OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL COVER SHEET
Complete Only Applicable Items

1. QA: QA

2. ☒ Analysis — Check all that apply

Type of Analysis	☐ Engineering ☒ Performance Assessment ☐ Scientific
Intended Use of Analysis	☐ Input to Calculation ☒ Input to another Analysis or Model ☒ Input to Technical Document ☒ Input to other Technical Products

Describe use:
To calculate uncertainty distribution for infiltration rates.
Obtaining weighting factors for use by TSPA

3. ☐ Model — Check all that apply

Type of Model	☐ Conceptual Model ☐ Abstraction Model ☐ Mathematical Model ☐ System Model ☐ Process Model
Intended Use of Model	☐ Input to Calculation ☐ Input to another Model or Analysis ☐ Input to Technical Document ☐ Input to other Technical Products

Describe use:

4. Title:
Analysis of Infiltration Uncertainty

5. Document Identifier (including Rev. No. and Change No., if applicable):
ANL-NBS-HS-000027 REV 00

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11. Responsible Manager	Clifford K. Ho	SIGNATURE ON FILE	4/12/00

12. Remarks:

Per Section 5.5.6 of AP-3.10Q, the responsible manager has determined that the subject AMR is not subject to AP-2.14Q review because the analysis does not affect a discipline or area other than the originating organization (Performance Assessment). The upstream supplier for this AMR was Joe Hevesi (USGS), and he worked closely with the originators in the development of the subject AMR to ensure that the inputs were used properly. The downstream user of the information resulting from this AMR is Performance Assessment (PA), which is also the originating organization of this work. PA leads, such as Mike Wilson, have worked with the originators during the development of this AMR. Nevertheless, both the upstream supplier and downstream customers were given the opportunity to provide informal comments on draft copies and to request a formal review if desired. However, it was determined that this analysis does not directly affect other organizations other than the originating organization. Therefore, no formal AP-2.14Q reviews were requested or determined to be necessary.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL REVISION RECORD

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ACRONYMS

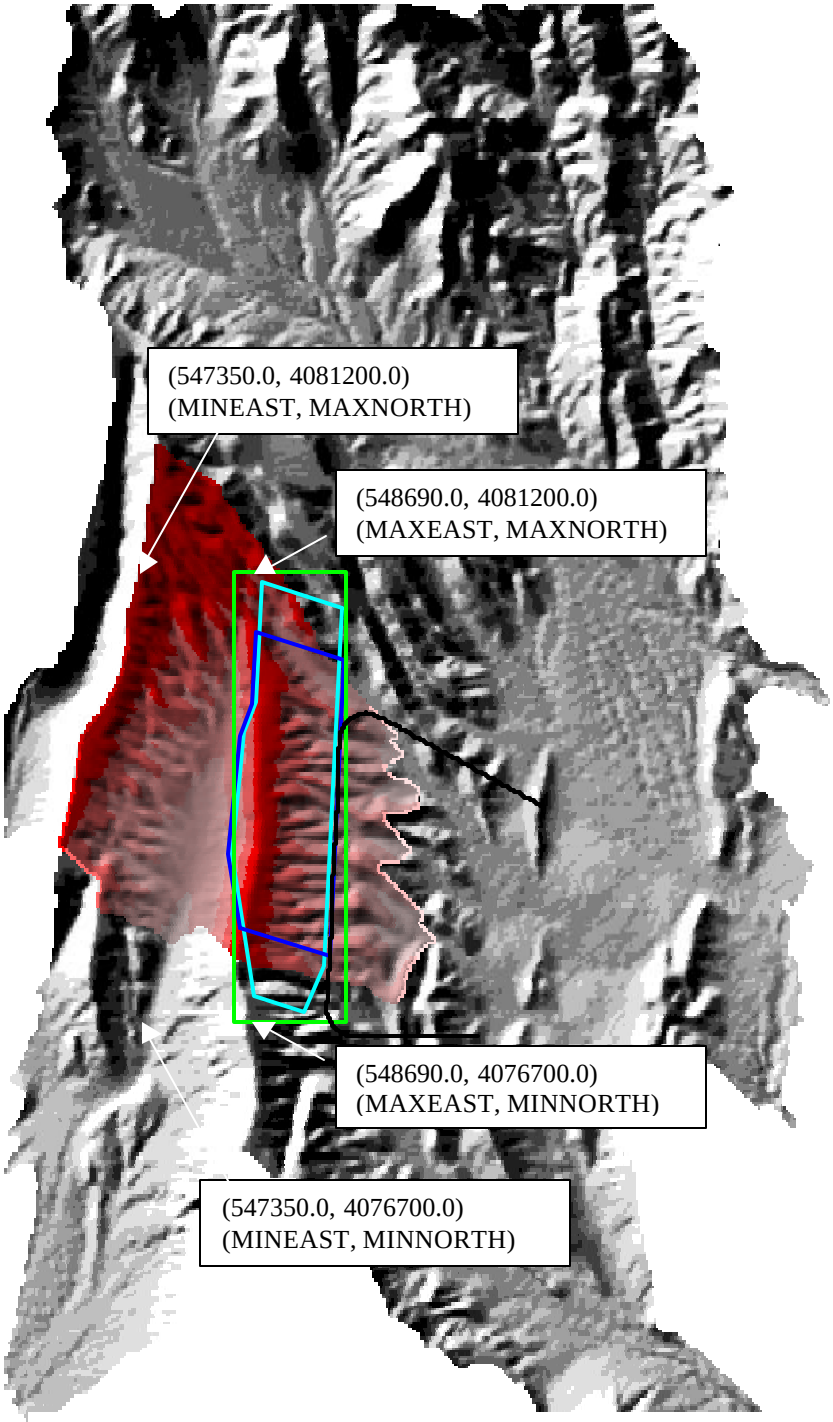
AMR	Analysis and Model Report
CDB	Computational Database
CFR	Code of Federal Regulations
CRWMS	Civilian Radioactive Waste Management Systems
DEC	Digital Equipment Corporation
DOE/RW	Department of Energy/Radioactive Waste
DTN	Data Tracking Number
DTR	Data Tracking Number
FE/FD	Finite Element/Finite Difference
LHS	Latin Hypercube Sampling
M&O	Management and Operating Contractor
NRC	U.S. Nuclear Regulatory Commission
PDF	Probability Density Function
QA	Quality Assurance
QARD	Quality Assurance Requirements and Description
RIP	Repository Integration Program
SAP	Software Activity Plan
SBR	Software Baseline Request
SR	Site Recommendation
SUR	Software User's Request
TBV	To Be Verified
TSPA	Total-System Performance Assessment
TSPA&I	Total-System Performance Assessment and Integration
URN	Unresolved Reference Number
USGS	U.S. Geological Survey
UZ	Unsaturated Zone
VA	Viability Assessment
VMS	Virtual Memory System (DEC operating system)
WIPP	Waste Isolation Pilot Plant

1. PURPOSE

The purpose of this analysis and model report (AMR) is to perform and document uncertainty analysis for the infiltration rates over the footprint of the repository. This uncertainty analysis was performed for the glacial transition climate. The results of this analysis yielded three weighting coefficients for infiltration (i.e., the probabilities for infiltration rates at the low, middle, and high bounds). The analysis is needed to address concerns raised by peer review groups, including the U.S. Nuclear Regulatory Commission (NRC), that the infiltration rate uncertainty was not adequately addressed in the Total-System Performance Assessment (TSPA)-Viability Assessment (VA).

TSPA-Site Recommendation (SR) has included three distinct climate regimes in the comprehensive repository performance analysis for Yucca Mountain; those being modern long term, monsoon, and glacial transition. For each of these climate regimes, infiltration rate maps have been provided to Performance Assessment for defining the hydrologic infiltration upper boundary condition for unsaturated zone flow and transport. For a more detailed discussion of these infiltration rate maps, see *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a). Each climate regime has three infiltration rate maps associated, including a lower and upper bound and a middle or medium value (equal to the average of the two boundary values). (Note that the middle rate map is not necessarily the mean or the median.) For each of these maps, which were obtained based on analog site climate data, a spatially averaged value was also calculated by the USGS. For this AMR, spatially averaged values were calculated for the lower, middle, and upper climate analogs only for the glacial transition climate regime using the modeled rectangular region in Figure 1-1. (For brevity, these maps will be referred to as the analog maps, and the corresponding averaged value as the analog value.) This was necessary to properly evaluate the location of each of these maps, using the corresponding analog value, within the appropriate uncertainty distribution calculated in this AMR. The primary objective of this uncertainty analysis is to use the uncertainty distribution and the results from selected analog site calculations done in *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a) to obtain weighting factors. These weighting factors are applied (in Repository Integration Program (RIP), Golder Associates, 1998) according to whether the analog maps produced for each climate regime, as provided by *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a) correspond to the lower, middle, and upper bound climate.

This analysis and model report provides an uncertainty analysis for the glacial transition climate only, since the climate model used in TSPA for the 10,000 year performance period is predominantly a glacial transition climate. The reader should note that this AMR provides an uncertainty analysis for only a single representative infiltration rate. This rate is obtained by spatially averaging the rates in a group of grid cells that range over the modeled rectangular region that encompasses the loaded footprint of the repository (see Figure 1-1). (The information that was contained in the infiltration rate map has been folded into this single averaged rate.) Details on how this averaged rate was arrived at are found in Sections 4.1.3 and 6.1.



NOTE: Outline of area (outer rectangular region) used in uncertainty analysis of infiltration relative to repository footprint regions (inner two)

UTM coordinates supplied by USGS (DTN: GS000308311221.004)

Figure 1-1. Modeled Region and Repository Footprint

This analysis incorporates the uncertainty inherent in probabilistic epistemic parameters (Rechard 1996, p. 4-3) by assigning, using known site characterization data, expert judgment and analog site data records, a range of values, and a distribution type to select infiltration model input parameters. These parameters were judged to account for the majority of uncertainty in the output infiltration rates. A detailed description of uncertainty input data and the justification for using the corresponding uncertain distributions is found in Sections 4.1.1 and 4.1.2.

The averaged infiltration rates calculated in this analysis used a set of uncertain input parameters (for the infiltration code INFIL) whose selection was constrained by schedule limitations. A future analysis might include some parameters not considered here, and exclude some that were considered.

As stated in the Work Direction and Planning Document, (CRWMS M&O 1999a) governing this activity, Paragraph 2 under the secondary heading "Infiltration" under "Scientific Approach and Primary Tasks," and in accordance with AP-3.10Q, *Analyses and Models*, this document evaluates the uncertainty in infiltration rate maps. Other subparts of this Work Direction and Planning Document (CRWMS M&O 1999a) are accomplished by other AMRs.

2. QUALITY ASSURANCE

This AMR is determined to be applicable to the QA program. In accordance with QAP-2-0, *Conduct of Activities*, an activity evaluation, *Conduct of Performance Assessment* (CRWMS M&O 1999b) has determined that the preparation of this technical document is subject to the requirements of the *Quality Assurance Requirements and Description* (QARD), DOE/RW-0333P (DOE 2000). Preparation of this AMR did not require the classification of items, in accordance with QAP-2-3, *Classification of Permanent Items*. The analyses conducted were not field activities. Therefore, a Determination of Importance Evaluation, in accordance with NLP-2-0, *Determination of Importance Evaluations*, was not required. The governing procedure for preparation of this AMR is AP-3.10Q, *Analysis and Models*.

3. COMPUTER SOFTWARE AND MODEL USAGE

The following two sections describe the software codes and the routines used in this analysis. All of the codes and routines used are in FORTRAN and compiled with the F77 compiler, with the exception of INFIL, which was compiled with the FORTRAN 90 compiler. All FORTRAN software was used on Platform DEC Alpha and Operating System Open VMS AXP V7 at Sandia National Laboratories.

3.1 SOFTWARE CODES (UNCERTAINTY ANALYSIS)

The analyses included the use of two major computer codes:

- INFIL (INFIL V.A_2.a1, compiled under FORTRAN90), a modified version (specifically to run on the platform described above in Section 3) of INFIL V. 2.0 performs climatic and hydrologic modeling to produce groundwater infiltration rate maps
- Latin Hypercube Sampling (LHS) (LHS V.2.50), a Monte Carlo engine using the LHS technique.

These two software codes require qualification under AP-SI.1Q, *Software Management*. INFIL V.A_2.a1 is a modified version of INFIL documented in DTN: GS960908312211.003. LHS is a software code that was qualified under the Waste Isolation Pilot Plant (WIPP) quality assurance (QA) requirements and a Software Activity Plan (SAP). A Software User's Request (SUR), a copy of software executable, along with a Software Baseline Request (SBR) have been submitted to the Software Configuration Secretariat to begin the qualification process for LHS (LHS V. 2.50) for the Yucca Mountain Site Characterization Project. The code INFIL (INFIL V.2.0 and INFIL V.A_2.a1) is currently in the process of being qualified according to AP-SI.1Q, *Software Management*, by the USGS. This code was developed and revised by the USGS for the purpose of modeling natural processes and features to produce output surface infiltration rate maps as described in *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a). It was also modified for this AMR to run on the DEC Alpha platform. It has been approved for use as unqualified software. A Software User's Request and Software Activity Plan have been submitted to the Software Configuration Secretariat to begin the qualification process for this code for the Yucca Mountain Site Characterization Project. This AMR is in no manner involved in maintenance or qualification of this software, except to verify that it produces essentially equivalent results on the platform used in this analysis as on the platform *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a). By "essentially equivalent results" means agreement to within 1 part in 10,000, a difference which is negligible relative to the precision or accuracy of the output infiltration rates developed by this software code. This is documented in Attachment I, containing a comparison of the infiltration rate, as found in the summary output file (of INFIL), of INFIL V A_2.a1 on DEC ALPHA at Sandia National Laboratories and of INFIL V 2.0 on a Windows NT 4.0 platform using a Pentium Pro PC at the USGS site. This documentation shows that the summary output net infiltration rates agree to about 1 part in 10 million (see Table I-1 in Attachment I). A listing of the source code can be found in Attachment II, Listing of Source Codes.

3.2 ROUTINES (UNCERTAINTY ANALYSIS)

Several FORTRAN routines (each consisting of multiple subroutines) were utilized for this analysis, including the development of a preprocessor, PREINFIL (PREINFIL V1.20), and postprocessor. POSTINFIL (POSTINFIL V2.50) for the code INFIL. The routines used were developed and used on the following platform; DEC Alpha running Open VMS AXP V7 (owned by the WIPP program) at Sandia National Laboratories.

The documentation to satisfy AP-SI.1Q, Paragraph 5.1.1.2, can be found in Attachments III and IV, for PREINFIL, and V and VI, for POSTINFIL.

The routines used in this analysis are listed in Table 3-1. All of the routines, with the exception of PREINFIL and POSTINFIL, were originally developed for the WIPP under the WIPP QA program. Documentation of the routines developed under WIPP is included in Attachment X of this AMR to begin the process of approval of the use of these routines for the Yucca Mountain Site Characterization Project. Use of the listed software routines, in this manner, is subject to the requirements listed in Section 5.1.1.2 of AP-SI.1Q. Documentation to satisfy the requirements of AP-SI.1Q is included in the Attachments as indicated in Table 3-1. Another routine used in this analysis, that was also developed under WIPP QA, is GROPECDB. However, this routine is

used for display of binary data only (data found in CDB files) and is exempt according to Section 2.1.5 of AP-SI.1Q.

The routines GENMESH (GENMESH V. 6.08) and MATSET (MATSET V. 9.01) set up a template computational database (CDB) file that will serve throughout the analysis as a dynamically changing reservoir of data from which the final stages of the uncertainty analysis and a potential sensitivity analysis can be accomplished. The CDB file also maintains a set of QA records that includes a complete history of what and when codes have written data to it.

The routine PRELHS (PRELHS V. 2.02) reads a file that contains the uncertain distribution data (DTN: GS000308311221.008) for the uncertain parameters and automatically creates the input file for LHS, the sampling engine. POSTLHS (POSTLHS V. 4.07) uses the output from LHS and an input user control file to create a new CDB file for each realization of sampled input data. (See Attachment VII, Listing of Sample Input Routines, and Attachment VIII, Sample Procedure Files, for examples of input control and procedure files and further elucidation of the interaction of these codes.)

Table 3-1. Routines Used in Uncertainty Analysis of Infiltration Rates

Code	Function	Attachment Where Documentation Resides
GENMESH* V.6.08	Generates FE/FD mesh or grid and original CDB file. Necessary for MATSET input.	X
MATSET* V.9.01	Sets up material property names in CDB file for sampling using LHS. Necessary for POSTLHS and multiple realization CDBs.	X
PRELHS* V.2.02	Creates input for LHS code using data file containing distribution parameters for uncertain parameters input to INFIL. Necessary for transfer of input distributions to create LHS input.	X
POSTLHS* V.4.07	Required transfers output of LHS consisting of sampled parameter values for multiple realizations into corresponding CDB file	X
PREINFIL V.1.20	Automatically transfers sampled values from CDB file from POSTLHS to INFIL input control files	III, IV
POSTINFIL V.2.50	Automatically transfers selected summary output from INFIL, including the spatial average infiltration rate for the calculated watershed into CDBs containing sampled parameter values.	V, VI
ALGEBRACDB* V.2.35	Required to calculate a mean infiltration rate for the repository footprint utilizing average infiltration rate and number of active cells information from all watersheds.	X

NOTES: An * (asterisk) after the name of a code indicates it was originally developed under QA requirements for the WIPP program. Each of the routines listed above utilize an input user control file (see Attachment VIII). Documentation to satisfy AP-SI.1Q is found in the attachments.

The above WIPP-QA-approved routines each have a User's Manual; citations for these manuals are included in the List of References. (Note that in some cases the version of the manual may not be the same as the version of the code because the version change in the code did not require a version change in the manual.)

The routine PREINFIL was developed to automate the process of producing input control files formatted specifically for INFIL. This was essential for the process of readily producing numerous realizations of input for INFIL each containing a unique set of values for the sampled parameters. This enabled rapid and accurate transfer of data, in an automated environment, between LHS output and the input control file used by INFIL. The routine, POSTINFIL, was developed to automate the transfer of selected output, including the spatially averaged infiltration rate and the number of active cells for each watershed simulated, to intermediate CDB files. The CDB file is needed to exercise the uncertainty software for producing the uncertainty distributions. Both routines, PREINFIL and POSTINFIL, were developed and documented in this AMR.

Once the desired infiltration rate and watershed dimension data for each watershed included in the analysis has been stored in the CDB file, a routine called ALGEBRACDB (ALGEBRACDB V.2.35) computes the spatial average over the entire simulated domain (i.e., the rectangular region that includes the loaded repository footprint). The collection of these results for 100 realizations is displayed in a plot that shows the resulting infiltration rate distribution as a probability distribution function (PDF) (Figure 6-1, Figure 6-2). The data these plots represent can be found in Table 6-1.

Finally, for the uncertainty analysis, the predicted weights that can be applied to the analog maps are calculated (see Section 6.3).

Because so many routines are used in this analysis, a wiring diagram showing the sequence of code interactions is included in Attachment IX, *Flow Diagram of Uncertainty Analysis*. A simplified diagram is shown in Figure 3-1. Table 3-1 lists the routines used, a brief description of their function, and identifies the status. The use of these routines and input descriptions are described in the corresponding users manuals. (See Attachment VII, *Listing of Sample Input Routines*, and Attachment VIII, *Listing of Sample Procedure Files*, for examples of the input control and procedure files for further elucidation of the interaction of these codes.)

The documentation for the WIPP QA-approved codes (designated with an asterisk in Table 3-1) to satisfy AP-SI.1Q, Paragraph 5.1.1.2, can be found in Attachment X, *Documentation for Other Routines Used in the Uncertainty Analysis*.

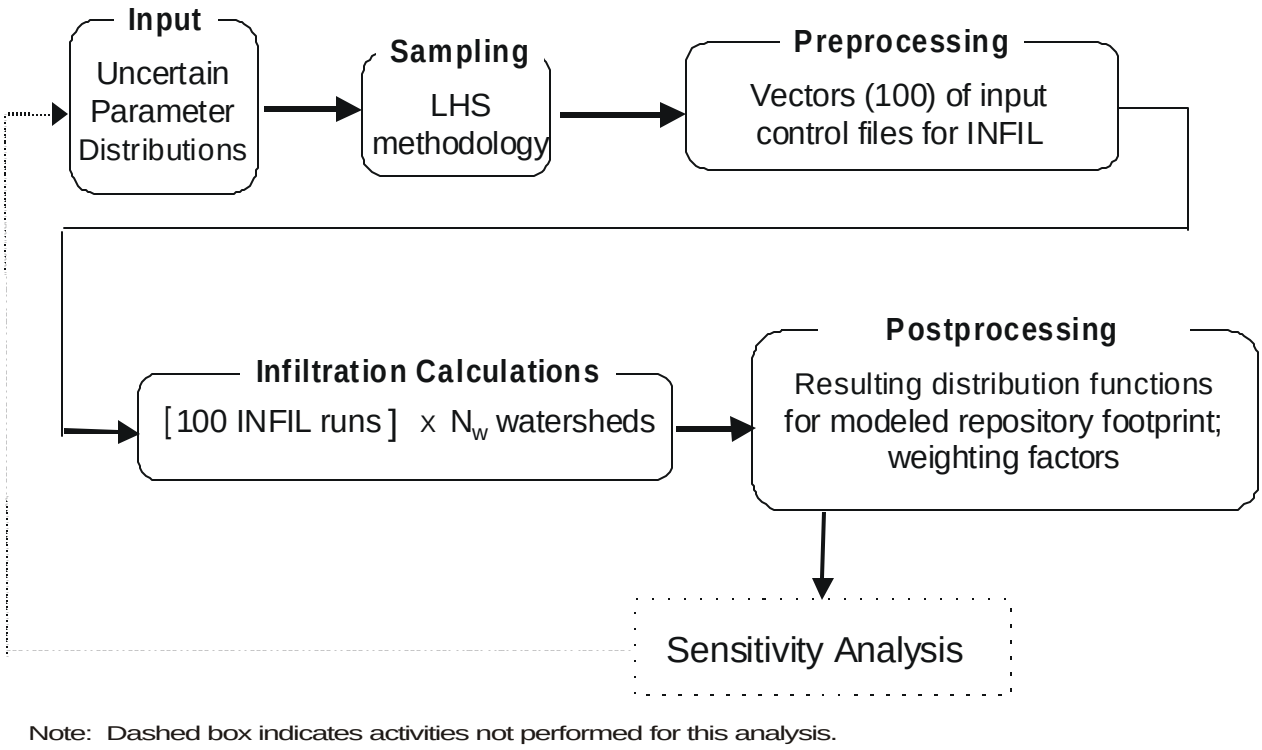


Figure 3-1. Simplified Diagram of Process Flow for Uncertainty Analysis

4. INPUTS

4.1 DATA AND PARAMETERS

The following five sections contain a brief summary of the input data and parameters used in the calculations for the analysis of the uncertainty in the infiltration rates. A sample listing of the input for each routine can be found in Attachment VII. A chart showing what input and output files are owned by each of the routines used is also included in Attachment VII.

4.1.1 Uncertain Parameters

The discussion in this section is limited to the (uncertain) analysis input (for INFIL) parameters (USGS 2000a, Section 6.10.2) that were judged as having potentially significant effects on the resultant infiltration rate uncertainty. The uncertainty analysis for the glacial transition climate regime includes a set of 12 (uncertain) parameters. These parameters, that were selected for sampling, are tabulated with distributions provided in Table 4-1 (see DTN in note below table). PRELHS, a routine (Section 3.2) uses the distribution data in this table as input in order to produce an input file for LHS. Table 4-2 provides a brief description of these parameters. The file containing the sampled parameter values per realization (for 100 realizations) resulting from LHS operating on these distributions is found in Attachment XI, Output Files from LHS Containing Sampled Values of Input Parameters

Table 4-1. Uncertain Input Parameter Distributions for Glacial Transition Climate

Idpram	Mean	Low Range	High Range	Distribution Type	Units
BRPERM	1.000	0.05	20.0	LOGNORMAL	NONE
BRPOROS	10.030	0.0000	0.040	NORMAL	NONE
BRZDEPTH	3.000	1.0000	5.000	NORMAL	METERS
ETCOEFFA	1.00	-5.000	-15.0	NORMAL	NONE
ETCOEFFB	1.040	0.540	1.540	NORMAL	NONE
FLAREA	100	0.01	0.490	NORMAL	NONE
POTETMUL	1.04.000	0.6000	1.400	NORMAL	NONE
PRECIPM	-10.000	0.6000	1.400	NORMAL	NONE
SNOPAR1	1.78	0.78	2.78	UNIFORM	NONE
SOILDEPM	3.000	0.5000	1.500	NORMAL	NONE
SOILPERM	1.000	0.05	20.0	LOGNORMAL	NONE
SUBPAR1	0.1	0	.2	UNIFORM	NONE

NOTE: Idpram (uncertain input parameter) values defined in Table 4-3.

For lognormal and normal distributions LHS assumes that the low and high values in the range are at the 1.0 and 99.0 percentile (Section 5.3).

The Data Tracking Number for this table is DTN: GS000308311221.008

Table 4-2. Description of Uncertain Input Parameters

Parameter	Description
BRPERM	Bedrock bulk saturated hydraulic conductivity multiplier
BRPOROS	Bedrock effective root-zone porosity
BRZDEPTH	Bedrock root-zone thickness multiplier
ETCOEFFA	First coefficient in expression for evapotranspiration
ETCOEFFB	Second coefficient in expression for evapotranspiration
FLAREA	Surface flow runoff area
POTETMUL	Daily evapotranspiration multiplier
PRECIPM	Daily precipitation multiplier
SNOPAR1	Snow-melt parameter
SOILDEPM	Soil zone thickness multiplier
SOILPERM	Soil saturated hydraulic conductivity multiplier
SUBPAR1	First term ("A1") in snow loss (sublimation) equation for temperature regime below freezing (i.e. $T_k \leq 0.0\ ^0C$)

NOTES: All 12 are used in the analyses for the infiltration rate uncertainty for the glacial transition climate.

For a more detailed description of input used in the INFIL code, refer to *Simulation of Net Infiltration for Modern and Potential Future Climates (*USGS 2000a).

4.1.1.1 Justification of Uncertainty Distributions

It is necessary to provide defensible explanation for the distribution types and ranges selected for the sampled input parameters used in this analysis (Table 4-1). All of the sampled input parameters were deemed to be normally distributed except for BRPERM, SOILPERM, SNOPAR1, and SUBPAR1; the first two were assigned lognormal distributions and the last two uniform distributions. See Section 6.10.2 in *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a) for details on the justification of the uncertainty distributions and their associated ranges.

4.1.2 Template Input Control File for INFIL

A template input user control file, for the software code INFIL V A_2.a1, was modified for each realization that was done, using the parameter values corresponding to each realization. The distributions and ranges of these parameters are described in Table 4-1. The values for these parameters for the 100 realizations can be found in Attachment XI, *Output File from LHS Containing Sampled Values of Input Parameters for All 100 Realizations.* The template input user control file was modified (by PREINFIL) by substitution of these sampled values to obtain the input user control file which was used for that realization. The template input user control file is found in Table VII-8, *Template Input User Control File for INFIL Version A_2.a1 Input to PREINFIL* (DTN: GS00308311221.011). The verification of the routine PREINFIL is found in Attachment III, *Documentation of PREINFIL (to satisfy AP-SI.1Q),* and Attachment IV, *Listing of Source Code PREINFIL(to satisfy AP-SI.1Q).* The documentation in Attachment III shows that PREINFIL correctly substitutes the sampled values from an arbitrary realization into the template input user control file.

4.1.3 Climate Data

Climate data consisting primarily of precipitation records were provided by USGS. Each climate regime has analog climate data associated with it; that analog data representing the average of the lower and upper climate bounds for that climate regime. The names and locations of the files on the DEC Alpha representing the glacial climate regime is given in Table 4-3.

Table 4-3. Climate Data for Uncertainty Analysis

Climate Analog	Data File Pathname on DEC Alpha	Status	Data Tracking Number
Glacial Transition	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.GLACIAL]TUKELAKE.INP	TBV	DTN GS000308311221.010

4.1.4 Watershed Data

The watersheds used to evaluate the spatial mean infiltration rate for the glacial transition climate are listed in Table 4-4.

In order to compute the spatial mean rate over the repository footprint for each watershed evaluated, the number of cells within the specified footprint boundary and the corresponding mean infiltration rate averaged over those cells were required. If the entire watershed falls within the footprint boundary, then the information corresponding to this watershed is output in a summary output file produced by INFIL. Otherwise, a subset of values corresponding to cells within the footprint boundary is averaged.

The coordinates of the loaded footprint boundary were provided by the U.S. Geological Survey (USGS) (Figure 1-1, DTN: GS000308311221.004). These coordinates (UTM) are determined from :

- Maximum East = 548690.0
- Maximum North = 4081200.0
- Minimum East = 547350.0
- Minimum North = 4076700.0.

Since the postprocessor to INFIL only considers rectangular regions, a rectangular approximation to the geometry of the loaded region (Figure 1-1) was provided by the USGS to determine the number of active cells within each watershed not falling completely inside this region. This is described more completely in Section 6.1.2.

Table 4-4. Watersheds Used in Glacial Climate Uncertainty Analysis

Name of Watershed	Symbolic Name	Data File Pathname on DEC Alpha	Status	Data Tracking Number (DTN:)
Wren Wash	ww1	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.GLACIAL.WW1]W1.W20	TBV	GS000308311221.004
Split Wash	sw1	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRA TION.INFIL.GLACIAL SW1]SW1.W20	TBV	GS000308311221.004
Coyote Wash	cw1	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRA TION.INFIL.GLACIAL.CW1]CW1.W20	TBV	GS000308311221.004
WT2 Wash	wt2	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRA TION.INFIL.GLACIAL.WT2]WT2.W20	TBV	GS000308311221.004
Drillhole Wash	dh3	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRA TION.INFIL.GLACIAL.DH3]DH2.W20	TBV	GS000308311221.004
Drillhole Wash	dh4	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRA TION.INFIL.GLACIAL.DH4]DH2.W.20	TBV	GS000308311221.004

Name of Watershed	Symbolic Name	Data File Pathname on DEC Alpha	Status	Data Tracking Number (DTN:)
Solitario Canyon Watersheds	us1	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.US1]US1.W20	TBV	GS000308311221.004
	se1	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE1]SE1.W20	TBV	GS000308311221.004
	se2	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE2]SE2.W20	TBV	GS000308311221.004
	se3	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE3]SE3.W20	TBV	GS000308311221.004
	se4	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE4]SE4.W20	TBV	GS000308311221.004
	se5	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE5]SE5.W20	TBV	GS000308311221.004
	se6	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE6]SE6.W20	TBV	GS000308311221.004
	se7	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE7]SE7.W20	TBV	GS000308311221.004
	se8	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE8]SE8.W20	TBV	GS000308311221.004
	se9	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE9]SE9.W20	TBV	GS000308311221.004
	se10	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTR A TION.INFIL.GLACIAL.SE10]SE10.W20	TBV	GS000308311221.004

4.1.5 Sampling Control Parameters

Two other parameters (one fairly incidental), specific to the sampling process, are the random seed used to initiate the Monte Carlo process (input to LHS) and the number of realizations (or samples), a control parameter. The random seeds used can be found in Attachment VII-7 that includes the PRELHS input control file that is used to produce the LHS input files used for each set of realizations. The number of realizations has already been stated to be 100. These are mathematical parameters and have no physical basis and, thus, no additional documentation is required.

4.1.6 Control Input for Routines

Each routine used in this analysis, tabulated in Section 3, has associated input and output files. Because of the linkage of codes used here, each of these routines, in addition to the two major codes used (LHS and INFIL), have output files that serve as input files to the code that is subsequently used in the analysis. Attachment IX, the Flow Diagram, showing the linkage of codes and routines, and Table VII-1 lists the files that serve to link and automate the entire procedure. The input files and their use for each routine used here, with the exceptions of the pre- and post- processor for the code INFIL, are described in their respective users manuals (Table 3-1). Sample input files and script (called also ‘procedure’) files, showing their use for each routine as used in these analyses, are included in Attachments VII and VIII. These inputs are control parameters, such as naming conventions, computational storage directives, etc., they have no basis in physical reality and, thus, no additional documentation is required.

4.2 CRITERIA

The NRC's *Issue Resolution Status Report Key Technical Issue: Total Performance Assessment and Integration* (TSPS&I) (NRC 1998) establishes generic technical acceptance criteria considered by the NRC staff to be essential to a defensible, transparent, and comprehensive assessment methodology for the repository system. These regulatory acceptance criteria address five fundamental elements of the U.S. Department of Energy TSPA model for the Yucca Mountain site:

1. Data and model justification, focusing on sufficiency of data to support the conceptual basis of the process model and abstractions

2. Data uncertainty and verification, focusing on technical basis for bounding assumptions and statistical representations of uncertainties and parameter variability

3. Model uncertainty, focusing on alternative conceptual models consistent with available site data

4. Model verification, focusing on testing of model abstractions using detailed process-level models and empirical observations

5. Integration, focusing on appropriate and consistent coupling of model abstractions.

Relevant to the topic of this AMR, elements 1 through 4 of the acceptance criteria are addressed herein and/or in the supporting calculation document(s). Element 5 of the NRC acceptance criteria, which strictly applies to the completed synthesis of process-level models and abstractions, will be addressed separately in the TSPA-SR.

This AMR was prepared to comply with the above NRC TSPA&I acceptance criteria, as well as the U.S. Department of Energy interim guidance (Dyer 1999) that requires the use of specified Subparts/Sections of the proposed NRC high-level waste rule, 10 CFR Part 63 (64 FR 8640). Subparts of this proposed rule that are particularly applicable to data include Subpart B, Section 15 (Site Characterization) and Subpart E, Section 114 (Requirements for Performance Assessment).

4.3 CODES AND STANDARDS

N/A. There are no codes and standards that apply to the analyses addressed in this AMR.

5. ASSUMPTIONS

The assumptions discussed below are summarized in Table 5-1.

Table 5-1. Assumptions

Assumption Description	Section Where Basis Is Described	Section Used in
Uniform variation in space of uncertain input parameters	5.1	4.1.1
Rectangular region analyzed adequate for developing weights for repository footprint	5.2	6.1.2
LHS assumes distribution endpoints represent 1.0 and 99.0 percentile	5.3	4.1.1, 6.1.1
Assumption of use of Glacial Transition climate analysis results for TSPA	5.4	6.2

5.1 ASSUMPTIONS OF SPATIAL UNIFORMITY

Because most of the parameters that were sampled are (linear) scaling factors for climatic, geological, and hydrological properties (e.g. soil/rock permeability, precipitation, etc.), the assumption is made, implicitly, that these properties will vary uniformly over the set of realizations independent of location. Thus, the original spatial heterogeneity (in a relative sense) of these properties is maintained. The basis for this assumption is that, by sampling on a set of scaling factors, the range of variability in the uncertainty of these climatic, geological and hydrological properties, that characterize the infiltration model, will be captured. For a complete discussion of these properties, see *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a, Section 6).

As discussed in Section 6.1.2 of this AMR, multiple watersheds were needed to produce a spatially averaged (over the footprint of the repository) infiltration rate. Each of these watersheds yields (for this analysis) a single associated (spatially averaged) infiltration rate and a weighted average is calculated for the simulated region. Each watershed has distinct geologic and hydrologic spatial variation (or heterogeneity). Since scaling factors for these properties are sampled in this analysis, this analysis (implicitly) assumes that all watersheds have the same relative variability in their associated climatic, geological and hydrological properties (thus, again, the original spatial heterogeneity is maintained). The basis for this assumption is essentially identical to that discussed in the preceding paragraph. Additional discussion regarding the selection of scaling factors for properties as sampled sampled parameters rather than the properties themselves is provided in *Simulation of Net Infiltration for Modern and Potential Future Climates* (USGS 2000a, Section 6.10.2).

This set of assumptions is utilized in selecting parameters to sample on, Section 4.1.1.

5.2 ASSUMPTION OF SIMULATED DOMAIN EQUIVALENCE TO REPOSITORY FOOTPRINT

Because the watersheds encompass areas extending outside the boundary of the simulated repository footprint region, it was necessary to compute a spatially averaged infiltration rate over

the subregion of each watershed that fell within the simulated domain. The simulated domain is, in actuality, the minimum area rectangular region that encloses the loaded footprint region. It is implicitly assumed that this is a reasonable approximation for computing infiltration rates representative of the loaded footprint region. Figure 1-1 shows this area outlined relative to the repository footprint. The basis for this assumption is that the behavior of infiltration in this region closely approximates the behavior of infiltration in the footprint (USGS 2000a, Section 6.10.1). For this analysis, the range of infiltration behavior is reasonably bounded and no further confirmation is required. Also the reader may refer to Table 6-2, note b.

This assumption is used in Section 6.1.2.

5.3 ASSUMPTIONS USED FOR SAMPLING OF UNCERTAIN PARAMETERS FOR LHS

For this AMR, zero pairwise correlation has been assumed between the sampled input parameters; that is, the parameters are assumed to vary independently of one another. The reason this zero correlation was assumed was that there was no evidence provided to suggest that the sampled input parameters were correlated.

For lognormal and normal distributions, LHS assumes that the low and high values in the range are at the 1.0 and 99.0 percentile. The basis for this assumption is that the 1.0 and 99.0 percentile values of a distribution contain nearly the entire range of the actual distribution. These values reasonably bound the distribution for this analysis and no further confirmation is required.

This group of assumptions is used both in the discussion of distributions for uncertain input parameters as listed in Section 4.1.1 and in the sampling process, as described in Section 6.1.1.

5.4 ASSUMPTIONS USED FOR CALCULATION OF WEIGHTING FACTORS

The glacial transition climate was chosen for estimation of the weighting factors, as derived for the lower, middle, and upper bound infiltration rate maps, because of the duration of this climate regime. The glacial-transition climate will dominate the majority of the simulated period (USGS 2000b), beginning at ~2000 years and lasting beyond the regulatory time period of 10,000 years. Consequently, no additional confirmation is required. It is used in Section 6.2.

6. ANALYSIS/MODEL

This is an analysis which uses a model, represented by the code INFIL (INFIL V A_2.a1) described in Section 3.1. No model was developed in this analysis. The use of INFIL in this analysis is both reasonable and necessary. This was the code used by TSPA for developing infiltration rate maps for use by the UZ models downstream. The primary rationale for this uncertainty analysis was to provide a basis for the numerical value of the weights chosen for the lower, middle, and upper analog infiltration rates.

6.1 LHS METHODOLOGY

6.1.1 Overall Approach

This analysis used a Monte Carlo technique, LHS, developed by McKay et al. (1979), and Iman and Shortencarier (1984). LHS is a form of stratified sampling, whereby, the sampling interval is divided into k intervals of equal probability, so that an equal number of samples, n, are drawn from each of the k intervals; thus, there will be nk samples in all.

The main advantage for using LHS is that greater confidence in the resulting output distribution, $f(\chi_1, \chi_2, \ldots, \chi_m)$ for uncertain parameters $\chi_1, \chi_2, \ldots, \chi_m$ can be obtained with far fewer samples than with Monte Carlo random sampling. A detailed discussion of the LHS methodology is beyond the scope of this AMR.

In order to avoid spurious pairwise correlation between uncorrelated input parameters, it is desirable to have at least 4/3 $\times$ m (m is the number of uncertain input parameters) samples (realizations) in the analysis. In this analysis, we chose to sample on 12 parameters, limited to 10 of these for the modern climate (listed in Section 4.1); thus, a minimum of 16 realizations would be necessary to do this. However, far more realizations (>>16) may be desirable for obtaining sufficient confidence in the quantification of the output distribution (i.e., infiltration rates). In this analysis 100 realizations (samples) were used. Limitations on the number of potential samples are driven by computational resources and the confidence in the input distributions and their ranges.

6.1.2 Methodology Applied to Glacial Transition Analysis

The long run times (CPU time) experienced in performing scoping calculations (~4.5 hours per realization for the larger watersheds along with a need to use a significantly long climate record for this future climate), motivated a decision to reduce the size of previously established watershed regions into multiple smaller watersheds that could be run in parallel. All of the watershed regions extended beyond the simulated rectangular region approximating the loaded footprint boundary. The USGS (DTN: GS000308311221.004) provided new watershed input files that significantly reduced the areas of the largest watershed region, by subdividing this region into smaller regions and eliminating much of the area from the simulated domain. Thus, for the glacial transition analysis, a total of 17 watersheds were used. The spatially averaged infiltration rate for each watershed is a spatial mean infiltration rate calculated as the averaged pointwise infiltration rates on the set of all nodal locations within the boundary of the designated rectangular subregion of the repository footprint. An areal (or number of active cells) weighted mean infiltration rate over the repository footprint was calculated using Equation 6-1. Using the definition of a weighted average for a discrete sum,

$$\vartheta_{rf} = \sum_{k=1}^{17} (\alpha_k \phi_k) / \sum_{k=1}^{17} \alpha_k \qquad \text{(Eq. 6-1)}$$

where

ϑ_{rf} = Mean (spatial) infiltration rate over the entire repository footprint

α_k = The weights are each represented by the area of corresponding watershed based on the number of active cells and the area of each cell; since the area of each cell is the same (900 m^2), this coefficient may also represent the number of active cells in watershed k

ϕ_k = The spatially averaged infiltration rate or hydrologic flux across the upper boundary of the unsaturated zone for each watershed, k

(The sum runs from 1 to 17 since there are 17 watersheds.)

Thus, ϑ_{rf} is calculated as a single number for each of the realizations done for this uncertainty analysis, and the calculated uncertainty distribution (the PDF) is a distribution for $\vartheta_{rf.}$

All of the watersheds extend beyond this rectangular region's boundary. Thus, a subarea that corresponds to that part of the watershed within that boundary was used as the α_k. The average infiltration rate for each subpart of a watershed was calculated by averaging the infiltration rates over the cells within that subpart.

6.2 RESULTS OF GLACIAL TRANSITION CLIMATE UNCERTAINTY ANALYSIS

The USGS provided the output files (from INFIL V 2.0) (USGS 1999) containing infiltration rate maps that were produced from calculations corresponding to the lower, upper, and middle analog simulations as developed in *Simulation of Net Infiltration for Modern and Potential Future Climates (*USGS 2000a. Section 6.11.3). Each of these output files (containing infiltration rate map data) was used, in this analysis, for the calculation of a representative (analog) infiltration rate, averaged over an area identical to that used in these uncertainty calculations. Thus, three representative rates, corresponding to the lower, upper, and middle analog simulations were calculated for the simulated rectangular region. These rates are, here, called 'analog values'. The uncertainty distribution was used as a metric to determine where in the obtained distribution (i.e., the percentile) these representative analog values, corresponding to the mean, high, and low climate (for the glacial transition) would fall. A probability distribution function of these rates showing the locations of these analog values is shown in Figure 6-1. A probability distribution function of the logarithms (base 10) of the infiltration rates is shown in Figure 6-2. The approximate lognormal distribution of Figure 6-1 is predicted by the Central Limit Theorem. This figure is meant to display the data found in Table 6-1, along with the location in the distribution, of the analog values. The distribution displayed in Figure 6-1 for the uncertain infiltration rates (not the logs) has a mean of 25.5 [mm/yr] and a standard deviation of 19.2 [mm/yr] (see bottom of Table 6-1). The distribution displayed in Figure 6-2 for the uncertain log infiltration rates has a mean of 1.25, and a standard deviation of 0.42 (see bottom of Table 6-1).

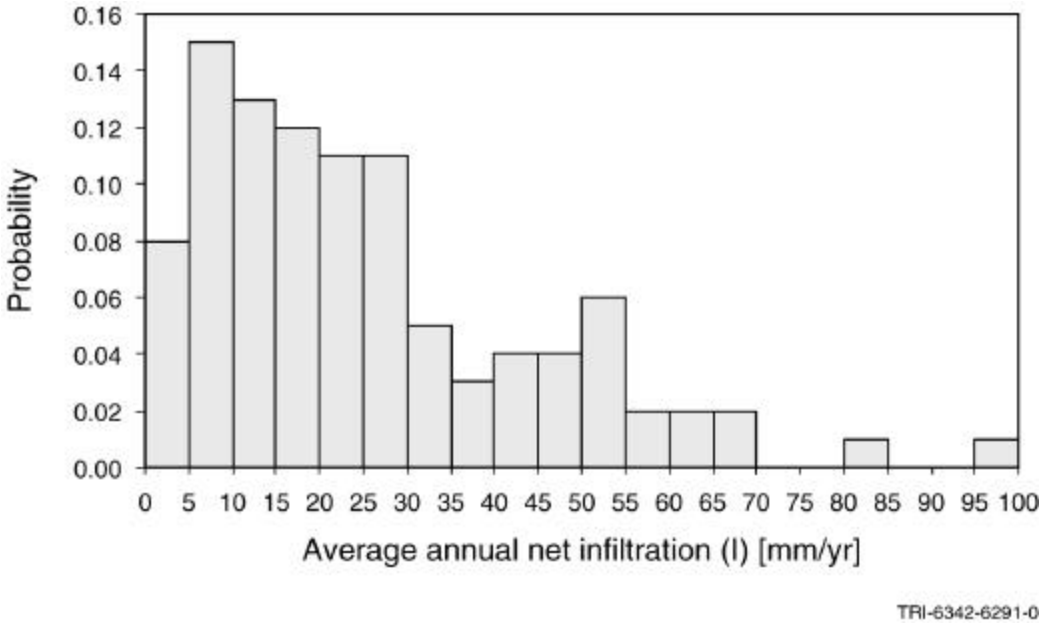
Table 6-1. Resulting Infiltration and $\log_{10}$ Infiltration Representative Rates for 100 Realizations

R*	Infiltration Rate [mm/yr]	Log_{10} of Infiltration Rate
1	5.14E+01	1.711
2	2.33E+01	1.368
3	1.57E+01	1.197
4	2.25E+01	1.352
5	2.73E+01	1.436
6	1.64E+00	0.216
7	1.17E+01	1.066
8	2.48E+01	1.394
9	5.14E+01	1.711
10	3.07E+01	1.487
11	8.18E+01	1.913
12	2.07E+01	1.316
13	2.00E+01	1.301
14	1.50E+01	1.177
15	1.99E+01	1.299
16	4.95E+01	1.694
17	4.20E+01	1.623
18	9.35E+00	0.971
19	5.57E+01	1.746
20	3.65E+01	1.563
21	6.34E+00	0.802
22	6.80E+01	1.832
23	1.01E+01	1.003
24	1.14E+01	1.057
25	9.67E+01	1.986
26	8.60E+00	0.935
27	4.63E+01	1.666
28	2.66E+01	1.425
29	5.30E+01	1.724
30	2.23E+01	1.349
31	1.14E+01	1.058
32	6.18E+01	1.791
33	2.98E+01	1.475
34	5.77E+01	1.761
35	2.17E+01	1.336
36	5.17E+01	1.713
37	3.47E+00	0.540
38	2.28E+01	1.358
39	2.98E+01	1.475
40	3.43E+01	1.535
41	9.31E+00	0.969
42	1.05E+01	1.020

R*	Infiltration Rate [mm/yr]	Log_{10} of Infiltration Rate
43	5.38E+01	1.731
44	2.97E+01	1.473
45	8.11E+00	0.909
46	4.39E+01	1.642
47	3.08E+01	1.488
48	8.29E+00	0.918
49	2.06E+01	1.313
50	5.45E+00	0.736
51	4.12E+01	1.614
52	3.64E+00	0.561
53	1.36E+01	1.133
54	8.76E+00	0.943
55	1.14E+01	1.058
56	6.40E+01	1.806
57	1.24E+01	1.094
58	3.47E+01	1.540
59	8.79E+00	0.944
60	1.56E+01	1.192
61	6.11E+00	0.786
62	1.31E+00	0.117
63	1.31E+01	1.118
64	1.94E+00	0.287
65	2.20E+01	1.341
66	1.55E+01	1.191
67	3.74E+01	1.573
68	1.26E+01	1.102
69	7.67E+00	0.885
70	2.66E+01	1.424
71	9.02E+00	0.955
72	1.23E+01	1.090
73	2.00E+01	1.302
74	3.29E+01	1.518
75	4.51E+01	1.654
76	1.15E+00	0.059
77	4.61E+01	1.663
78	1.96E+01	1.292
79	5.31E+01	1.725
80	6.72E+01	1.828
81	4.78E+00	0.680
82	6.00E+00	0.778
83	3.70E+01	1.568
84	2.33E+01	1.368

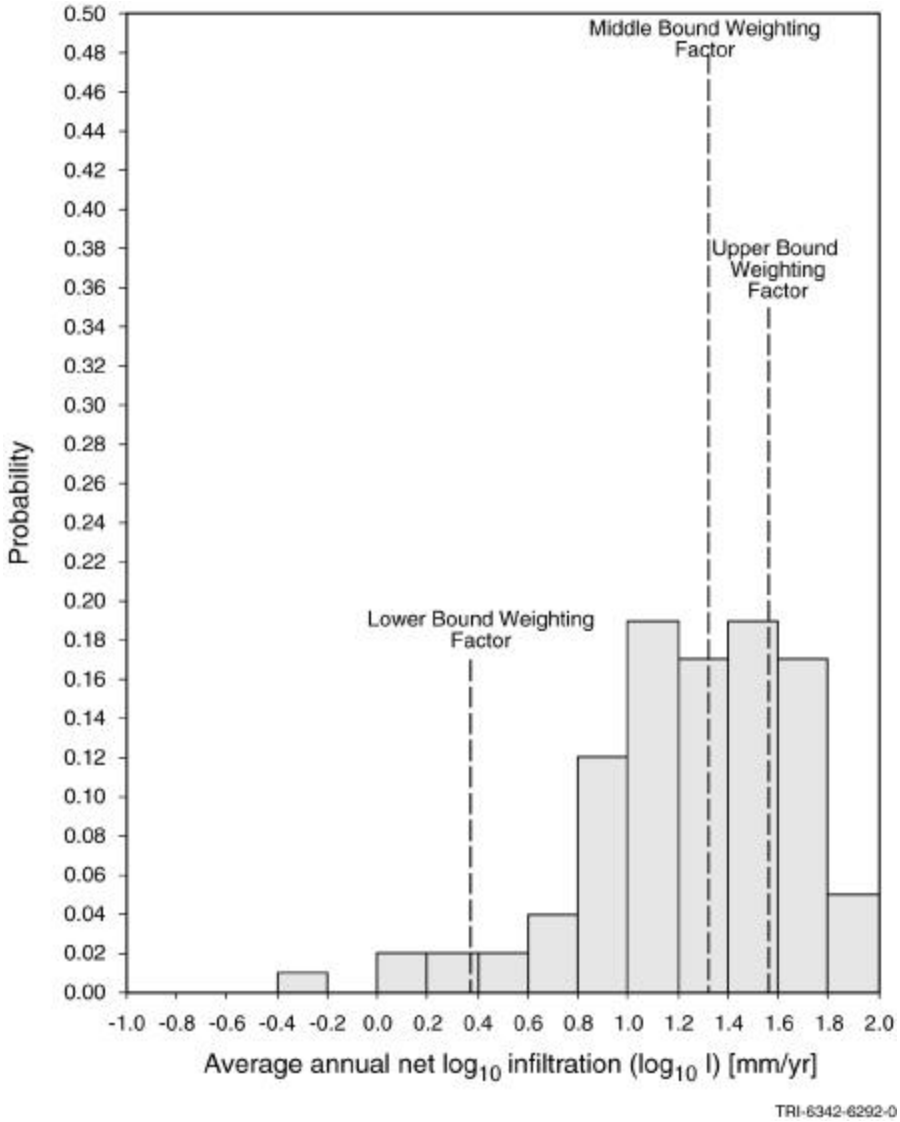
R*	Infiltration Rate [mm/yr]	Log_{10} of Infiltration Rate
85	2.89E+01	1.461
86	1.48E+01	1.169
87	5.04E-01	-0.298
88	1.58E+01	1.199
89	8.16E+00	0.912
90	1.17E+01	1.068
91	2.54E+01	1.405
92	1.70E+01	1.230
93	2.77E+01	1.443
94	1.61E+01	1.206
95	2.71E+01	1.434
96	1.65E+01	1.218
97	9.54E+00	0.980
98	1.53E+01	1.185
99	4.45E+01	1.648
100	2.55E+01	1.407
Mean=25.5		*Mean (log)=1.25*
StDev=19.2		***StDev (log)=0.42***

R* = Realization



NOTE: This plot only represents data presented in Table 6-1 (column 2).

Figure 6-1. Probability Distribution Function of Average Annual Infiltration for Glacial Transition Climate



NOTE: This plot only represents data presented in Table 6-1 (column 3).

Figure 6-2. Probability Distribution Function of Log Average Annual Infiltration for Glacial Transition Climate (weighting factors determined in Section 6.3)

6.3 CALCULATION OF WEIGHTING FACTORS FOR TSPA

The final desired product from these uncertainty analysis was to obtain defensible weighting factors, w_1, w_2, w_3, for the lower, medium, and upper analog climate infiltration rate maps (USGS 2000a, Section 6.11.3). Because the distribution of infiltration rates is nearly lognormal, it was decided that the logarithms of the infiltration rates would be used to evaluate the weighting coefficients. Thus, in log space, the following three equations hold;

$$w_1 + w_2 + w_3 = 1.0 \qquad \text{(Eq. 6-2)}$$

$$w_1 \bullet R_1 + w_2 \bullet R_2 + w_3 \bullet R_3 = \overline{R} \qquad \text{(Eq. 6-3)}$$

$$w_1 \bullet (R_1)^2 + w_2 \bullet (R_2)^2 + w_3 \bullet (R_3)^2 = \sigma^2 + \overline{R}^2 \qquad \text{(Eq. 6-4)}$$

where

> w_1, w_2, and w_3 are the weights applied to the lower, middle, and upper analog climate infiltration rate maps; R_1, R_2, and R_3 are these same rate maps spatially averaged over the simulated rectangular region; σ and $\overline{R}$ are the standard deviation and the mean of the uncertainty distribution (all in log space); respectively. These equations are based on the definitions of normalized weighting factors, mean, and standard deviation. Equation 6-4 is merely a restatement of the definition of variance.

In log space, R_1=0.37, R_2=1.32, and R_3=1.59 (Table 6-2). And $\sigma = 0.42$ and $\overline{R}$ = 1.25 (Table 6-1) correspond to the standard deviation and the mean of the uncertainty distribution in log space.

The weights must be the same, independent of climate regime (modern, glacial transition, monsoon) since this is the way these weights are treated in RIP. The results of the three independent uncertainty analyses performed for the three climate regimes do not produce equal weighting factors, nor should they be expected to. Since the RIP simulations will spend the majority of the simulated temporal domain in the glacial transition climate regime, the decision was made to use the weighting factors determined from the glacial transition climate uncertainty analysis. When Equations 6-2, 6-3, and 6-4 are solved to two significant decimal digits using the results from the glacial transition analysis, the values for w_1, w_2, and w_3 turn out to be 0.17, 0.48, and 0.35. Table 6-2 summarizes the results for the analog map representative values and the weighting factors corresponding to the lower, middle, and upper climates for the glacial transition climate regime.

Table 6-2 Summary of Analog Infiltration Results and Weighting Factors Calculated in This Analysis

Glacial Transition Climate	Analog Value [a,b]	Log_{10} Analog Value	Weighting Factor [c]
Low	2.36 [mm/yr]	0.37 [log_{10} mm/yr]	0.17
Middle	20.79 [mm/yr]	1.32 [log_{10} mm/yr]	0.48
High	39.22 [mm/yr]	1.59 [log_{10} mm/yr]	0.35

NOTE(s) :

[a] The second column of numbers are calculated using the infiltration rate maps calculated by the USGS for the low, middle, and high glacial transition climates (DTN: GS000308311221.005) averaged over the simulated rectangular region (Figure 1-1). See Attachment XII. The routine POSTINFIL, documented in Section 3.2 and Attachment V, calculates the spatially averaged infiltration rate restricted to the simulated rectangular region

[b] The USGS-calculated analog values are 2.2, 19.8, and 37.3 mm/yr for the Low, Middle, and High Glacial Transition Climates, respectively (Table 7-13, USGS 2000a). The USGS calculated infiltration rates for the repository footprint, while the analysis documented in this report calculated infiltration rates for the outer rectangular region shown in Figure 1-1. The minor differences between the calculated means for the two results (result obtained for rectangular area and result obtained for potential repository area) are consistent with expected differences because of the slight differences in the two areas. The rectangular area is slightly larger than the potential repository area (see Figure 1-1) and includes locations with relatively higher estimates of net infiltration, which causes a slight increase in the means calculated for the rectangular area relative to the mean calculated for the potential repository area.

[c] Weighting factors are solutions to Equations 6-2, 6-3, and 6-4

6.4 SUMMARY OF UNCERTAINTY ANALYSIS

Uncertainty analysis was performed using 100 realizations of a selected set of 12 uncertain input parameters. This analysis results in a distribution of spatially averaged infiltration rates for a rectangular region closely approximating what is referred to as the loaded repository footprint. These distributions are displayed as probability distribution functions (Figures 6-1 and 6-2), and the locations relative to the uncertainty distribution (i.e., the percentile) of the corresponding lower, middle, and upper analog site results are shown in log space (vertical dashed lines in Figure 6-2). The height of these dashed lines represents the value of the weighting factors.

An inspection of Figure 6-2 shows that the middle analog value in log space is near, but above the mean value of the uncertainty distribution; an inspection of Figure 6-1 reveals that the value of the weight for the high analog value is reflected in the fact that the distribution is skewed toward the upper range of uncertainty.

7. CONCLUSIONS

7.1 SUMMARY

The uncertainty measure is provided by a probability distribution function (PDF) resulting from a set of 100 realizations (or vectors); each of which provides a unique representative infiltration rate. This representative rate is obtained by calculating the spatial average for the corresponding infiltration rate map, averaged over a rectangular region (see Figure 1-1) including the loaded footprint of the repository.

This analysis derived uncertainty distributions for the glacial transition climate regime, considered for TSPA-SR, since the time duration for this climate regime dominated the 10,000 year performance period. The uncertainty distributions, in conjunction with the analog site evaluations, are used to determine weighting factors for the analog maps that can be used by the TSPA. The results are based on input that is TBV. These results are displayed in Table 7-1.

Table 7-1. Weights to be Used by TSPA for Choosing Number of Samples Which Use Low, Middle, or High Analog Infiltration Rate Maps

Symbol	Weight	Climate
W_1	0.17	Low Analog
W_2	0.48	Middle Analog
W_3	0.35	High Analog

Weights to be used by TSPA for determining the number of samples that use the Low, Middle, or High Analog Infiltration Rate Maps

7.2 RECOMMENDATIONS

The following future work would enhance these analyses:

1. Determine a mean uncertainty distribution (in the form of a mean CCDF) of the mean infiltration rates by performing multiple sets of uncertainty analyses for a climate regime to provide an estimate of the measure of confidence in the obtained mean CCDF.

2. Perform a rigorous determination of uncertain input parameter correlation.

3. Implement an analysis to determine which parameters input to the infiltration code may significantly and adversely impact the criteria for compliance and licensing.

It may also be useful, in future work, to incorporate an uncertainty analysis into the process of selecting potential analog sites to represent the appropriate lower, upper, and middle climate for each climate regime.

To accomplish the first suggestion, it is necessary to perform multiple sets of realizations. For example, this analysis could be extended so that three sets of 100 realizations, using three distinct random seeds to begin the sampling process, which each produce an independent CCDF, from which a mean CCDF and a confidence measure of the mean CCDF, could be determined. The confidence measure is a stochastic estimate of the numerical robustness of the computer model used to obtain these distribution measures.

Accomplishing the second and third suggestions would require a sensitivity analysis, where the metrics for repository compliance (e.g., doses) are correlated with uncertain inputs to the infiltration model. Additional knowledge regarding the interrelationships between certain input parameters is necessary to define any significant correlation (pairwise) among these input parameters.

The final recommendation could be implemented by integration of the uncertainty/sensitivity analysis and results with selection of more appropriate analog sites for lower and upper climate bounds.

7.3 LIMITATION AND UNCERTAINTIES

The uncertainty analysis, by its very nature, incorporates uncertainties in the knowledge of parameter input values. The amount of uncertainty that is incorporated is based on multiple sources; that is, expert judgment, empirical data, model limitations, etc.

7.3.1 Epistemic Limitations and Uncertainties

The uncertainties in future climates and, thus, infiltration are directly related to the selection appropriate analog climate data; using this approach to forecast the future is problematic, given the chaotic nature of climate and the possibility that human activity may change the cyclical patterns. The climate records may be too short to adequately predict future precipitation patterns.

The effects of changes in the input parameter uncertainties can be qualitatively estimated from the results of the sensitivity analysis. Those uncertain input parameters which may show significant correlation with the output infiltration uncertainty will have significant impact, due to the nature of the propagation of uncertainty in the infiltration model, on the output infiltration rate distributions. The range in values of these significant parameters would be reflected in a qualitatively similar change in the output distribution range.

7.3.2 Aleatoric Limitations and Uncertainties

The glacial transition climate was the climate chosen for estimation of the weighting factors derived for the lower, middle, and upper bound climates used in RIP. The uncertainties in future climate onset and duration make this assumption problematic.

7.3.3 Statistical Limitations and Uncertainties

Limitations on the number of potential samples are driven by computational resources, runtime , and also by the number and size of watersheds used in the analysis. The limitations in

confidence in the input distributions and their ranges is propagated through the analysis to the output infiltration rate distributions and ranges, albeit somewhat nonlinearly.

7.4 GENERAL IMPACT OF UNRESOLVED TECHNICAL INFORMATION

This document may be affected by technical product input information that requires confirmation. Any changes to the document that may occur as a result of completing the confirmation activities will be reflected in subsequent revisions. The status of the input information quality may be confirmed by review of the Document Input System database.

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ATTACHMENT I

Verification of INFIL V A_2.a1 as Used on DEC Alpha at SANDIA NATIONAL LABORATORIES

This attachment contains a comparison between Summary Output results from execution of the code INFIL V A_2.a1 on the DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories and the code INFIL V 2.0 using Windows NT 4.0 on a Pentium Pro PC by the USGS. Table I-1 shows the difference in the results to be negligible. Both codes (INFIL V A_2.a1 and INFIL V 2.0) are being qualified by the USGS.

Comparison of results as displayed in the summary output file using equivalent input (see Table I-1) for platform used at Sandia National Laboratories (Section 3.1) with corresponding results from the version of the code as executed by the USGS on a system designated by:

User Location: U.S. Geological Survey, Room 5000E, Placer Hall, 6000 J Street,
Sacramento, California 95819-6129
Computer Identification: SM321276 with a USGS specific hostname P720dcasr
Platform identification information: Pentium Pro PC
Operating System: Windows NT 4.0

Table I-1. Comparison of Summary Output Results from version of INFIL at Sandia National Laboratories with those from INFIL as used by USGS

Ouput Parameter	Version		Relative Error
	SNL	USGS	
Precipitation	290.532770	290.532762	2.75356E-08
Rain	233.901757	233.901750	2.99271E-08
Snowfall	56.631013	56.631012	1.76582E-08
Snow-cover	631.284972	631.285751	1.23399E-06
Snow-melt	50.640619	50.640612	1.38229E-07
Sublimation	5.261948	5.261954	1.14026E-06
Potential Evapotranspiration	832.586015	832.585923	1.10499E-07
ACTUAL EVAPOTRANSPIRATION	262.509388	262.509371	6.47596E-08
Change in Soil Moisture	0.727825	0.727825	0
*Net Infiltration**	*21.305163*	*21.305166*	*1.40811E-07*
Runoff Generation	0.690760	0.690760	0
Cumulative Daily Run-on	0.094091	0.094091	0

NOTE: Net Infiltration is the output parameter of importance.

Table I-2. User Control File Used to for Verification of INFIL (version A_2.a1) on Platform DEC Alpha and Operating System Open VMS AXP V7 at Sandia National Laboratories

```
INFIL2a1.ctl: Solitario East, Tule Lake, se10-2a1-gm1-k2-w20 (11/18/1999)
1   0.00000001                                  IROUT(1 = coupled, 0 = uncoupled, -1 = flow routing off, -2 = infil off), IFRTOL
2   2     1.78                                      ISNOW, ISNWMOD, SNOPAR1
3   0.1   0.3                                   ISUBLIM, SUBPAR1, SUBPAR2
0   1.                                          IPPTTEST (1 for testing), PPTTEST = constant
0   .0                                          IETTEST (1 for testing), ETTEST = constant
30.0                                                CELSIZE (node spacing (meters): using for flow volume calculations)
544721.0  4072203.0                             xcfs,ycfs: coords for discharge cell
1950  1    1996    366   1   5                 yr1 = start year, dnn1 = start day, yr2 = end year, dn2 = end day
1     1    1    1                              multipliers ( pptfact, etfact, imbfact, sksfact)
1.0   0    0.4                                 SDFACT (soil depth multiplier), IVEGC (set to 1 for map data), FVEGC (use if IVEGC =
0)
1.0   0.8   0.8    0.2                         ROOTF1,ROOTF2,ROOTF3,ROOTF4
1.0   1.0   0.5    0.1                         MAXWGT1, MAXWGT2, MAXWGT3, MAXWGT4
0.3   2.0   3.0    2.0                          RDEPTH1,RDEPTH2,RDEPTH3,RDEPTH4,RDEPTHF
0.02  1.0  .25                                 RKPOR, RKMMFACT, FLAREA
1   1    0                                     INFMOD, ETMOD, RUNMOD
 -10.0  1.04                                BARSOIL1, BARSOIL2:  bare soil et parameters
3   17.3  11.74                                IAIRTEMP = 1 for new air temp model, ATEMP1 = avg. air temp, ATEMP2 = air temp
seasonal deviation
2                                              HSTEP: time step for PET model (hours)
5  181  3                                      PPTYUC (=5 diminished elev. correlation, =2 for 4JA , =1 for simple elevation
transfer), AAPREPX, IPPTDAT
Tulelake.inp                                   input file name:  daily precip
     0      1    0.5      1     1              dpthflag, irtz, delvwcf, moistcr, fracmod
     0      1.75                               IVWCFLG,   vwcfact
se10.w20                                       input file name:  map parameters (*.inp)
-1
se10-gm1.2a1                                     dayall: average daily mass balance terms
1    1                                   ndaymap, imap
70   1995
se10-gm1.2a2
se10-gm1.2a3                                     output file name:  daily mass balance
se10-gm1.2a4                                     output file name:  total daily fluxes
1      1                                       dbgflag, dbgflag2
se10-gm1.2a5                                     output file name:  annual mass balance terms
0                                              IDEBUG:  debugging option parameter
se10-gm1.2a6                                     new debug file
se10-gm1                                        map output:  annual totals or mult-year averages

--
--------------- Parameters for dynamic root-zone function -------------------------------------
--     depth  rtza   rtzb   rtzc  rtzd  bsoil    delvwc
--     m
     4
     1    0.5     15      3     3     2     0.30      0.50
     2    1.5     15      4     2     2     0.20      0.50
```

```
     3    4.5     10    1.5     1     2     0.10      0.50
     4    6.0     10    1.5     1     2     0.05      0.25
--
--------------- Soil Properties (Brooks & Corey/van Genuchten combined) ----------------------------------------
--     fdcp   etresidpor    beta  alpah ksat     PE        B     n     vg-alpha sorp     SOILP   potis
--                                       Kg s /m^3J/Kg                 1/(J/Kg) ???              J/Kg
    10
     1  0.242  0.054  0.366  -3.5  1.26  5.6E-04 -1.19E+00  4.72  1.24  5.2E-01    0.390    0.05 -1.0E+02
     2  0.173  0.023  0.315  -3.5  1.26  1.2E-03 -9.41E-01  3.70  1.31  6.2E-01    0.500    0.05 -1.0E+02
     3  0.163  0.017  0.325  -3.5  1.26  1.3E-03 -8.60E-01  3.36  1.36  6.6E-01    0.510    0.05 -1.0E+02
     4  0.073  0.002  0.281  -3.5  1.26  3.8E-03 -6.22E-01  2.18  1.62  8.7E-01    0.700    0.05 -1.0E+02
     5  0.200  0.035  0.330  -3.5  1.26  6.7E-04 -1.07E+00  4.14  1.78  5.6E-01    0.400    0.05 -1.0E+02
     6  0.150  0.011  0.339  -3.5  1.26  2.7E-03 -7.55E-01  3.06  1.40  7.4E-01    0.700    0.05 -1.0E+02
     7  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     8  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     9  0.189  0.028  0.322  -3.5  1.26  5.7E-04 -1.08E+00  3.88  1.30  5.5E-01    0.370    0.05 -1.0E+02
    10  0.189  0.028  0.322  -3.5  1.26  5.7E-05 -1.08E+00  3.88  1.00  5.5E-01    0.037    0.05 -1.0E+02
--

---------------Rockl Properties (Brooks & Corey/van Genuchten combined)----------------------------------------
--     rkcp   etresidpor    beta  alpha ksat     PE        B     n     vg-alpha fracks   imbibe  potir
--                                       Kg s /m^3J/Kg                 1/(J/Kg) Kg s /m^3mm/dy   J/Kg
     129
       1     0.35    0.065    0.366     -1.5     1.26   0.0011    -0.93      3.6     1.25     0.52  0.00056      500     -100
       2    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       3    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       4    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       5    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       6    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       7    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       8    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       9    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      10    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      11    0.105     0.02     0.11     -1.5     1.26  4.0E-09       -6     3.92     1.47       64  2.4E-07     0.06     -100
      12    0.388    0.039    0.393     -1.5     1.26 0.000053     -242     4.57     1.38     2400 0.000053     2.74     -100
      13     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
      14    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      15    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      16    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      17    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.35     -100
      18    0.248     0.01    0.253     -1.5     1.26  3.8E-06    -82.3     2.71     1.84      830  3.9E-06     3.34     -100
      19    0.159     0.01    0.164     -1.5     1.26  1.2E-06     -140     3.61     1.53     1400  1.3E-06     1.13     -100
      20    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      21    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      22    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      23    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      24    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      25    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      26    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      27    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      28    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
```

29	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
30	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
31	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
32	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
33	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
34	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
35	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
36	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
37	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
38	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
39	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
40	0.494	0.05	0.499	-1.5	1.26	0.000088	-341	4.19	1.43	3400	0.000088	75.62	-100
41	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
42	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
43	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
44	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-26.9	5.6	1.29	270	2.1E-07	0.09	-100
45	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
99	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
46	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
47	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
48	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
49	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
50	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
51	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
52	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
53	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
54	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
55	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
56	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
57	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
58	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
59	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
60	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
61	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
62	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
63	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
64	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
65	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
66	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
67	0.031	0.018	0.036	-1.5	1.26	5.0E-09	-0.6	3.39	1.58	10	2.4E-07	0.17	-100
68	0.168	0.021	0.173	-1.5	1.26	7.3E-08	-125	5.36	1.31	1300	1.3E-07	0.07	-100
69	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.02	-100
70	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
71	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.01	-100
72	0.317	0.023	0.322	-1.5	1.26	3.8E-08	-181	4.01	1.46	1800	9.9E-08	1.65	-100
73	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
74	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
75	0.281	0.051	0.286	-1.5	1.26	1.7E-08	-17.5	4.01	1.45	180	7.8E-08	0.02	-100
76	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
77	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
201	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100

202	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.06	-100
203	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
204	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	120	1.4E-07	500	-100
205	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
206	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
207	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
208	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
209	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
210	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
211	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
212	0	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
213	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
214	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
301	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
302	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
303	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
304	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
305	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
306	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
307	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
308	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
309	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
310	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
311	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
312	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
313	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
314	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
315	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
316	0.159	0.01	0.164	-1.5	1.26	1.2E-06	-140	3.61	1.53	1400	1.3E-06	1.13	-100
317	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
318	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
319	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
320	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
321	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
322	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
323	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
324	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
325	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
326	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
327	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
328	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
329	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
330	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
331	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
332	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
333	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
334	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
335	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
336	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
345	0.097	0.01	0.102	-1.5	1.26	1.3E-07	-154.6	5.02	1.56	1560	2.9E-07	0.24	-100

Table I-3. Summary Output Produced for Verification of INFIL (version A_2.a1) on Platform DEC Alpha running Open VMS AXP V7 at Sandia National Laboratories

```
INFIL2a1.ctl: Solitario East, Tule Lake, se10-2a1-gm1-k2-w20 (11/18/1999)
Daily precipitation input:             Tulelake.inp
Watershed modeling domain parameters:  se10.w20
Average daily mass balance terms:      se10-gm1.2a1
24-hour mass balance map:              se10-gm1.2a2
Annual mass balance map:               se10-gm1.1
Average annual mass balance map:       se10-gm1.2a4
Summary statistics output:             se10-gm1.2a3
Debugging output:                      se10-gm1.2a5


Total number of days read in   =    12053
Total daily precip             =   9660.7
Average annual precip (mm)     =    292.8
Maximum daily precip (mm)      =     51.3


TOTAL NUMBER OF LOCATIONS    =       69
AVERAGE ELEVATION OF SAMPLE  =   1339.3
MAXIMUM ELEVATION OF SAMPLE  =   1377.0
MINIMUM ELEVATION OF SAMPLE  =   1301.0
AVERAGE SOIL DEPTH (M)       =    2.124
AVERAGE SLOPE OF SAMPLE      =     12.8
MAXIMUM SLOPE OF SAMPLE      =     23.0
NUMBER OF ACTIVE LOCATIONS   =       17


  Yr  Dy    Precip      Rain      Snow  Sn-cover  Snowmelt    Sublim       PET     PETRS  Evapotrs  Del-soil   Net-inf    Runoff  Out-
flow    Mass-balance
1950 365   288.823   218.232    70.591   432.356    60.488     5.658   835.723   663.272   242.653    36.067     0.000     0.000
0.000  -0.896813276E-10
1951 365   212.451   120.978    91.473   736.623    54.355     7.819   842.857   668.934   194.543   -19.922     0.711     0.000
0.000  -0.670113706E-09
1952 366   271.664   232.269    39.395   354.124    64.979     4.581   812.532   644.867   292.275    -8.315    13.289     0.000
0.000  -0.118735058E-08
1953 365   367.872   313.935    53.937   178.650    51.584     5.932   799.670   634.659   315.938    37.982    11.599     0.000
0.000  -0.161001923E-08
1954 365   212.451   135.956    76.495   495.140    53.006     7.244   813.631   645.739   223.574   -55.092    20.480     0.000
0.000  -0.254417724E-08
1955 365   254.902   127.629   127.273  1372.195    91.170     8.873   832.747   660.911   156.121    58.930     3.748     0.000
0.000  -0.116435381E-09
1956 366   310.147   281.781    28.367  1903.177    65.457     6.385   828.810   657.786   324.945   -38.969    61.261     8.775
0.000  -0.183099313E-08
1957 365   381.163   363.570    17.592    37.571    15.850     1.742   845.560   671.079   327.175    36.173    16.072     0.000
0.000  -0.249317704E-08
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1958	365	341.291	301.092	40.198	154.009	29.814	3.133	818.516	649.616	358.730	-51.929	24.106	0.000	0.000 -0.363462775E-08
1959	365	120.607	110.988	9.619	86.665	14.498	2.372	862.267	684.339	156.361	-30.875	0.000	0.000	0.000 -0.408099911E-08
1960	366	282.276	271.893	10.384	33.734	8.881	1.503	845.880	671.334	218.626	61.323	0.826	0.000	0.000 -0.741168510E-10
1962	365	338.712	312.850	25.862	224.619	22.460	3.402	830.644	659.242	267.587	36.307	31.416	0.176	0.000 -0.634508074E-09
1963	365	233.379	179.558	53.821	1076.487	39.313	9.210	811.546	644.085	260.099	-53.651	12.423	0.000	0.000 -0.143827826E-08
1964	366	378.187	225.224	152.963	1169.237	47.514	4.296	825.651	655.279	254.243	14.771	3.723	0.000	0.000 -0.201924445E-08
1966	365	232.387	189.844	42.543	2289.880	128.425	9.780	843.435	669.393	229.022	41.116	48.131	0.000	0.000 -0.403216082E-08
1967	365	206.302	174.810	31.492	232.016	38.340	3.713	852.245	676.385	279.375	-83.650	17.425	0.000	0.000 -0.648956358E-09
1968	366	290.905	277.997	12.908	34.296	10.462	2.565	839.402	666.192	247.988	40.471	0.000	0.000	0.000 -0.852496186E-09
1969	365	333.356	234.815	98.541	1113.232	29.055	4.130	845.652	671.152	264.208	-17.865	17.527	0.000	0.000 -0.138001286E-08
1970	365	258.175	179.126	79.049	1328.668	124.590	8.793	833.578	661.570	228.047	30.552	45.117	1.920	0.000 -0.350565337E-08
1971	365	281.384	242.377	39.006	323.340	45.848	4.291	836.134	663.598	291.648	-13.915	10.492	0.000	0.000 -0.431267944E-08
1974	365	167.323	131.266	36.057	171.037	31.414	4.643	837.322	664.541	187.377	-26.855	2.157	0.000	0.000 -0.259751234E-09
1975	365	267.498	230.968	36.530	91.871	31.777	4.753	830.917	659.458	262.708	-3.118	3.155	0.000	0.000 -0.708225371E-09
1976	366	227.329	194.598	32.731	545.162	27.352	5.379	822.342	652.653	241.625	-19.755	0.080	0.000	0.000 -0.103352604E-08
1977	365	313.618	235.905	77.713	498.200	31.490	3.201	834.295	662.139	230.039	37.357	0.000	0.000	0.000 -0.137197357E-08
1978	365	257.877	208.165	49.713	721.268	87.363	5.371	849.230	673.992	271.385	-17.794	41.937	0.000	0.000 -0.283669747E-08
1979	365	313.519	282.240	31.280	67.986	29.239	2.041	843.151	669.167	227.781	69.200	14.497	0.000	0.000 -0.261695151E-09
1980	366	257.877	237.226	20.651	128.283	18.391	2.150	857.524	680.574	289.409	-69.175	35.383	0.299	0.000 -0.280423179E-08
1981	365	390.486	276.116	114.370	406.011	72.334	8.066	814.972	646.803	254.882	71.770	21.798	0.000	0.000 -0.366651546E-08
1982	365	328.694	297.352	31.342	446.031	55.426	4.752	816.770	648.230	346.565	-25.551	31.765	0.000	0.000 -0.594888706E-08
1983	365	450.889	307.306	143.583	1341.380	70.336	8.617	813.936	645.981	297.566	29.337	50.739	0.464	0.000 -0.843875677E-08
1987	365	238.933	199.277	39.656	1924.282	94.977	7.509	848.007	673.021	294.840	-52.029	51.443	5.062	0.000 -0.210783399E-08
1995	365	412.604	368.866	43.738	277.639	46.667	4.115	824.088	654.038	312.516	50.800	52.217	0.237	0.000 -0.439056246E-08
1996	366	364.301	254.389	109.912	636.803	78.251	7.623	825.734	655.345	312.781	-39.681	59.540	5.863	0.000 -0.763445402E-08

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                                        Global Summary Statistics (mm/year):
                                     ------------------------------------------------

Precipitation...................       290.532770
Rain............................       233.901757
Snowfall........................        56.631013
Snow-cover......................       631.284972
Snow-melt.......................        50.640619
Sublimation.....................         5.261948
Potential Evapotranspiration....       832.586015
Actual Evapotranspiration.......       262.509388
Change in Soil Moisture.........         0.727825
Net Infiltration................        21.305163
Runoff Generation...............         0.690760
Cumulative Daily Run-on.........         0.094091
Outflow.........................         0.000000
Average Mass Balance Error......    -0.264155E-12
Average Max Daily Error (mm/dy).    -0.386456E-13
```

Table II-4. Input Control File Used on Platform Pentium Pro PC and Operating System Windows NT 4.0 Using INFIL Version 2.0

```
INFIL2a1.ctl: Solitario East, Tule Lake, se10-2a1-gm1-k2-w20 (11/18/1999)
1   0.00000001                                  IROUT(1 = coupled, 0 = uncoupled, -1 = flow routing off, -2 = infil off), IFRTOL
2   2     1.78                                      ISNOW, ISNWMOD, SNOPAR1
3   0.1   0.3                                    ISUBLIM, SUBPAR1, SUBPAR2
0   1.                                           IPPTTEST (1 for testing), PPTTEST = constant
0   .0                                           IETTEST (1 for testing), ETTEST = constant
30.0                                                 CELSIZE (node spacing (meters): using for flow volume calculations)
544721.0  4072203.0                              xcfs,ycfs: coords for discharge cell
1950  1    1996    366   1   5                  yr1 = start year, dnn1 = start day, yr2 = end year, dn2 = end day
1     1    1    1                               multipliers ( pptfact, etfact, imbfact, sksfact)
1.0   0    0.4                                  SDFACT (soil depth multiplier), IVEGC (set to 1 for map data), FVEGC (use if IVEGC =
0)
1.0   0.8   0.8    0.2                          ROOTF1,ROOTF2,ROOTF3,ROOTF4
1.0   1.0   0.5    0.1                          MAXWGT1, MAXWGT2, MAXWGT3, MAXWGT4
0.3   2.0   3.0    2.0                           RDEPTH1,RDEPTH2,RDEPTH3,RDEPTH4,RDEPTHF
0.02  1.0  .25                                  RKPOR, RKMMFACT, FLAREA
1   1    0                                      INFMOD, ETMOD, RUNMOD
 -10.0  1.04                                BARSOIL1, BARSOIL2:  bare soil et parameters
3   17.3  11.74                                IAIRTEMP = 1 for new air temp model, ATEMP1 = avg. air temp, ATEMP2 = air temp
seasonal deviation
2                                               HSTEP: time step for PET model (hours)
5  181  3                                       PPTYUC (=5 diminished elev. correlation, =2 for 4JA , =1 for simple elevation
transfer), AAPREPX, IPPTDAT
Tulelake.inp                                    input file name:  daily precip
     0      1    0.5      1     1               dpthflag, irtz, delvwcf, moistcr, fracmod
     0      1.75                                IVWCFLG,   vwcfact
se10.w20                                         input file name:  map parameters (*.inp)
-1
se10-gm1.2a1                                       dayall: average daily mass balance terms
1    1                                     ndaymap, imap
70   1995
se10-gm1.2a2
se10-gm1.2a3                                       output file name:  daily mass balance
se10-gm1.2a4                                       output file name:  total daily fluxes
1      1                                        dbgflag, dbgflag2
se10-gm1.2a5                                       output file name:  annual mass balance terms
0                                               IDEBUG:  debugging option parameter
se10-gm1.2a6                                       new debug file
se10-gm1                                         map output:  annual totals or mult-year averages
--
--------------- Parameters for dynamic root-zone function -------------------------------------
--     depth  rtza   rtzb   rtzc  rtzd  bsoil    delvwc
--     m
     4
     1    0.5     15      3     3     2     0.30      0.50
     2    1.5     15      4     2     2     0.20      0.50
     3    4.5     10    1.5     1     2     0.10      0.50
     4    6.0     10    1.5     1     2     0.05      0.25
--
```

```
--------------- Soil Properties (Brooks & Corey/van Genuchten combined) ------------------------------------------
--     fdcp   etresidpor    beta  alpah ksat     PE        B     n     vg-alpha sorp     SOILP   potis
--                                       Kg s /m^3J/Kg                  1/(J/Kg) ???              J/Kg
    10
     1  0.242  0.054  0.366  -3.5  1.26  5.6E-04 -1.19E+00  4.72  1.24  5.2E-01    0.390    0.05 -1.0E+02
     2  0.173  0.023  0.315  -3.5  1.26  1.2E-03 -9.41E-01  3.70  1.31  6.2E-01    0.500    0.05 -1.0E+02
     3  0.163  0.017  0.325  -3.5  1.26  1.3E-03 -8.60E-01  3.36  1.36  6.6E-01    0.510    0.05 -1.0E+02
     4  0.073  0.002  0.281  -3.5  1.26  3.8E-03 -6.22E-01  2.18  1.62  8.7E-01    0.700    0.05 -1.0E+02
     5  0.200  0.035  0.330  -3.5  1.26  6.7E-04 -1.07E+00  4.14  1.78  5.6E-01    0.400    0.05 -1.0E+02
     6  0.150  0.011  0.339  -3.5  1.26  2.7E-03 -7.55E-01  3.06  1.40  7.4E-01    0.700    0.05 -1.0E+02
     7  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     8  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     9  0.189  0.028  0.322  -3.5  1.26  5.7E-04 -1.08E+00  3.88  1.30  5.5E-01    0.370    0.05 -1.0E+02
    10  0.189  0.028  0.322  -3.5  1.26  5.7E-05 -1.08E+00  3.88  1.00  5.5E-01    0.037    0.05 -1.0E+02
--
---------------Rockl Properties (Brooks & Corey/van Genuchten combined)-------------------------------------------
--     rkcp   etresidpor    beta  alpha ksat     PE        B     n     vg-alpha fracks   imbibe  potir
--                                       Kg s /m^3J/Kg                  1/(J/Kg) Kg s /m^3mm/dy   J/Kg
     129
       1     0.35    0.065    0.366     -1.5     1.26   0.0011    -0.93      3.6     1.25     0.52  0.00056      500     -100
       2    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       3    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       4    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       5    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       6    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       7    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       8    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       9    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      10    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      11    0.105     0.02     0.11     -1.5     1.26  4.0E-09       -6     3.92     1.47       64  2.4E-07     0.06     -100
      12    0.388    0.039    0.393     -1.5     1.26 0.000053     -242     4.57     1.38     2400 0.000053     2.74     -100
      13     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
      14    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      15    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      16    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      17    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.35     -100
      18    0.248     0.01    0.253     -1.5     1.26  3.8E-06    -82.3     2.71     1.84      830  3.9E-06     3.34     -100
      19    0.159     0.01    0.164     -1.5     1.26  1.2E-06     -140     3.61     1.53     1400  1.3E-06     1.13     -100
      20    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      21    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      22    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      23    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      24    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      25    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      26    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      27    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      28    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      29    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      30    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      31    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      32     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
```

