Exercise 5 – Segmentation

BASINS/HSPF Application Steps

Study Definition/ Modeling Strategy	Timeseries Data Management	Parameter Development/Model Setup	Hydrologic Calibration/ Validation	Water Quality Calibration/ Validation	Scenario Analysis
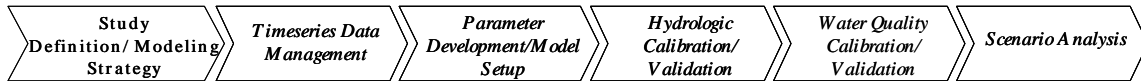
Question addressed in this section:
1) What is segmentation?
2) What are the advantages of creating multiple model segments?
3) What are some disadvantages of including a model segment for each subbasin?
4) How can I build a model with multiple meteorological segments?
5) How do I confirm that the meteorological segments have been created as desired?
6) How do I divide a reach?

A. Introduction to Segmentation

QUESTIONS ANSWERED:
1) What is segmentation?
2) What are the advantages of creating multiple model segments?
3) What are some disadvantages of including a model segment for each subbasin?

As discussed in Singh (1997), the accuracy of model output is dependent on the spatial and temporal sizes of discretization. Setting the level of discretization of a model in HSPF is known as "segmentation," or the process of creating model segments. Model segments are often created to account for differences in meteorological data, topography, soils variations, etc. that may require varying meteorological data inputs or land segment parameter values over the study area.

Model segments are sub-areas of a watershed with uniform parameters and meteorological inputs that are connected by a reach network. According to Singh (1997), the critical properties needed to represent the heterogeneity of a model segment include (a) rainfall or important meteorological data, (b) soil type, (c) land use conditions, (d) reach characteristics, and (e) any other important physical characteristic (infiltration, overland slope, etc.).

Dividing a watershed into two or more model segments has several advantages. Especially in large subbasins where more than one representative meteorological station may be required to adequately represent climate variations. Once segmented, it is possible to assign a separate meteorological station to each model segment. This is particularly important when considering available precipitation data. Assigning appropriate meteorological stations to model segments provides greater accuracy. As discussed above, segmentation also accounts for spatial variation in other meteorological data and in physical characteristics such as soil types, slopes, and distance of overland flow.

When considering segmentation, you should also take into account that it is possible to have

too many segments in your model. It is generally not best to include a model segment for each subwatershed because to do so would imply a greater level of detail than is generally possible to parameterize. It also provides a greater opportunity for error when modifying parameter values, is computationally less efficient, and makes calibration difficult.

As mentioned previously, one important basis for model segmentation is the variation in meteorological data across the study area. When a model is segmented to account for differences in meteorological data, those model segments are sometimes referred to as *meteorological segments*, or met segments. The following discussion will explain met segmentation.

Model segments based on differences in meteorological characteristics

Look at the following watershed diagram:
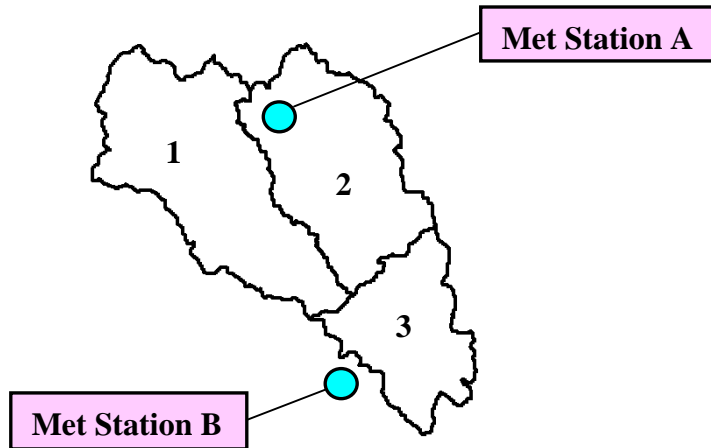
The watershed consists of 3 subwatersheds. Notice that there are two meteorological stations near the watershed that are representative of different portions of the drainage.

The HSPF setup tool in BASINS, as used in Exercise 4, created an input file with the following type of relationship:
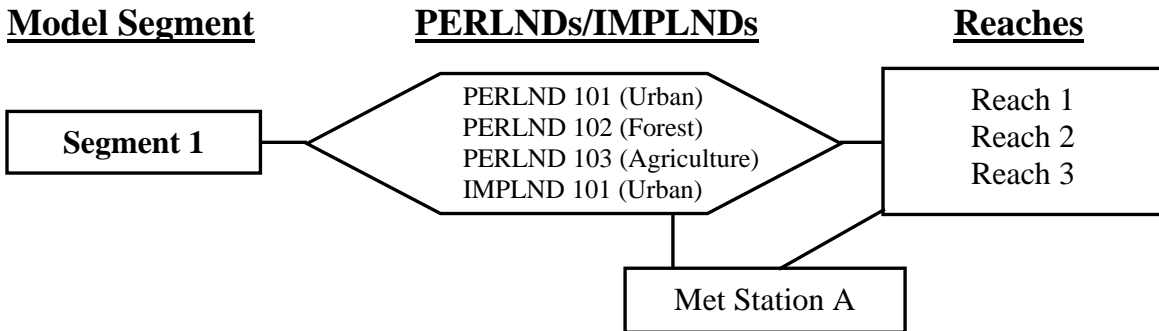

In this situation, each PERLND/IMPLND takes into account the area associated with each landuse in all three of the subwatersheds and uses the same meteorological data for all three subwatersheds. Since we have two met stations that are representative of different portions of the study area, it makes sense to create an input file with two met segments; one segment

