Techniques of Water-Resources Investigations of the United States Geological Survey

Chapter A6

A COUPLED SURFACE-WATER AND GROUND-WATER FLOW MODEL (MODBRANCH) FOR SIMULATION OF STREAM-AQUIFER INTERACTION

By Eric D. Swain and Eliezer J. Wexler

Book 6

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PREFACE

The series of manuals on techniques describes procedures for planning and executing specialized work in water-resources investigations. The material is grouped under major subject headings called "Books" and further subdivided into sections and chapters. Section A of Book 6 is on ground-water models.

This chapter documents the theory and application of a new coupled ground-water and surface-water model that was developed by combining the USGS models MODFLOW and BRANCH. The interfacing code is referred to as MODBRANCH. Although BRANCH is modified to act as a subroutine or module of MODFLOW, the input data sets for both models are very similar to their original form. Only model changes implemented for the coupling are documented in this chapter. For specifics on each model, users are advised to refer to the Techniques of Water-Resources Investigations chapters on MODFLOW and BRANCH.

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[1]This manual is a revision of "Measurement of Time of Travel and Dispersion in Streams by Dye Tracing," by E.F. Hubbard, F.A. Kilpatrick, L.A. Martens, and J.F. Wilson, Jr., Book 3, Chapter A9, published in 1982.

[2]Spanish translation also available.

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[3]This manual is a revision of TWRI 5–A3, "Methods of Analysis of Organic Substances in Water," by Donald F. Goerlitz and Eugene Brown, published in 1972.

[4]This manual supersedes TWRI 5–A4, "Methods for collection and analysis of aquatic biological and microbiological samples," edited by P.E. Greeson and others, published in 1977.

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METRIC CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
foot per second (ft/s)	0.3048	meter per second
foot per day (ft/d)	0.3048	meter per day
foot per year (ft/yr)	0.3048	meter per year
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
cubic foot per hour (ft^3/hr)	0.02832	cubic meter per hour

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

DEFINITION OF SYMBOLS

A = Cross-sectional area of channel
B = Channel topwidth
b' = Thickness of riverbed
C = Leakage coefficient = K'/b'
C_d = Water surface drag coefficient
DCFM = Dry channel friction multiplier, multiplied by σ when channel is dry
F = Inflow term in MODFLOW
g = Gravitational acceleration
H_{COEF} = Coefficient in ground-water flow equation in MODFLOW
h = Head in aquifer
i,j,k = Spatial coordinates
K = Hydraulic conductivity of aquifer
K' = Hydraulic conductivity of riverbed
k = Friction factor $(n/1.49)^2$ in inch-pound units or n^2 in metric units
L = Longitudinal distance down channel
m = Time level
$NTSAQ$ = Number of BRANCH' time intervals in one MODFLOW time step
n = Manning's frictional factor
P = Head-dependent inflow term in MODFLOW
Q = Flow rate in channel
q = Outflow per unit length of channel
r = Average hydraulic radius
R = Coefficient in ground-water flow equation in MODFLOW
RHS = Right-hand side of ground-water flow equation in MODFLOW
S_s = Specific storativity
T_s = Starting time interval when BRANCH' is entered from MODFLOW
t = Time
U = Coefficient in ground-water flow equation in MODFLOW
U_a = Wind speed
V = Coefficient in ground-water flow equation in MODFLOW
W = Volumetric flux per unit volume
x = Coordinate direction in MODFLOW
y = Coordinate direction in MODFLOW
Z = Stage in channel
Z_{BOT} = Elevation of river bottom
z = Coordinate direction in MODFLOW
α = Coefficient in continuity equation in BRANCH
β = Momentum coefficient
δ = Right-hand side of continuity equation in BRANCH
γ = Coefficient in continuity equation in BRANCH
Θ = Weighting factor for spatial derivatives in BRANCH
ε = Right-hand side of momentum equation in BRANCH
χ = Weighting factor for averaged quantities in BRANCH
λ = Coefficient in momentum equation in BRANCH
μ = Coefficient in momentum equation in BRANCH
ϕ = Angle between wind direction and channel orientation
σ = Coefficient in momentum equation in BRANCH containing friction term
ρ = Coefficient in momentum equation in BRANCH
ρ_a = Air density
ρ_w = Water density
ω = Coefficient in momentum equation in BRANCH
ζ = Coefficient in momentum equation in BRANCH
ξ = Wind friction term = $C_d\, \rho_a/\rho_w$

A Coupled Surface-Water and Ground-Water Flow Model (MODBRANCH) for Simulation of Stream-Aquifer Interaction

By Eric D. Swain and Eliezer J. Wexler

ABSTRACT

Ground-water and surface-water flow models traditionally have been developed separately, with interaction between subsurface flow and streamflow either not simulated at all or accounted for by simple formulations. In areas with dynamic and hydraulically well-connected ground-water and surface-water systems, stream-aquifer interaction should be simulated using deterministic responses of both systems coupled at the stream-aquifer interface. Accordingly, a new coupled ground-water and surface-water model was developed by combining the U.S. Geological Survey models MODFLOW and BRANCH; the interfacing code is referred to as MODBRANCH. MODFLOW is the widely used modular three-dimensional, finite-difference ground-water model, and BRANCH is a one-dimensional numerical model commonly used to simulate unsteady flow in open-channel networks.

MODFLOW was originally written with the River package, which calculates leakage between the aquifer and stream, assuming that the stream's stage remains constant during one model stress period. A simple streamflow routing model has been added to MODFLOW, but is limited to steady flow in rectangular, prismatic channels. To overcome these limitations, the BRANCH model, which simulates unsteady, nonuniform flow by solving the St. Venant equations, was restructured and incorporated into MODFLOW. Terms that describe leakage between stream and aquifer as a function of streambed conductance and differences in aquifer and stream stage were added to the continuity equation in BRANCH. Thus, leakage between the aquifer and stream can be calculated separately in each model, or leakages calculated in BRANCH can be used in MODFLOW. Total mass in the coupled models is accounted for and conserved.

The BRANCH model calculates new stream stages for each time interval in a transient simulation based on upstream boundary conditions, stream properties, and initial estimates of aquifer heads. Next, aquifer heads are calculated in MODFLOW based on stream stages calculated by BRANCH, aquifer properties, and stresses. This process is repeated until convergence criteria are met for head and stage. Because time steps used in ground-water modeling can be much longer than time intervals used in surface-water simulations, provision has been made for handling multiple BRANCH time intervals within one MODFLOW time step. An option was also added to BRANCH to allow the simulation of channel drying and rewetting. Testing of the coupled model was verified by using data from previous studies; by comparing results with output from a simpler, four-point implicit, open-channel flow model linked with MODFLOW; and by comparison to field studies of L–31N canal in southern Florida.

INTRODUCTION

Mathematical modeling has been developed to a high degree of sophistication in ground-water and surface-water disciplines. However, the interactions of these two systems generally have not been simulated at all or have been accounted for by less sophisticated formulations.

The processes and simulation of ground-water and surface-water interactions have interested researchers for many years. Pinder and Sauer (1971) coupled the unsteady river equations with the two-dimensional ground-water flow equations to study bank storage effects. Zitta and Wiggert (1971) and Morel-Seytoux (1975) incorporated bank storage into continuous streamflow simulation. Hall and Moench (1972) and Land (1977) used the convolution integral to account for river losses to bank storage. Faye and Mayer (1990) used the U.S. Geological Survey (USGS) MODFLOW three-dimensional ground-water flow model (McDonald and Harbaugh, 1988) with its River package to model stream-aquifer relations in the northern coastal plain of Georgia. However, a scheme that couples two widely accepted models to accurately simulate the ground-water and surface-water flows and their interaction has not been developed.

A strong interest in stream-aquifer relations developed in southern Florida because of the extensive canal network that is in close hydraulic contact with the surficial aquifer. Because of the high hydraulic conductivities in the surficial aquifer (Wilson, 1982), the two systems respond rapidly to each other. This response makes the coupling of two dynamic models necessary to appropriately simulate transient ground-water or surface-water conditions.

The USGS, in cooperation with the South Florida Water Management District, began a study in October 1988 to develop a coupled ground-water and surface-water flow model. The USGS modular three-dimensional, finite-difference ground-water flow model, MODFLOW, was modified to interface with the USGS unsteady surface-water flow model, BRANCH (Swain and Wexler, 1991).

PURPOSE AND SCOPE

This report documents the theory and application of a new coupled ground-water and surface-water flow model that was developed by combining the USGS models, MODFLOW and BRANCH. The interfacing code is referred to as MODBRANCH. The coupled models were applied to four tests. Results of the coupled models were compared to results of previous studies. Also, the ability of the coupled models to simulate conditions that could not be simulated accurately with separate models or with models using less deterministic or empirical algorithms was tested.

APPROACH

The MODFLOW ground-water flow model contains two packages that account for leakage to and from rivers and canals. The River package allows rivers to be represented with a stage fixed during a stress period with leakage to and from the aquifer (McDonald and Harbaugh, 1988). The Stream package accounts for leakage but allows flow to be routed through the river system only by a uniform, steady-state technique (Prudic, 1989). The coupling of BRANCH with MODFLOW expands the simulation capability to include one-dimensional routing of streamflow in a network of interconnected open channels while accounting for the effects of transient leakage between the aquifer and the stream. The MODBRANCH interface of MODFLOW and BRANCH is similar to the River and Stream packages of MODFLOW and processes the information passed from BRANCH through MODBRANCH using a method similar to that used in MODFLOW. The modified form of BRANCH, which is called through the MODBRANCH code, is known as BRANCH' (Branch prime).

The concept of initiating BRANCH' runs using MODFLOW is based on the need for coincident time periods for the coupled models. The time scale of variations in the surface-water flow is on the order of minutes and hours. Ground-water flow generally varies in hours, days, or months. Thus, it is necessary to allow multiple time intervals to pass in BRANCH' for each time step in MODFLOW. Each time MODFLOW runs one ground-water time step, BRANCH' is called from MODFLOW to simulate the number of surface-water time intervals that correspond to the ground-water time step. This scheme requires that the surface-water time-interval size be less than or equal to the ground-water time step, and the ground-water time step must be an integral multiple of the surface-water time interval. The need to specify a surface-water time interval longer than the ground-water time step is considered almost nonexistent, but frequently a surface-water time interval will be less than the ground-water interval. Determinations of relative time scales for surface and subsurface flow modeling based on the physical characteristics have been studied by Yen and Riggins (1991).

The computation of leakage between the stream and aquifer is included in MODFLOW; however, the current formulation of BRANCH does not include a leakage term. A scheme was developed where leakage was calculated separately in MODFLOW and BRANCH' as an implicit function of the stage in the river and the head in the corresponding aquifer. To conserve mass for coupled simulations, this scheme required a modification of the continuity equation originally used in BRANCH. Alternatively, when multiple BRANCH' time intervals occur within one MODFLOW time step, variations in river stage simulated by BRANCH' and occurring within the single MODFLOW time step could not be represented in the original formulation of MODFLOW, which only uses the values of river stage at the beginning and end of each MODFLOW time step. A floodwave could pass down the river channel in BRANCH' with BRANCH' simulations accounting for the ensuing riverbed leakage but without such leakage being accounted for by MODFLOW (fig. 1).

To account for leakage in the coupled models when BRANCH' time intervals do not equal MODFLOW time steps, a less numerically stable, but more accurate, scheme is used. Average leakage flow rates calculated by BRANCH' during a MODFLOW time step are computed and applied to MODFLOW simulations during the entire ground-water time step. The aquifer head at each BRANCH' time interval is linearly interpolated from the heads calculated by MODFLOW at the beginning and end of this time step. Although not as numerically stable at high leakage rates as the original implicit calculation of leakage in MODFLOW, this scheme maintains mass balance between the two models.

The scheme necessitates multiple iterations between the two models for each MODFLOW time step. Figure 2 shows how MODFLOW and BRANCH' interface and pass variables. Ground-water heads at the beginning and end of each new time step are initialized using heads computed at the end in the previous time step. BRANCH' is then called and, with the interpolated ground-water heads, the streamflow is calculated for the number of surface-water time intervals in the ground-water time step. The total leakage per BRANCH time step is calculated simultaneously. After returning to MODFLOW, the single MODFLOW time step

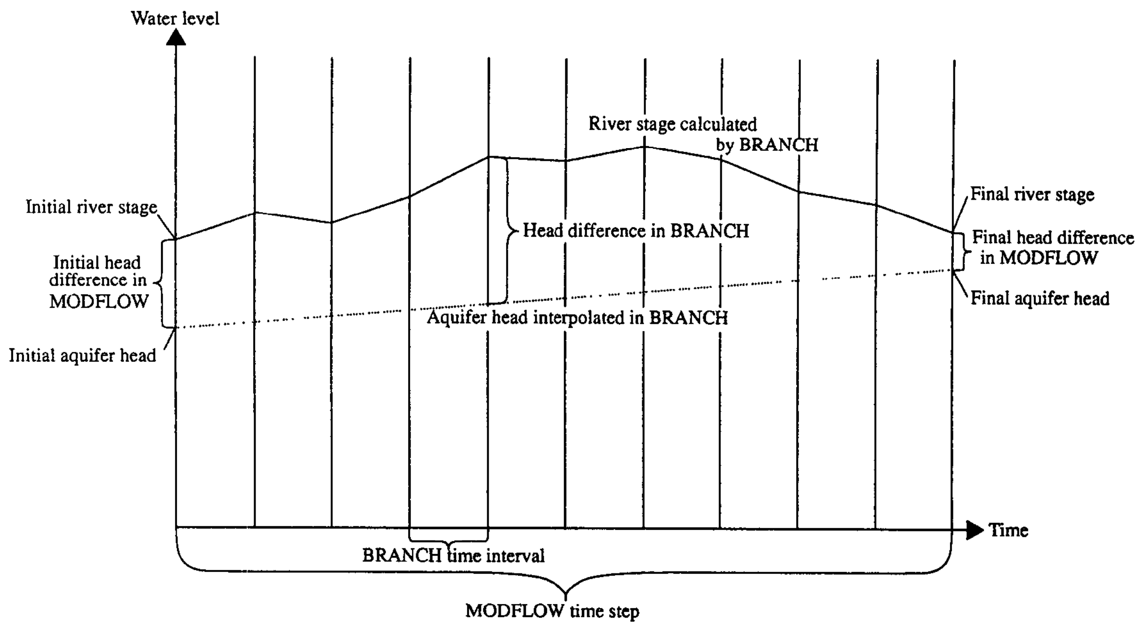

Figure 1. Computation of head differences in the BRANCH and MODFLOW models.

is simulated using leakage calculated by BRANCH', and a new estimate of ground-water heads is made. BRANCH' is called again, and stages and discharges in the channel are reset to their values at the beginning of the ground-water time step, and streamflow is recalculated with leakage based on the new estimate of ground-water heads at time-step end. This process is repeated until the difference in successive estimates of heads and stages drops below a user specified criteria. The model then advances to the next ground-water time step.

The locations in the aquifer corresponding to stream reaches are specified in the BRANCH' input. The head in each model aquifer cell is assumed to be the same throughout the entire cell. Each stream segment is assigned to an aquifer model cell; thus, no segment can span more than one cell, and a channel cross section is defined at each point where a river enters or leaves an aquifer model cell. Multiple river segments can occur within a cell, but inflow and outflow from each reach is considered to occur at the center of the cell. A typical arrangement of aquifer model cells and river segments is shown in figure 3. All leakage to and from a river segment is considered to occur only with the corresponding aquifer model cell.

To enhance the modular characteristics of the coupled model, BRANCH' was rearranged so that all of its array variables were allocated space in three main arrays in MODFLOW: a real and integer array, a character array, and a logical array. Thus, redimensioning of arrays is simpler and greatly reduces the number of common statements needed. (These statements transfer variables from routine to routine.) The sequence in which the modules in the MODBRANCH code are called from MODFLOW is shown in figure 4. The amount of space and position each BRANCH' array uses in one of the main arrays is allocated in an allocation (AL) module. The original BRANCH code was split into a data entry module (RP) and a computational model (BRANCH'). BRANCH', which contains all of BRANCH except the data entry procedure, is called from a formulation module (FM) in MODFLOW, which adds the BRANCH' leakage to MODFLOW. The BRANCH' computational model is also called from a BUDGET module (BD), which calculates the cumulative flows to and from the stream and prints a summary at the end of the time interval.

The AL and RP modules are called at the beginning of the simulation. The FM module is called for every iteration between MODFLOW and BRANCH'; the FM module, in turn, calls BRANCH'. The BD module is called at the end of each ground-water time step along with BRANCH'.

MATHEMATICAL FORMULATION

The main modification made to the mathematical formulation in this coupled ground-water and surface-water model is the addition of the leakage terms to the original continuity equation in BRANCH. Several smaller changes were made to BRANCH in conjunction with the creation of the connection package MODBRANCH called from MODFLOW.

INCORPORATION OF LEAKAGE

The term for leakage or another inflow or outflow in MODFLOW had already been incorporated in the well,

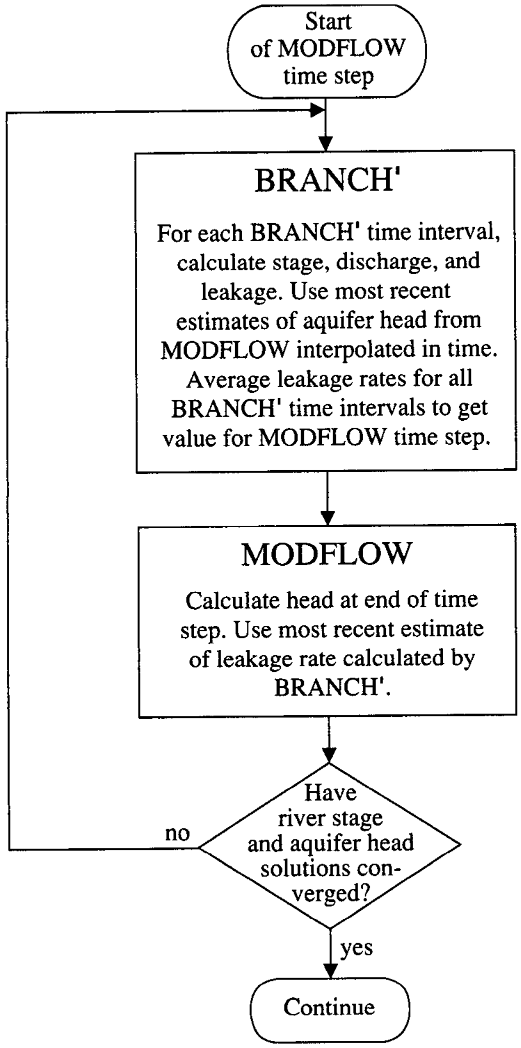

Figure 2. Iteration procedure between MODFLOW and BRANCH'.

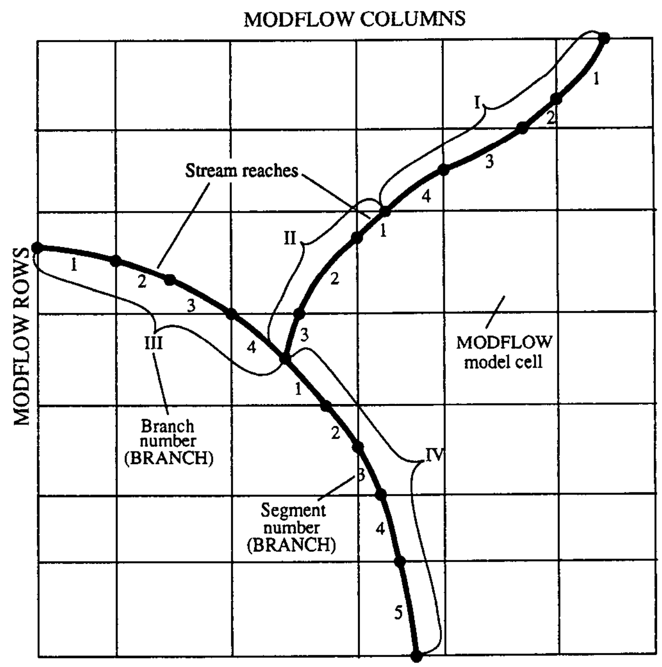

Figure 3. Arrangement of MODFLOW model cells and BRANCH stream reaches.

river, stream, drain, and recharge packages. Leakage from BRANCH' is incorporated in the same fashion into MODFLOW; however, leakage has to be incorporated into the BRANCH' formulation. The original partial differential equation of continuity used in BRANCH is (Schaffranek and others, 1981)

$$B\frac{\partial Z}{\partial t} + \frac{\partial Q}{\partial L} = 0, \tag{1}$$

where B is channel topwidth, Z is stage in the channel, t is time, Q is flow rate in the channel, and L is longitudinal distance down the channel. When lateral inflows and outflows are included, the equation is (Schaffranek, 1987)

$$B\frac{\partial Z}{\partial t} + \frac{\partial Q}{\partial L} + q = 0, \tag{2}$$

where q is outflow per unit length of channel. If outflow is the result of leakage to the aquifer and this leakage is considered to cross a riverbed with thickness b' and hydraulic conductivity K', Darcy's law gives the leakage as

$$q = \frac{K'}{b'} B(Z - h), \tag{3a}$$

where h is head in the aquifer. This equation is used for leakage in the River and Stream packages. Equation 3a is equivalent to equation 63a in McDonald and Harbaugh (1988). The leakage perimeter of the channel is approximated by the topwidth. If the head in the aquifer is below the river bottom, the aquifer is partly saturated under the riverbed, and leakage is based on the head in the stream or

$$q = \frac{K'}{b'} B(Z - Z_{BOT}), \tag{3b}$$

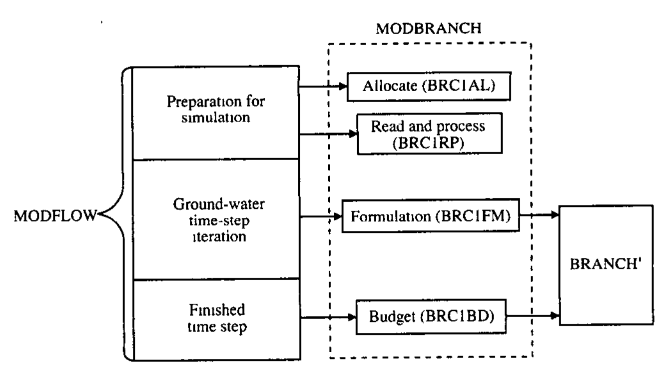

Figure 4. Schematic of module calling sequence.

where Z_{BOT} is elevation of river bottom. In the following equations, it will be assumed that if the aquifer head is below the river bottom, the value of h in the streamflow equation will be replaced by Z_{BOT}.

When equation 3a is included in equation 2, the resulting continuity equation can be put in finite-difference form with a similar format to that originally used in BRANCH (Schaffranek and others, 1981):

$$
\begin{aligned}
&\bar{B}\left[\frac{Z_{i+1}^{j+1}+Z_i^{j+1}}{2\Delta t}-\frac{Z_{i+1}^{j}+Z_i^{j}}{2\Delta t}\right] \\
&+\Theta\frac{Q_{i+1}^{j+1}-Q_i^{j+1}}{\Delta L_i}+(1-\Theta)\frac{Q_{i+1}^{j}-Q_i^{j}}{\Delta L_i} \\
&+\frac{\chi}{2}\Big[C_{i+1}B_{i+1}^{j+1}\left(Z_{i+1}^{j+1}-h^{j+1}\right) \\
&\qquad +C_i B_i^{j+1}\left(Z_i^{j+1}-h^{j+1}\right)\Big] \\
&+\frac{(1-\chi)}{2}\Big[C_{i+1}B_{i+1}^{j}\left(Z_{i+1}^{j}-h^{j}\right) \\
&\qquad +C_i B_i^{j}\left(Z_i^{j}-h^{j}\right)\Big] = 0,
\end{aligned}
\tag{4}
$$

where C is K'/b', ΔL_i is length of channel segment from points i to $i+1$, Θ is weighting factor for spatial derivatives, χ is a weighting factor for averaged quantities, and $\bar{B}$ is average channel topwidth from the previous time interval:

$$
\bar{B}=\chi\frac{B_{i+1}^{j}+B_i^{j}}{2}+(1-\chi)\,\frac{B_{i+1}^{j-1}+B_i^{j-1}}{2}\,. \tag{5}
$$

The subscripts indicate location in space, such that i is the upstream node and $i+1$ is the downstream node. The superscripts indicate time of occurrence, such that j is the beginning of the time interval, $j+1$ is the end of the time interval, and $j-1$ is the beginning of the previous time interval.

Equation 4 is solved simultaneously for all nodes (points along the channel where cross sections are defined), with the finite-difference form of the momentum equation unchanged in BRANCH' (Schaffranek and others, 1981). Coefficients for a matrix solution were developed to use the same matrix solution that was already implemented in BRANCH, putting equation 4 in the form

$$
Q_{i+1}^{j+1}+\gamma\,Z_{i+1}^{j+1}-Q_i^{j+1}+\alpha\,Z_i^{j+1}=\delta, \tag{6a}
$$

$$
\text{where}\quad \gamma=\frac{\bar{B}\Delta L_i}{2\Delta t\Theta}+\frac{\chi C_{i+1}B_{i+1}^{j+1}\Delta L_i}{2\Theta}\,, \tag{6b}
$$

$$
\alpha=\frac{\bar{B}\Delta L_i}{2\Delta t\Theta}+\frac{\chi C_i B_i^{j+1}\Delta L_i}{2\Theta}\,, \tag{6c}
$$

$$
\begin{aligned}
\text{and}\quad \delta = &-\frac{1-\Theta}{\Theta}\left(Q_{i+1}^{j}-Q_i^{j}\right)+\Bigg[\frac{\bar{B}\Delta L_i}{2\Delta t\Theta}-(1-\chi) \\
&\left(C_{i+1}B_{i+1}^{j}\right)\frac{\Delta L_i}{2\Theta}\Bigg]\,Z_{i+1}^{j} \\
&+\left[\frac{\bar{B}\Delta L_i}{2\Delta t\Theta}-(1-\chi)\left(C_iB_i^{j}\right)\frac{\Delta L_i}{2\Theta}\right]\,Z_i^{j}+\frac{\Delta L_i}{2\Theta} \\
&\Big[\chi\left(C_{i+1}B_{i+1}^{j+1}h^{j+1}+C_iB_i^{j+1}h^{j+1}\right) \\
&+(1-\chi)\left(C_{i+1}B_{i+1}^{j}h^{j}+C_iB_i^{j}h^{j}\right)\Big]
\end{aligned}
\tag{6d}
$$

In the scheme without leakage, γ and α are the same quantity (Schaffranek and others, 1981). However, the coefficients γ, α, and δ can be placed in the same positions in the matrix as their nonleakage predecessors. This provides a similar form of the matrix of the flow equations in the ith segment:

$$
\begin{bmatrix}1 & \zeta\\ \gamma & 1\end{bmatrix}\begin{bmatrix}Z_{i+1}^{j+1}\\ Q_{i+1}^{j+1}\end{bmatrix}-\begin{bmatrix}1 & -\omega\\ -\alpha & 1\end{bmatrix}\begin{bmatrix}Z_i^{j+1}\\ Q_i^{j+1}\end{bmatrix}=\begin{bmatrix}\varepsilon\\ \delta\end{bmatrix}, \tag{7}
$$

where ζ, ω, and ε are coefficients in the momentum equation. The preexisting method of saving computational effort in BRANCH by branch transformation as described in Schaffranek and others (1981) is maintained in BRANCH' using the coefficients in equation 7.

The BRANCH' model is modified to incorporate channel-bed leakage to and from the aquifer. The only variable in the computation scheme upon which leakage depends is the stage Z. The only input needed from the ground-water model is the aquifer heads h, which are fixed values for the solution of equation 7. The feedback of leakage quantity occurring in BRANCH' is returned to MODFLOW so it can calculate new values of h. The leakage quantities for all the BRANCH' time intervals during one MODFLOW time step must be calculated and averaged in BRANCH'. This averaging process is accomplished using

$$\overline{q\Delta L_i} = \frac{\Delta L_i}{NTSAQ} \sum_{j=T_s}^{T_s+NTSAQ} \frac{\chi}{2}\left[C_{i+1} B_{i+1}^{j+1} \left(Z_{i+1}^{j+1} - h^{j+1}\right) + C_i B_i^{j+1} \left(Z_i^{j+1} - h^{j+1}\right)\right]$$

$$+ \frac{1-\chi}{2}\left[C_{i+1} B_{i+1}^{j}\left(Z_{i+1}^{j} - h^{j}\right) + C_i B_i^{j}\left(Z_i^{j} - h^{j}\right)\right], \quad (8)$$

where T_s is the starting time interval when BRANCH' is entered from MODFLOW, and $NTSAQ$ is the number of BRANCH' time intervals in one MODFLOW time step. For example, if the MODFLOW time step is 1 hour, and the BRANCH' time interval is 5 minutes, then $NTSAQ$ is 12.

The quantity derived in equation 8 is the average leakage flow rate into or out of reach i of the stream during the MODFLOW time step ($NTSAQ$ BRANCH' times intervals). It can be transferred directly back to MODFLOW and added to the flow in the aquifer model cell. The three-dimensional ground-water flow equation takes the form (McDonald and Harbaugh, 1988)

$$\frac{\partial}{\partial x}\left(K_x \frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(K_y \frac{\partial h}{\partial y}\right) + \frac{\partial}{\partial z}\left(K_z \frac{\partial h}{\partial z}\right) - W = S_s \frac{\partial h}{\partial t}, \quad (9)$$

where x, y, and z are coordinate directions, K_x, K_y, and K_z are hydraulic conductivities of the aquifer in these coordinate directions, S_s is specific storativity, and W is volumetric flux per unit volume.

The W term corresponds to a leakage quantity or other inflow or outflow. In a report by McDonald and Harbaugh (1988), the derivation of the finite-difference form of equation 9 that is used in MODFLOW is shown. This derivation yields the equation

$$V_{i,j,k-1/2} h^m_{i,j,k-1} + U_{i-1/2,j,k} h^m_{i-1,j,k} + R_{i,j-1/2,k}$$

$$h^m_{i,j-1,k} + (-V_{i,j,k-1/2} - U_{i-1/2,j,k} - R_{i,j-1/2,k}$$

$$-R_{i,j+1/2,k} - U_{i+1/2,j,k} - V_{i,j,k+1/2} + H_{COEF\,i,j,k})\, h^m_{i,j,k}$$

$$+ R_{i,j+1/2,k}\, h^m_{i,j+1,k} + U_{i+1/2,j,k}\, h^m_{i+1,j,k} + V_{i,j,k+1/2}$$

$$h^m_{i,j,k+1} = RHS_{i,j,k}\,. \quad (10)$$

where i, j, and k are row, column, and layer indices, m is time level,

$$V_{i,j,k} = \frac{K_{z\,i,j,k}\Delta X_i \Delta Y_j}{\Delta Z_k},$$

$$U_{i,j,k} = \frac{K_{x\,i,j,k}\Delta Y_j \Delta Z_k}{\Delta X_i},$$

$$R_{i,j,k} = \frac{K_{y\,i,j,k}\Delta X_i \Delta Z_k}{\Delta Y_j},$$

$$H_{COEF\,i,j,k} = P_{ijk} - \frac{S_{s\,i,j,k}\Delta X_i \Delta Y_j \Delta Z_k}{t^m - t^{m-1}},$$

$$RHS_{i,j,k} = -F_{ijk} - \frac{S_{s\,i,j,k}\, h^{m-1}_{i,j,k}\Delta X_i \Delta Y_j \Delta Z_k}{t^m - t^{m-1}},$$

P_{ijk} is a head-dependent inflow term, and F_{ijk} is the inflow term.

The term F_{ijk} is the flow rate (L^3t^{-1}) from an external source into the aquifer model cell i, j, k. Thus, the $\overline{q\Delta L_i}$ term calculated in BRANCH' by equation 8 for a specific river segment can be passed to MODFLOW and added to the F_{ijk} term in equation 10 for the aquifer model cell containing the river segment.

If there is only one BRANCH' time interval in the MODFLOW time step (same time-scale lengths), leakage can be calculated implicitly in MODFLOW instead of passing $\overline{q\Delta L_i}$ from BRANCH'. This scheme is more stable numerically because it adds terms to the diagonal of the MODFLOW matrix, making it more diagonally dominant. This is achieved by setting the terms in equation 10 as follows:

$$P_{ijk} = -\left(C_{i+1} B_{i+1}^{j+1} + C_i B_i^{j+1}\right)\frac{\Delta L_i}{2} \quad (11)$$

$$F_{ijk} = \left(C_{i+1} B_{i+1}^{j+1} Z_{i+1}^{j+1} + C_i B_i^{j+1} Z_i^{j+1}\right)\frac{\Delta L_i}{2}. \quad (12)$$

These terms are fully forward weighted in time, as is the rest of the MODFLOW formulation. Thus, to be consistent, the BRANCH' formulation should have a forward-weighted leakage term (χ=1.0) in this case.

These equations are used in the module calling sequence shown in figure 4. Values of h are passed from MODFLOW to BRANCH' for solving the channel flow equation 4 along with the momentum equation for values of Z and Q. After this solution is made iteratively, the leakage rate equation 8 is used to determine $\overline{q\Delta L_i}$ for all river segments for the number of BRANCH' time intervals that occur during the MODFLOW time step. If multiple BRANCH' time intervals occur in one MODFLOW time step, these $\overline{q\Delta L_i}$ values are passed back to MODFLOW and used as the F_{ijk} inflow value in the ground-water flow equation 10 for the aquifer model cell containing the river segment. Alternatively, if MODFLOW and BRANCH' have the same time-step and time-interval lengths, components P_{ijk} and F_{ijk} are calculated by equations 11 and 12 and transferred to the ground-water flow equation 10. Solving equation 10 provides revised values of h to be passed back to BRANCH' and the process is repeated. This process is continued until the values of h and Z show no significant change from iteration to iteration, thus, signaling the completion of a MODFLOW time step. Four to nine iterations are usually sufficient for convergence of MODFLOW and BRANCH'. More iterations are usually necessary when either the ground-water or surface-water system changes rapidly.

DRYING AND REWETTING OF RIVER CHANNELS

Another option that is included in the coupled model is the representation of the drying and rewetting of the river channel. This option allows the modeling of an intermittent flow system where the river is periodically fed by ground water or is completely drained by leakage to the aquifer. Numerical stability is the most common problem that occurs when trying to simulate a dry condition with the unsteady flow equation. The continuity equation (eq. 4) creates no numerical problems at small values of B, but the momentum equation may be unstable under certain conditions. The finite-difference form of the momentum equation is (Schaffranek and others, 1981)

$$\begin{aligned} &\frac{1}{g\bar{A}}\left[\frac{Q_{i+1}^{j+1}+Q_i^{j+1}}{2\Delta t}-\frac{Q_{i+1}^{j}+Q_i^{j}}{2\Delta t}\right]+\frac{2\beta\bar{Q}}{g\bar{A}^2}\left[\Theta\frac{Q_{i+1}^{j+1}-Q_i^{j+1}}{\Delta L_i}\right.\\ &\left.+(1-\Theta)\frac{Q_{i+1}^{j}-Q_i^{j}}{\Delta L_i}\right]-\frac{\beta\bar{Q}^2}{g\bar{A}^3}\frac{\bar{A}_{i+1}^{j+1}-\bar{A}_i^{j+1}}{\Delta L_i}+\Theta\frac{Z_{i+1}^{j+1}-Z_i^{j+1}}{\Delta L_i}\\ &+(1-\Theta)\frac{Z_{i+1}^{j}-Z_i^{j}}{\Delta L_i}+\frac{k|\bar{Q}|}{\bar{A}^2 r^{4/3}}\left[\chi\frac{Q_{i+1}^{j+1}+Q_i^{j+1}}{2}+(1-\chi)\right.\\ &\left.\frac{Q_{i+1}^{j}+Q_i^{j}}{2}\right]-\frac{\xi\bar{B}}{g\bar{A}}U_a^2\cos\phi=0, \end{aligned} \tag{13}$$

where the overbar indicates quantities averaged from the previous time interval; A is the cross-sectional area of channel; ß is the momentum coefficient; g is gravitational acceleration; k is the friction factor $(n/1.49)^2$ based on Manning's equation, in inch-pound units or n^2 in metric units; r is the hydraulic radius; ξ is $C_d\,\rho_a/\rho_W$ (ρ_a is air density and ρ_W is water density); C_d is the water surface drag coefficient; U_a is the wind speed; and ϕ is the angle between wind direction and channel orientation.

Equation 13 has cross-sectional area, $\bar{A}$, in the denominator of many terms and would be unstable for small values of $\bar{A}$. To compensate for this problem, a scheme was developed that retains a small flow in the channel, increases the frictional resistance of the streambed to allow as little discharge as possible, and eliminates any leakage to the aquifer. Flow continuity is retained in the channel using this scheme. In addition, there is no rapid change in the mathematical formulation for the dry channel that would induce instabilities, and a rewetting of the channel can be initiated by a rise in stream stage. The creation of a small theoretical area below the riverbed to provide data for equation 13 is a simple but necessary addition to the cross-sectional geometry table in BRANCH'. A diagram of this channel configuration is shown in figure 5. When the stage in the channel drops into this theoretical area, the frictional resistance in the momentum equation is increased by a user-defined amount.

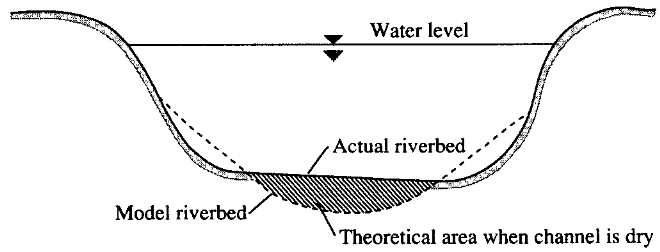

Figure 5. Theoretical channel configuration to allow for channel drying.

The increase to streambed resistance is accomplished using the coefficients λ, μ, σ for equation 13, such that

$$\lambda = \frac{\Delta L_i}{2\Delta t\Theta g\bar{A}}, \tag{14a}$$

$$\mu = \frac{2\beta\bar{Q}}{g\bar{A}^2}, \tag{14b}$$

$$\sigma = \frac{\chi\Delta L_i k|\bar{Q}|}{2\Theta\bar{A}^2 r^{4/3}}, \text{ and} \tag{14c}$$

$$\begin{aligned} \varepsilon = &\left(\lambda-\sigma\frac{(1-\chi)}{\chi}\right)\left(Q_{i+1}+Q_i^j\right)+-\mu\frac{(1-\Theta)}{\Theta}\left[Q_{i+1}^j-Q_i^j\right]\\ &-\frac{1-\Theta}{\Theta}\left[Z_{i+1}^j-Z_i^j\right]+\frac{\beta\bar{Q}^2}{\Theta g\bar{A}^3}\\ &\left[A_{i+1}^{j+1}-A_i^{j+1}\right]+\frac{\xi\Delta L_i\bar{B}}{\Theta g\bar{A}}U_a^2\cos\alpha\,. \end{aligned} \tag{14d}$$

With $\zeta=\lambda+\sigma+\mu$ and $\omega=\lambda+\sigma-\mu$, equation 13 becomes,

$$\zeta\, Q_{i+1}^{j+1}+Z_{i+1}^{j+1}+\omega Q_i^{j+1}-Z_i^{j+1}=\varepsilon\cdot \tag{15}$$

These are the ζ, ω, and ε coefficients used in equation 7.

The coefficient σ contains the friction term. When a river stage drops below the elevation of the river bottom, σ is multiplied by a dry channel friction multiplier (DCFM). The value of DCFM should be as large as possible without creating computational instabilities. An increase of the DCFM causes a decrease in flow when the channel is dry.

If σ is multiplied by DCFM when the stage drops below the riverbed, two problems can occur: (1) the computational instabilities may cause an oscillation between two alternate solutions without convergence—where the stage is below the riverbed and water is flowing at high friction and where the stage is above the riverbed and water is flowing at normal friction; and (2) a jump in stage results when the channel rewets because of the sudden drop in friction.

These problems are solved by varying DCFM gradually as the channel dries and wets. When progressively higher values were applied to DCFM with decreasing stage below the riverbed, greater oscillations occurred in the BRANCH' solution as the stage fluctuated above and below the riverbed. The most stable solution seems to be gradating DCFM by time. If the channel is currently dry and was dry in the last time interval, DCFM is doubled with an upper limit at the DCFM value selected by the user. If the channel is rewet, DCFM is halved each time interval. BRANCH' performs the gradation from first drying to full value of DCFM in five time intervals and from full value of DCFM back to the lowest value also in five intervals. When the appropriate maximum DCFM value is chosen by the user, smooth transitions occur between dry and wet conditions.

Several concerns are raised by the empirical nature of this solution. Because the gradations in DCFM are performed in successive time intervals, time-interval length will affect the rate of drying and rewetting frictional changes. This is not a desirable condition, but trial runs (see example problem 3) indicated that this effect is concentrated around the times of transition between wet and dry and dry and wet and does not propagate into the rest of the solution. Although at full friction negligible flows should be expected, in practice DCFM is so low that significant flows may occur just before rewetting. This condition should probably be considered as wet by the program user.

The BRANCH' user should adjust the selected DCFM value to calibrate the drying and rewetting curves. A value of 100 worked well in the sample runs, but DCFM may vary according to the variability of streamflow and channel conditions. When interpreting results, recognize that the drying and rewetting process is empirically calibrated, and the exact moment the channel runs dry cannot be determined from model results. However, exact times of channel drying and rewetting also are difficult to determine in the field.

STEADY-STATE SIMULATION

Because BRANCH uses the full, unsteady flow St. Venant equation, it may seem counterproductive to make modifications in order to simulate steady-state riverflow. However, it is often desirable to model the steady-state aquifer condition in MODFLOW. Accordingly, a steady-state option was developed for BRANCH' that will make it compatible with MODFLOW. This is achieved by removing the time-dependent terms in the continuity and momentum equations 4 and 13, which is equivalent to setting Δt in the denominators to infinity. This is done in the coefficients by subtracting

$$\frac{\bar{B}\Delta L_i}{2\Delta t\Theta}$$

from γ and α (eqs. 6b and 6c), and by subtracting

$$\frac{\bar{B}\Delta L_i}{2\Delta t\Theta}\left(Z^j_{i+1}+Z^j_i\right)$$

from δ (eq. 6d), and setting λ to zero (eq. 14a). The equations are solved by the previously described method, and the leakage effects are retained.

MODEL DOCUMENTATION

The method used in integrating the BRANCH' and MODFLOW models was to create an interface code (MODBRANCH) called by MODFLOW that passes information between MODFLOW and BRANCH' and calls BRANCH'. The MODBRANCH code consists of four modules called by MODFLOW. The last two modules each call the model BRANCH'. Subroutines called by BRANCH' are not described in detail in this report. Descriptions of these subroutines can be found in the report by Schaffranek and others (1981).

MODBRANCH modules:

- BRC1AL allocates space for data arrays used by BRANCH'.
- BRC1RP reads input data for BRANCH'. Consists of the data reading section of the original BRANCH.
- BRC1FM calls BRANCH' and adds leakage to the *RHS* terms in each aquifer model cell containing a river reach.
- BRC1BD calls BRANCH' to calculate rates and accumulated volumes over a MODFLOW time step.

Model called by MODBRANCH modules:

- BRANCH' called by BRC1FM and BRC1BD modules. Simulates the unsteady flow in networks of reaches composed of interconnecting channels with leakage to the aquifer. This code consists of the computational section of the open-channel flow model BRANCH with modifications for leakage, drying and rewetting of reaches, and the steady-state option.

MODIFICATIONS TO MAIN CODE

Several modifications to the MODFLOW main program are necessary to allow it to use the MODBRANCH code. These modifications are as follows:

1. Introduce Y, YC, and YL arrays. This is done by inserting the following commands at the program beginning:
   COMMON Y (NUMERICAL LENGTH OF Y VECTOR)
   DOUBLE PRECISION Y
   DOUBLE PRECISION YUMMY
   EQUIVALENCE (YUMMY, Y(1))
   CHARACTER*4 YC (NUMERICAL LENGTH OF YC VECTOR)
   LOGICAL*4 YL (NUMERICAL LENGTH OF YL VECTOR)
2. Introduce common statements. There are 11 common cells and some dimension statements pertaining to the variables in the MODBRANCH code. These were placed at the beginning of the MODFLOW main program so appropriate variables can be passed between routines. This is given in the listing of the modified main program (table 1).
3. Define lengths of vectors. Between comments C1 and C2 in the main code, insert the vector lengths:
   LENY = (NUMERICAL LENGTH OF Y VECTOR)
   LENYC = (NUMERICAL LENGTH OF YC VECTOR)
   LENYL = (NUMERICAL LENGTH OF YL VECTOR)
4. Introduce calls to MODBRANCH modules. The four modules in the MODBRANCH code are called at the appropriate location.

   Between comments C4 and C5 is added:

```
   IF(IUNIT(??). GT.0)
1  CALL BRC1AL (LENY,LENYC,LENYL,LINDAT,
   LIZDAT,LIQDAT,LITQMA,LITQMI,
1  LQMAX,LQMIN,LQSUM,LZQMIN,LZQMAX,
   LAQMAX,LAQMIN,LA,LZ,LQ,LZP,LQ P,
2  LAP,LBP,LRP,LB,LR,LBT,LBTP,LXSTAT,LDX,
   LT,LRN,LWANGL,LGDATU,LORIEN,
3  LBETVE,LSUMET,LSUMCZ,LSC-
   ZQS,LSZQET,LITYPO,LZA,LAA,LBB,LBS,LI PT,
4  LQA,LTA,LETA,LFUNET,LROW,LAM,LBMX,
   LBRNAM,LIJF,LIJT,LNSEC,LXSKT,
5  LPLTBC,LPRTXS,LPRTBC,LPRTSU,LPPLTB,
   LITYPE,LIBJNC,LNDATA,LIZQB V,
6  LISTAT,LKTTDB,LZQ,LDTT,LDATUM,
   LZQBVC,LZQPMI,LLARBP,LZHIGH,
7  LZLOW,LLINPR,LARBER,LCLK,LZBOT,
   MXBH,NSEC,MAXS,MXTDBC,
8  MAXZBD,MAXCZQ,MXWIND,MXJN,NSEG,
   MXPT,MXMD,MAXQBD,MAXMZQ,ITMUNI ,
9  LWINDS,LWINDD,LIDX,LICT,LW,LU,LUU,
   LBU,LBUU,LZSAV,LQSAV,LZPSAV,
1  LQPSAV,IUNIT(??),IOUT,TFCTR,LISTRM,
   LZPL,LSLKG,IBEGIN,LZN,
2  LQLSUM,NELAP,LITRIA,DCFM)
```

Between comments C6 and C7 is added:

```
   IF(IUNIT(??).GT.0) CALL BRC1RP
&  (Y(LINDAT),Y(LIZDAT),Y(LIQDAT),Y(LITQ-
   MA),Y(LITQMI),Y(LQMAX),
1  Y(LQMIN),Y(LQSUM),Y(LZQMIN),Y(LZQ-
   MAX),(LAQMAX),Y(LAQMIN),Y(L A),
2  Y(LZ),Y(LQ),Y(LZP),Y(LQP),Y(LAP),Y(LBP),
   Y(LRP),Y(LB),Y(LR),
3  Y(LBT),Y(LBTP),Y(LXSTAT),Y(LDX),Y(LT),
   Y(LRN),Y(LWANGL),Y(LGDA TU),
4  (LORIEN),Y(LBETVE),Y(LSUMET),Y(LS-
   UMCZ),Y(LSCZQS),Y(LSZQET),
5  YC(LITYPO),Y(LZA),Y(LAA),Y(LBB),Y(LBS),
   Y(LIPT),Y(LQA),Y(LTA),
6  Y(LETA),Y(LFUNET),YC(LBRNAM),Y(LIJF),
7  Y(LIJT),Y(LNSEC),Y(LXSKT),Y(LPLTBC),
   Y(LPRTXS),Y(LPRTBC),Y(LPR TSU),
8  Y(LPPLTB),YC(LITYPE),Y(LIBJNC),Y(LN-
   DATA),Y(LIZQBV),Y(LISTAT),
9  Y(LKTTDB),Y(LZQ),Y(LDTT),Y(LDATUM),
   Y(LZQBVC),Y(LZQPMI),
1  YL(LLARBP),YL(LZHIGH),YL(LZLOW),YL-
   (LLINPR),YL(LARBER),Y(LCLK) ,
2  Y(LZBOT),MXBH,MXJN,MAXS,MXPT,MXT-
   DBC,MXMD,MAXZBD,
3  MAXQBD,MAXCZQ,MAXMZQ,MXWIND,
   MAXBD,MXOTDT,Y(LWINDS),Y(LWINDD),
4  Y(LICT),Y(LW),IUNIT(??),IOUT,Y(LISTRM))
```

Between comments C7C2A and C7C2B and after the call to BAS1FM is added:

```
   IF(IUNIT(??). GT.0) CALL BRC1FM
&  (Y(LINDAT),Y(LIZDAT),Y(LIQDAT),Y(LITQ-
   MA),Y(LITQMI),Y(LQMAX),
1  Y(LQMIN),Y(LQSUM),Y(LZQMIN),Y(LZQ-
   MAX),Y(LAQMAX),Y(LAQMIN),Y(L A),
2  Y(LZ),Y(LQ),Y(LZP),Y(LQP),Y(LAP),Y(LBP),
   Y(LRP),Y(LB),Y(LR),
3  Y(LBT),Y(LBTP),Y(LXSTAT),Y(LDX),Y(LT),
   Y(LRN),Y(LWANGL),Y(LGDA TU),
4  Y(LORIEN),Y(LBETVE),Y(LSUMET),Y(LSU-
   MCZ),Y(LSCZQS),Y(LSZQET),
5  YC(LITYPO),Y(LZA),Y(LAA),Y(LBB),Y(LBS),
   Y(LIPT),Y(LQA),Y(LTA),
6  Y(LETA),Y(LFUNET),Y(LROW),Y(LAM),
   Y(LBMX),YC(LBRNAM),Y(LIJF),
7  Y(LIJT),Y(LNSEC),Y(LXSKT),Y(LPLTBC),
   Y(LPRTXS),Y(LPRTBC),Y(LPR TSU),
8  Y(LPPLTB),YC(LITYPE),Y(LIBJNC),Y
   (LNDATA),Y(LIZQBV),Y(LISTAT) ,
```

Table 1. Example listing of a modified main program

```
C     ****************************************************************
C     MAIN CODE FOR MODULAR MODEL --     4/1/91
C          BY MICHAEL G. MCDONALD AND ARLEN W. HARBAUGH
C-----VERSION 1700  1APR1991 MAIN1 MODIFIED TO INTERFACE WITH THE
C     UNSTEADY OPEN CHANNEL FLOW MODEL BRANCH
C     ****************************************************************
C
C        SPECIFICATIONS:
C     ----------------------------------------------------------------
      COMMON X(30000)
      COMMON Y(50000)
      DOUBLE PRECISION Y
      COMMON /FLWCOM/LAYCON(80)
      CHARACTER*4 HEADNG,VBNM
      DIMENSION HEADNG(32),VBNM(4,20),VBVL(4,20),IUNIT(24)
      DOUBLE PRECISION DUMMY
      EQUIVALENCE (DUMMY,X(1))
      DOUBLE PRECISION YUMMY
      EQUIVALENCE (YUMMY,Y(1))
      CHARACTER*4 YC(1000)
      LOGICAL*4 YL(1000)
C BEGIN COMMON_COMCON ================================================
C
      CHARACTER*2 IUNET,OUNIT
      INTEGER*4 NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,IPLOPT,IPLDEV,
     1 IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,IRDIC,NUMCOM,INWIND,
     2 TYPETA,OTTDDB,ISMOPT,NTDIOF,IRDNXT,IARDEM
      REAL THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,H2ODEN,CHI,QZCONV,
     1 ZDATUM,DT,G,AIRDEN,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
      COMMON /COMCON/ NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,
     1 IPLOPT,IPLDEV,IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,
     2 IRDIC,NUMCOM,INWIND,THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,
     3 H2ODEN,CHI,ZDATUM,IUNET,OUNIT,TYPETA,OTTDDB,ISMOPT,G,QZCONV,DT,
     4 AIRDEN,IARDEM,NTDIOF,IRDNXT,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
C
C  END   COMMON_COMCON ================================================
C BEGIN   COMMON_DTYPES ===============================================
C
      CHARACTER*2 DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
      COMMON /DTYPES/ DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
C
C  END    COMMON_DTYPES ===============================================
C BEGIN COMMON_UNITS =================================================
C
      CHARACTER*2 IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
      COMMON /UNITS/ IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
C
C  END   COMMON_UNITS =================================================
C BEGIN COMMON_LUNUMS ================================================
C
      INTEGER*4 READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,LUIVOL,
     1        LUGEOM,LUINIT,LUCVOL
      COMMON /LUNUMS/ READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,
     1 LUIVOL,LUGEOM,LUINIT,LUCVOL
C
C  END   COMMON_LUNUMS ================================================
C BEGIN COMMON_DADCOM ================================================
C
      INTEGER*2 LISTB,LISTA,STRIP,RTCODE
      COMMON /DADCOM/ LISTB,LISTA,STRIP,RTCODE
```

Table 1. Example listing of a modified main program—Continued

```
C
C  END   COMMON_DADCOM ================================================
C BEGIN COMMON_DAYPMO ================================================
C
      INTEGER*2 DPERM(12)
      COMMON /DAYPMO/ DPERM
C
C  END   COMMON_DAYPMO ================================================
C BEGIN COMMON_LOGICS ================================================
C
      LOGICAL*4 PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
      COMMON /LOGICS/ PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
C
C  END   COMMON_LOGICS ================================================
C BEGIN COMMON_BCTIME ================================================
C
      INTEGER*4 IETIME,NETIME
      INTEGER *2 IRDPDY,IYR,IMO,IDA,IHR,IMN,NYR,NMO,NDA,NHR,NMN
      COMMON /BCTIME/ IETIME,NETIME,IRDPDY,IYR,IMO,IDA,IHR,IMN,
     1                                    NYR,NMO,NDA,NHR,NMN
C
C  END   COMMON_BCTIME ================================================
C BEGIN COMMON_DATIME ================================================
C
      INTEGER*4 KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
      COMMON /DATIME/ KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
C
C  END   COMMON_DATIME ================================================
C BEGIN COMMON_NETWRK ================================================
C
      CHARACTER*80 NETNAM
      COMMON /NETWRK/ NETNAM
C
C  END   COMMON_NETWRK ================================================
C BEGIN COMMON_MODBRCH ================================================
C
      COMMON /MODBRCH/ TWOCSQ,IDTPDY,TWOG,CW,II,ONECHI,DCHI,DTHETA,
     1                     IBCH,IJZPBC,IJQPBC,DCFM1,KKITER
C
C  END   COMMON_MODBRCH ================================================
      INTEGER*4 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,KTTDBC
      LOGICAL*4 ARBERR
      REAL*8 C1, C2, C3, C4, UUIJP1, UUIJP2, UUIJP3, UUIJP4
      REAL LAMBDA,MU,SETA,WDTT,TWOCSQ,TWOG,CW,ONECHI,DCHI,DTHETA,TH,WIND
      INTEGER*4 IAR,I,J,K,L,II,IJ,NS,KT,IS,N,NWREAD,NWDATA,INTDBC,IDTPDY
      REAL QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      COMMON /LIMITS/ QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      INTEGER*2 JYR,JMO,JDA,JHR,JMN,MYR,MMO,MDA,MHR,MMN
      INTEGER*4 ND,NDFIRT,NDPART,JETIME,NTSAQ
      COMMON /PARTIM/ ND,NDFIRT,NDPART,JETIME,JYR,JMO,JDA,JHR,JMN,
     1MYR,MMO,MDA,MHR,MMN
      CHARACTER*80 COMENT(9)
      COMMON /CMMNT/ COMENT
      CHARACTER*2 IDETA(7)
      COMMON /ETASYM/ IDETA
      REAL WRATIO,DTZERO,ZTEMP,QTEMP,ZIJ,QIJ,DXIJ,QIJP1,ZIJP1,APZPIJ,
     1     BPZPIJ,BTZPIJ,RPZPIJ,BAVG,BTAVG,AAVG,RAVG,QAVG,ZAVG,BETCOR,
```

Table 1. Example listing of a modified main program—Continued

```
     2      RNIJ,AAVGSQ,AAVGCU,SIGMA,EPSLON,ZETA,OMEGA,GAMMA,DELTA,DET,
     3 DZDT,DQDXC,DQDT,DQDXM,DADX,DZDX,FRIC,ZQPIJ,BIGQ,BIGZ,ZTOL,SOLPDT
     4 ,ALPHA
      INTEGER*4 IBCH,IJZPBC,IJQPBC,KTMATS,LASTN,IJP1,NSM1,JP1,IJ2,IJ4,
     1  IJ4P1,IJ4P2,IJ4P3,IJ4P4,IJ2P1,IJ2P2,I2,I4,I4P1,I4P2,I4P3,I4P4,
     2  I2P1,I2P2,NN,MM,NNN,NBPJ,M0,IBIGZ,JBIGZ,IBIGQ,JBIGQ,IJPNS,ICHK
C     -----------------------------------------------------------------
C
C1------SET SIZE OF X, Y, YC, YL ARRAYS. REMEMBER TO REDIMENSION ARRAYS.
      LENX=30000
      LENY=50000
      LENYC=1000
      LENYL=1000
C
C2------ASSIGN BASIC INPUT UNIT AND PRINTER UNIT.
      INBAS=15
      IOUT=16
C
C3------DEFINE PROBLEM__ROWS,COLUMNS,LAYERS,STRESS PERIODS,PACKAGES
      CALL BAS1DF(ISUM,HEADNG,NPER,ITMUNI,TOTIM,NCOL,NROW,NLAY,
     1              NODES,INBAS,IOUT,IUNIT)
C
C4------ALLOCATE SPACE IN "X, Y, YL, YC," ARRAYS.
      CALL BAS1AL(ISUM,LENX,LCHNEW,LCHOLD,LCIBOU,LCCR,LCCC,LCCV,
     1               LCHCOF,LCRHS,LCDELR,LCDELC,LCSTRT,LCBUFF,LCIOFL,
     2               INBAS,ISTRT,NCOL,NROW,NLAY,IOUT)
      IF(IUNIT(1).GT.0) CALL BCF1AL(ISUM,LENX,LCSC1,LCHY,
     1      LCBOT,LCTOP,LCSC2,LCTRPY,IUNIT(1),ISS,
     2      NCOL,NROW,NLAY,IOUT,IBCFCB)
      IF(IUNIT(2).GT.0) CALL WEL1AL(ISUM,LENX,LCWELL,MXWELL,NWELLS,
     1                  IUNIT(2),IOUT,IWELCB)
      IF(IUNIT(3).GT.0) CALL DRN1AL(ISUM,LENX,LCDRAI,NDRAIN,MXDRN,
     1                  IUNIT(3),IOUT,IDRNCB)
      IF(IUNIT(8).GT.0) CALL RCH1AL(ISUM,LENX,LCIRCH,LCRECH,NRCHOP,
     1             NCOL,NROW,IUNIT(8),IOUT,IRCHCB)
      IF(IUNIT(5).GT.0) CALL EVT1AL(ISUM,LENX,LCIEVT,LCEVTR,LCEXDP,
     1             LCSURF,NCOL,NROW,NEVTOP,IUNIT(5),IOUT,IEVTCB)
      IF(IUNIT(4).GT.0) CALL RIV1AL(ISUM,LENX,LCRIVR,MXRIVR,NRIVER,
     1             IUNIT(4),IOUT,IRIVCB)
      IF(IUNIT(13).GT.0) CALL STR1AL(ISUM,LENX,LCSTRM,ICSTRM,MXSTRM,
     1                  NSTREM,IUNIT(13),IOUT,ISTCB1,ISTCB2,NSS,NTRIB,
     2                    NDIV,ICALC,CONST,LCTBAR,LCTRIB,LCIVAR)
      IF(IUNIT(15).GT.0)
     1 CALL BRC1AL(LENY,LENYC,LENYL,LINDAT,LIZDAT,LIQDAT,LITQMA,LITQMI,
     1 LQMAX,LQMIN,LQSUM,LZQMIN,LZQMAX,LAQMAX,LAQMIN,LA,LZ,LQ,LZP,LQP,
     2 LAP,LBP,LRP,LB,LR,LBT,LBTP,LXSTAT,LDX,LT,LRN,LWANGL,LGDATU,LORIEN
     3 ,LBETVE,LSUMET,LSUMCZ,LSCZQS,LSZQET,LITYPO,LZA,LAA,LBB,LBS,LIPT,
     4 LQA,LTA,LETA,LFUNET,LROW,LAM,LBMX,LBRNAM,LIJF,LIJT,LNSEC,LXSKT,
     5 LPLTBC,LPRTXS,LPRTBC,LPRTSU,LPPLTB,LITYPE,LIBJNC,LNDATA,LIZQBV,
     6 LISTAT,LKTTDB,LZQ,LDTT,LDATUM,LZQBVC,LZQPMI,LLARBP,LZHIGH,
     7 LZLOW,LLINPR,LARBER,LCLK,LZBOT,MXBH,NSEC,MAXS,MXTDBC,
     8 MAXZBD,MAXCZQ,MXWIND,MXJN,NSEG,MXPT,MXMD,MAXQBD,MAXMZQ,ITMUNI,
     9 LWINDS,LWINDD,LIDX,LICT,LW,LU,LUU,LBU,LBUU,LZSAV,LQSAV,LZPSAV,
     & LQPSAV,IUNIT(15),IOUT,TFCTR,LISTRM,LZPL,LSLKG,IBEGIN,LZN,
     & LQLSUM,NELAP,LITRIA,DCFM)
      IF(IUNIT(7).GT.0) CALL GHB1AL(ISUM,LENX,LCBNDS,NBOUND,MXBND,
     1             IUNIT(7),IOUT,IGHBCB)
      IF(IUNIT(9).GT.0) CALL SIP1AL(ISUM,LENX,LCEL,LCFL,LCGL,LCV,
     1            LCHDCG,LCLRCH,LCW,MXITER,NPARM,NCOL,NROW,NLAY,
     2            IUNIT(9),IOUT)
```

Table 1. Example listing of a modified main program—Continued

```
      IF(IUNIT(11).GT.0) CALL SOR1AL(ISUM,LENX,LCA,LCRES,LCHDCG,LCLRCH,
     1           LCIEQP,MXITER,NCOL,NLAY,NSLICE,MBW,IUNIT(11),IOUT)
      IF(IUNIT(20).GT.0) CALL CHD1AL(ISUM,LENX,LCCHDS,NCHDS,MXCHD,
     1          IUNIT(20),IOUT)
C
C5------IF THE "X" ARRAY IS NOT BIG ENOUGH THEN STOP.
      IF(ISUM-1.GT.LENX) STOP
C
C6------READ AND PREPARE INFORMATION FOR ENTIRE SIMULATION.
      CALL BAS1RP(X(LCIBOU),X(LCHNEW),X(LCSTRT),X(LCHOLD),
     1      ISTRT,INBAS,HEADNG,NCOL,NROW,NLAY,NODES,VBVL,X(LCIOFL),
     2      IUNIT(12),IHEDFM,IDDNFM,IHEDUN,IDDNUN,IOUT)
      IF(IUNIT(1).GT.0) CALL BCF1RP(X(LCIBOU),X(LCHNEW),X(LCSC1),
     1          X(LCHY),X(LCCR),X(LCCC),X(LCCV),X(LCDELR),
     2           X(LCDELC),X(LCBOT),X(LCTOP),X(LCSC2),X(LCTRPY),
     3           IUNIT(1),ISS,NCOL,NROW,NLAY,NODES,IOUT)
      IF(IUNIT(9).GT.0) CALL SIP1RP(NPARM,MXITER,ACCL,HCLOSE,X(LCW),
     1          IUNIT(9),IPCALC,IPRSIP,IOUT)
      IF(IUNIT(11).GT.0) CALL SOR1RP(MXITER,ACCL,HCLOSE,IUNIT(11),
     1         IPRSOR,IOUT)
      IF(IUNIT(15).GT.0) CALL BRC1RP
     & (Y(LINDAT),Y(LIZDAT),Y(LIQDAT),Y(LITQMA),Y(LITQMI),Y(LQMAX),
     1 Y(LQMIN),Y(LQSUM),Y(LZQMIN),Y(LZQMAX),Y(LAQMAX),Y(LAQMIN),Y(LA),
     2 Y(LZ),Y(LQ),Y(LZP),Y(LQP),Y(LAP),Y(LBP),Y(LRP),Y(LB),Y(LR),
     3 Y(LBT),Y(LBTP),Y(LXSTAT),Y(LDX),Y(LT),Y(LRN),Y(LWANGL),Y(LGDATU),
     4 Y(LORIEN),Y(LBETVE),Y(LSUMET),Y(LSUMCZ),Y(LSCZQS),Y(LSZQET),
     5 YC(LITYPO),Y(LZA),Y(LAA),Y(LBB),Y(LBS),Y(LIPT),Y(LQA),Y(LTA),
     6 Y(LETA),Y(LFUNET),YC(LBRNAM),Y(LIJF),
     7Y(LIJT),Y(LNSEC),Y(LXSKT),Y(LPLTBC),Y(LPRTXS),Y(LPRTBC),Y(LPRTSU),
     8Y(LPPLTB),YC(LITYPE),Y(LIBJNC),Y(LNDATA),Y(LIZQBV),Y(LISTAT),
     9Y(LKTTDB),Y(LZQ),Y(LDTT),Y(LDATUM),Y(LZQBVC),Y(LZQPMI),
     &YL(LLARBP),YL(LZHIGH),YL(LZLOW),YL(LLINPR),YL(LARBER),Y(LCLK),
     & Y(LZBOT),MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     & MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,Y(LWINDS),Y(LWINDD),
     & Y(LICT),Y(LW),IUNIT(15),IOUT,Y(LISTRM))
C
C7------SIMULATE EACH STRESS PERIOD.
      DO 300 KPER=1,NPER
      KKPER=KPER
      write(*,*) 'stress period no.',kper
C
C7A-----READ STRESS PERIOD TIMING INFORMATION.
      CALL BAS1ST(NSTP,DELT,TSMULT,PERTIM,KKPER,INBAS,IOUT)
C
C7B-----READ AND PREPARE INFORMATION FOR STRESS PERIOD.
      IF(IUNIT(2).GT.0) CALL WEL1RP(X(LCWELL),NWELLS,MXWELL,IUNIT(2),
     1            IOUT)
      IF(IUNIT(3).GT.0) CALL DRN1RP(X(LCDRAI),NDRAIN,MXDRN,IUNIT(3),
     1                IOUT)
      IF(IUNIT(8).GT.0) CALL RCH1RP(NRCHOP,X(LCIRCH),X(LCRECH),
     1           X(LCDELR),X(LCDELC),NROW,NCOL,IUNIT(8),IOUT)
      IF(IUNIT(5).GT.0) CALL EVT1RP(NEVTOP,X(LCIEVT),X(LCEVTR),
     1           X(LCEXDP),X(LCSURF),X(LCDELR),X(LCDELC),NCOL,NROW,
     1           IUNIT(5),IOUT)
      IF(IUNIT(4).GT.0) CALL RIV1RP(X(LCRIVR),NRIVER,MXRIVR,IUNIT(4),
     1           IOUT)
      IF(IUNIT(13).GT.0) CALL STR1RP(X(LCSTRM),X(ICSTRM),NSTREM,
     1                   MXSTRM,IUNIT(13),IOUT,X(LCTBAR),NDIV,NSS,
     1                   NTRIB,X(LCIVAR),ICALC,IPTFLG)
      IF(IUNIT(7).GT.0) CALL GHB1RP(X(LCBNDS),NBOUND,MXBND,IUNIT(7),
```