33	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
34	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
35	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
36	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
37	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
38	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
39	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
40	0.494	0.05	0.499	-1.5	1.26	0.000088	-341	4.19	1.43	3400	0.000088	75.62	-100
41	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
42	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
43	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
44	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-26.9	5.6	1.29	270	2.1E-07	0.09	-100
45	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
99	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
46	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
47	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
48	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
49	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
50	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
51	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
52	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
53	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
54	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
55	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
56	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
57	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
58	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
59	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
60	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
61	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
62	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
63	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
64	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
65	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
66	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
67	0.031	0.018	0.036	-1.5	1.26	5.0E-09	-0.6	3.39	1.58	10	2.4E-07	0.17	-100
68	0.168	0.021	0.173	-1.5	1.26	7.3E-08	-125	5.36	1.31	1300	1.3E-07	0.07	-100
69	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.02	-100
70	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
71	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.01	-100
72	0.317	0.023	0.322	-1.5	1.26	3.8E-08	-181	4.01	1.46	1800	9.9E-08	1.65	-100
73	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
74	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
75	0.281	0.051	0.286	-1.5	1.26	1.7E-08	-17.5	4.01	1.45	180	7.8E-08	0.02	-100
76	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
77	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
201	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
202	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.06	-100
203	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
204	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	120	1.4E-07	500	-100
205	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100

206	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
207	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
208	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
209	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
210	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
211	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
212	0	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
213	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
214	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
301	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
302	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
303	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
304	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
305	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
306	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
307	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
308	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
309	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
310	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
311	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
312	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
313	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
314	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
315	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
316	0.159	0.01	0.164	-1.5	1.26	1.2E-06	-140	3.61	1.53	1400	1.3E-06	1.13	-100
317	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
318	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
319	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
320	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
321	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
322	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
323	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
324	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
325	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
326	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
327	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
328	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
329	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
330	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
331	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
332	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
333	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
334	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
335	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
336	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
345	0.097	0.01	0.102	-1.5	1.26	1.3E-07	-154.6	5.02	1.56	1560	2.9E-07	0.24	-100

Table I-5. Summary Output File Produced on Platform Pentium Pro PC PC and Operating System Windows NT 4.0 Using INFIL Version 2.0

```
INFIL2a1.ctl: Solitario East, Tule Lake, se10-2a1-gm1-k2-w20 (11/18/1999)
Daily precipitation input:             Tulelake.inp
Watershed modeling domain parameters:  se10.w20
Average daily mass balance terms:      se10-gm1.2a1
24-hour mass balance map:              se10-gm1.2a2
Annual mass balance map:               se10-gm1.1
Average annual mass balance map:       se10-gm1.2a4
Summary statistics output:             se10-gm1.2a3
Debugging output:                      se10-gm1.2a5


Total number of days read in   =    12053
Total daily precip             =   9660.7
Average annual precip (mm)     =    292.8
Maximum daily precip (mm)      =     51.3


TOTAL NUMBER OF LOCATIONS    =       69
AVERAGE ELEVATION OF SAMPLE  =   1339.3
MAXIMUM ELEVATION OF SAMPLE  =   1377.0
MINIMUM ELEVATION OF SAMPLE  =   1301.0
AVERAGE SOIL DEPTH (M)       =    2.124
AVERAGE SLOPE OF SAMPLE      =     12.8
MAXIMUM SLOPE OF SAMPLE      =     23.0
NUMBER OF ACTIVE LOCATIONS   =       17


   Yr  Dy    Precip      Rain      Snow  Sn-cover  Snowmelt    Sublim       PET     PETRS  Evapotrs  Del-soil   Net-inf    Runoff
Out-flow    Mass-balance
 1950 365   288.823   218.232    70.591   432.356    60.488     5.658   835.723   663.272   242.653    36.067     0.000     0.000
0.000   0.175624822E-09
 1951 365   212.451   120.978    91.473   736.625    54.355     7.819   842.857   668.934   194.543   -19.922     0.711     0.000
0.000   0.218118841E-09
 1952 366   271.664   232.269    39.395   354.124    64.979     4.581   812.532   644.867   292.275    -8.315    13.289     0.000
0.000   0.192151030E-09
 1953 365   367.872   313.935    53.937   178.650    51.584     5.932   799.670   634.659   315.938    37.982    11.599     0.000
0.000   0.263993153E-09
 1954 365   212.451   135.956    76.495   495.141    53.006     7.244   813.631   645.739   223.574   -55.092    20.480     0.000
0.000   0.241319896E-09
 1955 365   254.902   127.629   127.273  1372.197    91.170     8.873   832.747   660.910   156.121    58.930     3.748     0.000
0.000  -0.112246360E-09
 1956 366   310.147   281.781    28.367  1903.180    65.457     6.385   828.810   657.786   324.945   -38.969    61.261     8.775
0.000  -0.156601933E-09
 1957 365   381.162   363.570    17.592    37.572    15.850     1.742   845.560   671.079   327.175    36.173    16.072     0.000
0.000  -0.164860299E-09
 1958 365   341.291   301.092    40.198   154.009    29.814     3.133   818.516   649.616   358.730   -51.929    24.106     0.000
0.000   0.444154606E-10
```

```
 1959 365   120.607   110.988     9.619    86.666    14.498     2.372   862.267   684.339   156.361   -30.875     0.000     0.000
0.000   0.187447951E-09
 1960 366   282.276   271.893    10.384    33.734     8.881     1.503   845.880   671.334   218.626    61.323     0.826     0.000
0.000  -0.364036219E-10
 1962 365   338.712   312.850    25.862   224.620    22.460     3.402   830.644   659.241   267.587    36.307    31.416     0.176
0.000   0.156433114E-09
 1963 365   233.379   179.558    53.821  1076.488    39.313     9.210   811.546   644.084   260.099   -53.651    12.423     0.000
0.000   0.137249349E-09
 1964 366   378.187   225.224   152.963  1169.237    47.514     4.296   825.651   655.279   254.243    14.771     3.723     0.000
0.000   0.531510373E-10
 1966 365   232.387   189.844    42.543  2289.883   128.425     9.780   843.435   669.393   229.022    41.116    48.131     0.000
0.000  -0.619987124E-10
 1967 365   206.302   174.810    31.492   232.017    38.340     3.713   852.245   676.385   279.375   -83.650    17.425     0.000
0.000   0.923037274E-10
 1968 366   290.905   277.997    12.908    34.296    10.462     2.565   839.402   666.192   247.988    40.471     0.000     0.000
0.000   0.614522354E-10
 1969 365   333.356   234.815    98.541  1113.233    29.055     4.130   845.652   671.152   264.208   -17.865    17.527     0.000
0.000   0.656519736E-10
 1970 365   258.175   179.126    79.049  1328.669   124.590     8.793   833.578   661.570   228.047    30.552    45.117     1.920
0.000  -0.883941765E-10
 1971 365   281.384   242.377    39.006   323.340    45.848     4.291   836.133   663.598   291.648   -13.915    10.492     0.000
0.000  -0.168360502E-09
 1974 365   167.323   131.266    36.057   171.037    31.414     4.643   837.322   664.541   187.377   -26.855     2.157     0.000
0.000  -0.687992874E-10
 1975 365   267.498   230.968    36.530    91.871    31.777     4.753   830.917   659.458   262.708    -3.118     3.155     0.000
0.000  -0.182410852E-09
 1976 366   227.329   194.598    32.731   545.162    27.352     5.379   822.342   652.653   241.625   -19.755     0.080     0.000
0.000  -0.218551604E-09
 1977 365   313.618   235.905    77.713   498.201    31.490     3.201   834.295   662.139   230.039    37.357     0.000     0.000
0.000  -0.180917354E-09
 1978 365   257.877   208.165    49.713   721.270    87.363     5.371   849.229   673.992   271.385   -17.794    41.937     0.000
0.000  -0.114093109E-09
 1979 365   313.519   282.240    31.280    67.986    29.239     2.041   843.151   669.167   227.781    69.200    14.497     0.000
0.000   0.100798462E-09
 1980 366   257.877   237.226    20.651   128.283    18.391     2.150   857.524   680.574   289.409   -69.175    35.383     0.299
0.000   0.193833364E-09
 1981 365   390.486   276.116   114.370   406.012    72.334     8.066   814.972   646.803   254.882    71.770    21.798     0.000
0.000   0.557352754E-10
 1982 365   328.694   297.352    31.342   446.031    55.426     4.752   816.770   648.230   346.565   -25.551    31.765     0.000
0.000  -0.160379148E-09
 1983 365   450.889   307.306   143.583  1341.381    70.336     8.617   813.935   645.981   297.566    29.337    50.739     0.464
0.000  -0.492668107E-09
 1987 365   238.933   199.277    39.656  1924.285    94.977     7.509   848.007   673.021   294.840   -52.029    51.443     5.062
0.000  -0.710995995E-10
 1995 365   412.604   368.866    43.738   277.639    46.667     4.115   824.088   654.038   312.516    50.800    52.217     0.237
0.000  -0.251104930E-09
 1996 366   364.301   254.389   109.912   636.804    78.251     7.623   825.734   655.345   312.781   -39.681    59.540     5.863
0.000  -0.259870723E-09

 Global Summary Statistics (mm/year):
```

```
-----------------------------------------------

Precipitation..................       290.532762
Rain...........................       233.901750
Snowfall.......................        56.631012
Snow-cover.....................       631.285751
Snow-melt......................        50.640612
Sublimation....................         5.261954
Potential Evapotranspiration....      832.585923
Actual Evapotranspiration.......      262.509371
Change in Soil Moisture........         0.727825
Net Infiltration...............        21.305166
Runoff Generation..............         0.690760
Cumulative Daily Run-on........         0.094091
Outflow........................         0.000000
Average Mass Balance Error......    -0.998939E-13
Average Max Daily Error (mm/dy).    -0.109569E-13
```

ATTACHMENT II

LISTING OF SOURCE CODE

FOR

INFIL V. A_2a.1

This attachment contains a listing of INFIL (INFIL V. A_2a.1) that was used on the DEC ALPHA platform at Sandia National Laboratories in this analysis. The use of this code for this analysis is as unqualified. A Software Activity Plan, Software Users Request, and a copy of the executable has been submitted to the Software Secretariat.

```
      program infil2a1
c     compiled 7/26/99, p944dcaser, WinNT
c
c     program INFIL, version 2.a1
c     developers Joe Hevesi, Alan Flint, U.S Geological Survey
c     final version of test program infils5o
c*********************************************************************
**
c     modified from program INFIL, version A_2.a1
c       modified for DEC ALPHA by Ron McCurley beginning July 27, 1999
c         - added "status=unknown" to open statements
c         - modified OPEN statements with max record length
modifications
c           (i.e. 'recl=256' or 'recl=512')
c       commented out writes to unnecesary auxillary output files to
c       facilitate quicker run times (units 13, 14, *)
c*********************************************************************
**
c This is a primary tree starting at the program 'INFIL2A1'
c
c INFIL2A1-+-(ADJUSTR)
c          |
c          +-(ADJUSTL)
c          |
c          +-(ADJUSTL)
c          |
c          +-ATMOS
c          |
c          +-POTEVAP
c          |
c          +-PPTDIST
c          |
c          +-SNOW
c          |
c          +-V4CBUCK
c          |
c          +-IFR
c
c
c     max dimension = 100,000 grid cells
c     max simulation time = 400,000 days (1,095.14 years)
c
c
      integer itime,ipptdat,ia,ndays2,ncell
      integer rown,coln,edge,n2,imap
      integer irday(10),nyrout(10)
c
      integer nrockid,nsoilid,rockid,soilid
      integer maxiter,maxit,minit,iter
      integer i,dbgflag,ilocout,ndays,ndayout,depthflg,irtz,moistcr
      integer yrbeg,yrend,dnbeg,dnend,nall,tyear1,tyear2
      integer pptyuc,dbgflag2,locstart,lnumber,inumber
c
c---- temporal input file parameters
c     ppt = daily precip (mm)
c     maxairt = max daily air temp (deg C)
c     minairt = min daily air temp (deg C)
```

```
58   c     avgairt = avg daily air temp (deg C)
59   c
60         integer yr(400000),dn(400000),month(400000),day(400000)
61         double precision ppt(400000),maxairt(400000),
62        1           minairt(400000),avgairt(400000)
63         real snowdat
64   c
65   c---- variables for reading in quality flags
66   c     and station ID info included with climate input
67         character*2 dayflg
68         character*6 stcode
69         character*8 stname
70   c
71   c---- overland flow routing parameters
72         integer row(100000),col(100000),hole(100000),iwat(100000)
73         real elev(0:800,0:800)
74         double precision flowout(0:800,0:800)
75         double precision totout(0:800,0:800),totin(0:800,0:800)
76         double precision flowin(300000)
77   C
78   C---- map parameter input file variables
79         integer locid(100000),topoid(100000),
80        1        soiltype(100000),rocktype(100000)
81   c
82         double precision easting(100000),northing(100000),
83        1                 sl(100000),asp(100000)
84         double precision ridge(100000,0:36)
85         double precision lat(100000),lon(100000)
86         double precision viewfactor
87         double precision depth(100000)
88   C
89         real years
90         double precision tpet,petrs
91         double precision ssw2,avgsw2
92   c
93         double precision sbalance
94         double precision SSPPT,AVGPPT2,SSET,AVGET,SSPOND,AVGPOND
95   C
96         double precision PONDFACT,FR2FACT
97         double precision MAXPPT,SPPT,AVGELEV,MAXELEV,MINELEV,SELEV
98         double precision AVGSL,SSL,MAXSL
99         double precision pptfact2,pptfact,etfact,avgppt
100  C
101        DOUBLE PRECISION BETA(366),PG(366),WP(366),CSR(366),OZONE(366)
102        double precision TR,RD,DR,PI
103  C
104  c----- Richards eq. parameters for rock and soil types ---------
105  c      max of 300 different rock types, 20 different soil types
106        double precision ROCKCAP(0:500),ROCKRESID(0:500),ROCKPORO(0:500),
107       1     ROCKALBETA(0:500),ROCKTALPHA(0:500),ROCKKS(0:500),
108       2     ROCKPE(0:500),ROCKBVAL(0:500),ralpha(0:500),
109       3     ROCKFRACKS(0:500),POTIR(0:500),ROCKVGN(0:500),imbibe(0:500)
110
111        double precision
112  FIELDCAP(20),SOILRESID(20),SOILPORO(20),sorp(20),
113       1     SOILALBETA(20),SOILTALPHA(20),POTIS(20),salpha(20),
114       2     SOILKS(20),SOILPE(20),SOILBVAL(20),SOILPOND(20),SOILVGN(20)
```

```
c
c
c---- Dynamic root zone parameters -----------------------------
c
      integer IDPTH
      double precision RTZA(10),RTZB(10),RTZC(10),
     1                 RTZD(10),BSOIL(10),VWCF2(10)
      double precision IDPTH2
      double precision SRTZFN,BSOIL2,DELVWCF
c
c---- Thomas Algorithm parameters (after G. Camplbell) -------------
      double precision wd,gr,im2,im3
c
c---- following parameters are specific to the BUCKET model
      double precision soilvwc(100000),runoffmm(100000),
     1                infilmm(100000)
      double precision massbal,finalvwc
      double precision imb,tet,dsoilmm
      double precision totppt,tottet,totdsw,totnet,totinf,totoff,
     1          totpet,totbal
      double precision zdum(10)
      double precision z7,vwcfact
      integer locid2,year2
      double precision pptday,tetday,infday,runday,
     1                 petday,petrsday,atday,soilday
c
c
c---- new parameters
c
c     vegt = vegetation type
c     vegc = vegetation cover
c     isoild = variable soil depth option
c
      integer vegt,isoild,noutyear,stepyear
      double precision totoutc
      double precision vegc(100000)
      double precision imbfact
c
c     terms for annual summary statistics
      double precision pptyr,tetyr,dswyr,infyr,runyr,
     1                 outyr,petyr,petrsyr,atyr
      double precision airtemp
c
c---- mapping terms
c     (year = annual, aa = average annual, gaa = global)
      double precision yearppt(100000),yeartet(100000),
     1      yeardsw(100000),yearnet(100000),yearinf(100000),
     2      yearoff(100000),yearpet(100000),yearbal(100000),
     3      yearrun(100000)
c
      double precision aappt(100000),aapet(100000),aatet(100000),
     1      aadsw(100000),aainf(100000),aaoff(100000),aabal(100000),
     2      aarun(100000),aanet(100000),dayvwc(100000)
c
      double precision gaappt,gaapet,gaatet,gaadsw,gaainf,
     1            gaaoff,gaarun,gaanet,gaamb1,gaamb2
c
```

```
      double precision sdfact,avgdepth,atemp1,atemp2,ta
c
c---- new 7/12/98 (infilsda)
      integer dclass,iairtemp,ibuck2
      double precision fdepth
      double precision rockpor(100000),rockmm(100000)
      double precision cdepth(4,100000)
      double precision soilmm(3,100000)
      double precision pptloc(100000)
c
c---- added 3/29/99 (infils5d): snow-cover module terms
      double precision snowmm(100000),snowfall(100000),
     1                 rain(100000),sublim(100000)
      double precision yearrain(100000),yearsnow(100000),
     1                 yearsncv(100000),yearmelt(100000),
     +                 yearsubl(100000)
      double precision aarain(100000),aasnow(100000),aasncv(100000),
     1                      aamelt(100000),aasubl(100000)
      double precision rainyr,snowyr,sncvyr,meltyr,sublyr
      double precision melt,meltday,snowday,rainday,sncvday,sublday
      double precision gaarain,gaasnow,gaasncv,gaamelt,gaasubl
      double precision massb2(100000)
      double precision dsnowcv
      double precision trn,petrs2
      integer isnow,isnwmod,isublim
      real snopar1,subpar1,subpar2
c
      double precision xcfs,ycfs,cfsday,totout3,totout2,totflow
      integer idebug,dayn,infmod,etmod,runmod
      double precision rootf1,rootf2,rootf3,rootf4
      double precision ifrtol,rkpor,flarea
      double precision barsoil1,barsoil2,rdepthf
      double precision rdepth1,rdepth2,rdepth3,rdepth4,rkmmfact
      real hstep
      double precision maxbal(100000),massb(100000)
      double precision rinfmm1(100000),rinfmm2(100000)
      double precision yearinfr(100000),aainfr(100000)
      double precision ppttest,ettest,tsoilmm
      double precision rinfday,rinfday2,infrday
      double precision sksfact,imb2,skmm,fnd,fvegc
      double precision maxwgt1,maxwgt2,maxwgt3,maxwgt4,massbal2

      integer ippttest,iettest,ivegc

      real aaprepx
      double precision celsize
      double precision daybal,locbal,ndays5

      integer ndays4
      integer icalday
      integer optmassb
c
c---- file names
      character*20 infile,outfile,pptfile,dbgfile,flxfile
      character*20 dayall,vwcfile,outyear3,dbugout
      character*20 daymap(10)
      character*8  outyear1
```

```
229         character*3  outyear2
230         character*20 outyear(2000)
231         character*256 header,header0,header1
232   C
233   c
234   c=================================================================
235   c=============== begin main program ==============================
236   c
237   c     open control file and all I/O files
238   c
239    5    format(A)
240    6    format(1x,a100)
241   c
242
243   open(unit=7,file='infil2a1.ctl',form='formatted',status='unknown')
244         read(7,5) header
245   c
246   c     hard-wired optmassb (infil2a1, 7/23/99)
247   c     read(7,*) optmassb
248   c     optmassb = 1
249         read(7,*) irout, ifrtol
250   c
251   c     optmassb = 1 to stop runoff routing on last day of simulation
252   c     irout = 0 for de-coupled flow routing, = 1 for coupled routing
253   c     irout = -1 for no flow routing, -2 for no infiltration
254   c     ifrtol = flow routing tolerance term
255   c
256         read(7,*) isnow,isnwmod,snopar1
257         read(7,*) isublim,subpar1,subpar2
258         read(7,*) ippttest,ppttest
259         read(7,*) iettest,ettest
260         read(7,*) celsize
261   c
262   c     ippttest = 1 sets precip to constant = ppttest
263   c     iettest = 1 sets et to constant = ettest
264   c
265   c     isnow = 2 : snow module enabled
266   c     isnow = 0 : snow module dissabled
267   c     isnwmod = snow-cover model type
268   c                       >= 1 for setting et = 0 for days at freezing or
269   below
270   c                       = 2 for snow-cover mod enabled
271   c     snopar1 = model parameter
272   c
273   c     isublim = sublimation model option (0 = off, 1 = on)
274   c     subpar1 = sublimation factor
275   c
276   c     added input for generating discharge output
277   c     at user specified location 7/21/98
278         read(7,*) xcfs,ycfs
279   c
280   c     tyear option added 5/2/97 for limiting output
281   c     tyear1: controls output to screen
282   c     tyear2: controls output to file
283   c
284         read(7,*) yrbeg,dnbeg,yrend,dnend,tyear1,tyear2
285   c     read(7,*) maxiter,maxdt,mindt,maxit,minit,hstep
```

```
286   c     read(7,*) ilocout,ndayout
287   c
288   c     pptfact = daily precip scaling factor
289   c     etfact  = daily potential et scaling factor
290   c     imbfact = bedrock permeability (mm/day) scaling factor
291   c     sksfact = soil permeability scaling factor
292         read(7,*) pptfact,etfact,imbfact,sksfact
293   c
294   c     sdfact = soil depth scaling factor
295   c     rootf1 = upper cascading bucket et weighting function limit
296   c     rootf2 = 2nd cascading bucket " " " limit
297   c     rootf3 = 3rd cascading bucket " " " limit
298   c     rootf4 = lower cascading bucket " " " limit
299         read(7,*) sdfact,ivegc,fvegc
300         read(7,*) rootf1,rootf2,rootf3,rootf4
301         read(7,*) maxwgt1,maxwgt2,maxwgt3,maxwgt4
302   c
303         read(7,*) rdepth1,rdepth2,rdepth4,rdepthf
304         read(7,*) rkpor,rkmmfact,flarea
305         read(7,*) infmod,etmod,runmod
306   c
307   c     bares1 = barsoil1 soil et parameter 1
308   c     bares2 = barsoil2 soil et parameter 2
309   c     iairtemp = airtemp model type (0 = original, 1 = new)
310   c     atemp1   = average annual air temp (deg. C)
311   c     atemp2   = half amplitude of air temp deviation (deg. C)
312   c     hstep  = time step for modeling PET (hours)
313         read(7,*) barsoil1,barsoil2
314         read(7,*) iairtemp,atemp1,atemp2
315         read(7,*) hstep
316   c
317   c     pptyuc = precip spatial distribution model
318   c     aaprepx = average annual precip for site (use when pptyuc = 5)
319   c     ipptdat = input data type: 1 = stochastic simulation, 0 = data
320   c     pptfile (unit 11) = daily precip input file
321         read(7,*) pptyuc,aaprepx,ipptdat
322         read(7,5) pptfile
323   c
324         read(7,*) depthflg,irtz,delvwcf,moistcr,fracmod
325         read(7,*) ivwcflg,vwcfact
326         if(ivwcflg.eq.1) then
327            read(7,5) vwcfile
328            open(unit=16,file=vwcfile,status='unknown')
329            do II = 1,12
330               read(16,5) header0
331            enddo
332         endif
333   c
334   c     infile (unit 8) = main input file: geospatial input parameters
335         read(7,5) infile
336   c
337   c     option to re-start after crash (4/30/97)
338         read(7,*) locstart
339   c
340   c     dayall (unit 14) = daily mass balance terms averaged for all
341   points
342   c     same as screen output
```

```
343         read(7,5) Dayall
344   c
345   c     daymap(i) (unit 10) = 24-hour mass balance results for mapping
346   c     maximum 10 output files
347         read(7,*) ndaymap, imap
348         do i = 1,ndaymap
349               read(7,*) irday(i),nyrout(i)
350               read(7,5) daymap(i)
351         enddo
352   c
353   c     outfile (unit 9) = summary info and annual summary statistics
354         read(7,5) outfile
355   c
356   c     flxfile (unit 12) = average annual mass balance terms
357         read(7,5) flxfile
358   c
359   c     dbgfile (unit 13) = 2nd daily mass balance output file
360         read(7,*) dbgflag,dbgflag2
361         read(7,5) dbgfile
362   c
363   c---- added idebug option 8/2/98 to check mass balance
364   c     if idebuh = 0 then echo input parameters
365         read(7,*) idebug
366         read(7,5) dbugout
367         open(unit=23,file=dbugout,status='unknown',recl=256)
368   c
369   c---- noutyear = number of annual map files
370   c     or multi-year average map files (outyear(i) = unit 15)
371   c     mod 3/19/1999 to handle max of 1000 annual maps (INFILS5B)
372   c     ------------------------------------------------------------
373         read(7,*) outyear1
374         outyear1 = adjustr(outyear1)
375
376         if(tyear1.eq.1) then
377               stepyear = tyear2
378         else
379               stepyear = 1
380         endif
381
382         open(unit=17,file='yearfile.txt',status='unknown')
383         noutyear = 0
384
385         do i = yrbeg,yrend,stepyear
386               noutyear = noutyear + 1
387               noutyrf = noutyear
388               if(noutyear.gt.999) noutyrf = 0
389               write(17,10) noutyrf
390   10          format(i3)
391         enddo
392   c
393         rewind(17)
394
395         do i = 1,noutyear
396               read(17,5) outyear2
397               outyear2 = adjustl(outyear2)
398               outyear(i) = (outyear1//'.'//outyear2)
399   c
```

```
        enddo

        rewind(17)

        do i = 1,noutyear
              write(17,5) outyear(i)
        enddo

        close(17)
c
C
C---- read in parameters for dynamic root-zone function -------
        do i = 1,4
           read(7,5) header0
        enddo

        read(7,*) NUMDEPTH

        do I = 1,NUMDEPTH
           READ(7,*) IDPTH,IDPTH2,RTZA(IDPTH),RTZB(IDPTH),
      1             RTZC(IDPTH),RTZD(IDPTH),BSOIL(IDPTH),
      2             VWCF2(IDPTH)
        enddo
C
C---- read in soil properties data -----------
        do i = 1,4
           READ(7,5) header1
        enddo

        READ(7,*) NSOILID

        DO I = 1,NSOILID
           READ(7,*) SOILID,FIELDCAP(SOILID),SOILRESID(SOILID),
      1             SOILPORO(SOILID),SOILALBETA(SOILID),
      2             SOILTALPHA(SOILID),SOILKS(SOILID),SOILPE(SOILID),
      3             SOILBVAL(SOILID),SALPHA(soilid),SOILVGN(SOILID),
      4             SORP(SOILID),soilpond(soilid),POTIS(SOILID)
        ENDDO
C
C---- read in rock properties data -----------

        do i = 1,4
           READ(7,5) header1
        enddo

        READ(7,*) NROCKID

        DO I = 1,NROCKID
           READ(7,*) ROCKID,ROCKCAP(ROCKID),ROCKRESID(ROCKID),
      1                             ROCKPORO(ROCKID),ROCKALBETA(ROCKID),
      2             ROCKTALPHA(ROCKID),ROCKKS(ROCKID),ROCKPE(ROCKID),
      3             ROCKBVAL(ROCKID),RALPHA(rockid),ROCKVGN(ROCKID),
      4             ROCKFRACKS(ROCKID),IMBIBE(ROCKID),POTIR(ROCKID)
        ENDDO
C
c
C---- finished reading control file, write info to summary file
```

```
457   c     ------------------------------------------------------------
458         open(unit=9,file=outfile,status='unknown',recl=256)
459         write(9,6) header
460         write(*,6) header
461   c
462         write(9,15) pptfile
463         write(*,15) pptfile
464   15    format(1x, 'Daily precipitation input:             ',a20)
465   c
466         write(9,16) infile
467         write(*,16) infile
468   16    format(1x, 'Watershed modeling domain parameters:  ',a20)
469   c
470         write(9,17) dayall
471         write(*,17) dayall
472   17    format(1x, 'Average daily mass balance terms:      ',a20)
473   c
474         do i = 1,ndaymap
475               write(9,18) daymap(i)
476               write(*,18) daymap(i)
477   18    format(1x, '24-hour mass balance map:              ',a20)
478         enddo
479   c
480         outyear3 = adjustl(outyear(1))
481         write(9,19) outyear3
482         write(*,19) outyear3
483   19    format(1x, 'Annual mass balance map:               ',a20)
484   c
485         write(9,20) flxfile
486         write(*,20) flxfile
487   20    format(1x, 'Average annual mass balance map:       ',a20)
488   c
489         write(9,21) outfile
490         write(*,21) outfile
491   21    format(1x, 'Summary statistics output:             ',a20)
492   c
493         write(9,22) dbgfile
494         write(*,22) dbgfile
495   22    format(1x, 'Debugging output:                      ',a20)
496   c
497   c     dbgfile = debugging output
498         open(unit=13,file=dbgfile,status='unknown')
499   c
500   C
501   c---- read precipitation file
502   c     ND = total number of days for simulation
503   c     IPPTDAT = 1 for simulated precip input
504   c     IPPTDAT = 2 for precip input as data
505   c     PPTFILE = daily precipitation input file
506   c     mod 4/15/99 (infils5i - infils5j)
507   c     mod 3/18/99 (infils4i - infils5b)
508   c
509         open(unit=11,file=pptfile,status='unknown')
510         if(ipptdat.eq.3) then
511               do i = 1,33
512                     read(11,5) header0
513               enddo
```

```
        endif
        nd = 0
        sppt = 0.
        maxppt = 0.
80         nd = nd +1
c
c            ipptdat = 3 for reading output generated by DAILY09
             if(ipptdat.eq.3) then
               read(11,8011,end=90) icalday,yr(nd),month(nd),day(nd),
     1               dn(nd),ppt(nd),dayflg,maxairt(nd),
     2               dayflg,minairt(nd),dayflg,avgairt(nd),
     3               dayflg,snowdat,dayflg
c
8011           format(i8,i5,i3,i3,i5,6(f7.1,a3))
c
c              ipptdat = 2 for new daily climate output from DAYINP10
             else if(ipptdat.eq.2) then
                   read(11,8021,end=90) stname,stcode,yr(nd),month(nd),
     1               day(nd),dn(nd),ppt(nd),dayflg,maxairt(nd),
     2               dayflg,minairt(nd),dayflg,avgairt(nd),
     3               dayflg
c
8021           format(1x,a8,1x,a6,1x,i4,1x,i2,1x,i2,1x,i3,1x,f5.1,1x,
     1                     a2,1x,f5.1,1x,a2,
     2                  1x,f5.1,1x,a2,1x,f5.1,1x,a2)
c
c              ipptdat = 1 for output from PPTSIM
             else if(ipptdat.eq.1) then
                   read(11,*,end=90) month(nd),day(nd),yr(nd),dn(nd),
     +                               ppt(nd)
c
c            ipptdat = 0 for reading mod3-ppt.dat
                 else
                   read(11,*,end=90) yr(nd),dn(nd),ppt(nd)
               yr(nd) = 1900 + yr(nd)
               month(nd) = -9
               day(nd) = -9
               endif
C
             if((yr(nd).ge.yrend).and.(dn(nd).ge.dnend)) then
                nd = nd + 1
                goto 90
             endif
           if(yr(nd).lt.yrbeg) then
                nd = nd - 1
                goto 80
             endif
           if((yr(nd).eq.yrbeg).and.(dn(nd).lt.dnbeg)) then
                nd = nd - 1
                goto 80
           endif
           sppt = sppt + ppt(nd)
          if(maxppt.lt.ppt(nd)) maxppt = ppt(nd)
c
          goto 80
c
 90   nd = nd - 1
```

```
571   c
572         years = float(nd)/365.25
573         avgppt = sppt/years
574         write(*,95) nd,sppt,avgppt,maxppt
575         write(9,95) nd,sppt,avgppt,maxppt
576   c
577    95   format(//1X,'Total number of days read in   = ',I8,
578        2        /1X,'Total daily precip             = ',F8.1,
579        3        /1X,'Average annual precip (mm)     = ',F8.1,
580        4        /1X,'Maximum daily precip (mm)      = ',F8.1/)
581   C
582   c
583         nloc    = 1
584         ssl     = 0.
585         selev   = 0.
586         maxsl   = -99999.
587         maxelev = -99999.
588         minelev =  99999.
589         illopx = 0
590         lnumber = 0
591         inumber = 0
592         maxrow  = 0
593         maxcol  = 0
594   c
595   c
596   C---- INFILE  = site specific parameter input file
597   c     read in INFILE for parameters needed to define material
598   c     properties for Richards Eq and Et function, for
599   c     net radiation calculations, and for the BUCKET model
600   c     (either as neutron borehole data or for generating maps)
601   c     added depthclass parameter (dclass) as dummy input  7/12/98
602   c
603         ncell = 0
604         n2    = 0
605         elold = 999999
606         n = 1
607         avgdepth = 0.
608   c
609         open(unit=8,file=infile,status='unknown')
610   100   read(8,*,end=130) locid(n),easting(n),northing(n),lat(n),lon(n),
611         1
612         row(n),col(n),iwat(n),totoutc,elev(row(n),col(n)),
613        3         sl(n),asp(n),soiltype(n),
614        4         dclass,depth(n),rocktype(n),topoid(n),vegt,vegc(n),
615        5         (ridge(n,j), j=1,36)
616   c
617               if(iwat(n).ne.-3) ncell = ncell + 1
618               n2 = n2+1
619               if(elev(row(n),col(n)).gt.elold) then
620                  write(*,106) n2,elev(row(n),col(n)),elold
621   106            format(1x,'error in sequence: n2 = ',i8,'elev = ',
622        1               f8.2,'previous = ',f8.2)
623   C WARNING!!!
624                  stop
625               endif
626               elold = elev(row(n),col(n))
627               hole(n) = 0
```

```
628   c
629                 if(row(n).gt.maxrow) maxrow = row(n)
630                 if(col(n).gt.maxcol) maxcol = col(n)
631   c
632   c             catch error in input sequence (not used anymore)
633
634                 if(locid(n2).lt.locstart) goto 100
635   C
636   c             modify input parameters as needed
637                 vegc(n)  = vegc(n)/100.
638                 depth(n) = depth(n)*sdfact
639                 if(lon(n).lt.0) lon(n) = -lon(n)
640   c
641   c             calculate statistics for watershed domain
642                 if(iwat(n).ne.-3) then
643                       avgdepth = avgdepth + depth(n)
644                       ssl   = ssl + sl(n)
645                       selev = selev + elev(row(n),col(n))
646                       if (maxsl.le.sl(n)) maxsl = sl(n)
647                       if (maxelev.le.elev(row(n),col(n)))
648         1             maxelev = elev(row(n),col(n))
649                       if (minelev.ge.elev(row(n),col(n)))
650         1             minelev = elev(row(n),col(n))
651                 endif
652   c
653   c
654   c-------      set up cascading bucket layer depths
655   c             cdepth(4,n) = thickness of bedrock storage term
656   c             mod 08/28/98 INFILS4D
657   c             cdepth(1,n) = thickness of surface layer for bare-soil E
658   c             cdepth(2,n) = thickness of primary root zone
659   c             cdepth(3,n) = thickness of deep root-zone
660   c             cdepth(4,n) = thickness of bedrock root-zone
661   c
662                 if(rdepthf.ne.0.)
663          1            cdepth(4,n) = rdepth4-(depth(n)/rdepthf)
664                 if(cdepth(4,n).lt.0.) cdepth(4,n) = 0.
665   c
666                 if(depth(n).le.rdepth1) then
667                       cdepth(1,n) = depth(n)
668                       cdepth(2,n) = 0.
669                       cdepth(3,n) = 0.
670   c
671                 else if (depth(n).gt.rdepth1.and.depth(n).le.rdepth2) then
672                       cdepth(1,n) = rdepth1
673                       cdepth(2,n) = depth(n)-rdepth1
674                       cdepth(3,n) = 0.
675   c
676                 else if (depth(n).gt.rdepth2) then
677                       cdepth(1,n) = rdepth1
678                       cdepth(2,n) = rdepth2-rdepth1
679                       cdepth(3,n) = depth(n)-rdepth2
680   c
681                 endif
682   c
683                 n = n + 1
684   c
```

```
685         goto 100
686   c
687   c
688   130   n = n - 1
689         rown = maxrow
690         coln = maxcol
691         nloc    = n
692         avgsl   = ssl/ncell
693         avgelev = selev/ncell
694         avgdepth = avgdepth/ncell
695   C
696         write(*,135) NLOC,AVGELEV,MAXELEV,MINELEV,avgdepth,
697         1                    AVGSL,MAXSL,NCELL
698         write(9,135) NLOC,AVGELEV,MAXELEV,MINELEV,avgdepth,
699         1                       AVGSL,MAXSL,NCELL
700    135  format(/1X,'TOTAL NUMBER OF LOCATIONS    = ',I8,
701        1       /1X,'AVERAGE ELEVATION OF SAMPLE  = ',F8.1,
702        2       /1X,'MAXIMUM ELEVATION OF SAMPLE  = ',F8.1,
703        3       /1X,'MINIMUM ELEVATION OF SAMPLE  = ',F8.1,
704         4       /1x,'AVERAGE SOIL DEPTH (M)       = ',f8.3,
705        5       /1X,'AVERAGE SLOPE OF SAMPLE      = ',F8.1,
706        6       /1X,'MAXIMUM SLOPE OF SAMPLE      = ',F8.1,
707        7       /1X,'NUMBER OF ACTIVE LOCATIONS   = ',I8,//)
708   c
709   c     pause
710   c
711   c     write header line for annual summary output
712         write(9,141)
713   141   format(3x,'Yr',2x,'Dy',4x,'Precip',6x,'Rain',6x,'Snow',
714        1             2x,'Sn-cover',2x,'Snowmelt',4x,'Sublim',7x,'PET',
715        2             5x,'PETRS',2x,'Evapotrs',2x,'Del-soil',
716        3             3x,'Net-inf',4x,'Runoff',2x,'Out-flow',
717        4             4x,'Mass-balance')
718   c
719   C
720   C------ Added VWCFILE for inputting finalvwc from
721   c       previous simulation as initial conditions for
722   c       next simulation
723   c       Format for VWCFILE (*.dx1) is:
724   c          zz(1) = ppt
725   c          zz(2) =
726   C
727   c**** modified following on 4/30/97 to allow re-start option
728         if(ivwcflg.eq.1) then
729            read(16,*) locid2,year2,(zdum(jj),jj=1,6),z7
730             if(locid2.ne.locid(nloc)) then
731                  write(*,137) locid2,locid(nloc)
732    137         format(/1x,'WARNING!!! locid2= ',i8,2x,'locid= ',i8/)
733             endif
734         endif
735   C
736   c     --------------------------------
737   c==== Finished reading all input files ============================
738   c     --------------------------------
739   c
740   c---- initialize constants
741   c
```

```
742   C     DR  = degrees to radians conversion
743   c     RD  = radians to degrees conversion
744   c     GR  = gravitational accelleration (m/s)
745   c     PI  = pie
746   c     WD  = water mass to volume conversion term (water density factor)
747   c
748         dr    = 0.0174533
749         rd    = 57.29579
750         pi    = 3.141592654
751         gr    = 9.8
752         wd    = 1000.
753   c
754   c
755   c---- initialize terms
756   c
757         tpet         = 0.
758         tet          = 0.
759         dsoilmm      = 0.
760         massbal      = 0.
761         totppt = 0.
762         tottet = 0.
763         totdsw = 0.
764         totnet = 0.
765         totinf = 0.
766         totoff = 0.
767         totpet = 0.
768         totbal = 0.
769   c
770         sbalance = 0.
771         noutyr  = 0
772   c
773         pptyr  = 0.
774         rainyr = 0.
775         snowyr = 0.
776         sncvyr = 0.
777         meltyr = 0.
778         sublyr = 0.
779         atyr  = 0.
780         petyr  = 0.
781         petrsyr = 0.
782         tetyr  = 0.
783         dswyr  = 0.
784         infyr  = 0.
785         rinfyr = 0.
786         runyr  = 0.
787         outyr  = 0.
788   c
789         pptday  = 0.
790         rainday = 0.
791         snowday = 0.
792         sncvday = 0.
793         meltday = 0.
794         sublday = 0.
795         atday   = 0.
796         tetday  = 0.
797         petday  = 0.
798         petrsday = 0.
```

```
799         soilday  = 0.
800         infday   = 0.
801         runday   = 0.
802         rinfday  = 0.
803         rinfday2 = 0.
804         runinf   = 0.
805         infrday  = 0.
806
807   c
808   c     -------------------------------------------------------
809   C==== Loop through all locations for initializing parameters
810   ===========
811   C     -------------------------------------------------------
812   C
813         do 150 ia = 1,nloc
814   C
815   c           initialize water balance terms
816               pptloc(ia)   = 0.
817               infilmm(ia)  = 0.
818               runoffmm(ia) = 0.
819               rockmm(ia)   = 0.
820               snowmm(ia)   = 0.
821               rain(ia)     = 0.
822               snowfall(ia) = 0.
823               sublim(ia)   = 0.
824               maxbal(ia)   = 0.
825   c
826   c           initial vwc determined by residual VWC and vwcfact
827               soilvwc(ia)  = soilresid(soiltype(ia))*vwcfact
828               if((ivwcflg.eq.1).and.(locid(ia).eq.locid2))
829        1       soilvwc(ia) = z7
830   c
831   c           set initial conditions for 3 soil layers
832   c           in cascading bucket (v4cbuck)
833               do i = 1,3
834                     soilmm(i,ia) = soilvwc(ia)*cdepth(i,ia)*1000.
835               enddo
836
837   c           generate soil conductivities for mapping
838   c           (conversion from kg sec / m^3 to mm/day
839               skmm = soilks(soiltype(ia))*86400*9.8
840               imb2 = imbibe(rocktype(ia))*365.25
841   c
842   c           calculate storage capacities for output
843               scapmm1 = (soilporo(soiltype(ia))
844         1           -soilresid(soiltype(ia)))*cdepth(1,ia)*1000.
845               scapmm2 = (soilporo(soiltype(ia))
846         1           -soilresid(soiltype(ia)))*cdepth(2,ia)*1000.
847               scapmm3 = (soilporo(soiltype(ia))
848         1           -soilresid(soiltype(ia)))*cdepth(3,ia)*1000.
849               rkmm = rkpor*cdepth(4,ia)*1000.
850               scapmmt = scapmm1 + scapmm2 + scapmm3 + rkmm
851   c
852   c
853   c           generate map file to check watershed parameters
854   c           SCAPMMT = total water storage capacity
855               if(idebug.eq.0) then
```

```
                 if(iwat(ia).ne.-3) then
                   write(23,107) easting(ia),northing(ia),ia,
      1                  row(ia),col(ia),elev(row(ia),col(ia)),sl(ia),
      2
depth(ia),cdepth(1,ia),cdepth(2,ia),cdepth(3,ia),
      3                  cdepth(4,ia),soiltype(ia),skmm,
      +                soilresid(soiltype(ia)),
      4                  fieldcap(soiltype(ia)),soilporo(soiltype(ia)),
      5                  scapmm1,scapmm2,scapmm3,rkmm,scapmmt,
      6                  rocktype(ia),imbibe(rocktype(ia)),imb2
c
107              format(1x,2f11.1,i8,2i5,f7.1,f5.1,5f8.3,
       1                i5,f9.3,3f7.4,5(1x,f9.4),i5,f12.7,f12.4)
                 endif
               endif
c
               yearppt(ia) = 0.
               yearrain(ia) = 0.
               yearsnow(ia) = 0.
               yearsncv(ia) = 0.
               yearmelt(ia) = 0.
               yearsubl(ia) = 0.
               yeartet(ia) = 0.
               yeardsw(ia) = 0.
               yearnet(ia) = 0.
               yearinf(ia) = 0.
               yearoff(ia) = 0.
               yearpet(ia) = 0.
               yearbal(ia) = 0.
               yearrun(ia) = 0.
c
               aappt(ia) = 0.
               aarain(ia) = 0.
               aasnow(ia) = 0.
               aasncv(ia) = 0.
               aamelt(ia) = 0.
               aasubl(ia) = 0.
               aatet(ia) = 0.
               aadsw(ia) = 0.
               aapet(ia) = 0.
               aanet(ia) = 0.
               aainf(ia) = 0.
               aaoff(ia) = 0.
               aarun(ia) = 0.
               aainfr(ia) = 0.
c
c
 150   continue
C
C
c     ----------------------------------------------------
C==== SET DAILY ATMOSPHERIC PARAMETERS FOR YUCCA MOUNTAIN
================
C     ----------------------------------------------------
      call atmos(ozone,wp,beta,csr,pg)
C
c     ---------------------------------
```

```
913   C==== FINISHED INITIALIZATION PROCEDURE
914   ==================================
915   c     ---------------------------------
916   c
917   c
918   c     Dayall = daily mass balance terms averaged for all points
919   c     (same as screen output)
920         open(unit=14,file=Dayall,status='unknown',recl=512)
921   c
922   c     write header info
923         write(14,161)
924   161   format(3x,'day',1x,'year',1x,'mo',1x,'dy',1x,'day',
925        1            2x,'temp',10x,'precip',11x,'rain',6x,'snow-fall',
926        2            5x,'snow-cover',6x,'snow-melt',4x,'sublimation',
927        3            4x,'pot-evaptrs',
928        3            4x,'evapo-trans',6x,'run-infil',7x,'del-soil',
929        4            6x,'net-infil',9x,'runoff',9x,'run-on',
930        5            6x,'fract-inf',3x,'it',2x,'discharge-#1',
931        6            4x,'discharge-#2',4x,'mass-balance',
932        7            4x,'mass-balance 2')
933   c
934   c
935   c     --------------------------
936   C==== BEGIN LOOPING THROUGH DAYS ==================================
937   c     --------------------------
938   c
939   c     J                 = simulation day number
940   c     ND                = total simulation time in days
941   c     IA             = location ID
942   c     MLOC        = total number of locations
943   c     NDAYS       = counter for spyglass output increment
944   c     ndays2      = counter for annual and mult-year output
945   c     ndays3      = number of days in year
946   C
947         ndays   = 0
948         ndays2  = 0
949         ndays3  = 0
950         ndays4  = 0
951         ndays5  = 0.
952         jold    = 0
953   c
954   c
955         do 4000 j = 1,nd
956            ndays2 = ndays2 + 1
957               ndays3 = ndays3 + 1
958   c
959   c           initialize runoff terms for each day
960               do 250 i = 1,nloc
961                 flowout(row(i),col(i)) = 0.
962                 flowin(locid(i))             = 0.
963                 totout(row(i),col(i))  = 0.
964                 totin(row(i),col(i))   = 0.
965   250         continue
966   C
967   c           ----------------------------------------
968   C======= LOOP THROUGH ALL LOCATIONS FOR EACH DAY
969   =======================
```

```
970   C           ---------------------------------------
971             do 3000 ia = 1,nloc
972   c
973                       tpet = 0.
974   c
975   c                   bypass outer boundary for flow routing logic (7/1/97)
976                       if(iwat(ia).eq.-3) goto 3000
977   c
978   C                   call subroutine for calculating solar radiation,
979   c                   net radiation, and potential evapotranspiration
980   c                   -----------------------------------------------------
981   -------
982                       call potevap (j,ia,dn,lat,lon,sl,asp,ridge,elev,
983        1                    dr,rd,pi,hstep,beta,pg,csr,wp,ozone,viewfactor,
984        2                    tr,tpet,row,col,atemp1,atemp2,avgairt,
985        3                    airtemp,iairtemp,trn)
986   c
987   c
988   c                   Call subroutine for spatially distributing daily
989   precip totals
990   c                   PPTLOC = average daily precip for each grid cell
991   c                   Use IPPTEST = 1 for mass balance testing
992   c                   mod 3/19/1999 aaprepx = average annual precip for
993   area
994   C                   of potential repository
995   c                   (used for scaling precip - elevation model)
996   c                   -----------------------------------------------------
997   -------
998                       call pptdist(ia,elev,pptfact,avgppt,pptyuc,pptfact2,
999        1                           row,col,pptloc,ppt,j,aaprepx)
1000                      if(ippttest.eq.1) pptloc(ia) = ppttest
1001  c
1002  c
1003  c                   Adust potential ET if precipitation occurs to account
1004  c                   for increased cloud cover and humidity (assumed
1005  function).
1006  c                   PETRS  = total daily potential evapotranspiration,
1007  c                   TPET   = advective term adjusted daily PET
1008  c                   Use IETEST = 1 to set PET to constant for testing
1009  c                   -----------------------------------------------------
1010  -------
1011                      petrs  = tpet/(((4*pptloc(ia))/25.4)+1)*etfact
1012  c
1013                      if(petrs.lt.0.) petrs = 0.
1014                      if(iettest.eq.1) petrs = ettest
1015                      petrs2 = petrs
1016                      tpet   = petrs*1.26
1017  c
1018  c                   added snow-cover module 3/29/99 (infils5d)
1019                      sublim(ia) = 0.
1020                      dsnowcv = 0.
1021                      melt = 0.
1022                      if(isnow.eq.2) then
1023                            call snow(ia,airtemp,snowmm,snopar1,
1024       1                          pptloc,rain,snowfall,melt,dsnowcv,
1025       2
1026        isublim,subpar1,sublim,tpet,isnwmod,trn,subpar2)
```

```
1027                    else
1028                          melt = 0.
1029                    endif
1030   c
1031   c                mod 4/1/99 (infils5i)
1032   c                if sublimation occurring, reduce trans for soil
1033   moisture
1034   c                if airtemp < 0 deg C, turn off et from soil and
1035   bedrock
1036   c                petrs2 = potential et term used by infil module
1037                    if(isnwmod.gt.0) then
1038                          if(sublim(ia).gt.0) petrs2 = petrs - sublim(ia)
1039                          if(petrs2.lt.0) petrs2 = 0.
1040                          if(airtemp.le.0) petrs2 = 0.
1041                    endif
1042   c
1043   c
1044   c---------- Call bucket for determining soil moisture,
1045   c                et, net infil, and runoff
1046   c                Use irout = -2 to bypass infiltration module for
1047   testing
1048   c                added melt term 3/29/99 for snow-melt term (infils5d)
1049   c                -----------------------------------------------------
1050   ---
1051                    if(irout.ne.-2) then
1052                call v4cbuck(j,dn,ia,soiltype,rocktype,ivegc,fvegc,
1053        1                 soilporo,fieldcap,imbibe,imb,soilks,sksfact,
1054        2                 soilalbeta,soiltalpha,soilresid,
1055        3                 pptloc,petrs,sorp,dsoilmm,tet,infilmm,
1056        4                 runoffmm,maxwgt1,maxwgt2,maxwgt3,maxwgt4,
1057        5                 massbal,finalvwc,soilmm,imbfact,
1058        6                 ibuck2,fdepth,rockpor,cdepth,rockmm,
1059        7                 rootf1,rootf2,rootf3,rootf4,idebug,
1060        8                 barsoil1,barsoil2,vegc,rocktalpha,rockalbeta,
1061        9
1062         rkmmfact,rkpor,infmod,etmod,rinfmm1,rinfmm2,melt,
1063        1                 snowmm,snowfall,rain,petrs2)
1064   c
1065                    else
1066                          runoffmm(ia) = pptloc(ia)
1067
1068                    endif
1069   c
1070   c---------- daily mass balance check for each location
1071                massbal = rain(ia)+snowfall(ia)-tet-dsoilmm-runoffmm(ia)
1072        1                      -infilmm(ia)-dsnowcv-sublim(ia)+rinfmm1(ia)
1073                locbal  = pptloc(ia)-rain(ia)-snowfall(ia)
1074   c
1075   c                find maximum mass balance error for each location
1076                if(abs(massbal).gt.abs(maxbal(ia))) maxbal(ia) = massbal
1077   c
1078   c
1079   c---------- if runoff generated, set up flow routing terms
1080   c                use irout = -1 to prevent flow routing
1081   c                use irout = 0 to de-couple flow routing and
1082   infiltration
1083   c                mod infils5o (5/12/99)
```

```
1084   c                 do not perform flow-routing on last day of simulation
1085                 optmassb = 1
1086                 if(((yr(j).eq.yrend).and.(dn(j).eq.dnend)).and.
1087        1              (optmassb.eq.1)) irout = -1
1088                 if(irout.ne.-1) then
1089                       flowout(row(ia),col(ia)) = runoffmm(ia)
1090                 else
1091                       flowout(row(ia),col(ia)) = 0.
1092                 endif
1093                 totflow     = totflow+flowout(row(ia),col(ia))
1094                 rinfmm1(ia) = 0.
1095   c
1096   c
1097   c                 sum daily results for all locations
1098   c                 to calculate spatially averaged daily mass balance
1099   c                 and total daily mass balance
1100                     pptday   = pptday + pptloc(ia)
1101                     rainday  = rainday + rain(ia)
1102                     snowday  = snowday + snowfall(ia)
1103                     sncvday  = sncvday + snowmm(ia)
1104                     meltday  = meltday + melt
1105                     sublday  = sublday + sublim(ia)
1106                     atday    = atday + airtemp
1107                     petday   = petday + tpet
1108                     petrsday = petrsday + petrs
1109                     tetday   = tetday + tet
1110                     soilday  = soilday + dsoilmm
1111                     infday   = infday + infilmm(ia)
1112                     runday   = runday + runoffmm(ia)
1113                     dayvwc(ia)  = soilmm(1,ia)
1114   c
1115   c---------- calc annual totals for each location for map output
1116                     yearppt(ia)  = yearppt(ia) + pptloc(ia)
1117                     yearrain(ia) = yearrain(ia) + rain(ia)
1118                     yearsnow(ia) = yearsnow(ia) + snowfall(ia)
1119                     yearsncv(ia) = yearsncv(ia) + snowmm(ia)
1120                     yearmelt(ia) = yearmelt(ia) + melt
1121                     yearsubl(ia) = yearsubl(ia) + sublim(ia)
1122                     yearpet(ia)  = yearpet(ia) + tpet
1123   c                 yearpet(ia)  = yearpet(ia) + petrs
1124                     yeartet(ia)  = yeartet(ia) + tet
1125                     yeardsw(ia)  = yeardsw(ia) + dsoilmm
1126                     yearinf(ia)  = yearinf(ia) + infilmm(ia)
1127                     yearoff(ia)  = yearoff(ia) + runoffmm(ia)
1128                     yearbal(ia)  = yearbal(ia) + massbal
1129                     totbal       = totbal + yearbal(ia)
1130   c
1131   c
1132    3000        continue
1133   C
1134   c------- If runoff is generated then distribute runoff
1135   C            at end of day using surface flow routing
1136   C            ------------------------------------------------------------
1137                 rinfday2 = rinfday
1138                 rinfday = 0.
1139                 infrday = 0.
1140                 iter = 0
```

```
1141   c           if(totflow.gt.0.000000001) then
1142         if(totflow.gt.0.) then
1143               jifr = j
1144               call ifr(nloc,row,col,flowout,rinfmm1,rinfmm2,
1145        1                  soilporo,fieldcap,soiltype,soilmm,
1146        2                  soilvwc,buckmm,irout,imap,dn,j,
1147        3                  soilks,sksfact,rown,coln,totout2,totout,
1148        4                  iter,iwat,locid,nrun,cdepth,
1149        5                  imbibe,imbfact,rocktype,rockmm,
1150        6                  easting,northing,xcfs,ycfs,cfsday,idebug,
1151        7                  ifrtol,rkpor,rkmmfact,infilmm,flarea,
1152        8                  infmod,pptloc)
1153   c
1154   c
1155               do i = 1,nloc
1156                     yearrun(i)  = yearrun(i) + totout(row(i),col(i))
1157                     rinfday        = rinfday + rinfmm1(i)
1158                     infrday     = infrday + rinfmm2(i)
1159                     yearinfr(i) = yearinfr(i) + rinfmm2(i)
1160                     yearinfr(i) = yearinfr(i) + rinfmm1(i)
1161
1162               enddo
1163         endif
1164         totflow = 0.
1165   C
1166   c
1167   c------- calc annual totals and write output to map files
1168   c           ------------------------------------------------------------
1169   ---
1170         if((yr(j+1).gt.yr(j)).or.
1171        1      ((yr(j).eq.yrend).and.(dn(j).eq.dnend))) then
1172               ndays4 = ndays3
1173               ndays3 = 0
1174               nall   = nall + 1
1175   c
1176               if(tyear1.eq.0) then
1177                     noutyr = noutyr + 1
1178                     open(unit=15,file=outyear(noutyr),
1179        +                       status='unknown',recl=512)
1180   c
1181   c                 write header line
1182                     write(15,181)
1183   181               format(5x,'easting',3x,'northing',7x,'precip',
1184        1                 9x,'rain',5x,'snowfall',4x,'snowcover',
1185        2                 5x,'snowmelt',2x,'sublimation',4x,'evapotrns',
1186        3                 5x,'del-soil',4x,'net-infil',4x,'run-infil',
1187        4                 7x,'runoff',8x,'run-on',10x,'PET',
1188        5                 6x,'mass-balance')
1189   c
1190                          do 3011 i = 1,nloc
1191                                if(iwat(i).eq.-3) goto 3011
1192   c
1193                   write(15,180)  easting(i),northing(i),yearppt(i),
1194        1                         yearrain(i),yearsnow(i),yearsncv(i),
1195        2                         yearmelt(i),yearsubl(i),
1196        3                         yeartet(i),yeardsw(i),
1197        4                           yearinf(i),yearinfr(i),yearoff(i),
```

```
1198        5                        yearrun(i),yearpet(i),yearbal(i)
1199    180              format(1x,2f11.1,1x,
1200        1                   7(f12.6,1x),4(f12.4,1x),
1201        2                   f14.4,1x,f12.4,2x,g16.9)
1202   c
1203                aappt(i) = aappt(i) + yearppt(i)
1204         aarain(i) = aarain(i) + yearrain(i)
1205         aasnow(i) = aasnow(i) + yearsnow(i)
1206         aasncv(i) = aasncv(i) + yearsncv(i)
1207         aamelt(i) = aamelt(i) + yearmelt(i)
1208         aasubl(i) = aasubl(i) + yearsubl(i)
1209           aatet(i) = aatet(i) + yeartet(i)
1210           aadsw(i) = aadsw(i) + yeardsw(i)
1211         aapet(i) = aapet(i) + yearpet(i)
1212   c                             aapetrs(i) = aapetrs(i) + yrpetrs(i)
1213   c                       aanet(i) = aanet(i) + yearnet(i)
1214           aainf(i) = aainf(i) + yearinf(i)
1215           aaoff(i) = aaoff(i) + yearoff(i)
1216         aarun(i) = aarun(i) + yearrun(i)
1217         aainfr(i) = aainfr(i) + yearinfr(i)
1218   c                       totbal = totbal + yearbal(i)
1219   c
1220           yearppt(i) = 0.
1221         yearrain(i) = 0.
1222         yearsnow(i) = 0.
1223         yearsncv(i) = 0.
1224         yearmelt(i) = 0.
1225         yearsubl(i) = 0.
1226           yeartet(i) = 0.
1227         yearpet(i) = 0.
1228   c                             yrpetrs(i) = 0.
1229           yeardsw(i) = 0.
1230   c                       yearnet(i) = 0.
1231           yearinf(i) = 0.
1232           yearoff(i) = 0.
1233           yearbal(i) = 0.
1234           yearrun(i) = 0.
1235         yearinfr(i) = 0.
1236   c
1237   3011  continue
1238   c
1239         close(15)
1240         ndays2 = 0.
1241   c
1242   c
1243   c-------- calc annual averages for multi-year periods (using 365.25
1244   days/yr)
1245   c            write output to map files
1246   c            ------------------------------------------------------------
1247   ----
1248                       else if(((tyear1.eq.1).and.(nall.eq.tyear2)).or.
1249        1              ((yr(j).eq.yrend).and.(dn(j).eq.dnend))) then
1250                             noutyr = noutyr + 1
1251                             OPEN(UNIT=15,file=outyear(noutyr),
1252        +                                 status='unknown',recl=512)
1253   c
1254   c                         write header line
```

```
                         write(15,181)
c181                     format(5x,'easting',3x,'northing',4x,'precip',
c     1
      8x,'rain',4x,'snowfall',3x,'snowcover',
c     2
      4x,'snowmelt',1x,'sublimation',3x,'evapotrns',
c     3                            4x,'del-soil',3x,'net-
infil',3x,'run-infil',
c     4                            6x,'runoff',6x,'run-on',9x,'PET',
c     5                            1x,'massbalance')
c
                         ndays5 = float(ndays2)
                         do 3012 i = 1,nloc
                               if(iwat(i).eq.-3) goto 3012
c
      aappt(i) = aappt(i) + yearppt(i)
      aarain(i) = aarain(i) + yearrain(i)
      aasnow(i) = aasnow(i) + yearsnow(i)
      aasncv(i) = aasncv(i) + yearsncv(i)
      aamelt(i) = aamelt(i) + yearmelt(i)
      aasubl(i) = aasubl(i) + yearsubl(i)
      aatet(i) = aatet(i) + yeartet(i)
c                        aapetrs(i) = aapetrs(i) + yrpetrs(i)
      aadsw(i)  = aadsw(i) + yeardsw(i)
      aapet(i)  = aapet(i) + yearpet(i)
      aanet(i)  = aanet(i) + yearnet(i)
      aainf(i)  = aainf(i) + yearinf(i)
      aaoff(i)  = aaoff(i) + yearoff(i)
      aarun(i)  = aarun(i) + yearrun(i)
      aainfr(i) = aainfr(i) + yearinfr(i)
c
      yearppt(i) = (yearppt(i)/ndays5)*365.25
      yearrain(i) = (yearrain(i)/ndays5)*365.25
      yearsnow(i) = (yearsnow(i)/ndays5)*365.25
      yearsncv(i) = (yearsncv(i)/ndays5)*365.25
      yearmelt(i) = (yearmelt(i)/ndays5)*365.25
      yearsubl(i) = (yearsubl(i)/ndays5)*365.25
      yearpet(i) = (yearpet(i)/ndays5)*365.25
      yeartet(i) = (yeartet(i)/ndays5)*365.25
      yeardsw(i) = (yeardsw(i)/ndays5)*365.25
      yearinf(i) = (yearinf(i)/ndays5)*365.25
      yearoff(i) = (yearoff(i)/ndays5)*365.25
      yearbal(i) = (yearbal(i)/ndays5)*365.25
      yearrun(i) = (yearrun(i)/ndays5)*365.25
      yearinfr(i) = (yearinfr(i)/ndays5)*365.25
c                        totbal = totbal + yearbal(i)
c
c
         write(15,180)  easting(i),northing(i),yearppt(i),
     1                  yearrain(i),yearsnow(i),yearsncv(i),
     2                  yearmelt(i),yearsubl(i),
     3                  yeartet(i),yeardsw(i),
     4                  yearinf(i),yearinfr(i),yearoff(i),
     5                  yearrun(i),yearpet(i),yearbal(i)
c     6                                                     dayvwc(i)
c
c                 write(15,180)  easting(i),northing(i),
```

```
1312   c     1                           yearppt(i),yeartet(i),yeardsw(i),
1313   c     2                           yearinf(i),yearinfr(i),yearoff(i),
1314   c     3
1315         yearrun(i),yearpet(i),dayvwc(i)
1316   c
1317   c
1318                           yearppt(i) = 0.
1319                                 yearrain(i) = 0.
1320                                 yearsnow(i) = 0.
1321                                 yearsncv(i) = 0.
1322                                 yearmelt(i) = 0.
1323                                 yearsubl(i) = 0.
1324                           yeartet(i) = 0.
1325                           yearpet(i) = 0.
1326   c                             yrpetrs(i) = 0.
1327                           yeardsw(i) = 0.
1328                           yearnet(i) = 0.
1329                           yearinf(i) = 0.
1330                           yearoff(i) = 0.
1331                           yearbal(i) = 0.
1332                                 yearrun(i) = 0.
1333                                 yearinfr(i) = 0.
1334   c
1335   c
1336   3012                    continue
1337                           close(15)
1338                           nall   = 0
1339                           ndays5 = 0.
1340                           ndays2 = 0.
1341   c
1342                     endif
1343             endif
1344   C
1345   C------- calculate global average daily mass balance terms
1346                pptday   = pptday/float(ncell)
1347                rainday  = rainday/float(ncell)
1348                snowday  = snowday/float(ncell)
1349                sncvday  = sncvday/float(ncell)
1350                meltday  = meltday/float(ncell)
1351                sublday  = sublday/float(ncell)
1352   c
1353                atday    = atday/float(ncell)
1354                petday   = petday/float(ncell)
1355                tetday   = tetday/float(ncell)
1356                petrsday = petrsday/float(ncell)
1357                soilday  = soilday/float(ncell)
1358                infday   = infday/float(ncell)
1359                runday   = runday/float(ncell)
1360                totout3  = totout2/float(ncell)
1361                rinfday2    = rinfday2/float(ncell)
1362                infrday  = infrday/float(ncell)
1363   c
1364   c
1365   c------- calculate total daily discharge in cfs
1366   c            at user specified location (hard-wired for 30-meter grid)
1367   c            mod 3-21-1999 to use celsize from control file (infils5c)
1368   c
```

```
1369         totout2  = totout2/1000*celsize*celsize*(3.281**3.)/24/60/60
1370         cfsday   = cfsday/1000*celsize*celsize*(3.281**3.)/24/60/60
1371   c
1372   c
1373   c           calculate global average daily mass balance
1374         massbal2 = pptday+rinfday2-tetday-soilday-infday
1375        1            -runday-snowday+meltday
1376   c
1377               daybal = pptday - rainday - snowday
1378   c
1379               jold     = j
1380   c
1381   C****Comment out writes to unnecesary files for uncertainty analysis
1382   c
1383   c------- output global average daily mass balance terms
1384   c           mod to output formats 3/19/1999 (infils5b)
1385   C*          write(14,692) j,yr(j),month(j),day(j),dn(j),
1386   C*     1    atday,pptday,rainday,snowday,sncvday,meltday,
1387   C*     2    sublday,petrsday,
1388   C*     3    tetday,rinfday2,soilday,infday,runday,totout3,infrday,
1389   C*     4    iter,totout2,cfsday,massbal2,daybal
1390   c
1391   692         format(1x,i5,1x,i4,i3,i3,i4,1x,f5.1,1x,
1392        1                  14f15.9,1x,i3,3(1x,g15.9),3x,g15.9)
1393   c
1394   C*    write(*,693) yr(j),dn(j),pptday,atday,sncvday,petrsday,
1395   C*     1               tetday,rinfday2,soilday,infday,runday,totout3
1396   c
1397   c693        format(1x,i4,i4,f8.2,f5.0,2f6.2,2f8.2,3f8.2,1x,i2)
1398   693         format(1x,i4,i4,f6.1,f5.0,f6.1,2f5.1,2f7.1,3f7.1)
1399   c
1400   C*    write(13,694) j,yr(j),dn(j),pptday,atday,petday,petrsday,
1401   C*     1    tetday
1402   c
1403   694         format(1x,i5,i5,i4,f12.7,2x,f7.3,3f12.7)
1404   c
1405   c
1406   c------- sum global average daily mass balance for annual mass balance
1407   c           ------------------------------------------------------------
1408   --
1409               pptyr  = pptyr + pptday
1410               rainyr = rainyr + rainday
1411               snowyr = snowyr + snowday
1412               sncvyr = sncvyr + sncvday
1413               meltyr = meltyr + meltday
1414               sublyr = sublyr + sublday
1415   c
1416               atyr    = atyr + atday
1417               petyr   = petyr + petday
1418               petrsyr = petrsyr + petrsday
1419               tetyr   = tetyr + tetday
1420               dswyr   = dswyr + soilday
1421               infyr   = infyr + infday
1422               rinfyr  = rinfyr + rinfday
1423               runyr   = runyr + runday
1424               outyr   = outyr + totout3
1425               soutyr  = soutyr + totout3
```

```
1426   c
1427                pptday   = 0.
1428                rainday = 0.
1429                snowday = 0.
1430                sncvday = 0.
1431                meltday = 0.
1432                sublday = 0.
1433                atday    = 0.
1434                petday   = 0.
1435                petrsday = 0.
1436                tetday   = 0.
1437                soilday  = 0.
1438                infday   = 0.
1439   c            rinfday  = 0.
1440                runday   = 0.
1441                totout2  = 0.
1442                totout3  = 0.
1443                cfsday   = 0.
1444                iter     = 0
1445   c
1446             if((yr(j+1).gt.yr(j)).or.
1447        1    ((yr(j).eq.yrend).and.(dn(j).eq.dnend))) then
1448   c
1449   c                  atyr = atyr/365.25
1450   c                  write(9,305)
1451   yr(j),pptyr,atyr,petyr,petrsyr,tetyr,dswyr,
1452   c     1            infyr,runyr,outyr
1453   c305               format(1x,i4,9(1x,f9.3))
1454   c
1455                write(9,305) yr(j),ndays4,pptyr,rainyr,snowyr,sncvyr,
1456        1             meltyr,sublyr,
1457        2             petyr,petrsyr,tetyr,dswyr,
1458        3             infyr,runyr,outyr,totbal
1459   305                format(1x,2i4,13(1x,f9.3),2x,g16.9)
1460   c
1461                      pptyr  = 0.
1462                      rainyr = 0.
1463                      snowyr = 0.
1464                      sncvyr = 0.
1465                      meltyr = 0.
1466                      sublyr = 0.
1467                      atyr = 0.
1468                      petyr = 0.
1469                      petrsyr = 0.
1470                      tetyr  = 0.
1471                      dswyr  = 0.
1472                      infyr  = 0.
1473                      runyr  = 0.
1474                      outyr  = 0.
1475                      totbal = 0.
1476   c
1477                endif
1478   c
1479   c
1480   c------- print map output for daily results
1481   c            -------------------------------------------------------------
1482         ndayout = ndaymap
```

```
1483         do i = 1,ndayout
1484               if((dn(j).eq.irday(i)).and.(yr(j).eq.nyrout(i))) then
1485                          open(unit=10,file=daymap(i),
1486        +                                status='unknown')
1487               do 1292 iii = 1,nloc
1488               if(iwat(iii).eq.-3) goto 1292
1489   c                 bckvwc = buckmm(iii)/depth(iii)/1000.
1490                     write(10,1291) easting(iii),northing(iii),j,
1491        1                pptloc(iii),soilmm(1,iii),soilmm(2,iii),
1492        2                soilmm(3,iii),rockmm(iii),
1493        2                infilmm(iii),runoffmm(iii),
1494        2                totout(row(iii),col(iii))
1495   c
1496   1292        continue
1497   1291        format(1x,f10.1,f11.1,1x,i5,7(1x,f10.4),1x,f16.4)
1498   c
1499               close(10)
1500               endif
1501               enddo
1502   C
1503   C
1504   C/////// end of day loop, go to next day ////////////////////////
1505   C=================================================================
1506   c
1507   3900  continue
1508   4000  continue
1509   4900  continue
1510   c
1511   c
1512   c---- calculate annual averages and write to ouput
1513   c     ---------------------------------------------
1514   c     flxfile = mapping file fo average annual mass balance terms
1515         open(unit=12,file=flxfile,status='unknown',recl=256)
1516   c
1517   c     write header line
1518         write(12,4915)
1519   4915  format(5x,'easting',3x,'northing',1x,7x,'precip',9x,'rain',
1520        1                4x,'snow-fall',3x,'snow-cover',4x,'snow-melt',
1521        2                2x,'sublimation',
1522        2                3x,'evapotrans',4x,'run-infil',5x,'del-soil',
1523        3                4x,'net-infil',7x,'runoff',11x,'run-on',
1524        4                5x,'mass-balance',6x,'max-balance',
1525        5                2x,'mass-balance #2')
1526   c
1527   c
1528   c     initialize summary statistics for global averages
1529         gaappt = 0.
1530         gaarain = 0.
1531         gaasnow = 0.
1532         gaasncv = 0.
1533         gaamelt = 0.
1534         gaasubl = 0.
1535         gaatet = 0.
1536         gaadsw = 0.
1537         gaapet = 0.
1538         gaanet = 0.
1539         gaainf = 0.
```

```
      gaaoff = 0.
      gaarun = 0.
      gaamb1 = 0.
      gaamb2 = 0.
c
      fnd = float(nd)
      do 4910 i = 1,nloc
            if(iwat(i).eq.-3) goto 4910
c
            aappt(i)  = aappt(i)*(365.25/fnd)
            aarain(i) = aarain(i)*(365.25/fnd)
            aasnow(i) = aasnow(i)*(365.25/fnd)
            aasncv(i) = aasncv(i)*(365.25/fnd)
            aamelt(i) = aamelt(i)*(365.25/fnd)
            aasubl(i) = aasubl(i)*(365.25/fnd)
            aatet(i)  = aatet(i)*(365.25/fnd)
            aadsw(i)  = aadsw(i)*(365.25/fnd)
            aapet(i)  = aapet(i)*(365.25/fnd)
c           aapetrs(i) = aapetrs(i)*(365.25/nd)
            aanet(i)  = aanet(i)*(365.25/fnd)
            aainf(i)  = aainf(i)*(365.25/fnd)
            aaoff(i)  = aaoff(i)*(365.25/fnd)
            aarun(i)  = aarun(i)*(365.25/fnd)
            aainfr(i) = aainfr(i)*(365.25/fnd)
c
c           note: this mass balance check does not work
c           if runoff is routed on last day (optmassb = 0)
            massb(i) = aarain(i) - aatet(i) - aadsw(i) - aainf(i)
     1                  -aaoff(i) + aainfr(i) + aamelt(i)
c
            massb2(i) = aappt(i) - aarain(i) - aasnow(i)

      write(12,4905) easting(i),northing(i),aappt(i),aarain(i),
     1                  aasnow(i),aasncv(i),aamelt(i),aasubl(i),
     2                  aatet(i),
     2
      aainfr(i),aadsw(i),aainf(i),aaoff(i),aarun(i),massb(i),
     3            maxbal(i),
     4        massb2(i)
c
4905        format(1x,2f11.1,1x,11f13.5,4(1x,g16.7))
c
            gaappt = gaappt + aappt(i)
            gaarain = gaarain + aarain(i)
            gaasnow = gaasnow + aasnow(i)
            gaasncv = gaasncv + aasncv(i)
            gaamelt = gaamelt + aamelt(i)
            gaasubl = gaasubl + aasubl(i)
            gaatet = gaatet + aatet(i)
            gaadsw = gaadsw + aadsw(i)
            gaapet = gaapet + aapet(i)
c           gaapetrs + geepetrs + aapetrs(i)
            gaanet = gaanet + aanet(i)
            gaainf = gaainf + aainf(i)
            gaaoff = gaaoff + aaoff(i)
            gaarun = gaarun + aarun(i)
            gaamb1 = gaamb1 + massb(i)
```

```
1597                gaamb2 = gaamb2 + maxbal(i)
1598   c
1599   4910  continue
1600         close(12,status='keep')
1601   c
1602   c
1603         soutyr = soutyr*(365.25/fnd)
1604   c
1605         gaappt = gaappt/float(ncell)
1606         gaarain = gaarain/float(ncell)
1607         gaasnow = gaasnow/float(ncell)
1608         gaasncv = gaasncv/float(ncell)
1609         gaamelt = gaamelt/float(ncell)
1610         gaasubl = gaasubl/float(ncell)
1611         gaatet = gaatet/float(ncell)
1612         gaadsw = gaadsw/float(ncell)
1613         gaapet = gaapet/float(ncell)
1614         gaanet = gaanet/float(ncell)
1615         gaainf = gaainf/float(ncell)
1616         gaaoff = gaaoff/float(ncell)
1617         gaarun = gaarun/float(ncell)
1618         gaamb1 = gaamb1/float(ncell)
1619         gaamb2 = gaamb2/float(ncell)
1620   c
1621         write(*,4955) gaappt,gaarain,gaasnow,gaasncv,gaamelt,gaasubl,
1622        1                  gaapet,gaatet,gaadsw,gaainf,gaaoff,gaarun,
1623        2            soutyr,gaamb1,gaamb2
1624         write(9,4955) gaappt,gaarain,gaasnow,gaasncv,gaamelt,gaasubl,
1625        1            gaapet,gaatet,gaadsw,gaainf,gaaoff,gaarun,
1626        2                    soutyr,gaamb1,gaamb2
1627   c
1628   4955  format(//1x,'Global Summary Statistics (mm/year):',
1629        1             /1x,'-----------------------------------------------
1630   --',
1631        2             //1x,'Precipitation..................... ',f16.6,
1632        3              /1x,'Rain............................. ',f16.6,
1633        4              /1x,'Snowfall......................... ',f16.6,
1634        5              /1x,'Snow-cover....................... ',f16.6,
1635        6              /1x,'Snow-melt........................ ',f16.6,
1636        7              /1x,'Sublimation...................... ',f16.6,
1637        7              /1x,'Potential Evapotranspiration.... ',f16.6,
1638        8              /1x,'Actual Evapotranspiration....... ',f16.6,
1639        9              /1x,'Change in Soil Moisture......... ',f16.6,
1640        1              /1x,'Net Infiltration................ ',f16.6,
1641        2              /1x,'Runoff Generation............... ',f16.6,
1642        3              /1x,'Cumulative Daily Run-on......... ',f16.6,
1643        4              /1x,'Outflow......................... ',f16.6,
1644        5              /1x,'Average Mass Balance Error...... ',g16.6,
1645        6        /1x,'Average Max Daily Error (mm/dy). ',g16.6,//)
1646
1647   c
1648         write(*,5) '  SIMULATION SUCCESSFULLY COMPLETED'
1649   c
1650   C
1651         close(11,status='keep')
1652         close(9,status='keep')
1653         close(13,status='keep')
```

```
      close(14,STATUS='keep')
      close(23,status='keep')
      if(ivwcflg.eq.1) close(16)
      stop
      end
C
C
c===================== END OF MAIN PROGRAM
=================================
C/////////////////////////////////////////////////////////////////////
/////
C
C/////////////////////////////////////////////////////////////////////
/////
C/////////////////    ATMOS SUBROUTINE
//////////////////////////////////
C        ******** set atmospheric parameters, *********************
c        ***** updated 12/11/95 by Don Burrows and Alan Flint ******
C
C       calulate clear sky solar radiation
c
C       OZONE -- ozone layer thickness (CM)
c       WP    -- water in atmosphere(CM)
C       BETA  -- mean atmospheric turbidity
C       CSR   -- circumsolar radiation
C       ELEV  -- meters elevation
C       PG    -- reflectivity (surface)
c
C
      SUBROUTINE ATMOS(OZONE,WP,BETA,CSR,PG)
      DOUBLE PRECISION BETA(366),PG(366),WP(366),CSR(366),OZONE(366)
      DOUBLE PRECISION
OZONE1,OZONE2,OZONE3,OZONE4,OZONE5,OZONE6,OZONE7,
     1       OZONE8,OZONE9,OZONE10,OZONE11,OZONE12,
     2       WP1,WP2,WP3,WP4,WP5,WP6,WP7,WP8,WP9,WP10,WP11,WP12,
     3       BETA1,BETA2,BETA3,BETA4,BETA5,BETA6,BETA7,
     4       BETA8,BETA9,BETA10,BETA11,BETA12,
     5       CSR1,CSR2,CSR3,CSR4,CSR5,CSR6,CSR7,CSR8,CSR9,
     6       CSR10,CSR11,CSR12,
     7       PG1,PG2,PG3,PG4,PG5,PG6,PG7,PG8,PG9,PG10,PG11,PG12
C
      COMMON DBGFLAG
c
      OZONE1=.29
      OZONE2=.31
      OZONE3=.32
      OZONE4=.33
      OZONE5=.33
      OZONE6=.32
      OZONE7=.30
      OZONE8=.29
      OZONE9=.28
      OZONE10=.27
      OZONE11=.27
      OZONE12=.28
      WP1=1.000
      WP2=1.000
```

```
      WP3=1.050
      WP4=1.100
      WP5=1.500
      WP6=1.800
      WP7=2.200
      WP8=2.440
      WP9=2.000
      WP10=1.400
      WP11=1.050
      WP12=0.950
      BETA1=.075
      BETA2=.075
      BETA3=.075
      BETA4=.085
      BETA5=.085
      BETA6=.090
      BETA7=.090
      BETA8=.084
      BETA9=.077
      BETA10=.075
      BETA11=.075
      BETA12=.075
      CSR1=.85
      CSR2=.85
      CSR3=.85
      CSR4=.85
      CSR5=.74
      CSR6=.74
      CSR7=.57
      CSR8=.57
      CSR9=.66
      CSR10=.74
      CSR11=.90
      CSR12=.90
      PG1=.24
      PG2=.24
      PG3=.24
      PG4=.24
      PG5=.24
      PG6=.24
      PG7=.24
      PG8=.24
      PG9=.24
      PG10=.24
      PG11=.24
      PG12=.24
c
c     set ozone and atmospheric turbidity terms as average for middle
c     of each month (leep-year logic included as 1 extra day for
December)
c
      DO N=1,366
C
c     December
      IF (N .LE. 15.) THEN
         OZONE(N)=OZONE1 - ((OZONE1 - OZONE12) * ((15. - N) / 15.))
         WP(N) = WP1 - ((WP1 - WP12) * ((15. - N) / 15.))
```

```
1768            BETA(N) = BETA1 - ((BETA1 - BETA12) * ((15. - N) / 15.))
1769            CSR(N) = CSR1 - ((CSR1 - CSR12) * ((15. - N) / 15.))
1770            PG(N) = PG1 - ((PG1 - PG12) * ((15. - N) / 15.))
1771   C
1772        ELSE IF (N .GT. 349.) THEN
1773            OZONE(N) = OZONE1 - ((OZONE1 - OZONE12) * ((365. - N) / 15.))
1774            WP(N) = WP1 - ((WP1 - WP12) * ((365. - N) / 15.))
1775            BETA(N) = BETA1 - ((BETA1 - BETA12) * ((365. - N) / 15.))
1776            CSR(N)= CSR1 - ((CSR1 - CSR12) * ((365. - N) / 15.))
1777            PG(N) = PG1 - ((PG1 - PG12) * ((365. - N) / 15.))
1778
1779   C
1780   c     January
1781        ELSE IF (N .GT. 15 .AND. N .LE. 46) THEN
1782            OZONE(N) = OZONE2 - ((OZONE2 - OZONE1) * ((46.- N) / 31))
1783            WP(N) = WP2 - ((WP2 - WP1) * ((46.- N) / 31))
1784            BETA(N) = BETA2 - ((BETA2 - BETA1) * ((46.- N) / 31))
1785            CSR(N)= CSR2 - ((CSR2 - CSR1) * ((46.- N) / 31))
1786            PG(N) = PG2 - ((PG2 - PG1) * ((46.- N) / 31))
1787   C
1788   c     February
1789        ELSE IF (N .GT. 46. .AND. N .LE. 74.) THEN
1790            OZONE(N) = OZONE3 - ((OZONE3 - OZONE2) * ((74. - N) / 28.))
1791            WP(N) = WP3 - ((WP3 - WP2) * ((74. - N) / 28.))
1792            BETA(N) = BETA3 - ((BETA3 - BETA2) * ((74. - N) / 28.))
1793            CSR(N)= CSR3 - ((CSR3 - CSR2) * ((74. - N) / 28.))
1794            PG(N) = PG3 - ((PG3 - PG2) * ((74. - N) / 28.))
1795   C
1796   c     March
1797        ELSE IF (N .GT. 74. .AND. N .LE. 105.) THEN
1798            OZONE(N) = OZONE4 - ((OZONE4 - OZONE3) * ((105. - N) / 31.))
1799            WP(N) = WP4 - ((WP4 - WP3) * ((105. - N) / 31.))
1800            BETA(N) = BETA4 - ((BETA4 - BETA3) * ((105. - N) / 31.))
1801            CSR(N)= CSR4 - ((CSR4 - CSR3) * ((105. - N) / 31.))
1802            PG(N) = PG4 - ((PG4 - PG3) * ((105. - N) / 31.))
1803   C
1804   c     April
1805        ELSE IF (N .GT. 105. .AND. N .LE. 135.) THEN
1806            OZONE(N) = OZONE5 - ((OZONE5 - OZONE4) * ((135. - N) / 30.))
1807            WP(N) = WP5 - ((WP5 - WP4) * ((135. - N) / 30.))
1808            BETA(N) = BETA5 - ((BETA5 - BETA4) * ((135. - N) / 30.))
1809            CSR(N)= CSR5 - ((CSR5 - CSR4) * ((135. - N) / 30.))
1810            PG(N) = PG5 - ((PG5 - PG4) * ((135. - N) / 30.))
1811   C
1812   c     May
1813        ELSE IF (N .GT. 135. .AND. N .LE. 166.) THEN
1814            OZONE(N) = OZONE6 - ((OZONE6 - OZONE5) * ((166. - N) / 31.))
1815            WP(N) = WP6 - ((WP6 - WP5) * ((166. - N) / 31.))
1816            BETA(N) = BETA6 - ((BETA6 - BETA5) * ((166. - N) / 31.))
1817            CSR(N)= CSR6 - ((CSR6 - CSR5) * ((166. - N) / 31.))
1818            PG(N) = PG6 - ((PG6 - PG5) * ((166. - N) / 31.))
1819   C
1820   c     June
1821        ELSE IF (N .GT. 166. .AND. N .LE. 196.) THEN
1822            OZONE(N) = OZONE7 - ((OZONE7 - OZONE6) * ((196. - N) / 30.))
1823            WP(N) = WP7 - ((WP7 - WP6) * ((196. - N) / 30.))
1824            BETA(N) = BETA7 - ((BETA7 - BETA6) * ((196. - N) / 30.))
```

```
            CSR(N)= CSR7 - ((CSR7 - CSR6) * ((196. - N) / 30.))
            PG(N) = PG7 - ((PG7 - PG6) * ((196. - N) / 30.))
C
c     July
      ELSE IF (N .GT. 196. .AND. N .LE. 227.) THEN
            OZONE(N) = OZONE8 - ((OZONE8 - OZONE7) * ((227. - N) / 31.))
            WP(N) = WP8 - ((WP8 - WP7) * ((227. - N) / 31.))
            BETA(N) = BETA8 - ((BETA8 - BETA7) * ((227. - N) / 31.))
            CSR(N)= CSR8 - ((CSR8 - CSR7) * ((227. - N) / 31.))
            PG(N) = PG8 - ((PG8 - PG7) * ((227. - N) / 31.))
C
c     August
      ELSE IF (N .GT. 227. .AND. N .LE. 258.) THEN
            OZONE(N) = OZONE9 - ((OZONE9 - OZONE8) * ((258. - N) / 31.))
            WP(N) = WP9 - ((WP9 - WP8) * ((258. - N) / 31.))
            BETA(N) = BETA9 - ((BETA9 - BETA8) * ((258. - N) / 31.))
            CSR(N)= CSR9 - ((CSR9 - CSR8) * ((258. - N) / 31.))
                 PG(N) = PG9 - ((PG9 - PG8) * ((259. - N) / 31.))
C
c     September
      ELSE IF (N .GT.258. .AND. N .LE. 288.) THEN
            OZONE(N) = OZONE10 - ((OZONE10 - OZONE9) * ((288. - N) /
30.))
            WP(N) = WP10 - ((WP10 - WP9) * ((288. - N) / 30.))
            BETA(N) = BETA10 - ((BETA10 - BETA9) * ((288. - N) / 30.))
            CSR(N)= CSR10 - ((CSR10 - CSR9) * ((288. - N) / 30.))
            PG(N) = PG10 - ((PG10 - PG9) * ((288. - N) / 30.))
C
c     October
      ELSE IF (N .GT. 288. .AND. N .LE. 319.) THEN
            OZONE(N) = OZONE11 - ((OZONE11 - OZONE10) * ((319.- N) /
31.))
            WP(N) = WP11 - ((WP11 - WP10) * ((319.      - N) / 31.))
            BETA(N) = BETA11 - ((BETA11 - BETA10) * ((319.- N) / 31.))
            CSR(N)= CSR11 - ((CSR11 - CSR10) * ((319. - N) / 31.))
            PG(N) = PG11 - ((PG11 - PG10) * ((319. - N) / 31.))
C
c     November
      ELSE IF (N .GT.319. .AND. N .LE. 349.) THEN
            OZONE(N) = OZONE12 - ((OZONE12 - OZONE11) * ((349.- N) /
30.))
            WP(N) = WP12 - ((WP12 - WP11) * ((349. - N) / 30.))
            BETA(N) = BETA12 - ((BETA12 - BETA11) * ((349. - N) / 30.))
            CSR(N)= CSR12 - ((CSR12 - CSR11) * ((349. - N) / 30.))
            PG(N) = PG12 - ((PG12 - PG11) * ((349. - N) / 30.))
      ENDIF
      ENDDO
C
      RETURN
      END
C=====================================================================
=====
c//////////////////////////////////////////////////////////////////////
/////
C///////////////// POTEVAP SUBROUTINE
////////////////////////////////////
```

```
C
c     start solar radiation routine
c     find position of sun for each hour for each day
C
      SUBROUTINE POTEVAP  (J,IA,DN,LAT,LON,SL,ASP,RIDGE,ELEV,
     1                     DR,RD,PI,HSTEP,
     2                     BETA,PG,CSR,WP,OZONE,VIEWFACTOR,
     3                     TR,TPET,row,col,atemp1,atemp2,avgairt,
     4                                       airtemp,iairtemp,trn)
C
C
      INTEGER DN(400000)
      double precision avgairt(400000)
      INTEGER J,IA,DBGFLAG
      integer row(100000),col(100000)
      DOUBLE PRECISION LAT(100000),LON(100000),LAT2(100000)
      real elev(0:800,0:800)
      real H1,H2,HSTEP
      double precision SL(100000),SL2(100000),ASP(100000)
      double precision RIDGE(100000,0:36),RIDGE2(100000,0:36),
     1                 SLOPE(100000,0:36),HORIZ(100000,0:36)

      DOUBLE PRECISION BETA(366),PG(366),WP(366),CSR(366),OZONE(366)
      DOUBLE PRECISION TAU,DEC,ET,ALT,AZ,STD,
     1     HASS,HASR,CF,LST,T,MA,IDR,IDA,IDM,ID,IR,ISS,IB
C
      DOUBLE PRECISION II,COSTHETA,THETA,
     1     HA,ISC,PO,P,WO,AMSP,W,U1,U3,EO,TRR,TRO,ABO,TRG,ABW,TRW,
     2     TRA,TRAA,TRAS,FC,PAP,INN,SUNAZ,RNHORIZ
c
      double precision zenith,idhoriz,ibhoriz,ibslope,rnslope
      double precision YRAD,DRAD,RAD,RN,GH,SSG,ALPHA
      double precision DR,RD,PI,TR,VIEWF,TA,PET,VIEWFACTOR
c     real atfact
      double precision atemp1,atemp2,pi2,taa,airtemp
      double precision dnn2,newatemp,trn
      double precision tpet
C
c     write(*,*) ia,airtemp ok
      DR    = 0.0174533
      RD    = 57.29579
c
C     standard meridian
      STD=120
C
C     latitude in radians
      LAT2(ia) = LAT(ia) * DR
c
C     slope in degrees
      SL2(ia) = ATAN(.01 * SL(ia)) * RD
      YRAD=0.
c
c
C     *****  input elevation data for the surrounding ridges each 10
******
C     *****************   startiNg at 10 degrees    *****************
C     Input ridge elevation data each 10 deg starting at 10 deg
```

```
c
      VIEWFACTOR = 0.
      DO II=1,36
       RIDGE2(ia,ii) = 90. - RIDGE(ia,II)
       COSTHETA = COS(SL2(ia)*DR)*COS((RIDGE2(ia,ii))*DR)
     1            +SIN(SL2(ia)*DR)
     2            *SIN((RIDGE2(IA,II))*DR)*COS((II*10.-ASP(ia))*DR)
       THETA = -ATAN(COSTHETA / SQRT(-COSTHETA ** 2. + 1.)) + 90. * DR
       THETA = 90. - THETA * RD
       VIEWF = 90. - THETA
       IF (VIEWF .GE. 90.) THEN
        VIEWF = 90.
       ENDIF
       VIEWFACTOR = VIEWFACTOR + VIEWF
      END DO
      VIEWFACTOR = VIEWFACTOR / (36. * 90.)
      II = 0
c
c
C     SOLAR ROUTINE
C     This subroutine is written to calculate the location of the sun
C
C
C  ALT   ALTITUDE OF THE SUN (RADIANS)
C  AZ    AZIMUTH OF THE SUN (RADIANS)
C  LAT   LATITUDE OF THE SITE  (DEGREES)
C  LON   LONGITUDE OF THE SITE (DEGREES)
C  STD   STANDARD MERIDIAN OF THE SITE (DEGREES)
C  DR    DEGREES TO RADIANS (DEGREES/RADIAN)
C  RD    RADIANS TO DEGREES (RADIANS/DEGREE)
C  CF    CORRECTION FACTOR FOR THE EQUATION OF TIME AND LONGITUDE
CORRECTION (HOURS)
C  LST   LOCAL STANDARD TIME (HOURS)
C  T     LOCAL APPARENT TIME (HOURS)
C  H1    STARTING HOUR FOR THE SIMULATION (HOURS)
C  H2    ENDING HOUR FOR THE SIMULATION (HOURS)
C  HSTEP TIME STEP OF THE SIMULATION (HOURS)
C  DN    DAY NUMBER (DAY OF THE YEAR, UNITLESS)
C  DNN1   DAY OF THE YEAR TO BEGIN THE SIMULATION (UNITLESS)
C  DN2   DAY OF THE YEAR TO END THE SIMULATION   (UNITLESS)
c
C
c     TA   = air temperature (Kelvin) as a function of Julian day
number
c     TAU  = day angle (radians)
c     DEC  = solar declination (radians)
c     ET   = equation of time (minutes)
c     HASR = hour angle of the sun at sunrise (radians)
c     HASS = hour angle of the sun at sunset (radians)
c
c---- mod on 4/8/98: air temp shift (atfact)
c     mod on 06/21/98 to distribute air temp by elevation
c     mod on 7/13/98:
c     user option when IAIRTEMP set to 1
c     original model if iairtemp ne 1
c
c---- mod 9/2/98 newatemp = scaling function for future climate
```

```
c     air temp - elevation correlation (data from Thompson et al)
c     mod 3/18/99 (Infils5b): iairtemp = 3 for reading average
c     daily air temp (C) from climate input file
c
      dnn2 = float(dn(j))
      if(iairtemp.eq.3) then
            ta = (1400.-elev(row(ia),col(ia)))/1000.*9.8+273.15
            ta = ta + avgairt(j)
c
      else if(iairtemp.eq.-1) then
            ta = avgairt(j) + 273.15

      else if(iairtemp.eq.2) then
            newatemp = 0.006114*elev(row(ia),col(ia))-14.1819+5.3166
            ta  = ((atemp1-atemp2*sin(dnn2/366.*2.*pi+1.3)))
     1              +(1524.-
elev(row(ia),col(ia)))/1000.*9.8+273.15+newatemp
      else if(iairtemp.eq.1) then
            ta  = ((atemp1-atemp2*sin(dnn2/366.*2.*pi+1.3)))
     1      +(1524.-elev(row(ia),col(ia)))/1000.*9.8+273.15
      else
            ta  = (atemp1-atemp2*sin(dnn2/366.*2.*pi+1.3))+273.15
      endif
      airtemp = ta - 273.15
c
      TAU = 2*PI*(DN(J)-1)/365
c
      DEC = (0.006918-0.399912*COS(TAU)+0.07257*SIN(TAU)
     1      -0.006758*COS(2*TAU)+0.000907*SIN(2*TAU)
     2            -0.002697*COS(3*TAU)
     3      +0.00148*SIN(3*TAU))
c
      ET  = (0.000075+0.001868*COS(TAU)-0.032077*SIN(TAU)
     1      -0.014615*COS(2*TAU)-0.04089*SIN(2*TAU))*229.18

      HASR = DACOS(-TAN(LAT2(ia))*TAN(DEC))
      HASS = -HASR
      H1   = 12.-HASR*RD/15.
      H2   = 12.-HASS*RD/15.
c
C     CORRECTION FACTOR FOR STANDARD TIME AT LOCAL LONGITUDE IN HOURS
      CF=(4*(STD-LON(ia))+ET)/60.
C
C----- LOOP THROUGH DAYLIGHT HOURS
C      HOUR OF THE DAY LOOP MODEL RUNS FROM SUNRISE TO SUNSET
c     trn = total net radiation for day (mod infils5i)
C
      trn = 0.
      DO 2000 LST=H1,H2,HSTEP
c
C        CORRECTION FOR LOCAL TIME
         T  = LST+CF
         HA = 15.*(T-12.)*DR
C
C        ALTITUDE OF THE SUN AT HOUR ANGLE HA
         ALT = DASIN(SIN(DEC)*SIN(LAT2(ia))+COS(DEC)
     1         *COS(LAT2(ia))*COS(HA))
```

```
c
C         AZIMUTH OF THE SUN AT HOUR ANGLE HA
          if((SIN(ALT)*SIN(LAT2(ia))-SIN(DEC))/(COS(ALT)
     1         *COS(LAT2(ia))).lt.1.) then
          AZ = DACOS((SIN(ALT)*SIN(LAT2(ia))-SIN(DEC))/(COS(ALT)
     1         *COS(LAT2(ia))))
          else
          AZ = DACOS(1-((SIN(ALT)*SIN(LAT2(ia))-SIN(DEC))/(COS(ALT)
     1         *COS(LAT2(ia)))-1))
          endif
          IF (HA .LT. 0.) THEN
             AZ = PI-AZ
          ELSE IF (HA .GE. 0.) THEN
             AZ = AZ+PI
          END IF

          ALT = ALT*RD
          AZ  = AZ*RD

          IF (ALT .LE. 0.) THEN
             ZENITH = 90
          ELSE IF (ALT .GT.0.) THEN
             ZENITH = 90-ALT
          ENDIF

C         END OF SOLAR POSTION ROUTINE
C
C
C------- begin routine for calculating net radiation ------------
c
c            ISC = solar constant
c            PO  = pressure at sea level
c            P   = pressure at site
c            WO  = single scatter albedo by aerosols
c
          ALPHA = 1.
          ISC   = 1367.
          PO    = 1013.25
          P     = EXP(-.0001184 * ELEV(row(ia),col(ia))) * PO
          WO    = .9
c
C------- set coefficients
          AMSP = (COS(ZENITH*DR)+.15 * (93.885-ZENITH)
     1       **(-1.253))**(-1.)
          MA   = AMSP * (P / PO)
          P    = EXP(-.0001184 * 0) * PO
c
C------- pressure at beta measurement
c
          W  = WP(DN(J)) * (P / PO)**.75 * (273. / TA)**.5
          U1 = W * AMSP
          U3 = OZONE(DN(J)) * AMSP
c
c------- corrected floating point error 4/15/98
c          EO = 1. + .033 * COS((2 * 3.14159 * DN(J) / 365.))
          EO = 1. + .033 * COS((2 * 3.14159 * dnn2 / 365.))
c
```

```
C------- eccentricity correction
         TRR  = EXP(-.0903 * MA**.84 * (1. + MA - MA**1.01))
         ABO  = ((.1611 * U3 * ((1 + 139.48 * U3)**(-.3035)))
     1         - .002715 * U3 * ((1.+.044*U3+.0003*(U3**2))**(-1)))
         TRO  = 1. - ABO
         TRG  = EXP(-.0127 * MA**.26)
         ABW  = 2.4959 * U1 *
     1         ((1.+79.034*U1)**.6828 + 6.385 * U1)**(-1.)
         TRW  = 1. - ABW
         TRA  = (.12445 * ALPHA - .0162) + (1.003 - .125 * ALPHA)
     1         * EXP(-BETA(DN(J)) * ALPHA * MA * (1.089 + .5120001))
         TRAA = 1. - (1. - WO) * (1. - MA + MA**1.06) * (1. - TRA)
         IDR  = EO*.79*ISC*COS(ZENITH*DR)*TRO*TRG*TRW*TRAA
     1         * .5 * (1. - TRR) * (1. - MA + MA**1.02) ** (-1.)
         TRAS = TRA / TRAA
         FC   = .84
         IDA  = EO*.79*ISC*COS(ZENITH*DR)*TRO*TRG*TRW*TRAA
     1         *FC*(1.-TRAS)/(1.-MA+MA**1.02)
         PAP  = .0685 + (1. - FC) * (1. - TRAS)
c
C------- direct beam (normal to surface)
         INN = EO * .9751 * ISC * TRR * TRO * TRG * TRW * TRA
c
C------- direct beam (horizontal surface)
         IB = INN * COS(ZENITH * DR)
c
C------- diffuse (multiple reflected)
         IDM = (IB+IDA+IDR) * (PG(DN(J)) * PAP / (1.-PG(DN(J))*PAP))
c
C------- block all radiation
         IF (ZENITH .GE. 90.) THEN
            IB = 0.
            INN = 0.
            IDR = 0.
            IDA = 0.
            IDM = 0.
         ENDIF
         SUNAZ = INT(AZ / 10. + .5)
c
C------- block by east-west ridge
         IF (RIDGE2(ia,SUNAZ) .LE. ZENITH) THEN
            IB = 0
         ENDIF
         IF ((RIDGE2(ia,SUNAZ) - 4.) .LE. ZENITH) THEN
            IDA = (1. - CSR(DN(J))) * IDA
         ENDIF
c
C------- diffuse radiation on a horizontal surface
         ID = IDR + IDA + IDM
c
C------- calculate solar angle of incidence, (90-THETA)
         COSTHETA = COS(SL2(ia)*DR) * COS(ZENITH*DR) + SIN(SL2(ia)*DR)
     1              * SIN(ZENITH*DR) * COS((AZ-ASP(ia))*DR)
         THETA    = -ATAN(COSTHETA / SQRT(-COSTHETA**2.+1.)) + 90. * DR
         THETA    = THETA * RD
         IF (THETA .GT. 90.) THEN
            THETA = 90.
```

```
2167            ENDIF
2168   c
2169   C------- add for ground reflection and subtract blocked sky
2170            IR = (ID + IB) * PG(DN(J)) * (1. - VIEWFACTOR)
2171            ISS = ID * VIEWFACTOR
2172   c
2173   C------- DIFFUSE RADIATION, SLOPE OR HORIZONTAL
2174            IDHORIZ = ISS + IR
2175            IDSLOPE = ISS + IR
2176   c
2177   C------- DIRECT BEAM RADIATION, SLOPE OR HORIZONTAL
2178            IBHORIZ = IB
2179            IBSLOPE = IBHORIZ * (COS(THETA * DR) / COS(ZENITH * DR))
2180            RNHORIZ = (IBHORIZ + IDHORIZ)
2181            RNSLOPE = (IBSLOPE + IDSLOPE)
2182            IF (RNHORIZ .LT. 0.) THEN
2183               RNHORIZ = 0.
2184            ENDIF
2185            IF (RNSLOPE .LT. 0.) THEN
2186               RNSLOPE = 0.
2187            ENDIF
2188            HORIZ(ia,II) = IBHORIZ + IDHORIZ
2189            SLOPE(ia,II) = IBSLOPE + IDSLOPE
2190   c
2191   C------- RADIATION (RAD) IS IN J/m^2 PER TIME STEP
2192            RAD = RNSLOPE*HSTEP*3600.
2193            TR  = TR + RAD
2194   c
2195   C------- CALCULATE NET RADIATIION
2196            RN = (-71*hstep*3600.)+.72*RAD
2197               trn = trn + rn
2198   c
2199   C------- CALCULATE SOIL HEAT FLUX
2200            GH   =  (-20*hstep*3600)+.386*RN
2201            SSG  =  -13.281+.083864*TA-.00012375*TA**2
2202            PET  =  SSG*(RN-GH)/2.45E6
2203            TPET =  TPET + PET
2204   c     write(*,*) tpet,et
2205   c
2206   C
2207   2000  CONTINUE
2208   C
2209   C---- END OF HOUR LOOP
2210   C
2211   c---- DRAD = total daily radiation ---------------------------
2212   C
2213         DRAD=TR
2214         TR = 0.
2215   C
2216         RETURN
2217         END
2218   c
2219   C=====================================================================
2220   ===========
2221   c//////////////////////////////////////////////////////////////////
2222   ///////////
2223   c///////////////// Cascading Bucket subroutine ////////////
```

```
2224   c
2225   c     mod to use snow-melt term 3/29/99 (infils5d)
2226   c     mod to use variable 4-layer cascading bucket routine
2227   c     mod to include dynamic root zone weighting
2228   c     (3 soil layers and 1 bedrock layer) (7/23/98)
2229   c
2230   c
2231         subroutine v4cbuck(j,dn,ia,soiltype,rocktype,ivegc,fvegc,
2232        1                   soilporo,fieldcap,imbibe,imb,soilks,sksfact,
2233        2                   soilalbeta,soiltalpha,soilresid,
2234        3                   pptloc,petrs,sorp,dsoilmm,tet,infilmm,
2235        4                   runoffmm,maxwgt1,maxwgt2,maxwgt3,maxwgt4,
2236        5                   massbal,finalvwc,soilmm,imbfact,
2237        6                   ibuck2,fdepth,rockpor,cdepth,rockmm,
2238        7                   rootf1,rootf2,rootf3,rootf4,idebug,
2239        8                   barsoil1,barsoil2,vegc,rocktalpha,rockalbeta,
2240        9
2241         rkmmfact,rkpor,infmod,etmod,rinfmm1,rinfmm2,melt,
2242        1                   snowmm,snowfall,rain,petrs2)
2243   c
2244         integer ia,ibuck2,idebug,infmod,etmod,j,ivegc
2245         integer soiltype(100000),rocktype(100000),topoid(100000)
2246         integer dn(400000)
2247         double precision vegc(100000)
2248         double precision cdepth(4,100000)
2249         double precision soilporo(20),fieldcap(20),imbibe(0:500)
2250         double precision rocktalpha(0:500),rockalbeta(0:500)
2251         double precision soilalbeta(20),soiltalpha(20),soilks(20)
2252         double precision runoffmm(100000),infilmm(100000)
2253         double precision soilmm(3,100000)
2254         double precision sorp(100000),soilresid(100000)
2255         double precision runonmm(100000)
2256         double precision rockpor(100000),rockmm(100000)
2257   c
2258         double precision pptloc(100000)
2259         double precision rinfmm1(100000),rinfmm2(100000)
2260         double precision snowmm(100000),snowfall(100000)
2261         double precision rain(100000)
2262   c
2263         double precision extra,tet,buckvwc,initvwc,finalvwc
2264         double precision fieldcp,pptvwc,spor,sresid
2265         double precision a,b,imbfact
2266         double precision fstore,fdepth,rootf1,rootf2,rootf3,rootf4
2267         double precision rpor,sks
2268         double precision fcmm1,fcmm2,fcmm3,rkmm
2269         double precision drmm1,drmm2,drmm3,drmm4,drmm5
2270         double precision pormm1,pormm2,pormm3
2271         double precision resmm1,resmm2,resmm3,resmm4
2272         double precision relsat1,relsat2,relsat3,relsat4,srelsat
2273         double precision et1,et2,et3,et4
2274         double precision soilmm1,soilmm2,soilmm3,rockmm1
2275         double precision vwc1,vwc2,vwc3,vwc4
2276         double precision massbal,dsoilmm,imb,initmm,finalmm
2277         double precision wgt1,wgt2,wgt3,wgt4
2278         double precision barsoil1,barsoil2,a2,b2
2279         double precision rkmmfact,etbackmm
2280         double precision rkpor,pptin,pptout
```

```
      double precision skmm,soilks1,sksfact,imbp,skmmp,fvegc
      double precision maxwgt1,maxwgt2,maxwgt3,maxwgt4
      double precision melt
      double precision petrs,petrs2
c
c
c     initialize drainage terms
      drmm1 = 0.
      drmm2 = 0.
      drmm3 = 0.
      drmm4 = 0.
c
c     initialize root zone weights and saturation terms
      wgt1 = 0.
      wgt2 = 0.
      wgt3 = 0.
      wgt4 = 0.
c
      vwc1 = 0.
      vwc2 = 0.
      vwc3 = 0.
      vwc4 = 0.
c
      relsat1 = 0.
      relsat2 = 0.
      relsat3 = 0.
      relsat4 = 0.
c
c     set rooting density terms
c     bedrock root density is function of soil depth
      rden1 = rootf1
      rden2 = rootf2
      rden3 = rootf3
      rden4 = cdepth(4,ia)*rootf4
      if(rden4.gt.1.) rden4 = 1.
c
c     initialize parameters
      a        = soiltalpha(soiltype(ia))
      b        = soilalbeta(soiltype(ia))
      a3       = rocktalpha(rocktype(ia))
      b3       = rockalbeta(rocktype(ia))
      a2       = barsoil2
      b2       = barsoil1
      imb      = imbibe(rocktype(ia))*imbfact
c
c     convert ks (kg sec /M^3 ) to mm/day
c     use 86400*9.8 for kgm/sec^2 to mm/day conversion
c     mult. by user specified scaler SKSFACT
      skmm  = soilks(soiltype(ia))* 86400. * 9.8 * sksfact
      if(soiltype(ia).eq.8) then
        skmm = imbibe(rocktype(ia))*imbfact
      endif
c
c     set infiltration capacity using soil ks
c     and estimated storm duration
c     winter storm = 12 hours, summer storms = 2 hours

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```
2338          if((dn(j).gt.183).and.(dn(j).lt.274)) then
2339                skmmp   = skmm/12.
2340                imbp    = imb/12.
2341          else
2342                skmmp   = skmm/2.
2343                imbp    = imb/2.
2344          endif
2345    c
2346    c
2347          infilmm(ia)  = 0.
2348          runoffmm(ia) = 0.
2349    c
2350    c
2351    c---- set field capacity terms for 3 soil layers
2352    c     rkpor is user specified input variable
2353    c     which defines effective bedrock storage capacity
2354          fieldcp  = fieldcap(soiltype(ia))
2355          fcmm1    = fieldcp*cdepth(1,ia)*1000.
2356          fcmm2    = fieldcp*cdepth(2,ia)*1000.
2357          fcmm3    = fieldcp*cdepth(3,ia)*1000.
2358          rkmm     = rkpor*cdepth(4,ia)*1000.
2359    c
2360    c---- set storage limit terms for 3 soil layers
2361    c     storage limit for bedrock = rkmm
2362          spor     = soilporo(soiltype(ia))
2363          pormm1   = spor*cdepth(1,ia)*1000.
2364          pormm2   = spor*cdepth(2,ia)*1000.
2365          pormm3   = spor*cdepth(3,ia)*1000.
2366    c
2367    c
2368    c---- set residual storage terms for soil layers
2369    c     residual for bedrock = 0.
2370          sresid   = soilresid(soiltype(ia))
2371          resmm1      = sresid*cdepth(1,ia)*1000.
2372          resmm2      = sresid*cdepth(2,ia)*1000.
2373          resmm3      = sresid*cdepth(3,ia)*1000.
2374          resmm4   = 0.
2375    c
2376    c
2377    c---- calculate intial storage for mass
2378    c     balance calculations.  Subtract increase in
2379    c     soil and bedrock storage caused by infiltrated runoff
2380    c     (rinfmm1 = change in soil & bedrock storage during
2381    c     runoff routing)
2382    c
2383          initmm = soilmm(1,ia) + soilmm(2,ia) +
2384         1                  soilmm(3,ia) + rockmm(ia) - rinfmm1(ia)
2385    c
2386    c---- step 1: add precip to upper soil profile
2387    c     and start forward cascade based on field capacity
2388    c     and soil permeability.
2389    c     Added snowmelt term (melt) 3/29/99 (infils5d)
2390    c     soilmm(1,ia) = soilmm(1,ia) + pptloc(ia) + melt
2391          soilmm(1,ia) = soilmm(1,ia) + rain(ia) + melt
2392    c
2393    c     set 1st layer permeability limit using precip intensity (skmmp)
2394    c     (top layer only INFILS4D, top 2 layers INFILS4C)
```

```
2395          if(soilmm(1,ia).gt.fcmm1) then
2396                drmm1 = soilmm(1,ia)-fcmm1
2397                if(drmm1.gt.skmmp) then
2398                      drmm1 = skmmp
2399                      soilmm(1,ia) = soilmm(1,ia) - skmmp
2400                else
2401   c                  soilmm(1,ia) = soilmm(1,ia) - drmm1
2402                      soilmm(1,ia) = fcmm1
2403                endif
2404          endif
2405   c
2406          soilmm(2,ia) = soilmm(2,ia) + drmm1
2407          if(soilmm(2,ia).gt.fcmm2) then
2408                drmm2 = soilmm(2,ia)-fcmm2
2409                if(drmm2.gt.skmm) then
2410                      drmm2 = skmm
2411                      soilmm(2,ia) = soilmm(2,ia) - skmm
2412                else
2413   c                  soilmm(2,ia) = soilmm(2,ia) - drmm2
2414                      soilmm(2,ia) = fcmm2
2415                endif
2416          endif
2417   c
2418          soilmm(3,ia) = soilmm(3,ia) + drmm2
2419          if(soilmm(3,ia).gt.fcmm3) then
2420                drmm3 = soilmm(3,ia)-fcmm3
2421                if(drmm3.gt.skmm) then
2422                      drmm3 = skmm
2423                      soilmm(3,ia) = soilmm(3,ia) - skmm
2424                else
2425   c                  soilmm(3,ia) = soilmm(3,ia) - drmm3
2426                      soilmm(3,ia) = fcmm3
2427                endif
2428          endif
2429   c
2430   c---- set net infil to imb (effective bedrock permeability)
2431   c      when rockmm > rkmm (effective bedrock storage capacity)
2432   c      if very shallow soil then limit bedrock infil by precip intensity
2433
2434   c
2435          if((cdepth(1,ia).lt.0.05).and.(drmm3.gt.imbp)) then
2436                soilmm(3,ia) = soilmm(3,ia) + drmm3-imbp
2437                drmm3 = imbp
2438          endif
2439          rockmm(ia) = rockmm(ia) + drmm3
2440          drmm5 = 0.
2441   c
2442   c      if bedrock storage exceeded then drainage <= imb
2443          if(rockmm(ia).gt.rkmm) then
2444                drmm4 = rockmm(ia)-rkmm
2445                if(drmm4.gt.imb) then
2446                      drmm4 = imb
2447                      rockmm(ia) = rockmm(ia) - imb
2448                else
2449   c                  rockmm(ia) = rockmm(ia) - drmm4
2450                      rockmm(ia) = rkmm
2451                endif
```

```
2452   c     endif
2453   c
2454   c     mod 08/10/98 to allow slow drainage as a function of
2455   c     saturation when rockmm > 0 but < rkmm
2456   c     if infmod = 1 then allow slow drainage function
2457   c     if infmod = 2 then allow full drainage: (drmm4 + drmm5 =< imb)
2458   c     note that slow drainage allowed only if cdepth4 > 0 (rkmm > 0.)
2459   c     if(rkmm.gt.0.) then
2460         else if(rockmm(ia).gt.0.and.rockmm(ia).le.rkmm) then
2461               if(rkmm.gt.0.) then
2462   c     if(infmod.eq.0) then
2463   c           drmm5 = 0.
2464   c
2465                     if(infmod.eq.1) then
2466   c                 if(rkmm.gt.0.) then
2467                            drmm5 = ((rockmm(ia)/rkmm)**rkmmfact)*imb
2468                            if(drmm5.gt.(imb-drmm4)) drmm5 = imb-drmm4
2469                            if(drmm5.gt.rockmm(ia)) then
2470                                  drmm5 = rockmm(ia)
2471                                  rockmm(ia) = 0.
2472                            else
2473                                  rockmm(ia) = rockmm(ia) - drmm5
2474                            endif
2475   c                        else
2476   c                        drmm5 = 0.
2477   c                        endif
2478   c
2479                     else if(infmod.eq.2) then
2480   c                 if(rockmm(ia).gt.0.) then
2481                            drmm5 = imb - drmm4
2482                            if(drmm5.gt.rockmm(ia)) then
2483                                  drmm5 = rockmm(ia)
2484                                  rockmm(ia) = 0.
2485                            else
2486                                  rockmm(ia) = rockmm(ia) - drmm5
2487                            endif
2488   c                 endif
2489                     endif
2490               endif
2491         endif
2492   c
2493         drmm4 = drmm4 + drmm5
2494   c====
2495   c
2496   c==== STEP 2: do reverse cascade to get excess water into top layer
2497   c     before et and final infil volumes computed
2498   c
2499         if(rockmm(ia).gt.rkmm) then
2500               soilmm(3,ia) = soilmm(3,ia) + rockmm(ia) - rkmm
2501               rockmm(ia) = rkmm
2502         endif
2503         if(soilmm(3,ia).gt.pormm3) then
2504               soilmm(2,ia) = soilmm(2,ia) + soilmm(3,ia) - pormm3
2505               soilmm(3,ia) = pormm3
2506         endif
2507         if(soilmm(2,ia).gt.pormm2) then
2508               soilmm(1,ia) = soilmm(1,ia) + soilmm(2,ia) - pormm2
```

```
2509                soilmm(2,ia) = pormm2
2510          endif
2511    c====
2512    c
2513    c==== STEP 3: remove et volume before calculating final infil and
2514    c     runoff volume. Set soil moisture to porosity
2515    c     if runoff volume exists
2516    c
2517          soilmm1 = soilmm(1,ia)
2518          if(soilmm1.gt.pormm1) soilmm1 = pormm1
2519          soilmm2 = soilmm(2,ia)
2520          if(soilmm2.gt.pormm2) soilmm2 = pormm2
2521          soilmm3 = soilmm(3,ia)
2522          if(soilmm3.gt.pormm3) soilmm3 = pormm3
2523          rockmm1 = rockmm(ia)
2524          if(rockmm1.gt.rkmm) rockmm1 = rkmm
2525
2526    c---- convert terms to relative saturation for et calculations
2527          if(cdepth(1,ia).gt.0.) vwc1 = soilmm1/cdepth(1,ia)/1000.
2528          if(cdepth(2,ia).gt.0.) vwc2 = soilmm2/cdepth(2,ia)/1000.
2529          if(cdepth(3,ia).gt.0.) vwc3 = soilmm3/cdepth(3,ia)/1000.
2530          if(cdepth(4,ia).gt.0.) vwc4 = rockmm1/cdepth(4,ia)/1000.
2531    c
2532          relsat1 = (vwc1-sresid)/(spor-sresid)
2533          if(relsat1.lt.0) relsat1 = 0.
2534          relsat2 = (vwc2-sresid)/(spor-sresid)
2535          if(relsat2.lt.0) relsat2 = 0.
2536          relsat3 = (vwc3-sresid)/(spor-sresid)
2537          if(relsat3.lt.0) relsat3 = 0.
2538          relsat4 = vwc4/rkpor
2539          if(relsat4.lt.0) relsat4 = 0.
2540    c
2541    c
2542    c---- calculate normalized dynamic root zone weights
2543    c     multiplied by root density terms
2544          srelsat = relsat1 + relsat2 + relsat3 + relsat4
2545          if(srelsat.gt.0.) then
2546                wgt1 = (relsat1/srelsat)*rden1
2547                wgt2 = (relsat2/srelsat)*rden2
2548                wgt3 = (relsat3/srelsat)*rden3
2549                wgt4 = (relsat4/srelsat)*rden4
2550          else
2551                wgt1 = 0.
2552                wgt2 = 0.
2553                wgt3 = 0.
2554                wgt4 = 0.
2555          endif
2556    c
2557    c     normalize root density terms and set upper weight limits
2558          swgt = wgt1+wgt2+wgt3+wgt4
2559          if(swgt.gt.0.) then
2560                wgt1 = wgt1/swgt
2561                if(wgt1.gt.maxwgt1) wgt1 = maxwgt1
2562                wgt2 = wgt2/swgt
2563                if(wgt2.gt.maxwgt2) wgt2 = maxwgt2
2564                wgt3 = wgt3/swgt
2565                if(wgt3.gt.maxwgt3) wgt3 = maxwgt3
```

```
2566              wgt4 = wgt4/swgt
2567              if(wgt4.gt.maxwgt4) wgt4 = maxwgt4
2568        endif
2569  c
2570  c
2571  c---- calculate et using Flint function and
2572  c     root-zone weights, then take et from soil
2573  c     and rock storage terms. For layer 1, use
2574  c     veg cover term to include bare soil evap
2575  c
2576  c     et1 = ((1-vegc(ia))*(a2*(1-exp(b2*relsat1))) +
2577  c     1           (vegc(ia))*(a*(1-exp(b*relsat1))))
2578  c
2579  c     mod 08/18/98
2580  c     if ivegc = 1, then use veg cover map data
2581  c     if ivegc = 0, use constant veg cover = fvegc
2582        if(ivegc.eq.1) then
2583              et1 = (1-vegc(ia))*(a2*(1-exp(b2*relsat1))) +
2584       1                  vegc(ia)*(a*(1-exp(b*relsat1)))
2585        else
2586              et1 = (1-fvegc)*(a2*(1-exp(b2*relsat1))) +
2587       1                  fvegc*(a*(1-exp(b*relsat1)))
2588        endif
2589        et1 = et1*wgt1*petrs2
2590        if(et1.lt.0) et1 = 0.
2591        soilmm(1,ia) = soilmm(1,ia) - et1
2592        if(soilmm(1,ia).lt.resmm1) then
2593              et1 = et1 - (resmm1 - soilmm(1,ia))
2594              soilmm(1,ia) = resmm1
2595        endif
2596  c
2597        et2 = a*(1-exp(b*relsat2))
2598        et2 = et2*wgt2*petrs2
2599        if(et2.lt.0) et2 = 0.
2600        soilmm(2,ia) = soilmm(2,ia) - et2
2601        if(soilmm(2,ia).lt.resmm2) then
2602              et2 = et2 - (resmm2 - soilmm(2,ia))
2603              soilmm(2,ia) = resmm2
2604        endif
2605  c
2606        et3 = a*(1-exp(b*relsat3))
2607        et3 = et3*wgt3*petrs2
2608        if(et3.lt.0) et3 = 0.
2609        soilmm(3,ia) = soilmm(3,ia) - et3
2610        if(soilmm(3,ia).lt.resmm3) then
2611              et3 = et3 - (resmm3 - soilmm(3,ia))
2612              soilmm(3,ia) = resmm3
2613        endif
2614  c
2615        et4 = a3*(1-exp(b3*relsat4))
2616        et4 = et4*wgt4*petrs2
2617        if(et4.lt.0) et4 = 0.
2618        rockmm(ia) = rockmm(ia) - et4
2619        if(soilmm(4,ia).lt.resmm4) then
2620              et4 = et4 - (resmm4 - soilmm(4,ia))
2621              soilmm(4,ia) = resmm4
2622        endif
```

```
2623
2624          tet = et1+et2+et3+et4
2625    c====
2626    c
2627    c==== STEP 4: If rockmm < rkmm then put drmm4 back into rockmm
2628    c     before calculating final net infil.
2629    c     daily ET demand must be satisfied for net
2630    c     infiltration to occur at end of day)
2631    c
2632          etbackmm = 0.
2633          if (etmod.eq.1) then
2634                etbackmm = rkmm - rockmm(ia)
2635                if(etbackmm.lt.0.) etbackmm = 0.
2636                if(etbackmm.gt.drmm4) then
2637                      etbackmm = drmm4
2638                      drmm4 = 0.
2639                else
2640                      drmm4 = drmm4 - etbackmm
2641                endif
2642          endif
2643    c
2644    c     added rinfmm2 to include infiltration from runoff (8/18/98)
2645          rockmm(ia)  = rockmm(ia) + etbackmm
2646          infilmm(ia) = drmm4 + rinfmm2(ia)
2647
2648    c====
2649    c
2650    c==== STEP 5: calculate final runoff volume
2651    c     add runoff volume obtained if precip intensity exceeded
2652    c     saturated soil permeability (skmm)
2653    c
2654          if(soilmm(1,ia).gt.pormm1) then
2655                runoffmm(ia) = soilmm(1,ia) - pormm1
2656                soilmm(1,ia) = pormm1
2657          endif
2658    c
2659    c
2660          finalmm = soilmm(1,ia) + soilmm(2,ia)
2661          1                       + soilmm(3,ia) + rockmm(ia)
2662          dsoilmm = finalmm - initmm
2663    c
2664    c     massbal  = pptloc(ia)-tet-dsoilmm-runoffmm(ia)-infilmm(ia)
2665    c     massbal  = rain(ia)+melt-tet-dsoilmm
2666    c     1                       -runoffmm(ia)-infilmm(ia)
2667    c
2668    c
2669    c---- added debugging option to check mass balance 8/2/98
2670          if(idebug.eq.1) then
2671                write(*,5) ia,pptloc(ia)
2672    5           format(1x,i5,1x,'precip =              ',f15.8)
2673                write(*,10) ia,initmm
2674    10          format(1x,i5,1x,'initial soilmm =      ',f15.8)
2675                write(*,15) ia,tet
2676    15          format(1x,i5,1x,'total et =            ',f15.8)
2677                write(*,16) ia,drmm4
2678    16          format(1x,i5,1x,'drmm4 =               ',f15.8)
2679                write(*,17) ia,drmm5
```

```
17          format(1x,i5,1x,'drmm5 =               ',f15.8)
            write(*,18) ia,imb
18          format(1x,i5,1x,'imb =                 ',f15.8)
            write(*,20) ia,infilmm(ia)
20          format(1x,i5,1x,'net infiltration =    ',f15.8)
            write(*,22) ia,runoffmm(ia)
22          format(1x,i5,1x,'runoff =              ',f15.8)
            write(*,25) ia,finalmm
25          format(1x,i5,1x,'final soilmm =        ',f15.8)
            write(*,30) ia,dsoilmm
30          format(1x,i5,1x,'change soilmm =       ',f15.8)
            write(*,35) ia,massbal
35          format(1x,i5,1x,'mass balance =        ',f15.8)
            pause
      endif
      return
      end
c
C=====================================================================
===========
c//////////////////////////////////////////////////////////////////////
///////////
c///////////////// added ifr subroutine 6/27/97 ////////////
c
c     Surface water flow routing routine (coupled)
c     routing parameters defined using programs CHNNET16 and WATSHD20
c
c
      subroutine ifr(nloc,row,col,flowout,rinfmm1,rinfmm2,
      1                 soilporo,fieldcap,soiltype,soilmm,
     2                  soilvwc,buckmm,irout,imap,dn,j,
     3                  soilks,sksfact,rown,coln,totout2,totout,
     4                  iter,iwat,locid,nrun,cdepth,
     5                  imbibe,imbfact,rocktype,rockmm,
     6                  easting,northing,xcfs,ycfs,cfsday,idebug,
     7                  ifrtol,rkpor,rkmmfact,infilmm,flarea,
     8                  runmod,pptloc)
c
c
      integer dayn,edge,N2,irout,imap,jifr,rown,coln,runmod
      integer iter
c
      double precision imbfact,imbfact2
      double precision rkmmfact
      double precision delay,buckvwc,totvwc,imb
      double precision fieldmm,poromm,infmm,maxmm
      double precision runmm,runmm2,xcfs,ycfs
      integer hole(100000),dn(400000)
      integer idir(0:800,0:800),locid(100000)
      integer row(100000),col(100000),soiltype(100000)
      integer rocktype(100000)
c
      double precision cdepth(4,100000)
      double precision rinfmm1(100000),rinfmm2(100000),initmm(100000)
      double precision soilporo(20),fieldcap(20),soilks(20)
c
      double precision flowin(300000),run(300000)
```

```
2737          integer iwat(100000)
2738          double precision soilvwc(100000)
2739          double precision infilmm(100000),pptloc(100000)
2740          double precision flowout(0:800,0:800),totout(0:800,0:800)
2741          double precision soilmm(3,100000),rockmm(100000)
2742          double precision imbibe(0:500)
2743          double precision easting(100000),northing(100000)
2744    c
2745          double precision pormm1,pormm2,pormm3,totmm
2746          double precision drmm1,drmm2,drmm3,drmm4,drmm5
2747          double precision fcmm1,fcmm2,fcmm3,rkmm
2748          double precision cfsday,finalmm
2749          double precision stormm1,stormm2,stormm3,stormm
2750          double precision ifrtol,rkpor,flarea,sksfact,imbp,skmmp
2751          double precision totout2,totflow
2752    c
2753    c
2754    c
2755    c---- initialize parameters
2756          imbfact2 = 0.
2757          drmm4 = 0.
2758          drmm5 = 0.
2759          cfsday = 0.
2760          delay = 1.
2761          iopt = 0
2762          iter = 0
2763          totout2 = 0.
2764    c
2765    c
2766    400   nrun = 0
2767          iter = iter + 1
2768          edge = 1
2769          totflow = 0.
2770    c
2771    c---- loop through all locations to rout surface flow
2772    c     do not loop through watershed boundary cells (iwat(i) = -3)
2773    c
2774          do 250 i = 1,nloc
2775                if(iwat(i).eq.-3) goto 250
2776    c
2777    c           calculate initial soil and bedrock water content
2778    c           for mass balance checking
2779                if(iter.eq.1) then
2780                      initmm(i) = soilmm(1,i) + soilmm(2,i) + soilmm(3,i)
2781          1                               + rockmm(i)
2782                endif
2783    c
2784                idir(row(i),col(i)) = 0
2785                if(iter.gt.1) then
2786    c
2787    c---------- if irout = 1, do coupled flow routing
2788                if(irout.ge.1) then
2789                            runmm2 = 0.
2790                            pormm1  =
2791    soilporo(soiltype(i))*cdepth(1,i)*1000.
2792                            pormm2  =
2793    soilporo(soiltype(i))*cdepth(2,i)*1000.
```

```
2794                            pormm3  =
2795   soilporo(soiltype(i))*cdepth(3,i)*1000.
2796                            rkmm    = rkpor*cdepth(4,i)*1000.
2797   c
2798                            totmm = pormm1+pormm2+pormm3+rkmm
2799                            if(initmm(i).gt.totmm) then
2800                                  write(*,*) initmm(i),totmm
2801                                  pause
2802                            endif
2803   c
2804                            fieldcp = fieldcap(soiltype(i))
2805                            fcmm1   = fieldcp*cdepth(1,i)*1000.
2806                            fcmm2   = fieldcp*cdepth(2,i)*1000.
2807                            fcmm3   = fieldcp*cdepth(3,i)*1000.
2808   c
2809   c                        initialize drainage terms
2810                            drmm1 = 0.
2811                            drmm2 = 0.
2812                            drmm3 = 0.
2813                            drmm4 = 0.
2814                            drmm5 = 0.
2815   c
2816   c                        set infiltration capacity using soil ks
2817   c                        and estimated storm duration
2818   c                        winter storm = 12 hours
2819   c                        summer storms = 2 hours
2820   c                        convert ks (kg sec /M^3 ) to mm/day
2821   c                        mult by flow area (flarea) for cell area
2822   affected
2823   c                        assume precip infil does not affect infil of
2824   runoff volume
2825   c                        use 86400*9.8 for kgm/sec^2 to mm/day
2826   conversion
2827   c
2828                            skmm =
2829   soilks(soiltype(i))*86400.*9.8*sksfact*flarea
2830                            imb  = imbibe(rocktype(i))*imbfact2*flarea
2831                            if((dn(j).gt.183).and.(dn(j).lt.274)) then
2832                                  skmmp  = skmm/12.
2833                                  imbp   = imb/12.
2834                            else
2835                                  skmmp  = skmm/2.
2836                                  imbp   = imb/2.
2837                            endif
2838   c
2839   c                        write(*,*) imb,imbfact,imbibe(rocktype(i))
2840   c                        pause
2841   c                        initmm =
2842   soilmm(1,i)+soilmm(2,i)+soilmm(3,i)+rockmm(i)
2843
2844                            stormm1  = pormm1 - soilmm(1,i)
2845                            stormm2     = pormm2 - soilmm(2,i)
2846                            stormm3  = pormm3 - soilmm(3,i)
2847                            stormm   = stormm1 + stormm2 + stormm3
2848   c
2849                            if(idebug.eq.2) then
```

```
2850                                write(23,1005)
2851   i,easting(i),northing(i),iter,j,
2852         1
2853         fcmm1,fcmm2,fcmm3,rkmm,pormm1,pormm2,pormm3,initmm,
2854         2
2855         soilmm(1,i),soilmm(2,i),soilmm(3,i),rockmm(i),
2856         3                      flowout(row(i),col(i)),flowin(i)
2857   1005                         format(1x,i8,2f11.1,2i5,14f10.4)
2858                           endif
2859   c
2860   c------------- start forward cascade
2861                           soilmm(1,i) = soilmm(1,i) + flowin(locid(i))
2862                           if(soilmm(1,i).gt.fcmm1) then
2863                                 drmm1 = soilmm(1,i)-fcmm1
2864                                 if(drmm1.gt.skmmp) then
2865                                       drmm1 = skmmp
2866                                       soilmm(1,i) = soilmm(1,i) - skmmp
2867                                 else
2868                                       soilmm(1,i) = soilmm(1,i) - drmm1
2869                                 endif
2870                           endif
2871   c
2872                           soilmm(2,i) = soilmm(2,i) + drmm1
2873                           if(soilmm(2,i).gt.fcmm2) then
2874                                 drmm2 = soilmm(2,i) - fcmm2
2875                                 if(drmm2.gt.skmmp) then
2876                                       drmm2 = skmmp
2877                                       soilmm(2,i) = soilmm(2,i) - skmmp
2878                                 else
2879                                       soilmm(2,i) = soilmm(2,i) - drmm2
2880                                 endif
2881                           endif
2882   c
2883                           soilmm(3,i) = soilmm(3,i) + drmm2
2884                           if(soilmm(3,i).gt.fcmm3) then
2885                                 drmm3 = soilmm(3,i) - fcmm3
2886                                 if(drmm3.gt.skmm) then
2887                                       drmm3 = skmm
2888                                       soilmm(3,i) = soilmm(3,i) - skmm
2889                                 else
2890                                       soilmm(3,i) = soilmm(3,i) - drmm3
2891                                 endif
2892                           endif
2893   c
2894   c                       mod INFILS3V 08/21/98
2895   c                       if shallow soil, then limit infil into bedrock
2896   c                       using estimated storm intensity
2897                           if((drmm3.gt.imbp).and.(cdepth(2,i).lt.2.0))
2898   then
2899                                 soilmm(3,i) = soilmm(3,i) + drmm3 - imbp
2900                                 drmm3 = imbp
2901                           endif
2902                           rockmm(i) = rockmm(i) + drmm3
2903                           drmm5 = 0.
2904   c
2905   c------------- Following modifications (starting INFILS3P) are to
2906   c                       allow net infil to occur during runoff routing
```

```
2907   c                       set net infil to imb (effective bedrock
2908   permeability)
2909   c                       when rockmm > rkmm (effective bedrock storage
2910   capacity)
2911   c                       mod 08/10/98 to allow slow drainage as a
2912   function of
2913   c                       saturation when rockmm > 0 but < rkmm
2914   c                       if infmod = 2 then allow slow drainage function
2915   c                       if infmod = 3 then allow full drainage:
2916   c                       (drmm4 + drmm5 =< imb in all cases)
2917   c
2918   c                       RUNMOD = 0, net infil occurs only during infil
2919   module
2920                           if(runmod.eq.0) then
2921                                 goto 99
2922
2923   c                       RUNMOD = 1, allow simple net infil only when
2924   rkmm exceeded
2925                           else if((runmod.eq.1).and.
2926         1                 (rockmm(i).gt.rkmm)) then
2927                                 drmm4 = rockmm(i)-rkmm
2928                                 if(drmm4.gt.imb) then
2929                                       drmm4 = imb
2930                                       rockmm(i) = rockmm(i) - imb
2931                                 else
2932                                       rockmm(i) = rockmm(i) - drmm4
2933                                 endif
2934   c
2935   c                       RUNMOD = 2,3, allow net infil when rkmm > 0.
2936                           else if(runmod.gt.1) then
2937                                 if (rockmm(i).gt.rkmm) then
2938                                       drmm4 = rockmm(i)-rkmm
2939                                       if(drmm4.gt.imb) then
2940                                             drmm4 = imb
2941                                             rockmm(i) = rockmm(i) - imb
2942                                       else
2943                                             rockmm(i) = rockmm(i) - drmm4
2944                                       endif
2945   c
2946   c
2947                                 else if((rockmm(i).gt.0).and.
2948         1                       (rockmm(i).le.rkmm)) then
2949   c
2950   c                                 RUNMOD = 2, allow slow drainage
2951   when rkmm > 0
2952                                     if(runmod.eq.2) then
2953   c                                 if(rockmm(ia).gt.0.) then
2954                                             drmm5 =
2955   ((rockmm(i)/rkmm)**rkmmfact)*imb
2956                                             if(drmm5.gt.(imb-drmm4))
2957   drmm5=imb-drmm4
2958                                             if(drmm5.gt.rockmm(i)) then
2959                                                   drmm5 = rockmm(i)
2960                                                   rockmm(i) = 0.
2961                                             else
2962                                                   rockmm(i) = rockmm(i) -
2963   drmm5
```

```
2964                                          endif
2965   c                                   endif
2966   c
2967   c                                   RUNMOD = 3, allow full drainage
2968   when rkmm > 0
2969                                       else if (runmod.eq.3) then
2970   c                                   if(rockmm(ia).gt.0.) then
2971                                          drmm5 = imb - drmm4
2972                                          if(drmm5.gt.rockmm(i)) then
2973                                                drmm5 = rockmm(i)
2974                                                rockmm(i) = 0.
2975                                          else
2976                                                rockmm(i) = rockmm(i) -
2977   drmm5
2978                                          endif
2979                                       endif
2980                                 endif
2981   c
2982                           endif
2983   c
2984   c
2985   c                       mod INFILS3V  08/21/98
2986   c                       calculate net infiltration and limit
2987   c                       maximum combined net infil to permeability
2988                           drmm4 = drmm4 + drmm5
2989                           if((drmm4+infilmm(i)).gt.imb) then
2990                                 rockmm(i) = rockmm(i) + drmm4-imb
2991                                 drmm4 = imb
2992                           endif
2993   c
2994   c
2995   c---------------- start reverse cascade to determine runoff
2996   c
2997   99                      continue
2998                           if(rockmm(i).gt.rkmm) then
2999                                 soilmm(3,i) = soilmm(3,i)+rockmm(i)-rkmm
3000                                 rockmm(i) = rkmm
3001                           endif
3002                           if(soilmm(3,i).gt.pormm3) then
3003                                 soilmm(2,i) = soilmm(2,i)+soilmm(3,i)-
3004   pormm3
3005                                 soilmm(3,i) = pormm3
3006                           endif
3007                           if(soilmm(2,i).gt.pormm2) then
3008                                 soilmm(1,i) = soilmm(1,i)+soilmm(2,i)-
3009   pormm2
3010                                 soilmm(2,i) = pormm2
3011                           endif
3012                           if(soilmm(1,i).gt.pormm1) then
3013                                 runmm2 = soilmm(1,i) - pormm1
3014                                 soilmm(1,i) = pormm1
3015                           endif
3016   c
3017                           if(runmm2.gt.0.) then
3018                                 flowout(row(i),col(i)) = runmm2
3019                           else
3020                                 flowout(row(i),col(i)) = 0.
```

```
                         endif
c
                         flowin(locid(i)) = 0.
                         totout(row(i),col(i)) = totout(row(i),col(i)) +
     1                                  flowout(row(i),col(i))
c
c
c---------- if irout ne 1, do decoupled flow routing
c             ----------------------------------------
             else
                flowout(row(i),col(i)) = flowin(locid(i))*delay
                totout(row(i),col(i))  = totout(row(i),col(i)) +
     1                                   flowout(row(i),col(i))
                flowin(locid(i))  = flowin(locid(i))*(1-delay)

                endif
          endif
c
             finalmm = soilmm(1,i)+soilmm(2,i)+soilmm(3,i)+rockmm(i)
             rinfmm1(i) = finalmm - initmm(i)
             rinfmm2(i) = drmm4
c
c----- module testing 08/18/98
c     write(*,*) j,i,iter,' pptloc  = ',pptloc(i)
c     write(*,*) j,i,iter,' totmm   = ',totmm
c     write(*,*) j,i,iter,' initmm  = ',initmm(i)
c     write(*,*) j,i,iter,' finalmm = ',finalmm
c     write(*,*) j,i,iter,' flowin  = ',flowin(locid(i))
c     write(*,*) j,i,iter,' flowout = ',flowout(row(i),col(i))
c     write(*,*) j,i,iter,' rinfmm1 = ',rinfmm1(i)
c     write(*,*) j,i,iter,' rinfmm2 = ',rinfmm2(i)
c     pause
c
c            truninf = truninf + runinf(i)
c
c-------- flow routing -------------------
c            ------------
             flowin(iwat(i)) =
     1             flowout(row(i),col(i)) + flowin(iwat(i))
             run(iwat(i)) = flowin(iwat(i))
c
             totflow = totflow + flowout(row(i),col(i))
c
             if(flowout(row(i),col(i)).gt.ifrtol) then
                   irun = 1
             else
                   irun = 0
             endif
                   nrun = nrun + irun
c
c-------    sum outflow for specified cell, then convert
c            to discharge units in main program (cfs)
             if(easting(i).eq.xcfs.and.northing(i).eq.ycfs) then
                   cfsday = flowout(row(i),col(i)) + cfsday
             endif
c
c
```

```
250   continue
c
c
c------ calculate total outflow
c
      totout2 = 0.
      do 550 i = 1,nloc
            if(iwat(i).ne.-3) goto 550
            flowout(row(i),col(i)) =
      1     flowout(row(i),col(i)) + flowin(locid(i))
            flowin(locid(i)) = 0.
          totout2 = totout2 + flowout(row(i),col(i))
550   continue
c
c
c---- continue iteration if exces ppt still exists
c     stop if more than 10 iterations
c
      if(iter.gt.10) then
c           do 750 i = 1,nloc
c                 if(iwat(i).eq.-3) goto 750
c                 if(flowout(row(i),col(i)).gt.0.) then
c                       write(*,*)
nrun,flowin(iwat(i)),flowout(row(i),col(i))
c                 endif
c750        continue
c           pause
            goto 500
      endif
      if(nrun.gt.0) goto 400
c
c
500   continue
      return
      end
c
C=====================================================================
===========
c//////////////////////////////////////////////////////////////////
///////////
c///////////////// added pptdist subroutine 6/27/97 ////////////
c
C-------- The next 5 lines added on 7/22/96 to use the 4JA - Yucca Mt.
c         Precip transfer equation used in the Bucket Model
c            mod 3/19/99 (infils5b) aaprepx = average annual precip
(aap)
c            over area of potential repository
c         170 = average annual precip at 1400 m at Yucca Mountain
c         133 = average annual precip at 4JA
c         avgppt = average annual precip for input file (mod 7/28/96)
c
      subroutine pptdist(ia,elev,pptfact,avgppt,pptyuc,pptfact2,
     1                   row,col,pptloc,ppt,j,aaprepx)
      integer ia,pptyuc,j
      integer row(100000),col(100000)
      double precision pptfact,pptfact2,avgppt
      real elev(0:800,0:800)
```

```
3135         double precision pptloc(100000),ppt(40000)
3136         real aaprepx
3137   c
3138   c---- modified on 6/21/98 (for infils1h)
3139   c     mod 3/19/99 (infils5b) pptyuc = 5 for monsoon climate
3140   c     mod 9/1/98 (infils4i) pptyuc = 4 for future climates
3141   c     pptyuc = 3 for Yucca Mt (4JA) using constant scaler
3142   c     pptyuc = 2 for Yucca Mt (4JA) using variable scaler
3143   c     pptyuc = 1 for analog climate simulations (Area 12, etc)
3144   c     pptyuc = (0) for uniform precip distribution
3145   c     - values used for original precip model
3146   c
3147         if(pptyuc.eq.5) then
3148         pptfact2 = pptfact*((exp(0.0006458*elev(row(ia),col(ia))+4.317)
3149        1              /aaprepx)/2. + 0.5)
3150   c
3151         else if(pptyuc.eq.4) then
3152         pptfact2 = pptfact*((exp(0.0006458*elev(row(ia),col(ia))+4.317)
3153        1           /170.)/2. + 0.5)
3154   c
3155         else if(pptyuc.eq.3) then
3156         pptfact2 = pptfact*(exp(0.0006458*elev(row(ia),col(ia))+4.317)
3157        1           /170.)*(170./133.)
3158   c
3159         else if(pptyuc.eq.2) then
3160         pptfact2 = pptfact*(exp(0.0006458*elev(row(ia),col(ia))+4.317)
3161        1           /170.)*(170./avgppt)
3162   c
3163         else if(pptyuc.eq.1) then
3164         pptfact2 = pptfact*(exp(0.0006458*elev(row(ia),col(ia))+4.317)
3165        1              /170.)
3166   c
3167   c
3168   c---- original 1996 model (added back 7/13/98)
3169   c
3170         else if(pptyuc.eq.-3) then
3171            PPTFACT2 = PPTFACT*(ELEV(row(IA),col(ia))/1400.)
3172        1                  *(170./133.)
3173         else IF(PPTYUC.EQ.-2) THEN
3174            PPTFACT2 = PPTFACT*(ELEV(row(IA),col(ia))/1400.)
3175        1                  *(170./avgppt)
3176         ELSE IF (PPTYUC.EQ.-1) THEN
3177            PPTFACT2 = PPTFACT*(elev(row(ia),col(ia))/1400.)
3178   c
3179   c---- uniform precip distribution
3180   c
3181         else
3182               pptfact2 = pptfact
3183
3184         endif
3185   c
3186   c     calculate location precip using daily precip input and pptfact2
3187         pptloc(ia) = ppt(j)*pptfact2
3188   c
3189         return
3190         end
3191   c
```

```
C=====================================================================
===========
c//////////////////////////////////////////////////////////////////////
///////////
c///////////////// added snow subroutine 3/29/99  (infils5d)
////////////
c

      subroutine snow(ia,airtemp,snowmm,snopar1,pptloc,rain,
     1                snowfall,melt,dsnowcv,isublim,subpar1,sublim,
     2                tpet,isnwmod,trn,subpar2)
c
      integer ia,isublim,isnwmod
      double precision snowmm(100000),pptloc(100000)
      double precision snowfall(100000),rain(100000)
      double precision sublim(100000)
      double precision airtemp,melt,snowbeg,dsnowcv
      double precision trn,tpet
      real snopar1,subpar1,subpar2
c
      melt = 0.
      rain(ia) = 0.
      snowfall(ia) = 0.
      snowbeg = snowmm(ia)
      sublim(ia) = 0.
c
c---- set rain = precip if above freezing
c     (this will later be moved to pptdist module)
      if(airtemp.gt.0) then
            rain(ia) = pptloc(ia)
            snowfall(ia) = 0.
c
c---- calculate amount of melting if snow-cover > 0 and airtemp > 0
c     isnwmod = 2 only available model for now
            if(snowmm(ia).gt.0) then
                  if(isnwmod.eq.2) then
                        melt = snopar1*airtemp
                  else
                        melt = 0.
                  endif
                  if(melt.gt.snowmm(ia)) melt = snowmm(ia)
                  snowmm(ia) = snowmm(ia) - melt
            endif
c
c---- convert precip to snowfall if airtemp below freezing
c     use simple version for testing
c     (this will later be moved to pptdist module)
c
      else
            if(pptloc(ia).gt.0) then
                  snowfall(ia) = pptloc(ia)
                  rain(ia) = 0.
                  snowmm(ia) = snowmm(ia) + snowfall(ia)
            endif
      endif
c
c
```

```
c     mod 4/1/99 (infils5h)
c---- calculate snow-cover sublimation rate for dry days,
c     as a function of air temp (this function is preliminary)
c     sublimation = 0. if precip occurring
c     do not let sublimation rate exceed potential et rate
c
      if((isublim.eq.1).and.(pptloc(ia).eq.0.)) then
            sublim(ia) = ((20. + airtemp)/10.) * subpar1
            if(sublim(ia).lt.0) sublim(ia) = 0.
            if(sublim(ia).gt.snowmm(ia)) sublim(ia) = snowmm(ia)
            if(sublim(ia).gt.tpet) sublim(ia) = tpet
            snowmm(ia) = snowmm(ia) - sublim(ia)

c     test model
      else if((isublim.eq.2).and.(pptloc(ia).eq.0.)) then
            sublim(ia) = trn/2.501
            if(sublim(ia).lt.0) sublim(ia) = 0.
            if(sublim(ia).gt.snowmm(ia)) sublim(ia) = snowmm(ia)
            if(sublim(ia).gt.tpet) sublim(ia) = tpet
            snowmm(ia) = snowmm(ia) - sublim(ia)

      else if(isublim.eq.3) then
            if(airtemp.gt.0.) sublim(ia) = subpar2 * tpet
            if(airtemp.le.0.) sublim(ia) = subpar1 * tpet
            if(sublim(ia).gt.subpar2*tpet) sublim(ia) = subpar2 * tpet
            if(sublim(ia).gt.snowmm(ia)) sublim(ia) = snowmm(ia)
            snowmm(ia) = snowmm(ia) - sublim(ia)

      endif
c
      dsnowcv = snowmm(ia) - snowbeg
c
c---- debugging
c     write(*,101) ia,airtemp,pptloc(ia),rain(ia),snowfall(ia),
c     1                 snowmm(ia),melt
c101  format(1x,i8,1x,f6.2,1x,5f7.2)
c     pause
c
      return
      end
c
c////////////////////////////// end of program
//////////////////////////////////////
c//////////////////////////////////////////////////////////////////////
///////////////
c
c
```