(we'll call it Segment 1) that will be comprised of Subwatersheds 1 and 2 and will use meteorological data from Station A, and one (Segment 2) that will be comprised of Subwatershed 3 and will use data from Station B.
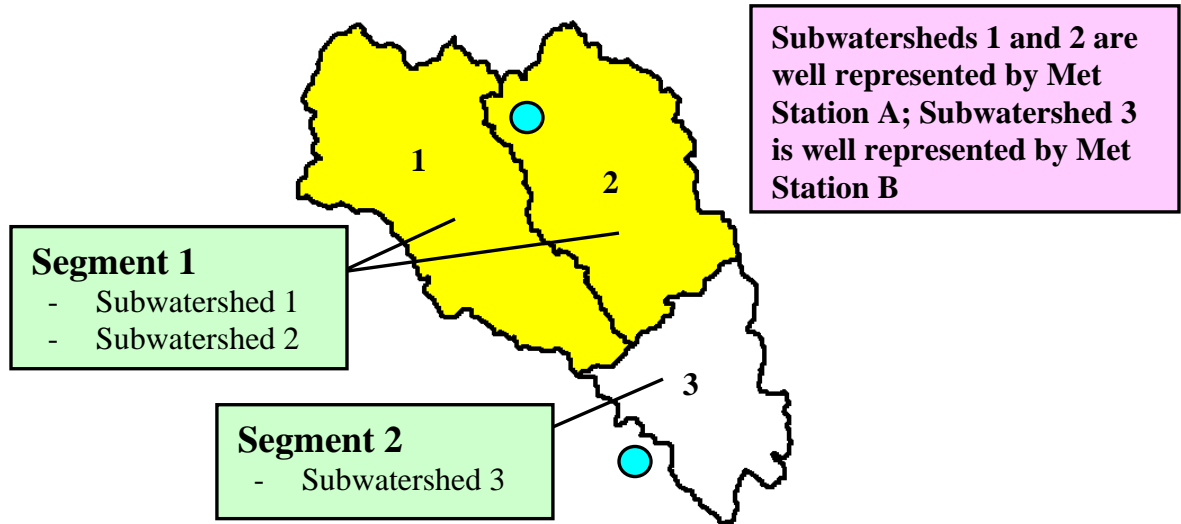
In this scenario, there would be two met segments, and therefore two sets of PERLNDs/IMPLNDs. The following diagram shows the relationship between the met segments and PERLNDs/IMPLNDs after the additional met segment has been added.
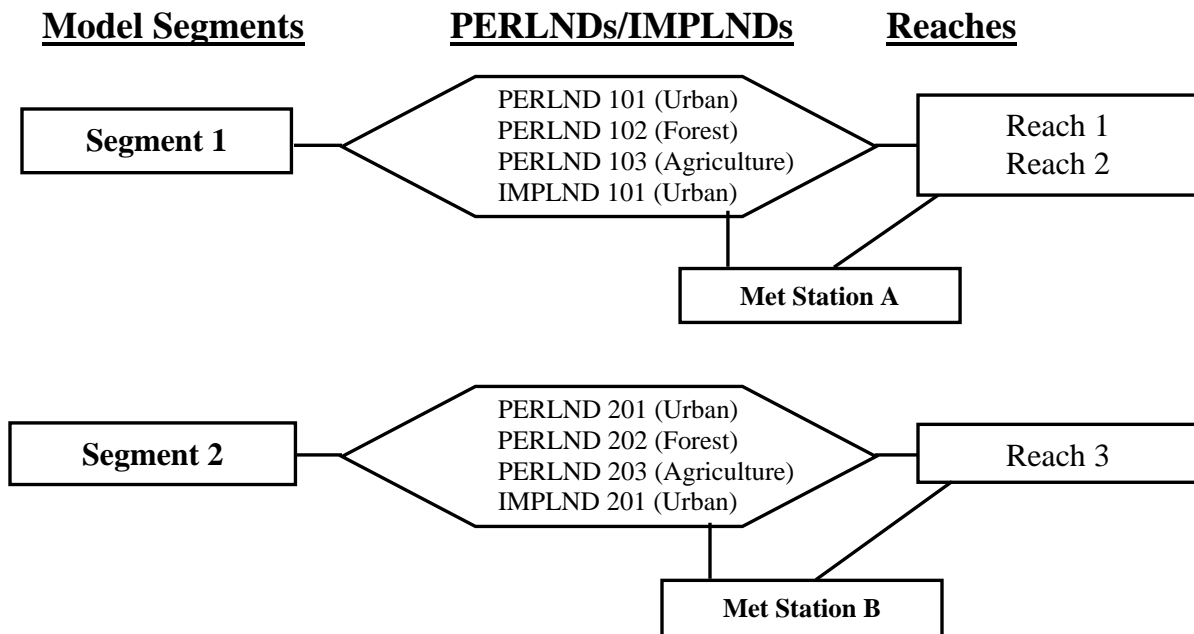

Note: Keep in mind that a model segment based on differences in meteorological characteristics is often called a met segment.

In this scenario, all the meteorological time series associated with Met Station A would be applied to the land area associated with PERLND 101-103, IMPLND 101, and Reach 1-2.

Similarly, the time series associated with Met Station B would be applied to PERLND 201-203, IMPLND 201, and Reach 3.

Model segments based on differences in physical characteristics

Recall that heterogeneity of physical characteristics may be the basis for model segmentation. In such cases, two different model segments can use the same met data but will have different model parameter assignments. Using the example watershed above, let's assume another situation in which we desire to segment our model based on differences in physical characteristics in addition to the met segmentation. In this scenario, let Subwatershed 1 represent farmland where the predominant soil type is clay. Let Subwatersheds 2 and 3 represent farmland where the predominant soil type is silty-loam.
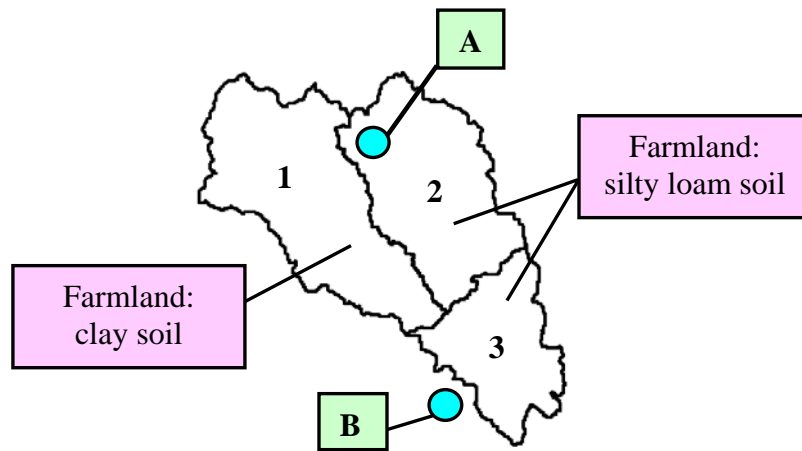
Although all three subwatersheds have a portion of their total area that is the same land use category (agriculture land), it is desirable to create two model segments because the physical characteristics of clay and silty-loam are significantly different. These differences will affect factors such as infiltration, subsurface water storage, surface roughness, root depth, etc. and therefore, require the model to be parameterized accordingly.
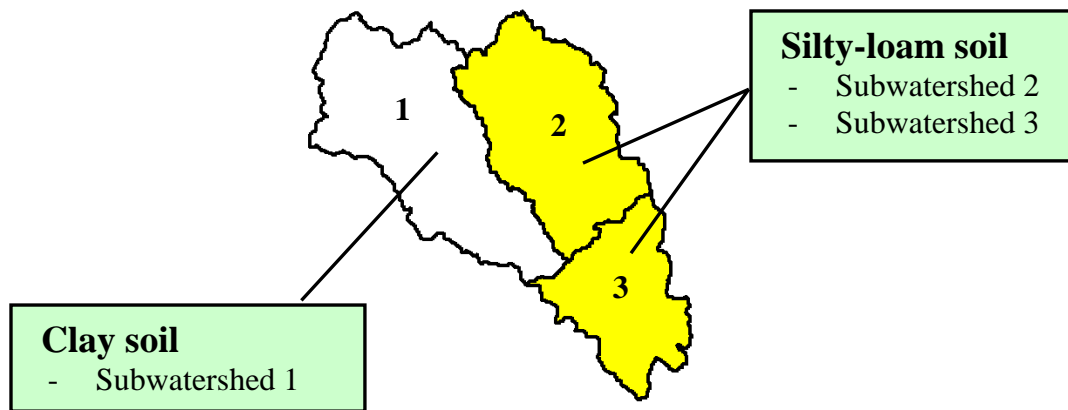
Recall that a met segment is a type of a model segment. In the previous example we divided our model into two met segments, and therefore two model segments. In this example, we will divide Met Segment 1 into two separate model segments resulting in a total of three

model segments with the following relationship:

Model Segments	**PERLNDs/IMPLNDs**	**Reach**

Clay Soil

Model Segment 1

PERLND 101 (Urban)
PERLND 102 (Forest)
PERLND 103 (Agriculture)
IMPLND 101 (Urban)

Reach 1

Met Station A

Silty-Loam Soil Parameters

Model Segment 2

PERLND 201 (Urban)
PERLND 202 (Forest)
PERLND 203 (Agriculture)
IMPLND 201 (Urban)

Reach 2

Met Station A

Silty-Loam Soil Parameters

Model Segment 3

PERLND 301 (Urban)
PERLND 302 (Forest)
PERLND 303 (Agriculture)
IMPLND 301 (Urban)

Reach 3

Met Station B

Remember that in this scenario Model Segment 1 and Model Segment 2 will use the same meteorological data, but will have many different input parameters. Model Segment 2 and 3 will use different meteorological data, but will likely have the same or similar input parameters.

