V.3.3-SARROUTE  SSARR CHANNEL ROUTING OPERATION

Identifier: SARROUTE

Application: All programs

Description: This Operation routes flows using the Streamflow Simulation and Reservoir Regulation System (SSARR) method. A complete description of this Operation is in Section II.4-SARROUTE.

Contact: Northwest River Forecast Center

Allowable Data Time Intervals: 1, 2, 3, 4, 6, 8, 12 and 24 hours

Time Series Used: Time series used in this Operation are as follows:

<table>
<thead>
<tr>
<th>General Type</th>
<th>Dim</th>
<th>Units</th>
<th>Use</th>
<th>Required</th>
<th>Data Time Interval</th>
<th>Missing Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin inflow</td>
<td>L3/T</td>
<td>CMS</td>
<td>I</td>
<td>No</td>
<td>Variable</td>
<td>No</td>
</tr>
<tr>
<td>End inflow</td>
<td>L3/T</td>
<td>CMS</td>
<td>I</td>
<td>Yes</td>
<td>Variable</td>
<td>No</td>
</tr>
<tr>
<td>Begin outflow</td>
<td>L3/T</td>
<td>CMS</td>
<td>O</td>
<td>No</td>
<td>Variable</td>
<td>No</td>
</tr>
<tr>
<td>End outflow</td>
<td>L3/T</td>
<td>CMS</td>
<td>O</td>
<td>Yes</td>
<td>Variable</td>
<td>No</td>
</tr>
</tbody>
</table>

If the begin and end outflow time series are both specified their units are in CMS. However if the begin outflow time series is not specified the end outflow time series becomes an average volume between the time increment.

Input Summary: The card input for this Operation is in free-format and is as follows:

<table>
<thead>
<tr>
<th>Card</th>
<th>Field</th>
<th>Format</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>A72</td>
<td>User supplied information</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>A8</td>
<td>Begin interval inflow time series identifier</td>
</tr>
<tr>
<td>2</td>
<td>A4</td>
<td></td>
<td>Begin interval inflow data type code: 'SQIB' = both begin and end time interval inflow time series are specified, 'NONE' = no begin interval inflow</td>
</tr>
<tr>
<td>Card</td>
<td>Field</td>
<td>Format</td>
<td>Contents</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>time series identified; only the end interval inflow time series is specified</td>
</tr>
<tr>
<td>3</td>
<td>A8</td>
<td></td>
<td>End interval inflow time series identifier</td>
</tr>
<tr>
<td>4</td>
<td>A4</td>
<td></td>
<td>End interval inflow data type code</td>
</tr>
<tr>
<td>5</td>
<td>A8</td>
<td></td>
<td>Begin interval outflow time series identifier</td>
</tr>
<tr>
<td>6</td>
<td>A4</td>
<td></td>
<td>Begin interval outflow data type code: 'SQIB' = both begin and end time interval outflow time series are specified 'NONE' = no begin interval outflow time series identified; only the end interval outflow time series is specified</td>
</tr>
<tr>
<td>7</td>
<td>A8</td>
<td></td>
<td>End interval outflow time series identifier</td>
</tr>
<tr>
<td>8</td>
<td>A4</td>
<td></td>
<td>End interval outflow data type</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>I</td>
<td>Number of routing phases (must be greater than zero)</td>
</tr>
<tr>
<td>2</td>
<td>R</td>
<td></td>
<td>N value of KTS/Q**N computation for time of storage; if N=0 then the time of storage is extracted from the discharge-time of storage table</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td></td>
<td>KTS value in hours if N value is non-zero</td>
</tr>
<tr>
<td>4</td>
<td>I</td>
<td></td>
<td>Number of points in the discharge-time of storage; maximum of 20 0 = N value not equal to 0</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td></td>
<td>Computation data time interval; must be equal to the inflow and outflow time series data time interval</td>
</tr>
</tbody>
</table>

Card 4+ is needed if the value of N is zero.

4+ 1 R Discharge (units of CFS)
2 R Time of storage (units of HR)

Card 5 is needed if no begin inflow time series is specified.

5 1 R Initial begin increment inflow (units of CFS)
### Card Field Format Contents

<table>
<thead>
<tr>
<th>Card</th>
<th>Field</th>
<th>Format</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>6+</td>
<td>1</td>
<td>R</td>
<td>Phase flow (units of CFS); one card per phase flow value; maximum of 99</td>
</tr>
</tbody>
</table>

**Sample Input and Information Display:** Sample input is shown in Figure 1. Sample output from the parameter print routine is shown in Figure 2. There is no execution routine output.

**Execution Printer Output:** None

**Error and Warning Messages:** The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

A. Messages that can occur during setup:

1. **ERROR**
   **NUMBER OF POINTS IN THE DISCHARGE-TIME OF STORAGE TABLE GREATER THAN MAX ALLOWED 50**
   
   **Action:** Check input sequence on card 3 or decrease number of points in the discharge-time of storage table to less or equal to 50 pairs.

