

INTRODUCTION TO HYDROLOGIC MODELING USING HEC-HMS

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SEMINAR OUTLINE

- Overview of hydrologic modeling using HEC-HMS
- HEC-HMS technical capabilities
- Components of a HEC-HMS hydrologic model
- Introduction to HEC-HMS
- HEC-HMS example problems
 - Group example (simple detention)
 - Individual examples (complex detention)

HYDROLOGIC MODELING OVERVIEW



U.S. Environmental Protection Agency



US Army Corps of Engineers

Hydrologic Engineering Center

A. Recent History (State-of-the-Practice)

1. DOS based - batch data models (before 1990)
2. Pre- and post processors (1990-1995)
3. Windows pre- and post-processors (1993-1997)
4. Windows GUI models (present)
5. GIS based models (present and future)

HEC-1 IN DOS

	10	20	30	40	50	60	70	80	90
	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.	.2.4.6.8.
40	<u>KKPondB3</u>								
41	KM								
42	RS	1.	STOR	0.					
43	SV	0.	0.45	2.42	2.60	3.25	4.07	5.72	
44	SE	758.2	760.0	762.0	762.11	762.5	763.0	764.0	
45	SQ	1.1	1.4	1.8	1.81	14.9	200.6	2219.7	
46	*								
47	KK	B2							
48	KM	RUNOFF FROM B2							
49	BA	0.011							
50	LS	0	81	0					
51	UD	0.564							
52	*								
53	KK	<u>BatFO</u>	Sum of B1 and B2 as B area crosses Fair Oaks Rd						
54	HC	2							
55	*								
56	KK	B1							
57	KM	RUNOFF FROM B1							
58	BA	0.135							
59	LS	0	75	0					
60	UD	0.540							
61	*								
62	KKB	<u>atWB</u>	Sum of all B areas at West Branch DuPage River						
63	HC	2							
64	*								
65	KK	C6	RUNOFF FROM C6						
66	BA	0.022							
67	LS	0	83	0					
68	UD	0.330							
69	*								
70	<u>KKPondC6</u>								

HEC-HMS IN WINDOWS

The screenshot displays the HEC-HMS 4.0 software interface. The title bar indicates the project file is located at `C:\Users\sherry\Documents\Example_1\Example_1.hms`. The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation.

The left sidebar shows a project tree structure:

- Example 1
 - Basin Models
 - Basin 1
 - Subbasin-1
 - Reservoir-1
 - Meteorologic Models
 - Control Specifications
 - Time-Series Data
 - Paired Data

The main workspace, titled "Basin Model [Basin 1]", contains a diagram showing a connection between "Subbasin-1" and "Reservoir-1".

The bottom-left panel is titled "Reservoir" and "Options". It displays the following configuration for "Basin Name: Basin 1" and "Element Name: Reservoir-1":

- Description:
- Downstream: --None--
- Method: Outflow Curve
- Storage Method: Elevation-Storage-Discharge
- *Stor-Dis Function: Pond1
- *Elev-Stor Function: Pond1
- Primary: Storage-Discharge
- Initial Condition: Inflow = Outflow

The bottom-right panel shows a log of system messages:

- NOTE 10008: Finished opening project "Example 1" in directory "C:\Users\sherry\Documents\Example_1" at time 25Mar2014, 09:40:13.
- NOTE 10179: Opened basin model "Basin 1" at time 25Mar2014, 09:40:17.

HEC-HMS WEBSITE

- The latest version of HEC-HMS is available for download at the following website:

<http://www.hec.usace.army.mil/software/hec-hms/>

- Additional information available on website:
 - Quick Start Guide
 - User's Manual
 - Technical Reference Manual
 - Release notes

TECHNICAL CAPABILITIES

Precipitation

- gaged storms
- design storms



- lumped (precipitation and losses spatially averaged over the subbasin), or
- linear-distributed (precipitation and losses specified for grid cells for radar R/F data)

TECHNICAL CAPABILITIES

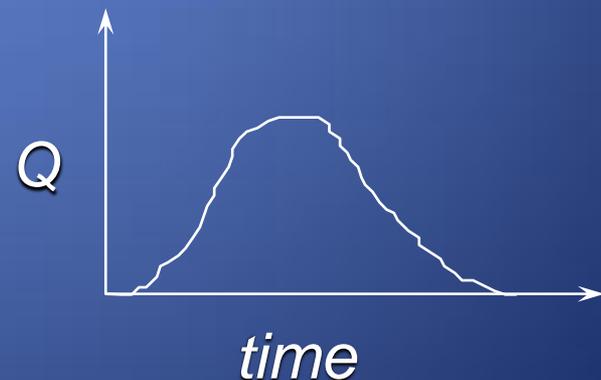
Rainfall Losses (abstractions)

- initial/constant
- SCS curve number
- SMA (5 layer)
- deficit/constant rate (DC) and gridded DC
- Green and Ampt
- exponential
- gridded SCS & SMA

TECHNICAL CAPABILITIES

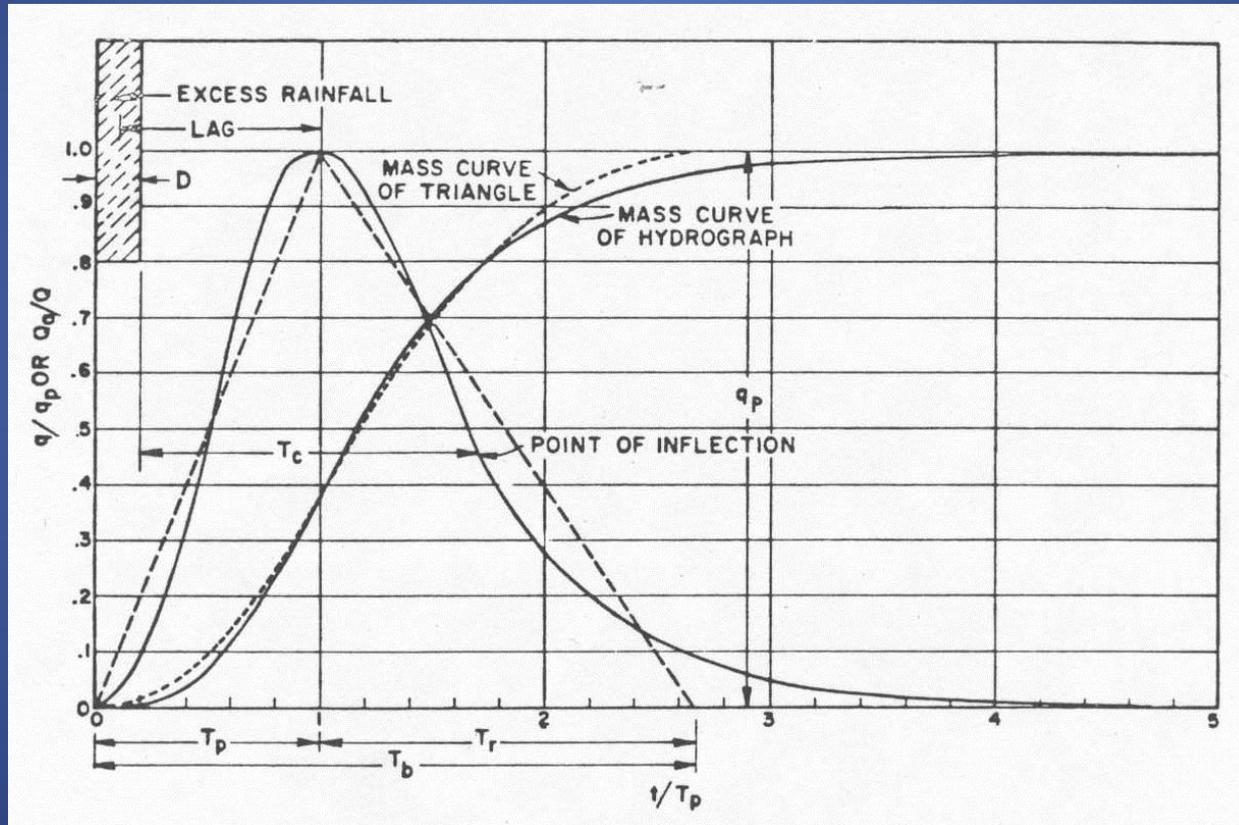
Runoff Transformation

- unit hydrograph (user specified UH or S-graph, Clark, Snyder, or SCS methods)
- modified Clark (for gridded meteorological data)
- kinematic wave (up to 2 overland flow planes, 2 collector channels, and a main channel)



SCS UNIT HYDROGRAPH

Hydrologic modeling in the WMO must use the SCS unit hydrograph (shown below).

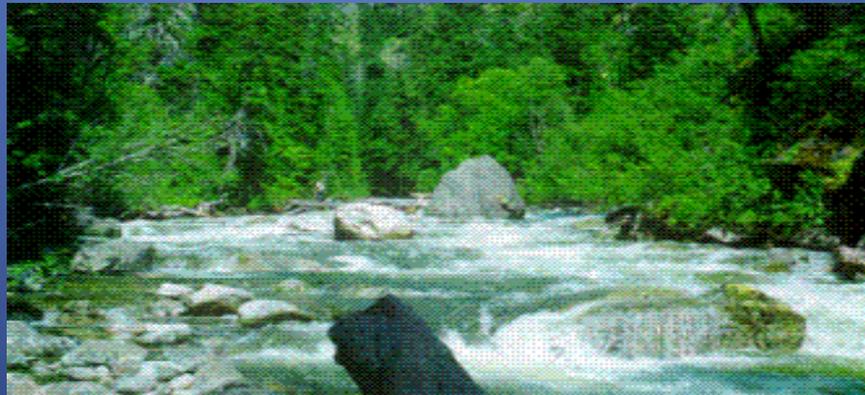


The rainfall hyetograph is used with the unit hydrograph to develop the storm hydrograph using hydrograph convolution.

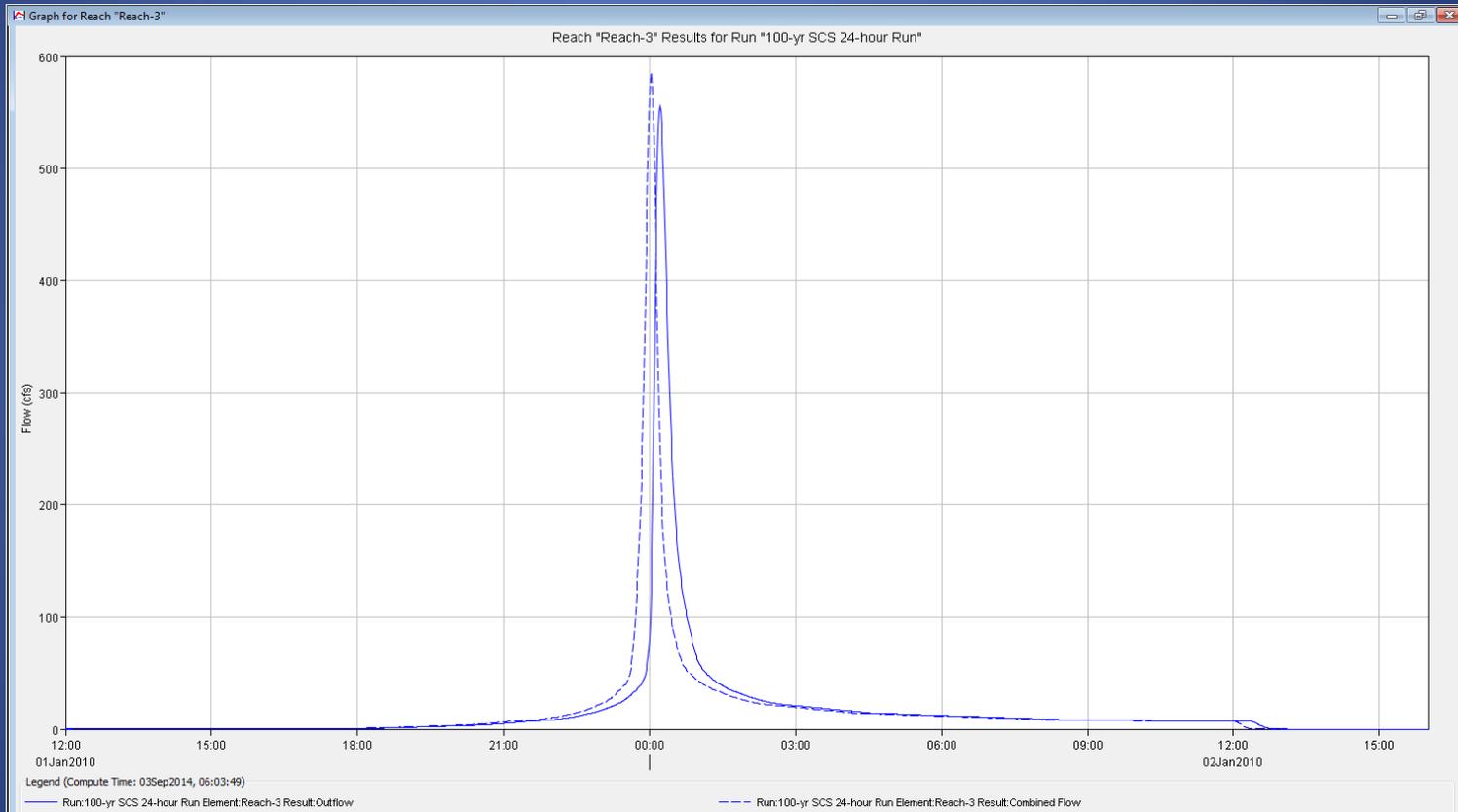
TECHNICAL CAPABILITIES

Routing (channel)

- simple lag
- straddle-stagger
- modified Puls
- kinematic wave
- Muskingum
- Muskingum-Cunge (standard shapes)
- Muskingum-Cunge (8 pt.)



Channel Routing



Trib Area = 110 acres, Routing using Muskingum Cunge
 $L = 3200$ ft, $S = 0.009$, $n = 0.08$, Trapezoid with $W = 60'$ and 2H:1V

RESERVOIR ROUTING CAPABILITIES



- Attenuation of a hydrograph from any storage element (ponds, wetlands, infiltration devices)
- Outflow calculations from either 1) user supplied storage-outflow, elev-storage-outflow, or elev-area-outflow; or 2) user supplied elev-storage or elev-area and defined outlet structures (up to 10 spillways and 10 outlets). Note: Spillway outflow can also be determined from user supplied elev-discharge data.

RESERVOIR ROUTING CAPABILITIES (cont.)



- Outlets can be orifices or culverts (up to 9 shapes from FHWA design charts which will compute outlet control)
- Backwater Effects (constant or elev-discharge)
- Dam Break and Pump Capabilities
- Reservoir Dam Seepage

RESERVOIR ROUTING METHOD

Modified Puls Routing ==> Limitations:

- No rule-operational gates allowed
- Monotonically Increasing Relationship Between Storage and Outflow
- No ponds in series (unless constant tailwater)



METHODOLOGY USED BY HEC-HMS

$$I - O = \frac{\Delta S}{\Delta t}$$

Where: I = inflow; O = outflow; S = storage; and t = time interval

$$I(\Delta t) - O(\Delta t) = \Delta S$$

If t_1 and t_2 are used to indicate time t and Δt

$$\frac{(I_1 + I_2) \Delta t}{2} - \frac{(O_1 + O_2) \Delta t}{2} = S_2 - S_1$$

Rearranging knowns and unknowns yields:

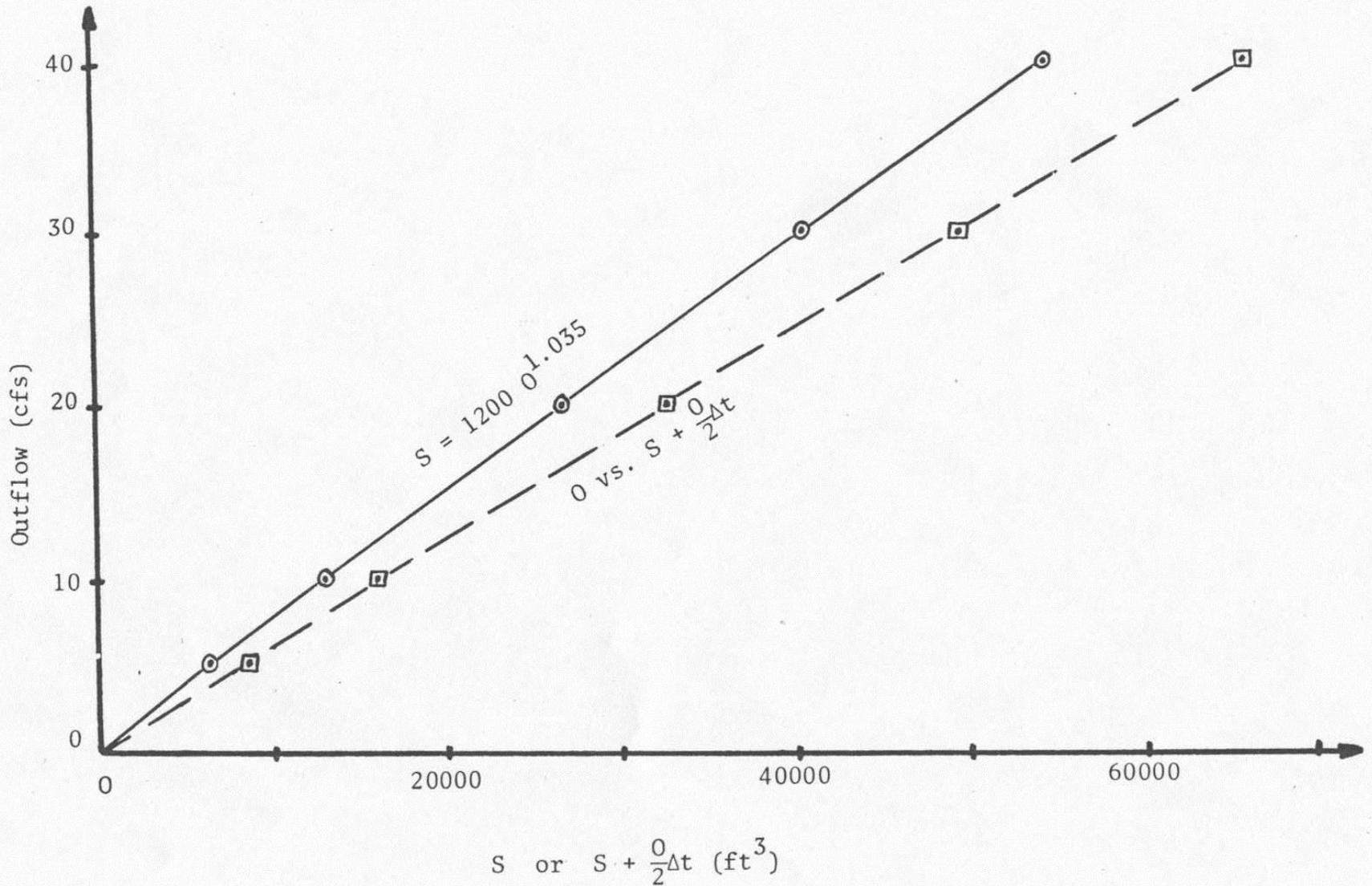
$$\frac{(I_1 + I_2) \Delta t}{2} + S_1 - \frac{O_1 \Delta t}{2} = S_2 + \frac{O_2 \Delta t}{2}$$

METHODOLOGY USED BY HEC-HMS

- The procedure used to solve this equation is known as the storage indication method or Modified-Puls method. We know the inflows at all times, the initial storage S_1 and the initial outflow O_1 . After solving for S_2 and O_2 these become the inputs for the next time step. The solution procedure uses curves of

$$S + \frac{O_2 \Delta t}{2} \text{ as shown on the next slide:}$$

METHODOLOGY USED BY HEC-HMS



METHODOLOGY USED BY HEC-HMS

- The routing of the hydrographs through the facility procedure shown in Tabular form:

TABLE 16. Computation of Reservoir Outflow Hydrograph for Example 14-1

(1) Time (min)	(2) Inflow (cfs)	(3) Average Inflow (cfs)	(4) $0.5(I_1 + I_2)\Delta t$	(5) $S_1 - 0.5Q$ $S - 0.5 Q \Delta t$	(6) $S_2 + \frac{Q_2}{2}$ $S + 0.5 Q \Delta t$	(7) Outflow (O) (cfs)	(8) Storage (S) (ft ³)
0	0 - I						
		7.5	4500	0	4500		0
10	15 - I ₂	25.0	15000	2390 *	17390	2.7	3200
20	35	32.5	19500	3270	22770	10.9	14000
30	30	27.5	16500	14500	31000	14.0	18700
40	25	20.0	12000	19600	31600	19.0	25300
50	15	10.0	6000	20150	26150	19.5	26000
60	5	2.5	1500	16400	17900	16.0	21200
70	0	0	0	11200	11200	11.0	14500
80	0	0	0	6900	6900	7.0	9000
90	0	0	0	3800	3800	4.0	5000
100	0	0	0			2.0	3000

Eqn 37

Fig 21

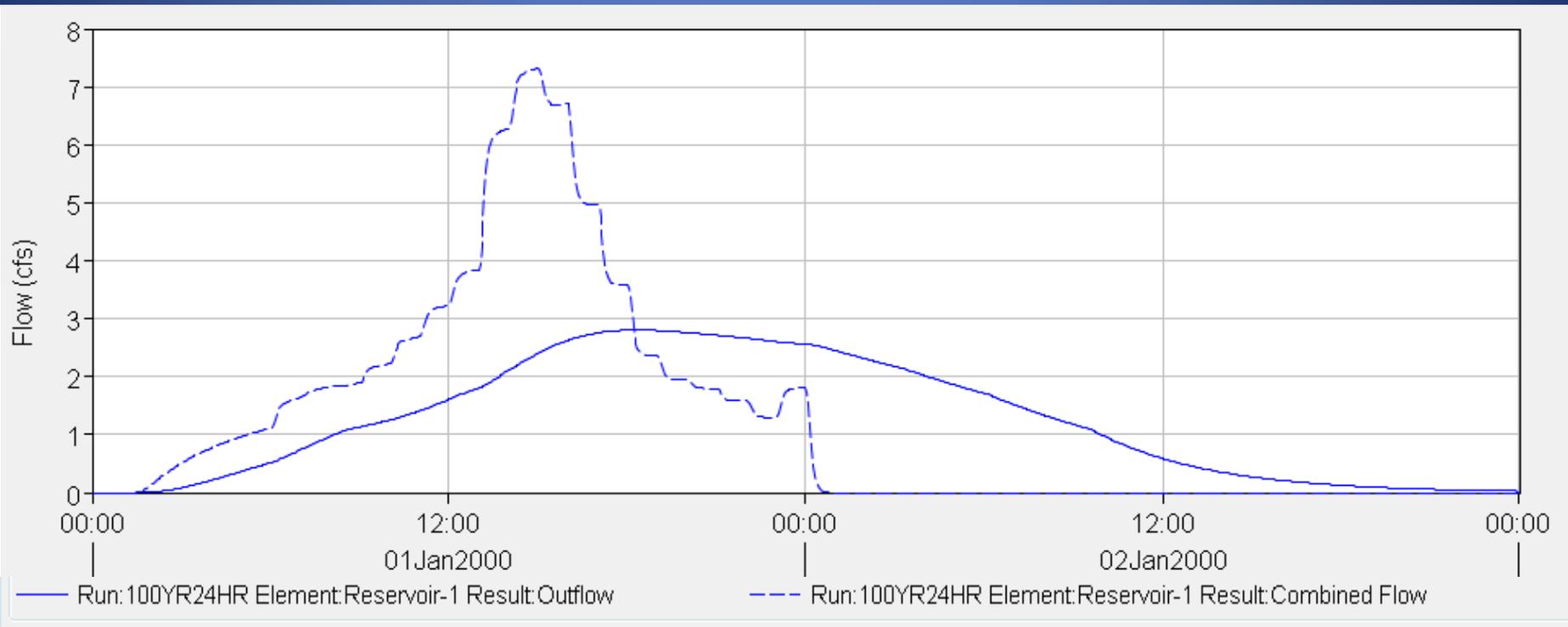
col 4 + col 5

$S = 1200 \times 0^{1.035}$
↑
col 7

$$* 3200 - 0.5Q = 3200 \text{ ft}^3 - (0.5) \frac{2.7 \text{ ft}^3}{\text{sec}} \times 10 \text{ min} \times \frac{60 \text{ sec}}{\text{min}} = 2390 \text{ ft}^3$$

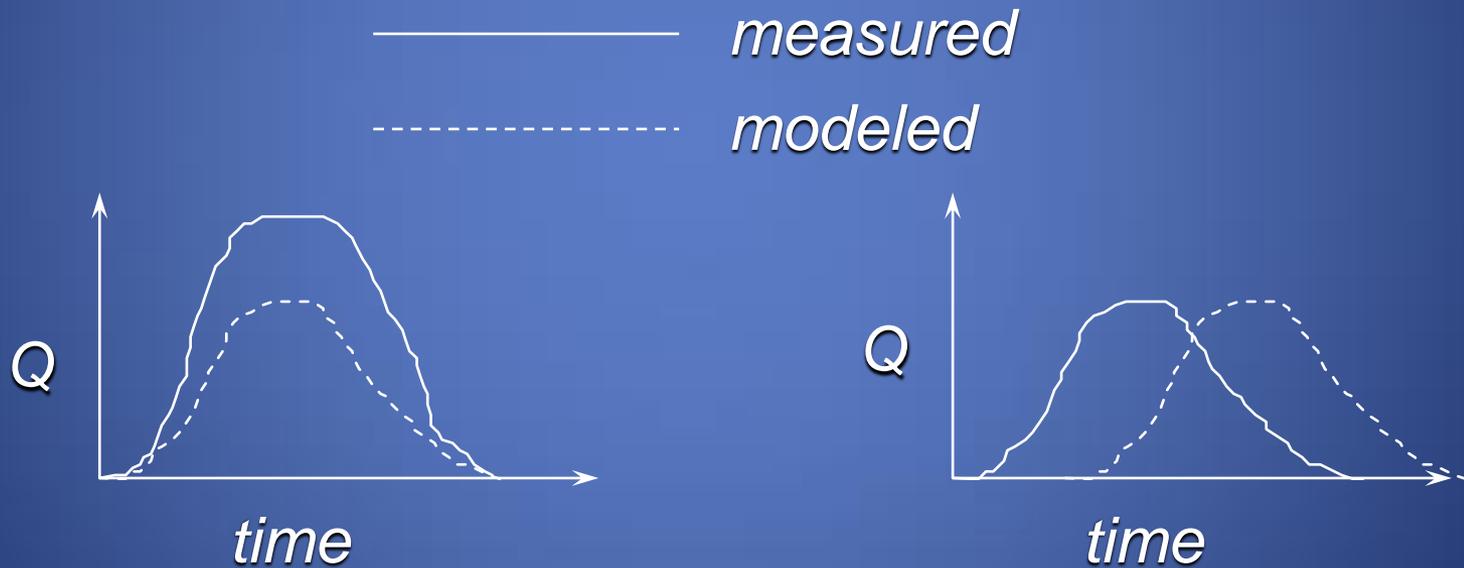
METHODOLOGY USED BY HEC-HMS

- The inflow and outflow hydrographs computed by HEC-HMS are shown graphically



CALIBRATION & VALIDATION

What model parameters would you change if...