How is Segmentation related to Delineation?

In Exercise 2, Watershed Delineation, you began the process of segmentation as you became familiar with the BASINS watershed delineation tools. In fact, delineation is a part of the segmentation process. As you decide how best to segment your study area based on meteorologic data and physical characteristics, you very well might find that you need to revisit your subbasin delineations.

One common method of assigning meteorologic data to model subbasins is through the use of Thiessen polygons. Thiessen polygons are created by joining the perpendicular bisectors of imaginary lines connecting the met stations on a map, which essentially assigns each subbasin to the nearest met station (not the most representative weather station, just the nearest weather station).

In the example below, a Thiessen polygon line has been drawn between the 2 met stations. Subbasins above the Thiessen line are assigned to Met Station A, and subbasins below the line are assigned to Met Station B.
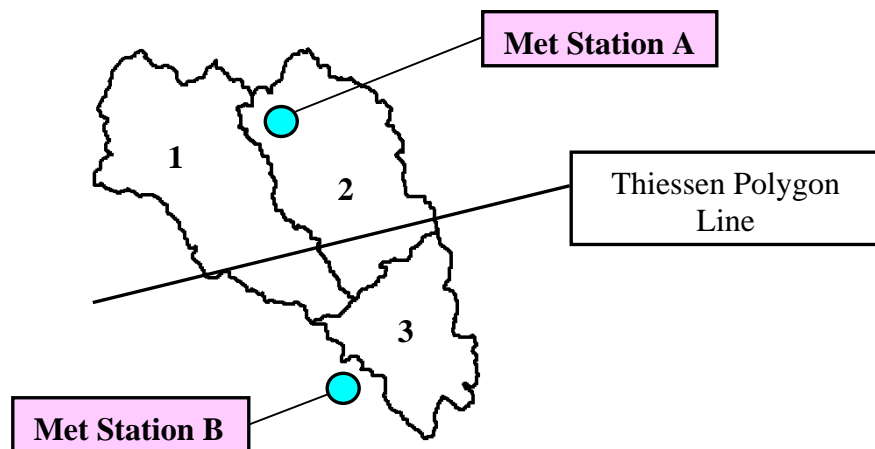
Assigning Met Station A to subbasins 1 and 2 may or may not be acceptable depending on whether it is the most representative meteorological station of the subbasin area. A modeler will have to make this judgment given local knowledge of the area being modeled. Once the most representative meteorological station is selected, a modeler may decide to further delineate subbasins to increase modeling accuracy by dividing subbasins 1 and 2 into additional subbasins 4 and 5, as shown below.

BASINS/HSPF Training   **Exercises**
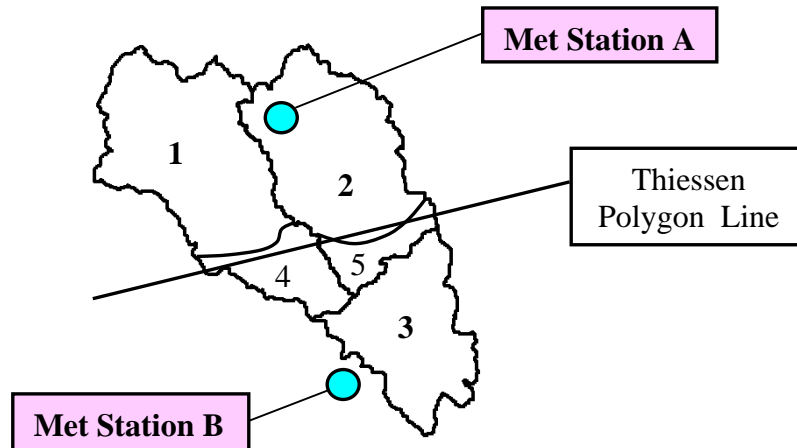
Met Station B would be assigned to subbasins 3, 4, and 5, and the smaller versions of subbasins 1 and 2 would be assigned to Met Station A.

You can see from this example that watershed delineation can often be an iterative process, needing refinement during segmentation in order to capture spatial variation in meteorologic inputs and other physical characteristics of the study area.

## B. Building a Model with Multiple Met Segments

QUESTIONS ANSWERED:

4) How can I build a model with multiple met segments?

In the following section, we will build a new model containing two met segments. We will first use the BASINS Model Segmentation tool to specify our segments, and then we will use the BASINS Model Setup tool for HSPF to build that model. (If we wanted to, we could add an additional met segment to our existing model using WinHSPF instead of creating a new model. Details of that process are available in Appendix H.)

1.   If BASINS isn't open, from the **Start** menu under **Programs**, select **BASINS** and then **BASINS 4**.

2.   **Click** "*Patuxent*" in the "Welcome to BASINS 4" window.

3.   Make sure that your *Subbasins*, *Streams*, and *Outlets* layers are visible on that map as you did in Section A of Exercise 4.

4.   From the **Plug-ins** menu, make sure **Model Segmentation** is checked (on).
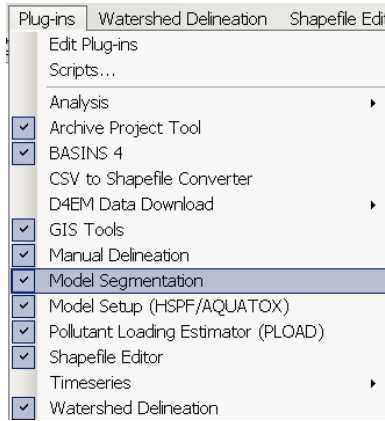
5.   From the **Models** menu, select **Model Segmentation**.

6.   The following window will appear. Set *Subbasins* to be the "Subbasins Layer", and make sure *Weather Station Sites 2006* defaults to the be the "Met Stations Layer".
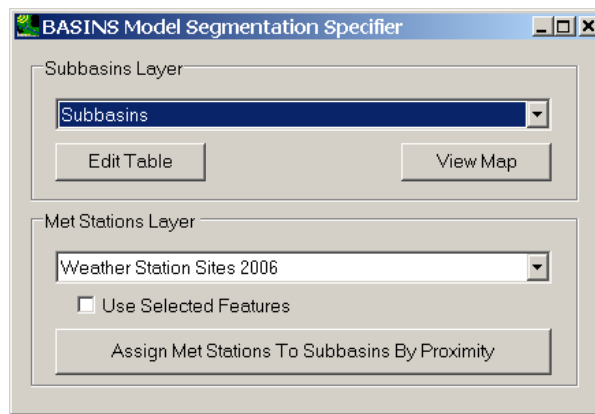
7.   Click **Edit Table**.

