VS2DH Version 3.3

Data Input Formats

Line	Variable	Description
	[Line group A read by SETUP]	
A-1	**TITL**	80-character problem description (formatted read, 20A4).
A-2	**TMAX**	Maximum simulation time.
	STIM	Initial time (usually set to 0).
	ANG	Angle by which grid is to be tilted (Must be between -90 and +90 degrees, ANG = 0 for no tilting, see Healy (1990) for further discussion), degrees.
A-3	**ZUNIT**	Units used for length (A4), “m” for meters.
	TUNIT	Units used for time (A4), “sec” for seconds
	CUNX	Units used for heat (A4), “J” for Joules.
Note: Line A-3 is read in 3A4 format, so the unit designations must occur in columns 1-4, 5-8, 9-12, respectively		
A-4	**NXR**	Number of cells in horizontal or radial direction.
	NLY	Number of cells in vertical direction.
A-5	**NRECH**	Number of recharge periods. *(NOTE: set NRECH to a negative number (-1 times actual number of recharge periods) to output binary values of head and concentration at selected observation times to file fort.12. Selecting this option allows the simulation to be restarted at any observation time; however, it may require a large amount of disk storage space.)*
	NUMT	Maximum number of time steps. *(NOTE: if enhanced precision in print out to file 9 and file 11 is desired set NUMT equal to a negative number. That is, multiply actual maximum number of time steps by –1)*[1]
A-6	**RAD**	Logical variable = T if radial coordinates are used; otherwise = F.

[1]A note on output file names: in these instructions, files are referred to as "file n" where n may be 6, 7, 8, 9, or 11 and refers to Fortran unit numbers associated with output statements within the pro-

gram. Actual file names are assigned by the user within the namelist file. The first line in that file gives the data input file for which these instructions apply (commonly vs2dh.dat); lines 2 through 6 of the namelist file list names for file 6, file 7, file 8, file 9, and file11.

File 6 is the main output file (commonly named vs2dh.out). **File 7** is an auxiliary file that is currently unused. **File 8** contains pressure heads and temperatures for all nodes in the model grid at selected observation times (variables.out). **File 9** lists selected mass balance components at all or selected times (balance.out). **File 11** contains heads, moisture content, saturations, and temperatures at selected observation points for all or selected times (obsPoints.out).

Line A-6A is present only if TRANS = T.

Line	Variable	Description
A-6	**ITSTOP**	Logical variable = T if simulation is to terminate after ITMAX iterations in one time step; otherwise = F.
	TRANS	Logical variable = T if energy transport is to be simulated.
A-6A	**CIS**	Logical variable = T if centered-in-space differencing is to be used; = F if backward-in-space differencing is to be used for transport equation.
	CIT	Logical variable = T if centered-in-time differencing is to be used; = F if backward-in-time or fully implicit differencing is to be used.
A-7	**F11P**	Logical variable = T if temperature, head, moisture content, and saturation at selected observation points are to be written to file 11 at end of each time step; otherwise = F.
	F7P	Logical variable = T if fluxes through selected boundary faces are output to file07.out for each time step. Boundary faces are specified on input lines B-26 to B-28; otherwise = F.
	F8P	Logical variable = T if output of pressure heads (and temperatures if TRANS = T) to file 8 is desired at selected observation times; otherwise = F.
	F9P	Logical variable = T if one-line mass balance summary for each time step is to be written to file 9; otherwise = F.
	F6P	Logical variable = T if mass balance is to be written to file 6 for each time step; = F if mass balance is to be written to file 6 only at observation times and ends of recharge periods.

Line	Variable	Description
A-8	**THPT**	Logical variable = T if volumetric moisture contents are to be written to file 6; otherwise = F.
	SPNT	Logical variable = T if saturations are to be written to file 6; otherwise = F.
	PPNT	Logical variable = T if pressure heads are to be written to file 6; otherwise F.
	HPNT	Logical variable = T if total heads are to be written to file 6; otherwise = F.
	VPNT	Logical variable = T if velocities are to be written to file 6; otherwise =F.