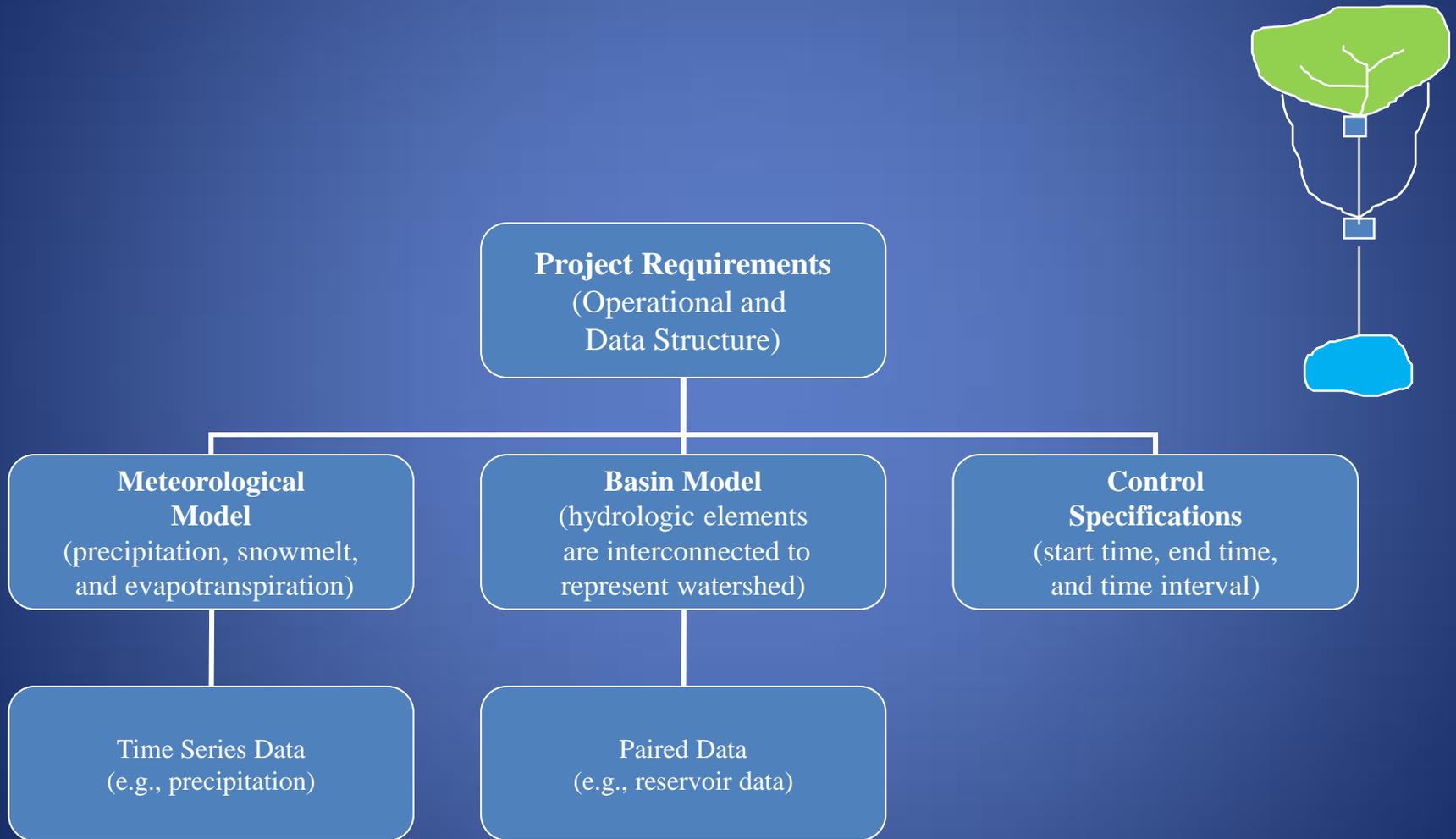
TECHNICAL CAPABILITIES

Additional Capabilities

- diversions and sinks
 - base flow and pumps
 - GIS connection
 - evapotranspiration
 - snowfall/snow melt
 - reservoir routing (w/tailwater) and dam breach
 - parameter optimization
 - hot start – use data from end of previous run
 - land surface erosion and sediment transport*
 - customizable graphs and reports*
- * future versions



HEC-HMS MODEL STRUCTURE



HEC-HMS MODEL COMPONENTS

- Basin Model
 - Physical components of a watershed (subbasins, reservoirs, reaches, etc.)
- Meteorologic Model
 - Specify precipitation events to be simulated by the hydrologic model
 - Can include snowmelt and evapotranspiration
- Control Specifications
 - Start time, end time, and time interval

***You need all 3 components to complete a successful simulation in HEC-HMS**

INPUT DATA COMPONENTS



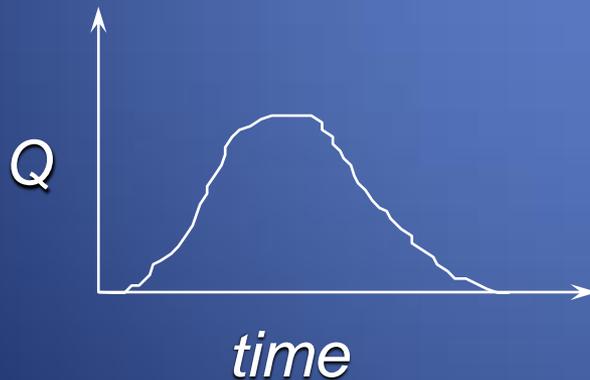
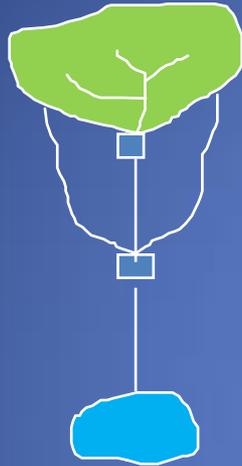
Time Series Data

- Precipitation gages
- Discharge gages
- Stage gages
- Temperature gages
- Etc.

Paired Data

- Storage-discharge
- Elevation-storage
- Inflow-diversion
- Cross sections
- Etc.

WORKING WITH HEC-HMS



Application Steps

- create a new project
- enter Basin Model data
- enter time series & paired data
- enter Met. Model data
- enter Control Specifications
- create and execute a run
- view results (global and element summary tables, time series tables and graphs, and results from multiple elements and multiple runs)
- exit program



WATERSHED EXPLORER

- Example 1
 - Basin Models
 - Basin 1
 - Subbasin-1
 - Reservoir-1
 - Meteorologic Models
 - Control Specifications
 - Time-Series Data
 - Paired Data

Components Compute Results

Reservoir Options

Basin Name: Basin 1
Element Name: Reservoir-1

Description:

Downstream: --None--

Method: Outflow Curve

Storage Method: Elevation-Storage-Discharge

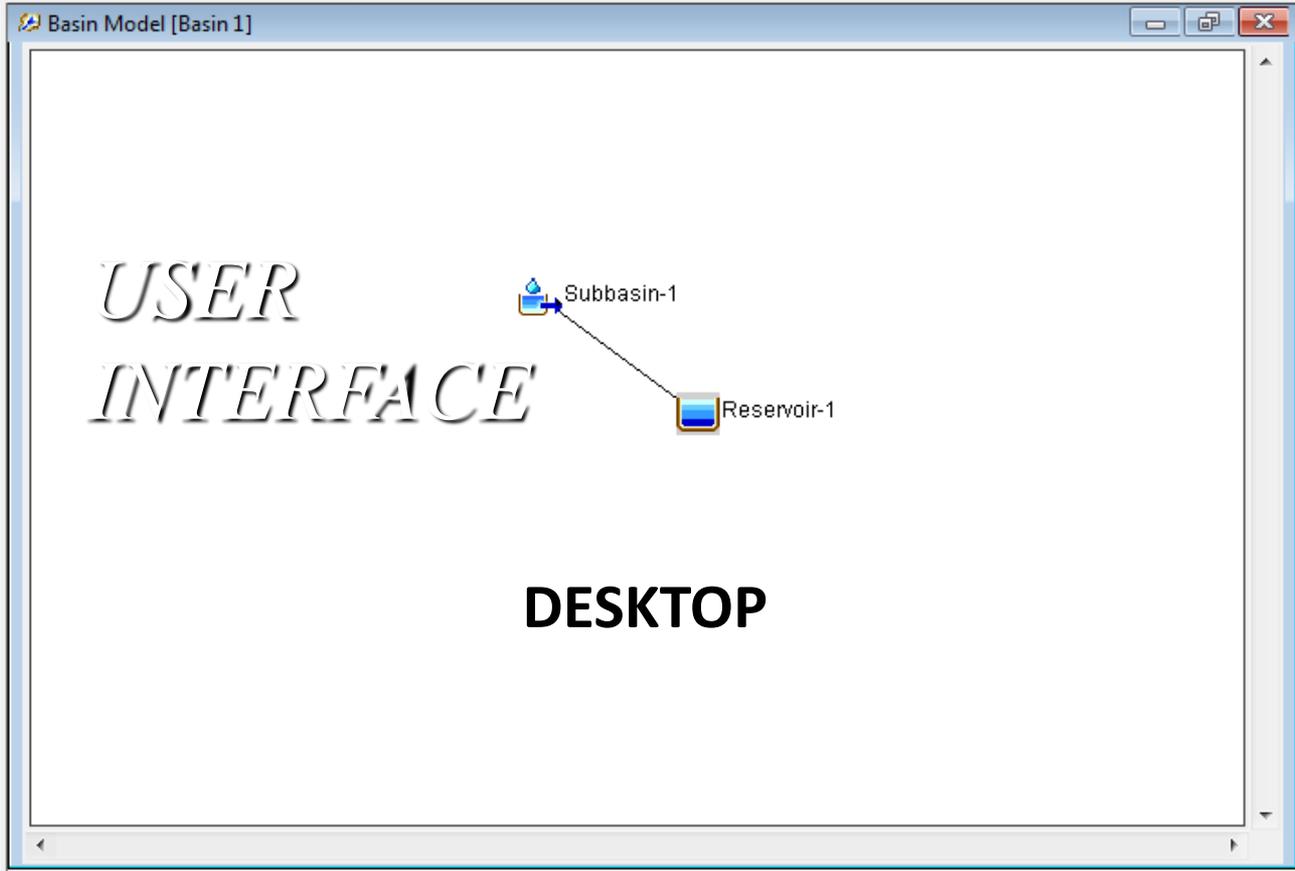
*Stor-Dis Function: Pond1

*Elev-Stor Function: Pond1

Primary: Storage-Discharge

Initial Condition: Inflow = Outflow

COMPONENT EDITOR



DESKTOP

NOTE 10008: Finished opening project "Example 1" in directory "C:\Users\sherry\Documents\Example_1" at time 25Mar2014, 09:40:13.
 NOTE 10179: Opened basin model "Basin 1" at time 25Mar2014, 09:40:17.

MESSAGE LOG

EXAMPLE PROBLEM #1 (GROUP)

Goal of Example:

- Enter Input Data
 - Subbasin Information
 - Rainfall Data
 - Reservoir (Detention) Information
- Run HEC-HMS
 - 100-Year, 24-Hour Storm Event
 - Additional Storm Events
- View Output and Results
 - Tabular Output
 - Flow and Stage Hydrographs

EXAMPLE PROBLEM #1 (GROUP)

Given the following information, determine the required detention volume based on the WMO.

Site Information:

- Site Area = 5 acres
- CN = 93, Proposed Site is 80% Impervious
- Tc = 15 minutes, SCS Lag Time = 9 minutes
- Assume no unrestricted releases from the site

EXAMPLE 1 – STEP 1

Step 1: Determine the required volume control storage for the site.

The curve number for the site is 93, with a total impervious area of 4 acres (80%). The required volume control storage, V_c , for the site is calculated as:

$$V_c = 1'' \times \frac{1 \text{ foot}}{12 \text{ inches}} \times 4 \text{ acres} = 0.33 \text{ acre-feet}$$

EXAMPLE 1 – STEP 2

Step 2: Determine the CN reduction corresponding to volume control calculated in Step 1.

Using the CN Adjustment Calculator spreadsheet, the adjusted curve number is 86.22 (it was assumed that only the required 1" of volume control storage would be provided).

RUNOFF CURVE NUMBER ADJUSTMENT CALCULATOR			
Site Information:			
Total Site Area, A_w (ac) =	5	Total Impervious Area, A_i (ac) =	4
Runoff, R (in) =	6.75		
P = rainfall depth (in) =	7.58		
CN =	93		
S =	0.75		
Runoff Volume Over Watershed, V_w (ac-ft) =	2.81		
Volume of GI Provided:			
Control Volume, V_R =	0.33	ac-ft	1" of volume over impervious area
Additional Volume, V_{GI} =	0.00	ac-ft	Additional volume over the required 1"
Adjusted Volume Over Watershed, $V_{ADJ} = V_w - V_R - V_{GI}$			
V_{ADJ} (ac-ft) =	2.48		
Adjusted Runoff Over Watershed, $R_{ADJ} = \frac{V_{ADJ}}{A_w}$			
R_{ADJ} (in) =	5.95		
S_{ADJ} =	1.60		
Adjusted CN for detention calcs, CN_{ADJ} =	86.22		
*Blue values are entered by user			

EXAMPLE 1 – STEP 3

Step 3: Determine the allowable release rate from the site.

Maximum allowable release rate = $0.30 \text{ cfs/acre} \times 5 \text{ acres} = 1.50 \text{ cfs}$

Maximum allowable release rate – unrestricted release rate = net allowable release rate

The net allowable release rate = $1.50 \text{ cfs} - 0.00 \text{ cfs} = \underline{1.50 \text{ cfs}}$

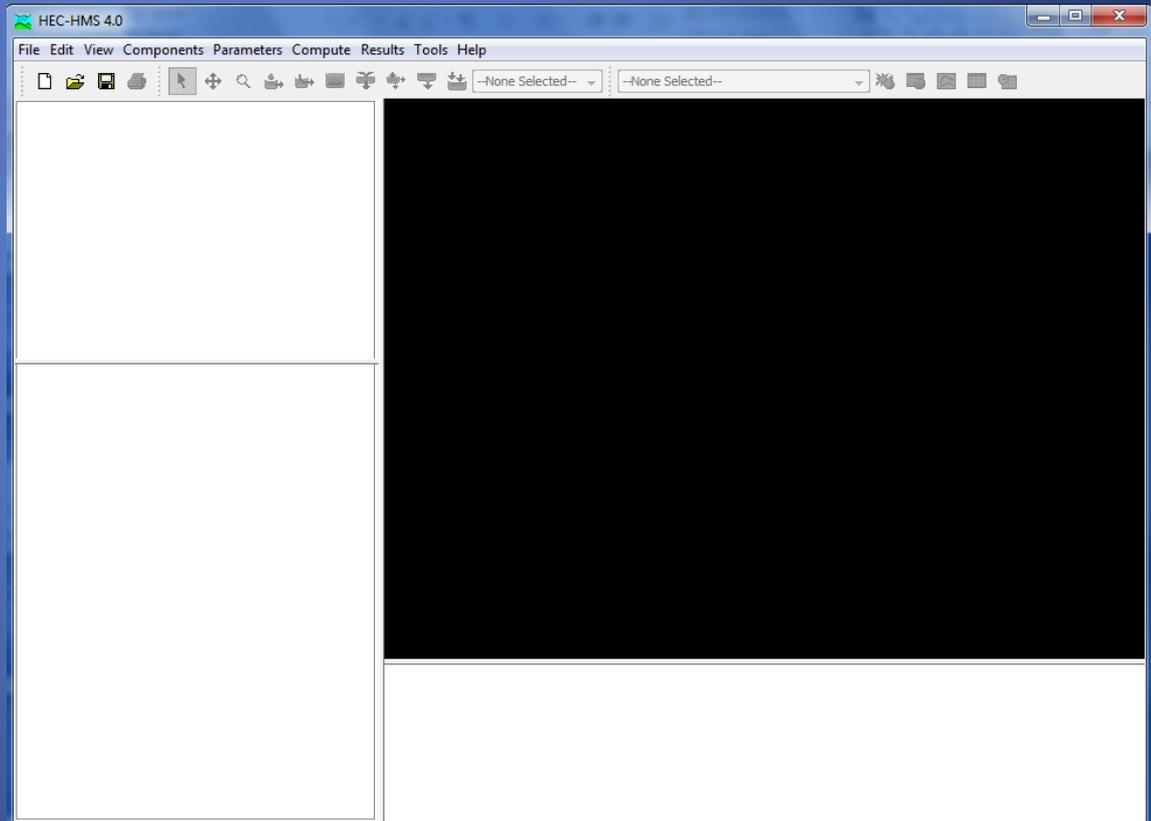
GETTING STARTED

THE INITIAL HEC-HMS SCREEN

- Double-click on the HEC-HMS icon on your desktop

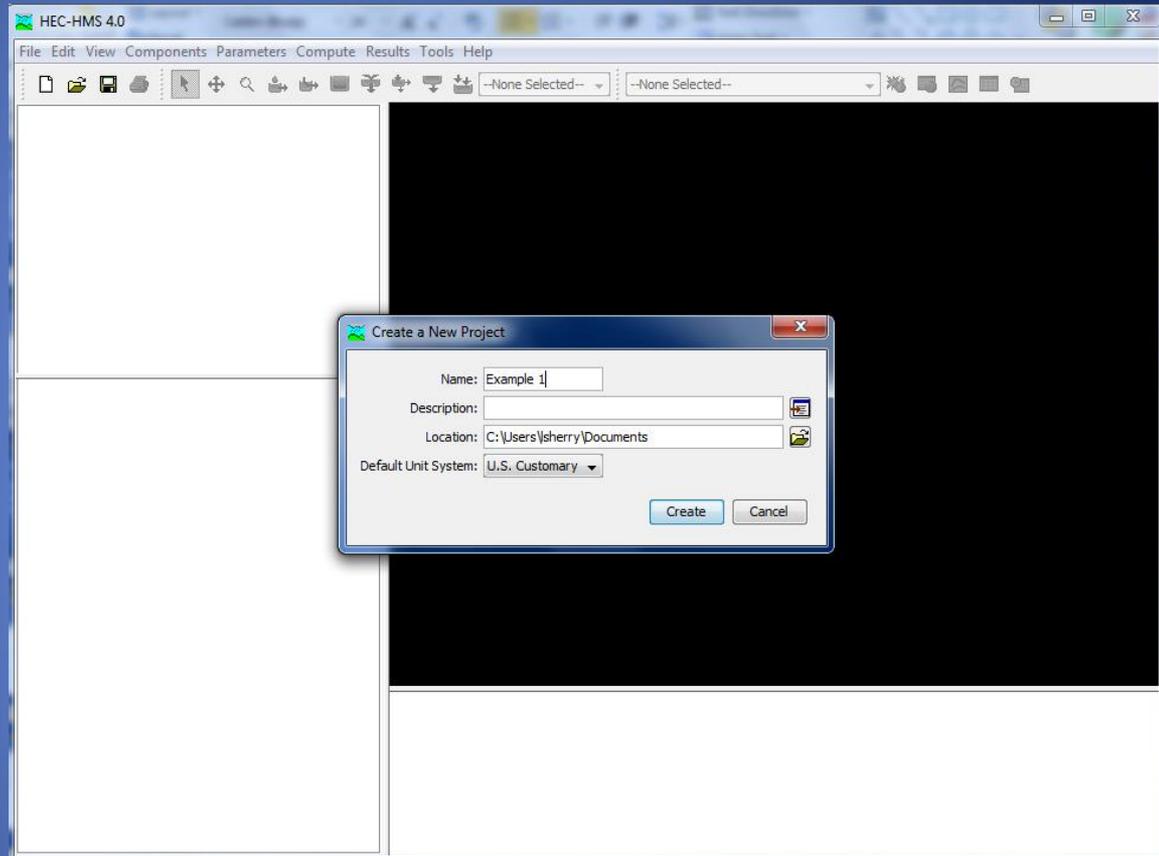


- The following HEC-HMS Screen comes up:



