORT
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MODIFIED 11/08/88, D. CHANIN, LOG # 9/16/88-A,
C   USING A NEW ROUTINE, CENACU, TO UPDATE THE CENTERLINE DOSE ARRAYS
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 11/07/92, D. Chanin, new emergency response model for DOE
C Modified 4/16/96, D.C., implement TRAVELPOINT (CENTERPOINT or BOUNDARY) option
C
      EXTERNAL CENACU, EDOSIN, HOWLNG
      INTRINSIC ABS, TAN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
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     $         AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $         TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $         HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /ROOTS/ NROOTS, ROOT(2,376)
      COMMON /EDOSES/SDD,CD(MAXORG),PID(MAXORG),GD(MAXORG),RESID(MAXORG)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)
      CHARACTER       EVATYP*7, REFPNT*7, TRAVELPOINT*11
      COMMON /EFLAGS/ EVATYP,   REFPNT,   TRAVELPOINT
C
      LOGICAL   ORIG
      DIMENSION ORIG(MAXRAD,16), DOSE(MAXORG)
C
      DATA GAUWID / 3./
C
C  SKIP THE CALCULATION OF DOSES TO MOVING INDIVIDUALS IF THERE IS NO EVACUATION
C
      IF (LASMOV .EQ. 0) RETURN
C
C Calculate the time after accident initiation when the first evacuee moves.
C
      FRSTEV = 1.E20

      IF (REFPNT .EQ. 'ARRIVAL') THEN
        DO 20 IRAD = 1, NUMEVA
   20   FRSTEV = MIN (FRSTEV, TSTART(IRAD,1)+DLTSHL(IRAD)+DLTEVA(IRAD))
        ENDBEG = FRSTEV + DURBEG
        ENDMID = ENDBEG + DURMID
      ELSE IF (REFPNT .EQ. 'ALARM') THEN
        DO 40 IRAD = 1, NUMEVA
   40   FRSTEV = MIN (FRSTEV, OALARM + DLTSHL(IRAD) + DLTEVA(IRAD))
        ENDBEG = FRSTEV + DURBEG
        ENDMID = ENDBEG + DURMID
      ELSE

C modified for WinMaccs, 4/12/01, D. Chanin, add CALL ABORT

C        STOP 'Internal error in EMOVE'

        WRITE(6,*) 'Internal error in EMOVE'
        WRITE(7,*) 'Internal error in EMOVE'
        CALL ABORT ('terminating')
      ENDIF
C
C  LOOP ON RELEASE SEGMENTS
C
      DO 900 IREL = 1, NUMREL
C
C  SET THE FLAGS THAT INDICATE ELEMENTS WHERE PEOPLE HAVE ORIGINATED MOVEMENT
C
      DO 100 J = 1, NUMCOR
      DO 100 I = 1, NUMRAD
  100 ORIG(I,J) = .FALSE.
C
C  CALCULATE THE HEIGHT OF THE GAUSSIAN TOP HAT
C
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```
      GAUHIT = SQR2PI / GAUWID
C
C  FOLLOW THE PATHS FROM EACH ROOT NODE IN TURN
C
      DO 900 IROOT = 1, NROOTS

      ISORC = ROOT(1,IROOT)
      JSORC = ROOT(2,IROOT)
C
C  FOR THE STRAIGHT LINE PLUME MODEL USED WITH STRAIGHT LINE EVACUATION,
C  ONLY EVACUATE PEOPLE WHO WILL FALL UNDER THE PLUME.
C
      IF (IPLUME .EQ. 1) THEN
      ANG = (JSORC - 1) * TWOPI / NUMCOR
      IF (ANG .GT. ANGMAX) GO TO 900
      ENDIF
C
C  ACCUMULATE THE DOSES RECEIVED BY THE COHORT THAT ORIGINATED AT (ISORC,JSORC)
C
  200 ORIG(ISORC,JSORC) = .TRUE.
      ICURR = ISORC
      JCURR = JSORC
C
C Initialize time counter to account for shelter/evacuation delay time
C
      TEND = TZERO(ISORC) + DLTSHL(ISORC) + DLTEVA(ISORC)
C
C Calculate the start and end times for the people in the element
C
  300 TBEG = TEND
C
C If this is the source node AND (TRAVELPOINT .EQ. 'BOUNDARY'),
C then travel time is halved because people only travel to the element boundary
C
      IF (ISORC .EQ. ICURR .AND. JSORC .EQ. JCURR .AND.
     1    TRAVELPOINT .EQ. 'BOUNDARY') THEN
        TEND = TEND + .5 * HOWLNG(ICURR,JCURR,TEND)
      ELSE
        TEND = TEND + HOWLNG(ICURR,JCURR,TEND)
      ENDIF
C
C  DETERMINE IF THE ELEMENT CENTER FALLS UNDER THE TOP HAT PLUME.
C  SKIP THE DOSIMETRY CALCULATIONS IF IT DOESN'T FALL UNDER THE PLUME.
C
      ANG = ABS (IWINDT(IREL) - JCURR) * TWOPI / NUMCOR

      IF (ANG .LT. PI / 2.) THEN
        DIST = TAN (ANG) * SPACEN(ICURR)
        IF (DIST .GT. .5 * GAUWID * SIGMAY(ICURR,IREL)) GO TO 700
      ELSE
        GO TO 700
      ENDIF
C
C  CALCULATE THE DOSES RECEIVED FROM TBEG TO TEND AT THE CENTERLINE
C  OF SPATIAL INTERVAL ICURR. RESULTS ARE STORED IN /EDOSES/.
C
      CALL EDOSIN (TBEG, TEND, ICURR, 1, IREL)
C
C  ACCUMULATE THE DOSE TO EACH ORGAN AND SAVE TEMPORARILY IN DOSE1,DOSE2.
C
      IF (IROOT .EQ. 1 .AND. IPLUME .EQ. 1) THEN
C
C  ACCUMULATE THE CENTERLINE PLUME DOSES IF WE ARE UNDER THE PLUME TRACK
```

```
C
        CALL CENACU (ISORC, IREL)
      ENDIF
C
C  CALCULATE ACUTE DOSES TO ALL ORGANS, BY ALL PATHWAYS
C
      DO 400 IORG = 2, NUMORG
  400 DOSE(IORG) = GAUHIT * (GD(IORG) + PID(IORG) + RESID(IORG)) +
     $             CLDFAC(1,ICURR,IREL) * CD(IORG)
C
C  LOOP OVER THE FINE GRID ELEMENTS AND ALL ORGANS AND ACCUMULATE THE DOSE.
C
      DO 500 IFINE = 1, NUMFIN
      T1DOSE(1,IFINE,ISORC,JSORC) = T1DOSE(1,IFINE,ISORC,JSORC) +
     1                              GAUHIT * SDD
      DO 500 IORG = 2, NUMORG
  500 T1DOSE(IORG,IFINE,ISORC,JSORC)  =
     1 T1DOSE(IORG,IFINE,ISORC,JSORC) + DOSE(IORG)
C
C  FOR STRAIGHT LINE PLUME, RADIAL EVACUATION, COPY THE DOSES TO THE
C  OTHER SIDE OF THE CENTERLINE.
C
      IF (IPLUME .EQ. 1 .AND. JSORC .GT. 1) THEN
        DO 600 IFINE = 1, NUMFIN
        DO 600 IORG  = 2, NUMORG

  600   T1DOSE(IORG,IFINE,ISORC,NUMCOR+2-JSORC) =
     1    T1DOSE(IORG,IFINE,ISORC,JSORC)
      ENDIF
C
C  CHECK TO SEE IF THE NEXT ELEMENT ON THE PATH IS INSIDE THE MOVEMENT ZONE.
C  IF IT IS, THEN GO BACK TO ACCUMULATE DOSES AT THE NEXT ELEMENT.
C
  700 ITEMP = NEXTND(1,ICURR,JCURR)
      JCURR = NEXTND(2,ICURR,JCURR)
      ICURR = ITEMP

      IF (ICURR .LE. LASMOV) GO TO 300
C
C  CHECK TO SEE IF THE SUCCESSOR OF THE CURRENT SOURCE ELEMENT HAS
C  ORIGINATED THE MOVEMENT OF PEOPLE. IF AN ELEMENT HAS ORIGINATED MOVEMENT
C  ALREADY, THEN NO SUBSEQUENT ELEMENT ON THE PATH WILL ORIGINATE MOVEMENT.
C  ONLY ELEMENTS WITHIN THE EVACUATION ZONE CAN ORIGINATE MOVEMENT.
C
  800 ITEMP = NEXTND(1,ISORC,JSORC)
      JSORC = NEXTND(2,ISORC,JSORC)
      ISORC = ITEMP
      IF (.NOT. ORIG(ISORC,JSORC)) THEN
        IF (ISORC .LE. NUMEVA) THEN
          GO TO 200
        ELSE IF (ISORC .LE. LASMOV) THEN
          GO TO 800
        ENDIF
      ENDIF

  900 CONTINUE
      RETURN
      END
      FUNCTION HOWLNG (IRAD, JANG, TENTER)
C This routine calculates the residence time of evacuees who enter element
C (IRAD,JANG) at time=TENTER taking account of variable evacuation speeds.
C It is called by SUBROUTINE EMOVE.
C
```

```
C Glossary of variables:
C
C ENDBEG - End time of the beginning phase evacuation period (from scram)
C ENDMID - End time of the middle phase evacuation period (from scram)
C TRTIME - Traversal times for evacuees during initial, middle, and end phase
C
C Written by D. Chanin 8/15/92, new emergency response model for DOE
      INTRINSIC MIN
C  NO EXTERNAL FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /NETWOR/ LASMOV, NUMEVA, DLTSHL(MAXRAD), DLTEVA(MAXRAD),
     1  DURBEG, DURMID, TRTIME(3,MAXRAD,16), NEXTND(2,MAXRAD,16),
     2  TZERO(MAXRAD), ENDBEG, ENDMID, ESPEED(3)

      IF (TENTER .GE. ENDBEG) THEN
        TFRACB = 0.0
        HOWLNG = 0.0
      ELSE
        TFRACB = MIN (1.0, (ENDBEG - TENTER) / TRTIME(1,IRAD,JANG) )
        HOWLNG = TFRACB * TRTIME(1,IRAD,JANG)
        IF (TFRACB .GT. 0.9999) RETURN
      ENDIF

      IF (TENTER .LT. ENDMID) THEN
        TFRACM = MIN (1.0 - TFRACB, (ENDMID - MAX (ENDBEG, TENTER)) /
     1                                TRTIME(2,IRAD,JANG))
        HOWLNG = HOWLNG + TFRACM * TRTIME(2,IRAD,JANG)
      ENDIF

      TFRACE = 1.0 - TFRACB - TFRACM

      IF (TFRACE .GT. 0.0001)
     1 HOWLNG = HOWLNG + TFRACE * TRTIME(3,IRAD,JANG)

      RETURN
      END
*DECK ZERREM
      SUBROUTINE ZERREM (IRAD, JANG)
C
C ZERO OUT THE DOSE ACCUMULATED FOR EACH OF THE GRID ELEMENTS
C WHICH REQUIRE HOT SPOT OR NORMAL RELOCATION SO THAT THE NEW
C DOSES THERE CAN BE ACCUMULATED BY THE SUBROUTINE INCREM.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE RELZON.
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
C
      DO 100 IFIN = 1, NUMFIN
      DO 100 IORG = 1, NUMORG
  100 T1DOSE(IORG,IFIN,IRAD,JANG) = 0.0
      RETURN
      END
*DECK INCREM
      SUBROUTINE INCREM (IRAD, JANG, IREL)
C
C RECALCULATES THE DOSE RECEIVED BY AN INDIVIDUAL IN A SINGLE
C SPATIAL ELEMENT FOR A SINGLE PLUME SEGMENT IF EITHER NORMAL OR HOT-SPOT
C RELOCATION IS NECESSARY TO REDUCE EXPOSURE TO ACCEPTABLE LEVELS.
```

```
C
C THIS ROUTINE IS CALLED BY SUBROUTINE RELZON.
C
C GLOSSARY OF VARIABLES:
C
C CD     - CENTERLINE CLOUDSHINE DOSE FROM SUBROUTINE EDOSIN
C CLDFAC - FINITE CLOUD CORRECTION FACTOR
C GAULEV - AVERAGE HEIGHT OF THE GAUSSIAN PLUME DISTRIBUTION IN THE CROSSWIND
C GD     - CENTERLINE GROUNDSHINE DOSE FROM SUBROUTINE EDOSIN
C IFIN   - LOOP COUNTER ON FINE GRID DIVISIONS WITHIN THE COARSE GRID ELEMENT
C IRAD   - RADIAL SPATIAL INDEX TO THE ELEMENT OF INTEREST
C IOFF   - ANGULAR OFFSET FROM THE PLUME CENTERLINE (COARSE GRID DIVISIONS)
C IORG   - LOOP COUNTER ON ORGANS
C IREL   - INDEX TO THE CURRENT PLUME SEGMENT OF THE RELEASE
C IWINDT - TRANSFORMED WIND DIRECTION USED IN THE DOSIMETRY CALCULATIONS
C MIDPNT - INDEX TO THE FINE GRID ELEMENT IN THE MIDDLE OF THE SECTOR
C NUMCOR - NUMBER OF COARSE GRID ANGULAR DIVISIONS DEFINED (WIND SECTORS)
C NUMFIN - NUMBER OF FINE GRID SUBELEMENTS IN A COARSE ELEMENT (ODD)
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C PID    - CENTERLINE PLUME INHALATION DOSE (ORGAN) FROM SUB EDOSIN
C T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C GLOSSARY OF EXTERNALS:
C
C CENACU - UPDATES THE CENTERLINE DOSE ARRAYS FOR ACCUMULATED DOSE
C CENZER - ZEROES THE CENTERLINE DOSE ARRAYS BETWEEN A DISTANCE RANGE
C
C WRITTEN BY D. CHANIN, 6 JUL 88.
C
C MODIFIED 11/08/88, D. CHANIN, TWO DEFECTS!, 9/15/88-B AND 10/10/88-A
C   1) THE DOSE TO RELOCATED INDIVIDUALS ONLY REFLECTED THEIR
C   EXPOSURE TO THE LAST PLUME SEGMENT OF A MULTI-PUFF RELEASE,
C
C   2) THE CALCULATION OF COARSE GRID DIRECTION TO THE LEFT OF
C   CENTERLINE WAS INCORRECTLY CALCULATED.
C
C
C MODIFIED 12/13/88, J. ROLLSTIN AND D. CHANIN, LOG # 12/01/88-A,
C   THIS ROUTINE HAS BEEN MODIFIED SO THAT IT NOW ADDS THE INCREMENTAL
C   DOSE RECEIVED IN SPATIAL ELEMENTS WHICH WERE SUBJECT TO RELOCATION.
C   PREVIOUS TO THIS CHANGE, THE INTENTION HERE WAS TO COMBINE THE
C   OPERATIONS OF ZEROING OUT AND INCREMENTATION BUT IT DIDN'T WORK RIGHT.
C   NOW, THOSE TWO OPERATIONS ARE CLEANLY SEPARATED AND THE NEWLY WRITTEN
C   SUBROUTINE ZERREM PERFORMS THE ZEROING FUNCTION.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
C NO INTRINSIC FUNCTIONS
C
      EXTERNAL CENACU, CENZER
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /EDOSES/SDD,CD(MAXORG),PID(MAXORG),GD(MAXORG),RESID(MAXORG)
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
C
C  CALCULATE THE OFFSET FROM THE CENTERLINE DIRECTION TO THE DIRECTION
```

```
C  OF THIS COARSE GRID ELEMENT
C
      IOFF = JANG - IWINDT(IREL)

      IF (IOFF .GT. NUMCOR / 2 + 1) THEN
         IOFF = IOFF - NUMCOR
      ELSE IF (IOFF .LT. - NUMCOR / 2 - 1) THEN
         IOFF = IOFF + NUMCOR
      ENDIF

      MIDPNT = (NUMFIN + 1) / 2
C
C  LOOP OVER ALL FINE GRID DIVISIONS IN THE COARSE GRID ELEMENT
C
      DO 300 IFIN = 1, NUMFIN
C
C  CALCULATE THE INDEX TO THE GAUSSIAN STEP FUNCTION AND CLOUDSHINE
C  CORRECTION FACTOR ARRAYS
C
      IF (IOFF .EQ. 0) THEN
        IFINE = ABS (IFIN - MIDPNT) + 1
      ELSE IF (IOFF .GT. 0) THEN
        IFINE = MIDPNT + IFIN + (IOFF - 1) * NUMFIN
      ELSE
        IFINE = MIDPNT - IOFF * NUMFIN - IFIN + 1
      ENDIF
C
C  CHECK TO SEE IF THE PLUME EXTENDS OUT TO THIS FINE GRID ELEMENT
C
      IF (IFINE .GT. MAXFIN(IRAD,IREL)) GO TO 300

      T1DOSE(1,IFIN,IRAD,JANG) = SDD

      DO 200 IORG = 2, NUMORG
C
C  INCREMENT THE DOSE FOR ACUTE EFFECTS TO ALL ORGANS, BY ALL PATHWAYS
C  FOR THE DOSE CONTRIBUTION OF SUBSEQUENT PLUME SEGMENTS
C
  200 T1DOSE(IORG,IFIN,IRAD,JANG) = T1DOSE(IORG,IFIN,IRAD,JANG) +
     1      GAULEV(IFINE,IRAD,IREL) *
     2     (GD(IORG) + PID(IORG) + RESID(IORG)) +
     3      CLDFAC(IFINE,IRAD,IREL) * CD(IORG)
  300 CONTINUE

      IF (IPLUME .EQ. 1 .AND. JANG .EQ. 1) THEN
C
C  USE THE NEWLY WRITTEN ROUTINES CENZER AND CENACU
C  TO HANDLE THE ACCUMULATION OF CENTERLINE DOSES.
C
        IF (IREL .EQ. 1) CALL CENZER (IRAD, IRAD)

        CALL CENACU (IRAD, IREL)

      ENDIF

      RETURN
      END
*DECK FATRIS
      SUBROUTINE FATRIS
C
C THIS ROUTINE CALCULATES THE RISK OF EARLY FATALITY FOR ALL SPATIAL ELEMENTS
C FROM SHORT TERM EXPOSURE (1-7 DAYS), AND STORES THE RESULTS IN /RISFAT/.
C
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C THE FATALITY RISK MODEL WAS OBTAINED FROM SECTION 2.1 OF VOL. 1
C 'HEALTH EFFECTS MODEL FOR NUCLEAR POWER PLANT ACCIDENT, CONSEQUENCE ANALYSIS'
C J. S. EVANS, D. W. MOELLER, D. W. COOPER, SANDIA NATIONAL LABORATORIES,
C NUREG-CR-4214, 1985, ALBUQUERQUE N.M.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C CENCD  - CENTERLINE CLOUDSHINE DOSE (INTRVL,ORGAN)
C CENDOS - CENTERLINE TOTAL DOSE AT THIS DISTANCE
C CENFAT - CENTERLINE RISK OF FATALITY ARRAY (IRAD)
C CENGD  - CENTERLINE GROUNDSHINE DOSE (INTRVL,ORGAN)
C CENPID - CENTERLINE PLUME INHALATION DOSE (INTRVL,ORGAN)
C CENRID - CENTERLINE RESUSPENSION INHALATION DOSE (INTRVL,ORGAN)
C DRATIO - DOSE DIVIDED BY LD50, THE SO CALLED NORMALIZED DOSE
C EFFACA - EARLY FATALITY PARAMETER ALPHA FOR ALL EARLY FATALITIES
C EFFACB - EARLY FATALITY PARAMETER BETA FOR ALL EARLY FATALITIES
C EFFTHR - EARLY FATALITY THRESHOLD DOSE (Sv)
C FATAVG - AVERAGE RISK OF FATALITY IN THE COARSE GRID ELEMENT (RADIAL,ANGULAR)
C I      - IMPLIED DO LOOP INDEX FOR WRITE
C IFAT   - LOOP COUNTER ON EARLY FATALITY EFFECTS
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDXEF - INDEX TO THE EARLY FATALITY ORGANS
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL INTERVALS
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C JANG   - LOOP COUNTER ON ANGULAR SPATIAL INTERVALS
C KFIN   - LOOP COUNTER ON FINE ANGULAR SUBDIVISIONS
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMEFA - NUMBER OF EARLY FATALITY ORGANS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C RISFAT - RISK OF EARLY DEATH IN EACH FINE SPATIAL ELEMENT(FIN,RADIAL,ANGULAR)
C RISK   - TEMPORARY VARIABLE USED TO CALCULATE RISK
C TOTHAZ - ACCUMULATED TOTAL OF THE HAZARD FUNCTION FOR ALL FATALITY EFFECTS
C TOTRIS - ACCUMULATED FATAL INJURY RISK OVER ALL FINE SUBDVISIONS IN ELEMENT
C T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C DAVID CHANIN, DIV. 6415, 12 SEPT 84.
C
C MODIFIED 30 JULY 86, BY D. CHANIN, SEE SER #29.
C   NOW IT SKIPS THE CALCULATION OF CENTERLINE FATALITY RISK IF DOSE IS ZERO.
C
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C
C MODIFIED 31 MAR 87, D.C., SER #49, DIMENSION ERROR ON THE RISFAT ARRAY
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATIONS OF RISK IF PLUME DIDN'T REACH
C                          AND CENTERLINE RISK IF (IPLUME .GT. 1)
C
C MODIFIED 31 MAY 88, D.C., USE A USER-SPECIFIED DOSE THRESHOLD INSTEAD OF
C                           THE PREVIOUS HARD-WIRED RISK THRESHOLD OF .005
C MODIFIED 2/13/92, D.C., LOG # 2/13/92-A, AVOID OVERFLOW IN FATALITY AND
C   INJURY RISK CALCULATIONS WHEN DOSES ARE VERY HIGH

C  NO EXTERNAL FUNCTIONS
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      INTRINSIC EXP, LOG10
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /EFATAL/ NUMEFA, INDXEF(5), EFFACA(5), EFFACB(5), EFFTHR(5)
      COMMON /RISFAT/ RISFAT(7,MAXRAD,16), FATAVG(MAXRAD,16)
      COMMON /CENDOS/ CENCD(MAXRAD,2:MAXORG), CENGD(MAXRAD,2:MAXORG),
     1 CENSKI(MAXRAD), CENPID(MAXRAD,2:MAXORG), CENRID(MAXRAD,2:MAXORG)
      COMMON /CENFAT/ CENFAT(MAXRAD)
      COMMON /IPRINT/ IPRINT
C
      IF (NUMEFA .EQ. 0) THEN
C
C  ZERO OUT THE RISK ARRAYS IF NO EARLY FATALITY MODEL IS DEFINED
C
         DO 20 IRAD = 1, NUMRAD
         CENFAT(IRAD) = 0.
         DO 20 IFIN = 1, NUMFIN
         DO 20 IANG = 1, NUMCOR
   20    RISFAT(IFIN,IRAD,IANG) = 0.
         RETURN
      ENDIF
C
C  IF WE ARE USING WIND-SHIFT SKIP OVER THE CENTERLINE RISK CALCULATIONS
C
      IF (IPLUME .GT. 1) GO TO 90
C
C  CALCULATE CENTERLINE RISK OF FATALITY
C
      DO 80 IRAD = 1, NUMRAD

      TOTHAZ = 0.

      DO 60 IFAT = 1, NUMEFA
      IF (INDXEF(IFAT) .GT. 1) THEN
      CENDOS = CENCD(IRAD,INDXEF(IFAT)) + CENGD(IRAD,INDXEF(IFAT)) +
     1           CENPID(IRAD,INDXEF(IFAT)) + CENRID(IRAD,INDXEF(IFAT))
      ELSE
      CENDOS = CENSKI(IRAD)
      ENDIF
C
C AVOID OVERFLOW AND LOG OF ZERO IN CALCULATING FATALITY RISK
C
      IF (CENDOS .GT. EFFTHR(IFAT)) THEN
         DRATIO = CENDOS / EFFACA(IFAT)
         IF (DRATIO .LT. 1.E-6) THEN
            GO TO 60
         ELSE IF (LOG10(DRATIO) * EFFACB(IFAT) .GT. 6.0) THEN
            CENFAT(IRAD) = 1.0
            GO TO 70
         ENDIF
         TOTHAZ = TOTHAZ + DRATIO ** EFFACB(IFAT)
      ENDIF

   60 CONTINUE
      CENFAT(IRAD) = 1. - EXP (-.693 * TOTHAZ)
   70 CONTINUE
```

```
   80 CONTINUE
   90 CONTINUE
      IF (IPLUME .EQ. 1) THEN
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
        IROTAT = NUMCOR
      ENDIF
C
C  LOOP OVER ALL SPATIAL ELEMENTS UNDER THE PLUME
C
      DO 500 JANG = 1, IROTAT
      DO 400 IRAD = 1, NUMRAD
C
C  SKIP THE RISK CALCULATIONS IF THE PLUME NEVER GOT TO THIS ELEMENT
C
      IF (.NOT. IHITIT(IRAD,JANG)) THEN
        FATAVG(IRAD,JANG) = 0.
        GO TO 400
      ENDIF

      IF (IPRINT .GE. 4) THEN
        WRITE(6,100) IRAD, JANG, SPACEN(IRAD)
  100   FORMAT(/' (', I2, ',', I2,') AT', F9.0, ' METERS')
      ENDIF

      TOTRIS = 0.
C
C  LOOP OVER ALL FINE GRID SUBDIVISIONS
C
      DO 300 KFIN = 1, NUMFIN

      TOTHAZ = 0.
C
C  LOOP OVER ALL EARLY FATALITY EFFECTS
C
      DO 200 IFAT = 1, NUMEFA
C
C AVOID OVERFLOW AND LOG OF ZERO IN CALCULATING FATALITY RISK
C
      IF (T1DOSE(INDXEF(IFAT),KFIN,IRAD,JANG) .GT. EFFTHR(IFAT)) THEN
         DRATIO = T1DOSE(INDXEF(IFAT),KFIN,IRAD,JANG) / EFFACA(IFAT)
         IF (DRATIO .LT. 1.E-6) THEN
            RISFAT(KFIN,IRAD,JANG) = 0.0
            GO TO 300
         ELSE IF (LOG10(DRATIO) * EFFACB(IFAT) .GT. 6.0) THEN
            RISFAT(KFIN,IRAD,JANG) = 1.0
            GO TO 300
         ENDIF
         TOTHAZ = TOTHAZ + DRATIO ** EFFACB(IFAT)
      ENDIF

  200 CONTINUE

      RISFAT(KFIN,IRAD,JANG) = 1. - EXP (-.693 * TOTHAZ)

  300 TOTRIS = TOTRIS + RISFAT(KFIN,IRAD,JANG)
C
C  CALCULATE THE AVERAGE PROBABILITY OF EARLY DEATH IN THIS INTERVAL
C
      FATAVG(IRAD,JANG) = TOTRIS / NUMFIN

      IF (IPRINT .GE. 4) THEN
        WRITE(6,350) FATAVG(IRAD,JANG), (RISFAT(I,IRAD,JANG),I=1,NUMFIN)
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```
  350   FORMAT(' AVG FATALITY RISK=', 1PE9.2,
     $         ',FINE GRID RISK OF FATALITY= ',7E9.2)
        ENDIF

  400 CONTINUE
  500 CONTINUE

      RETURN
      END
*DECK INJRIS
      SUBROUTINE INJRIS
C
C THIS ROUTINE CALCULATES THE RISK OF EARLY INJURY FOR ALL SPATIAL ELEMENTS
C AND STORES THE RESULTS IN /CENINJ/ AND /RISINJ/.
C
C THE INJURY RISK MODEL WAS OBTAINED FROM SECTION 2.1 OF VOL. 1
C 'HEALTH EFFECTS MODEL FOR NUCLEAR POWER PLANT ACCIDENT, CONSEQUENCE ANALYSIS'
C J. S. EVANS, D. W. MOELLER, D. W. COOPER, SANDIA NATIONAL LABORATORIES,
C NUREG-CR-4214, 1985, ALBUQUERQUE N.M.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C CENCD  - CENTERLINE CLOUDSHINE DOSE (INTRVL,ORGAN)
C CENDOS - CENTERLINE TOTAL DOSE AT THIS DISTANCE MINUS THRESHOLD DOSE
C CENFAT - CENTERLINE RISK OF FATALITY ARRAY (IRAD)
C CENGD  - CENTERLINE GROUNDSHINE DOSE (INTRVL,ORGAN)
C CENINJ - CENTERLINE RISK OF INJURY (IRAD,INJU)
C CENPID - CENTERLINE PLUME INHALATION CLOUDSHINE DOSE (INTRVL,ORGAN)
C CENRID - CENTERLINE RESUSPENSION INHALATION DOSE (INTRVL,ORGAN)
C DOSTEM - DOSE IN THE FINE GRID ELEMENT MINUS THRESHOLD DOSE FOR THE EFFECT
C DRATIO - DOSE DIVIDED BY LD50, THE SO CALLED NORMALIZED DOSE
C EIFACA - EARLY INJURY PARAMETER ALPHA FOR ALL EARLY INJURIES
C EIFACB - EARLY INJURY PARAMETER BETA FOR ALL EARLY INJURIES
C EINAME - NAMES OF THE EARLY INJURIES DEFINED IN THE MODEL
C EISUSC - FRACTION OF THE POPULATION THAT IS SUSCEPTIBLE TO THIS INJURY
C EITHRE - THRESHOLD DOSE FOR EARLY INJURY EFFECTS
C HAZARD - HAZARD FUNCTION FOR A SINGLE INJURY IN A FINE GRID ELEMENT
C I      - IMPLIED DO LOOP COUNTER FOR A WRITE STATEMENT
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDXEI - INDEX TO THE EARLY INJURY ORGANS
C INJU   - LOOP COUNTER ON TYPE OF EARLY INJURY
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL INTERVALS
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C JANG   - LOOP COUNTER ON ANGULAR SPATIAL INTERVALS
C KFIN   - LOOP COUNTER ON FINE ANGULAR SUBDIVISIONS
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMEIN - NUMBER OF EARLY INJURY EFFECTS
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C ORGNAM - NAMES OF THE ORGANS DEFINED IN THE MODEL
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C RISINJ - RISKS OF EACH INJURY IN EACH COARSE SPATIAL ELEMENT (INJU,IRAD,JANG)
C SPACEN - ARRAY OF DISTANCES TO SPATIAL ELEMENT CENTERPOINTS
C TOTRIS - ACCUMULATED RISK FOR EACH INJURY OVER ALL FINE GRID SUBDIVISIONS
C T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C GLOSSARY OF EXTERNALS:
C
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C DAVID CHANIN, DIV. 6415, 12 SEPT 84.
C
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C
C MODIFIED 31 MAR 87, D.C., SER #49, DIMENSION ERROR ON THE RISFAT ARRAY
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATIONS OF RISK IF PLUME DIDN'T REACH
C                          AND CENTERLINE RISK IF (IPLUME .GT. 1)
C
C MODIFIED 31 MAY 88, D.C., CHANGED HANDLING OF THRESHOLD DOSE,
C                           AND ADJUSTMENT FOR FATALITY RISK.
C MODIFIED 2/13/92, D.C., LOG # 2/13/92-A, AVOID OVERFLOW IN FATALITY AND
C   INJURY RISK CALCULATIONS WHEN DOSES ARE VERY HIGH
C
C  NO EXTERNAL FUNCTIONS
      INTRINSIC EXP, LOG10
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      CHARACTER *16   EINAME
      COMMON /EINAME/ EINAME(10)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /RISINJ/ RISINJ(10,MAXRAD,16)
      COMMON /CENDOS/ CENCD(MAXRAD,2:MAXORG), CENGD(MAXRAD,2:MAXORG),
     1 CENSKI(MAXRAD), CENPID(MAXRAD,2:MAXORG), CENRID(MAXRAD,2:MAXORG)
      COMMON /CENINJ/ CENINJ(MAXRAD,10)
      COMMON /IPRINT/ IPRINT
      DIMENSION TOTRIS(10)
C
      IF (NUMEIN .EQ. 0) RETURN
C
C  IF WE ARE USING WIND-SHIFT SKIP OVER THE CENTERLINE RISK CALCULATIONS
C
      IF (IPLUME .GT. 1) GO TO 90
C
C  CALCULATE THE CENTERLINE RISK OF EARLY INJURIES
C
      DO 80 INJU = 1, NUMEIN
      DO 80 IRAD = 1, NUMRAD

      IF (INDXEI(INJU) .GT. 1) THEN
      CENDOS = CENCD(IRAD,INDXEI(INJU)) + CENGD(IRAD,INDXEI(INJU))
     1         + CENPID(IRAD,INDXEI(INJU)) + CENRID(IRAD,INDXEI(INJU))
      ELSE
      CENDOS = CENSKI(IRAD)
      ENDIF
C
C AVOID OVERFLOW AND LOG OF ZERO IN CALCULATING INJURY RISK
C
      IF (CENDOS .GT. EITHRE(INJU)) THEN
         DRATIO = CENDOS / EIFACA(INJU)
```

```
         IF (DRATIO .LT. 1.E-6) THEN
            CENINJ(IRAD,INJU) = 0.0
         ELSE IF (LOG10(DRATIO) * EIFACB(INJU) .GT. 6.0) THEN
            CENINJ(IRAD,INJU) = 1.0
         ELSE
            CENINJ(IRAD,INJU) = 1.0-EXP(-.693 * DRATIO ** EIFACB(INJU))
         ENDIF
      ELSE
         CENINJ(IRAD,INJU) = 0.0
      ENDIF

   80 CONTINUE
   90 CONTINUE

      IF (IPLUME .EQ. 1) THEN
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
        IROTAT = NUMCOR
      ENDIF
C
C  LOOP OVER ALL SPATIAL ELEMENTS UNDER THE PLUME
C
      DO 600 JANG = 1, IROTAT
      DO 500 IRAD = 1, NUMRAD
C
C  SKIP THE RISK CALCULATIONS IF THE PLUME NEVER GOT TO THIS ELEMENT
C
      IF (.NOT. IHITIT(IRAD,JANG)) THEN
        DO 100 INJU = 1, NUMEIN
  100   RISINJ(INJU,IRAD,JANG) = 0.
        GO TO 500
      ENDIF

      IF (IPRINT .GE. 4) THEN
        WRITE(6,120) IRAD, JANG, SPACEN(IRAD)
  120   FORMAT(/' (', I2, ',', I2, ') AT', F9.0, ' METERS',
     $          ', RISKS OF EARLY INJURIES:  ')
      ENDIF

      DO 400 INJU = 1, NUMEIN

      TOTRIS(INJU) = 0.
C
C  LOOP OVER ALL FINE GRID SUBDIVISIONS
C
      DO 200 KFIN = 1, NUMFIN

      DOSTEM = T1DOSE(INDXEI(INJU),KFIN,IRAD,JANG)
C
C AVOID OVERFLOW AND LOG OF ZERO IN CALCULATING INJURY RISKS
C
      IF (DOSTEM .GE. EITHRE(INJU)) THEN

         DRATIO  = DOSTEM / EIFACA(INJU)

         IF (DRATIO .LT. 1.E-6) THEN
            RISINJ(INJU,IRAD,JANG) = 0.0
         ELSE IF (LOG10(DRATIO) * EIFACB(INJU) .GT. 6.0) THEN
            RISINJ(INJU,IRAD,JANG) = 1.0
            GO TO 220
         ENDIF

         HAZARD = DRATIO ** EIFACB(INJU)
```

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         RISK = 1. - EXP (-.693 * HAZARD)
         TOTRIS(INJU) = TOTRIS(INJU) + RISK
      ENDIF

  200 CONTINUE

      RISINJ(INJU,IRAD,JANG) = TOTRIS(INJU) / NUMFIN

  220 CONTINUE

      IF (IPRINT .GE. 4) THEN
        WRITE(6,250) EINAME(INJU), ORGNAM(INDXEI(INJU)),
     $               RISINJ(INJU,IRAD,JANG)
  250   FORMAT(1X, A, ', ', A, ' ,AVG RISK=', 1PE8.2)
      ENDIF

  400 CONTINUE
  500 CONTINUE
  600 CONTINUE

      RETURN
      END
*DECK CANRIS
      SUBROUTINE CANRIS
C
C THIS ROUTINE CALCULATES THE RISK OF CANCER FOR ALL SPATIAL ELEMENTS
C FROM ACUTE EXPOSURE AND STORES THE RESULTS IN /CENCAN/ AND /RISCAN/.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C ACNAME - NAMES OF THE LATENT CANCERS THAT CAN RESULT FROM ACUTE EXPOSURE
C ACSUSC - FRACTION OF THE POPULATION THAT IS SUSCEPTIBLE TO THIS CANCER
C ACTHRE - THRESHOLD DOSE FOR USING LINEAR DOSE RESPONSE FORMULA
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C CANFAT - RISK OF CANCER FATALITY FROM ACUTE EXPOSURE IN EACH COARSE ELEMENT
C CANFAT - RISK OF CANCER FATALITY FROM ACUTE EXPOSURE IN EACH COARSE ELEMENT
C CANINJ - RISK OF CANCER INJURY FROM ACUTE EXPOSURE IN EACH COARSE ELEMENT
C CCANFA - CENTERLINE RISK OF CANCER FATALITY (IRAD,ICAN)
C CCANIN - CENTERLINE RISK OF CANCER INJURY (IRAD,ICAN)
C CENCD  - CENTERLINE CLOUDSHINE DOSE (INTRVL,ORGAN)
C CENDOS - CENTERLINE TOTAL DOSE AT THIS DISTANCE
C CENFAT - CENTERLINE RISK OF FATALITY ARRAY (IRAD)
C CENGD  - CENTERLINE GROUNDSHINE DOSE (INTRVL,ORGAN)
C CENPID - CENTERLINE PLUME INHALATION DOSE (INTRVL,ORGAN)
C CENRID - CENTERLINE RESUSPENSION INHALATION DOSE (INTRVL,ORGAN)
C CFRISK - RISK FACTOR FOR CANCER FATALITY (RISK/SIEVERT)
C CIRISK - RISK FACTOR FOR CANCER INJURY (RISK/SIEVERT)
C DDREFA - DOSE DEPENDENT CANCER RISK REDUCTION FACTOR
C DDTHRE - THRESHOLD DOSE FOR DOSE DEPENDENT CANCER RISK REDUCTION FACTOR
C DOSEFA - CANCER DOSE EFFECTIVENESS FACTOR ALPHA FOR ACUTE EXPOSURE
C DOSEFB - CANCER DOSE EFFECTIVENESS FACTOR BETA FOR ACUTE EXPOSURE
C DOSTEM - TEMPORARY VARIABLE STORING CURRENT DOSE LEVEL
C ICAN   - LOOP COUNTER ON CANCERS FROM ACUTE EXPOSURE
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDXAC - INDEX TO THE ACUTE CANCER ORGANS
C IPRINT - FLAG INDICATING THE LEVEL OF DEBUG OUTPUT DESIRED
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL INTERVALS
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C JANG   - LOOP COUNTER ON ANGULAR SPATIAL INTERVALS
C KFIN   - LOOP COUNTER ON FINE ANGULAR SUBDIVISIONS
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C NUMACA - NUMBER OF ACUTE EXPOSURE CANCER EFFECTS DEFINED IN THE MODEL
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C RISFAT - RISK OF EARLY DEATH IN EACH FINE SPATIAL ELEMENT (KFIN,IRAD,JANG)
C SPACEN - ARRAY OF DISTANCES TO SPATIAL ELEMENT CENTERPOINTS
C TOTFAT - ACCUMULATOR FOR CANCER FATALITY RISK IN A COARSE SPATIAL ELEMENT
C TOTINJ - ACCUMULATOR FOR CANCER INJURY RISK IN A COARSE SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 12 SEPT 84.
C
C MODIFIED 10 MARCH 86, BY D. CHANIN, SEE SER #5.
C    CALCULATION OF CANCER RISK WHEN DOSE EXCEEDED ACTHRE WAS INCORRECT.
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C MODIFIED 31 MAR 87, D.C., SER #49, DIMENSION ERROR ON THE RISFAT ARRAY
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATIONS OF RISK IF PLUME DIDN'T REACH
C                          AND CENTERLINE RISK IF (IPLUME .GT. 1)
C MODIFIED 2/12/92, D.C., # 2/12/92-A, APPLY A DOSE DEPENDENT REDUCTION FACTOR,
C   DDREFA, TO CANCER RISKS IF THE DOSE TO AN INDIVIDUAL TARGET ORGAN IS LESS
C   THAN DDTHRE
C MODIFIED 11/12/94, D.C., FIXED THE INCORRECT DDREFA IMPLEMENTATION
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /IPRINT/ IPRINT
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      CHARACTER *10 ACNAME
      COMMON /ACNAME/ ACNAME(10)
      COMMON /RISCAN/ CANFAT(10,MAXRAD,16), CANINJ(10,MAXRAD,16)
      COMMON /RISFAT/ RISFAT(7,MAXRAD,16), FATAVG(MAXRAD,16)
      COMMON /CENDOS/ CENCD(MAXRAD,2:MAXORG), CENGD(MAXRAD,2:MAXORG),
     1 CENSKI(MAXRAD), CENPID(MAXRAD,2:MAXORG), CENRID(MAXRAD,2:MAXORG)
      COMMON /CENFAT/ CENFAT(MAXRAD)
      COMMON /CENCAN/ CCANFA(MAXRAD,10), CCANIN(MAXRAD,10)
C
      IF (NUMACA .EQ. 0) RETURN
C
C  IF WE ARE USING WIND-SHIFT SKIP OVER THE CENTERLINE RISK CALCULATIONS
C
      IF (IPLUME .GT. 1) GO TO 110

      DO 100 ICAN = 1, NUMACA
      DO 100 IRAD = 1, NUMRAD

      IF (INDXAC(ICAN) .GT. 1) THEN
      CENDOS = CENCD(IRAD,INDXAC(ICAN)) + CENGD(IRAD,INDXAC(ICAN))
     1         + CENPID(IRAD,INDXAC(ICAN)) + CENRID(IRAD,INDXAC(ICAN))
      ELSE
      CENDOS = CENSKI(IRAD)
      ENDIF
```

```
      CCANFA(IRAD,ICAN) = CENDOS * CFRISK(ICAN)
     $          * (DOSEFA(ICAN) + DOSEFB(ICAN) * MIN (CENDOS,ACTHRE))
     $          * (1. - CENFAT(IRAD)) * ACSUSC(ICAN)

      CCANIN(IRAD,ICAN) = CENDOS * CIRISK(ICAN)
     $          * (DOSEFA(ICAN) + DOSEFB(ICAN) * MIN (CENDOS,ACTHRE))
     $          * (1. - CENFAT(IRAD)) * ACSUSC(ICAN)
C
C  APPLY THE DOSE DEPENDENT REDUCTION FACTOR IF DOSE IS BELOW DDTHRE
C
      IF (CENDOS .LT. DDTHRE) THEN
        CCANFA(IRAD,ICAN) = CCANFA(IRAD,ICAN) / DDREFA(ICAN)
        CCANIN(IRAD,ICAN) = CCANIN(IRAD,ICAN) / DDREFA(ICAN)
      ENDIF
  100 CONTINUE
  110 CONTINUE
      IF (IPLUME .EQ. 1) THEN
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
        IROTAT = NUMCOR
      ENDIF
      DO 600 JANG = 1, IROTAT
      DO 500 IRAD = 1, NUMRAD
      IF (.NOT. IHITIT(IRAD,JANG)) THEN
        DO 40 ICAN = 1, NUMACA
        CANFAT(ICAN,IRAD,JANG) = 0.
   40   CANINJ(ICAN,IRAD,JANG) = 0.
        GO TO 500
      ENDIF
      IF (IPRINT .GE. 4) THEN
        WRITE(6,150) IRAD, JANG, SPACEN(IRAD)
  150   FORMAT(/' (', I2, ',', I2,') AT', F9.0, ' METERS')
      ENDIF
      DO 400 ICAN = 1, NUMACA
      TOTFAT = 0.
      TOTINJ = 0.
      DO 200 KFIN = 1, NUMFIN

      DOSTEM = T1DOSE(INDXAC(ICAN),KFIN,IRAD,JANG)
      IF (DOSTEM .LT. DDTHRE) DOSTEM = DOSTEM / DDREFA(ICAN)

      TOTFAT = TOTFAT + DOSTEM * CFRISK(ICAN)
     $       * (DOSEFA(ICAN) + DOSEFB(ICAN) * MIN (DOSTEM,ACTHRE))
     $       * (1. - RISFAT(KFIN,IRAD,JANG))
      TOTINJ = TOTINJ + DOSTEM * CIRISK(ICAN)
     $       * (DOSEFA(ICAN) + DOSEFB(ICAN) * MIN (DOSTEM,ACTHRE))
     $       * (1. - RISFAT(KFIN,IRAD,JANG))
  200 CONTINUE
      CANFAT(ICAN,IRAD,JANG) = TOTFAT / NUMFIN * ACSUSC(ICAN)
      CANINJ(ICAN,IRAD,JANG) = TOTINJ / NUMFIN * ACSUSC(ICAN)
      IF (IPRINT .GE. 4) THEN
        WRITE(6,350) ACNAME(ICAN), CANFAT(ICAN,IRAD,JANG),
     $                             CANINJ(ICAN,IRAD,JANG)
  350   FORMAT(1X, A, ': RISK OF FATALITY= ',1PE9.2,
     $          ', RISK OF INJURY= ',E9.2)
      ENDIF
  400 CONTINUE
  500 CONTINUE
  600 CONTINUE
      RETURN
      END
*DECK STOEAR
```

```
      SUBROUTINE STOEAR
C
C THIS ROUTINE CONTROLS THE CALCULATION OF THE EMERGENCY PHASE RESULTS
C
C THESE RESULTS ARE THEN STORED ON THE
C NSTRTG RESULTS FILES NUMBERED FROM 31 TO (30+NSTRTG)
C
C THIS ROUTINE IS CALLED BY SUBROUTINE EAROUT.
C
C GLOSSARY OF VARIABLES:
C
C IBINUM - THE BIN NUMBER OF THIS TRIAL
C IDAY   - THE DAY OF THIS TRIAL
C IHOUR  - THE HOUR OF THIS TRIAL
C IOUT   - LOOP COUNTER ON THE VARIOUS TYPES OF RESULTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C ITRIAL - THE SEQUENCE NUMBER OF THIS TRIAL
C PRBMET - PROBABILITY OF THIS WEATHER TRIAL
C
C GLOSSARY OF EXTERNALS:
C
C OUTPT1 - CALCULATES RESULTS OF TYPE 1
C OUTPT2 - CALCULATES RESULTS OF TYPE 2
C OUTPT3 - CALCULATES RESULTS OF TYPE 3
C OUTPT4 - CALCULATES RESULTS OF TYPE 4
C OUTPT5 - CALCULATES RESULTS OF TYPE 5
C OUTPT6 - CALCULATES RESULTS OF TYPE 6
C OUTPT7 - CALCULATES RESULTS OF TYPE 7
C OUTPT8 - CALCULATES RESULTS OF TYPE 8
C OUTPTA - Calculates results of TYPE A
C OUTPTB - Calculates results of TYPE B
C
C DAVID CHANIN, DIV. 6415, 26 MAR 85.
C
C MODIFIED 4 AUG 86, D.C., SER #30, ADDED RESULT TYPE 9,
C  POPULATION WEIGHTED CANCER DEATH RISK WITHIN 10 MILES
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
C  NO INTRINSIC FUNCTIONS
      EXTERNAL OUTPT1, OUTPT2, OUTPT3, OUTPT4, OUTPT5, OUTPT6,
     $         OUTPT7, OUTPT8, OUTPTA, OUTPTB
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
C
      IUNIT = 30 + ISTRTG
      IF (ISRCTM .EQ. 1 .AND. ITRIAL .EQ. 1) THEN
        REWIND (IUNIT)
        WRITE(IUNIT) HEADER
      ENDIF
C
      WRITE(IUNIT) ITRIAL, PRBMET, IBINUM, IDAY, IHOUR
C
      IRESUL = 0
C
```

```
      CALL OUTPT1 (IRESUL,IUNIT)
      CALL OUTPT2 (IRESUL,IUNIT)
      CALL OUTPT3 (IRESUL,IUNIT)
      CALL OUTPT4 (IRESUL,IUNIT)
      CALL OUTPT5 (IRESUL,IUNIT)
      CALL OUTPT6 (IRESUL,IUNIT)
      CALL OUTPT7 (IRESUL,IUNIT)
      CALL OUTPT8 (IRESUL,IUNIT)
      CALL OUTPTA (IRESUL,IUNIT)
      CALL OUTPTB (IRESUL,IUNIT)
C
      RETURN
      END
*DECK OUTPT1
      SUBROUTINE OUTPT1 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 1:
C
C TOTAL NUMBER OF A GIVEN HEALTH EFFECT
C (EARLY DEATHS AND INJURIES, LATENT CANCER DEATHS AND INJURIES)
C DUE TO THE EMERGENCY PHASE ("EARLY" DOSE MODULE)
C WITHIN A RANGE OF DISTANCES
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFEC1 - CALCULATED TOTAL CASES OF THE GIVEN HEALTH EFFECTS
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IECOD1 - ARRAY OF HEALTH EFFECTS CODES, SEE BELOW
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED FAN MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C I1DIS1 - INNER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C I2DIS1 - OUTER LIMIT ON THE REGION OF INTEREST FOR TYPE 1 RESULTS (INTERVAL)
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMEIN - NUMBER OF EARLY INJURIES DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM1   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C IECOD1 =  0, NUMBER OF EARLY DEATHS
C           I, (I IS BETWEEN 1 AND 10) NUMBER OF TYPE I EARLY INJURIES
C         100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) NUMBER OF TYPE I-100 CANCER DEATHS
C         200, TOTAL NUMBER OF LATENT CANCER INJURIES FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 201 AND 210) NUMBER OF TYPE I-200 CANCER INJURIES
C
C GLOSSARY OF EXTERNALS:
C
C EFFGET - RETURNS THE NUMBER OF A GIVEN EFFECT AT A GIVEN SPATIAL ELEMENT
C
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C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY D. CHANIN, 4 FEB 86, INCORRECT CALCULATION OF INPOP2, SEE SER #1
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATION OF RESULT IF PLUME DIDN'T REACH
C MODIFIED 10 MAR 88, D.C., SAVE ALL RESULTS IN AN ARRAY AND WRITE AS A BLOCK
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
      EXTERNAL ABORT
      EXTERNAL EFFGET
C  NO INTRINSIC FUNCTIONS
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      LOGICAL CCDF1
      COMMON /RESLT1/ NUM1, IECOD1(40), I1DIS1(40), I2DIS1(40),
     1                CCDF1(40)
      COMMON /EFFEC1/ EFFEC1(16,40)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
C
      DO 900 IOUT = 1, NUM1
      IRESUL = IRESUL + 1
      DO 100 IROT = 1, NUMCOR
  100 EFFEC1(IROT,IOUT) = 0.
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = I1DIS1(IOUT), I2DIS1(IOUT)
  200   EFFEC1(IROT,IOUT) = EFFEC1(IROT,IOUT) +
     1    EFFGET(IECOD1(IOUT),IRAD,1,IROT)
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
        DO 300 IANG = 2, IROTAT
        DO 300 IRAD = I1DIS1(IOUT), I2DIS1(IOUT)
        IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
  250     EFFEC1(IROT,IOUT) = EFFEC1(IROT,IOUT) +
     $      EFFGET(IECOD1(IOUT),IRAD,IANG,INPOP1) +
     $      EFFGET(IECOD1(IOUT),IRAD,IANG,INPOP2)
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = I1DIS1(IOUT), I2DIS1(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP = IANG + IROT - 1
          IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
  350     EFFEC1(IROT,IOUT) = EFFEC1(IROT,IOUT) +
     $      EFFGET(IECOD1(IOUT),IRAD,IANG,INPOP)
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      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 600 IANG = 1, NUMCOR
        DO 600 IRAD = I1DIS1(IOUT), I2DIS1(IOUT)
  600   IF (IHITIT(IRAD,IANG))
     1    EFFEC1(1,IOUT) = EFFEC1(1,IOUT) +
     2      EFFGET(IECOD1(IOUT),IRAD,IANG,IANG)

      ENDIF
  900 CONTINUE
C
C  WRITE THE RESULT ARRAYS ON IUNIT AS A BLOCK IN ORDER TO CUT I/O COST
C
      DO 950 IOUT = 1, NUM1
  950 WRITE(IUNIT) (EFFEC1(IROT,IOUT),IROT=1,NUMVAL(IRESUL))

      RETURN
      END
*DECK EFFGET
      FUNCTION EFFGET (IECOD1, IRAD, IANG, INDPOP)
C
C THIS ROUTINE HELPS CALCULATE RESULT NUMBER 1:
C TOTAL NUMBER OF A GIVEN EFFECT (LATENT CANCER, EARLY DEATH, EARLY INJURIES)
C IT RETURNS THE NUMBER OF A GIVEN EFFECT IN A GIVEN SPATIAL ELEMENT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTPT1.
C
C GLOSSARY OF VARIABLES:
C
C CANFAT - RISK OF CANCER FATALITY FROM ACUTE EXPOSURE IN EACH COARSE ELEMENT
C CANINJ - RISK OF CANCER INJURY FROM ACUTE EXPOSURE IN EACH COARSE ELEMENT
C EFFGET - CALCULATED NUMBER OF THE GIVEN EFFECT IN THE SPATIAL ELEMENT
C FATAVG - AVERAGE RISK OF FATALITY IN THE COARSE GRID ELEMENT (RADIAL,ANGULAR)
C IANG   - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE RISK IS TO BE USED
C ICAN   - LOOP COUNTER ON LATENT CANCER EFFECTS
C IECOD1 - EFFECT CODE THAT SIGNIFIES WHICH EFFECT IS REQUESTED, SEE BELOW
C INDPOP - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE POPULATION IS TO BE USED
C IRAD   - RADIAL SPATIAL INDEX TO BOTH SPATIAL ELEMENTS
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C NUMACA - NUMBER OF ACUTE EXPOSURE CANCER EFFECTS DEFINED IN THE MODEL
C NUMEIN - NUMBER OF EARLY INJURIES DEFINED INTHE MODEL
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C RISINJ - RISKS OF EACH INJURY IN EACH COARSE SPATIAL ELEMENT (INJU,IRAD,JANG)
C
C IECOD1 =  0, NUMBER OF EARLY DEATHS
C           I, (I IS BETWEEN 1 AND 10) NUMBER OF TYPE I EARLY INJURIES
C         100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) NUMBER OF TYPE I-100 CANCER DEATHS
C         200, TOTAL NUMBER OF LATENT CANCER INJURIES FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 201 AND 210) NUMBER OF TYPE I-200 CANCER INJURIES
C
C DAVID CHANIN, DIV. 6415, 5 FEB 85.
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
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```
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      COMMON /RISFAT/ RISFAT(7,MAXRAD,16), FATAVG(MAXRAD,16)
      COMMON /RISINJ/ RISINJ(10,MAXRAD,16)
      COMMON /RISCAN/ CANFAT(10,MAXRAD,16), CANINJ(10,MAXRAD,16)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
C
      EFFGET = 0.

      IF (IECOD1 .EQ. 0) THEN
C
C  CALCULATE NUMBER OF EARLY DEATHS
C
      EFFGET = FATAVG(IRAD,IANG) * POPDAT(IRAD,INDPOP,ISTRTG)
      ELSE IF (IECOD1 .GT. 0 .AND. IECOD1 .LE. NUMEIN) THEN
C
C  CALCULATE EARLY INJURIES OF A SPECIFIC TYPE, INJURY NUMBER IECOD1
C
      EFFGET = RISINJ(IECOD1,IRAD,IANG) * POPDAT(IRAD,INDPOP,ISTRTG)
      ELSE IF (IECOD1 .EQ. 100) THEN
C
C  CALCULATE TOTAL CANCER DEATHS FROM ACUTE EXPOSURE
C
        DO 300 ICAN = 1, NUMACA
  300   EFFGET = EFFGET +
     1    CANFAT(ICAN,IRAD,IANG) * POPDAT(IRAD,INDPOP,ISTRTG)
      ELSE IF (IECOD1 .GT. 100 .AND. IECOD1 .LE. NUMACA + 100) THEN
C
C  CALCULATE LATENT CANCER DEATHS OF A SPECIFIC TYPE, CANCER NUMBER IECOD1-100
C
      EFFGET=CANFAT(IECOD1-100,IRAD,IANG) * POPDAT(IRAD,INDPOP,ISTRTG)
      ELSE IF (IECOD1 .EQ. 200) THEN
C
C  CALCULATE TOTAL CANCER INJURIES FROM ACUTE EXPOSURE
C
        DO 400 ICAN = 1, NUMACA
  400   EFFGET = EFFGET + CANINJ(ICAN,IRAD,IANG) *
     1                    POPDAT(IRAD,INDPOP,ISTRTG)
      ELSE IF (IECOD1 .GT. 200 .AND. IECOD1 .LE. NUMACA + 200) THEN
C
C  CALCULATE LATENT CANCER INJURIES OF SPECIFIC TYPE, CANCER NUMBER IECOD1-200
C
      EFFGET=CANINJ(IECOD1-200,IRAD,IANG) * POPDAT(IRAD,INDPOP,ISTRTG)
      ELSE
C
C  OPTION CODE IS ILLEGAL
C
        WRITE(6,*) 'INVALID OPTION CODE ', IECOD1
        WRITE(7,*) 'INVALID OPTION CODE ', IECOD1
        CALL ABORT ('OUTPT1')
      ENDIF
      RETURN
      END
*DECK OUTPT2
      SUBROUTINE OUTPT2 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 2:
C
C FURTHEST DISTANCE AT WHICH A GIVEN PROBABILITY OF EARLY DEATH, RISTHR,
C IS EXCEEDED. THIS DISTANCE IS REPORTED IN KILOMETERS AS OF SER #34.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
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C GLOSSARY OF VARIABLES:
C
C EFFEC2 - CALCULATED FURTHEST DISTANCES AT WHICH THRESHOLDS ARE EXCEEDED
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IANG1  - LOWER BOUND ON IANG
C IANG2  - UPPER BOUND ON IANG
C IFIN   - LOOP COUNTER ON FINE GRID ELEMENTS
C IFIN1  - LOWER BOUND ON IFIN
C IFIN2  - UPPER BOUND ON IFIN
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C MAXDIS - INDEX TO THE FURTHEST ELEMENT THAT EXCEEDS THE RISK THRESHOLD
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM2   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C RISFAT - RISK OF EARLY DEATH IN EACH FINE SPATIAL ELEMENT(FIN,RADIAL,ANGULAR)
C RISTHR - RISK THRESHOLD FOR EARLY DEATH (FATAL RADIUS DEFINITION)
C SPAEND - ARRAY OF DISTANCES TO SPATIAL ELEMENT ENDPOINTS (METERS)
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C MODIFIED 31 MAR 87, D.C., SER #49, DIMENSION ERROR ON THE RISFAT ARRAY
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 14 MAR 88, D.C., USE ENDPOINT DISTANCE INSTEAD OF MIDPOINT DISTANCE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
C  NO EXTERNAL FUNCTIONS
      INTRINSIC MAX
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF2
      COMMON /RESLT2/ NUM2, RISTHR(10), CCDF2(10)
      COMMON /RISFAT/ RISFAT(7,MAXRAD,16), FATAVG(MAXRAD,16)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
C
      IF (IPLUME .EQ. 1) THEN
C
C  FOR STRAIGHT LINE PLUME, RADIAL EVACUATION, PEAK RISK IS ALONG ONE RAY
C
        IFIN1 = (NUMFIN + 1) / 2
        IFIN2 = IFIN1
      IANG1 = 1
        IANG2 = 1
      ELSE
C
C  FOR FAN-SHAPED PLUME, RADIAL EVACUATION, CHECK ALL SPATIAL ELEMENTS
C
        IFIN1 = 1
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        IFIN2 = NUMFIN
      IANG1 = 1
        IANG2 = NUMCOR
      ENDIF

      DO 400 IOUT = 1, NUM2
      IRESUL = IRESUL + 1
      MAXDIS = 0
      EFFEC2 = 0.
C
C  LOOP OVER ALL FINE GRID ELEMENTS
C
      DO 300 IANG = IANG1, IANG2
      DO 300 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IFIN = IFIN1, IFIN2
  250   IF (RISFAT(IFIN,IRAD,IANG) .GT. RISTHR(IOUT))
     1        MAXDIS = MAX (IRAD, MAXDIS)
      ENDIF
  300 CONTINUE
C
C  IF THE THRESHOLD IS NOT EXCEEDED ANYWHERE, RETURN A VALUE OF ZERO DISTANCE
C
      IF (MAXDIS .GT. 0) EFFEC2 = SPAEND(MAXDIS) / 1000.
C
C  WRITE THE RESULT ON IUNIT
C
      WRITE(IUNIT) EFFEC2
  400 CONTINUE
      RETURN
      END
*DECK OUTPT3
      SUBROUTINE OUTPT3 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 3:
C
C NUMBER OF PEOPLE WHOSE DOSE TO A GIVEN ORGAN EXCEEDS A THRESHOLD.
C DEPENDING ON A USER SPECIFIED OPTION, EITHER ACUTE OR LIFETIME
C DOSE IS USED FOR THE EVALUATION.  THIS TYPE OF RESULT IS PRODUCED
C ONLY BY THE EARLY MODULE AND CANNOT BE PRODUCED BY THE CHRONC MODULE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C DOSTH3 - LIST OF DOSE THRESHOLDS USED FOR THIS RESULT
C EFFEC3 - CALCULATED NUMBERS OF PEOPLE WHOSE THRESHOLD IS EXCEEDED
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IFIN   - LOOP COUNTER ON FINE GRID DIVISIONS
C INDEX3 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED FAN MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON ROTATED WIND DIRECTION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
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C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM3   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C T1DOSE - DOSE ARRAY FOR ACUTE EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY D. CHANIN, 4 FEB 86, INCORRECT CALCULATION OF INPOP2, SEE SER #1
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-B, ADDED (ACUTE,LIFETIME) SWITCH
C                                         EVALUATION OF TYPE 3 RESULTS
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE

C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL CCDF3
      COMMON /RESLT3/ NUM3, INDEX3(10), DOSTH3(10), CCDF3(10)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
C
      DIMENSION EFFEC3(16)
      DO 800 IOUT = 1, NUM3
      IRESUL = IRESUL + 1
      DO 100 IROT = 1, NUMCOR
  100 EFFEC3(IROT) = 0.
      IF (IPLUME .EQ. 1) THEN
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 400 IANG = 1, IROTAT
      DO 400 IRAD = 1, NUMRAD
      DO 400 IFIN = 1, NUMFIN
      IF (T1DOSE(INDEX3(IOUT),IFIN,IRAD,IANG).GT.DOSTH3(IOUT)) THEN
        IF (IANG .EQ. 1) THEN
          DO 200 IROT = 1, NUMCOR
  200       EFFEC3(IROT) = EFFEC3(IROT) + POPDAT(IRAD,IROT,ISTRTG)
        ELSE
          DO 300 IROT = 1, NUMCOR
          INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
          INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
  300       EFFEC3(IROT) = EFFEC3(IROT) + POPDAT(IRAD,INPOP1,ISTRTG) +
     $                     POPDAT(IRAD,INPOP2,ISTRTG)
        ENDIF
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
      DO 500 IROT = 1, NUMCOR
      DO 500 IANG = 1, NUMCOR
      INPOP = IANG + IROT - 1
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      IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
      DO 500 IFIN = 1, NUMFIN
      DO 500 IRAD = 1, NUMRAD
  500   IF (T1DOSE(INDEX3(IOUT),IFIN,IRAD,IANG) .GT. DOSTH3(IOUT))
     $  EFFEC3(IROT) = EFFEC3(IROT) + POPDAT(IRAD,INPOP,ISTRTG)
      ELSE IF (IPLUME .EQ. 3) THEN
      DO 600 IANG = 1, NUMCOR
      DO 600 IRAD = 1, NUMRAD
      DO 600 IFIN = 1, NUMFIN
      IF (T1DOSE(INDEX3(IOUT),IFIN,IRAD,IANG) .GT. DOSTH3(IOUT))
     $      EFFEC3(1) = EFFEC3(1) + POPDAT(IRAD,IANG,ISTRTG)
  600   CONTINUE
      ENDIF
      WRITE(IUNIT) (EFFEC3(IROT) / NUMFIN, IROT = 1, NUMVAL(IRESUL))
  800 CONTINUE
      RETURN
      END
*DECK OUTPT4
      SUBROUTINE OUTPT4 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 4:
C
C 360 DEGREE AVERAGE RISK OF A GIVEN EFFECT AT A GIVEN DISTANCE
C
C AVERAGE RISK IS CALCULATED BY ADDING UP THE VALUES OF RISK IN EACH FINE
C GRID ELEMENT AT THE DESIRED DISTANCE AND DIVIDING BY THE NUMBER OF ELEMENTS
C AROUND THE CIRCLE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C CANFAT - RISK OF CANCER FATALITY FROM ACUTE EXPOSURE IN EACH COARSE ELEMENT
C EFFEC4 - CALCULATED AVERAGE RISKS OF EARLY DEATH
C FATAVG - AVERAGE RISK OF FATALITY IN THE COARSE GRID ELEMENT (RADIAL,ANGULAR)
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C ICAN   - LOOP COUNTER ON LATENT CANCER EFFECTS
C IECOD4 - ARRAY OF EFFECTS CODES, SEE BELOW
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - TEMPORARY VARIABLE STORING THE INDEX TO THE DESIRED DISTANCE
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C I1DIS4 - INDEX TO THE RADIAL SPATIAL ELEMENT AT WHICH RESULTS ARE DESIRED
C MULTIP - SCALE FACTOR USED TO DOUBLE RISK TO ACCOUNT FOR SYMMETRY
C NUMACA - NUMBER OF ACUTE EXPOSURE CANCER EFFECTS DEFINED IN THE MODEL
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMEIN - NUMBER OF EARLY INJURIES DEFINED INTHE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM4   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C RISINJ - RISKS OF EACH INJURY IN EACH COARSE SPATIAL ELEMENT (INJU,IRAD,JANG)
C
C IECOD4 =  0, AVERAGE RISK OF EARLY DEATH
C           I, (I IS BETWEEN 1 AND 10) AVERAGE RISK OF TYPE I EARLY INJURY
C         100, AVERAGE RISK OF LATENT CANCER DEATH FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) RISK OF TYPE I-100 CANCER DEATHS
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
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C                                          AND ARRAY DIMENSIONS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL CCDF4
      COMMON /RESLT4/ NUM4, IECOD4(20), I1DIS4(20), CCDF4(20)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
      COMMON /RISFAT/ RISFAT(7,MAXRAD,16), FATAVG(MAXRAD,16)
      COMMON /RISINJ/ RISINJ(10,MAXRAD,16)
      COMMON /RISCAN/ CANFAT(10,MAXRAD,16), CANINJ(10,MAXRAD,16)
C
      IF (IPLUME .EQ. 1) THEN
        MULTIP = 2.
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
        MULTIP = 1.
        IROTAT = NUMCOR
      ENDIF
      DO 900 IOUT = 1, NUM4
      IRESUL = IRESUL + 1
      EFFEC4 = 0.
      IRAD = I1DIS4(IOUT)
C
C  CALCULATE AVERAGE RISK OF EARLY DEATH
C
      IF (IECOD4(IOUT) .EQ. 0) THEN
      EFFEC4 = FATAVG(IRAD,1)
      DO 100 IANG = 2, IROTAT
  100   EFFEC4 = EFFEC4 + MULTIP * FATAVG(IRAD,IANG)
      EFFEC4 = EFFEC4 / NUMCOR
C
C  CALCULATE RISK OF EARLY INJURIES OF A SPECIFIC TYPE: INJURY NUMBER IECOD4
C
      ELSE IF (IECOD4(IOUT) .GT. 0 .AND. IECOD4(IOUT) .LE. NUMEIN) THEN
      EFFEC4 = RISINJ(IECOD4(IOUT),IRAD,1)
      DO 200 IANG = 2, IROTAT
  200   EFFEC4 = EFFEC4 + MULTIP * RISINJ(IECOD4(IOUT),IRAD,IANG)
      EFFEC4 = EFFEC4 / NUMCOR
C
C  CALCULATE AVERAGE RISK OF LATENT CANCER DEATH, TOTAL LATENT CANCER RISK
C
      ELSE IF (IECOD4(IOUT) .EQ. 100) THEN
      EFFEC4 = 0.
      DO 300 ICAN = 1, NUMACA
      EFFEC4 = EFFEC4 + CANFAT(ICAN,IRAD,1)
      DO 300 IANG = 2, IROTAT
  300   EFFEC4 = EFFEC4 + MULTIP * CANFAT(ICAN,IRAD,IANG)
      EFFEC4 = EFFEC4 / NUMCOR
C
C  CALCULATE RISK OF LATENT CANCER DEATH OF A SPECIFIC TYPE:
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C     CANCER NUMBER IECOD4-100
C
      ELSE IF (IECOD4(IOUT) .GT. 100
     $   .AND. IECOD4(IOUT) .LE. NUMACA + 100) THEN
      EFFEC4 = CANFAT(IECOD4(IOUT) - 100,IRAD,1)
      DO 400 IANG = 2, IROTAT
  400   EFFEC4 = EFFEC4 + MULTIP * CANFAT(IECOD4(IOUT) - 100,IRAD,IANG)
      EFFEC4 = EFFEC4 / NUMCOR
      ELSE
      WRITE(6,*) 'INVALID VALUE OF IECOD4 IN OUTPT4', IECOD4(IOUT)
      WRITE(7,*) 'INVALID VALUE OF IECOD4 IN OUTPT4', IECOD4(IOUT)
        CALL ABORT ('OUTPT4')
      ENDIF
      WRITE(IUNIT) EFFEC4
  900 CONTINUE
      RETURN
      END
*DECK OUTPT5
      SUBROUTINE OUTPT5 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 5:
C
C TOTAL LONG TERM POPULATION DOSE TO A GIVEN ORGAN BETWEEN TWO DISTANCES.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFEC5 - CALCULATED TOTAL MAN-SIEVERTS DOSES
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IFIN   - LOOP COUNTER ON FINE GRID DIVISIONS
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDEX5 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED FAN MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON ROTATED WIND DIRECTION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C I1DIS5 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS5 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM5   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY D. CHANIN, 4 FEB 86, INCORRECT CALCULATION OF INPOP2, SEE SER #1
C MODIFIED 30 MAR 87, D.C., SER #61, I1DIS5 AND I2DIS5 WERE IGNORED WHEN
C                      CALCULATING THE POPULATION DOSE IN DIRECTIONS NOT
C                      DIRECTLY UNDER THE PLUME. DOSE WAS ACCUMULATED OVER
C                      ALL RADIAL SPATIAL INTERVALS (I.E. 1 TO NUMRAD).
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C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 8 MAR 88, D.C., SKIP CALCULATIONS OF RESULTS IF PLUME DIDN'T REACH
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      LOGICAL CCDF5
      COMMON /RESLT5/ NUM5, INDEX5(10), I1DIS5(10), I2DIS5(10),
     1                CCDF5(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
C
      DIMENSION EFFEC5(16)
      DO 900 IOUT = 1, NUM5
      IRESUL = IRESUL + 1
      DO 100 IROT = 1, NUMCOR
  100 EFFEC5(IROT) = 0.
      IF (IPLUME .EQ. 1) THEN
        DO 200 IFIN = 1, NUMFIN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = I1DIS5(IOUT), I2DIS5(IOUT)
  200   EFFEC5(IROT) = EFFEC5(IROT) +
     1  T1DOSE(INDEX5(IOUT),IFIN,IRAD,1) * POPDAT(IRAD,IROT,ISTRTG) /
     2  NUMFIN
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
        DO 300 IANG = 2, IROTAT
        DO 300 IRAD = I1DIS5(IOUT), I2DIS5(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
        DO 250 IFIN = 1, NUMFIN
  250     EFFEC5(IROT) = EFFEC5(IROT) +
     1     T1DOSE(INDEX5(IOUT),IFIN,IRAD,IANG) *
     2     (POPDAT(IRAD,INPOP1,ISTRTG) + POPDAT(IRAD,INPOP2,ISTRTG)) /
     3     NUMFIN
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = I1DIS5(IOUT), I2DIS5(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP = IANG + IROT - 1
          IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
        DO 350 IFIN = 1, NUMFIN
  350     EFFEC5(IROT) = EFFEC5(IROT) +
     1    T1DOSE(INDEX5(IOUT),IFIN,IRAD,IANG) *
     2    POPDAT(IRAD,INPOP,ISTRTG) / NUMFIN
```

```
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 700 IANG = 1, NUMCOR
        DO 700 IRAD = I1DIS5(IOUT), I2DIS5(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 600 IFIN = 1, NUMFIN
  600     EFFEC5(1) = EFFEC5(1) +
     1    T1DOSE(INDEX5(IOUT),IFIN,IRAD,IANG) *
     2    POPDAT(IRAD,IANG,ISTRTG) / NUMFIN
      ENDIF
  700   CONTINUE
      ENDIF
      WRITE(IUNIT) (EFFEC5(IROT),IROT=1,NUMVAL(IRESUL))
  900 CONTINUE
      RETURN
      END
*DECK OUTPT6
      SUBROUTINE OUTPT6 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 6:
C
C CENTERLINE DOSE AT VARIOUS DISTANCES FOR A SELECTED ORGAN BY PATHWAY.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C CENCD  - CENTERLINE CLOUDSHINE DOSE (INTRVL,ORGAN)
C CENGD  - CENTERLINE GROUNDSHINE DOSE (INTRVL,ORGAN)
C CENPID - CENTERLINE PLUME INHALATION DOSE (INTRVL,ORGAN)
C CENRID - CENTERLINE RESUSPENSION INHALATION DOSE (INTRVL,ORGAN)
C EFFEC6 - DOSE VS DISTANCE ARRAY FOR THIS RESULT
C INDEX6 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPATHW - PATHWAY CODES, DEFINED BELOW
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C I1DIS6 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS6 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C NUM6   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C
C  IPATHW = 1, CLOUDSHINE DOSE
C           2, GROUNDSHINE DOSE
C           3, ACUTE DIRECT INHALATION DOSE
C           4, LIFETIME DIRECT INHALATION DOSE
C           5, TOTAL ACUTE DOSE
C           6, TOTAL LONG TERM DOSE
C           7, LIFETIME RESUSPENSION INHALATION DOSE
C           8, ACUTE RESUSPENSION INHALATION DOSE
C
C DAVID CHANIN, DIV. 6415, 7 JUNE 1985.
C MODIFIED 5 SEPT 86, D.C., SER #35, ADDED RESUSPENSION INHALATION MODEL
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
```

```
      LOGICAL CCDF6
      COMMON /RESLT6/ NUM6, IPATHW(10), INDEX6(10),
     1                I1DIS6(10), I2DIS6(10), CCDF6(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /CENDOS/ CENCD(MAXRAD,2:MAXORG), CENGD(MAXRAD,2:MAXORG),
     1 CENSKI(MAXRAD), CENPID(MAXRAD,2:MAXORG), CENRID(MAXRAD,2:MAXORG)
C
      DIMENSION EFFEC6(MAXRAD)
C
      IF (NUM6 .EQ. 0) THEN
        RETURN
      ELSE IF (IPLUME .NE. 1) THEN
        WRITE(6,*) 'ERROR: INTERNAL ERROR FOUND IN SUBROUTINE OUTPT6'
        WRITE(6,*) 'STRAIGHT LINE PLUME, RADIAL EVACUATION IS REQUIRED'
        WRITE(6,*) 'INVALID OUTPUT REQUEST'
        WRITE(7,*) 'ERROR: INTERNAL ERROR FOUND IN SUBROUTINE OUTPT6'
        WRITE(7,*) 'STRAIGHT LINE PLUME, RADIAL EVACUATION IS REQUIRED'
        WRITE(7,*) 'INVALID OUTPUT REQUEST'
        CALL ABORT ('OUTPT6')
      ENDIF
C
      DO 900 IOUT = 1, NUM6
C
      DO 50 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
   50 EFFEC6(IRAD) = 0.
C
      IF (INDEX6(IOUT) .EQ. 1) THEN
      DO 80 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
   80   EFFEC6(IRAD) = CENSKI(IRAD)
      ELSE IF (IPATHW(IOUT) .EQ. 1) THEN
      DO 100 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
  100   EFFEC6(IRAD) = CENCD(IRAD,INDEX6(IOUT))
      ELSE IF (IPATHW(IOUT) .EQ. 2) THEN
        DO 200 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
  200   EFFEC6(IRAD) = CENGD(IRAD,INDEX6(IOUT))
      ELSE IF (IPATHW(IOUT) .EQ. 3) THEN
        DO 300 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
  300   EFFEC6(IRAD) = CENPID(IRAD,INDEX6(IOUT))
      ELSE IF (IPATHW(IOUT) .EQ. 4) THEN
        DO 400 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
  400   EFFEC6(IRAD) = CENPID(IRAD,INDEX6(IOUT))
      ELSE IF (IPATHW(IOUT) .EQ. 5 .OR. IPATHW(IOUT) .EQ. 6) THEN
        DO 500 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
  500   EFFEC6(IRAD) = CENCD(IRAD,INDEX6(IOUT)) +
     1    CENGD(IRAD,INDEX6(IOUT)) + CENPID(IRAD,INDEX6(IOUT)) +
     2    CENRID(IRAD,INDEX6(IOUT))
      ELSE IF (IPATHW(IOUT) .EQ. 7 .OR. IPATHW(IOUT) .EQ. 8) THEN
      DO 600 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
  600   EFFEC6(IRAD) = CENRID(IRAD,INDEX6(IOUT))
      ENDIF
C
      DO 850 IRAD = I1DIS6(IOUT), I2DIS6(IOUT)
      IRESUL = IRESUL + 1
  850 WRITE(IUNIT) EFFEC6(IRAD)
  900 CONTINUE
      RETURN
      END
*DECK OUTPT7
      SUBROUTINE OUTPT7 (IRESUL,IUNIT)
C
```

```
C THIS ROUTINE CALCULATES RESULT NUMBER 7:
C
C CENTERLINE RISK AT VARIOUS DISTANCES OF A GIVEN EFFECT
C (EARLY DEATHS AND INJURIES, LATENT CANCER DEATHS, INJURIES).
C
C THE RISK VALUE WAS CALCULATED BY THE RISK ROUTINES FATRIS,INJRIS,CANRIS
C BY USING THE CENTERLINE DOSE.
C
C THIS ROUTINE IS CALLED BY ROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C CCANFA - CENTERLINE RISK OF CANCER FATALITY (IRAD,ICAN)
C CCANIN - CENTERLINE RISK OF CANCER INJURY (IRAD,ICAN)
C CENFAT - CENTERLINE RISK OF FATALITY ARRAY (IRAD)
C CENINJ - CENTERLINE RISK OF INJURY (IRAD,INJU)
C EFFEC7 - CALCULATED RISK VS DISTANCE OF THE DESIRED EFFECT
C ICAN   - LOOP COUNTER ON CANCER TYPES
C IECOD7 - ARRAY OF EFFECTS CODES, DEFINED BELOW
C INJU   - LOOP COUNTER ON TYPES OF EARLY INJURY
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C I1DIS7 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS7 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C NUMACA - NUMBER OF ACUTE EXPOSURE CANCER EFFECTS DEFINED IN THE MODEL
C NUMEIN - NUMBER OF EARLY INJURIES DEFINED IN THE MODEL
C NUM7   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C REMFRA - REMAINING FRACTION OF THE POPULATION THAT HAS NOT CONTRACTED CANCER
C SAVRIS - RISK VALUE THAT WAS SAVED FROM THE PREVIOUS LOOP
C
C IECOD7 =  0, NUMBER OF EARLY DEATHS
C           I, (I IS BETWEEN 1 AND 10) NUMBER OF TYPE I EARLY INJURIES
C         100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) NUMBER OF TYPE I-100 CANCER DEATHS
C         200, TOTAL NUMBER OF LATENT CANCER INJURIES FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 201 AND 210) NUMBER OF TYPE I-200 CANCER INJURIES
C
C DAVID CHANIN, DIV. 6415, 7 JUNE 1985.
C
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                     AND ARRAY DIMENSIONS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CCDF7
      COMMON /RESLT7/ NUM7, IECOD7(10), I1DIS7(10), I2DIS7(10),
     1                CCDF7(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /EINJUR/ NUMEIN, INDXEI(10), EIFACA(10), EIFACB(10),
     $                EISUSC(10), EITHRE(10)
      COMMON /ACANCR/ NUMACA, DDTHRE, ACTHRE, INDXAC(10), ACSUSC(10),
     $  DOSEFA(10), DOSEFB(10), CFRISK(10), CIRISK(10), DDREFA(10)
```

```
      COMMON /CENFAT/ CENFAT(MAXRAD)
      COMMON /CENINJ/ CENINJ(MAXRAD,10)
      COMMON /CENCAN/ CCANFA(MAXRAD,10), CCANIN(MAXRAD,10)
C
      DIMENSION EFFEC7(MAXRAD)
C
      IF (NUM7 .EQ. 0) THEN
        RETURN
      ELSE IF (IPLUME .NE. 1) THEN
        WRITE(6,*) 'ERROR: INTERNAL ERROR FOUND IN SUBROUTINE OUTPT7'
        WRITE(6,*) 'STRAIGHT LINE PLUME, RADIAL EVACUATION IS REQUIRED'
        WRITE(6,*) 'INVALID OUTPUT REQUEST'
        WRITE(7,*) 'ERROR: INTERNAL ERROR FOUND IN SUBROUTINE OUTPT7'
        WRITE(7,*) 'STRAIGHT LINE PLUME, RADIAL EVACUATION IS REQUIRED'
        WRITE(7,*) 'INVALID OUTPUT REQUEST'
        CALL ABORT ('OUTPT7')
      ENDIF
      DO 900 IOUT = 1, NUM7
      IF (IECOD7(IOUT) .EQ. 0) THEN
        DO 100 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
  100   EFFEC7(IRAD) = CENFAT(IRAD)
      ELSE IF (IECOD7(IOUT) .GT. 0 .AND. IECOD7(IOUT) .LE. NUMEIN) THEN
        DO 300 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
  300   EFFEC7(IRAD) = CENINJ(IRAD,IECOD7(IOUT))
      ELSE IF (IECOD7(IOUT) .EQ. 100) THEN
        DO 400 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
      EFFEC7(IRAD) = 0.
      REMFRA = 1.
        SAVRIS = 0.
      DO 400 ICAN = 1, NUMACA
      REMFRA = REMFRA * (1. - SAVRIS)
        EFFEC7(IRAD) = EFFEC7(IRAD) + REMFRA * CCANFA(IRAD,ICAN)
  400   SAVRIS = CCANFA(IRAD,ICAN)
      ELSE IF (IECOD7(IOUT) .GT. 100
     $   .AND. IECOD7(IOUT) .LE. NUMACA + 100) THEN
        DO 500 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
  500   EFFEC7(IRAD) = CCANFA(IRAD,IECOD7(IOUT) - 100)
      ELSE IF (IECOD7(IOUT) .EQ. 200) THEN
        DO 600 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
      EFFEC7(IRAD) = 0.
      REMFRA = 1.
        SAVRIS = 0.
      DO 600 ICAN = 1, NUMACA
      REMFRA = REMFRA * (1. - SAVRIS)
        EFFEC7(IRAD) = EFFEC7(IRAD) + REMFRA * CCANIN(IRAD,ICAN)
  600   SAVRIS = CCANIN(IRAD,ICAN)
      ELSE IF (IECOD7(IOUT) .GT. 200
     $   .AND. IECOD7(IOUT) .LE. NUMACA + 200) THEN
        DO 700 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
  700   EFFEC7(IRAD) = CCANIN(IRAD,IECOD7(IOUT) - 200)
      ELSE
        WRITE(6,*) 'INVALID OPTION CODE ', IECOD7(IOUT)
        WRITE(7,*) 'INVALID OPTION CODE ', IECOD7(IOUT)
        CALL ABORT ('OUTPT7')
      ENDIF
      DO 850 IRAD = I1DIS7(IOUT), I2DIS7(IOUT)
      IRESUL = IRESUL + 1
  850 WRITE(IUNIT) EFFEC7(IRAD)
  900 CONTINUE
      RETURN
      END
*DECK OUTPT8
      SUBROUTINE OUTPT8 (IRESUL,IUNIT)
```

```
C
C THIS ROUTINE CALCULATES RESULT NUMBER 8:
C
C POPULATION WEIGHTED RISK OF A GIVEN HEALTH EFFECT BETWEEN 2 DISTANCES
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFEC8 - CALCULATED VALUES OF POPULATION WEIGHTED RISK OF EARLY DEATH
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IECOD8 - ARRAY OF HEALTH EFFECTS CODES, SEE BELOW
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED FAN MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C I1DIS8 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C I2DIS8 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUM8   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C TOTPOP - TOTAL POPULATION RESIDING IN THE REGION OF INTEREST
C
C IECOD8 =  0, POPULATION WEIGHTED RISK OF EARLY DEATH
C           I, (I IS BETWEEN 1 AND 10) RISK OF TYPE I EARLY INJURY
C         100, POP WTD RISK OF LATENT CANCER DEATH FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) RISK OF TYPE I-100 CANCER DEATH
C         200, POP WTD RISK OF LATENT CANCER INJURY FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 201 AND 210) RISK OF TYPE I-200 CANCER INJURIES
C
C GLOSSARY OF EXTERNALS:
C
C EFFGET - RETURNS THE NUMBER OF A GIVEN EFFECT AT A GIVEN SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 6 SEPT 85.
C MODIFIED BY D. CHANIN, 4 FEB 86, INCORRECT CALCULATION OF INPOP2, SEE SER #1
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C MODIFIED 2 JULY 87, D.C., SER #66, REVISION OF ALLOWABLE INPUT VALUES
C                                    AND ARRAY DIMENSIONS
C MODIFIED 18 AUG 87, DIC, SER #70, REVAMP FORMAT OF TAPE30 AND TAPE31 FILES
C MODIFIED 2 OCT 87, DIC, SER #72, NEW RESULT NAMES, NEW FORMAT RESULT FILES
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 8 MAR 88, D.C., SKIP CALCULATIONS OF RESULTS IF PLUME DIDN'T REACH
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL EFFGET
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
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      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      LOGICAL CCDF8
      COMMON /RESLT8/ NUM8, IECOD8(20), I1DIS8(20), I2DIS8(20),
     1                CCDF8(20)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
C
      DIMENSION EFFEC8(16)
C
      DO 900 IOUT = 1, NUM8
      IRESUL = IRESUL + 1
      DO 100 IROT = 1, NUMCOR
  100 EFFEC8(IROT) = 0.
      TOTPOP = 0.
      DO 120 IROT = 1, NUMCOR
      DO 120 IRAD = I1DIS8(IOUT), I2DIS8(IOUT)
  120 TOTPOP = TOTPOP + POPDAT(IRAD,IROT,ISTRTG)
      IF (TOTPOP .EQ. 0.) GO TO 900
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = I1DIS8(IOUT), I2DIS8(IOUT)
  200   EFFEC8(IROT) = EFFEC8(IROT) + EFFGET(IECOD8(IOUT),IRAD,1,IROT)
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 300 IANG = 2, IROTAT
        DO 300 IRAD = I1DIS8(IOUT), I2DIS8(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
  250     EFFEC8(IROT) = EFFEC8(IROT)
     $                 + EFFGET(IECOD8(IOUT),IRAD,IANG,INPOP1)
     $                 + EFFGET(IECOD8(IOUT),IRAD,IANG,INPOP2)
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = I1DIS8(IOUT), I2DIS8(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP = IANG + IROT - 1
          IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
  350     EFFEC8(IROT) = EFFEC8(IROT)
     $                 + EFFGET(IECOD8(IOUT),IRAD,IANG,INPOP)
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 600 IANG = 1, NUMCOR
        DO 600 IRAD = I1DIS8(IOUT), I2DIS8(IOUT)
      IF (IHITIT(IRAD,IANG))
     1  EFFEC8(1) = EFFEC8(1) + EFFGET(IECOD8(IOUT),IRAD,IANG,IANG)
  600   CONTINUE
      ENDIF
      DO 700 IROT = 1, NUMCOR
  700 EFFEC8(IROT) = EFFEC8(IROT) / TOTPOP
  900 WRITE(IUNIT) (EFFEC8(IROT),IROT=1,NUMVAL(IRESUL))
      RETURN
```

```
      END
*DECK OUTPTA
      SUBROUTINE OUTPTA (IRESUL,IUNIT)
C
C This routine calculates result of type A, the observed peak dose at
C a given distance.
C
C This routine is called by SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFECA - Calculated consequence measure for this result
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IFIN   - LOOP COUNTER ON FINE GRID DIVISIONS
C INDEXA - List of indices to the organs used for this result
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUMA   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C T1DOSE - DOSE ARRAY FOR CANCER EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C David Chanin, 8/15/92, New routine based in OUTPT3.
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL CCDFA
      COMMON /RESLTA/ NUMA, INDEXA(10),
     1                I1DISA(10), I2DISA(10), CCDFA(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
C
      IF (IPLUME .EQ. 1) THEN
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
      IROTAT = NUMCOR
      ENDIF
      DO 800 IOUT = 1, NUMA
      DO 800 IRAD = I1DISA(IOUT), I2DISA(IOUT)
      IRESUL = IRESUL + 1
      EFFECA = 0.
      DO 100 IANG = 1, IROTAT
      DO 100 IFIN = 1, NUMFIN
  100 EFFECA = MAX (EFFECA, T1DOSE(INDEXA(IOUT),IFIN,IRAD,IANG))
  800 WRITE(IUNIT) EFFECA
      RETURN
      END
*DECK OUTPTB
      SUBROUTINE OUTPTB (IRESUL,IUNIT)
C
```

```
C This routine calculates results of Type B, the observed peak dose at
C a given (r,theta) location.
C
C This routine is called by SUBROUTINE STOEAR.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFECB - Calculated consequence measure for this result
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IFIN   - LOOP COUNTER ON FINE GRID DIVISIONS
C INDEXB - List of indices to the organs used for this result
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMVAL - NUMBER OF RESULT VALUES PRODUCED FOR THIS RESULT IN A SINGLE TRIAL
C NUMA   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C T1DOSE - DOSE ARRAY FOR CANCER EFFECTS (ORGAN,FINE,RADIAL,ANGULAR)
C
C DAVID CHANIN, 2/16/96, new routine based on existing output routines.
C Modified 4/3/96: corrected the angular indexing so that it was not reversed
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL CCDFB
      COMMON /RESLTB/ NUMB, INDEXB(32),
     1                IRAD_B(32), IANG_B(32), CCDFB(32)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ T1DOSE(MAXORG,7,MAXRAD,16), PADIT1(88480)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      DIMENSION EFFECB(16,32)
C
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 900 IOUT = 1, NUMB
      DO 100 IROT = 1, 16
  100 EFFECB(IROT,IOUT) = 0.
      IRESUL = IRESUL + 1
      IRAD = IRAD_B(IOUT)
      IANG = IANG_B(IOUT)

      IF (IPLUME .EQ. 1) THEN
        DO 250 IROT = 1, 16
        INPOP1 = IANG - IROT + 1
        IF (INPOP1 .LT. 1) INPOP1 = INPOP1 + 16
        IF (INPOP1 .GT. 9) INPOP1 = 18 - INPOP1
        IF (INPOP1 .GT. IROTAT) GO TO 250
        DO 200 IFIN = 1, NUMFIN
  200   EFFECB(IROT,IOUT) =
     1    MAX (EFFECB(IROT,IOUT), T1DOSE(INDEXB(IOUT),IFIN,IRAD,INPOP1))
  250   CONTINUE
```

```
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IROT = 1, 16
        INPOP1 = IANG - IROT + 1
        IF (INPOP1 .LT. 1) INPOP1 = INPOP1 + 16
        DO 400 IFIN = 1, NUMFIN
  400   EFFECB(IROT,IOUT) =
     1    MAX (EFFECB(IROT,IOUT), T1DOSE(INDEXB(IOUT),IFIN,IRAD,INPOP1))

      ELSE IF (IPLUME .EQ. 3) THEN
        DO 800 IFIN = 1, NUMFIN
  800   EFFECB(1,IOUT) = MAX ( EFFECB(1,IOUT),
     1                         T1DOSE(INDEXB(IOUT),IFIN,IRAD,IANG) )
      ENDIF
  900 CONTINUE
C
C  WRITE THE RESULT ARRAYS ON IUNIT AS A BLOCK IN ORDER TO CUT I/O COST
C
      DO 950 IOUT = 1, NUMB
  950 WRITE(IUNIT) (EFFECB(IROT,IOUT),IROT=1,NUMVAL(IRESUL))
C
      RETURN
      END
*DECK CHROUT
      SUBROUTINE CHROUT
C
C THIS ROUTINE CONTROLS THE "CHRONC" SIMULATION FOR A SINGLE WEATHER TRIAL
C
C IT IS CALLED BY SUBROUTINE CONTRL.
C
C GLOSSARY OF EXTERNALS:
C
C CHRNDF - CALCULATES DOSES OVER VARIOUS EXPOSURE PERIODS FOR INITIAL
C          UNIT CONCENTRATIONS OF EACH RADIONUCLIDE
C CRNRSK - CONTROLS THE CHRONC SIMULATION PHASE
C SGCPLN - SUBROUTINE TO BUILD THE STRAIGHT LINE GROUND CONCENTRATIONS
C WGCPLN - SUBROUTINE TO BUILD THE WIND SHIFT GROUND CONCENTRATIONS
C
C MODIFIED BY D. CHANIN, 4 JAN 87, INTEGRATION OF MACCS INTO A SINGLE CODE
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-A, ELIMINATION OF INPGRC
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C
      EXTERNAL CHRNDF, SGCPLN, WGCPLN, CRNRSK
      SAVE
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
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     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
C
      DIMENSION IDIFF(MAX_ACCDAT)
C
C  INTEGRATE DOSES OVER THE VARIOUS TIME PERIODS USED IN THE CHRONC MODULE
C  FOR INITIAL UNIT CONCENTRATIONS OF EACH RADIONUCLIDE.
C  THESE ARE STORED IN BLANK COMMON (MEMORY SHARED WITH THE INPUT PROCESSOR).
C
      IF (ITRIAL .EQ. 1) CALL CHRNDF
C
C  SET THE DAY OF THE YEAR IN WHICH THE ACCIDENT OCCURS
C
      TIMACC = IDAY
C
C SET GROWSN IF TIMACC IN GROWING SEASON
C
      GROWSN = .FALSE.
      IF (FDPATH .EQ. 'OLD') THEN
      IF ((TSEEDG .LE. TIMACC) .AND. (TIMACC .LE. THRVST)) THEN
        GROWSN = .TRUE.
      ENDIF
      ELSE
      MINDIFF = 366
      DO 100 I = 1, NUMDATES
      IDIFF(I) = ABS (ACCDATES(I) - IDAY)
      IF (IDIFF(I) .GT. 182) IDIFF(I) = 365 - IDIFF(I)
      IF (MINDIFF .GT. IDIFF(I)) THEN
        MINDIFF = IDIFF(I)
        IFALLOUT = I
      ENDIF
  100   CONTINUE
      WRITE(6,120) IDAY, IFALLOUT, NUMDATES
  120   FORMAT(' For Julian Day ', I3,
     1          ', selecting COMIDA2 results # ', I1, ' of ', I1)
      ENDIF
C
      IF (IPLUME .EQ. 1) THEN
        CALL SGCPLN
      ELSE
        CALL WGCPLN
      ENDIF
      CALL CRNRSK
      RETURN
      END
*DECK CHRNDF
      SUBROUTINE CHRNDF
C
C CALCULATES THE CHRONC PATHWAY FACTORS: INTEGRATED DOSES OVER THE VARIOUS
C CHRONC EXPOSURE PERIODS FOR INITIAL UNIT CONCENTRATIONS OF EACH NUCLIDE,
C AND THE FOOD AND WATER TRANSFER FACTORS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHROUT.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C EXPTIM - LONGEST EXPOSURE TIME FOR INDIVIDUALS IN CHRONC CALCULATIONS
C GDF    - GROUNDSHINE DOSE RATE FACTOR (NUCLIDE,ORGAN)
C GWCOEF - ARRAY CONTAINING THE GROUNDSHINE WEATHERING COEFFICIENTS
C GSF    - GROUNDSHINE SHIELDING FACTOR FOR THE SITE
C ICRTRO - INDEX OF THE CRITICAL ORGAN FOR THE CHRONC MODEL
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C LVLDEC - NUMBER OF DECONTAMINATION LEVELS
C NTIM   - NUMBER OF TIME PERIODS FOR DOSE FACTOR COMPUTATION
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NGWTRM - NUMBER OF TERMS IN THE GROUNDSHINE WEATHERING RELATIONSHIP
C NRWTRM - NUMBER OF TERMS IN THE RESUSPENSION WEATHERING RELATIONSHIP
C RWCOEF - ARRAY CONTAINING THE RESUSPENSION WEATHERING COEFFICIENTS
C RDF  -  RESUSPENSION INHALATION DOSE FACTOR (NUCLIDE,ORGAN)
C TBEG(I) - BEGINNING TIME FOR DOSE FACTOR PERIOD I
C TEND(I) - ENDING TIME FOR DOSE FACTOR PERIOD I
C TGWHLF - ARRAY CONTAINING THE HALF-LIFE FOR EACH GROUNDSHINE
C          WEATHERING COEFFICIENT
C TIMDEC(I) - DECONTAMINATION TIME FOR DECONTAMINATION LEVEL I
C TINTRD(I) - INTERDICTION PERIODS CORRESPONDING TO THE TABULATED
C             PATHWAY FACTORS STORED IN: PPINLG, PPINLR, APINLG, APINLR
C TMONE  - TIME PERIOD OF ONE YEAR
C TMFIV  - TIME PERIOD OF FIVE YEARS
C TMTHRT - TIME PERIOD OF THIRTY YEARS
C TMEPND - TIME AT WHICH THE EMERGENCY PHASE ENDS
C TMIPND - TIME AT WHICH THE INTERMEDIATE PHASE ENDS
C TMPACT - DURATION OF THE LONG-TERM PHASE DOSE PROJECTION PERIOD
C TRWHLF - ARRAY CONTAINING THE HALF-LIFE FOR EACH RESUSPENSION
C          WEATHERING COEFFICIENT
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C NOTE: THE FOLLOWING 15 ARRAYS ARE ALL USED IN A SIMILAR WAY BY THE
C       CHRONC MODULE TO CALCULATE DOSES.  THEY REPRESENT THE DOSE WHICH
C       WOULD RESULT BY THE GROUNDSHINE AND RESUSPENSION PATHWAYS FOR AN
C       INITIAL UNIT GROUND CONCENTRATION OF EACH NUCLIDE AS A RESULT OF
C       EXPOSURE OVER VARIOUS TIME PERIODS.
C
C APDCWG(I,J,K) - ACCUMULATION - DECONTAMINATION WORKER DOSE-
C                 GROUNDSHINE: NUCLIDE I, ORGAN J, DECONTAMINATION LEVEL K
C APDCLG(I,J,K) - ACCUMULATION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C                 GROUNDSHINE: NUCLIDE I, ORGAN J, DECONTAMINATION LEVEL K
C APDCLR(I,J,K) - ACCUMULATION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C                 RESUSPENSION: NUCLIDE I, ORGAN J, DECONTAMINATION LEVEL K
C APINLG(I,J,K) - ACCUMULATION - DOSE AFTER INTERDICTION - LONG-TERM-
C                 GROUNDSHINE: NUCLIDE I, ORGAN J, INTERDICTION PERIOD K
C APINLR(I,J,K) - ACCUMULATION - DOSE AFTER INTERDICTION - LONG-TERM-
C                 RESUSPENSION: NUCLIDE I, ORGAN J, INTERDICTION PERIOD K
C APNOLG(I,J) - ACCUMULATION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C                              GROUNDSHINE: NUCLIDE I, ORGAN J
C APNOLR(I,J) - ACCUMULATION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C                              RESUSPENSION: NUCLIDE I, ORGAN J
C PPAPIG(I,J) - PROJECTION/ACCUMULATION - INTERMEDIATE PHASE PERIOD-
C               GROUNDSHINE: NUCLIDE I, ORGAN J
C PPAPIR(I,J) - PROJECTION/ACCUMULATION - INTERMEDIATE PHASE PERIOD-
C               RESUSPENSION: NUCLIDE I, ORGAN J
C PPDCLG(I,J) - PROJECTION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C               GROUNDSHINE: NUCLIDE I, DECONTAMINATION LEVEL J
C PPDCLR(I,J) - PROJECTION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C               RESUSPENSION: NUCLIDE I, DECONTAMINATION LEVEL J
C PPINLG(I,J) - PROJECTION - DOSE AFTER INTERDICTION - LONG-TERM-
C               GROUNDSHINE: NUCLIDE I, INTERDCTION PERIOD J
C PPINLR(I,J) - PROJECTION - DOSE AFTER INTERDICTION - LONG-TERM-
C               RESUSPENSION: NUCLIDE I, INTERDICTION PERIOD J
C PPNOLG(I) - PROJECTION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C             GROUNDSHINE: NUCLIDE I
C PPNOLR(I) - PROJECTION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C             RESUSPENSION: NUCLIDE I
C
C  LYNN RITCHIE, DIV. 6415, 21 DECEMBER 1984
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C
C  MODIFIED 27 APR 87, D.C., SER #53, BASE THE DIRECT EXPOSURE INTERDICTION
C   ON THE SUM OF GROUNDSHINE AND RESUSPENSION DOSES
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C MODIFIED 1/4/93, J.ROLLSTIN: INCLUSION OF NEW FOOD PATHWAY MODEL
C MODIFIED 3/23/93, D.C., TINTRD NEEDS TO BE SET AFTER, INSTEAD OF BEFORE
C  THE POST-DECON INTERDICTION PERIODS ARE CALCULATED
C
      EXTERNAL TRFRCT, WTRTRF
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      COMMON /DECMOD/ LVLDEC, CDFRM(3), CDNFRM(3), FRFDL(3), FRNFDL(3),
     1                DSRFCT(3), TFWKF(3), TFWKNF(3), TIMDEC(3), DLBCST
      COMMON // PPAPIG(MAXNUC,2:MAXORG),
     1  PPAPIR(MAXNUC,2:MAXORG), PPNOLG(MAXNUC), PPNOLR(MAXNUC),
     2  PPDCLG(MAXNUC,3), PPDCLR(MAXNUC,3), PPINLG(MAXNUC,3),
     3  PPINLR(MAXNUC,3), APNOLG(MAXNUC,2:MAXORG),
     4  APNOLR(MAXNUC,2:MAXORG), APDCLG(MAXNUC,2:MAXORG,3),
     5  APDCLR(MAXNUC,2:MAXORG,3), APINLG(MAXNUC,2:MAXORG,3),
     6  APINLR(MAXNUC,2:MAXORG,3), APDCWG(MAXNUC,2:MAXORG,3)
      COMMON /EXPTIM/ EXPTIM
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *8    NUCNAM
      COMMON /ISONAM/ NUCNAM(MAXNUC)
      COMMON /KOPRNT/ KSWDSC
      COMMON /ICRTRO/ ICRTRO
C
      DIMENSION TBEG(3), TEND(3)
C
C INITIALIZE DOSE FACTOR ARRAYS IN BLANK COMMON TO ZERO
C
      DO 80 INUC = 1, MAXNUC
      PPNOLG(INUC) = 0.
      PPNOLR(INUC) = 0.
      DO 60 ITIM = 1, 3
      PPDCLG(INUC,ITIM) = 0.
      PPDCLR(INUC,ITIM) = 0.
      PPINLG(INUC,ITIM) = 0.
   60 PPINLR(INUC,ITIM) = 0.
C
      DO 80 IORG = INICHR, NUMORG
      PPAPIG(INUC,IORG) = 0.
      PPAPIR(INUC,IORG) = 0.
      APNOLG(INUC,IORG) = 0.
      APNOLR(INUC,IORG) = 0.
      DO 80 ITIM = 1, 3
      APDCLG(INUC,IORG,ITIM) = 0.
      APDCLR(INUC,IORG,ITIM) = 0.
      APINLG(INUC,IORG,ITIM) = 0.
      APINLR(INUC,IORG,ITIM) = 0.
   80 APDCWG(INUC,IORG,ITIM) = 0.
C
C  SET INTERDICTION ENDPOINT TIMES TO BE USED LATER FOR INTERPOLATION
C
      TMONE  = 365.25 * 24. * 3600.
      TMFIV  = 5.  * TMONE
      TMTHRT = 30. * TMONE
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C
C CALCULATE THE DOSE WHICH WOULD RESULT FROM AN INITIAL UNIT CONCENTRATION
C OF EACH NUCLIDE TO AN INDIVIDUAL WHO WAS PRESENT FOR THE INTERMEDIATE
C PHASE PERIOD BY BOTH GROUNDSHINE AND RESUSPENSION PATHWAYS (ALL ORGANS).
C
      NT = 1
      N1 = 2
      N2 = MAXORG
      NORG1 = INICHR
      NORG2 = MAXORG
      TBEG(1) = TMEPND
      TEND(1) = TMIPND
C
      IF (ABS (TEND(1) - TBEG(1)) .GT. 1.0)
     1 CALL GNDRES(NT,N1,N2,NORG1,NORG2,TBEG,TEND,PPAPIG,.FALSE.,PPAPIR)
C
C THE FOLLOWING SECTION CALCULATES FACTORS FOR LONG-TERM PHASE DOSE PROJECTION:
C   PPNOLG, PPNOLR, PPDCLG, PPDCLR, PPINLG, AND PPINLR.
C THESE DOSE PROJECTIONS ARE CALCULATED FOR EXPOSURE PERIODS OF DURATION TMPACT.
C
C CALCULATE THE DOSE WHICH WOULD RESULT FROM INITIAL UNIT CONCENTRATIONS
C OF EACH NUCLIDE TO THE CRITICAL ORGAN OVER A PROJECTION PERIOD WHICH
C BEGINS AT THE END OF THE INTERMEDIATE PHASE.
C
      NT = 1
      N1 = 1
      N2 = 1
      NORG1 = 1
      NORG2 = 1
      TBEG(1) = TMIPND
      TEND(1) = TMIPND + TMPACT
C
      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,PPNOLG,.FALSE.,PPNOLR)
C
C IN ORDER TO EVAULATE THE DOSES WHICH WOULD RESULT FOLLOWING DECONTAMINATION,
C WE CALCULATE THE DOSES WHICH WOULD RESULT TO THE CRITICAL ORGAN FROM INITIAL
C UNIT GROUND CONCENTRATIONS OF EACH NUCLIDE.  THE DURATION OF THE PROJECTION
C PERIOD (TMPACT) IS THE SAME IN ALL CASES, BUT THE VARIOUS PROJECTION PERIODS
C EACH BEGIN AT THE COMPLETION TIME OF THE SPECIFIED DECONTAMINATION EFFORT.
C
      NT = LVLDEC
C
      DO 100 I = 1, NT
      TBEG(I) = TMIPND + TIMDEC(I)
  100 TEND(I) = TBEG(I) + TMPACT
C
      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,PPDCLG,.FALSE.,PPDCLR)
C
C IF DECONTAMINATION ALONE IS INSUFFICIENT, WE WILL NEED TO EVALUATE THE
C DOSE OVER THREE PROJECTION PERIODS WHICH BEGIN AFTER 1, 5, AND 30 YEARS
C OF INTERDICTION FOLLOWING THE MAXIMUM EFFORT DECONTAMINATION.
C
      NT = 3
      TBEG(1) = TMIPND  + TIMDEC(LVLDEC) + TMONE
      TEND(1) = TBEG(1) + TMPACT
      TBEG(2) = TMIPND  + TIMDEC(LVLDEC) + TMFIV
      TEND(2) = TBEG(2) + TMPACT
      TBEG(3) = TMIPND  + TIMDEC(LVLDEC) + TMTHRT
      TEND(3) = TBEG(3) + TMPACT
      TINTRD(1) = TBEG(1)
      TINTRD(2) = TBEG(2)
      TINTRD(3) = TBEG(3)
C
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```
      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,PPINLG,.FALSE.,PPINLR)
C
C FOLLOWING SECTION CALCULATES FACTORS FOR LONG-TERM PHASE DOSE ACCUMULATION:
C   APNOLG, APNOLR, APDCLG, APDCLR, APINLG, AND APINLR.
C LONG-TERM DOSE ACCUMULATION IS CALCULATED OVER A USER-SPECIFIED PERIOD.
C
C DETERMINE THE GROUNDSHINE AND RESUSPENSION DOSE FACTORS (ALL ORGANS)
C FOR THE ACCUMULATION PERIOD BEGINNING AT THE END OF THE INTERMEDIATE
C PHASE BASED ON THE ASSUMPTION THAT NO MITIGATIVE ACTION WILL BE TAKEN
C
      NT = 1
      N1 = 2
      N2 = MAXORG
      NORG1 = INICHR
      NORG2 = MAXORG
      TBEG(1) = TMIPND
      TEND(1) = TMIPND + EXPTIM

      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,APNOLG,.FALSE.,APNOLR)
C
C IN ORDER TO CALCULATE THE DOSES WHICH WOULD RESULT FOLLOWING DECONTAMINATION,
C WE CALCULATE THE DOSES WHICH WOULD RESULT OVER EXPOSURE PERIODS WHICH BEGIN
C AT THE COMPLETION TIME OF EACH LEVEL OF DECONTAMINATION EFFORT.
C
      NT = LVLDEC

      DO 120 I = 1, NT
      TBEG(I) = TMIPND + TIMDEC(I)
  120 TEND(I) = TBEG(I) + EXPTIM
C
      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,APDCLG,.FALSE.,APDCLR)
C
C IF DECONTAMINATION ALONE IS INSUFFICIENT, WE WILL NEED TO CALCULATE THE
C DOSE OVER THREE ACCUMULATION PERIODS WHICH BEGIN AFTER 1, 5, AND 30 YEARS
C OF INTERDICTION FOLLOWING THE COMPLETION OF MAXIMUM EFFORT DECONTAMINATION.
C
      NT = 3

      TBEG(1) = TMIPND  + TIMDEC(LVLDEC) + TMONE
      TEND(1) = TBEG(1) + EXPTIM
      TBEG(2) = TMIPND  + TIMDEC(LVLDEC) + TMFIV
      TEND(2) = TBEG(2) + EXPTIM
      TBEG(3) = TMIPND  + TIMDEC(LVLDEC) + TMTHRT
      TEND(3) = TBEG(3) + EXPTIM
C
      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,APINLG,.FALSE.,APINLR)
C
C FOR CALCULATING DOSES TO DECONTAMINATION WORKERS, EXPOSURE FACTORS ARE
C CALCULATED FOR THE DURATION OF EACH SPECIFIED LEVEL OF DECONTAMINATION.
C ONLY THE GROUNDSHINE EXPOSURE PATHWAY IS CONSIDERED FOR DECON WORKERS.
C
      NT = LVLDEC
C
      DO 140 LVL = 1, NT
      TBEG(LVL) = TMIPND
  140 TEND(LVL) = TMIPND + TIMDEC(LVL)
C
      CALL GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,APDCWG,.TRUE., APDCWG)
C
C  COMPUTE DIRECT TRANSFER FRACTIONS AND THE LONG-TERM TRANSFER
C   FACTORS FOR CROPS, MILK, AND MEAT
C
      IF (FDPATH .EQ. 'OLD') CALL TRFRCT
```

```
C
C  COMPUTE THE TRANSFER FACTORS FOR THE LIQUID PATHWAY
C
      CALL WTRTRF
C
      IF (KSWDSC .EQ. 0) RETURN
      WRITE(6,200)'  PPAPIG ','  PPNOLG ',' PPDCLG-1',' PPDCLG-2',
     1            ' PPINLG-1',' PPINLG-2',' PPINLG-3','  APNOLG ',
     2            ' APDCLG-1',' APDCLG-2',' APINLG-1',' APINLG-2',
     3            ' APINLG-3'
      DO 220 IN = 1,NUMISO
        WRITE(6,240) NUCNAM(IN), PPAPIG(IN,ICRTRO), PPNOLG(IN),
     1               PPDCLG(IN,1), PPDCLG(IN,2), PPINLG(IN,1),
     2               PPINLG(IN,2), PPINLG(IN,3), APNOLG(IN,ICRTRO),
     3               APDCLG(IN,ICRTRO,1), APDCLG(IN,ICRTRO,2),
     4               APINLG(IN,ICRTRO,1), APINLG(IN,ICRTRO,2),
     5               APINLG(IN,ICRTRO,3)
 220  CONTINUE
C
      WRITE(6,200)'  PPAPIR ','  PPNOLR ',' PPDCLR-1',' PPDCLR-2',
     1            ' PPINLR-1',' PPINLR-2',' PPINLR-3','  APNOLR ',
     2            ' APDCLR-1',' APDCLR-2',' APINLR-1',' APINLR-2',
     3            ' APINLR-3'
C
      DO 260 IN = 1,NUMISO
        WRITE(6,240) NUCNAM(IN), PPAPIR(IN,ICRTRO), PPNOLR(IN),
     1               PPDCLR(IN,1), PPDCLR(IN,2), PPINLR(IN,1),
     2               PPINLR(IN,2), PPINLR(IN,3), APNOLR(IN,ICRTRO),
     3               APDCLR(IN,ICRTRO,1), APDCLR(IN,ICRTRO,2),
     4               APINLR(IN,ICRTRO,1), APINLR(IN,ICRTRO,2),
     5               APINLR(IN,ICRTRO,3)
 260  CONTINUE
C
 200  FORMAT('1',8X,13A9)
 240  FORMAT(1X,A8,1P13E9.2)
C
      RETURN
      END
*DECK GNDRES
      SUBROUTINE GNDRES (NT,N1,N2,NORG1,NORG2,TBEG,TEND,DFG,SKPRES,DFR)
C
C COMPUTE PATHWAY EFFECTIVENESS FACTORS FOR GROUNDSHINE OR RESUSPENSION
C
C THESE FACTORS ARE REALLY PRE-INTEGRATED DOSES OVER VARIOUS TIME
C PERIODS FOR AN INITIAL UNIT CONCENTRATION OF EACH NUCLIDE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHRNDF.
C
C  MEANING OF ARGUMENT NAMES:
C
C    NT    - NUMBER OF GROUNDSHINE TIME PERIODS
C    SKPRES - Logical flag indicating that resuspension calcs are skipped
C    TBEG(I) - BEGINNING TIME FOR TIME PERIOD I
C    TEND(I) - ENDING TIME FOR TIME PERIOD I
C    NW - NUMBER OF TERMS IN THE WEATHERING RELATIONSHIP
C
C  GLOSSARY OF VARIABLE NAMES OF INPUT DATA
C
C   NORG1    - ENDING INDEX FOR ORGANS
C   NORG2   - STARTING INDEX FOR ORGANS
C   NUMISO - NUMBER OF NUCLIDES
C   NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C
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C  LYNN RITCHIE, DIV. 6415, 12 JULY 1984
C
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C MODIFIED 3/23/93, D.C., THE GOTCHA FLAG TEST WAS CAUSING ALMOST ALL
C  NUCLIDES TO BE TREATED AS IF THEY WERE CO-60, THE SKIP FOR NOBLE
C  GASES WAS PREVENTING THE ZEROING OUT OF INFORMATION FOR THE NEXT
C  NUCLIDE IN THE 200 AND 400 LOOPS
C
C  NO EXTERNAL FUNCTIONS
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /DCFVAL/ DCFCLD(2:MAXORG,MAXNUC), DCFGRD(2:MAXORG,MAXNUC),
     1                DCFINH(2:MAXORG,MAXNUC), DCFING(2:MAXORG,MAXNUC)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
      COMMON /REWTHR/ NRWTRM, RWCOEF(3), TRWHLF(3), RPF, RINHL
      COMMON /GSWTHR/ NGWTRM, GWCOEF(2), TGWHLF(2), GSF
      COMMON /ICRTRO/ ICRTRO
      LOGICAL GOTCHA
      COMMON /GOTCHA/ GOTCHA(MAXNUC)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
C
      LOGICAL SKPRES
      DIMENSION TBEG(NT), TEND(NT),
     1          DFG(MAXNUC,N1:N2,NT), DFR(MAXNUC,N1:N2,NT),
     2          RADIO1(MXDKCN), RADIO2(MXDKCN), DISRAY(MXDKCN)
C
      DO 20 INUC = 1, NUMFND
   20 RADIO1(INUC) = 0.0

      DO 200 KTIM = 1, NT
      RADIO1(IPNTDK(NUMISO)) = 0.0
      DO 200 JISO = 1, NUMISO
      IF (.NOT. GOTCHA(JISO)) GO TO 200
      IF (JISO .GT. 1) RADIO1(IPNTDK(JISO-1)) = 0.0
      RADIO1(IPNTDK(JISO)) = 1.0

      CALL NEWAMX (RADIO1, RADIO2, TBEG(KTIM), NGWTRM, GWCOEF, TGWHLF)
      CALL DISINX (RADIO2, DISRAY, TEND(KTIM) - TBEG(KTIM),
     1             NGWTRM, GWCOEF, TGWHLF)

      IF (NORG1 .EQ. 1 .AND. NORG2 .EQ. 1) THEN
      DFG(JISO,1,KTIM) = 0.0
      DO 140 INUC = 1, NUMISO
  140   DFG(JISO,1,KTIM) = DFG(JISO,1,KTIM) +
     1        DISRAY(IPNTDK(INUC)) * DCFGRD(ICRTRO,INUC)
C
      DFG(JISO,1,KTIM) = DFG(JISO,1,KTIM) * GSF
      ELSE
        DO 180 JORG = NORG1, NORG2
          DFG(JISO,JORG,KTIM) = 0.0
          DO 160 INUC = 1, NUMISO
  160     DFG(JISO,JORG,KTIM) = DFG(JISO,JORG,KTIM) +
     1      DISRAY(IPNTDK(INUC)) * DCFGRD(JORG,INUC)
C
  180   DFG(JISO,JORG,KTIM) = DFG(JISO,JORG,KTIM) * GSF
```

```
      ENDIF

  200 RADIO1(IPNTDK(JISO)) = 0.0
C
C For decontamination workers, the resuspension calculations are skipped
C
      IF (SKPRES) RETURN

      DO 220 INUC = 1, NUMFND
  220 RADIO1(INUC) = 0.0

      DO 400 KTIM = 1, NT
      RADIO1(IPNTDK(NUMISO)) = 0.0
      DO 400 JISO = 1, NUMISO
      IF (.NOT. GOTCHA(JISO)) GO TO 400
      IF (JISO .GT. 1) RADIO1(IPNTDK(JISO-1)) = 0.0
      RADIO1(IPNTDK(JISO)) = 1.0

      CALL NEWAMX (RADIO1, RADIO2, TBEG(KTIM), NRWTRM, RWCOEF, TRWHLF)
      CALL DISINX (RADIO2, DISRAY, TEND(KTIM) - TBEG(KTIM),
     1             NRWTRM, RWCOEF, TRWHLF)

      IF (NORG1 .EQ. 1 .AND. NORG2 .EQ. 1) THEN
      DFR(JISO,1,KTIM) = 0.0
      DO 340 INUC = 1, NUMISO
  340   DFR(JISO,1,KTIM) = DFR(JISO,1,KTIM) +
     1   DISRAY(IPNTDK(INUC)) * DCFINH(ICRTRO,INUC)
C
      DFR(JISO,1,KTIM) = DFR(JISO,1,KTIM) * RINHL
      ELSE
      DO 380 JORG = NORG1, NORG2
          DFR(JISO,JORG,KTIM) = 0.0
        DO 360 INUC = 1, NUMISO
  360     DFR(JISO,JORG,KTIM) = DFR(JISO,JORG,KTIM) +
     1          DISRAY(IPNTDK(INUC)) * DCFINH(JORG,INUC)
C
  380   DFR(JISO,JORG,KTIM) = DFR(JISO,JORG,KTIM) * RINHL
C
      ENDIF

  400 RADIO1(IPNTDK(JISO)) = 0.0

      RETURN
      END
*DECK NEWAMX
      SUBROUTINE NEWAMX (RADIO1, RADIO2, DELTIM, NWTERM, WCOEF, WHALF)
C
C This routine takes as input an array, RADIO1, representing the radioactive
C inventory in a compartment, and calculates the decay and daughter ingrowth
C which occurs over a period of DELTIM.  The resultant new inventory array is
C returned as RADIO2. The original values of RADIO1 and DELTIM are unchanged.
C
C This routine is called by SUBROUTINE GNDRES.
C A variant of this routine not incorporating weathering is named NEWAMT.
C
C This routine is based on closed-form solutions to the Bateman equations
C given by A. Birchall, "A Microcomputer Algorithm for Solving Compartmental
C Models Involving Radionuclide Transforamtions," Health Physics, Vol. 50,
C (March), pp. 545-553, (1986).  The same equations are given by Skrable et al.,
C "A General Equation for the Kinetics of Linear First Order Phenomena and
C Suggested Applications," Health Physics, Vol. 27 (July), pp. 155-157, (1974).
C
C Written 2/04/93, D.C., Expanded Nuclide Set for DOE
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C Modified 3/17/93, D.C., CHNFRC is used as a flag--numeric value is not used
C Modified 12/03/95, D.C., Changed DKRATE from type DOUBLE PRECISION to REAL
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
C
      DIMENSION RADIO1(MXDKCN), RADIO2(MXDKCN),
     1          WCOEF(NWTERM), WHALF(NWTERM), WLAMDA(3)
      DOUBLE PRECISION AMOUNT, PROD, ABOVE, BELOW, SUM, TOTAL
C
      TOTAL = 0.0D0
      DO 20 NW = 1, NWTERM
      TOTAL = TOTAL + DBLE(WCOEF(NW))
   20 WLAMDA(NW) = LOG(2.0) / WHALF(NW)
C
      DO 40 INUC = 1, NUMFND
   40 RADIO2(INUC) = 0.0
C
      DO 400 ICHAIN = 1, NUMCHN
      DO 400 N = 1, LENCHN(ICHAIN)
      DO 400 I = 1, N
C
      IF (CHNFRC(ICHAIN,I,N) .LT. 1.E-6) GO TO 400
      AMOUNT = RADIO1(IBRNCH(ICHAIN,I)) / DKRATE(IBRNCH(ICHAIN,I))
      IF (AMOUNT .LT. 0.5D0) GO TO 400
C
      PROD = 1.0D0
C
      DO 100 J = I, N - 1
  100 PROD = PROD * DBLE(BRNRAT(ICHAIN,J))
C
      SUM = 0.0D0
C
      DO 200 J = I, N
      DO 200 NW = 1, NWTERM
C
      ABOVE = DBLE(WCOEF(NW)) / TOTAL * AMOUNT *
     1 EXP(-DELTIM * (WLAMDA(NW) + DKRATE(IBRNCH(ICHAIN,J))))
C
      BELOW = 1.0D0
C
      DO 150 IP = I, N
  150 IF (IP .NE. J) BELOW = BELOW *
     1  (DKRATE(IBRNCH(ICHAIN,IP))) - DKRATE(IBRNCH(ICHAIN,J))
C
      SUM = SUM + ABOVE / BELOW
C
  200 CONTINUE
C
      RADIO2(IBRNCH(ICHAIN,N)) = RADIO2(IBRNCH(ICHAIN,N)) + (PROD * SUM)
C
  400 CONTINUE
C
C Convert number of atoms back to radioactivity
C
      DO 450 INUC = 1, NUMFND
  450 RADIO2(INUC) = RADIO2(INUC) * DKRATE(INUC)
C
      RETURN
      END
```

```
*DECK DISINX
      SUBROUTINE DISINX (RADIO1, RADIO2, DELTIM, NWTERM, WCOEF, WHALF)
C
C This routine takes as input an array, RADIO1, representing the radioactive
C inventory in a compartment, and calculates the decay and daughter ingrowth
C which occurs over a period of DELTIM.  The resultant integrated radioactivity
C array (i.e., the number of disintegrations of each nuclide) is returned as
C RADIO2. The original values of RADIO1 and DELTIM are unchanged.
C
C This routine is called by SUBROUTINE GNDRES.
C A variant of this routine not incorporating weathering is named DISINX.
C
C This routine is based on closed-form solutions to the Bateman equations
C given by A. Birchall, "A Microcomputer Algorithm for Solving Compartmental
C Models Involving Radionuclide Transforamtions," Health Physics, Vol. 50,
C (March), pp. 545-553, (1986).  The same equations are given by Skrable et al.,
C "A General Equation for the Kinetics of Linear First Order Phenomena and
C Suggested Applications," Health Physics, Vol. 27 (July), pp. 155-157, (1974).
C
C Written 2/04/93, D.C., Expanded Nuclide Set for DOE
C Modified 3/17/93, D.C., CHNFRC is used as a flag--numeric value is not used
C Modified 12/03/95, D.C., Changed DKRATE from type DOUBLE PRECISION to REAL
C
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /FINCHN/ NUMCHN, LENCHN(MAXCHN), IBRNCH(MAXCHN,MAXGEN),
     1          CHNFRC(MAXCHN,MAXGEN,MAXGEN), BRNRAT(MAXCHN,MAXGEN)
C
      DIMENSION RADIO1(MXDKCN), RADIO2(MXDKCN),
     1          WCOEF(NWTERM), WHALF(NWTERM), WLAMDA(3)
      DOUBLE PRECISION AMOUNT, PROD, ABOVE, BELOW, SUM, TERM
C
      DO 20 NW = 1, NWTERM
   20 WLAMDA(NW) = LOG(2.0) / WHALF(NW)
C
      DO 40 INUC = 1, NUMFND
   40 RADIO2(INUC) = 0.0
C
      DO 400 ICHAIN = 1, NUMCHN
      DO 400 N = 1, LENCHN(ICHAIN)
      DO 400 I = 1, N
C
      IF (CHNFRC(ICHAIN,I,N) .LT. 1.E-6) GO TO 400
      AMOUNT = RADIO1(IBRNCH(ICHAIN,I)) / DKRATE(IBRNCH(ICHAIN,I))
      IF (AMOUNT .LT. 0.5D0) GO TO 400
C
      PROD = 1.0D0
C
      DO 100 J = I, N - 1
  100 PROD = PROD * DBLE(BRNRAT(ICHAIN,J))
C
      SUM = 0.0D0
C
      DO 200  J = I, N
      DO 200 NW = 1, NWTERM
      TERM = DBLE(DELTIM * (WLAMDA(NW) + DKRATE(IBRNCH(ICHAIN,J))))
C
      IF (TERM .GE. 0.01D0) THEN
      ABOVE = AMOUNT * (1.D0 - EXP(-TERM)) /
     1          DBLE(WLAMDA(NW) + DKRATE(IBRNCH(ICHAIN,J)))
      ELSE
      ABOVE = AMOUNT * (DBLE(DELTIM) - 0.5D0 * TERM * DBLE(DELTIM))
```

```
      ENDIF
C
      BELOW = 1.0D0
C
      DO 150 IP = I, N
  150 IF (IP .NE. J) BELOW = BELOW *
     1  (DKRATE(IBRNCH(ICHAIN,IP)) - DKRATE(IBRNCH(ICHAIN,J)))
C
      SUM = SUM + DBLE(WCOEF(NW)) * ABOVE / BELOW
C
  200 CONTINUE
C
      RADIO2(IBRNCH(ICHAIN,N)) = RADIO2(IBRNCH(ICHAIN,N)) +
     1 (PROD * SUM) * DKRATE(IBRNCH(ICHAIN,N))
C
  400 CONTINUE
C
      RETURN
      END
*DECK TRFRCT
      SUBROUTINE TRFRCT
C
C  COMPUTE DIRECT TRANSFER FRACTIONS AND LONG-TERM TRANSFER FACTORS
C  FOR CROPS, MILK, AND MEAT
C
C  GLOSSARY OF VARIABLE NAMES FOR INPUT DATA
C
C   DCYPCH(I,J) - DECAY LOSS FACTOR FOR INGESTION MODEL NUCLIDE I FOR
C                 PRODUCTION OF CROP J TO HUMAN CONSUMPTION
C   DCYPCM(I,J) - DECAY LOSS FACTOR FOR INGESTION MODEL NUCLIDE I FOR
C                 PRODUCTION OF CROP J TO CONSUMPTION BY MILK COWS
C   DCYPCB(I,J) - DECAY LOSS FACTOR FOR INGESTION MODEL NUCLIDE I FOR
C                 PRODUCTION OF CROP J TO CONSUMPTION BY MEAT ANIMALS
C   DCYPMH(I)   - DECAY LOSS FACTOR FOR INGESTION MODEL NUCLIDE I FOR
C                 PRODUCTION OF MILK TO CONSUMPTION BY HUMANS
C   DCYPBH(I)   - DECAY LOSS FACTOR FOR INGESTION MODEL NUCLIDE I FROM
C                 SLAUGHTER OF MEAT ANIMALS TO HUMAN CONSUMPTION
C DCFING(J,I) - INGESTION DOSE FACTORS FOR INGESTION MODEL NUCLIDE MEMBER
C                 M IN DECAY CHAIN I TO ORGAN J
C   FPLSCH(I,J) - FOOD PROCESSING LOSS FACTOR FOR INGESTION MODEL
C                 NUCLIDE I FROM CROP J FOR HUMAN CONSUMPTION
C   FRCTCH(I)   - FRACTION OF CROP I FOR HUMAN CONSUMPTION
C   FRCTCM(I)   - FRACTION OF CROP I FOR MILK PRODUCTION
C   FRCTCB(I)   - FRACTION OF CROP I FOR MEAT PRODUCTION
C   FRCTFL(I)   - FRACTION OF FARMLAND USED FOR PRODUCTION OF CROP I
C   NFIISO      - NUMBER OF FOOD INGESTION  MODEL NUCLIDES
C   NFICRP      - NUMBER OF FOOD INGESTION MODEL CROPS
C   NUMORG      - NUMBER OF ORGANS DEFINED IN THE MODEL
C   TCROOT(I,J) - LONG-TERM ROOT UPTAKE TRANSFER COMPONENT OF INGESTION
C                 MODEL NUCLIDE I BY CROP J
C   TFMLK(I)    - TRANSFER FACTOR (FRACTION) FOR INGESTION MODEL
C                 NUCLIDE I IN MILK
C   TFBF(I)     - FRANSFER FACTOR (FRACTION) FOR NUCLIDE I IN MEAT
C
C  GLOSSARY OF VARIABLE NAMES FOR OUTPUT DATA
C
C   DTFCPT(I,J,K) - DIRECT TRANSFER FRACTION FOR CROP DOSE TERM
C   DTFMPT(I,J,K) _ DIRECT TRANSFER FRACTION FOR MILK DOSE TERM
C   DTFBPT(I,J,K) - DIRECT TRANSFER FRACTION FOR MEAT DOSE TERM
C   TFLCPT(I,J,K) - LONG-TERM TRANSFER FACTOR FOR CROP DOSE TERM
C   TFLMPT(I,J,K) - LONG-TERM TRANSFER FACTOR FOR MILK DOSE TERM
C   TFLBPT(I,J,K) - LONG-TERM TRANSFER FACTOR FOR MEAT DOSE TERM
C   TFLMLK(I,J)   - LONG-TERM TRANSFER FACTOR FOR MILK PATHWAY
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C   TFLOTH(I,J)    - LONG-TERM TRANSFER FACTOR FOR OTHER PATHWAY
C
C  LYNN RITCHIE, DIV. 6415, 18 JULY 1984
C
C MODIFIED 6/20/89/, DIC, LOG # 6/14/89-A, ELIMINATE AN INCONSISTENT
C                    TREATMENT OF RADIOLOGICAL DECAY FACTORS BETWEEN
C                    THE GROWING-SEASON AND LONG-TERM FOOD PATHWAYS
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /DTFRCT/ DTFCPT(MXNUC,MXCRP,2:MAXORG),
     1 DTFMPT(MXNUC,MXCRP,2:MAXORG),
     2 DTFBPT(MXNUC,MXCRP,2:MAXORG)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      COMMON /ISOTDT/ TFMLK(MXNUC), TFBF(MXNUC), DCYPMH(MXNUC),
     *                DCYPBH(MXNUC)
      COMMON /ISOCRP/ DCYPCH(MXNUC,MXCRP), DCYPCM(MXNUC,MXCRP),
     1                DCYPCB(MXNUC,MXCRP), FPLSCH(MXNUC,MXCRP)
      COMMON /LONGTF/ TFLMLK(MXNUC,2:MAXORG), TFLOTH(MXNUC,2:MAXORG)
      COMMON /TRCMPL/ TCROOT(MXNUC,MXCRP)
      COMMON /DCFVAL/ DCFCLD(2:MAXORG,MAXNUC), DCFGRD(2:MAXORG,MAXNUC),
     1                DCFINH(2:MAXORG,MAXNUC), DCFING(2:MAXORG,MAXNUC)
      COMMON /CROPDT/ FRCTCH(MXCRP), FRCTCM(MXCRP), FRCTCB(MXCRP),
     *                FRCTFL(MXCRP), FRCTCP(MXCRP), FRCTCO(MXCRP)
C
      DIMENSION TFLCPT(MXNUC,MXCRP,2:MAXORG),
     1 TFLMPT(MXNUC,MXCRP,2:MAXORG), TFLBPT(MXNUC,MXCRP,2:MAXORG)
C
      DO 100 I = 1, NFIISO
      DO 100 J = 1, NFICRP
C
C  TRANSFER COEFFICIENT FOR GROWING-SEASON PATHWAY FOOD TO HUMANS
C
      TRMCPD = FRCTFL(J) * FRCTCH(J) * FPLSCH(I,J) * DCYPCH(I,J)
C
C  TRANSFER COEFFICIENT FOR LONG-TERM PATHWAY FOOD TO HUMANS
C
      TRMCPL = TRMCPD * TCROOT(I,J)
C
C  TRANSFER COEFFICIENT FOR GROWING-SEASON PATHWAY FOOD THROUGH MILK
C
      TRMMKD = FRCTFL(J) * FRCTCM(J) * TFMLK(I) * DCYPCM(I,J) *
     1         DCYPMH(I)
C
C  TRANSFER COEFFICIENT FOR LONG-TERM PATHWAY FOOD THROUGH MILK
C
      TRMMKL = TRMMKD * TCROOT(I,J)
C
C  TRANSFER COEFFICIENT FOR GROWING-SEASON PATHWAY FOOD THROUGH MEAT
C
      TRMBFD = FRCTFL(J) * FRCTCB(J) * TFBF(I) * DCYPCB(I,J) *
     1         DCYPBH(I)
C
C  TRANSFER COEFFICIENT FOR LONG-TERM PATHWAY FOOD THROUGH MEAT
C
      TRMBFL = TRMBFD * TCROOT(I,J)
C
C  LOOP THROUGH THE ORGANS OF THE FOOD INGESTION MODEL
C
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```
      DO 100 K = INICHR, NUMORG
      FACTOR = DCFING(K,NDXFII(I))
C
C  SET DIRECT DEPOSITION TERMS
C
      DTFCPT(I,J,K) = TRMCPD * FACTOR
      DTFMPT(I,J,K) = TRMMKD * FACTOR
      DTFBPT(I,J,K) = TRMBFD * FACTOR
C
C  SET LONG-TERM DEPOSITION TRANSFER FACTORS
C
      TFLCPT(I,J,K) = TRMCPL * FACTOR
      TFLMPT(I,J,K) = TRMMKL * FACTOR
  100 TFLBPT(I,J,K) = TRMBFL * FACTOR
C
C  COMBINE RESULTS FOR THE MILK AND "OTHER" LONG TERM TRANSFER PATHWAYS
C  FOR EACH FOOD PATHWAY NUCLIDE FOR EACH CHRONIC ORGAN
C
      DO 420 K = INICHR, NUMORG
      DO 420 I = 1, NFIISO

      SUMBP = 0.0
      SUMMP = 0.0
      SUMCP = 0.0

      DO 400 NCRP = 1, NFICRP
      SUMBP = SUMBP + TFLBPT(I,NCRP,K)
      SUMCP = SUMCP + TFLCPT(I,NCRP,K)
  400 SUMMP = SUMMP + TFLMPT(I,NCRP,K)

      TFLOTH(I,K) = SUMBP + SUMCP
  420 TFLMLK(I,K) = SUMMP

      RETURN
      END
*DECK WTRTRF
      SUBROUTINE WTRTRF
C
C COMPUTE THE TRANSFER FACTORS FOR THE LIQUID PATHWAY OR
C WATER MODEL CORRESPONDING TO DIRECT DEPOSITION ON THE
C WATERBODY OR WASHOFF TO THE WATERBODY.
C
C THE TRANSFER FACTORS CAN BE COMPUTED FOR AS MANY AS
C FOUR DIFFERENT WATERSHEDS, BUT A COARSE GRID ELEMENT
C MUST LIE ENTIRELY WITHIN ONE WATERSHED.
C
C GLOSSARY OF VARIABLE NAMES FOR INPUT DATA:
C
C DCFING(J,I) - INGESTION DOSE FACTORS FOR INGESTION MODEL NUCLIDE MEMBER
C                 MEMBER M OF DECAY CHAIN I TO ORGAN J
C NDXFII - POINTER ARRAY SHOWING LOCATION OF THE FOOD/WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE OLD FOOD MODEL
C NDXWII - POINTER ARRAY SHOWING LOCATION OF THE WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE NEW FOOD MODEL
C NUMWPA - NUMBER OF WATER PATHWAYS (WATERSHEDS)
C NUMWPI - NUMBER OF INGESTION MODEL NUCLIDES FOR WATER PATHWAY MODEL
C WINGF(I,J) - WATERSHED INGESTION FACTOR FOR INGESTION MODEL
C              NUCLIDE I DEPOSITED IN WATERSHED J
C WSHRTA(I) - ANNUAL WASHOFF RATE FOR WATER PATHWAY NUCLIDE I
C WSHFRI(I) - INITIAL WASHOFF FRACTION FOR WATER PATHWAY NUCLIDE I
C
C GLOSSARY OF VARIABLE NAMES FOR OUTPUT DATA:
C
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C WSHFRC(I)     - WASHOFF FRACTION FOR WATER PATHWAY NUCLIDE I
C                 DEPOSITED IN ANY WATERSHED
C TFLPD(I,J,K) - DIRECT LIQUID PATHWAY TRANSFER FACTOR OF WATER
C                 PATHWAY NUCLIDE I DEPOSITED TO WATERSHED K TO ORGAN J
C TFLPW(I,J,K) - WASHOFF LIQUID PATHWAY TRANSFER FACTOR OF WATER
C                 PATHWAY NUCLIDE I DEPOSITED TO WATERSHED K TO ORGAN J
C
C  LYNN RITCHIE, DIV. 6415, 14 DECEMBER 1984
C
C  MODIFIED 15 AUG 88, D.C. CORRECTED WASHOFF EQUATION
C  TO CONFORM TO THE EQUATION GIVEN BY HELTON, MULLER AND BAYER
C  (HEALTH PHYSICS, 48 NO. 6 (JUNE) PP 757-771, 1985)
C  IN REPONSE TO AN ERROR REPORT FROM EDUARDO GALLEGO OF SPAIN.
C
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C   AND ALSO LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MXNUC=10,MXCRP=10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      COMMON /WATRM/  NUMWPA, NUMWPI
      COMMON /WTRDTA/ WINGF(MXNUC,4), WSHFRI(MXNUC), WSHRTA(MXNUC),
     1                NDXWII(MXNUC)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /WTRDAT/ TFLPD(10,2:MAXORG,4), TFLPW(10,2:MAXORG,4)
      COMMON /DCFVAL/ DCFCLD(2:MAXORG,MAXNUC), DCFGRD(2:MAXORG,MAXNUC),
     1                DCFINH(2:MAXORG,MAXNUC), DCFING(2:MAXORG,MAXNUC)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
C
      DIMENSION WSHFRC(10)
C
C  COMPUTE THE LIQUID PATHWAY TRANSFER FACTORS OF NUCLIDES
C   CORRESPONDING TO DIRECT DEPOSIT TO OR WASHOFF FROM THE WATERSHED
C
      DO 120 NWPI = 1, NUMWPI
C
      IF (FDPATH .EQ. 'OLD') THEN
      INUC = NDXFII(NWPI)
      ELSE
      INUC = NDXWII(NWPI)
      ENDIF
C
      DECAY = DKRATE(IPNTDK(INUC))
C
C  COMPUTE THE WASHOFF FRACTION FOR NUCLIDES TO WATERSHED LAND
C
      WSHFRC(NWPI) = (WSHFRI(NWPI) * DECAY + WSHRTA(NWPI)) /
     1               (DECAY + WSHRTA(NWPI))

      DO 120 NORG = INICHR, NUMORG
      DO 120 NWPA = 1, NUMWPA
      TFLPD(NWPI,NORG,NWPA) = WINGF(NWPI,NWPA) * DCFING(NORG,INUC)
  120 TFLPW(NWPI,NORG,NWPA) = TFLPD(NWPI,NORG,NWPA) * WSHFRC(NWPI)

      RETURN
```

```
      END
*DECK SGCPLN
      SUBROUTINE SGCPLN
C
C THIS ROUTINE BUILDS THE STRAIGHT LINE GROUND CONCENTRATIONS IN THE PLANE
C
C THIS ROUTINE IS CALLED BY THE SUBROUTINE CHROUT.
C
C GLOSSARY OF VARIABLE NAMES OF DATA USED BY SGCPLN:
C
C GAULEV(I,J,K) - FRACTION OF THE GAUSSIAN CONCENTRATION OVER FINE
C                 GRID ELEMENT I FOR SEGMENT K AT SPATIAL INTERVAL J
C GRNCON(I,J,K) - CENTERLINE GROUND CONCENTRATION FOR NUCLIDE I AT
C                 SPATIAL INTERVAL I FOR PLUME SEGMENT K
C MAXFIN(I,J) - THE NUMBER OF FINE GRID ELEMENTS FROM CENTERLINE
C               FALLING UNDER THE PLUME FOR SEGMENT J AT INTERVAL I
C NEND   - (NUMFIN - NINC)
C NINCM1 - (NINC - 1)
C NUMFIN - NUMBER OF FINE GRID ELEMENTS IN A COARSE GRID ELEMENT
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMRAD - NUMBER OF SPATIAL INTERVALS IN THE RADIAL DIRECTION
C NUMREL - NUMBER OF PLUME SEGMENTS IN THE RELEASE
C
C GLOSSARY OF VARIABLE NAMES OF DATA PRODUCED BY SGCPLN:
C
C ADDR(I) - ADDER TO ACCUMULATE GROUND CONCENTRATIONS FOR FINE GRID
C           ELEMENT I
C AGRNDC(I,J,K) - AVG. GROUND CONCENTRATION OF NUCLIDE I IN THE COARSE GRID
C                 ELEMENT AT INTERVAL K IN DIRECTION J (Bq / SQ M)
C NFINE  - THE NUMBER OF FINE GRID ELEMENTS, COUNTING FROM THE CENTERLINE
C          AT THE CURRENT RADIAL DISTANCE
C
C LYNN RITCHIE, DIV. 6415, 15 NOVEMBER 1984
C
C MODIFIED 30 SEPT 87, S.E.R. #71, LTR, IMPLEMENTATION OF WINDSHIFT MODEL
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C
      EXTERNAL ABORT
      SAVE
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      COMMON /NUMGRD/ NINC, NINCM1, NEND, NUMFNT
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
C
C  THE DIMENSION OF THE FOLLOWING ARRAY MUST BE LARGE ENOUGH
C  TO STORE ALL THE FINE GRID STEPS IN ONE DIRECTION FROM CENTERLINE.
C
      DIMENSION ADDR(30)
C
C  LOOP ON RADIONUCLIDES
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C
      DO 40 NISO = 1, NUMISO
C
C  LOOP ON SPATIAL RADII
C
      DO 40 IRAD = 1, NUMRAD
C
C  INITIALIZE OUT TO THE FURTHEST FINE GRID FROM CENTERLINE (>90 DEGREES)
C
      DO 1 N = 1, 30
    1 ADDR(N) = 0.
C
C  INITIALIZE OUT TO THE FURTHEST COARSE GRID FROM CENTERLINE (>90 DEGREES)
C
      DO 2 IDIR = 1, 5
    2 AGRNDC(IDIR,NISO,IRAD) = 0.
C
C  LOOP ON RELEASES
C
      DO 20 IREL = 1, NUMREL
C
C  SET THE NUMBER OF FINE GRID ELEMENTS
C
      NFINE = MAXFIN(IRAD,IREL)

      IF (NFINE .LT. 1 .OR. NFINE .GT. 30) THEN
        WRITE(6,*) 'INTERNAL ERROR IN SGCPLN: NFINE=', NFINE
        WRITE(7,*) 'INTERNAL ERROR IN SGCPLN: NFINE=', NFINE
        CALL ABORT ('SGCPLN')
      ENDIF
C
C  LOOP ON DIRECTIONS
C
      DO 10 N = 1, NFINE
C
C  ACCUMULATE THE GROUND CONCENTRATION COMPONENT
C
   10 ADDR(N) = ADDR(N) + GRNCON(NISO,IRAD,IREL) * GAULEV(N,IRAD,IREL)
   20 CONTINUE
C
C  SET THE ACCUMULATED GROUND CONCENTRATION INTO CONCENTRATION ARRAY BY
C  COARSE GRID ELEMENT
C
      IF (NFINE .EQ. 1) THEN

        AGRNDC(1,NISO,IRAD) = ADDR(1)

      ELSE
C
C  COMPLETE THE ACCUMULATIONS FOR THE REFERENCE COARSE GRID ELEMENT
C
        NLST = NEND

        IF (NLST .GT. NFINE) NLST = NFINE
C
C  ADD IN COMPONENTS OF CENTER GRID THAT ARE LEFT OF THE CENTER LINE
C
         DO 22 N = 2, NLST
   22    AGRNDC(1,NISO,IRAD) = ADDR(N) + AGRNDC(1,NISO,IRAD)
C
C  ADD COMPONENTS THAT ARE RIGHT OF THE CENTER LINE
C
        DO 25 N = 1, NFINE
```

```
         IDIR = (N + NINCM1) / NUMFIN + 1
   25    AGRNDC(IDIR,NISO,IRAD) = AGRNDC(IDIR,NISO,IRAD) + ADDR(N)

      ENDIF
C
C  NORMALIZE THE GROUND CONCENTRATIONS
C
      DO 35 IDIR = 1, 5
   35 AGRNDC(IDIR,NISO,IRAD) = AGRNDC(IDIR,NISO,IRAD) / NUMFIN

   40 CONTINUE

      RETURN
      END
*DECK WGCPLN
      SUBROUTINE WGCPLN
C
C THIS ROUTINE BUILDS THE WIND SHIFT GROUND CONCENTRATIONS IN THE PLANE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHROUT.
C
C GLOSSARY OF VARIABLE NAMES OF DATA USED BY WGCPLN:
C
C GAULEV(I,J,K) - FRACTION OF THE GAUSSIAN CONCENTRATION OVER FINE
C                 GRID ELEMENT I FOR SEGMENT K AT SPATIAL INTERVAL J
C GRNCON(I,J,K) - CENTERLINE GROUND CONCENTRATION FOR NUCLIDE I AT
C                 SPATIAL INTERVAL I FOR PLUME SEGMENT K
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IWINDT - TRANSFORMED WIND DIRECTION USED IN THE DOSIMETRY CALCULATIONS
C MAXFIN(I,J) - THE NUMBER OF FINE GRID ELEMENTS FROM CENTERLINE
C               FALLING UNDER THE PLUME FOR SEGMENT J AT INTERVAL I
C NEND   - NUMFIN - NINC
C NINC   - NUMFIN/2
C NINCM1 - NINC - 1
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS
C NUMFIN - NUMBER OF FINE GRID ELEMENTS IN A COARSE GRID ELEMENT
C NUMFNT - THE TOTAL NUMBER OF FINE GRID ELEMENTS (NUMCOR*NUMFIN)
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMRAD - NUMBER OF SPATIAL INTERVALS IN THE RADIAL DIRECTION
C NUMREL - NUMBER OF PLUME SEGMENTS IN THE RELEASE
C
C GLOSSARY OF VARIABLE NAMES OF DATA PRODUCED BY WGCPLN:
C
C ACGRND - ACCUMULATOR OF THE GROUND CONCENTRATION IN A COARSE GRID
C ADDR(I) - ADDER TO ACCUMULATE GROUND CONCENTRATIONS FOR FINE GRID
C           ELEMENT I
C AGRNDC(I,J,K) - AVG. GROUND CONCENTRATION OF NUCLIDE I IN THE COARSE GRID
C                 ELEMENT AT INTERVAL K IN DIRECTION J (Bq / SQ M)
C GCOMP  -  FINE GRID GROUND CONCENTRATION COMPONENT
C I      -  INDEX FOR DO LOOPS AND IMPLIED DO LOOPS
C IWDIR  -  THE WIND DIRECTION OF THE CURRENT RELEASE
C IRAD   -  INDEX FOR DO LOOP OVER SPATIAL DISTANCES
C J      -  INDEX FOR DO LOOPS AND IMPLIED DO LOOPS
C JMX    -  NORMALIZED WIND DIRECTION OF THE RISK DOMINANT PLUME
C KDIR   -  INDEX FOR DO LOOP OVER WIND DIRECTIONS
C MKDIR  -  INDEX OF THE CENTER FINE GRID ELEMENT OF THE COARSE GRID
C MDXFIN -  INDEX OF THE FINE GRID ELEMENT LEFT OF THE CENTER
C MKDIR  -  INDEX OF THE CENTER FINE GRID ELEMENT
C N      -  INDEX FOR DO LOOPS AND IMPLIED DO LOOPS
C NCNT   -  INDEX FOR DO LOOP OVER FINE GRID ELEMENTS
C NDXFIN -  INDEX OF THE FINE GRID ELEMENT RIGHT OF THE CENTER
C NFINE  -  THE NUMBER OF FINE GRID ELEMENTS, COUNTING FROM THE
C           CENTER LINE, AT THE CURRENT RADIAL DISTANCE
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C NISO   -  INDEX FOR DO LOOP OVER NUCLIDES
C NLEFT  -  INDEX FOR FINE GRID ELEMENTS LEFT OF THE CENTER
C NRIGHT -  INDEX FOR FINE GRID ELEMENTS RIGHT OF THE CENTER
C
C  LYNN RITCHIE, DIV. 6415, 30 SEPTEMBER 1987
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ATMDAT/ OALARM, MAXRIS, IDIREC(4),
     $        AIRCON(MAXNUC,MAXRAD,4), GRNCON(MAXNUC,MAXRAD,4),
     $        TIMCEN(MAXRAD,4), TIMOVH(MAXRAD,4), AVGHIT(MAXRAD,4),
     $        HTFCTR(MAXRAD,4), SIGYM(MAXRAD,4),  SIGZM(MAXRAD,4)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      COMMON /NUMGRD/ NINC, NINCM1, NEND, NUMFNT
      COMMON /DOSFAC/ CLDRAT(2:MAXORG,MAXRAD,4), GRDTIM(0:8),
     1 GRDRAT(2:MAXORG,MAXRAD,4), GRDINT(2:MAXORG,MAXRAD,4,8),
     2 RESINT(2:MAXORG,MAXRAD,4,8), GAULEV(30,MAXRAD,4), PSF(MAXRAD,4),
     3 CLDFAC(30,MAXRAD,4), MAXFIN(MAXRAD,4), TSTART(MAXRAD,4),
     4 TSTOP(MAXRAD,4),SIGMAY(MAXRAD,4),IWINDT(4),PIF(2:MAXORG,MAXRAD,4)
C
C  THE FOLLOWING ARRAY IS DIMENSIONED TO HANDLE THE NUMBER OF FINE GRID
C  DIVISIONS NEEDED TO GO ALL THE WAY AROUND THE CIRCLE WITH (NUMFIN=7).

      DIMENSION ADDR(112)
C
C  LOOP OVER ALL SPATIAL INTERVALS
C
      DO 500 IRAD = 1, NUMRAD
C
C  INITIALIZE THE GROUND CONCENTRATION ARRAYS
C
      DO 160 J = 1, NUMISO
      DO 160 N = 1, NUMCOR
  160 AGRNDC(N,J,IRAD) = 0.
C
C  LOOP ON RADIONUCLIDES
C
      DO 400 NISO = 1, NUMISO
C
C  INITIALIZE THE ADDR ARRAY
C
      DO 180 I = 1, NUMFNT
  180 ADDR(I) = 0.
C
C  LOOP ON RELEASES
C
      DO 200 IREL = 1, NUMREL
C
C  SET THE TRANSFORMED DIRECTION OF THE RELEASED PLUME
C
      IWDIR = IWINDT(IREL)
C
C  SET THE NUMBER OF FINE GRID ELEMENTS
C
      NFINE = MAXFIN(IRAD,IREL)
C
```

```
C  LOOP ON THE FINE GRID ELEMENTS AND DISTRIBUTE THE PLUME
C
      DO 200 N = 1, NFINE
C
C  COMPUTE THE GROUND CONCENTRATION COMPONENT FOR FINE GRID ELEMENT N
C
      GCOMP = GRNCON(NISO,IRAD,IREL) * GAULEV(N,IRAD,IREL)
C
C  ACCUMULATED GROUND CONCENTRATION COMPONENT N INTO THE ADDR
C
      IF (N .EQ. 1) THEN

        NDXFIN = (IWDIR - 1) * NUMFIN + 1
        MDXFIN = NDXFIN
        ADDR(NDXFIN) = GCOMP + ADDR(NDXFIN)

      ELSE

        NDXFIN = NDXFIN + 1
        IF (NDXFIN .GT. NUMFNT) NDXFIN = 1

        MDXFIN = MDXFIN - 1
        IF (MDXFIN .EQ. 0) MDXFIN = NUMFNT

        ADDR(NDXFIN) = GCOMP + ADDR(NDXFIN)
        ADDR(MDXFIN) = GCOMP + ADDR(MDXFIN)

      ENDIF

  200 CONTINUE
C
C  CALCULATE THE AVERAGE GROUND CONCENTRATION FOR EACH COARSE GRID ELEMENT
C
      DO 260 KDIR = 1, NUMCOR

      IF (KDIR .EQ. 1) THEN
C
C  SET THE LEFT AND RIGHT HAND INDICES OF GRID ELEMENT 1
C
        NLEFT = NUMFNT - NINCM1
        NRIGHT = 1 + NINC
C
C  INITIALIZE THE ACCUMULATION OF THE GROUND CONCENTRATION
C  COARSE GRID DIRECTION 1
C
        ACGRND = ADDR(1)
C
C  COMPLETE THE ACCUMULATION OF THE GROUND CONCENTRATION AND
C  THE SEARCH FOR THE MAXIMUM GROUND CONCENTRATION
C
        DO 220 NCNT = 1, NINC
  220   ACGRND = ACGRND + ADDR(NRIGHT - NCNT + 1) +
     1                    ADDR (NLEFT + NCNT - 1)

      ELSE
C
C  SET THE CENTER AND THE LEFT AND RIGHT HAND INDICES OF THE FINE
C  GRID ELEMENTS THAT CORRESPOND TO THE COARSE GRID ELEMENT
C  KDIR (KDIR .NE. 1)
C
        MKDIR  = (KDIR - 1) * NUMFIN + 1
        NLEFT  = MKDIR - NINC
        NRIGHT = MKDIR + NINC
```

```
C
C  INITIALIZE THE ACCUMULATION OF THE GROUND CONCENTRATION AND
C  THE DETERMINATION OF THE MAXIMUM GROUND CONCENTRATION IN
C  COARSE GRID DIRECTION KDIR
C
         ACGRND = ADDR(NLEFT)

         NLEFT = NLEFT + 1
C
C  COMPLETE THE ACCUMULATION OF THE GROUND CONCENTRATION AND
C  THE SEARCH FOR THE MAXIMUM GROUND CONCENTRATION
C
         DO 240 NFNG = NLEFT, NRIGHT
  240    ACGRND = ADDR(NFNG) + ACGRND

      ENDIF
C
C  SET RESULTS INTO THE PROPER ARRAYS
C
  260 AGRNDC(KDIR,NISO,IRAD) = ACGRND / NUMFIN

  400 CONTINUE

  500 CONTINUE

      RETURN
      END
*DECK CRNRSK
      SUBROUTINE CRNRSK
C
C DETERMINE THE CHRONIC RISKS FOR THE CURRENT TRIAL
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CHROUT.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C KSWDSC - PRINT CONTROL SWITCH FOR CHRONIC DOSES AND COSTS
C NUMRAD - THE NUMBER OF SPATIAL INTERVALS IN THE RADIAL DIRECTION
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C IDIR   - DIRECTION INDEX
C INTRVL - INTERVAL INDEX
C
C GLOSSARY OF EXTERNALS:
C
C DIRDEP - COMPUTE THE TRANSFER FACTORS FOR DIRECTLY DEPOSITED
C          RADIONUCLIDES THROUGH MILK AND OTHER CROPS
C EMRGPH - EMERGENCY PHASE ECONOMIC RISK MODEL
C GETTIM - GET THE START TIME TO USE FOR COCINA OUTPUT
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INITLZ - INITIALIZE THE LONG-TERM ACTION AND COST ARRAYS
C INTRPH - INTERMEDIATE PHASE EMERGENCY RESPONSE MODEL
C LNGTPH - LONG-TERM PHASE CHRONIC DOSE AND ECONOMIC RISK MODEL
C LOKSEE - PRINT A SUMMARY OF THE RESULTING DOSES AND COSTS FOR THIS
C          GRID ELEMENT AS REQUESTED
C NTFCTR - CALCULATES THE NEW FOOD PATHWAY TRANSFER FACTORS FOR THIS
C          START TIME
C STOCHR - CALCULATE THE CHRONIC/ECONOMIC RESULTS SELECTED FOR OUTPUT
C
C  MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
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```
C
C  MODIFIED 30 SEPT 86, S.E.R. #71, LTR, IMPLEMENTATION OF WIND SHIFT MODEL
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      EXTERNAL DIRDEP, EMRGPH, INITLZ, INTRPH, LNGTPH, LOKSEE, STOCHR
      PARAMETER (MXNUC=10,MXCRP=10)
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /INDXS/ INTRVL, IDIR
      COMMON /KOPRNT/ KSWDSC
      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
C
C  COMPUTE THOSE TRANSFER FACTORS FOR DIRECT DEPOSITION THAT
C   ARE DEPENDENT ON THE TIME OF YEAR OF THE ACCIDENT AND GET NEW
C   TRANSFER FACTORS IF NEEDED FOR NEW FOOD MODEL
C
      IF (FDPATH .EQ. 'OLD') THEN
      CALL DIRDEP
      ENDIF
C
C  INITIALIZE THE INTERMEDIATE AND LONG-TERM RESULTS
C
      CALL INITLZ
C
C  CALCULATE THE EMERGENCY PHASE EVACUATION AND RELOCATION TIMES
C  WHETHER OR NOT THERE WAS ANY CONTAMINATION IN THE SPATIAL ELEMENT
C
      CALL EMRGPH
C
C  FOR STRAIGHT-LINE PLUME, COVER ONLY ONE SIDE BECAUSE OF SYMMETRY,
C  FOR WIND-SHIFT MODEL, COVER ALL WIND DIRECTIONS
C
      IF (IPLUME .EQ. 1) THEN
      LASANG = NUMCOR / 4 + 1
      ELSE
      LASANG = NUMCOR
      ENDIF

      DO 200 IDIR = 1, LASANG
      DO 100 INTRVL = 1, NUMRAD
C
C  CALCULATE THE INTERMEDIATE AND LONG-TERM PHASE RESULTS ONLY IF THERE
C  WAS SOME CONTAMINATION IN THE ELEMENT
C
      IF (IHITIT(INTRVL,IDIR)) THEN
C
C   TREAT THE INTERMEDIATE (DECISION) PHASE
C
        CALL INTRPH
C
C   TREAT THE LONG TERM PHASE
C
        CALL LNGTPH

      ENDIF
```

```
  100 CONTINUE
C
C  IF THE PRINT FLAG HAS BEEN TURNED ON, PRINT OUT TABLES OF DOSES AND COSTS
C
      IF (KSWDSC .NE. 0) CALL LOKSEE

  200 CONTINUE
C
C  CALCULATE THE RESULTING EFFECTS OF THIS TRIAL AND STORE ON A FILE
C
      CALL STOCHR
C
      RETURN
      END
*DECK DIRDEP
      SUBROUTINE DIRDEP
C
C COMPUTE THE TRANSFER FACTORS FOR DIRECTLY DEPOSITED RADIONUCLIDES
C THROUGH THE PASTURE AND THE OTHER CROP FOOD PATHWAYS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO DIRDEP:
C
C CTCOEF(I,J,K) - CROP TRANSFER COEFFICIENT FOR NUCLIDE I DEPOSITED
C                 ON CROP J FOR CROP TRANSFER TERM K
C CTHALF(I,J,K) - CROP TRANSFER HALF-LIFE FOR NUCLIDE I DEPOSITED
C                 ON CROP J FOR CROP TRANSFER TERM K
C DTFBPT(I,J,K) - DIRECT TRANSFER FRACTION FOR MEAT DOSE TERM FOR
C                 NUCLIDE I ON CROP J TO ORGAN K
C DTFCPT(I,J,K) - DIRECT TRANSFER FRACTION FOR CROP DOSE TERM FOR
C                 NUCLIDE I ON CROP J TO ORGAN K
C DTFMPT(I,J,K) - DIRECT TRANSFER FRACTION FOR MILK DOSE TERM FOR
C                 NUCLIDE I ON CROP J TO ORGAN K
C NAMCRP(I) - NAME OF FOOD INGESTION MODEL CROP I
C NDXFII - POINTER ARRAY SHOWING LOCATION OF THE FOOD NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES
C NFICRP - NUMBER OF FOOD INGESTION MODEL CROPS
C NFIISO - NUMBER OF FOOD INGESTION MODEL NUCLIDES
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C TGSBEG(I) - THE TIME (DAYS) THE GROWING SEASON BEGINS FOR CROP I
C TGSEND(I) - THE TIME (DAYS) THE GROWING SEASON ENDS FOR CROP I
C TIMACC - TIME (DAY) OF THE ACCIDENT
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C CTF(I,J)- CROP TRANSFER FUNCTION FOR NUCLIDE I DEPOSITED ON CROP J
C DTFBP(I,J,K) - DIRECT TRANSFER FACTOR FOR MEAT DOSE TO THE POPULATION
C                FOR NUCLIDE I ON CROP J TO ORGAN K
C DTFCP(I,J,K) - DIRECT TRANSFER FACTOR FOR CROP DOSE TO THE POPULATION
C                FOR NUCLIDE I ON CROP J TO ORGAN K
C DTFMP(I,J,K) - DIRECT TRANSFER FACTOR FOR MILK DOSE TO THE POPULATION
C                FOR NUCLIDE I ON CROP J TO ORGAN K
C DTFMLK(I,J) - DIRECT TRANSFER FACTOR FOR THE MILK PATHWAY FOR FOOD
C               INGESTION NUCLIDE I TO ORGAN K
C DTFOTH(I,J) - DIRECT TRANSFER FACTOR FOR THE OTHER FOOD PATHWAY FOR
C               FOOD INGESTION NUCLIDE I TO ORGAN K
C GSLMDA - DECAY RATE USED FOR CALCULATING HARVESTING FUNCTION FROM PASTURE
C
C LYNN RITCHIE, DIV. 6415, 18 JULY 1984
C
C MOD 24 MAR 88, D.C., ELIMINATE THE PRECALCULATION OF GSLMDA IN INPUT ROUTINES
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C MODIFIED 7/30/91, D. CHANIN, #8/2/91-A, CHANGE HOLLERITHS TO TYPE CHARACTER
C
C  NO EXTERNAL FUNCTIONS
      INTRINSIC LOG, EXP
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXDKCN=900, MAXGEN=6, MAXELS=5, MAXCHN=110)
      PARAMETER (MXNUC=10,MXCRP=10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *20   NAMCRP
      COMMON /NAMCRP/ NAMCRP(MXCRP)
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      COMMON /CRPTRF/ NTTRM, CTCOEF(MXNUC,MXCRP,3),
     *                CTHALF(MXNUC,MXCRP,3)
      COMMON /ISOGRP/ MAXGRP, IGROUP(MAXNUC)
      COMMON /DIRCTF/ DTFMLK(MXNUC,2:MAXORG), DTFOTH(MXNUC,2:MAXORG)
      COMMON /DTFRCT/ DTFCPT(MXNUC,MXCRP,2:MAXORG),
     1 DTFMPT(MXNUC,MXCRP,2:MAXORG),
     2 DTFBPT(MXNUC,MXCRP,2:MAXORG)
      COMMON /IPNTDK/ IPNTDK(MAXNUC)
      COMMON /INDEXR/ DKRATE(MXDKCN), NUMFND, IDEKTO(3,MXDKCN),
     1                DKFRAC(3,MXDKCN)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
C
      DIMENSION DTFCP(MXNUC,MXCRP,2:MAXORG),
     1 DTFMP(MXNUC,MXCRP,2:MAXORG),
     2 DTFBP(MXNUC,MXCRP,2:MAXORG)
C
C  LOOP THROUGH THE SET OF FOOD INGESTION CROPS AND NUCLIDES
C
      FLN2 = LOG (2.)
C
      DO 300 K = 1, NFICRP
C
      TMFCTR = (TGSEND(K) - TIMACC) * 24. * 3600.
      GSFCTR = (TGSEND(K) - TGSBEG(K)) * 24. * 3600.
C
      DO 200 J = 1, NFIISO
C
      DECAY = DKRATE(IPNTDK(NDXFII(J)))
C
C  COMPUTE THE DIRECT DEPOSIT TRANSFER FACTORS FOR ALL CROP ORGANS
C
      IF (TIMACC .LT. TGSBEG(K) .OR. TIMACC .GT. TGSEND(K)) THEN
C
C  ACCIDENT HAPPENED OUTSIDE OF THE GROWING SEASON
C
      DO 100 N = INICHR, NUMORG
        DTFCP(J,K,N) = 0.
        DTFMP(J,K,N) = 0.
  100   DTFBP(J,K,N) = 0.
C
      ELSE
C
C  ACCIDENT OCCURED DURING THE GROWING SEASON
C
        WSUM = 0.

        IF (NAMCRP(K) .EQ. 'PASTURE') THEN
```

```
C
C  THERE IS SPECIAL TREATMENT OF THE PASTURE PATHWAY WHICH USES A TRICKY
C  INTEGRATION TO HANDLE THE CONTINOUS HARVESTING PROCESS OF GRAZING CATTLE
C
C  CALCULATE A DECAY RATE CORRESPONDING TO A HALF-LIFE OF THE GROWING SEASON
C
          GSLMDA = FLN2 / GSFCTR
        TERM = GSLMDA + DECAY
C
          DO 140 L = 1, NTTRM
          AFCTR = FLN2 / CTHALF(J,K,L) + TERM
  140     WSUM = WSUM +
     1      CTCOEF(J,K,L) * (1. - EXP(-AFCTR * TMFCTR)) / AFCTR
          WSUM = WSUM / GSFCTR
C
        ELSE
C
          DO 160 L = 1, NTTRM
C
C  CALCULATE TRANSFER FACTORS FOR ALL CROPS OTHER THAN PASTURE
C
  160     WSUM = WSUM + CTCOEF(J,K,L)
     1    * EXP( (-FLN2 / CTHALF(J,K,L) - DECAY) * TMFCTR)
        ENDIF

      DO 180 N = INICHR, NUMORG
        DTFCP(J,K,N) = WSUM * DTFCPT(J,K,N)
        DTFMP(J,K,N) = WSUM * DTFMPT(J,K,N)
  180   DTFBP(J,K,N) = WSUM * DTFBPT(J,K,N)

      ENDIF

  200 CONTINUE
  300 CONTINUE
C
C  COMBINE RESULTS FOR THE MILK AND "OTHER" DIRECT DEPOSITION TRANSFER
C  PATHWAYS FOR EACH FOOD INGESTION MODEL NUCLIDE FOR EACH ORGAN
C
      DO 420 K = INICHR, NUMORG
      DO 410 I = 1, NFIISO

      SUMBP = 0.
      SUMMP = 0.
      SUMCP = 0.

      DO 400 NCRP = 1, NFICRP
      SUMBP = SUMBP + DTFBP(I,NCRP,K)
      SUMCP = SUMCP + DTFCP(I,NCRP,K)
  400 SUMMP = SUMMP + DTFMP(I,NCRP,K)

      DTFMLK(I,K) = SUMMP
      DTFOTH(I,K) = SUMCP + SUMBP

  410 CONTINUE
  420 CONTINUE

      RETURN
      END
*DECK INITLZ
      SUBROUTINE INITLZ
C
C INITIALIZE ACTION AND COST ARRAYS
C
```

```
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C GLOSSARY OF VARIABLES:
C
C CSTDF(I,J) - COST OF FARM DECONTAMINATION PER UNIT AREA FOR THE COARSE
C              GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTDNF(I,J) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR THE COARSE
C               GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C CSTLF(I,J) - LABOR COST FOR DECONTAMINATING FARM IN THE GRID ELEMENT
C              AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTLNF(I,J) - LABOR COST FOR DECONTAMINATING NON-FARM IN THE GRID
C               ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C DSFOOD(I,J,K) - FOOD INGESTION DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSPCRP(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR CROPS
C DSPMLK(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR MILK
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE DECONTAMINATION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
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C               TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C               THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C               TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C               THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C               TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C               PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9: A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C              IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C              BECAUSE THE DOSE CRITERION CANNOT BE MET.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C TRMDRL(I,J) - RELOCATION PERIOD OF TEMPORARY INTERDICTION FOR DECONTAMINATION
C                OF THE GRID ELEMENT AT INTERVAL J IN DIRECTION I (SECONDS)
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
C
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C MODIFIED 3/23/93, D.C., CHANGE TDECON TO AN ARRAY AND ADD IT TO THE LIST
C   OF VARIABLES WHICH ARE PRINTED WHEN KSWDSC IS SET NON-ZERO
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL          DSPMLK,         DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
C
C  FOR STRAIGHT LINE PLUME WE ONLY NEED TO INITIALIZE OUT TO 90 DEGREES
C
      IF (IPLUME .EQ. 1) THEN
        LASANG = NUMCOR / 4 + 1
      ELSE
        LASANG = NUMCOR
```

```
      ENDIF

      DO 50 INTRVL = 1, NUMRAD
      DO 50 IDIR   = 1, LASANG
      INIMLK(IDIR,INTRVL) = 0
      INIOTH(IDIR,INTRVL) = 0
      LRACTN(IDIR,INTRVL) = 0
      LTACTN(IDIR,INTRVL) = 0
      LVELDC(IDIR,INTRVL) = 0
      CSTDF(IDIR,INTRVL)  = 0.
      CSTDNF(IDIR,INTRVL) = 0.
      CSTIF(IDIR,INTRVL)  = 0.
      CSTINF(IDIR,INTRVL) = 0.
      CSTLF(IDIR,INTRVL)  = 0.
      CSTLNF(IDIR,INTRVL) = 0.
      TRMEVA(IDIR,INTRVL) = 0.
      TRMREL(IDIR,INTRVL) = 0.
      TRMDRL(IDIR,INTRVL) = 0.
      TRMIRL(IDIR,INTRVL) = 0.
      TDECON(IDIR,INTRVL) = 0.
      DSPMLK(IDIR,INTRVL) = .FALSE.
      DSPCRP(IDIR,INTRVL) = .FALSE.
C
C  INITIALIZE DOSE ARRAYS
C
      DO 50 NORG = INICHR, MAXORG
      DSDXPS(IDIR,INTRVL,NORG) = 0.
      DSFOOD(IDIR,INTRVL,NORG) = 0.
      DMDOSE(IDIR,INTRVL,NORG) = 0.
      DODOSE(IDIR,INTRVL,NORG) = 0.
      DSWKF(IDIR,INTRVL,NORG)  = 0.
      DSWKNF(IDIR,INTRVL,NORG) = 0.
      GSDOSE(IDIR,INTRVL,NORG) = 0.
      REDOSE(IDIR,INTRVL,NORG) = 0.
      RMDOSE(IDIR,INTRVL,NORG) = 0.
      RODOSE(IDIR,INTRVL,NORG) = 0.
      WDDOSE(IDIR,INTRVL,NORG,1) = 0.
      WDDOSE(IDIR,INTRVL,NORG,2) = 0.
      WDDOSE(IDIR,INTRVL,NORG,3) = 0.
      WDDOSE(IDIR,INTRVL,NORG,4) = 0.
      WWDOSE(IDIR,INTRVL,NORG,1) = 0.
      WWDOSE(IDIR,INTRVL,NORG,2) = 0.
      WWDOSE(IDIR,INTRVL,NORG,3) = 0.
      WWDOSE(IDIR,INTRVL,NORG,4) = 0.
   50 CONTINUE

      RETURN
      END
*DECK EMRGPH
      SUBROUTINE EMRGPH
C
C EMERGENCY PHASE ECONOMIC RISK MODEL
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C COMPUTE THE DURATION FOR WHICH INDIVIDUALS ARE REMOVED FROM THEIR HOMES
C DURING THE EMERGENCY PHASE PERIOD EITHER FROM EVACUATION OR RELOCATION
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C ENDEMP - END OF THE EMERGENCY PHASE (SECONDS FROM PLUME FIRST ARRIVAL)
C IDIR   - DIRECTION INDEX
C INDXR  - EMERGENCY PHASE RESPONSE INDEX
```

```
C INTRVL - INTERVAL INDEX
C RETCOD(I,J) - EMERGENCY RESPONSE INDEX (RETURN CODE) FOR TTHE
C               GRID ELEMENT AT INTERVAL I AND DIRECTION J, SEE BELOW
C TIMHOT - HOT SPOT RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C TIMNRM - NORMAL RELOCATION TIME (SECONDS FROM PLUME ARRIVAL)
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C TRMEVA(I,J) - TERM OF EVACUATION FOR THE POPULATION AT THE GRID
C               ELEMENT AT INTERVAL I AND DIRECTION J
C TRMREL(I,J) - TERM OF RELOCATION FOR THE POPULATION IN THE GRID
C               ELEMENT AT INTERVAL I AND DIRECTION J
C
C INTERPRETATION OF THE THIRTEEN POSSIBLE VALUES OF RETCOD:
C
C  1. - PEOPLE IN INNER SHELTER ZONE, MOVED BACK IN AT TIMNRM
C  2. - PEOPLE IN INNER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  3. - PEOPLE IN FIRST EVACUATION ZONE, MOVED BACK IN AT TIMNRM
C  4. - PEOPLE IN FIRST EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  5. - PEOPLE IN SECOND EVACUATION ZONE, MOVED BACK IN AT TIMNRM
C  6. - PEOPLE IN SECOND EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  7. - PEOPLE IN THIRD EVACUATION ZONE, MOVED BACK IN AT TIMNRM
C  8. - PEOPLE IN THIRD EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  9. - PEOPLE IN OUTER SHELTER ZONE, MOVED BACK IN AT TIMNRM
C 10. - PEOPLE IN OUTER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
C 11. - PEOPLE IN RELOCATION ZONE, CAN REMAIN UNTIL ENDEMP
C 12. - PEOPLE IN RELOCATION ZONE, NORMAL RELOCATION OCCURS AT TIMNRM
C 13. - PEOPLE IN RELOCATION ZONE, HOT SPOT RELOCATION OCCURS AT TIMHOT
C
C LYNN RITCHIE, DIV. 6415, 23 NOVEMBER 1984
C
C MODIFIED 7/11/89, D. CHANIN, LOG # 7/5/89-B,
C   INCORRECT EVACUATION TIME FOR INNER SHELTER ZONE
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /RELOCA/ ENDEMP, TIMHOT, TIMNRM, DOSHOT, DOSNRM, INDORG
      COMMON /RETCOD/ RETCOD(MAXRAD,16)
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
C
      DO 900 IDIR   = 1, 16
      DO 900 INTRVL = 1, NUMRAD
      IF (RETCOD(INTRVL,IDIR) .EQ. 1.) THEN
C
C  PEOPLE IN INNER SHELTER ZONE, MOVED BACK IN AT TIMNRM
      TRMEVA(IDIR,INTRVL) = TIMNRM
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 2.) THEN
C
C  PEOPLE IN INNER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
      TRMEVA(IDIR,INTRVL) = ENDEMP
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 3.) THEN
C
C  PEOPLE IN FIRST EVACUATION ZONE, MOVED BACK IN AT TIMNRM
      TRMEVA(IDIR,INTRVL) = TIMNRM
```

```
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 4.) THEN
C
C  PEOPLE IN FIRST EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
      TRMEVA(IDIR,INTRVL) = ENDEMP
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 5.) THEN
C
C  PEOPLE IN SECOND EVACUATION ZONE, MOVED BACK IN AT TIMNRM
      TRMEVA(IDIR,INTRVL) = TIMNRM
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 6.) THEN
C
C  PEOPLE IN SECOND EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
      TRMEVA(IDIR,INTRVL) = ENDEMP
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 7.) THEN
C
C  PEOPLE IN THIRD EVACUATION ZONE, MOVED BACK IN AT TIMNRM
      TRMEVA(IDIR,INTRVL) = TIMNRM
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 8.) THEN
C
C  PEOPLE IN THIRD EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
      TRMEVA(IDIR,INTRVL) = ENDEMP
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 9.) THEN
C
C  PEOPLE IN OUTER SHELTER ZONE, MOVED BACK IN AT TIMNRM
      TRMEVA(IDIR,INTRVL) = TIMNRM
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 10.) THEN
C
C  PEOPLE IN OUTER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
      TRMEVA(IDIR,INTRVL) = ENDEMP
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 11.) THEN
C
C  PEOPLE IN RELOCATION ZONE, CAN REMAIN UNTIL ENDEMP
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 12.) THEN
C
C  PEOPLE IN RELOCATION ZONE, NORMAL RELOCATION OCCURS AT TIMNRM
      TRMREL(IDIR,INTRVL) = ENDEMP - TIMNRM
      ELSE IF (RETCOD(INTRVL,IDIR) .EQ. 13.) THEN
C
C  PEOPLE IN RELOCATION ZONE, HOT SPOT RELOCATION OCCURS AT TIMHOT
      TRMREL(IDIR,INTRVL) = ENDEMP - TIMHOT
      ENDIF
  900 CONTINUE
      RETURN
      END
*DECK INTRPH
      SUBROUTINE INTRPH
C
C CALCULATE CONSEQUENCES RESULTING FROM THE INTERMEDIATE PHASE PERIOD
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C AGRNDC(I,J,K) - AVG. GROUND CONCENTRATION OF NUCLIDE I IN THE COARSE GRID
C                 ELEMENT AT INTERVAL K IN DIRECTION J (Bq / SQ M)
C DSCRTI - DOSE CRITERION FOR INTERMEDIATE PHASE RELOCATION
C ICRTRO - INDEX OF THE CRITICAL ORGAN FOR THE LONG-TERM MODEL
C IDIR   - DIRECTION INDEX
C INTRVL - INTERVAL INDEX
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C PPAPIG(I,J) - PROJECTION/ACCUMULATION - INTERMEDIATE PHASE PERIOD-
C               GROUNDSHINE: NUCLIDE I, ORGAN J
C PPAPIR(I,J) - PROJECTION/ACCUMULATION - INTERMEDIATE PHASE PERIOD-
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C                 RESUSPENSION: NUCLIDE I, ORGAN J
C TMEPND - THE TIME AT WHICH THE EMERGENCY PHASE ENDS
C TMIPND - THE TIME AT WHICH THE INTERMEDIATE PHASE ENDS
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C GSDOSE(I,J,K) - CHRONC GROUNDSHINE DOSE TO ORGAN K AT INTERVAL J
C                  IN DIRECTION I
C PRJGDS - PROJECTED DOSE TO CRITICAL ORGAN FROM GROUNDSHINE
C PRJRDS - PROJECTED DOSE TO CRITICAL ORGAN FROM RESUSPENSION
C TRMIRL(I,J) - RELOCATION TERM FOR INTERMEDIATE (DECISION) PHASE
C                AT INTERVAL J IN DIRECTION I
C
C  LYNN RITCHIE, DIV. 6415, 27 NOVEMBER 1984
C
C  MODIFIED 27 APR 87, D.C., SER #53, BASE THE DIRECT EXPOSURE INTERDICTION
C   ON THE SUM OF GROUNDSHINE AND RESUSPENSION DOSES
C
C  MODIFIED 30 SEPT 87, S.E.R. #71, LTR, IMPLEMENTATION OF WIND SHIFT MODEL
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C MODIFIED 11/12/94, D.C., ADDED THE CALCULATION OF DSDXPS AFTER GRUPA LETTER
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON // PPAPIG(MAXNUC,2:MAXORG),
     1  PPAPIR(MAXNUC,2:MAXORG), PPNOLG(MAXNUC), PPNOLR(MAXNUC),
     2  PPDCLG(MAXNUC,3), PPDCLR(MAXNUC,3), PPINLG(MAXNUC,3),
     3  PPINLR(MAXNUC,3), APNOLG(MAXNUC,2:MAXORG),
     4  APNOLR(MAXNUC,2:MAXORG), APDCLG(MAXNUC,2:MAXORG,3),
     5  APDCLR(MAXNUC,2:MAXORG,3), APINLG(MAXNUC,2:MAXORG,3),
     6  APINLR(MAXNUC,2:MAXORG,3), APDCWG(MAXNUC,2:MAXORG,3)
      COMMON /ICRTRO/ ICRTRO
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      COMMON /INDXS/  INTRVL, IDIR
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
C
C COMPUTE PROJECTED DOSE TO THE CRITICAL ORGAN FROM GROUNDSHINE AND
C RESUSPENSION (ARRAYS PPAPIG AND PPAPIR ARE DEFINED IN ROUTINE CHRNDF)
```

```
C
      PRJGDS = 0.
      PRJRDS = 0.

      DO 60 NISO = 1, NUMISO
      PRJGDS = PRJGDS + AGRNDC(IDIR,NISO,INTRVL) * PPAPIG(NISO,ICRTRO)
   60 PRJRDS = PRJRDS + AGRNDC(IDIR,NISO,INTRVL) * PPAPIR(NISO,ICRTRO)
C
C  CHECK WHETHER INTERMEDIATE PHASE RELOCATION IS REQUIRED BASED ON
C  THE SUM OF THE RESUSPENSION AND GROUNDSHINE DOSES TO CRITICAL ORGAN
C
      IF (PRJGDS + PRJRDS .LE. DSCRTI) THEN
C
C  NO INTERMEDIATE (DECISION) PHASE RELOCATION IS REQUIRED, SO WE
C  COMPUTE GROUNDSHINE AND RESUSPENSION DOSES TO ALL CHRONC ORGANS
C
      DO 100 NORG = INICHR, NUMORG
        DO 100 NISO = 1, NUMISO
        GSDOSE(IDIR,INTRVL,NORG) = GSDOSE(IDIR,INTRVL,NORG) +
     1    AGRNDC(IDIR,NISO,INTRVL) * PPAPIG(NISO,NORG)
  100   REDOSE(IDIR,INTRVL,NORG) = REDOSE(IDIR,INTRVL,NORG) +
     1    AGRNDC(IDIR,NISO,INTRVL) * PPAPIR(NISO,NORG)
C
C  NO RELOCATION REQUIRED
C
        TRMIRL(IDIR,INTRVL) = 0.

      ELSE
C
C  SET THE DURATION OF RELOCATION RESULTING FROM THE MITIGATIVE ACTION
C
        TRMIRL(IDIR,INTRVL) = TMIPND - TMEPND

      ENDIF

      DO 600 NORG = INICHR, NUMORG
  600 DSDXPS(IDIR,INTRVL,NORG) = REDOSE(IDIR,INTRVL,NORG) +
     1                           GSDOSE(IDIR,INTRVL,NORG)

      RETURN
      END
*DECK LNGTPH
      SUBROUTINE LNGTPH
C
C LONG-TERM PHASE CHRONIC DOSE AND ECONOMIC RISK MODEL
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C COMPUTE CHRONIC DOSES AND ECONOMIC COSTS FOR THIS PHASE.
C ECONOMIC COSTS IN THIS PHASE CAN RESULT FROM RELOCATION,
C DECONTAMINATION, INTERDICTION, CONDEMNATION, AND CROP DISPOSAL
C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C
      EXTERNAL LTPROJ, CSTEFF, LTACUM
C
C  PERFORM A PROJECTION OF THE ACTIONS REQUIRED TO MEET CRITERIA
C
      CALL LTPROJ
C
C  EVALUATE THE COST-EFFECTIVENESS OF THE PROJECTED ACTIONS AND CONDEMN THE
C  PROPERTY IF THE ACTIONS NEEDED TO MEET CRITERIA ARE NOT COST-EFFECTIVE
C
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```
      CALL CSTEFF
C
C  ACCUMULATE THE RESULTING DOSES AND COSTS
C
      CALL LTACUM

      RETURN
      END
*DECK LTPROJ
      SUBROUTINE LTPROJ
C
C THIS ROUTINE CALCULATES THE LONG-TERM ACTIONS REQUIRED TO MEET CRITERIA
C
C IT IS CALLED BY SUBROUTINE LNGTPH.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C AGRNDC(I,J,K) - AVG. GROUND CONCENTRATION OF NUCLIDE I IN THE COARSE GRID
C                 ELEMENT AT INTERVAL K IN DIRECTION J (Bq / SQ M)
C COUPLD - LOGICAL FLAG INDICATING LONG-TERM AND GROWING-SEASON ACTIONS
C          ARE TO BE PERFORMED IN A COUPLED FASHION (MUTUALLY DEPENDENT)
C DSCRLT - DOSE CRITERION FOR LONG-TERM PHASE
C GCMAXR(I) - MAXIMUM GROUND CONTAMINATION FOR FOOD INGESTION MODEL
C             NUCLIDE I IN THE ROOT UPTAKE PATHWAY
C IDIR   - DIRECTION INDEX
C INTRVL - INTERVAL INDEX
C JSTART - INDEX TO THE COCINA DATA TO USE FOR THIS TRIAL
C KSTART - INDEX TO THE COCINA DAT USED FOR THE LAST TRIAL
C NDXFII - POINTER ARRAY SHOWING LOCATION OF THE FOOD NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES
C NFIISO - NUMBER OF NUCLIDES FOR FOOD INGESTION MODEL
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C PPNOLG(I) - PROJECTION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C             GROUNDSHINE: NUCLIDE I
C PPNOLR(I) - PROJECTION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C             RESUSPENSION: NUCLIDE I
C PSCMLK(I) - PERMISSIBLE SURFACE CONCENTRATION OF NUCLIDE I FOR MILK
C PSCOTH(I) - PERMISSIBLE SURFACE CONCENTRATION OF NUCLIDE I FOR CROPS
C TIMACC - TIME (DAY) OF THE ACCIDENT
C TSEEDG - TIME (DAY) OF THE SEEDING
C THRVST - TIME (DAY) OF THE HARVEST
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C DSPCRP(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR CROPS
C DSPMLK(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR MILK
C HABTBL - LOGICAL FLAG INDICATING IMMEDIATE HABITABILITY OF LAND
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C PRJLTG - PROJECTED LONG-TERM DOSE TO THE CRITICAL ORGAN FROM GROUNDSHINE
C PRJLTR - PROJECTED LONG-TERM DOSE TO THE CRITICAL ORGAN FORM RESUSPENSION
C RATMLK - ACTION GUIDE FOR MILK, I.E., RATIO OF THE ACTUAL GROUND CONCENTRATION
C          TO THE MAXIMUM PERMISSIBLE CONCENTRATION ALLOWED FOR MILK PRODUCTION
C RATOTH - ACTION GUIDE FOR OTHER CROPS AND PRODUCTS, I.E., THE RATIO OF THE
C          ACTUAL GROUND CONCENTRATION TO THE MAXIMUM PERMISSIBLE
C          GROUND CONCENTRATION FOR PRODUCTION OF CROPS
C TDECON - THE TIME AT WHICH THE PROJECTED DOSE SATISFIES LONG TERM CRITERION
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C
C GLOSSARY OF EXTERNALS:
C
C LTMACT - DETERMINE LONG-TERM ACTIONS (DECONTAMINATION AND DECAY)
C          NEEDED FOR MEETING GROUNDSHINE AND RESUSPENSION CRITERIA
C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C
C MODIFIED 11/18/88, CHANIN AND ROLLSTIN, LOG # 11/09/88-A,
C   CHANGED HANDLING OF ROOT-UPTAKE AND CROP-DISPOSAL ACTIONS
C MODIFIED 5/16/89, DIC, LOG # 5/11/89-A, ADD A CONTROL FLAG, COUPLD,
C          WHICH DETERMINES WHETHER LONG-TERM AND GROWING-SEASON ACTIONS
C          ARE TO BE PERFORMED IN A COUPLED FASHION (MUTUALLY DEPENDENT)
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C MODIFIED 3/23/93, D.C., CHANGE TDECON TO AN ARRAY AND ADD IT TO THE
C  LIST OF VARIABLES WHICH ARE PRINTED WHEN KSWDSC IS SET TO NON-ZERO
C
      EXTERNAL LTMACT
      INTRINSIC MAX, REAL
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      LOGICAL          DSPMLK,         DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
      COMMON // PPAPIG(MAXNUC,2:MAXORG),
     1  PPAPIR(MAXNUC,2:MAXORG), PPNOLG(MAXNUC), PPNOLR(MAXNUC),
     2  PPDCLG(MAXNUC,3), PPDCLR(MAXNUC,3), PPINLG(MAXNUC,3),
     3  PPINLR(MAXNUC,3), APNOLG(MAXNUC,2:MAXORG),
     4  APNOLR(MAXNUC,2:MAXORG), APDCLG(MAXNUC,2:MAXORG,3),
     5  APDCLR(MAXNUC,2:MAXORG,3), APINLG(MAXNUC,2:MAXORG,3),
     6  APINLR(MAXNUC,2:MAXORG,3), APDCWG(MAXNUC,2:MAXORG,3)
      LOGICAL COUPLD
      COMMON /COUPLD/ COUPLD
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ICRTRO/ ICRTRO
      COMMON /INDXS/  INTRVL, IDIR
      COMMON /PSCDIR/ PSCMLK(MXNUC), PSCOTH(MXNUC)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      COMMON /RTINTR/ GCMAXR(MXNUC), QROOT(MXNUC)
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      COMMON /KOPRNT/ KSWDSC
C
      LOGICAL HABTBL
C
      DIMENSION DSMILK(2), DSOTHR(2), DSLONG(2)
      DATA MAXYRS / 9/
C
C******
C OLD FOOD PATHWAY
C******
C
C  DETERMINE THE NUMBER OF YEARS (IF ANY) OF ROOT-UPTAKE INTERDICTION
C  WHICH ARE REQUIRED IN ORDER TO MEET THE ROOT-UPTAKE CRITERIA FOR OLD
C  FOOD PATHWAY
C
      IF (FDPATH .EQ. 'OLD') THEN
        DO 80 N = 0, MAXYRS - 1
          RTSUM = 0.
          DO 40 NFII = 1, NFIISO
 40         RTSUM = RTSUM +
     1          EXP ( -QROOT(NFII) * REAL (N) ) *
     2          AGRNDC(IDIR,NDXFII(NFII),INTRVL) / GCMAXR(NFII)
C
C  WE CAN JUMP OUT OF THE DO LOOP WHEN WE HAVE FOUND A PERIOD OF
C  ROOT-UPTAKE INTERDICTION WHICH SATISFIES THE CRITERION.
C
            IF (RTSUM .LE. 1.) GO TO 120
 80     CONTINUE
C
C  IF WE DROP DOWN AFTER COMPLETING THE DO-LOOP, N WILL EQUAL MAXYRS.
C
C  STORE THE RESULT OF THE DETERMINATION IN INTEGER ARRAY LRACTN.
C
 120    LRACTN(IDIR,INTRVL) = N
      ENDIF
C
C CALCULATE THE DOSE WHICH WOULD BE INCURRED OVER THE PROJECTION PERIOD IF
C NO MITIGATIVE ACTIONS ARE TAKEN (PPNOLG AND PPNOLR ARE DEFINED IN CHRNDF)
C
      PRJLTG = 0.
      PRJLTR = 0.

      DO 160 NISO = 1, NUMISO
      PRJLTG = PRJLTG + AGRNDC(IDIR,NISO,INTRVL) * PPNOLG(NISO)
  160 PRJLTR = PRJLTR + AGRNDC(IDIR,NISO,INTRVL) * PPNOLR(NISO)
C
C  DETERMINE WHETHER LONG TERM ACTIONS ARE REQUIRED AND SET
C  AN INDICATOR SIGNIFYING THE LAND'S IMMEDIATE HABITABILITY
C
      IF (PRJLTG + PRJLTR .LE. DSCRLT) THEN
         HABTBL = .TRUE.
      ELSE
C
C  CALL A ROUTINE WHICH TRIES TO FIND A SET OF MITIGATIVE ACTIONS
C  WHICH WILL ALLOW THE CRITERIA FOR HABITABILITY TO BE ACHIEVED
C
       HABTBL = .FALSE.
       CALL LTMACT
C*****************************************************************
C NEW FOOD MODEL FRAMEWORK
C
C INTERDIC is the first year after the accident at which food production
C will be allowed if the land is unsuitable for habitation.  For example,
```

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C if TDECON is less than a year, food production can be allowed in the second
C year, and INTERDIC would have a value of 2 for that situation.
C
C If the user has chosen in COMIDA2 to generate accumulation doses for less
C than NACUM_TIM (9) time periods by setting LASTACUM to a value of less than
C 9, then permanent interdiction of farmland is triggered if an interdiction
C period exceeding LASTACUM years would be necessary in order to satisfy the
C interdiction criteria for food production, DOSEMILK and DOSEOTHR
C
C For example, if LASTACUM is set to 4, dose accumulation is only possible for
C dose accumulation periods (0-4 y, 1-4 y, 2-4 y, and 3-4 y).  If more than
C 4 years of interdiction are required, permanent farmland interdiction is
C then necessary.  However, the dose projection array DOS_PROJ is always
C calculated for NACUM_TIM (9) periods, irrespective of LASTACUM and LASTSTOR.
C
      INTERDIC = 2.0 + TDECON(IDIR,INTRVL) / 3.15E7
      IF (INTERDIC .GT. LASTSTOR) INTERDIC = 0
      INIMLK(IDIR,INTRVL) = INTERDIC
      INIOTH(IDIR,INTRVL) = INTERDIC
C
C END OF NEW STUFF FOR NEW FOOD MODEL FRAMEWORK
C*****************************************************************
      ENDIF
C
C IF HABITABILITY CRITERIA EXCEEDED, SET FLAGS FOR CROP AND MILK DISPOSAL
C
      IF (FDPATH .EQ. 'OLD') THEN
        IF (GROWSN) THEN
          IF (.NOT. HABTBL) THEN
             DSPMLK(IDIR,INTRVL) = .TRUE.
             DSPCRP(IDIR,INTRVL) = .TRUE.
          ELSE
C
C  EVALUATE THE GROWING-SEASON ACTION GUIDES, PSCMLK AND PSCOTH,
C  AND DETERMINE IF THERE IS A NEED FOR CROP AND MILK DISPOSAL
C  IN THE CURRENT GROWING SEASON AS A RESULT OF EXCEEDING THE GUIDES
C
            RATMLK = 0.
            RATOTH = 0.