ATTACHMENT III

Documentation of PREINFIL (to satisfy AP-SI.1Q)

This attachment and Attachment IV contain documentation necessary to satisfy procedure AP-SI.1Q, Section 5.1.1.2 verification of routines used. PREINFIL can be considered to be a routine since it can be verified by visual inspection and hand calculations. Its purpose is to create automatically and readily input user control files for the computer model INFIL as used in these analyses. Attachment IV contains a listing of the source code for PREINFIL.

PREINFIL Version A1.20 software routine verification showing conformance to AP-SI.IQ Revision 2 ICN 4, Section 5.1.1.2.

Creation of INFIL Version 2.a1 input control files containing the following:

1. sampled parameter data using LHS, and
2. designated filenames,
3. As extracted from Procedure AP-SI.IQ Revision 2 ICN 4, Section 5.1.1.2:

> **5.1.1.2 Software Developer:**
> Include, as a minimum the following information:
> - Identification, including version of the software routine or macro.
> - The name and version identification of the commercial software under which the routine or macro was developed.
> - Sufficient documentation that the software routine or macro provides correct results for a specified range of input parameters. This includes inputs; computer generated results for a specified range of input parameters; computer generated evidence of the programmed algorithms or equations, e.g., computer program listings and spreadsheet cell contents; and verification results.

Documentation to satisfy first and second bullets of Section 5.1.1.2:

A software routine (consisting of several modules) was developed in accordance with AP-SI.1Q , Section 5.1.1.2 for the purpose of readily and automatically creating input control files compatible with INFIL V A_2.a1 which also incorporate designated 1) sampled parameter values (using Latin Hypercube Sampling) and 2) filenames which are read from this file and subsequently output by INFIL. The software developed, PREINFIL, V. 1.20, is in FORTRAN 77. The source code, which includes a change history, and the executable reside in the following directory location on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.PREINFIL.SOURCE_CODE .NEW].

This satisfies the requirements of Section 5.1.1.2, first bullet of AP-SI.1Q for routines.

Documentation to satisfy third bullet of Section 5.1.1.2:

Satisfaction of the second bullet of Section 5.1.1.2 is accomplished by utilizing a sample input user file produced by PREINFIL for the process of executing INFIL V A_2.a1, and requiring that 1) the INFIL code terminates normally, 2) the correct values as sampled by LHS V. 2.50 are placed correctly into the same input control files, 3) the files with designated filenames (as input in the same input user control files are output as such by INFIL, and 4) the output files produced are equivalent to output files produced using the same input by an independently designed calculation. PREINFIL requires the following input; 1) a (binary) ‘computational’ database file (CDB), 2) a user control file which contains instructions for PREINFIL, and 3) a template input control file for INFIL V A_2.a1. The output from PREINFIL consists of a new input control file for INFIL V A_2.a1, satisfying the 4 items listed above, and an optional debug file.

Verification of requirement 1) can be obtained by noting that INFIL terminates normally.

To verify requirement 2), the following is done. Examine the input CDB file using a software tool called GROPECDB to determine the values of sampled parameters. A sample ascii output printout of the CDB file using GROPECDB is shown in Table III-3. This file shows the values of the sampled parameters from LHS (the parameter called ATEMP1 in the CDB file was not sampled). The input template user control file for INFIL that is modified is found in Table VII-8 (Attachment VII). Table III-1 and III-2 shows the corresponding input user control file for INFIL Version A_2.a1 produced by PREINFIL and manually, respectively. A comparison of the Table III-1 and III-2 shows the bolded entries, rounded to three significant decimal digits, are equivalent to the bolded values in Table III-3. One exception is for the parameter ETCOEFFA in Table III-3, corresponding to BARSOIL1 in Table III-1 and III-2, has a sign change which is done within PREINFIL. To determine the correspondence between names of parameters in the INFIL input user control file and the names in the GROPECDB listing, refer to the Input User Control File for PREINFIL (Table VII-7 in Attachment VII).

Verification of requirement 3) can be obtained by noting that the names of output files produced by INFIL (bold italics in Table III-1) are identical to the names as specified in the input user control file for PREINFIL.

Verification of item 4) is contained in the following argument. The independently designed calculation is one in which the input user control file is produced by hand using the same template as PREINFIL, and substituting the sampled parameter values as found in the input CDB file. A comparison of the summary output files produced by the INFIL code using the input user control file produced by PREINFIL, see Table III-4, Summary Output File from Executing INFIL Using PREINFIL to produce an Input Control File (Table III-1), and by hand, see Table III-5, Summary Output File from Executing INFIL Using Manual Substitutions into a Template Input Control File (Table III-2) shows that they are equivalent calculations. Figure III-1 shows this diagrammatically. Note specifically the output parameter (Net Infiltration) of importance here (bolded) is identical in both Table III-4 and III-5.

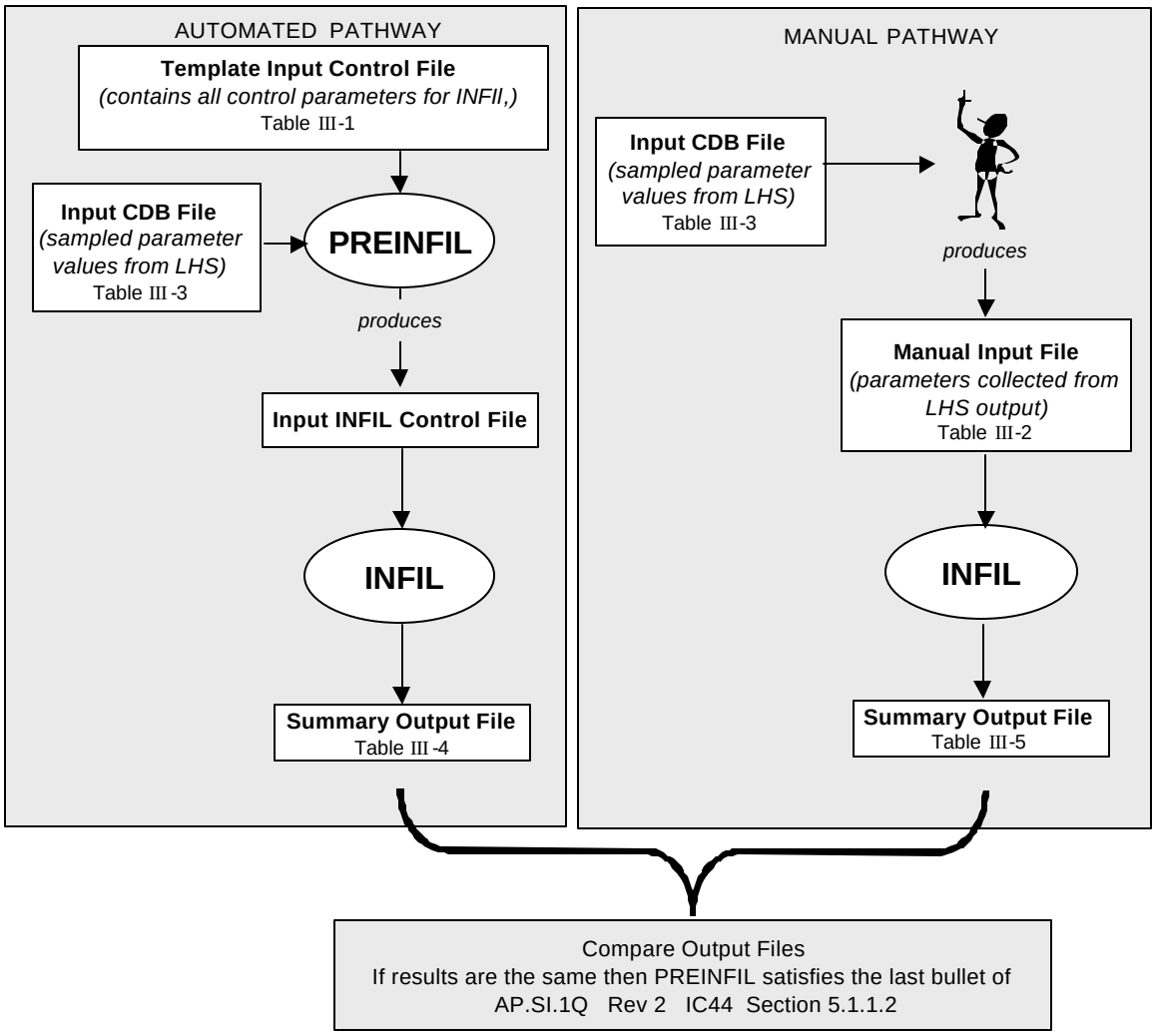

Figure III-1 Process of Verifying PREINFIL According to AP-SI.1Q

Table III-1. Sample Input User Control File for INFIL Version A_2.a1 produced by PREINFIL. (PREINFIL presents bolded values generally to three significant decimal digits, except for values corresponding to BARSOIL1, BARSOIL2, which have four)

```
INFIL2a1.ctl: Solitario East, Tule Lake, ww1-2a1-gm1-k2-w20 (11/18/1999)

1      0.00000001     IROUT(1 = coupled, 0 = uncoupled, -1 = flow routing off, -2 = infil off), IFRTOL
2      2        2.16E+00      ISNOW ISNWMOD SNOPAR1
3      1.57E-01       3.00E-01       ISUBLIM SUBPAR1 SUBPAR2
0      1.     IPPTTEST (1 for testing), PPTTEST = constant
0      .0     IETTEST (1 for testing), ETTEST = constant
3      0.0    CELSIZE (node spacing (meters): using for flow volume 31.0 calculations)
544721.0   4072203.0                        xcfs,ycfs: coords for discharge cell
1950   1   1996   366   1   5              yr1=start year, dnn1=start day, yr2=end year, dn2=end day
1.12E+00   9.01E-01   5.48E+00  2.23E+00    MULTIPLI (PPTFACT ETFACT IMBFACT SKSFACT)
1.13E+00   0   4.00E-01                    SDFACT (SOIL DEPTH
1.0   0.8   0.8   0.2                      ROOTF1,ROOTF2,ROOTF3,ROOTF4
1.0   1.0   0.5   0.1                      MAXWGT1,MAXWGT2,MAXWGT3,MAXWGT4
0.30   2.00   3.75   2.00                  RDEPTH1 RDEPTH2 RDEPTH3 RDEPTH4
2.95E-02  1.00E+00  3.04E-01               RKPOR RKMMFACT FLAREA
1   1   0                                  INFMOD, ETMOD, RUNMOD
-10.610   1.102                            BARSOIL1 BARSOIL2
3   17.3   11.74                           IAIRTEMP=1 for new air temp model, ATEMP1=avg. air temp,
       ATEMP2 = air temp seaso
2                                          HSTEP: time step for PET model (hours)
5   181   3                                PPTYUC (=5 diminished elev. correlation, =2 for 4JA , =1 for
       simple elevation transf
Tulelake.inp                               input file name:  daily precip
0      1    0.5      1     1         dpthflag, irtz, delvwcf, moistcr, fracmod
0      1.75                           IVWCFLG, vwcfact
ww1.w20                                    input file name:  map parameters (*.inp)
-1
ww1-gm1.2a1                                dayall: average daily mass balance terms
1    1  ndaymap, imap
70   1995
ww1-gm1.2a2
INFILSM_WW1_R001.OUT
INFILMN_WW1_R001.OUT
1   1                              dbgflag, dbgflag2
ww1-gm1.2a5                                output file name:  annual mass balance terms
0                                          IDEBUG: debugging option parameter
INFILECHO_R001.OUT
ww1-gm1                                    map output:  annual totals or mult-year averages
--
--------------- Parameters for dynamic root-zone function -------------------------------------
--     depth  rtza   rtzb   rtzc  rtzd  bsoil    delvwc
--     m
```

```
     4
     1    0.5     15      3     3     2     0.30      0.50
     2    1.5     15      4     2     2     0.20      0.50
     3    4.5     10    1.5     1     2     0.10      0.50
     4    6.0     10    1.5     1     2     0.05      0.25
--
--------------- Soil Properties (Brooks & Corey/van Genuchten combined) ----------------------------------------
--     fdcp   etresidpor    beta  alpah ksat     PE        B     n     vg-alpha sorp     SOILP   potis
--                                       Kg s /m^3J/Kg                 1/(J/Kg) ???              J/Kg
    10
     1  0.242  0.054  0.366  -3.5  1.26  5.6E-04 -1.19E+00  4.72  1.24  5.2E-01    0.390    0.05 -1.0E+02
     2  0.173  0.023  0.315  -3.5  1.26  1.2E-03 -9.41E-01  3.70  1.31  6.2E-01    0.500    0.05 -1.0E+02
     3  0.163  0.017  0.325  -3.5  1.26  1.3E-03 -8.60E-01  3.36  1.36  6.6E-01    0.510    0.05 -1.0E+02
     4  0.073  0.002  0.281  -3.5  1.26  3.8E-03 -6.22E-01  2.18  1.62  8.7E-01    0.700    0.05 -1.0E+02
     5  0.200  0.035  0.330  -3.5  1.26  6.7E-04 -1.07E+00  4.14  1.78  5.6E-01    0.400    0.05 -1.0E+02
     6  0.150  0.011  0.339  -3.5  1.26  2.7E-03 -7.55E-01  3.06  1.40  7.4E-01    0.700    0.05 -1.0E+02
     7  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     8  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     9  0.189  0.028  0.322  -3.5  1.26  5.7E-04 -1.08E+00  3.88  1.30  5.5E-01    0.370    0.05 -1.0E+02
    10  0.189  0.028  0.322  -3.5  1.26  5.7E-05 -1.08E+00  3.88  1.00  5.5E-01    0.037    0.05 -1.0E+02
--
---------------Rockl Properties (Brooks & Corey/van Genuchten combined)----------------------------------------
--     rkcp   etresidpor    beta  alpha ksat     PE        B     n     vg-alpha fracks   imbibe  potir
--                                       Kg s /m^3J/Kg                 1/(J/Kg) Kg s /m^3mm/dy   J/Kg
     129
       1     0.35    0.065    0.366     -1.5     1.26   0.0011    -0.93      3.6     1.25     0.52  0.00056      500     -100
       2    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       3    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       4    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       5    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       6    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       7    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       8    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       9    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      10    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      11    0.105     0.02     0.11     -1.5     1.26  4.0E-09       -6     3.92     1.47       64  2.4E-07     0.06     -100
      12    0.388    0.039    0.393     -1.5     1.26 0.000053     -242     4.57     1.38     2400 0.000053     2.74     -100
      13     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
      14    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      15    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      16    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      17    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.35     -100
      18    0.248     0.01    0.253     -1.5     1.26  3.8E-06    -82.3     2.71     1.84      830  3.9E-06     3.34     -100
      19    0.159     0.01    0.164     -1.5     1.26  1.2E-06     -140     3.61     1.53     1400  1.3E-06     1.13     -100
      20    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      21    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      22    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      23    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      24    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      25    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      26    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
```

27	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
28	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
29	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
30	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
31	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
32	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
33	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
34	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
35	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
36	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
37	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
38	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
39	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
40	0.494	0.05	0.499	-1.5	1.26	0.000088	-341	4.19	1.43	3400	0.000088	75.62	-100
41	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
42	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
43	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
44	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-26.9	5.6	1.29	270	2.1E-07	0.09	-100
45	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
99	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
46	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
47	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
48	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
49	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
50	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
51	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
52	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
53	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
54	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
55	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
56	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
57	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
58	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
59	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
60	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
61	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
62	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
63	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
64	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
65	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
66	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
67	0.031	0.018	0.036	-1.5	1.26	5.0E-09	-0.6	3.39	1.58	10	2.4E-07	0.17	-100
68	0.168	0.021	0.173	-1.5	1.26	7.3E-08	-125	5.36	1.31	1300	1.3E-07	0.07	-100
69	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.02	-100
70	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
71	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.01	-100
72	0.317	0.023	0.322	-1.5	1.26	3.8E-08	-181	4.01	1.46	1800	9.9E-08	1.65	-100
73	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
74	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
75	0.281	0.051	0.286	-1.5	1.26	1.7E-08	-17.5	4.01	1.45	180	7.8E-08	0.02	-100
76	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100

77	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
201	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
202	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.06	-100
203	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
204	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	120	1.4E-07	500	-100
205	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
206	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
207	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
208	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
209	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
210	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
211	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
212	0	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
213	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
214	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
301	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
302	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
303	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
304	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
305	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
306	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
307	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
308	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
309	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
310	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
311	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
312	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
313	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
314	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
315	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
316	0.159	0.01	0.164	-1.5	1.26	1.2E-06	-140	3.61	1.53	1400	1.3E-06	1.13	-100
317	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
318	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
319	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
320	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
321	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
322	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
323	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
324	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
325	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
326	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
327	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
328	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
329	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
330	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
331	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
332	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
333	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
334	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
335	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
336	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100

345	0.097	0.01	0.102	-1.5	1.26	1.3E-07	-154.6	5.02	1.56	1560	2.9E-07	0.24	-100

Table III-2. Sample Input Control File for INFIL Version 2.a1 Produced by Manually Substituting Sampled Parameter Values

```
INFIL2a1.ctl: Solitario East, Tule Lake, ww1-2a1-gm1-k2-w20 (11/18/1999)
1   0.00000001                                  IROUT(1=coupled, 0=uncoupled, -1=flow routing off, -2=infil off),
                                                          IFRTOL
2   2     2.16                                       ISNOW, ISNWMOD, SNOPAR1
3   0.157 0.3                                     ISUBLIM, SUBPAR1, SUBPAR2
0   1.                                            IPPTTEST (1 for testing), PPTTEST = constant
0   .0                                            IETTEST (1 for testing), ETTEST = constant
30.0                                                  CELSIZE (node spacing (meters): using for flow volume calculations)
544721.0  4072203.0                               xcfs,ycfs: coords for discharge cell
1950  1    1996    366   1   5                   yr1 = start year, dnn1 = start day, yr2 = end year, dn2 = end day
1.12   0.901  5.48  2.23                          multipliers ( pptfact, etfact, imbfact, sksfact)
1.13  0    0.4                                    SDFACT (soil depth multiplier), IVEGC (set to 1 for map data), FVEGC
                                                          use if IVEGC = 0)
1.0   0.8   0.8    0.2                            ROOTF1,ROOTF2,ROOTF3,ROOTF4
1.0   1.0   0.5    0.1                            MAXWGT1, MAXWGT2, MAXWGT3, MAXWGT4
0.3   2.0   3.75   2.0                            RDEPTH1,RDEPTH2,RDEPTH3,RDEPTH4,RDEPTHF
2.95E-02 1.0  .304                                RKPOR, RKMMFACT, FLAREA
1   1    0                                        INFMOD, ETMOD, RUNMOD
 -10.61  1.102                                 BARSOIL1, BARSOIL2:  bare soil et parameters
3   17.3  11.74                                   IAIRTEMP=1 for new air temp model, ATEMP1 = avg. air temp,
                                                          ATEMP2=air temp seasonal deviation
2                                                 HSTEP: time step for PET model (hours)
5  181  3                                         PPTYUC (=5 diminished elev. correlation, =2 for 4JA , =1 for simple
                                                          elevation transfer), AAPREPX, IPPTDAT
Tulelake.inp                                      input file name:  daily precip
0      1    0.5      1     1                        dpthflag, irtz, delvwcf, moistcr, fracmod
0      1.75                                   IVWCFLG,   vwcfact
ww1.w20                                           input file name:  map parameters (*.inp)
-1
ww1-gm1.2a1                                       dayall: average daily mass balance terms
1    1                                         ndaymap, imap
70   1995
ww1-gm1.2a2
ww1-gm1.2a3                                       output file name:  daily mass balance
ww1-gm1.2a4                                       output file name:  total daily fluxes
1      1                                          dbgflag, dbgflag2
ww1-gm1.2a5                                       output file name:  annual mass balance terms
0                                                 IDEBUG:  debugging option parameter
ww1-gm1.2a6                                       new debug file
ww1-gm1                                           map output:  annual totals or mult-year averages
--
--------------- Parameters for dynamic root-zone function -------------------------------------
--     depth  rtza   rtzb   rtzc  rtzd  bsoil    delvwc
```

```
--      m
     4
     1    0.5     15      3     3     2     0.30      0.50
     2    1.5     15      4     2     2     0.20      0.50
     3    4.5     10    1.5     1     2     0.10      0.50
     4    6.0     10    1.5     1     2     0.05      0.25
--
--------------- Soil Properties (Brooks & Corey/van Genuchten combined) ----------------------------------------
--      fdcp   etresidpor    beta  alpah ksat     PE        B     n     vg-alpha sorp     SOILP   potis
--                                       Kg s /m^3J/Kg                  1/(J/Kg) ???              J/Kg
    10
     1  0.242  0.054  0.366  -3.5  1.26  5.6E-04 -1.19E+00  4.72  1.24  5.2E-01    0.390    0.05 -1.0E+02
     2  0.173  0.023  0.315  -3.5  1.26  1.2E-03 -9.41E-01  3.70  1.31  6.2E-01    0.500    0.05 -1.0E+02
     3  0.163  0.017  0.325  -3.5  1.26  1.3E-03 -8.60E-01  3.36  1.36  6.6E-01    0.510    0.05 -1.0E+02
     4  0.073  0.002  0.281  -3.5  1.26  3.8E-03 -6.22E-01  2.18  1.62  8.7E-01    0.700    0.05 -1.0E+02
     5  0.200  0.035  0.330  -3.5  1.26  6.7E-04 -1.07E+00  4.14  1.78  5.6E-01    0.400    0.05 -1.0E+02
     6  0.150  0.011  0.339  -3.5  1.26  2.7E-03 -7.55E-01  3.06  1.40  7.4E-01    0.700    0.05 -1.0E+02
     7  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     8  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     9  0.189  0.028  0.322  -3.5  1.26  5.7E-04 -1.08E+00  3.88  1.30  5.5E-01    0.370    0.05 -1.0E+02
    10  0.189  0.028  0.322  -3.5  1.26  5.7E-05 -1.08E+00  3.88  1.00  5.5E-01    0.037    0.05 -1.0E+02
--
---------------Rockl Properties (Brooks & Corey/van Genuchten combined)-----------------------------------------
--      rkcp   etresidpor    beta  alpha ksat     PE        B     n     vg-alpha fracks   imbibe  potir
--                                       Kg s /m^3J/Kg                  1/(J/Kg) Kg s /m^3mm/dy   J/Kg
     129
       1     0.35    0.065    0.366     -1.5     1.26   0.0011    -0.93      3.6     1.25     0.52  0.00056      500     -100
       2    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       3    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       4    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       5    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       6    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       7    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       8    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       9    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      10    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      11    0.105     0.02     0.11     -1.5     1.26  4.0E-09       -6     3.92     1.47       64  2.4E-07     0.06     -100
      12    0.388    0.039    0.393     -1.5     1.26 0.000053     -242     4.57     1.38     2400 0.000053     2.74     -100
      13     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
      14    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      15    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      16    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      17    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.35     -100
      18    0.248     0.01    0.253     -1.5     1.26  3.8E-06    -82.3     2.71     1.84      830  3.9E-06     3.34     -100
      19    0.159     0.01    0.164     -1.5     1.26  1.2E-06     -140     3.61     1.53     1400  1.3E-06     1.13     -100
      20    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      21    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      22    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      23    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      24    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      25    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
```

26	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
27	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
28	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
29	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
30	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
31	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
32	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
33	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
34	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
35	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
36	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
37	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
38	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
39	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
40	0.494	0.05	0.499	-1.5	1.26	0.000088	-341	4.19	1.43	3400	0.000088	75.62	-100
41	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
42	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
43	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
44	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-26.9	5.6	1.29	270	2.1E-07	0.09	-100
45	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
99	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
46	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
47	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
48	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
49	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
50	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
51	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
52	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
53	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
54	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
55	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
56	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
57	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
58	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
59	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
60	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
61	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
62	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
63	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
64	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
65	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
66	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
67	0.031	0.018	0.036	-1.5	1.26	5.0E-09	-0.6	3.39	1.58	10	2.4E-07	0.17	-100
68	0.168	0.021	0.173	-1.5	1.26	7.3E-08	-125	5.36	1.31	1300	1.3E-07	0.07	-100
69	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.02	-100
70	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
71	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.01	-100
72	0.317	0.023	0.322	-1.5	1.26	3.8E-08	-181	4.01	1.46	1800	9.9E-08	1.65	-100
73	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
74	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
75	0.281	0.051	0.286	-1.5	1.26	1.7E-08	-17.5	4.01	1.45	180	7.8E-08	0.02	-100

76	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
77	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
201	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
202	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.06	-100
203	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
204	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	120	1.4E-07	500	-100
205	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
206	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
207	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
208	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
209	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
210	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
211	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
212	0	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
213	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
214	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
301	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
302	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
303	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
304	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
305	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
306	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
307	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
308	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
309	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
310	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
311	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
312	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
313	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
314	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
315	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
316	0.159	0.01	0.164	-1.5	1.26	1.2E-06	-140	3.61	1.53	1400	1.3E-06	1.13	-100
317	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
318	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
319	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
320	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
321	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
322	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
323	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
324	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
325	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
326	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
327	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
328	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
329	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
330	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
331	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
332	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
333	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
334	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
335	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100

336	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
345	0.097	0.01	0.102	-1.5	1.26	1.3E-07	-154.6	5.02	1.56	1560	2.9E-07	0.24	-100

Table III-3 Listing of sampled parameter values in Realization #001 as shown by GROPECDB. (Element Block 1 FOOTPRNT contains the sampled values).