8.   The Attribute Table Editor will appear, showing the table associated with the Subbasins layer.

APE__I	ID	GRIDCOD	SUBBASIN	AREA	LEN1	SLO1	SLL	CSL	WID1	DEP1	LATITUDE	ELEV	BNAME	ModelSeg
1	1	1	7334.1512	17724.242	1.3207	121.9512	0.158	16.9746	0.7246	38.938535	45			
2	6	6	3580.3828	14806.209	1.3647	121.9512	0.3107	11.0394	0.5439	38.920236	31			
3	3	3	1772.9876	9784.1398	2.3021	91.4634	0.3168	7.2412	0.4106	38.849048	25			
4	5	5	66.116	1186.8626	0	0.05	0.1	1.0064	0.1102	38.815122	15			
5	2	2	8323.8664	21994.026	2.0767	91.4634	0.2773	18.3141	0.7622	38.863157	35			
6	4	4	659.8105	6022.3672	1.8563	121.9512	0.5148	4.0017	0.2765	38.805852	15			

9.   Notice that a field named 'ModelSeg' appears at the right end of the table. This field

was added by the Model Segmentation tool for storing an identifier indicating to which segment each subbasin shall belong.

For this exercise, let's pretend that we have examined our map layer of weather station sites and determined that Subbasins 1 and 6 should have different meteorologic data applied to them than the rest of the subbasins.

10.   Enter '1' for the 'ModelSeg' for Subbasins 1 and 6, and '2' for the 'ModelSeg' for the other subbasins, as shown here.


11.   Click **Apply** and then **Close**.

12.   Close the Model Segmentation tool.

There are several other functions of the Model Segmentation tool that we will not be using here for the sake of keeping this exercise to a reasonable length. Other features of this tool include the ability to assign met stations by proximity, in other words picking the closest met station to each subbasin, and displaying a thematic map of the specified model segments with the **View Map** button. These functions are detailed in the BASINS User's Manual.

13.   Back in the main BASINS window, from the **Models** menu, select **HSPF**.

14.   The following window will appear. Enter "TwoSeg" in the "HSPF project name:" box. Leave "USGS GIRAS Shapefile" in the "Land Use Type" box. Set Subbasins to be the "Subbasins Layer", Streams to be the "Streams Layer", and Outlets to be the "Point Sources Layer". Weather Station Sites 2006 will default to the "Met Stations Layer".
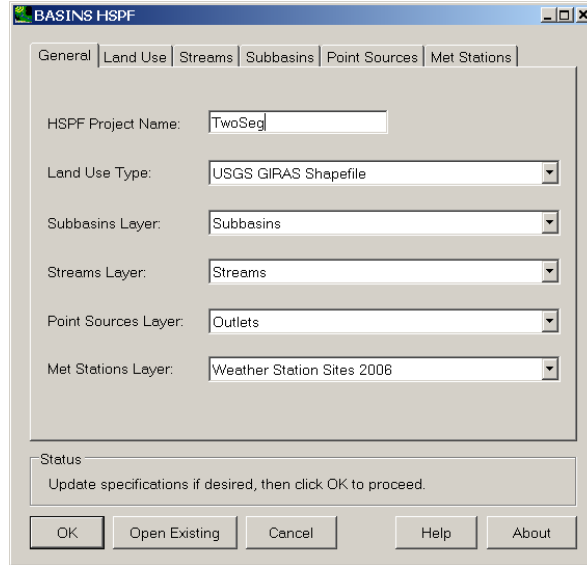
15. Click on the **Met Stations** tab. Because we specified *Weather Station Sites 2006* as the "Met Stations Layer", the "Met WDM File" will be set to the WDM file associated with the *Weather Station Sites 2006*, which is named 'met.wdm' and is located in the '\BASINS\data\02060006' folder.

Notice that the grid on the **Met Stations** tab now looks different than it did in Exercise 4. That is because we just went through the Model Segmentation tool and added a Model Segment field to our Subbasins shapefile. The Model Setup tool now assumes that we want to create a model with two model segments.
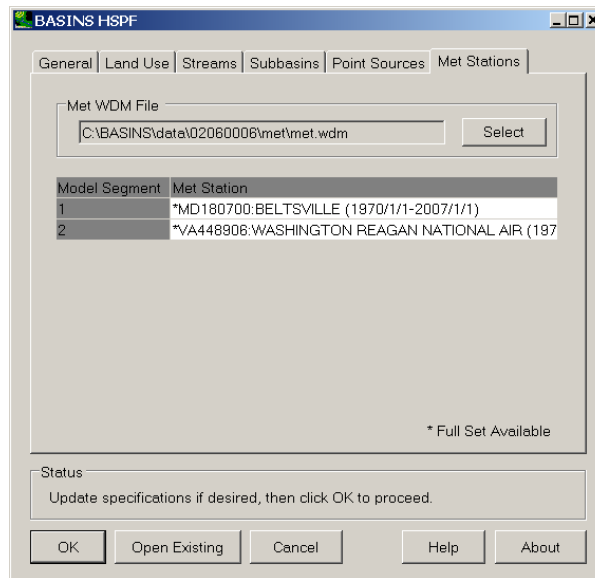
16. Select "MD180700: BELTSVILLE" as the Met Station to use for Model Segment 1 (the northern region), and "VA448906:WASHINGTON REAGAN NATIONAL" as the Met Station to use for Model Segment 2.

Note that we could have specified the same Met Station for each Model Segment. Doing so would have applied the same meteorological data to both model segments, but retained the two model segments for the purpose of specifying different input parameters for the two model segments.

For this exercise we have chosen two Met Stations near the watershed containing the full range of meteorological constituents. For a 'real' project we would expect to examine the *Weather Station Sites 2006* layer within BASINS much more carefully to determine which stations are closest, most representative, have the most appropriate period of record, etc. for the given modeling study.

17.   Click **OK**.

Note: You will see some processing messages appear along with a status bar at the bottom of the main BASINS window. During this time the HSPF User Control Input (UCI) file will be created for the specified project.