Table 1. Example listing of a modified main program—Continued

```
     1              IOUT)
      IF(IUNIT(20).GT.0) CALL CHD1RP(X(LCCHDS),NCHDS,MXCHD,X(LCIBOU),
     1          NCOL,NROW,NLAY,PERLEN,DELT,NSTP,TSMULT,IUNIT(20),IOUT)
C
C7C-----SIMULATE EACH TIME STEP.
      DO 200 KSTP=1,NSTP
      KKSTP=KSTP
      write(*,*) '    time step no.',kstp
C
C7C1----CALCULATE TIME STEP LENGTH. SET HOLD=HNEW.
      CALL BAS1AD(DELT,TSMULT,TOTIM,PERTIM,X(LCHNEW),X(LCHOLD),KKSTP,
     1              NCOL,NROW,NLAY)
      IF(IUNIT(20).GT.0) CALL CHD1FM(NCHDS,MXCHD,X(LCCHDS),X(LCIBOU),
     1 X(LCHNEW),X(LCHOLD),PERLEN,PERTIM,DELT,NCOL,NROW,NLAY)
C
C7C2----ITERATIVELY FORMULATE AND SOLVE THE EQUATIONS.
      DO 100 KITER=1,MXITER
      KKITER=KITER
c     write(*,*) '        iteration no.',kiter
C
C7C2A---FORMULATE THE FINITE DIFFERENCE EQUATIONS.
      CALL BAS1FM(X(LCHCOF),X(LCRHS),NODES)
      IF(IUNIT(1).GT.0) CALL BCF1FM(X(LCHCOF),X(LCRHS),X(LCHOLD),
     1          X(LCSC1),X(LCHNEW),X(LCIBOU),X(LCCR),X(LCCC),X(LCCV),
     2          X(LCHY),X(LCTRPY),X(LCBOT),X(LCTOP),X(LCSC2),
     3          X(LCDELR),X(LCDELC),DELT,ISS,KKITER,KKSTP,KKPER,NCOL,
     4          NROW,NLAY,IOUT)
      IF(IUNIT(2).GT.0) CALL WEL1FM(NWELLS,MXWELL,X(LCRHS),X(LCWELL),
     1           X(LCIBOU),NCOL,NROW,NLAY)
      IF(IUNIT(3).GT.0) CALL DRN1FM(NDRAIN,MXDRN,X(LCDRAI),X(LCHNEW),
     1          X(LCHCOF),X(LCRHS),X(LCIBOU),NCOL,NROW,NLAY)
      IF(IUNIT(8).GT.0) CALL RCH1FM(NRCHOP,X(LCIRCH),X(LCRECH),
     1            X(LCRHS),X(LCIBOU),NCOL,NROW,NLAY)
      IF(IUNIT(5).GT.0) CALL EVT1FM(NEVTOP,X(LCIEVT),X(LCEVTR),
     1            X(LCEXDP),X(LCSURF),X(LCRHS),X(LCHCOF),X(LCIBOU),
     1            X(LCHNEW),NCOL,NROW,NLAY)
      IF(IUNIT(4).GT.0) CALL RIV1FM(NRIVER,MXRIVR,X(LCRIVR),X(LCHNEW),
     1            X(LCHCOF),X(LCRHS),X(LCIBOU),NCOL,NROW,NLAY)
      IF(IUNIT(13).GT.0) CALL STR1FM(NSTREM,X(LCSTRM),X(ICSTRM),
     1                                X(LCHNEW),X(LCHCOF),X(LCRHS),
     2               X(LCIBOU),MXSTRM,NCOL,NROW,NLAY,IOUT,NSS,
     3             X(LCTBAR),NTRIB,X(LCTRIB),X(LCIVAR),ICALC,CONST)
      IF(IUNIT(15).GT.0) CALL BRC1FM
     & (Y(LINDAT),Y(LIZDAT),Y(LIQDAT),Y(LITQMA),Y(LITQMI),Y(LQMAX),
     1 Y(LQMIN),Y(LQSUM),Y(LZQMIN),Y(LZQMAX),Y(LAQMAX),Y(LAQMIN),Y(LA),
     2 Y(LZ),Y(LQ),Y(LZP),Y(LQP),Y(LAP),Y(LBP),Y(LRP),Y(LB),Y(LR),
     3 Y(LBT),Y(LBTP),Y(LXSTAT),Y(LDX),Y(LT),Y(LRN),Y(LWANGL),Y(LGDATU),
     4 Y(LORIEN),Y(LBETVE),Y(LSUMET),Y(LSUMCZ),Y(LSCZQS),Y(LSZQET),
     5 YC(LITYPO),Y(LZA),Y(LAA),Y(LBB),Y(LBS),Y(LIPT),Y(LQA),Y(LTA),
     6 Y(LETA),Y(LFUNET),Y(LROW),Y(LAM),Y(LBMX),YC(LBRNAM),Y(LIJF),
     7Y(LIJT),Y(LNSEC),Y(LXSKT),Y(LPLTBC),Y(LPRTXS),Y(LPRTBC),Y(LPRTSU),
     8Y(LPPLTB),YC(LITYPE),Y(LIBJNC),Y(LNDATA),Y(LIZQBV),Y(LISTAT),
     9Y(LKTTDB),Y(LZQ),Y(LDTT),Y(LDATUM),Y(LZQBVC),Y(LZQPMI),
     &YL(LLARBP),YL(LZHIGH),YL(LZLOW),YL(LLINPR),YL(LARBER),Y(LCLK),
     & Y(LZBOT),MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     & MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,Y(LWINDS),Y(LWINDD),
     & Y(LIDX),Y(LICT),Y(LW),Y(LU),Y(LUU),Y(LBU),Y(LBUU),Y(LZSAV),
     & Y(LQSAV),Y(LZPSAV),Y(LQPSAV),NELAP,IOUT,Y(LZPL),Y(LSLKG),
     1                        X(LCHNEW),X(LCHOLD),X(LCHCOF),X(LCRHS),
     2                 X(LCIBOU),NCOL,NROW,NLAY,TFCTR,
```

Table 1. Example listing of a modified main program—Continued

```
     4    ISS,NTSAQ,DELT,TOTIM,IBCONV,HCLOSE,Y(LISTRM),IBEGIN,
     5    Y(LZN),Y(LQLSUM),Y(LITRIA),DCFM,KKSTP)
      IF(IUNIT(7).GT.0) CALL GHB1FM(NBOUND,MXBND,X(LCBNDS),X(LCHCOF),
     1            X(LCRHS),X(LCIBOU),NCOL,NROW,NLAY)
C
C7C2B---MAKE ONE CUT AT AN APPROXIMATE SOLUTION.
      IF(IUNIT(9).GT.0) CALL SIP1AP(X(LCHNEW),X(LCIBOU),X(LCCR),X(LCCC),
     1     X(LCCV),X(LCHCOF),X(LCRHS),X(LCEL),X(LCFL),X(LCGL),X(LCV),
     2     X(LCW),X(LCHDCG),X(LCLRCH),NPARM,KKITER,HCLOSE,ACCL,ICNVG,
     3     KKSTP,KKPER,IPCALC,IPRSIP,MXITER,NSTP,NCOL,NROW,NLAY,NODES,
     4     IOUT)
      IF(IUNIT(11).GT.0) CALL SOR1AP(X(LCHNEW),X(LCIBOU),X(LCCR),
     1     X(LCCC),X(LCCV),X(LCHCOF),X(LCRHS),X(LCA),X(LCRES),X(LCIEQP),
     2     X(LCHDCG),X(LCLRCH),KKITER,HCLOSE,ACCL,ICNVG,KKSTP,KKPER,
     3     IPRSOR,MXITER,NSTP,NCOL,NROW,NLAY,NSLICE,MBW,IOUT)
C
C7C2C---IF CONVERGENCE CRITERION HAS BEEN MET STOP ITERATING.
C             CHECK CONVERGENCE ON STREAM STAGE TOO.
C     IF(ICNVG.EQ.1) GO TO 110
      IF(ICNVG.EQ.1) THEN
C       IF(IUNIT(14).GT.0) THEN
C         IF(ISCONV.EQ.1) GO TO 110
C       ELSE
C         GO TO 110
C       END IF
        IF(IUNIT(15).GT.0) THEN
          IF(IBCONV.EQ.1) GO TO 110
        ELSE
          GO TO 110
        END IF
      END IF
  100 CONTINUE
      KITER=MXITER
  110 CONTINUE
      write(*,*) '       converged at iteration no.',kiter
C
C7C3----DETERMINE WHICH OUTPUT IS NEEDED.
      CALL BAS1OC(NSTP,KKSTP,ICNVG,X(LCIOFL),NLAY,
     1  IBUDFL,ICBCFL,IHDDFL,IUNIT(12),IOUT)
C
C7C4----CALCULATE BUDGET TERMS. SAVE CELL-BY-CELL FLOW TERMS.
      MSUM=1
      IF(IUNIT(1).GT.0) CALL BCF1BD(VBNM,VBVL,MSUM,X(LCHNEW),
     1     X(LCIBOU),X(LCHOLD),X(LCSC1),X(LCCR),X(LCCC),X(LCCV),
     2     X(LCTOP),X(LCSC2),DELT,ISS,NCOL,NROW,NLAY,KKSTP,KKPER,
     3     IBCFCB,ICBCFL,X(LCBUFF),IOUT)
      IF(IUNIT(2).GT.0) CALL WEL1BD(NWELLS,MXWELL,VBNM,VBVL,MSUM,
     1     X(LCWELL),X(LCIBOU),DELT,NCOL,NROW,NLAY,KKSTP,KKPER,IWELCB,
     1     ICBCFL,X(LCBUFF),IOUT)
      IF(IUNIT(3).GT.0) CALL DRN1BD(NDRAIN,MXDRN,VBNM,VBVL,MSUM,
     1     X(LCDRAI),DELT,X(LCHNEW),NCOL,NROW,NLAY,X(LCIBOU),KKSTP,
     2     KKPER,IDRNCB,ICBCFL,X(LCBUFF),IOUT)
      IF(IUNIT(8).GT.0) CALL RCH1BD(NRCHOP,X(LCIRCH),X(LCRECH),
     1     X(LCIBOU),NROW,NCOL,NLAY,DELT,VBVL,VBNM,MSUM,KKSTP,KKPER,
     2     IRCHCB,ICBCFL,X(LCBUFF),IOUT)
      IF(IUNIT(5).GT.0) CALL EVT1BD(NEVTOP,X(LCIEVT),X(LCEVTR),
     1     X(LCEXDP),X(LCSURF),X(LCIBOU),X(LCHNEW),NCOL,NROW,NLAY,
     2     DELT,VBVL,VBNM,MSUM,KKSTP,KKPER,IEVTCB,ICBCFL,X(LCBUFF),IOUT)
      IF(IUNIT(4).GT.0) CALL RIV1BD(NRIVER,MXRIVR,X(LCRIVR),X(LCIBOU),
     1     X(LCHNEW),NCOL,NROW,NLAY,DELT,VBVL,VBNM,MSUM,
```

Table 1. Example listing of a modified main program—Continued

```
     2      KKSTP,KKPER,IRIVCB,ICBCFL,X(LCBUFF),IOUT)
      IF(IUNIT(13).GT.0) CALL STR1BD(NSTREM,X(LCSTRM),X(ICSTRM),
     1          X(LCIBOU),MXSTRM,X(LCHNEW),NCOL,NROW,NLAY,DELT,VBVL,
     2        VBNM,MSUM,KKSTP,KKPER,ISTCB1,ISTCB2,ICBCFL,X(LCBUFF),IOUT,
     3       NTRIB,NSS,X(LCTRIB),X(LCTBAR),X(LCIVAR),ICALC,CONST,IPTFLG)
      IF(IUNIT(15).GT.0) CALL BRC1BD
     & (Y(LINDAT),Y(LIZDAT),Y(LIQDAT),Y(LITQMA),Y(LITQMI),Y(LQMAX),
     1 Y(LQMIN),Y(LQSUM),Y(LZQMIN),Y(LZQMAX),Y(LAQMAX),Y(LAQMIN),Y(LA),
     2 Y(LZ),Y(LQ),Y(LZP),Y(LQP),Y(LAP),Y(LBP),Y(LRP),Y(LB),Y(LR),
     3 Y(LBT),Y(LBTP),Y(LXSTAT),Y(LDX),Y(LT),Y(LRN),Y(LWANGL),Y(LGDATU),
     4 Y(LORIEN),Y(LBETVE),Y(LSUMET),Y(LSUMCZ),Y(LSCZQS),Y(LSZQET),
     5 YC(LITYPO),Y(LZA),Y(LAA),Y(LBB),Y(LBS),Y(LIPT),Y(LQA),Y(LTA),
     6 Y(LETA),Y(LFUNET),Y(LROW),Y(LAM),Y(LBMX),YC(LBRNAM),Y(LIJF),
     7Y(LIJT),Y(LNSEC),Y(LXSKT),Y(LPLTBC),Y(LPRTXS),Y(LPRTBC),Y(LPRTSU),
     8Y(LPPLTB),YC(LITYPE),Y(LIBJNC),Y(LNDATA),Y(LIZQBV),Y(LISTAT),
     9Y(LKTTDB),Y(LZQ),Y(LDTT),Y(LDATUM),Y(LZQBVC),Y(LZQPMI),
     &YL(LLARBP),YL(LZHIGH),YL(LZLOW),YL(LLINPR),YL(LARBER),Y(LCLK),
     & Y(LZBOT),MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     & MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,Y(LWINDS),Y(LWINDD),
     & Y(LIDX),Y(LICT),Y(LW),Y(LU),Y(LUU),Y(LBU),Y(LBUU),Y(LZSAV),
     & Y(LQSAV),Y(LZPSAV),Y(LQPSAV),NELAP,IOUT,Y(LZPL),Y(LSLKG),
     1                       X(LCHNEW),X(LCHOLD),
     2                  X(LCIBOU),NCOL,NROW,NLAY,TFCTR,
     4     NTSAQ,DELT,KKSTP,KKPER,Y(LISTRM),
     1 VBVL,VBNM,MSUM,IMPCB1,ICBCFL,IHDDFL,X(LCBUFF),IPTFL2,
     2 Y(LZN),ISS,Y(LQLSUM),Y(LITRIA),DCFM)
      IF(IUNIT(7).GT.0) CALL GHB1BD(NBOUND,MXBND,VBNM,VBVL,MSUM,
     1      X(LCBNDS),DELT,X(LCHNEW),NCOL,NROW,NLAY,X(LCIBOU),KKSTP,
     2      KKPER,IGHBCB,ICBCFL,X(LCBUFF),IOUT)
C
C7C5---PRINT AND OR SAVE HEADS AND DRAWDOWNS. PRINT OVERALL BUDGET.
      CALL BAS1OT(X(LCHNEW),X(LCSTRT),ISTRT,X(LCBUFF),X(LCIOFL),
     1         MSUM,X(LCIBOU),VBNM,VBVL,KKSTP,KKPER,DELT,
     2         PERTIM,TOTIM,ITMUNI,NCOL,NROW,NLAY,ICNVG,
     3      IHDDFL,IBUDFL,IHEDFM,IHEDUN,IDDNFM,IDDNUN,IOUT)
C
C7C6----IF ITERATION FAILED TO CONVERGE THEN STOP.
      IF(ICNVG.EQ.0) STOP
  200 CONTINUE
  300 CONTINUE
C
C8------END PROGRAM
      STOP
C
      END
```

```
9 Y(LKTTDB),Y(LZQ),Y(LDTT),Y(LDATUM),
  Y(LZQBVC),Y(LZQPMI),
1 YL(LLARBP),YL(LZHIGH),YL(LZLOW),YL
  (LLINPR),YL(LARBER),Y(LCLK),
2 Y(LZBOT),MXBH,MXJN,MAXS,MXPT,MXT-
  DBC,MXMD,MAXZBD,
3 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,
  MAXBD,MXOTDT,Y(LWINDS),Y(LWINDD),
4 Y(LIDX),Y(LICT),Y(LW),Y(LU),Y(LUU),
  Y(LBU),Y(LBUU),Y(LZSAV),
5 Y(LQSAV),Y(LZPSAV),Y(LQPSAV),NELAP,
  IOUT,Y(LZPL),Y(LSLKG),
6 X(LCHNEW),X(LCHOLD),X(LCHCOF),X(LC-
  RHS),
7 X(LCIBOU),NCOL,NROW,NLAY,TFCTR,
8 ISS,NTSAQ,DELT,TOTIM,IBCONV,HCLOSE,
  Y(LISTRM),IBEGIN,
9 Y(LZN),Y(LQLSUM),Y(LITRIA),DCFM,KKS-
  TP)
```

Between comments C7C4 and C7C5 is added:

```
  IF(IUNIT (??).GT.0) CALL BRC1BD
& (Y(LINDAT),Y(LIZDAT),Y(LIQDAT),Y(LITQ-
  MA),Y(LITQMI),Y(LQMAX),
1 Y(LQMIN),Y(LQSUM),Y(LZQMIN),Y(LZQ-
  MAX),Y(LAQMAX),Y(LAQMIN),Y(L A),
2 Y(LZ),Y(LQ),Y(LZP),Y(LQP),Y(LAP),Y(LBP),
  Y(LRP),Y(LB),Y(LR),
3 Y(LBT),Y(LBTP),Y(LXSTAT),Y(LDX),Y(LT),
  Y(LRN),Y(LWANGL),Y(LGDA TU),
4 Y(LORIEN),Y(LBETVE),Y(LSUMET),Y(LSU-
  MCZ),Y(LSCZQS),Y(LSZQET),
5 YC(LITYPO),Y(LZA),Y(LAA),Y(LBB),Y(LBS),
  Y(LIPT),Y(LQA),Y(LTA),
6 Y(LETA),Y(LFUNET),Y(LROW),Y(LAM),Y
  (LBMX),YC(LBRNAM),Y(LIJF),
7 Y(LIJT),Y(LNSEC),Y(LXSKT),Y(LPLTBC),
  Y(LPRTXS),Y(LPRTBC),Y(LPR TSU),
8 Y(LPPLTB),YC(LITYPE),Y(LIBJNC),Y(LN-
  DATA),Y(LIZQBV),Y(LISTAT),
9 Y(LKTTDB),Y(LZQ),Y(LDTT),Y(LDATUM),
  Y(LZQBVC),Y(LZQPMI),
1 YL(LLARBP),YL(LZHIGH),YL(LZLOW),YLL-
  LINPR),YL(LARBER),Y(LCLK),
2 Y(LZBOT),MXBH,MXJN,MAXS,MXPT,MXT-
  DBC,MXMD,MAXZBD,
3 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,
  MAXBD,MXOTDT,Y(LWINDS),Y(LWINDD),
4 Y(LIDX),Y(LICT),Y(LW),Y(LU),Y(LUU),
  Y(LBU),Y(LBUU),Y(LZSAV),
5 Y(LQSAV),Y(LZPSAV),Y(LQPSAV),NELAP,
  IOUT,Y(LZPL),Y(LSLKG),
6 X(LCHNEW),X(LCHOLD),
7 X(LCIBOU),NCOL,NROW,NLAY,TFCTR,
8 NTSAQ,DELT,KKSTP,KKPER,Y(LISTRM),
9 VBVL,VBNM,MSUM,IMPCB1,ICBCFL,IHD-
  DFL,X(LCBUFF),IPTFL2,
1 Y(LZN),ISS,Y(LQLSUM),Y(LITRIA),DCFM)
```

The user must specify a number between 13 and 24 for IUNIT(??), which is defined in the basic package (McDonald and Harbaugh, 1988, p. 4–9 to 4–12). In the example main program list, IUNIT(15) is used.

DATA ENTRY

The format for entering data into MODFLOW and BRANCH' when coupled by MODBRANCH is nearly the same as using each model separately. The original input instructions were described by McDonald and Harbaugh (1988) and Schaffranek and others (1981). Modifications to these original formats are described below.

Modifications in MODFLOW Data Input—The only difference in MODFLOW input is the instruction to use the MODBRANCH code. This occurs in the input to the basic package. Element 15 in the IUNIT array specifies the FORTRAN unit number of the input data file for MODBRANCH. If IUNIT(15) is set to zero, MODBRANCH is not used.

Modifications in BRANCH' Data Input—Although most of the input data for BRANCH' are the same, there are several added items. At the beginning of the BRANCH' data set, two records are added containing input data for the BRC1AL routine. The records are

Data –	MXBH	NSEC	MAXS	MXTDBC	MAXZBD	MAXCZQ	MXWIND
Format –	I10	I10	I10	I10	I10	I10	I10
Data –	MXJN	NSEG	MXPT	MXMD	MAXQBD	MAXMZQ	DCFM
Format –	I10	I10	I10	I10	I10	I10	F10 3

The record variables are

MXBH	- Maximum number of branches in the network.
NSEC	- Maximum cross sections per branch.
MAXS	- Maximum number of cross sections in the entire channel network.
MXTDBC	- Maximum number of boundaries in the network.
MAXZBD	- Maximum number of stage boundary value data held in storage for computation.
MAXCZQ	- Maximum number of daily computed results held in storage for plotting purposes.
MXWIND	- Maximum number of wind data points input.
MXJN	- Maximum number of junctions in the network.
NSEG	- Maximum segments per branch.
MXPT	- Maximum number of points used to define a cross section.
MXMD	- Maximum number of measured data locations accommodated in the network.
MAXQBD	- Maximum number of discharge boundary value data held in storage for computation.
MAXMZQ	- Maximum number of measured data held in storage for plotting purposes.

DCFM - Maximum value of the multiplier for the friction term in the momentum equation when the channel is dry.

All of these variables, except for DCFM, are BRANCH array dimensions described by Schaffranek and others (1981). DCFM is described previously in this text.

Another modification to the BRANCH' input data occurs in the second initial condition record for cross section (Schaffranek and others, 1981). The new input format is

Data -	ORIENT (MAXS)	BETVEL (MAXS)	ISTRM (1, MAXS)	ISTRM (2, MAXS),
Format -	F10.3	F10.3	I10	I10
Data -	ISTRM (3, MAXS)	CLK (MAXS)	ZBOT (MAXS)	
Format -	I10	F10.4	F10.4	

The new variables added to these records are

ISTRM (1, MAXS) - Layer number of aquifer model cell containing river reach.

ISTRM (2, MAXS) - Row number of aquifer model cell containing river reach.

ISTRM (3, MAXS) - Column number of aquifer model cell containing river reach.

CLK (MAXS) - Leakage coefficient for reach.

ZBOT (MAXS) - Elevation of riverbed.

To accommodate the additional cross-section data points added by the program to account for drying, the maximum number of cross-sectional data points per cross section (MXPT) should be set at least four more than the actual number of points input by the user.

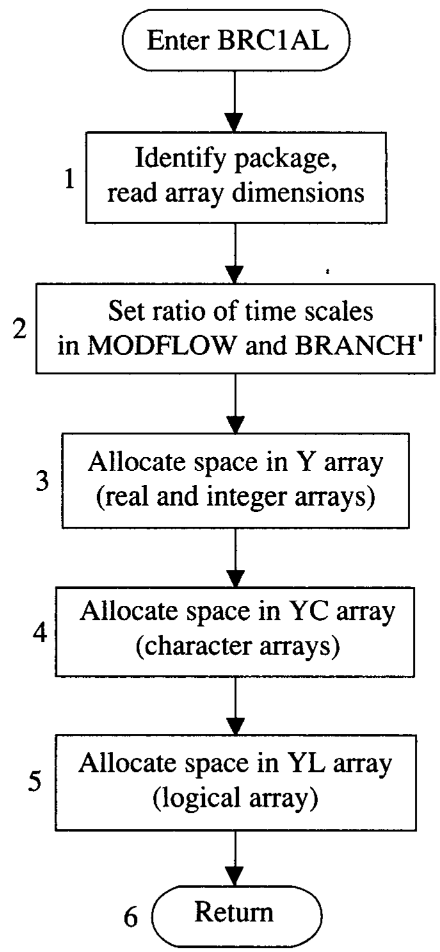

Figure 6. Flowchart of allocation module (BRC1AL).

MODULE BRC1AL

This module allocates space in three large arrays in the main program of MODFLOW for storing the arrays used in BRANCH'. The numbered sections in the narrative correspond to the numbered steps in the flowchart for BRC1AL shown in figure 6.

NARRATIVE

1. Print a message identifying the package. The array dimensions MXBH, NSEC, MAXS, MXTDBC, MAXZBD, MAXCZQ, MXWIND, MXJN, NSEG, MXPT, MXMD, MAXQBD, and MAXMZQ are entered along with a DCFM value. The multiplier DCFM is the factor by which the friction term in the momentum equation is multiplied when the channel is dry. The data entry format is described in the data entry section. The definition of the array dimensions can be found in the report by Schaffranek and others (1981) and in the data entry section.
2. Set the ratio of time scales in MODFLOW and BRANCH'. Although BRANCH' always works in seconds, MODFLOW can work in seconds, minutes, hours, days, and years, or the time units can be undefined. This option, defined as the variable ITMUNI (McDonald and Harbaugh, 1988), is used to calculate the ratio of the time units in the models, the variable TFCTR. An error message is printed if the undefined option is selected in MODFLOW.
3. Allocate space in the Y array. All BRANCH' arrays that contain real or integer numbers are stored in the Y array, with positions and space allocated by this routine.
4. Allocate space in the YC array. All BRANCH' arrays that contain character variables are allocated positions and space in the YC array.
5. Allocate space in the YL array. All BRANCH' arrays that contain logical variables are allocated positions and space in the YL array.
6. Return to MODFLOW.

PROGRAM LISTING FOR MODULE BRC1AL

```
      SUBROUTINE BRC1AL
     & (LENY,LENYC,LENYL,LINDAT,LIZDAT,LIQDAT,LITQMA,LITQMI,
     1 LQMAX,LQMIN,LQSUM,LZQMIN,LZQMAX,LAQMAX,LAQMIN,LA,LZ,LQ,LZP,LQP,
     2 LAP,LBP,LRP,LB,LR,LBT,LBTP,LXSTAT,LDX,LT,LRN,LWANGL,LGDATU,LORIEN
     3 ,LBETVE,LSUMET,LSUMCZ,LSCZQS,LSZQET,LITYPO,LZA,LAA,LBB,LBS,LIPT,
     4 LQA,LTA,LETA,LFUNET,LROW,LAM,LBMX,LBRNAM,LIJF,LIJT,LNSEC,LXSKT,
     5 LPLTBC,LPRTXS,LPRTBC,LPRTSU,LPPLTB,LITYPE,LIBJNC,LNDATA,LIZQBV,
     6 LISTAT,LKTTDB,LZQ,LDTT,LDATUM,LZQBVC,LZQPMI,LLARBP,LZHIGH,
     7 LZLOW,LLINPR,LARBER,LCLK,LZBOT,MXBH,NSEC,MAXS,MXTDBC,
     8 MAXZBD,MAXCZQ,MXWIND,MXJN,NSEG,MXPT,MXMD,MAXQBD,MAXMZQ,ITMUNI,
     9 LWINDS,LWINDD,LIDX,LICT,LW,LU,LUU,LBU,LBUU,LZSAV,LQSAV,LZPSAV,
     & LQPSAV,IN,IOUT,TFCTR,LISTRM,LZPL,LSLKG,IBEGIN,LZN,LQLSUM,NELAP,
     & LITRIA,DCFM)
C                                                                      C
C-----VERSION    1  1JUL1991 BRC1AL                                    C
C     *****************************************************************C
C     ALLOCATE ARRAY STORAGE FOR BRANCH                                C
C     *****************************************************************C
C     **************************************************************
C     * THIS SUBROUTINE ALLOCATES SPACE IN THE THREE MAIN ARRAYS IN *
C     * BRANCH. THE ARRAY Y CONTAINS REAL AND INTEGER VECTORS, THE  *
C     * ARRAY YC CONTAINS CHARACTER VECTORS, AND THE ARRAY YL CON-  *
C     * TAINS LOGICAL VECTORS.                                      *
C     **************************************************************
C                                                                      C
C     SPECIFICATIONS:                                                  C
C     -----------------------------------------------------------------C
C     -----------------------------------------------------------------C
C                                                                      C
C1------IDENTIFY PACKAGE AND INITIALIZE DIMENSIONS                     C
      IBEGIN=0
      NELAP=1
      WRITE(IOUT,1) IN
C       WRITE(*,*) 'DOWN TO BRC1AL'
    1 FORMAT(1H0,' BRANCH UNSTEADY FLOW MODEL, 7/30/90',
     1'INPUT READ FROM UNIT',I3)
      READ (IN,1000) MXBH,NSEC,MAXS,MXTDBC,MAXZBD,MAXCZQ,MXWIND
      READ (IN,1010) MXJN,NSEG,MXPT,MXMD,MAXQBD,MAXMZQ,DCFM
C
C2 -----SET RATIO OF TIMESCALES IN MODFLOW AND BRANCH = TFCTR, BASED
C       ON THE VALUE OF ITMUNI
C
      TFCTR=0.0
      IF (ITMUNI.EQ.1) TFCTR=1.0
      IF (ITMUNI.EQ.2) TFCTR=60.0
      IF (ITMUNI.EQ.3) TFCTR=3600.0
      IF (ITMUNI.EQ.4) TFCTR=86400.0
      IF (ITMUNI.EQ.5) TFCTR=31536000.0
      IF (TFCTR.EQ.0.0) THEN
      WRITE(*,*) ' PROGRAM ABORTED, PROPER VALUE OF ITMUNI TO
     1 CALCULATE TIMESCALE RATIOS NOT SET'
      STOP
      ENDIF
C
C3 ------ALLOCATE SPACE IN Y ARRAY
C
      ISUM=1
      LINDAT=ISUM
      ISUM=ISUM+MAXQBD
      LIZDAT=ISUM
```

Program listing—Continued

```
ISUM=ISUM+MAXZBD
LIQDAT=ISUM
ISUM=ISUM+MAXQBD
LITQMA=ISUM
ISUM=ISUM+MAXS
LITQMI=ISUM
ISUM=ISUM+MAXS
LQMAX=ISUM
ISUM=ISUM+MAXS
LQMIN=ISUM
ISUM=ISUM+MAXS
LQSUM=ISUM
ISUM=ISUM+MAXS
LZQMIN=ISUM
ISUM=ISUM+MAXS
LZQMAX=ISUM
ISUM=ISUM+MAXS
LAQMAX=ISUM
ISUM=ISUM+MAXS
LAQMIN=ISUM
ISUM=ISUM+MAXS
LA=ISUM
ISUM=ISUM+MAXS
LZ=ISUM
ISUM=ISUM+MAXS
LQ=ISUM
ISUM=ISUM+MAXS
LZP=ISUM
ISUM=ISUM+MAXS
LQP=ISUM
ISUM=ISUM+MAXS
LAP=ISUM
ISUM=ISUM+MAXS
LBP=ISUM
ISUM=ISUM+MAXS
LRP=ISUM
ISUM=ISUM+MAXS
LB=ISUM
ISUM=ISUM+MAXS
LR=ISUM
ISUM=ISUM+MAXS
LBT=ISUM
ISUM=ISUM+MAXS
LBTP=ISUM
ISUM=ISUM+MAXS
LXSTAT=ISUM
ISUM=ISUM+MAXS
LDX=ISUM
ISUM=ISUM+MAXS
LT=ISUM
ISUM=ISUM+MAXS
LRN=ISUM
ISUM=ISUM+MAXS*4
LWANGL=ISUM
ISUM=ISUM+MAXS
LGDATU=ISUM
ISUM=ISUM+MAXS
LORIEN=ISUM
ISUM=ISUM+MAXS
LBETVE=ISUM
```

Program listing—Continued

```
ISUM=ISUM+MAXS
LSUMET=ISUM
ISUM=ISUM+MAXS
LSUMCZ=ISUM
ISUM=ISUM+MAXS
LSCZQS=ISUM
ISUM=ISUM+MAXS
LSZQET=ISUM
ISUM=ISUM+MAXS
LZA=ISUM
ISUM=ISUM+MXPT*MAXS
LAA=ISUM
ISUM=ISUM+MXPT*MAXS
LBB=ISUM
ISUM=ISUM+MXPT*MAXS
LBS=ISUM
ISUM=ISUM+MXPT*MAXS
LIPT=ISUM
ISUM=ISUM+MAXS
LQA=ISUM
ISUM=ISUM+MXPT*MAXS
LTA=ISUM
ISUM=ISUM+MXPT*MAXS
LETA=ISUM
ISUM=ISUM+MXPT*MAXS
LFUNET=ISUM
ISUM=ISUM+MXPT*MAXS
LROW=ISUM
ISUM=ISUM+MXBH*4
LAM=ISUM
ISUM=ISUM+((MXBH*4)**2)
LBMX=ISUM
ISUM=ISUM+MXBH*4
LIJF=ISUM
ISUM=ISUM+MXBH
LIJT=ISUM
ISUM=ISUM+MXBH
LNSEC=ISUM
ISUM=ISUM+MXBH
LXSKT=ISUM
ISUM=ISUM+MXBH
LPLTBC=ISUM
ISUM=ISUM+MXBH
LPRTXS=ISUM
ISUM=ISUM+MXBH
LPRTBC=ISUM
ISUM=ISUM+MXBH
LPRTSU=ISUM
ISUM=ISUM+MXBH
LPPLTB=ISUM
ISUM=ISUM+MXBH
LIBJNC=ISUM
ISUM=ISUM+MXJN
LNDATA=ISUM
ISUM=ISUM+MXJN
LIZQBV=ISUM
ISUM=ISUM+MXJN
LISTAT=ISUM
ISUM=ISUM+MXJN
LKTTDB=ISUM
```

Program listing—Continued

```
      ISUM=ISUM+1
      LZQ=ISUM
      ISUM=ISUM+MAXZBD*MXTDBC
      LDTT=ISUM
      ISUM=ISUM+MXJN
      LDATUM=ISUM
      ISUM=ISUM+MXJN
      LZQBVC=ISUM
      ISUM=ISUM+MXJN*4
      LZQPMI=ISUM
      ISUM=ISUM+MXJN
      LCLK=ISUM
      ISUM=ISUM+MAXS
      LZBOT=ISUM
      ISUM=ISUM+MAXS
      LWINDS=ISUM
      ISUM=ISUM+MXWIND
      LWINDD=ISUM
      ISUM=ISUM+MXWIND
      LIDX=ISUM
      ISUM=ISUM+MXJN*MXBH
      LICT=ISUM
      ISUM=ISUM+MXJN
      LW=ISUM
      ISUM=ISUM+MXJN
      LU=ISUM
      ISUM=ISUM+2*MAXS
      LUU=ISUM
      ISUM=ISUM+4*MAXS
      LBU=ISUM
      ISUM=ISUM+2*MXBH
      LBUU=ISUM
      ISUM=ISUM+4*MXBH
      LZSAV=ISUM
      ISUM=ISUM+MAXS
      LQSAV=ISUM
      ISUM=ISUM+MAXS
      LZPSAV=ISUM
      ISUM=ISUM+MAXS
      LQPSAV=ISUM
      ISUM=ISUM+MAXS
      LISTRM=ISUM
      ISUM=ISUM+3*MAXS
      LZPL=ISUM
      ISUM=ISUM+MAXS
      LSLKG=ISUM
      ISUM=ISUM+MAXS
      LZN=ISUM
      ISUM=ISUM+MAXS
      LQLSUM=ISUM
      ISUM=ISUM+MAXS+MXJN
      LITRIA=ISUM
      ISUM=ISUM+MAXS*MAXCZQ
C                                                                       C
C3A ----PRINT AMOUNT OF SPACE USED BY THE Y VECTOR FOR BRANCH.          C
      ISUM1=ISUM-1
      WRITE(IOUT,9)ISUM1,LENY
    9 FORMAT(1X,I8,' ELEMENTS OF Y ARRAY USED OUT OF',I7)
      IF(ISUM1.GT.LENY) WRITE(IOUT,10)
   10 FORMAT(1X,'    ***Y ARRAY MUST BE DIMENSIONED LARGER***')
```

Program listing—Continued

```
C
C4 -----ALLOCATE SPACE IN YC ARRAY
C
      ISUM=1
      LITYPO=ISUM
      ISUM=ISUM+MAXS*4
      LBRNAM=ISUM
      ISUM=ISUM+MXBH*10
      LITYPE=ISUM
      ISUM=ISUM+MXJN
C                                                                       C
C4A ----PRINT AMOUNT OF SPACE USED BY THE YC VECTOR FOR BRANCH.          C
      ISUM1=ISUM-1
      WRITE(IOUT,19)ISUM1,LENYC
   19 FORMAT(1X,I8,' ELEMENTS OF YC ARRAY USED OUT OF',I7)
      IF(ISUM1.GT.LENYC) WRITE(IOUT,20)
   20 FORMAT(1X,'    ***YC ARRAY MUST BE DIMENSIONED LARGER***')
C
C5 -----ALLOCATE SPACE IN YL ARRAY
C
      ISUM=1
      LLARBP=ISUM
      ISUM=ISUM+MAXS
      LZHIGH=ISUM
      ISUM=ISUM+MAXS
      LZLOW=ISUM
      ISUM=ISUM+MAXS
      LLINPR=ISUM
      ISUM=ISUM+MAXS
      LARBER=ISUM
      ISUM=ISUM+1
C                                                                       C
C5A ----PRINT AMOUNT OF SPACE USED BY THE YL VECTOR FOR BRANCH.          C
      ISUM1=ISUM-1
      WRITE(IOUT,29)ISUM1,LENYL
   29 FORMAT(1X,I8,' ELEMENTS OF YL ARRAY USED OUT OF',I7)
      IF(ISUM1.GT.LENYL) WRITE(IOUT,30)
   30 FORMAT(1X,'    ***YL ARRAY MUST BE DIMENSIONED LARGER***')
      RETURN
 1000 FORMAT(7I10)
 1010 FORMAT(6I10,1F10.3)
      END
```

LIST OF VARIABLES

Variable	Range	Definition
DCFM	Package	Multiplier for the friction term in the momentum equation when the channel runs dry.
IBEGIN	Package	Flag indicating if BRANCH' is being called for the first time (0, first time; 1, not first time).
IN	Package	Primary unit number for all printed output.
IOUT	Global	Primary unit number for all printed output.
ISUM	Module	Index number of lowest element in Y, YC, or YL array that has not yet been allocated.
ISUM1	Module	ISUM minus 1.
ITMUNI	Global	Time units used by MODFLOW (0, undefined; 1, seconds; 2, minutes; 3, hours; 4, days; and 5, years).
L??	Package	Location in the Y, YC, or YL array of the first element of BRANCH variable ??.
MAXCZQ	Package	Maximum number of daily computed results held in storage for plotting purposes.
MAXMZQ	Package	Maximum number of measured data held in storage for plotting purposes.
MAXQBD	Package	Maximum number of discharge boundary value data held in storage for computation.
MAXS	Package	Maximum number of cross sections in the entire channel network.
MAXZBD	Package	Maximum number of stage boundary value data held in storage for computation.
MXBH	Package	Maximum number of branches in the network.
MXJN	Package	Maximum number of junctions in the network.
MXMD	Package	Maximum number of measured data locations accommodated in the network.
MXPT	Package	Maximum number of points used to define a cross section.
MXTDBC	Package	Maximum number of boundaries in the network.
MXWIND	Package	Maximum number of wind data points input.
NELAP	Package	Number of elapsed MODFLOW time steps since beginning of simulation.
NSEC	Package	Maximum cross sections per branch.
NSEG	Package	Maximum segments per branch.
TFCTR	Package	Number of time steps in one time unit in MODFLOW.

MODULE BRC1RP

This module consists of the first five sections of the original BRANCH program, which handle the reading of data used in BRANCH' and is called only once at the beginning of the simulation. The numbered sections in the narrative correspond to the numbered steps in the flowchart for BRC1RP in figure 7. The flowchart is divided with the original code to the left of the dotted line and the modifications made to interface with MODFLOW placed to the right of the dotted line. The modifications are signified with a number and letter (the original code just by number).

NARRATIVE

1. Read program control parameters and assign defaults. This is done by calling the BRANCH subroutine RDCOMP, which reads basic information such as name of network; unit; number of branches, junctions, and boundaries; time-interval lengths; convergence criterion; plot and print options; weighting factors; and wind-drag information. Details are given by Schaffranek and others (1981). Default values are assigned where values are not given.
2. Read branch identification, initial values, and geometry data. This is done by calling the BRANCH subroutine BRICXS. BRICXS reads information for each branch such as inlet and outlet junctions, number of cross sections, branch name, initial conditions, length of segments, water temperature, wind direction, momentum coefficient, and cross-sectional geometry data. Details on input structures are given by Schaffranek and others (1981).

2a. Read aquifer location, riverbed elevation, and leakage coefficient. This addition to the BRICXS subroutine reads the layer, row, and column of the aquifer model cell that contains the river segment. This is followed by the leakage coefficient K'/b', defined by the FORTRAN variable CLK (segment number) and the riverbed elevation Z_{BOT}, defined by the FORTRAN variable ZBOT (cross-section number). The format is described in the data entry section.

2b. Extrapolate cross-sectional geometry. The channel can run dry if cross-sectional geometry is defined in the hypothetical zone below the river bottom. Thus, three additional cross-sectional geometry points are added below the true riverbed to define geometry to a distance below the river-bed equal to the distance from the highest defined cross-sectional geometry point down to the riverbed. The same topwidth is maintained in this extrapolated zone as was used for the lowest entered data point, and the cross-sectional area is reduced to 31 percent of the lowest entered data point. Although this geometry below the riverbed could carry substantial flow, the DCFM factor described previously increases

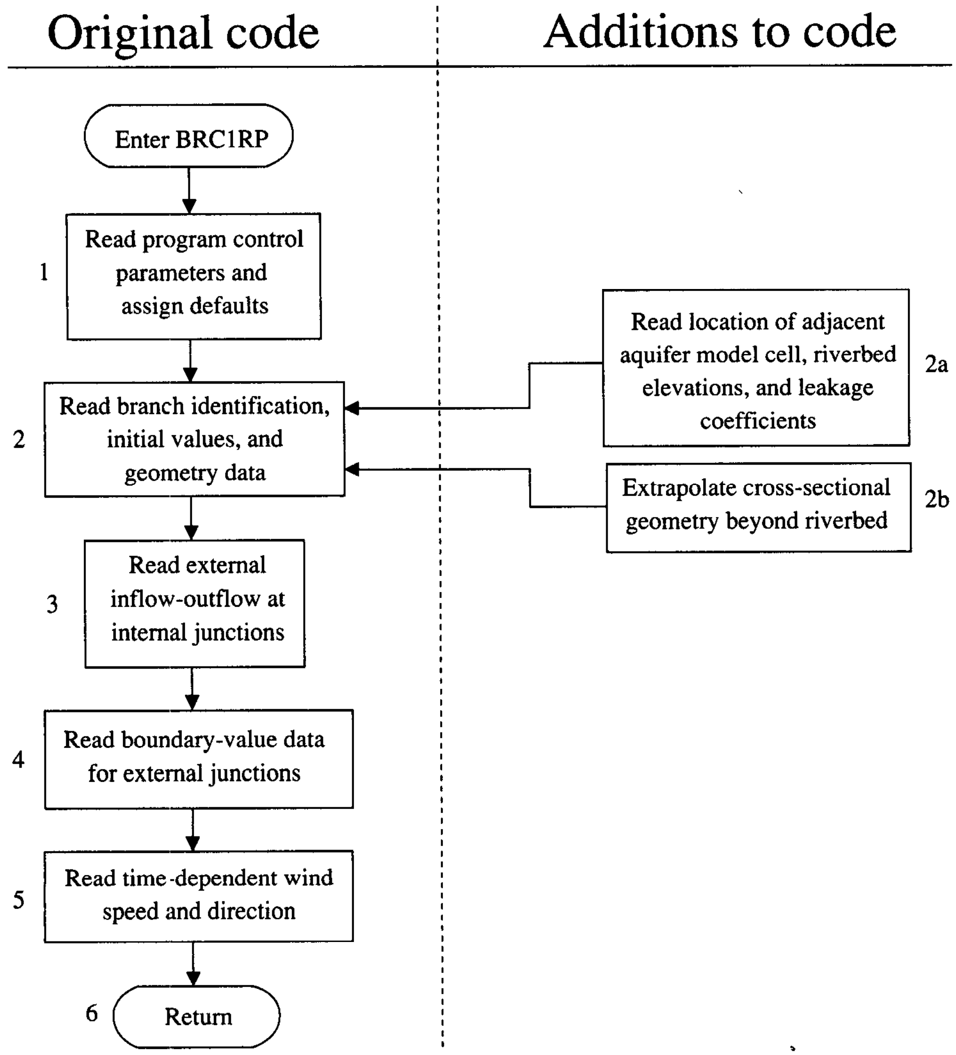

Figure 7. Flowchart of data entry module (BRC1RP).

the resistance in this zone to create flows low enough to approximate a dry condition.

3. Read junction inflows and outflows. External outflows (or inflows) at an internal junction are read according to Schaffranek and others (1981).
4. Read boundary-value data for external junctions. The BRANCH subroutine BVDINP is called to read the type of boundary data, location of boundary, time scale of boundary data, datum corrections, and boundary data points according to Schaffranek and others (1981).
5. Read wind speed and direction. The wind velocities and directions are input the same as the boundary value data (Schaffranek and others, 1981).
6. Return to MODFLOW.

PROGRAM LISTING FOR MODULE BRC1RP

```
      SUBROUTINE BRC1RP(INDATA,IZDATA,IQDATA,ITQMAX,ITQMIN,
     1 QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,A,Z,Q,ZP,QP,
     2 AP,BP,RP,B,R,BT,BTP,XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT
     3 ,BETVEL,SUMETA,SUMCZQ,SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     4 QA,TA,ETA,FUNETA,BRNAME,IJF,IJT,NSEC,XSKT,
     5 PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ITYPE,IBJNC,NDATA,IZQBVE,
     6 ISTATN,KTTDBC,ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,LARBPR,ZHIGH,
     7 ZLOW,LINPRT,ARBERR,CLK,ZBOT,
     8 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     9 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,WINDSP,WINDDR,
     & ICT,W,IN,IOUT,ISTRM)
C                                                                    C
C-----VERSION   1 1APR1991  BRC1RP                                   C
C     ***********************************************************
C     * READ INPUT DATA FOR BRANCH PROGRAM AND MODFLOW INTERFACE   *
C     ***********************************************************
C BEGIN COMMON_COMCON ===============================================
C
      CHARACTER*2 IUNIT,OUNIT
      INTEGER*4 NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,IPLOPT,IPLDEV,
     1 IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,IRDIC,NUMCOM,INWIND,
     2 TYPETA,OTTDDB,ISMOPT,NTDIOF,IRDNXT,IARDEM
      REAL THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,H2ODEN,CHI,QZCONV,
     1 ZDATUM,DT,G,AIRDEN,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
      COMMON /COMCON/ NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,
     1 IPLOPT,IPLDEV,IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,
     2 IRDIC,NUMCOM,INWIND,THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,
     3 H2ODEN,CHI,ZDATUM,IUNIT,OUNIT,TYPETA,OTTDDB,ISMOPT,G,QZCONV,DT,
     4 AIRDEN,IARDEM,NTDIOF,IRDNXT,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
C
C  END  COMMON_COMCON ===============================================
C BEGIN  COMMON_DTYPES ==============================================
C
      CHARACTER*2 DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
      COMMON /DTYPES/ DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
C
C  END   COMMON_DTYPES ==============================================
C BEGIN COMMON_UNITS ================================================
C
      CHARACTER*2 IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
      COMMON /UNITS/ IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
C
C  END  COMMON_UNITS ================================================
C BEGIN COMMON_LUNUMS ===============================================
C
      INTEGER*4 READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,LUIVOL,
     1        LUGEOM,LUINIT,LUCVOL
      COMMON /LUNUMS/ READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,
     1 LUIVOL,LUGEOM,LUINIT,LUCVOL
C
C  END  COMMON_LUNUMS ===============================================
C BEGIN COMMON_DADCOM ===============================================
C
      INTEGER*2 LISTB,LISTA,STRIP,RTCODE
      COMMON /DADCOM/ LISTB,LISTA,STRIP,RTCODE
C
C  END  COMMON_DADCOM ===============================================
C BEGIN COMMON_DAYPMO ===============================================
C
      INTEGER*2 DPERM(12)
```

Program listing—Continued

```
      COMMON /DAYPMO/ DPERM
C
C   END  COMMON_DAYPMO =================================================
C BEGIN COMMON_LOGICS =================================================
C
      LOGICAL*4 PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
      COMMON /LOGICS/ PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
C
C   END  COMMON_LOGICS =================================================
C BEGIN COMMON_BCTIME =================================================
C
      INTEGER*4 IETIME,NETIME
      INTEGER *2 IRDPDY,IYR,IMO,IDA,IHR,IMN,NYR,NMO,NDA,NHR,NMN
      COMMON /BCTIME/ IETIME,NETIME,IRDPDY,IYR,IMO,IDA,IHR,IMN,
     1                                     NYR,NMO,NDA,NHR,NMN
C
C   END  COMMON_BCTIME =================================================
C BEGIN COMMON_DATIME =================================================
C
      INTEGER*4 KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
      COMMON /DATIME/ KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
C
C   END  COMMON_DATIME =================================================
C BEGIN COMMON_NETWRK =================================================
C
      CHARACTER*80 NETNAM
      COMMON /NETWRK/ NETNAM
C
C   END  COMMON_NETWRK =================================================
C BEGIN COMMON_MODBRCH ================================================
C
      COMMON /MODBRCH/ TWOCSQ,IDTPDY,TWOG,CW,II,ONECHI,DCHI,DTHETA,
     1                 IBCH,IJZPBC,IJQPBC,DCFM1,KKITER
C
C   END  COMMON_MODBRCH ================================================
      INTEGER*4 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT
      INTEGER*4 ITQMAX(MAXS), ITQMIN(MAXS),ISTRM(3,MAXS)
      REAL QMAX(MAXS), QMIN(MAXS), QSUM(MAXS), ZQMIN(MAXS), ZQMAX(MAXS),
     1     AQMAX(MAXS), AQMIN(MAXS)
      REAL A(MAXS),Z(MAXS),Q(MAXS),ZP(MAXS),QP(MAXS),AP(MAXS),
     1 BP(MAXS),RP(MAXS),B(MAXS),R(MAXS),BT(MAXS),BTP(MAXS)
      INTEGER*4 XSTATN(MAXS)
      REAL DX(MAXS), T(MAXS), RN(4,MAXS), WANGLE(MAXS), GDATUM(MAXS),
     1 ORIENT(MAXS), BETVEL(MAXS), SUMETA(MAXS), SUMCZQ(MAXS),
     2 SCZQSQ(MAXS),SZQETA(MAXS)
      CHARACTER*4 ITYPEO(4,MAXS)
      INTEGER*4 IPT(MAXS)
      REAL ZA(MXPT,MAXS), AA(MXPT,MAXS), BB(MXPT,MAXS), BS(MXPT,MAXS)
      REAL QA(MXPT,MAXS), TA(MXPT,MAXS), ETA(MXPT,MAXS),
     1 FUNETA(MXPT,MAXS)
      CHARACTER*40 BRNAME(MXBH)
      INTEGER*4 IJF(MXBH),IJT(MXBH),NSEC(MXBH),XSKT(MXBH),
     1 PLTBCH(MXBH),PRTXSG(MXBH),PRTBCH(MXBH),PRTSUM(MXBH),PPLTBH(MXBH)
      CHARACTER*4 ITYPE(MXJN)
      INTEGER*4 IBJNC(MXJN),NDATA(MXJN),IZQBVE(MXJN)
      INTEGER*4 ISTATN(MXJN),KTTDBC
      REAL ZQ(MAXZBD,MXTDBC),DTT(MXJN),DATUM(MXJN),ZQBVCO(4,MXJN),
```

Program listing—Continued

```
     1 ZQPMIN(MXJN)
      LOGICAL*4 LARBPR(MAXS),ZHIGH(MAXS),ZLOW(MAXS),LINPRT(MAXS),ARBERR
      INTEGER*4 IZDATA(MAXZBD)
      INTEGER*4 IQDATA(MAXQBD),INDATA(MAXQBD)
C     EQUIVALENCE (INDATA(1),IQDATA(1),IZDATA(1))
      REAL CLK(MAXS),ZBOT(MAXS)
      REAL WINDSP( MXWIND),WINDDR( MXWIND)
      INTEGER*4 ICT(MXJN)
      REAL W(MXJN)
      REAL*8 C1, C2, C3, C4, UUIJP1, UUIJP2, UUIJP3, UUIJP4
      REAL LAMBDA,MU,SETA,WDTT,TWOCSQ,TWOG,CW,ONECHI,DCHI,DTHETA,TH,WIND
      INTEGER*4 IAR,I,J,K,L,II,IJ,NS,KT,IS,N,NWREAD,NWDATA,INTDBC,IDTPDY
      REAL QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      COMMON /LIMITS/ QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      INTEGER*2 JYR,JMO,JDA,JHR,JMN,MYR,MMO,MDA,MHR,MMN
      INTEGER*4 ND,NDFIRT,NDPART,JETIME,NTSAQ
      COMMON /PARTIM/ ND,NDFIRT,NDPART,JETIME,JYR,JMO,JDA,JHR,JMN,
     1MYR,MMO,MDA,MHR,MMN
      CHARACTER*80 COMENT(9)
      COMMON /CMMNT/ COMENT
      CHARACTER*2 IDETA(7)
      COMMON /ETASYM/ IDETA
      REAL WRATIO,DTZERO,ZTEMP,QTEMP,ZIJ,QIJ,DXIJ,QIJP1,ZIJP1,APZPIJ,
     1     BPZPIJ,BTZPIJ,RPZPIJ,BAVG,BTAVG,AAVG,RAVG,QAVG,ZAVG,BETCOR,
     2     RNIJ,AAVGSQ,AAVGCU,SIGMA,EPSLON,ZETA,OMEGA,GAMMA,DELTA,DET,
     3 DZDT,DQDXC,DQDT,DQDXM,DADX,DZDX,FRIC,ZQPIJ,BIGQ,BIGZ,ZTOL,SOLPDT
     4 ,ALPHA
      INTEGER*4 IBCH,IJZPBC,IJQPBC,KTMATS,LASTN,IJP1,NSM1,JP1,IJ2,IJ4,
     1  IJ4P1,IJ4P2,IJ4P3,IJ4P4,IJ2P1,IJ2P2,I2,I4,I4P1,I4P2,I4P3,I4P4,
     2  I2P1,I2P2,NN,MM,NNN,NBPJ,M0,IBIGZ,JBIGZ,IBIGQ,JBIGQ,IJPNS,ICHK
C
C1----READ PROGRAM CONTROL PARAMETERS AND ASSIGN DEFAULTS
C
      CALL RDCOMP (MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ITQMAX,ITQMIN,QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,IN)
C
C2----READ BRANCH IDENTIFICATION, INITIAL VALUES, AND GEOMETRY DATA
C
      CALL BRICXS (CLK,ZBOT,MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,
     1 MAXZBD,MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     3 A,Z,Q,ZP,QP,AP,BP,RP,B,R,BT,BTP,
     & XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT,BETVEL,SUMETA,SUMCZQ,
     & SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     & QA,TA,ETA,FUNETA,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR,IN,ISTRM)
C
C3----READ EXTERNAL INFLOW/OUTFLOW AT INTERNAL JUNCTIONS
C
  130 CONTINUE
      WRITE(*,'(A/)') ' Read constant nodal flow at internal junctions!'
      READ (IN,1750) (W(J),J=1,NJNC)
C
C4----READ BOUNDARY-VALUE DATA FOR EXTERNAL JUNCTIONS
C
      READ (IN,1760) LISTB,LISTA
      CALL BVDINP (MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
```

Program listing—Continued

```
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & ITYPE,IBJNC,NDATA,IZQBVE,ISTATN,
     & ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,KTTDBC,
     & INDATA,IZDATA,IQDATA,IN)
C
C5----READ TIME-DEPENDENT WIND SPEED AND DIRECTION
C
      NWREAD=0
      IF (INWIND.EQ.0) GO TO 440
      WRITE(*,'(A/)') ' Read time-varying wind conditions!'
      READ (IN,1780,END=640) NWDATA,WDTT,NWREAD
      IF (WDTT.EQ.0.0.AND.NWREAD.EQ.0) GO TO 1450
      IF (NWREAD.EQ.0) NWREAD=1440./WDTT
      IF (WDTT.EQ.0.0) WDTT=1440./NWREAD
      IF (NWREAD.NE.1440./WDTT) GO TO 1450
      IF (NWDATA.LT.1.OR.NWDATA.GT.MXWIND) THEN
         WRITE (IOUT,2020) NWDATA
         STOP
      ENDIF
      WDTT=WDTT*60.
      READ (IN,1790) (WINDSP(K),WINDDR(K),K=1,NWDATA)
  440 CONTINUE
 1450 CONTINUE
 640  CONTINUE
C6------RETURN
      RETURN
C
C     INPUT/OUTPUT FORMAT STATEMENTS
C
 1740 FORMAT (2(A2,3X,2(I2,1X)))
 1750 FORMAT (10F8.2)
 1760 FORMAT (37X,I2,6X,I2)
 1780 FORMAT (4X,I3,F2.0,52X,I4)
 1790 FORMAT (8F10.3)
 1920 FORMAT (' ***** ERROR,     INITIAL STAGE VALUE UNSPECIFIED IN BRAN
     1CH ',I2,' SECTION ',I2,' *****')
 1960 FORMAT (' ***** ERROR,     MATRIX NOT SQUARE : REVIEW SCHEMATIZATI
     1ON AND EXTERNAL BOUNDARY-CONDITION SPECIFICATIONS *****')
 1980 FORMAT (' ***** ERROR,     WIND DATA FREQUENCY UNSPECIFIED OR INCO
     1NSISTENT *****')
 1990 FORMAT (' ***** ERROR,     MATRIX IS SINGULAR *****')
 2020 FORMAT (' ***** ERROR,     IMPROPER NUMBER OF WIND DATA SPECIFIED
     1(1<=NWDATA<=',I5,') *****')
 2050 FORMAT (' ***** ERROR,     INITIAL VALUE(S) OUT OF DEFINED RANGE O
     1F CHANNEL GEOMETRY FOR BRANCH ',I2,' SECTION ',I2,' *****')
 2075 FORMAT ('+',T69,'(STEEP SLOPE CHANNEL NEEDS ADDITIONAL A(Z) FOR DA
     1/DX TERM)')
 2080 FORMAT (/' ',11X,A2,'(J,I),J=1,NSEC(I)')
 2090 FORMAT (' ',1X,A2,'( J,',I2,')',12F10.4/11X,12F10.4)
 2110 FORMAT (' WARNING,   MAXIMUM ITERATIONS EXCEEDED AT ',I2,':',I2,'
     1ON ',I2,'/',I2,'/',I2,'      Z-ZP(',I2,',',I2,')=',F7.4,' Q-QP(',I2
     2,',',I2,')=',F7.1)
 2140 FORMAT (/' NUMBER OF SOLUTIONS = ',I5/)
 2145 FORMAT (' SOLUTIONS/TIME STEP = ',F5.1)
 2150 FORMAT (' Z=',E13.6,' Q=',E13.6,' QT=',E13.6,' QX=',E13.6,' AX=',E
     113.6,' ZX=',E13.6,' F=',E13.6,' W=',E13.6)
 2160 FORMAT (1X,8I16)
 2170 FORMAT (1X,8E16.8)
      END
```

LIST OF VARIABLES

(Variables specific to original BRANCH code not included)

Variable	Range	Definition
CLK (MAXS)	Package	Value of *K'*/*b'* (leakage coefficient).
ISTRM (3, MAXS)	Package	Vector describing row, column, and layer of aquifer model cell that corresponds to channel segment.
MAXCZQ	Package	Maximum number of daily computed results held in storage for plotting purposes.
MAXMZQ	Package	Maximum number of measured data held in storage for plotting purposes.
MAXQBD	Package	Maximum number of discharge boundary value data held in storage for computation.
MAXS	Package	Maximum number of cross sections in the entire channel network.
MAXZBD	Package	Maximum number of stage boundary value data held in storage for computation.
MXBH	Package	Maximum number of branches in the network.
MXJN	Package	Maximum number of junctions in the network.
MXMD	Package	Maximum number of measured data locations accommodated in the network.
MXPT	Package	Maximum number of points used to define a cross section.
MXTDBC	Package	Maximum number of boundaries in the network.
MXWIND	Package	Maximum number of wind data points input.
NCOL	Global	Maximum number of MODFLOW aquifer columns.
NLAY	Global	Maximum number of MODFLOW aquifer layers.
NROW	Global	Maximum number of MODFLOW aquifer rows.
NSEC	Package	Maximum cross sections per branch.
NSEG	Package	Maximum segments per branch.
ZBOT (MAXS)	Package	Elevation of channel bottom.

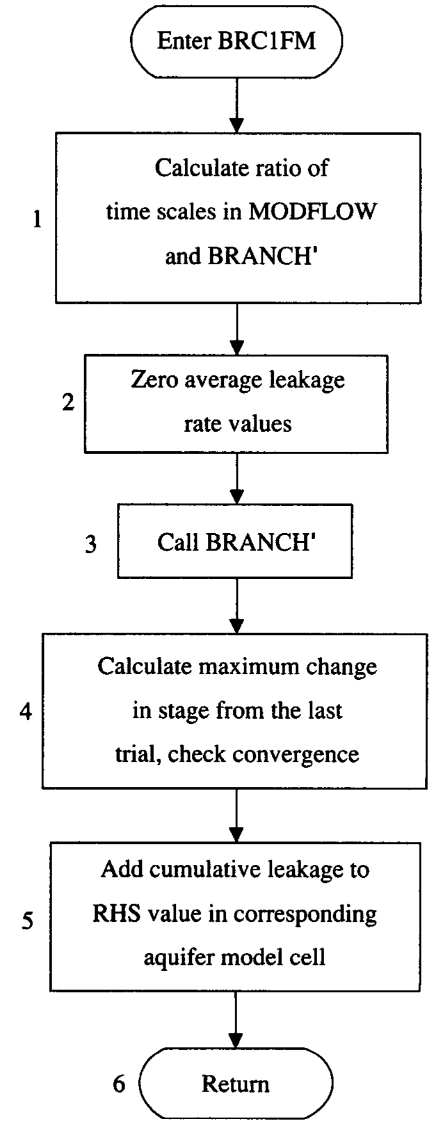

Figure 8. Flowchart of formulation module (BRC1FM).

MODULE BRC1FM

The module BRC1FM is executed when MODFLOW iterates on a time-step solution. This module determines the number of time intervals that BRANCH' calculates to equal the time-step length in MODFLOW, executes BRANCH', and adds the leakage flows calculated in BRANCH' to the MODFLOW calculations. In addition, this module checks the maximum change in river stage from the last MODFLOW iteration to ascertain whether the models have converged. The numbered sections in the narrative correspond to the numbered steps in the flowchart for BRC1FM in figure 8.

NARRATIVE

1. Calculate ratio of time scales in MODFLOW and BRANCH'. Using the ratio of time units (TFCTR), the MODFLOW time-step length (DELT), and the BRANCH' time-interval length in minutes (IDTM), the number of BRANCH' time intervals passing in one MODFLOW time step is calculated (NTSAQ). This computation is made for each MODFLOW time step because if a new stress period is entered, the MODFLOW time step can change and NTSAQ can change. If the MODFLOW time step is not an integral multiple of

the BRANCH' time interval, an error message will print. For steady state, NTSAQ is set to one.

2. Zero average leakage rate values. Before BRANCH' is executed, the average leakage rates for each segment (QLSUM [segment number]) are set to zero so only the leakages for the following BRANCH' run will be saved.
3. Call BRANCH'. BRANCH' is executed for NTSAQ time intervals.
4. Calculate maximum change in stage from last MODFLOW iteration. Using the stage values saved from the final BRANCH' time interval in the last MODFLOW iteration (ZPL [node number]), the difference between these values and the stages in the new iteration (ZN [node number]) is calculated to see if the convergence criteria have been met. If so, a convergence flag is set.
5. Add cumulative leakages to RHS value in aquifer model cell. The corresponding aquifer model cell is located for each river segment. The average leakage rates from the MODFLOW time step (QLSUM [segment number]) are then multiplied by TFCTR to convert from BRANCH' time units to MODFLOW time units. The QLSUM values are added (subtract flow out) to the RHS value in the MODFLOW equations for the aquifer model cell. If NTSAQ is 1, the leakage values are calculated and added to the HCOEF and RHS values instead of adding QLSUM to RHS.
6. Return to MODFLOW.