Line	Variable	Description
A-9	**IFAC**	= 0 if grid spacing in horizontal (or radial) direction is to be read in for each column and multiplied by FACX. = 1 if all horizontal grid spacing is to be constant and equal to FACX. = 2 if horizontal grid spacing is variable, with spacing for the first two columns equal to FACX and the spacing for each subsequent column equal to XMULT times the spacing of the previous column, until the spacing equals XMAX, whereupon spacing becomes constant at XMAX.
	FACX	Constant grid spacing in horizontal (or radial) direction (if IFAC=1); constant multiplier for all spacing (if IFAC=0); or initial spacing (if IFAC=2), L.

Line set A-10 is present if IFAC = 0 or 2.
If IFAC = 0,

A-10	**DXR**	Grid spacing in horizontal or radial direction. Number of entries must equal NXR, L.

If IFAC = 2,

A-10	**XMULT**	Multiplier by which the width of each cell is increased from that of the previous cell.
	XMAX	Maximum allowed horizontal or radial spacing, L.
A-11	**JFAC**	= 0 if grid spacing in vertical direction is to be read in for each row and multiplied by FACZ. = 1 if all vertical grid spacing is to be constant and equal to FACZ. = 2 if vertical grid spacing is variable,

		with spacing for the first two rows equal to FACZ and the spacing for each subsequent row equal to ZMULT times the spacing at the previous row, until spacing equals ZMAX, whereupon spacing becomes constant at ZMAX.
	FACZ	Constant grid spacing in vertical direction (if JFAC=1); constant multiplier for all spacing (if JFAC=0); or initial vertical spacing (if JFAC=2), L.

Line	Variable	Description
Line set A-12 is present only if JFAC = 0 or 2.		
If JFAC = 0,		
A-12	**DELZ**	Grid spacing in vertical direction; number of entries must equal NLY, L.
If JFAC = 2,		
A-12	**ZMULT**	Multiplier by which each cell is increased from that of previous cell.
	ZMAX	Maximum allowed vertical spacing, L.
Line sets A-13 to A-14 are present only if F8P = T,		
A-13	**NPLT**	Number of time steps to write pressure Heads and temperatures to file 8 and heads, temperatures, saturations, moisture contents, and/or velocities to file 6.
A-14	**PLTIM**	Elapsed times at which pressure heads and temperatures are to be written to file 8, and heads, temperatures, saturations, veloci - ties, and/or moisture contents to file 6, T.
Line sets A-15 to A-16 are present only if F11P = T,		
A-15	**NOBS**	Number of observation points for which heads, temperatures, moisture contents, and saturations are to be written to file 11. *(NOTE: Set NOBS equal to a negative number {-1 times number of observation points} if output to file 11 is desired only at selected output times rather than at each time step.*
A-16	**J,N**	Row and column of observation points. A double entry is required for each observation point, resulting in 2xNOBS values. No comments allowed.
Lines A-17 and A-18 are present only if F9P = T.		

A-17	**NMB9**	Total number of mass balance components written to file 9.Must be less than 73. *(NOTE: Set NMB9 equal to a negative number {-1 times number of components} if output to file 9 is desired only at selected output times rather than at each time step*.
A-18	**MB9**	The index number of each mass balance component to be written to file 9. (See table 7, from p. 66, in Healy (1990) listed at end of these instructions.

Line	Variable	Description
	[Line group B read by subroutine VSREAD]	
B-1	**EPS**	Head closure criterion for iterative solution of flow equation, L.
	HMAX	Relaxation parameter for iterative solution. See discussion in Lappala and others (1987) for more detail. Value is generally in the range of 0.4 to 1.2.
	WUS	Weighting option for intercell relative hydraulic conductivity: WUS = 1 for full upstream weighting. WUS = 0.5 for arithmetic mean. WUS = 0.0 for geometric mean.
	EPS1	Temperature closure criterion for iterative solution of transport equation, °C.
	EPS2	Velocity closure criterion for outer iteration loop at each time step, L/T.
B-3	**MINIT**	Minimum number of iterations per time step.
	ITMAX	Maximum number of iterations per time step.
B-4	**PHRD**	Logical variable = T if initial conditions are read in as pressure heads; = F if initial conditions are read in as moisture contents.
B-5	**NTEX**	Number of textural classes or lithologies having different values of hydraulic conductivity, specific storage, and/or constants in the functional relations among pressure head, relative conductivity, and moisture content, must be less than 11.
	NPROP	Number of flow properties to be read in for each textural class. When using Brooks

