APPENDIX D: SAMPLE CUTTINGS_S DEBUG FILE FROM TEST-RUN PROBLEM #1

This file is taken from QA test problem number 1 (see Section 6.4) The file itself is annotated here and there with explanatory comments that describe the various collections of data. Explanatory comments are printed in italics to offset them from the normal content of the Debug file. The Debug file itself is described in Section 6.1 as file number 8.

Explanatory Comment: The data below are the standard WIPP title page and disclaimer, followed by dynamic memory allocation data. End comment.

```
-----------
CUSP_PA96 5.03 PROD PA96 05/23/96                              06/04/96 09:52:46

  CCCCC   UU   UU   SSSSSS  PPPPPP            PPPPPP    AAAAA     9999    6666
 CC   CC  UU   UU  SS      PP   PP           PP   PP  AA   AA   9    9  6
 CC       UU   UU  SS      PP   PP           PP   PP  AA   AA   9    9  6
 CC       UU   UU   SSSSS  PPPPPP            PPPPPP  AAAAAAA   99999  66666
 CC       UU   UU       SS PP                PP      AA   AA       9  6    6
 CC   CC  UU   UU       SS PP                PP      AA   AA       9  6    6
  CCCCC    UUUUU   SSSSSS  PP          _____  PP      AA   AA    9999    6666

          Program for computing the quantity of radioactive material
        (in Curies) brought to the surface as cuttings/spall generated
      by a drilling operation that penetrates a rad-waste repository.

                          CUSP_PA96 Version 5.03
                        PROD PA96 Built 05/23/96
                        Written by Jerry W. Berglund
                     Sponsored by Robert A. Cole & (J. S. Rath)

                          Run on 06/04/96 at 09:52:46
                       Run on ALPHA AXP BEATLE OpenVMS V6.1

      ************************************************************

      Prepared for
      Sandia National Laboratories
      Albuquerque, New Mexico 87185-5800
      for the United States Department of Energy
      under Contract DE-AC04-76DP00789

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                                  Disclaimer
                                  ----------

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      contractors or subcontractors. The views and opinions
      expressed herein do not necessarily state or reflect those
      of the United States Government, any agency thereof or any
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           of their contractors or subcontractors.

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 Program Name      CUT_SPAL
 Program Version
 Program UpDated


CUSP$EXE           WP$PRODROOT:[CUSP.EXE]CUSP_PA96.EXE


 SUMMARY OF INPUT & OUTPUT FILES USED IN THIS RUN


CUSP_INP$TXT0      CUSP_TEST_REPOSITORY.DAT
CUSP_INP$TXT1      CUSP_TEST_1.INP
CUSP_INP$BRAGCDB   CUSP_TEST_INP_BF.CDB
CUSP_OUT$DBG       CUSP_OUT_TEST_1.DBG
CUSP_INP$CDB       CUSP_TEST_1.CDB
CUSP_OUT$CDB       CUSP_OUT_TEST_1.CDB
CUSP_OUT$NVERFY    CUSP_OUT_TEST_1.VER

Debug flag DBRAG is ON

 ************************************************************************
 (SCATXT0)

Explanatory Comment:  The folowing is an echo of data read from the repository/model
input control file (logical symbol CUSP_INP$TEXT0)        End of Comment.

   MODEL_DATA

 !
 !
 !    The following input variables are hard wired and are related to the
 ! repository modeling paper written by J. W. Berglund (see Appendix A)
 !
 ! PR_MAX  <>The maximum pressure allowed by model
   PR_MAX             15.0E6

 ! PR_MIN  <>The minimum pressure allowed by model
   PR_MIN              0.0E6

 ! PE_MAX  <>The maximum permeability allowed by model
   PE_MAX            1.0E-12

 ! PE_MIN  <>The minimum permeability allowed by model
   PE_MIN            1.0E-17

 ! PCUT    <> Pressure (Pa) which defines the border between the
 !                    erosion phase and the blowout phase
   PCUT               8.0E6

 ! PGAS    <> Pressure (Pa) which defines the border between the gas
 !                    erosion phase and the stuck-pipe phase
   PGAS              10.0E6

 ! KCRIT   <> Permeability which defines the phase border the blowout
 !                     phase and the gas erosion/stuck pipe phase
   KCRIT             1.0E-16



 !
 ! Properities relative to the model (repository) <<<<<<<<<<<<<<<<<<<<<<<
 !
 ! DELTR   <>  Delta radius for derivative in stress calculation
   DELTR             0.00001
```

```
! ITER     <> Number of iterations to solve for reynolds number
  ITER                  1

! FGE      <>  Gravity  effectiveness factor
  FGE                18.4

! FSE      <>  Strength effectiveness factor
  FSE                 0.0

! FCE      <>  Cementation  effectiveness factor
  FCE                 0.0

! CEMENT   <>  Cementation stress
  CEMENT              0.0

! SUFTEN   <> Surface tension (N/N)
  SUFTEN            8.0E-2


! Properties of the gas (Hydrogen) in the repository <<<<<<<<<<<<<<<<<<<<<<<<
!
! KGAS     <> Ratio of Specific Heats
  KGAS              1.41E0

! RGAS     <> Gas Constant for Hydrogen
  RGAS              4116.0

! VISC     <> Hydrogen viscosity
  VISC             0.92E-5

! PSUF     <> Surface presure (Pa)
  PSUF          0.089465E6


! Properties to do with the repository <<<<<<<<<<<<<<<<<<<<<<<<
!
! TREPO    <> Temperature of repository (K)
  TREPO             300.0

! DEPTH    <> Distance from repository depth to depth where casing
!                       is set (m)
  DEPTH             716.0

! FLWCNST <> Percent volume of material that is carried by Drilling
!                       mud (unitless)
  FLWCNST            0.05

! HREPO    <> Height of repository at burial time      (4m)
  HREPO             3.96

! RPANEL   <> The equivalent radius of 1 panel     (910.0m**2)
  RPANEL            60.87

! ROOM     <> The equivalent radius of 1 room      (11,640m**2)
  ROOM              17.1

! RHOS     <> Waste particle density (kg/m**3)
  RHOS             2650.0


! Variables to do with drilling <<<<<<<<<<<<<<<<<<<<<<<<
!
! L1       <> Collar Length (m)
  L1                182.88

! L2       <> Drill pipe length (m)
  L2                472.12
```

```
! COLDIA  <> Collar diameter (m)
  COLDIA          0.2032004

! PIPED   <> Drill pipe diameter (m)
  PIPED           0.1143002

! ROUGHP  <> Friction factor (unitless)
  ROUGHP                0.08

!
! APORO   <> A constant in equation to determine permeability as a
!             function of porosity
  APORO             1.0E-11

! NPORO   <> N constant in equation to determine permeability as a
!             function of porosity
  NPORO                  4.6
!
! END_OF_MODEL_INPUT
!


   RADIONUCLIDE_DATA


!GEOMETRY

  INV_AR        1.11520E+05

  RHW_AR        1.11520E+05

  WUF           5.25

!MATERIAL
  OUT_MAT       BOREHOLE

!REPOSITORY_TYPE

 REP_NAME    WIPP
 REP_GEOLogy HALITE

 RADWASte_type  CONtact_handled

!RADIOISOTOPE_chains

!
!  chain1/chain2 from U234  & down are the same:
!  (Both chains are required input)

!          \/       \/       \/       \/       \/       \/       \/

 CHAIN1     PU242    U238     TH234    PA234M   U234     TH230    RA226
            RN222    PO218    PB214    BI214    PO214    PB210    <

 CHAIN2     PU238    U234     TH230    RA226    RN222    PO218
            PB214    BI214    PO214    PB210    <

!  chain3/chain4 from PU239 & down are the same:

 CHAIN3     AM243    NP239    PU239    U235     TH231    PA231    AC227
            TH227    RA223    RN219    PO215    PB211    BI211    TL207    <

 CHAIN4     CM243    PU239    U235     TH231    PA231    AC227    TH227
            RA223    RN219    PO215    PB211    BI211    TL207    <

!  chain5/chain6 from U236  & down are the same:

 CHAIN5     CF252    CM248    PU244    PU240    U236     TH232    RA228
            AC228    TH228    RA224    RN220    PO216    PB212    BI212
            PO212    <
```

```
 CHAIN6     CM244   PU240   U236    TH232   RA228   AC228   TH228
            RA224   RN220   PO216   PB212   BI212   PO212   <

 CHAIN7     CM245   PU241   AM241   NP237   PA233   U233    TH229
            RA225   AC225   FR221   AT217   BI213   PO213   PB209   <

 CHAIN8     CS137   BA137M  <

 CHAIN9     PM147   SM147   ND143   <

 CHAIN10    SR90    Y90     ZR90    <

!           ^       ^       ^       ^       ^       ^       ^

 SAVE     AM241  AM243  CF252  CM243  CM244  CM245  CM248  CS137
          NP237  PA231  PB210  PM147  PU238  PU239  PU240  PU241
          PU242  PU244  RA226  RA228  SR90   TH229  TH230  TH232
          U233   U234   U235   U236   U238  <

   TABULAR_DATA

!
! Example of how radioisotope data are entered:
!
!  ...1st Line: Radionuclide (an asterisk in column 1 follow
!                             by radionuclide name, ex; *AC225 )
!  ...2nd & 3rd line
!
!  ...Field#1 Atomic Weight       (Kg/Mole) AWT     [REAL]  (3(11x,1pe14.6))
!  ...Field#2 Half-Life            (Years)  HALFY   [REAL]          "
!  ...Field#3 Activity Conversion  (Ci/Kg)  AWTCNV  [REAL]          "
!  ...Field#4 EPA Release Limit     (Ci)    EPAREL  [REAL]          "
!  ...Field#5 Inventory             (Ci)    INVCHD  [REAL]          "
!  ...Field#6 Inventory             (Ci)    INVRHD  [REAL]          "
!
!
!*PU241
!xxxaaaaaaaaeeeeeeeeeeeeeeexxxaaaaaaaaeeeeeeeeeeeeeexxxaaaaaaaaeeeeeeeeeeeeee
!   AWT       2.410000E-01   HALFY     1.439900E+01   ACTCNV    1.030000E+05
!   EPAREL    1.000000E+07   INVCHD    1.930000E+06   INVRHD    0.000000E+00
!
!
<TABLE_INPUTS
*AC225
   AWT       2.250230E-01   HALFY     2.737909E-02   ACTCNV    5.802700E+07
   EPAREL    0.000000E+00   INVCHD    0.000000E+00
*AC227
   AWT       2.270280E-01   HALFY     2.177335E+01   ACTCNV    7.232300E+04
   EPAREL    1.000000E+02   INVCHD    0.000000E+00
*AC228
   AWT       2.280310E-01   HALFY     6.993710E-04   ACTCNV    2.241700E+09
   EPAREL    0.000000E+00   INVCHD    0.000000E+00
*AM241
   AWT       2.410570E-01   HALFY     4.322347E+02   ACTCNV    3.431200E+03
   EPAREL    1.000000E+02   INVCHD    2.400000E+05
*AM243
   AWT       2.430610E-01   HALFY     7.380313E+03   ACTCNV    1.992900E+02
   EPAREL    1.000000E+02   INVCHD    0.000000E+00
*AT217
   AWT       2.170050E-01   HALFY     1.023547E-09   ACTCNV    1.609500E+15
   EPAREL    0.000000E+00   INVCHD    0.000000E+00
*BA137M
   AWT       1.369070E-01   HALFY     4.851550E-06   ACTCNV    5.382400E+11
   EPAREL    0.000000E+00   INVCHD    0.000000E+00
*BI211
   AWT       2.109870E-01   HALFY     4.049824E-06   ACTCNV    4.184000E+11
```

EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*BI212					
AWT	2.119910E-01	HALFY	1.151253E-04	ACTCNV	1.464800E+10
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*BI213					
AWT	2.129940E-01	HALFY	8.679553E-05	ACTCNV	1.933800E+10
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*BI214					
AWT	2.139990E-01	HALFY	3.783638E-05	ACTCNV	4.415300E+10
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*CF252					
AWT	2.520820E-01	HALFY	2.638090E+00	ACTCNV	5.375899E+05
EPAREL	0.000000E+00	INVCHD	2.960000E+03		
*CM243					
AWT	2.430610E-01	HALFY	2.850088E+01	ACTCNV	5.160700E+04
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*CM244					
AWT	2.440630E-01	HALFY	1.811013E+01	ACTCNV	8.088299E+04
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*CM245					
AWT	2.450650E-01	HALFY	8.498927E+03	ACTCNV	1.716500E+02
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*CM248					
AWT	2.480720E-01	HALFY	3.390698E+05	ACTCNV	4.250200E+00
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*CS137					
AWT	1.369070E-01	HALFY	2.999975E+01	ACTCNV	8.704300E+04
EPAREL	1.000000E+03	INVCHD	2.070000E+04		
*FR221					
AWT	2.210140E-01	HALFY	9.126364E-06	ACTCNV	1.772400E+11
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*ND143					
AWT	1.430000E-01	HALFY	3.168876E+30	ACTCNV	0.000000E+00
EPAREL	1.000000E+03	INVCHD	0.000000E+00		
*NP237					
AWT	2.370480E-01	HALFY	2.139942E+06	ACTCNV	7.047600E-01
EPAREL	1.000000E+02	INVCHD	6.670000E+01		
*NP239					
AWT	2.390530E-01	HALFY	6.448664E-03	ACTCNV	2.319100E+08
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PA231					
AWT	2.310360E-01	HALFY	3.276618E+04	ACTCNV	4.722500E+01
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*PA233					
AWT	2.330400E-01	HALFY	7.392988E-02	ACTCNV	2.075100E+07
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PA234M					
AWT	2.340430E-01	HALFY	2.224551E-06	ACTCNV	6.866600E+11
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PB209					
AWT	2.089810E-01	HALFY	3.764625E-04	ACTCNV	4.544100E+09
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PB210					
AWT	2.099840E-01	HALFY	2.229938E+01	ACTCNV	7.634800E+04
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*PB211					
AWT	2.109890E-01	HALFY	6.863786E-05	ACTCNV	2.468600E+10
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PB212					
AWT	2.119920E-01	HALFY	1.213680E-03	ACTCNV	1.389500E+09
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PB214					
AWT	2.140000E-01	HALFY	5.095553E-05	ACTCNV	3.278500E+10
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PM147					
AWT	1.469150E-01	HALFY	2.623513E+00	ACTCNV	9.275300E+05
EPAREL	0.000000E+00	INVCHD	5.250000E+02		
*PO212					
AWT	2.119890E-01	HALFY	9.506629E-15	ACTCNV	1.773900E+20
EPAREL	0.000000E+00	INVCHD	0.000000E+00		

