THE CLEAN AIR ACT ASSESSMENT PACKAGE-1988 (CAP-88)
A DOSE AND RISK ASSESSMENT METHODOLOGY FOR RADIONUCLIDE EMISSIONS TO AIR

VOLUME 2

APPENDICES A - H

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APPENDIX A

AIRDOS-EPA (AIRDOS2.FOR) PROGRAM FILE

AIRDOS-EPA (AIRDOS2.FOR) Program File

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

C
C                   AIRDOS2 PA CODE
C
C       R. E. MOORE  HEALTH AND SAFETY RESEARCH DIV.  ORNL
C       DOSEN MODIFIED TO SUPPRESS PRINT FOR NSTB.NE.1.  11/10/82
C
C       ADP 534 MODIFICATIONS JUNE 1988 BY CARYN PLUMMER.
C
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD, ACON(36,20,
     >  20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11), ORMODI(36,12,8)
     > , VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      COMMON /OCOMCHAR/ NAMNUC(36),WORD
      CHARACTER*8 NAMNUC,WORD
      CHARACTER*36 DATE_AND_TIME

      INTEGER OPTION(9)
      DATA DATE_AND_TIME /'                                    '/

      CALL ERRSET(208,256,-1,1)

C***  GET DATE AND TIME
      READ(50,1000) DATE_AND_TIME
1000  FORMAT(A)

      READ(50,9004)WORD,OPTION
      WRITE(6,9005)
      WRITE(6,9006)
      WRITE(6,9007)
      IF (OPTION(1).EQ.1) WRITE(6,9008)
      IF (OPTION(1).EQ.2) WRITE(6,9017)
      IF (OPTION(2).EQ.1) WRITE(6,9009)
      IF (OPTION(2).EQ.0) WRITE(6,9019)
C
      IF (OPTION(3).EQ.0) WRITE(6,9011)
      IF (OPTION(3).EQ.1) WRITE(6,9010)
C
      IF (OPTION(4).EQ.0) WRITE(6,9012)
      IF (OPTION(4).EQ.1) WRITE(6,9013)
      IF (OPTION(4).EQ.2) WRITE(6,9014)
C
      IF (OPTION(5).EQ.1.AND.OPTION(2).EQ.1) WRITE(6,9015)
      IF (OPTION(5).EQ.1.AND.OPTION(2).NE.1) WRITE(6,9016)
      IF (OPTION(5).EQ.1.AND.OPTION(2).NE.1) STOP
C
      IF (OPTION(6).NE.0) WRITE(6,9018)OPTION(6)
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
      IF (OPTION(7).EQ.1) WRITE(6,9000)
      IF (OPTION(8).EQ.1) WRITE(6,9001)
      IF (OPTION(9).EQ.1) WRITE(6,9002)
C
      CALL CONCEN(OPTION(2),OPTION(3),OPTION(4),OPTION(5),OPTION(6),
     > OPTION(7),OPTION(8),OPTION(9),DATE_AND_TIME)
      IF (OPTION(1).EQ.0) CALL DOSEN(DATE_AND_TIME)
      STOP
 9000 FORMAT(' ',T30,'THE CALCULATIONS ARE MADE FOR A UNIFORM CIRCULAR A
     >REA SOURCE')
 9001 FORMAT(' ',T30,'THE MAIN OUTPUT TABLE IN SUBROUTINE CONCEN IS NOT
     >PRINTED')
 9002 FORMAT(' ',T30,'THE CHI/Q TABLES ARE NOT PRINTED')
 9004 FORMAT(A8,5I1,I2,3I1)
 9005 FORMAT('1',T50,'OUTPUT OF AIRDOS-EPA COMPUTER CODE')
 9006 FORMAT('0')
 9007 FORMAT(' ',T20,'OPTIONS SELECTED--')
 9008 FORMAT('0',T30,'PROGRAM TERMINATED AFTER PRINTING RADIONUCLIDE CON
     >CENTRATIONS')
 9009 FORMAT(' ',T30,'RADIONUCLIDE CONCENTRATIONS ARE LISTED FOR DIRECTI
     >ON AND DISTANCE FROM FACILITY')
 9010 FORMAT(' ',T30,'RADIONUCLIDE CONCENTRATIONS LISTED ARE PLUME CENTE
     >RLINE VALUES')
 9011 FORMAT('0',T30,'RADIONUCLIDE CONCENTRATIONS LISTED ARE SECTOR-AVER
     >AGED VALUES')
 9012 FORMAT(' ',T30,'PLUME RISE IS COMPUTED FOR BUOYANT PLUMES BY BRIGG
     >S EQUATIONS')
 9013 FORMAT(' ',T30,
     > 'PLUME RISE IS COMPUTED FOR MOMENTUM-TYPE EMISSIONS')
 9014 FORMAT(' ',T30,'SPECIFIC PLUME RISE USED FOR EACH AIR STABILITY CL
     >ASS (METERS)-')
 9015 FORMAT('0',T30,'DEPOSITION VELOCITY IS VARIED WITH DIRECTION AND D
     >ISTANCE')
 9016 FORMAT('0',T30,'ERROR--ILLEGAL USE OF VARIABLE DEPOSITION VELOCITY
     > WITH SQUARE GRID')
 9017 FORMAT('0',T30,'DOSES ARE CALCULATED FROM INPUT AIR CONCENTRATIONS
     > AND GROUND DEPOSITION RATES')
 9018 FORMAT(' ',T30,'AIR CONCENTRATIONS AND GROUND DEPOSITION RATES ARE
     > PUNCHED ON CARDS FOR THE FIRST ',I2,' RADIONUCLIDES')
 9019 FORMAT(' ',T30,'THE ASSESSMENT AREA IS A 20 BY 20 SQUARE GRID')
      END

      BLOCK DATA
      REAL KIQ
      COMMON /TCOM/ KIQ(36,20,20)
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD,ACON(36,20,20),
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     >GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11),ORMODI(36,12,8),
     >VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      DATA KIQ /14400*0.0/,VDCOEF /400*1.0/,ORMODI /3456*0/
      DATA ACON /14400*0.0/,GCON /14400*0.0/
      END
C*****************************************************************
C*****************************************************************
      SUBROUTINE CHIQ
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD, ACON(36,20,
     >  20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11), ORMODI(36,12,8)
     > , VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      COMMON /OCOMCHAR/ NAMNUC(36),WORD
      CHARACTER*8 NAMNUC,WORD
      COMMON /PCOM/ REL(6,36),IDIST(20),NUMST
      COMMON /TCOM/ KIQ(36,20,20)
      DIMENSION REGL(36)
      REAL KIQ
      DO 50 I=1,NNUCS
         REGL(I)=0
         DO 40 J=1,NUMST
   40       REGL(I)=REGL(I)+REL(J,I)
   50    CONTINUE
      DO 90 I=1,NNUCS
         DO 80 NO=NOL,NOU
            DO 60 NR=NRL,NRU
               IF (REGL(I).EQ.0) GO TO 70
   60          KIQ(I,NO,NR)=(ACON(I,NO,NR)/REGL(I))*1.E6
            GO TO 80
   70       KIQ(I,NO,NR)=0.
   80       CONTINUE
   90    CONTINUE
      DO 130 I=1,NNUCS
         WRITE(51,9000)NAMNUC(I)
         WRITE(51,9001)
         WRITE(51,9002)
         WRITE(51,9003)
         WRITE(51,9001)
         WRITE(51,9004)
         WRITE(51,9005)
         NO=1
         DO 100 NR=NRL,NRU
  100       WRITE(51,9007)IDIST(NR),KIQ(I,NO,NR),KIQ(I,NO+1,NR),KIQ(I,
     >       NO+2,NR),KIQ(I,NO+3,NR),KIQ(I,NO+4,NR),KIQ(I,NO+5,NR),
     >       KIQ(I,NO+6,NR), KIQ(I,NO+7,NR)
         ISP=(22-2*(NRU/2))/2
         DO 110 IG=1,ISP
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

 110        WRITE(51,9001)
         WRITE(51,9006)
         WRITE(51,9005)
         NO=9
         DO 120 NR=NRL,NRU
 120        WRITE(51,9007)IDIST(NR),KIQ(I,NO,NR),KIQ(I,NO+1,NR),KIQ(I,
     >       NO+2,NR),KIQ(I,NO+3,NR),KIQ(I,NO+4,NR),KIQ(I,NO+5,NR),
     >       KIQ(I,NO+6,NR), KIQ(I,NO+7,NR)
 130     CONTINUE
      RETURN
 9000 FORMAT('1',T25,'GROUND-LEVEL CHI/Q VALUES FOR ',A8,
     > 'AT VARIOUS DISTANCES IN EACH COMPASS DIRECTION')
 9001 FORMAT('0')
 9002 FORMAT(' ',T20,'DISTANCE',T52,'CHI/Q TOWARD INDICATED DIRECTION')
 9003 FORMAT(' ',T20,'(METERS)',T60,'(SEC/CUBIC METER)')
 9004 FORMAT(' ',T32,'N',T43,'NNW',T54,'NW',T65,'WNW',T76,'W',T87,'WSW',
     > T98,'SW',T109,'SSW')
 9005 FORMAT(' ')
 9006 FORMAT(' ',T32,'S',T43,'SSE',T54,'SE',T65,'ESE',T76,'E',T87,'ENE',
     > T98,'NE',T109,'NNE')
 9007 FORMAT(' ',T19,I7,T30,E9.3,T41,E9.3,T52,E9.3,T63,E9.3,T74,E9.3,
     > T85,E9.3,T96,E9.3,T107,E9.3)
      END
C*********************************************************************
C*********************************************************************
      SUBROUTINE CONCEN(LORT,LOST,LRISE,LDEP,LPUN,LARE,LTAB,LCHI,
     +                  DATE_AND_TIME)

C
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD, ACON(36,20,
     >  20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11), ORMODI(36,12,8)
     > , VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      COMMON /PCOM/ REL(6,36),IDIST(20),NUMST
      COMMON /FCOM/ FEQWL,INTPA(20,20)
      COMMON /OCOMCHAR/ NAMNUC(36),WORD
      CHARACTER*8 NAMNUC,WORD
      CHARACTER*3 DIRECTION(16)
      CHARACTER*36 DATE_AND_TIME
      INTEGER ALPH
      LOGICAL RADON_FLAG
C
      DIMENSION AA(7,4,4),DIA(6),FRAW(7,16),PERD(16),AVON(20,20), PH(6),
     >  PR(7),QH(6), SC(36),TAI(36),TG(3),TGD(36), UDAV(7,16), UDCAT(7,
     > 16),VEL(6),VG(36),NOMA(36),NSPTMO(20,20),NSPTM1(200),NSPTM2(200),
     > FDSTOR(36,6,7),BOUND(21),LIST(20),TQ(36)
      DIMENSION DIM(6)
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
      DATA AVON/400*0/
      DATA NOMA/36*0/,ALPH/0/
      DATA RADON_FLAG /.FALSE./
      DATA DIRECTION/'N  ','NNW','NW ','WNW','W  ','WSW','SW ','SSW',
     > 'S  ','SSE','SE ','ESE','E  ','ENE','NE ','NNE'/
      EQUIVALENCE (NSPTMO(1,1),NSPTM1(1)),(NSPTMO(1,11),NSPTM2(1))
      DATA NSPTM1/ 07,07,07,07,08,08,08,08,09,09,09,09,10,10,10,10,11,
     > 11,11,11, 07,07,07,07,08,08,08,08,09,09,09,09,10,10,10,10,11,11,
     > 11;11, 07,07,07,07,07,08,08,08,08,09,09,10,10,10,10,11,11,11,11,
     > 11, 07,07,07,07,07,07,08,08,08,09,09,10,10,10,11,11,11,11,11,11,
     > 06,06,07,07,07,07,08,08,08,09,09,10,10,10,11,11,11,11,12,12, 06,
     > 06,06,07,07,07,07,08,08,09,09,10,10,11,11,11,11,12,12,12, 06,06,
     > 06,06,06,07,07,07,08,09,09,10,11,11,11,12,12,12,12,12, 06,06,06,
     > 06,06,06,07,07,08,09,09,10,11,11,12,12,12,12,12,12, 05,05,06,06,
     > 06,06,06,06,07,08,10,11,12,12,12,12,12,12,13,13, 05,05,05,05,05,
     > 05,05,05,06,07,11,12,13,13,13,13,13,13,13,13/
      DATA NSPTM2/ 05,05,05,05,05,05,05,05,04,03,15,14,13,13,13,13,13,
     > 13,13,13, 05,05,04,04,04,04,04,04,03,02,16,15,14,14,14,14,14,14,
     > 13,13, 04,04,04,04,04,04,03,03,02,01,01,16,15,15,14,14,14,14,14,
     > 14, 04,04,04,04,04,03,03,03,02,01,01,16,15,15,15,14,14,14,14,14,
     > 04,04,04,03,03,03,03,02,02,01,01,16,16,15,15,15,15,14,14,14, 04,
     > 04,03,03,03,03,02,02,02,01,01,16,16,16,15,15,15,15,14,14, 03,03,
     > 03,03,03,03,02,02,02,01,01,16,16,16,15,15,15,15,15,15, 03,03,03,
     > 03,03,02,02,02,02,01,01,16,16,16,16,15,15,15,15,15, 03,03,03,03,
     > 02,02,02,02,01,01,01,01,16,16,16,16,15,15,15,15, 03,03,03,03,02,
     > 02,02,02,01,01,01,01,16,16,16,16,15,15,15,15/
C
C-----THIS ARRAY HOLDS THE VALUES FOR CONSTANTS ASSOCIATED WITH EACH
C-----OF THE 7 PASQUILL AIR STABILITY CATAGORIES (A,C,D,F).
C
      DATA AA/.9757,.9986,.9767,.9600,.9615,.9733,.9986, .8660,.8493,
     > .8540,.8670,.8670,.8540,.8360, .8660,.8493,.8540,.8670,.8670,
     > .8540,.8360, .6294,.6303,.6254,.6342,.6260,.6342,.8360, 3.928,
     > 6.205,7.623,10.00,14.13,21.28,31.03, 1.841,2.213,3.266,5.261,
     > 7.357,9.333,10.093, 1.841,2.213,3.266,5.261,7.357,9.333,10.093,
     > .2083,.2946,.3977,.6166,.8042,1.233,10.093, 1.000,1.000,.9540,
     > .8061,.8600,.8823,.8257, 1.000,1.000,.8330,.6715,.6290,.6321,
     > .6547, 1.000,1.000,.8330,.5099,.4054,.3710,.3818, 1.000,1.000,
     > .5524,.5251,.1110,.1106,.1106, 5.020,8.350,10.015,7.48,15.50,
     > 34.70,61.25, 5.020,8.350,4.400,2.950,3.150,6.132,18.80, 5.020,
     > 8.350,4.400,.8100,.5240,.7640,2.115, 5.020,8.350,.3320,.9300,
     > .0349,.0694,.1739/
C
C---END OF DECLARATIONS
C
      READ(50,9008)NOL,NOU,NRL,NRU
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

      READ(50,9009)PR
      READ(50,9011)WORD
      READ(50,9009)SQSD
      READ(50,9000)SEQWL
      READ(50,9008)IDIST
      READ(50,9011)WORD
      READ(50,9008)LIDA1
      READ(50,9009)RR,TA,TG
      READ(50,9010)PERD
      READ(50,9010)((UDCAT(I,J),J=1,16),I=1,7)
      READ(50,9010)(( UDAV(I,J),J=1,16),I=1,7)
      READ(50,9012)FRAW
      READ(50,9011)WORD
      READ(50,9008)NUMST
      DO 30 J=1,NUMST
   30    READ(50,9009)PH(J),DIA(J),VEL(J),QH(J),DIM(J)
      READ(50,9011)WORD
      READ(50,9008)NNUCS
      DO 40 I=1,NNUCS
         READ(50,9011) NAMNUC(I)
         IF ( NAMNUC(I) .EQ. 'RN-222' ) THEN
             RADON_FLAG = .TRUE.
         ENDIF
         READ(50,9009)ANLAM(I),SC(I),VD(I),VG(I)
   40    READ(50,9009)(REL(J,I),J=1,NUMST)
      IF (LDEP.EQ.1) THEN
         READ(50,9009) (BOUND(I),I=2,21)
         READ(50,9059) ((VDCOEF(I,J),J=NRL,NRU),I=NOL,NOU)
         READ(50,9060) LIST
         BOUND(1)=0.0
      ELSE
         LID1=LIDA1
         FEQWL=SEQWL
         LA1=LIDA1
      ENDIF
      IF (LIDA1.EQ.10000) LA1=ALPH
  130 IF (LTAB.EQ.0) THEN
         WRITE(51,90521) DATE_AND_TIME
         WRITE(51,9052)
         WRITE(51,9053)
         IF ( RADON_FLAG ) THEN
            WRITE(51,9054)
         ELSE
            WRITE(51,90541)
         ENDIF
         WRITE(51,9013)
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

      ENDIF
      DO 170 I=1,NNUCS
         DO 160 J=1,NUMST
  160       REL(J,I)=REL(J,I)*3.17098E4
  170    CONTINUE
C---END OF INPUT ROUTINE
C
C---THIS SUBROUTINE CALCULATES AIR CONCENTRATION(ACON)
C---AND GROUND DEPOSITION RATE(GCON)
C-----IF(EXP(-(ANLAM(I)*SQRT(2*10*SQSD**2)/(2*8.64E4)).LT.0.99))
C-----REDUCES TO
C-----IF(ANLAM(I).GT.(122.188054/SQSD))
      DISTG=122.188054/SQSD
C
C-----THIS BLOCK EXAMINES CERTAIN INPUT VALUES FOR EQUALITY.  IF THEY
C-----ARE EQUAL, THEN MUCH OF THE FOLLOWING CALCULATION NEED NOT BE
C-----PERFORMED FOR THAT NUCLIDE.  NOMA IS THE ARRAY OF FLAGS THAT
C-----EQUALITY HAS BEEN FOUND & WITH WHICH NUCLIDE.
C
      IF(NNUCS.GE.2) THEN
         DO 192 I=2,NNUCS
            IEN=I-1
            DO 190 M=1,IEN
               IF (REL(1,M).EQ.0) GO TO 190
               IF (VD(I).NE.VD(M)) GO TO 190
               IF (VG(I).NE.VG(M)) GO TO 190
               IF (SC(I).NE.SC(M)) GO TO 190
               IF (ANLAM(I).GT.DISTG) GO TO 190
               IF (ANLAM(M).GT.DISTG) GO TO 190
               NOMA(I)=M
               GO TO 192
  190       CONTINUE
  192    CONTINUE
      ENDIF
C
C-----THIS BLOCK LOOPS THRU THE GRID COVERING THE AREA AROUND THE PLANT.
C
      DO 680 NO=NOL,NOU
         DO 200 I=1,NNUCS
            IF (LDEP.NE.1) GO TO 210
            DO 200 J=1,NUMST
               DO 200 K=1,7
                  FDSTOR(I,J,K)=1
  200             CONTINUE
  210    DO 670 NR=NRL,NRU
            DO 220 I=1,NNUCS
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

            TQ(I)=0.
               TAI(I)=0.
  220          TGD(I)=0.
  240             X=IDIST(NR)
                  MO=NO
  250             X0=X
                  THETA=1.0
                  M=0
C
C-----THIS BLOCK LOOPS THRU THE STACKS (EMISSION POINTS).
C
                  DO 600 J=1,NUMST
                     M=0
                     IF (LARE.EQ.0) GO TO 290
C
C-----AREA SOURCE BLOCK (BY CHRISTOPHER B. NELSON,EPA).
C
C... CONSIDER SOURCES TO BE POINT SOURCES IF LESS THAN 10 METERS
C... DIAM. OR IF RATIO OF DISTANCE X TO THE DIAM. IS GREATER THAN 2.5.
C
                     TESTAR=X/(DIM(J)+.00001)
                     IF (DIM(J).LT.10..OR.TESTAR.GT.2.5) GO TO 290
C
C... R0 IS THE RADIUS OF THE SOURCE.
C... R1 IS THE INNER RADIUS OF THE TRANSFORMED SOURCE.
C... R2 IS THE OUTER RADIUS OF THE TRANSFORMED SOURCE.
C... X IS THE EFFECTIVE DISTANCE FOR CALCULATING CHI/Q.
C... THETA IS THE ANGULAR WIDTH IN SECTORS OF THE TRANSFORMED SOURCE.
C... (MULTIPLY THETA BY PI/8.0 TO CONVERT THETA TO RADIANS.)
C... 0.88622693=SQRT(PI/4.)
C... 2.5198421=4.0**(2/3)
C... 4.5135167=8./SQRT(PI)
C
                     R0=DIM(J)/2.0
                     IF (X0.GT.0.88622693*R0) GO TO 270
                     IF (X0.GT.0.5*R0) GO TO 260
C
C... 0.LE.X0.LE.R0/2.
                     R1=0.
                     R2=R0
                     X=R2/2.5198421
                     THETA=16.
                     GO TO 280
C
C... R0/2.LT.X0.LE.R0*SQRT(PI/4.)
  260                R1=0.
```