18.   After clicking OK, BASINS will create the HSPF User Control Input (UCI) file as specified. Once the UCI has been created, the main window of the HSPF interface (WinHSPF) will open.
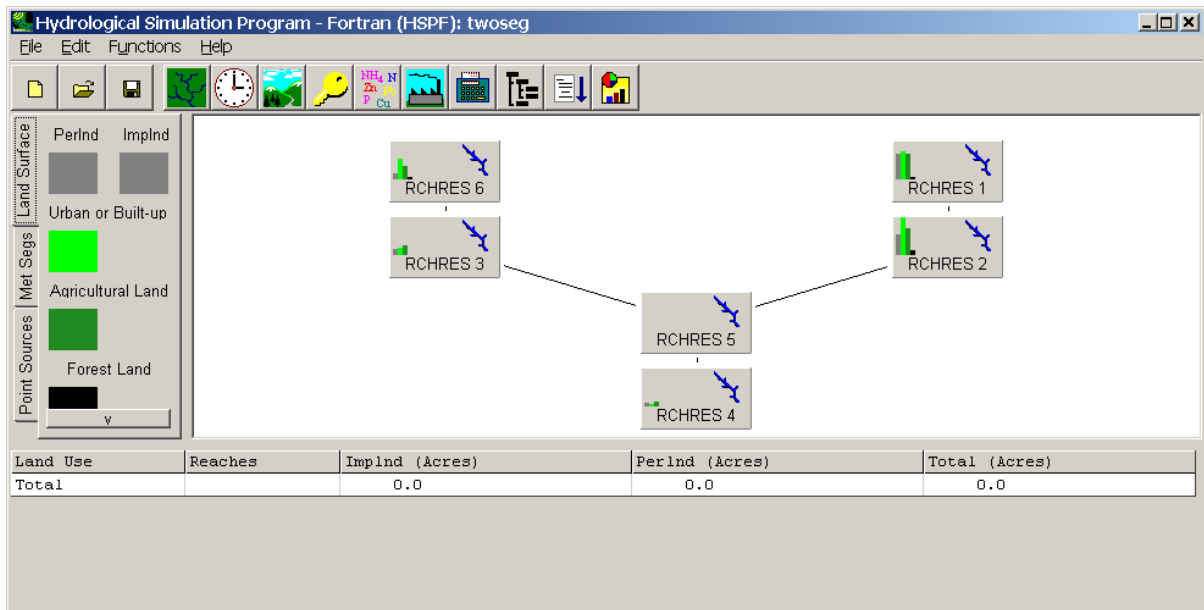
C. Viewing the Met Segments

QUESTIONS ANSWERED:

5) How do I confirm that the met segments have been created as desired?

One way to verify that the met segments were created successfully is to view the met segment schematic in the main WinHSPF window.

1.   With the main WinHSPF window open, click the "Met Segs" tab (located at the left side of the screen).

2.   Click the button that corresponds to the first met segment, [1:MD180700]. Your schematic should look like the following:
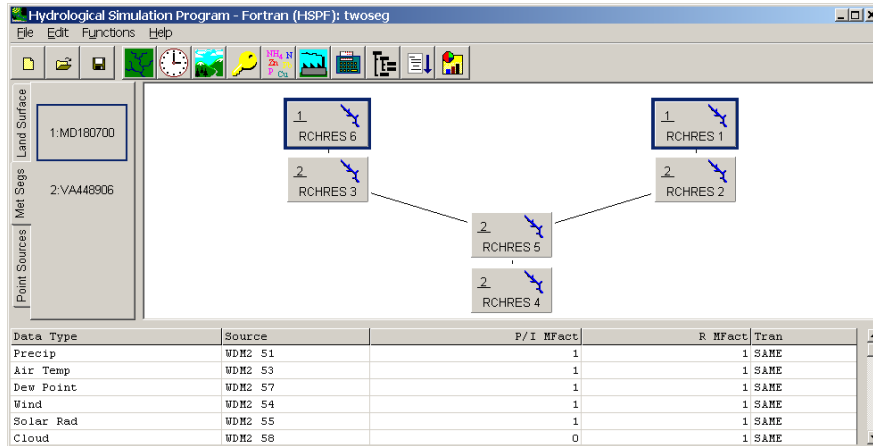
Notice that the blocks corresponding to RCHRES 1 and RCHRES 6 are highlighted, and that these blocks have a "1" in the upper left corner. This means that they are assigned to met segment "1", the BELTSVILLE station.

3.   Click on the button that corresponds to the second met segment, [2:VA448906]. Your schematic should look like the following:
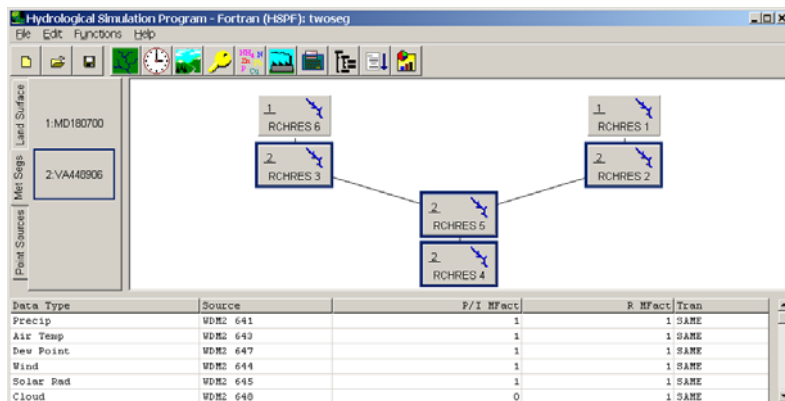
Now RCHRES 2 through RCHRES 5 are highlighted and have a "2" in the upper left corner. This means they have been assigned to the second met segment (corresponding to the REAGAN-NATIONAL station).

Two other ways to verify that the new met segment was successfully added to the model are to look in the "Land Use Editor" and the "Input Data Editor."

6.   Click the "Land Use Editor" button, ![icon]. Notice that both a 100 series of PERLNDs/IMPLNDs and a 200 series of PERLNDs/IMPLNDs appear in the "Sources – Selected:" box.

7.   Click OK.

8.   Click the "Input Data Editor" button, ![icon].

9.   **Double click** PERLND → PWAT → PWAT-PARM2. Notice that both a 100 series of PERLNDs and a 200 series of PERLNDs appear in the table. The parameters for PERLNDs 201-205 are identical to those for PERLNDS 101-105. You can change parameter values for the new met segment.

10.   Click OK.

11.   Click CLOSE.

D. Dividing a Reach

Closely related to meteorological segmentation is the issue of reach/channel segmentation. In most cases, it is best to consider reach segmentation in watershed delineation, but it is possible to divide a channel after delineation is complete. The following are examples of conditions in which it might be appropriate to segment a reach:

> 1) Significant differences in flow due to either a flow input source or withdrawal (point source, tributary, groundwater seep, diversion)
> 2) Significant changes in channel slope
> 3) Changes in roughness (Manning's N)
> 4) Changes in channel geometry
> 5) Obstructions (dams, etc)

As with watershed delineation, an important factor when considering segmentation is the availability and location of data. Since output from the model is available only at reach outlets, it is best to divide a reach where data is available and/or model output is desired.

For the purposes of this exercise, we will assume the following hypothetical situation: Water quality data has been collected in RCHRES 1 at the midpoint of the reach. We would like to use this data for calibration to ensure that we are modeling the headwaters of the system accurately. Since output is only available at reach outlets, we will break RCHRES 1 into two reaches and appropriately adjust the landuse areas associated with each.

1.   Click the "Input Data Editor" button, [icon].

2.   **Double click** OPN SEQUENCE.