PROGRAM LISTING FOR MODULE BRC1FM

```
      SUBROUTINE BRC1FM(INDATA,IZDATA,IQDATA,ITQMAX,ITQMIN,
     1 QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,A,Z,Q,ZP,QP,
     2 AP,BP,RP,B,R,BT,BTP,XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT
     3 ,BETVEL,SUMETA,SUMCZQ,SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     4 QA,TA,ETA,FUNETA,ROW,AM,BMX,BRNAME,IJF,IJT,NSEC,XSKT,
     5 PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ITYPE,IBJNC,NDATA,IZQBVE,
     6 ISTATN,KTTDBC,ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,LARBPR,ZHIGH,
     7 ZLOW,LINPRT,ARBERR,CLK,ZBOT,
     8 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     9 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,WINDSP,WINDDR,
     & IDX,ICT,W,U,UU,BU,BUU,ZSAV,QSAV,ZPSAV,QPSAV,NELAP,IOUT,ZPL,SLKG,
     & HNEW,HOLD,HCOF,RHS,IBOUND,NCOL,NROW,NLAY,TFCTR,ISS,NTSAQ,
     2 DELT,TOTIM,IBCONV,HCLOSE,ISTRM,IBEGIN,ZN,QLSUM,ITRIAL,DCFM,KKSTP)
C                                                                     C
C-----VERSION   1 1APR1991   BRC1FM                                   C
C     *****************************************************************C
C     CALL BRANCH MODEL AND ADD LEAKAGE TERMS TO RHS QUANTITY         C
C     *****************************************************************C
C                                                                     C
C     SPECIFICATIONS:                                                 C
C     ----------------------------------------------------------------C
C                                                                     C
C BEGIN COMMON_COMCON ===============================================
C
      CHARACTER*2 IUNIT,OUNIT
      INTEGER*4 NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,IPLOPT,IPLDEV,
     1 IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,IRDIC,NUMCOM,INWIND,
     2 TYPETA,OTTDDB,ISMOPT,NTDIOF,IRDNXT,IARDEM
      REAL THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,H2ODEN,CHI,QZCONV,
     1 ZDATUM,DT,G,AIRDEN,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
      COMMON /COMCON/ NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,
     1 IPLOPT,IPLDEV,IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,
     2 IRDIC,NUMCOM,INWIND,THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,
     3 H2ODEN,CHI,ZDATUM,IUNIT,OUNIT,TYPETA,OTTDDB,ISMOPT,G,QZCONV,DT,
     4 AIRDEN,IARDEM,NTDIOF,IRDNXT,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
C
C  END   COMMON_COMCON ===============================================
C BEGIN   COMMON_DTYPES ==============================================
C
      CHARACTER*2 DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
      COMMON /DTYPES/ DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
C
C  END    COMMON_DTYPES ==============================================
C BEGIN COMMON_UNITS ================================================
C
      CHARACTER*2 IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
      COMMON /UNITS/ IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
C
C  END   COMMON_UNITS ===============================================
C BEGIN COMMON_LUNUMS ===============================================
C
      INTEGER*4 READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,LUIVOL,
     1        LUGEOM,LUINIT,LUCVOL
      COMMON /LUNUMS/ READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,
     1 LUIVOL,LUGEOM,LUINIT,LUCVOL
C
C  END   COMMON_LUNUMS ==============================================
C BEGIN COMMON_DADCOM ===============================================
C
      INTEGER*2 LISTB,LISTA,STRIP,RTCODE
```

Program listing—Continued

```
      COMMON /DADCOM/ LISTB,LISTA,STRIP,RTCODE
C
C  END   COMMON_DADCOM ==================================================
C BEGIN COMMON_DAYPMO ==================================================
C
      INTEGER*2 DPERM(12)
      COMMON /DAYPMO/ DPERM
C
C  END   COMMON_DAYPMO ==================================================
C BEGIN COMMON_LOGICS ==================================================
C
      LOGICAL*4 PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
      COMMON /LOGICS/ PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
C
C  END   COMMON_LOGICS ==================================================
C BEGIN COMMON_BCTIME ==================================================
C
      INTEGER*4 IETIME,NETIME
      INTEGER *2 IRDPDY,IYR,IMO,IDA,IHR,IMN,NYR,NMO,NDA,NHR,NMN
      COMMON /BCTIME/ IETIME,NETIME,IRDPDY,IYR,IMO,IDA,IHR,IMN,
     1                                    NYR,NMO,NDA,NHR,NMN
C
C  END   COMMON_BCTIME ==================================================
C BEGIN COMMON_DATIME ==================================================
C
      INTEGER*4 KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
      COMMON /DATIME/ KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
C
C  END   COMMON_DATIME ==================================================
C BEGIN COMMON_NETWRK ==================================================
C
      CHARACTER*80 NETNAM
      COMMON /NETWRK/ NETNAM
C
C  END   COMMON_NETWRK ==================================================
C BEGIN COMMON_MODBRCH =================================================
C
      COMMON /MODBRCH/ TWOCSQ,IDTPDY,TWOG,CW,II,ONECHI,DCHI,DTHETA,
     1                        IBCH,IJZPBC,IJQPBC,DCFM1,KKITER
C
C  END   COMMON_MODBRCH =================================================
      INTEGER*4 MXBHMMXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT
      INTEGER*4 ITQMAX(MAXS), ITQMIN(MAXS),ISTRM(3,MAXS),ITRIAL(MAXS,
     1 MAXCZQ)
      REAL QMAX(MAXS), QMIN(MAXS), QSUM(MAXS), ZQMIN(MAXS), ZQMAX(MAXS),
     1     AQMAX(MAXS), AQMIN(MAXS)
      REAL A(MAXS),Z(MAXS),Q(MAXS),ZP(MAXS),QP(MAXS),AP(MAXS),
     1 BP(MAXS),RP(MAXS),B(MAXS),R(MAXS),BT(MAXS),BTP(MAXS),
     2 ZSAV(MAXS),QSAV(MAXS),ZPSAV(MAXS),QPSAV(MAXS),ZPL(MAXS),
     3 ZN(MAXS)
      INTEGER*4 XSTATN(MAXS)
      REAL DX(MAXS), T(MAXS), RN(4,MAXS), WANGLE(MAXS), GDATUM(MAXS),
     1 ORIENT(MAXS), BETVEL(MAXS), SUMETA(MAXS), SUMCZQ(MAXS),
     2 SCZQSQ(MAXS),SZQETA(MAXS)
      CHARACTER*4 ITYPEO(4,MAXS)
      INTEGER*4 IPT(MAXS)
      REAL ZA(MXPT,MAXS), AA(MXPT,MAXS), BB(MXPT,MAXS), BS(MXPT,MAXS)
```

Program listing—Continued

```
      REAL QA(MXPT,MAXS), TA(MXPT,MAXS), ETA(MXPT,MAXS),
     1 FUNETA(MXPT,MAXS)
      INTEGER*4 ROW(4*MXBH)
      REAL*4 AM((4*MXBH)**2),BMX(4*MXBH)
      CHARACTER*40 BRNAME(MXBH)
      INTEGER*4 IJF(MXBH),IJT(MXBH),NSEC(MXBH),XSKT(MXBH),
     1 PLTBCH(MXBH),PRTXSG(MXBH),PRTBCH(MXBH),PRTSUM(MXBH),PPLTBH(MXBH)
      CHARACTER*4 ITYPE(MXJN)
      INTEGER*4 IBJNC(MXJN),NDATA(MXJN),IZQBVE(MXJN)
      INTEGER*4 ISTATN(MXJN),KTTDBC
      REAL ZQ(MAXZBD,MXTDBC),DTT(MXJN),DATUM(MXJN),ZQBVCO(4,MXJN),
     1 ZQPMIN(MXJN)
      LOGICAL*4 LARBPR(MAXS),ZHIGH(MAXS),ZLOW(MAXS),LINPRT(MAXS),ARBERR
      INTEGER*4 IZDATA(MAXZBD)
      INTEGER*4 IQDATA(MAXQBD),INDATA(MAXQBD)
C     EQUIVALENCE (INDATA(1),IQDATA(1),IZDATA(1))
      REAL CLK(MAXS),ZBOT(MAXS)
      REAL WINDSP( MXWIND),WINDDR( MXWIND)
      INTEGER*4 IDX(MXJN,MXBH), ICT(MXJN)
      REAL W(MXJN)
      REAL*8 U(2*MAXS), UU(4*MAXS), BU(2*MXBH),BUU(4*MXBH)
      REAL*8 C1, C2, C3, C4, UUIJP1, UUIJP2, UUIJP3, UUIJP4
      REAL LAMBDA,MU,SETA,WDTT,TWOCSQ,TWOG,CW,ONECHI,DCHI,DTHETA,TH,WIND
      INTEGER*4 IAR,I,J,K,L,II,IJ,NS,KT,IS,N,NWREAD,NWDATA,INTDBC,IDTPDY
      REAL QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      COMMON /LIMITS/ QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      INTEGER*2 JYR,JMO,JDA,JHR,JMN,MYR,MMO,MDA,MHR,MMN
      INTEGER*4 ND,NDFIRT,NDPART,JETIME,NTSAQ
      COMMON /PARTIM/ ND,NDFIRT,NDPART,JETIME,JYR,JMO,JDA,JHR,JMN,
     1MYR,MMO,MDA,MHR,MMN
      CHARACTER*80 COMENT(9)
      COMMON /CMMNT/ COMENT
      CHARACTER*2 IDETA(7)
      COMMON /ETASYM/ IDETA
      REAL WRATIO,DTZERO,ZTEMP,QTEMP,ZIJ,QIJ,DXIJ,QIJP1,ZIJP1,APZPIJ,
     1      BPZPIJ,BTZPIJ,RPZPIJ,BAVG,BTAVG,AAVG,RAVG,QAVG,ZAVG,BETCOR,
     2      RNIJ,AAVGSQ,AAVGCU,SIGMA,EPSLON,ZETA,OMEGA,GAMMA,DELTA,DET,
     3 DZDT,DQDXC,DQDT,DQDXM,DADX,DZDX,FRIC,ZQPIJ,BIGQ,BIGZ,ZTOL,SOLPDT
     4 ,ALPHA
      INTEGER*4 IBCH,IJZPBC,IJQPBC,KTMATS,LASTN,IJP1,NSM1,JP1,IJ2,IJ4,
     1  IJ4P1,IJ4P2,IJ4P3,IJ4P4,IJ2P1,IJ2P2,I2,I4,I4P1,I4P2,I4P3,I4P4,
     2  I2P1,I2P2,NN,MM,NNN,NBPJ,M0,IBIGZ,JBIGZ,IBIGQ,JBIGQ,IJPNS,ICHK,
     3  IBOUND(NCOL,NROW,NLAY)
      DOUBLE PRECISION HNEW
      DIMENSION HNEW(NCOL,NROW,NLAY),HOLD(NCOL,NROW,NLAY),HCOF(NCOL,NROW
     2,NLAY),QLSUM(MAXS+MXJN),RHS(NCOL,NROW,NLAY)
C     ------------------------------------------------------------------C
        IDBG=0
C                                                                       C
C       WRITE(*,*) 'DOWN TO BRC1FM'
C                                                                       C
C1 ---------CALCULATE RATIO OF TIMESTEPS IN MODFLOW AND BRANCH
       IF(ISS.EQ.0) THEN
      IF(MOD(INT(TFCTR*DELT+0.5),60*IDTM).NE.0) THEN
      WRITE(*,600) IDTM,INT(TFCTR*DELT+0.5)/60
      STOP
      ENDIF
      NTSAQ1=INT(TFCTR*DELT+0.5)/(60*IDTM)
      IF(KKSTP.EQ.1.AND.NELAP.NE.1) NELAP=(NELAP-1)*NTSAQ/NTSAQ1+1
      NTSAQ=NTSAQ1
```

Program listing—Continued

```
      ENDIF
C
C1A-----FOR STEADY-STATE SIMULATIONS ...
      IF(ISS.NE.0) THEN
      NTSAQ=1
      IDTM=1
      ENDIF
C
C2 -----ZERO AVERAGE LEAKAGE RATE VALUES
      DO 80 I=1,NBCH
      NSM1=NSEC(I)-1
      IJ=MAXS-XSKT(I)
      IJFI=MAXS+IJF(I)
      IJTI=MAXS+IJT(I)
      DO 81 J=1,NSM1
      IJ=IJ+1
      IJP1=IJ+1
      QLSUM(IJ)=0.0
      QLSUM(IJP1)=0.0
81    CONTINUE
      QLSUM(IJFI)=0.0
      QLSUM(IJTI)=0.0
80    CONTINUE
      IBRPRN=0
C
C3 ----CALL BRANCH MODEL
C
      CALL BRCH(INDATA,IZDATA,IQDATA,ITQMAX,ITQMIN,
     1 QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,A,Z,Q,ZP,QP,
     2 AP,BP,RP,B,R,BT,BTP,XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT
     3 ,BETVEL,SUMETA,SUMCZQ,SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     4 QA,TA,ETA,FUNETA,ROW,AM,BMX,BRNAME,IJF,IJT,NSEC,XSKT,
     5 PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ITYPE,IBJNC,NDATA,IZQBVE,
     6 ISTATN,KTTDBC,ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,LARBPR,ZHIGH,
     7 ZLOW,LINPRT,ARBERR,CLK,ZBOT,
     8 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     9 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,WINDSP,WINDDR,
     & IDX,ICT,W,U,UU,BU,BUU,ZSAV,QSAV,ZPSAV,QPSAV,NELAP,IOUT,
     & NTSAQ,HOLD,HNEW,IBOUND,NCOL,NROW,NLAY,ISTRM,ZPL,IBEGIN,
     & IBRPRN,ZN,ISS,QLSUM,ITRIAL,DCFM)
C
C4 -----CALCULATE MAXIMUM CHANGE OVER MODFLOW ITERATION
      IBCONV=0
      DHMAX=0.0
      IF(IDBG.GT.2) WRITE(*,*) 'UNIT DISCHARGE    DEPTH OF FLOW'
      DO 70 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 71 J=1,NS
            DH=ZN(IJ)-ZPL(IJ)
            IF(ABS(DH).GT.DHMAX) DHSIGN=DH
            IF(ABS(DH).GT.DHMAX) DHMAX=ABS(DHSIGN)
            ZPL(IJ)=ZN(IJ)
      IF(IDBG.GT.2) WRITE(*,*) ZN(IJ)
71    CONTINUE
70    CONTINUE
      IF(IDBG.GT.2) WRITE(*,*)'MAXIMUM CHANGE IN STAGE = ',DHMAX
C      IF (DHMAX.GT.0) WRITE(*,*) HCLOSE*100/DHMAX,DHSIGN
C     WRITE(IOUT,1000) DHMAX
      IF(DHMAX.LE.HCLOSE) IBCONV=1
```

Program listing—Continued

```
C                                                                       C
C4A-----DETERMINE LAYER, ROW, COLUMN OF EACH REACH.                      C
      DO 500 I=1,NBCH
      NSM1=NSEC(I)-1
      L=MAXS-XSKT(I)
      DO 501 J=1,NSM1
      L=L+1
      IF(ISTRM(3,L).LT.0) GO TO 501
      IC=ISTRM(1,L)
      IR=ISTRM(2,L)
      IL=ISTRM(3,L)
C5------ADD LEAKAGE TO RHS                                               C
C
C5A ---- IF NTSAQ=1, THE LEAKAGE IS CALCULATED IMPLICITLY
      IF(NTSAQ.EQ.1) THEN
      DXL=DX(L)
      HSTR=ZN(L)+ZDATUM
      PERIM=BP(L)
      CSTR=CLK(L)*PERIM*DXL*TFCTR
      HAQ=HNEW(IC,IR,IL)
      BOT=ZBOT(L)
      IF(HAQ.GT.BOT) THEN
        FLOBOT=0.5*CSTR*(HSTR-HAQ)
        RHS(IC,IR,IL)=RHS(IC,IR,IL)-0.5*CSTR*HSTR
        HCOF(IC,IR,IL)=HCOF(IC,IR,IL)-0.5*CSTR
      ELSE
        IF(HSTR.LT.BOT) HSTR=BOT
        FLOBOT=0.5*CSTR*(HSTR-BOT)
        RHS(IC,IR,IL)=RHS(IC,IR,IL)-FLOBOT
      END IF
      HSTR=ZN(L+1)+ZDATUM
      PERIM=BP(L+1)
      CSTR=CLK(L)*PEIM*DXL*TFCTR
      BOT=ZBOT(L+1)
      IF(HAQ.GT.BOT) THEN
        FLOBOT=FLOBOT+0.5*CSTR*(HSTR-HAQ)
        RHS(IC,IR,IL)=RHS(IC,IR,IL)-0.5*CSTR*HSTR
        HCOF(IC,IR,IL)=HCOF(IC,IR,IL)-0.5*CSTR
      ELSE
        IF(HSTR.LT.BOT) HSTR=BOT
        FLOBOT=FLOBOT+0.5*CSTR*(HSTR-BOT)
        RHS(IC,IR,IL)=RHS(IC,IR,IL)-0.5*CSTR*(HSTR-BOT)
      END IF
      ELSE
C
C5B ----IF NTSAQ>1, LEAKAGE IS TAKEN FROM BRANCH
        RHS(IC,IR,IL)=RHS(IC,IR,IL)-QLSUM(L)*TFCTR
      ENDIF
  501 CONTINUE
  500 CONTINUE
 600   FORMAT(1H0,' WARNING, THE RATIO OF BRANCH TO MODFLOW TIMESTEPS IS
     2 NOT AN INTEGER.'/'BRANCH TIMESTEP IS',1X,1I4,1X,'MINUTES,
     3 MODFLOW TIMESTEP IS',1X,1I7,1X,'MINUTES.'/)
 1000 FORMAT (/' MAXIMUM STAGE CHANGE IN BRANCH PER ITERATION',
     1 1PG12.5/)
C                                                                       C
C6 -----RETURN.                                                          C
      RETURN
      END
```

LIST OF VARIABLES

(Variables specific to original BRANCH code not included)

Variable	Range	Definition
BOT	Module	Local variable for channel bottom elevation.
CLK (MAXS)	Package	Value of *K'/b'* (leakage coefficient).
CSTR	Module	Local variable for *K'/b'* • B • L • TFCTR.
DCFM	Package	Multiplier for the friction term in the momentum equation when the channel runs dry.
DELT	Global	Time-step length in MODFLOW.
DH	Module	Difference in stage between the last two MODBRANCH iterations.
DHMAX	Module	Absolute value of DHSIGN.
DHSIGN	Module	Maximum difference in stage between the last two MOD-BRANCH iterations.
DXL	Module	Local variable for segment length.
FLOBOT	Module	Leakage rate between BRANCH and MODFLOW.
HAQ	Module	Aquifer head at beginning of BRANCH time interval.
HCLOSE	Module	Convergence criteria for head.
HNEW (NCOL, NROW, NLAY)	Global	Aquifer head at end of MODFLOW time step.
HOLD (NCOL, NROW, NLAY)	Global	Aquifer head at beginning of MOD-FLOW time step.
HSTR	Module	Local variable for stage in the channel.
IBCONV	Package	Flag indicating BRANCH convergence (0, no converge; 1 converge).
IBEGIN	Package	Flag indicating if BRANCH' is being called for the first time (0, first time; 1, not first time).
IBOUND (NCOL, NROW, NLAY)	Global	Status of each cell (<0 is constant head cell, =0 is inactive cell, >0 is variable head cell).
IBRPRN	Package	Flag indicating if BRANCH' is being called from the formulation or budget package (0, formulation; 1, budget).
IOUT	Package	FORTRAN unit number for printed output.
ISS	Global	Flag indicating steady-state simulation (0, not steady state; 1, steady state).
ISTRM (3, MAXS)	Package	Vector describing row, column, and layer of aquifer model cell that corresponds to channel segment.

LIST OF VARIABLES —Continued

(Variables specific to original BRANCH code not included)

Variable	Range	Definition
ITRIAL (MAXS, MAXCZQ)	Package	Flag indicating the wet-dry condition of a channel reach and the relative position of the surrounding aquifer to the riverbed by a two-digit number. For first digit, 0 is reach wet, 1 is upstream node dry, 2 is downstream node dry, and 3 to 8 are both nodes dry with successively high frictional resistance. For second digit, 0 is aquifer above riverbed at both nodes, 1 is aquifer below riverbed at upstream node, 2 is aquifer below riverbed at downstream node, and 3 is aquifer below riverbed at both nodes.
KDAS	Package	Saved value of day.
KHRS	Package	Saved value of hour.
KKITER	Global	MODFLOW iteration number.
KKSTP	Global	MODFLOW time-step number.
KMNS	Package	Saved value of minute.
KMOS	Package	Saved value of month.
KYRS	Package	Saved value of year.
MAXCZQ	Package	Maximum number of daily computed results held in storage for plotting purposes.
MAXMZQ	Package	Maximum number of measured data held in storage for plotting purposes.
MAXQBD	Package	Maximum number of discharge boundary value data held in storage for computation.
MAXS	Package	Maximum number of cross sections in the entire channel network.
MAXZBD	Package	Maximum number of stage boundary value data held in storage for computation.
MXBH	Package	Maximum number of branches in the network.
MXJN	Package	Maximum number of junctions in the network.
MXMD	Package	Maximum number of measured data locations accommodated in the network.
MXPT	Package	Maximum number of points used to define a cross section.
MXTDBC	Package	Maximum number of boundaries in the network.
MXWIND	Package	Maximum number of wind data points input.

LIST OF VARIABLES —Continued

(Variables specific to original BRANCH code not included)

Variable	Range	Definition
NCOL	Global	Maximum number of MODFLOW aquifer columns.
NELAP	Package	Number of elapsed MODFLOW time steps since beginning of simulation.
NLAY	Global	Maximum number of MODFLOW aquifer layers.
NROW	Global	Maximum number of MODFLOW aquifer rows.
NSEC	Package	Maximum cross sections per branch.
NTSAQ	Package	Number of BRANCH' time intervals in one MODFLOW time step.
NTSAQ1	Package	Adjustable NTSAQ for varying MODFLOW time-step length.
PERIM	Module	Local variable for channel wetted perimeter.
QLSUM (MAXS)	Package	Average leakage rate out of a river segment over one MODFLOW time step.
QPSAV (MAXS)	Package	Value of discharge at end of first BRANCH' time interval after beginning of a MODFLOW time step.
QSAV (MAXS)	Package	Value of discharge at beginning of first BRANCH' time interval in a MODFLOW time step.
SLKG (MAXS)	Package	Vector of leakage rates.
TFCTR	Module	Number of seconds in one time unit used in MODFLOW.
ZBOT (MAXS)	Module	Elevation of channel bottom.
ZN (MAXS)	Module	Value of stage at end of final BRANCH' time interval in a MODFLOW time step.
ZPL (MAXS)	Module	Value of stage at end of final BRANCH' time interval in a MODFLOW time step for previous trial.
ZPSAV (MAXS)	Module	Value of stage at end of first BRANCH' time interval after beginning of a MODFLOW time step.
ZSAV (MAXS)	Package	Value of stage at beginning of first BRANCH' time interval after beginning of a MODFLOW time step.

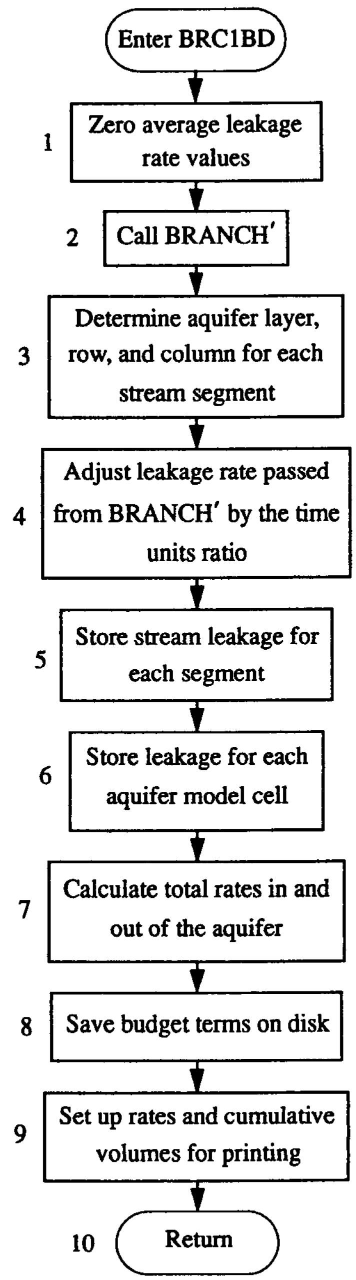

Figure 9. Flowchart of budget module (BRC1BD).

MODULE BRC1BD

This module calculates the volumetric budget for leakage for a single MODFLOW time step. It is executed each time the two models have converged and calls BRANCH' with a flag set to allow printout in BRANCH'. The numbered sections in the narrative correspond to the numbered steps in the flowchart for BRC1BD shown in figure 9.

NARRATIVE

1. Zero average leakage rate values. Before BRANCH' is executed, the average leakage rates for each segment (QLSUM [segment number]) are set to zero.
2. Call BRANCH'. BRANCH' is executed with a flag set (IBRPRN=1) so that normal printouts of results are

made (not made when BRANCH' is called from BRC1FM).

3. Determine aquifer layer, row, and column. A loop is begun. For each stream segment, the corresponding aquifer layer, row, and column are located.
4. Adjust leakage rates passed from BRANCH'. The value of the flow rate from river to aquifer (FLOBOT) is calculated as average leakage rate calculated by BRANCH' (QLSUM [segment number]), multiplied by the time units ratio (TFCTR), and converted into units comparable to MODFLOW.
5. Store stream leakage for each segment. The FLOBOT values are stored in the stream leakage rates array (SLKG [segment number]).
6. Store leakage for each aquifer model cell. If the leakage is to be saved, the FLOBOT value is added to the BUFFER value for the corresponding aquifer cell (BUFF [column, row layer]).
7. Calculate total rates in and out of aquifer. If the leakage is out of the aquifer, subtract FLOBOT from the total rate out value (RATOUT); if it is into the aquifer, add FLOBOT to the total rate in (RATIN). The flag that represents the dryness condition of the river segment at a time interval (ITRIAL [segment number, time-interval number]) is set to zero (fully wet). Loop back to step 3 until all river segments have been completed.
8. Save budget terms on disk. If the volumetric budget stored in the buffer in step 6 is to be saved, the subroutine UBUDSV is called (McDonald and Harbaugh, 1988) to write an unformatted record of budget terms.
9. Set up rates and cumulative volumes for printing. The inflow and outflow rates (RATIN and RATOUT) are stored in the VBVL array for printing by BASIOT. In addition, RATIN and RATOUT multiplied by the time-interval length are added to the volume accumulators in the VBVL array, also to be printed by BASIOT. The river budget term labels are moved to the VBNM array for BASIOT printing, and the budget term counter (MSUM) is increased by one.
10. Return to MODFLOW.

PROGRAM LISTING FOR MODULE BRC1BD

```
      SUBROUTINE BRC1BD(INDATA,IZDATA,IQDATA,ITQMAX,ITQMIN,
     1 QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,A,Z,Q,ZP,QP,
     2 AP,BP,RP,B,R,BT,BTP,XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT
     3 ,BETVEL,SUMETA,SUMCZQ,SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     4 QA,TA,ETA,FUNETA,ROW,AM,BMX,BRNAME,IJF,IJT,NSEC,XSKT,
     5 PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ITYPE,IBJNC,NDATA,IZQBVE,
     6 ISTATN,KTTDBC,ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,LARBPR,ZHIGH,
     7 ZLOW,LINPRT,ARBERR,CLK,ZBOT,
     8 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     9 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,WINDSP,WINDDR,
     & IDX,ICT,W,U,UU,BU,BUU,ZSAV,QSAV,ZPSAV,QPSAV,NELAP,IOUT,ZPL,SLKG,
     & HNEW,HOLD,IBOUND,NCOL,NROW,NLAY,TFCTR,NTSAQ,
     2 DELT,KKSTP,KKPER,ISTRM,
     1 VBVL,VBNM,MSUM,IMPCB1,ICBCFL,IHDDFL,BUFF,IPTFL2,ZN,
     2 ISS,QLSUM,ITRIAL,DCFM)
C-----VERSION 1  01APR1991 BRC1BD                                       C
C     ***************************************************************C
C     CALCULATE VOLUMETRIC BUDGET FOR STREAMS                           C
C     ***************************************************************C
C                                                                       C
C     SPECIFICATIONS:                                                   C
C     ---------------------------------------------------------------C
C                                                                       C
C BEGIN COMMON_COMCON ================================================
C
      CHARACTER*2 IUNIT,OUNIT
      INTEGER*4 NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,IPLOPT,IPLDEV,
     1 IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,IRDIC,NUMCOM,INWIND,
     2 TYPETA,OTTDDB,ISMOPT,NTDIOF,IRDNXT,IARDEM
      REAL THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,H2ODEN,CHI,QZCONV,
     1 ZDATUM,DT,G,AIRDEN,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
      COMMON /COMCON/ NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,
     1 IPLOPT,IPLDEV,IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,
     2 IRDIC,NUMCOM,INWIND,THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,
     3 H2ODEN,CHI,ZDATUM,IUNIT,OUNIT,TYPETA,OTTDDB,ISMOPT,G,QZCONV,DT,
     4 AIRDEN,IARDEM,NTDIOF,IRDNXT,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
C
C  END  COMMON_COMCON ================================================
C BEGIN  COMMON_DTYPES ===============================================
C
      CHARACTER*2 DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
      COMMON /DTYPES/ DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
C
C  END   COMMON_DTYPES ===============================================
C BEGIN COMMON_UNITS =================================================
C
      CHARACTER*2 IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
      COMMON /UNITS/ IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
C
C  END  COMMON_UNITS =================================================
C BEGIN COMMON_LUNUMS ================================================
C
      INTEGER*4 READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,LUIVOL,
     1        LUGEOM,LUINIT,LUCVOL
      COMMON /LUNUMS/ READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,
     1 LUIVOL,LUGEOM,LUINIT,LUCVOL
C
C  END  COMMON_LUNUMS ================================================
C BEGIN COMMON_DADCOM ================================================
C
```

Program listing—Continued

```
      INTEGER*2 LISTB,LISTA,STRIP,RTCODE
      COMMON /DADCOM/ LISTB,LISTA,STRIP,RTCODE
C
C  END   COMMON_DADCOM ==================================================
C BEGIN COMMON_DAYPMO ==================================================
C
      INTEGER*2 DPERM(12)
      COMMON /DAYPMO/ DPERM
C
C  END   COMMON_DAYPMO ==================================================
C BEGIN COMMON_LOGICS ==================================================
C
      LOGICAL*4 PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
      COMMON /LOGICS/ PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
C
C  END   COMMON_LOGICS ==================================================
C BEGIN COMMON_BCTIME ==================================================
C
      INTEGER*4 IETIME,NETIME
      INTEGER *2 IRDPDY,IYR,IMO,IDA,IHR,IMN,NYR,NMO,NDA,NHR,NMN
      COMMON /BCTIME/ IETIME,NETIME,IRDPDY,IYR,IMO,IDA,IHR,IMN,
     1                                    NYR,NMO,NDA,NHR,NMN
C
C  END   COMMON_BCTIME ==================================================
C BEGIN COMMON_DATIME ==================================================
C
      INTEGER*4 KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
      COMMON /DATIME/ KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
C
C  END   COMMON_DATIME ==================================================
C BEGIN COMMON_NETWRK ==================================================
C
      CHARACTER*80 NETNAM
      COMMON /NETWRK/ NETNAM
C
C  END   COMMON_NETWRK ==================================================
C BEGIN COMMON_MODBRCH =================================================
C
      COMMON /MODBRCH/ TWOCSQ,IDTPDY,TWOG,CW,II,ONECHI,DCHI,DTHETA,
     1                 IBCH,IJZPBC,IJQPBC,DCFM1,KKITER
C
C  END   COMMON_MODBRCH =================================================
      INTEGER*4 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT
      INTEGER*4 ITQMAX(MAXS), ITQMIN(MAXS),ISTRM(3,MAXS),ITRIAL(MAXS,
     1 MAXCZQ)
      REAL QMAX(MAXS), QMIN(MAXS), QSUM(MAXS), ZQMIN(MAXS), ZQMAX(MAXS),
     1     AQMAX(MAXS), AQMIN(MAXS)
      REAL A(MAXS),Z(MAXS),Q(MAXS),ZP(MAXS),QP(MAXS),AP(MAXS),
     1 BP(MAXS),RP(MAXS),B(MAXS),R(MAXS),BT(MAXS),BTP(MAXS),
     2 ZSAV(MAXS),QSAV(MAXS),ZPSAV(MAXS),QPSAV(MAXS),ZPL(MAXS),
     3 ZN(MAXS)
      INTEGER*4 XSTATN(MAXS)
      REAL DX(MAXS), T(MAXS), RN(4,MAXS), WANGLE(MAXS), GDATUM(MAXS),
     1 ORIENT(MAXS), BETVEL(MAXS), SUMETA(MAXS), SUMCZQ(MAXS),
     2 SCZQSQ(MAXS),SZQETA(MAXS)
      CHARACTER*4 ITYPEO(4,MAXS)
      INTEGER*4 IPT(MAXS)
```

Program listing—Continued

```
       REAL ZA(MXPT,MAXS), AA(MXPT,MAXS), BB(MXPT,MAXS), BS(MXPT,MAXS)
       REAL QA(MXPT,MAXS), TA(MXPT,MAXS), ETA(MXPT,MAXS),
      1 FUNETA(MXPT,MAXS)
       INTEGER*4 ROW(4*MXBH)
       REAL*4 AM((4*MXBH)**2),BMX(4*MXBH)
       CHARACTER*40 BRNAME(MXBH)
       INTEGER*4 IJF(MXBH),IJT(MXBH),NSEC(MXBH),XSKT(MXBH),
      1 PLTBCH(MXBH),PRTXSG(MXBH),PRTBCH(MXBH),PRTSUM(MXBH),PPLTBH(MXBH)
       CHARACTER*4 ITYPE(MXJN)
       INTEGER*4 IBJNC(MXJN),NDATA(MXJN),IZQBVE(MXJN)
       INTEGER*4 ISTATN(MXJN),KTTDBC
       REAL ZQ(MAXZBD,MXTDBC),DTT(MXJN),DATUM(MXJN),ZQBVCO(4,MXJN),
      1 ZQPMIN(MXJN)
       LOGICAL*4 LARBPR(MAXS),ZHIGH(MAXS),ZLOW(MAXS),LINPRT(MAXS),ARBERR
       INTEGER*4 IZDATA(MAXZBD)
       INTEGER*4 IQDATA(MAXQBD),INDATA(MAXQBD)
C      EQUIVALENCE (INDATA(1),IQDATA(1),IZDATA(1))
       REAL CLK(MAXS),ZBOT(MAXS)
       REAL WINDSP( MXWIND),WINDDR( MXWIND)
       INTEGER*4 IDX(MXJN,MXBH), ICT(MXJN)
       REAL W(MXJN)
       REAL*8 U(2*MAXS), UU(4*MAXS), BU(2*MXBH),BUU(4*MXBH)
       REAL*8 C1, C2, C3, C4, UUIJP1, UUIJP2, UUIJP3, UUIJP4
       REAL LAMBDA,MU,SETA,WDTT,TWOCSQ,TWOG,CW,ONECHI,DCHI,DTHETA,TH,WIND
       INTEGER*4 IAR,I,J,K,L,II,IJ,NS,KT,IS,N,NWREAD,NWDATA,INTDBC,IDTPDY
       REAL QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
       COMMON /LIMITS/ QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
       INTEGER*2 JYR,JMO,JDA,JHR,JMN,MYR,MMO,MDA,MHR,MMN
       INTEGER*4 ND,NDFIRT,NDPART,JETIME,NTSAQ
       COMMON /PARTIM/ ND,NDFIRT,NDPART,JETIME,JYR,JMO,JDA,JHR,JMN,
      1MYR,MMO,MDA,MHR,MMN
       CHARACTER*80 COMENT(9)
       COMMON /CMMNT/ COMENT
       CHARACTER*2 IDETA(7)
       COMMON /ETASYM/ IDETA
       REAL WRATIO,DTZERO,ZTEMP,QTEMP,ZIJ,QIJ,DXIJ,QIJP1,ZIJP1,APZPIJ,
      1     BPZPIJ,BTZPIJ,RPZPIJ,BAVG,BTAVG,AAVG,RAVG,QAVG,ZAVG,BETCOR,
      2     RNIJ,AAVGSQ,AAVGCU,SIGMA,EPSLON,ZETA,OMEGA,GAMMA,DELTA,DET,
      3 DZDT,DQDXC,DQDT,DQDXM,DADX,DZDX,FRIC,ZQPIJ,BIGQ,BIGZ,ZTOL,SOLPDT
      4 ,ALPHA
       INTEGER*4 IBCH,IJZPBC,IJQPBC,KTMATS,LASTN,IJP1,NSM1,JP1,IJ2,IJ4,
      1  IJ4P1,IJ4P2,IJ4P3,IJ4P4,IJ2P1,IJ2P2,I2,I4,I4P1,I4P2,I4P3,I4P4,
      2  I2P1,I2P2,NN,MM,NNN,NBPJ,M0,IBIGZ,JBIGZ,IBIGQ,JBIGQ,IJPNS,ICHK,
      3  IBOUND(NCOL,NROW,NLAY)
       DOUBLE PRECISION HNEW
       DIMENSION HNEW(NCOL,NROW,NLAY),HOLD(NCOL,NROW,NLAY),
      2    QLSUM(MAXS+MXJN)
       CHARACTER*4 VBNM,TEXT,STRTXT
       DIMENSION BUFF(NCOL,NROW,NLAY),VBVL(4,20),VBNM(4,20)
       DIMENSION TEXT(4),STRTXT(4),SLKG(MAXS)
       DATA TEXT(1),TEXT(2),TEXT(3),TEXT(4) /'  BR','ANCH',' LEA','KAGE'/
       DATA STRTXT(1),STRTXT(2),STRTXT(3),STRTXT(4) /'BRAN','CH F',
      1                                              'LOW ','OUT '/
C      ------------------------------------------------------------------C
         IDBG=0
         IBEGIN=1
C                                                                        C
C        WRITE(*,*) 'DOWN TO BRC1BD'
C                                                                        C
C1 ----ZERO LEAKAGE QUANTITIES
```

Program listing—Continued

```
      DO 80 I=1,NBCH
      NSM1=NSEC(I)-1
      IJ=MAXS-XSKT(I)
      IJFI=MAXS+IJF(I)
      IJTI=MAXS+IJT(I)
      DO 81 J=1,NSM1
      IJ=IJ+1
      IJP1=IJ+1
      QLSUM(IJ)=0.0
      QLSUM(IJP1)=0.0
81    CONTINUE
      QLSUM(IJFI)=0.0
      QLSUM(IJTI)=0.0
80    CONTINUE
C2 ------CALL BRANCH.
C
      IBRPRN=1
      CALL BRCH(INDATA,IZDATA,IQDATA,ITQMAX,ITQMIN,
     1 QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,A,Z,Q,ZP,QP,
     2 AP,BP,RP,B,R,BT,BTP,XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT
     3 ,BETVEL,SUMETA,SUMCZQ,SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     4 QA,TA,ETA,FUNETA,ROW,AM,BMX,BRNAME,IJF,IJT,NSEC,XSKT,
     5 PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ITYPE,IBJNC,NDATA,IZQBVE,
     6 ISTATN,KTTDBC,ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,LARBPR,ZHIGH,
     7 ZLOW,LINPRT,ARBERR,CLK,ZBOT,
     8 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     9 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,WINDSP,WINDDR,
     & IDX,ICT,W,U,UU,BU,BUU,ZSAV,QSAV,ZPSAV,QPSAV,NELAP,IOUT,
     & NTSAQ,HOLD,HNEW,IBOUND,NCOL,NROW,NLAY,ISTRM,ZPL,IBEGIN,
     & IBRPRN,ZN,ISS,QLSUM,ITRIAL,DCFM)
C                                                                       C
C3 ------DETERMINE LAYER, ROW, COLUMN OF EACH REACH.
      DCFM1=DCFM
      RATIN=0
      RATOUT=0
      DO 500 I=1,NBCH
      NSM1=NSEC(I)-1
      L=MAXS-XSKT(I)
      DO 501 J=1,NSM1
      L=L+1
      IF(ISTRM(3,L).LT.0) GO TO 501
      IC=ISTRM(1,L)
      IR=ISTRM(2,L)
      IL=ISTRM(3,L)
C                                                                       C
C4 ----CALCULATE LEAKAGE RATE                                           C
C
C4A ----IF NTSAQ=1, LEAKAGE RATE IS CALCULATED IMPLICITLY
      IF(NTSAQ.EQ.1) THEN
      DXL=DX(L)
      HSTR=ZN(L)+ZDATUM
      PERIM=BP(L)
      CSTR=CLK(L)*PERIM*DXL*TFCTR
      HAQ=HNEW(IC,IR,IL)
      BOT=ZBOT(L)
      IF(HAQ.GT.BOT) THEN
        FLOBOT=0.5*CSTR*(HSTR-HAQ)
      ELSE
        FLOBOT=0.5*CSTR*(HSTR-BOT)
      END IF
```

Program listing—Continued

```
      HSTR=ZN(L+1)+ZDATUM
      PERIM=BP(L+1)
      CSTR=CLK(L)*PERIM*DXL*TFCTR
      BOT=ZBOT(L+1)
      IF(HAQ.GT.BOT) THEN
        FLOBOT=FLOBOT+0.5*CSTR*(HSTR-HAQ)
      ELSE
        FLOBOT=FLOBOT+0.5*CSTR*(HSTR-BOT)
      END IF
      ELSE
C4B ---IF NTSAQ>1, THE LEAKAGE RATE IS TAKEN FROM BRANCH
        FLOBOT=QLSUM(L)*TFCTR
      ENDIF
C                                                                      C
C5 ----STORE STREAM INFLOW, OUTFLOW AND LEAKAGE FOR EACH REACH.         C
      SLKG(L)=FLOBOT
C                                                                      C
C6 ----IF LEAKAGE FROM STREAMS IS TO BE SAVED THEN ADD RATE TO BUFFER.
      IF(IBD.EQ.1) BUFF(IC,IR,IL)=BUFF(IC,IR,IL)+FLOBOT
C                                                                      C
C7 -----SUBTRACT FLOW RATE FROM RATOUT IF AQUIFER DISCHARGES TO STREAM.C
C        OR ADD FLOW RATE TO RATIN IF STREAM DISCHARGES TO AQUIFER.
      IF(FLOBOT.LT. 0.0) RATOUT=RATOUT-FLOBOT
      IF(FLOBOT.GT. 0.0) RATIN=RATIN+FLOBOT
C                                                                      C
      ITRIAL(L,1)=ITRIAL(L,NTSAQ+1)
      DO 1800 ICOT=2,NTSAQ+1
 1800 ITRIAL(L,ICOT)=0
  501 CONTINUE
  500 CONTINUE
C                                                                      C
C8 -----IF BUDGET TERMS WILL BE SAVED THEN WRITE TO DISK.               C
      IF(IBD.EQ.1) CALL UBUDSV(KKSTP,KKPER,TEXT,IMPCB1,BUFF,NCOL,NROW,
     1                          NLAY,IOUT)
C                                                                      C
C9 ------MOVE RATES INTO VBVL FOR PRINTING BY MODULE BAS_OT.            C
  600 VBVL(3,MSUM)=RATIN
      VBVL(4,MSUM)=RATOUT
C                                                                      C
C9A -----MOVE PRODUCT OF RATE AND TIME STEP INTO VBVL ACCUMULATORS.     C
      VBVL(1,MSUM)=VBVL(1,MSUM)+RATIN*DELT
      VBVL(2,MSUM)=VBVL(2,MSUM)+RATOUT*DELT
C                                                                      C
C9B -----MOVE BUDGET TERM LABELS INTO VBNM FOR PRINTING BY BAS_OT.      C
      VBNM(1,MSUM)=TEXT(1)
      VBNM(2,MSUM)=TEXT(2)
      VBNM(3,MSUM)=TEXT(3)
      VBNM(4,MSUM)=TEXT(4)
C                                                                      C
C9C ----INCREASE BUDGET TERM COUNTER BY ONE.                            C
      MSUM=MSUM+1
C                                                                      C
C9D ----RESET IBD COUNTER TO ZERO.                                      C
      IBD=0
      IF((IPTFL2.GT.0).OR.(IHDDFL.LE.0)) GO TO 800
      WRITE(IOUT,710)
  710 FORMAT(1H0,8X,'LAYER',2X,'ROW',1X,'COLUMN',1X,'REACH',1X,
     1'SEGMENT',4X,'AQUIFER HEAD',6X,'STAGE',6X,'LEAKAGE'/)
      DO 750 I=1,NBCH
```

Program listing—Continued

```
      NSM1=NSEC(I)-1
      L=MAXS-XSKT(I)
      DO 751 J=1,NSM1
      L=L+1
      IF(ISTRM(3,L).LT.0) GO TO 751
      IC=ISTRM(1,L)
      IR=ISTRM(2,L)
      IL=ISTRM(3,L)
      HAQ=HNEW(IC,IR,IL)
      STAGE = (ZN(L)+ZN(L+1))/2.+ZDATUM
      WRITE(IOUT,775)IL,IR,IC,I,J,HAQ,STAGE,SLKG(L)
  775 FORMAT(1X,5X,5I6,8X,F11.4,1X,F12.4,4X,F9.2)
  751 CONTINUE
  750 CONTINUE
  800 CONTINUE
      NELAP=NELAP+1
C                                                                   C
C10-----RETURN.                                                     C
      RETURN
      END
```

LIST OF VARIABLES

(Variables specific to original BRANCH code are not referenced)

Variable	Range	Definition
BOT	Module	Local variable for channel bottom elevation.
BUFF (NCOL, NROW, NLAY)	Global	Buffer used to accumulate information before sending it to a disk file.
CLK (MAXS)	Package	Value of *K'/b'* (leakage coefficient).
CSTR	Module	Local variable for *K'/b'* • *B* • *L* • TFCTR.
DCFM	Package	Multiplier for the friction term in the momentum equation when the channel runs dry.
DELT	Global	Time-step length in MODFLOW.
DH	Module	Difference in stage between the last two MODBRANCH iterations.
DHMAX	Module	Absolute value of DHSIGN.
DHSIGN	Module	Maximum difference in stage between the last two MODBRANCH iterations.
DXL	Module	Local variable for segment length.
FLOBOT	Module	Leakage rate between BRANCH and MODFLOW.
HAQ	Module	Aquifer head at upstream node at beginning of BRANCH time interval.
HNEW (NCOL, NROW, NLAY)	Global	Aquifer head at end of MODFLOW time step.
HOLD (NCOL, NROW, NLAY)	Global	Aquifer head at beginning of MODFLOW time step.
HSTR	Module	Local variable for stage in the channel.
IBEGIN	Package	Flag indicating if BRANCH' is being called for the first time (0, first time; 1, not first time).

LIST OF VARIABLES —Continued

(Variables specific to original BRANCH code are not referenced)

Variable	Range	Definition
IBOUND (NCOL, NROW, NLAY)	Global	Status of each cell (<0 is constant head cell, = 0 is inactive cell, >0 is variable head cell).
IBRPRN	Package	Flag indicating if BRANCH' is being called from the formulation or budget package (0, formulation; 1, budget).
IOUT	Package	FORTRAN unit number for printed output.
ISS	Global	Flag indicating steady-state simulation (0, not steady state; 1, steady state).
ISTRM (3, MAXS)	Package	Vector describing row, column, and layer of aquifer model that corresponds to channel segment.
ITRIAL (MAXS), MAXCZQ)	Package	Flag indicating the wet-dry condition of a channel reach and the relative position of the surrounding aquifer to the riverbed by a two-digit number. For first digit, 0 is reach wet, 1 is upstream node dry, 2 is downstream node dry, and 3 to 8 are both nodes dry with successively high frictional resistance. For second digit, 0 is aquifer above riverbed at both nodes, 1 is aquifer below riverbed at upstream node, 2 is aquifer below riverbed at downstream node, and 3 is aquifer below riverbed at both nodes.
KDAS	Package	Saved value of day.
KHRS	Package	Saved value of hour.
KKITER	Global	MODFLOW iteration number.

LIST OF VARIABLES —Continued

(Variables specific to original BRANCH code are not referenced)

Variable	Range	Definition
KKPER	Global	MODFLOW stress-period number.
KKSTP	Global	MODFLOW time-step number.
KMNS	Package	Saved value of minute.
KMOS	Package	Saved value of month.
KYRS	Package	Saved value of year.
MAXCZQ	Package	Maximum number of daily computed results held in storage for plotting purposes.
MAXMZQ	Package	Maximum number of measured data held in storage for plotting purposes.
MAXQBD	Package	Maximum number of discharge boundary value data held in storage for computation.
MAXS	Package	Maximum number of cross sections in the entire channel network.
MAXZBD	Package	Maximum number of stage boundary value data held in storage for computation.
MSUM	Global	Counter for budget entries and labels into VBVL and VBNM.
MXBH	Package	Maximum number of branches in the network.
MXJN	Package	Maximum number of junctions in the network.
MXMD	Package	Maximum number of measured data locations accommodated in the network.
MXPT	Package	Maximum number of points used to define a cross section.
MXTDBC	Package	Maximum number of boundaries in the network.
MXWIND	Package	Maximum number of wind data points input.
NCOL	Global	Maximum number of MODFLOW aquifer columns.
NELAP	Package	Number of elapsed MODFLOW time steps since beginning of simulation.
NLAY	Global	Maximum number of MODFLOW aquifer layers.
NROW	Global	Maximum number of MODFLOW aquifer rows.
NSEC	Package	Maximum cross sections per branch.
NTSAQ	Package	Number of BRANCH' time intervals in one MODFLOW time step.
PERIM	Module	Local variable for channel wetted perimeter.
QLSUM (MAXS)	Package	Average leakage rate out of a river segment over one MODFLOW time step.
QPSAV (MAXS)	Package	Value of discharge at end of first BRANCH' time interval after beginning of a MODFLOW time step.
QSAV (MAXS)	Package	Value of discharge at beginning of first BRANCH' time interval in a MODFLOW time step.
RATIN	Package	Flow rate from channel to aquifer.
RATOUT	Package	Flow rate from aquifer to channel.
SLKG (MAXS)	Package	Vector of leakage rates.
STAGE	Module	Average stage in channel segment.
TEXT	Module	Label to be recorded with leakage into or out of aquifer model cells from channel.
TFCTR	Module	Number of seconds in one time unit in MODFLOW.
VBNM (4,20)	Global	Labels for entries in volumetric budget.
VBVL (4,20)	Global	Entries for the volumetric budget.
ZBOT (MAXS)	Module	Elevation of channel bottom.
ZN (MAXS)	Module	Value of stage at end of final BRANCH' time interval in a MODFLOW time step.
ZPL (MAXS)	Module	Value of stage at end of final BRANCH' time interval in a MODFLOW time step for previous trial.
ZPSAV (MAXS)	Module	Value of stage at end of first BRANCH' time interval after beginning of a MODFLOW time step.
ZSAV (MAXS)	Module	Value of stage at beginning of first BRANCH' time interval after beginning of a MODFLOW time step.

MODEL BRANCH'

The BRANCH' model (or submodule called by a MODBRANCH module) simulates the unsteady flow in networks of reaches composed of interconnecting channels with leakage to the aquifer. It is the computation section of the BRANCH model. The BRANCH' model was modified to (1) equate the BRANCH' calculations with the time sequence in MODFLOW, (2) allow an iterative solution between MODFLOW and BRANCH', (3) model the effects of riverbed leakage to and from the aquifer, (4) allow the channel to run dry, (5) implement an alternate steady-state solution, and (6) pass leakage information back to MODFLOW.

This module is called either by BRC1FM when working out the iterative solution between MODFLOW and BRANCH' or by BRC1BD when an iterative solution has been completed for a MODFLOW time step and a printout

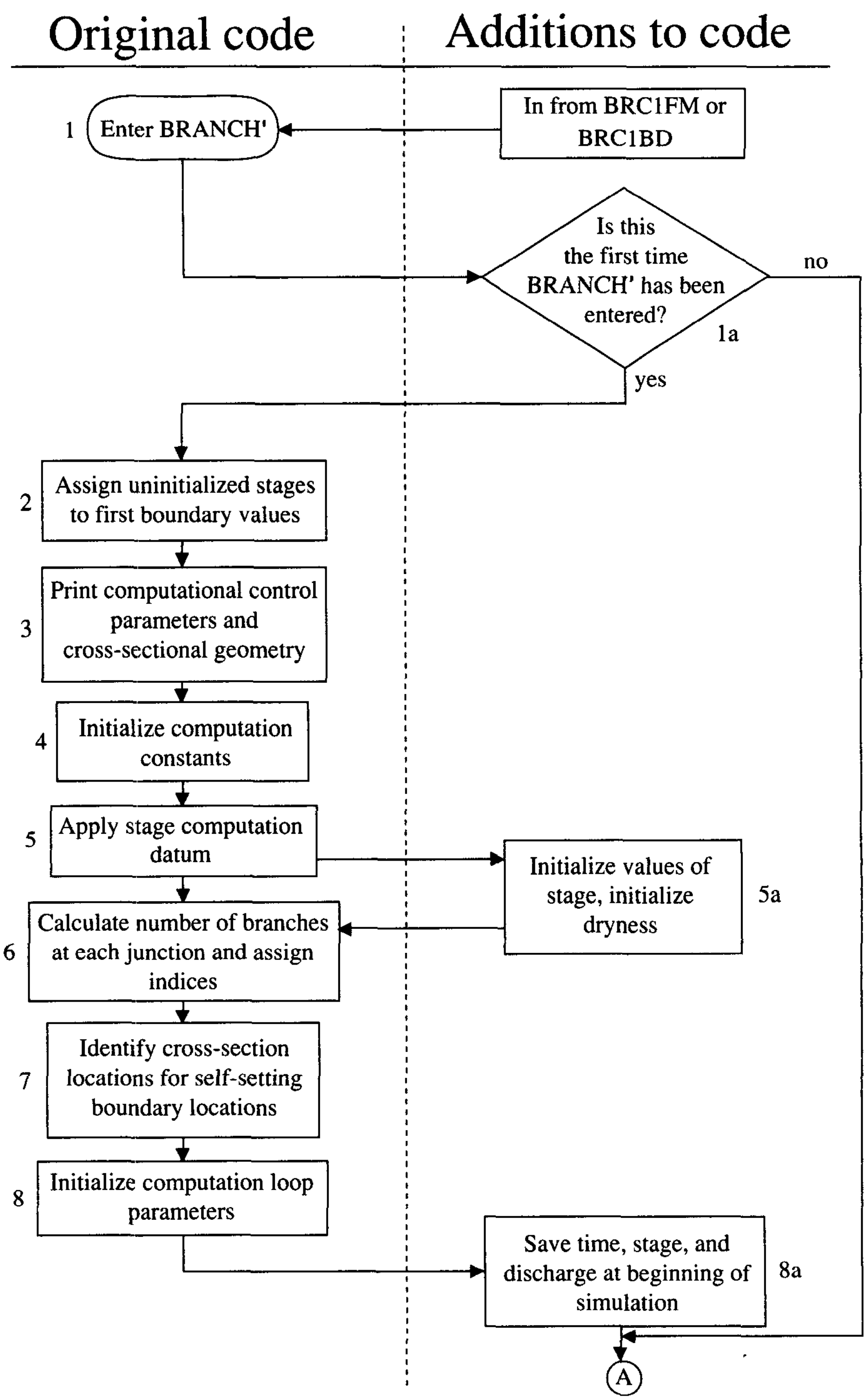

Figure 10. Flowchart of modified BRANCH'.

and budget calculation are needed. The numbered sections in the narrative correspond to the numbered steps in the flowchart for BRANCH' in figure 10. The flowchart is divided with the original code to the left of the dotted line and the modifications made to interface with MODFLOW to the right. The modifications are signified by a number and letter (the original code by a number only). More details are presented in this report for the modifications than for the original code, which is described by Schaffranek and others (1981).

NARRATIVE

1. Enter BRANCH'. Upon entry, the statement function that locates elements in the coefficient matrix is set, the

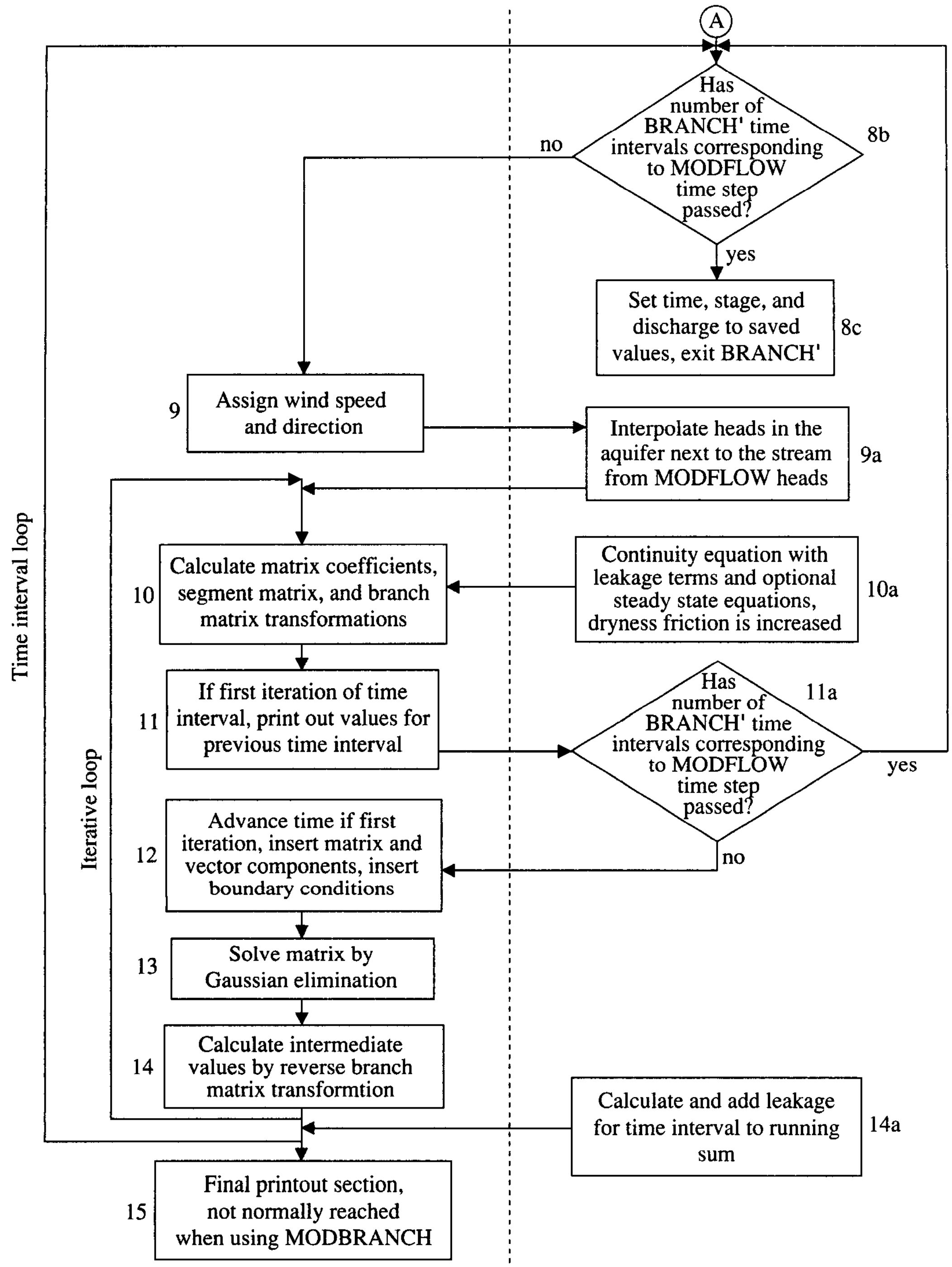

Figure 10. Continued.

MODFLOW and BRANCH' print devices are made equivalent, and the counter of BRANCH' time intervals elapsed within the MODFLOW time step (one count) is initialized.

1a. If this is not the first time interval, skip initialization. The following initialization steps (2–8a) are necessary once at the beginning of the simulation. Thus, if the initial flag is set (IBEGIN=1), steps 2 through 8a are skipped.

2. Assign uninitialized stage values to first boundary values. If the initial stages at the boundary nodes are not given values, their values are set to the first boundary value data point for the corresponding node.

3. Print computational-control parameter table and cross-section geometry data. The input data are written to the output file, and the Courant numbers and computational datum are calculated.
4. Initialize computation constants. The wind speed and Manning's n are adjusted for inch-pound or metric units. The number of BRANCH' time intervals per day are calculated, and various multiples of the weighting factors and gravitational acceleration commonly used are calculated.
5. Apply stage computation datum. The stage computation datum (ZDATUM), which adjusts stages so they all have lower absolute values in the computations, is applied to all stages and to the cross-sectional geometry data.

5a. Initialize stage values. Initialize dryness array (ITRIAL). Within the loop in step 5, the values of stages in BRANCH' for the end of the previous MODFLOW time step (ZPL [node number]) and this MODFLOW time step (ZN [node number]) are initialized to the initial values of stage in BRANCH' at the beginning of the simulation. The array of time-specified channel dryness flags (ITRIAL [node number, time-step number]) is also set to zero values (totally wet).

6. Calculate number of branches at each junction and assign indices. Indices are assigned to properly define the continuity of flows from all branches that meet at a junction.
7. Identify cross-section locations for self-setting boundary conditions. The self-setting boundary conditions (approximations of free outflows) are located.
8. Initialize computation loop parameters. The initial time counter, number of days in February (depends on leap year) matrix solution counter, and several other counters are initialized.

8a. Save time, stage, and discharge at beginning of simulation. The initial values of year, month, day, hour, minute, stages, and discharges are saved in the variables KYRS, KMOS, KDAS, KHRS, KMNS, ZSAV (node number), ZPSAV (node number), QSAV (node number), and QPSAV (node number).

8b. Check if the number of BRANCH' time intervals corresponding to the single MODFLOW time step has passed. If so, step 8c is executed. If not, the algorithm proceeds to step 9.

8c. If the solution has not converged between MODFLOW and BRANCH', the time, stage, and discharge values are reset to saved values, and BRANCH' is exited. If the solution has converged, BRANCH' is exited without resetting values. An expansion of sections 8b and 8c is shown in figure 11. The following lettered steps (a–i) correspond to the flowchart shown in figure 11.

(a) Advance the time-interval counter by one.

(b) If the time-interval counter is equal to the number of elapsed MODFLOW time steps (NELAP), multiplied by the number of BRANCH' time intervals (NTSAQ), plus 2, the preparations for exiting the BRANCH' model (steps c–i) are made. The term "plus 2" occurs because the time-interval loop must pass one extra time to print the last time-interval data and the counter adds one more in step a, making the counter equal to 2 more than

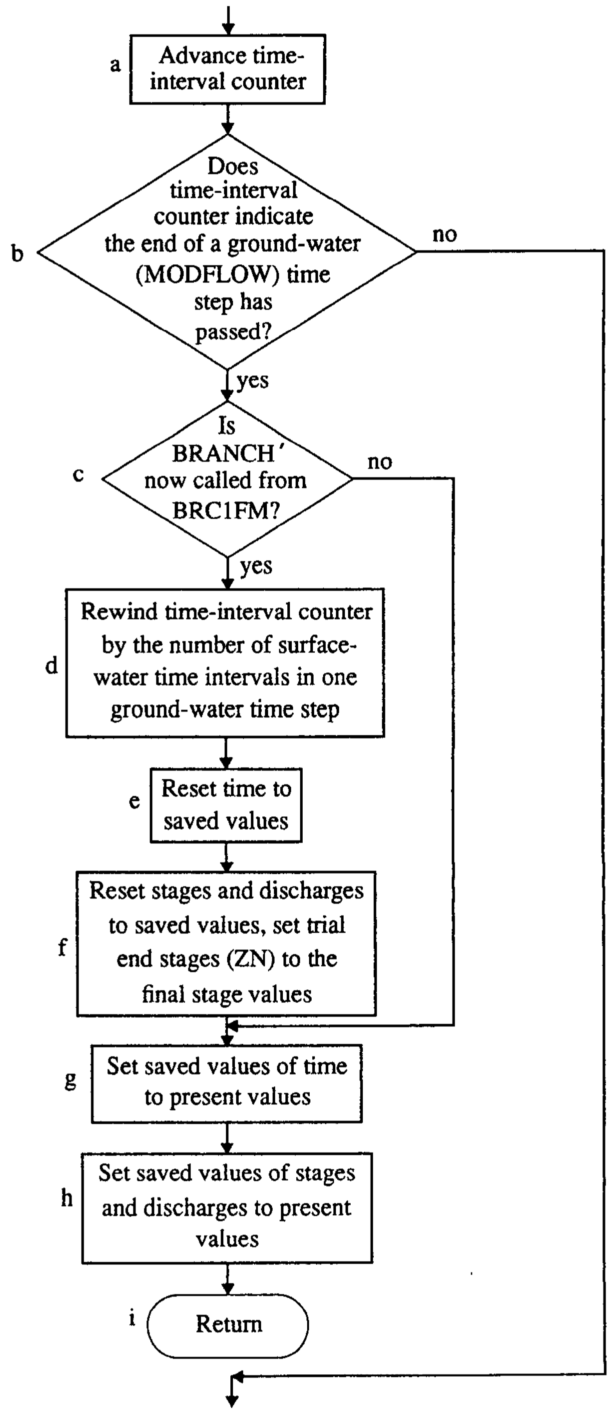

Figure 11. Expanded flowchart of step 8b in BRANCH'.

NELAP times NTSAQ. If the time-interval counter is not equal to NELAPxNTSAQ+2, the rest of section 8b (steps c–i) is skipped and step 9 is executed.

(c) If BRANCH' is being called from the formulation module (IBRPRN=0), it is assumed that the models have not converged for the MODFLOW time steps, and steps d to f are implemented to rewind the clock and repeat the calculations for the next trial. If BRANCH' is being called from the budget module (IBRPRN=1), the models have converged and steps d to f are skipped.

(d) The time-interval counter (M) is reduced by NTSAQ.

(e) The date and time (KYR, KMO, KDA, KHR, and KMN) are assigned to the saved values (KYRS, KMOS, KDAS, KHRS, and KMNS).

(f) The values of stage at the end of the trial (ZN [node number]) are assigned to the final stages (ZP [node number]). The stages and discharges are assigned to the saved values.

(g) The saved values of date and time are assigned to the present values.

(h) The saved values of stages and discharges are assigned to the present values.

(i) Return to calling module (BRC1FM or BRC1BD).

9. Assign wind speed and direction. After advancing the counter of BRANCH' time intervals within the MODFLOW time step (ICOUNT) and printing date and time if call is made from the budget module, the wind speed and direction are linearly interpolated from the time-dependent wind data. In preparation for the next time interval, the starting values of stage and time are set to the final values of the previous time interval. Average values of topwidth, area, hydraulic radius, discharge, stage, and momentum coefficient are calculated.

9a. Interpolate head in aquifer next to stream from MODFLOW heads. The heads in the aquifer at the beginning and end of the BRANCH' time interval (HAQ and HAQP) are linearly interpolated, using ICOUNT, from the aquifer heads at the beginning and end of the MODFLOW time step (HOLD and HNEW). If the river segment crosses an inactive aquifer model cell (IBOUND=0), the leakage coefficient for the segment is set to zero. If the aquifer at a river node at a specific time drops below the river bottom, the aquifer head, for the purpose of leakage, is set to the river bottom. If both aquifer and river stage drop below the river bottom at the present time (beginning of time interval), the leakage coefficient is temporarily set to zero (dry channel).

10. Calculate matrix coefficients, segment matrix, and branch matrix coefficients. This procedure is described by Schaffranek and others (1981). In short, the coefficients in the matrix form of the channel flow equation 7 are calculated, the branch-transformation process is implemented, and the coefficient positions are located.

10a. Continuity equation is arranged with leakage terms, and if steady-state conditions are simulated, without time-dependent terms. Dryness friction is increased. These modifications are placed directly into step 10 and basically implement the three major options added to the model. The inclusion of leakage terms in the continuity equation and the steady-state form of the equations are described in the formulation section of this report. The steady-state flag (ISS) is checked, and if MODFLOW is running in steady state, the steady-state forms of the continuity and momentum equations are used. The flag that signifies the dryness of a channel in previous trials (ITRIAL [segment number, time-interval number]) is checked. Based on the information in ITRIAL, the friction term (σ from Schaffranek and others, 1981) is multiplied by the appropriate fraction of DCFM to increase the dryness friction. If ITRIAL indicates a channel node dry and the aquifer below the riverbed, the leakage coefficient is set to zero at the node.

11. If first iteration of time interval, print values for previous time interval. If the iteration loop is on its first iteration and IPRPRN=1, the subroutine DTOUT is called to print discharges, velocities, stages, areas, topwidths, and Manning's n values at all nodes. This position for the printout of results from the last time interval was retained from the original code. (Setting the value of IPROPT in the computation control record to 3 will cause the values only to be printed for the last BRANCH time interval in a MODFLOW time step.)

11a. If number of BRANCH' time intervals corresponding to the MODFLOW time step has passed, go to beginning of the computation loop (step 8b). This allows the printout of the last time interval (step 11), but the next set of calculations (steps 12–14) does not occur unless further BRANCH' time intervals occur before the end of the MODFLOW time step.

12. Advance time if first BRANCH' iteration, insert matrix and vector components, and insert boundary conditions. The time is advanced by one BRANCH' time interval. The BRANCH' matrices calculated in step 10 are placed in the solution matrix. The right-hand side vector components are also put in position. For junctions, discharge continuity and stage compatibility conditions are created. Boundary conditions are calculated from the boundary-condition equation, parabolically interpolated from boundary-value data, or established by the self-setting stage or discharge boundary conditions.

13. Solve matrix by Gaussian elimination. The BRANCH' subroutine GEMXP solves the matrix of linear equations.

14. Calculate intermediate values by reverse branch matrix transformation. The values of stage and discharge at cross sections in the branch are calculated by reversing the branch matrix transformation in step 10. If solution for the BRANCH' time interval has not converged, go back to the beginning of the iterative loop. The largest changes in stage and discharge are compared to the convergence criterion to see if the BRANCH' solution has been completed. If not, return to step 10.

14a. Calculate and add leakage rate for time interval to running sum. The leakage rate for the last time interval is divided by NTSAQ and added to the sum (QLSUM [segment number]). Thus, after NTSAQ time intervals have passed (equal to the passage of one MODFLOW time step), QLSUM equals average leakage rate over the MODFLOW time step. After this, return to step 8a. Based on the positions of the aquifer heads and channel stages relative to the riverbed and the previous values of ITRIAL, and the variable expressing channel dryness, the values of ITRIAL (segment number, time-interval number) are reset. To avoid dual solution oscillations, the following criteria are followed: for the first five iterations, between BRANCH' and MODFLOW, all solutions of ITRIAL are accepted; from iterations 6 through 30, preference is given to solutions where the aquifer head and river stage are on the same side of the riverbed (above or below) or the river is completely wet; no changes in ITRIAL are made beyond iteration 30.

15. Final printout section is not normally reached when using MODBRANCH. This section from the original BRANCH prints cumulative flows and the final time interval. It is reached when the BRANCH boundary value data are exhausted or the number of time intervals specified in BRANCH is finished. Normally MODFLOW, the driver for BRANCH', controls when the simulation is ended and if step 15 is reached, an error message is printed.