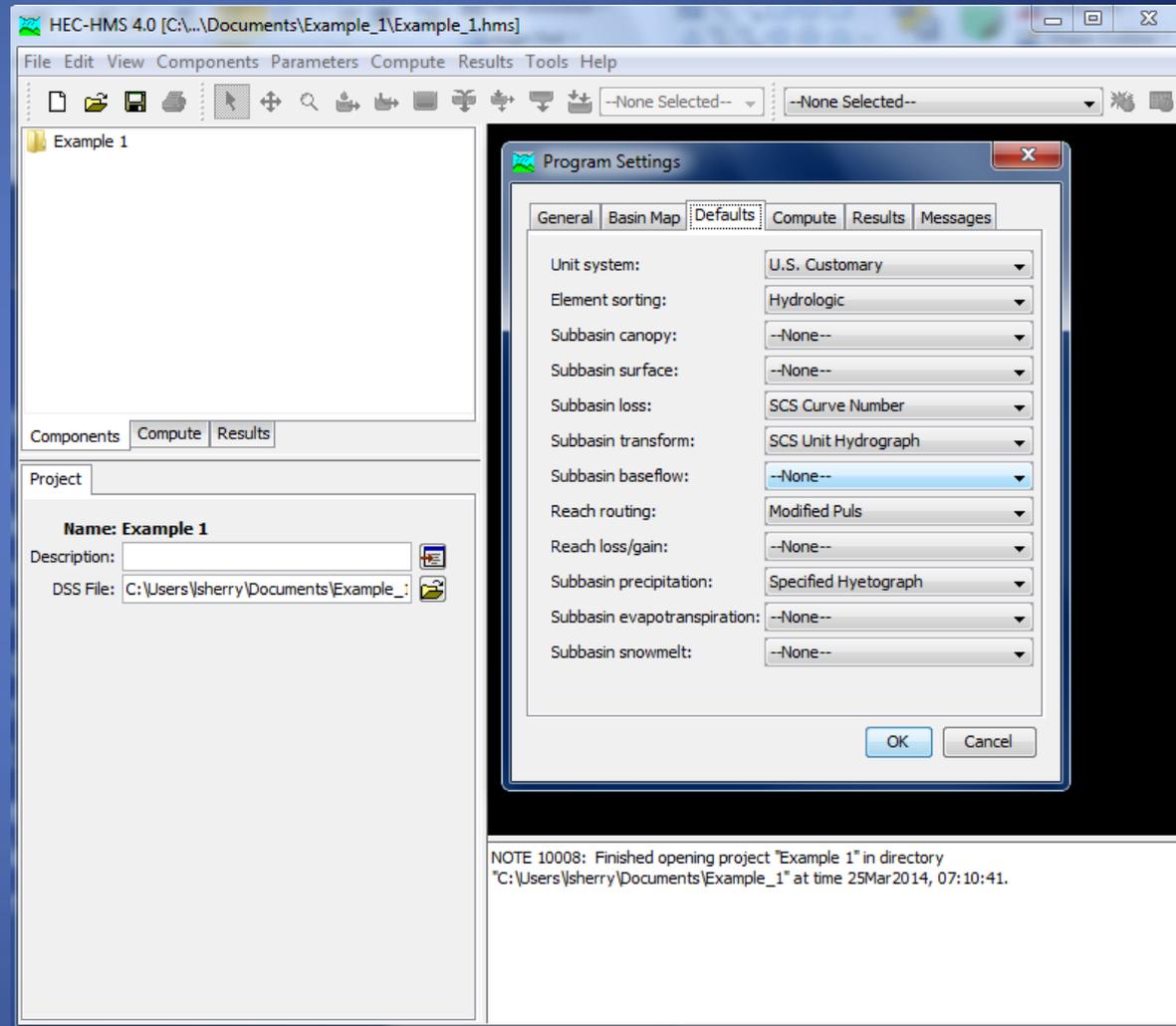
HEC-HMS – SETTING UP A NEW PROJECT

- Click on the “File” menu
- From the drop down menu, select “New”
- Name the new project “Example 1”
- Be sure to set the Default Unit System to “U.S. Customary”



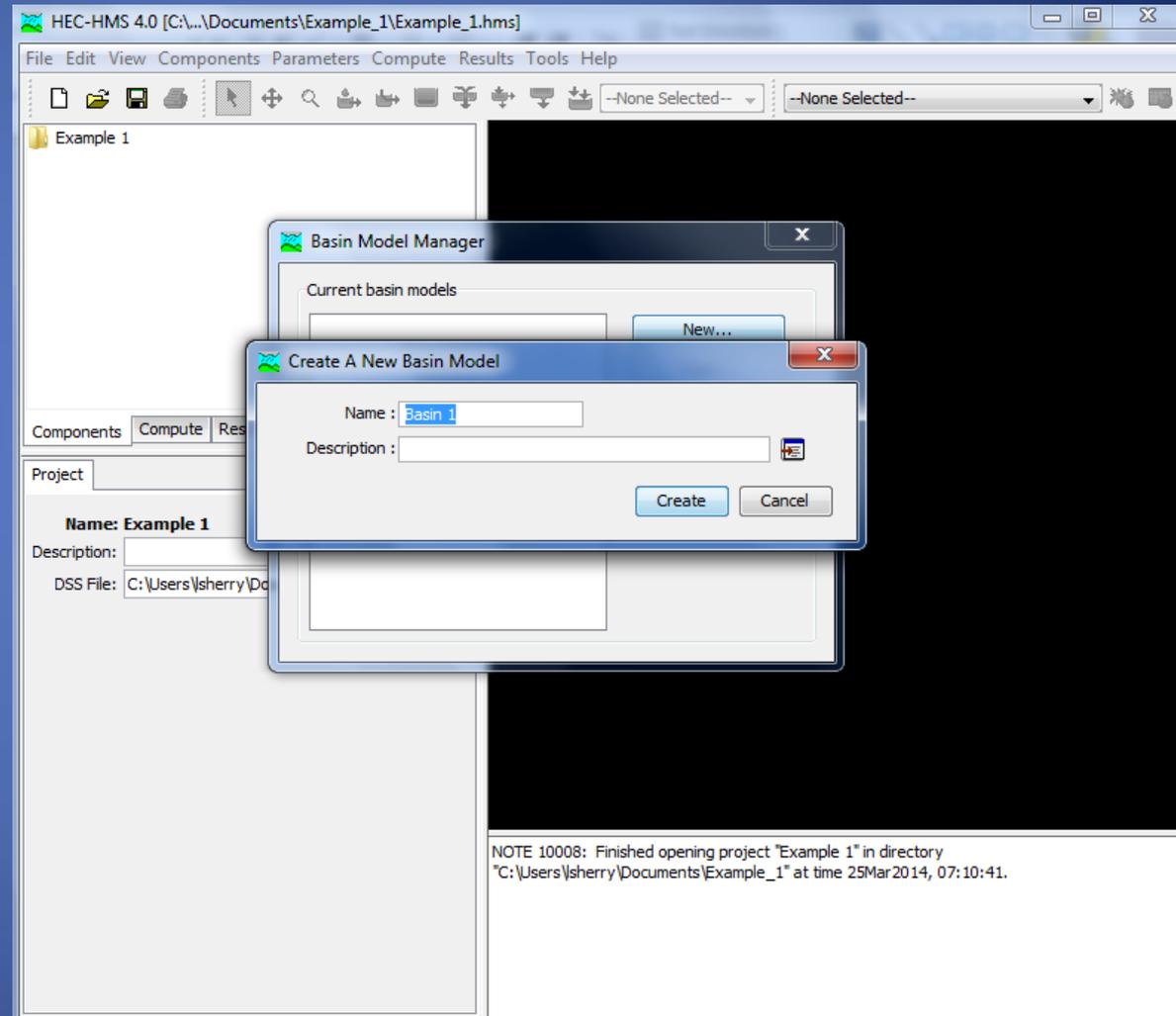
SETTING UP PROJECT DEFAULTS

- Under the **Tools** Menu, go to **Program Settings** and go to the **Defaults** tab
- Specify **SCS Curve Number** for **Subbasin loss**, **SCS Unit Hydrograph** for **Subbasin transform**, **Modified Puls** for **Reach routing**, and **Specified Hyetograph** for **Subbasin precipitation**
- Then go to the **Results** tab and make sure that the values for elevation, volume, flowrate, and depth are taken to 2 decimal places.



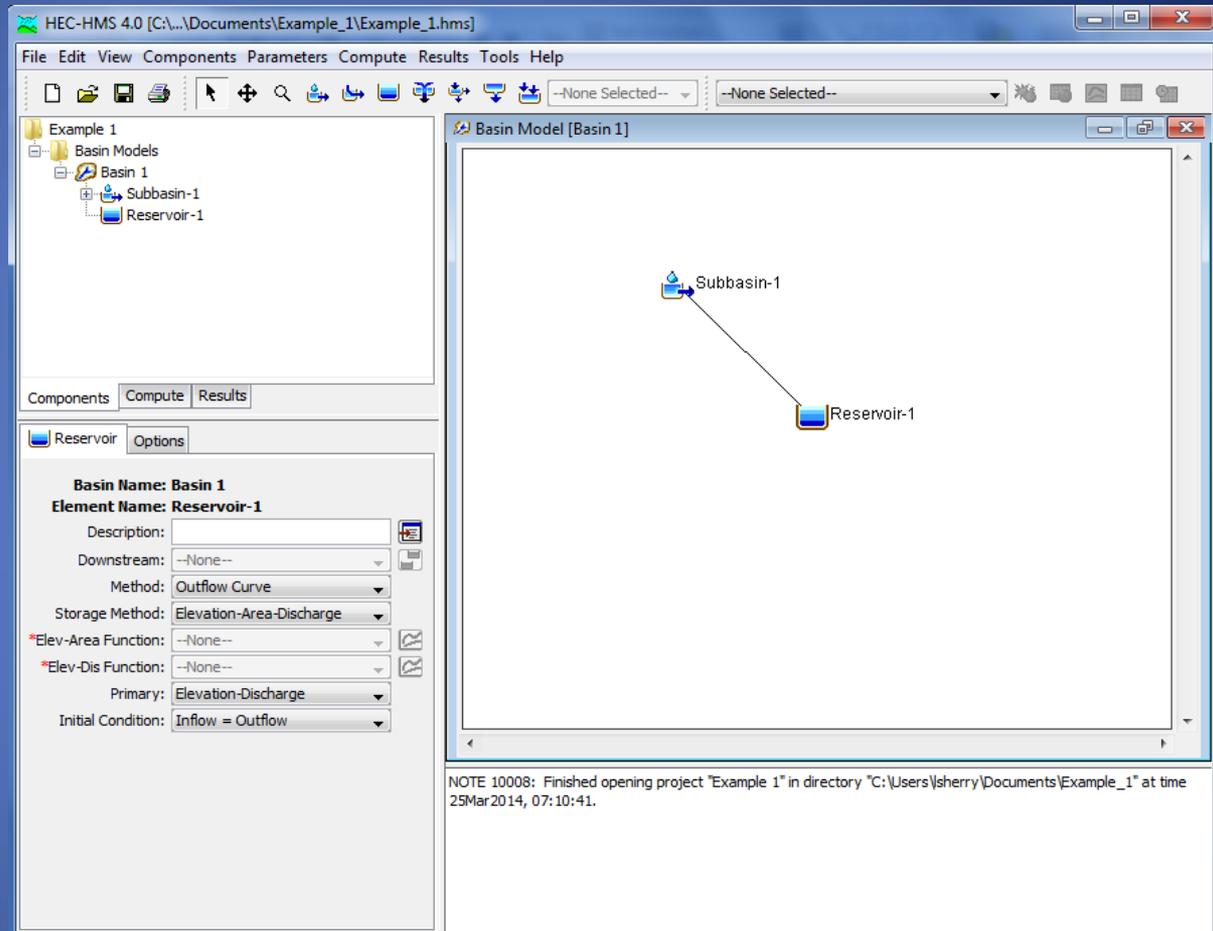
CREATING A BASIN MODEL

- Under the *Components* tab, go to *Basin Model Manager*
- Select “New” and name it “Basin 1”



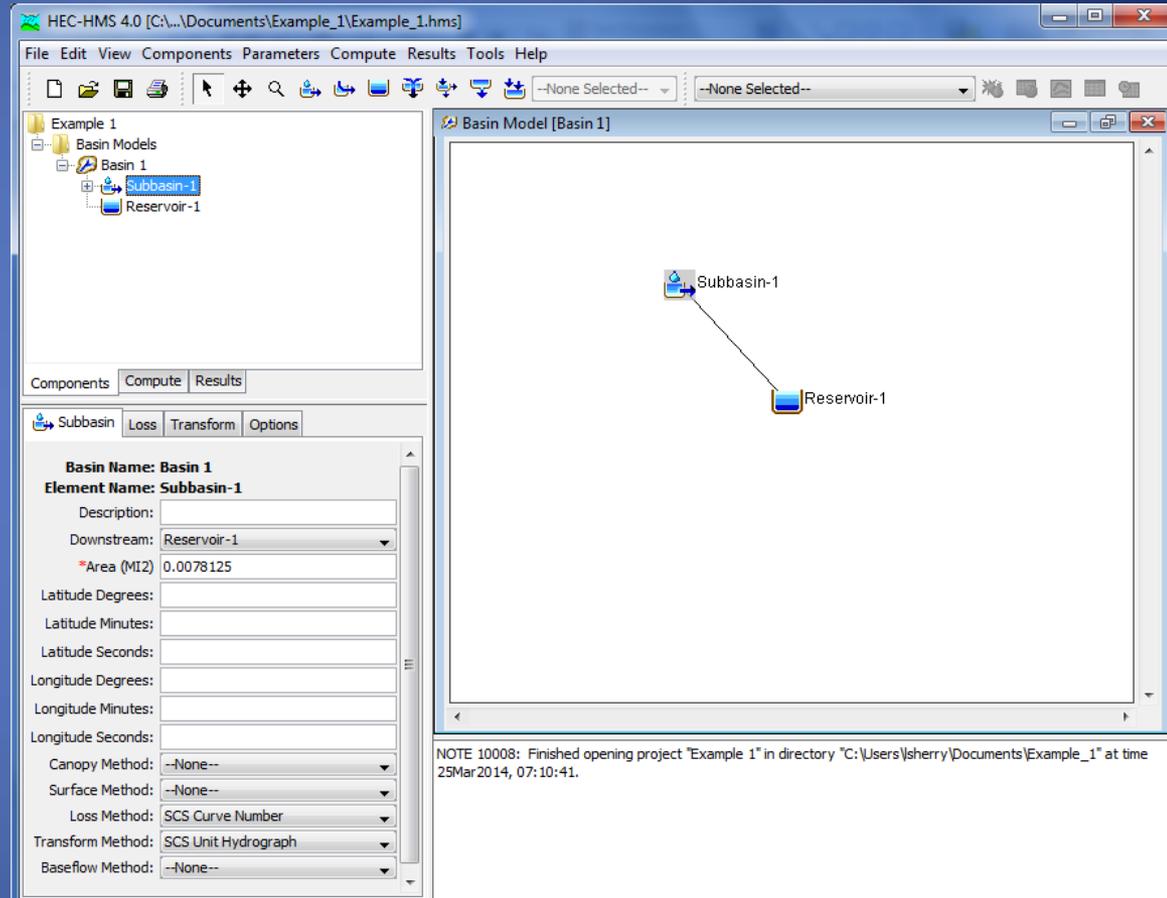
ADDING BASIN MODEL COMPONENTS

- Click on the **Subbasin Creation Tool** at the top of the screen to add a subbasin to the **Basin Model**
- Click on the **Reservoir Creation Tool** to add a reservoir to the **Basin Model**
- To route the subbasin through the reservoir, right-click on the subbasin and select “Connect Downstream” and click on the reservoir



ENTERING SUBBASIN DATA

- Click on *Subbasin-1* and the data entry tabs will appear at the lower left corner
- For *Area*, enter 0.0078125 mi² (5 acres)
- Under the *Loss* tab, enter the reduced CN of 86.22
- Under the *Transform* tab, enter the SCS Lag time of 9 minutes
(Lag time = 0.6 * Tc)



ENTERING RESERVOIR DATA

- Click on *Reservoir-1* and the data entry tabs will appear at the lower left corner
- For *Method*, enter *Outflow Curve*
- For Storage Method, select *Elevation-Storage-Discharge*
- Note that the Storage-Discharge and Elevation-Storage Functions are missing. This is the next step.

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]" and shows a diagram with "Subbasin-1" and "Reservoir-1" connected by a line. The left sidebar shows a tree view with "Example 1" > "Basin Models" > "Basin 1" > "Subbasin-1" > "Reservoir-1" selected. The bottom-left panel is titled "Reservoir" and contains the following settings:

- Basin Name:** Basin 1
- Element Name:** Reservoir-1
- Description:** [Empty text box]
- Downstream:** --None--
- Method:** Outflow Curve
- Storage Method:** Elevation-Storage-Discharge
- *Stor-Dis Function:** --None--
- *Elev-Stor Function:** --None--
- Primary:** Storage-Discharge
- Initial Condition:** Inflow = Outflow

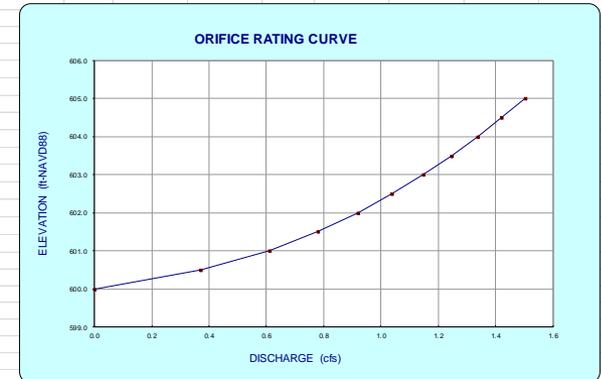
The bottom-right corner of the window displays a note: "NOTE 10008: Finished opening project 'Example 1' in directory 'C:\Users\sherry\Documents\Example_1' at time 25Mar2014, 07:10:41."

ENTERING RESERVOIR DATA

- Using the spreadsheet available on the MWRD website, the following stage-discharge relationship was determined for the proposed detention basin:

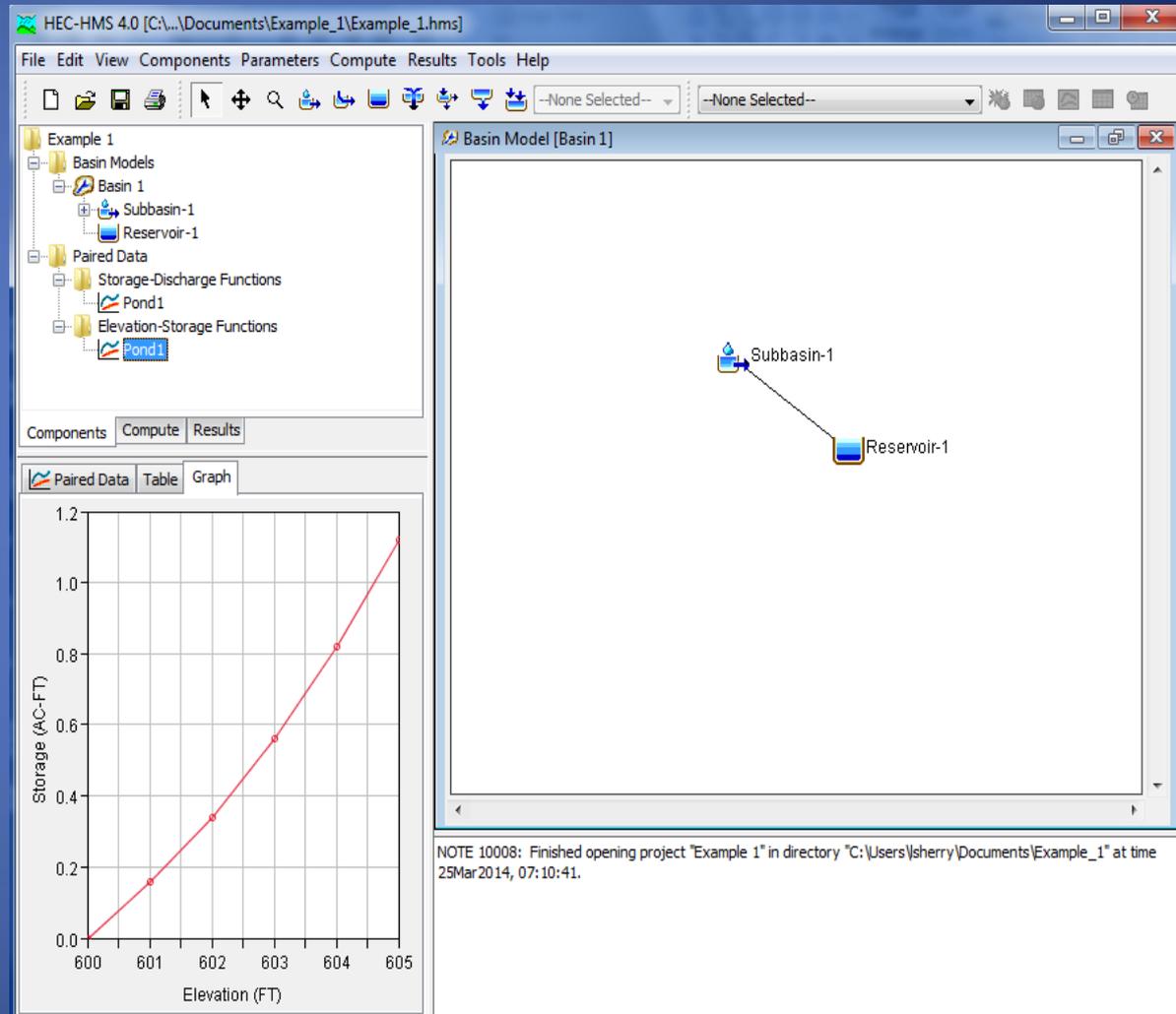
Stage (ft)	Discharge (cfs)
600	0.00
601	0.61
602	0.92
603	1.15
604	1.34
605	1.50

PROPOSED CONDITIONS							
ORIFICE/WEIR STRUCTURE RATING ANALYSIS							
PROJECT NAME:	Example 1						
PROJ. NO.:	WMO Training						
DESCRIPTION:	Detention Basin 1						
FILENAME:	Orifice.xlsx						
DATE:	31-Jul-14						
OUTLET:	<table border="1"> <tr> <td>ORIFICE:</td> <td>5.07 IN. DIA. @ ELEV</td> <td>600</td> </tr> <tr> <td>WEIR:</td> <td>12 FEET WIDE @ ELEV</td> <td>605</td> </tr> </table>	ORIFICE:	5.07 IN. DIA. @ ELEV	600	WEIR:	12 FEET WIDE @ ELEV	605
ORIFICE:	5.07 IN. DIA. @ ELEV	600					
WEIR:	12 FEET WIDE @ ELEV	605					
ORIFICE FLOW EQUATION: $Q = C_d A (2gh)^{3.5}$							
WEIR FLOW EQUATION: $Q = 3.0L(H)^{1.5}$							
HYDRAULIC DIMENSIONS							
	# 1						
ORIFICE AREA (ft ²)	0.1402						
ORIFICE DIAMETER (in)	5.07						
ORIFICE DISCHARGE COEFFICIENT	0.61						
ORIFICE ELEV. (ft-NAVD88)	600.00						
TAILWATER OR CENTROID (ft-NAVD88)	600.211						
WEIR LENGTH (ft)	12.00						
WEIR COEFFICIENT	3.0						
WEIR ELEV. (ft-NAVD88)	605.0						
ELEVATION-DISCHARGE RELATIONSHIP							
Elevation (feet)	Q-Orifice (cfs)	Q-Weir (cfs)	Q-Total (cfs)				
600.0	0.00	0.00	0.00				
600.5	0.37	0.00	0.37				
601.0	0.61	0.00	0.61				
601.5	0.78	0.00	0.78				
602.0	0.92	0.00	0.92				
602.5	1.04	0.00	1.04				
603.0	1.15	0.00	1.15				
603.5	1.24	0.00	1.24				
604.0	1.34	0.00	1.34				
604.5	1.42	0.00	1.42				
605.0	1.50	0.00	1.50				
605.5	1.58	12.73	14.31				
606.0	1.65	36.00	37.65				



ENTERING RESERVOIR DATA

- Under the *Components* tab, select *Paired Data Manager*
- Add a new *Storage-Discharge* and *Elevation-Storage* function. Name each of them “Pond 1”
- Under the *Table* tab, enter the appropriate elevation, storage, and discharge values
- Plots of the relationships are available under the *Graph* tab



ENTERING RESERVOIR DATA

- The last step is assigning the *Paired Data* to *Reservoir-1*
- For the ***Stor-Dis Function***, select the *Paired Data* from the drop-down menu
- For the ***Elev-Stor Function***, select the *Paired Data* from the drop-down menu
- For ***Primary***, select *Storage-Discharge*
- For ***Initial Condition***, select *Inflow = Outflow*

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Basin Models' expanded to 'Basin 1', which contains 'Subbasin-1' and 'Reservoir-1'. The 'Paired Data' section is also visible, showing 'Storage-Discharge Functions' and 'Elevation-Storage Functions', both with 'Pond1' selected. The 'Reservoir Options' dialog box is open, showing the following settings:

- Basin Name: Basin 1
- Element Name: Reservoir-1
- Description: (empty)
- Downstream: --None--
- Method: Outflow Curve
- Storage Method: Elevation-Storage-Discharge
- *Stor-Dis Function: Pond1
- *Elev-Stor Function: Pond1
- Primary: Storage-Discharge
- Initial Condition: Inflow = Outflow

The main workspace shows a diagram of 'Subbasin-1' connected to 'Reservoir-1'. A status bar at the bottom displays the message: 'NOTE 10008: Finished opening project "Example 1" in directory "C:\Users\sherry\Documents\Example_1" at time 25Mar2014, 07:10:41.'