```
0         1         2         3         4         5         6         7
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                      R2=2.*X0
                      X=R2/2.5198421
                      THETA=4.0*(R0/X0)**2
                      GO TO 280
C
C... R0*SQRT(PI/4).LT.X0
  270                 R1=X0-0.88622693*R0
                      R2=X0+0.88622693*R0
                      X=(X0*(SQRT(R2)+SQRT(R1))/2.0)**0.66666667
                      THETA=4.5135167*R0/X0
C
C... M IS THE NUMBER OF SECTORS ON EACH SIDE OF MO WHICH
C... INCLUDE THE TRANSFORMED SOURCE.
  280                 M=INT(THETA/2.0+0.5)
C... DTHETA IS THE ANGULAR WIDTH OF THE TRANSFORMED SOURCE IN THE FIRST
C... AND LAST SECTORS.
                      DTHETA=AMOD((THETA/2.0+0.5),1.0)
                      IF (DTHETA.LE.0.) THEN
                         M=M-1
                         DTHETA=1.0
                      ENDIF
  290                 IF (M.EQ.0) DTHETA=THETA
C... LL IS THE TOTAL NUMBER OF SECTORS WHICH CONTRIBUTE TO CHI/Q.
                      LL=2*M+1
C... L1 IS THE INITIAL SECTOR.
                      L1=MOD(MO-M+15,16)+1
                      DO 580 L=1,LL
                         MO=MOD(L1+L+14,16)+1
                         IF (L.EQ.1.OR.L.EQ.LL) THEN
                            PERW=PERD(MO)*DTHETA/THETA
                         ELSE
                            PERW=PERD(MO)/THETA
                         ENDIF
C
C-----END OF AREA SOURCE BLOCK.
C
C-----THIS BLOCK LOOPS THRU THE 7 PASQUILL AIR STABILITY CATEGORIES.
C
  310                    DO 580 JH=1,7
                            IF (FRAW(JH,MO).EQ.0) GO TO 580
                            U = UDAV(JH,MO)
                            UD=UDCAT(JH,MO)
                            IF (U.GT.6.OR.U.LT.1.) THEN
                               FF1=0.
                               FF2=1.
                               FF3=0.
```

```
0         1         2         3         4         5         6         7
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                              ELSE
                                 FF2=(1.167-U/6.-1./UD)/(1.167-U/6.-1./U)
                                 FF3=((U-1.)*(1.-FF2))/5.
                                 FF1=1.-FF2-FF3
                              ENDIF
C-----THIS BLOCK CALCULATES PLUME RISE
C-----RISE=0..BRIGGS' EQUATIONS FOR BUOYANT PLUMES
C-----RISE=1..RUPP'S EQUATIONS FOR MOMENTUM-TYPE EMISSIONS
C-----RISE=2..READ PLUME RISE FROM CARDS
  330                 IF (LRISE.EQ.0) THEN
                         IF (JH.GT.4) THEN
                            S=9.80665/TA*(TG(JH-4)+.0098)
                            IF (X.LE.2.4*U/SQRT(S)) THEN
                               H =PH(J)+(1.6/U*( (.000037*QH(J)*X*X)**
     >                          .33333333 ))
                            ELSE
                               H =PH(J)+(2.9*( (.000037*QH(J)/U/S)**
     >                          .33333333 ) )
                            ENDIF
                         ELSE
                            IF (X.LE.10.*PH(J)) THEN
                               H =PH(J)+(1.6/U*( (.000037*QH(J)*X*X)**
     >                          .33333333 ))
                            ELSE
                               H =PH(J)+(1.6/U*( (.0037000*QH(J)*PH(J)*PH(J)
     >                          )** .33333333))
                            ENDIF
                         ENDIF
                      ELSE
                         IF (LRISE.EQ.1) H=PH(J)+1.5*VEL(J)*DIA(J)/U
                         IF (LRISE.EQ.2) H=PH(J)+PR(JH)
                      ENDIF
C    END OF PLUME RISE CALCULATIONS
  380                         NX=1
                              IF (X.GT.1000) NX=2
                              IF (X.GT.3000) NX=3
                              IF (X.GT.10000) NX=4
                              A=AA(JH,NX,1)
                              C=AA(JH,NX,2)
                              D=AA(JH,NX,3)
                              F=AA(JH,NX,4)
C
C-----THIS BLOCK LOOPS THRU THE DIFFERENT NUCLIDES RELEASED IN THE PLUME
C
                              DO 570 I=1,NNUCS
                                 IF (NOMA(I).GT.0.AND.J.EQ.1) GO TO 570
```

```
0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

C-----DETERMINE XLIDO (VALUE OF X WHERE LID AFFECTS VERTICAL DISPERSION)
                                Y1=0.
                                Y2=10000.
                                DO 410 IX1=1,3
                                   DO 390 IX2=1,10
                                      Y=Y1+Y2*IX2
                                      IF (Y**D.GT.(.47*F*(LID1+Y*VG(I)/UD)
     >                                 )) GO TO 400
  390                                 CONTINUE
  400                              Y1=Y1+Y2*(IX2-1)
  410                              Y2=Y2/10.
                                XLIDO=2.*Y
C-----THIS BLOCK FINDS DEPLETION FRACTION
                                VD1=VD(I)
C-----SECTION TO FIND DEPLETION IF BY VARIABLE DEPOSITION
C-----LDEP=1 IS OPTION FOR VARIABLE DEPOSITION VELOCITY
C-----BOUND(NR) IS THE LOWER BOUND ON THE INTERVAL OF INTEGRATION
C-----BOUND(NR+1) IS THE UPPER BOUND
                                IF (LDEP.EQ.1) THEN
                                   VD1=VD1*VDCOEF(NO,NR)
                                   IF (X.LE.XLIDO) THEN
                                      CALL QX(BOUND(NR),X,U,UD,H,VD1,
     >                                        VG(I),JH,FDD)
                                   ELSE
                                      IF (BOUND(NR).LT.XLIDO) THEN
                                         CALL QX(BOUND(NR),XLIDO,U,UD,H,
     >                                              VD1,VG(I),JH, FDD)
                                      ENDIF
                                   ENDIF
                                FDD=FDD*FDSTOR(I,J,JH)
                                IF (X.NE.BOUND(NR+1)) THEN
                                   IF (BOUND(NR+1).GT.XLIDO) THEN
                                      IF (X.GT.XLIDO) THEN
                                         FD1=EXP(-((BOUND(NR+1)-
     >                                           XLIDO)*VD1/(LID1*UD)))
                                         FDSTOR(I,J,JH)=FDD*FD1
                                      ELSE
                                         CALL QX(X,BOUND(NR+1),U,UD,H,
     >                                        VD1,VG(I),JH,FD1)
                                         FD1=FD1*EXP(-((BOUND(NR+1)-
     >                                           XLIDO)*VD1/(LID1* UD)))
                                         FDSTOR(I,J,JH)=FDD*FD1
                                      ENDIF
                                   ELSE
                                      CALL QX(X,BOUND(NR+1),U,UD,H,VD1,
     >                                     VG(I),JH,FD1)
```

```
0         1         2         3         4         5         6         7
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                                    FDSTOR(I,J,JH)=FDD*FD1
                                 ENDIF
                              ELSE
                                 FDSTOR(I,J,JH)=FDD*FD1
                              ENDIF
                           ELSE
                              IF (X.LE.XLIDO) THEN
                                 IF (VG(I).EQ.0) THEN
                                    CALL QY(0,X,U,UD,H,VD1,VG(I),JH,FDD)
                                 ELSE
                                    CALL QX(0,X,U,UD,H,VD1,VG(I),JH,FDD)
                                 ENDIF
                              ELSE
                                 IF (VG(I).EQ.0) THEN
                                    CALL QY(0,XLIDO,U,UD,H,VD1,
     >                                      VG(I),JH,FDD)
                                 ELSE
                                    CALL QX(0,XLIDO,U,UD,H,VD1,
     >                                      VG(I),JH,FDD)
                                 ENDIF
                                 FDD=FDD*EXP(-((X-XLIDO)*
     >                                       VD1/(LID1*UD)))
                              ENDIF
                           ENDIF
C-----END VARIABLE DEPOSITION SECTION
C-----SECTION FOR DEPLETION IF BY CONSTANT DEPOSITION
                              IF (X.LE.XLIDO) THEN
                                 IF (VG(I).EQ.0) THEN
                                   CALL QY(0,X,U,UD,H,VD1,VG(I),JH,FDD)
                                 ELSE
                                   CALL QX(0,X,U,UD,H,VD1,VG(I),JH,FDD)
                                 ENDIF
                              ELSE
                                 IF (VG(I).EQ.0) THEN
                                    CALL QY(0,XLIDO,U,UD,H,VD1,VG(I),
     >                                      JH,FDD)
                                 ELSE
                                    CALL QX(0,XLIDO,U,UD,H,VD1,VG(I),
     >                                      JH,FDD)
                                 ENDIF
                                 FDD=FDD*EXP(-((X-XLIDO)*VD1/
     >                                      (LID1*UD)))
                              ENDIF
C-----END CONSTANT DEPOSITION SECTION
C-----END DEPLETION FRACTION BLOCK
                              QRED=-ANLAM(I)*X/86400.
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

                                QRED=REL(J,I)*FDD*(FF1*EXP(-SC(I)*X)+FF2*
     >                           EXP(-SC(I)*X/U)+FF3*EXP (-SC(I)*X/6.))*
     >                           (FF1* EXP(QRED)+FF2*EXP(QRED/U)+FF3*
     >                           EXP(QRED/6.))
                                CHAD=QRED/(6.2832*((X**A)/C)*((X**D)/F)*
     >                           UD)
                                IF ((VG(I)*X)/UD.GE.H) H=(VG(I)*X)/UD
                                IF ((.5*(((((VG(I)*X)/UD)-H)/((X**D)/F))**
     >                           2)).GT.50) BX=0
                                IF ((.5*(((((VG(I)*X)/UD)-H)/((X**D)/F))**
     >                           2)).GT.50) GO TO 540
                                BX=CHAD*(EXP(-.5*(((((VG(I)*X)/UD)-H)/((X*
     >                           *D) /F))**2))+ EXP(-.5*(((((-VG(I)*X)/UD)
     >                           +H)/ ((X**D)/F))**2)))
  540                           BT=BX
                                BU=0
                                VERT=QRED/(2.5066*((X**A)/C)*LID1*UD)
                                IF (X.LE.XLIDO) GO TO 550
                                BT=VERT
                                BU=BT
                                VERT=0
  550                           FRAC=(6.300835*((X**A)/C))/X
                                IF (LOST.EQ.1) FRAC=1.
  560                           FRAC=FRAC*PERW
                                VERT=FRAC*VERT
                                BU =FRAC*BU
                                BT =FRAC*BT
                                IF (I.EQ.1) AVON(NO,NR)=(FRAW(JH,MO)*
     >                           (VERT+BU))/1000000.+AVON(NO,NR)
                                TQ(I)=TQ(I)+FRAW(JH,MO)*PERW*QRED
                                TGD(I)=TGD(I)+FRAW(JH,MO)*(VD1*BT+SC(I)*
     >                           LID1* (VERT+BU))
                                TAI(I)=TAI(I)+FRAW(JH,MO)*BT
  570                           CONTINUE
C-----END OF NUCLIDE LOOP-----------------------------------------------
  580                       CONTINUE
C-----END OF PASQUILL CATAGORY LOOP-------------------------------------
                        DO 590 I=1,NNUCS
                           NMA=NOMA(I)
                           IF (NMA.LE.0.OR.J.GT.1) GO TO 590
                           TQ(I)=TQ(NMA)*REL(J,I)/REL(J,NMA)
                           TGD(I)=TGD(NMA)*REL(J,I)/REL(J,NMA)
                           TAI(I)=TAI(NMA)*REL(J,I)/REL(J,NMA)
  590                      CONTINUE
  600                   CONTINUE
C-----END OF STACK LOOP-------------------------------------------------
```

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0         1         2         3         4         5         6         7
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  630       IF (LDEP.EQ.1.AND.LIST(NR).EQ.1) GO TO 670
  650       DO 660 I=1,NNUCS
             - ACON(I,NO,NR)=TAI(I)/1000000.   Concentration in air at ground level
               GCON(I,NO,NR)=TGD(I)/10000.  - rate of deposition on ground
               VD1=VD(I) Dry Deposition velocity
               IF (LDEP.EQ.1) VD1=VD1*VDCOEF(NO,NR)
               DRYCON=ACON(I,NO,NR)*VD1*100
               WETCON=(GCON(I,NO,NR)-DRYCON)*(SC(I)/(SC(I)+1.E-30))
               IF (LTAB.EQ.1) GO TO 660

C*****  IF RADON OUTPUT ACON IN PCI/LITER OTHERWISE OUTPUT IN PCI/M**3
C*****  CURRENT CALCULATION IS IN PCI/CM**3

               IF ( RADON_FLAG ) THEN
                  WRITE(51,9058) DIRECTION(NO),IDIST(NR),NAMNUC(I),
     +                           1000*ACON(I,NO,NR),DRYCON,WETCON,
     +                           GCON(I,NO,NR)
               ELSE
                  WRITE(51,9058) DIRECTION(NO),IDIST(NR),NAMNUC(I),
     +                           1000000*ACON(I,NO,NR),DRYCON,WETCON,
     +                           GCON(I,NO,NR)
               ENDIF

  660          CONTINUE
  670       CONTINUE
  680    CONTINUE
      IF (LCHI.EQ.0) CALL CHIQ -
C-----END OF GRID LOOP-----------------------------------------------
  720 RETURN
 9000 FORMAT(F10.0)
 9001 FORMAT('1',T30,'NOTE-THE AREA SURROUNDING THE PLANT IS A SQUARE
     >WITH AN AREA')
 9002 FORMAT(' ',T35,'OF',F10.1,1X,
     > 'SQUARE KILOMETERS WITH THE PLANT AT THE CENTER.')
 9003 FORMAT(' ',T35,'THE SQUARE AREA IS ALIGNED DUE NORTH-SOUTH AND EAS
     >T-WEST. THE')
 9004 FORMAT(' ',T35,'400 SMALLER SQUARES, WHICH ARE EACH ',F7.1,1X,
     > 'METERS ON A SIDE,')
 9005 FORMAT(' ',T35,'ARE IDENTIFIED BY COLUMN AND ROW. COLUMNS ARE NUMB
     >ERED FROM')
 9006 FORMAT(' ',T35,'1 TO 20 FROM WEST TO EAST. ROWS ARE NUMBERED FROM
     >1 TO 20 FROM')
 9007 FORMAT(' ',T35,'SOUTH TO NORTH.')
 9008 FORMAT(8I10)
 9009 FORMAT(8F10.0)
 9010 FORMAT(16F5.0)
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

 9011 FORMAT(A8)
 9012 FORMAT(7F10.0)
 9013 FORMAT('0')
90521 FORMAT('1',T10,'DATE',2X,A)
 9052 FORMAT('0',T20,'ESTIMATED RADIONUCLIDE CONCENTRATIONS')
 9053 FORMAT('0','  WIND',T10,'DISTANCE',T29,'AIR CONCEN',T41,
     > 'DRY DEP RATE',T55,'WET DEP RATE',T69,'GND DEP RATE')
 9054 FORMAT('  TOWARD',T10,'(METERS)',T20,'NUCLIDE',
     >  T31,'(PCI/L)',T42,'(PCI/M2/S)',T56,'(PCI/M2/S)',
     >  T70,'(PCI/M2/S)')
90541 FORMAT('  TOWARD',T10,'(METERS)',T20,'NUCLIDE',
     >  T30,'(PCI/M3)',T42,'(PCI/M2/S)',T56,'(PCI/M2/S)',
     >  T70,'(PCI/M2/S)')
 9057 FORMAT(' ',T4,'COLUMN',T21,'ROW')
 9058 FORMAT(' ',T4,A3,T10,I6,T20,A8,T31,1PE7.1,T43,1PE7.1,T57,1PE7.1,
     >  T71,1PE7.1)
 9059 FORMAT(10F8.4)
 9060 FORMAT(20I1)
      END
      FUNCTION CV(I,LAMI,DEPRAT,GCRU,TSUBE,YSUBV,TSUBH,R)
C CALCULATES THE CONCENTRATION OF NUCLIDE I IN AND ON VEGETATION USING
C EQ C-5, REG GUIDE 1.109-25. THE INPUT PARAMETERS ARE DEFINED AS FOLLOW
C
C     I          INDEXES NUCLIDE
C     LAMI       RADIOACTIVE DECAY CONSTANT FOR THE NUCLIDE  (HR**-1)
C     DEPRAT     DEPOSITION RATE OF RADIONUCLIDE I ONTO GROUND
C                AT THE GIVEN LOCATION ( PCI /M**2-HR)
C     TSUBE      PERIOD OF CROP, LEAFY VEGETABLE, OR PASTURE GRASS EXPOSU
C                DURING GROWING SEASON (HR)
C     YSUBV      AGRICULTURAL PRODUCTIVITY BY UNIT AREA (MEASURED IN WET
C                WEIGHT)  (KG/M**2)
C     TSUBH      TIME DELAY BETWEEN HARVEST OF VEGETATION OR CROPS AND
C                INGESTION (HR)
C     R          FRACTION OF DEPOSITED ACTIVITY RETAINED
C                ON CROPS, DIMENSIONLESS
C
      REAL LAMEI,LAMSI,LAMI,LAMS,LAMRR,LAMW
      COMMON /INGDOS/LAMW,LAMS,TSUBB,P,BSUBV,DR,RATUA
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD,ACON(36,20,
     > 20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11),ORMODI(36,12,8),
     > VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      COMMON /OCOMCHAR/ NAMNUC(36),WORD
      CHARACTER*8 NAMNUC,WORD
C THE EFFECTIVE REMOVAL RATE CONSTANT FOR THE RADIONUCLIDE FROM CROPS
C IN HR**-1 IS  (REG GUIDE 1.109-4)
      LAMEI = LAMI + LAMW
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

C WHERE LAMW IS THE REMOVAL RATE CONSTANT FOR WEATHERING.
C
C THE FOLLOWING CODE CALCULATES CV= CONCENTRATION OF NUCLIDE I USING EQ
      STUBB=TSUBB*8760.
      ALT=LAMEI*TSUBE
      IF (ALT.GT.0.03) GO TO 10
      XNUD1=(R*DR/YSUBV)*((0.1666667*ALT-0.5)*ALT+1.0)*TSUBE
      GO TO 20
   10 XNUD1=(R*DR/YSUBV)*((1.0-EXP(-LAMEI*TSUBE))/LAMEI)
   20 CONTINUE
      LAMSI=LAMS+LAMI
      ALT=LAMSI*STUBB
      IF (ALT.GT.0.03) GO TO 30
      XNUD2=(BSUBV/P)*((0.1666667*ALT-0.5)*ALT+1.0)*STUBB
      GO TO 40
   30 XNUD2=(BSUBV/P)*((1.0-EXP(-LAMSI*STUBB))/LAMSI)
   40 CONTINUE
      SUM=XNUD1+XNUD2
      PROD=SUM*EXP(-LAMI*TSUBH)
      SUM2=XNUD2
      PROD2=SUM2*EXP(-LAMI*TSUBH)
      RATUA=0.
      IF(SUM2.NE.0.) RATUA=SUM2/SUM
      CV = GCRU * PROD + (DEPRAT-GCRU)*PROD2
      RETURN
      END
C*********************************************************************
C*********************************************************************
C*     NEW SUBROUTINE ADDED MAY 1988 TO VARY EQUILIBRIUM FRACTIONS     *
C*     OLD METHOD HAD EQUIL. FRACTIONS SET TO A CONSTANT OF .7         *
C*     THE NEW METHOD VARIES THE EQUILIBRIUM FRACTIONS DEPENDING ON THE*
C*     DISTANCE FROM THE SOURCE.                                       *
C*     THIS ROUTINE USES LINEAR INTERPOLATION TO DETERMINE THE EQUIL.  *
C*     FRACTIONS FOR DISTANCES THAT DO MATCH THE SET DISTANCES         *
C*     GIVEN AND THEIR EQUIL. FRACTIONS.  THE EQUATION IS AS FOLLOWS   *
C*        EFY = EFX + ( (EFZ - EFX) * (( Y - X) / (Z - X) ))           *
C*     WHERE YOU HAVE     X___________Y___________Z                    *
C*          X AND Z ARE THE SET DISTANCES GIVEN AND Y IS THE USER GIVEN*
C*          DISTANCE (BETW X AND Z)  YOU ARE FINDING THE EQ. FRACTION  *
C*          FOR . EFX AND EFZ IS THE SET_EQUIL_FRACTIONS CORRESPONDING *
C*          TO THE SET DISTANCES.                                      *
C*********************************************************************

      SUBROUTINE DETERMINE_EQUIL_FRACTIONS(IDIST,
     +                                     CALC_EQUIL_FRACTIONS,NRL,NRU)
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

      REAL CALC_EQUIL_FRACTIONS(20)
      INTEGER IDIST(20), NRL, NRU

      REAL SET_EQUIL_FRACTIONS(20)
      REAL SET_DISTANCES(20) ,DISTANCES(20)
      INTEGER*2 I , PTR, IN , UPPER_BOUNDRY, LOWER_BOUNDRY

C******SET EQUILIBRIUM FRACTIONS TO CONSTANTS FOR CHOSEN DISTANCES
C*****
      DATA SET_EQUIL_FRACTIONS /.267,.273,.276,.278,.284,.289,.293,.302,
     +                          .311,.331,.349,.366,.382,.414,.443,.471,
     +                          .522,.566,.650,.698/
      DATA SET_DISTANCES / 150.,200.,250.,300.,400.,500.,600.,800.,
     +                          1000.,1500.,2000.,2500.,3000.,4000.,
     +                          5000.,6000.,8000.,10000.,15000.,19551./
C****** SET UPPER AND LOWER BOUNDRY OF DISTANCE ARRAY
      DATA LOWER_BOUNDRY /1/,UPPER_BOUNDRY/20/

C****** SET INTEGER DISTANCES TO REALS FOR CALCULATIONS
      DO 5 I = NRL,NRU
         DISTANCES(I) = IDIST(I)
  5   CONTINUE
C***** IN IS THE INDEX TO THE FIRST DISTANCE SPECIFIED BY THE USER
      IN = NRL

C***** LOOP UNTIL USER GIVEN DISTANCES ARE <= TO 150 AND SET EQUIL
C***** FRACTIONS TO .267 (DISTANCES <= 150 ARE ALWAYS .267 )
 10   CONTINUE
      IF (( DISTANCES(IN) .LE. SET_DISTANCES(LOWER_BOUNDRY) ) .AND.
     +    ( IN .LE. NRU ) ) THEN
            CALC_EQUIL_FRACTIONS(IN) =SET_EQUIL_FRACTIONS(LOWER_BOUNDRY)
            IN = IN + 1
            GOTO 10
      ENDIF

C****** PTR     = Z (UPPER LIMIT)
C****** PTR - 1 = X (LOWER LIMIT)
C****** IN      = Y (GIVEN DISTANCE IN WHICH EQ. FRACTIONS IS BEING
C******                DETERMINED)

      PTR = 2

C****** WHILE INDEX TO USER SPECIFIED DISTANCES IS LESS THAN LAST
C****** GIVEN DISTANCES NDEX DO
  20  CONTINUE
      IF ( IN .LE. NRU) THEN
```