PROGRAM LISTING FOR MODEL BRANCH'

```
      SUBROUTINE BRCH(INDATA,IZDATA,IQDATA,ITQMAX,ITQMIN,
     1 QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,A,Z,Q,ZP,QP,
     2 AP,BP,RP,B,R,BT,BTP,XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT
     3 ,BETVEL,SUMETA,SUMCZQ,SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     4 QA,TA,ETA,FUNETA,ROW,AM,BMX,BRNAME,IJF,IJT,NSEC,XSKT,
     5 PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ITYPE,IBJNC,NDATA,IZQBVE,
     6 ISTATN,KTTDBC,ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,LARBPR,ZHIGH,
     7 ZLOW,LINPRT,ARBERR,CLK,ZBOT,
     8 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     9 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,WINDSP,WINDDR,
     & IDX,ICT,W,U,UU,BU,BUU,ZSAV,QSAV,ZPSAV,QPSAV,NELAP,IOUT,
     & NTSAQ,HOLD,HNEW,IBOUND,NCOL,NROW,NLAY,ISTRM,ZPL,IBEGIN,
     & IBRPRN,ZN,ISS,QLSUM,ITRIAL,DCFM)
C # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
C #    BRANCH-NETWORK FLOW MODEL USING A 4-POINT IMPLICIT TECHNIQUE    #
C #      BY R. W. SCHAFFRANEK, R. A. BALTZER, AND D. E. GOLDBERG       #
C #                         VERSION 91/04/01                           #
C #               BY R. W. SCHAFFRANEK AND R. S. REGAN                 #
C #             MODIFIED BY E. D. SWAIN AND E. J. WEXLER               #
C # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
C #                                                                    #
C #   THIS PROGRAM CALCULATES TRANSIENT FLOW IN A NETWORK OF           #
C #   INTERCONNECTED OPEN CHANNELS.  TIME DERIVATIVES ARE APPROXIMATED#
C #   AS CENTERED IN SPACE AND TIME; SPATIAL DERIVATIVES ARE TREATED   #
C #   AS CENTERED IN SPACE AND WEIGHTED IN TIME ACCORDING TO A USER    #
C #   DEFINED WEIGHTING FACTOR.  A LINEAR MATRIX SOLUTION IS EFFECTED  #
C #   WITH ITERATIVE IMPROVEMENT OF RESULTS OPTIONALLY SPECIFIABLE.    #
C #   THE 4*N BY 4*N MATRIX (N IS THE NUMBER OF BRANCHES) IS SOLVED    #
C #   BY GAUSS ELIMINATION USING MAXIMUM PIVOT STRATEGY. THIS VERSION  #
C #   IS MODIFIED TO INTERFACE WITH THE USGS GROUNDWATER FLOW MODEL    #
C #   MODFLOW, IN ORDER TO SIMULATE STREAM/AQUIFER RELATIONS.          #
C #                                                                    #
C # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
C #                         ARRAY SPECIFICATIONS                       #
C # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
C #                                                                    #
C #   MAXIMUM BRANCHES:   MXBH        MAXIMUM JUNCTIONS:   MXJN        #
C #   X-SECTIONS PER BRANCH: NSEC     SEGMENTS PER BRANCH: NSEG        #
C #   MAX CROSS SECTIONS:   MAXS      MAX POINTS PER X-SECT:  MXPT     #
C #   MAX T.D. BDY LOCATIONS: MXTDBC  MAX MEASURED LOCATIONS: MXMD     #
C #   MAXIMUM Z(T) B.V.D.: MAXZBD     MAXIMUM Q(T) B.V.D.: MAXQBD      #
C #   MAX COMPUTED PER DAY: MAXCZQ    MAX MEASURED DATA: MAXMZQ        #
C #   MAX WIND DATA INPUT: MXWIND                                      #
C #                                                                    #
C #   DIMENSION MAXQBD ONE-HALF OF MAXZBD                              #
C #                                                                    #
C #   DIMENSION DATAI4(MAXCZQ*MAXS/4,4) TO COINCIDE WITH ALLOCATION    #
C #   OF ZQCOMP(MAXCZQ,100) TO WHICH IT IS EQUIVALENCED                #
C #                                                                    #
C # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
C BEGIN COMMON_COMCON ================================================
C
      CHARACTER*2 IUNIT,OUNIT
      INTEGER*4 NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,IPLOPT,IPLDEV,
     1 IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,IRDIC,NUMCOM,INWIND,
     2 TYPETA,OTTDDB,ISMOPT,NTDIOF,IRDNXT,IARDEM
      REAL THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,H2ODEN,CHI,QZCONV,
     1 ZDATUM,DT,G,AIRDEN,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
      COMMON /COMCON/ NBCH,NJNC,NBND,NSTEPS,IRDGEO,NIT,IPROPT,
     1 IPLOPT,IPLDEV,IPRMSG,IPLMSG,IEXOPT,INHR,INMN,IDTM,IWRTIC,
```

Program listing—Continued

```
     2 IRDIC,NUMCOM,INWIND,THETA,QQTOL,ZZTOL,WSPEED,WDIREC,WSDRAG,
     3 H2ODEN,CHI,ZDATUM,IUNIT,OUNIT,TYPETA,OTTDDB,ISMOPT,G,QZCONV,DT,
     4 AIRDEN,IARDEM,NTDIOF,IRDNXT,GLETA,GLBETA,ETAMIN,ETAMAX,TOLERR
C
C  END  COMMON_COMCON =================================================
C BEGIN  COMMON_DTYPES ================================================
C
      CHARACTER*2 DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,DPTYPE
      COMMON /DTYPES/ DTYPE,ZTYPE,QTYPE,ATYPE,BTYPE,ZPTYPE,QPTYPE,
     1 DPTYPE
C
C  END   COMMON_DTYPES ================================================
C BEGIN COMMON_UNITS ==================================================
C
      CHARACTER*2 IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
      COMMON /UNITS/ IBLK,UNIT,EN,ME,MT,FT,TUNIT,DC
C
C  END  COMMON_UNITS ==================================================
C BEGIN COMMON_LUNUMS =================================================
C
      INTEGER*4 READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,LUIVOL,
     1        LUGEOM,LUINIT,LUCVOL
      COMMON /LUNUMS/ READER,PRINTR,PUNCH,DSREF,TDDATA,LUPTRK,LUIFLO,
     1 LUIVOL,LUGEOM,LUINIT,LUCVOL
C
C  END  COMMON_LUNUMS =================================================
C BEGIN COMMON_DADCOM =================================================
C
      INTEGER*2 LISTB,LISTA,STRIP,RTCODE
      COMMON /DADCOM/ LISTB,LISTA,STRIP,RTCODE
C
C  END  COMMON_DADCOM =================================================
C BEGIN COMMON_DAYPMO =================================================
C
      INTEGER*2 DPERM(12)
      COMMON /DAYPMO/ DPERM
C
C  END  COMMON_DAYPMO =================================================
C BEGIN COMMON_LOGICS =================================================
C
      LOGICAL*4 PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
      COMMON /LOGICS/ PRTMSG, NOCONV, ERROR, OPLOTS, FOUND, NOEXTP,
     1 NOPRIT, DAYSUM, MOREBD, DTPRT, PTPLT, DAOPEN, STAGES, MODETA
C
C  END  COMMON_LOGICS =================================================
C BEGIN COMMON_BCTIME =================================================
C
      INTEGER*4 IETIME,NETIME
      INTEGER *2 IRDPDY,IYR,IMO,IDA,IHR,IMN,NYR,NMO,NDA,NHR,NMN
      COMMON /BCTIME/ IETIME,NETIME,IRDPDY,IYR,IMO,IDA,IHR,IMN,
     1                                      NYR,NMO,NDA,NHR,NMN
C
C  END  COMMON_BCTIME =================================================
C BEGIN COMMON_DATIME =================================================
C
      INTEGER*4 KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
      COMMON /DATIME/ KYR,KMO,KDA,KHR,KMN,M,KYRS,KMOS,KDAS,KHRS,KMNS
C
C  END  COMMON_DATIME =================================================
```

Program Listing—Continued

```
C BEGIN COMMON_NETWRK =================================================
C
      CHARACTER*80 NETNAM
      COMMON /NETWRK/ NETNAM
C
C  END  COMMON_NETWRK =================================================
C BEGIN COMMON_MODBRCH ================================================
C
      COMMON /MODBRCH/ TWOCSQ,IDTPDY,TWOG,CW,II,ONECHI,DCHI,DTHETA,
     1                           IBCH,IJZPBC,IJQPBC,DCFM1,KKITER
C
C  END  COMMON_MODBRCH ================================================
      INTEGER*4 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT
      INTEGER*4 ITQMAX(MAXS), ITQMIN(MAXS),ISTRM(3,MAXS),ITRIAL(MAXS,
     1 MAXCZQ)
      REAL QMAX(MAXS), QMIN(MAXS), QSUM(MAXS), ZQMIN(MAXS), ZQMAX(MAXS),
     1     AQMAX(MAXS), AQMIN(MAXS)
      REAL A(MAXS),Z(MAXS),Q(MAXS),ZP(MAXS),QP(MAXS),AP(MAXS),
     1 BP(MAXS),RP(MAXS),B(MAXS),R(MAXS),BT(MAXS),BTP(MAXS),
     2 ZSAV(MAXS),QSAV(MAXS),ZPSAV(MAXS),QPSAV(MAXS),ZPL(MAXS),
     3 ZN(MAXS)
      INTEGER*4 XSTATN(MAXS)
      REAL DX(MAXS), T(MAXS), RN(4,MAXS), WANGLE(MAXS), GDATUM(MAXS),
     1 ORIENT(MAXS), BETVEL(MAXS), SUMETA(MAXS), SUMCZQ(MAXS),
     2 SCZQSQ(MAXS),SZQETA(MAXS)
      CHARACTER*4 ITYPEO(4,MAXS)
      INTEGER*4 IPT(MAXS)
      REAL ZA(MXPT,MAXS), AA(MXPT,MAXS), BB(MXPT,MAXS), BS(MXPT,MAXS)
      REAL QA(MXPT,MAXS), TA(MXPT,MAXS), ETA(MXPT,MAXS),
     1 FUNETA(MXPT,MAXS)
      INTEGER*4 ROW(4*MXBH)
      REAL*4 AM((4*MXBH)**2),BMX(4*MXBH)
      CHARACTER*40 BRNAME(MXBH)
      INTEGER*4 IJF(MXBH),IJT(MXBH),NSEC(MXBH),XSKT(MXBH),
     1 PLTBCH(MXBH),PRTXSG(MXBH),PRTBCH(MXBH),PRTSUM(MXBH),PPLTBH(MXBH)
      CHARACTER*4 ITYPE(MXJN)
      INTEGER*4 IBJNC(MXJN),NDATA(MXJN),IZQBVE(MXJN)
      INTEGER*4 ISTATN(MXJN),KTTDBC
      REAL ZQ(MAXZBD,MXTDBC),DTT(MXJN),DATUM(MXJN),ZQBVCO(4,MXJN),
     1 ZQPMIN(MXJN)
      LOGICAL*4 LARBPR(MAXS),ZHIGH(MAXS),ZLOW(MAXS),LINPRT(MAXS),ARBERR
      INTEGER*4 IZDATA(MAXZBD)
      INTEGER*4 IQDATA(MAXQBD),INDATA(MAXQBD)
C     EQUIVALENCE (INDATA(1),IQDATA(1),IZDATA(1))
      REAL CLK(MAXS),ZBOT(MAXS)
      REAL WINDSP( MXWIND),WINDDR( MXWIND)
      INTEGER*4 IDX(MXJN,MXBH), ICT(MXJN)
      REAL W(MXJN)
      REAL*8 U(2*MAXS), UU(4*MAXS), BU(2*MXBH),BUU(4*MXBH)
      REAL*8 C1, C2, C3, C4, UUIJP1, UUIJP2, UUIJP3, UUIJP4
      REAL LAMBDA,MU,SETA,WDTT,TWOCSQ,TWOG,CW,ONECHI,DCHI,DTHETA,TH,WIND
      INTEGER*4 IAR,I,J,K,L,II,IJ,NS,KT,IS,N,NWREAD,NWDATA,INTDBC,IDTPDY
      REAL QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      COMMON /LIMITS/ QTOL,ZTMIN,ZTMAX,ZPMIN,QPMIN,DXMIN,DXMAX
      INTEGER*2 JYR,JMO,JDA,JHR,JMN,MYR,MMO,MDA,MHR,MMN
      INTEGER*4 ND,NDFIRT,NDPART,JETIME,NTSAQ
      COMMON /PARTIM/ ND,NDFIRT,NDPART,JETIME,JYR,JMO,JDA,JHR,JMN,
     1MYR,MMO,MDA,MHR,MMN
      CHARACTER*80 COMENT(9)
```

Program Listing—Continued

```
      COMMON /CMMNT/ COMENT
      CHARACTER*2 IDETA(7)
      COMMON /ETASYM/ IDETA
      REAL WRATIO,DTZERO,ZTEMP,QTEMP,ZIJ,QIJ,DXIJ,QIJP1,ZIJP1,APZPIJ,
     1     BPZPIJ,BTZPIJ,RPZPIJ,BAVG,BTAVG,AAVG,RAVG,QAVG,ZAVG,BETCOR,
     2     RNIJ,AAVGSQ,AAVGCU,SIGMA,EPSLON,ZETA,OMEGA,GAMMA,DELTA,DET,
     3 DZDT,DQDXC,DQDT,DQDXM,DADX,DZDX,FRIC,ZQPIJ,BIGQ,BIGZ,ZTOL,SOLPDT
     4 ,ALPHA
      INTEGER*4 IBCH,IJZPBC,IJQPBC,KTMATS,LASTN,IJP1,NSM1,JP1,IJ2,IJ4,
     1  IJ4P1,IJ4P2,IJ4P3,IJ4P4,IJ2P1,IJ2P2,I2,I4,I4P1,I4P2,I4P3,I4P4,
     2  I2P1,I2P2,NN,MM,NNN,NBPJ,M0,IBIGZ,JBIGZ,IBIGQ,JBIGQ,IJPNS,ICHK
      DOUBLE PRECISION HNEW
      DIMENSION HNEW(NCOL,NROW,NLAY),HOLD(NCOL,NROW,NLAY),
     2          IBOUND(NCOL,NROW,NLAY),QLSUM(MAXS+MXJN)
C1----STATEMENT FUNCTION FOR LOCATING ELEMENTS IN COEFFICIENT MATRIX
      IAR(I,J,II)=I+II*(J-1)
      PRINTR=IOUT
      ICOUNT=0
C
C1A---IF THIS IS NOT THE FIRST TIMESTEP, SKIP INITIALIZATIONS.
C
      IF(IBEGIN.EQ.1) GO TO 1700
C
C2----ASSIGN UNINITIALIZED STAGE VALUE AT BOUNDARY-VALUE-DATA LOCATION
C     TO FIRST STAGE VALUE OF BOUNDARY-VALUE-DATA INPUT.
C
  640 DO 695 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 690 J=1,NS
      IJ=IJ+1
      IF (Z(IJ).NE.0.0) GO TO 690
      IF (J.NE.1.AND.J.NE.NS) GO TO 680
      FOUND=.FALSE.
      INTDBC=0
      DO 670 L=1,NBND
      IF (IBJNC(L).LE.0) GO TO 670
      IF (IZQBVE(L).EQ.1) GO TO 670
      IF (ITYPE(L).EQ.ZPTYPE.OR.ITYPE(L).EQ.QPTYPE) GO TO 670
      INTDBC=INTDBC+1
      IF (ITYPE(L).NE.ZTYPE) GO TO 670
      IF (J.EQ.NS) GO TO 650
      IF (IBJNC(L).EQ.IJF(I)) GO TO 660
      GO TO 670
  650 IF (IBJNC(L).NE.IJT(I)) GO TO 670
  660 FOUND=.TRUE.
      Z(IJ)=ZQ(1,INTDBC)+ZDATUM
      ZP(IJ)=Z(IJ)
      CALL ARB(ZP(IJ),I,J,M,AP(IJ),BP(IJ),BTP(IJ),RP(IJ),
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ZA,AA,BB,BS,IPT,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR)
      IF (ARBERR) THEN
         WRITE (*,2050) I,J
         RETURN
      ENDIF
  670 CONTINUE
```

Program Listing—Continued

```
      IF (FOUND) GO TO 690
  680 ERROR=.TRUE.
      WRITE (*,1920) I,J
  690 CONTINUE
  695 CONTINUE
      IF (ERROR) RETURN
      DCFM1=DCFM
C
C3----PRINT COMPUTATION-CONTROL PARAMETER TABLE AND CROSS-SECTION
C     GEOMETRY DATA
C
      DT=IDTM*60.
      CALL PRTBXS(NWREAD,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     3 A,Z,Q,ZP,QP,AP,BP,RP,B,R,BT,BTP,
     & XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT,BETVEL,SUMETA,SUMCZQ,
     & SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     & QA,TA,ETA,FUNETA,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR,
     & ITYPE,IBJNC,NDATA,IZQBVE,ISTATN,
     & ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,KTTDBC,IOUT)
C
C4----INITIALIZE COMPUTATION CONSTANTS
C
      IF (IUNIT.NE.EN) THEN
         WSPEED=WSPEED*1000./3600.
         TWOCSQ=2.0
      ELSE
         WSPEED=WSPEED*5280./3600.
         TWOCSQ=2.0*1.486*1.486
      ENDIF
      IF(IDTM.LE.1440) THEN
      IDTPDY=1440/IDTM
      ELSE
      IDTPDY=1
      ENDIF
      TWOG=2.0*G
      CW=WSDRAG*AIRDEN/(H2ODEN*G)*WSPEED*WSPEED
      II=4*NBCH
      ONECHI=1.0-CHI
      DCHI=ONECHI/CHI
      DTHETA=(1.0-THETA)/THETA
C
C5----APPLY STAGE COMPUTATION DATUM
C
C     IF (ZDATUM.EQ.0.0) GO TO 790
      DO 785 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 784 J=1,NS
      IJ=IJ+1
      Z(IJ)=Z(IJ)-ZDATUM
      ZP(IJ)=Z(IJ)
C
C5A---INITIALIZE VALUES OF STAGE AT THE END OF LAST TRIAL
C     AND THIS TIMESTEP, INITIALIZE ITRIAL
C
```

Program Listing—Continued

```
      ZPL(IJ)=ZP(IJ)
      ZN(IJ)=ZP(IJ)
      ND=IPT(IJ)
      DO 780 K=1,ND
  780 ZA(K,IJ)=ZA(K,IJ)-ZDATUM
      DO 1800 ICOT=1,NTSAQ+1
1800  ITRIAL(IJ,ICOT)=0
  784 CONTINUE
  785 CONTINUE
C
C6----CALCULATE NUMBER OF BRANCHES AT EACH JUNCTION AND ASSIGN INDICES
C
  790 DO 815 J=1,NJNC
      ICT(J)=0
      DO 810 I=1,NBCH
      IF (IJF(I).NE.J) GO TO 800
      ICT(J)=ICT(J)+1
      IDX(J,ICT(J))=-I
  800 IF (IJT(I).NE.J) GO TO 810
      ICT(J)=ICT(J)+1
      IDX(J,ICT(J))=I
  810 CONTINUE
  815 CONTINUE
C
C7----IDENTIFY CROSS-SECTION LOCATIONS FOR SELF-SETTING BOUNDARY COND.
C
C     IN THIS APPROXIMATION, THE WATER DEPTH (OR DISCHARGE) AT THE
C     SPECIFIED EXTERNAL BOUNDARY-CONDITION JUNCTION FOR THE PRESENT
C     TIME STEP WILL BE EQUATED TO THE WATER DEPTH (OR DISCHARGE)
C     COMPUTED DURING THE PREVIOUS TIME STEP AT THE NEAREST NEIGHBORING
C     UPSTREAM (IF EXTERNAL JUNCTION ENDS THE BRANCH) OR DOWNSTREAM
C     (IF EXTERNAL JUNCTION BEGINS THE BRANCH) CROSS SECTION.  AS A
C     SPECIAL CASE, A MINIMUM WATER DEPTH (OR DISCHARGE) CAN BE
C     SPECIFIED BELOW WHICH THE WATER DEPTH (OR DISCHARGE) WILL NOT BE
C     PERMITTED TO DROP, THEREBY SIMULATING A SUBMERGED WIER (OR GATE)
C     CONDITION.
C
      DO 820 L=1,NBND
      IBCH=IDX(IBJNC(L),1)
      IF (ITYPE(L).NE.ZPTYPE.AND.ITYPE(L).NE.DPTYPE) GO TO 816
      IF (IBCH.LT.0) THEN
         IJZPBC=MAXS-XSKT(IABS(IBCH))+2
      ELSE
         IJZPBC=MAXS-XSKT(IBCH)+NSEC(IBCH)-1
      ENDIF
      GO TO 820
  816 IF (ITYPE(L).NE.QPTYPE) GO TO 820
      IF (IBCH.LT.0) THEN
         IJQPBC=MAXS-XSKT(IABS(IBCH))+2
      ELSE
         IJQPBC=MAXS-XSKT(IBCH)+NSEC(IBCH)-1
      ENDIF
  820 CONTINUE
      IBEGIN=1
C
C8----INITIIALIZE COMPUTATION LOOP PARAMETERS
C
      LETIME=IETIME
      IF (PTPLT) THEN
         KT=0
```

Program Listing—Continued

```
      ELSE
         KT=(INHR*60+INMN-1)/IDTM
      ENDIF
      CALL GEMXP(II,IS,ICHK,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ROW,AM,BMX,XSKT)
      DPERM(2)=28+(4-MOD(KYR,4))/4
      KTMATS=0
      ND=1
      N=0
C8A---THE TIME, STAGE, AND DISCHARGE VALUES AT THE BEGINNING
C     OF THE SET OF TIMESTEPS ARE SAVED FOR REITERATION.
C
      M=0
      KYRS=KYR
      KMOS=KMO
      KDAS=KDA
      KHRS=KHR
      KMNS=KMN
      DO 1985 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 1984 J=1,NS
      IJ=IJ+1
      ZSAV(IJ)=Z(IJ)
      ZPSAV(IJ)=ZP(IJ)
      QSAV(IJ)=Q(IJ)
      QPSAV(IJ)=QP(IJ)
 1984 CONTINUE
 1985 CONTINUE
C
C     BEGIN COMPUTATION LOOP
C
 1700 CONTINUE
      M=M+1
C
C8B---IF REITERATION IS NECESSARY, TIME, STAGE, AND DISCHARGE VALUES
C     ARE REINITIALIZED TO THE PREVIOUS VALUES
C
      IF(M.EQ.NELAP*NTSAQ+2) THEN
      IF (IBRPRN.EQ.0) THEN
      M=M-NTSAQ
      KYR=KYRS
      KMO=KMOS
      KDA=KDAS
      KHR=KHRS
      KMN=KMNS
      DO 1885 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 1884 J=1,NS
      IJ=IJ+1
      ZN(IJ)=ZP(IJ)
      Z(IJ)=ZSAV(IJ)
      ZP(IJ)=ZPSAV(IJ)
      Q(IJ)=QSAV(IJ)
      QP(IJ)=QPSAV(IJ)
 1884 CONTINUE
 1885 CONTINUE
```

Program Listing—Continued

```
      ENDIF
      KYRS=KYR
      KMOS=KMO
      KDAS=KDA
      KHRS=KHR
      KMNS=KMN
      DO 1785 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 1784 J=1,NS
      IJ=IJ+1
      ZSAV(IJ)=Z(IJ)
      ZPSAV(IJ)=ZP(IJ)
      QSAV(IJ)=Q(IJ)
      QPSAV(IJ)=QP(IJ)
 1784 CONTINUE
 1785 CONTINUE
C
C8B---WHEN THE SET OF BRANCH TIMESTEPS ARE FINISHED, RETURN TO MODFLOW
C
      M=M-2
      RETURN
      ENDIF
      ICOUNT=ICOUNT+1
      IF(IBRPRN.GT.0.AND.ISS.EQ.0) WRITE(*,1410) KYR,KMO,KDA,KHR,KMN
 1410 FORMAT(' SIMULATION TIME = ',I2,'/',I2,'/',I2,' ',I2,':',I2)
      LASTN=N
      KT=KT+1
C
C     PREPARATION FOR NEXT TIME STEP
C
C9----ASSIGN WIND SPEED AND DIRECTION FROM TIME-DEPENDENT WIND INPUT
      IF (INWIND.NE.0) THEN
         K=(M-1)*DT/WDTT+1.
         WRATIO=((M-1)*DT-(K-1)*WDTT)/WDTT
         WSPEED=WINDSP(K)+WRATIO*(WINDSP(K+1)-WINDSP(K))
         WDIREC=WINDDR(K)+WRATIO*(WINDDR(K+1)-WINDDR(K))
         IF (IUNIT.NE.EN) THEN
            WSPEED=WSPEED*1000./3600.
         ELSE
            WSPEED=WSPEED*5280./3600.
         ENDIF
         CW=WSDRAG*AIRDEN/(H2ODEN*G)*WSPEED*WSPEED
      ENDIF
      DO 935 I=1,NBCH
      NS=NSEC(I)
      IJ=MAXS-XSKT(I)
      DO 930 J=1,NS
      IJ=IJ+1
      IF (IPROPT.NE.4) GO TO 880
  880 ZTEMP=Z(IJ)
      QTEMP=Q(IJ)
      Z(IJ)=ZP(IJ)
      Q(IJ)=QP(IJ)
      ZIJ=Z(IJ)+ZDATUM
      QIJ=Q(IJ)
      IF (INWIND.NE.0.AND.J.NE.NS) WANGLE(IJ)=COS(0.01745329*ABS(WDIREC-
     1ORIENT(IJ)))
      IF (OTTDDB.EQ.1) WRITE (LUIFLO) QIJ,ZIJ,AP(IJ),BP(IJ)
      QSUM(IJ)=QSUM(IJ)+QIJ
```

Program Listing—Continued

```
          IF (QIJ.GT.QMAX(IJ)) THEN
             QMAX(IJ)=QIJ
             ZQMAX(IJ)=ZIJ
             AQMAX(IJ)=AP(IJ)
             ITQMAX(IJ)=KHR*100+KMN
          ENDIF
          IF (QIJ.LT.QMIN(IJ)) THEN
             QMIN(IJ)=QIJ
             ZQMIN(IJ)=ZIJ
             AQMIN(IJ)=AP(IJ)
             ITQMIN(IJ)=KHR*100+KMN
          ENDIF
          IF (NOEXTP) GO TO 930
C         (IEXOPT=0) USE CURRENT VALUES AS INITIAL VALUES FOR UNKNOWNS
C         (IEXOPT=1) EXTRAPOLATE INITIAL VALUES FOR UNKNOWNS FROM CURRENT
          ZP(IJ)=2.*ZP(IJ)-ZTEMP
          QP(IJ)=2.*QP(IJ)-QTEMP
  930 CONTINUE
  935 CONTINUE
C
C         BEGIN ITERATIVE IMPROVEMENT LOOP
C
  936 DO 1360 N=1,NIT
C
C         CALCULATE BRANCH MATRICES
C
      DO 975 I=1,NBCH
      IJ=MAXS-XSKT(I)
      IJP1=IJ+1
      NSM1=NSEC(I)-1
      CALL ARB(Z(IJP1),I,1,M,A(IJP1),B(IJP1),BT(IJP1),R(IJP1),
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ZA,AA,BB,BS,IPT,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR)
      IF (ARBERR) GO TO 1530
      IF (M.EQ.NSTEPS) GO TO 940
      CALL ARB(ZP(IJP1),I,1,M,AP(IJP1),BP(IJP1),BTP(IJP1),RP(IJP1),
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ZA,AA,BB,BS,IPT,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR)
      IF (ARBERR) GO TO 1530
  940 DO 970 J=1,NSM1
      IJ=IJ+1
      DXIJ=DX(IJ)
      QIJ=Q(IJ)
      ZIJ=Z(IJ)
      JP1=J+1
      IJP1=IJ+1
      QIJP1=Q(IJP1)
      ZIJP1=Z(IJP1)
      CALL ARB(ZIJP1,I,JP1,M,A(IJP1),B(IJP1),BT(IJP1),R(IJP1),
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ZA,AA,BB,BS,IPT,
```

Program Listing—Continued

```
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR)
      IF (ARBERR) GO TO 1530
      IF (M.EQ.NSTEPS) GO TO 970
      CALL ARB(ZP(IJ),I,JP1,M,APZPIJ,BPZPIJ,BTZPIJ,RPZPIJ,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ZA,AA,BB,BS,IPT,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR)
      IF (ARBERR) GO TO 1529
      CALL ARB(ZP(IJP1),I,JP1,M,AP(IJP1),BP(IJP1),BTP(IJP1),RP(IJP1),
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ZA,AA,BB,BS,IPT,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,
     & LARBPR,ZHIGH,ZLOW,LINPRT,ARBERR)
      IF (ARBERR) GO TO 1530
      BAVG=CHI*((BP(IJ)+BP(IJP1))*0.5)+ONECHI*((B(IJ)+B(IJP1))*0.5)
      BTAVG=CHI*((BTP(IJ)+BTP(IJP1))*0.5)+ONECHI*((BT(IJ)+BT(IJP1))*0.5)
      AAVG=CHI*((AP(IJ)+AP(IJP1))*0.5)+ONECHI*((A(IJ)+A(IJP1))*0.5)
      RAVG=CHI*((RP(IJ)+RP(IJP1))*0.5)+ONECHI*((R(IJ)+R(IJP1))*0.5)
      QAVG=CHI*((QP(IJ)+QP(IJP1))*0.5)+ONECHI*((QIJ+QIJP1)*0.5)
      ZAVG=CHI*((ZP(IJ)+ZP(IJP1))*0.5)+ONEGHI*((ZIJ+ZIJP1)*0.5)+ZDATUM
      BETCOR=(BETVEL(IJ)+BETVEL(IJP1))*0.5
C
C9A---THE NEW AND OLD AQUIFER HEADS ARE USED TO INTERPOLATE THE
C     HEAD AT THE PRESENT BRANCH TIMESTEP (HAQ).
C
      HNEW1=HNEW(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ))
      HOLD1=HOLD(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ))
      HAQ=HOLD1+FLOAT(ICOUNT-1)*(HNEW1-HOLD1)/FLOAT(NTSAQ)
      HAQP=HOLD1+FLOAT(ICOUNT)*(HNEW1-HOLD1)/FLOAT(NTSAQ)
      IF(IBOUND(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ)).LE.0) CLK(IJ)=0.
      HAQP1=HAQ
      HAQPP1=HAQP
      CLKIJ=CLK(IJ)
      CLKP1=CLK(IJ)
      CLKP=CLK(IJ)
      CLKPP1=CLK(IJ)
C
C     IF THE AQUIFER IS BELOW THE STREAMBED, HEAD IN STREAM IS USED
C     TO CALCULATE LEAKAGE.
C
      IF(HAQP1.LT.ZBOT(IJP1)) HAQP1=ZBOT(IJP1)
      IF(HAQ.LT.ZBOT(IJ)) HAQ=ZBOT(IJ)
      IF(HAQPP1.LT.ZBOT(IJP1)) HAQPP1=ZBOT(IJP1)
      IF(HAQP.LT.ZBOT(IJ)) HAQP=ZBOT(IJ)
      HAQ=HAQ-ZDATUM
      HAQP1=HAQP1-ZDATUM
      HAQP=HAQP-ZDATUM
      HAQPP1=HAQPP1-ZDATUM
      IF (ETA(1,IJ).NE.0.0) THEN
         CALL SETAB(2,IJ,ZAVG,QAVG,AAVG,RAVG,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT,BETVEL,SUMETA,SUMCZQ,
```

Program Listing—Continued

```
     & SCZQSQ,SZQETA,ITYPEO,ZA,AA,BB,BS,IPT,
     & QA,TA,ETA,FUNETA)
      ELSE
         IF (TYPETA.NE.1) RN(4,IJ)=SETA(IJ,ZAVG,QAVG,AAVG,RAVG)
      ENDIF
      RNIJ=RN(4,IJ)
      AAVGSQ=AAVG*AAVG
      AAVGCU=AAVGSQ*AAVG
C
C10---THE MATRIX COEFFICIENTS LAMBDA, SIGMA, MU, ALPHA, EPSLON,
C     OMEGA, AND DELTA ARE COMPUTED.
C
      LAMBDA=DXIJ/(TWOG*AAVG*DT*THETA)
      IF (ISS.NE.0) LAMBDA=0.
      SIGMA=ABS(QAVG)*RNIJ*RNIJ*DXIJ*CHI/(TWOCSQ*AAVGSQ*RAVG**1.3333333*
     1THETA)
C
C10A--THE DRYNESS CONDITION IS CHECKED FOR FRICTION AND LEAKAGE
      IF(ITRIAL(IJ,ICOUNT+1).GE.10) SIGMA=SIGMA*DCFM1/64.
      DO 2121 L=3,8
      IF(ITRIAL(IJ,ICOUNT+1).GE.L*10) SIGMA=SIGMA*2.
2121  CONTINUE
      IF(ITRIAL(IJ,ICOUNT+1).EQ.11) CLKP=0.0
      IF(ITRIAL(IJ,ICOUNT+1).EQ.22) CLKPP1=0.0
      IF(ITRIAL(IJ,ICOUNT+1).GE.33) THEN
      CLKP=0.0
      CLKPP1=0.0
      ENDIF
      IF(ITRIAL(IJ,ICOUNT).EQ.11) CLKIJ=0.0
      IF(ITRIAL(IJ,ICOUNT).EQ.22) CLKP1=0.0
      IF(ITRIAL(IJ,ICOUNT).GE.33) THEN
      CLKIJ=0.0
      CLKP1=0.0
      ENDIF
      MU=2.0*BETCOR*QAVG/(G*AAVGSQ)
      ALPHA=DXIJ*BTAVG/(2.*DT*THETA)+DXIJ*CHI*CLKP*BP(IJ)
     1 /(2.*THETA)
       IF(ISS.NE.0) ALPHA=DXIJ*CHI*CLKP*BP(IJ)/(2.*THETA)
      EPSLON=(LAMBDA-DCHI*SIGMA)*(QIJ+QIJP1)-MU*DTHETA*(QIJP1-QIJ)-
     1 DTHETA*(ZIJP1-ZIJ)+BETCOR*QAVG*QAVG/(G*THETA*AAVGCU)*(BAVG*
     2 (ZP(IJP1)-ZP(IJ))+(APZPIJ-AP(IJ)))+CW*BAVG*WANGLE(IJ)*DXIJ/
     3 (THETA*AAVG)
      ZETA=LAMBDA+SIGMA+MU
      OMEGA=LAMBDA+SIGMA-MU
      GAMMA=DXIJ*BTAVG/(2.*DT*THETA)+CHI*DXIJ*CLKPP1*BP(IJP1)
     1 /(2.*THETA)
      IF(ISS.NE.0) GAMMA=CHI*DXIJ*CLKPP1*BP(IJP1)/(2.*THETA)
      DELTA=-DTHETA*(Q(IJP1)-Q(IJ))+(BAVG*DXIJ/(2.*DT*THETA)
     &-ONECHI*DXIJ*CLKP1*B(IJP1)/(2.*THETA))*Z(IJP1)+(BAVG*DXIJ
     &/(2.*DT*THETA)-ONECHI*DXIJ*CLKIJ*B(IJ)/(2.*THETA))*Z(IJ)
     &+DXIJ*(CHI*(CLKP*HAQP*BP(IJ)+CLKPP1*HAQPP1*BP(IJP1))+
     &ONECHI*(CLKIJ*HAQ*B(IJ)+CLKP1*HAQP1*B(IJP1)))/(2*THETA)
      IF(ISS.NE.0) DELTA=-DTHETA*(Q(IJP1)-Q(IJ))-
     &(ONECHI*DXIJ*CLKP1*B(IJP1)/(2.*THETA))*Z(IJP1)-
     &(ONECHI*DXIJ*CLKIJ*B(IJ)/(2.*THETA))*Z(IJ)
     &+DXIJ*(CHI*(CLKP*HAQP*BP(IJ)+CLKPP1*HAQPP1*BP(IJP1))+
     &ONECHI*(CLKIJ*HAQ*B(IJ)+CLKP1*HAQP1*B(IJP1)))/(2*THETA)
C
      DET=1./(1.-ZETA*GAMMA)
      IF (IPROPT.LT.5.OR.IPROPT.GT.8) GO TO 950
```

Program Listing—Continued

```
      DZDT=BTAVG/(2.*DT)*(ZP(IJP1)+ZP(IJ)-ZIJP1-ZIJ)
      DQDXC=THETA/DXIJ*(QP(IJP1)-QP(IJ)+DTHETA*(QIJP1-QIJ))
      DQDT=LAMBDA*(THETA/DXIJ)*(QP(IJP1)+QP(IJ)-QIJP1-QIJ)
      DQDXM=MU*(THETA*(QP(IJP1)-QP(IJ))+(1.0-THETA)*(QIJP1-QIJ))/DXIJ
      DADX=BETCOR*QAVG*QAVG/(G*DXIJ*AAVGCU)*(BAVG*(ZP(IJP1)-ZP(IJ))+
     1 (APZPIJ-AP(IJ)))
      DZDX=(THETA*(ZP(IJP1)-ZP(IJ))+(1.0-THETA)*(ZIJP1-ZIJ))/DXIJ
      FRIC=SIGMA*(THETA/DXIJ)*(QP(IJP1)+QP(IJ)+DCHI*(QIJP1+QIJ))
      WIND=CW*BAVG*WANGLE(IJ)/AAVG
      WRITE (PRINTR,2150) DZDT,DQDXC,DQDT,DQDXM,DADX,DZDX,FRIC,WIND
      IF (IPROPT.LT.7) GO TO 950
      WRITE (PRINTR,2160) N,I,J,IJ,JP1,IJP1
      WRITE (PRINTR,2170) ZIJ,QIJ,ZIJP1,QIJP1,ZP(IJ),QP(IJ),ZP(IJP1),
     1 QP(IJP1)
      WRITE (PRINTR,2170) APZPIJ,BPZPIJ,A(IJ),B(IJ),R(IJ),A(IJP1),
     1 B(IJP1),R(IJP1)
      WRITE (PRINTR,2170) AP(IJ),BP(IJ),RP(IJ),AP(IJP1),BP(IJP1),
     1 RP(IJP1)
      WRITE (PRINTR,2170) DXIJ,BAVG,AAVG,RAVG,QAVG,BETCOR,RNIJ,
     1 WANGLE(IJ)
      WRITE (PRINTR,2170) LAMBDA,SIGMA,MU,EPSLON,ZETA,OMEGA,GAMMA,DELTA
  950 CONTINUE
C
C     SEGMENT MATRIX COMPUTATION
C
      IJ2=(IJ-1)*2
      IJ4=IJ2*2
      IJ4P1=IJ4+1
      IJ4P2=IJ4+2
      IJ4P3=IJ4+3
      IJ4P4=IJ4+4
      UU(IJ4P1)=(1.+ZETA*ALPHA)*DET
      UU(IJ4P2)=(-OMEGA-ZETA)*DET
      UU(IJ4P3)=(-ALPHA-GAMMA)*DET
      UU(IJ4P4)=(1.+OMEGA*GAMMA)*DET
      IJ2P1=IJ2+1
      IJ2P2=IJ2+2
      U(IJ2P1)=(EPSLON-ZETA*DELTA)*DET
      U(IJ2P2)=(DELTA-EPSLON*GAMMA)*DET
      I2=(I-1)*2
      I4=I2*2
      I4P1=I4+1
      I4P2=I4+2
      I4P3=I4+3
      I4P4=I4+4
      I2P1=I2+1
      I2P2=I2+2
C
C     BRANCH MATRIX COMPUTATION
C
      IF (J.GT.1) THEN
         C1=BUU(I4P1)
         C2=BUU(I4P2)
         C3=BUU(I4P3)
         C4=BUU(I4P4)
         UUIJP1=UU(IJ4P1)
         UUIJP2=UU(IJ4P2)
         UUIJP3=UU(IJ4P3)
         UUIJP4=UU(IJ4P4)
         BUU(I4P1)=UUIJP1*C1+UUIJP2*C3
```

Program Listing—Continued

```
            BUU(I4P2)=UUIJP1*C2+UUIJP2*C4
            BUU(I4P3)=UUIJP3*C1+UUIJP4*C3
            BUU(I4P4)=UUIJP3*C2+UUIJP4*C4
            C1=BU(I2P1)
            C2=BU(I2P2)
            BU(I2P1)=UUIJP1*C1+UUIJP2*C2+U(IJ2P1)
            BU(I2P2)=UUIJP3*C1+UUIJP4*C2+U(IJ2P2)
         ELSE
            BUU(I4P1)=UU(IJ4P1)
            BUU(I4P2)=UU(IJ4P2)
            BUU(I4P3)=UU(IJ4P3)
            BUU(I4P4)=UU(IJ4P4)
            BU(I2P1)=U(IJ2P1)
            BU(I2P2)=U(IJ2P2)
         ENDIF
  970 CONTINUE
  975 CONTINUE
C
C11---IS THIS THE FIRST ITERATION (N=1) OF THIS TIME STEP (M) ?
C
      IF(N.NE.1) GO TO 1030
      IF(IPROPT.NE.3.OR.M.EQ.NELAP*NTSAQ+1) THEN
      IF (IBRPRN.GT.0) CALL DTOUT(LASTN,Q,Z,A,B,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     2 ITQMAX,ITQMIN,QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,
     & XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT,BETVEL,SUMETA,SUMCZQ,
     & SCZQSQ,SZQETA,ITYPEO,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ZBOT,ITRIAL,ICOUNT)
      ENDIF
C
C11A--IF END OF GROUNDWATER TIMESTEP, GO TO COMPUTATION LOOP START
      IF(M.EQ.NELAP*NTSAQ+1) GO TO 1700
      IF (PTPLT) THEN
         IF (KT.LT.MAXCZQ.AND.KHR.NE.24) GO TO 990
         KETIME=IETIME+(M-1)*IDTM
         KT=0
      ELSE
         IF (KT.LT.IDTPDY) GO TO 990
         KT=0
         IF (OPLOTS) THEN
            KETIME=IETIME+(M-1)*IDTM
         ENDIF
      ENDIF
  990 IF (M.EQ.NSTEPS) GO TO 1610
      KMN=KMN+IDTM
      IF (KMN.LT.60) GO TO 1000
      KHR=KHR+KMN/60
      KMN=MOD(KMN,60)
 1000 IF (KHR.LT.24.OR.(KHR.EQ.24.AND.KMN.EQ.0)) GO TO 1010
      KHR=KHR-24
      KDA=KDA+1
 1010 IF (KDA.GT.DPERM(KMO)) THEN
         KDA=1
         KMO=KMO+1
      ENDIF
      IF (KMO.LT.13) GO TO 1030
      KMO=1
      KYR=KYR+1
```

Program Listing—Continued

```
      IF (KYR.GT.99) KYR=0
      DPERM(2)=28+(4-MOD(KYR,4))/4
 1030 IF (NOPRIT) GO TO 1040
      LASTN=N-1
C     IF(IBRPRN.GT.0)
      CALL DTOUT(LASTN,QP,ZP,AP,BP,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     2 ITQMAX,ITQMIN,QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,
     & XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT,BETVEL,SUMETA,SUMCZQ,
     & SCZQSQ,SZQETA,ITYPEO,
     & BRNAME,IJF,IJT,NSEC,XSKT,
     & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ZBOT,ITRIAL,ICOUNT)
 1040 CONTINUE
C
C12---SET UP NETWORK MATRIX AND VECTOR
C
      NN=1
      MM=1
      DO 1050 I=1,NBCH
C     INSERT BRANCH MATRICES
      NNN=IAR(NN,MM,II)
      I2=(I-1)*2
      I4=I2*2
      AM(NNN)=BUU(I4+1)
      NNN=NNN+II
      AM(NNN)=BUU(I4+2)
      NNN=NNN+II
      AM(NNN)=-1.0
      NNN=IAR(NN+1,MM,II)
      AM(NNN)=BUU(I4+3)
      NNN=NNN+II
      AM(NNN)=BUU(I4+4)
      NNN=NNN+II+II
      AM(NNN)=-1.0
C     CONSTRUCT RIGHT SIDE VECTOR
      BMX(NN)=-BU(I2+1)
      BMX(NN+1)=-BU(I2+2)
      NN=NN+2
      MM=MM+4
 1050 CONTINUE
C
C     INSERT BOUNDARY CONDITIONS FOR INTERNAL JUNCTIONS
C
      DO 1080 J=1,NJNC
      IF (ICT(J).EQ.1) GO TO 1080
      NBPJ=ICT(J)
C     INSERT DISCHARGE CONTINUITY
      DO 1060 I=1,NBPJ
      IBCH=IDX(J,I)
      MM=4+(IABS(IBCH)-1)*4
      IF (IBCH.LT.0) MM=MM-2
      NNN=IAR(NN,MM,II)
      AM(NNN)=IBCH/IABS(IBCH)
 1060 CONTINUE
      BMX(NN)=-W(J)
      NN=NN+1
C     INSERT STAGE COMPATIBILITY
      IBCH=IDX(J,1)
      M0=3+(IABS(IBCH)-1)*4
```

Program Listing—Continued

```
      IF (IBCH.LT.0) M0=M0-2
      DO 1070 I=2,NBPJ
      IBCH=IDX(J,I)
      MM=3+(IABS(IBCH)-1)*4
      NNN=IAR(NN,M0,II)
      AM(NNN)=1.0
      IF (IBCH.LT.0) MM=MM-2
      NNN=IAR(NN,MM,II)
      AM(NNN)=-1.0
      BMX(NN)=0.0
      NN=NN+1
 1070 CONTINUE
 1080 CONTINUE
C
C     RETRIEVE ADDITIONAL BOUNDARY-VALUE DATA FROM DIRECT-ACCESS STORAGE
C
      IF (N.NE.1.OR.MODETA) GO TO 1230
      IF (MOREBD) CALL GETBVD
     1 (MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ITYPE,IBJNC,NDATA,IZQBVE,ISTATN,
     & ZQ,DTT,DATUM,ZQBVCO,ZQPMIN,KTTDBC,
     & INDATA,IZDATA,IQDATA)
C
C     INSERT BOUNDARY CONDITIONS FOR EXTERNAL JUNCTIONS
C
 1230 INTDBC=0
      DO 1310 L=1,NBND
      IF (IBJNC(L).LE.0) GO TO 1310
      IBCH=IDX(IBJNC(L),1)
      MM=1+(IABS(IBCH)-1)*4
      IF (ITYPE(L).EQ.QTYPE.OR.ITYPE(L).EQ.QPTYPE) MM=MM+1
      IF (IBCH.GT.0) MM=MM+2
      NNN=IAR(NN,MM,II)
      AM(NNN)=1.0
C     DETERMINE BOUNDARY VALUE FROM STAGE (OR DISCHARGE) BOUNDARY-
C     CONDITION EQUATION
      IF (IZQBVE(L).EQ.1) THEN
      IF (IBCH.LT.0) THEN
         IJ=MAXS-XSKT(IABS(IBCH))+1
      ELSE
         IJ=MAXS-XSKT(IBCH)+NSEC(IBCH)
      ENDIF
      IF (ITYPE(L).EQ.QTYPE) THEN
         ZQPIJ=QP(IJ)
      ELSE
         ZQPIJ=ZP(IJ)
      ENDIF
      BMX(NN)=ZQBVCO(1,L)+(ZQBVCO(2,L)+(ZQBVCO(3,L)+ZQBVCO(4,L)*ZQPIJ)*Z
     1QPIJ)*ZQPIJ
      ELSE
C     PARABOLIC INTERPOLATION FOR BOUNDARY CONDITION FROM BOUNDARY-VALUE
C     DATA
      IF (ITYPE(L).NE.ZPTYPE.AND.ITYPE(L).NE.QPTYPE) THEN
         INTDBC=INTDBC+1
         IF (NDATA(L).EQ.0) THEN
            K=ND*DT/DTT(L)+1.
            TH=(ND*DT-(K-1)*DTT(L))/DTT(L)
         ELSE
            K=M*DT/DTT(L)+1.
```

Program Listing—Continued

```
              TH=(M*DT-(K-1)*DTT(L))/DTT(L)
           ENDIF
           IF (K.NE.1) GO TO 1280
           K=2
           TH=TH-1.
 1280      BMX(NN)=.5*TH*(ZQ(K+1,INTDBC)-ZQ(K-1,INTDBC)+TH*(ZQ(K+1,INTDBC)
     1      +ZQ(K-1,INTDBC)-2.0*ZQ(K,INTDBC)))+ZQ(K,INTDBC)
        ELSE
        IF (ITYPE(L).EQ.ZPTYPE) THEN
C       SELF-SETTING STAGE BOUNDARY CONDITION
           BMX(NN)=Z(IJZPBC)
         IF (ISS.NE.0)
     1     BMX(NN)=ZP(IJZPBC)
           IF (Z(IJZPBC).LT.ZQPMIN(L)) BMX(NN)=ZQPMIN(L)
        ENDIF
        IF (ITYPE(L).EQ.DPTYPE) THEN
C       SELF-SETTING DEPTH OF FLOW BOUNDARY CONDITION
           BMX(NN)=Z(IJZPBC)-ZBOT(IJZPBC)+ZBOT(IJZPBC+1)
         IF (ISS.NE.0)
     1     BMX(NN)=ZP(IJZPBC)-ZBOT(IJZPBC)+ZBOT(IJZPBC+1)
           IF (Z(IJZPBC).LT.ZQPMIN(L)) BMX(NN)=ZQPMIN(L)
        ENDIF
        IF (ITYPE(L).EQ.QPTYPE) THEN
C       SELF-SETTING DISCHARGE BOUNDARY CONDITION
           BMX(NN)=Q(IJQPBC)
           IF (Q(IJQPBC).LT.ZQPMIN(L)) BMX(NN)=ZQPMIN(L)
        ENDIF
        ENDIF
        ENDIF
        NN=NN+1
 1310 CONTINUE
C
C13---SOLVE MATRIX OF LINEAR EQUATIONS
C
      IF (II.NE.NN-1) GO TO 1430
      CALL GEMXP(II,IS,ICHK,
     1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
     1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
     & ROW,AM,BMX,XSKT)
      KTMATS=KTMATS+1
      IF (IS.EQ.1) THEN
         WRITE (PRINTR,1990)
         GO TO 1610
      ENDIF
C
C14---CALCULATE INTERMEDIATE VALUES
C
      NN=1
      BIGQ=0.0
      BIGZ=0.0
      BIGQP=0.0
      BIGZP=0.0
      DO 1355 I=1,NBCH
      IJ=MAXS-XSKT(I)
      IJP1=IJ+1
      ZTEMP=ZP(IJP1)
      QTEMP=QP(IJP1)
      ZP(IJP1)=BMX(NN)
      QP(IJP1)=BMX(NN+1)
      ZTOL=ABS(ZTEMP-ZP(IJP1))
```

Program Listing—Continued

```
      QTOL=ABS(QTEMP-QP(IJP1))
      ZPTOL=ABS(ZP(IJP1)-Z(IJP1))
      QPTOL=ABS(QP(IJP1)-Q(IJP1))
      IF (ZTOL.GT.BIGZ) THEN
         BIGZ=ZTOL
         IBIGZ=I
         JBIGZ=1
      ENDIF
      IF (QTOL.GT.BIGQ) THEN
         BIGQ=QTOL
         IBIGQ=I
         JBIGQ=1
      ENDIF
      IF(ZPTOL.GT.BIGZP) BIGZP=ZPTOL
      IF(QPTOL.GT.BIGQP) BIGQP=QPTOL
      NN=NN+4
      NSM1=NSEC(I)-1
      DO 1350 J=1,NSM1
      IJ=IJ+1
      IJP1=IJ+1
      IJ2=(IJ-1)*2
      IJ4=(IJ-1)*4
      ZTEMP=ZP(IJP1)
      QTEMP=QP(IJP1)
      ZP(IJP1)=UU(IJ4+1)*ZP(IJ)+UU(IJ4+2)*QP(IJ)+U(IJ2+1)
      QP(IJP1)=UU(IJ4+3)*ZP(IJ)+UU(IJ4+4)*QP(IJ)+U(IJ2+2)
      ZTOL=ABS(ZTEMP-ZP(IJP1))
      QTOL=ABS(QTEMP-QP(IJP1))
      ZPTOL=ABS(ZP(IJP1)-Z(IJP1))
      QPTOL=ABS(QP(IJP1)-Q(IJP1))
      IF (ZTOL.GT.BIGZ) THEN
         BIGZ=ZTOL
         IBIGZ=I
         JBIGZ=J+1
      ENDIF
      IF (QTOL.GT.BIGQ) THEN
         BIGQ=QTOL
         IBIGQ=I
         JBIGQ=J+1
      ENDIF
      IF(ZPTOL.GT.BIGZP) BIGZP=ZPTOL
      IF(QPTOL.GT.BIGQP) BIGQP=QPTOL
 1350 CONTINUE
 1355 CONTINUE
      IF (BIGZ.LE.ZZTOL.AND.BIGQ.LE.QQTOL) GO TO 1390
 1360 CONTINUE
C
C     END ITERATIVE IMPROVEMENT LOOP
C
      IF (NOCONV) GO TO 1380
      IF (IUNIT.EQ.EN) THEN
         BIGZ=BIGZ*0.3048
         BIGQ=BIGQ*0.02832
      ELSE
         BIGZ=BIGZ*3.281
         BIGQ=BIGQ*35.31
      ENDIF
 1380 WRITE (PRINTR,2110) KHR,KMN,KYR,KMO,KDA,IBIGZ,JBIGZ,BIGZ,IBIGQ,
     1 JBIGQ,BIGQ
 1390 IF (TOLERR.EQ.0.0) GO TO 1395
```

Program Listing—Continued

```
C     IF (MODETA) GO TO 936
 1395 ND=ND+1
C
C14A--THE NEW AND OLD AQUIFER HEADS ARE USED TO INTERPOLATE THE
C     HEAD AT THE PRESENT BRANCH TIMESTEP (HAQ) FOR CALCULATING
C     THE TOTAL VOLUME OF LEAKAGE.
C
      DO 2185 I=1,NBCH
      NSM1=NSEC(I)-1
      IJ=MAXS-XSKT(I)
      IJFI=MAXS+IJF(I)
      IJP1=IJ+1
      QLSUM(IJFI)=QLSUM(IJFI)-QP(IJP1)/NTSAQ
      DO 2184 J=1,NSM1
      IJ=IJ+1
      IJP1=IJ+1
      IF (ISTRM(3,IJ).LT.0) GO TO 2184
      HNEW1=HNEW(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ))
      HOLD1=HOLD(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ))
      HAQ=HOLD1+FLOAT(ICOUNT-1)*(HNEW1-HOLD1)/FLOAT(NTSAQ)
      HAQP=HOLD1+FLOAT(ICOUNT)*(HNEW1-HOLD1)/FLOAT(NTSAQ)
      IF(IBOUND(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ)).LE.0) CLK(IJ)=0.
      HAQP1=HAQ
      HAQPP1=HAQP
      CLKIJ=CLK(IJ)
      CLKP1=CLK(IJ)
      CLKP=CLK(IJ)
      CLKPP1=CLK(IJ)
C
C     IF THE AQUIFER IS BELOW THE STREAMBED, HEAD IN STREAM IS USED
C     TO CALCULATE LEAKAGE.
C
      IF(HAQP1.LT.ZBOT(IJP1)) HAQP1=ZBOT(IJP1)
      IF(HAQ.LT.ZBOT(IJ)) HAQ=ZBOT(IJ)
      IF(HAQPP1.LT.ZBOT(IJP1)) HAQPP1=ZBOT(IJP1)
      IF(HAQP.LT.ZBOT(IJ)) HAQP=ZBOT(IJ)
      HAQ=HAQ-ZDATUM
      HAQP1=HAQP1-ZDATUM
      HAQP=HAQP-ZDATUM
      HAQPP1=HAQPP1-ZDATUM
      IF(ITRIAL(IJ,ICOUNT+1).EQ.11) CLKP=0.0
      IF(ITRIAL(IJ,ICOUNT+1).EQ.22) CLKPP1=0.0
      IF(ITRIAL(IJ,ICOUNT+1).GE.33) THEN
      CLKP=0.0
      CLKPP1=0.0
      ENDIF
      IF(ITRIAL(IJ,ICOUNT).EQ.11) CLKIJ=0.0
      IF(ITRIAL(IJ,ICOUNT).EQ.22) CLKP1=0.0
      IF(ITRIAL(IJ,ICOUNT).GE.33) THEN
      CLKIJ=0.0
      CLKP1=0.0
      ENDIF
      QLSUM(IJ)=QLSUM(IJ)+(CHI*(CLKPP1*BP(IJP1)*(ZP(IJP1)-HAQPP1)+
     1 CLKP*BP(IJ)*(ZP(IJ)-HAQP))+ONECHI*(CLKP1*B(IJP1)*(Z(IJP1)-
     2 HAQP1)+CLKIJ*B(IJ)*(Z(IJ)-HAQ)))*DX(IJ)/(2.*NTSAQ)
      IF(KKITER.LE.50) THEN
      HNEW1=HNEW(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ))
      HOLD1=HOLD(ISTRM(1,IJ),ISTRM(2,IJ),ISTRM(3,IJ))
      HAQ=HOLD1+FLOAT(ICOUNT-1)*(HNEW1-HOLD1)/FLOAT(NTSAQ)
      HAQP=HOLD1+FLOAT(ICOUNT)*(HNEW1-HOLD1)/FLOAT(NTSAQ)
```

Program Listing—Continued

```
      HAQP1=HAQ
      HAQPP1=HAQP
C
C     THE DRYNESS CONDITIONS ARE CHECKED TO SET VALUES OF ITRIAL
      ITRIA1=0
      IF(ZP(IJ).LT.ZBOT(IJ)-ZDATUM) ITRIA1=ITRIA1+10
      IF(ZP(IJP1).LT.ZBOT(IJP1)-ZDATUM) ITRIA1=ITRIA1+20
       IF (HAQP.LT.ZBOT(IJ)) ITRIA1=ITRIA1+1
       IF (HAQPP1.LT.ZBOT(IJP1)) ITRIA1=ITRIA1+2
       ITRIA2=ITRIAL(IJ,ICOUNT+1)
       ITRIA3=ITRIAL(IJ,ICOUNT)
       MOD1=MOD(ITRIA1,10)
       MOD2=MOD(ITRIA2,10)
       MOD3=MOD(ITRIA3,10)
       IF(ITRIA3.GE.30) THEN
       IF(ITRIA3.LT.80) THEN
       IF(ITRIA1.GE.30) THEN
       ITRIA1=MOD1+ITRIA3-MOD3+10
       ELSE
       ITRIA1=MOD1+ITRIA3-MOD3-10
       ENDIF
       ELSE
       IF(ITRIA1.GE.30)
     1 ITRIA1=MOD1+ITRIA3-MOD3
       ENDIF
       ENDIF
       IF(KKITER.LE.5.OR.(ITRIA1-MOD1)/10.EQ.MOD2.OR.ITRIA1-MOD1.LT.
     1 ITRIA3-MOD3) ITRIAL(IJ,ICOUNT+1)=ITRIA1
       ITRIAL(IJ,ICOUNT+1)=ITRIAL(IJ,ICOUNT+1)-MOD(ITRIAL(IJ,ICOUNT+1),
     1 10)+MOD1
       ENDIF
 2184 CONTINUE
      IJTI=MAXS+IJT(I)
      QLSUM(IJTI)=QLSUM(IJTI)+QP(IJP1)/NTSAQ
 2185 CONTINUE
      IF(M.LT.NSTEPS) GO TO 1700
 1400 CONTINUE
C
C     END COMPUTATION LOOP
C
      GO TO 1610
C
C15---TERMINATE EXECUTION
C
 1430 WRITE (PRINTR,1960)
      GO TO 1610
 1450 WRITE (PRINTR,1980)
      RETURN
 1529 WRITE (PRINTR,2075)
 1530 DO 1600 K=1,2
      WRITE (PRINTR,2080) ZTYPE
      DO 1590 I=1,NBCH
      IJ=MAXS-XSKT(I)
      IJP1=IJ+1
      IJPNS=IJ+NSEC(I)
      IF (K.EQ.1) THEN
      DO 1540 IJ=IJP1,IJPNS
 1540 Z(IJ)=Z(IJ)+ZDATUM
      WRITE (PRINTR,2090) ZTYPE,I,(Z(IJ),IJ=IJP1,IJPNS)
      DO 1550 IJ=IJP1,IJPNS
```

Program Listing—Continued

```
1550 Z(IJ)=Z(IJ)-ZDATUM
     ELSE
     DO 1570 IJ=IJP1,IJPNS
1570 ZP(IJ)=ZP(IJ)+ZDATUM
     WRITE (PRINTR,2090) ZTYPE,I,(ZP(IJ),IJ=IJP1,IJPNS)
     DO 1580 IJ=IJP1,IJPNS
1580 ZP(IJ)=ZP(IJ)-ZDATUM
     ENDIF
1590 CONTINUE
     ZTYPE=ZPTYPE
1600 CONTINUE
1610 CONTINUE
     IF (DTPRT.AND.N.NE.1) CALL DTOUT(LASTN,QP,ZP,AP,BP,
    1 MXBH,MXJN,MAXS,MXPT,MXTDBC,MXMD,MAXZBD,
    1 MAXQBD,MAXCZQ,MAXMZQ,MXWIND,MAXBD,MXOTDT,
    2 ITQMAX,ITQMIN,QMAX,QMIN,QSUM,ZQMIN,ZQMAX,AQMAX,AQMIN,
    & XSTATN,DX,T,RN,WANGLE,GDATUM,ORIENT,BETVEL,SUMETA,SUMCZQ,
    & SCZQSQ,SZQETA,ITYPEO,
    & BRNAME,IJF,IJT,NSEC,XSKT,
    & PLTBCH,PRTXSG,PRTBCH,PRTSUM,PPLTBH,ZBOT,ITRIAL,ICOUNT)
     KETIME=NETIME
     WRITE (PRINTR,2140) KTMATS
     SOLPDT=FLOAT(KTMATS)/(NSTEPS-1)
     WRITE (PRINTR,2145) SOLPDT
     WRITE(*,*) ' ERROR, BRANCH SIMULATION FINISHED BEFORE MODFLOW'
     STOP
C
C    INPUT/OUTPUT FORMAT STATEMENTS
C
1740 FORMAT (2(A2,3X,2(I2,1X)))
1750 FORMAT (10F8.2)
1760 FORMAT (37X,I2,6X,I2)
1780 FORMAT (4X,I3,F2.0,52X,I4)
1790 FORMAT (8F10.3)
1920 FORMAT (' ***** ERROR,     INITIAL STAGE VALUE UNSPECIFIED IN BRAN
    1CH ',I2,' SECTION ',I2,' *****')
1960 FORMAT (' ***** ERROR,     MATRIX NOT SQUARE : REVIEW SCHEMATIZATI
    1ON AND EXTERNAL BOUNDARY-CONDITION SPECIFICATIONS *****')
1980 FORMAT (' ***** ERROR,     WIND DATA FREQUENCY UNSPECIFIED OR INCO
    1NSISTENT *****')
1990 FORMAT (' ***** ERROR,     MATRIX IS SINGULAR *****')
2020 FORMAT (' ***** ERROR,     IMPROPER NUMBER OF WIND DATA SPECIFIED
    1(1<=NWDATA<=',I5,') *****')
2050 FORMAT (' ***** ERROR,     INITIAL VALUE(S) OUT OF DEFINED RANGE O
    1F CHANNEL GEOMETRY FOR BRANCH ',I2,' SECTION ',I2,' *****')
2075 FORMAT ('+',T69,'(STEEP SLOPE CHANNEL NEEDS ADDITIONAL A(Z) FOR DA
    1/DX TERM)')
2080 FORMAT (/' ',11X,A2,'(J,I),J=1,NSEC(I)')
2090 FORMAT (' ',1X,A2,'( J,',I2,')',12F10.4/11X,12F10.4)
2110 FORMAT (' WARNING,    MAXIMUM ITERATIONS EXCEEDED AT ',I2,':',I2,'
    1ON ',I2,'/',I2,'/',I2,'     Z-ZP(',I2,',',I2,')=',F7.4,' Q-QP(',I2
    2,',',I2,')=',F7.1)
2140 FORMAT (/' NUMBER OF SOLUTIONS = ',I5/)
2145 FORMAT (' SOLUTIONS/TIME STEP = ',F5.1)
2150 FORMAT (' Z=',E13.6,' Q=',E13.6,' QT=',E13.6,' QX=',E13.6,' AX=',E
    113.6,' ZX=',E13.6,' F=',E13.6,' W=',E13.6)
2160 FORMAT (1X,8I16)
2170 FORMAT (1X,8E16.8)
     END
```

LIST OF VARIABLES

(Value in parentheses is array dimension; only variables necessary to convert BRANCH to BRANCH' are included)

Variable	Range	Definition
CLK (MAXS)	Package	Value of *K'/b'* (leakage coefficient).
CLKIJ	Module	*K'/b'* at upstream cross section at beginning of BRANCH' time interval.
CLKP	Module	*K'/b'* at upstream cross section at end of BRANCH' time interval.
CLKP1	Module	*K'/b'* at downstream cross section at beginning of BRANCH' time interval.
CLKPP1	Module	*K'/b'* at downstream cross section at end of BRANCH' time interval.
DCFM	Package	Maximum value of the multiplier for the friction term in the momentum equation when the channel runs dry.
DCFM1	Package	Multiplier for the friction term in the momentum equation when the channel runs dry; maximum value is DCFM.
HAQ	Module	Aquifer head at upstream node at beginning of BRANCH time interval.
HAQP	Module	Aquifer head at upstream node at end of BRANCH time interval.
HAQP1	Module	Aquifer head at downstream node at beginning of BRANCH time interval.
HAQPP1	Module	Aquifer head at downstream node at end of BRANCH time interval.
HNEW (NCOL, NROW, NLAY)	Global	Value of aquifer head at end of MODFLOW time step.
HNEW1	Module	Local variable for aquifer head at end of MODFLOW time step.
HOLD (NCOL, NROW, NLAY)	Global	Value of aquifer head at beginning of MODFLOW time step.
HOLD1	Module	Local variable for aquifer head at beginning of MODFLOW time step.
IBEGIN	Package	Flag indicating if BRANCH' is being called for the first time (0, first; 1, not first time).
IBOUND (NCOL, NROW, NLAY)	Global	Status of each cell (<0 is constant head cell, =0 is inactive cell, >0 is variable head cell).
IBRPRN	Package	Flag indicating if BRANCH' is being called from the formulation or budget package (0, formulation; 1, budget).
ICOUNT	Module	Counter of number of BRANCH time intervals passed within the MODFLOW time step.
ISS	Global	Flag indicating steady-state simulation (0, not steady state; 1, steady state).

LIST OF VARIABLES—Continued

(Value in parentheses is array dimension, only variables necessary to convert BRANCH to BRANCH' are included)

Variable	Range	Definition
ISTRM (3, MAXS)	Package	Vector describing row, layer, and column of aquifer model cell that corresponds to channel segment.
ITRIA1	Module	Temporary value for ITRIAL vector for comparison.
ITRIA2	Module	Temporary value for ITRIAL vector for comparison.
ITRIA3	Module	Temporary value for ITRIAL vector for comparison.
ITRIAL (MAXS, MAXCZQ)	Package	Flag indicating the wet-dry condition of a channel reach and the relative position of the surrounding aquifer to the riverbed by a two-digit number. For first digit, 0 is reach wet, 1 is upstream node dry, 2 is downstream node dry, and 3 to 8 are both nodes dry with successively high frictional resistance. For second digit, 0 is aquifer above riverbed at both nodes, 1 is aquifer below riverbed at upstream node, 2 is aquifer below riverbed at downstream node, and 3 is aquifer below riverbed at both nodes.
KDAS	Package	Saved value of day.
KHRS	Package	Saved value of hour.
KKITER	Global	MODFLOW iteration number.
KMNS	Package	Saved value of minute.
KMOS	Package	Saved value of month.
KYRS	Package	Saved value of year.
MAXCZQ	Package	Maximum number of daily computed results held in storage for plotting purposes.
MAXMZQ	Package	Maximum number of measured data held in storage for plotting purposes.
MAXQBD	Package	Maximum number of discharge boundary value data held in storage for computation.
MAXS	Package	Maximum number of cross sections in the entire channel network.
MAXZBD	Package	Maximum number of stage boundary value data held in storage for computation.
MXBH	Package	Maximum number of branches in the network.
MXJN	Package	Maximum number of junctions in the network.
MXMD	Package	Maximum number of measured data locations accommodated in the network.
MXPT	Package	Maximum number of points used to define a cross section.

LIST OF VARIABLES—Continued

(Value in parentheses is array dimension; only variables necessary to convert BRANCH to BRANCH' are included)

Variable	Range	Definition
MXTDBC	Package	Maximum number of boundaries in the network.
MXWIND	Package	Maximum number of wind data points input.
NCOL	Global	Maximum number of MODFLOW aquifer columns.
NELAP	Package	Number of elapsed MODFLOW time steps since beginning of simulation.
NLAY	Global	Maximum number of MODFLOW aquifer layers.
NROW	Global	Maximum number of MODFLOW aquifer rows.
NTSAQ	Package	Number of BRANCH time intervals in one MODFLOW time step.
QLSUM (MAXS)	Package	Average leakage rate out of a river segment over one MODFLOW time step.
QPSAV (MAXS)	Package	Value of discharge at end of first BRANCH' time interval in a MODFLOW time step.
QSAV (MAXS)	Package	Value of discharge at beginning of first BRANCH' time interval in a MODFLOW time step.
ZBOT (MAXS)	Package	Elevation of channel bottom.
ZN (MAXS)	Package	Value of stage at end of final BRANCH' time interval in a MODFLOW time step.
ZPL (MAXS)	Package	Value of stage at end of final BRANCH' time interval in a MODFLOW time step for previous trial.
ZPSAV (MAXS)	Package	Value of stage at end of first BRANCH' time interval after beginning of a MODFLOW time step.
ZSAV (MAXS)	Package	Value of stage at beginning of first BRANCH' time interval after beginning of a MODFLOW time step.

SIMULATIONS OF STREAM-AQUIFER INTERACTION

The verification procedure for MODBRANCH was developed with the following criteria to be satisfied: (1) compare results with previously existing models; (2) simulate events that cannot be modeled with existing models; (3) demonstrate the use of special options, drying and rewetting of channels and steady-state simulation; and (4) compare simulation results with field data collected at a site in southern Florida.

SCHEMES FOR COMPARISON

In order to verify the MODBRANCH solution scheme, MODBRANCH results were compared with results from three other solution schemes: (1) the one-dimensional, unsteady, constant cross-section model described by Pinder and Sauer (1971); (2) a simple, four-point implicit scheme for a rectangular channel attached to MODFLOW in the same manner that BRANCH was attached; and (3) the flow-routing Stream package for MODFLOW (Prudic, 1989).

The one-dimensional, unsteady, constant cross-section streamflow model (referred to as the Pinder model) solved the continuity and momentum equations by an explicit finite-difference, staggered-net method. The two-dimensional ground-water flow equation is solved by the iterative, alternating direction implicit technique. The streamflow and ground-water equations are coupled by a leakage equation similar to equation 3a. This coupled model was used to demonstrate the modification of a floodwave because of bank storage (Pinder and Sauer, 1971). Thus, the Pinder model results can be reproduced by MODBRANCH for comparison.

The four-point implicit scheme (referred to as the four-point model) was created by Lewis Delong, Jon Lee, and David Thompson of the USGS as a training supplement in surface-water modeling. It solves the continuity and momentum equations in integral form for a unit width of channel. As in the case of the Pinder model, its use is confined to single rectangular channels of constant width. As a prelude to creating MODBRANCH, the four-point model was coupled with MODFLOW. The same format was used as in MODBRANCH; allocation, data input, formulation, and budget subroutines were created for the four-point model. This coupled four-point model can be used for comparison with MODBRANCH.

The stream module in MODFLOW (Prudic, 1989) can route flow from more than one tributary into a channel, so it is not limited to single channels as are the Pinder and four-point models. However, it is restricted to rectangular cross sections; only routes flow downstream, and backwater effects cannot be simulated. Flows into diversions and forks must be user defined, and the depth in each reach is calculated as steady uniform flow. This makes it comparable to MODBRANCH especially in steady-state simulation.

PROBLEM 1—FLOODWAVE PROPAGATION WITH BANK STORAGE

This verification involves duplicating the results from Pinder and Sauer (1971) with MODBRANCH and the four-point model. The hypothetical aquifer used extends 130,000 ft along the length of the channel and is 1,400 ft across. The hydraulic conductivity of the aquifer is 0.01 ft/s (864 ft/d), and the initial saturated thickness ranges from 220 ft at the upstream boundary to 90 ft at the downstream boundary. The aquifer is surrounded by impermeable boundaries. The stream is a straight channel with a constant width of 100 ft and a slope of 0.001. Initial depth of flow in the stream is 20 ft, and the initial discharge is 18,000 ft^3/s.

The suggested *K'/b'* value of 4 ft/s per foot was supposed to be high enough so that riverbed conductance was not a limiting factor in the amount of water entering the aquifer (Pinder and Sauer, 1971). However, a value of 0.01 ft/s per foot would be equivalent to the hydraulic conductivity of the aquifer with a riverbed thickness of 1 ft. This value was used in the trial run, and results indicate the model is not sensitive to higher values. Assuming the 18,000 ft^3/s was normal flow in the channel at a 20-ft depth, Manning's equation indicates an n value of 0.03858. The aquifer storativity was set to a nominal value of 0.25.

With these input data, the stream-aquifer system was modeled on MODBRANCH and the four-point model. The aquifer was defined with a land-surface elevation 1,000 ft above the aquifer base everywhere except at the river, where the aquifer top is defined at the river bottom, effectively making the aquifer confined under the river. The finite-difference grid was arranged with 2,000-ft spacings from north to south (corresponding to the lengths of the river reaches crossing the model grid cell) and 100-ft spacings everywhere from east to west, except on either side of the river where 50-ft spacings were used for detail. The river was continued 10,000 ft beyond the southern boundary of the aquifer (total river length 140,000 ft), and the downstream end was set as a "self-setting boundary condition." This approximates a free outflow.

Because the four-point model is fully forward weighted in time, the weighting factors Θ and χ in BRANCH' were set to one. Because of potential numerical instabilities with a relatively high leakage coefficient, the same time-step and time-interval length of 5 minutes was used in MODFLOW and BRANCH'. Although the exact upstream hydrograph used in Pinder and Sauer (1971) was unknown, a cosine wave was set up with a peak of 28,000 ft^3/s and a length of 2.5 hours.

The discharge hydrographs simulated by BRANCH' (MODBRANCH model) (solid lines) and the four-point model (dotted line) are shown in figure 12. Hydrographs are shown at three points: the upstream boundary, 50,000 ft downstream, and 140,000 ft downstream (10,000 ft beyond the end of the aquifer). The very close correlation in the results of the two models indicates that MODBRANCH has the same solution as the simple four-point scheme coupled to MODFLOW. The modification of the floodwave by leakage can be seen in figure 12 as the downstream hydrographs demonstrate marked attenuation in wave magnitude.

For comparison of MODBRANCH results with results from the Pinder model, discharge hydrographs in the report by Pinder and Sauer (1971) were compared to hydrographs simulated by MODBRANCH (fig. 13). The upper set of curves in figure 13 is the discharge at 50,000 ft from the upstream boundary without leakage; the lower set of curves is at the same location with leakage to the aquifer. The close correlation indicates the MODBRANCH solution corresponds to results from the Pinder model. Small differences between the curves produced by the two models can be attributed to digitizing errors, differing convergence criteria, and differing input hydrographs.

The comparison involving the results from Pinder and Sauer (1971) indicates that MODBRANCH reproduces the results from the four-point and Pinder models for a simple case. This case only involved a single channel with a constant, rectangular cross section. Unlike the four-point and Pinder models, MODBRANCH can simulate channels with nonrectangular, nonprismatic cross sections and complex junctions.

PROBLEM 2—STEADY-STATE SIMULATION, BACKWATER, AND DISTRIBUTION OF FLOWS AT JUNCTIONS

This problem illustrates the steady-state option in MODBRANCH and allows a comparison of MODBRANCH results with results from the Stream package of MODFLOW. It also allows a demonstration of the ability of MODBRANCH to redistribute flows in BRANCH' at junctions based on backwater effects.

The hypothetical aquifer stretches 20,500 ft from north to south and 10,500 ft from east to west and is surrounded by impermeable boundaries. The aquifer is 8 ft thick and has a hydraulic conductivity of 0.28 ft/s (24,000 ft/d). This high conductivity is similar to some values found in southern Florida. The aquifer, being very shallow, will be dominated by the river leakage. The river starts at the center of the northern boundary and proceeds southward 15,250 ft until it divides into two secondary channels that proceed diagonally to the southern boundary (fig. 14). To duplicate the problem on the Stream package, the channels were made rectangular with the main channel 10 ft wide and the secondary channels 7 ft wide. The river has a bottom elevation 4.95 ft above the aquifer bottom at the northern boundary. The main channel has a slope of 0.0001, and the secondary channels each have a slope of 0.000141. The southern river boundaries have bottom elevations 2.375 ft above the aquifer bottom. Manning's n is 0.0145 for all channels, and the flow at the upstream boundary is 50 ft^3/s. The leakage coefficient for the river is 0.0001 per second.