3.   Scroll down and select the record that corresponds to Reach 1 (the reach we would like to split). Your screen should look like the following:

Edit Opn Sequence Block	
Indelt:	60

Operations

Name	Number
PERLND	204
PERLND	205
IMPLND	201
RCHRES	1
RCHRES	6
RCHRES	2
RCHRES	3
RCHRES	5
RCHRES	4

OK   Cancel   Apply   Help   Add   Remove   Edit
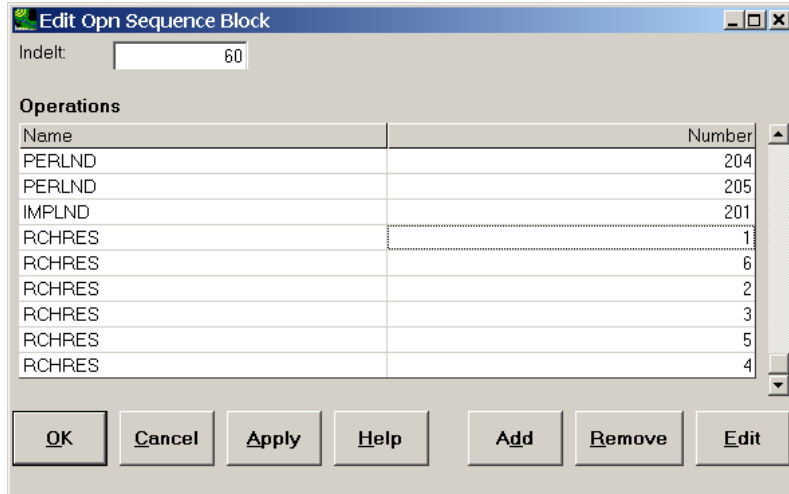
4.   Click ADD.

5.   In the "Operation Type" box, select "RCHRES."

6.   In the "Number' box, enter "7."

7.   In the "Description" box, enter "New Reach."

8.   In the "Upstream Operations" box, select the following: PERLND 101, PERLND 102, PERLND 103, PERLND 104, PERLND 105, and IMPLND 101.

9.   In the 'Downstream Operations" box, select "RCHRES 1."
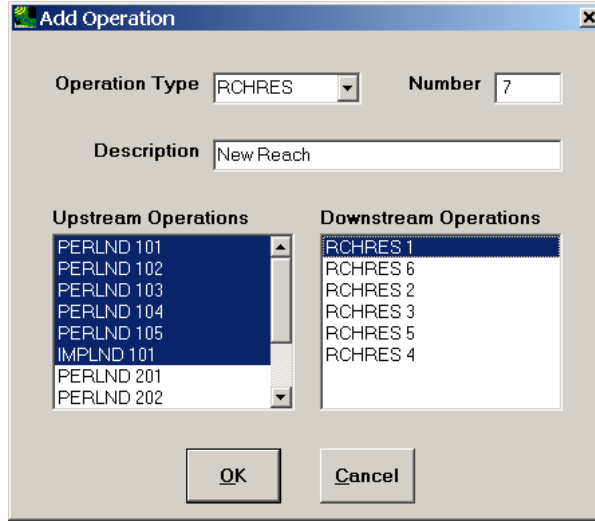
10.   Click OK to exit the "Add Operation" window.

11.   You should see a new record in the "Operations" table; scroll down and notice that
       RCHRES 7 has been added to the list. Click OK to exit the "Opn Sequence Block"
       window.

12.   Click CLOSE.

Next, we will adjust the land use areas that will contribute to the new reach and Reach 1.

13.   Click the "Land Use Editor" button, .

14.   Look at the table (located toward the bottom half of the window). Notice that the
       area values for RCHRES 7 are all "1," signifying 1 acre of area from PERLNDs 101-
       105 and IMPLND 101 to Reach 7. We need to adjust these values to represent the
       amount of area draining to each reach.

Source ID	Source Description	Target ID	Target Description	Area (Acres)
PERLND 101	Urban or Built-up La	RCHRES 7	New Reach	1
PERLND 102	Agricultural Land	RCHRES 7	New Reach	1
PERLND 103	Forest Land	RCHRES 7	New Reach	1
PERLND 104	Barren Land	RCHRES 7	New Reach	1
PERLND 105	Wetlands/Water	RCHRES 7	New Reach	1
IMPLND 101	Urban or Built-up La	RCHRES 7	New Reach	1
PERLND 101	Urban or Built-up La	RCHRES 1	Western Branch Patux	2830.3
IMPLND 101	Urban or Built-up La	RCHRES 1	Western Branch Patux	2830.3
PERLND 102	Agricultural Land	RCHRES 1	Western Branch Patux	6254.9
PERLND 103	Forest Land	RCHRES 1	Western Branch Patux	5785.1
PERLND 104	Barren Land	RCHRES 1	Western Branch Patux	382.4
PERLND 101	Urban or Built-up La	RCHRES 6	North Collington Bra	640.8
IMPLND 101	Urban or Built-up La	RCHRES 6	North Collington Bra	640.8

Total: 53588.3

       For simplification purposes, we will assume that half of the area (for each land use)
       that originally contributed to Reach 1 will now contribute to Reach 7. We will divide

the original contributing areas for Reach 1 in half, and adjust the table accordingly. In practice, you should determine the appropriate proportions of the original land use areas that will contribute to each reach by delineating the area draining to the location of the new sampling station.

15.   Change the areas for RCHRES 1 and RCHRES 7 to the following. Note that there was no land in the Wetlands/Water category contributing to RCHRES 1, so there will likewise be zero acres of Wetlands/Water contributing to RCHRES 7.
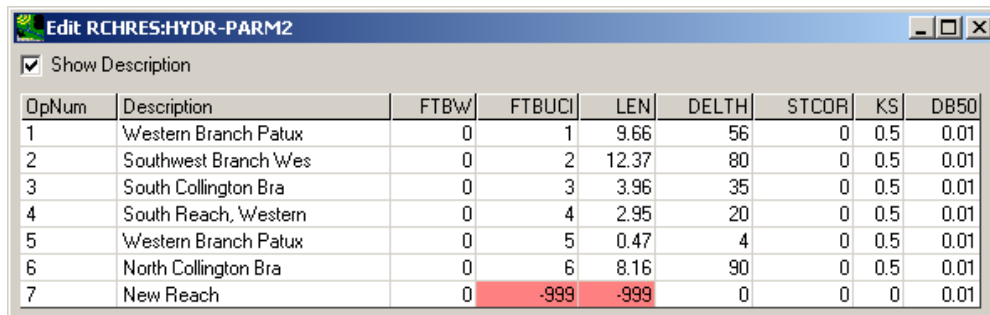
Source ID	Source Description	Target ID	Target Description	Area (Acres)
PERLND 101	Urban or Built-up La	RCHRES 7	New Reach	1415
PERLND 102	Agricultural Land	RCHRES 7	New Reach	3127
PERLND 103	Forest Land	RCHRES 7	New Reach	2892
PERLND 104	Barren Land	RCHRES 7	New Reach	191
PERLND 105	Wetlands/Water	RCHRES 7	New Reach	0
IMPLND 101	Urban or Built-up La	RCHRES 7	New Reach	1415
PERLND 101	Urban or Built-up La	RCHRES 1	Western Branch Patux	1415
IMPLND 101	Urban or Built-up La	RCHRES 1	Western Branch Patux	1415
PERLND 102	Agricultural Land	RCHRES 1	Western Branch Patux	3127
PERLND 103	Forest Land	RCHRES 1	Western Branch Patux	2892
PERLND 104	Barren Land	RCHRES 1	Western Branch Patux	191
PERLND 101	Urban or Built-up La	RCHRES 6	North Collington Bra	640.8
IMPLND 101	Urban or Built-up La	RCHRES 6	North Collington Bra	640.8

Note also that there will be a small difference between the original total and the new total area shown in this window, and that is anticipated since we're not being precise here. Keep in mind that a single acre of each land use was assumed when we added RCHRES 7, and there is some rounding error.