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0         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456789012

C****** WHILE INDEX TO SET DISTANCES IS <= UPPER BOUNDRY INTERPOLATE
C****** THE EQ. FRACTIONS FOR EACH DISTANCE GIVEN. IF > UPPER BOUNDRY
C****** SET FRACTION TO GIVEN FRACTION FOR DISTANCES > 19550 = .698

         IF ( PTR .LE. UPPER_BOUNDRY ) THEN
C******        USE LINEAR EQ IF DISTANCE IS < SET DISTANCE Z
            IF ( DISTANCES(IN) .LT. SET_DISTANCES(PTR) ) THEN
               CALC_EQUIL_FRACTIONS(IN) = SET_EQUIL_FRACTIONS(PTR - 1) +
     +         ((SET_EQUIL_FRACTIONS(PTR) - SET_EQUIL_FRACTIONS(PTR-1))
     +         * (( DISTANCES(IN) - SET_DISTANCES(PTR - 1 ) ) /
     +         (SET_DISTANCES(PTR) - SET_DISTANCES(PTR - 1))))
               IN = IN + 1
C******        IF DISTANCES ARE = SAME EQ. FRACTIONS IE Y = Z
            ELSE IF ( DISTANCES(IN) .EQ. SET_DISTANCES(PTR) ) THEN
               CALC_EQUIL_FRACTIONS(IN) = SET_EQUIL_FRACTIONS(PTR)
               IN = IN + 1
               PTR = PTR + 1
C******        OTHERWISE Y > Z ..NEXT SET DISTANCE
            ELSE
               PTR = PTR + 1
            ENDIF
C******     SET REST OF FRACTIONS ALL ARE > 19550
         ELSE
           CALC_EQUIL_FRACTIONS(IN) = SET_EQUIL_FRACTIONS(UPPER_BOUNDRY)
            IN = IN + 1
         ENDIF
         GOTO 20
       ENDIF
       RETURN
       END
C*********************************************************************
C*********************************************************************
C*****************************************************************
      SUBROUTINE DOSEN(DATE_AND_TIME)
C
C       USNRC REG. GUIDE 1.109 MODELS FOR INGESTION DOSE CALCULATIONS
C       WERE IMPLEMENTED AND INCORPORATED WITHIN DOSEN BY J. C. PLEASANT
C       OF THE MATHEMATICS DEPARTMENT, EAST TENNESSEE STATE UNIVERSITY.
C
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD, ACON(36,20,
     >  20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11), ORMODI(36,12,8)
     > , VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      COMMON /INGDOS/LAMW,LAMS,TSUBB,P,BSUBV,DR,RATUA
      COMMON /NCOM/ NOML(11),NRML(11)
      COMMON /RVAL/ S1,S3,SD1,SD3,ACN,GCN,SW1,SW3
      COMMON /TCOM/ KIQ(36,20,20)
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      COMMON /PCOM/ REL(6,36),IDIST(20),NUMST
      COMMON /FCOM/ FEQWL,INTPA(20,20)
      COMMON /OCOMCHAR/NAMNUC(36),WORD
C
      DIMENSION VAGAC(36),VAGCON(36),BAGAC(36),BAGCON(36)
      DIMENSION FING(36,20,20),GBUP(36,20,20)
      DIMENSION GI(36,4),PARSIZ(36),CLASS(36)
      DIMENSION GFIN(36,20,20),CEXP(4,36)
      REAL KIQ
      CHARACTER*36 DATE_AND_TIME
      CHARACTER*8 NADRN, NAMES(11)
      CHARACTER*8 NAMNUC,WORD,NADEC1,NADEC3,NAME(11),NAMORG(11)
      REAL CFINGA(11),CFINHA(11),DOSING(11),FROG(11),INTPA,
     > LAMH2O,LAMSUR,MSUBB,LAMRR,INTFC(20,20), DCC14(11),DOSIN(11,36),
     > VEGDOS(11),BEFDOS(11),MLKDOS(11),LAMI,LAMW,LAMS,LEFDOS,MAGAC(36),
     > MAGCON(36)
C**  NEW ARRAYS ADDED MAY 1988 FOR VARYING EQUILIBRIUM FRACTIONS
      REAL CALC_EQUIL_FRACTIONS(20),NEWWAL(20,20)
      INTEGER NOBCT(20,20),NOMCT(20,20),TNOBCT,TNOMCT
      INTEGER CLASS
      INTEGER*2 RNPTR
      LOGICAL RNFLAG
      DATA RNFLAG/.FALSE./,RNPTR/0/

      DATA NAME/'TOT.BODY','R MAR   ','LUNGS   ','ENDOST  ','S WALL  ',
     > 'LLI WALL','THYROID ','LIVER   ','KIDNEYS ','TESTES  ',
     > 'OVARIES '/
      DATA NADRN/'RN-222  '/
      DATA NADEC1/'H-3     '/,NADEC3/'C-14    '/
      DATA DCC14/1.16E3,2.03E3,5.07E2,1.85E3,7.43E2,8.92E2,5.27E2,
     > 7.30E2,6.49E2,4.46E2,4.46E2/,CEXP/144*0./,GI/144*0./
      DATA DOSIN/396*0.0/,GBUP/14400*0.0/,FING/14400*0.0/
C---END OF DECLARATIONS
      DO 5 I=1,11
    5   NAMES(I)=NAME(I)
      READ(50,9061)LIPO
      READ(50,9061)NNTB,NRTB,NSTB,NTTB,NUTB,NVTB
      READ(50,9062)((NOBCT(I,J),J=1,20),I=1,20)
      READ(50,9063)((NOMCT(I,J),J=1,20),I=1,20)
      READ(50,9064)((INTFC(I,J),J=1,20),I=1,20)
      READ(50,9065)((INTPA(I,J),J=1,20),I=1,20)
      READ(50,9067)IMPFIX
      READ(50,9068)RVEG,F3VEGM,RBEF,F3BEFM,RMLK,F3MLKM
      READ(50,9069)BRTHRT,DILFAC,USEFAC,T,DD1
C READ PARAMETERS FOR NRC MODEL
      READ(50,9000)TSUBH1,TSUBH2,TSUBH3,TSUBH4
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      READ(50,9000)LAMW
      READ(50,9000)TSUBE1,TSUBE2
      READ(50,9000)YSUBV1,YSUBV2
      READ(50,9000)FSUBP
      READ(50,9000)FSUBS
      READ(50,9000)QSUBF
      READ(50,9000)TSUBF
      READ(50,9000)UV,UM,UF,UL
      READ(50,9000)TSUBS
      READ(50,9000)FSUBG,FSUBL
      READ(50,9000)TSUBB
      READ(50,9000)P
      READ(50,9070)TAUBEF,MSUBB,VSUBM
      TAUCM=UM/365.
      TAUBM=UF/365.
      V=(UL+UV)/365.
      A=(UV+UL)/YSUBV2
      READ(50,9070)R1,R2
      S10=R2
      S30=R1
      S1=R2
      S3=R1
      WRITE(51,90011) DATE_AND_TIME
      WRITE(51,9001)
      IF (LIPO.EQ.1) WRITE(51,9003)
      IF (LIPO.EQ.0) WRITE(51,9002)
      WRITE(51,9004)
      WRITE(51,90004)
      IF (NUTB.NE.0) THEN
         WRITE(51,9009)
         WRITE(51,90009)
      ENDIF
      IF (NVTB.NE.0) WRITE(51,19010)
      WRITE(51,90011) DATE_AND_TIME
      WRITE(51,9079)
      WRITE(51,9080)NNUCS
      WRITE(51,9012)TSUBH1
      WRITE(51,9013)TSUBH2
      WRITE(51,9014)TSUBH3
      WRITE(51,9015)TSUBH4
      WRITE(51,9016)
      WRITE(51,90116)LAMW
      WRITE(51,9017)TSUBE1
      WRITE(51,9018)
      WRITE(51,90118)TSUBE2
      WRITE(51,9019)
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
      WRITE(51,90119)YSUBV1
      WRITE(51,9020)
      WRITE(51,90220)YSUBV2
      WRITE(51,9021)FSUBP
      WRITE(51,9022)
      WRITE(51,90222)FSUBS
      WRITE(51,9023)
      WRITE(51,90223)QSUBF
      WRITE(51,9024)TSUBF
      WRITE(51,9025)UV
      WRITE(51,9026)UM
      WRITE(51,9027)UF
      WRITE(51,9028)UL
      WRITE(51,9029)
      WRITE(51,90229)TSUBS
      WRITE(51,9030)FSUBG
      WRITE(51,9031)FSUBL
      WRITE(51,9011)TSUBB
      WRITE(51,9010)
      WRITE(51,90110)P
      WRITE(51,9081)
      WRITE(51,90881)RVEG
      WRITE(51,9082)
      WRITE(51,90882)RBEF
      WRITE(51,9083)
      WRITE(51,90883)RMLK
      WRITE(51,9072)
      IF (IMPFIX.EQ.0) THEN
         WRITE(51,9085)
         WRITE(51,90885)
      ELSE
         WRITE(51,9084)
         WRITE(51,90884)
      ENDIF
  120 WRITE(51,9086)F3VEGM
      WRITE(51,9087)F3BEFM
      WRITE(51,9088)F3MLKM
      WRITE(51,9089)BRTHRT
      WRITE(51,9090)
      WRITE(51,90990)T
      WRITE(51,9091)DILFAC
      WRITE(51,9092)USEFAC
      WRITE(51,9093)MSUBB
      WRITE(51,9096)TAUBEF
      WRITE(51,9097)VSUBM
      WRITE(51,9094)S1
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
      WRITE(51,9095)S3
      WRITE(51,9098)
      WRITE(51,90998)DD1
      TPOP=0
      TNOBCT=0
      TNOMCT=0
      TARFC=0
      DO 140 NR=NRL,NRU
         DO 130 NO=NOL,NOU
            TPOP=INTPA(NO,NR)+TPOP
            TNOBCT=NOBCT(NO,NR)+TNOBCT
            TNOMCT=NOMCT(NO,NR)+TNOMCT
 130        TARFC=INTFC(NO,NR)+TARFC
 140     CONTINUE
      ANUMM=TARFC/A
      TKGBCA=TAUBM*365.*TPOP
      ANOBCT=TNOBCT
      TKGBPA=ANOBCT*TAUBEF*365.*MSUBB
      CONMK=TAUCM*TPOP
      ANOMCT=TNOMCT
      PRNMK=VSUBM*ANOMCT
      YCONMK=CONMK*365.
      YPRNMK=PRNMK*365.
      PFCY=YSUBV2*TARFC
      CFCY=TPOP*V*365.

C***  CHECK ADDED 8/88 TO STOP DIVIDE BY ZERO ERROR WHEN TPOP = 0.
      IF ( ANUMM .GE. TPOP ) THEN
         AF = 1.0
      ELSE
        AF=ANUMM/TPOP
      ENDIF

      F3V=F3VEGM
      IF ((1.-AF).GE.F3V) F3V=1.-AF
      IF (IMPFIX.EQ.1) F3V=F3VEGM
      F1V=RVEG*(1.-F3V)
      F2V=1.-F3V-F1V

C*** DIVIDE BY ZERO CHECK ADDED 8/88
      IF ( TKGBPA .GE. TKGBCA ) THEN
         BF = 1.0
      ELSE
         BF=TKGBPA/TKGBCA
      ENDIF
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      F3B=F3BEFM
      IF ((1.-BF).GE.F3B) F3B=1.-BF
      IF (IMPFIX.EQ.1) F3B=F3BEFM
      F1B=RBEF*(1.-F3B)
      F2B=1.-F3B-F1B

C*** DIVIDE BY ZERO CHECK ADDED 8/88
      IF ( PRNMK .GE. CONMK ) THEN
         CF = 1.0
      ELSE
         CF=PRNMK/CONMK
      ENDIF