		and Corey, van Genuchten or Rossi-Nimmo functions, set NPROP = 6; when using Haverkamp functions, set NPROP =8. When using tabulated data, set NPROP = 6 plus number of data points in table. [For example, if the number of pressure heads in the table is equal to N1, then set NPROP=3*(N1+1)+3]
	NPROP1	Number of transport properties to be read in for each textural class. For VS2DH set NPROP1 = 6.

Line	Variable	Description
B-5A	**HFT**	Hydraulic function type, 0 for Brooks-Corey; 1 for van Genuchten; 2 for Haverkamp; 3 for tabular data; and 4 for Rossi-Nimmo.

Line sets B-6, B-7, and B-7A must be repeated NTEX times

B-6	**ITEX**	Index to textural class.
B-7	**ANIZ(ITEX)**	Ratio of hydraulic conductivity in the z-coordinate direction to that in the x-coordinate direction for textural class ITEX.
	HK(ITEX,1)	Saturated hydraulic conductivity (K) at 20 °C in the x-coordinate direction for class ITEX, L/T.
	HK(ITEX,2)	Specific storage (S_s) for class ITEX, L^{-1}.
	HK(ITEX,3)	Porosity (ϕ) for class ITEX.

Definitions for the remaining sequential values on this line are dependent upon which functional relation is selected to represent the nonlinear coefficients. Five different functional relations are allowed: (0) Brooks and Corey, (1) van Genuchten, (2) Haverkamp, (3) tabular data, and (4) Rossi-Nimmo. In the following descriptions, definitions for the different functional relations are indexed by the above numbers. For tabular data, all pressure heads are input first (in decreasing order from the largest to the smallest), all relative hydraulic conductivities are then input in the same order, followed by all moisture contents. See Healy (1990) and Lappala and others (1987) for additional details.

HK(ITEX,4)

(0) h_b, Brooks-Corey bubbling pressure head (must be less than 0), L.

(1) α, van Genuchten alpha. NOTE: α is as defined by van Genuchten (1980) and is the negative reciprocal of α' used in earlier versions (prior to version 3.0) of VS2DT, L.

(2) A', Haverkamp parameter (must be less than 0.0), L.

(3) Largest pressure head in table.

	(4)	Ψ_0, Rossi-Nimmo parameter.
HK(ITEX,5)	(0)	Residual moisture content (θ_r).
	(1)	Residual moisture content (θ_r).
	(2)	Residual moisture content (θ_r).
	(3)	Second largest pressure head in table.
	(4)	Ψ_D, Rossi-Nimmo parameter.
HK(ITEX,6)	(0)	λ, Brooks-Corey pore-size distribution index.
	(1)	n, van Genuchten parameter, β' in Healy (1990) and Lappala and others (1987).
	(2)	B', Haverkamp parameter.
	(3)	Third largest pressure head in table.
	(4)	λ, Rossi-Nimmo parameter.
HK(ITEX,7)	(0)	Not used.
	(1)	Not used.
	(2)	α, Haverkamp parameter (must be less than 0.0), L.
	(3)	Fourth largest pressure head in table.

Line	Variable	Description
	(4)	Not used.
HK(ITEX,8)	(0)	Not used.
	(1)	Not used.
	(2)	β, Haverkamp parameter.
	(3)	Fifth largest pressure head in table.
	(4)	Not used.