            DO 200 NFII = 1, NFIISO
C
C  ACCUMULATE ACTION GUIDE DOSE COMPARATOR FOR MILK AND NON-MILK CROPS
C
          RATMLK = RATMLK + AGRNDC(IDIR,NDXFII(NFII),INTRVL)
     1                     / PSCMLK(NFII)
 200        RATOTH = RATOTH + AGRNDC(IDIR,NDXFII(NFII),INTRVL)
     1                     / PSCOTH(NFII)
C
C  CHECK WHETHER THE TWO ACTION GUIDES FOR AGRICULTURE ARE EXCEEDED
C
            IF (RATMLK .GT. 1.) DSPMLK(IDIR,INTRVL) = .TRUE.
            IF (RATOTH .GT. 1.) DSPCRP(IDIR,INTRVL) = .TRUE.
C
C  EVALUATE THE MUTUAL DEPENDENCIES BETWEEN THE TWO KINDS OF FOOD
C  ACTIONS IF THE USER HAS CHOSEN THE OPTION, COUPLD=.TRUE.
C
            IF (COUPLD) THEN
C
C  IF BOTH OF THE GROWING-SEASON ACTION GUIDES ARE EXCEEDED,
C  THEN TRIGGER AT LEAST ONE YEAR OF ROOT-UPTAKE INTERDICTION.
C  ALTERNATIVELY, IF AT LEAST ONE YEAR OF LONG-TERM INTERICTION
C  IS NEEDED, THEN TRIGGER BOTH MILK AND CROP DISPOSAL.
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C
              IF (DSPMLK(IDIR,INTRVL) .AND. DSPCRP(IDIR,INTRVL)) THEN
                LRACTN(IDIR,INTRVL) = MAX (1, LRACTN(IDIR,INTRVL))
              ELSE IF (LRACTN(IDIR,INTRVL) .GT. 0) THEN
                DSPMLK(IDIR,INTRVL) = .TRUE.
                DSPCRP(IDIR,INTRVL) = .TRUE.
              ENDIF
            ENDIF
          ENDIF
        ENDIF
      ENDIF
C********
C  NEW FOOD PATHWAY
C********
      IF (FDPATH .EQ. 'NEW') THEN
C
C if farmland is being condemned, skip the evaluation of food interdiction
C
      IF (LTACTN(IDIR,INTRVL) .EQ.  9 .OR.
     1      LTACTN(IDIR,INTRVL) .EQ. 49 .OR.
     2      LTACTN(IDIR,INTRVL) .EQ. 59)  THEN
        INIMLK(IDIR,INTRVL) = 0
        INIOTH(IDIR,INTRVL) = 0
        GO TO 510
      ENDIF
C
C LOOP ON YEARS AND DETERMINE WHICH IS THE FIRST YEAR SATISFYING CRITERIA
C
C Note: INIMLK and INIOTH may have been set in LTMACT to the first year that
C the habitability criterion (see TDECON) is satisfied (if so, INIMLK=INIOTH).
C
C So, start with the first year that the land satisfies the habitability
C criterion and look for the first year that the long-term food dose limit
C is satisfied.
C
C Glossary of New Variables added at Version 1.10:
C  DSMILK(1) is the projected first year effective dose from milk
C  DSMILK(2) is the projected first year thyroid dose from milk
C  DSOTHR(1) is the projected first year effective dose from non-milk crops
C  DSOTHR(2) is the projected first year thyroid dose from non-milk crops
C  DSLONG is the projected subsequent year's effective dose from ALL crops
C  INIOTH is the first year when non-milk crops are acceptable, 0 means never
C  INIMLK is the first year when milk crops are acceptable, 0 means never
C
C  Milk is crop category 7
C
      DO 300 IYR = MAX (2, INIMLK(IDIR,INTRVL)), LASTSTOR
      DSLONG(1) = 0.
      DSLONG(2) = 0.
      DO 290 INUC = 1, NMFDNUCL
      INDNUC = IFPOINT(INUC)
      IF (INDNUC .EQ. 0) GO TO 290
      DSLONG(1)=DSLONG(1) + (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
     1   (PRJ_DOSE(1,1,IYR,IFALLOUT,INUC) +
     2    PRJ_DOSE(1,2,IYR,IFALLOUT,INUC) +
     3    PRJ_DOSE(1,3,IYR,IFALLOUT,INUC) +
     4    PRJ_DOSE(1,4,IYR,IFALLOUT,INUC) +
     5    PRJ_DOSE(1,5,IYR,IFALLOUT,INUC) +
     6    PRJ_DOSE(1,6,IYR,IFALLOUT,INUC) +
     7    PRJ_DOSE(1,7,IYR,IFALLOUT,INUC) +
     8    PRJ_DOSE(1,8,IYR,IFALLOUT,INUC) +
     9    PRJ_DOSE(1,9,IYR,IFALLOUT,INUC))
      DSLONG(2)=DSLONG(2) + (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
```

```
     1   (PRJ_DOSE(2,1,IYR,IFALLOUT,INUC) +
     2    PRJ_DOSE(2,2,IYR,IFALLOUT,INUC) +
     3    PRJ_DOSE(2,3,IYR,IFALLOUT,INUC) +
     4    PRJ_DOSE(2,4,IYR,IFALLOUT,INUC) +
     5    PRJ_DOSE(2,5,IYR,IFALLOUT,INUC) +
     6    PRJ_DOSE(2,6,IYR,IFALLOUT,INUC) +
     7    PRJ_DOSE(2,7,IYR,IFALLOUT,INUC) +
     8    PRJ_DOSE(2,8,IYR,IFALLOUT,INUC) +
     9    PRJ_DOSE(2,9,IYR,IFALLOUT,INUC))
  290   CONTINUE
      IF (DSLONG(1).LE.DOSELONG(1).AND.DSLONG(2).LE.DOSELONG(2)) THEN
        INIMLK(IDIR,INTRVL) = IYR
        INIOTH(IDIR,INTRVL) = IYR
        IF (IYR .EQ. 2) THEN
C if the long-term dose limit is satisfied in year 2, (the earliest possible),
C then check the first year's milk and non-milk doses against the criteria
          GO TO 310
        ELSE
C if the long-term dose limit isn't satisfied in year 2, but is satisfied in
C a subsequent examined year, then both milk and non-milk crops will be
C interdicted for the first year, and there is no need to compare the first
C year's doses against the first year milk and non-milk dose limits.
          GO TO 510
        ENDIF
      ENDIF
  300   CONTINUE
C if it gets here, none of the years tested meet the long-term food dose limits
      INIMLK(IDIR,INTRVL) = 0
      INIOTH(IDIR,INTRVL) = 0
      GO TO 510
C and so, skip the examination of the first year milk and non-milk dose limits
  310   CONTINUE
C
      IYR = 1
      DSMILK(1) = 0.
      DSMILK(2) = 0.
      DO 460 INUC = 1, NMFDNUCL
      INDNUC = IFPOINT(INUC)
      IF (INDNUC .EQ. 0) GO TO 460
      DSMILK(1)=DSMILK(1) + (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
     1  PRJ_DOSE(1,7,IYR,IFALLOUT,INUC)
      DSMILK(2)=DSMILK(2) + (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
     1  PRJ_DOSE(2,7,IYR,IFALLOUT,INUC)
  460   CONTINUE
      IF (DSMILK(1).LE.DOSEMILK(1).AND.DSMILK(2).LE.DOSEMILK(2)) THEN
        INIMLK(IDIR,INTRVL) = IYR
      ENDIF
C
      IYR = 1
      DSOTHR(1) = 0.
      DSOTHR(2) = 0.
      DO 490 INUC = 1, NMFDNUCL
      INDNUC = IFPOINT(INUC)
      IF (INDNUC .EQ. 0) GO TO 490
      DSOTHR(1)=DSOTHR(1) + (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
     1   (PRJ_DOSE(1,1,IYR,IFALLOUT,INUC) +
     2    PRJ_DOSE(1,2,IYR,IFALLOUT,INUC) +
     3    PRJ_DOSE(1,3,IYR,IFALLOUT,INUC) +
     4    PRJ_DOSE(1,4,IYR,IFALLOUT,INUC) +
     5    PRJ_DOSE(1,5,IYR,IFALLOUT,INUC) +
     6    PRJ_DOSE(1,6,IYR,IFALLOUT,INUC) +
     7    PRJ_DOSE(1,8,IYR,IFALLOUT,INUC) +
     8    PRJ_DOSE(1,9,IYR,IFALLOUT,INUC))
```

```
      DSOTHR(2)=DSOTHR(2) + (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
     1   (PRJ_DOSE(2,1,IYR,IFALLOUT,INUC) +
     2    PRJ_DOSE(2,2,IYR,IFALLOUT,INUC) +
     3    PRJ_DOSE(2,3,IYR,IFALLOUT,INUC) +
     4    PRJ_DOSE(2,4,IYR,IFALLOUT,INUC) +
     5    PRJ_DOSE(2,5,IYR,IFALLOUT,INUC) +
     6    PRJ_DOSE(2,6,IYR,IFALLOUT,INUC) +
     7    PRJ_DOSE(2,8,IYR,IFALLOUT,INUC) +
     8    PRJ_DOSE(2,9,IYR,IFALLOUT,INUC))
  490   CONTINUE
      IF (DSOTHR(1).LE.DOSEOTHR(1).AND.DSOTHR(2).LE.DOSEOTHR(2)) THEN
        INIOTH(IDIR,INTRVL) = IYR
      ENDIF
  510   CONTINUE
C
C temporary patch to test and see if logic above is working ok
C
c      IF (IDIR .NE. 1) RETURN
c      IF (INIOTH(IDIR,INTRVL).EQ.0.AND.INIMLK(IDIR,INTRVL).EQ.0)THEN
c        write(8,540) ' Condemn farmland at ', intrvl
c  540   FORMAT(1X,A,T45,2I3)
c      else IF (INIOTH(IDIR,INTRVL).EQ.INIMLK(IDIR,INTRVL)
c     1            .AND. INIOTH(IDIR,INTRVL).NE. 1) THEN
c       write(8,560) INIOTH(IDIR,INTRVL)-1,
c     1   ' years of farm interdiction at ', intrvl
c  560   FORMAT(1X,i2, A, T45, 2I3)
c      ELSE IF (INIOTH(IDIR,INTRVL) .NE. 1) then
c       write(8,570)' first year disposal of non-milk production at ',
c     1                 intrvl
c  570   FORMAT(1X, A, T45, 2I3)
c      else IF (INIMLK(IDIR,INTRVL).NE.1) then
c       write(*,570)' first year disposal of milk production at ',
c     1                 intrvl
c      endif
      ENDIF
      RETURN
      END
*DECK LTMACT
      SUBROUTINE LTMACT
C
C DETERMINE WHAT LONG TERM ACTIONS ARE NEEDED TO MEET THE
C HABITABILITY CRITERIA: DECONTAMINATION, INTERDICTION, CONDEMNATION
C
C THIS ROUTINE IS CALLED BY SUBROUTINE LTPROJ.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C DSCRLT - DOSE CRITERION FOR LONG-TERM PHASE
C DSRFCT(I) - DOSE REDUCTION FACTOR FOR DECONTAMINATION LEVEL I
C IDIR   - DIRECTION INDEX
C INTRVL - INTERVAL INDEX
C LVELDC(I,J) - LEVEL OF DECONTAMINATION REQUIRED FOR INTERVAL J
C               IN DIRECTION I
C LVLDEC - NUMBER OF DECONTAMINATION LEVELS IN THE MODEL
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C PPDCLG(I,J) - PROJECTION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C               GROUNDSHINE: NUCLIDE I, DECONTAMINATION LEVEL J
C PPDCLR(I,J) - PROJECTION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C               RESUSPENSION: NUCLIDE I, DECONTAMINATION LEVEL J
C PPINLG(I,J) - PROJECTION - DOSE AFTER INTERDICTION - LONG-TERM-
C               GROUNDSHINE: NUCLIDE I, INTERDCTION PERIOD J
C PPINLR(I,J) - PROJECTION - DOSE AFTER INTERDICTION - LONG-TERM-
C               RESUSPENSION: NUCLIDE I, INTERDICTION PERIOD J
```

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C PRJLTG - PROJECTED LONG-TERM DOSE TO CRITICAL ORGAN FROM GROUNDSHINE
C PRJLTR - PROJECTED LONG-TERM DOSE TO CRITICAL ORGAN FROM RESUSPENSION
C TIMDEC(I) - DURATION OF THE DECONTAMINATION PERIOD FOR EACH LEVEL
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C LTACTN(I,J) - LONG-TERM ACTION CODE FOR INTERVAL J IN DIRECTION I, SEE BELOW
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE DECONTAMINATION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9: A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C             IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C             BECAUSE THE DOSE CRITERION CANNOT BE MET.
C             PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
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C-----------------------------------------------------------------------------
C TDECON - THE TIME AT WHICH THE PROJECTED DOSE SATISFIES LONG TERM CRITERION
C T1 - THE LOWER BOUND ON INTERDICTION DURATION USED FOR INTERPOLATION
C T2 - THE UPPER BOUND ON INTERDICTION DURATION USED FOR INTERPOLATION
C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C MODIFIED 3/23/93, D.C., CHANGE TDECON TO AN ARRAY AND ADD IT TO THE
C  LIST OF VARIABLES WHICH ARE PRINTED WHEN KSWDSC IS SET NON-ZERO
C Modified 4/25/01, D. Chanin, DIR # 4/25/01-A, guard against taking
C  Log of zero in TDECON calculation
C
C  NO EXTERNAL FUNCTIONS
      INTRINSIC LOG
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /DECMOD/ LVLDEC, CDFRM(3), CDNFRM(3), FRFDL(3), FRNFDL(3),
     1                DSRFCT(3), TFWKF(3), TFWKNF(3), TIMDEC(3), DLBCST
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      COMMON // PPAPIG(MAXNUC,2:MAXORG),
     1  PPAPIR(MAXNUC,2:MAXORG), PPNOLG(MAXNUC), PPNOLR(MAXNUC),
     2  PPDCLG(MAXNUC,3), PPDCLR(MAXNUC,3), PPINLG(MAXNUC,3),
     3  PPINLR(MAXNUC,3), APNOLG(MAXNUC,2:MAXORG),
     4  APNOLR(MAXNUC,2:MAXORG), APDCLG(MAXNUC,2:MAXORG,3),
     5  APDCLR(MAXNUC,2:MAXORG,3), APINLG(MAXNUC,2:MAXORG,3),
     6  APINLR(MAXNUC,2:MAXORG,3), APDCWG(MAXNUC,2:MAXORG,3)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      COMMON /INDXS/  INTRVL, IDIR
      LOGICAL         DSPMLK,        DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     1                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     2                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
C
C  EXAMINE THE EFFECTIVENESS OF DECONTAMINATION ALONE IN SATSIFYING
C  THE HABITABILITY CRITERION BASED ON DOSE PROJECTION PERIODS
C  WHICH BEGIN AT THE COMPLETION OF THE DECONTAMINATION ACTIVITIES
C
      DO 100 LDEC = 1, LVLDEC
C
C FOR EACH LEVEL OF DECONTAMINATION, COMPUTE THE DOSE WHICH WOULD BE
C INCURRED OVER A PROJECTION PERIOD WHICH BEGINS AT THE COMPLETION OF
C THE DECONTAMINATION PROCESS. THIS PERIOD MAY DIFFER FOR EACH LEVEL
C OF DECONTAMINATION. PPDCLG AND PPDCLR ARE DEFINED IN SUBROUTINE CHRNDF.
C
      PRJLNG = 0.
      PRJLNR = 0.
      T1 = TMIPND + TIMDEC(LDEC)
      CMPRTR = DSCRLT * DSRFCT(LDEC)
C
C  BASE ACTIONS ON THE SUM OF THE GROUNDSHINE AND RESUSPENSION DOSES
C
      DO 80 NISO = 1, NUMISO
      PRJLNG = PRJLNG + AGRNDC(IDIR,NISO,INTRVL) * PPDCLG(NISO,LDEC)
   80 PRJLNR = PRJLNR + AGRNDC(IDIR,NISO,INTRVL) * PPDCLR(NISO,LDEC)
```

```
      IF (PRJLNG + PRJLNR .LE. CMPRTR) THEN
C
C  DECONTAMINATION ALONE IS SUFFICIENT AT DECONTAMINATION LEVEL LDEC
C
        TDECON(IDIR,INTRVL) = T1
        LVELDC(IDIR,INTRVL) = LDEC
        LTACTN(IDIR,INTRVL) = 40

        RETURN

      ENDIF

  100 CONTINUE
C
C DETERMINE IF THE MAXIMUM EFFORT DECONTAMINATION FOLLOWED BY
C INTERDICTION WILL ALLOW THE HABITABILITY CRITERION TO BE MET
C BY LOOPING ON THREE PROSPECTIVE INTERDICTION PERIODS.
C PPINLG AND PPINLR ARE DEFINED BY SUBROUTINE CHRNDF.
C
      GDSOLD = PRJLNG
      RDSOLD = PRJLNR

      DO 140 LINT = 1, 3

      GDSNEW = 0.
      RDSNEW = 0.
      T2 = TINTRD(LINT)

      DO 120 NISO = 1, NUMISO
      GDSNEW = GDSNEW + AGRNDC(IDIR,NISO,INTRVL) * PPINLG(NISO,LINT)
  120 RDSNEW = RDSNEW + AGRNDC(IDIR,NISO,INTRVL) * PPINLR(NISO,LINT)

      IF (GDSNEW + RDSNEW .LE. CMPRTR) THEN
C
C  THE INTERDICTION PERIOD, LINT, IS SUFFICIENT TO RESTORE HABITABILITY.
C  ESTIMATE THE TIME, TDECON, AT WHICH THE PROJECTED DOSE, FOLLOWING
C  DECONTAMINATION AND INTERDICTION, SATISFIES THE LONG TERM CRITERION.
C
C
C  guard against taking the log of zero, see DIR # 4/25/01-A
C  code modified 4/25/01, D. Chanin
C
        IF (CMPRTR .EQ. 0. .OR. GDSOLD + RDSOLD .EQ. 0. .OR.
     1      GDSNEW + RDSNEW .EQ. 0.) THEN

          TDECON(IDIR,INTRVL) = T1

        ELSE

          TDECON(IDIR,INTRVL) = T1 + (T2-T1) *
     1              (LOG(CMPRTR) - LOG (GDSOLD + RDSOLD)) /
     2              ( LOG (GDSNEW + RDSNEW) - LOG (GDSOLD + RDSOLD))
        ENDIF

        LVELDC(IDIR,INTRVL) = LVLDEC
        LTACTN(IDIR,INTRVL) = 50
        RETURN
      ELSE
        GDSOLD = GDSNEW
        RDSOLD = RDSNEW
      ENDIF

  140 T1 = T2
```

```
C
C  THE MAXIMUM DURATION INTERDICTION IS NOT SUFFICIENT TO ALLOW
C  REHABITATION, THIS LOCATION MUST THEREFORE BE CONDEMNED
C
      LTACTN(IDIR,INTRVL) = 9

      RETURN
      END
*DECK CSTEFF
      SUBROUTINE CSTEFF
C
C COMPUTE COSTS OF THE PROJECTED ACTIONS OF DECONTAMINATION AND INTERDICTION
C AND DECIDE IF IT IS COST-EFFECTIVE TO IMPLEMENT THEM.
C
C IF IT ISN'T COST-EFFECTIVE, THEN THIS ROUTINE CONDEMNS THE PROPERTY.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE LNGTPH.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C DPRATE - DEPRECIATION RATE DURING THE INTERDICTION PERIOD (/ SEC)
C DSRATE - SOCIETAL DISCOUNT RATE DURING THE INTERDICTION PERIOD (/ SEC)
C FRFIM  - FRACTION OF FARMLAND WEALTH IN IMPROVEMENTS
C FRNFIM - FRACTION OF NON-FARMLAND WEALTH IN IMPROVEMENTS
C GROWSN - LOGICAL FLAG INDICATING ACCIDENT OCCURING DURING THE GROWING
C          SEASON
C IDIR   - DIRECTION INDEX
C INTRVL - INTERVAL INDEX
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C LVELDC(I,J) - LEVEL OF DECONTAMINATION REQUIRED FOR INTERVAL J
C               IN DIRECTION I
C RLCOST - RELOCATION COST (DOLLARS/PERSON-SEC)
C POPCST - COMPENSATION COST FOR LOST INCOME TO TEMPORARILY INTERDICTED
C          INDIVIDUALS AND THOSE WHOSE PROPERTY IS CONDEMNED ($ / PERSON)
C VALWF  - VALUE OF THE TANGIBLE WEALTH IN FARMLAND AND IMPROVEMENTS
C VALWNF - VALUE OF THE TANGIBLE WEALTH IN NON-FARMLAND
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C COSTF - PROSPECTIVE COST OF ALL ACTIONS NEEDED TO RECLAIM FARM PROPERTY
C COSTNF - PROSPECTIVE COST OF ALL ACTIONS NEEDED TO RECLAIM NON-FARM PROPERTY
C CSTDF(I,J) - COST OF FARM DECONTAMINATION PER UNIT AREA FOR THE COARSE
C              GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTDNF(I,J) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR THE COARSE
C               GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C CSTIF(I,J) -  DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               FARMLAND AT INTERVAL J IN DIRECTION I ($ / HECTARE)
C CSTINF(I,J) - DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               NON-FARM AREAS IN THE INTERVAL J IN DIRECTION I ($ / RESIDENT)
C CSTLF(I,J) - LABOR COST FOR DECONTAMINATING FARM IN THE GRID ELEMENT
C              AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTLNF(I,J) - LABOR COST FOR DECONTAMINATING NON-FARM IN THE GRID
C               ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C DPTERM - DEPRECIATION FACTOR USED FOR LOSSES TO PROPERTY IMPROVEMENTS
C DSTERM - DEPRECIATION FACTOR USED FOR LOSS OF THE VALUE OF LAND ITSELF
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C INIMLK(I,J) - integer flag indicating the first year of milk production in
```

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C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C LTACTN(I,J) - LONG-TERM ACTION CODE FOR INTERVAL J IN DIRECTION I, SEE BELOW
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE DECONTAMINATION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9: A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C             IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C             BECAUSE THE DOSE CRITERION CANNOT BE MET.
C             PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C LEVLDC - SPECIFIED LEVEL OF DECONTAMINATION EFFORT
C POPCST - COMPENSATION COST FOR LOST INCOME TO TEMPORARILY INTERDICTED
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C          INDIVIDUALS AND THOSE WHOSE PROPERTY IS CONDEMNED ($ / PERSON)
C TRMDRL(I,J) - RELOCATION PERIOD OF TEMPORARY INTERDICTION FOR DECONTAMINATION
C               OF THE GRID ELEMENT AT INTERVAL J IN DIRECTION I (SECONDS)
C
C GLOSSARY OF EXTERNALS:
C
C CSTDCN - DETERMINE DECONTAMINATION COSTS FOR GIVEN DECONTAMINATION EFFORT
C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 3/23/93, D.C., CHANGE TDECON TO AN ARRAY AND ADD IT TO THE LIST
C  OF VARIABLES WHICH ARE PRINTED OUT WHEN KSWDSC IS SET NON-ZERO
C Modified 11/11/95, D.C., Fixed new food model cost calculations so that when
C  farmland is permanently interdicted due to projected food doses, the cost
C  of farmland "interdiction" is set to zero because the "condemnation" cost
C  is assessed.  This change makes the new food model consistent with the old
C  food model.  Previous coding erroneously assessed both condemnation and
C  interdiction costs when INIMLK and INIOTH are zero.
C
      EXTERNAL CSTDCN
      INTRINSIC EXP
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      COMMON /FRMDAT/ FMAREA(MAXRAD,16)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /INDXS/  INTRVL, IDIR
      LOGICAL         DSPMLK,         DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     1                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     2                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON /SITEDT/ DPRATE,DSRATE,FRFIM,FRNFIM,VALWF,VALWNF,POPCST
      LOGICAL UNFSWT
      COMMON /UNFSWT/ UNFSWT
C
C LYNN RITCHIE, DIV. 6415, 15 DECEMBER 1984
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C TOTAL REWRITE, D.C., 27 JUN 88
C
C  WE CAN RETURN IMMEDIATELY IF PERMANENT INTERDICTION OF POPULATION
C  IS NECESSARY DUE TO THE HABITABILITY CRITERIA, FARMING WILL BE TOO!
C
      IF (LTACTN(IDIR,INTRVL) .EQ. 9) RETURN
C
C  COMPUTE THE SPECIFIED DECONTAMINATION AND INTERDICTION COSTS
C  IF ANY LONG-TERM ACTIONS NEEEDED
C
      IF (LTACTN(IDIR,INTRVL) .GT. 0) THEN
C
C  DETERMINE WHAT LEVEL OF DECONTAMINATION AND WHAT (IF ANY) PERIOD
C  OF TEMPORARY INTERDICTION IS NEEDED TO MAKE THE LAND HABITABLE
C
        CALL CSTDCN
C
C  CALCULATE THE COST OF TEMPORARY INTERDICTION FOR DECONTAMINATION ALONE
C  OR DECONTAMINATION FOLLOWED BY A PERIOD OF TEMPORARY INTERDICTION.
C
C  THE TERM 'CONDEMNATION' WILL HENCEFORTH BE USED TO INDICATE
C  A PERMANENT INTERDICTION OF THE PROPERTY.
C
C  THE COST OF INTERDICTION IS THE SUM OF THE FOLLOWING TWO COSTS:
C   1) THE COST OF POPULATION RELOCATION TO A NEW AREA, AND
C   2) THE DIFFERENCE BETWEEN THE VALUE OF THE PROPERTY AT THE TIME OF
C      THE ACCIDENT AND ITS DEPRECIATED VALUE WHEN IT IS RESTORED TO USAGE.
C
C  LOSS FACTOR FOR DEPRECIATION OF IMPROVEMENTS TO PROPERTY
C
      DPTERM = EXP (-DPRATE * TDECON(IDIR,INTRVL))
C
C  MORTGAGE INTEREST RATE FACTOR (DON'T ASK!, IT CAME FROM WASH-1400) D.C.
C
        DSTERM = EXP (-DSRATE * TDECON(IDIR,INTRVL))

        CSTINF(IDIR,INTRVL) = POPCST + VALWNF - DSTERM *
     1    VALWNF * (1. - FRNFIM + FRNFIM * DPTERM)

      ENDIF
C
C CHECK IF THE INTERDICTION OF NON-FARM PROPERTY IS A COST EFFECTIVE ACTION
C BY COMPARING THE COST OF INTERDICTION TO THE COST OF CONDEMNATION.
C THE COST OF CONDEMNATION IS THE COST OF POPULATION RELOCATION
C PLUS THE VALUE OF THE PROPERTY.
C
      COSTNF = CSTDNF(IDIR,INTRVL) + CSTINF(IDIR,INTRVL)

      IF (COSTNF .GT. VALWNF + POPCST) THEN
C
C  SPECIFIED DECONTAMINATION OF NON-FARM AREA IS NOT COST EFFECTIVE
C  NON-FARM AREA MUST BE PERMANENTLY INTERDICTED
C
        LTACTN(IDIR,INTRVL) = 5 + LTACTN(IDIR,INTRVL)

        CSTINF(IDIR,INTRVL) = 0.
        CSTDNF(IDIR,INTRVL) = 0.
        CSTLNF(IDIR,INTRVL) = 0.
        TRMDRL(IDIR,INTRVL) = 0.

      DO 40 NORG = INICHR, NUMORG
   40   DSWKNF(IDIR,INTRVL,NORG) = 0.
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      ENDIF
C
C  WE CAN RETURN IF PERMANENT INTERDICTION OF ROOT UPTAKE IS REQUIRED
C  OR IF NO ROOT UPTAKE INTERDICTION ACTIONS ARE REQUIRED
C
      IF (FDPATH .EQ. 'OLD' .AND.
     1    (LRACTN(IDIR,INTRVL) .EQ. 9 .OR.
     2     LRACTN(IDIR,INTRVL) .EQ. 0) ) RETURN
C new coding added 11/11/95
      IF (FDPATH .EQ. 'NEW' .AND. INIOTH(IDIR,INTRVL) .EQ. 0) RETURN
C end of new coding added 11/11/95
C
C  CALCULATE DURATION OF THE TEMPORARY INTERDICTION OF THE FARMLAND PRODUCTION
C  THIS IS THE LARGER OF THE HABITABILITY INTERDICTION PERIOD (TDECON)
C  AND THE  LONG-TERM FOOD INTERDICTION PERIOD (LRACTN IS IN YEARS).
C
      IF (FDPATH .EQ. 'OLD') THEN
      TIME = MAX (LRACTN(IDIR,INTRVL) * 3.15E7, TDECON(IDIR,INTRVL))
      ELSE
      TIME = MAX ( (INIOTH(IDIR,INTRVL)-1) * 3.15E7,
     1                TDECON(IDIR,INTRVL))
      ENDIF

      DPTERM = EXP (-DPRATE * TIME)
      DSTERM = EXP (-DSRATE * TIME)

      CSTIF(IDIR,INTRVL) = VALWF - DSTERM *
     1  VALWF * (1. - FRFIM + FRFIM * DPTERM)
C
      COSTF = CSTDF(IDIR,INTRVL) + CSTIF(IDIR,INTRVL)
C
      IF (COSTF .GT. VALWF) THEN
C
C  SPECIFIED DECONTAMINATION OF FARM AREA IS NOT COST EFFECTIVE
C  FARM AREA MUST BE PERMANENTLY INTERDICTED
C
        LTACTN(IDIR,INTRVL) = 4 + LTACTN(IDIR,INTRVL)
C
C  FARM DECONTAMINATION INEFFECTIVE: CONDEMN THE FARMLAND AREA
C
        CSTIF(IDIR,INTRVL) = 0.
        CSTDF(IDIR,INTRVL) = 0.
        CSTLF(IDIR,INTRVL) = 0.
      INIMLK(IDIR,INTRVL) = 0
      INIOTH(IDIR,INTRVL) = 0
      DO 80 NORG = INICHR, NUMORG
   80   DSWKF(IDIR,INTRVL,NORG) = 0.
      ENDIF
      RETURN
      END
*DECK CSTDCN
      SUBROUTINE CSTDCN
C
C COMPUTE COSTS OF DECONTAMINATION ACCORDING TO THE GIVEN
C DECONTAMINATION EFFORT (LEVEL) USING SITE ENVIRONS ECONOMIC VALUES
C
C IF CONDEMNATION OF FARM PROPERTY IS NEEDED BECAUSE OF ROOT-UPTAKE CRITERIA,
C THERE IS NO DECONTAMINATION OF FARM PROPERTY.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CSTEFF.
C
C ALL DECONTAMINATION COSTS EXCLUDING RELOCATION COSTS ARE FOR
C TWO DISTINCT COST CLASSES:
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C
C   1 - FARMLAND (COSTS PER UNIT AREA)
C   2 - NON-FARMLAND, I.E., RESIDENTIAL, BUSINESS, AND PUBLIC PROPERTY
C       (COSTS PER RESIDENT INDIVIDUAL)
C
C FOUR GROUPS OF DECONTAMINATION COSTS ARE COLLECTED:
C
C   1 - TOTAL COST OF DECONTAMINATION EFFORT
C   2 - COST OF LABOR UTILIZED IN THE DECONTAMINATION EFFORT
C   3 - DECONTAMINATION WORKER GROUNDSHINE DOSES TO THE CANCER ORGANS
C   4 - MAN-YEARS OF LABOR EFFORT REQUIRED FOR DECONTAMINATION
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
C AGRNDC(I,J,K) - AVG. GROUND CONCENTRATION OF NUCLIDE I IN THE COARSE GRID
C                 ELEMENT AT INTERVAL K IN DIRECTION J (Bq / SQ M)
C APDCWG(I,J,K) - ACCUMULATION - DECONTAMINATION WORKER DOSE-
C                 GROUNDSHINE: NUCLIDE I, ORGAN J, DECONTAMINATION LEVEL K
C CDFRM(I) - COST OF FARM DECONTAMINATION PER UNIT AREA
C            FOR DECONTAMINATION LEVEL I (DOLLARS / HECTARE)
C CDNFRM(I) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR
C             DECONTAMINATIOM LEVEL I (DOLLARS / PERSON)
C DLBCST - LABOR COST OF DECONTAMINATION WORKER (DOLLARS / MAN-SECOND)
C FRFDL(I) - FRACTION OF FARM LAND DECONTAMINATION COST DUE TO LABOR
C            AT DECONTAMINATION LEVEL I (UNITLESS)
C FRNFDL(I) - FRACTION OF NON-FARM DECONTAMINATION COST DUE TO LABOR
C             AT DECONTAMINATION LEVEL I (UNITLESS)
C IDIR   - DIRECTION INDEX
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INTRVL - INTERVAL INDEX
C LEVLDC - LEVEL OF DECONTAMINATION EFFORT REQUIRED (1, 2, OR 3)
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C LVELDC(I,J) - LEVEL OF DECONTAMINATION REQUIRED FOR INTERVAL J
C               IN DIRECTION I
C NUMISO - NUMBER OF NUCLIDES
C NUMORG - NUMBER OF ORGANS BEING USED IN THE CHRONC MODEL
C TFWKF(I) - TIME FRACTION OF THE LEVEL I DECONTAMINATION PROCESS SPENT
C            IN THE DECONTAMINATION AREA FOR FARMS (UNITLESS)
C TFWKNF(I) - TIME FRACTION OF THE LEVEL I DECONTAMINATION PROCESS SPENT
C             IN THE CONTAMINATED AREA FOR NON-FARMS (UNITLESS)
C TIMDEC(I) - TIME FROM START TO END OF THE DECONTAMINATION PROCESS
C             AT DECONTAMINATION LEVEL I (SECONDS ELAPSED)
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C CSTDF(I,J) - COST OF FARM DECONTAMINATION PER UNIT AREA FOR THE COARSE
C              GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTDNF(I,J) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR THE COARSE
C               GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C CSTLF(I,J) - LABOR COST FOR DECONTAMINATING FARM IN THE GRID ELEMENT
C              AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTLNF(I,J) - LABOR COST FOR DECONTAMINATING NON-FARM IN THE GRID
C               ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C DMYF   - LABOR PER HECTARE TO DECONTAMINATE FARM AREAS (MAN-SECONDS)
C DMYNF  - LABOR PER RESIDENT TO DECONTAMINATE NON-FARM AREAS (MAN-SECONDS)
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
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C                    NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C FNWKF  - NUMBER OF WORKERS PER HECTARE FOR DECONTAMINATION OF FARM AREA
C FNWKNF - NUMBER OF WORKERS PER PERSON FOR DECONTAMINATION OF NON-FARM AREA
C TRMDRL(I,J) - RELOCATION PERIOD OF TEMPORARY INTERDICTION FOR DECONTAMINATION
C                OF THE GRID ELEMENT AT INTERVAL J IN DIRECTION I (SECONDS)
C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS
C  AND ALSO LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C Modified 11/11/95, D. Chanin, When the "new" food model was being used and
C   farmland was being condemned, the code was erroneously assessing
C   decontamination costs for that farmalnd, in addition to condemnation costs
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON // PPAPIG(MAXNUC,2:MAXORG),
     1  PPAPIR(MAXNUC,2:MAXORG), PPNOLG(MAXNUC), PPNOLR(MAXNUC),
     2  PPDCLG(MAXNUC,3), PPDCLR(MAXNUC,3), PPINLG(MAXNUC,3),
     3  PPINLR(MAXNUC,3), APNOLG(MAXNUC,2:MAXORG),
     4  APNOLR(MAXNUC,2:MAXORG), APDCLG(MAXNUC,2:MAXORG,3),
     5  APDCLR(MAXNUC,2:MAXORG,3), APINLG(MAXNUC,2:MAXORG,3),
     6  APINLR(MAXNUC,2:MAXORG,3), APDCWG(MAXNUC,2:MAXORG,3)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      LOGICAL         DSPMLK,         DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     1                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     2                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      COMMON /DECMOD/ LVLDEC, CDFRM(3), CDNFRM(3), FRFDL(3), FRNFDL(3),
     1                DSRFCT(3), TFWKF(3), TFWKNF(3), TIMDEC(3), DLBCST
      COMMON /INDXS/  INTRVL, IDIR
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
C
      LEVLDC = LVELDC(IDIR,INTRVL)
C
C  THERE IS NO NEED TO be here TO CALCULATE DECONTAMINATION COST IF THERE
C  IS NO DECONTAMINATION GOING ON
C
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      IF (LEVLDC .EQ. 0) Write(6,*) 'INTERNAL ERROR IN CSTDCN'
C
C Calculate total cost and labor cost from decontaminating farm areas if the
C farmland is not being condemned; labor cost is used to calculate worker doses.
C
      IF ( (FDPATH .EQ. 'NEW' .AND. INIMLK(IDIR,INTRVL) .EQ. 0) .OR.
     1     (FDPATH .EQ. 'OLD' .AND. LRACTN(IDIR,INTRVL) .EQ. 9) ) THEN
      CSTDF(IDIR,INTRVL) = 0.
      DMYF = 0.
      ELSE
      CSTDF(IDIR,INTRVL) = CDFRM(LEVLDC)
      CSTLF(IDIR,INTRVL) = CDFRM(LEVLDC) * FRFDL(LEVLDC)
      DMYF = CSTLF(IDIR,INTRVL) / DLBCST
      ENDIF
C
C  CALCULATE TOTAL COST AND LABOR COST FROM DECONTAMINATING NON-FARM.
C  LABOR COST IS USED FOR CALCULATING DOSE TO THE WORKERS
C
      CSTDNF(IDIR,INTRVL) = CDNFRM(LEVLDC)
      CSTLNF(IDIR,INTRVL) = CDNFRM(LEVLDC) * FRNFDL(LEVLDC)
      DMYNF = CSTLNF(IDIR,INTRVL) / DLBCST
C
C  ASSIGN TERM OF RELOCATION FOR INDIVIDUALS RELOCATING DURING DECONTAMINATION
C
      TRMDRL(IDIR,INTRVL) = TIMDEC(LEVLDC)
C
C  COMPUTE GROUNDSHINE DOSES TO DECONTAMINATION PERSONNEL
C
C  DETERMINE THE NUMBER OF WORKERS REQUIRED TO COMPLETE THE
C  DECONTAMINATION PROGRAM AT THE LEVEL SPECIFIED
C
      FNWKF  = DMYF / TIMDEC(LEVLDC)
      FNWKNF = DMYNF / TIMDEC(LEVLDC)
C
C DETERMINE THE DOSES EXPERIENCED BY THE DECONTAMINATION WORKERS
C APDCWG IS DEFINED BY SUBROUTINE CHRNDF
C
      DO 140 NORG = INICHR, NUMORG

      DOSE = 0.

      DO 120 NISO = 1, NUMISO
  120 DOSE = DOSE + AGRNDC(IDIR,NISO,INTRVL) * APDCWG(NISO,NORG,LEVLDC)
C
C!!!! WARNING: DSWKF IS CONVERTED TO UNITS OF (MAN-SIEVERTS PER SQ. METER) !!!!
C
      DSWKF(IDIR,INTRVL,NORG) = DOSE * FNWKF * TFWKF(LEVLDC) / 10000.
      DSWKNF(IDIR,INTRVL,NORG) = DOSE * FNWKNF * TFWKNF(LEVLDC)

  140 CONTINUE

      RETURN
      END
*DECK LTACUM
      SUBROUTINE LTACUM
C
C THIS ROUTINE ACCUMULATES THE DOSES AND COSTS RESULTING FROM THE
C ACTIONS TAKING PLACE IN THE LONG-TERM PHASE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE LNGTPH.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA:
C
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C ADSCRP - TEMPORARY VARIABLE FOR ACCUMULATING THE DOSE TO ORGAN K OF THE
C          POPULATION FROM NON-MILK FOODS
C ADSMLK - TEMPORARY VARIABLE FOR ACCUMULATING THE DOSE TO ORGAN K OF THE
C          POPULATION FROM MILK
C ADSPOP - TEMPORARY VARIABLE FOR ACCUMULATING THE TOTAL DOSE TO ORGAN K
C          OF THE POPULATION
C AGRNDC(I,J,K) - AVG. GROUND CONCENTRATION OF NUCLIDE I IN THE COARSE GRID
C                 ELEMENT AT INTERVAL K IN DIRECTION J (Bq / SQ M)
C APDCLG(I,J,K) - ACCUMULATION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C                 GROUNDSHINE: NUCLIDE I, ORGAN J, DECONTAMINATION LEVEL K
C APDCLR(I,J,K) - ACCUMULATION - DOSE AFTER DECONTAMINATION - LONG-TERM-
C                 RESUSPENSION: NUCLIDE I, ORGAN J, DECONTAMINATION LEVEL K
C APINLG(I,J,K) - ACCUMULATION - DOSE AFTER INTERDICTION - LONG-TERM-
C                 GROUNDSHINE: NUCLIDE I, ORGAN J, INTERDICTION PERIOD K
C APINLR(I,J,K) - ACCUMULATION - DOSE AFTER INTERDICTION - LONG-TERM-
C                 RESUSPENSION: NUCLIDE I, ORGAN J, INTERDICTION PERIOD K
C APNOLG(I,J) - ACCUMULATION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C                              GROUNDSHINE: NUCLIDE I, ORGAN J
C APNOLR(I,J) - ACCUMULATION - DOSE WITHOUT ANY ACTIONS - LONG-TERM-
C                              RESUSPENSION: NUCLIDE I, ORGAN J
C AVADOS - TEMPORARY VARIABLE TO CCUMULATE THE DOSE TO ORGAN K
C          FOR THE AVERAGE INDIVIDUAL
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C DSFOOD(I,J,K) - FOOD INGESTION DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSRFCT(I) - DOSE REDUCTION FACTOR FOR DECONTAMINATION LEVEL I
C DTFMLK(I,J)   - DIRECT MILK TRANSFER FACTOR OF FOOD INGESTION
C                 NUCLIDE I FOR ORGAN J
C DTFOTH(I,J)   - DIRECT OTHER TRANSFER FACTOR OF FOOD INGESTION
C .               NUCLIDE I FOR ORGAN J
C EPSLON - SMALLEST ARGUMENT VALUE PASSED TO THE INTRINSIC LOG FUNCTION
C IDIR   - DIRECTION INDEX
C INTRVL - INTERVAL INDEX
C NDXFII - POINTER ARRAY SHOWING LOCATION OF THE FOOD/WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE OLD FOOD MODEL
C NDXWII - POINTER ARRAY SHOWING LOCATION OF THE WATER NUCLIDES ON THE
C          DEFINITION LIST OF NUCLIDES USED FOR THE NEW FOOD MODEL
C NFIISO - NUMBER OF NUCLIDES FOR FOOD INGESTION MODEL
C NWPISO - NUMBER OF NUCLIDES FOR WATER PATHWAY MODEL
C NUMISO - NUMBER OF NUCLIDES DEFINED IN THE MODEL
C NUMORG - NUMBER OF ORGANS DEFINED IN THE MODEL
C NUMWPA - NUMBER OF WATER PATHWAYS DEFINED IN THE MODEL
C POPDOS(K,Y) - DOSE TO ORGAN K OF THE POPULATION DURING YEAR Y
C TDECON - THE TIME AT WHICH THE PROJECTED DOSE SATISFIES LONG TERM CRITERION
C TFIDOS(K) - TOTAL LIFETIME DOSE TO ORGAN K FOR THE AVERAGE INDIVIDUAL
C TFLMLK(I,J)   - LONG-TERM TRANSFER FACTOR FOR MILK OF FOOD INGESTION
C                 NUCLIDE I TO ORGAN J
C TFLOTH(I,J)   - LONG-TERM TRANSFER FACTOR FOR OTHER CROPS OF FOOD
C                 INGESTION NUCLIDE I TO ORGAN J
C TFLPD(I,J,K) - DIRECT LIQUID PATHWAY TRANSFER FACTOR OF LIQUID
C                PATHWAY NUCLIDE I FOR ORGAN J IN WATERSHED K
C TFLPW(I,J,K) - WASHOFF LIQUID PATHWAY TRANSFER FACTOR OF LIQUID
C                PATHWAY NUCLIDE I FOR ORGAN J IN WATERSHED K
C TFPDOS(K) - TOTAL DOSE TO ORGAN K FOR THE POPULATION
C TIMACC - TIME (DAY) OF THE ACCIDENT
C THRVST - TIME (DAY) OF THE HARVEST
C TSEEDG - TIME (DAY) OF THE SEEDING
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA:
C
C DMDOSE(I,J,K) - DIRECT DEPOSITION MILK DOSE TO ORGAN K IN THE
C                 COARSE GRID AT INTERVAL J IN DIRECTION K
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C DODOSE(I,J,K) - DIRECT DEPOSITION OTHER DOSE TO ORGAN K IN THE
C                 COARSE GRID AT INTERVAL J IN DIRECTION K
C DSPCRP(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR CROPS
C DSPMLK(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR MILK
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C GSDOSE(I,J,K) - GROUNDSHINE DOSE TO ORGAN K IN THE COARSE GRID AT
C                 INTERVAL J IN DIRECTION I
C
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C LTACTN(I,J) - LONG-TERM ACTION CODE FOR INTERVAL J IN DIRECTION I, SEE BELOW
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISTFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE DECONTAMINATION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISTFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
```

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C               PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9: A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C             IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C             BECAUSE THE DOSE CRITERION CANNOT BE MET.
C             PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C REDOSE(I,J,K) - RESUSPENSION DOSE TO ORGAN K IN THE COARSE GRID AT
C                 INTERVAL J IN DIRECTION I
C RMDOSE(I,J,K) - LONG-TERM ROOT UPTAKE MILK DOSE TO ORGAN K IN THE
C                 COARSE GRID AT INTERVAL J IN DIRECTION I
C RODOSE(I,J,K) - LONG-TERM ROOT UPTAKE OTHER DOSE TO ORGAN K IN THE
C                 COARSE GRID AT INTERVAL J IN DIRECTION I
C TFLMLK(I,J)   - LONG-TERM TRANSFER FACTOR FOR MILK OF FOOD INGESTION
C                 NUCLIDE I TO ORGAN J
C TFLOTH(I,J)   - LONG-TERM TRANSFER FACTOR FOR OTHER CROPS OF FOOD
C                 INGESTION NUCLIDE I TO ORGAN J
C WDDOSE(I,J,K,L) - DIRECT WATER DEPOSITION DOSE TO ORGAN K IN THE
C                   COARSE GRID AT INTERVAL J IN DIRECTION I FOR WATERSHED L
C WWDOSE(I,J,K,L) - WASHOFF WATER DEPOSITION DOSE TO ORGAN K IN THE
C                   COARSE GRID AT INTERVAL J IN DIRECTION I FOR WATERSHED L
C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C
C MODIFIED 7/25/89, D. CHANIN, LOG # 7/21/89-B, CLEANUP OF SGCPLN
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/1/89-A, 8/1/89-B,
C  CLEANUP OF THE CHRONC DECONTAMINATION AND INTERDICTION MODELS,
C  ALSO LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS,
C  ALSO LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 10/17/89, D. CHANIN, #10/13/89-A, TEST FOR LOGARITHM OF ZERO
C MODIFIED 2/12/92, D. CHANIN, #2/11/92-A, WHEN LTACTN=50, CALCULATE GDOSE1 AND
C  RDOSE1 FOR EACH INDIVIDUAL ORGAN, NOT JUST FOR THE LAST ORGAN ON THE LIST
C MODIFIED 3/17/92, D. CHANIN, #3/17/92-A, AVOID D.P. COMPILER BUG IN IBM 3090
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C MODIFIED 3/23/93, D.C., CHANGE TDECON TO AN ARRAY AND ADD IT TO THE LIST
C  OF VARIABLES WHICH ARE PRINTED WHEN KSWDSC IS SET NON-ZERO
C
      EXTERNAL ABORT
      INTRINSIC LOG
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MXNUC=10,MXCRP=10)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
C
C ACCDATES - is the array of accident dates for which results were calculated
C DCF_SORC - is a character flag indicating what type DCF file was used
C FDNUCLID - is the list of nuclides for which food data is supplied
C IFALLOUT - pointer to the COMIDA2 fallout date closest to the MACCS accident
C IFPOINT - is a pointer array for the food nuclides giving location in the
C   overall MACCS2 list of nuclides, a zero indicates that the food
C   nuclide at that position in the list does not appear in the MACCS2 list
C LASTACUM - is the last exposure year for which ingestion results were
C   calculated in COMIDA2, the values can range from 9 to 50 years
C NMFDNUCL - is the number of food nuclides for which data is found
C NUMDATES - is the number of accident dates (fallout time) for which COMIDA2
C   results were calaculated
C
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
```

```
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
      CCMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 FRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
      LOGICAL          DSPMLK,DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON // PPAPIG(MAXNUC,2:MAXORG),
     1  PPAPIR(MAXNUC,2:MAXORG), PPNOLG(MAXNUC), PPNOLR(MAXNUC),
     2  PPDCLG(MAXNUC,3), PPDCLR(MAXNUC,3), PPINLG(MAXNUC,3),
     3  PPINLR(MAXNUC,3), APNOLG(MAXNUC,2:MAXORG),
     4  APNOLR(MAXNUC,2:MAXORG), APDCLG(MAXNUC,2:MAXORG,3),
     5  APDCLR(MAXNUC,2:MAXORG,3), APINLG(MAXNUC,2:MAXORG,3),
     6  APINLR(MAXNUC,2:MAXORG,3), APDCWG(MAXNUC,2:MAXORG,3)
      COMMON /DECMOD/ LVLDEC, CDFRM(3), CDNFRM(3), FRFDL(3), FRNFDL(3),
     1                DSRFCT(3), TFWKF(3), TFWKNF(3), TIMDEC(3), DLBCST
      COMMON /DOSTIM/ DSCRTI, DSCRLT, TMPACT, TMEPND, TMIPND, TINTRD(3)
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      COMMON /DIRCTF/ DTFMLK(MXNUC,2:MAXORG), DTFOTH(MXNUC,2:MAXORG)
      COMMON /FDINGM/ NFIISO, NFICRP, NDXFII(MXNUC)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /INDXS/  INTRVL, IDIR
      COMMON /LONGTF/ TFLMLK(MXNUC,2:MAXORG), TFLOTH(MXNUC,2:MAXORG)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /RTINTR/ GCMAXR(MXNUC), QROOT(MXNUC)
      COMMON /WATRM/  NUMWPA, NUMWPI
      COMMON /WTRDAT/ TFLPD(MXNUC,2:MAXORG,4), TFLPW(MXNUC,2:MAXORG,4)
      COMMON /WTRDTA/ WINGF(MXNUC,4), WSHFRI(MXNUC), WSHRTA(MXNUC),
     1                NDXWII(MXNUC)
C
C  LYNN RITCHIE, DIV. 6415, 4 DECEMBER 1984
C
      LRCODE = LRACTN(IDIR,INTRVL)
      LTCODE = LTACTN(IDIR,INTRVL)
C
C  TREAT WATER DOSES WITH NO POSSIBILITY OF INTERDICTION
C  WATER DOSES COME FROM EITHER DIRECT DEPOSITION TO WATER OR RUNOFF
C
      IF (FDPATH .EQ. 'OLD') THEN
      DO 20 NWPA = 1, NUMWPA
      DO 20 NORG = INICHR, NUMORG
```

```
      DO 20 NWPI = 1, NUMWPI
      WDDOSE(IDIR,INTRVL,NORG,NWPA) = WDDOSE(IDIR,INTRVL,NORG,NWPA) +
     1    AGRNDC(IDIR,NDXFII(NWPI),INTRVL) * TFLPD(NWPI,NORG,NWPA)
   20   WWDOSE(IDIR,INTRVL,NORG,NWPA) = WWDOSE(IDIR,INTRVL,NORG,NWPA) +
     1    AGRNDC(IDIR,NDXFII(NWPI),INTRVL) * TFLPW(NWPI,NORG,NWPA)
      ELSE
      DO 30 NWPA = 1, NUMWPA
      DO 30 NORG = INICHR, NUMORG
      DO 30 NWPI = 1, NUMWPI
      WDDOSE(IDIR,INTRVL,NORG,NWPA) = WDDOSE(IDIR,INTRVL,NORG,NWPA) +
     1    AGRNDC(IDIR,NDXWII(NWPI),INTRVL) * TFLPD(NWPI,NORG,NWPA)
   30   WWDOSE(IDIR,INTRVL,NORG,NWPA) = WWDOSE(IDIR,INTRVL,NORG,NWPA) +
     1    AGRNDC(IDIR,NDXWII(NWPI),INTRVL) * TFLPW(NWPI,NORG,NWPA)
      ENDIF
C
C  IMMEDIATE RETURN IF COST-EFFECTIVENESS TESTS SAY PERMANENT
C  INTERDICTION SHOULD OCCUR, NO DOSES WILL BE ACCUMULATED
C
      IF (LTCODE .EQ. 9  .OR.
     1    LTCODE .EQ. 49 .OR. LTCODE .EQ. 59) RETURN
      IF (LTCODE .EQ. 0) THEN
C
C LAND IS IMMEDIATELY HABITABLE, ACCUMULATE DOSE OVER THE SPECIFIED CHRONC
C EXPOSURE PERIOD, APNOLG AND APNOLR ARE DEFINED IN SUBROUTINE CHRNDF.
C
      DO 40 NORG = INICHR, NUMORG
      DO 40 NISO = 1, NUMISO
      GSDOSE(IDIR,INTRVL,NORG) = GSDOSE(IDIR,INTRVL,NORG) +
     1    AGRNDC(IDIR,NISO,INTRVL) * APNOLG(NISO,NORG)
   40   REDOSE(IDIR,INTRVL,NORG) = REDOSE(IDIR,INTRVL,NORG) +
     1    AGRNDC(IDIR,NISO,INTRVL) * APNOLR(NISO,NORG)
      ELSE IF (LTCODE .EQ. 40 .OR. LTCODE .EQ. 44) THEN
C
C CALCULATE DOSES TO RESIDENTS AFTER A PERIOD OF DECONTAMINATION OVER THE
C SPECIFIED EXPOSURE PERIOD, APDCLG AND APDCLR ARE DEFINED IN CHRNDF.
C
      LVEL = LVELDC(IDIR,INTRVL)
      DO 80 NORG = INICHR, NUMORG
      DO 80 NISO = 1, NUMISO
      GSDOSE(IDIR,INTRVL,NORG) = GSDOSE(IDIR,INTRVL,NORG) +
     1  AGRNDC(IDIR,NISO,INTRVL) * APDCLG(NISO,NORG,LVEL) / DSRFCT(LVEL)
   80   REDOSE(IDIR,INTRVL,NORG) = REDOSE(IDIR,INTRVL,NORG) +
     1  AGRNDC(IDIR,NISO,INTRVL) * APDCLR(NISO,NORG,LVEL) / DSRFCT(LVEL)
      ELSE IF (LTCODE .EQ. 50 .OR. LTCODE .EQ. 54) THEN
C
C  CALCULATE DOSES TO RESIDENTS AFTER THE MAXIMUM LEVEL DECONTAMINATION
C  FOLLOWED BY A PERIOD OF INTERDICTION WHICH IS ESTIMATED TO RESULT IN
C  THE MAXIMUM ALLOWABLE DOSE, DSCRLT, OVER A PROJECTION PERIOD OF
C  DURATION, TMPACT, WHICH BEGINS AT THE TIME OF THEIR PROSPECTIVE RETURN
C
C  THE ESTIMATION IS PERFORMED USING LOG-LINEAR INTERPOLATION;
C  LINEAR ON TIME, LOGARITHMIC ON DOSE
C
C  DETERMINE WHERE THE INTERDICTION PERIOD FALLS AMIDST THE HARD-WIRED
C  INTERDICTION PERIODS DEFINED BY CHRNDF AND STORED IN ARRAY TINTRD
C
      IF (TDECON(IDIR,INTRVL) .LE. TINTRD(1)) THEN
        I2 = 1
      ELSE IF (TDECON(IDIR,INTRVL) .LE. TINTRD(2)) THEN
        I2 = 2
      ELSE IF (TDECON(IDIR,INTRVL) .LE. TINTRD(3)) THEN
        I2 = 3
      ELSE
```

```
        WRITE(6,*) 'TDECON EXCEEDS UPPER LIMIT, INTERNAL ERROR'
        WRITE(7,*) 'TDECON EXCEEDS UPPER LIMIT, INTERNAL ERROR'
        CALL ABORT ('LTACUM')
      ENDIF

      DO 200 NORG = INICHR, NUMORG
C
C INITIALIZE ACCUMULATORS FOR GROUNDSHINE AND RESUSPENSION DOSE TO THIS ORGAN
C
C GDOSE1, RDOSE1 ARE RESULTANT DOSES AFTER THE SHORTER OF THE TWO INTERDICTION
C PERIODS WHILE GDOSE2, RDOSE2 ARE THE DOSES AFTER THE LONGER INTERDICTION
C
      GDOSE1 = 0.
      RDOSE1 = 0.
      GDOSE2 = 0.
      RDOSE2 = 0.
C
C CALCULATE DOSE OVER THE SHORTER OF THE TWO INTERDICTION PERIODS WHICH
C ARE BEING INTERPOLATED BETWEEN, SAVE RESULTS IN GDOSE1 AND RDOSE1
C
      IF (I2 .EQ. 1) THEN
C
C IF WE GET HERE, THE UPPER BOUNDARY ON DOSE IS THE DOSE FOLLOWING
C A MAXIMUM LEVEL DECONTAMINATION EFFORT WITHOUT ANY INTERDICTION.
C THE UPPER BOUNDARY ON DOSE CORRESPONDS TO THE LOWER BOUNDARY ON
C INTERDICTION TIME.  The exposure period for dose accumulation is
C defined by variable EXPTIM.  APINLG AND APINLR ARE DEFINED IN CHRNDF.
C
        TM1 = TMIPND + TIMDEC(LVLDEC)
        DO 140 NISO = 1, NUMISO
        GDOSE1 = GDOSE1 + AGRNDC(IDIR,NISO,INTRVL) *
     1                    APDCLG(NISO,NORG,LVLDEC)
  140     RDOSE1 = RDOSE1 + AGRNDC(IDIR,NISO,INTRVL) *
     1                    APDCLR(NISO,NORG,LVLDEC)
      ELSE
        I1  = I2 - 1
        TM1 = TINTRD(I1)
        DO 160 NISO = 1, NUMISO
        GDOSE1 = GDOSE1 +AGRNDC(IDIR,NISO,INTRVL)*APINLG(NISO,NORG,I1)
  160     RDOSE1 = RDOSE1 +AGRNDC(IDIR,NISO,INTRVL)*APINLR(NISO,NORG,I1)
      ENDIF
C
C CALCULATE DOSE OVER THE LONGER OF THE TWO INTERDICTION PERIODS WHICH
C ARE BEING INTERPOLATED BETWEEEN, SAVE RESULTS IN GDOSE2 AND RDOSE2
C
      TM2 = TINTRD(I2)
      DO 180 NISO = 1, NUMISO
      GDOSE2=GDOSE2 + AGRNDC(IDIR,NISO,INTRVL) * APINLG(NISO,NORG,I2)
  180   RDOSE2=RDOSE2 + AGRNDC(IDIR,NISO,INTRVL) * APINLR(NISO,NORG,I2)

      EPSLON = 1.E-20
      IF (GDOSE1 .GE. EPSLON .AND. GDOSE2 .GE. EPSLON)
     1  GSDOSE(IDIR,INTRVL,NORG) = GSDOSE(IDIR,INTRVL,NORG) +
     2          EXP ( LOG(GDOSE1) - (LOG(GDOSE1) - LOG(GDOSE2) ) *
     3          (TM1-TDECON(IDIR,INTRVL)) / (TM1-TM2) ) /
     4          DSRFCT(LVLDEC)
  200   IF (RDOSE1 .GE. EPSLON .AND. RDOSE2 .GE. EPSLON)
     1  REDOSE(IDIR,INTRVL,NORG) = REDOSE(IDIR,INTRVL,NORG) +
     2          EXP ( LOG(RDOSE1) - (LOG(RDOSE1) - LOG(RDOSE2) ) *
     3          (TM1-TDECON(IDIR,INTRVL)) / (TM1-TM2) )  /
     4          DSRFCT(LVLDEC)
      ENDIF
C********
```

```
C OLD FOOD PATHWAY
C********
      IF (FDPATH .EQ. 'OLD') THEN
C  DIRECT DEPOSITION IS CONSIDERED ONLY DURING THE GROWING SEASON
C
      IF (GROWSN) THEN
         IF (.NOT. DSPMLK(IDIR,INTRVL)) THEN
             DO 280 NORG = INICHR, NUMORG
            DO 280 NFII = 1, NFIISO
  280           DMDOSE(IDIR,INTRVL,NORG) = DMDOSE(IDIR,INTRVL,NORG) +
     1          AGRNDC(IDIR,NDXFII(NFII),INTRVL) * DTFMLK(NFII,NORG)
        ENDIF
        IF (.NOT. DSPCRP(IDIR,INTRVL)) THEN
             DO 320 NORG = INICHR, NUMORG
            DO 320 NFII = 1, NFIISO
  320           DODOSE(IDIR,INTRVL,NORG) = DODOSE(IDIR,INTRVL,NORG) +
     1          AGRNDC(IDIR,NDXFII(NFII),INTRVL) * DTFOTH(NFII,NORG)
        ENDIF
      ENDIF
C
C  CALCULATE ROOT UPTAKE DOSES ONLY IF FARMS HAVE NOT BEEN CONDEMNED
C
      IF (LRCODE .NE.  9 .AND.
     1    LTCODE .NE. 44 .AND. LTCODE .NE. 54) THEN
        DO 420 NFII = 1, NFIISO
          TERM = EXP(-QROOT(NFII) * LRCODE) *
     1           AGRNDC(IDIR,NDXFII(NFII),INTRVL)
          DO 420 NORG = INICHR, NUMORG
          RMDOSE(IDIR,INTRVL,NORG) = RMDOSE(IDIR,INTRVL,NORG) +
     1                               TERM * TFLMLK(NFII,NORG)
  420       RODOSE(IDIR,INTRVL,NORG) = RODOSE(IDIR,INTRVL,NORG) +
     1                               TERM * TFLOTH(NFII,NORG)
      ENDIF

      DO 440 NORG = INICHR, NUMORG
C
C  ACCUMULATE THE AGGREGATE MEASURE FOOD DOSE
C
  440   DSFOOD(IDIR,INTRVL,NORG) = DMDOSE(IDIR,INTRVL,NORG) +
     1    DODOSE(IDIR,INTRVL,NORG) + RMDOSE(IDIR,INTRVL,NORG) +
     2    RODOSE(IDIR,INTRVL,NORG)

      ELSE
C*******************
C  NEW FOOD PATHWAY
C*******************
C
C CONCBASE is the initial ground concentration (Bq/sq-meter) for which the
C ingestion dose factors were calculated in COMIDA2
C
      DO 700 NORG = INICHR, NUMORG
      INDORG = NORG - INICHR + 1
      DO 700 INUC  = 1, NMFDNUCL
      INDNUC = IFPOINT(INUC)
      IF (INDNUC .EQ. 0) GO TO 700
      DSFOOD(IDIR,INTRVL,NORG) = DSFOOD(IDIR,INTRVL,NORG) +
     1  (AGRNDC(IDIR,INDNUC,INTRVL) / CONCBASE) *
     2  (ACU_DOSE(INDORG,1,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
     3   ACU_DOSE(INDORG,2,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
     4   ACU_DOSE(INDORG,3,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
     5   ACU_DOSE(INDORG,4,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
     6   ACU_DOSE(INDORG,5,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
     7   ACU_DOSE(INDORG,6,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
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     8   ACU_DOSE(INDORG,7,INIMLK(IDIR,INTRVL),IFALLOUT,INUC) +
     9   ACU_DOSE(INDORG,8,INIOTH(IDIR,INTRVL),IFALLOUT,INUC) +
     A   ACU_DOSE(INDORG,9,INIOTH(IDIR,INTRVL),IFALLOUT,INUC))
  700   CONTINUE
      ENDIF
      DO 800 NORG = INICHR, NUMORG
  800 DSDXPS(IDIR,INTRVL,NORG) = REDOSE(IDIR,INTRVL,NORG) +
     1                           GSDOSE(IDIR,INTRVL,NORG)
      RETURN
      END
*DECK LOKSEE
      SUBROUTINE LOKSEE
C
C PRINT A SUMMARY OF THE RESULTING DOSES AND COSTS FOR THIS SPATIAL INTERVAL
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C GLOSSARY OF VARIABLES:
C
C CSTDF(I,J) - COST OF FARM DECONTAMINATION PER UNIT AREA FOR THE COARSE
C              GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTDNF(I,J) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR THE COARSE
C               GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C CSTIF(I,J) -  DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               FARMLAND AT INTERVAL J IN DIRECTION I ($ / HECTARE)
C CSTINF(I,J) - DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               NON-FARM AREAS IN THE INTERVAL J IN DIRECTION I ($ / RESIDENT)
C CSTLF(I,J) - LABOR COST FOR DECONTAMINATING FARM IN THE GRID ELEMENT
C              AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTLNF(I,J) - LABOR COST FOR DECONTAMINATING NON-FARM IN THE GRID
C               ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C DSPCRP(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR CROPS
C DSPMLK(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR MILK
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C LTACTN(I,J) - LONG-TERM ACTION CODE FOR INTERVAL J IN DIRECTION I, SEE BELOW
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
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C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE DECONTAMINATION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9: A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C             IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C             BECAUSE THE DOSE CRITERION CANNOT BE MET.
C             PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C TRMDRL(I,J) - RELOCATION PERIOD OF TEMPORARY INTERDICTION FOR DECONTAMINATION
C               OF THE GRID ELEMENT AT INTERVAL J IN DIRECTION I (SECONDS)
C
C RETCOD - RETURN CODES FOR EACH COARSE GRID ELEMENT, SEE BELOW
C
C INTERPRETATION OF THE THIRTEEN POSSIBLE VALUES OF RETCOD:
C
C  1. - PEOPLE IN INNER SHELTER ZONE, MOVED BACK IN AT TIMNRM
C  2. - PEOPLE IN INNER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  3. - PEOPLE IN FIRST EVACUATION ZONE, MOVED BACK IN AT TIMNRM
C  4. - PEOPLE IN FIRST EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  5. - PEOPLE IN SECOND EVACUATION ZONE, MOVED BACK IN AT TIMNRM
C  6. - PEOPLE IN SECOND EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  7. - PEOPLE IN THIRD EVACUATION ZONE, MOVED BACK IN AT TIMNRM
C  8. - PEOPLE IN THIRD EVACUATION ZONE, NOT MOVED BACK IN DURING EMERGENCY
C  9. - PEOPLE IN OUTER SHELTER ZONE, MOVED BACK IN AT TIMNRM
C 10. - PEOPLE IN OUTER SHELTER ZONE, NOT MOVED BACK IN DURING EMERGENCY
C 11. - PEOPLE IN RELOCATION ZONE, CAN REMAIN UNTIL ENDEMP
C 12. - PEOPLE IN RELOCATION ZONE, NORMAL RELOCATION OCCURS AT TIMNRM
C 13. - PEOPLE IN RELOCATION ZONE, HOT SPOT RELOCATION OCCURS AT TIMHOT
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C
C MASSIVE REWRITE OF LONG-TERM MODULE OF CHRONC, D. CHANIN, 11 MAY 88.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C MODIFIED 7/30/91, D. CHANIN, #8/2/91-A, CHANGE HOLLERITHS TO TYPE CHARACTER
C MODIFIED 3/23/93, D.C., CHANGE TDECON TO AN ARRAY AND ADD IT TO THE LIST
C  OF VARIABLES WHICH ARE PRINTED WHEN KSWDSC IS SET NON-ZERO
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      LOGICAL         DSPMLK,        DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON /INDXS/  INTRVL, IDIR
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *11   ORGNAM
      COMMON /ORGNAM/ ORGNAM(MAXORG)
      COMMON /RETCOD/ RETCOD(MAXRAD,16)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      COMMON /ICRTRO/ ICRTRO
      COMMON /KOPRNT/ KSWDSC
C
C  CHECK TO SEE IF ANY CONTAMINATION HAS OCCURRED IN THIS DIRECTION
C  BY TESTING A CONTROL VARIABLE SET IN SUBROUTINE EPCALC USED FOR
C  BOTH STRAIGHT-LINE AND WIND-SHIFT DISPERSION
C
C  A .TRUE. VALUE OF IHITIT INDICATES CONTAMINATION IN THE ELEMENT
C
      DO 60 IRAD = 1, NUMRAD
   60 IF (IHITIT(IRAD,IDIR)) GO TO 80
      RETURN
   80 CONTINUE
C
C  SHOW THE DURATION OF THE EVACUATION AND RELOCATION ACTIONS
C
      WRITE (6,100) IDIR
  100 FORMAT('1 DURATION OF THE REQUIRED EVACUATION AND RELOCATION',
     1       ' ACTIONS FOR IDIR = ',I2,/,'O','  INTRVL ','   TRMEVA ',
     2       '   TRMREL ','   TRMIRL ','   RETCOD ',
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     3        '  LTACTN ','LVELDC','  LRACTN ')

      DO 120 INTRVL = 1, NUMRAD
  120 WRITE(6,140) INTRVL,TRMEVA(IDIR,INTRVL),TRMREL(IDIR,INTRVL),
     1             TRMIRL(IDIR,INTRVL),RETCOD(INTRVL,IDIR),
     2             LTACTN(IDIR,INTRVL),LVELDC(IDIR,INTRVL),
     3             LRACTN(IDIR,INTRVL)
  140 FORMAT(I8,1P,3E11.4,0P,F6.0,5X,3I7)
C
      IF (KSWDSC .EQ. 1) THEN
      IORG1 = ICRTRO
      IORG2 = ICRTRO
      ELSE
      IORG1 = INICHR
      IORG2 = NUMORG
      ENDIF
C
C  SHOW THE GROUNDSHINE AND RESUSPENSION DOSES
C
      DO 180 NORG = IORG1, IORG2
      WRITE(6,160) IDIR,ORGNAM(NORG)
  160 FORMAT('1 INDIVIDUAL DOSE RESULTS TO RESIDENTS AND ',
     1  'DECONTAMINATION WORKERS FOR IDIR = ',I2,' TO ',A,
     2 /" INTRVL ',' GSDOSE   ',' REDOSE   ','  DSWKF  ',
     3  " DSWKNF ',' LTACTN',' LVELDC','  TDECON  ', ' LRACTN')

      DO 180 INTRVL = 1, NUMRAD
  180 WRITE(6,200) INTRVL, GSDOSE(IDIR,INTRVL,NORG),
     1  REDOSE(IDIR,INTRVL,NORG), DSWKF(IDIR,INTRVL,NORG),
     2  DSWKNF(IDIR,INTRVL,NORG), LTACTN(IDIR,INTRVL),
     3  LVELDC(IDIR,INTRVL), TDECON(IDIR,INTRVL), LRACTN(IDIR,INTRVL)
  200 FORMAT(I4,1X,1P,4E10.3,I4,3X,I4,3X,E10.3,I4)
C
C  SHOW THE SOCIETAL RESULTS CORRESPONDING TO DIRECT, ROOT UPTAKE,
C   AND WATER PATHWAYS DOSES (WATERSHED 1 IS USED)
C
      IF (FDPATH .EQ. 'OLD') THEN
       DO 260 NORG = IORG1, IORG2
       WRITE(6,220) IDIR, ORGNAM(NORG)
  220  FORMAT('1 SOCIETAL DOSE RESULTS FOR IDIR = ',I2,
     1        ' TO ',A,' FOR THE INGESTION PATHWAYS')
       WRITE(6,240)
  240  FORMAT('0  INTRVL','    DMDOSE ','    RMDOSE ','    DODOSE ',
     1  '    RODOSE ','    WDDOSE ','    WWDOSE ',' LTACTN',' LVELDC',
     2  ' LRACTN')
       DO 260 INTRVL = 1, NUMRAD
  260  WRITE(6,280) INTRVL,DMDOSE(IDIR,INTRVL,NORG),
     1  RMDOSE(IDIR,INTRVL,NORG),DODOSE(IDIR,INTRVL,NORG),
     2  RODOSE(IDIR,INTRVL,NORG),WDDOSE(IDIR,INTRVL,NORG,1),
     3  WWDOSE(IDIR,INTRVL,NORG,1),LTACTN(IDIR,INTRVL),
     4  LVELDC(IDIR,INTRVL),LRACTN(IDIR,INTRVL)
  280 FORMAT(I8,1P,6E11.4,3I7)
      ELSE
      WRITE(6,300) IDIR,ORGNAM(NORG)
  300   FORMAT('1 SOCIETAL DOSE RESULTS FOR IDIR = ',I2,
     1         ' TO ',A,' FOR THE INGESTION PATHWAYS')
      WRITE(6,320)
  320   FORMAT('0  INTRVL','     DSFOOD',' LTACTN',' INIMLK',' INIOTH')
      DO 340 INTRVL = 1, NUMRAD
  340   WRITE(6,360) INTRVL, DSFOOD(IDIR,INTRVL,NORG),
     1    LTACTN(IDIR,INTRVL), INIMLK(IDIR,INTRVL), INIOTH(IDIR,INTRVL)
      ENDIF
  360 FORMAT(I8,1P,E11.4,3I7)
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C
C  SHOW THE FARM COSTS
C
      WRITE(6,380) IDIR
  380 FORMAT('1 FARM AND AGRICULTURAL COSTS FOR IDIR = ',I2,
     1 /'0  INTRVL ','     CSTDF ','     CSTLF ','     CSTIF ',
     2  '    DSPMLK ','    DSPCRP ','   LTACTN ','LVELDC','  LRACTN')

      DO 400 INTRVL = 1, NUMRAD
  400 WRITE(6,420) INTRVL,CSTDF(IDIR,INTRVL),CSTLF(IDIR,INTRVL),
     1  CSTIF(IDIR,INTRVL),DSPMLK(IDIR,INTRVL),DSPCRP(IDIR,INTRVL),
     2  LTACTN(IDIR,INTRVL),LVELDC(IDIR,INTRVL),LRACTN(IDIR,INTRVL)
  420 FORMAT(I8,1P,3E11.4,2L11,3I7)
C
C  SHOW THE NON-FARM (BUSINESS AND RESIDENTIAL) COSTS
C
      WRITE(6,440) IDIR
  440 FORMAT('1 BUSINESS AND RESIDENTIAL COSTS FOR IDIR = ',I2,
     1 /' INTRVL ','    CSTDNF ','   CSTLNF ','   CSTINF ',
     2  '    TRMDRL ',' LTACTN',' LVELDC','   TDECON ','  LRACTN')

      DO 460 INTRVL = 1, NUMRAD
  460 WRITE(6,480) INTRVL,CSTDNF(IDIR,INTRVL),CSTLNF(IDIR,INTRVL),
     1  CSTINF(IDIR,INTRVL),TRMDRL(IDIR,INTRVL),LTACTN(IDIR,INTRVL),
     2  LVELDC(IDIR,INTRVL),TDECON(IDIR,INTRVL),LRACTN(IDIR,INTRVL)
  480 FORMAT(I4,4X,1P,4E10.3,0P,I4,3X,I4,3X,1P,E10.3,I4)

      RETURN
      END
*DECK STOCHR
      SUBROUTINE STOCHR
C
C THIS ROUTINE CONTROLS THE CALCULATION OF THE CHRONIC/ECONOMIC RESULTS
C THAT ARE TO BE USED BY THE SUMMARY PROGRAM.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE CRNRSK.
C
C GLOSSARY OF VARIABLES:
C
C IDAY   - THE DAY OF THIS TRIAL
C IHOUR  - THE HOUR OF THIS TRIAL
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C ITRIAL - THE SEQUENCE NUMBER OF THIS TRIAL
C NUMRES - TOTAL NUMBER OF RESULTS THAT WILL BE WRITTEN ON THE FILE
C NUMTRI - THE NUMBER OF METEOROLOGICAL TRIALS IN THE RUN
C PRBMET - PROBABILITY OF THIS MET SEQUENCE
C
C GLOSSARY OF EXTERNALS:
C
C OXTPT1-8 and OXTPTA - Calculates results of TYPE 1-8 and A
C
C DAVID CHANIN, DIV. 6415, 26 MAR 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 26 JULY 1985
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
C  NO INTRINSIC FUNCTIONS
      EXTERNAL OXTPT1, OXTPT4, OXTPT5, OXTPT6, OXTPT7, OXTPT8,
     $         OXTPTA, OXTPTB, OXTPT9, OXPT10, OXPT11, OXPT12, OXPT13
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      COMMON /METOUT/ ITRIAL, PRBMET, ISECON, IHOUR, IDAY, IBINUM
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
C
C  WRITE A HEADER ON THE "CHRONC" BINARY RESULTS FILE IDENTIFYING THIS RUN
C
      IUNIT = 34

      IF (ISRCTM .EQ. 1 .AND. ITRIAL .EQ. 1) THEN
        REWIND (IUNIT)
        WRITE(IUNIT) HEADER
      ENDIF
C
C  WRITE A RECORD ON THE RESULTS FILE IDENTIFYING THIS TRIAL
C
      WRITE(IUNIT) ITRIAL, PRBMET, IBINUM, IDAY, IHOUR

      IRESUL = 0

      CALL OXTPT1 (IRESUL,IUNIT)
      CALL OXTPT4 (IRESUL,IUNIT)
      CALL OXTPT5 (IRESUL,IUNIT)
      CALL OXTPT6 (IRESUL,IUNIT)
      CALL OXTPT7 (IRESUL,IUNIT)
      CALL OXTPT8 (IRESUL,IUNIT)
      CALL OXTPTA (IRESUL,IUNIT)
      CALL OXTPTB (IRESUL,IUNIT)
      CALL OXTPT9 (IRESUL,IUNIT)
      CALL OXPT10 (IRESUL,IUNIT)
      CALL OXPT11 (IRESUL,IUNIT)
      CALL OXPT12 (IRESUL,IUNIT)
      IF (FDPATH .EQ. 'NEW') THEN
        CALL OXPT13 (IRESUL,IUNIT)
      ENDIF
C
      RETURN
      END
*DECK OXTPT1
      SUBROUTINE OXTPT1 (IRESUL, IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 1:
C  TOTAL CASES OF A GIVEN HEALTH EFFECT (CANCER INJURY, DEATH, TOTAL CANCERS)
C  RESULTING FROM MATERIAL DEPOSITED BETWEEN A RANGE OF DISTANCES.
C
C NOTICE: CANCER CASES HERE ARE DEFINED TO BE FROM BOTH DIRECT AND INDIRECT
C         EXPOSURE. CANCERS RESULTING FROM FOOD AND WATER PRODUCED IN THE
C         REGION ARE ADDED TO THE DIRECT EXPOSURE CANCERS OF PEOPLE WHO
C         ACTUALLY LIVE IN THE REGION. FOR AREAS OF HIGH AGRICULTURAL
C         PRODUCTIVITY, MORE CANCERS MAY RESULT THAN THERE ARE PEOPLE.
C         D. CHANIN, 30 SEPT. 1986.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C DXONLY - LOGICAL FLAG INDICATING ONLY DIRECT EXPOSURE DOSES ARE TO BE INCLUDED
C          AND FOOD, WATER AND DECONTAMINATION DOSE IS TO BE EXCLUDED
C EFFEC1 - CALCULATED TOTAL CASES OF THE GIVEN HEALTH EFFECTS
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
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C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDEX  - POINTER TO LOCATION IN THE RESULT ARRAY AT WHICH RESULTS ARE STORED
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED WIND SHIFT MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IXCOD1 - ARRAY OF EFFECTS CODES, SEE BELOW
C IX1DS1 - INNER SPATIAL INTERVAL OF THE REGION OF INTEREST FOR TYPE 1 RESULTS
C IX2DS1 - OUTER SPATIAL INTERVAL OF THE REGION OF INTEREST FOR TYPE 1 RESULTS
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NXMVAL - NUMBER OF CONESEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM1  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C IXCOD1 = 100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM CHRONIC EXPOSURE
C            M, (M IS BETWEEN 101 AND 110) NUMBER OF TYPE M-100 CANCER DEATHS
C          200, TOTAL NUMBER OF LATENT CANCER INJURIES FROM CHRONIC EXPOSURE
C            N, (N IS BETWEEN 201 AND 210) NUMBER OF TYPE N-200 CANCER INJURIES
C
C GLOSSARY OF EXTERNALS:
C
C CASGET - RETURNS THE NUMBER OF A GIVEN EFFECT AT A GIVEN SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 26 JULY 1985
C MODIFIED 30 JAN 86, S.E.R. # 1, LTR, INCORRECT CALCULATION OF INPOP2
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATION OF RESULT IF PLUME DIDN'T REACH
C
      EXTERNAL CASGET
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /IXOUT1/ NXUM1, IXCOD1(40), IX1DS1(40), IX2DS1(40)
      COMMON /EFFEC1/ EFFEC1(16,40)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
C
      DIMENSION CASES1(40), CASES2(40)
      LOGICAL DXONLY
      DATA DXONLY /.FALSE./
C
      IF (NXUM1 .EQ. 0) RETURN
      DO 100 IRES = 1, NXUM1
      DO 100 IROT = 1, NUMCOR
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  100 EFFEC1(IROT,IRES) = 0.

      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = 1, NUMRAD
        CALL CASGET (NXUM1,IXCOD1,CASES1,IRAD,1,IROT,DXONLY)
        DO 200 IRES = 1, NXUM1
  200   IF (IRAD. GE. IX1DS1(IRES) .AND. IRAD .LE. IX2DS1(IRES))
     1    EFFEC1(IROT,IRES) = EFFEC1(IROT,IRES) + CASES1(IRES)
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
        DO 300 IANG = 2, IROTAT
        DO 300 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
        CALL CASGET (NXUM1,IXCOD1,CASES1,IRAD,IANG,INPOP1,DXONLY)
          CALL CASGET (NXUM1,IXCOD1,CASES2,IRAD,IANG,INPOP2,DXONLY)
        DO 250 IRES = 1, NXUM1
  250     IF (IRAD. GE. IX1DS1(IRES) .AND. IRAD .LE. IX2DS1(IRES))
     1     EFFEC1(IROT,IRES) = EFFEC1(IROT,IRES) +
     2                         CASES1(IRES) + CASES2(IRES)
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        CALL CASGET (NXUM1,IXCOD1,CASES1,IRAD,IANG,INPOP1,DXONLY)
        DO 350 IRES = 1, NXUM1
  350     IF (IRAD. GE. IX1DS1(IRES) .AND. IRAD .LE. IX2DS1(IRES))
     1      EFFEC1(IROT,IRES) = EFFEC1(IROT,IRES) + CASES1(IRES)
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 600 IANG = 1, NUMCOR
        DO 600 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        CALL CASGET (NXUM1,IXCOD1,CASES1,IRAD,IANG,IANG,DXONLY)
        DO 500 IRES = 1, NXUM1
  500     IF (IRAD. GE. IX1DS1(IRES) .AND. IRAD .LE. IX2DS1(IRES))
     1      EFFEC1(1,IRES) = EFFEC1(1,IRES) + CASES1(IRES)
      ENDIF
  600   CONTINUE
      ENDIF
      DO 950 IRES = 1, NXUM1
      IRESUL = IRESUL + 1
  950 WRITE(IUNIT) (EFFEC1(IROT,IRES),IROT=1,NXMVAL(IRESUL))
      RETURN
      END
*DECK CASGET
      SUBROUTINE CASGET (NUMRES,ICODE,CASES,IRAD,IANG,INPOP,DXONLY)
C
C THIS ROUTINE HELPS CALCULATE RESULT NUMBER 1:
C   IT NOW RETURNS THE NUMBER OF CASES OF CANCER OCCURRING IN A SPECIFIED
C   GRID ELEMENT FOR ALL THE NUMRES RESULTS WHICH HAVE BEEN REQUESTED
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPT1.
```

```
C
C GLOSSARY OF VARIABLES:
C
C CFRISK - CANCER DEATH RISK FACTOR (EFFECTS/SIEVERT)
C CIRISK - CANCER INJURY RISK FACTOR (EFFECTS/SIEVERT)
C AREA(I) - AREA OF THE GRID ELEMENT AT DISTANCE INTERVAL I (SQ. METERS)
C DOSFRM - STATEMENT FUNCTION CALCULATING FARM AREA DEPENDANT DOSE
C DOSPOP - STATEMENT FUNCTION CALCULATING RESIDENT POPULATION DEPENDANT DOSE
C DOSWAT - STATEMENT FUNCTION CALCULATING WATER INGESTION DOSE
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C DSFOOD(I,J,K) - FOOD INGESTION DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C DXONLY - LOGICAL FLAG INDICATING ONLY DIRECT EXPOSURE DOSES ARE TO BE INCLUDED
C          AND FOOD, WATER AND DECONTAMINATION DOSE IS TO BE EXCLUDED
C CASGET - CALCULATED NUMBER OF THE GIVEN EFFECT IN THE SPATIAL ELEMENT
C IANG   - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE RISK IS TO BE USED
C ICAN   - LOOP COUNTER ON LATENT CANCER EFFECTS
C INDREG(I,J) - ECONOMIC REGION INDEX OF GRID ELEMENT AT SPATIAL
C               DISTANCE I IN DIRECTION J
C INDXCA(I) - ORGAN INDEX FOR CANCER EFFECT I
C INPOP  - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE POPULATION IS TO BE USED
C IRAD   - RADIAL SPATIAL INDEX TO BOTH SPATIAL ELEMENTS
C IXCOD1 - EFFECT CODE THAT SIGNIFIES WHICH EFFECT IS REQUESTED, SEE BELOW
C NUMORG - NUMBER OF ORGANS BEING USED IN THE CHRONC MODEL
C NUMCNC - NUMBER OF TYPES OF CANCER THAT CAN RESULT FROM CHRONIC EXPOSURE
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C FRCLND(I,J) - TOTAL LAND FRACTION OF GRID ELEMENT AT SPATIAL DISTANCE I,
C               DIRECTION J
C FRMFRC(I) - FARM LAND FRACTION IN ECONOMIC REGION I
C
C ICODE = 100, TOTAL NUMBER OF LATENT CANCER DEATHS FROM CHRONIC EXPOSURE
C           M, (M IS BETWEEN 101 AND 110) NUMBER OF TYPE M-100 CANCER DEATHS
C         200, TOTAL NUMBER OF LATENT CANCER INJURIES FROM CHRONIC EXPOSURE
C           N, (N IS BETWEEN 201 AND 210) NUMBER OF TYPE N-200 CANCER INJURIES
C
C DAVID CHANIN, DIV. 6415, 5 FEB 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 26 JULY 1985
C MODIFIED 6/20/89/, DIC, LOG # 11/18/88-A,
C   THERE IS INSUFFICIENT STORAGE ALLOCATED FOR STATE ECONOMIC DATA,
C   THE UPPER LIMIT ON NECRGN IS BEING CHANGED FROM 59 TO 99,
C   VALIDATION IS BEING ADDED TO ENSURE THAT A VALID VALUE IS SUPPLIED.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL ABORT
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /CCANCR/ NUMCNC, INDXCA(10), ACFRSK(10), ACIRSK(10)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
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     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      COMMON /FRCLND/ FRCLND(MAXRAD,16)
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /INDWTR/ INDWTR(MAXRAD,16)
      COMMON /GRDDTA/ AREA(MAXRAD)
      DIMENSION DOSRAY(MAXORG), ICODE(NUMRES), CASES(NUMRES)

      LOGICAL DXONLY
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES POPULATION DOSE FROM FARM
C PRODUCTION AND DECONTAMINATION WORKERS WORKING ON THE FARMS (person-Sv)
C
      DOSFRM(IRAD,IANG,INPOP,IORG) = FRMFRC(INDREG(IRAD,INPOP)) *
     1   FRCLND(IRAD,INPOP) * AREA(IRAD) *
     2   (DSWKF(IANG,IRAD,IORG) + DSFOOD(IANG,IRAD,IORG))
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES POPULATION DOSE TO THE RESIDENT
C POPULATION AND DECONTAMINATION WORKERS CLEANING THEIR NEIGHBORHOOD (person-Sv)
C
      DOSPOP(IRAD,IANG,INPOP,IORG) = POPDAT(IRAD,INPOP,4) *
     1   (DSDXPS(IANG,IRAD,IORG) + DSWKNF(IANG,IRAD,IORG))
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES THE WATER INGESTION DOSE
C IN THE ELEMENT FROM DEPOSITION TO A MIXTURE OF LAND AND WATER (person-Sv)
C
      DOSWAT(IRAD,IANG,INPOP,IORG) = AREA(IRAD) *
     1   ((WWDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP))
     2     - WDDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP)))
     3     * FRCLND(IRAD,INPOP)
     4     + WDDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP)))
C
C  CALCULATE THE POPULATION DOSES TO EACH OF THE CHRONC ORGANS IN THIS SPATIAL
C  ELEMENT AND SAVE THEM FOR LATER USE SO THEY ARE ONLY CALCULATED ONCE
C
      IF (DXONLY) THEN
      DO 20 IORG = INICHR, NUMORG
   20   DOSRAY(IORG) = DSDXPS(IANG,IRAD,IORG) * POPDAT(IRAD,INPOP,4)
      ELSE
      DO 40 IORG = INICHR, NUMORG
   40   DOSRAY(IORG) = DOSFRM(IRAD,IANG,INPOP,IORG) +
     1                  DOSPOP(IRAD,IANG,INPOP,IORG) +
     2                  DOSWAT(IRAD,IANG,INPOP,IORG)
      ENDIF
      DO 600 IRES = 1, NUMRES
      CASES(IRES) = 0
      ICOD = ICODE(IRES)
      IF (ICOD .EQ. 100) THEN
C
C  CALCULATE TOTAL CANCER DEATHS FROM CHRONIC EXPOSURE
C
        DO 100 ICAN = 1, NUMCNC
  100   CASES(IRES) = CASES(IRES) +
     1                DOSRAY(INDXCA(ICAN)) * ACFRSK(ICAN)

      ELSE IF (ICOD .GT. 100 .AND. ICOD .LE. NUMCNC + 100) THEN
C
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C  CALCULATE LATENT CANCER DEATHS OF A SPECIFIC TYPE, CANCER NUMBER IXCOD1-100
C
        CASES(IRES) = DOSRAY(INDXCA(ICOD-100)) *  ACFRSK(ICOD-100)
      ELSE IF (ICOD .EQ. 200) THEN
C
C  CALCULATE TOTAL CANCER INJURIES FROM CHRONIC EXPOSURE
C
        DO 200 ICAN = 1, NUMCNC
  200   CASES(IRES) = CASES(IRES) +
     1                DOSRAY(INDXCA(ICAN)) * ACIRSK(ICAN)
      ELSE IF (ICOD .GT. 200 .AND. ICOD .LE. NUMCNC + 200) THEN
C
C  CALCULATE LATENT CANCER INJURIES OF SPECIFIC TYPE, CANCER NUMBER IXCOD1-200
C
        CASES(IRES) = DOSRAY(INDXCA(ICOD-200)) * ACIRSK(ICOD-200)
      ELSE
C
C  OPTION CODE IS ILLEGAL
C
        WRITE(6,*) 'INVALID OPTION CODE', ICOD
        WRITE(7,*) 'INVALID OPTION CODE', ICOD
        CALL ABORT ('CASGET')
      ENDIF
  600 CONTINUE
      RETURN
      END
*DECK OXTPT4
      SUBROUTINE OXTPT4 (IRESUL, IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 4:
C
C 360 DEGREE AVERAGE ON-GRID RISK OF A GIVEN EFFECT AT A GIVEN DISTANCE
C
C AVERAGE RISK IS CALCULATED BY ADDING UP THE VALUES OF INDIVIDUAL
C RISK IN EACH FINE GRID ELEMENT AT THE DESIRED DISTANCE AND DIVIDING
C BY THE NUMBER OF ELEMENTS AROUND THE CIRCLE.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ACFRSK - COMBINED DOSE EFFECTIVENESS AND CANCER DEATH RISK FACTOR
C ACIRSK - COMBINED DOSE EFFECTIVENESS AND CANCER INJURY RISK FACTOR
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C EFFEC4 - CALCULATED AVERAGE RISKS OF CANCER DEATH
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C ICAN   - LOOP COUNTER ON LATENT CANCER EFFECTS
C IXCOD4 - ARRAY OF EFFECTS CODES, SEE BELOW
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - TEMPORARY VARIABLE STORING THE INDEX TO THE DESIRED DISTANCE
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IX1DS4 - INDEX TO THE RADIAL SPATIAL ELEMENT AT WHICH RESULTS ARE DESIRED
C MULTIP - SCALE FACTOR TO BE USED WHEN DOSES ARE SYMMTERIC AROUND CENTERLINE
C NUMCNC - NUMBER OF CHRONIC EXPOSURE CANCER EFFECTS DEFINED IN THE MODEL
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NXUM4  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C IXCOD4 = 100, AVERAGE RISK OF LATENT CANCER DEATH FROM CHRONIC EXPOSURE
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C             M, (M IS BETWEEN 101 AND 110) RISK OF TYPE M-100 CANCER DEATHS
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 26 JULY 1985
C
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C
      EXTERNAL ABORT
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /CCANCR/ NUMCNC, INDXCA(10), ACFRSK(10), ACIRSK(10)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /IXOUT4/ NXUM4, IXCOD4(20), IX1DS4(20)
      IF (IPLUME .EQ. 1) THEN
        MULTIP = 2.
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
        MULTIP = 1.
        IROTAT = NUMCOR
      ENDIF
      DO 900 IOUT = 1, NXUM4
      IRESUL = IRESUL + 1
      EFFEC4 = 0.
      IRAD = IX1DS4(IOUT)
      IF (IXCOD4(IOUT) .EQ. 100) THEN
      DO 300 ICAN = 1, NUMCNC
      EFFEC4 = EFFEC4 + DSDXPS(1,IRAD,INDXCA(ICAN)) * ACFRSK(ICAN)
      DO 300 IANG = 2, IROTAT
  300   EFFEC4 = EFFEC4 + MULTIP * DSDXPS(IANG,IRAD,INDXCA(ICAN)) *
     $           ACFRSK(ICAN)
      EFFEC4 = EFFEC4 / NUMCOR
      ELSE IF (IXCOD4(IOUT) .GT. 100
     $   .AND. IXCOD4(IOUT) .LE. NUMCNC + 100) THEN
      ICAN = IXCOD4(IOUT) - 100
      EFFEC4 = DSDXPS(1,IRAD,INDXCA(ICAN)) * ACFRSK(ICAN)
      DO 400 IANG = 2, IROTAT
  400   EFFEC4 = EFFEC4 + MULTIP * DSDXPS(IANG,IRAD,INDXCA(ICAN)) *
     1           ACFRSK(ICAN)
      EFFEC4 = EFFEC4 / NUMCOR
      ELSE
      WRITE(6,*) 'INVALID VALUE OF IXCOD4 IN OXTPT4', IXCOD4(IOUT)
      WRITE(7,*) 'INVALID VALUE OF IXCOD4 IN OXTPT4', IXCOD4(IOUT)
        CALL ABORT ('OXTPT4')
      ENDIF
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      WRITE(IUNIT) EFFEC4
  900 CONTINUE
      RETURN
      END
*DECK OXTPT5
      SUBROUTINE OXTPT5 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 5:
C
C TOTAL POPULATION DOSE TO A GIVEN ORGAN RESULTING
C FROM MATERIAL DEPOSITED BETWEEN TWO DISTANCES.
C
C IT INCLUDES GROUNDSHINE, RESUSPENSION, FOOD, AND WATER DOSES
C AND ALSO INCLUDES DOSES TO THE DECONTAMINATION WORKERS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOCHR.
C
C GLOSSARY OF VARIABLES:
C
C AREA(I) - AREA OF THE GRID ELEMENT AT DISTANCE INTERVAL I (SQ. METERS)
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C DOSFRM - STATEMENT FUNCTION CALCULATING FARM AREA DEPENDANT DOSE
C DOSPOP - STATEMENT FUNCTION CALCULATING RESIDENT POPULATION DEPENDANT DOSE
C DOSWAT - STATEMENT FUNCTION CALCULATING WATER INGESTION DOSE
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C DSFOOD(I,J,K) - FOOD INGESTION DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C EFFEC5 - CALCULATED TOTAL POPULATION DOSE CONSEQUENCE VALUES
C FRCLND(I,J) - TOTAL LAND FRACTION OF GRID ELEMENT AT SPATIAL
C               DISTANCE I AND DIRECTION J
C FRMFRC(I) - FARM LAND FRACTION IN ECONOMIC REGION I
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDREG(I,J) - ECONOMIC REGION INDEX OF GRID ELEMENT AT SPATIAL
C               DISTANCE I AND DIRECTION J
C INDWTR(I,J) - WATERSHED INDEX OF GRID ELEMENT AT SPATIAL DISTANCE I
C               AND DIRECTION J
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED WIND SHIFT MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON ROTATED WIND DIRECTION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IXDEX5 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IX1DS5 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C IX2DS5 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NXMVAL - NUMBER OF CONESEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM5  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
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C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 22 AUG 85.
C MODIFIED 30 JAN 86, S.E.R. #1, LTR, INCORRECT CALCULATION OF INPOP2
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                    ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATION OF RESULT IF PLUME DIDN'T REACH
C MODIFIED 6/20/89/, DIC, LOG # 11/18/88-A,
C   THERE IS INSUFFICIENT STORAGE ALLOCATED FOR STATE ECONOMIC DATA,
C   THE UPPER LIMIT ON NECRGN IS BEING CHANGED FROM 59 TO 99,
C   VALIDATION IS BEING ADDED TO ENSURE THAT A VALID VALUE IS SUPPLIED.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      COMMON /FRCLND/ FRCLND(MAXRAD,16)
      COMMON /GRDDTA/ AREA(MAXRAD)
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /INDWTR/ INDWTR(MAXRAD,16)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /IXOUT5/ NXUM5, IXDEX5(10), IX1DS5(10), IX2DS5(10)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      DIMENSION EFFEC5(16)
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES POPULATION DOSE FROM FARM
C PRODUCTION AND DECONTAMINATION WORKERS WORKING ON THE FARMS (person-Sv)
C
      DOSFRM(IRAD,IANG,INPOP,IORG) = FRMFRC(INDREG(IRAD,INPOP)) *
     1   FRCLND(IRAD,INPOP) * AREA(IRAD) *
     2   (DSWKF(IANG,IRAD,IORG) + DSFOOD(IANG,IRAD,IORG))
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES POPULATION DOSE TO THE RESIDENT
C POPULATION AND DECONTAMINATION WORKERS CLEANING THEIR NEIGHBORHOOD (person-Sv)
C
      DOSPOP(IRAD,IANG,INPOP,IORG) = POPDAT(IRAD,INPOP,4) *
     1   (DSDXPS(IANG,IRAD,IORG) + DSWKNF(IANG,IRAD,IORG))
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES THE WATER INGESTION DOSE
C IN THE ELEMENT FROM DEPOSITION TO A MIXTURE OF LAND AND WATER (person-Sv)
C
      DOSWAT(IRAD,IANG,INPOP,IORG) = AREA(IRAD) *
```

```
     1   ((WWDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP))
     2     - WDDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP)))
     3     * FRCLND(IRAD,INPOP)
     4     + WDDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP)))
C
      DO 900 IOUT = 1, NXUM5
      IRESUL = IRESUL + 1
      DO 100 IROT = 1, NUMCOR
  100 EFFEC5(IROT) = 0.
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = IX1DS5(IOUT), IX2DS5(IOUT)
  200   EFFEC5(IROT) = EFFEC5(IROT) +
     1    DOSPOP(IRAD,1,IROT,IXDEX5(IOUT)) +
     2    DOSFRM(IRAD,1,IROT,IXDEX5(IOUT)) +
     3    DOSWAT(IRAD,1,IROT,IXDEX5(IOUT))
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 300 IANG = 2, IROTAT
        DO 300 IRAD = IX1DS5(IOUT), IX2DS5(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
  250     EFFEC5(IROT) = EFFEC5(IROT) +
     1      DOSPOP(IRAD,IANG,INPOP1,IXDEX5(IOUT)) +
     2      DOSFRM(IRAD,IANG,INPOP1,IXDEX5(IOUT)) +
     3      DOSWAT(IRAD,IANG,INPOP1,IXDEX5(IOUT)) +
     4      DOSPOP(IRAD,IANG,INPOP2,IXDEX5(IOUT)) +
     5      DOSFRM(IRAD,IANG,INPOP2,IXDEX5(IOUT)) +
     6      DOSWAT(IRAD,IANG,INPOP2,IXDEX5(IOUT))
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = IX1DS5(IOUT), IX2DS5(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
  350     EFFEC5(IROT) = EFFEC5(IROT) +
     1      DOSPOP(IRAD,IANG,INPOP1,IXDEX5(IOUT)) +
     2      DOSFRM(IRAD,IANG,INPOP1,IXDEX5(IOUT)) +
     3      DOSWAT(IRAD,IANG,INPOP1,IXDEX5(IOUT))
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 700 IANG = 1, NUMCOR
        DO 700 IRAD = IX1DS5(IOUT), IX2DS5(IOUT)
  700   IF (IHITIT(IRAD,IANG))
     1  EFFEC5(1) = EFFEC5(1) +
     2    DOSPOP(IRAD,IANG,IANG,IXDEX5(IOUT)) +
     3    DOSFRM(IRAD,IANG,IANG,IXDEX5(IOUT)) +
     4    DOSWAT(IRAD,IANG,IANG,IXDEX5(IOUT))
      ENDIF
      WRITE(IUNIT) (EFFEC5(IROT),IROT=1,NXMVAL(IRESUL))
  900 CONTINUE
      RETURN
      END
*DECK OXTPT6
      SUBROUTINE OXTPT6 (IRESUL,IUNIT)
C
```

```
C THIS ROUTINE CALCULATES RESULT NUMBER 6:
C
C PEAK OCCURRENCE DOSE VS DISTANCE FOR A SELECTED ORGAN BY PATHWAY.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C EFFEC6 - DOSE VS DISTANCE ARRAY FOR THIS RESULT
C GSDOSE(I,J,K) - CHRONIC GROUNDSHINE DOSE TO ORGAN K AT INTERVAL J
C                 IN DIRECTION I
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON ANGULAR INDEX
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IXDEX6 - LIST OF INDICES TO THE ORGANS USED FOR THIS RESULT
C IXPATH - PATHWAY CODES, DEFINED BELOW
C LASANG - UPPER BOUND ON THE ANGULAR INDEX WHICH NEEDS TO BE CHECKED
C NXUM6  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C REDOSE(I,J,K) - CHRONIC RESUSPENSION DOSE TO ORGAN K AT INTERVAL J
C                 IN DIRECTION I
C
C IXPATH = 1, CLOUDSHINE DOSE
C          2, GROUNDSHINE DOSE
C          3, ACUTE INHALATION DOSE
C          4, LIFETIME INHALATION DOSE
C          5, TOTAL ACUTE DOSE
C          6, TOTAL LONG TERM DOSE
C          7, LIFETIME RESUSPENSION DOSE
C          8, ACUTE RESUSPENSION DOSE
C (ONLY PATHWAYS 2, 6, AND 7 ARE DEFINED FOR CHRONC)
C
C DAVID CHANIN, DIV. 6415, 7 JUNE 1985.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C
      EXTERNAL ABORT
      INTRINSIC MAX
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /IXOUT6/ NXUM6, IXPATH(10), IXDEX6(10),
     $                        IX1DS6(10), IX2DS6(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
C
      DIMENSION EFFEC6(MAXRAD)
C
```

```
      IF (NXUM6 .LT. 1) RETURN
      IF (IPLUME .EQ. 1) THEN
        LASANG = 1
      ELSE
        LASANG = NUMCOR
      ENDIF
      DO 900 IOUT = 1, NXUM6
      IRESUL = IRESUL + IX2DS6(IOUT) - IX1DS6(IOUT) + 1
      DO 50 IRAD = IX1DS6(IOUT), IX2DS6(IOUT)
   50 EFFEC6(IRAD) = 0.
      IF (IXPATH(IOUT) .EQ. 2) THEN
        DO 200 IRAD = IX1DS6(IOUT), IX2DS6(IOUT)
        DO 200 IROT = 1, LASANG
  200   EFFEC6(IRAD) = MAX(EFFEC6(IRAD),GSDOSE(IROT,IRAD,IXDEX6(IOUT)))
      ELSE IF (IXPATH(IOUT) .EQ. 6) THEN
        DO 600 IRAD = IX1DS6(IOUT), IX2DS6(IOUT)
        DO 600 IROT = 1, LASANG
  600   EFFEC6(IRAD) = MAX(EFFEC6(IRAD),DSDXPS(IROT,IRAD,IXDEX6(IOUT)))
      ELSE IF (IXPATH(IOUT) .EQ. 7) THEN
        DO 700 IRAD = IX1DS6(IOUT), IX2DS6(IOUT)
        DO 700 IROT = 1, LASANG
  700   EFFEC6(IRAD) = MAX(EFFEC6(IRAD),REDOSE(IROT,IRAD,IXDEX6(IOUT)))
      ELSE
        WRITE(6,*) ' PATHWAY ERROR FOUND IN SUBROUTINE OXTPT6'
        WRITE(6,*) ' INVALID OUTPUT REQUEST'
        WRITE(7,*) ' PATHWAY ERROR FOUND IN SUBROUTINE OXTPT6'
        WRITE(7,*) ' INVALID OUTPUT REQUEST'
        CALL ABORT ('OXTPT6')
      ENDIF
      DO 800 IRAD = IX1DS6(IOUT), IX2DS6(IOUT)
  800 WRITE(IUNIT) EFFEC6(IRAD)
  900 CONTINUE
      RETURN
      END
*DECK OXTPT7
      SUBROUTINE OXTPT7 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 7:
C
C PEAK OCCURRENCE RISK VERSUS DISTANCE OF A GIVEN EFFECT (INDIVIDUAL
C LATENT CANCER DEATHS OR INDIVIDUAL LATENT CANCER INJURIES).
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ACFRSK - COMBINED DOSE EFFECTIVENESS AND CANCER DEATH RISK FACTOR
C DSDXPS(I,J,K) - DIRECT EXPOSURE DOSE FOR ORGAN K AT SPATIAL DISTANCE J
C                 IN DIRECTION I (Sv FOR INDIVIDUALS AT THE LOCATION)
C EFFEC7 - CALCULATED RISK VS DISTANCE OF THE DESIRED EFFECT
C ICAN   - INDEX TO THE TYPES OF CANCER DEFINED IN THE MODEL
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL SPATIAL ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON ANGULAR INDEX
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IXCOD7 - ARRAY OF EFFECTS CODES, DEFINED BELOW
C NUMCNC - NUMBER OF CHRONIC EXPOSURE CANCER EFFECTS DEFINED IN THE MODEL
C NXUM7  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C LASANG - UPPER BOUND ON THE ANGULAR INDEX WHICH NEEDS TO BE CHECKED
C RISFAT - STATEMENT FUNCTION TO CALCULATE CANCER DEATH RISK
C RISINJ - STATEMENT FUNCTION TO CALCULATE CANCER INJURY RISK
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C
C IXCOD7 = 100, RISK OF INDIVIDUAL LATENT CANCER DEATHS FROM CHRONIC EXPOSURE
C            M, (M IS BETWEEN 101 AND 110) NUMBER OF TYPE M-100 CANCER DEATHS
C          200, RISK OF INDIVIDUAL LATENT CANCER INJURIES FROM CHRONIC EXPOSURE
C            N, (N IS BETWEEN 201 AND 210) NUMBER OF TYPE N-200 CANCER INJURIES
C
C DAVID CHANIN, DIV. 6415, 7 JUNE 1985.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C
      EXTERNAL ABORT
      INTRINSIC MAX, MIN
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /CCANCR/ NUMCNC, INDXCA(10), ACFRSK(10), ACIRSK(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /IXOUT7/ NXUM7, IXCOD7(10), IX1DS7(10), IX2DS7(10)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
C
      DIMENSION EFFEC7(MAXRAD)
C
C  DEFINE STATEMENT FUNCTIONS WHICH CALCULATE THE RISKS OF CANCER DEATH
C  AND INJURY FOR A SPECIFIC TYPE OF CANCER (ICAN) AT RADIAL DISTANCE (IRAD)
C  AND AT THE ANGULAR LOCATION (IANG)
C
      RISFAT(ICAN,IRAD,IROT) = DSDXPS(IROT,IRAD,INDXCA(ICAN)) *
     1                         ACFRSK(ICAN)

      RISINJ(ICAN,IRAD,IROT) = DSDXPS(IROT,IRAD,INDXCA(ICAN)) *
     1                         ACIRSK(ICAN)

      IF (NXUM7 .LT. 1) RETURN
      IF (IPLUME .EQ. 1) THEN
        LASANG = 1
      ELSE
        LASANG = NUMCOR
      ENDIF
      DO 900 IOUT = 1, NXUM7
      ICODE  = IXCOD7(IOUT)
      IRESUL = IRESUL + IX2DS7(IOUT) - IX1DS7(IOUT) + 1
      DO 50 IRAD = IX1DS7(IOUT), IX2DS7(IOUT)
   50 EFFEC7(IRAD) = 0.
      IF (ICODE .EQ. 100) THEN
        DO 140 IRAD = IX1DS7(IOUT), IX2DS7(IOUT)
      DO 120 IROT = 1, LASANG
      SUMRIS = 0.
      DO 100 ICAN = 1, NUMCNC
  100   SUMRIS = SUMRIS + RISFAT(ICAN,IRAD,IROT)
  120   EFFEC7(IRAD) = MAX (EFFEC7(IRAD), SUMRIS)
  140   EFFEC7(IRAD) = MIN (EFFEC7(IRAD), 1.)
      ELSE IF (ICODE .GT. 100 .AND. ICODE .LE. NUMCNC + 100) THEN
```

```
          ICAN = ICODE - 100
        DO 200 IRAD = IX1DS7(IOUT), IX2DS7(IOUT)
          DO 200 IROT = 1, LASANG
  200     EFFEC7(IRAD) = MAX (EFFEC7(IRAD), RISFAT(ICAN,IRAD,IROT))
        ELSE IF (ICODE .EQ. 200) THEN
          DO 340 IRAD = IX1DS7(IOUT), IX2DS7(IOUT)
        DO 320 IROT = 1, LASANG
        SUMRIS = 0.
        DO 300 ICAN = 1, NUMCNC
  300     SUMRIS = SUMRIS + RISFAT(ICAN,IRAD,IROT)
  320     EFFEC7(IRAD) = MAX (EFFEC7(IRAD), SUMRIS)
  340     EFFEC7(IRAD) = MIN (EFFEC7(IRAD), 1.)
        ELSE IF (ICODE .GT. 200 .AND. ICODE .LE. NUMCNC + 200) THEN
          ICAN = ICODE - 200
        DO 700 IRAD = IX1DS7(IOUT), IX2DS7(IOUT)
          DO 700 IROT = 1, LASANG
  700     EFFEC7(IRAD) = MAX (EFFEC7(IRAD), RISINJ(ICAN,IRAD,IROT))
        ELSE
          WRITE(6,*) 'INVALID OPTION CODE IN OXTPT7, ', ICODE
          WRITE(7,*) 'INVALID OPTION CODE IN OXTPT7, ', ICODE
          CALL ABORT ('OXTPT7')
        ENDIF
        DO 800 IRAD = IX1DS7(IOUT), IX2DS7(IOUT)
  800 WRITE(IUNIT) EFFEC7(IRAD)
  900 CONTINUE
        RETURN
        END
*DECK OXTPT8
        SUBROUTINE OXTPT8 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 8:
C POPULATION WEIGHTED RISK OF A GIVEN HEALTH EFFECT BETWEEN 2 DISTANCES
C
C NOTICE: CANCER RISK HERE IS DEFINED TO BE FROM ONLY DIRECT EXPOSURE.
C         INGESTION OF FOOD AND WATER ARE NOT INCLUDED IN THE DOSES
C         USED FOR CALCULATING THIS RESULT. D. CHANIN, 30 SEPT. 1986.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C DXONLY - LOGICAL FLAG INDICATING ONLY DIRECT EXPOSURE DOSES ARE TO BE INCLUDED
C          AND FOOD, WATER AND DECONTAMINATION DOSE IS TO BE EXCLUDED
C EFFEC8 - CALCULATED VALUES OF POPULATION WEIGHTED RISK OF EARLY DEATH
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED WIND SHIFT MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IXCOD8 - ARRAY OF HEALTH EFFECTS CODES, SEE BELOW
C IX1DS8 - INNER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C IX2DS8 - OUTER BOUNDARY ON THE REGION OF INTEREST, RADIAL SPATIAL INTERVAL
C LIMINN - LIMIT ON THE INNER BOUNDARY OVER WHICH THIS RESULT CAN OCCUR
C LIMOUT - LIMIT ON THE OUTER BOUNDARY OVER WHICH THIS RESULT CAN OCCUR
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
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C NXMVAL - NUMBER OF CONSEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM8  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C TOTPOP - TOTAL POPULATION RESIDING IN THE REGION OF INTEREST
C
C IXCOD8 =  0, POPULATION WEIGHTED RISK OF EARLY DEATH
C           I, (I IS BETWEEN 1 AND 10) RISK OF TYPE I EARLY INJURY
C         100, POP WTD RISK OF LATENT CANCER DEATH FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 101 AND 110) RISK OF TYPE I-100 CANCER DEATH
C         200, POP WTD RISK OF LATENT CANCER INJURY FROM ACUTE EXPOSURE
C           I, (I IS BETWEEN 201 AND 210) RISK OF TYPE I-200 CANCER INJURIES
C
C GLOSSARY OF EXTERNALS:
C
C CASGET - RETURNS THE NUMBER OF A GIVEN EFFECT AT A GIVEN SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 6 SEPT 85.
C MODIFIED BY D. CHANIN, 4 FEB 86, INCORRECT CALCULATION OF INPOP2, SEE SER #1
C MODIFIED 25 AUG 86, D.C., SER #34, THOROUGH REVISION OF CALCULATED RESULTS
C    REMOVED RESULT TYPE 9,
C    CHANGED TYPE 1 TO BE CONSTRAINED BY A RANGE OF DISTANCES,
C    CHANGED TYPE 2 TO BE REPORTED IN KILOMETERS,
C    CHANGED TYPE 8 TO SHOW POP WTD RISK FOR ANY HEALTH EFFECT,
C    REVISED THE NAMING CONVENTION OF RESULTS 1,2,4,5,8 FOR CONSISTENCY
C MODIFIED 30 SEPT 86, SER #37, DIC, CHANGED TYPE 1 FOR A RANGE OF DISTANCES
C                                   ADDED RESULT TYPE 8, MISC FIXES FOR 1.3
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 8 MAR 88, D.C., SKIP CALCULATIONS OF RESULTS IF PLUME DIDN'T REACH
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL CASGET
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /IXOUT8/ NXUM8, IXCOD8(20), IX1DS8(20), IX2DS8(20)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
C
      DIMENSION EFFEC8(16,20)
      DIMENSION CASES1(20), CASES2(20)
      LOGICAL DXONLY
C
C  ONLY INCLUDE DIRECT EXPOSURE DOSES
C
      DATA DXONLY /.TRUE./

      IF (NXUM8 .EQ. 0) RETURN
C
C  CALCULATE INNER AND OUTER BOUNDS OVER WHICH THESE RESULTS ARE CALCULATED
C
      LIMOUT = 0
      LIMINN = NUMRAD

      DO 40 IRES = 1, NXUM8
      LIMOUT = MAX (LIMOUT, IX2DS8(IRES))
```

```
 40 LIMINN = MIN (LIMINN, IX1DS8(IRES))
    DO 100 IRES = 1, NXUM8
    DO 100 IROT = 1, NUMCOR
100 EFFEC8(IROT,IRES) = 0.
    IF (IPLUME .EQ. 1) THEN
      DO 200 IROT = 1, NUMCOR
      DO 200 IRAD = LIMINN, LIMOUT
    CALL CASGET (NXUM8,IXCOD8,CASES1,IRAD,1,IROT,DXONLY)
    DO 200 IRES = 1, NXUM8
200   IF (IRAD. GE. IX1DS8(IRES) .AND. IRAD .LE. IX2DS8(IRES))
   1    EFFEC8(IROT,IRES) = EFFEC8(IROT,IRES) + CASES1(IRES)
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
    DO 300 IANG = 2, IROTAT
      DO 300 IRAD = LIMINN, LIMOUT
    IF (IHITIT(IRAD,IANG)) THEN
      DO 250 IROT = 1, NUMCOR
      INPOP1 = IANG + IROT - 1
        IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
      INPOP2 = IROT + NUMCOR - IANG + 1
        IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
      CALL CASGET (NXUM8,IXCOD8,CASES1,IRAD,IANG,INPOP1,DXONLY)
        CALL CASGET (NXUM8,IXCOD8,CASES2,IRAD,IANG,INPOP2,DXONLY)
      DO 250 IRES = 1, NXUM8
250     IF (IRAD. GE. IX1DS8(IRES) .AND. IRAD .LE. IX2DS8(IRES))
   1    EFFEC8(IROT,IRES) = EFFEC8(IROT,IRES) +
   2                        CASES1(IRES) + CASES2(IRES)
    ENDIF
300   CONTINUE
    ELSE IF (IPLUME .EQ. 2) THEN
      DO 400 IANG = 1, NUMCOR
      DO 400 IRAD = LIMINN, LIMOUT
    IF (IHITIT(IRAD,IANG)) THEN
      DO 350 IROT = 1, NUMCOR
      INPOP1 = IANG + IROT - 1
        IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
      CALL CASGET (NXUM8,IXCOD8,CASES1,IRAD,IANG,INPOP1,DXONLY)
      DO 350 IRES = 1, NXUM8
350     IF (IRAD. GE. IX1DS8(IRES) .AND. IRAD .LE. IX2DS8(IRES))
   1      EFFEC8(IROT,IRES) = EFFEC8(IROT,IRES) + CASES1(IRES)
    ENDIF
400   CONTINUE
    ELSE IF (IPLUME .EQ. 3) THEN
      DO 600 IANG = 1, NUMCOR
      DO 600 IRAD = LIMINN, LIMOUT
    IF (IHITIT(IRAD,IANG)) THEN
      CALL CASGET (NXUM8,IXCOD8,CASES1,IRAD,IANG,IANG,DXONLY)
      DO 500 IRES = 1, NXUM8
500     IF (IRAD. GE. IX1DS8(IRES) .AND. IRAD .LE. IX2DS8(IRES))
   1      EFFEC8(1,IRES) = EFFEC8(1,IRES) + CASES1(IRES)
    ENDIF
600   CONTINUE
    ENDIF
    DO 900 IRES = 1, NXUM8
    IRESUL = IRESUL + 1
    TOTPOP = 0.
    DO 700 IROT = 1, NUMCOR
    DO 700 IRAD = IX1DS8(IRES), IX2DS8(IRES)
700 TOTPOP = TOTPOP + POPDAT(IRAD,IROT,4)
    DO 800 IROT = 1, NUMCOR
    IF (TOTPOP .GT. 0.) THEN
      EFFEC8(IROT,IRES) = EFFEC8(IROT,IRES) / TOTPOP
    ELSE
      EFFEC8(IROT,IRES) = 0.
```

```
      ENDIF
  800 CONTINUE
  900 WRITE(IUNIT) (EFFEC8(IROT,IRES), IROT = 1, NXMVAL(IRESUL))
      RETURN
      END
*DECK OXTPTA
      SUBROUTINE OXTPTA (IRESUL,IUNIT)
C
C This routine calculates result of type A, the observed peak dose at
C a given distance.
C
C This routine is called by SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFECA - Calculated consequence measure for this result
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C INDEXA - List of indices to the organs used for this result
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE OUTPUT IS TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMFIN - NUMBER OF FINE ANGULAR SUBDIVISIONS DEFINED IN THE MODEL
C NUMA   - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C DSDXPS - Dose array for direct exposure doses
C
C David Chanin, 8/15/92, New routine based on OUTPTA.
C
C  NO EXTERNAL FUNCTIONS
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /IXOUTA/ NXUMA, IXDEXA(10), IX1DSA(10), IX2DSA(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
C
      IF (IPLUME .EQ. 1) THEN
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      ELSE
      IROTAT = NUMCOR
      ENDIF
      DO 800 IOUT = 1, NXUMA
      DO 800 IRAD = IX1DSA(IOUT), IX2DSA(IOUT)
      IRESUL = IRESUL + 1
```

```
      EFFECA = 0.
      DO 100 IANG = 1, IROTAT
  100 EFFECA = MAX (EFFECA, DSDXPS(IANG,IRAD,IXDEXA(IOUT)))
  800 WRITE(IUNIT) EFFECA
      RETURN
      END
*DECK OXTPTB
      SUBROUTINE OXTPTB (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT TYPE B:
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C EFFECB - CALCULATED VALUES OF THE REQUESTED CONSEQUENCE MEASURE
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INPOP  - INDEX TO THE POPULATION ELEMENT USED FOR THE ROTATED WIND SHIFT MODEL
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IXDEXB -
C NUMCOR - NUMBER OF COARSE GRID ELEMENTS IN ANGULAR DIRECTION (EVEN)
C NXMVAL - NUMBER OF CONSEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUMB  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C DAVID CHANIN, 2/16/96, new routine based on existing output routines.
C Modified 4/3/96: corrected the angular indexing so that it was not reversed
      EXTERNAL CASGET
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /IXOUTB/ NXUMB, IXDEXB(30), IXRAD_B(30), IXANG_B(30)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
C
      DIMENSION EFFECB(16,32)
C
```

```
      IF (NXUMB .EQ. 0) RETURN
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
C
      DO 100 IRES = 1, NXUMB
      DO 100 IROT = 1, 16
  100 EFFECB(IROT,IRES) = 0.
C
      DO 900 IOUT = 1, NXUMB
      IRESUL = IRESUL + 1
      IRAD = IXRAD_B(IOUT)
      IANG = IXANG_B(IOUT)
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, 16
        INPOP1 = IANG - IROT + 1
        IF (INPOP1 .LT. 1) INPOP1 = INPOP1 + 16
        IF (INPOP1 .GT. 9) INPOP1 = 18 - INPOP1
        IF (INPOP1 .LE. IROTAT)
     1      EFFECB(IROT,IOUT) = DSDXPS(INPOP1,IRAD,IXDEXB(IOUT))
  200   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 300 IROT = 1, 16
        INPOP1 = IANG - IROT + 1
        IF (INPOP1 .LT. 1) INPOP1 = INPOP1 + 16
  300     EFFECB(IROT,IOUT) = DSDXPS(INPOP1,IRAD,IXDEXB(IOUT))
      ELSE IF (IPLUME .EQ. 3) THEN
        EFFECB(1,IOUT) = DSDXPS(IANG,IRAD,IXDEXB(IOUT))
      ENDIF
  900 WRITE(IUNIT) (EFFECB(IROT,IOUT),IROT=1,NXMVAL(IRESUL))
      RETURN
      END
*DECK OXTPT9
      SUBROUTINE OXTPT9 (IRESUL, IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 9:
C POPULATION DOSE TO A SELECTED ORGAN IN A GIVEN REGION BY THE VARIOUS PATHWAYS
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C DOSE   - ARRAY STORING THE 12 DOSES BROKEN DOWN BY PATHWAY, SEE BELOW
C EFFEC9 - CALCULATED TOTAL POPULATION DOSES
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INPOP1 - INDEX TO THE FIRST (OR ONLY) POPULATION BEING USED IN THE SUMMATION
C INPOP2 - INDEX TO THE SECOND POPULATION BEING USED IN THE SUMMATION
C IORG   - INDEX TO THE ORGAN OF INTEREST ON THE LIST OF CHRONC ORGANS
C IOUT   - LOOP COUNTER ON THE 12 RESULTS OF THIS TYPE
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON ROTATED WIND DIRECTION
C IROTAT - UPPER BOUND ON WIND DIRECTION LOOP ROTATION
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C IX1DS9 - INNER SPATIAL ELEMENT OF THE REGION OF INTEREST FOR THIS RESULT
C IX2DS9 - OUTER SPATIAL ELEMENT OF THE REGION OF INTEREST FOR THIS RESULT
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NXMVAL - NUMBER OF CONSEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM9  - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
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C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C
C DOSE(1) - TOTAL LONG-TERM PATHWAYS DOSE
C DOSE(2) - LONG-TERM DIRECT EXPOSURE PATHWAYS
C DOSE(3) - TOTAL INGESTION PATHWAYS DOSE
C DOSE(4) - LONG-TERM GROUNDSHINE DOSE
C DOSE(5) - LONG-TERM RESUSPENSION DOSE
C DOSE(6) - POP.-DEPENDENT DECONTAMINATION DOSE
C DOSE(7) - FARM-DEPENDENT DECONTAMINATION DOSE
C DOSE(8) - MILK DIRECT-DEPOSITION DOSE
C DOSE(9) - CROP DIRECT-DEPOSITION DOSE
C DOSE(10)- MILK ROOT-UPTAKE DOSE
C DOSE(11)- CROP ROOT-UPTAKE DOSE
C DOSE(12)- WATER INGESTION DOSE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 2 DEC 85.
C MODIFIED 30 JAN 86, S.E.R. #1, LTR, INCORRECT CALCULATION OF INPOP2
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 30 SEPT 87, S.E.R. #71, LTR, IMPLEMENTATION OF WINDSHIFT MODLE
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATION OF RESULT IF PLUME DIDN'T REACH
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      LOGICAL CXDF9
      COMMON /RESLT9/ NXUM9, IXCOD9(10), IX1DS9(10), IX2DS9(10),
     1                CXDF9(10)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
C
      DIMENSION DOSE1(17), DOSE2(17), EFFEC9(17,16)
C
      IF (FDPATH .EQ. 'OLD') THEN
      NUM = 12
      ELSE
      NUM = 17
      ENDIF
C
      DO 900 IOUT = 1, NXUM9
C
C  LOAD THE INDEX TO THE ORGAN OF INTEREST
C
      IORG = IXCOD9(IOUT)
      DO 100 IROT = 1, NUMCOR
      DO 100 IRES = 1, NUM
  100 EFFEC9(IRES,IROT) = 0.
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = IX1DS9(IOUT), IX2DS9(IOUT)
      CALL DOSGET (DOSE1, IORG, IRAD, 1, IROT)
      DO 200 IRES = 1, NUM
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  200   EFFEC9(IRES,IROT) = EFFEC9(IRES,IROT) + DOSE1(IRES)
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 300 IANG = 2, IROTAT
        DO 300 IRAD = IX1DS9(IOUT), IX2DS9(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
        CALL DOSGET (DOSE1, IORG, IRAD, IANG, INPOP1)
          CALL DOSGET (DOSE2, IORG, IRAD, IANG, INPOP2)
        DO 250 IRES = 1, NUM
  250     EFFEC9(IRES,IROT) = EFFEC9(IRES,IROT) +
     1                        DOSE1(IRES) + DOSE2(IRES)
      ENDIF
  300   CONTINUE
       ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = IX1DS9(IOUT), IX2DS9(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        CALL DOSGET (DOSE1, IORG, IRAD, IANG, INPOP1)
        DO 350 IRES = 1, NUM
            EFFEC9(IRES,IROT) = EFFEC9(IRES,IROT) + DOSE1(IRES)
  350     CONTINUE
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 600 IANG = 1, NUMCOR
        DO 600 IRAD = IX1DS9(IOUT), IX2DS9(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        CALL DOSGET (DOSE1, IORG, IRAD, IANG, IANG)
        DO 500 IRES = 1, NUM
  500     EFFEC9(IRES,1) = EFFEC9(IRES,1) + DOSE1(IRES)
      ENDIF
  600   CONTINUE
      ENDIF
      DO 900 IRES = 1, NUM
      IRESUL = IRESUL + 1
      WRITE(IUNIT) (EFFEC9(IRES,IROT),IROT=1,NXMVAL(IRESUL))
  900 CONTINUE
      RETURN
      END
*DECK DOSGET
      SUBROUTINE DOSGET (DOSE, IORG, IRAD, IANG, INPOP)
C
C THIS ROUTINE HELPS CALCULATES RESULT NUMBER 9:
C POPULATION DOSE TO A SELECTED ORGAN IN AN ELEMENT BY THE VARIOUS PATHWAYS
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPT9.
C
C GLOSSARY OF VARIABLES:
C
C AREA(I) - AREA OF THE GRID ELEMENT AT DISTANCE INTERVAL I (SQ. METERS)
C DOSE - ARRAY OF 12 POPULATION DOSES FROM THE VARIOUS PATHWAYS, SEE BELOW
C DSWKF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING FARMLAND
C                AT INTERVAL J IN DIRECTION I (person-Sv / SQ. METER OF FARM)
C DSWKNF(I,J,K) - POP. DOSE TO ORGAN K FOR WORKERS DECONTAMINATING
C                 NON-FARM AT INTERVAL J IN DIRECTION I (person-Sv / RESIDENT)
C FRCLND(I,J) - TOTAL LAND FRACTION OF GRID ELEMENT AT SPATIAL
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C                 DISTANCE I AND DIRECTION J
C FRMFRC(I) - FARM LAND FRACTION IN ECONOMIC REGION I
C IANG    - INDEX TO THE ANGULAR DIRECTION ON THE DOSE GRID
C INDREG(I,J) - ECONOMIC REGION INDEX OF GRID ELEMENT AT SPATIAL
C                 DISTANCE I IN DIRECTION J
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INPOP   - INDEX TO THE ANGULAR DIRECTION ON THE POPULATION GRID
C IORG    - INDEX TO THE ORGAN OF INTEREST ON THE LIST OF CHRONC ORGANS
C IRAD    - INDEX TO THE RADIAL DISTANCE OF INTEREST
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C TOTPOP - TEMPORARY VARIABLE USED TO STORE POPULATION IN THE ELEMENT
C DOSFRM - STATEMENT FUNCTION CALCULATING FARM AREA DEPENDANT DOSE
C DOSPOP - STATEMENT FUNCTION CALCULATING RESIDENT POPULATION DEPENDANT DOSE
C DOSWAT - STATEMENT FUNCTION CALCULATING WATER INGESTION DOSE
C
C DOSE(1) - TOTAL LONG-TERM PATHWAYS DOSE
C DOSE(2) - LONG-TERM DIRECT EXPOSURE PATHWAYS
C DOSE(3) - TOTAL INGESTION PATHWAYS DOSE
C DOSE(4) - LONG-TERM GROUNDSHINE DOSE
C DOSE(5) - LONG-TERM RESUSPENSION DOSE
C DOSE(6) - WATER INGESTION DOSE
C DOSE(7) - POP.-DEPENDENT DECONTAMINATION DOSE
C DOSE(8) - FARM-DEPENDENT DECONTAMINATION DOSE
C DOSE(9) - MILK DIRECT-DEPOSITION DOSE
C DOSE(10)- CROP DIRECT-DEPOSITION DOSE
C DOSE(11)- MILK ROOT-UPTAKE DOSE
C DOSE(12)- CROP ROOT-UPTAKE DOSE
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 2 DEC 85.
C MODIFIED 30 JAN 86, S.E.R. #1, LTR, INCORRECT CALCULATION OF INPOP2
C MODIFIED 18 JULY 86, S.E.R. #27, MISC CHANGES FOR COMPATIBILITY WITH EARLY
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 30 SEPT 87, S.E.R. #71, LTR, IMPLEMENTATION OF WINDSHIFT MODLE
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATION OF RESULT IF PLUME DIDN'T REACH
C MODIFIED 9 MAR 88, D.C., ELIMINATE SCTDOS, PRODUCE RESULTS A S A SET OF 12
C MODIFIED 6/20/89/, DIC, LOG # 11/18/88-A,
C   THERE IS INSUFFICIENT STORAGE ALLOCATED FOR STATE ECONOMIC DATA,
C   THE UPPER LIMIT ON NECRGN IS BEING CHANGED FROM 59 TO 99,
C   VALIDATION IS BEING ADDED TO ENSURE THAT A VALID VALUE IS SUPPLIED.
C MODIFIED 9/19/89, D. CHANIN, LOG # 8/30/89-A, ALLOW UP TO 4 WATERSHEDS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 11/25/94, D. Chanin, Fixed the inadvertent omission of water term,
C  DOSE(6) from the summation of "total ingestion" and "total long-term" doses
C  for the "new" food model.  The "old" food model was unchanged in this fix.
C  Also, "new" food model now uses farmland area to calculate food ingestion
C  doses, (MACCS2 v. 1.10 used the area not covered with water instead of the
C  farmland area).
C
C Modified 3/01/01, Log # 3/01/01-C, D. Chanin:  correcting the
C   crop index per S. Ryufuku, note of 11/01/99 from Julie Gregory
C
C  NO EXTERNAL OR INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
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     $                  SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /REUSE1/ GSDOSE(16,MAXRAD,2:MAXORG),
     1                REDOSE(16,MAXRAD,2:MAXORG),
     2                DSDXPS(16,MAXRAD,2:MAXORG),
     3                DSFOOD(16,MAXRAD,2:MAXORG),
     4                DMDOSE(16,MAXRAD,2:MAXORG),
     5                DODOSE(16,MAXRAD,2:MAXORG),
     6                DSWKF (16,MAXRAD,2:MAXORG),
     7                DSWKNF(16,MAXRAD,2:MAXORG),
     8                RMDOSE(16,MAXRAD,2:MAXORG),
     9                RODOSE(16,MAXRAD,2:MAXORG),
     A                WDDOSE(16,MAXRAD,2:MAXORG,4),
     B                WWDOSE(16,MAXRAD,2:MAXORG,4)
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      COMMON /FRCLND/ FRCLND(MAXRAD,16)
      COMMON /GRDDTA/ AREA(MAXRAD)
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /INDWTR/ INDWTR(MAXRAD,16)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
      LOGICAL           DSPMLK,         DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
C
      DIMENSION DOSE(17)
C
C DEFINE A STATEMENT FUNCTION WHICH CALCULATES THE WATER INGESTION DOSE
C IN THE ELEMENT FROM DEPOSITION TO A MIXTURE OF LAND AND WATER (person-Sv)
C
      DOSWAT(IRAD,IANG,INPOP,IORG) = AREA(IRAD) *
     1   ((WWDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP))
     2     - WDDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP)))
     3     * FRCLND(IRAD,INPOP)
     4     + WDDOSE(IANG,IRAD,IORG,INDWTR(IRAD,INPOP)))
C
      FMAREA = FRMFRC(INDREG(IRAD,INPOP)) * FRCLND(IRAD,INPOP) *
     1         AREA(IRAD)
C
C  LONG-TERM GROUNDSHINE DOSE
      DOSE(4) = GSDOSE(IANG,IRAD,IORG) * POPDAT(IRAD,INPOP,4)
C
C  LONG-TERM RESUSPENSION DOSE
      DOSE(5) = REDOSE(IANG,IRAD,IORG) * POPDAT(IRAD,INPOP,4)
C
C  WATER INGESTION DOSE
      DOSE(6) = DOSWAT(IRAD,IANG,INPOP,IORG)
C
C   POP.-DEPENDENT DECONTAMINATION DOSE
      DOSE(7) = DSWKNF(IANG,IRAD,IORG) * POPDAT(IRAD,INPOP,4)
C
C  FARM-DEPENDENT DECONTAMINATION DOSE
      DOSE(8) = DSWKF(IANG,IRAD,IORG) * FMAREA
```

```
C
      IF (FDPATH .EQ. 'OLD') THEN
C
C  MILK DIRECT-DEPOSITION DOSE
      DOSE(9) = DMDOSE(IANG,IRAD,IORG) * FMAREA
C
C  CROP DIRECT-DEPOSITION DOSE
      DOSE(10) = DODOSE(IANG,IRAD,IORG) * FMAREA
C
C  MILK ROOT-UPTAKE DOSE
      DOSE(11) = RMDOSE(IANG,IRAD,IORG) * FMAREA
C
C  CROP ROOT-UPTAKE DOSE
      DOSE(12) = RODOSE(IANG,IRAD,IORG) * FMAREA
C
C  TOTAL INGESTION PATHWAYS DOSE
      DOSE(3) = DOSE(6) + DOSE(9) + DOSE(10) + DOSE(11) + DOSE(12)
C
      ELSE
C
C CONCBASE is the initial ground concentration (Bq/sq.-m) for which the
C ingestion dose factors were calculated in COMIDA2
C
      INDORG = IORG - INICHR + 1
      DOSE(9)  = 0.
      DOSE(10) = 0.
      DOSE(11) = 0.
      DOSE(12) = 0.
      DOSE(13) = 0.
      DOSE(14) = 0.
      DOSE(15) = 0.
      DOSE(16) = 0.
      DOSE(17) = 0.
C
      DO 500 INUC = 1, NMFDNUCL
      INDNUC = IFPOINT(INUC)
      IF (INDNUC .EQ. 0) GO TO 500
      TERM = AGRNDC(IANG,INDNUC,IRAD) / CONCBASE * FMAREA

C      DOSE(9) = DOSE(9) + TERM *
C     1  ACU_DOSE(INDORG,2,INIOTH(IANG,IRAD),IFALLOUT,INUC)
C
C Revised 3/01/01, Log # 3/01/01-C, D. Chanin:  correcting the
C   crop index per S. Ryufuku, 11/01/99 note from Julie Gregory
C
      DOSE(9) = DOSE(9) + TERM *
     1  ACU_DOSE(INDORG,1,INIOTH(IANG,IRAD),IFALLOUT,INUC)

      DOSE(10) = DOSE(10) + TERM *
     1  ACU_DOSE(INDORG,2,INIOTH(IANG,IRAD),IFALLOUT,INUC)
      DOSE(11) = DOSE(11) + TERM *
     1  ACU_DOSE(INDORG,3,INIOTH(IANG,IRAD),IFALLOUT,INUC)
      DOSE(12) = DOSE(12) + TERM *
     1  ACU_DOSE(INDORG,4,INIOTH(IANG,IRAD),IFALLOUT,INUC)
      DOSE(13) = DOSE(13) + TERM *
     1  ACU_DOSE(INDORG,5,INIOTH(IANG,IRAD),IFALLOUT,INUC)
      DOSE(14) = DOSE(14) + TERM *
     1  ACU_DOSE(INDORG,6,INIOTH(IANG,IRAD),IFALLOUT,INUC)
      DOSE(15) = DOSE(15) + TERM *
     1  ACU_DOSE(INDORG,7,INIMLK(IANG,IRAD),IFALLOUT,INUC)
      DOSE(16) = DOSE(16) + TERM *
     1  ACU_DOSE(INDORG,8,INIOTH(IANG,IRAD),IFALLOUT,INUC)
      DOSE(17) = DOSE(17) + TERM *
```

```
     1  ACU_DOSE(INDORG,9,INIOTH(IANG,IRAD),IFALLOUT,INUC)
  500   CONTINUE
C
C Note: before 11/25/95, following summation incorrectly omitted water, DOSE(6),
C       and also erroneously used the area of land (i.e., not covered by water),
C       instead of the area covered with farms for calculating ingestion doses
C
      DOSE(3) = DOSE(6) + DSFOOD(IANG,IRAD,IORG) * FMAREA
      ENDIF
C
C  LONG-TERM DIRECT EXPOSURE PATHWAYS (groundshine and resuspension)
C
      DOSE(2) = DOSE(4) + DOSE(5)
C
C TOTAL LONG-TERM PATHWAYS DOSE (everything, including water, as fixed 11/25/95)
C
      DOSE(1) = DOSE(2) + DOSE(3) + DOSE(7) + DOSE(8)
      RETURN
      END
*DECK OXPT10
      SUBROUTINE OXPT10 (IRESUL, IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 10:
C ECONOMIC COST MEASURES PRODUCED AS A SET OF 12 FOR A USER SPECIFIED REGION
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C ECC1   - CALCULATED MEASURES OF THE 12 TYPES OF ECONOMIC COSTS, SEE BELOW
C ECC2   - TEMPORARY ARRAY USED JUST LIKE ECC1, SEE BELOW
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C ICODE  - LOOP COUNTER ON THE 12 TYPES OF RESULTS IN THE CATEGORY, SEE BELOW
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C INDEX  - POINTER TO LOCATION IN THE RESULT ARRAY AT WHICH RESULTS ARE STORED
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NXMVAL - NUMBER OF CONESEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM10 - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C ECC1(1) = TOTAL ECONOMIC COSTS
C ECC1(2) = POP.-DEPENDENT COSTS
C ECC1(3) = FARM-DEPENDENT COSTS
C ECC1(4) = POP.-DEPENDENT DECONTAMINATION COST
C ECC1(5) = FARM-DEPENDENT DECONTAMINATION COST
C ECC1(6) = POP.-DEPENDENT INTERDICTION COST
C ECC1(7) = FARM-DEPENDENT INTERDICTION COST
C ECC1(8) = POP.-DEPENDENT CONDEMNATION COST
C ECC1(9) = FARM-DEPENDENT CONDEMNATION COST
C ECC1(10)= EMERGENCY PHASE COST
C ECC1(11)= INTERMEDIATE PHASE COST
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C ECC1(12)= MILK DISPOSAL COST
C ECC1(13)= CROP DISPOSAL COST
C
C GLOSSARY OF EXTERNALS:
C
C ECCGET - RETURNS THE 13 ECONOMIC COSTS AT A GIVEN SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 26 JULY 1985
C MODIFIED 30 JAN 86, S.E.R. #1, LTR, INCORRECT CALCULATION OF INPOP2
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 30 SEPT 81, S.E.R #71, LTR, IMPLEMENTATION OF WIND SHIFT MODEL
C MODIFIED 7 MAR 88, D.C., SKIP CALCULATION OF RESULT IF PLUME DIDN'T REACH
C                          AND CALCULATE ECONOMIC COSTS AS A SET OF 12
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 1/4/94, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      EXTERNAL ECCGET
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CXDF10
      COMMON /RSLT10/ NXUM10, I1DS10(10), I2DS10(10), CXDF10(10)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      DIMENSION ECC1(13), ECC2(13), ECST10(13,16)
C
      INUM = 13
C
      DO 900 IOUT = 1, NXUM10
      DO 100 IROT = 1, NUMCOR
      DO 100 IRES = 1, INUM
  100 ECST10(IRES,IROT) = 0.
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = I1DS10(IOUT), I2DS10(IOUT)
      CALL ECCGET (ECC1,IRAD,1,IROT)
      DO 200 IRES = 1, INUM
  200   ECST10(IRES,IROT) = ECST10(IRES,IROT) + ECC1(IRES)
        IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 300 IANG = 2, IROTAT
        DO 300 IRAD = I1DS10(IOUT), I2DS10(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
        CALL ECCGET(ECC1,IRAD,IANG,INPOP1)
          CALL ECCGET(ECC2,IRAD,IANG,INPOP2)
        DO 250 IRES = 1, INUM
  250     ECST10(IRES,IROT) = ECST10(IRES,IROT) +
     $                        ECC1(IRES) + ECC2(IRES)
        ENDIF
  300   CONTINUE
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      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IRAD = I1DS10(IOUT), I2DS10(IOUT)
        DO 400 IANG = 1, NUMCOR
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP = IANG + IROT - 1
          IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
        CALL ECCGET (ECC1,IRAD,IANG,INPOP)
        DO 350 IRES = 1, INUM
  350     ECST10(IRES,IROT) = ECST10(IRES,IROT) + ECC1(IRES)
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 600 IANG = 1, NUMCOR
        DO 600 IRAD = I1DS10(IOUT), I2DS10(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        CALL ECCGET (ECC1,IRAD,IANG,IANG)
        DO 500 IRES = 1, INUM
  500     ECST10(IRES,1) = ECST10(IRES,1) + ECC1(IRES)
      ENDIF
  600   CONTINUE
      ENDIF
      DO 700 IRES = 1, INUM
      IRESUL = IRESUL + 1
  700 WRITE(IUNIT) (ECST10(IRES,IROT),IROT=1,NXMVAL(IRESUL))
  900 CONTINUE
      RETURN
      END
*DECK ECCGET
      SUBROUTINE ECCGET (ECC, IRAD, IANG, INDPOP)
C
C THIS ROUTINE HELPS CALCULATE RESULT NUMBER 10:
C
C THIS ROUTINE RETURNS THE 12 COST MEASURES IN A SINGLE SPATIAL ELEMENT
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXPT10.
C
C GLOSSARY OF VARIABLES:
C
C ASFP(I) - AVERAGE ANNUAL FARM SALES PER HECTARE FOR ECONOMIC REGION I
C CSTDF(I,J) - COST OF FARM DECONTAMINATION PER UNIT AREA FOR THE COARSE
C              GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / HECTARE)
C CSTDNF(I,J) - COST OF NON-FARM DECONTAMINATION PER PERSON FOR THE COARSE
C               GRID ELEMENT AT INTERVAL J IN DIRECTION I (DOLLARS / RESIDENT)
C CSTIF(I,J) -  DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               FARMLAND AT INTERVAL J IN DIRECTION I ($ / HECTARE)
C CSTINF(I,J) - DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               NON-FARM AREAS IN THE INTERVAL J IN DIRECTION I ($ / RESIDENT)
C DPF(I)  - FRACTION OF FARM SALES FROM DAIRY IN ECONOMIC REGION I
C ECC - COST ARRAY FOR THE ECONOMIC EFFECTS IN THE SPATIAL ELEMENT, SEE BELOW
C EVCOST - emergency phase relocation cost (dollars/person-sec)
C FMAREA(I,J) - FARM AREA IN HECTARES OF THE GRID ELEMENT AT SPATIAL
C               DISTANCE I IN DIRECTION J
C IANG   - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE COST IS TO BE USED
C INDPOP - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE POPULATION IS TO BE USED
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C IRAD   - RADIAL SPATIAL INDEX TO BOTH SPATIAL ELEMENTS
C IXCD10 - ECONOMIC CODE THAT SIGNIFIES WHICH COST IS REQUESTED, SEE BELOW
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
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```
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C LTACTN(I,J) - LONG-TERM ACTION CODE FOR INTERVAL J IN DIRECTION I, SEE BELOW
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C              RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE DECONTAMINATION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55: IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C              TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C              THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59: IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C              TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9: A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C             IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C             BECAUSE THE DOSE CRITERION CANNOT BE MET.
C             PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C POPCST - COMPENSATION COST FOR LOST INCOME TO TEMPORARILY INTERDICTED
C          INDIVIDUALS AND THOSE WHOSE PROPERTY IS CONDEMNED ($ / PERSON)
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C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C RLCOST - intermediate phase relocation cost (dollars/person-sec)
C EVCOST - emergency phase relocation cost (dollars/person-sec)
C TRMDRL(I,J) - RELOCATION PERIOD OF TEMPORARY INTERDICTION FOR DECONTAMINATION
C               OF THE GRID ELEMENT AT INTERVAL J IN DIRECTION I (SECONDS)
C VFRM(I) - AVERAGE FARM VALUE FOR ECONOMIC REGION I ($ / HECTARE)
C VNFRM(I) - AVERAGE NON-FARM VALUE FOR ECONOMIC REGION I ($ / RESIDENT)
C
C ECC1(1) = TOTAL ECONOMIC COSTS
C ECC1(2) = POP.-DEPENDENT COSTS
C ECC1(3) = FARM-DEPENDENT COSTS
C ECC1(4) = POP.-DEPENDENT DECONTAMINATION COST
C ECC1(5) = FARM-DEPENDENT DECONTAMINATION COST
C ECC1(6) = POP.-DEPENDENT INTERDICTION COST
C ECC1(7) = FARM-DEPENDENT INTERDICTION COST
C ECC1(8) = POP.-DEPENDENT CONDEMNATION COST
C ECC1(9) = FARM-DEPENDENT CONDEMNATION COST
C ECC1(10)= EVACUATION AND RELOCATION COST
C ECC1(11)= MILK DISPOSAL COST
C ECC1(12)= CROP DISPOSAL COST
C
C MODIFIED 6/20/89/, DIC, LOG # 11/18/88-A,
C   THERE IS INSUFFICIENT STORAGE ALLOCATED FOR STATE ECONOMIC DATA,
C   THE UPPER LIMIT ON NECRGN IS BEING CHANGED FROM 59 TO 99,
C   VALIDATION IS BEING ADDED TO ENSURE THAT A VALID VALUE IS SUPPLIED.
C MODIFIED 7/11/89, D. CHANIN, LOG # 4/13/89-A,
C  ELIMINATE THE DOUBLE-COUNTING OF EVACUATION COST
C MODIFIED 7/30/91, D. CHANIN, #2/4/91-A, OMITTED FARMLAND DECON COST IN TOTAL
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      PARAMETER (MXNUC=10,MXCRP=10)
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      LOGICAL         DSPMLK,        DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      LOGICAL GROWSN
      COMMON /CRPTIM/ TGSBEG(MXCRP), TGSEND(MXCRP), TIMACC, TSEEDG,
     *                THRVST, GROWSN
      COMMON /ECNDTA/ FRMFRC(99), DPF(99), ASFP(99), VFRM(99), VNFRM(99)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      COMMON /FRMDAT/ FMAREA(MAXRAD,16)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /SITEDT/ DPRATE,DSRATE,FRFIM,FRNFIM,VALWF,VALWNF,POPCST
      COMMON /ERLCST/ EVCOST, RLCOST
      COMMON /INDREG/ INDREG(MAXRAD,16)
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
C
      DIMENSION ECC(13)
C
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C  SET FRACTION OF YEAR (FRACTN) FOR ACTION GUIDE DISPOSAL OF MILK
C  THIS IS INTENDED TO ACCOUNT FOR MILK PRODUCTION BEING SHIFTED TO
C  UNCONTAMINATED FEED IN A FRACTION OF A YEAR FOLLWING THE ACCIDENT
C
      DATA FRACTN / .25/

      INDXRG = INDREG(IRAD,INDPOP)
      LRCODE = LRACTN(IANG,IRAD)
      LTCODE = LTACTN(IANG,IRAD)
      ECC(1) = 0.
      ECC(2) = 0.
      ECC(3) = 0.
      ECC(4) = 0.
      ECC(5) = 0.
      ECC(6) = 0.
      ECC(7) = 0.
      ECC(8) = 0.
      ECC(9) = 0.
      ECC(10) = 0.
      ECC(11) = 0.
      ECC(12) = 0.
      ECC(13) = 0.
C
C  COMPUTE THE CROP DISPOSAL COSTS DUE TO EITHER ACTION GUIDES
C  OR THE OCCURENCE OF DECONTAMINATION OR INTERDICTION.
C
C  THESE COSTS CAN BE ASSESSED EVEN IF THE ACCIDENT
C  OCCURS OUTSIDE OF THE GROWING SEASON.
C
      IF (FDPATH .EQ. 'OLD') THEN
      IF (DSPCRP(IANG,IRAD))
     1    ECC(13) = ASFP(INDXRG) * (1. - DPF(INDXRG)) *
     2              FMAREA(IRAD,INDPOP)
      ELSE
      IF (INIOTH(IANG,IRAD) .NE. 1)
     1     ECC(13) = ASFP(INDXRG) * (1. - DPF(INDXRG)) *
     2               FMAREA(IRAD,INDPOP)
      ENDIF
C
C  COMPUTE THE MILK DISPOSAL COSTS DUE TO EITHER ACTION GUIDES
C  OR THE OCCURENCE OF DECONTAMINATION OR INTERDICTION.
C
C  THESE COSTS CAN BE ASSESSED EVEN IF THE ACCIDENT
C  OCCURS OUTSIDE OF THE GROWING SEASON.
C
      IF (FDPATH .EQ. 'OLD') THEN
        IF (DSPMLK(IANG,IRAD)) THEN
C
C Old food model: Action guide disposal of milk for a QUARTER of one year
C
        ECC(12) = ASFP(INDXRG) * DPF(INDXRG) * FRACTN *
     1              FMAREA(IRAD,INDPOP)
        ENDIF
      ELSE
C
C New food model: Action guide disposal of milk for a QUARTER of the year
C
      IF (INIMLK(IANG,IRAD) .NE. 1)
     1     ECC(12) = ASFP(INDXRG) * DPF(INDXRG) * FRACTN *
     2              FMAREA(IRAD,INDPOP)
      ENDIF
C
C Calculate evacuation and relocation costs resulting from emergency phase
```

```
C actions (per-diem costs) for temporary housing of evacuees and relocatees:
C  1) emergency phase evacuation costs, and
C  2) emergency phase relocation costs.
C
      ECC(10) = POPDAT(IRAD,INDPOP,4) * EVCOST *
     1          (TRMEVA(IANG,IRAD) + TRMREL(IANG,IRAD))
C
C Calculate relocation costs resulting from intermedate phase actions
C (i.e., per-diem cost of relocating people for the duration of the entire
C intermediate phase).  Costs should include replacement of clothing and
C other personal possessions, cost of rental housing, loss of income, and
C other costs which could be incurred for a relocation of up to one year's
C duration.
C
      ECC(11) = POPDAT(IRAD,INDPOP,4) * RLCOST * TRMIRL(IANG,IRAD)
C
C  CALCULATE FARMLAND CONDEMNATION COSTS IF WE HAD TO BUY THE FARMS DUE TO
C  PERMANENT INTERDICTION OF ROOT UPTAKE OR IF THE LAND IS UNINHABITABLE,
C  OR IF RECLAMATION OF THE PROPERTY IS NOT COST-EFFECTIVE.
C
      IF (FDPATH .EQ. 'OLD') THEN
      IF (LRCODE .EQ.  9 .OR. LTCODE .EQ.  9 .OR.
     1    LTCODE .EQ. 44 .OR. LTCODE .EQ. 49 .OR.
     2    LTCODE .EQ. 54 .OR. LTCODE .EQ. 59)
     3      ECC(9) = VFRM(INDXRG) * FMAREA(IRAD,INDPOP)
      ELSE
C
C For permanent interdiction of milk and non-milk crops, which are condemned
C together, (no allowance for condemning only milk or non-milk separately),
C assess the value of the farm as FARM-DEPENDENT COMDEMNATION COST.
C
C If farmland is uninhabitable, (i.e., TDECON is more years than LASTSTOR, the
C number of years considered in COMIDA2), the INIMLK and INIOTH arrays have
C already been zeroed in LTPROJ, signifying permanent farmland interdiction.
C
      IF (LTCODE .EQ.  9 .OR. LTCODE .EQ. 44 .OR.
     1      LTCODE .EQ. 49 .OR. LTCODE .EQ. 54 .OR.
     2      LTCODE .EQ. 59 .OR. INIOTH(IANG,IRAD) .EQ. 0)
     3        ECC(9) = VFRM(INDXRG) * FMAREA(IRAD,INDPOP)

      ENDIF
C
C  CALCULATE NON-FARM CONDEMNATION COSTS IF WE HAD TO BUY OUT THE PEOPLE
C  DUE TO PERMANENT INTERDICTION AS A RESULT OF UNINHABITABILITY,
C  OR IF RECLAMATION OF THE PROPERTY IS NOT COST-EFFECTIVE.
C
C  THEY ARE COMPENSATED FOR THE VALUE OF THEIR TANGIBLE PROPERTY AND ALSO
C  THE TEMPORARY LOSS OF INCOME DURING THE TRANSITION PERIOD TO NEW HOMES
C
      IF (LTCODE .EQ.  9 .OR.
     1    LTCODE .EQ. 45 .OR. LTCODE .EQ. 49 .OR.
     2    LTCODE .EQ. 55 .OR. LTCODE .EQ. 59)
     3  ECC(8) = (VNFRM(INDXRG) + POPCST) * POPDAT(IRAD,INDPOP,4)
C
C  CALCULATE FARMLAND INTERDICTION COSTS
C
      ECC(7) = CSTIF(IANG,IRAD) * FMAREA(IRAD,INDPOP)
C
C  CALCULATE NON-FARM INTERDICTION COSTS
C
      ECC(6) = CSTINF(IANG,IRAD) * POPDAT(IRAD,INDPOP,4)
C
C  CALCULATE FARMLAND DECONTAMINATION COSTS
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C
      ECC(5) = CSTDF(IANG,IRAD) * FMAREA(IRAD,INDPOP)
C
C  CALCULATE NON-FARM DECONTAMINATION COSTS
C
      ECC(4) = CSTDNF(IANG,IRAD) * POPDAT(IRAD,INDPOP,4)
C
C  CALCULATE TOTAL FARMLAND ECONOMIC COSTS:
C   DECONTAMINATION, INTERDICTION, CONDEMNATION, AND CROP AND MILK DISPOSAL
C
      ECC(3) = ECC(5) + ECC(7) + ECC(9) + ECC(12) + ECC(13)
C
C  CALCULATE TOTAL NON-FARM ECONOMIC COSTS
C
      ECC(2) = ECC(4) + ECC(6) + ECC(8) + ECC(10) + ECC(11)
C
C  CALCULATE TOTAL ECONOMIC COST
C
      ECC(1) = ECC(2) + ECC(3)

      RETURN
      END
*DECK OXPT11
      SUBROUTINE OXPT11 (IRESUL,IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 11:
C
C MAXIMUM IMPACT DISTANCE OF A GIVEN LONG TERM ACTION:
C DECONTAMINATION, INTERDICTION, CONDEMNATION, MILK DISPOSAL, OR CROP DISPOSAL
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C AFFEC1 - TEMPORARY ARRAY STORING THE 8 TYPES OF IMPACT RESULTS, SEE BELOW
C AFFEC2 - TEMPORARY ARRAY SERVING SAME PURPOSE AS AFFEC1, SEE BELOW
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C DSTLTA - MAXIMUM DISTANCES AT WHICH THE 8 TYPES OF ACTIONS OCCURRED
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRES   - LOOP COUNTER ON THE 8 TYPES OF RESULTS PRODUCED AS A SET
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IROTAT - INDEX TO THE FURTHEST WIND SECTOR AFFECTED BY THE PLUME TO THE RIGHT
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NXMVAL - NUMBER OF CONSEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM11 - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C AFFEC1(1) - TOTAL DECONTAMINATED FARMLAND AREA (HECTARES)
C AFFEC1(2) - TOTAL POPULATION ON DECONTAMINATED LAND (INDIVIDUALS)
C AFFEC1(3) - TOTAL INTERDICTED FARMLAND AREA (HECTARES)
C AFFEC1(4) - TOTAL POPULATION FROM INTERDICTED LAND (INDIVIDUALS)
C AFFEC1(5) - TOTAL CONDEMNED FARMLAND AREA (HECTARES)
C AFFEC1(6) - TOTAL POPULATION FROM CONDEMNED LAND (INDIVIDUALS)
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C AFFEC1(7) - TOTAL FARMLAND AREA REQUIRING MILK DISPOSAL DUE TO ACTION GUIDES
C AFFEC1(8) - TOTAL FARMLAND AREA REQUIRING CROP DISPOSAL DUE TO ACTION GUIDES
C
C GLOSSARY OF EXTERNALS:
C
C GETIMP - RETURNS THE IMPACTED AREA OR POPULATION OF 8 TYPES OF LONG-TERM
C          ACTIONS AT A GIVEN SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 5 NOV 85
C MODIFIED 18 AUG 87, SER #70, DIC, REVAMP FORMAT OF INTERMEDIATE FILES 30,33
C MODIFIED 30 SEPT 87, S.E.R. #71, LTR, IMPLEMENTATION OF WINDSHIFT MODEL
C MODIFIED 17 DEC 87, DIC, REWRITTEN TO USE THE SAME LOOP STRUCTURE AS THE OTHER
C   OUTPUT ROUTINES. THERE IS NO ASSUMPTION HERE NOW ABOUT THE CHARACTERISTICS
C   OF THE LONG-TERM ACTION MODELS IN SETTING UP THE LOOPS.
C   PREVIOUS TO THE IMPLEMENTATION OF THIS CHANGE, THIS ROUTINE HAD A DIFFERENT
C   METHOD OF LOOPING ON THE SPATIAL GRID.
C MODIFIED 8 MAR 88, D.C., SKIP CALCULATIONS OF RESULTS IF PLUME DIDN'T REACH
C MODIFIED 10 MAR 88, D.C., ALWAYS PRODUCE THIS RESULT AS A SET OF 6
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY
C Modified 4/2/95, DIC, Restore the coding that was corrupted in the last
C   modification when this routine was changed so that the consequence measures
C   reported for this result were always the distance to the last spatial
C   interval.  The needed coding was obtained from OXPT11 of MACCS 1.5.11.1.
C
      EXTERNAL GETIMP
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CXDF11
      COMMON /RSLT11/ NXUM11, CXDF11
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      DIMENSION AFFEC1(8), AFFEC2(8), DSTLTA(8,16)
C
      DO 900 IOUT = 1, NXUM11
C
C  INITIALIZE THE RESULTS ARRAY TO ZERO
C
      DO 100 IROT = 1, NUMCOR
      DO 100 IRES = 1, 8
  100 DSTLTA(IRES,IROT) = 0.
C
C  FIND THE MAXIMUM DISTANCE AT WHICH THE LONG TERM ACTION OCCURED
C
      IF (IPLUME .EQ. 1) THEN
C
C  FOR THE CASE OF A STRAIGHT LINE PLUME,
C  LOOP OVER SPATIAL ELEMENTS ON ONLY ONE SIDE OF THE PLUME BECAUSE OF SYMMETRY.
C
      DO 200 IROT = 1, NUMCOR
      DO 200 IRAD = 1, NUMRAD
      CALL GETIMP (AFFEC1,IRAD,1,IROT)
      DO 200 IRES = 1, 8
      IF (AFFEC1(IRES) .GT. 0.)
     1    DSTLTA(IRES,IROT) = MAX (DSTLTA(IRES,IROT), SPAEND(IRAD))
  200   CONTINUE
```

```
C
C  IF ELEMENT IS NOT UNDER THE PLUME, perform rotation around circle
C
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 300 IANG = 2, IROTAT
      DO 300 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
        IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
        IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
        CALL GETIMP (AFFEC1,IRAD,IANG,INPOP1)
        CALL GETIMP (AFFEC2,IRAD,IANG,INPOP2)
        DO 250 IRES = 1, 8
        IF (AFFEC1(IRES) .GT. 0. .OR. AFFEC2(IRES) .GT. 0.)
     1      DSTLTA(IRES,IROT) = MAX (DSTLTA(IRES,IROT), SPAEND(IRAD))
  250     CONTINUE
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
C
C  FOR FAN SHAPED PLUME WITH ROTATION, LOOP OVER ALL ROTATIONS,
C  ALL SPATIAL ELEMENTS. ONE RESULT IS CALCULATED FOR EACH ROTATION.
C
      DO 400 IANG = 1, NUMCOR
      DO 400 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP = IANG + IROT - 1
        IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
        CALL GETIMP (AFFEC1,IRAD,IANG,INPOP)
        DO 350 IRES = 1, 8
        IF (AFFEC1(IRES) .GT. 0.)
     1      DSTLTA(IRES,IROT) = MAX (DSTLTA(IRES,IROT), SPAEND(IRAD))
  350     CONTINUE
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
C
C  FOR FAN SHAPED PLUME WIHOUT ROTATION,
C  LOOP OVER ALL SPATIAL ELEMENTS. ONLY ONE RESULT IS CALCULATED.
C
      DO 600 IANG = 1, NUMCOR
      DO 600 IRAD = 1, NUMRAD
      IF (IHITIT(IRAD,IANG)) THEN
        CALL GETIMP (AFFEC1,IRAD,IANG,IANG)
        DO 500 IRES = 1, 8
        IF (AFFEC1(IRES) .GT. 0.)
     1      DSTLTA(IRES,1) = MAX (DSTLTA(IRES,1), SPAEND(IRAD))
  500     CONTINUE
      ENDIF
  600   CONTINUE
      ENDIF
      DO 900 IRES = 1, 8
C
C  INCREMENT THE COUNT ON RESULTS, THIS GOES BACK TO SUBROUTINE STOCHR
C
      IRESUL = IRESUL + 1
C
C  WRITE THE RESULT ARRAY TO THE "CHRONC" RESULT FILE, IUNIT,
C  AND CONVERT FROM METERS TO KILOMETERS
C
```

```
  900 WRITE(IUNIT) (DSTLTA(IRES,IROT) / 1000.,
     1              IROT = 1, NXMVAL(IRESUL))
      RETURN
      END
*DECK OXPT12
      SUBROUTINE OXPT12 (IRESUL, IUNIT)
C
C THIS ROUTINE CALCULATES RESULT NUMBER 12:
C
C IMPACT OF LONG TERM ACTIONS:
C  MEASURES OF THE FARMLAND AREA AND NUMBER OF PEOPLE AFFECTED BY
C  DECONTAMINATION, INTERDICTION, CONDEMNATION, MILK DISPOSAL, OR CROP DISPOSAL.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OXTPUT.
C
C GLOSSARY OF VARIABLES:
C
C AFFEC1 - TEMPORARY ARRAY STORING THE 8 TYPES OF IMPACT RESULTS, SEE BELOW
C AFFEC2 - TEMPORARY ARRAY SERVING SAME PURPOSE AS AFFEC1, SEE BELOW
C AFFECT - ARRAY STORING THE CONSEQUENCE MEASURES FOR ALL 8 RESULTS
C ANGMAX - GREATEST VALUE OF ANGCOV OVER ALL RADIAL SPATIAL INTERVALS
C IANG   - LOOP COUNTER ON COARSE ANGULAR DIRECTION
C INDEX  - POINTER TO LOCATION IN THE RESULT ARRAY AT WHICH RESULTS ARE STORED
C IHITIT(IRAD,IANG) - LOGICAL FLAG INDICATING GROUND CONTAMINATION IN THE
C                     COARSE GRID ELEMENT AT DISTANCE IRAD, ANGLE IANG
C IOUT   - LOOP COUNTER ON DESIRED RESULTS OF THIS TYPE
C INPOP1 - INDEX TO THE POPULATION ELEMENT TO THE RIGHT OF THE WIND DIRECTION
C INPOP2 - INDEX TO THE POPULATION ELEMENT TO THE LEFT OF THE WIND DIRECTION
C IPLUME - DISPERSION FLAG: 1-STRAIGHT LINE, 2-FAN (WITH ROT.), 3-FAN (NO ROT.)
C IRAD   - LOOP COUNTER ON RADIAL DISTANCE ELEMENTS
C IRES   - LOOP COUNTER ON THE 8 DIFFERENT RESUYLTS PRODUCED AS A SET
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IROT   - LOOP COUNTER ON WIND DIRECTION ROTATION
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C NUMCOR - NUMBER OF COARSE ANGULAR SPATIAL INTERVALS DEFINED IN THE MODEL
C NUMRAD - NUMBER OF RADIAL SPATIAL INTERVALS DEFINED IN THE MODEL
C NXMVAL - NUMBER OF CONSEQUENCE VALUES FOR THIS RESULT IN A SINGLE TRIAL
C NXUM12 - NUMBER OF RESULTS OF THIS TYPE THAT ARE REQUESTED
C PI     - RATIO OF A CIRCLE'S CIRCUMFERENCE TO ITS DIAMETER
C
C AFFEC1(1) - TOTAL DECONTAMINATED FARMLAND AREA (HECTARES)
C AFFEC1(2) - TOTAL POPULATION ON DECONTAMINATED LAND (INDIVIDUALS)
C AFFEC1(3) - TOTAL INTERDICTED FARMLAND AREA (HECTARES)
C AFFEC1(4) - TOTAL POPULATION FROM INTERDICTED LAND (INDIVIDUALS)
C AFFEC1(5) - TOTAL CONDEMNED FARMLAND AREA (HECTARES)
C AFFEC1(6) - TOTAL POPULATION FROM CONDEMNED LAND (INDIVIDUALS)
C AFFEC1(7) - TOTAL FARMLAND AREA REQUIRING MILK DISPOSAL DUE TO ACTION GUIDES
C AFFEC1(8) - TOTAL FARMLAND AREA REQUIRING CROP DISPOSAL DUE TO ACTION GUIDES
C
C GLOSSARY OF EXTERNALS:
C
C GETIMP - RETURNS THE IMPACTED AREA OR POPULATION OF 8 TYPES OF LONG-TERM
C          ACTIONS AT A GIVEN SPATIAL ELEMENT
C
C DAVID CHANIN, DIV. 6415, 28 MAR 85.
C MODIFIED BY LYNN RITCHIE, DIV. 6415, 5 NOV 85
C MODIFIED 30 JAN 86. S.E.R. #1, LTR, INCORRECT CALCULATION OF INPOP2
C MODIFIED 18 AUG 87, SER #70, DIC, CHANGE TO BINARY RESULT FILES
C MODIFIED 30 SEPT 87, S.E.R. #71, LTR, IMPLEMENTATION OF WINDSHIFT MODEL
C MODIFIED 8 MAR 88, D.C., SKIP CALCULATIONS OF RESULTS IF PLUME DIDN'T REACH
C MODIFIED 10 MAR 88, D.C., ALWAYS PRODUCE THIS RESULT AS A SET OF 6
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
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C
      EXTERNAL GETIMP
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL CXDF12
      COMMON /RSLT12/ NXUM12, I1DS12(10), I2DS12(10), CXDF12(10)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL IHITIT
      COMMON /IHITIT/ IHITIT(MAXRAD,16)
      COMMON /PHYCON/ PI, TWOPI, SQRHPI, SQR2PI
      COMMON /NXMVAL/ NXMVAL(MAXNRS)

      DIMENSION AFFEC1(8), AFFEC2(8), AFFECT(8,16)
C
      INUM = 8
C
      DO 900 IOUT = 1, NXUM12
      DO 100 IROT = 1, NUMCOR
      DO 100 IRES = 1, INUM
  100 AFFECT(IRES,IROT) = 0.
      IF (IPLUME .EQ. 1) THEN
        DO 200 IROT = 1, NUMCOR
        DO 200 IRAD = I1DS12(IOUT), I2DS12(IOUT)
      CALL GETIMP (AFFEC1,IRAD,1,IROT)
      DO 200 IRES = 1, INUM
  200   AFFECT(IRES,IROT) = AFFECT(IRES,IROT) + AFFEC1(IRES)
      IROTAT = (ANGMAX - PI / 16.) * 8. / PI + 2.
      DO 300 IANG = 2, IROTAT
        DO 300 IRAD = I1DS12(IOUT), I2DS12(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 250 IROT = 1, NUMCOR
        INPOP1 = IANG + IROT - 1
          IF (INPOP1 .GT. NUMCOR) INPOP1 = INPOP1 - NUMCOR
        INPOP2 = IROT + NUMCOR - IANG + 1
          IF (INPOP2 .GT. NUMCOR) INPOP2 = INPOP2 - NUMCOR
        CALL GETIMP (AFFEC1,IRAD,IANG,INPOP1)
          CALL GETIMP (AFFEC2,IRAD,IANG,INPOP2)
        DO 250 IRES = 1, INUM
  250     AFFECT(IRES,IROT) = AFFECT(IRES,IROT) +
     1                        AFFEC1(IRES) + AFFEC2(IRES)
      ENDIF
  300   CONTINUE
      ELSE IF (IPLUME .EQ. 2) THEN
        DO 400 IANG = 1, NUMCOR
        DO 400 IRAD = I1DS12(IOUT), I2DS12(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
        DO 350 IROT = 1, NUMCOR
        INPOP = IANG + IROT - 1
          IF (INPOP .GT. NUMCOR) INPOP = INPOP - NUMCOR
        CALL GETIMP (AFFEC1,IRAD,IANG,INPOP)
        DO 350 IRES = 1, INUM
  350     AFFECT(IRES,IROT) = AFFECT(IRES,IROT) + AFFEC1(IRES)
      ENDIF
  400   CONTINUE
      ELSE IF (IPLUME .EQ. 3) THEN
        DO 600 IANG = 1, NUMCOR
        DO 600 IRAD = I1DS12(IOUT), I2DS12(IOUT)
      IF (IHITIT(IRAD,IANG)) THEN
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        CALL GETIMP (AFFEC1,IRAD,IANG,IANG)
        DO 500 IRES = 1, INUM
  500     AFFECT(IRES,1) = AFFECT(IRES,1) + AFFEC1(IRES)
      ENDIF
  600   CONTINUE
      ENDIF
      DO 900 IRES = 1, INUM
      IRESUL = IRESUL + 1
      WRITE(IUNIT) (AFFECT(IRES,IROT),IROT=1,NXMVAL(IRESUL))
  900 CONTINUE
      RETURN
      END
*DECK GETIMP
      SUBROUTINE GETIMP (AFF, IRAD, IANG, INDPOP)
C
C THIS ROUTINE HELPS CALCULATE RESULT NUMBERS 11 AND 12:
C
C EXTENT OF A GIVEN LONG TERM ACTION:
C DECONTAMINATION, INTERDICTION, CONDEMNATION, MILK DISPOSAL, OR CROP DISPOSAL
C
C THE ROUTINE RETURNS THE AREA OR POPULATION AFFECTED BY A GIVEN
C LONG TERM ACTION IN A GIVEN SPATIAL ELEMENT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINES OXPT11 AND OXPT12.
C
C GLOSSARY OF VARIABLE NAMES OF INPUT DATA TO GETIMP:
C
C CSTIF(I,J) -  DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               FARMLAND AT INTERVAL J IN DIRECTION I ($ / HECTARE)
C CSTINF(I,J) - DEPRECIATION COST FROM THE TEMPORARY INTERDICTION OF
C               NON-FARM AREAS IN THE INTERVAL J IN DIRECTION I ($ / RESIDENT)
C DSPCRP(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR CROPS
C DSPMLK(I,J) - LOGICAL FLAG INDICATING CROP DISPOSAL WILL OCCUR FOR PASTURE
C FMAREA(I,J) - FARM AREA IN HECTARES OF THE GRID ELEMENT AT SPATIAL
C               DISTANCE I IN DIRECTION J
C IANG   - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE COST IS TO BE USED
C INDPOP - ANGULAR SPATIAL INDEX TO THE ELEMENT WHOSE POPULATION OR FARM
C          AREA IS TO BE USED
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C IRAD   - RADIAL SPATIAL INDEX TO BOTH SPATIAL ELEMENTS
C LRACTN(I,J) - LENGTH OF ROOT PATHWAY INTERDICTION FOR INTERVAL J, DIRECTION I;
C  IF LESS THAN 9, IT IS NUMBER OF YEARS FARMLAND IS REMOVED FROM PRODUCTION,
C  IF THE VALUE EQUALS 9, IT SIGNIFIES THAT FARMLAND IS PERMANENTLY REMOVED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 0: NO DECONTAMINATION IS REQUIRED FOR THE HABITABILITY
C             DOSE CRITERION TO BE SATISFIED AT THE END OF THE
C             INTERMEDIATE PHASE PERIOD. IMMEDIATE REHABITATION IS ALLOWED.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 40, 44, 45, 49: DECONTAMINATION ALONE IS EFFECTIVE ENOUGH TO ALLOW
C                          THE DOSE CRITERIA FOR REHABITATION TO BE SATISFIED
C                          AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 40: IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C              RETURN AFTER THE DECONTAMINATION PERIOD.
C
C LTACTN = 44: IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
```

```
C               DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C               RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 45:  IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C               DECONTAMINATION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW THE
C               RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 49:  IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C               TO RETURN AFTER THE DECONTAMINATION PERIOD.
C               PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 50, 54, 55, 59: DECONTAMINATION AND TEMPORARY INTERDICTION
C                          ARE EFFECTIVE ENOUGH TO ALLOW THE DOSE CRITERION
C                          TO BE SATISFIED AFTER THAT PERIOD HAS ELAPSED.
C
C LTACTN = 50:  IT'S COST-EFFECTIVE TO ALLOW BOTH POPULATION AND FARMING TO
C               RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C
C LTACTN = 54:  IT'S COST-EFFECTIVE TO ALLOW POPULATION TO RETURN AFTER THE
C               TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C               THE RETURN OF FARMING. PERMANENT INTERDICTION OF FARMING.
C
C LTACTN = 55:  IT'S COST-EFFECTIVE TO ALLOW FARMING TO RETURN AFTER THE
C               TEMPORARY INTERDICTION PERIOD BUT NOT COST-EFFECTIVE TO ALLOW
C               THE RETURN OF POPULATION. PERMANENT INTERDICTION OF POPULATION.
C
C LTACTN = 59:  IT'S NOT COST-EFFECTIVE TO ALLOW EITHER POPULATION OR FARMING
C               TO RETURN AFTER THE TEMPORARY INTERDICTION PERIOD.
C               PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C
C LTACTN = 9:  A COMBINATION OF DECONTAMINATION AND TEMPORARY INTERDICTION
C              IS NOT EFFECTIVE ENOUGH TO ALLOW REHABITATION WITHIN 30 YEARS
C              BECAUSE THE DOSE CRITERION CANNOT BE MET.
C              PERMANENT INTERDICTION OF POPULATION AND FARMING.
C
C-----------------------------------------------------------------------------
C POPDAT - population grid element (IRAD,IANG,IPOP) where IPOP is indexed
C          in EARLY to the variable ISTRTG and in CHRONC hard-wired to 4
C
C GLOSSARY OF VARIABLE NAMES OF OUTPUT DATA FROM GETIMP:
C
C AFF - CALCULATED EXTENT OF THE GIVEN LONG TERM ACTION IN THE SPATIAL
C       ELEMENT (HECTARES OR PEOPLE)
C
C AFF(1) - TOTAL DECONTAMINATED FARMLAND AREA (HECTARES)
C AFF(2) - TOTAL POPULATION ON DECONTAMINATED LAND (INDIVIDUALS)
C AFF(3) - TOTAL INTERDICTED FARMLAND AREA (HECTARES)
C AFF(4) - TOTAL POPULATION FROM INTERDICTED LAND (INDIVIDUALS)
C AFF(5) - TOTAL CONDEMNED FARMLAND AREA (HECTARES)
C AFF(6) - TOTAL POPULATION FROM CONDEMNED LAND (INDIVIDUALS)
C AFF(7) - TOTAL FARMLAND AREA REQUIRING MILK DISPOSAL DUE TO ACTION GUIDES
C AFF(8) - TOTAL FARMLAND AREA REQUIRING CROP DISPOSAL DUE TO ACTION GUIDES
C
C LYNN RITCHIE, DIV. 6415, 5 NOV 85.
C MODIFIED 10 MAR 88, D.C., ALWAYS PRODUCE THIS RESULT AS A SET OF 6
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C MODIFIED 1/4/93, J.ROLLSTIN, INCLUSION OF NEW FOOD PATHWAY MODEL
C
C  NO EXTERNAL FUNCTIONS
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C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      CHARACTER*3 FDPATH
      COMMON /FDPATH/ FDPATH
      COMMON /FRMDAT/ FMAREA(MAXRAD,16)
      LOGICAL         DSPMLK,        DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
      COMMON /CSTTIM/ CSTIF(16,MAXRAD),  CSTINF(16,MAXRAD),
     1                CSTDF(16,MAXRAD),  CSTDNF(16,MAXRAD),
     2                CSTLF(16,MAXRAD),  CSTLNF(16,MAXRAD),
     3                TRMDRL(16,MAXRAD), TRMIRL(16,MAXRAD),
     4                TRMEVA(16,MAXRAD), TRMREL(16,MAXRAD)
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
C
      DIMENSION AFF(8)
C
      AFF(1) = 0.
      AFF(2) = 0.
      AFF(3) = 0.
      AFF(4) = 0.
      AFF(5) = 0.
      AFF(6) = 0.
      AFF(7) = 0.
      AFF(8) = 0.
C
      LRCODE = LRACTN(IANG,IRAD)
      LTCODE = LTACTN(IANG,IRAD)
C
C  CALCULATE TOTAL POPULATION FROM DECONTAMINATED LAND
C
      IF (CSTDNF(IANG,IRAD) .GT. 0.) AFF(2) = POPDAT(IRAD,INDPOP,4)
C
C  CALCULATE TOTAL POPULATION FROM INTERDICTED LAND
C
      IF (CSTINF(IANG,IRAD) .GT. 0.) AFF(4) = POPDAT(IRAD,INDPOP,4)
C
C  CALCULATE TOTAL POPULATION FROM CONDEMNED RESIDENTIAL LAND
C  DUE TO PERMANENT INTERDICTION DUE TO HABITABILITY CRITERIA
C  OR IF RECLAMATION OF THE PROPERTY IS NOT COST-EFFECTIVE.
C
      IF (LTCODE .EQ.  9 .OR.
     1    LTCODE .EQ. 45 .OR. LTCODE .EQ. 49 .OR.
     2    LTCODE .EQ. 55 .OR. LTCODE .EQ. 59)
     3 AFF(6) = POPDAT(IRAD,INDPOP,4)
C
      IF (FDPATH .EQ. 'OLD') THEN
C
C  CALCULATE TOTAL DECONTAMINATED FARMLAND AREA IN HECTARES
      IF (CSTDF(IANG,IRAD) .GT. 0.) AFF(1) = FMAREA(IRAD,INDPOP)
C
C  CALCULATE TOTAL INTERDICTED FARMLAND AREA IN HECTARES
      IF (CSTIF(IANG,IRAD) .GT. 0.) AFF(3) = FMAREA(IRAD,INDPOP)
C
C  CALCULATE CONDEMNED FARMLAND AREA IF WE HAD TO BUY THE FARMS DUE TO
C  PERMANENT INTERDICTION OF ROOT UPTAKE OR IF THE LAND IS UNINHABITABLE,
```

```
C  OR IF RECLAMATION OF THE PROPERTY IS NOT COST-EFFECTIVE.
      IF (LRCODE .EQ.  9 .OR. LTCODE .EQ.  9 .OR.
     1      LTCODE .EQ. 44 .OR. LTCODE .EQ. 49 .OR.
     2      LTCODE .EQ. 54 .OR. LTCODE .EQ. 59)
     3   AFF(5) = FMAREA(IRAD,INDPOP)
C
C  CALCULATE TOTAL MILK DISPOSAL AREA IN HECTARES
      IF (DSPMLK(IANG,IRAD)) AFF(7) = FMAREA(IRAD,INDPOP)
C
C  CALCULATE TOTAL CROP DISPOSAL AREA IN HECTARES
      IF (DSPCRP(IANG,IRAD)) AFF(8) = FMAREA(IRAD,INDPOP)
C
       ELSE
C*********************************
C NEW FOOD MODEL IS ACTIVE
C*********************************
C  CALCULATE TOTAL DECONTAMINATED FARMLAND AREA IN HECTARES
      IF (CSTDF(IANG,IRAD) .GT. 0.) AFF(1) = FMAREA(IRAD,INDPOP)
C
C  CALCULATE TOTAL INTERDICTED FARMLAND AREA IN HECTARES
      IF (CSTIF(IANG,IRAD) .GT. 0.) AFF(3) = FMAREA(IRAD,INDPOP)
C
C check for permanent interdiction of any of the nine crop types, condemn
      IF (INIMLK(IANG,IRAD) .EQ. 0 .OR. INIOTH(IANG,IRAD) .EQ. 0
     1      .OR. LTCODE .EQ. 44 .OR. LTCODE .EQ. 49
     2      .OR. LTCODE .EQ. 54 .OR. LTCODE .EQ. 59)
     3     AFF(5) = FMAREA(IRAD,INDPOP)
C
C check for permanent or temporary interdiction of milk
       IF (INIMLK(IANG,IRAD) .NE. 1) AFF(7) = FMAREA(IRAD,INDPOP)
C
C check for permanent or temporary interdiction of the non-milk crop types
       IF (INIOTH(IANG,IRAD) .NE. 1) AFF(8) = FMAREA(IRAD,INDPOP)
      ENDIF
      RETURN
      END
*DECK OXPT13
      SUBROUTINE OXPT13 (IRESUL, IUNIT)
C
C MAXIMAL PROJECTED INDIVIDUAL INGESTION DOSE AT A SPECIFIED DISTANCE
C
C THIS ROUTINE IS CALLED BY SUBROUTINE STOCHR.
C
C GLOSSARY OF VARIABLES:
C
C CXDF13  - LOGICAL FLAG INDICATING THAT A CCDF TABLE IS BEING
C           REQUESTED FOR THIS TYPE 10 RESULT
C IANG13  - ANGLE OF REGION OF INTEREST FOR TYPE 13 RESULTS
C IEXP13  - EXPOSURE PERIOD FOR TYPE 13 RESULT
C INIMLK(I,J) - integer flag indicating the first year of milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C INIOTH(I,J) - integer flag indicating the first year of non-milk production in
C  the spatial element, zero indicates permanent interdiction, max value
C IRAD13 - RADIAL DISTANCE OF THE INDIVIDUAL FROM THE SITE
C IRESUL - COUNTER ON THE NUMBER OF RESULTS THAT HAVE BEEN CALCULATED SO FAR
C IUNIT  - UNIT NUMBER ON WHICH THE RESULTS ARE TO BE WRITTEN
C NXUM13  - NUMBER OF ECONOMIC RESULTS THAT ARE TO BE PRODUCED
C
C WRITTEN BY JUDY ROLLSTIN, 3 DEC 92
C
C  NO INTRINSIC FUNCTIONS
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      PARAMETER (MAX_ACCDAT=9, NCROP_TYP=9, NPROJ_ORG=2,
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```
     1  NACUM_TIM=9, NACUM_ORG=10, MAX_NUC=50)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /ICRTRO/ ICRTRO
      LOGICAL CXDF13
      COMMON /RSLT13/ NXUM13, IRAD13(40), IORG13(40), CXDF13(40)
      COMMON /REUSE2/ AGRNDC(16,MAXNUC,MAXRAD), PADIT2(6620)
      INTEGER ACCDATES
      COMMON /USERFILE/ NMFDNUCL, IFPOINT(MAX_NUC), NUMDATES, LASTACUM,
     1  ACCDATES(MAX_ACCDAT), CONCBASE,
     2  DOSEMILK(2), DOSEOTHR(2), DOSELONG(2)
      LOGICAL         DSPMLK,         DSPCRP
      COMMON /ACTCOD/ DSPMLK(16,MAXRAD), DSPCRP(16,MAXRAD),
     1                INIMLK(16,MAXRAD), INIOTH(16,MAXRAD),
     2                LRACTN(16,MAXRAD), LTACTN(16,MAXRAD),
     3                LVELDC(16,MAXRAD), TDECON(16,MAXRAD)
C
      COMMON /DS/ IFALLOUT, LASTSTOR,
     1 ACU_DOSE(NACUM_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC),
     2 PRJ_DOSE(NPROJ_ORG, NCROP_TYP, 0:NACUM_TIM, MAX_ACCDAT, MAX_NUC)
C
      DIMENSION RESULT(40)
C
C LOOP ON NUMBER OF RESULTS DESIRED
C
      DO 200 IOUT = 1, NXUM13
      IRESUL = IRESUL + 1
      RESULT(IOUT) = 0.
      IORG = IORG13(IOUT)
      IRAD = IRAD13(IOUT)
      DO 100 IANG = 1, NUMCOR
      DOSE = 0.
      DO 80 INUC = 1, NMFDNUCL
      INDNUC = IFPOINT(INUC)
      IF (INDNUC .EQ. 0) GO TO 80
      DOSE = DOSE + AGRNDC(IANG,INDNUC,IRAD) / CONCBASE *
     1 (PRJ_DOSE(IORG,1,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     2  PRJ_DOSE(IORG,2,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     3  PRJ_DOSE(IORG,3,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     4  PRJ_DOSE(IORG,4,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     5  PRJ_DOSE(IORG,5,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     6  PRJ_DOSE(IORG,6,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     7  PRJ_DOSE(IORG,7,INIMLK(IANG,IRAD),IFALLOUT,INUC) +
     8  PRJ_DOSE(IORG,8,INIOTH(IANG,IRAD),IFALLOUT,INUC) +
     2  PRJ_DOSE(IORG,9,INIOTH(IANG,IRAD),IFALLOUT,INUC))
   80 CONTINUE
  100 RESULT(IOUT) = MAX (RESULT(IOUT), DOSE)
  200 WRITE(IUNIT) RESULT(IOUT)
      RETURN
      END
*DECK OUTPUT
      SUBROUTINE OUTPUT
C
C THIS ROUTINE GENERATES THE SUMMARY INFORMATION FOR THE MACCS INTEGRATED CODE.
C
C IT CAN HANDLE MULTIPLE SOURCE TERMS AND MULTIPLE EMERGENCY RESPONSE
C STRATEGIES IN A SINGLE EXECUTION.
C
C IT ALSO AUTOMATICALLY MERGES THE RESULTS PRODUCED BY THE "CHRONC" MODULE
C TOGETHER WITH THE RESULTS PRODUCED BY THE "EARLY" MODULE.
C
```

```
C DEPENDING ON THE NUMBER OF EMERGENCY RESPONSE STRATEGIES BEING RUN,
C EITHER 1, 2, OR 3 "EARLY" RESULTS FILES WILL BE READ FROM UNITS 31, 32, 33.
C
C IF THE "CHRONC" MODULE IS RUN, ITS RESULTS WILL BE READ FROM UNIT 34.
C
C GLOSSARY OF VARIABLES:
C
C ISRCTM - LOOP COUNTER ON THE NUMBER OF SOURCE TERMS TO BE PROCESSED
C NSRCTM - TOTAL NUMBER OF SOURCE TERMS TO BE PROCESSED
C NUMPAG - PAGE COUNTER FOR OUTPUT LISTING
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPUT PROCESSING
C
C GLOSSARY OF EXTERNALS:
C
C PRINT  - PRODUCES THE OUTPUT OF SUMMARIES AND/OR CCDF TABLES
C READ1  - READS HEADER RECORDS FROM ALL THE FILES AND PREPARES FOR PROCESSING
C READ2  - GENERATES THE CCDFS FOR ALL COHORTS FOR A SINGLE SOURCE TERM
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      EXTERNAL PRINT, READ1, READ2
      EXTERNAL ABORT
      COMMON /NUMPAG/ NUMPAG
      COMMON /SRCTRM/ ISRCTM, NSRCTM
C
      NUMPAG = 0
C
C  READ THE HEADER RECORDS ON THE RESULTS FILES AND CHECK FOR THEIR CORRECTNESS
C
      CALL READ1
C
C  LOOP ON SOURCE TERMS, ALWAYS STARTING WITH THE SAME BIN MAGNITUDES
C
      DO 100 ISRCTM = 1, NSRCTM
C
C  ACCUMULATE THE CCDFS
C
      CALL READ2
C
C  PRINT THE RESULTS
C
  100 CALL PRINT
      RETURN
      END
*DECK READ1
      SUBROUTINE READ1
C
C THIS ROUTINE READS THE HEADER RECORDS ON THE BINARY RESULTS FILES
C BEING PROCESSED IN ORDER TO ENSURE THEIR VALIDITY AND TO OBTAIN
C THE INFORMATION NECESSARY TO GENERATE THE CCDF BINS.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTPUT.
C
C GLOSSARY OF VARIABLES:
C
C APPEND - LOGICAL FLAG INDICATING THIS RESULT WAS ONLY FOUND ON CHRONC LIST
C CHNAME - NAME OF THE GENERAL DESCRIPTION GIVEN FOR THE CHRONC INPUT FILE
C IBEGIN - FIRST COHORT TO BE PROCESSED (0 OR 1), 0 MEANS "OVERALL COMBINED"
C IRESID - RESIDENCE CODE (1-EARLY ONLY, 2-BOTH EARLY AND CHRONC, 3-CHRONC ONLY)
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C IUNIT  - ARRAY STORING THE UNIT NUMBERS OF THE NFILES RESULT FILES PROCESSED
C I1     - LOOP COUNTER ON THE EARLY RESULTS
C I2     - LOOP COUNTER ON THE CHRONC RESULTS
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```
C LASPOT - LAST RESULT SPOT ON THE NEW LIST ALLOCATED SO FAR
C MAXNRS - MAXIMUM NUMBER OF RESULTS THAT CAN BE PRODUCED (DEFINED IN HEDEAR)
C NCHRFL - NUMBER OF CHRONC RESULT FILES TO BE FOUND (0 OR 1)
C NFILES - TOTAL NUMBER OF RESULT FILES TO BE PROCESSED
C NSRCTM - TOTAL NUMBER OF SOURCE TERMS TO BE PROCESSED
C NSTRTG - NUMBER OF EMERGENCY RESPONSE STRATEGIES FROM EARLY
C NUMRES - NUMBER OF RESULTS FOUND ON THE NEW COMBINED RESULT LIST
C NXMRES - NUMBER OF RESULTS FOUND ON THE CHRONC LIST
C NUMVAL - CONSEQUENCE VALUES PER RESULT ON THE NEW COMBINED RESULT LIST
C NXMVAL - NUMBER OF CONSEQUENCE VALUES FOR EACH RESULT ON THE CHRONC LIST
C NUMTRI - NUMBER OF WEATHER TRIALS
C RESNAM - NAMES OF RESULTS ON THE NEW COMBINED RESULT LIST
C RXSNAM - NAMES OF THE RESULTS FOUND ON THE CHRONC LIST
C HEADER - 80 CHARACTER STRING IDENTIFYING MACCS VERSION, AND DATE, TIME OF RUN
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL ABORT
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /OUTCOM/ IBEGIN, NFILES, IRESID(MAXNRS)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /NUMRES/ NUMRES
      CHARACTER *77   RESNAM
      COMMON /RESNAM/ RESNAM(MAXNRS)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      LOGICAL         ENDAT1, ENDAT2
      COMMON /STOPME/ ENDAT1, ENDAT2
      COMMON /NXMRES/ NXMRES
      CHARACTER  *77  RXSNAM
      COMMON /RXSNAM/ RXSNAM(MAXNRS)
      COMMON /NXMVAL/ NXMVAL(MAXNRS)
      COMMON /NCHRFL/ NCHRFL
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
      COMMON /IUNIT/  IUNIT(4)
      LOGICAL APPEND
      CHARACTER *80 LINE80
      APPEND = .FALSE.
      IF (.NOT. ENDAT2) THEN
        NCHRFL = 1
      ELSE
        NCHRFL = 0
      ENDIF
      NFILES = NSTRTG + NCHRFL
      IF (NFILES .EQ. 1) THEN
C
C  NO NEED TO CALCULATE RESULTS FOR THE "OVERALL COMBINED RESULTS COHORT"
C
        IBEGIN = 1
      ELSE
C
C  IS A NEED TO CALCULATE RESULTS FOR THE "OVERALL COMBINED RESULTS COHORT"
C
        IBEGIN = 0
      ENDIF
      DO 140 ISTRTG = 1, NSTRTG
  140 IUNIT(ISTRTG) = 30 + ISTRTG
      IF (NCHRFL .EQ. 1) THEN
        IUNIT(NFILES) = 34
      ELSE IF (NCHRFL .NE. 0) THEN
        CALL ABORT ('ERROR FOUND WHEN CHECKING NCHRFL')
```

```
      ENDIF
      DO 200 IFILE = 1, NFILES
      REWIND (IUNIT(IFILE))
      READ (IUNIT(IFILE),END=220,ERR=220) LINE80
      IF (LINE80 .NE. HEADER) THEN
        WRITE(6,180) IUNIT(IFILE), HEADER, LINE80
        WRITE(7,180) IUNIT(IFILE), HEADER, LINE80
 180    FORMAT(' ERROR: MISMATCH OF RUN IDENT ON UNIT ', I2,
     $        /' EXPECTING: ', A/ ' FOUND: ', A)
        CALL ABORT ('ERROR, MISMATCH FOUND ON RUNID')
      ENDIF
  200 CONTINUE
      GO TO 260
  220 WRITE(6,240) IUNIT(IFILE)
      WRITE(7,240) IUNIT(IFILE)
  240 FORMAT(' ERROR READING FROM UNIT ', I2)
      CALL ABORT ('ERROR, I/O ERROR WHEN READING RUNID')
  260 CONTINUE
C
C  SET A FLAG INDICATING ALL THE EARLY RESULTS ARE UNIQUE TO EARLY
C  THE FLAG WILL BE RESET TO 2 IF THAT IS NOT THE CASE
C
      DO 280 I = 1, NUMRES
  280 IRESID(I) = 1
C
C  GO THROUGH THE LIST OF CHRONC RESULTS AND DECIDE
C  WHERE THEY WILL GO ON THE NEW LIST.
C
      LASPOT = NUMRES
      DO 500 I2 = 1, NXMRES
      DO 300 I1 = 1, NUMRES
  300 IF (RXSNAM(I2) .EQ. RESNAM(I1)) GO TO 320
C
C  WE NEED TO APPEND THIS CHRONC RESULT AT THE END OF THE NEW RESULT LIST
C
      APPEND = .TRUE.
      LASPOT = LASPOT + 1
      IF (LASPOT .GT. MAXNRS) THEN
        WRITE(6,*) 'ERROR: TOO MANY RESULTS, CAN ONLY HANDLE', MAXNRS
        WRITE(7,*) 'ERROR: TOO MANY RESULTS, CAN ONLY HANDLE', MAXNRS
        CALL ABORT ('TOO MANY RESULTS')
      ENDIF
      IRESID(LASPOT) = 3
      RESNAM(LASPOT) = RXSNAM(I2)
      NUMVAL(LASPOT) = NXMVAL(I2)
      GO TO 500
C
C  THIS RESULT APPEARS ON BOTH THE EARLY LIST AND THE CHRONC LIST
C
  320 IRESID(I1) = 2
C
C  CHECK TO SEE IF THIS NAME APPEARS MORE THAN ONCE ON TAPE31
C
      IWAS = 0
      DO 340 ITEMP = 1, NUMRES
  340 IF (RESNAM(I1) .EQ. RESNAM(ITEMP)) IWAS = IWAS + 1
      IF (IWAS .GT. 1) THEN
        WRITE(6,360) RESNAM(I1)
        WRITE(7,360) RESNAM(I1)
  360   FORMAT(//' ERROR: EARLY list has two occurrences of:'/ A)
      CALL ABORT ('Duplicated result is illegal--terminating')
      ENDIF
      IF (APPEND) THEN
```

```
        WRITE(6,380)
        WRITE(7,380)
  380   FORMAT(' ERROR: RESULTS THAT ARE TO BE MERGED MUST APPEAR '/
     $    ' ON CHRONC LIST BEFORE THE RESULTS UNIQUE TO THAT FILE.')
        WRITE(6,400) RXSNAM(I2)
        WRITE(7,400) RXSNAM(I2)
  400   FORMAT(/' ERROR FOUND AT RESULT,'/ A)
        CALL ABORT ('INTERNAL ERROR')
      ENDIF
  500 CONTINUE
      NUMRES = LASPOT
      RETURN
      END
*DECK READ2
      SUBROUTINE READ2
C
C THIS ROUTINE READS ALL THE RESULT FILES TO ACCUMULATE THE PROBABILITY
C DISTRIBUTION (CCDF) OF EACH RESULT FOR ALL COHORTS, SINGLE SOURCE TERM.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTPUT.
C
C THE PROBABILITY DISTRIBUTION IS ACCUMULATED BY SUBROUTINE DO1CDF
C WHICH CALLS THE BIN GENERATION ROUTINES (GNBIN1 AND GNBIN2) AS NEEDED.
C
C GLOSSARY OF VARIABLES:
C
C BINAVG - ACCUMULATED MEAN CONSEQUENCE FOR EACH WEATHER SAMPLING BIN
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINNED - LOGICAL ARRAY INDICATING THE BIN MAGNITUDES HAVE BEEN GENERATED
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C IBEGIN - FIRST COHORT TO BE PROCESSED (EITHER 0 OR 1)
C IBINUM - WEATHER SAMPLING BIN NUMBER FOR EACH WEATHER TRIAL
C ICOH   - LOOP COUNTER ON COHORTS
C IDAY   - START DAY IN THE YEAR FOR EACH WEATHER TRIAL
C IFIL1  - LOWER BOUND OF LOOP ON RESULT FILES
C IFIL2  - UPPER BOUND OF LOOP ON RESULT FILES
C IHOUR  - START HOUR IN THE DAY FOR EACH WEATHER TRIAL
C IRES   - LOOP COUNTER ON RESULTS
C IRESID - RESIDENCE CODE (1-EARLY ONLY, 2-BOTH EARLY AND CHRONC, 3-CHRONC ONLY)
C IUNIT  - ARRAY STORING THE UNIT NUMBERS OF THE NFILES RESULT FILES PROCESSED
C METBIN - LOOP COUNTER ON WEATHER SAMPLING BINS
C NFILES - TOTAL NUMBER OF RESULT FILES TO BE PROCESSED
C NSTRTG - NUMBER OF EMERGENCY RESPONSE STRATEGIES FROM EARLY
C NUMRES - NUMBER OF RESULTS FOUND ON THE NEW COMBINED RESULT LIST
C NUMVAL - CONSEQUENCE VALUES PER RESULT ON THE NEW COMBINED RESULT LIST
C NUMTRI - NUMBER OF WEATHER TRIALS
C PRBMET - PROBABILITY OF THE WEATHER SEQUENCE FOR EACH WEATHER TRIAL
C WTFRAC - WEIGHTING FRACTION APPPLIED TO THIS STRATEGY
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 11/08/88, D. CHANIN, LOG # 11/02/88-B,
C   INCORRECT HANDLING OF THE OVERALL COMBINED RESULTS WHEN
C   "FRACTION OF THE TIME" WEIGHTING IS USED
C MODIFIED 6/20/89/, D. CHANIN, LOG # 1/12/89-B,
C   INCORRECT COMBINATION OF RESULTS WHEN CHRONC IS OMITTED
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL ABORT, DO1CDF
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
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     $                 NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                 SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      COMMON /OUTCOM/ IBEGIN, NFILES, IRESID(MAXNRS)
      COMMON /NUMRES/ NUMRES
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      LOGICAL BINNED
      COMMON /BINNED/ BINNED (MAXNRS,0:4)
      COMMON /MAXOCU/ MAXTRI(MAXNRS,0:4), CONMAX(MAXNRS,0:4),
     $                MAXDIR(MAXNRS,0:4)
      COMMON /SAVMET/ PRBMET(8760), IBINUM(8760), IDAY(8760),
     $                IHOUR(8760)
      CHARACTER *6    WTNAME
      COMMON /WTNAME/ WTNAME
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /WTFRAC/ WTFRAC(3)
      COMMON /IUNIT/  IUNIT(4)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
      COMMON /COHAVG/ COHAVG(MAXNRS,0:4)
      COMMON /PNZERO/ PNZERO(MAXNRS,0:4)
      COMMON // BINAVG(41,MAXNRS,0:4)
      DIMENSION CONVAL(16,4)
C
C  INITIALIZE THE ARRAYS TO ZERO
C
      DO 40 ICOH = IBEGIN, NFILES
      DO 40 IRES = 1, NUMRES
      COHAVG(IRES,ICOH) = 0.
      CONMAX(IRES,ICOH) = 0.
      PNZERO(IRES,ICOH) = 0.
      MAXDIR(IRES,ICOH) = 0
      MAXTRI(IRES,ICOH) = 0
      BINNED(IRES,ICOH) = .FALSE.
      DO 20 METBIN = 1, 41
   20 BINAVG(METBIN,IRES,ICOH) = 0.
      DO 40 MYBINS = 1, 46
      BINMAG(MYBINS,IRES,ICOH) = 0.
   40 BINPRB(MYBINS,IRES,ICOH) = 0.
      DO 500 ITRIAL = 1, NUMTRI
      DO 100 IFILE = 1, NFILES
  100 READ(IUNIT(IFILE)) IDUM, PRBMET(ITRIAL), IBINUM(ITRIAL),
     $                   IDAY(ITRIAL), IHOUR(ITRIAL)
      IF (IDUM .NE. ITRIAL) THEN
        WRITE(6,120) IUNIT
        WRITE(7,120) IUNIT
  120   FORMAT(' MISMATCHED TRIAL NUMBER ON UNIT ', I3)
        CALL ABORT ('READ2')
      ENDIF
      DO 500 IRES = 1, NUMRES
C
C  READ THE CONSEQUENCE VALUES FOR A SINGLE RESULT
C  FROM ALL THE RESULT FILES ON WHICH IT WAS WRITTEN
C
      IF (IRESID(IRES) .EQ. 1) THEN
        IFIL1 = 1
        IFIL2 = NSTRTG
      ELSE IF (IRESID(IRES) .EQ. 2) THEN
        IFIL1 = 1
        IFIL2 = NFILES
      ELSE IF (IRESID(IRES) .EQ. 3) THEN
        IFIL1 = NFILES
        IFIL2 = NFILES
      ELSE
```

```
        CALL ABORT ('ILLEGAL VALUE OF IRESID')
      ENDIF
      DO 260 ICOH = IFIL1, IFIL2
      READ(IUNIT(ICOH)) (CONVAL(IROT,ICOH),IROT=1,NUMVAL(IRES))
C
C  ACCUMULATE THE CCDF FOR EACH COHORT SEPARATELY
C
      DO 260 IROT = 1, NUMVAL(IRES)
      EXPCON = CONVAL(IROT,ICOH)
  260 CALL DO1CDF (ICOH, IRES, ITRIAL, IROT, EXPCON, 1.)
C
C DO NOT UPDATE THE OVERALL SUMMARY CCDF FOR RESULTS THAT APPEAR ONLY ON THE
C "CHRONC" RESULTS FILE
C
      IF (IRESID(IRES) .EQ. 3) GO TO 500
      IF (NFILES .GT. 1 .AND. WTNAME .EQ. 'PEOPLE') THEN
C
C ACCUMULATE THE SUMMARY COMBINED CCDF FOR "FRACTION OF THE PEOPLE"
C
        DO 360 IROT = 1, NUMVAL(IRES)
        EXPCON = 0.
C
C  SUM IN THE WEIGHTED PEOPLE FRACTIONS FROM THE VARIOUS EMERGENCY RESPONSES
C
        DO 320 ICOH = 1, NSTRTG
  320   EXPCON = EXPCON + CONVAL(IROT,ICOH) * WTFRAC(ICOH)
C
C  SUM IN THE UNWEIGHTED RESULTS FROM CHRONC IF IT IS BEING EXERCISED
C
        IF (IRESID(IRES) .EQ. 2 .AND. NFILES .GT. NSTRTG)
     1    EXPCON = EXPCON + CONVAL(IROT,NFILES)
  360   CALL DO1CDF (0, IRES, ITRIAL, IROT, EXPCON, 1.)
      ELSE IF (NFILES .GT. 1 .AND. WTNAME .EQ. 'TIME') THEN
C
C ACCUMULATE THE SUMMARY COMBINED CCDF FOR "FRACTION OF THE TIME"
C
        DO 460 ICOH = 1, NSTRTG
        DO 460 IROT = 1, NUMVAL(IRES)
        EXPCON = CONVAL(IROT,ICOH)
C
C  SUM IN THE UNWEIGHTED RESULTS FROM CHRONC IF IT IS BEING EXERCISED
C
        IF (IRESID(IRES) .EQ. 2 .AND. NFILES .GT. NSTRTG)
     1    EXPCON = EXPCON + CONVAL(IROT,NFILES)
  460   CALL DO1CDF (0, IRES, ITRIAL, IROT, EXPCON, WTFRAC(ICOH))
      ELSE IF (NFILES .GT. 1 .AND. WTNAME .EQ. 'SUMPOP') THEN
C
C Accumulate the summary combined ccdf for simple summation of population
C
      DO 560 IROT = 1, NUMVAL(IRES)
      EXPCON = 0.
C
C  Sum in the unweighted results from the various emergency responses
C
      DO 520 ICOH = 1, NSTRTG
  520   EXPCON = EXPCON + CONVAL(IROT,ICOH)
C
C  Sum in the unweighted results from CHRONC if it is being exercised
C
      IF (IRESID(IRES) .EQ. 2 .AND. NFILES .GT. NSTRTG)
     1    EXPCON = EXPCON + CONVAL(IROT,NFILES)
  560   CALL DO1CDF (0, IRES, ITRIAL, IROT, EXPCON, 1.)
      ENDIF
```

```
  500 CONTINUE
      RETURN
      END
*DECK DO1CDF
      SUBROUTINE DO1CDF (ICOH, IRES, ITRIAL, IROT, EXPCON, PSCALE)
C
C THIS ROUTINE UPDATES THE CCDF FOR A SINGLE CONSEQUENCE VALUE
C AND ALSO KEEPS TRACK OF MEANS, P NOT-ZERO, AND PEAK TRIAL.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE READ2.
C
C GLOSSARY OF VARIABLES:
C
C BINAVG - ACCUMULATED MEAN CONSEQUENCE BROKEN DOWN BY WEATHER SAMPLING BIN
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINNED - LOGICAL ARRAY INDICATING THE BIN MAGNITUDES HAVE BEEN GENERATED
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C COHAVG - ACCUMULATED MEAN CONSEQUENCE VALUE FOR THIS (RESULT,COHORT)
C CONMAX - THE MAXIMUM CONSEQUENCE VALUE OBSERVED FOR THIS (RESULT,COHORT)
C EXPCON - EXPECTED VALUE OF THIS CONSEQUENCE
C MAXDIR - THE WIND DIRECTION PRODUCING THE LAST MAXIMUM CONSEQUENCE
C MAXTRI - THE LAST WEATHER TRIAL WHICH PRODUCED THE MAXIMUM CONSEQUENCE
C NUMVAL - CONSEQUENCE VALUES PER RESULT ON THE NEW COMBINED RESULT LIST
C PNZERO - PROBABILITY OF EXCEEDING ZERO FOR THIS (RESULT,COHORT)
C PROBAB - PROBABILITY TO BE ASSOCIATED WITH THE CONSEQUENCE VALUE, EXPCON
C PRBMET - PROBABILITY OF THE WEATHER SEQUENCE FOR EACH WEATHER TRIAL
C PSCALE - SCALE FACTOR TO BE APPLIED TO THE PROBABILITY OF THIS CONSEQUENCE
C ROSEBI - WIND ROSE ARRAY FOR EACH WEATHER CATEGORY SAMPLING BIN
C
C GLOSSARY OF EXTERNALS:
C
C GNBIN1 - GENERATES THE INITIAL BIN MAGNITUDES WHEN THE FIRST NON-ZERO
C          CONSEQUENCE VALUE IS ENCOUNTERED
C
C GNBIN2 - REGENRATES THE BIN DEFINITION WHEN A CONSEQUENCE VALUE IS
C          ENCOUNTERED WHICH EXCEEDS THE PREVIOUS MAXIMUM VALUE
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/01/96, D. Chanin, test for ratio before performing division
C  to avoid overflow when new peak is many orders of magnitude larger than old
C
      EXTERNAL GNBIN1, GNBIN2
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      COMMON /ROSEBI/ ROSEBI(16,41)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
      COMMON /COHAVG/ COHAVG(MAXNRS,0:4)
      COMMON /PNZERO/ PNZERO(MAXNRS,0:4)
      COMMON // BINAVG(41,MAXNRS,0:4)
      COMMON /SAVMET/ PRBMET(8760), IBINUM(8760), IDAY(8760),
     $                IHOUR(8760)
      LOGICAL BINNED
      COMMON /BINNED/ BINNED (MAXNRS,0:4)
      COMMON /MAXOCU/ MAXTRI(MAXNRS,0:4), CONMAX(MAXNRS,0:4),
     $                MAXDIR(MAXNRS,0:4)
      IF (EXPCON .LE. 0.) RETURN
C
C  CALCULATE THE PROBABILITY TO BE ASSOCIATED WITH THE EXPECTED VALUE, EXPCON
C
      IF (NUMVAL(IRES) .EQ. 1) THEN
        PROBAB = PSCALE * PRBMET(ITRIAL)
```

```
      ELSE IF (IBINUM(ITRIAL) .GT. 0) THEN
        PROBAB = PSCALE * PRBMET(ITRIAL) * ROSEBI(IROT,IBINUM(ITRIAL))
      ELSE
        PROBAB = PSCALE * PRBMET(ITRIAL) * ROSEBI(IROT,1)
      ENDIF
C
C  SKIP UPDATE OF CCDF IF PROBABILITY IS ZERO
C
      IF (PROBAB .LE. 0) RETURN
C
C  CHECK TO SEE IF THE BIN GENERATION ROUTINES NEED TO BE CALLED
C
      IF (.NOT. BINNED(IRES,ICOH)) THEN
        BINNED(IRES,ICOH) = .TRUE.
        CONMAX(IRES,ICOH) = EXPCON
        MAXTRI(IRES,ICOH) = ITRIAL
        MAXDIR(IRES,ICOH) = IROT
        CALL GNBIN1 (EXPCON, IRES, ICOH)
      ELSE IF (EXPCON .GT. 0. .AND. CONMAX(IRES,ICOH) .GT. 0.) THEN
C
C  DETERMINE IF WE HAVE A NEW MAXIMUM VALUE EXCEEDING THE OLD ONE BY
C  MORE THAN ONE PART PER MILLION. THIS TEST IS FOR ENSURING THAT
C  RESULTS ARE IDENTICAL ON MACHINES OF DIFFERING NUMERICAL PRECISION.
C
C MODIFIED 7/01/96 TO TEST FOR A LARGE RATIO BEFORE DIVISION TO AVOID OVERFLOW
C
        IF (LOG10(EXPCON) - LOG10(CONMAX(IRES,ICOH)) .GT. 1.0) THEN
          CONMAX(IRES,ICOH) = EXPCON
          MAXTRI(IRES,ICOH) = ITRIAL
          MAXDIR(IRES,ICOH) = IROT
          IF (EXPCON .GT. BINMAG(46,IRES,ICOH))
     $      CALL GNBIN2 (EXPCON, IRES, ICOH)
        ELSE IF (EXPCON / CONMAX(IRES,ICOH) .GT. 1.000001) THEN
          CONMAX(IRES,ICOH) = EXPCON
          MAXTRI(IRES,ICOH) = ITRIAL
          MAXDIR(IRES,ICOH) = IROT
          IF (EXPCON .GT. BINMAG(46,IRES,ICOH))
     $      CALL GNBIN2 (EXPCON, IRES, ICOH)
        ENDIF
      ENDIF
C
C  UPDATE THE ACCUMULATOR FOR MEAN CONSEQUENCE FOR ALL COHORTS
C
      COHAVG(IRES,ICOH) = COHAVG(IRES,ICOH) + EXPCON * PROBAB
C
C  UPDATE THE ACCUMULATOR FOR MEAN CONSEQUENCE BY WEATHER BIN FOR ALL COHORTS
C
      IF (IBINUM(ITRIAL) .GT. 0)
     1 BINAVG(IBINUM(ITRIAL),IRES,ICOH) =
     2   BINAVG(IBINUM(ITRIAL),IRES,ICOH) + EXPCON * PROBAB
C
C  ACCUMULATE THE PROBABILITY OF EXCEEDING ZERO (P NOT ZERO)
C
      IF (EXPCON .GT. 0.) PNZERO(IRES,ICOH) = PNZERO(IRES,ICOH) + PROBAB
C
C  ADD TO THE PROBABILITY OF ALL BINS WHOSE MAGNITUDE IS EQUALLED OR EXCEEDED
C
      DO 80 IBIN = 1, 46
   80 IF (EXPCON .GE. BINMAG(IBIN,IRES,ICOH))
     $  BINPRB(IBIN,IRES,ICOH) = BINPRB(IBIN,IRES,ICOH) + PROBAB
      RETURN
      END
*DECK GNBIN1
```

```
      SUBROUTINE GNBIN1 (EXPCON, IRES, ICOH)
C
C THIS ROUTINE GENERATES THE INITIAL BIN MAGNITUDES FOR A SINGLE RESULT
C
C THE BINNING ALWAYS STARTS AT A POWER OF 10
C AND THE BIN COEFFICIENTS ARE:  1, 2, 3, 5, 7
C
C THIS ROUTINE IS CALLED BY SUBROUTINE DO1CDF.
C
C GLOSSARY OF VARIABLES:
C
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C EXPCON - INITIAL NON-ZERO CONSEQUENCE VALUE OBSERVED FOR THIS (RESULT,COHORT)
C IBIN   - LOOP COUNTER ON CCDF BINS
C IBINVL - ARRAY OF COEFFICIENTS USED TO GENERATE THE BIN MAGNITUDES
C ICOH   - INDEX TO THE DESIRED COHORT
C IRES   - INDEX TO THE DESIRED RESULT
C ISCALE - POWER OF 10 TO BE USED FOR THE BIN MAGNITUDE
C
C GLOSSARY OF EXTERNALS:
C
C ILOG10 - INTEGER FUNCTION WHICH RETURNS THE NEAREST
C          POWER OF 10 LESS THAN THE ARGUMENT
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      EXTERNAL ILOG10
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      DIMENSION IBINVL(5)
      DATA IBINVL / 1, 2, 3, 5, 7/
C
C PICK AN INITIAL BIN MAGNITUDE 6 ORDERS LOWER THAN INITIAL CONSEQUENCE VALUE
C BUT NO LOWER THAN 1.E-20 IN ORDER TO AVOID NUMERICAL PROBLEMS
C
      ISCALE = MAX (ILOG10 (EXPCON) - 6, -20)
      DO 100 IBIN = 1, 46
C
C  THE FOLLOWING STATEMENT IS A TRICKY WAY OF PADDING THE UPPER END
C  OF THE CCDF TABLE WITH THE THE PEAK CONSEQUENCE MAGNITUDE
C
      BINMAG(IBIN,IRES,ICOH) =
     $  MIN (EXPCON, IBINVL (1 + MOD (IBIN-1, 5) ) * 10. ** ISCALE)
  100 IF (MOD (IBIN, 5) .EQ. 0) ISCALE = ISCALE + 1
      RETURN
      END
*DECK ILOG10
      FUNCTION ILOG10 (EXPCON)
C
C THIS FUNCTION RETURNS THE NEAREST POWER OF 10 LESS THAN THE ARGUMENT
C
      INTRINSIC LOG10
      ILOG10 = INT (LOG10 (EXPCON))
      IF (EXPCON .LT. 1.) ILOG10 = ILOG10 - 1
      RETURN
      END
*DECK GNBIN2
      SUBROUTINE GNBIN2 (EXPCON, IRES, ICOH)
C
C THIS ROUTINE REGENERATES BIN MAGNITUDES FOR A SINGLE RESULT
C WHEN A NEW MAXIMUM CONSEQUENCE VALUE IS FOUND.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE DO1CDF.
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C
C THE BINNING ALWAYS STARTS AT A POWER OF 10
C AND THE BIN COEFFICIENTS ARE:  1, 2, 3, 5, 7
C
C GLOSSARY OF VARIABLES:
C
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C EXPCON - THE NEW MAXIMUM CONSEQUENCE VALUE FOR THIS (RESULT,COHORT)
C IBINVL - ARRAY OF COEFFICIENTS USED TO GENERATE THE BIN MAGNITUDES
C ICOH   - INDEX TO THE DESIRED COHORT
C IRES   - INDEX TO THE DESIRED RESULT
C INCPOW - NUMBER OF POWERS OF 10 TO BE THROWN AWAY IN THE RESCALING OPERATION
C ISCALE - POWER OF 10 TO BE USED FOR THE BIN MAGNITUDE
C IZERO  - LOOP COUNTER USED TO FIND THE BEGINNING OF PADDING AT THE TOP OF CCDF
C NTHROW - NUMBER OF BINS TO BE THROWN AWAY IN THE RESCALING OPERATION
C LIMBIN - POINTER TO THE PROBABILITIES AT TOP OF CCDF NOT NEEDING TO BE SAVED
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      INTRINSIC NINT, LOG10
C  NO EXTERNAL FUNCTIONS
      SAVE
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
      DIMENSION IBINVL(5)
      DATA IBINVL / 1, 2, 3, 5, 7/
C
C  FIND THE POINT IN THE CCDF WHERE IT HAS BEEN PADDED WITH THE PEAK
C
      DO 80 IZERO = 2, 46
      IF (BINMAG(IZERO-1,IRES,ICOH) .EQ. BINMAG(IZERO,IRES,ICOH)) THEN
C
C  SET ALL THE PREVIOUS PEAK CONSEQUENCE PROBABILITIES TO ZERO
C
        DO 40 IBIN = IZERO - 1, 46
   40   BINPRB (IBIN,IRES,ICOH) = 0.
        GO TO 120
      ENDIF
   80 CONTINUE
  120 CONTINUE
      ISCALE = NINT (LOG10 (BINMAG(1,IRES,ICOH)))
      INCPOW = LOG10 (EXPCON / BINMAG (1,IRES,ICOH)) + 1
C
C  NOTE TO ANYONE MODIFYING THE FOLLOWING SECTION:
C
C   THIS ROUTINE CANNOT BE MODIFIED WITHOUT CHECKING DO1CDF AND GNBIN1,
C    9 IS THE NUMBER OF DECADES COVERED BY THE 46 BINS,
C    5 IS THE NUMBER OF COEFFICIENT VALUES PER DECADE (1,2,3,5,7).
C
      IF (INCPOW .GT. 9) THEN
        INCPOW = INCPOW - 9
        NTHROW = 5 * INCPOW
        ISCALE = ISCALE + INCPOW
        LIMBIN = 46 - NTHROW
        DO 160 IBIN = 1, 46
        IF (IBIN .LT. LIMBIN) THEN
C
C MOVE DOWN THE CCDF TABLE PROBABILITIES BY INCPOW POWERS OF 10
C
          BINPRB (IBIN,IRES,ICOH) = BINPRB (IBIN + NTHROW,IRES,ICOH)
        ELSE
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          BINPRB (IBIN,IRES,ICOH) = 0.
        ENDIF
  160   CONTINUE
      ENDIF
C
C  THE FOLLOWING STATEMENT IS A TRICKY WAY OF PADDING THE UPPER END
C  OF THE CCDF TABLE WITH THE THE PEAK CONSEQUENCE MAGNITUDE
C
      DO 200 IBIN = 1, 46
      BINMAG(IBIN,IRES,ICOH) =
     $  MIN (EXPCON, IBINVL (1 + MOD (IBIN-1, 5) ) * 10. ** ISCALE)
  200 IF (MOD (IBIN, 5) .EQ. 0) ISCALE = ISCALE + 1
      RETURN
      END
*DECK PRINT
      SUBROUTINE PRINT
C
C THIS ROUTINE PRINTS THE RESULTS FOR ALL COHORTS AND THEIR COMBINATION
C FOR A SINGLE SOURCE TERM.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE OUTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ATNAM1 - NAME OF THE GENERAL DESCRIPTION GIVEN FOR THE ATMOS INPUT FILE
C ATNAM2 - NAME OF THE SOURCE TERM GIVEN FOR THE ATMOS INPUT FILE
C BINAVG - ACCUMULATED MEAN CONSEQUENCE FOR EACH WEATHER SAMPLING BIN
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C CCDF   - LOGICAL FLAGS INDICATING IF CCDF TABLE RESULTS ARE REQUESTED
C CHNAME - NAME OF THE GENERAL DESCRIPTION GIVEN FOR THE CHRONC INPUT FILE
C COHAVG - ACCUMULATED MEAN CONSEQUENCE VALUE FOR THIS (RESULT,COHORT)
C CONMAX - THE MAXIMUM CONSEQUENCE VALUE OBSERVED FOR THIS (RESULT,COHORT)
C EANAM1 - NAME OF THE GENERAL DESCRIPTION GIVEN FOR THE EARLY INPUT FILE
C EANAM2 - NAME OF THE EMERGENCY RESPONSE STRATEGY GIVEN FOR THE EARLY INPUT
C IBEGIN - FIRST COHORT TO BE PROCESSED (0 OR 1), 0 MEANS "OVERALL COMBINED"
C ICOH   - LOOP COUNTER ON COHORTS
C INDCOH - INDEX TO EACH COHORT FOR CCDF TABLE PAGES
C IRES   - LOOP COUNTER ON RESULTS
C IRESID - RESIDENCE CODE (1-EARLY ONLY, 2-BOTH EARLY AND CHRONC, 3-CHRONC ONLY)
C ISRCTM - LOOP COUNTER ON THE NUMBER OF SOURCE TERMS TO BE PROCESSED
C ISTART - LOGICAL FLAG INDICATING THIS IS THE FIRST RESULT IN THE COHORT
C ISTRT  - STARTING COLUMN POSITION FOR PRINTING CCDF TABLES
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C MAXDIR - THE WIND DIRECTION PRODUCING THE LAST MAXIMUM CONSEQUENCE
C MAXTRI - THE LAST WEATHER TRIAL WHICH PRODUCED THE MAXIMUM CONSEQUENCE
C METBIN - LOOP COUNTER ON WEATHER SAMPLING BINS
C NAMCOH - NAME OF EACH COHORT PRINTED ON CCDF TABLE PAGES
C NCHRFL - NUMBER OF CHRONC RESULT FILES TO BE FOUND (0 OR 1)
C NFILES - TOTAL NUMBER OF RESULT FILES TO BE PROCESSED
C NSRCTM - TOTAL NUMBER OF SOURCE TERMS TO BE PROCESSED
C NSTRTG - NUMBER OF EMERGENCY RESPONSE STRATEGIES FROM EARLY
C NUMLIN - LINE COUNTER ON THE OUTPUT LISTING
C NUMPAG - PAGE COUNTER ON THE OUTPUT LISTING
C NUMRES - NUMBER OF RESULTS FOUND ON THE NEW COMBINED RESULT LIST
C NUMTRI - NUMBER OF WEATHER TRIALS
C OLDCAT - "CATEGORY NAME" OF THE PREVIOUS RESULT (FIRST 40 CHARACTERS OF NAME)
C PNZERO - PROBABILITY OF EXCEEDING ZERO FOR THIS (RESULT,COHORT)
C RESNAM - NAMES OF RESULTS ON THE NEW COMBINED RESULT LIST
C RISCAT - LOGICAL FLAG SAYING THAT RISK BREAKDOWN BY WEATHER BIN IS REQUESTED
C SKIPME - LOGICAL FLAG SAYING THAT CCDF FOR THIS COHORT IS NOT DEFINED
C TEXBUF - CHARACTER ARRAY USED TO STORE THE QUANTILE INFORMATION
C HEADER - 80 CHARACTER STRING IDENTIFYING MACCS VERSION, AND DATE, TIME OF RUN
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C TITLES - TWO LINE TITLE OF IDENTIFICATION INFO PRINTED ON EACH PAGE
C VAL50  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED 50 % OF TIME
C VAL90  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED 10 % OF TIME
C VAL95  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED  5 % OF TIME
C VAL99  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED  1 % OF TIME
C VAL995 - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED .5 % OF TIME
C WTFRAC - WEIGHTING FRACTION APPPLIED TO THIS STRATEGY
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C GLOSSARY OF EXTERNALS:
C
C NOTFOU - CHARACTER FUNCTION WHICH RETURNS EITHER A NUMBER OR 'NOT-FOUND'
C QUANTL - PERFORMS EXPONENTIAL INTERPOLATION ON CCDF TABLES TO FIND QUANTILES
C SOLID  - WRITES A SOLID PAGE OF CHARACTERS TO DELIMIT RESULTS FOR THE COHORTS
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 7/11/89/, D. CHANIN, LOG # 7/11/89-A,
C  AVOID USING THE VARIABLE ISTART AS BOTH AN INTEGER AND A LOGICAL
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 11/30/94, D. Chanin, Report 99.5th quantile instead of the 99.9th
C
      INTRINSIC NINT
      EXTERNAL NOTFOU, QUANTL, SOLID
      SAVE
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /OUTCOM/ IBEGIN, NFILES, IRESID(MAXNRS)
      COMMON /NUMPAG/ NUMPAG
      LOGICAL         ENDAT1, ENDAT2
      COMMON /STOPME/ ENDAT1, ENDAT2
      CHARACTER *80   ATNAM1
      COMMON /ATNAM1/ ATNAM1
      CHARACTER *80   EANAM1
      COMMON /EANAM1/ EANAM1
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      CHARACTER *80   ATNAM2
      COMMON /ATNAM2/ ATNAM2(60)
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      CHARACTER *80   EANAM2
      COMMON /EANAM2/ EANAM2(3)
      COMMON /WTFRAC/ WTFRAC(3)
      CHARACTER *6    WTNAME
      COMMON /WTNAME/ WTNAME
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
      CHARACTER *80   CHNAME
      COMMON /CHNAME/ CHNAME
      COMMON /NUMRES/ NUMRES
      LOGICAL CCDF
      COMMON /CCDF/ CCDF(MAXNRS)
      CHARACTER *77   RESNAM
      COMMON /RESNAM/ RESNAM(MAXNRS)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
      COMMON /COHAVG/ COHAVG(MAXNRS,0:4)
      COMMON /PNZERO/ PNZERO(MAXNRS,0:4)
      COMMON // BINAVG(41,MAXNRS,0:4)
      COMMON /SAVMET/ PRBMET(8760), IBINUM(8760), IDAY(8760),
     $                IHOUR(8760)
      COMMON /MAXOCU/ MAXTRI(MAXNRS,0:4), CONMAX(MAXNRS,0:4),
     $                MAXDIR(MAXNRS,0:4)
      LOGICAL RISCAT
```

```
      COMMON /RISCAT/ RISCAT
C
C  DECLARATION OF TEMPORARY VARIABLES USED FOR PRINTING CCDF TABLES
C
      LOGICAL SKIPME (5)
      DIMENSION INDCOH(5)
      CHARACTER *22 NAMCOH(5)
      CHARACTER *40 OLDCAT
      CHARACTER *131 TITLES(2)
      CHARACTER *10 NOTFOU, TEXBUF(5)
      CHARACTER *110 LIN100
      LOGICAL ISTART
C
C  SET UP THE INFORMATION NECESSARY TO PRESENT CCDF TABLES
C
      IF (NFILES .EQ. 1) THEN
        NUMCOH = 1
        INDCOH(1) = 1
        WRITE(NAMCOH(1),4) 1
    4   FORMAT('   EMER. RESP. #', I2, '  ')
      ELSE
        NUMCOH = NSTRTG + 1
        INDCOH(1) = 0
        NAMCOH(1) = '      OVERALL  '
        DO 5 I = 1, NSTRTG
        INDCOH(I+1) = I
    5   WRITE(NAMCOH(I+1),4) I
      ENDIF
      IF (NFILES .GT. NSTRTG) THEN
        NUMCOH = NUMCOH + 1
        INDCOH(NUMCOH) = NFILES
        WRITE(NAMCOH(NUMCOH),6)
    6   FORMAT('    CHRONC RESULTS  ')
      ENDIF
C
C  DETERMINE THE COHORT NUMBER OF THE FIRST SET OF RESULTS, 0 MEANS OVERALL
C
      IF (NFILES .EQ. 1) THEN
        IBEGIN = 1
      ELSE
        IBEGIN = 0
      ENDIF
      IF (RISCAT .AND. IBINUM(1) .GT. 0) THEN
        NLOOPS = 2
      ELSE
        NLOOPS = 1
      ENDIF
C
C  WRITE A SOLID PAGE OF CHARACTERS TO SEPARATE THE SECTIONS IF THIS
C  IS NOT THE FIRST SOURCE TERM
C
      IF (ISRCTM .GT. 1) CALL SOLID
      DO 500 ILOOP = 1, NLOOPS
      IF (ILOOP .EQ. 1) THEN
      WRITE(TITLES,20)' NON-ZERO', ' MEAN  ', '  50TH  ', '  90TH  ',
     $                '  95TH  ', '  99TH  ', ' 99.5TH ', '  CONS  ',
     $                '  PROB', ' TRIAL'
   20   FORMAT(T42,'PROB',T73,'QUANTILES',
     $       T111,'PEAK',T121,'PEAK',T127,'PEAK'
     $       /T37,9(2X,A),1X,A)
      ELSE
      CALL SOLID
      WRITE(TITLES,30) (I, I = 1, 32)
```

```
 30   FORMAT(T50,'RELATIVE CONTRIBUTION TO THE MEAN',
     $    ' FROM EACH WEATHER CATEGORY BIN (%)' / 35X, 32I3)
      ENDIF
      DO 500 ICOH = IBEGIN, NFILES
      OLDCAT = ' '
      NUMLIN = 0
      NUMPAG = NUMPAG + 1
      WRITE(TITLES(1)(1:19),60) HEADER(8:26)
 60   FORMAT(A)
      WRITE(TITLES(1)(24:31),80) NUMPAG
 80   FORMAT('PAGE ', I3)
      WRITE(6,100) HEADER, ATNAM1, EANAM1
100   FORMAT('1  DATE AND TIME OF RUN = ', A,
     $       /'   "ATMOS"  DESCRIPTION = ', A,
     $       /'   "EARLY"  DESCRIPTION = ', A)
      NUMLIN = NUMLIN + 3
      IF ((ICOH .EQ. 0 .AND. .NOT. ENDAT2)
     $                    .OR. ICOH .GT. NSTRTG) THEN
      WRITE(6,110) CHNAME
110     FORMAT('   "CHRONC" DESCRIPTION = ', A)
      NUMLIN = NUMLIN + 1
      ENDIF
      WRITE(6,120) ISRCTM, NSRCTM, ATNAM2(ISRCTM)
120   FORMAT(/' SOURCE TERM', I3, ' OF', I3, ':'/5X,A/)
      NUMLIN = NUMLIN + 4
      IF (ICOH .EQ. 0) THEN
      WRITE(6,140) NSTRTG, WTNAME
140     FORMAT(' OVERALL RESULTS OBTAINED BY COMBINING', I2,
     $    ' EMERGENCY RESPONSE COHORTS FROM "EARLY" WITH THE',
     $    ' WEIGHTING FRACTIONS BELOW APPLIED TO THEM:',
     $   //T85, 'FRACTION OF THE ', A6,
     $    /T85, '                  ------')
      NUMLIN = NUMLIN + 4
      WRITE(6,160) (I,EANAM2(I),WTFRAC(I),I=1,NSTRTG)
160     FORMAT((5X,'COHORT',I2, ' = ',A,T99,F8.3/))
      NUMLIN = NUMLIN + 2 * NSTRTG
      IF (.NOT. ENDAT2) THEN
        WRITE(6,180) NSTRTG
180       FORMAT(' AND THEN MERGING THE',I2,' RESULTS ABOVE WITH',
     $    ' THE SINGLE SET OF RESULTS FROM "CHRONC" DESCRIBED BELOW:')
        WRITE(6,200) NFILES, CHNAME
200       FORMAT(/(5X,'COHORT',I2, ' = ', A))
        NUMLIN = NUMLIN + 3
      ENDIF
      WRITE(6,220)
220     FORMAT(/' RESULTS WHICH ARE PRODUCED ONLY BY "EARLY" OR',
     $          ' ONLY BY "CHRONC" ARE PRESENTED IN LATER SECTIONS.')
      NUMLIN = NUMLIN + 2
      ELSE IF (ICOH .LE. NSTRTG) THEN
      WRITE(6,240)
240     FORMAT(' RESULTS FOR A SINGLE EMERGENCY RESPONSE COHORT',
     $          ' WITHOUT ANY WEIGHTING FRACTIONS BEING APPLIED')
      WRITE(6,200) ICOH, EANAM2(ICOH)
      NUMLIN = NUMLIN + 3
      ELSE
      WRITE(6,260)
260     FORMAT(' RESULTS FROM THE "CHRONC" MODULE ALONE')
      WRITE(6,200) NFILES, CHNAME
      NUMLIN = NUMLIN + 4
      ENDIF
      ISTART = .TRUE.
      DO 500 IRES = 1, NUMRES
C
```

```
C  SKIP THE PRESENTATION OF RESULTS IF IT WAS NOT CALCULATED FOR THIS COHORT
C
      IF (IRESID(IRES) .EQ. 1) THEN
C
C  THIS RESULT WAS ONLY CALCULATED FOR THE "EARLY" COHORTS
C
        IF (ICOH .GT. NSTRTG) GO TO 500
C
C  SKIP PRINTING OF THIS RESULT, IT WILL APPEAR IN THE SINGLE "EARLY" RESULTS
C
        IF (ICOH .EQ. 0 .AND. NSTRTG .EQ. 1) GO TO 500
      ELSE IF (IRESID(IRES) .EQ. 3) THEN
C
C  THIS RESULT WAS ONLY CALCULATED FOR THE "CHRONC" COHORT
C  IT WILL ONLY APPEAR ON THE SUMMARY RESULTS FOR "CHRONC" ALONE
C
        IF (ICOH .LE. NSTRTG) GO TO 500
      ENDIF
      IF (ISTART) THEN
C
C  ONLY PRINT THE TITLE AT MIDPAGE IF WE ARE ON THE FIRST RESULT IN THE COHORT
C
        WRITE(6,300) TITLES
  300   FORMAT(/1X,A/1X,A)
      NUMLIN = NUMLIN + 3
      ENDIF
      IF (ILOOP .EQ. 1) THEN
      CALL QUANTL (BINMAG(1,IRES,ICOH), BINPRB(1,IRES,ICOH),
     $               VAL50, VAL90, VAL95, VAL99, VAL995)
      TEXBUF(1) = NOTFOU(VAL50)
        TEXBUF(2) = NOTFOU(VAL90)
        TEXBUF(3) = NOTFOU(VAL95)
        TEXBUF(4) = NOTFOU(VAL99)
      TEXBUF(5) = NOTFOU(VAL995)
      ENDIF
      IF (NUMLIN .GT. 55) THEN
      NUMPAG = NUMPAG + 1
      WRITE(TITLES(1)(24:31),80) NUMPAG
      WRITE(6,320) TITLES
  320   FORMAT('1',A/1X,A)
      OLDCAT = RESNAM(IRES)(1:40)
      WRITE(6,340) RESNAM(IRES)(1:40)
  340   FORMAT(1X,A)
      NUMLIN = 3
      ELSE
      IF (RESNAM(IRES)(1:40) .NE. OLDCAT) THEN
        OLDCAT = RESNAM(IRES)(1:40)
        IF (ISTART) THEN
          WRITE(6,340) RESNAM(IRES)(1:40)
          NUMLIN = NUMLIN + 1
        ELSE
          WRITE(6,360) RESNAM(IRES)(1:40)
  360       FORMAT(/1X,A)
          NUMLIN = NUMLIN + 2
        ENDIF
      ENDIF
      ENDIF
      IF (ILOOP .EQ. 1) THEN
      WRITE(6,380) RESNAM(IRES)(41:77), PNZERO(IRES,ICOH),
     $               COHAVG(IRES,ICOH), (TEXBUF(I),I=1,5),
     $               CONMAX(IRES,ICOH), BINPRB(46,IRES,ICOH),
     $               MAXTRI(IRES,ICOH)
  380   FORMAT(2X, A, F8.4, 1PE10.2, 5A10, 2E10.2, 1X, I4)
```

```
      ELSE
      IF (COHAVG(IRES,ICOH) .GT. 0.) THEN
          WRITE(6,420) RESNAM(IRES)(41:74),
     $      (NINT (100 * BINAVG(METBIN,IRES,ICOH) / COHAVG(IRES,ICOH)),
     $       METBIN = 1, 32)
  420     FORMAT(2X, A, 32I3)
        ELSE
          WRITE(6,420) RESNAM(IRES)(41:74), (0, METBIN = 1, 32)
        ENDIF
      ENDIF
      NUMLIN = NUMLIN + 1
      ISTART = .FALSE.
  500 CONTINUE
C
C  LOOP OVER ALL RESULTS AND PRINT A CCDF TABLE PAGE FOR EACH REQUEST
C
      DO 700 IRES = 1, NUMRES
      IF (.NOT. CCDF(IRES)) GO TO 700
C
C  SET UP THE INFORMATION NECESSARY TO PRESENT CCDF TABLES
C
      IF (NFILES .EQ. 1) THEN
      SKIPME(1) = .FALSE.
      ELSE
      IF (IRESID(IRES) .EQ. 1 .AND. NSTRTG .EQ. 1
     1 .OR. IRESID(IRES) .EQ. 3) THEN
            SKIPME(1) = .TRUE.
        ELSE
            SKIPME(1) = .FALSE.
        ENDIF
      DO 510 I = 1, NSTRTG
      IF (IRESID(IRES) .EQ. 3) THEN
          SKIPME(I+1) = .TRUE.
        ELSE
          SKIPME(I+1) = .FALSE.
        ENDIF
  510   CONTINUE
      ENDIF
      IF (NFILES .GT. NSTRTG) THEN
      IF (IRESID(IRES) .EQ. 1) THEN
          SKIPME(NFILES+1) = .TRUE.
        ELSE
          SKIPME(NFILES+1) = .FALSE.
        ENDIF
      ENDIF
      NUMPAG = NUMPAG + 1
      WRITE(TITLES(1)(24:31),80) NUMPAG
      WRITE(6,320) HEADER // ' ' // TITLES(1)(24:31)
      WRITE(6,530) ISRCTM, NSRCTM, ATNAM2(ISRCTM)
  530 FORMAT(' SOURCE TERM', I3, ' OF', I3, ':'/5X,A/)
      WRITE(6,540) RESNAM(IRES)(1:40), RESNAM(IRES)(41:77)
  540 FORMAT(' RESULT NAME = ', A,
     1       /'                ', A)
      IF (WTNAME .EQ. 'PEOPLE') THEN
        WRITE(6,550) '    PEOPLE FRACTION =', (WTFRAC(I),I=1,NSTRTG)
      ELSE
        WRITE(6,550) '    TIME FRACTION =  ', (WTFRAC(I),I=1,NSTRTG)
      ENDIF
  550 FORMAT(/A,3(7X,F6.4,9X))
      WRITE(6,560) (NAMCOH(ICOH), ICOH=1,NUMCOH)
  560 FORMAT(/5(A))
      WRITE(6,570) ('  ', ICOH=1,NUMCOH)
  570 FORMAT(5(A,'------------------  '))
```

```
      WRITE(6,580) ('  ', ICOH=1,NUMCOH)
  580 FORMAT(5(A,'     X       PROB>=X  '))
      DO 660 I = 1, 46
      WRITE(LIN100,600) (BINMAG(I,IRES,INDCOH(ICOH)),
     1                   BINPRB(I,IRES,INDCOH(ICOH)), ICOH=1,NUMCOH)
  600 FORMAT(1P,5(2E10.2,2X))
      DO 620 ICOH = 1, NUMCOH
      IF (SKIPME(ICOH)) THEN
      ISTRT = (ICOH - 1) * 22 + 1
        LIN100(ISTRT:ISTRT+21) = '     N.A.      N.A.   '
      ELSE IF (I .GT. 1) THEN
       IF (BINMAG(I-1,IRES,INDCOH(ICOH))
     1       .EQ. BINMAG(46,IRES,INDCOH(ICOH))
     2       .AND. BINMAG(46,IRES,INDCOH(ICOH)) .GT. 0.) THEN
         ISTRT = (ICOH - 1) * 22 + 1
           LIN100(ISTRT:ISTRT+21) = '     N.D.      N.D.   '
         ENDIF
      ENDIF
  620 CONTINUE
      WRITE(6,640) LIN100
  640 FORMAT(A)
  660 CONTINUE
  700 CONTINUE
      RETURN
      END
*DECK SOLID
      SUBROUTINE SOLID
C
C THIS ROUTINE WRITES A PAGE OF CHARACTERS TO HELP LOCATE
C SECTIONS OF THE LISTING.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE PRINT.
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      CHARACTER *131 LINE
      LINE = 'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX'
     1    // 'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX'
     2    // 'XXXXXXXXXXXXXXXXXXXXXXXX'
      WRITE(6,100) (LINE,I=1,60)
  100 FORMAT('1',A/(1X,A))
      RETURN
      END
*DECK QUANTL
      SUBROUTINE QUANTL (VALUES, PROBAB, VAL50, VAL10, VAL05, VAL01,
     $                   VAL005)
C
C THIS ROUTINE ESTIMATES CERTAIN QUANTILE VALUES FROM A CCDF TABLE
C STORED IN ARRAYS VALUES AND PROBAB USING LOGARITHMIC INTERPOLATION
C
C THIS ROUTINE IS CALLED BY SUBROUTINE PRINT.
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C Modified 11/30/94, D. Chanin, Report 99.5th quantile instead of the 99.9th
C
      EXTERNAL EXPINT
      DIMENSION VALUES(46), PROBAB(46)
C
C  SET ALL QUANTILES TO ZERO IF ALL CONSEQUENCES ARE ZERO,
C  OTHERWISE INITIALIZE THE QUANTILES WITH A VALUE SIGNIFYING 'NOT-FOUND'.
C
      IF (VALUES(1) .EQ. 0.) THEN
        VAL50 = 0.
```

```
          VAL10 = 0.
          VAL05 = 0.
          VAL01 = 0.
        VAL005 = 0.
        RETURN
        ELSE
          VAL50 = -1.
          VAL10 = -1.
          VAL05 = -1.
          VAL01 = -1.
        VAL005 = -1.
        ENDIF
C
C  FIND THE CONSEQUENCE VALUE EXCEEDED 50% OF THE TIME
C
        DO 100 I = 2, 46
        IF (PROBAB(I-1) .GT. .50 .AND. PROBAB(I) .LE. .50
     $                           .AND. PROBAB(I) .GT. 0.) THEN
        VAL50 = EXPINT (.50, PROBAB(I-1), PROBAB(I),
     $                        VALUES(I-1), VALUES(I))
          GO TO 120
        ENDIF
  100 CONTINUE
C
C  FIND THE CONSEQUENCE VALUE EXCEEDED 10% OF THE TIME
C
  120 DO 200 I = 2, 46
        IF (PROBAB(I-1) .GT. .10 .AND. PROBAB(I) .LE. .10
     $                           .AND. PROBAB(I) .GT. 0.) THEN
        VAL10 = EXPINT (.10, PROBAB(I-1), PROBAB(I),
     $                        VALUES(I-1), VALUES(I))
          GO TO 220
        ENDIF
  200 CONTINUE
C
C  FIND THE CONSEQUENCE VALUE EXCEEDED  5% OF THE TIME
C
  220 DO 300 I = 2, 46
        IF (PROBAB(I-1) .GT. .05 .AND. PROBAB(I) .LE. .05
     $                           .AND. PROBAB(I) .GT. 0.) THEN
        VAL05 = EXPINT( .05, PROBAB(I-1), PROBAB(I),
     $                        VALUES(I-1), VALUES(I))
          GO TO 320
        ENDIF
  300 CONTINUE
C
C  FIND THE CONSEQUENCE VALUE EXCEEDED  1% OF THE TIME
C
  320 DO 400 I = 2, 46
        IF (PROBAB(I-1) .GT. .01 .AND. PROBAB(I) .LE. .01
     $                           .AND. PROBAB(I) .GT. 0.) THEN
        VAL01 = EXPINT( .01, PROBAB(I-1), PROBAB(I),
     $                        VALUES(I-1), VALUES(I))
          GO TO 420
        ENDIF
  400 CONTINUE
C
C  FIND THE CONSEQUENCE VALUE EXCEEDED 0.5% OF THE TIME, the 99.5th quantile
C
  420 DO 500 I = 2, 46
        IF (PROBAB(I-1) .GT. 0.005 .AND. PROBAB(I) .LE. 0.005
     $                           .AND. PROBAB(I) .GT. 0.) THEN
        VAL005 = EXPINT (0.005, PROBAB(I-1), PROBAB(I),
```

```
     $                          VALUES(I-1), VALUES(I))
        GO TO 700
      ENDIF
  500 CONTINUE
  700 CONTINUE
C
C  SET CONSEQUENCE VALUE TO ZERO FOR ALL QUANTILES LYING ABOVE THE CURVE
C
  800 IF (PROBAB(1) .LT. .50) VAL50 = 0.
      IF (PROBAB(1) .LT. .10) VAL10 = 0.
      IF (PROBAB(1) .LT. .05) VAL05 = 0.
      IF (PROBAB(1) .LT. .01) VAL01 = 0.
      IF (PROBAB(1) .LT. .005) VAL005 = 0.
      RETURN
      END
*DECK EXPINT
      FUNCTION EXPINT (P, P1, P2, X1, X2)
C
C THIS FUNCTION RETURNS A LOGARITHMIC BASE 10 INTERPOLATION TO FIND
C THE CONSEQUENCE VALUE CORRESPONDING TO THE P QUANTILE.
C
C THIS FUNCTION IS CALLED BY SUBROUTINE QUANTL.
C
C D. CHANIN, DIV. 6415, 1 MAY 87, NEW ROUTINE ADDED TO SUMMER
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C
      INTRINSIC LOG10
      PLOG  = LOG10 (P)
      P1LOG = LOG10 (P1)
      X1LOG = LOG10 (X1)
      P2LOG = LOG10 (P2)
      X2LOG = LOG10 (X2)
      EXPINT = 10. **
     $ (X1LOG + (X2LOG - X1LOG) * (PLOG - P1LOG) / (P2LOG - P1LOG))
      RETURN
      END
*DECK NOTFOU
      FUNCTION NOTFOU (VALUE)
C
C THIS ROUTINE RETURNS THE CHARACTER STRING ' NOT-FOUND' IF (VALUE .EQ. -1.)
C OTHERWISE, IT RETURNS A STRING WITH THE NUMERIC VALUE IN 1PE10.2 FORMAT.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE PRINT.
C
C DAVID CHANIN, DIV. 6415, 20 AUG 86.
C
      CHARACTER *10 NOTFOU

      IF (VALUE .EQ. -1.) THEN
        NOTFOU = ' NOT-FOUND'
      ELSE
        WRITE(NOTFOU,10) VALUE
   10   FORMAT(1PE10.2)
      ENDIF

      RETURN
      END
      SUBROUTINE WRIT80
C
C THIS ROUTINE WRITES THE NUREG-1150 POST-PROCESSOR INFO TO UNIT80.
C IT SHOULD ONLY BE CALLED IF MACCS IS BEING USED WITH POST, PRPOST, ETC.
C THIS ROUTINE IS ACTIVATED WHEN "*DEFINE UNIT80" IS FOUND BY CMP.
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C UNITS 31,32,33,34,80 ARE OPENED WITH STATUS='NEW' SO DELETE THEM WHEN DONE.
C
C WRITTEN FOR NRC CONSEQUENCE UNCERTAINTY STUDY, DAVID CHANIN, 4/6/92
C
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      CHARACTER *80   ATNAM1
      COMMON /ATNAM1/ ATNAM1
      CHARACTER *80   ATNAM2
      COMMON /ATNAM2/ ATNAM2(60)
      CHARACTER *80   EANAM1
      COMMON /EANAM1/ EANAM1
      CHARACTER *80   EANAM2
      COMMON /EANAM2/ EANAM2(3)
      CHARACTER *80   CHNAME
      COMMON /CHNAME/ CHNAME
      COMMON /SRCTRM/ ISRCTM, NSRCTM
      COMMON /POPDAT/ NSTRTG, ISTRTG, POPDAT(MAXRAD,16,4)
      COMMON /OUTCOM/ IBEGIN, NFILES, IRESID(MAXNRS)
      COMMON /NUMRES/ NUMRES
      CHARACTER *77   RESNAM
      COMMON /RESNAM/ RESNAM(MAXNRS)
      COMMON /NUMVAL/ NUMVAL(MAXNRS)
      COMMON /WTFRAC/ WTFRAC(3)
      COMMON /ROSEBI/ ROSEBI(16,41)
C
      WRITE(80) HEADER, ATNAM1, EANAM1, NSRCTM, (ATNAM2(I),I=1,NSRCTM),
     1 NSTRTG, (EANAM2(I),I=1,NSTRTG), CHNAME, NUMTRI, NFILES, NUMRES,
     2 (RESNAM(I),I=1,NUMRES), (NUMVAL(I),I=1,NUMRES),
     3 (IRESID(I),I=1,NUMRES), (WTFRAC(I),I=1,NSTRTG),
     4 ((ROSEBI(IDIR,IBIN),IDIR=1,16),IBIN=1,41)

      WRITE(6,*)
     1 HEADER, ATNAM1, EANAM1, NSRCTM, (ATNAM2(I),I=1,NSRCTM),
     1 NSTRTG, (EANAM2(I),I=1,NSTRTG), CHNAME, NUMTRI, NFILES, NUMRES,
     2 (RESNAM(I),I=1,NUMRES), (NUMVAL(I),I=1,NUMRES),
     3 (IRESID(I),I=1,NUMRES), (WTFRAC(I),I=1,NSTRTG),
     4 ((ROSEBI(IDIR,IBIN),IDIR=1,16),IBIN=1,41)
      RETURN
      END
*DECK XUTPUT
      SUBROUTINE XUTPUT
C
C This routine generates the summary information for the ATMOS results
C
C GLOSSARY OF VARIABLES:
C
C ISRCTM - LOOP COUNTER ON THE NUMBER OF SOURCE TERMS TO BE PROCESSED
C NSRCTM - TOTAL NUMBER OF SOURCE TERMS TO BE PROCESSED
C NUMPAG - PAGE COUNTER FOR OUTPUT LISTING
C OK     - LOGICAL FLAG INDICATING SUCCESSFUL COMPLETION OF INPUT PROCESSING
C
C GLOSSARY OF EXTERNALS:
C
C XRINT  - PRODUCES THE OUTPUT OF SUMMARIES AND/OR CCDF TABLES
C XEAD2  - GENERATES THE CCDFS FOR ALL COHORTS FOR A SINGLE SOURCE TERM
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
```

```
C
      EXTERNAL ABORT, XRINT, XEAD2
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /NUMPAG/ NUMPAG
      LOGICAL CCDFX
      COMMON /CCDFX/ CCDFX(MAXNRS)
      COMMON /RESNAX/ RESNAX
      CHARACTER *77 RESNAX(350)
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
      COMMON /SRCTRM/ ISRCTM, NSRCTM
C
      CHARACTER *80 LINE80
C
      NUMPAG = 0
C
C  READ THE HEADER RECORDS ON THE RESULTS FILES AND CHECK FOR THEIR CORRECTNESS
C
      IUNIT = 30
      REWIND (IUNIT)
      READ (IUNIT,END=220,ERR=220) LINE80
      IF (LINE80 .NE. HEADER) THEN
      WRITE(6,180) IUNIT, HEADER, LINE80
      WRITE(7,180) IUNIT, HEADER, LINE80
 180    FORMAT(' ERROR: MISMATCH OF RUN IDENT ON UNIT ', I2,
     $        /' EXPECTING: ', A/ ' FOUND: ', A)
      CALL ABORT ('ERROR, MISMATCH FOUND ON RUNID')
      ENDIF
      GO TO 260
  220 WRITE(6,240) IUNIT
      WRITE(7,240) IUNIT
  240 FORMAT(' ERROR READING FROM UNIT ', I2)
      CALL ABORT ('ERROR, I/O ERROR WHEN READING RUNID')
  260 CONTINUE
C
C  ACCUMULATE THE CCDFS
C
      CALL XEAD2
C
C  PRINT THE RESULTS
C
      CALL XRINT
      RETURN
      END
*DECK READ2
      SUBROUTINE XEAD2
C
C THIS ROUTINE READS ALL THE RESULT FILES TO ACCUMULATE THE PROBABILITY
C DISTRIBUTION (CCDF) OF EACH RESULT FOR ALL COHORTS, SINGLE SOURCE TERM.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE XUTPUT.
C
C THE PROBABILITY DISTRIBUTION IS ACCUMULATED BY SUBROUTINE DO1CDF
C WHICH CALLS THE BIN GENERATION ROUTINES (GNBIN1 AND GNBIN2) AS NEEDED.
C
C GLOSSARY OF VARIABLES:
C
C BINAVG - ACCUMULATED MEAN CONSEQUENCE FOR EACH WEATHER SAMPLING BIN
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINNED - LOGICAL ARRAY INDICATING THE BIN MAGNITUDES HAVE BEEN GENERATED
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C IBEGIN - FIRST COHORT TO BE PROCESSED (EITHER 0 OR 1)
C IBINUM - WEATHER SAMPLING BIN NUMBER FOR EACH WEATHER TRIAL
```

```
C ICOH   - LOOP COUNTER ON COHORTS
C IDAY   - START DAY IN THE YEAR FOR EACH WEATHER TRIAL
C IFIL1  - LOWER BOUND OF LOOP ON RESULT FILES
C IFIL2  - UPPER BOUND OF LOOP ON RESULT FILES
C IHOUR  - START HOUR IN THE DAY FOR EACH WEATHER TRIAL
C IRES   - LOOP COUNTER ON RESULTS
C IRESID - RESIDENCE CODE (1-EARLY ONLY, 2-BOTH EARLY AND CHRONC, 3-CHRONC ONLY)
C IUNIT  - ARRAY STORING THE UNIT NUMBERS OF THE NFILES RESULT FILES PROCESSED
C METBIN - LOOP COUNTER ON WEATHER SAMPLING BINS
C NFILES - TOTAL NUMBER OF RESULT FILES TO BE PROCESSED
C NSTRTG - NUMBER OF EMERGENCY RESPONSE STRATEGIES FROM EARLY
C NUMRES - NUMBER OF RESULTS FOUND ON THE NEW COMBINED RESULT LIST
C NUMVAL - CONSEQUENCE VALUES PER RESULT ON THE NEW COMBINED RESULT LIST
C NUMTRI - NUMBER OF WEATHER TRIALS
C PRBMET - PROBABILITY OF THE WEATHER SEQUENCE FOR EACH WEATHER TRIAL
C WTFRAC - WEIGHTING FRACTION APPPLIED TO THIS STRATEGY
C WTNAME - Weighting type for CCDF generation: 'TIME', 'PEOPLE', or 'SUMPOP'
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 11/08/88, D. CHANIN, LOG # 11/02/88-B,
C   INCORRECT HANDLING OF THE OVERALL COMBINED RESULTS WHEN
C   "FRACTION OF THE TIME" WEIGHTING IS USED
C MODIFIED 6/20/89/, D. CHANIN, LOG # 1/12/89-B,
C   INCORRECT COMBINATION OF RESULTS WHEN CHRONC IS OMITTED
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C
      EXTERNAL ABORT, DO1CDF
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      LOGICAL ORGFLG
      COMMON /GLOBAL/ ORGFLG(MAXORG), NUMTRI, NUMREL, NUMRAD, IPLUME,
     $                NUMORG, INICHR, NUMISO, NUMCOR, NUMFIN, ANGMAX,
     $                SPACEN(MAXRAD), SPALEN(MAXRAD), SPAEND(0:MAXRAD)
      LOGICAL BINNED
      COMMON /BINNED/ BINNED (MAXNRS,0:4)
      COMMON /MAXOCU/ MAXTRI(MAXNRS,0:4), CONMAX(MAXNRS,0:4),
     $                MAXDIR(MAXNRS,0:4)
      COMMON /SAVMET/ PRBMET(8760), IBINUM(8760), IDAY(8760),
     $                IHOUR(8760)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
      COMMON /COHAVG/ COHAVG(MAXNRS,0:4)
      COMMON /PNZERO/ PNZERO(MAXNRS,0:4)
      COMMON // BINAVG(41,MAXNRS,0:4)
      LOGICAL CCDF0
      COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)
      COMMON /RESNAX/ RESNAX
      CHARACTER *77 RESNAX(350)
C
      ICOH = 0
      NUMRES = 10 * NUM0
      DO 40 IRES = 1, NUMRES
      COHAVG(IRES,ICOH) = 0.
      CONMAX(IRES,ICOH) = 0.
      PNZERO(IRES,ICOH) = 0.
      MAXDIR(IRES,ICOH) = 0
      MAXTRI(IRES,ICOH) = 0
      BINNED(IRES,ICOH) = .FALSE.
      DO 20 METBIN = 1, 41
   20 BINAVG(METBIN,IRES,ICOH) = 0.
      DO 40 MYBINS = 1, 46
      BINMAG(MYBINS,IRES,ICOH) = 0.
   40 BINPRB(MYBINS,IRES,ICOH) = 0.
```

```
      IUNIT = 30
      DO 500 ITRIAL = 1, NUMTRI
      READ(IUNIT) IDUM, PRBMET(ITRIAL), IBINUM(ITRIAL),
     1                  IDAY(ITRIAL), IHOUR(ITRIAL)
      IF (IDUM .NE. ITRIAL) THEN
      WRITE(6,120) IUNIT
      WRITE(7,120) IUNIT
  120   FORMAT(' MISMATCHED TRIAL NUMBER ON UNIT ', I3)
      CALL ABORT ('XEAD2')
      ENDIF
      DO 500 IRES = 1, NUMRES
      READ(IUNIT) EXPCON
  500 CALL XO1CDF (0, IRES, ITRIAL, IROT, EXPCON, 1.)
      RETURN
      END
*DECK XO1CDF
      SUBROUTINE XO1CDF (ICOH, IRES, ITRIAL, IROT, EXPCON, PSCALE)
C
C THIS ROUTINE UPDATES THE CCDF FOR A SINGLE CONSEQUENCE VALUE
C AND ALSO KEEPS TRACK OF MEANS, P NOT-ZERO, AND PEAK TRIAL.
C
C THIS ROUTINE IS CALLED BY SUBROUTINE READ2.
C
C GLOSSARY OF VARIABLES:
C
C BINAVG - ACCUMULATED MEAN CONSEQUENCE BROKEN DOWN BY WEATHER SAMPLING BIN
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINNED - LOGICAL ARRAY INDICATING THE BIN MAGNITUDES HAVE BEEN GENERATED
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C COHAVG - ACCUMULATED MEAN CONSEQUENCE VALUE FOR THIS (RESULT,COHORT)
C CONMAX - THE MAXIMUM CONSEQUENCE VALUE OBSERVED FOR THIS (RESULT,COHORT)
C EXPCON - EXPECTED VALUE OF THIS CONSEQUENCE
C MAXDIR - THE WIND DIRECTION PRODUCING THE LAST MAXIMUM CONSEQUENCE
C MAXTRI - THE LAST WEATHER TRIAL WHICH PRODUCED THE MAXIMUM CONSEQUENCE
C NUMVAL - CONSEQUENCE VALUES PER RESULT ON THE NEW COMBINED RESULT LIST
C PNZERO - PROBABILITY OF EXCEEDING ZERO FOR THIS (RESULT,COHORT)
C PROBAB - PROBABILITY TO BE ASSOCIATED WITH THE CONSEQUENCE VALUE, EXPCON
C PRBMET - PROBABILITY OF THE WEATHER SEQUENCE FOR EACH WEATHER TRIAL
C PSCALE - SCALE FACTOR TO BE APPLIED TO THE PROBABILITY OF THIS CONSEQUENCE
C ROSEBI - WIND ROSE ARRAY FOR EACH WEATHER CATEGORY SAMPLING BIN
C
C GLOSSARY OF EXTERNALS:
C
C GNBIN1 - GENERATES THE INITIAL BIN MAGNITUDES WHEN THE FIRST NON-ZERO
C          CONSEQUENCE VALUE IS ENCOUNTERED
C
C GNBIN2 - REGENRATES THE BIN DEFINITION WHEN A CONSEQUENCE VALUE IS
C          ENCOUNTERED WHICH EXCEEDS THE PREVIOUS MAXIMUM VALUE
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C MODIFIED 7/01/96, D. Chanin, test for ratio before performing division
C  to avoid overflow when new peak is many orders of magnitude larger than old
C
      EXTERNAL GNBIN1, GNBIN2
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /ROSEBI/ ROSEBI(16,41)
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
      COMMON /PNZERO/ PNZERO(MAXNRS,0:4)
      COMMON /COHAVG/ COHAVG(MAXNRS,0:4)
      COMMON /SAVMET/ PRBMET(8760), IBINUM(8760), IDAY(8760),
     $                IHOUR(8760)
```

```
      LOGICAL BINNED
      COMMON /BINNED/ BINNED (MAXNRS,0:4)
      COMMON /MAXOCU/ MAXTRI(MAXNRS,0:4), CONMAX(MAXNRS,0:4),
     $                MAXDIR(MAXNRS,0:4)
C
      IF (EXPCON .LE. 0.) RETURN
C
C  CALCULATE THE PROBABILITY TO BE ASSOCIATED WITH THE EXPECTED VALUE, EXPCON
C
      PROBAB = PSCALE * PRBMET(ITRIAL)
C
C  SKIP UPDATE OF CCDF IF PROBABILITY IS ZERO
C
      IF (PROBAB .LE. 0) RETURN
C
C  CHECK TO SEE IF THE BIN GENERATION ROUTINES NEED TO BE CALLED
C
      IF (.NOT. BINNED(IRES,ICOH)) THEN
      BINNED(IRES,ICOH) = .TRUE.
      CONMAX(IRES,ICOH) = EXPCON
      MAXTRI(IRES,ICOH) = ITRIAL
      MAXDIR(IRES,ICOH) = IROT
      CALL GNBIN1 (EXPCON, IRES, ICOH)
      ELSE IF (EXPCON .GT. 0. .AND. CONMAX(IRES,ICOH) .GT. 0.) THEN
C
C  DETERMINE IF WE HAVE A NEW MAXIMUM VALUE EXCEEDING THE OLD ONE BY
C  MORE THAN ONE PART PER MILLION. THIS TEST IS FOR ENSURING THAT
C  RESULTS ARE IDENTICAL ON MACHINES OF DIFFERING NUMERICAL PRECISION.
C
C MODIFIED 7/01/96 TO TEST FOR A LARGE RATIO BEFORE DIVISION TO AVOID OVERFLOW
C
        IF (LOG10(EXPCON) - LOG10(CONMAX(IRES,ICOH)) .GT. 1.0) THEN
          CONMAX(IRES,ICOH) = EXPCON
          MAXTRI(IRES,ICOH) = ITRIAL
          MAXDIR(IRES,ICOH) = IROT
          IF (EXPCON .GT. BINMAG(46,IRES,ICOH))
     $      CALL GNBIN2 (EXPCON, IRES, ICOH)
        ELSE IF (EXPCON / CONMAX(IRES,ICOH) .GT. 1.000001) THEN
          CONMAX(IRES,ICOH) = EXPCON
          MAXTRI(IRES,ICOH) = ITRIAL
          MAXDIR(IRES,ICOH) = IROT
          IF (EXPCON .GT. BINMAG(46,IRES,ICOH))
     $      CALL GNBIN2 (EXPCON, IRES, ICOH)
        ENDIF
      ENDIF
C
C  ACCUMULATE THE PROBABILITY OF EXCEEDING ZERO (P NOT ZERO)
C
      IF (EXPCON .GT. 0.) PNZERO(IRES,ICOH) = PNZERO(IRES,ICOH) + PROBAB
C
C  ADD TO THE PROBABILITY OF ALL BINS WHOSE MAGNITUDE IS EQUALLED OR EXCEEDED
C
      DO 80 IBIN = 1, 46
   80 IF (EXPCON .GE. BINMAG(IBIN,IRES,ICOH))
     $  BINPRB(IBIN,IRES,ICOH) = BINPRB(IBIN,IRES,ICOH) + PROBAB
C
C  UPDATE THE ACCUMULATOR FOR MEAN CONSEQUENCE FOR ALL COHORTS
C
      COHAVG(IRES,ICOH) = COHAVG(IRES,ICOH) + EXPCON * PROBAB
      RETURN
      END
*DECK XRINT
      SUBROUTINE XRINT
```

```
C
C THIS ROUTINE IS CALLED BY SUBROUTINE XUTPUT.
C
C GLOSSARY OF VARIABLES:
C
C ATNAM2 - NAME OF THE SOURCE TERM GIVEN FOR THE ATMOS INPUT FILE
C BINAVG - ACCUMULATED MEAN CONSEQUENCE FOR EACH WEATHER SAMPLING BIN
C BINMAG - ARRAY OF CONSEQUENCE VALUES FOR EACH BIN OF THE CCDF TABLE
C BINPRB - ARRAY OF PROBABILITIES FOR EACH BIN OF THE CCDF TABLE
C CCDF   - LOGICAL FLAGS INDICATING IF CCDF TABLE RESULTS ARE REQUESTED
C CHNAME - NAME OF THE GENERAL DESCRIPTION GIVEN FOR THE CHRONC INPUT FILE
C COHAVG - ACCUMULATED MEAN CONSEQUENCE VALUE FOR THIS (RESULT,COHORT)
C CONMAX - THE MAXIMUM CONSEQUENCE VALUE OBSERVED FOR THIS (RESULT,COHORT)
C IRES   - LOOP COUNTER ON RESULTS
C ISTRT  - STARTING COLUMN POSITION FOR PRINTING CCDF TABLES
C ISTRTG - Loop counter on emergency response scenarios used by EARLY
C MAXDIR - THE WIND DIRECTION PRODUCING THE LAST MAXIMUM CONSEQUENCE
C MAXTRI - THE LAST WEATHER TRIAL WHICH PRODUCED THE MAXIMUM CONSEQUENCE
C METBIN - LOOP COUNTER ON WEATHER SAMPLING BINS
C NUMLIN - LINE COUNTER ON THE OUTPUT LISTING
C NUMPAG - PAGE COUNTER ON THE OUTPUT LISTING
C NUMTRI - NUMBER OF WEATHER TRIALS
C OLDCAT - "CATEGORY NAME" OF THE PREVIOUS RESULT (FIRST 40 CHARACTERS OF NAME)
C PNZERO - PROBABILITY OF EXCEEDING ZERO FOR THIS (RESULT,COHORT)
C RESNAM - NAMES OF RESULTS ON THE NEW COMBINED RESULT LIST
C RISCAT - LOGICAL FLAG SAYING THAT RISK BREAKDOWN BY WEATHER BIN IS REQUESTED
C SKIPME - LOGICAL FLAG SAYING THAT CCDF FOR THIS COHORT IS NOT DEFINED
C TEXBUF - CHARACTER ARRAY USED TO STORE THE QUANTILE INFORMATION
C HEADER - 80 CHARACTER STRING IDENTIFYING MACCS VERSION, AND DATE, TIME OF RUN
C TITLES - TWO LINE TITLE OF IDENTIFICATION INFO PRINTED ON EACH PAGE
C VAL50  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED 50 % OF TIME
C VAL90  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED 10 % OF TIME
C VAL95  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED  5 % OF TIME
C VAL99  - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED  1 % OF TIME
C VAL995 - CONSEQUENCE VALUE EXPECTED TO BE EQUALLED OR EXCEEDED .5 % OF TIME
C
C GLOSSARY OF EXTERNALS:
C
C NOTFOU - CHARACTER FUNCTION WHICH RETURNS EITHER A NUMBER OR 'NOT-FOUND'
C QUANTL - PERFORMS EXPONENTIAL INTERPOLATION ON CCDF TABLES TO FIND QUANTILES
C SOLID  - WRITES A SOLID PAGE OF CHARACTERS TO DELIMIT RESULTS FOR THE COHORTS
C
C MODIFIED 8 JAN 88, D. CHANIN, INTEGRATION OF MACCS INTO A SINGLE CODE
C MODIFIED 6/20/89/, DIC, LOG # 6/6/89-A, ADD CCDF TABLE CAPABILITY
C MODIFIED 7/11/89/, D. CHANIN, LOG # 7/11/89-A,
C  AVOID USING THE VARIABLE ISTART AS BOTH AN INTEGER AND A LOGICAL
C MODIFIED 9/19/89, D. CHANIN, LOG # 9/14/89-A, REMOVE UNNEEDED COMMONS
C Modified 8/15/92, D. Chanin, New emergency response model for DOE
C Modified 11/29/94, D. Chanin, Allow printing of trial numbers with I4 mask
C Modified 11/30/94, D. Chanin, Report 99.5th quantile instead of the 99.9th
C
      EXTERNAL NOTFOU, QUANTL, SOLID
      SAVE
      PARAMETER (MAXRAD=35,MAXNUC=150,MAXORG=16,MAXNRS=394)
      COMMON /NUMPAG/ NUMPAG
      CHARACTER *80   ATNAM1
      COMMON /ATNAM1/ ATNAM1
      CHARACTER *80   ATNAM2
      COMMON /ATNAM2/ ATNAM2(60)
      CHARACTER *80   HEADER
      COMMON /HEADER/ HEADER
      COMMON /REUSE2/ BINMAG(46,MAXNRS,0:4)
      COMMON /BINPRB/ BINPRB(46,MAXNRS,0:4)
```

```
      COMMON /PNZERO/ PNZERO(MAXNRS,0:4)
      COMMON /COHAVG/ COHAVG(MAXNRS,0:4)
      COMMON // BINAVG(41,MAXNRS,0:4)
      COMMON /SAVMET/ PRBMET(8760), IBINUM(8760), IDAY(8760),
     $                IHOUR(8760)
      COMMON /MAXOCU/ MAXTRI(MAXNRS,0:4), CONMAX(MAXNRS,0:4),
     $                MAXDIR(MAXNRS,0:4)
      LOGICAL CCDF0
      COMMON /RESLT0/ NUM0, INDRAD(35), INDREL(35), CCDF0(35)
      COMMON /RESNAX/ RESNAX
      CHARACTER *77 RESNAX(350)
C
C  DECLARATION OF TEMPORARY VARIABLES USED FOR PRINTING CCDF TABLES
C
      CHARACTER *40 OLDCAT
      CHARACTER *132 TITLES(2)
      CHARACTER *10 NOTFOU, TEXBUF(5)
      CHARACTER *110 LIN100
      LOGICAL ISTART
C
C  SET UP THE INFORMATION NECESSARY TO PRESENT CCDF TABLES
C
      NUMRES = 10 * NUM0
      WRITE(TITLES,20)' NON-ZERO', ' MEAN  ', '  50TH  ', '  90TH  ',
     $                '  95TH  ', '  99TH  ', ' 99.5TH ', '  CONS  ',
     $                '  PROB', ' TRIAL'
   20   FORMAT(T42,'PROB',T73,'QUANTILES',
     $       T111,'PEAK',T121,'PEAK',T127,'PEAK'
     $       /T37,9(2X,A),1X,A)
      OLDCAT = ' '
      WRITE(6,100) HEADER, ATNAM1
  100 FORMAT('1  DATE AND TIME OF RUN = ', A,
     $      /'   "ATMOS"  DESCRIPTION = ', A)
      WRITE(6,120) TITLES
  120 FORMAT(1X,A/1X,A)
      NUMLIN = 4
      ISTART = .TRUE.
      DO 500 IRES = 1, NUMRES
      CALL QUANTL (BINMAG(1,IRES,0), BINPRB(1,IRES,0),
     $               VAL50, VAL90, VAL95, VAL99, VAL995)
      TEXBUF(1) = NOTFOU(VAL50)
      TEXBUF(2) = NOTFOU(VAL90)
      TEXBUF(3) = NOTFOU(VAL95)
      TEXBUF(4) = NOTFOU(VAL99)
      TEXBUF(5) = NOTFOU(VAL995)
      IF (NUMLIN .GT. 60) THEN
      WRITE(6,320) TITLES
  320   FORMAT('1',A/1X,A)
      OLDCAT = RESNAX(IRES)(1:40)
      WRITE(6,340) RESNAX(IRES)(1:40)
  340   FORMAT(1X,A)
      NUMLIN = 3
      ELSE
      IF (RESNAX(IRES)(1:40) .NE. OLDCAT) THEN
        OLDCAT = RESNAX(IRES)(1:40)
        IF (ISTART) THEN
          WRITE(6,340) RESNAX(IRES)(1:40)
          NUMLIN = NUMLIN + 1
        ELSE
          WRITE(6,360) RESNAX(IRES)(1:40)
  360       FORMAT(/1X,A)
          NUMLIN = NUMLIN + 2
        ENDIF
```

```
      ENDIF
      ENDIF
      WRITE(6,380) RESNAX(IRES)(41:77), PNZERO(IRES,0),
     $               COHAVG(IRES,0), (TEXBUF(I),I=1,5),
     $               CONMAX(IRES,0), BINPRB(46,IRES,0),
     $               MAXTRI(IRES,0)
  380 FORMAT(2X, A, F8.4, 1PE10.2, 5A10, 2E10.2, 1X, I4)
      NUMLIN = NUMLIN + 1
      ISTART = .FALSE.
  500 CONTINUE
C
C  LOOP OVER ALL RESULTS AND PRINT A CCDF TABLE PAGE FOR EACH REQUEST
C
      DO 700 IRES = 1, NUMRES
      IF (.NOT. CCDF0((IRES-1)/10+1)) GO TO 700
      WRITE(6,540) RESNAX(IRES)(1:40), RESNAX(IRES)(41:77)
  540 FORMAT('1 RESULT NAME = ', A, /'                    ', A)
      DO 660 I = 1, 46
      IF (I .GT. 1) THEN
      IF (BINMAG(I,IRES,0) .EQ. BINMAG(I-1,IRES,0)) GO TO 700
      ENDIF
      WRITE(LIN100,600) BINMAG(I,IRES,0), BINPRB(I,IRES,0)
  600 FORMAT(1P,5(2E10.2,2X))
      WRITE(6,640) LIN100
  640 FORMAT(A)
  660 CONTINUE
  700 CONTINUE
      RETURN
      END
```

```
FGRDCF 01/12/2004 09:38:06   Version 1.11
Implicit daughter halflives (m) less than  90 and less than 0.100 of parent
        9 ORGANS DEFINED IN THIS FILE:
GONADS
BREAST
LUNGS
RED MARR
BONE SUR
THYROID
REMAINDER
EFFECTIVE
SKIN(FGR)
       825 NUCLIDES DEFINED IN THIS FILE:
Ac-223           Including:Fr-219
Ac-224    Y      Including:Fr-220
Ac-225    Y      Including:Fr-221
Ac-226    Y      Including:Th-226 , Including:Fr-222
Ac-227    Y      Including:Fr-223
Ac-228    Y
Ag-102    Y
Ag-103    Y
Ag-104    Y
Ag-104m   Y
Ag-105    Y
Ag-106    Y
Ag-106m   Y
Ag-108
Ag-108m   Y      Including:Ag-108
Ag-109m
Ag-110
Ag-110m   Y      Including:Ag-110
Ag-111    Y
Ag-112    Y
Ag-115    Y
Al-26     D
Al-28
Am-237    W
Am-238    W
Am-239    W
Am-240    W
Am-241    W
Am-242    W
Am-242m   W
Am-243    W
Am-244    W
Am-244m   W
Am-245    W
Am-246    W
Am-246m   W
Ar-37
Ar-39
Ar-41
As-69     W
As-70     W
As-71     W
As-72     W
As-73     W
As-74     W
As-76     W
As-77     W
As-78     W
At-207    D
At-211    D      Including:Po-211
```