      F3M=F3MLKM
      IF ((1.-CF).GE.F3M) F3M=1.-CF
      IF (IMPFIX.EQ.1) F3M=F3MLKM
      F1M=RMLK*(1.-F3M)
      F2M=1.-F3M-F1M
      WRITE(51,90011) DATE_AND_TIME
      WRITE(51,9099)
      WRITE(51,9100)TPOP
      WRITE(51,9101)TNOBCT
      WRITE(51,9102)TNOMCT
      WRITE(51,9103)TARFC
      WRITE(51,9104)TKGBCA
      WRITE(51,9105)TKGBPA
      WRITE(51,9106)YCONMK
      WRITE(51,9107)YPRNMK
      WRITE(51,9108)CFCY
      WRITE(51,9109)PFCY
      IF (NVTB.NE.0) READ(50,9139)NAMES
      DO 680 I = 1, NNUCS
         IF ((NAMNUC(I) .EQ. NADRN ) .AND. ( .NOT. RNFLAG ) ) THEN
            RNFLAG = .TRUE.
            RNPTR  = I
         ENDIF
         READ(50,9110)NUMORG,LAMRR,CFSBA,CFSBW,CFSUR,KFLAG,TDCF,TDCW
         READ(50,9111)(FROG(IM),IM=1,11)
         READ(50,9000)FSUBMI,FSUBFI,BSUBV1,BSUBV2
         READ(50,9112)LAMSUR,LAMH2O,IFLAG,RD1,RD2,RW1,RW2
         READ(50,9032)I1,I2,I3,I4,I5,F1,F2,F3,F4,F5
         LAMI = LAMRR/24.
         LAMS = LAMSUR/24.
C  IFLAG=1 IF SPECIAL VALUES USED FOR R1 AND R2
C  IFLAG=2 IF R1 AND R2 ARE GIVEN FOR DRY AND WET DEPOSITION
         SD3=RD1
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0         1         2         3         4         5         6         7
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         SD1=RD2
         SW3=RW1
         SW1=RW2
C READ INHALATION DOSE CONVERSION FACTORS
C HEADER CARD GIVES  SOLUBILITY, PARTICLE SIZE, AND G.I. UPTAKE FRACTION
         READ(50,9033)ISOL,AMAD,F1INH
         DO 150 J=1,NUMORG
            READ(50,9034)NAMORG(J),CFINHA(J)
  150       CONTINUE
C READ INGESTION DOSE CONVERSION FACTORS
C HEADER CARD GIVES G.I. UPTAKE FRACTION
         READ(50,9035)F1ING
         DO 160 J=1,NUMORG
            READ(50,9035)CFINGA(J)
  160       CONTINUE
         CLASS(I)=ISOL
         PARSIZ(I)=AMAD
         GI(I,1)=F1INH
         GI(I,2)=F1ING
         IF (I1.NE.0) THEN
            IF (I2.EQ.0) I2=1
            IF (I3.EQ.0) I3=1
            IF (I4.EQ.0) I4=1
            IF (I5.EQ.0) I5=1
         ENDIF
         IF (I.LE.NNTB) THEN
            WRITE(51,9113)NAMNUC(I)
            WRITE(51,9072)
            WRITE(51,9114)
            WRITE(51,9115)
            WRITE(51,9072)
            WRITE(51,9116)
            WRITE(51,9117)
            WRITE(51,9072)
         ENDIF
  180    VAGCON(I)=0.
         BAGCON(I)=0.
         MAGCON(I)=0.
         VAGAC(I)=0.
         BAGAC(I)=0.
         MAGAC(I)=0.
         IF (I1.EQ.0) THEN
         DO 200 NR=NRL,NRU
            DO 190 NO=NOL,NOU
               VAGCON(I)=INTFC(NO,NR)*GCON(I,NO,NR)+VAGCON(I)
               BAGCON(I)=NOBCT(NO,NR)*GCON(I,NO,NR)+BAGCON(I)
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              MAGCON(I)=NOMCT(NO,NR)*GCON(I,NO,NR)+MAGCON(I)
              VAGAC(I)=INTFC(NO,NR)*ACON(I,NO,NR)+VAGAC(I)
              BAGAC(I)=NOBCT(NO,NR)*ACON(I,NO,NR)+BAGAC(I)
              MAGAC(I)=NOMCT(NO,NR)*ACON(I,NO,NR)+MAGAC(I)
 190          CONTINUE
 200       CONTINUE
        VAGCON(I)=VAGCON(I)/TARFC
        BAGCON(I)=BAGCON(I)/ANOBCT
        MAGCON(I)=MAGCON(I)/ANOMCT
        VAGAC(I)=VAGAC(I)/TARFC
        BAGAC(I)=BAGAC(I)/ANOBCT
        MAGAC(I)=MAGAC(I)/ANOMCT
        ELSE
 210    IF (REL(1,I).EQ.0.) THEN
        DO 230 NR=NRL,NRU
           DO 220 NO=NOL,NOU
              GCI=F1*GCON(I1,NO,NR)+F2*GCON(I2,NO,NR)+F3*GCON(I3,NO,NR)
     >         + F4*GCON(I4,NO,NR)+F5*GCON(I5,NO,NR)
              VAGCON(I)=INTFC(NO,NR)*GCI+VAGCON(I)
              BAGCON(I)=NOBCT(NO,NR)*GCI+BAGCON(I)
              MAGCON(I)=NOMCT(NO,NR)*GCI+MAGCON(I)
 220          CONTINUE
 230       CONTINUE
        VAGCON(I)=VAGCON(I)/TARFC
        BAGCON(I)=BAGCON(I)/ANOBCT
        MAGCON(I)=MAGCON(I)/ANOMCT
        ELSE
 240    MODE=1
        BSUBV=BSUBV2
        TSUBE=TSUBE2
        YSUBV=YSUBV2
        TSUBH=TSUBH4
        DR=DD1
        DO 260 NR=NRL,NRU
           DO 250 NO=NOL,NOU
              GCN=GCON(I,NO,NR)
              ACN=ACON(I,NO,NR)
              CALL RVALUE(IFLAG,MODE,I,NO,NR,R)
              A=CV(I,LAMI,1.,1.,TSUBE,YSUBV,TSUBH,R)
              GCI=F1*GCON(I1,NO,NR)+F2*GCON(I2,NO,NR)+F3*GCON(I3,NO,NR)
     >         + F4*GCON(I4,NO,NR)+F5*GCON(I5,NO,NR)
              GFA=GCON(I,NO,NR)+RATUA*GCI
              VAGCON(I)=INTFC(NO,NR)*GFA+VAGCON(I)
 250          CONTINUE
 260       CONTINUE
        VAGCON(I)=VAGCON(I)/TARFC
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         MODE=2
         DR=1.
         TSUBE=TSUBE1
         YSUBV=YSUBV1
         BSUBV=BSUBV1
         TSUBH=TSUBH1
         DO 280 NR=NRL,NRU
            DO 270 NO=NOL,NOU
               GCN=GCON(I,NO,NR)
               ACN=ACON(I,NO,NR)
               CALL RVALUE(IFLAG,MODE,I,NO,NR,R)
               A=CV(I,LAMI,1.,1.,TSUBE,YSUBV,TSUBH,R)
               GCI=F1*GCON(I1,NO,NR)+F2*GCON(I2,NO,NR)+F3*GCON(I3,NO,NR)
     >          + F4*GCON(I4,NO,NR)+F5*GCON(I5,NO,NR)
               GFA=GCON(I,NO,NR)+RATUA*GCI
               BAGCON(I)=NOBCT(NO,NR)*GFA+BAGCON(I)
               MAGCON(I)=NOMCT(NO,NR)*GFA+MAGCON(I)
 270           CONTINUE
 280        CONTINUE
         BAGCON(I)=BAGCON(I)/ANOBCT
         MAGCON(I)=MAGCON(I)/ANOMCT
         ENDIF
         ENDIF
         IF (NAMNUC(I) .EQ. NADEC1) THEN
            NTRIT = 1
         ELSE
            NTRIT = 0
         ENDIF
         DO 560 NO=NOL,NOU
            DO 550 NR=NRL,NRU
               GCI=0
               IF (I1.NE.0) THEN
               GCI=F1*GCON(I1,NO,NR)+F2*GCON(I2,NO,NR)+F3*GCON(I3,NO,NR)
     >          + F4*GCON(I4,NO,NR)+F5*GCON(I5,NO,NR)
               ENDIF
 330           GCN=GCON(I,NO,NR)+GCI
 340           ACN=ACON(I,NO,NR)
               IF (I1.EQ.0) THEN
                  D1=1.
                  D2=1.
                  D3=1.
                  D4=1.
                  IF (GCON(I,NO,NR).NE.0.) THEN
                     D4=F1M+F2M*(MAGCON(I)/GCON(I,NO,NR))
                     D3=F1B+F2B*(BAGCON(I)/GCON(I,NO,NR))
                     D2=F1V+F2V*(VAGCON(I)/GCON(I,NO,NR))
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                    D1=D2
                 ELSE
                    IF (REL(1,I).EQ.0.) THEN
                       D4=F1M+F2M*(MAGCON(I)/GCI)
                       D3=F1B+F2B*(BAGCON(I)/GCI)
                       D2=F1V+F2V*(VAGCON(I)/GCI)
                       D1=D2
                    ENDIF
                 ENDIF
              ELSE
                 IF (REL(1,I).EQ.0.) THEN
                    D4=F1M+F2M*(MAGCON(I)/GCI)
                    D3=F1B+F2B*(BAGCON(I)/GCI)
                    D2=F1V+F2V*(VAGCON(I)/GCI)
                    D1=D2
                 ENDIF
              ENDIF
  370         DO 540 J=1,11
                 X=LAMRR+LAMSUR
                 IF (KFLAG.EQ.1) X=ANLAM(I)+LAMSUR
                 DO 380 N=1,NUMORG
                    IF (NAMES(J) .EQ. NAMORG(N)) THEN
                       L=N
                    ELSE
                       L=1
                    ENDIF
  380               CONTINUE
C  INHALATION DOSE CALCULATIONS
  400            CFINH=CFINHA(L)
                 CFING=CFINGA(L)
                 IF (ACN.EQ.0) DOS1=0
                 IF (ACN.EQ.0) DOS2=0
                 IF (ACN.NE.0.) THEN
                    DOS1=ACN*1.E-6*BRTHRT*8760.*CFINH
C  AIR SUBMERSION DOSE CALCULATIONS
                    DOS2=ACN*1.E-6*8760.*CFSBA*FROG(J)
                 ENDIF
C  SURFACE EXPOSURE DOSE CALCULATIONS
  410            ALT=X*T
                 IF (ALT.GT.0.03) THEN
                 DOS3=GCN*1.E-6*8760.*CFSUR*FROG(J)*(1-EXP(-X*T))/X*
     >            3600.*24.
                 GBUP(I,NO,NR)=GCN*1.E-8*24.*3600.*(1.-EXP(-X*T))/X
                 ELSE
                 DOS3=GCN*1.E-6*8760.*CFSUR*FROG(J)*((0.1666667*ALT-
     >            0.5)*ALT+T) *3600.*24.
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                  GBUP(I,NO,NR)=GCN*1.E-8*24.*3600.* ((0.1666667*ALT-
     >             0.5)*ALT+T)
                  ENDIF
C  INGESTION DOSE CALCULATIONS
  430             IF (NTRIT.NE.1.AND.NAMNUC(I).NE.NADEC3) GO TO 450
                  IF (NTRIT.NE.1) GO TO 440
C  INGESTION DOSE CALCULATIONS FOR H-3
                  VEGDOS(J)=(F1V*ACN+F2V*VAGAC(I))*TDCF*.505
                  BEFDOS(J)=(F1B*ACN+F2B*BAGAC(I))*TDCF*.185
                  MLKDOS(J)=(F1M*ACN+F2M*MAGAC(I))*TDCF*.310
                  DOSING(J)=VEGDOS(J)+BEFDOS(J)+MLKDOS(J)+ACN*TDCW
                  KIQ(I,NO,NR)=(((F1V*ACN+F2V*VAGAC(I))*1.E6)/8.)*1560.*
     >             .505*365.+(((ACN*1.E6)/8.)*1440.*365.)*(TDCW/5.70)
                  GFIN(I,NO,NR)=(((F1B*ACN+F2B*BAGAC(I))*1.E6)/8.)*1560.
     >             *.185*365.
                  FING(I,NO,NR)=(((F1M*ACN+F2M*MAGAC(I))*1.E6)/8.)*1560.
     >             *.310*365.
                  TDCWB=TDCW
                  GO TO 480
  440             CONTINUE
C  INGESTION DOSE CALCULATIONS FOR C-14
                  WTCV=79.96*V
                  WTCB=238.16*TAUBM
                  WTCM=68.9*TAUCM
                  WTF=WTCV+WTCB+WTCM
                  DOSING(J)=(DCC14(J)/WTF)*(WTCV*(F1V*ACN+F2V*VAGAC(I))+
     >              WTCB*(F1B*ACN+F2B*BAGAC(I))+WTCM*(F1M*ACN+F2M*
     >             MAGAC(I)))
                  VEGDOS(J)=(DCC14(J)/WTF)*(WTCV*(F1V*ACN+F2V*VAGAC(I)))
                  BEFDOS(J)=(DCC14(J)/WTF)*(WTCV*(F1B*ACN+F2B*BAGAC(I)))
                  MLKDOS(J)=(DCC14(J)/WTF)*(WTCV*(F1M*ACN+F2M*MAGAC(I)))
                  KIQ(I,NO,NR)=((F1V*ACN+F2V*VAGAC(I))/1.8E-7)*WTCV*365.
                  GFIN(I,NO,NR)=((F1B*ACN+F2B*BAGAC(I))/1.8E-7)*WTCB*365
     >             .
                  FING(I,NO,NR)=((F1M*ACN+F2M*MAGAC(I))/1.8E-7)*WTCM*365
     >             .
                  GO TO 480
C  INGESTION DOSES DEFINED AS ZERO IF GROUND CONCENTRATION IS ZERO
  450             IF (GCN.NE.0) GO TO 460
                  DOSING(J)=0.
                  VEGDOS(J)=0.
                  BEFDOS(J)=0.
                  MLKDOS(J)=0.
                  KIQ(I,NO,NR)=0.
                  GFIN(I,NO,NR)=0.
                  FING(I,NO,NR)=0.
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                  GO TO 480
C INGESTION DOSE CALCULATIONS USING NRC MODEL
C CALCULATE CIV=CONCENTRATION OF RADIONUCLIDE IN THE ANIMAL'S FEED USING
C SLIGHTLY SIMPLIFIED FORM OF EQ C-11, REG GUIDE 1.109.27.
C CIV= FSUBP*FSUBS*(CONC. OF NUCLIDE ON PASTURE GRASS)
C      + (1.0-FSUBP*FSUBS)*(CONC. OF NUCLIDE IN STORED FEEDS)
C USE PARAMETERS FOR GRASS-COW-MILK-MAN-PATHWAY
C FIRST TERM..  USE TSUBH VALUE FOR INGESTION BY ANIMALS OF PASTURE GRAS
C THE DEPOSITION RATE GCN IS IN UNITS OF PCI/SQUARE CM-SEC.
C TO CONVERT TO PCI/SQUARE METER-HR,MULTIPLY BY 3.6E7.
  460             DEPRAT= GCN*3.6E7
                  GCRU=GCON(I,NO,NR)*3.6E7
                  GCN=GCRU/3.6E7
                  TSUBH=TSUBH1
                  TSUBE=TSUBE1
                  YSUBV=YSUBV1
                  BSUBV=BSUBV1
C LAMI IS THE RADIOACTIVE DECAY CONSTANT OF NUCLIDE I, IN HR**-1.
                  LAMI = LAMRR/24.
                  MODE=2
                  CALL RVALUE(IFLAG,MODE,I,NO,NR,R)
                  DR=1.
                  TERM1=FSUBP*FSUBS *CV(I,LAMI,DEPRAT,GCRU,TSUBE,YSUBV,
     >             TSUBH,R)
C SECOND TERM..  USE TSUBH VALUE FOR INGESTION BY ANIMALS OF STORED FEED
                  TSUBH=TSUBH2
                  TERM2=(1.0-FSUBP*FSUBS)*CV(I,LAMI,DEPRAT,GCRU,TSUBE,
     >             YSUBV,TSUBH,R)
                  CIV=TERM1 + TERM2
C
C CALCULATE CIM=NUCLIDE CONCENTRATION IN MILK USING EQ C-10, REG GUIDE
C 1.109-27
                  CIM=FSUBMI*CIV*QSUBF*EXP(-LAMRR*TSUBF)
C DFIJ IS THE DOSE CONVERSION FACTOR FOR THE INGESTION OF NUCLIDE I, ORG
C IN MREM/PCI.
                  DFIJ = 0.001*CFING
C CALCULATE MLKDOS(J)=ANNUAL DOSE TO ORGAN J FROM INGESTION OF RADIONUCL
C IN MILK USING EQ C-13,  REG GUIDE 1.109-28.
                  IF(I1.EQ.0.OR.REL(1,I).EQ.0..OR.RATUA.EQ.0.) GO TO 462
                  D4 = F1M+F2M*(MAGCON(I)/(GCON(I,NO,NR)+RATUA*GCI))
                  D3 = F1B+F2B*(BAGCON(I)/(GCON(I,NO,NR)+RATUA*GCI))
  462             MLKDOS(J)=DFIJ*UM*CIM*D4
C THE NRC MODEL GIVES DOSES IN MREM/YR.  TO CONVERT TO REM/YR,
C MULTIPLY BY 0.001
                  MLKDOS(J) = MLKDOS(J)*.001
C CALCULATE CIF=NUCLIDE CONCENTRATION IN MEAT USING EQ C-12, REG GUIDE 1
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                  CIF=FSUBFI*CIV*QSUBF*EXP(-LAMRR *TSUBS)
C CALCULATE BEFDOS(J)=ANNUAL DOSE TO ORGAN J FROM INGESTION OF
C RADIONUCLIDE I IN MEAT.  (REG GUIDE 1.109-28, EQ C-13)
                  BEFDOS(J)=DFIJ*UF*CIF*D3
                  BEFDOS(J) = BEFDOS(J) *.001
C CALCULATE CIVP=CONCENTRATION OF RADIONUCLIDE IN PRODUCE CONSUMED BY MA
C USE PARAMETERS FOR CROP/VEGETATION-MAN PATHWAY., TSUBH VALUE FOR PRODU
                  TSUBE= TSUBE2
                  YSUBV= YSUBV2
                  TSUBH= TSUBH4
                  BSUBV=BSUBV2
                  DR=DD1
                  MODE=1
                  CALL RVALUE(IFLAG,MODE,I,NO,NR,R)
                  CIVP=CV(I,LAMI,DEPRAT,GCRU,TSUBE,YSUBV,TSUBH,R)
C CALCULATE PRODOS=ANNUAL DOSE TO ORGAN J FROM INGESTION BY MAN OF RADIO
C IN PRODUCE.   (REG GUIDE 1.109-28, EQ C-13)
                  IF(I1.EQ.0.OR.REL(1,I).EQ.0..OR.RATUA.EQ.0.) GO TO 464
                  D2 = F1V+F2V*(VAGCON(I)/(GCON(I,NO,NR)+RATUA*GCI))
  464             D1=D2
                  PRODOS=DFIJ*UV*FSUBG*CIVP*D2
C CALCULATE CIVL=CONCENTRATION OF RADIONUCLIDE IN LEAFY VEGETABLES.
C USE PARAMETERS FOR CROP/VEGETATION-MAN PATHWAY.
C THE TSUBH VALUE IS FOR LEAFY VEGETABLES.
                  TSUBE=TSUBE2
                  YSUBV=YSUBV2
                  TSUBH=TSUBH3
                  BSUBV=BSUBV2
                  DR=DD1
                  CIVL=CV(I,LAMI,DEPRAT,GCRU,TSUBE,YSUBV,TSUBH,R)
C CALCULATE LEFDOS=ANNUAL DOSE TO ORGAN J FROM INGESTION OF RADIONUCLIDE
C IN LEAFY VEGETABLES.   (REG GUIDE 1.109-28, EQ C-13)
                  LEFDOS=DFIJ*UL*FSUBL*CIVL*D1
C VEGDOS(J) IS THE ANNUAL DOSE TO ORGAN J FROM INGESTION OF RADIONUCLIDE
C IN PRODUCE AND LEAFY VEGETABLES.
                  VEGDOS(J)=PRODOS + LEFDOS
                  VEGDOS(J) = VEGDOS(J)*.001
                  DOSING(J)=BEFDOS(J) + MLKDOS(J) + VEGDOS(J)
                  IF (J.NE.11) GO TO 470
                  KIQ(I,NO,NR)=UL*FSUBL*CIVL*D1+UV*FSUBG*CIVP*D2
                  GFIN(I,NO,NR)=UF*CIF*D3
                  FING(I,NO,NR)=UM*CIM*D4
  470             GCN=DEPRAT/3.6E7
C  WATER SUBMERSION DOSE CALCULATIONS
  480             X=LAMRR+LAMH2O
                  IF (KFLAG.EQ.1) X=ANLAM(I)+LAMH2O
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                  IF (GCN.NE.0) THEN
                     ALT=X*T
                     IF (ALT.GT.0.03) THEN
                        DOS5=GCN*1.E-6*8760.*CFSBW*FROG(J)*USEFAC
     >                       /DILFAC*(1-EXP(-X*T))/X *3600.*24.
                     ELSE
                        DOS5=GCN*1.E-6*8760.*CFSBW*FROG(J)*USEFAC
     >                  /DILFAC*((0.1666667* ALT-0.5)*ALT+T)*3600.*24.
                     ENDIF
                  ELSE
                     DOS5=0
                  ENDIF
  510             TDOS=DOS1+DOS2+DOS3+DOSING(J)+DOS5
                  IF (I.LE.NNTB) THEN
                     WRITE(51,9118)NO,NR,NAMES(J),DOS1,DOS2,DOS3,
     >                            DOSING(J),DOS5,TDOS
                  ENDIF
                  IF (LIPO.EQ.1) THEN
C POPULATION DOSE CALCULATIONS
                     ORMODI(I,J,1)=DOS1*INTPA(NO,NR)+ORMODI(I,J,1)
                     ORMODI(I,J,2)=DOS2*INTPA(NO,NR)+ORMODI(I,J,2)
                     ORMODI(I,J,3)=DOS3*INTPA(NO,NR)+ORMODI(I,J,3)
                     ORMODI(I,J,4)=DOSING(J)*INTPA(NO,NR)+ORMODI(I,J,4)
                     ORMODI(I,J,5)=DOS5*INTPA(NO,NR)+ORMODI(I,J,5)
                     ORMODI(I,J,6)=VEGDOS(J)*INTPA(NO,NR)+ORMODI(I,J,6)
                     ORMODI(I,J,7)=BEFDOS(J)*INTPA(NO,NR)+ORMODI(I,J,7)
                     ORMODI(I,J,8)=MLKDOS(J)*INTPA(NO,NR)+ORMODI(I,J,8)
C  CALCULATIONS OF THE HIGHEST INDIVIDUAL DOSE FOR EACH RADIONUCLIDE
C  AND ORGAN AND GRID LOCATION WHERE RECEIVED
                  ELSE
  530                IF (TDOS.GT.DOSIN(J,I)) THEN
                        NOMM(I,J)=NO
                        NRMM(I,J)=NR
                        ORMODI(I,J,1)=DOS1
                        ORMODI(I,J,2)=DOS2
                        ORMODI(I,J,3)=DOS3
                        ORMODI(I,J,4)=DOSING(J)
                        ORMODI(I,J,5)=DOS5
                        ORMODI(I,J,6)=VEGDOS(J)
                        ORMODI(I,J,7)=BEFDOS(J)
                        ORMODI(I,J,8)=MLKDOS(J)
                        DOSIN(J,I)=TDOS
                     ENDIF
                  ENDIF
  540             CONTINUE
  550          CONTINUE
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AIRDOS-EPA (AIRDOS2.FOR) Program File
(continued)