ENTERING RAINFALL DATA

- In HEC-HMS, rainfall data is entered as a combination of *Time-Series Data* and the *Meteorologic Model*
- The *Time-Series Data* reflects the rainfall distribution (Huff quartile distributions or actual rainfall records)
- *Time-Series Data* cannot be entered in user-specified increments, interpolation of points on the Huff curves may be necessary for some storm events
- The *Meteorologic Model* defines the rainfall depths and which subbasins those depths are applied

ENTERING TIME-SERIES DATA

- From the **Components** menu, select **Time-Series Data Manager** to create a new **Precipitation Gage** named “Huff3rd24hr”
- Under the **Time-Series Gage** tab, select **Manual Entry**, **Cumulative Inches**, and **1-hour** increments
- Under the **Time Window** tab, run the storm from 01Jan2000 through 02Jan2000 (24-hour duration)
- Enter the Huff 3rd Quartile Distribution for the 24-hour duration from the handout
- Use the **Graph** tab to see a plot of the distribution

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]" and shows a diagram of a basin model with a "Subbasin-1" and a "Reservoir-1" connected by an arrow. The left pane shows the project structure, including "Example 1", "Basin Models", "Time-Series Data", "Precipitation Gages", "Paired Data", "Storage-Discharge Functions", and "Elevation-Storage Functions". The "Time-Series Gage" tab is active, showing a table of precipitation data for the "Huff3rd24hr" gage. The table has columns for "Time (ddMMYYYY, HH:MM)" and "Precipitation (IN)". The data is as follows:

Time (ddMMYYYY, HH:MM)	Precipitation (IN)
01Jan2000, 00:00	0.000
01Jan2000, 01:00	0.025
01Jan2000, 02:00	0.050
01Jan2000, 03:00	0.075
01Jan2000, 04:00	0.100
01Jan2000, 05:00	0.125
01Jan2000, 06:00	0.150
01Jan2000, 07:00	0.183
01Jan2000, 08:00	0.217
01Jan2000, 09:00	0.250
01Jan2000, 10:00	0.287
01Jan2000, 11:00	0.330
01Jan2000, 12:00	0.380
01Jan2000, 13:00	0.438
01Jan2000, 14:00	0.530
01Jan2000, 15:00	0.635

The bottom right pane shows a status window with the following notes:

- NOTE 10008: Finished opening project "Example 1" in directory "C:\Users\lsherry\Documents\Example_1" at time 25Mar2014, 07:10:41.
- NOTE 10604: 98 missing or invalid values for gage "Huff3rd24hr".

CREATING THE METEOROLOGIC MODEL

- From the **Components** tab, create a new **Meteorologic Model** named "100yr24hr"
- Under the **Meteorology Model** tab, make sure the **Replace Missing is Set to Default**
- Under the **Basins** tab, select **Yes** under **Include Subbasins?**
- Under the **Options** tab, select **Yes** for **Total Override**
- Under the **Specified Hyetograph** tab, select the rainfall distribution that we previously created and enter the 100-year, 24-hour rainfall depth.

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]". The left sidebar shows a project tree with the following structure:

- Example 1
 - Basin Models
 - Meteorologic Models
 - 100yr24hr (selected)
 - Specified Hyetograph
 - Time-Series Data
 - Precipitation Gages
 - Huff3rd24hr
 - 01Jan2000, 00:00 - 02Jan2000, 00:00
 - Paired Data
 - Storage-Discharge Functions

The "Subbasins" tab is active, showing a table with the following data:

Met Name: 100yr24hr		
Subbasin Name	Gage	Total Depth (IN)
Subbasin-1	Huff3rd24hr	7.58

The main workspace shows a diagram with a "Subbasin-1" icon connected to a "Reservoir-1" icon. The bottom status bar contains the following notes:

NOTE 10008: Finished opening project "Example 1" in directory "C:\Users\sherry\Documents\Example_1" at time 25Mar2014, 07:10:41.
NOTE 10604: 98 missing or invalid values for gage "Huff3rd24hr".

CREATING THE CONTROL SPECIFICATIONS

- We still need to specify how long to run the model for and how often we want to see output...this is performed under the **Control Specifications**
- Under the **Components** menu, select **Control Specifications Manager** to create a new one named "100yr24hr"
- Specify 01Jan2000 through 03Jan2000 (remember we're running a 24-hour storm event)
- Under **Time Interval**, specify 1 minute

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]" and shows a diagram with two components: "Subbasin-1" and "Reservoir-1", connected by a line. The left sidebar shows a project tree with "Example 1" expanded to show "Basin Models", "Meteorologic Models", "Control Specifications", "Time-Series Data", and "Paired Data". The "Control Specifications" folder is selected, and the "Control Specifications Manager" window is open. This window shows the following settings:

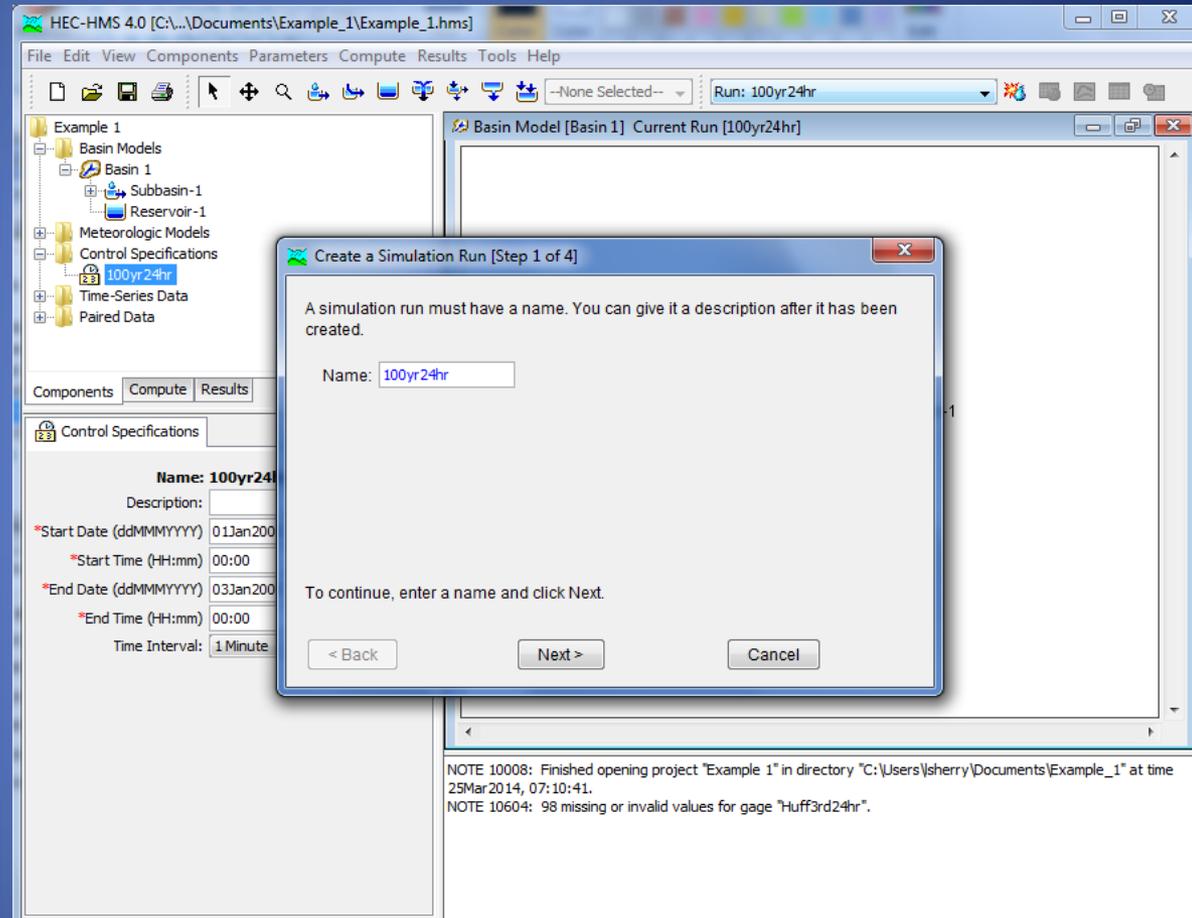
- Name: 100yr24hr
- Description: (empty)
- *Start Date (ddMMYYYY): 01Jan2000
- *Start Time (HH:mm): 00:00
- *End Date (ddMMYYYY): 03Jan2000
- *End Time (HH:mm): 00:00
- Time Interval: 1 Minute

At the bottom of the interface, there are two notes:

- NOTE 10008: Finished opening project "Example 1" in directory "C:\Users\sherry\Documents\Example_1" at time 25Mar2014, 07:10:41.
- NOTE 10604: 98 missing or invalid values for gage "Huff3rd24hr".

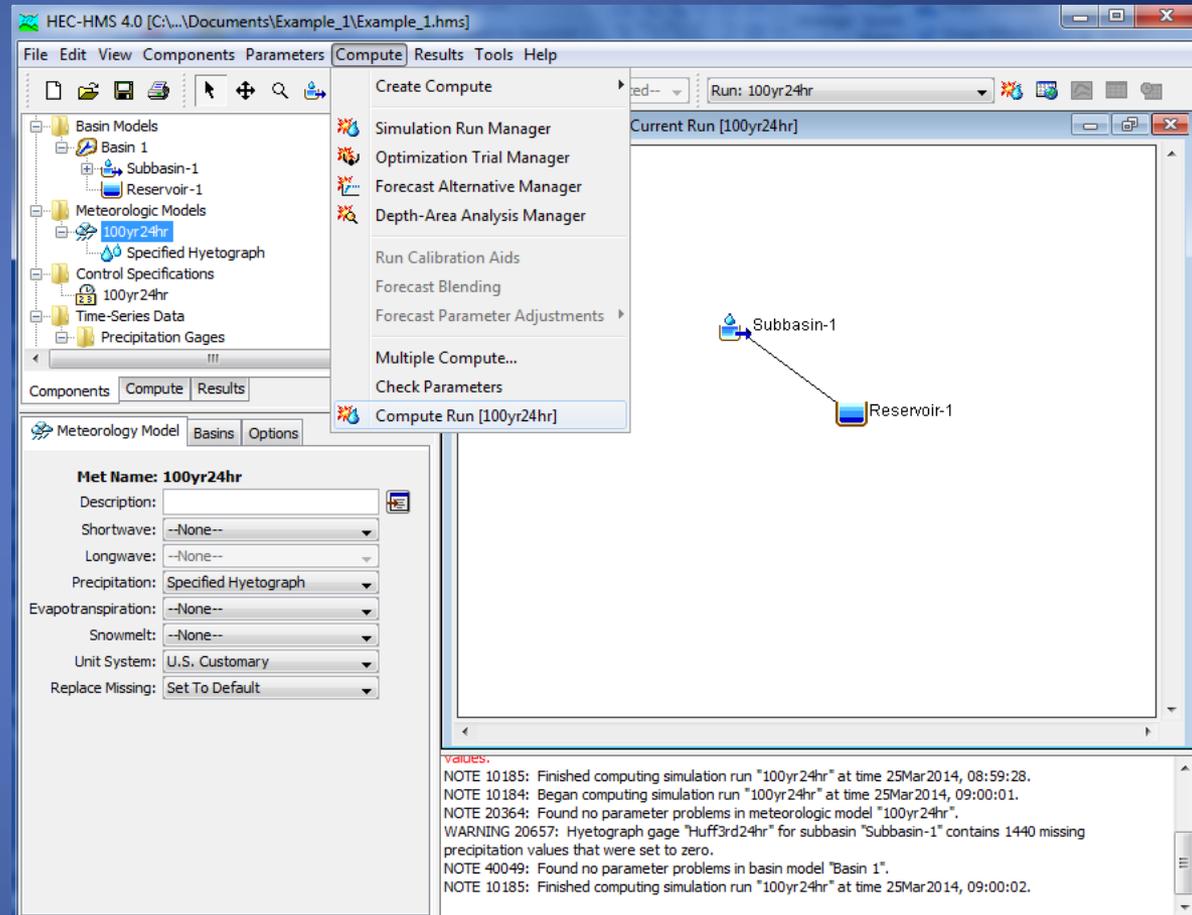
CREATING THE SIMULATION RUN

- A *Simulation Run* is a combination of:
 - *Basin Model*
 - *Meteorologic Model*
 - *Control Specifications*
- To create a new *Simulation Run*, select **Create Compute > Simulation Run** under the **Components** menu
- Name the run “100yr24hr” and click **Next**
- Specify the *Basin Model*, *Meteorologic Model*, and *Control Specifications* that we’ve just created



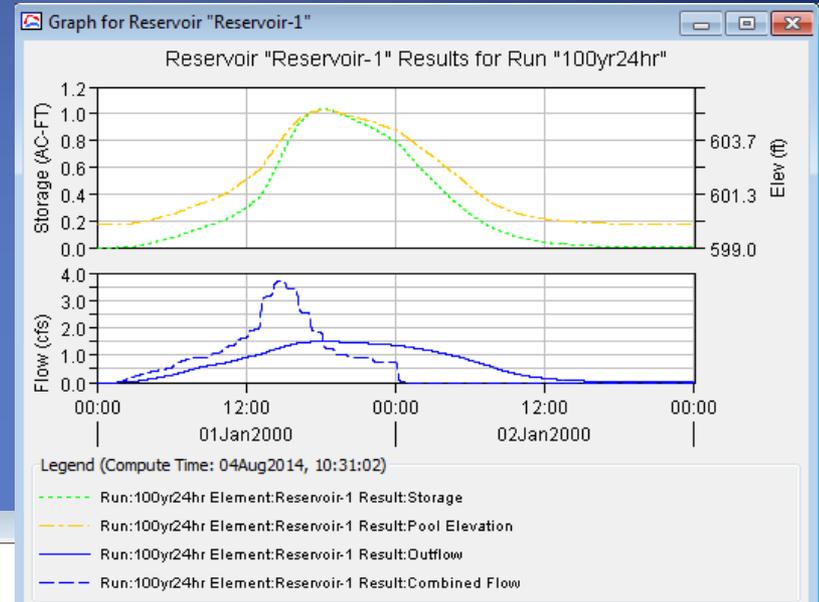
RUNNING THE SIMULATION

- Under the **Compute** menu, select **Compute Run [100yr24hr]**
- All errors, warnings, and notes are shown in the lower right hand window
- If there are errors, they will show up in red and the simulation will not run successfully



VIEWING RESULTS

- If the *Simulation Run* was successful, right-click on the components of the *Basin Model* to view individual results
- Results are available as a *Graph*, *Summary Table*, or *Time-Series Table*
- To view the results for all model components at once, choose *Global Summary Table* under the *Results Menu*



Basin Model [Basin 1] Current Run [100yr24hr]

Subbasin-1

Reservoir-1

Summary Results for Reservoir "Reservoir-1"

Project: Example4 Simulation Run: 100yr24hr
Reservoir: Reservoir-1

Start of Run: 01Jan2000, 00:00 Basin Model: Basin 1
End of Run: 03Jan2000, 00:00 Meteorologic Model: 100yr24hr
Compute Time: 04Aug2014, 10:31:02 Control Specifications: 100yr24hr

Volume Units: IN AC-FT

Computed Results

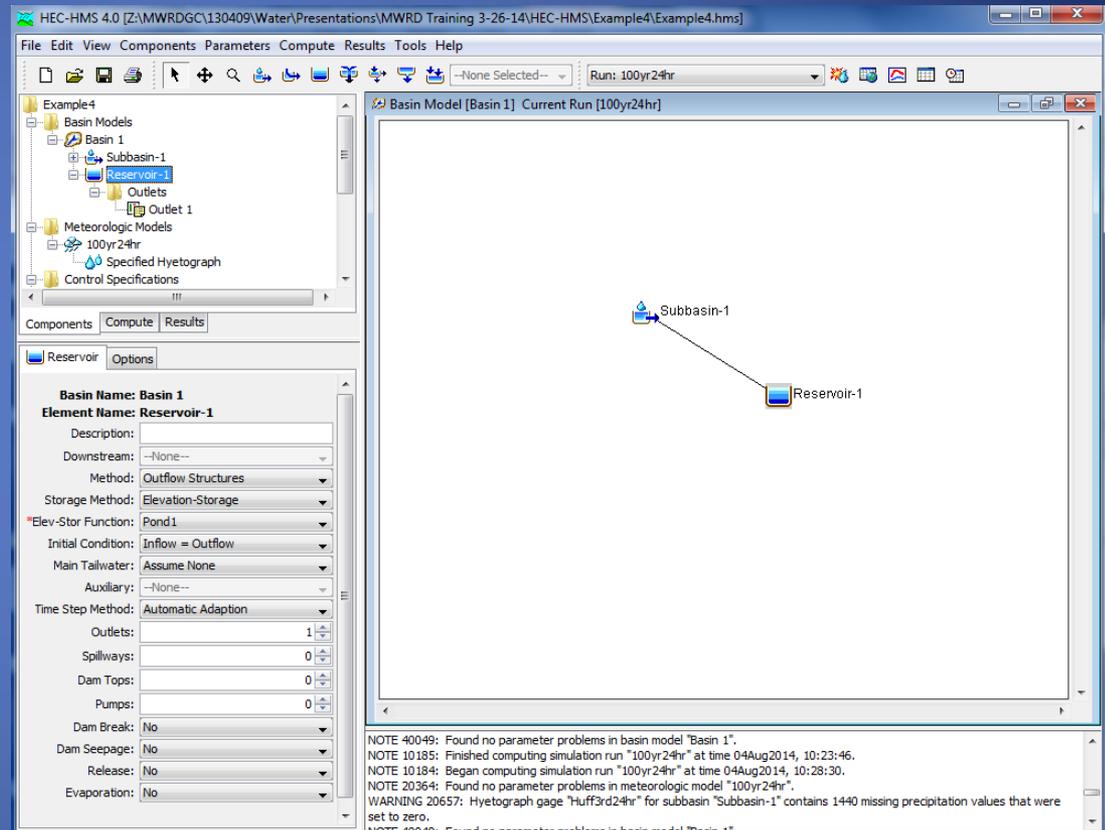
Peak Inflow: 3.72 (CFS)	Date/Time of Peak Inflow: 01Jan2000, 15:01
Peak Discharge: 1.50 (CFS)	Date/Time of Peak Discharge: 01Jan2000, 18:11
Inflow Volume: 5.95 (IN)	Peak Storage: 1.04 (AC-FT)
Discharge Volume: 5.95 (IN)	Peak Elevation: 604.99 (FT)

EXAMPLE 1 RESULTS

- What is the peak elevation in the proposed detention basin for the 100-year, 24-hour storm event? 605.0 ft
- What is the peak 100-year, 24-hour release rate from the proposed detention basin? 1.50 cfs
- Does the proposed detention basin meet the requirements of the WMO? YES

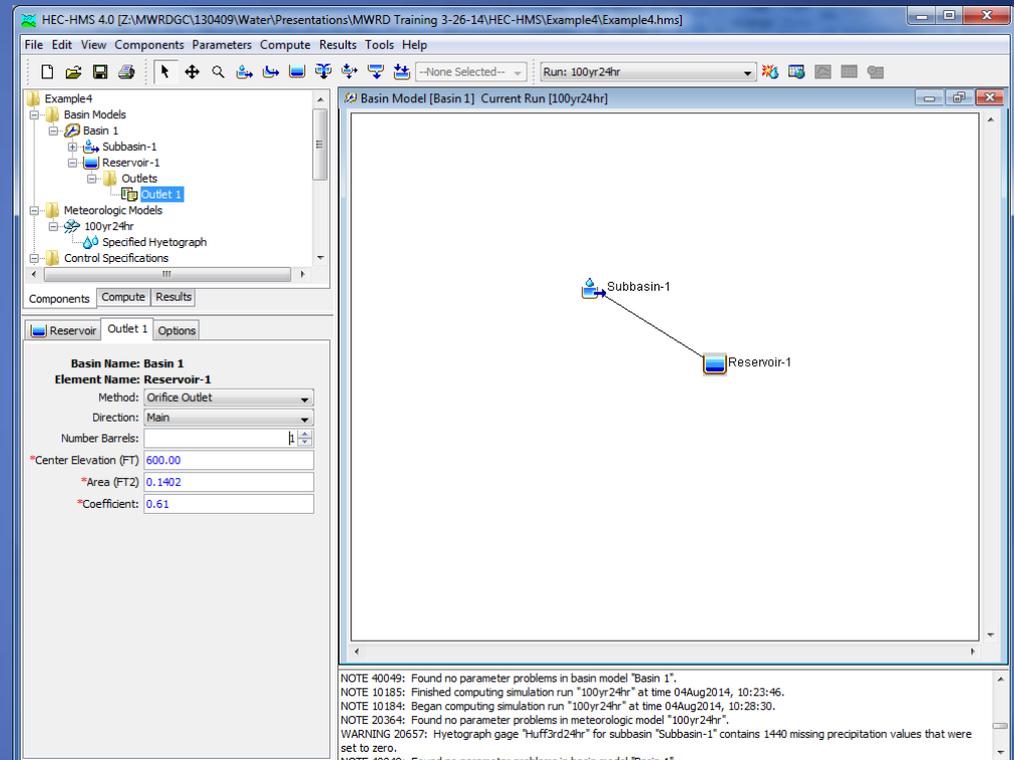
RESERVOIR OUTLET STRUCTURES

- Instead of specifying a stage-discharge relationship, HEC-HMS can calculate the outflow based on user-specified structure data
- Under the *Reservoir-1* tab, select *Outflow Structures* under *Method*
- For the *Initial Condition*, assume *Inflow = Outflow*
- Under *Main Tailwater*, select *None*
- Under *Outlets*, specify “1”



RESERVOIR OUTLET STRUCTURES

- Use the following restrictor information to enter the outlet structure in HEC-HMS:
 - Diameter = 5.07 in
 - Discharge Coefficient = 0.61
 - Invert Elevation = 600.00
- Once you've entered the outlet information, rerun the model for the 100-year, 24-hour storm event.
- How do the results compare to the previous simulation?



EXAMPLE PROBLEM #2 (INDIVIDUAL)

Determine the required detention volume for the proposed development described below:

- Total Project Area = 10 acres
- Composite CN = 94, Reduced CN = 87.59
- 75% Impervious Area
- Time of Concentration = 15 minutes
- Unrestricted Area = 0.3 acres
- CN = 74
- Time of Concentration = 10 minutes

See Handout

EXAMPLE 2 – STEP 1

Step 1: Determine the required volume control storage for the site.