GROPECDB_PA96

```
 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR   RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR   RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB         PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP
```

GROPECDB_PA96 Version 2.12
PROD PA96 Built 06/27/96
Sponsored by Amy Gilkey

Run on 01/19/00 at 12:39:40
Run on ALPHA AXP BEATLE OpenVMS V7.1

Database: I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.GLACIAL]POSTLHS_1_R001.CDB;2
Written on: 12/01/99 18:02:24

CAMDAT Version: 1 (EXODUS Version: 1)

PROPERTIES

Element Block 1) "FOOTPRNT" 1=ID 75 elements (1..75)
8-node 5 attributes 13 properties

BRPOROS	**BRZDEPTH**	**SOILDEPM**	**PRECIPM**	**POTETMUL**	**BRPERM**
SOILPERM	**ETCOEFFA**	**ETCOEFFB**	**FLAREA**	**ATEMP1**	**SNOPAR1**
SUBPAR1					
2.95100E-02	**3.74700E+00**	**1.12800E+00**	**1.11500E+00**	**9.01500E-01**	**5.48200E+00**
2.22800E+00	**1.06100E+01**	**1.10200E+00**	**3.04400E-01**	**1.73000E+01**	**2.15800E+00**
1.57100E-01					

Element Block 2) "OUTSIDE " 2=ID 25 elements (76..100)

```
   8-node     5 attributes    13 properties
 BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
 SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
 SUBPAR1
2.00000E-02  1.50000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
1.00000E+00 -1.50000E+00  1.26000E+00  5.00000E-01  1.73000E+01  1.78000E+00
1.00000E-01
```

Table III-4. Summary Output File from Executing INFIL Using PREINFIL to produce an Input User Control File.

```
INFIL2a1.ctl: Solitario East, Tule Lake, ww1-2a1-gm1-k2-w20 (11/18/1999)
Daily precipitation input:             Tulelake.inp
Watershed modeling domain parameters:  ww1.w20
Average daily mass balance terms:      ww1-gm1.2a1
24-hour mass balance map:              ww1-gm1.2a2
Annual mass balance map:               ww1-gm1.1
Average annual mass balance map:       INFILMN_WW1_R001.OUT
Summary statistics output:             INFILSM_WW1_R001.OUT
Debugging output:                      ww1-gm1.2a5


Total number of days read in   =    12053
Total daily precip             =   9660.7
Average annual precip (mm)     =    292.8
Maximum daily precip (mm)      =     51.3


TOTAL NUMBER OF LOCATIONS    =     1325
AVERAGE ELEVATION OF SAMPLE  =   1375.1
MAXIMUM ELEVATION OF SAMPLE  =   1477.0
MINIMUM ELEVATION OF SAMPLE  =   1244.0
AVERAGE SOIL DEPTH (M)       =    0.978
AVERAGE SLOPE OF SAMPLE      =     15.7
MAXIMUM SLOPE OF SAMPLE      =     31.0
NUMBER OF ACTIVE LOCATIONS   =     1121


  Yr  Dy    Precip      Rain      Snow  Sn-cover  Snowmelt    Sublim       PET     PETRS  Evapotrs  Del-soil   Net-inf    Runoff  Out-flow    Mass
balance
1950 365   327.368   247.180    80.188   518.376    64.458     6.440   740.934   588.043   237.019    74.619     0.000     0.000     0.000  -
0.116272812E-07
1951 365   240.805   133.410   107.395  1050.796    67.072     9.551   748.068   593.705   190.816     8.893     0.773     0.000     0.000  -
0.684339702E-07
1952 366   307.920   259.992    47.928   447.559    78.249     5.716   719.220   570.810   296.593    19.635    22.014     6.051     0.000  -
0.264484373E-06
1953 365   416.968   346.823    70.145   339.105    64.321     7.574   707.794   561.741   315.174    54.204    41.546     6.212     0.000  -
0.508485369E-06
1954 365   240.805   152.043    88.761   721.181    64.230     8.407   720.911   572.151   241.519   -69.759    44.734    12.262     0.000  -
0.849553510E-06
1955 365   288.921   137.320   151.600  1844.158   102.263     9.147   738.829   586.372   192.625    44.914     1.773     0.570     0.000  -
0.438779343E-07
1956 366   351.539   319.022    32.517  2744.499    83.849     7.256   734.147   582.656   309.279    17.799    74.861    48.234     1.203  -
0.445807547E-06
1957 365   432.032   400.401    31.631    92.526    28.441     3.190   749.154   594.567   324.425    46.042    58.374    13.873     0.000  -
0.832975722E-06
1958 365   386.839   338.501    48.338   184.839    35.584     4.291   723.782   574.430   374.525   -56.217    55.777    22.067     0.000  -
0.156226674E-05
```

```
1959 365   136.703   121.848    14.855   118.058    19.872     3.445   765.636   607.647   220.895   -82.705     3.530     0.000     0.000  -
0.187680335E-05
1960 366   319.949   301.681    18.268    46.664    15.739     2.529   750.060   595.286   248.931    63.339     5.150     0.028     0.000  -
0.538488827E-07
1962 365   383.916   344.603    39.313   352.410    34.481     4.833   736.569   584.579   276.128    54.420    48.535    15.961     0.000  -
0.252647791E-06
1963 365   264.525   202.033    62.492  1285.523    45.994    10.539   718.305   570.083   259.738   -51.876    40.165     3.419     0.000  -
0.679942992E-06
1964 366   428.659   252.576   176.084  1379.128    54.457     4.992   731.361   580.445   278.515    12.023    16.495     2.263     0.000  -
0.916769591E-06
1966 365   263.401   198.532    64.870  3496.565   147.752    10.580   748.145   593.766   247.151    34.955    64.178    30.882     0.000  -
0.136124145E-05
1967 365   233.835   197.682    36.153   537.506    60.049     4.990   755.938   599.951   292.812   -82.392    47.311     6.070     0.000  -
0.287281606E-06
1968 366   329.729   311.471    18.259    53.384    13.964     4.034   743.881   590.381   283.441    40.148     1.845     0.881     0.000  -
0.455076946E-06
1969 365   377.845   264.531   113.314  1294.414    33.754     4.306   749.990   595.230   276.185    -9.894    31.994    12.672     0.000  -
0.733306847E-06
1970 365   292.631   197.782    94.848  1641.513   147.064     9.340   739.280   586.730   235.241    36.249    73.356    37.382     0.000  -
0.127013259E-05
1971 365   318.937   272.421    46.516   423.788    55.306     5.302   741.081   588.160   302.568    -7.868    33.027     2.133     0.000  -
0.161401473E-05
1974 365   189.653   145.123    44.531   232.463    36.380     6.180   742.654   589.408   214.243   -47.742    15.002     0.528     0.000  -
0.914091675E-07
1975 365   303.198   254.524    48.674   169.348    43.390     6.045   736.015   584.139   277.469     8.366    12.078     0.350     0.000  -
0.263568769E-06
1976 366   257.668   219.856    37.812   668.688    32.468     6.664   728.463   578.145   270.515   -26.376     8.185     0.618     0.000  -
0.408913383E-06
1977 365   355.474   261.063    94.411   638.011    38.991     3.691   739.356   586.791   270.753    27.269     2.031     0.106     0.000  -
0.544388076E-06
1978 365   292.293   234.584    57.709  1134.339   103.323     6.116   752.387   597.133   273.794    -5.961    70.074    38.256     0.000  -
0.954334071E-06
1979 365   355.361   308.980    46.381   136.882    41.819     2.950   747.073   592.915   251.077    76.559    23.138     7.664     0.000  -
0.890559467E-07
1980 366   292.293   265.029    27.265   160.762    25.550     2.639   759.633   602.883   296.760   -71.858    65.703    29.325     0.000  -
0.730462317E-06
1981 365   442.599   299.707   142.892   694.287    95.155     9.846   722.279   573.237   261.592    85.962    47.308    13.348     0.000  -
0.105218025E-05
1982 365   372.562   332.566    39.995   588.422    66.373     5.585   722.813   573.661   335.504    -8.368    71.585    27.398     0.218  -
0.181866569E-05
1983 365   511.064   338.886   172.178  1811.492    78.738     9.325   720.650   571.945   301.493    17.793    98.338    38.298     0.000  -
0.268142379E-05
1987 365   270.821   219.715    51.106  2953.074   121.743     9.380   751.721   596.604   298.932   -47.595    86.171    42.315     3.950  -
0.600794386E-06
1995 365   467.669   406.737    60.932   396.442    66.445     5.202   729.251   578.770   316.553    56.781    99.068    39.465     0.740  -
0.145672736E-05
1996 366   412.920   276.575   136.345   860.166    99.629     9.452   730.884   580.066   310.163   -38.762   104.463    49.617     0.381  -
0.252140816E-05


Global Summary Statistics (mm/year):
```

```
99    ------------------------------------------------
100
101   Precipitation...................       329.306884
102   Rain............................       259.496179
103   Snowfall........................        69.810705
104   Snow-cover......................       879.302133
105   Snow-melt.......................        62.634724
106   Sublimation.....................         6.349767
107   Potential Evapotranspiration....       737.780869
108   Actual Evapotranspiration.......       275.230822
109   Change in Soil Moisture.........         5.230281
110   Net Infiltration................        41.473078
111   Runoff Generation...............        15.401762
112   Cumulative Daily Run-on.........       126.673640
113   Outflow.........................         0.196722
114   Average Mass Balance Error......    -0.100983E-11
115   Average Max Daily Error (mm/dy).    -0.753407E-13
```

Table III-5. Summary Output File from Executing INFIL Using Manual Substitutions to produce an Input User Control File.

```
INFIL2a1.ctl: Solitario East, Tule Lake, ww1-2a1-gm1-k2-w20 (11/18/1999)
Daily precipitation input:             Tulelake.inp
Watershed modeling domain parameters:  ww1.w20
Average daily mass balance terms:      ww1-gm1.2a1
24-hour mass balance map:              ww1-gm1.2a2
Annual mass balance map:               ww1-gm1.1
Average annual mass balance map:       ww1-gm1.2a4
Summary statistics output:             ww1-gm1.2a3
Debugging output:                      ww1-gm1.2a5


Total number of days read in   =    12053
Total daily precip             =   9660.7
Average annual precip (mm)     =    292.8
Maximum daily precip (mm)      =     51.3


TOTAL NUMBER OF LOCATIONS    =     1325
AVERAGE ELEVATION OF SAMPLE  =   1375.1
MAXIMUM ELEVATION OF SAMPLE  =   1477.0
MINIMUM ELEVATION OF SAMPLE  =   1244.0
AVERAGE SOIL DEPTH (M)       =    0.978
AVERAGE SLOPE OF SAMPLE      =     15.7
MAXIMUM SLOPE OF SAMPLE      =     31.0
NUMBER OF ACTIVE LOCATIONS   =     1121
```

Yr	Dy	Precip	Rain	Snow	Sn-cover	Snowmelt	Sublim	PET	PETRS	Evapotrs	Del-soil	Net-inf	Runoff	Out-flow	Mass-balance
1950	365	327.368	247.180	80.188	518.376	64.458	6.440	740.934	588.043	237.019	74.619	0.000	0.000	0.000	-0.116272812E-07
1951	365	240.805	133.410	107.395	1050.796	67.072	9.551	748.068	593.705	190.816	8.893	0.773	0.000	0.000	-0.684339702E-07
1952	366	307.920	259.992	47.928	447.559	78.249	5.716	719.220	570.810	296.593	19.635	22.014	6.051	0.000	-0.264484373E-06
1953	365	416.968	346.823	70.145	339.105	64.321	7.574	707.794	561.741	315.174	54.204	41.546	6.212	0.000	-0.508485369E-06
1954	365	240.805	152.043	88.761	721.181	64.230	8.407	720.911	572.151	241.519	-69.759	44.734	12.262	0.000	-0.849553510E-06
1955	365	288.921	137.320	151.600	1844.158	102.263	9.147	738.829	586.372	192.625	44.914	1.773	0.570	0.000	-0.438779343E-07
1956	366	351.539	319.022	32.517	2744.499	83.849	7.256	734.147	582.656	309.279	17.799	74.861	48.234	1.203	-0.445807547E-06
1957	365	432.032	400.401	31.631	92.526	28.441	3.190	749.154	594.567	324.425	46.042	58.374	13.873	0.000	-0.832975722E-06
1958	365	386.839	338.501	48.338	184.839	35.584	4.291	723.782	574.430	374.525	-56.217	55.777	22.067	0.000	-0.156226674E-05
1959	365	136.703	121.848	14.855	118.058	19.872	3.445	765.636	607.647	220.895	-82.705	3.530	0.000	0.000	-0.187680335E-05
1960	366	319.949	301.681	18.268	46.664	15.739	2.529	750.060	595.286	248.931	63.339	5.150	0.028	0.000	-0.538488827E-07
1962	365	383.916	344.603	39.313	352.410	34.481	4.833	736.569	584.579	276.128	54.420	48.535	15.961	0.000	-0.252647791E-06
1963	365	264.525	202.033	62.492	1285.523	45.994	10.539	718.305	570.083	259.738	-51.876	40.165	3.419	0.000	-0.679942992E-06
1964	366	428.659	252.576	176.084	1379.128	54.457	4.992	731.361	580.445	278.515	12.023	16.495	2.263	0.000	-0.916769591E-06
1966	365	263.401	198.532	64.870	3496.565	147.752	10.580	748.145	593.766	247.151	34.955	64.178	30.882	0.000	-0.136124145E-05
1967	365	233.835	197.682	36.153	537.506	60.049	4.990	755.938	599.951	292.812	-82.392	47.311	6.070	0.000	-0.287281606E-06
1968	366	329.729	311.471	18.259	53.384	13.964	4.034	743.881	590.381	283.441	40.148	1.845	0.881	0.000	-0.455076946E-06
1969	365	377.845	264.531	113.314	1294.414	33.754	4.306	749.990	595.230	276.185	-9.894	31.994	12.672	0.000	-0.733306847E-06
1970	365	292.631	197.782	94.848	1641.513	147.064	9.340	739.280	586.730	235.241	36.249	73.356	37.382	0.000	-0.127013259E-05
1971	365	318.937	272.421	46.516	423.788	55.306	5.302	741.081	588.160	302.568	-7.868	33.027	2.133	0.000	-0.161401473E-05
1974	365	189.653	145.123	44.531	232.463	36.380	6.180	742.654	589.408	214.243	-47.742	15.002	0.528	0.000	-0.914091675E-07
1975	365	303.198	254.524	48.674	169.348	43.390	6.045	736.015	584.139	277.469	8.366	12.078	0.350	0.000	-0.263568769E-06
1976	366	257.668	219.856	37.812	668.688	32.468	6.664	728.463	578.145	270.515	-26.376	8.185	0.618	0.000	-0.408913383E-06
1977	365	355.474	261.063	94.411	638.011	38.991	3.691	739.356	586.791	270.753	27.269	2.031	0.106	0.000	-0.544388076E-06
1978	365	292.293	234.584	57.709	1134.339	103.323	6.116	752.387	597.133	273.794	-5.961	70.074	38.256	0.000	-0.954334071E-06

1979	365	355.361	308.980	46.381	136.882	41.819	2.950	747.073	592.915	251.077	76.559	23.138	7.664	0.000	-0.890559467E-07
1980	366	292.293	265.029	27.265	160.762	25.550	2.639	759.633	602.883	296.760	-71.858	65.703	29.325	0.000	-0.730462317E-06
1981	365	442.599	299.707	142.892	694.287	95.155	9.846	722.279	573.237	261.592	85.962	47.308	13.348	0.000	-0.105218025E-05
1982	365	372.562	332.566	39.995	588.422	66.373	5.585	722.813	573.661	335.504	-8.368	71.585	27.398	0.218	-0.181866569E-05
1983	365	511.064	338.886	172.178	1811.492	78.738	9.325	720.650	571.945	301.493	17.793	98.338	38.298	0.000	-0.268142379E-05
1987	365	270.821	219.715	51.106	2953.074	121.743	9.380	751.721	596.604	298.932	-47.595	86.171	42.315	3.950	-0.600794386E-06
1995	365	467.669	406.737	60.932	396.442	66.445	5.202	729.251	578.770	316.553	56.781	99.068	39.465	0.740	-0.145672736E-05
1996	366	412.920	276.575	136.345	860.166	99.629	9.452	730.884	580.066	310.163	-38.762	104.463	49.617	0.381	-0.252140816E-05

Global Summary Statistics (mm/year):

Precipitation.....	329.306884
Rain.....	259.496179
Snowfall.....	69.810705
Snow-cover.....	879.302133
Snow-melt.....	62.634724
Sublimation.....	6.349767
Potential Evapotranspiration....	737.780869
Actual Evapotranspiration.....	275.230822
Change in Soil Moisture.....	5.230281
Net Infiltration.....	**41.473078**
Runoff Generation.....	15.401762
Cumulative Daily Run-on.....	126.673640
Outflow.....	0.196722
Average Mass Balance Error.....	-0.100983E-11
Average Max Daily Error (mm/dy).	-0.753407E-13

ATTACHMENT IV

LISTING OF SOURCE CODE PREINFIL

(TO SATISFY AP-SI.1Q)

This attachment contains a listing of the software routine PREINFIL developed at Sandia National Laboratories which serves as a preprocessor to produce input user control files for the code INFIL (INFIL V.A_2a.1). Verification of the use of this routine is found in Attachment III.

Table IV-1. Source listing file for PREINFIL routine. Writes a new input control file for Program INFIL. McCurley (299-1282) December 1999.

```
PROGRAM PREINFIL
C*********************************************************************
C
C                               PREINFIL
C                               ------
C
C        The PREINFIL translator extracts (LHS) sampled and fixed
C        parameter data and other auxillary information
C        requested by the user from a Computational DataBase file
C        (.CDB), and sets up the INFIL program input control file
C
C                               MAY 1999
C
C
C                               Authors
C                               -------
C
C                          Ron D. McCurley
C                       Applied Mechanics Division
C              NEW MEXICO ENGINEERING RESEARCH INSTITUTE
C                        University of New Mexico
C                   Albuquerque, NM  87131 (505) 272-7227
C
C
C                             Abstract
C                             --------
C
C   Translates input from a Computational Data Base file and a PREINFIL
C   input control file template to a new input control file that is
recognized
C   by the INFIL code used in the YMP performanxce assessment analysis.
C
C                         Primary Reference
C                         -----------------
C
C
C                          Update History
C                          --------------
C
C
C  Version     Date          Modified by        Changes
C
C  ALPHA 1.0   May,1999      Ron D. McCurley    Original Version
C  ALPHA 1.1   Aug, 1999     Ron D. McCurley    modified for writing new
C                                               filenames to INFIL .ctl
C  ALPHA 1.11  Nov 8, 1999   Ron D. McCurley   modified for modifying
lognormally
C                                               distributed etcoeffa sign to
C                                               be negative
C  ALPHA 1.20  Nov 10, 1999  Ron D. McCurley   modified for adding new
C                                              sampled parameters
C
C                             Disclaimer
```

```
C                           ----------
C
C       This computer program was prepared as an account of work
C  sponsored by an agency of the United States Government.  Neither the
C  United States Government nor any agency thereof, nor any of their
C  employees, nor any of their contractors, subcontractors,or their
C  employees, makes any warranty, express or implied, or assumes any
C  legal liability or responsibility for the accuracy, completeness,
C  or usefulness of any information, apparatus, product, or process
C  disclosed, or represents that its use would not infringe privately
C  owned rights.  Reference herein to any specific commercial product,
C  process, or service by trade name, trademark, manufacturer, or
C  otherwise, does not necessarily constitute or imply its
C  endorsement, recommendation, or favoring by the United States
C  Government, any agency thereof or any of their contractors or
C  subcontractors.  The views and opinions expressed herein do not
C  necessarily state or reflect those of the United States
C  Government, any agency thereof or any of their contractors
C  or subcontractors.
C
C
C                        Program Modules
C                        ---------------
C
C   CBOUND:   Locates the initial and final non-blank characters in a string.
C   DOECH2:   Entry point in subroutine DOECHO.  This section just reads over
C             portion of a file and does nothing.
C   DOECHO:   Echoes portions of the PREINFIL input control to temporary
files.
C   DYNMEM:   Allocates memory dynamically.
C   EXDATE:   Returns the current date in a character string.
C   EXTIME:   Returns the current time in a character string.
C   EXCPUS:   Returns accumulated CPU time, in seconds.
C   EXPARM:   Returns the operating environment parameters.
C   FILECHO2: Echoes a formatted ASCII inuput file, line by line, to a
C             formatted output file.
C   FFRDLRDS:  Substitute for subroutine FREFLD, input is prompted for, read,
C             and echoed, using specified I/O units.
C   GETINP:   Gets literal input line.
C   GETID:    Gets material and property character IDs.
C   INITDA:   Initializes dynamic array lengths and names.
C   MDCOMP:   Advanced memory management routine used to compress storage.
C   MDDEL:    Memory management routine used to delete dynamic array.
C   MDEROR:   Memory management routine used to print dynamic memory error
C             summary.
C   MDFIND:   Advanced memory management routine used to locate dynamic
array.
C   MDGET:    Memory management routine used to reserve memory block.
C   MDGIVE:   Memory management routine used to release unallocated memory.
C   MDINIT:   Memory management routine used to initialize dynamic memory.
C   MDLIST:   Memory management debugging routine used to list dynamic memory
C             storage tables.
C   MDLONG:   Advanced memory management routine used to adjust dynamic array
C             length.
C   MDRSRV:   Memory management routine used to define dynamic array.
C   MDSTAT:   Memory management routine used to obtain dynamic memory
C             statistics.
```

```
C   MEMADJ:   Adjusts amount of dynamic memory required.
C   OUTPUT:   Writes ASCII information to file NOUTFL about the INFIL input
C             translation run.
C   PREINFIL: PREINFIL program main driver.
C   PREPRO:   PREINFIL input preprocessor which performs QA functions and
calls
C             routine for parsing command line arguements consisting of
C             filenames.  Those files are opened when appropriate or prompted
C             for if not supplied on the command line or set to defaults.
C   PROCTL:   Processes PREINFIL input control file, and determines new
C             parameters needed for INFIL control file.
C   QAABORT:  Prints a fatal error message and then aborts job in case of
error
C             detected in input.
C   QABANNER: Prints the program banner to the terminal or an output file.
C             The banner includes the program name in large letters, the
program
C             description, the version, the revision date, the author, the
C             sponsor, and the current run date and time.
C   QADOEDIS: Prints the Sandia DOE contract statement and the DOE disclaimer
C             to the terminal or an output file.
C   QAFETCH:  Returns the program QA information.  Routine QASETUP must be
C             called to set up the CAMCON_LIB common before QAFETCH is
called.
C   QAPAGE:   Starts a new page (except for the first call) and puts the QA
C             information (program name, run time, etc.) at the top of each
C             page.  At the end of the file, it prints the ending QA
C             information.
C   QAMAXERR: Checksan integer value against a maximum value.  If the value
is
C             over the maximum, an error message is printed and QAABORT is
C             called (if requested).
C   QASETUP:  Called at the start of the program.  It performs initialization
C             details common to all programs.  Specifically, it:
C               Initializes the CPU time,
C               Sets the common area CAMCON_LIB common with the passed
C               information,
C               Sets the current run date and time,
C               Sets the execution machine and operating system,
C               Adds the machine to the program version,
C               Starts a new page on the terminal.
C   RDCMDL:   Reads and parses the command line fields.
C   RDPAR:    Reads the PREINFIL input control file parameter information
C             and returns the variables found.
C   RDINFTMP: Reads the PREINFIL input INFIL template file, stores all
C             record data
C   STRPACK:  Left justifies a string and removes all embedded blanks.
C   TYPRQS:   Outputs a request for a character string and then inputs the
C             character string in an interactive session.
C   WELCOM:   Produces Instructions for main program usage, writes banner and
C             program credits.
C   WRIINF:   Uses Computational Database material properties to write a
C             the revised INFIL input file.
C
C
C
C                       Assumptions and Limitations
```

```
C                       ---------------------------
C
C    Language used is ANSI X3.9-1978 FORTRAN 77 except that comments
C    and Hollerith strings use lowercase characters. INTEGER and REAL
C    variable names are explicitly typed.  Machine dependent coding
C    exists in subroutine WRIINF
C
C                               Statistics
C                               ----------
C
C       ALPHA  Version 2.02:
C       12659 lines total,   6730 FORTRAN lines,   5508 FORTRAN statements
C        5930 comment lines, 3487 text lines,
C       total/FORTRAN lines ratio: 1.881
C
C                           Types of data sets
C                           ------------------
C
C  INPUT/
C    ASCII:  in units INASCI, ISECDB
C
C  OUTPUT/
C    ASCII:  in units IOUT, INPINF, ITEMP2, ITEMP3, NOUTFL
C
C                              Files used
C                              ----------
C
C  filename          unit     description
C (PREINFILTEMP2.SCR)  2        PREINFIL temporary file #2(STATUS='SCRATCH')
C (PREINFILTEMP3.SCR)  3        "                     #3
C (POSTLHS.CDB)        4        COMPUTATIONAL DATA BASE file
C  SYS$COMMAND         5        Terminal screen/keyboard
C (PREINFIL_SXX.DBG)   6 or 7  (OPTIONAL) PREINFIL diagnostics/debug file
C (PREINFIL_SXX.INP)   8        PREINFIL input control file
C (PREINFIL_SXX.TRN)   9        INFIL input file generated by PREINFIL
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC/LIST'
      INCLUDE 'ARRAY.INC/LIST'
      INCLUDE 'DYNAME.INC/LIST'
      INCLUDE 'FLWCHR.INC/LIST'
      INCLUDE 'INDEX.INC/LIST'
      INCLUDE 'LENGTH.INC/LIST'
      INCLUDE 'LOCAT.INC/LIST'
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'CAMCON_COMMON.INC/LIST'

      COMMON /IQACOMMON/ INPROG, INVERS, INDATE, INAUTH, INSPON

      INTEGER  IERR, MORMEMC, MORMEMR
      INTEGER  KI, KF, NUMREC, NUMVAR
      INTEGER  INFDAT(MAXREC,20), NUMFLD(MAXREC)

      REAL     INFIL_VAL(MAXVAR), RDUM, RINFDAT(MAXREC,20)

```

```
      CHARACTER*12 INPROG
      CHARACTER*8  INVERS, INDATE
      CHARACTER*80 INAUTH, INSPON
      CHARACTER*80 CINFDAT(MAXREC,20)
      CHARACTER*8  NAMVAR(MAXVAR), INFIL_NAME(MAXVAR)
      CHARACTER*80 FINF, FOUT, FCDB, FTMP, FUSR

      LOGICAL  WRTOUT

      EXTERNAL BLOCK

C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>

C     ...Perform routine initializations
      CALL QASETUP ( INPROG, INVERS, INDATE, INAUTH, INSPON )
C
C     ...Call for program QA information
      CALL QAFETCH (INPROG, INVERS, INDATE, RUNDAT, RUNTIM,
     &   INAUTH, INSPON)
C
C     ...Prompt USER for program execution control options
      CALL PREPRO( FUSR, FCDB, FTMP, FINF, FOUT )

C     ...Show USER the program status
C      PRINT *,' *** Begin processing input data ***'
C
C**** Process the PREINFIL input control file ****
C
C     ...Read PREINFIL input control file first time
      OPEN(INASCI,FILE=FUSR,STATUS='UNKNOWN',
     +     FORM='FORMATTED',READONLY)
      CALL PROCTL

      CLOSE(INASCI)
C     ...read INFIL template and store
      OPEN(INPTMP,FILE=FTMP,STATUS='UNKNOWN',
     +     FORM='FORMATTED',READONLY)
      CALL RDINFTMP(NUMREC, NUMFLD, INFDAT, RINFDAT, CINFDAT)
C     ...Show USER the program status
      PRINT*,' *** Completed processing input data ***'
      PRINT*,' *** Begin translation to INFIL input file ***'
C
C     ...Initialize DYNAMIC base arrays
      CALL MDINIT( Q )
      CALL MCINIT( CQ )

C     ...Set-up the DYNAMIC base arrays
      IERR = 0
      CALL DBSETUP( Q, CQ, IERR )
      IF(IERR.NE.0)CALL QAABORT('(PREINFIL) - Setting up DYNAMIC base'//
     $                          ' arrays %%%')

C     ...Set debugging/diagnostics file unit
      CALL DBERRUNI( NOUTFL )

```

```
C     ...Process input CAMDAT
      CALL DBIOPEN( ICDB, FCDB, Q, CQ, IERR )
C*      OPEN(ICDB,FILE=FCDB,STATUS='UNKNOWN',FORM='UNFORMATTED')
      CALL PROCDB( MAXC, MAXQ, CQ, IQ, LQ, Q )

C****    Match COMPUTATIONAL Data Base names and variables with INFIL data
and
C        translate selected CDB analysis variable values to INFIL values ****
      CALL TRNDAT(IQ(LNUMPRP), Q(LXMATPR), CQ(LNAMELB), CQ(LNMATPR),
     +            INFIL_VAL)
      OPEN(INPINF,FILE=FINF,STATUS='NEW',FORM='FORMATTED')
C
      REWIND INPTMP
C     ...Write the new INFIL input file
      CALL WRIINF(FCDB,NUMREC,NUMFLD,INFDAT,RINFDAT,CINFDAT,INFIL_VAL)
      CLOSE(ICDB)
      CLOSE(INPINF)
      CLOSE(INPTMP)
C     ...Show USER the program status
C      PRINT*,' *** Completed translation to INFIL input file ***'

C     ...Successful TRANSLATION, record information
      CALL OUTPUT
C
C**** Begin program termination procedures ****
C
      CALL EXCPUS( RDUM )
      WRITE(NOUTFL,'(/A,F10.4,A)')' CPU time was',RDUM,' seconds'
      CALL QAPAGE(NOUTFL,'END')
      CLOSE(NOUTFL)
      STOP 'PREINFIL Normal Completion'
C-----------------------------------------------------------------------
C**** END OF PROGRAM PREINFIL {A1MAIN} ****
C-----------------------------------------------------------------------
      END
```

```
*DECK ADDMEM
      SUBROUTINE ADDMEM( MORMEMR, MORMEMC )
C*********************************************************************
C***                                                               ****
C***        computes  A_D_D_itional  M_E_M_ory  needed  module     ****
C***                  - - -          - - -                          ****
C*********************************************************************
C
C  PURPOSE:      Sets dynamic array lengths, and computes the
C                amount of memory needed for the REAL base
C                Q array and CHARACTER*1 base C array.
C
C  AUTHOR:       Jonathan Scott Rath, Esq. [NMERI]
C
C  UPDATED:      17-AUG-1995  --JSR: Deleted TDEC array
C                26-AUG-1994  --JSR: Adapted for new GENERIC.RDB
C                14-JUN-1994  --JSR: First Ed.
C
C  CALLED BY:    PREINFIL {main program}
C
C  ENTRY POINTS: ADDMEM1
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C     /IOCOM/ ($include 'IOCOM.INC')
C      NOUTFL = File unit of diagnostics/debug output file
C
C     /DYNAME/ ($include 'DYNAME.INC')
C      CNAMES = Names of the CHARACTER*1 type dynamic arrays
C      DTYPES = Data types of the CNAMES arrays
C      RNAMES = Names of the REAL type dynamic arrays
C
C     /GEOPAR/ ($include 'GEOPAR.INC')
C      NELBLK = Number of ELement BLocKs in mesh (materials)
C      NQAREC = Number of QA records
C      NUQPRP = No. of UniQUe PRoperty names
C
C     /MISCDAT/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C
C  LOCAL/
C      IERR   = INTEGER error flag
C
C  EXIT/
C    --common block
C     /LENGTH/ ($include 'LENGTH.INC')
C      CLENGT = CHARACTER*1 type dynamic array lengths array
C      RLENGT = REAL type dynamic array LENGTHS array
C
C     /INDEX/ ($include 'INDEX.INC')
C      LASCIDX = Last CHARACTER dynamic array index
C      BCDAIDX = Beginning index of CHARACTER dyanamic arrays
C      ECDAIDX = Ending "                              "
C      LASRIDX = Last REAL dynamic array index
C      BRDAIDX = Beginning index of REAL dyanamic arrays
C      ERDAIDX = Ending "                              "
```

```
C
C    --through subroutine call
C      MORMEMR= No. of REAL words of memory needed
C      MORMEMC= No. of CHARACTER*1 words of memory needed
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'GEOPAR.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'MISCDAT.INC'
      INTEGER I, IERR, MORMEMC, MORMEMR
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
C*********************************************************************
C
C     PSEUDO ENTRY ADDMEM( MORMEMR, MORMEMC )
C
C*********************************************************************
C
C     THIS SECTION COMPUTES MEMORY REQUIRED FOR THE ARRAYS ASSOCIATED
C     WITH THE INPUT CAMDAT.
C
C     (CALLED BY PROCDB)
C
      IERR       = 0
      MORMEMC    = 0
      MORMEMR    = 0
C     ...Set beginning and ending dynamic array indices
      BRDAIDX    = 1
      ERDAIDX    = 4
      BCDAIDX    = 1
      ECDAIDX    = 3
C     ...Set dynamic REAL array lengths
C     ...(1:4) IDEBLK, NUMPRP, IASPRP, XMATPR
      RLENGT(1)  = NELBLK
      RLENGT(2)  = RLENGT(1)
      RLENGT(3)  = NELBLK*NUQPRP
      RLENGT(4)  = RLENGT(3)
C     ...Set dynamic CHARACTER*1 array lengths
C     ...(1:3) QAINFO, NAMELB, NMATPR
      CLENGT(1) = (NQAREC+2)*32
      CLENGT(2) = NELBLK*8
      CLENGT(3) = NUQPRP*8
C     ...Compute MORMEMR and check for ZERO length (must be at least=1)
      DO 10 I = BRDAIDX, ERDAIDX, 1
         IF(RLENGT(I).EQ.0)THEN
            RLENGT(I) = 1
         ELSEIF(RLENGT(I).LT.0)THEN
            IERR = IERR + 1
            WRITE(NOUTFL,'(A,I3,A)')' ***RLENGT(',I,') < 0***'
```

```
431               WRITE(NOUTFL,'(A,I3,2A)')' RNAMES(',I,')=',RNAMES(I)
432            ENDIF
433            MORMEMR = MORMEMR + RLENGT(I)
434     10  CONTINUE
435         IF(DEBUG)WRITE(NOUTFL,'(A)')' $$$$$$$$$$$$$$$$$$$$$$$$$$$$$'//
436        $'$$ ADDMEM $$$$$$$$$$$$$$$$$$$$$$$$$$$$'
437         IF(IERR.GT.0)THEN
438            CALL QAABORT(
439        $   '(ADDMEM) - REAL array size errors detected ***')
440         ELSEIF(MORMEMR.LT.0)THEN
441            WRITE(NOUTFL,*)' **** MORMEMR < 0 in ADDMEM ****'
442            DO 15 I=BRDAIDX,ERDAIDX
443               WRITE(NOUTFL,'(1X,2A,I2,A,I9)')
444        $      RNAMES(I),' RLENGT(',I,')=',RLENGT(I)
445     15     CONTINUE
446            CALL QAABORT(
447        $   '(ADDMEM) - REAL array memory errors detected ***')
448         ENDIF
449   C
450   C     ...Compute MORMEMC and check for ZERO length (must be at least=1)
451         DO 20 I = BCDAIDX, ECDAIDX, 1
452            IF(CLENGT(I).EQ.0)THEN
453               CLENGT(I) = 1
454            ELSEIF(CLENGT(I).LT.0)THEN
455               IERR = IERR + 1
456               WRITE(NOUTFL,'(A,I3,A)')' ***CLENGT(',I,') < 0***'
457               WRITE(NOUTFL,'(A,I3,2A)')' CNAMES(',I,')=',CNAMES(I)
458            ENDIF
459            MORMEMC = MORMEMC + CLENGT(I)
460     20  CONTINUE
461         IF(IERR.GT.0)THEN
462            CALL QAABORT(
463        $   '(ADDMEM) - CHARACTER array size errors detected ***')
464         ELSEIF(MORMEMC.LT.0)THEN
465            WRITE(NOUTFL,*)' **** MORMEMC < 0 in ADDMEM ****'
466            DO 25 I=BCDAIDX,ECDAIDX
467               WRITE(NOUTFL,'(1X,2A,I2,A,I9)')
468        $      CNAMES(I),' CLENGT(',I,')=',CLENGT(I)
469     25     CONTINUE
470            CALL QAABORT(
471        $   '(ADDMEM) - CHARACTER array memory errors detected ***')
472         ENDIF
473         RETURN
474   C
475   C*********************************************************************
476   C
477   C*      ENTRY ADDMEM1( MORMEMR, MORMEMC )
478   C
479   C*********************************************************************
480   C
481   C     THIS SECTION COMPUTES THE MEMORY REQUIRED FOR
482   C     POSTINFIL including net infitration, AND OTHER RELATED DYNAMIC ARRAYS:
483   C
484   C     ...Set beginning and ending dynamic array indices
485   C     ...Set dynamic REAL array lengths
486   C     ...()  MAPGEN
487   C     ...Set dynamic CHARACTER*1 array lengths
```

```
C     ...Check for ZERO length (must be at least=1)

C*      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE ADDMEM ****
C-----------------------------------------------------------------------
      END
```

```
*COMDECK BLOCK
      BLOCK DATA BLOCK
C*********************************************************************
      INCLUDE 'CAMCON_COMMON.INC/LIST'
      INCLUDE 'INDEX.INC/LIST'
      INCLUDE 'DYNAME.INC/LIST'

      INTEGER
     +ITEMP1,ICDB,ISCREN,NOUTFL,INASCI,INPTMP,INPINF

      CHARACTER*80 LINE1,LINE2,LINE3
      CHARACTER*12 INPROG
      CHARACTER*8 INVERS, INDATE
      CHARACTER*80 INAUTH, INSPON

      COMMON /IOCOM/
     +ITEMP1,ICDB,ISCREN,NOUTFL,INASCI,INPTMP,INPINF

      COMMON /L1/  LINE1
      COMMON /L2/  LINE2
      COMMON /L3/  LINE3

      COMMON /IQACOMMON/ INPROG, INVERS, INDATE, INAUTH, INSPON

C     ...Dynamic array names (COMMON /DYNAME/)
      DATA DTYPES/
     $'INTEGER','INTEGER','LOGICAL','REAL'/
      DATA RNAMES/
     $'IDEBLK', 'NUMPRP', 'IASPRP', 'XMATPR'/
      DATA CNAMES/
     $'QAINFO','NAMELB','NMATPR'/

      DATA ITEMP1/1/ICDB/4/ISCREN/5/
     +     INASCI/2/INPTMP/3/INPINF/8/

C        LASRIDX= Last index of REAL dynamic arrays [INTEGER]
      DATA LASCIDX/3/LASRIDX/4/

      DATA
     +LINE1/'The PREINFIL translator extracts new parameter data'/
     +LINE2/'requested by the user from the computational database file,
     +'/LINE3/'XXX.CDB, & sets up the INFIL program input control file'/

      DATA INPROG / 'PREINF' /
      DATA INVERS / 'A1.20' /
      DATA INDATE / '11/10/99' /
      DATA INAUTH / 'Ron McCurley' /
      DATA INSPON / 'Ron McCurley' /
*********************************************************************
      END
```

```
*DECK,DOECHO
      SUBROUTINE DOECHO( INFIL, OUTFIL, INREC, BEGIN_ECHO )
C***********************************************************************
C
C   PURPOSE :    Echoes portions of the INFIL input template file
C                to selected file and to debug file
C
C   AUTHOR:      Ron McCurley
C
C   UPDATED:     June 8, 1999 --RDM Modified for PREINFIL
C
C   CALLED BY:   WRIINF
C
C   ENTRY POINT: DOECH2
C
C   CALLS:       CBOUND, QAABORT
C
C   ARGUMENTS:
C   ENTRY/
C     --through subroutine call
C       BEGIN_ECHO = Integer variable describing a record of INASCI
C                    where echoing begins
C       INREC = Last record read in INASCI
C
C     --common blocks
C      /IOCOM/ ($include 'IOCOM.INC')
C       INASCI = File unit of PREINFIL input control file
C       ISCREN = "            terminal screen
C       NOUTFL = "            diagnostics/debug file
C
C   LOCAL/
C       IL,IR  = Beg. & Ending positions of non-blank characters
C       IFILE  = Current file information being echoed to
C       IOSTAT = ANSI FORTRAN I/O status integer
C
C   EXIT/
C       none
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC/LIST'
      INTEGER BEGIN_ECHO, I, IERR, IFILE, INFIL, IOSTAT, INREC, IREC,
     +        OUTFIL
      CHARACTER*(132) RECORD

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

C     ...Set initial values
      IERR   = 0
      IREC = INREC + 1

C     ...Read INFIL input template file
 100  READ (INFIL,'(A)',IOSTAT=IOSTAT) RECORD
```

```
603         IF (NOUTFL .GT. 0) WRITE (NOUTFL,'(1X,A)') RECORD
604
605         IF(IOSTAT.LT.0)THEN
606   C        ...E-O-F read
607            GOTO 111
608
609         ELSEIF(IOSTAT.GT.0)THEN
610   C        ...Error in while reading
611            IERR = IERR + 1
612
613   C        ...Read next record
614            IREC = IREC + 1
615            GOTO 100
616
617         ELSEIF(IOSTAT.EQ.0)THEN
618
619   C           ...Echo this record to the SPECIFIED file
620            IF ( (IREC .GE. BEGIN_ECHO) .AND. (OUTFIL .NE. NOUTFL) )
621        +     WRITE (OUTFIL,'(A)') RECORD
622
623   C           ...Read next record
624            IREC = IREC + 1
625               GOTO 100
626
627         ENDIF
628
629    111  IF(IERR.GT.0)THEN
630            WRITE(NOUTFL,*)' *** ',IERR,' Errors found in DOECHO ***'
631            CALL QAABORT('DOECHO')
632         ENDIF
633
634         RETURN
635
636   C*********************************************************************
637   C
638   C*      ENTRY DOECH2( RECORD )
639   C
640   C*********************************************************************
641   C
642   C     THIS SECTION JUST READS OVER PORTION OF A FILE AND DOES
643   C     NOTHING (USED BECAUSE THE FREE-FIELD READER CANNOT PROCESS
644   C     THIS INFORMATION DUE TO ITS NON-LIST DIRECTED READ FORMAT !!!)
645
646   C*      IERR = 0
647
648   C* 900  READ (INASCI,'(A)',IOSTAT=IOSTAT) RECORD
649   C*      IF (NOUTFL .GT. 0) WRITE (NOUTFL,'(1X,A)') RECORD
650
651   C*      IF(IOSTAT.LT.0)THEN
652   C        ...E-O-F read
653   C*         GOTO 111
654
655   C*      ELSEIF(IOSTAT.GT.0)THEN
656   C        ...Error in while reading
657   C*         IERR = IERR + 1
658   C        ...Read next record
659   C*         GOTO 900
```

```

C*      ELSEIF(IOSTAT.EQ.0)THEN

C*      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE DOECHO ****
C-----------------------------------------------------------------------
      END
```

```
*DECK DYNMEM
      SUBROUTINE DYNMEM( MORMEMR, MEMORY, Q )
C***********************************************************************
C***                                                                 ***
C***           applies D_Y_N_amic  M_E_M_eory  allocation            ***
C***                    - - -       - - -                            ***
C***********************************************************************
C
C   PURPOSE:     Allocates MEMORY DYNAMICally
C
C   AUTHOR:      Jonathan S. Rath
C
C   UPDATED:     19-DEC-1991  --Adapted for REAL dynamic base array
C                01-FEB-1990  --Fixed record lengths <= 72 chars.
C                14-DEC-1989  --Increased INTEGER formats
C                13-JUN-1989  --First Ed.
C
C   CALLED BY:   PROCDB
C                PROCIN
C                PROCQA
C
C   ENTRY POINT: DYNMEM2, DYNMEM3
C
C   CALLS:       MEMADJ
C                MEMADJ2
C                MEMADJ3
C
C   ARGUMENTS:
C   ENTRY/
C     --common block
C      /IOCOM/ ($include 'IOCOM.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C     --through subroutine call
C       MORMEMR = Add'l words needed for REAL core allocation (Q)
C       Q      = Dynamic memory REAL base array
C
C   LOCAL/
C       MEMADD = Actual number of words added to core (REAL-Q)
C       MEMOLD = Previous total no. of words allocated to core (Q)
C
C   EXIT/
C     --through subroutine call
C       MEMORY = Total number of words allocated to core (Q-REAL)
C       Q      = Dynamic memory REAL base array
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC'
      INTEGER MEMADD, MEMOLD, MEMORY, MORMEMR
      REAL Q(*)
C
C***********************************************************************
C
C     PSEUDO ENTRY DYNMEM( MORMEMR, MEMORY, Q )
```

```
C
C*********************************************************************
C
      MEMOLD = MEMORY
      CALL MEMADJ( MORMEMR, MEMORY, Q )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEM', MEMORY
      RETURN
C
C*********************************************************************
C
      ENTRY DYNMEM2( MORMEMR, MEMORY, Q )
C
C*********************************************************************
C
C     THIS SECTION ADJUSTS MEMORY ALLOCATION BY LENGTHENING
C     (OR SHORTENING) CERTAIN DYNAMIC ARRAYS
C
      MEMOLD = MEMORY
      CALL MEMADJ2( MORMEMR, MEMORY, Q )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEM2', MEMORY
      IF(MORMEMR.GT.MEMADD)WRITE(NOUTFL,910)MORMEMR,MEMADD,MEMOLD,MEMORY
      RETURN
C
C*********************************************************************
C
      ENTRY DYNMEM3( MEMORY, Q )
C
C*********************************************************************
C
C     THIS SECTION IS USED TO CONSOLIDATE MEMORY AND/OR FOR
C     ADJUSTING MEMORY ALLOCATION DUE TO "PSEUDO-DELETING"
C     DYNAMIC ARRAYS.  "PSEUDO-DELETING" MEANS SETTING THE UNUSED
C     DYNAMIC ARRAYS TO LENGTH 1.
C
      MEMOLD = MEMORY
      CALL MEMADJ3( MEMORY, Q )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEM3', MEMORY
      RETURN
C
C---------------  F O R M A T   S T A T E M E N T S  -----------------
C
 900  FORMAT(
     +//5X,'-------------------------------------------------------',
     + /5X,'       ',I10,' more words allocated by ',A,
     + /5X,'           Total allocated is ',I10,
     + /5X,'-------------------------------------------------------',//)
 910  FORMAT( //,'***** Possible Error in  D y n a m i c  Memory',
     +           ' Allocation (Q) *****',
     +  /,5X,' Min. Additional words REQ"D     = ',I10,' (MORMEMR)',
     +  /,5X,' Additional words added          = ',I10,' (MEMADD)',
     +  /,5X,' Previous total word allocation  = ',I10,' (MEMOLD)',
     +  /,5X,' Current total word allocation   = ',I10,' (MEMORY)',
     +       //,'*********************************************',
     +          '******************' )
```

```
C
C-----------------------------------------------------------------------
C**** END OF SUBOUTINE DYNMEM ****
C-----------------------------------------------------------------------
C
      END
```

```
*DECK DYNMEMC
      SUBROUTINE DYNMEMC( MORMEMC, MEMORY, C )
C***********************************************************************
C***                                                                 ****
C***  applies D_Y_N_amic  M_E_M_ory  (C_haracter type) allocation   ****
C***          - - -       - - -       -                             ****
C***********************************************************************
C
C   PURPOSE:     Allocates MEMORY DYNAMICally to CHARACTER base array
C
C   AUTHOR:      Jonathan S. Rath
C
C   UPDATED:     02-DEC-1991  --First Ed.
C
C   CALLED BY:   PROCDB
C                PROCIN
C                PROCQA
C
C   ENTRY POINT: DYNMEMC2, DYNMEMC3
C
C   CALLS:       MEMADC
C                MEMADJC2
C                MEMADJC3
C   ARGUMENTS:
C   ENTRY/
C     --common block
C      /IOCOM/ ($include 'IOCOM.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C     --through subroutine call
C       MORMEMC = Add'l words needed for CHAR core allocation (C)
C       C      = Dynamic memory CHARACTER*1 base array
C
C   LOCAL/
C       MEMADD = Actual number of words added to core (CHAR-C)
C       MEMOLD = Previous total no. of words allocated to core (C)
C
C   EXIT/
C     --through subroutine call
C       MEMORY = Total number of words allocated to core (C-CHAR)
C       C      = Dynamic memory CHARACTER*1 base array
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC'
      INTEGER MEMADD, MEMOLD, MEMORY, MORMEMC
      CHARACTER*(1) C(*)
C
C***********************************************************************
C
C     PSEUDO ENTRY DYNMEMC( MORMEMC, MEMORY, C )
C
C***********************************************************************
C
      MEMOLD = MEMORY
```

```
      CALL MEMADJC( MORMEMC, MEMORY, C )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEMC', MEMORY
      RETURN
C
C*********************************************************************
C
      ENTRY DYNMEMC2( MORMEMC, MEMORY, C )
C
C*********************************************************************
C
C     THIS SECTION ADJUSTS MEMORY ALLOCATION BY LENGTHENING
C     (OR SHORTENING) CERTAIN DYNAMIC ARRAYS
C
      MEMOLD = MEMORY
      CALL MEMADJC2( MORMEMC, MEMORY, C )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEMC2', MEMORY
      IF(MORMEMC.GT.MEMADD)WRITE(NOUTFL,910)MORMEMC,MEMADD,MEMOLD,MEMORY
      RETURN
C
C*********************************************************************
C
      ENTRY DYNMEMC3( MEMORY, C )
C
C*********************************************************************
C
C     THIS SECTION CAN BE USED FOR MEMORY CONSOLIDATION AND/OR FOR
C     ADJUSTING MEMORY ALLOCATION DUE TO "PSEUDO-DELETING"
C     DYNAMIC ARRAYS.  "PSEUDO-DELETING" MEANS SETTING THE UNUSED
C     DYNAMIC ARRAYS TO LENGTH 1.
C
      MEMOLD = MEMORY
      CALL MEMADJC3( MEMORY, C )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEMC3', MEMORY
      RETURN
C
C---------------  F O R M A T   S T A T E M E N T S  -----------------
C
 900  FORMAT(
     +//5X,'-------------------------------------------------------',
     + /5X,' ',I10,' more CHAR*1 words allocated by ',A,
     + /5X,'           Total allocated is ',I10,
     + /5X,'-------------------------------------------------------',//)
 910  FORMAT( //,'***** Possible Error in  D y n a m i c  Memory',
     +           ' Allocation (C) *****',
     +  /,5X,' Min. Additional words REQ"D     = ',I10,' (MORMEMC)',
     +  /,5X,' Additional words added          = ',I10,' (MEMADD)',
     +  /,5X,' Previous total word allocation  = ',I10,' (MEMOLD)',
     +  /,5X,' Current total word allocation   = ',I10,' (MEMORY)',
     +       //,'*********************************************',
     +          '******************' )
C
C-----------------------------------------------------------------------
C**** END OF SUBOUTINE DYNMEMC ****
C-----------------------------------------------------------------------
```

```
C
      END
```

```
*DECK,ECHOREC
      SUBROUTINE ECHOREC( INFILUNT, OUTFILUNT, INREC )
C*********************************************************************
C
C   PURPOSE :    Echoes single record of the FILE corresponding to input
C                INFILUNT to the file corresponding to output OUTFILUNT
C
C   AUTHOR:      Ron McCurley
C
C   UPDATED:     25 May, 1999 --initial version for PREINFIL
C
C   CALLED BY:   WRIINF
C
C   CALLS:       QAABORT
C
C   ARGUMENTS:
C   ENTRY/
C     --through subroutine call
C       LASTREC = integer variable describing a location of last record
C                  read in INFILUNT
C       INREC = integer variable pointing to location of record in INFILUNT
C
C     --common blocks
C      /IOCOM/ ($include 'IOCOM.INC')
C       INASCI = File unit of PREINFIL input control file
C       ISCREN = "            terminal screen
C       NOUTFL = "            diagnostics/debug file
C
C   LOCAL/
C       IL,IR  = Beg. & Ending positions of non-blank characters
C       IFILE  = Current file information being echoed to
C       IOSTAT = ANSI FORTRAN I/O status integer
C
C   EXIT/
C       none
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC/LIST'
      INTEGER INFILUNT, OUTFILUNT, I, IERR, INREC, IOSTAT, IREC,
     +        LASTREC
      CHARACTER*(132) RECORD

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

C     ...Set initial values
      IERR   = 0
C     ...Read input file
 100  READ (INFILUNT,'(A)',IOSTAT=IOSTAT) RECORD

      IF(IOSTAT.LT.0)THEN
C        ...E-O-F read
         GOTO 999
```

```

      ELSEIF(IOSTAT.GT.0)THEN
C        ...Error in while reading
         IERR = IERR + 1
C        ...Read next record
         GOTO 999

      ELSEIF(IOSTAT.EQ.0) THEN
         LASTREC = LASTREC + 1
         IF(LASTREC .EQ. INREC) THEN
C          ...write to output file
           IF (OUTFILUNT .GT. 0) WRITE (OUTFILUNT,'(A)') RECORD
           GOTO 999
         ELSE
           IREC = IREC + 1
           GOTO 100
         ENDIF
      ENDIF
C
 999  IF(IERR.GT.0)THEN
         WRITE(NOUTFL,*)' *** ',IERR,' Errors found in ECHOREC ***'
         CALL QAABORT('ECHOREC')
      ENDIF
      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE ECHOREC ****
C-----------------------------------------------------------------------
      END
```

```
      SUBROUTINE GTVECT(FILENMIN,FILENMOU)
C*****************************************************************
C  AUTHOR  Ron McCurley
C*****************************************************************
      INTEGER ICHAR
      CHARACTER*(*) FILENMIN, FILENMOU
      CHARACTER*(3) SAVSTRG

C...Find characters preceding vector index in filename, i.e. '_R'
      DO 50 ICHAR=1,80
         IF (FILENMIN(ICHAR:ICHAR+1).EQ.'_R')
     +       SAVSTRG=FILENMIN(ICHAR+2:ICHAR+4)
   50 CONTINUE
C,..  replace '###' string in output filename with 3 digit character index
      DO 100 ICHAR=1,20
         IF (FILENMOU(ICHAR:ICHAR+2).EQ. '###')
     +       FILENMOU(ICHAR:ICHAR+2) = SAVSTRG
  100 CONTINUE
      RETURN
      END

*DECK MEMADJ
      SUBROUTINE MEMADJ( MORMEM, MNUSED, Q )
C*********************************************************************
C***                                                               ****
C***              A_D_J_usts  dynamic  M_E_M_ory                   ****
C***             - - -                - - -                        ****
C*********************************************************************
C
C  PURPOSE:     Adjusts the amount of dynamic memory allocated
C               the to REAL base array, Q.
C
C  AUTHOR:      Jonathan S. Rath
C
C  UPDATED:     13-JUN-1994  --JSR: First Edition
C
C  CALLED BY:   DYNMEM
C               DYNMEM2 (entry point)
C               DYNMEM3 (entry point)
C
C  ENTRY POINT: MEMADJ2
C               MEMADJ3
C
C  CALLS:       (MEM_MGR):  MDGET       (V_EXT_LIB): EXEMEM
C                           MDRSRV
C                           MDLONG
C                           MDLIST
C                           MDSTAT
C                           MDEROR
C                           MDDEBG
C                           MDDEL
C                           MDCOMP
C                           MDGIV
C
C  ARGUMENTS:
C  ENTRY/
```

```
C    --common blocks
C      /IOCOM/ (from FORTRAN statement: 'IOCOM.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C      /LENGTH/ (from FORTRAN statement: 'LENGTH.INC')
C       RLENGT = Dynamic REAL arrays LENGTHS array
C
C      /DYNAME/ (from FORTRAN statement: 'DYNAME.INC')
C       RNAMES = Dynamic REAL arrays NAMES array
C
C      /INDEX/ (from FORTRAN statement: 'INDEX.INC')
C       BRDAIDX = Beg. Real Dynamic Array InDeX for memory allocation
C       ERDAIDX = End. Real "
C
C      /MISCDAT/ (from FORTRAN statement: 'MISCDAT.INC')
C       DEBUG  = Logical debugging tool
C
C     --through subroutine call
C       MORMEM = Add'l no. of words needed for core allocation (REAL-Q)
C       Q      = Dynamic Memory base REAL array
C
C  LOCAL/
C       MNERRS =  Number of Memory manager ERRorS during execution
C
C  EXIT/
C     --common blocks
C      /LOCAT/ (from FORTRAN statement: 'LOCAT.INC')
C       LRPTR  = Pointer array used for REAL dynamic array (Q)
C
C     --through subroutine call
C       MNUSED = Total words allocated to REAL dynamic array
C       Q      = Dynamic Memory base REAL array
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC'
      INCLUDE 'LOCAT.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'MISCDAT.INC'
      INTEGER I, I1, I2, MORMEM, MNERRS, MNUSED
      REAL Q(*)
C
C*********************************************************************
C
C     PSEUDO ENTRY MEMADJ( MORMEM, MNUSED, Q )
C
C*********************************************************************
C
C     THIS SECTION SETS DYNAMIC ARRAY LENGTHS FOR FIRST TIME
C
C     ...Check for bad REAL dynamic array indices
      IF(BRDAIDX.LT.1.OR.ERDAIDX.GT.LASRIDX.OR.
     +   ERDAIDX.LT.1.OR.BRDAIDX.GT.LASRIDX    )THEN
         WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
```

```
1103            WRITE(NOUTFL,*)'     BRDAIDX = ',BRDAIDX
1104            WRITE(NOUTFL,*)'     ERDAIDX = ',ERDAIDX
1105            WRITE(NOUTFL,*)'     LASRIDX = ',LASRIDX
1106            CALL QAABORT('(MEMADJ) - Invalid REAL dynamic array '//
1107         +              'indices detected ***')
1108         ENDIF
1109         CALL MDGET(MORMEM)
1110         CALL MDFILL(1.0)
1111         DO 100 I = BRDAIDX, ERDAIDX, 1
1112            CALL MDRSRV(RNAMES(I),I1,RLENGT(I))
1113            LRPTR(I) = I1
1114   100   CONTINUE
1115   C     ...Check for dynamic memory allocation errors
1116         IF(DEBUG)CALL MDDEBG(NOUTFL)
1117         CALL MDSTAT(MNERRS,MNUSED)
1118         IF(MNERRS.NE.0.OR.DEBUG)CALL MDLIST(NOUTFL)
1119         IF(MNERRS.NE.0.        )THEN
1120            CALL MDEROR(NOUTFL)
1121            CALL QAABORT('(MEMADJ) - REAL DYNAMIC MEMORY '//
1122         +              'ALLOCATION ERRORS ***')
1123         ENDIF
1124         RETURN
1125   C
1126   C*********************************************************************
1127   C
1128         ENTRY MEMADJ2( MORMEM, MNUSED, Q )
1129   C
1130   C*********************************************************************
1131   C
1132   C     THIS SECTION LENGTHENS OR SHORTENS DYNAMIC ARRAYS
1133   C
1134   C     ...Check for bad REAL dynamic array indices
1135         IF(BRDAIDX.LT.1.OR.ERDAIDX.GT.LASRIDX.OR.
1136         +   ERDAIDX.LT.1.OR.BRDAIDX.GT.LASRIDX    )THEN
1137            WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
1138            WRITE(NOUTFL,*)'     BRDAIDX = ',BRDAIDX
1139            WRITE(NOUTFL,*)'     ERDAIDX = ',ERDAIDX
1140            WRITE(NOUTFL,*)'     LASRIDX = ',LASRIDX
1141            CALL QAABORT('(MEMADJ2) - Invalid REAL dynamic array '//
1142         +              'indices detected ***')
1143         ENDIF
1144         DO 200 I = BRDAIDX, ERDAIDX, 1
1145            CALL MDLONG(RNAMES(I),I1,RLENGT(I))
1146            LRPTR(I) = I1
1147   200   CONTINUE
1148   C     ...Check for dynamic memory allocation errors
1149         IF(DEBUG)CALL MDDEBG(NOUTFL)
1150         CALL MDSTAT(MNERRS,MNUSED)
1151         IF(MNERRS.NE.0.OR.DEBUG)CALL MDLIST(NOUTFL)
1152         IF(MNERRS.NE.0.        )THEN
1153            CALL MDEROR(NOUTFL)
1154            CALL QAABORT('(MEMADJ2) - REAL '//
1155         $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
1156         ENDIF
1157         RETURN
1158   C
1159   C*********************************************************************
```

```
C
      ENTRY MEMADJ3( MNUSED, Q )
C
C*********************************************************************
C
C     THIS SECTION CONSOLIDATES FRAGMENTED MEMORY, RETURNS UNUSED
C     STORAGE TO THE OPERATING SYSTEM, AND THEN RECALCULATES ALL
C     DYNAMIC ARRAY POINTERS.
C
C
C     ...Consolidate the fragmented memeory
      CALL MDCOMP
C     ...Return unused storage back to the operating system
      CALL MDGIVE
C     ...Recalculate ALL pointers of the Q-array
      DO 300 I = BRDAIDX, ERDAIDX, 1
         I2 = 0
         CALL MDFIND(RNAMES(I),I1,I2)
         LRPTR(I)  = I1
         RLENGT(I) = I2
 300  CONTINUE
C     ...Check for dynamic memeory allocation errors
      IF(DEBUG)CALL MDDEBG(NOUTFL)
      CALL MDSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MDLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MDEROR(NOUTFL)
         CALL QAABORT('(MEMADJ3) - REAL '//
     $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C---------------------------------------------------------------------
C**** END OF SUBROUTINE MEMADJ ****
C---------------------------------------------------------------------
      END
```

```
*DECK MEMADJC
      SUBROUTINE MEMADJC( MORMEMC, MNUSED, C )
C***********************************************************************
C***                                                                 ****
C***       A_D_J_usts  dynamic  M_E_M_ory  (C_haracter type)         ****
C***       - - -                - - -       -                        ****
C***********************************************************************
C
C  PURPOSE:     Adjusts the amount of dynamic memory allocated to
C               the CHARACTER*1 base array, C.
C
C  AUTHOR:      Jonathan S. Rath
C
C  UPDATED:     13-JUN-1994  --JSR: First Edition
C
C  CALLED BY:   DYNMEMC
C               DYNMEMC2 (entry point)
C               DYNMEMC3 (entry point)
C
C  ENTRY POINT: MEMADJC2
C               MEMADJC3
C
C  CALLS:       (MEM_MGR):  MCGET       (V_EXT_LIB): EXEMEM
C                           MCRSRV
C                           MCLONG
C                           MCLIST
C                           MCSTAT
C                           MCEROR
C                           MCFIL
C                           MCDEBG
C                           MCCOMP
C                           MCGIV
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C      /IOCOM/ (from FORTRAN statement: 'IOCOM.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C      /LENGTH/ (from FORTRAN statement: 'LENGTH.INC')
C       CLENGT = Dynamic CHAR arrays LENGTHS array
C
C      /DYNAME/ (from FORTRAN statement: 'DYNAME.INC')
C       CNAMES = Dynamic CHAR arrays NAMES array
C
C      /INDEX/ (from FORTRAN statement: 'INDEX.INC')
C       BCDAIDX = Beg. Char Dynamic Array InDeX for memory allocation
C       ECDAIDX = End. Char "
C
C      /MISCDAT/ (from FORTRAN statement: 'MISCDAT.INC')
C       DEBUG  = Logical debugging tool
C
C     --through subroutine call
C       MORMEMC = Add'l no. of words needed for core allocation (CHAR-C)
C       C      = Dynamic memory CHARACTER*1 base array
C
```

```
C     --through ENTRY POINT
C       NAME   = Name of array to be deleted
C
C  LOCAL/
C       MNERRS =  Number of Memory manager ERRorS during execution
C
C  EXIT/
C     --common blocks
C      /LOCAT/ (from FORTRAN statement: 'LOCAT.INC')
C       LCPTR  = Pointer array used for CHAR dynamic array (C)
C
C     --through subroutine call
C       MNUSED = Total words allocated to CHARACTER dynamic array
C       C      = Dynamic Memory CHARACTER*1 base array
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC'
      INCLUDE 'LOCAT.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'MISCDAT.INC'
      INTEGER I, I1, I2, MORMEMC, MNERRS, MNUSED
      CHARACTER*(1) C(*)
C
C*********************************************************************
C
C     PSEUDO ENTRY MEMADJC( MORMEMC, MNUSED, C )
C
C*********************************************************************
C
C     THIS SECTION SETS DYNAMIC ARRAY LENGTHS FOR FIRST TIME
C
C     ...Check for bad CHARACTER dynamic array indices
      IF(BCDAIDX.LT.1.OR.ECDAIDX.GT.LASCIDX.OR.
     +   ECDAIDX.LT.1.OR.BCDAIDX.GT.LASCIDX    )THEN
         WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
         WRITE(NOUTFL,*)'     BCDAIDX = ',BCDAIDX
         WRITE(NOUTFL,*)'     ECADIDX = ',ECDAIDX
         WRITE(NOUTFL,*)'     LASCIDX = ',LASCIDX
         CALL QAABORT('(MEMADJ) - Invalid CHARACTER dynamic array '//
     +              'indices detected ***')
      ENDIF
      CALL MCGET(MORMEMC)
      CALL MCFILL(' ')
      DO 100 I = BCDAIDX, ECDAIDX, 1
         CALL MCRSRV(CNAMES(I),I1,CLENGT(I))
         LCPTR(I) = I1
 100  CONTINUE
C     ...Check for dynamic memory allocation errors
      IF(DEBUG)CALL MCDEBG(NOUTFL)
      CALL MCSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MCLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MCEROR(NOUTFL)
```

```
1309            CALL QAABORT('(MEMADJC) - CHARACTER DYNAMIC MEMORY '//
1310         +              'ALLOCATION ERRORS ***')
1311          ENDIF
1312          RETURN
1313    C
1314    C*********************************************************************
1315    C
1316          ENTRY MEMADJC2( MORMEMC, MNUSED, C )
1317    C
1318    C*********************************************************************
1319    C
1320    C     THIS SECTION LENGTHENS OR SHORTENS DYNAMIC ARRAYS
1321    C
1322    C     ...Check for bad CHARACTER dynamic array indices
1323          IF(BCDAIDX.LT.1 .OR. ECDAIDX.GT.LASCIDX .OR.
1324         +   ECDAIDX.LT.1 .OR. BCDAIDX.GT.LASCIDX    )THEN
1325            WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
1326            WRITE(NOUTFL,*)'     BCDAIDX = ',BCDAIDX
1327            WRITE(NOUTFL,*)'     ECADIDX = ',ECDAIDX
1328            WRITE(NOUTFL,*)'     LASCIDX = ',LASCIDX
1329            CALL QAABORT('(MEMADJC2) - Invalid CHARACTER dynamic array '//
1330         +              'indices detected ***')
1331          ENDIF
1332          DO 200 I = BCDAIDX, ECDAIDX, 1
1333             CALL MCLONG(CNAMES(I),I1,CLENGT(I))
1334             LCPTR(I) = I1
1335     200  CONTINUE
1336          CALL MCFILL(' ')
1337    C     ...Check for dynamic memory allocation errors
1338          IF(DEBUG)CALL MCDEBG(NOUTFL)
1339          CALL MCSTAT(MNERRS,MNUSED)
1340          IF(MNERRS.NE.0.OR.DEBUG)CALL MCLIST(NOUTFL)
1341          IF(MNERRS.NE.0.        )THEN
1342             CALL MCEROR(NOUTFL)
1343             CALL QAABORT('(MEMADJC2) - CHARACTER '//
1344         $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
1345          ENDIF
1346          RETURN
1347    C
1348    C*********************************************************************
1349    C
1350          ENTRY MEMADJC3( MNUSED, C )
1351    C
1352    C*********************************************************************
1353    C
1354    C     THIS SECTION CONSOLIDATES FRAGMENTED MEMORY, RETURNS UNUSED
1355    C     STORAGE TO THE OPERATING SYSTEM, AND THEN RECALCULATES ALL
1356    C     DYNAMIC ARRAY POINTERS.
1357    C
1358    C     ...Consolidate the fragmented memory
1359          CALL MCCOMP
1360    C     ...Return unused storage back to the operating system
1361          CALL MCGIVE
1362    C     ...Recalculate ALL pointers of the C-array
1363          DO 300 I = BCDAIDX, ECDAIDX, 1
1364          I2 = 0
1365          CALL MCFIND(CNAMES(I),I1,I2)
```

```
1366            LCPTR(I)  = I1
1367            CLENGT(I) = I2
1368     300  CONTINUE
1369   C     ...Check for dynamic memeory allocation errors
1370         IF(DEBUG)CALL MCDEBG(NOUTFL)
1371         CALL MCSTAT(MNERRS,MNUSED)
1372         IF(MNERRS.NE.0.OR.DEBUG)CALL MCLIST(NOUTFL)
1373         IF(MNERRS.NE.0.        )THEN
1374            CALL MCEROR(NOUTFL)
1375            CALL QAABORT('(MEMADJC3) - ### CHARACTER ### '//
1376        $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
1377         ENDIF
1378         RETURN
1379   C-----------------------------------------------------------------------
1380   C**** END OF SUBROUTINE MEMADJC ****
1381   C-----------------------------------------------------------------------
1382         END
```

```
*DECK,OUTPUT
      SUBROUTINE OUTPUT
C***********************************************************************
C
C  PURPOSE:       Writes ASCII information to file NOUTFL about
C                 the LHS input translation run.
C
C  AUTHORS:       Ron McCurley, Jonathan S. Rath
C
C  UPDATED:       16 January, 1989  --J.S.R. adapted to new version
C                 23 May, 1989 --J.S.R. deleted CLOSE statements
C                 19 May, 1993 --L.N.S. replaced all ECHO2 calls with
C                                       calls to subroutine FILECHO2.
C
C  CALLED BY:     PRELHS
C
C  CALLS:         FILECHO2
C
C  ARGUMENTS:
C  ENTRY/
C     --common block
C      /IOCOM/ ($include 'IOCOM.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C  EXIT/
C       none
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC/LIST'

      WRITE(NOUTFL,*)' This is the PREINFIL input information ECHOED'
      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE OUTPUT *****
C-----------------------------------------------------------------------
      END
```

```
*DECK,PREPRO
      SUBROUTINE PREPRO( FUSR, FCDB, FTMP, FINF, FOUT )
C*********************************************************************
C
C  PURPOSE:    PREPRO input preprocessor which performs:
C              1.  QA functions
C              2.  Calls routine for parsing command line argUements
C                  which consists of filenames.  Those files are
C                  opened when appropriate or prompted for if not
C                  supplied on the command line or set to defaults.
C
C  AUTHOR:     Ron D McCurley
C
C  UPDATED:    07 May, 1999  --
C
C  CALLED BY:  PREINFIL {main program}
C
C  CALLS:      EXPARM
C              FILCMDLIN
C              WELCOM
C              TYPRQS
C              ISTRLEN
C              QABANNER
C              QAPAGE
C              QADOEDIS
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C   /IOCOM/ ($include 'IOCOM.INC')
C    IOUTFL  = Device no. of diagnostics/debUg output file
C              (Equilabrated to NOUTFL)
C   /L1/  Contains Line 1 of a 3-line program discription written out
C         following the program banner
C   /L2/  Contains Line 2 of a 3-line program discription written out
C         following the program banner
C   /L3/  Contains Line 3 of a 3-line program discription written out
C         following the program banner
C
C  LOCAL/
C     NFILES = Maximum nUmber of files on command line
C     BATCHF = Logical BATCH process flag
C     INTRAF = Logical INTERACTIVE process flag
C     ERRORF = Logical ERROR flag
C     HARD   = System hardware ID
C     SOFT   = System software ID
C     MODE   = BATCH(0) or INTERACTIVE(1) mode
C     KCSU   = Characters Units per base Unit
C     KNSU   = Numeric storage Units per base Unit
C     IDAU   = Units of storage which  define size of Unformatted
C              direct I/O  records 0=character, 1=nUmeric
C
C  EXIT/
C   --common block
C   /IOCOM/ ($include 'IOCOM.INC')
C    NOUTFL  = Device no. of diagnostics/debug output file
```

```
C
C   --through subroutine call
C    FUSR    = PRE-INFIL Control Card Data filename
C    FCDB    = Calculational data base filename
C    FTMP    = Template INFIL input file
C    FINF    = PREINF transfer file
C    FOUT    = PREINF program diagnostics/debug filename
C
C-----------------------------------------------------------------------
C234567
      IMPLICIT NONE
      INTEGER  ISTRLEN
      INCLUDE 'IOCOM.INC/LIST'
      COMMON /L1/  LINE1
      COMMON /L2/  LINE2
      COMMON /L3/  LINE3

      INTEGER       I,     IDAU,   IOUTFL, KCSU,  KNSU, MODE, NFILES
      LOGICAL       EXIST, BATCHF, ERRORF, INTRAF
      CHARACTER*8   HARD,  SOFT
      CHARACTER*(*) FUSR,  FTMP, FINF, FOUT, FCDB
      CHARACTER*80  FILESP(5)
      CHARACTER*80  LINE1,LINE2,LINE3

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

C     ...Check if current run is BATCH or INTERACTIVE
C        BATCH -> messages to debug file
C        INTER -> messages to screen
      CALL EXPARM(HARD,SOFT,MODE,KCSU,KNSU,IDAU)
      IF (MODE .EQ. 0) THEN
         BATCHF = .TRUE.
      ELSE
         BATCHF = .FALSE.
      ENDIF

C     ...Get files names from command line
C        FILESP(1 to 5) are: FUSR, FCDB, FTMP, FINF, FOUT
C     ...If FUSR = 'default' all files will be defaulted, otherwise
C        they will be prompted for.  A blank response to the prompt will
C        also result in default file name.
      ERRORF = .FALSE.
      CALL FILCMDLIN(5,NFILES,FILESP)
      FUSR = FILESP(1)
      FCDB = FILESP(2)
      FTMP = FILESP(3)
      FINF = FILESP(4)
      FOUT = FILESP(5)

C     ...If any files specified on command line set INTRAF to false
      INTRAF = .TRUE.
      IF (NFILES .GT. 0) THEN
         INTRAF = .FALSE.
         BATCHF = .TRUE.
      ELSE
```

```
1536            INTRAF = .TRUE.
1537         ENDIF
1538
1539         IF (INTRAF) THEN
1540   C     ...INTERACTIVE:  Prompt for filenames
1541
1542            CALL WELCOM
1543            WRITE(*,1000)
1544   C
1545   C        ------------------------------
1546   C        PRE-INFIL Control Card Data file
1547   C        ------------------------------
1548
1549     100    CALL TYPRQS(' Enter PREINF Control Card Data filename'//
1550        +               ' <PREINF.INP>',FUSR)
1551   C        ...Null response implies default
1552            IF (FUSR .EQ. 'default' .OR. FUSR .EQ. 'DEFAULT' .OR.
1553        &       FUSR .EQ. ' ') FUSR = 'PREINF.INP'
1554            INQUIRE(FILE=FUSR, EXIST=EXIST)
1555            IF (.NOT. EXIST) THEN
1556               WRITE(*,'(3A/)')
1557        &        ' FUSR=',FUSR(1:ISTRLEN(FUSR)),' does not exist'
1558               FUSR = ' '
1559               GOTO 100
1560            ENDIF
1561
1562   C        -------------------
1563   C        COMPUTATIONAL data base
1564   C        -------------------
1565   C
1566   C        ...Prompt User for COMPUTATIONAL data base
1567    200     CALL TYPRQS(' Enter COMPUTATIONAL data base filename'//
1568        +               ' <POSTLHS.CDB>',FCDB)
1569   C        ...Null response implies default
1570            IF (FCDB .EQ. 'default' .OR. FCDB .EQ. 'DEFAULT' .OR.
1571        &       FCDB .EQ. ' ') FCDB='POSTLHS.CDB'
1572            INQUIRE(FILE=FCDB, EXIST=EXIST)
1573            IF (.NOT. EXIST) THEN
1574               WRITE(*,'(3A/)')
1575        &        ' FCDB=',FCDB(1:ISTRLEN(FCDB)),' does not exist'
1576               FCDB = ' '
1577               GOTO 200
1578            ENDIF
1579
1580   C        ---------------------
1581   C        PREINFIL input INFIL template control file
1582   C        ---------------------
1583   C
1584   C        ...Prompt User for PREINFIL input INFIL template filename
1585            CALL TYPRQS(' Enter PREINFIL input INFIL template filename'//
1586        +               ' <INFIL.TMP>',FTMP)
1587   C        ...Null response implies default
1588            IF (FTMP .EQ. 'default' .OR. FTMP .EQ. 'DEFAULT' .OR.
1589        &       FTMP .EQ. ' ') FTMP = 'INFIL.TMP'
1590
1591   C        ---------------------
1592   C        PREINFIL output transfer file (to INFIL) input control file
```

```
C        ---------------------
C
C        ...Prompt User for PREINFIL transfer filename
         CALL TYPRQS(' Enter PREINF to INFIL transfer filename'//
     +               ' <INFIL.CTL>',FINF)
C        ...Null response implies default
         IF (FINF .EQ. 'default' .OR. FINF .EQ. 'DEFAULT' .OR.
     &       FINF .EQ. ' ') FINF = 'INFIL.CTL'

C        ----------------------------
C        Diagnostics/Debug output file
C        ----------------------------
C
         WRITE(*,1100)
C        ...Prompt User for OPTIONAL diagnostics/debUg file
         CALL TYPRQS(' Enter (optional) PREINF diagnostics/debug'//
     +               ' filename <PREINF.DBG>',FOUT)
C        ...Null response implies default
         IF (FOUT .EQ. 'default' .OR. FOUT .EQ. 'DEFAULT' .OR.
     &       FOUT .EQ. ' ') FOUT='PREINF.DBG'
         IF (FOUT(:3) .EQ. 'CAN' .OR. FOUT(:3) .EQ. 'can') THEN
C           ...Don't write a recoverable diagnostics/debug file
            NOUTFL = 6
            FOUT   = 'PREINF.SCR'
         ELSE
            NOUTFL = 7
         ENDIF

       ELSE

C     ...Set Undefined files to defaults and check for existence
         IF (FUSR .EQ. 'default' .OR. FUSR .EQ. 'DEFAULT' .OR.
     &    (BATCHF .AND. FUSR .EQ. ' ') ) FUSR = 'PRECTL.INP'
         INQUIRE(FILE=FUSR,EXIST=EXIST)
         IF (.NOT.EXIST) THEN
            WRITE(*,'(3A/)')
     &        ' FUSR=',FUSR(1:ISTRLEN(FUSR)),' does not exist'
            ERRORF = .TRUE.
         ENDIF

         IF (FCDB .EQ. 'DEFAULT' .OR. FCDB .EQ. 'default' .OR.
     &    (BATCHF .AND. FCDB .EQ. ' ') ) FCDB = 'POSTLHS.CDB'
         INQUIRE(FILE=FCDB,EXIST=EXIST)
         IF (.NOT.EXIST) THEN
            WRITE(*,'(3A/)')
     &        ' FCDB=',FCDB(1:ISTRLEN(FCDB)),' does not exist'
            ERRORF = .TRUE.
         ENDIF

         IF (FTMP .EQ. 'default' .OR. FTMP .EQ. 'DEFAULT' .OR.
     &    (BATCHF .AND. FTMP .EQ. ' ') ) FTMP = 'INFIL.TMP'

         IF (FINF .EQ. 'default' .OR. FINF .EQ. 'DEFAULT' .OR.
     &    (BATCHF .AND. FINF .EQ. ' ') ) FINF = 'INFIL.CTL'

         IF (FOUT .EQ. 'default' .OR. FOUT .EQ. 'DEFAULT' .OR.
     &    (BATCHF .AND. FOUT .EQ. ' ') ) FOUT = 'PREINFIL.DBG'
```

```
1650
1651            IF (FOUT(:3).EQ. 'CAN' .OR. FOUT(:3).EQ. 'can') THEN
1652   C ...Don't write a recoverable diagnostics/debug file
1653               NOUTFL = 6
1654               FOUT   = 'PREINFIL.SCR'
1655            ELSE
1656               NOUTFL = 7
1657            ENDIF
1658         ENDIF
1659
1660   C     ...Open Diagnostics/Debug output file
1661         IF (NOUTFL.EQ.7) THEN
1662            OPEN(NOUTFL,FILE=FOUT,FORM='FORMATTED',STATUS='UNKNOWN')
1663         ELSEIF (NOUTFL.EQ.6) THEN
1664            OPEN(NOUTFL,FILE=FOUT,STATUS='SCRATCH')
1665         ENDIF
1666
1667   C     ...Write QA stuff
1668         CALL QABANNER(NOUTFL,LINE1,LINE2,LINE3)
1669         CALL QAPAGE(NOUTFL,' ')
1670         CALL QADOEDIS(NOUTFL,'*')
1671
1672         WRITE(NOUTFL,1200)
1673         WRITE(NOUTFL,'(A)')'            FILE ASSIGNMENTS'
1674         WRITE(NOUTFL,'(A)')'            ----------------'
1675         WRITE(NOUTFL,'(A,A)')' PREINFIL Input Control FILE...........',
1676        +                     FUSR(1:40)
1677         WRITE(NOUTFL,'(A,A)')' COMPUTATIONAL Data Base FILE............',
1678        +                     FCDB(1:40)
1679         WRITE(NOUTFL,'(A,A)')' PREINFIL input INFIL Template FILE......',
1680        +                     FTMP(1:40)
1681         WRITE(NOUTFL,'(A,A)')' PREINFIL to INFIL Transfer FILE.........',
1682        +                     FINF(1:40)
1683         WRITE(NOUTFL,'(A,A)')' DIAGNOSTICS/DEBUG Output FILE.......',
1684        +                     FOUT(1:40)
1685
1686   C     ...Equate IOUTFL to NOUTFL
1687         IOUTFL = NOUTFL
1688
1689   C     ...Stop if ERRORF
1690         IF (ERRORF) THEN
1691            WRITE(NOUTFL,'(A)')' FILE SPECIFICATION ERROR(S)'
1692            STOP '*** FILE SPECIFICATION ERROR(S) IN PREPRO ***'
1693         ENDIF
1694         RETURN
1695   C
1696   C------------------ F O R M A T   S T A T E M E N T S ------------------
1697   C
1698   1000  FORMAT(/,' ...For <default filenames>, press RETURN',/)
1699   1100  FORMAT(/,' ...To CANCEL optional files requested, respond',
1700        +         ' with: CANCEL',/)
1701   1200  FORMAT(/,79('*'),/,1X,'(PREPRO)')
1702   C
1703   C-----------------------------------------------------------------------
1704   C**** END OF subroutine PREPRO ****
1705   C-----------------------------------------------------------------------
1706         END
```

```
*DECK PROCDB
      SUBROUTINE PROCDB( MAXC, MAXQ, C, IQ, LQ, Q )
C***********************************************************************
C****                                                                ****
C****           P_R_O_C_ess  input D_ata  B_ase  routine             ****
C****           - - - -            -      -                          ****
C***********************************************************************
C
C  PURPOSE:    Process dynamic memory allocation for input
C              CAMDAT file etc...
C
C  AUTHOR:     Jonathan S. Rath
C
C  UPDATED:    18-MAY-1999  --(RDM) MODIFIED FOR PREINFIL
C              16-APR-1992  --Added arguments in REAHEA
C                           --Added calls to ZERODA
C              27-MAR-1992  --Changed arguments in GIEBLO
C              17-DEC-1991  --First Ed.
C
C  CALLED BY:  PREINFIL{main program}
C
C  CALLS:      RECHEA
C              REATIM
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C    /IOCOM/ ($INCLUDE 'IOCOM.INC')
C     ICAMBFN    = Device no of Input CAMDAT File
C     OCAMBFN    = "            Output CAMDAT file
C
C   --through subroutine call
C     MAXC   = Total no. of CHAR*1 words allocated to dynamic storage
C     MAXQ   = Total no. of words allocated to dynamic storage
C     IQ     = INTEGER Dynamic Q-array (equivalenced to Q)
C     LQ     = LOGICAL Dynamic Q-array (equivalenced to Q)
C     Q      = REAL Dynamic memory base array
C     C      = CHARACTER Dynamic memory base array
C
C  LOCAL/
C     IERR   = INTEGER error code
C     MORMEMC= No. additional words to be allocated to C array
C     MORMEMR= No. additoinal words to be allocated to Q array
C
C  EXIT/
C   --common blocks
C    /LOCATR/ ($INCLUDE 'LOCAT.INC')
C     L[name]= Pointer to [name] Q-array integers
C     LRPTR  = Pointer of Q-array
C
C    /LOCATC/ ($INCLUDE 'LOCAT.INC')
C     L[name]= Pointer to [name] C-array integers
C     LCPTR  = Pointer of C-array
C
C    /GEOPAR/ ($INCLUDE 'GEOPAR.INC')
C     HEADER = Character description of problem, etc...
```

```
C     IMAX   = No. of I-lines in grid
C     JMAX   = No. of J-lines in grid
C     KMAX   = No. of K-lines in grid
C     LESSEL = List of Element Side sets concatenated Element List
C     LESSNL = List of Element Side sets concatenated Nodes associated
C              with each element side set Node List
C     LNPSNL = List of Nodal Point set concatenated Nodes List
C     MAXNENO= Max. no. of nodes of any element
C     NDIM   = Number of physical DIMensions
C     NDBCAM = CAMDAT versoin number
C     NELBLK = Number of ELement BLocKs in mesh
C     NELX   = No. of elements along X-axis of mesh
C     NELY   = No. of elements along Y-axis of mesh
C     NELZ   = No. of elements along Z-axis of mesh
C     NQAREC = Number of QA records
C     NUMEL  = NUmber of ELeMents in mesh
C     NUMESS = NUMber of Element Side set in mesh
C     NUMNOD = NUMber of NODes in mesh
C     NUMNPS = NUMber of Nodal Point set in mesh
C     NVAREL = No. of ELEMENT type ANALYSIS variables
C     NVARGL = No. of GLOBAL  "                    "
C     NVARHI = No. of HISTORY "                    "
C     NVARND = No. of NODA    "                    "
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC/LIST'
      INCLUDE 'LOCAT.INC/LIST'
      INCLUDE 'GEOPAR.INC/LIST'
      INTEGER  IERR, MAXC, MAXQ, MORMEMC, MORMEMR
      INTEGER IQ(*)
      REAL Q(*)
      CHARACTER*(1) C(*)
      LOGICAL LQ(*)
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
      IERR = 0
C
      CALL DBISIZES( ICDB,     NQAREC,  NXINFO,  NDIM,   NUMNOD,
     $               NELBLK,  NUMEL,   NELX,    NELY,   NELZ,
     $               MAXNENO, NUQATR,  NUQPRP,  NUMNPS, LNPSNL,
     $               NUMESS,  LESSEL,  LESSNL,  IERR )

      CALL ADDMEM(MORMEMR,MORMEMC)
      CALL MDDEBG(NOUTFL)
      CALL DYNMEM( MORMEMR, MAXQ, Q )
      CALL DYNMEMC( MORMEMC, MAXC, C )

C     ...Read various CAMDAT "header" sections into arrays
      CALL RECHEA( Q,    C,    IQ(LIDEBLK), IQ(LNUMPRP), LQ(LIASPRP),
     $             Q(LXMATPR), C(LQAINFO), C(LNAMELB), C(LNMATPR) )
C     ...Read various CAMDAT "analysis/times" section into arrays
C*      CALL REATIM( Q,          C,          C(LNAMHIV), C(LNAMGLV),
```

```
C*     1             C(LNAMNDV), C(LNAMELV), Q(LTIME),   Q(LHIFLAG),
C*     2             Q(LVALHIV), Q(LVALGLV), Q(LVALNDV), Q(LVALELV) )
      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE PROCDB *****
C-----------------------------------------------------------------------
      END
```

```
*DECK,PROCTL
      SUBROUTINE PROCTL
C*********************************************************************
C***                                                                ****
C***              P_R_Ocess  input  C_on_T_ro_L File  module       ****
C***              - - -             -    -    -                    ****
C*********************************************************************
C
C  PURPOSE :    Reads the PREINFIL input control file and RETURNS the
C               variables which will be modified from the template file
C               (i.e.--the sampled parameters).  May also return file
C               names as used by INFIL
C
C  AUTHOR:      Ron D McCurley
C
C  UPDATED:     May, 1999
C
C  CALLED BY:   PREINFIL
C
C  CALLS:       FFRDFLDS
C               RETRIE
C               QAABORT
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C    /IOCOM/ ($include 'IOCOM.INC')
C     INASCI = File unit of PRELHS input control file
C     NOUTFL = "                   diagnostics/debug file
C
C    /FFRDAT/ ($include 'FFRDAT.INC')
C     MFIELD = Max. no. of fields that Free-Field-Reader can process
C     NFORM  = Max. length of a CHARACTER data field
C
C  LOCAL/
C     CVALUE = CHARACTER values of the data fields
C     IERR   = INTEGER error flag
C     IOSTAT = INTEGER value for ANSI FORTRAN I/O status
C     IVALUE = INTEGER values of the data fields
C     KVALUE = Translation states of the data fields
C     NFIELD = Number of fields
C     RVALUE = REAL values of the data fields
C
C  EXIT/
C   --through subroutine call
C     NUMVAR = No. of LHS variables
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC/LIST'
      INCLUDE 'FFRDAT.INC/LIST'
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'NEWPAR.INC/LIST'

      INTEGER IERR, IOSTAT, NFIELD
```

```
      INTEGER IVALUE(MFIELD), KVALUE(MFIELD)
      REAL RVALUE(MFIELD)
      CHARACTER*(NFORM) CVALUE(MFIELD)

C<><><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><><>

      IERR   = 0

C     ...Begin Scanning PREINFIL control card data batch file
   10 CALL FFRDFLDS( INASCI, NOUTFL, ' ', MFIELD, IOSTAT,
     +              NFIELD, KVALUE, CVALUE, IVALUE, RVALUE )

   20 IF (IOSTAT.LT.0) THEN
C        ...End Of File for PREINFIL control card input file found
         GOTO 100

      ELSEIF (IOSTAT.GT.0) THEN
C        ...Set the error flag, abort after EOF found
         IERR = IERR + 1
C        ...Read next record
         GOTO 10

      ELSEIF (IOSTAT.EQ.0) THEN

         IF ( KVALUE(1).EQ.-1 .OR.
     +       (KVALUE(1).EQ.0 .AND.CVALUE(1).EQ.'!')) THEN
C           ...This is a comment line or a blank w/o information
C           ...Read next record
            GOTO 10

         ELSEIF(KVALUE(1).EQ.0.AND.CVALUE(1)(:5).EQ.'*ECHO')THEN
C           ...This is info. to be echoed directly to INFIL input control
C              file
C*            CALL DOECHO( CVALUE )
C           ...Read next record
            GOTO 10

         ELSEIF(KVALUE(1).EQ.0.AND.CVALUE(1)(:5).EQ.'*FILE')THEN
C           ...allows user to select certain output filenames for INFIL
C              these filenames are inserted into the INFIL input control file
C           ...initialize filenames used by INFIL
               FILESUMM = ' '
               FILEMAIN = ' '
               FILEECHO = ' '
            CALL RDFILNM(IOSTAT, NFIELD, KVALUE, CVALUE, IVALUE, RVALUE)
C           ...Read next record
            GOTO 10

         ELSEIF(KVALUE(1).EQ.0.AND.CVALUE(1)(:8).EQ.'*REPLACE')THEN
C           ...Begin retrieving parameter identity (e.g. sampled by LHS)
C              for replacement into new INFIL input control file
            CALL RDPAR(IOSTAT, NFIELD, KVALUE, CVALUE, IVALUE, RVALUE)
C           ...Read next record
            GOTO 10