*PO213					
AWT	2.129930E-01	HALFY	1.330928E-13	ACTCNV	1.261100E+19
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PO214					
AWT	2.139950E-01	HALFY	5.206464E-12	ACTCNV	3.208700E+17
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PO215					
AWT	2.149990E-01	HALFY	5.640600E-11	ACTCNV	2.947900E+16
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PO216					
AWT	2.160020E-01	HALFY	4.753314E-09	ACTCNV	3.482000E+14
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PO218					
AWT	2.180090E-01	HALFY	5.799044E-06	ACTCNV	2.827800E+11
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*PU238					
AWT	2.380500E-01	HALFY	8.774619E+01	ACTCNV	1.711500E+04
EPAREL	1.000000E+02	INVCHD	4.240000E+06		
*PU239					
AWT	2.390520E-01	HALFY	2.406445E+04	ACTCNV	6.214600E+01
EPAREL	1.000000E+02	INVCHD	3.920000E+05		
*PU240					
AWT	2.400540E-01	HALFY	6.537392E+03	ACTCNV	2.278100E+02
EPAREL	1.000000E+02	INVCHD	6.930000E+04		
*PU241					
AWT	2.410570E-01	HALFY	1.439937E+01	ACTCNV	1.030000E+05
EPAREL	0.000000E+00	INVCHD	1.930000E+06		
*PU242					
AWT	2.420590E-01	HALFY	3.869198E+05	ACTCNV	3.817100E+00
EPAREL	1.000000E+02	INVCHD	4.910000E+04		
*PU244					
AWT	2.440640E-01	HALFY	8.261261E+07	ACTCNV	1.773100E-02
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*RA223					
AWT	2.230190E-01	HALFY	3.130533E-02	ACTCNV	5.120600E+07
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*RA224					
AWT	2.240200E-01	HALFY	1.001999E-02	ACTCNV	1.592700E+08
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*RA225					
AWT	2.250240E-01	HALFY	4.052993E-02	ACTCNV	3.919900E+07
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*RA226					
AWT	2.260250E-01	HALFY	1.599966E+03	ACTCNV	9.885801E+02
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*RA228					
AWT	2.280310E-01	HALFY	6.699955E+00	ACTCNV	2.340000E+05
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*RN219					
AWT	2.190090E-01	HALFY	1.254875E-07	ACTCNV	1.300800E+13
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*RN220					
AWT	2.200110E-01	HALFY	1.761895E-06	ACTCNV	9.222600E+11
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*RN222					
AWT	2.220180E-01	HALFY	1.046997E-02	ACTCNV	1.538000E+08
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*SM147					
AWT	1.470000E-01	HALFY	1.059355E+11	ACTCNV	2.295400E-05
EPAREL	1.000000E+02	INVCHD	0.000000E+00		
*SR90					
AWT	8.990801E-02	HALFY	2.912197E+01	ACTCNV	1.365400E+05
EPAREL	1.000000E+03	INVCHD	9.850002E+03		
*TH227					
AWT	2.270280E-01	HALFY	5.124073E-02	ACTCNV	3.073200E+07
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*TH228					
AWT	2.280290E-01	HALFY	1.913051E+00	ACTCNV	8.195301E+05
EPAREL	0.000000E+00	INVCHD	0.000000E+00		
*TH229					

```
    AWT         2.290320E-01    HALFY       7.339118E+03    ACTCNV      2.126900E+02
    EPAREL      1.000000E+02    INVCHD      0.000000E+00
*TH230
    AWT         2.300330E-01    HALFY       7.700370E+04    ACTCNV      2.018300E+01
    EPAREL      1.000000E+01    INVCHD      0.000000E+00
*TH231
    AWT         2.310360E-01    HALFY       2.911247E-03    ACTCNV      5.315200E+08
    EPAREL      0.000000E+00    INVCHD      0.000000E+00
*TH232
    AWT         2.320380E-01    HALFY       1.405080E+10    ACTCNV      1.096500E-04
    EPAREL      1.000000E+01    INVCHD      6.110000E-01
*TH234
    AWT         2.340440E-01    HALFY       6.597601E-02    ACTCNV      2.315200E+07
    EPAREL      0.000000E+00    INVCHD      0.000000E+00
*TL207
    AWT         2.069770E-01    HALFY       9.069325E-06    ACTCNV      1.904500E+11
    EPAREL      0.000000E+00    INVCHD      0.000000E+00
*U233
    AWT         2.330400E-01    HALFY       1.585072E+05    ACTCNV      9.678300E+00
    EPAREL      1.000000E+02    INVCHD      1.310000E+03
*U234
    AWT         2.340410E-01    HALFY       2.445105E+05    ACTCNV      6.247300E+00
    EPAREL      1.000000E+02    INVCHD      0.000000E+00
*U235
    AWT         2.350440E-01    HALFY       7.038074E+08    ACTCNV      2.161100E-03
    EPAREL      1.000000E+02    INVCHD      1.150000E+00
*U236
    AWT         2.360460E-01    HALFY       2.341483E+07    ACTCNV      6.468300E-02
    EPAREL      1.000000E+02    INVCHD      0.000000E+00
*U238
    AWT         2.380510E-01    HALFY       4.468115E+09    ACTCNV      3.361100E-04
    EPAREL      1.000000E+02    INVCHD      2.010000E-01
*Y90
    AWT         8.990701E-02    HALFY       7.301091E-03    ACTCNV      5.446300E+08
    EPAREL      0.000000E+00    INVCHD      0.000000E+00
*ZR90
    AWT         9.000000E-02    HALFY       3.168876E+30    ACTCNV      0.000000E+00
    EPAREL      1.000000E+03    INVCHD      0.000000E+00
END_TABLES>
!
! END_OF_RADIOISOTOPE_INPUT
!

 ************************************************************************
 (SCATXT1)

Explanatory Comment:  This ends the listing of data read from the repository/model
input control file and begins the echo of drilling/intrusion data read from the (input
control) file whose logical symbol is CUSP_INP$TXT1.          End of Comment.
!
!
!  INTRUSION

 TINTR          100.0
 TAUFAIL    BOREHOLE:TAUFAIL
 *** CUTTINGS variable: TAUFAIL value extracted from CAMDAT ***
     (CAMDAT MATERIAL:PROPERTY:VALUE = BOREHOLE:TAUFAIL   :  8.11200E+00)

 TCLOUT     WAS_AREA:TCLOUT
 *** CUTTINGS variable: TCLOUT(*) value extracted from CAMDAT ***
     (CAMDAT MATERIAL:PROPERTY:VALUE = WAS_AREA:TCLOUT    :  6.48000E+04)

 PARTDIA        0.006

!PROPERTIES

 DNSFLUID   DRILLMUD:DENSITY
 *** CUTTINGS variable: DENSITY value extracted from CAMDAT ***
     (CAMDAT MATERIAL:PROPERTY:VALUE = DRILLMUD:DENSITY   :  1.21000E+03)
```

```
DOMEGA     BOREHOLE:DOMEGA
*** CUTTINGS variable: DOMEGA value extracted from CAMDAT ***
    (CAMDAT MATERIAL:PROPERTY:VALUE = BOREHOLE:DOMEGA    :  7.80000E+00)

VISCO      DRILLMUD:VISCO
*** CUTTINGS variable: VISCO value extracted from CAMDAT ***
    (CAMDAT MATERIAL:PROPERTY:VALUE = DRILLMUD:VISCO     :  9.17000E-03)

YLDSTRSS   DRILLMUD:YLDSTRSS
*** CUTTINGS variable: YLDSTRSS value extracted from CAMDAT ***
    (CAMDAT MATERIAL:PROPERTY:VALUE = DRILLMUD:YLDSTRSS  :  4.40000E+00)

ABSROUGH   WAS_AREA:ROUGH
*** CUTTINGS variable: ABSRO value extracted from CAMDAT ***
    (CAMDAT MATERIAL:PROPERTY:VALUE = WAS_AREA:ROUGH     :  2.50000E-02)


!
! BRAGFLOW
!
! Multiple hits (max of 10, 0 thru 9) must be entered in order
!
! MHIT_0    is associated with the hit that CUTTINGS used for BRAG flow
!            properities
!

INTR_0    CAVITY_1        <

INTR_1    CAVITY_1    NO_GRDVOL <
SIMPLE AVERAGE WILL BE USED INSTEAD OF  WEIGHTED AVERAGE VOLUME

INTR_2    457   458   459   <

INTR_3    460   461   462   <

INTR_4    463   464   465   <
```