2. **ERROR**
   **NUMBER OF POINTS IN THE DISCHARGE-TIME OF STORAGE TABLE LESS THAN 2**
   
   **Action:** Check input sequence on card 3 or increase number of points in the discharge-time of storage table to greater than 1 or less or equal to 50.

3. **ERROR**
   **NUMBER OF ROUTING PHASES GREATER THAN MAX ALLOWED 99**
   
   **Action:** Check input sequence on card 3 or decrease number of routing phases to less than or equal to 99 phases.

4. **ERROR**
   **NUMBER OF ROUTING PHASES LESS THAN OR EQUAL TO ZERO**
   
   **Action:** Check input sequence on card 3 or increase number of routing phases to greater than zero.

B. Messages that can occur during execution: None

**Carryover Transfer Rules:** The following rules are used during the carryover transfer process for this Operation:
Determine whether any of the routing parameters have been changed through inspection of the old and new P arrays:

1. Check whether the routing method has changed; equation or table routing. If the old routing method uses an equation routing and the new routing method uses table routing or vice versa then the routing parameters have changed.

2. If equation routing used (N value is non-zero) then check the KTS values. If the KTS values differ between the old and new then the routing parameters have changed.

3. If table routing used (N value is zero) then check the flow versus time of storage tables. If the number of points in the table or if any of the points on the tables differ then the routing parameters have changed.

4. If the above 3 tests are passed with no changes then the routing parameters have not changed from old to new.

Transfer the phase flow values in the C arrays:

1. If the routing parameters have changed then all new phase flow values are set to zero.

2. If the routing parameters have remained unchanged then the following is done depending on the number of phases used by the old and new routing parameters.
   a. If new and old number of phases are equal then all the old phase values are transferred. This is the case where the routing parameters between the old and new are identical and all routing parameters are transferred intact.
   b. If the new number of phases are less than the old number of phases then the old phase flow values for phase numbers 1 through the new number of phases are transferred.
   c. If the new number of phases are greater than the old number of phases then all the old phase flow values are set equal to the last old phase flow value.

Transfer the initial begin increment inflow value in the C array if the new routing identifies only the end increment inflow time series. If the new routing identified both the begin and end inflow time series then the initial begin increment inflow value is not required to be stored in the C array but will be from the begin increment inflow time series.

1. If the old routing identified only 1 inflow time series (the end increment inflow) then the old initial begin increment inflow value is transferred:

\[ C_{NEW}(1) = C_{OLD}(1) \]
2. If the old routing identified both the begin and end increment inflow time series then the new initial begin increment inflow is set as follows:

   a. If the old routing had more than 1 phase flow value then the new initial begin increment inflow is set to an interpolated flow value using the old first and second phase flow values:

      \[
      C_{NEW}(1) = C_{OLD}(1) + (C_{OLD}(1) - C_{OLD}(2))
      \]

   b. If the old routing had just 1 phase then the new initial begin increment inflow is set equal to the old phase flow value:

      \[
      C_{NEW}(1) = C_{OLD}(1)
      \]

**Punched Card Rules:** The following rules are used when punching input cards for this Operation:

1. The format of punched cards is identical to those described in the Input Card Summary of this documentation.

2. No checks are made for the validity of the parametric or carryover data during the punching process.

3. Carryover values may be defaulted if desired. In this case all carryover values are set to zero.
Figure 1. Sample card input for Operation SARROUTE

SARRoute   CORWE     INPUT CO
CORWE/QINE ROUTE TO SLMWE
CORWE NONE  CORWE QINE  CORSLMWE SQIB CORSLMWE SQIE
2 0.2 16.0 0 6
100.
100.
100.

Figure 2. Sample output from Operation SARROUTE print parameter routine

*************************
SARRoute OPERATION     NAME=CORWE        PREVIOUS NAME= INPUT CO
*************************

SSARR ROUTING - VERSION    1
CORWE/QINE ROUTE TO SLMWE

-------------------------------------------------------------------------------------
ID     CODE
START INFLOW TIME SERIES       CORWE     NONE
END   INFLOW TIME SERIES        CORWE     QINE
START OUTFLOW TIME SERIES       CORSLMWE  SQIB
END   OUTFLOW TIME SERIES       CORSLMWE  SQIE
-------------------------------------------------------------------------------------

# OF ROUTING PHASES
-------------------------- 2

TIME OF STORAGE (HOURS) PER PHASE
-----------------------------------
TIME OF STORAGE = 16.00 / (DISCHARGE (IN CFS) ** 0.20)

INITIAL START INFLOW TO REACH
-----------------------------------
100.0

CARRYOVER PHASE FLOW VALUES
CURRENT TO FUTURE PHASE FLOW VALUES
-----------------------------------

<table>
<thead>
<tr>
<th>FLOW</th>
<th>PHASE (CFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.0</td>
<td>1</td>
</tr>
<tr>
<td>100.0</td>
<td>2</td>
</tr>
</tbody>
</table>