At-215		
At-216		
At-217		
At-218		
Au-193	Y	
Au-194	Y	
Au-195	Y	
Au-195m		
Au-198	Y	
Au-198m	Y	
Au-199	Y	
Au-200	Y	
Au-200m	Y	Including:Au-200
Au-201	Y	
Ba-126	D	Including:Cs-126
Ba-128	D	Including:Cs-128
Ba-131	D	
Ba-131m	D	
Ba-133	D	
Ba-133m	D	
Ba-135m	D	
Ba-137m		
Ba-139	D	
Ba-140	D	
Ba-141	D	
Ba-142	D	
Be-10	Y	
Be-7	Y	
Bi-200	W	
Bi-201	W	
Bi-202	W	
Bi-203	W	
Bi-205	W	
Bi-206	W	
Bi-207	W	
Bi-210	W	
Bi-210m	W	Including:Tl-206
Bi-211		Including:Po-211
Bi-212	W	Including:Tl-208 , Including:Po-212
Bi-213	W	Including:Tl-209 , Including:Po-213
Bi-214	W	Including:Po-214
Bk-245	W	
Bk-246	W	
Bk-247	W	
Bk-249	W	
Bk-250	W	
Br-74	D	
Br-74m	D	
Br-75	D	
Br-76	D	
Br-77	D	
Br-80	D	
Br-80m	D	Including:Br-80
Br-82	D	
Br-83	D	
Br-84	D	
C-11	C	
C-14	C	
Ca-41	W	
Ca-45	W	
Ca-47	W	
Ca-49		
Cd-104	Y	

Cd-107	Y	
Cd-109	Y	
Cd-113	Y	
Cd-113m	Y	
Cd-115	Y	
Cd-115m	Y	
Cd-117	Y	
Cd-117m	Y	
Ce-134	Y	Including:La-134
Ce-135	Y	
Ce-137	Y	
Ce-137m	Y	
Ce-139	Y	
Ce-141	Y	
Ce-143	Y	
Ce-144	Y	Including:Pr-144m, Including:Pr-144
Cf-244	Y	
Cf-246	Y	
Cf-248	Y	
Cf-249	Y	
Cf-250	Y	
Cf-251	Y	
Cf-252	Y	
Cf-253	Y	Including:Cm-249
Cf-254	Y	
Cl-36	D	
Cl-38	D	
Cl-39	D	
Cm-238	W	
Cm-240	W	
Cm-241	W	
Cm-242	W	
Cm-243	W	
Cm-244	W	
Cm-245	W	
Cm-246	W	
Cm-247	W	
Cm-248	W	
Cm-249	W	
Cm-250	W	
Co-55	Y	
Co-56	Y	
Co-57	Y	
Co-58	Y	
Co-58m	Y	
Co-60	Y	
Co-60m	Y	
Co-61	Y	
Co-62m	Y	
Cr-48	Y	
Cr-49	Y	
Cr-51	Y	
Cs-125	D	
Cs-126		
Cs-127	D	
Cs-128		
Cs-129	D	
Cs-130	D	
Cs-131	D	
Cs-132	D	
Cs-134	D	
Cs-134m	D	
Cs-135	D	

Cs-135m	D	
Cs-136	D	
Cs-137	D	Including:Ba-137m
Cs-138	D	
Cu-60	Y	
Cu-61	Y	
Cu-62		
Cu-64	Y	
Cu-66		
Cu-67	Y	
Dy-155	W	
Dy-157	W	
Dy-159	W	
Dy-165	W	
Dy-166	W	
Er-161	W	
Er-165	W	
Er-169	W	
Er-171	W	
Er-172	W	
Es-250	W	
Es-251	W	
Es-253	W	
Es-254	W	
Es-254m	W	
Eu-145	W	
Eu-146	W	
Eu-147	W	
Eu-148	W	
Eu-149	W	
Eu-150a	W	
Eu-150b	W	
Eu-152	W	
Eu-152m	W	
Eu-154	W	
Eu-155	W	
Eu-156	W	
Eu-157	W	
Eu-158	W	
F-18	Y	
Fe-52	W	Including:Mn-52m
Fe-55	W	
Fe-59	W	
Fe-60	W	Including:Co-60m
Fm-252	W	
Fm-253	W	
Fm-254	W	
Fm-255	W	
Fm-257	W	
Fr-219		Including:At-215
Fr-220		Including:At-216
Fr-221		Including:At-217
Fr-222	D	Including:Ra-222
Fr-223	D	
Ga-65	W	
Ga-66	W	
Ga-67	W	
Ga-68	W	
Ga-70	W	
Ga-72	W	
Ga-73	W	
Gd-145	W	
Gd-146	W	

Gd-147	W	
Gd-148	W	
Gd-149	W	
Gd-151	W	
Gd-152	W	
Gd-153	W	
Gd-159	W	
Ge-66	W	
Ge-67	W	
Ge-68	W	Including:Ga-68
Ge-69	W	
Ge-71	W	
Ge-75	W	
Ge-77	W	
Ge-78	W	
H-3	V	
Hf-170	D	
Hf-172	D	
Hf-173	D	
Hf-175	D	
Hf-177m	D	
Hf-178m	D	
Hf-179m	D	
Hf-180m	D	
Hf-181	D	
Hf-182	D	
Hf-182m	D	
Hf-183	D	
Hf-184	D	
Hg-193	V	
Hg-193m	V	
Hg-194	V	
Hg-195	V	
Hg-195m	V	
Hg-197	V	
Hg-197m	V	
Hg-199m	V	
Hg-203	V	
Ho-155	W	
Ho-157	W	
Ho-159	W	
Ho-161	W	
Ho-162	W	
Ho-162m	W	
Ho-164	W	
Ho-164m	W	
Ho-166	W	
Ho-166m	W	
Ho-167	W	
I-120	D	
I-120m	D	
I-121	D	
I-122		
I-123	D	
I-124	D	
I-125	D	
I-126	D	
I-128	D	
I-129	D	
I-130	D	
I-131	D	
I-132	D	
I-132m	D	

I-133	D	
I-134	D	
I-135	D	Including:Xe-135m
In-109	W	
In-110a	W	
In-110b	W	
In-111	W	
In-112	W	
In-113m	W	
In-114		
In-114m	W	Including:In-114
In-115	W	
In-115m	W	
In-116m	W	
In-117	W	
In-117m	W	
In-119		
In-119m	W	
Ir-182	Y	
Ir-184	Y	
Ir-185	Y	
Ir-186a	Y	
Ir-186b		
Ir-187	Y	
Ir-188	Y	
Ir-189	Y	
Ir-190	Y	
Ir-190m	Y	
Ir-190n		
Ir-191m		
Ir-192	Y	
Ir-192m	Y	
Ir-194	Y	
Ir-194m	Y	
Ir-195	Y	
Ir-195m	Y	
K-38		
K-40	D	
K-42	D	
K-43	D	
K-44	D	
K-45	D	
Kr-74		
Kr-76		
Kr-77		
Kr-79		
Kr-81		
Kr-81m		
Kr-83m		
Kr-85		
Kr-85m		
Kr-87		
Kr-88		
La-131	W	
La-132	W	
La-134		
La-135	W	
La-137	W	
La-138	W	
La-140	W	
La-141	W	
La-142	W	
La-143	W	

Lu-169	Y	
Lu-170	Y	
Lu-171	Y	
Lu-172	Y	
Lu-173	Y	
Lu-174	Y	
Lu-174m	Y	
Lu-176	Y	
Lu-176m	Y	
Lu-177	Y	
Lu-177m	Y	
Lu-178	Y	
Lu-178m	Y	
Lu-179	Y	
Md-257	W	
Md-258	W	
Mg-28	W	Including:Al-28
Mn-51	W	
Mn-52	W	
Mn-52m	W	
Mn-53	W	
Mn-54	W	
Mn-56	W	
Mo-101	Y	
Mo-90	Y	
Mo-93	Y	
Mo-93m	Y	
Mo-99	Y	
N-13		
Na-22	D	
Na-24	D	
Nb-88	Y	
Nb-89a	Y	
Nb-89b	Y	
Nb-90	Y	
Nb-93m	Y	
Nb-94	Y	
Nb-95	Y	
Nb-95m	Y	
Nb-96	Y	
Nb-97	Y	
Nb-97m		
Nb-98	Y	
Nd-136	Y	
Nd-138	Y	Including:Pr-138
Nd-139	Y	
Nd-139m	Y	Including:Nd-139
Nd-141	Y	
Nd-141m		
Nd-147	Y	
Nd-149	Y	
Nd-151	Y	
Ne-19		
Ni-56	W	
Ni-57	W	
Ni-59	W	
Ni-63	W	
Ni-65	W	
Ni-66	W	Including:Cu-66
Np-232	W	
Np-233	W	
Np-234	W	
Np-235	W	

Np-236a	W	
Np-236b	W	
Np-237	W	
Np-238	W	
Np-239	W	
Np-240	W	
Np-240m		
O-15		
Os-180	Y	
Os-181	Y	
Os-182	Y	
Os-185	Y	
Os-189m	Y	
Os-190m		
Os-191	Y	
Os-191m	Y	
Os-193	Y	
Os-194	Y	
P-30		
P-32	D	
P-33	D	
Pa-227	Y	Including:Ac-223
Pa-228	Y	
Pa-230	Y	
Pa-231	Y	
Pa-232	Y	
Pa-233	Y	
Pa-234	Y	
Pa-234m		
Pb-195m	D	
Pb-198	D	
Pb-199	D	
Pb-200	D	
Pb-201	D	
Pb-202	D	
Pb-202m	D	
Pb-203	D	
Pb-205	D	
Pb-209	D	
Pb-210	D	
Pb-211	D	Including:Bi-211
Pb-212	D	Including:Bi-212
Pb-214	D	
Pd-100	Y	
Pd-101	Y	
Pd-103	Y	Including:Rh-103m
Pd-107	Y	
Pd-109	Y	
Pm-141	Y	Including:Nd-141m
Pm-142		
Pm-143	Y	
Pm-144	Y	
Pm-145	Y	
Pm-146	Y	
Pm-147	Y	
Pm-148	Y	
Pm-148m	Y	
Pm-149	Y	
Pm-150	Y	
Pm-151	Y	
Po-203	W	
Po-205	W	
Po-207	W	

Po-210	W	
Po-211		
Po-212		
Po-213		
Po-214		
Po-215		
Po-216		
Po-218		Including:At-218
Pr-136	Y	
Pr-137	Y	
Pr-138		
Pr-138m	Y	
Pr-139	Y	
Pr-142	Y	
Pr-142m	Y	
Pr-143	Y	
Pr-144	Y	
Pr-144m		
Pr-145	Y	
Pr-147	Y	
Pt-186	D	
Pt-188	D	
Pt-189	D	
Pt-191	D	
Pt-193	D	
Pt-193m	D	
Pt-195m	D	
Pt-197	D	
Pt-197m	D	
Pt-199	D	
Pt-200	D	Including:Au-200
Pu-234	Y	
Pu-235	Y	
Pu-236	Y	
Pu-237	Y	
Pu-238	Y	
Pu-239	Y	
Pu-240	Y	
Pu-241	Y	
Pu-242	Y	
Pu-243	Y	
Pu-244	Y	
Pu-245	Y	
Pu-246	Y	Including:Am-246
Ra-222		Including:Rn-218
Ra-223	W	Including:Rn-219
Ra-224	W	Including:Rn-220
Ra-225	W	
Ra-226	W	
Ra-227	W	
Ra-228	W	
Rb-79	D	
Rb-80		
Rb-81	D	
Rb-81m	D	
Rb-82		
Rb-82m	D	
Rb-83	D	
Rb-84	D	
Rb-86	D	
Rb-87	D	
Rb-88	D	
Rb-89	D	

Re-177	W	
Re-178	W	
Re-180		
Re-181	W	
Re-182a	W	
Re-182b	W	
Re-184	W	
Re-184m	W	
Re-186	W	
Re-186m	W	
Re-187	W	
Re-188	W	
Re-188m	W	
Re-189	W	
Rh-100	Y	
Rh-101	Y	
Rh-101m	Y	
Rh-102	Y	
Rh-102m	Y	
Rh-103m	Y	
Rh-105	Y	
Rh-106		
Rh-106m	Y	
Rh-107	Y	
Rh-99	Y	
Rh-99m	Y	
Rn-218		Including:Po-214
Rn-219		Including:Po-215
Rn-220		Including:Po-216
Rn-222		Including:Po-218
Ru-103	Y	Including:Rh-103m
Ru-105	Y	
Ru-106	Y	Including:Rh-106
Ru-94	Y	
Ru-97	Y	
S-35	D	
Sb-115	D	
Sb-116	D	
Sb-116m	D	
Sb-117	D	
Sb-118m	D	
Sb-119	D	
Sb-120a	D	
Sb-120b	D	
Sb-122	D	
Sb-124	D	
Sb-124m		
Sb-124n	D	Including:Sb-124m
Sb-125	D	
Sb-126	D	
Sb-126m	D	
Sb-127	D	
Sb-128a	D	
Sb-128b	D	
Sb-129	D	
Sb-130	D	
Sb-131	D	
Sc-43	Y	
Sc-44	Y	
Sc-44m	Y	
Sc-46	Y	
Sc-47	Y	
Sc-48	Y	

Sc-49	Y	
Se-70	W	
Se-73	W	
Se-73m	W	
Se-75	W	
Se-77m		
Se-79	W	
Se-81	W	
Se-81m	W	
Se-83	W	
Si-31	W	
Si-32	W	
Sm-141	W	
Sm-141m	W	
Sm-142	W	Including:Pm-142
Sm-145	W	
Sm-146	W	
Sm-147	W	
Sm-151	W	
Sm-153	W	
Sm-155	W	
Sm-156	W	
Sn-110	W	
Sn-111	W	
Sn-113	W	
Sn-117m	W	
Sn-119m	W	
Sn-121	W	
Sn-121m	W	
Sn-123	W	
Sn-123m	W	
Sn-125	W	
Sn-126	W	Including:Sb-126m
Sn-127	W	
Sn-128	W	
Sr-80	D	Including:Rb-80
Sr-81	D	
Sr-82	D	Including:Rb-82
Sr-83	D	
Sr-85	D	
Sr-85m	D	
Sr-87m	D	
Sr-89	D	
Sr-90	D	
Sr-91	D	Including:Y-91m
Sr-92	D	
Ta-172	Y	
Ta-173	Y	
Ta-174	Y	
Ta-175	Y	
Ta-176	Y	
Ta-177	Y	
Ta-178a		
Ta-178b	Y	
Ta-179	Y	
Ta-180	Y	
Ta-180m	Y	
Ta-182	Y	
Ta-182m	Y	
Ta-183	Y	
Ta-184	Y	
Ta-185	Y	
Ta-186	Y	

Tb-147	W	
Tb-149	W	
Tb-150	W	
Tb-151	W	
Tb-153	W	
Tb-154	W	
Tb-155	W	
Tb-156	W	
Tb-156m	W	
Tb-156n	W	
Tb-157	W	
Tb-158	W	
Tb-160	W	
Tb-161	W	
Tc-101	W	
Tc-104	W	
Tc-93	W	
Tc-93m	W	
Tc-94	W	
Tc-94m	W	
Tc-95	W	
Tc-95m	W	
Tc-96	W	
Tc-96m	W	
Tc-97	W	
Tc-97m	W	
Tc-98	W	
Tc-99	W	
Tc-99m	W	
Te-116	W	
Te-121	W	
Te-121m	W	
Te-123	W	
Te-123m	W	
Te-125m	W	
Te-127	W	
Te-127m	W	
Te-129	W	
Te-129m	W	Including:Te-129
Te-131	W	
Te-131m	W	Including:Te-131
Te-132	W	
Te-133	W	
Te-133m	W	
Te-134	W	
Th-226	Y	Including:Ra-222
Th-227	Y	
Th-228	Y	
Th-229	Y	
Th-230	Y	
Th-231	Y	
Th-232	Y	
Th-234	Y	Including:Pa-234m
Ti-44	Y	
Ti-45	Y	
Tl-194	D	
Tl-194m	D	
Tl-195	D	
Tl-197	D	
Tl-198	D	
Tl-198m	D	
Tl-199	D	
Tl-200	D	

Tl-201	D	
Tl-202	D	
Tl-204	D	
Tl-206		
Tl-207		
Tl-208		
Tl-209		
Tm-162	W	
Tm-166	W	
Tm-167	W	
Tm-170	W	
Tm-171	W	
Tm-172	W	
Tm-173	W	
Tm-175	W	
U-230	Y	Including:Th-226
U-231	Y	
U-232	Y	
U-233	Y	
U-234	Y	
U-235	Y	
U-236	Y	
U-237	Y	
U-238	Y	
U-239	Y	
U-240	Y	Including:Np-240m
V-47	W	
V-48	W	
V-49	W	
W-176	D	
W-177	D	
W-178	D	Including:Ta-178a
W-179	D	
W-181	D	
W-185	D	
W-187	D	
W-188	D	
Xe-120		
Xe-121		
Xe-122		Including:I-122
Xe-123		
Xe-125		
Xe-127		
Xe-129m		
Xe-131m		
Xe-133		
Xe-133m		
Xe-135		
Xe-135m		
Xe-138		
Y-86	Y	
Y-86m	Y	
Y-87	Y	
Y-88	Y	
Y-90	Y	
Y-90m	Y	
Y-91	Y	
Y-91m	Y	
Y-92	Y	
Y-93	Y	
Y-94	Y	
Y-95	Y	
Yb-162	Y	

Yb-166	Y	
Yb-167	Y	
Yb-169	Y	
Yb-175	Y	
Yb-177	Y	
Yb-178	Y	
Zn-62	Y	Including:Cu-62
Zn-63	Y	
Zn-65	Y	
Zn-69	Y	
Zn-69m	Y	Including:Zn-69
Zn-71m	Y	
Zn-72	Y	
Zr-86	W	
Zr-88	W	
Zr-89	W	
Zr-93	W	
Zr-95	W	
Zr-97	W	Including:Nb-97m , Including:Nb-97

	CLOUDSHINE	GROUND SHINE 8HR	GROUND SHINE 7DAY	GROUND SHINE RATE	INHALED ACUTE	INHALED CHRONIC	INGESTION
Ac-223							
GONADS	3.650E-16	1.649E-15	1.649E-15	8.660E-18	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.230E-16	1.674E-15	1.674E-15	8.790E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.540E-16	1.398E-15	1.398E-15	7.340E-18	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.310E-16	1.392E-15	1.392E-15	7.310E-18	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.080E-16	2.832E-15	2.832E-15	1.487E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	3.680E-16	1.447E-15	1.447E-15	7.600E-18	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.360E-16	1.383E-15	1.383E-15	7.260E-18	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.730E-16	1.541E-15	1.541E-15	8.090E-18	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.090E-16	3.912E-15	3.912E-15	2.054E-17	-1.000E+00	0.000E+00	0.000E+00
Ac-224							
GONADS	8.868E-15	2.504E-12	2.939E-12	1.951E-16	-1.000E+00	7.480E-11	6.360E-11
BREAST	1.026E-14	2.466E-12	2.893E-12	1.921E-16	-1.000E+00	5.380E-12	6.820E-12
LUNGS	8.416E-15	2.271E-12	2.665E-12	1.770E-16	-1.000E+00	2.430E-07	1.810E-12
RED MARR	7.531E-15	2.181E-12	2.559E-12	1.699E-16	-1.000E+00	3.820E-10	9.650E-11
BONE SUR	2.454E-14	5.821E-12	6.831E-12	4.535E-16	-1.000E+00	4.730E-09	1.050E-09
THYROID	8.828E-15	2.284E-12	2.680E-12	1.780E-16	-1.000E+00	2.680E-12	2.040E-13
REMAINDER	7.913E-15	2.194E-12	2.575E-12	1.709E-16	-1.000E+00	1.180E-09	2.480E-09
EFFECTIVE	9.049E-15	2.440E-12	2.862E-12	1.900E-16	-1.000E+00	2.970E-08	8.030E-10
SKIN(FGR)	1.089E-14	3.287E-12	3.857E-12	2.561E-16	-1.000E+00	0.000E+00	0.000E+00
Ac-225							
GONADS	2.138E-15	1.337E-12	2.271E-11	4.740E-17	-1.000E+00	5.200E-09	1.360E-09
BREAST	2.468E-15	1.323E-12	2.247E-11	4.690E-17	-1.000E+00	4.660E-11	2.730E-11
LUNGS	2.044E-15	1.193E-12	2.026E-11	4.230E-17	-1.000E+00	1.790E-05	3.980E-12
RED MARR	1.853E-15	1.170E-12	1.988E-11	4.150E-17	-1.000E+00	3.630E-08	7.990E-09
BONE SUR	5.550E-15	2.806E-12	4.762E-11	9.940E-17	-1.000E+00	4.530E-07	9.940E-08
THYROID	2.139E-15	1.204E-12	2.045E-11	4.270E-17	-1.000E+00	2.640E-11	5.490E-13
REMAINDER	1.922E-15	1.165E-12	1.978E-11	4.130E-17	-1.000E+00	6.140E-08	8.570E-08
EFFECTIVE	2.181E-15	1.286E-12	2.184E-11	4.560E-17	-1.000E+00	2.190E-06	3.000E-08
SKIN(FGR)	2.960E-15	1.907E-12	3.234E-11	6.750E-17	-1.000E+00	0.000E+00	0.000E+00
Ac-226							
GONADS	6.201E-15	3.544E-12	2.008E-11	1.358E-16	-1.000E+00	1.308E-09	2.302E-10
BREAST	7.129E-15	3.492E-12	1.979E-11	1.338E-16	-1.000E+00	1.507E-11	1.131E-11
LUNGS	5.946E-15	3.179E-12	1.801E-11	1.218E-16	-1.000E+00	2.485E-06	1.829E-12
RED MARR	5.446E-15	3.149E-12	1.784E-11	1.206E-16	-1.000E+00	7.991E-09	7.705E-10
BONE SUR	1.573E-14	7.080E-12	4.014E-11	2.714E-16	-1.000E+00	1.001E-07	9.465E-09
THYROID	6.200E-15	3.209E-12	1.818E-11	1.229E-16	-1.000E+00	1.007E-11	2.190E-13
REMAINDER	5.609E-15	3.098E-12	1.755E-11	1.187E-16	-1.000E+00	1.732E-08	3.749E-08
EFFECTIVE	6.327E-15	3.404E-12	1.929E-11	1.304E-16	-1.000E+00	3.078E-07	1.171E-08
SKIN(FGR)	2.203E-14	4.854E-11	2.740E-10	1.853E-15	-1.000E+00	0.000E+00	0.000E+00
Ac-227							
GONADS	3.752E-17	2.784E-14	6.158E-13	1.021E-18	-1.000E+00	3.560E-05	8.310E-07

BREAST	4.452E-17	2.869E-14	6.339E-13	1.051E-18	-1.000E+00	1.062E-08	1.730E-10
LUNGS	3.379E-17	2.185E-14	4.848E-13	8.040E-19	-1.000E+00	1.540E-03	2.520E-10
RED MARR	2.943E-17	1.997E-14	4.426E-13	7.340E-19	-1.000E+00	2.330E-04	5.400E-06
BONE SUR	1.036E-16	6.936E-14	1.539E-12	2.551E-18	-1.000E+00	2.910E-03	6.730E-05
THYROID	3.651E-17	2.276E-14	5.048E-13	8.371E-19	-1.000E+00	6.490E-09	1.075E-10
REMAINDER	3.183E-17	2.153E-14	4.774E-13	7.917E-19	-1.000E+00	1.340E-04	3.080E-06
EFFECTIVE	3.742E-17	2.551E-14	5.649E-13	9.367E-19	-1.000E+00	3.490E-04	3.800E-06
SKIN(FGR)	3.284E-16	1.032E-12	2.307E-11	3.828E-17	-1.000E+00	0.000E+00	0.000E+00
Ac-228							
GONADS	4.670E-14	1.840E-11	3.091E-11	9.710E-16	-1.000E+00	6.840E-10	1.790E-10
BREAST	5.300E-14	1.763E-11	2.961E-11	9.300E-16	-1.000E+00	1.280E-11	2.310E-11
LUNGS	4.660E-14	1.683E-11	2.827E-11	8.880E-16	-1.000E+00	2.530E-07	7.340E-12
RED MARR	4.560E-14	1.721E-11	2.891E-11	9.080E-16	-1.000E+00	4.760E-09	2.750E-10
BONE SUR	7.390E-14	2.464E-11	4.139E-11	1.300E-15	-1.000E+00	5.930E-08	3.010E-09
THYROID	4.790E-14	1.711E-11	2.875E-11	9.030E-16	-1.000E+00	7.790E-12	9.390E-13
REMAINDER	4.480E-14	1.668E-11	2.802E-11	8.800E-16	-1.000E+00	3.360E-09	1.380E-09
EFFECTIVE	4.780E-14	1.759E-11	2.955E-11	9.280E-16	-1.000E+00	3.390E-08	5.850E-10
SKIN(FGR)	7.880E-14	9.003E-11	1.512E-10	4.750E-15	-1.000E+00	0.000E+00	0.000E+00
Ag-102							
GONADS	1.630E-13	3.718E-12	3.718E-12	3.330E-15	-1.000E+00	1.710E-13	5.280E-12
BREAST	1.850E-13	3.551E-12	3.551E-12	3.180E-15	-1.000E+00	8.740E-13	2.780E-12
LUNGS	1.640E-13	3.417E-12	3.417E-12	3.060E-15	-1.000E+00	5.680E-11	2.820E-12
RED MARR	1.610E-13	3.484E-12	3.484E-12	3.120E-15	-1.000E+00	8.190E-13	2.570E-12
BONE SUR	2.540E-13	4.891E-12	4.891E-12	4.380E-15	-1.000E+00	6.410E-13	1.240E-12
THYROID	1.670E-13	3.439E-12	3.439E-12	3.080E-15	-1.000E+00	7.430E-13	2.860E-13
REMAINDER	1.570E-13	3.383E-12	3.383E-12	3.030E-15	-1.000E+00	2.300E-12	8.360E-11
EFFECTIVE	1.670E-13	3.551E-12	3.551E-12	3.180E-15	-1.000E+00	7.820E-12	2.750E-11
SKIN(FGR)	2.450E-13	1.429E-11	1.429E-11	1.280E-14	-1.000E+00	0.000E+00	0.000E+00
Ag-103							
GONADS	3.590E-14	4.414E-12	4.442E-12	7.810E-16	-1.000E+00	8.630E-13	1.480E-11
BREAST	4.100E-14	4.250E-12	4.277E-12	7.520E-16	-1.000E+00	1.200E-12	3.520E-12
LUNGS	3.560E-14	3.973E-12	3.998E-12	7.030E-16	-1.000E+00	9.310E-11	2.180E-12
RED MARR	3.440E-14	4.024E-12	4.049E-12	7.120E-16	-1.000E+00	1.240E-12	4.720E-12
BONE SUR	6.350E-14	6.329E-12	6.370E-12	1.120E-15	-1.000E+00	8.900E-13	1.810E-12
THYROID	3.660E-14	4.097E-12	4.123E-12	7.250E-16	-1.000E+00	8.880E-13	2.610E-13
REMAINDER	3.410E-14	3.905E-12	3.930E-12	6.910E-16	-1.000E+00	6.940E-12	1.170E-10
EFFECTIVE	3.680E-14	4.188E-12	4.214E-12	7.410E-16	-1.000E+00	1.390E-11	4.020E-11
SKIN(FGR)	5.840E-14	2.181E-11	2.195E-11	3.860E-15	-1.000E+00	0.000E+00	0.000E+00
Ag-104							
GONADS	1.290E-13	1.610E-11	1.623E-11	2.710E-15	-1.000E+00	3.020E-12	5.270E-11
BREAST	1.460E-13	1.539E-11	1.551E-11	2.590E-15	-1.000E+00	4.190E-12	1.250E-11
LUNGS	1.290E-13	1.467E-11	1.480E-11	2.470E-15	-1.000E+00	6.700E-11	7.680E-12
RED MARR	1.260E-13	1.503E-11	1.515E-11	2.530E-15	-1.000E+00	4.090E-12	1.550E-11
BONE SUR	2.020E-13	2.115E-11	2.132E-11	3.560E-15	-1.000E+00	2.940E-12	5.980E-12
THYROID	1.320E-13	1.503E-11	1.515E-11	2.530E-15	-1.000E+00	3.360E-12	9.260E-13
REMAINDER	1.230E-13	1.456E-11	1.468E-11	2.450E-15	-1.000E+00	1.150E-11	1.470E-10
EFFECTIVE	1.320E-13	1.533E-11	1.545E-11	2.580E-15	-1.000E+00	1.360E-11	6.220E-11
SKIN(FGR)	1.560E-13	2.359E-11	2.378E-11	3.970E-15	-1.000E+00	0.000E+00	0.000E+00
Ag-104m							
GONADS	5.670E-14	3.393E-12	3.393E-12	1.170E-15	-1.000E+00	1.020E-12	1.830E-11
BREAST	6.430E-14	3.248E-12	3.248E-12	1.120E-15	-1.000E+00	1.540E-12	4.630E-12
LUNGS	5.680E-14	3.103E-12	3.103E-12	1.070E-15	-1.000E+00	9.460E-11	2.990E-12
RED MARR	5.560E-14	3.161E-12	3.161E-12	1.090E-15	-1.000E+00	1.500E-12	5.650E-12
BONE SUR	9.140E-14	4.552E-12	4.553E-12	1.570E-15	-1.000E+00	1.090E-12	2.210E-12
THYROID	5.820E-14	3.161E-12	3.161E-12	1.090E-15	-1.000E+00	1.210E-12	3.580E-13
REMAINDER	5.460E-14	3.074E-12	3.074E-12	1.060E-15	-1.000E+00	5.930E-12	1.300E-10
EFFECTIVE	5.820E-14	3.248E-12	3.248E-12	1.120E-15	-1.000E+00	1.390E-11	4.550E-11
SKIN(FGR)	1.000E-13	1.989E-11	1.989E-11	6.860E-15	-1.000E+00	0.000E+00	0.000E+00
Ag-105							
GONADS	2.400E-14	1.565E-11	3.109E-10	5.450E-16	-1.000E+00	3.400E-10	6.430E-10
BREAST	2.750E-14	1.522E-11	3.023E-10	5.300E-16	-1.000E+00	3.530E-10	1.110E-10
LUNGS	2.360E-14	1.373E-11	2.726E-10	4.780E-16	-1.000E+00	6.230E-09	9.560E-11
RED MARR	2.260E-14	1.387E-11	2.755E-10	4.830E-16	-1.000E+00	3.820E-10	1.770E-10

BONE SUR	4.540E-14	2.312E-11	4.592E-10	8.050E-16-1.000E+00	2.740E-10	7.950E-11
THYROID	2.440E-14	1.433E-11	2.846E-10	4.990E-16-1.000E+00	2.390E-10	2.000E-11
REMAINDER	2.250E-14	1.347E-11	2.675E-10	4.690E-16-1.000E+00	8.920E-10	1.130E-09
EFFECTIVE	2.450E-14	1.468E-11	2.915E-10	5.110E-16-1.000E+00	1.210E-09	5.520E-10
SKIN(FGR)	2.900E-14	1.924E-11	3.822E-10	6.700E-16-1.000E+00	0.000E+00	0.000E+00
Ag-106						
GONADS	3.320E-14	1.541E-12	1.541E-12	7.430E-16-1.000E+00	1.030E-13	3.010E-12
BREAST	3.800E-14	1.483E-12	1.483E-12	7.150E-16-1.000E+00	3.840E-13	1.180E-12
LUNGS	3.290E-14	1.390E-12	1.390E-12	6.700E-16-1.000E+00	5.860E-11	1.060E-12
RED MARR	3.170E-14	1.404E-12	1.404E-12	6.770E-16-1.000E+00	3.630E-13	1.270E-12
BONE SUR	5.840E-14	2.136E-12	2.136E-12	1.030E-15-1.000E+00	2.820E-13	5.460E-13
THYROID	3.380E-14	1.456E-12	1.456E-12	7.020E-16-1.000E+00	3.250E-13	9.840E-14
REMAINDER	3.140E-14	1.363E-12	1.363E-12	6.570E-16-1.000E+00	1.780E-12	7.200E-11
EFFECTIVE	3.390E-14	1.460E-12	1.460E-12	7.040E-16-1.000E+00	7.710E-12	2.280E-11
SKIN(FGR)	7.270E-14	1.444E-11	1.444E-11	6.960E-15-1.000E+00	0.000E+00	0.000E+00
Ag-106m						
GONADS	1.350E-13	8.096E-11	1.310E-09	2.850E-15-1.000E+00	1.210E-09	2.590E-09
BREAST	1.540E-13	7.755E-11	1.255E-09	2.730E-15-1.000E+00	5.180E-10	3.840E-10
LUNGS	1.350E-13	7.386E-11	1.195E-09	2.600E-15-1.000E+00	4.230E-09	1.920E-10
RED MARR	1.320E-13	7.528E-11	1.218E-09	2.650E-15-1.000E+00	5.850E-10	5.830E-10
BONE SUR	2.140E-13	1.074E-10	1.737E-09	3.780E-15-1.000E+00	3.580E-10	2.290E-10
THYROID	1.380E-13	7.557E-11	1.222E-09	2.660E-15-1.000E+00	3.270E-10	3.920E-11
REMAINDER	1.300E-13	7.301E-11	1.181E-09	2.570E-15-1.000E+00	1.710E-09	3.150E-09
EFFECTIVE	1.380E-13	7.727E-11	1.250E-09	2.720E-15-1.000E+00	1.490E-09	1.750E-09
SKIN(FGR)	1.580E-13	9.431E-11	1.526E-09	3.320E-15-1.000E+00	0.000E+00	0.000E+00
Ag-108						
GONADS	9.100E-16	4.349E-15	4.349E-15	2.120E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	1.040E-15	4.206E-15	4.206E-15	2.050E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	8.960E-16	3.836E-15	3.836E-15	1.870E-17-1.000E+00	0.000E+00	0.000E+00
RED MARR	8.630E-16	3.857E-15	3.857E-15	1.880E-17-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.610E-15	6.339E-15	6.339E-15	3.090E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	9.250E-16	4.041E-15	4.041E-15	1.970E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	8.560E-16	3.775E-15	3.775E-15	1.840E-17-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	9.280E-16	4.083E-15	4.083E-15	1.990E-17-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.000E-14	1.450E-12	1.450E-12	7.070E-15-1.000E+00	0.000E+00	0.000E+00
Ag-108m						
GONADS	7.638E-14	4.844E-11	1.017E-09	1.682E-15-1.000E+00	3.790E-09	1.930E-09
BREAST	8.719E-14	4.671E-11	9.808E-10	1.622E-15-1.000E+00	2.240E-08	5.140E-10
LUNGS	7.578E-14	4.382E-11	9.203E-10	1.522E-15-1.000E+00	4.560E-07	6.030E-10
RED MARR	7.348E-14	4.440E-11	9.324E-10	1.542E-15-1.000E+00	2.140E-08	6.630E-10
BONE SUR	1.291E-13	6.632E-11	1.393E-09	2.303E-15-1.000E+00	1.680E-08	3.550E-10
THYROID	7.788E-14	4.584E-11	9.626E-10	1.592E-15-1.000E+00	2.010E-08	1.300E-10
REMAINDER	7.248E-14	4.296E-11	9.021E-10	1.492E-15-1.000E+00	4.630E-08	4.440E-09
EFFECTIVE	7.808E-14	4.613E-11	9.687E-10	1.602E-15-1.000E+00	7.660E-08	2.060E-09
SKIN(FGR)	9.406E-14	7.559E-11	1.590E-09	2.629E-15-1.000E+00	0.000E+00	0.000E+00
Ag-109m						
GONADS	2.130E-16	8.113E-16	8.113E-16	1.420E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	2.850E-16	8.970E-16	8.970E-16	1.570E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.400E-16	2.582E-16	2.582E-16	4.520E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.230E-16	2.588E-16	2.588E-16	4.530E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.720E-16	1.348E-15	1.348E-15	2.360E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	1.880E-16	4.325E-16	4.325E-16	7.570E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.400E-16	3.399E-16	3.399E-16	5.950E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.920E-16	5.547E-16	5.547E-16	9.710E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.590E-16	1.874E-15	1.874E-15	3.280E-17-1.000E+00	0.000E+00	0.000E+00
Ag-110						
GONADS	1.750E-15	1.434E-15	1.434E-15	4.040E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	2.000E-15	1.381E-15	1.381E-15	3.890E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.730E-15	1.285E-15	1.285E-15	3.620E-17-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.670E-15	1.292E-15	1.292E-15	3.640E-17-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.050E-15	2.101E-15	2.101E-15	5.920E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	1.780E-15	1.342E-15	1.342E-15	3.780E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.650E-15	1.260E-15	1.260E-15	3.550E-17-1.000E+00	0.000E+00	0.000E+00

EFFECTIVE	1.780E-15	1.356E-15	1.356E-15	3.820E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.220E-14	4.507E-13	4.507E-13	1.270E-14	-1.000E+00	0.000E+00	0.000E+00
Ag-110m							
GONADS	1.330E-13	7.975E-11	1.659E-09	2.771E-15	-1.000E+00	2.430E-09	2.990E-09
BREAST	1.510E-13	7.630E-11	1.588E-09	2.651E-15	-1.000E+00	7.100E-09	7.510E-10
LUNGS	1.330E-13	7.313E-11	1.522E-09	2.540E-15	-1.000E+00	1.200E-07	8.300E-10
RED MARR	1.300E-13	7.486E-11	1.558E-09	2.600E-15	-1.000E+00	6.740E-09	9.420E-10
BONE SUR	2.050E-13	1.042E-10	2.169E-09	3.621E-15	-1.000E+00	5.190E-09	4.930E-10
THYROID	1.360E-13	7.515E-11	1.564E-09	2.611E-15	-1.000E+00	6.390E-09	1.810E-10
REMAINDER	1.270E-13	7.256E-11	1.510E-09	2.520E-15	-1.000E+00	1.510E-08	6.080E-09
EFFECTIVE	1.360E-13	7.630E-11	1.588E-09	2.651E-15	-1.000E+00	2.170E-08	2.920E-09
SKIN(FGR)	1.581E-13	9.755E-11	2.030E-09	3.389E-15	-1.000E+00	0.000E+00	0.000E+00
Ag-111							
GONADS	1.260E-15	7.969E-13	1.249E-11	2.810E-17	-1.000E+00	1.690E-11	3.580E-11
BREAST	1.440E-15	7.713E-13	1.209E-11	2.720E-17	-1.000E+00	8.470E-12	1.090E-11
LUNGS	1.230E-15	7.203E-13	1.129E-11	2.540E-17	-1.000E+00	8.700E-09	8.840E-12
RED MARR	1.170E-15	7.203E-13	1.129E-11	2.540E-17	-1.000E+00	9.920E-12	1.380E-11
BONE SUR	2.590E-15	1.256E-12	1.969E-11	4.430E-17	-1.000E+00	7.410E-12	9.670E-12
THYROID	1.270E-15	7.401E-13	1.160E-11	2.610E-17	-1.000E+00	6.190E-12	7.480E-12
REMAINDER	1.170E-15	7.004E-13	1.098E-11	2.470E-17	-1.000E+00	2.030E-09	4.510E-09
EFFECTIVE	1.290E-15	7.572E-13	1.187E-11	2.670E-17	-1.000E+00	1.660E-09	1.370E-09
SKIN(FGR)	2.190E-14	7.798E-11	1.222E-09	2.750E-15	-1.000E+00	0.000E+00	0.000E+00
Ag-112							
GONADS	3.250E-14	8.886E-12	1.069E-11	6.600E-16	-1.000E+00	5.270E-12	4.440E-11
BREAST	3.680E-14	8.496E-12	1.022E-11	6.310E-16	-1.000E+00	3.240E-12	8.890E-12
LUNGS	3.270E-14	8.186E-12	9.852E-12	6.080E-16	-1.000E+00	1.080E-09	4.300E-12
RED MARR	3.220E-14	8.375E-12	1.008E-11	6.220E-16	-1.000E+00	3.440E-12	1.190E-11
BONE SUR	4.980E-14	1.165E-11	1.402E-11	8.650E-16	-1.000E+00	2.260E-12	4.860E-12
THYROID	3.340E-14	8.200E-12	9.868E-12	6.090E-16	-1.000E+00	2.140E-12	1.370E-12
REMAINDER	3.150E-14	8.119E-12	9.771E-12	6.030E-16	-1.000E+00	1.560E-10	1.420E-09
EFFECTIVE	3.340E-14	8.523E-12	1.026E-11	6.330E-16	-1.000E+00	1.790E-10	4.410E-10
SKIN(FGR)	1.330E-13	1.858E-10	2.236E-10	1.380E-14	-1.000E+00	0.000E+00	0.000E+00
Ag-115							
GONADS	3.510E-14	1.188E-12	1.188E-12	6.860E-16	-1.000E+00	8.360E-13	3.930E-12
BREAST	3.970E-14	1.139E-12	1.139E-12	6.580E-16	-1.000E+00	4.790E-13	1.130E-12
LUNGS	3.530E-14	1.101E-12	1.101E-12	6.360E-16	-1.000E+00	1.220E-10	8.880E-13
RED MARR	3.470E-14	1.125E-12	1.125E-12	6.500E-16	-1.000E+00	5.420E-13	1.340E-12
BONE SUR	5.570E-14	1.622E-12	1.622E-12	9.370E-16	-1.000E+00	3.580E-13	5.830E-13
THYROID	3.610E-14	1.072E-12	1.072E-12	6.190E-16	-1.000E+00	3.100E-13	1.290E-13
REMAINDER	3.410E-14	1.094E-12	1.094E-12	6.320E-16	-1.000E+00	1.320E-11	1.390E-10
EFFECTIVE	3.610E-14	1.144E-12	1.144E-12	6.610E-16	-1.000E+00	1.900E-11	4.310E-11
SKIN(FGR)	1.110E-13	1.991E-11	1.991E-11	1.150E-14	-1.000E+00	0.000E+00	0.000E+00
Al-26							
GONADS	1.320E-13	7.430E-11	1.560E-09	2.580E-15	-1.000E+00	1.870E-08	3.010E-09
BREAST	1.490E-13	7.114E-11	1.494E-09	2.470E-15	-1.000E+00	1.560E-08	6.450E-10
LUNGS	1.330E-13	6.912E-11	1.452E-09	2.400E-15	-1.000E+00	1.670E-08	3.760E-10
RED MARR	1.320E-13	7.085E-11	1.488E-09	2.460E-15	-1.000E+00	3.980E-08	1.350E-09
BONE SUR	1.970E-13	9.619E-11	2.020E-09	3.340E-15	-1.000E+00	3.790E-08	9.710E-10
THYROID	1.360E-13	6.710E-11	1.409E-09	2.330E-15	-1.000E+00	1.440E-08	3.120E-10
REMAINDER	1.290E-13	6.883E-11	1.445E-09	2.390E-15	-1.000E+00	2.040E-08	9.470E-09
EFFECTIVE	1.360E-13	7.171E-11	1.506E-09	2.490E-15	-1.000E+00	2.150E-08	3.940E-09
SKIN(FGR)	1.810E-13	2.269E-10	4.766E-09	7.880E-15	-1.000E+00	0.000E+00	0.000E+00
Al-28							
GONADS	8.970E-14	3.238E-13	3.238E-13	1.670E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.010E-13	3.083E-13	3.083E-13	1.590E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	9.150E-14	3.044E-13	3.044E-13	1.570E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	9.130E-14	3.122E-13	3.122E-13	1.610E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.240E-13	4.033E-13	4.033E-13	2.080E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	9.280E-14	2.831E-13	2.831E-13	1.460E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	8.900E-14	3.044E-13	3.044E-13	1.570E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	9.280E-14	3.141E-13	3.141E-13	1.620E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.880E-13	2.928E-12	2.928E-12	1.510E-14	-1.000E+00	0.000E+00	0.000E+00
Am-237							

GONADS	1.670E-14	2.326E-12	2.351E-12	3.720E-16	-1.000E+00	7.070E-13	9.460E-12
BREAST	1.920E-14	2.270E-12	2.294E-12	3.630E-16	-1.000E+00	8.150E-13	1.960E-12
LUNGS	1.620E-14	2.070E-12	2.092E-12	3.310E-16	-1.000E+00	4.160E-11	1.070E-12
RED MARR	1.510E-14	2.057E-12	2.079E-12	3.290E-16	-1.000E+00	1.330E-12	3.420E-12
BONE SUR	3.780E-14	4.208E-12	4.253E-12	6.730E-16	-1.000E+00	3.740E-12	1.210E-12
THYROID	1.680E-14	2.132E-12	2.155E-12	3.410E-16	-1.000E+00	5.770E-13	7.970E-14
REMAINDER	1.530E-14	2.026E-12	2.047E-12	3.240E-16	-1.000E+00	2.970E-12	4.840E-11
EFFECTIVE	1.700E-14	2.213E-12	2.237E-12	3.540E-16	-1.000E+00	6.470E-12	1.780E-11
SKIN(FGR)	2.140E-14	3.089E-12	3.122E-12	4.940E-16	-1.000E+00	0.000E+00	0.000E+00
Am-238							
GONADS	4.240E-14	7.297E-12	7.550E-12	8.900E-16	-1.000E+00	6.150E-11	2.920E-11
BREAST	4.820E-14	7.002E-12	7.245E-12	8.540E-16	-1.000E+00	2.200E-12	5.930E-12
LUNGS	4.210E-14	6.633E-12	6.863E-12	8.090E-16	-1.000E+00	7.800E-11	3.070E-12
RED MARR	4.100E-14	6.756E-12	6.990E-12	8.240E-16	-1.000E+00	3.260E-10	1.110E-11
BONE SUR	7.050E-14	1.041E-11	1.077E-11	1.270E-15	-1.000E+00	4.050E-09	3.660E-11
THYROID	4.340E-14	6.780E-12	7.015E-12	8.270E-16	-1.000E+00	1.800E-12	3.330E-13
REMAINDER	4.040E-14	6.575E-12	6.803E-12	8.020E-16	-1.000E+00	1.550E-10	8.190E-11
EFFECTIVE	4.330E-14	6.969E-12	7.211E-12	8.500E-16	-1.000E+00	2.320E-10	3.560E-11
SKIN(FGR)	5.090E-14	1.074E-11	1.111E-11	1.310E-15	-1.000E+00	0.000E+00	0.000E+00
Am-239							
GONADS	1.020E-14	5.387E-12	1.446E-11	2.340E-16	-1.000E+00	2.260E-11	9.160E-11
BREAST	1.180E-14	5.341E-12	1.434E-11	2.320E-16	-1.000E+00	6.220E-12	1.070E-11
LUNGS	9.620E-15	4.650E-12	1.248E-11	2.020E-16	-1.000E+00	4.750E-10	2.050E-12
RED MARR	8.600E-15	4.489E-12	1.205E-11	1.950E-16	-1.000E+00	2.740E-11	2.830E-11
BONE SUR	2.830E-14	1.218E-11	3.269E-11	5.290E-16	-1.000E+00	1.900E-10	1.060E-11
THYROID	1.010E-14	4.765E-12	1.279E-11	2.070E-16	-1.000E+00	2.870E-12	1.370E-13
REMAINDER	9.040E-15	4.535E-12	1.217E-11	1.970E-16	-1.000E+00	1.720E-10	7.940E-10
EFFECTIVE	1.040E-14	5.111E-12	1.372E-11	2.220E-16	-1.000E+00	1.240E-10	2.670E-10
SKIN(FGR)	1.560E-14	7.804E-12	2.095E-11	3.390E-16	-1.000E+00	0.000E+00	0.000E+00
Am-240							
GONADS	4.900E-14	2.810E-11	2.443E-10	1.030E-15	-1.000E+00	2.800E-10	7.160E-10
BREAST	5.560E-14	2.698E-11	2.346E-10	9.890E-16	-1.000E+00	7.670E-11	9.060E-11
LUNGS	4.870E-14	2.551E-11	2.218E-10	9.350E-16	-1.000E+00	1.060E-09	1.860E-11
RED MARR	4.750E-14	2.608E-11	2.267E-10	9.560E-16	-1.000E+00	2.710E-10	1.550E-10
BONE SUR	7.840E-14	3.874E-11	3.368E-10	1.420E-15	-1.000E+00	2.100E-09	6.950E-11
THYROID	5.020E-14	2.630E-11	2.286E-10	9.640E-16	-1.000E+00	4.240E-11	2.590E-12
REMAINDER	4.660E-14	2.537E-11	2.206E-10	9.300E-16	-1.000E+00	6.340E-10	1.560E-09
EFFECTIVE	5.000E-14	2.685E-11	2.334E-10	9.840E-16	-1.000E+00	4.960E-10	6.830E-10
SKIN(FGR)	5.790E-14	3.792E-11	3.297E-10	1.390E-15	-1.000E+00	0.000E+00	0.000E+00
Am-241							
GONADS	8.580E-16	9.360E-13	1.966E-11	3.250E-17	-1.000E+00	3.250E-05	2.700E-07
BREAST	1.070E-15	1.014E-12	2.129E-11	3.520E-17	-1.000E+00	2.670E-09	2.620E-11
LUNGS	6.740E-16	5.789E-13	1.216E-11	2.010E-17	-1.000E+00	1.840E-05	3.360E-11
RED MARR	5.210E-16	4.838E-13	1.016E-11	1.680E-17	-1.000E+00	1.740E-04	1.450E-06
BONE SUR	2.870E-15	2.678E-12	5.625E-11	9.300E-17	-1.000E+00	2.170E-03	1.810E-05
THYROID	7.830E-16	6.365E-13	1.337E-11	2.210E-17	-1.000E+00	1.600E-09	1.320E-11
REMAINDER	6.340E-16	5.933E-13	1.246E-11	2.060E-17	-1.000E+00	7.820E-05	6.660E-07
EFFECTIVE	8.180E-16	7.920E-13	1.663E-11	2.750E-17	-1.000E+00	1.200E-04	9.840E-07
SKIN(FGR)	1.280E-15	2.396E-12	5.032E-11	8.320E-17	-1.000E+00	0.000E+00	0.000E+00
Am-242							
GONADS	6.090E-16	4.431E-13	1.513E-12	1.820E-17	-1.000E+00	1.940E-09	2.740E-11
BREAST	7.300E-16	4.650E-13	1.588E-12	1.910E-17	-1.000E+00	2.940E-12	9.380E-13
LUNGS	5.510E-16	2.970E-13	1.014E-12	1.220E-17	-1.000E+00	5.200E-08	1.580E-13
RED MARR	4.770E-16	2.873E-13	9.811E-13	1.180E-17	-1.000E+00	1.320E-08	1.240E-10
BONE SUR	1.880E-15	9.932E-13	3.392E-12	4.080E-17	-1.000E+00	1.650E-07	1.520E-09
THYROID	5.940E-16	3.286E-13	1.122E-12	1.350E-17	-1.000E+00	2.520E-12	2.610E-14
REMAINDER	5.180E-16	3.043E-13	1.039E-12	1.250E-17	-1.000E+00	8.540E-09	1.050E-09
EFFECTIVE	6.150E-16	3.822E-13	1.305E-12	1.570E-17	-1.000E+00	1.580E-08	3.810E-10
SKIN(FGR)	8.200E-15	6.208E-12	2.120E-11	2.550E-16	-1.000E+00	0.000E+00	0.000E+00
Am-242m							
GONADS	3.800E-17	1.463E-13	3.072E-12	5.080E-18	-1.000E+00	3.210E-05	2.660E-07
BREAST	6.010E-17	1.788E-13	3.756E-12	6.210E-18	-1.000E+00	1.380E-09	1.220E-11
LUNGS	1.720E-17	1.884E-14	3.955E-13	6.540E-19	-1.000E+00	4.200E-06	1.650E-11

RED MARR	1.720E-17	2.710E-14	5.691E-13	9.410E-19	-1.000E+00	1.690E-04	1.410E-06
BONE SUR	7.940E-17	1.529E-13	3.211E-12	5.310E-18	-1.000E+00	2.120E-03	1.760E-05
THYROID	2.950E-17	4.723E-14	9.918E-13	1.640E-18	-1.000E+00	5.640E-10	3.770E-12
REMAINDER	1.940E-17	3.974E-14	8.346E-13	1.380E-18	-1.000E+00	7.480E-05	6.200E-07
EFFECTIVE	3.170E-17	8.698E-14	1.826E-12	3.020E-18	-1.000E+00	1.150E-04	9.500E-07
SKIN(FGR)	1.360E-16	6.941E-13	1.458E-11	2.410E-17	-1.000E+00	0.000E+00	0.000E+00
Am-243							
GONADS	2.190E-15	1.581E-12	3.320E-11	5.490E-17	-1.000E+00	3.260E-05	2.710E-07
BREAST	2.610E-15	1.596E-12	3.351E-11	5.540E-17	-1.000E+00	1.520E-08	1.410E-10
LUNGS	1.920E-15	1.371E-12	2.879E-11	4.760E-17	-1.000E+00	1.780E-05	1.950E-10
RED MARR	1.550E-15	1.189E-12	2.498E-11	4.130E-17	-1.000E+00	1.730E-04	1.440E-06
BONE SUR	7.470E-15	5.357E-12	1.125E-10	1.860E-16	-1.000E+00	2.170E-03	1.800E-05
THYROID	2.090E-15	1.377E-12	2.891E-11	4.780E-17	-1.000E+00	8.290E-09	6.800E-11
REMAINDER	1.790E-15	1.325E-12	2.782E-11	4.600E-17	-1.000E+00	7.740E-05	6.610E-07
EFFECTIVE	2.180E-15	1.541E-12	3.236E-11	5.350E-17	-1.000E+00	1.190E-04	9.790E-07
SKIN(FGR)	2.750E-15	2.189E-12	4.596E-11	7.600E-17	-1.000E+00	0.000E+00	0.000E+00
Am-244							
GONADS	3.770E-14	1.826E-11	4.322E-11	8.240E-16	-1.000E+00	1.060E-09	2.240E-10
BREAST	4.300E-14	1.757E-11	4.160E-11	7.930E-16	-1.000E+00	1.600E-11	2.970E-11
LUNGS	3.740E-14	1.629E-11	3.856E-11	7.350E-16	-1.000E+00	2.010E-09	7.810E-12
RED MARR	3.650E-14	1.664E-11	3.939E-11	7.510E-16	-1.000E+00	6.000E-09	9.720E-11
BONE SUR	6.170E-14	2.482E-11	5.875E-11	1.120E-15	-1.000E+00	7.470E-08	6.380E-10
THYROID	3.860E-14	1.702E-11	4.029E-11	7.680E-16	-1.000E+00	9.670E-12	9.830E-13
REMAINDER	3.580E-14	1.616E-11	3.824E-11	7.290E-16	-1.000E+00	3.340E-09	1.490E-09
EFFECTIVE	3.850E-14	1.726E-11	4.086E-11	7.790E-16	-1.000E+00	4.470E-09	5.380E-10
SKIN(FGR)	5.250E-14	3.479E-11	8.236E-11	1.570E-15	-1.000E+00	0.000E+00	0.000E+00
Am-244m							
GONADS	6.380E-17	7.832E-15	7.832E-15	3.480E-18	-1.000E+00	4.360E-11	3.710E-13
BREAST	8.040E-17	8.687E-15	8.687E-15	3.860E-18	-1.000E+00	1.150E-13	1.890E-15
LUNGS	5.160E-17	3.556E-15	3.556E-15	1.580E-18	-1.000E+00	1.080E-10	8.090E-16
RED MARR	4.690E-17	3.578E-15	3.578E-15	1.590E-18	-1.000E+00	2.560E-10	2.140E-12
BONE SUR	1.560E-16	1.287E-14	1.287E-14	5.720E-18	-1.000E+00	3.200E-09	2.670E-11
THYROID	5.970E-17	4.591E-15	4.591E-15	2.040E-18	-1.000E+00	1.130E-13	1.500E-16
REMAINDER	5.000E-17	4.096E-15	4.096E-15	1.820E-18	-1.000E+00	1.310E-10	6.610E-11
EFFECTIVE	6.130E-17	5.874E-15	5.874E-15	2.610E-18	-1.000E+00	1.900E-10	2.100E-11
SKIN(FGR)	3.110E-14	1.202E-11	1.202E-11	5.340E-15	-1.000E+00	0.000E+00	0.000E+00
Am-245							
GONADS	1.430E-15	3.249E-13	3.482E-13	3.270E-17	-1.000E+00	1.310E-12	1.160E-13
BREAST	1.660E-15	3.209E-13	3.439E-13	3.230E-17	-1.000E+00	3.040E-13	1.930E-14
LUNGS	1.370E-15	2.822E-13	3.024E-13	2.840E-17	-1.000E+00	1.250E-10	8.810E-15
RED MARR	1.240E-15	2.762E-13	2.960E-13	2.780E-17	-1.000E+00	5.660E-12	8.210E-14
BONE SUR	3.750E-15	6.766E-13	7.251E-13	6.810E-17	-1.000E+00	6.220E-11	5.230E-13
THYROID	1.430E-15	2.901E-13	3.109E-13	2.920E-17	-1.000E+00	3.010E-13	1.980E-15
REMAINDER	1.290E-15	2.762E-13	2.960E-13	2.780E-17	-1.000E+00	1.280E-11	1.630E-10
EFFECTIVE	1.460E-15	3.080E-13	3.301E-13	3.100E-17	-1.000E+00	2.180E-11	4.880E-11
SKIN(FGR)	1.620E-14	1.242E-11	1.331E-11	1.250E-15	-1.000E+00	0.000E+00	0.000E-00
Am-246							
GONADS	3.210E-14	2.420E-12	2.421E-12	7.170E-16	-1.000E+00	1.090E-12	6.770E-12
BREAST	3.670E-14	2.342E-12	2.343E-12	6.940E-16	-1.000E+00	8.930E-13	1.870E-12
LUNGS	3.160E-14	2.137E-12	2.137E-12	6.330E-16	-1.000E+00	1.120E-10	1.370E-12
RED MARR	3.040E-14	2.167E-12	2.167E-12	6.420E-16	-1.000E+00	3.830E-12	2.390E-12
BONE SUR	5.820E-14	3.510E-12	3.511E-12	1.040E-15	-1.000E+00	3.630E-11	1.220E-12
THYROID	3.260E-14	2.231E-12	2.231E-12	6.610E-16	-1.000E+00	7.750E-13	1.230E-13
REMAINDER	3.020E-14	2.106E-12	2.107E-12	6.240E-16	-1.000E+00	5.450E-12	1.430E-10
EFFECTIVE	3.280E-14	2.275E-12	2.275E-12	6.740E-16	-1.000E+00	1.710E-11	4.540E-11
SKIN(FGR)	6.420E-14	1.323E-11	1.323E-11	3.920E-15	-1.000E+00	0.000E+00	0.000E-00
Am-246m							
GONADS	4.920E-14	2.207E-12	2.207E-12	1.020E-15	-1.000E+00	6.520E-13	5.120E-12
BREAST	5.580E-14	2.112E-12	2.112E-12	9.760E-16	-1.000E+00	6.630E-13	1.680E-12
LUNGS	4.920E-14	2.017E-12	2.017E-12	9.320E-16	-1.000E+00	5.780E-11	1.430E-12
RED MARR	4.830E-14	2.071E-12	2.071E-12	9.570E-16	-1.000E+00	2.430E-12	1.750E-12
BONE SUR	7.460E-14	2.878E-12	2.878E-12	1.330E-15	-1.000E+00	2.240E-11	9.380E-13
THYROID	5.050E-14	2.062E-12	2.062E-12	9.530E-16	-1.000E+00	6.380E-13	1.500E-13

REMAINDER	4.720E-14	2.006E-12	2.006E-12	9.270E-16	-1.000E+00	2.800E-12	7.830E-11
EFFECTIVE	5.030E-14	2.110E-12	2.110E-12	9.750E-16	-1.000E+00	9.020E-12	2.540E-11
SKIN(FGR)	8.560E-14	1.238E-11	1.238E-11	5.720E-15	-1.000E+00	0.000E+00	0.000E+00
Ar-37							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.060E-18	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.270E-19	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Ar-39							
GONADS	9.380E-18	1.135E-14	2.383E-13	3.940E-19	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.140E-17	1.187E-14	2.492E-13	4.120E-19	-1.000E+00	0.000E+00	0.000E+00
LUNGS	7.820E-18	7.574E-15	1.591E-13	2.630E-19	-1.000E+00	0.000E+00	0.000E+00
RED MARR	6.630E-18	6.682E-15	1.403E-13	2.320E-19	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.740E-17	2.828E-14	5.939E-13	9.820E-19	-1.000E+00	0.000E+00	0.000E+00
THYROID	8.870E-18	8.554E-15	1.796E-13	2.970E-19	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	7.420E-18	7.690E-15	1.615E-13	2.670E-19	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	9.100E-18	9.734E-15	2.044E-13	3.380E-19	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.070E-14	6.451E-12	1.355E-10	2.240E-16	-1.000E+00	0.000E+00	0.000E+00
Ar-41							
GONADS	6.330E-14	1.129E-11	1.186E-11	1.250E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	7.160E-14	1.075E-11	1.129E-11	1.190E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	6.380E-14	1.048E-11	1.101E-11	1.160E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	6.320E-14	1.084E-11	1.139E-11	1.200E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.080E-14	1.436E-11	1.509E-11	1.590E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	6.520E-14	1.039E-11	1.091E-11	1.150E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	6.160E-14	1.048E-11	1.101E-11	1.160E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	6.500E-14	1.084E-11	1.139E-11	1.200E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.010E-13	5.456E-11	5.731E-11	6.040E-15	-1.000E+00	0.000E+00	0.000E+00
As-69							
GONADS	4.770E-14	1.395E-12	1.395E-12	1.060E-15	-1.000E+00	9.990E-13	4.260E-12
BREAST	5.460E-14	1.342E-12	1.342E-12	1.020E-15	-1.000E+00	8.740E-13	1.710E-12
LUNGS	4.740E-14	1.271E-12	1.271E-12	9.660E-16	-1.000E+00	9.520E-11	1.560E-12
RED MARR	4.560E-14	1.282E-12	1.282E-12	9.740E-16	-1.000E+00	9.080E-13	1.860E-12
BONE SUR	8.510E-14	1.960E-12	1.960E-12	1.490E-15	-1.000E+00	7.180E-13	1.030E-12
THYROID	4.860E-14	1.329E-12	1.329E-12	1.010E-15	-1.000E+00	7.470E-13	5.220E-13
REMAINDER	4.520E-14	1.243E-12	1.243E-12	9.450E-16	-1.000E+00	4.030E-12	1.150E-10
EFFECTIVE	4.890E-14	1.329E-12	1.329E-12	1.010E-15	-1.000E+00	1.320E-11	3.620E-11
SKIN(FGR)	1.430E-13	1.921E-11	1.921E-11	1.460E-14	-1.000E+00	0.000E+00	0.000E+00
As-70							
GONADS	1.990E-13	1.850E-11	1.853E-11	4.070E-15	-1.000E+00	3.180E-12	4.680E-11
BREAST	2.260E-13	1.768E-11	1.771E-11	3.890E-15	-1.000E+00	5.360E-12	1.500E-11
LUNGS	2.000E-13	1.704E-11	1.707E-11	3.750E-15	-1.000E+00	2.250E-10	1.150E-11
RED MARR	1.970E-13	1.741E-11	1.744E-11	3.830E-15	-1.000E+00	5.260E-12	1.680E-11
BONE SUR	3.060E-13	2.418E-11	2.422E-11	5.320E-15	-1.000E+00	4.200E-12	8.190E-12
THYROID	2.050E-13	1.713E-11	1.717E-11	3.770E-15	-1.000E+00	4.700E-12	3.370E-12
REMAINDER	1.920E-13	1.686E-11	1.689E-11	3.710E-15	-1.000E+00	1.550E-11	3.190E-10
EFFECTIVE	2.040E-13	1.773E-11	1.776E-11	3.900E-15	-1.000E+00	3.420E-11	1.130E-10
SKIN(FGR)	2.890E-13	6.681E-11	6.693E-11	1.470E-14	-1.000E+00	0.000E+00	0.000E+00
As-71							
GONADS	2.680E-14	1.604E-11	1.631E-10	5.810E-16	-1.000E+00	1.160E-10	3.060E-10
BREAST	3.060E-14	1.546E-11	1.572E-10	5.600E-16	-1.000E+00	6.000E-11	7.910E-11
LUNGS	2.640E-14	1.466E-11	1.491E-10	5.310E-16	-1.000E+00	1.530E-09	5.840E-11
RED MARR	2.520E-14	1.474E-11	1.499E-10	5.340E-16	-1.000E+00	7.320E-11	1.120E-10
BONE SUR	5.240E-14	2.490E-11	2.532E-10	9.020E-16	-1.000E+00	5.260E-11	7.030E-11
THYROID	2.720E-14	1.507E-11	1.533E-10	5.460E-16	-1.000E+00	4.440E-11	4.700E-11
REMAINDER	2.510E-14	1.430E-11	1.454E-10	5.180E-16	-1.000E+00	3.680E-10	9.820E-10
EFFECTIVE	2.740E-14	1.535E-11	1.561E-10	5.560E-16	-1.000E+00	3.440E-10	4.070E-10
SKIN(FGR)	3.780E-14	3.367E-11	3.425E-10	1.220E-15	-1.000E+00	0.000E+00	0.000E+00

As-72						
GONADS	8.580E-14	4.772E-11	2.456E-10	1.840E-15-1.000E+00	2.010E-10	6.400E-10
BREAST	9.770E-14	4.565E-11	2.350E-10	1.760E-15-1.000E+00	1.090E-10	1.940E-10
LUNGS	8.550E-14	4.357E-11	2.243E-10	1.680E-15-1.000E+00	5.110E-09	1.480E-10
RED MARR	8.330E-14	4.435E-11	2.283E-10	1.710E-15-1.000E+00	1.200E-10	2.380E-10
BONE SUR	1.410E-13	6.406E-11	3.298E-10	2.470E-15-1.000E+00	9.130E-11	1.630E-10
THYROID	8.780E-14	4.487E-11	2.310E-10	1.730E-15-1.000E+00	8.850E-11	1.280E-10
REMAINDER	8.190E-14	4.279E-11	2.203E-10	1.650E-15-1.000E+00	1.340E-09	4.660E-09
EFFECTIVE	8.780E-14	4.539E-11	2.336E-10	1.750E-15-1.000E+00	1.100E-09	1.640E-09
SKIN(FGR)	1.700E-13	3.449E-10	1.776E-09	1.330E-14-1.000E+00	0.000E+00	0.000E+00
As-73						
GONADS	2.000E-16	1.818E-13	3.709E-12	6.320E-18-1.000E+00	3.010E-11	4.780E-11
BREAST	2.480E-16	1.872E-13	3.821E-12	6.510E-18-1.000E+00	3.300E-11	3.780E-11
LUNGS	1.560E-16	1.464E-13	2.987E-12	5.090E-18-1.000E+00	6.940E-09	3.740E-11
RED MARR	1.170E-16	1.119E-13	2.283E-12	3.890E-18-1.000E+00	3.600E-11	4.290E-11
BONE SUR	6.790E-16	6.643E-13	1.356E-11	2.310E-17-1.000E+00	3.310E-11	4.020E-11
THYROID	1.830E-16	1.504E-13	3.069E-12	5.230E-18-1.000E+00	2.740E-11	3.920E-11
REMAINDER	1.460E-16	1.403E-13	2.864E-12	4.880E-18-1.000E+00	2.760E-10	5.380E-10
EFFECTIVE	1.900E-16	1.711E-13	3.492E-12	5.950E-18-1.000E+00	9.340E-10	1.910E-10
SKIN(FGR)	2.780E-16	4.458E-13	9.097E-12	1.550E-17-1.000E+00	0.000E+00	0.000E+00
As-74						
GONADS	3.560E-14	2.246E-11	4.154E-10	7.850E-16-1.000E+00	3.170E-10	6.250E-10
BREAST	4.070E-14	2.155E-11	3.985E-10	7.530E-16-1.000E+00	2.910E-10	2.580E-10
LUNGS	3.540E-14	2.046E-11	3.784E-10	7.150E-16-1.000E+00	1.320E-08	2.310E-10
RED MARR	3.430E-14	2.072E-11	3.832E-10	7.240E-16-1.000E+00	3.040E-10	3.040E-10
BONE SUR	6.100E-14	3.062E-11	5.663E-10	1.070E-15-1.000E+00	2.440E-10	2.360E-10
THYROID	3.640E-14	2.140E-11	3.959E-10	7.480E-16-1.000E+00	2.550E-10	2.030E-10
REMAINDER	3.390E-14	2.006E-11	3.710E-10	7.010E-16-1.000E+00	1.290E-09	2.650E-09
EFFECTIVE	3.650E-14	2.137E-11	3.953E-10	7.470E-16-1.000E+00	2.150E-09	1.070E-09
SKIN(FGR)	5.800E-14	9.242E-11	1.709E-09	3.230E-15-1.000E+00	0.000E+00	0.000E+00
As-76						
GONADS	2.080E-14	1.153E-11	5.997E-11	4.440E-16-1.000E+00	7.540E-11	2.160E-10
BREAST	2.370E-14	1.104E-11	5.740E-11	4.250E-16-1.000E+00	5.330E-11	1.090E-10
LUNGS	2.080E-14	1.054E-11	5.483E-11	4.060E-16-1.000E+00	5.020E-09	9.830E-11
RED MARR	2.030E-14	1.072E-11	5.578E-11	4.130E-16-1.000E+00	5.590E-11	1.200E-10
BONE SUR	3.390E-14	1.550E-11	8.063E-11	5.970E-16-1.000E+00	4.900E-11	1.020E-10
THYROID	2.130E-14	1.083E-11	5.632E-11	4.170E-16-1.000E+00	4.800E-11	9.350E-11
REMAINDER	1.990E-14	1.039E-11	5.402E-11	4.000E-16-1.000E+00	1.240E-09	4.350E-09
EFFECTIVE	2.130E-14	1.101E-11	5.727E-11	4.240E-16-1.000E+00	1.010E-09	1.410E-09
SKIN(FGR)	9.610E-14	3.064E-10	1.594E-09	1.180E-14-1.000E+00	0.000E+00	0.000E+00
As-77						
GONADS	4.220E-16	2.520E-13	1.798E-12	9.390E-18-1.000E+00	1.210E-11	2.730E-11
BREAST	4.840E-16	2.450E-13	1.748E-12	9.130E-18-1.000E+00	1.130E-11	2.420E-11
LUNGS	4.110E-16	2.273E-13	1.622E-12	8.470E-18-1.000E+00	1.460E-09	2.390E-11
RED MARR	3.880E-16	2.268E-13	1.618E-12	8.450E-18-1.000E+00	1.150E-11	2.460E-11
BONE SUR	9.010E-16	4.213E-13	3.006E-12	1.570E-17-1.000E+00	1.120E-11	2.410E-11
THYROID	4.260E-16	2.329E-13	1.662E-12	8.680E-18-1.000E+00	1.110E-11	2.380E-11
REMAINDER	3.910E-16	2.214E-13	1.580E-12	8.250E-18-1.000E+00	3.430E-10	1.090E-09
EFFECTIVE	4.310E-16	2.402E-13	1.714E-12	8.950E-18-1.000E+00	2.850E-10	3.440E-10
SKIN(FGR)	1.200E-14	1.511E-11	1.078E-10	5.630E-16-1.000E+00	0.000E+00	0.000E+00
As-78						
GONADS	6.160E-14	9.563E-12	9.814E-12	1.250E-15-1.000E+00	3.550E-12	3.070E-11
BREAST	6.970E-14	9.104E-12	9.343E-12	1.190E-15-1.000E+00	4.180E-12	1.130E-11
LUNGS	6.190E-14	8.798E-12	9.029E-12	1.150E-15-1.000E+00	5.070E-10	8.920E-12
RED MARR	6.090E-14	9.028E-12	9.264E-12	1.180E-15-1.000E+00	4.180E-12	1.270E-11
BONE SUR	9.350E-14	1.239E-11	1.272E-11	1.620E-15-1.000E+00	3.540E-12	8.050E-12
THYROID	6.330E-14	8.798E-12	9.029E-12	1.150E-15-1.000E+00	3.700E-12	5.600E-12
REMAINDER	5.960E-14	8.722E-12	8.950E-12	1.140E-15-1.000E+00	3.040E-11	5.630E-10
EFFECTIVE	6.320E-14	9.181E-12	9.421E-12	1.200E-15-1.000E+00	7.220E-11	1.810E-10
SKIN(FGR)	1.650E-13	1.071E-10	1.099E-10	1.400E-14-1.000E+00	0.000E+00	0.000E+00
At-207						
GONADS	6.370E-14	1.168E-11	1.225E-11	1.310E-15-1.000E+00	9.870E-11	2.160E-10
BREAST	7.230E-14	1.124E-11	1.178E-11	1.260E-15-1.000E+00	1.000E-10	2.140E-10