The recharge package in MODFLOW is used to simulate two situations where recharge from precipitation enters the ground water, leaks into the river, and flows out of the area. In the first situation, uniform recharge of 2 ft/yr (0.005472 ft/d) covers the entire area. The second situation is one in which the area has been covered with impermeable material except for a 5,000 by 5,000-ft area in the southwest

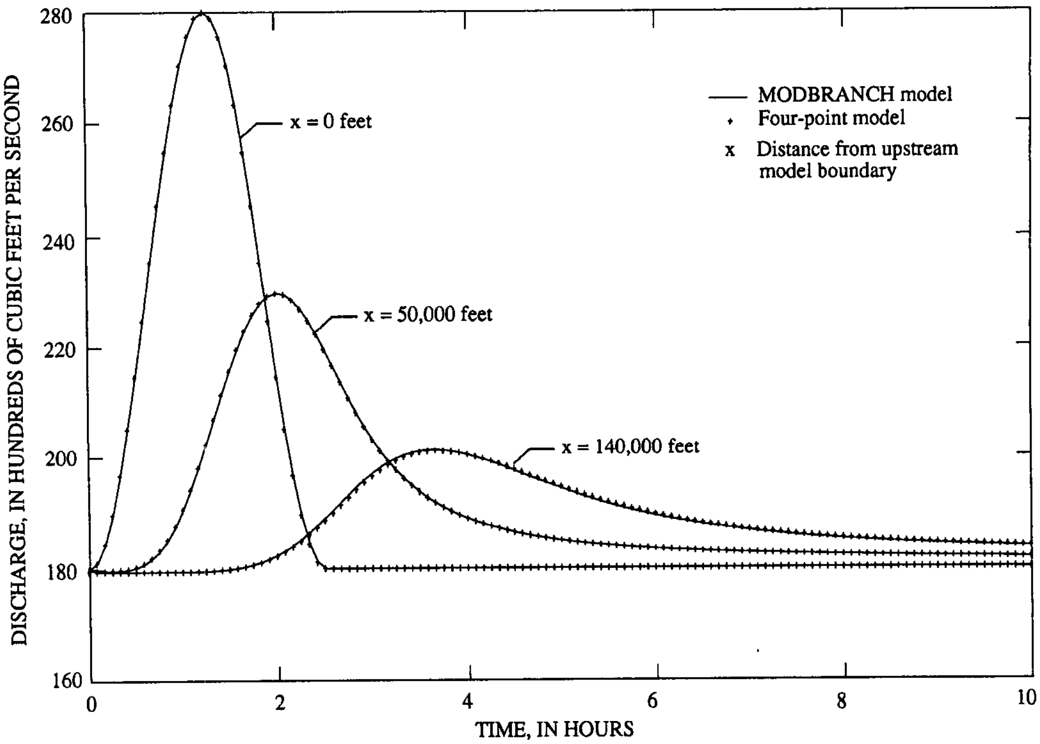

Figure 12. Discharge hydrograph simulated by the MODBRANCH and four-point models.

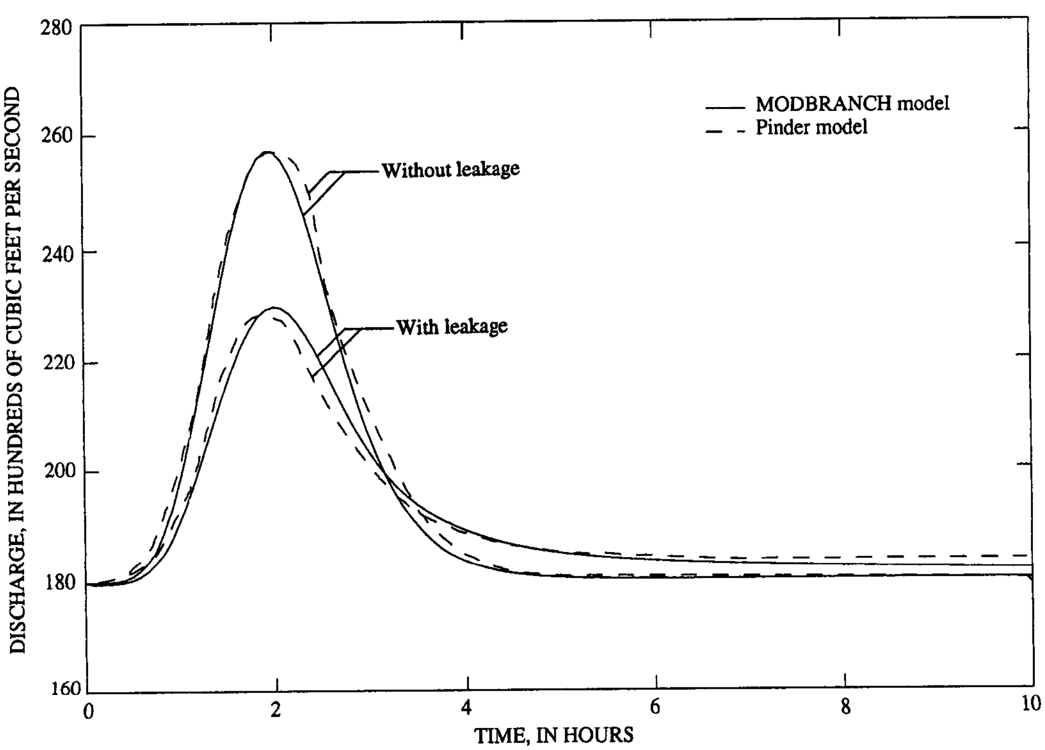

Figure 13. Discharge hydrograph simulated by the MODBRANCH and Pinder models for a site 50,000 feet from upstream boundary.

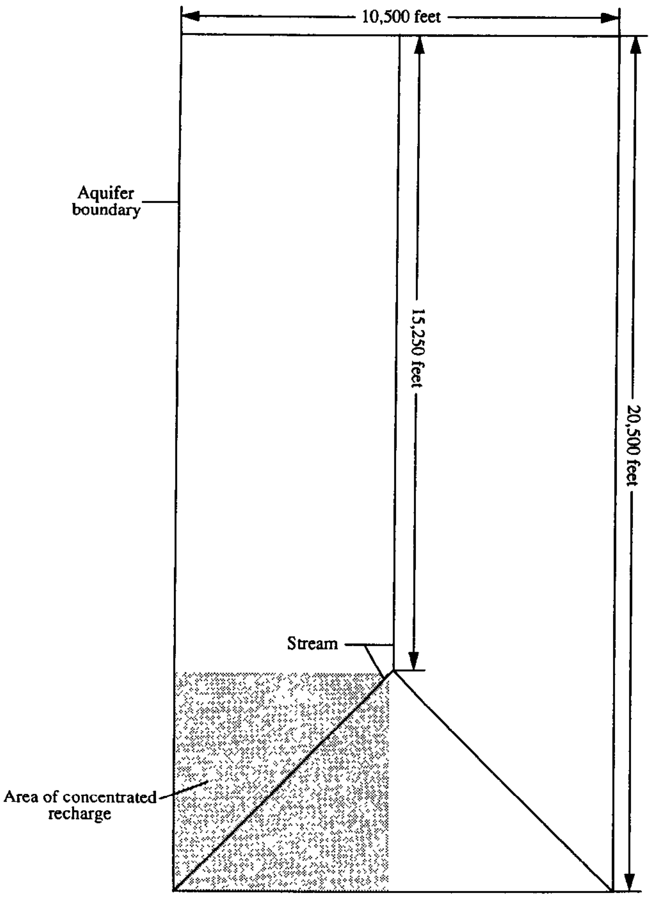

Figure 14. Diagram showing aquifer and river layout for steady-state problem.

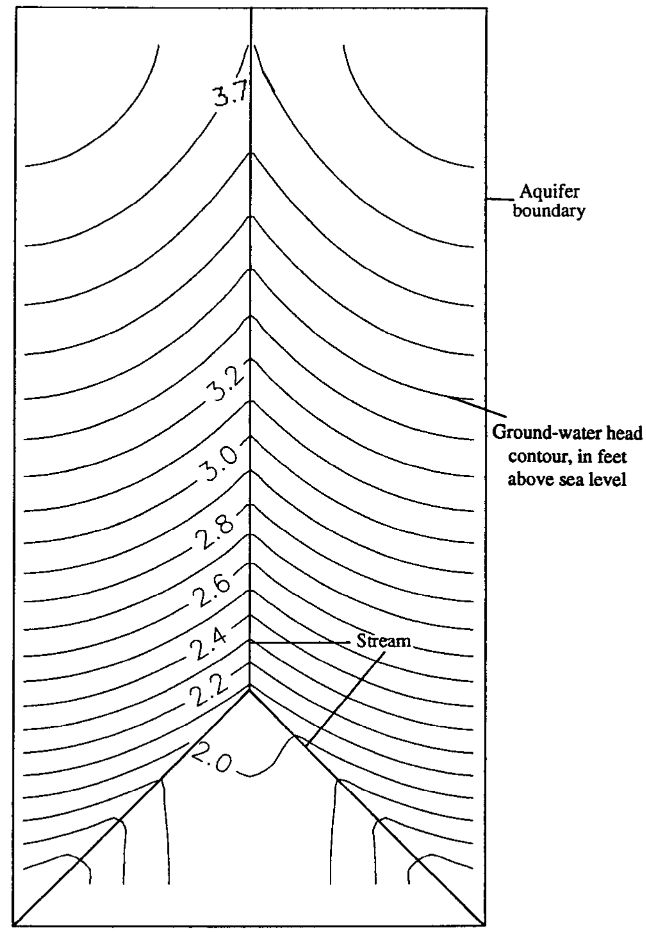

Figure 15. Ground-water head contours produced by MODBRANCH for symmetric recharge (contour interval 0.1 foot).

corner (fig. 14). If the 2 ft/yr recharge over the entire 10,000 by 20,000-ft area was drained into this 5,000 by 5,000-ft area, it would effectively be 16 ft/yr (0.04392 ft/d) in this small area. Taking into account other routes of escape (evaporation and additional drainage areas), a value of 8 ft/yr (0.022536 ft/d) was used in the southwest corner.

A MODFLOW grid spacing of 500 ft was used. The river reaches in BRANCH' and the Stream package were designed to make one reach per aquifer model cell. This made the reaches 500 ft long in the main channel and about 700 ft long in the diagonal secondary channels. In BRANCH', the weighting factors Θ and χ were set to 1 (appropriate for steady state), and the southern boundaries were made "self setting" to simulate free outflows. In the Stream package, the amount of flows going down each secondary channel must be user specified. They were set to divide the flow 50 percent down each channel.

The ground-water contours for the first situation of uniform recharge are shown for MODBRANCH in figure 15 and for the Stream package in figure 16. The close correlation of these two results indicates that backwater conditions in the channel (which can be modeled by MODBRANCH but not by the Stream package) are not greatly affecting the ground-water contours. The river flows produced by the two models are presented in more detail in table 2, which presents stage and discharge at four points along the channel. The two models calculate very similar results with a deviation at the west downstream boundary of only 0.01 ft for stage and 0.1 ft^3/s for discharge.

The ground-water head contours for the second situation of nonuniform recharge are shown for MODBRANCH in figure 17 and for the Stream package in figure 18. The results deviate the most between the two models at the southwest corner. Comparison of figures 17 and 18 shows that MODBRANCH represents the westernmost ground-water mound as farther south, nearer the canal, and having a higher elevation (2.80 ft) than the MODFLOW simulation using the Stream package (2.30 ft). The asymmetrical recharge of the river conditions are apparent from the data presented in the last four columns of table 2.

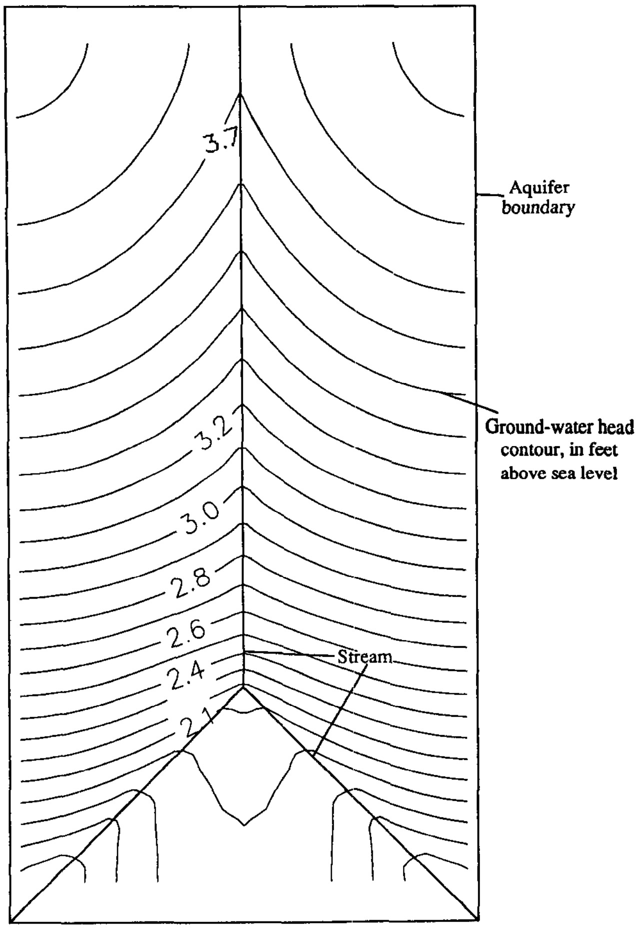

Figure 16. Ground-water head contours produced by stream package for symmetric recharge (contour interval 0.1 foot).

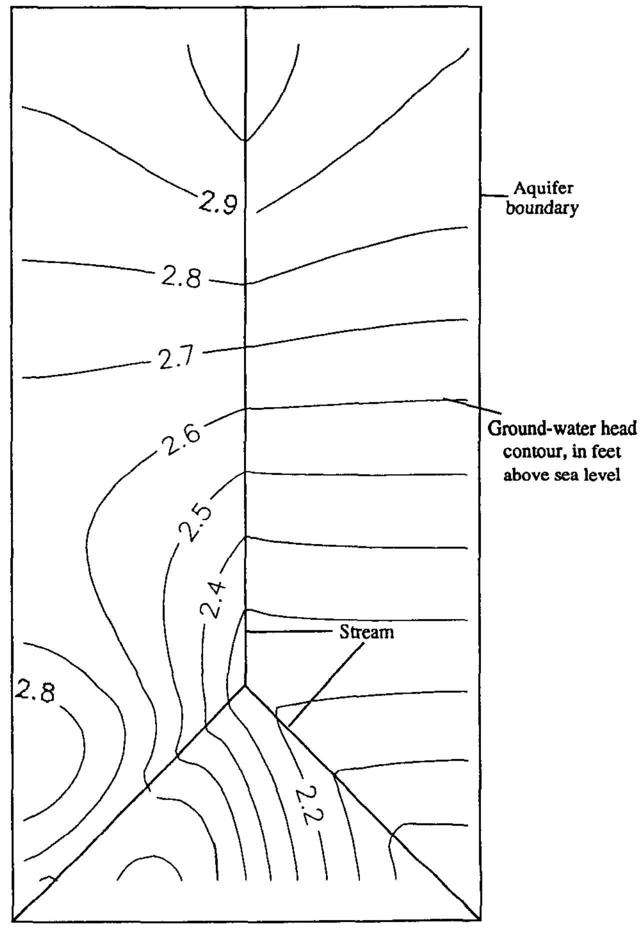

Figure 17. Ground-water head contours produced by MODBRANCH for asymmetric recharge (contour interval 0.1 foot).

Both packages represent virtually the same stage and discharge at the upstream boundary. Immediately upstream of the junction, the BRANCH' stage is 0.50 ft higher than that calculated by the Stream package in MODFLOW. This is primarily because of backwater effects in BRANCH'. Immediately downstream of the junction in the west channel, the Stream package indicates 24.2 ft^3/s, 50 percent of the flow in the main channel; BRANCH' shows 24.1 ft^3/s, 48 percent of the flow in the main channel. Although the percentage of discharge into the west channel is only affected slightly by the backwater effects represented in BRANCH', the stages react more severely. At the downstream boundary, the difference in stages is 0.97 ft. This higher stage, calculated by BRANCH', explains the ground-water mound being higher and closer to the canal in the simulation with MODBRANCH.

These results indicate that MODBRANCH simulates steady-state conditions reasonably well. MODBRANCH differs from the Stream package in MODFLOW in its representation of nonuniform flow and distribution of flows at junctions. These differences can result in significant differences under some conditions.

PROBLEM 3—REWETTING OF CHANNEL BY RECHARGE WELLS

This problem describes a MODBRANCH simulation of a river rewet by discharge from an aquifer. The same aquifer in problem 2 is used with the storativity set to 0.30. A different stream is used, with two tributaries starting from each corner of the northern boundary and joining 5,250 ft south of the northern boundary (fig. 19). A main channel connects the junction to the southern boundary. All channels are rectangular; the tributaries are 10 ft wide, and the main channel is 20 ft wide. All channels have a slope of 0.0001 and a Manning's *n* of 0.0145. The upstream boundaries of the tributaries have riverbed elevations 5.17 ft above the aquifer bottom. At the junction, the riverbed is 4.425 ft above the aquifer bed, and at the southern boundary

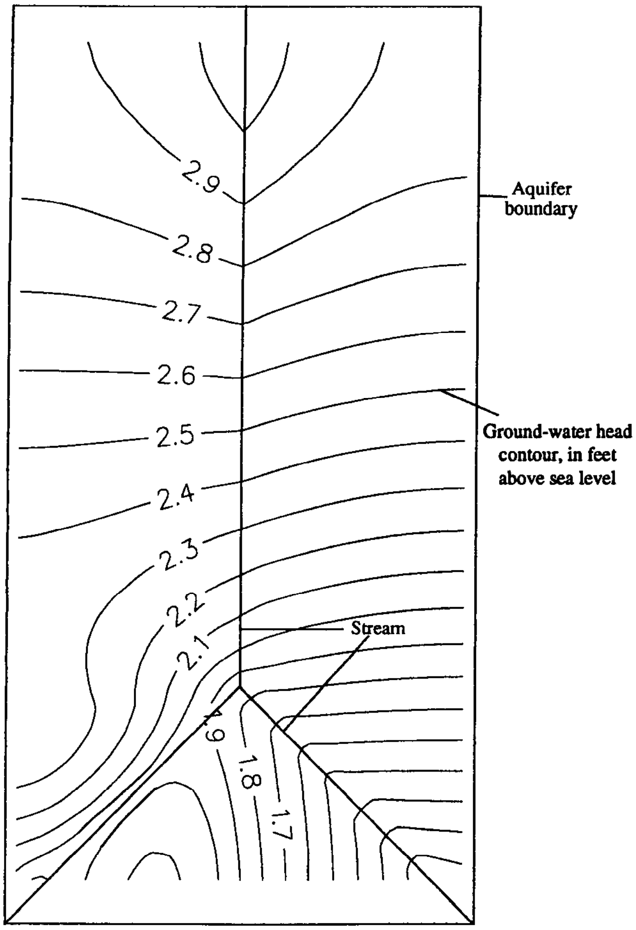

Figure 18. Ground-water head contours produced by stream package for asymmetric recharge (contour interval 0.1 foot).

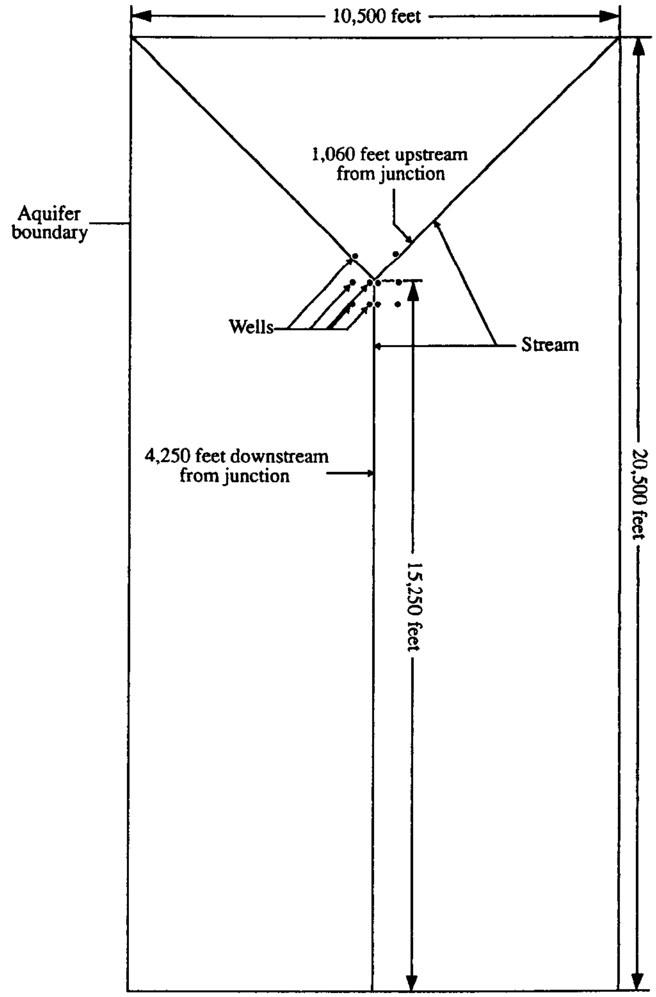

Figure 19. Diagram showing aquifer, river, and well layout for drying and rewetting problem.

it is 2.900 ft above the bed. The leakage coefficient for the river is 0.0010 per second. Grouped around the river junction are 10 recharge wells shown as dots in figure 19. When activated, each well pumps about 11 ft^3/s (40,000 ft^3/hr) into the aquifer.

The simulation starts with the ground-water head 5.0 ft above the aquifer bottom at the northern boundary and sloping linearly to 1 ft above the bottom at the southern boundary (ground-water slope 0.0002). The initial discharge is 15 ft^3/s flowing down each of the tributaries. In the first 45

Table 2. Flows calculated in BRANCH' and stream package of MODFLOW for symmetrical and asymmetrical recharge
[Stage, in feet above or below sea level; discharge, in cubic feet per second]

Location	Symmetrical recharge				Asymmetrical recharge			
	BRANCH'		Stream package		BRANCH'		Stream package	
	Stage	Discharge	Stage	Discharge	Stage	Discharge	Stage	Discharge
Upstream boundary	3.51	50.0	3.49	50.0	3.50	50.0	3.49	50.0
Immediate upstream of junction	1.56	56.3	1.52	55.6	1.85	50.0	1.35	48.3
Immediately downstream of junction in west channel	1.56	28.2	1.47	27.8	1.85	24.1	1.31	24.2
Downstream boundary of west channel	.66	31.5	.67	31.4	1.53	28.0	.56	28.9

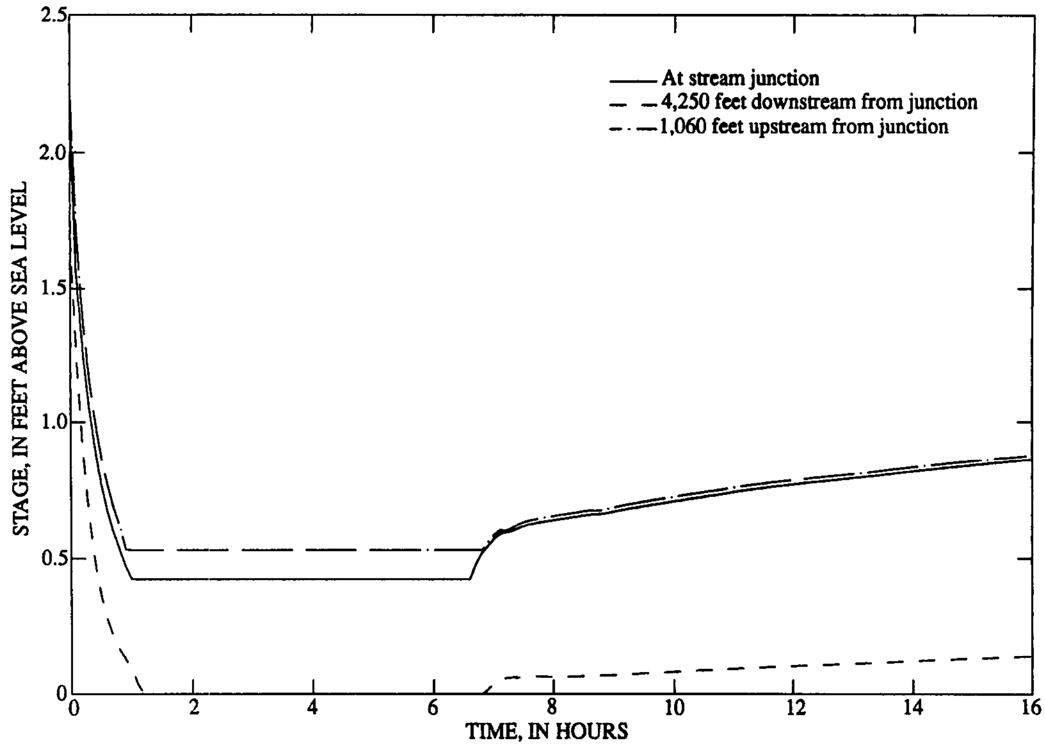

Figure 20. Stage hydrographs for drying and rewetting problem.

minutes, the inflow is cut to zero. The river runs dry. At 4 hours, the 10 wells begin pumping, the aquifer heads around the wells rise until flow from the aquifer fills the channel, rewets it, and flows downstream.

Experimentation indicates a good value for the dry-channel friction multiplier (DCFM) to be 100. Higher values caused small jumps and oscillations in the solution. The time intervals and time steps selected for this run are 6 minutes for BRANCH' and 1 hour for MODFLOW. This allows the option for multiple BRANCH' time intervals in one MODFLOW time step to be demonstrated. The southern boundary of the river is specified as a self-setting boundary condition.

Stage hydrographs at three points in the river are shown in figure 20. The solid line is at the junction, the dashed line is at 4,250 ft downstream, and the dashed-dotted line is 1,060 ft upstream of the junction (points shown in fig. 19). The channel runs dry upstream, at the junction, and downstream. Although the wells start pumping at 4 hours, the ground-water heads do not rise high enough to rewet the channel until about 7 hours. The point at the junction is rewet first with the upstream point not rewet until the stage at the junction has almost reached the bottom elevation of the upstream point. Relatively smooth transitions from wet to dry and dry to wet are indicated. The MODBRANCH output data (Appendix II) indicate that flows of 1–3 ft^3/s occur when the channel is dry. Higher values are present immediately before and after transitions between wet and dry. When rewet, flows of 30–50 ft^3/s are indicated.

The ground-water head contours in the simulation at 6, 10, and 16 hours are shown in figure 21. At 6 hours, the ground-water mound created by the recharge wells becomes apparent, but leakage to the river has not yet begun. At 10 hours, the mound is starting to show a division in the middle because of leakage to the river. By 16 hours, the divide in the ground-water mound is apparent. Finally, figure 22 shows the ground-water head contours at 16 hours if the river is completely removed, but the well recharging schedule is maintained.

To determine the sensitivity of the drying and rewetting option to time-interval length (see Drying and Rewetting of River Channels section), the problem was run again with BRANCH' time intervals of 3 and 12 minutes. A comparison of the hydrographs when time intervals of 3, 6, and 12 minutes are used is shown at the junction, 4,250 ft downstream of the junction, and 1,060 ft upstream of the junction (figs. 23–25). Slight differences occur only at or near the times of drying and rewetting. The solutions are virtually identical at other times. The longer time-interval sizes tend to slightly delay the times of drying and rewetting.

This sample problem demonstrates the ability of MODBRANCH to model a situation where a river runs dry and is rewet from the aquifer by recharging the aquifer with injection wells. It also demonstrates the option of multiple BRANCH' time intervals occurring in one MODFLOW time step. Trial runs indicated that the drying and rewetting process is insensitive to time-interval length in problem 3.

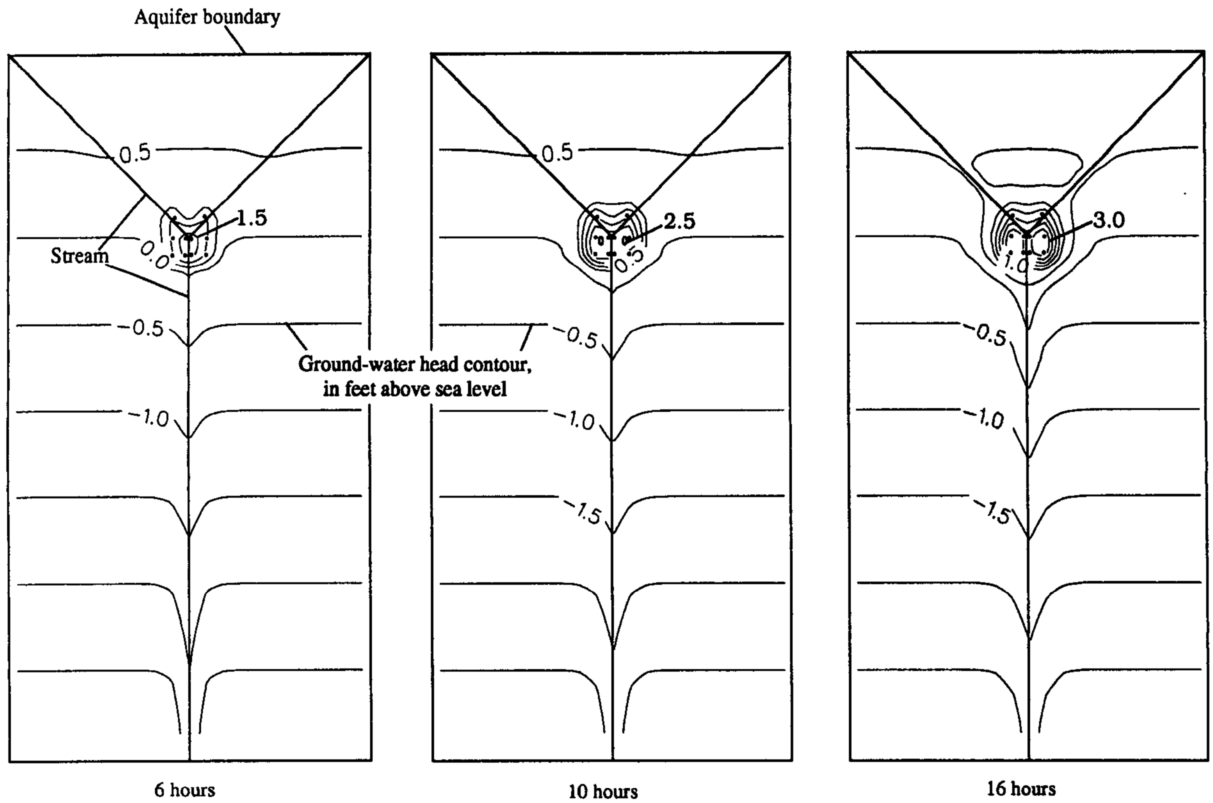

Figure 21. Ground-water head contours at 6, 10, and 16 hours (contour interval 0.5 foot).

PROBLEM 4—FIELD MODEL OF L–31N CANAL

L–31N canal in Dade County (fig. 26) was the site of extensive data collection for a USGS study (Chin, 1990). Three sites along a 2-mi reach beginning at 1 mi south of Tamiami Trail were instrumented with ground-water level measuring wells, stage recorders, and ultrasonic velocity meters (UVM) to measure discharge. The field installation locations are shown in figure 27. The channel cross sections at these three sites were surveyed carefully. The data collected were sufficient to construct a MODBRANCH model of the 2-mi reach of the canal and the surrounding aquifer.

The model aquifer grid for MODFLOW is shown in figure 28. The grid spacings are chosen to place the monitoring wells at the center of grid cells. The aquifer is modeled as one layer with a hydraulic conductivity of 1,667 ft/hr (40,000 ft/d)—a nominal value for the aquifer in this area (Fish and Stewart, 1991). The aquifer top elevation is defined as 8 ft above sea level everywhere, except beneath the canal where the aquifer top elevation is set to the canal-bed elevations, effectively making the aquifer confined beneath the canal. Values of confined storage coefficient and specific yield were chosen, 0.0002 and 0.20, respectively, based on accepted values (M.L. Merritt, U.S. Geological Survey, written commun., 1991). The aquifer bottom elevation is 52.0 ft below sea level.

The time-variant head package for MODFLOW (Leake and Prudic, 1988) was used so that the ground-water heads at the model boundary could be varied during the simulation to match the values recorded in the field. This package allows the ground-water boundary heads to vary linearly from the beginning to the end of a stress period. The simulation included two stress periods, 12 and 48 hours. Each stress period corresponds to a period of comprehensive ground-water data collection.

The channel cross-section measurements were used to define the stage-area-topwidth relations used in BRANCH. Cross sections between the measured locations were defined by interpolating the values of stage, area, and topwidth. The 2-mi canal reach was divided into two branches, each 1 mi long and containing five cross sections. Manning's n value for this type of channel, straight with minimal aquatic growth, was 0.025 (Roberson and others, 1988). For L–31N canal, Chin (1990) concluded that the local reach transmissivity was 630 ft^3/s per mile of canal length per foot of head difference between the canal stage and aquifer head (0.1193 ft^3/s per foot per foot). The local reach transmissivity must be divided by the wetted perimeter to convert to a leakage coefficient, K'/b'. If the average wetted perimeter of L–31N canal is about 135 ft, the value of K'/b' is 0.0009 per second (the value used in BRANCH).

A 15-minute time interval was used in BRANCH and a 4-hour time step was used in MODFLOW. The stage values

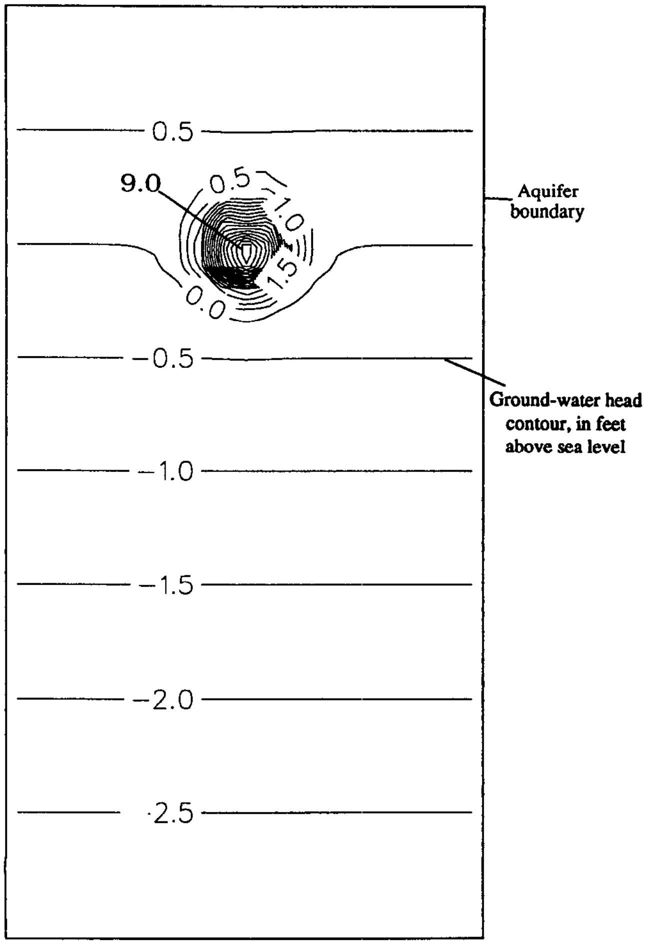

Figure 22. Ground-water head contours at 16 hours without river (contour interval 0.5 foot).

at the upstream and downstream ends of the canal were recorded at 15-minute intervals and were used as boundaries for streamflow routing using the BRANCH' model. The simulation was run from 9:00 p.m. on May 1, 1989, to 9:00 a.m. on May 4, 1989. Verification tests were made by comparing the (1) computed stage at the middle of the channel reach (1 mi from upstream boundary) with measured values, (2) computed discharge at the middle of the channel reach with measured values, and (3) computed groundwater heads with those measured at the interior (not boundary) wells.

RESULTS

The stage computed at the middle of the channel reach is compared to the measured stage at this location in figure 29. The computed stage tends to be slightly higher than the measured stage (0.01 ft or less). This difference is within the order of the accuracy of the stage measurements and these results are considered good. However, because measured stages are used as upstream and downstream boundaries and this comparison point is only 1 mi from each boundary, the closeness of fit can be attributed greatly to boundary effects.

A more rigorous test is to compare computed to measured discharge at the middle of the reach as shown in figure 30. In addition to the initial condition, only two discharge measurements were made using the UVM during the simulation period. The first discharge measurement deviates from the computed value by 76.8 ft^3/s (11.2 percent) because a peak in the model occurs at the time of measurement. However, if the actual time of measurement had been 8:15 a.m. on May 2, 1989, 30 minutes before the time written in the field notes, the deviation would be 10.2 ft^3/s (1.5 percent error). Because of the time for setup of the UVM, the recorded time of measurement could be in error. The second discharge measurement deviates by 6.1 ft^3/s (0.9 percent error). Thus, based on the sparse discharge-measurement data, the model seems to represent the flow in the canal reasonably well without any calibration effort. The model results and the field measurements (Chin, 1990) indicate that the leakage loss along the 2-mi reach during this period could be more than 100 ft^3/s Thus, simulating the canal leakage to the aquifer is critical to model accuracy.

Water-level measurements in observation wells and UVM discharge measurements in the L–31N canal were made simultaneously. The only wells not on the aquifer boundaries are those at sites 4, 5, and 6 (fig. 27). These data are presented along with model results at 9:00 a.m. on May 2, 1989, and 9:00 a.m. on May 4, 1989, in table 3. The shallowest well at each site was used for comparison because the depths of these wells were similar to the depth of the canal. Head differences between the measured and simulated heads varied from 0.01 to 0.07 ft (table 3). Inspection of the field data at these locations (Chin, 1990) indicates that vertical head variation at each site varied from 0.0 to 0.07 ft at the times of measurement. Therefore, the difference between the model and field results can be largely attributable to modeling the aquifer as a single layer. It is also likely that a calibration effort could produce even closer results, but the noncalibrated results shown in figures 29 and 30 are considered a better test of model validity.

CONCLUSIONS

The U.S. Geological Survey models, MODFLOW and BRANCH, were coupled with an interfacing code called MODBRANCH to allow the simulation of ground-water and surface-water interactions with sophisticated models of both systems. The BRANCH code was modified to implement this connection. The modified BRANCH code, referred to as BRANCH', was designed to operate from a subroutine package in MODFLOW. This configuration allows multiple BRANCH' time intervals to pass during one

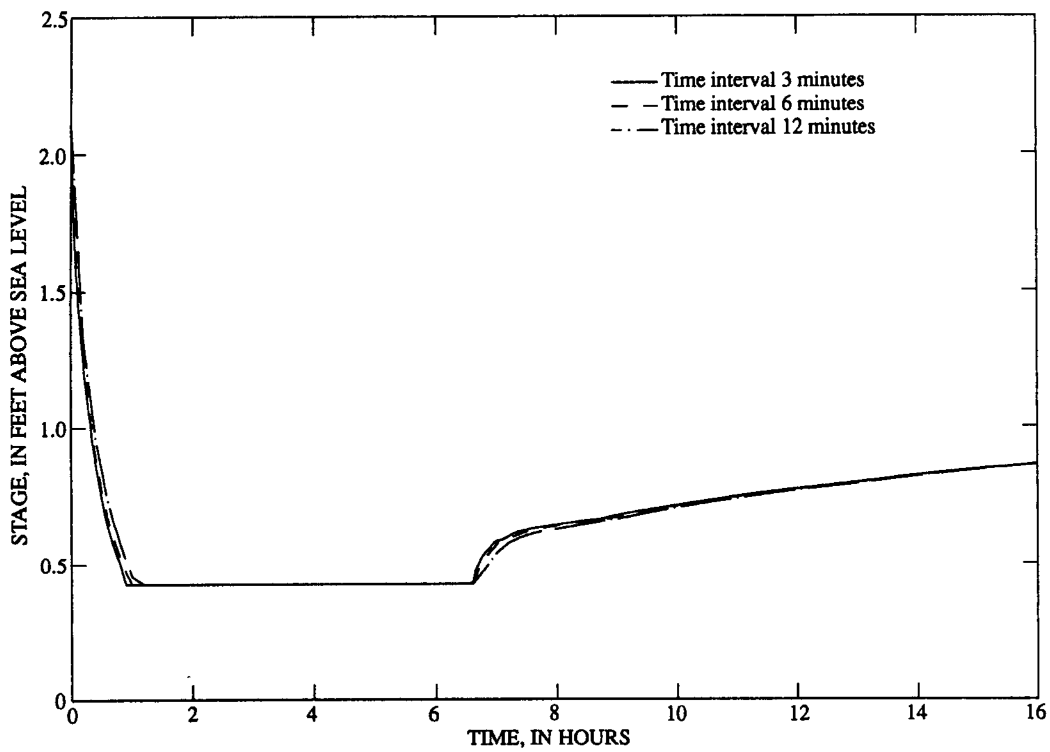

Figure 23. Stage hydrograph for time intervals of 3, 6, and 12 minutes at a site at the stream junction.

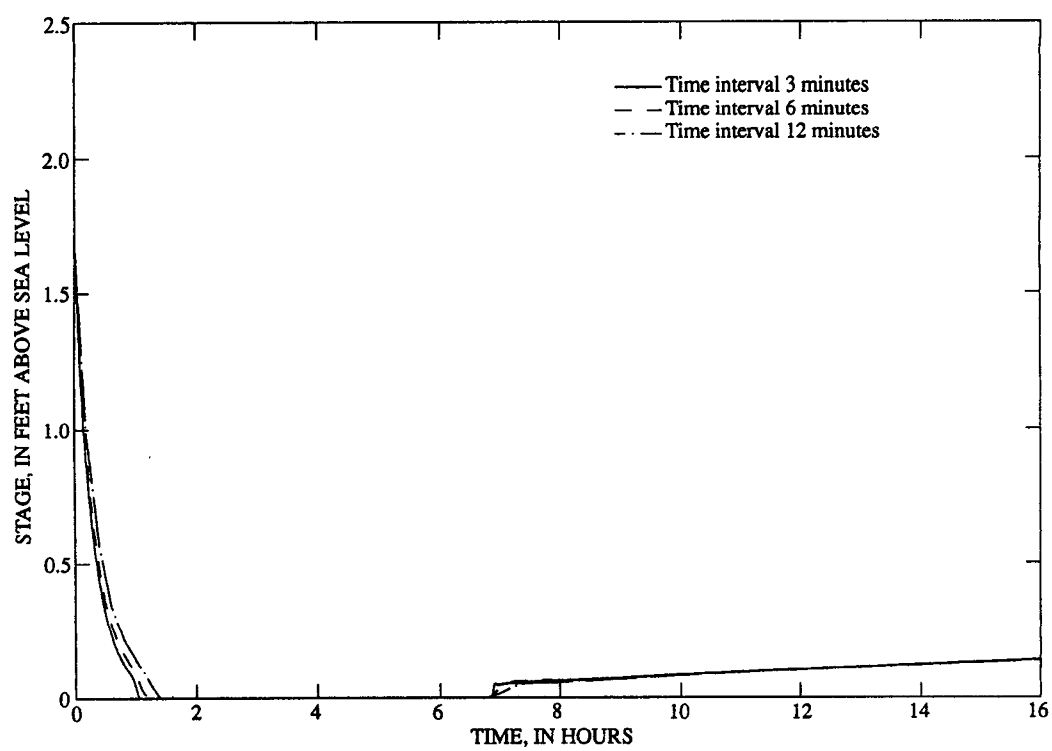

Figure 24. Stage hydrograph for time intervals of 3, 6, and 12 minutes at a site 4,250 feet downstream from the stream junction.

Table 3. Measured and model computed ground-water levels at the L–31N canal test site

Date	Time	Well	Measured water level (feet above sea level)	Computed water level (feet above sea levels)	Difference (feet)
5/2/89	9:00 a.m.	4	4.63	4.70	0.07
		5	4.65	4.68	.03
		6	4.63	4.66	.03
5/4/89	9:00 a.m.	4	4.53	4.58	.05
		5	4.54	4.55	.01
		6	4.50	4.53	.03

MODFLOW time step. When the time-step and time-interval lengths are the same in MODFLOW and BRANCH', the leakage quantities are calculated separately in MODFLOW and BRANCH'. This is the most stable scheme numerically. However, when multiple BRANCH' time intervals occur within one MODFLOW time step, the leakage values calculated in BRANCH' are passed to MODFLOW. This is necessary to conserve proper mass balance.

Additional features of the coupled model are the modularization of BRANCH' to allow its arrays to be passed from main arrays in MODFLOW, an option to allow the channel to dry and rewet, and a steady-state option that reduces the equations in BRANCH' to their nontime-dependent form if MODFLOW is running with the steady-state option. Sample runs have shown the usefulness of these options as well as the validity of MODBRANCH's formulation by comparison to previous models and to field data collected at a test site on the L–31N canal in southern Florida.

The new coupled model using the MODBRANCH code is most applicable when rapid stream and aquifer changes are modeled in a well-connected system. It can be used in conjunction with the simpler River and Stream packages with BRANCH' applied specifically to the transient, multiple junctioned, or irregular cross-sectioned rivers.

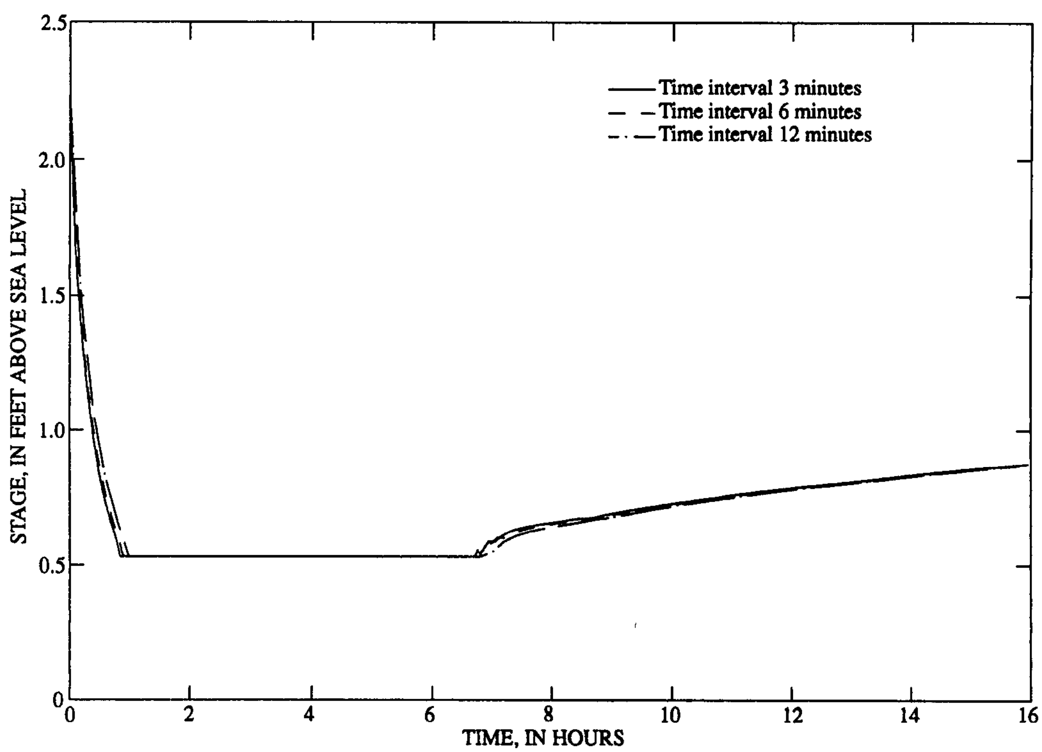

Figure 25. Stage hydrograph for time intervals of 3, 6, and 12 minutes at a site 1,060 feet upstream from the stream junction.

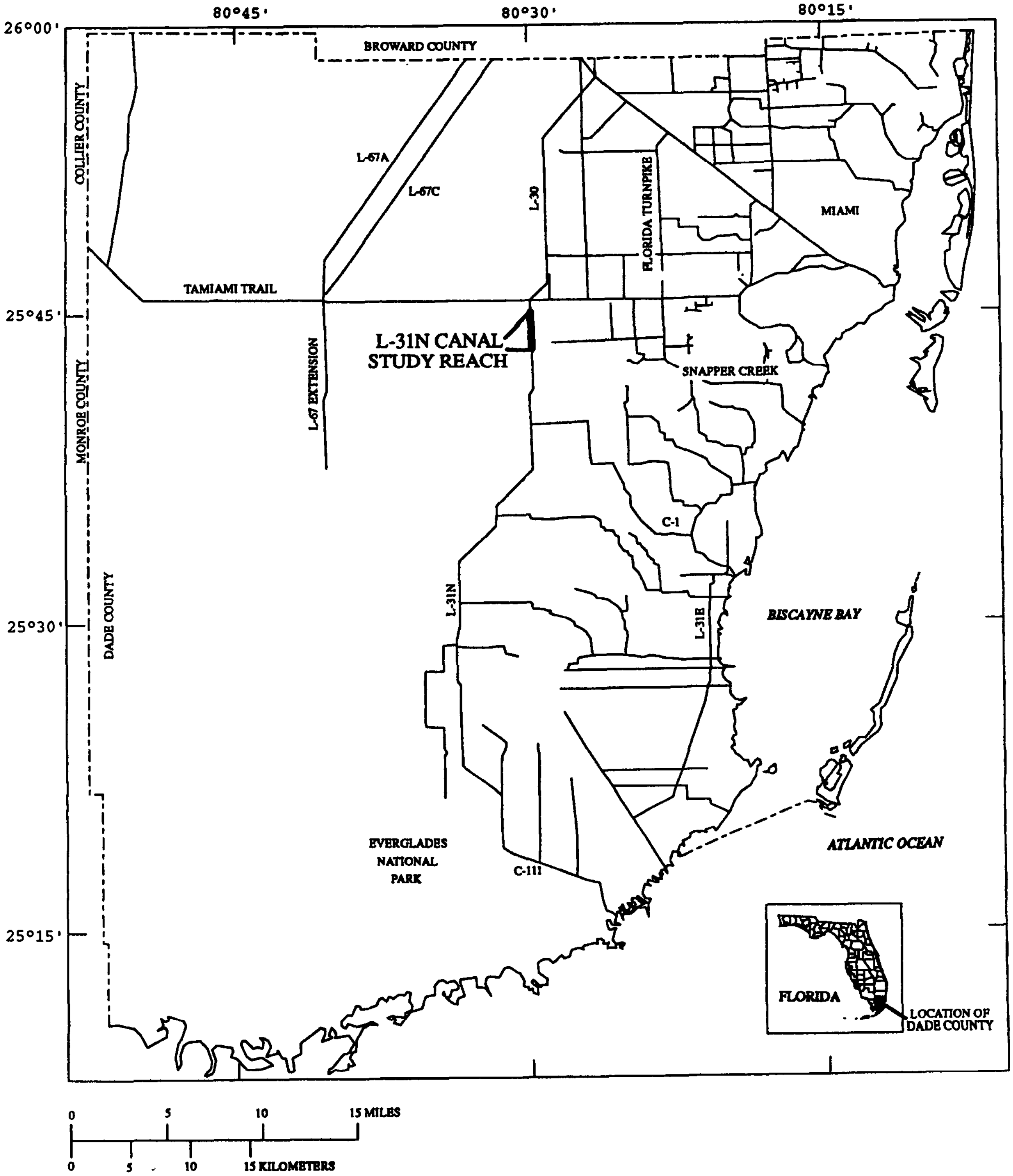

Figure 26. Map showing location of L–31N canal test reach.

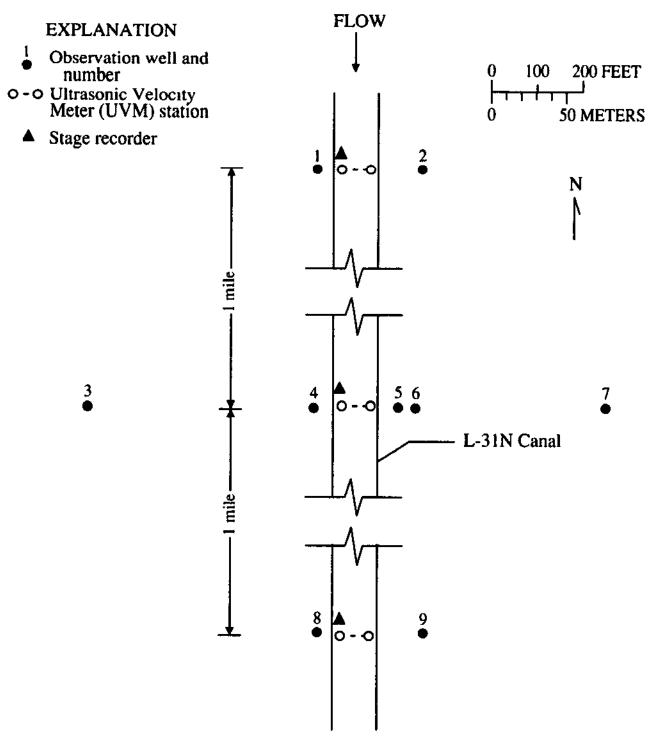

Figure 27. Diagram showing field instrumentation at L–31N canal test reach (Chen, 1990).

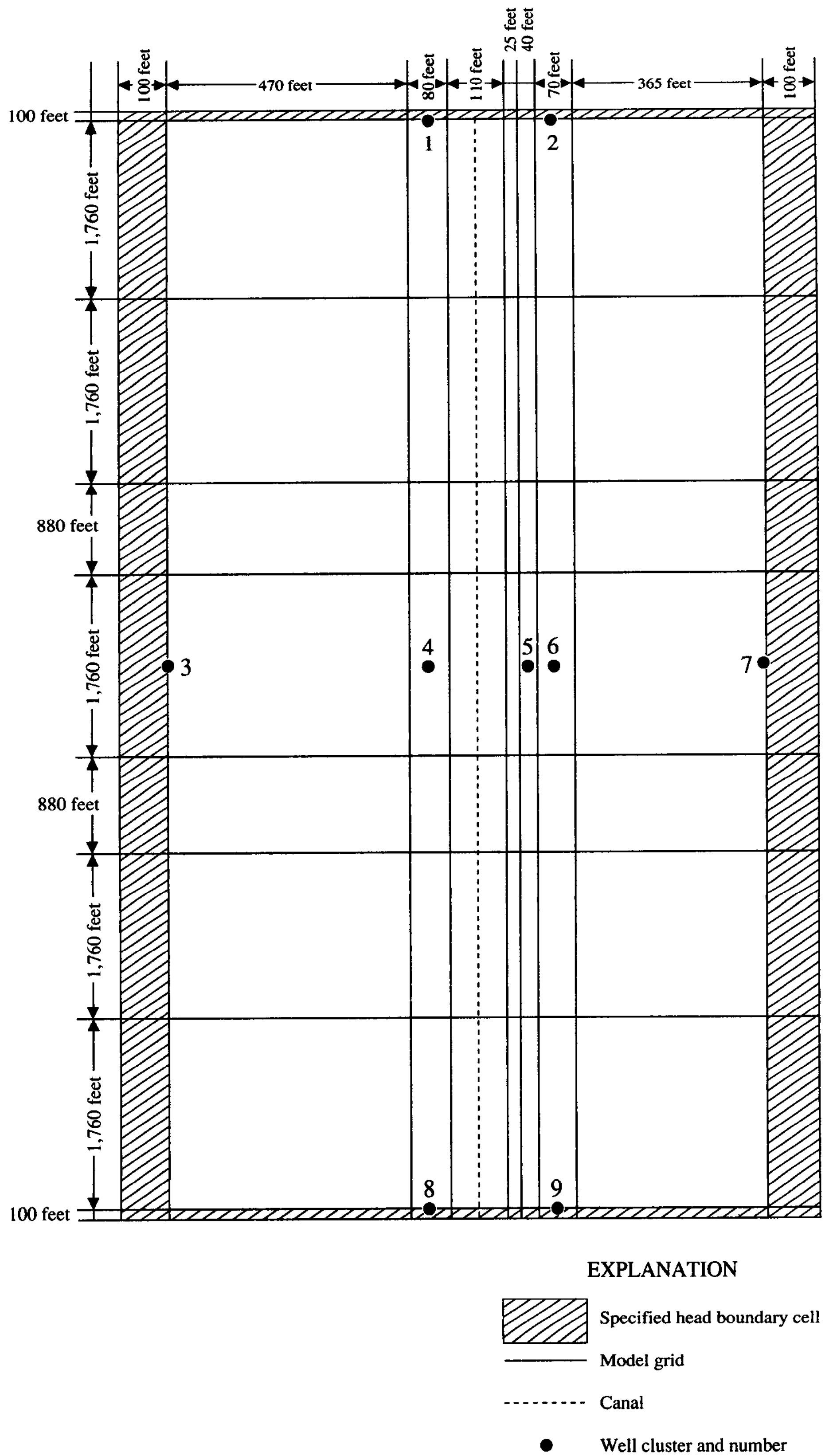

Figure 28. Model aquifer grid for the L–31N canal field problem.

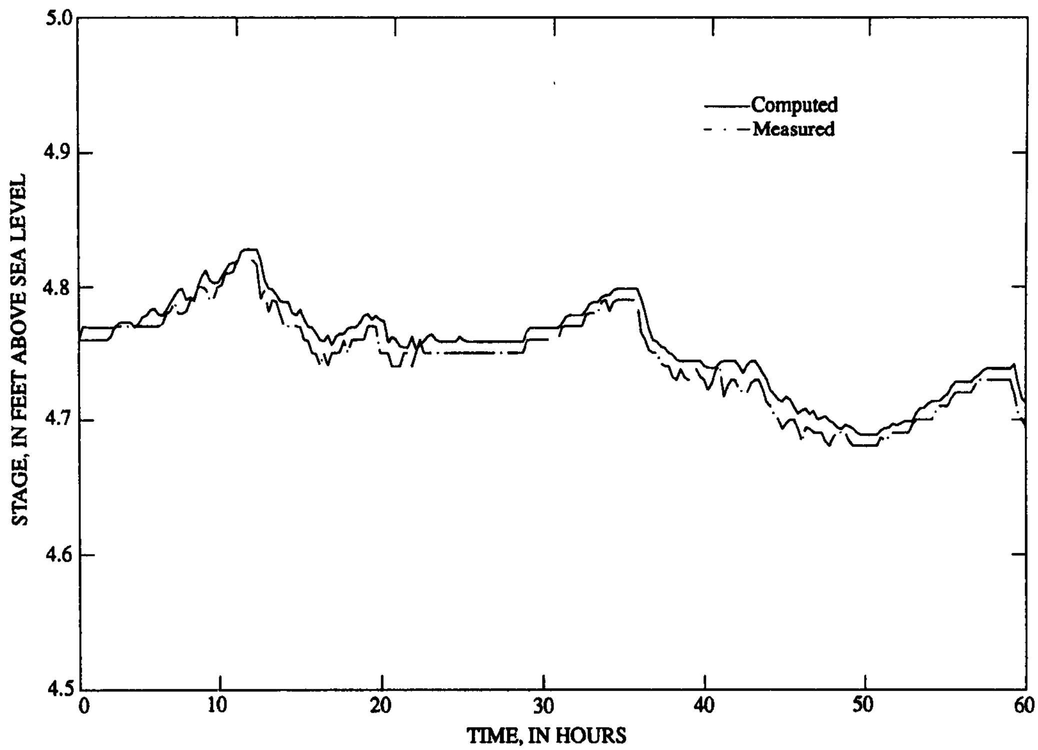

Figure 29. Measured and computed stage at L–31N canal at mile 1.

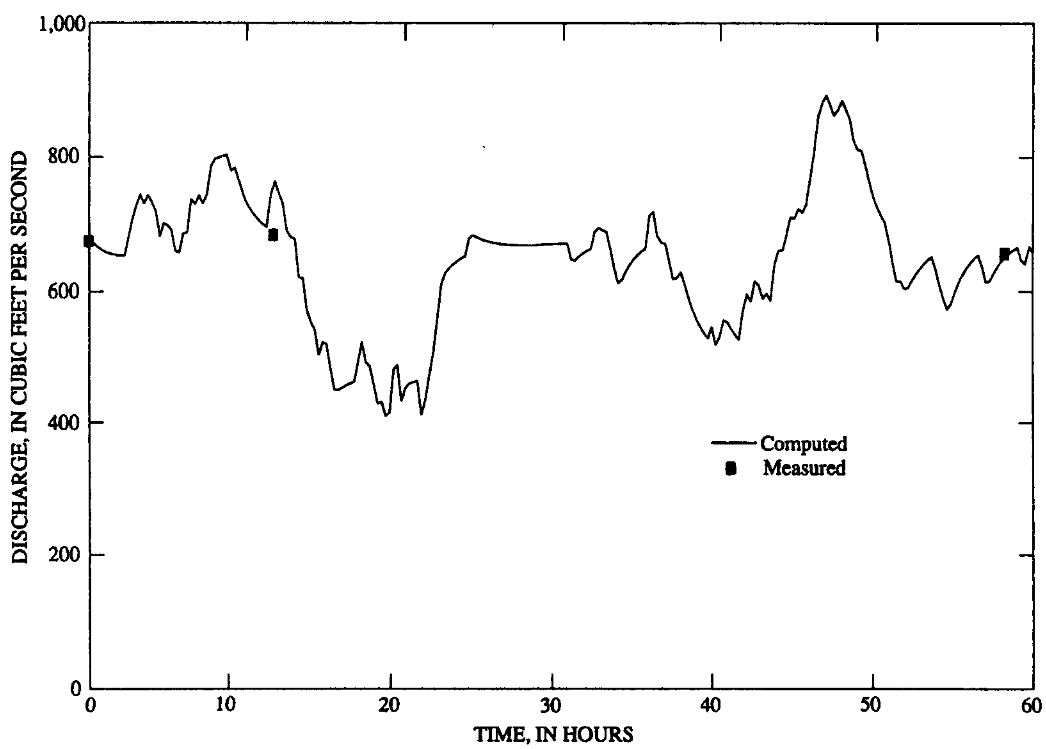

Figure 30. Measured and computed discharge at L–31N canal.