The curve number for the site is 94, with a total impervious area of 7.5 acres (75%). The required volume control storage, V_c , for the site is calculated as:

$$V_c = 1'' \times \frac{1 \text{ foot}}{12 \text{ inches}} \times 7.5 \text{ acres} = 0.63 \text{ acre-feet}$$

EXAMPLE 2 – STEP 2

Step 2: Determine the CN reduction corresponding to volume control calculated in Step 1.

Using the CN Adjustment Calculator spreadsheet, the adjusted curve number is 87.59 (it was assumed that only the required 1” of volume control storage would be provided).

RUNOFF CURVE NUMBER ADJUSTMENT CALCULATOR			
Site Information:			
Total Site Area, A_w (ac) =	10	Total Impervious Area, A_i (ac) =	7.5
Runoff, R (in) =	6.86		
P = rainfall depth (in) =	7.58		
CN =	94		
S =	0.64		
Runoff Volume Over Watershed, V_w (ac-ft) =	5.72		
Volume of GI Provided:			
Volume Control Storage, V_r =	0.63	ac-ft	1" of volume over impervious area
Additional Volume, V_{GI} =	0.00	ac-ft	Additional volume over the required 1"
Adjusted Volume Over Watershed, $V_{ADJ} = V_w - V_r - V_{GI}$			
V_{ADJ} (ac-ft) =	5.10		
Adjusted Runoff Over Watershed, $R_{ADJ} = \frac{V_{ADJ}}{A_w}$			
R_{ADJ} (in) =	6.11		
S_{ADJ} =	1.42		
Adjusted CN for detention calcs, CN_{ADJ} =	87.59		
*Blue values are entered by user			

EXAMPLE 2 – STEP 3

Step 3A: Determine the 100-yr, 24-hr peak flow rate from the unrestricted area.

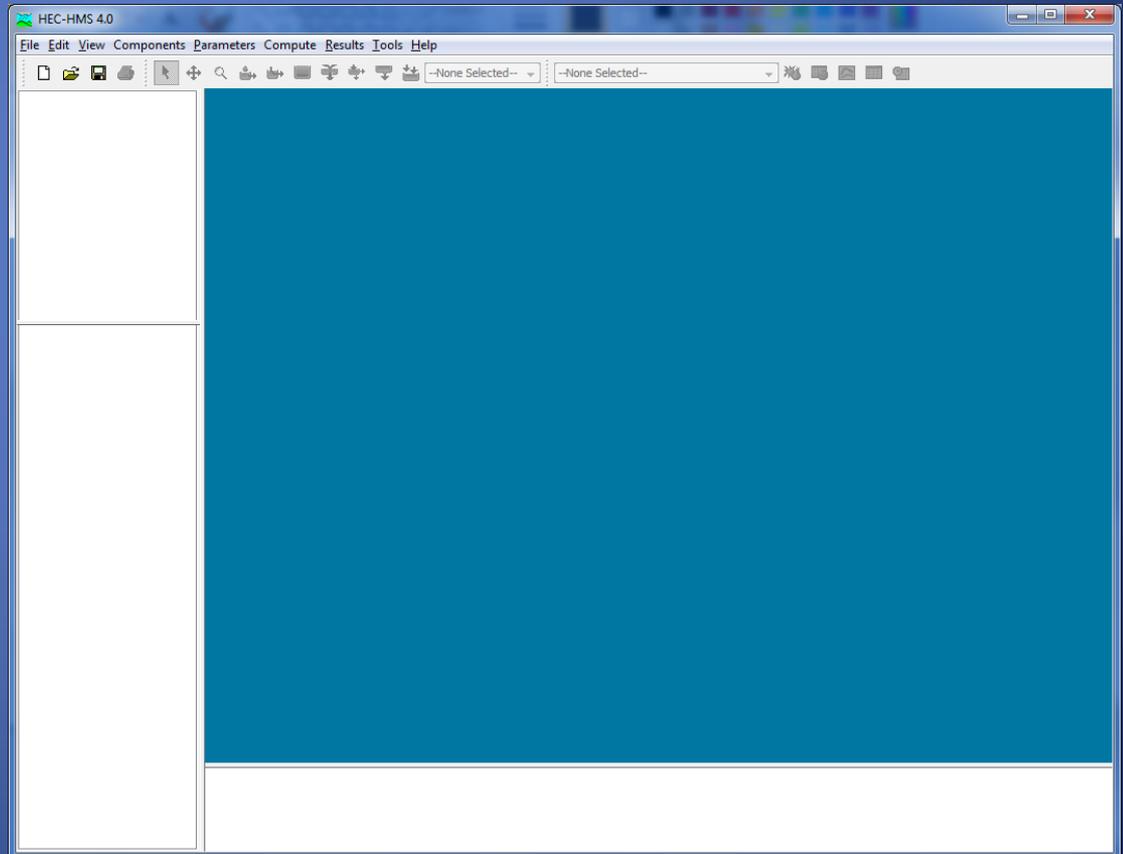
GETTING STARTED

THE INITIAL HEC-HMS SCREEN

- Double-click on the HEC-HMS icon on your desktop

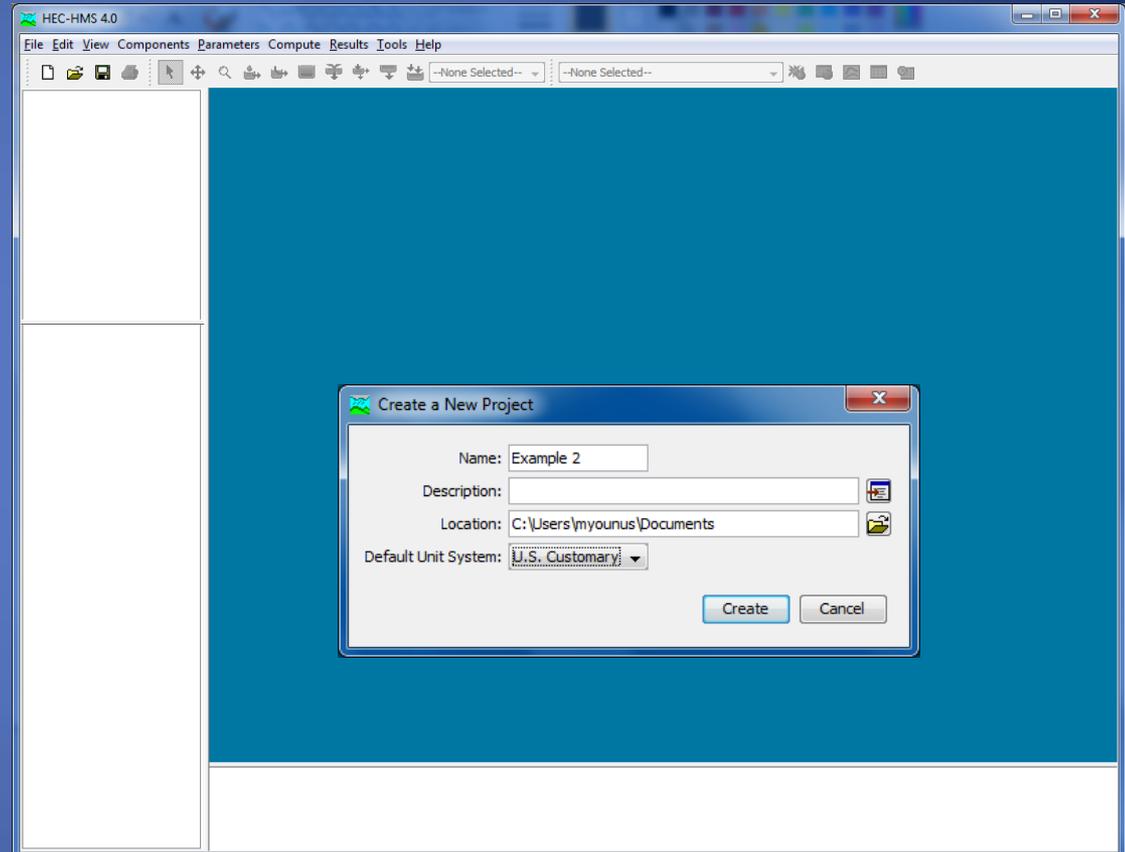


- The following HEC-HMS Screen comes up:



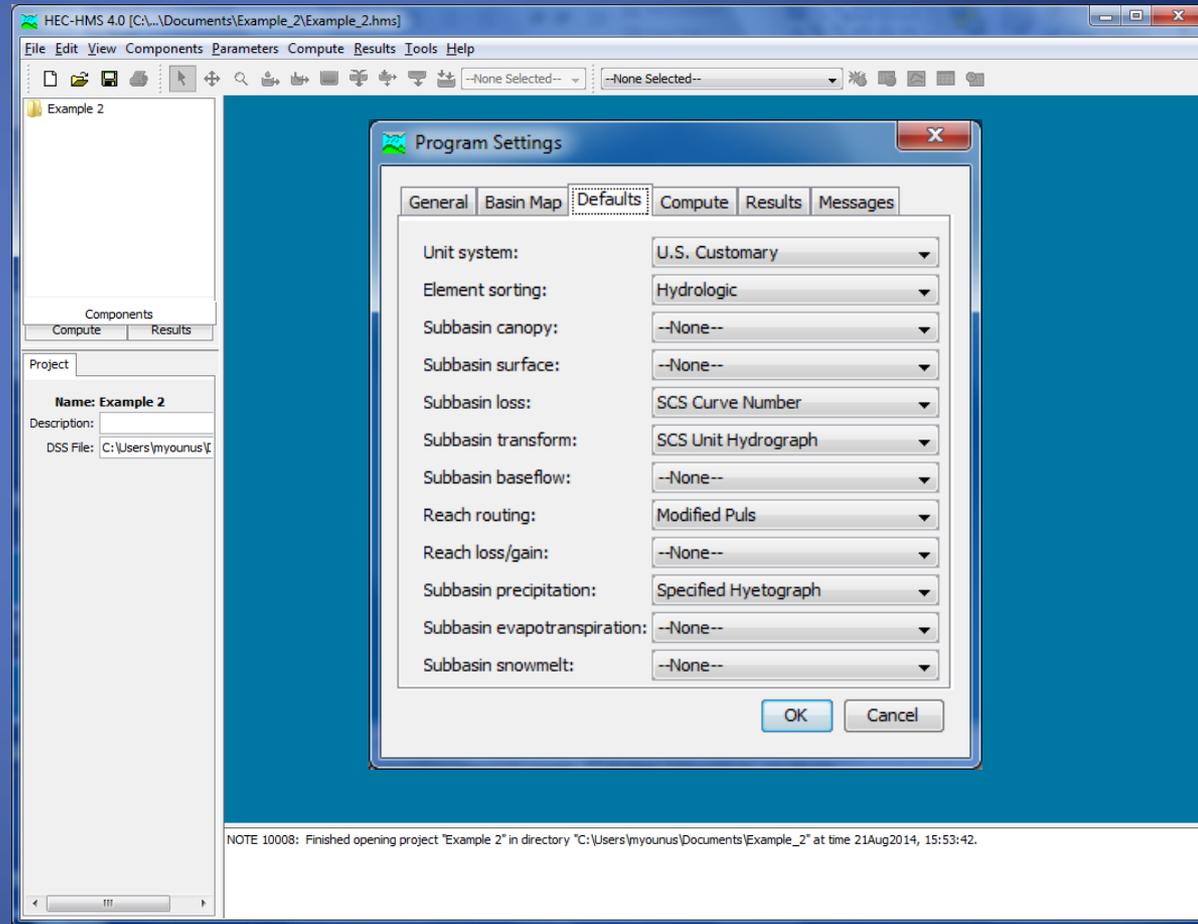
HEC-HMS – SETTING UP A NEW PROJECT

- Click on the “File” menu
- From the drop down menu, select “New”
- Name the new project “Example 2”
- Be sure to set the Default Unit System to “U.S. Customary”



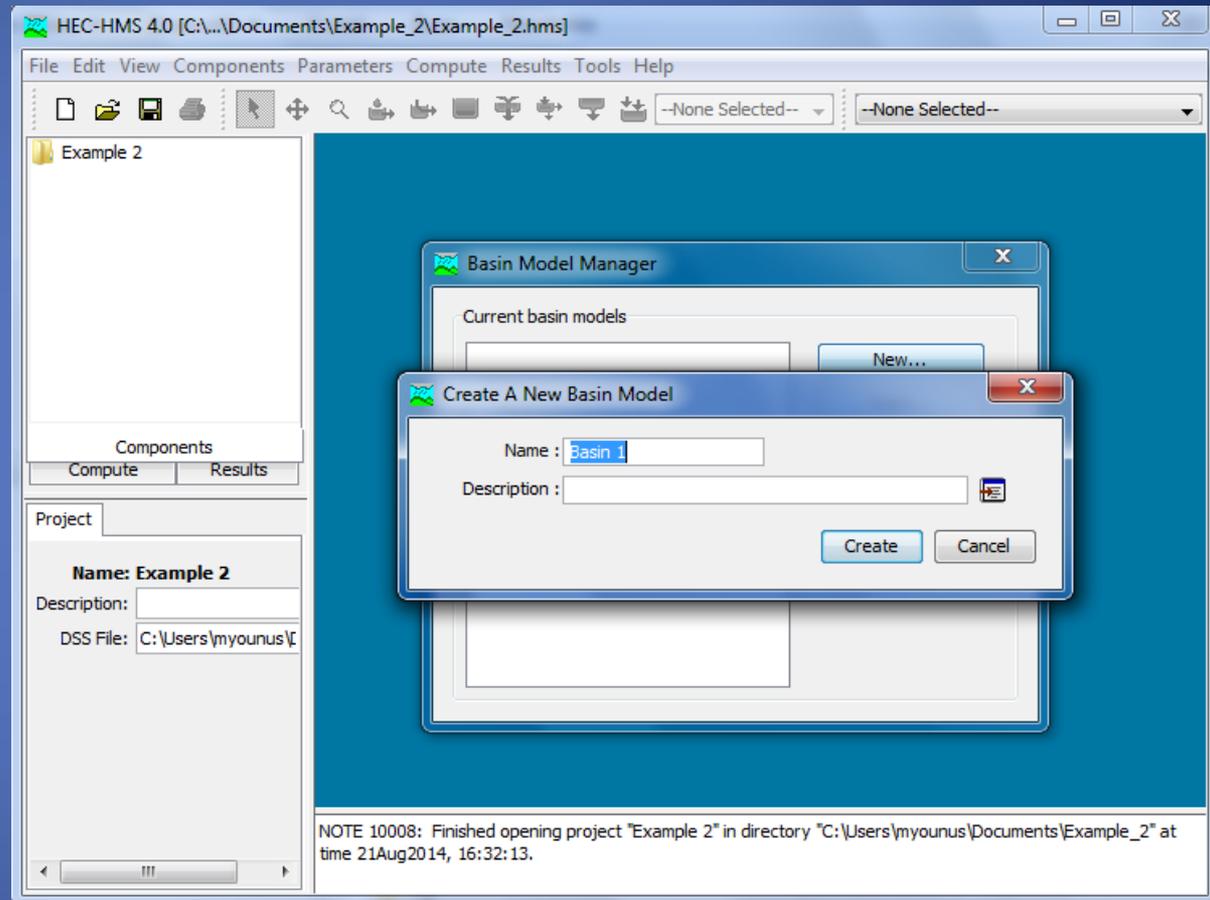
SETTING UP PROJECT DEFAULTS

- Under the **Tools** Menu, go to **Program Settings** and go to the **Defaults** tab
- Specify **SCS Curve Number** for **Subbasin loss**, **SCS Unit Hydrograph** for **Subbasin transform**, **Modified Puls** for **Reach routing**, and **Specified Hyetograph** for **Subbasin precipitation**
- Then go to the **Results** tab and make sure that the values for elevation, volume, flowrate, and depth are taken to 2 decimal places.



CREATING A BASIN MODEL

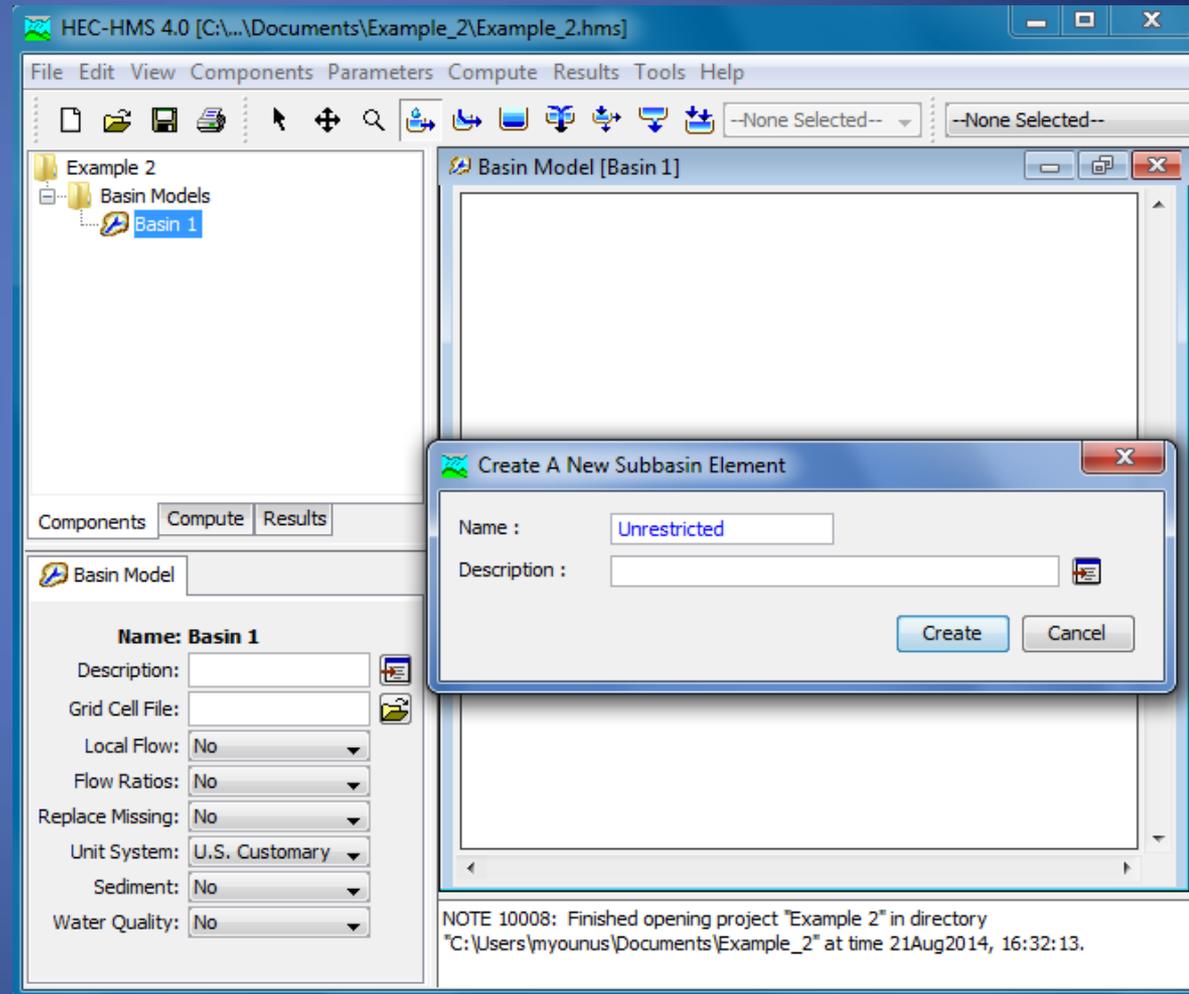
- Under the *Components* tab, go to *Basin Model Manager*
- Select “New” and name it “Basin 1”



ADDING BASIN MODEL COMPONENTS

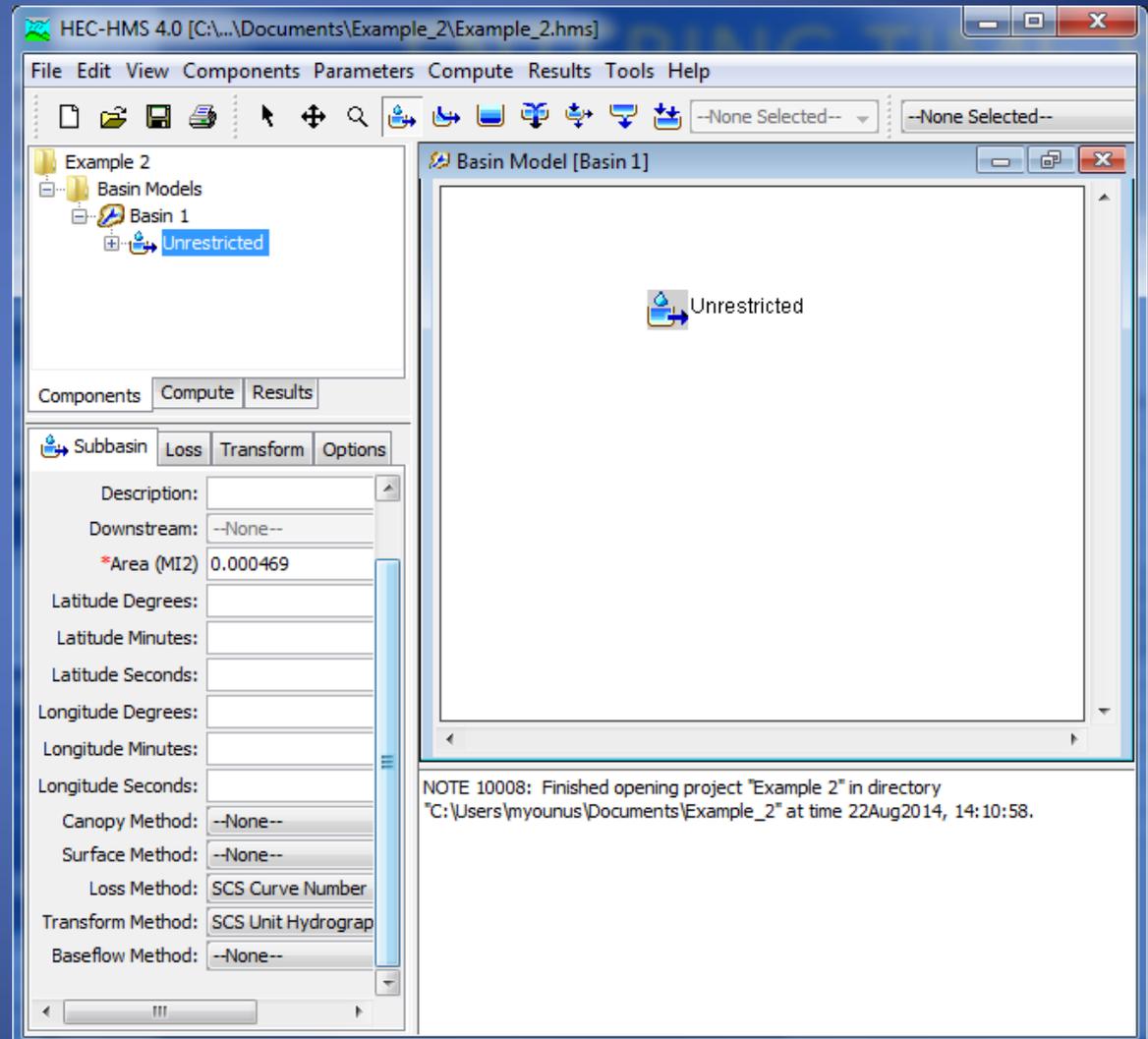
Subbasin: “Unrestricted”

- Click on the *Subbasin Creation Tool* at the top of the screen to add a subbasin to the *Basin Model*.
- Enter Subbasin Name as “Unrestricted”, and click at Create.