LUNGS	6.350E-14	1.079E-11	1.131E-11	1.210E-15-1.000E+00	4.320E-09	2.140E-10
RED MARR	6.200E-14	1.097E-11	1.150E-11	1.230E-15-1.000E+00	1.030E-10	2.180E-10
BONE SUR	1.040E-13	1.659E-11	1.739E-11	1.860E-15-1.000E+00	1.000E-10	2.140E-10
THYROID	6.520E-14	1.088E-11	1.141E-11	1.220E-15-1.000E+00	1.000E-10	2.120E-10
REMAINDER	6.100E-14	1.061E-11	1.112E-11	1.190E-15-1.000E+00	1.160E-10	2.850E-10
EFFECTIVE	6.520E-14	1.124E-11	1.178E-11	1.260E-15-1.000E+00	6.110E-10	2.360E-10
SKIN(FGR)	7.760E-14	1.516E-11	1.589E-11	1.700E-15-1.000E+00	0.000E+00	0.000E+00
At-211						
GONADS	1.797E-15	8.270E-13	1.542E-12	4.115E-17-1.000E+00	5.080E-09	1.060E-08
BREAST	2.117E-15	8.209E-13	1.530E-12	4.085E-17-1.000E+00	5.080E-09	1.060E-08
LUNGS	1.656E-15	7.526E-13	1.403E-12	3.745E-17-1.000E+00	1.480E-07	1.060E-08
RED MARR	1.401E-15	6.840E-13	1.275E-12	3.404E-17-1.000E+00	5.080E-09	1.060E-08
BONE SUR	5.568E-15	2.496E-12	4.653E-12	1.242E-16-1.000E+00	5.080E-09	1.060E-08
THYROID	1.753E-15	7.559E-13	1.409E-12	3.761E-17-1.000E+00	5.080E-09	1.060E-08
REMAINDER	1.538E-15	7.253E-13	1.352E-12	3.609E-17-1.000E+00	5.120E-09	1.090E-08
EFFECTIVE	1.812E-15	8.166E-13	1.523E-12	4.064E-17-1.000E+00	2.220E-08	1.070E-08
SKIN(FGR)	2.221E-15	1.230E-12	2.294E-12	6.123E-17-1.000E+00	0.000E+00	0.000E+00
At-215						
GONADS	9.020E-18	0.000E+00	0.000E+00	2.000E-19-1.000E+00	0.000E+00	0.000E+00
BREAST	1.030E-17	0.000E+00	0.000E+00	1.930E-19-1.000E+00	0.000E+00	0.000E+00
LUNGS	8.900E-18	0.000E+00	0.000E+00	1.820E-19-1.000E+00	0.000E+00	0.000E+00
RED MARR	8.500E-18	0.000E+00	0.000E+00	1.830E-19-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.720E-17	0.000E+00	0.000E+00	2.950E-19-1.000E+00	0.000E+00	0.000E+00
THYROID	9.150E-18	0.000E+00	0.000E+00	1.890E-19-1.000E+00	0.000E+00	0.000E+00
REMAINDER	8.480E-18	0.000E+00	0.000E+00	1.780E-19-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	9.220E-18	0.000E+00	0.000E+00	1.910E-19-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.120E-17	0.000E+00	0.000E+00	2.300E-19-1.000E+00	0.000E+00	0.000E+00
At-216						
GONADS	6.190E-17	0.000E+00	0.000E+00	1.410E-18-1.000E+00	0.000E+00	0.000E+00
BREAST	7.290E-17	0.000E+00	0.000E+00	1.400E-18-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.620E-17	0.000E+00	0.000E+00	1.300E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.650E-17	0.000E+00	0.000E+00	1.160E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.060E-16	0.000E+00	0.000E+00	4.590E-18-1.000E+00	0.000E+00	0.000E+00
THYROID	5.990E-17	0.000E+00	0.000E+00	1.290E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.220E-17	0.000E+00	0.000E+00	1.240E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	6.240E-17	0.000E+00	0.000E+00	1.410E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.030E-17	0.000E+00	0.000E+00	1.960E-18-1.000E+00	0.000E+00	0.000E+00
At-217						
GONADS	1.450E-17	0.000E+00	0.000E+00	3.170E-19-1.000E+00	0.000E+00	0.000E+00
BREAST	1.650E-17	0.000E+00	0.000E+00	3.050E-19-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.430E-17	0.000E+00	0.000E+00	2.890E-19-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.370E-17	0.000E+00	0.000E+00	2.910E-19-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.670E-17	0.000E+00	0.000E+00	4.700E-19-1.000E+00	0.000E+00	0.000E+00
THYROID	1.470E-17	0.000E+00	0.000E+00	3.000E-19-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.360E-17	0.000E+00	0.000E+00	2.820E-19-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.480E-17	0.000E+00	0.000E+00	3.030E-19-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.860E-17	0.000E+00	0.000E+00	4.110E-19-1.000E+00	0.000E+00	0.000E+00
At-218						
GONADS	1.260E-16	1.368E-17	1.368E-17	4.740E-18-1.000E+00	0.000E+00	0.000E+00
BREAST	1.600E-16	1.541E-17	1.541E-17	5.340E-18-1.000E+00	0.000E+00	0.000E+00
LUNGS	9.670E-17	9.147E-18	9.147E-18	3.170E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	7.250E-17	7.185E-18	7.185E-18	2.490E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	4.230E-16	4.299E-17	4.299E-17	1.490E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	1.140E-16	9.695E-18	9.695E-18	3.360E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	9.120E-17	9.262E-18	9.262E-18	3.210E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.190E-16	1.206E-17	1.206E-17	4.180E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.120E-16	6.694E-17	6.694E-17	2.320E-17-1.000E+00	0.000E+00	0.000E+00
Au-193						
GONADS	6.790E-15	3.855E-12	1.428E-11	1.560E-16-1.000E+00	2.610E-11	8.970E-11
BREAST	7.920E-15	3.806E-12	1.410E-11	1.540E-16-1.000E+00	6.520E-12	1.170E-11
LUNGS	6.280E-15	3.509E-12	1.300E-11	1.420E-16-1.000E+00	2.660E-10	3.530E-12
RED MARR	5.490E-15	3.238E-12	1.199E-11	1.310E-16-1.000E+00	1.460E-11	3.350E-11
BONE SUR	1.900E-14	1.028E-11	3.808E-11	4.160E-16-1.000E+00	7.410E-12	1.180E-11

THYROID	6.650E-15	3.534E-12	1.309E-11	1.430E-16-1.000E+00	2.370E-12	1.890E-12
REMAINDER	5.900E-15	3.386E-12	1.254E-11	1.370E-16-1.000E+00	1.230E-10	4.220E-10
EFFECTIVE	6.830E-15	3.781E-12	1.401E-11	1.530E-16-1.000E+00	7.820E-11	1.560E-10
SKIN(FGR)	9.160E-15	4.770E-12	1.767E-11	1.930E-16-1.000E+00	0.000E+00	0.000E+00
Au-194						
GONADS	5.160E-14	2.794E-11	2.022E-10	1.040E-15-1.000E+00	2.370E-10	6.370E-10
BREAST	5.860E-14	2.684E-11	1.942E-10	9.990E-16-1.000E+00	6.360E-11	8.900E-11
LUNGS	5.150E-14	2.582E-11	1.868E-10	9.610E-16-1.000E+00	6.370E-10	2.690E-11
RED MARR	5.020E-14	2.617E-11	1.893E-10	9.740E-16-1.000E+00	8.880E-11	1.550E-10
BONE SUR	8.580E-14	4.084E-11	2.955E-10	1.520E-15-1.000E+00	4.730E-11	5.920E-11
THYROID	5.280E-14	2.542E-11	1.839E-10	9.460E-16-1.000E+00	2.880E-11	1.300E-11
REMAINDER	4.960E-14	2.553E-11	1.847E-10	9.500E-16-1.000E+00	3.940E-10	1.040E-09
EFFECTIVE	5.290E-14	2.687E-11	1.944E-10	1.000E-15-1.000E+00	2.760E-10	5.080E-10
SKIN(FGR)	6.190E-14	3.627E-11	2.624E-10	1.350E-15-1.000E+00	0.000E+00	0.000E+00
Au-195						
GONADS	3.240E-15	2.277E-12	4.721E-11	7.910E-17-1.000E+00	7.670E-11	1.330E-10
BREAST	3.850E-15	2.277E-12	4.721E-11	7.910E-17-1.000E+00	2.290E-10	1.980E-11
LUNGS	2.830E-15	2.046E-12	4.244E-11	7.110E-17-1.000E+00	2.650E-08	9.070E-12
RED MARR	2.270E-15	1.753E-12	3.635E-11	6.090E-17-1.000E+00	4.350E-10	6.290E-11
BONE SUR	1.110E-14	8.030E-12	1.665E-10	2.790E-16-1.000E+00	3.390E-10	2.560E-11
THYROID	3.080E-15	2.038E-12	4.226E-11	7.080E-17-1.000E+00	1.080E-10	7.430E-12
REMAINDER	2.630E-15	1.960E-12	4.065E-11	6.810E-17-1.000E+00	6.630E-10	8.050E-10
EFFECTIVE	3.210E-15	2.256E-12	4.679E-11	7.840E-17-1.000E+00	3.500E-09	2.870E-10
SKIN(FGR)	4.120E-15	3.137E-12	6.506E-11	1.090E-16-1.000E+00	0.000E+00	0.000E+00
Au-195m						
GONADS	9.190E-15	8.800E-15	8.800E-15	2.000E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	1.050E-14	8.624E-15	8.624E-15	1.960E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	8.880E-15	8.052E-15	8.052E-15	1.830E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	8.260E-15	7.964E-15	7.964E-15	1.810E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.120E-14	1.606E-14	1.606E-14	3.650E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	9.230E-15	8.096E-15	8.096E-15	1.840E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	8.410E-15	7.832E-15	7.832E-15	1.780E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	9.370E-15	8.492E-15	8.492E-15	1.930E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.350E-14	1.065E-14	1.065E-14	2.420E-16-1.000E+00	0.000E+00	0.000E+00
Au-198						
GONADS	1.890E-14	1.162E-11	1.181E-10	4.210E-16-1.000E+00	1.400E-10	3.430E-10
BREAST	2.170E-14	1.118E-11	1.136E-10	4.050E-16-1.000E+00	4.160E-11	5.510E-11
LUNGS	1.870E-14	1.057E-11	1.074E-10	3.830E-16-1.000E+00	3.510E-09	2.440E-11
RED MARR	1.790E-14	1.063E-11	1.080E-10	3.850E-16-1.000E+00	5.400E-11	8.570E-11
BONE SUR	3.580E-14	1.700E-11	1.728E-10	6.160E-16-1.000E+00	3.190E-11	4.060E-11
THYROID	1.920E-14	1.098E-11	1.116E-10	3.980E-16-1.000E+00	2.370E-11	1.850E-11
REMAINDER	1.780E-14	1.032E-11	1.049E-10	3.740E-16-1.000E+00	1.390E-09	3.440E-09
EFFECTIVE	1.940E-14	1.107E-11	1.125E-10	4.010E-16-1.000E+00	8.870E-10	1.140E-09
SKIN(FGR)	4.080E-14	6.983E-11	7.096E-10	2.530E-15-1.000E+00	0.000E+00	0.000E+00
Au-198m						
GONADS	2.610E-14	1.559E-11	1.433E-10	5.690E-16-1.000E+00	2.680E-10	6.210E-10
BREAST	3.010E-14	1.526E-11	1.403E-10	5.570E-16-1.000E+00	7.790E-11	9.000E-11
LUNGS	2.490E-14	1.428E-11	1.313E-10	5.210E-16-1.000E+00	5.490E-09	3.610E-11
RED MARR	2.260E-14	1.384E-11	1.272E-10	5.050E-16-1.000E+00	1.260E-10	1.860E-10
BONE SUR	6.810E-14	3.398E-11	3.124E-10	1.240E-15-1.000E+00	7.140E-11	7.930E-11
THYROID	2.600E-14	1.433E-11	1.318E-10	5.230E-16-1.000E+00	3.990E-11	2.690E-11
REMAINDER	2.340E-14	1.384E-11	1.272E-10	5.050E-16-1.000E+00	1.840E-09	4.140E-09
EFFECTIVE	2.660E-14	1.515E-11	1.393E-10	5.530E-16-1.000E+00	1.310E-09	1.440E-09
SKIN(FGR)	3.750E-14	1.825E-11	1.678E-10	6.660E-16-1.000E+00	0.000E+00	0.000E+00
Au-199						
GONADS	4.000E-15	2.405E-12	2.666E-11	8.660E-17-1.000E+00	3.840E-11	9.210E-11
BREAST	4.620E-15	2.355E-12	2.611E-11	8.480E-17-1.000E+00	1.190E-11	1.630E-11
LUNGS	3.800E-15	2.205E-12	2.444E-11	7.940E-17-1.000E+00	1.710E-09	8.620E-12
RED MARR	3.420E-15	2.132E-12	2.364E-11	7.680E-17-1.000E+00	2.070E-11	3.270E-11
BONE SUR	1.090E-14	5.470E-12	6.065E-11	1.970E-16-1.000E+00	1.220E-11	1.570E-11
THYROID	3.980E-15	2.207E-12	2.448E-11	7.950E-17-1.000E+00	6.470E-12	7.230E-12
REMAINDER	3.570E-15	2.135E-12	2.368E-11	7.690E-17-1.000E+00	6.180E-10	1.500E-09
EFFECTIVE	4.080E-15	2.346E-12	2.602E-11	8.450E-17-1.000E+00	4.050E-10	4.820E-10

SKIN(FGR)	8.230E-15	2.888E-12	3.202E-11	1.040E-16-1.000E+00	0.000E+00	0.000E+00
Au-200						
GONADS	1.330E-14	1.147E-12	1.148E-12	2.740E-16-1.000E+00	1.680E-13	3.220E-12
BREAST	1.510E-14	1.097E-12	1.098E-12	2.620E-16-1.000E+00	3.060E-13	9.670E-13
LUNGS	1.330E-14	1.055E-12	1.056E-12	2.520E-16-1.000E+00	1.600E-10	6.980E-13
RED MARR	1.310E-14	1.080E-12	1.081E-12	2.580E-16-1.000E+00	3.010E-13	1.140E-12
BONE SUR	2.110E-14	1.544E-12	1.546E-12	3.690E-16-1.000E+00	2.280E-13	5.160E-13
THYROID	1.370E-14	1.059E-12	1.060E-12	2.530E-16-1.000E+00	2.420E-13	1.670E-13
REMAINDER	1.280E-14	1.046E-12	1.047E-12	2.500E-16-1.000E+00	6.460E-12	1.780E-10
EFFECTIVE	1.370E-14	1.101E-12	1.102E-12	2.630E-16-1.000E+00	2.130E-11	5.460E-11
SKIN(FGR)	6.360E-14	3.528E-11	3.532E-11	8.430E-15-1.000E+00	0.000E+00	0.000E+00
Au-200m						
GONADS	1.008E-13	5.440E-11	2.122E-10	2.189E-15-1.000E+00	2.780E-10	9.296E-10
BREAST	1.147E-13	5.236E-11	2.042E-10	2.107E-15-1.000E+00	7.466E-11	1.322E-10
LUNGS	9.969E-14	4.958E-11	1.934E-10	1.995E-15-1.000E+00	1.829E-09	4.203E-11
RED MARR	9.596E-14	5.010E-11	1.955E-10	2.016E-15-1.000E+00	9.915E-11	2.152E-10
BONE SUR	1.818E-13	7.845E-11	3.060E-10	3.156E-15-1.000E+00	5.294E-11	8.349E-11
THYROID	1.025E-13	5.133E-11	2.002E-10	2.066E-15-1.000E+00	3.764E-11	1.993E-11
REMAINDER	9.510E-14	4.858E-11	1.895E-10	1.955E-15-1.000E+00	9.402E-10	3.142E-09
EFFECTIVE	1.035E-13	5.187E-11	2.023E-10	2.087E-15-1.000E+00	5.968E-10	1.230E-09
SKIN(FGR)	1.384E-13	1.024E-10	4.175E-10	4.307E-15-1.000E+00	0.000E+00	0.000E+00
Au-201						
GONADS	2.510E-15	1.282E-13	1.282E-13	5.610E-17-1.000E+00	1.640E-14	3.410E-13
BREAST	2.880E-15	1.234E-13	1.234E-13	5.400E-17-1.000E+00	4.350E-14	1.310E-13
LUNGS	2.480E-15	1.161E-13	1.161E-13	5.080E-17-1.000E+00	5.030E-11	1.140E-13
RED MARR	2.370E-15	1.165E-13	1.165E-13	5.100E-17-1.000E+00	4.400E-14	1.510E-13
BONE SUR	4.630E-15	1.931E-13	1.931E-13	8.450E-17-1.000E+00	3.510E-14	7.090E-14
THYROID	2.550E-15	1.209E-13	1.209E-13	5.290E-17-1.000E+00	3.690E-14	2.190E-14
REMAINDER	2.360E-15	1.136E-13	1.136E-13	4.970E-17-1.000E+00	1.150E-12	5.560E-11
EFFECTIVE	2.570E-15	1.218E-13	1.218E-13	5.330E-17-1.000E+00	6.400E-12	1.680E-11
SKIN(FGR)	2.780E-14	9.027E-12	9.027E-12	3.950E-15-1.000E+00	0.000E+00	0.000E+00
Ba-126						
GONADS	5.829E-14	1.065E-11	1.101E-11	1.318E-15-1.000E+00	1.200E-11	4.310E-11
BREAST	6.680E-14	1.031E-11	1.066E-11	1.276E-15-1.000E+00	8.980E-12	9.150E-12
LUNGS	5.742E-14	9.579E-12	9.899E-12	1.185E-15-1.000E+00	4.980E-10	5.080E-12
RED MARR	5.517E-14	9.635E-12	9.957E-12	1.192E-15-1.000E+00	1.170E-11	1.280E-11
BONE SUR	1.057E-13	1.540E-11	1.591E-11	1.905E-15-1.000E+00	8.500E-12	5.010E-12
THYROID	5.918E-14	9.999E-12	1.033E-11	1.237E-15-1.000E+00	7.590E-12	1.130E-12
REMAINDER	5.482E-14	9.409E-12	9.723E-12	1.164E-15-1.000E+00	1.110E-10	7.700E-10
EFFECTIVE	5.943E-14	1.012E-11	1.046E-11	1.252E-15-1.000E+00	9.920E-11	2.460E-10
SKIN(FGR)	1.713E-13	1.218E-10	1.258E-10	1.507E-14-1.000E+00	0.000E+00	0.000E+00
Ba-128						
GONADS	4.521E-14	2.800E-11	2.695E-10	1.030E-15-1.000E+00	2.020E-10	7.780E-10
BREAST	5.174E-14	2.706E-11	2.604E-10	9.951E-16-1.000E+00	1.050E-10	1.040E-10
LUNGS	4.448E-14	2.490E-11	2.397E-10	9.159E-16-1.000E+00	2.290E-09	3.190E-11
RED MARR	4.279E-14	2.498E-11	2.405E-10	9.188E-16-1.000E+00	3.470E-10	2.250E-10
BONE SUR	8.098E-14	4.039E-11	3.887E-10	1.485E-15-1.000E+00	3.430E-10	1.220E-10
THYROID	4.584E-14	2.617E-11	2.519E-10	9.624E-16-1.000E+00	8.950E-11	1.900E-11
REMAINDER	4.247E-14	2.445E-11	2.354E-10	8.994E-16-1.000E+00	1.410E-09	8.660E-09
EFFECTIVE	4.606E-14	2.637E-11	2.539E-10	9.700E-16-1.000E+00	8.200E-10	2.840E-09
SKIN(FGR)	1.109E-13	2.803E-10	2.700E-09	1.032E-14-1.000E+00	0.000E+00	0.000E+00
Ba-131						
GONADS	2.060E-14	1.378E-11	2.395E-10	4.830E-16-1.000E+00	1.280E-10	5.230E-10
BREAST	2.380E-14	1.343E-11	2.336E-10	4.710E-16-1.000E+00	5.840E-11	6.300E-11
LUNGS	2.000E-14	1.195E-11	2.078E-10	4.190E-16-1.000E+00	2.620E-10	1.690E-11
RED MARR	1.900E-14	1.184E-11	2.058E-10	4.150E-16-1.000E+00	1.700E-10	1.470E-10
BONE SUR	4.080E-14	2.236E-11	3.888E-10	7.840E-16-1.000E+00	7.050E-10	1.800E-10
THYROID	2.080E-14	1.263E-11	2.197E-10	4.430E-16-1.000E+00	4.620E-11	9.370E-12
REMAINDER	1.900E-14	1.175E-11	2.043E-10	4.120E-16-1.000E+00	2.190E-10	1.110E-09
EFFECTIVE	2.100E-14	1.289E-11	2.241E-10	4.520E-16-1.000E+00	1.810E-10	4.980E-10
SKIN(FGR)	2.550E-14	1.680E-11	2.921E-10	5.890E-16-1.000E+00	0.000E+00	0.000E+00
Ba-131m						
GONADS	3.050E-15	1.022E-13	1.022E-13	8.090E-17-1.000E+00	1.760E-13	6.550E-13

BREAST	3.620E-15	1.020E-13	1.020E-13	8.070E-17-1.000E+00	1.290E-13	1.450E-13
LUNGS	2.720E-15	8.164E-14	8.164E-14	6.460E-17-1.000E+00	7.040E-12	9.870E-14
RED MARR	2.330E-15	7.381E-14	7.381E-14	5.840E-17-1.000E+00	2.700E-13	2.770E-13
BONE SUR	9.320E-15	2.730E-13	2.730E-13	2.160E-16-1.000E+00	6.190E-13	2.190E-13
THYROID	2.960E-15	8.834E-14	8.834E-14	6.990E-17-1.000E+00	9.710E-14	1.150E-14
REMAINDER	2.550E-15	8.000E-14	8.000E-14	6.330E-17-1.000E+00	9.530E-13	1.010E-11
EFFECTIVE	3.040E-15	9.428E-14	9.428E-14	7.460E-17-1.000E+00	1.250E-12	3.280E-12
SKIN(FGR)	3.940E-15	1.263E-13	1.263E-13	9.990E-17-1.000E+00	0.000E+00	0.000E+00
Ba-133						
GONADS	1.760E-14	1.233E-11	2.587E-10	4.280E-16-1.000E+00	1.070E-09	7.330E-10
BREAST	2.040E-14	1.212E-11	2.545E-10	4.210E-16-1.000E+00	1.100E-09	2.730E-10
LUNGS	1.680E-14	1.045E-11	2.194E-10	3.630E-16-1.000E+00	1.290E-09	2.190E-10
RED MARR	1.580E-14	1.022E-11	2.146E-10	3.550E-16-1.000E+00	6.560E-09	1.460E-09
BONE SUR	3.750E-14	2.160E-11	4.533E-10	7.500E-16-1.000E+00	9.510E-09	1.970E-09
THYROID	1.760E-14	1.106E-11	2.321E-10	3.840E-16-1.000E+00	9.990E-10	2.030E-10
REMAINDER	1.600E-14	1.028E-11	2.158E-10	3.570E-16-1.000E+00	1.410E-09	1.430E-09
EFFECTIVE	1.780E-14	1.143E-11	2.400E-10	3.970E-16-1.000E+00	2.110E-09	9.190E-10
SKIN(FGR)	2.190E-14	1.477E-11	3.101E-10	5.130E-16-1.000E+00	0.000E+00	0.000E+00
Ba-133m						
GONADS	2.640E-15	1.997E-12	1.428E-11	7.440E-17-1.000E+00	2.300E-11	6.550E-11
BREAST	3.100E-15	2.010E-12	1.437E-11	7.490E-17-1.000E+00	1.480E-11	8.540E-12
LUNGS	2.390E-15	1.514E-12	1.082E-11	5.640E-17-1.000E+00	5.200E-10	3.610E-12
RED MARR	2.220E-15	1.428E-12	1.021E-11	5.320E-17-1.000E+00	5.790E-11	2.790E-11
BONE SUR	5.810E-15	3.758E-12	2.687E-11	1.400E-16-1.000E+00	1.050E-10	2.700E-11
THYROID	2.600E-15	1.672E-12	1.196E-11	6.230E-17-1.000E+00	1.330E-11	2.880E-12
REMAINDER	2.280E-15	1.508E-12	1.079E-11	5.620E-17-1.000E+00	2.900E-10	1.810E-09
EFFECTIVE	2.620E-15	1.769E-12	1.265E-11	6.590E-17-1.000E+00	1.680E-10	5.660E-10
SKIN(FGR)	1.360E-14	2.590E-12	1.852E-11	9.650E-17-1.000E+00	0.000E+00	0.000E+00
Ba-135m						
GONADS	2.350E-15	1.786E-12	9.990E-12	6.820E-17-1.000E+00	1.770E-11	5.240E-11
BREAST	2.770E-15	1.804E-12	1.009E-11	6.890E-17-1.000E+00	1.120E-11	6.740E-12
LUNGS	2.100E-15	1.325E-12	7.412E-12	5.060E-17-1.000E+00	4.450E-10	2.790E-12
RED MARR	1.940E-15	1.239E-12	6.929E-12	4.730E-17-1.000E+00	3.820E-11	2.100E-11
BONE SUR	5.220E-15	3.431E-12	1.919E-11	1.310E-16-1.000E+00	4.060E-11	1.250E-11
THYROID	2.300E-15	1.480E-12	8.276E-12	5.650E-17-1.000E+00	9.930E-12	2.190E-12
REMAINDER	2.010E-15	1.325E-12	7.412E-12	5.060E-17-1.000E+00	2.340E-10	1.470E-09
EFFECTIVE	2.320E-15	1.571E-12	8.789E-12	6.000E-17-1.000E+00	1.360E-10	4.600E-10
SKIN(FGR)	1.300E-14	2.320E-12	1.298E-11	8.860E-17-1.000E+00	0.000E+00	0.000E+00
Ba-137m						
GONADS	2.820E-14	1.363E-13	1.363E-13	6.170E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	3.220E-14	1.303E-13	1.303E-13	5.900E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.800E-14	1.239E-13	1.239E-13	5.610E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.730E-14	1.259E-13	1.259E-13	5.700E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	4.630E-14	1.827E-13	1.827E-13	8.270E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	2.880E-14	1.297E-13	1.297E-13	5.870E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.680E-14	1.217E-13	1.217E-13	5.510E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.880E-14	1.295E-13	1.295E-13	5.860E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.730E-14	3.645E-13	3.645E-13	1.650E-15-1.000E+00	0.000E+00	0.000E+00
Ba-139						
GONADS	2.130E-15	3.368E-13	3.429E-13	4.790E-17-1.000E+00	2.560E-12	1.560E-12
BREAST	2.450E-15	3.297E-13	3.357E-13	4.690E-17-1.000E+00	2.460E-12	5.170E-13
LUNGS	2.030E-15	3.002E-13	3.057E-13	4.270E-17-1.000E+00	2.530E-10	3.890E-13
RED MARR	1.870E-15	2.932E-13	2.985E-13	4.170E-17-1.000E+00	3.410E-12	8.590E-13
BONE SUR	5.290E-15	6.841E-13	6.965E-13	9.730E-17-1.000E+00	2.490E-12	4.380E-13
THYROID	2.130E-15	3.044E-13	3.100E-13	4.330E-17-1.000E+00	2.400E-12	2.660E-13
REMAINDER	1.920E-15	2.932E-13	2.985E-13	4.170E-17-1.000E+00	4.820E-11	3.570E-10
EFFECTIVE	2.170E-15	3.227E-13	3.286E-13	4.590E-17-1.000E+00	4.640E-11	1.080E-10
SKIN(FGR)	6.160E-14	7.241E-11	7.373E-11	1.030E-14-1.000E+00	0.000E+00	0.000E+00
Ba-140						
GONADS	8.410E-15	5.451E-12	9.607E-11	1.910E-16-1.000E+00	4.300E-10	9.960E-10
BREAST	9.640E-15	5.280E-12	9.305E-11	1.850E-16-1.000E+00	2.870E-10	1.590E-10
LUNGS	8.270E-15	4.852E-12	8.550E-11	1.700E-16-1.000E+00	1.660E-09	6.630E-11
RED MARR	7.930E-15	4.880E-12	8.601E-11	1.710E-16-1.000E+00	1.290E-09	4.390E-10

BONE SUR	1.550E-14	8.020E-12	1.413E-10	2.810E-16-1.000E+00	2.410E-09	5.530E-10
THYROID	8.530E-15	5.109E-12	9.003E-11	1.790E-16-1.000E+00	2.560E-10	5.250E-11
REMAINDER	7.890E-15	4.766E-12	8.399E-11	1.670E-16-1.000E+00	1.410E-09	7.370E-09
EFFECTIVE	8.580E-15	5.137E-12	9.053E-11	1.800E-16-1.000E+00	1.010E-09	2.560E-09
SKIN(FGR)	2.520E-14	5.565E-11	9.808E-10	1.950E-15-1.000E+00	0.000E+00	0.000E+00
Ba-141						
GONADS	4.060E-14	1.347E-12	1.347E-12	8.520E-16-1.000E+00	1.410E-12	2.860E-12
BREAST	4.630E-14	1.297E-12	1.297E-12	8.200E-16-1.000E+00	1.470E-12	1.220E-12
LUNGS	4.030E-14	1.234E-12	1.234E-12	7.800E-16-1.000E+00	1.160E-10	1.100E-12
RED MARR	3.910E-14	1.251E-12	1.251E-12	7.910E-16-1.000E+00	2.490E-12	1.470E-12
BONE SUR	7.170E-14	1.945E-12	1.945E-12	1.230E-15-1.000E+00	4.730E-12	1.270E-12
THYROID	4.150E-14	1.246E-12	1.246E-12	7.880E-16-1.000E+00	1.330E-12	2.250E-13
REMAINDER	3.870E-14	1.215E-12	1.215E-12	7.680E-16-1.000E+00	2.270E-11	1.840E-10
EFFECTIVE	4.160E-14	1.289E-12	1.289E-12	8.150E-16-1.000E+00	2.180E-11	5.650E-11
SKIN(FGR)	1.070E-13	1.676E-11	1.676E-11	1.060E-14-1.000E+00	0.000E+00	0.000E+00
Ba-142						
GONADS	5.040E-14	9.634E-13	9.634E-13	1.050E-15-1.000E+00	2.160E-12	9.880E-12
BREAST	5.730E-14	9.267E-13	9.267E-13	1.010E-15-1.000E+00	1.600E-12	2.520E-12
LUNGS	5.020E-14	8.818E-13	8.818E-13	9.610E-16-1.000E+00	5.480E-11	1.670E-12
RED MARR	4.910E-14	8.992E-13	8.992E-13	9.800E-16-1.000E+00	1.930E-12	3.000E-12
BONE SUR	8.090E-14	1.321E-12	1.321E-12	1.440E-15-1.000E+00	1.420E-12	1.240E-12
THYROID	5.170E-14	8.983E-13	8.983E-13	9.790E-16-1.000E+00	1.270E-12	2.710E-13
REMAINDER	4.810E-14	8.735E-13	8.735E-13	9.520E-16-1.000E+00	1.140E-11	8.890E-11
EFFECTIVE	5.150E-14	9.267E-13	9.267E-13	1.010E-15-1.000E+00	1.110E-11	3.010E-11
SKIN(FGR)	8.370E-14	4.404E-12	4.404E-12	4.800E-15-1.000E+00	0.000E+00	0.000E+00
Be-10						
GONADS	1.160E-17	1.377E-14	2.891E-13	4.780E-19-1.000E+00	2.560E-10	2.420E-11
BREAST	1.400E-17	1.437E-14	3.018E-13	4.990E-19-1.000E+00	2.560E-10	2.420E-11
LUNGS	9.690E-18	9.274E-15	1.947E-13	3.220E-19-1.000E+00	7.780E-07	2.420E-11
RED MARR	8.240E-18	8.237E-15	1.730E-13	2.860E-19-1.000E+00	7.650E-09	7.230E-10
BONE SUR	3.370E-17	3.427E-14	7.197E-13	1.190E-18-1.000E+00	2.270E-08	2.150E-09
THYROID	1.100E-17	1.045E-14	2.195E-13	3.630E-19-1.000E+00	2.560E-10	2.420E-11
REMAINDER	9.190E-18	9.389E-15	1.972E-13	3.260E-19-1.000E+00	2.350E-09	3.660E-09
EFFECTIVE	1.120E-17	1.187E-14	2.492E-13	4.120E-19-1.000E+00	9.580E-08	1.260E-09
SKIN(FGR)	1.290E-14	8.813E-12	1.851E-10	3.060E-16-1.000E+00	0.000E+00	0.000E+00
Be-7						
GONADS	2.310E-15	1.474E-12	2.966E-11	5.130E-17-1.000E+00	3.170E-11	5.670E-11
BREAST	2.640E-15	1.417E-12	2.850E-11	4.930E-17-1.000E+00	3.820E-11	6.970E-12
LUNGS	2.290E-15	1.342E-12	2.700E-11	4.670E-17-1.000E+00	3.730E-10	1.410E-12
RED MARR	2.200E-15	1.354E-12	2.723E-11	4.710E-17-1.000E+00	3.990E-11	1.230E-11
BONE SUR	4.160E-15	2.081E-12	4.185E-11	7.240E-17-1.000E+00	2.980E-11	5.030E-12
THYROID	2.350E-15	1.402E-12	2.821E-11	4.880E-17-1.000E+00	3.100E-11	6.080E-13
REMAINDER	2.190E-15	1.313E-12	2.642E-11	4.570E-17-1.000E+00	7.230E-11	5.830E-11
EFFECTIVE	2.360E-15	1.405E-12	2.827E-11	4.890E-17-1.000E+00	8.670E-11	3.450E-11
SKIN(FGR)	2.740E-15	1.675E-12	3.370E-11	5.830E-17-1.000E+00	0.000E+00	0.000E+00
Bi-200						
GONADS	1.140E-13	7.656E-12	7.657E-12	2.430E-15-1.000E+00	6.040E-12	3.400E-11
BREAST	1.290E-13	7.341E-12	7.341E-12	2.330E-15-1.000E+00	3.320E-12	7.510E-12
LUNGS	1.120E-13	6.994E-12	6.995E-12	2.220E-15-1.000E+00	6.900E-11	4.800E-12
RED MARR	1.090E-13	7.089E-12	7.089E-12	2.250E-15-1.000E+00	4.180E-12	1.060E-11
BONE SUR	1.970E-13	1.103E-11	1.103E-11	3.500E-15-1.000E+00	2.630E-12	4.030E-12
THYROID	1.160E-13	7.215E-12	7.215E-12	2.290E-15-1.000E+00	2.270E-12	4.990E-13
REMAINDER	1.080E-13	6.868E-12	6.869E-12	2.180E-15-1.000E+00	1.770E-11	1.250E-10
EFFECTIVE	1.160E-13	7.309E-12	7.310E-12	2.320E-15-1.000E+00	1.620E-11	4.920E-11
SKIN(FGR)	1.430E-13	1.307E-11	1.308E-11	4.150E-15-1.000E+00	0.000E+00	0.000E+00
Bi-201						
GONADS	6.380E-14	1.204E-11	1.262E-11	1.350E-15-1.000E+00	1.280E-11	9.030E-11
BREAST	7.260E-14	1.151E-11	1.206E-11	1.290E-15-1.000E+00	6.380E-12	1.520E-11
LUNGS	6.330E-14	1.097E-11	1.150E-11	1.230E-15-1.000E+00	1.920E-10	6.120E-12
RED MARR	6.160E-14	1.115E-11	1.169E-11	1.250E-15-1.000E+00	8.390E-12	2.470E-11
BONE SUR	1.050E-13	1.721E-11	1.804E-11	1.930E-15-1.000E+00	5.060E-12	8.600E-12
THYROID	6.520E-14	1.133E-11	1.187E-11	1.270E-15-1.000E+00	4.040E-12	8.060E-13
REMAINDER	6.070E-14	1.088E-11	1.141E-11	1.220E-15-1.000E+00	4.760E-11	3.260E-10

EFFECTIVE	6.510E-14	1.151E-11	1.206E-11	1.290E-15-1.000E+00	4.280E-11	1.270E-10
SKIN(FGR)	8.990E-14	4.183E-11	4.385E-11	4.690E-15-1.000E+00	0.000E+00	0.000E+00
Bi-202						
GONADS	1.300E-13	2.282E-11	2.368E-11	2.730E-15-1.000E+00	6.130E-12	8.990E-11
BREAST	1.480E-13	2.182E-11	2.264E-11	2.610E-15-1.000E+00	6.500E-12	1.860E-11
LUNGS	1.300E-13	2.090E-11	2.168E-11	2.500E-15-1.000E+00	9.670E-11	9.680E-12
RED MARR	1.260E-13	2.123E-11	2.203E-11	2.540E-15-1.000E+00	7.110E-12	2.550E-11
BONE SUR	2.120E-13	3.160E-11	3.279E-11	3.780E-15-1.000E+00	4.880E-12	9.370E-12
THYROID	1.330E-13	2.140E-11	2.220E-11	2.560E-15-1.000E+00	4.990E-12	1.140E-12
REMAINDER	1.240E-13	2.065E-11	2.142E-11	2.470E-15-1.000E+00	2.240E-11	2.240E-10
EFFECTIVE	1.330E-13	2.182E-11	2.264E-11	2.610E-15-1.000E+00	2.200E-11	9.710E-11
SKIN(FGR)	1.570E-13	3.135E-11	3.253E-11	3.750E-15-1.000E+00	0.000E+00	0.000E+00
Bi-203						
GONADS	1.170E-13	5.304E-11	1.411E-10	2.310E-15-1.000E+00	1.530E-10	6.690E-10
BREAST	1.320E-13	5.075E-11	1.350E-10	2.210E-15-1.000E+00	5.070E-11	9.740E-11
LUNGS	1.170E-13	4.914E-11	1.307E-10	2.140E-15-1.000E+00	5.750E-10	2.710E-11
RED MARR	1.160E-13	5.029E-11	1.338E-10	2.190E-15-1.000E+00	6.670E-11	1.580E-10
BONE SUR	1.770E-13	7.118E-11	1.893E-10	3.100E-15-1.000E+00	3.600E-11	5.470E-11
THYROID	1.200E-13	4.845E-11	1.289E-10	2.110E-15-1.000E+00	2.460E-11	4.850E-12
REMAINDER	1.130E-13	4.891E-11	1.301E-10	2.130E-15-1.000E+00	3.300E-10	1.250E-09
EFFECTIVE	1.200E-13	5.121E-11	1.362E-10	2.230E-15-1.000E+00	2.240E-10	5.800E-10
SKIN(FGR)	1.390E-13	7.624E-11	2.028E-10	3.320E-15-1.000E+00	0.000E+00	0.000E+00
Bi-205						
GONADS	8.260E-14	4.688E-11	8.501E-10	1.640E-15-1.000E+00	6.910E-10	1.520E-09
BREAST	9.360E-14	4.488E-11	8.138E-10	1.570E-15-1.000E+00	3.700E-10	1.970E-10
LUNGS	8.320E-14	4.345E-11	7.879E-10	1.520E-15-1.000E+00	4.310E-09	4.480E-11
RED MARR	8.190E-14	4.430E-11	8.034E-10	1.550E-15-1.000E+00	4.310E-10	3.330E-10
BONE SUR	1.260E-13	6.317E-11	1.146E-09	2.210E-15-1.000E+00	2.740E-10	1.170E-10
THYROID	8.500E-14	4.259E-11	7.723E-10	1.490E-15-1.000E+00	2.410E-10	1.070E-11
REMAINDER	8.030E-14	4.316E-11	7.827E-10	1.510E-15-1.000E+00	1.200E-09	2.090E-09
EFFECTIVE	8.490E-14	4.516E-11	8.190E-10	1.580E-15-1.000E+00	1.170E-09	1.080E-09
SKIN(FGR)	9.700E-14	5.803E-11	1.052E-09	2.030E-15-1.000E+00	0.000E+00	0.000E+00
Bi-206						
GONADS	1.580E-13	9.274E-11	1.379E-09	3.280E-15-1.000E+00	1.160E-09	2.860E-09
BREAST	1.790E-13	8.878E-11	1.320E-09	3.140E-15-1.000E+00	4.380E-10	3.640E-10
LUNGS	1.570E-13	8.510E-11	1.266E-09	3.010E-15-1.000E+00	5.620E-09	7.760E-11
RED MARR	1.540E-13	8.680E-11	1.291E-09	3.070E-15-1.000E+00	5.410E-10	6.180E-10
BONE SUR	2.530E-13	1.272E-10	1.892E-09	4.500E-15-1.000E+00	3.140E-10	2.140E-10
THYROID	1.620E-13	8.652E-11	1.287E-09	3.060E-15-1.000E+00	2.680E-10	1.750E-11
REMAINDER	1.510E-13	8.426E-11	1.253E-09	2.980E-15-1.000E+00	2.200E-09	4.690E-09
EFFECTIVE	1.610E-13	8.878E-11	1.320E-09	3.140E-15-1.000E+00	1.770E-09	2.270E-09
SKIN(FGR)	1.900E-13	1.202E-10	1.787E-09	4.250E-15-1.000E+00	0.000E+00	0.000E+00
Bi-207						
GONADS	7.370E-14	4.464E-11	9.373E-10	1.550E-15-1.000E+00	9.710E-10	1.570E-09
BREAST	8.380E-14	4.262E-11	8.949E-10	1.480E-15-1.000E+00	1.250E-09	2.010E-10
LUNGS	7.350E-14	4.090E-11	8.587E-10	1.420E-15-1.000E+00	3.170E-08	4.430E-11
RED MARR	7.170E-14	4.147E-11	8.708E-10	1.440E-15-1.000E+00	1.320E-09	3.470E-10
BONE SUR	1.190E-13	6.192E-11	1.300E-09	2.150E-15-1.000E+00	9.580E-10	1.210E-10
THYROID	7.550E-14	4.176E-11	8.768E-10	1.450E-15-1.000E+00	1.080E-09	1.200E-11
REMAINDER	7.040E-14	4.032E-11	8.466E-10	1.400E-15-1.000E+00	3.190E-09	3.350E-09
EFFECTIVE	7.540E-14	4.262E-11	8.949E-10	1.480E-15-1.000E+00	5.410E-09	1.480E-09
SKIN(FGR)	9.310E-14	9.158E-11	1.923E-09	3.180E-15-1.000E+00	0.000E+00	0.000E+00
Bi-210						
GONADS	3.320E-17	3.293E-14	4.533E-13	1.170E-18-1.000E+00	6.470E-11	1.970E-11
BREAST	3.950E-17	3.378E-14	4.649E-13	1.200E-18-1.000E+00	6.470E-11	1.970E-11
LUNGS	2.950E-17	2.477E-14	3.410E-13	8.800E-19-1.000E+00	4.260E-07	1.970E-11
RED MARR	2.600E-17	2.283E-14	3.142E-13	8.110E-19-1.000E+00	6.470E-11	1.970E-11
BONE SUR	8.980E-17	7.712E-14	1.062E-12	2.740E-18-1.000E+00	6.470E-11	1.970E-11
THYROID	3.220E-17	2.685E-14	3.696E-13	9.540E-19-1.000E+00	6.470E-11	1.970E-11
REMAINDER	2.790E-17	2.466E-14	3.394E-13	8.760E-19-1.000E+00	5.660E-09	5.720E-09
EFFECTIVE	3.290E-17	2.955E-14	4.068E-13	1.050E-18-1.000E+00	5.290E-08	1.730E-09
SKIN(FGR)	2.300E-14	9.626E-11	1.325E-09	3.420E-15-1.000E+00	0.000E+00	0.000E+00
Bi-210m						

GONADS	1.207E-14	7.579E-12	1.592E-10	2.632E-16-1.000E+00	3.200E-09	1.360E-09
BREAST	1.378E-14	7.349E-12	1.544E-10	2.552E-16-1.000E+00	3.230E-09	1.070E-09
LUNGS	1.176E-14	6.904E-12	1.450E-10	2.397E-16-1.000E+00	1.660E-05	1.040E-09
RED MARR	1.105E-14	6.900E-12	1.449E-10	2.396E-16-1.000E+00	3.280E-09	1.110E-09
BONE SUR	2.607E-14	1.270E-11	2.667E-10	4.409E-16-1.000E+00	3.200E-09	1.060E-09
THYROID	1.217E-14	7.022E-12	1.475E-10	2.438E-16-1.000E+00	3.160E-09	1.040E-09
REMAINDER	1.116E-14	6.701E-12	1.407E-10	2.327E-16-1.000E+00	1.920E-07	8.380E-08
EFFECTIVE	1.227E-14	7.257E-12	1.524E-10	2.520E-16-1.000E+00	2.050E-06	2.590E-08
SKIN(FGR)	4.990E-14	1.765E-10	3.749E-09	6.203E-15-1.000E+00	0.000E+00	0.000E+00
Bi-211						
GONADS	2.171E-15	8.877E-15	8.877E-15	4.792E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	2.491E-15	8.599E-15	8.599E-15	4.642E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.131E-15	8.099E-15	8.099E-15	4.372E-17-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.011E-15	8.099E-15	8.099E-15	4.372E-17-1.000E+00	0.000E+00	0.000E+00
BONE SUR	4.442E-15	1.416E-14	1.416E-14	7.643E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	2.191E-15	8.321E-15	8.321E-15	4.492E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.021E-15	7.877E-15	7.877E-15	4.252E-17-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.221E-15	8.488E-15	8.488E-15	4.582E-17-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.071E-15	1.029E-14	1.029E-14	5.553E-17-1.000E+00	0.000E+00	0.000E+00
Bi-212						
GONADS	7.082E-14	6.770E-12	6.799E-12	1.297E-15-1.000E+00	4.740E-11	2.760E-11
BREAST	7.919E-14	6.447E-12	6.475E-12	1.235E-15-1.000E+00	4.800E-11	1.180E-11
LUNGS	7.191E-14	6.293E-12	6.320E-12	1.206E-15-1.000E+00	3.890E-08	9.860E-12
RED MARR	7.139E-14	6.464E-12	6.492E-12	1.239E-15-1.000E+00	4.800E-11	1.290E-11
BONE SUR	1.009E-13	8.597E-12	8.634E-12	1.647E-15-1.000E+00	4.750E-11	9.140E-12
THYROID	7.322E-14	6.065E-12	6.091E-12	1.162E-15-1.000E+00	4.750E-11	7.110E-12
REMAINDER	6.977E-14	6.325E-12	6.352E-12	1.212E-15-1.000E+00	1.590E-09	9.160E-10
EFFECTIVE	7.284E-14	6.522E-12	6.550E-12	1.250E-15-1.000E+00	5.170E-09	2.870E-10
SKIN(FGR)	1.246E-13	4.625E-11	4.644E-11	8.860E-15-1.000E+00	0.000E+00	0.000E+00
Bi-213						
GONADS	8.399E-15	7.169E-13	7.174E-13	1.816E-16-1.000E+00	3.800E-11	6.170E-12
BREAST	9.601E-15	6.895E-13	6.900E-13	1.746E-16-1.000E+00	3.800E-11	4.730E-12
LUNGS	8.330E-15	6.536E-13	6.541E-13	1.655E-16-1.000E+00	3.160E-08	4.560E-12
RED MARR	8.040E-15	6.610E-13	6.615E-13	1.674E-16-1.000E+00	3.810E-11	4.890E-12
BONE SUR	1.505E-14	1.043E-12	1.044E-12	2.641E-16-1.000E+00	3.800E-11	4.450E-12
THYROID	8.553E-15	6.691E-13	6.696E-13	1.694E-16-1.000E+00	3.800E-11	4.200E-12
REMAINDER	7.983E-15	6.449E-13	6.453E-13	1.633E-16-1.000E+00	1.140E-09	6.380E-10
EFFECTIVE	8.593E-15	6.833E-13	6.838E-13	1.730E-16-1.000E+00	4.160E-09	1.950E-10
SKIN(FGR)	3.733E-14	1.755E-11	1.756E-11	4.443E-15-1.000E+00	0.000E+00	0.000E+00
Bi-214						
GONADS	7.440E-14	2.515E-12	2.515E-12	1.460E-15-1.000E+00	1.510E-11	5.170E-12
BREAST	8.420E-14	2.412E-12	2.412E-12	1.400E-15-1.000E+00	1.550E-11	2.550E-12
LUNGS	7.510E-14	2.343E-12	2.343E-12	1.360E-15-1.000E+00	1.320E-08	2.380E-12
RED MARR	7.430E-14	2.395E-12	2.395E-12	1.390E-15-1.000E+00	1.550E-11	2.510E-12
BONE SUR	1.090E-13	3.239E-12	3.239E-12	1.880E-15-1.000E+00	1.540E-11	1.510E-12
THYROID	7.670E-14	2.291E-12	2.291E-12	1.330E-15-1.000E+00	1.540E-11	8.550E-13
REMAINDER	7.260E-14	2.326E-12	2.326E-12	1.350E-15-1.000E+00	2.770E-10	2.470E-10
EFFECTIVE	7.650E-14	2.429E-12	2.429E-12	1.410E-15-1.000E+00	1.680E-09	7.640E-11
SKIN(FGR)	1.280E-13	1.461E-11	1.461E-11	8.480E-15-1.000E+00	0.000E+00	0.000E+00
Bk-245						
GONADS	1.010E-14	6.500E-12	8.897E-11	2.310E-16-1.000E+00	1.810E-10	2.640E-10
BREAST	1.180E-14	6.415E-12	8.782E-11	2.280E-16-1.000E+00	3.580E-11	2.760E-11
LUNGS	9.650E-15	5.656E-12	7.742E-11	2.010E-16-1.000E+00	4.760E-09	3.620E-12
RED MARR	8.670E-15	5.515E-12	7.549E-11	1.960E-16-1.000E+00	7.050E-10	8.160E-11
BONE SUR	2.770E-14	1.435E-11	1.964E-10	5.100E-16-1.000E+00	7.600E-09	9.790E-11
THYROID	1.010E-14	5.824E-12	7.973E-11	2.070E-16-1.000E+00	1.750E-11	3.070E-13
REMAINDER	9.070E-15	5.543E-12	7.588E-11	1.970E-16-1.000E+00	8.630E-10	1.900E-09
EFFECTIVE	1.040E-14	6.190E-12	8.474E-11	2.200E-16-1.000E+00	1.190E-09	6.520E-10
SKIN(FGR)	1.580E-14	8.835E-12	1.209E-10	3.140E-16-1.000E+00	0.000E+00	0.000E+00
Bk-246						
GONADS	4.490E-14	2.603E-11	2.040E-10	9.620E-16-1.000E+00	2.550E-10	6.470E-10
BREAST	5.120E-14	2.497E-11	1.957E-10	9.230E-16-1.000E+00	6.440E-11	8.080E-11
LUNGS	4.460E-14	2.348E-11	1.840E-10	8.680E-16-1.000E+00	7.740E-10	1.600E-11

RED MARR	4.340E-14	2.394E-11	1.876E-10	8.850E-16-1.000E+00	3.790E-10	1.430E-10
BONE SUR	7.440E-14	3.653E-11	2.862E-10	1.350E-15-1.000E+00	3.600E-09	7.710E-11
THYROID	4.600E-14	2.435E-11	1.908E-10	9.000E-16-1.000E+00	3.470E-11	2.190E-12
REMAINDER	4.270E-14	2.327E-11	1.823E-10	8.600E-16-1.000E+00	4.730E-10	1.240E-09
EFFECTIVE	4.590E-14	2.476E-11	1.940E-10	9.150E-16-1.000E+00	4.630E-10	5.680E-10
SKIN(FGR)	5.310E-14	3.382E-11	2.650E-10	1.250E-15-1.000E+00	0.000E+00	0.000E+00
Bk-247						
GONADS	4.630E-15	2.995E-12	6.290E-11	1.040E-16-1.000E+00	3.430E-05	2.850E-07
BREAST	5.380E-15	2.938E-12	6.169E-11	1.020E-16-1.000E+00	6.280E-09	6.280E-11
LUNGS	4.370E-15	2.687E-12	5.643E-11	9.330E-17-1.000E+00	1.880E-05	6.420E-11
RED MARR	3.880E-15	2.566E-12	5.389E-11	8.910E-17-1.000E+00	2.640E-04	2.190E-06
BONE SUR	1.300E-14	7.258E-12	1.524E-10	2.520E-16-1.000E+00	3.300E-03	2.740E-05
THYROID	4.590E-15	2.722E-12	5.715E-11	9.450E-17-1.000E+00	4.600E-09	3.800E-11
REMAINDER	4.100E-15	2.601E-12	5.461E-11	9.030E-17-1.000E+00	4.540E-05	3.950E-07
EFFECTIVE	4.710E-15	2.909E-12	6.108E-11	1.010E-16-1.000E+00	1.550E-04	1.270E-06
SKIN(FGR)	7.430E-15	3.715E-12	7.802E-11	1.290E-16-1.000E+00	0.000E+00	0.000E+00
Bk-249						
GONADS	9.740E-20	2.839E-16	5.918E-15	9.860E-21-1.000E+00	8.420E-08	6.990E-10
BREAST	1.370E-19	3.282E-16	6.843E-15	1.140E-20-1.000E+00	5.270E-11	4.350E-13
LUNGS	5.210E-20	9.357E-17	1.951E-15	3.250E-21-1.000E+00	1.190E-08	5.100E-13
RED MARR	4.240E-20	8.090E-17	1.687E-15	2.810E-21-1.000E+00	6.460E-07	5.360E-09
BONE SUR	2.450E-19	5.297E-16	1.104E-14	1.840E-20-1.000E+00	8.070E-06	6.690E-08
THYROID	8.020E-20	1.465E-16	3.055E-15	5.090E-21-1.000E+00	4.180E-11	3.450E-13
REMAINDER	5.380E-20	1.192E-16	2.485E-15	4.140E-21-1.000E+00	1.100E-07	1.390E-09
EFFECTIVE	8.210E-20	1.972E-16	4.112E-15	6.850E-21-1.000E+00	3.750E-07	3.240E-09
SKIN(FGR)	4.070E-17	1.094E-15	2.281E-14	3.800E-20-1.000E+00	0.000E+00	0.000E+00
Bk-250						
GONADS	4.290E-14	1.224E-11	1.491E-11	8.910E-16-1.000E+00	3.830E-10	6.640E-11
BREAST	4.860E-14	1.169E-11	1.424E-11	8.510E-16-1.000E+00	5.120E-12	1.140E-11
LUNGS	4.280E-14	1.117E-11	1.360E-11	8.130E-16-1.000E+00	8.180E-10	4.640E-12
RED MARR	4.220E-14	1.149E-11	1.399E-11	8.360E-16-1.000E+00	3.300E-09	4.300E-11
BONE SUR	6.420E-14	1.580E-11	1.924E-11	1.150E-15-1.000E+00	4.110E-08	3.480E-10
THYROID	4.410E-14	1.146E-11	1.396E-11	8.340E-16-1.000E+00	4.170E-12	5.880E-13
REMAINDER	4.110E-14	1.113E-11	1.355E-11	8.100E-16-1.000E+00	7.080E-10	4.080E-10
EFFECTIVE	4.380E-14	1.169E-11	1.424E-11	8.510E-16-1.000E+00	2.040E-09	1.570E-10
SKIN(FGR)	6.430E-14	3.298E-11	4.016E-11	2.400E-15-1.000E+00	0.000E+00	0.000E+00
Br-74						
GONADS	2.320E-13	9.198E-12	9.198E-12	4.200E-15-1.000E+00	3.340E-12	8.270E-12
BREAST	2.580E-13	8.760E-12	8.760E-12	4.000E-15-1.000E+00	4.370E-12	8.730E-12
LUNGS	2.340E-13	8.519E-12	8.519E-12	3.890E-15-1.000E+00	1.270E-10	9.780E-12
RED MARR	2.330E-13	8.738E-12	8.738E-12	3.990E-15-1.000E+00	4.310E-12	7.880E-12
BONE SUR	3.360E-13	1.180E-11	1.180E-11	5.390E-15-1.000E+00	3.740E-12	6.440E-12
THYROID	2.410E-13	8.366E-12	8.366E-12	3.820E-15-1.000E+00	3.950E-12	5.520E-12
REMAINDER	2.270E-13	8.519E-12	8.519E-12	3.890E-15-1.000E+00	1.930E-11	1.490E-10
EFFECTIVE	2.380E-13	8.848E-12	8.848E-12	4.040E-15-1.000E+00	2.330E-11	5.050E-11
SKIN(FGR)	3.400E-13	3.460E-11	3.460E-11	1.580E-14-1.000E+00	0.000E+00	0.000E+00
Br-74m						
GONADS	2.020E-13	1.422E-11	1.423E-11	3.960E-15-1.000E+00	6.620E-12	1.570E-11
BREAST	2.280E-13	1.357E-11	1.358E-11	3.780E-15-1.000E+00	8.300E-12	1.620E-11
LUNGS	2.030E-13	1.311E-11	1.311E-11	3.650E-15-1.000E+00	2.450E-10	1.760E-11
RED MARR	2.010E-13	1.339E-11	1.340E-11	3.730E-15-1.000E+00	8.270E-12	1.530E-11
BONE SUR	3.070E-13	1.853E-11	1.854E-11	5.160E-15-1.000E+00	7.360E-12	1.330E-11
THYROID	2.090E-13	1.311E-11	1.311E-11	3.650E-15-1.000E+00	7.640E-12	1.200E-11
REMAINDER	1.960E-13	1.300E-11	1.300E-11	3.620E-15-1.000E+00	3.530E-11	2.350E-10
EFFECTIVE	2.080E-13	1.361E-11	1.361E-11	3.790E-15-1.000E+00	4.430E-11	8.160E-11
SKIN(FGR)	3.310E-13	6.249E-11	6.251E-11	1.740E-14-1.000E+00	0.000E+00	0.000E+00
Br-75						
GONADS	5.710E-14	1.025E-11	1.060E-11	1.250E-15-1.000E+00	6.750E-12	1.520E-11
BREAST	6.530E-14	9.920E-12	1.026E-11	1.210E-15-1.000E+00	8.010E-12	1.540E-11
LUNGS	5.650E-14	9.346E-12	9.671E-12	1.140E-15-1.000E+00	1.960E-10	1.650E-11
RED MARR	5.420E-14	9.428E-12	9.756E-12	1.150E-15-1.000E+00	8.430E-12	1.610E-11
BONE SUR	1.050E-13	1.484E-11	1.535E-11	1.810E-15-1.000E+00	7.640E-12	1.460E-11
THYROID	5.810E-14	9.674E-12	1.001E-11	1.180E-15-1.000E+00	7.420E-12	1.320E-11

REMAINDER	5.390E-14	9.182E-12	9.501E-12	1.120E-15	-1.000E+00	2.500E-11	1.280E-10
EFFECTIVE	5.840E-14	9.838E-12	1.018E-11	1.200E-15	-1.000E+00	3.540E-11	4.940E-11
SKIN(FGR)	1.010E-13	6.223E-11	6.439E-11	7.590E-15	-1.000E+00	0.000E+00	0.000E+00
Br-76							
GONADS	1.300E-13	6.195E-11	2.135E-10	2.540E-15	-1.000E+00	1.660E-10	3.170E-10
BREAST	1.470E-13	5.926E-11	2.043E-10	2.430E-15	-1.000E+00	1.580E-10	2.740E-10
LUNGS	1.310E-13	5.731E-11	1.976E-10	2.350E-15	-1.000E+00	1.450E-09	2.760E-10
RED MARR	1.290E-13	5.853E-11	2.018E-10	2.400E-15	-1.000E+00	1.650E-10	2.880E-10
BONE SUR	1.970E-13	8.097E-11	2.791E-10	3.320E-15	-1.000E+00	1.540E-10	2.720E-10
THYROID	1.340E-13	5.682E-11	1.959E-10	2.330E-15	-1.000E+00	1.570E-10	2.730E-10
REMAINDER	1.260E-13	5.707E-11	1.967E-10	2.340E-15	-1.000E+00	2.260E-10	5.390E-10
EFFECTIVE	1.340E-13	5.951E-11	2.051E-10	2.440E-15	-1.000E+00	3.360E-10	3.660E-10
SKIN(FGR)	1.970E-13	2.322E-10	8.004E-10	9.520E-15	-1.000E+00	0.000E+00	0.000E+00
Br-77							
GONADS	1.480E-14	8.884E-12	8.246E-11	3.240E-16	-1.000E+00	4.650E-11	7.950E-11
BREAST	1.690E-14	8.582E-12	7.966E-11	3.130E-16	-1.000E+00	4.280E-11	6.800E-11
LUNGS	1.460E-14	8.089E-12	7.507E-11	2.950E-16	-1.000E+00	1.120E-10	7.120E-11
RED MARR	1.400E-14	8.171E-12	7.584E-11	2.980E-16	-1.000E+00	4.970E-11	7.990E-11
BONE SUR	2.780E-14	1.305E-11	1.211E-10	4.760E-16	-1.000E+00	4.470E-11	7.230E-11
THYROID	1.510E-14	8.363E-12	7.762E-11	3.050E-16	-1.000E+00	4.200E-11	6.710E-11
REMAINDER	1.390E-14	7.897E-12	7.329E-11	2.880E-16	-1.000E+00	5.820E-11	1.000E-10
EFFECTIVE	1.510E-14	8.473E-12	7.864E-11	3.090E-16	-1.000E+00	5.750E-11	8.240E-11
SKIN(FGR)	1.770E-14	1.111E-11	1.031E-10	4.050E-16	-1.000E+00	0.000E+00	0.000E+00
Br-80							
GONADS	3.760E-15	1.250E-13	1.250E-13	8.300E-17	-1.000E+00	4.020E-13	7.980E-13
BREAST	4.300E-15	1.199E-13	1.199E-13	7.960E-17	-1.000E+00	4.250E-13	8.280E-13
LUNGS	3.740E-15	1.137E-13	1.137E-13	7.550E-17	-1.000E+00	5.010E-11	8.490E-13
RED MARR	3.620E-15	1.152E-13	1.152E-13	7.650E-17	-1.000E+00	4.240E-13	8.140E-13
BONE SUR	6.400E-15	1.702E-13	1.702E-13	1.130E-16	-1.000E+00	4.160E-13	7.910E-13
THYROID	3.840E-15	1.188E-13	1.188E-13	7.890E-17	-1.000E+00	4.190E-13	7.710E-13
REMAINDER	3.580E-15	1.115E-13	1.115E-13	7.400E-17	-1.000E+00	4.560E-12	5.070E-11
EFFECTIVE	3.850E-15	1.188E-13	1.188E-13	7.890E-17	-1.000E+00	7.620E-12	1.580E-11
SKIN(FGR)	2.020E-14	4.217E-12	4.217E-12	2.800E-15	-1.000E+00	0.000E+00	0.000E+00
Br-80m							
GONADS	4.131E-15	1.677E-12	2.399E-12	1.045E-16	-1.000E+00	1.840E-11	4.020E-11
BREAST	4.800E-15	1.665E-12	2.381E-12	1.037E-16	-1.000E+00	1.863E-11	3.993E-11
LUNGS	3.946E-15	1.386E-12	1.988E-12	8.660E-17	-1.000E+00	6.341E-10	4.015E-11
RED MARR	3.769E-15	1.350E-12	1.937E-12	8.439E-17	-1.000E+00	1.902E-11	4.071E-11
BONE SUR	7.382E-15	2.728E-12	3.889E-12	1.694E-16	-1.000E+00	1.882E-11	4.029E-11
THYROID	4.150E-15	1.495E-12	2.142E-12	9.330E-17	-1.000E+00	1.852E-11	3.977E-11
REMAINDER	3.787E-15	1.376E-12	1.972E-12	8.590E-17	-1.000E+00	4.326E-11	2.067E-10
EFFECTIVE	4.161E-15	1.537E-12	2.201E-12	9.590E-17	-1.000E+00	9.982E-11	9.030E-11
SKIN(FGR)	2.091E-14	4.605E-11	6.622E-11	2.885E-15	-1.000E+00	0.000E+00	0.000E+00
Br-82							
GONADS	1.270E-13	7.116E-11	4.714E-10	2.670E-15	-1.000E+00	2.520E-10	4.480E-10
BREAST	1.440E-13	6.796E-11	4.502E-10	2.550E-15	-1.000E+00	2.370E-10	3.810E-10
LUNGS	1.270E-13	6.530E-11	4.326E-10	2.450E-15	-1.000E+00	7.820E-10	3.840E-10
RED MARR	1.240E-13	6.663E-11	4.414E-10	2.500E-15	-1.000E+00	2.540E-10	4.140E-10
BONE SUR	1.990E-13	9.355E-11	6.198E-10	3.510E-15	-1.000E+00	2.310E-10	3.800E-10
THYROID	1.300E-13	6.690E-11	4.432E-10	2.510E-15	-1.000E+00	2.380E-10	3.830E-10
REMAINDER	1.220E-13	6.450E-11	4.273E-10	2.420E-15	-1.000E+00	3.150E-10	5.800E-10
EFFECTIVE	1.300E-13	6.796E-11	4.502E-10	2.550E-15	-1.000E+00	3.310E-10	4.620E-10
SKIN(FGR)	1.540E-13	8.129E-11	5.385E-10	3.050E-15	-1.000E+00	0.000E+00	0.000E+00
Br-83							
GONADS	3.740E-16	9.637E-14	1.069E-13	8.610E-18	-1.000E+00	3.280E-12	7.350E-12
BREAST	4.290E-16	9.302E-14	1.032E-13	8.310E-18	-1.000E+00	3.290E-12	7.340E-12
LUNGS	3.690E-16	8.608E-14	9.546E-14	7.690E-18	-1.000E+00	1.500E-10	7.350E-12
RED MARR	3.540E-16	8.630E-14	9.570E-14	7.710E-18	-1.000E+00	3.300E-12	7.350E-12
BONE SUR	6.750E-16	1.422E-13	1.576E-13	1.270E-17	-1.000E+00	3.290E-12	7.330E-12
THYROID	3.800E-16	9.033E-14	1.002E-13	8.070E-18	-1.000E+00	3.290E-12	7.330E-12
REMAINDER	3.520E-16	8.440E-14	9.359E-14	7.540E-18	-1.000E+00	1.130E-11	6.540E-11
EFFECTIVE	3.820E-16	9.100E-14	1.009E-13	8.130E-18	-1.000E+00	2.330E-11	2.470E-11
SKIN(FGR)	1.850E-14	2.339E-11	2.594E-11	2.090E-15	-1.000E+00	0.000E+00	0.000E+00

Br-84						
GONADS	9.160E-14	4.569E-12	4.569E-12	1.660E-15-1.000E+00	2.840E-12	6.750E-12
BREAST	1.020E-13	4.349E-12	4.349E-12	1.580E-15-1.000E+00	3.310E-12	6.620E-12
LUNGS	9.270E-14	4.239E-12	4.239E-12	1.540E-15-1.000E+00	1.560E-10	6.990E-12
RED MARR	9.260E-14	4.377E-12	4.377E-12	1.590E-15-1.000E+00	3.270E-12	6.210E-12
BONE SUR	1.280E-13	5.725E-12	5.726E-12	2.080E-15-1.000E+00	2.990E-12	5.560E-12
THYROID	9.500E-14	4.101E-12	4.101E-12	1.490E-15-1.000E+00	3.120E-12	5.200E-12
REMAINDER	8.990E-14	4.267E-12	4.267E-12	1.550E-15-1.000E+00	1.870E-11	1.480E-10
EFFECTIVE	9.410E-14	4.404E-12	4.404E-12	1.600E-15-1.000E+00	2.610E-11	4.910E-11
SKIN(FGR)	1.880E-13	3.523E-11	3.523E-11	1.280E-14-1.000E+00	0.000E+00	0.000E+00
C-11						
GONADS	4.780E-14	1.870E-12	1.870E-12	1.060E-15-1.000E+00	3.410E-12	3.410E-12
BREAST	5.470E-14	1.799E-12	1.799E-12	1.020E-15-1.000E+00	2.980E-12	2.980E-12
LUNGS	4.750E-14	1.704E-12	1.704E-12	9.660E-16-1.000E+00	3.090E-12	3.090E-12
RED MARR	4.570E-14	1.720E-12	1.720E-12	9.750E-16-1.000E+00	3.180E-12	3.180E-12
BONE SUR	8.430E-14	2.593E-12	2.593E-12	1.470E-15-1.000E+00	3.030E-12	3.030E-12
THYROID	4.870E-14	1.782E-12	1.782E-12	1.010E-15-1.000E+00	2.970E-12	2.970E-12
REMAINDER	4.530E-14	1.669E-12	1.669E-12	9.460E-16-1.000E+00	3.540E-12	3.540E-12
EFFECTIVE	4.890E-14	1.782E-12	1.782E-12	1.010E-15-1.000E+00	3.290E-12	3.290E-12
SKIN(FGR)	7.910E-14	7.321E-12	7.321E-12	4.150E-15-1.000E+00	0.000E+00	0.000E+00
C-14						
GONADS	2.590E-19	6.394E-16	1.343E-14	2.220E-20-1.000E+00	5.640E-10	5.640E-10
BREAST	3.520E-19	7.258E-16	1.524E-14	2.520E-20-1.000E+00	5.640E-10	5.640E-10
LUNGS	1.530E-19	2.491E-16	5.232E-15	8.650E-21-1.000E+00	5.640E-10	5.640E-10
RED MARR	1.210E-19	2.088E-16	4.385E-15	7.250E-21-1.000E+00	5.640E-10	5.640E-10
BONE SUR	7.060E-19	1.333E-15	2.800E-14	4.630E-20-1.000E+00	5.640E-10	5.640E-10
THYROID	2.190E-19	3.600E-16	7.560E-15	1.250E-20-1.000E+00	5.640E-10	5.640E-10
REMAINDER	1.540E-19	2.966E-16	6.229E-15	1.030E-20-1.000E+00	5.640E-10	5.640E-10
EFFECTIVE	2.240E-19	4.637E-16	9.737E-15	1.610E-20-1.000E+00	5.640E-10	5.640E-10
SKIN(FGR)	2.430E-16	2.148E-15	4.512E-14	7.460E-20-1.000E+00	0.000E+00	0.000E+00
Ca-41						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.430E-12	2.710E-12
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.980E-12	3.190E-12
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	4.530E-10	2.840E-12
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.620E-09	1.780E-09
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.650E-09	4.010E-09
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.570E-12	2.840E-12
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.530E-11	2.740E-11
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.640E-10	3.440E-10
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E-00
Ca-45						
GONADS	9.440E-19	1.707E-15	3.534E-14	5.930E-20-1.000E+00	4.490E-11	5.360E-11
BREAST	1.220E-18	1.871E-15	3.873E-14	6.500E-20-1.000E+00	4.490E-11	5.360E-11
LUNGS	6.640E-19	8.519E-16	1.764E-14	2.960E-20-1.000E+00	9.670E-09	5.360E-11
RED MARR	5.340E-19	7.137E-16	1.478E-14	2.480E-20-1.000E+00	2.920E-09	3.470E-09
BONE SUR	2.770E-18	4.029E-15	8.342E-14	1.400E-19-1.000E+00	4.390E-09	5.230E-09
THYROID	8.400E-19	1.088E-15	2.252E-14	3.780E-20-1.000E+00	4.490E-11	5.360E-11
REMAINDER	6.430E-19	9.296E-16	1.925E-14	3.230E-20-1.000E+00	4.270E-10	8.400E-10
EFFECTIVE	8.630E-19	1.327E-15	2.747E-14	4.610E-20-1.000E+00	1.790E-09	8.550E-10
SKIN(FGR)	1.460E-15	4.634E-15	9.594E-14	1.610E-19-1.000E+00	0.000E+00	0.000E+00
Ca-47						
GONADS	5.220E-14	2.920E-11	3.860E-10	1.040E-15-1.000E+00	3.310E-10	7.460E-10
BREAST	5.910E-14	2.791E-11	3.690E-10	9.940E-16-1.000E+00	1.940E-10	2.260E-10
LUNGS	5.260E-14	2.707E-11	3.578E-10	9.640E-16-1.000E+00	7.890E-09	1.540E-10
RED MARR	5.210E-14	2.785E-11	3.682E-10	9.920E-16-1.000E+00	9.860E-10	1.490E-09
BONE SUR	7.590E-14	3.734E-11	4.937E-10	1.330E-15-1.000E+00	2.710E-09	4.070E-09
THYROID	5.380E-14	2.681E-11	3.545E-10	9.550E-16-1.000E+00	1.470E-10	1.380E-10
REMAINDER	5.070E-14	2.698E-11	3.567E-10	9.610E-16-1.000E+00	1.690E-09	4.060E-09
EFFECTIVE	5.360E-14	2.808E-11	3.712E-10	1.000E-15-1.000E+00	1.770E-09	1.760E-09
SKIN(FGR)	8.020E-14	9.603E-11	1.269E-09	3.420E-15-1.000E+00	0.000E+00	0.000E+00
Ca-49						
GONADS	1.680E-13	2.045E-12	2.045E-12	2.710E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	1.850E-13	1.939E-12	1.939E-12	2.570E-15-1.000E+00	0.000E+00	0.000E+00

LUNGS	1.710E-13	1.916E-12	1.916E-12	2.540E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.730E-13	1.984E-12	1.984E-12	2.630E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.200E-13	2.490E-12	2.490E-12	3.300E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.760E-13	1.788E-12	1.788E-12	2.370E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.670E-13	1.947E-12	1.947E-12	2.580E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.730E-13	1.984E-12	1.984E-12	2.630E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.460E-13	9.808E-12	9.808E-12	1.300E-14	-1.000E+00	0.000E+00	0.000E+00
Cd-104							
GONADS	1.120E-14	1.354E-12	1.359E-12	2.720E-16	-1.000E+00	4.890E-12	6.250E-11
BREAST	1.300E-14	1.329E-12	1.334E-12	2.670E-16	-1.000E+00	4.150E-12	1.170E-11
LUNGS	1.090E-14	1.120E-12	1.124E-12	2.250E-16	-1.000E+00	6.730E-11	4.910E-12
RED MARR	1.030E-14	1.120E-12	1.124E-12	2.250E-16	-1.000E+00	4.280E-12	1.640E-11
BONE SUR	2.150E-14	2.196E-12	2.203E-12	4.410E-16	-1.000E+00	2.880E-12	5.880E-12
THYROID	1.130E-14	1.205E-12	1.209E-12	2.420E-16	-1.000E+00	2.980E-12	7.370E-13
REMAINDER	1.030E-14	1.115E-12	1.119E-12	2.240E-16	-1.000E+00	1.460E-11	1.430E-10
EFFECTIVE	1.140E-14	1.245E-12	1.249E-12	2.500E-16	-1.000E+00	1.500E-11	6.300E-11
SKIN(FGR)	1.380E-14	1.807E-12	1.813E-12	3.630E-16	-1.000E+00	0.000E+00	0.000E+00
Cd-107							
GONADS	6.640E-16	8.520E-13	1.483E-12	4.400E-17	-1.000E+00	1.890E-12	1.050E-11
BREAST	8.780E-16	9.411E-13	1.638E-12	4.860E-17	-1.000E+00	6.120E-13	1.010E-12
LUNGS	4.560E-16	2.672E-13	4.652E-13	1.380E-17	-1.000E+00	1.430E-10	3.280E-13
RED MARR	4.350E-16	2.808E-13	4.888E-13	1.450E-17	-1.000E+00	7.640E-13	2.420E-12
BONE SUR	1.370E-15	1.218E-12	2.120E-12	6.290E-17	-1.000E+00	4.320E-13	8.110E-13
THYROID	5.980E-16	4.550E-13	7.921E-13	2.350E-17	-1.000E+00	1.210E-13	2.000E-13
REMAINDER	4.610E-16	3.563E-13	6.202E-13	1.840E-17	-1.000E+00	3.840E-11	2.150E-10
EFFECTIVE	6.020E-16	5.770E-13	1.004E-12	2.980E-17	-1.000E+00	2.940E-11	6.760E-11
SKIN(FGR)	1.500E-15	1.975E-12	3.438E-12	1.020E-16	-1.000E+00	0.000E+00	0.000E+00
Cd-109							
GONADS	3.580E-16	1.025E-12	2.142E-11	3.560E-17	-1.000E+00	2.660E-10	3.460E-10
BREAST	5.210E-16	1.157E-12	2.419E-11	4.020E-17	-1.000E+00	4.540E-10	3.100E-10
LUNGS	1.650E-16	2.223E-13	4.645E-12	7.720E-18	-1.000E+00	7.810E-08	3.170E-10
RED MARR	1.570E-16	2.387E-13	4.988E-12	8.290E-18	-1.000E+00	4.450E-10	3.700E-10
BONE SUR	7.870E-16	1.445E-12	3.020E-11	5.020E-17	-1.000E+00	3.940E-10	3.280E-10
THYROID	2.910E-16	4.808E-13	1.005E-11	1.670E-17	-1.000E+00	2.400E-10	2.750E-10
REMAINDER	1.830E-16	3.513E-13	7.340E-12	1.220E-17	-1.000E+00	8.800E-09	1.100E-08
EFFECTIVE	2.940E-16	6.478E-13	1.354E-11	2.250E-17	-1.000E+00	1.220E-08	3.550E-09
SKIN(FGR)	9.950E-16	2.577E-12	5.385E-11	8.950E-17	-1.000E+00	0.000E+00	0.000E+00
Cd-113							
GONADS	1.560E-18	2.517E-15	5.286E-14	8.740E-20	-1.000E+00	5.730E-09	3.750E-09
BREAST	1.980E-18	2.730E-15	5.734E-14	9.480E-20	-1.000E+00	5.730E-09	3.750E-09
LUNGS	1.160E-18	1.365E-15	2.867E-14	4.740E-20	-1.000E+00	2.930E-07	3.750E-09
RED MARR	9.420E-19	1.158E-15	2.431E-14	4.020E-20	-1.000E+00	5.730E-09	3.750E-09
BONE SUR	4.630E-18	6.134E-15	1.288E-13	2.130E-19	-1.000E+00	5.730E-09	3.750E-09
THYROID	1.410E-18	1.685E-15	3.538E-14	5.850E-20	-1.000E+00	5.730E-09	3.750E-09
REMAINDER	1.110E-18	1.457E-15	3.060E-14	5.060E-20	-1.000E+00	2.250E-07	1.480E-07
EFFECTIVE	1.450E-18	2.013E-15	4.228E-14	6.990E-20	-1.000E+00	1.060E-07	4.700E-08
SKIN(FGR)	2.410E-15	6.307E-15	1.325E-13	2.190E-19	-1.000E+00	0.000E+00	0.000E+00
Cd-113m							
GONADS	7.170E-18	8.899E-15	1.868E-13	3.090E-19	-1.000E+00	4.720E-09	3.440E-09
BREAST	8.760E-18	9.331E-15	1.959E-13	3.240E-19	-1.000E+00	4.720E-09	3.440E-09
LUNGS	5.930E-18	5.817E-15	1.221E-13	2.020E-19	-1.000E+00	4.090E-07	3.440E-09
RED MARR	5.010E-18	5.126E-15	1.076E-13	1.780E-19	-1.000E+00	4.720E-09	3.440E-09
BONE SUR	2.100E-17	2.215E-14	4.649E-13	7.690E-19	-1.000E+00	4.720E-09	3.440E-09
THYROID	6.760E-18	6.624E-15	1.390E-13	2.300E-19	-1.000E+00	4.720E-09	3.440E-09
REMAINDER	5.630E-18	5.933E-15	1.245E-13	2.060E-19	-1.000E+00	1.860E-07	1.370E-07
EFFECTIVE	6.940E-18	7.574E-15	1.590E-13	2.630E-19	-1.000E+00	1.080E-07	4.350E-08
SKIN(FGR)	8.480E-15	4.464E-12	9.370E-11	1.550E-16	-1.000E+00	0.000E+00	0.000E+00
Cd-115							
GONADS	1.090E-14	6.648E-12	5.983E-11	2.430E-16	-1.000E+00	1.320E-10	3.170E-10
BREAST	1.250E-14	6.401E-12	5.761E-11	2.340E-16	-1.000E+00	3.470E-11	4.440E-11
LUNGS	1.080E-14	6.018E-12	5.417E-11	2.200E-16	-1.000E+00	4.210E-09	1.650E-11
RED MARR	1.040E-14	6.073E-12	5.466E-11	2.220E-16	-1.000E+00	4.650E-11	7.400E-11
BONE SUR	1.930E-14	9.301E-12	8.371E-11	3.400E-16	-1.000E+00	2.540E-11	3.060E-11

THYROID	1.110E-14	6.292E-12	5.663E-11	2.300E-16	-1.000E+00	1.710E-11	9.490E-12
REMAINDER	1.030E-14	5.909E-12	5.318E-11	2.160E-16	-1.000E+00	1.970E-09	4.810E-09
EFFECTIVE	1.120E-14	6.319E-12	5.688E-11	2.310E-16	-1.000E+00	1.140E-09	1.540E-09
SKIN(FGR)	2.970E-14	6.237E-11	5.614E-10	2.280E-15	-1.000E+00	0.000E+00	0.000E+00
Cd-115m							
GONADS	1.150E-15	7.038E-13	1.404E-11	2.450E-17	-1.000E+00	1.060E-10	1.840E-10
BREAST	1.300E-15	6.750E-13	1.347E-11	2.350E-17	-1.000E+00	1.080E-10	1.660E-10
LUNGS	1.140E-15	6.377E-13	1.272E-11	2.220E-17	-1.000E+00	7.780E-08	1.640E-10
RED MARR	1.120E-15	6.492E-13	1.295E-11	2.260E-17	-1.000E+00	1.080E-10	1.680E-10
BONE SUR	1.800E-15	9.767E-13	1.948E-11	3.400E-17	-1.000E+00	1.030E-10	1.640E-10
THYROID	1.180E-15	6.521E-13	1.301E-11	2.270E-17	-1.000E+00	1.050E-10	1.610E-10
REMAINDER	1.100E-15	6.320E-13	1.261E-11	2.200E-17	-1.000E+00	7.410E-09	1.420E-08
EFFECTIVE	1.170E-15	6.722E-13	1.341E-11	2.340E-17	-1.000E+00	1.160E-08	4.370E-09
SKIN(FGR)	3.990E-14	2.011E-10	4.011E-09	7.000E-15	-1.000E+00	0.000E+00	0.000E+00
Cd-117							
GONADS	5.310E-14	1.235E-11	1.384E-11	1.070E-15	-1.000E+00	1.040E-11	8.740E-11
BREAST	6.020E-14	1.177E-11	1.319E-11	1.020E-15	-1.000E+00	5.960E-12	1.600E-11
LUNGS	5.330E-14	1.139E-11	1.276E-11	9.870E-16	-1.000E+00	6.270E-10	6.680E-12
RED MARR	5.240E-14	1.165E-11	1.306E-11	1.010E-15	-1.000E+00	6.780E-12	2.370E-11
BONE SUR	8.230E-14	1.638E-11	1.836E-11	1.420E-15	-1.000E+00	4.240E-12	8.830E-12
THYROID	5.460E-14	1.130E-11	1.266E-11	9.790E-16	-1.000E+00	3.610E-12	1.560E-12
REMAINDER	5.140E-14	1.131E-11	1.267E-11	9.800E-16	-1.000E+00	1.140E-10	9.170E-10
EFFECTIVE	5.450E-14	1.188E-11	1.332E-11	1.030E-15	-1.000E+00	1.140E-10	3.030E-10
SKIN(FGR)	8.790E-14	5.942E-11	6.660E-11	5.150E-15	-1.000E+00	0.000E+00	0.000E+00
Cd-117m							
GONADS	1.020E-13	2.750E-11	3.403E-11	1.950E-15	-1.000E+00	2.610E-11	2.080E-10
BREAST	1.150E-13	2.637E-11	3.263E-11	1.870E-15	-1.000E+00	1.390E-11	3.630E-11
LUNGS	1.030E-13	2.566E-11	3.176E-11	1.820E-15	-1.000E+00	5.010E-10	1.440E-11
RED MARR	1.020E-13	2.637E-11	3.263E-11	1.870E-15	-1.000E+00	1.550E-11	5.240E-11
BONE SUR	1.460E-13	3.497E-11	4.328E-11	2.480E-15	-1.000E+00	9.600E-12	1.910E-11
THYROID	1.050E-13	2.496E-11	3.089E-11	1.770E-15	-1.000E+00	8.570E-12	2.830E-12
REMAINDER	9.950E-14	2.566E-11	3.176E-11	1.820E-15	-1.000E+00	1.130E-10	8.510E-10
EFFECTIVE	1.050E-13	2.651E-11	3.281E-11	1.880E-15	-1.000E+00	1.050E-10	3.210E-10
SKIN(FGR)	1.290E-13	4.399E-11	5.445E-11	3.120E-15	-1.000E+00	0.000E+00	0.000E+00
Ce-134							
GONADS	3.328E-14	2.088E-11	2.299E-10	7.674E-16	-1.000E+00	2.740E-10	6.610E-10
BREAST	3.818E-14	2.019E-11	2.223E-10	7.418E-16	-1.000E+00	7.020E-11	7.480E-11
LUNGS	3.269E-14	1.844E-11	2.031E-10	6.779E-16	-1.000E+00	8.670E-09	1.180E-11
RED MARR	3.151E-14	1.843E-11	2.030E-10	6.776E-16	-1.000E+00	1.010E-10	1.400E-10
BONE SUR	5.863E-14	3.054E-11	3.361E-10	1.122E-15	-1.000E+00	5.590E-11	4.550E-11
THYROID	3.378E-14	1.942E-11	2.139E-10	7.139E-16	-1.000E+00	3.320E-11	1.560E-12
REMAINDER	3.130E-14	1.812E-11	1.996E-10	6.663E-16	-1.000E+00	3.570E-09	8.700E-09
EFFECTIVE	3.397E-14	1.961E-11	2.160E-10	7.209E-16	-1.000E+00	2.210E-09	2.810E-09
SKIN(FGR)	8.976E-14	2.451E-10	2.701E-09	9.015E-15	-1.000E+00	0.000E+00	0.000E+00
Ce-135							
GONADS	8.350E-14	4.546E-11	1.680E-10	1.840E-15	-1.000E+00	2.440E-10	8.230E-10
BREAST	9.540E-14	4.348E-11	1.607E-10	1.760E-15	-1.000E+00	5.900E-11	1.020E-10
LUNGS	8.280E-14	4.126E-11	1.524E-10	1.670E-15	-1.000E+00	1.190E-09	2.150E-11
RED MARR	7.980E-14	4.175E-11	1.543E-10	1.690E-15	-1.000E+00	7.940E-11	1.720E-10
BONE SUR	1.480E-13	6.374E-11	2.355E-10	2.580E-15	-1.000E+00	4.120E-11	5.740E-11
THYROID	8.510E-14	4.299E-11	1.588E-10	1.740E-15	-1.000E+00	2.620E-11	2.560E-12
REMAINDER	7.910E-14	4.027E-11	1.488E-10	1.630E-15	-1.000E+00	6.830E-10	2.300E-09
EFFECTIVE	8.540E-14	4.323E-11	1.598E-10	1.750E-15	-1.000E+00	4.290E-10	9.370E-10
SKIN(FGR)	1.100E-13	6.744E-11	2.492E-10	2.730E-15	-1.000E+00	0.000E+00	0.000E+00
Ce-137							
GONADS	9.850E-16	9.826E-13	2.136E-12	4.570E-17	-1.000E+00	3.680E-12	1.710E-11
BREAST	1.250E-15	1.026E-12	2.230E-12	4.770E-17	-1.000E+00	9.000E-13	1.560E-12
LUNGS	6.860E-16	5.612E-13	1.220E-12	2.610E-17	-1.000E+00	4.290E-11	2.120E-13
RED MARR	5.930E-16	4.451E-13	9.676E-13	2.070E-17	-1.000E+00	1.870E-12	5.280E-12
BONE SUR	2.160E-15	2.258E-12	4.908E-12	1.050E-16	-1.000E+00	1.030E-12	1.430E-12
THYROID	8.860E-16	7.203E-13	1.566E-12	3.350E-17	-1.000E+00	1.320E-13	8.870E-15
REMAINDER	6.760E-16	5.870E-13	1.276E-12	2.730E-17	-1.000E+00	1.620E-11	7.550E-11
EFFECTIVE	8.810E-16	7.848E-13	1.706E-12	3.650E-17	-1.000E+00	1.130E-11	2.790E-11

SKIN(FGR)	1.450E-15	1.428E-12	3.104E-12	6.640E-17	-1.000E+00	0.000E+00	0.000E+00
Ce-137m							
GONADS	2.010E-15	1.607E-12	1.043E-11	6.040E-17	-1.000E+00	3.740E-11	9.590E-11
BREAST	2.390E-15	1.625E-12	1.055E-11	6.110E-17	-1.000E+00	6.660E-12	7.610E-12
LUNGS	1.760E-15	1.186E-12	7.698E-12	4.460E-17	-1.000E+00	1.370E-09	6.850E-13
RED MARR	1.610E-15	1.077E-12	6.991E-12	4.050E-17	-1.000E+00	1.610E-11	2.760E-11
BONE SUR	4.510E-15	3.351E-12	2.175E-11	1.260E-16	-1.000E+00	8.300E-12	7.660E-12
THYROID	1.950E-15	1.325E-12	8.596E-12	4.980E-17	-1.000E+00	1.290E-12	6.330E-14
REMAINDER	1.680E-15	1.181E-12	7.664E-12	4.440E-17	-1.000E+00	6.830E-10	1.880E-09
EFFECTIVE	1.960E-15	1.412E-12	9.166E-12	5.310E-17	-1.000E+00	3.820E-10	5.940E-10
SKIN(FGR)	1.200E-14	2.080E-12	1.350E-11	7.820E-17	-1.000E+00	0.000E+00	0.000E+00
Ce-139							
GONADS	6.720E-15	4.863E-12	1.004E-10	1.690E-16	-1.000E+00	1.560E-10	2.570E-10
BREAST	7.850E-15	4.834E-12	9.984E-11	1.680E-16	-1.000E+00	3.310E-10	2.420E-11
LUNGS	6.160E-15	3.971E-12	8.201E-11	1.380E-16	-1.000E+00	1.670E-08	3.560E-12
RED MARR	5.550E-15	3.770E-12	7.785E-11	1.310E-16	-1.000E+00	4.960E-10	7.430E-11
BONE SUR	1.760E-14	1.065E-11	2.199E-10	3.700E-16	-1.000E+00	6.420E-10	3.370E-11
THYROID	6.610E-15	4.201E-12	8.676E-11	1.460E-16	-1.000E+00	1.660E-10	4.490E-13
REMAINDER	5.820E-15	3.914E-12	8.082E-11	1.360E-16	-1.000E+00	9.050E-10	7.690E-10
EFFECTIVE	6.730E-15	4.489E-12	9.271E-11	1.560E-16	-1.000E+00	2.450E-09	3.090E-10
SKIN(FGR)	8.940E-15	5.928E-12	1.224E-10	2.060E-16	-1.000E+00	0.000E+00	0.000E+00
Ce-141							
GONADS	3.380E-15	2.213E-12	4.332E-11	7.710E-17	-1.000E+00	5.540E-11	1.080E-10
BREAST	3.930E-15	2.170E-12	4.247E-11	7.560E-17	-1.000E+00	4.460E-11	1.110E-11
LUNGS	3.170E-15	1.951E-12	3.820E-11	6.800E-17	-1.000E+00	1.670E-08	1.430E-12
RED MARR	2.830E-15	1.860E-12	3.641E-11	6.480E-17	-1.000E+00	8.960E-11	3.390E-11
BONE SUR	9.410E-15	5.166E-12	1.011E-10	1.800E-16	-1.000E+00	2.540E-10	2.300E-11
THYROID	3.350E-15	2.003E-12	3.922E-11	6.980E-17	-1.000E+00	2.550E-11	1.800E-13
REMAINDER	2.980E-15	1.894E-12	3.708E-11	6.600E-17	-1.000E+00	1.260E-09	2.500E-09
EFFECTIVE	3.430E-15	2.118E-12	4.146E-11	7.380E-17	-1.000E+00	2.420E-09	7.830E-10
SKIN(FGR)	1.020E-14	3.788E-12	7.416E-11	1.320E-16	-1.000E+00	0.000E+00	0.000E+00
Ce-143							
GONADS	1.280E-14	7.900E-12	4.958E-11	2.980E-16	-1.000E+00	7.530E-11	2.120E-10
BREAST	1.470E-14	7.688E-12	4.825E-11	2.900E-16	-1.000E+00	1.660E-11	2.320E-11
LUNGS	1.230E-14	6.893E-12	4.325E-11	2.600E-16	-1.000E+00	3.880E-09	3.820E-12
RED MARR	1.170E-14	6.787E-12	4.259E-11	2.560E-16	-1.000E+00	2.960E-11	5.070E-11
BONE SUR	2.520E-14	1.323E-11	8.302E-11	4.990E-16	-1.000E+00	1.640E-11	1.610E-11
THYROID	1.280E-14	7.211E-12	4.525E-11	2.720E-16	-1.000E+00	6.230E-12	4.350E-13
REMAINDER	1.170E-14	6.734E-12	4.226E-11	2.540E-16	-1.000E+00	1.420E-09	3.890E-09
EFFECTIVE	1.290E-14	7.396E-12	4.642E-11	2.790E-16	-1.000E+00	9.160E-10	1.230E-09
SKIN(FGR)	3.960E-14	1.058E-10	6.638E-10	3.990E-15	-1.000E+00	0.000E+00	0.000E+00
Ce-144							
GONADS	2.725E-15	6.328E-13	1.319E-11	6.088E-17	-1.000E+00	2.390E-10	6.987E-11
BREAST	3.129E-15	6.274E-13	1.307E-11	5.922E-17	-1.000E+00	3.480E-10	1.223E-11
LUNGS	2.639E-15	5.228E-13	1.089E-11	5.362E-17	-1.000E+00	7.911E-07	6.551E-12
RED MARR	2.507E-15	4.755E-13	9.907E-12	5.247E-17	-1.000E+00	2.880E-09	8.923E-11
BONE SUR	5.441E-15	1.646E-12	3.429E-11	1.127E-16	-1.000E+00	4.720E-09	1.280E-10
THYROID	2.753E-15	5.529E-13	1.152E-11	5.418E-17	-1.000E+00	2.920E-10	5.154E-12
REMAINDER	2.534E-15	5.086E-13	1.060E-11	5.283E-17	-1.000E+00	1.910E-08	1.890E-08
EFFECTIVE	2.773E-15	5.909E-13	1.231E-11	5.766E-17	-1.000E+00	1.010E-07	5.711E-09
SKIN(FGR)	8.574E-14	7.648E-13	1.594E-11	1.250E-14	-1.000E+00	0.000E+00	0.000E+00
Cf-244							
GONADS	9.790E-18	3.359E-15	3.359E-15	2.000E-18	-1.000E+00	4.450E-11	1.370E-12
BREAST	1.800E-17	4.131E-15	4.131E-15	2.460E-18	-1.000E+00	1.210E-12	2.430E-14
LUNGS	1.150E-18	2.603E-16	2.603E-16	1.550E-19	-1.000E+00	2.020E-08	2.330E-14
RED MARR	2.090E-18	4.685E-16	4.685E-16	2.790E-19	-1.000E+00	3.630E-10	1.180E-11
BONE SUR	1.290E-17	3.140E-15	3.140E-15	1.870E-18	-1.000E+00	4.520E-09	1.480E-10
THYROID	6.260E-18	9.992E-16	9.992E-16	5.950E-19	-1.000E+00	1.200E-12	2.230E-14
REMAINDER	2.670E-18	7.826E-16	7.826E-16	4.660E-19	-1.000E+00	7.740E-11	1.510E-10
EFFECTIVE	6.910E-18	1.914E-15	1.914E-15	1.140E-18	-1.000E+00	2.640E-09	5.150E-11
SKIN(FGR)	4.650E-17	1.553E-14	1.553E-14	9.250E-18	-1.000E+00	0.000E+00	0.000E+00
Cf-246							
GONADS	7.430E-18	3.681E-14	2.461E-13	1.380E-18	-1.000E+00	9.860E-10	8.860E-11

BREAST	1.310E-17	4.508E-14	3.013E-13	1.690E-18-1.000E+00	3.520E-11	7.720E-12
LUNGS	1.500E-18	3.228E-15	2.158E-14	1.210E-19-1.000E+00	1.300E-06	7.640E-12
RED MARR	2.050E-18	5.468E-15	3.655E-14	2.050E-19-1.000E+00	8.840E-09	8.180E-10
BONE SUR	1.110E-17	3.521E-14	2.354E-13	1.320E-18-1.000E+00	1.100E-07	1.010E-08
THYROID	5.020E-18	1.120E-14	7.489E-14	4.200E-19-1.000E+00	3.500E-11	7.630E-12
REMAINDER	2.460E-18	8.856E-15	5.920E-14	3.320E-19-1.000E+00	6.040E-09	1.150E-08
EFFECTIVE	5.480E-18	2.102E-14	1.405E-13	7.880E-19-1.000E+00	1.620E-07	3.860E-09
SKIN(FGR)	3.350E-17	1.681E-13	1.123E-12	6.300E-18-1.000E+00	0.000E+00	0.000E+00
Cf-248						
GONADS	6.700E-18	3.915E-14	8.166E-13	1.360E-18-1.000E+00	3.980E-07	1.510E-08
BREAST	1.230E-17	4.808E-14	1.003E-12	1.670E-18-1.000E+00	1.590E-10	1.000E-11
LUNGS	8.040E-19	3.052E-15	6.364E-14	1.060E-19-1.000E+00	9.670E-05	9.260E-12
RED MARR	1.440E-18	5.499E-15	1.147E-13	1.910E-19-1.000E+00	3.610E-06	1.440E-07
BONE SUR	8.860E-18	3.685E-14	7.685E-13	1.280E-18-1.000E+00	4.510E-05	1.800E-06
THYROID	4.290E-18	1.169E-14	2.438E-13	4.060E-19-1.000E+00	1.400E-10	9.130E-12
REMAINDER	1.840E-18	9.155E-15	1.909E-13	3.180E-19-1.000E+00	7.830E-07	5.110E-08
EFFECTIVE	4.730E-18	2.228E-14	4.647E-13	7.740E-19-1.000E+00	1.370E-05	9.040E-08
SKIN(FGR)	3.170E-17	1.811E-13	3.777E-12	6.290E-18-1.000E+00	0.000E+00	0.000E+00
Cf-249						
GONADS	1.540E-14	9.965E-12	2.093E-10	3.460E-16-1.000E+00	1.310E-05	2.860E-07
BREAST	1.770E-14	9.648E-12	2.026E-10	3.350E-16-1.000E+00	1.370E-08	2.330E-10
LUNGS	1.520E-14	8.928E-12	1.875E-10	3.100E-16-1.000E+00	3.590E-04	2.260E-10
RED MARR	1.440E-14	8.986E-12	1.887E-10	3.120E-16-1.000E+00	1.040E-04	2.210E-06
BONE SUR	3.060E-14	1.509E-11	3.169E-10	5.240E-16-1.000E+00	1.300E-03	2.760E-05
THYROID	1.560E-14	9.274E-12	1.947E-10	3.220E-16-1.000E+00	1.080E-08	1.510E-10
REMAINDER	1.440E-14	8.726E-12	1.833E-10	3.030E-16-1.000E+00	1.850E-05	4.000E-07
EFFECTIVE	1.580E-14	9.446E-12	1.984E-10	3.280E-16-1.000E+00	1.030E-04	1.280E-06
SKIN(FGR)	1.910E-14	1.189E-11	2.498E-10	4.130E-16-1.000E+00	0.000E+00	0.000E+00
Cf-250						
GONADS	6.380E-18	3.744E-14	7.858E-13	1.300E-18-1.000E+00	4.490E-06	1.120E-07
BREAST	1.170E-17	4.579E-14	9.611E-13	1.590E-18-1.000E+00	4.060E-09	7.440E-11
LUNGS	7.620E-19	2.909E-15	6.105E-14	1.010E-19-1.000E+00	2.710E-04	4.100E-11
RED MARR	1.370E-18	5.241E-15	1.100E-13	1.820E-19-1.000E+00	3.960E-05	9.770E-07
BONE SUR	8.420E-18	3.514E-14	7.375E-13	1.220E-18-1.000E+00	4.950E-04	1.220E-05
THYROID	4.080E-18	1.115E-14	2.339E-13	3.870E-19-1.000E+00	2.280E-09	3.120E-11
REMAINDER	1.750E-18	8.726E-15	1.832E-13	3.030E-19-1.000E+00	8.110E-06	2.170E-07
EFFECTIVE	4.500E-18	2.123E-14	4.455E-13	7.370E-19-1.000E+00	5.570E-05	5.760E-07
SKIN(FGR)	3.020E-17	1.725E-13	3.621E-12	5.990E-18-1.000E+00	0.000E+00	0.000E+00
Cf-251						
GONADS	5.480E-15	3.744E-12	7.862E-11	1.300E-16-1.000E+00	1.340E-05	2.920E-07
BREAST	6.380E-15	3.744E-12	7.862E-11	1.300E-16-1.000E+00	5.630E-09	9.360E-11
LUNGS	5.180E-15	3.110E-12	6.532E-11	1.080E-16-1.000E+00	3.600E-04	9.560E-11
RED MARR	4.650E-15	3.053E-12	6.411E-11	1.060E-16-1.000E+00	1.060E-04	2.250E-06
BONE SUR	1.510E-14	8.093E-12	1.699E-10	2.810E-16-1.000E+00	1.330E-03	2.810E-05
THYROID	5.450E-15	3.226E-12	6.774E-11	1.120E-16-1.000E+00	3.760E-09	5.250E-11
REMAINDER	4.870E-15	3.082E-12	6.471E-11	1.070E-16-1.000E+00	1.880E-05	4.050E-07
EFFECTIVE	5.580E-15	3.514E-12	7.379E-11	1.220E-16-1.000E+00	1.050E-04	1.310E-06
SKIN(FGR)	1.120E-14	5.674E-12	1.191E-10	1.970E-16-1.000E+00	0.000E+00	0.000E+00
Cf-252						
GONADS	6.850E-18	3.628E-14	7.601E-13	1.260E-18-1.000E+00	1.090E-06	5.390E-08
BREAST	1.210E-17	4.435E-14	9.290E-13	1.540E-18-1.000E+00	6.120E-08	1.490E-09
LUNGS	1.420E-18	3.225E-15	6.757E-14	1.120E-19-1.000E+00	2.990E-04	4.670E-10
RED MARR	1.910E-18	5.414E-15	1.134E-13	1.880E-19-1.000E+00	1.100E-05	4.690E-07
BONE SUR	1.040E-17	3.484E-14	7.300E-13	1.210E-18-1.000E+00	1.370E-04	5.840E-06
THYROID	4.640E-18	1.112E-14	2.329E-13	3.860E-19-1.000E+00	3.200E-08	2.680E-10
REMAINDER	2.290E-18	8.783E-15	1.840E-13	3.050E-19-1.000E+00	2.730E-06	1.580E-07
EFFECTIVE	5.060E-18	2.079E-14	4.356E-13	7.220E-19-1.000E+00	4.240E-05	2.930E-07
SKIN(FGR)	3.080E-17	1.656E-13	3.469E-12	5.750E-18-1.000E+00	0.000E+00	0.000E+00
Cf-253						
GONADS	4.040E-18	3.999E-15	8.012E-14	1.518E-19-1.000E+00	4.330E-09	5.160E-10
BREAST	4.855E-18	4.265E-15	8.480E-14	1.607E-19-1.000E+00	7.231E-12	2.213E-13
LUNGS	3.606E-18	2.331E-15	4.864E-14	9.234E-20-1.000E+00	6.820E-06	2.152E-13
RED MARR	3.364E-18	2.239E-15	4.701E-14	8.926E-20-1.000E+00	4.100E-08	5.370E-09

BONE SUR	8.372E-18	7.167E-15	1.414E-13	2.678E-19	1.000E+00	5.120E-07	6.720E-08
THYROID	3.942E-18	2.796E-15	5.752E-14	1.091E-19	1.000E+00	6.491E-12	2.040E-13
REMAINDER	3.468E-18	2.495E-15	5.160E-14	9.791E-20	1.000E+00	1.060E-08	3.310E-09
EFFECTIVE	3.982E-18	3.238E-15	6.573E-14	1.246E-19	1.000E+00	8.430E-07	3.780E-09
SKIN(FGR)	1.709E-15	1.135E-13	2.541E-12	4.837E-18	1.000E+00	0.000E+00	0.000E+00
Cf-254							
GONADS	2.080E-20	1.216E-16	2.458E-15	4.230E-21	1.000E+00	4.100E-07	3.120E-07
BREAST	3.810E-20	1.492E-16	3.016E-15	5.190E-21	1.000E+00	2.480E-07	3.450E-08
LUNGS	2.490E-21	9.457E-18	1.912E-16	3.290E-22	1.000E+00	6.440E-04	4.950E-09
RED MARR	4.460E-21	1.702E-17	3.441E-16	5.920E-22	1.000E+00	3.070E-06	5.450E-07
BONE SUR	2.750E-20	1.138E-16	2.301E-15	3.960E-21	1.000E+00	3.600E-05	6.140E-06
THYROID	1.330E-20	3.622E-17	7.323E-16	1.260E-21	1.000E+00	1.240E-07	1.090E-09
REMAINDER	5.700E-21	2.837E-17	5.736E-16	9.870E-22	1.000E+00	1.350E-06	1.070E-06
EFFECTIVE	1.470E-20	6.899E-17	1.395E-15	2.400E-21	1.000E+00	7.930E-05	6.550E-07
SKIN(FGR)	9.830E-20	5.605E-16	1.133E-14	1.950E-20	1.000E+00	0.000E+00	0.000E+00
Cl-36							
GONADS	2.240E-17	2.177E-14	4.572E-13	7.560E-19	1.000E+00	5.040E-10	7.990E-10
BREAST	2.660E-17	2.223E-14	4.669E-13	7.720E-19	1.000E+00	5.040E-10	7.990E-10
LUNGS	2.020E-17	1.621E-14	3.405E-13	5.630E-19	1.000E+00	1.330E-09	7.990E-10
RED MARR	1.810E-17	1.503E-14	3.157E-13	5.220E-19	1.000E+00	5.040E-10	7.990E-10
BONE SUR	5.630E-17	4.867E-14	1.022E-12	1.690E-18	1.000E+00	5.040E-10	7.990E-10
THYROID	2.190E-17	1.774E-14	3.726E-13	6.160E-19	1.000E+00	5.040E-10	7.990E-10
REMAINDER	1.920E-17	1.621E-14	3.405E-13	5.630E-19	1.000E+00	5.140E-10	8.610E-10
EFFECTIVE	2.230E-17	1.938E-14	4.070E-13	6.730E-19	1.000E+00	6.060E-10	8.180E-10
SKIN(FGR)	1.470E-14	3.053E-11	6.411E-10	1.060E-15	1.000E+00	0.000E+00	0.000E+00
Cl-38							
GONADS	7.610E-14	4.444E-12	4.445E-12	1.380E-15	1.000E+00	3.850E-12	8.750E-12
BREAST	8.560E-14	4.251E-12	4.252E-12	1.320E-15	1.000E+00	4.210E-12	8.520E-12
LUNGS	7.770E-14	4.187E-12	4.187E-12	1.300E-15	1.000E+00	2.200E-10	8.760E-12
RED MARR	7.770E-14	4.316E-12	4.316E-12	1.340E-15	1.000E+00	4.180E-12	8.120E-12
BONE SUR	1.050E-13	5.572E-12	5.572E-12	1.730E-15	1.000E+00	3.910E-12	7.540E-12
THYROID	7.890E-14	3.897E-12	3.897E-12	1.210E-15	1.000E+00	3.850E-12	7.060E-12
REMAINDER	7.560E-14	4.219E-12	4.219E-12	1.310E-15	1.000E+00	2.490E-11	1.920E-10
EFFECTIVE	7.870E-14	4.316E-12	4.316E-12	1.340E-15	1.000E+00	3.620E-11	6.360E-11
SKIN(FGR)	1.940E-13	4.509E-11	4.509E-11	1.400E-14	1.000E+00	0.000E+00	0.000E+00
Cl-39							
GONADS	7.090E-14	6.721E-12	6.738E-12	1.400E-15	1.000E+00	4.460E-12	1.060E-11
BREAST	8.030E-14	6.433E-12	6.449E-12	1.340E-15	1.000E+00	5.120E-12	1.020E-11
LUNGS	7.140E-14	6.241E-12	6.257E-12	1.300E-15	1.000E+00	1.770E-10	1.050E-11
RED MARR	7.060E-14	6.385E-12	6.401E-12	1.330E-15	1.000E+00	5.090E-12	9.780E-12
BONE SUR	1.060E-13	8.737E-12	8.759E-12	1.820E-15	1.000E+00	4.650E-12	8.930E-12
THYROID	7.300E-14	6.097E-12	6.112E-12	1.270E-15	1.000E+00	4.600E-12	8.210E-12
REMAINDER	6.900E-14	6.241E-12	6.257E-12	1.300E-15	1.000E+00	2.210E-11	1.420E-10
EFFECTIVE	7.290E-14	6.481E-12	6.497E-12	1.350E-15	1.000E+00	3.060E-11	4.960E-11
SKIN(FGR)	1.360E-13	5.281E-11	5.294E-11	1.100E-14	1.000E+00	0.000E+00	0.000E+00
Cm-238							
GONADS	3.180E-15	8.354E-13	9.274E-13	7.440E-17	1.000E+00	1.170E-10	5.810E-11
BREAST	3.740E-15	8.298E-13	9.212E-13	7.390E-17	1.000E+00	2.160E-11	9.020E-12
LUNGS	2.980E-15	7.141E-13	7.928E-13	6.360E-17	1.000E+00	8.730E-09	2.690E-12
RED MARR	2.580E-15	6.771E-13	7.516E-13	6.030E-17	1.000E+00	5.480E-10	1.990E-11
BONE SUR	9.940E-15	2.178E-12	2.418E-12	1.940E-16	1.000E+00	6.590E-09	6.080E-11
THYROID	3.150E-15	7.366E-13	8.177E-13	6.560E-17	1.000E+00	2.030E-11	4.130E-13
REMAINDER	2.780E-15	6.973E-13	7.741E-13	6.210E-17	1.000E+00	3.070E-10	2.380E-10
EFFECTIVE	3.250E-15	7.972E-13	8.850E-13	7.100E-17	1.000E+00	1.440E-09	9.200E-11
SKIN(FGR)	3.940E-15	1.235E-12	1.371E-12	1.100E-16	1.000E+00	0.000E+00	0.000E+00
Cm-240							
GONADS	8.380E-18	5.363E-14	1.035E-12	1.870E-18	1.000E+00	3.010E-07	2.710E-09
BREAST	1.600E-17	6.768E-14	1.306E-12	2.360E-18	1.000E+00	8.320E-10	9.580E-12
LUNGS	9.640E-19	3.183E-15	6.145E-14	1.110E-19	1.000E+00	7.510E-06	9.620E-12
RED MARR	1.820E-18	7.054E-15	1.362E-13	2.460E-19	1.000E+00	1.820E-06	1.660E-08
BONE SUR	1.110E-17	4.617E-14	8.912E-13	1.610E-18	1.000E+00	2.270E-05	2.070E-07
THYROID	5.140E-18	1.374E-14	2.652E-13	4.790E-19	1.000E+00	7.930E-10	9.110E-12
REMAINDER	2.260E-18	1.176E-14	2.270E-13	4.100E-19	1.000E+00	9.920E-07	2.670E-08

EFFECTIVE	6.000E-18	3.011E-14	5.812E-13	1.050E-18-1.000E+00	2.170E-06	1.690E-08
SKIN(FGR)	4.680E-17	2.954E-13	5.702E-12	1.030E-17-1.000E+00	0.000E+00	0.000E+00
Cm-241						
GONADS	2.250E-14	1.472E-11	2.884E-10	5.130E-16-1.000E+00	7.790E-09	6.610E-10
BREAST	2.590E-14	1.432E-11	2.805E-10	4.990E-16-1.000E+00	2.880E-10	6.680E-11
LUNGS	2.210E-14	1.303E-11	2.552E-10	4.540E-16-1.000E+00	9.010E-08	1.100E-11
RED MARR	2.080E-14	1.303E-11	2.552E-10	4.540E-16-1.000E+00	4.170E-08	4.980E-10
BONE SUR	4.630E-14	2.402E-11	4.706E-10	8.370E-16-1.000E+00	5.130E-07	4.510E-09
THYROID	2.280E-14	1.363E-11	2.670E-10	4.750E-16-1.000E+00	1.840E-10	1.730E-12
REMAINDER	2.100E-14	1.277E-11	2.502E-10	4.450E-16-1.000E+00	2.150E-08	2.810E-09
EFFECTIVE	2.310E-14	1.392E-11	2.727E-10	4.850E-16-1.000E+00	3.970E-08	1.210E-09
SKIN(FGR)	3.140E-14	2.158E-11	4.228E-10	7.520E-16-1.000E+00	0.000E+00	0.000E+00
Cm-242						
GONADS	7.830E-18	4.893E-14	1.013E-12	1.700E-18-1.000E+00	5.700E-07	5.200E-09
BREAST	1.480E-17	6.159E-14	1.275E-12	2.140E-18-1.000E+00	9.440E-10	8.950E-12
LUNGS	1.130E-18	3.022E-15	6.257E-14	1.050E-19-1.000E+00	1.550E-05	8.840E-12
RED MARR	1.890E-18	6.562E-15	1.359E-13	2.280E-19-1.000E+00	3.900E-06	3.570E-08
BONE SUR	1.060E-17	4.231E-14	8.759E-13	1.470E-18-1.000E+00	4.870E-05	4.460E-07
THYROID	4.910E-18	1.261E-14	2.610E-13	4.380E-19-1.000E+00	9.410E-10	8.820E-12
REMAINDER	2.270E-18	1.079E-14	2.235E-13	3.750E-19-1.000E+00	2.450E-06	4.020E-08
EFFECTIVE	5.690E-18	2.751E-14	5.697E-13	9.560E-19-1.000E+00	4.670E-06	3.100E-08
SKIN(FGR)	4.290E-17	2.700E-13	5.589E-12	9.380E-18-1.000E+00	0.000E+00	0.000E+00
Cm-243						
GONADS	5.770E-15	3.802E-12	7.981E-11	1.320E-16-1.000E+00	2.070E-05	1.730E-07
BREAST	6.680E-15	3.773E-12	7.921E-11	1.310E-16-1.000E+00	6.290E-09	6.960E-11
LUNGS	5.500E-15	3.283E-12	6.893E-11	1.140E-16-1.000E+00	1.940E-05	7.730E-11
RED MARR	5.000E-15	3.226E-12	6.772E-11	1.120E-16-1.000E+00	1.180E-04	9.810E-07
BONE SUR	1.500E-14	7.862E-12	1.651E-10	2.730E-16-1.000E+00	1.470E-03	1.230E-05
THYROID	5.760E-15	3.370E-12	7.075E-11	1.170E-16-1.000E+00	3.830E-09	3.150E-11
REMAINDER	5.190E-15	3.226E-12	6.772E-11	1.120E-16-1.000E+00	5.760E-05	4.970E-07
EFFECTIVE	5.880E-15	3.600E-12	7.558E-11	1.250E-16-1.000E+00	8.300E-05	6.790E-07
SKIN(FGR)	9.790E-15	5.472E-12	1.149E-10	1.900E-16-1.000E+00	0.000E+00	0.000E+00
Cm-244						
GONADS	6.900E-18	4.522E-14	9.492E-13	1.570E-18-1.000E+00	1.590E-05	1.330E-07
BREAST	1.330E-17	5.702E-14	1.197E-12	1.980E-18-1.000E+00	1.040E-09	8.820E-12
LUNGS	7.080E-19	2.592E-15	5.441E-14	9.000E-20-1.000E+00	1.930E-05	8.810E-12
RED MARR	1.460E-18	5.875E-15	1.233E-13	2.040E-19-1.000E+00	9.380E-05	7.820E-07
BONE SUR	8.820E-18	3.859E-14	8.101E-13	1.340E-18-1.000E+00	1.170E-03	9.770E-06
THYROID	4.190E-18	1.146E-14	2.406E-13	3.980E-19-1.000E+00	1.010E-09	8.440E-12
REMAINDER	1.810E-18	9.821E-15	2.062E-13	3.410E-19-1.000E+00	4.780E-05	4.150E-07
EFFECTIVE	4.910E-18	2.529E-14	5.308E-13	8.780E-19-1.000E+00	6.700E-05	5.450E-07
SKIN(FGR)	3.910E-17	2.506E-13	5.260E-12	8.700E-18-1.000E+00	0.000E+00	0.000E+00
Cm-245						
GONADS	3.880E-15	2.652E-12	5.570E-11	9.210E-17-1.000E+00	3.370E-05	2.800E-07
BREAST	4.550E-15	2.655E-12	5.576E-11	9.220E-17-1.000E+00	6.690E-09	6.800E-11
LUNGS	3.630E-15	2.226E-12	4.675E-11	7.730E-17-1.000E+00	1.800E-05	8.340E-11
RED MARR	3.170E-15	2.125E-12	4.463E-11	7.380E-17-1.000E+00	1.790E-04	1.490E-06
BONE SUR	1.180E-14	6.595E-12	1.385E-10	2.290E-16-1.000E+00	2.240E-03	1.860E-05
THYROID	3.840E-15	2.301E-12	4.832E-11	7.990E-17-1.000E+00	3.680E-09	3.020E-11
REMAINDER	3.400E-15	2.183E-12	4.584E-11	7.580E-17-1.000E+00	7.960E-05	6.790E-07
EFFECTIVE	3.960E-15	2.506E-12	5.262E-11	8.700E-17-1.000E+00	1.230E-04	1.010E-06
SKIN(FGR)	5.360E-15	4.205E-12	8.830E-11	1.460E-16-1.000E+00	0.000E+00	0.000E+00
Cm-246						
GONADS	6.240E-18	4.032E-14	8.467E-13	1.400E-18-1.000E+00	3.340E-05	2.770E-07
BREAST	1.200E-17	5.098E-14	1.070E-12	1.770E-18-1.000E+00	4.000E-09	3.910E-11
LUNGS	7.000E-19	2.379E-15	4.996E-14	8.260E-20-1.000E+00	1.820E-05	2.670E-11
RED MARR	1.350E-18	5.299E-15	1.113E-13	1.840E-19-1.000E+00	1.780E-04	1.480E-06
BONE SUR	8.170E-18	3.456E-14	7.258E-13	1.200E-18-1.000E+00	2.220E-03	1.850E-05
THYROID	3.820E-18	1.031E-14	2.165E-13	3.580E-19-1.000E+00	2.260E-09	1.870E-11
REMAINDER	1.670E-18	8.813E-15	1.851E-13	3.060E-19-1.000E+00	7.940E-05	6.760E-07
EFFECTIVE	4.460E-18	2.261E-14	4.748E-13	7.850E-19-1.000E+00	1.220E-04	1.000E-06
SKIN(FGR)	3.490E-17	2.229E-13	4.681E-12	7.740E-18-1.000E+00	0.000E+00	0.000E+00
Cm-247						

GONADS	1.470E-14	9.389E-12	1.972E-10	3.260E-16-1.000E+00	3.070E-05	2.560E-07
BREAST	1.680E-14	9.072E-12	1.905E-10	3.150E-16-1.000E+00	2.230E-08	2.290E-10
LUNGS	1.440E-14	8.525E-12	1.790E-10	2.960E-16-1.000E+00	1.670E-05	2.660E-10
RED MARR	1.380E-14	8.554E-12	1.796E-10	2.970E-16-1.000E+00	1.630E-04	1.360E-06
BONE SUR	2.830E-14	1.400E-11	2.939E-10	4.860E-16-1.000E+00	2.040E-03	1.700E-05
THYROID	1.490E-14	8.842E-12	1.857E-10	3.070E-16-1.000E+00	1.450E-08	1.200E-10
REMAINDER	1.380E-14	8.323E-12	1.748E-10	2.890E-16-1.000E+00	7.300E-05	6.230E-07
EFFECTIVE	1.500E-14	8.928E-12	1.875E-10	3.100E-16-1.000E+00	1.120E-04	9.240E-07
SKIN(FGR)	1.790E-14	1.092E-11	2.292E-10	3.790E-16-1.000E+00	0.000E+00	0.000E+00
Cm-248						
GONADS	4.750E-18	3.082E-14	6.471E-13	1.070E-18-1.000E+00	1.210E-04	1.020E-06
BREAST	9.120E-18	3.888E-14	8.165E-13	1.350E-18-1.000E+00	1.070E-06	1.100E-08
LUNGS	5.170E-19	1.803E-15	3.786E-14	6.260E-20-1.000E+00	6.650E-05	6.520E-09
RED MARR	1.020E-18	4.032E-15	8.467E-14	1.400E-19-1.000E+00	6.520E-04	5.420E-06
BONE SUR	6.170E-18	2.644E-14	5.552E-13	9.180E-19-1.000E+00	8.120E-03	6.750E-05
THYROID	2.900E-18	7.862E-15	1.651E-13	2.730E-19-1.000E+00	4.710E-07	3.870E-09
REMAINDER	1.260E-18	6.710E-15	1.409E-13	2.330E-19-1.000E+00	2.890E-04	2.490E-06
EFFECTIVE	3.390E-18	1.728E-14	3.629E-13	6.000E-19-1.000E+00	4.470E-04	3.680E-06
SKIN(FGR)	2.670E-17	1.705E-13	3.580E-12	5.920E-18-1.000E+00	0.000E+00	0.000E+00
Cm-249						
GONADS	9.160E-16	1.126E-13	1.133E-13	2.040E-17-1.000E+00	1.190E-11	4.650E-13
BREAST	1.050E-15	1.082E-13	1.088E-13	1.960E-17-1.000E+00	2.120E-13	8.680E-14
LUNGS	9.070E-16	1.016E-13	1.022E-13	1.840E-17-1.000E+00	7.510E-11	5.410E-14
RED MARR	8.740E-16	1.027E-13	1.033E-13	1.860E-17-1.000E+00	6.260E-11	6.200E-13
BONE SUR	1.620E-15	1.618E-13	1.627E-13	2.930E-17-1.000E+00	7.780E-10	6.370E-12
THYROID	9.330E-16	1.066E-13	1.072E-13	1.930E-17-1.000E+00	2.050E-13	5.530E-15
REMAINDER	8.660E-16	9.995E-14	1.005E-13	1.810E-17-1.000E+00	3.110E-11	8.880E-11
EFFECTIVE	9.360E-16	1.071E-13	1.077E-13	1.940E-17-1.000E+00	5.220E-11	2.700E-11
SKIN(FGR)	1.590E-14	8.117E-12	8.163E-12	1.470E-15-1.000E+00	0.000E+00	0.000E+00
Cm-250						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	6.900E-04	5.850E-06
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	8.490E-06	8.660E-08
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.800E-04	5.170E-08
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.710E-03	3.090E-05
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	4.610E-02	3.830E-04
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.710E-06	3.050E-08
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.650E-03	1.420E-05
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.540E-03	2.100E-05
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Co-55						
GONADS	9.560E-14	4.988E-11	1.838E-10	2.020E-15-1.000E+00	2.260E-10	7.720E-10
BREAST	1.090E-13	4.790E-11	1.765E-10	1.940E-15-1.000E+00	6.190E-11	1.100E-10
LUNGS	9.540E-14	4.568E-11	1.683E-10	1.850E-15-1.000E+00	1.780E-09	3.070E-11
RED MARR	9.310E-14	4.667E-11	1.719E-10	1.890E-15-1.000E+00	7.680E-11	1.680E-10
BONE SUR	1.540E-13	6.667E-11	2.456E-10	2.700E-15-1.000E+00	4.030E-11	6.120E-11
THYROID	9.790E-14	4.691E-11	1.729E-10	1.900E-15-1.000E+00	3.120E-11	9.570E-12
REMAINDER	9.150E-14	4.519E-11	1.665E-10	1.830E-15-1.000E+00	9.140E-10	3.130E-09
EFFECTIVE	9.780E-14	4.765E-11	1.756E-10	1.930E-15-1.000E+00	5.650E-10	1.180E-09
SKIN(FGR)	1.390E-13	1.726E-10	6.359E-10	6.990E-15-1.000E+00	0.000E+00	0.000E+00
Co-56						
GONADS	1.780E-13	9.835E-11	2.006E-09	3.420E-15-1.000E+00	2.160E-09	3.470E-09
BREAST	2.010E-13	9.375E-11	1.912E-09	3.260E-15-1.000E+00	3.420E-09	6.180E-10
LUNGS	1.800E-13	9.116E-11	1.859E-09	3.170E-15-1.000E+00	5.930E-08	3.040E-10
RED MARR	1.790E-13	9.375E-11	1.912E-09	3.260E-15-1.000E+00	3.360E-09	8.700E-10
BONE SUR	2.570E-13	1.251E-10	2.551E-09	4.350E-15-1.000E+00	2.530E-09	4.320E-10
THYROID	1.840E-13	8.972E-11	1.830E-09	3.120E-15-1.000E+00	2.910E-09	2.320E-10
REMAINDER	1.740E-13	9.087E-11	1.853E-09	3.160E-15-1.000E+00	6.700E-09	5.370E-09
EFFECTIVE	1.830E-13	9.461E-11	1.930E-09	3.290E-15-1.000E+00	1.070E-08	2.730E-09
SKIN(FGR)	2.130E-13	1.501E-10	3.062E-09	5.220E-15-1.000E+00	0.000E+00	0.000E+00
Co-57						
GONADS	5.470E-15	3.368E-12	7.013E-11	1.170E-16-1.000E+00	1.240E-10	1.830E-10
BREAST	6.360E-15	3.282E-12	6.833E-11	1.140E-16-1.000E+00	3.750E-10	4.100E-11
LUNGS	5.210E-15	3.109E-12	6.474E-11	1.080E-16-1.000E+00	1.690E-08	2.890E-11

RED MARR	4.590E-15	2.994E-12	6.234E-11	1.040E-16-1.000E+00	5.880E-10	8.840E-11
BONE SUR	1.630E-14	8.492E-12	1.768E-10	2.950E-16-1.000E+00	4.520E-10	4.920E-11
THYROID	5.460E-15	3.167E-12	6.594E-11	1.100E-16-1.000E+00	2.710E-10	1.930E-11
REMAINDER	4.870E-15	3.023E-12	6.294E-11	1.050E-16-1.000E+00	8.220E-10	4.420E-10
EFFECTIVE	5.610E-15	3.311E-12	6.893E-11	1.150E-16-1.000E+00	2.450E-09	2.010E-10
SKIN(FGR)	6.630E-15	3.973E-12	8.272E-11	1.380E-16-1.000E+00	0.000E+00	0.000E+00
Co-58						
GONADS	4.660E-14	2.867E-11	5.828E-10	9.970E-16-1.000E+00	6.170E-10	1.040E-09
BREAST	5.300E-14	2.737E-11	5.565E-10	9.520E-16-1.000E+00	9.370E-10	1.790E-10
LUNGS	4.640E-14	2.617E-11	5.319E-10	9.100E-16-1.000E+00	1.600E-08	8.530E-11
RED MARR	4.530E-14	2.671E-11	5.430E-10	9.290E-16-1.000E+00	9.230E-10	2.600E-10
BONE SUR	7.410E-14	3.795E-11	7.716E-10	1.320E-15-1.000E+00	6.930E-10	1.250E-10
THYROID	4.770E-14	2.720E-11	5.530E-10	9.460E-16-1.000E+00	8.720E-10	6.310E-11
REMAINDER	4.440E-14	2.585E-11	5.255E-10	8.990E-16-1.000E+00	1.890E-09	1.580E-09
EFFECTIVE	4.760E-14	2.732E-11	5.553E-10	9.500E-16-1.000E+00	2.940E-09	8.090E-10
SKIN(FGR)	5.580E-14	3.278E-11	6.664E-10	1.140E-15-1.000E+00	0.000E+00	0.000E+00
Co-58m						
GONADS	1.220E-19	3.197E-16	7.033E-16	1.480E-20-1.000E+00	3.140E-12	4.710E-12
BREAST	1.880E-19	3.585E-16	7.889E-16	1.660E-20-1.000E+00	5.030E-12	8.650E-13
LUNGS	2.910E-20	6.933E-17	1.525E-16	3.210E-21-1.000E+00	1.340E-10	4.810E-13
RED MARR	3.100E-20	6.501E-17	1.430E-16	3.010E-21-1.000E+00	4.920E-12	1.220E-12
BONE SUR	2.030E-19	4.773E-16	1.050E-15	2.210E-20-1.000E+00	3.720E-12	6.590E-13
THYROID	9.010E-20	1.587E-16	3.493E-16	7.350E-21-1.000E+00	4.690E-12	4.050E-13
REMAINDER	4.300E-20	1.086E-16	2.390E-16	5.030E-21-1.000E+00	2.320E-11	7.690E-11
EFFECTIVE	8.770E-20	2.013E-16	4.429E-16	9.320E-21-1.000E+00	2.540E-11	2.460E-11
SKIN(FGR)	3.050E-19	6.998E-16	1.540E-15	3.240E-20-1.000E+00	0.000E+00	0.000E+00
Co-60						
GONADS	1.230E-13	7.056E-11	1.480E-09	2.450E-15-1.000E+00	4.760E-09	3.190E-09
BREAST	1.390E-13	6.739E-11	1.413E-09	2.340E-15-1.000E+00	1.840E-08	1.100E-09
LUNGS	1.240E-13	6.537E-11	1.371E-09	2.270E-15-1.000E+00	3.450E-07	8.770E-10
RED MARR	1.230E-13	6.710E-11	1.407E-09	2.330E-15-1.000E+00	1.720E-08	1.320E-09
BONE SUR	1.780E-13	8.956E-11	1.879E-09	3.110E-15-1.000E+00	1.350E-08	9.390E-10
THYROID	1.270E-13	6.480E-11	1.359E-09	2.250E-15-1.000E+00	1.620E-08	7.880E-10
REMAINDER	1.200E-13	6.508E-11	1.365E-09	2.260E-15-1.000E+00	3.600E-08	4.970E-09
EFFECTIVE	1.260E-13	6.768E-11	1.419E-09	2.350E-15-1.000E+00	5.910E-08	2.770E-09
SKIN(FGR)	1.450E-13	7.948E-11	1.667E-09	2.760E-15-1.000E+00	0.000E+00	0.000E+00
Co-60m						
GONADS	2.140E-16	4.169E-15	4.169E-15	4.600E-18-1.000E+00	1.830E-14	1.930E-14
BREAST	2.460E-16	4.033E-15	4.033E-15	4.450E-18-1.000E+00	7.120E-14	7.750E-15
LUNGS	2.070E-16	3.788E-15	3.788E-15	4.180E-18-1.000E+00	4.160E-12	7.050E-15
RED MARR	1.970E-16	3.661E-15	3.661E-15	4.040E-18-1.000E+00	6.670E-14	9.170E-15
BONE SUR	3.990E-16	8.166E-15	8.166E-15	9.010E-18-1.000E+00	5.250E-14	5.620E-15
THYROID	2.160E-16	3.743E-15	3.743E-15	4.130E-18-1.000E+00	6.200E-14	3.320E-15
REMAINDER	1.980E-16	3.707E-15	3.707E-15	4.090E-18-1.000E+00	1.600E-13	3.210E-12
EFFECTIVE	2.170E-16	4.006E-15	4.006E-15	4.420E-18-1.000E+00	5.740E-13	9.700E-13
SKIN(FGR)	3.460E-16	2.012E-14	2.012E-14	2.220E-17-1.000E+00	0.000E+00	0.000E+00
Co-61						
GONADS	3.940E-15	7.627E-13	7.901E-13	9.220E-17-1.000E+00	3.300E-13	4.360E-12
BREAST	4.610E-15	7.503E-13	7.773E-13	9.070E-17-1.000E+00	3.010E-13	8.720E-13
LUNGS	3.600E-15	6.891E-13	7.138E-13	8.330E-17-1.000E+00	1.980E-10	4.760E-13
RED MARR	3.140E-15	6.254E-13	6.479E-13	7.560E-17-1.000E+00	5.240E-13	2.020E-12
BONE SUR	1.060E-14	2.151E-12	2.228E-12	2.600E-16-1.000E+00	3.720E-13	7.490E-13
THYROID	3.840E-15	6.949E-13	7.198E-13	8.400E-17-1.000E+00	1.710E-13	1.410E-13
REMAINDER	3.390E-15	6.659E-13	6.899E-13	8.050E-17-1.000E+00	1.540E-11	2.320E-10
EFFECTIVE	3.940E-15	7.461E-13	7.730E-13	9.020E-17-1.000E+00	2.860E-11	7.110E-11
SKIN(FGR)	3.240E-14	3.880E-11	4.019E-11	4.690E-15-1.000E+00	0.000E+00	0.000E+00
Co-62m						
GONADS	1.340E-13	3.155E-12	3.155E-12	2.620E-15-1.000E+00	1.640E-13	5.160E-12
BREAST	1.510E-13	3.010E-12	3.010E-12	2.500E-15-1.000E+00	7.310E-13	2.340E-12
LUNGS	1.350E-13	2.926E-12	2.926E-12	2.430E-15-1.000E+00	7.140E-11	2.280E-12
RED MARR	1.340E-13	3.010E-12	3.010E-12	2.500E-15-1.000E+00	6.840E-13	2.120E-12
BONE SUR	1.920E-13	3.998E-12	3.998E-12	3.320E-15-1.000E+00	5.330E-13	1.030E-12
THYROID	1.380E-13	2.878E-12	2.878E-12	2.390E-15-1.000E+00	6.450E-13	2.610E-13

REMAINDER	1.300E-13	2.914E-12	2.914E-12	2.420E-15	-1.000E+00	2.210E-12	9.610E-11
EFFECTIVE	1.370E-13	3.034E-12	3.034E-12	2.520E-15	-1.000E+00	9.500E-12	3.100E-11
SKIN(FGR)	2.250E-13	1.722E-11	1.722E-11	1.430E-14	-1.000E+00	0.000E+00	0.000E+00
Cr-48							
GONADS	2.020E-14	1.123E-11	5.202E-11	4.390E-16	-1.000E+00	1.360E-10	3.310E-10
BREAST	2.320E-14	1.087E-11	5.036E-11	4.250E-16	-1.000E+00	6.550E-11	5.010E-11
LUNGS	1.960E-14	1.029E-11	4.764E-11	4.020E-16	-1.000E+00	9.500E-10	1.960E-11
RED MARR	1.820E-14	1.018E-11	4.716E-11	3.980E-16	-1.000E+00	8.100E-11	9.380E-11
BONE SUR	4.700E-14	2.072E-11	9.598E-11	8.100E-16	-1.000E+00	5.200E-11	4.160E-11
THYROID	2.030E-14	1.049E-11	4.858E-11	4.100E-16	-1.000E+00	4.680E-11	1.400E-11
REMAINDER	1.860E-14	9.979E-12	4.621E-11	3.900E-16	-1.000E+00	2.220E-10	4.490E-10
EFFECTIVE	2.060E-14	1.082E-11	5.013E-11	4.230E-16	-1.000E+00	2.370E-10	2.400E-10
SKIN(FGR)	2.400E-14	1.274E-11	5.901E-11	4.980E-16	-1.000E+00	0.000E+00	0.000E+00
Cr-49							
GONADS	4.920E-14	3.970E-12	3.971E-12	1.090E-15	-1.000E+00	4.610E-13	1.100E-11
BREAST	5.640E-14	3.824E-12	3.826E-12	1.050E-15	-1.000E+00	1.040E-12	3.210E-12
LUNGS	4.860E-14	3.624E-12	3.625E-12	9.950E-16	-1.000E+00	1.220E-10	2.400E-12
RED MARR	4.640E-14	3.631E-12	3.632E-12	9.970E-16	-1.000E+00	1.090E-12	4.150E-12
BONE SUR	9.300E-14	6.046E-12	6.048E-12	1.660E-15	-1.000E+00	8.280E-13	1.690E-12
THYROID	5.000E-14	3.788E-12	3.789E-12	1.040E-15	-1.000E+00	8.320E-13	2.800E-13
REMAINDER	4.630E-14	3.540E-12	3.541E-12	9.720E-16	-1.000E+00	5.790E-12	1.510E-10
EFFECTIVE	5.030E-14	3.788E-12	3.789E-12	1.040E-15	-1.000E+00	1.680E-11	4.950E-11
SKIN(FGR)	9.650E-14	3.019E-11	3.020E-11	8.290E-15	-1.000E+00	0.000E+00	0.000E+00
Cr-51							
GONADS	1.470E-15	9.264E-13	1.792E-11	3.230E-17	-1.000E+00	2.030E-11	4.000E-11
BREAST	1.690E-15	8.977E-13	1.737E-11	3.130E-17	-1.000E+00	1.580E-11	7.510E-12
LUNGS	1.450E-15	8.432E-13	1.631E-11	2.940E-17	-1.000E+00	5.340E-10	4.380E-12
RED MARR	1.370E-15	8.489E-13	1.642E-11	2.960E-17	-1.000E+00	1.870E-11	1.250E-11
BONE SUR	3.040E-15	1.440E-12	2.785E-11	5.020E-17	-1.000E+00	1.390E-11	7.860E-12
THYROID	1.490E-15	8.633E-13	1.670E-11	3.010E-17	-1.000E+00	1.080E-11	3.710E-12
REMAINDER	1.380E-15	8.202E-13	1.587E-11	2.860E-17	-1.000E+00	5.260E-11	8.750E-11
EFFECTIVE	1.510E-15	8.833E-13	1.709E-11	3.080E-17	-1.000E+00	9.030E-11	3.980E-11
SKIN(FGR)	1.750E-15	1.055E-12	2.042E-11	3.680E-17	-1.000E+00	0.000E+00	0.000E+00
Cs-125							
GONADS	3.150E-14	2.760E-12	2.762E-12	7.090E-16	-1.000E+00	1.460E-12	3.300E-12
BREAST	3.610E-14	2.659E-12	2.660E-12	6.830E-16	-1.000E+00	1.890E-12	3.700E-12
LUNGS	3.120E-14	2.468E-12	2.470E-12	6.340E-16	-1.000E+00	6.360E-11	4.080E-12
RED MARR	3.010E-14	2.484E-12	2.485E-12	6.380E-16	-1.000E+00	1.950E-12	3.670E-12
BONE SUR	5.540E-14	3.932E-12	3.934E-12	1.010E-15	-1.000E+00	1.760E-12	3.240E-12
THYROID	3.210E-14	2.589E-12	2.590E-12	6.650E-16	-1.000E+00	1.710E-12	2.800E-12
REMAINDER	2.980E-14	2.425E-12	2.427E-12	6.230E-16	-1.000E+00	8.460E-12	5.690E-11
EFFECTIVE	3.220E-14	2.604E-12	2.606E-12	6.690E-16	-1.000E+00	1.120E-11	1.960E-11
SKIN(FGR)	5.970E-14	1.900E-11	1.901E-11	4.880E-15	-1.000E+00	0.000E+00	0.000E+00
Cs-126							
GONADS	5.130E-14	1.618E-13	1.618E-13	1.140E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	5.870E-14	1.562E-13	1.562E-13	1.100E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.080E-14	1.476E-13	1.476E-13	1.040E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.890E-14	1.491E-13	1.491E-13	1.050E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.180E-14	2.286E-13	2.286E-13	1.610E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	5.220E-14	1.533E-13	1.533E-13	1.080E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.850E-14	1.448E-13	1.448E-13	1.020E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	5.240E-14	1.547E-13	1.547E-13	1.090E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.620E-13	2.101E-12	2.101E-12	1.480E-14	-1.000E+00	0.000E+00	0.000E+00
Cs-127							
GONADS	1.900E-14	8.458E-12	1.438E-11	4.430E-16	-1.000E+00	7.120E-12	1.500E-11
BREAST	2.190E-14	8.229E-12	1.399E-11	4.310E-16	-1.000E+00	7.920E-12	1.340E-11
LUNGS	1.850E-14	7.370E-12	1.253E-11	3.860E-16	-1.000E+00	5.980E-11	1.460E-11
RED MARR	1.770E-14	7.351E-12	1.250E-11	3.850E-16	-1.000E+00	9.540E-12	1.660E-11
BONE SUR	3.590E-14	1.293E-11	2.198E-11	6.770E-16	-1.000E+00	8.400E-12	1.480E-11
THYROID	1.920E-14	7.771E-12	1.321E-11	4.070E-16	-1.000E+00	7.080E-12	1.200E-11
REMAINDER	1.770E-14	7.236E-12	1.230E-11	3.790E-16	-1.000E+00	1.380E-11	3.640E-11
EFFECTIVE	1.930E-14	7.905E-12	1.344E-11	4.140E-16	-1.000E+00	1.590E-11	2.120E-11
SKIN(FGR)	2.380E-14	1.170E-11	1.990E-11	6.130E-16	-1.000E+00	0.000E+00	0.000E+00

Cs-128						
GONADS	4.230E-14	3.180E-13	3.180E-13	9.420E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.830E-14	3.059E-13	3.059E-13	9.060E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.190E-14	2.880E-13	2.880E-13	8.530E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.040E-14	2.903E-13	2.903E-13	8.600E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	7.460E-14	4.456E-13	4.456E-13	1.320E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	4.300E-14	3.008E-13	3.008E-13	8.910E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.000E-14	2.822E-13	2.822E-13	8.360E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.320E-14	3.018E-13	3.018E-13	8.940E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.070E-13	3.443E-12	3.443E-12	1.020E-14	-1.000E+00	0.000E+00	0.000E+00
Cs-129							
GONADS	1.220E-14	8.066E-12	4.944E-11	3.050E-16	-1.000E+00	3.040E-11	5.420E-11
BREAST	1.420E-14	7.934E-12	4.863E-11	3.000E-16	-1.000E+00	2.830E-11	4.580E-11
LUNGS	1.170E-14	6.691E-12	4.101E-11	2.530E-16	-1.000E+00	1.080E-10	5.000E-11
RED MARR	1.110E-14	6.585E-12	4.036E-11	2.490E-16	-1.000E+00	3.800E-11	6.290E-11
BONE SUR	2.360E-14	1.280E-11	7.846E-11	4.840E-16	-1.000E+00	3.400E-11	5.650E-11
THYROID	1.230E-14	7.220E-12	4.425E-11	2.730E-16	-1.000E+00	2.600E-11	4.320E-11
REMAINDER	1.120E-14	6.612E-12	4.053E-11	2.500E-16	-1.000E+00	3.930E-11	7.300E-11
EFFECTIVE	1.240E-14	7.379E-12	4.523E-11	2.790E-16	-1.000E+00	4.290E-11	5.890E-11
SKIN(FGR)	1.520E-14	9.918E-12	6.079E-11	3.750E-16	-1.000E+00	0.000E+00	0.000E+00
Cs-130							
GONADS	2.400E-14	1.405E-12	1.405E-12	5.430E-16	-1.000E+00	7.830E-13	1.730E-12
BREAST	2.750E-14	1.354E-12	1.354E-12	5.230E-16	-1.000E+00	1.020E-12	2.020E-12
LUNGS	2.370E-14	1.255E-12	1.255E-12	4.850E-16	-1.000E+00	4.820E-11	2.240E-12
RED MARR	2.290E-14	1.263E-12	1.263E-12	4.880E-16	-1.000E+00	1.040E-12	1.950E-12
BONE SUR	4.200E-14	1.983E-12	1.983E-12	7.660E-16	-1.000E+00	9.410E-13	1.720E-12
THYROID	2.440E-14	1.317E-12	1.317E-12	5.090E-16	-1.000E+00	9.280E-13	1.490E-12
REMAINDER	2.260E-14	1.232E-12	1.232E-12	4.760E-16	-1.000E+00	5.840E-12	4.710E-11
EFFECTIVE	2.450E-14	1.325E-12	1.325E-12	5.120E-16	-1.000E+00	8.070E-12	1.550E-11
SKIN(FGR)	5.480E-14	1.405E-11	1.405E-11	5.430E-15	-1.000E+00	0.000E+00	0.000E+00
Cs-131							
GONADS	4.250E-16	9.505E-13	1.589E-11	3.340E-17	-1.000E+00	3.770E-11	6.120E-11
BREAST	5.920E-16	1.033E-12	1.727E-11	3.630E-17	-1.000E+00	3.300E-11	5.260E-11
LUNGS	1.750E-16	3.728E-13	6.233E-12	1.310E-17	-1.000E+00	7.290E-11	6.220E-11
RED MARR	1.360E-16	2.709E-13	4.529E-12	9.520E-18	-1.000E+00	6.210E-11	9.960E-11
BONE SUR	9.150E-16	2.021E-12	3.378E-11	7.100E-17	-1.000E+00	5.580E-11	8.960E-11
THYROID	3.350E-16	5.976E-13	9.991E-12	2.100E-17	-1.000E+00	3.000E-11	4.860E-11
REMAINDER	1.930E-16	4.383E-13	7.327E-12	1.540E-17	-1.000E+00	3.950E-11	6.640E-11
EFFECTIVE	3.280E-16	6.802E-13	1.137E-11	2.390E-17	-1.000E+00	4.500E-11	6.670E-11
SKIN(FGR)	7.840E-16	1.582E-12	2.645E-11	5.560E-17	-1.000E+00	0.000E+00	0.000E+00
Cs-132							
GONADS	3.280E-14	2.085E-11	3.137E-10	7.370E-16	-1.000E+00	3.200E-10	5.240E-10
BREAST	3.750E-14	2.006E-11	3.018E-10	7.090E-16	-1.000E+00	2.690E-10	4.270E-10
LUNGS	3.240E-14	1.850E-11	2.783E-10	6.540E-16	-1.000E+00	4.200E-10	4.490E-10
RED MARR	3.150E-14	1.873E-11	2.818E-10	6.620E-16	-1.000E+00	3.170E-10	5.060E-10
BONE SUR	5.380E-14	2.858E-11	4.299E-10	1.010E-15	-1.000E+00	2.870E-10	4.600E-10
THYROID	3.340E-14	1.952E-11	2.937E-10	6.900E-16	-1.000E+00	2.730E-10	4.330E-10
REMAINDER	3.100E-14	1.822E-11	2.741E-10	6.440E-16	-1.000E+00	3.540E-10	5.840E-10
EFFECTIVE	3.340E-14	1.961E-11	2.949E-10	6.930E-16	-1.000E+00	3.320E-10	5.120E-10
SKIN(FGR)	3.920E-14	2.575E-11	3.873E-10	9.100E-16	-1.000E+00	0.000E+00	0.000E+00
Cs-134							
GONADS	7.400E-14	4.607E-11	9.646E-10	1.600E-15	-1.000E+00	1.300E-08	2.060E-08
BREAST	8.430E-14	4.406E-11	9.224E-10	1.530E-15	-1.000E+00	1.080E-08	1.720E-08
LUNGS	7.370E-14	4.204E-11	8.802E-10	1.460E-15	-1.000E+00	1.180E-08	1.760E-08
RED MARR	7.190E-14	4.262E-11	8.922E-10	1.480E-15	-1.000E+00	1.180E-08	1.870E-08
BONE SUR	1.200E-13	6.105E-11	1.278E-09	2.120E-15	-1.000E+00	1.100E-08	1.740E-08
THYROID	7.570E-14	4.377E-11	9.163E-10	1.520E-15	-1.000E+00	1.110E-08	1.760E-08
REMAINDER	7.060E-14	4.147E-11	8.681E-10	1.440E-15	-1.000E+00	1.390E-08	2.210E-08
EFFECTIVE	7.570E-14	4.377E-11	9.163E-10	1.520E-15	-1.000E+00	1.250E-08	1.980E-08
SKIN(FGR)	9.450E-14	6.249E-11	1.308E-09	2.170E-15	-1.000E+00	0.000E+00	0.000E+00
Cs-134m							
GONADS	9.300E-16	3.864E-13	4.534E-13	3.010E-17	-1.000E+00	3.610E-12	6.720E-12
BREAST	1.120E-15	3.954E-13	4.639E-13	3.080E-17	-1.000E+00	3.390E-12	6.280E-12

LUNGS	7.840E-16	2.644E-13	3.103E-13	2.060E-17-1.000E+00	6.400E-11	6.420E-12
RED MARR	6.810E-16	2.349E-13	2.756E-13	1.830E-17-1.000E+00	3.760E-12	6.910E-12
BONE SUR	2.610E-15	9.191E-13	1.078E-12	7.160E-17-1.000E+00	3.550E-12	6.570E-12
THYROID	8.880E-16	3.081E-13	3.615E-13	2.400E-17-1.000E+00	3.340E-12	6.220E-12
REMAINDER	7.450E-16	2.670E-13	3.133E-13	2.080E-17-1.000E+00	6.900E-12	2.890E-11
EFFECTIVE	9.050E-16	3.325E-13	3.901E-13	2.590E-17-1.000E+00	1.180E-11	1.330E-11
SKIN(FGR)	2.880E-15	5.314E-13	6.236E-13	4.140E-17-1.000E+00	0.000E+00	0.000E+00
Cs-135						
GONADS	6.280E-19	1.261E-15	2.649E-14	4.380E-20-1.000E+00	1.200E-09	1.910E-09
BREAST	8.230E-19	1.397E-15	2.933E-14	4.850E-20-1.000E+00	1.200E-09	1.910E-09
LUNGS	4.190E-19	5.818E-16	1.222E-14	2.020E-20-1.000E+00	1.410E-09	1.910E-09
RED MARR	3.340E-19	4.867E-16	1.022E-14	1.690E-20-1.000E+00	1.200E-09	1.910E-09
BONE SUR	1.810E-18	2.880E-15	6.048E-14	1.000E-19-1.000E+00	1.200E-09	1.910E-09
THYROID	5.500E-19	7.718E-16	1.621E-14	2.680E-20-1.000E+00	1.200E-09	1.910E-09
REMAINDER	4.090E-19	6.509E-16	1.367E-14	2.260E-20-1.000E+00	1.200E-09	1.930E-09
EFFECTIVE	5.650E-19	9.590E-16	2.014E-14	3.330E-20-1.000E+00	1.230E-09	1.910E-09
SKIN(FGR)	9.060E-16	3.658E-15	7.681E-14	1.270E-19-1.000E+00	0.000E+00	0.000E+00
Cs-135m						
GONADS	7.600E-14	7.418E-12	7.432E-12	1.620E-15-1.000E+00	1.960E-12	5.300E-12
BREAST	8.640E-14	7.098E-12	7.111E-12	1.550E-15-1.000E+00	3.150E-12	5.760E-12
LUNGS	7.570E-14	6.777E-12	6.790E-12	1.480E-15-1.000E+00	2.280E-11	6.450E-12
RED MARR	7.410E-14	6.915E-12	6.928E-12	1.510E-15-1.000E+00	3.150E-12	5.420E-12
BONE SUR	1.190E-13	9.708E-12	9.726E-12	2.120E-15-1.000E+00	2.660E-12	4.390E-12
THYROID	7.790E-14	7.052E-12	7.065E-12	1.540E-15-1.000E+00	3.000E-12	3.840E-12
REMAINDER	7.250E-14	6.686E-12	6.698E-12	1.460E-15-1.000E+00	8.130E-12	3.730E-11
EFFECTIVE	7.760E-14	7.052E-12	7.065E-12	1.540E-15-1.000E+00	6.680E-12	1.500E-11
SKIN(FGR)	9.100E-14	1.085E-11	1.087E-11	2.370E-15-1.000E+00	0.000E+00	0.000E+00
Cs-136						
GONADS	1.040E-13	6.223E-11	1.102E-09	2.180E-15-1.000E+00	1.880E-09	3.040E-09
BREAST	1.180E-13	5.966E-11	1.056E-09	2.090E-15-1.000E+00	1.670E-09	2.650E-09
LUNGS	1.040E-13	5.710E-11	1.011E-09	2.000E-15-1.000E+00	2.320E-09	2.620E-09
RED MARR	1.010E-13	5.824E-11	1.031E-09	2.040E-15-1.000E+00	1.860E-09	2.950E-09
BONE SUR	1.660E-13	8.422E-11	1.491E-09	2.950E-15-1.000E+00	1.700E-09	2.710E-09
THYROID	1.070E-13	5.852E-11	1.036E-09	2.050E-15-1.000E+00	1.730E-09	2.740E-09
REMAINDER	9.950E-14	5.652E-11	1.001E-09	1.980E-15-1.000E+00	2.190E-09	3.520E-09
EFFECTIVE	1.060E-13	5.966E-11	1.056E-09	2.090E-15-1.000E+00	1.980E-09	3.040E-09
SKIN(FGR)	1.250E-13	7.251E-11	1.284E-09	2.540E-15-1.000E+00	0.000E+00	0.000E+00
Cs-137						
GONADS	2.669E-14	1.669E-11	3.530E-10	5.840E-16-1.000E+00	8.760E-09	1.390E-08
BREAST	3.047E-14	1.596E-11	3.376E-10	5.585E-16-1.000E+00	7.840E-09	1.240E-08
LUNGS	2.649E-14	1.517E-11	3.209E-10	5.309E-16-1.000E+00	8.820E-09	1.270E-08
RED MARR	2.583E-14	1.542E-11	3.260E-10	5.394E-16-1.000E+00	8.300E-09	1.320E-08
BONE SUR	4.382E-14	2.238E-11	4.734E-10	7.832E-16-1.000E+00	7.940E-09	1.260E-08
THYROID	2.725E-14	1.588E-11	3.358E-10	5.556E-16-1.000E+00	7.930E-09	1.260E-08
REMAINDER	2.536E-14	1.490E-11	3.152E-10	5.215E-16-1.000E+00	9.120E-09	1.450E-08
EFFECTIVE	2.725E-14	1.585E-11	3.353E-10	5.546E-16-1.000E+00	8.630E-09	1.350E-08
SKIN(FGR)	4.392E-14	5.253E-11	1.110E-09	1.836E-15-1.000E+00	0.000E+00	0.000E+00
Cs-138						
GONADS	1.170E-13	6.327E-12	6.327E-12	2.270E-15-1.000E+00	3.280E-12	8.000E-12
BREAST	1.330E-13	6.048E-12	6.048E-12	2.170E-15-1.000E+00	4.020E-12	8.000E-12
LUNGS	1.190E-13	5.881E-12	5.881E-12	2.110E-15-1.000E+00	1.590E-10	8.530E-12
RED MARR	1.180E-13	6.048E-12	6.048E-12	2.170E-15-1.000E+00	3.950E-12	7.370E-12
BONE SUR	1.700E-13	8.083E-12	8.083E-12	2.900E-15-1.000E+00	3.550E-12	6.470E-12
THYROID	1.210E-13	5.742E-12	5.742E-12	2.060E-15-1.000E+00	3.570E-12	5.730E-12
REMAINDER	1.150E-13	5.881E-12	5.881E-12	2.110E-15-1.000E+00	2.060E-11	1.570E-10
EFFECTIVE	1.210E-13	6.104E-12	6.104E-12	2.190E-15-1.000E+00	2.740E-11	5.250E-11
SKIN(FGR)	2.170E-13	4.237E-11	4.237E-11	1.520E-14-1.000E+00	0.000E+00	0.000E+00
Cu-60						
GONADS	1.920E-13	7.591E-12	7.591E-12	3.780E-15-1.000E+00	4.960E-13	1.360E-11
BREAST	2.170E-13	7.250E-12	7.250E-12	3.610E-15-1.000E+00	1.800E-12	5.850E-12
LUNGS	1.940E-13	7.029E-12	7.029E-12	3.500E-15-1.000E+00	1.110E-10	5.320E-12
RED MARR	1.920E-13	7.210E-12	7.210E-12	3.590E-15-1.000E+00	1.700E-12	5.810E-12
BONE SUR	2.860E-13	9.800E-12	9.800E-12	4.880E-15-1.000E+00	1.310E-12	2.840E-12

THYROID	1.980E-13	6.928E-12	6.928E-12	3.450E-15-1.000E+00	1.450E-12	9.200E-13
REMAINDER	1.870E-13	6.989E-12	6.989E-12	3.480E-15-1.000E+00	5.280E-12	1.550E-10
EFFECTIVE	1.980E-13	7.290E-12	7.290E-12	3.630E-15-1.000E+00	1.560E-11	5.210E-11
SKIN(FGR)	2.820E-13	2.892E-11	2.892E-11	1.440E-14-1.000E+00	0.000E+00	0.000E+00
Cu-61						
GONADS	3.900E-14	1.217E-11	1.515E-11	8.560E-16-1.000E+00	6.770E-12	5.460E-11
BREAST	4.450E-14	1.168E-11	1.453E-11	8.210E-16-1.000E+00	4.960E-12	1.520E-11
LUNGS	3.870E-14	1.109E-11	1.381E-11	7.800E-16-1.000E+00	2.930E-10	1.090E-11
RED MARR	3.730E-14	1.122E-11	1.397E-11	7.890E-16-1.000E+00	5.280E-12	1.920E-11
BONE SUR	6.820E-14	1.692E-11	2.106E-11	1.190E-15-1.000E+00	3.740E-12	1.120E-11
THYROID	3.970E-14	1.153E-11	1.435E-11	8.110E-16-1.000E+00	3.730E-12	7.250E-12
REMAINDER	3.700E-14	1.087E-11	1.352E-11	7.640E-16-1.000E+00	4.060E-11	3.280E-10
EFFECTIVE	3.990E-14	1.159E-11	1.443E-11	8.150E-16-1.000E+00	5.060E-11	1.180E-10
SKIN(FGR)	6.500E-14	5.902E-11	7.346E-11	4.150E-15-1.000E+00	0.000E+00	0.000E+00
Cu-62						
GONADS	4.750E-14	8.937E-13	8.937E-13	1.060E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	5.440E-14	8.515E-13	8.515E-13	1.010E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.720E-14	8.102E-13	8.102E-13	9.610E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.550E-14	8.178E-13	8.178E-13	9.700E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.380E-14	1.239E-12	1.239E-12	1.470E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.840E-14	8.431E-13	8.431E-13	1.000E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.510E-14	7.934E-13	7.934E-13	9.410E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.860E-14	8.431E-13	8.431E-13	1.000E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.440E-13	1.248E-11	1.248E-11	1.480E-14-1.000E+00	0.000E+00	0.000E+00
Cu-64						
GONADS	8.890E-15	4.597E-12	1.299E-11	1.970E-16-1.000E+00	1.240E-11	4.780E-11
BREAST	1.020E-14	4.411E-12	1.247E-11	1.890E-16-1.000E+00	6.380E-12	1.590E-11
LUNGS	8.840E-15	4.177E-12	1.181E-11	1.790E-16-1.000E+00	3.500E-10	1.280E-11
RED MARR	8.520E-15	4.224E-12	1.194E-11	1.810E-16-1.000E+00	7.120E-12	1.940E-11
BONE SUR	1.560E-14	6.347E-12	1.794E-11	2.720E-16-1.000E+00	5.290E-12	1.390E-11
THYROID	9.060E-15	4.364E-12	1.233E-11	1.870E-16-1.000E+00	4.980E-12	1.130E-11
REMAINDER	8.440E-15	4.084E-12	1.154E-11	1.750E-16-1.000E+00	9.200E-11	3.570E-10
EFFECTIVE	9.100E-15	4.364E-12	1.233E-11	1.870E-16-1.000E+00	7.480E-11	1.260E-10
SKIN(FGR)	1.640E-14	9.171E-12	2.592E-11	3.930E-16-1.000E+00	0.000E+00	0.000E+00
Cu-66						
GONADS	4.370E-15	4.061E-14	4.061E-14	9.200E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	4.950E-15	3.885E-14	3.885E-14	8.800E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.350E-15	3.704E-14	3.704E-14	8.390E-17-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.270E-15	3.788E-14	3.788E-14	8.580E-17-1.000E+00	0.000E+00	0.000E+00
BONE SUR	6.680E-15	5.430E-14	5.430E-14	1.230E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	4.480E-15	3.792E-14	3.792E-14	8.590E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.180E-15	3.682E-14	3.682E-14	8.340E-17-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.460E-15	3.876E-14	3.876E-14	8.780E-17-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	7.690E-14	5.253E-12	5.253E-12	1.190E-14-1.000E+00	0.000E+00	0.000E+00
Cu-67						
GONADS	5.300E-15	3.140E-12	3.105E-11	1.140E-16-1.000E+00	4.770E-11	1.180E-10
BREAST	6.100E-15	3.058E-12	3.023E-11	1.110E-16-1.000E+00	3.080E-11	6.290E-11
LUNGS	5.060E-15	2.892E-12	2.860E-11	1.050E-16-1.000E+00	1.590E-09	5.940E-11
RED MARR	4.590E-15	2.810E-12	2.778E-11	1.020E-16-1.000E+00	3.990E-11	8.130E-11
BONE SUR	1.400E-14	6.749E-12	6.673E-11	2.450E-16-1.000E+00	3.290E-11	6.760E-11
THYROID	5.290E-15	2.892E-12	2.860E-11	1.050E-16-1.000E+00	2.600E-11	5.520E-11
REMAINDER	4.770E-15	2.782E-12	2.751E-11	1.010E-16-1.000E+00	3.950E-10	9.840E-10
EFFECTIVE	5.410E-15	3.058E-12	3.023E-11	1.110E-16-1.000E+00	3.320E-10	3.550E-10
SKIN(FGR)	1.180E-14	4.435E-12	4.385E-11	1.610E-16-1.000E+00	0.000E+00	0.000E+00
Dy-155						
GONADS	2.720E-14	1.300E-11	3.054E-11	5.880E-16-1.000E+00	3.710E-11	1.760E-10
BREAST	3.110E-14	1.256E-11	2.950E-11	5.680E-16-1.000E+00	1.190E-11	2.310E-11
LUNGS	2.660E-14	1.172E-11	2.753E-11	5.300E-16-1.000E+00	1.790E-10	5.460E-12
RED MARR	2.550E-14	1.167E-11	2.742E-11	5.280E-16-1.000E+00	2.350E-11	4.610E-11
BONE SUR	5.010E-14	2.120E-11	4.981E-11	9.590E-16-1.000E+00	4.620E-11	1.500E-11
THYROID	2.760E-14	1.187E-11	2.789E-11	5.370E-16-1.000E+00	5.320E-12	6.340E-13
REMAINDER	2.550E-14	1.150E-11	2.701E-11	5.200E-16-1.000E+00	7.700E-11	3.400E-10
EFFECTIVE	2.770E-14	1.238E-11	2.908E-11	5.600E-16-1.000E+00	6.000E-11	1.560E-10

SKIN(FGR)	3.270E-14	1.607E-11	3.776E-11	7.270E-16	-1.000E+00	0.000E+00	0.000E+00
Dy-157							
GONADS	1.610E-14	7.737E-12	1.561E-11	3.710E-16	-1.000E+00	1.640E-11	9.630E-11
BREAST	1.850E-14	7.549E-12	1.523E-11	3.620E-16	-1.000E+00	5.230E-12	1.200E-11
LUNGS	1.540E-14	6.882E-12	1.388E-11	3.300E-16	-1.000E+00	5.930E-11	2.780E-12
RED MARR	1.450E-14	6.715E-12	1.355E-11	3.220E-16	-1.000E+00	9.040E-12	2.540E-11
BONE SUR	3.420E-14	1.381E-11	2.785E-11	6.620E-16	-1.000E+00	9.100E-12	8.080E-12
THYROID	1.610E-14	7.090E-12	1.430E-11	3.400E-16	-1.000E+00	2.240E-12	2.450E-13
REMAINDER	1.470E-14	6.673E-12	1.346E-11	3.200E-16	-1.000E+00	2.730E-11	1.550E-10
EFFECTIVE	1.630E-14	7.320E-12	1.477E-11	3.510E-16	-1.000E+00	2.160E-11	7.600E-11
SKIN(FGR)	1.940E-14	8.946E-12	1.805E-11	4.290E-16	-1.000E+00	0.000E+00	0.000E+00
Dy-159							
GONADS	1.380E-15	1.502E-12	3.105E-11	5.220E-17	-1.000E+00	7.600E-11	9.960E-11
BREAST	1.740E-15	1.534E-12	3.170E-11	5.330E-17	-1.000E+00	7.990E-11	8.300E-12
LUNGS	9.660E-16	1.088E-12	2.248E-11	3.780E-17	-1.000E+00	2.370E-09	6.340E-13
RED MARR	7.040E-16	7.885E-13	1.630E-11	2.740E-17	-1.000E+00	8.210E-10	4.200E-11
BONE SUR	4.370E-15	5.209E-12	1.077E-10	1.810E-16	-1.000E+00	5.090E-09	2.530E-11
THYROID	1.230E-15	1.191E-12	2.462E-11	4.140E-17	-1.000E+00	3.120E-11	6.220E-14
REMAINDER	9.200E-16	1.050E-12	2.171E-11	3.650E-17	-1.000E+00	2.940E-10	2.930E-10
EFFECTIVE	1.250E-15	1.338E-12	2.766E-11	4.650E-17	-1.000E+00	6.560E-10	1.200E-10
SKIN(FGR)	1.890E-15	1.896E-12	3.919E-11	6.590E-17	-1.000E+00	0.000E+00	0.000E+00
Dy-165							
GONADS	1.190E-15	3.134E-13	3.455E-13	2.850E-17	-1.000E+00	1.240E-13	1.670E-12
BREAST	1.380E-15	3.046E-13	3.358E-13	2.770E-17	-1.000E+00	9.410E-14	2.810E-13
LUNGS	1.130E-15	2.749E-13	3.031E-13	2.500E-17	-1.000E+00	2.420E-10	1.150E-13
RED MARR	1.050E-15	2.628E-13	2.897E-13	2.390E-17	-1.000E+00	1.890E-12	5.840E-13
BONE SUR	2.580E-15	6.388E-13	7.043E-13	5.810E-17	-1.000E+00	2.470E-12	1.940E-13
THYROID	1.190E-15	2.859E-13	3.152E-13	2.600E-17	-1.000E+00	5.450E-14	8.600E-15
REMAINDER	1.070E-15	2.672E-13	2.946E-13	2.430E-17	-1.000E+00	2.270E-11	3.250E-10
EFFECTIVE	1.200E-15	2.958E-13	3.261E-13	2.690E-17	-1.000E+00	3.620E-11	9.810E-11
SKIN(FGR)	2.820E-14	4.849E-11	5.346E-11	4.410E-15	-1.000E+00	0.000E+00	0.000E+00
Dy-166							
GONADS	1.450E-15	1.189E-12	1.375E-11	4.270E-17	-1.000E+00	2.860E-11	7.140E-11
BREAST	1.770E-15	1.192E-12	1.379E-11	4.280E-17	-1.000E+00	8.090E-12	6.910E-12
LUNGS	1.200E-15	9.717E-13	1.124E-11	3.490E-17	-1.000E+00	9.100E-09	6.480E-13
RED MARR	9.600E-16	7.880E-13	9.115E-12	2.830E-17	-1.000E+00	4.370E-10	2.910E-11
BONE SUR	4.550E-15	3.926E-12	4.541E-11	1.410E-16	-1.000E+00	1.440E-09	1.360E-11
THYROID	1.360E-15	1.013E-12	1.172E-11	3.640E-17	-1.000E+00	2.680E-12	4.090E-14
REMAINDER	1.130E-15	9.327E-13	1.079E-11	3.350E-17	-1.000E+00	2.750E-09	5.880E-09
EFFECTIVE	1.400E-15	1.117E-12	1.292E-11	4.010E-17	-1.000E+00	2.020E-09	1.790E-09
SKIN(FGR)	5.790E-15	1.442E-12	1.668E-11	5.180E-17	-1.000E+00	0.000E+00	0.000E+00
Er-161							
GONADS	4.330E-14	1.277E-11	1.558E-11	9.260E-16	-1.000E+00	8.980E-12	8.150E-11
BREAST	4.940E-14	1.224E-11	1.494E-11	8.880E-16	-1.000E+00	5.450E-12	1.340E-11
LUNGS	4.280E-14	1.161E-11	1.417E-11	8.420E-16	-1.000E+00	1.020E-10	4.900E-12
RED MARR	4.170E-14	1.172E-11	1.430E-11	8.500E-16	-1.000E+00	8.000E-12	2.330E-11
BONE SUR	7.090E-14	1.861E-11	2.272E-11	1.350E-15	-1.000E+00	1.120E-11	7.750E-12
THYROID	4.420E-14	1.191E-11	1.454E-11	8.640E-16	-1.000E+00	3.700E-12	5.450E-13
REMAINDER	4.110E-14	1.144E-11	1.397E-11	8.300E-16	-1.000E+00	2.590E-11	2.220E-10
EFFECTIVE	4.420E-14	1.218E-11	1.486E-11	8.830E-16	-1.000E+00	2.450E-11	9.260E-11
SKIN(FGR)	5.230E-14	1.558E-11	1.902E-11	1.130E-15	-1.000E+00	0.000E+00	0.000E+00
Er-165							
GONADS	1.210E-15	9.367E-13	2.260E-12	4.200E-17	-1.000E+00	3.750E-12	1.910E-11
BREAST	1.510E-15	9.478E-13	2.287E-12	4.250E-17	-1.000E+00	1.080E-12	2.010E-12
LUNGS	8.860E-16	7.159E-13	1.727E-12	3.210E-17	-1.000E+00	2.700E-11	2.810E-13
RED MARR	6.520E-16	5.285E-13	1.275E-12	2.370E-17	-1.000E+00	3.510E-12	8.310E-12
BONE SUR	3.960E-15	3.368E-12	8.125E-12	1.510E-16	-1.000E+00	5.620E-12	2.360E-12
THYROID	1.090E-15	7.605E-13	1.835E-12	3.410E-17	-1.000E+00	2.940E-13	2.300E-15
REMAINDER	8.380E-16	6.869E-13	1.657E-12	3.080E-17	-1.000E+00	1.050E-11	5.380E-11
EFFECTIVE	1.110E-15	8.564E-13	2.066E-12	3.840E-17	-1.000E+00	8.080E-12	2.230E-11
SKIN(FGR)	1.610E-15	1.146E-12	2.766E-12	5.140E-17	-1.000E+00	0.000E+00	0.000E+00
Er-169							
GONADS	1.860E-18	2.845E-15	4.712E-14	1.000E-19	-1.000E+00	2.810E-12	1.620E-14

BREAST	2.340E-18	3.072E-15	5.089E-14	1.080E-19-1.000E+00	2.810E-12	1.090E-14
LUNGS	1.400E-18	1.590E-15	2.634E-14	5.590E-20-1.000E+00	2.720E-09	1.090E-14
RED MARR	1.140E-18	1.354E-15	2.243E-14	4.760E-20-1.000E+00	1.450E-10	5.610E-13
BONE SUR	5.520E-18	6.998E-15	1.159E-13	2.460E-19-1.000E+00	1.760E-09	6.830E-12
THYROID	1.690E-18	1.940E-15	3.214E-14	6.820E-20-1.000E+00	2.810E-12	1.090E-14
REMAINDER	1.340E-18	1.687E-15	2.794E-14	5.930E-20-1.000E+00	5.530E-10	1.350E-09
EFFECTIVE	1.740E-18	2.304E-15	3.817E-14	8.100E-20-1.000E+00	5.640E-10	4.060E-10
SKIN(FGR)	2.830E-15	6.998E-15	1.159E-13	2.460E-19-1.000E+00	0.000E+00	0.000E+00
Er-171						
GONADS	1.750E-14	7.946E-12	1.523E-11	3.900E-16-1.000E+00	1.690E-11	9.260E-11
BREAST	2.010E-14	7.722E-12	1.480E-11	3.790E-16-1.000E+00	6.700E-12	1.200E-11
LUNGS	1.690E-14	7.192E-12	1.379E-11	3.530E-16-1.000E+00	7.000E-10	2.900E-12
RED MARR	1.580E-14	7.090E-12	1.359E-11	3.480E-16-1.000E+00	2.160E-11	2.520E-11
BONE SUR	3.900E-14	1.444E-11	2.769E-11	7.090E-16-1.000E+00	5.220E-11	8.250E-12
THYROID	1.760E-14	7.355E-12	1.410E-11	3.610E-16-1.000E+00	3.960E-12	2.540E-13
REMAINDER	1.610E-14	6.988E-12	1.340E-11	3.430E-16-1.000E+00	1.950E-10	1.210E-09
EFFECTIVE	1.780E-14	7.599E-12	1.457E-11	3.730E-16-1.000E+00	1.520E-10	3.910E-10
SKIN(FGR)	4.220E-14	6.805E-11	1.304E-10	3.340E-15-1.000E+00	0.000E+00	0.000E+00
Er-172						
GONADS	2.420E-14	1.476E-11	1.257E-10	5.420E-16-1.000E+00	2.010E-10	5.080E-10
BREAST	2.780E-14	1.419E-11	1.208E-10	5.210E-16-1.000E+00	6.560E-11	5.950E-11
LUNGS	2.390E-14	1.337E-11	1.139E-10	4.910E-16-1.000E+00	4.600E-09	9.860E-12
RED MARR	2.290E-14	1.337E-11	1.139E-10	4.910E-16-1.000E+00	2.870E-10	1.110E-10
BONE SUR	4.440E-14	2.228E-11	1.897E-10	8.180E-16-1.000E+00	8.100E-10	3.940E-11
THYROID	2.460E-14	1.392E-11	1.185E-10	5.110E-16-1.000E+00	3.760E-11	1.300E-12
REMAINDER	2.280E-14	1.305E-11	1.111E-10	4.790E-16-1.000E+00	1.450E-09	3.290E-09
EFFECTIVE	2.470E-14	1.403E-11	1.194E-10	5.150E-16-1.000E+00	1.110E-09	1.140E-09
SKIN(FGR)	3.210E-14	1.722E-11	1.466E-10	6.320E-16-1.000E+00	0.000E+00	0.000E+00
Es-250						
GONADS	1.860E-14	4.011E-12	4.319E-12	3.960E-16-1.000E+00	2.460E-10	2.060E-11
BREAST	2.120E-14	3.869E-12	4.166E-12	3.820E-16-1.000E+00	1.430E-12	3.460E-12
LUNGS	1.840E-14	3.606E-12	3.883E-12	3.560E-16-1.000E+00	4.000E-10	1.580E-12
RED MARR	1.770E-14	3.657E-12	3.937E-12	3.610E-16-1.000E+00	2.150E-09	2.350E-11
BONE SUR	3.380E-14	6.260E-12	6.740E-12	6.180E-16-1.000E+00	2.680E-08	2.250E-10
THYROID	1.900E-14	3.707E-12	3.992E-12	3.660E-16-1.000E+00	1.120E-12	1.650E-13
REMAINDER	1.750E-14	3.575E-12	3.850E-12	3.530E-16-1.000E+00	4.400E-10	5.530E-11
EFFECTIVE	1.900E-14	3.829E-12	4.123E-12	3.780E-16-1.000E+00	1.300E-09	3.200E-11
SKIN(FGR)	2.210E-14	5.449E-12	5.868E-12	5.380E-16-1.000E+00	0.000E+00	0.000E+00
Es-251						
GONADS	4.050E-15	2.572E-12	1.614E-11	9.700E-17-1.000E+00	1.850E-10	7.900E-11
BREAST	4.750E-15	2.566E-12	1.610E-11	9.680E-17-1.000E+00	9.010E-12	8.170E-12
LUNGS	3.800E-15	2.129E-12	1.336E-11	8.030E-17-1.000E+00	4.060E-09	1.180E-12
RED MARR	3.340E-15	2.047E-12	1.284E-11	7.720E-17-1.000E+00	1.270E-09	3.540E-11
BONE SUR	1.210E-14	6.150E-12	3.860E-11	2.320E-16-1.000E+00	1.570E-08	1.450E-10
THYROID	4.010E-15	2.222E-12	1.394E-11	8.380E-17-1.000E+00	5.280E-12	1.030E-13
REMAINDER	3.560E-15	2.094E-12	1.314E-11	7.900E-17-1.000E+00	4.010E-10	5.690E-10
EFFECTIVE	4.130E-15	2.410E-12	1.512E-11	9.090E-17-1.000E+00	1.280E-09	2.000E-10
SKIN(FGR)	5.350E-15	3.817E-12	2.396E-11	1.440E-16-1.000E+00	0.000E+00	0.000E+00
Es-253						
GONADS	1.940E-17	3.437E-14	6.462E-13	1.200E-18-1.000E+00	5.090E-08	5.960E-10
BREAST	2.520E-17	3.952E-14	7.431E-13	1.380E-18-1.000E+00	7.840E-10	9.550E-12
LUNGS	1.500E-17	1.097E-14	2.062E-13	3.830E-19-1.000E+00	6.340E-06	9.460E-12
RED MARR	1.440E-17	1.214E-14	2.283E-13	4.240E-19-1.000E+00	5.180E-07	6.100E-09
BONE SUR	3.810E-17	4.210E-14	7.915E-13	1.470E-18-1.000E+00	6.470E-06	7.610E-08
THYROID	1.790E-17	1.687E-14	3.172E-13	5.890E-19-1.000E+00	7.830E-10	9.440E-12
REMAINDER	1.480E-17	1.449E-14	2.725E-13	5.060E-19-1.000E+00	1.390E-07	1.980E-08
EFFECTIVE	1.830E-17	2.343E-14	4.405E-13	8.180E-19-1.000E+00	1.070E-06	9.100E-09
SKIN(FGR)	4.550E-17	1.186E-13	2.229E-12	4.140E-18-1.000E+00	0.000E+00	0.000E+00
Es-254						
GONADS	2.190E-16	5.729E-13	1.193E-11	1.990E-17-1.000E+00	1.570E-06	1.450E-08
BREAST	3.110E-16	6.765E-13	1.409E-11	2.350E-17-1.000E+00	3.720E-09	1.290E-10
LUNGS	1.310E-16	1.258E-13	2.620E-12	4.370E-18-1.000E+00	1.830E-05	4.720E-11
RED MARR	1.220E-16	1.439E-13	2.998E-12	5.000E-18-1.000E+00	1.510E-05	1.310E-07

BONE SUR	4.880E-16	7.312E-13	1.523E-11	2.540E-17	-1.000E+00	1.880E-04	1.630E-06
THYROID	1.850E-16	2.323E-13	4.838E-12	8.070E-18	-1.000E+00	2.440E-09	1.930E-11
REMAINDER	1.360E-16	1.952E-13	4.065E-12	6.780E-18	-1.000E+00	3.500E-06	5.470E-08
EFFECTIVE	1.930E-16	3.656E-13	7.614E-12	1.270E-17	-1.000E+00	1.110E-05	8.470E-08
SKIN(FGR)	5.650E-16	2.260E-12	4.706E-11	7.850E-17	-1.000E+00	0.000E+00	0.000E+00
Es-254m							
GONADS	2.210E-14	1.305E-11	9.407E-11	4.860E-16	-1.000E+00	8.100E-09	4.070E-10
BREAST	2.520E-14	1.252E-11	9.020E-11	4.660E-16	-1.000E+00	4.650E-10	4.640E-11
LUNGS	2.190E-14	1.174E-11	8.459E-11	4.370E-16	-1.000E+00	8.910E-07	1.460E-11
RED MARR	2.130E-14	1.195E-11	8.614E-11	4.450E-16	-1.000E+00	7.250E-08	8.290E-10
BONE SUR	3.640E-14	1.754E-11	1.264E-10	6.530E-16	-1.000E+00	9.010E-07	9.480E-09
THYROID	2.250E-14	1.233E-11	8.885E-11	4.590E-16	-1.000E+00	4.500E-10	8.160E-12
REMAINDER	2.100E-14	1.158E-11	8.343E-11	4.310E-16	-1.000E+00	2.170E-08	1.450E-08
EFFECTIVE	2.250E-14	1.236E-11	8.904E-11	4.600E-16	-1.000E+00	1.510E-07	4.830E-09
SKIN(FGR)	3.760E-14	4.754E-11	3.426E-10	1.770E-15	-1.000E+00	0.000E+00	0.000E+00
Eu-145							
GONADS	7.050E-14	4.068E-11	5.951E-10	1.440E-15	-1.000E+00	5.420E-10	1.290E-09
BREAST	8.010E-14	3.898E-11	5.703E-10	1.380E-15	-1.000E+00	2.180E-10	1.580E-10
LUNGS	7.060E-14	3.729E-11	5.455E-10	1.320E-15	-1.000E+00	1.960E-09	3.130E-11
RED MARR	6.950E-14	3.813E-11	5.579E-10	1.350E-15	-1.000E+00	3.580E-10	2.710E-10
BONE SUR	1.070E-13	5.480E-11	8.018E-10	1.940E-15	-1.000E+00	6.730E-10	9.570E-11
THYROID	7.240E-14	3.757E-11	5.497E-10	1.330E-15	-1.000E+00	1.190E-10	4.780E-12
REMAINDER	6.800E-14	3.700E-11	5.414E-10	1.310E-15	-1.000E+00	9.030E-10	1.760E-09
EFFECTIVE	7.220E-14	3.898E-11	5.703E-10	1.380E-15	-1.000E+00	7.410E-10	9.120E-10
SKIN(FGR)	8.330E-14	5.282E-11	7.728E-10	1.870E-15	-1.000E+00	0.000E+00	0.000E+00
Eu-146							
GONADS	1.200E-13	7.107E-11	9.463E-10	2.530E-15	-1.000E+00	8.750E-10	2.190E-09
BREAST	1.360E-13	6.798E-11	9.052E-10	2.420E-15	-1.000E+00	3.150E-10	2.680E-10
LUNGS	1.200E-13	6.489E-11	8.641E-10	2.310E-15	-1.000E+00	2.620E-09	5.010E-11
RED MARR	1.170E-13	6.601E-11	8.790E-10	2.350E-15	-1.000E+00	4.410E-10	4.500E-10
BONE SUR	1.890E-13	9.551E-11	1.272E-09	3.400E-15	-1.000E+00	3.310E-10	1.520E-10
THYROID	1.230E-13	6.657E-11	8.865E-10	2.370E-15	-1.000E+00	1.760E-10	7.270E-12
REMAINDER	1.150E-13	6.405E-11	8.528E-10	2.280E-15	-1.000E+00	1.350E-09	2.950E-09
EFFECTIVE	1.230E-13	6.798E-11	9.052E-10	2.420E-15	-1.000E+00	1.050E-09	1.540E-09
SKIN(FGR)	1.430E-13	9.382E-11	1.249E-09	3.340E-15	-1.000E+00	0.000E+00	0.000E+00
Eu-147							
GONADS	2.290E-14	1.465E-11	2.798E-10	5.110E-16	-1.000E+00	3.050E-10	5.810E-10
BREAST	2.620E-14	1.416E-11	2.705E-10	4.940E-16	-1.000E+00	2.130E-10	6.520E-11
LUNGS	2.230E-14	1.301E-11	2.486E-10	4.540E-16	-1.000E+00	3.900E-09	1.120E-11
RED MARR	2.140E-14	1.293E-11	2.470E-10	4.510E-16	-1.000E+00	4.560E-10	1.410E-10
BONE SUR	4.120E-14	2.379E-11	4.545E-10	8.300E-16	-1.000E+00	1.620E-09	6.150E-11
THYROID	2.320E-14	1.350E-11	2.579E-10	4.710E-16	-1.000E+00	1.280E-10	1.590E-12
REMAINDER	2.130E-14	1.278E-11	2.442E-10	4.460E-16	-1.000E+00	9.070E-10	1.200E-09
EFFECTIVE	2.320E-14	1.384E-11	2.645E-10	4.830E-16	-1.000E+00	9.550E-10	5.360E-10
SKIN(FGR)	2.770E-14	1.768E-11	3.379E-10	6.170E-16	-1.000E+00	0.000E+00	0.000E+00
Eu-148							
GONADS	1.030E-13	6.409E-11	1.290E-09	2.230E-15	-1.000E+00	1.610E-09	2.360E-09
BREAST	1.180E-13	6.121E-11	1.233E-09	2.130E-15	-1.000E+00	1.610E-09	2.860E-10
LUNGS	1.030E-13	5.834E-11	1.175E-09	2.030E-15	-1.000E+00	1.200E-08	5.670E-11
RED MARR	9.990E-14	5.891E-11	1.186E-09	2.050E-15	-1.000E+00	2.430E-09	4.960E-10
BONE SUR	1.690E-13	8.765E-11	1.765E-09	3.050E-15	-1.000E+00	2.760E-09	1.820E-10
THYROID	1.050E-13	6.006E-11	1.209E-09	2.090E-15	-1.000E+00	1.070E-09	9.940E-12
REMAINDER	9.840E-14	5.719E-11	1.152E-09	1.990E-15	-1.000E+00	4.600E-09	2.820E-09
EFFECTIVE	1.060E-13	6.093E-11	1.227E-09	2.120E-15	-1.000E+00	3.870E-09	1.550E-09
SKIN(FGR)	1.220E-13	7.673E-11	1.545E-09	2.670E-15	-1.000E+00	0.000E+00	0.000E+00
Eu-149							
GONADS	2.330E-15	2.068E-12	4.237E-11	7.190E-17	-1.000E+00	7.780E-11	1.180E-10
BREAST	2.800E-15	2.080E-12	4.261E-11	7.230E-17	-1.000E+00	8.560E-11	1.040E-11
LUNGS	1.970E-15	1.568E-12	3.212E-11	5.450E-17	-1.000E+00	2.020E-09	1.570E-12
RED MARR	1.750E-15	1.355E-12	2.776E-11	4.710E-17	-1.000E+00	3.860E-10	3.990E-11
BONE SUR	5.550E-15	5.063E-12	1.037E-10	1.760E-16	-1.000E+00	1.700E-09	2.670E-11
THYROID	2.230E-15	1.723E-12	3.530E-11	5.990E-17	-1.000E+00	3.230E-11	2.170E-13
REMAINDER	1.890E-15	1.539E-12	3.153E-11	5.350E-17	-1.000E+00	4.580E-10	2.910E-10