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  560       CONTINUE
  570    CONTINUE
  580    WRITE(51,90011) DATE_AND_TIME
         WRITE(51,9119)NAMNUC(I)
         IF (IFLAG.GT.2.OR.IFLAG.LT.0) PRINT 9120
  590    IF (IFLAG.EQ.1) THEN
            WRITE(51,9121)SD1
            WRITE(51,9122)SD3
         ENDIF
  600    IF (IFLAG.EQ.2) THEN
            WRITE(51,9123)SD1
            WRITE(51,9124)SW1
            WRITE(51,9125)SD3
            WRITE(51,9126)SW3
         ENDIF
  610    WRITE(51,9127)LAMRR
         IF (KFLAG.EQ.1) THEN
            WRITE(51,9128)
            WRITE(51,9129)
         ENDIF
  620    WRITE(51,9130)LAMSUR
         WRITE(51,9131)LAMH2O
         IF (NTRIT.EQ.1) THEN
            WRITE(51,9132)TDCF
            WRITE(51,9133)TDCW
  630    ELSE
            WRITE(51,9036)
            WRITE(51,90336) FSUBMI
            WRITE(51,9037)
            WRITE(51,90337) FSUBFI
            WRITE(51,9038)
            WRITE(51,90338) BSUBV1
            WRITE(51,9039)
            WRITE(51,9040)
            WRITE(51,90440) BSUBV2
            WRITE(51,9041)
            WRITE(51,9042)F1INH
            WRITE(51,9043)F1ING
            WRITE(51,9044)AMAD
            WRITE(51,9045)ISOL
            IF (I1.NE.0) THEN
               WRITE(51,9046)
               WRITE(51,9047)
               WRITE(51,9048)
               WRITE(51,9049)NAMNUC(I1),F1
               IF (F2.NE.0.) WRITE(51,9050)NAMNUC(I2),F2
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                IF (F3.NE.0.) WRITE(51,9050)NAMNUC(I3),F3
                IF (F4.NE.0.) WRITE(51,9050)NAMNUC(I4),F4
                IF (F5.NE.0.) WRITE(51,9050)NAMNUC(I5),F5
             ENDIF
          ENDIF
          WRITE(51,9072)
          DO 670 J=1,NUMORG
             DO 660 K=1,11
                IF (NAMORG(J).EQ.NAMES(K)) THEN
                   CASBA=CFSBA*FROG(K)
                   CASUR=CFSUR*FROG(K)
                   CASBW=CFSBW*FROG(K)
                ENDIF
  660           CONTINUE
  670        CONTINUE
  680     CONTINUE
C START OF MAXIMIZING CALCULATIONS FOR THE INDIVIDUAL DOSE OPTION
      IF (LIPO.EQ.0) THEN
      DO 840 J=1,11
         ADSE=0
         DO 750 NO=NOL,NOU
            DO 740 NR=NRL,NRU
               DSE=0
               AKR=0
               BKR=0
               DKR=0
               EKR=0
               VEG=0
               BEF=0
               AME=0
               DO 730 I=1,NNUCS
                  AC=ACON(I,NOMM(I,J),NRMM(I,J))
                  IF (AC.EQ.0.) GO TO 690
                  AKR=ORMODI(I,J,1)/AC*ACON(I,NO,NR)+AKR
                  BKR=ORMODI(I,J,2)/AC*ACON(I,NO,NR)+BKR
  690             BC=GBUP(I,NOMM(I,J),NRMM(I,J))
                  IF (BC.EQ.0) GO TO 700
                  DKR=ORMODI(I,J,3)/BC*GBUP(I,NO,NR)+DKR
                  EKR=ORMODI(I,J,5)/BC*GBUP(I,NO,NR)+EKR
  700             IF (NAMNUC(I).EQ.NADEC1.OR.NAMNUC(I).EQ.NADEC3) GO TO
     >             710
                  IF (BC.EQ.0) GO TO 720
                  VEG=ORMODI(I,J,6)*(KIQ(I,NO,NR)/(KIQ(I,NOMM(I,J),
     >             NRMM(I,J))+1.E-60))+VEG
                  BEF=ORMODI(I,J,7)*(GFIN(I,NO,NR)/(GFIN(I,NOMM(I,J),
     >             NRMM(I,J))+1.E-60))+BEF
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0         1         2         3         4         5         6         7
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                 AME=ORMODI(I,J,8)*(FING(I,NO,NR)/(FING(I,NOMM(I,J),
     >            NRMM(I,J))+1.E-60))+AME
                 GO TO 720
  710            ACO=ACON(I,NO,NR)
                 VEG=((F1V*ACO+F2V*VAGAC(I))/(F1V*AC+F2V*VAGAC(I)+1.E-
     >            60))* ORMODI(I,J,6)+VEG
                 BEF=((F1B*ACO+F2B*BAGAC(I))/(F1B*AC+F2B*BAGAC(I)+1.E-
     >            60))* ORMODI(I,J,7)+BEF
                 AME=((F1M*ACO+F2M*MAGAC(I))/(F1M*AC+F2M*MAGAC(I)+1.E-
     >            60))* ORMODI(I,J,8)+AME
                 IF (NAMNUC(I).EQ.NADEC1) AME=AME+ACO*TDCWB
  720            CONTINUE
                 TING=VEG+BEF+AME
  730            DSE=AKR+BKR+DKR+EKR+TING
              IF (DSE.GE.ADSE) THEN
                 ADSE=DSE
                 NOML(J)=NO
                 NRML(J)=NR
              ENDIF
  740         CONTINUE
  750      CONTINUE
        NO=NOML(J)
        NR=NRML(J)
        DO 830 I=1,NNUCS
           AC=ACON(I,NOMM(I,J),NRMM(I,J))
           IF(AC.NE.0.) THEN
              ACI=ACON(I,NO,NR)
              IF (ACI.NE.0.) THEN
                 ORMODI(I,J,1)=ORMODI(I,J,1)/AC*ACI
                 ORMODI(I,J,2)=ORMODI(I,J,2)/AC*ACI
              ELSE
                 ORMODI(I,J,1)=0.
                 ORMODI(I,J,2)=0.
              ENDIF
           ELSE
                 ORMODI(I,J,1)=0.
                 ORMODI(I,J,2)=0.
           ENDIF
  770      BC=GBUP(I,NOMM(I,J),NRMM(I,J))
           IF(BC.EQ.0.) THEN
              ORMODI(I,J,3)=0
              ORMODI(I,J,5)=0
           ELSE
              BCI=GBUP(I,NO,NR)
              IF (BCI.EQ.0) THEN
                 ORMODI(I,J,3)=0
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                 ORMODI(I,J,5)=0
              ELSE
                 ORMODI(I,J,3)=ORMODI(I,J,3)/BC*BCI
                 ORMODI(I,J,5)=ORMODI(I,J,5)/BC*BCI
              ENDIF
           ENDIF
  790      IF (NAMNUC(I).EQ.NADEC1.OR.NAMNUC(I).EQ.NADEC3) GO TO 810
           IF (BCI.EQ.0) GO TO 800
           ORMODI(I,J,6)=ORMODI(I,J,6)*(KIQ(I,NO,NR)/(KIQ(I,NOMM(I,J),
     >      NRMM(I,J))+1.E-60))
           ORMODI(I,J,7)=ORMODI(I,J,7)*(GFIN(I,NO,NR)/(GFIN(I,NOMM(I,J)
     >      ,NRMM(I,J))+1.E-60))
           ORMODI(I,J,8)=ORMODI(I,J,8)*(FING(I,NO,NR)/(FING(I,NOMM(I,J)
     >      ,NRMM(I,J))+1.E-60))
           GO TO 820
  800      ORMODI(I,J,6)=0
           ORMODI(I,J,7)=0
           ORMODI(I,J,8)=0
           GO TO 820
  810      CONTINUE
           ORMODI(I,J,6)=((F1V*ACI+F2V*VAGAC(I))/(F1V*AC+F2V*VAGAC(I)+
     >      1.E-60) )* ORMODI(I,J,6)
           ORMODI(I,J,7)=((F1B*ACI+F2B*BAGAC(I))/(F1B*AC+F2B*BAGAC(I)+
     >      1.E-60) )* ORMODI(I,J,7)
           ORMODI(I,J,8)=((F1M*ACI+F2M*MAGAC(I))/(F1M*AC+F2M*MAGAC(I)+
     >      1.E-60) )* ORMODI(I,J,8)
  820      ORMODI(I,J,4)=ORMODI(I,J,6)+ORMODI(I,J,7)+ORMODI(I,J,8)
           IF (NAMNUC(I).EQ.NADEC1) ORMODI(I,J,4)=ORMODI(I,J,4)+ACI*
     >      TDCWB
  830      CONTINUE
  840    CONTINUE
C END OF MAXIMIZING CALCULATIONS FOR THE INDIVIDUAL DOSE OPTION
      ENDIF

C***  CALCULATE VARYING EQUILIBRIUM FRACTIONS..NO LONGER CONSTANT OF .7
C****   CHANGED MAY 1988
C***
      IF ( ( RNFLAG ) .AND. ( NUTB .NE. 0 ) ) THEN
          CALL DETERMINE_EQUIL_FRACTIONS(IDIST,CALC_EQUIL_FRACTIONS,
     +                                   NRL,NRU)
      ENDIF
C  OUTPUT FOR HEALTH RISK CALCULATIONS
      DO 970 I=1,NNUCS
         TIME=0
         WRITE(25)NAMNUC(I),PARSIZ(I),CLASS(I),(GI(I,J),J=1,4),TIME,LIPO
         WRITE(25)NOL,NOU,NRL,NRU,(IDIST(IG),IG=NRL,NRU)
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  922     ALIP=LIPO
          DO 960 NO=NOL,NOU
             DO 950 NR=NRL,NRU
                ACUP=ACON(I,NO,NR)*1.E-6*(ALIP*(INTPA(NO,NR)-1.)+1.)
                CEXP(1,I)=CEXP(1,I)+ACUP
                GBIP=GBUP(I,NO,NR)*(ALIP*(INTPA(NO,NR)-1.)+1.)
                CEXP(2,I)=CEXP(2,I)+GBIP
                FIOP=(KIQ(I,NO,NR)+GFIN(I,NO,NR)+FING(I,NO,NR))* (ALIP*
     >           (INTPA(NO,NR)-1.)+1.)
                CEXP(3,I)=CEXP(3,I)+FIOP
                FINH=ACON(I,NO,NR)*BRTHRT*8760.*(ALIP*(INTPA(NO,NR)-1.)+
     >           1.)
                CEXP(4,I)=CEXP(4,I)+FINH
  924           IF (NAMNUC(I).NE.NADRN) THEN
                   WRITE(25) ACUP,GBIP,FIOP,FINH
                ELSE
  930              NEWWAL(NO,NR) = CALC_EQUIL_FRACTIONS(NR) * 10. *
     +                 ACON(I,NO,NR) * (ALIP * (INTPA(NO,NR) - 1.) + 1.)

C***  CHECK TO SEE IF POPULATION RUN.. IF INDIVIDUAL OUTPUT GROUND CONCENTRA.
C***    FOR NEW SYNOPSIS REPORT IN DARTAB

C***               IF   ( LIPO .EQ. 0 ) THEN
                      WRITE(25) CALC_EQUIL_FRACTIONS(NR),NEWWAL(NO,NR),
     +                          1000*ACON(I,NO,NR)
C***               ELSE
C***                  WRITE(25) CALC_EQUIL_FRACTIONS(NR),NEWWAL(NO,NR)
C***               ENDIF

                ENDIF
  950           CONTINUE
  960        CONTINUE
          IF (LIPO.EQ.1) WRITE(25)INTPA
  970     CONTINUE
  980 CONTINUE
      IF ((NUTB .NE. 0 ) .AND. ( RNFLAG ) )
     + CALL DOSMIC(CALC_EQUIL_FRACTIONS,NEWWAL,RNPTR,IDIST,NAMES,
     +              DATE_AND_TIME)
  990 RETURN
 9000 FORMAT(8E10.3)
90011 FORMAT('1',T10,'DATE',2X,A)
 9001 FORMAT('0',T3,
     > '***OPTIONS SELECTED FOR DOSE AND INTAKE CALCULATIONS***')
 9002 FORMAT('0',T11,'CALCULATIONS ARE MADE FOR THE MAXIMALLY-EXPOSED I
     >NDIVIDUAL.')
 9003 FORMAT('0',T11,'CALCULATIONS ARE MADE FOR THE POPULATION.')
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 9004 FORMAT('0',T11,'TABLES FOR EACH NUCLIDE LISTING DOSES BY ORGAN',
     > ' AND PATHWAY')
90004 FORMAT(' ',T11,'AT EACH ENVIRONMENTAL LOCATION ARE OMITTED.')
 9009 FORMAT('0',T11,'WORKING LEVELS ARE CALCULATED FOR RN-222 IF')
90009 FORMAT(' ',T11,'IT IS IN THE SOURCE TERM.')
19010 FORMAT('0',T11,'ORGAN NAMES ARE INPUT.')
 9010 FORMAT('0',T11,'EFFECTIVE SURFACE DENSITY OF SOIL',
     > 'KG/SQ. M, DRY WEIGHT.')
90110 FORMAT(T11,'(ASSUMES 15 CM PLOW LAYER)',T71,E10.2)
 9011 FORMAT('0',T6,'PERIOD OF LONG-TERM BUILDUP FOR ',
     > 'ACTIVITY IN SOIL (YEARS)',T71,E10.2)
 9012 FORMAT('0',T6,'TIME DELAY--INGESTION OF PASTURE GRASS BY ',
     > 'ANIMALS (HR)',T71,E10.2)
 9013 FORMAT('0',T6,'TIME DELAY--INGESTION OF STORED FEED BY ',
     > 'ANIMALS (HR)',T71,E10.2)
 9014 FORMAT('0',T6,'TIME DELAY--INGESTION OF LEAFY VEGETABLES ',
     > 'BY MAN (HR)' ,T71,E10.2)
 9015 FORMAT('0',T6,'TIME DELAY--INGESTION OF PRODUCE BY ',  'MAN (HR)',
     > T71,E10.2)
 9016 FORMAT('0',T6,'REMOVAL RATE CONSTANT FOR PHYSICAL LOSS BY')
90116 FORMAT(T11,'WEATHERING (PER HOUR)',T71,E10.2)
 9017 FORMAT('0',T6,'PERIOD OF EXPOSURE DURING GROWING SEASON--',
     > 'PASTURE GRASS (HR)',T71,E10.2)
 9018 FORMAT('0',T6,'PERIOD OF EXPOSURE DURING GROWING SEASON--')
90118 FORMAT(T11,'CROPS OR LEAFY VEGETABLES (HR)',T71,E10.2)
 9019 FORMAT('0',T6,'AGRICULTURAL PRODUCTIVITY BY UNIT AREA')
90119 FORMAT(T11,'(GRASS-COW-MILK-MAN PATHWAY (KG/SQ. METER))',
     > T71,E10.2)
 9020 FORMAT('0',T6,'AGRICULTURAL PRODUCTIVITY BY UNIT AREA')
90220 FORMAT(T11,'(PRODUCE OR LEAFY VEG INGESTED BY MAN (KG/SQ METER))',
     > T71,E10.2)
 9021 FORMAT('0',T6,'FRACTION OF YEAR ANIMALS GRAZE ON PASTURE ',T71,
     > E10.2)
 9022 FORMAT('0',T6,'FRACTION OF DAILY FEED THAT IS PASTURE GRASS')
90222 FORMAT(T11,'WHEN ANIMAL GRAZES ON PASTURE',T71,E10.2)
 9023 FORMAT('0',T6,'CONSUMPTION RATE OF CONTAMINATED FEED OR FORAGE')
90223 FORMAT(T11,'BY AN ANIMAL IN KG/DAY (DRY WEIGHT)',T71,E10.2)
 9024 FORMAT('0',T6,'TRANSPORT TIME FROM ANIMAL FEED-MILK-MAN (DAY)',
     > T71,E10.2)
 9025 FORMAT('0',T6,'RATE OF INGESTION OF PRODUCE BY MAN (KG/YR)',
     > T71,E10.2)
 9026 FORMAT('0',T6,'RATE OF INGESTION OF MILK BY MAN (LITERS/YR)',
     > T71,E10.2)
 9027 FORMAT('0',T6,'RATE OF INGESTION OF MEAT BY MAN (KG/YR)', T71,
     > E10.2)
 9028 FORMAT('0',T6,'RATE OF INGESTION OF LEAFY VEGETABLES BY MAN ',
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     > '(KG/YR)',T71,E10.2)
 9029 FORMAT('0',T6,'AVERAGE TIME FROM SLAUGHTER OF MEAT ANIMAL TO')
90229 FORMAT(T11,'CONSUMPTION (DAY)',T71,E10.2)
 9030 FORMAT('0',T6,'FRACTION OF PRODUCE INGESTED GROWN IN GARDEN ',
     > 'OF INTEREST',T71,E10.2)
 9031 FORMAT('0',T6,'FRACTION OF LEAFY VEGETABLES GROWN IN GARDEN ',
     > 'OF INTEREST',T71,E10.2)
 9032 FORMAT(5I4,5E10.3)
 9033 FORMAT(T11,A1,T15,E10.3,T27,E10.3)
 9034 FORMAT(A8,T10,E10.3)
 9035 FORMAT(T11,E10.3)
 9036 FORMAT('0',T6,'AVERAGE FRACTION OF ANIMAL''S DAILY INTAKE OF ',
     >'NUCLIDE')
90336 FORMAT(T10, 'WHICH APPEARS IN EACH L OF MILK (DAYS/L)',T71,E10.2)
 9037 FORMAT('0',T6,'FRACTION OF ANIMAL''S DAILY INTAKE OF NUCLIDE')
90337 FORMAT(T10,'WHICH APPEARS IN EACH KG OF FLESH (DAYS/KG)',
     > T71,E10.2)
 9038 FORMAT('0',T6,'CONCENTRATION FACTOR FOR UPTAKE OF NUCLIDE FROM ',
     >'SOIL FOR')
90338 FORMAT(T10,'PASTURE AND FORAGE',T71,E10.2)
 9039 FORMAT(' ',T10,'(IN PCI/KG DRY WEIGHT PER PCI/KG DRY SOIL)')
 9040 FORMAT('0',T6,'CONCENTRATION FACTOR FOR UPTAKE OF NUCLIDE FROM ',
     >'SOIL BY')
90440 FORMAT(T10,'EDIBLE PARTS OF CROPS',T71,E10.2)
 9041 FORMAT(' ',T10,'(IN PCI/KG WET WEIGHT PER PCI/KG DRY SOIL)')
 9042 FORMAT('0',T6,'GI UPTAKE FRACTION (INHALATION)',T71,E10.2)
 9043 FORMAT('0',T6,'GI UPTAKE FRACTION (INGESTION)' ,T71,E10.2)
 9044 FORMAT('0',T6,'PARTICLE SIZE (MICRONS)',T71,E10.2)
 9045 FORMAT('0',T6,'SOLUBILITY CLASS',T71,A1)
 9046 FORMAT('0',T20,'CONCENTRATIONS ON GROUND AND WATER INCLUDE CONTRIB
     >UTIONS RESULTING FROM ')
 9047 FORMAT(' ',T20,'DECAY OF THE FOLLOWING PARENT NUCLIDES AFTER DEPOS
     >ITION--')
 9048 FORMAT('0',T40,'NUCLIDE',T67,'BUILDUP FACTOR')
 9049 FORMAT('0',T41,A8,T69,E10.3)
 9050 FORMAT(' ',T41,A8,T69,E10.3)
 9059 FORMAT(' ',T6,I2,T18,I7,T45,E10.3,T68,E10.3,T92,E10.3,T118,E10.3)
 9061 FORMAT(6I10)
 9062 FORMAT(16I5)
 9063 FORMAT(16I5)
 9064 FORMAT(8E10.3)
 9065 FORMAT(8F10.1)
 9066 FORMAT(40I2)
 9067 FORMAT(I10)
 9068 FORMAT(6F10.3)
 9069 FORMAT(6F10.3)
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0         1         2         3         4         5         6         7
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 9070 FORMAT (10F8.4)
 9072 FORMAT('0')
 9079 FORMAT('0',T21,'*VALUES FOR RADIONUCLIDE-INDEPENDENT VARIABLES*')
 9080 FORMAT('0',T6,'NUMBER OF NUCLIDES CONSIDERED',T71,I10)
 9081 FORMAT('0',T6,'VEGETABLE INGESTION RATIO-IMMEDIATE')
90881 FORMAT(T11,'SURROUNDING AREA/TOTAL WITHIN AREA',T71,E10.2)
 9082 FORMAT('0',T6,'MEAT INGESTION RATIO-IMMEDIATE')
90882 FORMAT(T11,'SURROUNDING AREA/TOTAL WITHIN AREA',T71,E10.2)
 9083 FORMAT('0',T6,'MILK INGESTION RATIO-IMMEDIATE')
90883 FORMAT(T11,'SURROUNDING AREA/TOTAL WITHIN AREA',T71,E10.2)
 9084 FORMAT(' ',T6,'MINIMUM FRACTIONS OF FOOD TYPES FROM OUTSIDE AREA')
90884 FORMAT(T10,'LISTED BELOW ARE ACTUAL FIXED VALUES')
 9085 FORMAT(' ',T15,'**ACTUAL FRACTIONS OF FOOD TYPES FROM OUTSIDE',
     > ' AREA CAN BE GREATER')
90885 FORMAT(T26,'THAN THE MINIMUM FRACTIONS LISTED BELOW**')
 9086 FORMAT('0',T6,
     > 'MINIMUM FRACTION VEGETABLES INGESTED FROM OUTSIDE AREA',T71,
     > E10.2)
 9087 FORMAT('0',T6,'MINIMUM FRACTION MEAT INGESTED FROM OUTSIDE AREA',
     >  T71,E10.2)
 9088 FORMAT('0',T6,'MINIMUM FRACTION MILK INGESTED FROM OUTSIDE AREA',
     >  T71,E10.2)
 9089 FORMAT('0',T6,'INHALATION RATE OF MAN (CUBIC CENTIMETERS/HR)',
     > T71,E10.2)
 9090 FORMAT('0',T6,'BUILDUP TIME FOR RADIONUCLIDES DEPOSITED')
90990 FORMAT(T11,'ON GROUND AND WATER (DAYS)',T71,E10.2)
 9091 FORMAT('0',T6,'DILUTION FACTOR FOR WATER FOR SWIMMING (CM)',T71,
     >  E10.2)
 9092 FORMAT('0',T6,'FRACTION OF TIME SPENT SWIMMING',T71,E10.2)
 9093 FORMAT('0',T6,'MUSCLE MASS OF ANIMAL AT SLAUGHTER (KG)',T71,
     > E10.2)
 9094 FORMAT('0',T6,'FALLOUT INTERCEPTION FRACTION-VEGETABLES', T71,
     > E10.2)
 9095 FORMAT('0',T6,'FALLOUT INTERCEPTION FRACTION-PASTURE',T71,E10.2)
 9096 FORMAT('0',T6,'FRACTION OF ANIMAL HERD SLAUGHTERED PER DAY',T71,
     >  E10.2)
 9097 FORMAT('0',T6,'MILK PRODUCTION OF COW (LITERS/DAY)',T71,E10.2)
 9098 FORMAT('0',T6,'FRACTION OF RADIOACTIVITY RETAINED ON LEAFY')
90998 FORMAT(T11,'VEGETABLES AND PRODUCE AFTER WASHING',T71,E10.2)
 9099 FORMAT('0',T21,'*COMPUTED VALUES FOR THE AREA*')
 9100 FORMAT('0',T6,'TOTAL POPULATION',T71,F12.1)
 9101 FORMAT('0',T6,'TOTAL NUMBER OF MEAT ANIMALS',T71,I12)
 9102 FORMAT('0',T6,'TOTAL NUMBER OF MILK CATTLE',T71,I12)
 9103 FORMAT('0',T6,
     > 'TOTAL AREA OF VEGETABLE FOOD CROPS (SQUARE METERS)',T71,E10.2)
 9104 FORMAT('0',T6,'TOTAL MEAT CONSUMPTION (KG PER YEAR)',T71,E10.2)
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 9105 FORMAT('0',T6,'TOTAL MEAT PRODUCTION (KG PER YEAR)',T71,E10.2)
 9106 FORMAT('0',T6,'TOTAL MILK CONSUMPTION (LITERS/YEAR)',T71,E10.2)
 9107 FORMAT('0',T6,'TOTAL MILK PRODUCTION (LITERS/YEAR)',T71,E10.2)
 9108 FORMAT('0',T6,'TOTAL VEGETABLE FOOD CONSUMPTION (KG PER YEAR)',
     > T71,E10.2)
 9109 FORMAT('0',T6,'TOTAL VEGETABLE FOOD PRODUCED (KG PER YEAR)',T71,
     >  E10.2)
 9110 FORMAT(8X,I2,4E10.3,I10,2E10.3)
 9111 FORMAT(11F5.3)
 9112 FORMAT (2E10.3,I1,6F8.4)
 9113 FORMAT('1',T42,'RESULTS OF DOSE COMPUTATIONS FOR NUCLIDE ',A8)
 9114 FORMAT('0',T15,'AREA',T26,'ORGAN',T60,
     > 'DOSE THROUGH EACH PATHWAY (REMS/YEAR)')
 9115 FORMAT('0',T11,'COLUMN',T20,'ROW')
 9116 FORMAT('0',T40,'INHALATION',T55,'SUBMERSION',T70,'SURFACE',T85,
     > 'INGESTION',T100,'SUBMERSION',T117,'TOTAL')
 9117 FORMAT(' ',T57,'IN AIR',T69,'EXPOSURE',T102,'IN WATER')
 9118 FORMAT(' ',T13,I2,T20,I2,T25,A8,T40,E10.3,T55,E10.3,T70,E10.3,T85,
     >  E10.3,T100,E10.3,T115,E10.3)
 9119 FORMAT('0',T21,'*LIST OF INPUT DATA FOR NUCLIDE ',A8,'*')
 9120 FORMAT('0',T13,'FLAG ERROR')
 9121 FORMAT('0',T6,'FALLOUT INTERCEPTION FRACTION-VEGETABLES', T71,
     > E10.2)
 9122 FORMAT('0',T6,'FALLOUT INTERCEPTION FRACTION-PASTURE',T71,E10.2)
 9123 FORMAT ('0',T6, 'FALLOUT INTERCEPTION FRACTION(DRY)-VEGETABLES',
     > T71, E10.2)
 9124 FORMAT ('0',T6, 'FALLOUT INTERCEPTION FRACTION(WET)-VEGETABLES',
     > T71, E10.2)
 9125 FORMAT('0',T6,'FALLOUT INTERCEPTION FRACTION(DRY)-PASTURE', T71,
     > E10.2)
 9126 FORMAT('0',T6,'FALLOUT INTERCEPTION FRACTION(WET)-PASTURE', T71,
     > E10.2)
 9127 FORMAT('0',T6,'RADIOACTIVE DECAY CONSTANT (PER DAY)',T71,E10.2)
 9128 FORMAT('0',T25,'RADIOACTIVE DECAY FOR SURFACE EXPOSURE AND FOR WAT
     >ER IMMERSION PROCEEDS IN ACCORDANCE WITH THE')
 9129 FORMAT(' ',T25,'EFFECTIVE DECAY CONSTANT IN THE PLUME INSTEAD OF T
     >HE ABOVE VALUE')
 9130 FORMAT('0',T6,'ENVIRONMENTAL DECAY CONSTANT--SURFACE (PER DAY)',
     > T71,E10.2)
 9131 FORMAT('0',T6,'ENVIRONMENTAL DECAY CONSTANT--WATER (PER DAY)',
     > T71,E10.2)
 9132 FORMAT('0',T6,'DOSE CONVERSION FACTOR FOR FOOD INGESTION (REM-CC/
     >PCI-YEAR)',T71,E10.2)
 9133 FORMAT('0',T6,'DOSE CONVERSION FACTOR FOR WATER INGESTION (REM-CC
     >/PCI-YEAR)',T71,E10.2)
C9134 FORMAT('0',T55,'DOSE CONVERSION FACTORS')
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C9135 FORMAT('0',T5,'ORGAN',T20,'INHALATION',T38,'INGESTION',T58,
C    > 'SUBMERSION IN AIR',T83,'SURFACE EXPOSURE',T107,
C    > 'SUBMERSION IN WATER')
C9136 FORMAT(' ',T17,'(REMS/MICROCURIE)',T34,'(REMS/MICROCURIE)',T59,
C    > '(REMS-CUBIC CM/',T83,'(REMS-SQUARE CM/',T109,'(REMS-CUBIC CM/')
C9137 FORMAT(' ',T60,'MICROCURIE-HR)',T84,'MICROCURIE-HR)',T110,
C    > 'MICROCURIE-HR)')
C9138 FORMAT(' ',T4,A8,T21,E10.3,T38,E10.3,T61,E10.3,T86,E10.3,T111,
C    > E10.3)
 9139 FORMAT(10A8)
 9150 FORMAT(8I10)
 9155 FORMAT(8(1PE10.3))
 9160 FORMAT(A8)
      END
C*****************************************************************
20620032
      SUBROUTINE DOSMIC(CALC_EQUIL_FRACTIONS,NEWWAL,RNPTR,IDIST,NAMES,
     +                  DATE_AND_TIME)
C
      REAL CALC_EQUIL_FRACTIONS(20),NEWWAL(20,20)
      INTEGER*2 RNPTR
      INTEGER IDIST(20)
      CHARACTER*8 NAMES(11)
      CHARACTER*36 DATE_AND_TIME
      CHARACTER*8 NAMNUC,WORD
      CHARACTER*3 DIRECTION(16)
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD, ACON(36,20,
20710032
     >  20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11),
ORMODI(36,12,8)20720032
     > , VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
20730032
      COMMON /NCOM/ NOML(11),NRML(11)
      COMMON /FCOM/ FEQWL,INTPA(20,20)
      COMMON /OCOMCHAR/ NAMNUC(36),WORD
      REAL INTPA,NEWCWL
      DIMENSION WL(20,20)
      DATA DIRECTION/'N  ','NNW','NW ','WNW','W  ','WSW','SW ','SSW',
     > 'S  ','SSE','SE ','ESE','E  ','ENE','NE ','NNE'/
      ALI = LIPO
      IF (FEQWL .EQ. 0.) FEQWL = 0.7
      CWL = 0
      NEWCWL = 0
      DO 510 NO=NOL,NOU
         DO 500 NR=NRL,NRU
            WL(NO,NR) = FEQWL * 10. * ACON(RNPTR,NO,NR) *
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
     +                    ( ALI * ( INTPA(NO,NR) - 1. ) + 1. )
            CWL=CWL+WL(NO,NR)
            NEWCWL=NEWCWL+NEWWAL(NO,NR)
  500       CONTINUE
  510    CONTINUE
      WRITE(51,90277) DATE_AND_TIME
      WRITE(51,9027)
      WRITE(51,90227)
C     WRITE(51,9038)FEQWL
      WRITE(51,9003)
      WRITE(51,9028)
      WRITE(51,9040)
      WRITE(51,9019)
      WRITE(51,9029)
      WRITE(51,9030)
      WRITE(51,9003)
      WRITE(51,9032) ((DIRECTION(NO),IDIST(NR),WL(NO,NR),
     +                 CALC_EQUIL_FRACTIONS(NR),
     +                 NEWWAL(NO,NR),NR=NRL,NRU),NO=NOL,NOU)
  560 CONTINUE
      IF (LIPO.EQ.1) GO TO 569
      WRITE(51,90277) DATE_AND_TIME
      WRITE(51,9034)
      WRITE(51,9035)
      WRITE(51,9036)
      WRITE(51,936)
      WRITE(51,9019)
      WRITE(51,9037)(NAMES(J),NOML(J),NRML(J),WL(NOML(J),NRML(J)),
     >               CALC_EQUIL_FRACTIONS(J),NEWWAL(NOML(J),NRML(J)),
     +               J = 1,11)
CC 569  IF(LIPO.EQ.1) WRITE(51,9039)CWL,NEWCWL
 569  IF(LIPO.EQ.1) WRITE(51,9039)NEWCWL