Explanatory Comment: The following is a summary of the data CUTTINGS_S read from the BRAGFLO output CDB file. Note that block number 7, which contains 21 elements, is the location of the repository. End of Comment.

```
element block names found

block name, block id
 S_HALITE        1
 DRZ_0           2
 TRANS_0         3
 S_MB139         4
 S_ANH_AB        5
 S_MB138         6
 CAVITY_1        7
 CAVITY_2        8
 CAVITY_3        9
 CAVITY_4       10
 IMPERM_Z       11
 CASTILER       12
 WAS_AREA       13
 REPOSIT        14
 DRZ_1          15
 UNNAMED        16
 CULEBRA        17
 TAMARISK       18
 MAGENTA        19
 FORTYNIN       20
 DEWYLAKE       21
 SANTAROS       22
 BACKFILL       23
 EXP_AREA       24
 SHFT_B_1       25
```

SHFT_B_2	26
SHFT_L_1	27
SHFT_L_2	28
SHFT_U_1	29
SHFT_U_2	30
SHFT_LS1	31
SHFT_LS2	32
SHFT_US1	33
SHFT_US2	34
PAN_S_1	35
PAN_S_2	36
BOREHOLE	37
BRINESAL	38
H2	39
PB210	40
RA226	41
RA228	42
TH229	43
TH230	44
TH232	45
PA231	46
U233	47
U234	48
U235	49
U236	50
U238	51
NP237	52
PU238	53
PU239	54
PU240	55
PU241	56
PU242	57
PU244	58
AM241	59
CM244	60
CM248	61
CF252	62
PB	63
RA	64
TH	65
PA	66
U	67
NP	68
PU	69
AM	70
CM	71
CF	72
TRANS_1	73

number of elements per block

block number,	number of elements
1	297
2	64
3	16
4	14
5	14
6	30
7	21
8	9
9	12
10	27
11	275
12	27
13	0
14	0
15	0
16	0
17	0

```
 18              0
 19              0
 20              0
 21              0
 22              0
 23              0
 24              0
 25              0
 26              0
 27              0
 28              0
 29              0
 30              0
 31              0
 32              0
 33              0
 34              0
 35              0
 36              0
 37              0
 38              0
 39              0
 40              0
 41              0
 42              0
 43              0
 44              0
 45              0
 46              0
 47              0
 48              0
 49              0
 50              0
 51              0
 52              0
 53              0
 54              0
 55              0
 56              0
 57              0
 58              0
 59              0
 60              0
 61              0
 62              0
 63              0
 64              0
 65              0
 66              0
 67              0
 68              0
 69              0
 70              0
 71              0
 72              0
 73              0

attribute  names found

  i,    name
  1      THICK
  2      ELEVAT
  3      DEL_X
  4      DEL_Y
  5      DEL_Z
  6      GRIDVOL
```

element #	attribute value
1	1.2799E+11
2	1.4830E+10
3	1.9030E+09
4	2.3061E+08
5	2.9423E+07
6	1.0210E+07
7	2.4135E+06
8	1.8411E+06
9	9.8849E+06
10	1.9705E+06
11	5.5664E+04
12	7.6922E+05
13	4.0078E+04
14	1336.
15	10.96
16	1336.
17	4.0078E+04
18	7.6922E+05
19	2.1041E+05
20	7.4433E+05
21	1.3151E+05
22	1.3220E+04
23	1.7117E+05
24	3.6947E+06
25	1.7519E+06
26	8.1208E+06
27	2.8095E+07
28	2.7331E+08
29	2.0035E+09
30	1.5118E+10
31	1.2885E+11
32	4.5986E+10
33	5.3286E+09
34	6.8375E+08
35	8.2858E+07
36	1.0572E+07
37	3.6686E+06
38	8.6715E+05
39	6.6150E+05
40	3.5516E+06
41	7.0800E+05
42	2.0000E+04
43	2.7638E+05
44	1.4400E+04
45	480.0
46	3.936
47	480.0
48	1.4400E+04
49	2.7638E+05
50	7.5600E+04
51	2.6744E+05
52	4.7250E+04
53	4750.
54	6.1500E+04
55	1.3275E+06
56	6.2945E+05
57	2.9178E+06
58	1.0095E+07
59	9.8200E+07
60	7.1985E+08
61	5.4317E+09
62	4.6295E+10
63	1.0117E+10
64	1.1723E+09
65	1.5043E+08
66	1.8229E+07
67	2.3257E+06
68	8.0709E+05
69	1.9077E+05

70	1.4553E+05
71	7.8136E+05
72	1.5576E+05
73	4400.
74	6.0803E+04
75	3168.
76	105.6
77	0.8660
78	105.6
79	3168.
80	6.0803E+04
81	1.6632E+04
82	5.8836E+04
83	1.0395E+04
84	1045.
85	1.3530E+04
86	2.9205E+05
87	1.3848E+05
88	6.4192E+05
89	2.2208E+06
90	2.1604E+07
91	1.5837E+08
92	1.1950E+09
93	1.0185E+10
94	1.2692E+09
95	1.4707E+08
96	1.8872E+07
97	2.2869E+06
98	2.9177E+05
99	1.0125E+05
100	2.3933E+04
101	1.2148E+09
102	1.4076E+08
103	1.8062E+07
104	2.1888E+06
105	2.7926E+05
106	9.6910E+04
107	2.2907E+04
108	1.2148E+09
109	1.4076E+08
110	1.8062E+07
111	2.1888E+06
112	2.7926E+05
113	9.6910E+04
114	2.2907E+04
115	1.2148E+09
116	1.4076E+08
117	1.8062E+07
118	2.1888E+06
119	2.7926E+05
120	9.6910E+04
121	2.2907E+04
122	2.4074E+09
123	2.7896E+08
124	3.5796E+07
125	4.3378E+06
126	5.5344E+05
127	1.9206E+05
128	4.5397E+04
129	1.7373E+04
130	8.0531E+04
131	2.7861E+05
132	2.7103E+06
133	1.9868E+07
134	1.4992E+08
135	1.2777E+09
136	1.6628E+04
137	7.7077E+04
138	2.6666E+05
139	2.5941E+06