16.   Click OK.

17.   Click the "Input Data Editor" button, .

18.   **Double click** RCHRES → HYDR → HYDR-PARM2. The table should look like the following:

OpNum	Description	FTBW	FTBUCI	LEN	DELTH	STCOR	KS	DB50
1	Western Branch Patux	0	1	9.66	56	0	0.5	0.01
2	Southwest Branch Wes	0	2	12.37	80	0	0.5	0.01
3	South Collington Bra	0	3	3.96	35	0	0.5	0.01
4	South Reach, Western	0	4	2.95	20	0	0.5	0.01
5	Western Branch Patux	0	5	0.47	4	0	0.5	0.01
6	North Collington Bra	0	6	8.16	90	0	0.5	0.01
7	New Reach	0	-999	-999	0	0	0	0.01

Edit RCHRES:HYDR-PARM2 — ☑ Show Description

Notice that there are two cells that are highlighted pink and have values of "-999." We need to adjust these values so that they represent the new reach. FTBUCI is the user's number for the F-Table that contains the geometric and hydraulic properties of the RCHRES.

19.   In the cell that corresponds to Reach 7 ("OpNum" = 7) and "FTBUCI," enter "7."

LEN is the length of the reach. We will assume that we divided Reach 1 in the center, and that the resultant reaches will be half as long as the original Reach 1. We need to adjust the lengths for Reach 1 and Reach 7.

20.   In the cell that corresponds to Reach 1 ("OpNum" =1) and "LEN," enter "4.83."

21.   In the cell that corresponds to Reach 7 ("OpNum" = 7) and "LEN," enter "4.83."

DELTH is the drop in water elevation from the upstream to the downstream extremities of the RCHRES. We need to adjust the change in elevation for Reach 1 and Reach 7. For simplification purposes, we will assume that the original Reach 1 had uniform slope and that the changes in elevation for Reach 1 and Reach 7 will both be half of the elevation change for the original Reach 1. Keep in mind that in practice, you should figure out the actual changes in elevation for the respective reaches.

22.   In the cell that corresponds to Reach 1 and "DELTH," enter "28."

23.   In the cell that corresponds to Reach 7 and "DELTH," enter "28."

KS is the weighting factor for hydraulic routing, and STCOR is the correction to the RCHRES depth to calculate stage. We will assume that the "STCOR" and "KS" values for both Reach 1 and Reach 7 are the same as for the original Reach 1.

24.   In the cell that corresponds to Reach 7 and "STCOR" enter "3.2". In the cell that corresponds to Reach 7 and "KS" enter "0.5". The HYDR-PARM2 table should look like the following:

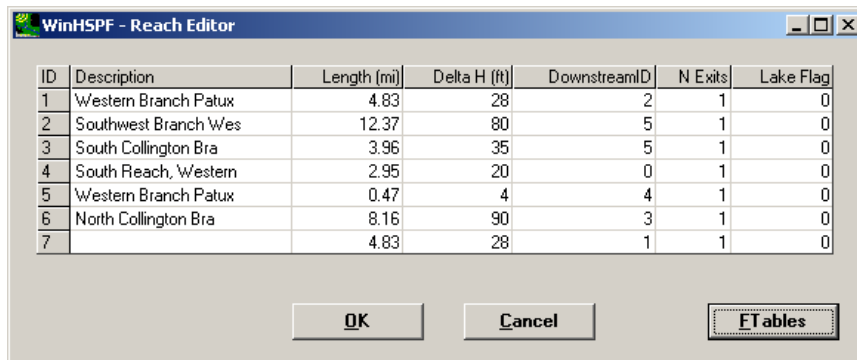| OpNum	Description	FTBW	FTBUCI	LEN	DELTH	STCOR	KS	DB50
1	Western Branch Patux	0	1	4.83	28	3.2	0.5	0.01
2	Southwest Branch Wes	0	2	12.37	200	3.2	0.5	0.01
3	South Collington Bra	0	3	3.96	3	3.2	0.5	0.01
4	South Reach, Western	0	4	2.95	7	3.2	0.5	0.01
5	Western Branch Patux	0	5	0.47	0	3.2	0.5	0.01
6	North Collington Bra	0	6	8.16	102	3.2	0.5	0.01
7	New Reach	0	7	4.83	28	3.2	0.5	0.01

25.   Click APPLY.

26.   Click OK to exit the HYDR-PARM2 table.

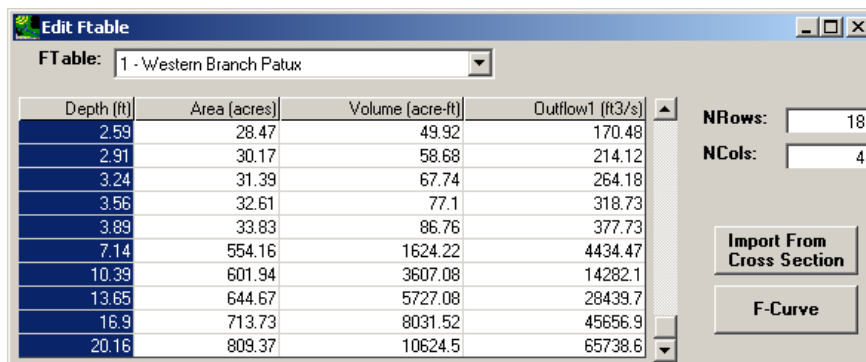27.   Click CLOSE to exit the "Input Data Editor."

We will now adjust the reach properties of Reach 1 and Reach 7. We will assume that both of the reaches will retain the same characteristics (channel geometry, stage-discharge

relationship, etc) as the original reach. The F-table for Reach 7 is (by default) blank and the F-table for Reach 1 contains the values for the original reach. Recall that the F-table for each reach has four fields: depth, area (surface), volume, and discharge. We can keep the values found in Reach 1's F-table for the depth and discharge fields and enter the same values for Reach 7's F-table; however, we will need to divide the surface area and volume values by two and use those values for the "area" and "volume" fields in the tables for both reaches.

28.   Click the "Reach Editor" button, ⬛. Your screen should look like the following (notice that there is no description for Reach 7):

ID	Description	Length (mi)	Delta H (ft)	DownstreamID	N Exits	Lake Flag
1	Western Branch Patux	4.83	28	2	1	0
2	Southwest Branch Wes	12.37	80	5	1	0
3	South Collington Bra	3.96	35	5	1	0
4	South Reach, Western	2.95	20	0	1	0
5	Western Branch Patux	0.47	4	4	1	0
6	North Collington Bra	8.16	90	3	1	0
7		4.83	28	1	1	0

| OK | Cancel | FTables |

29.   In the cell that corresponds to Reach 7 ("ID" = 7) and "Description," enter "New Reach."

30.   Click FTABLES.

31.   From the "FTable" menu, select "1- Western Branch Patux." Highlight all the values in the "Depth" column by clicking on the column heading.