  570 CONTINUE
      RETURN
 9000 FORMAT('1',T36,'PERCENT OF ',A8,' DOSE BY EACH PATHWAY')
 9003 FORMAT('0')
 9019 FORMAT(' ')
90277 FORMAT('1',T10,'DATE',2X,A)
 9027 FORMAT('0',T20,'EXPOSURE LEVELS FOR SHORT-LIFE PROGENY OF RN-222')
90227 FORMAT(T27,'AT VARIOUS LOCATIONS IN THE ENVIRONMENT')
 9028 FORMAT(' ',T8,'AREA',T25,'EXPOSURE LEVEL(.7 EQF)',T52,'ADJUSTED'
     +       ,T70,'ADJUSTED')
 9029 FORMAT(' ',T3,'WIND',T12,'DISTANCE')
 9030 FORMAT(' ',T2,'TOWARD',T12,'(METERS)')
 9032 FORMAT(' ',T3,A3,T10,I7,T33,1PE7.1,T52,0PF7.2,T68,1PE7.1)
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0         1         2         3         4         5         6         7
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 9034 FORMAT('0',T10,'EXPOSURE LEVEL FOR SHORT-LIFE PROGENY OR RN-222',
     +                 ' AT LOCATION OF MAXIMUM')
 9035 FORMAT(' ',T23,'INDIVIDUAL DOSE FROM ALL PATHWAYS FOR EACH ORGAN')
 9036 FORMAT('0',T2,'ORGAN',T15,'LOCATION OF' ,T29,
     > 'EXPOSURE LEVEL(.7 EQF)',T56,'ADJUSTED',T70,'ADJUSTED')
 936  FORMAT(' ',T15,'MAXIMUM DOSE',T54,'EQUIL. FRACT.',T70,'EXPOSURE'
     +       ,/,T71, 'LEVELS')
 9037 FORMAT(' ',T1,A8,T20,I2,T27,I2,T33,1PE7.1,T52,1PE7.1,T68,1PE7.1)
C9038 FORMAT(' ',T32,'(FRACTION OF EQUILIBRIUM ASSUMED FOR WORKING LEVEL
C    > CALCULATIONS=',F5.3,')')
 9039 FORMAT('0',T29,'COLLECTIVE EXPOSURE LEVELS => ',T67,E10.3)
 9040 FORMAT(' ',T30,'(PERSON .WL)',T50,'EQUIL. FRACT.',T70,'EXPOSURE'
     +       ,/,T71,'LEVELS')
      END
C*****************************************************************
C*****************************************************************
      SUBROUTINE QX(BND,X,U,UD,HS,VD,VG,INDEX1,QXR)
C
C-----NUMERICAL INTEGRATION BY SIMPSON'S RULE
C-----ROUTINE CHANGED BY D.P.STEWART 7/76
C
      REAL AB(7,4,2)
      INTEGER AC(5,4)
C                1       2       3       4       5       6       7
      DATA AB/ 1.0000, 1.0000, .9540, .8061, .8600, .8823, .8257,
     > 99.9999,99.9999, .8330, .6715, .6290, .6321, .6547, 99.9999,
     > 99.9999, .5524, .5099, .4054, .3710, .3818, 99.9999,99.9999,
     > 99.9999, .5251, .1110, .1106, .1106, 5.0200, 8.3500,10.0150,
     > 7.4800,15.5000,34.7000,61.2500, 99.9999,99.9999, 4.4000, 2.9500,
     > 3.1500, 6.1320,18.8000, 99.9999,99.9999, .3320, .8100, .5240,
     > .7640, 2.1150, 99.9999,99.9999,99.9999, .9300, .0349, .0694,
     > .1739/
C                1     2     3     4     5
      DATA AC/ 0, 0,99999, 1000, 1000, 1000, 1000, 0,10000, 3000, 10000,
     >  3000, 0,99999,10000, 0,10000, 0, 0,99999/
      FUNC(D,F,HH,X)=F*EXP(-(HH**2*F**2)/(2.*X**(2*D)))/X**D
      IF (INDEX1-3) 10,20,30
C-----SET UP BOUNDS OF INTEGRATION
C-----INDEX3 GIVES COLUMN OF AC CONTAINING LOWER BOUNDS
C-----INDEX4 GIVES COLUMN WITH UPPER BOUND
C-----LIM1 AND LIM2 DETERMINE  THE ROWS OF AC USED
C-----THEY ALSO DETERMINE WHICH VALUES OF D AND F SHOULD BE USED
   10 INDEX3=1
      INDEX4=3
      LIM2=1
      LIM1=1
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0         1         2         3         4         5         6         7
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      GO TO 40
   20 INDEX3=1
      INDEX4=4
      LIM2=3
      LIM1=1
      IF (BND.GE.1000.) LIM1=2
      IF (BND.GE.10000) LIM1=3
      GO TO 40
   30 INDEX3=2
      INDEX4=5
      LIM2=4
      LIM1=1
      IF (BND.GE.1000) LIM1=2
      IF (BND.GE.3000) LIM1=3
      IF (BND.GE.10000) LIM1=4
   40 QXR=0
      STOR1=AC(INDEX3,LIM1)
      AC(INDEX3,LIM1)=BND
      AC(INDEX4,LIM2)=X
      EPS=.1
C-----THIS LOOP SPLITS THE INTEGRATION ACCORDING TO CHANGES IN D AND F
      DO 90 INDEX2=LIM1,LIM2
         D=AB(INDEX1,INDEX2,1)
         F=AB(INDEX1,INDEX2,2)
         B=AC(INDEX4,INDEX2)
         IF (X.LT.B) B=X
         A=AC(INDEX3,INDEX2)
         WIDTH=(B-A)/2.
         JLIM=1
C-----FOFA AND FOFB ARE THE FUNCTION VALUES AT ENDPOINTS OF INTERVAL
         FOFA=0.0
         IF (A.EQ.0.0) GO TO 50
         HA=HS-VG*A/UD
         IF (HA.LT.1.0) HA=1.0
         FOFA=FUNC(D,F,HA,A)
   50    HB=HS-VG*B/UD
         IF (HB.LT.1.0) HB=1.0
         FOFB=FUNC(D,F,HB,B)
         X1=A+WIDTH
         H1=HS-VG*X1/UD
         IF (H1.LT.1.0) H1=1.0
C-----COMPUTE FIRST APPROXIMATION OF SIMP
         SIMP=(FOFA+4*FUNC(D,F,H1,X1)+FOFB)*WIDTH/3.
C-----THIS SECTION IS REPEATED UNTIL THE CHANGE IN SIMP IS LESS THAN EPS
   60    FUNC1=0.0
         FUNC2=0.0
```

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0         1         2         3         4         5         6         7
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         WIDTH=WIDTH/2
         JLIM=JLIM*2
         OLDS=SIMP
         JLESS=JLIM-1
         DO 70 J=1,JLESS
            X1=A+(2*J-1.)*WIDTH
            H1=HS-VG*X1/UD
            IF (H1.LT.1.0) H1=1.0
            FUNC1=FUNC1+FUNC(D,F,H1,X1)
            X2=A+2*J*WIDTH
            H2=HS-VG*X2/UD
            IF (H2.LT.1.0) H2=1.0
            FUNC2=FUNC2+FUNC(D,F,H2,X2)
   70       CONTINUE
         X1=A+2*JLIM*WIDTH
         H1=HS-VG*X1/UD
         IF (H1.LT.1.0) H1=1.0
         FUNC1=FUNC1+FUNC(D,F,H1,X1)
         SIMP=(FOFA+4*FUNC1+2*FUNC2+FOFB)*WIDTH/3
         IF (ABS(SIMP-OLDS).GT.EPS) GO TO 60
C-----END SIMP APPROXIMATION LOOP
   80    QXR=QXR+SIMP
         IF (X.LT.AC(INDEX4,INDEX2)) GO TO 100
   90    CONTINUE
  100 QXR=EXP(-.79788*QXR*VD/UD)
      AC(INDEX3,LIM1)=STOR1
      RETURN
      END
C*****************************************************************
C*****************************************************************
      SUBROUTINE QY(BND,X,U,UD,HS,VD,VG,INDEX1,QXR)
C
C       R. E. MOORE   HEALTH AND SAFETY RESEARCH DIV.,  ORNL  3-1-78
C
C       A TABLE CALLOUT SUBROUTINE FOR DETERMINING DEPLETION FRACTIONS F
C       DEPOSITION FOR CONSTANT DEPOSITION VELOCITY AND FOR ZERO GRAVITA
C       EFFECT.
C
C       TABULATED VALUES IN DATA STATEMENT WERE DERIVED THROUGH THE USE
C       SUBROUTINE QX, A SIMPSON'S RULE SUBROUTINE WRITTEN ORIGINALLY BY
C       D. E. DUNNING, MODIFIED BY J. F. HULL, AND LATER CHANGED BY
C       D. P. STEWART.
C
      COMMON /QCOM/ REFA(34,7,20)
      DIMENSION XIDI(20),KP(34)
      REAL KP
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0         1         2         3         4         5         6         7
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      INTEGER IDOM
      DATA XIDI/35.,65.,100.,150.,200.,300.,400.,500.,650.,800.,1000.,
     > 1500.,2000.,4000.,7000.,10000.,25000.,60000.,90000.,200000./
      DATA KP/1.,1.5,2.,3.,4.,5.,6.,7.,8.,9.,10.,12.5,15.,17.5,20.,25.,
     > 30.,35.,40.,50.,60.,70.,80.,90.,100.,120.,140.,160.,180.,200.,
     > 240.,260.,300.,400./
      IF (IDOM.EQ.121) GO TO 20
   10 CALL QY1
      CALL QY2
      CALL QY3
      IDOM=121
   20 JH=INDEX1
      H1=HS
      DO 30 ID=1,20
         IF (X.LT.XIDI(ID)) GO TO 50
   30    CONTINUE
   40 ID2=35
      GO TO 60
   50 ID1=ID
      ID2=ID-1
   60 DO 70 KR=1,34
         IF (H1.LT.KP(KR)) GO TO 90
   70    CONTINUE
   80 KP2=21
      GO TO 100
   90 KP1=KR
      KP2=KR-1
  100 IF (KP2.EQ.0.AND.ID2.EQ.0) GO TO 140
      IF (KP2.EQ.0) GO TO 150
      IF (ID2.EQ.0) GO TO 170
      IF (X.GE.200000.) GO TO 110
      IF (H1.GE.400.) GO TO 130
      CUX1=REFA(KP1,JH,ID2)-((REFA(KP1,JH,ID2)-REFA(KP1,JH,ID1))* ((X-
     > XIDI(ID2))/(XIDI(ID1)-XIDI(ID2))))
      CUX2=REFA(KP2,JH,ID2)-((REFA(KP2,JH,ID2)-REFA(KP2,JH,ID1))* ((X-
     > XIDI(ID2))/(XIDI(ID1)-XIDI(ID2))))
      CUXA=CUX1-(((CUX1-CUX2)*(KP(KP1)-H1))/(KP(KP1)-KP(KP2)))
      GO TO 190
  110 IF (H1.GT.400.) GO TO 120
      CUX1=X*((REFA(KP1,JH,20)-REFA(KP1,JH,19))/110000.)+ (REFA(KP1,JH,
     > 19)-.8181818*(REFA(KP1,JH,20)-REFA(KP1,JH,19)))
      CUX2=X*((REFA(KP2,JH,20)-REFA(KP2,JH,19))/110000.)+ (REFA(KP2,JH,
     > 19)-.8181818*(REFA(KP2,JH,20)-REFA(KP2,JH,19)))
      CUXA=CUX1-(((CUX1-CUX2)*(KP(KP1)-H1))/(KP(KP1)-KP(KP2)))
      GO TO 190
  120 CUM1=H1*((REFA(34,JH,20)-REFA(33,JH,20))/100.)+4.*REFA(33,JH,20)-
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     > 3.*REFA(34,JH,20)
      CUM2=H1*((REFA(34,JH,19)-REFA(33,JH,19))/100.)+4.*REFA(33,JH,19)-
     > 3.*REFA(34,JH,19)
      CUXA=((CUM1-CUM2)/110000.)*X+CUM1-1.8181818*(CUM1-CUM2)
      GO TO 190
  130 CUX1=H1*((REFA(34,JH,ID1)-REFA(33,JH,ID1))/100.)+4.*REFA(33,JH,
     > ID1)-3.*REFA(34,JH,ID1)
      CUX2=H1*((REFA(34,JH,ID2)-REFA(33,JH,ID2))/100.)+4.*REFA(33,JH,
     > ID2)-3.*REFA(34,JH,ID2)
      CUXA=((CUX2-CUX1)/(XIDI(ID2)-XIDI(ID1)))*(X-XIDI(ID1))+CUX1
      GO TO 190
  140 CUXA=1.-(1.-REFA(1,JH,1)*(X/XIDI(1)))
      GO TO 190
  150 IF (X.GE.200000.) GO TO 160
      CUXA=REFA(1,JH,ID2)-((REFA(1,JH,ID2)-REFA(1,JH,ID1))* ((X-
     > XIDI(ID2))/(XIDI(ID1)-XIDI(ID2))))
      GO TO 190
  160 CUXA=((REFA(1,JH,20)-REFA(1,JH,19))/110000.)*X+REFA(1,JH,20)-
     > 1.8181818*(REFA(1,JH,20)-REFA(1,JH,19))
      GO TO 190
  170 IF (H1.GT.400.) GO TO 180
      CUX1=1.-(1.-REFA(KP1,JH,1)*(X/XIDI(1)))
      CUX2=1.-(1.-REFA(KP2,JH,1)*(X/XIDI(1)))
      CUXA=CUX1-(((CUX1-CUX2)*(KP(KP1)-H1))/(KP(KP1)-KP(KP2)))
      GO TO 190
  180 CUX1=1.-((1.-REFA(33,JH,1))*(X/XIDI(1)))
      CUX2=1.-((1.-REFA(34,JH,1))*(X/XIDI(1)))
      CUXA=((CUX2-CUX1)/100.)*H1+CUX1-3.*(CUX2-CUX1)
  190 QXR=CUXA**((100.*VD)/UD)
      RETURN
      END
C*********************************************************************
C*********************************************************************
      SUBROUTINE QY1
      COMMON /QCOM/ REFA(34,7,20)
      DIMENSION SEFA(34,7,20)
      DIMENSION AA(114),AB(114),AC(114),AD(114),AE(114),AF(114),AG(114),
     > AH(114),AI(114),AJ(114),AK(114),AL(114),AM(114),AN(114),AO(70)
      EQUIVALENCE (SEFA( 1,1, 1),AA(1)),(SEFA(13,4, 1),AB(1)),(SEFA(25,
     > 7, 1),AC(1)),(SEFA( 3,4, 2),AD(1)),(SEFA(15,7, 2),AE(1)),
     > (SEFA(27,3, 3),AF(1)),(SEFA( 5,7, 3),AG(1)),(SEFA(17,3, 4),AH(1))
     > ,(SEFA(29,6, 4),AI(1)),(SEFA( 7,3, 5),AJ(1)),(SEFA(19,6, 5),AK(1)
     > ),(SEFA(31,2, 6),AL(1)),(SEFA( 9,6, 6),AM(1)),(SEFA(21,2, 7),
     > AN(1)),(SEFA(33,5, 7),AO(1))
      DATA AA/ .9229E 00,.9370E 00,.9483E 00,.9639E 00,.9728E 00,.9798E
     > 00, .9851E 00,.9882E 00,.9919E 00,.9941E 00,.9957E 00,.9982E 00,
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     > .9991E 00,.9993E 00,.9997E 00,.1000E 01,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.9051E 00,.9283E 00,
     > .9448E 00,.9665E 00,.9790E 00,.9878E 00,.9929E 00,.9959E 00,
     > .9978E 00,.9988E 00,.9991E 00,.9997E 00,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.8943E 00,.9259E 00,.9476E 00,.9738E 00,
     > .9874E 00,.9943E 00,.9976E 00,.9990E 00,.9990E 00,.9996E 00,
     > .9999E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .8839E 00,.9234E 00,.9494E 00,.9791E 00,.9922E 00,.9974E 00,
     > .9992E 00,.9994E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01/
      DATA AB/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DATA AC/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
     > 01, .1000E 01,.1000E 01,.1000E 01,.1000E 01,.9004E 00,.9151E 00,
     > .9256E 00,.9408E 00,.9510E 00,.9590E 00,.9655E 00,.9708E 00,
     > .9752E 00,.9789E 00,.9820E 00,.9875E 00,.9921E 00,.9948E 00,
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     > .9491E 00,.9611E 00,.9701E 00,.9772E 00,.9826E 00,.9868E 00,
     > .9900E 00,.9953E 00,.9979E 00,.9991E 00,.9990E 00,.9998E 00,
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0         1         2         3         4         5         6         7
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     > .8445E 00,.8766E 00,.8997E 00,.9319E 00,.9535E 00,.9683E 00,
     > .9786E 00,.9858E 00,.9907E 00,.9940E 00,.9963E 00,.9989E 00,
     > .9992E 00,.9998E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.8222E 00,.8620E 00/
      DATA AD/ .8919E 00,.9340E 00,.9603E 00,.9772E 00,.9875E 00,.9934E
     > 00, .9965E 00,.9983E 00,.9992E 00,.9997E 00,.1000E 01,.1000E 01,
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     > .9867E 00,.9957E 00,.9987E 00,.9990E 00,.9997E 00,.9999E 00,
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     > .8356E 00,.9325E 00,.9758E 00,.9980E 00,.9996E 00,.1000E 01,
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12345678901234567890123456789012345678901234567890123456789012345678901 2

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      DATA AF/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
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     > .9601E 00,.9742E 00,.9837E 00,.9898E 00,.9938E 00,.9979E 00/
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     > .9680E 00,.9892E 00,.9968E 00,.9990E 00,.9992E 00,.9998E 00,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DATA AI/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
     > 01, .6767E 00,.8770E 00,.9627E 00,.9981E 00,.9998E 00,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .7559E 00,.7852E 00,.8070E 00,.8391E 00,.8636E 00,.8815E 00/
      DATA AJ/ .8968E 00,.9123E 00,.9209E 00,.9306E 00,.9392E 00,.9560E
     > 00, .9682E 00,.9774E 00,.9840E 00,.9923E 00,.9965E 00,.9985E 00,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
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12345678901234567890123456789012345678901234567890123456789012345678901 2

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     > .9834E 00,.9933E 00,.9975E 00,.9990E 00,.9989E 00,.9999E 00,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DATA AK/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
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     > .9947E 00,.9964E 00,.9976E 00,.9990E 00,.9989E 00,.9995E 00,
     > .9998E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .7847E 00,.8061E 00,.8217E 00,.8442E 00,.8604E 00,.8733E 00,
     > .8838E 00,.8928E 00,.9006E 00,.9075E 00,.9137E 00,.9267E 00,
     > .9391E 00,.9460E 00,.9535E 00,.9651E 00,.9739E 00,.9796E 00,
     > .9855E 00,.9922E 00,.9959E 00,.9980E 00,.9990E 00,.9988E 00,
     > .9994E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DATA AL/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.7250E 00,.7532E
     > 00, .7742E 00,.8052E 00,.8283E 00,.8466E 00,.8627E 00,.8751E 00,
     > .8842E 00,.8966E 00,.9056E 00,.9245E 00,.9396E 00,.9515E 00,
     > .9611E 00,.9753E 00,.9846E 00,.9906E 00,.9944E 00,.9982E 00,
     > .9992E 00,.9996E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.6494E 00,.6831E 00,.7101E 00,.7532E 00,
     > .7869E 00,.8151E 00,.8393E 00,.8601E 00,.8806E 00,.8943E 00,
     > .9085E 00,.9366E 00,.9568E 00,.9714E 00,.9814E 00,.9927E 00,
     > .9972E 00,.9991E 00,.9992E 00,.9999E 00,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .5547E 00,.6084E 00,.6516E 00,.7197E 00,.7728E 00,.8157E 00,
     > .8510E 00,.8803E 00,.9042E 00,.9238E 00,.9401E 00,.9682E 00,
     > .9841E 00,.9925E 00,.9966E 00,.9994E 00,.9997E 00,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.4271E 00,.5210E 00,
     > .6001E 00,.7257E 00,.8180E 00,.8833E 00,.9280E 00,.9574E 00/
      DATA AM/ .9758E 00,.9866E 00,.9929E 00,.9986E 00,.9993E 00,.9999E
     > 00, .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     > .1000E 01,.1000E 01,.3527E 00,.5497E 00,.7144E 00,.9105E 00,
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     > .8372E 00,.8509E 00,.8607E 00,.8749E 00,.8850E 00,.8930E 00,
     > .8995E 00,.9050E 00,.9098E 00,.9141E 00,.9180E 00,.9261E 00,
     > .9328E 00,.9380E 00,.9436E 00,.9515E 00,.9581E 00,.9645E 00,
     > .9683E 00,.9757E 00,.9813E 00,.9856E 00,.9882E 00,.9916E 00,
     > .9936E 00,.9964E 00,.9980E 00,.9990E 00,.9987E 00,.9993E 00,
     > .9998E 00,.9999E 00,.1000E 01,.1000E 01,.7698E 00,.7909E 00,
     > .8062E 00,.8283E 00,.8442E 00,.8568E 00,.8673E 00,.8761E 00,
     > .8838E 00,.8906E 00,.8952E 00,.9099E 00,.9206E 00,.9295E 00,
     > .9391E 00,.9500E 00,.9597E 00,.9676E 00,.9739E 00,.9832E 00/
      DATA AN/ .9893E 00,.9933E 00,.9959E 00,.9976E 00,.9986E 00,.9988E
     > 00, .9996E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.7036E 00,.7309E 00,.7513E 00,.7815E 00,
     > .8040E 00,.8220E 00,.8370E 00,.8500E 00,.8621E 00,.8716E 00,
     > .8807E 00,.9000E 00,.9157E 00,.9287E 00,.9398E 00,.9569E 00,
     > .9681E 00,.9784E 00,.9850E 00,.9932E 00,.9969E 00,.9987E 00,
     > .9993E 00,.9995E 00,.9998E 00,.1000E 01,.1000E 01,.1000E 01,
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     > .8000E 00,.8200E 00,.8387E 00,.8555E 00,.8731E 00,.9023E 00,
     > .9268E 00,.9457E 00,.9602E 00,.9797E 00,.9902E 00,.9956E 00,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.5120E 00,.5618E 00,
     > .6020E 00,.6663E 00,.7174E 00,.7599E 00,.8002E 00,.8267E 00,
     > .8533E 00,.8764E 00,.8960E 00,.9340E 00,.9594E 00,.9758E 00,
     > .9861E 00,.9959E 00,.9988E 00,.9991E 00,.9998E 00,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DATA AO/ .1000E 01,.1000E 01,.3662E 00,.4477E 00,.5183E 00,.6357E
     > 00, .7289E 00,.8025E 00,.8590E 00,.9016E 00,.9331E 00,.9556E 00,
     > .9712E 00,.9910E 00,.9976E 00,.9993E 00,.9995E 00,.1000E 01,
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     > .2497E 00,.4085E 00,.5622E 00,.7974E 00,.9235E 00,.9758E 00,
     > .9935E 00,.9984E 00,.9993E 00,.9997E 00,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01/
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

      DO 30 L=1,7
         DO 20 K=1,7
            DO 10 I=1,34
   10          REFA(I,K,L)=SEFA(I,K,L)
   20       CONTINUE
   30    CONTINUE
      RETURN
      END
C*********************************************************************
C*********************************************************************
      SUBROUTINE QY2
      COMMON /QCOM/ REFA(34,7,20)
      DIMENSION SEFA(34,7,20)
      DIMENSION BQ(98),BC(114),BD(114),BE(114),BF(114),BG(114),BH(114),
     > BI(114),BJ(114),BK(114),BL(114),BM(114),BN(114),BO(114),BP(86)
      EQUIVALENCE (SEFA( 1,1,14),BQ(1)),(SEFA(31,3,14),BC(1)),(SEFA( 9,
     > 7,14),BD(1)),(SEFA(21,3,15),BE(1)),(SEFA(33,6,15),BF(1)),
     > (SEFA(11,3,16),BG(1)),(SEFA(23,6,16),BH(1)),(SEFA( 1,3,17),BI(1))
     > ,(SEFA(13,6,17),BJ(1)),(SEFA(25,2,18),BK(1)),(SEFA( 3,6,18),BL(1)
     > ),(SEFA(15,2,19),BM(1)),(SEFA(27,5,19),BN(1)),(SEFA( 5,2,20),
     > BO(1)),(SEFA(17,5,20),BP(1))
      DATA BQ/ .7636E 00,.7761E 00, .7850E 00,.7979E 00,.8071E 00,
     > .8143E 00,.8204E 00,.8254E 00, .8298E 00,.8306E 00,.8372E 00,
     > .8448E 00,.8509E 00,.8562E 00, .8607E 00,.8685E 00,.8749E 00,
     > .8803E 00,.8850E 00,.8930E 00, .8995E 00,.9050E 00,.9098E 00,
     > .9141E 00,.9180E 00,.9246E 00, .9303E 00,.9352E 00,.9399E 00,
     > .9436E 00,.9501E 00,.9518E 00, .9581E 00,.9683E 00,.6605E 00,
     > .6785E 00,.6915E 00,.7105E 00, .7242E 00,.7351E 00,.7440E 00,
     > .7517E 00,.7585E 00,.7644E 00, .7698E 00,.7813E 00,.7909E 00,
     > .7990E 00,.8061E 00,.8182E 00, .8283E 00,.8367E 00,.8442E 00,
     > .8568E 00,.8673E 00,.8761E 00, .8838E 00,.8906E 00,.8952E 00,
     > .9075E 00,.9166E 00,.9243E 00, .9312E 00,.9391E 00,.9477E 00,
     > .9521E 00,.9597E 00,.9739E 00, .5360E 00,.5569E 00,.5725E 00,
     > .5956E 00,.6084E 00,.6267E 00, .6384E 00,.6485E 00,.6535E 00,
     > .6656E 00,.6733E 00,.6889E 00, .7024E 00,.7141E 00,.7246E 00,
     > .7402E 00,.7575E 00,.7707E 00, .7824E 00,.8028E 00,.8199E 00,
     > .8348E 00,.8483E 00,.8604E 00, .8714E 00,.8912E 00,.9076E 00,
     > .9219E 00,.9343E 00,.9441E 00/
      DATA BC/ .9600E 00,.9662E 00,.9781E 00,.9923E 00,.3404E 00,.3582E
     > 00, .3726E 00,.3958E 00,.4146E 00,.4309E 00,.4453E 00,.4585E 00,
     > .4706E 00,.4819E 00,.4925E 00,.5167E 00,.5369E 00,.5585E 00,
     > .5771E 00,.6110E 00,.6417E 00,.6700E 00,.6964E 00,.7441E 00,
     > .7871E 00,.8225E 00,.8547E 00,.8820E 00,.9051E 00,.9409E 00,
     > .9648E 00,.9799E 00,.9890E 00,.9940E 00,.9984E 00,.9993E 00,
     > .9999E 00,.1000E 01,.2136E 00,.2346E 00,.2518E 00,.2797E 00,