140	1.9016E+07
141	1.4348E+08
142	1.2229E+09
143	1.6628E+04
144	7.7077E+04
145	2.6666E+05
146	2.5941E+06
147	1.9016E+07
148	1.4348E+08
149	1.2229E+09
150	1.6628E+04
151	7.7077E+04
152	2.6666E+05
153	2.5941E+06
154	1.9016E+07
155	1.4348E+08
156	1.2229E+09
157	3.2953E+04
158	1.5275E+05
159	5.2847E+05
160	5.1410E+06
161	3.7686E+07
162	2.8436E+08
163	2.4236E+09
164	8.3326E+09
165	9.6554E+08
166	1.2390E+08
167	1.5014E+07
168	1.9156E+06
169	6.6475E+05
170	1.5713E+05
171	1.1406E+05
172	5.2871E+05
173	1.8291E+06
174	1.7794E+07
175	1.3044E+08
176	9.8423E+08
177	8.3887E+09
178	5.6084E+10
179	6.4987E+09
180	8.3390E+08
181	1.0105E+08
182	1.2893E+07
183	4.4742E+06
184	1.0576E+06
185	8.0677E+05
186	4.3316E+06
187	8.6348E+05
188	2.4392E+04
189	3.3707E+05
190	1.7562E+04
191	585.4
192	4.801
193	585.4
194	1.7562E+04
195	3.3707E+05
196	9.2202E+04
197	3.2616E+05
198	5.7626E+04
199	1.4580E+11
200	1.6895E+10
201	2.1679E+09
202	2.6271E+08
203	3.3518E+07
204	1.1632E+07
205	2.7494E+06
206	2.0974E+06
207	1.1261E+07
208	2.2448E+06
209	6.3412E+04

210	8.7628E+05
211	4.5657E+04
212	1522.
213	12.48
214	1522.
215	4.5657E+04
216	8.7628E+05
217	2.3970E+05
218	8.4793E+05
219	1.4981E+05
220	1.4580E+11
221	1.6895E+10
222	2.1679E+09
223	2.6271E+08
224	3.3518E+07
225	1.1632E+07
226	2.7494E+06
227	2.0974E+06
228	1.1261E+07
229	2.2448E+06
230	6.3412E+04
231	8.7628E+05
232	4.5657E+04
233	1522.
234	12.48
235	1522.
236	4.5657E+04
237	8.7628E+05
238	2.3970E+05
239	8.4793E+05
240	1.4981E+05
241	4.6721E+09
242	5.4138E+08
243	6.9469E+07
244	8.4183E+06
245	1.0741E+06
246	3.7273E+05
247	8.8102E+04
248	6.7208E+04
249	3.6085E+05
250	7.1933E+04
251	2032.
252	2.8080E+04
253	1463.
254	48.77
255	0.3999
256	48.77
257	1463.
258	2.8080E+04
259	7681.
260	2.7171E+04
261	4801.
262	7.5005E+04
263	1.6190E+06
264	7.6768E+05
265	3.5585E+06
266	1.2311E+07
267	1.1976E+08
268	8.7793E+08
269	6.6245E+09
270	5.6462E+10
271	1.9499E+05
272	4.2090E+06
273	1.9957E+06
274	9.2512E+06
275	3.2006E+07
276	3.1135E+08
277	2.2824E+09
278	1.7222E+10
279	1.4678E+11

280	1.9499E+05
281	4.2090E+06
282	1.9957E+06
283	9.2512E+06
284	3.2006E+07
285	3.1135E+08
286	2.2824E+09
287	1.7222E+10
288	1.4678E+11
289	6248.
290	1.3487E+05
291	6.3952E+04
292	2.9645E+05
293	1.0256E+06
294	9.9771E+06
295	7.3137E+07
296	5.5186E+08
297	4.7036E+09
298	1.1246E+04
299	6.0378E+04
300	1.2036E+04
301	340.0
302	4698.
303	244.8
304	8.160
305	6.6916E-02
306	8.160
307	244.8
308	4698.
309	1285.
310	4546.
311	803.3
312	1.8257E+04
313	9.8025E+04
314	1.9541E+04
315	552.0
316	7628.
317	397.4
318	13.25
319	0.1086
320	13.25
321	397.4
322	7628.
323	2087.
324	7381.
325	1304.
326	1046.
327	2.2568E+04
328	1697.
329	3.6639E+04
330	3.4631E+04
331	1.8593E+05
332	3.7065E+04
333	1047.
334	1.4469E+04
335	753.9
336	25.13
337	0.2061
338	25.13
339	753.9
340	1.4469E+04
341	3958.
342	1.4001E+04
343	2474.
344	3572.
345	1.9179E+04
346	3823.
347	108.0
348	1492.
349	77.76

350	2.592
351	2.1256E-02
352	2.592
353	77.76
354	1492.
355	408.2
356	1444.
357	255.1
358	3220.
359	6.9497E+04
360	332.1
361	7169.
362	1.1986E+05
363	6.4355E+05
364	1.2829E+05
365	3624.
366	5.0080E+04
367	2609.
368	86.98
369	0.7132
370	86.98
371	2609.
372	5.0080E+04
373	1.3699E+04
374	4.8459E+04
375	8562.
376	1.1144E+04
377	2.4054E+05
378	7.8176E+08
379	9.0586E+07
380	1.1624E+07
381	1.4086E+06
382	1.7972E+05
383	6.2366E+04
384	1.4742E+04
385	1.0701E+04
386	4.9603E+04
387	1.7161E+05
388	1.6694E+06
389	1.2238E+07
390	9.2339E+07
391	7.8702E+08
392	2.4832E+08
393	2.8774E+07
394	3.6923E+06
395	4.4743E+05
396	5.7086E+04
397	1.9810E+04
398	4683.
399	3399.
400	1.5756E+04
401	5.4510E+04
402	5.3028E+05
403	3.8872E+06
404	2.9331E+07
405	2.4999E+08
406	1.6555E+08
407	1.9183E+07
408	2.4615E+06
409	2.9829E+05
410	3.8057E+04
411	1.3207E+04
412	3122.
413	2381.
414	1.2786E+04
415	2549.
416	72.00
417	995.0
418	51.84
419	1.728

420	1.4170E-02
421	1.728
422	51.84
423	995.0
424	272.2
425	962.8
426	170.1
427	221.4
428	4779.
429	2266.
430	1.0504E+04
431	3.6340E+04
432	3.5352E+05
433	2.5915E+06
434	1.9554E+07
435	1.6666E+08
436	7301.
437	380.4
438	12.68
439	0.1040
440	12.68
441	380.4
442	7301.
443	7301.
444	380.4
445	12.68
446	0.1040
447	12.68
448	380.4
449	7301.
450	7301.
451	380.4
452	12.68
453	0.1040
454	12.68
455	380.4
456	7301.
457	1.7474E+04
458	9.3820E+04
459	1.8703E+04
460	1.7474E+04
461	9.3820E+04
462	1.8703E+04
463	1.7474E+04
464	9.3820E+04
465	1.8703E+04
466	7065.
467	1248.
468	7065.
469	1248.
470	7065.
471	1248.
472	1625.
473	3.5067E+04
474	1625.
475	3.5067E+04
476	1625.
477	3.5067E+04
478	528.3
479	528.3
480	528.3
481	1997.
482	1997.
483	1997.
484	80.75
485	131.1
486	125.5
487	125.5
488	125.5
489	248.7