Edit Ftable

FTable: 1 - Western Branch Patux

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (ft3/s)
2.59	28.47	49.92	170.48
2.91	30.17	58.68	214.12
3.24	31.39	67.74	264.18
3.56	32.61	77.1	318.73
3.89	33.83	86.76	377.73
7.14	554.16	1624.22	4434.47
10.39	601.94	3607.08	14282.1
13.65	644.67	5727.08	28439.7
16.9	713.73	8031.52	45656.9
20.16	809.37	10624.5	65738.6

NRows: 18
NCols: 4

Import From Cross Section

F-Curve

32.   Press Ctrl + C to copy the values.

33.   From the "FTable" menu, select "7 – New Reach."

34.   In the "NRows:" box, enter "8".

35.   In the "NCols:" box, enter "4".

36.　　Highlight all the cells in the "Depth" menu by clicking on the column heading.

37.　　Press CTRL + V to paste the values (from Reach 1) to the column.

　　　Note: You may need to click in a cell and retype a value before the APPLY button will become active.

38.　　Click APPLY.

39.　　From the "FTable" menu, select "1- Western Branch Patux." Highlight all the values in the "Outflow" column by clicking on the column heading.

40.　　Press Ctrl + C to copy the values.

41.　　From the "FTable" menu, select "7 – New Reach."

42.　　Highlight all the cells in the "Outflow" menu by clicking on the column heading.

43.　　Press CTRL + V to paste the values (from Reach 1) to the column.

44.　　Click APPLY.

45.　　From the "FTable" menu, select "1- Western Branch Patux." Enter the following values for the "Area" and "Volume" columns.

Depth	**Area**	**Volume**	Outflow
0	**29.8**	**0**	0
0.24	**30.1**	**7.1**	4.56
2.38	**32.6**	**74.2**	210.66
2.97	**33.3**	**93.7**	305.36
3.71	**100.2**	**167.5**	392.25
4.46	**102.0**	**242.6**	717.99
76.5	**270.7**	**13665.**	297940.8
148.54	**439.4**	**39243.**	1240442

46.　　Click APPLY.

47.　　From the "FTable" menu, select "7 – Lower Western Branch." Enter the values from the table above for the "Volume" and "Area" columns.

48.　　Click APPLY.

49.　　Click OK to exit the "Edit Ftable" window.

50.　　Click OK to exit the "Reach Editor" window.

We now need to specify that Reach 7 will be associated with the new met segment that we

created.

51.   Click the "Simulation Time and Meteorological Data" button, [clock icon].

52.   Scroll down until you see the record for RCHRES 7. Notice that there is no
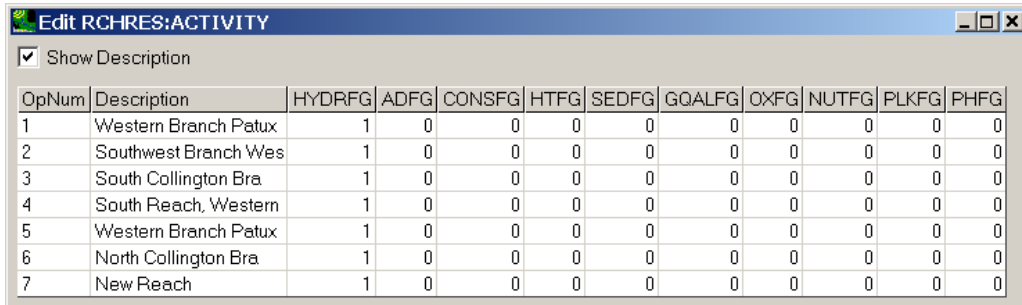   meteorological segment assigned to Reach 7.
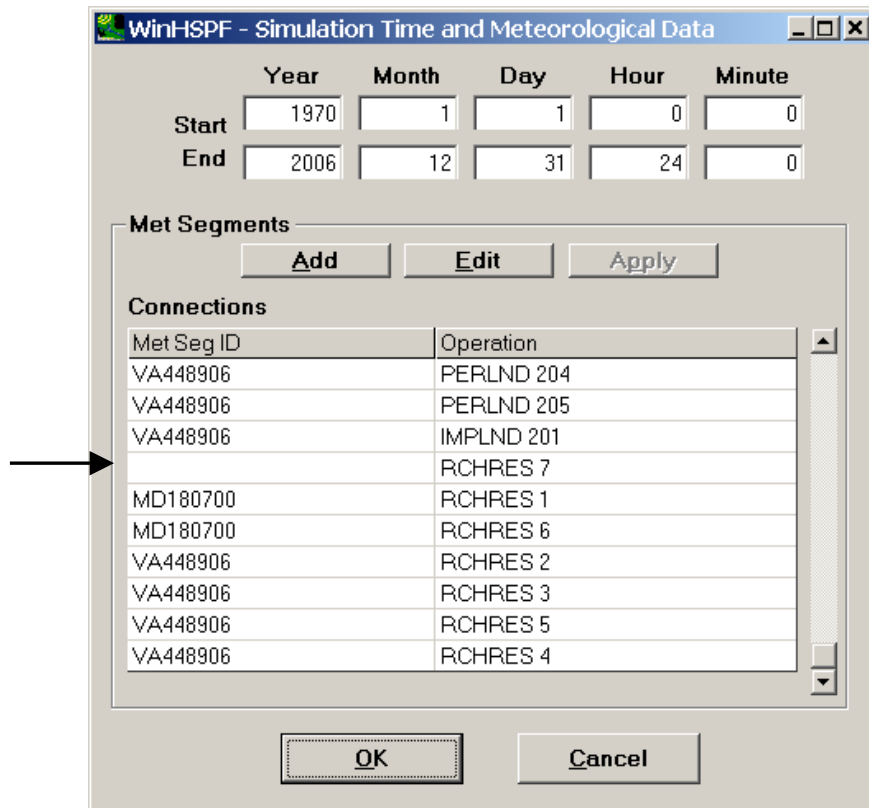
53.   **Double click** the cell that corresponds to RCHRES 7 and "Met Seg ID." Select
        "MD180700" from the menu.

54.   Click APPLY. The following message will appear:

55.   Click OK.

56.   Click OK to exit the "Simulation Time and Meteorological Data" window.

        Note: If you want to run the model, you will need to click the "Input Data Editor"

button, **Double click** RCHRES → GENERAL → ACTIVITY and change the value of HYDRFG (the flag indicating that the status of the HYDR module for each reach) is "1" or "on."

OpNum	Description	HYDRFG	ADFG	CONSFG	HTFG	SEDFG	GQALFG	OXFG	NUTFG	PLKFG	PHFG
1	Western Branch Patux	1	0	0	0	0	0	0	0	0	0
2	Southwest Branch Wes	1	0	0	0	0	0	0	0	0	0
3	South Collington Bra	1	0	0	0	0	0	0	0	0	0
4	South Reach, Western	1	0	0	0	0	0	0	0	0	0
5	Western Branch Patux	1	0	0	0	0	0	0	0	0	0
6	North Collington Bra	1	0	0	0	0	0	0	0	0	0
7	New Reach	1	0	0	0	0	0	0	0	0	0

Edit RCHRES:ACTIVITY — ☑ Show Description

References:

Singh, Vijay P. <u>Kinematic Wave Modeling in Water Resources</u>. New York: John Wiley & Sons. 1997.