     > .3028E 00,.3229E 00,.3409E 00,.3574E 00,.3737E 00,.3873E 00,
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     > .4011E 00,.4330E 00,.4622E 00,.4896E 00,.5157E 00,.5642E 00,
     > .6101E 00,.6527E 00,.6928E 00,.7648E 00,.8252E 00,.8741E 00,
     > .9116E 00,.9401E 00,.9605E 00,.9840E 00,.9940E 00,.9978E 00,
     > .9994E 00,.9998E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .6861E-01,.8460E-01,.9887E-01,.1246E 00,.1481E 00,.1703E 00,
     > .1917E 00,.2126E 00,.2331E 00,.2535E 00,.2738E 00,.3243E 00,
     > .3750E 00,.4260E 00,.4769E 00,.5765E 00,.6685E 00,.7496E 00,
     > .8175E 00,.9120E 00,.9625E 00,.9853E 00,.9947E 00,.9981E 00,
     > .9995E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.3687E-02,.6718E-02,
     > .1064E-01,.2151E-01,.3705E-01,.5805E-01,.8520E-01,.1190E 00/
      DATA BD/ .1596E 00,.2075E 00,.2597E 00,.4086E 00,.5628E 00,.6993E
     > 00, .8076E 00,.9341E 00,.9816E 00,.9953E 00,.9990E 00,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.7439E 00,.7587E 00,.7649E 00,.7801E 00,
     > .7864E 00,.7963E 00,.8020E 00,.8071E 00,.8085E 00,.8152E 00,
     > .8187E 00,.8260E 00,.8321E 00,.8372E 00,.8417E 00,.8493E 00,
     > .8555E 00,.8607E 00,.8654E 00,.8732E 00,.8796E 00,.8850E 00,
     > .8897E 00,.8939E 00,.8977E 00,.9043E 00,.9098E 00,.9147E 00,
     > .9190E 00,.9229E 00,.9295E 00,.9325E 00,.9370E 00,.9483E 00,
     > .6364E 00,.6536E 00,.6662E 00,.6845E 00,.6977E 00,.7082E 00,
     > .7168E 00,.7242E 00,.7307E 00,.7364E 00,.7416E 00,.7527E 00,
     > .7619E 00,.7698E 00,.7767E 00,.7883E 00,.7979E 00,.8062E 00,
     > .8133E 00,.8255E 00,.8356E 00,.8442E 00,.8477E 00,.8584E 00,
     > .8646E 00,.8749E 00,.8838E 00,.8916E 00,.8973E 00,.9051E 00,
     > .9154E 00,.9200E 00,.9283E 00,.9448E 00,.4937E 00,.5129E 00,
     > .5273E 00,.5486E 00,.5604E 00,.5772E 00,.5880E 00,.5974E 00,
     > .6019E 00,.6131E 00,.6201E 00,.6346E 00,.6470E 00,.6578E 00,
     > .6675E 00,.6820E 00,.6980E 00,.7103E 00,.7212E 00,.7403E 00/
      DATA BE/ .7566E 00,.7708E 00,.7838E 00,.7957E 00,.8066E 00,.8265E
     > 00, .8438E 00,.8593E 00,.8733E 00,.8889E 00,.9075E 00,.9173E 00,
     > .9332E 00,.9617E 00,.2670E 00,.2811E 00,.2923E 00,.3106E 00,
     > .3254E 00,.3382E 00,.3496E 00,.3599E 00,.3695E 00,.3785E 00,
     > .3869E 00,.4062E 00,.4225E 00,.4399E 00,.4551E 00,.4831E 00,
     > .5091E 00,.5333E 00,.5568E 00,.6012E 00,.6437E 00,.6817E 00,
     > .7185E 00,.7525E 00,.7844E 00,.8389E 00,.8837E 00,.9185E 00,
     > .9445E 00,.9632E 00,.9851E 00,.9910E 00,.9970E 00,.9998E 00,
     > .1454E 00,.1597E 00,.1714E 00,.1905E 00,.2062E 00,.2200E 00,
     > .2324E 00,.2439E 00,.2552E 00,.2647E 00,.2744E 00,.2970E 00,
     > .3181E 00,.3383E 00,.3579E 00,.3958E 00,.4330E 00,.4700E 00,
     > .5069E 00,.5794E 00,.6489E 00,.7132E 00,.7713E 00,.8220E 00,
     > .8646E 00,.9267E 00,.9635E 00,.9831E 00,.9930E 00,.9971E 00,
     > .9995E 00,.9998E 00,.1000E 01,.1000E 01,.3230E-01,.3984E-01,
     > .4660E-01,.5883E-01,.7010E-01,.8089E-01,.9144E-01,.1019E 00,
     > .1124E 00,.1229E 00,.1337E 00,.1615E 00,.1913E 00,.2232E 00,
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     > .2573E 00,.3320E 00,.4135E 00,.4982E 00,.5821E 00,.7337E 00,
     > .8479E 00,.9214E 00,.9629E 00,.9836E 00,.9935E 00,.9988E 00,
     > .9999E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DATA BF/ .1000E 01,.1000E 01,.5537E-03,.1017E-02,.1627E-02,.3389E-
     > 02, .6080E-02,.1002E-01,.1563E-01,.2338E-01,.3384E-01,.4774E-01,
     > .6508E-01,.1285E 00,.2219E 00,.3402E 00,.4721E 00,.7158E 00,
     > .8758E 00,.9541E 00,.9853E 00,.9984E 00,.9999E 00,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .7360E 00,.7484E 00,.7567E 00,.7691E 00,.7780E 00,.7850E 00,
     > .7907E 00,.7956E 00,.7999E 00,.8037E 00,.8071E 00,.8143E 00,
     > .8204E 00,.8254E 00,.8298E 00,.8372E 00,.8434E 00,.8486E 00,
     > .8531E 00,.8607E 00,.8672E 00,.8725E 00,.8771E 00,.8813E 00,
     > .8850E 00,.8916E 00,.8970E 00,.9018E 00,.9060E 00,.9098E 00,
     > .9166E 00,.9194E 00,.9246E 00,.9352E 00,.6215E 00,.6386E 00,
     > .6506E 00,.6684E 00,.6813E 00,.6916E 00,.7000E 00,.7034E 00,
     > .7135E 00,.7192E 00,.7242E 00,.7351E 00,.7441E 00,.7517E 00,
     > .7584E 00,.7698E 00,.7792E 00,.7872E 00,.7943E 00,.8062E 00,
     > .8160E 00,.8244E 00,.8318E 00,.8383E 00,.8442E 00,.8545E 00,
     > .8632E 00,.8709E 00,.8777E 00,.8838E 00,.8944E 00,.8991E 00,
     > .9075E 00,.9243E 00,.4667E 00,.4849E 00,.4984E 00,.5185E 00,
     > .5297E 00,.5456E 00,.5558E 00,.5647E 00,.5690E 00,.5795E 00/
      DATA BG/ .5862E 00,.5999E 00,.6116E 00,.6219E 00,.6308E 00,.6446E
     > 00, .6597E 00,.6713E 00,.6817E 00,.6999E 00,.7154E 00,.7290E 00,
     > .7415E 00,.7529E 00,.7767E 00,.7828E 00,.7998E 00,.8153E 00,
     > .8294E 00,.8417E 00,.8651E 00,.8752E 00,.8939E 00,.9284E 00,
     > .2202E 00,.2318E 00,.2410E 00,.2561E 00,.2683E 00,.2789E 00,
     > .2883E 00,.2969E 00,.3048E 00,.3122E 00,.3192E 00,.3353E 00,
     > .3488E 00,.3634E 00,.3761E 00,.3999E 00,.4222E 00,.4431E 00,
     > .4637E 00,.5033E 00,.5422E 00,.5783E 00,.6143E 00,.6489E 00,
     > .6820E 00,.7447E 00,.7983E 00,.8447E 00,.8833E 00,.9140E 00,
     > .9563E 00,.9699E 00,.9863E 00,.9984E 00,.1055E 00,.1158E 00,
     > .1243E 00,.1382E 00,.1496E 00,.1597E 00,.1688E 00,.1772E 00,
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     > .2626E 00,.2922E 00,.3221E 00,.3526E 00,.3839E 00,.4484E 00,
     > .5145E 00,.5819E 00,.6441E 00,.7043E 00,.7591E 00,.8489E 00,
     > .9119E 00,.9520E 00,.9756E 00,.9882E 00,.9977E 00,.9985E 00,
     > .9997E 00,.1000E 01,.1705E-01,.2104E-01,.2461E-01,.3111E-01,
     > .3713E-01,.4294E-01,.4865E-01,.5437E-01,.6016E-01,.6608E-01,
     > .7216E-01,.8827E-01,.1061E 00,.1258E 00,.1479E 00,.1992E 00,
     > .2602E 00,.3299E 00,.4059E 00,.5647E 00,.7102E 00,.8240E 00/
      DATA BH/ .9016E 00,.9489E 00,.9753E 00,.9951E 00,.9987E 00,.9998E
     > 00, .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1117E-03,.2060E-03,.3318E-03,.7035E-03,.1294E-02,.2200E-02,
     > .3561E-02,.5560E-02,.8440E-02,.1255E-01,.1809E-01,.4159E-01,
     > .8444E-01,.1521E 00,.2460E 00,.4827E 00,.7077E 00,.8603E 00,
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

     > .9419E 00,.9927E 00,.9988E 00,.9999E 00,.1000E 01,.1000E 01,
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     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.7105E 00,.7221E 00,
     > .7294E 00,.7414E 00,.7500E 00,.7567E 00,.7623E 00,.7641E 00,
     > .7711E 00,.7748E 00,.7780E 00,.7850E 00,.7907E 00,.7956E 00,
     > .7999E 00,.8071E 00,.8130E 00,.8180E 00,.8224E 00,.8298E 00,
     > .8358E 00,.8410E 00,.8455E 00,.8495E 00,.8531E 00,.8594E 00,
     > .8647E 00,.8693E 00,.8734E 00,.8771E 00,.8835E 00,.8864E 00,
     > .8916E 00,.9018E 00,.5851E 00,.6005E 00,.6130E 00,.6289E 00,
     > .6410E 00,.6506E 00,.6586E 00,.6654E 00,.6713E 00,.6766E 00,
     > .6814E 00,.6916E 00,.7000E 00,.7034E 00,.7135E 00,.7242E 00,
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     > .7825E 00,.7887E 00,.7943E 00,.8040E 00,.8079E 00,.8195E 00,
     > .8261E 00,.8318E 00,.8419E 00,.8464E 00,.8544E 00,.8709E 00/
      DATA BI/ .3878E 00,.4029E 00,.4142E 00,.4309E 00,.4402E 00,.4534E
     > 00, .4619E 00,.4692E 00,.4728E 00,.4816E 00,.4871E 00,.4985E 00,
     > .5083E 00,.5168E 00,.5243E 00,.5357E 00,.5484E 00,.5580E 00,
     > .5667E 00,.5820E 00,.5950E 00,.6065E 00,.6171E 00,.6268E 00,
     > .6470E 00,.6528E 00,.6678E 00,.6817E 00,.6945E 00,.7060E 00,
     > .7285E 00,.7386E 00,.7579E 00,.7982E 00,.1120E 00,.1179E 00,
     > .1226E 00,.1303E 00,.1365E 00,.1419E 00,.1467E 00,.1511E 00,
     > .1552E 00,.1590E 00,.1626E 00,.1709E 00,.1779E 00,.1855E 00,
     > .1922E 00,.2049E 00,.2170E 00,.2286E 00,.2402E 00,.2633E 00,
     > .2871E 00,.3104E 00,.3349E 00,.3598E 00,.3851E 00,.4379E 00,
     > .4903E 00,.5431E 00,.5949E 00,.6448E 00,.7339E 00,.7732E 00,
     > .8399E 00,.9423E 00,.2555E-01,.2807E-01,.3013E-01,.3351E-01,
     > .3631E-01,.3879E-01,.4104E-01,.4313E-01,.4521E-01,.4700E-01,
     > .4885E-01,.5325E-01,.5754E-01,.6182E-01,.6617E-01,.7524E-01,
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     > .2608E 00,.3156E 00,.3761E 00,.5068E 00,.6372E 00,.7521E 00,
     > .8426E 00,.9065E 00,.9727E 00,.9851E 00,.9968E 00,.1000E 01,
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     > .2953E-02,.3335E-02,.3733E-02,.4154E-02,.4604E-02,.5880E-02/
      DATA BJ/ .7439E-02,.9372E-02,.1178E-01,.1852E-01,.2885E-01,.4429E-
     > 01, .6657E-01,.1385E 00,.2527E 00,.4015E 00,.5617E 00,.7066E 00,
     > .8197E 00,.9452E 00,.9864E 00,.9972E 00,.9996E 00,.9999E 00,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.9405E-07,.1762E-06,
     > .2900E-06,.6541E-06,.1310E-05,.2483E-05,.4578E-05,.8309E-05,
     > .1494E-04,.2677E-04,.4723E-04,.1902E-03,.7132E-03,.2424E-02,
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     > .9854E 00,.9983E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
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     > .7219E 00,.7283E 00,.7337E 00,.7359E 00,.7422E 00,.7458E 00,
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12345678901234567890123456789012345678901234567890123456789012345678901 2

     > .8138E 00,.8177E 00,.8211E 00,.8271E 00,.8324E 00,.8367E 00,
     > .8407E 00,.8442E 00,.8504E 00,.8531E 00,.8580E 00,.8680E 00,
     > .5533E 00,.5684E 00,.5795E 00,.5933E 00,.6048E 00,.6138E 00,
     > .6213E 00,.6278E 00,.6334E 00,.6384E 00,.6429E 00,.6525E 00,
     > .6605E 00,.6673E 00,.6732E 00,.6832E 00,.6915E 00,.6987E 00,
     > .7049E 00,.7155E 00,.7242E 00,.7317E 00,.7382E 00,.7440E 00/
      DATA BK/ .7493E 00,.7585E 00,.7663E 00,.7731E 00,.7792E 00,.7847E
     > 00, .7943E 00,.7985E 00,.8062E 00,.8217E 00,.2979E 00,.3095E 00,
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     > .3631E 00,.3699E 00,.3741E 00,.3829E 00,.3904E 00,.3969E 00,
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     > .6984E-01,.1372E 00,.2418E 00,.3787E 00,.5296E 00,.6713E 00,
     > .8716E 00,.9266E 00,.9798E 00,.9995E 00,.2537E-05,.3139E-05/
      DATA BL/ .3686E-05,.4710E-05,.5708E-05,.6729E-05,.7808E-05,.8974E-
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     > .5018E-04,.1039E-03,.2224E-03,.4847E-03,.1058E-02,.4772E-02,
     > .1847E-01,.5763E-01,.1418E 00,.2781E 00,.4481E 00,.7576E 00,
     > .9219E 00,.9801E 00,.9957E 00,.9991E 00,.1000E 01,.1000E 01,
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     > .5664E-12,.1298E-11,.3005E-11,.7108E-11,.1725E-10,.4305E-10,
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     > 00, .7032E 00,.7105E 00,.7169E 00,.7225E 00,.7276E 00,.7365E 00,
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12345678901234567890123456789012345678901234567890123456789012345678901 2

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     > .3182E 00,.3256E 00,.3320E 00,.3376E 00,.3424E 00,.3499E 00,
     > .3582E 00,.3646E 00,.3702E 00,.3803E 00,.3888E 00,.3965E 00,
     > .4035E 00,.4100E 00,.4233E 00,.4273E 00,.4375E 00,.4470E 00,
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     > .2077E-03,.2170E-03,.2268E-03,.2513E-03,.2771E-03,.3047E-03,
     > .3352E-03,.4064E-03,.4970E-03,.6136E-03,.7655E-03,.1225E-02,
     > .2019E-02,.3404E-02,.5762E-02,.9766E-02,.1636E-01,.4290E-01/
      DATA BN/ .9892E-01,.1957E 00,.3315E 00,.4878E 00,.7641E 00,.8557E
     > 00, .9550E 00,.9986E 00,.2082E-07,.2579E-07,.3034E-07,.3895E-07,
     > .4752E-07,.5651E-07,.6627E-07,.7711E-07,.8938E-07,.1035E-06,
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     > .3775E-01,.1086E 00,.2360E 00,.5815E 00,.8398E 00,.9532E 00,
     > .9887E 00,.9971E 00,.9999E 00,.1000E 01,.1000E 01,.1000E 01,
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     > .3040E-16,.8674E-16,.2603E-15,.8231E-15,.2698E-14,.6198E-13,
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     > .6778E 00,.6826E 00,.6909E 00,.6946E 00,.7013E 00,.7148E 00,
     > .1665E 00,.1730E 00,.1778E 00,.1850E 00,.1890E 00,.1947E 00,
     > .1983E 00,.2015E 00,.2030E 00,.2068E 00,.2092E 00,.2140E 00,
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     > .6162E-02,.6314E-02,.6458E-02,.6792E-02,.7078E-02,.7388E-02,
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     > .6362E-07,.7194E-07,.8128E-07,.9203E-07,.1046E-06,.1374E-06/
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     > .4544E-01,.1173E 00,.3945E 00,.5580E 00,.8127E 00,.9910E 00,
     > .1555E-14,.1933E-14,.2286E-14,.2977E-14,.3706E-14,.4522E-14,
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     > .3607E-13,.6798E-13,.1349E-12,.6143E-12,.3299E-11,.2013E-10,
     > .1339E-09,.6559E-08,.2887E-06,.9102E-05,.1779E-03,.2027E-02,
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     > .2231E-33,.2266E-33,.2369E-33,.2738E-33,.4361E-33,.1266E-32,
     > .6106E-32,.3799E-31,.2696E-30,.5640E-28,.1856E-25,.7880E-23,
     > .3573E-20,.4526E-15,.1309E-10,.4985E-07,.2293E-04,.2535E-01,
     > .3578E 00,.7910E 00,.9570E 00,.9932E 00,.9988E 00,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01/
      DO 30 L=14,20
         DO 20 K=1,7
            DO 10 I=1,34
   10          REFA(I,K,L)=SEFA(I,K,L)
   20       CONTINUE
   30    CONTINUE
      RETURN
      END
C*********************************************************************
C*********************************************************************
      SUBROUTINE QY3
      COMMON /QCOM/ REFA(34,7,20)
      DIMENSION SEFA(34,7,20)
      DIMENSION CA(44),AP(114),AQ(114),AR(114),AS(114),AT(114),AU(114),
     > AV(114),AW(114),AX(114),AY(114),AZ(114),BA(114),BB(16)
      EQUIVALENCE (SEFA( 1,1, 8),CA(1)), (SEFA(11,2, 8),AP(1)),(SEFA(23,
     > 5, 8),AQ(1)),(SEFA( 1,2, 9),AR(1)),(SEFA(13,5, 9),AS(1)),
     > (SEFA(25,1,10),AT(1)),(SEFA( 3,5,10),AU(1)),(SEFA(15,1,11),AV(1))
     > ,(SEFA(27,4,11),AW(1)),(SEFA( 5,1,12),AX(1)),(SEFA(17,4,12),AY(1)
     > ),(SEFA(29,7,12),AZ(1)),(SEFA( 7,4,13),BA(1)),(SEFA(19,7,13),
     > BB(1))
      DATA CA/ .8298E 00,.8434E 00, .8531E 00,.8672E 00,.8771E 00,
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12345678901234567890123456789012345678901234567890123456789012345678901 2
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     > .9180E 00,.9246E 00,.9303E 00, .9352E 00,.9436E 00,.9501E 00,
     > .9556E 00,.9617E 00,.9683E 00, .9744E 00,.9792E 00,.9831E 00,
     > .9863E 00,.9882E 00,.9928E 00, .9954E 00,.9972E 00,.9983E 00,
     > .9990E 00,.9991E 00,.9994E 00, .9998E 00,.1000E 01,.7585E 00,
     > .7792E 00,.7943E 00,.8160E 00, .8318E 00,.8442E 00,.8545E 00,
     > .8632E 00,.8709E 00,.8777E 00/
      DATA AP/ .8838E 00,.8952E 00,.9075E 00,.9166E 00,.9243E 00,.9391E
     > 00, .9477E 00,.9561E 00,.9631E 00,.9739E 00,.9816E 00,.9871E 00,
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     > .9987E 00,.9997E 00,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
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     > .9955E 00,.9983E 00,.9992E 00,.9999E 00,.1000E 01,.1000E 01/
      DATA AQ/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
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     > .9953E 00,.9967E 00,.9984E 00,.9990E 00,.9989E 00,.9999E 00/
      DATA AR/ .7453E 00,.7657E 00,.7805E 00,.8019E 00,.8174E 00,.8296E
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0         1         2         3         4         5         6         7
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     > .6985E 00,.7290E 00,.7562E 00,.7854E 00,.8029E 00,.8498E 00/
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     > 00, .9969E 00,.9992E 00,.9998E 00,.1000E 01,.1000E 01,.1000E 01,
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     > .9436E 00,.9515E 00,.9581E 00,.9645E 00,.9683E 00,.9722E 00/
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
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     > .8409E 00,.9094E 00,.9514E 00,.9753E 00,.9881E 00,.9984E 00,
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     > .8771E 00,.8781E 00,.8850E 00,.8930E 00,.8995E 00,.9050E 00/
      DATA AV/ .9098E 00,.9180E 00,.9246E 00,.9303E 00,.9352E 00,.9436E
     > 00, .9501E 00,.9556E 00,.9617E 00,.9647E 00,.9683E 00,.9744E 00,
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12345678901234567890123456789012345678901234567890123456789012345678901 2

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     > .9858E 00,.9932E 00,.9970E 00,.9986E 00,.9991E 00,.9997E 00/
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     > .5471E 00,.5823E 00,.6133E 00,.6412E 00,.6683E 00,.6901E 00,
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     > .1791E 00,.3204E 00,.4701E 00,.6098E 00,.7277E 00,.8190E 00,
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     > .1000E 01,.1000E 01,.7941E 00,.8071E 00,.8164E 00,.8298E 00/
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     > 00, .8707E 00,.8786E 00,.8850E 00,.8906E 00,.8952E 00,.9032E 00,
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     > .9458E 00,.9501E 00,.9529E 00,.9617E 00,.9659E 00,.9705E 00,
     > .9744E 00,.9777E 00,.9831E 00,.9854E 00,.9882E 00,.9947E 00,
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     > .7071E 00,.7418E 00,.7731E 00,.8259E 00,.8678E 00,.9011E 00,
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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2
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     > .5245E 00,.5625E 00,.5984E 00,.6790E 00,.7479E 00,.8050E 00,
     > .8525E 00,.9203E 00,.9601E 00,.9816E 00,.9921E 00,.9985E 00,
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     > .2801E 00,.3206E 00,.3588E 00,.3952E 00,.4300E 00,.4635E 00,
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12345678901234567890123456789012345678901234567890123456789012345678901 2

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     > .3296E 00,.4194E 00,.5092E 00,.5953E 00,.6741E 00,.8284E 00,
     > .9204E 00,.9661E 00,.9875E 00,.9984E 00,.9998E 00,.1000E 01/
      DATA BB/ .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E
     > 01, .1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,.1000E 01,
     > .1000E 01,.1000E 01,.1000E 01,.1000E 01/
      DO 30 L=8,13
         DO 20 K=1,7
            DO 10 I=1,34
   10          REFA(I,K,L)=SEFA(I,K,L)
   20       CONTINUE
   30    CONTINUE
      RETURN
      END
C*********************************************************************
C*********************************************************************
      SUBROUTINE RVALUE (IFLAG,MODE,I,NO,NR,R)
      COMMON /RVAL/ S1,S3,SD1,SD3,ACN,GCN,SW1,SW3
      COMMON /OCOM/ NNUCS,ANLAM(36),RR,SQSD,ACON(36,20,
     > 20),GCON(36,20,20),LIPO,NOMM(36,11),NRMM(36,11),ORMODI(36,12,8),
     > VD(36),VDCOEF(20,20),NOL,NOU,NRL,NRU
      COMMON /OCOMCHAR/ NAMNUC(36),WORD
      CHARACTER*8 NAMNUC,WORD
C THIS SUBROUTINE ASSIGNS A VALUE TO THE PARAMETER
C    R - THE FRACTION OF DEPOSITED ACTIVITY RETAINED ON CROPS (DIMENSION
C AS FOLLOWS..
C (1) IF THE VALUES USED FOR S1 AND S3 ARE NOT NUCLIDE-SPECIFIC (NORMAL
C     IFLAG=0), THEN
C           R - S1 FOR VEGETABLES (MODE=1)
C           R - S3 FOR PASTURE    (MODE=2)
C (2) IF VALUES FOR S1 AND S3 ARE NUCLIDE-SPECIFIC, AND DEPOSITION RATES
C     ARE NOT SPECIFIED SEPARATELY FOR WET AND DRY DEPOSITION (SPECIAL R
C     IFLAG=1), THEN
C           R - SD1 FOR VEGETABLES (MODE=1)
C           R - SD3 FOR PASTURE    (MODE=2)
C (3) IF VALUES FOR S1 AND S3 ARE NUCLIDE-SPECIFIC, AND DEPOSITION RATES
C     ARE SPECIFIED SEPARATELY FOR WET AND DRY DEPOSITION (IFLAG=2), THE
C     R IS CALCULATED BY AVERAGING DRY AND WET DEPOSITION RATES AS FOLLO
C
C     R =(SD1*DRY DEP RATE  +  SW1*WET DEP RATE) /(DRY DEP RATE+WET DEP
C   FOR VEGETABLES (MODE - 1).
C
C R=(SD3*DRY DEP RATE + SW3*WET DEP RATE)/ (DRY DEP RATE + WET DEP RATE)
C   FOR PASTURE (MODE - 2)
```