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APPENDIXES I–II

APPENDIX I--SAMPLE MODBRANCH INPUT (SELECTED PARTS)

```
        25          5        100          5        720        720       1488
        25          5         20          5        360        288      100.0
TEST CHANNEL RUNNING DRY
EN1920 3   0EN0 100000001 0 000 61.0  0.10.001 0.00.002619617 1.0 00  0.00000100
 1 204REACH 1                                                                  1
    2.125      30.0                 250.0          0.0145
                     1         11         11         0.00100   0.425
 2
2.425        40.     20.                 0.0145
4.425        80.     20.                 0.0145
     2.10      30.0                 500.0          0.0145
                     1         12         11         0.00100   0.4000
 2
2.40         40.     20.                 0.0145
4.40         80.     20.                 0.0145
     2.05      30.0                 500.0          0.0145
                     1         13         11         0.00100   0.3500
 2
2.35         40.     20.                 0.0145
4.35         80.     20.                 0.0145
     2.00      30.0                 500.0          0.0145
                     1         14         11         0.00100   0.3000
 2
2.30         40.     20.                 0.0145
4.30         80.     20.                 0.0145
 2 304REACH 2                                                                  1
     2.00      30.0                 500.0          0.0145
                     1         14         11         0.00100    0.300
 2
2.30         40.     20.                 0.0145
4.30         80.     20.                 0.0145
     1.95      30.0                 500.0          0.0145
                     1         15         11         0.00100    0.250
 2
2.25         40.     20.                 0.0145
4.25         80.     20.                 0.0145
     1.90      30.0                 500.0          0.0145
                     1         16         11         0.00100    0.200
 2
2.20         40.     20.                 0.0145
4.20         80.     20.                 0.0145
     1.85      30.0                 500.0          0.0145
                     1         17         11         0.00100    0.150
 2
2.15         40.     20.                 0.0145
4.15         80.     20.                 0.0145
 3 404REACH 3                                                                  1
     1.85      30.0                 500.0          0.0145
                     1         17         11         0.00100    0.150
 2
2.15         40.     20.                 0.0145
4.15         80.     20.                 0.0145
     1.80      30.0                 500.0          0.0145
                     1         18         11         0.00100    0.100
```

```
 2
2.10          40.      20.                    0.0145
4.10          80.      20.                    0.0145
      1.75       30.0                    500.0            0.0145
                         1          19          11        0.00100    0.050
 2
2.05          40.      20.                    0.0145
4.05          80.      20.                    0.0145
      1.70       30.0                    500.0            0.0145
                         1          20          11        0.00100   0.0001
 2
2.00          40.      20.                    0.0145
4.00          80.      20.                    0.0145
 4 504REACH 4                                                                      1
      1.70       30.0                    500.0            0.0145
                         1          20          11        0.00100   0.0001
 2
2.            40.      20.                    0.0145
4.            80.      20.                    0.0145
      1.65       30.0                    500.0            0.0145
                         1          21          11        0.00100   -0.050
 2
1.95          40.      20.                    0.0145
3.95          80.      20.                    0.0145
      1.60       30.0                    500.0            0.0145
                         1          22          11        0.00100   -0.100
 2
1.90          40.      20.                    0.0145
3.90          80.      20.                    0.0145
      1.55       30.0                    500.0            0.0145
                         1          23          11        0.00100   -0.150
 2
1.85          40.      20.                    0.0145
3.85          80.      20.                    0.0145
 5 604REACH 5                                                                      1
      1.55       30.0                    500.0            0.0145
                         1          23          11        0.00100   -0.150
 2
1.85          40.      20.                    0.0145
3.85          80.      20.                    0.0145
      1.50       30.0                    500.0            0.0145
                         1          24          11        0.00100   -0.200
 2
1.80          40.      20.                    0.0145
3.80          80.      20.                    0.0145
      1.45       30.0                    500.0            0.0145
                         1          25          11        0.00100   -0.250
 2
1.75          40.      20.                    0.0145
3.75          80.      20.                    0.0145
      1.40       30.0                    500.0            0.0145
                         1          26          11        0.00100   -0.300
 2
1.70          40.      20.                    0.0145
3.70          80.      20.                    0.0145
 6 704REACH 6                                                                      1
      1.40       30.0                    500.0            0.0145
                         1          26          11        0.00100   -0.300
```

```
 2
1.70          40.     20.                 0.0145
3.70          80.     20.                 0.0145
     1.35       30.0              500.0           0.0145
                   1         27         11        0.00100    -0.350
 2
1.65          40.     20.                 0.0145
3.65          80.     20.                 0.0145
     1.30       30.0              500.0           0.0145
                   1         28         11        0.00100    -0.400
 2
1.60          40.     20.                 0.0145
3.60          80.     20.                 0.0145
     1.25       30.0              500.0           0.0145
                   1         29         11        0.00100    -0.450
 2
1.55          40.     20.                 0.0145
3.55          80.     20.                 0.0145
 7 804REACH 7                                                                  1
     1.25       30.0              500.0           0.0145
                   1         29         11        0.00100    -0.450
 2
1.55          40.     20.                 0.0145
3.55          80.     20.                 0.0145
     1.20       30.0              500.0           0.0145
                   1         30         11        0.00100    -0.500
 2
1.50          40.     20.                 0.0145
3.50          80.     20.                 0.0145
     1.15       30.0              500.0           0.0145
                   1         31         11        0.00100    -0.5500
 2
1.45          40.     20.                 0.0145
3.45          80.     20.                 0.0145
     1.10       30.0              500.0           0.0145
                   1         31         11        0.00100    -0.6000
 2
1.40          40.     20.                 0.0145
3.40          80.     20.                 0.0145
 8 904REACH 8                                                                  1
     1.10       30.0              500.0           0.0145
                   1         32         11        0.00100    -0.6000
 2
1.40          40.     20.                 0.0145
3.40          80.     20.                 0.0145
     1.05       30.0              500.0           0.0145
                   1         33         11        0.00100    -0.6500
 2
1.35          40.     20.                 0.0145
3.35          80.     20.                 0.0145
     1.00       30.0              500.0           0.0145
                   1         34         11        0.00100    -0.7000
 2
1.30          40.     20.                 0.0145
3.30          80.     20.                 0.0145
     0.95       30.0              500.0           0.0145
                   1         35         11        0.00100    -0.7500
```

```
 2
1.25          40.      20.                       0.0145
3.25          80.      20.                       0.0145
 91004REACH 9                                                                       1
      0.95       30.0                 500.0           0.0145
                        1          35         11          0.00100    -0.7500
 2
1.25          40.      20.                       0.0145
3.25          80.      20.                       0.0145
      0.90       30.0                 500.0           0.0145
                        1          36         11          0.00100    -0.8000
 2
1.20          40.      20.                       0.0145
3.20          80.      20.                       0.0145
      0.85       30.0                 500.0           0.0145
                        1          37         11          0.00100    -0.8500
 2
1.15          40.      20.                       0.0145
3.15          80.      20.                       0.0145
      0.80       30.0                 500.0           0.0145
                        1          38         11          0.00100    -0.9000
 2
1.10          40.      20.                       0.0145
3.10          80.      20.                       0.0145
101102REACH 10                                                                      1
      0.80       30.0                 500.0           0.0145
                        1          38         11          0.00100    -0.9000
 2
1.10          40.      20.                       0.0145
3.10          80.      20.                       0.0145
      0.75       30.0                 500.0           0.0145
                        1          39         11          0.00100    -0.9500
 2
1.05          40.      20.                       0.0145
3.05          80.      20.                       0.0145
111204REACH 11                                                                      1
      0.75       30.0                 500.0           0.0145
                        1          39         11          0.00100    -0.9500
 2
1.05          40.      20.                       0.0145
3.05          80.      20.                       0.0145
      0.70       30.0                 500.0           0.0145
                        1          40         11          0.00100    -1.0000
 2
1.00          40.      20.                       0.0145
3.00          80.      20.                       0.0145
      0.65       30.0                 500.0           0.0145
                        1          41         11          0.00100    -1.0500
 2
0.95          40.      20.                       0.0145
2.95          80.      20.                       0.0145
      0.60       30.0                 500.0           0.0145
                        1          41         11          0.00100    -1.1000
 2
0.90          40.      20.                       0.0145
2.90          80.      20.                       0.0145
  11304REACH 12                                                                     1
      2.125      15.0                 353.6           0.0145
                        1          11         11          0.00100    0.425
```

```
 2
 2.425         20.     10.                0.0145
 4.425         40.     10.                0.0145
      2.16        15.0                707.1         0.0145
                       1         10        10         0.00100    0.4600
 2
 2.460         20.     10.                0.0145
 4.460         40.     10.                0.0145
     2.231        15.0                707.1         0.0145
                       1         9         9          0.00100    0.5310
 2
 2.531         20.     10.                0.0145
 4.531         40.     10.                0.0145
     2.302        15.0                707.1         0.0145
                       1         8         8          0.00100    0.6020
 2
 2.602         20.     10.                0.0145
 4.602         40.     10.                0.0145
131404REACH 13                                                                      1
     2.302        15.0                707.1         0.0145
                       1         8         8          0.00100     0.602
 2
 2.602         20.     10.                0.0145
 4.602         40.     10.                0.0145
     2.373        15.0                707.1         0.0145
                       1         7         7          0.00100     0.673
 2
 2.673         20.     10.                0.0145
 4.673         40.     10.                0.0145
     2.444        15.0                707.1         0.0145
                       1         6         6          0.00100     0.744
 2
 2.744         20.     10.                0.0145
 4.744         40.     10.                0.0145
     2.515        15.0                707.1         0.0145
                       1         5         5          0.00100     0.815
 2
 2.815         20.     10.                0.0145
 4.815         40.     10.                0.0145
141504REACH 14                                                                      1
     2.515        15.0                707.1         0.0145
                       1         5         5          0.00100     0.815
 2
 2.815         20.     10.                0.0145
 4.815         40.     10.                0.0145
     2.586        15.0                707.1         0.0145
                       1         4         4          0.00100     0.886
 2
 2.886         20.     10.                0.0145
 4.886         40.     10.                0.0145
     2.657        15.0                707.1         0.0145
                       1         3         3          0.00100     0.957
 2
 2.957         20.     10.                0.0145
 4.957         40.     10.                0.0145
     2.728        15.0                707.1         0.0145
                       1         2         2          0.00100     1.028
```

```
 2
3.028         20.      10.                 0.0145
5.028         40.      10.                 0.0145
151603REACH 15                                                                1
     2.728       15.0               707.1           0.0145
                    1         2          2          0.00100     1.028
 2
3.028         20.      10.                 0.0145
5.028         40.      10.                 0.0145
     2.799       15.0               707.1           0.0145
                    1         1          1          0.00100     1.099
 2
3.099         20.      10.                 0.0145
5.099         40.      10.                 0.0145
     2.870       15.0               707.1           0.0145
                    1         1          1          0.00100     1.170
 2
3.170         20.      10.                 0.0145
5.170         40.      10.                 0.0145
 11704REACH 16                                                                1
     2.125       15.0               353.6           0.0145
                    1        11         11          0.00100    0.425
 2
2.425         20.      10.                 0.0145
4.425         40.      10.                 0.0145
      2.16       15.0               707.1           0.0145
                    1        10         12          0.00100    0.4600
 2
2.460         20.      10.                 0.0145
4.460         40.      10.                 0.0145
     2.231       15.0               707.1           0.0145
                    1         9         13          0.00100    0.5310
 2
2.531         20.      10.                 0.0145
4.531         40.      10.                 0.0145
     2.302       15.0               707.1           0.0145
                    1         8         14          0.00100    0.6020
 2
2.602         20.      10.                 0.0145
4.602         40.      10.                 0.0145
171804REACH 17                                                                1
     2.302       15.0               707.1           0.0145
                    1         8         14          0.00100     0.602
 2
2.602         20.      10.                 0.0145
4.602         40.      10.                 0.0145
     2.373       15.0               707.1           0.0145
                    1         7         15          0.00100     0.673
 2
2.673         20.      10.                 0.0145
4.673         40.      10.                 0.0145
     2.444       15.0               707.1           0.0145
                    1         6         16          0.00100     0.744
 2
2.744         20.      10.                 0.0145
4.744         40.      10.                 0.0145
     2.515       15.0               707.1           0.0145
                    1         5         17          0.00100     0.815
```

```
 2
2.815         20.       10.                  0.0145
4.815         40.       10.                  0.0145
181904REACH 18                                                                              1
     2.515        15.0               707.1          0.0145
                     1          5          17          0.00100     0.815
 2
2.815         20.       10.                  0.0145
4.815         40.       10.                  0.0145
     2.586        15.0               707.1          0.0145
                     1          4          18          0.00100     0.886
 2
2.886         20.       10.                  0.0145
4.886         40.       10.                  0.0145
     2.657        15.0               707.1          0.0145
                     1          3          19          0.00100     0.957
 2
2.957         20.       10.                  0.0145
4.957         40.       10.                  0.0145
     2.728        15.0               707.1          0.0145
                     1          2          20          0.00100     1.028
 2
3.028         20.       10.                  0.0145
5.028         40.       10.                  0.0145
192003REACH 19                                                                              1
     2.728        15.0               707.1          0.0145
                     1          2          20          0.00100     1.028
 2
3.028         20.       10.                  0.0145
5.028         40.       10.                  0.0145
     2.799        15.0               707.1          0.0145
                     1          1          21          0.00100     1.099
 2
3.099         20.       10.                  0.0145
5.099         40.       10.                  0.0145
     2.870        15.0               707.1          0.0145
                     1          1          21          0.00100     1.170
 2
3.170         20.       10.                  0.0145
5.170         40.       10.                  0.0145
 Q16  72  11447500 FROM- 90/10/01 08:00  TO- 90/10/02  1:45 8    96
      -15.      -10.0      -5.4       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
 Q20  72  11447514 FROM- 90/10/01 08:00  TO- 90/10/02  1:45 8    96
      -15.      -10.0      -5.4       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
       0.0        0.0       0.0       0.0       0.0       0.0       0.0       0.0
ZP12
```

APPENDIX II--SAMPLE MODBRANCH OUTPUT (SELECTED PARTS)

```
1                     U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER MODEL
0CHANNEL DRYING AND REWETTING IN AN AQUIFER                                      WITH RECHARGE WELLS
   1 LAYERS        41 ROWS        21 COLUMNS
   2 STRESS PERIOD(S) IN SIMULATION
 MODEL TIME UNIT IS HOURS
0I/O UNITS:
 ELEMENT OF IUNIT:  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
         I/O UNIT: 17 18  0  0  0  0  0  0 32  0  0 31  0  0 20  0  0  0  0  0  0  0  0  0
0BAS1 -- BASIC MODEL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 15
 ARRAYS RHS AND BUFF WILL SHARE MEMORY.
 START HEAD WILL NOT BE SAVED -- DRAWDOWN CANNOT BE CALCULATED
     6954 ELEMENTS IN X ARRAY ARE USED BY BAS
     6954 ELEMENTS OF X ARRAY USED OUT OF   30000
0BCF1 -- BLOCK-CENTERED FLOW PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 17
 TRANSIENT SIMULATION
      LAYER  AQUIFER TYPE
      -------------------
        1        3
     4306 ELEMENTS IN X ARRAY ARE USED BY BCF
    11260 ELEMENTS OF X ARRAY USED OUT OF   30000
0WEL1 -- WELL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM 18
 MAXIMUM OF     8 WELLS
       32 ELEMENTS IN X ARRAY ARE USED FOR WELLS
    11292 ELEMENTS OF X ARRAY USED OUT OF   30000
0 BRANCH UNSTEADY FLOW MODEL, 7/30/90INPUT READ FROM UNIT 20
   115592 ELEMENTS OF Y ARRAY USED OUT OF7000000
      675 ELEMENTS OF YC ARRAY USED OUT OF    8000
      401 ELEMENTS OF YL ARRAY USED OUT OF    3000
0SIP1 -- STRONGLY IMPLICIT PROCEDURE SOLUTION PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 32
 MAXIMUM OF 125 ITERATIONS ALLOWED FOR CLOSURE
  5 ITERATION PARAMETERS
     3949 ELEMENTS IN X ARRAY ARE USED BY SIP
    15241 ELEMENTS OF X ARRAY USED OUT OF   30000
1CHANNEL DRYING AND REWETTING IN AN AQUIFER                                      WITH RECHARGE WELLS
0

                                        BOUNDARY ARRAY FOR LAYER  1 WILL BE READ ON UNIT 33 USING FORMAT: (40I2)
                              ----------------------------------------------------------------------------------------------------
0AQUIFER HEAD WILL BE SET TO -99.000     AT ALL NO-FLOW NODES (IBOUND=0).
0

                                         INITIAL HEAD FOR LAYER  1 WILL BE READ ON UNIT 34 USING FORMAT: (40F4.0)
                              ----------------------------------------------------------------------------------------------------
0HEAD PRINT FORMAT IS FORMAT NUMBER   4    DRAWDOWN PRINT FORMAT IS FORMAT NUMBER    0
0HEADS WILL BE SAVED ON UNIT 42    DRAWDOWNS WILL BE SAVED ON UNIT  0
0OUTPUT CONTROL IS SPECIFIED EVERY TIME STEP
0                                             COLUMN TO ROW ANISOTROPY =   1.000000
0                                                                 DELR =   500.0000
0                                                                 DELC =   500.0000
0                                                  PRIMARY STORAGE COEF =  0.3000000E-03 FOR LAYER  1
0                                                 HYD. COND. ALONG ROWS =   1000.000     FOR LAYER  1
0                                                                BOTTOM =  -4.000000     FOR LAYER  1
0                                                SECONDARY STORAGE COEF =  0.3000000     FOR LAYER  1
0                                                                   TOP =   4.000000     FOR LAYER  1
0


                                                  SOLUTION BY THE STRONGLY IMPLICIT PROCEDURE
                                                  -------------------------------------------
0                                          MAXIMUM ITERATIONS ALLOWED FOR CLOSURE =       125
                                                          ACCELERATION PARAMETER =      1.0000
                                              HEAD CHANGE CRITERION FOR CLOSURE =    0.20000E-02
                                              SIP HEAD CHANGE PRINTOUT INTERVAL =         1
0                                             CALCULATE ITERATION PARAMETERS FROM MODEL CALCULATED WSEED
1                                            STRESS PERIOD NO.   1, LENGTH =   4.000000
                                             ---------------------------------------------

                                             NUMBER OF TIME STEPS =     4

                                              MULTIPLIER FOR DELT =     1.000

                                           INITIAL TIME STEP SIZE =   1.000000
0          0 WELLS
1                                       UNSTEADY FLOW COMPUTATION IN A NETWORK OF OPEN CHANNELS

                                              BRANCH-NETWORK MODEL (VERSION 90/08/01)
                                                  A FOUR-POINT IMPLICIT SCHEME

                                                     LINEAR MATRIX SOLUTION
                                         BY GAUSS ELIMINATION USING MAXIMUM PIVOT STRATEGY
                                                     WITH OPTIONAL ITERATION
                             =================================================================

                             TEST CHANNEL RUNNING DRY

                             =================================================================
```

BRANCH MODEL RUN FOR FLOW CONDITIONS OF 90/10/ 1 8: 0 TO 90/10/ 2 1:45

VARIABLE	DEFINITION	POSITION	FORMAT	VALUES	ASSIGNED
IUNIT	UNITS OF INPUT	1-2	A2	EN/ME	EN
NBCH	NUMBER OF BRANCHES	3-4	I2	0<N<=25	19
NJNC	NUMBER OF JUNCTIONS	5-6	I2	1<N<=25	20
NBND	NUMBER OF EXTERNAL BOUNDARIES	7-8	I2	1<N<=25	3
NSTEPS	NUMBER OF TIME STEPS	9-12	I4	-------	178
OUNIT	UNITS OF OUTPUT	13-14	A2	EN/ME	EN
IRDGEO	READ GEOMETRY FILE	15	I1	0/1	0
NIT	MAXIMUM ITERATIONS ALLOWED	17-18	I2	-------	10
IPROPT	PRINTOUT OPTION	19	I1	0<=N<=9	0
IPLOPT	PLOT OPTION	20	I1	0<=N<=4	0
IPLDEV	PLOTTER DEVICE TYPE	21	I1	0<=N<=9	0
IPRMSG	TDDS MESSAGE PRINTOUT OPTION	22	I1	0/1	0
IPLMSG	DISSPLA MESSAGE PRINTOUT OPTION	23	I1	0/1	0
IEXOPT	EXTRAPOLATION OPTION	24	I1	0/1	0
TYPETA	FRICTION RESISTANCE TYPE	25	I1	1<=N<=7	1
INHR	INITIAL-VALUE DATA HOUR	26-27	I2	0<=N<25	8
INMN	INITIAL-VALUE DATA MINUTE	28-29	I2	0<=N<60	0
IDTM	TIME STEP	30-33	I4	-------	6
THETA	THETA WEIGHTING FACTOR	34-36	F3.2	0<=N<=1	1.00
QQTOL	DISCHARGE CONVERGENCE	37-41	F5.1	-------	0.1
ZZTOL	STAGE CONVERGENCE	42-46	F5.3	-------	0.001
WSPEED	CONSTANT WIND SPEED	47-51	F5.2	-------	0.00
WSDRAG	SURFACE DRAG COEFFICIENT	52-56	F5.4	-------	0.0026
H2ODEN	WATER DENSITY	57-61	F5.4	-------	1.9617
CHI	CHI WEIGHTING FACTOR	62-64	F3.2	0<=N<=1	1.00
IWRTIC	WRITE INITIAL-VALUE FILE	65	I1	0/1	0
IRDIC	READ INITIAL-VALUE FILE	67	I1	0/1	0
NUMCOM	NUMBER OF COMMENT RECORDS INPUT	68	I1	0<=N<10	0
WDIREC	CONSTANT WIND DIRECTION	69-73	F5.1	-------	0.0
INWIND	TIME-VARYING WIND INPUT OPTION	74	I1	0/1	0
OTTDDB	TDDB OUTPUT OPTION	75	I1	0/1	0
ISMOPT	SEGMENT MESSAGE PRINTOUT OPTION	76	I1	0/1	0
IARDEM	ARRAY DIMENSION PRINTOUT OPTION	77	I1	0/1	0
IRDNXT	READ SECOND COMP-CONTROL RECORD	80	I1	0/1	0
GLBETA	GLOBAL DEFAULT BETA COEFFICIENT	1-4	F4.2	N>=1	1.000
GLETA	GLOBAL DEFAULT ETA COEFFICIENT	5-9	F5.3	N>0	0.0000
ETAMIN	MINIMUM ETA FOR OPTIMIZATION	10-14	F5.3	N>0	0.0000
ETAMAX	MAXIMUM ETA FOR OPTIMIZATION	15-19	F5.3	N<1	0.0000
TOLERR	OPTIMIZATION ERROR TOLERENCE	20-23	F4.2	0<N<1	0.000

STAGE COMPUTATION DATUM	2.035
BVD(16) DATUM CORRECTION	0.000
BVD(20) DATUM CORRECTION	0.000

```
6 MINUTE TIME STEP AND DX( 1, 2)  =   250.0 YIELDS COURANT NUMBER OF  11.4
6 MINUTE TIME STEP AND BRANCH 10  =   500.0 YIELDS COURANT NUMBER OF   5.7
0AVERAGE SEED = 0.00145440
 MINIMUM SEED = 0.00143520
0
    5 ITERATION PARAMETERS CALCULATED FROM AVERAGE SEED:

        0.0000000E+00  0.8047142E+00  0.9618634E+00  0.9925524E+00  0.9985455E+00
0HEAD/DRAWDOWN PRINTOUT FLAG = 0    TOTAL BUDGET PRINTOUT FLAG = 0    CELL-BY-CELL FLOW TERM FLAG = 0
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
  HEAD    DRAWDOWN  HEAD  DRAWDOWN
 PRINTOUT PRINTOUT  SAVE    SAVE
 ---------------------------------
    0        0        0       0
1                      FLOW RESULTS FOR TEST CHANNEL RUNNING DRY
```

DATE YR/MO/DY	TIME HR:MN	STAGE (FT)	VELOCITY (FT/SEC)	DISCHARGE (FT**3/S)	AREA (FT**2)	WIDTH (FT)	FALL (FT)	BRANCH	SECTION (SOLUTIONS)	ETA	STAGE (FT)	VELOCITY (FT/SEC)	DISCHARGE (FT**3/S)	AREA (FT**2)	WIDTH (FT)
90/10/ 1	9: 0	0.43	0.70	17.5	25.2	20.0	0.02	1 (*)	1: 2	0.0145	0.40	0.72	18.2	25.3	20.0
		0.40	0.72	18.2	25.3	20.0	0.05	1	2: 3	0.0145	0.36	0.78	19.6	25.3	20.0
		0.36	0.78	19.6	25.3	20.0	0.06	1	3: 4	0.0145	0.30	0.00	21.5	0.0	0.0
		0.30	0.00	21.5	0.0	0.0	0.04	2	1: 2	0.0145	0.26	0.94	23.7	25.3	20.0
		0.26	0.94	23.7	25.3	20.0	0.03	2	2: 3	0.0145	0.23	1.00	25.5	25.5	20.0
		0.23	1.00	25.5	25.5	20.0	0.03	2	3: 4	0.0145	0.20	1.04	26.7	25.7	20.0
		0.20	1.04	26.7	25.7	20.0	0.03	3	1: 2	0.0145	0.16	1.06	27.5	25.9	20.0
		0.16	1.06	27.5	25.9	20.0	0.04	3	2: 3	0.0145	0.13	1.07	28.0	26.0	20.0
		0.13	1.07	28.0	26.0	20.0	0.04	3	3: 4	0.0145	0.09	1.07	38.2	26.2	20.0
		0.09	1.07	28.2	26.2	20.0	0.04	4	1: 2	0.0145	0.06	1.07	28.1	26.4	20.0
		0.06	1.07	28.1	26.4	20.0	0.03	4	2: 3	0.0145	0.02	1.05	27.9	26.5	20.0

	0.02	1.05	27.9	26.5	20.0	0.03	4	3: 4	0.0145	-0.01	1.03	27.4	26.7	20.0
	-0.01	1.03	27.4	26.7	20.0	0.03	5	1: 2	0.0145	-0.04	0.99	26.8	26.9	20.0
	-0.04	0.99	26.8	26.9	20.0	0.03	5	2: 3	0.0145	-0.07	0.95	25.9	27.2	20.0
	-0.07	0.95	25.9	27.2	20.0	0.02	5	3: 4	0.0145	-0.09	0.90	24.8	27.5	20.0
	-0.09	0.90	24.8	27.5	20.0	0.02	6	1: 2	0.0145	-0.11	0.85	23.6	27.8	20.0
	-0.11	0.85	23.6	27.8	20.0	0.02	6	2: 3	0.0145	-0.13	0.78	22.0	28.1	20.0
	-0.13	0.78	22.0	28.1	20.0	0.01	6	3: 4	0.0145	-0.14	0.71	20.2	28.5	20.0
	-0.14	0.71	20.2	28.5	20.0	0.01	7	1: 2	0.0145	-0.15	0.63	18.2	28.9	20.0
	-0.15	0.63	18.2	28.9	20.0	0.01	7	2: 3	0.0145	-0.16	0.54	15.8	29.4	20.0
	-0.16	0.54	15.8	29.4	20.0	0.01	7	3: 4	0.0145	-0.17	0.44	13.0	29.9	20.0
	-0.17	0.44	13.0	29.9	20.0	0.00	8	1: 2	0.0145	-0.17	0.32	9.8	30.3	20.0
	-0.17	0.32	9.8	30.3	20.0	0.00	8	2: 3	0.0145	-0.18	0.20	6.3	30.8	20.0
	-0.18	0.20	6.3	30.8	20.0	0.00	8	3: 4	0.0145	-0.18	0.07	2.3	31.3	20.0
	-0.18	0.07	2.3	31.3	20.0	0.00	9	1: 2	0.0145	-0.19	-0.07	-2.2	31.8	20.0
	-0.19	-0.07	-2.2	31.8	20.0	0.01	9	2: 3	0.0145	-0.19	-0.22	-7.1	32.3	20.0
	-0.19	-0.22	-7.1	32.3	20.0	0.01	9	3: 4	0.0145	-0.20	-0.38	-12.4	32.8	20.0
	-0.20	-0.38	-12.4	32.8	20.0	0.01	10	1: 2	0.0145	-0.20	-0.54	-18.1	33.3	20.0
	-0.20	-0.54	-18.1	33.3	20.0	0.00	11	1: 2	0.0145	-0.21	-0.72	-24.2	33.7	20.0
	-0.21	-0.72	-24.2	33.7	20.0	0.00	11	2: 3	0.0145	-0.21	-0.89	-30.6	34.3	20.0
	-0.21	-0.89	-30.6	34.3	20.0	-0.01	11	3: 4	0.0145	-0.20	-0.82	-28.8	35.0	20.0
	0.43	-0.70	-8.8	12.6	10.0	-0.03	12	1: 2	0.0145	0.46	0.00	-8.4	0.0	0.0
	0.46	0.00	-8.4	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-7.6	0.0	0.0
	0.53	0.00	-7.6	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-6.7	0.0	0.0
	0.60	0.00	-6.7	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-5.8	0.0	0.0
	0.67	0.00	-5.8	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-4.9	0.0	0.0
	0.74	0.00	-4.9	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-4.0	0.0	0.0
	0.82	0.00	-4.0	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-3.2	0.0	0.0
	0.89	0.00	-3.2	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-2.3	0.0	0.0
	0.96	0.00	-2.3	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-1.5	0.0	0.0
	1.03	0.00	-1.5	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.7	0.0	0.0
	1.10	0.00	-0.7	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	-0.70	-8.8	12.6	10.0	-0.03	16	1: 2	0.0145	0.46	0.00	-8.4	0.0	0.0
	0.46	0.00	-8.4	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-7.6	0.0	0.0
	0.53	0.00	-7.6	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-6.7	0.0	0.0
	0.60	0.00	-6.7	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-5.8	0.0	0.0
	0.67	0.00	-5.8	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-4.9	0.0	0.0
	0.74	0.00	-4.9	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-4.0	0.0	0.0
	0.82	0.00	-4.0	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-3.2	0.0	0.0
	0.89	0.00	-3.2	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-2.3	0.0	0.0
	0.96	0.00	-2.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-1.5	0.0	0.0
	1.03	0.00	-1.5	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.7	0.0	0.0
	1.10	0.00	-0.7	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9: 6	0.43	0.00	12.2	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	12.7	0.0	0.0
	0.40	0.00	12.7	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	13.8	0.0	0.0
	0.35	0.00	13.8	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	15.0	0.0	0.0
	0.30	0.00	15.0	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	16.0	0.0	0.0
	0.25	0.00	16.0	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	17.1	0.0	0.0
	0.20	0.00	17.1	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	18.4	0.0	0.0
	0.15	0.00	18.4	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	20.2	0.0	0.0
	0.10	0.00	20.2	0.0	0.0	0.04	3	2: 3	0.0145	0.06	0.88	22.2	25.3	20.0
	0.06	0.88	22.2	25.3	20.0	0.02	3	3: 4	0.0145	0.03	0.93	23.8	25.6	20.0
	0.03	0.93	23.8	25.6	20.0	0.03	4	1: 2	0.0145	0.01	0.96	24.8	25.8	20.0
	0.01	0.96	24.8	25.8	20.0	0.03	4	2: 3	0.0145	-0.02	0.97	25.3	26.1	20.0
	-0.02	0.97	25.3	26.1	20.0	0.03	4	3: 4	0.0145	-0.05	0.97	25.5	26.3	20.0
	-0.05	0.97	25.5	26.3	20.0	0.03	5	1: 2	0.0145	-0.07	0.96	25.4	26.6	20.0
	-0.07	0.96	25.4	26.6	20.0	0.03	5	2: 3	0.0145	-0.10	0.93	25.0	26.8	20.0
	-0.10	0.93	25.0	26.8	20.0	0.02	5	3: 4	0.0145	-0.13	0.90	24.4	27.1	20.0
	-0.13	0.90	24.4	27.1	20.0	0.02	6	1: 2	0.0145	-0.15	0.86	23.5	27.4	20.0
	-0.15	0.86	23.5	27.4	20.0	0.02	6	2: 3	0.0145	-0.17	0.81	22.4	27.7	20.0
	-0.17	0.81	22.4	27.7	20.0	0.02	6	3: 4	0.0145	-0.18	0.75	21.0	28.1	20.0
	-0.18	0.75	21.0	28.1	20.0	0.01	7	1: 2	0.0145	-0.20	0.68	19.3	28.5	20.0
	-0.20	0.68	19.3	28.5	20.0	0.01	7	2: 3	0.0145	-0.21	0.60	17.3	28.9	20.0
	-0.21	0.60	17.3	28.9	20.0	0.01	7	3: 4	0.0145	-0.22	0.51	14.9	29.3	20.0
	-0.22	0.51	14.9	29.3	20.0	0.01	8	1: 2	0.0145	-0.22	0.41	12.2	29.8	20.0
	-0.22	0.41	12.2	29.8	20.0	0.00	8	2: 3	0.0145	-0.23	0.30	9.1	30.3	20.0
	-0.23	0.30	9.1	30.3	20.0	0.00	8	3: 4	0.0145	-0.23	0.18	5.6	30.8	20.0
	-0.23	0.18	5.6	30.8	20.0	0.00	9	1: 2	0.0145	-0.24	0.05	1.6	31.3	20.0
	-0.24	0.05	1.6	31.3	20.0	0.01	9	2: 3	0.0145	-0.24	-0.09	-2.9	31.8	20.0
	-0.24	-0.09	-2.9	31.8	20.0	0.01	9	3: 4	0.0145	-0.25	-0.24	-7.8	32.2	20.0
	-0.25	-0.24	-7.8	32.2	20.0	0.01	10	1: 2	0.0145	-0.26	-0.40	-13.1	32.7	20.0
	-0.26	-0.40	-13.1	32.7	20.0	0.01	11	1: 2	0.0145	-0.26	-0.57	-18.8	33.2	20.0
	-0.26	-0.57	-18.8	33.2	20.0	0.00	11	2: 3	0.0145	-0.27	-0.74	-24.9	33.7	20.0
	-0.27	-0.74	-24.9	33.7	20.0	-0.01	11	3: 4	0.0145	-0.26	-0.68	-23.2	34.3	20.0
	0.43	0.00	-6.1	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-5.8	0.0	0.0
	0.46	0.00	-5.8	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-5.2	0.0	0.0
	0.53	0.00	-5.2	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-4.6	0.0	0.0
	0.60	0.00	-4.6	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-4.0	0.0	0.0
	0.67	0.00	-4.0	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-3.4	0.0	0.0
	0.74	0.00	-3.4	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-2.8	0.0	0.0
	0.82	0.00	-2.8	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-2.2	0.0	0.0
	0.89	0.00	-2.2	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-1.6	0.0	0.0
	0.96	0.00	-1.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-1.1	0.0	0.0
	1.03	0.00	-1.1	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.5	0.0	0.0
	1.10	0.00	-0.5	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-6.1	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-5.8	0.0	0.0
	0.46	0.00	-5.8	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-5.2	0.0	0.0
	0.53	0.00	-5.2	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-4.6	0.0	0.0
	0.60	0.00	-4.6	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-4.0	0.0	0.0
	0.67	0.00	-4.0	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-3.4	0.0	0.0
	0.74	0.00	-3.4	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-2.8	0.0	0.0

	0.82	0.00	-2.8	0.0	0.0	-0.07	18		1. 2	0.0145	0.89	0.00	-2.2	0.0	0.0
	0.89	0.00	-2.2	0.0	0.0	-0.07	18		2 3	0.0145	0.96	0.00	-1.6	0.0	0.0
	0.96	0.00	-1.6	0.0	0.0	-0.07	18		3 4	0.0145	1.03	0.00	-1.1	0.0	0.0
	1.03	0.00	-1.1	0.0	0.0	-0.07	19		1 2	0.0145	1.10	0.00	-0.5	0.0	0.0
	1.10	0.00	-0.5	0.0	0.0	-0.07	19		2 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:12	0.43	0.00	8.6	0.0	0.0	0.03	1	(*)	1 2	0.0145	0.40	0.00	9.0	0.0	0.0
	0.40	0.00	9.0	0.0	0.0	0.05	1		2. 3	0.0145	0.35	0.00	9.7	0.0	0.0
	0.35	0.00	9.7	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	10.5	0.0	0.0
	0.30	0.00	10.5	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	11.3	0.0	0.0
	0.25	0.00	11.3	0.0	0.0	0.05	2		2. 3	0.0145	0.20	0.00	12.1	0.0	0.0
	0.20	0.00	12.1	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	13.2	0.0	0.0
	0.15	0.00	13.2	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	14.3	0.0	0.0
	0.10	0.00	14.3	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	15.4	0.0	0.0
	0.05	0.00	15.4	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	16.7	0.0	0.0
	0.00	0.00	16.7	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	18.4	0.0	0.0
	-0.05	0.00	18.4	0.0	0.0	0.04	4		2: 3	0.0145	-0.09	0.80	20.2	25.4	20.0
	-0.09	0.80	20.2	25.4	20.0	0.02	4		3: 4	0.0145	-0.10	0.84	21.7	25.7	20.0
	-0.10	0.84	21.7	25.7	20.0	0.02	5		1: 2	0.0145	-0.12	0.87	22.5	26.0	20.0
	-0.12	0.87	22.5	26.0	20.0	0.02	5		2: 3	0.0145	-0.15	0.87	22.9	26.3	20.0
	-0.15	0.87	22.9	26.3	20.0	0.02	5		3: 4	0.0145	-0.17	0.86	23.0	26.6	20.0
	-0.17	0.86	23.0	26.6	20.0	0.02	6		1: 2	0.0145	-0.19	0.84	22.7	26.9	20.0
	-0.19	0.84	22.7	26.9	20.0	0.02	6		2: 3	0.0145	-0.21	0.81	22.1	27.3	20.0
	-0.21	0.81	22.1	27.3	20.0	0.02	6		3: 4	0.0145	-0.23	0.77	21.1	27.6	20.0
	-0.23	0.77	21.1	27.6	20.0	0.02	7		1: 2	0.0145	-0.24	0.71	19.9	28.0	20.0
	-0.24	0.71	19.9	28.0	20.0	0.01	7		2: 3	0.0145	-0.25	0.65	18.4	28.4	20.0
	-0.25	0.65	18.4	28.4	20.0	0.01	7		3: 4	0.0145	-0.26	0.57	16.5	28.8	20.0
	-0.26	0.57	16.5	28.8	20.0	0.01	8		1: 2	0.0145	-0.27	0.49	14.2	29.3	20.0
	-0.27	0.49	14.2	29.3	20.0	0.01	8		2: 3	0.0145	-0.28	0.39	11.6	29.8	20.0
	-0.28	0.39	11.6	29.8	20.0	0.00	8		3: 4	0.0145	-0.28	0.28	8.5	30.2	20.0
	-0.28	0.28	8.5	30.2	20.0	0.00	9		1: 2	0.0145	-0.29	0.16	5.0	30.7	20.0
	-0.29	0.16	5.0	30.7	20.0	0.00	9		2: 3	0.0145	-0.29	0.03	1.1	31.2	20.0
	-0.29	0.03	1.1	31.2	20.0	0.01	9		3: 4	0.0145	-0.30	-0.11	-3.4	31.7	20.0
	-0.30	-0.11	-3.4	31.7	20.0	0.01	10		1: 2	0.0145	-0.30	-0.26	-8.3	32.2	20.0
	-0.30	-0.26	-8.3	32.2	20.0	0.01	11		1: 2	0.0145	-0.31	-0.42	-13.5	32.6	20.0
	-0.31	-0.42	-13.5	32.6	20.0	0.01	11		2: 3	0.0145	-0.32	-0.58	-19.2	33.1	20.0
	-0.32	-0.58	-19.2	33.1	20.0	0.00	11		3: 4	0.0145	-0.32	-0.53	-17.7	33.7	20.0
	0.43	0.00	-4.3	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-4.1	0.0	0.0
	0.46	0.00	-4.1	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-3.6	0.0	0.0
	0.53	0.00	-3.6	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-3.2	0.0	0.0
	0.60	0.00	-3.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-2.8	0.0	0.0
	0.67	0.00	-2.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-2.4	0.0	0.0
	0.74	0.00	-2.4	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-2.0	0.0	0.0
	0.82	0.00	-2.0	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-1.6	0.0	0.0
	0.89	0.00	-1.6	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-1.2	0.0	0.0
	0.96	0.00	-1.2	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.8	0.0	0.0
	1.03	0.00	-0.8	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.4	0.0	0.0
	1.10	0.00	-0.4	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-4.3	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-4.1	0.0	0.0
	0.46	0.00	-4.1	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-3.6	0.0	0.0
	0.53	0.00	-3.6	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-3.2	0.0	0.0
	0.60	0.00	-3.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-2.8	0.0	0.0
	0.67	0.00	-2.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-2.4	0.0	0.0
	0.74	0.00	-2.4	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-2.0	0.0	0.0
	0.82	0.00	-2.0	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-1.6	0.0	0.0
	0.89	0.00	-1.6	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-1.2	0.0	0.0
	0.96	0.00	-1.2	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.8	0.0	0.0
	1.03	0.00	-0.8	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.4	0.0	0.0
	1.10	0.00	-0.4	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:18	0.43	0.00	6.2	0.0	0.0	0.03	1	(*)	1: 2	0.0145	0.40	0.00	6.4	0.0	0.0
	0.40	0.00	6.4	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	6.9	0.0	0.0
	0.35	0.00	6.9	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	7.5	0.0	0.0
	0.30	0.00	7.5	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	8.1	0.0	0.0
	0.25	0.00	8.1	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	8.7	0.0	0.0
	0.20	0.00	8.7	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	9.4	0.0	0.0
	0.15	0.00	9.4	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	10.2	0.0	0.0
	0.10	0.00	10.2	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	11.1	0.0	0.0
	0.05	0.00	11.1	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	12.2	0.0	0.0
	0.00	0.00	12.2	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	13.4	0.0	0.0
	-0.05	0.00	13.4	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	14.7	0.0	0.0
	-0.10	0.00	14.7	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	16.3	0.0	0.0
	-0.15	0.00	16.3	0.0	0.0	0.04	5		1: 2	0.0145	-0.19	0.72	18.1	25.3	20.0
	-0.19	0.72	18.1	25.3	20.0	0.01	5		2: 3	0.0145	-0.20	0.76	19.5	25.7	20.0
	-0.20	0.76	19.5	25.7	20.0	0.02	5		3: 4	0.0145	-0.22	0.78	20.4	26.1	20.0
	-0.22	0.78	20.4	26.1	20.0	0.02	6		1: 2	0.0145	-0.24	0.79	20.8	26.4	20.0
	-0.24	0.79	20.8	26.4	20.0	0.02	6		2: 3	0.0145	-0.25	0.78	20.9	26.8	20.0
	-0.25	0.78	20.9	26.8	20.0	0.02	6		3: 4	0.0145	-0.27	0.76	20.5	27.1	20.0
	-0.27	0.76	20.5	27.1	20.0	0.02	7		1: 2	0.0145	-0.29	0.72	19.8	27.5	20.0
	-0.29	0.72	19.8	27.5	20.0	0.01	7		2: 3	0.0145	-0.30	0.67	18.8	27.9	20.0
	-0.30	0.67	18.8	27.9	20.0	0.01	7		3: 4	0.0145	-0.31	0.61	17.4	28.3	20.0
	-0.31	0.61	17.4	28.3	20.0	0.01	8		1: 2	0.0145	-0.32	0.54	15.6	28.8	20.0
	-0.32	0.54	15.6	28.8	20.0	0.01	8		2: 3	0.0145	-0.33	0.46	13.5	29.2	20.0
	-0.33	0.46	13.5	29.2	20.0	0.01	8		3: 4	0.0145	-0.33	0.37	10.9	29.7	20.0
	-0.33	0.37	10.9	29.7	20.0	0.00	9		1: 2	0.0145	-0.34	0.26	7.9	30.2	20.0
	-0.34	0.26	7.9	30.2	20.0	0.00	9		2: 3	0.0145	-0.34	0.15	4.5	30.7	20.0
	-0.34	0.15	4.5	30.7	20.0	0.00	9		3: 4	0.0145	-0.35	0.02	0.5	31.2	20.0
	-0.35	0.02	0.5	31.2	20.0	0.01	10		1: 2	0.0145	-0.35	-0.12	-3.9	31.7	20.0
	-0.35	-0.12	-3.9	31.7	20.0	0.01	11		1: 2	0.0145	-0.36	-0.27	-8.7	32.1	20.0
	-0.36	-0.27	-8.7	32.1	20.0	0.01	11		2: 3	0.0145	-0.37	-0.43	-14.0	32.6	20.0
	-0.37	-0.43	-14.0	32.6	20.0	0.00	11		3: 4	0.0145	-0.37	-0.38	-12.6	33.1	20.0
	0.43	0.00	-3.1	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-2.9	0.0	0.0

	0.46	0.00	-2.9	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-2.6	0.0	0.0
	0.53	0.00	-2.6	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-2.3	0.0	0.0
	0.60	0.00	-2.3	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-2.0	0.0	0.0
	0.67	0.00	-2.0	0.0	0.0	-0.07	13		2. 3	0.0145	0.74	0.00	-1.7	0.0	0.0
	0.74	0.00	-1.7	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-1.4	0.0	0.0
	0.82	0.00	-1.4	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-1.2	0.0	0.0
	0.89	0.00	-1.2	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-1.0	0.0	0.0
	0.96	0.00	-1.0	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.7	0.0	0.0
	1.03	0.00	-0.7	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.4	0.0	0.0
	1.10	0.00	-0.4	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-3.1	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-2.9	0.0	0.0
	0.46	0.00	-2.9	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-2.6	0.0	0.0
	0.53	0.00	-2.6	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-2.3	0.0	0.0
	0.60	0.00	-2.3	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-2.0	0.0	0.0
	0.67	0.00	-2.0	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-1.7	0.0	0.0
	0.74	0.00	-1.7	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-1.4	0.0	0.0
	0.82	0.00	-1.4	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-1.2	0.0	0.0
	0.89	0.00	-1.2	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-1.0	0.0	0.0
	0.96	0.00	-1.0	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.7	0.0	0.0
	1.03	0.00	-0.7	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.4	0.0	0.0
	1.10	0.00	-0.4	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:24	0.43	0.00	4.5	0.0	0.0	0.03	1	(*)	1: 2	0.0145	0.40	0.00	4.7	0.0	0.0
	0.40	0.00	4.7	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	5.1	0.0	0.0
	0.35	0.00	5.1	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	5.4	0.0	0.0
	0.30	0.00	5.4	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	5.9	0.0	0.0
	0.25	0.00	5.9	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	6.3	0.0	0.0
	0.20	0.00	6.3	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	6.9	0.0	0.0
	0.15	0.00	6.9	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	7.5	0.0	0.0
	0.10	0.00	7.5	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	8.1	0.0	0.0
	0.05	0.00	8.1	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	8.9	0.0	0.0
	0.00	0.00	8.9	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	9.8	0.0	0.0
	-0.05	0.00	9.8	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	10.9	0.0	0.0
	-0.10	0.00	10.9	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	12.1	0.0	0.0
	-0.15	0.00	12.1	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	13.4	0.0	0.0
	-0.20	0.00	13.4	0.0	0.0	0.05	5		2; 3	0.0145	-0.25	0.00	14.9	0.0	0.0
	-0.25	0.00	14.9	0.0	0.0	0.03	5		3: 4	0.0145	-0.28	0.66	16.6	25.4	20.0
	-0.28	0.66	16.6	25.4	20.0	0.01	6		1: 2	0.0145	-0.29	0.69	17.9	25.8	20.0
	-0.29	0.69	17.9	25.8	20.0	0.01	6		2: 3	0.0145	-0.31	0.71	18.7	26.2	20.0
	-0.31	0.71	18.7	26.2	20.0	0.01	6		3: 4	0.0145	-0.32	0.71	19.0	26.6	20.0
	-0.32	0.71	19.0	26.6	20.0	0.01	7		1: 2	0.0145	-0.33	0.70	18.9	27.0	20.0
	-0.33	0.70	18.9	27.0	20.0	0.01	7		2: 3	0.0145	-0.35	0.67	18.4	27.4	20.0
	-0.35	0.67	18.4	27.4	20.0	0.01	7		3: 4	0.0145	-0.36	0.63	17.5	27.8	20.0
	-0.36	0.63	17.5	27.8	20.0	0.01	8		1: 2	0.0145	-0.37	0.58	16.3	28.2	20.0
	-0.37	0.58	16.3	28.2	20.0	0.01	8		2: 3	0.0145	-0.38	0.51	14.6	28.7	20.0
	-0.38	0.51	14.6	28.7	20.0	0.01	8		3: 4	0.0145	-0.38	0.43	12.6	29.2	20.0
	-0.38	0.43	12.6	29.2	20.0	0.00	9		1: 2	0.0145	-0.39	0.34	10.1	29.6	20.0
	-0.39	0.34	10.1	29.6	20.0	0.00	9		2: 3	0.0145	-0.39	0.24	7.1	30.1	20.0
	-0.39	0.24	7.1	30.1	20.0	0.00	9		3: 4	0.0145	-0.40	0.12	3.7	30.6	20.0
	-0.40	0.12	3.7	30.6	20.0	0.00	10		1: 2	0.0145	-0.40	-0.01	-0.2	31.1	20.0
	-0.40	-0.01	-0.2	31.1	20.0	0.01	11		1: 2	0.0145	-0.41	-0.15	-4.6	31.6	20.0
	-0.41	-0.15	-4.6	31.6	20.0	0.01	11		2: 3	0.0145	-0.41	-0.29	-9.4	32.1	20.0
	-0.41	-0.29	-9.4	32.1	20.0	0.00	11		3: 4	0.0145	-0.42	-0.25	-8.1	32.6	20.0
	0.43	0.00	-2.3	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-2.1	0.0	0.0
	0.46	0.00	-2.1	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.9	0.0	0.0
	0.53	0.00	-1.9	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-1.7	0.0	0.0
	0.60	0.00	-1.7	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-1.5	0.0	0.0
	0.67	0.00	-1.5	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-1.3	0.0	0.0
	0.74	0.00	-1.3	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-1.2	0.0	0.0
	0.82	0.00	-1.2	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-1.1	0.0	0.0
	0.89	0.00	-1.1	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.9	0.0	0.0
	0.96	0.00	-0.9	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.6	0.0	0.0
	1.03	0.00	-0.6	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.3	0.0	0.0
	1.10	0.00	-0.3	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-2.3	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-2.1	0.0	0.0
	0.46	0.00	-2.1	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.9	0.0	0.0
	0.53	0.00	-1.9	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-1.7	0.0	0.0
	0.60	0.00	-1.7	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-1.5	0.0	0.0
	0.67	0.00	-1.5	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-1.3	0.0	0.0
	0.74	0.00	-1.3	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-1.2	0.0	0.0
	0.82	0.00	-1.2	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-1.1	0.0	0.0
	0.89	0.00	-1.1	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.9	0.0	0.0
	0.96	0.00	-0.9	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.6	0.0	0.0
	1.03	0.00	-0.6	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.3	0.0	0.0
	1.10	0.00	-0.3	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:30	0.43	0.00	3.3	0.0	0.0	0.03	1	(*)	1: 2	0.0145	0.40	0.00	3.5	0.0	0.0
	0.40	0.00	3.5	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	3.7	0.0	0.0
	0.35	0.00	3.7	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	4.0	0.0	0.0
	0.30	0.00	4.0	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	4.3	0.0	0.0
	0.25	0.00	4.3	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	4.7	0.0	0.0
	0.20	0.00	4.7	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	5.0	0.0	0.0
	0.15	0.00	5.0	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	5.5	0.0	0.0
	0.10	0.00	5.5	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	6.0	0.0	0.0
	0.05	0.00	6.0	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	6.6	0.0	0.0
	0.00	0.00	6.6	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	7.2	0.0	0.0
	-0.05	0.00	7.2	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	8.0	0.0	0.0
	-0.10	0.00	8.0	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	9.0	0.0	0.0
	-0.15	0.00	9.0	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	10.0	0.0	0.0
	-0.20	0.00	10.0	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	11.2	0.0	0.0
	-0.25	0.00	11.2	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	12.4	0.0	0.0
	-0.30	0.00	12.4	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	13.9	0.0	0.0

	-0.35	0.00	13.9	0.0	0.0	0.02	6	2 3	0.0145	-0.37	0.60	15.4	25.6	20.0
	-0.37	0.60	15.4	25.6	20.0	0.01	6	3 4	0.0145	-0.38	0.64	16.5	26.0	20.0
	-0.38	0.64	16.5	26.0	20.0	0.01	7	1 2	0.0145	-0.39	0.65	17.1	26.4	20.0
	-0.39	0.65	17.1	26.4	20.0	0.01	7	2 3	0.0145	-0.40	0.64	17.2	26.8	20.0
	-0.40	0.64	17.2	26.8	20.0	0.01	7	3 4	0.0145	-0.41	0.62	16.9	27.3	20.0
	-0.41	0.62	16.9	27.3	20.0	0.01	8	1 2	0.0145	-0.42	0.58	16.2	27.7	20.0
	-0.42	0.58	16.2	27.7	20.0	0.01	8	2 3	0.0145	-0.43	0.53	15.0	28.2	20.0
	-0.43	0.53	15.0	28.2	20.0	0.01	8	3 4	0.0145	-0.43	0.47	13.5	28.6	20.0
	-0.43	0.47	13.5	28.6	20.0	0.01	9	1: 2	0.0145	-0.44	0.39	11.5	29.1	20.0
	-0.44	0.39	11.5	29.1	20.0	0.00	9	2: 3	0.0145	-0.44	0.30	9.0	29.6	20.0
	-0.44	0.30	9.0	29.6	20.0	0.00	9	3: 4	0.0145	-0.45	0.20	6.1	30.1	20.0
	-0.45	0.20	6.1	30.1	20.0	0.00	10	1: 2	0.0145	-0.45	0.09	2.7	30.6	20.0
	-0.45	0.09	2.7	30.6	20.0	0.00	11	1. 2	0.0145	-0.45	-0.04	-1.2	31.1	20.0
	-0.45	-0.04	-1.2	31.1	20.0	0.01	11	2 3	0.0145	-0.46	-0.18	-5.6	31.6	20.0
	-0.46	-0.18	-5.6	31.6	20.0	0.00	11	3. 4	0.0145	-0.46	-0.13	-4.3	32.1	20.0
	0.43	0.00	-1.7	0.0	0.0	-0.03	12	1. 2	0.0145	0.46	0.00	-1.6	0.0	0.0
	0.46	0.00	-1.6	0.0	0.0	-0.07	12	2. 3	0.0145	0.53	0.00	-1.4	0.0	0.0
	0.53	0.00	-1.4	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.4	0.0	0.0
	0.60	0.00	-1.4	0.0	0.0	-0.07	13	1. 2	0.0145	0.67	0.00	-1.4	0.0	0.0
	0.67	0.00	-1.4	0.0	0.0	-0.07	13	2. 3	0.0145	0.74	0.00	-1.3	0.0	0.0
	0.74	0.00	-1.3	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-1.1	0.0	0.0
	0.82	0.00	-1.1	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-1.0	0.0	0.0
	0.89	0.00	-1.0	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.8	0.0	0.0
	0.96	0.00	-0.8	0.0	0.0	-0.07	14	3. 4	0.0145	1.03	0.00	-0.6	0.0	0.0
	1.03	0.00	-0.6	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.3	0.0	0.0
	1.10	0.00	-0.3	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.7	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.6	0.0	0.0
	0.46	0.00	-1.6	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.4	0.0	0.0
	0.53	0.00	-1.4	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.4	0.0	0.0
	0.60	0.00	-1.4	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.4	0.0	0.0
	0.67	0.00	-1.4	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.3	0.0	0.0
	0.74	0.00	-1.3	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-1.1	0.0	0.0
	0.82	0.00	-1.1	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-1.0	0.0	0.0
	0.89	0.00	-1.0	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.8	0.0	0.0
	0.96	0.00	-0.8	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.6	0.0	0.0
	1.03	0.00	-0.6	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.3	0.0	0.0
	1.10	0.00	-0.3	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:36	0.43	0.00	3.1	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	3.2	0.0	0.0
	0.40	0.00	3.2	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	3.4	0.0	0.0
	0.35	0.00	3.4	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	3.4	0.0	0.0
	0.30	0.00	3.4	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.3	0.0	0.0
	0.25	0.00	3.3	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3.4	0.0	0.0
	0.20	0.00	3.4	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.7	0.0	0.0
	0.15	0.00	3.7	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	4.0	0.0	0.0
	0.10	0.00	4.0	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	4.4	0.0	0.0
	0.05	0.00	4.4	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	4.8	0.0	0.0
	0.00	0.00	4.8	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	5.3	0.0	0.0
	-0.05	0.00	5.3	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	5.9	0.0	0.0
	-0.10	0.00	5.9	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	6.6	0.0	0.0
	-0.15	0.00	6.6	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	7.5	0.0	0.0
	-0.20	0.00	7.5	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	8.4	0.0	0.0
	-0.25	0.00	8.4	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	9.5	0.0	0.0
	-0.30	0.00	9.5	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	10.8	0.0	0.0
	-0.35	0.00	10.8	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	12.2	0.0	0.0
	-0.40	0.00	12.2	0.0	0.0	0.03	6	3: 4	0.0145	-0.43	0.54	13.8	25.4	20.0
	-0.43	0.54	13.8	25.4	20.0	0.01	7	1: 2	0.0145	-0.44	0.58	14.9	25.8	20.0
	-0.44	0.58	14.9	25.8	20.0	0.01	7	2: 3	0.0145	-0.45	0.59	15.6	26.3	20.0
	-0.45	0.59	15.6	26.3	20.0	0.01	7	3: 4	0.0145	-0.46	0.59	15.8	26.7	20.0
	-0.46	0.59	15.8	26.7	20.0	0.01	8	1: 2	0.0145	-0.47	0.57	15.5	27.2	20.0
	-0.47	0.57	15.5	27.2	20.0	0.01	8	2: 3	0.0145	-0.48	0.54	14.9	27.6	20.0
	-0.48	0.54	14.9	27.6	20.0	0.01	8	3: 4	0.0145	-0.48	0.49	13.8	28.1	20.0
	-0.48	0.49	13.8	28.1	20.0	0.01	9	1: 2	0.0145	-0.49	0.43	12.2	28.6	20.0
	-0.49	0.43	12.2	28.6	20.0	0.00	9	2: 3	0.0145	-0.49	0.35	10.2	29.1	20.0
	-0.49	0.35	10.2	29.1	20.0	0.00	9	3: 4	0.0145	-0.50	0.26	7.8	29.6	20.0
	-0.50	0.26	7.8	29.6	20.0	0.00	10	1: 2	0.0145	-0.50	0.16	4.9	30.1	20.0
	-0.50	0.16	4.9	30.1	20.0	0.00	11	1: 2	0.0145	-0.50	0.05	1.4	30.6	20.0
	-0.50	0.05	1.4	30.6	20.0	0.00	11	2: 3	0.0145	-0.51	-0.08	-2.5	31.1	20.0
	-0.51	-0.08	-2.5	31.1	20.0	0.00	11	3: 4	0.0145	-0.51	-0.04	-1.2	31.6	20.0
	0.43	0.00	-1.6	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.5	0.0	0.0
	0.46	0.00	-1.5	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.4	0.0	0.0
	0.53	0.00	-1.4	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.3	0.0	0.0
	0.67	0.00	-1.3	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.2	0.0	0.0
	0.74	0.00	-1.2	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-1.1	0.0	0.0
	0.82	0.00	-1.1	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.9	0.0	0.0
	0.89	0.00	-0.9	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.8	0.0	0.0
	0.96	0.00	-0.8	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.5	0.0	0.0
	1.03	0.00	-0.5	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.3	0.0	0.0
	1.10	0.00	-0.3	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.6	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.5	0.0	0.0
	0.46	0.00	-1.5	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.4	0.0	0.0
	0.53	0.00	-1.4	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.3	0.0	0.0
	0.67	0.00	-1.3	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.2	0.0	0.0
	0.74	0.00	-1.2	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-1.1	0.0	0.0
	0.82	0.00	-1.1	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.9	0.0	0.0
	0.89	0.00	-0.9	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.8	0.0	0.0
	0.96	0.00	-0.8	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.5	0.0	0.0
	1.03	0.00	-0.5	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.3	0.0	0.0
	1.10	0.00	-0.3	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0

9:42	0.43	0.00	3.0	0.0	0.0	0.03	1 (*)	1 2	0.0145	0.40	0.00	3.1	0.0	0.0
	0.40	0.00	3.1	0.0	0.0	0.05	1	2. 3	0.0145	0.35	0.00	3.2	0.0	0.0
	0.35	0.00	3.2	0.0	0.0	0.05	1	3 4	0.0145	0.30	0.00	3.2	0.0	0.0
	0.30	0.00	3.2	0.0	0.0	0.05	2	1 2	0.0145	0.25	0.00	3.2	0.0	0.0
	0.25	0.00	3.2	0.0	0.0	0.05	2	2, 3	0.0145	0.20	0.00	3.3	0.0	0.0
	0.20	0.00	3.3	0.0	0.0	0.05	2	3 4	0.0145	0.15	0.00	3.4	0.0	0.0
	0.15	0.00	3.4	0.0	0.0	0.05	3	1 2	0.0145	0.10	0.00	3.4	0.0	0.0
	0.10	0.00	3.4	0.0	0.0	0.05	3	2. 3	0.0145	0.05	0.00	3.3	0.0	0.0
	0.05	0.00	3.3	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.6	0.0	0.0
	0.00	0.00	3.6	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.9	0.0	0.0
	-0.05	0.00	3.9	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	4.4	0.0	0.0
	-0.10	0.00	4.4	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	4.9	0.0	0.0
	-0.15	0.00	4.9	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	5.5	0.0	0.0
	-0.20	0.00	5.5	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	6.3	0.0	0.0
	-0.25	0.00	6.3	0.0	0.0	0.05	5	3. 4	0.0145	-0.30	0.00	7.2	0.0	0.0
	-0.30	0.00	7.2	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	8.3	0.0	0.0
	-0.35	0.00	8.3	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	9.6	0.0	0.0
	-0.40	0.00	9.6	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	10.9	0.0	0.0
	-0.45	0.00	10.9	0.0	0.0	0.04	7	1: 2	0.0145	-0.49	0.50	12.5	25.3	20.0
	-0.49	0.50	12.5	25.3	20.0	0.01	7	2: 3	0.0145	-0.50	0.53	13.7	25.7	20.0
	-0.50	0.53	13.7	25.7	20.0	0.01	7	3: 4	0.0145	-0.51	0.55	14.3	26.2	20.0
	-0.51	0.55	14.3	26.2	20.0	0.01	8	1. 2	0.0145	-0.52	0.55	14.5	26.7	20.0
	-0.52	0.55	14.5	26.7	20.0	0.01	8	2: 3	0.0145	-0.52	0.53	14.3	27.1	20.0
	-0.52	0.53	14.3	27.1	20.0	0.01	8	3: 4	0.0145	-0.53	0.49	13.6	27.6	20.0
	-0.53	0.49	13.6	27.6	20.0	0.01	9	1: 2	0.0145	-0.54	0.45	12.5	28.1	20.0
	-0.54	0.45	12.5	28.1	20.0	0.00	9	2: 3	0.0145	-0.54	0.38	11.0	28.5	20.0
	-0.54	0.38	11.0	28.5	20.0	0.00	9	3: 4	0.0145	-0.54	0.31	9.0	29.1	20.0
	-0.54	0.31	9.0	29.1	20.0	0.00	10	1: 2	0.0145	-0.55	0.22	6.5	29.6	20.0
	-0.55	0.22	6.5	29.6	20.0	0.00	11	1: 2	0.0145	-0.55	0.12	3.6	30.1	20.0
	-0.55	0.12	3.6	30.1	20.0	0.00	11	2: 3	0.0145	-0.55	0.00	0.1	30.6	20.0
	-0.55	0.00	0.1	30.6	20.0	0.00	11	3: 4	0.0145	-0.56	0.04	1.4	31.1	20.0
	0.43	0.00	-1.5	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.5	0.0	0.0
	0.46	0.00	-1.5	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.4	0.0	0.0
	0.53	0.00	-1.4	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.2	0.0	0.0
	0.74	0.00	-1.2	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-1.0	0.0	0.0
	0.82	0.00	-1.0	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.9	0.0	0.0
	0.89	0.00	-0.9	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.7	0.0	0.0
	0.96	0.00	-0.7	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.5	0.0	0.0
	1.03	0.00	-0.5	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.5	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.5	0.0	0.0
	0.46	0.00	-1.5	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.4	0.0	0.0
	0.53	0.00	-1.4	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.2	0.0	0.0
	0.74	0.00	-1.2	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-1.0	0.0	0.0
	0.82	0.00	-1.0	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.9	0.0	0.0
	0.89	0.00	-0.9	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.7	0.0	0.0
	0.96	0.00	-0.7	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.5	0.0	0.0
	1.03	0.00	-0.5	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:48	0.43	0.00	2.9	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	3.0	0.0	0.0
	0.40	0.00	3.0	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	3.0	0.0	0.0
	0.35	0.00	3.0	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	3.1	0.0	0.0
	0.30	0.00	3.1	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.2	0.0	0.0
	0.25	0.00	3.2	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3.2	0.0	0.0
	0.20	0.00	3.2	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.3	0.0	0.0
	0.15	0.00	3.3	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.3	0.0	0.0
	0.10	0.00	3.3	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.3	0.0	0.0
	0.05	0.00	3.3	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.4	0.0	0.0
	0.00	0.00	3.4	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.3	0.0	0.0
	-0.05	0.00	3.3	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.3	0.0	0.0
	-0.10	0.00	3.3	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.6	0.0	0.0
	-0.15	0.00	3.6	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	4.1	0.0	0.0
	-0.20	0.00	4.1	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	4.7	0.0	0.0
	-0.25	0.00	4.7	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	5.5	0.0	0.0
	-0.30	0.00	5.4	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	6.3	0.0	0.0
	-0.35	0.00	6.3	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	7.4	0.0	0.0
	-0.40	0.00	7.4	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	8.6	0.0	0.0
	-0.45	0.00	8.6	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	9.9	0.0	0.0
	-0.50	0.00	9.9	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.46	11.5	25.2	20.0
	-0.55	0.46	11.5	25.2	20.0	0.01	7	3: 4	0.0145	-0.56	0.49	12.7	25.7	20.0
	-0.56	0.49	12.7	25.7	20.0	0.01	8	1: 2	0.0145	-0.56	0.51	13.3	26.2	20.0
	-0.56	0.51	13.3	26.2	20.0	0.01	8	2: 3	0.0145	-0.57	0.51	13.5	26.6	20.0
	-0.57	0.51	13.5	26.6	20.0	0.01	8	3: 4	0.0145	-0.58	0.49	13.2	27.1	20.0
	-0.58	0.49	13.2	27.1	20.0	0.01	9	1: 2	0.0145	-0.58	0.46	12.5	27.6	20.0
	-0.58	0.46	12.5	27.6	20.0	0.00	9	2: 3	0.0145	-0.59	0.41	11.4	28.1	20.0
	-0.59	0.41	11.4	28.1	20.0	0.00	9	3: 4	0.0145	-0.59	0.34	9.8	28.5	20.0
	-0.59	0.34	9.8	28.5	20.0	0.00	10	1: 2	0.0145	-0.59	0.27	7.8	29.1	20.0
	-0.59	0.27	7.8	29.1	20.0	0.00	11	1: 2	0.0145	-0.60	0.18	5.3	29.6	20.0
	-0.60	0.18	5.3	29.6	20.0	0.00	11	2: 3	0.0145	-0.60	0.08	2.3	30.1	20.0
	-0.60	0.08	2.3	30.1	20.0	0.00	11	3: 4	0.0145	-0.60	0.12	3.6	30.6	20.0
	0.43	0.00	-1.5	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-1.0	0.0	0.0

	0.82	0.00	-1.0	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.9	0.0	0.0
	0.89	0.00	-0.9	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.7	0.0	0.0
	0.96	0.00	-0.7	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.5	0.0	0.0
	1.03	0.00	-0.5	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2· 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.5	0.0	0.0	-0.03	16	1· 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	16	2. 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-1.0	0.0	0.0
	0.82	0.00	-1.0	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.9	0.0	0.0
	0.89	0.00	-0.9	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.7	0.0	0.0
	0.96	0.00	-0.7	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.5	0.0	0.0
	1.03	0.00	-0.5	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
9:54	0.43	0.00	2.9	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.9	0.0	0.0
	0.40	0.00	2.9	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	3.0	0.0	0.0
	0.35	0.00	3.0	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	3.0	0.0	0.0
	0.30	0.00	3.0	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.1	0.0	0.0
	0.25	0.00	3.1	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3.1	0.0	0.0
	0.20	0.00	3.1	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.2	0.0	0.0
	0.15	0.00	3.2	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.2	0.0	0.0
	0.10	0.00	3.2	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.2	0.0	0.0
	0.05	0.00	3.2	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.3	0.0	0.0
	0.00	0.00	3.3	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.3	0.0	0.0
	-0.05	0.00	3.3	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.3	0.0	0.0
	-0.10	0.00	3.3	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.2	0.0	0.0
	-0.15	0.00	3.2	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.2	0.0	0.0
	-0.20	0.00	3.2	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	3.6	0.0	0.0
	-0.25	0.00	3.6	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	4.1	0.0	0.0
	-0.30	0.00	4.1	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	4.8	0.0	0.0
	-0.35	0.00	4.8	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	5.6	0.0	0.0
	-0.40	0.00	5.6	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	6.6	0.0	0.0
	-0.45	0.00	6.6	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	7.7	0.0	0.0
	-0.50	0.00	7.7	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	8.9	0.0	0.0
	-0.55	0.00	8.9	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	10.2	0.0	0.0
	-0.60	0.00	10.2	0.0	0.0	0.01	8	1: 2	0.0145	-0.61	0.44	11.4	25.6	20.0
	-0.61	0.44	11.4	25.6	20.0	0.00	8	2: 3	0.0145	-0.62	0.46	12.1	26.1	20.0
	-0.62	0.46	12.1	26.1	20.0	0.01	8	3: 4	0.0145	-0.62	0.46	12.4	26.6	20.0
	-0.62	0.46	12.4	26.6	20.0	0.01	9	1: 2	0.0145	-0.63	0.45	12.1	27.1	20.0
	-0.63	0.45	12.1	27.1	20.0	0.00	9	2: 3	0.0145	-0.63	0.42	11.4	27.6	20.0
	-0.63	0.42	11.4	27.6	20.0	0.00	9	3: 4	0.0145	-0.64	0.37	10.3	28.1	20.0
	-0.64	0.37	10.3	28.1	20.0	0.00	10	1: 2	0.0145	-0.64	0.31	8.7	28.6	20.0
	-0.64	0.31	8.7	28.6	20.0	0.00	11	1: 2	0.0145	-0.64	0.23	6.7	29.1	20.0
	-0.64	0.23	6.7	29.1	20.0	0.00	11	2: 3	0.0145	-0.64	0.14	4.1	29.6	20.0
	-0.64	0.14	4.1	29.6	20.0	0.00	11	3: 4	0.0145	-0.65	0.18	5.4	30.1	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2·	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-1.0	0.0	0.0
	0.82	0.00	-1.0	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.8	0.0	0.0
	0.89	0.00	-0.8	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-1.0	0.0	0.0
	0.82	0.00	-1.0	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.8	0.0	0.0
	0.89	0.00	-0.8	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
90/10/ 1 10: 0	0.43	0.00	2.8	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.9	0.0	0.0
	0.40	0.00	2.9	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.9	0.0	0.0
	0.35	0.00	2.9	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	3.0	0.0	0.0
	0.30	0.00	3.0	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.1	0.0	0.0
	0.25	0.00	3.1	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3.1	0.0	0.0
	0.20	0.00	3.1	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.1	0.0	0.0
	0.15	0.00	3.1	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.2	0.0	0.0
	0.10	0.00	3.2	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.2	0.0	0.0
	0.05	0.00	3.2	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.2	0.0	0.0
	0.00	0.00	3.2	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.2	0.0	0.0
	-0.05	0.00	3.2	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.2	0.0	0.0
	-0.10	0.00	3.2	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.2	0.0	0.0
	-0.15	0.00	3.2	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.2	0.0	0.0
	-0.20	0.00	3.2	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	3.1	0.0	0.0
	-0.25	0.00	3.1	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.2	0.0	0.0
	-0.30	0.00	3.2	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.6	0.0	0.0
	-0.35	0.00	3.6	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	4.3	0.0	0.0
	-0.40	0.00	4.3	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	5.1	0.0	0.0
	-0.45	0.00	5.1	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	6.0	0.0	0.0
	-0.50	0.00	6.0	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	7.0	0.0	0.0
	-0.55	0.00	7.0	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	8.1	0.0	0.0

```
              | -0.60   0.00      8.1    0.0    0.0| 0.05    8    1  2  0.0145| -0.65   0.00     9.3    0.0    0.0|
              | -0.65   0.00      9.3    0.0    0.0| 0.01    8    2  3  0.0145| -0.66   0.41    10.5   25.6   20.0|
              | -0.66   0.41     10.5   25.6   20.0| 0.00    8    3  4  0.0145| -0.67   0.43    11.2   26.1   20.0|
              | -0.67   0.43     11.2   26.1   20.0| 0.00    9    1  2  0.0145| -0.67   0.43    11.4   26.6   20.0|
              | -0.67   0.43     11.4   26.6   20.0| 0.00    9    2  3  0.0145| -0.68   0.41    11.2   27.1   20.0|
              | -0.68   0.41     11.2   27.1   20.0| 0.00    9    3  4  0.0145| -0.68   0.38    10.5   27.6   20.0|
              | -0.68   0.38     10.5   27.6   20.0| 0.00   10    1  2  0.0145| -0.68   0.33     9.3   28.1   20.0|
              | -0.68   0.33      9.3   28.1   20.0| 0.00   11    1. 2  0.0145| -0.69   0.27     7.7   28.6   20.0|
              | -0.69   0.27      7.7   28.6   20.0| 0.00   11    2: 3  0.0145| -0.69   0.19     5.6   29.1   20.0|
              | -0.69   0.19      5.6   29.1   20.0| 0.00   11    3: 4  0.0145| -0.69   0.23     6.9   29.6   20.0|
              |  0.43   0.00     -1.4    0.0    0.0|-0.03   12    1: 2  0.0145|  0.46   0.00    -1.4    0.0    0.0|
              |  0.46   0.00     -1.4    0.0    0.0|-0.07   12    2. 3  0.0145|  0.53   0.00    -1.3    0.0    0.0|
              |  0.53   0.00     -1.3    0.0    0.0|-0.07   12    3: 4  0.0145|  0.60   0.00    -1.3    0.0    0.0|
              |  0.60   0.00     -1.3    0.0    0.0|-0.07   13    1: 2  0.0145|  0.67   0.00    -1.2    0.0    0.0|
              |  0.67   0.00     -1.2    0.0    0.0|-0.07   13    2: 3  0.0145|  0.74   0.00    -1.1    0.0    0.0|
              |  0.74   0.00     -1.1    0.0    0.0|-0.07   13    3: 4  0.0145|  0.82   0.00    -0.9    0.0    0.0|
              |  0.82   0.00     -0.9    0.0    0.0|-0.07   14    1: 2  0.0145|  0.89   0.00    -0.8    0.0    0.0|
              |  0.89   0.00     -0.8    0.0    0.0|-0.07   14    2: 3  0.0145|  0.96   0.00    -0.6    0.0    0.0|
              |  0.96   0.00     -0.6    0.0    0.0|-0.07   14    3: 4  0.0145|  1.03   0.00    -0.4    0.0    0.0|
              |  1.03   0.00     -0.4    0.0    0.0|-0.07   15    1: 2  0.0145|  1.10   0.00    -0.2    0.0    0.0|
              |  1.10   0.00     -0.2    0.0    0.0|-0.07   15    2. 3  0.0145|  1.17   0.00     0.0    0.0    0.0|
              |  0.43   0.00     -1.4    0.0    0.0|-0.03   16    1. 2  0.0145|  0.46   0.00    -1.4    0.0    0.0|
              |  0.46   0.00     -1.4    0.0    0.0|-0.07   16    2. 3  0.0145|  0.53   0.00    -1.3    0.0    0.0|
              |  0.53   0.00     -1.3    0.0    0.0|-0.07   16    3  4  0.0145|  0.60   0.00    -1.3    0.0    0.0|
              |  0.60   0.00     -1.3    0.0    0.0|-0.07   17    1: 2  0.0145|  0.67   0.00    -1.2    0.0    0.0|
              |  0.67   0.00     -1.2    0.0    0.0|-0.07   17    2: 3  0.0145|  0.74   0.00    -1.1    0.0    0.0|
              |  0.74   0.00     -1.1    0.0    0.0|-0.07   17    3: 4  0.0145|  0.82   0.00    -0.9    0.0    0.0|
              |  0.82   0.00     -0.9    0.0    0.0|-0.07   18    1: 2  0.0145|  0.89   0.00    -0.8    0.0    0.0|
              |  0.89   0.00     -0.8    0.0    0.0|-0.07   18    2: 3  0.0145|  0.96   0.00    -0.6    0.0    0.0|
              |  0.96   0.00     -0.6    0.0    0.0|-0.07   18    3: 4  0.0145|  1.03   0.00    -0.4    0.0    0.0|
              |  1.03   0.00     -0.4    0.0    0.0|-0.07   19    1: 2  0.0145|  1.10   0.00    -0.2    0.0    0.0|
              |  1.10   0.00     -0.2    0.0    0.0|-0.07   19    2: 3  0.0145|  1.17   0.00     0.0    0.0    0.0|
     5 ITERATIONS FOR TIME STEP   3 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
 ----------------------------------------------------------------------------------------------------------------------------------
-
  -0.1295    (  1,  2,  2)  0.1125    (  1,  2,  2)  0.6819E-01 (  1, 29, 11)  0.1892E-01 (  1, 38, 11)  0.1050E-02 (  1, 36, 11)
0
     6 ITERATIONS FOR TIME STEP   3 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
 ----------------------------------------------------------------------------------------------------------------------------------
-
  -0.1295    (  1,  2,  2)  0.1125    (  1,  2,  2)  0.6819E-01 (  1, 29, 11)  0.1892E-01 (  1, 38, 11)  0.1050E-02 (  1, 36, 11)
   0.1013E-02 (  1, 37, 11)
0
     7 ITERATIONS FOR TIME STEP   3 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
 ----------------------------------------------------------------------------------------------------------------------------------
-
  -0.1295    (  1,  2,  2)  0.1125    (  1,  2,  2)  0.6819E-01 (  1, 29, 11)  0.1892E-01 (  1, 38, 11)  0.1050E-02 (  1, 36, 11)
   0.1013E-02 (  1, 37, 11) -0.5009E-05 (  1, 37, 11)
0
0HEAD/DRAWDOWN PRINTOUT FLAG = 0    TOTAL BUDGET PRINTOUT FLAG = 0     CELL-BY-CELL FLOW TERM FLAG = 0
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
   HEAD    DRAWDOWN  HEAD  DRAWDOWN
 PRINTOUT  PRINTOUT  SAVE    SAVE
 ----------------------------------
    0         0        0       0
 90/10/ 1 10: 0|  0.43   0.00      2.8    0.0    0.0| 0.03    1 (*) 1: 2  0.0145|  0.40   0.00     2.9    0.0    0.0|
              |  0.40   0.00      2.9    0.0    0.0| 0.05    1     2: 3  0.0145|  0.35   0.00     2.9    0.0    0.0|
              |  0.35   0.00      2.9    0.0    0.0| 0.05    1     3: 4  0.0145|  0.30   0.00     3.0    0.0    0.0|
              |  0.30   0.00      3.0    0.0    0.0| 0.05    2     1: 2  0.0145|  0.25   0.00     3.1    0.0    0.0|
              |  0.25   0.00      3.1    0.0    0.0| 0.05    2     2: 3  0.0145|  0.20   0.00     3.1    0.0    0.0|
              |  0.20   0.00      3.1    0.0    0.0| 0.05    2     3: 4  0.0145|  0.15   0.00     3.1    0.0    0.0|
              |  0.15   0.00      3.1    0.0    0.0| 0.05    3     1: 2  0.0145|  0.10   0.00     3.2    0.0    0.0|
              |  0.10   0.00      3.2    0.0    0.0| 0.05    3     2: 3  0.0145|  0.05   0.00     3.2    0.0    0.0|
              |  0.05   0.00      3.2    0.0    0.0| 0.05    3     3: 4  0.0145|  0.00   0.00     3.2    0.0    0.0|
              |  0.00   0.00      3.2    0.0    0.0| 0.05    4     1: 2  0.0145| -0.05   0.00     3.2    0.0    0.0|
              | -0.05   0.00      3.2    0.0    0.0| 0.05    4     2: 3  0.0145| -0.10   0.00     3.2    0.0    0.0|
              | -0.10   0.00      3.2    0.0    0.0| 0.05    4     3: 4  0.0145| -0.15   0.00     3.2    0.0    0.0|
              | -0.15   0.00      3.2    0.0    0.0| 0.05    5     1: 2  0.0145| -0.20   0.00     3.2    0.0    0.0|
              | -0.20   0.00      3.2    0.0    0.0| 0.05    5     2: 3  0.0145| -0.25   0.00     3.1    0.0    0.0|
              | -0.25   0.00      3.1    0.0    0.0| 0.05    5     3: 4  0.0145| -0.30   0.00     3.2    0.0    0.0|
              | -0.30   0.00      3.2    0.0    0.0| 0.05    6     1: 2  0.0145| -0.35   0.00     3.6    0.0    0.0|
              | -0.35   0.00      3.6    0.0    0.0| 0.05    6     2: 3  0.0145| -0.40   0.00     4.3    0.0    0.0|
              | -0.40   0.00      4.3    0.0    0.0| 0.05    6     3: 4  0.0145| -0.45   0.00     5.1    0.0    0.0|
              | -0.45   0.00      5.1    0.0    0.0| 0.05    7     1: 2  0.0145| -0.50   0.00     6.0    0.0    0.0|
              | -0.50   0.00      6.0    0.0    0.0| 0.05    7     2: 3  0.0145| -0.55   0.00     7.0    0.0    0.0|
              | -0.55   0.00      7.0    0.0    0.0| 0.05    7     3: 4  0.0145| -0.60   0.00     8.1    0.0    0.0|
              | -0.60   0.00      8.1    0.0    0.0| 0.05    8     1: 2  0.0145| -0.65   0.00     9.3    0.0    0.0|
              | -0.65   0.00      9.3    0.0    0.0| 0.01    8     2: 3  0.0145| -0.66   0.41    10.5   25.6   20.0|
              | -0.66   0.41     10.5   25.6   20.0| 0.00    8     3: 4  0.0145| -0.67   0.43    11.2   26.1   20.0|
              | -0.67   0.43     11.2   26.1   20.0| 0.00    9     1: 2  0.0145| -0.67   0.43    11.4   26.6   20.0|
              | -0.67   0.43     11.4   26.6   20.0| 0.00    9     2: 3  0.0145| -0.68   0.41    11.2   27.1   20.0|
              | -0.68   0.41     11.2   27.1   20.0| 0.00    9     3: 4  0.0145| -0.68   0.38    10.5   27.6   20.0|
              | -0.68   0.38     10.5   27.6   20.0| 0.00   10     1: 2  0.0145| -0.68   0.33     9.3   28.1   20.0|
              | -0.68   0.33      9.3   28.1   20.0| 0.00   11     1: 2  0.0145| -0.69   0.27     7.7   28.6   20.0|
```