ENTERING SUBBASIN DATA

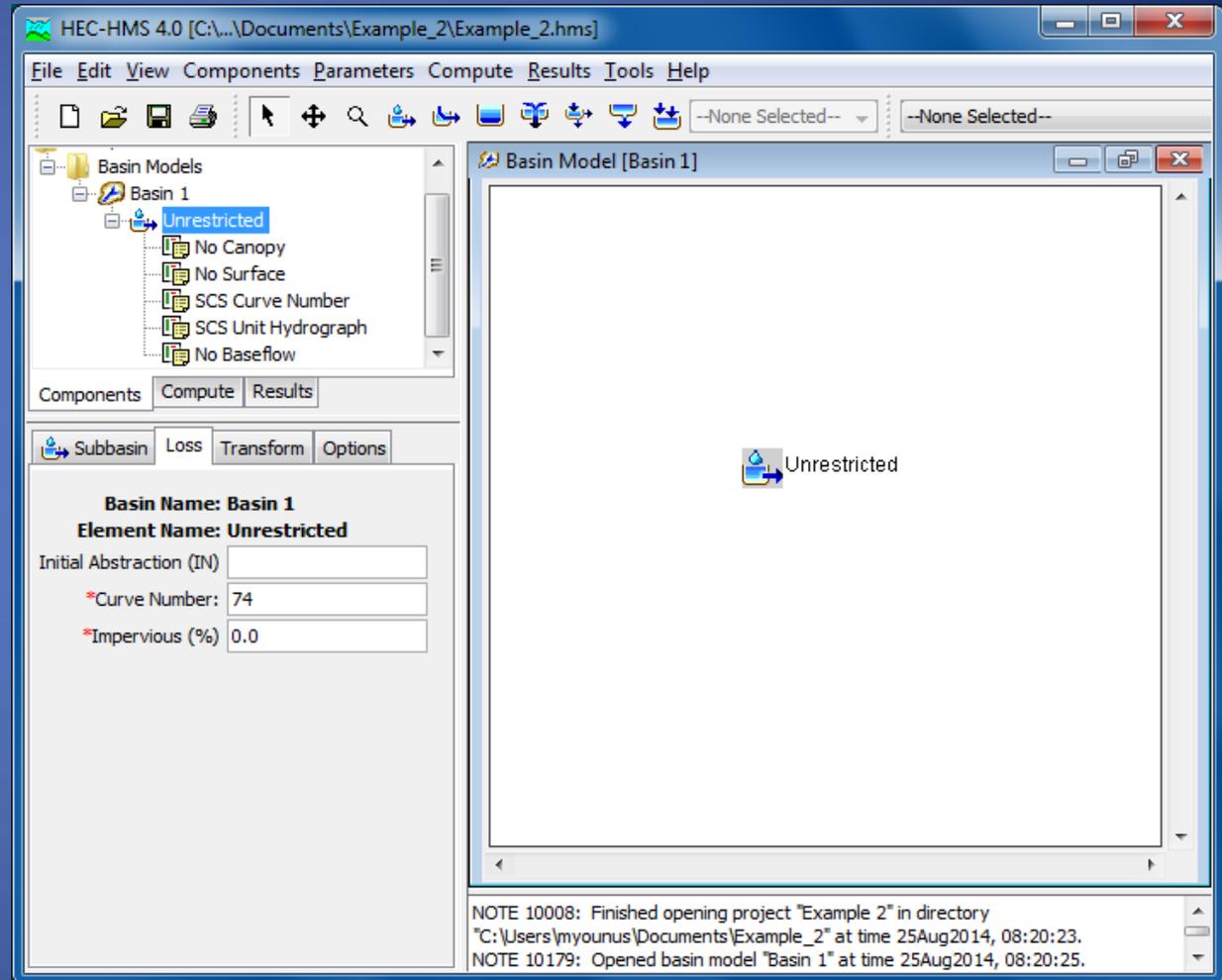
- Click on *Unrestricted* and the data entry tabs will appear at the lower left corner
- For *Area*, enter 0.000469 mi² (0.3 acres)



ENTERING SUBBASIN DATA

Continue ...

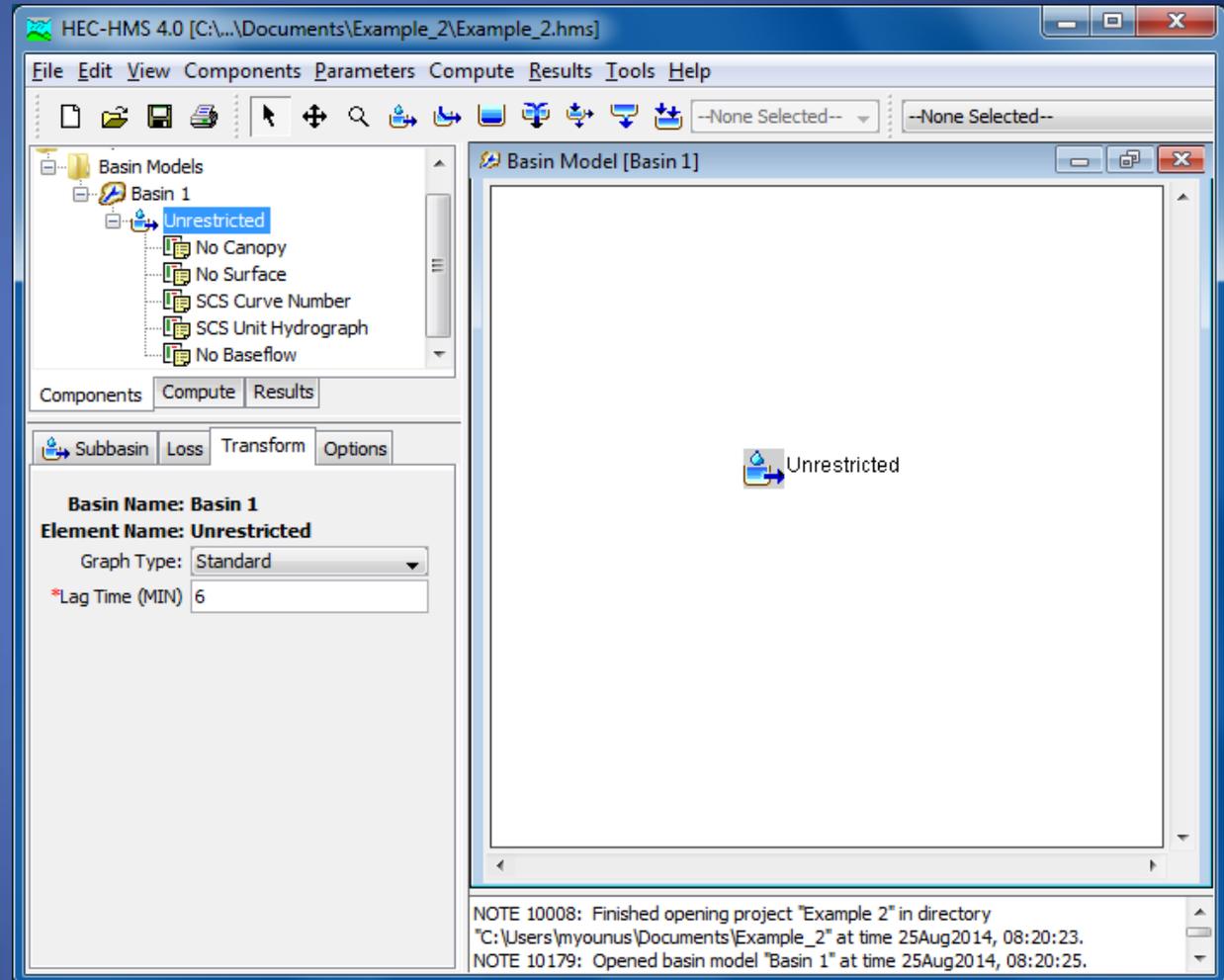
- Under the *Loss* tab, enter the reduced CN of 74



ENTERING SUBBASIN DATA

Continue ...

- Under the **Transform** tab, enter the SCS Lag time of 6 minutes
(Lag time = $0.6 * T_c$)

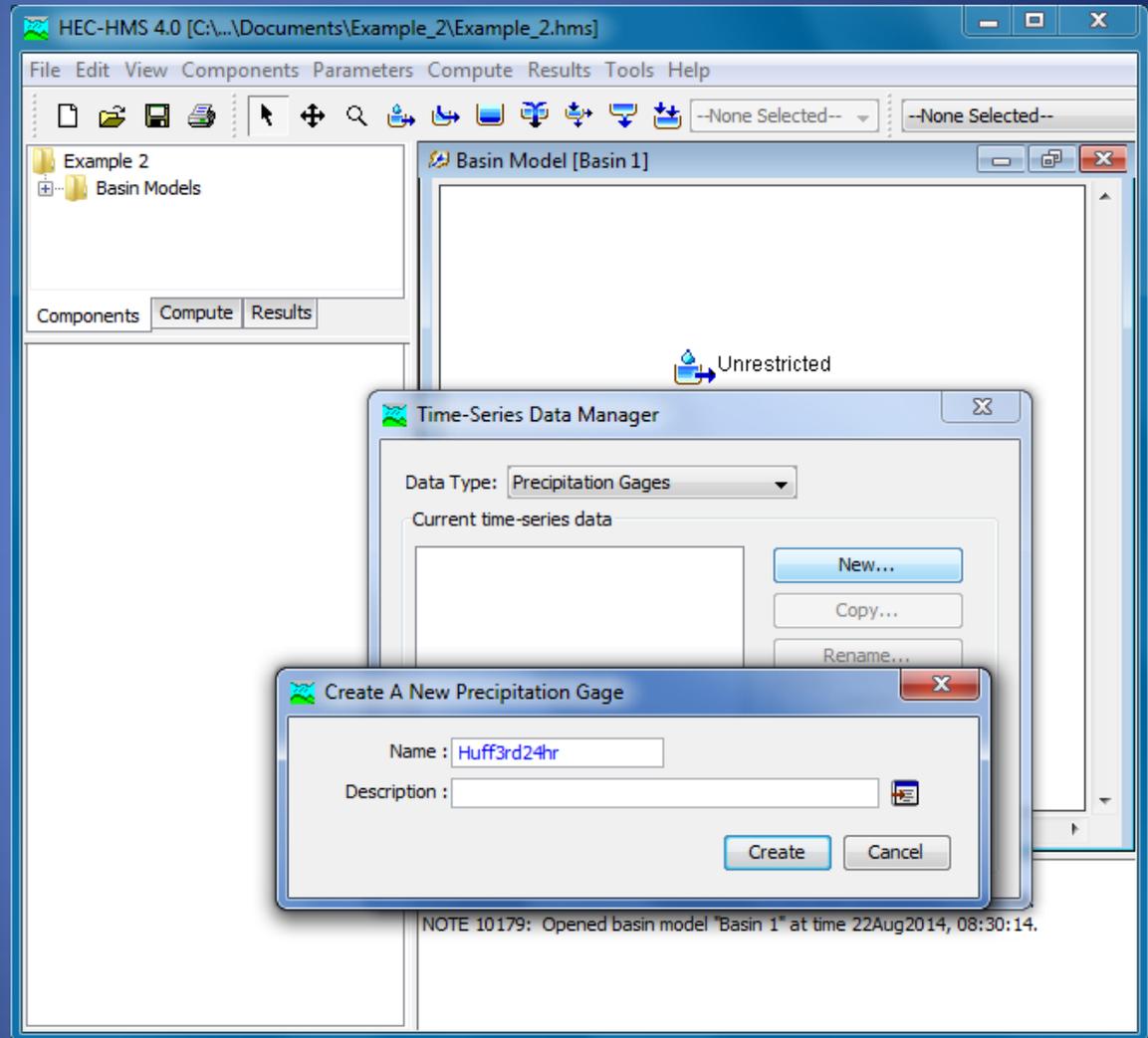


ENTERING RAINFALL DATA

- In HEC-HMS, rainfall data is entered as a combination of *Time-Series Data* and the *Meteorologic Model*
- The *Time-Series Data* reflects the rainfall distribution (Huff quartile distributions or actual rainfall records)
- *Time-Series Data* cannot be entered in user-specified increments, interpolation of points on the Huff curves may be necessary for some storm events
- The *Meteorologic Model* defines the rainfall depths and which subbasins those depths are applied

ENTERING TIME-SERIES DATA

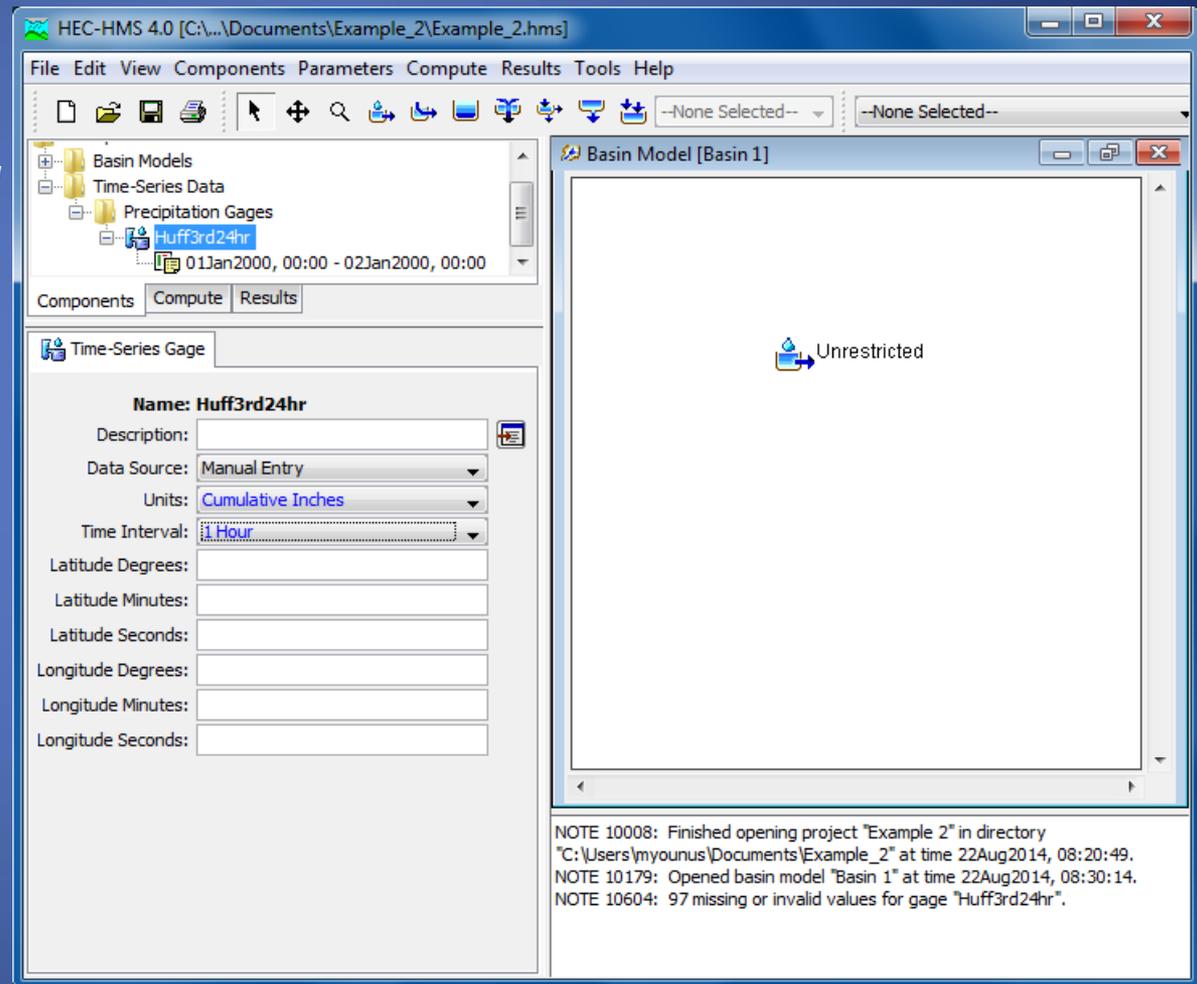
- From the **Components** menu, select **Time-Series Data Manager** to create a new **Precipitation Gage** named “Huff3rd24hr”



ENTERING TIME-SERIES DATA

Continue ...

- Under the *Time-Series Gage* tab, select *Manual Entry*, *Cumulative Inches*, and *1-hour* increments



ENTERING TIME-SERIES DATA

Continue ...

- Under the *Time Window* tab, run the storm from 01Jan2000 through 02Jan2000 (24-hour duration)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_2\Example_2.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left sidebar shows a tree view with folders for "Unrestricted", "Time-Series Data", "Precipitation Gages", and "Huff3rd24hr". The "Time-Series Data" folder is expanded, showing a file named "01Jan2000, 00:00 - 02Jan2000, 00:00". The "Components" tab is active, showing a "Time-Series Gage" configuration for "Huff3rd24hr". The "Time Window" sub-tab is selected, displaying the following configuration:

Name: Huff3rd24hr	
*Start Date (ddMMYYYY)	01Jan2000
*Start Time (HH:mm)	00:00
*End Date (ddMMYYYY)	02Jan2000
*End Time (HH:mm)	00:00

The right sidebar shows a "Basin Model [Basin 1]" window with a diagram of the "Unrestricted" gage. The bottom status bar contains the following notes:

NOTE 10008: Finished opening project "Example 2" in directory "C:\Users\myounus\Documents\Example_2" at time 22Aug2014, 08:57:31.
NOTE 10179: Opened basin model "Basin 1" at time 22Aug2014, 08:57:39.

ENTERING TIME-SERIES DATA

Continue ...

- Under the *Table Tab*, Enter the Huff 3rd Quartile Distribution for the 24-hour duration from the handout

HEC-HMS 4.0 [C:\...Documents\Example_2\Example_2.hms]

File Edit View Components Parameters Compute Results Tools Help

Unrestricted
Time-Series Data
Precipitation Gages
Huff3rd24hr
01Jan2000, 00:00 - 02Jan2000, 00:00

Components Compute Results

Time-Series Gage Time Window Table Graph

Time (ddMMYYYY, HH:mm)	Precipitation (IN)
01Jan2000, 00:00	0
01Jan2000, 01:00	0.025
01Jan2000, 02:00	0.05
01Jan2000, 03:00	0.075
01Jan2000, 04:00	0.1
01Jan2000, 05:00	0.125
01Jan2000, 06:00	0.15
01Jan2000, 07:00	0.183
01Jan2000, 08:00	0.217
01Jan2000, 09:00	0.25
01Jan2000, 10:00	0.287
01Jan2000, 11:00	0.33
01Jan2000, 12:00	0.38
01Jan2000, 13:00	0.438
01Jan2000, 14:00	0.53
01Jan2000, 15:00	0.635
01Jan2000, 16:00	0.73

Basin Model [Basin 1]

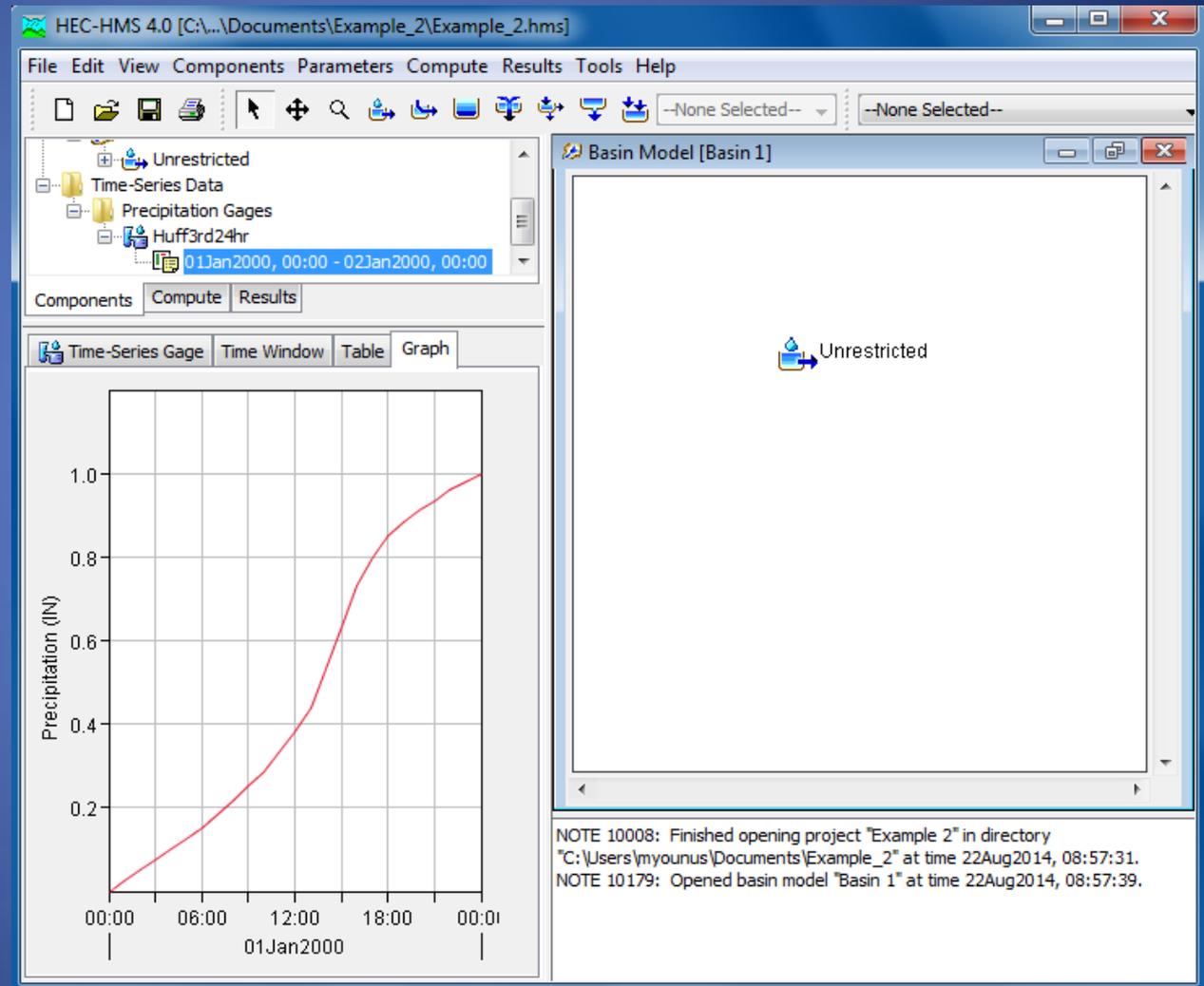
Unrestricted

NOTE 10008: Finished opening project "Example 2" in directory "C:\Users\myounus\Documents\Example_2" at time 22Aug2014, 08:57:31.
NOTE 10179: Opened basin model "Basin 1" at time 22Aug2014, 08:57:39.