490	25.65
491	860.7
492	17.10
493	5793.
494	1.5060E+04
495	1.5060E+04
496	482.6
497	3420.
498	731.5
499	2356.
500	807.5
501	1644.
502	1.0070E+04
503	4114.
504	1497.
505	3.3110E+10
506	3.8366E+09
507	4.9230E+08
508	5.9657E+07
509	7.6115E+06
510	2.6414E+06
511	6.2435E+05
512	4.7628E+05
513	2.5572E+06
514	5.0976E+05
515	1.4400E+04
516	1.9899E+05
517	1.0368E+04
518	345.6
519	2.834
520	345.6
521	1.0368E+04
522	1.9899E+05
523	5.4432E+04
524	1.9255E+05
525	3.4020E+04
526	4.4280E+04
527	9.5580E+05
528	4.5320E+05
529	2.1008E+06
530	7.2680E+06
531	7.0704E+07
532	5.1829E+08
533	3.9108E+09
534	3.3333E+10
535	7.0818E+09
536	8.2060E+08
537	1.0530E+08
538	1.2760E+07
539	1.6280E+06
540	5.6496E+05
541	1.3354E+05
542	1.0187E+05
543	5.4695E+05
544	1.0903E+05
545	3080.
546	4.2562E+04
547	2218.
548	73.92
549	0.6062
550	73.92
551	2218.
552	4.2562E+04
553	1.1642E+04
554	4.1185E+04
555	7277.
556	9471.
557	2.0444E+05
558	9.6935E+04
559	4.4934E+05

560	1.5546E+06
561	1.5123E+07
562	1.1086E+08
563	8.3649E+08
564	7.1295E+09
565	2.2809E+10
566	2.6430E+09
567	3.3914E+08
568	4.1097E+07
569	5.2435E+06
570	1.8196E+06
571	4.3011E+05
572	3.2810E+05
573	1.7616E+06
574	3.5117E+05
575	9920.
576	1.3708E+05
577	7142.
578	238.1
579	1.952
580	238.1
581	7142.
582	1.3708E+05
583	3.7498E+04
584	1.3265E+05
585	2.3436E+04
586	3.0504E+04
587	6.5844E+05
588	3.1221E+05
589	1.4472E+06
590	5.0069E+06
591	4.8707E+07
592	3.5705E+08
593	2.6941E+09
594	2.2962E+10
595	7.8176E+09
596	9.0586E+08
597	1.1624E+08
598	1.4086E+07
599	1.7972E+06
600	6.2366E+05
601	1.4742E+05
602	1.1246E+05
603	6.0378E+05
604	1.2036E+05
605	3400.
606	4.6984E+04
607	2448.
608	81.60
609	0.6692
610	81.60
611	2448.
612	4.6984E+04
613	1.2852E+04
614	4.5464E+04
615	8033.
616	1.0455E+04
617	2.2568E+05
618	1.0701E+05
619	4.9603E+05
620	1.7161E+06
621	1.6694E+07
622	1.2238E+08
623	9.2339E+08
624	7.8702E+09
625	1.5911E+10
626	1.8437E+09
627	2.3658E+08
628	2.8669E+07
629	3.6577E+06

630	1.2693E+06
631	3.0003E+05
632	2.2888E+05
633	1.2289E+06
634	2.4497E+05
635	6920.
636	9.5627E+04
637	4982.
638	166.1
639	1.362
640	166.1
641	4982.
642	9.5627E+04
643	2.6158E+04
644	9.2533E+04
645	1.6349E+04
646	2.1279E+04
647	4.5932E+05
648	2.1779E+05
649	1.0096E+06
650	3.4927E+06
651	3.3977E+07
652	2.4907E+08
653	1.8794E+09
654	1.6018E+10
655	9.7490E+10
656	1.1297E+10
657	1.4496E+09
658	1.7566E+08
659	2.2412E+07
660	7.7774E+06
661	1.8384E+06
662	1.4024E+06
663	7.5294E+06
664	1.5010E+06
665	4.2400E+04
666	5.8592E+05
667	3.0528E+04
668	1018.
669	8.345
670	1018.
671	3.0528E+04
672	5.8592E+05
673	1.6027E+05
674	5.6696E+05
675	1.0017E+05
676	3.9824E+10
677	4.6145E+09
678	5.9213E+08
679	7.1755E+07
680	9.1549E+06
681	3.1770E+06
682	7.5095E+05
683	5.7286E+05
684	3.0757E+06
685	6.1313E+05
686	1.7320E+04
687	2.3934E+05
688	1.2470E+04
689	415.7
690	3.409
691	415.7
692	1.2470E+04
693	2.3934E+05
694	6.5470E+04
695	2.3160E+05
696	4.0919E+04
697	1.3038E+05
698	2.8143E+06
699	1.3344E+06

700	6.1857E+06
701	2.1400E+07
702	2.0818E+08
703	1.5261E+09
704	1.1515E+10
705	9.8146E+10
706	5.3259E+04
707	1.1496E+06
708	5.4510E+05
709	2.5268E+06
710	8.7418E+06
711	8.5041E+07
712	6.2339E+08
713	4.7039E+09
714	4.0092E+10
715	1.4495E+10
716	1.6796E+09
717	2.1552E+08
718	2.6117E+07
719	3.3321E+06
720	1.1563E+06
721	2.7333E+05
722	2.0850E+05
723	1.1195E+06
724	2.2316E+05
725	6304.
726	8.7114E+04
727	4539.
728	151.3
729	1.241
730	151.3
731	4539.
732	8.7114E+04
733	2.3829E+04
734	8.4296E+04
735	1.4893E+04
736	1.9385E+04
737	4.1843E+05
738	1.9840E+05
739	9.1969E+05
740	3.1818E+06
741	3.0953E+07
742	2.2690E+08
743	1.7121E+09
744	1.4592E+10
745	2.5090E+09
746	2.9073E+08
747	2.9635E+08
748	2.5259E+09
749	4.3569E+10
750	5.0485E+09
751	6.4781E+08
752	7.8503E+07
753	1.0016E+07
754	3.4758E+06
755	8.2157E+05
756	6.2673E+05
757	3.3650E+06
758	6.7079E+05
759	1.8949E+04
760	2.6185E+05
761	1.3643E+04
762	454.8
763	3.729
764	454.8
765	1.3643E+04
766	2.6185E+05
767	7.1626E+04
768	2.5338E+05
769	4.4767E+04

```
       770          4500.
       771        5.8268E+04
       772        1.2577E+06
       773        5.9637E+05
       774        2.7644E+06
       775        9.5639E+06
       776        9.3039E+07
       777        6.8202E+08
       778        5.1462E+09
       779        4.3862E+10
       780        3.7305E+07
       781        4.5207E+06
       782        5.7678E+05
       783        2.0016E+05
       784        4.7312E+04
       785        3.6091E+04
       786        1.9378E+05
       787        3.8628E+04
       788         1091.
       789        1.5079E+04
       790         785.7
       791         26.19
       792        0.2148
       793         26.19
       794         785.7
       795        1.5079E+04
       796         4125.
       797        1.4591E+04
       798         2578.
       799         259.2
       800         3355.
       801        7.2428E+04
       802        3.4343E+04
       803        1.5920E+05
       804        5.5076E+05
       805        5.3578E+06
       806        3.9275E+07
     1                297
     2                 64
     3                 16
     4                 14
     5                 14
     6                 30
     7                 21
     8                  9
     9                 12
    10                 27
    11                275
    12                 27

number of elements to average over   21

number of elements to average over   21

number of elements to average over    3

number of elements to average over    3

number of element to average over    3

unique property names
```