	-0.69	0.27	7.7	28.6	20.0	0.00	11	2 3	0.0145	-0.69	0.19	5.6	29.1	20.0
	-0.69	0.19	5.6	29.1	20.0	0.00	11	3 4	0.0145	-0.69	0.23	6.9	29.6	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12	1 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12	2 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12	3 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	13	1 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	13	2. 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	13	3· 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.8	0.0	0.0
	0.89	0.00	-0.8	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15	1. 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.3	0.0	0.0
	0.60	0.00	-1.3	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	17	3. 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07.	18	1: 2	0.0145	0.89	0.00	-0.8	0.0	0.0
	0.89	0.00	-0.8	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10: 6	0.43	0.00	2.8	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.8	0.0	0.0
	0.40	0.00	2.8	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.9	0.0	0.0
	0.35	0.00	2.9	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	3.0	0.0	0.0
	0.30	0.00	3.0	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.0	0.0	0.0
	0.25	0.00	3.0	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3.1	0.0	0.0
	0.20	0.00	3.1	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.1	0.0	0.0
	0.15	0.00	3.1	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.1	0.0	0.0
	0.10	0.00	3.1	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.2	0.0	0.0
	0.00	0.00	3.2	0.0	0.0	0.05	4	1: 3	0.0145	-0.05	0.00	3.1	0.0	0.0
	-0.05	0.00	3.1	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.1	0.0	0.0
	-0.10	0.00	3.1	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.1	0.0	0.0
	-0.15	0.00	3.1	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.1	0.0	0.0
	-0.20	0.00	3.1	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	3.1	0.0	0.0
	-0.25	0.00	3.1	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.2	0.0	0.0
	-0.30	0.00	3.2	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.2	0.0	0.0
	-0.35	0.00	3.2	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	3.4	0.0	0.0
	-0.40	0.00	3.4	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	3.9	0.0	0.0
	-0.45	0.00	3.9	0.0	0.0	0.05	7	1. 2	0.0145	-0.50	0.00	4.6	0.0	0.0
	-0.50	0.00	4.6	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	5.4	0.0	0.0
	-0.55	0.00	5.4	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	6.4	0.0	0.0
	-0.60	0.00	6.4	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	7.5	0.0	0.0
	-0.65	0.00	7.5	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	8.7	0.0	0.0
	-0.70	0.00	8.7	0.0	0.0	0.01	8	3: 4	0.0145	-0.71	0.38	9.8	25.6	20.0
	-0.71	0.38	9.8	25.6	20.0	0.00	9	1: 2	0.0145	-0.72	0.40	10.5	26.1	20.0
	-0.72	0.40	10.5	26.1	20.0	0.00	9	2: 3	0.0145	-0.72	0.40	10.7	26.6	20.0
	-0.72	0.40	[illegible]	26.6	20.0	0.00	9	3: 4	0.0145	-0.73	0.38	10.4	27.1	20.0
	-0.73	0.38	10.4	27.1	20.0	0.00	10	1: 2	0.0145	-0.73	0.35	9.7	27.6	20.0
	-0.73	0.35	9.7	27.6	20.0	0.00	11	1: 2	0.0145	-0.73	0.30	8.5	28.1	20.0
	-0.73	0.30	8.5	28.1	20.0	0.00	11	2: 3	0.0145	-0.74	0.24	6.8	28.6	20.0
	-0.74	0.24	6.8	28.6	20.0	0.00	11	3: 4	0.0145	-0.74	0.28	8.1	29.1	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.8	0.0	0.0
	0.89	0.00	-0.8	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15	1. 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.2	0.0	0.0
	0.67	0.00	-1.2	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.1	0.0	0.0
	0.74	0.00	-1.1	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.8	0.0	0.0
	0.89	0.00	-0.8	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:12	0.43	0.00	2.8	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.8	0.0	0.0
	0.40	0.00	2.8	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.9	0.0	0.0
	0.35	0.00	2.9	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	3.0	0.0	0.0
	0.30	0.00	3.0	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.0	0.0	0.0
	0.25	0.00	3.0	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3 0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.1	0.0	0.0
	0.15	0.00	3.1	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.1	0.0	0.0
	0.10	0.00	3.1	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.1	0.0	0.0
	0.00	0.00	3.1	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.1	0.0	0.0
	-0.05	0.00	3.1	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.1	0.0	0.0
	-0.10	0.00	3.1	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.1	0.0	0.0
	-0.15	0.00	3.1	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.1	0.0	0.0

	-0.20	0.00	3.1	0.0	0.0	0.05	5	2 3	0.0145	-0.25	0.00	3.1	0.0	0.0
	-0.25	0.00	3.1	0.0	0.0	0.05	5	3 4	0.0145	-0.30	0.00	3.1	0.0	0.0
	-0.30	0.00	3.1	0.0	0.0	0.05	6	1 2	0.0145	-0.35	0.00	3.1	0.0	0.0
	-0.35	0.00	3.1	0.0	0.0	0.05	6	2 3	0.0145	-0.40	0.00	3.1	0.0	0.0
	-0.40	0.00	3.1	0.0	0.0	0.05	6	3 4	0.0145	-0.45	0.00	3.2	0.0	0.0
	-0.45	0.00	3.2	0.0	0.0	0.05	7	1 2	0.0145	-0.50	0.00	3.6	0.0	0.0
	-0.50	0.00	3.6	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	4.3	0.0	0.0
	-0.55	0.00	4.3	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	5.1	0.0	0.0
	-0.60	0.00	5.1	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	6.0	0.0	0.0
	-0.65	0.00	6.0	0.0	0.0	0.05	8	2· 3	0.0145	-0.70	0.00	7.1	0.0	0.0
	-0.70	0.00	7.1	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	8.3	0.0	0.0
	-0.75	0.00	8.3	0.0	0.0	0.01	9	1: 2	0.0145	-0.76	0.36	9.3	25.6	20.0
	-0.76	0.36	9.3	25.6	20.0	0.00	9	2: 3	0.0145	-0.77	0.38	10.0	26.1	20.0
	-0.77	0.38	10.0	26.1	20.0	0.00	9	3. 4	0.0145	-0.77	0.38	10.1	26.6	20.0
	-0.77	0.38	10.1	26.6	20.0	0.00	10	1. 2	0.0145	-0.77	0.36	9.8	27.1	20.0
	-0.77	0.36	9.8	27.1	20.0	0.00	11	1: 2	0.0145	-0.78	0.33	9.0	27.6	20.0
	-0.78	0.33	9.0	27.6	20.0	0.00	11	2: 3	0.0145	-0.78	0.28	7.8	28.1	20.0
	-0.78	0.28	7.8	28.1	20.0	0.00	11	3: 4	0.0145	-0.79	0.32	9.1	28.6	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12	1. 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:18	0.43	0.00	2.8	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.8	0.0	0.0
	0.40	0.00	2.8	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.9	0.0	0.0
	0.35	0.00	2.9	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	2.9	0.0	0.0
	0.30	0.00	2.9	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	3.0	0.0	0.0
	0.25	0.00	3.0	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	3.0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.1	0.0	0.0
	0.15	0.00	3.1	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.1	0.0	0.0
	0.10	0.00	3.1	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.1	0.0	0.0
	0.00	0.00	3.1	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.1	0.0	0.0
	-0.05	0.00	3.1	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.1	0.0	0.0
	-0.10	0.00	3.1	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.1	0.0	0.0
	-0.15	0.00	3.1	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.1	0.0	0.0
	-0.20	0.00	3.1	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	3.1	0.0	0.0
	-0.25	0.00	3.1	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.1	0.0	0.0
	-0.30	0.00	3.1	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.1	0.0	0.0
	-0.35	0.00	3.1	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0
	-0.40	0.00	3.0	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	3.0	0.0	0.0
	-0.50	0.00	3.0	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	3.4	0.0	0.0
	-0.55	0.00	3.4	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	4.0	0.0	0.0
	-0.60	0.00	4.0	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	4.8	0.0	0.0
	-0.65	0.00	4.8	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	5.7	0.0	0.0
	-0.70	0.00	5.7	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	6.8	0.0	0.0
	-0.75	0.00	6.8	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	8.0	0.0	0.0
	-0.80	0.00	8.0	0.0	0.0	0.01	9	2: 3	0.0145	-0.81	0.35	9.0	25.6	20.0
	-0.81	0.35	9.0	25.6	20.0	0.00	9	3: 4	0.0145	-0.81	0.37	9.6	26.1	20.0
	-0.81	0.37	9.6	26.1	20.0	0.00	10	1: 2	0.0145	-0.82	0.36	9.7	26.6	20.0
	-0.82	0.36	9.7	26.6	20.0	0.00	11	1: 2	0.0145	-0.82	0.35	9.4	27.1	20.0
	-0.82	0.35	9.4	27.1	20.0	0.00	11	2: 3	0.0145	-0.83	0.31	8.6	27.6	20.0
	-0.83	0.31	8.6	27.6	20.0	0.01	11	3: 4	0.0145	-0.83	0.35	9.8	28.1	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0
	0.96	0.00	-0.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0 46	0.00	-1.4	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.6	0.0	0.0

	0.96	0.00	-0.6	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:24	0.43	0.00	2.8	0.0	0.0	0.03	1	(*)	1: 2	0.0145	0.40	0.00	2.8	0.0	0.0
	0.40	0.00	2.8	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.9	0.0	0.0
	0.35	0.00	2.9	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	2.9	0.0	0.0
	0.30	0.00	2.9	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	3.0	0.0	0.0
	0.25	0.00	3.0	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	3.0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	3.1	0.0	0.0
	0.10	0.00	3.1	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	3.1	0.0	0.0
	0.00	0.00	3.1	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	3.1	0.0	0.0
	-0.05	0.00	3.1	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	3.1	0.0	0.0
	-0.10	0.00	3.1	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	3.1	0.0	0.0
	-0.15	0.00	3.1	0.0	0.0	0.05	5		1. 2	0.0145	-0.20	0.00	3.1	0.0	0.0
	-0.20	0.00	3.1	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	3.1	0.0	0.0
	-0.25	0.00	3.1	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	3.1	0.0	0.0
	-0.30	0.00	3.1	0.0	0.0	0.05	6		1. 2	0.0145	-0.35	0.00	3.1	0.0	0.0
	-0.35	0.00	3.1	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0
	-0.40	0.00	3.0	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7		1. 2	0.0145	-0.50	0.00	2.8	0.0	0.0
	-0.50	0.00	2.8	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	2.8	0.0	0.0
	-0.55	0.00	2.8	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	3.2	0.0	0.0
	-0.60	0.00	3.2	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	3.8	0.0	0.0
	-0.65	0.00	3.8	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	4.6	0.0	0.0
	-0.70	0.00	4.6	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	5.6	0.0	0.0
	-0.75	0.00	5.6	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	6.6	0.0	0.0
	-0.80	0.00	6.6	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	7.8	0.0	0.0
	-0.85	0.00	7.8	0.0	0.0	0.01	9		3: 4	0.0145	-0.86	0.34	8.8	25.7	20.0
	-0.86	0.34	8.8	25.7	20.0	0.00	10		1: 2	0.0145	-0.86	0.36	9.4	26.2	20.0
	-0.86	0.36	9.4	26.2	20.0	0.00	11		1: 2	0.0145	-0.87	0.36	9.5	26.7	20.0
	-0.87	0.36	9.5	26.7	20.0	0.00	11		2: 3	0.0145	-0.87	0.34	9.1	27.1	20.0
	-0.87	0.34	9.1	27.1	20.0	0.01	11		3: 4	0.0145	-0.88	0.38	10.4	27.6	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-1.4	0.0	0.0
	0.46	0.00	-1.4	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.9	0.0	0.0
	0.82	0.00	-0.9	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:30	0.43	0.00	2.7	0.0	0.0	0.03	1	(*)	1: 2	0.0145	0.40	0.00	2.8	0.0	0.0
	0.40	0.00	2.8	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.9	0.0	0.0
	0.35	0.00	2.9	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	2.9	0.0	0.0
	0.30	0.00	2.9	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	3.0	0.0	0.0
	0.25	0.00	3.0	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	3.0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	3.1	0.0	0.0
	0.10	0.00	3.1	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	3.1	0.0	0.0
	0.00	0.00	3.1	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	3.1	0.0	0.0
	-0.05	0.00	3.1	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	3.1	0.0	0.0
	-0.10	0.00	3.1	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	3.1	0.0	0.0
	-0.15	0.00	3.1	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	3.1	0.0	0.0
	-0.20	0.00	3.1	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	3.1	0.0	0.0
	-0.25	0.00	3.1	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	3.1	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	3.0	0.0	0.0
	-0.35	0.00	3.0	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0
	-0.40	0.00	3.0	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	2.8	0.0	0.0
	-0.50	0.00	2.8	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	2.8	0.0	0.0
	-0.55	0.00	2.8	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	2.9	0.0	0.0
	-0.60	0.00	2.9	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	3.1	0.0	0.0
	-0.65	0.00	3.1	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	3.7	0.0	0.0
	-0.70	0.00	3.7	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	4.5	0.0	0.0
	-0.75	0.00	4.5	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	5.5	0.0	0.0
	-0.80	0.00	5.5	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	6.5	0.0	0.0
	-0.85	0.00	6.5	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	7.7	0.0	0.0
	-0.90	0.00	7.7	0.0	0.0	0.01	10		1: 2	0.0145	-0.91	0.34	8.7	25.7	20.0
	-0.91	0.34	8.7	25.7	20.0	0.00	11		1: 2	0.0145	-0.91	0.35	9.3	26.2	20.0
	-0.91	0.35	9.3	26.2	20.0	0.00	11		2: 3	0.0145	-0.91	0.35	9.4	26.7	20.0
	-0.91	0.35	9.4	26.7	20.0	0.01	11		3: 4	0.0145	-0.92	0.39	10.6	27.1	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0

	0.60	0.00	-1.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.4	0.0	0.0
	1.03	0.00	-0.4	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:36	0.43	0.00	2.7	0.0	0.0	0.03	1	(*)	1: 2	0.0145	0.40	0.00	2.8	0.0	0.0
	0.40	0.00	2.8	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.8	0.0	0.0
	0.35	0.00	2.8	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	2.9	0.0	0.0
	0.30	0.00	2.9	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	2.9	0.0	0.0
	0.25	0.00	2.9	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	3.0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	3.0	0.0	0.0
	0.10	0.00	3.0	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	3.1	0.0	0.0
	0.00	0.00	3.1	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	3.1	0.0	0.0
	-0.05	0.00	3.1	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	3.1	0.0	0.0
	-0.10	0.00	3.1	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	3.1	0.0	0.0
	-0.15	0.00	3.1	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	3.1	0.0	0.0
	-0.20	0.00	3.1	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	3.0	0.0	0.0
	-0.25	0.00	3.0	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	3.0	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	3.0	0.0	0.0
	-0.35	0.00	3.0	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	2.9	0.0	0.0
	-0.50	0.00	2.9	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	2.9	0.0	0.0
	-0.55	0.00	2.9	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	2.9	0.0	0.0
	-0.60	0.00	2.9	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	2.9	0.0	0.0
	-0.65	0.00	2.9	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	3.1	0.0	0.0
	-0.70	0.00	3.1	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	3.7	0.0	0.0
	-0.75	0.00	3.7	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	4.5	0.0	0.0
	-0.80	0.00	4.5	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	5.5	0.0	0.0
	-0.85	0.00	5.5	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	6.7	0.0	0.0
	-0 90	0.00	6.7	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.32	8.1	25.2	20.0
	-0.95	0.32	8.1	25.2	20.0	0.00	11		1: 2	0.0145	-0.95	0.35	9.1	25.7	20.0
	-0.95	0.35	9.1	25.7	20.0	0.00	11		2: 3	0.0145	-0.96	0.37	9.6	26.2	20.0
	-0.96	0.37	9.6	26.2	20.0	0.01	11		3: 4	0.0145	-0.96	0.40	10.8	26.7	20.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0 00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.4	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.3	0.0	0.0
	0.53	0.00	-1.3	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-1.0	0.0	0.0
	0.74	0.00	-1.0	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:42	0.43	0.00	2.7	0.0	0.0	0.03	1	(9)	1: 2	0.0145	0.40	0.00	2.7	0.0	0.0
	0.40	0.00	2.7	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.8	0.0	0.0
	0.35	0.00	2.8	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	2.9	0.0	0.0
	0.30	0.00	2.9	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	2.9	0.0	0.0
	0.25	0.00	2.9	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	3.0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	3.0	0.0	0.0
	0.10	0.00	3.0	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	3.0	0.0	0.0
	0.05	0.00	3.0	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	3.0	0.0	0.0
	0.00	0.00	3.0	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	3.0	0.0	0.0
	-0.05	0.00	3.0	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	3.0	0.0	0.0
	-0.10	0.00	3.0	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	3.0	0.0	0.0
	-0.15	0.00	3.0	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	3.0	0.0	0.0
	-0.20	0.00	3.0	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	3.0	0.0	0.0
	-0.25	0.00	3.0	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	3.0	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	2.9	0.0	0.0
	-0.35	0.00	2.9	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	2.8	0.0	0.0

	-0.45	0.00	2.8	0.0	0.0	0.05	7		1 2	0.0145	-0.50	0.00	2.8	0.0	0.0
	-0.50	0.00	2.8	0.0	0.0	0.05	7		2 3	0.0145	-0.55	0.00	2.8	0.0	0.0
	-0.55	0.00	2.8	0.0	0.0	0.05	7		3 4	0.0145	-0.60	0.00	2.8	0.0	0.0
	-0.60	0.00	2.8	0.0	0.0	0.05	8		1 2	0.0145	-0.65	0.00	2.8	0.0	0.0
	-0.65	0.00	2.8	0.0	0.0	0.05	8		2 3	0.0145	-0.70	0.00	2.8	0.0	0.0
	-0.70	0.00	2.8	0.0	0.0	0.05	8		3 4	0.0145	-0.75	0.00	3.1	0.0	0.0
	-0.75	0.00	3.1	0.0	0.0	0.05	9		1 2	0.0145	-0.80	0.00	3.7	0.0	0.0
	-0.80	0.00	3.7	0.0	0.0	0.05	9		2 3	0.0145	-0.85	0.00	4.6	0.0	0.0
	-0.85	0.00	4.6	0.0	0.0	0.05	9		3 4	0.0145	-0.90	0.00	5.7	0.0	0.0
	-0.90	0.00	5.7	0.0	0.0	0.05	10		1 2	0.0145	-0.95	0.00	6.9	0.0	0.0
	-0.95	0.00	6.9	0.0	0.0	0.05	11		1. 2	0.0145	-1.00	0.33	8.4	25.2	20.0
	-1.00	0.33	8.4	25.2	20.0	0.00	11		2 3	0.0145	-1.00	0.36	9.3	25.7	20.0
	-1.00	0.36	9.3	25.7	20.0	0.01	11		3. 4	0.0145	-1.01	0.40	10.6	26.2	20.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	12		1 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	12		2. 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	14		1. 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14		2 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	14		3 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	15		1 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15		2 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	16		1 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:48	0.43	0.00	2.7	0.0	0.0	0.03	1	(7)	1: 2	0.0145	0.40	0.00	2.7	0.0	0.0
	0.40	0.00	2.7	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.8	0.0	0.0
	0.35	0.00	2.8	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	2.9	0.0	0.0
	0.30	0.00	2.9	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	2.9	0.0	0.0
	0.25	0.00	2.9	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	3.0	0.0	0.0
	0.20	0.00	3.0	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	3.0	0.0	0.0
	0.10	0.00	3.0	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	3.0	0.0	0.0
	0.05	0.00	3.0	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	3.0	0.0	0.0
	0.00	0.00	3.0	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	3.0	0.0	0.0
	-0.05	0.00	3.0	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	3.0	0.0	0.0
	-0.10	0.00	3.0	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	3.0	0.0	0.0
	-0.15	0.00	3.0	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	3.0	0.0	0.0
	-0.20	0.00	3.0	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	3.0	0.0	0.0
	-0.25	0.00	3.0	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	3.0	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	2.9	0.0	0.0
	-0.35	0.00	2.9	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	2.8	0.0	0.0
	-0.50	0.00	2.8	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	2.8	0.0	0.0
	-0.55	0.00	2.8	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	2.8	0.0	0.0
	-0.60	0.00	2.8	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	2.8	0.0	0.0
	-0.65	0.00	2.8	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	2.9	0.0	0.0
	-0.70	0.00	2.9	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	2.9	0.0	0.0
	-0.75	0.00	2.9	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	3.1	0.0	0.0
	-0.80	0.00	3.1	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	3.8	0.0	0.0
	-0.85	0.00	3.8	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	4.8	0.0	0.0
	-0.90	0.00	4.8	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	5.9	0.0	0.0
	-0.95	0.00	5.9	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	7.2	0.0	0.0
	-1.00	0.00	7.2	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.34	8.6	25.2	20.0
	-1.05	0.34	8.6	25.2	20.0	0.00	11		3: 4	0.0145	-1.05	0.38	9.9	25.7	20.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-1.2	0.0	0.0
	0.60	0.00	-1.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-1.1	0.0	0.0
	0.67	0.00	-1.1	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.7	0.0	0.0
	0.89	0.00	-0.7	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
10:54	0.43	0.00	2.7	0.0	0.0	0.03	1	(7)	1: 2	0.0145	0.40	0.00	2.7	0.0	0.0
	0.40	0.00	2.7	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.8	0.0	0.0

	0.35	0.00	2.8	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	2.8	0.0	0.0
	0.30	0.00	2.8	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	2.9	0.0	0.0
	0.25	0.00	2.9	0.0	0.0	0.05	2	2· 3	0.0145	0.20	0.00	2.9	0.0	0.0
	0.20	0.00	2.9	0.0	0.0	0.05	2	3. 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.0	0.0	0.0
	0.10	0.00	3.0	0.0	0.0	0.05	3	2. 3	0.0145	0.05	0.00	3.0	0.0	0.0
	0.05	0.00	3.0	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.0	0.0	0.0
	0.00	0.00	3.0	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.0	0.0	0.0
	-0.05	0.00	3.0	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.0	0.0	0.0
	-0.10	0.00	3.0	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.0	0.0	0.0
	-0.15	0.00	3.0	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.0	0.0	0.0
	-0.20	0.00	3.0	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	3.0	0.0	0.0
	-0.25	0.00	3.0	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.0	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	2.9	0.0	0.0
	-0.35	0.00	2.9	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	2.9	0.0	0.0
	-0.50	0.00	2.9	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	2.8	0.0	0.0
	-0.55	0.00	2.8	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	2.8	0.0	0.0
	-0.60	0.00	2.8	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	2.9	0.0	0.0
	-0.65	0.00	2.9	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	2.9	0.0	0.0
	-0.70	0.00	2.9	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	2.9	0.0	0.0
	-0.75	0.00	2.9	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	2.9	0.0	0.0
	-0.80	0.00	2.9	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	3.2	0.0	0.0
	-0.85	0.00	3.2	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	4.0	0.0	0.0
	-0.90	0.00	4.0	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	5.0	0.0	0.0
	-0.95	0.00	5.0	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	6.2	0.0	0.0
	-1.00	0.00	6.2	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	7.4	0.0	0.0
	-1.05	0.00	7.4	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.34	8.7	25.2	20.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.1	0.0	0.0
	0.60	0.00	-1.1	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.0	0.0	0.0
	0.67	0.00	-1.0	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.6	0.0	0.0
	0.89	0.00	-0.6	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.1	0.0	0.0
	0.60	0.00	-1.1	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.0	0.0	0.0
	0.67	0.00	-1.0	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.6	0.0	0.0
	0.89	0.00	-0.6	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
90/10/ 1 11: 0	0.43	0.00	2.7	0.0	0.0	0.03	1 (6)	1: 2	0.0145	0.40	0.00	2.7	0.0	0.0
	0.40	0.00	2.7	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.8	0.0	0.0
	0.35	0.00	2.8	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	2.8	0.0	0.0
	0.30	0.00	2.8	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	2.9	0.0	0.0
	0.25	0.00	2.9	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	2.9	0.0	0.0
	0.20	0.00	2.9	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	3.0	0.0	0.0
	0.15	0.00	3.0	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	3.0	0.0	0.0
	0.10	0.00	3.0	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.0	0.0	0.0
	0.05	0.00	3.0	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.0	0.0	0.0
	0.00	0.00	3.0	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	3.0	0.0	0.0
	-0.05	0.00	3.0	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	3.0	0.0	0.0
	-0.10	0.00	3.0	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.0	0.0	0.0
	-0.15	0.00	3.0	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.0	0.0	0.0
	-0.20	0.00	3.0	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	3.0	0.0	0.0
	-0.25	0.00	3.0	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.0	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	2.9	0.0	0.0
	-0.35	0.00	2.9	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	2.9	0.0	0.0
	-0.50	0.00	2.9	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	2.9	0.0	0.0
	-0.55	0.00	2.9	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	2.9	0.0	0.0
	-0.60	0.00	2.9	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	2.9	0.0	0.0
	-0.65	0.00	2.9	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	2.9	0.0	0.0
	-0.70	0.00	2.9	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	3.0	0.0	0.0
	-0.75	0.00	3.0	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	3.1	0.0	0.0
	-0.80	0.00	3.1	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	3.1	0.0	0.0
	-0.85	0.00	3.1	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	3.5	0.0	0.0
	-0.90	0.00	3.5	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	4.3	0.0	0.0
	-0.95	0.00	4.3	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	5.3	0.0	0.0
	-1.00	0.00	5.3	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	6.4	0.0	0.0
	-1.05	0.00	6.4	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	7.7	0.0	0.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-1.1	0.0	0.0
	0.60	0.00	-1.1	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-1.0	0.0	0.0
	0.67	0.00	-1.0	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.6	0.0	0.0
	0.89	0.00	-0.6	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0

	0.96	0.00	-0.5	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.3	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.3	0.0	0.0
	0.46	0.00	-1.3	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.2	0.0	0.0
	0.53	0.00	-1.2	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-1.1	0.0	0.0
	0.60	0.00	-1.1	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-1.0	0.0	0.0
	0.67	0.00	-1.0	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.9	0.0	0.0
	0.74	0.00	-0.9	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.8	0.0	0.0
	0.82	0.00	-0.8	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.6	0.0	0.0
	0.89	0.00	-0.6	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.5	0.0	0.0
	0.96	0.00	-0.5	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.3	0.0	0.0
	1.03	0.00	-0.3	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.2	0.0	0.0
	1.10	0.00	-0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0

0HEAD/DRAWDOWN PRINTOUT FLAG = 0 TOTAL BUDGET PRINTOUT FLAG = 0 CELL-BY-CELL FLOW TERM FLAG = 0
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:

HEAD PRINTOUT	DRAWDOWN PRINTOUT	HEAD SAVE	DRAWDOWN SAVE
0	0	0	0

90/10/ 1 14: 0	0.43	0.00	2.2	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.3	0.0	0.0
	0.40	0.00	2.3	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.4	0.0	0.0
	0.35	0.00	2.4	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	2.5	0.0	0.0
	0.30	0.00	2.5	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	2.5	0.0	0.0
	0.25	0.00	2.5	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	2.6	0.0	0.0
	0.20	0.00	2.6	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	2.7	0.0	0.0
	0.15	0.00	2.7	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	2.7	0.0	0.0
	0.10	0.00	2.7	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	2.8	0.0	0.0
	0.05	0.00	2.8	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	2.8	0.0	0.0
	0.00	0.00	2.8	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	2.9	0.0	0.0
	-0.05	0.00	2.9	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	2.9	0.0	0.0
	-0.10	0.00	2.9	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	2.9	0.0	0.0
	-0.15	0.00	2.9	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	2.9	0.0	0.0
	-0.20	0.00	2.9	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	2.9	0.0	0.0
	-0.25	0.00	2.9	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.0	0.0	0.0
	-0.30	0.00	3.0	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.0	0.0	0.0
	-0.35	0.00	3.0	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0
	-0.40	0.00	3.0	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	3.0	0.0	0.0
	-0.45	0.00	3.0	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	3.0	0.0	0.0
	-0.50	0.00	3.0	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	3.0	0.0	0.0
	-0.55	0.00	3.0	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	3.0	0.0	0.0
	-0.60	0.00	3.0	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	3.0	0.0	0.0
	-0.65	0.00	3.0	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	3.0	0.0	0.0
	-0.70	0.00	3.0	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	3.0	0.0	0.0
	-0.75	0.00	3.0	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	3.0	0.0	0.0
	-0.80	0.00	3.0	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	2.9	0.0	0.0
	-0.85	0.00	2.9	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	2.9	0.0	0.0
	-0.90	0.00	2.9	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	2.9	0.0	0.0
	-1.00	0.00	2.9	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	2.9	0.0	0.0
	-1.05	0.00	2.9	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	2.9	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.1	0.0	0.0
	0.46	0.00	-1.1	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.1	0.0	0.0
	0.46	0.00	-1.1	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14: 6	0.43	0.00	2.2	0.0	0.0	0.03	1 (2)	1: 2	0.0145	0.40	0.00	2.3	0.0	0.0
	0.40	0.00	2.3	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.4	0.0	0.0
	0.35	0.00	2.4	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	2.4	0.0	0.0
	0.30	0.00	2.4	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	2.5	0.0	0.0
	0.25	0.00	2.5	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	2.6	0.0	0.0
	0.20	0.00	2.6	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	2.7	0.0	0.0
	0.15	0.00	2.7	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	2.7	0.0	0.0
	0.10	0.00	2.7	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	2.8	0.0	0.0
	0.05	0.00	2.8	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	2.8	0.0	0.0
	0.00	0.00	2.8	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	2.9	0.0	0.0
	-0.05	0.00	2.9	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	2.9	0.0	0.0
	-0.10	0.00	2.9	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	2.9	0.0	0.0
	-0.15	0.00	2.9	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	2.9	0.0	0.0
	-0.20	0.00	2.9	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	2.9	0.0	0.0
	-0.25	0.00	2.9	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	2.9	0.0	0.0
	-0.30	0.00	2.9	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.0	0.0	0.0
	-0.35	0.00	3.0	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0

	-0.40	0.00	3.0	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	3.0	0.0	0.0
	-0.45	0.00	3.0	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	3.0	0.0	0.0
	-0.50	0.00	3.0	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	3.0	0.0	0.0
	-0.55	0.00	3.0	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	3.0	0.0	0.0
	-0.60	0.00	3.0	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	3.0	0.0	0.0
	-0.65	0.00	3.0	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	3.0	0.0	0.0
	-0.70	0.00	3.0	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	3.0	0.0	0.0
	-0.75	0.00	3.0	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	3.0	0.0	0.0
	-0.80	0.00	3.0	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	2.9	0.0	0.0
	-0.85	0.00	2.9	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	2.9	0.0	0.0
	-0.90	0.00	2.9	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	2.9	0.0	0.0
	-1.00	0.00	2.9	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	2.9	0.0	0.0
	-1.05	0.00	2.9	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	2.9	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-1.1	0.0	0.0
	0.46	0.00	-1.1	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-1.1	0.0	0.0
	0.46	0.00	-1.1	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:12	0.43	0.00	2.2	0.0	0.0	0.03	1	(2)	1: 2	0.0145	0.40	0.00	2.2	0.0	0.0
	0.40	0.00	2.2	0.0	0.0	0.05	1		2: 3	0.0145	0.35	0.00	2.3	0.0	0.0
	0.35	0.00	2.3	0.0	0.0	0.05	1		3: 4	0.0145	0.30	0.00	2.4	0.0	0.0
	0.30	0.00	2.4	0.0	0.0	0.05	2		1: 2	0.0145	0.25	0.00	2.5	0.0	0.0
	0.25	0.00	2.5	0.0	0.0	0.05	2		2: 3	0.0145	0.20	0.00	2.6	0.0	0.0
	0.20	0.00	2.6	0.0	0.0	0.05	2		3: 4	0.0145	0.15	0.00	2.7	0.0	0.0
	0.15	0.00	2.7	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	2.7	0.0	0.0
	0.10	0.00	2.7	0.0	0.0	0.05	3		2: 3	0.0145	0.05	0.00	2.8	0.0	0.0
	0.05	0.00	2.8	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	2.8	0.0	0.0
	0.00	0.00	2.8	0.0	0.0	0.05	4		1: 2	0.0145	-0.05	0.00	2.8	0.0	0.0
	-0.05	0.00	2.8	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	2.9	0.0	0.0
	-0.10	0.00	2.9	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	2.9	0.0	0.0
	-0.15	0.00	2.9	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	2.9	0.0	0.0
	-0.20	0.00	2.9	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	2.9	0.0	0.0
	-0.25	0.00	2.9	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	2.9	0.0	0.0
	-0.30	0.00	2.9	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	3.0	0.0	0.0
	-0.35	0.00	3.0	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0
	-0.40	0.00	3.0	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	3.0	0.0	0.0
	-0.45	0.00	3.0	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	3.0	0.0	0.0
	-0.50	0.00	3.0	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	3.0	0.0	0.0
	-0.55	0.00	3.0	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	3.0	0.0	0.0
	-0.60	0.00	3.0	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	3.0	0.0	0.0
	-0.65	0.00	3.0	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	3.0	0.0	0.0
	-0.70	0.00	3.0	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	3.0	0.0	0.0
	-0.75	0.00	3.0	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	3.0	0.0	0.0
	-0.80	0.00	3.0	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	2.9	0.0	0.0
	-0.85	0.00	2.9	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	2.9	0.0	0.0
	-0.90	0.00	2.9	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	2.9	0.0	0.0
	-1.00	0.00	2.9	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	2.9	0.0	0.0
	-1.05	0.00	2.9	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	2.9	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	12		1: 2	0.0145	0.46	0.00	-1.1	0.0	0.0
	0.46	0.00	-1.1	0.0	0.0	-0.07	12		2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	16		1: 2	0.0145	0.46	0.00	-1.1	0.0	0.0
	0.46	0.00	-1.1	0.0	0.0	-0.07	16		2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:18	0.43	0.00	2.2	0.0	0.0	0.03	1	(2)	1: 2	0.0145	0.40	0.00	2.2	0.0	0.0

	0.40	0.00	2.2	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.3	0.0	0.0
	0.35	0.00	2.3	0.0	0.0	0.05	1	3. 4	0.0145	0.30	0.00	2.4	0.0	0.0
	0.30	0.00	2.4	0.0	0.0	0.05	2	1. 2	0.0145	0.25	0.00	2.5	0.0	0.0
	0.25	0.00	2.5	0.0	0.0	0.05	2	2. 3	0.0145	0.20	0.00	2.6	0.0	0.0
	0.20	0.00	2.6	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	2.6	0.0	0.0
	0.15	0.00	2.6	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	2.7	0.0	0.0
	0.10	0.00	2.7	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	2.8	0.0	0.0
	0.05	0.00	2.8	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	2.8	0.0	0.0
	0.00	0.00	2.8	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	2.8	0.0	0.0
	-0.05	0.00	2.8	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	2.9	0.0	0.0
	-0.10	0.00	2.9	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	2.9	0.0	0.0
	-0.15	0.00	2.9	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	2.9	0.0	0.0
	-0.20	0.00	2.9	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	2.9	0.0	0.0
	-0.25	0.00	2.9	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	2.9	0.0	0.0
	-0.30	0.00	2.9	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.0	0.0	0.0
	-0.35	0.00	3.0	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	3.0	0.0	0.0
	-0.40	0.00	3.0	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	3.0	0.0	0.0
	-0.45	0.00	3.0	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	3.0	0.0	0.0
	-0.50	0.00	3.0	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	3.0	0.0	0.0
	-0.55	0.00	3.0	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	3.0	0.0	0.0
	-0.60	0.00	3.0	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	3.0	0.0	0.0
	-0.65	0.00	3.0	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	3.0	0.0	0.0
	-0.70	0.00	3.0	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	3.0	0.0	0.0
	-0.75	0.00	3.0	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	3.0	0.0	0.0
	-0.80	0.00	3.0	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	2.9	0.0	0.0
	-0.85	0.00	2.9	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	2.9	0.0	0.0
	-0.90	0.00	2.9	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	2.9	0.0	0.0
	-1.00	0.00	2.9	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	2.9	0.0	0.0
	-1.05	0.00	2.9	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	2.9	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.0	0.0	0.0
	0.46	0.00	-1.0	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	13	1. 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	13	2 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	13	3. 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	14	2. 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14	3. 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.0	0.0	0.0
	0.46	0.00	-1.0	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-1.0	0.0	0.0
	0.53	0.00	-1.0	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.5	0.0	0.0
	0.89	0.00	-0.5	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:24	0.43	0.00	2.1	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.2	0.0	0.0
	0.40	0.00	2.2	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.3	0.0	0.0
	0.35	0.00	2.3	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	2.4	0.0	0.0
	0.30	0.00	2.4	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	2.4	0.0	0.0
	0.25	0.00	2.4	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	2.5	0.0	0.0
	0.20	0.00	2.5	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	2.6	0.0	0.0
	0.15	0.00	2.6	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	2.7	0.0	0.0
	0.10	0.00	2.7	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	2.8	0.0	0.0
	0.05	0.00	2.8	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	3.1	0.0	0.0
	0.00	0.00	3.1	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	4.7	0.0	0.0
	-0.05	0.00	4.7	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	4.6	0.0	0.0
	-0.10	0.00	4.6	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	3.4	0.0	0.0
	-0.15	0.00	3.4	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	3.0	0.0	0.0
	-0.20	0.00	3.0	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	2.9	0.0	0.0
	-0.25	0.00	2.9	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	2.9	0.0	0.0
	-0.30	0.00	2.9	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	2.9	0.0	0.0
	-0.35	0.00	2.9	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	2.9	0.0	0.0
	-0.50	0.00	2.9	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	2.9	0.0	0.0
	-0.55	0.00	2.9	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	2.9	0.0	0.0
	-0.60	0.00	2.9	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	2.9	0.0	0.0
	-0.65	0.00	2.9	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	2.9	0.0	0.0
	-0.70	0.00	2.9	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	2.9	0.0	0.0
	-0.75	0.00	2.9	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	2.9	0.0	0.0
	-0.80	0.00	2.9	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	2.9	0.0	0.0
	-0.85	0.00	2.9	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	2.9	0.0	0.0
	-0.90	0.00	2.9	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	2.9	0.0	0.0
	-1.00	0.00	2.9	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	2.9	0.0	0.0
	-1.05	0.00	2.9	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	2.9	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.0	0.0	0.0
	0.46	0.00	-1.0	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-0.9	0.0	0.0
	0.53	0.00	-0.9	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.4	0.0	0.0

	0.89	0.00	-0.4	0.0	0.0	-0.07	14	2. 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14	3· 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15	1. 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15	2 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.1	0.0	0.0	-0.03	16	1 2	0.0145	0.46	0.00	-1.0	0.0	0.0
	0.46	0.00	-1.0	0.0	0.0	-0.07	16	2 3	0.0145	0.53	0.00	-0.9	0.0	0.0
	0.53	0.00	-0.9	0.0	0.0	-0.07	16	3. 4	0.0145	0.60	0.00	-0.9	0.0	0.0
	0.60	0.00	-0.9	0.0	0.0	-0.07	17	1. 2	0.0145	0.67	0.00	-0.8	0.0	0.0
	0.67	0.00	-0.8	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.7	0.0	0.0
	0.74	0.00	-0.7	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.6	0.0	0.0
	0.82	0.00	-0.6	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.4	0.0	0.0
	0.89	0.00	-0.4	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:30	0.43	0.00	2.1	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	2.1	0.0	0.0
	0.40	0.00	2.1	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	2.2	0.0	0.0
	0.35	0.00	2.2	0.0	0.0	0.05	1	3. 4	0.0145	0.30	0.00	2.3	0.0	0.0
	0.30	0.00	2.3	0.0	0.0	0.05	2	1· 2	0.0145	0.25	0.00	2.4	0.0	0.0
	0.25	0.00	2.4	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	2.5	0.0	0.0
	0.20	0.00	2.5	0.0	0.0	0.05	2	3. 4	0.0145	0.15	0.00	2.6	0.0	0.0
	0.15	0.00	2.6	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	2.8	0.0	0.0
	0.10	0.00	2.8	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	3.1	0.0	0.0
	0.05	0.00	3.1	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	4.1	0.0	0.0
	0.00	0.00	4.1	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	5.4	0.0	0.0
	-0.05	0.00	5.4	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	6.9	0.0	0.0
	-0.10	0.00	6.9	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	8.6	0.0	0.0
	-0.15	0.00	8.6	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	8.1	0.0	0.0
	-0.20	0.00	8.1	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	5.9	0.0	0.0
	-0.25	0.00	5.9	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	3.7	0.0	0.0
	-0.30	0.00	3.7	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	3.1	0.0	0.0
	-0.35	0.00	3.1	0.0	0.0	0.05	6	2; 3	0.0145	-0.40	0.00	2.9	0.0	0.0
	-0.40	0.00	2.9	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	2.9	0.0	0.0
	-0.45	0.00	2.9	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	2.8	0.0	0.0
	-0.50	0.00	2.8	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	2.9	0.0	0.0
	-0.55	0.00	2.9	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	2.9	0.0	0.0
	-0.60	0.00	2.9	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	2.9	0.0	0.0
	-0.65	0.00	2.9	0.0	0.0	0.05	8	2. 3	0 0145	-0.70	0.00	2.9	0.0	0.0
	-0.70	0.00	2.9	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	2.9	0.0	0.0
	-0.75	0.00	2.9	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	2.9	0.0	0.0
	-0.80	0.00	2.9	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	2.9	0.0	0.0
	-0.85	0.00	2.9	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	2.9	0.0	0.0
	-0.90	0.00	2.9	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	2.9	0.0	0.0
	-1.00	0.00	2.9	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	2.9	0.0	0.0
	-1.05	0.00	2.9	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	2.9	0.0	0.0
	0.43	0.00	-1.0	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	-1.0	0.0	0.0
	0.46	0.00	-1.0	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	-0.9	0.0	0.0
	0.53	0.00	-0.9	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	-0.8	0.0	0.0
	0.60	0.00	-0.8	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-0.7	0.0	0.0
	0.67	0.00	-0.7	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-0.6	0.0	0.0
	0.74	0.00	-0.6	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.5	0.0	0.0
	0.82	0.00	-0.5	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.4	0.0	0.0
	0.89	0.00	-0.4	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-1.0	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	-1.0	0.0	0.0
	0.46	0.00	-1.0	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	-0.9	0.0	0.0
	0.53	0.00	-0.9	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	-0.8	0.0	0.0
	0.60	0.00	-0.8	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-0.7	0.0	0.0
	0.67	0.00	-0.7	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.6	0.0	0.0
	0.74	0.00	-0.6	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.5	0.0	0.0
	0.82	0.00	-0.5	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.4	0.0	0.0
	0.89	0.00	-0.4	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:36	0.43	0.00	8.2	0.0	0.0	0.03	1 (*)	1: 2	0.0145	0.40	0.00	14.1	0.0	0.0
	0.40	0.00	14.1	0.0	0.0	0.05	1	2: 3	0.0145	0.35	0.00	26.5	0.0	0.0
	0.35	0.00	26.5	0.0	0.0	0.05	1	3: 4	0.0145	0.30	0.00	23.6	0.0	0.0
	0.30	0.00	23.6	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	21.7	0.0	0.0
	0.25	0.00	21.7	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	20.5	0.0	0.0
	0.20	0.00	20.5	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	19.8	0.0	0.0
	0.15	0.00	19.8	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	19.4	0.0	0.0
	0.10	0.00	19.4	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	18.9	0.0	0.0
	0.05	0.00	18.9	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	17.8	0.0	0.0
	0.00	0.00	17.8	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	16.4	0.0	0.0
	-0.05	0.00	16.4	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	15.5	0.0	0.0
	-0.10	0.00	15.5	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	14.4	0.0	0.0
	-0.15	0.00	14.4	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	14.4	0.0	0.0
	-0.20	0.00	14.4	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	15.5	0.0	0.0
	-0.25	0.00	15.5	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	16.9	0.0	0.0
	-0.30	0.00	16.9	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	16.4	0.0	0.0
	-0.35	0.00	16.4	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	15.1	0.0	0.0
	-0.40	0.00	15.1	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	13.3	0.0	0.0
	-0.45	0.00	13.3	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	10.6	0.0	0.0
	-0.50	0.00	10.6	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	6.7	0.0	0.0
	-0.55	0.00	6.7	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	3.8	0.0	0.0
	-0.60	0.00	3.8	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	3.1	0.0	0.0

	-0.65	0.00	3.1	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	2.8	0.0	0.0
	-0.70	0.00	2.8	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	2.8	0.0	0.0
	-0.75	0.00	2.8	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	2.7	0.0	0.0
	-0.80	0.00	2.7	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	2.8	0.0	0.0
	-0.85	0.00	2.8	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	2.8	0.0	0.0
	-0.90	0.00	2.8	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	2.8	0.0	0.0
	-0.95	0.00	2.8	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	2.8	0.0	0.0
	-1.00	0.00	2.8	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	2.8	0.0	0.0
	-1.05	0.00	2.8	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	2.8	0.0	0.0
	0.43	0.00	-4.1	0.0	0.0	-0.03	12	1: 2	0.0145	0.46	0.00	0.1	0.0	0.0
	0.46	0.00	0.1	0.0	0.0	-0.07	12	2: 3	0.0145	0.53	0.00	2.4	0.0	0.0
	0.53	0.00	2.4	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	0.4	0.0	0.0
	0.60	0.00	0.4	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	-0.2	0.0	0.0
	0.67	0.00	-0.2	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	-0.4	0.0	0.0
	0.74	0.00	-0.4	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.5	0.0	0.0
	0.82	0.00	-0.5	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.4	0.0	0.0
	0.89	0.00	-0.4	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.43	0.00	-4.1	0.0	0.0	-0.03	16	1: 2	0.0145	0.46	0.00	0.1	0.0	0.0
	0.46	0.00	0.1	0.0	0.0	-0.07	16	2: 3	0.0145	0.53	0.00	2.4	0.0	0.0
	0.53	0.00	2.4	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	0.4	0.0	0.0
	0.60	0.00	0.4	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	-0.2	0.0	0.0
	0.67	0.00	-0.2	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	-0.4	0.0	0.0
	0.74	0.00	-0.4	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.5	0.0	0.0
	0.82	0.00	-0.5	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.4	0.0	0.0
	0.89	0.00	-0.4	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:42	0.48	0.35	9.1	25.8	20.0	0.01	1 (*)	1: 2	0.0145	0.47	0.61	15.8	25.9	20.0
	0.47	0.61	15.8	25.9	20.0	0.05	1	2: 3	0.0145	0.41	1.10	28.6	25.9	20.0
	0.41	1.10	28.6	25.9	20.0	0.11	1	3: 4	0.0145	0.30	0.00	24.9	0.0	0.0
	0.30	0.00	24.9	0.0	0.0	0.05	2	1: 2	0.0145	0.25	0.00	22.4	0.0	0.0
	0.25	0.00	22.4	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	20.6	0.0	0.0
	0.20	0.00	20.6	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	19.3	0.0	0.0
	0.15	0.00	19.3	0.0	0.0	0.05	3	1: 2	0.0145	0.10	0.00	18.3	0.0	0.0
	0.10	0.00	18.3	0.0	0.0	0.05	3	2: 3	0.0145	0.05	0.00	17.6	0.0	0.0
	0.05	0.00	17.6	0.0	0.0	0.05	3	3: 4	0.0145	0.00	0.00	17.0	0.0	0.0
	0.00	0.00	17.0	0.0	0.0	0.05	4	1: 2	0.0145	-0.05	0.00	16.8	0.0	0.0
	-0.05	0.00	16.8	0.0	0.0	0.05	4	2: 3	0.0145	-0.10	0.00	17.0	0.0	0.0
	-0.10	0.00	17.0	0.0	0.0	0.05	4	3: 4	0.0145	-0.15	0.00	18.3	0.0	0.0
	-0.15	0.00	18.3	0.0	0.0	0.05	5	1: 2	0.0145	-0.20	0.00	18.7	0.0	0.0
	-0.20	0.00	18.7	0.0	0.0	0.05	5	2: 3	0.0145	-0.25	0.00	18.4	0.0	0.0
	-0.25	0.00	18.4	0.0	0.0	0.05	5	3: 4	0.0145	-0.30	0.00	17.3	0.0	0.0
	-0.30	0.00	17.3	0.0	0.0	0.05	6	1: 2	0.0145	-0.35	0.00	16.6	0.0	0.0
	-0.35	0.00	16.6	0.0	0.0	0.05	6	2: 3	0.0145	-0.40	0.00	16.0	0.0	0.0
	-0.40	0.00	16.0	0.0	0.0	0.05	6	3: 4	0.0145	-0.45	0.00	15.8	0.0	0.0
	-0.45	0.00	15.8	0.0	0.0	0.05	7	1: 2	0.0145	-0.50	0.00	16.0	0.0	0.0
	-0.50	0.00	16.0	0.0	0.0	0.05	7	2: 3	0.0145	-0.55	0.00	17.4	0.0	0.0
	-0.55	0.00	17.4	0.0	0.0	0.05	7	3: 4	0.0145	-0.60	0.00	18.7	0.0	0.0
	-0.60	0.00	18.7	0.0	0.0	0.05	8	1: 2	0.0145	-0.65	0.00	17.7	0.0	0.0
	-0.65	0.00	17.7	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	16.0	0.0	0.0
	-0.70	0.00	16.0	0.0	0.0	0.05	8	3: 4	0.0145	-0.75	0.00	13.8	0.0	0.0
	-0.75	0.00	13.8	0.0	0.0	0.05	9	1: 2	0.0145	-0.80	0.00	10.9	0.0	0.0
	-0.80	0.00	10.9	0.0	0.0	0.05	9	2: 3	0.0145	-0.85	0.00	6.8	0.0	0.0
	-0.85	0.00	6.8	0.0	0.0	0.05	9	3: 4	0.0145	-0.90	0.00	3.7	0.0	0.0
	-0.90	0.00	3.7	0.0	0.0	0.05	10	1: 2	0.0145	-0.95	0.00	2.9	0.0	0.0
	-0.95	0.00	2.9	0.0	0.0	0.05	11	1: 2	0.0145	-1.00	0.00	2.6	0.0	0.0
	-1.00	0.00	2.6	0.0	0.0	0.05	11	2: 3	0.0145	-1.05	0.00	2.5	0.0	0.0
	-1.05	0.00	2.5	0.0	0.0	0.05	11	3: 4	0.0145	-1.10	0.00	2.5	0.0	0.0
	0.48	-0.35	-4.6	12.9	10.0	0.00	12	1: 2	0.0145	0.48	0.02	0.2	12.7	10.0
	0.48	0.02	0.2	12.7	10.0	-0.05	12	2: 3	0.0145	0.53	0.00	3.0	0.0	0.0
	0.53	0.00	3.0	0.0	0.0	-0.07	12	3: 4	0.0145	0.60	0.00	1.2	0.0	0.0
	0.60	0.00	1.2	0.0	0.0	-0.07	13	1: 2	0.0145	0.67	0.00	0.4	0.0	0.0
	0.67	0.00	0.4	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	0.0	0.0	0.0
	0.74	0.00	0.0	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	-0.2	0.0	0.0
	0.82	0.00	-0.2	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	-0.3	0.0	0.0
	0.89	0.00	-0.3	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.48	-0.35	-4.6	12.9	10.0	0.00	16	1: 2	0.0145	0.48	0.02	0.2	12.7	10.0
	0.48	0.02	0.2	12.7	10.0	-0.05	16	2: 3	0.0145	0.53	0.00	3.0	0.0	0.0
	0.53	0.00	3.0	0.0	0.0	-0.07	16	3: 4	0.0145	0.60	0.00	1.2	0.0	0.0
	0.60	0.00	1.2	0.0	0.0	-0.07	17	1: 2	0.0145	0.67	0.00	0.4	0.0	0.0
	0.67	0.00	0.4	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	0.0	0.0	0.0
	0.74	0.00	0.0	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	-0.2	0.0	0.0
	0.82	0.00	-0.2	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	-0.3	0.0	0.0
	0.89	0.00	-0.3	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	-0.3	0.0	0.0
	0.96	0.00	-0.3	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	-0.2	0.0	0.0
	1.03	0.00	-0.2	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	-0.1	0.0	0.0
	1.10	0.00	-0.1	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:48	0.52	0.38	9.9	26.3	20.0	0.02	1 (*)	1: 2	0.0145	0.51	0.67	17.8	26.4	20.0
	0.51	0.67	17.8	26.4	20.0	0.08	1	2: 3	0.0145	0.43	1.29	33.6	26.1	20.0
	0.43	1.29	33.6	26.1	20.0	0.09	1	3: 4	0.0145	0.34	1.26	32.2	25.6	20.0
	0.34	1.26	32.2	25.6	20.0	0.09	2	1: 2	0.0145	0.25	0.00	31.0	0.0	0.0
	0.25	0.00	31.0	0.0	0.0	0.05	2	2: 3	0.0145	0.20	0.00	29.9	0.0	0.0
	0.20	0.00	29.9	0.0	0.0	0.05	2	3: 4	0.0145	0.15	0.00	28.7	0.0	0.0

	0.15	0.00	28.7	0.0	0.0	0.05	3		1: 2	0.0145	0.10	0.00	27.5	0.0	0.0
	0.10	0.00	27.5	0.0	0.0	0.05	3		2. 3	0.0145	0.05	0.00	26.2	0.0	0.0
	0.05	0.00	26.2	0.0	0.0	0.05	3		3: 4	0.0145	0.00	0.00	25.0	0.0	0.0
	0.00	0.00	25.0	0.0	0.0	0.05	4		1. 2	0.0145	-0.05	0.00	23.5	0.0	0.0
	-0.05	0.00	23.5	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	21.5	0.0	0.0
	-0.10	0.00	21.5	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	19.7	0.0	0.0
	-0.15	0.00	19.7	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	19.1	0.0	0.0
	-0.20	0.00	19.1	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	19.5	0.0	0.0
	-0.25	0.00	19.5	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	20.7	0.0	0.0
	-0.30	0.00	20.7	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	21.4	0.0	0.0
	-0.35	0.00	21.4	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	21.9	0.0	0.0
	-0.40	0.00	21.9	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	21.9	0.0	0.0
	-0.45	0.00	21.9	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	21.5	0.0	0.0
	-0.50	0.00	21.5	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	20.4	0.0	0.0
	-0.55	0.00	20.4	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	19.0	0.0	0.0
	-0.60	0.00	19.0	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	17.9	0.0	0.0
	-0.65	0.00	17.9	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	17.2	0.0	0.0
	-0.70	0.00	17.2	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	16.9	0.0	0.0
	-0.75	0.00	16.9	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	17.2	0.0	0.0
	-0.80	0.00	17.2	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	19.0	0.0	0.0
	-0.85	0.00	19.0	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	20.8	0.0	0.0
	-0.90	0.00	20.8	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	20.8	0.0	0.0
	-0.95	0.00	20.8	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	20.9	0.0	0.0
	-1.00	0.00	20.9	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	21.3	0.0	0.0
	-1.05	0.00	21.3	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	20.9	0.0	0.0
	0.52	-0.38	-5.0	13.1	10.0	-0.01	12		1: 2	0.0145	0.53	0.04	0.5	13.0	10.0
	0.53	0.04	0.5	13.0	10.0	0.00	12		2: 3	0.0145	0.53	0.00	4.8	0.0	0.0
	0.53	0.00	4.8	0.0	0.0	-0.07	12		3: 4	0.0145	0.60	0.00	3.2	0.0	0.0
	0.60	0.00	3.2	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	1.0	0.0	0.0
	0.67	0.00	1.0	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	0.5	0.0	0.0
	0.74	0.00	0.5	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	0.2	0.0	0.0
	0.82	0.00	0.2	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.1	0.0	0.0
	0.89	0.00	0.1	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.0	0.0	0.0
	0.96	0.00	0.0	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.0	0.0	0.0
	1.03	0.00	0.0	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.0	0.0	0.0
	1.10	0.00	0.0	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.52	-0.38	-5.0	13.1	10.0	-0.01	16		1: 2	0.0145	0.53	0.04	0.5	13.0	10.0
	0.53	0.04	0.5	13.0	10.0	0.00	16		2: 3	0.0145	0.53	0.00	4.8	0.0	0.0
	0.53	0.00	4.8	0.0	0.0	-0.07	16		3: 4	0.0145	0.60	0.00	3.2	0.0	0.0
	0.60	0.00	3.2	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	1.0	0.0	0.0
	0.67	0.00	1.0	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	0.5	0.0	0.0
	0.74	0.00	0.5	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	0.2	0.0	0.0
	0.82	0.00	0.2	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	0.1	0.0	0.0
	0.89	0.00	0.1	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.0	0.0	0.0
	0.96	0.00	0.0	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.0	0.0	0.0
	1.03	0.00	0.0	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.0	0.0	0.0
	1.10	0.00	0.0	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
14:54	0.55	0.47	12.4	26.5	20.0	0.02	1	(9)	1: 2	0.0145	0.52	0.78	20.6	26.5	20.0
	0.52	0.78	20.6	26.5	20.0	0.09	1		2: 3	0.0145	0.43	1.43	37.4	26.1	20.0
	0.43	1.43	37.4	26.1	20.0	0.07	1		3: 4	0.0145	0.36	1.40	36.3	25.9	20.0
	0.36	1.40	36.3	25.9	20.0	0.07	2		1: 2	0.0145	0.29	1.35	34.7	25.7	20.0
	0.29	1.35	34.7	25.7	20.0	0.06	2		2: 3	0.0145	0.23	1.29	32.9	25.6	20.0
	0.23	1.29	32.9	25.6	20.0	0.05	2		3: 4	0.0145	0.18	1.21	30.9	25.5	20.0
	0.18	1.21	30.9	25.5	20.0	0.04	3		1: 2	0.0145	0.14	1.11	28.5	25.6	20.0
	0.14	1.11	28.5	25.6	20.0	0.03	3		2: 3	0.0145	0.11	0.99	25.4	25.8	20.0
	0.11	0.99	25.4	25.8	20.0	0.09	3		3: 4	0.0145	0.02	0.91	23.1	25.4	20.0
	0.02	0.91	23.1	25.4	20.0	0.07	4		1: 2	0.0145	-0.05	0.00	21.9	0.0	0.0
	-0.05	0.00	21.9	0.0	0.0	0.05	4		2: 3	0.0145	-0.10	0.00	21.9	0.0	0.0
	-0.10	0.00	21.9	0.0	0.0	0.05	4		3: 4	0.0145	-0.15	0.00	22.7	0.0	0.0
	-0.15	0.00	22.7	0.0	0.0	0.05	5		1: 2	0.0145	-0.20	0.00	22.5	0.0	0.0
	-0.20	0.00	22.5	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	21.2	0.0	0.0
	-0.25	0.00	21.2	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	19.6	0.0	0.0
	-0.30	0.00	19.6	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	18.8	0.0	0.0
	-0.35	0.00	18.8	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	18.4	0.0	0.0
	-0.40	0.00	18.4	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	18.4	0.0	0.0
	-0.45	0.00	18.4	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	19.0	0.0	0.0
	-0.50	0.00	19.0	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	20.3	0.0	0.0
	-0.55	0.00	20.3	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	22.1	0.0	0.0
	-0.60	0.00	22.1	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	22.9	0.0	0.0
	-0.65	0.00	22.9	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	23.1	0.0	0.0
	-0.70	0.00	23.1	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	23.2	0.0	0.0
	-0.75	0.00	23.2	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	23.1	0.0	0.0
	-0.80	0.00	23.1	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	22.2	0.0	0.0
	-0.85	0.00	22.2	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	21.0	0.0	0.0
	-0.90	0.00	21.0	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	20.3	0.0	0.0
	-0.95	0.00	20.3	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	19.9	0.0	0.0
	-1.00	0.00	19.9	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	19.6	0.0	0.0
	-1.05	0.00	19.6	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	19.0	0.0	0.0
	0.55	-0.47	-6.2	13.2	10.0	-0.01	12		1: 2	0.0145	0.56	-0.04	-0.6	13.1	10.0
	0.56	-0.04	-0.6	13.1	10.0	0.00	12		2: 3	0.0145	0.56	0.29	3.7	12.7	10.0
	0.56	0.29	3.7	12.7	10.0	-0.04	12		3: 4	0.0145	0.60	0.00	2.8	0.0	0.0
	0.60	0.00	2.8	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	1.7	0.0	0.0
	0.67	0.00	1.7	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	0.9	0.0	0.0
	0.74	0.00	0.9	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	0.5	0.0	0.0
	0.82	0.00	0.5	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.3	0.0	0.0
	0.89	0.00	0.3	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.2	0.0	0.0
	0.96	0.00	0.2	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.1	0.0	0.0
	1.03	0.00	0.1	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.55	-0.47	-6.2	13.2	10.0	-0.01	16		1: 2	0.0145	0.56	-0.04	-0.6	13.1	10.0

```
                | 0.56   -0.04      -0.6     13.1    10.0| 0.00     16     2: 3  0.0145| 0.56   0.29        3.7    12.7   10.0|
                | 0.56    0.29       3.7     12.7    10.0|-0.04     16     3: 4  0.0145| 0.60   0.00        2.8     0.0    0.0|
                | 0.60    0.00       2.8      0.0     0.0|-0.07     17     1. 2  0.0145| 0.67   0.00        1.7     0.0    0.0|
                | 0.67    0.00       1.7      0.0     0.0|-0.07     17     2. 3  0.0145| 0.74   0.00        0.9     0.0    0.0|
                | 0.74    0.00       0.9      0.0     0.0|-0.07     17     3: 4  0.0145| 0.82   0.00        0.5     0.0    0.0|
                | 0.82    0.00       0.5      0.0     0.0|-0.07     18     1: 2  0.0145| 0.89   0.00        0.3     0.0    0.0|
                | 0.89    0.00       0.3      0.0     0.0|-0.07     18     2: 3  0.0145| 0.96   0.00        0.2     0.0    0.0|
                | 0.96    0.00       0.2      0.0     0.0|-0.07     18     3: 4  0.0145| 1.03   0.00        0.1     0.0    0.0|
                | 1.03    0.00       0.1      0.0     0.0|-0.07     19     1: 2  0.0145| 1.10   0.00        0.1     0.0    0.0|
                | 1.10    0.00       0.1      0.0     0.0|-0.07     19     2: 3  0.0145| 1.17   0.00        0.0     0.0    0.0|
 90/10/ 1 15: 0| 0.57    0.53      14.1     26.8    20.0| 0.02      1 (6) 1: 2  0.0145| 0.55   0.83       22.3    26.8   20.0|
                | 0.55    0.83      22.3     26.8    20.0| 0.09      1     2: 3  0.0145| 0.46   1.47       38.8    26.3   20.0|
                | 0.46    1.47      38.8     26.3    20.0| 0.07      1     3: 4  0.0145| 0.39   1.42       37.2    26.2   20.0|
                | 0.39    1.42      37.2     26.2    20.0| 0.06      2     1: 2  0.0145| 0.33   1.37       35.5    26.0   20.0|
                | 0.33    1.37      35.5     26.0    20.0| 0.06      2     2: 3  0.0145| 0.27   1.31       33.9    25.9   20.0|
                | 0.27    1.31      33.9     25.9    20.0| 0.05      2     3: 4  0.0145| 0.21   1.24       32.2    25.9   20.0|
                | 0.21    1.24      32.2     25.9    20.0| 0.05      3     1: 2  0.0145| 0.17   1.18       30.7    25.9   20.0|
                | 0.17    1.18      30.7     25.9    20.0| 0.05      3     2: 3  0.0145| 0.12   1.14       29.5    25.9   20.0|
                | 0.12    1.14      29.5     25.9    20.0| 0.07      3     3: 4  0.0145| 0.04   1.11       28.4    25.7   20.0|
                | 0.04    1.11      28.4     25.7    20.0| 0.07      4     1: 2  0.0145|-0.03   1.07       27.1    25.5   20.0|
                |-0.03    1.07      27.1     25.5    20.0| 0.06      4     2: 3  0.0145|-0.09   1.01       25.6    25.3   20.0|
                |-0.09    1.01      25.6     25.3    20.0| 0.03      4     3: 4  0.0145|-0.12   0.92       23.5    25.5   20.0|
                |-0.12    0.92      23.5     25.5    20.0| 0.08      5     1: 2  0.0145|-0.20   0.00       22.2     0.0    0.0|
                |-0.20    0.00      22.2      0.0     0.0| 0.05      5     2: 3  0.0145|-0.25   0.00       22.4     0.0    0.0|
                |-0.25    0.00      22.4      0.0     0.0| 0.05      5     3: 4  0.0145|-0.30   0.00       23.3     0.0    0.0|
                |-0.30    0.00      23.3      0.0     0.0| 0.05      6     1: 2  0.0145|-0.35   0.00       23.7     0.0    0.0|
                |-0.35    0.00      23.7      0.0     0.0| 0.05      6     2: 3  0.0145|-0.40   0.00       24.0     0.0    0.0|
                |-0.40    0.00      24.0      0.0     0.0| 0.05      6     3: 4  0.0145|-0.45   0.00       23.7     0.0    0.0|
                |-0.45    0.00      23.7      0.0     0.0| 0.05      7     1: 2  0.0145|-0.50   0.00       22.9     0.0    0.0|
                |-0.50    0.00      22.9      0.0     0.0| 0.05      7     2: 3  0.0145|-0.55   0.00       21.4     0.0    0.0|
                |-0.55    0.00      21.4      0.0     0.0| 0.05      7     3: 4  0.0145|-0.60   0.00       19.9     0.0    0.0|
                |-0.60    0.00      19.9      0.0     0.0| 0.05      8     1: 2  0.0145|-0.65   0.00       19.3     0.0    0.0|
                |-0.65    0.00      19.3      0.0     0.0| 0.05      8     2: 3  0.0145|-0.70   0.00       19.2     0.0    0.0|
                |-0.70    0.00      19.2      0.0     0.0| 0.05      8     3: 4  0.0145|-0.75   0.00       19.5     0.0    0.0|
                |-0.75    0.00      19.5      0.0     0.0| 0.05      9     1: 2  0.0145|-0.80   0.00       20.1     0.0    0.0|
                |-0.80    0.00      20.1      0.0     0.0| 0.05      9     2: 3  0.0145|-0.85   0.00       21.4     0.0    0.0|
                |-0.85    0.00      21.4      0.0     0.0| 0.05      9     3: 4  0.0145|-0.90   0.00       23.3     0.0    0.0|
                |-0.90    0.00      23.3      0.0     0.0| 0.05     10     1: 2  0.0145|-0.95   0.00       23.9     0.0    0.0|
                |-0.95    0.00      23.9      0.0     0.0| 0.05     11     1: 2  0.0145|-1.00   0.00       23.8     0.0    0.0|
                |-1.00    0.00      23.8      0.0     0.0| 0.05     11     2: 3  0.0145|-1.05   0.00       23.4     0.0    0.0|
                |-1.05    0.00      23.4      0.0     0.0| 0.05     11     3: 4  0.0145|-1.10   0.00       22.5     0.0    0.0|
                | 0.57   -0.53      -7.1     13.4    10.0|-0.01     12     1: 2  0.0145| 0.58  -0.10       -1.4    13.3   10.0|
                | 0.58   -0.10      -1.4     13.3    10.0| 0.00     12     2: 3  0.0145| 0.58   0.24        3.1    12.9   10.0|
                | 0.58    0.24       3.1     12.9    10.0|-0.02     12     3: 4  0.0145| 0.60   0.00        2.5     0.0    0.0|
                | 0.60    0.00       2.5      0.0     0.0|-0.07     13     1: 2  0.0145| 0.67   0.00        1.8     0.0    0.0|
                | 0.67    0.00       1.8      0.0     0.0|-0.07     13     2: 3  0.0145| 0.74   0.00        1.1     0.0    0.0|
                | 0.74    0.00       1.1      0.0     0.0|-0.07     13     3: 4  0.0145| 0.82   0.00        0.7     0.0    0.0|
                | 0.82    0.00       0.7      0.0     0.0|-0.07     14     1: 2  0.0145| 0.89   0.00        0.5     0.0    0.0|
                | 0.89    0.00       0.5      0.0     0.0|-0.07     14     2: 3  0.0145| 0.96   0.00        0.3     0.0    0.0|
                | 0.96    0.00       0.3      0.0     0.0|-0.07     14     3: 4  0.0145| 1.03   0.00        0.2     0.0    0.0|
                | 1.03    0.00       0.2      0.0     0.0|-0.07     15     1: 2  0.0145| 1.10   0.00        0.1     0.0    0.0|
                | 1.10    0.00       0.1      0.0     0.0|-0.07     15     2: 3  0.0145| 1.17   0.00        0.0     0.0    0.0|
                | 0.57   -0.53      -7.1     13.4    10.0|-0.01     16     1: 2  0.0145| 0.58  -0.10       -1.4    13.3   10.0|
                | 0.58   -0.10      -1.4     13.3    10.0| 0.00     16     2: 3  0.0145| 0.58   0.24        3.1    12.9   10.0|
                | 0.58    0.24       3.1     12.9    10.0|-0.02     16     3: 4  0.0145| 0.60   0.00        2.5     0.0    0.0|
                | 0.60    0.00       2.5      0.0     0.0|-0.07     17     1: 2  0.0145| 0.67   0.00        1.8     0.0    0.0|
                | 0.67    0.00       1.8      0.0     0.0|-0.07     17     2: 3  0.0145| 0.74   0.00        1.1     0.0    0.0|
                | 0.74    0.00       1.1      0.0     0.0|-0.07     17     3: 4  0.0145| 0.82   0.00        0.7     0.0    0.0|
                | 0.82    0.00       0.7      0.0     0.0|-0.07     18     1: 2  0.0145| 0.89   0.00        0.5     0.0    0.0|
                | 0.89    0.00       0.5      0.0     0.0|-0.07     18     2: 3  0.0145| 0.96   0.00        0.3     0.0    0.0|
                | 0.96    0.00       0.3      0.0     0.0|-0.07     18     3: 4  0.0145| 1.03   0.00        0.2     0.0    0.0|
                | 1.03    0.00       0.2      0.0     0.0|-0.07     19     1: 2  0.0145| 1.10   0.00        0.1     0.0    0.0|
                | 1.10    0.00       0.1      0.0     0.0|-0.07     19     2: 3  0.0145| 1.17   0.00        0.0     0.0    0.0|
   10 ITERATIONS FOR TIME STEP   4 IN STRESS PERIOD  2
 0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
 0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
 ---------------------------------------------------------------------------------------------------------------------------------
 -
    0.3980     (  1, 11, 12)  0.1016      (  1,  2,  2)  0.5735E-01 (  1, 35, 11)  0.4777E-01 (  1, 38, 11) -0.3928E-01 (  1, 34, 11)
   -0.2480E-01 (  1, 34, 11) -0.2070E-01 (  1, 38, 11) -0.3450E-02 (  1, 28, 11)  0.3682E-02 (  1, 30, 11)  0.1838E-02 (  1, 35, 11)
 0
 0HEAD/DRAWDOWN PRINTOUT FLAG = 0     TOTAL BUDGET PRINTOUT FLAG = 0      CELL-BY-CELL FLOW TERM FLAG = 0
 0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
    HEAD    DRAWDOWN  HEAD   DRAWDOWN
  PRINTOUT  PRINTOUT  SAVE     SAVE
  -------------------------------
      0         0       0        0
 90/10/ 1 15: 0| 0.57    0.53      14.1     26.8    20.0| 0.02      1 (*) 1: 2  0.0145| 0.55   0.83       22.3    26.8   20.0|
                | 0.55    0.83      22.3     26.8    20.0| 0.09      1     2: 3  0.0145| 0.46   1.47       38.8    26.3   20.0|
                | 0.46    1.47      38.8     26.3    20.0| 0.07      1     3: 4  0.0145| 0.39   1.42       37.2    26.2   20.0|
                | 0.39    1.42      37.2     26.2    20.0| 0.06      2     1: 2  0.0145| 0.33   1.37       35.5    26.0   20.0|
                | 0.33    1.37      35.5     26.0    20.0| 0.06      2     2: 3  0.0145| 0.27   1.31       33.9    25.9   20.0|
                | 0.27    1.31      33.9     25.9    20.0| 0.05      2     3: 4  0.0145| 0.21   1.24       32.2    25.9   20.0|
                | 0.21    1.24      32.2     25.9    20.0| 0.05      3     1: 2  0.0145| 0.17   1.18       30.7    25.9   20.0|
                | 0.17    1.18      30.7     25.9    20.0| 0.05      3     2: 3  0.0145| 0.12   1.14       29.5    25.9   20.0|
                | 0.12    1.14      29.5     25.9    20.0| 0.07      3     3: 4  0.0145| 0.04   1.11       28.4    25.7   20.0|
                | 0.04    1.11      28.4     25.7    20.0| 0.07      4     1: 2  0.0145|-0.03   1.07       27.1    25.5   20.0|
                |-0.03    1.07      27.1     25.5    20.0| 0.06      4     2: 3  0.0145|-0.09   1.01       25.6    25.3   20.0|
                |-0.09    1.01      25.6     25.3    20.0| 0.03      4     3: 4  0.0145|-0.12   0.92       23.5    25.5   20.0|
                |-0.12    0.92      23.5     25.5    20.0| 0.08      5     1: 2  0.0145|-0.20   0.00       22.2     0.0    0.0|
```