EFFECTIVE	2.250E-15	1.844E-12	3.777E-11	6.410E-17-1.000E+00	5.100E-10	1.240E-10
SKIN(FGR)	3.090E-15	2.609E-12	5.345E-11	9.070E-17-1.000E+00	0.000E+00	0.000E+00
Eu-150a						
GONADS	2.180E-15	1.149E-12	3.231E-12	4.930E-17-1.000E+00	3.690E-12	1.720E-11
BREAST	2.500E-15	1.114E-12	3.133E-12	4.780E-17-1.000E+00	1.080E-12	2.140E-12
LUNGS	2.120E-15	1.018E-12	2.864E-12	4.370E-17-1.000E+00	7.790E-10	4.740E-13
RED MARR	2.030E-15	1.011E-12	2.844E-12	4.340E-17-1.000E+00	1.220E-11	4.230E-12
BONE SUR	4.010E-15	1.825E-12	5.132E-12	7.830E-17-1.000E+00	1.230E-11	1.450E-12
THYROID	2.200E-15	1.053E-12	2.962E-12	4.520E-17-1.000E+00	4.670E-13	5.390E-14
REMAINDER	2.030E-15	9.975E-13	2.805E-12	4.280E-17-1.000E+00	2.850E-10	1.330E-09
EFFECTIVE	2.210E-15	1.084E-12	3.048E-12	4.650E-17-1.000E+00	1.820E-10	4.050E-10
SKIN(FGR)	2.050E-14	5.593E-11	1.573E-10	2.400E-15-1.000E+00	0.000E+00	0.000E+00
Eu-150b						
GONADS	7.020E-14	4.435E-11	9.312E-10	1.540E-15-1.000E+00	1.950E-08	1.900E-09
BREAST	8.020E-14	4.262E-11	8.949E-10	1.480E-15-1.000E+00	3.060E-08	4.430E-10
LUNGS	6.940E-14	4.003E-11	8.405E-10	1.390E-15-1.000E+00	6.550E-08	4.100E-10
RED MARR	6.690E-14	4.061E-11	8.526E-10	1.410E-15-1.000E+00	7.950E-08	1.020E-09
BONE SUR	1.240E-13	6.422E-11	1.348E-09	2.230E-15-1.000E+00	1.200E-07	1.110E-09
THYROID	7.150E-14	4.147E-11	8.707E-10	1.440E-15-1.000E+00	1.630E-08	1.320E-10
REMAINDER	6.630E-14	3.946E-11	8.284E-10	1.370E-15-1.000E+00	1.380E-07	3.220E-09
EFFECTIVE	7.170E-14	4.205E-11	8.828E-10	1.460E-15-1.000E+00	7.250E-08	1.720E-09
SKIN(FGR)	8.500E-14	5.760E-11	1.209E-09	2.000E-15-1.000E+00	0.000E+00	0.000E+00
Eu-152						
GONADS	5.530E-14	3.341E-11	7.012E-10	1.160E-15-1.000E+00	1.310E-08	1.330E-09
BREAST	6.290E-14	3.197E-11	6.710E-10	1.110E-15-1.000E+00	1.740E-08	2.850E-10
LUNGS	5.500E-14	3.024E-11	6.347E-10	1.050E-15-1.000E+00	5.760E-08	2.400E-10
RED MARR	5.370E-14	3.082E-11	6.468E-10	1.070E-15-1.000E+00	7.910E-08	9.190E-10
BONE SUR	8.890E-14	4.694E-11	9.853E-10	1.630E-15-1.000E+00	2.400E-07	2.090E-09
THYROID	5.660E-14	3.082E-11	6.468E-10	1.070E-15-1.000E+00	8.250E-09	6.660E-11
REMAINDER	5.280E-14	2.995E-11	6.287E-10	1.040E-15-1.000E+00	9.990E-08	3.920E-09
EFFECTIVE	5.650E-14	3.168E-11	6.649E-10	1.100E-15-1.000E+00	5.970E-08	1.750E-09
SKIN(FGR)	6.900E-14	5.040E-11	1.058E-09	1.750E-15-1.000E+00	0.000E+00	0.000E+00
Eu-152m						
GONADS	1.400E-14	6.534E-12	1.457E-11	3.010E-16-1.000E+00	1.330E-11	7.160E-11
BREAST	1.590E-14	6.273E-12	1.399E-11	2.890E-16-1.000E+00	4.690E-12	1.020E-11
LUNGS	1.380E-14	5.904E-12	1.317E-11	2.720E-16-1.000E+00	9.940E-10	2.780E-12
RED MARR	1.350E-14	5.969E-12	1.331E-11	2.750E-16-1.000E+00	1.770E-11	1.720E-11
BONE SUR	2.260E-14	9.355E-12	2.086E-11	4.310E-16-1.000E+00	1.940E-11	5.870E-12
THYROID	1.430E-14	6.121E-12	1.365E-11	2.820E-16-1.000E+00	2.600E-12	3.490E-13
REMAINDER	1.320E-14	5.839E-12	1.302E-11	2.690E-16-1.000E+00	3.170E-10	1.730E-09
EFFECTIVE	1.420E-14	6.208E-12	1.384E-11	2.860E-16-1.000E+00	2.210E-10	5.400E-10
SKIN(FGR)	4.850E-14	1.326E-10	2.958E-10	6.110E-15-1.000E+00	0.000E+00	0.000E+00
Eu-154						
GONADS	6.000E-14	3.571E-11	7.494E-10	1.240E-15-1.000E+00	1.170E-08	1.370E-09
BREAST	6.810E-14	3.398E-11	7.131E-10	1.180E-15-1.000E+00	1.550E-08	2.790E-10
LUNGS	5.990E-14	3.283E-11	6.890E-10	1.140E-15-1.000E+00	7.920E-08	2.160E-10
RED MARR	5.870E-14	3.341E-11	7.010E-10	1.160E-15-1.000E+00	1.060E-07	1.150E-09
BONE SUR	9.430E-14	4.867E-11	1.021E-09	1.690E-15-1.000E+00	5.230E-07	4.460E-09
THYROID	6.150E-14	3.312E-11	6.950E-10	1.150E-15-1.000E+00	7.140E-09	5.710E-11
REMAINDER	5.750E-14	3.254E-11	6.829E-10	1.130E-15-1.000E+00	1.130E-07	6.320E-09
EFFECTIVE	6.140E-14	3.427E-11	7.192E-10	1.190E-15-1.000E+00	7.730E-08	2.580E-09
SKIN(FGR)	8.290E-14	8.380E-11	1.759E-09	2.910E-15-1.000E+00	0.000E+00	0.000E+00
Eu-155						
GONADS	2.490E-15	1.754E-12	3.678E-11	6.090E-17-1.000E+00	3.560E-10	9.830E-11
BREAST	2.950E-15	1.731E-12	3.630E-11	6.010E-17-1.000E+00	6.140E-10	1.440E-11
LUNGS	2.220E-15	1.538E-12	3.225E-11	5.340E-17-1.000E+00	1.190E-08	9.640E-12
RED MARR	1.850E-15	1.356E-12	2.845E-11	4.710E-17-1.000E+00	1.430E-08	1.560E-10
BONE SUR	8.090E-15	5.472E-12	1.148E-10	1.900E-16-1.000E+00	1.520E-07	1.290E-09
THYROID	2.410E-15	1.578E-12	3.310E-11	5.480E-17-1.000E+00	2.400E-10	1.780E-12
REMAINDER	2.070E-15	1.474E-12	3.092E-11	5.120E-17-1.000E+00	1.110E-08	1.090E-09
EFFECTIVE	2.490E-15	1.699E-12	3.564E-11	5.900E-17-1.000E+00	1.120E-08	4.130E-10
SKIN(FGR)	3.390E-15	2.027E-12	4.252E-11	7.040E-17-1.000E+00	0.000E+00	0.000E+00
Eu-156						

GONADS	6.570E-14	3.659E-11	6.627E-10	1.280E-15-1.000E+00	6.120E-10	1.220E-09
BREAST	7.420E-14	3.516E-11	6.368E-10	1.230E-15-1.000E+00	3.640E-10	1.520E-10
LUNGS	6.630E-14	3.401E-11	6.161E-10	1.190E-15-1.000E+00	1.840E-08	3.240E-11
RED MARR	6.560E-14	3.487E-11	6.316E-10	1.220E-15-1.000E+00	1.140E-09	2.560E-10
BONE SUR	9.580E-14	4.745E-11	8.594E-10	1.660E-15-1.000E+00	2.760E-09	1.160E-10
THYROID	6.780E-14	3.344E-11	6.057E-10	1.170E-15-1.000E+00	2.160E-10	5.230E-12
REMAINDER	6.410E-14	3.401E-11	6.161E-10	1.190E-15-1.000E+00	3.910E-09	7.040E-09
EFFECTIVE	6.750E-14	3.516E-11	6.368E-10	1.230E-15-1.000E+00	3.820E-09	2.480E-09
SKIN(FGR)	9.980E-14	1.443E-10	2.614E-09	5.050E-15-1.000E+00	0.000E+00	0.000E+00
Eu-157						
GONADS	1.160E-14	6.656E-12	2.171E-11	2.760E-16-1.000E+00	2.840E-11	1.230E-10
BREAST	1.340E-14	6.488E-12	2.116E-11	2.690E-16-1.000E+00	7.690E-12	1.440E-11
LUNGS	1.110E-14	5.861E-12	1.911E-11	2.430E-16-1.000E+00	1.190E-09	2.740E-12
RED MARR	1.040E-14	5.668E-12	1.848E-11	2.350E-16-1.000E+00	3.060E-11	3.300E-11
BONE SUR	2.370E-14	1.228E-11	4.003E-11	5.090E-16-1.000E+00	3.900E-11	1.060E-11
THYROID	1.160E-14	6.126E-12	1.998E-11	2.540E-16-1.000E+00	3.040E-12	2.690E-13
REMAINDER	1.060E-14	5.716E-12	1.864E-11	2.370E-16-1.000E+00	4.820E-10	2.070E-09
EFFECTIVE	1.170E-14	6.295E-12	2.053E-11	2.610E-16-1.000E+00	3.010E-10	6.590E-10
SKIN(FGR)	3.570E-14	8.079E-11	2.635E-10	3.350E-15-1.000E+00	0.000E+00	0.000E+00
Eu-158						
GONADS	5.150E-14	4.209E-12	4.212E-12	1.060E-15-1.000E+00	4.470E-13	1.220E-11
BREAST	5.840E-14	4.010E-12	4.013E-12	1.010E-15-1.000E+00	9.570E-13	3.210E-12
LUNGS	5.150E-14	3.847E-12	3.850E-12	9.690E-16-1.000E+00	1.890E-10	2.240E-12
RED MARR	5.060E-14	3.935E-12	3.937E-12	9.910E-16-1.000E+00	1.350E-12	3.770E-12
BONE SUR	7.820E-14	5.598E-12	5.602E-12	1.410E-15-1.000E+00	1.590E-12	1.510E-12
THYROID	5.290E-14	3.899E-12	3.902E-12	9.820E-16-1.000E+00	8.400E-13	2.470E-13
REMAINDER	4.950E-14	3.823E-12	3.826E-12	9.630E-16-1.000E+00	7.540E-12	2.430E-10
EFFECTIVE	5.270E-14	4.010E-12	4.013E-12	1.010E-15-1.000E+00	2.540E-11	7.710E-11
SKIN(FGR)	1.210E-13	4.367E-11	4.371E-11	1.100E-14-1.000E+00	0.000E+00	0.000E+00
F-18						
GONADS	4.790E-14	9.586E-12	1.007E-11	1.060E-15-1.000E+00	6.250E-13	4.970E-12
BREAST	5.480E-14	9.224E-12	9.692E-12	1.020E-15-1.000E+00	2.660E-12	6.360E-12
LUNGS	4.760E-14	8.745E-12	9.188E-12	9.670E-16-1.000E+00	1.400E-10	6.540E-12
RED MARR	4.580E-14	8.835E-12	9.283E-12	9.770E-16-1.000E+00	6.570E-12	5.940E-11
BONE SUR	8.450E-14	1.338E-11	1.406E-11	1.480E-15-1.000E+00	6.210E-12	6.020E-11
THYROID	4.880E-14	9.134E-12	9.597E-12	1.010E-15-1.000E+00	2.320E-12	4.520E-12
REMAINDER	4.540E-14	8.573E-12	9.008E-12	9.480E-16-1.000E+00	9.150E-12	7.030E-11
EFFECTIVE	4.900E-14	9.134E-12	9.597E-12	1.010E-15-1.000E+00	2.110E-11	3.310E-11
SKIN(FGR)	6.940E-14	1.492E-11	1.568E-11	1.650E-15-1.000E+00	0.000E+00	0.000E-00
Fe-52						
GONADS	1.516E-13	6.400E-11	1.359E-10	3.161E-15-1.000E+00	1.296E-10	6.448E-10
BREAST	1.726E-13	6.141E-11	1.304E-10	3.033E-15-1.000E+00	5.961E-11	1.114E-10
LUNGS	1.511E-13	5.879E-11	1.248E-10	2.904E-15-1.000E+00	2.641E-09	4.436E-11
RED MARR	1.475E-13	5.986E-11	1.271E-10	2.957E-15-1.000E+00	6.791E-11	1.624E-10
BONE SUR	2.497E-13	8.779E-11	1.861E-10	4.330E-15-1.000E+00	4.608E-11	6.673E-11
THYROID	1.551E-13	5.952E-11	1.263E-10	2.939E-15-1.000E+00	3.928E-11	1.984E-11
REMAINDER	1.455E-13	5.804E-11	1.232E-10	2.867E-15-1.000E+00	7.927E-10	4.522E-09
EFFECTIVE	1.554E-13	6.129E-11	1.301E-10	3.027E-15-1.000E+00	6.070E-10	1.559E-09
SKIN(FGR)	2.647E-13	3.434E-10	7.336E-10	1.707E-14-1.000E+00	0.000E+00	0.000E+00
Fe-55						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.790E-10	1.070E-10
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.740E-10	1.040E-10
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.060E-09	1.020E-10
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.760E-10	1.050E-10
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.750E-10	1.050E-10
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.850E-10	1.100E-10
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	4.370E-10	3.000E-10
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.610E-10	1.640E-10
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Fe-59						
GONADS	5.830E-14	3.361E-11	6.704E-10	1.170E-15-1.000E+00	1.390E-09	1.660E-09
BREAST	6.590E-14	3.217E-11	6.418E-10	1.120E-15-1.000E+00	1.260E-09	7.370E-10
LUNGS	5.850E-14	3.102E-11	6.189E-10	1.080E-15-1.000E+00	1.380E-08	6.350E-10

RED MARR	5.790E-14	3.189E-11	6.360E-10	1.110E-15	-1.000E+00	1.310E-09	8.450E-10
BONE SUR	8.510E-14	4.309E-11	8.595E-10	1.500E-15	-1.000E+00	1.110E-09	6.610E-10
THYROID	6.000E-14	3.102E-11	6.189E-10	1.080E-15	-1.000E+00	1.170E-09	6.030E-10
REMAINDER	5.640E-14	3.102E-11	6.189E-10	1.080E-15	-1.000E+00	2.960E-09	3.560E-09
EFFECTIVE	5.970E-14	3.217E-11	6.418E-10	1.120E-15	-1.000E+00	3.300E-09	1.810E-09
SKIN(FGR)	7.130E-14	3.849E-11	7.678E-10	1.340E-15	-1.000E+00	0.000E+00	0.000E+00
Fe-60							
GONADS	2.142E-16	1.289E-13	2.790E-12	4.621E-18	-1.000E+00	6.060E-08	3.510E-08
BREAST	2.463E-16	1.248E-13	2.702E-12	4.474E-18	-1.000E+00	5.430E-08	3.150E-08
LUNGS	2.071E-16	1.168E-13	2.529E-12	4.188E-18	-1.000E+00	7.310E-08	3.140E-08
RED MARR	1.971E-16	1.129E-13	2.444E-12	4.046E-18	-1.000E+00	5.690E-08	3.300E-08
BONE SUR	3.996E-16	2.525E-13	5.467E-12	9.052E-18	-1.000E+00	5.280E-08	3.060E-08
THYROID	2.162E-16	1.155E-13	2.501E-12	4.141E-18	-1.000E+00	5.270E-08	3.060E-08
REMAINDER	1.981E-16	1.144E-13	2.476E-12	4.099E-18	-1.000E+00	1.030E-07	6.040E-08
EFFECTIVE	2.172E-16	1.237E-13	2.678E-12	4.435E-18	-1.000E+00	7.290E-08	4.120E-08
SKIN(FGR)	5.100E-16	6.213E-13	1.345E-11	2.227E-17	-1.000E+00	0.000E+00	0.000E+00
Fm-252							
GONADS	7.130E-18	3.347E-14	1.535E-13	1.310E-18	-1.000E+00	7.040E-09	6.940E-11
BREAST	1.260E-17	4.037E-14	1.852E-13	1.580E-18	-1.000E+00	5.670E-10	7.020E-12
LUNGS	9.950E-19	3.271E-15	1.500E-14	1.280E-19	-1.000E+00	6.310E-07	6.980E-12
RED MARR	1.570E-18	5.034E-15	2.309E-14	1.970E-19	-1.000E+00	6.380E-08	6.120E-10
BONE SUR	9.820E-18	3.424E-14	1.570E-13	1.340E-18	-1.000E+00	7.870E-07	7.520E-09
THYROID	4.720E-18	1.106E-14	5.075E-14	4.330E-19	-1.000E+00	5.670E-10	6.970E-12
REMAINDER	2.050E-18	8.356E-15	3.832E-14	3.270E-19	-1.000E+00	1.800E-08	9.270E-09
EFFECTIVE	5.030E-18	1.932E-14	8.860E-14	7.560E-19	-1.000E+00	1.140E-07	3.100E-09
SKIN(FGR)	2.950E-17	1.359E-13	6.235E-13	5.320E-18	-1.000E+00	0.000E+00	0.000E+00
Fm-253							
GONADS	3.460E-15	2.278E-12	2.464E-11	8.220E-17	-1.000E+00	7.540E-09	1.750E-10
BREAST	4.040E-15	2.267E-12	2.452E-11	8.180E-17	-1.000E+00	1.100E-10	1.010E-11
LUNGS	3.250E-15	1.899E-12	2.053E-11	6.850E-17	-1.000E+00	9.200E-07	2.340E-12
RED MARR	2.880E-15	1.835E-12	1.984E-11	6.620E-17	-1.000E+00	7.660E-08	9.260E-10
BONE SUR	1.000E-14	5.267E-12	5.695E-11	1.900E-16	-1.000E+00	9.570E-07	1.120E-08
THYROID	3.430E-15	1.979E-12	2.140E-11	7.140E-17	-1.000E+00	1.050E-10	1.270E-12
REMAINDER	3.050E-15	1.868E-12	2.020E-11	6.740E-17	-1.000E+00	2.060E-08	2.930E-09
EFFECTIVE	3.530E-15	2.134E-12	2.308E-11	7.700E-17	-1.000E+00	1.560E-07	1.370E-09
SKIN(FGR)	4.550E-15	3.271E-12	3.537E-11	1.180E-16	-1.000E+00	0.000E+00	0.000E+00
Fm-254							
GONADS	8.790E-18	1.958E-14	2.390E-14	1.420E-18	-1.000E+00	7.050E-10	5.540E-12
BREAST	1.480E-17	2.344E-14	2.861E-14	1.700E-18	-1.000E+00	2.380E-10	1.630E-12
LUNGS	2.200E-18	2.220E-15	2.709E-15	1.610E-19	-1.000E+00	1.080E-07	1.620E-12
RED MARR	2.640E-18	3.199E-15	3.904E-15	2.320E-19	-1.000E+00	4.510E-09	3.570E-11
BONE SUR	1.440E-17	2.068E-14	2.524E-14	1.500E-18	-1.000E+00	5.360E-08	4.280E-10
THYROID	6.220E-18	6.687E-15	8.161E-15	4.850E-19	-1.000E+00	2.380E-10	1.620E-12
REMAINDER	3.190E-18	5.102E-15	6.226E-15	3.700E-19	-1.000E+00	1.290E-09	1.500E-09
EFFECTIVE	6.570E-18	1.142E-14	1.393E-14	8.280E-19	-1.000E+00	1.570E-08	4.690E-10
SKIN(FGR)	3.430E-17	7.804E-14	9.524E-14	5.660E-18	-1.000E+00	0.000E+00	0.000E+00
Fm-255							
GONADS	1.260E-16	3.347E-13	1.382E-12	1.330E-17	-1.000E+00	1.830E-09	3.220E-11
BREAST	1.860E-16	4.051E-13	1.673E-12	1.610E-17	-1.000E+00	5.490E-10	7.140E-12
LUNGS	7.010E-17	5.939E-14	2.453E-13	2.360E-18	-1.000E+00	5.230E-07	6.680E-12
RED MARR	6.420E-17	7.373E-14	3.045E-13	2.930E-18	-1.000E+00	1.420E-08	1.740E-10
BONE SUR	3.050E-16	4.051E-13	1.673E-12	1.610E-17	-1.000E+00	1.720E-07	2.080E-09
THYROID	1.030E-16	1.185E-13	4.895E-13	4.710E-18	-1.000E+00	5.480E-10	6.650E-12
REMAINDER	7.340E-17	1.032E-13	4.261E-13	4.100E-18	-1.000E+00	6.380E-09	9.020E-09
EFFECTIVE	1.100E-16	2.068E-13	8.542E-13	8.220E-18	-1.000E+00	7.210E-08	2.800E-09
SKIN(FGR)	3.950E-16	1.527E-12	6.308E-12	6.070E-17	-1.000E+00	0.000E+00	0.000E+00
Fm-257							
GONADS	4.580E-15	3.164E-12	6.495E-11	1.100E-16	-1.000E+00	5.890E-07	5.720E-09
BREAST	5.350E-15	3.164E-12	6.495E-11	1.100E-16	-1.000E+00	1.290E-09	2.530E-11
LUNGS	4.310E-15	2.606E-12	5.349E-11	9.060E-17	-1.000E+00	2.210E-05	1.230E-11
RED MARR	3.840E-15	2.534E-12	5.202E-11	8.810E-17	-1.000E+00	6.150E-06	5.820E-08
BONE SUR	1.290E-14	7.048E-12	1.447E-10	2.450E-16	-1.000E+00	7.690E-05	7.270E-07
THYROID	4.550E-15	2.721E-12	5.585E-11	9.460E-17	-1.000E+00	1.220E-09	1.000E-11

REMAINDER	4.050E-15	2.572E-12	5.278E-11	8.940E-17	-1.000E+00	1.580E-06	3.530E-08
EFFECTIVE	4.660E-15	2.963E-12	6.081E-11	1.030E-16	-1.000E+00	6.320E-06	4.080E-08
SKIN(FGR)	7.180E-15	4.747E-12	9.742E-11	1.650E-16	-1.000E+00	0.000E+00	0.000E+00
Fr-219							
GONADS	1.710E-16	0.000E+00	0.000E+00	3.790E-18	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.963E-16	0.000E+00	0.000E+00	3.663E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.689E-16	0.000E+00	0.000E+00	3.452E-18	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.605E-16	0.000E+00	0.000E+00	3.463E-18	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.382E-16	0.000E+00	0.000E+00	5.865E-18	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.742E-16	0.000E+00	0.000E+00	3.569E-18	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.605E-16	0.000E+00	0.000E+00	3.368E-18	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.752E-16	0.000E+00	0.000E+00	3.621E-18	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.152E-16	0.000E+00	0.000E+00	4.570E-18	-1.000E+00	0.000E+00	0.000E+00
Fr-220							
GONADS	5.439E-16	4.906E-16	4.906E-16	1.241E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	6.339E-16	4.902E-16	4.902E-16	1.240E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.122E-16	4.289E-16	4.289E-16	1.085E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.535E-16	4.111E-16	4.111E-16	1.040E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.566E-15	1.178E-15	1.178E-15	2.979E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	5.389E-16	4.332E-16	4.332E-16	1.096E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.812E-16	4.186E-16	4.186E-16	1.059E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	5.544E-16	4.708E-16	4.708E-16	1.191E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	9.333E-16	9.116E-16	9.116E-16	2.306E-17	-1.000E+00	0.000E+00	0.000E+00
Fr-221							
GONADS	1.445E-15	1.293E-14	1.293E-14	3.112E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.656E-15	1.267E-14	1.267E-14	3.051E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.394E-15	1.180E-14	1.180E-14	2.839E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.284E-15	1.171E-14	1.171E-14	2.819E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.507E-15	2.454E-14	2.454E-14	5.907E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.455E-15	1.184E-14	1.184E-14	2.850E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.314E-15	1.150E-14	1.150E-14	2.768E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.475E-15	1.251E-14	1.251E-14	3.010E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.039E-15	1.542E-14	1.542E-14	3.711E-17	-1.000E+00	0.000E+00	0.000E+00
Fr-222							
GONADS	5.460E-16	1.633E-14	1.633E-14	1.310E-17	-1.000E+00	3.290E-10	5.760E-10
BREAST	6.280E-16	1.597E-14	1.597E-14	1.281E-17	-1.000E+00	3.290E-10	5.760E-10
LUNGS	5.290E-16	1.441E-14	1.441E-14	1.156E-17	-1.000E+00	2.520E-08	5.760E-10
RED MARR	4.970E-16	1.426E-14	1.426E-14	1.144E-17	-1.000E+00	3.290E-10	5.760E-10
BONE SUR	1.173E-15	2.816E-14	2.816E-14	2.259E-17	-1.000E+00	3.290E-10	5.760E-10
THYROID	5.500E-16	1.490E-14	1.490E-14	1.195E-17	-1.000E+00	3.290E-10	5.760E-10
REMAINDER	5.020E-16	1.406E-14	1.406E-14	1.128E-17	-1.000E+00	3.520E-10	8.690E-10
EFFECTIVE	5.560E-16	1.543E-14	1.543E-14	1.238E-17	-1.000E+00	3.320E-09	6.640E-10
SKIN(FGR)	4.815E-14	1.052E-11	1.052E-11	8.441E-15	-1.000E+00	0.000E+00	0.000E+00
Fr-223							
GONADS	2.300E-15	1.138E-13	1.138E-13	6.030E-17	-1.000E+00	1.440E-09	2.320E-09
BREAST	2.720E-15	1.147E-13	1.147E-13	6.080E-17	-1.000E+00	1.440E-09	2.320E-09
LUNGS	2.070E-15	9.435E-14	9.435E-14	5.000E-17	-1.000E+00	3.440E-09	2.320E-09
RED MARR	1.800E-15	8.492E-14	8.492E-14	4.500E-17	-1.000E+00	1.440E-09	2.320E-09
BONE SUR	6.290E-15	2.982E-13	2.982E-13	1.580E-16	-1.000E+00	1.440E-09	2.320E-09
THYROID	2.240E-15	9.737E-14	9.737E-14	5.160E-17	-1.000E+00	1.440E-09	2.320E-09
REMAINDER	1.950E-15	9.171E-14	9.171E-14	4.860E-17	-1.000E+00	1.440E-09	2.350E-09
EFFECTIVE	2.290E-15	1.066E-13	1.066E-13	5.650E-17	-1.000E+00	1.680E-09	2.330E-09
SKIN(FGR)	2.300E-14	5.133E-12	5.133E-12	2.720E-15	-1.000E+00	0.000E+00	0.000E+00
Ga-65							
GONADS	5.520E-14	1.592E-12	1.592E-12	1.210E-15	-1.000E+00	2.230E-13	2.520E-12
BREAST	6.320E-14	1.539E-12	1.539E-12	1.170E-15	-1.000E+00	5.170E-13	1.230E-12
LUNGS	5.470E-14	1.460E-12	1.460E-12	1.110E-15	-1.000E+00	5.800E-11	1.230E-12
RED MARR	5.250E-14	1.460E-12	1.460E-12	1.110E-15	-1.000E+00	5.420E-13	1.300E-12
BONE SUR	1.010E-13	2.355E-12	2.355E-12	1.790E-15	-1.000E+00	4.650E-13	5.880E-13
THYROID	5.620E-14	1.513E-12	1.513E-12	1.150E-15	-1.000E+00	4.660E-13	1.020E-13
REMAINDER	5.220E-14	1.421E-12	1.421E-12	1.080E-15	-1.000E+00	1.430E-12	7.700E-11
EFFECTIVE	5.650E-14	1.526E-12	1.526E-12	1.160E-15	-1.000E+00	7.610E-12	2.420E-11
SKIN(FGR)	1.190E-13	1.434E-11	1.434E-11	1.090E-14	-1.000E+00	0.000E+00	0.000E+00

Ga-66							
GONADS	1.260E-13	5.026E-11	1.128E-10	2.310E-15	1.000E+00	1.100E-10	5.290E-10
BREAST	1.400E-13	4.786E-11	1.074E-10	2.200E-15	1.000E+00	4.290E-11	7.650E-11
LUNGS	1.270E-13	4.656E-11	1.045E-10	2.140E-15	1.000E+00	2.070E-09	2.270E-11
RED MARR	1.260E-13	4.786E-11	1.074E-10	2.200E-15	1.000E+00	6.350E-11	1.130E-10
BONE SUR	1.820E-13	6.440E-11	1.445E-10	2.960E-15	1.000E+00	4.590E-11	3.990E-11
THYROID	1.300E-13	4.569E-11	1.025E-10	2.100E-15	1.000E+00	2.780E-11	3.640E-12
REMAINDER	1.230E-13	4.656E-11	1.045E-10	2.140E-15	1.000E+00	7.030E-10	3.800E-09
EFFECTIVE	1.290E-13	4.830E-11	1.084E-10	2.220E-15	1.000E+00	5.030E-10	1.300E-09
SKIN(FGR)	2.110E-13	2.371E-10	5.321E-10	1.090E-14	1.000E+00	0.000E+00	0.000E+00
Ga-67							
GONADS	7.050E-15	4.254E-12	4.814E-11	1.530E-16	1.000E+00	6.120E-11	1.580E-10
BREAST	8.120E-15	4.143E-12	4.689E-11	1.490E-16	1.000E+00	1.830E-11	1.700E-11
LUNGS	6.790E-15	3.920E-12	4.437E-11	1.410E-16	1.000E+00	5.370E-10	2.380E-12
RED MARR	6.220E-15	3.837E-12	4.342E-11	1.380E-16	1.000E+00	3.710E-11	4.140E-11
BONE SUR	1.750E-14	8.647E-12	9.786E-11	3.110E-16	1.000E+00	7.840E-11	1.400E-11
THYROID	7.060E-15	3.976E-12	4.500E-11	1.430E-16	1.000E+00	9.430E-12	2.430E-13
REMAINDER	6.410E-15	3.781E-12	4.279E-11	1.360E-16	1.000E+00	2.040E-10	5.490E-10
EFFECTIVE	7.200E-15	4.143E-12	4.689E-11	1.490E-16	1.000E+00	1.510E-10	2.120E-10
SKIN(FGR)	8.500E-15	4.838E-12	5.475E-11	1.740E-16	1.000E+00	0.000E+00	0.000E+00
Ga-68							
GONADS	4.470E-14	5.778E-12	5.821E-12	9.890E-16	1.000E+00	1.690E-12	1.950E-11
BREAST	5.110E-14	5.544E-12	5.586E-12	9.490E-16	1.000E+00	2.150E-12	4.560E-12
LUNGS	4.440E-14	5.264E-12	5.303E-12	9.010E-16	1.000E+00	2.150E-10	2.790E-12
RED MARR	4.290E-14	5.316E-12	5.356E-12	9.100E-16	1.000E+00	2.470E-12	5.810E-12
BONE SUR	7.840E-14	8.004E-12	8.064E-12	1.370E-15	1.000E+00	2.060E-12	2.180E-12
THYROID	4.560E-14	5.492E-12	5.533E-12	9.400E-16	1.000E+00	1.880E-12	2.610E-13
REMAINDER	4.240E-14	5.159E-12	5.198E-12	8.830E-16	1.000E+00	1.260E-11	2.860E-10
EFFECTIVE	4.580E-14	5.497E-12	5.539E-12	9.410E-16	1.000E+00	3.070E-11	9.240E-11
SKIN(FGR)	1.010E-13	5.842E-11	5.886E-11	1.000E-14	1.000E+00	0.000E+00	0.000E+00
Ga-70							
GONADS	4.550E-16	1.904E-14	1.904E-14	1.040E-17	1.000E+00	1.110E-13	3.130E-14
BREAST	5.190E-16	1.849E-14	1.849E-14	1.010E-17	1.000E+00	1.140E-13	1.060E-14
LUNGS	4.460E-16	1.682E-14	1.682E-14	9.190E-18	1.000E+00	5.740E-11	9.400E-15
RED MARR	4.310E-16	1.692E-14	1.692E-14	9.240E-18	1.000E+00	1.340E-13	1.090E-14
BONE SUR	7.930E-16	2.984E-14	2.984E-14	1.630E-17	1.000E+00	1.320E-13	4.930E-15
THYROID	4.630E-16	1.736E-14	1.736E-14	9.480E-18	1.000E+00	1.140E-13	1.070E-15
REMAINDER	4.270E-16	1.664E-14	1.664E-14	9.090E-18	1.000E+00	9.570E-13	6.750E-11
EFFECTIVE	4.620E-16	1.798E-14	1.798E-14	9.820E-18	1.000E+00	7.240E-12	2.030E-11
SKIN(FGR)	4.170E-14	1.382E-11	1.382E-11	7.550E-15	1.000E+00	0.000E+00	0.000E-00
Ga-72							
GONADS	1.350E-13	6.191E-11	1.904E-10	2.600E-15	1.000E+00	2.050E-10	8.520E-10
BREAST	1.520E-13	5.905E-11	1.816E-10	2.480E-15	1.000E+00	6.860E-11	1.190E-10
LUNGS	1.360E-13	5.739E-11	1.764E-10	2.410E-15	1.000E+00	1.670E-09	3.180E-11
RED MARR	1.350E-13	5.905E-11	1.816E-10	2.480E-15	1.000E+00	9.440E-11	1.790E-10
BONE SUR	1.950E-13	7.882E-11	2.423E-10	3.310E-15	1.000E+00	6.230E-11	6.230E-11
THYROID	1.390E-13	5.643E-11	1.735E-10	2.370E-15	1.000E+00	3.990E-11	4.950E-12
REMAINDER	1.320E-13	5.739E-11	1.764E-10	2.410E-15	1.000E+00	7.530E-10	3.310E-09
EFFECTIVE	1.390E-13	5.953E-11	1.830E-10	2.500E-15	1.000E+00	5.020E-10	1.250E-09
SKIN(FGR)	1.860E-13	1.712E-10	5.264E-10	7.190E-15	1.000E+00	0.000E+00	0.000E+00
Ga-73							
GONADS	1.450E-14	5.505E-12	8.135E-12	3.190E-16	1.000E+00	7.820E-12	4.620E-11
BREAST	1.660E-14	5.333E-12	7.880E-12	3.090E-16	1.000E+00	4.370E-12	6.510E-12
LUNGS	1.420E-14	5.005E-12	7.395E-12	2.900E-16	1.000E+00	5.540E-10	1.930E-12
RED MARR	1.350E-14	5.005E-12	7.395E-12	2.900E-16	1.000E+00	7.970E-12	1.170E-11
BONE SUR	3.010E-14	8.819E-12	1.303E-11	5.110E-16	1.000E+00	9.850E-12	3.940E-12
THYROID	1.470E-14	5.108E-12	7.548E-12	2.960E-16	1.000E+00	3.160E-12	1.930E-13
REMAINDER	1.350E-14	4.867E-12	7.191E-12	2.820E-16	1.000E+00	1.090E-10	8.810E-10
EFFECTIVE	1.480E-14	5.264E-12	7.778E-12	3.050E-16	1.000E+00	1.030E-10	2.790E-10
SKIN(FGR)	4.370E-14	8.008E-11	1.183E-10	4.640E-15	1.000E+00	0.000E+00	0.000E+00
Gd-145							
GONADS	1.120E-13	4.282E-12	4.282E-12	2.160E-15	1.000E+00	1.690E-12	1.140E-11
BREAST	1.260E-13	4.103E-12	4.103E-12	2.070E-15	1.000E+00	1.520E-12	3.640E-12

LUNGS	1.130E-13	3.984E-12	3.984E-12	2.010E-15	-1.000E+00	6.740E-11	2.890E-12
RED MARR	1.120E-13	4.083E-12	4.083E-12	2.060E-15	-1.000E+00	1.970E-12	3.990E-12
BONE SUR	1.640E-13	5.590E-12	5.590E-12	2.820E-15	-1.000E+00	2.800E-12	1.710E-12
THYROID	1.150E-13	3.865E-12	3.865E-12	1.950E-15	-1.000E+00	1.050E-12	3.290E-13
REMAINDER	1.090E-13	3.965E-12	3.965E-12	2.000E-15	-1.000E+00	4.400E-12	9.760E-11
EFFECTIVE	1.150E-13	4.123E-12	4.123E-12	2.080E-15	-1.000E+00	1.040E-11	3.360E-11
SKIN(FGR)	1.660E-13	1.661E-11	1.661E-11	8.380E-15	-1.000E+00	0.000E+00	0.000E+00
Gd-146							
GONADS	1.000E-14	7.556E-12	1.513E-10	2.630E-16	-1.000E+00	1.190E-09	8.880E-10
BREAST	1.190E-14	7.499E-12	1.502E-10	2.610E-16	-1.000E+00	1.650E-09	9.310E-11
LUNGS	8.870E-15	6.263E-12	1.254E-10	2.180E-16	-1.000E+00	2.500E-08	1.310E-11
RED MARR	7.600E-15	5.545E-12	1.111E-10	1.930E-16	-1.000E+00	3.840E-09	2.440E-10
BONE SUR	2.960E-14	2.092E-11	4.189E-10	7.280E-16	-1.000E+00	1.380E-08	1.150E-10
THYROID	9.720E-15	6.579E-12	1.318E-10	2.290E-16	-1.000E+00	1.130E-09	2.290E-12
REMAINDER	8.340E-15	6.062E-12	1.214E-10	2.110E-16	-1.000E+00	5.220E-09	2.840E-09
EFFECTIVE	9.950E-15	7.068E-12	1.416E-10	2.460E-16	-1.000E+00	6.020E-09	1.120E-09
SKIN(FGR)	1.330E-14	9.022E-12	1.807E-10	3.140E-16	-1.000E+00	0.000E+00	0.000E+00
Gd-147							
GONADS	6.320E-14	3.645E-11	2.565E-10	1.360E-15	-1.000E+00	3.040E-10	9.260E-10
BREAST	7.210E-14	3.511E-11	2.470E-10	1.310E-15	-1.000E+00	9.200E-11	1.120E-10
LUNGS	6.240E-14	3.323E-11	2.338E-10	1.240E-15	-1.000E+00	1.060E-09	2.110E-11
RED MARR	6.040E-14	3.350E-11	2.357E-10	1.250E-15	-1.000E+00	1.550E-10	2.020E-10
BONE SUR	1.090E-13	5.307E-11	3.734E-10	1.980E-15	-1.000E+00	2.430E-10	6.720E-11
THYROID	6.440E-14	3.404E-11	2.395E-10	1.270E-15	-1.000E+00	4.590E-11	2.740E-12
REMAINDER	5.970E-14	3.243E-11	2.282E-10	1.210E-15	-1.000E+00	5.430E-10	1.550E-09
EFFECTIVE	6.450E-14	3.484E-11	2.451E-10	1.300E-15	-1.000E+00	4.070E-10	7.420E-10
SKIN(FGR)	7.670E-14	4.342E-11	3.055E-10	1.620E-15	-1.000E+00	0.000E+00	0.000E+00
Gd-148							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.080E-05	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.560E-05	8.900E-08
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	4.450E-04	1.110E-06
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.630E-05	4.980E-08
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	2.380E-05	5.890E-08
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Gd-149							
GONADS	1.900E-14	1.240E-11	2.060E-10	4.360E-16	-1.000E+00	2.240E-10	5.080E-10
BREAST	2.180E-14	1.206E-11	2.003E-10	4.240E-16	-1.000E+00	1.010E-10	5.380E-11
LUNGS	1.820E-14	1.098E-11	1.824E-10	3.860E-16	-1.000E+00	2.440E-09	7.510E-12
RED MARR	1.720E-14	1.075E-11	1.786E-10	3.780E-16	-1.000E+00	2.660E-10	1.270E-10
BONE SUR	3.890E-14	2.210E-11	3.671E-10	7.770E-16	-1.000E+00	8.330E-10	4.240E-11
THYROID	1.910E-14	1.141E-11	1.894E-10	4.010E-16	-1.000E+00	5.280E-11	8.500E-13
REMAINDER	1.730E-14	1.070E-11	1.776E-10	3.760E-16	-1.000E+00	6.520E-10	1.290E-09
EFFECTIVE	1.920E-14	1.172E-11	1.946E-10	4.120E-16	-1.000E+00	6.180E-10	5.410E-10
SKIN(FGR)	2.420E-14	1.476E-11	2.452E-10	5.190E-16	-1.000E+00	0.000E+00	0.000E-00
Gd-151							
GONADS	2.290E-15	2.043E-12	4.208E-11	7.100E-17	-1.000E+00	8.680E-11	1.220E-10
BREAST	2.760E-15	2.063E-12	4.250E-11	7.170E-17	-1.000E+00	9.810E-11	1.040E-11
LUNGS	1.890E-15	1.551E-12	3.195E-11	5.390E-17	-1.000E+00	4.840E-09	1.060E-12
RED MARR	1.620E-15	1.306E-12	2.691E-11	4.540E-17	-1.000E+00	9.490E-10	4.300E-11
BONE SUR	6.160E-15	5.553E-12	1.144E-10	1.930E-16	-1.000E+00	7.790E-09	3.390E-11
THYROID	2.170E-15	1.683E-12	3.468E-11	5.850E-17	-1.000E+00	3.770E-11	1.030E-13
REMAINDER	1.800E-15	1.513E-12	3.118E-11	5.260E-17	-1.000E+00	7.990E-10	6.150E-10
EFFECTIVE	2.200E-15	1.836E-12	3.782E-11	6.380E-17	-1.000E+00	1.210E-09	2.230E-10
SKIN(FGR)	3.250E-15	2.578E-12	5.311E-11	8.960E-17	-1.000E+00	0.000E+00	0.000E+00
Gd-152							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	7.280E-06	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	2.630E-05	6.570E-08
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.290E-04	8.210E-07

THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.200E-05	3.620E-08
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.750E-05	4.340E-08
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Gd-153						
GONADS	3.830E-15	3.310E-12	6.886E-11	1.150E-16-1.000E+00	1.930E-10	1.970E-10
BREAST	4.660E-15	3.339E-12	6.946E-11	1.160E-16-1.000E+00	2.590E-10	1.800E-11
LUNGS	3.160E-15	2.597E-12	5.401E-11	9.020E-17-1.000E+00	7.750E-09	2.190E-12
RED MARR	2.560E-15	2.139E-12	4.449E-11	7.430E-17-1.000E+00	2.710E-09	8.070E-11
BONE SUR	1.210E-14	1.036E-11	2.156E-10	3.600E-16-1.000E+00	2.150E-08	7.920E-11
THYROID	3.610E-15	2.792E-12	5.808E-11	9.700E-17-1.000E+00	1.040E-10	2.180E-13
REMAINDER	2.970E-15	2.510E-12	5.221E-11	8.720E-17-1.000E+00	1.900E-09	8.440E-10
EFFECTIVE	3.710E-15	3.051E-12	6.347E-11	1.060E-16-1.000E+00	2.560E-09	3.170E-10
SKIN(FGR)	5.000E-15	4.059E-12	8.443E-11	1.410E-16-1.000E+00	0.000E+00	0.000E+00
Gd-159						
GONADS	2.190E-15	1.329E-12	5.138E-12	5.340E-17-1.000E+00	7.170E-12	2.860E-11
BREAST	2.550E-15	1.302E-12	5.032E-12	5.230E-17-1.000E+00	1.800E-12	3.180E-12
LUNGS	2.070E-15	1.158E-12	4.474E-12	4.650E-17-1.000E+00	1.050E-09	5.380E-13
RED MARR	1.920E-15	1.103E-12	4.262E-12	4.430E-17-1.000E+00	2.230E-11	7.920E-12
BONE SUR	4.740E-15	2.614E-12	1.010E-11	1.050E-16-1.000E+00	4.000E-11	2.550E-12
THYROID	2.190E-15	1.207E-12	4.666E-12	4.850E-17-1.000E+00	6.460E-13	4.850E-14
REMAINDER	1.970E-15	1.125E-12	4.349E-12	4.520E-17-1.000E+00	4.400E-10	1.760E-09
EFFECTIVE	2.210E-15	1.250E-12	4.830E-12	5.020E-17-1.000E+00	2.640E-10	5.350E-10
SKIN(FGR)	1.910E-14	4.581E-11	1.770E-10	1.840E-15-1.000E+00	0.000E+00	0.000E+00
Ge-66						
GONADS	3.180E-14	7.579E-12	8.300E-12	7.040E-16-1.000E+00	1.050E-11	3.690E-11
BREAST	3.640E-14	7.299E-12	7.993E-12	6.780E-16-1.000E+00	1.450E-11	3.310E-11
LUNGS	3.130E-14	6.868E-12	7.522E-12	6.380E-16-1.000E+00	5.570E-10	3.360E-11
RED MARR	3.000E-14	6.879E-12	7.534E-12	6.390E-16-1.000E+00	1.480E-11	3.510E-11
BONE SUR	5.980E-14	1.152E-11	1.261E-11	1.070E-15-1.000E+00	1.300E-11	3.250E-11
THYROID	3.230E-14	7.105E-12	7.781E-12	6.600E-16-1.000E+00	1.370E-11	3.230E-11
REMAINDER	2.990E-14	6.707E-12	7.345E-12	6.230E-16-1.000E+00	3.790E-11	1.080E-10
EFFECTIVE	3.250E-14	7.213E-12	7.899E-12	6.700E-16-1.000E+00	8.560E-11	5.680E-11
SKIN(FGR)	4.260E-14	1.410E-11	1.544E-11	1.310E-15-1.000E+00	0.000E+00	0.000E+00
Ge-67						
GONADS	6.700E-14	2.331E-12	2.331E-12	1.440E-15-1.000E+00	3.900E-13	2.710E-12
BREAST	7.640E-14	2.250E-12	2.250E-12	1.390E-15-1.000E+00	8.510E-13	3.250E-12
LUNGS	6.650E-14	2.137E-12	2.137E-12	1.320E-15-1.000E+00	1.100E-10	3.640E-12
RED MARR	6.420E-14	2.153E-12	2.153E-12	1.330E-15-1.000E+00	8.680E-13	3.090E-12
BONE SUR	1.190E-13	3.351E-12	3.351E-12	2.070E-15-1.000E+00	7.390E-13	2.630E-12
THYROID	6.830E-14	2.201E-12	2.201E-12	1.360E-15-1.000E+00	7.630E-13	2.170E-12
REMAINDER	6.360E-14	2.088E-12	2.088E-12	1.290E-15-1.000E+00	2.610E-12	1.100E-10
EFFECTIVE	6.860E-14	2.234E-12	2.234E-12	1.380E-15-1.000E+00	1.440E-11	3.520E-11
SKIN(FGR)	1.680E-13	2.396E-11	2.396E-11	1.480E-14-1.000E+00	0.000E+00	0.000E-00
Ge-68						
GONADS	4.470E-14	2.270E-11	5.874E-10	9.890E-16-1.000E+00	2.177E-10	2.615E-10
BREAST	5.110E-14	2.178E-11	5.637E-10	9.491E-16-1.000E+00	7.522E-10	2.276E-10
LUNGS	4.440E-14	2.068E-11	5.351E-10	9.010E-16-1.000E+00	1.112E-07	2.308E-10
RED MARR	4.290E-14	2.088E-11	5.405E-10	9.100E-16-1.000E+00	7.195E-10	2.388E-10
BONE SUR	7.840E-14	3.144E-11	8.137E-10	1.370E-15-1.000E+00	5.961E-10	2.272E-10
THYROID	4.560E-14	2.157E-11	5.583E-10	9.400E-16-1.000E+00	6.919E-10	2.223E-10
REMAINDER	4.240E-14	2.027E-11	5.245E-10	8.830E-16-1.000E+00	1.443E-09	7.080E-10
EFFECTIVE	4.580E-14	2.160E-11	5.589E-10	9.410E-16-1.000E+00	1.403E-08	3.814E-10
SKIN(FGR)	1.010E-13	2.296E-10	5.941E-09	1.000E-14-1.000E+00	0.000E+00	0.000E+00
Ge-69						
GONADS	4.170E-14	2.376E-11	1.704E-10	8.850E-16-1.000E+00	3.000E-11	7.440E-11
BREAST	4.740E-14	2.271E-11	1.629E-10	8.460E-16-1.000E+00	5.020E-11	6.750E-11
LUNGS	4.160E-14	2.175E-11	1.560E-10	8.100E-16-1.000E+00	1.440E-09	6.860E-11
RED MARR	4.060E-14	2.218E-11	1.590E-10	8.260E-16-1.000E+00	5.030E-11	7.200E-11
BONE SUR	6.720E-14	3.168E-11	2.272E-10	1.180E-15-1.000E+00	4.350E-11	6.650E-11
THYROID	4.270E-14	2.236E-11	1.604E-10	8.330E-16-1.000E+00	4.820E-11	6.590E-11
REMAINDER	3.990E-14	2.145E-11	1.538E-10	7.990E-16-1.000E+00	1.020E-10	1.720E-10
EFFECTIVE	4.270E-14	2.266E-11	1.625E-10	8.440E-16-1.000E+00	2.270E-10	1.010E-10

SKIN(FGR)	5.960E-14	7.571E-11	5.429E-10	2.820E-15-1.000E+00	0.000E+00	0.000E+00
Ge-71						
GONADS	4.830E-20	7.387E-16	1.284E-14	2.590E-20-1.000E+00	9.450E-13	1.940E-12
BREAST	3.370E-19	2.056E-15	3.575E-14	7.210E-20-1.000E+00	1.360E-12	1.810E-12
LUNGS	2.620E-22	2.852E-18	4.959E-17	1.000E-22-1.000E+00	2.660E-10	1.750E-12
RED MARR	1.350E-20	6.331E-17	1.101E-15	2.220E-21-1.000E+00	9.220E-13	1.880E-12
BONE SUR	7.200E-20	3.879E-16	6.744E-15	1.360E-20-1.000E+00	9.090E-13	1.860E-12
THYROID	3.780E-21	1.389E-16	2.415E-15	4.870E-21-1.000E+00	1.020E-12	2.100E-12
REMAINDER	2.710E-20	3.536E-16	6.149E-15	1.240E-20-1.000E+00	2.060E-12	4.310E-12
EFFECTIVE	7.470E-20	6.217E-16	1.081E-14	2.180E-20-1.000E+00	3.310E-11	2.600E-12
SKIN(FGR)	6.710E-18	8.356E-14	1.453E-12	2.930E-18-1.000E+00	0.000E+00	0.000E+00
Ge-75						
GONADS	1.640E-15	2.533E-13	2.580E-13	3.600E-17-1.000E+00	5.780E-13	4.300E-12
BREAST	1.880E-15	2.470E-13	2.515E-13	3.510E-17-1.000E+00	6.220E-13	4.310E-12
LUNGS	1.600E-15	2.294E-13	2.336E-13	3.260E-17-1.000E+00	1.390E-10	4.330E-12
RED MARR	1.500E-15	2.301E-13	2.343E-13	3.270E-17-1.000E+00	6.310E-13	4.340E-12
BONE SUR	3.600E-15	4.250E-13	4.328E-13	6.040E-17-1.000E+00	6.150E-13	4.290E-12
THYROID	1.650E-15	2.336E-13	2.379E-13	3.320E-17-1.000E+00	6.030E-13	4.240E-12
REMAINDER	1.520E-15	2.238E-13	2.279E-13	3.180E-17-1.000E+00	4.200E-12	7.460E-11
EFFECTIVE	1.680E-15	2.421E-13	2.465E-13	3.440E-17-1.000E+00	1.830E-11	2.540E-11
SKIN(FGR)	2.710E-14	2.773E-11	2.823E-11	3.940E-15-1.000E+00	0.000E+00	0.000E+00
Ge-77						
GONADS	5.200E-14	2.504E-11	6.456E-11	1.100E-15-1.000E+00	2.590E-11	8.620E-11
BREAST	5.920E-14	2.413E-11	6.221E-11	1.060E-15-1.000E+00	3.430E-11	8.210E-11
LUNGS	5.160E-14	2.299E-11	5.927E-11	1.010E-15-1.000E+00	1.980E-09	8.300E-11
RED MARR	4.990E-14	2.322E-11	5.986E-11	1.020E-15-1.000E+00	3.560E-11	8.680E-11
BONE SUR	9.280E-14	3.596E-11	9.273E-11	1.580E-15-1.000E+00	3.210E-11	8.210E-11
THYROID	5.310E-14	2.322E-11	5.986E-11	1.020E-15-1.000E+00	3.180E-11	7.870E-11
REMAINDER	4.940E-14	2.249E-11	5.798E-11	9.880E-16-1.000E+00	9.770E-11	3.210E-10
EFFECTIVE	5.320E-14	2.390E-11	6.162E-11	1.050E-15-1.000E+00	2.850E-10	1.550E-10
SKIN(FGR)	1.020E-13	1.873E-10	4.830E-10	8.230E-15-1.000E+00	0.000E+00	0.000E+00
Ge-78						
GONADS	1.310E-14	2.085E-12	2.131E-12	2.830E-16-1.000E+00	4.590E-12	2.820E-11
BREAST	1.490E-14	2.026E-12	2.071E-12	2.750E-16-1.000E+00	6.330E-12	2.740E-11
LUNGS	1.270E-14	1.901E-12	1.943E-12	2.580E-16-1.000E+00	5.510E-10	2.760E-11
RED MARR	1.200E-14	1.908E-12	1.950E-12	2.590E-16-1.000E+00	6.360E-12	2.810E-11
BONE SUR	2.830E-14	3.396E-12	3.472E-12	4.610E-16-1.000E+00	5.740E-12	2.690E-11
THYROID	1.320E-14	1.930E-12	1.973E-12	2.620E-16-1.000E+00	5.850E-12	2.620E-11
REMAINDER	1.210E-14	1.856E-12	1.898E-12	2.520E-16-1.000E+00	2.740E-11	1.750E-10
EFFECTIVE	1.340E-14	1.996E-12	2.041E-12	2.710E-16-1.000E+00	7.750E-11	7.190E-11
SKIN(FGR)	2.750E-14	7.042E-12	7.200E-12	9.560E-16-1.000E+00	0.000E+00	0.000E+00
H-3						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
LUNGS	2.750E-18	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
EFFECTIVE	3.310E-19	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.730E-11	1.730E-11
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Hf-170						
GONADS	2.480E-14	1.368E-11	4.670E-11	5.620E-16-1.000E+00	1.700E-10	6.030E-10
BREAST	2.860E-14	1.324E-11	4.520E-11	5.440E-16-1.000E+00	8.830E-11	7.210E-11
LUNGS	2.390E-14	1.234E-11	4.213E-11	5.070E-16-1.000E+00	3.410E-10	1.340E-11
RED MARR	2.240E-14	1.202E-11	4.105E-11	4.940E-16-1.000E+00	2.270E-10	1.420E-10
BONE SUR	5.220E-14	2.556E-11	8.725E-11	1.050E-15-1.000E+00	7.360E-10	4.940E-11
THYROID	2.490E-14	1.276E-11	4.354E-11	5.240E-16-1.000E+00	6.510E-11	2.100E-12
REMAINDER	2.270E-14	1.198E-11	4.088E-11	4.920E-16-1.000E+00	2.750E-10	1.300E-09
EFFECTIVE	2.520E-14	1.307E-11	4.462E-11	5.370E-16-1.000E+00	2.310E-10	5.730E-10
SKIN(FGR)	3.000E-14	1.607E-11	5.484E-11	6.600E-16-1.000E+00	0.000E+00	0.000E+00
Hf-172						
GONADS	4.180E-15	3.455E-12	7.232E-11	1.200E-16-1.000E+00	1.910E-08	5.560E-10

BREAST	5.070E-15	3.484E-12	7.292E-11	1.210E-16	1.000E+00	2.220E-08	1.410E-10
LUNGS	3.470E-15	2.828E-12	5.918E-11	9.820E-17	1.000E+00	2.070E-08	9.010E-11
RED MARR	2.750E-15	2.315E-12	4.845E-11	8.040E-17	1.000E+00	1.930E-07	9.490E-10
BONE SUR	1.380E-14	1.169E-11	2.447E-10	4.060E-16	1.000E+00	1.450E-06	6.140E-09
THYROID	3.930E-15	2.937E-12	6.147E-11	1.020E-16	1.000E+00	1.440E-08	6.110E-11
REMAINDER	3.250E-15	2.718E-12	5.689E-11	9.440E-17	1.000E+00	2.760E-08	2.460E-09
EFFECTIVE	4.060E-15	3.254E-12	6.810E-11	1.130E-16	1.000E+00	8.600E-08	1.210E-09
SKIN(FGR)	5.460E-15	4.319E-12	9.040E-11	1.500E-16	1.000E+00	0.000E+00	0.000E+00
Hf-173							
GONADS	1.820E-14	1.057E-11	5.083E-11	4.110E-16	1.000E+00	6.050E-11	2.630E-10
BREAST	2.110E-14	1.029E-11	4.947E-11	4.000E-16	1.000E+00	2.740E-11	3.010E-11
LUNGS	1.730E-14	9.566E-12	4.601E-11	3.720E-16	1.000E+00	1.680E-10	4.890E-12
RED MARR	1.580E-14	9.155E-12	4.403E-11	3.560E-16	1.000E+00	1.240E-10	8.020E-11
BONE SUR	4.530E-14	2.304E-11	1.108E-10	8.960E-16	1.000E+00	6.790E-10	2.780E-11
THYROID	1.820E-14	9.720E-12	4.675E-11	3.780E-16	1.000E+00	1.970E-11	4.560E-13
REMAINDER	1.640E-14	9.232E-12	4.440E-11	3.590E-16	1.000E+00	1.180E-10	6.340E-10
EFFECTIVE	1.850E-14	1.018E-11	4.898E-11	3.960E-16	1.000E+00	1.110E-10	2.710E-10
SKIN(FGR)	2.230E-14	1.229E-11	5.912E-11	4.780E-16	1.000E+00	0.000E+00	0.000E+00
Hf-175							
GONADS	1.670E-14	1.093E-11	2.220E-10	3.800E-16	1.000E+00	5.510E-10	4.950E-10
BREAST	1.920E-14	1.064E-11	2.162E-10	3.700E-16	1.000E+00	5.530E-10	5.390E-11
LUNGS	1.600E-14	9.862E-12	2.004E-10	3.430E-16	1.000E+00	7.230E-10	8.670E-12
RED MARR	1.500E-14	9.603E-12	1.952E-10	3.340E-16	1.000E+00	4.410E-09	1.430E-10
BONE SUR	3.600E-14	2.016E-11	4.096E-10	7.010E-16	1.000E+00	1.420E-08	9.880E-11
THYROID	1.670E-14	1.012E-11	2.057E-10	3.520E-16	1.000E+00	5.060E-10	2.770E-12
REMAINDER	1.520E-14	9.546E-12	1.940E-10	3.320E-16	1.000E+00	7.710E-10	1.130E-09
EFFECTIVE	1.690E-14	1.044E-11	2.121E-10	3.630E-16	1.000E+00	1.510E-09	4.920E-10
SKIN(FGR)	2.150E-14	1.254E-11	2.548E-10	4.360E-16	1.000E+00	0.000E+00	0.000E-00
Hf-177m							
GONADS	1.040E-13	1.017E-11	1.019E-11	2.290E-15	1.000E+00	7.100E-12	3.500E-11
BREAST	1.190E-13	9.907E-12	9.922E-12	2.230E-15	1.000E+00	5.350E-12	8.460E-12
LUNGS	1.010E-13	9.240E-12	9.254E-12	2.080E-15	1.000E+00	1.170E-10	5.380E-12
RED MARR	9.450E-14	9.151E-12	9.165E-12	2.060E-15	1.000E+00	7.640E-12	1.330E-11
BONE SUR	2.280E-13	1.790E-11	1.793E-11	4.030E-15	1.000E+00	9.710E-12	4.960E-12
THYROID	1.050E-13	9.462E-12	9.477E-12	2.130E-15	1.000E+00	3.760E-12	4.070E-13
REMAINDER	9.570E-14	8.974E-12	8.988E-12	2.020E-15	1.000E+00	2.910E-11	2.060E-10
EFFECTIVE	1.060E-13	9.773E-12	9.788E-12	2.200E-15	1.000E+00	2.670E-11	7.430E-11
SKIN(FGR)	1.390E-13	1.177E-11	1.179E-11	2.650E-15	1.000E+00	0.000E+00	0.000E+00
Hf-178m							
GONADS	1.100E-13	6.970E-11	1.463E-09	2.420E-15	1.000E+00	1.630E-07	3.590E-09
BREAST	1.250E-13	6.739E-11	1.415E-09	2.340E-15	1.000E+00	1.860E-07	1.100E-09
LUNGS	1.070E-13	6.336E-11	1.330E-09	2.200E-15	1.000E+00	1.700E-07	7.550E-10
RED MARR	1.020E-13	6.336E-11	1.330E-09	2.200E-15	1.000E+00	1.610E-06	7.390E-09
BONE SUR	2.180E-13	1.109E-10	2.328E-09	3.850E-15	1.000E+00	1.040E-05	4.370E-08
THYROID	1.110E-13	6.566E-11	1.379E-09	2.280E-15	1.000E+00	1.750E-07	7.380E-10
REMAINDER	1.020E-13	6.192E-11	1.300E-09	2.150E-15	1.000E+00	2.170E-07	7.690E-09
EFFECTIVE	1.120E-13	6.653E-11	1.397E-09	2.310E-15	1.000E+00	6.650E-07	5.680E-09
SKIN(FGR)	1.360E-13	8.294E-11	1.741E-09	2.880E-15	1.000E+00	0.000E+00	0.000E+00
Hf-179m							
GONADS	4.130E-14	2.640E-11	5.065E-10	9.210E-16	1.000E+00	7.480E-10	1.130E-09
BREAST	4.740E-14	2.560E-11	4.911E-10	8.930E-16	1.000E+00	6.330E-10	1.240E-10
LUNGS	4.010E-14	2.397E-11	4.597E-10	8.360E-16	1.000E+00	1.290E-09	1.850E-11
RED MARR	3.750E-14	2.365E-11	4.537E-10	8.250E-16	1.000E+00	5.320E-09	2.930E-10
BONE SUR	8.920E-14	4.673E-11	8.964E-10	1.630E-15	1.000E+00	4.030E-08	2.570E-10
THYROID	4.160E-14	2.463E-11	4.724E-10	8.590E-16	1.000E+00	5.770E-10	4.060E-12
REMAINDER	3.800E-14	2.328E-11	4.465E-10	8.120E-16	1.000E+00	1.220E-09	3.710E-09
EFFECTIVE	4.210E-14	2.528E-11	4.850E-10	8.820E-16	1.000E+00	2.670E-09	1.460E-09
SKIN(FGR)	5.260E-14	3.039E-11	5.829E-10	1.060E-15	1.000E+00	0.000E+00	0.000E+00
Hf-180m							
GONADS	4.640E-14	1.869E-11	2.942E-11	1.030E-15	1.000E+00	3.470E-11	1.720E-10
BREAST	5.330E-14	1.814E-11	2.857E-11	1.000E-15	1.000E+00	1.570E-11	2.370E-11
LUNGS	4.520E-14	1.705E-11	2.685E-11	9.400E-16	1.000E+00	1.750E-10	6.740E-12
RED MARR	4.260E-14	1.691E-11	2.662E-11	9.320E-16	1.000E+00	3.060E-11	4.470E-11

BONE SUR	9.710E-14	3.175E-11	4.999E-11	1.750E-15	-1.000E+00	7.720E-11	1.490E-11
THYROID	4.690E-14	1.753E-11	2.759E-11	9.660E-16	-1.000E+00	1.100E-11	6.410E-13
REMAINDER	4.300E-14	1.656E-11	2.608E-11	9.130E-16	-1.000E+00	8.210E-11	4.810E-10
EFFECTIVE	4.740E-14	1.794E-11	2.825E-11	9.890E-16	-1.000E+00	6.300E-11	1.980E-10
SKIN(FGR)	5.820E-14	2.195E-11	3.456E-11	1.210E-15	-1.000E+00	0.000E+00	0.000E+00
Hf-181							
GONADS	2.570E-14	1.643E-11	3.269E-10	5.720E-16	-1.000E+00	6.850E-10	6.620E-10
BREAST	2.950E-14	1.583E-11	3.149E-10	5.510E-16	-1.000E+00	6.160E-10	7.700E-11
LUNGS	2.520E-14	1.494E-11	2.972E-10	5.200E-16	-1.000E+00	1.260E-09	1.290E-11
RED MARR	2.390E-14	1.488E-11	2.960E-10	5.180E-16	-1.000E+00	8.210E-09	1.850E-10
BONE SUR	5.120E-14	2.654E-11	5.280E-10	9.240E-16	-1.000E+00	7.990E-08	3.860E-10
THYROID	2.600E-14	1.551E-11	3.086E-10	5.400E-16	-1.000E+00	5.850E-10	3.650E-12
REMAINDER	2.400E-14	1.456E-11	2.897E-10	5.070E-16	-1.000E+00	1.190E-09	3.530E-09
EFFECTIVE	2.620E-14	1.568E-11	3.120E-10	5.460E-16	-1.000E+00	4.170E-09	1.270E-09
SKIN(FGR)	3.620E-14	1.959E-11	3.897E-10	6.820E-16	-1.000E+00	0.000E+00	0.000E+00
Hf-182							
GONADS	1.110E-14	6.998E-12	1.470E-10	2.430E-16	-1.000E+00	1.350E-07	9.010E-10
BREAST	1.280E-14	6.797E-12	1.427E-10	2.360E-16	-1.000E+00	1.660E-07	7.330E-10
LUNGS	1.080E-14	6.365E-12	1.337E-10	2.210E-16	-1.000E+00	1.500E-07	6.350E-10
RED MARR	1.010E-14	6.336E-12	1.331E-10	2.200E-16	-1.000E+00	2.000E-06	8.470E-09
BONE SUR	2.520E-14	1.227E-11	2.576E-10	4.260E-16	-1.000E+00	1.720E-05	7.220E-08
THYROID	1.120E-14	6.451E-12	1.355E-10	2.240E-16	-1.000E+00	1.190E-07	5.000E-10
REMAINDER	1.020E-14	6.192E-12	1.300E-10	2.150E-16	-1.000E+00	2.060E-07	2.260E-09
EFFECTIVE	1.140E-14	6.710E-12	1.409E-10	2.330E-16	-1.000E+00	8.980E-07	4.290E-09
SKIN(FGR)	1.460E-14	7.978E-12	1.675E-10	2.770E-16	-1.000E+00	0.000E+00	0.000E+00
Hf-182m							
GONADS	4.350E-14	5.045E-12	5.068E-12	9.520E-16	-1.000E+00	4.240E-12	1.830E-11
BREAST	4.970E-14	4.865E-12	4.887E-12	9.180E-16	-1.000E+00	3.320E-12	4.150E-12
LUNGS	4.260E-14	4.590E-12	4.610E-12	8.660E-16	-1.000E+00	6.320E-11	2.520E-12
RED MARR	4.050E-14	4.584E-12	4.605E-12	8.650E-16	-1.000E+00	9.360E-12	6.230E-12
BONE SUR	8.390E-14	8.162E-12	8.198E-12	1.540E-15	-1.000E+00	5.420E-11	2.490E-12
THYROID	4.400E-14	4.733E-12	4.754E-12	8.930E-16	-1.000E+00	2.510E-12	2.200E-13
REMAINDER	4.050E-14	4.478E-12	4.498E-12	8.450E-16	-1.000E+00	1.620E-11	1.100E-10
EFFECTIVE	4.430E-14	4.823E-12	4.844E-12	9.100E-16	-1.000E+00	1.680E-11	3.930E-11
SKIN(FGR)	5.820E-14	7.261E-12	7.293E-12	1.370E-15	-1.000E+00	0.000E+00	0.000E+00
Hf-183							
GONADS	3.560E-14	4.231E-12	4.255E-12	7.680E-16	-1.000E+00	5.210E-12	1.760E-11
BREAST	4.060E-14	4.060E-12	4.083E-12	7.370E-16	-1.000E+00	4.060E-12	3.680E-12
LUNGS	3.520E-14	3.862E-12	3.884E-12	7.010E-16	-1.000E+00	1.200E-10	2.120E-12
RED MARR	3.400E-14	3.901E-12	3.922E-12	7.080E-16	-1.000E+00	1.720E-11	5.530E-12
BONE SUR	6.080E-14	6.226E-12	6.260E-12	1.130E-15	-1.000E+00	1.300E-10	2.540E-12
THYROID	3.620E-14	3.994E-12	4.016E-12	7.250E-16	-1.000E+00	3.510E-12	2.090E-13
REMAINDER	3.360E-14	3.796E-12	3.817E-12	6.890E-16	-1.000E+00	3.060E-11	2.090E-10
EFFECTIVE	3.630E-14	4.044E-12	4.066E-12	7.340E-16	-1.000E+00	3.160E-11	6.870E-11
SKIN(FGR)	6.830E-14	2.788E-11	2.803E-11	5.060E-15	-1.000E+00	0.000E+00	0.000E+00
Hf-184							
GONADS	1.120E-14	3.957E-12	5.350E-12	2.500E-16	-1.000E+00	5.600E-11	2.250E-10
BREAST	1.290E-14	3.862E-12	5.221E-12	2.440E-16	-1.000E+00	2.910E-11	2.830E-11
LUNGS	1.070E-14	3.577E-12	4.836E-12	2.260E-16	-1.000E+00	6.290E-10	5.660E-12
RED MARR	9.870E-15	3.482E-12	4.708E-12	2.200E-16	-1.000E+00	9.300E-11	5.220E-11
BONE SUR	2.660E-14	7.819E-12	1.057E-11	4.940E-16	-1.000E+00	2.270E-10	1.800E-11
THYROID	1.120E-14	3.656E-12	4.943E-12	2.310E-16	-1.000E+00	2.370E-11	7.370E-13
REMAINDER	1.010E-14	3.466E-12	4.686E-12	2.190E-16	-1.000E+00	2.800E-10	1.710E-09
EFFECTIVE	1.140E-14	3.799E-12	5.136E-12	2.400E-16	-1.000E+00	1.970E-10	5.820E-10
SKIN(FGR)	3.120E-14	3.435E-11	4.643E-11	2.170E-15	-1.000E+00	0.000E+00	0.000E+00
Hg-193							
GONADS	8.610E-15	2.847E-12	3.581E-12	1.970E-16	-1.000E+00	2.190E-12	1.230E-11
BREAST	1.000E-14	2.803E-12	3.527E-12	1.940E-16	-1.000E+00	4.930E-12	1.140E-11
LUNGS	8.000E-15	2.572E-12	3.236E-12	1.780E-16	-1.000E+00	3.700E-10	1.200E-11
RED MARR	7.040E-15	2.399E-12	3.018E-12	1.660E-16	-1.000E+00	7.520E-12	1.780E-11
BONE SUR	2.400E-14	7.341E-12	9.234E-12	5.080E-16	-1.000E+00	6.260E-12	1.580E-11
THYROID	8.460E-15	2.587E-12	3.254E-12	1.790E-16	-1.000E+00	3.500E-12	1.100E-11
REMAINDER	7.520E-15	2.485E-12	3.127E-12	1.720E-16	-1.000E+00	1.060E-11	6.980E-11

EFFECTIVE	8.690E-15	2.774E-12	3.490E-12	1.920E-16-1.000E+00	5.010E-11	3.010E-11
SKIN(FGR)	1.260E-14	5.462E-12	6.871E-12	3.780E-16-1.000E+00	0.000E+00	0.000E+00
Hg-193m						
GONADS	4.940E-14	2.358E-11	5.995E-11	1.040E-15-1.000E+00	2.030E-11	7.980E-11
BREAST	5.640E-14	2.267E-11	5.765E-11	1.000E-15-1.000E+00	4.260E-11	7.210E-11
LUNGS	4.890E-14	2.165E-11	5.505E-11	9.550E-16-1.000E+00	1.340E-09	7.310E-11
RED MARR	4.710E-14	2.178E-11	5.540E-11	9.610E-16-1.000E+00	5.120E-11	1.040E-10
BONE SUR	8.880E-14	3.627E-11	9.224E-11	1.600E-15-1.000E+00	4.250E-11	9.090E-11
THYROID	5.030E-14	2.183E-11	5.552E-11	9.630E-16-1.000E+00	3.570E-11	7.390E-11
REMAINDER	4.680E-14	2.124E-11	5.402E-11	9.370E-16-1.000E+00	8.960E-11	3.100E-10
EFFECTIVE	5.050E-14	2.265E-11	5.759E-11	9.990E-16-1.000E+00	2.080E-10	1.500E-10
SKIN(FGR)	6.210E-14	3.038E-11	7.725E-11	1.340E-15-1.000E+00	0.000E+00	0.000E+00
Hg-194						
GONADS	7.050E-19	9.101E-15	1.911E-13	3.160E-19-1.000E+00	3.720E-08	4.730E-08
BREAST	2.690E-18	1.722E-14	3.617E-13	5.980E-19-1.000E+00	3.000E-08	3.950E-08
LUNGS	6.100E-21	4.982E-17	1.046E-15	1.730E-21-1.000E+00	3.030E-08	3.780E-08
RED MARR	1.460E-19	8.266E-16	1.736E-14	2.870E-20-1.000E+00	3.750E-08	6.040E-08
BONE SUR	7.980E-19	4.954E-15	1.040E-13	1.720E-19-1.000E+00	3.210E-08	5.150E-08
THYROID	1.670E-19	1.149E-15	2.413E-14	3.990E-20-1.000E+00	2.750E-08	4.520E-08
REMAINDER	2.160E-19	2.511E-15	5.274E-14	8.720E-20-1.000E+00	7.750E-08	1.510E-07
EFFECTIVE	6.920E-19	5.904E-15	1.240E-13	2.050E-19-1.000E+00	4.700E-08	7.780E-08
SKIN(FGR)	2.650E-17	2.995E-13	6.290E-12	1.040E-17-1.000E+00	0.000E+00	0.000E+00
Hg-195						
GONADS	9.080E-15	4.432E-12	1.033E-11	2.010E-16-1.000E+00	4.510E-12	1.780E-11
BREAST	1.050E-14	4.300E-12	1.003E-11	1.950E-16-1.000E+00	8.430E-12	1.680E-11
LUNGS	8.730E-15	4.035E-12	9.409E-12	1.830E-16-1.000E+00	3.800E-10	1.740E-11
RED MARR	8.130E-15	3.903E-12	9.101E-12	1.770E-16-1.000E+00	1.160E-11	2.620E-11
BONE SUR	1.930E-14	8.975E-12	2.093E-11	4.070E-16-1.000E+00	9.790E-12	2.310E-11
THYROID	9.110E-15	4.101E-12	9.564E-12	1.860E-16-1.000E+00	7.200E-12	1.710E-11
REMAINDER	8.290E-15	3.925E-12	9.152E-12	1.780E-16-1.000E+00	1.970E-11	8.650E-11
EFFECTIVE	9.200E-15	4.278E-12	9.975E-12	1.940E-16-1.000E+00	5.580E-11	3.940E-11
SKIN(FGR)	1.110E-14	6.218E-12	1.450E-11	2.820E-16-1.000E+00	0.000E+00	0.000E+00
Hg-195m						
GONADS	9.470E-15	5.662E-12	4.261E-11	2.100E-16-1.000E+00	6.490E-11	1.390E-10
BREAST	1.090E-14	5.527E-12	4.160E-11	2.050E-16-1.000E+00	7.620E-11	1.300E-10
LUNGS	9.140E-15	5.150E-12	3.876E-11	1.910E-16-1.000E+00	2.500E-09	1.320E-10
RED MARR	8.520E-15	5.042E-12	3.794E-11	1.870E-16-1.000E+00	9.690E-11	1.870E-10
BONE SUR	2.080E-14	1.065E-11	8.015E-11	3.950E-16-1.000E+00	8.560E-11	1.680E-10
THYROID	9.500E-15	5.231E-12	3.936E-11	1.940E-16-1.000E+00	6.970E-11	1.360E-10
REMAINDER	8.670E-15	4.988E-12	3.754E-11	1.850E-16-1.000E+00	2.340E-10	7.630E-10
EFFECTIVE	9.630E-15	5.447E-12	4.099E-11	2.020E-16-1.000E+00	4.140E-10	3.300E-10
SKIN(FGR)	1.380E-14	7.900E-12	5.945E-11	2.930E-16-1.000E+00	0.000E+00	0.000E+00
Hg-197						
GONADS	2.680E-15	1.780E-12	1.798E-11	6.450E-17-1.000E+00	3.150E-11	6.100E-11
BREAST	3.180E-15	1.782E-12	1.801E-11	6.460E-17-1.000E+00	3.470E-11	5.660E-11
LUNGS	2.350E-15	1.611E-12	1.628E-11	5.840E-17-1.000E+00	1.120E-09	5.880E-11
RED MARR	1.880E-15	1.385E-12	1.400E-11	5.020E-17-1.000E+00	5.340E-11	9.590E-11
BONE SUR	9.180E-15	6.318E-12	6.384E-11	2.290E-16-1.000E+00	4.700E-11	8.540E-11
THYROID	2.550E-15	1.597E-12	1.614E-11	5.790E-17-1.000E+00	3.090E-11	5.690E-11
REMAINDER	2.180E-15	1.545E-12	1.561E-11	5.600E-17-1.000E+00	1.180E-10	3.630E-10
EFFECTIVE	2.660E-15	1.771E-12	1.790E-11	6.420E-17-1.000E+00	1.920E-10	1.560E-10
SKIN(FGR)	3.350E-15	2.511E-12	2.537E-11	9.100E-17-1.000E+00	0.000E+00	0.000E+00
Hg-197m						
GONADS	3.990E-15	2.279E-12	1.088E-11	8.870E-17-1.000E+00	3.140E-11	7.810E-11
BREAST	4.640E-15	2.240E-12	1.070E-11	8.720E-17-1.000E+00	3.470E-11	7.430E-11
LUNGS	3.730E-15	2.084E-12	9.950E-12	8.110E-17-1.000E+00	2.220E-09	7.550E-11
RED MARR	3.260E-15	1.953E-12	9.324E-12	7.600E-17-1.000E+00	4.650E-11	1.000E-10
BONE SUR	1.170E-14	6.037E-12	2.883E-11	2.350E-16-1.000E+00	4.190E-11	9.250E-11
THYROID	3.930E-15	2.094E-12	9.999E-12	8.150E-17-1.000E+00	3.170E-11	7.390E-11
REMAINDER	3.490E-15	2.004E-12	9.569E-12	7.800E-17-1.000E+00	1.190E-10	4.960E-10
EFFECTIVE	4.050E-15	2.235E-12	1.067E-11	8.700E-17-1.000E+00	3.230E-10	2.050E-10
SKIN(FGR)	1.020E-14	2.954E-12	1.411E-11	1.150E-16-1.000E+00	0.000E+00	0.000E+00
Hg-199m						

GONADS	8.220E-15	6.709E-13	6.711E-13	1.820E-16-1.000E+00	7.290E-14	1.940E-12
BREAST	9.520E-15	6.561E-13	6.564E-13	1.780E-16-1.000E+00	4.220E-13	2.040E-12
LUNGS	7.800E-15	6.156E-13	6.158E-13	1.670E-16-1.000E+00	1.480E-10	2.140E-12
RED MARR	7.000E-15	5.861E-13	5.863E-13	1.590E-16-1.000E+00	5.890E-13	2.290E-12
BONE SUR	2.180E-14	1.552E-12	1.552E-12	4.210E-16-1.000E+00	4.760E-13	2.090E-12
THYROID	8.170E-15	6.193E-13	6.195E-13	1.680E-16-1.000E+00	2.890E-13	1.740E-12
REMAINDER	7.340E-15	5.935E-13	5.937E-13	1.610E-16-1.000E+00	8.430E-13	4.730E-11
EFFECTIVE	8.360E-15	6.524E-13	6.527E-13	1.770E-16-1.000E+00	1.820E-11	1.560E-11
SKIN(FGR)	2.710E-14	8.441E-13	8.444E-13	2.290E-16-1.000E+00	0.000E+00	0.000E+00
Hg-203						
GONADS	1.110E-14	6.924E-12	1.384E-10	2.410E-16-1.000E+00	8.650E-10	1.370E-09
BREAST	1.270E-14	6.751E-12	1.350E-10	2.350E-16-1.000E+00	7.900E-10	1.230E-09
LUNGS	1.080E-14	6.320E-12	1.264E-10	2.200E-16-1.000E+00	3.320E-09	1.230E-09
RED MARR	1.010E-14	6.320E-12	1.264E-10	2.200E-16-1.000E+00	9.450E-10	1.690E-09
BONE SUR	2.450E-14	1.181E-11	2.361E-10	4.110E-16-1.000E+00	8.490E-10	1.510E-09
THYROID	1.120E-14	6.406E-12	1.281E-10	2.230E-16-1.000E+00	7.320E-10	1.290E-09
REMAINDER	1.020E-14	6.148E-12	1.229E-10	2.140E-16-1.000E+00	2.770E-09	7.100E-09
EFFECTIVE	1.130E-14	6.665E-12	1.333E-10	2.320E-16-1.000E+00	1.730E-09	3.090E-09
SKIN(FGR)	1.560E-14	8.015E-12	1.603E-10	2.790E-16-1.000E+00	0.000E+00	0.000E+00
Ho-155						
GONADS	1.760E-14	1.673E-12	1.674E-12	4.030E-16-1.000E+00	3.340E-12	1.980E-11
BREAST	2.030E-14	1.619E-12	1.620E-12	3.900E-16-1.000E+00	1.400E-12	3.190E-12
LUNGS	1.710E-14	1.494E-12	1.496E-12	3.600E-16-1.000E+00	6.560E-11	1.280E-12
RED MARR	1.620E-14	1.474E-12	1.475E-12	3.550E-16-1.000E+00	2.400E-12	5.700E-12
BONE SUR	3.420E-14	2.810E-12	2.813E-12	6.770E-16-1.000E+00	3.610E-12	1.940E-12
THYROID	1.780E-14	1.557E-12	1.558E-12	3.750E-16-1.000E+00	7.080E-13	1.170E-13
REMAINDER	1.630E-14	1.457E-12	1.458E-12	3.510E-16-1.000E+00	9.260E-12	9.550E-11
EFFECTIVE	1.790E-14	1.586E-12	1.587E-12	3.820E-16-1.000E+00	1.210E-11	3.500E-11
SKIN(FGR)	3.460E-14	1.200E-11	1.201E-11	2.890E-15-1.000E+00	0.000E+00	0.000E+00
Ho-157						
GONADS	2.210E-14	5.562E-13	5.562E-13	5.100E-16-1.000E+00	4.540E-13	3.460E-12
BREAST	2.550E-14	5.410E-13	5.410E-13	4.960E-16-1.000E+00	2.750E-13	7.650E-13
LUNGS	2.120E-14	4.930E-13	4.930E-13	4.520E-16-1.000E+00	7.540E-12	5.170E-13
RED MARR	2.000E-14	4.799E-13	4.799E-13	4.400E-16-1.000E+00	4.020E-13	1.200E-12
BONE SUR	4.500E-14	1.024E-12	1.024E-12	9.390E-16-1.000E+00	3.780E-13	4.590E-13
THYROID	2.220E-14	5.093E-13	5.093E-13	4.670E-16-1.000E+00	1.520E-13	3.700E-14
REMAINDER	2.020E-14	4.799E-13	4.799E-13	4.400E-16-1.000E+00	9.410E-13	1.410E-11
EFFECTIVE	2.240E-14	5.268E-13	5.268E-13	4.830E-16-1.000E+00	1.410E-12	5.420E-12
SKIN(FGR)	2.900E-14	9.762E-13	9.762E-13	8.950E-16-1.000E+00	0.000E+00	0.000E+00
Ho-159						
GONADS	1.590E-14	1.077E-12	1.077E-12	3.770E-16-1.000E+00	9.820E-14	3.380E-12
BREAST	1.850E-14	1.054E-12	1.054E-12	3.690E-16-1.000E+00	2.980E-13	9.400E-13
LUNGS	1.490E-14	9.455E-13	9.455E-13	3.310E-16-1.000E+00	1.080E-11	7.010E-13
RED MARR	1.350E-14	8.912E-13	8.912E-13	3.120E-16-1.000E+00	5.250E-13	1.640E-12
BONE SUR	3.860E-14	2.408E-12	2.408E-12	8.430E-16-1.000E+00	1.080E-12	6.330E-13
THYROID	1.580E-14	9.712E-13	9.712E-13	3.400E-16-1.000E+00	1.730E-13	3.890E-14
REMAINDER	1.410E-14	9.169E-13	9.169E-13	3.210E-16-1.000E+00	9.640E-13	1.880E-11
EFFECTIVE	1.600E-14	1.023E-12	1.023E-12	3.580E-16-1.000E+00	1.760E-12	6.920E-12
SKIN(FGR)	1.980E-14	1.257E-12	1.257E-12	4.400E-16-1.000E+00	0.000E+00	0.000E+00
Ho-161						
GONADS	1.870E-15	8.158E-13	9.154E-13	7.050E-17-1.000E+00	4.690E-13	6.280E-12
BREAST	2.350E-15	8.389E-13	9.414E-13	7.250E-17-1.000E+00	3.330E-13	8.600E-13
LUNGS	1.380E-15	5.612E-13	6.297E-13	4.850E-17-1.000E+00	2.450E-11	2.700E-13
RED MARR	1.050E-15	4.305E-13	4.830E-13	3.720E-17-1.000E+00	8.010E-13	2.700E-12
BONE SUR	5.890E-15	2.592E-12	2.908E-12	2.240E-16-1.000E+00	2.020E-12	8.090E-13
THYROID	1.700E-15	6.306E-13	7.076E-13	5.450E-17-1.000E+00	7.450E-14	2.670E-15
REMAINDER	1.310E-15	5.531E-13	6.206E-13	4.780E-17-1.000E+00	3.130E-12	3.820E-11
EFFECTIVE	1.730E-15	7.116E-13	7.985E-13	6.150E-17-1.000E+00	4.200E-12	1.350E-11
SKIN(FGR)	2.590E-15	1.110E-12	1.245E-12	9.590E-17-1.000E+00	0.000E+00	0.000E+00
Ho-162						
GONADS	7.320E-15	2.246E-13	2.246E-13	1.730E-16-1.000E+00	9.030E-15	4.220E-13
BREAST	8.490E-15	2.194E-13	2.194E-13	1.690E-16-1.000E+00	5.760E-14	1.880E-13
LUNGS	6.920E-15	1.961E-13	1.961E-13	1.510E-16-1.000E+00	4.690E-12	1.820E-13

RED MARR	6.510E-15	1.857E-13	1.857E-13	1.430E-16-1.000E+00	8.020E-14	2.400E-13
BONE SUR	1.420E-14	4.544E-13	4.544E-13	3.500E-16-1.000E+00	1.160E-13	1.080E-13
THYROID	7.320E-15	2.013E-13	2.013E-13	1.550E-16-1.000E+00	3.560E-14	1.180E-14
REMAINDER	6.620E-15	1.909E-13	1.909E-13	1.470E-16-1.000E+00	1.600E-13	6.940E-12
EFFECTIVE	7.350E-15	2.116E-13	2.116E-13	1.630E-16-1.000E+00	6.360E-13	2.270E-12
SKIN(FGR)	1.010E-14	5.440E-13	5.440E-13	4.190E-16-1.000E+00	0.000E+00	0.000E+00
Ho-162m						
GONADS	2.700E-14	3.377E-12	3.402E-12	5.780E-16-1.000E+00	6.770E-13	1.490E-11
BREAST	3.080E-14	3.254E-12	3.279E-12	5.570E-16-1.000E+00	1.020E-12	3.270E-12
LUNGS	2.640E-14	3.050E-12	3.073E-12	5.220E-16-1.000E+00	4.190E-11	1.850E-12
RED MARR	2.550E-14	3.038E-12	3.061E-12	5.200E-16-1.000E+00	1.360E-12	5.160E-12
BONE SUR	4.680E-14	5.427E-12	5.468E-12	9.290E-16-1.000E+00	2.400E-12	1.860E-12
THYROID	2.740E-14	3.090E-12	3.114E-12	5.290E-16-1.000E+00	6.920E-13	1.760E-13
REMAINDER	2.530E-14	2.997E-12	3.020E-12	5.130E-16-1.000E+00	3.980E-12	7.010E-11
EFFECTIVE	2.740E-14	3.219E-12	3.243E-12	5.510E-16-1.000E+00	6.800E-12	2.610E-11
SKIN(FGR)	3.220E-14	3.885E-12	3.914E-12	6.650E-16-1.000E+00	0.000E+00	0.000E+00
Ho-164						
GONADS	9.710E-16	8.334E-14	8.334E-14	3.320E-17-1.000E+00	6.130E-15	3.110E-13
BREAST	1.210E-15	8.460E-14	8.460E-14	3.370E-17-1.000E+00	2.720E-14	8.340E-14
LUNGS	7.290E-16	6.376E-14	6.376E-14	2.540E-17-1.000E+00	1.830E-11	6.420E-14
RED MARR	5.470E-16	4.795E-14	4.795E-14	1.910E-17-1.000E+00	7.880E-14	1.840E-13
BONE SUR	3.160E-15	2.912E-13	2.912E-13	1.160E-16-1.000E+00	1.610E-13	6.980E-14
THYROID	8.830E-16	6.803E-14	6.803E-14	2.710E-17-1.000E+00	7.880E-15	4.990E-16
REMAINDER	6.880E-16	6.125E-14	6.125E-14	2.440E-17-1.000E+00	4.380E-13	2.200E-11
EFFECTIVE	9.050E-16	7.606E-14	7.606E-14	3.030E-17-1.000E+00	2.350E-12	6.730E-12
SKIN(FGR)	8.330E-15	2.124E-12	2.124E-12	8.460E-16-1.000E+00	0.000E+00	0.000E+00
Ho-164m						
GONADS	1.440E-15	1.659E-13	1.659E-13	5.110E-17-1.000E+00	3.900E-14	1.380E-12
BREAST	1.800E-15	1.688E-13	1.688E-13	5.200E-17-1.000E+00	9.240E-14	2.760E-13
LUNGS	1.050E-15	1.243E-13	1.243E-13	3.830E-17-1.000E+00	3.790E-11	1.630E-13
RED MARR	7.720E-16	9.185E-14	9.186E-14	2.830E-17-1.000E+00	2.760E-13	7.200E-13
BONE SUR	4.670E-15	5.842E-13	5.843E-13	1.800E-16-1.000E+00	9.230E-13	2.450E-13
THYROID	1.290E-15	1.337E-13	1.337E-13	4.120E-17-1.000E+00	2.460E-14	1.100E-15
REMAINDER	9.920E-16	1.198E-13	1.198E-13	3.690E-17-1.000E+00	1.680E-12	4.640E-11
EFFECTIVE	1.320E-15	1.503E-13	1.503E-13	4.630E-17-1.000E+00	5.140E-12	1.440E-11
SKIN(FGR)	1.930E-15	2.061E-13	2.061E-13	6.350E-17-1.000E+00	0.000E+00	0.000E+00
Ho-166						
GONADS	1.400E-15	8.195E-13	4.328E-12	3.150E-17-1.000E+00	5.020E-12	1.750E-11
BREAST	1.620E-15	7.987E-13	4.218E-12	3.070E-17-1.000E+00	1.380E-12	2.140E-12
LUNGS	1.340E-15	7.310E-13	3.861E-12	2.810E-17-1.000E+00	3.250E-09	3.930E-13
RED MARR	1.260E-15	6.972E-13	3.682E-12	2.680E-17-1.000E+00	6.310E-11	5.970E-12
BONE SUR	2.840E-15	1.725E-12	9.109E-12	6.630E-17-1.000E+00	9.350E-11	2.110E-12
THYROID	1.410E-15	7.258E-13	3.833E-12	2.790E-17-1.000E+00	4.660E-13	4.770E-14
REMAINDER	1.280E-15	7.128E-13	3.764E-12	2.740E-17-1.000E+00	1.490E-09	5.010E-09
EFFECTIVE	1.420E-15	7.831E-13	4.135E-12	3.010E-17-1.000E+00	8.480E-10	1.510E-09
SKIN(FGR)	4.460E-14	2.006E-10	1.059E-09	7.710E-15-1.000E+00	0.000E+00	0.000E+00
Ho-166m						
GONADS	8.280E-14	5.126E-11	1.077E-09	1.780E-15-1.000E+00	3.050E-08	2.050E-09
BREAST	9.430E-14	4.925E-11	1.034E-09	1.710E-15-1.000E+00	4.840E-08	3.480E-10
LUNGS	8.190E-14	4.694E-11	9.858E-10	1.630E-15-1.000E+00	1.080E-07	2.160E-10
RED MARR	7.920E-14	4.752E-11	9.979E-10	1.650E-15-1.000E+00	1.610E-07	8.120E-10
BONE SUR	1.440E-13	7.373E-11	1.548E-09	2.560E-15-1.000E+00	8.870E-07	2.350E-09
THYROID	8.440E-14	4.838E-11	1.016E-09	1.680E-15-1.000E+00	2.140E-08	5.530E-11
REMAINDER	7.820E-14	4.608E-11	9.677E-10	1.600E-15-1.000E+00	4.500E-07	4.740E-09
EFFECTIVE	8.450E-14	4.896E-11	1.028E-09	1.700E-15-1.000E+00	2.090E-07	2.180E-09
SKIN(FGR)	9.900E-14	6.077E-11	1.276E-09	2.110E-15-1.000E+00	0.000E+00	0.000E+00
Ho-167						
GONADS	1.690E-14	5.042E-12	6.054E-12	3.760E-16-1.000E+00	2.890E-12	3.160E-11
BREAST	1.940E-14	4.894E-12	5.877E-12	3.650E-16-1.000E+00	1.720E-12	4.960E-12
LUNGS	1.650E-14	4.572E-12	5.490E-12	3.410E-16-1.000E+00	1.680E-10	1.790E-12
RED MARR	1.560E-14	4.559E-12	5.474E-12	3.400E-16-1.000E+00	3.210E-12	8.750E-12
BONE SUR	3.500E-14	8.233E-12	9.886E-12	6.140E-16-1.000E+00	9.100E-12	2.950E-12
THYROID	1.710E-14	4.707E-12	5.651E-12	3.510E-16-1.000E+00	9.540E-13	1.550E-13

REMAINDER	1.570E-14	4.452E-12	5.345E-12	3.320E-16	1.000E+00	2.520E-11	2.630E-10
EFFECTIVE	1.730E-14	4.814E-12	5.780E-12	3.590E-16	1.000E+00	2.940E-11	8.900E-11
SKIN(FGR)	2.950E-14	1.435E-11	1.723E-11	1.070E-15	1.000E+00	0.000E+00	0.000E+00
I-120							
GONADS	1.340E-13	1.841E-11	1.872E-11	2.670E-15	1.000E+00	1.070E-11	2.460E-11
BREAST	1.520E-13	1.759E-11	1.788E-11	2.550E-15	1.000E+00	1.280E-11	2.490E-11
LUNGS	1.350E-13	1.696E-11	1.725E-11	2.460E-15	1.000E+00	4.330E-10	2.610E-11
RED MARR	1.330E-13	1.731E-11	1.760E-11	2.510E-15	1.000E+00	1.280E-11	2.420E-11
BONE SUR	2.080E-13	2.427E-11	2.468E-11	3.520E-15	1.000E+00	1.170E-11	2.210E-11
THYROID	1.380E-13	1.696E-11	1.725E-11	2.460E-15	1.000E+00	1.550E-09	3.450E-09
REMAINDER	1.300E-13	1.683E-11	1.711E-11	2.440E-15	1.000E+00	5.020E-11	2.920E-10
EFFECTIVE	1.380E-13	1.765E-11	1.795E-11	2.560E-15	1.000E+00	1.200E-10	2.080E-10
SKIN(FGR)	2.550E-13	1.090E-10	1.108E-10	1.580E-14	1.000E+00	0.000E+00	0.000E+00
I-120m							
GONADS	2.580E-13	2.399E-11	2.404E-11	5.240E-15	1.000E+00	9.010E-12	2.200E-11
BREAST	2.930E-13	2.294E-11	2.298E-11	5.010E-15	1.000E+00	1.230E-11	2.330E-11
LUNGS	2.590E-13	2.207E-11	2.211E-11	4.820E-15	1.000E+00	2.870E-10	2.530E-11
RED MARR	2.550E-13	2.258E-11	2.262E-11	4.930E-15	1.000E+00	1.220E-11	2.190E-11
BONE SUR	3.990E-13	3.146E-11	3.152E-11	6.870E-15	1.000E+00	1.070E-11	1.870E-11
THYROID	2.660E-13	2.221E-11	2.225E-11	4.850E-15	1.000E+00	5.840E-10	1.260E-09
REMAINDER	2.500E-13	2.189E-11	2.193E-11	4.780E-15	1.000E+00	4.550E-11	2.690E-10
EFFECTIVE	2.650E-13	2.299E-11	2.303E-11	5.020E-15	1.000E+00	7.150E-11	1.340E-10
SKIN(FGR)	3.860E-13	8.288E-11	8.304E-11	1.810E-14	1.000E+00	0.000E+00	0.000E+00
I-121							
GONADS	1.910E-14	4.450E-12	4.801E-12	4.360E-16	1.000E+00	1.960E-12	4.320E-12
BREAST	2.190E-14	4.348E-12	4.691E-12	4.260E-16	1.000E+00	3.530E-12	5.990E-12
LUNGS	1.850E-14	3.888E-12	4.195E-12	3.810E-16	1.000E+00	4.690E-11	5.910E-12
RED MARR	1.760E-14	3.878E-12	4.184E-12	3.800E-16	1.000E+00	3.440E-12	5.830E-12
BONE SUR	3.870E-14	7.103E-12	7.663E-12	6.960E-16	1.000E+00	3.020E-12	5.120E-12
THYROID	1.920E-14	4.052E-12	4.371E-12	3.970E-16	1.000E+00	7.540E-10	1.370E-09
REMAINDER	1.760E-14	3.807E-12	4.107E-12	3.730E-16	1.000E+00	7.650E-12	3.100E-11
EFFECTIVE	1.940E-14	4.174E-12	4.503E-12	4.090E-16	1.000E+00	3.210E-11	5.390E-11
SKIN(FGR)	2.720E-14	1.184E-11	1.277E-11	1.160E-15	1.000E+00	0.000E+00	0.000E+00
I-122							
GONADS	4.460E-14	3.102E-13	3.102E-13	9.900E-16	1.000E+00	0.000E+00	0.000E+00
BREAST	5.100E-14	2.980E-13	2.980E-13	9.510E-16	1.000E+00	0.000E+00	0.000E+00
LUNGS	4.430E-14	2.811E-13	2.811E-13	8.970E-16	1.000E+00	0.000E+00	0.000E+00
RED MARR	4.280E-14	2.839E-13	2.839E-13	9.060E-16	1.000E+00	0.000E+00	0.000E+00
BONE SUR	7.780E-14	4.293E-13	4.293E-13	1.370E-15	1.000E+00	0.000E+00	0.000E+00
THYROID	4.550E-14	2.933E-13	2.933E-13	9.360E-16	1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.230E-14	2.758E-13	2.758E-13	8.800E-16	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.560E-14	2.946E-13	2.946E-13	9.400E-16	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.250E-13	3.792E-12	3.792E-12	1.210E-14	1.000E+00	0.000E+00	0.000E+00
I-123							
GONADS	7.220E-15	4.280E-12	1.248E-11	1.820E-16	1.000E+00	2.890E-12	5.610E-12
BREAST	8.420E-15	4.280E-12	1.248E-11	1.820E-16	1.000E+00	4.870E-12	7.230E-12
LUNGS	6.700E-15	3.433E-12	1.001E-11	1.460E-16	1.000E+00	6.570E-11	6.660E-12
RED MARR	6.110E-15	3.316E-12	9.665E-12	1.410E-16	1.000E+00	5.970E-12	8.680E-12
BONE SUR	1.850E-14	8.677E-12	2.529E-11	3.690E-16	1.000E+00	5.180E-12	7.650E-12
THYROID	7.150E-15	3.668E-12	1.069E-11	1.560E-16	1.000E+00	2.250E-09	4.420E-09
REMAINDER	6.350E-15	3.386E-12	9.871E-12	1.440E-16	1.000E+00	7.890E-12	2.010E-11
EFFECTIVE	7.280E-15	3.904E-12	1.138E-11	1.660E-16	1.000E+00	8.010E-11	1.430E-10
SKIN(FGR)	9.400E-15	5.479E-12	1.597E-11	2.330E-16	1.000E+00	0.000E+00	0.000E+00
I-124							
GONADS	5.250E-14	3.110E-11	3.972E-10	1.110E-15	1.000E+00	3.490E-11	5.670E-11
BREAST	5.970E-14	2.970E-11	3.793E-10	1.060E-15	1.000E+00	1.150E-10	1.720E-10
LUNGS	5.250E-14	2.802E-11	3.578E-10	1.000E-15	1.000E+00	7.450E-10	1.440E-10
RED MARR	5.140E-14	2.858E-11	3.650E-10	1.020E-15	1.000E+00	8.630E-11	1.250E-10
BONE SUR	8.310E-14	4.147E-11	5.296E-10	1.480E-15	1.000E+00	7.780E-11	1.140E-10
THYROID	5.380E-14	2.858E-11	3.650E-10	1.020E-15	1.000E+00	1.690E-07	2.820E-07
REMAINDER	5.050E-14	2.782E-11	3.553E-10	9.930E-16	1.000E+00	1.220E-10	2.200E-10
EFFECTIVE	5.380E-14	2.942E-11	3.757E-10	1.050E-15	1.000E+00	5.230E-09	8.600E-09
SKIN(FGR)	7.390E-14	9.806E-11	1.252E-09	3.500E-15	1.000E+00	0.000E+00	0.000E+00

I-125						
GONADS	6.920E-16	1.788E-12	3.614E-11	6.220E-17	-1.000E+00	1.840E-11	2.930E-11
BREAST	9.900E-16	1.969E-12	3.980E-11	6.850E-17	-1.000E+00	9.250E-11	1.450E-10
LUNGS	2.480E-16	5.979E-13	1.209E-11	2.080E-17	-1.000E+00	1.190E-10	4.080E-11
RED MARR	2.070E-16	4.570E-13	9.239E-12	1.590E-17	-1.000E+00	4.410E-11	6.820E-11
BONE SUR	1.390E-15	3.421E-12	6.914E-11	1.190E-16	-1.000E+00	4.270E-11	6.630E-11
THYROID	5.340E-16	1.052E-12	2.127E-11	3.660E-17	-1.000E+00	2.160E-07	3.440E-07
REMAINDER	2.930E-16	7.502E-13	1.517E-11	2.610E-17	-1.000E+00	3.330E-11	5.800E-11
EFFECTIVE	5.220E-16	1.227E-12	2.481E-11	4.270E-17	-1.000E+00	6.530E-09	1.040E-08
SKIN(FGR)	1.390E-15	3.248E-12	6.566E-11	1.130E-16	-1.000E+00	0.000E+00	0.000E-00
I-126							
GONADS	2.110E-14	1.356E-11	2.398E-10	4.750E-16	-1.000E+00	3.480E-11	5.550E-11
BREAST	2.420E-14	1.307E-11	2.312E-10	4.580E-16	-1.000E+00	1.370E-10	2.120E-10
LUNGS	2.090E-14	1.207E-11	2.136E-10	4.230E-16	-1.000E+00	6.340E-10	1.720E-10
RED MARR	2.020E-14	1.219E-11	2.156E-10	4.270E-16	-1.000E+00	9.840E-11	1.500E-10
BONE SUR	3.660E-14	1.898E-11	3.358E-10	6.650E-16	-1.000E+00	9.020E-11	1.380E-10
THYROID	2.150E-14	1.270E-11	2.247E-10	4.450E-16	-1.000E+00	3.940E-07	6.360E-07
REMAINDER	1.990E-14	1.185E-11	2.095E-10	4.150E-16	-1.000E+00	1.210E-10	2.150E-10
EFFECTIVE	2.150E-14	1.276E-11	2.257E-10	4.470E-16	-1.000E+00	1.200E-08	1.920E-08
SKIN(FGR)	3.370E-14	4.596E-11	8.129E-10	1.610E-15	-1.000E+00	0.000E+00	0.000E+00
I-128							
GONADS	4.070E-15	2.007E-13	2.007E-13	9.280E-17	-1.000E+00	6.800E-13	1.390E-12
BREAST	4.670E-15	1.938E-13	1.938E-13	8.960E-17	-1.000E+00	7.150E-13	1.440E-12
LUNGS	4.010E-15	1.795E-13	1.795E-13	8.300E-17	-1.000E+00	7.220E-11	1.470E-12
RED MARR	3.850E-15	1.804E-13	1.804E-13	8.340E-17	-1.000E+00	7.170E-13	1.430E-12
BONE SUR	7.470E-15	2.920E-13	2.920E-13	1.350E-16	-1.000E+00	7.030E-13	1.390E-12
THYROID	4.130E-15	1.882E-13	1.882E-13	8.700E-17	-1.000E+00	5.340E-11	1.080E-10
REMAINDER	3.830E-15	1.761E-13	1.761E-13	8.140E-17	-1.000E+00	7.020E-12	6.710E-11
EFFECTIVE	4.160E-15	1.897E-13	1.897E-13	8.770E-17	-1.000E+00	1.280E-11	2.430E-11
SKIN(FGR)	5.380E-14	1.899E-11	1.899E-11	8.780E-15	-1.000E+00	0.000E+00	0.000E+00
I-129							
GONADS	4.830E-16	1.022E-12	2.147E-11	3.550E-17	-1.000E+00	8.690E-11	1.380E-10
BREAST	6.660E-16	1.106E-12	2.322E-11	3.840E-17	-1.000E+00	2.090E-10	3.310E-10
LUNGS	2.140E-16	4.262E-13	8.951E-12	1.480E-17	-1.000E+00	3.140E-10	1.650E-10
RED MARR	1.640E-16	3.082E-13	6.471E-12	1.070E-17	-1.000E+00	1.400E-10	2.210E-10
BONE SUR	1.100E-15	2.278E-12	4.784E-11	7.910E-17	-1.000E+00	1.380E-10	2.170E-10
THYROID	3.860E-16	6.566E-13	1.379E-11	2.280E-17	-1.000E+00	1.560E-06	2.480E-06
REMAINDER	2.300E-16	4.867E-13	1.022E-11	1.690E-17	-1.000E+00	1.180E-10	1.990E-10
EFFECTIVE	3.800E-16	7.430E-13	1.560E-11	2.580E-17	-1.000E+00	4.690E-08	7.460E-08
SKIN(FGR)	1.100E-15	1.670E-12	3.508E-11	5.800E-17	-1.000E+00	0.000E+00	0.000E+00
I-130							
GONADS	1.010E-13	5.105E-11	1.412E-10	2.200E-15	-1.000E+00	2.810E-11	5.520E-11
BREAST	1.160E-13	4.897E-11	1.354E-10	2.110E-15	-1.000E+00	4.870E-11	7.320E-11
LUNGS	1.010E-13	4.664E-11	1.290E-10	2.010E-15	-1.000E+00	6.030E-10	7.180E-11
RED MARR	9.820E-14	4.734E-11	1.309E-10	2.040E-15	-1.000E+00	4.550E-11	6.740E-11
BONE SUR	1.680E-13	6.869E-11	1.900E-10	2.960E-15	-1.000E+00	4.030E-11	6.120E-11
THYROID	1.040E-13	4.850E-11	1.342E-10	2.090E-15	-1.000E+00	1.990E-08	3.940E-08
REMAINDER	9.660E-14	4.572E-11	1.265E-10	1.970E-15	-1.000E+00	8.020E-11	1.970E-10
EFFECTIVE	1.040E-13	4.873E-11	1.348E-10	2.100E-15	-1.000E+00	7.140E-10	1.280E-09
SKIN(FGR)	1.360E-13	9.956E-11	2.754E-10	4.290E-15	-1.000E+00	0.000E+00	0.000E+00
I-131							
GONADS	1.780E-14	1.119E-11	1.789E-10	3.940E-16	-1.000E+00	2.530E-11	4.070E-11
BREAST	2.040E-14	1.082E-11	1.730E-10	3.810E-16	-1.000E+00	7.880E-11	1.210E-10
LUNGS	1.760E-14	1.016E-11	1.626E-10	3.580E-16	-1.000E+00	6.570E-10	1.020E-10
RED MARR	1.680E-14	1.022E-11	1.635E-10	3.600E-16	-1.000E+00	6.260E-11	9.440E-11
BONE SUR	3.450E-14	1.675E-11	2.679E-10	5.900E-16	-1.000E+00	5.730E-11	8.720E-11
THYROID	1.810E-14	1.053E-11	1.685E-10	3.710E-16	-1.000E+00	2.920E-07	4.760E-07
REMAINDER	1.670E-14	9.908E-12	1.585E-10	3.490E-16	-1.000E+00	8.030E-11	1.570E-10
EFFECTIVE	1.820E-14	1.067E-11	1.707E-10	3.760E-16	-1.000E+00	8.890E-09	1.440E-08
SKIN(FGR)	2.980E-14	1.825E-11	2.920E-10	6.430E-16	-1.000E+00	0.000E+00	0.000E+00
I-132							
GONADS	1.090E-13	2.523E-11	2.771E-11	2.320E-15	-1.000E+00	9.950E-12	2.330E-11
BREAST	1.240E-13	2.414E-11	2.652E-11	2.220E-15	-1.000E+00	1.410E-11	2.520E-11

LUNGS	1.090E-13	2.305E-11	2.532E-11	2.120E-15	-1.000E+00	2.710E-10	2.640E-11
RED MARR	1.070E-13	2.360E-11	2.592E-11	2.170E-15	-1.000E+00	1.400E-11	2.460E-11
BONE SUR	1.730E-13	3.327E-11	3.655E-11	3.060E-15	-1.000E+00	1.240E-11	2.190E-11
THYROID	1.120E-13	2.381E-11	2.616E-11	2.190E-15	-1.000E+00	1.740E-09	3.870E-09
REMAINDER	1.050E-13	2.283E-11	2.509E-11	2.100E-15	-1.000E+00	3.780E-11	1.650E-10
EFFECTIVE	1.120E-13	2.403E-11	2.640E-11	2.210E-15	-1.000E+00	1.030E-10	1.820E-10
SKIN(FGR)	1.580E-13	8.199E-11	9.007E-11	7.540E-15	-1.000E+00	0.000E+00	0.000E+00
I-132m							
GONADS	1.500E-14	2.379E-12	2.424E-12	3.350E-16	-1.000E+00	6.480E-12	1.450E-11
BREAST	1.710E-14	2.294E-12	2.337E-12	3.230E-16	-1.000E+00	8.880E-12	1.540E-11
LUNGS	1.480E-14	2.116E-12	2.156E-12	2.980E-16	-1.000E+00	1.770E-10	1.570E-11
RED MARR	1.430E-14	2.137E-12	2.178E-12	3.010E-16	-1.000E+00	8.860E-12	1.540E-11
BONE SUR	2.540E-14	3.338E-12	3.401E-12	4.700E-16	-1.000E+00	7.950E-12	1.420E-11
THYROID	1.520E-14	2.223E-12	2.265E-12	3.130E-16	-1.000E+00	1.650E-09	3.690E-09
REMAINDER	1.410E-14	2.081E-12	2.120E-12	2.930E-16	-1.000E+00	2.010E-11	7.130E-11
EFFECTIVE	1.530E-14	2.237E-12	2.280E-12	3.150E-16	-1.000E+00	8.100E-11	1.420E-10
SKIN(FGR)	2.220E-14	7.527E-12	7.671E-12	1.060E-15	-1.000E+00	0.000E+00	0.000E+00
I-133							
GONADS	2.870E-14	1.585E-11	6.748E-11	6.270E-16	-1.000E+00	1.950E-11	3.630E-11
BREAST	3.280E-14	1.519E-11	6.468E-11	6.010E-16	-1.000E+00	2.940E-11	4.680E-11
LUNGS	2.860E-14	1.446E-11	6.156E-11	5.720E-16	-1.000E+00	8.200E-10	4.530E-11
RED MARR	2.770E-14	1.466E-11	6.242E-11	5.800E-16	-1.000E+00	2.720E-11	4.300E-11
BONE SUR	4.870E-14	2.161E-11	9.202E-11	8.550E-16	-1.000E+00	2.520E-11	4.070E-11
THYROID	2.930E-14	1.502E-11	6.393E-11	5.940E-16	-1.000E+00	4.860E-08	9.100E-08
REMAINDER	2.730E-14	1.418E-11	6.038E-11	5.610E-16	-1.000E+00	5.000E-11	1.550E-10
EFFECTIVE	2.940E-14	1.509E-11	6.425E-11	5.970E-16	-1.000E+00	1.580E-09	2.800E-09
SKIN(FGR)	5.830E-14	1.150E-10	4.897E-10	4.550E-15	-1.000E+00	0.000E+00	0.000E+00
I-134							
GONADS	1.270E-13	1.200E-11	1.202E-11	2.640E-15	-1.000E+00	4.250E-12	1.100E-11
BREAST	1.440E-13	1.145E-11	1.147E-11	2.520E-15	-1.000E+00	6.170E-12	1.170E-11
LUNGS	1.270E-13	1.100E-11	1.102E-11	2.420E-15	-1.000E+00	1.430E-10	1.260E-11
RED MARR	1.250E-13	1.127E-11	1.129E-11	2.480E-15	-1.000E+00	6.080E-12	1.090E-11
BONE SUR	1.960E-13	1.568E-11	1.571E-11	3.450E-15	-1.000E+00	5.310E-12	9.320E-12
THYROID	1.300E-13	1.127E-11	1.129E-11	2.480E-15	-1.000E+00	2.880E-10	6.210E-10
REMAINDER	1.220E-13	1.091E-11	1.093E-11	2.400E-15	-1.000E+00	2.270E-11	1.340E-10
EFFECTIVE	1.300E-13	1.150E-11	1.152E-11	2.530E-15	-1.000E+00	3.550E-11	6.660E-11
SKIN(FGR)	1.870E-13	4.477E-11	4.485E-11	9.850E-15	-1.000E+00	0.000E+00	0.000E+00
I-135							
GONADS	8.078E-14	3.113E-11	5.489E-11	1.599E-15	-1.000E+00	1.700E-11	3.610E-11
BREAST	9.143E-14	2.971E-11	5.240E-11	1.526E-15	-1.000E+00	2.340E-11	3.850E-11
LUNGS	8.145E-14	2.886E-11	5.089E-11	1.482E-15	-1.000E+00	4.410E-10	3.750E-11
RED MARR	8.054E-14	2.965E-11	5.228E-11	1.523E-15	-1.000E+00	2.240E-11	3.650E-11
BONE SUR	1.184E-13	3.983E-11	7.024E-11	2.046E-15	-1.000E+00	2.010E-11	3.360E-11
THYROID	8.324E-14	2.852E-11	5.030E-11	1.465E-15	-1.000E+00	8.460E-09	1.790E-08
REMAINDER	7.861E-14	2.883E-11	5.084E-11	1.481E-15	-1.000E+00	4.700E-11	1.540E-10
EFFECTIVE	8.294E-14	2.989E-11	5.271E-11	1.535E-15	-1.000E+00	3.320E-10	6.080E-10
SKIN(FGR)	1.156E-13	9.826E-11	1.733E-10	5.047E-15	-1.000E+00	0.000E+00	0.000E-00
In-109							
GONADS	3.150E-14	1.094E-11	1.492E-11	6.840E-16	-1.000E+00	9.620E-12	7.340E-11
BREAST	3.590E-14	1.058E-11	1.444E-11	6.620E-16	-1.000E+00	5.300E-12	1.160E-11
LUNGS	3.100E-14	9.721E-12	1.326E-11	6.080E-16	-1.000E+00	8.570E-11	4.100E-12
RED MARR	3.000E-14	9.865E-12	1.346E-11	6.170E-16	-1.000E+00	1.510E-11	1.980E-11
BONE SUR	5.630E-14	1.594E-11	2.175E-11	9.970E-16	-1.000E+00	8.420E-12	7.060E-12
THYROID	3.200E-14	9.993E-12	1.363E-11	6.250E-16	-1.000E+00	3.410E-12	6.000E-13
REMAINDER	2.970E-14	9.593E-12	1.309E-11	6.000E-16	-1.000E+00	2.410E-11	1.770E-10
EFFECTIVE	3.210E-14	1.033E-11	1.409E-11	6.460E-16	-1.000E+00	2.290E-11	7.640E-11
SKIN(FGR)	3.910E-14	1.538E-11	2.098E-11	9.620E-16	-1.000E+00	0.000E+00	0.000E+00
In-110a							
GONADS	7.440E-14	9.374E-12	9.451E-12	1.580E-15	-1.000E+00	5.100E-11	3.720E-10
BREAST	8.460E-14	9.018E-12	9.092E-12	1.520E-15	-1.000E+00	2.570E-11	6.000E-11
LUNGS	7.430E-14	8.543E-12	8.613E-12	1.440E-15	-1.000E+00	1.800E-10	2.100E-11
RED MARR	7.240E-14	8.662E-12	8.733E-12	1.460E-15	-1.000E+00	3.090E-11	8.690E-11
BONE SUR	1.220E-13	1.264E-11	1.274E-11	2.130E-15	-1.000E+00	1.900E-11	3.050E-11

THYROID	7.620E-14	8.781E-12	8.852E-12	1.480E-15-1.000E+00	1.830E-11	3.060E-12
REMAINDER	7.120E-14	8.425E-12	8.494E-12	1.420E-15-1.000E+00	8.310E-11	5.670E-10
EFFECTIVE	7.620E-14	8.959E-12	9.032E-12	1.510E-15-1.000E+00	6.790E-11	2.860E-10
SKIN(FGR)	1.290E-13	5.405E-11	5.449E-11	9.110E-15-1.000E+00	0.000E+00	0.000E+00
In-110b						
GONADS	1.460E-13	5.362E-11	7.915E-11	3.110E-15-1.000E+00	2.370E-12	3.150E-11
BREAST	1.660E-13	5.138E-11	7.584E-11	2.980E-15-1.000E+00	3.050E-12	7.350E-12
LUNGS	1.450E-13	4.879E-11	7.202E-11	2.830E-15-1.000E+00	1.950E-10	4.490E-12
RED MARR	1.420E-13	4.983E-11	7.355E-11	2.890E-15-1.000E+00	4.230E-12	9.330E-12
BONE SUR	2.280E-13	7.035E-11	1.038E-10	4.080E-15-1.000E+00	2.990E-12	3.570E-12
THYROID	1.490E-13	5.052E-11	7.457E-11	2.930E-15-1.000E+00	2.590E-12	5.060E-13
REMAINDER	1.390E-13	4.828E-11	7.126E-11	2.800E-15-1.000E+00	1.340E-11	2.770E-10
EFFECTIVE	1.490E-13	5.104E-11	7.533E-11	2.960E-15-1.000E+00	2.920E-11	9.390E-11
SKIN(FGR)	1.710E-13	6.276E-11	9.263E-11	3.640E-15-1.000E+00	0.000E+00	0.000E+00
In-111						
GONADS	1.820E-14	1.145E-11	1.197E-10	4.140E-16-1.000E+00	1.570E-10	4.150E-10
BREAST	2.100E-14	1.131E-11	1.183E-10	4.090E-16-1.000E+00	4.370E-11	4.370E-11
LUNGS	1.750E-14	9.928E-12	1.038E-10	3.590E-16-1.000E+00	6.250E-10	8.350E-12
RED MARR	1.620E-14	9.873E-12	1.033E-10	3.570E-16-1.000E+00	1.110E-10	1.080E-10
BONE SUR	4.370E-14	2.074E-11	2.169E-10	7.500E-16-1.000E+00	5.750E-11	3.730E-11
THYROID	1.830E-14	1.018E-11	1.064E-10	3.680E-16-1.000E+00	1.910E-11	2.100E-12
REMAINDER	1.660E-14	9.735E-12	1.018E-10	3.520E-16-1.000E+00	3.010E-10	7.800E-10
EFFECTIVE	1.860E-14	1.079E-11	1.128E-10	3.900E-16-1.000E+00	2.270E-10	3.590E-10
SKIN(FGR)	2.290E-14	1.408E-11	1.472E-10	5.090E-16-1.000E+00	0.000E+00	0.000E+00
In-112						
GONADS	1.240E-14	3.503E-13	3.503E-13	2.810E-16-1.000E+00	4.770E-14	5.080E-13
BREAST	1.420E-14	3.378E-13	3.378E-13	2.710E-16-1.000E+00	1.130E-13	2.650E-13
LUNGS	1.220E-14	3.116E-13	3.116E-13	2.500E-16-1.000E+00	1.590E-11	2.660E-13
RED MARR	1.180E-14	3.141E-13	3.141E-13	2.520E-16-1.000E+00	1.220E-13	2.580E-13
BONE SUR	2.160E-14	4.849E-13	4.849E-13	3.890E-16-1.000E+00	9.870E-14	1.190E-13
THYROID	1.260E-14	3.278E-13	3.278E-13	2.630E-16-1.000E+00	1.010E-13	2.280E-14
REMAINDER	1.170E-14	3.066E-13	3.066E-13	2.460E-16-1.000E+00	3.280E-13	2.070E-11
EFFECTIVE	1.260E-14	3.291E-13	3.291E-13	2.640E-16-1.000E+00	2.060E-12	6.460E-12
SKIN(FGR)	2.880E-14	2.854E-12	2.854E-12	2.290E-15-1.000E+00	0.000E+00	0.000E+00
In-113m						
GONADS	1.180E-14	2.235E-12	2.316E-12	2.690E-16-1.000E+00	8.230E-13	9.580E-12
BREAST	1.360E-14	2.168E-12	2.248E-12	2.610E-16-1.000E+00	8.220E-13	1.860E-12
LUNGS	1.160E-14	1.985E-12	2.058E-12	2.390E-16-1.000E+00	5.830E-11	9.250E-13
RED MARR	1.110E-14	1.994E-12	2.067E-12	2.400E-16-1.000E+00	1.410E-12	2.820E-12
BONE SUR	2.270E-14	3.298E-12	3.419E-12	3.970E-16-1.000E+00	9.380E-13	1.020E-12
THYROID	1.200E-14	2.077E-12	2.153E-12	2.500E-16-1.000E+00	6.120E-13	9.970E-14
REMAINDER	1.110E-14	1.944E-12	2.015E-12	2.340E-16-1.000E+00	4.990E-12	8.370E-11
EFFECTIVE	1.210E-14	2.110E-12	2.187E-12	2.540E-16-1.000E+00	9.040E-12	2.830E-11
SKIN(FGR)	2.180E-14	2.733E-12	2.833E-12	3.290E-16-1.000E+00	0.000E+00	0.000E+00
In-114						
GONADS	1.360E-16	2.977E-16	2.977E-16	2.870E-18-1.000E+00	0.000E+00	0.000E+00
BREAST	1.550E-16	2.873E-16	2.873E-16	2.770E-18-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.360E-16	2.624E-16	2.624E-16	2.530E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.340E-16	2.687E-16	2.687E-16	2.590E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.000E-16	3.911E-16	3.911E-16	3.770E-18-1.000E+00	0.000E+00	0.000E+00
THYROID	1.400E-16	2.645E-16	2.645E-16	2.550E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.310E-16	2.635E-16	2.635E-16	2.540E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.390E-16	2.801E-16	2.801E-16	2.700E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.950E-15	1.929E-15	1.929E-15	1.860E-17-1.000E+00	0.000E+00	0.000E+00
In-114m						
GONADS	4.260E-15	2.952E-12	5.919E-11	1.027E-16-1.000E+00	6.810E-10	2.490E-10
BREAST	4.908E-15	2.918E-12	5.850E-11	1.016E-16-1.000E+00	6.520E-10	1.320E-10
LUNGS	4.110E-15	2.431E-12	4.875E-11	8.462E-17-1.000E+00	7.190E-08	1.230E-10
RED MARR	3.928E-15	2.447E-12	4.907E-11	8.518E-17-1.000E+00	1.770E-08	3.510E-09
BONE SUR	8.171E-15	4.528E-12	9.080E-11	1.576E-16-1.000E+00	9.130E-09	1.810E-09
THYROID	4.294E-15	2.607E-12	5.228E-11	9.074E-17-1.000E+00	6.200E-10	1.170E-10
REMAINDER	3.925E-15	2.417E-12	4.847E-11	8.413E-17-1.000E+00	1.260E-08	1.340E-08
EFFECTIVE	4.313E-15	2.703E-12	5.420E-11	9.408E-17-1.000E+00	1.510E-08	4.610E-09

SKIN(FGR)	1.332E-14	4.274E-12	8.572E-11	1.488E-16-1.000E+00	0.000E+00	0.000E+00
In-115						
GONADS	4.690E-18	6.221E-15	1.306E-13	2.160E-19-1.000E+00	3.160E-08	4.860E-09
BREAST	5.780E-18	6.566E-15	1.379E-13	2.280E-19-1.000E+00	3.160E-08	4.860E-09
LUNGS	3.780E-18	3.888E-15	8.165E-14	1.350E-19-1.000E+00	5.670E-08	4.860E-09
RED MARR	3.160E-18	3.370E-15	7.076E-14	1.170E-19-1.000E+00	9.960E-07	1.530E-07
BONE SUR	1.390E-17	1.549E-14	3.254E-13	5.380E-19-1.000E+00	5.140E-07	7.910E-08
THYROID	4.380E-18	4.493E-15	9.435E-14	1.560E-19-1.000E+00	3.160E-08	4.860E-09
REMAINDER	3.590E-18	4.003E-15	8.407E-14	1.390E-19-1.000E+00	4.040E-07	6.410E-08
EFFECTIVE	4.500E-18	5.213E-15	1.095E-13	1.810E-19-1.000E+00	2.760E-07	4.260E-08
SKIN(FGR)	6.180E-15	5.962E-13	1.252E-11	2.070E-17-1.000E+00	0.000E+00	0.000E+00
In-115m						
GONADS	7.250E-15	2.794E-12	3.938E-12	1.690E-16-1.000E+00	3.290E-12	2.200E-11
BREAST	8.340E-15	2.744E-12	3.868E-12	1.660E-16-1.000E+00	1.800E-12	3.160E-12
LUNGS	7.050E-15	2.413E-12	3.402E-12	1.460E-16-1.000E+00	1.810E-10	1.030E-12
RED MARR	6.700E-15	2.413E-12	3.402E-12	1.460E-16-1.000E+00	5.910E-12	6.110E-12
BONE SUR	1.460E-14	4.281E-12	6.034E-12	2.590E-16-1.000E+00	3.390E-12	2.190E-12
THYROID	7.320E-15	2.529E-12	3.565E-12	1.530E-16-1.000E+00	1.190E-12	1.860E-13
REMAINDER	6.720E-15	2.364E-12	3.332E-12	1.430E-16-1.000E+00	3.440E-11	2.880E-10
EFFECTIVE	7.390E-15	2.612E-12	3.681E-12	1.580E-16-1.000E+00	3.400E-11	9.330E-11
SKIN(FGR)	1.810E-14	4.513E-12	6.361E-12	2.730E-16-1.000E+00	0.000E+00	0.000E+00
In-116m						
GONADS	1.220E-13	1.127E-11	1.130E-11	2.410E-15-1.000E+00	2.020E-12	3.190E-11
BREAST	1.380E-13	1.076E-11	1.078E-11	2.300E-15-1.000E+00	3.140E-12	8.640E-12
LUNGS	1.230E-13	1.043E-11	1.045E-11	2.230E-15-1.000E+00	9.270E-11	5.730E-12
RED MARR	1.210E-13	1.071E-11	1.073E-11	2.290E-15-1.000E+00	3.480E-12	1.010E-11
BONE SUR	1.780E-13	1.441E-11	1.444E-11	3.080E-15-1.000E+00	2.590E-12	4.040E-12
THYROID	1.250E-13	1.034E-11	1.036E-11	2.210E-15-1.000E+00	2.610E-12	7.070E-13
REMAINDER	1.180E-13	1.038E-11	1.041E-11	2.220E-15-1.000E+00	8.510E-12	1.600E-10
EFFECTIVE	1.250E-13	1.085E-11	1.087E-11	2.320E-15-1.000E+00	1.520E-11	5.930E-11
SKIN(FGR)	1.580E-13	2.194E-11	2.198E-11	4.690E-15-1.000E+00	0.000E+00	0.000E-00
In-117						
GONADS	3.230E-14	2.702E-12	2.703E-12	7.130E-16-1.000E+00	5.020E-13	7.820E-12
BREAST	3.700E-14	2.600E-12	2.601E-12	6.860E-16-1.000E+00	8.490E-13	2.150E-12
LUNGS	3.190E-14	2.456E-12	2.457E-12	6.480E-16-1.000E+00	5.420E-11	1.540E-12
RED MARR	3.050E-14	2.467E-12	2.468E-12	6.510E-16-1.000E+00	1.100E-12	2.880E-12
BONE SUR	6.190E-14	4.093E-12	4.095E-12	1.080E-15-1.000E+00	8.230E-13	1.120E-12
THYROID	3.290E-14	2.550E-12	2.552E-12	6.730E-16-1.000E+00	7.160E-13	1.380E-13
REMAINDER	3.040E-14	2.395E-12	2.396E-12	6.320E-16-1.000E+00	2.880E-12	7.680E-11
EFFECTIVE	3.310E-14	2.573E-12	2.574E-12	6.790E-16-1.000E+00	7.800E-12	2.590E-11
SKIN(FGR)	5.160E-14	6.253E-12	6.256E-12	1.650E-15-1.000E+00	0.000E+00	0.000E+00
In-117m						
GONADS	4.120E-15	9.124E-13	9.681E-13	9.600E-17-1.000E+00	2.570E-12	2.190E-11
BREAST	4.740E-15	8.972E-13	9.520E-13	9.440E-17-1.000E+00	2.060E-12	3.600E-12
LUNGS	3.960E-15	7.822E-13	8.299E-13	8.230E-17-1.000E+00	2.630E-10	1.340E-12
RED MARR	3.710E-15	7.794E-13	8.269E-13	8.200E-17-1.000E+00	5.330E-12	6.310E-12
BONE SUR	9.240E-15	1.568E-12	1.664E-12	1.650E-16-1.000E+00	3.310E-12	2.230E-12
THYROID	4.140E-15	8.164E-13	8.663E-13	8.590E-17-1.000E+00	1.620E-12	2.120E-13
REMAINDER	3.760E-15	7.680E-13	8.148E-13	8.080E-17-1.000E+00	2.540E-11	3.610E-10
EFFECTIVE	4.190E-15	8.516E-13	9.036E-13	8.960E-17-1.000E+00	4.090E-11	1.150E-10
SKIN(FGR)	3.170E-14	3.954E-11	4.195E-11	4.160E-15-1.000E+00	0.000E+00	0.000E+00
In-119						
GONADS	3.670E-14	1.645E-13	1.645E-13	7.920E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	4.170E-14	1.575E-13	1.575E-13	7.580E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.650E-14	1.492E-13	1.492E-13	7.180E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.560E-14	1.525E-13	1.525E-13	7.340E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.820E-14	2.161E-13	2.161E-13	1.040E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	3.750E-14	1.558E-13	1.558E-13	7.500E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.490E-14	1.475E-13	1.475E-13	7.100E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.740E-14	1.564E-13	1.564E-13	7.530E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.200E-14	1.645E-12	1.645E-12	7.920E-15-1.000E+00	0.000E+00	0.000E+00
In-119m						
GONADS	6.180E-16	3.132E-14	3.132E-14	2.010E-17-1.000E+00	1.470E-13	8.740E-14

BREAST	7.280E-16	3.194E-14	3.194E-14	2.050E-17-1.000E+00	1.540E-13	3.420E-14
LUNGS	5.660E-16	2.103E-14	2.103E-14	1.350E-17-1.000E+00	8.110E-11	3.110E-14
RED MARR	5.400E-16	2.088E-14	2.088E-14	1.340E-17-1.000E+00	2.500E-13	3.700E-14
BONE SUR	1.200E-15	5.017E-14	5.017E-14	3.220E-17-1.000E+00	2.000E-13	1.770E-14
THYROID	6.120E-16	2.415E-14	2.415E-14	1.550E-17-1.000E+00	1.530E-13	4.990E-15
REMAINDER	5.450E-16	2.181E-14	2.181E-14	1.400E-17-1.000E+00	1.200E-12	9.580E-11
EFFECTIVE	6.140E-16	2.633E-14	2.633E-14	1.690E-17-1.000E+00	1.020E-11	2.880E-11
SKIN(FGR)	7.110E-14	1.792E-11	1.792E-11	1.150E-14-1.000E+00	0.000E+00	0.000E+00
Ir-182						
GONADS	6.350E-14	1.779E-12	1.779E-12	1.370E-15-1.000E+00	3.100E-12	1.060E-11
BREAST	7.250E-14	1.701E-12	1.701E-12	1.310E-15-1.000E+00	1.120E-12	2.290E-12
LUNGS	6.290E-14	1.623E-12	1.623E-12	1.250E-15-1.000E+00	7.870E-11	1.510E-12
RED MARR	6.050E-14	1.636E-12	1.636E-12	1.260E-15-1.000E+00	1.530E-12	3.340E-12
BONE SUR	1.140E-13	2.649E-12	2.649E-12	2.040E-15-1.000E+00	8.710E-13	1.280E-12
THYROID	6.470E-14	1.662E-12	1.662E-12	1.280E-15-1.000E+00	6.430E-13	1.490E-13
REMAINDER	6.010E-14	1.584E-12	1.584E-12	1.220E-15-1.000E+00	8.160E-12	1.030E-10
EFFECTIVE	6.500E-14	1.701E-12	1.701E-12	1.310E-15-1.000E+00	1.310E-11	3.450E-11
SKIN(FGR)	1.350E-13	1.213E-11	1.213E-11	9.340E-15-1.000E+00	0.000E+00	0.000E+00
Ir-184						
GONADS	9.160E-14	2.492E-11	2.964E-11	1.890E-15-1.000E+00	1.500E-11	1.330E-10
BREAST	1.040E-13	2.400E-11	2.855E-11	1.820E-15-1.000E+00	8.800E-12	2.360E-11
LUNGS	9.120E-14	2.294E-11	2.729E-11	1.740E-15-1.000E+00	2.800E-10	9.530E-12
RED MARR	8.860E-14	2.320E-11	2.761E-11	1.760E-15-1.000E+00	1.030E-11	3.650E-11
BONE SUR	1.550E-13	3.626E-11	4.313E-11	2.750E-15-1.000E+00	6.480E-12	1.270E-11
THYROID	9.370E-14	2.307E-11	2.745E-11	1.750E-15-1.000E+00	5.510E-12	1.200E-12
REMAINDER	8.750E-14	2.268E-11	2.698E-11	1.720E-15-1.000E+00	5.610E-11	4.860E-10
EFFECTIVE	9.380E-14	2.400E-11	2.855E-11	1.820E-15-1.000E+00	5.710E-11	1.880E-10
SKIN(FGR)	1.210E-13	5.261E-11	6.258E-11	3.990E-15-1.000E+00	0.000E+00	0.000E+00
Ir-185						
GONADS	2.870E-14	1.355E-11	4.144E-11	5.700E-16-1.000E+00	5.770E-11	2.080E-10
BREAST	3.270E-14	1.306E-11	3.991E-11	5.490E-16-1.000E+00	2.040E-11	2.830E-11
LUNGS	2.850E-14	1.256E-11	3.838E-11	5.280E-16-1.000E+00	5.100E-10	7.260E-12
RED MARR	2.770E-14	1.253E-11	3.831E-11	5.270E-16-1.000E+00	2.930E-11	5.640E-11
BONE SUR	4.940E-14	2.245E-11	6.862E-11	9.440E-16-1.000E+00	1.630E-11	1.870E-11
THYROID	2.930E-14	1.206E-11	3.686E-11	5.070E-16-1.000E+00	1.030E-11	1.360E-12
REMAINDER	2.750E-14	1.241E-11	3.795E-11	5.220E-16-1.000E+00	2.150E-10	7.850E-10
EFFECTIVE	2.940E-14	1.313E-11	4.013E-11	5.520E-16-1.000E+00	1.480E-10	3.000E-10
SKIN(FGR)	3.520E-14	1.998E-11	6.106E-11	8.400E-16-1.000E+00	0.000E+00	0.000E+00
Ir-186a						
GONADS	7.870E-14	3.935E-11	1.329E-10	1.620E-15-1.000E+00	1.770E-10	6.280E-10
BREAST	8.950E-14	3.789E-11	1.279E-10	1.560E-15-1.000E+00	4.590E-11	8.340E-11
LUNGS	7.830E-14	3.619E-11	1.222E-10	1.490E-15-1.000E+00	6.130E-10	2.000E-11
RED MARR	7.600E-14	3.668E-11	1.238E-10	1.510E-15-1.000E+00	6.450E-11	1.470E-10
BONE SUR	1.350E-13	5.829E-11	1.968E-10	2.400E-15-1.000E+00	3.260E-11	4.960E-11
THYROID	8.040E-14	3.643E-11	1.230E-10	1.500E-15-1.000E+00	2.000E-11	3.190E-12
REMAINDER	7.510E-14	3.570E-11	1.206E-10	1.470E-15-1.000E+00	3.730E-10	1.310E-09
EFFECTIVE	8.060E-14	3.789E-11	1.279E-10	1.560E-15-1.000E+00	2.460E-10	5.860E-10
SKIN(FGR)	9.550E-14	5.101E-11	1.722E-10	2.100E-15-1.000E+00	0.000E+00	0.000E+00
Ir-186b						
GONADS	4.560E-14	8.463E-12	8.834E-12	9.720E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	5.200E-14	8.123E-12	8.480E-12	9.330E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.510E-14	7.740E-12	8.080E-12	8.890E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.350E-14	7.792E-12	8.135E-12	8.950E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	7.970E-14	1.280E-11	1.336E-11	1.470E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.640E-14	7.923E-12	8.271E-12	9.100E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.310E-14	7.601E-12	7.935E-12	8.730E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.650E-14	8.097E-12	8.453E-12	9.300E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	6.410E-14	2.403E-11	2.509E-11	2.760E-15-1.000E+00	0.000E+00	0.000E+00
Ir-187						
GONADS	1.660E-14	8.211E-12	2.001E-11	3.670E-16-1.000E+00	2.620E-11	1.120E-10
BREAST	1.900E-14	7.921E-12	1.930E-11	3.540E-16-1.000E+00	7.360E-12	1.480E-11
LUNGS	1.610E-14	7.451E-12	1.816E-11	3.330E-16-1.000E+00	1.850E-10	3.600E-12
RED MARR	1.520E-14	7.339E-12	1.789E-11	3.280E-16-1.000E+00	1.190E-11	3.120E-11

BONE SUR	3.230E-14	1.466E-11	3.572E-11	6.550E-16-1.000E+00	6.100E-12	1.000E-11
THYROID	1.670E-14	7.652E-12	1.865E-11	3.420E-16-1.000E+00	3.370E-12	4.960E-13
REMAINDER	1.530E-14	7.249E-12	1.767E-11	3.240E-16-1.000E+00	8.370E-11	3.570E-10
EFFECTIVE	1.680E-14	7.853E-12	1.914E-11	3.510E-16-1.000E+00	5.670E-11	1.420E-10
SKIN(FGR)	2.030E-14	1.103E-11	2.688E-11	4.930E-16-1.000E+00	0.000E+00	0.000E+00
Ir-188						
GONADS	7.780E-14	4.071E-11	3.058E-10	1.510E-15-1.000E+00	3.700E-10	9.830E-10
BREAST	8.810E-14	3.909E-11	2.936E-10	1.450E-15-1.000E+00	9.260E-11	1.250E-10
LUNGS	7.830E-14	3.774E-11	2.835E-10	1.400E-15-1.000E+00	9.130E-10	2.910E-11
RED MARR	7.720E-14	3.855E-11	2.896E-10	1.430E-15-1.000E+00	1.280E-10	2.170E-10
BONE SUR	1.200E-13	5.688E-11	4.273E-10	2.110E-15-1.000E+00	6.520E-11	7.450E-11
THYROID	8.010E-14	3.666E-11	2.754E-10	1.360E-15-1.000E+00	3.950E-11	5.690E-12
REMAINDER	7.570E-14	3.774E-11	2.835E-10	1.400E-15-1.000E+00	6.100E-10	1.590E-09
EFFECTIVE	8.010E-14	3.936E-11	2.957E-10	1.460E-15-1.000E+00	4.170E-10	7.730E-10
SKIN(FGR)	9.180E-14	4.960E-11	3.726E-10	1.840E-15-1.000E+00	0.000E+00	0.000E+00
Ir-189						
GONADS	3.230E-15	2.247E-12	3.988E-11	7.870E-17-1.000E+00	5.890E-11	1.240E-10
BREAST	3.810E-15	2.236E-12	3.968E-11	7.830E-17-1.000E+00	2.660E-11	1.360E-11
LUNGS	2.870E-15	2.004E-12	3.557E-11	7.020E-17-1.000E+00	2.520E-09	3.170E-12
RED MARR	2.410E-15	1.764E-12	3.132E-11	6.180E-17-1.000E+00	5.680E-11	4.820E-11
BONE SUR	9.890E-15	6.967E-12	1.236E-10	2.440E-16-1.000E+00	3.530E-11	1.560E-11
THYROID	3.110E-15	2.007E-12	3.562E-11	7.030E-17-1.000E+00	1.060E-11	1.610E-12
REMAINDER	2.690E-15	1.924E-12	3.416E-11	6.740E-17-1.000E+00	3.910E-10	8.160E-10
EFFECTIVE	3.210E-15	2.196E-12	3.897E-11	7.690E-17-1.000E+00	4.460E-10	2.840E-10
SKIN(FGR)	4.140E-15	2.941E-12	5.220E-11	1.030E-16-1.000E+00	0.000E+00	0.000E+00
Ir-190						
GONADS	6.710E-14	4.222E-11	7.374E-10	1.480E-15-1.000E+00	7.920E-10	1.660E-09
BREAST	7.690E-14	4.051E-11	7.075E-10	1.420E-15-1.000E+00	3.610E-10	1.990E-10
LUNGS	6.600E-14	3.851E-11	6.726E-10	1.350E-15-1.000E+00	7.530E-09	4.370E-11
RED MARR	6.300E-14	3.851E-11	6.726E-10	1.350E-15-1.000E+00	4.720E-10	3.920E-10
BONE SUR	1.280E-13	6.590E-11	1.151E-09	2.310E-15-1.000E+00	2.950E-10	1.360E-10
THYROID	6.810E-14	3.965E-11	6.926E-10	1.390E-15-1.000E+00	2.300E-10	1.390E-11
REMAINDER	6.290E-14	3.737E-11	6.527E-10	1.310E-15-1.000E+00	1.690E-09	3.240E-09
EFFECTIVE	6.860E-14	4.022E-11	7.025E-10	1.410E-15-1.000E+00	1.730E-09	1.470E-09
SKIN(FGR)	8.240E-14	5.135E-11	8.968E-10	1.800E-15-1.000E+00	0.000E+00	0.000E+00
Ir-190m						
GONADS	1.060E-19	3.234E-16	3.266E-16	5.240E-20-1.000E+00	3.280E-12	6.740E-12
BREAST	5.360E-19	7.344E-16	7.417E-16	1.190E-19-1.000E+00	1.490E-12	7.940E-13
LUNGS	7.980E-22	1.463E-18	1.477E-18	2.370E-22-1.000E+00	3.900E-11	1.640E-13
RED MARR	2.500E-20	2.833E-17	2.861E-17	4.590E-21-1.000E+00	1.950E-12	1.580E-12
BONE SUR	1.350E-19	1.703E-16	1.720E-16	2.760E-20-1.000E+00	1.220E-12	5.460E-13
THYROID	1.580E-20	4.752E-17	4.799E-17	7.700E-21-1.000E+00	9.460E-13	5.680E-14
REMAINDER	4.290E-20	1.148E-16	1.159E-16	1.860E-20-1.000E+00	7.400E-12	2.170E-11
EFFECTIVE	1.270E-19	2.351E-16	2.375E-16	3.810E-20-1.000E+00	8.240E-12	8.540E-12
SKIN(FGR)	7.520E-18	1.938E-14	1.957E-14	3.140E-18-1.000E+00	0.000E+00	0.000E-00
Ir-190n						
GONADS	7.230E-14	2.145E-11	2.576E-11	1.600E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	8.280E-14	2.065E-11	2.479E-11	1.540E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	7.120E-14	1.958E-11	2.351E-11	1.460E-15-1.000E+00	0.000E+00	0.000E+00
RED MARR	6.800E-14	1.958E-11	2.351E-11	1.460E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.370E-13	3.272E-11	3.929E-11	2.440E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	7.340E-14	2.025E-11	2.431E-11	1.510E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	6.790E-14	1.904E-11	2.286E-11	1.420E-15-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	7.390E-14	2.052E-11	2.463E-11	1.530E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.890E-14	2.642E-11	3.172E-11	1.970E-15-1.000E+00	0.000E+00	0.000E+00
Ir-191m						
GONADS	3.010E-15	4.996E-16	4.996E-16	7.010E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	3.550E-15	4.939E-16	4.939E-16	6.930E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.730E-15	4.533E-16	4.533E-16	6.360E-17-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.290E-15	4.055E-16	4.055E-16	5.690E-17-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.620E-15	1.554E-15	1.554E-15	2.180E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	2.920E-15	4.540E-16	4.540E-16	6.370E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.540E-15	4.340E-16	4.340E-16	6.090E-17-1.000E+00	0.000E+00	0.000E+00

EFFECTIVE	3.020E-15	4.925E-16	4.925E-16	6.910E-17	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.070E-15	6.635E-16	6.635E-16	9.310E-17	1.000E+00	0.000E+00	0.000E+00
Ir-192							
GONADS	3.830E-14	2.421E-11	4.929E-10	8.420E-16	1.000E+00	6.080E-10	1.030E-09
BREAST	4.380E-14	2.338E-11	4.759E-10	8.130E-16	1.000E+00	8.630E-10	1.510E-10
LUNGS	3.760E-14	2.206E-11	4.490E-10	7.670E-16	1.000E+00	5.240E-08	6.540E-11
RED MARR	3.590E-14	2.217E-11	4.513E-10	7.710E-16	1.000E+00	9.380E-10	2.540E-10
BONE SUR	7.500E-14	3.681E-11	7.493E-10	1.280E-15	1.000E+00	7.000E-10	1.110E-10
THYROID	3.880E-14	2.275E-11	4.631E-10	7.910E-16	1.000E+00	6.510E-10	3.780E-11
REMAINDER	3.590E-14	2.148E-11	4.373E-10	7.470E-16	1.000E+00	2.940E-09	4.080E-09
EFFECTIVE	3.910E-14	2.309E-11	4.701E-10	8.030E-16	1.000E+00	7.610E-09	1.550E-09
SKIN(FGR)	5.530E-14	3.479E-11	7.083E-10	1.210E-15	1.000E+00	0.000E+00	0.000E+00
Ir-192m							
GONADS	7.460E-15	4.579E-12	9.616E-11	1.590E-16	1.000E+00	2.480E-09	3.630E-10
BREAST	8.590E-15	4.464E-12	9.374E-11	1.550E-16	1.000E+00	1.380E-08	1.550E-10
LUNGS	7.150E-15	4.205E-12	8.830E-11	1.460E-16	1.000E+00	7.490E-07	1.590E-10
RED MARR	6.490E-15	4.118E-12	8.648E-11	1.430E-16	1.000E+00	1.510E-08	2.210E-10
BONE SUR	2.000E-14	9.734E-12	2.044E-10	3.380E-16	1.000E+00	1.200E-08	1.570E-10
THYROID	7.470E-15	4.234E-12	8.890E-11	1.470E-16	1.000E+00	1.080E-08	1.060E-10
REMAINDER	6.740E-15	4.090E-12	8.588E-11	1.420E-16	1.000E+00	3.040E-08	8.530E-10
EFFECTIVE	7.630E-15	4.464E-12	9.374E-11	1.550E-16	1.000E+00	1.040E-07	4.230E-10
SKIN(FGR)	8.810E-15	5.184E-12	1.089E-10	1.800E-16	1.000E+00	0.000E+00	0.000E+00
Ir-194							
GONADS	4.440E-15	2.400E-12	9.526E-12	9.600E-17	1.000E+00	1.350E-11	4.330E-11
BREAST	5.060E-15	2.315E-12	9.189E-12	9.260E-17	1.000E+00	3.840E-12	6.330E-12
LUNGS	4.380E-15	2.185E-12	8.673E-12	8.740E-17	1.000E+00	2.990E-09	2.170E-12
RED MARR	4.210E-15	2.208E-12	8.762E-12	8.830E-17	1.000E+00	5.040E-12	1.030E-11
BONE SUR	8.190E-15	3.576E-12	1.419E-11	1.430E-16	1.000E+00	2.890E-12	4.150E-12
THYROID	4.510E-15	2.233E-12	8.861E-12	8.930E-17	1.000E+00	2.040E-12	1.190E-12
REMAINDER	4.190E-15	2.140E-12	8.494E-12	8.560E-17	1.000E+00	1.400E-09	4.720E-09
EFFECTIVE	4.540E-15	2.290E-12	9.090E-12	9.160E-17	1.000E+00	7.840E-10	1.430E-09
SKIN(FGR)	5.850E-14	2.333E-10	9.258E-10	9.330E-15	1.000E+00	0.000E+00	0.000E+00
Ir-194m							
GONADS	1.100E-13	6.936E-11	1.437E-09	2.410E-15	1.000E+00	2.040E-09	2.830E-09
BREAST	1.250E-13	6.677E-11	1.383E-09	2.320E-15	1.000E+00	4.770E-09	4.580E-10
LUNGS	1.090E-13	6.332E-11	1.312E-09	2.200E-15	1.000E+00	1.130E-07	2.310E-10
RED MARR	1.050E-13	6.389E-11	1.324E-09	2.220E-15	1.000E+00	4.820E-09	7.160E-10
BONE SUR	1.970E-13	9.872E-11	2.045E-09	3.430E-15	1.000E+00	3.700E-09	3.270E-10
THYROID	1.120E-13	6.591E-11	1.366E-09	2.290E-15	1.000E+00	4.040E-09	1.260E-10
REMAINDER	1.040E-13	6.188E-11	1.282E-09	2.150E-15	1.000E+00	9.680E-09	5.180E-09
EFFECTIVE	1.120E-13	6.620E-11	1.371E-09	2.300E-15	1.000E+00	1.850E-08	2.460E-09
SKIN(FGR)	1.340E-13	8.490E-11	1.759E-09	2.950E-15	1.000E+00	0.000E+00	0.000E+00
Ir-195							
GONADS	2.320E-15	6.480E-13	7.271E-13	5.600E-17	1.000E+00	5.020E-13	4.960E-12
BREAST	2.750E-15	6.468E-13	7.258E-13	5.590E-17	1.000E+00	3.170E-13	7.760E-13
LUNGS	2.060E-15	5.809E-13	6.518E-13	5.020E-17	1.000E+00	2.400E-10	2.990E-13
RED MARR	1.700E-15	5.091E-13	5.713E-13	4.400E-17	1.000E+00	6.180E-13	2.270E-12
BONE SUR	7.630E-15	2.141E-12	2.402E-12	1.850E-16	1.000E+00	4.050E-13	7.350E-13
THYROID	2.230E-15	5.820E-13	6.531E-13	5.030E-17	1.000E+00	1.450E-13	4.600E-14
REMAINDER	1.920E-15	5.577E-13	6.258E-13	4.820E-17	1.000E+00	2.800E-11	3.030E-10
EFFECTIVE	2.320E-15	6.387E-13	7.167E-13	5.520E-17	1.000E+00	3.750E-11	9.250E-11
SKIN(FGR)	2.190E-14	2.823E-11	3.168E-11	2.440E-15	1.000E+00	0.000E+00	0.000E+00
Ir-195m							
GONADS	1.900E-14	6.438E-12	8.388E-12	4.250E-16	1.000E+00	6.160E-12	4.700E-11
BREAST	2.180E-14	6.257E-12	8.151E-12	4.130E-16	1.000E+00	2.820E-12	7.110E-12
LUNGS	1.840E-14	5.832E-12	7.598E-12	3.850E-16	1.000E+00	3.660E-10	2.420E-12
RED MARR	1.720E-14	5.742E-12	7.480E-12	3.790E-16	1.000E+00	4.050E-12	1.400E-11
BONE SUR	4.050E-14	1.166E-11	1.520E-11	7.700E-16	1.000E+00	2.420E-12	4.630E-12
THYROID	1.910E-14	5.999E-12	7.815E-12	3.960E-16	1.000E+00	1.500E-12	2.940E-13
REMAINDER	1.750E-14	5.666E-12	7.381E-12	3.740E-16	1.000E+00	6.980E-11	5.380E-10
EFFECTIVE	1.930E-14	6.166E-12	8.033E-12	4.070E-16	1.000E+00	6.740E-11	1.760E-10
SKIN(FGR)	3.530E-14	2.166E-11	2.822E-11	1.430E-15	1.000E+00	0.000E+00	0.000E+00
K-38							

GONADS	1.590E-13	2.003E-12	2.003E-12	3.030E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.790E-13	1.910E-12	1.910E-12	2.890E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.610E-13	1.864E-12	1.864E-12	2.820E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.600E-13	1.910E-12	1.910E-12	2.890E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.350E-13	2.584E-12	2.584E-12	3.910E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.640E-13	1.798E-12	1.798E-12	2.720E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.560E-13	1.864E-12	1.864E-12	2.820E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.640E-13	1.930E-12	1.930E-12	2.920E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.660E-13	1.091E-11	1.091E-11	1.650E-14	-1.000E+00	0.000E+00	0.000E+00
K-40							
GONADS	7.810E-15	4.378E-12	9.193E-11	1.520E-16	-1.000E+00	3.190E-09	5.070E-09
BREAST	8.840E-15	4.176E-12	8.770E-11	1.450E-16	-1.000E+00	3.080E-09	4.890E-09
LUNGS	7.910E-15	4.061E-12	8.528E-11	1.410E-16	-1.000E+00	4.660E-09	4.850E-09
RED MARR	7.860E-15	4.176E-12	8.770E-11	1.450E-16	-1.000E+00	3.100E-09	4.910E-09
BONE SUR	1.110E-14	5.558E-12	1.167E-10	1.930E-16	-1.000E+00	3.070E-09	4.880E-09
THYROID	8.070E-15	3.917E-12	8.225E-11	1.360E-16	-1.000E+00	3.060E-09	4.850E-09
REMAINDER	7.660E-15	4.061E-12	8.528E-11	1.410E-16	-1.000E+00	3.210E-09	5.180E-09
EFFECTIVE	8.050E-15	4.205E-12	8.830E-11	1.460E-16	-1.000E+00	3.340E-09	5.020E-09
SKIN(FGR)	4.200E-14	1.800E-10	3.780E-09	6.250E-15	-1.000E+00	0.000E+00	0.000E-00
K-42							
GONADS	1.420E-14	6.405E-12	1.772E-11	2.760E-16	-1.000E+00	1.080E-10	2.130E-10
BREAST	1.600E-14	6.126E-12	1.695E-11	2.640E-16	-1.000E+00	1.060E-10	2.080E-10
LUNGS	1.440E-14	5.964E-12	1.650E-11	2.570E-16	-1.000E+00	2.150E-09	2.070E-10
RED MARR	1.430E-14	6.126E-12	1.695E-11	2.640E-16	-1.000E+00	1.060E-10	2.080E-10
BONE SUR	2.030E-14	8.238E-12	2.279E-11	3.550E-16	-1.000E+00	1.060E-10	2.070E-10
THYROID	1.460E-14	5.732E-12	1.585E-11	2.470E-16	-1.000E+00	1.050E-10	2.060E-10
REMAINDER	1.390E-14	5.964E-12	1.650E-11	2.570E-16	-1.000E+00	1.570E-10	5.300E-10
EFFECTIVE	1.460E-14	6.173E-12	1.707E-11	2.660E-16	-1.000E+00	3.670E-10	3.060E-10
SKIN(FGR)	1.150E-13	3.272E-10	9.051E-10	1.410E-14	-1.000E+00	0.000E+00	0.000E+00
K-43							
GONADS	4.570E-14	2.554E-11	1.167E-10	1.000E-15	-1.000E+00	9.690E-11	1.800E-10
BREAST	5.220E-14	2.459E-11	1.124E-10	9.630E-16	-1.000E+00	9.600E-11	1.650E-10
LUNGS	4.530E-14	2.334E-11	1.067E-10	9.140E-16	-1.000E+00	7.580E-10	1.700E-10
RED MARR	4.360E-14	2.362E-11	1.079E-10	9.250E-16	-1.000E+00	1.030E-10	1.780E-10
BONE SUR	8.130E-14	3.601E-11	1.645E-10	1.410E-15	-1.000E+00	9.650E-11	1.680E-10
THYROID	4.650E-14	2.429E-11	1.110E-10	9.510E-16	-1.000E+00	9.450E-11	1.620E-10
REMAINDER	4.320E-14	2.283E-11	1.043E-10	8.940E-16	-1.000E+00	1.310E-10	2.890E-10
EFFECTIVE	4.670E-14	2.439E-11	1.114E-10	9.550E-16	-1.000E+00	1.870E-10	2.080E-10
SKIN(FGR)	7.110E-14	7.355E-11	3.361E-10	2.880E-15	-1.000E+00	0.000E+00	0.000E+00
K-44							
GONADS	1.160E-13	4.042E-12	4.042E-12	2.110E-15	-1.000E+00	2.080E-12	5.190E-12
BREAST	1.300E-13	3.850E-12	3.850E-12	2.010E-15	-1.000E+00	2.570E-12	5.170E-12
LUNGS	1.170E-13	3.774E-12	3.774E-12	1.970E-15	-1.000E+00	1.360E-10	5.550E-12
RED MARR	1.170E-13	3.889E-12	3.889E-12	2.030E-15	-1.000E+00	2.520E-12	4.690E-12
BONE SUR	1.610E-13	5.076E-12	5.076E-12	2.650E-15	-1.000E+00	2.280E-12	4.080E-12
THYROID	1.200E-13	3.640E-12	3.640E-12	1.900E-15	-1.000E+00	2.380E-12	3.650E-12
REMAINDER	1.140E-13	3.774E-12	3.774E-12	1.970E-15	-1.000E+00	1.590E-11	1.440E-10
EFFECTIVE	1.190E-13	3.908E-12	3.908E-12	2.040E-15	-1.000E+00	2.240E-11	4.670E-11
SKIN(FGR)	2.350E-13	2.893E-11	2.893E-11	1.510E-14	-1.000E+00	0.000E+00	0.000E+00
K-45							
GONADS	9.370E-14	3.030E-12	3.030E-12	1.750E-15	-1.000E+00	1.350E-12	3.330E-12
BREAST	1.060E-13	2.891E-12	2.891E-12	1.670E-15	-1.000E+00	1.720E-12	3.480E-12
LUNGS	9.510E-14	2.839E-12	2.839E-12	1.640E-15	-1.000E+00	8.350E-11	3.770E-12
RED MARR	9.450E-14	2.908E-12	2.908E-12	1.680E-15	-1.000E+00	1.710E-12	3.130E-12
BONE SUR	1.370E-13	3.965E-12	3.965E-12	2.290E-15	-1.000E+00	1.510E-12	2.650E-12
THYROID	9.680E-14	2.683E-12	2.683E-12	1.550E-15	-1.000E+00	1.440E-12	2.160E-12
REMAINDER	9.230E-14	2.839E-12	2.839E-12	1.640E-15	-1.000E+00	1.010E-11	9.260E-11
EFFECTIVE	9.670E-14	2.926E-12	2.926E-12	1.690E-15	-1.000E+00	1.390E-11	3.010E-11
SKIN(FGR)	1.740E-13	2.251E-11	2.251E-11	1.300E-14	-1.000E+00	0.000E+00	0.000E+00
Kr-74							
GONADS	5.460E-14	1.205E-12	1.205E-12	1.210E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	6.260E-14	1.155E-12	1.155E-12	1.160E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.390E-14	1.095E-12	1.095E-12	1.100E-15	-1.000E+00	0.000E+00	0.000E+00

RED MARR	5.150E-14	1.095E-12	1.095E-12	1.100E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.040E-13	1.822E-12	1.822E-12	1.830E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	5.550E-14	1.135E-12	1.135E-12	1.140E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.140E-14	1.065E-12	1.065E-12	1.070E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	5.590E-14	1.145E-12	1.145E-12	1.150E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.160E-13	1.065E-11	1.065E-11	1.070E-14	-1.000E+00	0.000E+00	0.000E+00
Kr-76							
GONADS	1.990E-14	1.057E-11	3.381E-11	4.400E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	2.280E-14	1.028E-11	3.289E-11	4.280E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.950E-14	9.560E-12	3.058E-11	3.980E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.850E-14	9.584E-12	3.066E-11	3.990E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	4.040E-14	1.681E-11	5.379E-11	7.000E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	2.010E-14	9.848E-12	3.150E-11	4.100E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.850E-14	9.320E-12	2.981E-11	3.880E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.030E-14	1.009E-11	3.227E-11	4.200E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.370E-14	1.321E-11	4.226E-11	5.500E-16	-1.000E+00	0.000E+00	0.000E+00
Kr-77							
GONADS	4.740E-14	6.647E-12	6.725E-12	1.040E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	5.440E-14	6.455E-12	6.531E-12	1.010E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.680E-14	6.091E-12	6.162E-12	9.530E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.460E-14	6.110E-12	6.182E-12	9.560E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.250E-14	1.035E-11	1.048E-11	1.620E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	4.820E-14	6.327E-12	6.401E-12	9.900E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.460E-14	5.944E-12	6.014E-12	9.300E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.860E-14	6.385E-12	6.460E-12	9.990E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	9.740E-14	5.611E-11	5.677E-11	8.780E-15	-1.000E+00	0.000E+00	0.000E+00
Kr-79							
GONADS	1.180E-14	6.926E-12	4.561E-11	2.600E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.350E-14	6.686E-12	4.403E-11	2.510E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.170E-14	6.286E-12	4.140E-11	2.360E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.120E-14	6.340E-12	4.175E-11	2.380E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.180E-14	9.989E-12	6.579E-11	3.750E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.200E-14	6.499E-12	4.280E-11	2.440E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.120E-14	6.126E-12	4.035E-11	2.300E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.210E-14	6.579E-12	4.333E-11	2.470E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.500E-14	9.589E-12	6.315E-11	3.600E-16	-1.000E+00	0.000E+00	0.000E+00
Kr-81							
GONADS	2.620E-16	1.958E-13	4.113E-12	6.800E-18	-1.000E+00	0.000E+00	0.000E+00
BREAST	3.060E-16	2.223E-13	4.669E-12	7.720E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.530E-16	1.477E-13	3.103E-12	5.130E-18	-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.390E-16	1.512E-13	3.175E-12	5.250E-18	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.660E-16	2.820E-13	5.921E-12	9.790E-18	-1.000E+00	0.000E+00	0.000E+00
THYROID	2.620E-16	1.538E-13	3.230E-12	5.340E-18	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.410E-16	1.529E-13	3.211E-12	5.310E-18	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.670E-16	1.771E-13	3.720E-12	6.150E-18	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.040E-16	1.264E-12	2.655E-11	4.390E-17	-1.000E+00	0.000E+00	0.000E+00
Kr-81m							
GONADS	6.010E-15	2.419E-15	2.419E-15	1.290E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	6.890E-15	2.363E-15	2.363E-15	1.260E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.780E-15	2.194E-15	2.194E-15	1.170E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	5.320E-15	2.176E-15	2.176E-15	1.160E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.500E-14	4.632E-15	4.632E-15	2.470E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	6.030E-15	2.194E-15	2.194E-15	1.170E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.460E-15	2.157E-15	2.157E-15	1.150E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	6.140E-15	2.326E-15	2.326E-15	1.240E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	9.420E-15	3.001E-15	3.001E-15	1.600E-16	-1.000E+00	0.000E+00	0.000E+00
Kr-83m							
GONADS	1.710E-18	5.572E-15	5.855E-15	6.160E-19	-1.000E+00	0.000E+00	0.000E+00
BREAST	5.050E-18	9.498E-15	9.980E-15	1.050E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.640E-19	1.266E-16	1.331E-16	1.400E-20	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.830E-19	5.617E-16	5.902E-16	6.210E-20	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.250E-18	3.437E-15	3.612E-15	3.800E-19	-1.000E+00	0.000E+00	0.000E+00
THYROID	6.430E-19	7.698E-16	8.088E-16	8.510E-20	-1.000E+00	0.000E+00	0.000E+00

REMAINDER	5.300E-19	1.393E-15	1.464E-15	1.540E-19	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.500E-18	3.437E-15	3.612E-15	3.800E-19	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.560E-17	1.167E-13	1.226E-13	1.290E-17	-1.000E+00	0.000E+00	0.000E+00
Kr-85							
GONADS	1.170E-16	8.121E-14	1.704E-12	2.820E-18	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.340E-16	7.891E-14	1.656E-12	2.740E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.140E-16	7.056E-14	1.481E-12	2.450E-18	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.090E-16	6.998E-14	1.469E-12	2.430E-18	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.200E-16	1.287E-13	2.702E-12	4.470E-18	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.180E-16	7.459E-14	1.565E-12	2.590E-18	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.090E-16	6.941E-14	1.457E-12	2.410E-18	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.190E-16	7.603E-14	1.596E-12	2.640E-18	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.320E-14	2.304E-11	4.835E-10	8.000E-16	-1.000E+00	0.000E+00	0.000E+00
Kr-85m							
GONADS	7.310E-15	2.594E-12	3.653E-12	1.570E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	8.410E-15	2.527E-12	3.560E-12	1.530E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	7.040E-15	2.379E-12	3.351E-12	1.440E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	6.430E-15	2.346E-12	3.304E-12	1.420E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.880E-14	5.286E-12	7.446E-12	3.200E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	7.330E-15	2.395E-12	3.374E-12	1.450E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	6.640E-15	2.313E-12	3.257E-12	1.400E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	7.480E-15	2.511E-12	3.537E-12	1.520E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.240E-14	2.247E-11	3.164E-11	1.360E-15	-1.000E+00	0.000E+00	0.000E+00
Kr-87							
GONADS	4.000E-14	4.962E-12	5.026E-12	7.610E-16	-1.000E+00	0.000E+00	0.000E-00
BREAST	4.500E-14	4.740E-12	4.802E-12	7.270E-16	-1.000E+00	0.000E+00	0.000E-00
LUNGS	4.040E-14	4.603E-12	4.663E-12	7.060E-16	-1.000E+00	0.000E+00	0.000E-00
RED MARR	4.000E-14	4.708E-12	4.769E-12	7.220E-16	-1.000E+00	0.000E+00	0.000E-00
BONE SUR	6.020E-14	6.514E-12	6.598E-12	9.990E-16	-1.000E+00	0.000E+00	0.000E-00
THYROID	4.130E-14	4.473E-12	4.531E-12	6.860E-16	-1.000E+00	0.000E+00	0.000E-00
REMAINDER	3.910E-14	4.590E-12	4.650E-12	7.040E-16	-1.000E+00	0.000E+00	0.000E-00
EFFECTIVE	4.120E-14	4.773E-12	4.835E-12	7.320E-16	-1.000E+00	0.000E+00	0.000E-00
SKIN(FGR)	1.370E-13	8.802E-11	8.916E-11	1.350E-14	-1.000E+00	0.000E+00	0.000E-00
Kr-88							
GONADS	9.900E-14	2.278E-11	2.655E-11	1.800E-15	-1.000E+00	0.000E+00	0.000E-00
BREAST	1.110E-13	2.177E-11	2.537E-11	1.720E-15	-1.000E+00	0.000E+00	0.000E-00
LUNGS	1.010E-13	2.139E-11	2.493E-11	1.690E-15	-1.000E+00	0.000E+00	0.000E-00
RED MARR	1.000E-13	2.190E-11	2.552E-11	1.730E-15	-1.000E+00	0.000E+00	0.000E-00
BONE SUR	1.390E-13	2.886E-11	3.363E-11	2.280E-15	-1.000E+00	0.000E+00	0.000E-00
THYROID	1.030E-13	2.012E-11	2.345E-11	1.590E-15	-1.000E+00	0.000E+00	0.000E-00
REMAINDER	9.790E-14	2.139E-11	2.493E-11	1.690E-15	-1.000E+00	0.000E+00	0.000E-00
EFFECTIVE	1.020E-13	2.202E-11	2.567E-11	1.740E-15	-1.000E+00	0.000E+00	0.000E-00
SKIN(FGR)	1.350E-13	5.607E-11	6.534E-11	4.430E-15	-1.000E+00	0.000E+00	0.000E-00
La-131							
GONADS	3.080E-14	3.567E-12	3.580E-12	7.010E-16	-1.000E+00	1.700E-12	1.390E-11
BREAST	3.540E-14	3.450E-12	3.463E-12	6.780E-16	-1.000E+00	1.620E-12	3.050E-12
LUNGS	3.020E-14	3.170E-12	3.182E-12	6.230E-16	-1.000E+00	6.810E-11	1.810E-12
RED MARR	2.890E-14	3.165E-12	3.177E-12	6.220E-16	-1.000E+00	2.100E-12	4.430E-12
BONE SUR	5.810E-14	5.445E-12	5.465E-12	1.070E-15	-1.000E+00	2.720E-12	1.630E-12
THYROID	3.120E-14	3.318E-12	3.330E-12	6.520E-16	-1.000E+00	1.140E-12	1.550E-13
REMAINDER	2.880E-14	3.109E-12	3.120E-12	6.110E-16	-1.000E+00	6.430E-12	9.150E-11
EFFECTIVE	3.140E-14	3.364E-12	3.376E-12	6.610E-16	-1.000E+00	1.110E-11	3.220E-11
SKIN(FGR)	4.870E-14	1.506E-11	1.512E-11	2.960E-15	-1.000E+00	0.000E+00	0.000E+00
La-132							
GONADS	9.750E-14	3.398E-11	4.961E-11	1.990E-15	-1.000E+00	3.330E-11	2.400E-10
BREAST	1.110E-13	3.262E-11	4.762E-11	1.910E-15	-1.000E+00	1.710E-11	3.770E-11
LUNGS	9.780E-14	3.125E-11	4.562E-11	1.830E-15	-1.000E+00	6.520E-10	1.300E-11
RED MARR	9.590E-14	3.176E-11	4.637E-11	1.860E-15	-1.000E+00	2.130E-11	5.560E-11
BONE SUR	1.540E-13	4.560E-11	6.656E-11	2.670E-15	-1.000E+00	1.510E-11	1.930E-11
THYROID	1.000E-13	3.142E-11	4.587E-11	1.840E-15	-1.000E+00	1.110E-11	1.670E-12
REMAINDER	9.410E-14	3.091E-11	4.512E-11	1.810E-15	-1.000E+00	1.560E-10	1.190E-09
EFFECTIVE	1.000E-13	3.245E-11	4.737E-11	1.900E-15	-1.000E+00	1.390E-10	4.300E-10
SKIN(FGR)	1.490E-13	1.286E-10	1.877E-10	7.530E-15	-1.000E+00	0.000E+00	0.000E+00

La-134							
GONADS	3.270E-14	4.221E-13	4.221E-13	7.310E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	3.740E-14	4.059E-13	4.059E-13	7.030E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.240E-14	3.811E-13	3.811E-13	6.600E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.130E-14	3.839E-13	3.839E-13	6.650E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.720E-14	5.947E-13	5.947E-13	1.030E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	3.330E-14	3.978E-13	3.978E-13	6.890E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.100E-14	3.736E-13	3.736E-13	6.470E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.350E-14	4.001E-13	4.001E-13	6.930E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.880E-14	5.173E-12	5.173E-12	8.960E-15	-1.000E+00	0.000E+00	0.000E+00
La-135							
GONADS	1.020E-15	1.171E-12	4.718E-12	4.670E-17	-1.000E+00	8.720E-12	3.380E-11
BREAST	1.280E-15	1.226E-12	4.940E-12	4.890E-17	-1.000E+00	2.000E-12	2.710E-12
LUNGS	7.330E-16	6.568E-13	2.647E-12	2.620E-17	-1.000E+00	4.750E-11	2.730E-13
RED MARR	6.520E-16	5.389E-13	2.172E-12	2.150E-17	-1.000E+00	4.660E-12	9.960E-12
BONE SUR	2.110E-15	2.532E-12	1.020E-11	1.010E-16	-1.000E+00	4.710E-12	2.680E-12
THYROID	9.280E-16	8.573E-13	3.455E-12	3.420E-17	-1.000E+00	4.370E-13	1.790E-14
REMAINDER	7.220E-16	6.944E-13	2.798E-12	2.770E-17	-1.000E+00	2.370E-11	8.810E-11
EFFECTIVE	9.210E-16	9.300E-13	3.748E-12	3.710E-17	-1.000E+00	1.600E-11	3.660E-11
SKIN(FGR)	1.490E-15	1.727E-12	6.960E-12	6.890E-17	-1.000E+00	0.000E+00	0.000E+00
La-137							
GONADS	5.100E-16	9.878E-13	2.074E-11	3.430E-17	-1.000E+00	9.060E-10	7.820E-11
BREAST	6.930E-16	1.060E-12	2.226E-11	3.680E-17	-1.000E+00	1.380E-09	1.550E-11
LUNGS	2.400E-16	4.522E-13	9.495E-12	1.570E-17	-1.000E+00	4.690E-09	2.250E-11
RED MARR	1.790E-16	3.197E-13	6.713E-12	1.110E-17	-1.000E+00	5.910E-09	7.050E-11
BONE SUR	1.200E-15	2.353E-12	4.941E-11	8.170E-17	-1.000E+00	2.530E-08	2.150E-10
THYROID	4.130E-16	6.595E-13	1.385E-11	2.290E-17	-1.000E+00	6.340E-10	5.230E-12
REMAINDER	2.520E-16	5.011E-13	1.052E-11	1.740E-17	-1.000E+00	1.260E-08	2.760E-10
EFFECTIVE	4.060E-16	7.402E-13	1.554E-11	2.570E-17	-1.000E+00	6.270E-09	1.230E-10
SKIN(FGR)	8.680E-16	1.538E-12	3.230E-11	5.340E-17	-1.000E+00	0.000E+00	0.000E+00
La-138							
GONADS	6.040E-14	3.485E-11	7.318E-10	1.210E-15	-1.000E+00	3.850E-08	1.500E-09
BREAST	6.850E-14	3.341E-11	7.016E-10	1.160E-15	-1.000E+00	4.040E-08	4.790E-10
LUNGS	6.080E-14	3.197E-11	6.713E-10	1.110E-15	-1.000E+00	7.970E-08	5.610E-10
RED MARR	6.020E-14	3.283E-11	6.895E-10	1.140E-15	-1.000E+00	6.190E-08	7.530E-10
BONE SUR	8.780E-14	4.493E-11	9.435E-10	1.560E-15	-1.000E+00	1.590E-07	1.390E-09
THYROID	6.220E-14	3.168E-11	6.653E-10	1.100E-15	-1.000E+00	2.180E-08	1.800E-10
REMAINDER	5.880E-14	3.197E-11	6.713E-10	1.110E-15	-1.000E+00	1.940E-07	3.140E-09
EFFECTIVE	6.200E-14	3.341E-11	7.016E-10	1.160E-15	-1.000E+00	9.630E-08	1.590E-09
SKIN(FGR)	7.090E-14	4.003E-11	8.407E-10	1.390E-15	-1.000E+00	0.000E+00	0.000E+00
La-140							
GONADS	1.140E-13	6.027E-11	4.425E-10	2.240E-15	-1.000E+00	4.540E-10	1.340E-09
BREAST	1.290E-13	5.758E-11	4.228E-10	2.140E-15	-1.000E+00	1.450E-10	1.800E-10
LUNGS	1.150E-13	5.596E-11	4.109E-10	2.080E-15	-1.000E+00	4.210E-09	4.010E-11
RED MARR	1.140E-13	5.731E-11	4.208E-10	2.130E-15	-1.000E+00	2.140E-10	2.810E-10
BONE SUR	1.690E-13	7.776E-11	5.709E-10	2.890E-15	-1.000E+00	1.410E-10	9.770E-11
THYROID	1.180E-13	5.462E-11	4.010E-10	2.030E-15	-1.000E+00	6.870E-11	6.400E-12
REMAINDER	1.110E-13	5.569E-11	4.089E-10	2.070E-15	-1.000E+00	2.120E-09	6.260E-09
EFFECTIVE	1.170E-13	5.812E-11	4.267E-10	2.160E-15	-1.000E+00	1.310E-09	2.280E-09
SKIN(FGR)	1.660E-13	2.217E-10	1.628E-09	8.240E-15	-1.000E+00	0.000E+00	0.000E+00
La-141							
GONADS	2.330E-15	7.315E-13	9.675E-13	4.740E-17	-1.000E+00	2.890E-12	3.770E-12
BREAST	2.640E-15	7.007E-13	9.267E-13	4.540E-17	-1.000E+00	2.680E-12	7.070E-13
LUNGS	2.340E-15	6.713E-13	8.879E-13	4.350E-17	-1.000E+00	8.880E-10	2.720E-13
RED MARR	2.310E-15	6.852E-13	9.063E-13	4.440E-17	-1.000E+00	7.060E-12	1.070E-12
BONE SUR	3.490E-15	9.923E-13	1.312E-12	6.430E-17	-1.000E+00	2.360E-11	6.060E-13
THYROID	2.390E-15	6.590E-13	8.716E-13	4.270E-17	-1.000E+00	2.450E-12	5.290E-14
REMAINDER	2.260E-15	6.682E-13	8.838E-13	4.330E-17	-1.000E+00	1.430E-10	1.240E-09
EFFECTIVE	2.390E-15	7.007E-13	9.267E-13	4.540E-17	-1.000E+00	1.520E-10	3.740E-10
SKIN(FGR)	6.580E-14	1.667E-10	2.204E-10	1.080E-14	-1.000E+00	0.000E+00	0.000E+00
La-142							
GONADS	1.400E-13	1.978E-11	2.034E-11	2.540E-15	-1.000E+00	5.910E-12	6.990E-11
BREAST	1.570E-13	1.885E-11	1.938E-11	2.420E-15	-1.000E+00	6.280E-12	1.540E-11