For functional relations (0), (1), (2), and (4) no further values are required on this line for this textural class. For tabular data (3), data input continues as follows:

HK(ITEX,9)	Next largest pressure head in table.
HK(ITEX,N1+3)	Minimum pressure head in table. Here N1 = Number of pressure heads in table; NPROP = 3*(N1+1)+3).
HK(ITEX,N1+4)	Always input a value of 99.
HK(ITEX,N1+5)	Relative hydraulic conductivity corresponding to first pressure head.
HK(ITEX,N1+6)	Relative hydraulic conductivity corresponding to second pressure head.
•	
•	
•	
HK(ITEX,2*N1+4)	Relative hydraulic conductivity corresponding to smallest pressure head.
HK(ITEX,2*N1+5)	Always input a value of 99.
HK(ITEX,2*N1+6)	Moisture content corresponding to first pressure head.
HK(ITEX,2*N1+7)	Moisture content corresponding to second pressure head.
HK(ITEX,3*N1+5)	Moisture content corresponding to smallest pressure head.
HK(ITEX,3*N1+6)	Always input a value of 99.

Regardless of which functional relation is selected there must be NPROP+1 values on line B-7.

Line B-7A is present only if TRANS = T.

B-7A	**HT(ITEX,1)**	Longitudinal dispersivity (α_L), L.
	HT(ITEX,2)	Transverse dispersivity (α_T), L.
	HT(ITEX,5)	Heat capacity of dry solids (C_s), Q/L^3 °C.
	HT(ITEX,9)	Thermal conductivity of water-sediment at residual moisture content, $K_T(\theta_r)$, Q/LT°C.
	HT(ITEX,10)	Thermal conductivity of water-sediment at full saturation, $K_T(\phi)$, Q/L°C.
	HT(ITEX,11)	Heat capacity of water (C_w), which is the product of density times specific heat of water, Q/L^3 °C.

Line	**Variable**	**Description**
B-8	**IROW**	If IROW = 0, textural classes are read for each row. This option is preferable if many rows differ from the others. If IROW = 1, textural classes are read in by blocks of rows, each block consisting of all the rows in sequence consisting of uniform properties or uniform properties separated by vertical interface.

Line set B-9 is present only if IROW = 0.

B-9	**JTEX**	Indices (ITEX) for textural class for each node, read in row by row. There must be NLY*NXR entries.

Line set B-10 is present only if IROW = 1.

As many groups of B-10 variables as are needed to completely cover the grid are required. The final group of variables for this set must have IR = NXR and JBT = NLY.

B-10	**IL**	Left hand column for which texture class applies. Must equal 1 or IR (from previous line set)+1.
	IR	Right hand column for which texture class applies. Final IR for sequence of rows must equal NXR.
	JBT	Bottom row of all rows for which the column designations apply. JBT must not

		be increased from its initial or previous value until IR = NXR.
	JRD	Texture class within block.

Note: As an example, for a column of uniform material: IL = 1, IR = NXR, JBT = NLY, and JRD = texture class designation for the column material. One line will represent the set for this example.

B-11	**IREAD**	If IREAD = 0, all initial conditions in terms of pressure head or moisture content as determined by the value of PHRD are set equal to FACTOR. If IREAD = 1, all initial conditions are read from file IU in user-designated format and multiplied by FACTOR. If IREAD = 2 initial conditions are defined in terms of pressure head, and an equilibrium profile is specified above a free-water surface at a depth of DWTX until a pressure head of HMIN is reached. all pressure heads above this are set to HMIN. If IREAD=3 initial heads and concentrations are read unformatted from file fort.13 for continuation of a previous simulation beginning at time STIM (line A-2).

Line	**Variable**	**Description**
B-11	**FACTOR**	Multiplier or constant value, depending on value of IREAD, for initial conditions.
Line B-12 is present only if IREAD = 2,		
B-12	**DWTX**	Depth to free-water surface above which an equilibrium profile is computed, L.
	HMIN	Minimum pressure head to limit height of equilibrium profile, L. Must be negative.
Line B-13 is read only if IREAD =1,		
B-13	**IU**	Unit number from which initial head or moisture content values are to be read.
	IFMT	Format to be used in reading initial values from unit IU. Must be enclosed in quotation marks, for example '(10X,E10.3)'.
B-14	**BCIT**	Logical variable = T if evaporation is to be simulated at any time during the simulation; otherwise = F.
	ETSIM	Logical variable = T if evapotranspiration (plant-root extraction) is to be simulated at any time during the simulation.