property number	property name
1	PRMX_LOG
2	POROSITY
3	SP_S_LOG
4	RELP_MOD
5	CAP_MOD
6	PC_MAX
7	SAT_RBRN
8	SAT_RGAS
9	PORE_DIS
10	COMP_RCK
11	SB_MIN
12	PO_MIN
13	PCT_A
14	PCT_EXP
15	PCT_FLAG
16	PTINDEX
17	GRID_ID
18	REF_PRES
19	PTHRESH
20	PRESSURE
21	PERM_EXP
22	PHIMAX
23	DPHIMAX
24	PI_DELTA
25	PF_DELTA
26	P_LITHO
27	FRAC_PMX
28	FRAC_PMY
29	FRAC_PMZ
30	KMAXLOG
31	DELTA_PF
32	CG_NF
33	CG_F
34	CB
35	SAT_IBRN
36	SAT_PUD
37	GRATCORI
38	GRATCORH
39	GRATMICI
40	GRATMICH
41	STOICOR
42	STOIMIC
43	DCELLCHW
44	DCELLRHW
45	DIRONCHW
46	DIRONRHW
47	DPLASCHW
48	DPLASRHW
49	DRUBBCHW
50	DRUBBRHW
51	DIRNCCHW
52	DIRNCRHW
53	DPLSCCHW
54	VOLCHW
55	VOLRHW
56	DRH_METL
57	DCH_METL
58	DRH_BIO
59	DCH_BIO
60	FRAC_PR
61	PRMX
62	STORAGEC
63	DIAMMOD
64	DNSFLUID
65	WTF
66	COMPRES
67	RSOD0
68	RSOD1

```
 69         BSLOPE
 70         RSLOPE
 71         VSLOPE
 72         VISCO
 73         REF_TEMP
 74         INVCHD
 75         INVRHD
 76         HALFLIFE
 77         ATWEIGHT
 78         DIS_ENGY
 79         LOGSOLM
 80         PERM_X
 81         PERM_Y
 82         PERM_Z
 83         SOLUB
 84         PAVE
 85         COMP
```

Explanatory Comment: The data below represent CUTTINGS_S's search (through BRAGFLO's output CDB file) for the time of intrusion. End of Comment.

```
 element block   37    3.16599995E-01
 TIME-years  0.00000000E+00
 TIME-years  5.34747819E-08
 TIME-years  2.22228164E-06
 TIME-years  1.09104358E-05
 TIME-years  7.41431795E-05
 TIME-years  2.42588285E-04
 TIME-years  2.23672390E-03
 TIME-years  2.98848525E-02
 TIME-years  6.96178913E-01
 TIME-years  3.18654060E+00
 TIME-years  1.78978786E+01
 TIME-years  2.58163357E+01
 TIME-years  3.57182579E+01
 TIME-years  5.97380142E+01
 TIME-years  6.10059128E+01
 TIME-years  6.26197319E+01
 TIME-years  7.07265167E+01
 TIME-years  7.27253571E+01
 TIME-years  7.28040161E+01
 TIME-years  7.83843460E+01
 TIME-years  8.09984283E+01
 TIME-years  8.67234039E+01
 TIME-years  1.00000221E+02

 Interpolation xval   9.99983311E-01
  for TINT(KINT)     1.00000000E+02
```

Explanatory Comment: The listing below represents all the data CUTTINGS_S extracted from the BRAGFLO output CDB file. End of Comment.

```
 RESULTS from BRAGFLOW file: CUSP_INP$BRAGCDB

  Unaltered output follows here:

 Diameter of borehole   3.16599995E-01

 Initial porosity       8.81034851E-01

  Intrusion          element          average
   time (yrs)       properity          value

 Multiple hits_0
      0.00           POROS       8.81034851E-01
```

```
                    PRESGAS     6.80242750E+06
                    PRESBRIN    1.01325008E+05
                    SATGAS      9.95905936E-01
 Multiple hits_1
      0.00          POROS       8.81034970E-01
                    PRESGAS     6.80243050E+06
                    PRESBRIN    1.01325000E+05
                    SATGAS      9.95906115E-01
 Multiple hits_2
      0.00          POROS       8.81034911E-01
                    PRESGAS     6.80242850E+06
                    PRESBRIN    1.01324992E+05
                    SATGAS      9.95905936E-01
 Multiple hits_3
      0.00          POROS       8.81034911E-01
                    PRESGAS     6.80242850E+06
                    PRESBRIN    1.01324992E+05
                    SATGAS      9.95905936E-01
 Multiple hits_4
      0.00          POROS       8.81034911E-01
                    PRESGAS     6.80242850E+06
                    PRESBRIN    1.01324992E+05
                    SATGAS      9.95905936E-01
 Multiple hits_0
    100.00          POROS       3.00751239E-01
                    PRESGAS     1.65183310E+07
                    PRESBRIN    9.81722700E+06
                    SATGAS      9.83161747E-01
 Multiple hits_1
    100.00          POROS       3.00751239E-01
                    PRESGAS     1.65183330E+07
                    PRESBRIN    9.81722900E+06
                    SATGAS      9.83178914E-01
 Multiple hits_2
    100.00          POROS       3.00751209E-01
                    PRESGAS     1.65185040E+07
                    PRESBRIN    9.81740000E+06
                    SATGAS      9.77457225E-01
 Multiple hits_3
    100.00          POROS       3.00751209E-01
                    PRESGAS     1.65183470E+07
                    PRESBRIN    9.81724400E+06
                    SATGAS      9.89357471E-01
 Multiple hits_4
    100.00          POROS       3.00751209E-01
                    PRESGAS     1.65181900E+07
                    PRESBRIN    9.81708600E+06
                    SATGAS      9.82479930E-01

   From these two relationships:

  (1.0-Pi)*Hi = (1.0-Pf)*Hf
                &
         Pf*Hf=Pb*Hi
Where:
   Pi = Initial porosity
   Hi = Initial height
   Pf =  Final  porosity
   Hf =  Final  height
   Pb =  Brag   porosity

Code will calculate porosity as:
   Pf=Pb/(1.0-Pi+Pb)
   Hf=(1.0-Pi)/(1.0-Pf)*Hi

   & output these transformed values
      to the output cuttings CDB


after max, min
```

```
 repo pres (pa)    1.5000E+07
 permeability       1.0000E-12

 ********************************************************************************
 (DRILL)
```