```

```
          ELSEIF(KVALUE(1).EQ.0.AND.CVALUE(1)(:4).EQ.'*END')THEN
C            ...Found END of PREINFIL control file
C            ...Abort scaning session
             GOTO 100

          ELSE
C            ...Meaningless data found
C            ...Read next record
             GOTO 10
          ENDIF
       ENDIF

 100   IF (IERR.GT.0) THEN
          WRITE(NOUTFL,*)' ***',IERR,' ERRORS FOUND IN RDINFL ***'
          CALL QAABORT('PROCTL')
       ENDIF
       RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE PROCTL ****
C-----------------------------------------------------------------------
       END
```

```
*DECK RDFILNM
      SUBROUTINE RDFILNM( IOSTAT,NFIELD,KVALUE,CVALUE,IVALUE,RVALUE )
C***********************************************************************
C****                                                                ****
C****            R_ea_D  P_A_R ameter names module                   ****
C****            -    -  - - -                                       ****
C***********************************************************************
C
C   PURPOSE:    Reads names of USER SELECTED INFIL output file names
C
C   AUTHOR:     Ron McCurley
C
C   UPDATED:    Aug 13 1999
C
C  CALLED BY:   PRCTRL
C
C  CALLS:       FREFLD
C               QAABORT
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C     /COMMIO/ ($includE 'GI1_COMMIO.INC')
C      ISCRAT = Device no. of PREINFIL scratch file
C      FILEIN = Device no. of PREINFIL input text file
C      NOUTFL = Device no. of diagnostics/debut output file
C
C     /P/ ($includE '.INC')
C
C    --through subroutine call
C      MFIELD = Max. no. of data fields FFR can process
C      IOSTAT = ANSI FORTRAN I/O error flag
C      NFIELD = No. of data fields read by FFR
C      KVALUE = INTEGER array of types of data fields read by FFR.
C      CVALUE = CHARACTER  array of data fields read by FFR.
C      IVALUE = INTEGER    "
C      RVALUE = REAL       "
C
C  LOCAL/
C      none
C
C  EXIT/
C    --common blocks
C     /I/ ($includE 'I.INC') ???
C      ...REAL variables
C
C    --through subroutine call
C      MFIELD = Max. no. of data fields FFR can process
C      IOSTAT = ANSI FORTRAN I/O error flag
C      NFIELD = No. of data fields read by FFR
C      KVALUE = INTEGER array of types of data fields read by FFR.
C      CVALUE = CHARACTER  array of data fields read by FFR.
C      IVALUE = INTEGER    "
C      RVALUE = REAL       "
C
C***********************************************************************
```

```
C234567
      IMPLICIT NONE
      INCLUDE 'FFRDAT.INC/LIST'
      INCLUDE 'IOCOM.INC/LIST'
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'NEWPAR.INC/LIST'

      INTEGER I, IERR, IOSTAT, K, NFIELD
      INTEGER IVALUE(*), KVALUE(*)
      REAL RVALUE(*)
      CHARACTER*(NFORM) CVALUE(*)
      LOGICAL NAMED_REG

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

      IERR   = 0

C     ...Read data for parameter replacement into new INFIL input control
C        file
   10 CALL FFRDFLDS( INASCI, NOUTFL, ' ', MFIELD, IOSTAT,
     +               NFIELD, KVALUE, CVALUE, IVALUE, RVALUE )

   20 IF (IOSTAT.LT.0) THEN
C        ...End Of File for PREINFIL control card input file found
         WRITE(NOUTFL,1001)
         WRITE(NOUTFL,1002)
         WRITE(NOUTFL,1001)
         GO TO 100

      ELSEIF (IOSTAT.GT.0) THEN
C        ...Set the error flag, abort after EOF found
         IERR = IERR + 1
C        ...Read next record
         GOTO 10

      ELSEIF (IOSTAT.EQ.0) THEN

         IF ( KVALUE(1).EQ.-1 .OR.
     +      (KVALUE(1).EQ.0 .AND.CVALUE(1).EQ.'!')) THEN
C          ...This is a comment line or a blank w/o information
C          ...Read next record
           GOTO 10

         ELSEIF( KVALUE(1).EQ.0.AND.CVALUE(1)(:4).EQ.'NAME' .OR.
     +           CVALUE(1)(:4).EQ.'name' ) THEN
           DO 30, I=2,NFIELD-1,2
              IF( KVALUE(I).EQ.0.AND.CVALUE(I)(:4).EQ.'SUMM' .OR.
     +            CVALUE(I)(1:4).EQ.'summ') THEN
C                 ...get name of main output file containing net infiltration
data
                  FILESUMM = CVALUE(I+1)

              ELSEIF( KVALUE(I).EQ.0.AND.CVALUE(I)(:4).EQ.'MAIN' .OR.
     +            CVALUE(I)(1:4).EQ.'main') THEN
```

```
C                 ...get name of main output file containing net infiltration
data
                  FILEMAIN = CVALUE(I+1)

               ELSEIF(KVALUE(I).EQ.0.AND.CVALUE(I)(:4).EQ.'ECHO' .OR.
     +               CVALUE(I)(:4).EQ.'echo') THEN
C               ...get name of output file echoing input to INFIL
                FILEECHO = CVALUE(I+1)
               ENDIF
   30      CONTINUE
C          ...Read next keyword
           GOTO 100
          ELSE
C        ...Found meaningless data
           WRITE(NOUTFL,*)' ***found unexpected meaningless data ',
     +                     'may be a problem in user input file!***'
C          ...Read next record
           GOTO 10
          ENDIF
C        ...Read next record
          GOTO 10
       ENDIF
C
  100 CONTINUE
C
       RETURN
 1001 FORMAT('****************************************')
 1002 FORMAT('WARNING! '/
     +       'Encountered unexpected end of user input'/
     +       'May be bad file! ')
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE RDFILNM  ****
C-----------------------------------------------------------------------
       END
```

```
*DECK RDINFTMP
      SUBROUTINE RDINFTMP(NUMREC, NUMFLD, INFDAT, RINFDAT, CINFDAT)
C***********************************************************************
C
C  ReaDs INFIL TeMPlate file and stores lines/data
C
C***********************************************************************
C
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'FFRDAT.INC/LIST'

      INTEGER IERR, IOSTAT, NFIELD, NUMREC
      INTEGER INFDAT(MAXREC,*), IVALUE(MFIELD), KVALUE(MFIELD),
     +        NUMFLD(MAXREC)
      REAL RVALUE(MFIELD)
      REAL RINFDAT(MAXREC,*)
      CHARACTER*(NFORM) CVALUE(MFIELD)
      CHARACTER*80 CINFDAT(MAXREC,*)

      INCLUDE 'NEWPAR.INC/LIST'
      INCLUDE 'IOCOM.INC/LIST'

C ***Begin reading template for Input Control File (ICF) for INFIL
      ILINE = 0

   10 CONTINUE
        ILINE = ILINE + 1
C     ...Begin Scanning PREINFIL template INFIL control file
  15    CALL FFRDFLDS( INPTMP, NOUTFL, ' ',    MFIELD, IOSTAT,
     +                 NFIELD, KVALUE, CVALUE, IVALUE, RVALUE )

  20    IF (IOSTAT.LT.0) THEN
C          ...End Of File for PREINFIL template INFIL control file found
           GOTO 100

        ELSEIF (IOSTAT.GT.0) THEN
C          ...Set the error flag, abort after EOF found
           IERR = IERR + 1
C          ...Read next record
           GOTO 10

        ELSEIF (IOSTAT.EQ.0) THEN
           NUMFLD(ILINE) = NFIELD
           DO 30 I=1,NFIELD
             IF ( KVALUE(I).EQ.-1 .OR. KVALUE(I).EQ.0 ) THEN
C            ...This is a comment field or a blank w/o information
                CINFDAT(ILINE,I) = CVALUE(I)
             ELSEIF( KVALUE(I).EQ.1 ) THEN
C            ...This is real data
                RINFDAT(ILINE,I) = RVALUE(I)
             ELSEIF( KVALUE(I).EQ.2 ) THEN
C            ...This is integer data
                INFDAT(ILINE,I) = IVALUE(I)

             ENDIF
  30       CONTINUE
```

```
          ENDIF

          IF (ILINE.GT.MAXREC) THEN
             PRINT *, 'The number of lines is greater than ',
       +                     'allowed (',MAXREC,')'
             CALL QAABORT('(RDINFTMP) - reading INFIL ICF ***')
          ENDIF
C          ...Read next record
          GO TO 10
  100 CONTINUE

      NUMREC = ILINE
C
      RETURN
C
      END
```

```
*DECK RDPAR
      SUBROUTINE RDPAR( IOSTAT, NFIELD, KVALUE, CVALUE, IVALUE, RVALUE )
C***********************************************************************
C****                                                                ****
C****            R_ea_D  P_A_R ameter names module                   ****
C****            -    -  - - -                                       ****
C***********************************************************************
C
C   PURPOSE:    Reads names of new INFIL input CONTROL parameters
C               as stored (with values) in CDB files as matched with
C               key user names (fixed or sampled)
C
C   AUTHOR:     Ron McCurley
C
C   UPDATED:    May 1999
C
C  CALLED BY:   PRCTRL
C
C  CALLS:       FREFLD
C               QAABORT
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C     /COMMIO/ ($includE 'GI1_COMMIO.INC')
C      ISCRAT = Device no. of PREINFIL scratch file
C      FILEIN = Device no. of PREINFIL input text file
C      NOUTFL = Device no. of diagnostics/debut output file
C
C     /PGENII/ ($includE 'GI1_PGENII.INC')
C
C    --through subroutine call
C      MFIELD = Max. no. of data fields FFR can process
C      IOSTAT = ANSI FORTRAN I/O error flag
C      NFIELD = No. of data fields read by FFR
C      KVALUE = INTEGER array of types of data fields read by FFR.
C      CVALUE = CHARACTER  array of data fields read by FFR.
C      IVALUE = INTEGER    "
C      RVALUE = REAL       "
C
C  LOCAL/
C      none
C
C  EXIT/
C    --common blocks
C     /I/ ($includE 'I.INC') ???
C      ...REAL variables
C
C    --through subroutine call
C      MFIELD = Max. no. of data fields FFR can process
C      IOSTAT = ANSI FORTRAN I/O error flag
C      NFIELD = No. of data fields read by FFR
C      KVALUE = INTEGER array of types of data fields read by FFR.
C      CVALUE = CHARACTER  array of data fields read by FFR.
C      IVALUE = INTEGER    "
C      RVALUE = REAL       "
```

```
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FFRDAT.INC/LIST'
      INCLUDE 'IOCOM.INC/LIST'
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'NEWPAR.INC/LIST'
      INCLUDE 'INFIL.INC/LIST'

      INTEGER I, IERR, IOSTAT, K, NFIELD
      INTEGER IVALUE(*), KVALUE(*)
      REAL RVALUE(*)
      CHARACTER*(NFORM) CVALUE(*)
      LOGICAL NAMED_REG

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

      IERR   = 0

C     ...Read data for parameter replacement into new INFIL input control
C        file
   10 CALL FFRDFLDS( INASCI, NOUTFL, ' ', MFIELD, IOSTAT,
     +               NFIELD, KVALUE, CVALUE, IVALUE, RVALUE )

   20 IF (IOSTAT.LT.0) THEN
C        ...End Of File for PREINFIL control card input file found
         WRITE(NOUTFL,1001)
         WRITE(NOUTFL,1002)
         WRITE(NOUTFL,1001)
         GO TO 100

      ELSEIF (IOSTAT.GT.0) THEN
C        ...Set the error flag, abort after EOF found
         IERR = IERR + 1
C        ...Read next record
         GOTO 10

      ELSEIF (IOSTAT.EQ.0) THEN

         IF ( KVALUE(1).EQ.-1 .OR.
     +      (KVALUE(1).EQ.0 .AND.CVALUE(1).EQ.'!')) THEN
C          ...This is a comment line or a blank w/o information
C          ...Read next record
           GOTO 10

         ELSEIF(KVALUE(1).EQ.0.AND.CVALUE(1)(:6).EQ.'REGION' .OR.
     +          CVALUE(1)(1:6).EQ.'region') THEN
C          ...get region name in CDB's where infitration parameters are
           REGION=CVALUE(2)
           NAMED_REG =.TRUE.
C          ...Read next record
           GOTO 10

         ELSEIF(KVALUE(1).EQ.0.AND.CVALUE(1)(:4).EQ.'PROP' .OR.
```

```
     +          CVALUE(1)(:4).EQ.'prop') THEN
C           ...Begin retrieving parameter identity (e.g. sampled by LHS)
C              for replacement into new INFIL input control file;
C              loop over remaining words in this field
            DO 40 I=2,NFIELD,2
C              ...get CDB names of variables to retrieve their LHS sampled
C                 values
               K = K+1
               IF(K.GT.MAXVAR) THEN
                 WRITE(NOUTFL,*)'*** Exceeded max number of NEW (LHS ',
     +                          'or fixed parameters at KEYWORD = ',
     +                          CVALUE(I),' Check PARACM.INC!'
                 CALL QAABORT('Exceeded max number of new (LHS or ',
     +                       'fixed parameters, check PARACM.INC' )
               ENDIF

C              ...INFIL_NAME is the name of the parameter as designated in
C                 INFIL.INC; CDB_NAME is the name of the same parameter as
C                 designated in the suite of
C                 CDB files produced by POSTLHS; these may be identical
               INFIL_NAME(K) = CVALUE(I)
               CDB_NAME(K) = CVALUE(I+1)
               IF(CDB_NAME(K)(1:4).EQ.'SAME' .OR.
     +            CDB_NAME(K)(1:4).EQ.'same') CDB_NAME(K)=INFIL_NAME(K)

  40        CONTINUE
C           ...Read next record
            GOTO 10
          ELSE
C         ...Found meaningless data
            WRITE(NOUTFL,*)' ***found unexpected meaningless data ',
     +                     'may be a problem in user input file!***'
C           ...Read next record
            GOTO 10
          ENDIF
C         ...Read next record
          GOTO 10
        ENDIF

 100    NUMVAR = K
        IF(.NOT. NAMED_REG) REGION = 'REGION00'
C
        RETURN
 1001   FORMAT('****************************************')
 1002   FORMAT('WARNING! '/
     +       'Encountered unexpected end of user input'/
     +       'May be bad file! ')
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE RDPAR  ****
C-----------------------------------------------------------------------
        END
```

```
*DECK RECHEA
      SUBROUTINE RECHEA( Q,      C,      IDEBLK, NUMPRP, IASPRP,
     $                   XMATPR, QAINFO, NAMELB, NMATPR )
C***********************************************************************
C****                                                                ****
C****          R_E_ad  C_amdat  H_E_A_der  section  routine         ****
C****          - -     -        - - -                               ****
C***********************************************************************
C
C  PURPOSE:    Reads pertinent "HEADER" sections of the input
C              CAMDAT file into common blocks and arrays
C
C  AUTHOR:     Jonathan S. Rath
C
C  UPDATED:    13-JUN-1994  --JSR: First Edition
C
C  CALLED BY:  PROCDB
C
C  CALLS:      DBIELBLK
C              DBIPROP
C              DBIPRNM
C              DBIQAREC
C              DBINSTEP
C              QAABORT
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C    /IOCOM/ (from FORTRAN statement: INCLUDE 'IOCOM.INC')
C     ICDB    = Device no of Input CAMDAT File
C
C    /GEOPAR/ (from FORTRAN statement: INCLUDE 'GEOPAR.INC')
C     NELBLK = Number of ELement BLocKs in mesh (i.e. # of materials)
C     NQAREC = Number of QA records
C     NSTEP  = No. of time steps in input CAMDAT (INTEGER)
C     NVAREL = No. of element variables (INTEGER)
C     NUQPRP = No. of UniQUe PRoperty names (INTEGER)
C
C   --through subroutine call
C     Q      = REAL type base dynamic array
C     C      = CHARACTER*1 type base dynamic array
C
C  LOCAL/
C     IERR   = INTEGER error code
C
C  EXIT/
C   --through subroutine call
C     IDEBLK = INTEGER ID array of matrial regions (INTEGER)
C     NUMPRP = No. of properties per material region (INTEGER)
C     IASPRP = Logical array for properties in materials
C     XMATPR = Properties array (REAL)
C     QAINFO = Quality Assurance array (CHAR*8)
C     NAMELB = Names of the material regions (CHAR*8)
C     NMATPR = Names of the properties (CHAR*8)
C
C***********************************************************************
```

```
C234567
      IMPLICIT NONE
      INCLUDE 'IOCOM.INC'
      INCLUDE 'GEOPAR.INC'
      INTEGER  I, IERR, J, K, NHISTP
      INTEGER IDEBLK(*), NUMPRP(*)
      REAL Q(*), XMATPR(*)
      CHARACTER*(1) C(*)
      CHARACTER*(8) NAMELB(*), NMATPR(*), QAINFO(*)
      LOGICAL IASPRP(*)
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
      IERR = 0

C     ...Read material ID and names information
      CALL DBIELBLK( ICDB, NELBLK, NAMELB, IDEBLK, IERR )
      IF(IERR.NE.0)
     $CALL QAABORT('(RECHEA) - reading material ID and names array ***')

C     ...Read property names
      CALL DBIPRNAM( ICDB, NUQPRP, NMATPR, Q, C, IERR )
      IF(IERR.NE.0)
     $CALL QAABORT('(RECHEA) - reading PROPERTY NAMES array ***')

C     ...Read property data
      DO 10 I=1,NUQPRP
         J = (I-1)*NELBLK+1
         CALL DBIPROP( ICDB, '*', I, IASPRP(J), XMATPR(J),
     $                 Q,        C, IERR )
         IF(IERR.NE.0)
     $   CALL QAABORT('(RECHEA) - reading PROPERTY values ***')
   10 CONTINUE

C     ...Construct the number of properties per material array
      DO 30 J=1,NELBLK
         NUMPRP(J) = 0
         DO 20 I=1,NUQPRP
            K = (I-1)*J+1
            IF(IASPRP(K))NUMPRP(J) = NUMPRP(J)+1
   20    CONTINUE
   30 CONTINUE

C     ...Read QA data
      CALL DBIQAREC( ICDB, NQAREC, QAINFO, IERR )
      IF(IERR.NE.0)CALL QAABORT('(RECHEA) - reading QA array ***')

C     ...Get the number of time steps (NSTEP)
      CALL DBINSTEP( ICDB, NSTEP, NHISTP, IERR )
      IF(IERR.NE.0)CALL QAABORT('(RECHEA) - obtaining input CAMDAT '//
     $                          'no. of time steps ***')

      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE RECHEA *****
```

```
C-----------------------------------------------------------------------
      END
```

```
*DECK TRNDAT
      SUBROUTINE TRNDAT( NUMPRP, XMATPR, NAMELB, NMATPR, XINFILVAL )
C     ***Modified 8 Nov 99 to account for sampling for lognormal distribution
C        for etcoeffa with negative values RDM
C*********************************************************************
C

      INCLUDE 'GEOPAR.INC/LIST'
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'INFIL.INC/LIST'
      INCLUDE 'NEWPAR.INC/LIST'

      INTEGER  I, IBLK, IERR, INDEXJ, J, K
      INTEGER  ISUM(NELBLK), NUMPRP(*)
      REAL XINFILVAL(*), XMATPR(*)
      CHARACTER*(8) NAMELB(*), NMATPR(*)
      LOGICAL MATCH(NUMVAR)

C***  translate material property values extracted from the input
C     CDB file to appropriate parameter values for the INFIL input
C     control file

      DO 100 IBLK=1,NELBLK

        IF(REGION .EQ. NAMELB(IBLK)) THEN

          DO 80 J=1,NUMPRP(IBLK)

            INDEXJ = IBLK + NELBLK*(J-1)

            DO 50 I=1,NUMVAR
              MATCH(I) = .FALSE.

              IF(NMATPR(J) .EQ. CDB_NAME(I)) THEN
                XINFILVAL(I)=XMATPR(INDEXJ)
C               ...change sign of etcoeffa to negative
                IF(CDB_NAME(I)(1:8).EQ.'ETCOEFFA') THEN
                   XINFILVAL(I) = -1.0*(XINFILVAL(I))
                   MATCH(I)=.TRUE.
C               ...change value of 'small' negative sampled variables to
C                  zero where LHS picked below the 99 percentile
                ELSEIF( CDB_NAME(I)(1:7).EQ.'BRPOROS' .AND.
     +                  XINFILVAL(I).LE.0.0 ) THEN
                   XINFILVAL(I) = 1.0E-3
                ELSEIF( CDB_NAME(I)(1:8).EQ.'BRZDEPTH' .AND.
     +                  XINFILVAL(I).LE.0.0 ) THEN
                   XINFILVAL(I) = 1.0E-1
                ENDIF
                GOTO 80
              ENDIF
   50       CONTINUE
   80     CONTINUE
        ENDIF

 100  CONTINUE
```

```
      RETURN
      END
```

```
*DECK,TYPRQS
      SUBROUTINE TYPRQS( PROMPT, ISTRNG )
C***********************************************************************
C
C  PURPOSE:     Outputs a request for a character string using PROMPT
C               and then inputs the character string (ISTRNG) in an
C               interactive session.
C
C  AUTHOR:      Rob Rechard
C
C  UPDATED:     June 1985
C               July 1987          --Ginger Wilkinson
C               15 February, 1989  --Jonathan S. Rath made more generic
C
C  CALLED BY:   PREPRO
C
C  ARGUMENTS:
C  ENTRY/
C   --through subroutine call
C     PROMPT  = Message to print on the screen
C
C  EXIT/
C   --subroutine call
C     ISTRNG  = Character string read
C
C***********************************************************************
C234567
      IMPLICIT NONE
      CHARACTER*(*) ISTRNG, PROMPT
      WRITE(*,1000)PROMPT
   10 READ(*,'(A)',END=20,ERR=30) ISTRNG
      RETURN

   20 WRITE(*,2000)
      GOTO 10
   30 WRITE(*,3000)
      GOTO 10

C---------------- F O R M A T   S T A T E M E N T S ------------------
1000  FORMAT(A,'  >>')
2000  FORMAT(' ***NO DATA--TRY AGAIN***')
3000  FORMAT(' ***BAD CHARACTER STRING--TRY AGAIN***')
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE TYPRQS ****
C-----------------------------------------------------------------------
      END
```

```
*DECK,WELCOM
      SUBROUTINE WELCOM
C*********************************************************************
C
C  PURPOSE:     Produces Instructions for main program usage
C
C  PROGRAMMER:  Jonathan S. Rath
C
C  UPDATED:     24 May, 1989 --First Ed.
C
C  CALLED BY:   PREPRO
C
C  CALLS:       QABANNER
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C
C    /QACOMMON/
C     PROGRM  =  The program name (CHAR*12)
C     PVERSN  =  The program version number (CHAR*8)
C
C    /L1/  Contains Line 1 of a 3-line program discription written out
C          following the program banner
C    /L2/  Contains Line 2 of a 3-line program discription written out
C          following the program banner
C    /L3/  Contains Line 3 of a 3-line program discription written out
C          following the program banner

C  LOCAL/
C     IOUT   =  Device number of output file
C
C  EXIT/
C      none
C
C*********************************************************************
C234567

      IMPLICIT NONE

      INCLUDE 'CAMCON_COMMON.INC/list'

      INTEGER IOUT
      CHARACTER*1  CHAR
      CHARACTER*80 LINE1,LINE2,LINE3
      COMMON /L1/  LINE1
      COMMON /L2/  LINE2
      COMMON /L3/  LINE3
      DATA IOUT/5/

C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>

      OPEN(IOUT,FILE='SYS$OUTPUT',FORM='FORMATTED',STATUS='UNKNOWN')
      CALL QABANNER(IOUT,LINE1,LINE2,LINE3)
```

```
      WRITE(IOUT,1000)
C     ...Abort PROGRM program execution ?
      WRITE(IOUT,1200)PROGRM,PVERSN
      READ(IOUT,'(A)')CHAR
      IF(CHAR.NE.' ')THEN
         STOP '**** USER ABORTED EXECUTION IN SUBROUTINE WELCOM ****'
      ENDIF
      CLOSE(IOUT)
      RETURN
C
C--------------  F O R M A T   S T A T E M E N T S  ------------------
C
1000  FORMAT(///
     +'*************************************************************'/
     +'    PREINFIL: PRE-processor for INFIL input control file    '/
     +'*************************************************************'///
     +' Following are prompts for'//
     +'      (1) Filename of PREINFIL control input file'/
     +'      (2) Filename of Computational Data Base to be read'/
     +'      (3) Filename of Template INFIL input control file '/
     +'      (3) Filename of PREINFIL generated INFIL input file'/
     +'      (4) (OPTIONAL) Filename of PREINFIL diagnostics/debug'/
     +'          file'//,
     +'*************************************************************'/)

1200  FORMAT(/79('*'),///1X,'To CONTINUE program ',A,' V',A,' press',
     +       ' the RETURN key.',/1X,'To ABORT program, type the word',
     +       ' ABORT')
C
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE WELCOM ****
C-----------------------------------------------------------------------
      END
```

```
*DECK WRIINF
      SUBROUTINE WRIINF(FCDB,NUMREC,NUMFLD,INFDAT,RINFDAT,CINFDAT,
     +                  INFIL_VAL)
C*********************************************************************
C***                                                               ***
C***       WRIte INFIL input control file                          ***
C***                                                               ***
C*********************************************************************
C
C   PURPOSE:  Writes new INFIL input control file using both unmodified
C             data from a template input control file and new values
C             from a designated computational data base and specified
C             parameters
C
C   AUTHOR:   Ron McCurley
C
C   UPDATED:  25 May, 1999 --Original version
C              5 Aug, 1999 --fixed format bug in record 11 and in record 15
C             10 Nov, 1999 --modified for ndaymap files
C
C   CALLED BY:   PREINF (MAIN program)
C
C   CALLS:       QAABORT
C
C   LIMITATION:  This routine writes input specifically for a
C                particular version of the INF code.
C
C   ARGUMENTS:
C   ENTRY/
C     --common block
C      /IOCOM.INC/ ($include 'IOCOM.INC')
C       NOUTFL = File unit of diagnostics/debug file
C       INPINF = File unit of the INF input file
C
C      /CAMCON_COMMON.INC/ ($include 'CAMCON_COMMON.INC')
C       RUNDAT, RUNTIM - the run date and time
C
C     --through subroutine call
C       NUMVAR = No. of INF varaibles
C       INFVAR = INF material and parameter ID array
C       FCDB   = Name of Computational database file.
C
C   LOCAL/
C       IERR   = INTEGER error flag
C
C  EXIT/
C     --subroutine call
C       INFDIS = INF variable distribution name array
C       INFVRN = Lower & Upper distribution ranges of INF varaible array
C
C*********************************************************************
C234567
      IMPLICIT NONE

      INCLUDE 'CAMCON_COMMON.INC/list'
      INCLUDE 'FFRDAT.INC/LIST'
```

```
      INCLUDE 'PARACM.INC/LIST'
      INCLUDE 'IOCOM.INC/LIST'
      INCLUDE 'NEWPAR.INC/LIST'
      INCLUDE 'INFIL.INC/LIST'

      INTEGER  I,   I1,  I2,  I3,  ICHAR,  J,   K,   IERR,  IFLD,
     +         LASTREC, NDAYMAP, NFLD,  NUMREC
      INTEGER  INFDAT(MAXREC,*), NUMFLD(*)

      REAL     INFIL_VAL(*), RINFDAT(MAXREC,*)
      CHARACTER*80 CINFDAT(MAXREC,*)
      CHARACTER*80 FCDB

      LOGICAL  ERROR, GOTALL, NEWREC(100)

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

      IERR   = 0
      WRITE(NOUTFL,900)

C...Assemble new arrays INFDAT, RINFDAT
C   (only line 3 thru 18 may contain new paramemter data)--this may change!
C   so may want to make this another user input parameter for PREINFIL
      I1 = 3
      I2 = 26
      LASTREC = 0
      NDAYMAP = INFDAT(27,1)
      I3 = I2 + 2*NDAYMAP + 8
C
      DO 200 J = I1,I2
         NEWREC(J) = .FALSE.
C        ...loop over fields in record, starting with 3 (no comments
C           until at least the 3rd field)
         DO 190 IFLD=3,NUMFLD(J)
           ICHAR = 8
           IF ( CINFDAT(J,IFLD)(8:8) .EQ. ')' ) ICHAR = 7
C          ...loop over parameters changed
           DO 100 K = 1, NUMVAR
C*              IF(J.EQ.18 .AND. INFIL_NAME(K)(1:5).EQ.'ATEMP1')
C*     +           RINFDAT(J,2) = INFIL_VAL(K)
C            ...first ICHAR chars is enough
             IF( INFIL_NAME(K)(1:ICHAR) .EQ. CINFDAT(J,IFLD)(1:ICHAR) )
     +         THEN
C              ...this is the name of a modified parameter
               NFLD = IFLD-3
               IF( CINFDAT(J,5)(1:5) .EQ. 'MULTI' .OR.
     +             CINFDAT(J,5)(1:5) .EQ. 'multi') NFLD=IFLD-6
               IF( CINFDAT(J,5)(1:4) .EQ. 'BARE' .OR.
     +             CINFDAT(J,5)(1:4) .EQ. 'bare') NFLD=IFLD-2
               IF( J .EQ.14) NFLD = 3
C              ...modified integer, real data
               RINFDAT(J,NFLD) = INFIL_VAL(K)
C              ...substitution has been made in this field
               NEWREC(J) = .TRUE.
               GO TO 190
```

```
               ENDIF

  100      CONTINUE
  190    CONTINUE
  200 CONTINUE

C**** Write out the new INFIL input control file
      DO 300 I=1,I3+1
         IF(I.LE.I3) THEN
            IF(I .EQ. (28+2*NDAYMAP) .AND. FILEMAIN(:1).NE.' ') THEN
               NEWREC(I) = .TRUE.
               CALL GTVECT(FCDB,FILESUMM)
               WRITE(INPINF,'(A)') FILESUMM
            ELSEIF(I .EQ. (29+2*NDAYMAP) .AND.
     +             FILEMAIN(:1).NE.' ') THEN
               NEWREC(I) = .TRUE.
               CALL GTVECT(FCDB,FILEMAIN)
               WRITE(INPINF,'(A)') FILEMAIN
            ELSEIF(I .EQ. (33+2*NDAYMAP) .AND.
     +             FILEECHO(:1).NE.' ') THEN
               NEWREC(I) = .TRUE.
               CALL GTVECT(FCDB,FILEECHO)
               WRITE(INPINF,'(A)') FILEECHO
            ENDIF
C
            IF(NEWREC(I) .EQ. .TRUE.) THEN
C           ..write out new record
              IF(I.EQ.3)
     +          WRITE(INPINF,1001) (INFDAT(I,IFLD),IFLD=1,2),
     +                             RINFDAT(I,3),
     +                             (CINFDAT(I,IFLD),IFLD=4,6)
              IF(I.EQ.4)
     +          WRITE(INPINF,1002) INFDAT(I,1),
     +                             (RINFDAT(I,IFLD),IFLD=2,3),
     +                             (CINFDAT(I,IFLD),IFLD=4,6)
              IF(I.EQ.10)
     +          WRITE(INPINF,1003) (RINFDAT(I,IFLD),IFLD=1,4),
     +                             (CINFDAT(I,IFLD),IFLD=5,10)
              IF(I.EQ.11)
     +          WRITE(INPINF,1004) RINFDAT(I,1),INFDAT(I,2),
     +                             RINFDAT(I,3),
     +                             (CINFDAT(I,IFLD),IFLD=4,6)
              IF(I.EQ.14)
     +          WRITE(INPINF,1007) (RINFDAT(I,IFLD),IFLD=1,4),
     +                             (CINFDAT(I,IFLD),IFLD=5,8)
              IF(I.EQ.15)
     +          WRITE(INPINF,1005) (RINFDAT(I,IFLD),IFLD=1,3),
     +                             (CINFDAT(I,IFLD),IFLD=4,6)
              IF(I.EQ.17)
     +          WRITE(INPINF,1006) (RINFDAT(I,IFLD),IFLD=1,2),
     +                             (CINFDAT(I,IFLD),IFLD=3,4)
              IF(I.EQ.18)
     +          WRITE(INPINF,1006) (RINFDAT(I,IFLD),IFLD=1,3),
     +                             (CINFDAT(I,IFLD),IFLD=4,10)

            ELSE
C             ...echo the old record from the template
```

```
                CALL ECHOREC(INPTMP, INPINF, I)
             ENDIF
          ELSE
C         ...just echo the rest of the file
             CALL DOECHO(INPTMP, INPINF, I, I2+1)
          ENDIF
 300  CONTINUE

C*         IERR=IERR+1
C*         WRITE (NOUTFL,930)
C*         GO TO 100

C**** Mention errors ****

      IF (IERR .GT. 0) THEN
         WRITE(NOUTFL,*) ' **** ', IERR, ' Errors found in WRIINF ****'
         CALL QAABORT('WRIINF')
      ENDIF

      RETURN

C---------------- F O R M A T   S T A T E M E N T S  -----------------
C
 900  FORMAT( //,1X,79('*'),/,1X,'(WRIINF)',// )
 930  FORMAT(' *** Material=',A,'; Property/Parameter=',A,'; not found',
     +       ' in CDB ***')
 1001 FORMAT(2I4,1X,1PE8.2,31X,3A8)
 1002 FORMAT(I3,1X,2(1PE8.2,1X),26X,3A8)
 1003 FORMAT(4(1PE8.2,1X),12X,6A8)
 1004 FORMAT(1PE8.2,I4,2X,1PE8.2,26X,4A8)
 1005 FORMAT(3(1PE8.2,2X),22X,3(A8,1X))
 1006 FORMAT(2F8.3,32X,2(A8,1X))
 1007 FORMAT(4(1X,F5.2),26X,4A8)
C
C**** END OF SUBROUTINE WRIINF ****
C
      END
C-----------------------------------------------------------------------
```

```
*COMDECK ARRAY
C*********************************************************************
C     Q-array   include file:
C     UPDATED:  10 OCTOBER, 1988   --Jonathan S. Rath
C     Q         Dynamic Allocation array (REAL)
C     IQ        "                        (INTEGER)
C     CQ        "                        (CHAR*4)
C     MAXQ      Total number of storage words allocated
C*********************************************************************
C234567
      INTEGER     MAXC, MAXQ
      REAL        Q(1)
      INTEGER     IQ(1)
      CHARACTER*1 CQ(1)
      LOGICAL LQ(1)
      COMMON /ARRAY/  Q, CQ
      COMMON /MEMORY/ MAXC, MAXQ
      EQUIVALENCE(IQ,Q)
      COMMON /QACOMMON/ PROGRM, PVERSN, PDATE,
     &   RUNDAT, RUNTIM, AUTHOR, SPONSR
      CHARACTER*12 PROGRM
      CHARACTER*8 PVERSN, PDATE
      CHARACTER*8 RUNDAT, RUNTIM
      CHARACTER*80 AUTHOR, SPONSR

      DATA PROGRM / '            ' /
      DATA PVERSN / '        ' /
      DATA PDATE  / '        ' /
      DATA RUNDAT / '        ' /
      DATA RUNTIM / '        ' /
      DATA AUTHOR / ' ' /
      DATA SPONSR / ' ' /

C   --   PROGRM - the program name
C   --   PVERSN - the program version number
C   --   PDATE - the program revision date
C   --   RUNDAT, RUNTIM - the run date and time
C   --   AUTHOR - the program author
C   --   SPONSR - the program sponsor
*COMDECK DYNAME
C*********************************************************************
C       /DYNAME/ ($include 'DYNAME.INC')
C        CNAMES = Names of CHARACTER dynamic arrays (CHARACTER*8)
C        DTYPES = Types of REAL dynamic arrays (CHARACTER*8)
C        RNAMES = Names of REAL data dynamic arrays (CHARACTER*8)
C*********************************************************************
C234567
      CHARACTER*(8) CNAMES(3), DTYPES(4), RNAMES(4)
      COMMON /DYNAME/ CNAMES, DTYPES, RNAMES
C*********************************************************************
```

```
2921
2922  *COMDECK FFRDAT
2923  C*******************************************************************
2924  C     NFORM  = "           digits or characters contained in a word
2925  C     NSIZE  = "           words per record
2926  C     NCOL   = Max. no. of Characters per Record (record length)
2927  C*******************************************************************
2928        INTEGER MFIELD, NFORM, NCOL
2929        PARAMETER( NFORM = 80, MFIELD= 100, NCOL = 80 )
2930  *COMDECK GEOPAR
2931  C********************************************************************
2932  C    /GEOPAR/ ($include 'GEOPAR.INC')
2933  C     HEADER = Character description of problem, etc...
2934  C     IMAX   = No. of I-lines in grid
2935  C     JMAX   = No. of J-lines in grid
2936  C     KMAX   = No. of K-lines in grid
2937  C     LESSEL = List of Element Side sets concatenated Element List
2938  C     LESSNL = List of Element Side sets concatenated Nodes associated
2939  C              with each element side set Node List
2940  C     LNPSNL = List of Nodal Point set concatenated Nodes List
2941  C     MAXNENO= Max. no. of nodes of any element
2942  C     NDIM   = Number of physical DIMensions
2943  C     NDBCAM = CAMDAT versoin number
2944  C     NELBLK = Number of ELement BLocKs in mesh
2945  C     NELX   = No. of elements along X-axis of mesh
2946  C     NELY   = No. of elements along Y-axis of mesh
2947  C     NELZ   = No. of elements along Z-axis of mesh
2948  C     NQAREC = Number of QA records
2949  C     NSTEP  = No. of time steps in input CAMDAT (INTEGER)
2950  C     NUMEL  = NUmber of ELeMents in mesh
2951  C     NUMNOD = NUMber of NODes in mesh
2952  C     NUMNPS = No. of Nodal Point Sets
2953  C     NUMESS = No. of Element Side Sets
2954  C     NUQATR = No. of UniQue ATtRibute names
2955  C     NUQPR0 = No. of UniQUe PRoperty names (old)
2956  C     NUQPRP = No. of UniQUe PRoPerty names (new)
2957  C     NVAREL = No. of ELEMENT type ANALYSIS variables
2958  C     NXINFO = No. of information records
2959  C********************************************************************
2960  C234567
2961        CHARACTER*(80) HEADER
2962        INTEGER
2963       1IMAX,    JMAX,    KMAX,    MAXNENO, LESSEL,  LESSNL,  LNPSNL,
2964       2NDBCAM,  NDIM,    NELBLK,  NELX,    NELY,    NELZ,    NQAREC,
2965       3NSTEP,   NUMEL,   NUMESS,  NUMNOD,  NUMNPS,  NUQATR,  NUQPR0,
2966       4NUQPRP,  NVARHI,  NVARGL,  NVARND,  NVAREL,  NXINFO
2967        COMMON /GEOPAR/
2968       1IMAX,    JMAX,    KMAX,    MAXNENO, LESSEL,  LESSNL,  LNPSNL,
2969       2NDBCAM,  NDIM,    NELBLK,  NELX,    NELY,    NELZ,    NQAREC,
2970       3NSTEP,   NUMEL,   NUMESS,  NUMNOD,  NUMNPS,  NUQATR,  NUQPR0,
2971       4NUQPRP,  NVARHI,  NVARGL,  NVARND,  NVAREL,  NXINFO,  HEADER
2972  C********************************************************************
2973
```

```
*COMDECK INDEX
C*********************************************************************
C    /INDEX/ ($include 'INDEX.INC')
C     LASCIDX= Last index of CHARACTER*1 dynamic arrays (INTEGER)
C     BCDAIDX= First index of current CHAR*1 dynamic array (INTEGER)
C     ECDAIDX= Last  index of current CHAR*1 dynamic array (INTEGER)
C     LASRIDX= Last index of REAL dynamic arrays (INTEGER)
C     BRDAIDX= First index of current REAL dynamic array (INTEGER)
C     ERDAIDX= Last  index of current REAL dynamic array (INTEGER)
C*********************************************************************
C234567
      INTEGER BCDAIDX,BRDAIDX,ECDAIDX,ERDAIDX,LASCIDX,LASRIDX
      COMMON /INDEX/ BCDAIDX,BRDAIDX,ECDAIDX,ERDAIDX,LASCIDX,LASRIDX
C*********************************************************************
```

```
*COMDECK INFIL
C  INFIL.INC
C*****************************************************************
C
C234567
      REAL BARSOIL1, BARSOIL2, ETFACT, IMBFACT, PPTFACT, RKPOR,
     +     RKMMFACT, SKSFACT,  SDFACT, SNOPAR1, SUBPAR1
      CHARACTER*8 REGION, CDB_NAME(MAXVAR), INFIL_NAME(MAXVAR)
      CHARACTER TITLE1*80, TITLE2*40, RUNDATE*8, RUNTIME*8
C*      LOGICAL
C
      COMMON /INFILNAM/ CDB_NAME, INFIL_NAME, REGION
      COMMON /INFILDAT/ BARSOIL1, BARSOIL2, ETFACT, IMBFACT, PPTFACT,
     +                  RKPOR, RKMMFACT, SKSFACT, SDFACT, SNOPAR1,
     +                  SUBPAR1
      DATA INFIL_NAME/'BARSOIL1','BARSOIL2','ETFACT  ','IMBFACT ',
     +              'PPTFACT ','RKPOR   ','RKMMFACT','SKSFACT ',
     +              'SDFACT  ','SNOPAR1 ','SUBPAR1 ',89*'        '/
C*****************************************************************
```

```
*COMDECK IOCOM
      INTEGER
     +ITEMP1,ICDB,ISCREN,NOUTFL,INASCI,INPTMP,INPINF
      COMMON /IOCOM/
     +ITEMP1,ICDB,ISCREN,NOUTFL,INASCI,INPTMP,INPINF
```

```
*COMDECK LENGTH
C*********************************************************************
C    /LENGTH/ ($include 'LENGTH.INC')
C     CLENGT = Length of CHARACTER*1 base type dynamic arrays
C     DLENGT = Length of Data types of dynamic arrays
C     RLENGT = Length of REAL base type dynamic arrays
C*********************************************************************
C234567
      INTEGER CLENGT(3), DLENGT(4), RLENGT(4)
      COMMON /LENGTH/ CLENGT, DLENGT, RLENGT
C*********************************************************************
```

```
*COMDECK LOCAT
C*********************************************************************
C    /LOCATC/ ($include 'LOCAT.INC')
C     LCPTR  = Array used for pointing to each dynamic array start
C              location in the base CHARACTER*1 array, C.
C     L[name]= Pointer to CHAR dynamic array ( L[dynamic-array-name] )
C*********************************************************************
C    /LOCATR/ ($include 'LOCAT.INC')
C     LRPTR  = Array used for pointing to each dynamic array start
C              location in the base REAL array, Q.
C     L[name]= Pointer to REAL dynamic array ( L[dynamic-array-name] )
C*********************************************************************
C234567
      INTEGER
     $LIDEBLK, LNUMPRP,  LIASPRP,  LXMATPR,
     $LRPTR(4)
      EQUIVALENCE (LRPTR,LIDEBLK)
      COMMON /LOCATR/
     $LIDEBLK, LNUMPRP,  LIASPRP,  LXMATPR
      INTEGER
     $LQAINFO,  LNAMELB, LNMATPR, LCPTR(3)
      EQUIVALENCE (LCPTR,LQAINFO)
      COMMON /LOCATC/
     $LQAINFO,  LNAMELB, LNMATPR
C*********************************************************************
```

```
*COMDECK MISCDAT
C*********************************************************************
C    /MISCDAT/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C     LTYEARS = Logical variable,
C             =.TRUE.; Time variables used are to be in YEARS
C              (Convert intrusion times specified in SECONDS
C              to YEARS)
C     LTSECON = Logical variable,
C             = .TRUE.; Time variables used are to be in SECONDS
C               (Convert intrusion times specified in YEARS to
C                SECONDS)
C     GLOBAL
C     DEBUG   = Logical variable,
C             = .TRUE.; Write debug statements to debug file (NOUTFL)
C*********************************************************************
C234567
      INTEGER HIFLAG
      LOGICAL DEBUG, GLOBAL, LTSECON, LTYEARS
      COMMON /MISCDAT/ HIFLAG, DEBUG, GLOBAL, LTSECON, LTYEARS
C*********************************************************************
```

```
*COMDECK NEWPAR
      INTEGER NUMVAR
      CHARACTER*(8) NAMVAR(MAXVAR)
      CHARACTER*(20) FILEMAIN, FILEECHO, FILESUMM
      COMMON /NEWPAR/ NUMVAR, NAMVAR, FILEMAIN, FILEECHO, FILESUMM
```

```
*COMDECK PARACM
C*****************************************************************
C     MAXVAR = Max. no. of NEW PREINFIL sampled or modified fixed variables
C     MAXREC = Max. no. of records in template control file
C     MAXDAT = Max. no. of (unmodified) data items in INFIL UTF template
C*****************************************************************
      INTEGER MAXDAT, MAXREC, MAXVAR
      PARAMETER( MAXDAT = 1000, MAXREC=1000, MAXVAR = 100 )
      EQUIVALENCE(LQ,Q)
```

ATTACHMENT V

Documentation of POSTINFIL (to satisfy AP-SI.1Q)

This attachment and attachment IV contains documentation necessary to satisfy procedure AP-SI.1Q, Section 5.1.1.2 verification of routines used. POSTINFIL can be considered to be a routine since it can be verified by visual inspection and hand calculations. Its purpose is to create automatically and readily input user control files for the computer model INFIL as used in these analyses. Attachment VI contains a listing of the source code for POSTINFIL.

POSTINFIL Version A2.50 Software Routine Verification

TRANSFERS INFILTRATION RATE MAP AND NUMBER OF ACTIVE CELLS IN MAP OR SUMMARY INFILTRATION RATE OF APPROPRIATE POSTINFIL OUTPUT FILES TO COMPUTATIONAL DATABASE (CDB) FILES ACCORDING TO DIRECTIVES SPECIFIED IN A USER INPUT CONTROL FILE. (AUTHOR: RON MCCURLEY, SNL-PAO)

Documentation to satisfy first and second bullet of Section 5.1.1.2:

A software routine (consisting of several modules) was developed in accordance with AP-SI.1Q for the purpose of automatically and readily transferring infiltration rate map data and the number of active cells in that map, or summary infiltration rate from appropriate output files of INFIL V A_2.a1 to which also incorporate 1) selected parameter sampled values (using Latin Hypercube Sampling) and 2) designated filenames which are read from this file and output by POSTINFIL. The software developed, POSTINFIL, version A2.50, is in FORTRAN 77. The source code and executable reside in the following directory location on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.SOURCE_CODE].

A listing of the source code is included in Attachment VI.

This satisfies the requirements of Section 5.1.1.2, first and second bullets of AP-SI.1Q for routines.

Documentation to satisfy third bullet of Section 5.1.1.2:

The correct and accurate transfer of spatially averaged infiltration rates and corresponding values of active grid cells into each output CDB file produced by POSTINFIL is verified by executing POSTINFIL using the input user control file and input CDB file (from postlhs) and observing that 1) the POSTINFIL code terminates normally, 2) the correct values of spatially averaged infiltration rates and corresponding values of active grid cells are placed into the output CDB files. POSTINFIL requires the following input; 1) a (binary) 'computational' database file (CDB), 2) a user control file which contains instructions for POSTINFIL. The output from POSTINFIL consists of new CDB files, satisfying requirement 2) above, and an optional debug file. A sample of the input user control file is included Table VII-10. To examine the output CDB files, there is a software tool called GROPECDB. GROPECDB is used only for display of data contained in a binary file (the CDB file) and is exempt from AP-SI.1Q. An ascii output printout of the CDB file (corresponding to realization 1) using GROPECDB is shown in Table V-1. This file shows the spatially averaged infiltration rate (6.48678E+01**)** for the active grid cells. To verify that the calculated spatial average as calculated by POSTINFIL is correct, a comparison is made between this value as found in the CDB and as calculated by a hand

calculator using the grid cells within the specific rectangular region as modeled in this AMR for realization '001' of the 'se10' watershed for the glacial transition climate. The output file from INFIL displaying infiltration rates per cell is shown in Table V-2. The value in the CDB file as seen in the GROPECDB listing is 6.48678E+01. The value calculated with a hand calculator for the 8 active cells (in bold in Table V-2) with the rectangular region is 6.48678E+01. Since this is an arbitrary selection, it is a reasonable verification of this capability of the code POSTINFIL.

Table V-1 GROPECDB Display of Output Infiltration Rates from INFIL

```
GROPECDB_PA96

 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR   RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR   RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB          PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                          GROPECDB_PA96 Version 2.12
                           PROD PA96 Built 06/27/96
                           Sponsored by Amy Gilkey

                         Run on 01/25/00 at 15:18:45
                      Run on ALPHA AXP BEATLE OpenVMS V7.1

Database:  I1:[000000.RDMCCUR.YMP99.INFILTRATION.POSTINFIL.GLACIAL]POSTINF_WW1_R001.CDB;3
Written on:  11/29/99 12:45:44

CAMDAT Version:   1        (EXODUS Version:   1)

GLOBAL TIME STEP VARIABLES

   Step       Time       NCELLSE1      INF_SE1       RUN_SE1       NCELLSE2
                         INF_SE2       RUN_SE2       NCELLSE3      INF_SE3
                         RUN_SE3       NCELLSE4      INF_SE4       RUN_SE4
                         NCELLSE5      INF_SE5       RUN_SE5       NCELLSE6
                         INF_SE6       RUN_SE6       NCELLSE7      INF_SE7
                         RUN_SE7       NCELLSE8      INF_SE8       RUN_SE8
                         NCELLSE9      INF_SE9       RUN_SE9       NCELSE10
                         INF_SE10      RUN_SE10      NCELLWT2      INF_WT2
                         RUN_WT2       NCELLDH4      INF_DH4       RUN_DH4
                         NCELLDH3      INF_DH3       RUN_DH3       NCELLCW1
                         INF_CW1       RUN_CW1       NCELLSW1      INF_SW1
                         RUN_SW1       NCELLWW1      INF_WW1       RUN_WW1
      1   0.00000E+00   6.10000E+01   1.00936E+02   0.00000E+00   5.00000E+00
                        8.30917E+01   0.00000E+00   4.70000E+01   1.23239E+02
                        0.00000E+00   8.20000E+01   1.18034E+02   0.00000E+00
                        4.10000E+01   1.00655E+02   0.00000E+00   1.14000E+02
                        1.08497E+02   0.00000E+00   6.70000E+01   9.07320E+01
                        0.00000E+00   7.00000E+01   9.58903E+01   0.00000E+00
                        8.50000E+01   1.01568E+02   0.00000E+00   8.00000E+00
                        6.48678E+01   0.00000E+00   1.58300E+03   5.93866E+01
                        0.00000E+00   6.10000E+02   6.01417E+01   0.00000E+00
                        1.18800E+03   6.04595E+01   0.00000E+00   4.17000E+02
                        6.94956E+01   0.00000E+00   7.18000E+02   6.40361E+01
                        0.00000E+00   8.75000E+02   6.31565E+01   0.00000E+00
```

Table V-2. Output From INFIL Showing Selected Variable Values Including Net Annual Infiltration Rates By Grid Cell

easting	northing	POSTcip	rain	snow-fall	snow-cover	snow-melt	sublimation	evapotrans	run-infil	del-soil	net-infil	runoff	run-on	mass-balance	max-balance	mass-balance #2
547451.0	4078833.0	335.23593	262.58986	72.64607	876.91791	66.00954	5.77788	234.51203	0.00000	4.55407	89.53330	0.00000	0.000000	-0.1548983E-11	-0.4940492E-13	0.4405365E-12
547451.0	4078803.0	335.12734	262.50480	72.62254	871.25021	65.79229	5.97386	230.29920	0.00000	4.54790	93.44999	0.00000	0.000000	-0.1804779E-11	-0.5329071E-13	0.5258016E-12
547421.0	4078803.0	333.82920	266.29874	67.53045	775.77963	61.07342	5.61248	251.36128	0.00000	4.58303	71.42785	0.00000	0.000000	0.7105427E-13	-0.3794187E-13	-0.1278977E-12
547421.0	4078773.0	333.82920	266.29874	67.53045	775.77983	61.07352	5.61239	251.36039	0.00000	4.58304	71.42883	0.00000	0.000000	-0.1065814E-12	-0.3802514E-13	-0.1278977E-12
547391.0	4078773.0	332.96932	265.75405	67.21528	755.41416	60.79408	5.58459	263.85231	0.00000	4.48366	58.21216	0.00000	0.000000	-0.4760636E-12	-0.3907985E-13	-0.1705303E-12
547391.0	4078743.0	332.86218	265.66853	67.19365	751.28995	60.64830	5.71066	264.88062	0.00000	4.46021	56.97600	0.00000	0.000000	-0.3481659E-12	0.4429790E-13	0.1421085E-13
547361.0	4078743.0	332.22062	265.15648	67.06414	736.45340	60.54575	5.68987	280.11907	0.00000	4.40810	39.01341	2.16165	0.000000	-0.8242296E-12	-0.8215650E-13	-0.1989520E-12
547361.0	4078713.0	331.90076	264.90119	66.99957	729.26860	60.50165	5.67245	279.98899	0.00000	4.40464	38.90102	2.10819	0.000000	-0.3907985E-12	-0.8959500E-13	-0.2984279E-12
547331.0	4078713.0	331.15679	264.30740	66.84939	713.88551	60.42643	5.60450	275.89926	2.16165	4.09794	46.89828	0.00000	0.000000	-0.1527667E-11	-0.4268808E-13	-0.2415845E-12
547331.0	4078683.0	331.15679	264.30740	66.84939	715.24030	60.55110	5.47904	274.44367	2.10819	4.12288	48.40013	0.00000	0.000000	-0.1080025E-11	-0.4629630E-13	-0.2415845E-12
547301.0	4078683.0	330.31077	268.65535	61.65541	638.35519	55.66799	5.17615	322.48432	0.00000	1.83902	0.00000	0.00000	0.000000	-0.1421085E-12	0.1003642E-12	0.1563194E-12
547271.0	4078653.0	329.67907	268.14157	61.53750	626.62878	55.69172	5.03982	322.18628	0.00000	1.64701	0.00000	0.00000	0.000000	0.2202682E-12	-0.1136868E-12	-0.1918465E-12
547241.0	4078623.0	329.04983	267.62978	61.42005	613.88945	55.55046	5.06984	324.01997	0.00000	-0.83973	0.00000	0.00000	0.000000	0.2273737E-12	-0.9392487E-13	0.3055334E-12
547211.0	4078593.0	328.52727	270.80057	57.72670	590.61387	51.92048	5.01148	328.00809	0.00000	-5.28704	0.00000	0.00000	0.000000	-0.1563194E-12	-0.1509903E-12	-0.6394885E-13
547181.0	4078563.0	327.90248	270.28557	57.61691	577.94201	51.88177	4.94619	327.48242	0.00000	-5.31508	0.00000	0.00000	0.000000	-0.6039613E-12	0.1483258E-12	-0.2344791E-12
547151.0	4078533.0	327.59099	270.02881	57.56218	571.60049	51.86920	4.90702	320.95966	0.00000	0.93835	0.00000	0.00000	0.000000	-0.5968559E-12	-0.1139089E-12	-0.1776357E-12
547121.0	4078503.0	327.17655	269.68719	57.48936	562.83232	51.78948	4.91821	320.59254	0.00000	0.88413	0.00000	0.00000	0.000000	-0.2771117E-12	-0.9503509E-13	-0.3694822E-12

ATTACHMENT VI

POSTINFIL SOURCE CODE

This attachment contains a listing of the software routine POSTINFIL developed at Sandia National Laboratories which serves as a postprocessor to transfer output from INFIL V. A_2.a1 to a CDB file. Verification of the use of this routine is found in Attachment V.