ENTERING TIME-SERIES DATA

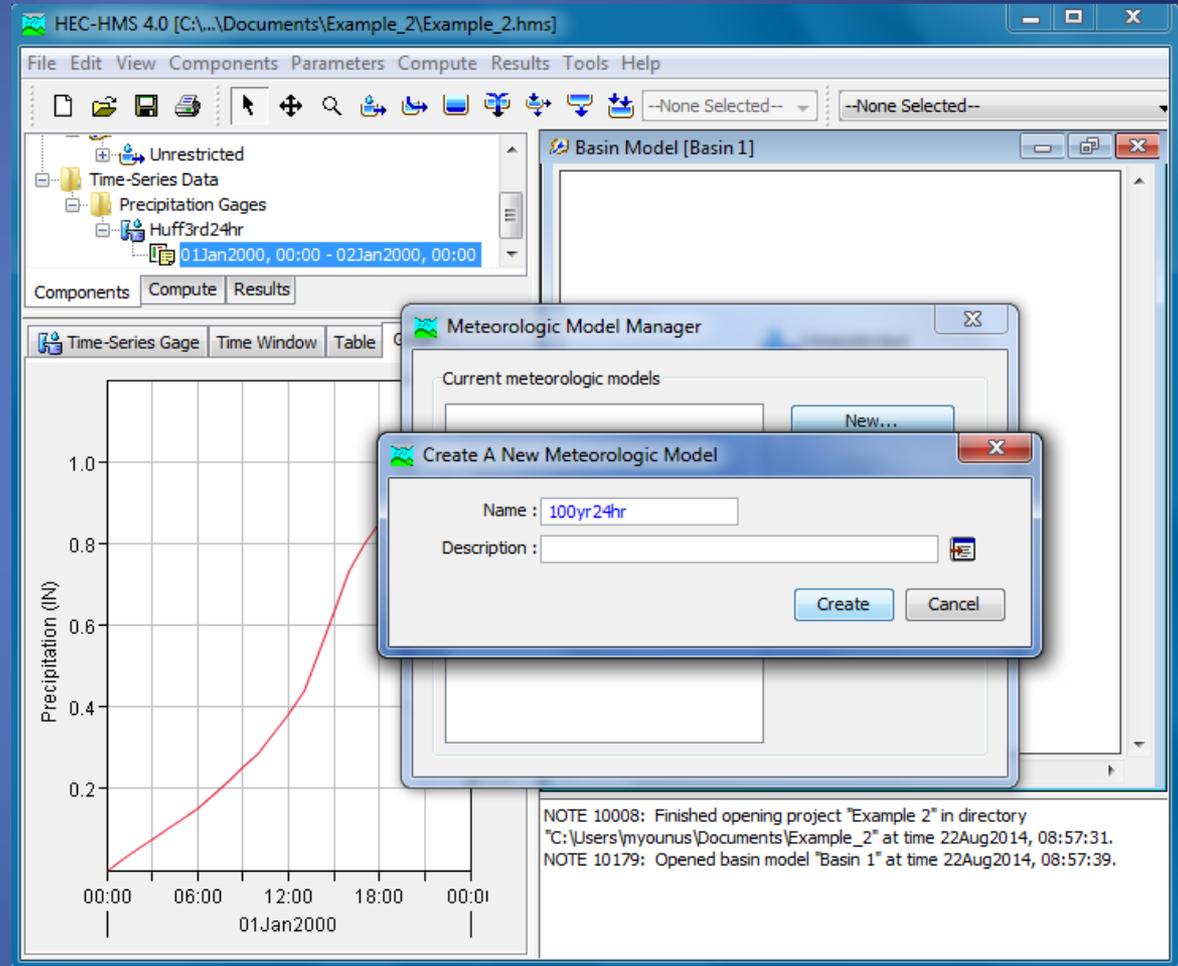
Continue ...

- Use the *Graph* tab to see a plot of the distribution



CREATING THE METEOROLOGIC MODEL

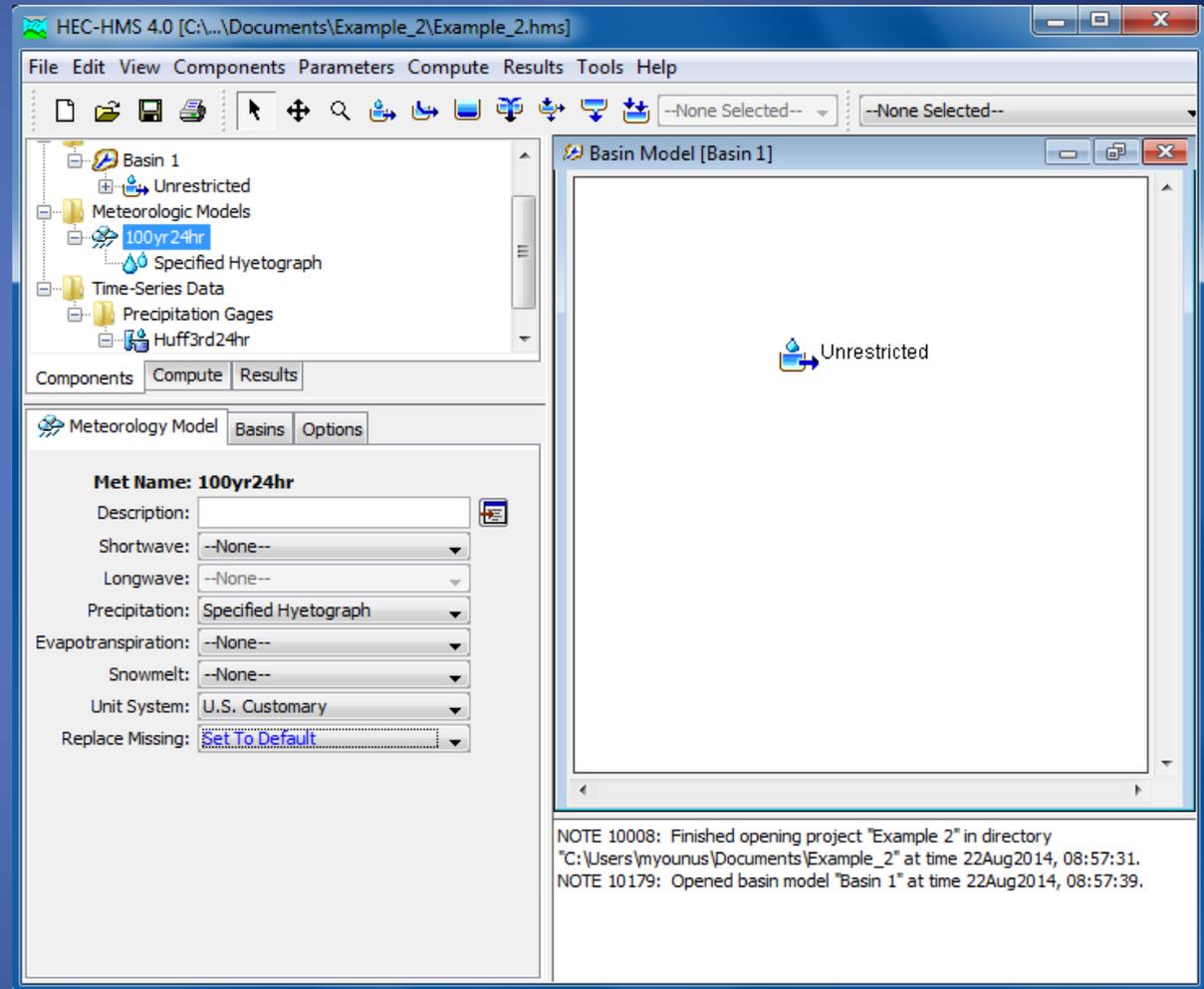
- From the *Components* tab, create a new *Meteorologic Model* named “100yr24hr”



CREATING THE METEOROLOGIC MODEL

Continue ...

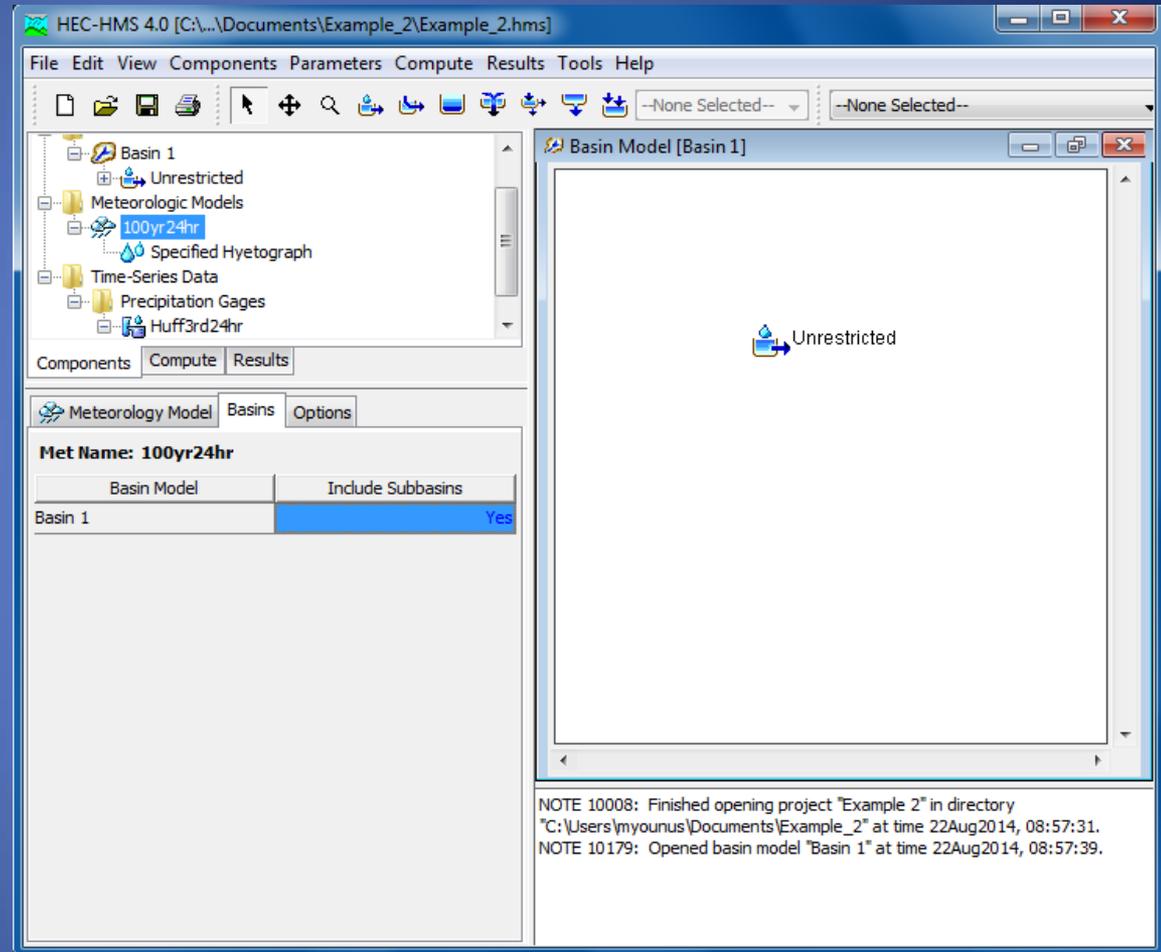
- Under the *Meteorologic Model* tab, make sure the *Replace Missing* is *Set to Default*



CREATING THE METEOROLOGIC MODEL

Continue ...

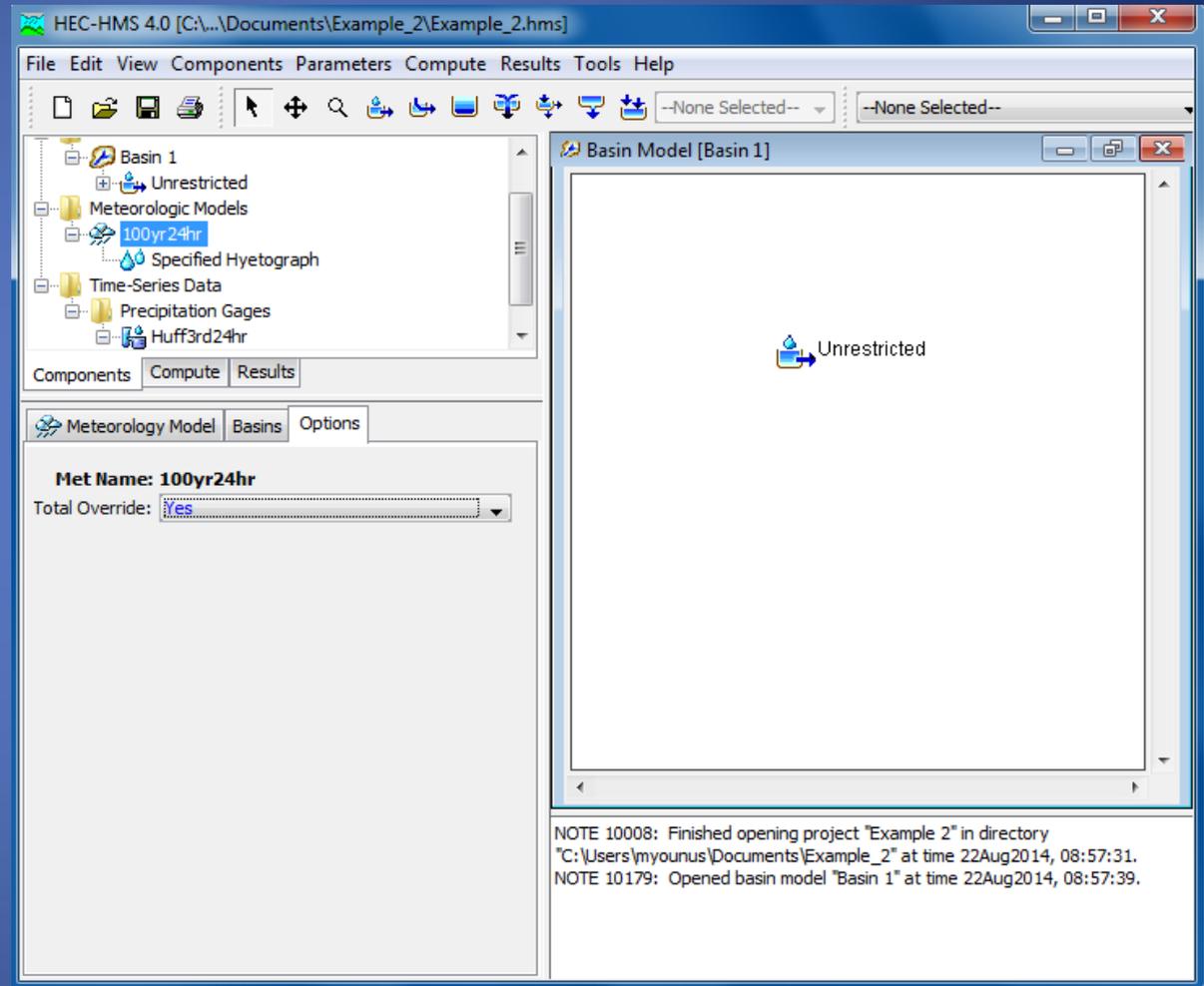
- Under the *Basins* tab, select *Yes* under *Include Subbasins*?



CREATING THE METEOROLOGIC MODEL

Continue ...

- Under the *Options* tab, select *Yes* for *Total Override*



CREATING THE METEOROLOGIC MODEL

Continue ...

- Under the *Specified Hyetograph* tab, select the rainfall distribution that we previously created and enter the 100-year, 24-hour rainfall depth.

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]". The left-hand pane shows a tree view of the project components. Under "Basin 1", the "Specified Hyetograph" sub-component is selected. Below this, a table lists the subbasins and their associated gages and rainfall depths.

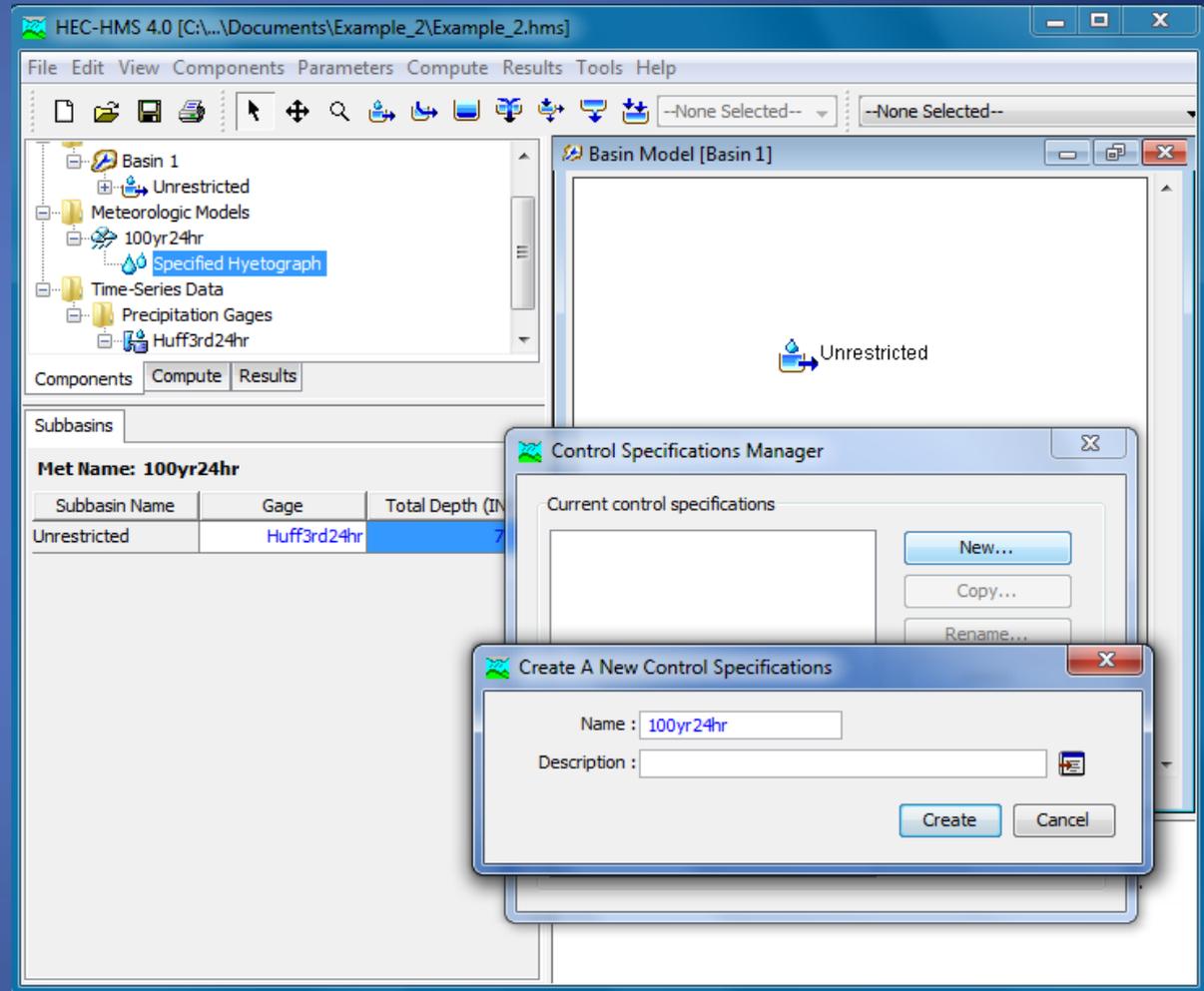
Met Name: 100yr24hr		
Subbasin Name	Gage	Total Depth (IN)
Unrestricted	Huff3rd24hr	7.58

The right-hand pane shows a diagram of the basin model with a single subbasin labeled "Unrestricted". At the bottom of the window, a status bar displays the following notes:

NOTE 10008: Finished opening project "Example 2" in directory "C:\Users\myounus\Documents\Example_2" at time 22Aug2014, 08:57:31.
NOTE 10179: Opened basin model "Basin 1" at time 22Aug2014, 08:57:39.

CREATING THE CONTROL SPECIFICATIONS

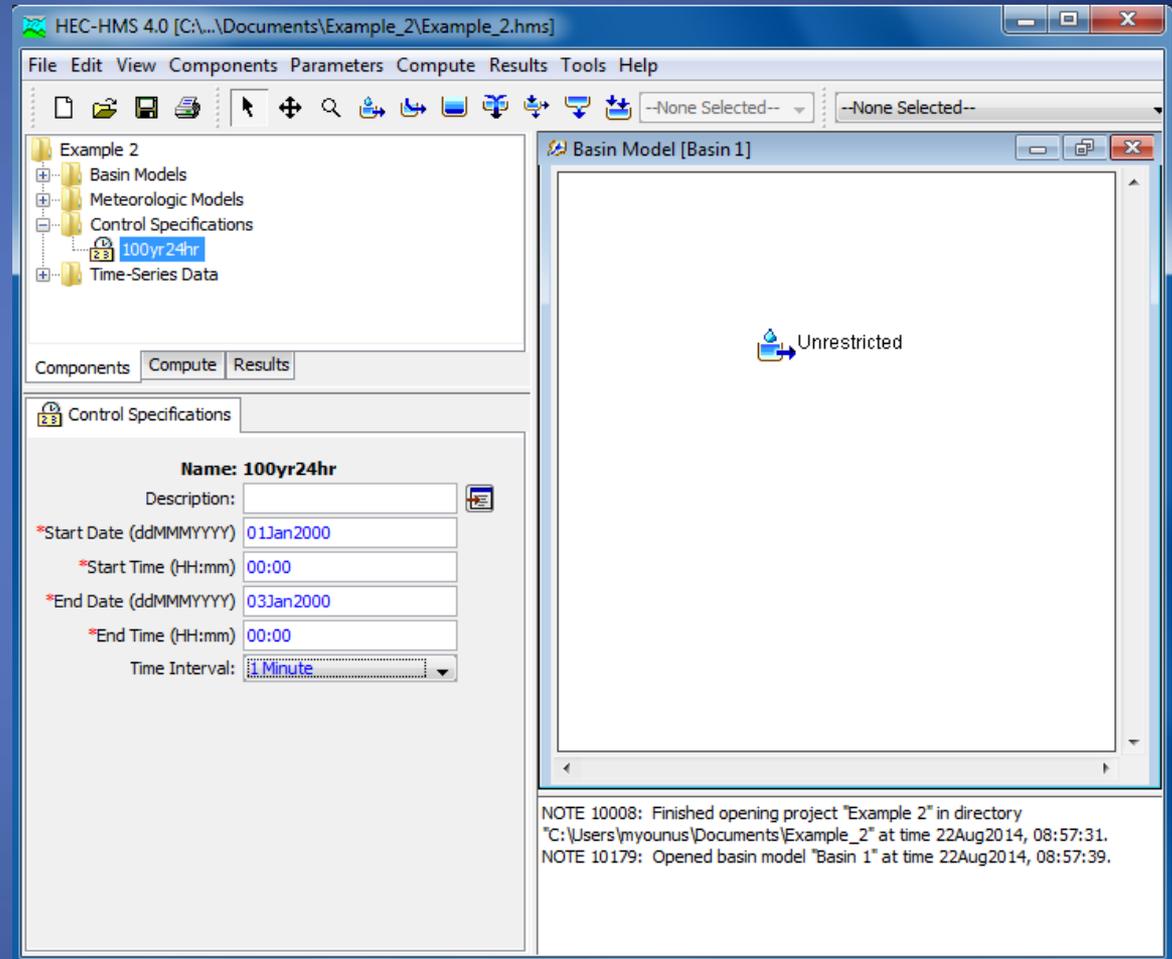
- We still need to specify how long to run the model for and how often we want to see output...this is performed under the *Control Specifications*
- Under the *Components* menu, select *Control Specifications Manager* to create a new one named “100yr24hr”



CREATING THE CONTROL SPECIFICATIONS

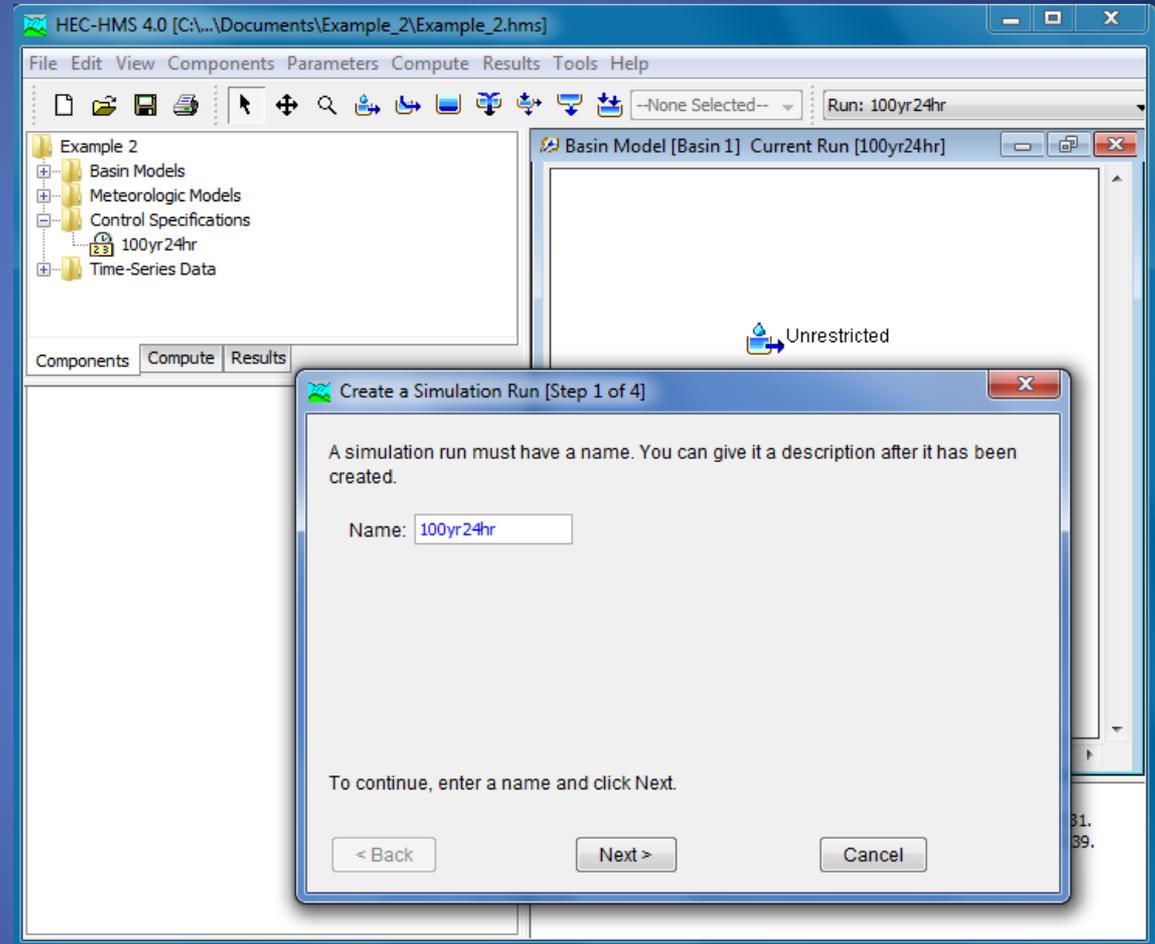
Continue ...