LUNGS	1.420E-13	1.846E-11	1.898E-11	2.370E-15-1.000E+00	3.500E-10	8.400E-12
RED MARR	1.420E-13	1.900E-11	1.954E-11	2.440E-15-1.000E+00	6.830E-12	1.930E-11
BONE SUR	1.950E-13	2.484E-11	2.554E-11	3.190E-15-1.000E+00	5.390E-12	7.400E-12
THYROID	1.450E-13	1.768E-11	1.818E-11	2.270E-15-1.000E+00	4.910E-12	1.160E-12
REMAINDER	1.380E-13	1.853E-11	1.906E-11	2.380E-15-1.000E+00	3.140E-11	5.200E-10
EFFECTIVE	1.440E-13	1.916E-11	1.970E-11	2.460E-15-1.000E+00	5.500E-11	1.790E-10
SKIN(FGR)	2.160E-13	9.111E-11	9.368E-11	1.170E-14-1.000E+00	0.000E+00	0.000E+00
La-143						
GONADS	5.040E-15	1.244E-13	1.244E-13	1.010E-16-1.000E+00	6.530E-13	1.700E-12
BREAST	5.700E-15	1.195E-13	1.195E-13	9.700E-17-1.000E+00	3.200E-13	2.490E-13
LUNGS	5.070E-15	1.148E-13	1.148E-13	9.320E-17-1.000E+00	1.060E-10	1.070E-13
RED MARR	5.010E-15	1.173E-13	1.173E-13	9.520E-17-1.000E+00	7.300E-13	4.440E-13
BONE SUR	7.590E-15	1.675E-13	1.675E-13	1.360E-16-1.000E+00	7.290E-13	1.560E-13
THYROID	5.190E-15	1.130E-13	1.130E-13	9.170E-17-1.000E+00	2.440E-13	1.260E-14
REMAINDER	4.900E-15	1.143E-13	1.143E-13	9.280E-17-1.000E+00	1.050E-11	1.240E-10
EFFECTIVE	5.180E-15	1.196E-13	1.196E-13	9.710E-17-1.000E+00	1.620E-11	3.770E-11
SKIN(FGR)	9.640E-14	1.651E-11	1.651E-11	1.340E-14-1.000E+00	0.000E+00	0.000E+00
Lu-169						
GONADS	4.980E-14	2.738E-11	1.762E-10	1.030E-15-1.000E+00	2.280E-10	6.270E-10
BREAST	5.670E-14	2.621E-11	1.687E-10	9.860E-16-1.000E+00	6.300E-11	8.060E-11
LUNGS	4.940E-14	2.504E-11	1.612E-10	9.420E-16-1.000E+00	1.230E-09	1.660E-11
RED MARR	4.820E-14	2.522E-11	1.624E-10	9.490E-16-1.000E+00	9.860E-11	1.530E-10
BONE SUR	8.120E-14	4.120E-11	2.652E-10	1.550E-15-1.000E+00	7.700E-11	5.190E-11
THYROID	5.090E-14	2.501E-11	1.610E-10	9.410E-16-1.000E+00	2.690E-11	2.350E-12
REMAINDER	4.750E-14	2.474E-11	1.593E-10	9.310E-16-1.000E+00	4.480E-10	1.190E-09
EFFECTIVE	5.090E-14	2.621E-11	1.687E-10	9.860E-16-1.000E+00	3.640E-10	5.490E-10
SKIN(FGR)	5.900E-14	3.455E-11	2.224E-10	1.300E-15-1.000E+00	0.000E+00	0.000E+00
Lu-170						
GONADS	1.240E-13	6.310E-11	5.272E-10	2.320E-15-1.000E+00	5.900E-10	1.520E-09
BREAST	1.400E-13	6.038E-11	5.045E-10	2.220E-15-1.000E+00	1.530E-10	1.980E-10
LUNGS	1.260E-13	5.875E-11	4.909E-10	2.160E-15-1.000E+00	1.580E-09	4.500E-11
RED MARR	1.250E-13	6.011E-11	5.023E-10	2.210E-15-1.000E+00	2.040E-10	3.260E-10
BONE SUR	1.780E-13	8.323E-11	6.954E-10	3.060E-15-1.000E+00	1.150E-10	1.120E-10
THYROID	1.290E-13	5.657E-11	4.727E-10	2.080E-15-1.000E+00	6.670E-11	7.410E-12
REMAINDER	1.220E-13	5.875E-11	4.909E-10	2.160E-15-1.000E+00	1.020E-09	2.590E-09
EFFECTIVE	1.280E-13	6.093E-11	5.091E-10	2.240E-15-1.000E+00	6.960E-10	1.230E-09
SKIN(FGR)	1.460E-13	8.377E-11	7.000E-10	3.080E-15-1.000E+00	0.000E+00	0.000E+00
Lu-171						
GONADS	3.200E-14	2.033E-11	3.271E-10	7.160E-16-1.000E+00	3.410E-10	7.360E-10
BREAST	3.670E-14	1.957E-11	3.147E-10	6.890E-16-1.000E+00	1.280E-10	8.510E-11
LUNGS	3.130E-14	1.829E-11	2.942E-10	6.440E-16-1.000E+00	3.350E-09	1.360E-11
RED MARR	3.010E-14	1.818E-11	2.923E-10	6.400E-16-1.000E+00	1.880E-10	1.800E-10
BONE SUR	5.640E-14	3.266E-11	5.253E-10	1.150E-15-1.000E+00	1.760E-10	6.230E-11
THYROID	3.250E-14	1.906E-11	3.065E-10	6.710E-16-1.000E+00	7.850E-11	1.780E-12
REMAINDER	2.990E-14	1.789E-11	2.878E-10	6.300E-16-1.000E+00	9.020E-10	1.880E-09
EFFECTIVE	3.250E-14	1.931E-11	3.106E-10	6.800E-16-1.000E+00	8.070E-10	7.850E-10
SKIN(FGR)	3.800E-14	2.428E-11	3.906E-10	8.550E-16-1.000E+00	0.000E+00	0.000E+00
Lu-172						
GONADS	9.060E-14	5.350E-11	8.133E-10	1.890E-15-1.000E+00	7.930E-10	1.730E-09
BREAST	1.030E-13	5.124E-11	7.789E-10	1.810E-15-1.000E+00	2.810E-10	2.130E-10
LUNGS	9.010E-14	4.897E-11	7.445E-10	1.730E-15-1.000E+00	4.700E-09	3.950E-11
RED MARR	8.800E-14	4.982E-11	7.574E-10	1.760E-15-1.000E+00	3.670E-10	3.810E-10
BONE SUR	1.450E-13	7.530E-11	1.145E-09	2.660E-15-1.000E+00	2.780E-10	1.310E-10
THYROID	9.280E-14	4.982E-11	7.574E-10	1.760E-15-1.000E+00	1.760E-10	5.720E-12
REMAINDER	8.640E-14	4.841E-11	7.359E-10	1.710E-15-1.000E+00	1.620E-09	3.370E-09
EFFECTIVE	9.250E-14	5.124E-11	7.789E-10	1.810E-15-1.000E+00	1.350E-09	1.530E-09
SKIN(FGR)	1.070E-13	6.539E-11	9.941E-10	2.310E-15-1.000E+00	0.000E+00	0.000E+00
Lu-173						
GONADS	5.170E-15	3.858E-12	8.065E-11	1.340E-16-1.000E+00	1.820E-10	2.150E-10
BREAST	6.130E-15	3.830E-12	8.005E-11	1.330E-16-1.000E+00	7.190E-10	2.170E-11
LUNGS	4.550E-15	3.340E-12	6.982E-11	1.160E-16-1.000E+00	4.200E-08	2.830E-12
RED MARR	3.890E-15	2.908E-12	6.079E-11	1.010E-16-1.000E+00	1.970E-09	9.400E-11
BONE SUR	1.450E-14	1.114E-11	2.329E-10	3.870E-16-1.000E+00	7.410E-09	1.460E-10

THYROID	4.980E-15	3.398E-12	7.102E-11	1.180E-16-1.000E+00	3.560E-10	7.320E-13
REMAINDER	4.290E-15	3.196E-12	6.681E-11	1.110E-16-1.000E+00	1.440E-09	7.410E-10
EFFECTIVE	5.100E-15	3.686E-12	7.704E-11	1.280E-16-1.000E+00	6.090E-09	2.950E-10
SKIN(FGR)	6.450E-15	4.521E-12	9.449E-11	1.570E-16-1.000E+00	0.000E+00	0.000E+00
Lu-174						
GONADS	5.450E-15	3.628E-12	7.605E-11	1.260E-16-1.000E+00	2.750E-10	1.680E-10
BREAST	6.330E-15	3.542E-12	7.424E-11	1.230E-16-1.000E+00	1.040E-09	1.970E-11
LUNGS	5.110E-15	3.225E-12	6.760E-11	1.120E-16-1.000E+00	7.130E-08	4.020E-12
RED MARR	4.740E-15	2.995E-12	6.277E-11	1.040E-16-1.000E+00	4.030E-09	8.720E-11
BONE SUR	1.120E-14	8.236E-12	1.726E-10	2.860E-16-1.000E+00	2.620E-08	3.080E-10
THYROID	5.420E-15	3.225E-12	6.760E-11	1.120E-16-1.000E+00	6.510E-10	1.400E-12
REMAINDER	4.880E-15	3.110E-12	6.519E-11	1.080E-16-1.000E+00	1.980E-09	7.850E-10
EFFECTIVE	5.460E-15	3.456E-12	7.243E-11	1.200E-16-1.000E+00	1.070E-08	3.010E-10
SKIN(FGR)	6.530E-15	4.176E-12	8.752E-11	1.450E-16-1.000E+00	0.000E+00	0.000E+00
Lu-174m						
GONADS	2.260E-15	1.830E-12	3.782E-11	6.360E-17-1.000E+00	8.560E-11	1.110E-10
BREAST	2.720E-15	1.827E-12	3.776E-11	6.350E-17-1.000E+00	2.540E-10	1.070E-11
LUNGS	1.880E-15	1.537E-12	3.175E-11	5.340E-17-1.000E+00	5.110E-08	1.170E-12
RED MARR	1.520E-15	1.255E-12	2.592E-11	4.360E-17-1.000E+00	1.020E-09	5.910E-11
BONE SUR	6.880E-15	6.101E-12	1.261E-10	2.120E-16-1.000E+00	6.520E-09	1.640E-10
THYROID	2.120E-15	1.574E-12	3.252E-11	5.470E-17-1.000E+00	1.260E-10	2.410E-13
REMAINDER	1.770E-15	1.470E-12	3.038E-11	5.110E-17-1.000E+00	1.160E-09	1.780E-09
EFFECTIVE	2.180E-15	1.738E-12	3.591E-11	6.040E-17-1.000E+00	6.860E-09	5.770E-10
SKIN(FGR)	2.890E-15	2.219E-12	4.584E-11	7.710E-17-1.000E+00	0.000E+00	0.000E-00
Lu-176						
GONADS	2.270E-14	1.431E-11	3.006E-10	4.970E-16-1.000E+00	3.860E-09	6.800E-10
BREAST	2.600E-14	1.394E-11	2.927E-10	4.840E-16-1.000E+00	1.100E-08	9.140E-11
LUNGS	2.200E-14	1.305E-11	2.740E-10	4.530E-16-1.000E+00	9.990E-07	3.150E-11
RED MARR	2.050E-14	1.290E-11	2.710E-10	4.480E-16-1.000E+00	1.210E-07	8.310E-10
BONE SUR	5.180E-14	2.575E-11	5.407E-10	8.940E-16-1.000E+00	1.190E-06	7.230E-09
THYROID	2.280E-14	1.322E-11	2.776E-10	4.590E-16-1.000E+00	8.240E-09	2.130E-11
REMAINDER	2.080E-14	1.267E-11	2.661E-10	4.400E-16-1.000E+00	2.100E-08	4.910E-09
EFFECTIVE	2.320E-14	1.377E-11	2.891E-10	4.780E-16-1.000E+00	1.790E-07	1.980E-09
SKIN(FGR)	3.740E-14	2.059E-11	4.324E-10	7.150E-16-1.000E+00	0.000E+00	0.000E+00
Lu-176m						
GONADS	5.910E-16	2.246E-13	2.886E-13	1.510E-17-1.000E+00	2.430E-13	1.960E-12
BREAST	7.050E-16	2.232E-13	2.867E-13	1.500E-17-1.000E+00	1.070E-13	2.690E-13
LUNGS	5.190E-16	1.979E-13	2.542E-13	1.330E-17-1.000E+00	4.230E-10	7.580E-14
RED MARR	4.220E-16	1.696E-13	2.179E-13	1.140E-17-1.000E+00	4.610E-13	8.970E-13
BONE SUR	1.970E-15	7.454E-13	9.576E-13	5.010E-17-1.000E+00	5.990E-13	2.880E-13
THYROID	5.660E-16	1.994E-13	2.561E-13	1.340E-17-1.000E+00	3.710E-14	1.730E-15
REMAINDER	4.830E-16	1.889E-13	2.427E-13	1.270E-17-1.000E+00	7.060E-11	5.750E-10
EFFECTIVE	5.870E-16	2.187E-13	2.810E-13	1.470E-17-1.000E+00	7.210E-11	1.730E-10
SKIN(FGR)	2.720E-14	6.397E-11	8.219E-11	4.300E-15-1.000E+00	0.000E+00	0.000E+00
Lu-177						
GONADS	1.590E-15	9.908E-13	1.507E-11	3.500E-17-1.000E+00	1.930E-11	4.290E-11
BREAST	1.840E-15	9.682E-13	1.472E-11	3.420E-17-1.000E+00	5.790E-12	4.430E-12
LUNGS	1.510E-15	9.003E-13	1.369E-11	3.180E-17-1.000E+00	3.330E-09	5.500E-13
RED MARR	1.370E-15	8.691E-13	1.322E-11	3.070E-17-1.000E+00	1.820E-11	1.210E-11
BONE SUR	4.170E-15	2.183E-12	3.319E-11	7.710E-17-1.000E+00	1.030E-10	1.070E-11
THYROID	1.580E-15	9.059E-13	1.378E-11	3.200E-17-1.000E+00	2.470E-12	4.450E-14
REMAINDER	1.420E-15	8.748E-13	1.330E-11	3.090E-17-1.000E+00	8.420E-10	1.890E-09
EFFECTIVE	1.620E-15	9.597E-13	1.460E-11	3.390E-17-1.000E+00	6.630E-10	5.810E-10
SKIN(FGR)	7.130E-15	1.597E-12	2.428E-11	5.640E-17-1.000E+00	0.000E+00	0.000E+00
Lu-177m						
GONADS	4.590E-14	2.935E-11	6.077E-10	1.020E-15-1.000E+00	8.890E-10	1.350E-09
BREAST	5.280E-14	2.849E-11	5.898E-10	9.900E-16-1.000E+00	2.030E-09	1.430E-10
LUNGS	4.420E-14	2.659E-11	5.505E-10	9.240E-16-1.000E+00	1.410E-07	1.980E-11
RED MARR	4.100E-14	2.607E-11	5.398E-10	9.060E-16-1.000E+00	3.460E-09	3.680E-10
BONE SUR	1.060E-13	5.554E-11	1.150E-09	1.930E-15-1.000E+00	1.070E-08	4.300E-10
THYROID	4.600E-14	2.708E-11	5.606E-10	9.410E-16-1.000E+00	1.370E-09	3.560E-12
REMAINDER	4.180E-14	2.579E-11	5.338E-10	8.960E-16-1.000E+00	5.150E-09	5.230E-09
EFFECTIVE	4.670E-14	2.812E-11	5.821E-10	9.770E-16-1.000E+00	1.980E-08	1.990E-09

SKIN(FGR)	5.890E-14	3.338E-11	6.911E-10	1.160E-15	-1.000E+00	0.000E+00	0.000E+00
Lu-178							
GONADS	6.920E-15	3.417E-13	3.417E-13	1.390E-16	-1.000E+00	2.550E-14	7.330E-13
BREAST	7.850E-15	3.270E-13	3.270E-13	1.330E-16	-1.000E+00	8.080E-14	2.590E-13
LUNGS	6.920E-15	3.171E-13	3.171E-13	1.290E-16	-1.000E+00	9.880E-11	2.120E-13
RED MARR	6.780E-15	3.220E-13	3.220E-13	1.310E-16	-1.000E+00	9.210E-14	2.960E-13
BONE SUR	1.090E-14	4.966E-13	4.966E-13	2.020E-16	-1.000E+00	8.200E-14	1.270E-13
THYROID	7.100E-15	3.097E-13	3.098E-13	1.260E-16	-1.000E+00	5.920E-14	2.240E-14
REMAINDER	6.670E-15	3.147E-13	3.147E-13	1.280E-16	-1.000E+00	2.420E-12	1.100E-10
EFFECTIVE	7.090E-15	3.294E-13	3.294E-13	1.340E-16	-1.000E+00	1.260E-11	3.320E-11
SKIN(FGR)	5.680E-14	2.122E-11	2.122E-11	8.630E-15	-1.000E+00	0.000E+00	0.000E+00
Lu-178m							
GONADS	5.120E-14	2.220E-12	2.220E-12	1.130E-15	-1.000E+00	1.360E-13	4.880E-12
BREAST	5.880E-14	2.161E-12	2.161E-12	1.100E-15	-1.000E+00	5.650E-13	1.810E-12
LUNGS	4.980E-14	2.024E-12	2.024E-12	1.030E-15	-1.000E+00	6.620E-11	1.550E-12
RED MARR	4.670E-14	2.004E-12	2.004E-12	1.020E-15	-1.000E+00	6.560E-13	2.410E-12
BONE SUR	1.110E-13	3.871E-12	3.871E-12	1.970E-15	-1.000E+00	5.220E-13	1.000E-12
THYROID	5.160E-14	2.083E-12	2.083E-12	1.060E-15	-1.000E+00	3.960E-13	1.130E-13
REMAINDER	4.730E-14	1.965E-12	1.965E-12	1.000E-15	-1.000E+00	2.230E-12	8.530E-11
EFFECTIVE	5.230E-14	2.142E-12	2.142E-12	1.090E-15	-1.000E+00	8.840E-12	2.760E-11
SKIN(FGR)	9.060E-14	1.083E-11	1.083E-11	5.510E-15	-1.000E+00	0.000E+00	0.000E+00
Lu-179							
GONADS	1.490E-15	5.450E-13	7.772E-13	3.260E-17	-1.000E+00	6.370E-13	4.360E-12
BREAST	1.710E-15	5.333E-13	7.605E-13	3.190E-17	-1.000E+00	2.430E-13	6.140E-13
LUNGS	1.430E-15	4.931E-13	7.033E-13	2.950E-17	-1.000E+00	5.020E-10	1.780E-13
RED MARR	1.330E-15	4.898E-13	6.985E-13	2.930E-17	-1.000E+00	6.460E-13	1.200E-12
BONE SUR	3.500E-15	1.013E-12	1.445E-12	6.060E-17	-1.000E+00	5.310E-13	4.060E-13
THYROID	1.500E-15	4.982E-13	7.104E-13	2.980E-17	-1.000E+00	1.080E-13	1.510E-14
REMAINDER	1.360E-15	4.814E-13	6.866E-13	2.880E-17	-1.000E+00	1.030E-10	7.190E-10
EFFECTIVE	1.520E-15	5.232E-13	7.462E-13	3.130E-17	-1.000E+00	9.130E-11	2.170E-10
SKIN(FGR)	2.990E-14	7.890E-11	1.125E-10	4.720E-15	-1.000E+00	0.000E+00	0.000E+00
Md-257							
GONADS	4.930E-15	2.019E-12	3.079E-12	1.140E-16	-1.000E+00	1.250E-09	2.970E-11
BREAST	5.720E-15	2.001E-12	3.052E-12	1.130E-16	-1.000E+00	3.540E-11	2.650E-12
LUNGS	4.710E-15	1.741E-12	2.655E-12	9.830E-17	-1.000E+00	6.550E-08	9.160E-13
RED MARR	4.290E-15	1.705E-12	2.601E-12	9.630E-17	-1.000E+00	1.270E-08	1.270E-10
BONE SUR	1.270E-14	4.162E-12	6.347E-12	2.350E-16	-1.000E+00	1.590E-07	1.520E-09
THYROID	4.930E-15	1.824E-12	2.782E-12	1.030E-16	-1.000E+00	3.480E-11	3.350E-13
REMAINDER	4.440E-15	1.705E-12	2.601E-12	9.630E-17	-1.000E+00	3.340E-09	4.000E-10
EFFECTIVE	5.030E-15	1.913E-12	2.917E-12	1.080E-16	-1.000E+00	1.550E-08	1.890E-10
SKIN(FGR)	6.200E-15	2.727E-12	4.159E-12	1.540E-16	-1.000E+00	0.000E+00	0.000E+00
Md-258							
GONADS	6.280E-17	2.112E-13	4.255E-12	7.350E-18	-1.000E+00	4.710E-07	4.350E-09
BREAST	9.540E-17	2.480E-13	4.996E-12	8.630E-18	-1.000E+00	1.500E-09	1.530E-11
LUNGS	2.660E-17	3.650E-14	7.352E-13	1.270E-18	-1.000E+00	1.420E-05	1.480E-11
RED MARR	2.550E-17	4.311E-14	8.683E-13	1.500E-18	-1.000E+00	4.660E-06	4.310E-08
BONE SUR	1.360E-16	2.676E-13	5.389E-12	9.310E-18	-1.000E+00	5.820E-05	5.380E-07
THYROID	4.890E-17	8.363E-14	1.685E-12	2.910E-18	-1.000E+00	1.240E-09	1.190E-11
REMAINDER	3.020E-17	6.466E-14	1.303E-12	2.250E-18	-1.000E+00	1.130E-06	3.160E-08
EFFECTIVE	5.080E-17	1.296E-13	2.611E-12	4.510E-18	-1.000E+00	4.470E-06	3.190E-08
SKIN(FGR)	1.820E-16	7.329E-13	1.476E-11	2.550E-17	-1.000E+00	0.000E+00	0.000E+00
Mg-28							
GONADS	1.561E-13	7.640E-11	3.278E-10	3.030E-15	-1.000E+00	2.590E-10	8.680E-10
BREAST	1.763E-13	7.287E-11	3.127E-10	2.890E-15	-1.000E+00	1.460E-10	2.720E-10
LUNGS	1.579E-13	7.085E-11	3.040E-10	2.810E-15	-1.000E+00	5.920E-09	1.960E-10
RED MARR	1.568E-13	7.262E-11	3.116E-10	2.880E-15	-1.000E+00	4.030E-10	9.240E-10
BONE SUR	2.237E-13	9.759E-11	4.187E-10	3.870E-15	-1.000E+00	6.400E-10	1.490E-09
THYROID	1.610E-13	6.834E-11	2.932E-10	2.710E-15	-1.000E+00	1.070E-10	1.680E-10
REMAINDER	1.530E-13	7.085E-11	3.040E-10	2.810E-15	-1.000E+00	1.550E-09	5.780E-09
EFFECTIVE	1.607E-13	7.363E-11	3.159E-10	2.920E-15	-1.000E+00	1.330E-09	2.180E-09
SKIN(FGR)	2.713E-13	4.197E-10	1.805E-09	1.668E-14	-1.000E+00	0.000E+00	0.000E+00
Mn-51							
GONADS	4.690E-14	4.156E-12	4.159E-12	1.040E-15	-1.000E+00	1.040E-12	1.160E-11

BREAST	5.370E-14	3.996E-12	3.999E-12	1.000E-15-1.000E+00	1.560E-12	3.340E-12
LUNGS	4.660E-14	3.788E-12	3.791E-12	9.480E-16-1.000E+00	1.860E-10	2.460E-12
RED MARR	4.490E-14	3.828E-12	3.831E-12	9.580E-16-1.000E+00	1.780E-12	4.050E-12
BONE SUR	8.280E-14	5.794E-12	5.799E-12	1.450E-15-1.000E+00	1.640E-12	1.800E-12
THYROID	4.780E-14	3.960E-12	3.963E-12	9.910E-16-1.000E+00	1.390E-12	3.460E-13
REMAINDER	4.450E-14	3.712E-12	3.715E-12	9.290E-16-1.000E+00	7.830E-12	2.360E-10
EFFECTIVE	4.800E-14	3.960E-12	3.963E-12	9.910E-16-1.000E+00	2.550E-11	7.510E-11
SKIN(FGR)	1.180E-13	4.875E-11	4.879E-11	1.220E-14-1.000E+00	0.000E+00	0.000E+00
Mn-52						
GONADS	1.680E-13	9.705E-11	1.391E-09	3.440E-15-1.000E+00	1.170E-09	2.740E-09
BREAST	1.910E-13	9.254E-11	1.326E-09	3.280E-15-1.000E+00	5.210E-10	4.550E-10
LUNGS	1.690E-13	8.944E-11	1.282E-09	3.170E-15-1.000E+00	4.240E-09	2.040E-10
RED MARR	1.660E-13	9.169E-11	1.314E-09	3.250E-15-1.000E+00	6.990E-10	7.590E-10
BONE SUR	2.530E-13	1.253E-10	1.795E-09	4.440E-15-1.000E+00	5.300E-10	4.220E-10
THYROID	1.730E-13	9.000E-11	1.290E-09	3.190E-15-1.000E+00	3.410E-10	1.040E-10
REMAINDER	1.620E-13	8.859E-11	1.270E-09	3.140E-15-1.000E+00	1.840E-09	3.870E-09
EFFECTIVE	1.720E-13	9.282E-11	1.330E-09	3.290E-15-1.000E+00	1.540E-09	2.050E-09
SKIN(FGR)	1.990E-13	1.114E-10	1.597E-09	3.950E-15-1.000E+00	0.000E+00	0.000E+00
Mn-52m						
GONADS	1.170E-13	4.383E-12	4.383E-12	2.400E-15-1.000E+00	6.340E-13	7.780E-12
BREAST	1.330E-13	4.201E-12	4.201E-12	2.300E-15-1.000E+00	1.310E-12	3.360E-12
LUNGS	1.170E-13	4.036E-12	4.036E-12	2.210E-15-1.000E+00	1.110E-10	3.060E-12
RED MARR	1.150E-13	4.128E-12	4.128E-12	2.260E-15-1.000E+00	1.310E-12	3.360E-12
BONE SUR	1.820E-13	5.772E-12	5.772E-12	3.160E-15-1.000E+00	1.080E-12	1.530E-12
THYROID	1.200E-13	4.055E-12	4.055E-12	2.220E-15-1.000E+00	1.080E-12	3.440E-13
REMAINDER	1.130E-13	4.000E-12	4.000E-12	2.190E-15-1.000E+00	3.710E-12	1.520E-10
EFFECTIVE	1.200E-13	4.201E-12	4.201E-12	2.300E-15-1.000E+00	1.500E-11	4.880E-11
SKIN(FGR)	2.130E-13	2.776E-11	2.776E-11	1.520E-14-1.000E+00	0.000E+00	0.000E+00
Mn-53						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.950E-12	2.090E-12
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.140E-12	1.550E-12
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	8.700E-10	1.530E-12
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.720E-11	2.180E-11
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.850E-10	2.250E-10
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.780E-12	1.620E-12
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	4.270E-11	6.280E-11
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.350E-10	2.920E-11
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Mn-54						
GONADS	4.010E-14	2.447E-11	5.101E-10	8.500E-16-1.000E+00	7.090E-10	9.480E-10
BREAST	4.550E-14	2.338E-11	4.873E-10	8.120E-16-1.000E+00	8.590E-10	2.770E-10
LUNGS	4.000E-14	2.237E-11	4.663E-10	7.770E-16-1.000E+00	6.660E-09	2.290E-10
RED MARR	3.910E-14	2.292E-11	4.777E-10	7.960E-16-1.000E+00	1.100E-09	4.890E-10
BONE SUR	6.230E-14	3.196E-11	6.661E-10	1.110E-15-1.000E+00	1.250E-09	5.710E-10
THYROID	4.110E-14	2.323E-11	4.843E-10	8.070E-16-1.000E+00	7.400E-10	1.330E-10
REMAINDER	3.830E-14	2.220E-11	4.627E-10	7.710E-16-1.000E+00	1.720E-09	1.210E-09
EFFECTIVE	4.090E-14	2.338E-11	4.873E-10	8.120E-16-1.000E+00	1.810E-09	7.480E-10
SKIN(FGR)	4.670E-14	2.778E-11	5.791E-10	9.650E-16-1.000E+00	0.000E+00	0.000E+00
Mn-56						
GONADS	8.370E-14	1.941E-11	2.196E-11	1.640E-15-1.000E+00	9.460E-12	8.530E-11
BREAST	9.460E-14	1.858E-11	2.103E-11	1.570E-15-1.000E+00	7.790E-12	1.760E-11
LUNGS	8.450E-14	1.799E-11	2.036E-11	1.520E-15-1.000E+00	5.370E-10	8.800E-12
RED MARR	8.370E-14	1.846E-11	2.089E-11	1.560E-15-1.000E+00	1.020E-11	2.430E-11
BONE SUR	1.220E-13	2.485E-11	2.812E-11	2.100E-15-1.000E+00	8.230E-12	1.060E-11
THYROID	8.640E-14	1.775E-11	2.009E-11	1.500E-15-1.000E+00	6.180E-12	2.400E-12
REMAINDER	8.170E-14	1.799E-11	2.036E-11	1.520E-15-1.000E+00	6.500E-11	7.840E-10
EFFECTIVE	8.610E-14	1.870E-11	2.116E-11	1.580E-15-1.000E+00	8.910E-11	2.640E-10
SKIN(FGR)	1.510E-13	1.207E-10	1.366E-10	1.020E-14-1.000E+00	0.000E+00	0.000E+00
Mo-101						
GONADS	6.690E-14	1.696E-12	1.696E-12	1.340E-15-1.000E+00	1.230E-13	3.840E-12
BREAST	7.580E-14	1.633E-12	1.633E-12	1.290E-15-1.000E+00	5.140E-13	1.630E-12
LUNGS	6.720E-14	1.569E-12	1.569E-12	1.240E-15-1.000E+00	7.520E-11	1.510E-12
RED MARR	6.620E-14	1.607E-12	1.607E-12	1.270E-15-1.000E+00	5.000E-13	1.670E-12

BONE SUR	1.020E-13	2.240E-12	2.240E-12	1.770E-15-1.000E+00	3.890E-13	7.610E-13
THYROID	6.880E-14	1.557E-12	1.557E-12	1.230E-15-1.000E+00	4.220E-13	1.590E-13
REMAINDER	6.480E-14	1.557E-12	1.557E-12	1.230E-15-1.000E+00	2.200E-12	9.350E-11
EFFECTIVE	6.870E-14	1.633E-12	1.633E-12	1.290E-15-1.000E+00	9.870E-12	2.970E-11
SKIN(FGR)	1.140E-13	8.935E-12	8.935E-12	7.060E-15-1.000E+00	0.000E+00	0.000E+00
Mo-90						
GONADS	3.850E-14	1.536E-11	2.462E-11	8.360E-16-1.000E+00	1.910E-10	6.210E-10
BREAST	4.400E-14	1.488E-11	2.385E-11	8.100E-16-1.000E+00	4.900E-11	8.390E-11
LUNGS	3.790E-14	1.385E-11	2.220E-11	7.540E-16-1.000E+00	9.360E-10	2.370E-11
RED MARR	3.610E-14	1.396E-11	2.238E-11	7.600E-16-1.000E+00	6.420E-11	1.370E-10
BONE SUR	7.500E-14	2.389E-11	3.828E-11	1.300E-15-1.000E+00	3.440E-11	5.370E-11
THYROID	3.910E-14	1.418E-11	2.273E-11	7.720E-16-1.000E+00	2.140E-11	7.040E-12
REMAINDER	3.610E-14	1.358E-11	2.176E-11	7.390E-16-1.000E+00	5.240E-10	1.770E-09
EFFECTIVE	3.930E-14	1.463E-11	2.344E-11	7.960E-16-1.000E+00	3.340E-10	7.190E-10
SKIN(FGR)	5.520E-14	4.042E-11	6.479E-11	2.200E-15-1.000E+00	0.000E+00	0.000E+00
Mo-93						
GONADS	3.590E-17	2.820E-13	5.921E-12	9.790E-18-1.000E+00	2.450E-11	2.540E-11
BREAST	7.460E-17	3.629E-13	7.620E-12	1.260E-17-1.000E+00	2.820E-10	6.780E-12
LUNGS	1.440E-18	8.093E-15	1.699E-13	2.810E-19-1.000E+00	6.290E-08	6.630E-12
RED MARR	6.690E-18	3.312E-14	6.955E-13	1.150E-18-1.000E+00	1.060E-10	1.970E-11
BONE SUR	3.930E-17	2.100E-13	4.409E-12	7.290E-18-1.000E+00	2.350E-10	7.220E-11
THYROID	1.950E-17	5.501E-14	1.155E-12	1.910E-18-1.000E+00	1.170E-11	5.890E-12
REMAINDER	7.740E-18	5.357E-14	1.125E-12	1.860E-18-1.000E+00	2.100E-10	1.740E-10
EFFECTIVE	2.520E-17	1.538E-13	3.230E-12	5.340E-18-1.000E+00	7.680E-09	6.520E-11
SKIN(FGR)	2.430E-16	1.587E-12	3.332E-11	5.510E-17-1.000E+00	0.000E+00	0.000E+00
Mo-93m						
GONADS	1.100E-13	4.363E-11	7.862E-11	2.210E-15-1.000E+00	6.360E-11	3.350E-10
BREAST	1.240E-13	4.166E-11	7.507E-11	2.110E-15-1.000E+00	2.540E-11	5.780E-11
LUNGS	1.100E-13	4.027E-11	7.258E-11	2.040E-15-1.000E+00	3.110E-10	1.980E-11
RED MARR	1.090E-13	4.126E-11	7.436E-11	2.090E-15-1.000E+00	2.930E-11	8.400E-11
BONE SUR	1.670E-13	5.686E-11	1.025E-10	2.880E-15-1.000E+00	1.650E-11	3.080E-11
THYROID	1.130E-13	3.988E-11	7.187E-11	2.020E-15-1.000E+00	1.230E-11	4.120E-12
REMAINDER	1.070E-13	4.008E-11	7.222E-11	2.030E-15-1.000E+00	1.410E-10	7.220E-10
EFFECTIVE	1.130E-13	4.185E-11	7.542E-11	2.120E-15-1.000E+00	1.040E-10	3.220E-10
SKIN(FGR)	1.320E-13	4.975E-11	8.965E-11	2.520E-15-1.000E+00	0.000E+00	0.000E+00
Mo-99						
GONADS	7.130E-15	4.282E-12	4.403E-11	1.550E-16-1.000E+00	9.510E-11	2.180E-10
BREAST	8.130E-15	4.116E-12	4.233E-11	1.490E-16-1.000E+00	2.750E-11	3.430E-11
LUNGS	7.060E-15	3.867E-12	3.977E-11	1.400E-16-1.000E+00	4.290E-09	1.510E-11
RED MARR	6.820E-15	3.923E-12	4.034E-11	1.420E-16-1.000E+00	5.240E-11	8.320E-11
BONE SUR	1.240E-14	6.105E-12	6.278E-11	2.210E-16-1.000E+00	4.130E-11	6.320E-11
THYROID	7.270E-15	4.033E-12	4.147E-11	1.460E-16-1.000E+00	1.520E-11	1.030E-11
REMAINDER	6.740E-15	3.812E-12	3.920E-11	1.380E-16-1.000E+00	1.740E-09	4.280E-09
EFFECTIVE	7.280E-15	4.061E-12	4.176E-11	1.470E-16-1.000E+00	1.070E-09	1.360E-09
SKIN(FGR)	3.140E-14	1.039E-10	1.068E-09	3.760E-15-1.000E+00	0.000E+00	0.000E+00
N-13						
GONADS	4.780E-14	9.143E-13	9.143E-13	1.060E-15-1.000E+00	0.000E+00	0.000E-00
BREAST	5.470E-14	8.798E-13	8.798E-13	1.020E-15-1.000E+00	0.000E+00	0.000E-00
LUNGS	4.750E-14	8.341E-13	8.341E-13	9.670E-16-1.000E+00	0.000E+00	0.000E-00
RED MARR	4.580E-14	8.419E-13	8.419E-13	9.760E-16-1.000E+00	0.000E+00	0.000E-00
BONE SUR	8.440E-14	1.277E-12	1.277E-12	1.480E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.870E-14	8.712E-13	8.712E-13	1.010E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.540E-14	8.169E-13	8.169E-13	9.470E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.900E-14	8.712E-13	8.712E-13	1.010E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.680E-14	5.400E-12	5.400E-12	6.260E-15-1.000E+00	0.000E+00	0.000E+00
Na-22						
GONADS	1.060E-13	6.335E-11	1.327E-09	2.200E-15-1.000E+00	1.770E-09	2.810E-09
BREAST	1.200E-13	6.047E-11	1.267E-09	2.100E-15-1.000E+00	1.650E-09	2.580E-09
LUNGS	1.060E-13	5.817E-11	1.219E-09	2.020E-15-1.000E+00	2.470E-09	2.510E-09
RED MARR	1.040E-13	5.932E-11	1.243E-09	2.060E-15-1.000E+00	2.730E-09	4.290E-09
BONE SUR	1.660E-13	8.351E-11	1.749E-09	2.900E-15-1.000E+00	3.510E-09	5.540E-09
THYROID	1.080E-13	5.903E-11	1.237E-09	2.050E-15-1.000E+00	1.600E-09	2.500E-09
REMAINDER	1.020E-13	5.759E-11	1.207E-09	2.000E-15-1.000E+00	2.000E-09	3.180E-09

EFFECTIVE	1.080E-13	6.047E-11	1.267E-09	2.100E-15	-1.000E+00	2.070E-09	3.100E-09
SKIN(FGR)	1.330E-13	7.487E-11	1.568E-09	2.600E-15	-1.000E+00	0.000E+00	0.000E+00
Na-24							
GONADS	2.120E-13	8.980E-11	2.905E-10	3.730E-15	-1.000E+00	1.780E-10	3.430E-10
BREAST	2.360E-13	8.547E-11	2.764E-10	3.550E-15	-1.000E+00	1.610E-10	2.710E-10
LUNGS	2.160E-13	8.403E-11	2.718E-10	3.490E-15	-1.000E+00	1.250E-09	2.600E-10
RED MARR	2.160E-13	8.667E-11	2.803E-10	3.600E-15	-1.000E+00	2.130E-10	3.740E-10
BONE SUR	2.870E-13	1.110E-10	3.590E-10	4.610E-15	-1.000E+00	2.580E-10	4.680E-10
THYROID	2.200E-13	7.921E-11	2.562E-10	3.290E-15	-1.000E+00	1.530E-10	2.600E-10
REMAINDER	2.100E-13	8.475E-11	2.741E-10	3.520E-15	-1.000E+00	2.350E-10	5.310E-10
EFFECTIVE	2.180E-13	8.692E-11	2.811E-10	3.610E-15	-1.000E+00	3.270E-10	3.840E-10
SKIN(FGR)	2.750E-13	2.480E-10	8.021E-10	1.030E-14	-1.000E+00	0.000E+00	0.000E+00
Nb-88							
GONADS	1.980E-13	5.199E-12	5.199E-12	4.200E-15	-1.000E+00	1.530E-13	3.550E-12
BREAST	2.250E-13	4.976E-12	4.976E-12	4.020E-15	-1.000E+00	8.370E-13	2.130E-12
LUNGS	1.970E-13	4.753E-12	4.753E-12	3.840E-15	-1.000E+00	5.310E-11	2.340E-12
RED MARR	1.920E-13	4.840E-12	4.840E-12	3.910E-15	-1.000E+00	7.990E-13	1.860E-12
BONE SUR	3.200E-13	6.994E-12	6.994E-12	5.650E-15	-1.000E+00	6.370E-13	9.470E-13
THYROID	2.020E-13	4.889E-12	4.889E-12	3.950E-15	-1.000E+00	7.680E-13	2.220E-13
REMAINDER	1.880E-13	4.679E-12	4.679E-12	3.780E-15	-1.000E+00	1.980E-12	7.410E-11
EFFECTIVE	2.020E-13	4.964E-12	4.964E-12	4.010E-15	-1.000E+00	7.270E-12	2.400E-11
SKIN(FGR)	3.120E-13	2.154E-11	2.154E-11	1.740E-14	-1.000E+00	0.000E+00	0.000E+00
Nb-89a							
GONADS	9.050E-14	1.135E-11	1.143E-11	2.000E-15	-1.000E+00	7.660E-12	5.090E-11
BREAST	1.030E-13	1.090E-11	1.097E-11	1.920E-15	-1.000E+00	4.570E-12	1.060E-11
LUNGS	8.990E-14	1.033E-11	1.040E-11	1.820E-15	-1.000E+00	2.960E-10	5.900E-12
RED MARR	8.690E-14	1.044E-11	1.051E-11	1.840E-15	-1.000E+00	5.020E-12	1.410E-11
BONE SUR	1.570E-13	1.567E-11	1.577E-11	2.760E-15	-1.000E+00	3.360E-12	5.390E-12
THYROID	9.230E-14	1.078E-11	1.085E-11	1.900E-15	-1.000E+00	3.300E-12	6.190E-13
REMAINDER	8.590E-14	1.010E-11	1.017E-11	1.780E-15	-1.000E+00	3.120E-11	3.810E-10
EFFECTIVE	9.260E-14	1.078E-11	1.085E-11	1.900E-15	-1.000E+00	4.830E-11	1.310E-10
SKIN(FGR)	1.630E-13	6.811E-11	6.856E-11	1.200E-14	-1.000E+00	0.000E+00	0.000E+00
Nb-89b							
GONADS	6.800E-14	1.362E-11	1.457E-11	1.380E-15	-1.000E+00	1.530E-11	8.060E-11
BREAST	7.700E-14	1.303E-11	1.394E-11	1.320E-15	-1.000E+00	6.880E-12	1.420E-11
LUNGS	6.820E-14	1.253E-11	1.341E-11	1.270E-15	-1.000E+00	6.550E-10	6.040E-12
RED MARR	6.690E-14	1.273E-11	1.362E-11	1.290E-15	-1.000E+00	8.040E-12	2.010E-11
BONE SUR	1.080E-13	1.816E-11	1.943E-11	1.840E-15	-1.000E+00	5.140E-12	7.650E-12
THYROID	6.990E-14	1.253E-11	1.341E-11	1.270E-15	-1.000E+00	4.420E-12	8.560E-13
REMAINDER	6.570E-14	1.234E-11	1.320E-11	1.250E-15	-1.000E+00	8.760E-11	8.380E-10
EFFECTIVE	6.980E-14	1.303E-11	1.394E-11	1.320E-15	-1.000E+00	1.110E-10	2.770E-10
SKIN(FGR)	1.560E-13	1.244E-10	1.331E-10	1.260E-14	-1.000E+00	0.000E+00	0.000E-00
Nb-90							
GONADS	2.110E-13	9.561E-11	3.024E-10	3.990E-15	-1.000E+00	3.680E-10	1.350E-09
BREAST	2.370E-13	9.130E-11	2.888E-10	3.810E-15	-1.000E+00	1.000E-10	1.870E-10
LUNGS	2.130E-13	8.890E-11	2.812E-10	3.710E-15	-1.000E+00	1.710E-09	5.120E-11
RED MARR	2.120E-13	9.106E-11	2.880E-10	3.800E-15	-1.000E+00	1.280E-10	2.910E-10
BONE SUR	3.080E-13	1.236E-10	3.911E-10	5.160E-15	-1.000E+00	7.180E-11	1.090E-10
THYROID	2.180E-13	8.578E-11	2.714E-10	3.580E-15	-1.000E+00	4.540E-11	9.110E-12
REMAINDER	2.070E-13	8.866E-11	2.805E-10	3.700E-15	-1.000E+00	9.600E-10	3.500E-09
EFFECTIVE	2.170E-13	9.201E-11	2.911E-10	3.840E-15	-1.000E+00	6.190E-10	1.460E-09
SKIN(FGR)	2.660E-13	2.092E-10	6.618E-10	8.730E-15	-1.000E+00	0.000E+00	0.000E-00
Nb-93m							
GONADS	6.330E-18	4.953E-14	1.040E-12	1.720E-18	-1.000E+00	1.550E-10	3.340E-11
BREAST	1.310E-17	6.365E-14	1.336E-12	2.210E-18	-1.000E+00	4.360E-11	2.570E-12
LUNGS	2.550E-19	1.426E-15	2.992E-14	4.950E-20	-1.000E+00	6.450E-08	2.450E-12
RED MARR	1.180E-18	5.817E-15	1.221E-13	2.020E-19	-1.000E+00	1.140E-10	2.320E-11
BONE SUR	6.920E-18	3.686E-14	7.738E-13	1.280E-18	-1.000E+00	2.840E-10	5.980E-11
THYROID	3.430E-18	9.677E-15	2.031E-13	3.360E-19	-1.000E+00	1.140E-11	2.440E-12
REMAINDER	1.360E-18	9.446E-15	1.983E-13	3.280E-19	-1.000E+00	3.040E-10	4.250E-10
EFFECTIVE	4.440E-18	2.704E-14	5.676E-13	9.390E-19	-1.000E+00	7.900E-09	1.410E-10
SKIN(FGR)	4.280E-17	2.794E-13	5.864E-12	9.700E-18	-1.000E+00	0.000E+00	0.000E+00
Nb-94							

GONADS	7.540E-14	4.637E-11	9.737E-10	1.610E-15-1.000E+00	4.420E-09	1.800E-09
BREAST	8.570E-14	4.435E-11	9.314E-10	1.540E-15-1.000E+00	2.240E-08	3.470E-10
LUNGS	7.510E-14	4.234E-11	8.891E-10	1.470E-15-1.000E+00	7.480E-07	1.720E-10
RED MARR	7.340E-14	4.320E-11	9.072E-10	1.500E-15-1.000E+00	2.260E-08	7.390E-10
BONE SUR	1.190E-13	6.077E-11	1.276E-09	2.110E-15-1.000E+00	1.970E-08	7.650E-10
THYROID	7.720E-14	4.406E-11	9.253E-10	1.530E-15-1.000E+00	2.220E-08	1.230E-10
REMAINDER	7.190E-14	4.176E-11	8.770E-10	1.450E-15-1.000E+00	4.450E-08	4.300E-09
EFFECTIVE	7.700E-14	4.406E-11	9.253E-10	1.530E-15-1.000E+00	1.120E-07	1.930E-09
SKIN(FGR)	9.520E-14	5.386E-11	1.131E-09	1.870E-15-1.000E+00	0.000E+00	0.000E+00
Nb-95						
GONADS	3.660E-14	2.253E-11	4.435E-10	7.850E-16-1.000E+00	4.320E-10	8.050E-10
BREAST	4.160E-14	2.150E-11	4.231E-10	7.490E-16-1.000E+00	4.070E-10	1.070E-10
LUNGS	3.650E-14	2.055E-11	4.045E-10	7.160E-16-1.000E+00	8.320E-09	2.740E-11
RED MARR	3.560E-14	2.101E-11	4.135E-10	7.320E-16-1.000E+00	4.420E-10	1.990E-10
BONE SUR	5.790E-14	2.957E-11	5.819E-10	1.030E-15-1.000E+00	5.130E-10	2.940E-10
THYROID	3.750E-14	2.144E-11	4.220E-10	7.470E-16-1.000E+00	3.580E-10	1.180E-11
REMAINDER	3.490E-14	2.032E-11	4.000E-10	7.080E-16-1.000E+00	1.070E-09	1.470E-09
EFFECTIVE	3.740E-14	2.147E-11	4.226E-10	7.480E-16-1.000E+00	1.570E-09	6.950E-10
SKIN(FGR)	4.300E-14	2.598E-11	5.112E-10	9.050E-16-1.000E+00	0.000E+00	0.000E+00
Nb-95m						
GONADS	2.880E-15	1.900E-12	2.265E-11	6.810E-17-1.000E+00	4.960E-11	9.300E-11
BREAST	3.310E-15	1.911E-12	2.278E-11	6.850E-17-1.000E+00	4.530E-11	1.060E-11
LUNGS	2.770E-15	1.565E-12	1.866E-11	5.610E-17-1.000E+00	3.070E-09	2.820E-12
RED MARR	2.590E-15	1.582E-12	1.886E-11	5.670E-17-1.000E+00	5.870E-11	3.330E-11
BONE SUR	6.600E-15	3.097E-12	3.691E-11	1.110E-16-1.000E+00	6.610E-11	4.310E-11
THYROID	2.890E-15	1.604E-12	1.912E-11	5.750E-17-1.000E+00	3.860E-11	1.630E-12
REMAINDER	2.630E-15	1.554E-12	1.852E-11	5.570E-17-1.000E+00	8.690E-10	1.970E-09
EFFECTIVE	2.930E-15	1.746E-12	2.082E-11	6.260E-17-1.000E+00	6.590E-10	6.220E-10
SKIN(FGR)	1.120E-14	3.041E-12	3.625E-11	1.090E-16-1.000E+00	0.000E+00	0.000E+00
Nb-96						
GONADS	1.190E-13	6.435E-11	3.023E-10	2.510E-15-1.000E+00	3.830E-10	1.190E-09
BREAST	1.350E-13	6.153E-11	2.891E-10	2.400E-15-1.000E+00	9.820E-11	1.590E-10
LUNGS	1.190E-13	5.896E-11	2.770E-10	2.300E-15-1.000E+00	1.610E-09	3.650E-11
RED MARR	1.160E-13	6.024E-11	2.830E-10	2.350E-15-1.000E+00	1.280E-10	2.540E-10
BONE SUR	1.870E-13	8.485E-11	3.987E-10	3.310E-15-1.000E+00	6.700E-11	9.130E-11
THYROID	1.220E-13	6.076E-11	2.855E-10	2.370E-15-1.000E+00	4.810E-11	6.370E-12
REMAINDER	1.140E-13	5.819E-11	2.734E-10	2.270E-15-1.000E+00	9.900E-10	3.050E-09
EFFECTIVE	1.210E-13	6.127E-11	2.879E-10	2.390E-15-1.000E+00	6.190E-10	1.270E-09
SKIN(FGR)	1.520E-13	9.562E-11	4.493E-10	3.730E-15-1.000E+00	0.000E+00	0.000E+00
Nb-97						
GONADS	3.110E-14	4.190E-12	4.231E-12	6.780E-16-1.000E+00	8.650E-13	1.450E-11
BREAST	3.550E-14	4.010E-12	4.050E-12	6.490E-16-1.000E+00	1.120E-12	3.300E-12
LUNGS	3.100E-14	3.819E-12	3.857E-12	6.180E-16-1.000E+00	1.560E-10	1.980E-12
RED MARR	3.010E-14	3.881E-12	3.919E-12	6.280E-16-1.000E+00	1.140E-12	4.200E-12
BONE SUR	5.110E-14	5.598E-12	5.654E-12	9.060E-16-1.000E+00	8.260E-13	1.600E-12
THYROID	3.180E-14	3.986E-12	4.026E-12	6.450E-16-1.000E+00	9.200E-13	2.110E-13
REMAINDER	2.960E-14	3.751E-12	3.788E-12	6.070E-16-1.000E+00	1.050E-11	1.940E-10
EFFECTIVE	3.180E-14	3.986E-12	4.026E-12	6.450E-16-1.000E+00	2.240E-11	6.300E-11
SKIN(FGR)	6.510E-14	3.436E-11	3.470E-11	5.560E-15-1.000E+00	0.000E+00	0.000E+00
Nb-97m						
GONADS	3.470E-14	6.466E-14	6.466E-14	7.470E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	3.950E-14	6.181E-14	6.181E-14	7.140E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.460E-14	5.904E-14	5.904E-14	6.820E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.380E-14	6.025E-14	6.025E-14	6.960E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.540E-14	8.526E-14	8.526E-14	9.850E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	3.560E-14	6.155E-14	6.155E-14	7.110E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.310E-14	5.826E-14	5.826E-14	6.730E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.550E-14	6.163E-14	6.163E-14	7.120E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.160E-14	9.349E-14	9.349E-14	1.080E-15-1.000E+00	0.000E+00	0.000E+00
Nb-98						
GONADS	1.180E-13	1.082E-11	1.083E-11	2.430E-15-1.000E+00	1.540E-12	3.190E-11
BREAST	1.340E-13	1.033E-11	1.034E-11	2.320E-15-1.000E+00	2.760E-12	8.450E-12
LUNGS	1.180E-13	9.970E-12	9.986E-12	2.240E-15-1.000E+00	2.300E-10	5.730E-12

RED MARR	1.160E-13	1.019E-11	1.021E-11	2.290E-15	-1.000E+00	2.700E-12	9.970E-12
BONE SUR	1.810E-13	1.411E-11	1.413E-11	3.170E-15	-1.000E+00	2.000E-12	3.960E-12
THYROID	1.210E-13	1.010E-11	1.012E-11	2.270E-15	-1.000E+00	2.300E-12	6.380E-13
REMAINDER	1.130E-13	9.881E-12	9.897E-12	2.220E-15	-1.000E+00	1.420E-11	3.020E-10
EFFECTIVE	1.210E-13	1.037E-11	1.039E-11	2.330E-15	-1.000E+00	3.310E-11	1.020E-10
SKIN(FGR)	1.960E-13	5.608E-11	5.617E-11	1.260E-14	-1.000E+00	0.000E+00	0.000E+00
Nd-136							
GONADS	1.260E-14	1.370E-12	1.372E-12	3.130E-16	-1.000E+00	1.720E-12	3.630E-11
BREAST	1.470E-14	1.344E-12	1.346E-12	3.070E-16	-1.000E+00	2.750E-12	8.360E-12
LUNGS	1.190E-14	1.156E-12	1.157E-12	2.640E-16	-1.000E+00	2.110E-10	4.860E-12
RED MARR	1.110E-14	1.108E-12	1.109E-12	2.530E-16	-1.000E+00	2.850E-12	1.120E-11
BONE SUR	2.630E-14	2.596E-12	2.600E-12	5.930E-16	-1.000E+00	2.120E-12	4.140E-12
THYROID	1.260E-14	1.235E-12	1.236E-12	2.820E-16	-1.000E+00	2.060E-12	4.860E-13
REMAINDER	1.130E-14	1.134E-12	1.136E-12	2.590E-16	-1.000E+00	1.530E-11	2.790E-10
EFFECTIVE	1.270E-14	1.270E-12	1.271E-12	2.900E-16	-1.000E+00	3.120E-11	9.620E-11
SKIN(FGR)	1.710E-14	2.701E-12	2.705E-12	6.170E-16	-1.000E+00	0.000E+00	0.000E+00
Nd-138							
GONADS	3.977E-14	1.584E-11	2.379E-11	9.090E-16	-1.000E+00	1.970E-11	1.260E-10
BREAST	4.559E-14	1.528E-11	2.295E-11	8.766E-16	-1.000E+00	7.580E-12	1.820E-11
LUNGS	3.904E-14	1.411E-11	2.119E-11	8.095E-16	-1.000E+00	1.420E-09	5.650E-12
RED MARR	3.759E-14	1.412E-11	2.121E-11	8.101E-16	-1.000E+00	9.860E-12	2.930E-11
BONE SUR	7.069E-14	2.320E-11	3.484E-11	1.331E-15	-1.000E+00	6.070E-12	9.780E-12
THYROID	4.036E-14	1.483E-11	2.228E-11	8.510E-16	-1.000E+00	4.130E-12	5.880E-13
REMAINDER	3.731E-14	1.385E-11	2.080E-11	7.948E-16	-1.000E+00	3.330E-10	2.170E-09
EFFECTIVE	4.047E-14	1.494E-11	2.245E-11	8.575E-16	-1.000E+00	2.780E-10	6.890E-10
SKIN(FGR)	1.269E-13	2.156E-10	3.238E-10	1.237E-14	-1.000E+00	0.000E+00	0.000E+00
Nd-139							
GONADS	1.870E-14	1.093E-12	1.093E-12	4.250E-16	-1.000E+00	4.220E-13	4.690E-12
BREAST	2.140E-14	1.054E-12	1.054E-12	4.100E-16	-1.000E+00	4.440E-13	1.120E-12
LUNGS	1.830E-14	9.692E-13	9.692E-13	3.770E-16	-1.000E+00	3.850E-11	7.590E-13
RED MARR	1.770E-14	9.692E-13	9.692E-13	3.770E-16	-1.000E+00	5.300E-13	1.550E-12
BONE SUR	3.260E-14	1.612E-12	1.612E-12	6.270E-16	-1.000E+00	4.770E-13	5.830E-13
THYROID	1.900E-14	1.018E-12	1.018E-12	3.960E-16	-1.000E+00	2.880E-13	6.570E-14
REMAINDER	1.750E-14	9.512E-13	9.512E-13	3.700E-16	-1.000E+00	2.850E-12	4.880E-11
EFFECTIVE	1.900E-14	1.028E-12	1.028E-12	4.000E-16	-1.000E+00	5.730E-12	1.630E-11
SKIN(FGR)	3.500E-14	7.378E-12	7.378E-12	2.870E-15	-1.000E+00	0.000E+00	0.000E-00
Nd-139m							
GONADS	7.704E-14	2.990E-11	4.716E-11	1.651E-15	-1.000E+00	4.485E-11	2.586E-10
BREAST	8.767E-14	2.860E-11	4.511E-11	1.579E-15	-1.000E+00	1.705E-11	3.863E-11
LUNGS	7.640E-14	2.690E-11	4.243E-11	1.485E-15	-1.000E+00	3.716E-10	1.189E-11
RED MARR	7.442E-14	2.744E-11	4.328E-11	1.515E-15	-1.000E+00	2.166E-11	6.279E-11
BONE SUR	1.239E-13	4.175E-11	6.585E-11	2.305E-15	-1.000E+00	1.396E-11	2.107E-11
THYROID	7.878E-14	2.785E-11	4.392E-11	1.538E-15	-1.000E+00	9.615E-12	1.438E-12
REMAINDER	7.320E-14	2.670E-11	4.212E-11	1.474E-15	-1.000E+00	1.323E-10	7.199E-10
EFFECTIVE	7.858E-14	2.840E-11	4.479E-11	1.568E-15	-1.000E+00	1.017E-10	2.960E-10
SKIN(FGR)	9.590E-14	4.944E-11	7.839E-11	2.744E-15	-1.000E+00	0.000E+00	0.000E+00
Nd-141							
GONADS	2.940E-15	9.853E-13	1.104E-12	8.540E-17	-1.000E+00	5.510E-13	5.830E-12
BREAST	3.480E-15	9.842E-13	1.103E-12	8.530E-17	-1.000E+00	3.670E-13	9.010E-13
LUNGS	2.630E-15	7.453E-13	8.354E-13	6.460E-17	-1.000E+00	1.490E-11	3.290E-13
RED MARR	2.470E-15	6.819E-13	7.643E-13	5.910E-17	-1.000E+00	5.200E-13	1.870E-12
BONE SUR	5.500E-15	1.950E-12	2.186E-12	1.690E-16	-1.000E+00	3.610E-13	5.830E-13
THYROID	2.890E-15	8.272E-13	9.272E-13	7.170E-17	-1.000E+00	1.430E-13	2.400E-14
REMAINDER	2.530E-15	7.430E-13	8.328E-13	6.440E-17	-1.000E+00	2.390E-12	2.440E-11
EFFECTIVE	2.880E-15	8.711E-13	9.764E-13	7.550E-17	-1.000E+00	2.780E-12	9.180E-12
SKIN(FGR)	4.240E-15	1.823E-12	2.043E-12	1.580E-16	-1.000E+00	0.000E+00	0.000E+00
Nd-141m							
GONADS	3.620E-14	7.022E-14	7.022E-14	7.800E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.120E-14	6.707E-14	6.707E-14	7.450E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.600E-14	6.392E-14	6.392E-14	7.100E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.520E-14	6.527E-14	6.527E-14	7.250E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.760E-14	9.272E-14	9.272E-14	1.030E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	3.710E-14	6.671E-14	6.671E-14	7.410E-16	-1.000E+00	0.000E+00	0.000E+00

REMAINDER	3.450E-14	6.311E-14	6.311E-14	7.010E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.700E-14	6.680E-14	6.680E-14	7.420E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.670E-14	1.710E-13	1.710E-13	1.900E-15-1.000E+00	0.000E+00	0.000E+00
Nd-147						
GONADS	6.130E-15	4.218E-12	7.235E-11	1.480E-16-1.000E+00	8.410E-11	1.790E-10
BREAST	7.120E-15	4.132E-12	7.088E-11	1.450E-16-1.000E+00	3.450E-11	1.870E-11
LUNGS	5.820E-15	3.648E-12	6.257E-11	1.280E-16-1.000E+00	1.060E-08	2.440E-12
RED MARR	5.400E-15	3.505E-12	6.013E-11	1.230E-16-1.000E+00	9.190E-11	5.050E-11
BONE SUR	1.320E-14	8.265E-12	1.418E-10	2.900E-16-1.000E+00	3.260E-10	2.220E-11
THYROID	6.120E-15	3.876E-12	6.648E-11	1.360E-16-1.000E+00	1.820E-11	2.640E-13
REMAINDER	5.530E-15	3.562E-12	6.111E-11	1.250E-16-1.000E+00	1.760E-09	3.760E-09
EFFECTIVE	6.190E-15	3.961E-12	6.795E-11	1.390E-16-1.000E+00	1.850E-09	1.180E-09
SKIN(FGR)	1.950E-14	3.135E-11	5.377E-10	1.100E-15-1.000E+00	0.000E+00	0.000E+00
Nd-149						
GONADS	1.780E-14	3.414E-12	3.558E-12	3.960E-16-1.000E+00	1.270E-12	1.600E-11
BREAST	2.040E-14	3.310E-12	3.450E-12	3.840E-16-1.000E+00	1.030E-12	2.960E-12
LUNGS	1.720E-14	3.069E-12	3.199E-12	3.560E-16-1.000E+00	3.320E-10	1.380E-12
RED MARR	1.620E-14	3.043E-12	3.172E-12	3.530E-16-1.000E+00	1.470E-12	5.010E-12
BONE SUR	3.740E-14	5.828E-12	6.074E-12	6.760E-16-1.000E+00	1.120E-12	1.740E-12
THYROID	1.790E-14	3.164E-12	3.298E-12	3.670E-16-1.000E+00	6.240E-13	1.140E-13
REMAINDER	1.640E-14	2.991E-12	3.118E-12	3.470E-16-1.000E+00	6.660E-11	4.030E-10
EFFECTIVE	1.810E-14	3.250E-12	3.387E-12	3.770E-16-1.000E+00	6.050E-11	1.260E-10
SKIN(FGR)	4.990E-14	4.345E-11	4.528E-11	5.040E-15-1.000E+00	0.000E+00	0.000E+00
Nd-151						
GONADS	4.390E-14	9.928E-13	9.928E-13	9.220E-16-1.000E+00	5.700E-13	3.130E-12
BREAST	4.990E-14	9.519E-13	9.519E-13	8.840E-16-1.000E+00	3.530E-13	9.380E-13
LUNGS	4.350E-14	9.067E-13	9.067E-13	8.420E-16-1.000E+00	5.090E-11	7.930E-13
RED MARR	4.210E-14	9.185E-13	9.185E-13	8.530E-16-1.000E+00	4.430E-13	1.140E-12
BONE SUR	7.570E-14	1.464E-12	1.464E-12	1.360E-15-1.000E+00	3.290E-13	4.850E-13
THYROID	4.480E-14	9.228E-13	9.228E-13	8.570E-16-1.000E+00	2.480E-13	7.320E-14
REMAINDER	4.170E-14	8.948E-13	8.948E-13	8.310E-16-1.000E+00	6.850E-12	6.700E-11
EFFECTIVE	4.480E-14	9.498E-13	9.498E-13	8.820E-16-1.000E+00	8.430E-12	2.130E-11
SKIN(FGR)	9.120E-14	8.475E-12	8.475E-12	7.870E-15-1.000E+00	0.000E+00	0.000E+00
Ne-19						
GONADS	4.810E-14	2.658E-14	2.658E-14	1.070E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	5.500E-14	2.534E-14	2.534E-14	1.020E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.770E-14	2.415E-14	2.415E-14	9.720E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.600E-14	2.437E-14	2.437E-14	9.810E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.490E-14	3.702E-14	3.702E-14	1.490E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.900E-14	2.534E-14	2.534E-14	1.020E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.560E-14	2.365E-14	2.365E-14	9.520E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.920E-14	2.534E-14	2.534E-14	1.020E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.210E-13	3.105E-13	3.105E-13	1.250E-14-1.000E+00	0.000E+00	0.000E+00
Ni-56						
GONADS	8.220E-14	4.917E-11	7.258E-10	1.740E-15-1.000E+00	7.870E-10	1.630E-09
BREAST	9.350E-14	4.691E-11	6.924E-10	1.660E-15-1.000E+00	4.210E-10	2.360E-10
LUNGS	8.170E-14	4.494E-11	6.632E-10	1.590E-15-1.000E+00	3.680E-09	7.860E-11
RED MARR	7.920E-14	4.578E-11	6.758E-10	1.620E-15-1.000E+00	4.810E-10	3.810E-10
BONE SUR	1.400E-13	6.924E-11	1.022E-09	2.450E-15-1.000E+00	3.350E-10	1.580E-10
THYROID	8.400E-14	4.607E-11	6.799E-10	1.630E-15-1.000E+00	3.270E-10	5.240E-11
REMAINDER	7.820E-14	4.437E-11	6.549E-10	1.570E-15-1.000E+00	1.040E-09	1.830E-09
EFFECTIVE	8.410E-14	4.691E-11	6.924E-10	1.660E-15-1.000E+00	1.090E-09	1.050E-09
SKIN(FGR)	9.610E-14	5.567E-11	8.218E-10	1.970E-15-1.000E+00	0.000E+00	0.000E+00
Ni-57						
GONADS	9.420E-14	4.992E-11	3.365E-10	1.870E-15-1.000E+00	3.330E-10	1.030E-09
BREAST	1.070E-13	4.779E-11	3.221E-10	1.790E-15-1.000E+00	1.020E-10	1.440E-10
LUNGS	9.510E-14	4.618E-11	3.113E-10	1.730E-15-1.000E+00	1.410E-09	3.680E-11
RED MARR	9.390E-14	4.752E-11	3.203E-10	1.780E-15-1.000E+00	1.240E-10	2.220E-10
BONE SUR	1.410E-13	6.487E-11	4.373E-10	2.430E-15-1.000E+00	7.040E-11	8.050E-11
THYROID	9.700E-14	4.538E-11	3.059E-10	1.700E-15-1.000E+00	5.160E-11	1.070E-11
REMAINDER	9.180E-14	4.618E-11	3.113E-10	1.730E-15-1.000E+00	7.480E-10	2.340E-09
EFFECTIVE	9.690E-14	4.805E-11	3.239E-10	1.800E-15-1.000E+00	5.110E-10	1.020E-09
SKIN(FGR)	1.170E-13	7.715E-11	5.201E-10	2.890E-15-1.000E+00	0.000E+00	0.000E+00

Ni-59						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.090E-10	3.830E-11
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.050E-10	3.580E-11
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.200E-09	3.500E-11
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.060E-10	3.660E-11
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.050E-10	3.620E-11
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.140E-10	3.900E-11
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.400E-10	1.030E-10
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.480E-10	5.670E-11
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E-00
Ni-63						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.470E-10	8.500E-11
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.470E-10	8.500E-11
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.070E-09	8.500E-11
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.470E-10	8.500E-11
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.470E-10	8.500E-11
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.470E-10	8.500E-11
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.670E-10	3.200E-10
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	6.220E-10	1.560E-10
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Ni-65						
GONADS	2.720E-14	6.227E-12	7.002E-12	5.350E-16-1.000E+00	3.270E-12	2.430E-11
BREAST	3.070E-14	5.947E-12	6.688E-12	5.110E-16-1.000E+00	2.950E-12	5.630E-12
LUNGS	2.740E-14	5.784E-12	6.505E-12	4.970E-16-1.000E+00	3.810E-10	2.750E-12
RED MARR	2.720E-14	5.947E-12	6.688E-12	5.110E-16-1.000E+00	2.990E-12	7.260E-12
BONE SUR	3.930E-14	7.949E-12	8.939E-12	6.830E-16-1.000E+00	2.380E-12	2.890E-12
THYROID	2.800E-14	5.668E-12	6.374E-12	4.870E-16-1.000E+00	2.300E-12	6.790E-13
REMAINDER	2.650E-14	5.773E-12	6.492E-12	4.960E-16-1.000E+00	4.150E-11	5.320E-10
EFFECTIVE	2.790E-14	5.994E-12	6.740E-12	5.150E-16-1.000E+00	5.990E-11	1.680E-10
SKIN(FGR)	7.180E-14	8.415E-11	9.463E-11	7.230E-15-1.000E+00	0.000E+00	0.000E+00
Ni-66						
GONADS	4.371E-15	2.484E-12	2.300E-11	9.205E-17-1.000E+00	4.300E-11	6.790E-11
BREAST	4.951E-15	2.376E-12	2.201E-11	8.805E-17-1.000E+00	2.970E-11	2.030E-11
LUNGS	4.350E-15	2.265E-12	2.097E-11	8.392E-17-1.000E+00	9.520E-09	1.460E-11
RED MARR	4.270E-15	2.316E-12	2.145E-11	8.582E-17-1.000E+00	3.090E-11	2.440E-11
BONE SUR	6.682E-15	3.322E-12	3.077E-11	1.231E-16-1.000E+00	2.770E-11	1.690E-11
THYROID	4.481E-15	2.319E-12	2.147E-11	8.593E-17-1.000E+00	2.750E-11	1.340E-11
REMAINDER	4.180E-15	2.251E-12	2.085E-11	8.342E-17-1.000E+00	3.610E-09	1.070E-08
EFFECTIVE	4.461E-15	2.370E-12	2.195E-11	8.783E-17-1.000E+00	2.250E-09	3.240E-09
SKIN(FGR)	7.791E-14	3.211E-10	2.974E-09	1.190E-14-1.000E+00	0.000E+00	0.000E-00
Np-232						
GONADS	5.680E-14	1.552E-12	1.552E-12	1.220E-15-1.000E+00	6.850E-11	3.330E-12
BREAST	6.470E-14	1.489E-12	1.489E-12	1.170E-15-1.000E+00	4.320E-13	1.190E-12
LUNGS	5.620E-14	1.400E-12	1.400E-12	1.100E-15-1.000E+00	2.060E-11	1.150E-12
RED MARR	5.430E-14	1.425E-12	1.425E-12	1.120E-15-1.000E+00	6.120E-10	6.250E-12
BONE SUR	9.950E-14	2.252E-12	2.252E-12	1.770E-15-1.000E+00	7.630E-09	6.300E-11
THYROID	5.790E-14	1.451E-12	1.451E-12	1.140E-15-1.000E+00	3.810E-13	1.040E-13
REMAINDER	5.370E-14	1.387E-12	1.387E-12	1.090E-15-1.000E+00	5.600E-11	2.110E-11
EFFECTIVE	5.800E-14	1.476E-12	1.476E-12	1.160E-15-1.000E+00	3.390E-10	1.010E-11
SKIN(FGR)	6.940E-14	2.125E-12	2.125E-12	1.670E-15-1.000E+00	0.000E+00	0.000E+00
Np-233						
GONADS	3.780E-15	2.729E-13	2.729E-13	8.710E-17-1.000E+00	5.850E-14	9.360E-13
BREAST	4.430E-15	2.704E-13	2.704E-13	8.630E-17-1.000E+00	9.080E-14	2.450E-13
LUNGS	3.540E-15	2.384E-13	2.385E-13	7.610E-17-1.000E+00	3.390E-12	1.750E-13
RED MARR	3.070E-15	2.250E-13	2.250E-13	7.180E-17-1.000E+00	2.610E-13	5.160E-13
BONE SUR	1.160E-14	7.206E-13	7.207E-13	2.300E-16-1.000E+00	1.570E-12	2.050E-13
THYROID	3.730E-15	2.444E-13	2.444E-13	7.800E-17-1.000E+00	6.100E-14	7.310E-15
REMAINDER	3.310E-15	2.319E-13	2.319E-13	7.400E-17-1.000E+00	2.380E-13	5.450E-12
EFFECTIVE	3.850E-15	2.629E-13	2.629E-13	8.390E-17-1.000E+00	5.870E-13	1.990E-12
SKIN(FGR)	4.780E-15	4.073E-13	4.074E-13	1.300E-16-1.000E+00	0.000E+00	0.000E-00
Np-234						
GONADS	7.060E-14	3.900E-11	5.093E-10	1.390E-15-1.000E+00	3.480E-10	8.420E-10
BREAST	8.000E-14	3.732E-11	4.873E-10	1.330E-15-1.000E+00	1.300E-10	1.110E-10

LUNGS	7.120E-14	3.591E-11	4.690E-10	1.280E-15-1.000E+00	1.590E-09	2.280E-11
RED MARR	7.040E-14	3.704E-11	4.836E-10	1.320E-15-1.000E+00	2.440E-10	1.860E-10
BONE SUR	1.050E-13	5.162E-11	6.742E-10	1.840E-15-1.000E+00	5.850E-10	6.890E-11
THYROID	7.270E-14	3.507E-11	4.580E-10	1.250E-15-1.000E+00	6.850E-11	3.790E-12
REMAINDER	6.890E-14	3.591E-11	4.690E-10	1.280E-15-1.000E+00	6.740E-10	1.630E-09
EFFECTIVE	7.260E-14	3.732E-11	4.873E-10	1.330E-15-1.000E+00	5.490E-10	7.430E-10
SKIN(FGR)	8.410E-14	5.696E-11	7.438E-10	2.030E-15-1.000E+00	0.000E+00	0.000E+00
Np-235						
GONADS	5.630E-17	1.704E-13	3.559E-12	5.920E-18-1.000E+00	1.490E-10	1.300E-11
BREAST	8.360E-17	2.142E-13	4.472E-12	7.440E-18-1.000E+00	1.710E-11	5.360E-13
LUNGS	3.470E-17	2.761E-14	5.765E-13	9.590E-19-1.000E+00	2.300E-09	1.050E-13
RED MARR	3.220E-17	3.772E-14	7.875E-13	1.310E-18-1.000E+00	1.680E-09	1.640E-11
BONE SUR	1.400E-16	1.857E-13	3.877E-12	6.450E-18-1.000E+00	1.670E-08	1.470E-10
THYROID	4.690E-17	5.442E-14	1.136E-12	1.890E-18-1.000E+00	3.130E-12	2.410E-14
REMAINDER	3.570E-17	5.096E-14	1.064E-12	1.770E-18-1.000E+00	3.460E-10	1.860E-10
EFFECTIVE	5.100E-17	1.051E-13	2.194E-12	3.650E-18-1.000E+00	1.120E-09	6.560E-11
SKIN(FGR)	1.820E-16	9.933E-13	2.074E-11	3.450E-17-1.000E+00	0.000E+00	0.000E+00
Np-236a						
GONADS	5.260E-15	3.744E-12	7.862E-11	1.300E-16-1.000E+00	6.290E-06	5.240E-08
BREAST	6.180E-15	3.802E-12	7.983E-11	1.320E-16-1.000E+00	9.830E-09	9.880E-11
LUNGS	4.910E-15	3.024E-12	6.350E-11	1.050E-16-1.000E+00	1.320E-07	9.290E-11
RED MARR	4.290E-15	2.880E-12	6.048E-11	1.000E-16-1.000E+00	5.120E-05	4.240E-07
BONE SUR	1.580E-14	8.957E-12	1.881E-10	3.110E-16-1.000E+00	6.390E-04	5.290E-06
THYROID	5.190E-15	3.139E-12	6.592E-11	1.090E-16-1.000E+00	6.290E-09	5.180E-11
REMAINDER	4.600E-15	2.966E-12	6.229E-11	1.030E-16-1.000E+00	3.990E-06	3.630E-08
EFFECTIVE	5.360E-15	3.456E-12	7.258E-11	1.200E-16-1.000E+00	2.810E-05	2.340E-07
SKIN(FGR)	9.170E-15	6.854E-12	1.439E-10	2.380E-16-1.000E+00	0.000E+00	0.000E+00
Np-236b						
GONADS	2.100E-15	1.251E-12	5.694E-12	4.900E-17-1.000E+00	4.050E-09	6.440E-11
BREAST	2.450E-15	1.241E-12	5.647E-12	4.860E-17-1.000E+00	3.930E-12	3.470E-12
LUNGS	1.970E-15	1.077E-12	4.904E-12	4.220E-17-1.000E+00	8.140E-09	5.660E-13
RED MARR	1.730E-15	1.024E-12	4.660E-12	4.010E-17-1.000E+00	3.870E-08	3.340E-10
BONE SUR	6.110E-15	3.114E-12	1.418E-11	1.220E-16-1.000E+00	4.830E-07	4.050E-09
THYROID	2.080E-15	1.110E-12	5.055E-12	4.350E-17-1.000E+00	2.000E-12	4.410E-14
REMAINDER	1.850E-15	1.052E-12	4.787E-12	4.120E-17-1.000E+00	4.040E-09	6.380E-10
EFFECTIVE	2.140E-15	1.192E-12	5.426E-12	4.670E-17-1.000E+00	2.230E-08	3.700E-10
SKIN(FGR)	5.760E-15	2.859E-12	1.301E-11	1.120E-16-1.000E+00	0.000E+00	0.000E+00
Np-237						
GONADS	1.040E-15	9.734E-13	2.044E-11	3.380E-17-1.000E+00	2.960E-05	2.460E-07
BREAST	1.260E-15	1.040E-12	2.183E-11	3.610E-17-1.000E+00	1.690E-08	1.450E-10
LUNGS	9.020E-16	6.278E-13	1.318E-11	2.180E-17-1.000E+00	1.610E-05	1.530E-10
RED MARR	7.690E-16	5.818E-13	1.222E-11	2.020E-17-1.000E+00	2.620E-04	2.180E-06
BONE SUR	3.200E-15	2.292E-12	4.814E-11	7.960E-17-1.000E+00	3.270E-03	2.720E-05
THYROID	9.940E-16	7.056E-13	1.482E-11	2.450E-17-1.000E+00	1.340E-08	1.100E-10
REMAINDER	8.500E-16	6.480E-13	1.361E-11	2.250E-17-1.000E+00	2.340E-05	2.100E-07
EFFECTIVE	1.030E-15	8.266E-13	1.736E-11	2.870E-17-1.000E+00	1.460E-04	1.200E-06
SKIN(FGR)	1.540E-15	2.408E-12	5.056E-11	8.360E-17-1.000E+00	0.000E+00	0.000E+00
Np-238						
GONADS	2.660E-14	1.514E-11	1.317E-10	5.550E-16-1.000E+00	1.990E-09	3.890E-10
BREAST	3.020E-14	1.449E-11	1.260E-10	5.310E-16-1.000E+00	4.180E-11	4.810E-11
LUNGS	2.650E-14	1.375E-11	1.196E-10	5.040E-16-1.000E+00	3.470E-09	1.020E-11
RED MARR	2.610E-14	1.416E-11	1.231E-10	5.190E-16-1.000E+00	1.690E-08	2.170E-10
BONE SUR	3.990E-14	1.951E-11	1.696E-10	7.150E-16-1.000E+00	2.100E-07	1.770E-09
THYROID	2.730E-14	1.413E-11	1.229E-10	5.180E-16-1.000E+00	2.450E-11	1.500E-12
REMAINDER	2.550E-14	1.372E-11	1.193E-10	5.030E-16-1.000E+00	2.550E-09	2.970E-09
EFFECTIVE	2.720E-14	1.443E-11	1.255E-10	5.290E-16-1.000E+00	1.000E-08	1.080E-09
SKIN(FGR)	4.310E-14	6.739E-11	5.859E-10	2.470E-15-1.000E+00	0.000E+00	0.000E+00
Np-239						
GONADS	7.530E-15	4.691E-12	4.380E-11	1.710E-16-1.000E+00	7.450E-11	1.620E-10
BREAST	8.730E-15	4.636E-12	4.329E-11	1.690E-16-1.000E+00	1.630E-11	1.720E-11
LUNGS	7.180E-15	4.115E-12	3.842E-11	1.500E-16-1.000E+00	2.360E-09	2.400E-12
RED MARR	6.500E-15	4.005E-12	3.740E-11	1.460E-16-1.000E+00	2.080E-10	4.660E-11
BONE SUR	2.000E-14	1.001E-11	9.349E-11	3.650E-16-1.000E+00	2.030E-09	3.590E-11

THYROID	7.520E-15	4.197E-12	3.919E-11	1.530E-16-1.000E+00	7.620E-12	2.070E-13
REMAINDER	6.760E-15	4.005E-12	3.740E-11	1.460E-16-1.000E+00	9.590E-10	2.770E-09
EFFECTIVE	7.690E-15	4.471E-12	4.175E-11	1.630E-16-1.000E+00	6.780E-10	8.820E-10
SKIN(FGR)	1.600E-14	7.215E-12	6.737E-11	2.630E-16-1.000E+00	0.000E+00	0.000E+00
Np-240						
GONADS	6.180E-14	7.438E-12	7.483E-12	1.330E-15-1.000E+00	2.280E-12	2.500E-11
BREAST	7.040E-14	7.159E-12	7.202E-12	1.280E-15-1.000E+00	2.260E-12	5.720E-12
LUNGS	6.120E-14	6.711E-12	6.752E-12	1.200E-15-1.000E+00	1.260E-10	3.490E-12
RED MARR	5.940E-14	6.823E-12	6.864E-12	1.220E-15-1.000E+00	8.150E-12	7.740E-12
BONE SUR	1.050E-13	1.046E-11	1.052E-11	1.870E-15-1.000E+00	6.990E-11	3.440E-12
THYROID	6.310E-14	6.991E-12	7.033E-12	1.250E-15-1.000E+00	1.980E-12	3.460E-13
REMAINDER	5.860E-14	6.655E-12	6.696E-12	1.190E-15-1.000E+00	9.300E-12	1.850E-10
EFFECTIVE	6.310E-14	7.103E-12	7.146E-12	1.270E-15-1.000E+00	2.200E-11	6.400E-11
SKIN(FGR)	9.150E-14	1.745E-11	1.755E-11	3.120E-15-1.000E+00	0.000E+00	0.000E+00
Np-240m						
GONADS	1.580E-14	2.216E-13	2.216E-13	3.460E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	1.800E-14	2.139E-13	2.139E-13	3.340E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.570E-14	1.986E-13	1.986E-13	3.100E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.530E-14	2.024E-13	2.024E-13	3.160E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.610E-14	2.985E-13	2.985E-13	4.660E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	1.620E-14	2.056E-13	2.056E-13	3.210E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.510E-14	1.960E-13	1.960E-13	3.060E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.620E-14	2.095E-13	2.095E-13	3.270E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.930E-14	4.766E-12	4.766E-12	7.440E-15-1.000E+00	0.000E+00	0.000E+00
O-15						
GONADS	4.790E-14	1.869E-13	1.869E-13	1.060E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	5.480E-14	1.799E-13	1.799E-13	1.020E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.760E-14	1.709E-13	1.709E-13	9.690E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.590E-14	1.725E-13	1.725E-13	9.780E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.460E-14	2.610E-13	2.610E-13	1.480E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.880E-14	1.781E-13	1.781E-13	1.010E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.540E-14	1.674E-13	1.674E-13	9.490E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.910E-14	1.781E-13	1.781E-13	1.010E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.040E-13	1.764E-12	1.764E-12	1.000E-14-1.000E+00	0.000E+00	0.000E+00
Os-180						
GONADS	2.340E-15	1.205E-13	1.205E-13	6.330E-17-1.000E+00	1.740E-13	5.920E-12
BREAST	2.800E-15	1.215E-13	1.215E-13	6.380E-17-1.000E+00	6.060E-13	1.900E-12
LUNGS	2.020E-15	1.007E-13	1.007E-13	5.290E-17-1.000E+00	2.500E-11	1.610E-12
RED MARR	1.650E-15	8.589E-14	8.589E-14	4.510E-17-1.000E+00	6.520E-13	2.270E-12
BONE SUR	7.320E-15	3.866E-13	3.866E-13	2.030E-16-1.000E+00	5.060E-13	9.610E-13
THYROID	2.220E-15	1.032E-13	1.032E-13	5.420E-17-1.000E+00	5.390E-13	1.450E-13
REMAINDER	1.890E-15	9.750E-14	9.750E-14	5.120E-17-1.000E+00	1.630E-12	3.980E-11
EFFECTIVE	2.300E-15	1.146E-13	1.146E-13	6.020E-17-1.000E+00	3.730E-12	1.420E-11
SKIN(FGR)	3.190E-15	2.228E-13	2.228E-13	1.170E-16-1.000E+00	0.000E+00	0.000E+00
Os-181						
GONADS	5.820E-14	1.062E-11	1.109E-11	1.220E-15-1.000E+00	1.440E-11	7.800E-11
BREAST	6.630E-14	1.019E-11	1.063E-11	1.170E-15-1.000E+00	5.660E-12	1.290E-11
LUNGS	5.760E-14	9.752E-12	1.018E-11	1.120E-15-1.000E+00	1.370E-10	5.130E-12
RED MARR	5.580E-14	9.752E-12	1.018E-11	1.120E-15-1.000E+00	7.680E-12	2.180E-11
BONE SUR	1.010E-13	1.611E-11	1.681E-11	1.850E-15-1.000E+00	4.440E-12	7.520E-12
THYROID	5.940E-14	9.839E-12	1.027E-11	1.130E-15-1.000E+00	3.180E-12	6.210E-13
REMAINDER	5.520E-14	9.577E-12	9.998E-12	1.100E-15-1.000E+00	4.710E-11	2.460E-10
EFFECTIVE	5.940E-14	1.019E-11	1.063E-11	1.170E-15-1.000E+00	3.620E-11	9.860E-11
SKIN(FGR)	7.030E-14	1.463E-11	1.527E-11	1.680E-15-1.000E+00	0.000E+00	0.000E+00
Os-182						
GONADS	1.970E-14	1.130E-11	5.048E-11	4.440E-16-1.000E+00	2.630E-10	6.750E-10
BREAST	2.270E-14	1.095E-11	4.889E-11	4.300E-16-1.000E+00	6.010E-11	8.090E-11
LUNGS	1.910E-14	1.023E-11	4.570E-11	4.020E-16-1.000E+00	8.700E-10	1.470E-11
RED MARR	1.790E-14	1.006E-11	4.491E-11	3.950E-16-1.000E+00	9.500E-11	1.650E-10
BONE SUR	4.180E-14	2.042E-11	9.118E-11	8.020E-16-1.000E+00	4.550E-11	5.400E-11
THYROID	1.990E-14	1.056E-11	4.718E-11	4.150E-16-1.000E+00	2.430E-11	2.820E-12
REMAINDER	1.820E-14	9.954E-12	4.445E-11	3.910E-16-1.000E+00	6.010E-10	1.520E-09
EFFECTIVE	2.010E-14	1.082E-11	4.832E-11	4.250E-16-1.000E+00	3.730E-10	6.590E-10

SKIN(FGR)	2.460E-14	1.497E-11	6.685E-11	5.880E-16	-1.000E+00	0.000E+00	0.000E+00
Os-185							
GONADS	3.360E-14	2.123E-11	4.350E-10	7.380E-16	-1.000E+00	5.200E-10	8.350E-10
BREAST	3.840E-14	2.037E-11	4.173E-10	7.080E-16	-1.000E+00	9.110E-10	1.250E-10
LUNGS	3.320E-14	1.933E-11	3.961E-10	6.720E-16	-1.000E+00	1.430E-08	5.240E-11
RED MARR	3.200E-14	1.942E-11	3.979E-10	6.750E-16	-1.000E+00	9.850E-10	2.160E-10
BONE SUR	5.820E-14	3.164E-11	6.484E-10	1.100E-15	-1.000E+00	7.450E-10	8.910E-11
THYROID	3.420E-14	2.011E-11	4.120E-10	6.990E-16	-1.000E+00	7.860E-10	2.650E-11
REMAINDER	3.170E-14	1.893E-11	3.879E-10	6.580E-16	-1.000E+00	1.790E-09	1.160E-09
EFFECTIVE	3.430E-14	2.025E-11	4.150E-10	7.040E-16	-1.000E+00	2.680E-09	6.110E-10
SKIN(FGR)	4.010E-14	2.733E-11	5.600E-10	9.500E-16	-1.000E+00	0.000E+00	0.000E+00
Os-189m							
GONADS	8.320E-20	7.763E-16	1.287E-15	4.130E-20	-1.000E+00	3.500E-14	1.690E-13
BREAST	4.530E-19	1.861E-15	3.085E-15	9.900E-20	-1.000E+00	1.760E-14	1.290E-14
LUNGS	1.280E-21	4.323E-18	7.167E-18	2.300E-22	-1.000E+00	4.160E-11	1.060E-14
RED MARR	2.060E-20	6.804E-17	1.128E-16	3.620E-21	-1.000E+00	9.070E-15	1.570E-14
BONE SUR	1.120E-19	4.116E-16	6.825E-16	2.190E-20	-1.000E+00	8.380E-15	1.180E-14
THYROID	1.210E-20	1.235E-16	2.047E-16	6.570E-21	-1.000E+00	8.150E-15	1.070E-14
REMAINDER	3.690E-20	3.007E-16	4.986E-16	1.600E-20	-1.000E+00	1.020E-11	6.020E-11
EFFECTIVE	1.060E-19	5.883E-16	9.754E-16	3.130E-20	-1.000E+00	8.070E-12	1.810E-11
SKIN(FGR)	7.160E-18	5.733E-14	9.504E-14	3.050E-18	-1.000E+00	0.000E+00	0.000E+00
Os-190m							
GONADS	7.430E-14	1.405E-12	1.405E-12	1.640E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	8.500E-14	1.345E-12	1.345E-12	1.570E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	7.350E-14	1.277E-12	1.277E-12	1.490E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	7.050E-14	1.285E-12	1.285E-12	1.500E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.370E-13	2.048E-12	2.048E-12	2.390E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	7.560E-14	1.328E-12	1.328E-12	1.550E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	7.010E-14	1.251E-12	1.251E-12	1.460E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	7.600E-14	1.337E-12	1.337E-12	1.560E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	9.120E-14	1.722E-12	1.722E-12	2.010E-15	-1.000E+00	0.000E+00	0.000E+00
Os-191							
GONADS	3.200E-15	2.138E-12	3.881E-11	7.480E-17	-1.000E+00	5.710E-11	1.180E-10
BREAST	3.770E-15	2.118E-12	3.844E-11	7.410E-17	-1.000E+00	2.960E-11	1.510E-11
LUNGS	2.890E-15	1.938E-12	3.517E-11	6.780E-17	-1.000E+00	6.850E-09	5.060E-12
RED MARR	2.410E-15	1.727E-12	3.133E-11	6.040E-17	-1.000E+00	6.100E-11	4.820E-11
BONE SUR	1.030E-14	6.717E-12	1.219E-10	2.350E-16	-1.000E+00	3.930E-11	1.720E-11
THYROID	3.100E-15	1.941E-12	3.523E-11	6.790E-17	-1.000E+00	1.430E-11	3.400E-12
REMAINDER	2.690E-15	1.855E-12	3.367E-11	6.490E-17	-1.000E+00	9.190E-10	1.950E-09
EFFECTIVE	3.210E-15	2.110E-12	3.829E-11	7.380E-17	-1.000E+00	1.130E-09	6.230E-10
SKIN(FGR)	4.350E-15	2.824E-12	5.126E-11	9.880E-17	-1.000E+00	0.000E+00	0.000E+00
Os-191m							
GONADS	2.810E-16	1.712E-13	4.940E-13	7.300E-18	-1.000E+00	2.730E-12	6.700E-12
BREAST	3.370E-16	1.733E-13	5.000E-13	7.390E-18	-1.000E+00	1.260E-12	8.260E-13
LUNGS	2.380E-16	1.506E-13	4.344E-13	6.420E-18	-1.000E+00	4.180E-10	2.680E-13
RED MARR	1.860E-16	1.243E-13	3.586E-13	5.300E-18	-1.000E+00	2.640E-12	2.770E-12
BONE SUR	9.730E-16	6.310E-13	1.820E-12	2.690E-17	-1.000E+00	1.650E-12	9.520E-13
THYROID	2.630E-16	1.501E-13	4.331E-13	6.400E-18	-1.000E+00	5.840E-13	1.790E-13
REMAINDER	2.210E-16	1.445E-13	4.168E-13	6.160E-18	-1.000E+00	1.020E-10	3.380E-10
EFFECTIVE	2.750E-16	1.686E-13	4.865E-13	7.190E-18	-1.000E+00	8.200E-11	1.040E-10
SKIN(FGR)	3.670E-16	3.073E-13	8.864E-13	1.310E-17	-1.000E+00	0.000E+00	0.000E-00
Os-193							
GONADS	3.340E-15	1.977E-12	1.148E-11	7.520E-17	-1.000E+00	1.810E-11	5.160E-11
BREAST	3.850E-15	1.922E-12	1.115E-11	7.310E-17	-1.000E+00	4.510E-12	6.620E-12
LUNGS	3.220E-15	1.796E-12	1.042E-11	6.830E-17	-1.000E+00	2.000E-09	1.760E-12
RED MARR	2.990E-15	1.751E-12	1.016E-11	6.660E-17	-1.000E+00	7.700E-12	1.460E-11
BONE SUR	7.450E-15	3.813E-12	2.213E-11	1.450E-16	-1.000E+00	4.000E-12	5.140E-12
THYROID	3.350E-15	1.846E-12	1.071E-11	7.020E-17	-1.000E+00	2.040E-12	8.760E-13
REMAINDER	3.050E-15	1.743E-12	1.012E-11	6.630E-17	-1.000E+00	9.820E-10	2.870E-09
EFFECTIVE	3.400E-15	1.901E-12	1.103E-11	7.230E-17	-1.000E+00	5.410E-10	8.770E-10
SKIN(FGR)	2.440E-14	7.389E-11	4.288E-10	2.810E-15	-1.000E+00	0.000E+00	0.000E+00
Os-194							
GONADS	3.080E-17	3.801E-14	7.975E-13	1.320E-18	-1.000E+00	9.360E-10	2.750E-10

BREAST	3.970E-17	4.089E-14	8.579E-13	1.420E-18-1.000E+00	1.530E-09	2.160E-10
LUNGS	2.060E-17	2.488E-14	5.220E-13	8.640E-19-1.000E+00	1.470E-06	2.120E-10
RED MARR	1.490E-17	1.797E-14	3.770E-13	6.240E-19-1.000E+00	1.560E-09	2.250E-10
BONE SUR	9.430E-17	1.218E-13	2.555E-12	4.230E-18-1.000E+00	1.390E-09	2.140E-10
THYROID	2.700E-17	2.834E-14	5.945E-13	9.840E-19-1.000E+00	1.370E-09	2.070E-10
REMAINDER	1.980E-17	2.485E-14	5.214E-13	8.630E-19-1.000E+00	1.300E-08	9.240E-09
EFFECTIVE	2.750E-17	3.283E-14	6.887E-13	1.140E-18-1.000E+00	1.810E-07	2.940E-09
SKIN(FGR)	5.220E-17	1.325E-13	2.779E-12	4.600E-18-1.000E+00	0.000E+00	0.000E+00
P-30						
GONADS	4.830E-14	2.315E-13	2.315E-13	1.070E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	5.530E-14	2.228E-13	2.228E-13	1.030E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.800E-14	2.113E-13	2.113E-13	9.770E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.620E-14	2.135E-13	2.135E-13	9.870E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.530E-14	3.245E-13	3.245E-13	1.500E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.920E-14	2.206E-13	2.206E-13	1.020E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.580E-14	2.070E-13	2.070E-13	9.570E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.940E-14	2.206E-13	2.206E-13	1.020E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.560E-13	3.396E-12	3.396E-12	1.570E-14-1.000E+00	0.000E+00	0.000E+00
P-32						
GONADS	9.890E-17	9.085E-14	1.631E-12	3.180E-18-1.000E+00	4.830E-10	6.550E-10
BREAST	1.160E-16	9.113E-14	1.636E-12	3.190E-18-1.000E+00	4.830E-10	6.550E-10
LUNGS	9.080E-17	7.256E-14	1.303E-12	2.540E-18-1.000E+00	2.500E-09	6.550E-10
RED MARR	8.190E-17	6.856E-14	1.231E-12	2.400E-18-1.000E+00	5.970E-09	8.090E-09
BONE SUR	2.480E-16	1.971E-13	3.538E-12	6.900E-18-1.000E+00	5.810E-09	7.870E-09
THYROID	9.730E-17	7.742E-14	1.390E-12	2.710E-18-1.000E+00	4.830E-10	6.550E-10
REMAINDER	8.600E-17	7.171E-14	1.287E-12	2.510E-18-1.000E+00	7.940E-10	2.670E-09
EFFECTIVE	9.900E-17	8.313E-14	1.492E-12	2.910E-18-1.000E+00	1.640E-09	2.370E-09
SKIN(FGR)	4.490E-14	2.360E-10	4.236E-09	8.260E-15-1.000E+00	0.000E+00	0.000E+00
P-33						
GONADS	9.020E-19	1.646E-15	3.160E-14	5.740E-20-1.000E+00	6.960E-11	9.370E-11
BREAST	1.170E-18	1.809E-15	3.474E-14	6.310E-20-1.000E+00	6.960E-11	9.370E-11
LUNGS	6.300E-19	8.113E-16	1.558E-14	2.830E-20-1.000E+00	2.960E-10	9.370E-11
RED MARR	5.060E-19	6.823E-16	1.310E-14	2.380E-20-1.000E+00	3.710E-10	4.990E-10
BONE SUR	2.640E-18	3.870E-15	7.432E-14	1.350E-19-1.000E+00	9.840E-10	1.320E-09
THYROID	8.010E-19	1.046E-15	2.009E-14	3.650E-20-1.000E+00	6.960E-11	9.370E-11
REMAINDER	6.110E-19	8.916E-16	1.712E-14	3.110E-20-1.000E+00	1.050E-10	3.220E-10
EFFECTIVE	8.230E-19	1.279E-15	2.455E-14	4.460E-20-1.000E+00	1.710E-10	2.480E-10
SKIN(FGR)	1.380E-15	4.530E-15	8.699E-14	1.580E-19-1.000E+00	0.000E+00	0.000E+00
Pa-227						
GONADS	1.019E-15	8.323E-14	8.325E-14	2.511E-17-1.000E+00	4.820E-14	8.230E-13
BREAST	1.201E-15	8.493E-14	8.494E-14	2.562E-17-1.000E+00	9.110E-14	2.010E-13
LUNGS	9.329E-16	6.981E-14	6.982E-14	2.106E-17-1.000E+00	1.100E-07	1.340E-13
RED MARR	7.952E-16	6.439E-14	6.440E-14	1.943E-17-1.000E+00	2.700E-11	4.090E-12
BONE SUR	3.194E-15	2.297E-13	2.298E-13	6.931E-17-1.000E+00	4.090E-10	4.920E-11
THYROID	9.936E-16	7.122E-14	7.124E-14	2.149E-17-1.000E+00	5.630E-14	8.110E-15
REMAINDER	8.724E-16	6.815E-14	6.816E-14	2.056E-17-1.000E+00	4.670E-11	1.180E-09
EFFECTIVE	1.030E-15	7.909E-14	7.911E-14	2.386E-17-1.000E+00	1.320E-08	3.550E-10
SKIN(FGR)	1.339E-15	1.680E-13	1.680E-13	5.067E-17-1.000E+00	0.000E+00	0.000E+00
Pa-228						
GONADS	5.410E-14	2.902E-11	1.296E-10	1.140E-15-1.000E+00	1.790E-10	5.560E-10
BREAST	6.160E-14	2.775E-11	1.239E-10	1.090E-15-1.000E+00	5.340E-11	7.220E-11
LUNGS	5.380E-14	2.622E-11	1.171E-10	1.030E-15-1.000E+00	9.310E-07	1.580E-11
RED MARR	5.230E-14	2.673E-11	1.194E-10	1.050E-15-1.000E+00	1.500E-08	8.920E-10
BONE SUR	9.140E-14	4.175E-11	1.864E-10	1.640E-15-1.000E+00	1.860E-07	9.590E-09
THYROID	5.530E-14	2.673E-11	1.194E-10	1.050E-15-1.000E+00	2.740E-11	2.080E-12
REMAINDER	5.150E-14	2.597E-11	1.160E-10	1.020E-15-1.000E+00	1.000E-09	1.960E-09
EFFECTIVE	5.540E-14	2.775E-11	1.239E-10	1.090E-15-1.000E+00	1.190E-07	1.130E-09
SKIN(FGR)	6.560E-14	3.946E-11	1.762E-10	1.550E-15-1.000E+00	0.000E+00	0.000E+00
Pa-230						
GONADS	3.070E-14	1.877E-11	3.462E-10	6.560E-16-1.000E+00	3.340E-10	6.750E-10
BREAST	3.500E-14	1.802E-11	3.325E-10	6.300E-16-1.000E+00	1.960E-10	8.060E-11
LUNGS	3.040E-14	1.702E-11	3.140E-10	5.950E-16-1.000E+00	3.250E-06	1.420E-11
RED MARR	2.940E-14	1.728E-11	3.188E-10	6.040E-16-1.000E+00	1.510E-08	1.780E-09

BONE SUR	5.270E-14	2.747E-11	5.067E-10	9.600E-16-1.000E+00	1.860E-07	2.050E-08
THYROID	3.130E-14	1.759E-11	3.246E-10	6.150E-16-1.000E+00	1.530E-10	2.060E-12
REMAINDER	2.900E-14	1.682E-11	3.103E-10	5.880E-16-1.000E+00	2.490E-09	2.230E-09
EFFECTIVE	3.130E-14	1.791E-11	3.304E-10	6.260E-16-1.000E+00	3.980E-07	1.680E-09
SKIN(FGR)	3.730E-14	2.443E-11	4.507E-10	8.540E-16-1.000E+00	0.000E+00	0.000E+00
Pa-231						
GONADS	1.710E-15	1.339E-12	2.812E-11	4.650E-17-1.000E+00	3.060E-09	1.210E-10
BREAST	1.990E-15	1.391E-12	2.921E-11	4.830E-17-1.000E+00	5.650E-09	7.810E-11
LUNGS	1.620E-15	9.821E-13	2.062E-11	3.410E-17-1.000E+00	7.470E-04	6.800E-11
RED MARR	1.520E-15	9.907E-13	2.081E-11	3.440E-17-1.000E+00	2.880E-04	5.780E-06
BONE SUR	3.640E-15	2.062E-12	4.330E-11	7.160E-17-1.000E+00	3.600E-03	7.220E-05
THYROID	1.700E-15	1.063E-12	2.232E-11	3.690E-17-1.000E+00	4.450E-09	6.330E-11
REMAINDER	1.540E-15	9.994E-13	2.099E-11	3.470E-17-1.000E+00	2.120E-07	1.710E-08
EFFECTIVE	1.720E-15	1.172E-12	2.462E-11	4.070E-17-1.000E+00	2.320E-04	2.860E-06
SKIN(FGR)	2.440E-15	3.082E-12	6.471E-11	1.070E-16-1.000E+00	0.000E+00	0.000E+00
Pa-232						
GONADS	4.470E-14	2.511E-11	1.515E-10	9.510E-16-1.000E+00	1.920E-10	5.440E-10
BREAST	5.080E-14	2.405E-11	1.451E-10	9.110E-16-1.000E+00	4.860E-11	6.950E-11
LUNGS	4.440E-14	2.281E-11	1.376E-10	8.640E-16-1.000E+00	7.470E-08	1.460E-11
RED MARR	4.340E-14	2.331E-11	1.406E-10	8.830E-16-1.000E+00	1.940E-08	5.190E-10
BONE SUR	7.190E-14	3.380E-11	2.039E-10	1.280E-15-1.000E+00	2.410E-07	5.110E-09
THYROID	4.570E-14	2.360E-11	1.424E-10	8.940E-16-1.000E+00	2.440E-11	1.970E-12
REMAINDER	4.260E-14	2.260E-11	1.363E-10	8.560E-16-1.000E+00	7.120E-10	2.000E-09
EFFECTIVE	4.560E-14	2.392E-11	1.443E-10	9.060E-16-1.000E+00	1.880E-08	9.650E-10
SKIN(FGR)	5.570E-14	3.327E-11	2.007E-10	1.260E-15-1.000E+00	0.000E+00	0.000E+00
Pa-233						
GONADS	9.160E-15	5.879E-12	1.135E-10	2.050E-16-1.000E+00	1.290E-10	2.580E-10
BREAST	1.050E-14	5.764E-12	1.113E-10	2.010E-16-1.000E+00	9.200E-11	2.710E-11
LUNGS	8.880E-15	5.248E-12	1.013E-10	1.830E-16-1.000E+00	1.700E-08	3.700E-12
RED MARR	8.270E-15	5.219E-12	1.007E-10	1.820E-16-1.000E+00	1.860E-10	6.890E-11
BONE SUR	2.080E-14	1.050E-11	2.026E-10	3.660E-16-1.000E+00	8.280E-10	1.020E-10
THYROID	9.210E-15	5.391E-12	1.041E-10	1.880E-16-1.000E+00	5.620E-11	4.810E-13
REMAINDER	8.420E-15	5.104E-12	9.854E-11	1.780E-16-1.000E+00	1.480E-09	3.000E-09
EFFECTIVE	9.350E-15	5.592E-12	1.079E-10	1.950E-16-1.000E+00	2.580E-09	9.810E-10
SKIN(FGR)	1.660E-14	7.743E-12	1.495E-10	2.700E-16-1.000E+00	0.000E+00	0.000E+00
Pa-234						
GONADS	9.140E-14	3.781E-11	6.716E-11	1.930E-15-1.000E+00	6.130E-11	3.300E-10
BREAST	1.040E-13	3.624E-11	6.438E-11	1.850E-15-1.000E+00	2.190E-11	4.990E-11
LUNGS	9.090E-14	3.448E-11	6.124E-11	1.760E-15-1.000E+00	8.970E-10	1.510E-11
RED MARR	8.860E-14	3.506E-11	6.229E-11	1.790E-15-1.000E+00	2.740E-11	7.860E-11
BONE SUR	1.500E-13	5.250E-11	9.326E-11	2.680E-15-1.000E+00	2.060E-11	2.740E-11
THYROID	9.350E-14	3.526E-11	6.264E-11	1.800E-15-1.000E+00	1.230E-11	1.860E-12
REMAINDER	8.710E-14	3.408E-11	6.055E-11	1.740E-15-1.000E+00	2.980E-10	1.610E-09
EFFECTIVE	9.340E-14	3.604E-11	6.403E-11	1.840E-15-1.000E+00	2.200E-10	5.840E-10
SKIN(FGR)	1.240E-13	7.620E-11	1.354E-10	3.890E-15-1.000E+00	0.000E+00	0.000E+00
Pa-234m						
GONADS	7.050E-16	1.631E-15	1.631E-15	1.610E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	8.050E-16	1.580E-15	1.580E-15	1.560E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	6.940E-16	1.448E-15	1.448E-15	1.430E-17-1.000E+00	0.000E+00	0.000E+00
RED MARR	6.700E-16	1.458E-15	1.458E-15	1.440E-17-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.240E-15	2.552E-15	2.552E-15	2.520E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	7.180E-16	1.489E-15	1.489E-15	1.470E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	6.640E-16	1.428E-15	1.428E-15	1.410E-17-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	7.190E-16	1.550E-15	1.550E-15	1.530E-17-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.480E-14	9.510E-13	9.510E-13	9.390E-15-1.000E+00	0.000E+00	0.000E+00
Pb-195m						
GONADS	7.510E-14	2.229E-12	2.229E-12	1.630E-15-1.000E+00	2.260E-12	1.120E-11
BREAST	8.580E-14	2.134E-12	2.134E-12	1.560E-15-1.000E+00	1.900E-12	3.290E-12
LUNGS	7.430E-14	2.038E-12	2.038E-12	1.490E-15-1.000E+00	3.610E-11	2.490E-12
RED MARR	7.150E-14	2.052E-12	2.052E-12	1.500E-15-1.000E+00	2.950E-12	4.500E-12
BONE SUR	1.340E-13	3.282E-12	3.282E-12	2.400E-15-1.000E+00	8.310E-12	4.430E-12
THYROID	7.650E-14	2.093E-12	2.093E-12	1.530E-15-1.000E+00	1.450E-12	3.640E-13
REMAINDER	7.090E-14	1.983E-12	1.983E-12	1.450E-15-1.000E+00	8.470E-12	6.730E-11

EFFECTIVE	7.680E-14	2.120E-12	2.120E-12	1.550E-15-1.000E+00	8.370E-12	2.450E-11
SKIN(FGR)	9.970E-14	4.253E-12	4.253E-12	3.110E-15-1.000E+00	0.000E+00	0.000E+00
Pb-198						
GONADS	2.000E-14	4.952E-12	5.497E-12	4.410E-16-1.000E+00	9.990E-12	3.390E-11
BREAST	2.300E-14	4.817E-12	5.347E-12	4.290E-16-1.000E+00	7.360E-12	7.210E-12
LUNGS	1.940E-14	4.514E-12	5.011E-12	4.020E-16-1.000E+00	5.570E-11	4.380E-12
RED MARR	1.810E-14	4.446E-12	4.936E-12	3.960E-16-1.000E+00	1.660E-11	1.490E-11
BONE SUR	4.420E-14	9.252E-12	1.027E-11	8.240E-16-1.000E+00	2.790E-11	1.300E-11
THYROID	2.010E-14	4.615E-12	5.123E-12	4.110E-16-1.000E+00	4.810E-12	1.650E-12
REMAINDER	1.840E-14	4.390E-12	4.874E-12	3.910E-16-1.000E+00	2.520E-11	1.070E-10
EFFECTIVE	2.040E-14	4.772E-12	5.298E-12	4.250E-16-1.000E+00	2.080E-11	4.430E-11
SKIN(FGR)	2.660E-14	6.366E-12	7.068E-12	5.670E-16-1.000E+00	0.000E+00	0.000E+00
Pb-199						
GONADS	7.130E-14	1.102E-11	1.130E-11	1.450E-15-1.000E+00	9.890E-12	4.930E-11
BREAST	8.100E-14	1.056E-11	1.083E-11	1.390E-15-1.000E+00	6.210E-12	1.060E-11
LUNGS	7.130E-14	1.018E-11	1.044E-11	1.340E-15-1.000E+00	5.790E-11	5.780E-12
RED MARR	6.960E-14	1.033E-11	1.060E-11	1.360E-15-1.000E+00	9.990E-12	1.690E-11
BONE SUR	1.160E-13	1.565E-11	1.605E-11	2.060E-15-1.000E+00	1.970E-11	1.230E-11
THYROID	7.310E-14	1.010E-11	1.036E-11	1.330E-15-1.000E+00	4.350E-12	1.290E-12
REMAINDER	6.850E-14	1.003E-11	1.028E-11	1.320E-15-1.000E+00	2.470E-11	1.430E-10
EFFECTIVE	7.310E-14	1.056E-11	1.083E-11	1.390E-15-1.000E+00	1.970E-11	6.010E-11
SKIN(FGR)	8.550E-14	1.360E-11	1.395E-11	1.790E-15-1.000E+00	0.000E+00	0.000E+00
Pb-200						
GONADS	9.070E-15	5.153E-12	2.257E-11	2.030E-16-1.000E+00	1.080E-10	4.140E-10
BREAST	1.050E-14	5.052E-12	2.212E-11	1.990E-16-1.000E+00	6.390E-11	6.620E-11
LUNGS	8.510E-15	4.696E-12	2.057E-11	1.850E-16-1.000E+00	3.400E-10	3.230E-11
RED MARR	7.520E-15	4.443E-12	1.945E-11	1.750E-16-1.000E+00	2.020E-10	1.740E-10
BONE SUR	2.530E-14	1.297E-11	5.681E-11	5.110E-16-1.000E+00	7.660E-10	3.600E-10
THYROID	8.960E-15	4.722E-12	2.068E-11	1.860E-16-1.000E+00	4.280E-11	1.700E-11
REMAINDER	7.990E-15	4.519E-12	1.979E-11	1.780E-16-1.000E+00	2.950E-10	1.060E-09
EFFECTIVE	9.200E-15	5.026E-12	2.201E-11	1.980E-16-1.000E+00	2.140E-10	4.670E-10
SKIN(FGR)	1.310E-14	6.727E-12	2.946E-11	2.650E-16-1.000E+00	0.000E+00	0.000E+00
Pb-201						
GONADS	3.550E-14	1.664E-11	3.735E-11	7.650E-16-1.000E+00	3.850E-11	1.840E-10
BREAST	4.060E-14	1.606E-11	3.603E-11	7.380E-16-1.000E+00	1.960E-11	2.930E-11
LUNGS	3.500E-14	1.521E-11	3.413E-11	6.990E-16-1.000E+00	1.460E-10	1.210E-11
RED MARR	3.340E-14	1.527E-11	3.427E-11	7.020E-16-1.000E+00	5.630E-11	6.550E-11
BONE SUR	6.680E-14	2.632E-11	5.907E-11	1.210E-15-1.000E+00	2.100E-10	1.010E-10
THYROID	3.610E-14	1.558E-11	3.496E-11	7.160E-16-1.000E+00	1.330E-11	4.890E-12
REMAINDER	3.330E-14	1.488E-11	3.339E-11	6.840E-16-1.000E+00	9.110E-11	4.320E-10
EFFECTIVE	3.630E-14	1.595E-11	3.579E-11	7.330E-16-1.000E+00	7.090E-11	1.920E-10
SKIN(FGR)	4.430E-14	2.117E-11	4.750E-11	9.730E-16-1.000E+00	0.000E+00	0.000E+00
Pb-202						
GONADS	3.860E-19	5.386E-15	1.131E-13	1.870E-19-1.000E+00	1.450E-08	5.760E-09
BREAST	1.880E-18	1.192E-14	2.504E-13	4.140E-19-1.000E+00	1.630E-08	6.450E-09
LUNGS	2.770E-21	2.500E-17	5.250E-16	8.680E-22-1.000E+00	1.620E-08	6.390E-09
RED MARR	8.910E-20	4.752E-16	9.979E-15	1.650E-20-1.000E+00	6.660E-08	2.630E-08
BONE SUR	4.820E-19	2.857E-15	6.000E-14	9.920E-20-1.000E+00	9.460E-08	3.730E-08
THYROID	6.670E-20	7.891E-16	1.657E-14	2.740E-20-1.000E+00	1.490E-08	5.880E-09
REMAINDER	1.510E-19	1.869E-15	3.925E-14	6.490E-20-1.000E+00	2.420E-08	9.630E-09
EFFECTIVE	4.520E-19	3.859E-15	8.104E-14	1.340E-19-1.000E+00	2.650E-08	1.050E-08
SKIN(FGR)	2.720E-17	3.283E-13	6.895E-12	1.140E-17-1.000E+00	0.000E+00	0.000E+00
Pb-202m						
GONADS	9.750E-14	3.065E-11	3.911E-11	2.080E-15-1.000E+00	3.170E-11	1.630E-10
BREAST	1.110E-13	2.933E-11	3.741E-11	1.990E-15-1.000E+00	1.800E-11	3.040E-11
LUNGS	9.700E-14	2.800E-11	3.572E-11	1.900E-15-1.000E+00	1.200E-10	1.420E-11
RED MARR	9.450E-14	2.859E-11	3.647E-11	1.940E-15-1.000E+00	2.510E-11	4.450E-11
BONE SUR	1.590E-13	4.141E-11	5.283E-11	2.810E-15-1.000E+00	3.520E-11	2.470E-11
THYROID	9.980E-14	2.903E-11	3.704E-11	1.970E-15-1.000E+00	1.350E-11	4.150E-12
REMAINDER	9.290E-14	2.771E-11	3.535E-11	1.880E-15-1.000E+00	6.260E-11	3.320E-10
EFFECTIVE	9.960E-14	2.933E-11	3.741E-11	1.990E-15-1.000E+00	4.830E-11	1.530E-10
SKIN(FGR)	1.170E-13	3.670E-11	4.681E-11	2.490E-15-1.000E+00	0.000E+00	0.000E+00
Pb-203						

GONADS	1.410E-14	8.524E-12	7.534E-11	3.120E-16-1.000E+00	6.010E-11	2.440E-10
BREAST	1.620E-14	8.332E-12	7.365E-11	3.050E-16-1.000E+00	3.440E-11	3.650E-11
LUNGS	1.350E-14	7.759E-12	6.858E-11	2.840E-16-1.000E+00	2.060E-10	1.770E-11
RED MARR	1.240E-14	7.567E-12	6.689E-11	2.770E-16-1.000E+00	1.540E-10	1.210E-10
BONE SUR	3.370E-14	1.707E-11	1.509E-10	6.250E-16-1.000E+00	7.540E-10	3.340E-10
THYROID	1.410E-14	7.841E-12	6.930E-11	2.870E-16-1.000E+00	2.340E-11	9.120E-12
REMAINDER	1.280E-14	7.513E-12	6.641E-11	2.750E-16-1.000E+00	1.860E-10	6.660E-10
EFFECTIVE	1.440E-14	8.223E-12	7.268E-11	3.010E-16-1.000E+00	1.430E-10	2.930E-10
SKIN(FGR)	1.870E-14	1.033E-11	9.128E-11	3.780E-16-1.000E+00	0.000E+00	0.000E+00
Pb-205						
GONADS	4.440E-19	6.106E-15	1.282E-13	2.120E-19-1.000E+00	5.250E-11	2.210E-11
BREAST	2.090E-18	1.322E-14	2.776E-13	4.590E-19-1.000E+00	5.870E-11	2.320E-11
LUNGS	3.360E-21	2.966E-17	6.229E-16	1.030E-21-1.000E+00	7.760E-11	2.040E-11
RED MARR	1.010E-19	5.414E-16	1.137E-14	1.880E-20-1.000E+00	4.370E-09	1.720E-09
BONE SUR	5.470E-19	3.254E-15	6.834E-14	1.130E-19-1.000E+00	9.580E-09	3.780E-09
THYROID	8.260E-20	8.813E-16	1.851E-14	3.060E-20-1.000E+00	5.510E-11	2.170E-11
REMAINDER	1.680E-19	2.059E-15	4.324E-14	7.150E-20-1.000E+00	7.300E-10	3.640E-10
EFFECTIVE	5.060E-19	4.320E-15	9.072E-14	1.500E-19-1.000E+00	1.060E-09	4.410E-10
SKIN(FGR)	2.920E-17	3.514E-13	7.379E-12	1.220E-17-1.000E+00	0.000E+00	0.000E+00
Pb-209						
GONADS	8.370E-18	4.838E-15	5.913E-15	3.500E-19-1.000E+00	1.480E-12	5.370E-13
BREAST	1.020E-17	5.073E-15	6.201E-15	3.670E-19-1.000E+00	1.480E-12	5.370E-13
LUNGS	6.980E-18	3.235E-15	3.953E-15	2.340E-19-1.000E+00	1.150E-10	5.370E-13
RED MARR	5.930E-18	2.861E-15	3.497E-15	2.070E-19-1.000E+00	6.030E-12	2.190E-12
BONE SUR	2.430E-17	1.201E-14	1.468E-14	8.690E-19-1.000E+00	5.750E-11	2.090E-11
THYROID	7.910E-18	3.649E-15	4.460E-15	2.640E-19-1.000E+00	1.480E-12	5.370E-13
REMAINDER	6.620E-18	3.276E-15	4.004E-15	2.370E-19-1.000E+00	2.920E-11	1.880E-10
EFFECTIVE	8.120E-18	4.161E-15	5.085E-15	3.010E-19-1.000E+00	2.560E-11	5.750E-11
SKIN(FGR)	9.350E-15	4.064E-12	4.967E-12	2.940E-16-1.000E+00	0.000E+00	0.000E+00
Pb-210						
GONADS	6.190E-17	8.697E-14	1.826E-12	3.020E-18-1.000E+00	3.180E-07	1.250E-07
BREAST	8.180E-17	1.034E-13	2.171E-12	3.590E-18-1.000E+00	3.180E-07	1.250E-07
LUNGS	4.250E-17	4.723E-14	9.916E-13	1.640E-18-1.000E+00	3.180E-07	1.250E-07
RED MARR	3.140E-17	3.658E-14	7.679E-13	1.270E-18-1.000E+00	3.750E-06	1.480E-06
BONE SUR	1.950E-16	2.393E-13	5.024E-12	8.310E-18-1.000E+00	5.470E-05	2.160E-05
THYROID	5.420E-17	5.386E-14	1.131E-12	1.870E-18-1.000E+00	3.180E-07	1.250E-07
REMAINDER	4.090E-17	5.069E-14	1.064E-12	1.760E-18-1.000E+00	4.690E-06	1.850E-06
EFFECTIVE	5.640E-17	7.142E-14	1.499E-12	2.480E-18-1.000E+00	3.670E-06	1.450E-06
SKIN(FGR)	1.280E-16	5.702E-13	1.197E-11	1.980E-17-1.000E+00	0.000E+00	0.000E+00
Pb-211						
GONADS	4.610E-15	3.162E-13	3.162E-13	1.012E-16-1.000E+00	1.630E-10	1.970E-11
BREAST	5.280E-15	3.050E-13	3.050E-13	9.760E-17-1.000E+00	1.630E-10	1.910E-11
LUNGS	4.550E-15	2.878E-13	2.878E-13	9.210E-17-1.000E+00	1.780E-08	1.900E-11
RED MARR	4.350E-15	2.900E-13	2.900E-13	9.280E-17-1.000E+00	2.640E-10	3.070E-11
BONE SUR	8.630E-15	4.743E-13	4.744E-13	1.518E-16-1.000E+00	1.390E-09	1.600E-10
THYROID	4.680E-15	2.975E-13	2.975E-13	9.520E-17-1.000E+00	1.630E-10	1.880E-11
REMAINDER	4.330E-15	2.815E-13	2.816E-13	9.010E-17-1.000E+00	2.510E-10	4.100E-10
EFFECTIVE	4.710E-15	3.018E-13	3.019E-13	9.660E-17-1.000E+00	2.350E-09	1.420E-10
SKIN(FGR)	3.367E-14	1.467E-11	1.467E-11	4.696E-15-1.000E+00	0.000E+00	0.000E+00
Pb-212						
GONADS	1.577E-14	6.858E-12	1.846E-11	3.340E-16-1.000E+00	3.517E-09	1.988E-09
BREAST	1.796E-14	6.639E-12	1.785E-11	3.230E-16-1.000E+00	3.478E-09	1.682E-09
LUNGS	1.549E-14	6.262E-12	1.685E-11	3.050E-16-1.000E+00	2.359E-07	1.640E-09
RED MARR	1.479E-14	6.293E-12	1.696E-11	3.070E-16-1.000E+00	3.345E-08	1.511E-08
BONE SUR	3.070E-14	1.144E-11	3.023E-11	5.470E-16-1.000E+00	3.710E-07	1.660E-07
THYROID	1.601E-14	6.341E-12	1.708E-11	3.090E-16-1.000E+00	3.468E-09	1.627E-09
REMAINDER	1.479E-14	6.176E-12	1.663E-11	3.010E-16-1.000E+00	1.939E-08	1.602E-08
EFFECTIVE	1.611E-14	6.616E-12	1.779E-11	3.220E-16-1.000E+00	5.077E-08	1.259E-08
SKIN(FGR)	5.400E-14	1.060E-10	3.060E-10	5.538E-15-1.000E+00	0.000E+00	0.000E+00
Pb-214						
GONADS	1.160E-14	5.892E-13	5.892E-13	2.540E-16-1.000E+00	1.630E-10	3.190E-11
BREAST	1.330E-14	5.730E-13	5.730E-13	2.470E-16-1.000E+00	1.620E-10	2.420E-11
LUNGS	1.130E-14	5.382E-13	5.382E-13	2.320E-16-1.000E+00	1.490E-08	2.320E-11

RED MARR	1.060E-14	5.359E-13	5.359E-13	2.310E-16-1.000E+00	4.630E-10	1.120E-10
BONE SUR	2.440E-14	9.836E-13	9.836E-13	4.240E-16-1.000E+00	3.880E-09	1.100E-09
THYROID	1.170E-14	5.498E-13	5.498E-13	2.370E-16-1.000E+00	1.620E-10	2.140E-11
REMAINDER	1.070E-14	5.220E-13	5.220E-13	2.250E-16-1.000E+00	2.620E-10	3.580E-10
EFFECTIVE	1.180E-14	5.660E-13	5.660E-13	2.440E-16-1.000E+00	2.110E-09	1.690E-10
SKIN(FGR)	2.770E-14	2.111E-12	2.111E-12	9.100E-16-1.000E+00	0.000E+00	0.000E+00
Pd-100						
GONADS	4.670E-15	3.711E-12	4.437E-11	1.330E-16-1.000E+00	7.860E-10	1.430E-09
BREAST	5.600E-15	3.823E-12	4.570E-11	1.370E-16-1.000E+00	2.360E-10	1.600E-10
LUNGS	4.090E-15	2.729E-12	3.263E-11	9.780E-17-1.000E+00	3.120E-09	2.770E-11
RED MARR	3.400E-15	2.483E-12	2.969E-11	8.900E-17-1.000E+00	3.050E-10	3.000E-10
BONE SUR	1.530E-14	1.035E-11	1.238E-10	3.710E-16-1.000E+00	1.710E-10	1.030E-10
THYROID	4.470E-15	2.930E-12	3.503E-11	1.050E-16-1.000E+00	1.190E-10	4.590E-12
REMAINDER	3.830E-15	2.729E-12	3.263E-11	9.780E-17-1.000E+00	1.360E-09	2.440E-09
EFFECTIVE	4.650E-15	3.348E-12	4.003E-11	1.200E-16-1.000E+00	1.060E-09	1.160E-09
SKIN(FGR)	6.110E-15	5.943E-12	7.106E-11	2.130E-16-1.000E+00	0.000E+00	0.000E+00
Pd-101						
GONADS	1.500E-14	7.387E-12	1.512E-11	3.520E-16-1.000E+00	2.800E-11	1.040E-10
BREAST	1.720E-14	7.240E-12	1.482E-11	3.450E-16-1.000E+00	7.990E-12	1.270E-11
LUNGS	1.470E-14	6.169E-12	1.263E-11	2.940E-16-1.000E+00	1.680E-10	3.010E-12
RED MARR	1.420E-14	6.295E-12	1.289E-11	3.000E-16-1.000E+00	1.030E-11	2.190E-11
BONE SUR	2.610E-14	1.009E-11	2.066E-11	4.810E-16-1.000E+00	5.580E-12	7.310E-12
THYROID	1.520E-14	6.526E-12	1.336E-11	3.110E-16-1.000E+00	3.520E-12	3.710E-13
REMAINDER	1.410E-14	6.148E-12	1.258E-11	2.930E-16-1.000E+00	6.800E-11	2.680E-10
EFFECTIVE	1.530E-14	6.757E-12	1.383E-11	3.220E-16-1.000E+00	5.030E-11	1.120E-10
SKIN(FGR)	1.940E-14	1.188E-11	2.431E-11	5.660E-16-1.000E+00	0.000E+00	0.000E+00
Pd-103						
GONADS	1.205E-16	5.925E-13	1.108E-11	2.108E-17-1.000E+00	1.920E-11	4.134E-11
BREAST	2.075E-16	6.927E-13	1.295E-11	2.464E-17-1.000E+00	8.696E-12	1.589E-12
LUNGS	1.927E-17	6.102E-14	1.142E-12	2.172E-18-1.000E+00	2.680E-09	1.329E-13
RED MARR	2.942E-17	9.215E-14	1.723E-12	3.278E-18-1.000E+00	7.044E-12	6.590E-12
BONE SUR	1.636E-16	6.128E-13	1.146E-11	2.181E-17-1.000E+00	4.673E-12	2.005E-12
THYROID	8.305E-17	2.127E-13	3.977E-12	7.566E-18-1.000E+00	1.435E-13	4.727E-14
REMAINDER	3.668E-17	1.499E-13	2.804E-12	5.335E-18-1.000E+00	3.214E-10	6.824E-10
EFFECTIVE	8.560E-17	3.416E-13	6.386E-12	1.215E-17-1.000E+00	4.253E-10	2.161E-10
SKIN(FGR)	4.349E-16	1.886E-12	3.526E-11	6.708E-17-1.000E+00	0.000E+00	0.000E+00
Pd-107						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.050E-13	9.910E-15
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.050E-13	9.910E-15
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.850E-08	9.910E-15
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	5.680E-13	5.360E-14
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.510E-12	1.430E-13
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.050E-13	9.910E-15
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	9.710E-11	1.350E-10
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.450E-09	4.040E-11
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Pd-109						
GONADS	2.710E-16	3.728E-13	1.102E-12	1.580E-17-1.000E+00	2.130E-12	7.900E-12
BREAST	3.520E-16	4.105E-13	1.213E-12	1.740E-17-1.000E+00	5.110E-13	6.270E-13
LUNGS	1.940E-16	1.383E-13	4.086E-13	5.860E-18-1.000E+00	1.200E-09	1.490E-13
RED MARR	1.740E-16	1.373E-13	4.058E-13	5.820E-18-1.000E+00	9.820E-13	2.040E-12
BONE SUR	7.020E-16	6.347E-13	1.876E-12	2.690E-17-1.000E+00	9.580E-13	1.020E-12
THYROID	2.460E-16	2.123E-13	6.275E-13	9.000E-18-1.000E+00	1.550E-13	9.480E-14
REMAINDER	1.920E-16	1.715E-13	5.069E-13	7.270E-18-1.000E+00	5.040E-10	1.950E-09
EFFECTIVE	2.510E-16	2.642E-13	7.809E-13	1.120E-17-1.000E+00	2.960E-10	5.870E-10
SKIN(FGR)	2.150E-14	6.771E-11	2.001E-10	2.870E-15-1.000E+00	0.000E+00	0.000E+00
Pm-141						
GONADS	3.524E-14	1.389E-12	1.389E-12	7.678E-16-1.000E+00	1.660E-13	3.450E-12
BREAST	4.024E-14	1.333E-12	1.333E-12	7.367E-16-1.000E+00	3.880E-13	1.190E-12
LUNGS	3.503E-14	1.259E-12	1.259E-12	6.957E-16-1.000E+00	6.500E-11	1.010E-12
RED MARR	3.393E-14	1.269E-12	1.269E-12	7.017E-16-1.000E+00	4.030E-13	1.390E-12
BONE SUR	5.946E-14	1.956E-12	1.956E-12	1.081E-15-1.000E+00	3.090E-13	5.710E-13
THYROID	3.594E-14	1.298E-12	1.298E-12	7.177E-16-1.000E+00	2.960E-13	9.050E-14

REMAINDER	3.353E-14	1.237E-12	1.237E-12	6.837E-16-1.000E+00	1.970E-12	7.970E-11
EFFECTIVE	3.604E-14	1.318E-12	1.318E-12	7.287E-16-1.000E+00	8.560E-12	2.530E-11
SKIN(FGR)	8.425E-14	1.406E-11	1.406E-11	7.772E-15-1.000E+00	0.000E+00	0.000E+00
Pm-142						
GONADS	4.120E-14	5.323E-14	5.323E-14	9.110E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	4.710E-14	5.113E-14	5.113E-14	8.750E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.090E-14	4.838E-14	4.838E-14	8.280E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.950E-14	4.879E-14	4.879E-14	8.350E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	7.180E-14	7.479E-14	7.479E-14	1.280E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.200E-14	5.031E-14	5.031E-14	8.610E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.910E-14	4.744E-14	4.744E-14	8.120E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.220E-14	5.060E-14	5.060E-14	8.660E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.440E-13	7.888E-13	7.888E-13	1.350E-14-1.000E+00	0.000E+00	0.000E+00
Pm-143						
GONADS	1.440E-14	9.557E-12	1.990E-10	3.320E-16-1.000E+00	3.260E-10	3.870E-10
BREAST	1.650E-14	9.241E-12	1.924E-10	3.210E-16-1.000E+00	9.630E-10	4.400E-11
LUNGS	1.400E-14	8.348E-12	1.738E-10	2.900E-16-1.000E+00	1.610E-08	9.010E-12
RED MARR	1.360E-14	8.320E-12	1.732E-10	2.890E-16-1.000E+00	1.120E-09	9.230E-11
BONE SUR	2.380E-14	1.436E-11	2.990E-10	4.990E-16-1.000E+00	1.250E-09	4.160E-11
THYROID	1.460E-14	8.838E-12	1.840E-10	3.070E-16-1.000E+00	7.740E-10	1.560E-12
REMAINDER	1.340E-14	8.204E-12	1.708E-10	2.850E-16-1.000E+00	1.960E-09	5.390E-10
EFFECTIVE	1.460E-14	8.924E-12	1.858E-10	3.100E-16-1.000E+00	2.940E-09	2.790E-10
SKIN(FGR)	1.720E-14	1.163E-11	2.421E-10	4.040E-16-1.000E+00	0.000E+00	0.000E+00
Pm-144						
GONADS	7.330E-14	4.664E-11	9.733E-10	1.620E-15-1.000E+00	1.800E-09	1.790E-09
BREAST	8.370E-14	4.491E-11	9.372E-10	1.560E-15-1.000E+00	5.740E-09	2.170E-10
LUNGS	7.260E-14	4.232E-11	8.831E-10	1.470E-15-1.000E+00	7.090E-08	4.850E-11
RED MARR	7.040E-14	4.261E-11	8.891E-10	1.480E-15-1.000E+00	6.170E-09	3.860E-10
BONE SUR	1.230E-13	6.449E-11	1.346E-09	2.240E-15-1.000E+00	5.580E-09	1.560E-10
THYROID	7.470E-14	4.434E-11	9.252E-10	1.540E-15-1.000E+00	4.980E-09	9.650E-12
REMAINDER	6.940E-14	4.146E-11	8.651E-10	1.440E-15-1.000E+00	1.210E-08	2.130E-09
EFFECTIVE	7.480E-14	4.434E-11	9.252E-10	1.540E-15-1.000E+00	1.450E-08	1.170E-09
SKIN(FGR)	8.710E-14	5.643E-11	1.178E-09	1.960E-15-1.000E+00	0.000E+00	0.000E+00
Pm-145						
GONADS	8.230E-16	1.140E-12	2.394E-11	3.960E-17-1.000E+00	1.670E-10	8.060E-11
BREAST	1.070E-15	1.189E-12	2.497E-11	4.130E-17-1.000E+00	8.430E-10	7.250E-12
LUNGS	5.040E-16	6.854E-13	1.439E-11	2.380E-17-1.000E+00	4.610E-08	3.810E-12
RED MARR	3.690E-16	4.896E-13	1.028E-11	1.700E-17-1.000E+00	4.540E-09	5.300E-11
BONE SUR	2.320E-15	3.370E-12	7.074E-11	1.170E-16-1.000E+00	2.770E-08	1.970E-10
THYROID	7.070E-16	8.409E-13	1.765E-11	2.920E-17-1.000E+00	1.720E-10	4.520E-13
REMAINDER	4.940E-16	6.941E-13	1.457E-11	2.410E-17-1.000E+00	3.830E-09	3.120E-10
EFFECTIVE	7.090E-16	9.389E-13	1.971E-11	3.260E-17-1.000E+00	8.230E-09	1.280E-10
SKIN(FGR)	1.220E-15	1.581E-12	3.319E-11	5.490E-17-1.000E+00	0.000E+00	0.000E+00
Pm-146						
GONADS	3.520E-14	2.252E-11	4.724E-10	7.820E-16-1.000E+00	2.470E-09	8.860E-10
BREAST	4.030E-14	2.163E-11	4.537E-10	7.510E-16-1.000E+00	8.040E-09	1.200E-10
LUNGS	3.480E-14	2.030E-11	4.259E-10	7.050E-16-1.000E+00	2.330E-07	4.600E-11
RED MARR	3.370E-14	2.048E-11	4.295E-10	7.110E-16-1.000E+00	1.600E-08	2.760E-10
BONE SUR	5.990E-14	3.168E-11	6.645E-10	1.100E-15-1.000E+00	1.880E-08	1.920E-10
THYROID	3.590E-14	2.125E-11	4.458E-10	7.380E-16-1.000E+00	6.330E-09	1.190E-11
REMAINDER	3.330E-14	1.990E-11	4.174E-10	6.910E-16-1.000E+00	2.380E-08	2.350E-09
EFFECTIVE	3.590E-14	2.134E-11	4.476E-10	7.410E-16-1.000E+00	3.960E-08	9.910E-10
SKIN(FGR)	4.640E-14	3.600E-11	7.551E-10	1.250E-15-1.000E+00	0.000E+00	0.000E-00
Pm-147						
GONADS	7.480E-19	1.258E-15	2.636E-14	4.370E-20-1.000E+00	8.250E-15	6.860E-15
BREAST	9.560E-19	1.379E-15	2.890E-14	4.790E-20-1.000E+00	3.600E-14	7.450E-16
LUNGS	5.450E-19	6.335E-16	1.327E-14	2.200E-20-1.000E+00	7.740E-08	1.960E-16
RED MARR	4.460E-19	5.356E-16	1.122E-14	1.860E-20-1.000E+00	1.610E-09	2.090E-11
BONE SUR	2.180E-18	2.937E-15	6.153E-14	1.020E-19-1.000E+00	2.010E-08	2.610E-10
THYROID	6.750E-19	8.063E-16	1.689E-14	2.800E-20-1.000E+00	1.980E-14	3.120E-17
REMAINDER	5.260E-19	6.911E-16	1.448E-14	2.400E-20-1.000E+00	1.560E-09	9.080E-10
EFFECTIVE	6.930E-19	9.820E-16	2.057E-14	3.410E-20-1.000E+00	1.060E-08	2.830E-10
SKIN(FGR)	8.110E-16	3.456E-15	7.239E-14	1.200E-19-1.000E+00	0.000E+00	0.000E+00

Pm-148							
GONADS	2.810E-14	1.610E-11	2.274E-10	5.710E-16	-1.000E+00	2.120E-10	4.720E-10
BREAST	3.190E-14	1.539E-11	2.174E-10	5.460E-16	-1.000E+00	7.190E-11	6.110E-11
LUNGS	2.830E-14	1.486E-11	2.098E-10	5.270E-16	-1.000E+00	1.370E-08	1.190E-11
RED MARR	2.790E-14	1.522E-11	2.150E-10	5.400E-16	-1.000E+00	1.070E-10	9.850E-11
BONE SUR	4.240E-14	2.092E-11	2.955E-10	7.420E-16	-1.000E+00	7.080E-11	3.490E-11
THYROID	2.890E-14	1.483E-11	2.094E-10	5.260E-16	-1.000E+00	3.820E-11	1.850E-12
REMAINDER	2.730E-14	1.477E-11	2.086E-10	5.240E-16	-1.000E+00	4.100E-09	9.320E-09
EFFECTIVE	2.890E-14	1.545E-11	2.182E-10	5.480E-16	-1.000E+00	2.950E-09	2.940E-09
SKIN(FGR)	7.970E-14	2.357E-10	3.329E-09	8.360E-15	-1.000E+00	0.000E+00	0.000E+00
Pm-148m							
GONADS	9.470E-14	5.916E-11	1.175E-09	2.060E-15	-1.000E+00	1.190E-09	2.180E-09
BREAST	1.080E-13	5.658E-11	1.124E-09	1.970E-15	-1.000E+00	1.240E-09	2.590E-10
LUNGS	9.420E-14	5.399E-11	1.073E-09	1.880E-15	-1.000E+00	3.590E-08	4.440E-11
RED MARR	9.140E-14	5.485E-11	1.090E-09	1.910E-15	-1.000E+00	1.360E-09	4.410E-10
BONE SUR	1.580E-13	8.041E-11	1.598E-09	2.800E-15	-1.000E+00	1.360E-09	1.740E-10
THYROID	9.680E-14	5.600E-11	1.113E-09	1.950E-15	-1.000E+00	1.050E-09	6.470E-12
REMAINDER	9.010E-14	5.284E-11	1.050E-09	1.840E-15	-1.000E+00	3.580E-09	4.750E-09
EFFECTIVE	9.680E-14	5.629E-11	1.118E-09	1.960E-15	-1.000E+00	6.100E-09	2.070E-09
SKIN(FGR)	1.180E-13	7.524E-11	1.495E-09	2.620E-15	-1.000E+00	0.000E+00	0.000E+00
Pm-149							
GONADS	5.300E-16	3.254E-13	2.915E-12	1.190E-17	-1.000E+00	3.610E-12	9.190E-12
BREAST	6.070E-16	3.172E-13	2.841E-12	1.160E-17	-1.000E+00	8.200E-13	1.020E-12
LUNGS	5.170E-16	2.926E-13	2.621E-12	1.070E-17	-1.000E+00	3.120E-09	1.620E-13
RED MARR	4.890E-16	2.926E-13	2.621E-12	1.070E-17	-1.000E+00	5.530E-12	2.270E-12
BONE SUR	1.100E-15	5.333E-13	4.776E-12	1.950E-17	-1.000E+00	5.010E-12	9.590E-13
THYROID	5.360E-16	3.008E-13	2.694E-12	1.100E-17	-1.000E+00	3.310E-13	1.780E-14
REMAINDER	4.910E-16	2.844E-13	2.547E-12	1.040E-17	-1.000E+00	1.390E-09	3.560E-09
EFFECTIVE	5.410E-16	3.090E-13	2.768E-12	1.130E-17	-1.000E+00	7.930E-10	1.070E-09
SKIN(FGR)	2.190E-14	8.122E-11	7.275E-10	2.970E-15	-1.000E+00	0.000E+00	0.000E+00
Pm-150							
GONADS	6.990E-14	1.715E-11	1.963E-11	1.410E-15	-1.000E+00	8.260E-12	7.970E-11
BREAST	7.920E-14	1.642E-11	1.879E-11	1.350E-15	-1.000E+00	5.520E-12	1.520E-11
LUNGS	7.010E-14	1.581E-11	1.809E-11	1.300E-15	-1.000E+00	5.780E-10	6.540E-12
RED MARR	6.890E-14	1.617E-11	1.851E-11	1.330E-15	-1.000E+00	6.110E-12	2.130E-11
BONE SUR	1.090E-13	2.286E-11	2.617E-11	1.880E-15	-1.000E+00	4.000E-12	7.630E-12
THYROID	7.180E-14	1.581E-11	1.809E-11	1.300E-15	-1.000E+00	3.540E-12	8.070E-13
REMAINDER	6.750E-14	1.569E-11	1.796E-11	1.290E-15	-1.000E+00	8.220E-11	8.140E-10
EFFECTIVE	7.170E-14	1.654E-11	1.893E-11	1.360E-15	-1.000E+00	9.790E-11	2.700E-10
SKIN(FGR)	1.340E-13	1.277E-10	1.462E-10	1.050E-14	-1.000E+00	0.000E+00	0.000E+00
Pm-151							
GONADS	1.480E-14	8.660E-12	4.801E-11	3.310E-16	-1.000E+00	7.170E-11	2.110E-10
BREAST	1.700E-14	8.372E-12	4.642E-11	3.200E-16	-1.000E+00	1.590E-11	2.420E-11
LUNGS	1.440E-14	7.770E-12	4.308E-11	2.970E-16	-1.000E+00	1.640E-09	4.230E-12
RED MARR	1.370E-14	7.744E-12	4.294E-11	2.960E-16	-1.000E+00	2.720E-11	4.940E-11
BONE SUR	2.990E-14	1.428E-11	7.920E-11	5.460E-16	-1.000E+00	1.860E-11	1.620E-11
THYROID	1.500E-14	8.058E-12	4.468E-11	3.080E-16	-1.000E+00	6.180E-12	4.550E-13
REMAINDER	1.370E-14	7.587E-12	4.207E-11	2.900E-16	-1.000E+00	8.390E-10	2.490E-09
EFFECTIVE	1.510E-14	8.241E-12	4.569E-11	3.150E-16	-1.000E+00	4.730E-10	8.090E-10
SKIN(FGR)	3.320E-14	5.416E-11	3.003E-10	2.070E-15	-1.000E+00	0.000E+00	0.000E+00
Po-203							
GONADS	7.930E-14	5.178E-12	5.178E-12	1.630E-15	-1.000E+00	9.120E-12	4.820E-11
BREAST	9.000E-14	4.955E-12	4.956E-12	1.560E-15	-1.000E+00	4.460E-12	9.290E-12
LUNGS	7.910E-14	4.765E-12	4.765E-12	1.500E-15	-1.000E+00	8.560E-11	4.790E-12
RED MARR	7.740E-14	4.860E-12	4.861E-12	1.530E-15	-1.000E+00	5.330E-12	1.320E-11
BONE SUR	1.270E-13	7.211E-12	7.211E-12	2.270E-15	-1.000E+00	3.470E-12	5.170E-12
THYROID	8.130E-14	4.796E-12	4.797E-12	1.510E-15	-1.000E+00	2.970E-12	1.030E-12
REMAINDER	7.600E-14	4.701E-12	4.702E-12	1.480E-15	-1.000E+00	1.960E-11	1.280E-10
EFFECTIVE	8.120E-14	4.955E-12	4.956E-12	1.560E-15	-1.000E+00	1.990E-11	5.410E-11
SKIN(FGR)	1.000E-13	9.371E-12	9.372E-12	2.950E-15	-1.000E+00	0.000E+00	0.000E+00
Po-205							
GONADS	7.620E-14	1.400E-11	1.468E-11	1.570E-15	-1.000E+00	8.740E-12	6.260E-11
BREAST	8.650E-14	1.338E-11	1.402E-11	1.500E-15	-1.000E+00	7.300E-12	1.340E-11

LUNGS	7.600E-14	1.284E-11	1.346E-11	1.440E-15	-1.000E+00	1.440E-10	7.290E-12
RED MARR	7.440E-14	1.311E-11	1.374E-11	1.470E-15	-1.000E+00	8.050E-12	1.850E-11
BONE SUR	1.210E-13	1.953E-11	2.047E-11	2.190E-15	-1.000E+00	5.880E-12	7.480E-12
THYROID	7.810E-14	1.302E-11	1.365E-11	1.460E-15	-1.000E+00	5.710E-12	1.840E-12
REMAINDER	7.300E-14	1.275E-11	1.337E-11	1.430E-15	-1.000E+00	2.030E-11	1.460E-10
EFFECTIVE	7.800E-14	1.347E-11	1.412E-11	1.510E-15	-1.000E+00	2.800E-11	6.490E-11
SKIN(FGR)	9.100E-14	1.962E-11	2.057E-11	2.200E-15	-1.000E+00	0.000E+00	0.000E+00
Po-207							
GONADS	6.380E-14	2.472E-11	4.029E-11	1.330E-15	-1.000E+00	2.810E-11	1.850E-10
BREAST	7.250E-14	2.379E-11	3.878E-11	1.280E-15	-1.000E+00	1.390E-11	3.090E-11
LUNGS	6.340E-14	2.268E-11	3.696E-11	1.220E-15	-1.000E+00	1.520E-10	1.160E-11
RED MARR	6.180E-14	2.323E-11	3.787E-11	1.250E-15	-1.000E+00	1.650E-11	4.780E-11
BONE SUR	1.030E-13	3.494E-11	5.696E-11	1.880E-15	-1.000E+00	1.060E-11	1.760E-11
THYROID	6.530E-14	2.323E-11	3.787E-11	1.250E-15	-1.000E+00	9.820E-12	3.160E-12
REMAINDER	6.080E-14	2.249E-11	3.666E-11	1.210E-15	-1.000E+00	5.910E-11	3.640E-10
EFFECTIVE	6.510E-14	2.379E-11	3.878E-11	1.280E-15	-1.000E+00	4.770E-11	1.680E-10
SKIN(FGR)	7.670E-14	3.513E-11	5.726E-11	1.890E-15	-1.000E+00	0.000E+00	0.000E+00
Po-210							
GONADS	4.080E-19	2.501E-16	5.165E-15	8.690E-21	-1.000E+00	1.260E-07	8.230E-08
BREAST	4.630E-19	2.388E-16	4.933E-15	8.300E-21	-1.000E+00	1.260E-07	8.230E-08
LUNGS	4.060E-19	2.285E-16	4.719E-15	7.940E-21	-1.000E+00	1.300E-05	8.230E-08
RED MARR	3.970E-19	2.337E-16	4.826E-15	8.120E-21	-1.000E+00	1.260E-07	8.230E-08
BONE SUR	6.390E-19	3.280E-16	6.775E-15	1.140E-20	-1.000E+00	1.260E-07	8.230E-08
THYROID	4.180E-19	2.377E-16	4.909E-15	8.260E-21	-1.000E+00	1.260E-07	8.230E-08
REMAINDER	3.890E-19	2.262E-16	4.671E-15	7.860E-21	-1.000E+00	2.300E-06	1.520E-06
EFFECTIVE	4.160E-19	2.386E-16	4.927E-15	8.290E-21	-1.000E+00	2.320E-06	5.140E-07
SKIN(FGR)	4.810E-19	3.194E-16	6.597E-15	1.110E-20	-1.000E+00	0.000E+00	0.000E+00
Po-211							
GONADS	3.730E-16	5.941E-18	5.941E-18	7.980E-18	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.240E-16	5.680E-18	5.680E-18	7.630E-18	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.710E-16	5.427E-18	5.427E-18	7.290E-18	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.620E-16	5.539E-18	5.539E-18	7.440E-18	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.970E-16	7.891E-18	7.891E-18	1.060E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	3.820E-16	5.635E-18	5.635E-18	7.570E-18	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.560E-16	5.352E-18	5.352E-18	7.190E-18	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.810E-16	5.665E-18	5.665E-18	7.610E-18	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.470E-16	8.338E-18	8.338E-18	1.120E-17	-1.000E+00	0.000E+00	0.000E+00
Po-212							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Po-213							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Po-214							
GONADS	4.000E-18	0.000E+00	0.000E+00	8.520E-20	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.540E-18	0.000E+00	0.000E+00	8.130E-20	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.980E-18	0.000E+00	0.000E+00	7.780E-20	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.890E-18	0.000E+00	0.000E+00	7.960E-20	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	6.270E-18	0.000E+00	0.000E+00	1.120E-19	-1.000E+00	0.000E+00	0.000E+00

THYROID	4.090E-18	0.000E+00	0.000E+00	8.100E-20	1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.810E-18	0.000E+00	0.000E+00	7.700E-20	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.080E-18	0.000E+00	0.000E+00	8.130E-20	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.710E-18	0.000E+00	0.000E+00	1.090E-19	1.000E+00	0.000E+00	0.000E+00
Po-215							
GONADS	8.240E-18	0.000E+00	0.000E+00	1.830E-19	1.000E+00	0.000E+00	0.000E+00
BREAST	9.430E-18	0.000E+00	0.000E+00	1.760E-19	1.000E+00	0.000E+00	0.000E+00
LUNGS	8.150E-18	0.000E+00	0.000E+00	1.670E-19	1.000E+00	0.000E+00	0.000E+00
RED MARR	7.810E-18	0.000E+00	0.000E+00	1.680E-19	1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.530E-17	0.000E+00	0.000E+00	2.650E-19	1.000E+00	0.000E+00	0.000E+00
THYROID	8.370E-18	0.000E+00	0.000E+00	1.740E-19	1.000E+00	0.000E+00	0.000E+00
REMAINDER	7.770E-18	0.000E+00	0.000E+00	1.630E-19	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	8.430E-18	0.000E+00	0.000E+00	1.740E-19	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.010E-17	0.000E+00	0.000E+00	2.150E-19	1.000E+00	0.000E+00	0.000E+00
Po-216							
GONADS	8.120E-19	0.000E+00	0.000E+00	1.730E-20	1.000E+00	0.000E+00	0.000E+00
BREAST	9.230E-19	0.000E+00	0.000E+00	1.650E-20	1.000E+00	0.000E+00	0.000E+00
LUNGS	8.090E-19	0.000E+00	0.000E+00	1.580E-20	1.000E+00	0.000E+00	0.000E+00
RED MARR	7.910E-19	0.000E+00	0.000E+00	1.620E-20	1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.270E-18	0.000E+00	0.000E+00	2.270E-20	1.000E+00	0.000E+00	0.000E+00
THYROID	8.320E-19	0.000E+00	0.000E+00	1.640E-20	1.000E+00	0.000E+00	0.000E+00
REMAINDER	7.750E-19	0.000E+00	0.000E+00	1.560E-20	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	8.290E-19	0.000E+00	0.000E+00	1.650E-20	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	9.570E-19	0.000E+00	0.000E+00	2.200E-20	1.000E+00	0.000E+00	0.000E+00
Po-218							
GONADS	4.642E-19	2.708E-18	2.708E-18	1.026E-20	1.000E+00	0.000E+00	0.000E+00
BREAST	5.300E-19	2.626E-18	2.626E-18	9.948E-21	1.000E+00	0.000E+00	0.000E+00
LUNGS	4.563E-19	2.411E-18	2.411E-18	9.134E-21	1.000E+00	0.000E+00	0.000E+00
RED MARR	4.425E-19	2.428E-18	2.428E-18	9.198E-21	1.000E+00	0.000E+00	0.000E+00
BONE SUR	7.656E-19	4.008E-18	4.008E-18	1.518E-20	1.000E+00	0.000E+00	0.000E+00
THYROID	4.728E-19	2.509E-18	2.509E-18	9.502E-21	1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.372E-19	2.395E-18	2.395E-18	9.072E-21	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.718E-19	2.565E-18	2.565E-18	9.716E-21	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	7.984E-19	4.314E-18	4.314E-18	1.634E-20	1.000E+00	0.000E+00	0.000E+00
Pr-136							
GONADS	1.010E-13	2.404E-12	2.404E-12	2.120E-15	1.000E+00	1.030E-13	3.430E-12
BREAST	1.150E-13	2.302E-12	2.302E-12	2.030E-15	1.000E+00	5.660E-13	1.810E-12
LUNGS	1.010E-13	2.200E-12	2.200E-12	1.940E-15	1.000E+00	4.990E-11	1.840E-12
RED MARR	9.850E-14	2.234E-12	2.234E-12	1.970E-15	1.000E+00	5.370E-13	1.700E-12
BONE SUR	1.630E-13	3.243E-12	3.243E-12	2.860E-15	1.000E+00	4.230E-13	8.080E-13
THYROID	1.030E-13	2.245E-12	2.245E-12	1.980E-15	1.000E+00	4.860E-13	1.740E-13
REMAINDER	9.690E-14	2.166E-12	2.166E-12	1.910E-15	1.000E+00	1.620E-12	6.910E-11
EFFECTIVE	1.030E-13	2.291E-12	2.291E-12	2.020E-15	1.000E+00	6.680E-12	2.230E-11
SKIN(FGR)	1.690E-13	1.157E-11	1.157E-11	1.020E-14	1.000E+00	0.000E+00	0.000E+00
Pr-137							
GONADS	2.320E-14	3.423E-12	3.468E-12	5.230E-16	1.000E+00	1.330E-12	1.500E-11
BREAST	2.650E-14	3.305E-12	3.348E-12	5.050E-16	1.000E+00	1.060E-12	2.950E-12
LUNGS	2.280E-14	3.050E-12	3.090E-12	4.660E-16	1.000E+00	8.090E-11	1.580E-12
RED MARR	2.200E-14	3.056E-12	3.097E-12	4.670E-16	1.000E+00	1.250E-12	4.490E-12
BONE SUR	4.030E-14	4.954E-12	5.019E-12	7.570E-16	1.000E+00	8.590E-13	1.560E-12
THYROID	2.350E-14	3.194E-12	3.236E-12	4.880E-16	1.000E+00	6.830E-13	1.450E-13
REMAINDER	2.180E-14	2.997E-12	3.037E-12	4.580E-16	1.000E+00	8.500E-12	1.120E-10
EFFECTIVE	2.360E-14	3.226E-12	3.269E-12	4.930E-16	1.000E+00	1.290E-11	3.850E-11
SKIN(FGR)	4.010E-14	1.931E-11	1.956E-11	2.950E-15	1.000E+00	0.000E+00	0.000E+00
Pr-138							
GONADS	3.840E-14	1.074E-13	1.074E-13	8.560E-16	1.000E+00	0.000E+00	0.000E+00
BREAST	4.390E-14	1.032E-13	1.032E-13	8.220E-16	1.000E+00	0.000E+00	0.000E+00
LUNGS	3.800E-14	9.727E-14	9.727E-14	7.750E-16	1.000E+00	0.000E+00	0.000E+00
RED MARR	3.670E-14	9.815E-14	9.815E-14	7.820E-16	1.000E+00	0.000E+00	0.000E+00
BONE SUR	6.740E-14	1.506E-13	1.506E-13	1.200E-15	1.000E+00	0.000E+00	0.000E+00
THYROID	3.910E-14	1.017E-13	1.017E-13	8.100E-16	1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.630E-14	9.539E-14	9.539E-14	7.600E-16	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.920E-14	1.020E-13	1.020E-13	8.130E-16	1.000E+00	0.000E+00	0.000E+00

SKIN(FGR)	1.250E-13	1.544E-12	1.544E-12	1.230E-14	-1.000E+00	0.000E+00	0.000E+00
Pr-138m							
GONADS	1.180E-13	2.552E-11	2.749E-11	2.520E-15	-1.000E+00	9.720E-12	1.130E-10
BREAST	1.350E-13	2.441E-11	2.629E-11	2.410E-15	-1.000E+00	7.560E-12	2.150E-11
LUNGS	1.180E-13	2.320E-11	2.498E-11	2.290E-15	-1.000E+00	1.830E-10	1.000E-11
RED MARR	1.150E-13	2.370E-11	2.552E-11	2.340E-15	-1.000E+00	8.000E-12	2.970E-11
BONE SUR	1.910E-13	3.454E-11	3.719E-11	3.410E-15	-1.000E+00	5.330E-12	1.060E-11
THYROID	1.210E-13	2.401E-11	2.585E-11	2.370E-15	-1.000E+00	5.680E-12	1.110E-12
REMAINDER	1.130E-13	2.299E-11	2.476E-11	2.270E-15	-1.000E+00	3.230E-11	3.400E-10
EFFECTIVE	1.210E-13	2.431E-11	2.618E-11	2.400E-15	-1.000E+00	3.650E-11	1.390E-10
SKIN(FGR)	1.520E-13	5.085E-11	5.475E-11	5.020E-15	-1.000E+00	0.000E+00	0.000E+00
Pr-139							
GONADS	5.170E-15	2.221E-12	3.139E-12	1.340E-16	-1.000E+00	2.790E-12	1.820E-11
BREAST	6.020E-15	2.188E-12	3.092E-12	1.320E-16	-1.000E+00	1.510E-12	2.490E-12
LUNGS	4.870E-15	1.807E-12	2.553E-12	1.090E-16	-1.000E+00	8.180E-11	7.370E-13
RED MARR	4.640E-15	1.740E-12	2.459E-12	1.050E-16	-1.000E+00	2.160E-12	4.920E-12
BONE SUR	9.340E-15	3.795E-12	5.364E-12	2.290E-16	-1.000E+00	1.890E-12	1.560E-12
THYROID	5.170E-15	1.956E-12	2.764E-12	1.180E-16	-1.000E+00	6.740E-13	6.870E-14
REMAINDER	4.670E-15	1.790E-12	2.530E-12	1.080E-16	-1.000E+00	1.500E-11	9.850E-11
EFFECTIVE	5.170E-15	2.022E-12	2.858E-12	1.220E-16	-1.000E+00	1.560E-11	3.520E-11
SKIN(FGR)	8.750E-15	9.165E-12	1.295E-11	5.530E-16	-1.000E+00	0.000E+00	0.000E+00
Pr-142							
GONADS	3.060E-15	1.500E-12	5.948E-12	6.000E-17	-1.000E+00	6.130E-12	2.020E-11
BREAST	3.460E-15	1.438E-12	5.700E-12	5.750E-17	-1.000E+00	1.780E-12	3.080E-12
LUNGS	3.100E-15	1.390E-12	5.512E-12	5.560E-17	-1.000E+00	2.970E-09	7.970E-13
RED MARR	3.070E-15	1.425E-12	5.650E-12	5.700E-17	-1.000E+00	3.780E-12	4.670E-12
BONE SUR	4.430E-15	1.973E-12	7.821E-12	7.890E-17	-1.000E+00	2.950E-12	1.720E-12
THYROID	3.160E-15	1.333E-12	5.284E-12	5.330E-17	-1.000E+00	6.380E-13	1.280E-13
REMAINDER	3.000E-15	1.390E-12	5.512E-12	5.560E-17	-1.000E+00	1.400E-09	4.710E-09
EFFECTIVE	3.150E-15	1.445E-12	5.730E-12	5.780E-17	-1.000E+00	7.790E-10	1.420E-09
SKIN(FGR)	5.670E-14	2.288E-10	9.070E-10	9.150E-15	-1.000E+00	0.000E+00	0.000E+00
Pr-142m							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	7.900E-14	2.590E-13
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	2.270E-14	3.900E-14
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.780E-11	9.610E-15
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	4.850E-14	5.960E-14
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.810E-14	2.190E-14
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	8.080E-15	1.580E-15
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.800E-11	6.020E-11
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	9.980E-12	1.810E-11
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E-00
Pr-143							
GONADS	2.130E-17	2.264E-14	4.032E-13	7.930E-19	-1.000E+00	4.370E-18	8.990E-18
BREAST	2.550E-17	2.330E-14	4.149E-13	8.160E-19	-1.000E+00	2.220E-18	1.090E-18
LUNGS	1.860E-17	1.642E-14	2.923E-13	5.750E-19	-1.000E+00	1.330E-08	1.910E-19
RED MARR	1.620E-17	1.493E-14	2.659E-13	5.230E-19	-1.000E+00	1.480E-11	1.030E-12
BONE SUR	5.930E-17	5.454E-14	9.711E-13	1.910E-18	-1.000E+00	1.490E-11	1.030E-12
THYROID	2.050E-17	1.802E-14	3.208E-13	6.310E-19	-1.000E+00	1.680E-18	2.660E-20
REMAINDER	1.760E-17	1.642E-14	2.923E-13	5.750E-19	-1.000E+00	1.970E-09	4.220E-09
EFFECTIVE	2.100E-17	2.002E-14	3.564E-13	7.010E-19	-1.000E+00	2.190E-09	1.270E-09
SKIN(FGR)	1.760E-14	5.711E-11	1.017E-09	2.000E-15	-1.000E+00	0.000E+00	0.000E+00
Pr-144							
GONADS	1.900E-15	5.923E-14	5.923E-14	3.960E-17	-1.000E+00	2.410E-15	7.380E-14
BREAST	2.150E-15	5.699E-14	5.699E-14	3.810E-17	-1.000E+00	1.050E-14	3.380E-14
LUNGS	1.900E-15	5.400E-14	5.400E-14	3.610E-17	-1.000E+00	9.400E-11	3.150E-14
RED MARR	1.870E-15	5.475E-14	5.475E-14	3.660E-17	-1.000E+00	1.380E-14	3.220E-14
BONE SUR	2.990E-15	8.451E-14	8.451E-14	5.650E-17	-1.000E+00	1.470E-14	1.520E-14
THYROID	1.950E-15	5.325E-14	5.325E-14	3.560E-17	-1.000E+00	8.470E-15	3.590E-15
REMAINDER	1.840E-15	5.355E-14	5.355E-14	3.580E-17	-1.000E+00	1.400E-12	1.050E-10
EFFECTIVE	1.950E-15	5.654E-14	5.654E-14	3.780E-17	-1.000E+00	1.170E-11	3.150E-11
SKIN(FGR)	8.430E-14	1.900E-11	1.900E-11	1.270E-14	-1.000E+00	0.000E+00	0.000E+00
Pr-144m							
GONADS	3.250E-16	1.010E-14	1.010E-14	1.620E-17	-1.000E+00	0.000E+00	0.000E+00

BREAST	4.200E-16	1.053E-14	1.053E-14	1.690E-17-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.000E-16	5.790E-15	5.790E-15	9.290E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.560E-16	4.232E-15	4.232E-15	6.790E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.160E-16	2.717E-14	2.717E-14	4.360E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	2.810E-16	7.354E-15	7.354E-15	1.180E-17-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.980E-16	5.964E-15	5.964E-15	9.570E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.790E-16	8.102E-15	8.102E-15	1.300E-17-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.080E-16	1.664E-14	1.664E-14	2.670E-17-1.000E+00	0.000E+00	0.000E+00
Pr-145						
GONADS	7.240E-16	3.097E-13	5.125E-13	1.650E-17-1.000E+00	3.530E-13	2.030E-12
BREAST	8.270E-16	3.003E-13	4.969E-13	1.600E-17-1.000E+00	1.340E-13	3.130E-13
LUNGS	7.110E-16	2.759E-13	4.566E-13	1.470E-17-1.000E+00	9.240E-10	9.860E-14
RED MARR	6.880E-16	2.759E-13	4.566E-13	1.470E-17-1.000E+00	4.490E-13	4.980E-13
BONE SUR	1.230E-15	4.730E-13	7.827E-13	2.520E-17-1.000E+00	4.140E-13	1.800E-13
THYROID	7.370E-16	2.872E-13	4.752E-13	1.530E-17-1.000E+00	7.960E-14	1.210E-14
REMAINDER	6.810E-16	2.722E-13	4.503E-13	1.450E-17-1.000E+00	2.360E-10	1.390E-09
EFFECTIVE	7.360E-16	2.928E-13	4.845E-13	1.560E-17-1.000E+00	1.820E-10	4.180E-10
SKIN(FGR)	4.440E-14	1.483E-10	2.454E-10	7.900E-15-1.000E+00	0.000E+00	0.000E+00
Pr-147						
GONADS	4.070E-14	1.041E-12	1.041E-12	8.840E-16-1.000E+00	1.170E-13	1.790E-12
BREAST	4.650E-14	1.002E-12	1.002E-12	8.510E-16-1.000E+00	2.810E-13	8.150E-13
LUNGS	4.020E-14	9.383E-13	9.383E-13	7.970E-16-1.000E+00	6.150E-11	7.940E-13
RED MARR	3.890E-14	9.430E-13	9.430E-13	8.010E-16-1.000E+00	3.240E-13	8.600E-13
BONE SUR	7.010E-14	1.542E-12	1.542E-12	1.310E-15-1.000E+00	3.760E-13	3.970E-13
THYROID	4.140E-14	9.630E-13	9.630E-13	8.180E-16-1.000E+00	2.170E-13	6.960E-14
REMAINDER	3.850E-14	9.218E-13	9.218E-13	7.830E-16-1.000E+00	2.390E-12	6.740E-11
EFFECTIVE	4.150E-14	9.877E-13	9.877E-13	8.390E-16-1.000E+00	8.220E-12	2.100E-11
SKIN(FGR)	9.750E-14	1.129E-11	1.129E-11	9.590E-15-1.000E+00	0.000E+00	0.000E+00
Pt-186						
GONADS	3.460E-14	7.391E-12	7.884E-12	7.590E-16-1.000E+00	1.750E-11	8.700E-11
BREAST	3.960E-14	7.089E-12	7.562E-12	7.280E-16-1.000E+00	9.350E-12	1.450E-11
LUNGS	3.420E-14	6.729E-12	7.178E-12	6.910E-16-1.000E+00	1.100E-10	5.340E-12
RED MARR	3.300E-14	6.768E-12	7.219E-12	6.950E-16-1.000E+00	1.170E-11	2.350E-11
BONE SUR	6.000E-14	1.100E-11	1.174E-11	1.130E-15-1.000E+00	8.290E-12	7.990E-12
THYROID	3.530E-14	7.011E-12	7.479E-12	7.200E-16-1.000E+00	6.950E-12	6.430E-13
REMAINDER	3.270E-14	6.593E-12	7.032E-12	6.770E-16-1.000E+00	4.990E-11	2.760E-10
EFFECTIVE	3.530E-14	7.050E-12	7.520E-12	7.240E-16-1.000E+00	3.580E-11	1.100E-10
SKIN(FGR)	4.100E-14	8.813E-12	9.401E-12	9.050E-16-1.000E+00	0.000E+00	0.000E+00
Pt-188						
GONADS	8.770E-15	5.695E-12	9.626E-11	2.000E-16-1.000E+00	4.950E-10	8.380E-10
BREAST	1.020E-14	5.581E-12	9.433E-11	1.960E-16-1.000E+00	3.360E-10	9.600E-11
LUNGS	8.220E-15	5.154E-12	8.711E-11	1.810E-16-1.000E+00	6.970E-10	1.930E-11
RED MARR	7.340E-15	4.869E-12	8.230E-11	1.710E-16-1.000E+00	4.460E-10	2.060E-10
BONE SUR	2.300E-14	1.364E-11	2.305E-10	4.790E-16-1.000E+00	3.500E-10	7.070E-11
THYROID	8.660E-15	5.211E-12	8.808E-11	1.830E-16-1.000E+00	2.690E-10	7.290E-12
REMAINDER	7.740E-15	4.983E-12	8.423E-11	1.750E-16-1.000E+00	1.730E-09	2.140E-09
EFFECTIVE	8.860E-15	5.524E-12	9.337E-11	1.940E-16-1.000E+00	8.480E-10	8.960E-10
SKIN(FGR)	1.180E-14	6.891E-12	1.165E-10	2.420E-16-1.000E+00	0.000E+00	0.000E+00
Pt-189						
GONADS	1.460E-14	7.354E-12	1.840E-11	3.260E-16-1.000E+00	2.500E-11	1.120E-10
BREAST	1.680E-14	7.151E-12	1.790E-11	3.170E-16-1.000E+00	1.170E-11	1.430E-11
LUNGS	1.400E-14	6.677E-12	1.671E-11	2.960E-16-1.000E+00	1.130E-10	3.220E-12
RED MARR	1.300E-14	6.452E-12	1.615E-11	2.860E-16-1.000E+00	1.910E-11	3.460E-11
BONE SUR	3.160E-14	1.498E-11	3.749E-11	6.640E-16-1.000E+00	1.340E-11	1.090E-11
THYROID	1.460E-14	6.835E-12	1.711E-11	3.030E-16-1.000E+00	8.420E-12	4.380E-13
REMAINDER	1.330E-14	6.497E-12	1.626E-11	2.880E-16-1.000E+00	7.950E-11	3.590E-10
EFFECTIVE	1.480E-14	7.083E-12	1.773E-11	3.140E-16-1.000E+00	4.840E-11	1.430E-10
SKIN(FGR)	1.820E-14	1.035E-11	2.591E-11	4.590E-16-1.000E+00	0.000E+00	0.000E+00
Pt-191						
GONADS	1.330E-14	8.459E-12	8.792E-11	3.060E-16-1.000E+00	8.620E-11	3.080E-10
BREAST	1.540E-14	8.265E-12	8.591E-11	2.990E-16-1.000E+00	4.510E-11	3.410E-11
LUNGS	1.260E-14	7.657E-12	7.959E-11	2.770E-16-1.000E+00	2.560E-10	5.330E-12
RED MARR	1.140E-14	7.270E-12	7.556E-11	2.630E-16-1.000E+00	7.650E-11	9.570E-11

BONE SUR	3.200E-14	1.905E-11	1.980E-10	6.890E-16-1.000E+00	5.580E-11	2.980E-11
THYROID	1.320E-14	7.823E-12	8.131E-11	2.830E-16-1.000E+00	3.410E-11	1.080E-12
REMAINDER	1.190E-14	7.409E-12	7.700E-11	2.680E-16-1.000E+00	3.190E-10	9.970E-10
EFFECTIVE	1.340E-14	8.183E-12	8.505E-11	2.960E-16-1.000E+00	1.660E-10	3.940E-10
SKIN(FGR)	1.710E-14	1.106E-11	1.149E-10	4.000E-16-1.000E+00	0.000E+00	0.000E-00
Pt-193						
GONADS	3.580E-19	4.925E-15	1.034E-13	1.710E-19-1.000E+00	1.430E-11	2.020E-12
BREAST	1.630E-18	1.043E-14	2.189E-13	3.620E-19-1.000E+00	1.330E-11	2.950E-13
LUNGS	2.610E-21	2.316E-17	4.862E-16	8.040E-22-1.000E+00	3.860E-11	2.730E-13
RED MARR	7.990E-20	4.378E-16	9.192E-15	1.520E-20-1.000E+00	1.360E-11	3.350E-13
BONE SUR	4.340E-19	2.615E-15	5.491E-14	9.080E-20-1.000E+00	1.350E-11	2.940E-13
THYROID	6.580E-20	6.797E-16	1.427E-14	2.360E-20-1.000E+00	1.420E-11	2.970E-13
REMAINDER	1.300E-19	1.593E-15	3.344E-14	5.530E-20-1.000E+00	1.620E-10	1.050E-10
EFFECTIVE	3.980E-19	3.427E-15	7.196E-14	1.190E-19-1.000E+00	6.140E-11	3.210E-11
SKIN(FGR)	2.070E-17	2.451E-13	5.146E-12	8.510E-18-1.000E+00	0.000E+00	0.000E+00
Pt-193m						
GONADS	4.200E-16	2.945E-13	3.819E-12	1.050E-17-1.000E+00	3.780E-11	1.690E-11
BREAST	5.010E-16	2.973E-13	3.855E-12	1.060E-17-1.000E+00	3.550E-11	2.250E-12
LUNGS	3.630E-16	2.617E-13	3.394E-12	9.330E-18-1.000E+00	4.090E-10	9.020E-13
RED MARR	2.880E-16	2.213E-13	2.870E-12	7.890E-18-1.000E+00	3.860E-11	7.130E-12
BONE SUR	1.450E-15	1.057E-12	1.371E-11	3.770E-17-1.000E+00	3.700E-11	2.620E-12
THYROID	3.970E-16	2.600E-13	3.372E-12	9.270E-18-1.000E+00	3.500E-11	7.600E-13
REMAINDER	3.370E-16	2.513E-13	3.259E-12	8.960E-18-1.000E+00	5.550E-10	1.620E-09
EFFECTIVE	4.150E-16	2.917E-13	3.783E-12	1.040E-17-1.000E+00	2.370E-10	4.900E-10
SKIN(FGR)	3.070E-15	5.104E-13	6.620E-12	1.820E-17-1.000E+00	0.000E+00	0.000E+00
Pt-195m						
GONADS	2.850E-15	1.948E-12	2.444E-11	6.960E-17-1.000E+00	6.800E-11	9.760E-11
BREAST	3.390E-15	1.951E-12	2.448E-11	6.970E-17-1.000E+00	5.420E-11	1.060E-11
LUNGS	2.510E-15	1.741E-12	2.185E-11	6.220E-17-1.000E+00	5.650E-10	2.090E-12
RED MARR	2.030E-15	1.503E-12	1.886E-11	5.370E-17-1.000E+00	7.240E-11	3.990E-11
BONE SUR	9.640E-15	6.689E-12	8.394E-11	2.390E-16-1.000E+00	6.290E-11	1.250E-11
THYROID	2.720E-15	1.741E-12	2.185E-11	6.220E-17-1.000E+00	5.040E-11	1.110E-12
REMAINDER	2.330E-15	1.668E-12	2.093E-11	5.960E-17-1.000E+00	7.480E-10	2.200E-09
EFFECTIVE	2.840E-15	1.923E-12	2.413E-11	6.870E-17-1.000E+00	3.290E-10	6.910E-10
SKIN(FGR)	5.920E-15	2.855E-12	3.582E-11	1.020E-16-1.000E+00	0.000E+00	0.000E+00
Pt-197						
GONADS	1.000E-15	5.715E-13	2.182E-12	2.300E-17-1.000E+00	1.640E-11	1.490E-11
BREAST	1.180E-15	5.715E-13	2.182E-12	2.300E-17-1.000E+00	1.450E-11	1.900E-12
LUNGS	9.180E-16	5.193E-13	1.983E-12	2.090E-17-1.000E+00	4.550E-10	5.580E-13
RED MARR	7.810E-16	4.746E-13	1.812E-12	1.910E-17-1.000E+00	1.590E-11	5.580E-12
BONE SUR	3.100E-15	1.685E-12	6.433E-12	6.780E-17-1.000E+00	1.500E-11	1.910E-12
THYROID	9.760E-16	5.168E-13	1.974E-12	2.080E-17-1.000E+00	1.410E-11	3.320E-13
REMAINDER	8.570E-16	4.994E-13	1.907E-12	2.010E-17-1.000E+00	2.970E-10	1.440E-09
EFFECTIVE	1.010E-15	5.640E-13	2.154E-12	2.270E-17-1.000E+00	1.530E-10	4.350E-10
SKIN(FGR)	1.060E-14	8.274E-12	3.160E-11	3.330E-16-1.000E+00	0.000E+00	0.000E+00
Pt-197m						
GONADS	3.460E-15	6.360E-13	6.553E-13	8.020E-17-1.000E+00	3.240E-12	4.670E-12
BREAST	4.030E-15	6.265E-13	6.455E-13	7.900E-17-1.000E+00	2.800E-12	7.760E-13
LUNGS	3.240E-15	5.742E-13	5.916E-13	7.240E-17-1.000E+00	1.400E-10	3.440E-13
RED MARR	2.890E-15	5.385E-13	5.548E-13	6.790E-17-1.000E+00	3.180E-12	1.850E-12
BONE SUR	8.950E-15	1.539E-12	1.585E-12	1.940E-16-1.000E+00	2.920E-12	6.280E-13
THYROID	3.410E-15	5.813E-13	5.990E-13	7.330E-17-1.000E+00	2.620E-12	5.970E-14
REMAINDER	3.050E-15	5.544E-13	5.712E-13	6.990E-17-1.000E+00	4.830E-11	2.770E-10
EFFECTIVE	3.490E-15	6.162E-13	6.349E-13	7.770E-17-1.000E+00	3.310E-11	8.460E-11
SKIN(FGR)	1.860E-14	9.993E-13	1.030E-12	1.260E-16-1.000E+00	0.000E+00	0.000E+00
Pt-199						
GONADS	9.520E-15	5.572E-13	5.572E-13	2.090E-16-1.000E+00	1.090E-12	1.970E-12
BREAST	1.090E-14	5.385E-13	5.386E-13	2.020E-16-1.000E+00	9.870E-13	5.070E-13
LUNGS	9.410E-15	5.092E-13	5.092E-13	1.910E-16-1.000E+00	6.610E-11	3.660E-13
RED MARR	9.030E-15	5.119E-13	5.119E-13	1.920E-16-1.000E+00	1.070E-12	7.090E-13
BONE SUR	1.750E-14	8.238E-13	8.238E-13	3.090E-16-1.000E+00	9.660E-13	2.780E-13
THYROID	9.680E-15	5.279E-13	5.279E-13	1.980E-16-1.000E+00	9.030E-13	3.800E-14
REMAINDER	8.970E-15	4.959E-13	4.959E-13	1.860E-16-1.000E+00	1.260E-11	9.510E-11

EFFECTIVE	9.730E-15	5.332E-13	5.332E-13	2.000E-16-1.000E+00	1.230E-11	2.920E-11
SKIN(FGR)	4.380E-14	1.512E-11	1.512E-11	5.670E-15-1.000E+00	0.000E+00	0.000E+00
Pt-200						
GONADS	1.583E-14	6.932E-12	2.154E-11	3.318E-16-1.000E+00	5.767E-11	1.112E-10
BREAST	1.805E-14	6.673E-12	2.072E-11	3.192E-16-1.000E+00	4.481E-11	1.617E-11
LUNGS	1.564E-14	6.357E-12	1.976E-11	3.044E-16-1.000E+00	1.570E-09	4.678E-12
RED MARR	1.514E-14	6.391E-12	1.990E-11	3.066E-16-1.000E+00	4.850E-11	2.914E-11
BONE SUR	2.832E-14	1.111E-11	3.395E-11	5.230E-16-1.000E+00	4.413E-11	1.032E-11
THYROID	1.618E-14	6.382E-12	1.984E-11	3.056E-16-1.000E+00	4.164E-11	1.497E-12
REMAINDER	1.499E-14	6.272E-12	1.951E-11	3.005E-16-1.000E+00	8.445E-10	4.408E-09
EFFECTIVE	1.625E-14	6.677E-12	2.074E-11	3.195E-16-1.000E+00	4.713E-10	1.355E-09
SKIN(FGR)	7.490E-14	1.786E-10	5.661E-10	8.720E-15-1.000E+00	0.000E+00	0.000E+00
Pu-234						
GONADS	2.790E-15	1.397E-12	2.989E-12	6.540E-17-1.000E+00	6.370E-11	7.450E-11
BREAST	3.280E-15	1.395E-12	2.985E-12	6.530E-17-1.000E+00	1.130E-11	9.000E-12
LUNGS	2.600E-15	1.196E-12	2.559E-12	5.600E-17-1.000E+00	6.000E-08	1.570E-12
RED MARR	2.230E-15	1.126E-12	2.409E-12	5.270E-17-1.000E+00	2.130E-10	1.890E-11
BONE SUR	8.870E-15	3.760E-12	8.044E-12	1.760E-16-1.000E+00	2.480E-09	9.350E-12
THYROID	2.750E-15	1.233E-12	2.637E-12	5.770E-17-1.000E+00	5.810E-12	2.030E-13
REMAINDER	2.430E-15	1.169E-12	2.500E-12	5.470E-17-1.000E+00	2.750E-10	4.610E-10
EFFECTIVE	2.850E-15	1.338E-12	2.861E-12	6.260E-17-1.000E+00	7.400E-09	1.610E-10
SKIN(FGR)	3.460E-15	2.158E-12	4.616E-12	1.010E-16-1.000E+00	0.000E+00	0.000E+00
Pu-235						
GONADS	3.850E-15	1.995E-13	1.995E-13	9.110E-17-1.000E+00	1.580E-14	5.590E-13
BREAST	4.510E-15	1.991E-13	1.991E-13	9.090E-17-1.000E+00	6.100E-14	1.740E-13
LUNGS	3.600E-15	1.691E-13	1.691E-13	7.720E-17-1.000E+00	4.460E-12	1.400E-13
RED MARR	3.140E-15	1.603E-13	1.603E-13	7.320E-17-1.000E+00	9.290E-14	3.320E-13
BONE SUR	1.150E-14	5.081E-13	5.081E-13	2.320E-16-1.000E+00	1.210E-13	1.320E-13
THYROID	3.800E-15	1.748E-13	1.748E-13	7.980E-17-1.000E+00	3.790E-14	6.020E-15
REMAINDER	3.370E-15	1.656E-13	1.656E-13	7.560E-17-1.000E+00	1.770E-13	4.980E-12
EFFECTIVE	3.920E-15	1.894E-13	1.894E-13	8.650E-17-1.000E+00	6.170E-13	1.720E-12
SKIN(FGR)	4.780E-15	3.154E-13	3.154E-13	1.440E-16-1.000E+00	0.000E+00	0.000E+00
Pu-236						
GONADS	8.310E-18	4.982E-14	1.044E-12	1.730E-18-1.000E+00	3.160E-06	7.850E-10
BREAST	1.560E-17	6.422E-14	1.346E-12	2.230E-18-1.000E+00	1.530E-09	3.900E-13
LUNGS	1.890E-18	3.139E-15	6.577E-14	1.090E-19-1.000E+00	1.880E-04	3.490E-13
RED MARR	2.470E-18	6.854E-15	1.436E-13	2.380E-19-1.000E+00	1.810E-05	4.490E-09
BONE SUR	1.310E-17	4.233E-14	8.870E-13	1.470E-18-1.000E+00	2.260E-04	5.610E-08
THYROID	5.350E-18	1.178E-14	2.468E-13	4.090E-19-1.000E+00	8.380E-10	1.560E-13
REMAINDER	2.880E-18	1.109E-14	2.323E-13	3.850E-19-1.000E+00	8.910E-06	1.900E-08
EFFECTIVE	6.350E-18	2.825E-14	5.919E-13	9.810E-19-1.000E+00	3.500E-05	8.120E-09
SKIN(FGR)	4.830E-17	3.168E-13	6.637E-12	1.100E-17-1.000E+00	0.000E+00	0.000E+00
Pu-237						
GONADS	1.990E-15	1.433E-12	2.862E-11	4.990E-17-1.000E+00	3.860E-11	7.220E-11
BREAST	2.350E-15	1.456E-12	2.908E-11	5.070E-17-1.000E+00	4.070E-11	7.020E-12
LUNGS	1.830E-15	1.152E-12	2.300E-11	4.010E-17-1.000E+00	3.700E-09	7.540E-13
RED MARR	1.570E-15	1.083E-12	2.162E-11	3.770E-17-1.000E+00	7.680E-11	2.350E-11
BONE SUR	6.310E-15	3.763E-12	7.513E-11	1.310E-16-1.000E+00	1.800E-10	7.400E-12
THYROID	1.950E-15	1.204E-12	2.403E-11	4.190E-17-1.000E+00	2.180E-11	3.280E-14
REMAINDER	1.710E-15	1.138E-12	2.271E-11	3.960E-17-1.000E+00	1.950E-10	3.230E-10
EFFECTIVE	2.020E-15	1.336E-12	2.667E-11	4.650E-17-1.000E+00	5.330E-10	1.190E-10
SKIN(FGR)	2.540E-15	2.603E-12	5.196E-11	9.060E-17-1.000E+00	0.000E+00	0.000E+00
Pu-238						
GONADS	6.560E-18	4.291E-14	9.011E-13	1.490E-18-1.000E+00	1.040E-05	2.330E-09
BREAST	1.270E-17	5.558E-14	1.167E-12	1.930E-18-1.000E+00	4.400E-10	1.800E-13
LUNGS	1.060E-18	2.267E-15	4.759E-14	7.870E-20-1.000E+00	3.200E-04	8.640E-14
RED MARR	1.680E-18	5.587E-15	1.173E-13	1.940E-19-1.000E+00	5.800E-05	1.270E-08
BONE SUR	9.300E-18	3.514E-14	7.378E-13	1.220E-18-1.000E+00	7.250E-04	1.580E-07
THYROID	4.010E-18	9.792E-15	2.056E-13	3.400E-19-1.000E+00	3.860E-10	7.990E-14
REMAINDER	1.990E-18	9.216E-15	1.935E-13	3.200E-19-1.000E+00	2.740E-05	2.180E-08
EFFECTIVE	4.880E-18	2.413E-14	5.068E-13	8.380E-19-1.000E+00	7.790E-05	1.340E-08
SKIN(FGR)	4.090E-17	2.776E-13	5.830E-12	9.640E-18-1.000E+00	0.000E+00	0.000E+00
Pu-239						