Note: The reader is cautioned on the use of evaporation and evapotranspiration in VS2DH. These processes can influence and be influenced by soil temperature. As described in Lappala and others (1987) and implemented inVS2DH, these processes are simplistically assumed to be isothermal. Users should evaluate the ramifications of this assumption in their applications. If these processes are an integral component of an application, then use of another numerical model that treats evaporation and evapotranspiration in a more realistic fashion may be warranted.

Line B-15 is present only if BCIT = T or ETSIM = T.

B-15	**NPV**	Number of ET periods to be simulated. NPV values for each variable required for the evaporation and/or evapotranspiration options must be entered on the following lines. If ET variables are held constant throughout the simulation code, NPV = 1.
	ETCYC	Length of each ET period, T.

Line B-16 to B-18 are present only if BCIT = T.

B-16	**PEVAL**	Potential evaporation rate (PEV) at beginning of each ET period. Number of entries must equal NPV, L/T.

To conform with the sign convention used in most existing equations for potential evaporation, all entries must be greater than or equal to 0. The program multiplies all nonzero entries by -1 so that the evaporative flux is treated as a sink rather than a source.

Line	**Variable**	**Description**
B-17	**RDC(1,J)**	Surface resistance to evaporation (SRES) at beginning of ET period, L^{-1}. For a uniform soil, SRES is equal to the reciprocal of the distance from the top active node to land surface, or 2/DELZ(2). If a surface crust is present, SRES may be decreased to account for the added resistance to water movement through the crust. Number of entries must equal NPV.
B-18	**RDC(2,J)**	Pressure potential of the atmosphere (HA) at beginning of each ET period; may be estimated using equation 6 of Lappala and others (1987), L. Number of entries must equal NPV.

Lines B-19 to B-23 are present only if ETSIM = T.

B-19	**PTVAL**	Potential evapotranspiration rate (PET) at beginning of each ET period, L/T. Number of entries must equal NPV. As with PEV, all values must be greater than or equal to 0.
B-20	**RDC(3,J)**	Rooting depth at beginning of each ET

Line	Variable	Description
		period, L. Number of entries must equal NPV.
B-21	**RDC(4,J)**	Root activity at base of root zone at beginning of each ET period, L^{-2}. Number of entries must equal NPV.
B-22	**RDC(5,J)**	Root activity at top of root zone at beginning of each ET period, L^{-2}. Number of entries must equal NPV.

Note: Values for root activity generally are determined empirically, but typically range from 0 to $3x10^4$ m/m^3. As programmed, root activity varies linearly from land surface to the base of the root zone, and its distribution with depth at any time is represented by a trapezoid. In general, root activities will be greater at land surface than at the base of the root zone.

Line	Variable	Description
B-23	**RDC(6,J)**	Pressure head in roots (HROOT) at beginning of each ET period, L. Number of entries must equal NPV.

Lines B-24 and B-25 are present only if TRANS = T and if IREAD on line B-11 is not equal to 3.

Line	Variable	Description
B-24	**IREAD**	If IREAD = 0, all initial temperatures are set equal to FACTOR. If READ =1, all initial temperatures are read from file IU in user designated format and multiplied by FACTOR.
B-24	**FACTOR**	Multiplier or constant value, depending on value of IREAD, for initial temperatures.

Line B-25 is present only if IREAD = 1.

Line	Variable	Description
B-25	**IU**	Unit number from which initial temperatures are to be read.
	IFMT	Format to be used in reading initial temperature values from unit IU. Must be enclosed in quotation marks, for example '(10X, E10.3)'.

Lines B-26 to B-28 are present only if F7P = T.

Line	Variable	Description
B-26	**NUMBF**	Number of boundary faces for which fluxes will be calculated and output to file file07.out.
	MAXCELLS	Maximum number of cells on any boundary face.

Lines B-27 and B-28 must be repeated NUMBF times.