Explanatory Comment: The data below are a summary of the inputs and results of CUTTINGS_S's drilling calculations. End of Comment.

```
  DOMEGA  =     7.8000E+00
  ROUTER  =     1.5830E-01
  RINNER  =     1.0160E-01
  DIADRIL =     3.1660E-01
  UPHOLEV =     6.7942E-01
  ETA0    =     1.8340E-02
  SIGMA1  =     1.0821E-06
  SIGMA2  =     5.4103E-07
  DENSITY =     1.2100E+03
  TAUFAIL =     8.1120E+00

  ABSOLUTE BOREHOLE ROUGHNESS =     2.5000E-02
  PLASTIC VISCOSITY           =     9.1700004E-03
  YIELD STRESS                =     4.4000001E+00
  INTRUSION NUMBER (OR HIT)   =          1
  INTRUSION_TIME  (UNITS=Years   ) =     1.0000000E+02

 FOR REYNOLDS # ≤2100  ASSUMES LAMINAR HELICAL FLOW
 FOR REYNOLDS # >2100  ASSUMES TURBULENT AXIAL FLOW

 INITIAL REYNOLDS NUMBER =      8301., FLOW IS TURBULENT.

 CRITICAL RADIUS      =    9.2572E-01

 VBAR MULTIPLIER (CC) =    1.4987E+00

 INTRUSION  COLLAR     DRILL      FINAL      CRITICAL   VBAR       FINAL      REYNOLDS
SOLUTION
 TIME       RADIUS     RADIUS     RADIUS     RADIUS     MULT.      AREA       NUMBER
ALGORITHM
 ---------- ---------- ---------- ---------- ---------- ---------- ---------- --------
-- ----------
 1.0000E+02 1.0160E-01 1.5830E-01 1.8928E-01 9.2572E-01 1.4987E+00 1.1255E-01
7.3961E+03 TURBULANT-AXIAL

********* WIPP TRU CONTACT HANDLED WASTE ********

 <SPALL>       PG         PARTDIA        AREA        VOLUME       VOLUME_S
  ^^^^^     1.5000E+07   6.0000E-03     1.206         2.005        0.5684

     \!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/
     >*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<
     /^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\
     \!/\!/\!/\!/                                        \!/\!/\!/\!/\!/\!/
     >*<>*<>*<>*     HIT NUMBER  1    *<>*<>*<>*<>*<
     /^\/^\/^\/^\                       /^\/^\/^\/^\/^\
     \!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/\!/
     >*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<>*<
     /^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\/^\

          diameter (m)          0.3166
          intrusion time (yrs)   100.0
          repository pre (pa)   1.5000E+07
```

```
porosity, initial
         (unitless)    0.8810
porosity (bragflow)    0.3008
porosity (unitless)    0.7166
permeability (m**2)    1.0000E-12
particle dia (m)       6.0000E-03


FINAL RESULTS: Type: SOLID_BLOWOUT
AREA (spall)            1.206
AREA (erosion)         0.1125
AREA (total)            1.319

*************************************************************************
(WRIOUT)
```

Explanatory Comment: The data below are the results of dividing the initial inventory (CMS-controlled data) by INV.AREA, whose numerical value is 1.11520e5 m^2.
End of Comment.

INITIAL radioisotope LOADING (CI) with an inventory area of 1.11520E+05 M**2 FOR WIPP TRU CH WASTE)

AM241	2.4000E+05
AM243	0.0000E+00
CF252	2.9600E+03
CM243	0.0000E+00
CM244	0.0000E+00
CM245	0.0000E+00
CM248	0.0000E+00
CS137	2.0700E+04
NP237	6.6700E+01
PA231	0.0000E+00
PB210	0.0000E+00
PM147	5.2500E+02
PU238	4.2400E+06
PU239	3.9200E+05
PU240	6.9300E+04
PU241	1.9300E+06
PU242	4.9100E+04
PU244	0.0000E+00
RA226	0.0000E+00
RA228	0.0000E+00
SR90	9.8500E+03
TH229	0.0000E+00
TH230	0.0000E+00
TH232	6.1100E-01
U233	1.3100E+03
U234	0.0000E+00
U235	1.1500E+00
U236	0.0000E+00
U238	2.0100E-01

Explanatory Comment: The data below represent the principal results of CUTTINGS_S's calculations, namely, releases to the surface (in Curies) at the time of intrusion. These data are also printed in the (binary) output CDB file. End of Comment.

radioisotope RELEASE (CI) for 1 hit
*** CUTTINGS & CAVING ONLY ***

AM241	2.6296E-01
AM243	0.0000E+00
CF252	1.1598E-14
CM243	0.0000E+00
CM244	0.0000E+00
CM245	0.0000E+00

CM248	2.3237E-08
CS137	2.0726E-03
NP237	7.6122E-05
PA231	2.4936E-09
PB210	3.0864E-09
PM147	1.7776E-15
PU238	1.9421E+00
PU239	3.9448E-01
PU240	6.9201E-02
PU241	1.5811E-02
PU242	4.9544E-02
PU244	1.8757E-14
RA226	6.4693E-09
RA228	6.1663E-07
SR90	9.1989E-04
TH229	1.2425E-05
TH230	4.2647E-07
TH232	6.1663E-07
U233	1.3215E-03
U234	8.3853E-04
U235	1.1995E-06
U236	2.0594E-07
U238	2.0362E-07

radioisotope RELEASE (CI) for 1 hit
*** SPALL ONLY ***

AM241	2.8188E+00
AM243	0.0000E+00
CF252	1.2432E-13
CM243	0.0000E+00
CM244	0.0000E+00
CM245	0.0000E+00
CM248	2.4910E-07
CS137	2.2217E-02
NP237	8.1600E-04
PA231	2.6731E-08
PB210	3.3085E-08
PM147	1.9055E-14
PU238	2.0819E+01
PU239	4.2286E+00
PU240	7.4181E-01
PU241	1.6949E-01
PU242	5.3109E-01
PU244	2.0107E-13
RA226	6.9349E-08
RA228	6.6101E-06
SR90	9.8609E-03
TH229	1.3320E-04
TH230	4.5716E-06
TH232	6.6101E-06
U233	1.4166E-02
U234	8.9887E-03
U235	1.2858E-05
U236	2.2076E-06
U238	2.1828E-06

radioisotope RELEASE (CI) for 1 hit
*** TOTAL CUTTINGS & SPALL ***
ratio of spall area
to cuttings area 10.72
type of blow out: SOLID_BLOWOUT

AM241	3.0818E+00
AM243	0.0000E+00
CF252	1.3592E-13
CM243	0.0000E+00
CM244	0.0000E+00
CM245	0.0000E+00
CM248	2.7233E-07

```
  CS137        2.4290E-02
  NP237        8.9212E-04
  PA231        2.9224E-08
  PB210        3.6172E-08
  PM147        2.0833E-14
  PU238        2.2761E+01
  PU239        4.6231E+00
  PU240        8.1101E-01
  PU241        1.8530E-01
  PU242        5.8064E-01
  PU244        2.1983E-13
  RA226        7.5818E-08
  RA228        7.2267E-06
  SR90         1.0781E-02
  TH229        1.4562E-04
  TH230        4.9981E-06
  TH232        7.2267E-06
  U233         1.5488E-02
  U234         9.8272E-03
  U235         1.4058E-05
  U236         2.4136E-06
  U238         2.3864E-06

********************************************************************************
(CUSP_MAIN)

J.W. BERGLUND: SPM2 MAR 95                              DIS_01  LOCAL   00000000

CAMDAT Version 1

QA Records (6):
   GENNET     C-2.03ZO  03/22/95  14:03:42
    WIPPSLT   X-4.00VV  02/24/95  10:37:00
   MATSET     C-8.07ZO  03/22/95  14:37:07
   POSTLHS    C-4.04VV  03/22/95  14:38:39

   CUSP_PA9   5.03      06/04/96  09:52:46

Number of coordinates per node       =     1
Number of nodes                      =     7
Number of element blocks             =     6
Number of elements                   =     6
Number of nodes per element          =     2
Number of properties                 =    14
Number of attributes                 =     1
Number of node sets                  =     0
Number of side sets                  =     0

CUSP_PA96 CPU time is 0:06 (minute:second)



*** END OF CUSP_PA96 ***
CUSP_PA96 5.03 PROD PA96 05/23/96                       06/04/96 09:52:46
```

END OF APPENDIX D