GONADS	4.840E-18	1.768E-14	3.713E-13	6.140E-19-1.000E+00	1.200E-05	2.640E-09
BREAST	7.550E-18	2.238E-14	4.699E-13	7.770E-19-1.000E+00	3.990E-10	1.210E-13
LUNGS	2.650E-18	2.267E-15	4.760E-14	7.870E-20-1.000E+00	3.230E-04	7.890E-14
RED MARR	2.670E-18	3.456E-15	7.258E-14	1.200E-19-1.000E+00	6.570E-05	1.410E-08
BONE SUR	9.470E-18	1.673E-14	3.514E-13	5.810E-19-1.000E+00	8.210E-04	1.760E-07
THYROID	3.880E-18	5.126E-15	1.077E-13	1.780E-19-1.000E+00	3.750E-10	7.500E-14
REMAINDER	2.860E-18	4.838E-15	1.016E-13	1.680E-19-1.000E+00	3.020E-05	2.120E-08
EFFECTIVE	4.240E-18	1.057E-14	2.220E-13	3.670E-19-1.000E+00	8.330E-05	1.400E-08
SKIN(FGR)	1.860E-17	1.057E-13	2.220E-12	3.670E-18-1.000E+00	0.000E+00	0.000E+00
Pu-240						
GONADS	6.360E-18	4.118E-14	8.649E-13	1.430E-18-1.000E+00	1.200E-05	2.640E-09
BREAST	1.230E-17	5.328E-14	1.119E-12	1.850E-18-1.000E+00	4.330E-10	1.730E-13
LUNGS	1.090E-18	2.249E-15	4.723E-14	7.810E-20-1.000E+00	3.230E-04	8.220E-14
RED MARR	1.650E-18	5.386E-15	1.131E-13	1.870E-19-1.000E+00	6.570E-05	1.410E-08
BONE SUR	9.260E-18	3.398E-14	7.137E-13	1.180E-18-1.000E+00	8.210E-04	1.760E-07
THYROID	3.920E-18	9.446E-15	1.984E-13	3.280E-19-1.000E+00	3.760E-10	7.510E-14
REMAINDER	1.960E-18	8.870E-15	1.863E-13	3.080E-19-1.000E+00	3.020E-05	2.130E-08
EFFECTIVE	4.750E-18	2.313E-14	4.857E-13	8.030E-19-1.000E+00	8.330E-05	1.400E-08
SKIN(FGR)	3.920E-17	2.644E-13	5.552E-12	9.180E-18-1.000E+00	0.000E+00	0.000E+00
Pu-241						
GONADS	7.190E-20	6.653E-17	1.396E-15	2.310E-21-1.000E+00	2.760E-07	5.660E-11
BREAST	8.670E-20	7.229E-17	1.517E-15	2.510E-21-1.000E+00	2.140E-11	2.790E-15
LUNGS	6.480E-20	4.090E-17	8.584E-16	1.420E-21-1.000E+00	3.180E-06	4.480E-15
RED MARR	5.630E-20	4.003E-17	8.403E-16	1.390E-21-1.000E+00	1.430E-06	2.780E-10
BONE SUR	2.190E-19	1.385E-16	2.908E-15	4.810E-21-1.000E+00	1.780E-05	3.480E-09
THYROID	6.980E-20	4.522E-17	9.491E-16	1.570E-21-1.000E+00	9.150E-12	1.010E-15
REMAINDER	6.090E-20	4.291E-17	9.007E-16	1.490E-21-1.000E+00	6.020E-07	1.850E-10
EFFECTIVE	7.250E-20	5.558E-17	1.167E-15	1.930E-21-1.000E+00	1.340E-06	2.070E-10
SKIN(FGR)	1.170E-19	2.033E-16	4.268E-15	7.060E-21-1.000E+00	0.000E+00	0.000E+00
Pu-242						
GONADS	5.340E-18	3.398E-14	7.137E-13	1.180E-18-1.000E+00	1.140E-05	2.510E-09
BREAST	1.030E-17	4.406E-14	9.253E-13	1.530E-18-1.000E+00	4.350E-10	2.540E-13
LUNGS	9.690E-19	1.901E-15	3.992E-14	6.600E-20-1.000E+00	3.070E-04	9.180E-14
RED MARR	1.430E-18	4.522E-15	9.495E-14	1.570E-19-1.000E+00	6.250E-05	1.340E-08
BONE SUR	7.900E-18	2.834E-14	5.951E-13	9.840E-19-1.000E+00	7.810E-04	1.670E-07
THYROID	3.320E-18	7.862E-15	1.651E-13	2.730E-19-1.000E+00	3.710E-10	7.380E-14
REMAINDER	1.680E-18	7.402E-15	1.554E-13	2.570E-19-1.000E+00	2.860E-05	2.020E-08
EFFECTIVE	4.010E-18	1.921E-14	4.034E-13	6.670E-19-1.000E+00	7.920E-05	1.330E-08
SKIN(FGR)	3.270E-17	2.192E-13	4.603E-12	7.610E-18-1.000E+00	0.000E+00	0.000E+00
Pu-243						
GONADS	1.020E-15	4.385E-13	6.512E-13	2.530E-17-1.000E+00	1.670E-12	4.560E-12
BREAST	1.210E-15	4.420E-13	6.564E-13	2.550E-17-1.000E+00	2.750E-13	5.930E-13
LUNGS	9.280E-16	3.692E-13	5.483E-13	2.130E-17-1.000E+00	2.270E-10	1.470E-13
RED MARR	7.840E-16	3.380E-13	5.019E-13	1.950E-17-1.000E+00	5.770E-12	1.820E-12
BONE SUR	3.230E-15	1.255E-12	1.864E-12	7.240E-17-1.000E+00	6.530E-11	5.710E-13
THYROID	9.910E-16	3.796E-13	5.637E-13	2.190E-17-1.000E+00	1.130E-13	5.500E-15
REMAINDER	8.660E-16	3.588E-13	5.328E-13	2.070E-17-1.000E+00	4.690E-11	2.960E-10
EFFECTIVE	1.030E-15	4.177E-13	6.203E-13	2.410E-17-1.000E+00	4.440E-11	9.020E-11
SKIN(FGR)	8.150E-15	2.045E-12	3.037E-12	1.180E-16-1.000E+00	0.000E+00	0.000E+00
Pu-244						
GONADS	4.100E-18	2.874E-14	6.036E-13	9.980E-19-1.000E+00	1.130E-05	2.940E-09
BREAST	8.230E-18	3.744E-14	7.862E-13	1.300E-18-1.000E+00	2.070E-08	5.360E-11
LUNGS	4.230E-19	1.339E-15	2.812E-14	4.650E-20-1.000E+00	3.030E-04	9.290E-12
RED MARR	8.800E-19	3.600E-15	7.560E-14	1.250E-19-1.000E+00	6.190E-05	1.330E-08
BONE SUR	5.290E-18	2.318E-14	4.869E-13	8.050E-19-1.000E+00	7.690E-04	1.650E-07
THYROID	2.390E-18	6.422E-15	1.349E-13	2.230E-19-1.000E+00	1.270E-08	2.220E-12
REMAINDER	1.080E-18	6.048E-15	1.270E-13	2.100E-19-1.000E+00	2.840E-05	2.840E-08
EFFECTIVE	2.970E-18	1.607E-14	3.375E-13	5.580E-19-1.000E+00	7.820E-05	1.580E-08
SKIN(FGR)	2.690E-17	1.869E-13	3.925E-12	6.490E-18-1.000E+00	0.000E+00	0.000E+00
Pu-245						
GONADS	1.950E-14	9.509E-12	2.318E-11	4.250E-16-1.000E+00	3.060E-11	1.220E-10
BREAST	2.230E-14	9.173E-12	2.236E-11	4.100E-16-1.000E+00	8.090E-12	1.620E-11
LUNGS	1.920E-14	8.592E-12	2.094E-11	3.840E-16-1.000E+00	1.400E-09	3.980E-12

RED MARR	1.850E-14	8.681E-12	2.116E-11	3.880E-16-1.000E+00	2.160E-11	2.830E-11
BONE SUR	3.570E-14	1.412E-11	3.441E-11	6.310E-16-1.000E+00	1.280E-10	9.460E-12
THYROID	1.980E-14	8.883E-12	2.165E-11	3.970E-16-1.000E+00	3.980E-12	4.500E-13
REMAINDER	1.840E-14	8.435E-12	2.056E-11	3.770E-16-1.000E+00	5.710E-10	2.320E-09
EFFECTIVE	1.990E-14	9.039E-12	2.203E-11	4.040E-16-1.000E+00	3.550E-10	7.340E-10
SKIN(FGR)	4.000E-14	4.542E-11	1.107E-10	2.030E-15-1.000E+00	0.000E+00	0.000E+00
Pu-246						
GONADS	3.803E-14	2.207E-11	4.169E-10	8.580E-16-1.000E+00	5.351E-10	9.468E-10
BREAST	4.361E-14	2.147E-11	4.052E-10	8.340E-16-1.000E+00	1.879E-10	1.029E-10
LUNGS	3.715E-14	1.936E-11	3.658E-10	7.530E-16-1.000E+00	3.101E-08	1.547E-11
RED MARR	3.537E-14	1.944E-11	3.678E-10	7.570E-16-1.000E+00	7.318E-10	2.104E-10
BONE SUR	7.430E-14	3.522E-11	6.595E-10	1.357E-15-1.000E+00	5.956E-09	7.022E-11
THYROID	3.848E-14	2.018E-11	3.814E-10	7.850E-16-1.000E+00	1.138E-10	1.833E-12
REMAINDER	3.543E-14	1.905E-11	3.600E-10	7.410E-16-1.000E+00	5.505E-09	1.144E-08
EFFECTIVE	3.881E-14	2.076E-11	3.921E-10	8.070E-16-1.000E+00	5.807E-09	3.705E-09
SKIN(FGR)	7.302E-14	1.042E-10	1.998E-09	4.114E-15-1.000E+00	0.000E+00	0.000E+00
Ra-222						
GONADS	4.647E-16	5.594E-16	5.594E-16	1.020E-17-1.000E+00	0.000E+00	0.000E+00
BREAST	5.318E-16	5.416E-16	5.416E-16	9.880E-18-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.565E-16	5.095E-16	5.095E-16	9.294E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.335E-16	5.117E-16	5.117E-16	9.334E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.470E-16	8.695E-16	8.695E-16	1.586E-17-1.000E+00	0.000E+00	0.000E+00
THYROID	4.715E-16	5.228E-16	5.228E-16	9.537E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.340E-16	4.961E-16	4.961E-16	9.050E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.755E-16	5.342E-16	5.342E-16	9.745E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.940E-16	6.496E-16	6.496E-16	1.185E-17-1.000E+00	0.000E+00	0.000E+00
Ra-223						
GONADS	8.590E-15	5.400E-12	9.335E-11	1.894E-16-1.000E+00	3.380E-08	4.260E-08
BREAST	9.910E-15	5.263E-12	9.098E-11	1.846E-16-1.000E+00	3.380E-08	4.230E-08
LUNGS	8.260E-15	4.912E-12	8.492E-11	1.723E-16-1.000E+00	1.660E-05	4.230E-08
RED MARR	7.590E-15	4.804E-12	8.305E-11	1.685E-16-1.000E+00	2.240E-07	2.800E-07
BONE SUR	2.084E-14	1.088E-11	1.882E-10	3.818E-16-1.000E+00	2.340E-06	2.930E-06
THYROID	8.610E-15	5.009E-12	8.659E-11	1.757E-16-1.000E+00	3.380E-08	4.230E-08
REMAINDER	7.810E-15	4.758E-12	8.226E-11	1.669E-16-1.000E+00	6.140E-08	1.100E-07
EFFECTIVE	8.770E-15	5.214E-12	9.014E-11	1.829E-16-1.000E+00	2.120E-06	1.780E-07
SKIN(FGR)	1.225E-14	6.654E-12	1.150E-10	2.334E-16-1.000E+00	0.000E+00	0.000E+00
Ra-224						
GONADS	4.791E-16	2.886E-13	3.464E-12	1.034E-17-1.000E+00	1.560E-08	2.120E-08
BREAST	5.487E-16	2.814E-13	3.378E-12	1.008E-17-1.000E+00	1.540E-08	2.060E-08
LUNGS	4.650E-16	2.633E-13	3.161E-12	9.435E-18-1.000E+00	6.560E-06	2.050E-08
RED MARR	4.344E-16	2.629E-13	3.156E-12	9.419E-18-1.000E+00	1.130E-07	1.520E-07
BONE SUR	1.101E-15	5.065E-13	6.081E-12	1.815E-17-1.000E+00	1.170E-06	1.590E-06
THYROID	4.825E-16	2.654E-13	3.187E-12	9.511E-18-1.000E+00	1.530E-08	2.050E-08
REMAINDER	4.412E-16	2.567E-13	3.081E-12	9.197E-18-1.000E+00	3.550E-08	7.150E-08
EFFECTIVE	4.895E-16	2.777E-13	3.334E-12	9.951E-18-1.000E+00	8.530E-07	9.890E-08
SKIN(FGR)	6.570E-16	3.383E-13	4.061E-12	1.212E-17-1.000E+00	0.000E+00	0.000E+00
Ra-225						
GONADS	3.240E-16	4.658E-13	8.405E-12	1.630E-17-1.000E+00	3.070E-08	3.370E-08
BREAST	4.240E-16	4.972E-13	8.973E-12	1.740E-17-1.000E+00	3.070E-08	3.370E-08
LUNGS	1.960E-16	2.686E-13	4.847E-12	9.400E-18-1.000E+00	1.670E-05	3.370E-08
RED MARR	1.420E-16	1.926E-13	3.476E-12	6.740E-18-1.000E+00	1.580E-07	1.680E-07
BONE SUR	9.200E-16	1.349E-12	2.434E-11	4.720E-17-1.000E+00	1.680E-06	1.780E-06
THYROID	2.770E-16	3.286E-13	5.930E-12	1.150E-17-1.000E+00	3.070E-08	3.370E-08
REMAINDER	1.930E-16	2.752E-13	4.966E-12	9.630E-18-1.000E+00	3.630E-08	4.090E-08
EFFECTIVE	2.790E-16	3.801E-13	6.858E-12	1.330E-17-1.000E+00	2.100E-06	1.040E-07
SKIN(FGR)	3.010E-15	9.287E-13	1.676E-11	3.250E-17-1.000E+00	0.000E+00	0.000E+00
Ra-226						
GONADS	3.080E-16	1.912E-13	4.016E-12	6.640E-18-1.000E+00	1.020E-07	9.160E-08
BREAST	3.540E-16	1.878E-13	3.943E-12	6.520E-18-1.000E+00	1.020E-07	9.170E-08
LUNGS	2.950E-16	1.745E-13	3.665E-12	6.060E-18-1.000E+00	1.610E-05	9.160E-08
RED MARR	2.700E-16	1.714E-13	3.599E-12	5.950E-18-1.000E+00	6.640E-07	5.980E-07
BONE SUR	7.950E-16	3.917E-13	8.225E-12	1.360E-17-1.000E+00	7.590E-06	6.830E-06
THYROID	3.090E-16	1.745E-13	3.665E-12	6.060E-18-1.000E+00	1.020E-07	9.150E-08

REMAINDER	2.790E-16	1.699E-13	3.568E-12	5.900E-18	-1.000E+00	1.070E-07	1.030E-07
EFFECTIVE	3.150E-16	1.855E-13	3.895E-12	6.440E-18	-1.000E+00	2.320E-06	3.580E-07
SKIN(FGR)	4.790E-16	2.339E-13	4.911E-12	8.120E-18	-1.000E+00	0.000E+00	0.000E+00
Ra-227							
GONADS	7.280E-15	6.244E-13	6.246E-13	1.710E-16	-1.000E+00	2.270E-12	3.650E-12
BREAST	8.380E-15	6.135E-13	6.137E-13	1.680E-16	-1.000E+00	2.360E-12	2.310E-12
LUNGS	7.070E-15	5.331E-13	5.333E-13	1.460E-16	-1.000E+00	3.320E-10	2.160E-12
RED MARR	6.690E-15	5.331E-13	5.333E-13	1.460E-16	-1.000E+00	4.810E-11	4.300E-11
BONE SUR	1.490E-14	9.969E-13	9.972E-13	2.730E-16	-1.000E+00	9.590E-10	8.540E-10
THYROID	7.340E-15	5.587E-13	5.589E-13	1.530E-16	-1.000E+00	2.300E-12	1.840E-12
REMAINDER	6.730E-15	5.258E-13	5.260E-13	1.440E-16	-1.000E+00	4.600E-12	9.560E-11
EFFECTIVE	7.410E-15	5.806E-13	5.808E-13	1.590E-16	-1.000E+00	7.680E-11	6.100E-11
SKIN(FGR)	3.190E-14	1.220E-11	1.220E-11	3.340E-15	-1.000E+00	0.000E+00	0.000E+00
Ra-228							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.830E-07	1.580E-07
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.840E-07	1.570E-07
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	7.220E-06	1.570E-07
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	7.380E-07	6.530E-07
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	6.510E-06	5.820E-06
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.830E-07	1.570E-07
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.870E-07	1.630E-07
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.290E-06	3.880E-07
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Rb-79							
GONADS	6.360E-14	2.775E-12	2.775E-12	1.400E-15	-1.000E+00	1.210E-12	2.740E-12
BREAST	7.280E-14	2.676E-12	2.676E-12	1.350E-15	-1.000E+00	1.700E-12	3.400E-12
LUNGS	6.310E-14	2.537E-12	2.537E-12	1.280E-15	-1.000E+00	7.940E-11	3.860E-12
RED MARR	6.060E-14	2.557E-12	2.557E-12	1.290E-15	-1.000E+00	1.760E-12	3.290E-12
BONE SUR	1.150E-13	4.004E-12	4.004E-12	2.020E-15	-1.000E+00	1.620E-12	2.870E-12
THYROID	6.480E-14	2.636E-12	2.636E-12	1.330E-15	-1.000E+00	1.530E-12	2.200E-12
REMAINDER	6.020E-14	2.478E-12	2.478E-12	1.250E-15	-1.000E+00	9.830E-12	8.580E-11
EFFECTIVE	6.510E-14	2.656E-12	2.656E-12	1.340E-15	-1.000E+00	1.330E-11	2.790E-11
SKIN(FGR)	1.280E-13	2.141E-11	2.141E-11	1.080E-14	-1.000E+00	0.000E+00	0.000E+00
Rb-80							
GONADS	5.930E-14	6.475E-14	6.475E-14	1.320E-15	-1.000E+00	0.000E+00	0.000E+00
BREAST	6.780E-14	6.181E-14	6.181E-14	1.260E-15	-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.890E-14	5.886E-14	5.886E-14	1.200E-15	-1.000E+00	0.000E+00	0.000E+00
RED MARR	5.680E-14	5.935E-14	5.935E-14	1.210E-15	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.040E-13	8.976E-14	8.976E-14	1.830E-15	-1.000E+00	0.000E+00	0.000E+00
THYROID	6.050E-14	6.131E-14	6.131E-14	1.250E-15	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.630E-14	5.739E-14	5.739E-14	1.170E-15	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	6.070E-14	6.131E-14	6.131E-14	1.250E-15	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.110E-13	8.976E-13	8.976E-13	1.830E-14	-1.000E+00	0.000E+00	0.000E+00
Rb-81							
GONADS	2.890E-14	1.062E-11	1.513E-11	6.360E-16	-1.000E+00	9.790E-12	2.120E-11
BREAST	3.310E-14	1.027E-11	1.463E-11	6.150E-16	-1.000E+00	1.090E-11	2.010E-11
LUNGS	2.850E-14	9.669E-12	1.377E-11	5.790E-16	-1.000E+00	1.830E-10	2.110E-11
RED MARR	2.720E-14	9.719E-12	1.384E-11	5.820E-16	-1.000E+00	1.350E-11	2.560E-11
BONE SUR	5.530E-14	1.590E-11	2.265E-11	9.520E-16	-1.000E+00	1.500E-11	2.930E-11
THYROID	2.930E-14	1.000E-11	1.425E-11	5.990E-16	-1.000E+00	1.030E-11	1.850E-11
REMAINDER	2.720E-14	9.435E-12	1.344E-11	5.650E-16	-1.000E+00	2.220E-11	7.920E-11
EFFECTIVE	2.960E-14	1.014E-11	1.444E-11	6.070E-16	-1.000E+00	3.510E-11	3.910E-11
SKIN(FGR)	4.460E-14	3.306E-11	4.710E-11	1.980E-15	-1.000E+00	0.000E+00	0.000E+00
Rb-81m							
GONADS	1.870E-16	1.767E-14	1.767E-14	6.380E-18	-1.000E+00	1.310E-12	2.820E-12
BREAST	2.300E-16	2.125E-14	2.125E-14	7.670E-18	-1.000E+00	1.430E-12	2.630E-12
LUNGS	1.660E-16	1.053E-14	1.053E-14	3.800E-18	-1.000E+00	2.990E-11	2.720E-12
RED MARR	1.380E-16	9.999E-15	1.000E-14	3.610E-18	-1.000E+00	1.770E-12	3.380E-12
BONE SUR	6.170E-16	4.072E-14	4.072E-14	1.470E-17	-1.000E+00	1.980E-12	3.920E-12
THYROID	1.780E-16	1.119E-14	1.119E-14	4.040E-18	-1.000E+00	1.350E-12	2.510E-12
REMAINDER	1.550E-16	1.136E-14	1.136E-14	4.100E-18	-1.000E+00	3.280E-12	1.440E-11
EFFECTIVE	1.880E-16	1.504E-14	1.504E-14	5.430E-18	-1.000E+00	5.430E-12	6.350E-12
SKIN(FGR)	4.010E-16	1.125E-13	1.125E-13	4.060E-17	-1.000E+00	0.000E+00	0.000E+00

Rb-82						
GONADS	5.180E-14	1.294E-13	1.294E-13	1.150E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	5.920E-14	1.238E-13	1.238E-13	1.100E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.140E-14	1.170E-13	1.170E-13	1.040E-15-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.960E-14	1.182E-13	1.182E-13	1.050E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.030E-14	1.789E-13	1.789E-13	1.590E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	5.280E-14	1.227E-13	1.227E-13	1.090E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.910E-14	1.148E-13	1.148E-13	1.020E-15-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	5.300E-14	1.227E-13	1.227E-13	1.090E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.580E-13	1.733E-12	1.733E-12	1.540E-14-1.000E+00	0.000E+00	0.000E+00
Rb-82m						
GONADS	1.400E-13	5.596E-11	9.467E-11	2.940E-15-1.000E+00	3.800E-11	8.050E-11
BREAST	1.590E-13	5.349E-11	9.048E-11	2.810E-15-1.000E+00	4.530E-11	7.580E-11
LUNGS	1.400E-13	5.120E-11	8.662E-11	2.690E-15-1.000E+00	2.530E-10	7.740E-11
RED MARR	1.370E-13	5.235E-11	8.855E-11	2.750E-15-1.000E+00	5.220E-11	9.070E-11
BONE SUR	2.190E-13	7.348E-11	1.243E-10	3.860E-15-1.000E+00	4.940E-11	8.840E-11
THYROID	1.430E-13	5.254E-11	8.887E-11	2.760E-15-1.000E+00	4.370E-11	6.990E-11
REMAINDER	1.340E-13	5.063E-11	8.565E-11	2.660E-15-1.000E+00	7.540E-11	1.860E-10
EFFECTIVE	1.430E-13	5.349E-11	9.048E-11	2.810E-15-1.000E+00	7.830E-11	1.120E-10
SKIN(FGR)	1.680E-13	7.576E-11	1.282E-10	3.980E-15-1.000E+00	0.000E+00	0.000E+00
Rb-83						
GONADS	2.330E-14	1.490E-11	3.046E-10	5.180E-16-1.000E+00	1.250E-09	1.980E-09
BREAST	2.670E-14	1.432E-11	2.929E-10	4.980E-16-1.000E+00	1.100E-09	1.730E-09
LUNGS	2.320E-14	1.352E-11	2.764E-10	4.700E-16-1.000E+00	1.350E-09	1.790E-09
RED MARR	2.240E-14	1.366E-11	2.793E-10	4.750E-16-1.000E+00	1.640E-09	2.610E-09
BONE SUR	4.060E-14	2.048E-11	4.187E-10	7.120E-16-1.000E+00	1.900E-09	3.020E-09
THYROID	2.380E-14	1.412E-11	2.888E-10	4.910E-16-1.000E+00	1.100E-09	1.740E-09
REMAINDER	2.210E-14	1.326E-11	2.711E-10	4.610E-16-1.000E+00	1.360E-09	2.170E-09
EFFECTIVE	2.390E-14	1.415E-11	2.893E-10	4.920E-16-1.000E+00	1.330E-09	2.080E-09
SKIN(FGR)	2.770E-14	1.832E-11	3.746E-10	6.370E-16-1.000E+00	0.000E+00	0.000E+00
Rb-84						
GONADS	4.370E-14	2.680E-11	5.251E-10	9.340E-16-1.000E+00	1.580E-09	2.520E-09
BREAST	4.970E-14	2.566E-11	5.026E-10	8.940E-16-1.000E+00	1.440E-09	2.290E-09
LUNGS	4.360E-14	2.445E-11	4.790E-10	8.520E-16-1.000E+00	2.030E-09	2.290E-09
RED MARR	4.250E-14	2.497E-11	4.891E-10	8.700E-16-1.000E+00	2.150E-09	3.430E-09
BONE SUR	6.990E-14	3.559E-11	6.971E-10	1.240E-15-1.000E+00	2.770E-09	4.410E-09
THYROID	4.480E-14	2.537E-11	4.969E-10	8.840E-16-1.000E+00	1.440E-09	2.290E-09
REMAINDER	4.170E-14	2.414E-11	4.728E-10	8.410E-16-1.000E+00	1.750E-09	2.790E-09
EFFECTIVE	4.470E-14	2.554E-11	5.003E-10	8.900E-16-1.000E+00	1.760E-09	2.700E-09
SKIN(FGR)	5.710E-14	5.367E-11	1.051E-09	1.870E-15-1.000E+00	0.000E+00	0.000E+00
Rb-86						
GONADS	4.710E-15	2.788E-12	5.187E-11	9.740E-17-1.000E+00	1.340E-09	2.150E-09
BREAST	5.340E-15	2.662E-12	4.953E-11	9.300E-17-1.000E+00	1.330E-09	2.140E-09
LUNGS	4.710E-15	2.553E-12	4.750E-11	8.920E-17-1.000E+00	3.300E-09	2.140E-09
RED MARR	4.640E-15	2.619E-12	4.873E-11	9.150E-17-1.000E+00	2.320E-09	3.720E-09
BONE SUR	7.050E-15	3.635E-12	6.764E-11	1.270E-16-1.000E+00	4.270E-09	6.860E-09
THYROID	4.840E-15	2.599E-12	4.836E-11	9.080E-17-1.000E+00	1.330E-09	2.140E-09
REMAINDER	4.520E-15	2.542E-12	4.729E-11	8.880E-17-1.000E+00	1.380E-09	2.330E-09
EFFECTIVE	4.810E-15	2.665E-12	4.958E-11	9.310E-17-1.000E+00	1.790E-09	2.530E-09
SKIN(FGR)	4.850E-14	2.210E-10	4.111E-09	7.720E-15-1.000E+00	0.000E+00	0.000E+00
Rb-87						
GONADS	1.960E-18	3.168E-15	6.653E-14	1.100E-19-1.000E+00	7.160E-10	1.140E-09
BREAST	2.480E-18	3.427E-15	7.197E-14	1.190E-19-1.000E+00	7.160E-10	1.140E-09
LUNGS	1.450E-18	1.722E-15	3.617E-14	5.980E-20-1.000E+00	1.050E-09	1.140E-09
RED MARR	1.180E-18	1.454E-15	3.054E-14	5.050E-20-1.000E+00	1.270E-09	2.020E-09
BONE SUR	5.840E-18	7.747E-15	1.627E-13	2.690E-19-1.000E+00	2.400E-09	3.800E-09
THYROID	1.770E-18	2.120E-15	4.451E-14	7.360E-20-1.000E+00	7.160E-10	1.140E-09
REMAINDER	1.390E-18	1.835E-15	3.853E-14	6.370E-20-1.000E+00	7.200E-10	1.170E-09
EFFECTIVE	1.820E-18	2.534E-15	5.322E-14	8.800E-20-1.000E+00	8.740E-10	1.330E-09
SKIN(FGR)	3.150E-15	7.862E-15	1.651E-13	2.730E-19-1.000E+00	0.000E+00	0.000E+00
Rb-88						
GONADS	3.260E-14	9.491E-13	9.491E-13	6.160E-16-1.000E+00	1.310E-12	2.780E-12
BREAST	3.670E-14	9.075E-13	9.075E-13	5.890E-16-1.000E+00	1.430E-12	2.820E-12

LUNGS	3.310E-14	8.860E-13	8.860E-13	5.750E-16-1.000E+00	1.470E-10	2.910E-12
RED MARR	3.300E-14	9.106E-13	9.106E-13	5.910E-16-1.000E+00	1.450E-12	2.760E-12
BONE SUR	4.620E-14	1.210E-12	1.210E-12	7.850E-16-1.000E+00	1.470E-12	2.750E-12
THYROID	3.370E-14	8.474E-13	8.474E-13	5.500E-16-1.000E+00	1.370E-12	2.430E-12
REMAINDER	3.210E-14	8.875E-13	8.875E-13	5.760E-16-1.000E+00	1.380E-11	1.500E-10
EFFECTIVE	3.360E-14	9.168E-13	9.168E-13	5.950E-16-1.000E+00	2.260E-11	4.710E-11
SKIN(FGR)	1.830E-13	2.573E-11	2.573E-11	1.670E-14-1.000E+00	0.000E+00	0.000E+00
Rb-89						
GONADS	1.030E-13	2.618E-12	2.618E-12	1.990E-15-1.000E+00	1.340E-12	3.320E-12
BREAST	1.170E-13	2.500E-12	2.500E-12	1.900E-15-1.000E+00	1.730E-12	3.380E-12
LUNGS	1.040E-13	2.434E-12	2.434E-12	1.850E-15-1.000E+00	6.800E-11	3.680E-12
RED MARR	1.040E-13	2.500E-12	2.500E-12	1.900E-15-1.000E+00	2.020E-12	3.530E-12
BONE SUR	1.480E-13	3.316E-12	3.316E-12	2.520E-15-1.000E+00	2.540E-12	4.190E-12
THYROID	1.070E-13	2.381E-12	2.381E-12	1.810E-15-1.000E+00	1.610E-12	2.210E-12
REMAINDER	1.010E-13	2.421E-12	2.421E-12	1.840E-15-1.000E+00	8.140E-12	8.040E-11
EFFECTIVE	1.060E-13	2.513E-12	2.513E-12	1.910E-15-1.000E+00	1.160E-11	2.650E-11
SKIN(FGR)	1.870E-13	1.592E-11	1.592E-11	1.210E-14-1.000E+00	0.000E+00	0.000E+00
Re-177						
GONADS	2.900E-14	7.441E-13	7.441E-13	6.140E-16-1.000E+00	4.130E-13	3.760E-12
BREAST	3.320E-14	7.174E-13	7.174E-13	5.920E-16-1.000E+00	6.430E-13	1.720E-12
LUNGS	2.860E-14	6.811E-13	6.811E-13	5.620E-16-1.000E+00	3.240E-11	1.610E-12
RED MARR	2.740E-14	6.750E-13	6.750E-13	5.570E-16-1.000E+00	8.040E-13	2.260E-12
BONE SUR	5.310E-14	1.248E-12	1.248E-12	1.030E-15-1.000E+00	6.390E-13	1.390E-12
THYROID	2.940E-14	6.823E-13	6.823E-13	5.630E-16-1.000E+00	6.600E-12	2.480E-11
REMAINDER	2.740E-14	6.677E-13	6.677E-13	5.510E-16-1.000E+00	2.180E-12	4.040E-11
EFFECTIVE	2.960E-14	7.150E-13	7.150E-13	5.900E-16-1.000E+00	5.060E-12	1.460E-11
SKIN(FGR)	5.170E-14	4.399E-12	4.399E-12	3.630E-15-1.000E+00	0.000E+00	0.000E+00
Re-178						
GONADS	5.950E-14	1.348E-12	1.348E-12	1.180E-15-1.000E+00	1.600E-13	1.920E-12
BREAST	6.720E-14	1.291E-12	1.291E-12	1.130E-15-1.000E+00	4.080E-13	1.120E-12
LUNGS	5.930E-14	1.234E-12	1.234E-12	1.080E-15-1.000E+00	3.710E-11	1.170E-12
RED MARR	5.780E-14	1.257E-12	1.257E-12	1.100E-15-1.000E+00	4.410E-13	1.140E-12
BONE SUR	9.910E-14	1.988E-12	1.988E-12	1.740E-15-1.000E+00	3.630E-13	6.340E-13
THYROID	6.100E-14	1.234E-12	1.234E-12	1.080E-15-1.000E+00	2.860E-12	4.350E-12
REMAINDER	5.700E-14	1.223E-12	1.223E-12	1.070E-15-1.000E+00	1.230E-12	4.850E-11
EFFECTIVE	6.090E-14	1.291E-12	1.291E-12	1.130E-15-1.000E+00	5.070E-12	1.560E-11
SKIN(FGR)	1.040E-13	7.278E-12	7.278E-12	6.370E-15-1.000E+00	0.000E+00	0.000E+00
Re-180						
GONADS	5.620E-14	2.524E-13	2.524E-13	1.200E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	6.400E-14	2.419E-13	2.419E-13	1.150E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.560E-14	2.293E-13	2.293E-13	1.090E-15-1.000E+00	0.000E+00	0.000E+00
RED MARR	5.400E-14	2.335E-13	2.335E-13	1.110E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	9.290E-14	3.660E-13	3.660E-13	1.740E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	5.740E-14	2.377E-13	2.377E-13	1.130E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.320E-14	2.272E-13	2.272E-13	1.080E-15-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	5.720E-14	2.419E-13	2.419E-13	1.150E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	7.110E-14	4.859E-13	4.859E-13	2.310E-15-1.000E+00	0.000E+00	0.000E+00
Re-181						
GONADS	3.580E-14	1.969E-11	8.109E-11	7.830E-16-1.000E+00	4.100E-11	1.380E-10
BREAST	4.100E-14	1.899E-11	7.819E-11	7.550E-16-1.000E+00	3.340E-11	6.120E-11
LUNGS	3.510E-14	1.793E-11	7.384E-11	7.130E-16-1.000E+00	6.860E-10	5.570E-11
RED MARR	3.350E-14	1.786E-11	7.353E-11	7.100E-16-1.000E+00	4.110E-11	8.110E-11
BONE SUR	6.730E-14	3.219E-11	1.326E-10	1.280E-15-1.000E+00	3.230E-11	6.060E-11
THYROID	3.630E-14	1.841E-11	7.581E-11	7.320E-16-1.000E+00	5.450E-10	1.550E-09
REMAINDER	3.350E-14	1.751E-11	7.208E-11	6.960E-16-1.000E+00	1.800E-10	5.760E-10
EFFECTIVE	3.650E-14	1.884E-11	7.757E-11	7.490E-16-1.000E+00	1.740E-10	2.810E-10
SKIN(FGR)	4.760E-14	2.324E-11	9.570E-11	9.240E-16-1.000E+00	0.000E+00	0.000E+00
Re-182a						
GONADS	5.660E-14	2.707E-11	7.651E-11	1.160E-15-1.000E+00	3.200E-11	1.270E-10
BREAST	6.430E-14	2.590E-11	7.321E-11	1.110E-15-1.000E+00	2.820E-11	5.490E-11
LUNGS	5.620E-14	2.497E-11	7.057E-11	1.070E-15-1.000E+00	3.790E-10	4.710E-11
RED MARR	5.480E-14	2.520E-11	7.123E-11	1.080E-15-1.000E+00	3.310E-11	7.080E-11
BONE SUR	9.200E-14	4.084E-11	1.154E-10	1.750E-15-1.000E+00	2.550E-11	5.070E-11

THYROID	5.790E-14	2.497E-11	7.057E-11	1.070E-15-1.000E+00	2.990E-10	9.470E-10
REMAINDER	5.400E-14	2.474E-11	6.991E-11	1.060E-15-1.000E+00	1.060E-10	3.890E-10
EFFECTIVE	5.780E-14	2.614E-11	7.387E-11	1.120E-15-1.000E+00	1.030E-10	2.010E-10
SKIN(FGR)	6.710E-14	3.477E-11	9.827E-11	1.490E-15-1.000E+00	0.000E+00	0.000E+00
Re-182b						
GONADS	8.980E-14	5.159E-11	5.208E-10	1.870E-15-1.000E+00	2.180E-10	5.430E-10
BREAST	1.020E-13	4.938E-11	4.985E-10	1.790E-15-1.000E+00	1.880E-10	2.560E-10
LUNGS	8.860E-14	4.717E-11	4.763E-10	1.710E-15-1.000E+00	3.040E-09	2.320E-10
RED MARR	8.540E-14	4.745E-11	4.790E-10	1.720E-15-1.000E+00	2.260E-10	3.330E-10
BONE SUR	1.600E-13	8.166E-11	8.244E-10	2.960E-15-1.000E+00	1.780E-10	2.540E-10
THYROID	9.140E-14	4.745E-11	4.790E-10	1.720E-15-1.000E+00	1.710E-09	3.770E-09
REMAINDER	8.480E-14	4.662E-11	4.707E-10	1.690E-15-1.000E+00	8.020E-10	1.850E-09
EFFECTIVE	9.160E-14	4.938E-11	4.985E-10	1.790E-15-1.000E+00	7.720E-10	9.180E-10
SKIN(FGR)	1.080E-13	6.152E-11	6.211E-10	2.230E-15-1.000E+00	0.000E+00	0.000E+00
Re-184						
GONADS	4.220E-14	2.596E-11	5.133E-10	9.040E-16-1.000E+00	2.250E-10	3.830E-10
BREAST	4.800E-14	2.484E-11	4.911E-10	8.650E-16-1.000E+00	4.050E-10	2.260E-10
LUNGS	4.160E-14	2.366E-11	4.679E-10	8.240E-16-1.000E+00	7.240E-09	2.160E-10
RED MARR	4.030E-14	2.389E-11	4.724E-10	8.320E-16-1.000E+00	4.440E-10	2.790E-10
BONE SUR	7.070E-14	3.847E-11	7.608E-10	1.340E-15-1.000E+00	3.560E-10	2.230E-10
THYROID	4.300E-14	2.446E-11	4.837E-10	8.520E-16-1.000E+00	1.120E-09	1.530E-09
REMAINDER	3.980E-14	2.334E-11	4.616E-10	8.130E-16-1.000E+00	1.010E-09	1.160E-09
EFFECTIVE	4.290E-14	2.481E-11	4.906E-10	8.640E-16-1.000E+00	1.390E-09	5.910E-10
SKIN(FGR)	5.000E-14	3.158E-11	6.246E-10	1.100E-15-1.000E+00	0.000E+00	0.000E+00
Re-184m						
GONADS	1.790E-14	1.125E-11	2.330E-10	3.910E-16-1.000E+00	2.390E-10	3.000E-10
BREAST	2.050E-14	1.085E-11	2.247E-10	3.770E-16-1.000E+00	5.880E-10	2.090E-10
LUNGS	1.740E-14	1.022E-11	2.116E-10	3.550E-16-1.000E+00	2.620E-08	2.080E-10
RED MARR	1.640E-14	1.007E-11	2.086E-10	3.500E-16-1.000E+00	6.790E-10	2.620E-10
BONE SUR	3.620E-14	2.035E-11	4.214E-10	7.070E-16-1.000E+00	5.520E-10	2.240E-10
THYROID	1.810E-14	1.045E-11	2.163E-10	3.630E-16-1.000E+00	2.100E-09	2.610E-09
REMAINDER	1.650E-14	9.987E-12	2.068E-10	3.470E-16-1.000E+00	1.770E-09	1.830E-09
EFFECTIVE	1.820E-14	1.079E-11	2.235E-10	3.750E-16-1.000E+00	3.980E-09	7.970E-10
SKIN(FGR)	2.190E-14	1.335E-11	2.765E-10	4.640E-16-1.000E+00	0.000E+00	0.000E+00
Re-186						
GONADS	9.090E-16	5.839E-13	7.116E-12	2.090E-17-1.000E+00	4.530E-11	1.000E-10
BREAST	1.060E-15	5.727E-13	6.980E-12	2.050E-17-1.000E+00	4.480E-11	9.540E-11
LUNGS	8.400E-16	5.280E-13	6.435E-12	1.890E-17-1.000E+00	4.420E-09	9.530E-11
RED MARR	7.270E-16	4.861E-13	5.924E-12	1.740E-17-1.000E+00	4.720E-11	9.890E-11
BONE SUR	2.720E-15	1.606E-12	1.958E-11	5.750E-17-1.000E+00	4.590E-11	9.690E-11
THYROID	8.930E-16	5.336E-13	6.503E-12	1.910E-17-1.000E+00	2.190E-09	4.790E-09
REMAINDER	7.870E-16	5.057E-13	6.163E-12	1.810E-17-1.000E+00	8.100E-10	1.950E-09
EFFECTIVE	9.190E-16	5.699E-13	6.946E-12	2.040E-17-1.000E+00	8.640E-10	7.950E-10
SKIN(FGR)	2.030E-14	7.152E-11	8.716E-10	2.560E-15-1.000E+00	0.000E+00	0.000E+00
Re-186m						
GONADS	5.200E-16	4.435E-13	9.314E-12	1.540E-17-1.000E+00	1.580E-10	2.080E-10
BREAST	6.350E-16	4.550E-13	9.556E-12	1.580E-17-1.000E+00	1.860E-10	1.990E-10
LUNGS	4.210E-16	3.629E-13	7.620E-12	1.260E-17-1.000E+00	7.440E-08	2.000E-10
RED MARR	3.230E-16	2.877E-13	6.042E-12	9.990E-18-1.000E+00	2.160E-10	2.110E-10
BONE SUR	1.750E-15	1.572E-12	3.302E-11	5.460E-17-1.000E+00	2.020E-10	2.060E-10
THYROID	4.820E-16	3.744E-13	7.862E-12	1.300E-17-1.000E+00	2.850E-09	2.810E-09
REMAINDER	3.930E-16	3.485E-13	7.318E-12	1.210E-17-1.000E+00	2.160E-09	2.850E-09
EFFECTIVE	5.000E-16	4.205E-13	8.830E-12	1.460E-17-1.000E+00	9.760E-09	1.080E-09
SKIN(FGR)	7.240E-16	1.002E-12	2.105E-11	3.480E-17-1.000E+00	0.000E+00	0.000E+00
Re-187						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.600E-13	3.940E-13
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.600E-13	3.940E-13
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.090E-10	3.940E-13
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.600E-13	3.940E-13
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.600E-13	3.940E-13
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	6.960E-12	1.050E-11
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	4.090E-12	6.640E-12
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.470E-11	2.570E-12

SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Re-188						
GONADS	2.810E-15	1.511E-12	5.418E-12	6.150E-17-1.000E+00	2.700E-11	8.320E-11
BREAST	3.230E-15	1.462E-12	5.242E-12	5.950E-17-1.000E+00	2.650E-11	7.790E-11
LUNGS	2.740E-15	1.373E-12	4.925E-12	5.590E-17-1.000E+00	2.520E-09	7.750E-11
RED MARR	2.580E-15	1.361E-12	4.881E-12	5.540E-17-1.000E+00	2.710E-11	7.950E-11
BONE SUR	6.020E-15	2.727E-12	9.779E-12	1.110E-16-1.000E+00	2.650E-11	7.800E-11
THYROID	2.840E-15	1.400E-12	5.021E-12	5.700E-17-1.000E+00	2.190E-09	6.620E-09
REMAINDER	2.610E-15	1.342E-12	4.810E-12	5.460E-17-1.000E+00	5.390E-10	1.930E-09
EFFECTIVE	2.870E-15	1.452E-12	5.206E-12	5.910E-17-1.000E+00	5.440E-10	8.310E-10
SKIN(FGR)	5.350E-14	2.184E-10	7.832E-10	8.890E-15-1.000E+00	0.000E+00	0.000E+00
Re-188m						
GONADS	3.060E-15	1.238E-13	1.238E-13	7.690E-17-1.000E+00	5.250E-13	1.860E-12
BREAST	3.650E-15	1.232E-13	1.232E-13	7.650E-17-1.000E+00	5.480E-13	1.600E-12
LUNGS	2.650E-15	1.101E-13	1.101E-13	6.840E-17-1.000E+00	5.410E-11	1.600E-12
RED MARR	2.120E-15	9.306E-14	9.306E-14	5.780E-17-1.000E+00	6.010E-13	1.740E-12
BONE SUR	1.040E-14	4.363E-13	4.363E-13	2.710E-16-1.000E+00	5.730E-13	1.590E-12
THYROID	2.900E-15	1.103E-13	1.103E-13	6.850E-17-1.000E+00	4.150E-11	1.250E-10
REMAINDER	2.460E-15	1.051E-13	1.051E-13	6.530E-17-1.000E+00	1.020E-11	4.460E-11
EFFECTIVE	3.020E-15	1.217E-13	1.217E-13	7.560E-17-1.000E+00	1.110E-11	1.830E-11
SKIN(FGR)	3.910E-15	1.596E-13	1.596E-13	9.910E-17-1.000E+00	0.000E+00	0.000E+00
Re-189						
GONADS	3.170E-15	1.797E-12	8.736E-12	6.980E-17-1.000E+00	2.030E-11	5.810E-11
BREAST	3.650E-15	1.759E-12	8.548E-12	6.830E-17-1.000E+00	1.900E-11	4.870E-11
LUNGS	3.030E-15	1.635E-12	7.948E-12	6.350E-17-1.000E+00	1.530E-09	4.810E-11
RED MARR	2.790E-15	1.597E-12	7.760E-12	6.200E-17-1.000E+00	2.040E-11	5.180E-11
BONE SUR	7.740E-15	3.631E-12	1.765E-11	1.410E-16-1.000E+00	1.920E-11	4.920E-11
THYROID	3.170E-15	1.648E-12	8.010E-12	6.400E-17-1.000E+00	1.270E-09	3.480E-09
REMAINDER	2.870E-15	1.586E-12	7.710E-12	6.160E-17-1.000E+00	3.450E-10	1.090E-09
EFFECTIVE	3.220E-15	1.736E-12	8.436E-12	6.740E-17-1.000E+00	3.360E-10	4.670E-10
SKIN(FGR)	2.150E-14	5.408E-11	2.628E-10	2.100E-15-1.000E+00	0.000E+00	0.000E+00
Rh-100						
GONADS	1.370E-13	6.699E-11	2.852E-10	2.650E-15-1.000E+00	3.470E-10	1.110E-09
BREAST	1.540E-13	6.396E-11	2.723E-10	2.530E-15-1.000E+00	9.290E-11	1.560E-10
LUNGS	1.380E-13	6.194E-11	2.637E-10	2.450E-15-1.000E+00	7.760E-10	4.480E-11
RED MARR	1.370E-13	6.345E-11	2.701E-10	2.510E-15-1.000E+00	1.150E-10	2.370E-10
BONE SUR	2.000E-13	8.545E-11	3.638E-10	3.380E-15-1.000E+00	6.040E-11	8.730E-11
THYROID	1.410E-13	6.042E-11	2.572E-10	2.390E-15-1.000E+00	4.180E-11	1.430E-11
REMAINDER	1.340E-13	6.168E-11	2.626E-10	2.440E-15-1.000E+00	5.490E-10	1.730E-09
EFFECTIVE	1.410E-13	6.421E-11	2.734E-10	2.540E-15-1.000E+00	3.750E-10	8.560E-10
SKIN(FGR)	1.630E-13	9.379E-11	3.993E-10	3.710E-15-1.000E+00	0.000E+00	0.000E+00
Rh-101						
GONADS	1.180E-14	7.804E-12	1.636E-10	2.710E-16-1.000E+00	6.410E-10	6.470E-10
BREAST	1.370E-14	7.718E-12	1.617E-10	2.680E-16-1.000E+00	2.070E-09	2.620E-10
LUNGS	1.130E-14	6.710E-12	1.406E-10	2.330E-16-1.000E+00	7.200E-08	2.430E-10
RED MARR	1.040E-14	6.623E-12	1.388E-10	2.300E-16-1.000E+00	2.510E-09	4.040E-10
BONE SUR	3.000E-14	1.518E-11	3.181E-10	5.270E-16-1.000E+00	2.000E-09	3.120E-10
THYROID	1.180E-14	6.883E-12	1.442E-10	2.390E-16-1.000E+00	1.350E-09	2.090E-10
REMAINDER	1.070E-14	6.566E-12	1.376E-10	2.280E-16-1.000E+00	3.910E-09	1.110E-09
EFFECTIVE	1.210E-14	7.343E-12	1.539E-10	2.550E-16-1.000E+00	1.070E-08	6.260E-10
SKIN(FGR)	1.490E-14	1.025E-11	2.149E-10	3.560E-16-1.000E+00	0.000E+00	0.000E+00
Rh-101m						
GONADS	1.380E-14	8.891E-12	1.154E-10	3.170E-16-1.000E+00	1.410E-10	3.240E-10
BREAST	1.590E-14	8.723E-12	1.132E-10	3.110E-16-1.000E+00	3.950E-11	3.810E-11
LUNGS	1.350E-14	7.713E-12	1.001E-10	2.750E-16-1.000E+00	6.470E-10	1.060E-11
RED MARR	1.280E-14	7.797E-12	1.012E-10	2.780E-16-1.000E+00	5.410E-11	7.170E-11
BONE SUR	2.850E-14	1.363E-11	1.770E-10	4.860E-16-1.000E+00	3.040E-11	2.750E-11
THYROID	1.400E-14	7.993E-12	1.038E-10	2.850E-16-1.000E+00	1.870E-11	6.010E-12
REMAINDER	1.280E-14	7.573E-12	9.831E-11	2.700E-16-1.000E+00	2.520E-10	5.640E-10
EFFECTIVE	1.410E-14	8.302E-12	1.078E-10	2.960E-16-1.000E+00	2.020E-10	2.670E-10
SKIN(FGR)	1.710E-14	1.130E-11	1.467E-10	4.030E-16-1.000E+00	0.000E+00	0.000E+00
Rh-102						
GONADS	1.020E-13	6.307E-11	1.321E-09	2.190E-15-1.000E+00	4.090E-09	3.540E-09

BREAST	1.160E-13	6.047E-11	1.267E-09	2.100E-15-1.000E+00	1.400E-08	1.500E-09
LUNGS	1.010E-13	5.731E-11	1.201E-09	1.990E-15-1.000E+00	1.580E-07	1.310E-09
RED MARR	9.850E-14	5.846E-11	1.225E-09	2.030E-15-1.000E+00	1.340E-08	1.830E-09
BONE SUR	1.650E-13	8.409E-11	1.762E-09	2.920E-15-1.000E+00	1.070E-08	1.410E-09
THYROID	1.040E-13	5.932E-11	1.243E-09	2.060E-15-1.000E+00	1.320E-08	1.280E-09
REMAINDER	9.670E-14	5.644E-11	1.183E-09	1.960E-15-1.000E+00	2.660E-08	4.190E-09
EFFECTIVE	1.040E-13	5.990E-11	1.255E-09	2.080E-15-1.000E+00	3.240E-08	2.820E-09
SKIN(FGR)	1.190E-13	7.401E-11	1.551E-09	2.570E-15-1.000E+00	0.000E+00	0.000E+00
Rh-102m						
GONADS	2.260E-14	1.454E-11	3.019E-10	5.050E-16-1.000E+00	5.820E-10	7.840E-10
BREAST	2.580E-14	1.399E-11	2.905E-10	4.860E-16-1.000E+00	1.370E-09	2.940E-10
LUNGS	2.240E-14	1.298E-11	2.696E-10	4.510E-16-1.000E+00	9.530E-08	2.490E-10
RED MARR	2.160E-14	1.315E-11	2.732E-10	4.570E-16-1.000E+00	1.330E-09	3.570E-10
BONE SUR	3.920E-14	1.998E-11	4.149E-10	6.940E-16-1.000E+00	1.060E-09	2.740E-10
THYROID	2.300E-14	1.359E-11	2.821E-10	4.720E-16-1.000E+00	1.200E-09	2.350E-10
REMAINDER	2.140E-14	1.278E-11	2.654E-10	4.440E-16-1.000E+00	3.100E-09	3.140E-09
EFFECTIVE	2.310E-14	1.370E-11	2.845E-10	4.760E-16-1.000E+00	1.290E-08	1.270E-09
SKIN(FGR)	3.680E-14	6.563E-11	1.363E-09	2.280E-15-1.000E+00	0.000E+00	0.000E+00
Rh-103m						
GONADS	1.250E-17	1.056E-14	1.059E-14	2.180E-18-1.000E+00	2.910E-15	4.020E-14
BREAST	2.150E-17	1.231E-14	1.234E-14	2.540E-18-1.000E+00	5.510E-15	8.650E-15
LUNGS	1.870E-18	1.124E-15	1.127E-15	2.320E-19-1.000E+00	9.530E-12	4.930E-15
RED MARR	2.820E-18	1.638E-15	1.642E-15	3.380E-19-1.000E+00	3.620E-15	1.010E-14
BONE SUR	1.760E-17	1.119E-14	1.122E-14	2.310E-18-1.000E+00	3.210E-15	5.290E-15
THYROID	8.550E-18	3.808E-15	3.818E-15	7.860E-19-1.000E+00	1.480E-15	3.270E-15
REMAINDER	3.680E-18	2.689E-15	2.696E-15	5.550E-19-1.000E+00	4.190E-13	1.040E-11
EFFECTIVE	8.800E-18	6.056E-15	6.072E-15	1.250E-18-1.000E+00	1.270E-12	3.140E-12
SKIN(FGR)	4.490E-17	3.333E-14	3.342E-14	6.880E-18-1.000E+00	0.000E+00	0.000E+00
Rh-105						
GONADS	3.640E-15	2.127E-12	1.411E-11	7.980E-17-1.000E+00	2.110E-11	5.800E-11
BREAST	4.160E-15	2.063E-12	1.369E-11	7.740E-17-1.000E+00	5.610E-12	8.970E-12
LUNGS	3.570E-15	1.935E-12	1.284E-11	7.260E-17-1.000E+00	9.580E-10	3.860E-12
RED MARR	3.380E-15	1.946E-12	1.291E-11	7.300E-17-1.000E+00	7.770E-12	1.470E-11
BONE SUR	7.530E-15	3.332E-12	2.210E-11	1.250E-16-1.000E+00	4.460E-12	6.750E-12
THYROID	3.680E-15	1.983E-12	1.316E-11	7.440E-17-1.000E+00	2.880E-12	2.910E-12
REMAINDER	3.390E-15	1.885E-12	1.250E-11	7.070E-17-1.000E+00	4.530E-10	1.270E-09
EFFECTIVE	3.720E-15	2.031E-12	1.347E-11	7.620E-17-1.000E+00	2.580E-10	3.990E-10
SKIN(FGR)	1.070E-14	4.691E-12	3.112E-11	1.760E-16-1.000E+00	0.000E+00	0.000E+00
Rh-106						
GONADS	1.010E-14	9.619E-15	9.619E-15	2.230E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	1.160E-14	9.231E-15	9.231E-15	2.140E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.010E-14	8.757E-15	8.757E-15	2.030E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	9.750E-15	8.843E-15	8.843E-15	2.050E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.720E-14	1.333E-14	1.333E-14	3.090E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	1.030E-14	9.102E-15	9.102E-15	2.110E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	9.630E-15	8.584E-15	8.584E-15	1.990E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.040E-14	9.145E-15	9.145E-15	2.120E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.090E-13	6.125E-13	6.125E-13	1.420E-14-1.000E+00	0.000E+00	0.000E+00
Rh-106m						
GONADS	1.410E-13	3.079E-11	3.348E-11	2.930E-15-1.000E+00	1.180E-11	1.300E-10
BREAST	1.600E-13	2.942E-11	3.199E-11	2.800E-15-1.000E+00	9.290E-12	2.620E-11
LUNGS	1.410E-13	2.826E-11	3.074E-11	2.690E-15-1.000E+00	2.490E-10	1.260E-11
RED MARR	1.380E-13	2.890E-11	3.142E-11	2.750E-15-1.000E+00	9.610E-12	3.500E-11
BONE SUR	2.220E-13	4.077E-11	4.433E-11	3.880E-15-1.000E+00	6.390E-12	1.300E-11
THYROID	1.440E-13	2.879E-11	3.131E-11	2.740E-15-1.000E+00	6.650E-12	1.940E-12
REMAINDER	1.350E-13	2.795E-11	3.039E-11	2.660E-15-1.000E+00	4.220E-11	4.380E-10
EFFECTIVE	1.440E-13	2.942E-11	3.199E-11	2.800E-15-1.000E+00	4.840E-11	1.740E-10
SKIN(FGR)	1.810E-13	5.464E-11	5.942E-11	5.200E-15-1.000E+00	0.000E+00	0.000E+00
Rh-107						
GONADS	1.470E-14	6.048E-13	6.048E-13	3.220E-16-1.000E+00	4.050E-14	1.240E-12
BREAST	1.680E-14	5.861E-13	5.861E-13	3.120E-16-1.000E+00	1.530E-13	4.800E-13
LUNGS	1.440E-14	5.504E-13	5.504E-13	2.930E-16-1.000E+00	4.490E-11	4.160E-13
RED MARR	1.370E-14	5.522E-13	5.522E-13	2.940E-16-1.000E+00	1.620E-13	5.850E-13

BONE SUR	2.990E-14	9.354E-13	9.354E-13	4.980E-16	-1.000E+00	1.250E-13	2.510E-13
THYROID	1.490E-14	5.635E-13	5.635E-13	3.000E-16	-1.000E+00	1.120E-13	3.760E-14
REMAINDER	1.370E-14	5.353E-13	5.353E-13	2.850E-16	-1.000E+00	1.050E-12	5.250E-11
EFFECTIVE	1.500E-14	5.767E-13	5.767E-13	3.070E-16	-1.000E+00	5.760E-12	1.630E-11
SKIN(FGR)	4.420E-14	8.697E-12	8.697E-12	4.630E-15	-1.000E+00	0.000E+00	0.000E+00
Rh-99							
GONADS	2.790E-14	1.781E-11	3.250E-10	6.230E-16	-1.000E+00	3.390E-10	6.930E-10
BREAST	3.190E-14	1.727E-11	3.151E-10	6.040E-16	-1.000E+00	1.930E-10	1.040E-10
LUNGS	2.740E-14	1.581E-11	2.885E-10	5.530E-16	-1.000E+00	3.930E-09	4.370E-11
RED MARR	2.620E-14	1.590E-11	2.901E-10	5.560E-16	-1.000E+00	2.320E-10	1.820E-10
BONE SUR	5.240E-14	2.722E-11	4.967E-10	9.520E-16	-1.000E+00	1.560E-10	8.170E-11
THYROID	2.830E-14	1.641E-11	2.995E-10	5.740E-16	-1.000E+00	1.320E-10	3.190E-11
REMAINDER	2.620E-14	1.553E-11	2.833E-10	5.430E-16	-1.000E+00	7.120E-10	1.290E-09
EFFECTIVE	2.850E-14	1.681E-11	3.068E-10	5.880E-16	-1.000E+00	8.360E-10	6.080E-10
SKIN(FGR)	3.420E-14	2.408E-11	4.393E-10	8.420E-16	-1.000E+00	0.000E+00	0.000E+00
Rh-99m							
GONADS	3.220E-14	1.180E-11	1.704E-11	6.980E-16	-1.000E+00	1.240E-11	8.220E-11
BREAST	3.670E-14	1.138E-11	1.643E-11	6.730E-16	-1.000E+00	5.370E-12	1.310E-11
LUNGS	3.190E-14	1.057E-11	1.526E-11	6.250E-16	-1.000E+00	7.870E-11	4.640E-12
RED MARR	3.100E-14	1.075E-11	1.553E-11	6.360E-16	-1.000E+00	6.240E-12	2.010E-11
BONE SUR	5.520E-14	1.635E-11	2.360E-11	9.670E-16	-1.000E+00	3.670E-12	7.130E-12
THYROID	3.280E-14	1.087E-11	1.570E-11	6.430E-16	-1.000E+00	3.030E-12	8.730E-13
REMAINDER	3.060E-14	1.043E-11	1.506E-11	6.170E-16	-1.000E+00	2.730E-11	1.730E-10
EFFECTIVE	3.290E-14	1.116E-11	1.611E-11	6.600E-16	-1.000E+00	2.250E-11	7.770E-11
SKIN(FGR)	3.940E-14	1.584E-11	2.287E-11	9.370E-16	-1.000E+00	0.000E+00	0.000E+00
Rn-218							
GONADS	3.970E-17	0.000E+00	0.000E+00	8.692E-19	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.534E-17	0.000E+00	0.000E+00	8.313E-19	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.948E-17	0.000E+00	0.000E+00	7.918E-19	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.839E-17	0.000E+00	0.000E+00	8.036E-19	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	6.627E-17	0.000E+00	0.000E+00	1.172E-18	-1.000E+00	0.000E+00	0.000E+00
THYROID	4.059E-17	0.000E+00	0.000E+00	8.280E-19	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.781E-17	0.000E+00	0.000E+00	7.770E-19	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.058E-17	0.000E+00	0.000E+00	8.263E-19	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.771E-17	0.000E+00	0.000E+00	1.159E-18	-1.000E+00	0.000E+00	0.000E+00
Rn-219							
GONADS	2.628E-15	3.290E-16	3.290E-16	5.758E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	3.009E-15	3.187E-16	3.187E-16	5.578E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.568E-15	2.997E-16	2.997E-16	5.247E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.438E-15	3.009E-16	3.009E-16	5.267E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.455E-15	5.260E-16	5.260E-16	9.207E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	2.658E-15	3.078E-16	3.078E-16	5.387E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.448E-15	2.917E-16	2.917E-16	5.106E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.688E-15	3.146E-16	3.146E-16	5.507E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.390E-15	3.806E-16	3.806E-16	6.661E-17	-1.000E+00	0.000E+00	0.000E+00
Rn-220							
GONADS	1.891E-17	3.347E-17	3.347E-17	4.173E-19	-1.000E+00	0.000E+00	0.000E+00
BREAST	2.162E-17	3.213E-17	3.213E-17	4.005E-19	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.881E-17	3.055E-17	3.055E-17	3.808E-19	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.819E-17	3.090E-17	3.090E-17	3.852E-19	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.257E-17	4.602E-17	4.602E-17	5.737E-19	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.933E-17	3.188E-17	3.188E-17	3.974E-19	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.798E-17	2.989E-17	2.989E-17	3.726E-19	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.933E-17	3.189E-17	3.189E-17	3.975E-19	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.296E-17	4.356E-17	4.356E-17	5.430E-19	-1.000E+00	0.000E+00	0.000E+00
Rn-222							
GONADS	1.914E-17	1.186E-14	1.454E-13	4.243E-19	-1.000E+00	0.000E+00	0.000E+00
BREAST	2.190E-17	1.137E-14	1.394E-13	4.069E-19	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.904E-17	1.080E-14	1.324E-13	3.865E-19	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.833E-17	1.089E-14	1.335E-13	3.897E-19	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.378E-17	1.652E-14	2.026E-13	5.912E-19	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.945E-17	1.128E-14	1.384E-13	4.038E-19	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.812E-17	1.057E-14	1.297E-13	3.784E-19	-1.000E+00	0.000E+00	0.000E+00

EFFECTIVE	1.955E-17	1.129E-14	1.384E-13	4.039E-19	-1.000E+00	0.000E+00	0.000E-00
SKIN(FGR)	2.356E-17	1.486E-14	1.822E-13	5.317E-19	-1.000E+00	0.000E+00	0.000E+00
Ru-103							
GONADS	2.191E-14	1.404E-11	2.783E-10	4.892E-16	-1.000E+00	3.070E-10	5.720E-10
BREAST	2.512E-14	1.350E-11	2.677E-10	4.705E-16	-1.000E+00	3.110E-10	1.200E-10
LUNGS	2.180E-14	1.273E-11	2.522E-10	4.432E-16	-1.000E+00	1.561E-08	7.310E-11
RED MARR	2.100E-14	1.287E-11	2.551E-10	4.483E-16	-1.000E+00	3.190E-10	1.660E-10
BONE SUR	3.892E-14	1.958E-11	3.882E-10	6.823E-16	-1.000E+00	2.370E-10	9.631E-11
THYROID	2.241E-14	1.331E-11	2.639E-10	4.638E-16	-1.000E+00	2.570E-10	6.250E-11
REMAINDER	2.080E-14	1.248E-11	2.472E-10	4.346E-16	-1.000E+00	1.250E-09	2.110E-09
EFFECTIVE	2.251E-14	1.332E-11	2.641E-10	4.642E-16	-1.000E+00	2.421E-09	8.271E-10
SKIN(FGR)	2.774E-14	1.785E-11	3.543E-10	6.229E-16	-1.000E+00	0.000E+00	0.000E+00
Ru-105							
GONADS	3.720E-14	1.327E-11	1.861E-11	8.070E-16	-1.000E+00	1.590E-11	9.670E-11
BREAST	4.240E-14	1.271E-11	1.783E-11	7.730E-16	-1.000E+00	6.610E-12	1.590E-11
LUNGS	3.700E-14	1.210E-11	1.697E-11	7.360E-16	-1.000E+00	5.730E-10	6.210E-12
RED MARR	3.590E-14	1.230E-11	1.725E-11	7.480E-16	-1.000E+00	7.700E-12	2.350E-11
BONE SUR	6.280E-14	1.809E-11	2.537E-11	1.100E-15	-1.000E+00	4.620E-12	8.890E-12
THYROID	3.800E-14	1.260E-11	1.766E-11	7.660E-16	-1.000E+00	4.150E-12	1.820E-12
REMAINDER	3.540E-14	1.189E-11	1.667E-11	7.230E-16	-1.000E+00	1.610E-10	8.540E-10
EFFECTIVE	3.810E-14	1.265E-11	1.773E-11	7.690E-16	-1.000E+00	1.230E-10	2.870E-10
SKIN(FGR)	6.730E-14	7.368E-11	1.033E-10	4.480E-15	-1.000E+00	0.000E+00	0.000E+00
Ru-106							
GONADS	1.010E-14	6.411E-12	1.340E-10	2.230E-16	-1.000E+00	1.300E-09	1.640E-09
BREAST	1.160E-14	6.152E-12	1.286E-10	2.140E-16	-1.000E+00	1.780E-09	1.440E-09
LUNGS	1.010E-14	5.836E-12	1.220E-10	2.030E-16	-1.000E+00	1.040E-06	1.420E-09
RED MARR	9.750E-15	5.893E-12	1.232E-10	2.050E-16	-1.000E+00	1.760E-09	1.460E-09
BONE SUR	1.720E-14	8.883E-12	1.856E-10	3.090E-16	-1.000E+00	1.610E-09	1.430E-09
THYROID	1.030E-14	6.066E-12	1.268E-10	2.110E-16	-1.000E+00	1.720E-09	1.410E-09
REMAINDER	9.630E-15	5.721E-12	1.196E-10	1.990E-16	-1.000E+00	1.200E-08	2.110E-08
EFFECTIVE	1.040E-14	6.095E-12	1.274E-10	2.120E-16	-1.000E+00	1.290E-07	7.400E-09
SKIN(FGR)	1.090E-13	4.082E-10	8.531E-09	1.420E-14	-1.000E+00	0.000E+00	0.000E+00
Ru-94							
GONADS	2.490E-14	2.458E-12	2.462E-12	5.490E-16	-1.000E+00	2.760E-12	4.250E-11
BREAST	2.840E-14	2.377E-12	2.381E-12	5.310E-16	-1.000E+00	2.930E-12	8.570E-12
LUNGS	2.460E-14	2.185E-12	2.188E-12	4.880E-16	-1.000E+00	1.940E-10	4.240E-12
RED MARR	2.380E-14	2.225E-12	2.228E-12	4.970E-16	-1.000E+00	2.950E-12	1.150E-11
BONE SUR	4.330E-14	3.407E-12	3.412E-12	7.610E-16	-1.000E+00	2.060E-12	4.290E-12
THYROID	2.530E-14	2.274E-12	2.278E-12	5.080E-16	-1.000E+00	2.240E-12	6.660E-13
REMAINDER	2.350E-14	2.153E-12	2.157E-12	4.810E-16	-1.000E+00	2.040E-11	2.660E-10
EFFECTIVE	2.540E-14	2.319E-12	2.323E-12	5.180E-16	-1.000E+00	3.100E-11	9.370E-11
SKIN(FGR)	2.950E-14	2.999E-12	3.004E-12	6.700E-16	-1.000E+00	0.000E+00	0.000E+00
Ru-97							
GONADS	1.070E-14	6.727E-12	7.136E-11	2.430E-16	-1.000E+00	9.780E-11	2.380E-10
BREAST	1.230E-14	6.672E-12	7.077E-11	2.410E-16	-1.000E+00	2.330E-11	2.630E-11
LUNGS	1.030E-14	5.813E-12	6.167E-11	2.100E-16	-1.000E+00	3.400E-10	6.430E-12
RED MARR	9.650E-15	5.813E-12	6.167E-11	2.100E-16	-1.000E+00	3.440E-11	5.250E-11
BONE SUR	2.460E-14	1.143E-11	1.213E-10	4.130E-16	-1.000E+00	1.820E-11	1.930E-11
THYROID	1.080E-14	5.924E-12	6.284E-11	2.140E-16	-1.000E+00	9.150E-12	3.220E-12
REMAINDER	9.790E-15	5.703E-12	6.049E-11	2.060E-16	-1.000E+00	1.620E-10	3.890E-10
EFFECTIVE	1.090E-14	6.312E-12	6.695E-11	2.280E-16	-1.000E+00	1.220E-10	1.880E-10
SKIN(FGR)	1.320E-14	8.914E-12	9.455E-11	3.220E-16	-1.000E+00	0.000E+00	0.000E+00
S-35							
GONADS	2.780E-19	6.615E-16	1.353E-14	2.300E-20	-1.000E+00	5.700E-11	7.630E-11
BREAST	3.760E-19	7.449E-16	1.524E-14	2.590E-20	-1.000E+00	5.700E-11	7.630E-11
LUNGS	1.680E-19	2.649E-16	5.418E-15	9.210E-21	-1.000E+00	2.040E-10	7.630E-11
RED MARR	1.340E-19	2.218E-16	4.536E-15	7.710E-21	-1.000E+00	5.700E-11	7.630E-11
BONE SUR	7.670E-19	1.398E-15	2.859E-14	4.860E-20	-1.000E+00	5.700E-11	7.630E-11
THYROID	2.370E-19	3.768E-16	7.707E-15	1.310E-20	-1.000E+00	5.700E-11	7.630E-11
REMAINDER	1.680E-19	3.106E-16	6.354E-15	1.080E-20	-1.000E+00	7.990E-11	2.250E-10
EFFECTIVE	2.430E-19	4.832E-16	9.884E-15	1.680E-20	-1.000E+00	8.150E-11	1.210E-10
SKIN(FGR)	2.920E-16	2.169E-15	4.436E-14	7.540E-20	-1.000E+00	0.000E+00	0.000E+00
Sb-115							

GONADS	4.230E-14	2.612E-12	2.612E-12	9.490E-16-1.000E+00	1.290E-12	5.960E-12
BREAST	4.840E-14	2.513E-12	2.513E-12	9.130E-16-1.000E+00	1.270E-12	2.020E-12
LUNGS	4.190E-14	2.345E-12	2.345E-12	8.520E-16-1.000E+00	3.470E-11	1.660E-12
RED MARR	4.040E-14	2.367E-12	2.367E-12	8.600E-16-1.000E+00	1.370E-12	2.280E-12
BONE SUR	7.420E-14	3.633E-12	3.634E-12	1.320E-15-1.000E+00	1.110E-12	9.550E-13
THYROID	4.300E-14	2.458E-12	2.458E-12	8.930E-16-1.000E+00	1.010E-12	1.680E-13
REMAINDER	4.000E-14	2.301E-12	2.301E-12	8.360E-16-1.000E+00	7.120E-12	5.720E-11
EFFECTIVE	4.320E-14	2.469E-12	2.469E-12	8.970E-16-1.000E+00	7.040E-12	1.950E-11
SKIN(FGR)	6.520E-14	1.068E-11	1.068E-11	3.880E-15-1.000E+00	0.000E+00	0.000E+00
Sb-116						
GONADS	1.050E-13	2.899E-12	2.899E-12	2.120E-15-1.000E+00	9.320E-13	4.760E-12
BREAST	1.190E-13	2.776E-12	2.776E-12	2.030E-15-1.000E+00	1.170E-12	2.180E-12
LUNGS	1.060E-13	2.667E-12	2.667E-12	1.950E-15-1.000E+00	3.330E-11	2.100E-12
RED MARR	1.050E-13	2.735E-12	2.735E-12	2.000E-15-1.000E+00	1.160E-12	2.050E-12
BONE SUR	1.580E-13	3.761E-12	3.761E-12	2.750E-15-1.000E+00	9.400E-13	9.670E-13
THYROID	1.080E-13	2.667E-12	2.667E-12	1.950E-15-1.000E+00	9.410E-13	2.290E-13
REMAINDER	1.020E-13	2.653E-12	2.653E-12	1.940E-15-1.000E+00	5.560E-12	5.640E-11
EFFECTIVE	1.080E-13	2.776E-12	2.776E-12	2.030E-15-1.000E+00	6.270E-12	1.900E-11
SKIN(FGR)	1.500E-13	1.004E-11	1.004E-11	7.340E-15-1.000E+00	0.000E+00	0.000E+00
Sb-116m						
GONADS	1.510E-13	1.638E-11	1.644E-11	3.150E-15-1.000E+00	9.460E-12	5.020E-11
BREAST	1.720E-13	1.570E-11	1.576E-11	3.020E-15-1.000E+00	7.170E-12	1.270E-11
LUNGS	1.510E-13	1.492E-11	1.498E-11	2.870E-15-1.000E+00	6.810E-11	8.220E-12
RED MARR	1.480E-13	1.528E-11	1.535E-11	2.940E-15-1.000E+00	7.880E-12	1.560E-11
BONE SUR	2.370E-13	2.189E-11	2.197E-11	4.210E-15-1.000E+00	6.310E-12	6.250E-12
THYROID	1.550E-13	1.518E-11	1.524E-11	2.920E-15-1.000E+00	5.510E-12	1.100E-12
REMAINDER	1.450E-13	1.482E-11	1.488E-11	2.850E-15-1.000E+00	2.590E-11	1.620E-10
EFFECTIVE	1.550E-13	1.565E-11	1.571E-11	3.010E-15-1.000E+00	2.070E-11	6.620E-11
SKIN(FGR)	1.820E-13	2.386E-11	2.396E-11	4.590E-15-1.000E+00	0.000E+00	0.000E+00
Sb-117						
GONADS	7.880E-15	2.432E-12	2.821E-12	1.940E-16-1.000E+00	3.000E-12	1.490E-11
BREAST	9.160E-15	2.419E-12	2.807E-12	1.930E-16-1.000E+00	1.570E-12	2.360E-12
LUNGS	7.400E-15	1.968E-12	2.283E-12	1.570E-16-1.000E+00	2.370E-11	9.260E-13
RED MARR	6.790E-15	1.930E-12	2.240E-12	1.540E-16-1.000E+00	2.630E-12	5.030E-12
BONE SUR	1.960E-14	4.738E-12	5.497E-12	3.780E-16-1.000E+00	3.340E-12	2.000E-12
THYROID	7.840E-15	2.093E-12	2.429E-12	1.670E-16-1.000E+00	9.840E-13	1.650E-13
REMAINDER	7.010E-15	1.943E-12	2.254E-12	1.550E-16-1.000E+00	8.340E-12	5.090E-11
EFFECTIVE	7.970E-15	2.219E-12	2.574E-12	1.770E-16-1.000E+00	6.780E-12	2.010E-11
SKIN(FGR)	1.030E-14	3.171E-12	3.679E-12	2.530E-16-1.000E+00	0.000E+00	0.000E+00
Sb-118m						
GONADS	1.250E-13	4.490E-11	6.700E-11	2.580E-15-1.000E+00	5.610E-11	2.850E-10
BREAST	1.410E-13	4.316E-11	6.440E-11	2.480E-15-1.000E+00	2.930E-11	5.040E-11
LUNGS	1.240E-13	4.072E-11	6.077E-11	2.340E-15-1.000E+00	1.500E-10	1.930E-11
RED MARR	1.220E-13	4.177E-11	6.232E-11	2.400E-15-1.000E+00	3.580E-11	7.360E-11
BONE SUR	1.920E-13	5.969E-11	8.907E-11	3.430E-15-1.000E+00	3.000E-11	2.840E-11
THYROID	1.280E-13	4.124E-11	6.155E-11	2.370E-15-1.000E+00	2.160E-11	4.810E-12
REMAINDER	1.190E-13	4.055E-11	6.051E-11	2.330E-15-1.000E+00	9.540E-11	5.110E-10
EFFECTIVE	1.270E-13	4.281E-11	6.388E-11	2.460E-15-1.000E+00	7.090E-11	2.440E-10
SKIN(FGR)	1.460E-13	5.203E-11	7.765E-11	2.990E-15-1.000E+00	0.000E+00	0.000E+00
Sb-119						
GONADS	2.980E-16	9.086E-13	6.392E-12	3.390E-17-1.000E+00	9.900E-12	3.570E-11
BREAST	4.500E-16	1.018E-12	7.166E-12	3.800E-17-1.000E+00	5.120E-12	2.800E-12
LUNGS	7.870E-17	2.171E-13	1.527E-12	8.100E-18-1.000E+00	7.970E-11	1.140E-12
RED MARR	7.820E-17	1.935E-13	1.361E-12	7.220E-18-1.000E+00	1.680E-11	1.130E-11
BONE SUR	5.170E-16	1.429E-12	1.005E-11	5.330E-17-1.000E+00	8.470E-11	2.040E-11
THYROID	2.220E-16	4.664E-13	3.281E-12	1.740E-17-1.000E+00	4.350E-12	9.510E-13
REMAINDER	1.090E-16	3.216E-13	2.263E-12	1.200E-17-1.000E+00	4.790E-11	2.610E-10
EFFECTIVE	2.160E-16	5.816E-13	4.092E-12	2.170E-17-1.000E+00	3.190E-11	8.970E-11
SKIN(FGR)	7.090E-16	1.930E-12	1.358E-11	7.200E-17-1.000E+00	0.000E+00	0.000E+00
Sb-120a						
GONADS	2.090E-14	6.533E-13	6.533E-13	4.750E-16-1.000E+00	2.820E-13	1.000E-12
BREAST	2.390E-14	6.313E-13	6.313E-13	4.590E-16-1.000E+00	3.520E-13	4.970E-13
LUNGS	2.060E-14	5.804E-13	5.804E-13	4.220E-16-1.000E+00	2.120E-11	4.910E-13

RED MARR	1.990E-14	5.846E-13	5.846E-13	4.250E-16-1.000E+00	3.660E-13	4.930E-13
BONE SUR	3.650E-14	9.106E-13	9.106E-13	6.620E-16-1.000E+00	3.130E-13	2.260E-13
THYROID	2.120E-14	6.107E-13	6.107E-13	4.440E-16-1.000E+00	2.970E-13	4.480E-14
REMAINDER	1.970E-14	5.708E-13	5.708E-13	4.150E-16-1.000E+00	2.720E-12	3.010E-11
EFFECTIVE	2.130E-14	6.148E-13	6.148E-13	4.470E-16-1.000E+00	3.540E-12	9.490E-12
SKIN(FGR)	4.460E-14	5.873E-12	5.873E-12	4.270E-15-1.000E+00	0.000E+00	0.000E+00
Sb-120b						
GONADS	1.190E-13	6.945E-11	1.006E-09	2.460E-15-1.000E+00	5.600E-10	2.030E-09
BREAST	1.350E-13	6.662E-11	9.647E-10	2.360E-15-1.000E+00	3.240E-10	2.980E-10
LUNGS	1.180E-13	6.324E-11	9.156E-10	2.240E-15-1.000E+00	7.330E-10	1.040E-10
RED MARR	1.160E-13	6.465E-11	9.360E-10	2.290E-15-1.000E+00	4.880E-10	5.040E-10
BONE SUR	1.890E-13	9.598E-11	1.390E-09	3.400E-15-1.000E+00	7.510E-10	2.890E-10
THYROID	1.220E-13	6.436E-11	9.320E-10	2.280E-15-1.000E+00	2.630E-10	5.570E-11
REMAINDER	1.140E-13	6.295E-11	9.115E-10	2.230E-15-1.000E+00	8.270E-10	2.760E-09
EFFECTIVE	1.220E-13	6.634E-11	9.606E-10	2.350E-15-1.000E+00	6.140E-10	1.460E-09
SKIN(FGR)	1.390E-13	8.017E-11	1.161E-09	2.840E-15-1.000E+00	0.000E+00	0.000E+00
Sb-122						
GONADS	2.090E-14	1.267E-11	1.289E-10	4.590E-16-1.000E+00	1.610E-10	3.490E-10
BREAST	2.380E-14	1.214E-11	1.235E-10	4.400E-16-1.000E+00	1.200E-10	6.290E-11
LUNGS	2.070E-14	1.154E-11	1.174E-10	4.180E-16-1.000E+00	1.570E-09	3.120E-11
RED MARR	2.010E-14	1.168E-11	1.188E-10	4.230E-16-1.000E+00	3.860E-10	1.450E-10
BONE SUR	3.540E-14	1.728E-11	1.758E-10	6.260E-16-1.000E+00	3.540E-10	9.620E-11
THYROID	2.130E-14	1.203E-11	1.224E-10	4.360E-16-1.000E+00	1.120E-10	2.400E-11
REMAINDER	1.980E-14	1.132E-11	1.151E-10	4.100E-16-1.000E+00	1.070E-09	5.690E-09
EFFECTIVE	2.130E-14	1.203E-11	1.224E-10	4.360E-16-1.000E+00	6.280E-10	1.830E-09
SKIN(FGR)	6.030E-14	1.855E-10	1.887E-09	6.720E-15-1.000E+00	0.000E+00	0.000E+00
Sb-124						
GONADS	8.890E-14	5.117E-11	1.034E-09	1.780E-15-1.000E+00	9.150E-10	1.740E-09
BREAST	1.010E-13	4.887E-11	9.878E-10	1.700E-15-1.000E+00	6.510E-10	3.210E-10
LUNGS	8.970E-14	4.743E-11	9.588E-10	1.650E-15-1.000E+00	2.030E-09	1.650E-10
RED MARR	8.850E-14	4.858E-11	9.820E-10	1.690E-15-1.000E+00	1.530E-09	6.160E-10
BONE SUR	1.340E-13	6.611E-11	1.336E-09	2.300E-15-1.000E+00	3.410E-09	7.990E-10
THYROID	9.150E-14	4.685E-11	9.471E-10	1.630E-15-1.000E+00	5.680E-10	1.180E-10
REMAINDER	8.660E-14	4.714E-11	9.530E-10	1.640E-15-1.000E+00	2.100E-09	6.810E-09
EFFECTIVE	9.150E-14	4.915E-11	9.936E-10	1.710E-15-1.000E+00	1.500E-09	2.650E-09
SKIN(FGR)	1.260E-13	1.495E-10	3.022E-09	5.200E-15-1.000E+00	0.000E+00	0.000E+00
Sb-124m						
GONADS	1.660E-14	4.884E-14	4.884E-14	3.640E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	1.890E-14	4.683E-14	4.683E-14	3.490E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.650E-14	4.454E-14	4.454E-14	3.320E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.600E-14	4.522E-14	4.522E-14	3.370E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.810E-14	6.641E-14	6.641E-14	4.950E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	1.690E-14	4.656E-14	4.656E-14	3.470E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.580E-14	4.361E-14	4.361E-14	3.250E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.700E-14	4.656E-14	4.656E-14	3.470E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.460E-14	1.597E-13	1.597E-13	1.190E-15-1.000E+00	0.000E+00	0.000E+00
Sb-124n						
GONADS	1.660E-14	6.367E-13	6.367E-13	3.641E-16-1.000E+00	4.420E-13	1.580E-12
BREAST	1.890E-14	6.105E-13	6.105E-13	3.491E-16-1.000E+00	4.310E-13	5.550E-13
LUNGS	1.650E-14	5.806E-13	5.806E-13	3.320E-16-1.000E+00	1.080E-11	4.790E-13
RED MARR	1.600E-14	5.893E-13	5.893E-13	3.370E-16-1.000E+00	6.070E-13	6.350E-13
BONE SUR	2.810E-14	8.658E-13	8.658E-13	4.952E-16-1.000E+00	9.180E-13	3.770E-13
THYROID	1.690E-14	6.068E-13	6.068E-13	3.471E-16-1.000E+00	3.620E-13	6.510E-14
REMAINDER	1.580E-14	5.683E-13	5.683E-13	3.250E-16-1.000E+00	2.100E-12	1.750E-11
EFFECTIVE	1.700E-14	6.069E-13	6.069E-13	3.471E-16-1.000E+00	2.210E-12	5.880E-12
SKIN(FGR)	2.460E-14	2.081E-12	2.081E-12	1.190E-15-1.000E+00	0.000E+00	0.000E+00
Sb-125						
GONADS	1.980E-14	1.304E-11	2.733E-10	4.530E-16-1.000E+00	3.190E-10	5.240E-10
BREAST	2.270E-14	1.261E-11	2.643E-10	4.380E-16-1.000E+00	2.510E-10	1.000E-10
LUNGS	1.950E-14	1.152E-11	2.413E-10	4.000E-16-1.000E+00	6.380E-10	6.030E-11
RED MARR	1.870E-14	1.158E-11	2.425E-10	4.020E-16-1.000E+00	6.490E-10	2.260E-10
BONE SUR	3.530E-14	1.872E-11	3.922E-10	6.500E-16-1.000E+00	2.730E-09	5.860E-10
THYROID	2.010E-14	1.215E-11	2.546E-10	4.220E-16-1.000E+00	2.280E-10	4.620E-11

REMAINDER	1.860E-14	1.132E-11	2.371E-10	3.930E-16	-1.000E+00	7.160E-10	1.860E-09
EFFECTIVE	2.020E-14	1.224E-11	2.564E-10	4.250E-16	-1.000E+00	5.750E-10	7.590E-10
SKIN(FGR)	2.650E-14	1.719E-11	3.602E-10	5.970E-16	-1.000E+00	0.000E+00	0.000E+00
Sb-126							
GONADS	1.350E-13	8.332E-11	1.461E-09	2.920E-15	-1.000E+00	9.110E-10	2.730E-09
BREAST	1.530E-13	7.961E-11	1.396E-09	2.790E-15	-1.000E+00	5.890E-10	4.170E-10
LUNGS	1.340E-13	7.590E-11	1.331E-09	2.660E-15	-1.000E+00	1.770E-09	1.660E-10
RED MARR	1.300E-13	7.733E-11	1.356E-09	2.710E-15	-1.000E+00	1.090E-09	7.230E-10
BONE SUR	2.220E-13	1.119E-10	1.962E-09	3.920E-15	-1.000E+00	1.710E-09	5.170E-10
THYROID	1.370E-13	7.904E-11	1.386E-09	2.770E-15	-1.000E+00	5.080E-10	1.050E-10
REMAINDER	1.280E-13	7.476E-11	1.311E-09	2.620E-15	-1.000E+00	1.810E-09	6.290E-09
EFFECTIVE	1.370E-13	7.932E-11	1.391E-09	2.780E-15	-1.000E+00	1.270E-09	2.760E-09
SKIN(FGR)	1.730E-13	1.521E-10	2.668E-09	5.330E-15	-1.000E+00	0.000E+00	0.000E+00
Sb-126m							
GONADS	7.330E-14	2.631E-12	2.631E-12	1.600E-15	-1.000E+00	1.190E-12	5.240E-12
BREAST	8.360E-14	2.516E-12	2.516E-12	1.530E-15	-1.000E+00	1.330E-12	2.070E-12
LUNGS	7.290E-14	2.401E-12	2.401E-12	1.460E-15	-1.000E+00	5.040E-11	1.910E-12
RED MARR	7.070E-14	2.434E-12	2.434E-12	1.480E-15	-1.000E+00	1.460E-12	2.180E-12
BONE SUR	1.240E-13	3.585E-12	3.585E-12	2.180E-15	-1.000E+00	1.320E-12	1.010E-12
THYROID	7.490E-14	2.500E-12	2.500E-12	1.520E-15	-1.000E+00	1.130E-12	1.990E-13
REMAINDER	6.970E-14	2.352E-12	2.352E-12	1.430E-15	-1.000E+00	7.920E-12	7.720E-11
EFFECTIVE	7.500E-14	2.500E-12	2.500E-12	1.520E-15	-1.000E+00	9.170E-12	2.530E-11
SKIN(FGR)	1.240E-13	1.416E-11	1.416E-11	8.610E-15	-1.000E+00	0.000E+00	0.000E+00
Sb-127							
GONADS	3.260E-14	1.985E-11	2.441E-10	7.100E-16	-1.000E+00	2.340E-10	5.880E-10
BREAST	3.720E-14	1.904E-11	2.341E-10	6.810E-16	-1.000E+00	1.650E-10	9.760E-11
LUNGS	3.240E-14	1.809E-11	2.224E-10	6.470E-16	-1.000E+00	1.360E-09	4.380E-11
RED MARR	3.140E-14	1.834E-11	2.255E-10	6.560E-16	-1.000E+00	4.940E-10	2.110E-10
BONE SUR	5.520E-14	2.720E-11	3.345E-10	9.730E-16	-1.000E+00	5.450E-10	1.500E-10
THYROID	3.330E-14	1.884E-11	2.317E-10	6.740E-16	-1.000E+00	1.500E-10	3.160E-11
REMAINDER	3.090E-14	1.775E-11	2.183E-10	6.350E-16	-1.000E+00	1.090E-09	5.390E-09
EFFECTIVE	3.330E-14	1.890E-11	2.324E-10	6.760E-16	-1.000E+00	6.550E-10	1.810E-09
SKIN(FGR)	5.580E-14	7.967E-11	9.799E-10	2.850E-15	-1.000E+00	0.000E+00	0.000E+00
Sb-128a							
GONADS	9.490E-14	1.836E-12	1.836E-12	2.040E-15	-1.000E+00	6.320E-13	3.920E-12
BREAST	1.080E-13	1.755E-12	1.755E-12	1.950E-15	-1.000E+00	1.020E-12	2.150E-12
LUNGS	9.420E-14	1.674E-12	1.674E-12	1.860E-15	-1.000E+00	2.530E-11	2.270E-12
RED MARR	9.170E-14	1.710E-12	1.710E-12	1.900E-15	-1.000E+00	1.010E-12	1.970E-12
BONE SUR	1.570E-13	2.485E-12	2.485E-12	2.760E-15	-1.000E+00	8.110E-13	9.590E-13
THYROID	9.700E-14	1.737E-12	1.737E-12	1.930E-15	-1.000E+00	8.740E-13	2.120E-13
REMAINDER	9.020E-14	1.647E-12	1.647E-12	1.830E-15	-1.000E+00	4.110E-12	4.700E-11
EFFECTIVE	9.690E-14	1.746E-12	1.746E-12	1.940E-15	-1.000E+00	4.750E-12	1.590E-11
SKIN(FGR)	1.730E-13	1.152E-11	1.152E-11	1.280E-14	-1.000E+00	0.000E+00	0.000E+00
Sb-128b							
GONADS	1.470E-13	6.818E-11	1.483E-10	3.170E-15	-1.000E+00	1.100E-10	4.530E-10
BREAST	1.680E-13	6.517E-11	1.418E-10	3.030E-15	-1.000E+00	6.220E-11	7.220E-11
LUNGS	1.470E-13	6.216E-11	1.352E-10	2.890E-15	-1.000E+00	1.270E-09	2.700E-11
RED MARR	1.430E-13	6.345E-11	1.380E-10	2.950E-15	-1.000E+00	1.110E-10	1.170E-10
BONE SUR	2.420E-13	9.162E-11	1.993E-10	4.260E-15	-1.000E+00	9.460E-11	5.140E-11
THYROID	1.510E-13	6.452E-11	1.404E-10	3.000E-15	-1.000E+00	5.200E-11	1.140E-11
REMAINDER	1.400E-13	6.130E-11	1.334E-10	2.850E-15	-1.000E+00	5.510E-10	3.270E-09
EFFECTIVE	1.510E-13	6.495E-11	1.413E-10	3.020E-15	-1.000E+00	3.720E-10	1.130E-09
SKIN(FGR)	1.990E-13	1.609E-10	3.500E-10	7.480E-15	-1.000E+00	0.000E+00	0.000E+00
Sb-129							
GONADS	6.970E-14	2.336E-11	3.231E-11	1.440E-15	-1.000E+00	3.790E-11	1.460E-10
BREAST	7.910E-14	2.222E-11	3.074E-11	1.370E-15	-1.000E+00	2.440E-11	2.740E-11
LUNGS	6.980E-14	2.141E-11	2.962E-11	1.320E-15	-1.000E+00	6.370E-10	1.220E-11
RED MARR	6.860E-14	2.190E-11	3.029E-11	1.350E-15	-1.000E+00	3.970E-11	4.040E-11
BONE SUR	1.070E-13	3.033E-11	4.196E-11	1.870E-15	-1.000E+00	4.210E-11	1.950E-11
THYROID	7.160E-14	2.174E-11	3.007E-11	1.340E-15	-1.000E+00	2.070E-11	4.450E-12
REMAINDER	6.710E-14	2.125E-11	2.939E-11	1.310E-15	-1.000E+00	2.260E-10	1.380E-09
EFFECTIVE	7.140E-14	2.238E-11	3.096E-11	1.380E-15	-1.000E+00	1.640E-10	4.610E-10
SKIN(FGR)	1.050E-13	8.273E-11	1.144E-10	5.100E-15	-1.000E+00	0.000E+00	0.000E+00

Sb-130						
GONADS	1.570E-13	1.142E-11	1.143E-11	3.300E-15	1.000E+00	6.270E-12	3.100E-11
BREAST	1.780E-13	1.094E-11	1.094E-11	3.160E-15	1.000E+00	5.530E-12	8.870E-12
LUNGS	1.560E-13	1.045E-11	1.046E-11	3.020E-15	1.000E+00	1.310E-10	6.600E-12
RED MARR	1.520E-13	1.070E-11	1.070E-11	3.090E-15	1.000E+00	6.070E-12	1.040E-11
BONE SUR	2.550E-13	1.547E-11	1.548E-11	4.470E-15	1.000E+00	4.880E-12	4.300E-12
THYROID	1.610E-13	1.073E-11	1.073E-11	3.100E-15	1.000E+00	4.530E-12	7.940E-13
REMAINDER	1.500E-13	1.035E-11	1.035E-11	2.990E-15	1.000E+00	2.960E-11	2.220E-10
EFFECTIVE	1.600E-13	1.094E-11	1.094E-11	3.160E-15	1.000E+00	2.800E-11	7.770E-11
SKIN(FGR)	2.290E-13	3.842E-11	3.843E-11	1.110E-14	1.000E+00	0.000E+00	0.000E+00
Sb-131							
GONADS	9.140E-14	3.643E-12	3.643E-12	1.830E-15	1.000E+00	2.930E-12	1.120E-11
BREAST	1.030E-13	3.484E-12	3.484E-12	1.750E-15	1.000E+00	2.900E-12	3.790E-12
LUNGS	9.180E-14	3.365E-12	3.365E-12	1.690E-15	1.000E+00	1.120E-10	3.070E-12
RED MARR	9.060E-14	3.464E-12	3.464E-12	1.740E-15	1.000E+00	3.270E-12	4.180E-12
BONE SUR	1.360E-13	4.718E-12	4.718E-12	2.370E-15	1.000E+00	3.230E-12	2.010E-12
THYROID	9.400E-14	3.365E-12	3.365E-12	1.690E-15	1.000E+00	5.780E-10	9.080E-10
REMAINDER	8.850E-14	3.345E-12	3.345E-12	1.680E-15	1.000E+00	2.110E-11	1.670E-10
EFFECTIVE	9.370E-14	3.504E-12	3.504E-12	1.760E-15	1.000E+00	3.880E-11	8.180E-11
SKIN(FGR)	1.400E-13	1.495E-11	1.495E-11	7.510E-15	1.000E+00	0.000E+00	0.000E+00
Sc-43							
GONADS	5.130E-14	1.750E-11	2.304E-11	1.140E-15	1.000E+00	1.550E-11	1.170E-10
BREAST	5.870E-14	1.673E-11	2.203E-11	1.090E-15	1.000E+00	7.100E-12	1.810E-11
LUNGS	5.090E-14	1.596E-11	2.102E-11	1.040E-15	1.000E+00	3.430E-10	6.380E-12
RED MARR	4.890E-14	1.612E-11	2.122E-11	1.050E-15	1.000E+00	8.220E-12	2.730E-11
BONE SUR	9.300E-14	2.471E-11	3.254E-11	1.610E-15	1.000E+00	4.980E-12	9.360E-12
THYROID	5.230E-14	1.658E-11	2.183E-11	1.080E-15	1.000E+00	4.280E-12	6.440E-13
REMAINDER	4.860E-14	1.550E-11	2.041E-11	1.010E-15	1.000E+00	7.560E-11	5.670E-10
EFFECTIVE	5.260E-14	1.658E-11	2.183E-11	1.080E-15	1.000E+00	7.000E-11	2.060E-10
SKIN(FGR)	7.910E-14	5.541E-11	7.295E-11	3.610E-15	1.000E+00	0.000E+00	0.000E+00
Sc-44							
GONADS	1.030E-13	3.332E-11	4.405E-11	2.160E-15	1.000E+00	2.690E-11	2.000E-10
BREAST	1.170E-13	3.193E-11	4.222E-11	2.070E-15	1.000E+00	1.340E-11	3.400E-11
LUNGS	1.030E-13	3.054E-11	4.038E-11	1.980E-15	1.000E+00	6.560E-10	1.260E-11
RED MARR	1.000E-13	3.116E-11	4.120E-11	2.020E-15	1.000E+00	1.480E-11	4.810E-11
BONE SUR	1.640E-13	4.427E-11	5.854E-11	2.870E-15	1.000E+00	9.050E-12	1.680E-11
THYROID	1.050E-13	3.132E-11	4.140E-11	2.030E-15	1.000E+00	8.570E-12	1.510E-12
REMAINDER	9.840E-14	3.024E-11	3.998E-11	1.960E-15	1.000E+00	1.450E-10	1.080E-09
EFFECTIVE	1.050E-13	3.193E-11	4.222E-11	2.070E-15	1.000E+00	1.330E-10	3.870E-10
SKIN(FGR)	1.580E-13	1.461E-10	1.931E-10	9.470E-15	1.000E+00	0.000E+00	0.000E+00
Sc-44m							
GONADS	1.320E-14	7.777E-12	7.432E-11	2.830E-16	1.000E+00	7.390E-10	1.700E-09
BREAST	1.510E-14	7.557E-12	7.222E-11	2.750E-16	1.000E+00	1.860E-10	2.010E-10
LUNGS	1.300E-14	7.117E-12	6.802E-11	2.590E-16	1.000E+00	6.580E-09	3.150E-11
RED MARR	1.230E-14	7.172E-12	6.855E-11	2.610E-16	1.000E+00	2.480E-10	3.380E-10
BONE SUR	2.730E-14	1.234E-11	1.179E-10	4.490E-16	1.000E+00	1.310E-10	1.140E-10
THYROID	1.340E-14	7.200E-12	6.881E-11	2.620E-16	1.000E+00	8.960E-11	4.600E-12
REMAINDER	1.230E-14	6.952E-12	6.645E-11	2.530E-16	1.000E+00	3.360E-09	7.640E-09
EFFECTIVE	1.350E-14	7.474E-12	7.144E-11	2.720E-16	1.000E+00	2.050E-09	2.790E-09
SKIN(FGR)	1.720E-14	8.876E-12	8.483E-11	3.230E-16	1.000E+00	0.000E+00	0.000E+00
Sc-46							
GONADS	9.770E-14	5.781E-11	1.181E-09	2.010E-15	1.000E+00	1.300E-09	2.010E-09
BREAST	1.110E-13	5.522E-11	1.128E-09	1.920E-15	1.000E+00	2.150E-09	2.510E-10
LUNGS	9.760E-14	5.321E-11	1.087E-09	1.850E-15	1.000E+00	4.620E-08	4.860E-11
RED MARR	9.620E-14	5.464E-11	1.116E-09	1.900E-15	1.000E+00	2.210E-09	4.030E-10
BONE SUR	1.460E-13	7.449E-11	1.522E-09	2.590E-15	1.000E+00	1.680E-09	1.390E-10
THYROID	1.000E-13	5.436E-11	1.111E-09	1.890E-15	1.000E+00	2.020E-09	7.690E-12
REMAINDER	9.380E-14	5.292E-11	1.081E-09	1.840E-15	1.000E+00	4.790E-09	3.780E-09
EFFECTIVE	9.980E-14	5.551E-11	1.134E-09	1.930E-15	1.000E+00	8.010E-09	1.730E-09
SKIN(FGR)	1.170E-13	6.557E-11	1.340E-09	2.280E-15	1.000E+00	0.000E+00	0.000E+00
Sc-47							
GONADS	5.030E-15	2.978E-12	3.419E-11	1.070E-16	1.000E+00	4.700E-11	1.120E-10
BREAST	5.780E-15	2.894E-12	3.323E-11	1.040E-16	1.000E+00	1.150E-11	1.210E-11

LUNGS	4.820E-15	2.738E-12	3.144E-11	9.840E-17	-1.000E+00	2.030E-09	1.620E-12
RED MARR	4.360E-15	2.683E-12	3.080E-11	9.640E-17	-1.000E+00	2.460E-11	3.130E-11
BONE SUR	1.350E-14	6.401E-12	7.349E-11	2.300E-16	-1.000E+00	1.390E-11	1.010E-11
THYROID	5.030E-15	2.750E-12	3.157E-11	9.880E-17	-1.000E+00	4.640E-12	1.190E-13
REMAINDER	4.530E-15	2.661E-12	3.055E-11	9.560E-17	-1.000E+00	7.920E-10	1.900E-09
EFFECTIVE	5.140E-15	2.894E-12	3.323E-11	1.040E-16	-1.000E+00	4.980E-10	6.040E-10
SKIN(FGR)	1.280E-14	5.427E-12	6.231E-11	1.950E-16	-1.000E+00	0.000E+00	0.000E+00
Sc-48							
GONADS	1.640E-13	8.980E-11	7.011E-10	3.320E-15	-1.000E+00	7.770E-10	2.040E-09
BREAST	1.850E-13	8.547E-11	6.673E-10	3.160E-15	-1.000E+00	2.070E-10	2.740E-10
LUNGS	1.640E-13	8.277E-11	6.462E-10	3.060E-15	-1.000E+00	2.770E-09	5.980E-11
RED MARR	1.620E-13	8.520E-11	6.652E-10	3.150E-15	-1.000E+00	2.600E-10	4.260E-10
BONE SUR	2.410E-13	1.150E-10	8.974E-10	4.250E-15	-1.000E+00	1.340E-10	1.460E-10
THYROID	1.680E-13	8.331E-11	6.504E-10	3.080E-15	-1.000E+00	1.050E-10	8.910E-12
REMAINDER	1.580E-13	8.250E-11	6.440E-10	3.050E-15	-1.000E+00	1.720E-09	4.470E-09
EFFECTIVE	1.680E-13	8.601E-11	6.715E-10	3.180E-15	-1.000E+00	1.110E-09	1.960E-09
SKIN(FGR)	2.010E-13	1.155E-10	9.017E-10	4.270E-15	-1.000E+00	0.000E+00	0.000E+00
Sc-49							
GONADS	1.910E-16	2.630E-14	2.638E-14	5.310E-18	-1.000E+00	2.600E-14	1.250E-14
BREAST	2.210E-16	2.606E-14	2.614E-14	5.260E-18	-1.000E+00	2.660E-14	3.800E-15
LUNGS	1.820E-16	2.199E-14	2.206E-14	4.440E-18	-1.000E+00	2.060E-10	2.500E-15
RED MARR	1.700E-16	2.130E-14	2.137E-14	4.300E-18	-1.000E+00	4.600E-14	4.450E-15
BONE SUR	4.100E-16	5.102E-14	5.118E-14	1.030E-17	-1.000E+00	4.540E-14	1.920E-15
THYROID	1.910E-16	2.274E-14	2.281E-14	4.590E-18	-1.000E+00	2.610E-14	4.380E-16
REMAINDER	1.740E-16	2.175E-14	2.181E-14	4.390E-18	-1.000E+00	9.300E-12	2.270E-10
EFFECTIVE	1.930E-16	2.442E-14	2.450E-14	4.930E-18	-1.000E+00	2.750E-11	6.800E-11
SKIN(FGR)	5.430E-14	4.825E-11	4.839E-11	9.740E-15	-1.000E+00	0.000E+00	0.000E+00
Se-70							
GONADS	4.630E-14	3.654E-12	3.656E-12	1.030E-15	-1.000E+00	3.800E-12	4.000E-11
BREAST	5.300E-14	3.523E-12	3.524E-12	9.930E-16	-1.000E+00	5.840E-12	1.780E-11
LUNGS	4.570E-14	3.321E-12	3.322E-12	9.360E-16	-1.000E+00	2.610E-10	1.560E-11
RED MARR	4.380E-14	3.335E-12	3.336E-12	9.400E-16	-1.000E+00	5.840E-12	1.990E-11
BONE SUR	8.500E-14	5.393E-12	5.395E-12	1.520E-15	-1.000E+00	4.740E-12	1.350E-11
THYROID	4.700E-14	3.459E-12	3.460E-12	9.750E-16	-1.000E+00	5.100E-12	1.020E-11
REMAINDER	4.360E-14	3.246E-12	3.247E-12	9.150E-16	-1.000E+00	1.820E-11	2.640E-10
EFFECTIVE	4.730E-14	3.481E-12	3.482E-12	9.810E-16	-1.000E+00	3.960E-11	9.670E-11
SKIN(FGR)	8.360E-14	2.285E-11	2.286E-11	6.440E-15	-1.000E+00	0.000E+00	0.000E+00
Se-73							
GONADS	5.050E-14	2.244E-11	4.159E-11	1.120E-15	-1.000E+00	2.240E-11	1.070E-10
BREAST	5.780E-14	2.164E-11	4.011E-11	1.080E-15	-1.000E+00	2.080E-11	5.330E-11
LUNGS	4.970E-14	2.044E-11	3.788E-11	1.020E-15	-1.000E+00	7.050E-10	5.070E-11
RED MARR	4.740E-14	2.044E-11	3.788E-11	1.020E-15	-1.000E+00	2.340E-11	6.460E-11
BONE SUR	9.590E-14	3.446E-11	6.387E-11	1.720E-15	-1.000E+00	1.930E-11	5.080E-11
THYROID	5.120E-14	2.124E-11	3.936E-11	1.060E-15	-1.000E+00	1.750E-11	4.160E-11
REMAINDER	4.740E-14	2.000E-11	3.706E-11	9.980E-16	-1.000E+00	8.920E-11	4.830E-10
EFFECTIVE	5.160E-14	2.144E-11	3.973E-11	1.070E-15	-1.000E+00	1.240E-10	1.960E-10
SKIN(FGR)	8.310E-14	1.082E-10	2.005E-10	5.400E-15	-1.000E+00	0.000E+00	0.000E+00
Se-73m							
GONADS	1.140E-14	8.539E-13	8.541E-13	2.530E-16	-1.000E+00	1.780E-12	9.040E-12
BREAST	1.300E-14	8.202E-13	8.203E-13	2.430E-16	-1.000E+00	1.750E-12	4.590E-12
LUNGS	1.130E-14	7.763E-13	7.765E-13	2.300E-16	-1.000E+00	7.740E-11	4.390E-12
RED MARR	1.090E-14	7.831E-13	7.832E-13	2.320E-16	-1.000E+00	1.940E-12	5.440E-12
BONE SUR	2.020E-14	1.195E-12	1.195E-12	3.540E-16	-1.000E+00	1.600E-12	4.220E-12
THYROID	1.160E-14	8.101E-13	8.102E-13	2.400E-16	-1.000E+00	1.500E-12	3.430E-12
REMAINDER	1.080E-14	7.594E-13	7.596E-13	2.250E-16	-1.000E+00	7.330E-12	6.200E-11
EFFECTIVE	1.170E-14	8.101E-13	8.102E-13	2.400E-16	-1.000E+00	1.250E-11	2.300E-11
SKIN(FGR)	2.390E-14	7.493E-12	7.495E-12	2.220E-15	-1.000E+00	0.000E+00	0.000E+00
Se-75							
GONADS	1.810E-14	1.125E-11	2.318E-10	3.910E-16	-1.000E+00	1.100E-09	1.800E-09
BREAST	2.080E-14	1.093E-11	2.252E-10	3.800E-16	-1.000E+00	1.090E-09	1.450E-09
LUNGS	1.750E-14	1.030E-11	2.122E-10	3.580E-16	-1.000E+00	5.440E-09	1.660E-09
RED MARR	1.630E-14	1.021E-11	2.104E-10	3.550E-16	-1.000E+00	1.500E-09	2.070E-09
BONE SUR	4.260E-14	2.072E-11	4.268E-10	7.200E-16	-1.000E+00	1.230E-09	1.700E-09

THYROID	1.820E-14	1.044E-11	2.152E-10	3.630E-16	-1.000E+00	8.390E-10	1.130E-09
REMAINDER	1.660E-14	1.001E-11	2.063E-10	3.480E-16	-1.000E+00	3.180E-09	4.680E-09
EFFECTIVE	1.850E-14	1.085E-11	2.235E-10	3.770E-16	-1.000E+00	2.290E-09	2.600E-09
SKIN(FGR)	2.160E-14	1.370E-11	2.821E-10	4.760E-16	-1.000E+00	0.000E+00	0.000E+00
Se-77m							
GONADS	3.940E-15	2.115E-15	2.115E-15	8.400E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	4.530E-15	2.069E-15	2.069E-15	8.220E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	3.770E-15	1.938E-15	1.938E-15	7.700E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	3.430E-15	1.903E-15	1.903E-15	7.560E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.050E-14	4.481E-15	4.481E-15	1.780E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	3.940E-15	1.946E-15	1.946E-15	7.730E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	3.550E-15	1.886E-15	1.886E-15	7.490E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.030E-15	2.059E-15	2.059E-15	8.180E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	6.990E-15	2.769E-15	2.769E-15	1.100E-16	-1.000E+00	0.000E+00	0.000E+00
Se-79							
GONADS	3.470E-19	8.150E-16	1.712E-14	2.830E-20	-1.000E+00	5.980E-10	9.060E-10
BREAST	4.670E-19	9.158E-16	1.923E-14	3.180E-20	-1.000E+00	5.980E-10	9.060E-10
LUNGS	2.110E-19	3.312E-16	6.955E-15	1.150E-20	-1.000E+00	9.810E-09	9.060E-10
RED MARR	1.670E-19	2.762E-16	5.800E-15	9.590E-21	-1.000E+00	5.980E-10	9.060E-10
BONE SUR	9.600E-19	1.740E-15	3.653E-14	6.040E-20	-1.000E+00	5.980E-10	9.060E-10
THYROID	2.960E-19	4.666E-16	9.798E-15	1.620E-20	-1.000E+00	5.980E-10	9.060E-10
REMAINDER	2.100E-19	3.859E-16	8.104E-15	1.340E-20	-1.000E+00	3.770E-09	5.730E-09
EFFECTIVE	3.030E-19	5.962E-16	1.252E-14	2.070E-20	-1.000E+00	2.660E-09	2.350E-09
SKIN(FGR)	3.710E-16	2.621E-15	5.504E-14	9.100E-20	-1.000E+00	0.000E+00	0.000E+00
Se-81							
GONADS	5.150E-16	1.922E-14	1.922E-14	1.200E-17	-1.000E+00	9.050E-14	2.180E-13
BREAST	5.900E-16	1.874E-14	1.874E-14	1.170E-17	-1.000E+00	9.320E-14	2.070E-13
LUNGS	5.020E-16	1.697E-14	1.697E-14	1.060E-17	-1.000E+00	4.790E-11	2.070E-13
RED MARR	4.770E-16	1.697E-14	1.697E-14	1.060E-17	-1.000E+00	9.340E-14	2.070E-13
BONE SUR	1.020E-15	3.123E-14	3.123E-14	1.950E-17	-1.000E+00	9.250E-14	2.010E-13
THYROID	5.210E-16	1.762E-14	1.762E-14	1.100E-17	-1.000E+00	9.260E-14	1.970E-13
REMAINDER	4.780E-16	1.665E-14	1.665E-14	1.040E-17	-1.000E+00	6.810E-13	5.300E-11
EFFECTIVE	5.240E-16	1.810E-14	1.810E-14	1.130E-17	-1.000E+00	6.010E-12	1.600E-11
SKIN(FGR)	3.940E-14	1.132E-11	1.132E-11	7.070E-15	-1.000E+00	0.000E+00	0.000E+00
Se-81m							
GONADS	6.050E-16	6.769E-14	6.789E-14	1.370E-17	-1.000E+00	6.020E-13	3.210E-12
BREAST	7.100E-16	6.868E-14	6.888E-14	1.390E-17	-1.000E+00	6.210E-13	3.020E-12
LUNGS	5.670E-16	6.028E-14	6.046E-14	1.220E-17	-1.000E+00	1.590E-10	3.000E-12
RED MARR	4.880E-16	5.633E-14	5.649E-14	1.140E-17	-1.000E+00	6.330E-13	3.090E-12
BONE SUR	1.910E-15	1.848E-13	1.853E-13	3.740E-17	-1.000E+00	6.210E-13	3.010E-12
THYROID	5.970E-16	6.127E-14	6.145E-14	1.240E-17	-1.000E+00	6.080E-13	2.950E-12
REMAINDER	5.290E-16	5.880E-14	5.897E-14	1.190E-17	-1.000E+00	6.350E-12	1.280E-10
EFFECTIVE	6.180E-16	6.621E-14	6.641E-14	1.340E-17	-1.000E+00	2.130E-11	4.050E-11
SKIN(FGR)	1.400E-15	2.179E-13	2.185E-13	4.410E-17	-1.000E+00	0.000E+00	0.000E+00
Se-83							
GONADS	1.180E-13	4.674E-12	4.674E-12	2.400E-15	-1.000E+00	6.790E-13	8.460E-12
BREAST	1.340E-13	4.480E-12	4.480E-12	2.300E-15	-1.000E+00	1.450E-12	4.690E-12
LUNGS	1.180E-13	4.304E-12	4.304E-12	2.210E-15	-1.000E+00	8.940E-11	4.580E-12
RED MARR	1.160E-13	4.402E-12	4.402E-12	2.260E-15	-1.000E+00	1.430E-12	4.650E-12
BONE SUR	1.860E-13	6.232E-12	6.232E-12	3.200E-15	-1.000E+00	1.190E-12	2.990E-12
THYROID	1.210E-13	4.324E-12	4.324E-12	2.220E-15	-1.000E+00	1.290E-12	1.870E-12
REMAINDER	1.140E-13	4.265E-12	4.265E-12	2.190E-15	-1.000E+00	4.480E-12	1.020E-10
EFFECTIVE	1.210E-13	4.480E-12	4.480E-12	2.300E-15	-1.000E+00	1.270E-11	3.470E-11
SKIN(FGR)	1.690E-13	1.435E-11	1.435E-11	7.370E-15	-1.000E+00	0.000E+00	0.000E+00
Si-31							
GONADS	1.160E-16	3.903E-14	4.439E-14	3.260E-18	-1.000E+00	1.200E-12	1.140E-13
BREAST	1.350E-16	3.880E-14	4.412E-14	3.240E-18	-1.000E+00	1.200E-12	8.050E-14
LUNGS	1.100E-16	3.221E-14	3.663E-14	2.690E-18	-1.000E+00	3.590E-10	7.550E-14
RED MARR	1.030E-16	3.101E-14	3.527E-14	2.590E-18	-1.000E+00	1.200E-12	8.330E-14
BONE SUR	2.500E-16	7.711E-14	8.769E-14	6.440E-18	-1.000E+00	1.190E-12	7.580E-14
THYROID	1.160E-16	3.365E-14	3.826E-14	2.810E-18	-1.000E+00	1.190E-12	7.200E-14
REMAINDER	1.050E-16	3.173E-14	3.608E-14	2.650E-18	-1.000E+00	3.790E-11	4.860E-10
EFFECTIVE	1.170E-16	3.604E-14	4.098E-14	3.010E-18	-1.000E+00	5.520E-11	1.460E-10

SKIN(FGR)	3.780E-14	8.214E-11	9.341E-11	6.860E-15	-1.000E+00	0.000E+00	0.000E+00
Si-32							
GONADS	5.840E-19	1.178E-15	2.474E-14	4.090E-20	-1.000E+00	1.530E-09	1.170E-10
BREAST	7.660E-19	1.308E-15	2.746E-14	4.540E-20	-1.000E+00	1.530E-09	1.170E-10
LUNGS	3.880E-19	5.414E-16	1.137E-14	1.880E-20	-1.000E+00	1.020E-07	1.170E-10
RED MARR	3.100E-19	4.522E-16	9.495E-15	1.570E-20	-1.000E+00	1.530E-09	1.170E-10
BONE SUR	1.680E-18	2.678E-15	5.625E-14	9.300E-20	-1.000E+00	1.530E-09	1.170E-10
THYROID	5.110E-19	7.200E-16	1.512E-14	2.500E-20	-1.000E+00	1.530E-09	1.170E-10
REMAINDER	3.800E-19	6.077E-16	1.276E-14	2.110E-20	-1.000E+00	3.210E-09	1.690E-09
EFFECTIVE	5.240E-19	8.928E-16	1.875E-14	3.100E-20	-1.000E+00	1.410E-08	5.900E-10
SKIN(FGR)	8.270E-16	3.456E-15	7.257E-14	1.200E-19	-1.000E+00	0.000E+00	0.000E+00
Sm-141							
GONADS	6.700E-14	1.263E-12	1.263E-12	1.430E-15	-1.000E+00	1.260E-13	3.640E-12
BREAST	7.640E-14	1.210E-12	1.210E-12	1.370E-15	-1.000E+00	4.630E-13	1.530E-12
LUNGS	6.680E-14	1.148E-12	1.148E-12	1.300E-15	-1.000E+00	6.310E-11	1.430E-12
RED MARR	6.500E-14	1.165E-12	1.165E-12	1.320E-15	-1.000E+00	5.370E-13	1.630E-12
BONE SUR	1.120E-13	1.748E-12	1.748E-12	1.980E-15	-1.000E+00	5.090E-13	7.170E-13
THYROID	6.850E-14	1.174E-12	1.174E-12	1.330E-15	-1.000E+00	3.690E-13	1.310E-13
REMAINDER	6.410E-14	1.130E-12	1.130E-12	1.280E-15	-1.000E+00	1.740E-12	8.490E-11
EFFECTIVE	6.870E-14	1.201E-12	1.201E-12	1.360E-15	-1.000E+00	8.290E-12	2.700E-11
SKIN(FGR)	1.270E-13	7.885E-12	7.885E-12	8.930E-15	-1.000E+00	0.000E+00	0.000E+00
Sm-141m							
GONADS	9.490E-14	3.913E-12	3.913E-12	2.000E-15	-1.000E+00	4.400E-13	1.340E-11
BREAST	1.080E-13	3.756E-12	3.756E-12	1.920E-15	-1.000E+00	1.290E-12	4.310E-12
LUNGS	9.440E-14	3.580E-12	3.580E-12	1.830E-15	-1.000E+00	1.140E-10	3.450E-12
RED MARR	9.190E-14	3.619E-12	3.619E-12	1.850E-15	-1.000E+00	1.520E-12	5.010E-12
BONE SUR	1.570E-13	5.478E-12	5.478E-12	2.800E-15	-1.000E+00	1.470E-12	2.060E-12
THYROID	9.700E-14	3.639E-12	3.639E-12	1.860E-15	-1.000E+00	1.030E-12	3.310E-13
REMAINDER	9.060E-14	3.521E-12	3.521E-12	1.800E-15	-1.000E+00	5.040E-12	1.610E-10
EFFECTIVE	9.710E-14	3.737E-12	3.737E-12	1.910E-15	-1.000E+00	1.580E-11	5.330E-11
SKIN(FGR)	1.390E-13	1.268E-11	1.268E-11	6.480E-15	-1.000E+00	0.000E+00	0.000E+00
Sm-142							
GONADS	4.503E-14	6.310E-12	6.375E-12	1.016E-15	-1.000E+00	1.050E-12	2.220E-11
BREAST	5.160E-14	6.074E-12	6.137E-12	9.780E-16	-1.000E+00	1.550E-12	4.970E-12
LUNGS	4.441E-14	5.665E-12	5.723E-12	9.121E-16	-1.000E+00	4.190E-10	2.900E-12
RED MARR	4.277E-14	5.670E-12	5.729E-12	9.130E-16	-1.000E+00	3.030E-12	6.720E-12
BONE SUR	7.932E-14	9.235E-12	9.331E-12	1.487E-15	-1.000E+00	3.110E-12	2.460E-12
THYROID	4.578E-14	5.916E-12	5.977E-12	9.525E-16	-1.000E+00	1.150E-12	2.640E-13
REMAINDER	4.246E-14	5.558E-12	5.615E-12	8.949E-16	-1.000E+00	2.320E-11	5.390E-10
EFFECTIVE	4.599E-14	5.968E-12	6.030E-12	9.609E-16	-1.000E+00	5.820E-11	1.690E-10
SKIN(FGR)	1.504E-13	8.628E-11	8.718E-11	1.389E-14	-1.000E+00	0.000E+00	0.000E-00
Sm-145							
GONADS	1.830E-15	2.332E-12	4.864E-11	8.100E-17	-1.000E+00	1.840E-10	1.610E-10
BREAST	2.350E-15	2.415E-12	5.038E-11	8.390E-17	-1.000E+00	2.900E-10	1.240E-11
LUNGS	1.180E-15	1.491E-12	3.111E-11	5.180E-17	-1.000E+00	6.580E-09	1.800E-12
RED MARR	8.620E-16	1.071E-12	2.234E-11	3.720E-17	-1.000E+00	3.460E-09	6.660E-11
BONE SUR	5.390E-15	7.255E-12	1.513E-10	2.520E-16	-1.000E+00	2.580E-08	8.330E-11
THYROID	1.590E-15	1.762E-12	3.675E-11	6.120E-17	-1.000E+00	7.460E-11	1.610E-13
REMAINDER	1.140E-15	1.488E-12	3.105E-11	5.170E-17	-1.000E+00	3.040E-09	6.450E-10
EFFECTIVE	1.610E-15	1.969E-12	4.107E-11	6.840E-17	-1.000E+00	2.980E-09	2.460E-10
SKIN(FGR)	2.640E-15	3.138E-12	6.546E-11	1.090E-16	-1.000E+00	0.000E+00	0.000E+00
Sm-146							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	8.400E-06	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.030E-05	7.570E-08
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.790E-04	9.460E-07
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	2.080E-05	5.890E-08
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	2.230E-05	5.510E-08
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Sm-147							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00

BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	7.620E-06	0.000E+00
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.750E-05	6.870E-08
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	3.440E-04	8.590E-07
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.890E-05	5.370E-08
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.020E-05	5.010E-08
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
Sm-151						
GONADS	5.200E-20	2.494E-16	5.237E-15	8.660E-21-1.000E+00	4.030E-14	2.120E-14
BREAST	8.800E-20	2.880E-16	6.048E-15	1.000E-20-1.000E+00	1.490E-13	1.030E-15
LUNGS	7.080E-21	2.909E-17	6.108E-16	1.010E-21-1.000E+00	3.260E-09	6.520E-16
RED MARR	1.130E-20	4.003E-17	8.406E-16	1.390E-21-1.000E+00	1.100E-08	2.760E-11
BONE SUR	7.090E-20	2.773E-16	5.824E-15	9.630E-21-1.000E+00	1.380E-07	3.450E-10
THYROID	3.580E-20	9.590E-17	2.014E-15	3.330E-21-1.000E+00	1.320E-14	3.270E-17
REMAINDER	1.490E-20	6.624E-17	1.391E-15	2.300E-21-1.000E+00	7.510E-09	3.040E-10
EFFECTIVE	3.610E-20	1.449E-16	3.042E-15	5.030E-21-1.000E+00	8.100E-09	1.050E-10
SKIN(FGR)	1.900E-19	7.286E-16	1.530E-14	2.530E-20-1.000E+00	0.000E+00	0.000E+00
Sm-153						
GONADS	2.330E-15	1.822E-12	1.493E-11	6.710E-17-1.000E+00	2.360E-11	7.170E-11
BREAST	2.820E-15	1.825E-12	1.495E-11	6.720E-17-1.000E+00	5.670E-12	6.910E-12
LUNGS	1.970E-15	1.458E-12	1.195E-11	5.370E-17-1.000E+00	2.050E-09	7.130E-13
RED MARR	1.620E-15	1.225E-12	1.004E-11	4.510E-17-1.000E+00	6.660E-11	2.720E-11
BONE SUR	7.290E-15	5.594E-12	4.584E-11	2.060E-16-1.000E+00	1.570E-10	8.380E-12
THYROID	2.220E-15	1.556E-12	1.275E-11	5.730E-17-1.000E+00	1.510E-12	2.360E-14
REMAINDER	1.850E-15	1.409E-12	1.155E-11	5.190E-17-1.000E+00	8.840E-10	2.620E-09
EFFECTIVE	2.280E-15	1.689E-12	1.384E-11	6.220E-17-1.000E+00	5.310E-10	8.070E-10
SKIN(FGR)	1.450E-14	1.933E-11	1.584E-10	7.120E-16-1.000E+00	0.000E+00	0.000E+00
Sm-155						
GONADS	4.580E-15	2.009E-13	2.009E-13	1.050E-16-1.000E+00	1.350E-14	5.150E-13
BREAST	5.360E-15	1.951E-13	1.951E-13	1.020E-16-1.000E+00	5.720E-14	1.770E-13
LUNGS	4.260E-15	1.798E-13	1.798E-13	9.400E-17-1.000E+00	5.320E-11	1.510E-13
RED MARR	3.710E-15	1.672E-13	1.672E-13	8.740E-17-1.000E+00	2.850E-13	3.330E-13
BONE SUR	1.370E-14	5.376E-13	5.376E-13	2.810E-16-1.000E+00	1.650E-12	1.390E-13
THYROID	4.520E-15	1.838E-13	1.838E-13	9.610E-17-1.000E+00	3.700E-14	6.280E-15
REMAINDER	3.990E-15	1.733E-13	1.733E-13	9.060E-17-1.000E+00	1.030E-12	6.370E-11
EFFECTIVE	4.650E-15	1.951E-13	1.951E-13	1.020E-16-1.000E+00	6.790E-12	1.930E-11
SKIN(FGR)	4.010E-14	1.194E-11	1.194E-11	6.240E-15-1.000E+00	0.000E+00	0.000E+00
Sm-156						
GONADS	5.360E-15	2.654E-12	5.956E-12	1.220E-16-1.000E+00	2.210E-11	6.420E-11
BREAST	6.200E-15	2.611E-12	5.858E-12	1.200E-16-1.000E+00	1.150E-11	7.570E-12
LUNGS	5.050E-15	2.350E-12	5.273E-12	1.080E-16-1.000E+00	8.740E-10	1.440E-12
RED MARR	4.570E-15	2.263E-12	5.077E-12	1.040E-16-1.000E+00	4.100E-11	1.660E-11
BONE SUR	1.400E-14	5.809E-12	1.304E-11	2.670E-16-1.000E+00	1.180E-10	5.680E-12
THYROID	5.320E-15	2.393E-12	5.370E-12	1.100E-16-1.000E+00	6.330E-12	1.480E-13
REMAINDER	4.760E-15	2.284E-12	5.126E-12	1.050E-16-1.000E+00	2.260E-10	8.540E-10
EFFECTIVE	5.430E-15	2.545E-12	5.712E-12	1.170E-16-1.000E+00	1.890E-10	2.760E-10
SKIN(FGR)	1.460E-14	9.377E-12	2.104E-11	4.310E-16-1.000E+00	0.000E+00	0.000E+00
Sn-110						
GONADS	1.350E-14	4.908E-12	6.544E-12	3.150E-16-1.000E+00	2.900E-11	2.130E-10
BREAST	1.550E-14	4.830E-12	6.440E-12	3.100E-16-1.000E+00	1.390E-11	3.060E-11
LUNGS	1.300E-14	4.191E-12	5.588E-12	2.690E-16-1.000E+00	6.390E-10	8.680E-12
RED MARR	1.230E-14	4.191E-12	5.588E-12	2.690E-16-1.000E+00	2.040E-11	4.860E-11
BONE SUR	2.900E-14	7.884E-12	1.051E-11	5.060E-16-1.000E+00	1.560E-11	1.720E-11
THYROID	1.360E-14	4.363E-12	5.817E-12	2.800E-16-1.000E+00	9.150E-12	1.500E-12
REMAINDER	1.240E-14	4.113E-12	5.485E-12	2.640E-16-1.000E+00	1.540E-10	1.160E-09
EFFECTIVE	1.370E-14	4.565E-12	6.087E-12	2.930E-16-1.000E+00	1.360E-10	4.130E-10
SKIN(FGR)	1.660E-14	6.061E-12	8.081E-12	3.890E-16-1.000E+00	0.000E+00	0.000E+00
Sn-111						
GONADS	2.390E-14	1.595E-12	1.595E-12	5.220E-16-1.000E+00	1.560E-12	7.420E-12
BREAST	2.730E-14	1.537E-12	1.537E-12	5.030E-16-1.000E+00	8.230E-13	1.580E-12
LUNGS	2.380E-14	1.424E-12	1.424E-12	4.660E-16-1.000E+00	4.170E-11	9.980E-13
RED MARR	2.320E-14	1.445E-12	1.445E-12	4.730E-16-1.000E+00	1.150E-12	2.230E-12

BONE SUR	3.950E-14	2.163E-12	2.163E-12	7.080E-16	-1.000E+00	1.270E-12	9.700E-13
THYROID	2.450E-14	1.467E-12	1.467E-12	4.800E-16	-1.000E+00	5.550E-13	1.060E-13
REMAINDER	2.290E-14	1.409E-12	1.409E-12	4.610E-16	-1.000E+00	3.900E-12	5.660E-11
EFFECTIVE	2.450E-14	1.503E-12	1.503E-12	4.920E-16	-1.000E+00	6.880E-12	1.950E-11
SKIN(FGR)	4.220E-14	9.838E-12	9.839E-12	3.220E-15	-1.000E+00	0.000E+00	0.000E-00
Sn-113							
GONADS	4.400E-16	9.005E-13	1.854E-11	3.130E-17	-1.000E+00	3.160E-10	3.880E-10
BREAST	5.900E-16	9.926E-13	2.043E-11	3.450E-17	-1.000E+00	2.990E-10	5.680E-11
LUNGS	2.680E-16	2.877E-13	5.922E-12	1.000E-17	-1.000E+00	1.840E-08	2.540E-11
RED MARR	2.580E-16	2.805E-13	5.774E-12	9.750E-18	-1.000E+00	7.710E-10	1.780E-10
BONE SUR	8.590E-16	1.364E-12	2.807E-11	4.740E-17	-1.000E+00	1.320E-09	2.340E-10
THYROID	3.840E-16	5.035E-13	1.036E-11	1.750E-17	-1.000E+00	2.270E-10	2.160E-11
REMAINDER	2.780E-16	3.798E-13	7.817E-12	1.320E-17	-1.000E+00	1.380E-09	2.320E-09
EFFECTIVE	3.820E-16	6.128E-13	1.261E-11	2.130E-17	-1.000E+00	2.880E-09	8.330E-10
SKIN(FGR)	8.200E-16	1.861E-12	3.832E-11	6.470E-17	-1.000E+00	0.000E+00	0.000E-00
Sn-117m							
GONADS	6.730E-15	4.683E-12	8.343E-11	1.640E-16	-1.000E+00	1.070E-10	2.230E-10
BREAST	7.830E-15	4.683E-12	8.343E-11	1.640E-16	-1.000E+00	5.140E-11	2.390E-11
LUNGS	6.290E-15	3.827E-12	6.817E-11	1.340E-16	-1.000E+00	6.120E-09	5.500E-12
RED MARR	5.700E-15	3.712E-12	6.614E-11	1.300E-16	-1.000E+00	2.550E-10	1.030E-10
BONE SUR	1.790E-14	9.709E-12	1.730E-10	3.400E-16	-1.000E+00	2.060E-09	4.780E-10
THYROID	6.680E-15	4.027E-12	7.173E-11	1.410E-16	-1.000E+00	2.930E-11	3.030E-12
REMAINDER	5.940E-15	3.770E-12	6.715E-11	1.320E-16	-1.000E+00	1.010E-09	2.370E-09
EFFECTIVE	6.820E-15	4.312E-12	7.682E-11	1.510E-16	-1.000E+00	1.170E-09	7.970E-10
SKIN(FGR)	1.250E-14	5.997E-12	1.068E-10	2.100E-16	-1.000E+00	0.000E+00	0.000E+00
Sn-119m							
GONADS	1.400E-16	4.721E-13	9.837E-12	1.640E-17	-1.000E+00	7.140E-11	4.110E-11
BREAST	2.140E-16	5.297E-13	1.104E-11	1.840E-17	-1.000E+00	7.050E-11	1.050E-11
LUNGS	3.580E-17	1.077E-13	2.243E-12	3.740E-18	-1.000E+00	1.150E-08	9.200E-12
RED MARR	3.650E-17	9.846E-14	2.051E-12	3.420E-18	-1.000E+00	4.620E-10	8.070E-11
BONE SUR	2.400E-16	7.226E-13	1.506E-11	2.510E-17	-1.000E+00	1.100E-09	1.820E-10
THYROID	1.040E-16	2.381E-13	4.961E-12	8.270E-18	-1.000E+00	5.450E-11	8.890E-12
REMAINDER	5.070E-17	1.641E-13	3.419E-12	5.700E-18	-1.000E+00	6.280E-10	1.160E-09
EFFECTIVE	1.010E-16	2.994E-13	6.238E-12	1.040E-17	-1.000E+00	1.690E-09	3.760E-10
SKIN(FGR)	3.420E-16	1.028E-12	2.141E-11	3.570E-17	-1.000E+00	0.000E+00	0.000E+00
Sn-121							
GONADS	2.510E-18	3.359E-15	1.788E-14	1.290E-19	-1.000E+00	8.470E-13	2.000E-13
BREAST	3.140E-18	3.594E-15	1.913E-14	1.380E-19	-1.000E+00	8.470E-13	2.000E-13
LUNGS	1.930E-18	1.937E-15	1.031E-14	7.440E-20	-1.000E+00	5.380E-10	2.000E-13
RED MARR	1.590E-18	1.661E-15	8.845E-15	6.380E-20	-1.000E+00	9.470E-12	2.230E-12
BONE SUR	7.460E-18	8.281E-15	4.409E-14	3.180E-19	-1.000E+00	1.060E-10	2.510E-11
THYROID	2.300E-18	2.323E-15	1.237E-14	8.920E-20	-1.000E+00	8.470E-13	2.000E-13
REMAINDER	1.850E-18	2.034E-15	1.083E-14	7.810E-20	-1.000E+00	2.280E-10	8.090E-10
EFFECTIVE	2.370E-18	2.734E-15	1.456E-14	1.050E-19	-1.000E+00	1.380E-10	2.440E-10
SKIN(FGR)	3.710E-15	7.838E-15	4.173E-14	3.010E-19	-1.000E+00	0.000E+00	0.000E+00
Sn-121m							
GONADS	7.920E-17	2.062E-13	4.330E-12	7.160E-18	-1.000E+00	1.960E-10	4.310E-11
BREAST	1.140E-16	2.275E-13	4.777E-12	7.900E-18	-1.000E+00	1.960E-10	2.950E-11
LUNGS	2.910E-17	6.682E-14	1.403E-12	2.320E-18	-1.000E+00	2.040E-08	2.900E-11
RED MARR	2.450E-17	5.270E-14	1.107E-12	1.830E-18	-1.000E+00	1.490E-09	2.320E-10
BONE SUR	1.620E-16	3.888E-13	8.164E-12	1.350E-17	-1.000E+00	3.980E-09	6.120E-10
THYROID	6.150E-17	1.189E-13	2.498E-12	4.130E-18	-1.000E+00	1.870E-10	2.860E-11
REMAINDER	3.410E-17	8.525E-14	1.790E-12	2.960E-18	-1.000E+00	9.220E-10	1.180E-09
EFFECTIVE	6.020E-17	1.408E-13	2.957E-12	4.890E-18	-1.000E+00	3.110E-09	4.190E-10
SKIN(FGR)	1.070E-15	3.859E-13	8.103E-12	1.340E-17	-1.000E+00	0.000E+00	0.000E+00
Sn-123							
GONADS	3.960E-16	2.547E-13	5.253E-12	8.850E-18	-1.000E+00	1.810E-10	3.800E-11
BREAST	4.510E-16	2.460E-13	5.075E-12	8.550E-18	-1.000E+00	1.820E-10	3.220E-11
LUNGS	3.910E-16	2.262E-13	4.666E-12	7.860E-18	-1.000E+00	6.110E-08	3.150E-11
RED MARR	3.800E-16	2.285E-13	4.713E-12	7.940E-18	-1.000E+00	1.360E-09	2.410E-10
BONE SUR	6.500E-16	3.798E-13	7.835E-12	1.320E-17	-1.000E+00	3.750E-09	6.620E-10
THYROID	4.040E-16	2.322E-13	4.790E-12	8.070E-18	-1.000E+00	1.810E-10	3.130E-11
REMAINDER	3.750E-16	2.242E-13	4.624E-12	7.790E-18	-1.000E+00	3.700E-09	7.350E-09

EFFECTIVE	4.030E-16	2.408E-13	4.968E-12	8.370E-18	-1.000E+00	8.790E-09	2.270E-09
SKIN(FGR)	3.280E-14	1.643E-10	3.389E-09	5.710E-15	-1.000E+00	0.000E+00	0.000E+00
Sn-123m							
GONADS	6.420E-15	4.856E-13	4.857E-13	1.400E-16	-1.000E+00	2.490E-13	1.620E-12
BREAST	7.400E-15	4.752E-13	4.753E-13	1.370E-16	-1.000E+00	3.160E-13	4.250E-13
LUNGS	6.120E-15	4.370E-13	4.371E-13	1.260E-16	-1.000E+00	7.940E-11	2.900E-13
RED MARR	5.550E-15	4.301E-13	4.302E-13	1.240E-16	-1.000E+00	4.550E-13	7.720E-13
BONE SUR	1.710E-14	1.037E-12	1.037E-12	2.990E-16	-1.000E+00	4.440E-13	2.980E-13
THYROID	6.410E-15	4.440E-13	4.441E-13	1.280E-16	-1.000E+00	2.680E-13	2.380E-14
REMAINDER	5.770E-15	4.266E-13	4.267E-13	1.230E-16	-1.000E+00	2.510E-12	9.570E-11
EFFECTIVE	6.550E-15	4.683E-13	4.684E-13	1.350E-16	-1.000E+00	1.050E-11	2.930E-11
SKIN(FGR)	3.580E-14	1.644E-11	1.644E-11	4.740E-15	-1.000E+00	0.000E+00	0.000E+00
Sn-125							
GONADS	1.550E-14	8.936E-12	1.492E-10	3.140E-16	-1.000E+00	1.590E-10	2.880E-10
BREAST	1.750E-14	8.537E-12	1.426E-10	3.000E-16	-1.000E+00	9.370E-11	4.410E-11
LUNGS	1.550E-14	8.224E-12	1.373E-10	2.890E-16	-1.000E+00	2.240E-08	1.600E-11
RED MARR	1.530E-14	8.423E-12	1.407E-10	2.960E-16	-1.000E+00	7.260E-10	2.080E-10
BONE SUR	2.310E-14	1.161E-11	1.939E-10	4.080E-16	-1.000E+00	1.070E-09	2.380E-10
THYROID	1.590E-14	8.281E-12	1.383E-10	2.910E-16	-1.000E+00	7.620E-11	9.780E-12
REMAINDER	1.490E-14	8.167E-12	1.364E-10	2.870E-16	-1.000E+00	4.380E-09	1.070E-08
EFFECTIVE	1.580E-14	8.566E-12	1.430E-10	3.010E-16	-1.000E+00	4.180E-09	3.330E-09
SKIN(FGR)	7.130E-14	2.621E-10	4.377E-09	9.210E-15	-1.000E+00	0.000E+00	0.000E+00
Sn-126							
GONADS	7.543E-14	4.517E-11	1.001E-09	1.660E-15	-1.000E+00	4.951E-09	2.415E-09
BREAST	8.615E-14	4.330E-11	9.596E-10	1.591E-15	-1.000E+00	5.391E-09	7.981E-10
LUNGS	7.475E-14	4.096E-11	9.082E-10	1.506E-15	-1.000E+00	1.511E-07	6.009E-10
RED MARR	7.223E-14	4.136E-11	9.172E-10	1.521E-15	-1.000E+00	1.690E-08	2.722E-09
BONE SUR	1.309E-13	6.418E-11	1.420E-09	2.353E-15	-1.000E+00	3.330E-08	5.061E-09
THYROID	7.693E-14	4.270E-11	9.468E-10	1.570E-15	-1.000E+00	4.901E-09	5.512E-10
REMAINDER	7.143E-14	4.013E-11	8.898E-10	1.475E-15	-1.000E+00	1.201E-08	1.338E-08
EFFECTIVE	7.711E-14	4.285E-11	9.499E-10	1.575E-15	-1.000E+00	2.691E-08	5.295E-09
SKIN(FGR)	1.306E-13	2.361E-10	5.242E-09	8.691E-15	-1.000E+00	0.000E+00	0.000E+00
Sn-127							
GONADS	9.350E-14	1.904E-11	2.050E-11	1.880E-15	-1.000E+00	1.260E-11	9.210E-11
BREAST	1.060E-13	1.823E-11	1.963E-11	1.800E-15	-1.000E+00	8.280E-12	1.750E-11
LUNGS	9.390E-14	1.752E-11	1.887E-11	1.730E-15	-1.000E+00	4.560E-10	7.980E-12
RED MARR	9.250E-14	1.803E-11	1.941E-11	1.780E-15	-1.000E+00	1.370E-11	2.480E-11
BONE SUR	1.410E-13	2.482E-11	2.672E-11	2.450E-15	-1.000E+00	1.400E-11	1.030E-11
THYROID	9.620E-14	1.762E-11	1.898E-11	1.740E-15	-1.000E+00	6.410E-12	1.200E-12
REMAINDER	9.040E-14	1.742E-11	1.876E-11	1.720E-15	-1.000E+00	8.700E-11	6.010E-10
EFFECTIVE	9.590E-14	1.823E-11	1.963E-11	1.800E-15	-1.000E+00	8.750E-11	2.100E-10
SKIN(FGR)	1.410E-13	6.564E-11	7.068E-11	6.480E-15	-1.000E+00	0.000E+00	0.000E+00
Sn-128							
GONADS	2.960E-14	3.619E-12	3.632E-12	7.100E-16	-1.000E+00	3.430E-12	5.000E-11
BREAST	3.410E-14	3.533E-12	3.545E-12	6.930E-16	-1.000E+00	4.620E-12	1.100E-11
LUNGS	2.870E-14	3.074E-12	3.085E-12	6.030E-16	-1.000E+00	3.140E-10	6.340E-12
RED MARR	2.740E-14	3.064E-12	3.075E-12	6.010E-16	-1.000E+00	5.330E-12	1.490E-11
BONE SUR	5.460E-14	5.556E-12	5.576E-12	1.090E-15	-1.000E+00	4.700E-12	5.570E-12
THYROID	2.980E-14	3.293E-12	3.305E-12	6.460E-16	-1.000E+00	3.940E-12	6.830E-13
REMAINDER	2.740E-14	3.038E-12	3.049E-12	5.960E-16	-1.000E+00	2.100E-11	4.390E-10
EFFECTIVE	3.000E-14	3.349E-12	3.361E-12	6.570E-16	-1.000E+00	4.640E-11	1.490E-10
SKIN(FGR)	4.500E-14	5.811E-12	5.832E-12	1.140E-15	-1.000E+00	0.000E+00	0.000E+00
Sr-80							
GONADS	5.931E-14	1.104E-11	1.145E-11	1.323E-15	-1.000E+00	1.680E-11	4.300E-11
BREAST	6.782E-14	1.055E-11	1.095E-11	1.265E-15	-1.000E+00	1.420E-11	1.260E-11
LUNGS	5.890E-14	1.001E-11	1.039E-11	1.200E-15	-1.000E+00	6.990E-10	9.140E-12
RED MARR	5.680E-14	1.010E-11	1.048E-11	1.210E-15	-1.000E+00	1.530E-11	1.550E-11
BONE SUR	1.040E-13	1.528E-11	1.586E-11	1.832E-15	-1.000E+00	1.040E-11	7.350E-12
THYROID	6.050E-14	1.043E-11	1.082E-11	1.250E-15	-1.000E+00	1.300E-11	5.090E-12
REMAINDER	5.630E-14	9.768E-12	1.013E-11	1.171E-15	-1.000E+00	1.430E-10	9.870E-10
EFFECTIVE	6.071E-14	1.045E-11	1.084E-11	1.252E-15	-1.000E+00	1.360E-10	3.120E-10
SKIN(FGR)	2.111E-13	1.531E-10	1.588E-10	1.835E-14	-1.000E+00	0.000E+00	0.000E+00
Sr-81							

GONADS	6.530E-14	3.156E-12	3.156E-12	1.430E-15	1.000E+00	3.530E-12	1.320E-11
BREAST	7.460E-14	3.046E-12	3.046E-12	1.380E-15	1.000E+00	2.940E-12	3.820E-12
LUNGS	6.460E-14	2.892E-12	2.892E-12	1.310E-15	1.000E+00	1.210E-10	2.920E-12
RED MARR	6.200E-14	2.914E-12	2.914E-12	1.320E-15	1.000E+00	3.160E-12	4.850E-12
BONE SUR	1.200E-13	4.613E-12	4.613E-12	2.090E-15	1.000E+00	2.330E-12	2.250E-12
THYROID	6.640E-14	3.002E-12	3.002E-12	1.360E-15	1.000E+00	2.480E-12	7.340E-13
REMAINDER	6.160E-14	2.825E-12	2.825E-12	1.280E-15	1.000E+00	2.140E-11	1.790E-10
EFFECTIVE	6.680E-14	3.024E-12	3.024E-12	1.370E-15	1.000E+00	2.280E-11	5.850E-11
SKIN(FGR)	1.440E-13	2.803E-11	2.803E-11	1.270E-14	1.000E+00	0.000E+00	0.000E+00
Sr-82							
GONADS	5.181E-14	3.293E-11	6.338E-10	1.153E-15	1.000E+00	1.370E-09	1.560E-09
BREAST	5.922E-14	3.155E-11	6.073E-10	1.105E-15	1.000E+00	1.230E-09	7.950E-10
LUNGS	5.140E-14	2.970E-11	5.716E-10	1.040E-15	1.000E+00	5.540E-09	7.090E-10
RED MARR	4.960E-14	2.999E-11	5.773E-10	1.050E-15	1.000E+00	8.220E-09	4.900E-09
BONE SUR	9.031E-14	4.545E-11	8.749E-10	1.592E-15	1.000E+00	1.150E-08	6.690E-09
THYROID	5.280E-14	3.114E-11	5.993E-10	1.090E-15	1.000E+00	1.210E-09	6.950E-10
REMAINDER	4.910E-14	2.915E-11	5.610E-10	1.021E-15	1.000E+00	3.530E-09	1.550E-08
EFFECTIVE	5.301E-14	3.118E-11	6.001E-10	1.092E-15	1.000E+00	3.620E-09	6.040E-09
SKIN(FGR)	1.581E-13	4.411E-10	8.491E-09	1.545E-14	1.000E+00	0.000E+00	0.000E+00
Sr-83							
GONADS	3.770E-14	2.144E-11	1.326E-10	8.100E-16	1.000E+00	1.100E-10	3.870E-10
BREAST	4.290E-14	2.059E-11	1.273E-10	7.780E-16	1.000E+00	6.600E-11	7.650E-11
LUNGS	3.750E-14	1.951E-11	1.206E-10	7.370E-16	1.000E+00	4.690E-10	4.150E-11
RED MARR	3.650E-14	1.985E-11	1.227E-10	7.500E-16	1.000E+00	1.490E-10	1.530E-10
BONE SUR	6.250E-14	2.912E-11	1.800E-10	1.100E-15	1.000E+00	3.670E-10	2.400E-10
THYROID	3.850E-14	2.012E-11	1.244E-10	7.600E-16	1.000E+00	5.800E-11	3.300E-11
REMAINDER	3.600E-14	1.922E-11	1.188E-10	7.260E-16	1.000E+00	2.560E-10	1.310E-09
EFFECTIVE	3.860E-14	2.041E-11	1.262E-10	7.710E-16	1.000E+00	2.010E-10	5.330E-10
SKIN(FGR)	5.200E-14	5.982E-11	3.699E-10	2.260E-15	1.000E+00	0.000E+00	0.000E-00
Sr-85							
GONADS	2.360E-14	1.515E-11	3.071E-10	5.270E-16	1.000E+00	4.440E-10	6.250E-10
BREAST	2.700E-14	1.458E-11	2.954E-10	5.070E-16	1.000E+00	3.720E-10	2.530E-10
LUNGS	2.340E-14	1.371E-11	2.780E-10	4.770E-16	1.000E+00	4.660E-10	2.060E-10
RED MARR	2.260E-14	1.386E-11	2.809E-10	4.820E-16	1.000E+00	9.200E-10	5.970E-10
BONE SUR	4.160E-14	2.093E-11	4.242E-10	7.280E-16	1.000E+00	1.020E-09	6.060E-10
THYROID	2.410E-14	1.435E-11	2.908E-10	4.990E-16	1.000E+00	3.630E-10	2.050E-10
REMAINDER	2.240E-14	1.345E-11	2.727E-10	4.680E-16	1.000E+00	4.760E-10	7.310E-10
EFFECTIVE	2.420E-14	1.437E-11	2.914E-10	5.000E-16	1.000E+00	5.180E-10	5.340E-10
SKIN(FGR)	2.830E-14	1.943E-11	3.939E-10	6.760E-16	1.000E+00	0.000E+00	0.000E+00
Sr-85m							
GONADS	1.020E-14	1.312E-12	1.324E-12	2.200E-16	1.000E+00	1.260E-12	5.220E-12
BREAST	1.170E-14	1.277E-12	1.287E-12	2.140E-16	1.000E+00	8.920E-13	1.290E-12
LUNGS	9.910E-15	1.193E-12	1.203E-12	2.000E-16	1.000E+00	6.410E-12	8.210E-13
RED MARR	9.240E-15	1.193E-12	1.203E-12	2.000E-16	1.000E+00	1.500E-12	2.230E-12
BONE SUR	2.410E-14	2.333E-12	2.352E-12	3.910E-16	1.000E+00	1.940E-12	1.550E-12
THYROID	1.030E-14	1.199E-12	1.209E-12	2.010E-16	1.000E+00	6.620E-13	2.720E-13
REMAINDER	9.390E-15	1.169E-12	1.179E-12	1.960E-16	1.000E+00	2.580E-12	1.440E-11
EFFECTIVE	1.050E-14	1.265E-12	1.275E-12	2.120E-16	1.000E+00	2.250E-12	6.230E-12
SKIN(FGR)	1.230E-14	1.533E-12	1.546E-12	2.570E-16	1.000E+00	0.000E+00	0.000E+00
Sr-87m							
GONADS	1.490E-14	4.154E-12	4.822E-12	3.310E-16	1.000E+00	4.540E-12	2.040E-11
BREAST	1.710E-14	4.004E-12	4.647E-12	3.190E-16	1.000E+00	2.740E-12	4.130E-12
LUNGS	1.470E-14	3.765E-12	4.371E-12	3.000E-16	1.000E+00	4.470E-11	2.250E-12
RED MARR	1.400E-14	3.790E-12	4.400E-12	3.020E-16	1.000E+00	3.290E-12	6.120E-12
BONE SUR	2.870E-14	6.125E-12	7.109E-12	4.880E-16	1.000E+00	2.330E-12	2.580E-12
THYROID	1.510E-14	3.916E-12	4.545E-12	3.120E-16	1.000E+00	2.110E-12	9.200E-13
REMAINDER	1.400E-14	3.677E-12	4.269E-12	2.930E-16	1.000E+00	1.380E-11	8.300E-11
EFFECTIVE	1.520E-14	3.953E-12	4.589E-12	3.150E-16	1.000E+00	1.160E-11	3.170E-11
SKIN(FGR)	2.150E-14	5.045E-12	5.856E-12	4.020E-16	1.000E+00	0.000E+00	0.000E+00
Sr-89							
GONADS	7.730E-17	7.155E-14	1.436E-12	2.490E-18	1.000E+00	4.160E-10	2.400E-10
BREAST	9.080E-17	7.212E-14	1.447E-12	2.510E-18	1.000E+00	4.160E-10	2.400E-10
LUNGS	7.080E-17	5.689E-14	1.142E-12	1.980E-18	1.000E+00	2.160E-09	2.400E-10

RED MARR	6.390E-17	5.345E-14	1.073E-12	1.860E-18-1.000E+00	5.630E-09	3.230E-09
BONE SUR	1.940E-16	1.560E-13	3.131E-12	5.430E-18-1.000E+00	8.370E-09	4.810E-09
THYROID	7.600E-17	6.063E-14	1.217E-12	2.110E-18-1.000E+00	4.160E-10	2.400E-10
REMAINDER	6.710E-17	5.603E-14	1.124E-12	1.950E-18-1.000E+00	1.320E-09	6.110E-09
EFFECTIVE	7.730E-17	6.523E-14	1.309E-12	2.270E-18-1.000E+00	1.760E-09	2.500E-09
SKIN(FGR)	3.690E-14	1.914E-10	3.841E-09	6.660E-15-1.000E+00	0.000E+00	0.000E+00
Sr-90						
GONADS	7.780E-18	9.590E-15	2.014E-13	3.330E-19-1.000E+00	2.640E-09	1.510E-09
BREAST	9.490E-18	1.008E-14	2.116E-13	3.500E-19-1.000E+00	2.640E-09	1.510E-09
LUNGS	6.440E-18	6.307E-15	1.324E-13	2.190E-19-1.000E+00	3.730E-09	1.510E-09
RED MARR	5.440E-18	5.558E-15	1.167E-13	1.930E-19-1.000E+00	3.360E-07	1.940E-07
BONE SUR	2.280E-17	2.393E-14	5.025E-13	8.310E-19-1.000E+00	7.270E-07	4.190E-07
THYROID	7.330E-18	7.171E-15	1.506E-13	2.490E-19-1.000E+00	2.640E-09	1.510E-09
REMAINDER	6.110E-18	6.422E-15	1.348E-13	2.230E-19-1.000E+00	3.360E-09	6.140E-09
EFFECTIVE	7.530E-18	8.179E-15	1.717E-13	2.840E-19-1.000E+00	6.470E-08	3.850E-08
SKIN(FGR)	9.200E-15	4.032E-12	8.465E-11	1.400E-16-1.000E+00	0.000E+00	0.000E+00
Sr-91						
GONADS	4.819E-14	2.155E-11	5.062E-11	1.026E-15-1.000E+00	6.429E-11	2.140E-10
BREAST	5.477E-14	2.059E-11	4.838E-11	9.806E-16-1.000E+00	4.485E-11	5.086E-11
LUNGS	4.803E-14	1.970E-11	4.626E-11	9.376E-16-1.000E+00	9.615E-10	3.124E-11
RED MARR	4.691E-14	2.011E-11	4.722E-11	9.570E-16-1.000E+00	1.234E-10	1.093E-10
BONE SUR	7.674E-14	2.852E-11	6.709E-11	1.360E-15-1.000E+00	1.144E-10	7.950E-11
THYROID	4.938E-14	2.035E-11	4.782E-11	9.693E-16-1.000E+00	4.109E-11	2.417E-11
REMAINDER	4.610E-14	1.948E-11	4.573E-11	9.268E-16-1.000E+00	3.352E-10	1.997E-09
EFFECTIVE	4.924E-14	2.057E-11	4.832E-11	9.793E-16-1.000E+00	2.577E-10	6.805E-10
SKIN(FGR)	9.938E-14	1.748E-10	3.987E-10	8.080E-15-1.000E+00	0.000E+00	0.000E+00
Sr-92						
GONADS	6.610E-14	1.593E-11	1.830E-11	1.300E-15-1.000E+00	3.030E-11	8.010E-11
BREAST	7.480E-14	1.520E-11	1.745E-11	1.240E-15-1.000E+00	2.440E-11	2.690E-11
LUNGS	6.670E-14	1.483E-11	1.703E-11	1.210E-15-1.000E+00	7.120E-10	1.890E-11
RED MARR	6.620E-14	1.520E-11	1.745E-11	1.240E-15-1.000E+00	3.680E-11	3.870E-11
BONE SUR	9.490E-14	2.010E-11	2.308E-11	1.640E-15-1.000E+00	2.560E-11	2.130E-11
THYROID	6.820E-14	1.446E-11	1.661E-11	1.180E-15-1.000E+00	2.190E-11	1.350E-11
REMAINDER	6.450E-14	1.471E-11	1.689E-11	1.200E-15-1.000E+00	2.250E-10	1.370E-09
EFFECTIVE	6.790E-14	1.532E-11	1.759E-11	1.250E-15-1.000E+00	1.700E-10	4.430E-10
SKIN(FGR)	8.560E-14	2.280E-11	2.618E-11	1.860E-15-1.000E+00	0.000E+00	0.000E+00
Ta-172						
GONADS	7.420E-14	4.937E-12	4.937E-12	1.550E-15-1.000E+00	5.750E-13	1.300E-11
BREAST	8.450E-14	4.714E-12	4.714E-12	1.480E-15-1.000E+00	1.600E-12	3.860E-12
LUNGS	7.380E-14	4.523E-12	4.523E-12	1.420E-15-1.000E+00	1.080E-10	2.910E-12
RED MARR	7.180E-14	4.587E-12	4.587E-12	1.440E-15-1.000E+00	1.700E-12	4.710E-12
BONE SUR	1.240E-13	7.135E-12	7.135E-12	2.240E-15-1.000E+00	1.450E-12	1.920E-12
THYROID	7.590E-14	4.555E-12	4.555E-12	1.430E-15-1.000E+00	1.300E-12	2.880E-13
REMAINDER	7.080E-14	4.459E-12	4.460E-12	1.400E-15-1.000E+00	5.440E-12	1.270E-10
EFFECTIVE	7.590E-14	4.714E-12	4.714E-12	1.480E-15-1.000E+00	1.530E-11	4.300E-11
SKIN(FGR)	1.160E-13	2.096E-11	2.096E-11	6.580E-15-1.000E+00	0.000E+00	0.000E+00
Ta-173						
GONADS	2.700E-14	8.796E-12	1.126E-11	5.940E-16-1.000E+00	2.160E-11	9.630E-11
BREAST	3.100E-14	8.485E-12	1.086E-11	5.730E-16-1.000E+00	6.710E-12	1.330E-11
LUNGS	2.640E-14	7.981E-12	1.022E-11	5.390E-16-1.000E+00	4.070E-10	3.750E-12
RED MARR	2.510E-14	7.892E-12	1.010E-11	5.330E-16-1.000E+00	1.150E-11	2.830E-11
BONE SUR	5.110E-14	1.496E-11	1.915E-11	1.010E-15-1.000E+00	6.760E-12	9.220E-12
THYROID	2.730E-14	8.174E-12	1.046E-11	5.520E-16-1.000E+00	3.080E-12	3.790E-13
REMAINDER	2.520E-14	7.789E-12	9.971E-12	5.260E-16-1.000E+00	9.830E-11	6.050E-10
EFFECTIVE	2.750E-14	8.411E-12	1.077E-11	5.680E-16-1.000E+00	8.640E-11	2.120E-10
SKIN(FGR)	5.080E-14	5.627E-11	7.204E-11	3.800E-15-1.000E+00	0.000E+00	0.000E+00
Ta-174						
GONADS	2.910E-14	3.925E-12	3.964E-12	6.360E-16-1.000E+00	8.630E-13	1.480E-11
BREAST	3.340E-14	3.789E-12	3.827E-12	6.140E-16-1.000E+00	1.100E-12	3.250E-12
LUNGS	2.850E-14	3.573E-12	3.609E-12	5.790E-16-1.000E+00	1.250E-10	1.860E-12
RED MARR	2.710E-14	3.542E-12	3.577E-12	5.740E-16-1.000E+00	1.320E-12	5.090E-12
BONE SUR	5.700E-14	6.665E-12	6.731E-12	1.080E-15-1.000E+00	9.670E-13	1.840E-12
THYROID	2.950E-14	3.647E-12	3.683E-12	5.910E-16-1.000E+00	7.520E-13	1.620E-13

REMAINDER	2.710E-14	3.487E-12	3.521E-12	5.650E-16	1.000E+00	8.790E-12	1.590E-10
EFFECTIVE	2.970E-14	3.758E-12	3.796E-12	6.090E-16	1.000E+00	1.820E-11	5.290E-11
SKIN(FGR)	5.360E-14	2.314E-11	2.337E-11	3.750E-15	1.000E+00	0.000E+00	0.000E+00
Ta-175							
GONADS	4.450E-14	2.045E-11	4.984E-11	9.140E-16	1.000E+00	6.040E-11	2.520E-10
BREAST	5.070E-14	1.967E-11	4.793E-11	8.790E-16	1.000E+00	1.980E-11	3.570E-11
LUNGS	4.410E-14	1.882E-11	4.586E-11	8.410E-16	1.000E+00	3.290E-10	9.170E-12
RED MARR	4.280E-14	1.886E-11	4.597E-11	8.430E-16	1.000E+00	2.880E-11	6.690E-11
BONE SUR	7.620E-14	3.222E-11	7.853E-11	1.440E-15	1.000E+00	1.650E-11	2.220E-11
THYROID	4.540E-14	1.859E-11	4.532E-11	8.310E-16	1.000E+00	8.910E-12	1.220E-12
REMAINDER	4.240E-14	1.853E-11	4.515E-11	8.280E-16	1.000E+00	1.360E-10	5.570E-10
EFFECTIVE	4.550E-14	1.967E-11	4.793E-11	8.790E-16	1.000E+00	1.030E-10	2.450E-10
SKIN(FGR)	5.320E-14	2.439E-11	5.944E-11	1.090E-15	1.000E+00	0.000E+00	0.000E+00
Ta-176							
GONADS	1.060E-13	4.272E-11	8.603E-11	2.050E-15	1.000E+00	8.130E-11	3.920E-10
BREAST	1.200E-13	4.084E-11	8.225E-11	1.960E-15	1.000E+00	2.830E-11	6.160E-11
LUNGS	1.070E-13	3.959E-11	7.973E-11	1.900E-15	1.000E+00	3.590E-10	1.880E-11
RED MARR	1.060E-13	4.043E-11	8.141E-11	1.940E-15	1.000E+00	3.500E-11	9.550E-11
BONE SUR	1.560E-13	5.730E-11	1.154E-10	2.750E-15	1.000E+00	1.960E-11	3.310E-11
THYROID	1.090E-13	3.855E-11	7.764E-11	1.850E-15	1.000E+00	1.340E-11	2.790E-12
REMAINDER	1.030E-13	3.959E-11	7.973E-11	1.900E-15	1.000E+00	1.770E-10	8.390E-10
EFFECTIVE	1.090E-13	4.105E-11	8.267E-11	1.970E-15	1.000E+00	1.260E-10	3.740E-10
SKIN(FGR)	1.250E-13	5.730E-11	1.154E-10	2.750E-15	1.000E+00	0.000E+00	0.000E-00
Ta-177							
GONADS	2.580E-15	1.871E-12	1.749E-11	6.820E-17	1.000E+00	3.130E-11	7.900E-11
BREAST	3.090E-15	1.857E-12	1.736E-11	6.770E-17	1.000E+00	6.920E-12	8.050E-12
LUNGS	2.220E-15	1.621E-12	1.515E-11	5.910E-17	1.000E+00	2.740E-10	8.560E-13
RED MARR	1.810E-15	1.361E-12	1.272E-11	4.960E-17	1.000E+00	2.000E-11	3.250E-11
BONE SUR	7.970E-15	6.145E-12	5.743E-11	2.240E-16	1.000E+00	1.170E-11	9.920E-12
THYROID	2.450E-15	1.643E-12	1.536E-11	5.990E-17	1.000E+00	1.810E-12	5.630E-14
REMAINDER	2.080E-15	1.550E-12	1.449E-11	5.650E-17	1.000E+00	1.280E-10	3.230E-10
EFFECTIVE	2.530E-15	1.802E-12	1.685E-11	6.570E-17	1.000E+00	8.290E-11	1.220E-10
SKIN(FGR)	3.360E-15	2.195E-12	2.051E-11	8.000E-17	1.000E+00	0.000E+00	0.000E+00
Ta-178a							
GONADS	4.610E-15	8.704E-14	8.704E-14	1.080E-16	1.000E+00	0.000E+00	0.000E+00
BREAST	5.390E-15	8.542E-14	8.542E-14	1.060E-16	1.000E+00	0.000E+00	0.000E+00
LUNGS	4.270E-15	7.745E-14	7.745E-14	9.610E-17	1.000E+00	0.000E+00	0.000E+00
RED MARR	3.860E-15	7.043E-14	7.043E-14	8.740E-17	1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.070E-14	2.216E-13	2.216E-13	2.750E-16	1.000E+00	0.000E+00	0.000E+00
THYROID	4.550E-15	7.720E-14	7.720E-14	9.580E-17	1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.060E-15	7.479E-14	7.479E-14	9.280E-17	1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.610E-15	8.381E-14	8.381E-14	1.040E-16	1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	5.650E-15	1.023E-13	1.023E-13	1.270E-16	1.000E+00	0.000E+00	0.000E+00
Ta-178b							
GONADS	4.670E-14	1.093E-11	1.188E-11	1.040E-15	1.000E+00	5.220E-12	5.930E-11
BREAST	5.370E-14	1.061E-11	1.154E-11	1.010E-15	1.000E+00	3.610E-12	1.010E-11
LUNGS	4.510E-14	9.961E-12	1.083E-11	9.480E-16	1.000E+00	1.180E-10	4.220E-12
RED MARR	4.200E-14	9.772E-12	1.063E-11	9.300E-16	1.000E+00	4.940E-12	1.910E-11
BONE SUR	1.040E-13	2.028E-11	2.205E-11	1.930E-15	1.000E+00	3.300E-12	6.420E-12
THYROID	4.690E-14	1.020E-11	1.109E-11	9.710E-16	1.000E+00	2.010E-12	3.280E-13
REMAINDER	4.280E-14	9.656E-12	1.050E-11	9.190E-16	1.000E+00	1.870E-11	2.000E-10
EFFECTIVE	4.750E-14	1.051E-11	1.143E-11	1.000E-15	1.000E+00	2.240E-11	7.930E-11
SKIN(FGR)	5.870E-14	1.261E-11	1.371E-11	1.200E-15	1.000E+00	0.000E+00	0.000E+00
Ta-179							
GONADS	1.140E-15	9.445E-13	1.977E-11	3.280E-17	1.000E+00	4.550E-11	6.060E-11
BREAST	1.390E-15	9.474E-13	1.983E-11	3.290E-17	1.000E+00	2.290E-10	5.940E-12
LUNGS	9.190E-16	8.005E-13	1.675E-11	2.780E-17	1.000E+00	1.260E-08	7.230E-13
RED MARR	6.960E-16	6.277E-13	1.314E-11	2.180E-17	1.000E+00	4.740E-10	2.750E-11
BONE SUR	3.900E-15	3.542E-12	7.412E-11	1.230E-16	1.000E+00	3.910E-10	9.000E-12
THYROID	1.050E-15	8.091E-13	1.693E-11	2.810E-17	1.000E+00	8.570E-11	2.740E-13
REMAINDER	8.570E-16	7.631E-13	1.597E-11	2.650E-17	1.000E+00	4.380E-10	1.810E-10
EFFECTIVE	1.090E-15	9.099E-13	1.904E-11	3.160E-17	1.000E+00	1.760E-09	7.390E-11
SKIN(FGR)	1.450E-15	1.126E-12	2.356E-11	3.910E-17	1.000E+00	0.000E+00	0.000E+00

Ta-180							
GONADS	2.550E-14	1.636E-11	3.435E-10	5.680E-16	-1.000E+00	1.450E-09	7.690E-10
BREAST	2.930E-14	1.596E-11	3.351E-10	5.540E-16	-1.000E+00	8.590E-09	8.340E-11
LUNGS	2.450E-14	1.483E-11	3.115E-10	5.150E-16	-1.000E+00	4.800E-07	1.440E-11
RED MARR	2.280E-14	1.454E-11	3.054E-10	5.050E-16	-1.000E+00	1.080E-08	1.980E-10
BONE SUR	5.830E-14	3.082E-11	6.471E-10	1.070E-15	-1.000E+00	8.970E-09	7.740E-11
THYROID	2.560E-14	1.509E-11	3.169E-10	5.240E-16	-1.000E+00	5.800E-09	5.190E-12
REMAINDER	2.330E-14	1.437E-11	3.018E-10	4.990E-16	-1.000E+00	1.750E-08	2.500E-09
EFFECTIVE	2.590E-14	1.570E-11	3.296E-10	5.450E-16	-1.000E+00	6.620E-08	9.820E-10
SKIN(FGR)	3.260E-14	1.875E-11	3.937E-10	6.510E-16	-1.000E+00	0.000E+00	0.000E+00
Ta-180m							
GONADS	1.760E-15	1.028E-12	2.074E-12	4.930E-17	-1.000E+00	3.550E-12	1.740E-11
BREAST	2.140E-15	1.028E-12	2.074E-12	4.930E-17	-1.000E+00	9.870E-13	2.030E-12
LUNGS	1.450E-15	8.800E-13	1.775E-12	4.220E-17	-1.000E+00	1.080E-10	3.570E-13
RED MARR	1.120E-15	7.028E-13	1.418E-12	3.370E-17	-1.000E+00	2.750E-12	7.850E-12
BONE SUR	6.020E-15	3.775E-12	7.614E-12	1.810E-16	-1.000E+00	1.660E-12	2.330E-12
THYROID	1.640E-15	8.905E-13	1.796E-12	4.270E-17	-1.000E+00	2.440E-13	9.410E-15
REMAINDER	1.350E-15	8.383E-13	1.691E-12	4.020E-17	-1.000E+00	3.600E-11	1.780E-10
EFFECTIVE	1.710E-15	9.926E-13	2.002E-12	4.760E-17	-1.000E+00	2.520E-11	5.900E-11
SKIN(FGR)	3.670E-15	2.502E-12	5.048E-12	1.200E-16	-1.000E+00	0.000E+00	0.000E+00
Ta-182							
GONADS	6.260E-14	3.683E-11	7.580E-10	1.280E-15	-1.000E+00	8.990E-10	1.320E-09
BREAST	7.110E-14	3.510E-11	7.225E-10	1.220E-15	-1.000E+00	1.790E-09	1.680E-10
LUNGS	6.240E-14	3.395E-11	6.988E-10	1.180E-15	-1.000E+00	8.280E-08	3.470E-11
RED MARR	6.100E-14	3.453E-11	7.107E-10	1.200E-15	-1.000E+00	1.920E-09	3.050E-10
BONE SUR	9.940E-14	5.236E-11	1.078E-09	1.820E-15	-1.000E+00	1.510E-09	1.150E-10
THYROID	6.420E-14	3.395E-11	6.988E-10	1.180E-15	-1.000E+00	1.530E-09	9.080E-12
REMAINDER	5.990E-14	3.366E-11	6.929E-10	1.170E-15	-1.000E+00	4.370E-09	4.540E-09
EFFECTIVE	6.400E-14	3.539E-11	7.284E-10	1.230E-15	-1.000E+00	1.210E-08	1.760E-09
SKIN(FGR)	7.850E-14	4.690E-11	9.653E-10	1.630E-15	-1.000E+00	0.000E+00	0.000E+00
Ta-182m							
GONADS	1.100E-14	3.400E-13	3.400E-13	2.480E-16	-1.000E+00	1.040E-13	8.540E-13
BREAST	1.280E-14	3.346E-13	3.346E-13	2.440E-16	-1.000E+00	2.680E-13	3.210E-13
LUNGS	1.030E-14	3.085E-13	3.085E-13	2.250E-16	-1.000E+00	2.710E-11	2.860E-13
RED MARR	9.160E-15	2.907E-13	2.907E-13	2.120E-16	-1.000E+00	3.340E-13	5.140E-13
BONE SUR	3.010E-14	8.241E-13	8.241E-13	6.010E-16	-1.000E+00	3.400E-13	2.310E-13
THYROID	1.090E-14	3.099E-13	3.099E-13	2.260E-16	-1.000E+00	2.030E-13	1.450E-14
REMAINDER	9.690E-15	2.975E-13	2.975E-13	2.170E-16	-1.000E+00	7.910E-13	2.380E-11
EFFECTIVE	1.110E-14	3.304E-13	3.304E-13	2.410E-16	-1.000E+00	3.610E-12	7.500E-12
SKIN(FGR)	1.930E-14	3.921E-13	3.921E-13	2.860E-16	-1.000E+00	0.000E+00	0.000E+00
Ta-183							
GONADS	1.300E-14	8.278E-12	1.147E-10	2.940E-16	-1.000E+00	1.540E-10	3.490E-10
BREAST	1.500E-14	8.081E-12	1.120E-10	2.870E-16	-1.000E+00	4.290E-11	3.640E-11
LUNGS	1.230E-14	7.462E-12	1.034E-10	2.650E-16	-1.000E+00	6.360E-09	4.810E-12
RED MARR	1.110E-14	7.152E-12	9.911E-11	2.540E-16	-1.000E+00	8.750E-11	1.020E-10
BONE SUR	3.270E-14	1.827E-11	2.532E-10	6.490E-16	-1.000E+00	1.160E-10	4.730E-11
THYROID	1.290E-14	7.574E-12	1.050E-10	2.690E-16	-1.000E+00	1.770E-11	6.970E-13
REMAINDER	1.160E-14	7.208E-12	9.989E-11	2.560E-16	-1.000E+00	1.960E-09	4.500E-09
EFFECTIVE	1.310E-14	7.969E-12	1.104E-10	2.830E-16	-1.000E+00	1.410E-09	1.460E-09
SKIN(FGR)	2.620E-14	1.546E-11	2.142E-10	5.490E-16	-1.000E+00	0.000E+00	0.000E+00
Ta-184							
GONADS	7.630E-14	3.493E-11	7.410E-11	1.640E-15	-1.000E+00	8.370E-11	3.900E-10
BREAST	8.700E-14	3.365E-11	7.139E-11	1.580E-15	-1.000E+00	2.540E-11	5.400E-11
LUNGS	7.540E-14	3.195E-11	6.778E-11	1.500E-15	-1.000E+00	1.190E-09	1.430E-11
RED MARR	7.270E-14	3.237E-11	6.868E-11	1.520E-15	-1.000E+00	3.390E-11	9.120E-11
BONE SUR	1.370E-13	5.133E-11	1.089E-10	2.410E-15	-1.000E+00	1.910E-11	3.080E-11
THYROID	7.780E-14	3.280E-11	6.959E-11	1.540E-15	-1.000E+00	1.300E-11	1.690E-12
REMAINDER	7.200E-14	3.131E-11	6.642E-11	1.470E-15	-1.000E+00	4.540E-10	2.130E-09
EFFECTIVE	7.800E-14	3.344E-11	7.094E-11	1.570E-15	-1.000E+00	3.090E-10	7.600E-10
SKIN(FGR)	1.160E-13	1.159E-10	2.458E-10	5.440E-15	-1.000E+00	0.000E+00	0.000E+00
Ta-185							
GONADS	8.630E-15	8.262E-13	8.271E-13	1.950E-16	-1.000E+00	1.510E-13	3.120E-12
BREAST	9.990E-15	8.092E-13	8.101E-13	1.910E-16	-1.000E+00	2.590E-13	7.300E-13

LUNGS	8.140E-15	7.457E-13	7.465E-13	1.760E-16-1.000E+00	1.710E-10	4.680E-13
RED MARR	7.370E-15	7.118E-13	7.126E-13	1.680E-16-1.000E+00	3.940E-13	1.390E-12
BONE SUR	2.170E-14	1.873E-12	1.875E-12	4.420E-16-1.000E+00	4.710E-13	5.350E-13
THYROID	8.570E-15	7.541E-13	7.550E-13	1.780E-16-1.000E+00	1.610E-13	2.810E-14
REMAINDER	7.690E-15	7.245E-13	7.253E-13	1.710E-16-1.000E+00	6.890E-12	1.790E-10
EFFECTIVE	8.730E-15	8.007E-13	8.016E-13	1.890E-16-1.000E+00	2.270E-11	5.490E-11
SKIN(FGR)	5.200E-14	3.173E-11	3.177E-11	7.490E-15-1.000E+00	0.000E+00	0.000E+00
Ta-186						
GONADS	7.370E-14	1.454E-12	1.454E-12	1.600E-15-1.000E+00	5.940E-14	1.970E-12
BREAST	8.410E-14	1.400E-12	1.400E-12	1.540E-15-1.000E+00	3.530E-13	1.120E-12
LUNGS	7.270E-14	1.327E-12	1.327E-12	1.460E-15-1.000E+00	5.090E-11	1.170E-12
RED MARR	6.980E-14	1.336E-12	1.336E-12	1.470E-15-1.000E+00	3.580E-13	1.120E-12
BONE SUR	1.360E-13	2.172E-12	2.172E-12	2.390E-15-1.000E+00	2.820E-13	5.350E-13
THYROID	7.490E-14	1.363E-12	1.363E-12	1.500E-15-1.000E+00	2.990E-13	9.870E-14
REMAINDER	6.940E-14	1.300E-12	1.300E-12	1.430E-15-1.000E+00	1.130E-12	6.610E-11
EFFECTIVE	7.530E-14	1.391E-12	1.391E-12	1.530E-15-1.000E+00	6.570E-12	2.080E-11
SKIN(FGR)	1.490E-13	1.109E-11	1.109E-11	1.220E-14-1.000E+00	0.000E+00	0.000E+00
Tb-147						
GONADS	7.610E-14	1.332E-11	1.380E-11	1.610E-15-1.000E+00	1.670E-11	9.150E-11
BREAST	8.660E-14	1.274E-11	1.320E-11	1.540E-15-1.000E+00	7.440E-12	1.540E-11
LUNGS	7.570E-14	1.216E-11	1.260E-11	1.470E-15-1.000E+00	2.940E-10	6.360E-12
RED MARR	7.390E-14	1.241E-11	1.285E-11	1.500E-15-1.000E+00	1.170E-11	2.320E-11
BONE SUR	1.230E-13	1.836E-11	1.902E-11	2.220E-15-1.000E+00	1.570E-11	8.160E-12
THYROID	7.790E-14	1.249E-11	1.294E-11	1.510E-15-1.000E+00	4.610E-12	7.080E-13
REMAINDER	7.260E-14	1.199E-11	1.243E-11	1.450E-15-1.000E+00	4.570E-11	4.390E-10
EFFECTIVE	7.780E-14	1.274E-11	1.320E-11	1.540E-15-1.000E+00	5.630E-11	1.610E-10
SKIN(FGR)	1.270E-13	6.245E-11	6.470E-11	7.550E-15-1.000E+00	0.000E+00	0.000E+00
Tb-149						
GONADS	7.820E-14	2.526E-11	3.427E-11	1.590E-15-1.000E+00	2.450E-11	1.710E-10
BREAST	8.870E-14	2.431E-11	3.298E-11	1.530E-15-1.000E+00	1.240E-11	2.800E-11
LUNGS	7.820E-14	2.320E-11	3.147E-11	1.460E-15-1.000E+00	1.530E-08	9.760E-12
RED MARR	7.670E-14	2.367E-11	3.212E-11	1.490E-15-1.000E+00	1.530E-10	4.330E-11
BONE SUR	1.240E-13	3.480E-11	4.720E-11	2.190E-15-1.000E+00	1.890E-09	1.920E-11
THYROID	8.020E-14	2.320E-11	3.147E-11	1.460E-15-1.000E+00	7.130E-12	1.230E-12
REMAINDER	7.530E-14	2.304E-11	3.125E-11	1.450E-15-1.000E+00	1.890E-10	7.390E-10
EFFECTIVE	8.020E-14	2.431E-11	3.298E-11	1.530E-15-1.000E+00	1.980E-09	2.760E-10
SKIN(FGR)	1.020E-13	5.799E-11	7.867E-11	3.650E-15-1.000E+00	0.000E+00	0.000E+00
Tb-150						
GONADS	8.060E-14	2.344E-11	2.870E-11	1.690E-15-1.000E+00	1.260E-11	1.290E-10
BREAST	9.170E-14	2.247E-11	2.751E-11	1.620E-15-1.000E+00	7.840E-12	2.230E-11
LUNGS	8.060E-14	2.149E-11	2.632E-11	1.550E-15-1.000E+00	4.630E-10	8.810E-12
RED MARR	7.870E-14	2.177E-11	2.666E-11	1.570E-15-1.000E+00	1.210E-11	3.210E-11
BONE SUR	1.300E-13	3.190E-11	3.906E-11	2.300E-15-1.000E+00	9.850E-12	1.120E-11
THYROID	8.260E-14	2.191E-11	2.683E-11	1.580E-15-1.000E+00	5.070E-12	1.030E-12
REMAINDER	7.740E-14	2.122E-11	2.598E-11	1.530E-15-1.000E+00	7.490E-11	7.780E-10
EFFECTIVE	8.260E-14	2.247E-11	2.751E-11	1.620E-15-1.000E+00	8.430E-11	2.740E-10
SKIN(FGR)	1.310E-13	1.043E-10	1.277E-10	7.520E-15-1.000E+00	0.000E+00	0.000E+00
Tb-151						
GONADS	4.120E-14	2.270E-11	8.389E-11	9.190E-16-1.000E+00	1.040E-10	4.200E-10
BREAST	4.730E-14	2.194E-11	8.106E-11	8.880E-16-1.000E+00	2.890E-11	5.130E-11
LUNGS	4.030E-14	2.041E-11	7.540E-11	8.260E-16-1.000E+00	4.790E-10	1.040E-11
RED MARR	3.850E-14	2.031E-11	7.504E-11	8.220E-16-1.000E+00	5.650E-11	1.000E-10
BONE SUR	7.780E-14	3.632E-11	1.342E-10	1.470E-15-1.000E+00	1.290E-10	3.270E-11
THYROID	4.180E-14	2.110E-11	7.796E-11	8.540E-16-1.000E+00	1.280E-11	1.170E-12
REMAINDER	3.850E-14	1.994E-11	7.367E-11	8.070E-16-1.000E+00	2.360E-10	9.190E-10
EFFECTIVE	4.200E-14	2.157E-11	7.969E-11	8.730E-16-1.000E+00	1.690E-10	4.030E-10
SKIN(FGR)	5.070E-14	2.792E-11	1.032E-10	1.130E-15-1.000E+00	0.000E+00	0.000E+00
Tb-153						
GONADS	9.870E-15	6.554E-12	6.095E-11	2.390E-16-1.000E+00	8.260E-11	2.350E-10
BREAST	1.150E-14	6.445E-12	5.993E-11	2.350E-16-1.000E+00	2.300E-11	2.410E-11
LUNGS	9.160E-15	5.649E-12	5.253E-11	2.060E-16-1.000E+00	6.340E-10	3.240E-12
RED MARR	8.370E-15	5.293E-12	4.922E-11	1.930E-16-1.000E+00	8.570E-11	6.830E-11
BONE SUR	2.310E-14	1.429E-11	1.329E-10	5.210E-16-1.000E+00	4.030E-10	2.180E-11