Post-processor POSTINFIL V. 2.50 for the INFIL V. A_2.a1 code. See flowchart entitled FLWCHR.INC located near the end of this file.

```
*DECK A1MAIN
      PROGRAM POSTINFIL
C***********************************************************************
C
C                                POSTINFIL
C                                ----
C
C                      A  post-processor for INFIL
C
C                            August 1999
C
C                              Author
C                              ------
C
C                        Ron D McCurley
C                      Information Systems Division
C                NEW MEXICO ENGINEERING RESEARCH INSTITUTE
C                       University of New Mexico
C                        851 University Blvd SE
C                              Suite 101
C                      Albuquerque, NM  87106-4342
C                            (505) 272-7227
C
C                              Abstract
C                              --------
C
C  POSTINFIL reads the output from INFIL
C  It also reads the input CDB file
C  (CAMDAT Data Base),
C  assembles the infitrations according to spatial discertization and
C  select times. It finally writes time dependent infiltration maps
C  to an output CDB file
C
C                              Limitations
C                              -----------
C
C
C
C                         Primary Reference
C                         -----------------
C
C                        Secondary References
C                        --------------------
C
C                            Update History
C                            --------------
C
C  VERSION    DATE          MODIFIER        CHANGES
C  A1.00      22-JAN-1999   R.D.McCurley    -Created for 99 TSPA
```

```
C  A1.10      12-AUG-1999   R.D.McCurley    -Modified for new version of
C                                           INFIL(2A)
C  A2.00      19-AUG-1999   R.D.McCurley    -Modified for adding processing
C                                           of INFIL summary output
C  A2.10      01-SEPT-1999  R.D.McCurley    -Modified for adding processing
C                                           of INFIL summary output
C                                           variable "RUNOFF"
C  A2.20      22-SEPT-1999  R.D.McCurley    -Modified for adding processing
C                                           of INFIL summary output
C                                           variable "NUMCELL"
C  A2.50      05-OCT-1999   R.D.McCurley    -Modified for adding processing
C                                           of POSTINFIL input file
C
C
C                             Disclaimer
C                             ----------
C
C     This computer program was prepared as an account of work
C  sponsored by an agency of the United States Government. Neither
C  the United States Government nor any agency thereof, nor any of
C  their employees, nor any of their contractors, subcontractors,
C  or their employees, makes any warranty, express or implied, or
C  assumes any legal liability or responsibility for the accuracy,
C  completeness, or usefulness of any information, apparatus,
C  product, or process disclosed, or represents that its use would
C  not infringe privately owned rights. Reference herein to any
C  specific commercial product, process, or service by trade name,
C  trademark, manufacturer, or otherwise, does not necessarily
C  constitute or imply its endorsement, recommendation, or
C  favoring by the United States Government, any agency thereof
C  or any of their contractors or subcontractors. The views and
C  opinions expressed herein do not necessarily state or reflect
C  those of the United States Government, any agency thereof or
C  any of their contractors or subcontractors.
C
C
C                            Program flowchart
C                            -----------------
C
      INCLUDE 'FLWCHR.INC'
C
C
C                       Assumptions and Limitations
C                       ---------------------------
C
C    Language used is ANSI X3.9-1978 FORTRAN 77 except that
C    comments and Hollerith strings use lowercase characters.
C    INTEGER and REAL variable names are explicitly typed.
C    Machine dependent coding exists in subroutines: QAPAGE
C
C                             Statistics
C                             ----------
C
C     Version:      A1.20               language:        FORTRAN 77
C     Computer:     ALPHA AXP           Total Lines:
C     Date:         08/12/99            Code Lines:
C                                       Percent Comment:
```

```
C
C
C                         Types of data sets
C                         ------------------
C
C  INPUT/
C    BINARY: in units 'IDB'
C    ASCII:  in units 'INPUTF','ISCRAT'
C
C  OUTPUT/
C    BINARY: in units 'ODB'
C    ASCII:  in units 'NOUTFL'
C
C                            Files used
C                            ----------
C
C  filename       unit  description
C  <PREPOSTINFIL.CDB>  30    Input Computational Data Base (REQUIRED)
C  <POSTINFIL.INP>      1    Input text file (REQUIRED)
C  <INFILPT.OUT>        9    Input INFIL pointwise infiltrations (OPTIONAL)
C  <INFILSUM.OUT>      10    Input INFIL summary infiltrations (REQUIRED)
C  <POSTINFIL.CDB>     31    Output Computational Data Base (REQUIRED)
C  <POSTINFIL.DBG>      6    Output diagnostics/debug file (OPTIONAL)
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'LOCAT.INC'
      INCLUDE 'GEOPAR.INC'
      INCLUDE 'PARAMS.INC'
      INCLUDE 'MISCDAT.INC'
      INCLUDE 'FILEUN.INC'
      INCLUDE 'QA.INC'
      INCLUDE 'TOOLS.INC'
      INCLUDE 'POSTINFIL.INC'

      INTEGER  IERR, MAXC, MAXQ, MORMEMC, MORMEMR
      INTEGER IQ(1)
      REAL CPUSEC
      REAL Q(1)
      REAL INFIL_AVE, RUNOFF_AVE
      REAL PRECIP(MAXSOLN),ET(MAXSOLN),RUNONINF(MAXSOLN),
     $     NET_INF(MAXSOLN),RUNOFF(MAXSOLN),RUNON(MAXSOLN),
     $     MEANH2OERR(MAXSOLN),MAXH2OERR(MAXSOLN),INFPT(MAXSOLN)
      REAL TIME( MAXTIMES )
      CHARACTER*(1) C(1)
      CHARACTER*(8) BLKNAM, NAMGLV2(3)
      CHARACTER*(8) TUNITS
      CHARACTER*(132) FIDB, FODB, FTRN, FTRN2, FTXT

      LOGICAL LQ(1)
      EQUIVALENCE( IQ, Q )
      EQUIVALENCE( LQ, Q )
      EXTERNAL BLOCK
C
C<><><><><><><><><><><>
C...BEGIN PROCEDURES...
```

```
C<><><><><><><><><><><>
C
C     ...Set-up constants
      MAXEAST = 548690.0
      MAXNORTH = 4081200.0
      MINEAST = 547350.0
      MINNORTH = 4076700.0
      CALL SUCONS

C     ...Prompt user for PROGRAM control options
      CALL PREPRO( FIDB, FTXT, FTRN, FTRN2, FODB )

C     ...Initialize DYNAMIC base arrays
      CALL MDINIT( Q )
      CALL MCINIT( C )

C     ...Set-up the DYNAMIC base arrays
      IERR = 0
      CALL DBSETUP( Q, C, IERR )
      IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - Setting up DYNAMIC base'//
     $                          ' arrays %%%')

C     ...Set debugging/diagnostics file unit
      CALL DBERRUNI( NOUTFL )

C     ...Process input CAMDAT
      CALL DBIOPEN( IDB, FIDB, Q, C, IERR )
      IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - Opening input CAMDAT %%%')
      CALL PROCDB( MAXC, MAXQ, IQ, LQ, Q, C )
C
C     ...Process POSTINFIL input user control file
      CALL FILOPEN( ICNTRLFIL, 'INP', 'FORM', FTXT, IERR )
      IF(IERR.NE.0) CALL QAABORT('(A1MAIN) - opening POSTINFIL'//
     $                           ' input text file %%%')
      CALL PROCIN(NAMGLV2)

      IF (FTRN(1:6) .NE. 'CANCEL' .AND. FTRN(1:1) .NE. ' ') THEN
         SUBSHED = .TRUE.
         CALL FILOPEN( INFLOUT1, 'INP', 'FORM', FTRN, IERR )
         IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - opening INFIL'//
     $                             ' pointwise output text file %%%')
C  UTMEAST      = utm easting [m]
C  UTMNORTH     = utm northing [m]
C  PRECIP       = average annual precip [mm/yr]
C  ET           = average annual evapotranspiration [mm/yr]
C  RUNONINF     = average annual infiltration from runon [mm/yr]
C  ROOTZONE_H2O = average annual change in root-zone water content [mm/yr]
C  NET_INF      = average annual net infiltration rate [mm/yr]
C  RUNOFF       = average annual runoff generation [mm/yr]
C  RUNON        = average annual surface water runon [mm/yr]
C  MEANH2OERR   = average annual water balance calculation error [mm/yr]
C  MAXH2OERR    = maximum daily water balance calculation error  [mm/day]
         CALL PRCOUT( PRECIP,ET,RUNONINF,NET_INF,RUNOFF,RUNON,MEANH2OERR,
     $               MAXH2OERR )

         CLOSE(INFLOUT1)
      ENDIF
```

```
C
      IF (FTRN2(1:6) .NE. 'CANCEL' .AND. FTRN2(1:1) .NE. ' ') THEN
        CALL FILOPEN( INFLOUT2, 'INP', 'FORM', FTRN2, IERR )
        IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - opening INFIL'//
     $                            ' summary output text file %%%')

         CALL PRCOUT2(INFLOUT2,NUMCELL,INFIL_AVE,RUNOFF_AVE)
         CLOSE(INFLOUT2)
      ENDIF
C     ...Open scratch file and output CAMDAT
      CALL DBOOPEN( ODB, IDB, IDBSCR, FODB, IERR )
      IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - Opening output'//
     $                          ' CAMDAT and SCRATCH files %%%')

C     ...Assemble QA record for program POSTINFIL
      CALL QAMAKREC( NQAREC, C(LQAINFO) )
C
      CALL ADDMEM1(  MORMEMR, MORMEMC )
      CALL DYNMEM(  MORMEMR, MAXQ, Q )
      CALL ZERODA( IQ, LQ )
      CALL DYNMEMC( MORMEMC, MAXC, C )

C     ...Write POSTINFIL output CAMDAT file header section
      CALL WRCHEA( Q, C, C(LQAINFO), C(LNAMELB), C(LSAVNAM) )
C
      TIME(1) = 0.0
C     ...Write output infiltration maps to output CDB
      CALL WRTANA (Q,       C,       TIME,    C(LNAMELB),  NAMGLV2,
     $             INFIL_AVE, INFPT, NET_INF, RUNOFF_AVE )
C
C**** Perform ending procedures ****
C
      WRITE(NOUTFL,900)
      CALL DBPTITLE(ODB,NOUTFL,HEADER)
      CALL DBPVERS(ODB,NOUTFL)
      CALL DBPQAREC(ODB,NOUTFL,NQAREC,C(LQAINFO))
      CALL DBPSIZES(ODB,NOUTFL)
      CALL DBICLOSE(IDB,IERR)
      IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - Closing input CAMDAT %%%')
      CALL DBOCLOSE(ODB,IERR)
      IF(IERR.NE.0)CALL QAABORT('(A1MAIN) - Trouble closing output'//
     $' cdb-scratch & CAMDAT files, etc... %%%')
      CALL QACPUS(NOUTFL,CPUSEC)
      CALL QAPAGE(NOUTFL,'END')
      CLOSE(ISCRAT)
      CLOSE(NOUTFL)

      STOP 'POSTINFIL Normal Completion'
C
C---------------  F O R M A T    S T A T E M E N T S  -----------------
C
 900  FORMAT(/,1X,72('*'),/,1X,'(A1MAIN)',//)
C
C-----------------------------------------------------------------------
C**** END OF PROGRAM POSTINFIL {A1MAIN} ****
C-----------------------------------------------------------------------
C
```

```
      END
*DECK ADDMEM
      SUBROUTINE ADDMEM( MORMEMR, MORMEMC )
C*********************************************************************
C***                                                               ****
C***        computes  A_D_D_itional  M_E_M_ory  needed  module     ****
C***                  - - -          - - -                          ****
C*********************************************************************
C
C  PURPOSE:      Sets dynamic array lengths, and computes the
C                amount of memory needed for the REAL base
C                Q array and CHARACTER*1 base C array.
C
C  AUTHOR:       Jonathan Scott Rath, Esq. [NMERI]
C
C  UPDATED:      17-AUG-1995  --JSR: Deleted TDEC array
C                26-AUG-1994  --JSR: Adapted for new GENERIC.RDB
C                14-JUN-1994  --JSR: First Ed. for POSTINFIL.
C
C  CALLED BY:    PROCDB
C                PROGEN
C                POSTINFIL {main program}
C
C  ENTRY POINTS: ADDMEM1
C                ADDMEM2
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C     /FILEUN/ ($include 'FILEUN.INC')
C      NOUTFL = File unit of diagnostics/debug output file
C
C     /DYNAME/ ($include 'DYNAME.INC')
C      CNAMES = Names of the CHARACTER*1 type dynamic arrays
C      DTYPES = Data types of the CNAMES arrays
C      RNAMES = Names of the REAL type dynamic arrays
C
C     /GEOPAR/ ($include 'GEOPAR.INC')
C      NELBLK = Number of ELement BLocKs in mesh (materials)
C      NQAREC = Number of QA records
C      NUQPRP = No. of UniQUe PRoperty names
C
C     /MISCDAT/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C      NSOLNS  = No. of times [INTEGER]
C      NUMCELL    = No. of cells used by POSTINFIL [INTEGER]
C      NORIAC  = No. Of Radioisotopes In All Chains [INTEGER]
C
C     /TOOLS/ ($include 'TOOLS.INC')
C      DEBUG  = Logical for writing debugging information to .dbg file
C      WRTHIS = Logical for writing Radioisotope Inventory
C               History table file.
C
C  LOCAL/
C      IERR   = INTEGER error flag
C
C  EXIT/
C    --common block
```

```
C     /LENGTH/ ($include 'LENGTH.INC')
C      CLENGT = CHARACTER*1 type dynamic array lengths array
C      RLENGT = REAL type dynamic array LENGTHS array
C
C     /INDEX/ ($include 'INDEX.INC')
C      LASCIDX = Last CHARACTER dynamic array index
C      BCDAIDX = Beginning index of CHARACTER dyanamic arrays
C      ECDAIDX = Ending "                              "
C      LASRIDX = Last REAL dynamic array index
C      BRDAIDX = Beginning index of REAL dyanamic arrays
C      ERDAIDX = Ending "                              "
C
C    --through subroutine call
C      MORMEMR= No. of REAL words of memory needed
C      MORMEMC= No. of CHARACTER*1 words of memory needed
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'GEOPAR.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'MISCDAT.INC'
C*      INCLUDE 'POSTINFIL.INC'
      INCLUDE 'TOOLS.INC'
      INTEGER I, IERR, MORMEMC, MORMEMR
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
C*********************************************************************
C
C     PSEUDO ENTRY ADDMEM( MORMEMR, MORMEMC )
C
C*********************************************************************
C
C     THIS SECTION COMPUTES MEMORY REQUIRED FOR THE ARRAYS ASSOCIATED
C     WITH THE INPUT CAMDAT.
C
C     (CALLED BY PROCDB)
C
      IERR       = 0
      MORMEMC    = 0
      MORMEMR    = 0
C     ...Set beginning and ending dynamic array indices
      BRDAIDX    = 1
      ERDAIDX    = 4
      BCDAIDX    = 1
      ECDAIDX    = 3
C     ...Set dynamic REAL array lengths
C     ...(1:4) IDEBLK, NUMPRP, IASPRP, XMATPR
      RLENGT(1)  = NELBLK
      RLENGT(2)  = RLENGT(1)
      RLENGT(3)  = NELBLK*NUQPRP
```

```
      RLENGT(4)  = RLENGT(3)
C     ...Set dynamic CHARACTER*1 array lengths
C     ...(1:3) QAINFO, NAMELB, NMATPR
      CLENGT(1) = (NQAREC+2)*32
      CLENGT(2) = NELBLK*8
      CLENGT(3) = NUQPRP*8
C     ...Compute MORMEMR and check for ZERO length (must be at least=1)
      DO 10 I = BRDAIDX, ERDAIDX, 1
         IF(RLENGT(I).EQ.0)THEN
            RLENGT(I) = 1
         ELSEIF(RLENGT(I).LT.0)THEN
            IERR = IERR + 1
            WRITE(NOUTFL,'(A,I3,A)')' ***RLENGT(',I,') < 0***'
            WRITE(NOUTFL,'(A,I3,2A)')' RNAMES(',I,')=',RNAMES(I)
         ENDIF
         MORMEMR = MORMEMR + RLENGT(I)
   10 CONTINUE
      IF(DEBUG)WRITE(NOUTFL,'(A)')' $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$'//
     $'$$ ADDMEM $$$$$$$$$$$$$$$$$$$$$$$$$$$$'
      IF(IERR.GT.0)THEN
         CALL QAABORT(
     $   '(ADDMEM) - REAL array size errors detected ***')
      ELSEIF(MORMEMR.LT.0)THEN
         WRITE(NOUTFL,*)' **** MORMEMR < 0 in ADDMEM ****'
         DO 15 I=BRDAIDX,ERDAIDX
            WRITE(NOUTFL,'(1X,2A,I2,A,I9)')
     $      RNAMES(I),' RLENGT(',I,')=',RLENGT(I)
   15    CONTINUE
         CALL QAABORT(
     $   '(ADDMEM) - REAL array memory errors detected ***')
      ENDIF
C
C     ...Compute MORMEMC and check for ZERO length (must be at least=1)
      DO 20 I = BCDAIDX, ECDAIDX, 1
         IF(CLENGT(I).EQ.0)THEN
            CLENGT(I) = 1
         ELSEIF(CLENGT(I).LT.0)THEN
            IERR = IERR + 1
            WRITE(NOUTFL,'(A,I3,A)')' ***CLENGT(',I,') < 0***'
            WRITE(NOUTFL,'(A,I3,2A)')' CNAMES(',I,')=',CNAMES(I)
         ENDIF
         MORMEMC = MORMEMC + CLENGT(I)
   20 CONTINUE
      IF(IERR.GT.0)THEN
         CALL QAABORT(
     $   '(ADDMEM) - CHARACTER array size errors detected ***')
      ELSEIF(MORMEMC.LT.0)THEN
         WRITE(NOUTFL,*)' **** MORMEMC < 0 in ADDMEM ****'
         DO 25 I=BCDAIDX,ECDAIDX
            WRITE(NOUTFL,'(1X,2A,I2,A,I9)')
     $      CNAMES(I),' CLENGT(',I,')=',CLENGT(I)
   25    CONTINUE
         CALL QAABORT(
     $   '(ADDMEM) - CHARACTER array memory errors detected ***')
      ENDIF
      RETURN
C
```

```
C*********************************************************************
C
      ENTRY ADDMEM1( MORMEMR, MORMEMC )
C
C*********************************************************************
C
C     THIS SECTION COMPUTES THE MEMORY REQUIRED FOR
C     POSTINFIL including net infitration, AND OTHER RELATED DYNAMIC ARRAYS:
C
C     (CALLED BY PROCIN)
C
      IERR       = 0
      MORMEMC    = 0
      MORMEMR    = 0
C     ...Set beginning and ending dynamic array indices
      BRDAIDX    = 5
      ERDAIDX    = 6
      BCDAIDX    = 4
      ECDAIDX    = 5
C     ...Set dynamic REAL array lengths
C     ...()  AVE_INFIL, NUMCELLS, RUNOFF previously stored and newly stored
      RLENGT(5) = NVARGL*24
      RLENGT(6) = NVARGL2*4
C     ...Set dynamic CHARACTER*1 array lengths
      CLENGT(4) = 8*NVARGL*8
      CLENGT(5) = 8*NVARGL2
C*      CLENGT(6) = 8*NVARGL2
C     ...Check for ZERO length (must be at least=1)
      DO 200 I = BRDAIDX, ERDAIDX, 1
         IF(RLENGT(I).EQ.0)THEN
            RLENGT(I) = 1
         ELSEIF(RLENGT(I).LT.0)THEN
            IERR = IERR + 1
            WRITE(NOUTFL,'(A,I3,A)')' ***RLENGT(',I,') < 0***'
            WRITE(NOUTFL,'(A,I3,2A)')' RNAMES(',I,')=',RNAMES(I)
         ENDIF
         MORMEMR = MORMEMR + RLENGT(I)
 200  CONTINUE
      IF(DEBUG)WRITE(NOUTFL,'(A)')' $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$'//
     $'$$ ADDMEM2 $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$'
      IF(IERR.GT.0)THEN
         CALL QAABORT('(ADDMEM2) - REAL array size errors detected ***')
      ELSEIF(MORMEMR.LT.0)THEN
         WRITE(NOUTFL,*)' **** MORMEMR < 0 in ADDMEM2 ****'
         DO 210 I=BRDAIDX,ERDAIDX
            WRITE(NOUTFL,'(1X,2A,I2,A,I9)')
     $      RNAMES(I),' RLENGT(',I,')=',RLENGT(I)
 210     CONTINUE
         CALL QAABORT('(ADDMEM2) - REAL memory errors detected ***')
      ENDIF

C     ...Check for ZERO length (must be at least=1)
      DO 220 I = BCDAIDX, ECDAIDX, 1
         IF(CLENGT(I).EQ.0)THEN
            CLENGT(I) = 1
         ELSEIF(CLENGT(I).LT.0)THEN
            IERR = IERR + 1
```

```
506               WRITE(NOUTFL,'(A,I3,A)')' ***CLENGT(',I,') < 0***'
507               WRITE(NOUTFL,'(A,I3,2A)')' CNAMES(',I,')=',CNAMES(I)
508            ENDIF
509            MORMEMC = MORMEMC + CLENGT(I)
510    220  CONTINUE
511         IF(IERR.GT.0)THEN
512            CALL QAABORT(
513        $   '(ADDMEM2) - CHARACTER array size errors detected ***')
514         ELSEIF(MORMEMC.LT.0)THEN
515            WRITE(NOUTFL,*)' **** MORMEMC < 0 in ADDMEM2 ****'
516            DO 230 I=BCDAIDX,ECDAIDX
517               WRITE(NOUTFL,'(1X,2A,I2,A,I9)')
518        $      CNAMES(I),' CLENGT(',I,')=',CLENGT(I)
519    230     CONTINUE
520            CALL QAABORT(
521        $   '(ADDMEM2) - CHARACTER array memory errors detected ***')
522         ENDIF
523
524         RETURN
525   C-----------------------------------------------------------------------
526   C**** END OF SUBROUTINE ADDMEM ****
527   C-----------------------------------------------------------------------
528         END
529   *DECK BLOCK
530         BLOCK DATA BLOCK
531   C***********************************************************************
532   C
533   C     PURPOSE:    Initializes variables that are in COMMON BLOCKS
534   C
535   C     AUTHOR:     Ron McCurley, [NMERI]
536   C
537   C     UPDATED:    17-JAN-1999
538   C                 19-AUG-1999 RDM: modified for adding INFIL summary file
539   C
540   C     ARGUMENTS:
541   C     ENTRY/
542   C       none
543   C
544   C     LOCAL/
545   C       none
546   C
547   C     EXIT/
548   C      --through common blocks:
549   C       /CONSTA/ (from FORTRAN statement: INCLUDE 'CONSTA.INC')
550   C        AVOGAD = Avogadro's number [DOUBLE PRECISION]
551   C        ACCNST = Activity Conversion CoNStanT [DOUBLE PRECISION]
552   C                 A radioisotope's activity conversion is equal
553   C                 to ACCNST/(half_life*Atomic_weight)
554   C        PI     = Circumference/Radius [DOUBLE PRECISION]
555   C
556   C       /DYNAME/ (from FORTRAN statement: INCLUDE 'DYNAME.INC')
557   C        CNAMES = Names of CHARACTER dynamic arrays (CHARACTER*8)
558   C        DTYPES = Types of REAL dynamic arrays (CHARACTER*8)
559   C        RNAMES = Names of REAL data dynamic arrays (CHARACTER*8)
560   C
561   C       /FILEUN/ (from FORTRAN statement: INCLUDE 'FILEUN.INC')
562   C        IDB    = Device no. of input CAMDAT file
```

```
C        IDBSCR = Device no. of CAMDAT scratch file
C        OUTPUTF = Device no. of input text file
C        ISCRAT = Device no. of SCRATCH file
C        NOUTFL = Device no. of output diagnostics/debug file
C        ODB    = Device no. of output CAMDAT file
C
C       /INDEX/ (from FORTRAN statement: INCLUDE 'INDEX.INC')
C        LASCIDX= Last index of CHARACTER*1 dynamic arrays [INTEGER]
C        LASRIDX= Last index of REAL dynamic arrays [INTEGER]
C
C       /MACHDP/ (from FORTRAN statement: INCLUDE 'MACHDP.INC')
C        XLIMDP = Machine limit for zero (REAL*8)
C        XMINDP = Machine limit lower exponent value (REAL*8)
C        XMAXDP = Machine limit upper exponent value (REAL*8)
C        VALMAXD= Largest DOUBLE PRECISION real value allowed (REAL*8)
C
C       /MACHINE/ (from FORTRAN statement: INCLUDE 'MACHINE.INC')
C        XLIM   = Machine limit for zero (REAL)
C        XMIN   = Machine limit lower exponent value (REAL)
C        XMAX   = Machine limit upper exponent value (REAL)
C        VALMAX = Largest SINGLE PRECISION real value allowed (REAL)
C
C       /MISCDAT/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C        NSOLNS  = No. of solution times [INTEGER]
C
C       /QA/     (from FORTRAN statement: INCLUDE 'QA.INC')
C        PRGNAM = Program name    (CHARACTER*8)
C        PRGVER = "       version (CHARACTER*8)
C        PRGUPD = "       update  (CHARACTER*8)
C        PRGATH = "       author  (CHARACTER*80)
C        PRGSPN = "       sponsor (CHARACTER*80)
C
C       /TOOLS/  (from FORTRAN statement: INCLUDE 'TOOLS.INC')
C        DEBUG  = Logical for debugging dynamic memory allocation
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'CONSTA.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'FILEUN.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'MACHDP.INC'
      INCLUDE 'MACHINE.INC'
      INCLUDE 'MISCDAT.INC'
      INCLUDE 'PARAMS.INC'
      INCLUDE 'QA.INC'
      INCLUDE 'TOOLS.INC'
C
C<><><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><><>
C
C     ##############################
C     ...Define conversion constants
C     ##############################
C     ...Common mathematical constants (COMMON /CONSTA/)
```

```
C     ...Source: "Preliminary Performance Assessment for the Waste
C                 Isolation Pilot Plant, December 1992 "
C                 Volume 3: Model Parameters., Table 15,
C                 p. Conversion Tables - 10.
      DATA ACCNST/1.128D+13/
      DATA AVOGAD/6.022D+23/

C     ...Dynamic array names (COMMON /DYNAME/)
      DATA DTYPES/
     $'INTEGER','INTEGER','LOGICAL','REAL',
     $'INTEGER','REAL'/
      DATA RNAMES/
     $'IDEBLK', 'NUMPRP', 'IASPRP', 'XMATPR',
     $'NUMCELL','AVEINF'/
      DATA CNAMES/
     $'QAINFO','NAMELB','NMATPR','SAVNAM','NAMNUM','NAMINF'/

C     ...File unit variables (COMMON /FILEUN/)
      DATA IDB/30/IDBSCR/2/ICNTRLFIL/8/INFLOUT1/9/INFLOUT2/10/ISCRAT/16/
     $     ODB/31/

C     ...Dynamic array variables (COMMON /INDEX/)
      DATA LASCIDX/6/LASRIDX/6/

C     ...Machine limit variables: DOUBLE PRECISION (COMMON /MACHDP/)
      DATA XMINDP, XMAXDP, VALMAXD / -709.19D0, 706.89D0, 1.0D+307 /
      DATA XLIMDP/1.0D-15/

C     ...Machine limit variables (COMMON /MACHINE/)
      DATA XMIN, XMAX, VALMAX / -88.75, 88.00, 1.0E+38 /
      DATA XLIM/1.0E-07/

C     ...Number of solution times (COMMON /MISCDAT/)
      DATA NSOLNS/1/

C     ...QA variables (COMMON /QA/)
      DATA PRGNAM/'POSTINFIL'/,PRGVER/'A2.70'/,PRGUPD/'11/21/99'/,
     $     PRGATH/'Ron McCurley, [NMERI]'/,
     $     PRGSPN/'Ron McCurley, [NMERI]'/

C     ...Debugging variables (COMMON /TOOLS/)
      DATA DEBUG/.FALSE./
      DATA GLOBAL/.TRUE./
C
C-----------------------------------------------------------------------
C**** END OF BLOCKDATA BLOCK ****
C-----------------------------------------------------------------------
C
      END
*DECK DYNMEM
      SUBROUTINE DYNMEM( MORMEMR, MEMORY, Q )
C*********************************************************************
C***                                                               ***
C***           applies D_Y_N_amic  M_E_M_eory  allocation          ***
C***                    - - -       - - -                          ***
C*********************************************************************
C
```

```
C   PURPOSE:     Allocates MEMORY DYNAMICally
C
C   AUTHOR:      Jonathan S. Rath
C
C   UPDATED:     19-DEC-1991  --Adapted for REAL dynamic base array
C                01-FEB-1990  --Fixed record lengths <= 72 chars.
C                14-DEC-1989  --Increased INTEGER formats
C                13-JUN-1989  --First Ed.
C
C   CALLED BY:   PROCDB
C                PROCIN
C                PROCQA
C
C   ENTRY POINT: DYNMEM2, DYNMEM3
C
C   CALLS:       MEMADJ
C                MEMADJ2
C                MEMADJ3
C
C   ARGUMENTS:
C   ENTRY/
C     --common block
C      /FILEUN/ ($include 'FILEUN.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C     --through subroutine call
C       MORMEMR = Add'l words needed for REAL core allocation (Q)
C       Q      = Dynamic memory REAL base array
C
C   LOCAL/
C       MEMADD = Actual number of words added to core (REAL-Q)
C       MEMOLD = Previous total no. of words allocated to core (Q)
C
C   EXIT/
C     --through subroutine call
C       MEMORY = Total number of words allocated to core (Q-REAL)
C       Q      = Dynamic memory REAL base array
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INTEGER MEMADD, MEMOLD, MEMORY, MORMEMR
      REAL Q(*)
C
C***********************************************************************
C
C     PSEUDO ENTRY DYNMEM( MORMEMR, MEMORY, Q )
C
C***********************************************************************
C
      MEMOLD = MEMORY
      CALL MEMADJ( MORMEMR, MEMORY, Q )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEM', MEMORY
      RETURN
C
```

```
C*********************************************************************
C
      ENTRY DYNMEM2( MORMEMR, MEMORY, Q )
C
C*********************************************************************
C
C     THIS SECTION ADJUSTS MEMORY ALLOCATION BY LENGTHENING
C     (OR SHORTENING) CERTAIN DYNAMIC ARRAYS
C
      MEMOLD = MEMORY
      CALL MEMADJ2( MORMEMR, MEMORY, Q )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEM2', MEMORY
      IF(MORMEMR.GT.MEMADD)WRITE(NOUTFL,910)MORMEMR,MEMADD,MEMOLD,MEMORY
      RETURN
C
C*********************************************************************
C
      ENTRY DYNMEM3( MEMORY, Q )
C
C*********************************************************************
C
C     THIS SECTION IS USED TO CONSOLIDATE MEMORY AND/OR FOR
C     ADJUSTING MEMORY ALLOCATION DUE TO "PSEUDO-DELETING"
C     DYNAMIC ARRAYS.  "PSEUDO-DELETING" MEANS SETTING THE UNUSED
C     DYNAMIC ARRAYS TO LENGTH 1.
C
      MEMOLD = MEMORY
      CALL MEMADJ3( MEMORY, Q )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEM3', MEMORY
      RETURN
C
C---------------  F O R M A T   S T A T E M E N T S  -----------------
C
 900  FORMAT(
     +//5X,'-------------------------------------------------------',
     + /5X,'       ',I10,' more words allocated by ',A,
     + /5X,'           Total allocated is ',I10,
     + /5X,'-------------------------------------------------------',//)
 910  FORMAT( //,'***** Possible Error in  D y n a m i c  Memory',
     +          ' Allocation (Q) *****',
     +  /,5X,' Min. Additional words REQ"D     = ',I10,' (MORMEMR)',
     +  /,5X,' Additional words added          = ',I10,' (MEMADD)',
     +  /,5X,' Previous total word allocation  = ',I10,' (MEMOLD)',
     +  /,5X,' Current total word allocation   = ',I10,' (MEMORY)',
     +       //,'*********************************************',
     +          '******************' )
C
C-------------------------------------------------------------------
C**** END OF SUBOUTINE DYNMEM ****
C-------------------------------------------------------------------
C
      END
*DECK DYNMEMC
      SUBROUTINE DYNMEMC( MORMEMC, MEMORY, C )
C*********************************************************************
```

```
C***                                                                  ****
C***  applies D_Y_N_amic  M_E_M_ory  (C_haracter type) allocation   ****
C***          - - -       - - -       -                             ****
C*********************************************************************
C
C   PURPOSE:     Allocates MEMORY DYNAMICally to CHARACTER base array
C
C   AUTHOR:      Jonathan S. Rath
C
C   UPDATED:     02-DEC-1991  --First Ed.
C
C   CALLED BY:   PROCDB
C                PROCIN
C                PROCQA
C
C   ENTRY POINT: DYNMEMC2, DYNMEMC3
C
C   CALLS:       MEMADC
C                MEMADJC2
C                MEMADJC3
C   ARGUMENTS:
C   ENTRY/
C     --common block
C      /FILEUN/ ($include 'FILEUN.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C     --through subroutine call
C       MORMEMC = Add'l words needed for CHAR core allocation (C)
C       C      = Dynamic memory CHARACTER*1 base array
C
C   LOCAL/
C       MEMADD = Actual number of words added to core (CHAR-C)
C       MEMOLD = Previous total no. of words allocated to core (C)
C
C   EXIT/
C     --through subroutine call
C       MEMORY = Total number of words allocated to core (C-CHAR)
C       C      = Dynamic memory CHARACTER*1 base array
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INTEGER MEMADD, MEMOLD, MEMORY, MORMEMC
      CHARACTER*(1) C(*)
C
C*********************************************************************
C
C     PSEUDO ENTRY DYNMEMC( MORMEMC, MEMORY, C )
C
C*********************************************************************
C
      MEMOLD = MEMORY
      CALL MEMADJC( MORMEMC, MEMORY, C )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEMC', MEMORY
      RETURN
```

```
C
C*********************************************************************
C
      ENTRY DYNMEMC2( MORMEMC, MEMORY, C )
C
C*********************************************************************
C
C     THIS SECTION ADJUSTS MEMORY ALLOCATION BY LENGTHENING
C     (OR SHORTENING) CERTAIN DYNAMIC ARRAYS
C
      MEMOLD = MEMORY
      CALL MEMADJC2( MORMEMC, MEMORY, C )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEMC2', MEMORY
      IF(MORMEMC.GT.MEMADD)WRITE(NOUTFL,910)MORMEMC,MEMADD,MEMOLD,MEMORY
      RETURN
C
C*********************************************************************
C
      ENTRY DYNMEMC3( MEMORY, C )
C
C*********************************************************************
C
C     THIS SECTION CAN BE USED FOR MEMORY CONSOLIDATION AND/OR FOR
C     ADJUSTING MEMORY ALLOCATION DUE TO "PSEUDO-DELETING"
C     DYNAMIC ARRAYS.  "PSEUDO-DELETING" MEANS SETTING THE UNUSED
C     DYNAMIC ARRAYS TO LENGTH 1.
C
      MEMOLD = MEMORY
      CALL MEMADJC3( MEMORY, C )
      MEMADD = MEMORY - MEMOLD
      WRITE(NOUTFL,900) MEMADD, 'DYNMEMC3', MEMORY
      RETURN
C
C---------------  F O R M A T   S T A T E M E N T S  -----------------
C
 900  FORMAT(
     +//5X,'-------------------------------------------------------',
     + /5X,' ',I10,' more CHAR*1 words allocated by ',A,
     + /5X,'           Total allocated is ',I10,
     + /5X,'-------------------------------------------------------',//)
 910  FORMAT( //,'***** Possible Error in  D y n a m i c  Memory',
     +           ' Allocation (C) *****',
     +  /,5X,' Min. Additional words REQ"D     = ',I10,' (MORMEMC)',
     +  /,5X,' Additional words added          = ',I10,' (MEMADD)',
     +  /,5X,' Previous total word allocation  = ',I10,' (MEMOLD)',
     +  /,5X,' Current total word allocation   = ',I10,' (MEMORY)',
     +       //,'*********************************************',
     +          '******************' )
C
C-----------------------------------------------------------------------
C**** END OF SUBOUTINE DYNMEMC ****
C-----------------------------------------------------------------------
C
      END
*DECK MEMADJ
      SUBROUTINE MEMADJ( MORMEM, MNUSED, Q )
```

```
905   C*********************************************************************
906   C***                                                               ****
907   C***               A_D_J_usts  dynamic  M_E_M_ory                  ****
908   C***              - - -                 - - -                      ****
909   C*********************************************************************
910   C
911   C  PURPOSE:     Adjusts the amount of dynamic memory allocated
912   C               the to REAL base array, Q.
913   C
914   C  AUTHOR:      Jonathan S. Rath
915   C
916   C  UPDATED:     13-JUN-1994  --JSR: First Edition
917   C
918   C  CALLED BY:   DYNMEM
919   C               DYNMEM2 (entry point)
920   C               DYNMEM3 (entry point)
921   C
922   C  ENTRY POINT: MEMADJ2
923   C               MEMADJ3
924   C
925   C  CALLS:       (MEM_MGR):  MDGET       (V_EXT_LIB): EXEMEM
926   C                           MDRSRV
927   C                           MDLONG
928   C                           MDLIST
929   C                           MDSTAT
930   C                           MDEROR
931   C                           MDDEBG
932   C                           MDDEL
933   C                           MDCOMP
934   C                           MDGIV
935   C
936   C  ARGUMENTS:
937   C  ENTRY/
938   C    --common blocks
939   C      /FILEUN/ (from FORTRAN statement: 'FILEUN.INC')
940   C       NOUTFL = File unit of diagnostics/debug output file
941   C
942   C      /LENGTH/ (from FORTRAN statement: 'LENGTH.INC')
943   C       RLENGT = Dynamic REAL arrays LENGTHS array
944   C
945   C      /DYNAME/ (from FORTRAN statement: 'DYNAME.INC')
946   C       RNAMES = Dynamic REAL arrays NAMES array
947   C
948   C      /INDEX/ (from FORTRAN statement: 'INDEX.INC')
949   C       BRDAIDX = Beg. Real Dynamic Array InDeX for memory allocation
950   C       ERDAIDX = End. Real "
951   C
952   C      /TOOLS/ (from FORTRAN statement: 'TOOLS.INC')
953   C       DEBUG  = Logical debugging tool
954   C
955   C     --through subroutine call
956   C       MORMEM = Add'l no. of words needed for core allocation (REAL-Q)
957   C       Q      = Dynamic Memory base REAL array
958   C
959   C  LOCAL/
960   C       MNERRS =  Number of Memory manager ERRorS during execution
961   C
```

```
C  EXIT/
C     --common blocks
C      /LOCAT/ (from FORTRAN statement: 'LOCAT.INC')
C       LRPTR  = Pointer array used for REAL dynamic array (Q)
C
C     --through subroutine call
C       MNUSED = Total words allocated to REAL dynamic array
C       Q      = Dynamic Memory base REAL array
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'LOCAT.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'TOOLS.INC'
      INTEGER I, I1, I2, MORMEM, MNERRS, MNUSED
      REAL Q(*)
C
C*********************************************************************
C
C     PSEUDO ENTRY MEMADJ( MORMEM, MNUSED, Q )
C
C*********************************************************************
C
C     THIS SECTION SETS DYNAMIC ARRAY LENGTHS FOR FIRST TIME
C
C     ...Check for bad REAL dynamic array indices
      IF(BRDAIDX.LT.1.OR.ERDAIDX.GT.LASRIDX.OR.
     +   ERDAIDX.LT.1.OR.BRDAIDX.GT.LASRIDX    )THEN
         WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
         WRITE(NOUTFL,*)'     BRDAIDX = ',BRDAIDX
         WRITE(NOUTFL,*)'     ERDAIDX = ',ERDAIDX
         WRITE(NOUTFL,*)'     LASRIDX = ',LASRIDX
         CALL QAABORT('(MEMADJ) - Invalid REAL dynamic array '//
     +              'indices detected ***')
      ENDIF
      CALL MDGET(MORMEM)
      CALL MDFILL(1.0)
      DO 100 I = BRDAIDX, ERDAIDX, 1
         CALL MDRSRV(RNAMES(I),I1,RLENGT(I))
         LRPTR(I) = I1
 100  CONTINUE
C     ...Check for dynamic memory allocation errors
      IF(DEBUG)CALL MDDEBG(NOUTFL)
      CALL MDSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MDLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MDEROR(NOUTFL)
         CALL QAABORT('(MEMADJ) - REAL DYNAMIC MEMORY '//
     +              'ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C
C*********************************************************************
```

```
C
      ENTRY MEMADJ2( MORMEM, MNUSED, Q )
C
C*********************************************************************
C
C     THIS SECTION LENGTHENS OR SHORTENS DYNAMIC ARRAYS
C
C     ...Check for bad REAL dynamic array indices
      IF(BRDAIDX.LT.1.OR.ERDAIDX.GT.LASRIDX.OR.
     +   ERDAIDX.LT.1.OR.BRDAIDX.GT.LASRIDX    )THEN
         WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
         WRITE(NOUTFL,*)'     BRDAIDX = ',BRDAIDX
         WRITE(NOUTFL,*)'     ERDAIDX = ',ERDAIDX
         WRITE(NOUTFL,*)'     LASRIDX = ',LASRIDX
         CALL QAABORT('(MEMADJ2) - Invalid REAL dynamic array '//
     +              'indices detected ***')
      ENDIF
      DO 200 I = BRDAIDX, ERDAIDX, 1
         CALL MDLONG(RNAMES(I),I1,RLENGT(I))
         LRPTR(I) = I1
 200  CONTINUE
C     ...Check for dynamic memory allocation errors
      IF(DEBUG)CALL MDDEBG(NOUTFL)
      CALL MDSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MDLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MDEROR(NOUTFL)
         CALL QAABORT('(MEMADJ2) - REAL '//
     $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C
C*********************************************************************
C
      ENTRY MEMADJ3( MNUSED, Q )
C
C*********************************************************************
C
C     THIS SECTION CONSOLIDATES FRAGMENTED MEMORY, RETURNS UNUSED
C     STORAGE TO THE OPERATING SYSTEM, AND THEN RECALCULATES ALL
C     DYNAMIC ARRAY POINTERS.
C
C
C     ...Consolidate the fragmented memeory
      CALL MDCOMP
C     ...Return unused storage back to the operating system
      CALL MDGIVE
C     ...Recalculate ALL pointers of the Q-array
      DO 300 I = BRDAIDX, ERDAIDX, 1
         I2 = 0
         CALL MDFIND(RNAMES(I),I1,I2)
         LRPTR(I)  = I1
         RLENGT(I) = I2
 300  CONTINUE
C     ...Check for dynamic memeory allocation errors
      IF(DEBUG)CALL MDDEBG(NOUTFL)
      CALL MDSTAT(MNERRS,MNUSED)
```

```
      IF(MNERRS.NE.0.OR.DEBUG)CALL MDLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MDEROR(NOUTFL)
         CALL QAABORT('(MEMADJ3) - REAL '//
     $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE MEMADJ ****
C-----------------------------------------------------------------------
      END
*DECK MEMADJC
      SUBROUTINE MEMADJC( MORMEMC, MNUSED, C )
C*********************************************************************
C***                                                               ****
C***       A_D_J_usts  dynamic  M_E_M_ory  (C_haracter type)       ****
C***       - - -                - - -       -                      ****
C*********************************************************************
C
C  PURPOSE:     Adjusts the amount of dynamic memory allocated to
C               the CHARACTER*1 base array, C.
C
C  AUTHOR:      Jonathan S. Rath
C
C  UPDATED:     13-JUN-1994  --JSR: First Edition
C
C  CALLED BY:   DYNMEMC
C               DYNMEMC2 (entry point)
C               DYNMEMC3 (entry point)
C
C  ENTRY POINT: MEMADJC2
C               MEMADJC3
C
C  CALLS:       (MEM_MGR):  MCGET       (V_EXT_LIB): EXEMEM
C                           MCRSRV
C                           MCLONG
C                           MCLIST
C                           MCSTAT
C                           MCEROR
C                           MCFIL
C                           MCDEBG
C                           MCCOMP
C                           MCGIV
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C      /FILEUN/ (from FORTRAN statement: 'FILEUN.INC')
C       NOUTFL = File unit of diagnostics/debug output file
C
C      /LENGTH/ (from FORTRAN statement: 'LENGTH.INC')
C       CLENGT = Dynamic CHAR arrays LENGTHS array
C
C      /DYNAME/ (from FORTRAN statement: 'DYNAME.INC')
C       CNAMES = Dynamic CHAR arrays NAMES array
C
C      /INDEX/ (from FORTRAN statement: 'INDEX.INC')
```

```
C       BCDAIDX = Beg. Char Dynamic Array InDeX for memory allocation
C       ECDAIDX = End. Char "
C
C      /TOOLS/ (from FORTRAN statement: 'TOOLS.INC')
C       DEBUG  = Logical debugging tool
C
C     --through subroutine call
C       MORMEMC = Add'l no. of words needed for core allocation (CHAR-C)
C       C      = Dynamic memory CHARACTER*1 base array
C
C     --through ENTRY POINT
C       NAME   = Name of array to be deleted
C
C  LOCAL/
C       MNERRS =  Number of Memory manager ERRorS during execution
C
C  EXIT/
C     --common blocks
C      /LOCAT/ (from FORTRAN statement: 'LOCAT.INC')
C       LCPTR  = Pointer array used for CHAR dynamic array (C)
C
C     --through subroutine call
C       MNUSED = Total words allocated to CHARACTER dynamic array
C       C      = Dynamic Memory CHARACTER*1 base array
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'LOCAT.INC'
      INCLUDE 'DYNAME.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'INDEX.INC'
      INCLUDE 'TOOLS.INC'
      INTEGER I, I1, I2, MORMEMC, MNERRS, MNUSED
      CHARACTER*(1) C(*)
C
C*********************************************************************
C
C     PSEUDO ENTRY MEMADJC( MORMEMC, MNUSED, C )
C
C*********************************************************************
C
C     THIS SECTION SETS DYNAMIC ARRAY LENGTHS FOR FIRST TIME
C
C     ...Check for bad CHARACTER dynamic array indices
      IF(BCDAIDX.LT.1.OR.ECDAIDX.GT.LASCIDX.OR.
     +   ECDAIDX.LT.1.OR.BCDAIDX.GT.LASCIDX    )THEN
         WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
         WRITE(NOUTFL,*)'     BCDAIDX = ',BCDAIDX
         WRITE(NOUTFL,*)'     ECADIDX = ',ECDAIDX
         WRITE(NOUTFL,*)'     LASCIDX = ',LASCIDX
         CALL QAABORT('(MEMADJ) - Invalid CHARACTER dynamic array '//
     +              'indices detected ***')
      ENDIF
      CALL MCGET(MORMEMC)
      CALL MCFILL(' ')
```

```
      DO 100 I = BCDAIDX, ECDAIDX, 1
         CALL MCRSRV(CNAMES(I),I1,CLENGT(I))
         LCPTR(I) = I1
 100  CONTINUE
C     ...Check for dynamic memory allocation errors
      IF(DEBUG)CALL MCDEBG(NOUTFL)
      CALL MCSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MCLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MCEROR(NOUTFL)
         CALL QAABORT('(MEMADJC) - CHARACTER DYNAMIC MEMORY '//
     +              'ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C
C*********************************************************************
C
      ENTRY MEMADJC2( MORMEMC, MNUSED, C )
C
C*********************************************************************
C
C     THIS SECTION LENGTHENS OR SHORTENS DYNAMIC ARRAYS
C
C     ...Check for bad CHARACTER dynamic array indices
      IF(BCDAIDX.LT.1 .OR. ECDAIDX.GT.LASCIDX .OR.
     +   ECDAIDX.LT.1 .OR. BCDAIDX.GT.LASCIDX    )THEN
         WRITE(NOUTFL,*)' *** Bad dynamic array indices ***'
         WRITE(NOUTFL,*)'     BCDAIDX = ',BCDAIDX
         WRITE(NOUTFL,*)'     ECADIDX = ',ECDAIDX
         WRITE(NOUTFL,*)'     LASCIDX = ',LASCIDX
         CALL QAABORT('(MEMADJC2) - Invalid CHARACTER dynamic array '//
     +              'indices detected ***')
      ENDIF
      DO 200 I = BCDAIDX, ECDAIDX, 1
         CALL MCLONG(CNAMES(I),I1,CLENGT(I))
         LCPTR(I) = I1
 200  CONTINUE
      CALL MCFILL(' ')
C     ...Check for dynamic memory allocation errors
      IF(DEBUG)CALL MCDEBG(NOUTFL)
      CALL MCSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MCLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MCEROR(NOUTFL)
         CALL QAABORT('(MEMADJC2) - CHARACTER '//
     $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C
C*********************************************************************
C
      ENTRY MEMADJC3( MNUSED, C )
C
C*********************************************************************
C
C     THIS SECTION CONSOLIDATES FRAGMENTED MEMORY, RETURNS UNUSED
C     STORAGE TO THE OPERATING SYSTEM, AND THEN RECALCULATES ALL
```

```
C     DYNAMIC ARRAY POINTERS.
C
C     ...Consolidate the fragmented memory
      CALL MCCOMP
C     ...Return unused storage back to the operating system
      CALL MCGIVE
C     ...Recalculate ALL pointers of the C-array
      DO 300 I = BCDAIDX, ECDAIDX, 1
      I2 = 0
      CALL MCFIND(CNAMES(I),I1,I2)
         LCPTR(I)  = I1
         CLENGT(I) = I2
 300  CONTINUE
C     ...Check for dynamic memeory allocation errors
      IF(DEBUG)CALL MCDEBG(NOUTFL)
      CALL MCSTAT(MNERRS,MNUSED)
      IF(MNERRS.NE.0.OR.DEBUG)CALL MCLIST(NOUTFL)
      IF(MNERRS.NE.0.        )THEN
         CALL MCEROR(NOUTFL)
         CALL QAABORT('(MEMADJC3) - ### CHARACTER ### '//
     $                'DYNAMIC MEMORY ALLOCATION ERRORS ***')
      ENDIF
      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE MEMADJC ****
C-----------------------------------------------------------------------
      END
      SUBROUTINE PRCOUT(AAPPT,AATET,AAINFR,AAINF,AAOFF,AARUN,MASSB,
     +                  MAXBAL)
C*************************************************************************
C
C************************************************************************
C
C  Memo from Joe Hevesi 8 Feb 1999
C
C Here's the format for the main net infiltration output file:
C
C Output file for mapping average annual mass balance terms (files with *.4e4
C                                                            extension):
C easting(i) = utm easting (m)
C northing(i) = utm northing (m)
C aappt(i) = average annual precip (mm/yr)
C aatet(i) = average annual evapotranspiration (mm/yr)
C aainfr(i) = average annual infiltration from runon (mm/yr)
C aadsw(i) = average annual change in root-zone water content (mm/yr)
C aainf(i) = average annual net infiltration rate (mm/yr)
C aaoff(i) = average annual runoff generation (mm/yr)
C aarun(i) = average annual surface water runon (mm/yr)
C massb(i) = average annual water balance calculation error (mm/yr)
C maxbal(i) = maximum daily water balance calculation error  (mm/day)
C
      INCLUDE 'PARAMS.INC'
      INCLUDE 'POSTINFIL.INC'
      INCLUDE 'FILEUN.INC'
      INTEGER I, ISAV
      REAL EAST,NORTH,AAPPT(*),AATET(*),
     +     AAINFR(*),AADSW,AAINF(*),AAOFF(*),AARUN(*),
```

```
     +     MASSB(*),MAXBAL(*),PPTRAIN,PPTSNOW,SNOWCVR,SNOWMELT,SUBLIM,
     +     MASSBAL2,SUM_INF
      CHARACTER*256 HEADER
      LOGICAL EOF
C
      EOF = .FALSE.
      I = 0
C     ...read header line
        READ(INFLOUT1,1000) HEADER
 1000   FORMAT(A)

C*      DO WHILE (.NOT. EOF)
   10 CONTINUE
         I = I+1
         IF (I.GT.MAXSOLN) THEN
           PRINT *, 'The number of locations is greater than ',
     +                    'allowed (',MAXSOLN,')'
           CALL QAABORT('(PRCOUT) - reading INFILTRATION values ***')
         ENDIF
         READ(INFLOUT1,1001,END=99) EAST,NORTH,AAPPT(I),
     +         PPTRAIN,PPTSNOW,SNOWCVR,SNOWMELT,SUBLIM,
     +         AATET(I),AAINFR(I),AADSW,AAINF(I),AAOFF(I),AARUN(I),
     +         MASSB(I),MAXBAL(I),MASSBAL2
1001     FORMAT(1X,2F11.1,1X,11F13.5,F13.4,4X,3E17.7)
C *** Save infiltration rates for designated locations
         IF(EAST .LE. MAXEAST .AND. EAST .GT. MINEAST .AND.
     +      NORTH .LE. MAXNORTH .AND. NORTH .GT. MINNORTH)
     +      THEN
            ISAV = ISAV + 1
            SUM_INF = SUM_INF + AAINF(I)
          ENDIF
      GO TO 10
C*      END DO
   99 CONTINUE
      IF(ISAV .GT. 0.0) THEN
C *** compute mean of saved pointwise infiltration rates
        NUMSOLN = ISAV
        AVE_INF = SUM_INF/NUMSOLN
        INCLUDE = .TRUE.
      ELSE
        INCLUDE = .FALSE.
      ENDIF
      WRITE (NOUTFL,*) 'This watershed has ',NUMSOLN,' points inside',
     +                 ' the specified boundary'
C
      RETURN
      END
      SUBROUTINE PRCOUT2(INFLOUT2,NUMCELL,AVE_INFIL,AVE_RUNOFF)
C***********************************************************************
C
C
C*********************************************************************
C234567
C
      IMPLICIT NONE
      INCLUDE 'PARAMS.INC'
      INCLUDE 'FFRDAT.INC'
```

```
      INTEGER IERR, INFLOUT2, IOSTAT, ISCRAT, NFIELD, NUMCELL
      INTEGER IVALUE(MFIELD), KVALUE(MFIELD)
      REAL AVE_INFIL,AVE_RUNOFF
      REAL RVALUE(MFIELD)
      CHARACTER*(NFORM) CVALUE(MFIELD)
      CHARACTER*40 LINE
      CHARACTER*80 HEADER

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

      IERR   =  0
      REWIND INFLOUT2

C     ...read header line
       READ(INFLOUT2,1000) HEADER
 1000  FORMAT(A80)

  10  CALL FFRDFLDS( INFLOUT2, ISCRAT, ' ',    MFIELD, IOSTAT,
     +               NFIELD,   KVALUE, CVALUE, IVALUE, RVALUE )
C
  20  IF(IOSTAT.LT.0)THEN
C        ...End Of File for INFIL control card input file found
         GOTO 100

      ELSEIF(IOSTAT.GT.0)THEN
C        ...Set the error flag, abort after EOF found
         IERR = IERR + 1
C        ...Read next record
         GOTO 10

      ELSEIF(IOSTAT.EQ.0)THEN

         IF((KVALUE(1).EQ.-1).OR.(CVALUE(1)(:1).EQ.'!').OR.
     +      (NFIELD.EQ.0))THEN
C           ...This is a comment line without information
C           ...Read next record
            GOTO 10

         ELSEIF( CVALUE(1)(:5).EQ.'TOTAL' .AND.
     +           CVALUE(4)(:3).EQ.'LOC' ) THEN
C****    this is the number of active cells in the watershed
            NUMCELL = IVALUE(5)
         ELSEIF(CVALUE(1)(:3).EQ.'NET')THEN
C****    this is the mean infiltration over this watershed
            AVE_INFIL = RVALUE(3)
         ELSEIF(CVALUE(1)(:3).EQ.'RUN')THEN
C****    this is the mean surface runoff over this watershed
            AVE_RUNOFF = RVALUE(3)
         ENDIF

      ENDIF
      GO TO 10

  100 CONTINUE
C
```

```
      RETURN
      END
*DECK PREPRO
      SUBROUTINE PREPRO( FIDB, FTXT, FTRN, FTRN2, FODB )
C*********************************************************************
C***                                                               ****
C***          P_R_E - P_R_O_cessing program execution module       ****
C***          - - -   - - -                                        ****
C*********************************************************************
C
C  PURPOSE:    PROGRAM input preprocessor which performs:
C              1.  QA functions
C              2.  Uses standard routines from CAMCON_LIB
C
C  AUTHOR:     Ron McCurley
C
C  UPDATED:    19-JAN-1999  --RDM: First Ed. for POSTINFIL
C              19-AUG-1999  --RDM: modified for adding INFIL summary output
C
C  CALLED BY:  A1MAIN {main program}
C
C  CALLS:      QASETUP
C              FILCMDLINN
C              QABANNER
C              FILDFNAM
C              WRFILN
C              QAABORT
C              FILRDNAMS
C              FILOPEN
C              IQAERRUNI
C              QAPAGE
C              QABANNER
C              QADOEDIS
C              FILOPEN
C              FILWRNAMS
C              FILOPEN
C
C  ARGUMENTS:
C  ENTRY/
C   --common block
C    /FILEUN/ (from FORTRAN statement: INCLUDE 'FILEUN.INC')
C     INPUTF = Device no. of input text file
C     ISCRAT = Device no. of scratch reading file
C     NOUTFL = Device no. of output diagnostics/debug file
C
C    /QA/
C     PRGNAM = Program name (CHAR*8)
C     PRGVER = Program version (CHAR*8)
C     PRGUPD = Program update (CHAR*8)
C     PRGATH = Program author (CHAR*80)
C     PRGSPN = Program sponsor (CHAR*80)
C
C  LOCAL/
C
C  EXIT/
C   --common blocks
C    /FILEUN/ (from FORTRAN statement: INCLUDE 'FILEUN.INC')
```

```
C     NOUTFL = Device no. of DIAGNOSTICS/DEBUG output file
C
C    /TOOLS/  (from FORTRAN statement: INCLUDE 'TOOLS.INC')
C
C   --through subroutine call
C     FIDB   = Filename of input CAMDAT
C     FTXT   = Filename of POSTINFIL input text file
C     FTRN   = Filename of INFIL pointwise output transfer file
C     FTRN2  = Filename of INFIL summary output transfer file
C     FODB   = Filename of output CAMDAT
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'QA.INC'
      INCLUDE 'TOOLS.INC'
      INTEGER  I,   IERR,   I1,  I2,   MAXFLD, NUMFLD
      PARAMETER(MAXFLD = 6)
      CHARACTER*(*)   FIDB, FODB, FTRN, FTRN2, FTXT
      CHARACTER*(132) FILESP(MAXFLD), FIELDS(MAXFLD)
C
C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>
C
      IERR   = 0
      NOUTFL = 0

C     ...Load the /PROCQA/ common with information
      CALL QASETUP(PRGNAM,PRGVER,PRGUPD,PRGATH,PRGSPN)

C     ...Write program banner to the terminal screen
      CALL QABANNER(0,
     $'Program for postprocessing infiltration maps',
     $' ',' ')

C     ...Check command line for a BATCH run
      DO 10 I=1,MAXFLD
         FIELDS(I)(:132)=' '
   10 CONTINUE
      CALL FILCMDLIN(MAXFLD,NUMFLD,FIELDS)
      IF(NUMFLD.GT.MAXFLD)THEN
      PRINT*,'*****************************************************'
      PRINT*,'*** Too many input files specified on command line ***'
      PRINT*,'*****************************************************'
      ENDIF

C     ...Define the files for FILRDNAMS
      CALL FILDFNAM('Input CAMDAT','inp','req',
     $              'POSTLHS.CDB')
      CALL FILDFNAM('Input Text Data File','inp','opt',
     $              'POSTINFIL.INP')
      CALL FILDFNAM('Output INFIL Summary Transfer File','inp','opt',
     $              'INFILSUM.OUT')
      CALL FILDFNAM('Output INFIL Point Transfer File','inp','opt',
     $              'INFILPT.OUT')
```

```
      CALL FILDFNAM('Output CAMDAT','out','req',
     $              'POSTINFIL.CDB')
      CALL FILDFNAM('Output Diagnostics/Debug File','out','opt',
     $              'POSTINFIL.DBG')

C     ...Read in the names of the files
      CALL FILRDNAMS(FILESP,IERR)
      IF(IERR.NE.0)THEN
         CALL FILWRNAMS(0,FILESP)
         CALL QAABORT('(PREPRO) - Incorrect file assignments ***')
      ENDIF

C     ...Open the Diagnostics/debug output file
      IF(FILESP(MAXFLD).NE.' ')THEN
         NOUTFL    = 7
         OPEN(NOUTFL,FILE=FILESP(MAXFLD),STATUS='UNKNOWN',
     $        FORM='FORMATTED',RECL=256)
      ELSE
         NOUTFL    = 0
         CALL FILOPEN(NOUTFL,'OUT','FORM','SYS$OUTPUT',IERR)
      ENDIF

C     ...Set the DEVICE number of the Diagnostics/debug output file
      CALL IQAERRUNI(NOUTFL)

      IF(NOUTFL.GT.0)THEN
C        ...Write headers, banner, DOE disclaimer, and file assignments
         CALL QAPAGE(NOUTFL,' ')
         CALL QABANNER(NOUTFL,
     $'Program for postprocessing infiltration maps',
     $' ',' ')
         CALL QADOEDIS(NOUTFL,'*')
         CALL FILWRNAMS(NOUTFL,FILESP)
      ENDIF

      FIDB  = FILESP(1)(:132)
      FTXT  = FILESP(2)(:132)
      FTRN2 = FILESP(3)(:132)
      FTRN  = FILESP(4)(:132)
      FODB  = FILESP(5)(:132)

      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE PREPRO ****
C-----------------------------------------------------------------------
      END
*DECK PROCDB
      SUBROUTINE PROCDB( MAXC, MAXQ, IQ, LQ, Q, C )
C***********************************************************************
C****                                                                ****
C****           P_R_O_C_ess  input D_ata  B_ase  routine             ****
C****           - - - -            -      -                          ****
C***********************************************************************
C
C  PURPOSE:    Process dynamic memory allocation for input
C              CAMDAT file etc...
C
```

```
C  AUTHOR:     Jonathan S. Rath
C
C  UPDATED:    13-JUN-1994  --JSR: First Ed. for WPRD.
C
C  CALLED BY:  WPRD {main program}
C
C  CALLS:      DBISIZES
C              DBITITLE
C              ADDMEM
C              DYNMEM
C              ZERODA
C              DYNMEMC
C              RECHEA
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C    /FILEUN/ ($include 'FILEUN.INC')
C     IDB    = Device no of Input CAMDAT File
C     ODB    = "            Output CAMDAT file
C
C   --through subroutine call
C     MAXC   = Total no. of CHAR*1 words allocated to dynamic storage
C     MAXQ   = Total no. of words allocated to dynamic storage
C     IQ     = INTEGER Dynamic Q-array (equivalenced to Q)
C     LQ     = LOGICAL Dynamic Q-array (equivalenced to Q)
C     Q      = REAL Dynamic memory base array
C     C      = CHARACTER Dynamic memory base array
C
C  LOCAL/
C     IERR   = INTEGER error code
C     MORMEMC= No. additional words to be allocated to C array
C     MORMEMR= No. additoinal words to be allocated to Q array
C
C  EXIT/
C   --common blocks
C    /LOCATR/ (from FORTRAN statement: INCLUDE 'LOCAT.INC')
C     L[name]= Pointer to [name] Q-array integers
C     LRPTR  = Pointer of Q-array
C
C    /LOCATC/ (from FORTRAN statement: INCLUDE 'LOCAT.INC')
C     L[name]= Pointer to [name] C-array integers
C     LCPTR  = Pointer of C-array
C
C    /GEOPAR/ (from FORTRAN statement: INCLUDE 'GEOPAR.INC')
C     HEADER = Character description of problem, etc...
C     LESSEL = List of Element Side sets concatenated Element List
C     LESSNL = List of Element Side sets concatenated Nodes associated
C              with each element side set Node List
C     LNPSNL = List of Nodal Point set concatenated Nodes List
C     MAXNENO= Max. no. of nodes of any element
C     NDIM   = Number of physical DIMensions
C     NDBCAM = CAMDAT version number
C     NELBLK = Number of ELement BLocKs in mesh
C     NELX   = No. of elements along X-axis of mesh
C     NELY   = No. of elements along Y-axis of mesh
C     NELZ   = No. of elements along Z-axis of mesh
```

```
C     NQAREC = Number of QA records
C     NSTEP  = No. of time steps in input CAMDAT (INTEGER)
C     NUMEL  = NUmber of ELeMents in mesh
C     NUMNOD = NUMber of NODes in mesh
C     NUMNPS = No. of Nodal Point Sets
C     NUMESS = No. of Element Side Sets
C     NUQATR = No. of UniQue ATtRibute names
C     NUQPR0 = No. of UniQUe PRoperty names (old)
C     NUQPRP = No. of UniQUe PRoPerty names (new)
C     NVAREL = No. of ELEMENT type ANALYSIS variables
C     NXINFO = No. of information records
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'LOCAT.INC'
      INCLUDE 'GEOPAR.INC'
      INTEGER  IERR, MAXC, MAXQ, MORMEMC, MORMEMR
      INTEGER IQ(*)
      REAL Q(*)
      CHARACTER*(1) C(*)
      LOGICAL LQ(*)
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
      IERR = 0
C     ...Read input CAMDAT file and get array sizes
      CALL DBISIZES( IDB,     NQAREC,  NXINFO,  NDIM,   NUMNOD,
     $               NELBLK,  NUMEL,   NELX,    NELY,   NELZ,
     $               MAXNENO, NUQATR,  NUQPRP,  NUMNPS, LNPSNL,
     $               NUMESS,  LESSEL,  LESSNL,  IERR )
      IF(IERR.NE.0)CALL QAABORT('(PROCDB) - reading input CAMDAT '//
     $                          'sizing parameters ***')
      CALL DBITITLE( IDB, HEADER, IERR )
      IF(IERR.NE.0)CALL QAABORT('(PROCDB) - reading input CAMDAT '//
     $                          'TITLE ***')

      CALL DBINVAR( IDB, NVARHI, NVARGL, NVARND, NVAREL, IERR )
      IF(IERR.NE.0)CALL QAABORT('(PROCDB) - reading number of input'//
     $                          ' CAMDAT analysis variables ***')

C     ...Initialize dynamic array lengths and compute active memory
      CALL ADDMEM(  MORMEMR, MORMEMC )
      CALL DYNMEM(  MORMEMR, MAXQ, Q )
      CALL ZERODA( IQ, LQ )
      CALL DYNMEMC( MORMEMC, MAXC, C )

C     ...Read various CAMDAT "header" sections into arrays
      CALL RECHEA( Q,           C,          IQ(LIDEBLK), IQ(LNUMPRP),
     $             LQ(LIASPRP), Q(LXMATPR),  C(LQAINFO),  C(LNAMELB),
     $             C(LNMATPR) )

      RETURN
C---------------------------------------------------------------------
```

```
C**** END OF SUBROUTINE PROCDB *****
C-----------------------------------------------------------------------
      END
*DECK PROCIN
      SUBROUTINE PROCIN(NAMGLV2)
C***********************************************************************
C***                                                                 ****
C***        PROC_ess  POSTINFIL  INput control  data  file  module  ****
C***        ----                 --                                 ****
C***********************************************************************
C
C  PURPOSE:     Reads POSTINFIL input text file
C
C  AUTHOR:      Ron McCurley
C
C  UPDATED:
C
C  CALLED BY:
C
C  CALLS:       FREFLD
C               MDRSRV
C               RPSBCS
C               MDDEL
C               ABORT
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C    /COMMIO/ ($INCLUDE 'COMMIO.INC')
C     ISCRAT = Device no. of PREINFIL scratch file
C     NOUTFL = Device no. of diagnostics/debug output file
C     PRSUTR = "            PRE-INFIL  Control Card Data file
C
C    /FFRDAT/ ($INCLUDE 'FFRDAT.INC')
C     MFIELD = Max. no. of fields that Free-Field-Reader can process
C     NFORM  = Max. length of a CHARACTER data field
C
C    /ARRAY/ ($INCLUDE 'ARRAY.INC')
C     Q      = Dynamic memory allocation BASE array
C     MAXQ   = Length of BASE array, Q
C
C    /LOCAT/ ($INCLUDE 'LOCAT.INC')
C     L[name]= Pointer to [name] dynamic array
C
C   --through subroutine call
C     TDPROP = LOGICAL for finding TIME-DEPENDENT property data
C
C  LOCAL/
C     CVALUE = CHARACTER values of the data fields
C     IERR   = INTEGER error flag
C     IOSTAT = INTEGER value for ANSI FORTRAN I/O status
C     IVALUE = INTEGER values of the data fields
C     KVALUE = Translation states of the data fields
C     NFIELD = Number of fields
C     RVALUE = REAL values of the data fields
C
C  EXIT/
```

```
C   --common block
C    /POSTINFIL/ ($INCLUDE 'POSTINFIL.INC')
C     TSTART = Time value when Initial Conditions are applied (REAL)
C     WRITIC = LOGICAL variable for writing I.C.s to TAPE55
C
C   --through subroutine call
C     NODEBC = INTEGER array of node points corresponding to B.C. values
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'FFRDAT.INC'
      INCLUDE 'POSTINFIL.INC'
C*      INCLUDE 'FLAGS.INC'
      INTEGER IERR, IOSTAT, LTEMP, NFIELD
      INTEGER IVALUE(MFIELD), KVALUE(MFIELD)
      REAL RVALUE(MFIELD)
      CHARACTER*(8) NAMGLV2(*)
      CHARACTER*(NFORM) CVALUE(MFIELD)

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>

      IERR   =  0
      REWIND ICNTRLFIL

   10 CALL FFRDFLDS( ICNTRLFIL, ISCRAT, ' ',    MFIELD, IOSTAT,
     +               NFIELD, KVALUE, CVALUE, IVALUE, RVALUE )
C
   20 IF(IOSTAT.LT.0)THEN
C        ...End Of File for INFIL control card input file found
         GOTO 100

      ELSEIF(IOSTAT.GT.0)THEN
C        ...Set the error flag, abort after EOF found
         IERR = IERR + 1
C        ...Read next record
         GOTO 10

      ELSEIF(IOSTAT.EQ.0)THEN

         IF((KVALUE(1).EQ.-1).OR.(CVALUE(1)(:1).EQ.'!').OR.
     +      (NFIELD.EQ.0))THEN
C           ...This is a comment line without information
C           ...Read next record
            GOTO 10

         ELSEIF(CVALUE(1)(:6).EQ.'*ARRAY')THEN
C           ...Read INFIL ARRAY data
C*            CALL RDARRD( NOUTFL, IOSTAT, NFIELD, KVALUE,
C*     1                   CVALUE, IVALUE, RVALUE )
            GO TO 10
         ELSEIF(CVALUE(1)(:6).EQ.'*STORE')THEN
C****    read input for analysis array where infiltration rates, etc. reside
            CALL RSTORE( NOUTFL, IOSTAT, NFIELD, KVALUE,
```

```
     1                    CVALUE, IVALUE, RVALUE )
            GO TO 10

         ELSEIF(CVALUE(1)(:4).EQ.'*END')THEN
C           ...Found END of input control data
            GOTO 100

         ELSE
C           ...Found meaningless data
C           ...Read next record
            GOTO 10
         ENDIF
      ENDIF

 100  IF(IERR.GT.0)CALL QAABORT('(PROCIN) - Read ERRORS encountered '//
     +                        'reading PREINFIL input text file ***')
      NAMGLV2(1) = NAMNUM
      NAMGLV2(2) = NAMINF
      NAMGLV2(3) = NAMRUN
C
      RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE PROCIN ****
C-----------------------------------------------------------------------
      END
*DECK RECHEA
      SUBROUTINE RECHEA( Q,      C,      IDEBLK, NUMPRP, IASPRP,
     $                   XMATPR, QAINFO, NAMELB, NMATPR )
C*********************************************************************
C****                                                             ****
C****          R_E_ad  C_amdat  H_E_A_der  section  routine       ****
C****          - -     -        - - -                             ****
C*********************************************************************
C
C  PURPOSE:    Reads pertinent "HEADER" sections of the input
C              CAMDAT file into common blocks and arrays
C
C  AUTHOR:     Jonathan S. Rath
C
C  UPDATED:    13-JUN-1994  --JSR: First Edition
C
C  CALLED BY:  PROCDB
C
C  CALLS:      DBIELBLK
C              DBIPROP
C              DBIPRNM
C              DBIQAREC
C              DBINSTEP
C              QAABORT
C
C  ARGUMENTS:
C  ENTRY/
C   --common blocks
C    /FILEUN/ (from FORTRAN statement: INCLUDE 'FILEUN.INC')
C     IDB    = Device no of Input CAMDAT File
C     ODB    = "            Output CAMDAT file
C
```

```
C    /GEOPAR/ (from FORTRAN statement: INCLUDE 'GEOPAR.INC')
C     NELBLK = Number of ELement BLocKs in mesh (i.e. # of materials)
C     NQAREC = Number of QA records
C     NSTEP  = No. of time steps in input CAMDAT (INTEGER)
C     NVAREL = No. of element variables (INTEGER)
C     NUQPRP = No. of UniQUe PRoperty names (INTEGER)
C
C   --through subroutine call
C     Q      = REAL type base dynamic array
C     C      = CHARACTER*1 type base dynamic array
C
C  LOCAL/
C     IERR   = INTEGER error code
C
C  EXIT/
C   --through subroutine call
C     IDEBLK = INTEGER ID array of matrial regions (INTEGER)
C     NUMPRP = No. of properties per material region (INTEGER)
C     IASPRP = Logical array for properties in materials
C     XMATPR = Properties array (REAL)
C     QAINFO = Quality Assurance array (CHAR*8)
C     NAMELB = Names of the material regions (CHAR*8)
C     NMATPR = Names of the properties (CHAR*8)
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'GEOPAR.INC'
      INTEGER  I, IERR, J, K, NHISTP
      INTEGER IDEBLK(*), NUMPRP(*)
      REAL Q(*), XMATPR(*)
      CHARACTER*(1) C(*)
      CHARACTER*(8) NAMELB(*), NMATPR(*), QAINFO(*)
      LOGICAL IASPRP(*)
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
      IERR = 0

C     ...Read material ID and names information
      CALL DBIELBLK( IDB, NELBLK, NAMELB, IDEBLK, IERR )
      IF(IERR.NE.0)
     $CALL QAABORT('(RECHEA) - reading material ID and names array ***')

C     ...Read property names
      CALL DBIPRNAM( IDB, NUQPRP, NMATPR, Q, C, IERR )
      IF(IERR.NE.0)
     $CALL QAABORT('(RECHEA) - reading PROPERTY NAMES array ***')

C     ...Read property data
      DO 10 I=1,NUQPRP
         J = (I-1)*NELBLK+1
         CALL DBIPROP( IDB, '*', I, IASPRP(J), XMATPR(J),    $
Q,        C, IERR )
```

```
1931            IF(IERR.NE.0)
1932         $   CALL QAABORT('(RECHEA) - reading PROPERTY values ***')
1933      10  CONTINUE
1934
1935   C     ...Construct the number of properties per material array
1936         DO 30 J=1,NELBLK
1937            NUMPRP(J) = 0
1938            DO 20 I=1,NUQPRP
1939               K = (I-1)*J+1
1940               IF(IASPRP(K))NUMPRP(J) = NUMPRP(J)+1
1941      20    CONTINUE
1942      30  CONTINUE
1943
1944   C     ...Read QA data
1945         CALL DBIQAREC( IDB, NQAREC, QAINFO, IERR )
1946         IF(IERR.NE.0)CALL QAABORT('(RECHEA) - reading QA array ***')
1947
1948   C     ...Get the number of time steps (NSTEP)
1949         CALL DBINSTEP( IDB, NSTEP, NHISTP, IERR )
1950         IF(IERR.NE.0)CALL QAABORT('(RECHEA) - obtaining input CAMDAT '//
1951        $                          'no. of time steps ***')
1952
1953         RETURN
1954   C-----------------------------------------------------------------------
1955   C**** END OF SUBROUTINE RECHEA *****
1956   C-----------------------------------------------------------------------
1957         END
1958   *DECK RSTORE
1959         SUBROUTINE RSTORE( DBGFIL, IOSTAT, NFIELD, KVALUE,
1960        1                   CVALUE, IVALUE, RVALUE )
1961   C***********************************************************************
1962   C****                                                                ****
1963   C****         R_ead  S_T_O_R_E  parameters  module               ****
1964   C****         -    -  - - - -                                     ****
1965   C***********************************************************************
1966   C
1967   C   PURPOSE:    Reads STORE parameters for INFIL from the
1968   C               POSTINFIL batch input file
1969   C
1970   C   AUTHOR:     Ron McCurley
1971   C
1972   C   UPDATED:
1973   C
1974   C  CALLED BY:   PROCIN
1975   C
1976   C  CALLS:       FREFLD
1977   C               ABORT
1978   C
1979   C  ARGUMENTS:
1980   C  ENTRY/
1981   C    --common blocks
1982   C     /COMMIO/ ($INCLUDE 'COMMIO.INC')
1983   C      ISCRAT = Device no. of PREINFIL scratch file
1984   C      FILEIN = Device no. of PREINFIL input text file
1985   C      DBGFIL = Device no. of diagnostics/debut output file
1986   C
1987   C     /POSTINFIL/ ($INCLUDE 'POSTINFIL.INC')
```

```
C       NFILES - number of input CDBs
C       TIMINT - time of intrusion into repository(1000,3000,5000,7000,
C                or 9000 years)
C       ROOT   - root of variable, 3 characters
C                (ie AC5 if AC5u234,ACPU240,... are wanted)
C       PATHWAY- Pathway to MAN ; may be 'STOCK_POnd'(default),
C                'FARM_FAMily',or 'DRILler'
C
C    --through subroutine call
C      MFIELD = Max. no. of data fields FFR can process
C      IOSTAT = ANSI FORTRAN I/O error flag
C      NFIELD = No. of data fields read by FFR
C      KVALUE = INTEGER array of types of data fields read by FFR.
C      CVALUE = CHARACTER  array of data fields read by FFR.
C      IVALUE = INTEGER    "
C      RVALUE = REAL       "
C
C  LOCAL/
C      none
C
C  EXIT/
C    --common blocks
C     /INFIL/ ($INCLUDE 'INFIL.INC')
C      ...REAL variables
C
C    --through subroutine call
C      MFIELD = Max. no. of data fields FFR can process
C      IOSTAT = ANSI FORTRAN I/O error flag
C      NFIELD = No. of data fields read by FFR
C      KVALUE = INTEGER array of types of data fields read by FFR.
C      CVALUE = CHARACTER  array of data fields read by FFR.
C      IVALUE = INTEGER    "
C      RVALUE = REAL       "
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FFRDAT.INC'
      INCLUDE 'GEOPAR.INC'
      INCLUDE 'POSTINFIL.INC'
C*      INCLUDE 'FLAGS.INC'

      INTEGER I, IERR, IOSTAT, ISAV, J, N, NFIELD, DBGFIL
      INTEGER IVALUE(*), KVALUE(*)
      REAL RVALUE(*)
      CHARACTER*(NFORM) CVALUE(*)

C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>
C
      IERR=0
      DO 40 I=2,NFIELD
         IF(CVALUE(I)(:5).EQ.'ARRAY')THEN
            ARRAY_STORE= CVALUE(I+1)
C*            STORE = .TRUE.
         ELSEIF(CVALUE(I)(:4).EQ.'TIME')THEN
```

```
              TIME_STORE = RVALUE(I+1)
           ELSEIF(CVALUE(I)(:4).EQ.'STEP')THEN
              STEP_STORE = RVALUE(I+1)
           ELSEIF(CVALUE(I)(:4).EQ.'COPY')THEN
              NVARGL = IVALUE(I+1)
           ELSEIF(CVALUE(I)(:4).EQ.'NAME') THEN
              ISAV = I
              DO 20 J=ISAV+1,NFIELD
                IF(CVALUE(J)(:6).EQ.'MEAN_I')THEN
                  NAMINF = CVALUE(J+1)
                  NVARGL2 = NVARGL2 + 1
                ELSEIF(CVALUE(J)(:3).EQ.'NUM')THEN
                  NAMNUM=CVALUE(J+1)
                  NVARGL2 = NVARGL2 + 1
                ELSEIF(CVALUE(J)(:6).EQ.'MEAN_R')THEN
                  NAMRUN=CVALUE(J+1)
                  NVARGL2 = NVARGL2 + 1
                ENDIF
   20         CONTINUE
C
C*         ELSE
C*            IF(CVALUE(I).NE.BLANK) THEN
C             ...Found meaningless data
C*              WRITE(DBGFIL,*)' *** BAD PATHWAY KEYWORD = ',
C*     +                  CVALUE(1)(:INDEX(CVALUE(1),' ')),' ***'
C*              IERR = IERR + 1
C*            ENDIF
           ENDIF
   40  CONTINUE
  100  IF(IERR.GT.0)CALL QAABORT('(RSTORE) - Errors reading pathway'//
      +                        ' parameters ***')
       RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE RSTORE  ****
C-----------------------------------------------------------------------
       END
*DECK SUCONS
       SUBROUTINE SUCONS
C***********************************************************************
C****                                                                ****
C****             S_et  U_p   C_O_N_S_tants  module                  ****
C****             -     -     - - - -                                ****
C***********************************************************************
C
C     PURPOSE:    Computes mathematical and other constants that
C                 cannot be iInitialized using a block data statement.
C
C     AUTHOR:     Jonathan Scott Rath, Esq. [NMERI]
C
C     UPDATED:    18-AUG-1995  --JSR: Adapted for DOUBLE PRECSION
C                 31-AUG-1993  --JSR: First Edition
C
C     ARGUMENTS:
C     ENTRY/
C       none
C
C     LOCAL/
```

```
C       none
C
C     EXIT/
C      --through common blocks:
C       /CONSTA/ (from FORTRAN statement: INCLUDE 'CONSTA.INC')
C        SECPYR = No. of seconds per year [DOUBLE PRECISION]
C        YRPSEC = No. of years per second [DOUBLE PRECISION]
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'CONSTA.INC'
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
C     ...Compute pi
      PI = 4.0*ATAN(1.0)
C     ...Compute number of seconds in one year
      SECPYR = 365.24D0*24.0D0*3600.0D0
C     ...Compute years per second
      YRPSEC = 1.0D0/SECPYR
C
      RETURN
C--------------------------------------------------------------------
C**** END OF SUBROUTINE SUCONS ****
C--------------------------------------------------------------------
      END
*DECK WRCHEA
      SUBROUTINE WRCHEA( Q, CH, QAINFO, BLKNAM, SAVNAM )
C*********************************************************************
C***                                                               ****
C***        W_R_ite   C_amdat  H_E_A_der  section  module          ****
C***        - -       -        - - -                               ****
C*********************************************************************
C
C  PURPOSE:       Writes the "header" section of CAMDAT to the scratch
C                 CAMDAT file using CAMDAT_LIB routines.
C
C  AUTHOR:        Jonathan S. Rath
C
C  UPDATED:       20-SEP-1994  --JSR: Added history variable "TOTCURIE"
C                 13-JUN-1994  --JSR: First Ed. for WPRD.
C
C  CALLED BY:     WPRD {main program}
C
C  CALLS:         DBOHEA
C                 DBOQAREC
C                 DBOVRNAM
C                 QAABORT
C
C  ARGUMENTS:
C  ENTRY/
C    --common blocks
C     /FILEUN/ ($include 'FILEUN.INC')
C      IDB    = Device number of Input CAMDAT file
```

```
C      ODB    = Device number of Output CAMDAT file
C
C     /GEOPAR/ ($include 'GEOPAR.INC')
C      NQAREC = no. of QA records
C
C     /MISCDAT/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C      NNUC   = No. of radionuclides used by WPRD (INTEGER)
C      NRADPR = No. of RADdionuclides to be PRinted (saved and
C               stored) to the output CAMDAT and debug/diagnostics
C               file (INTEGER)
C
C    --through subroutine call
C      Q      = REAL Dynamic memory base array
C      CH     = CHARACTER*1 Dynamic memory base array
C      QAINFO = QA information array [CHARACTER*8]
C      SAVNAM = Names of the regions used in POSTINFIL,
C               and to be written to output CAMDAT (CHARACTER*8)
C
C  EXIT/
C      none
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'GEOPAR.INC'
      INCLUDE 'MISCDAT.INC'
      INCLUDE 'PARAMS.INC'
C*      INCLUDE 'POSTINFIL.INC'
      INTEGER I, IDUM1, IERR
      REAL Q(*)
      CHARACTER*(1) CH(*)
      CHARACTER*(8) NAMTMP
      CHARACTER*(8) BLKNAM(*), QAINFO(*), SAVNAM(*)
C
C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>
C
      IDUM1  = 0
      IERR   = 0
C
C**** Write QA records to output CAMDAT scratch file ****
C
      CALL DBOQAREC(ODB,'ADD',QAINFO((NQAREC-2)*4+1),IERR)
      IF(IERR.NE.0)CALL QAABORT('(WRCHEA) - Trouble writing '//
     $'WPRD SDB QA record to CDB-scratch file %%%')

      CALL DBOQAREC(ODB,'ADD',QAINFO((NQAREC-1)*4+1),IERR)
      IF(IERR.NE.0)CALL QAABORT('(WRCHEA) - Trouble writing '//
     $'WPRD QA record to CDB-scratch file %%%')
C
C**** Write all "HEADER" information to the output CAMDAT ****
C
      CALL DBOHEAD( ODB, Q, CH, IERR )
      IF(IERR.NE.0)CALL QAABORT('(WRCHEA) - Writing "HEADER" '//
     $'section to the final output CAMDAT file %%%')
```

```
C
C
C     ...cell infiltrations [mm/yr]
C*      IF(NUMCELL.LT.MAXSOLN)THEN
         IF(GLOBAL) THEN
C      ...Net Infiltration variable names
C*          DO 30 I=1,NUMCELL
C*            SAVNAM(I)(:8) = 'I_'//BLKNAM(I)(1:3)//BLKNAM(I)(7:7)
C*  30      CONTINUE
C        ...Infiltration in mm/yr
C*          CALL DBOVRNAM( ODB,   'GLOBAL', 'ADD',  NUMCELL, SAVNAM,
C*     $                  IDUM1,  Q,        CH,    IERR )
           IF(IERR.NE.0)CALL QAABORT('(WRCHEA) - Error writing'//
      $    ' NEW GLOBAL variable names (SAVNAM) to CDB %%%')
C         ...Rebuild the INFILTRATION CELL names array??
C*         DO 40 I=1,NUMCELL
C*            SAVNAM(I)(:8) = SAVNAM(I)(3:8)//'  '
C*  40     CONTINUE
         ELSE
C
C**** Write POSTINFIL CAMDAT history variable names ****
C
C*         DO 50 I=1,NUMCELL
C*            SAVNAM(I)(:8) = 'I_'//BLKNAM(I)(:6)
  50     CONTINUE
       CALL DBOVRNAM( ODB,    'HISTORY', 'ADD',    1,   SAVNAM,
      $               IDUM1,   Q,         CH,      IERR )
       IF(IERR.NE.0)CALL QAABORT('(WRTHEA) - Error writing'//
      $' NEW HISTORY variable names to CDB %%%')

C        ...????
C*         CALL DBOVRNAM( ODB,    'GLOBAL', 'ADD',   NNUC,
C*     $                  BLKNAM, IDUM1,   Q,        CH,
C*     $                  IERR )

         ENDIF

       RETURN
C-----------------------------------------------------------------------
C**** END OF SUBROUTINE WRCHEA *****
C-----------------------------------------------------------------------
       END
*DECK WRTANA
       SUBROUTINE WRTANA( Q,       C,       TIME,    BLKNAM,  NAMGLV2,
      $                   AVE_INFIL, INFILTR, AVE_RUNOFF )
C*********************************************************************
C****                                                             ****
C****        W_R_i_T_e  camdat  A_N_A_lsis  section  routine      ****
C****        - -   -            - - -                             ****
C*********************************************************************
C
C  PURPOSE:     Writes analysis section of CAMDAT for a single timestep.
C
C  AUTHOR:      Ron McCurley
C
C  UPDATED:     20-JAN-1999  --RDM: First Edition for POSTINFIL
C
```

```
C  CALLED BY:
C
C  CALLS:       DBOTIME
C               DBOVAR
C               DBOSTEP
C               QAABORT
C
C  ARGUMENTS
C  ENTRY/
C    --common blocks
C     /FILEUN/ (from FORTRAN statement: 'FILEUN.INC')
C      NOUTFL = Device no. of diagnostics/debut file
C      ODB    = Device no. of output CAMDAT file
C
C     /POSTINFIL/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C      NUMCELL = No. of INFILTRATION cells used in POSTINFIL (INTEGER)
C
C    --through subroutine call
C      Q      = Dynamic memory REAL base array
C      C      = "              CHARACTER*1 base array
C      HIFLAG = History flag (REAL)
C      TIME   = Time (REAL)
C      BLKNAM = Names of POSTINFIL GRID blocks, array (CHARACTER*8)
C      AVE_INFIL = Average infiltration rate over spatial domain of watershed
C      AVE_RUNOFF= Average surface runoff rate over spatial domain of
watershed
C      INFILTR  = Infiltration rate in specific location, array (REAL)
C
C  LOCAL/
C      NAMTMP = Temporary character variable (CHARACTER*8)
C
C  EXIT/
C      none
C
C***********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'FILEUN.INC'
      INCLUDE 'GEOPAR.INC'
      INCLUDE 'MISCDAT.INC'
      INCLUDE 'POSTINFIL.INC'
      INTEGER I, IERR, INDX
      REAL AVE_INFIL, AVE_RUNOFF, DUM0, TIME, TOTINFIL, XNUMCELL
      REAL Q(*), INFILTR(*)
      CHARACTER*(1) C(*)
      CHARACTER*(8) NAMTMP
      CHARACTER*(8) BLKNAM(*), NAMGLV2(*)
      LOGICAL ALLVAR, WHOLE
      DATA GLOBAL/.TRUE./
C
C<><><><><><><><><><><><>
C...BEGIN PROCEDURES...
C<><><><><><><><><><><><>
      XNUMCELL = FLOAT(NUMCELL)
      IF(SUBSHED) THEN
        XNUMCELL = FLOAT(NUMSOLN)
        AVE_INFIL = AVE_INF
```

```
      ENDIF
C
C**** Write a time step to the CAMDAT ****
C
      IF(HIFLAG.EQ.1)THEN
         WHOLE = .FALSE.
      ELSEIF(HIFLAG.EQ.0)THEN
         WHOLE = .TRUE.
      ENDIF
C
C
C**** Write POSTINFIL CAMDAT history or global variables ****
C
C     ...Infiltration in mm/yr
      TOTINFIL = 0.0
      IF(NSTEP.GE.1) THEN
C       ...Advance time step of input CDB file
        CALL DBISTEP( IDB, 1, TIME, ALLVAR, IERR )
        IF(IERR.NE.0)CALL QAABORT('(RECHEA) - obtaining input CAMDAT '//
     $                            'no. of time steps ***')

        IF (GLOBAL) THEN
C       ...copy global analysis variables from input CDB to output CDB
          CALL DBOVRNAM( ODB, 'GLOBAL', 'COPY', NVARGL, '*',
     +                   DUM0, Q,        C,    IERR )
        ENDIF
      ENDIF

C
C**** Write POSTINFIL CAMDAT global variable names ****
C
      IF (GLOBAL) THEN

        IF(NVARGL2.GT.0)THEN
          CALL DBOVRNAM( ODB,    'GLOBAL', 'ADD', NVARGL2, NAMGLV2,
     +                   DUM0, Q,        C,    IERR )
          IF(IERR.GT.0)CALL QAABORT('(PRCTIM) - Error writing '//
     +                 'new GLOBAL variable names to output CDB ***')
C     **** Write the completed time-step and advance to the next step ****
C
          CALL DBOSTEP( ODB, Q, C, IERR )
          IF(IERR.NE.0)
     $       CALL QAABORT('(WRTANA) - Error writing a completed'//
     $            ' time-step and advancing to next step /DBOSTEP ***')
          CALL DBOTIME( ODB, TIME, WHOLE, IERR )
          CALL DBOVAR( ODB, 'GLOBAL', NAMGLV2(1), INDX, XNUMCELL, Q, C,
     +                    IERR)
C         ...Mean Infiltration in mm/yr
          CALL DBOVAR( ODB, 'GLOBAL', NAMGLV2(2), INDX, AVE_INFIL, Q, C,
     +                 IERR)
          IF(IERR.NE.0)CALL QAABORT('(WRTANA) - Error writing'//
     $          ' NEW GLOBAL variable values (AVE_INFIL) to CDB ***')
C*          CALL DBOVAR( ODB, 'GLOBAL', NAMGLV2(3), INDX, AVE_RUNOFF, Q,
C*     +                 C, IERR)
          IF(IERR.NE.0)CALL QAABORT('(WRTANA) - Error writing'//
     $            ' NEW GLOBAL variable values (AVE_RUNOFF) to CDB ***')
        ENDIF
```

```
2387
2388   C*      ELSE
2389   C*        IF(NVARHI2.GT.0)THEN
2390   C*           CALL DBOVRNAM( ODB,    'HISTORY', 'ADD', NVARHI2, NAMHIV2,
2391   C*     +                    DUM0, Q,         C,    IERR )
2392   C*           IF(IERR.GT.0)CALL QAABORT('(PRCTIM) - Error writing '//
2393   C*     +                 'new HISTORY variable names to output CDB ***')
2394   C*        ENDIF
2395
2396         ENDIF
2397   C
2398   C**** Write the completed time-step and advance to the next step ****
2399   C
2400         CALL DBOSTEP( ODB, Q, C, IERR )
2401         IF(IERR.NE.0)CALL QAABORT('(WRTANA) - Error writing a completed'//
2402        $' time-step and advancing to next step /DBOSTEP ***')
2403
2404         RETURN
2405   C
2406   C-----------------------------------------------------------------------
2407   C**** END OF SUBROUTINE WRTANA *****
2408   C-----------------------------------------------------------------------
2409   C
2410         END
2411   *DECK ZERODA
2412         SUBROUTINE ZERODA( IQ, LQ )
2413   C***********************************************************************
2414   C****                                                                ****
2415   C****              Z_E_R_O  D_ynamic  A_rrays  module                ****
2416   C****              - - - -  -         -                              ****
2417   C***********************************************************************
2418   C
2419   C  PURPOSE:      Sets all values of the current IQ(*) array to zero
2420   C                and sets all values of the current LQ(*) array
2421   C                to false.
2422   C
2423   C  AUTHOR:       Jonathan S. Rath
2424   C
2425   C  UPDATED:      13-JUN-1994  --JSR: First Ed.
2426   C
2427   C  CALLED BY:    PROCDB
2428   C                PROCIN
2429   C
2430   C  ARGUMENTS:
2431   C  ENTRY/
2432   C    --through common blocks:
2433   C     /DYNAME/ ($include 'DYNAME.INC')
2434   C      DTYPES  = TYPES of dynamic arrays (CHARACTER*8)
2435   C
2436   C     /LENGTH/ ($include 'LENGTH.INC')
2437   C      RLENGT  = Length of dynamic arrays (INTEGER)
2438   C
2439   C     /INDEX/  ($include 'INDEX.INC')
2440   C      BRDAIDX = Beginning current dynamic array index (INTEGER)
2441   C      ERDAIDX = Ending current dynamic aray index (INTEGER)
2442   C
2443   C     /LOCAT/ ($include 'LOCAT.INC')
```

```
C      LRPTR   = Dynamic array pointers array (INTEGER)
C
C    --through subroutine call
C      IQ      = INTEGER portion of the real dynamic base array
C      LQ      = LOGICAL portion of the real dynamic base array
C
C  LOCAL/
C    none
C
C  EXIT/
C    --through subroutine call
C      IQ      = INTEGER portion of the real dynamic base array
C      LQ      = LOGICAL portion of the real dynamic base array
C
C*********************************************************************
C234567
      IMPLICIT NONE
      INCLUDE 'DYNAME.INC'
      INCLUDE 'LENGTH.INC'
      INCLUDE 'LOCAT.INC'
      INCLUDE 'INDEX.INC'
      INTEGER I, IQ(*), J
      LOGICAL LQ(*)
C
C<><><><><><><><><><><><>
C...Begin Procedures...
C<><><><><><><><><><><><>
C
      DO 30 I=BRDAIDX,ERDAIDX,1
         IF(DTYPES(I)(:7).EQ.'INTEGER')THEN
C           ...Dynamic array index is an INTEGER type
            DO 10 J=1,RLENGT(I)
               IQ(LRPTR(I)+J-1) = 0
  10        CONTINUE
         ELSEIF(DTYPES(I)(:7).EQ.'LOGICAL')THEN
C           ...Dynamic array index is a LOGICAL type
            DO 20 J=1,RLENGT(I)
               LQ(LRPTR(I)+J-1) = .FALSE.
  20        CONTINUE
         ENDIF
  30  CONTINUE
      RETURN
C
C-------------------------------------------------------------------
C**** END OF SUBROUTINE ZERODA ****
C-------------------------------------------------------------------
C
      END
*COMDECK CONSTA
C*********************************************************************
C     /CONSTA/ (from FORTRAN statement: INCLUDE 'CONSTA.INC')
C      AVOGAD = Avogadro's number [DOUBLE PRECISION]
C      ACCNST = Activity Conversion CoNStanT [DOUBLE PRECISION]
C               A radioisotope's activity conversion is equal
C               to ACCNST/(half_life*Atomic_weight)
C      PI     = Common mathematical constant "PI" [DOUBLE PRECISION]
C      SECPYR = No. of seconds per year [DOUBLE PRECISION]
```

```
C      YRPSEC = No. of years per second [DOUBLE PRECISION]
C*********************************************************************
C234567
      DOUBLE PRECISION ACCNST, AVOGAD, PI, SECPYR, YRPSEC
      COMMON /CONSTA/ ACCNST, AVOGAD, PI, SECPYR, YRPSEC
C*********************************************************************

*COMDECK DYNAME
C*********************************************************************
C       /DYNAME/ ($include 'DYNAME.INC')
C        CNAMES = Names of CHARACTER dynamic arrays (CHARACTER*8)
C        DTYPES = Types of REAL dynamic arrays (CHARACTER*8)
C        RNAMES = Names of REAL data dynamic arrays (CHARACTER*8)
C*********************************************************************
C234567
      CHARACTER*(8) CNAMES(6), DTYPES(6), RNAMES(6)
      COMMON /DYNAME/ CNAMES, DTYPES, RNAMES
C*********************************************************************

*COMDECK FFRDAT
C*********************************************************************
C    /FFRDAT/ (from FORTRAN statement: INCLUDE 'FFRDAT.INC')
C     NFORM   = Maximum CHARACTER string length of a data field
C     MFIELD  = Maximum number of data of fields processed
C*********************************************************************
C234567
      INTEGER MFIELD, NFORM
      PARAMETER( NFORM = 80, MFIELD=500 )
C*********************************************************************

*COMDECK FILEUN
C*********************************************************************
C     /FILEUN/ (from FORTRAN statemetn: INCLUDE 'FILEUN.INC')
C      IDB       = Device no. of input CAMDAT file
C      IDBSCR    = Device no. of CAMDAT scratch file
C      ICNTRLFIL = Device no. of input text file
C      ISCRAT    = Device no. of scratch reading file
C      INFLOUT1  = Device no. of INFIL output file with pointwise
C                  infiltration maps
C      INFLOUT2  = Device no. of INFIL output file with summary
C                  infiltration maps
C      NOUTFL = Device no. of output diagnostics/debug file
C      ODB    = Device no. of output CAMDAT file
C*********************************************************************
C234567
      INTEGER IDB,    IDBSCR, ICNTRLFIL, ISCRAT, INFLOUT1, INFLOUT2,
     $        NOUTFL, ODB
      COMMON /FILEUN/ IDB,      IDBSCR, ICNTRLFIL, ISCRAT, INFLOUT1,
     $                INFLOUT2, NOUTFL, ODB
C*********************************************************************

*COMDECK FLWCHR
C
C WPRD-+-SUCONS
C      |
C      +-PREPRO-+-(QASETUP)
C      |        |
```

```
C       |         +-(QABANNER)
C       |         |
C       |         +-(FILCMDLIN)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILDFNAM)
C       |         |
C       |         +-(FILRDNAMS)
C       |         |
C       |         +-(FILWRNAMS)
C       |         |
C       |         +-(QAABORT)
C       |         |
C       |         +-(FILOPEN)
C       |         |
C       |         +-(FILOPEN)
C       |         |
C       |         +-(FILOPEN)
C       |         |
C       |         +-(FILOPEN)
C       |         |
C       |         +-(FILOPEN)
C       |         |
C       |         +-(FILOPEN)
C       |         |
C       |         +-(IQAERRUNI)
C       |         |
C       |         +-(QAPAGE)
C       |         |
C       |         +-(QABANNER)
C       |         |
C       |         +-(QADOEDIS)
C       |         |
C       |         +-(FILWRNAMS)
C       |
C       +-(MDINIT)
C       |
C       +-(MCINIT)
```

```
C       |
C       +-(DBSETUP)
C       |
C       +-(QAABORT)
C       |
C       +-(DBERRUNI)
C       |
C       +-(DBIOPEN)
C       |
C       +-(QAABORT)
C       |
C       +-PROCDB-+-(DBISIZES)
C       |        |
C       |        +-(QAABORT)
C       |        |
C       |        +-(DBITITLE)
C       |        |
C       |        +-(QAABORT)
C       |        |
C       |        +-(DBINVAR)
C       |        |
C       |        +-(QAABORT)
C       |        |
C       |        +-ADDMEM (1)-+-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        |            +-(QAABORT)
C       |        |            |
C       |        +-DYNMEM (2)-+-MEMADJ (3)-+-(QAABORT)
C       |        |            |            |
C       |        |            |            +-(MDGET)
C       |        |            |            |
C       |        |            |            +-(MDFILL)
C       |        |            |            |
C       |        |            |            +-(MDRSRV)
C       |        |            |            |
C       |        |            |            +-(MDDEBG)
C       |        |            |            |
```

```
C       |         |             |             +-(MDSTAT)
C       |         |             |             |
C       |         |             |             +-(MDLIST)
C       |         |             |             |
C       |         |             |             +-(MDEROR)
C       |         |             |             |
C       |         |             |             +-(QAABORT)
C       |         |             |             |
C       |         |             |             +-(QAABORT)
C       |         |             |             |
C       |         |             |             +-(MDLONG)
C       |         |             |             |
C       |         |             |             +-(MDDEBG)
C       |         |             |             |
C       |         |             |             +-(MDSTAT)
C       |         |             |             |
C       |         |             |             +-(MDLIST)
C       |         |             |             |
C       |         |             |             +-(MDEROR)
C       |         |             |             |
C       |         |             |             +-(QAABORT)
C       |         |             |             |
C       |         |             |             +-(MDCOMP)
C       |         |             |             |
C       |         |             |             +-(MDGIVE)
C       |         |             |             |
C       |         |             |             +-(MDFIND)
C       |         |             |             |
C       |         |             |             +-(MDDEBG)
C       |         |             |             |
C       |         |             |             +-(MDSTAT)
C       |         |             |             |
C       |         |             |             +-(MDLIST)
C       |         |             |             |
C       |         |             |             +-(MDEROR)
C       |         |             |             |
C       |         |             |             +-(QAABORT)
C       |         |             |
C       |         |            +-MEMADJ2>MEMADJ see 3
C       |         |            |
C       |         |            +-MEMADJ3>MEMADJ see 3
C       |         |
C       |        +-ZERODA
C       |         |
C       |        +-DYNMEMC (4)-+-MEMADJC (5)-+-(QAABORT)
C       |         |             |             |
C       |         |             |             +-(MCGET)
C       |         |             |             |
C       |         |             |             +-(MCFILL)
C       |         |             |             |
C       |         |             |             +-(MCRSRV)
C       |         |             |             |
C       |         |             |             +-(MCDEBG)
C       |         |             |             |
C       |         |             |             +-(MCSTAT)
C       |         |             |             |
C       |         |             |             +-(MCLIST)
```

```
C      |        |             |             |
C      |        |             |             +-(MCEROR)
C      |        |             |             |
C      |        |             |             +-(QAABORT)
C      |        |             |             |
C      |        |             |             +-(QAABORT)
C      |        |             |             |
C      |        |             |             +-(MCLONG)
C      |        |             |             |
C      |        |             |             +-(MCFILL)
C      |        |             |             |
C      |        |             |             +-(MCDEBG)
C      |        |             |             |
C      |        |             |             +-(MCSTAT)
C      |        |             |             |
C      |        |             |             +-(MCLIST)
C      |        |             |             |
C      |        |             |             +-(MCEROR)
C      |        |             |             |
C      |        |             |             +-(QAABORT)
C      |        |             |             |
C      |        |             |             +-(MCCOMP)
C      |        |             |             |
C      |        |             |             +-(MCGIVE)
C      |        |             |             |
C      |        |             |             +-(MCFIND)
C      |        |             |             |
C      |        |             |             +-(MCDEBG)
C      |        |             |             |
C      |        |             |             +-(MCSTAT)
C      |        |             |             |
C      |        |             |             +-(MCLIST)
C      |        |             |             |
C      |        |             |             +-(MCEROR)
C      |        |             |             |
C      |        |             |             +-(QAABORT)
C      |        |             |
C      |        |             +-MEMADJC2>MEMADJC see 5
C      |        |             |
C      |        |             +-MEMADJC3>MEMADJC see 5
C      |        |
C      |        +-RECHEA-+-(DBIELBLK)
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
C      |                 +-(DBIPRNAM)
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
C      |                 +-(DBIPROP)
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
C      |                 +-(DBIQAREC)
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
```

```
C      |                 +-(DBINSTEP)
C      |                 |
C      |                 +-(QAABORT)
C      |
C      +-(FILOPEN)
C      |
C      +-(QAABORT)
C      |
C      +-(FILOPEN)
C      |
C      +-(QAABORT)
C      |
C      +-PROGEN-+-SGRDB-+-(FFRDFLDS)
C      |        |       |
C      |        |       +-(QAMAXERR)
C      |        |       |
C      |        |       +-(QAABORT)
C      |        |       |
C      |        |       +-(QAABORT)
C      |        |
C      |        +-ADDMEM1>ADDMEM see 1
C      |        |
C      |        +-DYNMEM see 2
C      |        |
C      |        +-DYNMEMC see 4
C      |        |
C      |        +-ZERODA
C      |        |
C      |        +-RGRDB-+-(FFRDFLDS)
C      |                |
C      |                +-(QAMAXERR)
C      |                |
C      |                +-(QAABORT)
C      |                |
C      |                +-(QAABORT)
C      |
C      +-(FILOPEN)
C      |
C      +-(QAABORT)
C      |
C      +-PROCIN-+-SCHAINS-+-(FFRDFLDS)
C      |        |         |
C      |        |         +-(QAMAXERR)
C      |        |         |
C      |        |         +-(QAMAXERR)
C      |        |         |
C      |        |         +-(QAABORT)
C      |        |
C      |        +-SCATXT-+-(FFRDFLDS)
C      |        |        |
C      |        |        +-(QAMAXERR)
C      |        |        |
C      |        |        +-GETVAL (6)--(QAABORT)
C      |        |        |
C      |        |        +-(QAMAXERR)
C      |        |        |
C      |        |        +-(QAMAXERR)
```

```
C      |        |        |
C      |        |        +-GETVAL see 6
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |
C      |        +-ADDMEM2>ADDMEM see 1
C      |        |
C      |        +-DYNMEM see 2
C      |        |
C      |        +-DYNMEMC see 4
C      |        |
C      |        +-ZERODA
C      |        |
C      |        +-RCHAINS-+-(FFRDFLDS)
C      |        |         |
C      |        |         +-(QAMAXERR)
C      |        |         |
C      |        |         +-(QAMAXERR)
C      |        |         |
C      |        |         +-(QAABORT)
C      |        |         |
C      |        |         +-(QAABORT)
C      |        |         |
C      |        |         +-(QAABORT)
C      |        |         |
C      |        |         +-(QAABORT)
C      |        |
C      |        +-REATXT-+-(FFRDFLDS)
C      |                 |
C      |                 +-(QAMAXERR)
C      |                 |
C      |                 +-(QAMAXERR)
C      |                 |
C      |                 +-GETVAL see 6
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
C      |                 +-(QAABORT)
C      |
C      +-(QABIGLET)
C      |
C      +-PROSDB-+-SCASDB-+-(SDBINIT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(SDBCASES)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(SDBINFO)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(SDBNINFO)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
```

```
C      |        |        +-(QAMAXERR)
C      |        |        |
C      |        |        +-(QAMAXERR)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |
C      |        +-REASDB-+-(STRUPCASE)
C      |        |        |
C      |        |        +-(STRUPCASE)
C      |        |        |
C      |        |        +-(STRUPCASE)
C      |        |        |
C      |        |        +-(SDBRWIND)
C      |        |        |
C      |        |        +-(SDBGETL)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(STRUPCASE)
C      |        |        |
C      |        |        +-(STRUPCASE)
C      |        |        |
C      |        |        +-(STRUPCASE)
C      |        |        |
C      |        |        +-(STRUPCASE)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |        |
C      |        |        +-(QAABORT)
C      |        |
C      |        +-GSDBQA-+-(SDBRWIND)
C      |                 |
C      |                 +-(SDBQUERY)
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
C      |                 +-(SDBQUERY)
C      |                 |
C      |                 +-(QAABORT)
C      |                 |
C      |                 +-(SDBRWIND)
C      |                 |
C      |                 +-(EXFILDAT)
C      |
C      +-(DBOOPEN)
```

```
2957   C       |
2958   C       +-(QAABORT)
2959   C       |
2960   C       +-(QAMAKREC)
2961   C       |
2962   C       +-WRCHEA-+-(DBOQAREC)
2963   C       |        |
2964   C       |        +-(QAABORT)
2965   C       |        |
2966   C       |        +-(DBOQAREC)
2967   C       |        |
2968   C       |        +-(QAABORT)
2969   C       |        |
2970   C       |        +-(DBOHEAD)
2971   C       |        |
2972   C       |        +-(QAABORT)
2973   C       |        |
2974   C       |        +-(DBOVRNAM)
2975   C       |        |
2976   C       |        +-(QAABORT)
2977   C       |        |
2978   C       |        +-(DBOVRNAM)
2979   C       |        |
2980   C       |        +-(QAABORT)
2981   C       |        |
2982   C       |        +-(DBOVRNAM)
2983   C       |        |
2984   C       |        +-(QAABORT)
2985   C       |        |
2986   C       |        +-(DBOVRNAM)
2987   C       |        |
2988   C       |        +-(QAABORT)
2989   C       |        |
2990   C       |        +-(DBOVRNAM)
2991   C       |        |
2992   C       |        +-(QAABORT)
2993   C       |
2994   C       +-DECAYW-+-WRTANA (7)-+-(DBOTIME)
2995   C       |        |            |
2996   C       |        |            +-(DBOVAR)
2997   C       |        |            |
2998   C       |        |            +-(QAABORT)
2999   C       |        |            |
3000   C       |        |            +-(DBOVAR)
3001   C       |        |            |
3002   C       |        |            +-(QAABORT)
3003   C       |        |            |
3004   C       |        |            +-(DBOVAR)
3005   C       |        |            |
3006   C       |        |            +-(QAABORT)
3007   C       |        |            |
3008   C       |        |            +-(DBOVAR)
3009   C       |        |            |
3010   C       |        |            +-(QAABORT)
3011   C       |        |            |
3012   C       |        |            +-(DBOVAR)
3013   C       |        |            |
```

```
C      |        |            +-(QAABORT)
C      |        |            |
C      |        |            +-(DBOSTEP)
C      |        |            |
C      |        |            +-(QAABORT)
C      |        |
C      |        +-WRTANA see 7
C      |        |
C      |        +-GINDX (8)--(QAABORT)
C      |        |
C      |        +-GJNDX--(QAABORT)
C      |        |
C      |        +-QUANKG-+-(QAABORT)
C      |        |        |
C      |        |        +-PEXP
C      |        |        |
C      |        |        +-PEXP
C      |        |
C      |        +-WRTANA see 7
C      |        |
C      |        +-WRTANA see 7
C      |
C      +-WRIOUT-+-GINDX see 8
C      |        |
C      |        +-GINDX see 8
C      |        |
C      |        +-WRPLFIL--(QAABORT)
C      |
C      +-WRPTRN
C      |
C      +-(DBPTITLE)
C      |
C      +-(DBPVERS)
C      |
C      +-(DBPQAREC)
C      |
C      +-(DBPSIZES)
C      |
C      +-(DBICLOSE)
C      |
C      +-(QAABORT)
C      |
C      +-(DBOCLOSE)
C      |
C      +-(QAABORT)
C      |
C      +-(QACPUS)
C      |
C      +-(QAPAGE)
C
*COMDECK GEOPAR
C*********************************************************************
C    /GEOPAR/ ($include 'GEOPAR.INC')
C     HEADER = Character description of problem, etc...
C     IMAX   = No. of I-lines in grid
C     JMAX   = No. of J-lines in grid
C     KMAX   = No. of K-lines in grid
```

```
3071   C     LESSEL = List of Element Side sets concatenated Element List
3072   C     LESSNL = List of Element Side sets concatenated Nodes associated
3073   C              with each element side set Node List
3074   C     LNPSNL = List of Nodal Point set concatenated Nodes List
3075   C     MAXNENO= Max. no. of nodes of any element
3076   C     NDIM   = Number of physical DIMensions
3077   C     NDBCAM = CAMDAT versoin number
3078   C     NELBLK = Number of ELement BLocKs in mesh
3079   C     NELX   = No. of elements along X-axis of mesh
3080   C     NELY   = No. of elements along Y-axis of mesh
3081   C     NELZ   = No. of elements along Z-axis of mesh
3082   C     NQAREC = Number of QA records
3083   C     NSTEP  = No. of time steps in input CAMDAT (INTEGER)
3084   C     NUMEL  = NUmber of ELeMents in mesh
3085   C     NUMNOD = NUMber of NODes in mesh
3086   C     NUMNPS = No. of Nodal Point Sets
3087   C     NUMESS = No. of Element Side Sets
3088   C     NUQATR = No. of UniQue ATtRibute names
3089   C     NUQPR0 = No. of UniQUe PRoperty names (old)
3090   C     NUQPRP = No. of UniQUe PRoPerty names (new)
3091   C     NVAREL = No. of ELEMENT type ANALYSIS variables
3092   C     NXINFO = No. of information records
3093   C***********************************************************************
3094   C234567
3095         CHARACTER*(80) HEADER
3096         INTEGER
3097        1IMAX,    JMAX,    KMAX,    MAXNENO, LESSEL,  LESSNL,  LNPSNL,
3098        2NDBCAM,  NDIM,    NELBLK,  NELX,    NELY,    NELZ,    NQAREC,
3099        3NSTEP,   NUMEL,   NUMESS,  NUMNOD,  NUMNPS,  NUQATR,  NUQPR0,
3100        4NUQPRP,  NVARHI,  NVARHI2, NVARGL,  NVARGL2, NVARND,  NVAREL,
3101        5NXINFO
3102         COMMON /GEOPAR/
3103        1IMAX,    JMAX,    KMAX,    MAXNENO, LESSEL,  LESSNL,  LNPSNL,
3104        2NDBCAM,  NDIM,    NELBLK,  NELX,    NELY,    NELZ,    NQAREC,
3105        3NSTEP,   NUMEL,   NUMESS,  NUMNOD,  NUMNPS,  NUQATR,  NUQPR0,
3106        4NUQPRP,  NVARHI,  NVARHI2, NVARGL,  NVARGL2, NVARND,  NVAREL,
3107        5NXINFO
3108   C***********************************************************************
3109
3110   *COMDECK INDEX
3111   C***********************************************************************
3112   C    /INDEX/ ($include 'INDEX.INC')
3113   C     LASCIDX= Last index of CHARACTER*1 dynamic arrays (INTEGER)
3114   C     BCDAIDX= First index of current CHAR*1 dynamic array (INTEGER)
3115   C     ECDAIDX= Last  index of current CHAR*1 dynamic array (INTEGER)
3116   C     LASRIDX= Last index of REAL dynamic arrays (INTEGER)
3117   C     BRDAIDX= First index of current REAL dynamic array (INTEGER)
3118   C     ERDAIDX= Last  index of current REAL dynamic array (INTEGER)
3119   C***********************************************************************
3120   C234567
3121         INTEGER BCDAIDX,BRDAIDX,ECDAIDX,ERDAIDX,LASCIDX,LASRIDX
3122         COMMON /INDEX/ BCDAIDX,BRDAIDX,ECDAIDX,ERDAIDX,LASCIDX,LASRIDX
3123   C***********************************************************************
3124   *COMDECK LOCAT
3125   C***********************************************************************
3126   C    /LOCATC/ ($include 'LOCAT.INC')
3127   C     LCPTR  = Array used for pointing to each dynamic array start
```

```
C              location in the base CHARACTER*1 array, C.
C     L[name]= Pointer to CHAR dynamic array ( L[dynamic-array-name] )
C***********************************************************************
C    /LOCATR/ ($include 'LOCAT.INC')
C     LRPTR  = Array used for pointing to each dynamic array start
C              location in the base REAL array, Q.
C     L[name]= Pointer to REAL dynamic array ( L[dynamic-array-name] )
C***********************************************************************
C234567
      INTEGER
     $LIDEBLK, LNUMPRP, LIASPRP,  LXMATPR, LTIME,    LHIFLAG,
     $LISEVOK, LVALGLV, LVALNDV,  LVALELV,  LVALHIV,
     $LMAPGEN, LNUMCEL, LRPTR(13)
      EQUIVALENCE (LRPTR,LIDEBLK)
      COMMON /LOCATR/
     $LIDEBLK, LNUMPRP,  LIASPRP,  LXMATPR, LTIME,    LHIFLAG,
     $LISEVOK, LVALGLV, LVALNDV,  LVALELV,  LVALHIV,
     $LMAPGEN, LNUMCEL
      INTEGER
     $LQAINFO,  LNAMELB, LNMATPR,
     $LSAVNAM, LNAMINF, LCPTR(5)
      EQUIVALENCE (LCPTR,LQAINFO)
      COMMON /LOCATC/
     $LQAINFO,  LNAMELB, LNMATPR,
     $LSAVNAM, LNAMINF
C***********************************************************************
*COMDECK MACHDP
C***********************************************************************
C     /MACHDP/ (from FORTRAN statement: INCLUDE 'MACHDP.INC')
C      XLIMDP = MACHDP limit for zero (REAL*8)
C      XMINDP = MACHDP limit lower exponent value (REAL*8)
C      XMAXDP = MACHDP limit upper exponent value (REAL*8)
C      VALMAXD= Largest DOUBLE PRECISION real value allowed (REAL*8)
C***********************************************************************
C234567
      REAL*8 VALMAXD, XLIMDP, XMAXDP, XMINDP
      COMMON /MACHDP/ VALMAXD, XLIMDP, XMAXDP, XMINDP
C***********************************************************************

*COMDECK MISCDAT
C***********************************************************************
C    /MISCDAT/ (from FORTRAN statement: INCLUDE 'MISCDAT.INC')
C     LTYEARS = Logical variable,
C             =.TRUE.; Time variables used are to be in YEARS
C              (Convert intrusion times specified in SECONDS
C              to YEARS)
C     LTSECON = Logical variable,
C             = .TRUE.; Time variables used are to be in SECONDS
C               (Convert intrusion times specified in YEARS to
C                SECONDS)
C     GLOBAL
C***********************************************************************
C234567
      INTEGER HIFLAG, NSOLNS
      LOGICAL GLOBAL, LTSECON, LTYEARS
      COMMON /MISCDAT/ HIFLAG, GLOBAL, LTSECON, LTYEARS, NSOLNS
C***********************************************************************
```

```
*COMDECK PARAMS
C*********************************************************************
C    /PARAMS/ (from FORTRAN statement: INCLUDE 'PARAMS.INC')
C     MAXSOLN = Max. no. of infiltration solutions [INTEGER]
C     MAXCELL  = Max. NUMBER of grid cells where infiltration occurs
[INTEGER]
C*********************************************************************
C234567
      INTEGER MAXCELL, MAXSOLN, MAXTIMES
      PARAMETER (MAXCELL=25, MAXSOLN=12000, MAXTIMES=2)
C*********************************************************************

      INTEGER NUMCELL, NUMSOLN, STEP_STORE
      REAL AVE_INF, MAXEAST, MAXNORTH, MINEAST, MINNORTH, TIME_STORE
      CHARACTER*8  ARRAY_STORE, NAMINF, NAMNUM, NAMRUN
      LOGICAL INCLUDE, SUBSHED
      COMMON /POSTINF/ INCLUDE, SUBSHED, NUMCELL, NUMSOLN, STEP_STORE,
     +                 AVE_INF, MAXEAST, MAXNORTH,  MINEAST, MINNORTH,
     +                 TIME_STORE, ARRAY_STORE, NAMINF, NAMNUM, NAMRUN
*COMDECK QA
C*********************************************************************
C    /QA/ (from FORTRAN statement: INCLUDE 'QA.INC')
C     PRGNAM = Program name (CHAR*12)
C     PRGVER = "       version (CHAR*8)
C     PRGUPD = "       update (CHAR*8)
C     PRGATH = "       author (CHAR*80)
C     PRGSPN = "       sponsor (CHAR*80)
C*********************************************************************
C234567
      CHARACTER*(8)  PRGUPD,PRGVER
      CHARACTER*(12) PRGNAM
      CHARACTER*(80) PRGATH,PRGSPN
      COMMON /QA/ PRGNAM,PRGVER,PRGUPD,PRGATH,PRGSPN
C*********************************************************************
```