Line	Variable	Description
B-27	**IDBF**	Boundary face identifier (integer).
	NUMCELLS	Number of finite difference cells on this boundary face.
B-28	**J,N**	Row and column number of each cell on this boundary face. (NOTE: Line B-28 must be repeated

		NUMCELLS times for each boundary face.)

[Line group C read by subroutine VSTMER, NRECH sets of C lines are required]

C-1	**TPER**	Length of this recharge period, T.
	DELT	Length of initial time step for this period, T.
C-2	**TMLT**	Multiplier for time step length.
	DLTMX	Maximum allowed length of time step, T.
	DLTMIN	Minimum allowed length of time step, T.
	TRED	Factor by which time-step length is reduced if convergence is not obtained in ITMAX iterations. Values usually should be in the range 0.1 to 0.5. If no reduction of time-step length is desired, input a value of 0.0.
C-3	**DSMAX**	Maximum allowed change in head per time step for this period, L.
	STERR	Steady-state head criterion; when the maximum change in head between successive time steps is less than STERR, the program assumes that steady state has been reached for this period and advances to next recharge period, L.
C-4	**POND**	Maximum allowed height of ponded water for constant flux nodes. See Lappala and other (1987) for detailed discussion of POND, L.
C-5	**PRNT**	Logical variable = T if heads, temperature, moisture contents, and/or saturations are to be printed to file 6 after each time step; = F if they are to be written to file 6 only at observation times and ends of recharge periods.
C-6	**BCIT**	Logical variable = T if evaporation is to be simulated for this recharge period; otherwise = F.

Line	**Variable**	**Description**
C-6	**ETSIM**	Logical variable = T if evapotranspiration (plant-root extraction) is to be simulated for this recharge period; otherwise = F.
	SEEP	Logical variable = T if seepage faces are to be simulated for this recharge period; otherwise = F.

C-7 to C-9 cards are present only if SEEP = T,

C-7	**NFCS**	Number of possible seepage faces.

Line sets C-8 and C-9 must be repeated NFCS times.

C-8	**JJ**	Number of nodes on the possible seepage face.
	JLAST	Number of the node which initially represents the highest node of the seep; value can range from 0 (bottom of the face) up to JJ (top of the face).
C-9	**J,N**	Row and column of each cell on possible seepage face, in order from the lowest to the highest elevation; JJ pairs of values are required.
C-10	**IBC**	Code for reading in boundary conditions by individual node (IBC=0) or by row or column (IBC=1). Only one code may be used for each recharge period, and all boundary conditions for period must be input in the sequence for that code.

Line set C-11 is read only if IBC = 0. One line is required for each node for which new boundary conditions are specified.

C-11	**JJ**	Row number of node.
	NN	Column number of node.
	NTX	Node type identifier for boundary conditions. = 0 for no specified boundary (needed for resetting some nodes after initial recharge period); = 1 for specified pressure head; = 2 for specified flux per unit horizontal surface area in units of L/T; = 3 for possible seepage face; = 4 for specified total head; = 5 for evaporation; = 6 for specified volumetric flow in units of L^3/T. = 7 for gravity drain. (The gravity drain boundary condition allows gravity driven vertical fow out of the domain assuming a unit vertical hydraulic gradient. Flow into the domain cannot occur.)

Line	**Variable**	**Description**
C-11	**PFDUM**	Specified head for NTX = 1 or 4 or specified flux for NTX = 2 or 6. If codes 0, 3, 5, or 7

		are specified, the line should contain a dummy value for PFDUM or should be terminated after NTX by a blank and a slash (/).
	NTC	Node type identifier for transport boundary conditions. = 0 for no specified boundary; = 1 for specified temperatures;
	CF	Specified temperature for NTC = 1 or NTX = 1, 2, 4, 6, or 7. Present only if TRANS = T.