	-0.20	0.00	22.2	0.0	0.0	0.05	5		2: 3	0.0145	-0.25	0.00	22.4	0.0	0.0
	-0.25	0.00	22.4	0.0	0.0	0.05	5		3: 4	0.0145	-0.30	0.00	23.3	0.0	0.0
	-0.30	0.00	23.3	0.0	0.0	0.05	6		1: 2	0.0145	-0.35	0.00	23.7	0.0	0.0
	-0.35	0.00	23.7	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	24.0	0.0	0.0
	-0.40	0.00	24.0	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	23.7	0.0	0.0
	-0.45	0.00	23.7	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	22.9	0.0	0.0
	-0.50	0.00	22.9	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	21.4	0.0	0.0
	-0.55	0.00	21.4	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	19.9	0.0	0.0
	-0.60	0.00	19.9	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	19.3	0.0	0.0
	-0.65	0.00	19.3	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	19.2	0.0	0.0
	-0.70	0.00	19.2	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	19.5	0.0	0.0
	-0.75	0.00	19.5	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	20.1	0.0	0.0
	-0.80	0.00	20.1	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	21.4	0.0	0.0
	-0.85	0.00	21.4	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	23.3	0.0	0.0
	-0.90	0.00	23.3	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	23.9	0.0	0.0
	-0.95	0.00	23.9	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	23.8	0.0	0.0
	-1.00	0.00	23.8	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	23.4	0.0	0.0
	-1.05	0.00	23.4	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	22.5	0.0	0.0
	0.57	-0.53	-7.1	13.4	10.0	-0.01	12		1: 2	0.0145	0.58	-0.10	-1.4	13.3	10.0
	0.58	-0.10	-1.4	13.3	10.0	0.00	12		2: 3	0.0145	0.58	0.24	3.1	12.9	10.0
	0.58	0.24	3.1	12.9	10.0	-0.02	12		3: 4	0.0145	0.60	0.00	2.5	0.0	0.0
	0.60	0.00	2.5	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.1	0.0	0.0
	0.74	0.00	1.1	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	0.7	0.0	0.0
	0.82	0.00	0.7	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.5	0.0	0.0
	0.89	0.00	0.5	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.3	0.0	0.0
	0.96	0.00	0.3	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.2	0.0	0.0
	1.03	0.00	0.2	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.57	-0.53	-7.1	13.4	10.0	-0.01	16		1: 2	0.0145	0.58	-0.10	-1.4	13.3	10.0
	0.58	-0.10	-1.4	13.3	10.0	0.00	16		2: 3	0.0145	0.58	0.24	3.1	12.9	10.0
	0.58	0.24	3.1	12.9	10.0	-0.02	16		3: 4	0.0145	0.60	0.00	2.5	0.0	0.0
	0.60	0.00	2.5	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.1	0.0	0.0
	0.74	0.00	1.1	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	0.7	0.0	0.0
	0.82	0.00	0.7	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	0.5	0.0	0.0
	0.89	0.00	0.5	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.3	0.0	0.0
	0.96	0.00	0.3	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.2	0.0	0.0
	1.03	0.00	0.2	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15: 6	0.59	0.55	14.9	27.0	20.0	0.02	1	(*)	1: 2	0.0145	0.57	0.85	23.1	27.0	20.0
	0.57	0.85	23.1	27.0	20.0	0.09	1		2: 3	0.0145	0.47	1.49	39.5	26.5	20.0
	0.47	1.49	39.5	26.5	20.0	0.07	1		3: 4	0.0145	0.41	1.44	37.9	26.4	20.0
	0.41	1.44	37.9	26.4	20.0	0.06	2		1: 2	0.0145	0.34	1.39	36.3	26.2	20.0
	0.34	1.39	36.3	26.2	20.0	0.06	2		2: 3	0.0145	0.28	1.34	35.0	26.1	20.0
	0.28	1.34	35.0	26.1	20.0	0.06	2		3: 4	0.0145	0.23	1.30	33.8	26.0	20.0
	0.23	1.30	33.8	26.0	20.0	0.06	3		1: 2	0.0145	0.17	1.27	32.9	25.9	20.0
	0.17	1.27	32.9	25.9	20.0	0.06	3		2: 3	0.0145	0.11	1.25	32.4	25.9	20.0
	0.11	1.25	32.4	25.9	20.0	0.06	3		3: 4	0.0145	0.05	1.23	31.7	25.8	20.0
	0.05	1.23	31.7	25.8	20.0	0.05	4		1: 2	0.0145	0.00	1.19	30.7	25.7	20.0
	0.00	1.19	30.7	25.7	20.0	0.05	4		2: 3	0.0145	-0.05	1.14	29.3	25.8	20.0
	-0.05	1.14	29.3	25.8	20.0	0.04	4		3: 4	0.0145	-0.09	1.08	27.8	25.8	20.0
	-0.09	1.08	27.8	25.8	20.0	0.06	5		1: 2	0.0145	-0.15	1.02	26.1	25.7	20.0
	-0.15	1.02	26.1	25.7	20.0	0.05	5		2: 3	0.0145	-0.20	0.92	23.6	25.7	20.0
	-0.20	0.92	23.6	25.7	20.0	0.08	5		3: 4	0.0145	-0.28	0.85	21.6	25.4	20.0
	-0.28	0.85	21.6	25.4	20.0	0.07	6		1: 2	0.0145	-0.35	0.00	20.4	0.0	0.0
	-0.35	0.00	20.4	0.0	0.0	0.05	6		2: 3	0.0145	-0.40	0.00	19.6	0.0	0.0
	-0.40	0.00	19.6	0.0	0.0	0.05	6		3: 4	0.0145	-0.45	0.00	19.2	0.0	0.0
	-0.45	0.00	19.2	0.0	0.0	0.05	7		1: 2	0.0145	-0.50	0.00	19.4	0.0	0.0
	-0.50	0.00	19.4	0.0	0.0	0.05	7		2: 3	0.0145	-0.55	0.00	20.2	0.0	0.0
	-0.55	0.00	20.2	0.0	0.0	0.05	7		3: 4	0.0145	-0.60	0.00	21.3	0.0	0.0
	-0.60	0.00	21.3	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	21.7	0.0	0.0
	-0.65	0.00	21.7	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	21.6	0.0	0.0
	-0.70	0.00	21.6	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	21.1	0.0	0.0
	-0.75	0.00	21.1	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	19.7	0.0	0.0
	-0.80	0.00	19.7	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	18.4	0.0	0.0
	-0.85	0.00	18.4	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	17.9	0.0	0.0
	-0.90	0.00	17.9	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	17.8	0.0	0.0
	-0.95	0.00	17.8	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	17.6	0.0	0.0
	-1.00	0.00	17.6	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	16.9	0.0	0.0
	-1.05	0.00	16.9	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	15.8	0.0	0.0
	0.59	-0.55	-7.5	13.5	10.0	-0.01	12		1: 2	0.0145	0.60	-0.13	-1.8	13.4	10.0
	0.60	-0.13	-1.8	13.4	10.0	0.00	12		2: 3	0.0145	0.60	0.22	2.9	13.0	10.0
	0.60	0.22	2.9	13.0	10.0	0.00	12		3: 4	0.0145	0.60	0.00	2.3	0.0	0.0
	0.60	0.00	2.3	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.3	0.0	0.0
	0.74	0.00	1.3	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	0.8	0.0	0.0
	0.82	0.00	0.8	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.6	0.0	0.0
	0.89	0.00	0.6	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.4	0.0	0.0
	0.96	0.00	0.4	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.2	0.0	0.0
	1.03	0.00	0.2	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.59	-0.55	-7.5	13.5	10.0	-0.01	16		1: 2	0.0145	0.60	-0.13	-1.8	13.4	10.0
	0.60	-0.13	-1.8	13.4	10.0	0.00	16		2: 3	0.0145	0.60	0.22	2.9	13.0	10.0
	0.60	0.22	2.9	13.0	10.0	0.00	16		3: 4	0.0145	0.60	0.00	2.3	0.0	0.0
	0.60	0.00	2.3	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.3	0.0	0.0
	0.74	0.00	1.3	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	0.8	0.0	0.0
	0.82	0.00	0.8	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	0.6	0.0	0.0
	0.89	0.00	0.6	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.4	0.0	0.0

	0.96	0.00	0.4	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.2	0.0	0.0
	1.03	0.00	0.2	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:12	0.59	0.54	14.5	27.0	20.0	0.02	1	(*)	1: 2	0.0145	0.57	0.84	22.8	27.1	20.0
	0.57	0.84	22.8	27.1	20.0	0.09	1		2: 3	0.0145	0.48	1.49	39.6	26.6	20.0
	0.48	1.49	39.6	26.6	20.0	0.07	1		3: 4	0.0145	0.42	1.44	38.1	26.5	20.0
	0.42	1.44	38.1	26.5	20.0	0.06	2		1: 2	0.0145	0.35	1.40	36.8	26.3	20.0
	0.35	1.40	36.8	26.3	20.0	0.06	2		2: 3	0.0145	0.29	1.36	35.7	26.2	20.0
	0.29	1.36	35.7	26.2	20.0	0.06	2		3: 4	0.0145	0.23	1.33	34.7	26.1	20.0
	0.23	1.33	34.7	26.1	20.0	0.06	3		1: 2	0.0145	0.17	1.31	33.9	26.0	20.0
	0.17	1.31	33.9	26.0	20.0	0.06	3		2: 3	0.0145	0.11	1.28	33.1	25.9	20.0
	0.11	1.28	33.1	25.9	20.0	0.05	3		3: 4	0.0145	0.06	1.25	32.4	25.8	20.0
	0.06	1.25	32.4	25.8	20.0	0.05	4		1: 2	0.0145	0.01	1.22	31.6	25.8	20.0
	0.01	1.22	31.6	25.8	20.0	0.05	4		2: 3	0.0145	-0.04	1.19	30.9	25.8	20.0
	-0.04	1.19	30.9	25.8	20.0	0.05	4		3: 4	0.0145	-0.09	1.17	30.2	25.8	20.0
	-0.09	1.17	30.2	25.8	20.0	0.05	5		1: 2	0.0145	-0.14	1.14	29.3	25.9	20.0
	-0.14	1.14	29.3	25.9	20.0	0.05	5		2: 3	0.0145	-0.19	1.09	28.3	25.9	20.0
	-0.19	1.09	28.3	25.9	20.0	0.07	5		3: 4	0.0145	-0.25	1.05	27.0	25.7	20.0
	-0.25	1.05	27.0	25.7	20.0	0.06	6		1: 2	0.0145	-0.31	1.00	25.6	25.6	20.0
	-0.31	1.00	25.6	25.6	20.0	0.06	6		2: 3	0.0145	-0.37	0.95	24.2	25.5	20.0
	-0.37	0.95	24.2	25.5	20.0	0.05	6		3: 4	0.0145	-0.42	0.89	22.6	25.5	20.0
	-0.42	0.89	22.6	25.5	20.0	0.04	7		1: 2	0.0145	-0.46	0.80	20.6	25.7	20.0
	-0.46	0.80	20.6	25.7	20.0	0.02	7		2: 3	0.0145	-0.48	0.67	17.4	26.0	20.0
	-0.48	0.67	17.4	26.0	20.0	0.12	7		3: 4	0.0145	-0.60	0.00	16.0	0.0	0.0
	-0.60	0.00	16.0	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	16.4	0.0	0.0
	-0.65	0.00	16.4	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	16.7	0.0	0.0
	-0.70	0.00	16.7	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	16.8	0.0	0.0
	-0.75	0.00	16.8	0.0	0.0	0.05	9		1: 2	0.0145	-0.80	0.00	17.0	0.0	0.0
	-0.80	0.00	17.0	0.0	0.0	0.05	9		2: 3	0.0145	-0.85	0.00	16.2	0.0	0.0
	-0.85	0.00	16.2	0.0	0.0	0.05	9		3: 4	0.0145	-0.90	0.00	14.5	0.0	0.0
	-0.90	0.00	14.5	0.0	0.0	0.05	10		1: 2	0.0145	-0.95	0.00	13.4	0.0	0.0
	-0.95	0.00	13.4	0.0	0.0	0.05	11		1: 2	0.0145	-1.00	0.00	12.6	0.0	0.0
	-1.00	0.00	12.6	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.00	11.8	0.0	0.0
	-1.05	0.00	11.8	0.0	0.0	0.05	11		3: 4	0.0145	-1.10	0.00	10.9	0.0	0.0
	0.59	-0.54	-7.3	13.5	10.0	-0.01	12		1: 2	0.0145	0.60	-0.11	-1.5	13.4	10.0
	0.60	-0.11	-1.5	13.4	10.0	0.00	12		2: 3	0.0145	0.60	0.28	3.6	13.0	10.0
	0.60	0.28	3.6	13.0	10.0	0.00	12		3: 4	0.0145	0.60	0.00	3.5	0.0	0.0
	0.60	0.00	3.5	0.0	0.0	-0.07	13		1: 2	0.0145	0.67	0.00	2.9	0.0	0.0
	0.67	0.00	2.9	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.4	0.0	0.0
	0.74	0.00	1.4	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	0.9	0.0	0.0
	0.82	0.00	0.9	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.6	0.0	0.0
	0.89	0.00	0.6	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.4	0.0	0.0
	0.96	0.00	0.4	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.3	0.0	0.0
	1.03	0.00	0.3	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.59	-0.54	-7.3	13.5	10.0	-0.01	16		1: 2	0.0145	0.60	-0.11	-1.5	13.4	10.0
	0.60	-0.11	-1.5	13.4	10.0	0.00	16		2: 3	0.0145	0.60	0.28	3.6	13.0	10.0
	0.60	0.28	3.6	13.0	10.0	0.00	16		3: 4	0.0145	0.60	0.00	3.5	0.0	0.0
	0.60	0.00	3.5	0.0	0.0	-0.07	17		1: 2	0.0145	0.67	0.00	2.9	0.0	0.0
	0.67	0.00	2.9	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.4	0.0	0.0
	0.74	0.00	1.4	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	0.9	0.0	0.0
	0.82	0.00	0.9	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	0.6	0.0	0.0
	0.89	0.00	0.6	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.4	0.0	0.0
	0.96	0.00	0.4	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.3	0.0	0.0
	1.03	0.00	0.3	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.1	0.0	0.0
	1.10	0.00	0.1	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:18	0.60	0.54	14.6	27.1	20.0	0.02	1	(*)	1: 2	0.0145	0.58	0.84	22.9	27.1	20.0
	0.58	0.84	22.9	27.1	20.0	0.09	1		2: 3	0.0145	0.49	1.49	39.7	26.7	20.0
	0.49	1.49	39.7	26.7	20.0	0.07	1		3: 4	0.0145	0.42	1.45	38.3	26.5	20.0
	0.42	1.45	38.3	26.5	20.0	0.07	2		1: 2	0.0145	0.35	1.41	37.1	26.3	20.0
	0.35	1.41	37.1	26.3	20.0	0.06	2		2: 3	0.0145	0.29	1.38	36.0	26.2	20.0
	0.29	1.38	36.0	26.2	20.0	0.06	2		3: 4	0.0145	0.23	1.34	35.1	26.1	20.0
	0.23	1.34	35.1	26.1	20.0	0.06	3		1: 2	0.0145	0.17	1.32	34.2	26.0	20.0
	0.17	1.32	34.2	26.0	20.0	0.06	3		2: 3	0.0145	0.12	1.29	33.5	25.9	20.0
	0.12	1.29	33.5	25.9	20.0	0.05	3		3: 4	0.0145	0.06	1.27	32.8	25.9	20.0
	0.06	1.27	32.8	25.9	20.0	0.05	4		1: 2	0.0145	0.01	1.25	32.2	25.8	20.0
	0.01	1.25	32.2	25.8	20.0	0.05	4		2: 3	0.0145	-0.04	1.23	31.6	25.8	20.0
	-0.04	1.23	31.6	25.8	20.0	0.05	4		3: 4	0.0145	-0.10	1.21	31.2	25.8	20.0
	-0.10	1.21	31.2	25.8	20.0	0.05	5		1: 2	0.0145	-0.15	1.19	30.8	25.8	20.0
	-0.15	1.19	30.8	25.8	20.0	0.05	5		2: 3	0.0145	-0.20	1.18	30.5	25.8	20.0
	-0.20	1.18	30.5	25.8	20.0	0.05	5		3: 4	0.0145	-0.25	1.17	30.1	25.8	20.0
	-0.25	1.17	30.1	25.8	20.0	0.05	6		1: 2	0.0145	-0.30	1.13	29.2	25.8	20.0
	-0.30	1.13	29.2	25.8	20.0	0.05	6		2: 3	0.0145	-0.34	1.09	28.0	25.8	20.0
	-0.34	1.09	28.0	25.8	20.0	0.04	6		3: 4	0.0145	-0.38	1.02	26.5	25.9	20.0
	-0.38	1.02	26.5	25.9	20.0	0.03	7		1: 2	0.0145	-0.42	0.95	24.7	26.1	20.0
	-0.42	0.95	24.7	26.1	20.0	0.03	7		2: 3	0.0145	-0.45	0.87	22.8	26.3	20.0
	-0.45	0.87	22.8	26.3	20.0	0.15	7		3: 4	0.0145	-0.60	0.00	21.8	0.0	0.0
	-0.60	0.00	21.8	0.0	0.0	0.05	8		1: 2	0.0145	-0.65	0.00	21.2	0.0	0.0
	-0.65	0.00	21.2	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	20.7	0.0	0.0
	-0.70	0.00	20.7	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	20.3	0.0	0.0
	-0.75	0.00	20.3	0.0	0.0	0.04	9		1: 2	0.0145	-0.79	0.78	19.8	25.3	20.0
	-0.79	0.78	19.8	25.3	20.0	0.04	9		2: 3	0.0145	-0.83	0.75	19.0	25.4	20.0
	-0.83	0.75	19.0	25.4	20.0	0.06	9		3: 4	0.0145	-0.89	0.72	18.1	25.3	20.0
	-0.89	0.72	18.1	25.3	20.0	0.06	10		1: 2	0.0145	-0.95	0.68	17.1	25.2	20.0
	-0.95	0.68	17.1	25.2	20.0	0.05	11		1: 2	0.0145	-1.00	0.00	16.0	0.0	0.0
	-1.00	0.00	16.0	0.0	0.0	0.05	11		2: 3	0.0145	-1.05	0.60	15.1	25.2	20.0
	-1.05	0.60	15.1	25.2	20.0	0.05	11		3: 4	0.0145	-1.10	0.00	14.3	0.0	0.0
	0.60	-0.54	-7.3	13.5	10.0	-0.01	12		1: 2	0.0145	0.61	-0.11	-1.5	13.4	10.0
	0.61	-0.11	-1.5	13.4	10.0	0.00	12		2: 3	0.0145	0.61	0.26	3.4	13.0	10.0
	0.61	0.26	3.4	13.0	10.0	0.00	12		3: 4	0.0145	0.61	0.22	2.8	12.6	10.0

	0.61	0.22	2.8	12.6	10.0	-0.06	13		1; 2	0.0145	0.67	0.00	2.4	0.0	0.0
	0.67	0.00	2.4	0.0	0.0	-0.07	13		2; 3	0.0145	0.74	0.00	1.8	0.0	0.0
	0.74	0.00	1.8	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	1.1	0.0	0.0
	0.82	0.00	1.1	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.8	0.0	0.0
	0.89	0.00	0.8	0.0	0.0	-0.07	14		2; 3	0.0145	0.96	0.00	0.5	0.0	0.0
	0.96	0.00	0.5	0.0	0.0	-0.07	14		3; 4	0.0145	1.03	0.00	0.3	0.0	0.0
	1.03	0.00	0.3	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.60	-0.54	-7.3	13.5	10.0	-0.01	16		1; 2	0.0145	0.61	-0.11	-1.5	13.4	10.0
	0.61	-0.11	-1.5	13.4	10.0	0.00	16		2; 3	0.0145	0.61	0.26	3.4	13.0	10.0
	0.61	0.26	3.4	13.0	10.0	0.00	16		3; 4	0.0145	0.61	0.22	2.8	12.6	10.0
	0.61	0.22	2.8	12.6	10.0	-0.06	17		1: 2	0.0145	0.67	0.00	2.4	0.0	0.0
	0.67	0.00	2.4	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.8	0.0	0.0
	0.74	0.00	1.8	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	1.1	0.0	0.0
	0.82	0.00	1.1	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	0.8	0.0	0.0
	0.89	0.00	0.8	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.5	0.0	0.0
	0.96	0.00	0.5	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.3	0.0	0.0
	1.03	0.00	0.3	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:24	0.61	0.56	15.2	27.2	20.0	0.02	1	(8)	1: 2	0.0145	0.59	0.86	23.4	27.2	20.0
	0.59	0.86	23.4	27.2	20.0	0.09	1		2: 3	0.0145	0.49	1.50	40.1	26.7	20.0
	0.49	1.50	40.1	26.7	20.0	0.07	1		3: 4	0.0145	0.42	1.46	38.7	26.5	20.0
	0.42	1.46	38.7	26.5	20.0	0.07	2		1: 2	0.0145	0.36	1.42	37.4	26.4	20.0
	0.36	1.42	37.4	26.4	20.0	0.06	2		2: 3	0.0145	0.29	1.38	36.3	26.2	20.0
	0.29	1.38	36.3	26.2	20.0	0.06	2		3: 4	0.0145	0.23	1.35	35.3	26.1	20.0
	0.23	1.35	35.3	26.1	20.0	0.06	3		1: 2	0.0145	0.17	1.33	34.5	26.0	20.0
	0.17	1.33	34.5	26.0	20.0	0.06	3		2: 3	0.0145	0.12	1.30	33.7	25.9	20.0
	0.12	1.30	33.7	25.9	20.0	0.06	3		3: 4	0.0145	0.06	1.28	33.1	25.9	20.0
	0.06	1.28	33.1	25.9	20.0	0.05	4		1: 2	0.0145	0.01	1.26	32.5	25.8	20.0
	0.01	1.26	32.5	25.8	20.0	0.05	4		2: 3	0.0145	-0.05	1.24	31.9	25.8	20.0
	-0.05	1.24	31.9	25.8	20.0	0.05	4		3: 4	0.0145	-0.10	1.22	31.4	25.8	20.0
	-0.10	1.22	31.4	25.8	20.0	0.05	5		1: 2	0.0145	-0.14	1.20	30.8	25.8	20.0
	-0.14	1.20	30.8	25.8	20.0	0.05	5		2: 3	0.0145	-0.19	1.17	30.1	25.8	20.0
	-0.19	1.17	30.1	25.8	20.0	0.04	5		3: 4	0.0145	-0.23	1.12	29.2	25.9	20.0
	-0.23	1.12	29.2	25.9	20.0	0.03	6		1: 2	0.0145	-0.27	1.06	27.7	26.1	20.0
	-0.27	1.06	27.7	26.1	20.0	0.03	6		2: 3	0.0145	-0.29	0.97	25.7	26.4	20.0
	-0.29	0.97	25.7	26.4	20.0	0.02	6		3: 4	0.0145	-0.31	0.85	22.7	26.7	20.0
	-0.31	0.85	22.7	26.7	20.0	0.15	7		1: 2	0.0145	-0.45	0.86	22.1	25.7	20.0
	-0.45	0.86	22.1	25.7	20.0	0.04	7		2: 3	0.0145	-0.49	0.88	22.8	25.8	20.0
	-0.49	0.88	22.8	25.8	20.0	0.09	7		3: 4	0.0145	-0.58	0.90	22.9	25.4	20.0
	-0.58	0.90	22.9	25.4	20.0	0.07	8		1: 2	0.0145	-0.65	0.00	22.5	0.0	0.0
	-0.65	0.00	22.5	0.0	0.0	0.05	8		2: 3	0.0145	-0.70	0.00	22.9	0.0	0.0
	-0.70	0.00	22.9	0.0	0.0	0.05	8		3: 4	0.0145	-0.75	0.00	23.3	0.0	0.0
	-0.75	0.00	23.3	0.0	0.0	0.04	9		1: 2	0.0145	-0.79	0.92	23.3	25.3	20.0
	-0.79	0.92	23.3	25.3	20.0	0.04	9		2: 3	0.0145	-0.83	0.91	23.2	25.4	20.0
	-0.83	0.91	23.2	25.4	20.0	0.05	9		3: 4	0.0145	-0.88	0.90	22.8	25.4	20.0
	-0.88	0.90	22.8	25.4	20.0	0.05	10		1: 2	0.0145	-0.93	0.87	22.2	25.4	20.0
	-0.93	0.87	22.2	25.4	20.0	0.05	11		1: 2	0.0145	-0.98	0.84	21.4	25.4	20.0
	-0.98	0.84	21.4	25.4	20.0	0.04	11		2: 3	0.0145	-1.02	0.80	20.4	25.5	20.0
	-1.02	0.80	20.4	25.5	20.0	0.08	11		3: 4	0.0145	-1.10	0.78	19.7	25.2	20.0
	0.61	-0.56	-7.6	13.6	10.0	-0.01	12		1: 2	0.0145	0.62	-0.14	-1.9	13.5	10.0
	0.62	-0.14	-1.9	13.5	10.0	0.00	12		2: 3	0.0145	0.62	0.23	3.0	13.1	10.0
	0.62	0.23	3.0	13.1	10.0	0.00	12		3: 4	0.0145	0.62	0.19	2.4	12.7	10.0
	0.62	0.19	2.4	12.7	10.0	-0.05	13		1: 2	0.0145	0.67	0.00	2.2	0.0	0.0
	0.67	0.00	2.2	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.8	0.0	0.0
	0.74	0.00	1.8	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	1.2	0.0	0.0
	0.82	0.00	1.2	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	0.9	0.0	0.0
	0.89	0.00	0.9	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.6	0.0	0.0
	0.96	0.00	0.6	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.4	0.0	0.0
	1.03	0.00	0.4	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.61	-0.56	-7.6	13.6	10.0	-0.01	16		1: 2	0.0145	0.62	-0.14	-1.9	13.5	10.0
	0.62	-0.14	-1.9	13.5	10.0	0.00	16		2: 3	0.0145	0.62	0.23	3.0	13.1	10.0
	0.62	0.23	3.0	13.1	10.0	0.00	16		3: 4	0.0145	0.62	0.19	2.4	12.7	10.0
	0.62	0.19	2.4	12.7	10.0	-0.05	17		1: 2	0.0145	0.67	0.00	2.2	0.0	0.0
	0.67	0.00	2.2	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.8	0.0	0.0
	0.74	0.00	1.8	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	1.2	0.0	0.0
	0.82	0.00	1.2	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	0.9	0.0	0.0
	0.89	0.00	0.9	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.6	0.0	0.0
	0.96	0.00	0.6	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.4	0.0	0.0
	1.03	0.00	0.4	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:30	0.62	0.58	15.8	27.3	20.0	0.02	1	(8)	1: 2	0.0145	0.59	0.88	23.9	27.3	20.0
	0.59	0.88	23.9	27.3	20.0	0.09	1		2: 3	0.0145	0.50	1.52	40.6	26.8	20.0
	0.50	1.52	40.6	26.8	20.0	0.07	1		3: 4	0.0145	0.43	1.47	39.1	26.6	20.0
	0.43	1.47	39.1	26.6	20.0	0.07	2		1: 2	0.0145	0.36	1.43	37.8	26.4	20.0
	0.36	1.43	37.8	26.4	20.0	0.06	2		2: 3	0.0145	0.30	1.39	36.6	26.3	20.0
	0.30	1.39	36.6	26.3	20.0	0.06	2		3: 4	0.0145	0.24	1.36	35.6	26.1	20.0
	0.24	1.36	35.6	26.1	20.0	0.06	3		1: 2	0.0145	0.18	1.33	34.7	26.0	20.0
	0.18	1.33	34.7	26.0	20.0	0.06	3		2: 3	0.0145	0.12	1.31	33.9	25.9	20.0
	0.12	1.31	33.9	25.9	20.0	0.06	3		3: 4	0.0145	0.06	1.28	33.2	25.9	20.0
	0.06	1.28	33.2	25.9	20.0	0.05	4		1: 2	0.0145	0.01	1.26	32.6	25.8	20.0
	0.01	1.26	32.6	25.8	20.0	0.05	4		2: 3	0.0145	-0.04	1.24	32.0	25.8	20.0
	-0.04	1.24	32.0	25.8	20.0	0.05	4		3: 4	0.0145	-0.09	1.21	31.3	25.8	20.0
	-0.09	1.21	31.3	25.8	20.0	0.05	5		1: 2	0.0145	-0.14	1.19	30.6	25.8	20.0
	-0.14	1.19	30.6	25.8	20.0	0.04	5		2: 3	0.0145	-0.18	1.15	29.9	25.9	20.0
	-0.18	1.15	29.9	25.9	20.0	0.04	5		3: 4	0.0145	-0.23	1.12	29.0	26.0	20.0
	-0.23	1.12	29.0	26.0	20.0	0.04	6		1: 2	0.0145	-0.26	1.07	28.1	26.1	20.0
	-0.26	1.07	28.1	26.1	20.0	0.04	6		2: 3	0.0145	-0.30	1.04	27.2	26.3	20.0
	-0.30	1.04	27.2	26.3	20.0	0.04	6		3: 4	0.0145	-0.34	1.01	26.8	26.4	20.0

	-0.34	1.01	26.8	26.4	20.0	0.13	7	1: 2	0.0145	-0.46	1.07	27.3	25.6	20.0
	-0.46	1.07	27.3	25.6	20.0	0.05	7	2: 3	0.0145	-0.51	1.07	27.4	25.6	20.0
	-0.51	1.07	27.4	25.6	20.0	0.07	7	3: 4	0.0145	-0.58	1.08	27.4	25.4	20.0
	-0.58	1.08	27.4	25.4	20.0	0.07	8	1: 2	0.0145	-0.65	0.00	27.1	0.0	0.0
	-0.65	0.00	27.1	0.0	0.0	0.05	8	2: 3	0.0145	-0.70	0.00	26.6	0.0	0.0
	-0.70	0.00	26.6	0.0	0.0	0.04	8	3: 4	0.0145	-0.74	1.03	26.1	25.3	20.0
	-0.74	1.03	26.1	25.3	20.0	0.04	9	1: 2	0.0145	-0.78	1.01	25.7	25.4	20.0
	-0.78	1.01	25.7	25.4	20.0	0.06	9	2: 3	0.0145	-0.85	1.02	25.7	25.2	20.0
	-0.85	1.02	25.7	25.2	20.0	0.04	9	3: 4	0.0145	-0.89	1.03	26.0	25.3	20.0
	-0.89	1.03	26.0	25.3	20.0	0.04	10	1: 2	0.0145	-0.93	1.02	25.9	25.4	20.0
	-0.93	1.02	25.9	25.4	20.0	0.04	11	1: 2	0.0145	-0.97	1.00	25.6	25.5	20.0
	-0.97	1.00	25.6	25.5	20.0	0.04	11	2: 3	0.0145	-1.01	0.98	25.1	25.6	20.0
	-1.01	0.98	25.1	25.6	20.0	0.06	11	3: 4	0.0145	-1.07	0.97	24.6	25.5	20.0
	0.62	-0.58	-7.9	13.6	10.0	-0.01	12	1: 2	0.0145	0.63	-0.17	-2.2	13.5	10.0
	0.63	-0.17	-2.2	13.5	10.0	0.00	12	2: 3	0.0145	0.63	0.21	2.8	13.1	10.0
	0.63	0.21	2.8	13.1	10.0	0.00	12	3: 4	0.0145	0.63	0.17	2.1	12.7	10.0
	0.63	0.17	2.1	12.7	10.0	-0.04	13	1: 2	0.0145	0.67	0.00	2.0	0.0	0.0
	0.67	0.00	2.0	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	1.7	0.0	0.0
	0.74	0.00	1.7	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	0.9	0.0	0.0
	0.89	0.00	0.9	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	0.6	0.0	0.0
	0.96	0.00	0.6	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	0.4	0.0	0.0
	1.03	0.00	0.4	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.62	-0.58	-7.9	13.6	10.0	-0.01	16	1: 2	0.0145	0.63	-0.17	-2.2	13.5	10.0
	0.63	-0.17	-2.2	13.5	10.0	0.00	16	2: 3	0.0145	0.63	0.21	2.8	13.1	10.0
	0.63	0.21	2.8	13.1	10.0	0.00	16	3: 4	0.0145	0.63	0.17	2.1	12.7	10.0
	0.63	0.17	2.1	12.7	10.0	-0.04	17	1: 2	0.0145	0.67	0.00	2.0	0.0	0.0
	0.67	0.00	2.0	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	1.7	0.0	0.0
	0.74	0.00	1.7	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	0.9	0.0	0.0
	0.89	0.00	0.9	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	0.6	0.0	0.0
	0.96	0.00	0.6	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	0.4	0.0	0.0
	1.03	0.00	0.4	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:36	0.62	0.59	16.2	27.3	20.0	0.02	1 (6)	1: 2	0.0145	0.60	0.89	24.3	27.4	20.0
	0.60	0.89	24.3	27.4	20.0	0.10	1	2: 3	0.0145	0.50	1.53	41.0	26.9	20.0
	0.50	1.53	41.0	26.9	20.0	0.07	1	3: 4	0.0145	0.43	1.48	39.4	26.6	20.0
	0.43	1.48	39.4	26.6	20.0	0.07	2	1: 2	0.0145	0.37	1.44	38.1	26.5	20.0
	0.37	1.44	38.1	26.5	20.0	0.06	2	2: 3	0.0145	0.30	1.40	36.9	26.3	20.0
	0.30	1.40	36.9	26.3	20.0	0.06	2	3: 4	0.0145	0.24	1.37	35.8	26.2	20.0
	0.24	1.37	35.8	26.2	20.0	0.06	3	1: 2	0.0145	0.18	1.34	34.9	26.1	20.0
	0.18	1.34	34.9	26.1	20.0	0.06	3	2: 3	0.0145	0.12	1.31	34.1	26.0	20.0
	0.12	1.31	34.1	26.0	20.0	0.06	3	3: 4	0.0145	0.06	1.29	33.4	25.9	20.0
	0.06	1.29	33.4	25.9	20.0	0.05	4	1: 2	0.0145	0.01	1.26	32.7	25.9	20.0
	0.01	1.26	32.7	25.9	20.0	0.05	4	2: 3	0.0145	-0.04	1.24	32.1	25.8	20.0
	-0.04	1.24	32.1	25.8	20.0	0.05	4	3: 4	0.0145	-0.09	1.22	31.5	25.8	20.0
	-0.09	1.22	31.5	25.8	20.0	0.05	5	1: 2	0.0145	-0.14	1.20	30.9	25.8	20.0
	-0.14	1.20	30.9	25.8	20.0	0.05	5	2: 3	0.0145	-0.19	1.18	30.4	25.9	20.0
	-0.19	1.18	30.4	25.9	20.0	0.05	5	3: 4	0.0145	-0.24	1.16	30.0	25.9	20.0
	-0.24	1.16	30.0	25.9	20.0	0.05	6	1: 2	0.0145	-0.28	1.15	29.8	25.9	20.0
	-0.28	1.15	29.8	25.9	20.0	0.05	6	2: 3	0.0145	-0.33	1.15	29.9	25.9	20.0
	-0.33	1.15	29.9	25.9	20.0	0.05	6	3: 4	0.0145	-0.39	1.17	30.3	25.9	20.0
	-0.39	1.17	30.3	25.9	20.0	0.08	7	1: 2	0.0145	-0.47	1.20	30.6	25.5	20.0
	-0.47	1.20	30.6	25.5	20.0	0.06	7	2: 3	0.0145	-0.53	1.20	30.5	25.5	20.0
	-0.53	1.20	30.5	25.5	20.0	0.06	7	3: 4	0.0145	-0.58	1.20	30.4	25.4	20.0
	-0.58	1.20	30.4	25.4	20.0	0.05	8	1: 2	0.0145	-0.63	1.18	29.9	25.4	20.0
	-0.63	1.18	29.9	25.4	20.0	0.05	8	2: 3	0.0145	-0.69	1.15	29.3	25.4	20.0
	-0.69	1.15	29.3	25.4	20.0	0.05	8	3: 4	0.0145	-0.73	1.13	28.8	25.4	20.0
	-0.73	1.13	28.8	25.4	20.0	0.05	9	1: 2	0.0145	-0.78	1.12	28.5	25.4	20.0
	-0.78	1.12	28.5	25.4	20.0	0.05	9	2: 3	0.0145	-0.83	1.10	28.1	25.4	20.0
	-0.83	1.10	28.1	25.4	20.0	0.04	9	3: 4	0.0145	-0.87	1.08	27.4	25.5	20.0
	-0.87	1.08	27.4	25.5	20.0	0.04	10	1: 2	0.0145	-0.91	1.04	26.6	25.6	20.0
	-0.91	1.04	26.6	25.6	20.0	0.06	11	1: 2	0.0145	-0.97	1.02	26.0	25.5	20.0
	-0.97	1.02	26.0	25.5	20.0	0.06	11	2: 3	0.0145	-1.03	1.01	25.8	25.5	20.0
	-1.03	1.01	25.8	25.5	20.0	0.04	11	3: 4	0.0145	-1.06	1.01	25.9	25.6	20.0
	0.62	-0.59	-8.1	13.7	10.0	-0.01	12	1: 2	0.0145	0.64	-0.18	-2.4	13.5	10.0
	0.64	-0.18	-2.4	13.5	10.0	0.00	12	2: 3	0.0145	0.64	0.20	2.6	13.2	10.0
	0.64	0.20	2.6	13.2	10.0	0.00	12	3: 4	0.0145	0.64	0.16	2.0	12.8	10.0
	0.64	0.16	2.0	12.8	10.0	-0.04	13	1: 2	0.0145	0.67	0.00	1.9	0.0	0.0
	0.67	0.00	1.9	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	1.7	0.0	0.0
	0.74	0.00	1.7	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
	0.89	0.00	1.0	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	0.7	0.0	0.0
	0.96	0.00	0.7	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	0.4	0.0	0.0
	1.03	0.00	0.4	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.62	-0.59	-8.1	13.7	10.0	-0.01	16	1: 2	0.0145	0.64	-0.18	-2.4	13.5	10.0
	0.64	-0.18	-2.4	13.5	10.0	0.00	16	2: 3	0.0145	0.64	0.20	2.6	13.2	10.0
	0.64	0.20	2.6	13.2	10.0	0.00	16	3: 4	0.0145	0.64	0.16	2.0	12.8	10.0
	0.64	0.16	2.0	12.8	10.0	-0.04	17	1: 2	0.0145	0.67	0.00	1.9	0.0	0.0
	0.67	0.00	1.9	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	1.7	0.0	0.0
	0.74	0.00	1.7	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
	0.89	0.00	1.0	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	0.7	0.0	0.0
	0.96	0.00	0.7	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	0.4	0.0	0.0
	1.03	0.00	0.4	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:42	0.63	0.60	16.4	27.4	20.0	0.02	1 (6)	1: 2	0.0145	0.60	0.89	24.5	27.4	20.0
	0.60	0.89	24.5	27.4	20.0	0.10	1	2: 3	0.0145	0.51	1.53	41.3	26.9	20.0

	0.51	1.53	41.3	26.9	20.0	0.07	1		3: 4	0.0145	0.44	1.49	39.7	26.7	20.0
	0.44	1.49	39.7	26.7	20.0	0.07	2		1: 2	0.0145	0.37	1.45	38.3	26.5	20.0
	0.37	1.45	38.3	26.5	20.0	0.07	2		2: 3	0.0145	0.30	1.41	37.1	26.3	20.0
	0.30	1.41	37.1	26.3	20.0	0.06	2		3: 4	0.0145	0.24	1.38	36.0	26.2	20.0
	0.24	1.38	36.0	26.2	20.0	0.06	3		1: 2	0.0145	0.18	1.35	35.1	26.1	20.0
	0.18	1.35	35.1	26.1	20.0	0.06	3		2: 3	0.0145	0.12	1.32	34.3	26.0	20.0
	0.12	1.32	34.3	26.0	20.0	0.06	3		3: 4	0.0145	0.07	1.30	33.6	25.9	20.0
	0.07	1.30	33.6	25.9	20.0	0.06	4		1: 2	0.0145	0.01	1.27	32.9	25.9	20.0
	0.01	1.27	32.9	25.9	20.0	0.05	4		2: 3	0.0145	-0.04	1.25	32.4	25.8	20.0
	-0.04	1.25	32.4	25.8	20.0	0.05	4		3: 4	0.0145	-0.10	1.24	31.9	25.8	20.0
	-0.10	1.24	31.9	25.8	20.0	0.05	5		1: 2	0.0145	-0.15	1.22	31.5	25.8	20.0
	-0.15	1.22	31.5	25.8	20.0	0.05	5		2: 3	0.0145	-0.20	1.21	31.2	25.7	20.0
	-0.20	1.21	31.2	25.7	20.0	0.05	5		3: 4	0.0145	-0.25	1.21	31.0	25.7	20.0
	-0.25	1.21	31.0	25.7	20.0	0.05	6		1: 2	0.0145	-0.30	1.21	31.1	25.7	20.0
	-0.30	1.21	31.1	25.7	20.0	0.05	6		2: 3	0.0145	-0.36	1.22	31.2	25.7	20.0
	-0.36	1.22	31.2	25.7	20.0	0.06	6		3: 4	0.0145	-0.41	1.23	31.6	25.6	20.0
	-0.41	1.23	31.6	25.6	20.0	0.06	7		1: 2	0.0145	-0.47	1.24	31.6	25.5	20.0
	-0.47	1.24	31.6	25.5	20.0	0.05	7		2: 3	0.0145	-0.52	1.23	31.3	25.5	20.0
	-0.52	1.23	31.3	25.5	20.0	0.05	7		3: 4	0.0145	-0.58	1.22	31.0	25.5	20.0
	-0.58	1.22	31.0	25.5	20.0	0.05	8		1: 2	0.0145	-0.63	1.21	30.6	25.4	20.0
	-0.63	1.21	30.6	25.4	20.0	0.05	8		2: 3	0.0145	-0.68	1.19	30.3	25.4	20.0
	-0.68	1.19	30.3	25.4	20.0	0.05	8		3: 4	0.0145	-0.73	1.18	29.9	25.4	20.0
	-0.73	1.18	29.9	25.4	20.0	0.05	9		1: 2	0.0145	-0.78	1.16	29.5	25.4	20.0
	-0.78	1.16	29.5	25.4	20.0	0.05	9		2: 3	0.0145	-0.83	1.15	29.2	25.5	20.0
	-0.83	1.15	29.2	25.5	20.0	0.05	9		3: 4	0.0145	-0.87	1.13	28.8	25.5	20.0
	-0.87	1.13	28.8	25.5	20.0	0.05	10		1: 2	0.0145	-0.92	1.12	28.6	25.5	20.0
	-0.92	1.12	28.6	25.5	20.0	0.05	11		1: 2	0.0145	-0.97	1.11	28.3	25.6	20.0
	-0.97	1.11	28.3	25.6	20.0	0.04	11		2: 3	0.0145	-1.01	1.08	27.7	25.6	20.0
	-1.01	1.08	27.7	25.6	20.0	0.07	11		3: 4	0.0145	-1.08	1.08	27.6	25.5	20.0
	0.63	-0.60	-8.2	13.7	10.0	-0.01	12		1: 2	0.0145	0.64	-0.19	-2.6	13.6	10.0
	0.64	-0.19	-2.6	13.6	10.0	0.00	12		2: 3	0.0145	0.64	0.20	2.6	13.2	10.0
	0.64	0.20	2.6	13.2	10.0	0.00	12		3: 4	0.0145	0.64	0.15	2.0	12.8	10.0
	0.64	0.15	2.0	12.8	10.0	-0.03	13		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.7	0.0	0.0
	0.74	0.00	1.7	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
	0.89	0.00	1.0	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.7	0.0	0.0
	0.96	0.00	0.7	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
	1.03	0.00	0.5	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.63	-0.60	-8.2	13.7	10.0	-0.01	16		1: 2	0.0145	0.64	-0.19	-2.6	13.6	10.0
	0.64	-0.19	-2.6	13.6	10.0	0.00	16		2: 3	0.0145	0.64	0.20	2.6	13.2	10.0
	0.64	0.20	2.6	13.2	10.0	0.00	16		3: 4	0.0145	0.64	0.15	2.0	12.8	10.0
	0.64	0.15	2.0	12.8	10.0	-0.03	17		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.7	0.0	0.0
	0.74	0.00	1.7	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
	0.89	0.00	1.0	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.7	0.0	0.0
	0.96	0.00	0.7	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
	1.03	0.00	0.5	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:48	0.63	0.61	16.7	27.4	20.0	0.02	1	(4)	1: 2	0.0145	0.61	0.90	24.7	27.4	20.0
	0.61	0.90	24.7	27.4	20.0	0.10	1		2: 3	0.0145	0.51	1.54	41.5	26.9	20.0
	0.51	1.54	41.5	26.9	20.0	0.07	1		3: 4	0.0145	0.44	1.49	39.9	26.7	20.0
	0.44	1.49	39.9	26.7	20.0	0.07	2		1: 2	0.0145	0.37	1.45	38.5	26.5	20.0
	0.37	1.45	38.5	26.5	20.0	0.07	2		2: 3	0.0145	0.31	1.41	37.3	26.4	20.0
	0.31	1.41	37.3	26.4	20.0	0.06	2		3: 4	0.0145	0.24	1.38	36.2	26.2	20.0
	0.24	1.38	36.2	26.2	20.0	0.06	3		1: 2	0.0145	0.18	1.35	35.3	26.1	20.0
	0.18	1.35	35.3	26.1	20.0	0.06	3		2: 3	0.0145	0.12	1.33	34.5	26.0	20.0
	0.12	1.33	34.5	26.0	20.0	0.06	3		3: 4	0.0145	0.07	1.30	33.8	25.9	20.0
	0.07	1.30	33.8	25.9	20.0	0.06	4		1: 2	0.0145	0.01	1.28	33.2	25.8	20.0
	0.01	1.28	33.2	25.8	20.0	0.06	4		2: 3	0.0145	-0.05	1.27	32.7	25.8	20.0
	-0.05	1.27	32.7	25.8	20.0	0.05	4		3: 4	0.0145	-0.10	1.25	32.2	25.7	20.0
	-0.10	1.25	32.2	25.7	20.0	0.05	5		1: 2	0.0145	-0.15	1.24	31.9	25.7	20.0
	-0.15	1.24	31.9	25.7	20.0	0.05	5		2: 3	0.0145	-0.21	1.24	31.7	25.7	20.0
	-0.21	1.24	31.7	25.7	20.0	0.05	5		3: 4	0.0145	-0.26	1.23	31.5	25.6	20.0
	-0.26	1.23	31.5	25.6	20.0	0.05	6		1: 2	0.0145	-0.32	1.23	31.5	25.6	20.0
	-0.32	1.23	31.5	25.6	20.0	0.05	6		2: 3	0.0145	-0.37	1.23	31.4	25.5	20.0
	-0.37	1.23	31.4	25.5	20.0	0.05	6		3: 4	0.0145	-0.42	1.23	31.4	25.5	20.0
	-0.42	1.23	31.4	25.5	20.0	0.05	7		1: 2	0.0145	-0.47	1.23	31.3	25.5	20.0
	-0.47	1.23	31.3	25.5	20.0	0.05	7		2: 3	0.0145	-0.53	1.22	31.1	25.5	20.0
	-0.53	1.22	31.1	25.5	20.0	0.05	7		3: 4	0.0145	-0.58	1.22	30.9	25.4	20.0
	-0.58	1.22	30.9	25.4	20.0	0.05	8		1: 2	0.0145	-0.63	1.21	30.7	25.4	20.0
	-0.63	1.21	30.7	25.4	20.0	0.05	8		2: 3	0.0145	-0.68	1.20	30.5	25.4	20.0
	-0.68	1.20	30.5	25.4	20.0	0.05	8		3: 4	0.0145	-0.73	1.19	30.2	25.4	20.0
	-0.73	1.19	30.2	25.4	20.0	0.05	9		1: 2	0.0145	-0.78	1.18	30.0	25.4	20.0
	-0.78	1.18	30.0	25.4	20.0	0.05	9		2: 3	0.0145	-0.83	1.17	29.7	25.5	20.0
	-0.83	1.17	29.7	25.5	20.0	0.05	9		3: 4	0.0145	-0.87	1.16	29.5	25.5	20.0
	-0.87	1.16	29.5	25.5	20.0	0.05	10		1: 2	0.0145	-0.92	1.15	29.3	25.5	20.0
	-0.92	1.15	29.3	25.5	20.0	0.05	11		1: 2	0.0145	-0.97	1.14	29.1	25.5	20.0
	-0.97	1.14	29.1	25.5	20.0	0.05	11		2: 3	0.0145	-1.01	1.13	28.8	25.6	20.0
	-1.01	1.13	28.8	25.6	20.0	0.05	11		3: 4	0.0145	-1.06	1.12	28.7	25.6	20.0
	0.63	-0.61	-8.3	13.7	10.0	-0.01	12		1: 2	0.0145	0.65	-0.20	-2.7	13.6	10.0
	0.65	-0.20	-2.7	13.6	10.0	0.00	12		2: 3	0.0145	0.65	0.19	2.6	13.2	10.0
	0.65	0.19	2.6	13.2	10.0	0.00	12		3: 4	0.0145	0.65	0.15	1.9	12.8	10.0
	0.65	0.15	1.9	12.8	10.0	-0.03	13		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.6	0.0	0.0
	0.74	0.00	1.6	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
	0.89	0.00	1.0	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.8	0.0	0.0

	0.96	0.00	0.8	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
	1.03	0.00	0.5	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.63	-0.61	-8.3	13.7	10.0	-0.01	16		1. 2	0.0145	0.65	-0.20	-2.7	13.6	10.0
	0.65	-0.20	-2.7	13.6	10.0	0.00	16		2: 3	0.0145	0.65	0.19	2.6	13.2	10.0
	0.65	0.19	2.6	13.2	10.0	0.00	16		3: 4	0.0145	0.65	0.15	1.9	12.8	10.0
	0.65	0.15	1.9	12.8	10.0	-0.03	17		1: 2	0.0145	0.67	0.00	1.8	0.0	0.0
	0.67	0.00	1.8	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.6	0.0	0.0
	0.74	0.00	1.6	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
	0.89	0.00	1.0	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.8	0.0	0.0
	0.96	0.00	0.8	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
	1.03	0.00	0.5	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.2	0.0	0.0
	1.10	0.00	0.2	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
15:54	0.63	0.61	16.8	27.5	20.0	0.02	1	(4)	1: 2	0.0145	0.61	0.90	24.9	27.5	20.0
	0.61	0.90	24.9	27.5	20.0	0.10	1		2: 3	0.0145	0.51	1.54	41.7	27.0	20.0
	0.51	1.54	41.7	27.0	20.0	0.07	1		3: 4	0.0145	0.44	1.50	40.1	26.7	20.0
	0.44	1.50	40.1	26.7	20.0	0.07	2		1: 2	0.0145	0.37	1.46	38.7	26.5	20.0
	0.37	1.46	38.7	26.5	20.0	0.07	2		2: 3	0.0145	0.31	1.42	37.4	26.4	20.0
	0.31	1.42	37.4	26.4	20.0	0.06	2		3: 4	0.0145	0.24	1.39	36.4	26.2	20.0
	0.24	1.39	36.4	26.2	20.0	0.06	3		1: 2	0.0145	0.18	1.36	35.5	26.1	20.0
	0.18	1.36	35.5	26.1	20.0	0.06	3		2: 3	0.0145	0.12	1.33	34.7	26.0	20.0
	0.12	1.33	34.7	26.0	20.0	0.06	3		3: 4	0.0145	0.06	1.31	34.0	25.9	20.0
	0.06	1.31	34.0	25.9	20.0	0.06	4		1: 2	0.0145	0.01	1.29	33.4	25.8	20.0
	0.01	1.29	33.4	25.8	20.0	0.06	4		2: 3	0.0145	-0.05	1.28	32.9	25.8	20.0
	-0.05	1.28	32.9	25.8	20.0	0.06	4		3: 4	0.0145	-0.10	1.26	32.5	25.7	20.0
	-0.10	1.26	32.5	25.7	20.0	0.05	5		1: 2	0.0145	-0.16	1.25	32.2	25.6	20.0
	-0.16	1.25	32.2	25.6	20.0	0.05	5		2: 3	0.0145	-0.21	1.25	31.9	25.6	20.0
	-0.21	1.25	31.9	25.6	20.0	0.05	5		3: 4	0.0145	-0.27	1.24	31.7	25.6	20.0
	-0.27	1.24	31.7	25.6	20.0	0.05	6		1: 2	0.0145	-0.32	1.23	31.5	25.5	20.0
	-0.32	1.23	31.5	25.5	20.0	0.05	6		2: 3	0.0145	-0.37	1.23	31.4	25.5	20.0
	-0.37	1.23	31.4	25.5	20.0	0.05	6		3: 4	0.0145	-0.43	1.23	31.2	25.5	20.0
	-0.43	1.23	31.2	25.5	20.0	0.05	7		1: 2	0.0145	-0.48	1.22	31.1	25.4	20.0
	-0.48	1.22	31.1	25.4	20.0	0.05	7		2: 3	0.0145	-0.53	1.22	30.9	25.4	20.0
	-0.53	1.22	30.9	25.4	20.0	0.05	7		3: 4	0.0145	-0.58	1.21	30.8	25.4	20.0
	-0.58	1.21	30.8	25.4	20.0	0.05	8		1: 2	0.0145	-0.63	1.20	30.6	25.4	20.0
	-0.63	1.20	30.6	25.4	20.0	0.05	8		2: 3	0.0145	-0.68	1.20	30.4	25.4	20.0
	-0.68	1.20	30.4	25.4	20.0	0.05	8		3: 4	0.0145	-0.73	1.19	30.3	25.4	20.0
	-0.73	1.19	30.3	25.4	20.0	0.05	9		1: 2	0.0145	-0.78	1.18	30.1	25.4	20.0
	-0.78	1.18	30.1	25.4	20.0	0.05	9		2: 3	0.0145	-0.83	1.18	30.0	25.4	20.0
	-0.83	1.18	30.0	25.4	20.0	0.05	9		3: 4	0.0145	-0.88	1.17	29.8	25.5	20.0
	-0.88	1.17	29.8	25.5	20.0	0.05	10		1: 2	0.0145	-0.92	1.16	29.6	25.5	20.0
	-0.92	1.16	29.6	25.5	20.0	0.05	11		1: 2	0.0145	-0.97	1.15	29.4	25.5	20.0
	-0.97	1.15	29.4	25.5	20.0	0.05	11		2: 3	0.0145	-1.02	1.14	29.2	25.6	20.0
	-1.02	1.14	29.2	25.6	20.0	0.05	11		3: 4	0.0145	-1.06	1.14	29.3	25.6	20.0
	0.63	-0.61	-8.4	13.7	10.0	-0.01	12		1: 2	0.0145	0.65	-0.21	-2.8	13.6	10.0
	0.65	-0.21	-2.8	13.6	10.0	0.00	12		2: 3	0.0145	0.65	0.19	2.5	13.2	10.0
	0.65	0.19	2.5	13.2	10.0	0.00	12		3: 4	0.0145	0.65	0.14	1.9	12.9	10.0
	0.65	0.14	1.9	12.9	10.0	-0.02	13		1: 2	0.0145	0.67	0.00	1.7	0.0	0.0
	0.67	0.00	1.7	0.0	0.0	-0.07	13		2: 3	0.0145	0.74	0.00	1.6	0.0	0.0
	0.74	0.00	1.6	0.0	0.0	-0.07	13		3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	14		1: 2	0.0145	0.89	0.00	1.1	0.0	0.0
	0.89	0.00	1.1	0.0	0.0	-0.07	14		2: 3	0.0145	0.96	0.00	0.8	0.0	0.0
	0.96	0.00	0.8	0.0	0.0	-0.07	14		3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
	1.03	0.00	0.5	0.0	0.0	-0.07	15		1: 2	0.0145	1.10	0.00	0.3	0.0	0.0
	1.10	0.00	0.3	0.0	0.0	-0.07	15		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
	0.63	-0.61	-8.4	13.7	10.0	-0.01	16		1: 2	0.0145	0.65	-0.21	-2.8	13.6	10.0
	0.65	-0.21	-2.8	13.6	10.0	0.00	16		2: 3	0.0145	0.65	0.19	2.5	13.2	10.0
	0.65	0.19	2.5	13.2	10.0	0.00	16		3: 4	0.0145	0.65	0.14	1.9	12.9	10.0
	0.65	0.14	1.9	12.9	10.0	-0.02	17		1: 2	0.0145	0.67	0.00	1.7	0.0	0.0
	0.67	0.00	1.7	0.0	0.0	-0.07	17		2: 3	0.0145	0.74	0.00	1.6	0.0	0.0
	0.74	0.00	1.6	0.0	0.0	-0.07	17		3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
	0.82	0.00	1.3	0.0	0.0	-0.07	18		1: 2	0.0145	0.89	0.00	1.1	0.0	0.0
	0.89	0.00	1.1	0.0	0.0	-0.07	18		2: 3	0.0145	0.96	0.00	0.8	0.0	0.0
	0.96	0.00	0.8	0.0	0.0	-0.07	18		3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
	1.03	0.00	0.5	0.0	0.0	-0.07	19		1: 2	0.0145	1.10	0.00	0.3	0.0	0.0
	1.10	0.00	0.3	0.0	0.0	-0.07	19		2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
90/10/ 1 16: 0	0.64	0.62	17.1	27.5	20.0	0.02	1	(3)	1: 2	0.0145	0.61	0.91	25.1	27.5	20.0
	0.61	0.91	25.1	27.5	20.0	0.10	1		2: 3	0.0145	0.52	1.55	41.9	27.0	20.0
	0.52	1.55	41.9	27.0	20.0	0.07	1		3: 4	0.0145	0.45	1.51	40.3	26.8	20.0
	0.45	1.51	40.3	26.8	20.0	0.07	2		1: 2	0.0145	0.38	1.46	38.9	26.6	20.0
	0.38	1.46	38.9	26.6	20.0	0.07	2		2: 3	0.0145	0.31	1.43	37.7	26.4	20.0
	0.31	1.43	37.7	26.4.	20.0	0.06	2		3: 4	0.0145	0.25	1.39	36.6	26.2	20.0
	0.25	1.39	36.6	26.2	20.0	0.06	3		1: 2	0.0145	0.18	1.37	35.7	26.1	20.0
	0.18	1.37	35.7	26.1	20.0	0.06	3		2: 3	0.0145	0.12	1.34	34.9	26.0	20.0
	0.12	1.34	34.9	26.0	20.0	0.06	3		3: 4	0.0145	0.06	1.32	34.2	25.9	20.0
	0.06	1.32	34.2	25.9	20.0	0.06	4		1: 2	0.0145	0.01	1.30	33.6	25.8	20.0
	0.01	1.30	33.6	25.8	20.0	0.06	4		2: 3	0.0145	-0.05	1.29	33.1	25.7	20.0
	-0.05	1.29	33.1	25.7	20.0	0.06	4		3: 4	0.0145	-0.11	1.27	32.7	25.7	20.0
	-0.11	1.27	32.7	25.7	20.0	0.06	5		1: 2	0.0145	-0.16	1.26	32.3	25.6	20.0
	-0.16	1.26	32.3	25.6	20.0	0.05	5		2: 3	0.0145	-0.22	1.25	32.0	25.6	20.0
	-0.22	1.25	32.0	25.6	20.0	0.05	5		3: 4	0.0145	-0.27	1.24	31.8	25.5	20.0
	-0.27	1.24	31.8	25.5	20.0	0.05	6		1: 2	0.0145	-0.32	1.24	31.5	25.5	20.0
	-0.32	1.24	31.5	25.5	20.0	0.05	6		2: 3	0.0145	-0.37	1.23	31.3	25.5	20.0
	-0.37	1.23	31.3	25.5	20.0	0.05	6		3: 4	0.0145	-0.43	1.22	31.1	25.4	20.0
	-0.43	1.22	31.1	25.4	20.0	0.05	7		1: 2	0.0145	-0.48	1.22	31.0	25.4	20.0
	-0.48	1.22	31.0	25.4	20.0	0.05	7		2: 3	0.0145	-0.53	1.21	30.8	25.4	20.0
	-0.53	1.21	30.8	25.4	20.0	0.05	7		3: 4	0.0145	-0.58	1.21	30.7	25.4	20.0
	-0.58	1.21	30.7	25.4	20.0	0.05	8		1: 2	0.0145	-0.63	1.20	30.6	25.4	20.0
	-0.63	1.20	30.6	25.4	20.0	0.05	8		2: 3	0.0145	-0.68	1.20	30.4	25.4	20.0

-0.68	1.20	30.4	25.4	20.0	0.05	8	3: 4	0.0145	-0.73	1.19	30.3	25.4	20.0
-0.73	1.19	30.3	25.4	20.0	0.05	9	1: 2	0.0145	-0.78	1.19	30.2	25.4	20.0
-0.78	1.19	30.2	25.4	20.0	0.05	9	2: 3	0.0145	-0.83	1.18	30.0	25.4	20.0
-0.83	1.18	30.0	25.4	20.0	0.05	9	3: 4	0.0145	-0.88	1.18	29.9	25.4	20.0
-0.88	1.18	29.9	25.4	20.0	0.05	10	1: 2	0.0145	-0.93	1.17	29.8	25.5	20.0
-0.93	1.17	29.8	25.5	20.0	0.05	11	1: 2	0.0145	-0.97	1.16	29.6	25.5	20.0
-0.97	1.16	29.6	25.5	20.0	0.05	11	2: 3	0.0145	-1.02	1.15	29.4	25.5	20.0
-1.02	1.15	29.4	25.5	20.0	0.05	11	3: 4	0.0145	-1.07	1.15	29.5	25.6	20.0
0.64	-0.62	-8.5	13.7	10.0	-0.01	12	1: 2	0.0145	0.65	-0.22	-3.0	13.8	10.0
0.65	-0.22	-3.0	13.6	10.0	0.00	12	2: 3	0.0145	0.65	0.19	2.5	13.3	10.0
0.65	0.19	2.5	13.3	10.0	0.00	12	3: 4	0.0145	0.65	0.14	1.8	12.9	10.0
0.65	0.14	1.8	12.9	10.0	-0.02	13	1: 2	0.0145	0.67	0.00	1.6	0.0	0.0
0.67	0.00	1.6	0.0	0.0	-0.07	13	2: 3	0.0145	0.74	0.00	1.5	0.0	0.0
0.74	0.00	1.5	0.0	0.0	-0.07	13	3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
0.82	0.00	1.3	0.0	0.0	-0.07	14	1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
0.89	0.00	1.0	0.0	0.0	-0.07	14	2: 3	0.0145	0.96	0.00	0.8	0.0	0.0
0.96	0.00	0.8	0.0	0.0	-0.07	14	3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
1.03	0.00	0.5	0.0	0.0	-0.07	15	1: 2	0.0145	1.10	0.00	0.3	0.0	0.0
1.10	0.00	0.3	0.0	0.0	-0.07	15	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0
0.64	-0.62	-8.5	13.7	10.0	-0.01	16	1: 2	0.0145	0.65	-0.22	-3.0	13.6	10.0
0.65	-0.22	-3.0	13.6	10.0	0.00	16	2: 3	0.0145	0.65	0.19	2.5	13.3	10.0
0.65	0.19	2.5	13.3	10.0	0.00	16	3: 4	0.0145	0.65	0.14	1.8	12.9	10.0
0.65	0.14	1.8	12.9	10.0	-0.02	17	1: 2	0.0145	0.67	0.00	1.6	0.0	0.0
0.67	0.00	1.6	0.0	0.0	-0.07	17	2: 3	0.0145	0.74	0.00	1.5	0.0	0.0
0.74	0.00	1.5	0.0	0.0	-0.07	17	3: 4	0.0145	0.82	0.00	1.3	0.0	0.0
0.82	0.00	1.3	0.0	0.0	-0.07	18	1: 2	0.0145	0.89	0.00	1.0	0.0	0.0
0.89	0.00	1.0	0.0	0.0	-0.07	18	2: 3	0.0145	0.96	0.00	0.8	0.0	0.0
0.96	0.00	0.8	0.0	0.0	-0.07	18	3: 4	0.0145	1.03	0.00	0.5	0.0	0.0
1.03	0.00	0.5	0.0	0.0	-0.07	19	1: 2	0.0145	1.10	0.00	0.3	0.0	0.0
1.10	0.00	0.3	0.0	0.0	-0.07	19	2: 3	0.0145	1.17	0.00	0.0	0.0	0.0