ATTACHMENT VII

LISTING OF SAMPLE INPUT FOR ROUTINES

Example input files are included for the following routines in order of use in analysis. They appear in this attachment in the order below. Table VII-1 contains a cross reference chart describing the linkage of input files and output files for these routines.

GENMESH
MATSET
PRELHS
LHS
POSTLHS
PREINFIL
INFIL
POSTINFIL
ALGEBRACDB

Table VII-1. Code I/O Files Flowchart Key

Code	Input File	Table No.	Output File	Location of Input Files
GENMESH	*username_gn*.inp	VII-2	*username_gn.*cdb	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.MATSET]
MATSET	*username_gn.*cdb *username_ms*.inp	VII-3	*username_ms.*cdb	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.MATSET]
PRELHS	Prelhs.inp infil.sdb	VII-4a VII-4b	lhs.inp	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.GLACIAL.PRELHS]
LHS	lhs.inp	VII-5	lhs.out	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.GLACIAL.LHS]
POSTLHS	* *username_ms* cdb (from MATSET) postlhs.inp	VII-6	*username_lhs_r###.*cdb	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.GLACIAL.LHS]
PREINFIL	*usernamepre*.inp *template*.inp *username_lhs_###*.cdb	VII-7,8	*username_inf_###*.inp	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.PREINFIL.GLACIAL]
INFIL	*username_inf_###*.inp geospatial input climate input	VII-9	Infil_###.out (output file containing rate maps)	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.GLACIAL.*watershed_name*]
POSTINFIL	*username_ms*.inp	VII-10	*username_pi_###.*cdb	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.GLACIAL]
ALGEBRACDB	*username_pi*.inp *username_pi_###.*cdb	VII-11	*username_alg_###.*cdb	I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.GLACIAL]

- CDB – Computational Data Base file
- *username* – User defines this name
- .inp suffix denotes input user control file
- ### suffix denotes realizations 1 through 100

Table VII-2. GENMESH Sample Input User Control File for Infiltration Uncertainty Analysis, McCurley (299-1282) December 1999

```
!=================================================================
!
! TITLE:     3-D mesh/grid for Infiltration Uncertainty Analysis
! DATE:      12-JAN-1999
! ANALYST:   R. D. McCurley, SNL/COMPA 299-1282
!
!=================================================================
!
*TITLE
       TITLE=3-D MESH/GRID WITH ELEVATION ELEMENTS (SURFACE NORMAL TO Z)
!
*UNITS
       UNITS=SYSTEM_INTERNATIONAL
!
*SETUP
        DIM=    3
        ORIGIN= 0., 0., 0.
        IJKMAX= 11, 11, 2
!
*GRID
        DEL, COORD=X, DEL=1.0, INRANGE=1,11
        DEL, COORD=Y, DEL=1.0, INRANGE=1,11
        DEL, COORD=Z, DEL=1.0, INRANGE=1,2
!
*REGIONS
! -- test region1 for infiltration
        REGION=1, IRANGE=1,6,  JRANGE=1,11, KRANGE=1,2
        REGION=1, IRANGE=6,11, JRANGE=6,11, KRANGE=1,2
! -- test region1 for infiltration
        REGION=2, IRANGE=6,11, JRANGE=1,6, KRANGE=1,2
!
*ELEVATION_elements, ADJUST_Z_COORDINATES
!
        LOCAT, IRANGE=1,2, JRANGE=1,2, KRANGE=1,2, THICK=1.0, ELEVAT=0.0
!
        LOCAT, IRANGE=2,3, JRANGE=1,2, KRANGE=1,2, THICK=1.5, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=2,3, KRANGE=1,2, THICK=1.5, ELEVAT=0.0
!
        LOCAT, IRANGE=3,4, JRANGE=1,2, KRANGE=1,2, THICK=2.0, ELEVAT=0.0
        LOCAT, IRANGE=2,3, JRANGE=2,3, KRANGE=1,2, THICK=2.0, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=3,4, KRANGE=1,2, THICK=2.0, ELEVAT=0.0
!
        LOCAT, IRANGE=4,5, JRANGE=1,2, KRANGE=1,2, THICK=2.5, ELEVAT=0.0
        LOCAT, IRANGE=3,4, JRANGE=2,3, KRANGE=1,2, THICK=2.5, ELEVAT=0.0
        LOCAT, IRANGE=2,3, JRANGE=3,4, KRANGE=1,2, THICK=2.5, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=4,5, KRANGE=1,2, THICK=2.5, ELEVAT=0.0
!
        LOCAT, IRANGE=5,6, JRANGE=1,2, KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=4,5, JRANGE=2,3, KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=3,4, JRANGE=3,4, KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=2,3, JRANGE=4,5, KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=5,6, KRANGE=1,2, THICK=3.0, ELEVAT=0.0
!
        LOCAT, IRANGE=6,7, JRANGE=1,2, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=5,6, JRANGE=2,3, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=4,5, JRANGE=3,4, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=3,4, JRANGE=4,5, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=2,3, JRANGE=5,6, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=6,7, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
!
        LOCAT, IRANGE=7,8, JRANGE=1,2, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=6,7, JRANGE=2,3, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=5,6, JRANGE=3,4, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=4,5, JRANGE=4,5, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=3,4, JRANGE=5,6, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=2,3, JRANGE=6,7, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=7,8, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
```

```
!
        LOCAT, IRANGE=8,9, JRANGE=1,2, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=7,8, JRANGE=2,3, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=6,7, JRANGE=3,4, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=5,6, JRANGE=4,5, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=4,5, JRANGE=5,6, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=3,4, JRANGE=6,7, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=2,3, JRANGE=7,8, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=1,2, JRANGE=8,9, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
!
        LOCAT, IRANGE=9,10, JRANGE=1,2,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=8,9,  JRANGE=2,3,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=7,8,  JRANGE=3,4,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=6,7,  JRANGE=4,5,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=5,6,  JRANGE=5,6,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=4,5,  JRANGE=6,7,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=3,4,  JRANGE=7,8,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=2,3,  JRANGE=8,9,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=1,2,  JRANGE=9,10, KRANGE=1,2, THICK=5.0, ELEVAT=0.0
!!
        LOCAT, IRANGE=10,11, JRANGE=1,2,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=2,3,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=3,4,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=7,8,   JRANGE=4,5    KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=6,7,   JRANGE=5,6,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=5,6,   JRANGE=6,7,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=4,5,   JRANGE=7,8,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=3,4,   JRANGE=8,9,   KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=2,3,   JRANGE=9,10,  KRANGE=1,2, THICK=5.5, ELEVAT=0.0
        LOCAT, IRANGE=1,2,   JRANGE=10,11, KRANGE=1,2, THICK=5.5, ELEVAT=0.0
!!
        LOCAT, IRANGE=2,3,   JRANGE=10,11, KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=3,4,   JRANGE=9,10,  KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=4,5,   JRANGE=8,9,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=5,6,   JRANGE=7,8,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=6,7,   JRANGE=6,7,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=7,8,   JRANGE=5,6,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=4,5,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=3,4,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=2,3,   KRANGE=1,2, THICK=5.0, ELEVAT=0.0
!
        LOCAT, IRANGE=3,4,   JRANGE=10,11, KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=4,5,   JRANGE=9,10,  KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=5,6,   JRANGE=8,9,   KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=6,7,   JRANGE=7,8,   KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=7,8,   JRANGE=6,7,   KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=5,6,   KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=4,5,   KRANGE=1,2, THICK=4.5, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=3,4,   KRANGE=1,2, THICK=4.5, ELEVAT=0.0
!
        LOCAT, IRANGE=4,5,   JRANGE=10,11, KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=5,6,   JRANGE=9,10,  KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=6,7,   JRANGE=8,9,   KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=7,8,   JRANGE=7,8,   KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=6,7,   KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=5,6,   KRANGE=1,2, THICK=4.0, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=4,5,   KRANGE=1,2, THICK=4.0, ELEVAT=0.0
!
        LOCAT, IRANGE=5,6,   JRANGE=10,11, KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=6,7,   JRANGE=9,10,  KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=7,8,   JRANGE=8,9,   KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=7,8,   KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=6,7,   KRANGE=1,2, THICK=3.5, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=5,6,   KRANGE=1,2, THICK=3.5, ELEVAT=0.0
!
        LOCAT, IRANGE=6,7,   JRANGE=10,11, KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=7,8,   JRANGE=9,10,  KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=8,9,   KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=7,8,   KRANGE=1,2, THICK=3.0, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=6,7,   KRANGE=1,2, THICK=3.0, ELEVAT=0.0
!
```

```
        LOCAT, IRANGE=7,8,   JRANGE=10,11, KRANGE=1,2, THICK=2.5, ELEVAT=0.0
        LOCAT, IRANGE=8,9,   JRANGE=9,10,  KRANGE=1,2, THICK=2.5, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=8,9,   KRANGE=1,2, THICK=2.5, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=7,8,   KRANGE=1,2, THICK=2.5, ELEVAT=0.0
!
        LOCAT, IRANGE=8,9,   JRANGE=10,11, KRANGE=1,2, THICK=2.0, ELEVAT=0.0
        LOCAT, IRANGE=9,10,  JRANGE=9,10,  KRANGE=1,2, THICK=2.0, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=8,9,   KRANGE=1,2, THICK=2.0, ELEVAT=0.0
!
        LOCAT, IRANGE=9,10,  JRANGE=10,11, KRANGE=1,2, THICK=1.5, ELEVAT=0.0
        LOCAT, IRANGE=10,11, JRANGE=9,10,  KRANGE=1,2, THICK=1.5, ELEVAT=0.0
!
        LOCAT, IRANGE=10,11, JRANGE=10,11, KRANGE=1,2, THICK=1.0, ELEVAT=0.0
!
!*BOUNDARY_FLAGS
!
*END
```

Table VII-3. Sample Input User Control File for MATSET 9.01 routine, McCurley (299-1282) December 1999

```
!=================================================================
!
!   TITLE:    MATSET input text file for MATSET 9.01
!   ANALYST:  Ron McCurley - SNL/COMPA
!   DATE:     May-1999
!
!=================================================================
!
*PRINt_assigned_values
!
*HEADING
       SCENario, Test_YMP
       SCALe,    LOCAL
       TITLe,    MATSET 9.01: CAMDAT_LIB,SDBREAD_LIB & RENAMING loaded
!
*UNITS="System Internationale"
!
!*CREATE_blocks
!       BLOCK_IDS=1,2
!
*RETRieve*name
       COORDinates, DIM=3, NAMES=X,Y,Z
       MATerials, 1=FOOTPRNT,         2=OUTSIDE
!
       PROPerties, MATERIAL=FOOTPRNT,  NAMES= BRPOROS, BRZDEPTH, SOILDEPM, &
                                              PRECIPM, POTETMUL, BRPERM,   &
                                              SOILPERM, ETCOEFFA, ETCOEFFB, &
                                              FLAREA, ATEMP1, SNOPAR1,SUBPAR1
       PROPerties, MATERIAL=OUTSIDE, NAMES= BRPOROS, BRZDEPTH, SOILDEPM, &
                                             PRECIPM, POTETMUL, BRPERM,   &
                                             SOILPERM, ETCOEFFA, ETCOEFFB, &
                                             FLAREA, ATEMP1, SNOPAR1, SUBPAR1
!
*SET_values
!
       PROPerty_values, MATERIAL=FOOTPRNT,NAME*values: BRPOROS=.02, &
                                            BRZDEPTH=1.5, &
                                            SOILDEPM=1.0, PRECIPM=1.0, &
                                            POTETMUL=1.0, BRPERM=1.0,   &
                                            SOILPERM=1.0, ETCOEFFA=-1.5, &
                                            ETCOEFFB=1.26, SNOPAR1=1.78, &
                                            SUBPAR1 = 0.1, FLAREA=0.5, &
                                            ATEMP1=17.3
       PROPerty_values, MATERIAL=OUTSIDE,NAME*values: BRPOROS=.02, &
                                            BRZDEPTH=1.5, &
                                            SOILDEPM=1.0, PRECIPM=1.0, &
                                            POTETMUL=1.0, BRPERM=1.0,   &
                                            SOILPERM=1.0, ETCOEFFA=-1.5, &
                                            ETCOEFFB=1.26, SNOPAR1=1.78, &
                                            SUBPAR1 = 0.1, FLAREA=0.5, &
                                            ATEMP1=17.3
  !=====================================================================
*END
```

Table VII-4a. Sample Input User Control File for PRELHS routine, McCurley (299-1282) December 1999

```
!=====================================================================
!  TITLE:    PRELHS input file == PRELHS.INP
!  ANALYST:  Ron McCurley, Aug 19, 1999  COMPA/SNL 505-299-1282
!=====================================================================
!
!  DESCRIPTION:
!  PRELHS Variable Sampling Input File for Glacial Transition Climate
!
!========= No Comments Allowed between *ECHO and *ENDECHO ==============
*ECHOLHS
TITLE BEGIN MONTE CARLO, Nov 8, 1999 SAMPLING FOR FOOTPRINT SET WATERSHEDS
NOBS                100
RANDOM SEED         0733050198
OUTPUT CORR HIST DATA PLOT
*ENDECHO
!
!==== PROPERTIES TO BE RETRIEVED FROM YMP DATABASE, '.SDB' ====
*RETRIEVE
!
   MATERIALS,  FOOTPRNT
   PROPERTIES, BRPOROS, BRZDEPTH, SOILDEPM, PRECIPM, POTETMUL, BRPERM, &
               SOILPERM, ETCOEFFA, ETCOEFFB, FLAREA, SUBPAR1, SNOPAR1
!
!=====================================================================
!
*END
```

Table VII-4b. ASCII Datafile Containing Uncertain Parameter Distributions Used to Set Up Input Files for LHS, McCurley (299-1282) December 1999

```
*HEADERLINES=1
*ENTRY=IDMTRL,IDPRAM
ID         2:5        I4        'ID'
IDMTRL     7:14       A8        'MATERIAL ID'
IDPRAM    16:23       A8        'PARAMETER ID'
MEAN      24:35       1PE12.4     'MEAN'
MEDIAN    36:47       1PE12.4     'MEDIAN'
LOWRNG    48:59       1PE12.4     'MINIMUM'
HIRNGE    60:71       1PE12.4     'MAXIMUM'
VRYFRC    72:83       1PE12.4     'COEFFICIENT OF VARIATION'
SCALE     84:95       1PE12.4     'PROBABILITY'
DISTYP    97:108      A12       'DISTRIBUTION'
UNITS    110:121      A12       'UNITS'
IDWELL   123:130      A8        'DUMMY WELL ID'
IDSCAL   123:130      A8        'DUMMY SCALE ID'
*NMGEOL=INFIL.SDB
*NSDBVR=1
*ENDDSCR
, BRZDEPTH, SOILDEPM, PRECIPM, POTETMUL, BRPERM,
              SOILPERM, ETCOEFFA
 ID   IDMTRL   IDPRAM  MEAN        MEDIAN      LOWRNG      HIRNGE      VRYFRC      SCALE        DISTYP       UNITS
 1001 FOOTPRNT BRPOROS   2.0000E-02  2.0000E-02  0.0000E+00  4.0000E-02  0.0000E+00  0.0000E+00 NORMAL       NONE
 1002 FOOTPRNT BRZDEPTH  3.0000E+00  3.0000E+00  1.0000E+00  5.0000E+00  0.0000E+00  0.0000E+00 NORMAL       m
 1003 FOOTPRNT SOILDEPM  1.0000E+00  1.0000E+00  5.0000E-01  1.5000E+00  0.0000E+00  0.0000E+00 NORMAL       NONE
 1004 FOOTPRNT PRECIPM   1.0000E+00  1.0000E+00  6.0000E-01  1.4000E+00  0.0000E+00  0.0000E+00 NORMAL       NONE
 1005 FOOTPRNT POTETMUL  1.0000E+00  1.0000E+00  6.0000E-01  1.4000E+00  0.0000E+00  0.0000E+00 NORMAL       NONE
 1006 FOOTPRNT BRPERM    1.0000E+00  1.0000E+00  5.0000E-02  2.0000E+01  0.0000E+00  0.0000E+00 LOGNORMAL    NONE
 1007 FOOTPRNT SOILPERM  1.0000E+00  1.0000E+00  5.0000E-02  2.0000E+01  0.0000E+00  0.0000E+00 LOGNORMAL    NONE
 1008 FOOTPRNT ETCOEFFA  1.0000E+01  1.0000E+01  5.0000E+00  1.5000E+01  0.0000E+00  0.0000E+00 NORMAL       NONE
 1009 FOOTPRNT ETCOEFFB  1.0400E+00  1.0400E+00  5.4000E-01  1.5400E+00  0.0000E+00  0.0000E+00 NORMAL       NONE
 1010 FOOTPRNT FLAREA    2.5000E-01  2.5000E-01  1.0000E-02  4.9000E-01  0.0000E+00  0.0000E+00 NORMAL       NONE
 1011 FOOTPRNT SNOPAR1   1.7800E+00  1.7800E+00  7.8000E-01  2.7800E+00  0.0000E+00  0.0000E+00 UNIFORM      NONE
 1012 FOOTPRNT SUBPAR1   1.0000E-01  1.0000E-01  0.0000E+00  2.0000E-01  0.0000E+00  0.0000E+00 UNIFORM      NONE
 1013 FOOTPRNT ATEMP1    1.7300E+01  1.7300E+01  1.2300E+01  2.2300E+01  0.0000E-02  0.0000E+00 NORMAL       NONE
```

Table VII-5. Input file for LHS that is automatically produced by PRELHS routine.

```
TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05
TITLE BEGIN MONTE CARLO, Nov 8, 1999 SAMPLING FOR FOOTPRINT SET WATERSHEDS
NOBS                100
RANDOM SEED         0733050198
NORMAL                  FOOTPRNT  BRPOROS
    0.00000E+00    4.00000E-02
NORMAL                  FOOTPRNT  BRZDEPTH
    1.00000E+00    5.00000E+00
NORMAL                  FOOTPRNT  SOILDEPM
    5.00000E-01    1.50000E+00
NORMAL                  FOOTPRNT  PRECIPM
    6.00000E-01    1.40000E+00
NORMAL                  FOOTPRNT  POTETMUL
    6.00000E-01    1.40000E+00
LOGNORMAL               FOOTPRNT  BRPERM
    5.00000E-02    2.00000E+01
LOGNORMAL               FOOTPRNT  SOILPERM
    5.00000E-02    2.00000E+01
NORMAL                  FOOTPRNT  ETCOEFFA
    5.00000E+00    1.50000E+01
NORMAL                  FOOTPRNT  ETCOEFFB
    5.40000E-01    1.54000E+00
NORMAL                  FOOTPRNT  FLAREA
    1.00000E-02    4.90000E-01
UNIFORM                 FOOTPRNT  SUBPAR1
    0.00000E+00    2.00000E-01
UNIFORM                 FOOTPRNT  SNOPAR1
    7.80000E-01    2.78000E+00
OUTPUT CORR HIST DATA PLOT
TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05
```

Table VII-6. Sample Input User Control File for POSTLHS Routine which Post-processes the LHS Output, McCurley (299-1282) December 1999

```
!=====================================================================
!  TITLE:    POSTLHS input file == POSTLHS.INP
!  ANALYST:  R. McCurley--  10/14/99 SNL/COMPA 505-299-1282
!=====================================================================
!
!  DESCRIPTION:  YMP INFIL FOOTPRINT WATERSHEDS ANALYSIS, Glacial
!                Transition
!
!=====================================================================
*ATTRIBUTE_STORE
   MATERIALS  = FOOTPRNT , &
!   ATTRIBUTE_NAMES =
   PROPERTY_NAMES = BRPOROS, BRZDEPTH, SOILDEPM, PRECIPM, POTETMUL, BRPERM, &
                    SOILPERM, ETCOEFFA, ETCOEFFB, FLAREA, SUBPAR1, SNOPAR1
!
!=====================================================================
*END
```

Table VII-7. Sample Input User Control File for PREINFIL Routine, McCurley (299-1282) December 1999

```
!PREINFIL user input file -- alpha version
!Analyst--Ron McCurley SNL/COMPA  299-1282
! Date Oct 21, 1999
!Begin input
*FILES
 NAMES: MAIN=INFILMN_ww1_R###.OUT, ECHO=INFILECHO_R###.OUT, &
        SUMMARY=INFILSM_ww1_R###.OUT
*REPLACE
   REGION: FOOTPRNT
   PROPERTIES: PPTFACT=PRECIPM,ETFACT=POTETMUL,RDEPTH3=BRZDEPTH, &
       SKSFACT=SOILPERM, FLAREA=SAME, &
       SDFACT=SOILDEPM, RKPOR=BRPOROS, IMBFACT=BRPERM, BARSOIL1=ETCOEFFA, &
       BARSOIL2=ETCOEFFB, SUBPAR1=SAME, SNOPAR1=SAME
*END
```

Table VII-8. Template Input User Control File for INFIL Version A_2a.1 Input to PREINFIL

(DTN: GS00308311221.011)

```
INFIL2a1.ctl: Solitario East, Tule Lake, ww1-2a1-gm1-k2-w20 (11/18/1999)
1   0.00000001                                  IROUT(1 = coupled, 0 = uncoupled, -1 = flow routing off, -2 = infil off), IFRTOL
2   2     1.78                                      ISNOW, ISNWMOD, SNOPAR1
3   0.1   0.3                                    ISUBLIM, SUBPAR1, SUBPAR2
0   1.                                           IPPTTEST (1 for testing), PPTTEST = constant
0   .0                                           IETTEST (1 for testing), ETTEST = constant
30.0                                                 CELSIZE (node spacing (meters): using for flow volume calculations)
544721.0  4072203.0                              xcfs,ycfs: coords for discharge cell
1950  1    1996    366   1   5                  yr1 = start year, dnn1 = start day, yr2 = end year, dn2 = end day
1     1    1    1                               multipliers ( pptfact, etfact, imbfact, sksfact)
1.0   0    0.4                                  SDFACT (soil depth multiplier), IVEGC (set to 1 for map data), FVEGC (use if IVEGC =
0)
1.0   0.8   0.8    0.2                           ROOTF1,ROOTF2,ROOTF3,ROOTF4
1.0   1.0   0.5    0.1                           MAXWGT1, MAXWGT2, MAXWGT3, MAXWGT4
0.3   2.0   3.0    2.0                            RDEPTH1,RDEPTH2,RDEPTH3,RDEPTH4,RDEPTHF
0.02  1.0  .25                                   RKPOR, RKMMFACT, FLAREA
1   1    0                                       INFMOD, ETMOD, RUNMOD
 -10.0  1.04                                BARSOIL1, BARSOIL2:  bare soil et parameters
3   17.3  11.74                                 IAIRTEMP = 1 for new air temp model, ATEMP1 = avg. air temp, ATEMP2 = air temp
seasonal deviation
2                                                HSTEP: time step for PET model (hours)
5  181  3                                        PPTYUC (=5 diminished elev. correlation, =2 for 4JA , =1 for simple elevation
transfer), AAPREPX, IPPTDAT
Tulelake.inp                                     input file name:  daily precip
     0      1    0.5      1     1                dpthflag, irtz, delvwcf, moistcr, fracmod
     0      1.75                                  IVWCFLG,   vwcfact
ww1.w20                                          input file name:  map parameters (*.inp)
-1
ww1-gm1.2a1                                        dayall: average daily mass balance terms
1    1                                     ndaymap, imap
70   1995
ww1-gm1.2a2
ww1-gm1.2a3                                        output file name:  daily mass balance
ww1-gm1.2a4                                        output file name:  total daily fluxes
1      1                                         dbgflag, dbgflag2
ww1-gm1.2a5                                        output file name:  annual mass balance terms
0                                                IDEBUG:  debugging option parameter
ww1-gm1.2a6                                        new debug file
ww1-gm1                                          map output:  annual totals or mult-year averages
--
--------------- Parameters for dynamic root-zone function -------------------------------------
--     depth  rtza   rtzb   rtzc  rtzd  bsoil    delvwc
--     m
     4
```

```
     1    0.5     15      3     3     2     0.30      0.50
     2    1.5     15      4     2     2     0.20      0.50
     3    4.5     10    1.5     1     2     0.10      0.50
     4    6.0     10    1.5     1     2     0.05      0.25
--

--------------- Soil Properties (Brooks & Corey/van Genuchten combined) ------------------------------------------
--     fdcp   etresidpor    beta  alpah ksat     PE        B     n     vg-alpha sorp     SOILP   potis
--                                       Kg s /m^3J/Kg                 1/(J/Kg) ???              J/Kg
    10
     1  0.242  0.054  0.366  -3.5  1.26  5.6E-04 -1.19E+00  4.72  1.24  5.2E-01    0.390    0.05 -1.0E+02
     2  0.173  0.023  0.315  -3.5  1.26  1.2E-03 -9.41E-01  3.70  1.31  6.2E-01    0.500    0.05 -1.0E+02
     3  0.163  0.017  0.325  -3.5  1.26  1.3E-03 -8.60E-01  3.36  1.36  6.6E-01    0.510    0.05 -1.0E+02
     4  0.073  0.002  0.281  -3.5  1.26  3.8E-03 -6.22E-01  2.18  1.62  8.7E-01    0.700    0.05 -1.0E+02
     5  0.200  0.035  0.330  -3.5  1.26  6.7E-04 -1.07E+00  4.14  1.78  5.6E-01    0.400    0.05 -1.0E+02
     6  0.150  0.011  0.339  -3.5  1.26  2.7E-03 -7.55E-01  3.06  1.40  7.4E-01    0.700    0.05 -1.0E+02
     7  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     8  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     9  0.189  0.028  0.322  -3.5  1.26  5.7E-04 -1.08E+00  3.88  1.30  5.5E-01    0.370    0.05 -1.0E+02
    10  0.189  0.028  0.322  -3.5  1.26  5.7E-05 -1.08E+00  3.88  1.00  5.5E-01    0.037    0.05 -1.0E+02
--
---------------Rockl Properties (Brooks & Corey/van Genuchten combined)------------------------------------------
--     rkcp   etresidpor    beta  alpha ksat     PE        B     n     vg-alpha fracks   imbibe  potir
--                                       Kg s /m^3J/Kg                 1/(J/Kg) Kg s /m^3mm/dy   J/Kg
     129
       1     0.35    0.065    0.366     -1.5     1.26   0.0011    -0.93      3.6     1.25     0.52  0.00056      500     -100
       2    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       3    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       4    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       5    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       6    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       7    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       8    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       9    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      10    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      11    0.105     0.02     0.11     -1.5     1.26  4.0E-09       -6     3.92     1.47       64  2.4E-07     0.06     -100
      12    0.388    0.039    0.393     -1.5     1.26 0.000053     -242     4.57     1.38     2400 0.000053     2.74     -100
      13     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
      14    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      15    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      16    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      17    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.35     -100
      18    0.248     0.01    0.253     -1.5     1.26  3.8E-06    -82.3     2.71     1.84      830  3.9E-06     3.34     -100
      19    0.159     0.01    0.164     -1.5     1.26  1.2E-06     -140     3.61     1.53     1400  1.3E-06     1.13     -100
      20    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      21    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      22    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      23    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      24    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      25    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      26    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
```

27	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
28	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
29	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
30	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
31	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
32	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
33	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
34	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
35	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
36	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
37	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
38	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
39	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
40	0.494	0.05	0.499	-1.5	1.26	0.000088	-341	4.19	1.43	3400	0.000088	75.62	-100
41	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
42	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
43	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
44	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-26.9	5.6	1.29	270	2.1E-07	0.09	-100
45	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
99	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
46	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
47	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
48	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
49	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
50	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
51	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
52	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
53	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
54	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
55	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
56	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
57	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
58	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
59	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
60	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
61	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
62	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
63	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
64	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
65	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
66	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
67	0.031	0.018	0.036	-1.5	1.26	5.0E-09	-0.6	3.39	1.58	10	2.4E-07	0.17	-100
68	0.168	0.021	0.173	-1.5	1.26	7.3E-08	-125	5.36	1.31	1300	1.3E-07	0.07	-100
69	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.02	-100
70	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
71	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.01	-100
72	0.317	0.023	0.322	-1.5	1.26	3.8E-08	-181	4.01	1.46	1800	9.9E-08	1.65	-100
73	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
74	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
75	0.281	0.051	0.286	-1.5	1.26	1.7E-08	-17.5	4.01	1.45	180	7.8E-08	0.02	-100
76	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100

77	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
201	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
202	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.06	-100
203	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
204	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	120	1.4E-07	500	-100
205	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
206	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
207	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
208	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
209	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
210	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
211	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
212	0	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
213	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
214	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
301	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
302	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
303	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
304	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
305	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
306	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
307	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
308	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
309	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
310	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
311	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
312	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
313	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
314	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
315	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
316	0.159	0.01	0.164	-1.5	1.26	1.2E-06	-140	3.61	1.53	1400	1.3E-06	1.13	-100
317	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
318	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
319	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
320	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
321	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
322	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
323	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
324	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
325	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
326	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
327	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
328	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
329	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
330	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
331	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
332	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
333	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
334	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
335	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
336	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100

345	0.097	0.01	0.102	-1.5	1.26	1.3E-07	-154.6	5.02	1.56	1560	2.9E-07	0.24	-100

Table VII-9. Sample Input User Control File for INFIL Version A_2a.1 Produced by PREINFIL, McCurley (299-1282) December 1999

```
INFIL2a1.ctl: Solitario East, Tule Lake, ww1-2a1-gm1-k2-w20 (11/18/1999)
1   0.00000001                                  IROUT(1 = coupled, 0 = uncoupled, -1 = flow routing off, -2 = infil off), IFRTOL
   2   2 2.16E+00                               ISNOW   ISNWMOD SNOPAR1
  3 1.57E-01 3.00E-01                           ISUBLIM SUBPAR1 SUBPAR2
0   1.                                          IPPTTEST (1 for testing), PPTTEST = constant
0   .0                                          IETTEST (1 for testing), ETTEST = constant
30.0                                                CELSIZE (node spacing (meters): using for flow volume calculations)
544721.0  4072203.0                             xcfs,ycfs: coords for discharge cell
1950  1    1996    366   1   5                 yr1 = start year, dnn1 = start day, yr2 = end year, dn2 = end day
1.12E+00 9.01E-01 5.48E+00 2.23E+00             MULTIPLI(       PPTFACT ETFACT  IMBFACT SKSFACT)
1.13E+00   0  4.00E-01                          SDFACT  (SOIL   DEPTH
1.0   0.8   0.8    0.2                         ROOTF1,ROOTF2,ROOTF3,ROOTF4
1.0   1.0   0.5    0.1                         MAXWGT1, MAXWGT2, MAXWGT3, MAXWGT4
  0.30  2.00  3.75  2.00                          RDEPTH1 RDEPTH2 RDEPTH3 RDEPTH4
2.95E-02  1.00E+00  3.04E-01                      RKPOR    RKMMFACT FLAREA
1   1    0                                      INFMOD, ETMOD, RUNMOD
 -10.610   1.102                                BARSOIL1 BARSOIL2
3   17.3  11.74                                 IAIRTEMP = 1 for new air temp model, ATEMP1 = avg. air temp, ATEMP2 = air temp seaso
2                                               HSTEP: time step for PET model (hours)
5  181  3                                       PPTYUC (=5 diminished elev. correlation, =2 for 4JA , =1 for simple elevation transf
Tulelake.inp                                    input file name:  daily precip
     0      1    0.5      1     1               dpthflag, irtz, delvwcf, moistcr, fracmod
     0      1.75                                IVWCFLG,   vwcfact
ww1.w20                                         input file name:  map parameters (*.inp)
-1
ww1-gm1.2a1                                       dayall: average daily mass balance terms
1    1                                     ndaymap, imap
70   1995
ww1-gm1.2a2
INFILSM_WW1_R001.OUT
INFILMN_WW1_R001.OUT
1      1                                         dbgflag, dbgflag2
ww1-gm1.2a5                                       output file name:  annual mass balance terms
0                                                 IDEBUG:  debugging option parameter
INFILECHO_R001.OUT
ww1-gm1                                           map output:  annual totals or mult-year averages
--
--------------- Parameters for dynamic root-zone function -------------------------------------
--     depth  rtza   rtzb   rtzc  rtzd  bsoil    delvwc
--     m
     4
     1    0.5     15      3     3     2     0.30      0.50
     2    1.5     15      4     2     2     0.20      0.50
     3    4.5     10    1.5     1     2     0.10      0.50
     4    6.0     10    1.5     1     2     0.05      0.25
--
```

```
--------------- Soil Properties (Brooks & Corey/van Genuchten combined) -----------------------------------------
--     fdcp   etresidpor    beta  alpah ksat     PE        B     n     vg-alpha sorp     SOILP   potis
--                                       Kg s /m^3J/Kg                  1/(J/Kg) ???              J/Kg
    10
     1  0.242  0.054  0.366  -3.5  1.26  5.6E-04 -1.19E+00  4.72  1.24  5.2E-01    0.390    0.05 -1.0E+02
     2  0.173  0.023  0.315  -3.5  1.26  1.2E-03 -9.41E-01  3.70  1.31  6.2E-01    0.500    0.05 -1.0E+02
     3  0.163  0.017  0.325  -3.5  1.26  1.3E-03 -8.60E-01  3.36  1.36  6.6E-01    0.510    0.05 -1.0E+02
     4  0.073  0.002  0.281  -3.5  1.26  3.8E-03 -6.22E-01  2.18  1.62  8.7E-01    0.700    0.05 -1.0E+02
     5  0.200  0.035  0.330  -3.5  1.26  6.7E-04 -1.07E+00  4.14  1.78  5.6E-01    0.400    0.05 -1.0E+02
     6  0.150  0.011  0.339  -3.5  1.26  2.7E-03 -7.55E-01  3.06  1.40  7.4E-01    0.700    0.05 -1.0E+02
     7  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     8  0.234  0.046  0.370  -3.5  1.26  5.6E-04 -1.10E+00  4.43  1.26  5.5E-01    0.390    0.05 -1.0E+02
     9  0.189  0.028  0.322  -3.5  1.26  5.7E-04 -1.08E+00  3.88  1.30  5.5E-01    0.370    0.05 -1.0E+02
    10  0.189  0.028  0.322  -3.5  1.26  5.7E-05 -1.08E+00  3.88  1.00  5.5E-01    0.037    0.05 -1.0E+02
--
---------------Rockl Properties (Brooks & Corey/van Genuchten combined)-----------------------------------------
--     rkcp   etresidpor    beta  alpha ksat     PE        B     n     vg-alpha fracks   imbibe  potir
--                                       Kg s /m^3J/Kg                  1/(J/Kg) Kg s /m^3mm/dy   J/Kg
     129
       1     0.35    0.065    0.366     -1.5     1.26   0.0011    -0.93      3.6     1.25     0.52  0.00056      500     -100
       2    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       3    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       4    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       5    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       6    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.41     -100
       7    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
       8    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
       9    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      10    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      11    0.105     0.02     0.11     -1.5     1.26  4.0E-09       -6     3.92     1.47       64  2.4E-07     0.06     -100
      12    0.388    0.039    0.393     -1.5     1.26 0.000053     -242     4.57     1.38     2400 0.000053     2.74     -100
      13     0.43    0.044    0.435     -1.5     1.26   0.0004    -1790     6.81     1.23    18000   0.0004    13.83     -100
      14    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      15    0.401     0.07    0.406     -1.5     1.26 0.000052    -4150     6.78     1.23    42000 0.000052    46.66     -100
      16    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.09     -100
      17    0.043    0.005    0.048     -1.5     1.26  1.6E-07    -88.1     6.43     1.25      890  3.7E-07     0.35     -100
      18    0.248     0.01    0.253     -1.5     1.26  3.8E-06    -82.3     2.71     1.84      830  3.9E-06     3.34     -100
      19    0.159     0.01    0.164     -1.5     1.26  1.2E-06     -140     3.61     1.53     1400  1.3E-06     1.13     -100
      20    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      21    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      22    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      23    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      24    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      25    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      26    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      27    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      28    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      29    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
      30    0.077    0.011    0.082     -1.5     1.26  5.4E-09      -12     3.04     1.69      120  1.4E-07     0.06     -100
```

31	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
32	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
33	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
34	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
35	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
36	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
37	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
38	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
39	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
40	0.494	0.05	0.499	-1.5	1.26	0.000088	-341	4.19	1.43	3400	0.000088	75.62	-100
41	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
42	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
43	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
44	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-26.9	5.6	1.29	270	2.1E-07	0.09	-100
45	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
99	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
46	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
47	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
48	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
49	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
50	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
51	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
52	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
53	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
54	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
55	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
56	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
57	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
58	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
59	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
60	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
61	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
62	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
63	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
64	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
65	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.07	-100
66	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
67	0.031	0.018	0.036	-1.5	1.26	5.0E-09	-0.6	3.39	1.58	10	2.4E-07	0.17	-100
68	0.168	0.021	0.173	-1.5	1.26	7.3E-08	-125	5.36	1.31	1300	1.3E-07	0.07	-100
69	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.02	-100
70	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
71	0.327	0.066	0.332	-1.5	1.26	4.5E-09	-39	5.66	1.29	390	6.6E-08	0.01	-100
72	0.317	0.023	0.322	-1.5	1.26	3.8E-08	-181	4.01	1.46	1800	9.9E-08	1.65	-100
73	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
74	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
75	0.281	0.051	0.286	-1.5	1.26	1.7E-08	-17.5	4.01	1.45	180	7.8E-08	0.02	-100
76	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
77	0.043	0.002	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.25	-100
201	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
202	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.06	-100
203	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100

204	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	120	1.4E-07	500	-100
205	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
206	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.41	-100
207	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
208	0.089	0.03	0.094	-1.5	1.26	7.5E-09	-1.8	2.31	2.14	22	2.5E-07	0.14	-100
209	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
210	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.09	-100
211	0.112	0.011	0.117	-1.5	1.26	4.1E-08	-3.2	3.07	1.68	36	1.0E-07	0.09	-100
212	0	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
213	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
214	0.232	0.024	0.237	-1.5	1.26	3.8E-07	-6.8	3.31	1.6	72	4.4E-07	0.05	-100
301	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
302	0.35	0.065	0.366	-1.5	1.26	0.0011	-0.93	3.6	1.25	0.52	0.00056	500	-100
303	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
304	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
305	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
306	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
307	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
308	0.401	0.07	0.406	-1.5	1.26	0.000052	-4150	6.78	1.23	42000	0.000052	46.66	-100
309	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
310	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
311	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
312	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
313	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
314	0.248	0.01	0.253	-1.5	1.26	3.8E-06	-82.3	2.71	1.84	830	3.9E-06	3.34	-100
315	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
316	0.159	0.01	0.164	-1.5	1.26	1.2E-06	-140	3.61	1.53	1400	1.3E-06	1.13	-100
317	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
318	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
319	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
320	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
321	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
322	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
323	0.388	0.039	0.393	-1.5	1.26	0.000053	-242	4.57	1.38	2400	0.000053	2.74	-100
324	0.43	0.044	0.435	-1.5	1.26	0.0004	-1790	6.81	1.23	18000	0.0004	13.83	-100
325	0.494	0.05	0.499	-1.5	1.26	0.000088	-4000	3.78	1.49	40000	0.000088	75.62	-100
326	0.077	0.011	0.082	-1.5	1.26	5.4E-09	-12	3.04	1.69	120	1.4E-07	0.06	-100
327	0.485	0.05	0.49	-1.5	1.26	0.00042	-5260	5.86	1.28	53000	0.00042	276.49	-100
328	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
329	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
330	0.043	0.005	0.048	-1.5	1.26	1.6E-07	-88.1	6.43	1.25	890	3.7E-07	0.35	-100
331	0.151	0.007	0.156	-1.5	1.26	1.7E-07	-377	2.11	2.4	3800	2.8E-07	0.20	-100
332	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
333	0.149	0.01	0.154	-1.5	1.26	2.0E-08	-65.3	5.09	1.33	660	1.2E-07	0.05	-100
334	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
335	0.105	0.02	0.11	-1.5	1.26	4.0E-09	-6	3.92	1.47	64	2.4E-07	0.09	-100
336	0.125	0.01	0.13	-1.5	1.26	2.3E-08	-26.9	5.6	1.29	270	2.2E-07	0.09	-100
345	0.097	0.01	0.102	-1.5	1.26	1.3E-07	-154.6	5.02	1.56	1560	2.9E-07	0.24	-100

Table VII-10. Sample Input User Control File for POSTINFIL Routine, McCurley (299-1282) December 1999

```
!=========================================================================
!  POSTINFIL input file
!  ANALYST:  Ron McCurley, Oct 22, 1999
!
!  DESCRIPTION:
!   POSTINFIL Input File for ww1 watershed, glacial transition climate
!
!=========================================================================
!Store mean infiltration and no. of active cells for watershed WW1
*STORE, &
 ARRAY=GLOBAL, STEP=1, COPY=0, &
 NAMES: MEAN_INFIL=INF_WW1,NUMBER_CELLS=NCELLWW1,MEAN_RUNOFF=RUN_WW1
```

Table VII-11. Sample Input File for ALGEBRACDB for Obtaining Weighted Average over Repository Footprint, Glacial Transition Climate, McCurley (299-1282) December 1999

```
!=====================================================================
!  ALGEBRACDB input file
!  ANALYST:  Ron McCurley, Oct 22, 1999
!
!  DESCRIPTION:
!    ALGEBRACDB Input File for obtaining weighted average over repository
!    footprint, glacial transition climate
!
!=====================================================================
!$ compute the weighted mean infiltration rate
!$ sum over cells from all watersheds in repository footprint
 TEMPSUM1 = NCELLSE1+NCELLSE2+NCELLSE3+NCELLSE4+NCELLSE5
 TEMPSUM2 = NCELLSE6+NCELLSE7+NCELLSE8+NCELLSE9+NCELSE10
 TEMPSUM3 = NCELLWT2+NCELLDH4+NCELLDH3+NCELLCW1+NCELLSW1
 SUMCELLS= MAKEGLOB(TEMPSUM1+TEMPSUM2+TEMPSUM3+NCELLWW1+NCELLUS1)
!$
 TMPMEAN1 =  NCELLWT2*INF_WT2 + NCELLDH4*INF_DH4 + NCELLDH3*INF_DH3
 TMPMEAN2 =  NCELLCW1*INF_CW1 + NCELLSW1*INF_SW1 + NCELLWW1*INF_WW1
 TMPMEAN3 =  NCELLSE1*INF_SE1 + NCELLSE2*INF_SE2 + NCELLSE3*INF_SE3
 TMPMEAN4 =  NCELLSE4*INF_SE4 + NCELLSE5*INF_SE5 + NCELLSE6*INF_SE6
 TMPMEAN5 =  NCELLSE7*INF_SE7 + NCELLSE8*INF_SE8 + NCELLSE9*INF_SE9
 TMPMEAN6 =  NCELSE10*INF_SE10 + NCELLUS1*INF_US1
 TMPSUM1 = TMPMEAN1 + TMPMEAN2 + TMPMEAN3
 TMPSUM2 = TMPMEAN4 + TMPMEAN5 + TMPMEAN6
 INFMEAN = MAKEGLOB(TMPSUM1 + TMPSUM2)/SUMCELLS
 EXIT
```

ATTACHMENT VIII

SAMPLE PROCEDURE FILES

This attachment contains listings of sample output files as produced in this analysis for each of the routines listed below (in order of use in analysis).

MATSET
PRELHS
POSTLHS
PREINFIL
POSTINFIL
ALGEBRACDB

Table VIII-1. LHS procedure file for Glacial Transition Climate.

```
$! -----
$! MODULE:  LHS.COM
$! PURPOSE: RUN YMP 1999 LATIN HYPERCUBE SAMPLING USING CMS
$!              VERSION OF LHS for Glacial Transition Climate
$! AUTHORS: Ron McCurley  COMPA/SNL  505-299-1282
$! DATE:    10/21/99
$! -----
$!
$! Setup for LHS run:
$! -----
$  SET NOON
$  INDIR := "I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.GLACIAL]"
$  OUTDIR := "I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.GLACIAL]"
$! Define file names
$  DEFINE LHS2_UIF$INPUT   'INDIR'LHS_1.INP
$  DEFINE LHS2_OUT$OUTPUT  'OUTDIR'LHS_INFIL1.OUT
$  DEFINE LHS2_DBG$OUTPUT  'OUTDIR'LHS1.DBG
$  DEFINE LHS2_NO2$SCRTCH  'OUTDIR'FOR002.DAT
$  DEFINE LHS2_NO3$SCRTCH  'OUTDIR'FOR003.DAT
$  DEFINE LHS2_NO4$SCRTCH  'OUTDIR'FOR004.DAT
$  DEFINE LHS2_NO7$SCRTCH  'OUTDIR'FOR007.DAT
$  DEFINE LHS2_NO8$SCRTCH  'OUTDIR'FOR008.DAT
$  DEFINE LHS2_NO9$SCRTCH  'OUTDIR'FOR009.DAT
$! -----
$!
$! Execute LHS:
$! -----
$  RUN WP$PRODROOT:[LHS.EXE]LHS_QA0250.EXE
$! -----
$!
$  DEFINE LHS2_UIF$INPUT   'INDIR'LHS_2.INP
$  DEFINE LHS2_OUT$OUTPUT  'OUTDIR'LHS_INFIL2.OUT
$  DEFINE LHS2_DBG$OUTPUT  'OUTDIR'LHS2.DBG
$  DEFINE LHS2_NO2$SCRTCH  'OUTDIR'FOR002.DAT
$  DEFINE LHS2_NO3$SCRTCH  'OUTDIR'FOR003.DAT
$  DEFINE LHS2_NO4$SCRTCH  'OUTDIR'FOR004.DAT
$  DEFINE LHS2_NO7$SCRTCH  'OUTDIR'FOR007.DAT
$  DEFINE LHS2_NO8$SCRTCH  'OUTDIR'FOR008.DAT
$  DEFINE LHS2_NO9$SCRTCH  'OUTDIR'FOR009.DAT
$! -----
$!
$! Execute LHS:
$! -----
$  RUN WP$PRODROOT:[LHS.EXE]LHS_QA0250.EXE
$! -----
$  DEFINE LHS2_UIF$INPUT   'INDIR'LHS_3.INP
$  DEFINE LHS2_OUT$OUTPUT  'OUTDIR'LHS_INFIL3.OUT
$  DEFINE LHS2_DBG$OUTPUT  'OUTDIR'LHS3.DBG
$  DEFINE LHS2_NO2$SCRTCH  'OUTDIR'FOR002.DAT
$  DEFINE LHS2_NO3$SCRTCH  'OUTDIR'FOR003.DAT
$  DEFINE LHS2_NO4$SCRTCH  'OUTDIR'FOR004.DAT
$  DEFINE LHS2_NO7$SCRTCH  'OUTDIR'FOR007.DAT
$  DEFINE LHS2_NO8$SCRTCH  'OUTDIR'FOR008.DAT
```

```
$  DEFINE LHS2_NO9$SCRTCH  'OUTDIR'FOR009.DAT
$! -----
$!
$! Execute LHS:
$! -----
$  RUN WP$PRODROOT:[LHS.EXE]LHS_QA0250.EXE
$! -----
$!
$! Inform user where output files are
$  write sys$output -
" Run completed"
$  write sys$output -
" The LHS output file is in ''OUTDIR'LHS_TEST.TRN"
$  write sys$output -
" The LHS tabular output file is in ''OUTDIR'LHS.DBG"
$! -----
$!
$ EXIT
```

Table VIII-2. Procedure file for MATSET 9.01.

```
!=================================================================
!
!   TITLE:    MATSET Procedure file for MATSET 9.01
!   ANALYST:  Ron McCurley - SNL/COMPA
!   DATE:     May-1999
!   Use Description: MATSET [Input CDB File (from GENMESH)] -
!                           [Input User Control File] -
!                           [Input SDB File (not used)] -
!                           [Calculation Type of SDB(not used)] -
!                           [Output CDB file] [Output Debug File]
!SDB is acronym for Secondary Database
!=================================================================
$MATSET GENMESH.CDB -
        MS_NOSDB.INP -
        CANCEL -
        CANCEL -
        LHS_NOSDB.CDB -
        MS_NOSDB.DBG
```

Table VIII-3. Procedure file for POSTLHS. Ron McCurley (299-1282) December 1999.

```
!=================================================================
!
!   TITLE:    POSTLHS Procedure file for POSTLHS 9.01
!   ANALYST:  Ron McCurley - SNL/COMPA
!   DATE:     May-1999
!   Use Description: POSTLHS [Input CDB File (from MATSET)] -
!                            [Input User Control File] -
!                            [Input LHS (output) Transfer File] -
!                            [Output CDB file] [Output Debug File]
!=================================================================
SET DEF I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.GLACIAL]
!
$ POSTLHS  I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.MATSET]LHS_NOSDB.CDB -
           POSTLHS.INP LHS_INFIL1.OUT POSTLHS_1_r###.CDB POSTLHS.DBG
$ POSTLHS  I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.MATSET]LHS_NOSDB.CDB -
           POSTLHS.INP LHS_INFIL2.OUT POSTLHS_2_r###.CDB POSTLHS.DBG
$ POSTLHS  I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.MATSET]LHS_NOSDB.CDB -
           POSTLHS.INP LHS_INFIL3.OUT POSTLHS_3_r###.CDB POSTLHS.DBG
```

Table VIII-4. PREINFIL procedure file -- DEC alpha version

```
! Analyst--Ron McCurley SNL/COMPA  299-1282
! Date Oct 21, 1999.
! NEWPREINF [Input User Control File] [Input CDB File] -
!           [Input Template INFIL Input Control File] -
!           [Output INFIL Input Control File] [Output Debug File]
!
$ SET DEFAULT I1:[RDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.PrEINFIL.glacial]
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r001.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r001.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r002.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r002.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r003.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r003.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r004.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r004.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r005.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r005.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r006.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r006.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r007.CDB -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r010.CDB -
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        preinf.dbg
```

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$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r011.cdb -
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        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r011.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinf.dbg
$ newpreinf  -
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        preinfil_ww1.inp -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
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        PrEINFIL_ww1.INP -
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        PrEINFIL_ww1.INP -
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinfil_ww1.inp -
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        preinf.dbg
$ newpreinf  -
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r025.cdb -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r027.INP -
        preinf.dbg
$ NEWPrEINF  -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        PrEINFIL_ww1.INP -
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        preinf.dbg
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinfil_ww1.inp -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
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$ NEWPrEINF  -
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        PrEINFIL_ww1.INP -
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinf.dbg
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        preinfil_ww1.inp -
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        preinf.dbg
$ NEWPrEINF  -
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$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
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        preinfil_ww1.inp -
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        preinfil_ww1.inp -
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        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r056.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r056.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r057.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r057.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
```

```
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r058.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r058.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r059.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r059.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r060.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r060.INP -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r061.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r061.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r062.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r062.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r063.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r063.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r064.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r064.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r065.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r065.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r066.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r066.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r067.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r067.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r068.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r068.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r069.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r069.INP -
        preinf.dbg
$ NEWPrEINF  -
```

```
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r070.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r070.INP -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r071.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r071.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r072.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r072.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r073.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r073.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r074.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r074.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r075.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r075.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r076.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r076.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r077.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r077.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r078.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r078.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r079.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r079.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r080.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r080.INP -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r081.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r081.inp -
        preinf.dbg
```

```
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r082.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r082.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r083.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r083.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r084.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r084.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r085.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r085.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r086.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r086.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r087.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r087.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r088.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r088.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r089.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r089.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r090.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r090.INP -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r091.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r091.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r092.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r092.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r093.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r093.inp -
```

```
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r094.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r094.inp -
        preinf.dbg
$ newpreinf  -
        preinfil_ww1.inp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.lhs.glacial]postlhs_1_r095.cdb -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial]infil2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]infil_ww1_r095.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r096.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r096.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r097.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r097.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r098.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r098.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r099.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r099.INP -
        preinf.dbg
$ NEWPrEINF  -
        PrEINFIL_ww1.INP -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.lhs.glacial]POSTlhs_1_r100.CDB -
        I1:[rDMCCUr.INEEL_PA98.YMP_99.INFILTrATION.infil.glacial]INFIL2a1_ww1.tmp -
        i1:[rdmccur.ineel_pa98.ymp_99.infiltration.infil.glacial.ww1]INFIL_ww1_r100.INP -
        preinf.dbg
```

Table VIII-5. Procedure file for POSTINFIL; 100 realizations. Ron McCurley (299-1282) December 1999.

```
!=====================================================================
! Procedure file to execute POSTINFIL over 100 realizations
!  ANALYST:  Ron McCurley, Oct 22, 1999
!  NEWPOSTINF [Input CDB file] [Input User Control File] -
!             [Input INFIL (Output) Transfer Main File] -
!             [Input INFIL (Output) Transfer Summary File] -
!             [Output CDB File] [Output Debug File]
!=====================================================================
!
$ SET DEFAULT I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.glacial]
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R001.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R001.OUT
-
    CANCEL -
    POSTINF_ww1_R001.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R002.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R002.OUT
-
    CANCEL -
    POSTINF_ww1_R002.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R003.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R003.OUT
-
    CANCEL -
    POSTINF_ww1_R003.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R004.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R004.OUT
-
    CANCEL -
    POSTINF_ww1_R004.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R005.CDB
-
```

```
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R005.OUT
-
    CANCEL -
    POSTINF_ww1_R005.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R006.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R006.OUT
-
    CANCEL -
    POSTINF_ww1_R006.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R007.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R007.OUT
-
    CANCEL -
    POSTINF_ww1_R007.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R008.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R008.OUT
-
    CANCEL -
    POSTINF_ww1_R008.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R009.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R009.OUT
-
    CANCEL -
    POSTINF_ww1_R009.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R010.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R010.OUT
-
    CANCEL -
    POSTINF_ww1_R010.CDB -
    POSTINF.DBG
```

```
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R011.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R011.OUT
-
    CANCEL -
    POSTINF_ww1_R011.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R012.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R012.OUT
-
    CANCEL -
    POSTINF_ww1_R012.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R013.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R013.OUT
-
    CANCEL -
    POSTINF_ww1_R013.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R014.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R014.OUT
-
    CANCEL -
    POSTINF_ww1_R014.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R015.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R015.OUT
-
    CANCEL -
    POSTINF_ww1_R015.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R016.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R016.OUT
-
```

```
    CANCEL -
    POSTINF_ww1_R016.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R017.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R017.OUT
-
    CANCEL -
    POSTINF_ww1_R017.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R018.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R018.OUT
-
    CANCEL -
    POSTINF_ww1_R018.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R019.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R019.OUT
-
    CANCEL -
    POSTINF_ww1_R019.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R020.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R020.OUT
-
    CANCEL -
    POSTINF_ww1_R020.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R021.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R021.OUT
-
    CANCEL -
    POSTINF_ww1_R021.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R022.CDB
-
    POSTINF_ww1.INP -
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I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R022.OUT
-
    CANCEL -
    POSTINF_ww1_R022.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R023.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R023.OUT
-
    CANCEL -
    POSTINF_ww1_R023.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R024.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R024.OUT
-
    CANCEL -
    POSTINF_ww1_R024.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R025.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R025.OUT
-
    CANCEL -
    POSTINF_ww1_R025.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R026.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R026.OUT
-
    CANCEL -
    POSTINF_ww1_R026.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R027.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R027.OUT
-
    CANCEL -
    POSTINF_ww1_R027.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
```

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    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R028.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R028.OUT
-
    CANCEL -
    POSTINF_ww1_R028.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R029.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R028.OUT
-
    CANCEL -
    POSTINF_ww1_R029.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R030.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R030.OUT
-
    CANCEL -
    POSTINF_ww1_R030.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R031.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R031.OUT
-
    CANCEL -
    POSTINF_ww1_R031.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R032.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R032.OUT
-
    CANCEL -
    POSTINF_ww1_R032.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R033.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R033.OUT
-
    CANCEL -
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    POSTINF_ww1_R033.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R034.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R034.OUT
-
    CANCEL -
    POSTINF_ww1_R034.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R035.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R035.OUT
-
    CANCEL -
    POSTINF_ww1_R035.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R036.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R036.OUT
-
    CANCEL -
    POSTINF_ww1_R036.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R037.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R037.OUT
-
    CANCEL -
    POSTINF_ww1_R037.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R038.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R038.OUT
-
    CANCEL -
    POSTINF_ww1_R038.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R039.CDB
-
    POSTINF_ww1.INP -
```

```
I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R039.OUT
-
    CANCEL -
    POSTINF_ww1_R039.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R040.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R040.OUT
-
    CANCEL -
    POSTINF_ww1_R040.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R041.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R041.OUT
-
    CANCEL -
    POSTINF_ww1_R041.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R042.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R042.OUT
-
    CANCEL -
    POSTINF_ww1_R042.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R043.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R043.OUT
-
    CANCEL -
    POSTINF_ww1_R043.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R044.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R044.OUT
-
    CANCEL -
    POSTINF_ww1_R044.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
```

```
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R045.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R045.OUT
-
    CANCEL -
    POSTINF_ww1_R045.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R046.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R046.OUT
-
    CANCEL -
    POSTINF_ww1_R046.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R047.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R047.OUT
-
    CANCEL -
    POSTINF_ww1_R047.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R048.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R048.OUT
-
    CANCEL -
    POSTINF_ww1_R048.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R049.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R049.OUT
-
    CANCEL -
    POSTINF_ww1_R049.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R050.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R050.OUT
-
    CANCEL -
```

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    POSTINF_ww1_R050.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R051.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R051.OUT
-
    CANCEL -
    POSTINF_ww1_R051.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R052.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R052.OUT
-
    CANCEL -
    POSTINF_ww1_R052.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R053.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R053.OUT
-
    CANCEL -
    POSTINF_ww1_R053.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R054.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R054.OUT
-
    CANCEL -
    POSTINF_ww1_R054.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R055.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R055.OUT
-
    CANCEL -
    POSTINF_ww1_R055.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R056.CDB
-
    POSTINF_ww1.INP -
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I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R056.OUT
-
    CANCEL -
    POSTINF_ww1_R056.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R057.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R057.OUT
-
    CANCEL -
    POSTINF_ww1_R057.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R058.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R058.OUT
-
    CANCEL -
    POSTINF_ww1_R058.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R059.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R059.OUT
-
    CANCEL -
    POSTINF_ww1_R059.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R060.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R060.OUT
-
    CANCEL -
    POSTINF_ww1_R060.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R061.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R061.OUT
-
    CANCEL -
    POSTINF_ww1_R061.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
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    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R062.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R062.OUT
-
    CANCEL -
    POSTINF_ww1_R062.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R063.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R063.OUT
-
    CANCEL -
    POSTINF_ww1_R063.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R064.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R064.OUT
-
    CANCEL -
    POSTINF_ww1_R064.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R065.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R065.OUT
-
    CANCEL -
    POSTINF_ww1_R065.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R066.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R066.OUT
-
    CANCEL -
    POSTINF_ww1_R066.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R067.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R067.OUT
-
    CANCEL -
```

```
    POSTINF_ww1_R067.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R068.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R068.OUT
-
    CANCEL -
    POSTINF_ww1_R068.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R069.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R069.OUT
-
    CANCEL -
    POSTINF_ww1_R069.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R070.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R070.OUT
-
    CANCEL -
    POSTINF_ww1_R070.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R071.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R071.OUT
-
    CANCEL -
    POSTINF_ww1_R071.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R072.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R072.OUT
-
    CANCEL -
    POSTINF_ww1_R072.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R073.CDB
-
    POSTINF_ww1.INP -
```

```
I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R073.OUT
-
    CANCEL -
    POSTINF_ww1_R073.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R074.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R074.OUT
-
    CANCEL -
    POSTINF_ww1_R074.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R075.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R075.OUT
-
    CANCEL -
    POSTINF_ww1_R075.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R076.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R076.OUT
-
    CANCEL -
    POSTINF_ww1_R076.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R077.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R077.OUT
-
    CANCEL -
    POSTINF_ww1_R077.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R078.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R078.OUT
-
    CANCEL -
    POSTINF_ww1_R078.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
```

```
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R079.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R078.OUT
-
    CANCEL -
    POSTINF_ww1_R079.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R080.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R080.OUT
-
    CANCEL -
    POSTINF_ww1_R080.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R081.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R081.OUT
-
    CANCEL -
    POSTINF_ww1_R081.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R082.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R082.OUT
-
    CANCEL -
    POSTINF_ww1_R082.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R083.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R083.OUT
-
    CANCEL -
    POSTINF_ww1_R083.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R084.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R084.OUT
-
    CANCEL -
```

```
    POSTINF_ww1_R084.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R085.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R085.OUT
-
    CANCEL -
    POSTINF_ww1_R085.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R086.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R086.OUT
-
    CANCEL -
    POSTINF_ww1_R086.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R087.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R087.OUT
-
    CANCEL -
    POSTINF_ww1_R087.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R088.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R088.OUT
-
    CANCEL -
    POSTINF_ww1_R088.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R089.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R089.OUT
-
    CANCEL -
    POSTINF_ww1_R089.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R090.CDB
-
    POSTINF_ww1.INP -
```

```
I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R090.OUT
-
    CANCEL -
    POSTINF_ww1_R090.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R091.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R091.OUT
-
    CANCEL -
    POSTINF_ww1_R091.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R092.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R092.OUT
-
    CANCEL -
    POSTINF_ww1_R092.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R093.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R093.OUT
-
    CANCEL -
    POSTINF_ww1_R093.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R094.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R094.OUT
-
    CANCEL -
    POSTINF_ww1_R094.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R095.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R095.OUT
-
    CANCEL -
    POSTINF_ww1_R095.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
```

```
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R096.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R096.OUT
-
    CANCEL -
    POSTINF_ww1_R096.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R097.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R097.OUT
-
    CANCEL -
    POSTINF_ww1_R097.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R098.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R098.OUT
-
    CANCEL -
    POSTINF_ww1_R098.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R099.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R099.OUT
-
    CANCEL -
    POSTINF_ww1_R099.CDB -
    POSTINF.DBG
$ NEWPOSTINF -
    I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.glacial]POSTLHS_1_R100.CDB
-
    POSTINF_ww1.INP -

I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.INFIL.glacial.ww1]INFILSM_R100.OUT
-
    CANCEL -
    POSTINF_ww1_R100.CDB -
    POSTINF.DBG
```

Table VIII-6. Procedure file for PRELHS for Glacial Transition Climate

```
$! PURPOSE: RUN USING A "LOCAL BUILD"  EXECUTABLE for PRELHS
$! AUTHOR:  Ron McCurley
$! DATE:    10/14/99.
$! -----
$!
$  SET NOON
$  LHSDB   := INFIL.SDB
$!  LHSCALC :=
$  OUTDIR  := "I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.PRELHS.GLACIAL]"
$  TRNDIR  := "I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.GLACIAL]"
$  EXE_SRC :==
$I1:[RDMCCUR.INEEL_PA98.YMP_99.MONTE_CARLO.PRELHS.SOURCE_CODE]INELPRELHS.EXE
$! -----
$!
$! Define file names
$! -----
$  DEFINE LHS1_NO2$SCRATCH FOR002.DAT
$  DEFINE LHS2_NO3$SCRATCH FOR003.DAT
$! -----
$!
$! Execute test case COUNT
$! -----
$  EXE_SRC PRELHS_1.INP  -
           INFIL.SDB -
           'TRNDIR'LHS_1.INP   -
           'OUTDIR'PRELHS.DBG
$! -----
$  EXE_SRC PRELHS_2.INP  -
           INFIL.SDB -
           'TRNDIR'LHS_2.INP   -
           'OUTDIR'PRELHS.DBG
$! -----
$  EXE_SRC PRELHS_3.INP  -
           INFIL.SDB -
           'TRNDIR'LHS_3.INP   -
           'OUTDIR'PRELHS.DBG
$! -----
$!
$! Inform user where output files are
$  write sys$output -
" Test run completed"
$  write sys$output -
" The debug output file is in ''OUTDIR'PRELHS_TEST.DBG"
$  write sys$output -
" The LHS Input file is in ''TRNDIR'LHS_TEST.INP"
$! -----
$!
$ EXIT
```

Table VIII-7. Sample procedure file for ALGEBRACDB, 100 realizations. McCurley (299-1282) December 1999.