THYROID	9.770E-15	5.841E-12	5.432E-11	2.130E-16-1.000E+00	8.540E-12	2.940E-13
REMAINDER	8.690E-15	5.485E-12	5.100E-11	2.000E-16-1.000E+00	2.720E-10	7.350E-10
EFFECTIVE	9.890E-15	6.170E-12	5.738E-11	2.250E-16-1.000E+00	2.040E-10	2.920E-10
SKIN(FGR)	1.230E-14	7.898E-12	7.344E-11	2.880E-16-1.000E+00	0.000E+00	0.000E+00
Tb-154						
GONADS	1.170E-13	5.607E-11	2.446E-10	2.210E-15-1.000E+00	2.670E-10	9.890E-10
BREAST	1.320E-13	5.353E-11	2.335E-10	2.110E-15-1.000E+00	7.720E-11	1.320E-10
LUNGS	1.180E-13	5.201E-11	2.269E-10	2.050E-15-1.000E+00	7.210E-10	3.280E-11
RED MARR	1.180E-13	5.328E-11	2.324E-10	2.100E-15-1.000E+00	1.120E-10	2.140E-10
BONE SUR	1.690E-13	7.459E-11	3.254E-10	2.940E-15-1.000E+00	1.090E-10	7.360E-11
THYROID	1.210E-13	5.023E-11	2.191E-10	1.980E-15-1.000E+00	3.360E-11	5.230E-12
REMAINDER	1.150E-13	5.201E-11	2.269E-10	2.050E-15-1.000E+00	4.580E-10	1.660E-09
EFFECTIVE	1.210E-13	5.404E-11	2.357E-10	2.130E-15-1.000E+00	3.200E-10	7.960E-10
SKIN(FGR)	1.380E-13	7.611E-11	3.320E-10	3.000E-15-1.000E+00	0.000E+00	0.000E+00
Tb-155						
GONADS	5.620E-15	4.143E-12	5.832E-11	1.470E-16-1.000E+00	7.730E-11	1.960E-10
BREAST	6.660E-15	4.115E-12	5.793E-11	1.460E-16-1.000E+00	2.400E-11	1.890E-11
LUNGS	4.980E-15	3.467E-12	4.880E-11	1.230E-16-1.000E+00	7.670E-10	1.940E-12
RED MARR	4.300E-15	3.072E-12	4.325E-11	1.090E-16-1.000E+00	8.340E-11	6.700E-11
BONE SUR	1.580E-14	1.125E-11	1.583E-10	3.990E-16-1.000E+00	2.900E-10	2.060E-11
THYROID	5.440E-15	3.636E-12	5.118E-11	1.290E-16-1.000E+00	8.450E-12	1.120E-13
REMAINDER	4.690E-15	3.354E-12	4.721E-11	1.190E-16-1.000E+00	2.550E-10	6.120E-10
EFFECTIVE	5.560E-15	3.889E-12	5.475E-11	1.380E-16-1.000E+00	2.100E-10	2.440E-10
SKIN(FGR)	7.290E-15	4.988E-12	7.022E-11	1.770E-16-1.000E+00	0.000E+00	0.000E+00
Tb-156						
GONADS	8.740E-14	5.130E-11	7.231E-10	1.820E-15-1.000E+00	6.720E-10	1.640E-09
BREAST	9.950E-14	4.933E-11	6.953E-10	1.750E-15-1.000E+00	2.510E-10	2.000E-10
LUNGS	8.700E-14	4.707E-11	6.635E-10	1.670E-15-1.000E+00	3.300E-09	3.660E-11
RED MARR	8.490E-14	4.763E-11	6.715E-10	1.690E-15-1.000E+00	4.280E-10	3.570E-10
BONE SUR	1.420E-13	7.300E-11	1.029E-09	2.590E-15-1.000E+00	8.480E-10	1.210E-10
THYROID	8.950E-14	4.735E-11	6.675E-10	1.680E-15-1.000E+00	1.380E-10	5.320E-12
REMAINDER	8.360E-14	4.651E-11	6.556E-10	1.650E-15-1.000E+00	1.330E-09	3.030E-09
EFFECTIVE	8.940E-14	4.904E-11	6.913E-10	1.740E-15-1.000E+00	1.080E-09	1.400E-09
SKIN(FGR)	1.040E-13	5.947E-11	8.384E-10	2.110E-15-1.000E+00	0.000E+00	0.000E+00
Tb-156m						
GONADS	8.330E-16	7.291E-13	3.556E-12	2.830E-17-1.000E+00	1.040E-10	1.950E-10
BREAST	1.040E-15	7.342E-13	3.581E-12	2.850E-17-1.000E+00	4.320E-11	2.130E-11
LUNGS	6.210E-16	5.693E-13	2.777E-12	2.210E-17-1.000E+00	6.930E-10	2.770E-12
RED MARR	4.580E-16	4.225E-13	2.061E-12	1.640E-17-1.000E+00	8.100E-11	4.640E-11
BONE SUR	2.770E-15	2.653E-12	1.294E-11	1.030E-16-1.000E+00	1.960E-10	1.540E-11
THYROID	7.550E-16	5.977E-13	2.915E-12	2.320E-17-1.000E+00	2.480E-11	4.120E-13
REMAINDER	5.860E-16	5.410E-13	2.639E-12	2.100E-17-1.000E+00	2.480E-10	4.860E-10
EFFECTIVE	7.750E-16	6.724E-13	3.280E-12	2.610E-17-1.000E+00	2.060E-10	2.040E-10
SKIN(FGR)	1.110E-15	8.811E-13	4.297E-12	3.420E-17-1.000E+00	0.000E+00	0.000E+00
Tb-156n						
GONADS	1.230E-16	6.996E-14	1.044E-13	4.020E-18-1.000E+00	2.620E-11	5.850E-11
BREAST	1.520E-16	7.083E-14	1.057E-13	4.070E-18-1.000E+00	9.660E-12	6.730E-12
LUNGS	9.560E-17	5.395E-14	8.050E-14	3.100E-18-1.000E+00	2.180E-10	1.020E-12
RED MARR	7.390E-17	4.194E-14	6.258E-14	2.410E-18-1.000E+00	1.770E-11	1.260E-11
BONE SUR	3.980E-16	2.384E-13	3.558E-13	1.370E-17-1.000E+00	4.650E-11	4.260E-12
THYROID	1.130E-16	5.777E-14	8.622E-14	3.320E-18-1.000E+00	5.290E-12	1.550E-13
REMAINDER	9.020E-17	5.203E-14	7.765E-14	2.990E-18-1.000E+00	6.910E-11	2.460E-10
EFFECTIVE	1.160E-16	6.404E-14	9.556E-14	3.680E-18-1.000E+00	5.860E-11	9.120E-11
SKIN(FGR)	3.560E-16	8.614E-14	1.285E-13	4.950E-18-1.000E+00	0.000E+00	0.000E+00
Tb-157						
GONADS	7.570E-17	8.784E-14	1.845E-12	3.050E-18-1.000E+00	4.140E-11	6.450E-12
BREAST	9.640E-17	9.014E-14	1.893E-12	3.130E-18-1.000E+00	6.600E-11	6.270E-13
LUNGS	5.130E-17	6.106E-14	1.282E-12	2.120E-18-1.000E+00	1.180E-09	3.070E-13
RED MARR	3.720E-17	4.378E-14	9.193E-13	1.520E-18-1.000E+00	4.180E-09	1.270E-11
BONE SUR	2.350E-16	2.966E-13	6.229E-12	1.030E-17-1.000E+00	4.420E-08	1.110E-10
THYROID	6.680E-17	6.854E-14	1.439E-12	2.380E-18-1.000E+00	2.670E-11	6.500E-14
REMAINDER	4.910E-17	5.962E-14	1.252E-12	2.070E-18-1.000E+00	1.660E-09	8.970E-11
EFFECTIVE	6.780E-17	7.690E-14	1.615E-12	2.670E-18-1.000E+00	2.490E-09	3.350E-11

SKIN(FGR)	1.060E-16	1.132E-13	2.377E-12	3.930E-18	-1.000E+00	0.000E+00	0.000E+00
Tb-158							
GONADS	3.780E-14	2.336E-11	4.905E-10	8.110E-16	-1.000E+00	1.380E-08	9.150E-10
BREAST	4.300E-14	2.238E-11	4.699E-10	7.770E-16	-1.000E+00	1.780E-08	1.470E-10
LUNGS	3.730E-14	2.111E-11	4.433E-10	7.330E-16	-1.000E+00	4.910E-08	7.570E-11
RED MARR	3.630E-14	2.131E-11	4.475E-10	7.400E-16	-1.000E+00	1.180E-07	4.900E-10
BONE SUR	6.100E-14	3.398E-11	7.136E-10	1.180E-15	-1.000E+00	6.230E-07	1.620E-09
THYROID	3.860E-14	2.180E-11	4.578E-10	7.570E-16	-1.000E+00	7.740E-09	2.040E-11
REMAINDER	3.570E-14	2.088E-11	4.385E-10	7.250E-16	-1.000E+00	8.010E-08	2.730E-09
EFFECTIVE	3.840E-14	2.223E-11	4.669E-10	7.720E-16	-1.000E+00	6.910E-08	1.190E-09
SKIN(FGR)	4.700E-14	3.370E-11	7.076E-10	1.170E-15	-1.000E+00	0.000E+00	0.000E+00
Tb-160							
GONADS	5.420E-14	3.249E-11	6.610E-10	1.130E-15	-1.000E+00	9.360E-10	1.170E-09
BREAST	6.160E-14	3.105E-11	6.317E-10	1.080E-15	-1.000E+00	9.630E-10	1.430E-10
LUNGS	5.400E-14	2.962E-11	6.025E-10	1.030E-15	-1.000E+00	3.020E-08	2.720E-11
RED MARR	5.280E-14	3.048E-11	6.200E-10	1.060E-15	-1.000E+00	4.430E-09	2.540E-10
BONE SUR	8.590E-14	4.428E-11	9.008E-10	1.540E-15	-1.000E+00	2.470E-08	1.570E-10
THYROID	5.560E-14	3.019E-11	6.142E-10	1.050E-15	-1.000E+00	6.540E-10	4.290E-12
REMAINDER	5.180E-14	2.933E-11	5.967E-10	1.020E-15	-1.000E+00	4.840E-09	4.900E-09
EFFECTIVE	5.540E-14	3.105E-11	6.317E-10	1.080E-15	-1.000E+00	6.750E-09	1.820E-09
SKIN(FGR)	7.340E-14	5.406E-11	1.100E-09	1.880E-15	-1.000E+00	0.000E+00	0.000E+00
Tb-161							
GONADS	1.090E-15	1.124E-12	1.725E-11	3.970E-17	-1.000E+00	2.580E-11	6.400E-11
BREAST	1.360E-15	1.161E-12	1.782E-11	4.100E-17	-1.000E+00	8.380E-12	5.270E-12
LUNGS	8.200E-16	7.704E-13	1.182E-11	2.720E-17	-1.000E+00	4.190E-09	3.770E-13
RED MARR	6.360E-16	6.090E-13	9.342E-12	2.150E-17	-1.000E+00	1.900E-10	2.470E-11
BONE SUR	3.460E-15	3.512E-12	5.388E-11	1.240E-16	-1.000E+00	2.070E-09	1.470E-11
THYROID	9.900E-16	8.667E-13	1.330E-11	3.060E-17	-1.000E+00	1.930E-12	7.700E-15
REMAINDER	7.790E-16	7.647E-13	1.173E-11	2.700E-17	-1.000E+00	1.080E-09	2.560E-09
EFFECTIVE	1.020E-15	9.828E-13	1.508E-11	3.470E-17	-1.000E+00	9.200E-10	7.890E-10
SKIN(FGR)	7.690E-15	2.515E-12	3.859E-11	8.880E-17	-1.000E+00	0.000E+00	0.000E+00
Tc-101							
GONADS	1.570E-14	4.228E-13	4.228E-13	3.440E-16	-1.000E+00	7.310E-14	6.290E-13
BREAST	1.800E-14	4.093E-13	4.093E-13	3.330E-16	-1.000E+00	1.520E-13	4.060E-13
LUNGS	1.540E-14	3.847E-13	3.847E-13	3.130E-16	-1.000E+00	3.010E-11	4.130E-13
RED MARR	1.460E-14	3.872E-13	3.872E-13	3.150E-16	-1.000E+00	1.600E-13	4.360E-13
BONE SUR	3.210E-14	6.576E-13	6.576E-13	5.350E-16	-1.000E+00	1.360E-13	2.550E-13
THYROID	1.590E-14	3.946E-13	3.946E-13	3.210E-16	-1.000E+00	2.310E-12	3.890E-12
REMAINDER	1.470E-14	3.749E-13	3.749E-13	3.050E-16	-1.000E+00	6.600E-13	3.660E-11
EFFECTIVE	1.610E-14	4.032E-13	4.032E-13	3.280E-16	-1.000E+00	3.940E-12	1.140E-11
SKIN(FGR)	4.770E-14	6.465E-12	6.465E-12	5.260E-15	-1.000E+00	0.000E+00	0.000E-00
Tc-104							
GONADS	9.830E-14	3.041E-12	3.041E-12	1.930E-15	-1.000E+00	4.590E-13	4.730E-12
BREAST	1.110E-13	2.899E-12	2.899E-12	1.840E-15	-1.000E+00	9.590E-13	2.720E-12
LUNGS	9.900E-14	2.804E-12	2.804E-12	1.780E-15	-1.000E+00	1.300E-10	2.700E-12
RED MARR	9.760E-14	2.883E-12	2.883E-12	1.830E-15	-1.000E+00	9.410E-13	2.620E-12
BONE SUR	1.510E-13	4.017E-12	4.017E-12	2.550E-15	-1.000E+00	7.930E-13	1.590E-12
THYROID	1.010E-13	2.773E-12	2.773E-12	1.760E-15	-1.000E+00	1.340E-11	2.790E-11
REMAINDER	9.550E-14	2.788E-12	2.788E-12	1.770E-15	-1.000E+00	3.850E-12	1.600E-10
EFFECTIVE	1.010E-13	2.915E-12	2.915E-12	1.850E-15	-1.000E+00	1.760E-11	5.110E-11
SKIN(FGR)	2.250E-13	2.599E-11	2.599E-11	1.650E-14	-1.000E+00	0.000E+00	0.000E+00
Tc-93							
GONADS	7.170E-14	1.733E-11	2.000E-11	1.400E-15	-1.000E+00	4.420E-12	3.460E-11
BREAST	8.120E-14	1.659E-11	1.914E-11	1.340E-15	-1.000E+00	5.870E-12	1.480E-11
LUNGS	7.250E-14	1.610E-11	1.857E-11	1.300E-15	-1.000E+00	4.940E-11	1.210E-11
RED MARR	7.210E-14	1.659E-11	1.914E-11	1.340E-15	-1.000E+00	5.640E-12	1.600E-11
BONE SUR	1.020E-13	2.179E-11	2.514E-11	1.760E-15	-1.000E+00	4.360E-12	1.040E-11
THYROID	7.400E-14	1.560E-11	1.800E-11	1.260E-15	-1.000E+00	2.230E-11	9.780E-11
REMAINDER	7.020E-14	1.610E-11	1.857E-11	1.300E-15	-1.000E+00	1.420E-11	8.740E-11
EFFECTIVE	7.380E-14	1.671E-11	1.928E-11	1.350E-15	-1.000E+00	1.360E-11	4.370E-11
SKIN(FGR)	8.300E-14	2.006E-11	2.314E-11	1.620E-15	-1.000E+00	0.000E+00	0.000E+00
Tc-93m							
GONADS	3.620E-14	2.540E-12	2.542E-12	6.750E-16	-1.000E+00	1.460E-12	1.230E-11

BREAST	4.070E-14	2.431E-12	2.432E-12	6.460E-16-1.000E+00	2.010E-12	5.210E-12
LUNGS	3.660E-14	2.345E-12	2.346E-12	6.230E-16-1.000E+00	3.030E-11	4.340E-12
RED MARR	3.630E-14	2.401E-12	2.402E-12	6.380E-16-1.000E+00	1.970E-12	5.700E-12
BONE SUR	5.470E-14	3.335E-12	3.336E-12	8.860E-16-1.000E+00	1.530E-12	3.660E-12
THYROID	3.750E-14	2.266E-12	2.267E-12	6.020E-16-1.000E+00	1.010E-11	4.240E-11
REMAINDER	3.550E-14	2.345E-12	2.346E-12	6.230E-16-1.000E+00	5.170E-12	4.530E-11
EFFECTIVE	3.730E-14	2.439E-12	2.440E-12	6.480E-16-1.000E+00	6.440E-12	2.000E-11
SKIN(FGR)	4.620E-14	2.894E-12	2.896E-12	7.690E-16-1.000E+00	0.000E+00	0.000E+00
Tc-94						
GONADS	1.280E-13	4.682E-11	6.899E-11	2.720E-15-1.000E+00	1.970E-11	1.250E-10
BREAST	1.450E-13	4.476E-11	6.594E-11	2.600E-15-1.000E+00	2.210E-11	5.080E-11
LUNGS	1.270E-13	4.269E-11	6.290E-11	2.480E-15-1.000E+00	2.010E-10	4.340E-11
RED MARR	1.240E-13	4.373E-11	6.442E-11	2.540E-15-1.000E+00	2.220E-11	5.770E-11
BONE SUR	2.000E-13	6.146E-11	9.054E-11	3.570E-15-1.000E+00	1.720E-11	3.890E-11
THYROID	1.310E-13	4.441E-11	6.544E-11	2.580E-15-1.000E+00	1.220E-10	4.840E-10
REMAINDER	1.220E-13	4.218E-11	6.214E-11	2.450E-15-1.000E+00	5.860E-11	2.980E-10
EFFECTIVE	1.300E-13	4.459E-11	6.569E-11	2.590E-15-1.000E+00	5.680E-11	1.560E-10
SKIN(FGR)	1.510E-13	5.853E-11	8.623E-11	3.400E-15-1.000E+00	0.000E+00	0.000E+00
Tc-94m						
GONADS	8.960E-14	8.403E-12	8.417E-12	1.870E-15-1.000E+00	1.470E-12	1.740E-11
BREAST	1.020E-13	8.044E-12	8.057E-12	1.790E-15-1.000E+00	2.670E-12	8.240E-12
LUNGS	8.960E-14	7.684E-12	7.697E-12	1.710E-15-1.000E+00	1.780E-10	7.610E-12
RED MARR	8.770E-14	7.864E-12	7.877E-12	1.750E-15-1.000E+00	2.600E-12	8.630E-12
BONE SUR	1.420E-13	1.114E-11	1.116E-11	2.480E-15-1.000E+00	2.140E-12	5.650E-12
THYROID	9.190E-14	7.864E-12	7.877E-12	1.750E-15-1.000E+00	4.630E-11	1.940E-10
REMAINDER	8.600E-14	7.594E-12	7.607E-12	1.690E-15-1.000E+00	1.170E-11	2.070E-10
EFFECTIVE	9.180E-14	8.044E-12	8.057E-12	1.790E-15-1.000E+00	2.740E-11	7.570E-11
SKIN(FGR)	1.550E-13	4.808E-11	4.816E-11	1.070E-14-1.000E+00	0.000E+00	0.000E+00
Tc-95						
GONADS	3.760E-14	2.050E-11	8.441E-11	8.150E-16-1.000E+00	3.360E-11	1.140E-10
BREAST	4.280E-14	1.967E-11	8.099E-11	7.820E-16-1.000E+00	2.830E-11	4.730E-11
LUNGS	3.740E-14	1.844E-11	7.591E-11	7.330E-16-1.000E+00	1.990E-10	4.120E-11
RED MARR	3.660E-14	1.889E-11	7.778E-11	7.510E-16-1.000E+00	2.940E-11	5.510E-11
BONE SUR	5.930E-14	2.666E-11	1.098E-10	1.060E-15-1.000E+00	2.270E-11	3.970E-11
THYROID	3.850E-14	1.924E-11	7.923E-11	7.650E-16-1.000E+00	1.410E-10	3.710E-10
REMAINDER	3.580E-14	1.829E-11	7.529E-11	7.270E-16-1.000E+00	7.540E-11	2.210E-10
EFFECTIVE	3.840E-14	1.942E-11	7.995E-11	7.720E-16-1.000E+00	6.760E-11	1.260E-10
SKIN(FGR)	4.420E-14	2.472E-11	1.018E-10	9.830E-16-1.000E+00	0.000E+00	0.000E+00
Tc-95m						
GONADS	3.160E-14	1.981E-11	4.006E-10	6.890E-16-1.000E+00	1.980E-10	3.170E-10
BREAST	3.600E-14	1.909E-11	3.860E-10	6.640E-16-1.000E+00	3.840E-10	1.730E-10
LUNGS	3.120E-14	1.776E-11	3.593E-10	6.180E-16-1.000E+00	5.070E-09	1.670E-10
RED MARR	3.020E-14	1.808E-11	3.657E-10	6.290E-16-1.000E+00	3.860E-10	2.030E-10
BONE SUR	5.550E-14	2.797E-11	5.657E-10	9.730E-16-1.000E+00	3.080E-10	1.630E-10
THYROID	3.220E-14	1.843E-11	3.727E-10	6.410E-16-1.000E+00	7.190E-10	7.960E-10
REMAINDER	2.980E-14	1.751E-11	3.541E-10	6.090E-16-1.000E+00	8.510E-10	7.150E-10
EFFECTIVE	3.230E-14	1.877E-11	3.796E-10	6.530E-16-1.000E+00	1.050E-09	3.930E-10
SKIN(FGR)	3.760E-14	2.420E-11	4.895E-10	8.420E-16-1.000E+00	0.000E+00	0.000E+00
Tc-96						
GONADS	1.200E-13	7.149E-11	9.226E-10	2.550E-15-1.000E+00	3.020E-10	6.990E-10
BREAST	1.360E-13	6.841E-11	8.828E-10	2.440E-15-1.000E+00	3.050E-10	3.350E-10
LUNGS	1.190E-13	6.504E-11	8.393E-10	2.320E-15-1.000E+00	2.000E-09	3.040E-10
RED MARR	1.170E-13	6.673E-11	8.611E-10	2.380E-15-1.000E+00	3.130E-10	3.840E-10
BONE SUR	1.870E-13	9.336E-11	1.205E-09	3.330E-15-1.000E+00	2.460E-10	2.910E-10
THYROID	1.230E-13	6.757E-11	8.719E-10	2.410E-15-1.000E+00	8.700E-10	1.550E-09
REMAINDER	1.140E-13	6.448E-11	8.321E-10	2.300E-15-1.000E+00	7.000E-10	1.270E-09
EFFECTIVE	1.220E-13	6.813E-11	8.791E-10	2.430E-15-1.000E+00	6.420E-10	7.450E-10
SKIN(FGR)	1.400E-13	8.355E-11	1.078E-09	2.980E-15-1.000E+00	0.000E+00	0.000E+00
Tc-96m						
GONADS	2.200E-15	2.346E-13	2.349E-13	5.270E-17-1.000E+00	2.520E-12	6.110E-12
BREAST	2.520E-15	2.328E-13	2.331E-13	5.230E-17-1.000E+00	2.580E-12	2.940E-12
LUNGS	2.170E-15	1.860E-13	1.863E-13	4.180E-17-1.000E+00	2.310E-11	2.670E-12
RED MARR	2.130E-15	1.927E-13	1.930E-13	4.330E-17-1.000E+00	2.640E-12	3.350E-12

BONE SUR	3.360E-15	2.906E-13	2.911E-13	6.530E-17-1.000E+00	2.080E-12	2.540E-12
THYROID	2.240E-15	1.976E-13	1.979E-13	4.440E-17-1.000E+00	8.860E-12	1.990E-11
REMAINDER	2.080E-15	1.887E-13	1.890E-13	4.240E-17-1.000E+00	6.080E-12	1.750E-11
EFFECTIVE	2.240E-15	2.101E-13	2.104E-13	4.720E-17-1.000E+00	6.260E-12	8.610E-12
SKIN(FGR)	2.680E-15	3.681E-13	3.687E-13	8.270E-17-1.000E+00	0.000E+00	0.000E+00
Tc-97						
GONADS	4.790E-17	3.427E-13	7.197E-12	1.190E-17-1.000E+00	1.040E-11	1.680E-11
BREAST	9.440E-17	4.234E-13	8.891E-12	1.470E-17-1.000E+00	2.220E-11	1.010E-11
LUNGS	2.660E-18	1.405E-14	2.951E-13	4.880E-19-1.000E+00	1.970E-09	1.020E-11
RED MARR	9.130E-18	4.205E-14	8.830E-13	1.460E-18-1.000E+00	1.310E-11	1.270E-11
BONE SUR	5.430E-17	2.733E-13	5.740E-12	9.490E-18-1.000E+00	1.210E-11	1.170E-11
THYROID	2.790E-17	7.978E-14	1.675E-12	2.770E-18-1.000E+00	1.170E-10	1.770E-10
REMAINDER	1.080E-17	6.797E-14	1.427E-12	2.360E-18-1.000E+00	6.900E-11	1.070E-10
EFFECTIVE	3.330E-17	1.866E-13	3.919E-12	6.480E-18-1.000E+00	2.680E-10	4.630E-11
SKIN(FGR)	2.710E-16	1.604E-12	3.369E-11	5.570E-17-1.000E+00	0.000E+00	0.000E-00
Tc-97m						
GONADS	6.100E-17	3.164E-13	6.471E-12	1.100E-17-1.000E+00	3.370E-11	5.750E-11
BREAST	1.050E-16	3.797E-13	7.765E-12	1.320E-17-1.000E+00	3.940E-11	5.220E-11
LUNGS	1.600E-17	2.528E-14	5.171E-13	8.790E-19-1.000E+00	9.460E-09	5.240E-11
RED MARR	1.990E-17	4.746E-14	9.706E-13	1.650E-18-1.000E+00	3.560E-11	5.460E-11
BONE SUR	1.000E-16	2.905E-13	5.941E-12	1.010E-17-1.000E+00	3.480E-11	5.370E-11
THYROID	4.260E-17	9.233E-14	1.888E-12	3.210E-18-1.000E+00	8.580E-10	1.440E-09
REMAINDER	2.260E-17	7.248E-14	1.482E-12	2.520E-18-1.000E+00	4.760E-10	8.540E-10
EFFECTIVE	4.640E-17	1.777E-13	3.635E-12	6.180E-18-1.000E+00	1.320E-09	3.360E-10
SKIN(FGR)	5.550E-16	1.248E-12	2.553E-11	4.340E-17-1.000E+00	0.000E+00	0.000E+00
Tc-98						
GONADS	6.720E-14	4.176E-11	8.770E-10	1.450E-15-1.000E+00	5.600E-10	7.260E-10
BREAST	7.650E-14	4.003E-11	8.407E-10	1.390E-15-1.000E+00	1.350E-09	4.610E-10
LUNGS	6.690E-14	3.830E-11	8.044E-10	1.330E-15-1.000E+00	3.780E-08	4.540E-10
RED MARR	6.520E-14	3.888E-11	8.165E-10	1.350E-15-1.000E+00	1.310E-09	5.080E-10
BONE SUR	1.090E-13	5.558E-11	1.167E-09	1.930E-15-1.000E+00	1.060E-09	4.260E-10
THYROID	6.870E-14	3.974E-11	8.346E-10	1.380E-15-1.000E+00	3.360E-09	3.540E-09
REMAINDER	6.400E-14	3.773E-11	7.923E-10	1.310E-15-1.000E+00	3.380E-09	2.780E-09
EFFECTIVE	6.860E-14	3.974E-11	8.346E-10	1.380E-15-1.000E+00	6.180E-09	1.320E-09
SKIN(FGR)	8.530E-14	4.867E-11	1.022E-09	1.690E-15-1.000E+00	0.000E+00	0.000E+00
Tc-99						
GONADS	1.740E-18	2.805E-15	5.891E-14	9.740E-20-1.000E+00	3.990E-11	6.040E-11
BREAST	2.200E-18	3.053E-15	6.411E-14	1.060E-19-1.000E+00	3.990E-11	6.040E-11
LUNGS	1.290E-18	1.524E-15	3.199E-14	5.290E-20-1.000E+00	1.670E-08	6.040E-11
RED MARR	1.050E-18	1.290E-15	2.710E-14	4.480E-20-1.000E+00	3.990E-11	6.040E-11
BONE SUR	5.170E-18	6.854E-15	1.439E-13	2.380E-19-1.000E+00	3.990E-11	6.040E-11
THYROID	1.570E-18	1.878E-15	3.943E-14	6.520E-20-1.000E+00	1.070E-09	1.620E-09
REMAINDER	1.240E-18	1.627E-15	3.417E-14	5.650E-20-1.000E+00	6.260E-10	1.020E-09
EFFECTIVE	1.620E-18	2.246E-15	4.717E-14	7.800E-20-1.000E+00	2.250E-09	3.950E-10
SKIN(FGR)	2.740E-15	6.998E-15	1.470E-13	2.430E-19-1.000E+00	0.000E+00	0.000E+00
Tc-99m						
GONADS	5.750E-15	2.334E-12	3.877E-12	1.240E-16-1.000E+00	1.700E-12	9.750E-12
BREAST	6.650E-15	2.258E-12	3.752E-12	1.200E-16-1.000E+00	1.520E-12	3.570E-12
LUNGS	5.490E-15	2.127E-12	3.533E-12	1.130E-16-1.000E+00	3.070E-11	3.140E-12
RED MARR	4.910E-15	2.070E-12	3.439E-12	1.100E-16-1.000E+00	2.390E-12	6.290E-12
BONE SUR	1.630E-14	5.383E-12	8.942E-12	2.860E-16-1.000E+00	1.780E-12	4.060E-12
THYROID	5.750E-15	2.145E-12	3.564E-12	1.140E-16-1.000E+00	2.090E-11	8.460E-11
REMAINDER	5.150E-15	2.070E-12	3.439E-12	1.100E-16-1.000E+00	6.340E-12	3.340E-11
EFFECTIVE	5.890E-15	2.277E-12	3.783E-12	1.210E-16-1.000E+00	7.210E-12	1.680E-11
SKIN(FGR)	7.140E-15	2.710E-12	4.502E-12	1.440E-16-1.000E+00	0.000E+00	0.000E+00
Te-116						
GONADS	2.370E-15	1.005E-12	1.126E-12	8.710E-17-1.000E+00	1.170E-11	1.120E-10
BREAST	2.890E-15	1.048E-12	1.174E-12	9.080E-17-1.000E+00	9.500E-12	2.310E-11
LUNGS	1.970E-15	5.988E-13	6.712E-13	5.190E-17-1.000E+00	3.360E-10	1.110E-11
RED MARR	1.750E-15	5.480E-13	6.143E-13	4.750E-17-1.000E+00	1.040E-11	3.220E-11
BONE SUR	6.200E-15	2.123E-12	2.380E-12	1.840E-16-1.000E+00	8.220E-12	1.410E-11
THYROID	2.260E-15	7.465E-13	8.367E-13	6.470E-17-1.000E+00	7.120E-12	4.050E-12
REMAINDER	1.890E-15	6.334E-13	7.100E-13	5.490E-17-1.000E+00	4.900E-11	5.280E-10

EFFECTIVE	2.290E-15	8.226E-13	9.221E-13	7.130E-17-1.000E+00	6.110E-11	1.960E-10
SKIN(FGR)	3.370E-15	1.558E-12	1.746E-12	1.350E-16-1.000E+00	0.000E+00	0.000E+00
Te-121						
GONADS	2.650E-14	1.739E-11	3.199E-10	6.080E-16-1.000E+00	2.960E-10	6.000E-10
BREAST	3.040E-14	1.682E-11	3.094E-10	5.880E-16-1.000E+00	1.980E-10	1.310E-10
LUNGS	2.610E-14	1.530E-11	2.815E-10	5.350E-16-1.000E+00	1.880E-09	8.030E-11
RED MARR	2.530E-14	1.545E-11	2.841E-10	5.400E-16-1.000E+00	3.040E-10	2.910E-10
BONE SUR	4.550E-14	2.411E-11	4.435E-10	8.430E-16-1.000E+00	4.260E-10	4.290E-10
THYROID	2.690E-14	1.622E-11	2.983E-10	5.670E-16-1.000E+00	1.560E-10	7.110E-11
REMAINDER	2.500E-14	1.507E-11	2.773E-10	5.270E-16-1.000E+00	4.380E-10	7.500E-10
EFFECTIVE	2.700E-14	1.630E-11	2.999E-10	5.700E-16-1.000E+00	5.150E-10	4.540E-10
SKIN(FGR)	3.180E-14	2.143E-11	3.941E-10	7.490E-16-1.000E+00	0.000E+00	0.000E+00
Te-121m						
GONADS	9.760E-15	6.446E-12	1.334E-10	2.240E-16-1.000E+00	6.700E-10	7.230E-10
BREAST	1.120E-14	6.360E-12	1.316E-10	2.210E-16-1.000E+00	8.700E-10	5.070E-10
LUNGS	9.330E-15	5.525E-12	1.143E-10	1.920E-16-1.000E+00	1.560E-08	4.480E-10
RED MARR	8.740E-15	5.497E-12	1.137E-10	1.910E-16-1.000E+00	4.180E-09	3.770E-09
BONE SUR	2.200E-14	1.131E-11	2.340E-10	3.930E-16-1.000E+00	2.810E-08	2.740E-08
THYROID	9.790E-15	5.698E-12	1.179E-10	1.980E-16-1.000E+00	7.300E-10	4.400E-10
REMAINDER	8.870E-15	5.439E-12	1.125E-10	1.890E-16-1.000E+00	1.500E-09	1.620E-09
EFFECTIVE	9.900E-15	6.043E-12	1.250E-10	2.100E-16-1.000E+00	3.990E-09	2.080E-09
SKIN(FGR)	1.230E-14	7.799E-12	1.613E-10	2.710E-16-1.000E+00	0.000E+00	0.000E+00
Te-123						
GONADS	2.910E-16	8.467E-13	1.778E-11	2.940E-17-1.000E+00	3.310E-12	3.160E-12
BREAST	4.270E-16	9.418E-13	1.978E-11	3.270E-17-1.000E+00	3.280E-12	2.740E-12
LUNGS	9.010E-17	2.431E-13	5.105E-12	8.440E-18-1.000E+00	5.190E-10	2.630E-12
RED MARR	8.120E-17	1.979E-13	4.155E-12	6.870E-18-1.000E+00	2.570E-09	2.310E-09
BONE SUR	5.420E-16	1.477E-12	3.103E-11	5.130E-17-1.000E+00	3.120E-08	2.810E-08
THYROID	2.200E-16	4.694E-13	9.858E-12	1.630E-17-1.000E+00	2.220E-12	1.990E-12
REMAINDER	1.140E-16	3.283E-13	6.895E-12	1.140E-17-1.000E+00	2.030E-11	3.700E-11
EFFECTIVE	2.150E-16	5.616E-13	1.179E-11	1.950E-17-1.000E+00	1.310E-09	1.130E-09
SKIN(FGR)	6.320E-16	1.644E-12	3.453E-11	5.710E-17-1.000E+00	0.000E+00	0.000E+00
Te-123m						
GONADS	6.430E-15	4.402E-12	9.068E-11	1.530E-16-1.000E+00	1.880E-10	2.750E-10
BREAST	7.460E-15	4.345E-12	8.950E-11	1.510E-16-1.000E+00	2.040E-10	1.260E-10
LUNGS	6.020E-15	3.683E-12	7.587E-11	1.280E-16-1.000E+00	1.270E-08	1.100E-10
RED MARR	5.450E-15	3.568E-12	7.350E-11	1.240E-16-1.000E+00	2.410E-09	2.330E-09
BONE SUR	1.710E-14	9.293E-12	1.914E-10	3.230E-16-1.000E+00	2.400E-08	2.410E-08
THYROID	6.380E-15	3.855E-12	7.942E-11	1.340E-16-1.000E+00	1.460E-10	9.440E-11
REMAINDER	5.680E-15	3.625E-12	7.468E-11	1.260E-16-1.000E+00	8.060E-10	1.420E-09
EFFECTIVE	6.510E-15	4.114E-12	8.476E-11	1.430E-16-1.000E+00	2.860E-09	1.530E-09
SKIN(FGR)	8.480E-15	5.380E-12	1.108E-10	1.870E-16-1.000E+00	0.000E+00	0.000E+00
Te-125m						
GONADS	5.960E-16	1.506E-12	3.040E-11	5.240E-17-1.000E+00	7.930E-11	1.270E-10
BREAST	8.480E-16	1.656E-12	3.342E-11	5.760E-17-1.000E+00	7.080E-11	4.640E-11
LUNGS	2.230E-16	5.116E-13	1.033E-11	1.780E-17-1.000E+00	1.040E-08	4.360E-11
RED MARR	1.860E-16	3.909E-13	7.891E-12	1.360E-17-1.000E+00	1.150E-09	1.210E-09
BONE SUR	1.220E-15	2.903E-12	5.860E-11	1.010E-16-1.000E+00	1.180E-08	1.270E-08
THYROID	4.640E-16	8.910E-13	1.799E-11	3.100E-17-1.000E+00	3.870E-11	3.930E-11
REMAINDER	2.590E-16	6.381E-13	1.288E-11	2.220E-17-1.000E+00	6.750E-10	1.400E-09
EFFECTIVE	4.530E-16	1.038E-12	2.094E-11	3.610E-17-1.000E+00	1.970E-09	9.920E-10
SKIN(FGR)	1.940E-15	2.716E-12	5.483E-11	9.450E-17-1.000E+00	0.000E+00	0.000E+00
Te-127						
GONADS	2.370E-16	1.191E-13	2.661E-13	5.480E-18-1.000E+00	2.020E-12	4.020E-12
BREAST	2.730E-16	1.158E-13	2.588E-13	5.330E-18-1.000E+00	1.880E-12	3.000E-12
LUNGS	2.320E-16	1.060E-13	2.370E-13	4.880E-18-1.000E+00	4.270E-10	2.890E-12
RED MARR	2.210E-16	1.058E-13	2.365E-13	4.870E-18-1.000E+00	4.090E-12	6.570E-12
BONE SUR	4.650E-16	1.862E-13	4.162E-13	8.570E-18-1.000E+00	4.090E-12	6.460E-12
THYROID	2.400E-16	1.106E-13	2.472E-13	5.090E-18-1.000E+00	1.840E-12	2.860E-12
REMAINDER	2.210E-16	1.036E-13	2.316E-13	4.770E-18-1.000E+00	1.110E-10	6.130E-10
EFFECTIVE	2.420E-16	1.125E-13	2.515E-13	5.180E-18-1.000E+00	8.600E-11	1.870E-10
SKIN(FGR)	1.140E-14	1.173E-11	2.622E-11	5.400E-16-1.000E+00	0.000E+00	0.000E+00
Te-127m						

GONADS	1.900E-16	4.689E-13	9.642E-12	1.630E-17-1.000E+00	1.100E-10	1.250E-10
BREAST	2.690E-16	5.150E-13	1.059E-11	1.790E-17-1.000E+00	1.100E-10	9.740E-11
LUNGS	7.620E-17	1.602E-13	3.295E-12	5.570E-18-1.000E+00	3.340E-08	9.620E-11
RED MARR	6.430E-17	1.249E-13	2.567E-12	4.340E-18-1.000E+00	5.360E-09	5.430E-09
BONE SUR	3.940E-16	9.005E-13	1.852E-11	3.130E-17-1.000E+00	2.040E-08	2.070E-08
THYROID	1.500E-16	2.779E-13	5.714E-12	9.660E-18-1.000E+00	9.660E-11	9.430E-11
REMAINDER	8.640E-17	1.999E-13	4.111E-12	6.950E-18-1.000E+00	1.660E-09	2.980E-09
EFFECTIVE	1.470E-16	3.251E-13	6.684E-12	1.130E-17-1.000E+00	5.810E-09	2.230E-09
SKIN(FGR)	8.490E-16	1.496E-12	3.076E-11	5.200E-17-1.000E+00	0.000E+00	0.000E+00
Te-129						
GONADS	2.710E-15	3.889E-13	3.922E-13	6.510E-17-1.000E+00	5.050E-13	1.590E-12
BREAST	3.120E-15	3.800E-13	3.832E-13	6.360E-17-1.000E+00	5.390E-13	6.050E-13
LUNGS	2.640E-15	3.298E-13	3.326E-13	5.520E-17-1.000E+00	1.530E-10	4.910E-13
RED MARR	2.540E-15	3.298E-13	3.326E-13	5.520E-17-1.000E+00	6.190E-13	7.640E-13
BONE SUR	4.880E-15	5.753E-13	5.802E-13	9.630E-17-1.000E+00	6.220E-13	5.400E-13
THYROID	2.740E-15	3.525E-13	3.555E-13	5.900E-17-1.000E+00	5.090E-13	3.360E-13
REMAINDER	2.520E-15	3.262E-13	3.289E-13	5.460E-17-1.000E+00	7.280E-12	1.790E-10
EFFECTIVE	2.750E-15	3.590E-13	3.621E-13	6.010E-17-1.000E+00	2.090E-11	5.450E-11
SKIN(FGR)	3.570E-14	3.429E-11	3.458E-11	5.740E-15-1.000E+00	0.000E+00	0.000E+00
Te-129m						
GONADS	3.321E-15	2.206E-12	4.799E-11	8.561E-17-1.000E+00	1.783E-10	2.420E-10
BREAST	3.838E-15	2.181E-12	4.739E-11	8.454E-17-1.000E+00	1.694E-10	1.664E-10
LUNGS	3.176E-15	1.741E-12	3.815E-11	6.808E-17-1.000E+00	4.040E-08	1.593E-10
RED MARR	3.071E-15	1.729E-12	3.793E-11	6.768E-17-1.000E+00	3.100E-09	3.500E-09
BONE SUR	5.772E-15	3.287E-12	7.147E-11	1.275E-16-1.000E+00	7.050E-09	7.990E-09
THYROID	3.341E-15	1.923E-12	4.201E-11	7.495E-17-1.000E+00	1.563E-10	1.572E-10
REMAINDER	3.048E-15	1.746E-12	3.822E-11	6.819E-17-1.000E+00	3.275E-09	7.196E-09
EFFECTIVE	3.337E-15	1.974E-12	4.308E-11	7.686E-17-1.000E+00	6.484E-09	2.925E-09
SKIN(FGR)	3.811E-14	1.501E-10	3.360E-09	6.001E-15-1.000E+00	0.000E+00	0.000E-00
Te-131						
GONADS	1.990E-14	9.284E-13	9.284E-13	4.290E-16-1.000E+00	2.170E-12	1.570E-11
BREAST	2.280E-14	8.937E-13	8.937E-13	4.130E-16-1.000E+00	2.670E-12	4.960E-12
LUNGS	1.960E-14	8.440E-13	8.440E-13	3.900E-16-1.000E+00	2.990E-10	3.390E-12
RED MARR	1.880E-14	8.483E-13	8.483E-13	3.920E-16-1.000E+00	2.940E-12	6.600E-12
BONE SUR	3.800E-14	1.459E-12	1.459E-12	6.740E-16-1.000E+00	2.610E-12	3.690E-12
THYROID	2.030E-14	8.678E-13	8.678E-13	4.010E-16-1.000E+00	2.660E-09	4.210E-09
REMAINDER	1.870E-14	8.267E-13	8.267E-13	3.820E-16-1.000E+00	2.210E-11	3.730E-10
EFFECTIVE	2.040E-14	8.873E-13	8.873E-13	4.100E-16-1.000E+00	1.240E-10	2.440E-10
SKIN(FGR)	6.890E-14	1.809E-11	1.809E-11	8.360E-15-1.000E+00	0.000E+00	0.000E+00
Te-131m						
GONADS	7.292E-14	4.020E-11	2.343E-10	1.535E-15-1.000E+00	2.345E-10	7.415E-10
BREAST	8.286E-14	3.853E-11	2.246E-10	1.472E-15-1.000E+00	9.309E-11	1.361E-10
LUNGS	7.265E-14	3.657E-11	2.131E-10	1.397E-15-1.000E+00	2.296E-09	6.335E-11
RED MARR	7.097E-14	3.736E-11	2.178E-10	1.427E-15-1.000E+00	1.417E-10	2.435E-10
BONE SUR	1.174E-13	5.467E-11	3.189E-10	2.090E-15-1.000E+00	2.276E-10	3.248E-10
THYROID	7.471E-14	3.741E-11	2.181E-10	1.429E-15-1.000E+00	3.669E-08	4.383E-08
REMAINDER	6.965E-14	3.626E-11	2.113E-10	1.385E-15-1.000E+00	9.509E-10	3.153E-09
EFFECTIVE	7.463E-14	3.825E-11	2.229E-10	1.461E-15-1.000E+00	1.758E-09	2.514E-09
SKIN(FGR)	1.038E-13	1.033E-10	6.188E-10	4.056E-15-1.000E+00	0.000E+00	0.000E+00
Te-132						
GONADS	1.020E-14	6.812E-12	7.706E-11	2.450E-16-1.000E+00	4.150E-10	5.410E-10
BREAST	1.180E-14	6.756E-12	7.643E-11	2.430E-16-1.000E+00	3.630E-10	3.500E-10
LUNGS	9.650E-15	5.727E-12	6.479E-11	2.060E-16-1.000E+00	1.670E-09	3.300E-10
RED MARR	8.950E-15	5.588E-12	6.322E-11	2.010E-16-1.000E+00	4.270E-10	4.440E-10
BONE SUR	2.420E-14	1.273E-11	1.441E-10	4.580E-16-1.000E+00	7.120E-10	8.300E-10
THYROID	1.020E-14	5.978E-12	6.762E-11	2.150E-16-1.000E+00	6.280E-08	5.950E-08
REMAINDER	9.160E-15	5.644E-12	6.385E-11	2.030E-16-1.000E+00	7.890E-10	1.490E-09
EFFECTIVE	1.030E-14	6.339E-12	7.171E-11	2.280E-16-1.000E+00	2.550E-09	2.540E-09
SKIN(FGR)	1.390E-14	8.313E-12	9.405E-11	2.990E-16-1.000E+00	0.000E+00	0.000E+00
Te-133						
GONADS	4.490E-14	1.007E-12	1.007E-12	9.340E-16-1.000E+00	3.590E-13	1.850E-12
BREAST	5.100E-14	9.656E-13	9.656E-13	8.960E-16-1.000E+00	6.050E-13	1.230E-12
LUNGS	4.470E-14	9.236E-13	9.236E-13	8.570E-16-1.000E+00	4.640E-11	1.220E-12

RED MARR	4.360E-14	9.408E-13	9.408E-13	8.730E-16-1.000E+00	5.830E-13	1.180E-12
BONE SUR	7.500E-14	1.390E-12	1.390E-12	1.290E-15-1.000E+00	5.210E-13	7.730E-13
THYROID	4.590E-14	9.333E-13	9.333E-13	8.660E-16-1.000E+00	5.910E-10	9.390E-10
REMAINDER	4.290E-14	9.117E-13	9.117E-13	8.460E-16-1.000E+00	1.180E-12	6.050E-11
EFFECTIVE	4.600E-14	9.635E-13	9.635E-13	8.940E-16-1.000E+00	2.390E-11	4.730E-11
SKIN(FGR)	1.060E-13	1.088E-11	1.088E-11	1.010E-14-1.000E+00	0.000E+00	0.000E+00
Te-133m						
GONADS	1.120E-13	1.110E-11	1.113E-11	2.320E-15-1.000E+00	3.390E-12	3.680E-11
BREAST	1.270E-13	1.062E-11	1.065E-11	2.220E-15-1.000E+00	4.910E-12	1.140E-11
LUNGS	1.120E-13	1.019E-11	1.021E-11	2.130E-15-1.000E+00	2.060E-10	8.330E-12
RED MARR	1.090E-13	1.043E-11	1.045E-11	2.180E-15-1.000E+00	4.890E-12	1.310E-11
BONE SUR	1.750E-13	1.478E-11	1.482E-11	3.090E-15-1.000E+00	4.130E-12	6.610E-12
THYROID	1.150E-13	1.038E-11	1.041E-11	2.170E-15-1.000E+00	2.630E-09	4.170E-09
REMAINDER	1.070E-13	1.009E-11	1.012E-11	2.110E-15-1.000E+00	1.430E-11	2.890E-10
EFFECTIVE	1.140E-13	1.062E-11	1.065E-11	2.220E-15-1.000E+00	1.100E-10	2.260E-10
SKIN(FGR)	1.740E-13	4.832E-11	4.843E-11	1.010E-14-1.000E+00	0.000E+00	0.000E+00
Te-134						
GONADS	4.160E-14	3.299E-12	3.300E-12	9.120E-16-1.000E+00	7.900E-12	2.030E-11
BREAST	4.750E-14	3.176E-12	3.177E-12	8.780E-16-1.000E+00	7.960E-12	1.370E-11
LUNGS	4.100E-14	2.980E-12	2.981E-12	8.240E-16-1.000E+00	6.600E-11	1.290E-11
RED MARR	3.940E-14	3.009E-12	3.010E-12	8.320E-16-1.000E+00	8.380E-12	1.490E-11
BONE SUR	7.560E-14	4.883E-12	4.885E-12	1.350E-15-1.000E+00	7.780E-12	1.230E-11
THYROID	4.230E-14	3.100E-12	3.101E-12	8.570E-16-1.000E+00	5.560E-10	8.820E-10
REMAINDER	3.910E-14	2.923E-12	2.924E-12	8.080E-16-1.000E+00	1.090E-11	9.650E-11
EFFECTIVE	4.240E-14	3.136E-12	3.137E-12	8.670E-16-1.000E+00	3.230E-11	6.630E-11
SKIN(FGR)	6.350E-14	7.813E-12	7.815E-12	2.160E-15-1.000E+00	0.000E+00	0.000E+00
Th-226						
GONADS	7.810E-16	4.707E-14	4.708E-14	1.760E-17-1.000E+00	9.170E-12	1.830E-13
BREAST	9.010E-16	4.641E-14	4.641E-14	1.735E-17-1.000E+00	9.180E-12	8.740E-14
LUNGS	7.540E-16	4.162E-14	4.162E-14	1.556E-17-1.000E+00	7.820E-08	7.740E-14
RED MARR	6.960E-16	4.111E-14	4.111E-14	1.537E-17-1.000E+00	1.220E-10	6.070E-13
BONE SUR	1.884E-15	8.933E-14	8.934E-14	3.340E-17-1.000E+00	1.420E-09	6.250E-12
THYROID	7.850E-16	4.258E-14	4.258E-14	1.592E-17-1.000E+00	9.180E-12	4.880E-14
REMAINDER	7.130E-16	4.066E-14	4.066E-14	1.520E-17-1.000E+00	2.940E-11	8.320E-10
EFFECTIVE	7.980E-16	4.480E-14	4.480E-14	1.675E-17-1.000E+00	9.450E-09	2.500E-10
SKIN(FGR)	1.188E-15	6.794E-14	6.794E-14	2.540E-17-1.000E+00	0.000E+00	0.000E+00
Th-227						
GONADS	4.800E-15	3.120E-12	5.807E-11	1.090E-16-1.000E+00	2.960E-09	2.950E-10
BREAST	5.530E-15	3.091E-12	5.754E-11	1.080E-16-1.000E+00	2.980E-09	1.400E-10
LUNGS	4.610E-15	2.748E-12	5.115E-11	9.600E-17-1.000E+00	3.580E-05	1.250E-10
RED MARR	4.270E-15	2.708E-12	5.040E-11	9.460E-17-1.000E+00	1.300E-07	5.690E-09
BONE SUR	1.120E-14	5.810E-12	1.082E-10	2.030E-16-1.000E+00	1.580E-06	6.840E-08
THYROID	4.810E-15	2.799E-12	5.210E-11	9.780E-17-1.000E+00	2.940E-09	1.230E-10
REMAINDER	4.360E-15	2.685E-12	4.997E-11	9.380E-17-1.000E+00	2.060E-08	2.470E-08
EFFECTIVE	4.880E-15	2.977E-12	5.541E-11	1.040E-16-1.000E+00	4.370E-06	1.030E-08
SKIN(FGR)	6.500E-15	4.465E-12	8.311E-11	1.560E-16-1.000E+00	0.000E+00	0.000E+00
Th-228						
GONADS	9.120E-17	7.804E-14	1.633E-12	2.710E-18-1.000E+00	2.260E-07	2.530E-09
BREAST	1.090E-16	8.610E-14	1.802E-12	2.990E-18-1.000E+00	2.320E-07	2.330E-09
LUNGS	8.330E-17	5.212E-14	1.091E-12	1.810E-18-1.000E+00	6.910E-04	2.310E-09
RED MARR	7.320E-17	5.097E-14	1.067E-12	1.770E-18-1.000E+00	1.870E-05	1.930E-07
BONE SUR	2.640E-16	1.633E-13	3.417E-12	5.670E-18-1.000E+00	2.290E-04	2.370E-06
THYROID	8.880E-17	5.529E-14	1.157E-12	1.920E-18-1.000E+00	2.300E-07	2.300E-09
REMAINDER	7.840E-17	5.385E-14	1.127E-12	1.870E-18-1.000E+00	6.050E-07	3.860E-08
EFFECTIVE	9.200E-17	6.767E-14	1.416E-12	2.350E-18-1.000E+00	9.230E-05	1.070E-07
SKIN(FGR)	1.500E-16	2.805E-13	5.870E-12	9.740E-18-1.000E+00	0.000E+00	0.000E+00
Th-229						
GONADS	3.770E-15	2.578E-12	5.413E-11	8.950E-17-1.000E+00	1.180E-06	4.690E-09
BREAST	4.420E-15	2.601E-12	5.461E-11	9.030E-17-1.000E+00	1.180E-06	4.570E-09
LUNGS	3.500E-15	2.200E-12	4.621E-11	7.640E-17-1.000E+00	1.990E-03	4.560E-09
RED MARR	3.030E-15	2.068E-12	4.342E-11	7.180E-17-1.000E+00	4.600E-04	1.910E-06
BONE SUR	1.150E-14	6.739E-12	1.415E-10	2.340E-16-1.000E+00	5.730E-03	2.380E-05
THYROID	3.700E-15	2.244E-12	4.711E-11	7.790E-17-1.000E+00	1.180E-06	4.550E-09

REMAINDER	3.270E-15	2.146E-12	4.506E-11	7.450E-17-1.000E+00	3.020E-06	2.800E-08
EFFECTIVE	3.830E-15	2.460E-12	5.165E-11	8.540E-17-1.000E+00	4.670E-04	9.540E-07
SKIN(FGR)	5.410E-15	4.522E-12	9.495E-11	1.570E-16-1.000E+00	0.000E+00	0.000E+00
Th-230						
GONADS	1.800E-17	3.024E-14	6.350E-13	1.050E-18-1.000E+00	1.720E-07	6.820E-10
BREAST	2.380E-17	3.830E-14	8.044E-13	1.330E-18-1.000E+00	1.720E-07	6.800E-10
LUNGS	1.430E-17	1.014E-14	2.129E-13	3.520E-19-1.000E+00	3.000E-04	6.800E-10
RED MARR	1.220E-17	1.077E-14	2.262E-13	3.740E-19-1.000E+00	6.990E-05	2.890E-07
BONE SUR	5.290E-17	4.752E-14	9.979E-13	1.650E-18-1.000E+00	8.710E-04	3.600E-06
THYROID	1.630E-17	1.284E-14	2.697E-13	4.460E-19-1.000E+00	1.720E-07	6.800E-10
REMAINDER	1.370E-17	1.322E-14	2.776E-13	4.590E-19-1.000E+00	4.480E-07	1.540E-08
EFFECTIVE	1.740E-17	2.160E-14	4.536E-13	7.500E-19-1.000E+00	7.070E-05	1.480E-07
SKIN(FGR)	4.510E-17	2.065E-13	4.336E-12	7.170E-18-1.000E+00	0.000E+00	0.000E+00
Th-231						
GONADS	5.390E-16	6.264E-13	3.174E-12	2.420E-17-1.000E+00	6.950E-12	2.080E-11
BREAST	6.790E-16	7.119E-13	3.607E-12	2.750E-17-1.000E+00	1.420E-12	1.440E-12
LUNGS	4.350E-16	2.899E-13	1.469E-12	1.120E-17-1.000E+00	8.750E-10	1.430E-13
RED MARR	3.700E-16	2.796E-13	1.417E-12	1.080E-17-1.000E+00	2.780E-11	5.300E-12
BONE SUR	1.630E-15	1.237E-12	6.269E-12	4.780E-17-1.000E+00	3.150E-10	3.170E-12
THYROID	5.000E-16	3.650E-13	1.849E-12	1.410E-17-1.000E+00	3.090E-13	8.800E-15
REMAINDER	4.150E-16	3.313E-13	1.679E-12	1.280E-17-1.000E+00	3.910E-10	1.190E-09
EFFECTIVE	5.220E-16	4.789E-13	2.426E-12	1.850E-17-1.000E+00	2.370E-10	3.650E-10
SKIN(FGR)	2.520E-15	2.221E-12	1.125E-11	8.580E-17-1.000E+00	0.000E+00	0.000E+00
Th-232						
GONADS	9.340E-18	2.439E-14	5.123E-13	8.470E-19-1.000E+00	5.980E-07	1.250E-09
BREAST	1.360E-17	3.226E-14	6.774E-13	1.120E-18-1.000E+00	6.140E-07	1.260E-09
LUNGS	6.370E-18	5.011E-15	1.052E-13	1.740E-19-1.000E+00	9.400E-04	1.250E-09
RED MARR	5.520E-18	6.019E-15	1.264E-13	2.090E-19-1.000E+00	4.010E-04	1.480E-06
BONE SUR	2.600E-17	3.053E-14	6.411E-13	1.060E-18-1.000E+00	4.990E-03	1.850E-05
THYROID	7.900E-18	7.718E-15	1.621E-13	2.680E-19-1.000E+00	5.990E-07	1.210E-09
REMAINDER	6.340E-18	8.237E-15	1.730E-13	2.860E-19-1.000E+00	1.510E-06	1.470E-08
EFFECTIVE	8.720E-18	1.587E-14	3.332E-13	5.510E-19-1.000E+00	3.110E-04	7.380E-07
SKIN(FGR)	3.440E-17	1.976E-13	4.149E-12	6.860E-18-1.000E+00	0.000E+00	0.000E-00
Th-234						
GONADS	1.042E-15	7.140E-13	1.368E-11	2.497E-17-1.000E+00	2.110E-11	3.120E-11
BREAST	1.206E-15	7.069E-13	1.354E-11	2.472E-17-1.000E+00	1.660E-11	3.570E-12
LUNGS	9.936E-16	6.114E-13	1.171E-11	2.138E-17-1.000E+00	6.390E-08	7.050E-13
RED MARR	9.177E-16	5.939E-13	1.138E-11	2.077E-17-1.000E+00	2.560E-10	1.840E-11
BONE SUR	2.358E-15	1.472E-12	2.818E-11	5.145E-17-1.000E+00	6.290E-10	2.080E-11
THYROID	1.042E-15	6.294E-13	1.206E-11	2.201E-17-1.000E+00	1.270E-11	2.880E-13
REMAINDER	9.437E-16	6.017E-13	1.153E-11	2.104E-17-1.000E+00	5.800E-09	1.230E-08
EFFECTIVE	1.056E-15	6.746E-13	1.292E-11	2.359E-17-1.000E+00	9.470E-09	3.690E-09
SKIN(FGR)	5.544E-14	2.682E-10	5.142E-09	9.388E-15-1.000E+00	0.000E+00	0.000E+00
Ti-44						
GONADS	5.550E-15	3.773E-12	7.922E-11	1.310E-16-1.000E+00	1.760E-08	4.700E-09
BREAST	6.580E-15	3.773E-12	7.922E-11	1.310E-16-1.000E+00	3.990E-08	2.540E-09
LUNGS	4.890E-15	3.456E-12	7.257E-11	1.200E-16-1.000E+00	1.970E-06	2.350E-09
RED MARR	3.930E-15	2.995E-12	6.289E-11	1.040E-16-1.000E+00	4.170E-08	3.040E-09
BONE SUR	1.910E-14	1.348E-11	2.830E-10	4.680E-16-1.000E+00	3.490E-08	2.560E-09
THYROID	5.290E-15	3.427E-12	7.196E-11	1.190E-16-1.000E+00	3.700E-08	2.310E-09
REMAINDER	4.540E-15	3.312E-12	6.954E-11	1.150E-16-1.000E+00	6.910E-08	1.300E-08
EFFECTIVE	5.530E-15	3.802E-12	7.982E-11	1.320E-16-1.000E+00	2.750E-07	6.250E-09
SKIN(FGR)	6.790E-15	4.291E-12	9.010E-11	1.490E-16-1.000E+00	0.000E+00	0.000E+00
Ti-45						
GONADS	4.080E-14	1.208E-11	1.448E-11	9.050E-16-1.000E+00	7.800E-12	6.840E-11
BREAST	4.670E-14	1.160E-11	1.390E-11	8.690E-16-1.000E+00	4.340E-12	1.150E-11
LUNGS	4.050E-14	1.100E-11	1.318E-11	8.240E-16-1.000E+00	3.140E-10	4.620E-12
RED MARR	3.910E-14	1.111E-11	1.331E-11	8.320E-16-1.000E+00	4.690E-12	1.640E-11
BONE SUR	7.200E-14	1.683E-11	2.016E-11	1.260E-15-1.000E+00	2.960E-12	5.760E-12
THYROID	4.160E-14	1.150E-11	1.377E-11	8.610E-16-1.000E+00	2.870E-12	5.600E-13
REMAINDER	3.870E-14	1.079E-11	1.293E-11	8.080E-16-1.000E+00	5.280E-11	4.690E-10
EFFECTIVE	4.180E-14	1.150E-11	1.377E-11	8.610E-16-1.000E+00	5.690E-11	1.620E-10
SKIN(FGR)	7.070E-14	5.835E-11	6.991E-11	4.370E-15-1.000E+00	0.000E+00	0.000E+00

Tl-194							
GONADS	3.620E-14	2.279E-12	2.280E-12	7.980E-16	1.000E+00	5.750E-13	1.460E-12
BREAST	4.150E-14	2.194E-12	2.194E-12	7.680E-16	1.000E+00	9.660E-13	1.850E-12
LUNGS	3.570E-14	2.077E-12	2.077E-12	7.270E-16	1.000E+00	9.400E-12	2.170E-12
RED MARR	3.410E-14	2.079E-12	2.080E-12	7.280E-16	1.000E+00	1.090E-12	1.900E-12
BONE SUR	6.760E-14	3.542E-12	3.542E-12	1.240E-15	1.000E+00	8.950E-13	1.440E-12
THYROID	3.680E-14	2.154E-12	2.154E-12	7.540E-16	1.000E+00	7.980E-13	9.500E-13
REMAINDER	3.400E-14	2.028E-12	2.028E-12	7.100E-16	1.000E+00	2.970E-12	1.650E-11
EFFECTIVE	3.700E-14	2.177E-12	2.177E-12	7.620E-16	1.000E+00	2.490E-12	6.150E-12
SKIN(FGR)	4.410E-14	2.802E-12	2.802E-12	9.810E-16	1.000E+00	0.000E+00	0.000E+00
Tl-194m							
GONADS	1.090E-13	6.785E-12	6.786E-12	2.390E-15	1.000E+00	2.000E-12	5.010E-12
BREAST	1.240E-13	6.502E-12	6.502E-12	2.290E-15	1.000E+00	3.160E-12	6.100E-12
LUNGS	1.080E-13	6.161E-12	6.161E-12	2.170E-15	1.000E+00	5.810E-11	7.030E-12
RED MARR	1.040E-13	6.218E-12	6.218E-12	2.190E-15	1.000E+00	3.330E-12	5.960E-12
BONE SUR	1.920E-13	9.795E-12	9.795E-12	3.450E-15	1.000E+00	2.810E-12	4.700E-12
THYROID	1.110E-13	6.416E-12	6.417E-12	2.260E-15	1.000E+00	2.750E-12	3.520E-12
REMAINDER	1.030E-13	6.047E-12	6.048E-12	2.130E-15	1.000E+00	1.200E-11	7.500E-11
EFFECTIVE	1.110E-13	6.445E-12	6.445E-12	2.270E-15	1.000E+00	1.210E-11	2.650E-11
SKIN(FGR)	1.470E-13	1.525E-11	1.525E-11	5.370E-15	1.000E+00	0.000E+00	0.000E+00
Tl-195							
GONADS	6.170E-14	7.348E-12	7.410E-12	1.230E-15	1.000E+00	3.770E-12	8.740E-12
BREAST	7.000E-14	7.049E-12	7.109E-12	1.180E-15	1.000E+00	4.610E-12	8.330E-12
LUNGS	6.190E-14	6.811E-12	6.868E-12	1.140E-15	1.000E+00	5.260E-11	8.840E-12
RED MARR	6.080E-14	6.930E-12	6.989E-12	1.160E-15	1.000E+00	5.260E-12	9.190E-12
BONE SUR	9.720E-14	1.034E-11	1.042E-11	1.730E-15	1.000E+00	4.540E-12	7.850E-12
THYROID	6.340E-14	6.691E-12	6.748E-12	1.120E-15	1.000E+00	4.090E-12	6.430E-12
REMAINDER	5.970E-14	6.751E-12	6.808E-12	1.130E-15	1.000E+00	1.230E-11	5.040E-11
EFFECTIVE	6.340E-14	7.049E-12	7.109E-12	1.180E-15	1.000E+00	1.250E-11	2.110E-11
SKIN(FGR)	7.520E-14	1.159E-11	1.169E-11	1.940E-15	1.000E+00	0.000E+00	0.000E+00
Tl-197							
GONADS	1.890E-14	5.139E-12	5.989E-12	4.060E-16	1.000E+00	4.660E-12	9.610E-12
BREAST	2.170E-14	4.961E-12	5.782E-12	3.920E-16	1.000E+00	5.110E-12	8.930E-12
LUNGS	1.850E-14	4.708E-12	5.487E-12	3.720E-16	1.000E+00	5.510E-11	9.460E-12
RED MARR	1.760E-14	4.658E-12	5.428E-12	3.680E-16	1.000E+00	6.770E-12	1.170E-11
BONE SUR	3.720E-14	9.088E-12	1.059E-11	7.180E-16	1.000E+00	5.960E-12	1.030E-11
THYROID	1.910E-14	4.759E-12	5.546E-12	3.760E-16	1.000E+00	4.640E-12	7.880E-12
REMAINDER	1.770E-14	4.594E-12	5.354E-12	3.630E-16	1.000E+00	1.230E-11	3.800E-11
EFFECTIVE	1.930E-14	4.949E-12	5.767E-12	3.910E-16	1.000E+00	1.340E-11	1.820E-11
SKIN(FGR)	2.430E-14	8.341E-12	9.720E-12	6.590E-16	1.000E+00	0.000E+00	0.000E+00
Tl-198							
GONADS	9.810E-14	3.464E-11	5.340E-11	1.940E-15	1.000E+00	2.350E-11	5.070E-11
BREAST	1.110E-13	3.322E-11	5.120E-11	1.860E-15	1.000E+00	2.500E-11	4.180E-11
LUNGS	9.870E-14	3.214E-11	4.955E-11	1.800E-15	1.000E+00	1.300E-10	4.180E-11
RED MARR	9.710E-14	3.268E-11	5.037E-11	1.830E-15	1.000E+00	2.770E-11	4.690E-11
BONE SUR	1.520E-13	4.732E-11	7.295E-11	2.650E-15	1.000E+00	2.380E-11	4.080E-11
THYROID	1.010E-13	3.143E-11	4.845E-11	1.760E-15	1.000E+00	2.240E-11	3.650E-11
REMAINDER	9.530E-14	3.179E-11	4.900E-11	1.780E-15	1.000E+00	4.830E-11	1.220E-10
EFFECTIVE	1.010E-13	3.339E-11	5.147E-11	1.870E-15	1.000E+00	4.440E-11	6.860E-11
SKIN(FGR)	1.160E-13	4.268E-11	6.579E-11	2.390E-15	1.000E+00	0.000E+00	0.000E+00
Tl-198m							
GONADS	5.570E-14	1.133E-11	1.195E-11	1.230E-15	1.000E+00	9.520E-12	2.090E-11
BREAST	6.370E-14	1.087E-11	1.146E-11	1.180E-15	1.000E+00	1.100E-11	1.930E-11
LUNGS	5.490E-14	1.032E-11	1.088E-11	1.120E-15	1.000E+00	1.220E-10	2.020E-11
RED MARR	5.260E-14	1.032E-11	1.088E-11	1.120E-15	1.000E+00	1.230E-11	2.170E-11
BONE SUR	1.030E-13	1.704E-11	1.797E-11	1.850E-15	1.000E+00	1.070E-11	1.890E-11
THYROID	5.660E-14	1.069E-11	1.127E-11	1.160E-15	1.000E+00	1.000E-11	1.650E-11
REMAINDER	5.240E-14	1.004E-11	1.059E-11	1.090E-15	1.000E+00	2.700E-11	9.580E-11
EFFECTIVE	5.690E-14	1.078E-11	1.136E-11	1.170E-15	1.000E+00	2.890E-11	4.300E-11
SKIN(FGR)	7.400E-14	1.455E-11	1.535E-11	1.580E-15	1.000E+00	0.000E+00	0.000E+00
Tl-199							
GONADS	1.110E-14	5.031E-12	9.557E-12	2.480E-16	1.000E+00	6.450E-12	1.340E-11
BREAST	1.280E-14	4.909E-12	9.326E-12	2.420E-16	1.000E+00	6.900E-12	1.220E-11

LUNGS	1.070E-14	4.584E-12	8.709E-12	2.260E-16-1.000E+00	8.270E-11	1.290E-11
RED MARR	9.790E-15	4.442E-12	8.440E-12	2.190E-16-1.000E+00	9.570E-12	1.690E-11
BONE SUR	2.610E-14	1.051E-11	1.996E-11	5.180E-16-1.000E+00	8.370E-12	1.490E-11
THYROID	1.110E-14	4.666E-12	8.864E-12	2.300E-16-1.000E+00	6.240E-12	1.120E-11
REMAINDER	1.010E-14	4.442E-12	8.440E-12	2.190E-16-1.000E+00	1.540E-11	4.200E-11
EFFECTIVE	1.130E-14	4.868E-12	9.249E-12	2.400E-16-1.000E+00	1.880E-11	2.210E-11
SKIN(FGR)	1.490E-14	6.349E-12	1.206E-11	3.130E-16-1.000E+00	0.000E+00	0.000E+00
Tl-200						
GONADS	6.270E-14	3.399E-11	1.755E-10	1.310E-15-1.000E+00	8.530E-11	1.550E-10
BREAST	7.130E-14	3.243E-11	1.675E-10	1.250E-15-1.000E+00	8.320E-11	1.340E-10
LUNGS	6.240E-14	3.114E-11	1.608E-10	1.200E-15-1.000E+00	2.780E-10	1.340E-10
RED MARR	6.060E-14	3.165E-11	1.635E-10	1.220E-15-1.000E+00	9.780E-11	1.600E-10
BONE SUR	1.050E-13	4.878E-11	2.519E-10	1.880E-15-1.000E+00	8.570E-11	1.410E-10
THYROID	6.410E-14	3.139E-11	1.621E-10	1.210E-15-1.000E+00	7.900E-11	1.270E-10
REMAINDER	5.980E-14	3.062E-11	1.581E-10	1.180E-15-1.000E+00	1.420E-10	2.650E-10
EFFECTIVE	6.420E-14	3.243E-11	1.675E-10	1.250E-15-1.000E+00	1.270E-10	1.820E-10
SKIN(FGR)	7.500E-14	4.255E-11	2.197E-10	1.640E-15-1.000E+00	0.000E+00	0.000E+00
Tl-201						
GONADS	3.770E-15	2.441E-12	2.661E-11	8.800E-17-1.000E+00	3.660E-11	6.190E-11
BREAST	4.440E-15	2.432E-12	2.652E-11	8.770E-17-1.000E+00	3.320E-11	5.410E-11
LUNGS	3.390E-15	2.222E-12	2.422E-11	8.010E-17-1.000E+00	1.690E-10	5.780E-11
RED MARR	2.810E-15	1.972E-12	2.150E-11	7.110E-17-1.000E+00	5.370E-11	8.710E-11
BONE SUR	1.230E-14	7.904E-12	8.617E-11	2.850E-16-1.000E+00	4.770E-11	7.760E-11
THYROID	3.630E-15	2.208E-12	2.407E-11	7.960E-17-1.000E+00	3.140E-11	5.190E-11
REMAINDER	3.160E-15	2.130E-12	2.322E-11	7.680E-17-1.000E+00	6.710E-11	1.210E-10
EFFECTIVE	3.780E-15	2.421E-12	2.640E-11	8.730E-17-1.000E+00	6.340E-11	8.110E-11
SKIN(FGR)	4.890E-15	3.189E-12	3.477E-11	1.150E-16-1.000E+00	0.000E+00	0.000E+00
Tl-202						
GONADS	2.140E-14	1.369E-11	2.396E-10	4.800E-16-1.000E+00	2.190E-10	3.530E-10
BREAST	2.460E-14	1.324E-11	2.316E-10	4.640E-16-1.000E+00	1.900E-10	2.980E-10
LUNGS	2.090E-14	1.247E-11	2.182E-10	4.370E-16-1.000E+00	3.400E-10	3.180E-10
RED MARR	1.970E-14	1.232E-11	2.157E-10	4.320E-16-1.000E+00	2.550E-10	4.010E-10
BONE SUR	4.330E-14	2.305E-11	4.034E-10	8.080E-16-1.000E+00	2.240E-10	3.530E-10
THYROID	2.160E-14	1.290E-11	2.257E-10	4.520E-16-1.000E+00	1.810E-10	2.850E-10
REMAINDER	1.990E-14	1.215E-11	2.127E-10	4.260E-16-1.000E+00	3.290E-10	5.330E-10
EFFECTIVE	2.180E-14	1.310E-11	2.291E-10	4.590E-16-1.000E+00	2.660E-10	3.980E-10
SKIN(FGR)	2.630E-14	1.626E-11	2.846E-10	5.700E-16-1.000E+00	0.000E+00	0.000E+00
Tl-204						
GONADS	5.640E-17	4.464E-14	9.358E-13	1.550E-18-1.000E+00	4.140E-10	6.570E-10
BREAST	6.720E-17	4.521E-14	9.479E-13	1.570E-18-1.000E+00	4.140E-10	6.570E-10
LUNGS	4.920E-17	3.744E-14	7.849E-13	1.300E-18-1.000E+00	1.130E-09	6.570E-10
RED MARR	4.010E-17	3.254E-14	6.822E-13	1.130E-18-1.000E+00	4.150E-10	6.590E-10
BONE SUR	1.860E-16	1.428E-13	2.995E-12	4.960E-18-1.000E+00	4.150E-10	6.590E-10
THYROID	5.370E-17	3.830E-14	8.030E-13	1.330E-18-1.000E+00	4.140E-10	6.570E-10
REMAINDER	4.590E-17	3.628E-14	7.607E-13	1.260E-18-1.000E+00	9.140E-10	1.490E-09
EFFECTIVE	5.590E-17	4.262E-14	8.935E-13	1.480E-18-1.000E+00	6.500E-10	9.080E-10
SKIN(FGR)	1.240E-14	2.747E-11	5.760E-10	9.540E-16-1.000E+00	0.000E+00	0.000E+00
Tl-206						
GONADS	6.740E-17	7.962E-16	7.962E-16	2.190E-18-1.000E+00	0.000E+00	0.000E+00
BREAST	7.930E-17	8.035E-16	8.035E-16	2.210E-18-1.000E+00	0.000E+00	0.000E+00
LUNGS	6.130E-17	6.290E-16	6.290E-16	1.730E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	5.490E-17	5.890E-16	5.890E-16	1.620E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.740E-16	1.785E-15	1.785E-15	4.910E-18-1.000E+00	0.000E+00	0.000E+00
THYROID	6.600E-17	6.689E-16	6.689E-16	1.840E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.810E-17	6.217E-16	6.217E-16	1.710E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	6.730E-17	7.235E-16	7.235E-16	1.990E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.360E-14	2.141E-12	2.141E-12	5.890E-15-1.000E+00	0.000E+00	0.000E+00
Tl-207						
GONADS	1.600E-16	1.668E-15	1.668E-15	4.040E-18-1.000E+00	0.000E+00	0.000E+00
BREAST	1.840E-16	1.635E-15	1.635E-15	3.960E-18-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.550E-16	1.420E-15	1.420E-15	3.440E-18-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.470E-16	1.404E-15	1.404E-15	3.400E-18-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.030E-16	2.886E-15	2.886E-15	6.990E-18-1.000E+00	0.000E+00	0.000E+00

THYROID	1.620E-16	1.495E-15	1.495E-15	3.620E-18-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.470E-16	1.404E-15	1.404E-15	3.400E-18-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.620E-16	1.553E-15	1.553E-15	3.760E-18-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.060E-14	2.151E-12	2.151E-12	5.210E-15-1.000E+00	0.000E+00	0.000E+00
Tl-208						
GONADS	1.720E-13	8.212E-13	8.212E-13	3.090E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	1.920E-13	7.813E-13	7.813E-13	2.940E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.750E-13	7.653E-13	7.653E-13	2.880E-15-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.740E-13	7.866E-13	7.866E-13	2.960E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.420E-13	1.036E-12	1.036E-12	3.900E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	1.780E-13	7.308E-13	7.308E-13	2.750E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.700E-13	7.707E-13	7.707E-13	2.900E-15-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.770E-13	7.919E-13	7.919E-13	2.980E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.340E-13	2.596E-12	2.596E-12	9.770E-15-1.000E+00	0.000E+00	0.000E+00
Tl-209						
GONADS	9.950E-14	3.752E-13	3.752E-13	1.970E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	1.130E-13	3.580E-13	3.580E-13	1.880E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.000E-13	3.485E-13	3.485E-13	1.830E-15-1.000E+00	0.000E+00	0.000E+00
RED MARR	9.860E-14	3.561E-13	3.561E-13	1.870E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.550E-13	5.123E-13	5.123E-13	2.690E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	1.020E-13	3.390E-13	3.390E-13	1.780E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	9.690E-14	3.466E-13	3.466E-13	1.820E-15-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.020E-13	3.618E-13	3.618E-13	1.900E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.590E-13	1.880E-12	1.880E-12	9.870E-15-1.000E+00	0.000E+00	0.000E+00
Tm-162						
GONADS	8.780E-14	3.212E-12	3.212E-12	1.710E-15-1.000E+00	3.620E-13	6.240E-12
BREAST	9.910E-14	3.081E-12	3.081E-12	1.640E-15-1.000E+00	8.650E-13	2.430E-12
LUNGS	8.820E-14	2.968E-12	2.968E-12	1.580E-15-1.000E+00	4.110E-11	2.160E-12
RED MARR	8.700E-14	3.024E-12	3.024E-12	1.610E-15-1.000E+00	9.120E-13	2.560E-12
BONE SUR	1.330E-13	4.377E-12	4.377E-12	2.330E-15-1.000E+00	7.880E-13	1.150E-12
THYROID	9.040E-14	2.912E-12	2.912E-12	1.550E-15-1.000E+00	7.280E-13	2.320E-13
REMAINDER	8.520E-14	2.949E-12	2.949E-12	1.570E-15-1.000E+00	2.080E-12	6.430E-11
EFFECTIVE	9.010E-14	3.081E-12	3.081E-12	1.640E-15-1.000E+00	5.930E-12	2.180E-11
SKIN(FGR)	1.240E-13	9.955E-12	9.955E-12	5.300E-15-1.000E+00	0.000E+00	0.000E+00
Tm-166						
GONADS	9.110E-14	3.736E-11	7.278E-11	1.820E-15-1.000E+00	6.190E-11	3.540E-10
BREAST	1.030E-13	3.572E-11	6.959E-11	1.740E-15-1.000E+00	2.450E-11	5.290E-11
LUNGS	9.140E-14	3.449E-11	6.719E-11	1.680E-15-1.000E+00	3.100E-10	1.590E-11
RED MARR	9.000E-14	3.510E-11	6.839E-11	1.710E-15-1.000E+00	3.470E-11	8.440E-11
BONE SUR	1.400E-13	5.153E-11	1.004E-10	2.510E-15-1.000E+00	4.480E-11	2.890E-11
THYROID	9.370E-14	3.408E-11	6.639E-11	1.660E-15-1.000E+00	1.390E-11	2.210E-12
REMAINDER	8.820E-14	3.428E-11	6.679E-11	1.670E-15-1.000E+00	1.310E-10	7.480E-10
EFFECTIVE	9.350E-14	3.592E-11	6.999E-11	1.750E-15-1.000E+00	1.020E-10	3.340E-10
SKIN(FGR)	1.080E-13	4.968E-11	9.678E-11	2.420E-15-1.000E+00	0.000E+00	0.000E+00
Tm-167						
GONADS	6.080E-15	4.266E-12	7.058E-11	1.500E-16-1.000E+00	9.390E-11	2.080E-10
BREAST	7.130E-15	4.210E-12	6.963E-11	1.480E-16-1.000E+00	3.880E-11	2.030E-11
LUNGS	5.530E-15	3.698E-12	6.117E-11	1.300E-16-1.000E+00	3.640E-09	2.200E-12
RED MARR	4.900E-15	3.385E-12	5.599E-11	1.190E-16-1.000E+00	2.800E-10	6.560E-11
BONE SUR	1.600E-14	1.064E-11	1.760E-10	3.740E-16-1.000E+00	2.090E-09	2.730E-11
THYROID	5.950E-15	3.783E-12	6.258E-11	1.330E-16-1.000E+00	1.960E-11	1.880E-13
REMAINDER	5.220E-15	3.584E-12	5.928E-11	1.260E-16-1.000E+00	7.800E-10	1.870E-09
EFFECTIVE	6.060E-15	4.067E-12	6.728E-11	1.430E-16-1.000E+00	7.970E-10	6.260E-10
SKIN(FGR)	1.170E-14	5.006E-12	8.281E-11	1.760E-16-1.000E+00	0.000E+00	0.000E+00
Tm-170						
GONADS	2.270E-16	1.767E-13	3.644E-12	6.140E-18-1.000E+00	1.450E-10	9.560E-12
BREAST	2.720E-16	1.764E-13	3.638E-12	6.130E-18-1.000E+00	1.450E-10	1.300E-12
LUNGS	1.940E-16	1.511E-13	3.116E-12	5.250E-18-1.000E+00	3.900E-08	4.860E-13
RED MARR	1.560E-16	1.272E-13	2.623E-12	4.420E-18-1.000E+00	9.320E-09	3.080E-11
BONE SUR	7.530E-16	5.927E-13	1.223E-11	2.060E-17-1.000E+00	1.390E-08	4.140E-11
THYROID	2.150E-16	1.542E-13	3.181E-12	5.360E-18-1.000E+00	1.420E-10	4.070E-13
REMAINDER	1.810E-16	1.447E-13	2.985E-12	5.030E-18-1.000E+00	2.780E-09	4.760E-09
EFFECTIVE	2.230E-16	1.701E-13	3.508E-12	5.910E-18-1.000E+00	7.110E-09	1.430E-09

SKIN(FGR)	1.810E-14	6.100E-11	1.258E-09	2.120E-15	-1.000E+00	0.000E+00	0.000E+00
Tm-171							
GONADS	2.260E-17	1.938E-14	4.056E-13	6.730E-19	-1.000E+00	5.810E-11	1.380E-12
BREAST	2.760E-17	1.947E-14	4.074E-13	6.760E-19	-1.000E+00	5.850E-11	2.650E-13
LUNGS	1.800E-17	1.613E-14	3.375E-13	5.600E-19	-1.000E+00	3.990E-09	1.600E-13
RED MARR	1.360E-17	1.253E-14	2.622E-13	4.350E-19	-1.000E+00	3.810E-09	1.040E-11
BONE SUR	7.680E-17	7.199E-14	1.507E-12	2.500E-18	-1.000E+00	4.630E-08	1.200E-10
THYROID	2.080E-17	1.647E-14	3.447E-13	5.720E-19	-1.000E+00	5.750E-11	1.480E-13
REMAINDER	1.680E-17	1.535E-14	3.212E-13	5.330E-19	-1.000E+00	3.880E-10	3.710E-10
EFFECTIVE	2.150E-17	1.846E-14	3.863E-13	6.410E-19	-1.000E+00	2.470E-09	1.160E-10
SKIN(FGR)	3.170E-17	2.278E-14	4.767E-13	7.910E-19	-1.000E+00	0.000E+00	0.000E+00
Tm-172							
GONADS	2.350E-14	1.277E-11	1.284E-10	4.630E-16	-1.000E+00	1.240E-10	3.210E-10
BREAST	2.660E-14	1.222E-11	1.229E-10	4.430E-16	-1.000E+00	4.450E-11	4.320E-11
LUNGS	2.360E-14	1.186E-11	1.193E-10	4.300E-16	-1.000E+00	5.230E-09	9.160E-12
RED MARR	2.340E-14	1.214E-11	1.220E-10	4.400E-16	-1.000E+00	2.580E-10	7.170E-11
BONE SUR	3.470E-14	1.704E-11	1.714E-10	6.180E-16	-1.000E+00	5.060E-10	2.610E-11
THYROID	2.420E-14	1.158E-11	1.165E-10	4.200E-16	-1.000E+00	2.530E-11	1.470E-12
REMAINDER	2.280E-14	1.180E-11	1.187E-10	4.280E-16	-1.000E+00	2.040E-09	5.850E-09
EFFECTIVE	2.410E-14	1.230E-11	1.237E-10	4.460E-16	-1.000E+00	1.320E-09	1.850E-09
SKIN(FGR)	5.760E-14	1.578E-10	1.587E-09	5.720E-15	-1.000E+00	0.000E+00	0.000E+00
Tm-173							
GONADS	1.810E-14	8.448E-12	1.725E-11	4.030E-16	-1.000E+00	1.830E-11	9.720E-11
BREAST	2.070E-14	8.154E-12	1.665E-11	3.890E-16	-1.000E+00	6.950E-12	1.280E-11
LUNGS	1.780E-14	7.672E-12	1.566E-11	3.660E-16	-1.000E+00	5.800E-10	3.220E-12
RED MARR	1.700E-14	7.714E-12	1.575E-11	3.680E-16	-1.000E+00	1.850E-11	2.220E-11
BONE SUR	3.470E-14	1.268E-11	2.589E-11	6.050E-16	-1.000E+00	1.680E-11	7.390E-12
THYROID	1.830E-14	7.965E-12	1.626E-11	3.800E-16	-1.000E+00	4.250E-12	3.320E-13
REMAINDER	1.700E-14	7.504E-12	1.532E-11	3.580E-16	-1.000E+00	1.740E-10	1.020E-09
EFFECTIVE	1.850E-14	8.049E-12	1.643E-11	3.840E-16	-1.000E+00	1.300E-10	3.370E-10
SKIN(FGR)	3.890E-14	4.800E-11	9.800E-11	2.290E-15	-1.000E+00	0.000E+00	0.000E+00
Tm-175							
GONADS	5.010E-14	1.408E-12	1.408E-12	1.070E-15	-1.000E+00	2.030E-13	2.500E-12
BREAST	5.710E-14	1.355E-12	1.355E-12	1.030E-15	-1.000E+00	4.280E-13	1.090E-12
LUNGS	4.990E-14	1.291E-12	1.291E-12	9.810E-16	-1.000E+00	4.390E-11	1.060E-12
RED MARR	4.850E-14	1.310E-12	1.310E-12	9.960E-16	-1.000E+00	6.530E-13	1.080E-12
BONE SUR	8.250E-14	1.934E-12	1.934E-12	1.470E-15	-1.000E+00	2.890E-12	5.060E-13
THYROID	5.130E-14	1.329E-12	1.329E-12	1.010E-15	-1.000E+00	3.940E-13	9.820E-14
REMAINDER	4.780E-14	1.270E-12	1.270E-12	9.650E-16	-1.000E+00	2.330E-12	5.730E-11
EFFECTIVE	5.130E-14	1.342E-12	1.342E-12	1.020E-15	-1.000E+00	6.260E-12	1.830E-11
SKIN(FGR)	9.100E-14	7.723E-12	7.723E-12	5.870E-15	-1.000E+00	0.000E+00	0.000E+00
U-230							
GONADS	4.051E-16	2.819E-13	5.701E-12	1.060E-17	-1.000E+00	8.962E-10	3.582E-10
BREAST	4.766E-16	2.959E-13	5.965E-12	1.109E-17	-1.000E+00	8.912E-10	3.341E-10
LUNGS	3.782E-16	2.109E-13	4.306E-12	8.010E-18	-1.000E+00	4.358E-05	3.311E-10
RED MARR	3.373E-16	2.066E-13	4.215E-12	7.840E-18	-1.000E+00	3.292E-08	1.140E-08
BONE SUR	1.142E-15	5.932E-13	1.206E-11	2.243E-17	-1.000E+00	3.974E-07	1.370E-07
THYROID	4.000E-16	2.208E-13	4.500E-12	8.370E-18	-1.000E+00	8.872E-10	3.310E-10
REMAINDER	3.562E-16	2.127E-13	4.333E-12	8.060E-18	-1.000E+00	7.033E-08	1.028E-07
EFFECTIVE	4.113E-16	2.530E-13	5.135E-12	9.550E-18	-1.000E+00	5.269E-06	3.645E-08
SKIN(FGR)	7.440E-16	7.146E-13	1.416E-11	2.630E-17	-1.000E+00	0.000E+00	0.000E+00
U-231							
GONADS	2.910E-15	2.175E-12	2.783E-11	7.760E-17	-1.000E+00	4.150E-11	9.690E-11
BREAST	3.460E-15	2.247E-12	2.876E-11	8.020E-17	-1.000E+00	1.070E-11	9.030E-12
LUNGS	2.650E-15	1.656E-12	2.119E-11	5.910E-17	-1.000E+00	1.510E-09	1.020E-12
RED MARR	2.270E-15	1.555E-12	1.990E-11	5.550E-17	-1.000E+00	2.560E-11	3.130E-11
BONE SUR	9.260E-15	5.576E-12	7.137E-11	1.990E-16	-1.000E+00	5.030E-11	1.450E-11
THYROID	2.840E-15	1.757E-12	2.249E-11	6.270E-17	-1.000E+00	3.580E-12	7.730E-14
REMAINDER	2.480E-15	1.651E-12	2.112E-11	5.890E-17	-1.000E+00	4.140E-10	9.680E-10
EFFECTIVE	2.950E-15	1.981E-12	2.535E-11	7.070E-17	-1.000E+00	3.220E-10	3.200E-10
SKIN(FGR)	3.820E-15	4.484E-12	5.738E-11	1.600E-16	-1.000E+00	0.000E+00	0.000E+00
U-232							
GONADS	1.550E-17	4.666E-14	9.797E-13	1.620E-18	-1.000E+00	1.690E-08	3.340E-10

BREAST	2.320E-17	6.019E-14	1.264E-12	2.090E-18	-1.000E+00	2.660E-08	3.330E-10
LUNGS	9.840E-18	7.805E-15	1.639E-13	2.710E-19	-1.000E+00	1.480E-03	3.320E-10
RED MARR	8.990E-18	1.040E-14	2.183E-13	3.610E-19	-1.000E+00	4.680E-07	1.680E-08
BONE SUR	3.860E-17	5.126E-14	1.076E-12	1.780E-18	-1.000E+00	7.140E-06	2.650E-07
THYROID	1.290E-17	1.408E-14	2.957E-13	4.890E-19	-1.000E+00	2.430E-08	3.250E-10
REMAINDER	1.000E-17	1.420E-14	2.981E-13	4.930E-19	-1.000E+00	5.860E-07	2.830E-08
EFFECTIVE	1.420E-17	2.909E-14	6.108E-13	1.010E-18	-1.000E+00	1.780E-04	1.870E-08
SKIN(FGR)	5.920E-17	3.168E-13	6.652E-12	1.100E-17	-1.000E+00	0.000E+00	0.000E+00
U-233							
GONADS	1.690E-17	2.995E-14	6.290E-13	1.040E-18	-1.000E+00	2.690E-09	1.070E-10
BREAST	2.220E-17	3.686E-14	7.741E-13	1.280E-18	-1.000E+00	2.730E-09	1.050E-10
LUNGS	1.350E-17	9.216E-15	1.935E-13	3.200E-19	-1.000E+00	3.040E-04	1.050E-10
RED MARR	1.240E-17	1.040E-14	2.183E-13	3.610E-19	-1.000E+00	7.390E-08	2.950E-09
BONE SUR	4.120E-17	3.830E-14	8.044E-13	1.330E-18	-1.000E+00	1.160E-06	4.620E-08
THYROID	1.550E-17	1.273E-14	2.673E-13	4.420E-19	-1.000E+00	2.700E-09	1.050E-10
REMAINDER	1.310E-17	1.238E-14	2.601E-13	4.300E-19	-1.000E+00	1.080E-07	1.780E-08
EFFECTIVE	1.630E-17	2.062E-14	4.330E-13	7.160E-19	-1.000E+00	3.660E-05	7.150E-09
SKIN(FGR)	4.570E-17	1.711E-13	3.593E-12	5.940E-18	-1.000E+00	0.000E+00	0.000E+00
U-234							
GONADS	8.790E-18	3.600E-14	7.560E-13	1.250E-18	-1.000E+00	2.650E-09	1.060E-10
BREAST	1.440E-17	4.723E-14	9.919E-13	1.640E-18	-1.000E+00	2.680E-09	1.030E-10
LUNGS	4.380E-18	4.032E-15	8.467E-14	1.400E-19	-1.000E+00	2.980E-04	1.030E-10
RED MARR	4.200E-18	6.365E-15	1.337E-13	2.210E-19	-1.000E+00	7.220E-08	2.880E-09
BONE SUR	1.990E-17	3.514E-14	7.379E-13	1.220E-18	-1.000E+00	1.130E-06	4.520E-08
THYROID	6.690E-18	9.245E-15	1.941E-13	3.210E-19	-1.000E+00	2.650E-09	1.030E-10
REMAINDER	4.800E-18	9.446E-15	1.984E-13	3.280E-19	-1.000E+00	1.060E-07	1.770E-08
EFFECTIVE	7.630E-18	2.154E-14	4.524E-13	7.480E-19	-1.000E+00	3.580E-05	7.060E-09
SKIN(FGR)	4.250E-17	2.618E-13	5.498E-12	9.090E-18	-1.000E+00	0.000E+00	0.000E+00
U-235							
GONADS	7.050E-15	4.406E-12	9.253E-11	1.530E-16	-1.000E+00	2.840E-09	3.340E-10
BREAST	8.110E-15	4.349E-12	9.132E-11	1.510E-16	-1.000E+00	5.370E-09	1.210E-10
LUNGS	6.750E-15	3.974E-12	8.346E-11	1.380E-16	-1.000E+00	2.760E-04	1.010E-10
RED MARR	6.150E-15	3.917E-12	8.225E-11	1.360E-16	-1.000E+00	7.150E-08	2.780E-09
BONE SUR	1.840E-14	9.043E-12	1.899E-10	3.140E-16	-1.000E+00	1.050E-06	4.200E-08
THYROID	7.050E-15	4.003E-12	8.407E-11	1.390E-16	-1.000E+00	4.110E-09	9.820E-11
REMAINDER	6.370E-15	3.888E-12	8.165E-11	1.350E-16	-1.000E+00	1.020E-07	1.840E-08
EFFECTIVE	7.200E-15	4.262E-12	8.951E-11	1.480E-16	-1.000E+00	3.320E-05	7.220E-09
SKIN(FGR)	8.640E-15	5.587E-12	1.173E-10	1.940E-16	-1.000E+00	0.000E+00	0.000E+00
U-236							
GONADS	6.100E-18	3.226E-14	6.774E-13	1.120E-18	-1.000E+00	2.510E-09	1.000E-10
BREAST	1.100E-17	4.291E-14	9.012E-13	1.490E-18	-1.000E+00	2.540E-09	9.790E-11
LUNGS	2.180E-18	2.465E-15	5.177E-14	8.560E-20	-1.000E+00	2.820E-04	9.790E-11
RED MARR	2.330E-18	4.810E-15	1.010E-13	1.670E-19	-1.000E+00	6.830E-08	2.730E-09
BONE SUR	1.190E-17	2.834E-14	5.951E-13	9.840E-19	-1.000E+00	1.070E-06	4.280E-08
THYROID	4.190E-18	7.315E-15	1.536E-13	2.540E-19	-1.000E+00	2.510E-09	9.790E-11
REMAINDER	2.700E-18	7.603E-15	1.597E-13	2.640E-19	-1.000E+00	1.000E-07	1.670E-08
EFFECTIVE	5.010E-18	1.872E-14	3.931E-13	6.500E-19	-1.000E+00	3.390E-05	6.680E-09
SKIN(FGR)	3.570E-17	2.434E-13	5.111E-12	8.450E-18	-1.000E+00	0.000E+00	0.000E+00
U-237							
GONADS	5.900E-15	3.992E-12	6.082E-11	1.410E-16	-1.000E+00	8.150E-11	1.810E-10
BREAST	6.900E-15	3.992E-12	6.082E-11	1.410E-16	-1.000E+00	2.510E-11	1.810E-11
LUNGS	5.480E-15	3.398E-12	5.176E-11	1.200E-16	-1.000E+00	4.700E-09	2.170E-12
RED MARR	4.820E-15	3.199E-12	4.874E-11	1.130E-16	-1.000E+00	5.230E-11	5.690E-11
BONE SUR	1.690E-14	9.768E-12	1.488E-10	3.450E-16	-1.000E+00	6.820E-11	3.390E-11
THYROID	5.810E-15	3.482E-12	5.306E-11	1.230E-16	-1.000E+00	1.000E-11	2.310E-13
REMAINDER	5.150E-15	3.313E-12	5.047E-11	1.170E-16	-1.000E+00	1.190E-09	2.670E-09
EFFECTIVE	5.970E-15	3.766E-12	5.737E-11	1.330E-16	-1.000E+00	9.540E-10	8.570E-10
SKIN(FGR)	9.970E-15	5.861E-12	8.929E-11	2.070E-16	-1.000E+00	0.000E+00	0.000E+00
U-238							
GONADS	4.390E-18	2.779E-14	5.836E-13	9.650E-19	-1.000E+00	2.420E-09	1.020E-10
BREAST	8.540E-18	3.715E-14	7.802E-13	1.290E-18	-1.000E+00	2.910E-09	9.330E-11
LUNGS	9.960E-19	1.610E-15	3.381E-14	5.590E-20	-1.000E+00	2.660E-04	9.220E-11
RED MARR	1.240E-18	3.686E-15	7.741E-14	1.280E-19	-1.000E+00	6.880E-08	2.720E-09

BONE SUR	7.400E-18	2.330E-14	4.893E-13	8.090E-19-1.000E+00	1.010E-06	4.040E-08
THYROID	2.720E-18	5.875E-15	1.234E-13	2.040E-19-1.000E+00	2.730E-09	9.200E-11
REMAINDER	1.510E-18	6.163E-15	1.294E-13	2.140E-19-1.000E+00	9.610E-08	1.610E-08
EFFECTIVE	3.410E-18	1.587E-14	3.332E-13	5.510E-19-1.000E+00	3.200E-05	6.420E-09
SKIN(FGR)	2.910E-17	2.137E-13	4.488E-12	7.420E-18-1.000E+00	0.000E+00	0.000E+00
U-239						
GONADS	2.180E-15	1.084E-13	1.084E-13	5.320E-17-1.000E+00	4.600E-13	1.450E-12
BREAST	2.570E-15	1.084E-13	1.084E-13	5.320E-17-1.000E+00	1.400E-13	2.210E-13
LUNGS	1.960E-15	9.434E-14	9.434E-14	4.630E-17-1.000E+00	6.160E-11	1.030E-13
RED MARR	1.670E-15	8.497E-14	8.497E-14	4.170E-17-1.000E+00	2.700E-13	5.130E-13
BONE SUR	6.500E-15	3.199E-13	3.199E-13	1.570E-16-1.000E+00	3.110E-13	2.310E-13
THYROID	2.110E-15	9.577E-14	9.577E-14	4.700E-17-1.000E+00	5.920E-14	4.600E-15
REMAINDER	1.840E-15	9.149E-14	9.149E-14	4.490E-17-1.000E+00	8.500E-12	6.800E-11
EFFECTIVE	2.170E-15	1.049E-13	1.049E-13	5.150E-17-1.000E+00	1.010E-11	2.090E-11
SKIN(FGR)	2.610E-14	7.417E-12	7.417E-12	3.640E-15-1.000E+00	0.000E+00	0.000E+00
U-240						
GONADS	1.585E-14	8.255E-12	2.585E-11	3.530E-16-1.000E+00	3.350E-11	1.240E-10
BREAST	1.808E-14	8.015E-12	2.509E-11	3.427E-16-1.000E+00	8.980E-12	1.600E-11
LUNGS	1.572E-14	7.270E-12	2.277E-11	3.110E-16-1.000E+00	2.430E-09	3.690E-12
RED MARR	1.532E-14	7.417E-12	2.323E-11	3.173E-16-1.000E+00	1.260E-11	2.620E-11
BONE SUR	2.621E-14	1.109E-11	3.472E-11	4.742E-16-1.000E+00	1.490E-11	1.020E-11
THYROID	1.624E-14	7.556E-12	2.366E-11	3.232E-16-1.000E+00	4.150E-12	5.590E-13
REMAINDER	1.512E-14	7.199E-12	2.254E-11	3.079E-16-1.000E+00	1.030E-09	3.880E-09
EFFECTIVE	1.624E-14	7.745E-12	2.425E-11	3.312E-16-1.000E+00	6.130E-10	1.200E-09
SKIN(FGR)	6.242E-14	1.748E-10	5.474E-10	7.477E-15-1.000E+00	0.000E+00	0.000E+00
V-47						
GONADS	4.680E-14	2.935E-12	2.935E-12	1.040E-15-1.000E+00	5.490E-13	6.810E-12
BREAST	5.350E-14	2.811E-12	2.811E-12	9.960E-16-1.000E+00	9.920E-13	2.260E-12
LUNGS	4.650E-14	2.664E-12	2.664E-12	9.440E-16-1.000E+00	1.150E-10	1.840E-12
RED MARR	4.480E-14	2.692E-12	2.692E-12	9.540E-16-1.000E+00	1.040E-12	2.560E-12
BONE SUR	8.240E-14	4.063E-12	4.064E-12	1.440E-15-1.000E+00	8.810E-13	1.050E-12
THYROID	4.770E-14	2.782E-12	2.782E-12	9.860E-16-1.000E+00	8.920E-13	1.650E-13
REMAINDER	4.440E-14	2.610E-12	2.610E-12	9.250E-16-1.000E+00	3.930E-12	1.490E-10
EFFECTIVE	4.790E-14	2.785E-12	2.785E-12	9.870E-16-1.000E+00	1.540E-11	4.730E-11
SKIN(FGR)	1.080E-13	3.076E-11	3.076E-11	1.090E-14-1.000E+00	0.000E+00	0.000E+00
V-48						
GONADS	1.420E-13	8.293E-11	1.516E-09	2.900E-15-1.000E+00	1.300E-09	2.730E-09
BREAST	1.610E-13	7.921E-11	1.448E-09	2.770E-15-1.000E+00	7.420E-10	3.540E-10
LUNGS	1.420E-13	7.635E-11	1.396E-09	2.670E-15-1.000E+00	1.140E-08	7.530E-11
RED MARR	1.400E-13	7.835E-11	1.432E-09	2.740E-15-1.000E+00	1.080E-09	5.930E-10
BONE SUR	2.140E-13	1.075E-10	1.966E-09	3.760E-15-1.000E+00	8.690E-10	2.370E-10
THYROID	1.460E-13	7.721E-11	1.412E-09	2.700E-15-1.000E+00	5.510E-10	1.920E-11
REMAINDER	1.370E-13	7.578E-11	1.385E-09	2.650E-15-1.000E+00	2.600E-09	4.990E-09
EFFECTIVE	1.450E-13	7.950E-11	1.453E-09	2.780E-15-1.000E+00	2.760E-09	2.320E-09
SKIN(FGR)	1.720E-13	1.067E-10	1.950E-09	3.730E-15-1.000E+00	0.000E+00	0.000E+00
V-49						
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.800E-12	5.320E-13
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.870E-12	2.270E-13
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	6.300E-10	2.230E-13
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	4.040E-11	3.460E-12
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	1.030E-10	8.780E-12
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.710E-12	2.320E-13
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	2.860E-11	5.240E-11
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	9.330E-11	1.660E-11
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00-1.000E+00	0.000E+00	0.000E+00
W-176						
GONADS	7.060E-15	1.903E-12	2.090E-12	1.750E-16-1.000E+00	1.560E-11	9.950E-11
BREAST	8.410E-15	1.881E-12	2.067E-12	1.730E-16-1.000E+00	5.400E-12	1.460E-11
LUNGS	6.200E-15	1.696E-12	1.864E-12	1.560E-16-1.000E+00	9.320E-11	4.100E-12
RED MARR	5.040E-15	1.457E-12	1.601E-12	1.340E-16-1.000E+00	8.480E-12	2.670E-11
BONE SUR	2.360E-14	6.415E-12	7.048E-12	5.900E-16-1.000E+00	1.320E-11	1.440E-11
THYROID	6.760E-15	1.707E-12	1.875E-12	1.570E-16-1.000E+00	2.410E-12	6.170E-13
REMAINDER	5.780E-15	1.609E-12	1.768E-12	1.480E-16-1.000E+00	3.820E-11	2.400E-10

EFFECTIVE	7.020E-15	1.859E-12	2.043E-12	1.710E-16-1.000E+00	2.880E-11	1.030E-10
SKIN(FGR)	8.740E-15	2.186E-12	2.401E-12	2.010E-16-1.000E+00	0.000E+00	0.000E+00
W-177						
GONADS	4.180E-14	9.730E-12	1.063E-11	9.100E-16-1.000E+00	6.350E-12	4.390E-11
BREAST	4.790E-14	9.377E-12	1.025E-11	8.770E-16-1.000E+00	3.090E-12	8.030E-12
LUNGS	4.080E-14	8.864E-12	9.688E-12	8.290E-16-1.000E+00	6.850E-11	3.740E-12
RED MARR	3.870E-14	8.767E-12	9.582E-12	8.200E-16-1.000E+00	4.960E-12	1.480E-11
BONE SUR	8.110E-14	1.689E-11	1.846E-11	1.580E-15-1.000E+00	8.770E-12	8.170E-12
THYROID	4.230E-14	9.067E-12	9.910E-12	8.480E-16-1.000E+00	1.640E-12	3.670E-13
REMAINDER	3.890E-14	8.650E-12	9.454E-12	8.090E-16-1.000E+00	2.160E-11	1.450E-10
EFFECTIVE	4.260E-14	9.334E-12	1.020E-11	8.730E-16-1.000E+00	1.760E-11	5.820E-11
SKIN(FGR)	5.110E-14	1.262E-11	1.379E-11	1.180E-15-1.000E+00	0.000E+00	0.000E+00
W-178						
GONADS	5.089E-15	3.392E-12	6.572E-11	1.214E-16-1.000E+00	2.080E-11	1.200E-10
BREAST	5.971E-15	3.336E-12	6.464E-11	1.194E-16-1.000E+00	7.270E-12	1.450E-11
LUNGS	4.662E-15	3.006E-12	5.825E-11	1.076E-16-1.000E+00	1.560E-10	3.890E-12
RED MARR	4.159E-15	2.696E-12	5.226E-11	9.654E-17-1.000E+00	3.570E-11	5.890E-11
BONE SUR	1.235E-14	9.094E-12	1.760E-10	3.251E-16-1.000E+00	4.800E-11	3.810E-11
THYROID	4.995E-15	3.000E-12	5.814E-11	1.074E-16-1.000E+00	2.750E-12	1.130E-12
REMAINDER	4.425E-15	2.900E-12	5.620E-11	1.038E-16-1.000E+00	1.410E-10	5.400E-10
EFFECTIVE	5.072E-15	3.269E-12	6.334E-11	1.170E-16-1.000E+00	7.320E-11	2.030E-10
SKIN(FGR)	6.259E-15	4.021E-12	7.791E-11	1.439E-16-1.000E+00	0.000E+00	0.000E+00
W-179						
GONADS	1.940E-15	2.100E-13	2.100E-13	6.470E-17-1.000E+00	9.440E-14	8.370E-13
BREAST	2.390E-15	2.149E-13	2.149E-13	6.620E-17-1.000E+00	8.340E-14	2.050E-13
LUNGS	1.510E-15	1.561E-13	1.561E-13	4.810E-17-1.000E+00	4.990E-12	1.450E-13
RED MARR	1.150E-15	1.224E-13	1.224E-13	3.770E-17-1.000E+00	1.900E-13	4.730E-13
BONE SUR	6.420E-15	7.011E-13	7.011E-13	2.160E-16-1.000E+00	5.270E-13	2.730E-13
THYROID	1.770E-15	1.694E-13	1.694E-13	5.220E-17-1.000E+00	1.900E-14	1.650E-15
REMAINDER	1.420E-15	1.529E-13	1.529E-13	4.710E-17-1.000E+00	9.090E-13	7.740E-12
EFFECTIVE	1.830E-15	1.902E-13	1.902E-13	5.860E-17-1.000E+00	9.470E-13	2.640E-12
SKIN(FGR)	2.580E-15	2.739E-13	2.740E-13	8.440E-17-1.000E+00	0.000E+00	0.000E+00
W-181						
GONADS	1.450E-15	1.168E-12	2.407E-11	4.060E-17-1.000E+00	1.110E-11	5.360E-11
BREAST	1.760E-15	1.168E-12	2.407E-11	4.060E-17-1.000E+00	5.930E-12	7.460E-12
LUNGS	1.190E-15	1.004E-12	2.069E-11	3.490E-17-1.000E+00	5.250E-11	3.520E-12
RED MARR	9.100E-16	7.970E-13	1.642E-11	2.770E-17-1.000E+00	5.040E-11	4.860E-11
BONE SUR	5.000E-15	4.345E-12	8.952E-11	1.510E-16-1.000E+00	7.080E-11	4.580E-11
THYROID	1.350E-15	1.010E-12	2.081E-11	3.510E-17-1.000E+00	2.710E-12	1.390E-12
REMAINDER	1.110E-15	9.552E-13	1.968E-11	3.320E-17-1.000E+00	7.560E-11	1.840E-10
EFFECTIVE	1.400E-15	1.131E-12	2.330E-11	3.930E-17-1.000E+00	4.090E-11	7.740E-11
SKIN(FGR)	1.840E-15	1.378E-12	2.840E-11	4.790E-17-1.000E+00	0.000E+00	0.000E-00
W-185						
GONADS	5.530E-18	6.096E-15	1.242E-13	2.120E-19-1.000E+00	1.240E-14	6.350E-14
BREAST	6.720E-18	6.384E-15	1.300E-13	2.220E-19-1.000E+00	6.150E-15	8.780E-15
LUNGS	4.610E-18	4.112E-15	8.375E-14	1.430E-19-1.000E+00	3.800E-10	3.540E-15
RED MARR	3.830E-18	3.594E-15	7.321E-14	1.250E-19-1.000E+00	8.390E-11	4.830E-11
BONE SUR	1.700E-17	1.622E-14	3.303E-13	5.640E-19-1.000E+00	2.550E-10	1.470E-10
THYROID	5.210E-18	4.630E-15	9.429E-14	1.610E-19-1.000E+00	2.850E-15	1.360E-15
REMAINDER	4.350E-18	4.170E-15	8.492E-14	1.450E-19-1.000E+00	4.650E-10	1.390E-09
EFFECTIVE	5.370E-18	5.291E-15	1.078E-13	1.840E-19-1.000E+00	2.030E-10	4.280E-10
SKIN(FGR)	4.520E-15	4.515E-14	9.195E-13	1.570E-18-1.000E+00	0.000E+00	0.000E+00
W-187						
GONADS	2.240E-14	1.265E-11	6.060E-11	4.920E-16-1.000E+00	2.990E-11	1.900E-10
BREAST	2.560E-14	1.216E-11	5.826E-11	4.730E-16-1.000E+00	8.790E-12	2.440E-11
LUNGS	2.210E-14	1.151E-11	5.518E-11	4.480E-16-1.000E+00	6.050E-10	5.800E-12
RED MARR	2.120E-14	1.157E-11	5.543E-11	4.500E-16-1.000E+00	2.320E-11	5.090E-11
BONE SUR	4.000E-14	1.902E-11	9.115E-11	7.400E-16-1.000E+00	9.850E-11	7.380E-11
THYROID	2.270E-14	1.200E-11	5.752E-11	4.670E-16-1.000E+00	4.370E-12	9.000E-13
REMAINDER	2.110E-14	1.126E-11	5.395E-11	4.380E-16-1.000E+00	2.660E-10	1.640E-09
EFFECTIVE	2.280E-14	1.205E-11	5.777E-11	4.690E-16-1.000E+00	1.670E-10	5.530E-10
SKIN(FGR)	4.090E-14	5.218E-11	2.501E-10	2.030E-15-1.000E+00	0.000E+00	0.000E+00
W-188						

GONADS	8.890E-17	5.808E-14	1.180E-12	2.020E-18-1.000E+00	7.970E-12	3.310E-11
BREAST	1.020E-16	5.693E-14	1.157E-12	1.980E-18-1.000E+00	4.880E-12	5.570E-12
LUNGS	8.520E-17	5.175E-14	1.051E-12	1.800E-18-1.000E+00	1.360E-09	2.760E-12
RED MARR	7.900E-17	5.060E-14	1.028E-12	1.760E-18-1.000E+00	5.540E-10	3.250E-10
BONE SUR	2.070E-16	1.101E-13	2.237E-12	3.830E-18-1.000E+00	1.650E-09	9.520E-10
THYROID	8.900E-17	5.262E-14	1.069E-12	1.830E-18-1.000E+00	2.720E-12	1.420E-12
REMAINDER	8.080E-17	5.032E-14	1.022E-12	1.750E-18-1.000E+00	2.750E-09	6.780E-09
EFFECTIVE	9.040E-17	5.520E-14	1.122E-12	1.920E-18-1.000E+00	1.110E-09	2.110E-09
SKIN(FGR)	2.910E-15	7.131E-14	1.449E-12	2.480E-18-1.000E+00	0.000E+00	0.000E+00
Xe-120						
GONADS	1.920E-14	1.589E-12	1.589E-12	4.590E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	2.210E-14	1.554E-12	1.555E-12	4.490E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.850E-14	1.336E-12	1.337E-12	3.860E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.780E-14	1.333E-12	1.333E-12	3.850E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.490E-14	2.461E-12	2.462E-12	7.110E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	1.940E-14	1.430E-12	1.430E-12	4.130E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.770E-14	1.322E-12	1.323E-12	3.820E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.940E-14	1.464E-12	1.465E-12	4.230E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.400E-14	2.229E-12	2.230E-12	6.440E-16-1.000E+00	0.000E+00	0.000E+00
Xe-121						
GONADS	8.900E-14	6.108E-12	6.109E-12	1.760E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	1.010E-13	5.865E-12	5.866E-12	1.690E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	8.930E-14	5.587E-12	5.589E-12	1.610E-15-1.000E+00	0.000E+00	0.000E+00
RED MARR	8.790E-14	5.691E-12	5.693E-12	1.640E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.390E-13	8.294E-12	8.296E-12	2.390E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	9.150E-14	5.552E-12	5.554E-12	1.600E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	8.620E-14	5.552E-12	5.554E-12	1.600E-15-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	9.140E-14	5.865E-12	5.866E-12	1.690E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.400E-13	2.703E-11	2.704E-11	7.790E-15-1.000E+00	0.000E+00	0.000E+00
Xe-122						
GONADS	4.711E-14	2.671E-11	1.114E-10	1.071E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	5.399E-14	2.578E-11	1.076E-10	1.033E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	4.652E-14	2.374E-11	9.904E-11	9.516E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	4.487E-14	2.388E-11	9.964E-11	9.574E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.311E-14	3.780E-11	1.577E-10	1.515E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	4.795E-14	2.495E-11	1.041E-10	1.000E-15-1.000E+00	0.000E+00	0.000E+00
REMAINDER	4.443E-14	2.335E-11	9.741E-11	9.360E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	4.806E-14	2.515E-11	1.049E-10	1.008E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.284E-13	3.045E-10	1.271E-09	1.221E-14-1.000E+00	0.000E+00	0.000E+00
Xe-123						
GONADS	2.970E-14	6.473E-12	6.957E-12	6.440E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	3.390E-14	6.262E-12	6.730E-12	6.230E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.930E-14	5.770E-12	6.201E-12	5.740E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.830E-14	5.810E-12	6.244E-12	5.780E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.300E-14	9.720E-12	1.045E-11	9.670E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	3.020E-14	5.910E-12	6.352E-12	5.880E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.800E-14	5.679E-12	6.104E-12	5.650E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.030E-14	6.122E-12	6.579E-12	6.090E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.520E-14	2.523E-11	2.712E-11	2.510E-15-1.000E+00	0.000E+00	0.000E+00
Xe-125						
GONADS	1.180E-14	7.053E-12	2.531E-11	2.870E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	1.370E-14	7.004E-12	2.514E-11	2.850E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.120E-14	5.849E-12	2.099E-11	2.380E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.050E-14	5.726E-12	2.055E-11	2.330E-16-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.620E-14	1.261E-11	4.525E-11	5.130E-16-1.000E+00	0.000E+00	0.000E+00
THYROID	1.180E-14	6.193E-12	2.223E-11	2.520E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.060E-14	5.775E-12	2.073E-11	2.350E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.190E-14	6.512E-12	2.337E-11	2.650E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.500E-14	8.749E-12	3.140E-11	3.560E-16-1.000E+00	0.000E+00	0.000E+00
Xe-127						
GONADS	1.230E-14	8.440E-12	1.665E-10	2.940E-16-1.000E+00	0.000E+00	0.000E+00
BREAST	1.420E-14	8.354E-12	1.648E-10	2.910E-16-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.170E-14	7.120E-12	1.404E-10	2.480E-16-1.000E+00	0.000E+00	0.000E+00

RED MARR	1.080E-14	6.976E-12	1.376E-10	2.430E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.880E-14	1.550E-11	3.058E-10	5.400E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.230E-14	7.436E-12	1.467E-10	2.590E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.110E-14	6.976E-12	1.376E-10	2.430E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.250E-14	7.837E-12	1.546E-10	2.730E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.570E-14	1.028E-11	2.027E-10	3.580E-16	-1.000E+00	0.000E+00	0.000E+00
Xe-129m							
GONADS	1.230E-15	1.993E-12	3.183E-11	7.020E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.600E-15	2.135E-12	3.410E-11	7.520E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	7.550E-16	9.425E-13	1.506E-11	3.320E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	6.450E-16	7.438E-13	1.188E-11	2.620E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.840E-15	4.287E-12	6.847E-11	1.510E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.070E-15	1.340E-12	2.140E-11	4.720E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	7.600E-16	1.042E-12	1.664E-11	3.670E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.060E-15	1.502E-12	2.399E-11	5.290E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	8.290E-15	3.151E-12	5.034E-11	1.110E-16	-1.000E+00	0.000E+00	0.000E+00
Xe-131m							
GONADS	4.570E-16	7.872E-13	1.371E-11	2.760E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	6.020E-16	8.471E-13	1.475E-11	2.970E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	2.670E-16	3.565E-13	6.209E-12	1.250E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	2.270E-16	2.792E-13	4.863E-12	9.790E-18	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	1.060E-15	1.677E-12	2.920E-11	5.880E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	3.910E-16	5.220E-13	9.089E-12	1.830E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	2.710E-16	3.993E-13	6.954E-12	1.400E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	3.890E-16	5.876E-13	1.023E-11	2.060E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.820E-15	1.266E-12	2.205E-11	4.440E-17	-1.000E+00	0.000E+00	0.000E+00
Xe-133							
GONADS	1.610E-15	1.465E-12	2.052E-11	5.200E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.960E-15	1.505E-12	2.107E-11	5.340E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.320E-15	1.045E-12	1.464E-11	3.710E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.070E-15	8.791E-13	1.231E-11	3.120E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	5.130E-15	4.254E-12	5.958E-11	1.510E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.510E-15	1.181E-12	1.653E-11	4.190E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.240E-15	1.042E-12	1.460E-11	3.700E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.560E-15	1.299E-12	1.819E-11	4.610E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	4.970E-15	1.953E-12	2.734E-11	6.930E-17	-1.000E+00	0.000E+00	0.000E+00
Xe-133m							
GONADS	1.420E-15	1.337E-12	1.188E-11	4.890E-17	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.700E-15	1.383E-12	1.230E-11	5.060E-17	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.190E-15	8.609E-13	7.656E-12	3.150E-17	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.100E-15	7.844E-13	6.975E-12	2.870E-17	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.230E-15	2.599E-12	2.311E-11	9.510E-17	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.360E-15	1.028E-12	9.138E-12	3.760E-17	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.150E-15	8.855E-13	7.874E-12	3.240E-17	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.370E-15	1.112E-12	9.892E-12	4.070E-17	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.040E-14	1.894E-12	1.684E-11	6.930E-17	-1.000E+00	0.000E+00	0.000E+00
Xe-135							
GONADS	1.170E-14	5.455E-12	1.194E-11	2.530E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	1.330E-14	5.325E-12	1.166E-11	2.470E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.130E-14	4.959E-12	1.086E-11	2.300E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.070E-14	4.959E-12	1.086E-11	2.300E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	2.570E-14	9.120E-12	1.997E-11	4.230E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	1.180E-14	5.023E-12	1.100E-11	2.330E-16	-1.000E+00	0.000E+00	0.000E+00
REMAINDER	1.080E-14	4.829E-12	1.058E-11	2.240E-16	-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	1.190E-14	5.217E-12	1.142E-11	2.420E-16	-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	3.120E-14	4.506E-11	9.867E-11	2.090E-15	-1.000E+00	0.000E+00	0.000E+00
Xe-135m							
GONADS	2.000E-14	5.929E-13	5.929E-13	4.480E-16	-1.000E+00	0.000E+00	0.000E+00
BREAST	2.290E-14	5.691E-13	5.691E-13	4.300E-16	-1.000E+00	0.000E+00	0.000E+00
LUNGS	1.980E-14	5.347E-13	5.347E-13	4.040E-16	-1.000E+00	0.000E+00	0.000E+00
RED MARR	1.910E-14	5.400E-13	5.400E-13	4.080E-16	-1.000E+00	0.000E+00	0.000E+00
BONE SUR	3.500E-14	8.246E-13	8.246E-13	6.230E-16	-1.000E+00	0.000E+00	0.000E+00
THYROID	2.040E-14	5.612E-13	5.612E-13	4.240E-16	-1.000E+00	0.000E+00	0.000E+00

REMAINDER	1.890E-14	5.241E-13	5.241E-13	3.960E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	2.040E-14	5.612E-13	5.612E-13	4.240E-16-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	2.970E-14	1.866E-12	1.866E-12	1.410E-15-1.000E+00	0.000E+00	0.000E+00
Xe-138						
GONADS	5.590E-14	1.312E-12	1.312E-12	1.070E-15-1.000E+00	0.000E+00	0.000E+00
BREAST	6.320E-14	1.251E-12	1.251E-12	1.020E-15-1.000E+00	0.000E+00	0.000E+00
LUNGS	5.660E-14	1.223E-12	1.223E-12	9.970E-16-1.000E+00	0.000E+00	0.000E+00
RED MARR	5.600E-14	1.251E-12	1.251E-12	1.020E-15-1.000E+00	0.000E+00	0.000E+00
BONE SUR	8.460E-14	1.729E-12	1.729E-12	1.410E-15-1.000E+00	0.000E+00	0.000E+00
THYROID	5.770E-14	1.171E-12	1.171E-12	9.550E-16-1.000E+00	0.000E+00	0.000E+00
REMAINDER	5.490E-14	1.219E-12	1.219E-12	9.940E-16-1.000E+00	0.000E+00	0.000E+00
EFFECTIVE	5.770E-14	1.263E-12	1.263E-12	1.030E-15-1.000E+00	0.000E+00	0.000E+00
SKIN(FGR)	1.070E-13	9.383E-12	9.383E-12	7.650E-15-1.000E+00	0.000E+00	0.000E+00
Y-86						
GONADS	1.750E-13	8.497E-11	2.709E-10	3.540E-15-1.000E+00	3.300E-10	1.210E-09
BREAST	1.980E-13	8.113E-11	2.587E-10	3.380E-15-1.000E+00	9.050E-11	1.680E-10
LUNGS	1.760E-13	7.825E-11	2.495E-10	3.260E-15-1.000E+00	1.160E-09	4.270E-11
RED MARR	1.730E-13	8.017E-11	2.556E-10	3.340E-15-1.000E+00	1.120E-10	2.560E-10
BONE SUR	2.650E-13	1.104E-10	3.520E-10	4.600E-15-1.000E+00	5.870E-11	8.810E-11
THYROID	1.800E-13	7.849E-11	2.502E-10	3.270E-15-1.000E+00	4.320E-11	6.080E-12
REMAINDER	1.690E-13	7.777E-11	2.479E-10	3.240E-15-1.000E+00	7.100E-10	2.560E-09
EFFECTIVE	1.790E-13	8.137E-11	2.594E-10	3.390E-15-1.000E+00	4.650E-10	1.140E-09
SKIN(FGR)	2.170E-13	1.551E-10	4.944E-10	6.460E-15-1.000E+00	0.000E+00	0.000E+00
Y-86m						
GONADS	1.030E-14	9.132E-13	9.141E-13	2.200E-16-1.000E+00	1.880E-11	6.940E-11
BREAST	1.180E-14	8.924E-13	8.933E-13	2.150E-16-1.000E+00	5.190E-12	9.680E-12
LUNGS	1.000E-14	8.385E-13	8.393E-13	2.020E-16-1.000E+00	6.910E-11	2.470E-12
RED MARR	9.350E-15	8.343E-13	8.351E-13	2.010E-16-1.000E+00	6.490E-12	1.500E-11
BONE SUR	2.390E-14	1.627E-12	1.629E-12	3.920E-16-1.000E+00	3.400E-12	5.150E-12
THYROID	1.040E-14	8.385E-13	8.393E-13	2.020E-16-1.000E+00	2.440E-12	3.350E-13
REMAINDER	9.500E-15	8.177E-13	8.185E-13	1.970E-16-1.000E+00	4.060E-11	1.500E-10
EFFECTIVE	1.060E-14	8.841E-13	8.850E-13	2.130E-16-1.000E+00	2.690E-11	6.610E-11
SKIN(FGR)	1.280E-14	1.208E-12	1.209E-12	2.910E-16-1.000E+00	0.000E+00	0.000E+00
Y-87						
GONADS	2.100E-14	1.311E-11	1.504E-10	4.710E-16-1.000E+00	3.010E-10	6.970E-10
BREAST	2.400E-14	1.266E-11	1.453E-10	4.550E-16-1.000E+00	7.750E-11	7.840E-11
LUNGS	2.080E-14	1.183E-11	1.357E-10	4.250E-16-1.000E+00	1.420E-09	1.150E-11
RED MARR	2.000E-14	1.194E-11	1.370E-10	4.290E-16-1.000E+00	1.030E-10	1.380E-10
BONE SUR	3.760E-14	1.831E-11	2.101E-10	6.580E-16-1.000E+00	5.700E-11	4.600E-11
THYROID	2.140E-14	1.236E-11	1.417E-10	4.440E-16-1.000E+00	3.730E-11	1.440E-12
REMAINDER	1.990E-14	1.158E-11	1.328E-10	4.160E-16-1.000E+00	6.730E-10	1.510E-09
EFFECTIVE	2.150E-14	1.241E-11	1.424E-10	4.460E-16-1.000E+00	4.740E-10	6.580E-10
SKIN(FGR)	2.510E-14	1.642E-11	1.884E-10	5.900E-16-1.000E+00	0.000E+00	0.000E+00
Y-88						
GONADS	1.330E-13	7.365E-11	1.514E-09	2.560E-15-1.000E+00	1.790E-09	2.560E-09
BREAST	1.510E-13	7.048E-11	1.449E-09	2.450E-15-1.000E+00	3.290E-09	3.180E-10
LUNGS	1.350E-13	6.876E-11	1.413E-09	2.390E-15-1.000E+00	3.530E-08	6.740E-11
RED MARR	1.340E-13	7.048E-11	1.449E-09	2.450E-15-1.000E+00	3.320E-09	5.050E-10
BONE SUR	1.900E-13	9.292E-11	1.910E-09	3.230E-15-1.000E+00	2.640E-09	1.780E-10
THYROID	1.380E-13	6.617E-11	1.360E-09	2.300E-15-1.000E+00	2.620E-09	1.140E-11
REMAINDER	1.310E-13	6.876E-11	1.413E-09	2.390E-15-1.000E+00	6.200E-09	2.850E-09
EFFECTIVE	1.370E-13	7.106E-11	1.460E-09	2.470E-15-1.000E+00	7.590E-09	1.620E-09
SKIN(FGR)	1.540E-13	8.400E-11	1.726E-09	2.920E-15-1.000E+00	0.000E+00	0.000E+00
Y-90						
GONADS	1.890E-16	1.586E-13	1.601E-12	5.750E-18-1.000E+00	5.170E-13	1.430E-14
BREAST	2.200E-16	1.578E-13	1.593E-12	5.720E-18-1.000E+00	5.170E-13	1.270E-14
LUNGS	1.770E-16	1.313E-13	1.326E-12	4.760E-18-1.000E+00	9.310E-09	1.260E-14
RED MARR	1.620E-16	1.261E-13	1.273E-12	4.570E-18-1.000E+00	1.520E-11	3.700E-13
BONE SUR	4.440E-16	3.228E-13	3.259E-12	1.170E-17-1.000E+00	1.510E-11	3.670E-13
THYROID	1.870E-16	1.385E-13	1.398E-12	5.020E-18-1.000E+00	5.170E-13	1.260E-14
REMAINDER	1.680E-16	1.291E-13	1.303E-12	4.680E-18-1.000E+00	3.870E-09	9.680E-09
EFFECTIVE	1.900E-16	1.468E-13	1.482E-12	5.320E-18-1.000E+00	2.280E-09	2.910E-09
SKIN(FGR)	6.240E-14	2.897E-10	2.924E-09	1.050E-14-1.000E+00	0.000E+00	0.000E+00

Y-90m						
GONADS	2.940E-14	8.821E-12	1.070E-11	6.460E-16-1.000E+00	6.270E-12	5.410E-11
BREAST	3.360E-14	8.521E-12	1.034E-11	6.240E-16-1.000E+00	3.260E-12	8.620E-12
LUNGS	2.890E-14	8.029E-12	9.742E-12	5.880E-16-1.000E+00	5.090E-10	3.190E-12
RED MARR	2.750E-14	8.070E-12	9.792E-12	5.910E-16-1.000E+00	4.610E-12	1.370E-11
BONE SUR	5.860E-14	1.361E-11	1.652E-11	9.970E-16-1.000E+00	3.140E-12	4.700E-12
THYROID	2.980E-14	8.289E-12	1.006E-11	6.070E-16-1.000E+00	1.910E-12	3.000E-13
REMAINDER	2.750E-14	7.824E-12	9.493E-12	5.730E-16-1.000E+00	2.120E-10	5.810E-10
EFFECTIVE	3.010E-14	8.411E-12	1.021E-11	6.160E-16-1.000E+00	1.270E-10	1.910E-10
SKIN(FGR)	3.750E-14	1.364E-11	1.655E-11	9.990E-16-1.000E+00	0.000E+00	0.000E+00
Y-91						
GONADS	2.560E-16	1.756E-13	3.546E-12	6.110E-18-1.000E+00	8.200E-12	3.540E-12
BREAST	2.930E-16	1.713E-13	3.459E-12	5.960E-18-1.000E+00	8.920E-12	5.540E-13
LUNGS	2.500E-16	1.526E-13	3.082E-12	5.310E-18-1.000E+00	9.870E-08	2.020E-13
RED MARR	2.410E-16	1.521E-13	3.070E-12	5.290E-18-1.000E+00	3.190E-10	6.590E-12
BONE SUR	4.560E-16	2.903E-13	5.862E-12	1.010E-17-1.000E+00	3.180E-10	6.130E-12
THYROID	2.600E-16	1.564E-13	3.157E-12	5.440E-18-1.000E+00	8.500E-12	1.290E-13
REMAINDER	2.390E-16	1.509E-13	3.047E-12	5.250E-18-1.000E+00	4.200E-09	8.570E-09
EFFECTIVE	2.600E-16	1.650E-13	3.332E-12	5.740E-18-1.000E+00	1.320E-08	2.570E-09
SKIN(FGR)	3.850E-14	1.989E-10	4.016E-09	6.920E-15-1.000E+00	0.000E+00	0.000E+00
Y-91m						
GONADS	2.490E-14	2.364E-12	2.367E-12	5.500E-16-1.000E+00	3.210E-13	6.940E-12
BREAST	2.850E-14	2.265E-12	2.268E-12	5.270E-16-1.000E+00	6.080E-13	1.840E-12
LUNGS	2.480E-14	2.153E-12	2.156E-12	5.010E-16-1.000E+00	7.000E-11	1.280E-12
RED MARR	2.390E-14	2.179E-12	2.182E-12	5.070E-16-1.000E+00	7.740E-13	2.240E-12
BONE SUR	4.280E-14	3.232E-12	3.236E-12	7.520E-16-1.000E+00	6.210E-13	8.710E-13
THYROID	2.540E-14	2.248E-12	2.250E-12	5.230E-16-1.000E+00	5.020E-13	1.170E-13
REMAINDER	2.370E-14	2.110E-12	2.113E-12	4.910E-16-1.000E+00	3.740E-12	2.920E-11
EFFECTIVE	2.550E-14	2.248E-12	2.250E-12	5.230E-16-1.000E+00	9.820E-12	1.120E-11
SKIN(FGR)	3.110E-14	4.091E-12	4.096E-12	9.520E-16-1.000E+00	0.000E+00	0.000E+00
Y-92						
GONADS	1.270E-14	3.855E-12	4.872E-12	2.650E-16-1.000E+00	2.610E-12	1.960E-11
BREAST	1.440E-14	3.680E-12	4.652E-12	2.530E-16-1.000E+00	1.500E-12	3.550E-12
LUNGS	1.270E-14	3.535E-12	4.468E-12	2.430E-16-1.000E+00	1.240E-09	1.390E-12
RED MARR	1.250E-14	3.608E-12	4.560E-12	2.480E-16-1.000E+00	2.070E-12	4.910E-12
BONE SUR	1.950E-14	5.091E-12	6.435E-12	3.500E-16-1.000E+00	1.510E-12	1.750E-12
THYROID	1.300E-14	3.579E-12	4.523E-12	2.460E-16-1.000E+00	1.050E-12	1.770E-13
REMAINDER	1.220E-14	3.506E-12	4.431E-12	2.410E-16-1.000E+00	2.030E-10	1.700E-09
EFFECTIVE	1.300E-14	3.680E-12	4.652E-12	2.530E-16-1.000E+00	2.110E-10	5.150E-10
SKIN(FGR)	1.140E-13	2.022E-10	2.556E-10	1.390E-14-1.000E+00	0.000E+00	0.000E+00
Y-93						
GONADS	4.670E-15	2.108E-12	4.989E-12	9.510E-17-1.000E+00	5.310E-12	2.200E-11
BREAST	5.300E-15	2.026E-12	4.794E-12	9.140E-17-1.000E+00	1.740E-12	3.130E-12
LUNGS	4.680E-15	1.937E-12	4.585E-12	8.740E-17-1.000E+00	2.520E-09	8.670E-13
RED MARR	4.580E-15	1.972E-12	4.669E-12	8.900E-17-1.000E+00	4.040E-12	4.930E-12
BONE SUR	7.580E-15	2.948E-12	6.977E-12	1.330E-16-1.000E+00	3.140E-12	1.730E-12
THYROID	4.790E-15	1.908E-12	4.516E-12	8.610E-17-1.000E+00	9.260E-13	1.260E-13
REMAINDER	4.510E-15	1.919E-12	4.543E-12	8.660E-17-1.000E+00	9.250E-10	4.090E-09
EFFECTIVE	4.800E-15	2.021E-12	4.784E-12	9.120E-17-1.000E+00	5.820E-10	1.230E-09
SKIN(FGR)	8.500E-14	2.726E-10	6.452E-10	1.230E-14-1.000E+00	0.000E+00	0.000E+00
Y-94						
GONADS	5.490E-14	1.852E-12	1.852E-12	1.120E-15-1.000E+00	1.230E-13	3.610E-12
BREAST	6.210E-14	1.769E-12	1.769E-12	1.070E-15-1.000E+00	4.400E-13	1.370E-12
LUNGS	5.500E-14	1.703E-12	1.703E-12	1.030E-15-1.000E+00	1.480E-10	1.250E-12
RED MARR	5.420E-14	1.736E-12	1.736E-12	1.050E-15-1.000E+00	4.180E-13	1.330E-12
BONE SUR	8.220E-14	2.397E-12	2.397E-12	1.450E-15-1.000E+00	3.280E-13	6.070E-13
THYROID	5.650E-14	1.719E-12	1.719E-12	1.040E-15-1.000E+00	4.120E-13	1.340E-13
REMAINDER	5.300E-14	1.686E-12	1.686E-12	1.020E-15-1.000E+00	3.080E-12	1.730E-10
EFFECTIVE	5.620E-14	1.769E-12	1.769E-12	1.070E-15-1.000E+00	1.890E-11	5.330E-11
SKIN(FGR)	1.800E-13	2.695E-11	2.695E-11	1.630E-14-1.000E+00	0.000E+00	0.000E+00
Y-95						
GONADS	4.650E-14	7.660E-13	7.660E-13	8.270E-16-1.000E+00	1.070E-13	1.120E-12
BREAST	5.190E-14	7.289E-13	7.289E-13	7.870E-16-1.000E+00	3.170E-13	5.550E-13

LUNGS	4.720E-14	7.141E-13	7.141E-13	7.710E-16-1.000E+00	8.040E-11	5.550E-13
RED MARR	4.730E-14	7.363E-13	7.363E-13	7.950E-16-1.000E+00	3.200E-13	4.970E-13
BONE SUR	6.410E-14	9.633E-13	9.633E-13	1.040E-15-1.000E+00	3.790E-13	2.520E-13
THYROID	4.840E-14	6.826E-13	6.826E-13	7.370E-16-1.000E+00	2.790E-13	6.800E-14
REMAINDER	4.590E-14	7.187E-13	7.187E-13	7.760E-16-1.000E+00	1.250E-12	8.980E-11
EFFECTIVE	4.790E-14	7.400E-13	7.400E-13	7.990E-16-1.000E+00	1.020E-11	2.750E-11
SKIN(FGR)	1.590E-13	1.278E-11	1.278E-11	1.380E-14-1.000E+00	0.000E+00	0.000E+00
Yb-162						
GONADS	5.660E-15	2.274E-13	2.274E-13	1.390E-16-1.000E+00	2.950E-13	8.470E-12
BREAST	6.670E-15	2.241E-13	2.241E-13	1.370E-16-1.000E+00	7.480E-13	2.360E-12
LUNGS	5.100E-15	1.980E-13	1.980E-13	1.210E-16-1.000E+00	4.110E-11	1.650E-12
RED MARR	4.380E-15	1.783E-13	1.783E-13	1.090E-16-1.000E+00	8.040E-13	3.050E-12
BONE SUR	1.670E-14	6.364E-13	6.364E-13	3.890E-16-1.000E+00	6.230E-13	1.220E-12
THYROID	5.510E-15	2.029E-13	2.029E-13	1.240E-16-1.000E+00	5.550E-13	1.730E-13
REMAINDER	4.790E-15	1.898E-13	1.898E-13	1.160E-16-1.000E+00	2.630E-12	5.800E-11
EFFECTIVE	5.660E-15	2.176E-13	2.176E-13	1.330E-16-1.000E+00	6.040E-12	2.050E-11
SKIN(FGR)	6.990E-15	2.618E-13	2.618E-13	1.600E-16-1.000E+00	0.000E+00	0.000E+00
Yb-166						
GONADS	3.000E-15	2.499E-12	2.339E-11	9.110E-17-1.000E+00	5.760E-10	1.240E-09
BREAST	3.680E-15	2.510E-12	2.349E-11	9.150E-17-1.000E+00	1.400E-10	1.420E-10
LUNGS	2.380E-15	2.052E-12	1.920E-11	7.480E-17-1.000E+00	2.070E-09	2.250E-11
RED MARR	1.810E-15	1.591E-12	1.489E-11	5.800E-17-1.000E+00	2.120E-10	2.850E-10
BONE SUR	1.010E-14	9.109E-12	8.523E-11	3.320E-16-1.000E+00	1.280E-10	9.420E-11
THYROID	2.770E-15	2.113E-12	1.977E-11	7.700E-17-1.000E+00	6.040E-11	3.500E-12
REMAINDER	2.230E-15	1.953E-12	1.828E-11	7.120E-17-1.000E+00	1.200E-09	2.560E-09
EFFECTIVE	2.860E-15	2.362E-12	2.210E-11	8.610E-17-1.000E+00	8.040E-10	1.140E-09
SKIN(FGR)	3.880E-15	2.963E-12	2.773E-11	1.080E-16-1.000E+00	0.000E+00	0.000E+00
Yb-167						
GONADS	1.090E-14	4.105E-13	4.105E-13	2.710E-16-1.000E+00	1.460E-13	1.300E-12
BREAST	1.290E-14	4.029E-13	4.029E-13	2.660E-16-1.000E+00	1.650E-13	4.130E-13
LUNGS	9.820E-15	3.590E-13	3.590E-13	2.370E-16-1.000E+00	1.440E-11	3.600E-13
RED MARR	8.410E-15	3.181E-13	3.181E-13	2.100E-16-1.000E+00	3.080E-13	7.870E-13
BONE SUR	3.210E-14	1.183E-12	1.183E-12	7.810E-16-1.000E+00	3.390E-13	3.300E-13
THYROID	1.060E-14	3.651E-13	3.651E-13	2.410E-16-1.000E+00	8.140E-14	1.190E-14
REMAINDER	9.230E-15	3.439E-13	3.439E-13	2.270E-16-1.000E+00	1.410E-12	1.490E-11
EFFECTIVE	1.090E-14	3.939E-13	3.939E-13	2.600E-16-1.000E+00	2.260E-12	5.010E-12
SKIN(FGR)	1.380E-14	4.787E-13	4.787E-13	3.160E-16-1.000E+00	0.000E+00	0.000E-00
Yb-169						
GONADS	1.290E-14	9.097E-12	1.779E-10	3.170E-16-1.000E+00	2.370E-10	4.760E-10
BREAST	1.520E-14	8.982E-12	1.757E-10	3.130E-16-1.000E+00	1.850E-10	4.740E-11
LUNGS	1.170E-14	7.978E-12	1.560E-10	2.780E-16-1.000E+00	1.390E-08	4.870E-12
RED MARR	1.010E-14	7.174E-12	1.403E-10	2.500E-16-1.000E+00	3.820E-10	1.660E-10
BONE SUR	3.640E-14	2.468E-11	4.826E-10	8.600E-16-1.000E+00	6.290E-10	7.330E-11
THYROID	1.260E-14	8.092E-12	1.583E-10	2.820E-16-1.000E+00	8.570E-11	3.680E-13
REMAINDER	1.100E-14	7.633E-12	1.493E-10	2.660E-16-1.000E+00	1.180E-09	2.210E-09
EFFECTIVE	1.290E-14	8.724E-12	1.706E-10	3.040E-16-1.000E+00	2.180E-09	8.120E-10
SKIN(FGR)	1.730E-14	1.050E-11	2.054E-10	3.660E-16-1.000E+00	0.000E+00	0.000E-00
Yb-175						
GONADS	1.830E-15	1.146E-12	1.465E-11	4.090E-17-1.000E+00	1.780E-11	4.130E-11
BREAST	2.100E-15	1.112E-12	1.422E-11	3.970E-17-1.000E+00	4.710E-12	4.530E-12
LUNGS	1.780E-15	1.040E-12	1.329E-11	3.710E-17-1.000E+00	1.940E-09	6.470E-13
RED MARR	1.670E-15	1.028E-12	1.315E-11	3.670E-17-1.000E+00	1.080E-11	9.990E-12
BONE SUR	3.860E-15	1.964E-12	2.511E-11	7.010E-17-1.000E+00	4.680E-11	6.230E-12
THYROID	1.840E-15	1.070E-12	1.368E-11	3.820E-17-1.000E+00	2.120E-12	6.850E-14
REMAINDER	1.690E-15	1.012E-12	1.293E-11	3.610E-17-1.000E+00	6.570E-10	1.550E-09
EFFECTIVE	1.870E-15	1.096E-12	1.401E-11	3.910E-17-1.000E+00	4.380E-10	4.760E-10
SKIN(FGR)	6.930E-15	1.460E-12	1.866E-11	5.210E-17-1.000E+00	0.000E+00	0.000E+00
Yb-177						
GONADS	9.030E-15	1.746E-12	1.845E-12	1.870E-16-1.000E+00	8.240E-13	7.910E-12
BREAST	1.030E-14	1.680E-12	1.776E-12	1.800E-16-1.000E+00	5.760E-13	1.530E-12
LUNGS	8.930E-15	1.606E-12	1.697E-12	1.720E-16-1.000E+00	2.500E-10	7.120E-13
RED MARR	8.640E-15	1.624E-12	1.717E-12	1.740E-16-1.000E+00	8.570E-13	2.460E-12
BONE SUR	1.590E-14	2.698E-12	2.852E-12	2.890E-16-1.000E+00	1.530E-12	9.350E-13

THYROID	9.220E-15	1.624E-12	1.717E-12	1.740E-16	1.000E+00	3.940E-13	7.580E-14
REMAINDER	8.550E-15	1.587E-12	1.678E-12	1.700E-16	1.000E+00	2.940E-11	2.810E-10
EFFECTIVE	9.230E-15	1.680E-12	1.776E-12	1.800E-16	1.000E+00	3.930E-11	8.680E-11
SKIN(FGR)	3.600E-14	4.191E-11	4.431E-11	4.490E-15	1.000E+00	0.000E+00	0.000E+00
Yb-178							
GONADS	1.630E-15	2.306E-13	2.332E-13	3.640E-17	1.000E+00	2.740E-13	4.080E-12
BREAST	1.870E-15	2.236E-13	2.261E-13	3.530E-17	1.000E+00	2.960E-13	8.760E-13
LUNGS	1.600E-15	2.090E-13	2.114E-13	3.300E-17	1.000E+00	3.060E-10	4.070E-13
RED MARR	1.520E-15	2.097E-13	2.120E-13	3.310E-17	1.000E+00	3.990E-13	1.310E-12
BONE SUR	3.220E-15	3.553E-13	3.594E-13	5.610E-17	1.000E+00	5.140E-13	4.690E-13
THYROID	1.650E-15	2.166E-13	2.191E-13	3.420E-17	1.000E+00	1.890E-13	4.680E-14
REMAINDER	1.530E-15	2.040E-13	2.063E-13	3.220E-17	1.000E+00	2.350E-11	3.520E-10
EFFECTIVE	1.670E-15	2.198E-13	2.223E-13	3.470E-17	1.000E+00	4.390E-11	1.070E-10
SKIN(FGR)	1.070E-14	1.932E-12	1.954E-12	3.050E-16	1.000E+00	0.000E+00	0.000E+00
Zn-62							
GONADS	6.780E-14	3.231E-11	7.281E-11	1.514E-15	1.000E+00	6.740E-11	3.000E-10
BREAST	7.760E-14	3.086E-11	6.954E-11	1.446E-15	1.000E+00	3.730E-11	1.070E-10
LUNGS	6.720E-14	2.925E-11	6.594E-11	1.371E-15	1.000E+00	2.780E-09	8.700E-11
RED MARR	6.480E-14	2.949E-11	6.647E-11	1.382E-15	1.000E+00	5.830E-11	2.040E-10
BONE SUR	1.196E-13	4.529E-11	1.021E-10	2.122E-15	1.000E+00	4.710E-11	1.650E-10
THYROID	6.900E-14	3.049E-11	6.873E-11	1.429E-15	1.000E+00	2.940E-11	7.760E-11
REMAINDER	6.420E-14	2.864E-11	6.454E-11	1.342E-15	1.000E+00	6.400E-10	2.840E-09
EFFECTIVE	6.930E-14	3.051E-11	6.877E-11	1.430E-15	1.000E+00	5.570E-10	9.850E-10
SKIN(FGR)	1.692E-13	3.257E-10	7.383E-10	1.535E-14	1.000E+00	0.000E+00	0.000E+00
Zn-63							
GONADS	5.190E-14	3.759E-12	3.760E-12	1.140E-15	1.000E+00	3.780E-13	8.960E-12
BREAST	5.930E-14	3.627E-12	3.628E-12	1.100E-15	1.000E+00	9.710E-13	3.410E-12
LUNGS	5.160E-14	3.429E-12	3.430E-12	1.040E-15	1.000E+00	1.640E-10	2.920E-12
RED MARR	4.990E-14	3.462E-12	3.463E-12	1.050E-15	1.000E+00	9.380E-13	3.870E-12
BONE SUR	9.000E-14	5.210E-12	5.211E-12	1.580E-15	1.000E+00	7.210E-13	2.070E-12
THYROID	5.300E-14	3.594E-12	3.595E-12	1.090E-15	1.000E+00	8.270E-13	9.230E-13
REMAINDER	4.930E-14	3.363E-12	3.364E-12	1.020E-15	1.000E+00	6.250E-12	1.850E-10
EFFECTIVE	5.320E-14	3.594E-12	3.595E-12	1.090E-15	1.000E+00	2.200E-11	5.920E-11
SKIN(FGR)	1.230E-13	3.924E-11	3.925E-11	1.190E-14	1.000E+00	0.000E+00	0.000E+00
Zn-65							
GONADS	2.840E-14	1.664E-11	3.461E-10	5.780E-16	1.000E+00	2.030E-09	3.560E-09
BREAST	3.210E-14	1.586E-11	3.300E-10	5.510E-16	1.000E+00	3.080E-09	3.280E-09
LUNGS	2.840E-14	1.529E-11	3.180E-10	5.310E-16	1.000E+00	2.100E-08	3.080E-09
RED MARR	2.800E-14	1.575E-11	3.276E-10	5.470E-16	1.000E+00	3.620E-09	4.500E-09
BONE SUR	4.180E-14	2.127E-11	4.425E-10	7.390E-16	1.000E+00	3.360E-09	4.500E-09
THYROID	2.920E-14	1.549E-11	3.222E-10	5.380E-16	1.000E+00	3.020E-09	3.210E-09
REMAINDER	2.730E-14	1.523E-11	3.168E-10	5.290E-16	1.000E+00	4.660E-09	4.590E-09
EFFECTIVE	2.900E-14	1.592E-11	3.311E-10	5.530E-16	1.000E+00	5.510E-09	3.900E-09
SKIN(FGR)	3.290E-14	1.877E-11	3.904E-10	6.520E-16	1.000E+00	0.000E+00	0.000E+00
Zn-69							
GONADS	2.190E-17	3.995E-15	4.006E-15	8.120E-19	1.000E+00	2.770E-14	4.170E-13
BREAST	2.620E-17	4.113E-15	4.125E-15	8.360E-19	1.000E+00	2.770E-14	4.170E-13
LUNGS	1.910E-17	2.893E-15	2.901E-15	5.880E-19	1.000E+00	8.000E-11	4.170E-13
RED MARR	1.660E-17	2.632E-15	2.640E-15	5.350E-19	1.000E+00	3.560E-14	5.360E-13
BONE SUR	6.090E-17	9.593E-15	9.621E-15	1.950E-18	1.000E+00	3.430E-14	5.180E-13
THYROID	2.110E-17	3.178E-15	3.187E-15	6.460E-19	1.000E+00	2.770E-14	4.170E-13
REMAINDER	1.810E-17	2.898E-15	2.906E-15	5.890E-19	1.000E+00	3.210E-12	7.910E-11
EFFECTIVE	2.160E-17	3.532E-15	3.543E-15	7.180E-19	1.000E+00	1.060E-11	2.400E-11
SKIN(FGR)	1.810E-14	9.938E-12	9.967E-12	2.020E-15	1.000E+00	0.000E+00	0.000E+00
Zn-69m							
GONADS	1.952E-14	1.026E-11	3.092E-11	4.328E-16	1.000E+00	3.303E-11	1.234E-10
BREAST	2.233E-14	9.878E-12	2.978E-11	4.168E-16	1.000E+00	1.733E-11	4.462E-11
LUNGS	1.932E-14	9.351E-12	2.819E-11	3.946E-16	1.000E+00	1.080E-09	3.672E-11
RED MARR	1.852E-14	9.421E-12	2.840E-11	3.975E-16	1.000E+00	2.984E-11	9.204E-11
BONE SUR	3.606E-14	1.476E-11	4.451E-11	6.229E-16	1.000E+00	2.383E-11	7.322E-11
THYROID	1.982E-14	9.732E-12	2.934E-11	4.106E-16	1.000E+00	1.353E-11	3.322E-11
REMAINDER	1.842E-14	9.138E-12	2.755E-11	3.856E-16	1.000E+00	2.862E-10	1.078E-09
EFFECTIVE	1.992E-14	9.780E-12	2.949E-11	4.127E-16	1.000E+00	2.306E-10	3.790E-10

SKIN(FGR)	4.249E-14	5.411E-11	1.846E-10	2.583E-15	-1.000E+00	0.000E+00	0.000E+00
Zn-71m							
GONADS	7.330E-14	2.466E-11	3.257E-11	1.600E-15	-1.000E+00	1.610E-11	1.190E-10
BREAST	8.360E-14	2.373E-11	3.135E-11	1.540E-15	-1.000E+00	1.100E-11	3.260E-11
LUNGS	7.270E-14	2.250E-11	2.972E-11	1.460E-15	-1.000E+00	5.870E-10	2.300E-11
RED MARR	7.030E-14	2.281E-11	3.013E-11	1.480E-15	-1.000E+00	1.280E-11	4.860E-11
BONE SUR	1.280E-13	3.437E-11	4.540E-11	2.230E-15	-1.000E+00	9.250E-12	3.090E-11
THYROID	7.470E-14	2.343E-11	3.095E-11	1.520E-15	-1.000E+00	8.130E-12	1.590E-11
REMAINDER	6.950E-14	2.204E-11	2.911E-11	1.430E-15	-1.000E+00	8.990E-11	6.620E-10
EFFECTIVE	7.500E-14	2.358E-11	3.115E-11	1.530E-15	-1.000E+00	1.050E-10	2.430E-10
SKIN(FGR)	1.210E-13	1.210E-10	1.598E-10	7.850E-15	-1.000E+00	0.000E+00	0.000E+00
Zn-72							
GONADS	6.740E-15	3.937E-12	3.216E-11	1.450E-16	-1.000E+00	5.180E-10	1.080E-09
BREAST	7.790E-15	3.828E-12	3.127E-11	1.410E-16	-1.000E+00	2.790E-10	4.460E-10
LUNGS	6.440E-15	3.611E-12	2.950E-11	1.330E-16	-1.000E+00	5.210E-09	3.740E-10
RED MARR	5.780E-15	3.502E-12	2.861E-11	1.290E-16	-1.000E+00	4.640E-10	8.890E-10
BONE SUR	1.880E-14	8.959E-12	7.318E-11	3.300E-16	-1.000E+00	5.530E-10	1.190E-09
THYROID	6.740E-15	3.638E-12	2.972E-11	1.340E-16	-1.000E+00	2.280E-10	3.640E-10
REMAINDER	6.050E-15	3.502E-12	2.861E-11	1.290E-16	-1.000E+00	1.590E-09	3.200E-09
EFFECTIVE	6.900E-15	3.828E-12	3.127E-11	1.410E-16	-1.000E+00	1.350E-09	1.490E-09
SKIN(FGR)	1.000E-14	4.670E-12	3.814E-11	1.720E-16	-1.000E+00	0.000E+00	0.000E+00
Zr-86							
GONADS	1.260E-14	7.044E-12	2.466E-11	2.880E-16	-1.000E+00	4.190E-10	1.160E-09
BREAST	1.440E-14	6.996E-12	2.449E-11	2.860E-16	-1.000E+00	1.110E-10	1.370E-10
LUNGS	1.220E-14	6.066E-12	2.123E-11	2.480E-16	-1.000E+00	1.240E-09	2.360E-11
RED MARR	1.140E-14	6.091E-12	2.132E-11	2.490E-16	-1.000E+00	1.690E-10	2.300E-10
BONE SUR	2.760E-14	1.150E-11	4.024E-11	4.700E-16	-1.000E+00	1.240E-10	7.890E-11
THYROID	1.260E-14	6.213E-12	2.175E-11	2.540E-16	-1.000E+00	5.600E-11	3.900E-12
REMAINDER	1.160E-14	5.968E-12	2.089E-11	2.440E-16	-1.000E+00	8.390E-10	2.310E-09
EFFECTIVE	1.280E-14	6.580E-12	2.303E-11	2.690E-16	-1.000E+00	5.480E-10	1.040E-09
SKIN(FGR)	1.560E-14	1.032E-11	3.613E-11	4.220E-16	-1.000E+00	0.000E+00	0.000E+00
Zr-88							
GONADS	1.840E-14	1.188E-11	2.427E-10	4.130E-16	-1.000E+00	1.240E-09	5.280E-10
BREAST	2.110E-14	1.153E-11	2.356E-10	4.010E-16	-1.000E+00	1.600E-09	7.360E-11
LUNGS	1.810E-14	1.064E-11	2.174E-10	3.700E-16	-1.000E+00	9.380E-09	2.410E-11
RED MARR	1.730E-14	1.073E-11	2.192E-10	3.730E-16	-1.000E+00	3.680E-09	1.580E-10
BONE SUR	3.520E-14	1.737E-11	3.549E-10	6.040E-16	-1.000E+00	5.670E-09	1.300E-10
THYROID	1.860E-14	1.107E-11	2.262E-10	3.850E-16	-1.000E+00	9.950E-10	1.060E-11
REMAINDER	1.730E-14	1.044E-11	2.133E-10	3.630E-16	-1.000E+00	2.070E-09	7.800E-10
EFFECTIVE	1.880E-14	1.125E-11	2.297E-10	3.910E-16	-1.000E+00	2.940E-09	4.030E-10
SKIN(FGR)	2.260E-14	1.498E-11	3.061E-10	5.210E-16	-1.000E+00	0.000E+00	0.000E+00
Zr-89							
GONADS	5.560E-14	3.281E-11	3.718E-10	1.180E-15	-1.000E+00	3.620E-10	9.340E-10
BREAST	6.320E-14	3.142E-11	3.560E-10	1.130E-15	-1.000E+00	1.220E-10	1.170E-10
LUNGS	5.540E-14	3.003E-11	3.403E-10	1.080E-15	-1.000E+00	1.830E-09	2.270E-11
RED MARR	5.430E-14	3.059E-11	3.466E-10	1.100E-15	-1.000E+00	1.980E-10	1.890E-10
BONE SUR	8.730E-14	4.310E-11	4.883E-10	1.550E-15	-1.000E+00	1.610E-10	6.570E-11
THYROID	5.700E-14	3.086E-11	3.497E-10	1.110E-15	-1.000E+00	7.940E-11	3.620E-12
REMAINDER	5.310E-14	2.975E-11	3.371E-10	1.070E-15	-1.000E+00	8.210E-10	2.150E-09
EFFECTIVE	5.680E-14	3.142E-11	3.560E-10	1.130E-15	-1.000E+00	6.060E-10	9.250E-10
SKIN(FGR)	7.070E-14	5.923E-11	6.711E-10	2.130E-15	-1.000E+00	0.000E+00	0.000E+00
Zr-93							
GONADS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	5.580E-12	9.230E-14
BREAST	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.200E-11	1.970E-13
LUNGS	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	3.300E-09	1.150E-13
RED MARR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	4.490E-08	7.420E-10
BONE SUR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	5.540E-07	9.140E-09
THYROID	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	4.450E-12	7.310E-14
REMAINDER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	1.540E-10	2.830E-10
EFFECTIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	2.250E-08	4.480E-10
SKIN(FGR)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.000E+00	0.000E+00	0.000E+00
Zr-95							
GONADS	3.530E-14	2.182E-11	4.421E-10	7.590E-16	-1.000E+00	8.400E-10	8.160E-10

BREAST	4.010E-14	2.084E-11	4.223E-10	7.250E-16	1.000E+00	9.320E-10	1.050E-10
LUNGS	3.510E-14	1.989E-11	4.030E-10	6.920E-16	1.000E+00	1.860E-08	2.340E-11
RED MARR	3.430E-14	2.030E-11	4.112E-10	7.060E-16	1.000E+00	3.240E-09	2.140E-10
BONE SUR	5.620E-14	2.875E-11	5.824E-10	1.000E-15	1.000E+00	2.170E-08	4.860E-10
THYROID	3.610E-14	2.076E-11	4.205E-10	7.220E-16	1.000E+00	7.820E-10	8.270E-12
REMAINDER	3.360E-14	1.963E-11	3.978E-10	6.830E-16	1.000E+00	2.130E-09	2.530E-09
EFFECTIVE	3.600E-14	2.078E-11	4.211E-10	7.230E-16	1.000E+00	4.290E-09	1.020E-09
SKIN(FGR)	4.500E-14	2.561E-11	5.190E-10	8.910E-16	1.000E+00	0.000E+00	0.000E+00
Zr-97							
GONADS	4.166E-14	2.179E-11	7.799E-11	8.894E-16	1.000E+00	1.700E-10	6.220E-10
BREAST	4.740E-14	2.083E-11	7.455E-11	8.502E-16	1.000E+00	5.790E-11	8.120E-11
LUNGS	4.158E-14	1.992E-11	7.127E-11	8.129E-16	1.000E+00	3.950E-09	1.760E-11
RED MARR	4.065E-14	2.034E-11	7.279E-11	8.301E-16	1.000E+00	1.430E-10	1.300E-10
BONE SUR	6.626E-14	2.881E-11	1.031E-10	1.176E-15	1.000E+00	1.230E-10	4.550E-11
THYROID	4.274E-14	2.061E-11	7.377E-11	8.413E-16	1.000E+00	3.750E-11	2.660E-12
REMAINDER	3.983E-14	1.966E-11	7.035E-11	8.023E-16	1.000E+00	1.720E-09	6.980E-09
EFFECTIVE	4.264E-14	2.078E-11	7.438E-11	8.483E-16	1.000E+00	1.060E-09	2.280E-09
SKIN(FGR)	9.490E-14	2.281E-10	8.148E-10	9.293E-15	1.000E+00	0.000E+00	0.000E+00

```
*DECK OPNFIL
      SUBROUTINE OPNFIL (INPUT, IDENT, IUNIT, CTYPE)
C
C This routine opens the LISTOUTPUT file using CARRIAGECONTROL, if available,
C other files are opened in READONLY mode as either FORMATTED or UNFORMATTED
C Modified 8/21/01 by K.McFadden
C       New value for CTYPE, NOCCONTROL, added to support the correct creation of
C       MACCS STATUS file for WinMaccs
C       ERR = 200 statement added to end of OPEN to aid in user error diagnostics

      EXTERNAL ABORT
      LOGICAL FOUND
      CHARACTER *(*) INPUT, IDENT, CTYPE

C
      IF (CTYPE .EQ. 'LISTOUTPUT') THEN
C Lahey
C        OPEN (6,FILE=INPUT,STATUS='UNKNOWN',CARRIAGECONTROL='FORTRAN')
C Microsoft
C      OPEN (6, FILE=INPUT, STATUS='UNKNOWN')

C       OPEN (6,FILE=INPUT,STATUS='UNKNOWN',CARRIAGECONTROL='FORTRAN')

                OPEN (IUNIT,FILE=INPUT,STATUS='UNKNOWN',
     1       CARRIAGECONTROL='FORTRAN',ERR = 200)

        ELSE IF (CTYPE .EQ. 'NOCCONTROL') THEN
                OPEN (IUNIT,FILE=INPUT,STATUS='UNKNOWN',ERR =200)

      ELSE IF (INPUT(1:2) .NE. '""') THEN
                INQUIRE (FILE=INPUT, EXIST = FOUND)

                IF (FOUND) THEN
C*NOTE: THE SYNTAX FOR READONLY IS NOT DEFINED IN ANSI FORTRAN 77
*IF DEF,Microsoft
                        OPEN (IUNIT, FILE=INPUT, STATUS='OLD', MODE='READ',
     1          FORM = CTYPE,ERR =200)
*ENDIF,Microsoft
*IF DEF,Lahey
C          OPEN (IUNIT, FILE=INPUT, STATUS='OLD', ACTION='READ',
C      1         FORM=CTYPE)
*ENDIF,Lahey
*IF DEF,VAX/VMS
*ENDIF,VAX/VMS
*IF DEF,S/6000
*ENDIF,S/6000
*IF DEF,SPARC
*ENDIF,SPARC
*IF DEF,UNICOS
*ENDIF,UNICOS
C***********************************************************************
                ELSE
                        WRITE(*,20) INPUT, IDENT
                        WRITE(6,20) INPUT, IDENT
   20                   FORMAT(' ERROR!!! ', A, ' NOT FOUND',
     1           /' FILENAME = ', A)
                        CALL ABORT('CHECK FILENAMES')
                ENDIF
      ENDIF

      RETURN
  200   CONTINUE
        CALL ABORT('ERROR OPENING FILE' // TRIM(INPUT))
```

```
      END
*DECK MXXDAT
      SUBROUTINE MXXDAT (TODAY)
C
C THIS ROUTINE OBTAINS FROM THE OPERATING SYSTEM THE MONTH, DAY, AND YEAR
C
      CHARACTER *10 TODAY
C*****************************************************************************
C SECTION 1 FOR DOS PC SYSTEMS USING LAHEY FORTRAN,
C   CODING BY STEVE LEBIEN, 8/23/90
C   (THE FORMAT OF THE TEXT STRING IS MM/DD/YY)
C*****************************************************************************
C      CHARACTER *8 CHAR8
C      CALL DATE (CHAR8)
C      TODAY = CHAR8
C*****************************************************************************
C SECTION 2 FOR VAX/VMS SYSTEMS, CODING BY SAM THOMPSON, 10/12/83
C  THE FORMAT OF THE TEXT STRING RETURNED IN CHAR9 IS '11-JAN-88'
C*****************************************************************************
C      CHARACTER *9 CHAR9
C      CALL DATE (CHAR9)
C      TODAY = CHAR9
C*****************************************************************************
C SECTION 3 FOR IBM S/6000 UNIX WORKSTATIONS, CODING FROM SAM THOMPSON'S CMP
C*****************************************************************************
C      CHARACTER*8 DTODAY
C      CHARACTER*32 VTODAY
C      LOGICAL OPEND
C
C      DTODAY='ZqZqzQzD'
C      VTODAY='\\rm -f '//DTODAY
C      CALL SYSTEM(VTODAY)
C      VTODAY='date > '//DTODAY
C      CALL SYSTEM(VTODAY)
C      TODAY='no date   '
C
C       look for file unit that is not in use
C        DO 20 KIF=99,70,-1
C        INQUIRE(KIF,OPENED=OPEND)
C        IF(OPEND) GO TO 20
C        VTODAY=' '
C        OPEN(KIF,FILE=DTODAY,STATUS='OLD',FORM='FORMATTED',ERR=10)
C        READ(KIF,'(A)',ERR=10,END=10) VTODAY
C        KKIF=KIF
C        GO TO 30
C   10   CLOSE(KIF,ERR=20)
C   20   CONTINUE
C      GO TO 60
C   30 CLOSE(KKIF,STATUS='DELETE',ERR=60)
C      TODAY(1:2)=VTODAY(9:10)
C      TODAY(3:3)='-'
C      TODAY(4:6)=VTODAY(5:7)
C      TODAY(7:7)='-'
C      TODAY(8:9)=VTODAY(27:28)
C   60 CONTINUE
C*****************************************************************************
C SECTION 4 FOR SUN UNIX WORKSTATIONS
C*****************************************************************************
C      EXTERNAL FDATE
C      CHARACTER *24 STRING
C      CALL FDATE(STRING)
C      TODAY(1:2)=STRING(9:10)
C      TODAY(3:3)='-'
```

```
C       TODAY(4:6)=STRING(5:7)
C       TODAY(7:7)='-'
C       TODAY(8:10)=STRING(23:24)
C*****************************************************************************
C SECTION 5 FOR CRAY UNICOS, CODING FROM CHUCK DOBBE, INEL, 10/20/89
C*****************************************************************************
C       CHARACTER *9 CHAR9
C       CHARACTER *3 MONTH(12)
C       DATA MONTH /'JAN','FEB','MAR','APR','MAY','JUN',
C      1            'JUL','AUG','SEP','OCT','NOV','DEC'/
C       CALL DATE (IDATE)
C       WRITE (TODAY,'(A8)') IDATE
C       READ (TODAY, '(I2)') IMONTH
C       CHAR9 = TODAY(4:5) // '-' // MONTH(IMONTH) // '-'  // TODAY(7:8)
C       TODAY = CHAR9
C*****************************************************************************
*IF DEF,DOS/PC
      CHARACTER *9 CHAR9
      CALL DATE (CHAR9)
      TODAY = CHAR9
*ENDIF,DOS/PC
*IF DEF,VAX/VMS
*ENDIF,VAX/VMS
*IF DEF,S/6000
*ENDIF,S/6000
*IF DEF,SPARC
*ENDIF,SPARC
*IF DEF,UNICOS
*ENDIF,UNICOS
C*****************************************************************************
      RETURN
      END
*DECK ABORT
      SUBROUTINE ABORT (MESSAG)
C
C THIS ROUTINE FORCES AN ERROR EXIT WHICH TERMINATES EXECUTION
C
      CHARACTER *(*) MESSAG
      WRITE(6,200) MESSAG
  200 FORMAT(/' !!! ERROR--FORCING ABNORMAL EXIT !!! ', A)

C*****************************************************************************
C SECTION 1 FOR DOS/PC SYSTEMS USING LAHEY FORTRAN, JEFF FOSTER, 5/12/92
C*****************************************************************************
C       CALL EXIT(2)
C*****************************************************************************
C SECTION 2 IS FOR VAX/VMS SYSTEMS, DAVID CHANIN, 3/13/86
C*****************************************************************************
C       CALL EXIT(2)
C*****************************************************************************
C SECTION 3 FOR IBM S/6000 UNIX WORKSTATIONS
C*****************************************************************************
C       CALL EXIT(2)
C*****************************************************************************
C SECTION 3 FOR SUN UNIX WORKSTATIONS
C*****************************************************************************
C       CALL EXIT(2)
C*****************************************************************************
C SECTION 5 FOR CRAY UNICOS
C*****************************************************************************
C       CALL EXIT(2)
C*****************************************************************************
*IF DEF,DOS/PC
```

```
C Modified Aubust 21, 2001 by K. McFadden so console window remains open until
C       user prompts it to close (for WinMaccs application)

c       write (*,*) 'Click on X to close window or type a character follo'
c    1              //'wed by a carriage return to exit application'
c       read (*,*) Dummy

      CALL EXIT(2)
*ENDIF,DOS/PC
*IF DEF,VAX/VMS
*ENDIF,VAX/VMS
*IF DEF,S/6000
*ENDIF,S/6000
*IF DEF,SPARC
*ENDIF,SPARC
*IF DEF,UNICOS
*ENDIF,UNICOS
C*****************************************************************************
      RETURN
      END
      SUBROUTINE TIMER (ITICKS)
      INTEGER *2 IHR, IMIN, ISEC, ITICK
      CALL GETTIM (IHR, IMIN, ISEC, ITICK)
      ITICKS = ITICK + 100 * (ISEC + 60 * IMIN + 3600 * IHR)
      RETURN
      END
      SUBROUTINE DATE (DATVAL)
      CHARACTER *8 DATVAL
      INTEGER *2 IYR, IMON, IDAY
      CALL GETDAT (IYR, IMON, IDAY)
      WRITE (DATVAL,20) IMON, IDAY, IYR - 1900
   20 FORMAT (I2,'/',I2.2,'/',I2.2)
      RETURN
      END
      SUBROUTINE TIME (TIMVAL)
      CHARACTER *8 TIMVAL
      INTEGER *2 IHR, IMIN, ISEC, ITICK
      CALL GETTIM (IHR, IMIN, ISEC, ITICK)
      WRITE (TIMVAL,20) IHR, IMIN, ISEC
   20 FORMAT (I2,':',I2.2,':',I2.2)
      RETURN
      END

      SUBROUTINE EXIT (ICODE)
C NONSENSE CODE TO AVOID COMPILER WARNING
      IF (ICODE .EQ. ICODE) then
                STOP 2
        end if
      RETURN
      END
*DECK MXXCPU
      SUBROUTINE MXXCPU (CPUTIM)
C
C THIS ROUTINE OBTAINS FROM THE OPERATING SYSTEM THE CPU TIME CLOCK IN SECONDS
C
C*****************************************************************************
C SECTION 1 FOR DOS PC SYSTEMS USING LAHEY FORTRAN,
C   CODING BY STEVE LEBIEN, 8/23/90
C*****************************************************************************
C      CALL TIMER (ITICKS)
C      CPUTIM = 0.01 * FLOAT (ITICKS)
C*****************************************************************************
C SECTION 2 FOR VAX/VMS SYSTEMS, CODING BY SAM THOMPSON, 10/12/83
```

```
C*************************************************************************
C       DATA ICPUTC / 2 /
C       DATA FIRST / 0.0 /
C       IF (FIRST .EQ. 0.) THEN
C         FIRST = 1.
C         CALL LIB$INIT_TIMER
C       ENDIF
C       CALL LIB$STAT_TIMER (ICPUTC,IECPUI)
C       CPUTIM = 0.01 * FLOAT (IECPUI)
C*************************************************************************
C SECTION 3 FOR IBM S/6000 UNIX WORKSTATIONS, CODING FROM SAM THOMPSON'S CMP
C*************************************************************************
C       CPUTIM=0.01*MCLOCK()
C*************************************************************************
C SECTION 4 FOR SUN UNIX WORKSTATIONS,
C*************************************************************************
C       EXTERNAL ETIME
C       REAL TARRAY(2)
C       CPUTIM=ETIME(TARRAY)
C*************************************************************************
C SECTION 5 FOR CRAY UNICOS, CODING FROM CHUCK DOBBE, INEL, 10/20/89
C*************************************************************************
C       CALL SECOND (CPUTIM)
C*************************************************************************
*IF DEF,DOS/PC
       CALL TIMER (ITICKS)
       CPUTIM = 0.01 * FLOAT (ITICKS)
*ENDIF,DOS/PC
*IF DEF,VAX/VMS
*ENDIF,VAX/VMS
*IF DEF,S/6000
*ENDIF,S/6000
*IF DEF,SPARC
*ENDIF,SPARC
*IF DEF,UNICOS
*ENDIF,UNICOS
C*************************************************************************
      RETURN
      END
*DECK MXXCLK
      SUBROUTINE MXXCLK (WCLOCK)
C
C THIS ROUTINE OBTAINS FROM THE OPERATING SYSTEM THE TIME OF DAY
C
      CHARACTER *10 WCLOCK
C*************************************************************************
C SECTION 1 FOR DOS PC SYSTEMS USING LAHEY FORTRAN,
C   CODING BY STEVE LEBIEN, 8/23/90
C   (THE FORMAT OF THE TEXT STRING IS HH/MM/SS)
C*************************************************************************
C       CHARACTER  *8 CHAR8
C       CALL TIME (CHAR8)
C       WCLOCK = CHAR8
C*************************************************************************
C SECTION 2 FOR VAX/VMS SYSTEMS, CODING BY SAM THOMPSON, 10/12/83
C   (THE FORMAT OF THE TEXT STRING IS HH:MM:SS)
C*************************************************************************
C       CHARACTER  *8 CHAR8
C       CALL TIME (CHAR8)
C       WCLOCK = CHAR8
C*************************************************************************
C SECTION 3 FOR IBM S/6000 UNIX WORKSTATIONS, CODING FROM SAM THOMPSON'S CMP
C*************************************************************************
```

```
C       CHARACTER*8  DTODAY
C       CHARACTER*32 VTODAY
C       LOGICAL OPEND
C
C       DTODAY='ZqZqZqZD'
C       VTODAY='\\rm -f '//DTODAY
C       CALL SYSTEM(VTODAY)
C       VTODAY='date > '//DTODAY
C       CALL SYSTEM(VTODAY)
C       WCLOCK='no time    '
C
C        look for file unit that is not in use
C         DO 20 KIF=99,70,-1
C         INQUIRE(KIF,OPENED=OPEND)
C         IF(OPEND) GO TO 20
C         VTODAY=' '
C         OPEN(KIF,FILE=DTODAY,STATUS='OLD',FORM='FORMATTED',ERR=10)
C         READ(KIF,'(A)',ERR=10,END=10) VTODAY
C         KKIF=KIF
C         GO TO 30
C   10    CLOSE(KIF,ERR=20)
C   20    CONTINUE
C       GO TO 60
C   30 CLOSE(KKIF,STATUS='DELETE',ERR=60)
C       WCLOCK=VTODAY(12:19)
C   60 CONTINUE
C*****************************************************************************
C SECTION 4 FOR SUN UNIX WORKSTATIONS
C*****************************************************************************
C       CHARACTER *24 STRING
C       EXTERNAL FDATE
C       CALL FDATE(STRING)
C       WCLOCK=STRING(12:20)
C*****************************************************************************
C SECTION 5 FOR CRAY UNICOS, CODING FROM CHUCK DOBBE, INEL, 10/20/89
C*****************************************************************************
C       CALL CLOCK (ITIME)
C       WRITE (WCLOCK,'(A8)') ITIME
C*****************************************************************************
*IF DEF,DOS/PC
      CHARACTER  *8 CHAR8
      CALL TIME (CHAR8)
      WCLOCK = CHAR8
*ENDIF,DOS/PC
*IF DEF,VAX/VMS
*ENDIF,VAX/VMS
*IF DEF,S/6000
*ENDIF,S/6000
*IF DEF,SPARC
*ENDIF,SPARC
*IF DEF,UNICOS
*ENDIF,UNICOS
C*****************************************************************************
      RETURN
      END

        SUBROUTINE MXXENV(FNAME)
        USE DFLIB
C SET SYSTEM ENVIRONMENTAL VARIABLE FOR_DIAGNOSTIC_LOG_FILE TO FNAME
C WRITTEN BY K. MCFADDEN 8/21/2001, LIKELY ONLY TO WORK ON COMPAQ
*IF DEF,DOS/PC
        CHARACTER *(*) FNAME
        LOGICAL(4) RES
```

```
        RES = SETENVQQ('FOR_DIAGNOSTIC_LOG_FILE=' // TRIM(FNAME))
        IF (RES .EQ. .FALSE.) THEN
                WRITE(6,*) 'ERROR, UNABLE TO SET ENVIRONMENT VARIABLE '
        1                // 'FOR_DIAGNOSTIC_LOG_FILE TO ' // TRIM(FNAME)
        END IF
*ENDIF,DOS/PC
        RETURN
        END

        SUBROUTINE MXX_MACCS_TMP(FNAME, LOGPATH)
        USE DFLIB
C OPTIONALLY, THE USER IS ALLOWED TO SPECIFY THE NAME OF THE MACCS.TMP FILE
C       BY USING THE -i ARGUMENT TO THE PROGRAM
C IF IT IS NOT SPECIFIED, THE SET THE NAME TO MACCS3.TMP
C OTHERWISE, SET TO THE NAME SPECIFIED
C IF SPECIFIED, LOGPATH WILL BE TO THE PATH INDICATED
C       LOG FILES CREATED
C FIRST ARGUMENT IS EXPECTED TO BE '-i'
C SECOND ARGUMENT IS EXPECTED TO BE NAME OF FILE, INCLUDING PATH
C WRITTEN BY K. MCFADDEN  8/28/2001.  LIKELY ONLY TO WORK ON COMPAQ
C
C Modified 1/8/04. change default input file name from MACCS3.TMP to MACCS2.TMP
*IF DEF,DOS/PC
        CHARACTER *(*) FNAME, LOGPATH
        CHARACTER * 80 BUFFER
        INTEGER(2) STATUS

        CALL GETARG(1,BUFFER,STATUS)
        IF (STATUS .EQ. -1)  GO TO 100
        IF (BUFFER(1:2) .NE. '-i') GO TO 100

        CALL GETARG(2,BUFFER,STATUS)
        IF (STATUS .EQ. -1)  GO TO 100
        FNAME = BUFFER

C SET LOGPATH TO PATH STRIPPED FROM FNAME
C       LOOK FROM LAST NON BLANK IN STRING, BACKWARDS UNTIL FIND A PATH SEPARATOR
        DO I=LEN(TRIM(FNAME)), 1, -1
                IF (FNAME(I:I) .EQ. "\") THEN
                        LOGPATH = FNAME(1:I)
                        GO TO 50
                ENDIF
        END DO
C PATH SEPARATOR NOT FOUND
        LOGPATH = ""
   50 CONTINUE
        RETURN

  100 CONTINUE
C       ARGUMENT NOT PRESENT
        FNAME = "MACCS2.TMP"
        LOGPATH = ""
        RETURN
*ENDIF,DOS/PC
        END
```

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Job Messages

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Job Messages

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