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0         1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901 2

      IF (IFLAG.EQ.0.AND.MODE.EQ.1) R=S1
      IF (IFLAG.EQ.0.AND.MODE.EQ.2) R=S3
      IF (IFLAG.EQ.1.AND.MODE.EQ.1) R=SD1
      IF (IFLAG.EQ.1.AND.MODE.EQ.2) R=SD3
C CALCULATE DRY AND WET DEPOSITION RATES.
      DRYDEP = ACN*VD(I)*VDCOEF(NO,NR)
      WETDEP = GCN - DRYDEP
C THE SUM OF THESE DEPOSITION RATES IS GIVEN BY GCN.
      IF (IFLAG.EQ.2.AND.MODE.EQ.1) R= (SD1*DRYDEP+SW1*WETDEP)/ GCN
      IF (IFLAG.EQ.2.AND.MODE.EQ.2) R= (SD3*DRYDEP+SW3*WETDEP)/ GCN
C PRINT ERROR MESSAGE IF NONE OF THESE CONDITIONS IS MET.
      IF (MODE.NE.1.AND.MODE.NE.2) WRITE(6,9000)
      IF (IFLAG.NE.0.AND.IFLAG.NE.1.AND.IFLAG.NE.2) WRITE(51,9001)
      RETURN
 9000 FORMAT('0ERROR.. MODE SHOULD BE 1 OR 2 IN SUBROUTINE RVALUE')
 9001 FORMAT('0ERROR.. IFLAG SHOULD BE 0,1,OR 2 IN SUBROUTINE RVALUE')
      END
```