```
!=========================================================================
!Procedure file to execute ALGEBRACDB over 100 realizations
!  ANALYST:  Ron McCurley, Oct 22, 1999
! ALGEBRA [Input CDB] [Output CDB] [User Control File] [Debug File]
!=========================================================================
!
$ SET DEFAULT I1:[RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.GLACIAL]
$ ALGEBRA  POSTINF_US1_R001.CDB MEAN_R001.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R002.CDB MEAN_R002.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R003.CDB MEAN_R003.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R004.CDB MEAN_R004.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R005.CDB MEAN_R005.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R006.CDB MEAN_R006.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R007.CDB MEAN_R007.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R008.CDB MEAN_R008.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R009.CDB MEAN_R009.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R010.CDB MEAN_R010.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R011.CDB MEAN_R011.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R012.CDB MEAN_R012.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R013.CDB MEAN_R013.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R014.CDB MEAN_R014.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R015.CDB MEAN_R015.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R016.CDB MEAN_R016.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R017.CDB MEAN_R017.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R018.CDB MEAN_R018.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R019.CDB MEAN_R019.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R020.CDB MEAN_R020.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R021.CDB MEAN_R021.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R022.CDB MEAN_R022.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R023.CDB MEAN_R023.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R024.CDB MEAN_R024.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R025.CDB MEAN_R025.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R026.CDB MEAN_R026.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R027.CDB MEAN_R027.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R028.CDB MEAN_R028.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R029.CDB MEAN_R029.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R030.CDB MEAN_R030.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R031.CDB MEAN_R031.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R032.CDB MEAN_R032.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R033.CDB MEAN_R033.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R034.CDB MEAN_R034.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R035.CDB MEAN_R035.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R036.CDB MEAN_R036.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R037.CDB MEAN_R037.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R038.CDB MEAN_R038.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R039.CDB MEAN_R039.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R040.CDB MEAN_R040.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R041.CDB MEAN_R041.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R042.CDB MEAN_R042.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R043.CDB MEAN_R043.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R044.CDB MEAN_R044.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R045.CDB MEAN_R045.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R046.CDB MEAN_R046.CDB ALG_MEAN.INP ALG.DBG
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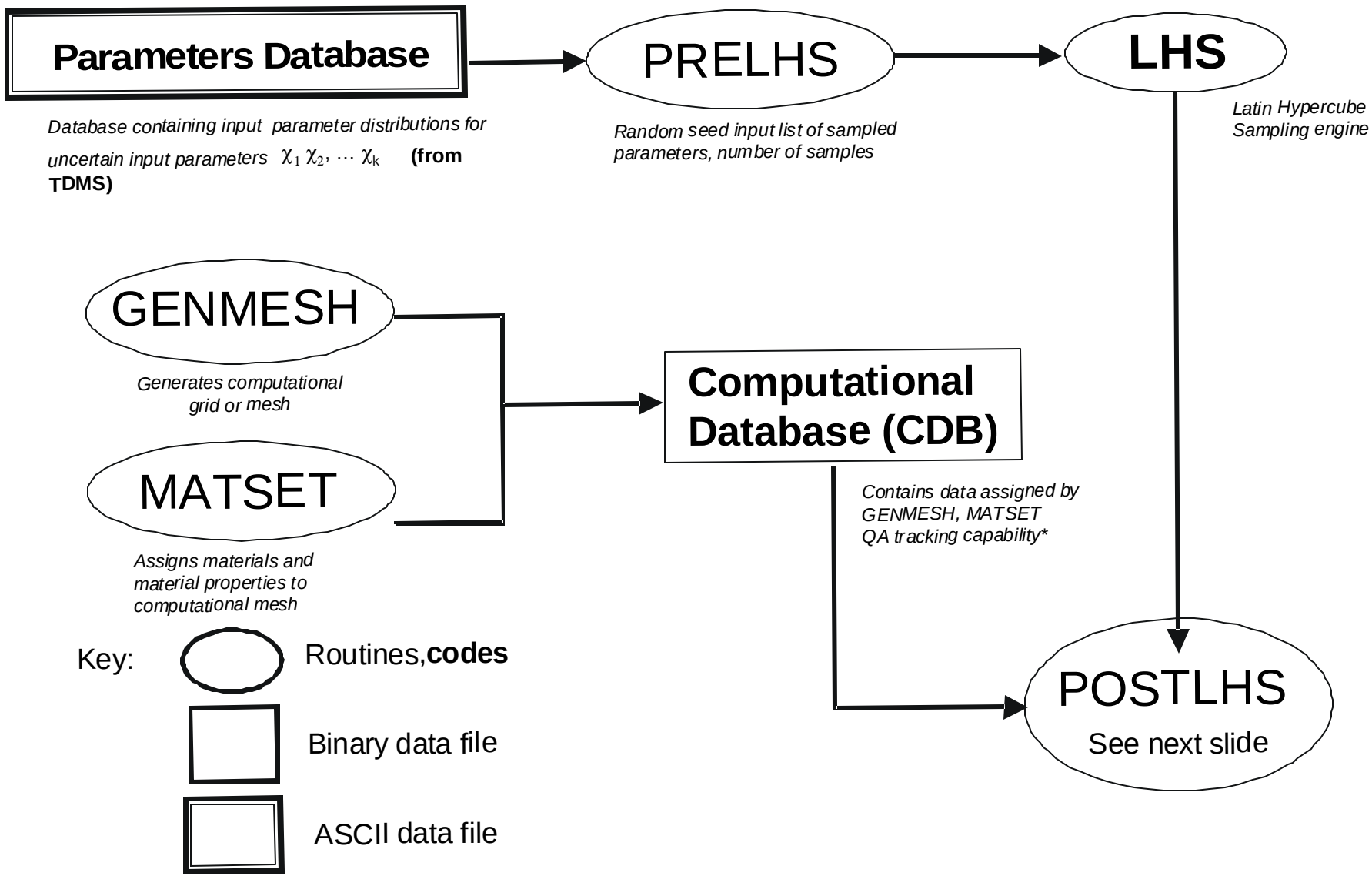
$ ALGEBRA  POSTINF_US1_R047.CDB MEAN_R047.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R048.CDB MEAN_R048.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R049.CDB MEAN_R049.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R050.CDB MEAN_R050.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R051.CDB MEAN_R051.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R052.CDB MEAN_R052.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R053.CDB MEAN_R053.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R054.CDB MEAN_R054.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R055.CDB MEAN_R055.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R056.CDB MEAN_R056.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R057.CDB MEAN_R057.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R058.CDB MEAN_R058.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R059.CDB MEAN_R059.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R060.CDB MEAN_R060.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R061.CDB MEAN_R061.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R062.CDB MEAN_R062.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R063.CDB MEAN_R063.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R064.CDB MEAN_R064.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R065.CDB MEAN_R065.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R066.CDB MEAN_R066.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R067.CDB MEAN_R067.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R068.CDB MEAN_R068.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R069.CDB MEAN_R069.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R070.CDB MEAN_R070.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R071.CDB MEAN_R071.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R072.CDB MEAN_R072.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R073.CDB MEAN_R073.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R074.CDB MEAN_R074.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R075.CDB MEAN_R075.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R076.CDB MEAN_R076.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R077.CDB MEAN_R077.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R078.CDB MEAN_R078.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R079.CDB MEAN_R079.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R080.CDB MEAN_R080.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R081.CDB MEAN_R081.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R082.CDB MEAN_R082.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R083.CDB MEAN_R083.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R084.CDB MEAN_R084.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R085.CDB MEAN_R085.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R086.CDB MEAN_R086.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R087.CDB MEAN_R087.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R088.CDB MEAN_R088.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R089.CDB MEAN_R089.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R090.CDB MEAN_R090.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R091.CDB MEAN_R091.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R092.CDB MEAN_R092.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R093.CDB MEAN_R093.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R094.CDB MEAN_R094.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R095.CDB MEAN_R095.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R096.CDB MEAN_R096.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R097.CDB MEAN_R097.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R098.CDB MEAN_R098.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R099.CDB MEAN_R099.CDB ALG_MEAN.INP ALG.DBG
$ ALGEBRA  POSTINF_US1_R100.CDB MEAN_R100.CDB ALG_MEAN.INP ALG.DBG
```

ATTACHMENT IX

FLOW DIAGRAM FOR UNCERTAINTY ANALYSIS

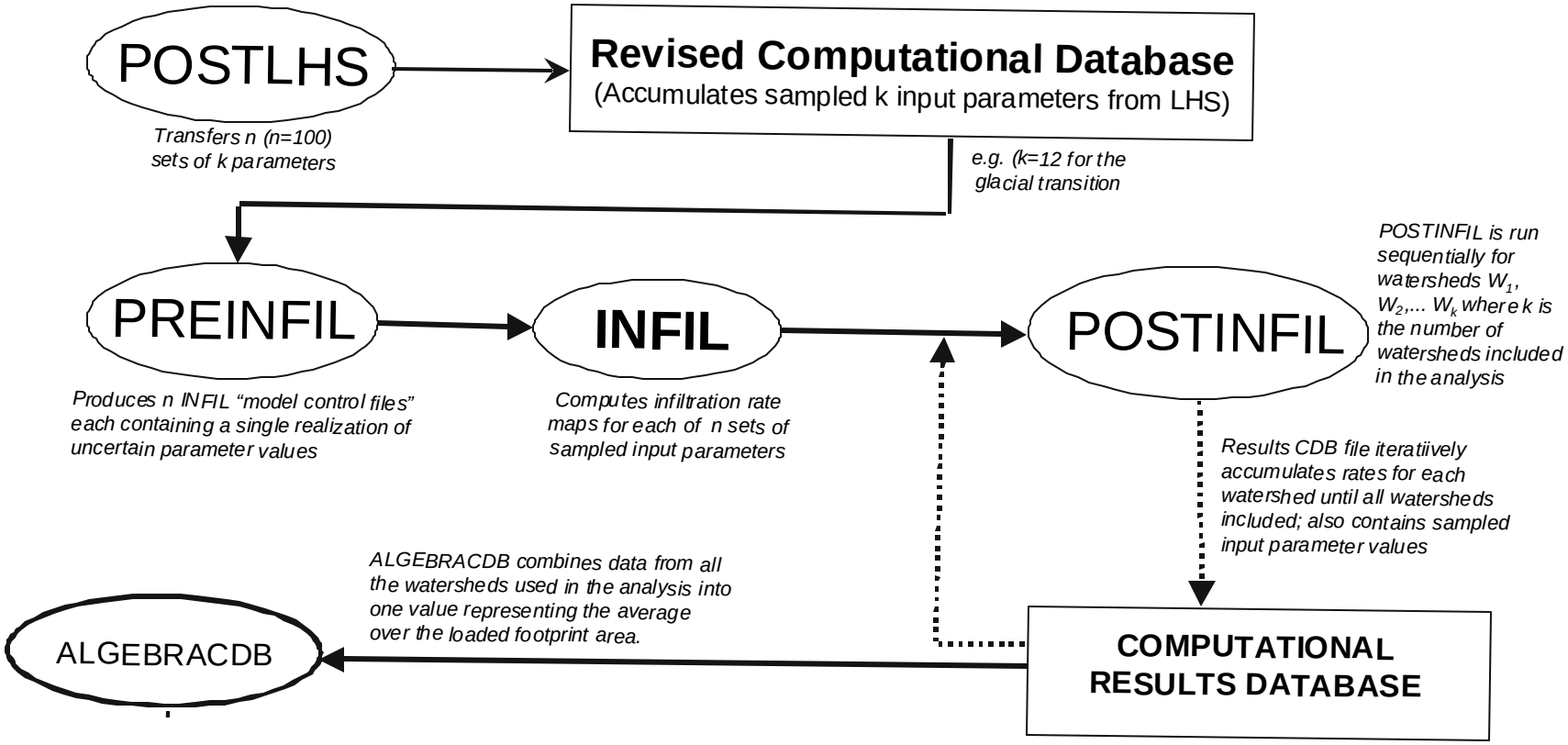
This attachment contains a diagram showing the flow of information as the uncertainty analysis proceeds towards the final product of a set of 100 realizations resulting in an uncertainty distribution for the infiltration rate maps as spatially averaged over the modeled rectangular region.

Analysis Flow Diagram



* applies to all CDB files generated

Continue to next slide


POSTLHS
Revised Computational Database
(Accumulates sampled k input parameters from LHS)
Transfers n (n=100) sets of k parameters
e.g. (k=12 for the glacial transition
PREINFIL
INFIL
POSTINFIL
POSTINFIL is run sequentially for watersheds W_1, W_2,... W_k where k is the number of watersheds included in the analysis
Produces n INFIL "model control files" each containing a single realization of uncertain parameter values
Computes infiltration rate maps for each of n sets of sampled input parameters
Results CDB file iteratiively accumulates rates for each watershed until all watersheds included; also contains sampled input parameter values
ALGEBRACDB combines data from all the watersheds used in the analysis into one value representing the average over the loaded footprint area.
ALGEBRACDB
COMPUTATIONAL RESULTS DATABASE

ATTACHMENT X

DOCUMENTATION FOR OTHER ROUTINES USED IN THE UNCERTAINTY ANALYSIS

(TO SATISFY AP-SI.1Q)

Documentation of software routines to satisfy AP-SI.1Q, Paragraph 5.1.1.2. These are all routines because they can be verified by visual inspection or hand calculations. The routines documented here are

ALGEBRACDB
GENMESH
MATSET
PRELHS
POSTLHS

ALGEBRACDB Version 2.35 Software Routine Verification

MODIFICATIONS OF FE/FD COMPUTATIONAL DATABASE

involving the following:
(1) NEW VARIABLES ASSIGNED VALUES ACCORDING TO ALGEBRAIC EQUATION OR FUNCTION

Documentation to satisfy first and second bullets of Section 5.1.1.2:

A software routine was used in accordance with AP-SI.1Q, Section 5.1.1.2 for the purpose of algebraically manipulating appropriate parameters and variables contained in a Computational Database file (CDB) to create appropriate new variables. These new variables and the corresponding algebraic equation are defined by the analyst in an input user control file (see Attachment I-25). The software developed, ALGEBRACDB, version 2.35, is in FORTRAN 77. The executable and the change history reside in the following directory locations on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

WP$PRODROOT:[ALG.EXE]ALGEBRACDB_PA96.EXE

DISK$BEATLE_CCA1:[NON_HSM.CMS_WIPP_PA.ALG]01CMS.HIS;1

This satisfies the requirements first and second bullets of Section 5.1.1.2 of procedure AP-SI.1Q for software routines.

Documentation to satisfy third bullet of Section 5.1.1.2:

ALGEBRACDB capability requirements, including acceptance criteria, and tests for verification and validation and can be found in the Requirements Document, Verification and Validation Plan (SNL, 1995b) and the Validation Document (SNL, 1995c). The use of the routine in this AMR was confined to algebraic manipulations involving addition, multiplication, and calculation of an arithmetic mean. The use of this routine in this manner falls within the domain of the use tested in the documentation referred to above. For this analysis, hand calculations were done verifying that the calculations done by ALGEBRACDB (see Table X-1) to obtain the spatially averaged infiltration rate for the modeled rectangular region (Figure 1-1) are correct. The sum of the cells over all the watersheds is shown as **SUMCELLS**. In italics are temporary partial sums of terms which are a product of average infiltration rate and number of cells for each watershed (see Table VII-11, the ALGEBRACDB input file used to produce this file displayed in Table X-1). In bold Italics, ***INFMEAN*** represents the averaged infiltration rate over the modeled rectangular region.

Table X-1. GROPECDB Listing of Realization 001 Showing Values of Number of Cells (bolded) Within Modeled Rectangular Region and Corresponding Average Infiltration Rates (adjacent to right).

```
                                GROPECDB_PA96

 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR   RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR   RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB         PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                          GROPECDB_PA96 Version 2.12
                           PROD PA96 Built 06/27/96
                           Sponsored by Amy Gilkey

                         Run on 04/05/00 at 09:14:19
                     Run on ALPHA AXP BEATLE OpenVMS V7.2-1

Database:  I1:[000000.RDMCCUR.YMP99.INFILTRATION.POSTINFIL.GLACIAL.NEW]MEAN_R001.CDB;1
Written on:  12/09/99 12:14:46

CAMDAT Version:   1        (EXODUS Version:   1)

GLOBAL TIME STEP VARIABLES
```

Step	Time	**NCELLSE1**	INF_SE1	RUN_SE1	**NCELLSE2**
		INF_SE2	RUN_SE2	**NCELLSE3**	INF_SE3
		RUN_SE3	**NCELLSE4**	INF_SE4	RUN_SE4
		NCELLSE5	INF_SE5	RUN_SE5	**NCELLSE6**
		INF_SE6	RUN_SE6	**NCELLSE7**	INF_SE7
		RUN_SE7	**NCELLSE8**	INF_SE8	RUN_SE8
		NCELLSE9	INF_SE9	RUN_SE9	**NCELSE10**
		INF_SE10	RUN_SE10	**NCELLWT2**	INF_WT2
		RUN_WT2	**NCELLDH4**	INF_DH4	RUN_DH4
		NCELLDH3	INF_DH3	RUN_DH3	**NCELLCW1**
		INF_CW1	RUN_CW1	**NCELLSW1**	INF_SW1
		RUN_SW1	**NCELLWW1**	INF_WW1	RUN_WW1
		NCELLUS1	INF_US1	RUN_US1	TEMPSUM1
		TEMPSUM2	TEMPSUM3	**SUMCELLS**	*TMPMEAN1*
		TMPMEAN2	*TMPMEAN3*	*TMPMEAN4*	*TMPMEAN5*
		TMPMEAN6	*TMPSUM1*	*TMPSUM2*	***INFMEAN***
1	0.00000E+00	**6.10000E+01**	7.59469E+01	0.00000E+00	**5.00000E+00**
		4.90990E+01	0.00000E+00	**4.70000E+01**	1.23239E+02
		0.00000E+00	**8.20000E+01**	1.01059E+02	0.00000E+00
		4.10000E+01	7.21075E+01	0.00000E+00	**1.14000E+02**
		9.24462E+01	0.00000E+00	**6.70000E+01**	7.74080E+01
		0.00000E+00	**7.00000E+01**	8.63004E+01	0.00000E+00
		8.50000E+01	8.58878E+01	0.00000E+00	**8.00000E+00**
		6.48678E+01	0.00000E+00	**1.58300E+03**	4.37066E+01
		0.00000E+00	**6.10000E+02**	4.03951E+01	0.00000E+00
		1.18800E+03	4.21285E+01	0.00000E+00	**4.17000E+02**
		5.63918E+01	0.00000E+00	**7.18000E+02**	4.74610E+01
		0.00000E+00	**8.75000E+02**	6.31565E+01	0.00000E+00
		6.86000E+02	4.92632E+01	0.00000E+00	2.36000E+02
		3.44000E+02	4.51600E+03	**6.65700E+03**	*1.43877E+05*
		1.12854E+05	*1.06705E+04*	*2.17821E+04*	*1.85278E+04*
		3.43135E+04	*2.67402E+05*	*7.46234E+04*	***5.13783E+01***

GENMESH Version 6.08 Software Routine Verification

CREATION OF FE/FD COMPUTATIONAL DATABASE

containing the following:
(2) ELEMENT BLOCKS (OR MATERIALS)

(3) DESIGNATED MATERIAL PROPERTY NAMES.

Documentation to satisfy first and second bullet of Section 5.1.1.2:

A software routine was used in accordance with AP-SI.1Q, Section 5.1.1.2 for the purpose of developing and assigning geometrical attributes to a computational mesh for input to MATSET to create a Computational Database file (CDB); with appropriate material properties as selected by the analyst. The software developed, GENMESH, version 6.08, is in FORTRAN 77. The executable and the change history reside in the following directory locations on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

WP$CGMROOT:[GM.CGM$001]GENMESH_QA0608.EXE;2

WP$CGMROOT:[GM]01CGM.HIS;1

This satisfies the requirements first and second bullets of Section 5.1.1.2 of procedure AP-SI.1Q for software routines.

Documentation to satisfy third bullet of Section 5.1.1.2:

GENMESH capability requirements, including acceptance criteria, and tests for verification and validation and can be found in the Requirements Document, Verification and Validation Plan (RDVVP) (SNL, 1996c) and the Validation Document (SNL, 1995d). GENMESH was used to create a binary file referred to in this AMR as a CDB file to serve as a vehicle for the traceable storage of data and computation steps as developed in the uncertainty analysis documented in this AMR. The CDB file is updated by MATSET (Table X-1) to prepare for the sampling process. The use of this routine in this manner falls within the domain of the use tested in the documentation referred to above. A visual inspection of the GROPECDB display of this file (Table X-1) verifies the use of this routine (in conjunction with MATSET).

MATSET Version 9.01 Software Routine Verification

CREATION OF FE/FD COMPUTATIONAL DATABASE

containing the following:
(4) ELEMENT BLOCKS (OR MATERIALS)

(5) DESIGNATED MATERIAL PROPERTY NAMES.

Documentation to satisfy first and second bullet of Section 5.1.1.2:

A software routine was used in accordance with AP-SI.1Q, Section 5.1.1.2 for the purpose of assigning material properties and corresponding (default) values to a Computational Database file (CDB); these material properties are the selected candidate properties for sampling (using Latin Hypercube Sampling) The software developed, MATSET, Version 9.01, is in FORTRAN 77. The executable and the change history reside in the following directory locations on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

WP$CMSROOT:[MS.CMS$001]MATSET_QA0901.EXE;2

WP$CMSROOT:[MS]01CMS.HIS;1

This satisfies the requirements first and second bullets of Section 5.1.1.2 of procedure AP-SI.1Q for software routines.

Documentation to satisfy third bullet of Section 5.1.1.2:

MATSET capability requirements, including acceptance criteria, and tests for verification and validation and can be found in the Requirements Document, Verification and Validation Plan (SNL, 1996d) and the Validation Document (SNL, 1996e). MATSET was used for adding, to the CDB file created by GENMESH, material property names (bold in Table X-2) corresponding to the parameters being sampled as developed in the uncertainty analysis documented in this AMR. The use of this routine in this manner falls within the domain of the use tested in the documentation referred to above. A visual inspection of the GROPECDB display of this file verifies the use of this routine (in conjunction with GENMESH).

Table X-2. GROPECDB listing of binary CDB file containing properties to be sampled by LHS

```
                                GROPECDB_PA96

 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR   RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR   RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB         PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                           GROPECDB_PA96 Version 2.12
                            PROD PA96 Built 06/27/96
                            Sponsored by Amy Gilkey

                          Run on 04/05/00 at 09:02:13
                      Run on ALPHA AXP BEATLE OpenVMS V7.2-1

Database:  I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.MATSET]LHS_NOSDB.CDB;5
Written on:  11/09/99 18:22:47

CAMDAT Version:   1        (EXODUS Version:   1)

PROPERTIES

Element Block 1)    "FOOTPRNT"     1=ID    75 elements (1..75)
      8-node     5 attributes    13 properties
   BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
   SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
   SUBPAR1
  2.00000E-02  1.50000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
  1.00000E+00 -1.50000E+00  1.26000E+00  5.00000E-01  1.73000E+01  1.78000E+00
  1.00000E-01

Element Block 2)    "OUTSIDE "     2=ID    25 elements (76..100)
      8-node     5 attributes    13 properties
   BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
   SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
   SUBPAR1
  2.00000E-02  1.50000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
  1.00000E+00 -1.50000E+00  1.26000E+00  5.00000E-01  1.73000E+01  1.78000E+00
  1.00000E-01
```

PRELHS Version 2.02 Software Routine Verification

CREATION OF LHS INPUT FILE CONTAINING THE FOLLOWING:

DESIGNATED MATERIAL PROPERTY NAMES WITH CORRESPONDING DISTRIBUTION TYPE AND RANGE.

Documentation to satisfy first and second bullet of Section 5.1.1.2:

A software routine was used in accordance with AP-SI.1Q, Section 5.1.1.2 for the purpose of developing input files for LHS. The developed LHS input files contain distributions of 'material property' or 'attribute' parameters as selected by the analyst in a PRELHS user control (see Attachment I-6) and as defined in an input data file (see Attachment I-7). The software developed, PRELHS, Version 2.02, is in FORTRAN 77. The executable and the change history reside in the following directory locations on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

I1:[RDMCCUR.INEEL_PA98.YMP_99.MONTE_CARLO.PRELHS.SOURCE_CODE]INELPRELH.EXE

WP$CGMROOT:[LHS]01CGM.HIS;1

This satisfies the requirements first and second bullets of Section 5.1.1.2 of procedure AP-SI.1Q for software routines.

Documentation to satisfy third bullet of Section 5.1.1.2:

PRELHS capability requirements, including acceptance criteria, and tests for verification and validation and can be found in the Requirements Document, Verification and Validation Plan (SNL, 1997a) and the Validation Document (SNL, 1997b). PRELHS was used to create input files for LHS V. 2.50 with the defined distribution and range of the parameters chosen for sampling in this analysis. Visual verification can be made by comparing the distribution and ranges of parameters as found in Table VII-4b with the LHS input file found in Table VII-5. The use of this routine in this manner also falls within the domain of the use tested in the documentation referred to above.

POSTLHS Version 4.07 Software Routine Verification

MODIFICATION OF FE/FD COMPUTATIONAL DATABASE

containing the following:
(6) DESIGNATED MATERIAL PROPERTY NAMES.

(2) the assigned value for each sampled material property, by LHS, for each realization

<u>Documentation to satisfy first and second bullets of Section 5.1.1.2:</u>

A software routine was used in accordance with AP-SI.1Q, Section 5.1.1.2 for the purpose of and assigning material property (or attribute) values, from each realization, to a corresponding Computational Database file (CDB) for all realizations. These material property (or attribute) values are for appropriate material properties (or attributes) as selected by the analyst in a user control file (see Attachment I-8) and are assigned values as sampled by LHS. The software developed, POSTLHS, Version 4.07, is in FORTRAN 77. The executable and the change history reside in the following directory locations on a DEC ALPHA using the operating system open VMS AXP V7 at Sandia National Laboratories:

WP$CMSROOT:[LHS.CMS$001]POSTLHS_PA96.EXE;2

WP$CGMROOT:[LHS]01CGM.HIS;1

This satisfies the requirements first and second bullets of Section 5.1.1.2 of procedure AP-SI.1Q for software routines.

<u>Documentation to satisfy third bullet of Section 5.1.1.2:</u>

POSTLHS capability requirements, including acceptance criteria, and tests for verification and validation and can be found in the Requirements Document, Verification and Validation Plan (SNL, 1995e) and the Validation Document (SNL, 1995f). POSTLHS was used to add the sampled input (to INFIL V A_2.a1) parameter values (as found in LHS output) to a CDB file corresponding to each realization. The name of each CDB file included a designator indicating the realization that produced these values. The use of this routine in this manner falls within the domain of the use tested in the documentation referred to above. Visual comparison of the GROPECDB display of each CDB file (e.g. Table X-3 for realization 001) produced by POSTLHS with the values produced by LHS (Attachment XI) verifies that the appropriate values corresponding to each realization are correctly inserted into that CDB file.

Table X-3. GROPECDB listing of realization 001 showing values of sampled properties

```
GGGGG   RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR   RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR   RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB         PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                          GROPECDB_PA96 Version 2.12
                           PROD PA96 Built 06/27/96
                           Sponsored by Amy Gilkey

                         Run on 04/05/00 at 09:08:45
                     Run on ALPHA AXP BEATLE OpenVMS V7.2-1

Database:
I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.LHS.GLACIAL]POSTLHS_1_R001.CDB;2
Written on:  12/01/99 18:02:24

CAMDAT Version:   1        (EXODUS Version:   1)

PROPERTIES

Element Block 1)    "FOOTPRNT"     1=ID    75 elements (1..75)
      8-node     5 attributes    13 properties
   BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
   SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
   SUBPAR1
  2.95100E-02  3.74700E+00  1.12800E+00  1.11500E+00  9.01500E-01  5.48200E+00
  2.22800E+00  1.06100E+01  1.10200E+00  3.04400E-01  1.73000E+01  2.15800E+00
  1.57100E-01

Element Block 2)    "OUTSIDE "     2=ID    25 elements (76..100)
      8-node     5 attributes    13 properties
   BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
   SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
   SUBPAR1
  2.00000E-02  1.50000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
  1.00000E+00 -1.50000E+00  1.26000E+00  5.00000E-01  1.73000E+01  1.78000E+00
  1.00000E-01
```

ATTACHMENT XI

OUTPUT FILE FROM LHS SAMPLED VALUES OF INPUT PARAMETERS FOR ALL 100 REALIZATIONS

This attachment contains sampled values for the twelve uncertain input parameters listed in Table 4-1 (as obtained from LHS) using 100 realizations.

Table XI-1. LHS Output File Containing Sampled values for 12 Uncertain Parameters

```
TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05
RANDOM SEED =   733050198
NUMBER OF VARIABLES =  12
NUMBER OF OBSERVATIONS =  100
THE SAMPLE INPUT VECTORS WILL BE PRINTED ALONG WITH THEIR CORRESPONDING RANKS
HISTOGRAMS OF THE ACTUAL SAMPLE WILL BE PLOTTED FOR EACH INPUT VARIABLE
THE CORRELATION MATRICES (RAW DATA AND RANK CORRELATIONS) WILL BE PRINTED
A PLOT FILE OF SAMPLED VALUES AND CUMULATIVE PROBABILITIES WILL BE CREATED

TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05
VARIABLE  DISTRIBUTION          RANGE            LABEL
    1     NORMAL            0.0000E+00 TO   4.0000E-02  FOOTPRNT  BRPOROS
    2     NORMAL             1.000     TO    5.000      FOOTPRNT  BRZDEPTH
    3     NORMAL            0.5000     TO    1.500      FOOTPRNT  SOILDEPM
    4     NORMAL            0.6000     TO    1.400      FOOTPRNT  PRECIPM
    5     NORMAL            0.6000     TO    1.400      FOOTPRNT  POTETMUL
    6     LOGNORMAL         5.0000E-02 TO    20.00      FOOTPRNT  BRPERM
    7     LOGNORMAL         5.0000E-02 TO    20.00      FOOTPRNT  SOILPERM
    8     NORMAL             5.000     TO    15.00      FOOTPRNT  ETCOEFFA
    9     NORMAL            0.5400     TO    1.540      FOOTPRNT  ETCOEFFB
   10     NORMAL            1.0000E-02 TO   0.4900      FOOTPRNT  FLAREA
   11     UNIFORM           0.0000E+00 TO   0.2000      FOOTPRNT  SUBPAR1
```

12 UNIFORM 0.7800 TO 2.780 FOOTPRNT SNOPAR1

TITLE SDB Name = INFIL.SDB , Ver = 1 12/01/99 17:58:05

LATIN HYPERCUBE SAMPLE INPUT VECTORS

RUN NO.	X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)	X(9)	X(10)
1	2.951E-02	3.747E+00	1.128E+00	1.115E+00	9.015E-01	5.482E+00	2.228E+00	1.061E+01	1.102E+00	3.044E-01
2	1.970E-02	5.000E+00	8.430E-01	8.211E-01	7.525E-01	5.518E-01	3.978E+00	1.185E+01	1.158E+00	1.557E-01
3	2.717E-02	4.735E+00	9.928E-01	9.971E-01	1.077E+00	2.689E-01	1.046E+00	9.708E+00	8.562E-01	3.208E-01
4	1.056E-02	3.048E+00	8.193E-01	9.582E-01	1.375E+00	7.215E+00	1.622E+00	1.180E+01	1.165E+00	4.268E-01
5	2.679E-02	2.762E+00	1.120E+00	1.024E+00	9.981E-01	6.245E+00	1.303E+00	7.633E+00	1.177E+00	2.193E-01
6	2.112E-02	3.101E+00	1.250E+00	6.208E-01	8.708E-01	8.638E-01	2.299E+00	1.045E+01	7.500E-01	1.340E-01
7	2.792E-02	3.020E+00	1.050E+00	9.348E-01	9.136E-01	4.410E-01	4.622E-01	9.903E+00	1.354E+00	3.492E-01
8	2.472E-02	2.557E+00	6.638E-01	1.194E+00	1.020E+00	2.081E-01	1.028E+00	9.261E+00	1.193E+00	1.893E-01
9	1.766E-02	2.406E+00	7.988E-01	1.144E+00	1.104E+00	3.344E+00	7.527E-01	7.565E+00	5.400E-01	8.259E-02
10	1.698E-02	2.726E+00	1.162E+00	1.073E+00	8.152E-01	1.935E+00	1.742E-01	5.707E+00	1.467E+00	2.785E-01
11	1.428E-02	4.024E+00	9.427E-01	1.252E+00	7.342E-01	1.009E+00	2.326E-01	8.754E+00	6.023E-01	1.303E-01
12	1.011E-02	2.613E+00	1.114E+00	8.813E-01	1.123E+00	9.765E+00	8.338E-01	9.673E+00	1.150E+00	2.856E-01
13	2.102E-02	3.365E+00	1.218E+00	1.170E+00	1.135E+00	1.083E+00	7.873E-01	1.351E+01	1.403E+00	4.811E-01
14	1.096E-02	3.413E+00	8.922E-01	8.351E-01	1.099E+00	4.265E+00	1.239E+00	6.349E+00	1.325E+00	2.183E-01
15	4.406E-03	3.695E+00	9.097E-01	8.849E-01	9.188E-01	5.913E-01	4.144E-01	1.071E+01	1.062E+00	2.707E-01
16	1.511E-02	4.786E+00	9.019E-01	1.177E+00	1.049E+00	2.573E+00	2.822E+00	8.652E+00	1.265E+00	2.907E-01
17	3.372E-02	3.874E+00	9.776E-01	1.102E+00	1.006E+00	3.734E+00	1.302E-01	8.971E+00	9.041E-01	4.194E-01
18	2.601E-02	3.684E+00	1.184E+00	6.838E-01	9.656E-01	1.484E+01	4.255E+00	6.677E+00	6.412E-01	3.573E-01
19	8.194E-03	4.063E+00	7.482E-01	9.258E-01	9.488E-01	2.000E+01	3.202E-01	1.108E+01	9.933E-01	1.944E-01
20	3.486E-02	2.895E+00	1.403E+00	1.153E+00	9.650E-01	3.490E+00	1.905E-01	1.452E+01	6.666E-01	1.836E-01
21	3.307E-02	2.450E+00	9.507E-01	9.036E-01	1.206E+00	5.304E-01	9.365E-01	1.106E+01	1.026E+00	2.750E-01
22	1.842E-02	2.987E+00	7.289E-01	1.225E+00	8.440E-01	1.331E+00	1.984E+00	9.511E+00	1.120E+00	2.346E-01

23	3.768E-02	3.449E+00	1.067E+00	9.242E-01	1.038E+00	1.627E+00	3.150E+00	1.052E+01	1.312E+00	1.000E-02
24	2.136E-02	3.305E+00	1.020E+00	9.756E-01	1.072E+00	2.208E-01	2.000E+01	1.500E+01	8.043E-01	2.331E-01
25	1.748E-02	1.707E+00	8.339E-01	1.357E+00	8.334E-01	4.768E+00	5.215E-01	1.330E+01	7.821E-01	1.279E-01
26	2.218E-02	3.462E+00	1.030E+00	8.575E-01	8.780E-01	1.739E-01	7.220E+00	8.828E+00	9.812E-01	2.615E-01
27	1.115E-02	3.956E+00	6.937E-01	9.433E-01	6.727E-01	6.810E-01	1.391E+00	1.092E+01	1.143E+00	2.931E-01
28	1.301E-02	2.738E+00	5.703E-01	9.059E-01	1.024E+00	1.121E+00	3.548E+00	1.289E+01	1.049E+00	3.741E-01
29	1.906E-02	1.907E+00	7.107E-01	9.912E-01	7.209E-01	1.683E+00	6.061E-01	9.762E+00	7.139E-01	4.411E-01
30	2.496E-02	1.787E+00	1.036E+00	1.038E+00	1.082E+00	2.466E+00	2.170E+00	1.009E+01	1.052E+00	3.320E-01
31	2.253E-02	4.295E+00	5.545E-01	7.330E-01	1.058E+00	8.050E-01	9.500E-01	9.890E+00	8.274E-01	1.745E-01
32	2.574E-02	3.758E+00	1.112E+00	1.325E+00	9.705E-01	1.241E+00	1.643E+00	7.338E+00	9.189E-01	3.029E-01
33	2.626E-02	3.071E+00	7.415E-01	1.070E+00	1.028E+00	4.637E-01	8.584E-01	6.964E+00	8.921E-01	3.356E-01
34	5.092E-03	2.643E+00	1.230E+00	1.282E+00	9.279E-01	2.759E+00	5.397E-01	8.395E+00	9.121E-01	7.665E-02
35	8.502E-03	3.510E+00	8.561E-01	8.227E-01	9.762E-01	4.007E+00	1.055E+01	1.207E+01	9.748E-01	3.830E-01
36	2.156E-02	2.818E+00	1.025E+00	1.034E+00	8.252E-01	9.187E+00	4.586E+00	1.256E+01	1.022E+00	1.685E-01
37	3.114E-02	3.558E+00	8.179E-01	7.822E-01	8.854E-01	8.770E-02	7.420E-01	1.142E+01	1.220E+00	2.143E-01
38	2.437E-02	1.977E+00	8.099E-01	1.013E+00	1.283E+00	3.189E+00	1.544E+00	7.880E+00	9.466E-01	2.052E-01
39	2.371E-02	2.787E+00	7.816E-01	1.130E+00	1.153E+00	5.839E-01	2.642E-01	7.981E+00	7.724E-01	2.544E-01
40	1.952E-02	4.004E+00	1.191E+00	1.118E+00	1.042E+00	2.911E+00	1.264E+00	1.268E+01	9.624E-01	3.420E-01
41	1.344E-02	1.187E+00	1.500E+00	8.661E-01	1.014E+00	1.432E+00	6.631E-01	1.302E+01	8.986E-01	1.622E-01
42	2.832E-02	2.597E+00	8.675E-01	1.020E+00	1.120E+00	2.417E-01	1.702E+00	1.072E+01	1.185E+00	2.517E-01
43	2.869E-02	2.947E+00	1.015E+00	9.552E-01	6.915E-01	1.170E+01	4.803E-01	1.119E+01	1.106E+00	2.251E-01
44	3.074E-02	3.347E+00	1.099E+00	1.262E+00	1.033E+00	2.819E-01	2.454E+00	1.391E+01	1.006E+00	3.529E-01
45	3.607E-02	3.278E+00	1.271E+00	1.004E+00	1.112E+00	7.296E-01	2.139E-01	8.605E+00	1.298E+00	1.457E-01
46	9.806E-03	1.000E+00	8.868E-01	1.008E+00	6.082E-01	8.379E-01	1.749E+01	8.050E+00	1.093E+00	2.392E-01
47	1.866E-02	2.326E+00	9.556E-01	1.108E+00	8.830E-01	5.019E-01	3.003E+00	1.238E+01	1.032E+00	1.002E-01

48	1.232E-02	2.423E+00	1.242E+00	1.054E+00	1.066E+00	1.851E-01	1.186E+01	9.090E+00	1.179E+00	4.109E-02
49	2.650E-02	2.647E+00	6.129E-01	8.403E-01	1.011E+00	1.750E+00	2.478E-01	1.026E+01	8.205E-01	3.896E-01
50	1.980E-02	2.000E+00	8.696E-01	7.585E-01	8.964E-01	3.005E-01	3.963E-01	9.394E+00	1.365E+00	1.515E-01
51	-3.725E-09	2.494E+00	6.738E-01	1.084E+00	1.212E+00	1.986E+00	6.346E-02	1.129E+01	9.522E-01	2.721E-01
52	1.660E-02	2.876E+00	1.203E+00	8.053E-01	1.143E+00	7.108E-01	5.560E-01	1.095E+01	1.016E+00	3.688E-01
53	1.487E-02	3.232E+00	9.316E-01	1.080E+00	1.323E+00	6.212E-01	1.783E+00	9.294E+00	1.490E+00	2.558E-01
54	2.992E-02	2.211E+00	9.139E-01	7.558E-01	7.670E-01	1.169E+00	9.037E-01	8.741E+00	1.385E+00	2.886E-01
55	3.174E-02	2.228E+00	1.071E+00	9.101E-01	9.056E-01	6.346E-01	7.149E-01	1.016E+01	1.224E+00	2.088E-01
56	3.032E-02	3.119E+00	1.153E+00	1.125E+00	8.406E-01	8.091E+00	9.303E+00	6.063E+00	9.879E-01	3.480E-01
57	1.821E-02	2.166E+00	1.093E+00	9.619E-01	1.110E+00	8.911E-01	2.900E-01	9.610E+00	1.131E+00	1.902E-01
58	2.900E-02	4.364E+00	7.745E-01	1.051E+00	9.838E-01	7.533E-01	3.644E+00	5.379E+00	1.281E+00	2.213E-01
59	2.669E-03	1.813E+00	1.339E+00	9.517E-01	9.823E-01	1.988E-01	5.110E+00	8.417E+00	1.088E+00	3.006E-01
60	2.287E-02	3.903E+00	6.246E-01	8.438E-01	1.244E+00	2.347E+00	6.503E-01	1.081E+01	8.598E-01	1.142E-01
61	1.927E-02	1.890E+00	1.418E+00	1.099E+00	9.216E-01	7.101E-02	1.851E+00	1.042E+01	9.649E-01	2.669E-01
62	2.038E-02	2.126E+00	1.176E+00	6.000E-01	9.348E-01	1.504E+00	5.000E-02	7.819E+00	9.996E-01	2.806E-01
63	7.731E-03	3.803E+00	1.039E+00	8.120E-01	7.936E-01	4.195E-01	3.768E-01	1.230E+01	1.125E+00	3.984E-01
64	6.695E-03	4.216E+00	1.138E+00	6.596E-01	1.349E+00	1.261E+00	1.933E+00	7.715E+00	1.167E+00	6.914E-02
65	1.400E-02	2.265E+00	8.411E-01	1.216E+00	1.267E+00	3.142E-01	1.205E+00	1.215E+01	1.099E+00	2.014E-01
66	2.317E-02	3.605E+00	1.004E+00	9.833E-01	1.163E+00	2.701E+00	5.684E-01	9.820E+00	1.329E+00	3.125E-01
67	1.559E-02	3.379E+00	1.358E+00	9.149E-01	6.000E-01	1.808E+00	1.454E+00	1.155E+01	8.758E-01	3.251E-01
68	1.172E-02	3.493E+00	1.283E+00	1.160E+00	1.070E+00	1.435E-01	2.537E+00	1.160E+01	1.060E+00	4.458E-01
69	1.328E-02	2.374E+00	1.140E+00	7.244E-01	7.780E-01	1.360E+00	1.375E-01	1.205E+01	1.140E+00	9.449E-02
70	6.542E-03	3.031E+00	7.206E-01	1.043E+00	9.298E-01	2.525E-01	8.168E-01	8.219E+00	9.714E-01	3.080E-01
71	1.423E-03	3.167E+00	1.080E+00	1.146E+00	1.147E+00	1.007E-01	7.752E-02	1.011E+01	1.233E+00	2.603E-01
72	3.223E-02	3.311E+00	1.255E+00	9.393E-01	1.089E+00	1.859E+00	2.096E+00	7.045E+00	7.620E-01	2.440E-01
73	3.729E-02	3.214E+00	7.627E-01	8.919E-01	8.610E-01	5.155E-01	6.235E-01	1.149E+01	1.078E+00	1.793E-01

74	2.285E-02	4.201E+00	1.167E+00	1.195E+00	9.398E-01	3.371E-01	1.073E+00	8.319E+00	1.010E+00	3.810E-01
75	1.580E-02	2.921E+00	7.914E-01	1.064E+00	8.032E-01	9.675E-01	7.436E+00	1.084E+01	1.114E+00	1.393E-01
76	2.080E-02	3.189E+00	1.315E+00	7.045E-01	1.055E+00	6.645E-01	4.461E-01	1.171E+01	1.043E+00	2.828E-01
77	2.017E-02	4.565E+00	1.289E+00	1.400E+00	1.266E+00	1.569E+00	1.382E+00	1.055E+01	9.288E-01	1.545E-01
78	2.540E-02	2.704E+00	1.063E+00	1.088E+00	9.907E-01	9.291E-01	9.998E-01	9.445E+00	1.540E+00	1.066E-01
79	1.802E-02	2.056E+00	8.807E-01	1.315E+00	9.447E-01	7.770E-01	2.611E+00	6.548E+00	1.081E+00	2.027E-01
80	1.718E-02	3.536E+00	9.604E-01	1.234E+00	8.629E-01	2.049E+00	1.139E+00	1.119E+01	9.382E-01	1.967E-01
81	2.780E-02	3.151E+00	9.188E-01	8.981E-01	1.400E+00	4.264E-01	4.264E-01	1.028E+01	8.511E-01	3.135E-01
82	1.669E-02	2.857E+00	1.060E+00	9.919E-01	1.167E+00	1.139E-01	2.621E-01	8.532E+00	7.362E-01	2.267E-01
83	2.750E-02	2.076E+00	9.952E-01	1.208E+00	1.130E+00	4.880E+00	9.401E-02	1.245E+01	1.256E+00	1.205E-01
84	1.525E-02	4.414E+00	1.008E+00	1.092E+00	8.092E-01	1.307E-01	1.117E+00	8.147E+00	1.037E+00	1.641E-01
85	2.180E-02	2.977E+00	9.365E-01	1.183E+00	1.180E+00	2.197E+00	3.311E+00	1.374E+01	1.418E+00	2.969E-01
86	2.383E-02	2.299E+00	9.788E-01	8.553E-01	8.915E-01	3.010E+00	3.362E-01	1.037E+01	1.213E+00	3.386E-01
87	4.000E-02	1.424E+00	9.638E-01	7.756E-01	1.230E+00	5.000E-02	1.508E+00	1.135E+01	9.410E-01	1.839E-01
88	1.368E-02	3.619E+00	1.105E+00	9.654E-01	1.195E+00	5.951E+00	3.633E-01	1.280E+01	1.252E+00	2.421E-01
89	1.257E-02	3.640E+00	1.320E+00	8.757E-01	9.562E-01	4.796E-01	3.537E-01	1.001E+01	9.270E-01	2.452E-01
90	1.455E-02	2.548E+00	1.085E+00	9.305E-01	1.233E+00	9.904E-01	4.531E+00	8.905E+00	8.151E-01	2.635E-01
91	2.506E-02	2.362E+00	5.000E-01	1.044E+00	1.094E+00	3.620E-01	2.940E-01	7.136E+00	7.918E-01	3.263E-01
92	1.871E-02	1.255E+00	1.146E+00	9.818E-01	1.189E+00	1.477E+00	6.268E+00	9.537E+00	8.358E-01	4.900E-01
93	2.355E-02	3.848E+00	9.887E-01	1.138E+00	7.849E-01	1.579E-01	1.578E-01	1.409E+01	6.957E-01	2.498E-01
94	9.140E-03	3.261E+00	1.049E+00	9.710E-01	1.047E+00	1.044E+00	6.952E-01	9.954E+00	1.287E+00	2.111E-01
95	2.054E-02	2.844E+00	9.269E-01	1.014E+00	9.574E-01	2.279E+00	5.026E-01	1.194E+01	1.199E+00	1.704E-01
96	1.629E-02	4.123E+00	1.466E+00	1.060E+00	1.002E+00	3.931E-01	1.123E-01	5.000E+00	8.723E-01	2.310E-01
97	1.603E-02	2.688E+00	9.701E-01	7.967E-01	8.518E-01	3.779E-01	2.902E+00	9.016E+00	8.878E-01	3.641E-01
98	1.211E-02	2.519E+00	8.959E-01	8.728E-01	1.175E+00	1.182E+00	5.797E+00	9.137E+00	5.755E-01	3.582E-02

99	2.408E-02	1.588E+00	8.531E-01	1.290E+00	7.100E-01	3.385E-01	2.017E-01	9.210E+00	1.241E+00	4.031E-01
100	2.205E-02	1.569E+00	1.206E+00	1.028E+00	9.944E-01	4.535E+00	5.309E+00	7.390E+00	1.072E+00	3.177E-01

TITLE SDB Name = INFIL.SDB , Ver = 1 12/01/99 17:58:05

LATIN HYPERCUBE SAMPLE INPUT VECTORS

RUN NO.	X(11)	X(12)
1	1.571E-01	2.158E+00
2	7.899E-02	1.084E+00
3	4.278E-02	1.073E+00
4	1.945E-01	1.778E+00
5	2.968E-04	8.480E-01
6	1.137E-01	2.000E+00
7	4.974E-02	1.687E+00
8	1.170E-01	1.806E+00
9	1.689E-01	1.169E+00
10	1.595E-01	1.047E+00
11	1.192E-01	2.216E+00
12	1.819E-01	2.654E+00
13	1.973E-01	1.849E+00
14	6.094E-02	1.668E+00
15	2.240E-02	1.587E+00
16	1.261E-01	2.285E+00
17	1.061E-01	8.812E-01
18	3.334E-02	2.513E+00
19	1.374E-01	1.399E+00
20	1.318E-01	2.001E+00
21	8.391E-02	1.916E+00

22	5.225E-03	1.629E+00
23	1.150E-01	1.945E+00
24	7.343E-02	1.821E+00
25	1.624E-01	2.581E+00
26	5.193E-02	1.747E+00
27	8.031E-02	2.772E+00
28	7.456E-02	1.787E+00
29	1.762E-02	9.068E-01
30	7.349E-03	9.300E-01
31	1.549E-01	8.084E-01
32	1.339E-01	2.498E+00
33	1.357E-01	2.758E+00
34	4.017E-02	1.710E+00
35	8.800E-02	2.732E+00
36	1.443E-01	2.047E+00
37	1.741E-01	2.604E+00
38	8.808E-02	2.339E+00
39	9.344E-02	1.139E+00
40	4.684E-02	1.110E+00
41	1.391E-02	2.166E+00
42	1.611E-01	1.872E+00
43	1.720E-01	8.214E-01
44	1.468E-02	2.232E+00
45	9.658E-02	2.523E+00
46	1.760E-01	1.498E+00

47	1.105E-01	1.577E+00
48	1.425E-01	1.005E+00
49	1.491E-01	1.333E+00
50	6.248E-02	2.022E+00
51	2.432E-02	2.469E+00
52	1.255E-01	9.749E-01
53	9.936E-02	1.306E+00
54	1.405E-01	1.272E+00
55	8.284E-03	2.407E+00
56	5.477E-02	2.197E+00
57	3.717E-02	1.231E+00
58	1.097E-01	2.430E+00
59	8.425E-02	1.030E+00
60	1.711E-01	2.663E+00
61	1.856E-01	2.709E+00
62	1.027E-01	2.255E+00
63	1.175E-02	2.094E+00
64	5.221E-02	1.509E+00
65	3.294E-03	2.108E+00
66	6.838E-02	2.632E+00
67	3.874E-02	1.723E+00
68	3.449E-02	1.430E+00
69	2.707E-02	2.273E+00
70	9.583E-02	1.477E+00
71	7.627E-02	1.368E+00
72	4.562E-02	1.199E+00

73	5.641E-02	9.557E-01
74	1.641E-01	1.211E+00
75	3.159E-02	2.301E+00
76	1.517E-01	2.399E+00
77	1.051E-01	1.257E+00
78	1.531E-01	1.538E+00
79	1.675E-01	1.407E+00
80	1.985E-02	1.459E+00
81	7.060E-02	1.617E+00
82	6.630E-02	2.065E+00
83	2.975E-02	1.152E+00
84	5.834E-02	2.578E+00
85	1.010E-01	1.293E+00
86	1.391E-01	1.921E+00
87	1.292E-01	1.644E+00
88	1.214E-01	9.884E-01
89	1.992E-01	1.971E+00
90	1.928E-01	2.556E+00
91	2.063E-02	2.458E+00
92	6.468E-02	2.350E+00
93	1.906E-01	1.356E+00
94	1.783E-01	1.548E+00
95	1.475E-01	2.690E+00
96	9.158E-02	2.367E+00
97	1.869E-01	7.898E-01

0 98 1.898E-01 8.639E-01

99 1.828E-01 1.880E+00

100 1.222E-01 2.122E+00

TITLE SDB Name = INFIL.SDB , Ver = 1 12/01/99 17:58:05

RANKS OF LATIN HYPERCUBE SAMPLE INPUT VECTORS

RUN NO.	X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)	X(9)	X(10)
1	87.	81.	73.	75.	29.	91.	74.	62.	62.	71.
2	49.	100.	24.	15.	8.	33.	86.	81.	71.	19.
3	80.	98.	49.	50.	68.	16.	52.	45.	20.	76.
4	14.	53.	21.	41.	99.	94.	65.	80.	72.	96.
5	79.	40.	72.	56.	50.	93.	59.	14.	74.	39.
6	56.	55.	88.	2.	23.	46.	75.	59.	9.	14.
7	83.	51.	60.	36.	31.	27.	28.	49.	93.	84.
8	71.	31.	6.	87.	55.	12.	51.	37.	77.	28.
9	40.	25.	18.	80.	73.	83.	42.	13.	1.	6.
10	37.	38.	78.	67.	15.	70.	9.	3.	98.	61.
11	26.	89.	40.	93.	7.	51.	13.	29.	3.	13.
12	13.	33.	71.	25.	77.	97.	45.	44.	70.	64.
13	55.	67.	85.	84.	79.	53.	43.	95.	96.	99.
14	15.	69.	31.	17.	72.	87.	57.	5.	91.	38.
15	4.	80.	34.	26.	32.	35.	25.	63.	55.	58.
16	29.	99.	33.	85.	62.	77.	79.	27.	86.	66.
17	95.	85.	46.	73.	52.	85.	6.	32.	27.	95.
18	76.	79.	81.	4.	43.	99.	87.	7.	4.	86.
19	9.	90.	13.	34.	39.	100.	19.	70.	42.	30.
20	96.	46.	97.	82.	42.	84.	10.	99.	5.	26.

21	94.	27.	41.	29.	89.	32.	48.	69.	48.	60.
22	43.	50.	11.	91.	19.	59.	71.	41.	65.	45.
23	99.	70.	63.	33.	59.	65.	82.	60.	90.	1.
24	57.	64.	54.	45.	67.	13.	100.	100.	14.	44.
25	39.	7.	22.	99.	17.	89.	31.	94.	12.	12.
26	61.	71.	56.	21.	24.	9.	94.	30.	40.	55.
27	16.	87.	8.	38.	3.	39.	61.	67.	69.	67.
28	21.	39.	3.	30.	56.	54.	84.	92.	52.	89.
29	46.	11.	9.	48.	6.	66.	35.	46.	7.	97.
30	72.	8.	57.	59.	69.	76.	73.	52.	53.	79.
31	62.	94.	2.	7.	64.	44.	49.	48.	17.	24.
32	75.	82.	70.	98.	44.	57.	66.	11.	29.	70.
33	77.	54.	12.	66.	57.	28.	46.	8.	25.	80.
34	5.	34.	86.	95.	34.	79.	32.	23.	28.	5.
35	10.	73.	26.	16.	45.	86.	97.	84.	39.	91.
36	58.	42.	55.	58.	16.	96.	89.	89.	47.	22.
37	91.	75.	20.	11.	26.	3.	41.	75.	80.	37.
38	70.	12.	19.	53.	96.	82.	64.	17.	34.	34.
39	67.	41.	16.	78.	82.	34.	16.	18.	11.	52.
40	48.	88.	82.	76.	60.	80.	58.	90.	36.	82.
41	23.	2.	100.	22.	54.	61.	38.	93.	26.	20.
42	84.	32.	27.	55.	76.	14.	67.	64.	76.	51.
43	85.	48.	53.	40.	4.	98.	29.	71.	63.	41.
44	90.	66.	68.	94.	58.	17.	76.	97.	44.	85.
45	97.	63.	90.	51.	75.	41.	12.	26.	89.	16.

46	12.	1.	30.	52.	2.	45.	99.	19.	60.	46.
47	44.	22.	42.	74.	25.	30.	81.	87.	49.	8.
48	19.	26.	87.	63.	65.	10.	98.	34.	75.	3.
49	78.	35.	4.	18.	53.	67.	14.	55.	16.	92.
50	50.	13.	28.	9.	28.	18.	24.	39.	94.	17.
51	1.	28.	7.	69.	90.	71.	2.	73.	35.	59.
52	35.	45.	83.	13.	80.	40.	33.	68.	46.	88.
53	28.	61.	38.	68.	97.	36.	68.	38.	99.	53.
54	88.	18.	35.	8.	9.	55.	47.	28.	95.	65.
55	92.	19.	64.	31.	30.	37.	40.	54.	81.	35.
56	89.	56.	77.	77.	18.	95.	96.	4.	41.	83.
57	42.	17.	67.	42.	74.	47.	17.	43.	67.	29.
58	86.	95.	15.	62.	47.	42.	85.	2.	87.	40.
59	3.	9.	95.	39.	46.	11.	90.	24.	59.	69.
60	64.	86.	5.	19.	93.	75.	37.	65.	21.	10.
61	47.	10.	98.	72.	33.	2.	69.	58.	37.	57.
62	52.	16.	80.	1.	36.	63.	1.	16.	43.	62.
63	8.	83.	58.	14.	12.	25.	23.	86.	66.	93.
64	7.	93.	74.	3.	98.	58.	70.	15.	73.	4.
65	25.	20.	23.	90.	95.	19.	56.	85.	61.	32.
66	65.	76.	51.	47.	83.	78.	34.	47.	92.	73.
67	31.	68.	96.	32.	1.	68.	62.	77.	23.	77.
68	17.	72.	91.	83.	66.	7.	77.	78.	54.	98.
69	22.	24.	75.	6.	10.	60.	7.	83.	68.	7.
70	6.	52.	10.	60.	35.	15.	44.	21.	38.	72.
71	2.	58.	65.	81.	81.	4.	3.	53.	82.	54.

72	93.	65.	89.	37.	70.	69.	72.	9.	10.	48.
73	98.	60.	14.	27.	21.	31.	36.	76.	57.	25.
74	63.	92.	79.	88.	37.	20.	53.	22.	45.	90.
75	32.	47.	17.	65.	13.	49.	95.	66.	64.	15.
76	54.	59.	93.	5.	63.	38.	27.	79.	51.	63.
77	51.	97.	92.	100.	94.	64.	60.	61.	31.	18.
78	74.	37.	62.	70.	48.	48.	50.	40.	100.	9.
79	41.	14.	29.	97.	38.	43.	78.	6.	58.	33.
80	38.	74.	43.	92.	22.	72.	55.	72.	32.	31.
81	82.	57.	36.	28.	100.	26.	26.	56.	19.	74.
82	36.	44.	61.	49.	84.	5.	15.	25.	8.	42.
83	81.	15.	50.	89.	78.	90.	4.	88.	85.	11.
84	30.	96.	52.	71.	14.	6.	54.	20.	50.	21.
85	59.	49.	39.	86.	86.	73.	83.	96.	97.	68.
86	68.	21.	47.	20.	27.	81.	20.	57.	79.	81.
87	100.	4.	44.	10.	91.	1.	63.	74.	33.	27.
88	24.	77.	69.	43.	88.	92.	22.	91.	84.	47.
89	20.	78.	94.	24.	40.	29.	21.	51.	30.	49.
90	27.	30.	66.	35.	92.	50.	88.	31.	15.	56.
91	73.	23.	1.	61.	71.	22.	18.	10.	13.	78.
92	45.	3.	76.	46.	87.	62.	93.	42.	18.	100.
93	66.	84.	48.	79.	11.	8.	8.	98.	6.	50.
94	11.	62.	59.	44.	61.	52.	39.	50.	88.	36.
95	53.	43.	37.	54.	41.	74.	30.	82.	78.	23.
96	34.	91.	99.	64.	51.	24.	5.	1.	22.	43.

97	33.	36.	45.	12.	20.	23.	80.	33.	24.	87.
98	18.	29.	32.	23.	85.	56.	92.	35.	2.	2.
99	69.	6.	25.	96.	5.	21.	11.	36.	83.	94.
100	60.	5.	84.	57.	49.	88.	91.	12.	56.	75.

TITLE SDB Name = INFIL.SDB , Ver = 1 12/01/99 17:58:05

RANKS OF LATIN HYPERCUBE SAMPLE INPUT VECTORS

RUN NO.	X(11)	X(12)
1	79.	69.
2	40.	16.
3	22.	15.
4	98.	50.
5	1.	4.
6	57.	61.
7	25.	46.
8	59.	52.
9	85.	20.
10	80.	14.
11	60.	72.
12	91.	94.
13	99.	54.
14	31.	45.
15	12.	41.
16	64.	76.
17	54.	6.
18	17.	87.
19	69.	31.

20	66.	62.
21	42.	57.
22	3.	43.
23	58.	59.
24	37.	53.
25	82.	91.
26	26.	49.
27	41.	100.
28	38.	51.
29	9.	7.
30	4.	8.
31	78.	2.
32	67.	86.
33	68.	99.
34	21.	47.
35	44.	98.
36	73.	64.
37	88.	92.
38	45.	78.
39	47.	18.
40	24.	17.
41	7.	70.
42	81.	55.
43	87.	3.
44	8.	73.

45	49.	88.
46	89.	36.
47	56.	40.
48	72.	12.
49	75.	28.
50	32.	63.
51	13.	85.
52	63.	10.
53	50.	27.
54	71.	25.
55	5.	82.
56	28.	71.
57	19.	23.
58	55.	83.
59	43.	13.
60	86.	95.
61	93.	97.
62	52.	74.
63	6.	66.
64	27.	37.
65	2.	67.
66	35.	93.
67	20.	48.
68	18.	33.
69	14.	75.
70	48.	35.

71	39.	30.
72	23.	21.
73	29.	9.
74	83.	22.
75	16.	77.
76	76.	81.
77	53.	24.
78	77.	38.
79	84.	32.
80	10.	34.
81	36.	42.
82	34.	65.
83	15.	19.
84	30.	90.
85	51.	26.
86	70.	58.
87	65.	44.
88	61.	11.
89	100.	60.
90	97.	89.
91	11.	84.
92	33.	79.
93	96.	29.
94	90.	39.
95	74.	96.

```
  96        46.        80.

  97        94.         1.

  98        95.         5.

  99        92.        56.

 100        62.        68.

  TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

 HISTOGRAM FOR VARIABLE NO.  1     NORMAL          DISTRIBUTION

   MIDPOINT          FREQ.

-0.1000000E-02         1    X
 0.1000000E-02         1    X
 0.3000000E-02         1    X
 0.5000001E-02         2    XX
 0.7000001E-02         3    XXX
 0.9000001E-02         4    XXXX
 0.1100000E-01         5    XXXXX
 0.1300000E-01         7    XXXXXXX
 0.1500000E-01         8    XXXXXXXX
 0.1700000E-01         8    XXXXXXXX
 0.1900000E-01        10    XXXXXXXXXX
 0.2100000E-01         9    XXXXXXXXX
 0.2300000E-01         9    XXXXXXXXX
 0.2500000E-01         7    XXXXXXX
 0.2700000E-01         8    XXXXXXXX
 0.2900000E-01         5    XXXXX
 0.3100001E-01         4    XXXX
 0.3300001E-01         3    XXX
 0.3500001E-01         1    X
 0.3700001E-01         3    XXX
 0.3900001E-01         1    X

                     100


    MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

-0.3725290E-08  0.4000000E-01  0.4000001E-01  0.1998924E-01  0.1998468E-01  0.7142533E-04


  TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

 HISTOGRAM FOR VARIABLE NO.  2     NORMAL          DISTRIBUTION
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```
  MIDPOINT          FREQ.

0.9000002            1    X
 1.100000            1    X
 1.300000            1    X
 1.500000            3    XXX
 1.700000            2    XX
 1.900000            5    XXXXX
 2.100000            4    XXXX
 2.300000            7    XXXXXXX
 2.500000            8    XXXXXXXX
 2.700001            9    XXXXXXXXX
 2.900001            9    XXXXXXXXX
 3.100001            9    XXXXXXXXX
 3.300001            9    XXXXXXXXX
 3.500001            7    XXXXXXX
 3.700001            7    XXXXXXX
 3.900001            5    XXXXX
 4.100001            4    XXXX
 4.300001            4    XXXX
 4.500000            2    XX
 4.700000            2    XX
 4.900000            0
 5.100000            1    X

                    100


   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.9999995       5.000000       4.000001       2.999520       3.003353      0.7086340


 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  3     NORMAL          DISTRIBUTION

  MIDPOINT          FREQ.

0.5249998            1    X
0.5749998            2    XX
0.6249998            2    XX
0.6749998            3    XXX
0.7249998            5    XXXXX
0.7749999            5    XXXXX
0.8249999            6    XXXXXX
0.8749999            8    XXXXXXXX
0.9249999            8    XXXXXXXX
0.9749999           10    XXXXXXXXXX
 1.025000            9    XXXXXXXXX
 1.075000            9    XXXXXXXXX
```

```
 1.125000            8    XXXXXXXX
 1.175000            6    XXXXXX
 1.225000            5    XXXXX
 1.275000            5    XXXXX
 1.325000            3    XXX
 1.375000            1    X
 1.424999            2    XX
 1.474999            1    X
 1.524999            1    X

                   100

   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.4999999       1.500000       1.000000       1.000313      0.9995143      0.4426514E-01


 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  4     NORMAL          DISTRIBUTION

  MIDPOINT          FREQ.

0.6199999            2    XX
0.6599999            1    X
0.6999999            2    XX
0.7399999            4    XXXX
0.7800000            3    XXX
0.8200000            5    XXXXX
0.8600000            7    XXXXXXX
0.9000000            8    XXXXXXXX
0.9400001            9    XXXXXXXXX
0.9800001            9    XXXXXXXXX
 1.020000            9    XXXXXXXXX
 1.060000            8    XXXXXXXX
 1.100000            9    XXXXXXXXX
 1.140000            7    XXXXXXX
 1.180000            5    XXXXX
 1.220000            4    XXXX
 1.260000            2    XX
 1.300000            3    XXX
 1.340000            2    XX
 1.380000            0
 1.420000            1    X

                   100

   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE
```

```
0.6000000       1.400000      0.8000001      0.9998415       1.000569      0.2853096E-01

 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  5     NORMAL          DISTRIBUTION

  MIDPOINT          FREQ.

0.6199999            2    XX
0.6599999            1    X
0.6999999            2    XX
0.7399999            3    XXX
0.7800000            4    XXXX
0.8200000            5    XXXXX
0.8600000            7    XXXXXXX
0.9000000            8    XXXXXXXX
0.9400001            9    XXXXXXXXX
0.9800001            9    XXXXXXXXX
 1.020000            9    XXXXXXXXX
 1.060000            9    XXXXXXXXX
 1.100000            7    XXXXXXX
 1.140000            7    XXXXXXX
 1.180000            6    XXXXXX
 1.220000            4    XXXX
 1.260000            3    XXX
 1.300000            1    X
 1.340000            2    XX
 1.380000            1    X
 1.420000            1    X

                   100

   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.6000000       1.400000      0.8000001       1.000062      0.9998701      0.2863144E-01

 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  6     LOGNORMAL       DISTRIBUTION

  MIDPOINT          FREQ.

0.4999997           50    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 1.499999           21    XXXXXXXXXXXXXXXXXXXXX
 2.499998            9    XXXXXXXXX
 3.499998            5    XXXXX
 4.499997            5    XXXXX
 5.499997            2    XX
```

```
 6.499996            1    X
 7.499996            1    X
 8.499995            1    X
 9.499994            2    XX
 10.49999            0
 11.49999            1    X
 12.49999            0
 13.49999            0
 14.49999            1    X
 15.49999            0
 16.49999            0
 17.49999            0
 18.49999            0
 19.49999            0
 20.49999            1    X

                   100


   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.4999997E-01   20.00001       19.95001       2.130778      0.9996805       9.782403


 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  7     LOGNORMAL       DISTRIBUTION

  MIDPOINT          FREQ.

0.4999997            50    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 1.499999            21    XXXXXXXXXXXXXXXXXXXXX
 2.499998             9    XXXXXXXXX
 3.499998             6    XXXXXX
 4.499997             3    XXX
 5.499997             3    XXX
 6.499996             1    X
 7.499996             2    XX
 8.499995             0
 9.499994             1    X
 10.49999             1    X
 11.49999             1    X
 12.49999             0
 13.49999             0
 14.49999             0
 15.49999             0
 16.49999             0
 17.49999             1    X
 18.49999             0
 19.49999             0
 20.49999             1    X
```

```
                    100

   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.4999997E-01   20.00001       19.95001       2.154755       1.013921       10.60305

 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  8     NORMAL          DISTRIBUTION

  MIDPOINT          FREQ.

 5.249998            2    XX
 5.749998            1    X
 6.249998            2    XX
 6.749998            3    XXX
 7.249998            4    XXXX
 7.749998            6    XXXXXX
 8.249998            6    XXXXXX
 8.749998            8    XXXXXXXX
 9.249998            8    XXXXXXXX
 9.749998           10    XXXXXXXXXX
 10.25000            9    XXXXXXXXX
 10.75000            9    XXXXXXXXX
 11.25000            8    XXXXXXXX
 11.75000            6    XXXXXX
 12.25000            6    XXXXXX
 12.75000            4    XXXX
 13.25000            2    XX
 13.75000            3    XXX
 14.25000            1    X
 14.75000            1    X
 15.25000            1    X

                    100

   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

 4.999999       15.00000       10.00000       9.996411       9.983184       4.441211

 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO.  9     NORMAL          DISTRIBUTION

  MIDPOINT          FREQ.
```

```
0.5249998            1    X
0.5749998            1    X
0.6249998            2    XX
0.6749998            2    XX
0.7249998            2    XX
0.7749999            5    XXXXX
0.8249999            5    XXXXX
0.8749999            8    XXXXXXXX
0.9249999            8    XXXXXXXX
0.9749999            9    XXXXXXXXX
 1.025000            9    XXXXXXXXX
 1.075000            9    XXXXXXXXX
 1.125000            8    XXXXXXXX
 1.175000            9    XXXXXXXXX
 1.225000            5    XXXXX
 1.275000            6    XXXXXX
 1.325000            3    XXX
 1.375000            3    XXX
 1.424999            2    XX
 1.474999            2    XX
 1.524999            1    X

                   100


   MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.5399998       1.540000       1.000000       1.039693       1.040313      0.4451736E-01


 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO. 10     NORMAL          DISTRIBUTION

  MIDPOINT          FREQ.

0.1200000E-01         1    X
0.3600001E-01         2    XX
0.6000002E-01         1    X
0.8400002E-01         3    XXX
0.1080000             3    XXX
0.1320000             5    XXXXX
0.1560000             6    XXXXXX
0.1800000             8    XXXXXXXX
0.2040000             8    XXXXXXXX
0.2280000             9    XXXXXXXXX
0.2520001            10    XXXXXXXXXX
0.2760001             8    XXXXXXXX
0.3000001             8    XXXXXXXX
0.3240001             8    XXXXXXXX
0.3480001             6    XXXXXX
```

```
0.3720002            5    XXXXX
0.3960002            3    XXX
0.4200002            2    XX
0.4440002            2    XX
0.4680002            0
0.4920003            2    XX

                   100

   MIN            MAX           RANGE           MEAN           MEDIAN        VARIANCE

0.9999931E-02  0.4900001      0.4800001      0.2500286      0.2507621      0.1025054E-01

 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO. 11     UNIFORM         DISTRIBUTION

  MIDPOINT          FREQ.

0.4949997E-02         5    XXXXX
0.1484999E-01         4    XXXX
0.2474998E-01         5    XXXXX
0.3464998E-01         6    XXXXXX
0.4454997E-01         4    XXXX
0.5444996E-01         6    XXXXXX
0.6434996E-01         5    XXXXX
0.7424995E-01         5    XXXXX
0.8414995E-01         5    XXXXX
0.9404995E-01         4    XXXX
0.1039499             5    XXXXX
0.1138499             5    XXXXX
0.1237499             5    XXXXX
0.1336499             5    XXXXX
0.1435499             5    XXXXX
0.1534499             5    XXXXX
0.1633499             5    XXXXX
0.1732499             5    XXXXX
0.1831499             5    XXXXX
0.1930499             5    XXXXX
0.2029499             1    X

                   100

   MIN            MAX           RANGE           MEAN           MEDIAN        VARIANCE

0.2967655E-03  0.1992379      0.1989412      0.9998050E-01  0.1001890      0.3331727E-02
```

```
 TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

HISTOGRAM FOR VARIABLE NO. 12     UNIFORM         DISTRIBUTION

  MIDPOINT          FREQ.

0.7424996            1    X
0.8414995            5    XXXXX
0.9404994            5    XXXXX
 1.039499            5    XXXXX
 1.138499            4    XXXX
 1.237499            5    XXXXX
 1.336499            5    XXXXX
 1.435499            5    XXXXX
 1.534499            5    XXXXX
 1.633499            5    XXXXX
 1.732499            5    XXXXX
 1.831499            6    XXXXXX
 1.930499            4    XXXX
 2.029499            5    XXXXX
 2.128499            5    XXXXX
 2.227499            5    XXXXX
 2.326499            5    XXXXX
 2.425499            5    XXXXX
 2.524499            4    XXXX
 2.623499            6    XXXXXX
 2.722499            5    XXXXX

                    100


    MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

0.7897703       2.771902       1.982131       1.780235       1.782253      0.3336386


TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05

CORRELATIONS AMONG INPUT VARIABLES CREATED BY THE LATIN HYPERCUBE SAMPLE FOR RAW DATA                                PAGE   1

    1  1.0000

    2 -0.0121  1.0000

    3 -0.0050 -0.0121  1.0000

    4  0.0042  0.0105 -0.0103  1.0000

    5 -0.0007  0.0074 -0.0030 -0.0016  1.0000

    6 -0.0180  0.0724  0.0070 -0.0582 -0.0394  1.0000
```

```
    7 -0.1086 -0.1241  0.0291 -0.0309 -0.1030 -0.0032  1.0000
    8  0.0002 -0.0006  0.0086  0.0084  0.0029  0.0041  0.0204  1.0000
    9  0.0065 -0.0072  0.0075  0.0022  0.0071 -0.0541 -0.0758  0.0153  1.0000
   10  0.0035  0.0043 -0.0063  0.0062 -0.0101  0.0310 -0.0191  0.0108  0.0018  1.0000
   11  0.0468 -0.0164 -0.0226  0.0110 -0.0057  0.0827  0.0240 -0.0168  0.0142 -0.0431  1.0000
   12  0.0099 -0.0099  0.0160 -0.0309 -0.0194  0.0040  0.0148 -0.0093 -0.0153  0.0117  0.0086  1.0000
            1       2       3       4       5       6       7       8       9      10      11      12
VARIABLES
THE VARIANCE INFLATION FACTOR FOR THIS MATRIX IS  1.05
TITLE SDB Name = INFIL.SDB       , Ver = 1                12/01/99 17:58:05
CORRELATIONS AMONG INPUT VARIABLES CREATED BY THE LATIN HYPERCUBE SAMPLE FOR RANK DATA                              PAGE   1
    1  1.0000
    2 -0.0177  1.0000
    3 -0.0097  0.0432  1.0000
    4  0.0330  0.0041 -0.0076  1.0000
    5 -0.0011 -0.0263  0.0272  0.0109  1.0000
    6  0.0056 -0.0069  0.0359  0.0131  0.0276  1.0000
    7 -0.0394  0.0051  0.0212 -0.0045  0.0126  0.0008  1.0000
    8 -0.0325  0.0420 -0.0150 -0.0459 -0.0076  0.0227 -0.0610  1.0000
    9 -0.0032 -0.0268 -0.0115  0.0025 -0.0192  0.0083  0.0021  0.0513  1.0000
   10  0.0442  0.0529  0.0334 -0.0153  0.0084 -0.0095  0.0338 -0.0228 -0.0400  1.0000
   11  0.0246 -0.0147 -0.0378 -0.0008 -0.0045  0.0242  0.0031 -0.0322  0.0200 -0.0386  1.0000
   12  0.0117  0.0168  0.0022 -0.0239 -0.0349  0.0010  0.0088  0.0132 -0.0117  0.0038  0.0082  1.0000
            1       2       3       4       5       6       7       8       9      10      11      12
VARIABLES
```

```
THE VARIANCE INFLATION FACTOR FOR THIS MATRIX IS  1.01
```

ATTACHMENT XII

OUTPUT RESULTS FROM ANALOG RATE MAPS SUPPLIED BY USGS OVER MODELED RECTANGULAR REGION

This attachment contains the GROPECDB displays of the analog maps, spatially averaged over the modeled rectangular region, corresponding to the analog infiltration rate maps produced by the USGS for the low, middle, and high glacial transition climates. The $\log_{10}$ of these bolded values (Tables XII-1 – XII-3) are used in calculating the weighting factors as presented in Table 6-2.

TABLE XII-1. GROPECDB Display of output data showing result for lower bound glacial transition analog infiltration rate map

```
                                GROPECDB_PA96

 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR   RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR   RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB          PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                          GROPECDB_PA96 Version 2.12
                           PROD PA96 Built 06/27/96
                           Sponsored by Amy Gilkey

                         Run on 03/04/00 at 10:42:17
                     Run on ALPHA AXP BEATLE OpenVMS V7.2-1

Database:
I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.GLACIAL.LOW]POSTINF_LOW.CDB;1
Written on:  11/30/99 14:02:49

CAMDAT Version:   1        (EXODUS Version:   1)

GLOBAL TIME STEP VARIABLES

   Step       Time       NCELMEAN      INF_MEAN       RUN_MEAN
      1   0.00000E+00   4.78500E+03   2.36104E+00   0.00000E+00
```

TABLE XII-2. GROPECDB Display of output data showing result for MIDDLE glacial transition analog infiltration rate map

```
                                GROPECDB_PA96

 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR    RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR    RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB          PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                          GROPECDB_PA96 Version 2.12
                           PROD PA96 Built 06/27/96
                           Sponsored by Amy Gilkey

                         Run on 03/04/00 at 09:08:14
                     Run on ALPHA AXP BEATLE OpenVMS V7.2-1

Database:
I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.GLACIAL.MEAN]POSTINF_R001.CDB
;1
Written on:  11/30/99 10:36:47

CAMDAT Version:   1        (EXODUS Version:   1)

PROPERTIES

Element Block 1)    "FOOTPRNT"     1=ID    75 elements (1..75)
      8-node     5 attributes    13 properties
   BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
   SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
   SUBPAR1
  2.95100E-02  3.74700E+00  1.23000E+00  1.14400E+00  8.52300E-01  1.36700E+01
  3.42700E+00  1.12100E+01  1.10200E+00  3.04400E-01  1.73000E+01  2.15800E+00
  1.57100E-01

Element Block 2)    "OUTSIDE "     2=ID    25 elements (76..100)
      8-node     5 attributes    13 properties
   BRPOROS      BRZDEPTH     SOILDEPM     PRECIPM      POTETMUL     BRPERM
   SOILPERM     ETCOEFFA     ETCOEFFB     FLAREA       ATEMP1       SNOPAR1
   SUBPAR1
  2.00000E-02  1.50000E+00  1.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
  1.00000E+00 -1.50000E+00  1.26000E+00  5.00000E-01  1.73000E+01  1.78000E+00
  1.00000E-01

GLOBAL TIME STEP VARIABLES

   Step       Time       NCELMEAN      INF_MEAN      RUN_MEAN
      1   0.00000E+00   4.78500E+03   2.07892E+01   0.00000E+00
```

TABLE XII-3. GROPECDB Display of output data showing result for UPPer bound glacial transition analog infiltration rate map

```
                                GROPECDB_PA96

 GGGGG  RRRRRR   OOOOO  PPPPPP  EEEEEEE  CCCCC  DDDDDD  BBBBBB          PPPPPP
GG   GG RR    RR OO   OO PP   PP EE      CC   CC DD   DD BB   BB         PP   PP
GG      RR    RR OO   OO PP   PP EE      CC      DD   DD BB   BB         PP   PP
GG      RRRRRR  OO   OO PPPPPP  EEEEE   CC      DD   DD BBBBBB          PPPPPP
GG  GGG RRRRR   OO   OO PP      EE      CC      DD   DD BB   BB         PP
GG   GG RR  RR  OO   OO PP      EE      CC   CC DD   DD BB   BB         PP
 GGGGG  RR   RR  OOOOO  PP      EEEEEEE  CCCCC  DDDDDD  BBBBBB  _______ PP

                          GROPECDB_PA96 Version 2.12
                           PROD PA96 Built 06/27/96
                           Sponsored by Amy Gilkey

                         Run on 03/04/00 at 10:25:29
                     Run on ALPHA AXP BEATLE OpenVMS V7.2-1

Database:
I1:[000000.RDMCCUR.INEEL_PA98.YMP_99.INFILTRATION.POSTINFIL.GLACIAL.HIGH]POSTINF_HIGH.CDB
;1
Written on:  12/01/99 09:37:14

CAMDAT Version:   1        (EXODUS Version:   1)

GLOBAL TIME STEP VARIABLES

   Step       Time       NCELMEAN      INF_MEAN      RUN_MEAN
      1   0.00000E+00   4.78500E+03   3.92174E+01   0.00000E+00
```