C-12 is present only if IBC = 1. One line should be present for each row or column for which new boundary conditions are specified,

C-12	**JJT**	Top node of row or column of nodes sharing same boundary condition.
	JJB	Bottom node of row or column of nodes having same boundary condition. Will equal JJT if a boundary row is being read.
	NNL	Left column in row or column of nodes having same boundary condition.
	NNR	Right column of row or column of nodes having same boundary condition. Will equal NNL if a boundary column is being read in.
	NTX	Same as line C-11.
	PFDUM	Same as line C-11.
	NTC	Same as line C-11.
	CF	Same as line C-11.
C-13	Designated end of recharge period. Must be included after line C-12 data for each recharge period. Two C-13 lines must be included after final recharge period. Line must always be entered as -999999 /.	

Table 7.--Index of Mass-Balance Components for Output to File 9

Index

Number	Component	
1	Flow in across specified head boundaries	-total for simulation
2	Flow in across specified head boundaries	-total for time step
3	Flow in across specified head boundaries	-rate for time step
4	Flow out across specified head boundaries	-total for simulation
5	Flow out across specified head boundaries	-total for time step
6	Flow out across specified head boundaries	-rate for time step
7	Flow in across specified flux boundaries	-total for simulation
8	Flow in across specified flux boundaries	-total for time step
9	Flow in across specified flux boundaries	-rate for time step
10	Flow out across specified flux boundaries	-total for simulation
11	Flow out across specified flux boundaries	-total for time step
12	Flow out across specified flux boundaries	-rate for time step
13	Total flow in	-total for simulation
14	Total flow in	-total for time step
15	Total flow in	-rate for time step
16	Total flow out	-total for simulation
17	Total flow out	-total for time step
18	Total flow out	-rate for time step
19	Evaporation	-total for simulation
20	Evaporation	-total for time step
21	Evaporation	-rate for time step
22	Transpiration	-total for simulation
23	Transpiration	-total for time step
24	Transpiration	-rate for time step
25	Evaporation + Transpiration	-total for simulation
26	Evaporation + Transpiration	-total for time step
27	Evaporation + Transpiration	-rate for time step
28	Change in fluid stored in domain	-total for simulation
29	Change in fluid stored in domain	-total for time step
30	Change in fluid stored in domain	-rate for time step
31	Fluid volumetric balance	-total for simulation
32	Fluid volumetric balance	-total for time step
33	Fluid volumetric balance	-rate for time step
34	Energy flux in across specified pressure head boundaries	-total for simulation
35	Energy flux in across specified pressure head boundaries	-total for time step
36	Energy flux in across specified pressure head boundaries	-rate for time step
37	Energy flux out across specified pressure head boundaries	-total for simulation
38	Energy flux out across specified pressure head boundaries	-total for time step
39	Energy flux out across specified pressure head boundaries	-rate for time step

40	Energy flux in across specified flux boundaries	-total for simulation
41	Energy flux in across specified flux boundaries	-total for time step
42	Energy flux in across specified flux boundaries	-rate for time step
43	Energy flux out across specified flux boundaries	-total for simulation
44	Energy flux out across specified flux boundaries	-total for time step
45	Energy flux out across specified flux boundaries	-rate for time step
46	Conductive/Dispersive flux in across specified flux boundaries	-total for simulation
47	Conductive/Dispersive flux in across specified flux boundaries	-total for time step
48	Conductive/Dispersive flux in across specified flux boundaries	-rate for time step
49	Conductive/Dispersive flux out across specified flux boundaries	-total for simulation
50	Conductive/Dispersive flux out across specified flux boundaries	-total for time step
51	Conductive/Dispersive flux out across specified flux boundaries	-rate for time step
52	Total Energy flux in	-total for simulation
53	Total Energy flux in	-total for time step
54	Total Energy flux in	-rate for time step
55	Total Energy flux out	-total for simulation
56	Total Energy flux out	-total for time step
57	Total Energy flux out	-rate for time step
58	Energy flux out through evapotranspiration	-total for simulation
59	Energy flux out through evapotranspiration	-total for time step
60	Energy flux out through evapotranspiration	-rate for time step
67	Change in Energy stored in domain	-total for simulation
68	Change in Energy stored in domain	-total for time step
69	Change in Energy stored in domain	-rate for time step
70	Energy balance	-total for simulation
71	Energy balance	-total for time step
72	Energy balance	-rate for time step