- Specify 01Jan2000 through 03Jan2000 (remember we're running a 24-hour storm event)
- Under *Time Interval*, specify 1 minute



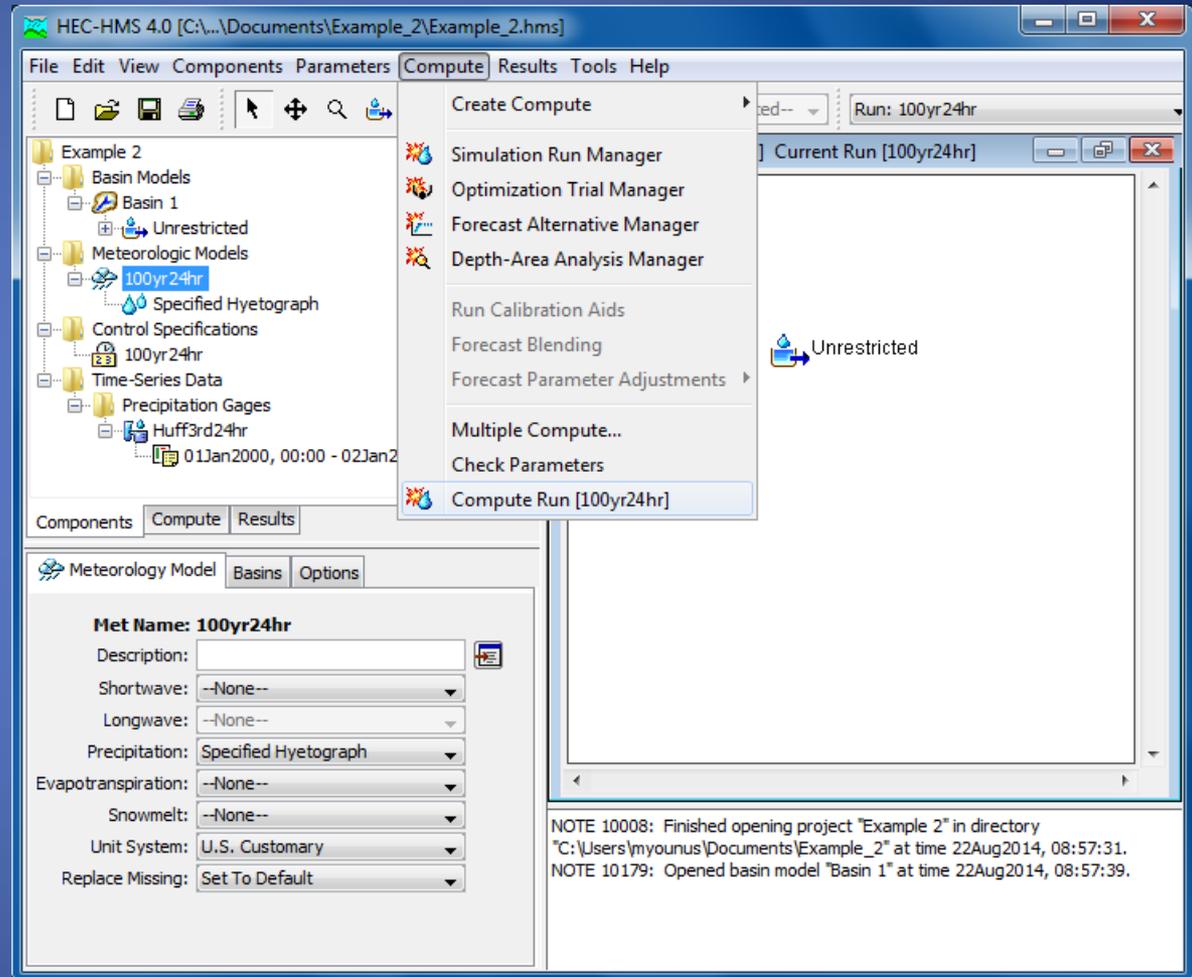
CREATING THE SIMULATION RUN

- A *Simulation Run* is a combination of:
 - *Basin Model*
 - *Meteorologic Model*
 - *Control Specifications*
- To create a new *Simulation Run*, select **Create Compute > Simulation Run** under the *Components* menu
- Name the run “100yr24hr” and click **Next**
- Specify the *Basin Model*, *Meteorologic Model*, and *Control Specifications* that we’ve just created



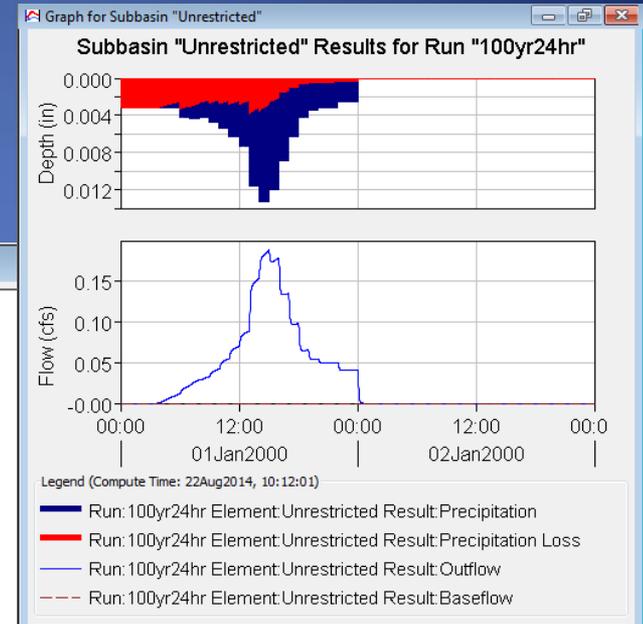
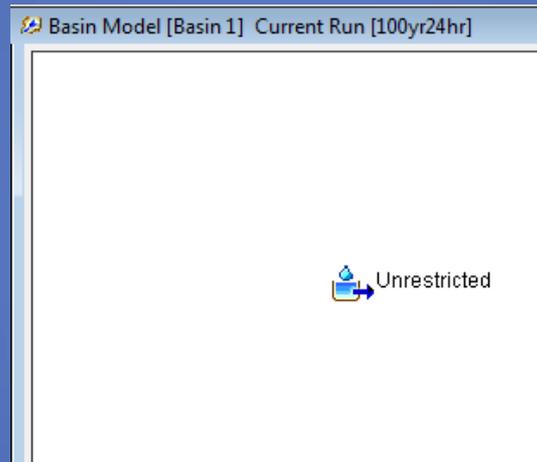
RUNNING THE SIMULATION

- Under the **Compute** menu, select **Compute Run [100yr24hr]**
- All errors, warnings, and notes are shown in the lower right hand window
- If there are errors, they will show up in red and the simulation will not run successfully



VIEWING RESULTS

- If the *Simulation Run* was successful, right-click on the components of the *Basin Model* to view individual results
- Results are available as a *Graph*, *Summary Table*, or *Time-Series Table*



Summary Results for Subbasin "Unrestricted"

Project: Example 2 Simulation Run: 100yr24hr
Subbasin: Unrestricted

Start of Run: 01Jan2000, 00:00 Basin Model: Basin 1
End of Run: 03Jan2000, 00:00 Meteorologic Model: 100yr24hr
Compute Time: 22Aug2014, 10:12:01 Control Specifications: 100yr24hr

Volume Units: IN AC-FT

Computed Results

Peak Discharge: 0.19 (CFS)	Date/Time of Peak Discharge: 01Jan2000, 15:01
Precipitation Volume: 7.58 (IN)	Direct Runoff Volume: 4.55 (IN)
Loss Volume: 3.03 (IN)	Baseflow Volume: 0.00 (IN)
Excess Volume: 4.55 (IN)	Discharge Volume: 4.55 (IN)

VIEWING RESULTS

Continue...

- To view the results for all model components at once, choose **Global Summary Table** under the **Results Menu**

The screenshot displays the HEC-HMS 4.0 interface. The left pane shows a tree view under 'Example 2' with 'Simulation Runs' expanded to '100yr24hr', where 'Global Summary' is selected. The main window shows 'Basin Model [Basin 1] Current Run [100yr24hr]' with a large empty area labeled 'Unrestricted'. A 'Global Summary Results for Run "100yr24hr"' dialog box is open, showing project details and a table of results.

Project: Example 2 Simulation Run: 100yr24hr

Start of Run: 01Jan2000, 00:00 Basin Model: Basin 1
End of Run: 03Jan2000, 00:00 Meteorologic Model: 100yr24hr
Compute Time: 22Aug2014, 10:12:01 Control Specifications: 100yr24hr

Show Elements: All Elements Volum... H AC Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak
Unrestricted	0.000469	0.19	01Jan2000, 15:01

NOTE 20364: Found no parameter problems in meteorologic model "100yr24hr".
WARNING 20657: Hyetograph gage "Huff3rd24hr" for subbasin "Unrestricted" contains 1440 missing precipitation values that were set to zero.
NOTE 40049: Found no parameter problems in basin model "Basin 1".
NOTE 10185: Finished computing simulation run "100yr24hr" at time 22Aug2014, 10:12:01.

EXAMPLE 2 – STEP 4

Determine Net Release Rate:

The unrestricted 100-yr, 24-hr flowrate for the site = 0.19 cfs

$$\begin{aligned}\text{Net Release Rate} &= 0.3 \text{ cfs/acre} \times 10 \text{ acres} - 0.19 \text{ cfs} \\ &= 2.81 \text{ cfs}\end{aligned}$$

EXAMPLE 2 – STEP 5

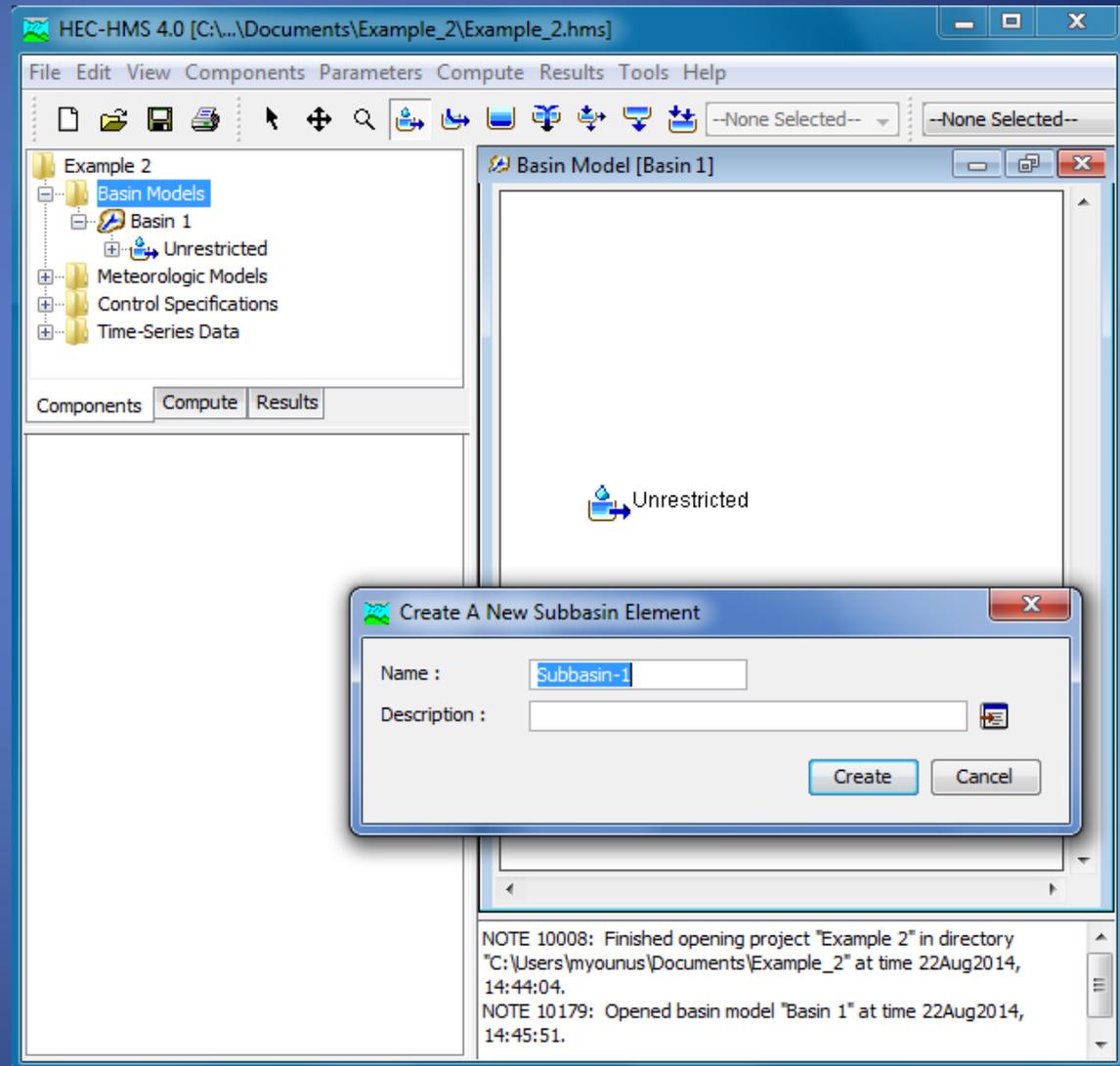
Adding Basin Model Components

- Subbasin-1 (Project Site)
- Reservoir-1 (Detention Facility)

ADDING BASIN MODEL COMPONENTS

Subbasin: "Subbasin-1"

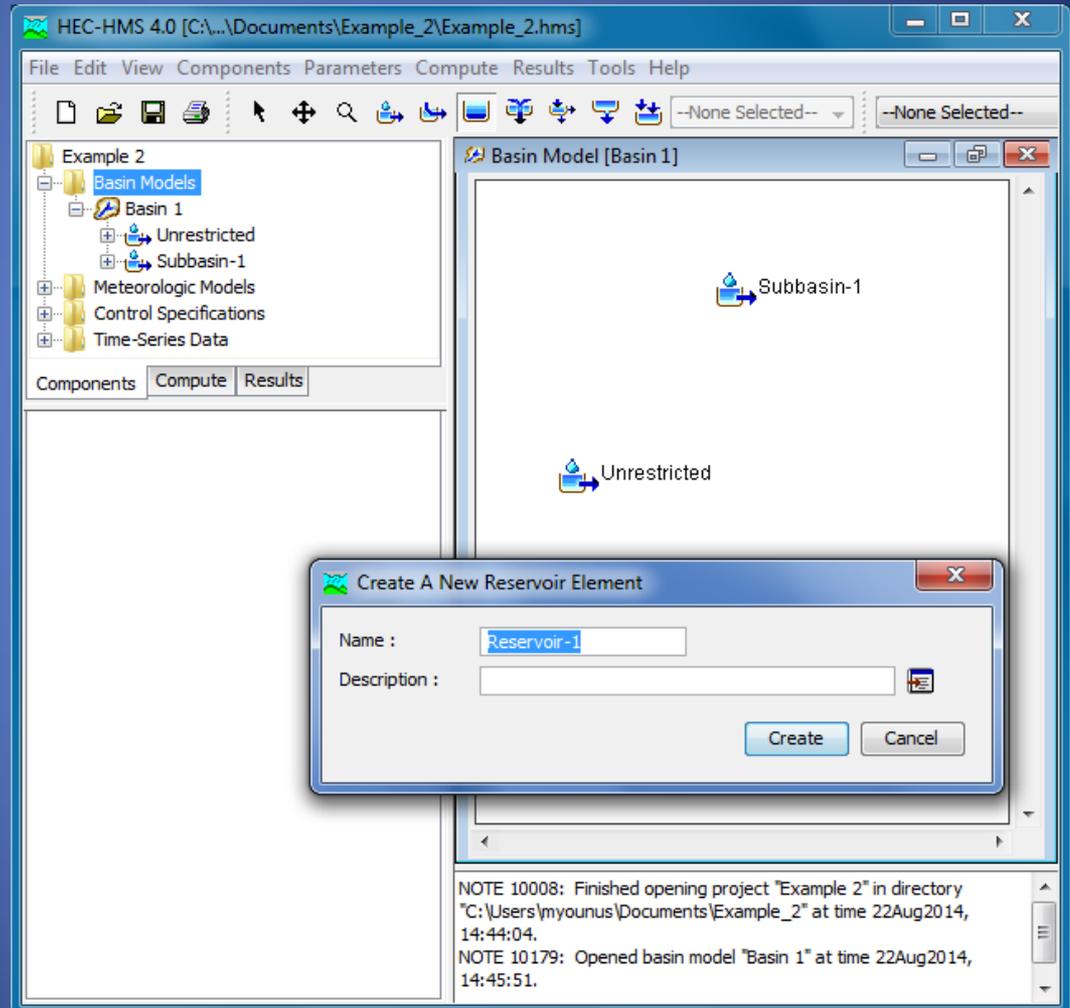
- Click on the *Subbasin Creation Tool* at the top of the screen to add a subbasin to the *Basin Model*.
- Enter Subbasin Name as "Subbasin-1", and click at Create.



ADDING BASIN MODEL COMPONENTS

Reservoir: "Reservoir-1"

- Click on the *Reservoir Creation Tool* at the top of the screen to add a subbasin to the *Basin Model*.
- Enter Reservoir Name as "Reservoir -1", and click at Create.



ADDING BASIN MODEL COMPONENTS

Connecting Subbasin-1 to Reservoir-1

- To route the subbasin through the reservoir, right-click on the subbasin and select “Connect Downstream” and click on the reservoir.

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]". On the left, a tree view shows the project structure: "Example 2" contains "Basin Models", which includes "Basin 1". Under "Basin 1", there are "Unrestricted", "Subbasin-1", and "Reservoir-1". Below the tree view, the "Subbasin" properties panel is active, showing the following details:

- Basin Name:** Basin 1
- Element Name:** Subbasin-1
- Description:** [Empty field]
- Downstream:** Reservoir-1
- *Area (MI²):** [Empty field]
- Latitude Degrees:** [Empty field]
- Latitude Minutes:** [Empty field]
- Latitude Seconds:** [Empty field]
- Longitude Degrees:** [Empty field]
- Longitude Minutes:** [Empty field]
- Longitude Seconds:** [Empty field]
- Canopy Method:** --None--
- Surface Method:** --None--
- Loss Method:** SCS Curve Number
- Transform Method:** SCS Unit Hydrograph

The main workspace shows a diagram with three components: "Unrestricted", "Subbasin-1", and "Reservoir-1". A line connects "Subbasin-1" to "Reservoir-1", indicating the downstream connection. The status bar at the bottom contains the following notes:

- NOTE 10008: Finished opening project "Example 2" in directory "C:\Users\myounus\Documents\Example_2" at time 22Aug2014, 14:44:04.
- NOTE 10179: Opened basin model "Basin 1" at time 22Aug2014, 14:45:51.

ENTERING SUBBASIN DATA

- Click on *Subbasin-1* and the data entry tabs will appear at the lower left corner
- For *Area*, enter 0.015156 mi² (9.7 acres)

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Subbasin-1' selected. The 'Subbasin' data entry tab is active, showing the following fields:

- Basin Name: Basin 1
- Element Name: Subbasin-1
- Description: (empty)
- Downstream: Reservoir-1
- *Area (MI2): 0.015156
- Latitude Degrees: (empty)
- Latitude Minutes: (empty)
- Latitude Seconds: (empty)
- Longitude Degrees: (empty)
- Longitude Minutes: (empty)
- Longitude Seconds: (empty)
- Canopy Method: --None--
- Surface Method: --None--
- Loss Method: SCS Curve Number
- Transform Method: SCS Unit Hydrograph
- Baseflow Method: --None--

The 'Basin Model [Basin 1]' window shows a diagram with three elements: 'Unrestricted', 'Subbasin-1', and 'Reservoir-1'. A line connects 'Subbasin-1' to 'Reservoir-1'. The 'Unrestricted' element is also present but not connected.

NOTE 10008: Finished opening project "Example 2" in directory "C:\Users\myounus\Documents\Example_2" at time 22Aug2014, 15:10:43.
NOTE 10179: Opened basin model "Basin 1" at time 22Aug2014, 15:10:46.
NOTE 40043: The basin model contains 2 elements with no downstream connection: Unrestricted, Reservoir-1

ENTERING SUBBASIN DATA

Continue...

- Under the **Loss** tab, enter the reduced CN of 87.59

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]". On the left, a tree view shows the project structure: "Example 2" contains "Basin Models", which includes "Basin 1". Under "Basin 1", there are "Unrestricted", "Subbasin-1", and "Reservoir-1". Below the tree view, the "Loss" tab is selected, showing the following data:

Basin Name:	Basin 1
Element Name:	Subbasin-1
Initial Abstraction (IN)	<input type="text"/>
*Curve Number:	87.59
*Impervious (%)	0.0

The main diagram area shows a flow network with three elements: "Unrestricted", "Subbasin-1", and "Reservoir-1". An arrow points from "Subbasin-1" to "Reservoir-1".

At the bottom of the window, a status bar displays the following text:

"C:\Users\myounus\Documents\Example_2" at time 25Aug2014, 08:28:30.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 08:28:40.

ENTERING SUBBASIN DATA

Continue ...

- Under the *Transform* tab, enter the SCS Lag time of 9 minutes
(Lag time = $0.6 * T_c$)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]". The left sidebar shows a tree view of the project structure, including "Example 2", "Basin Models", "Basin 1", "Unrestricted", "Subbasin-1", and "Reservoir-1". The "Transform" tab is selected, and the "Lag Time (MIN)" is set to 9. The main diagram area shows a flow from "Subbasin-1" to "Reservoir-1".

Basin Name: Basin 1
Element Name: Subbasin-1
Graph Type: Standard
*Lag Time (MIN) 9

NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 08:28:40.

ENTERING RESERVOIR DATA

- Click on *Reservoir-1* and the data entry tabs will appear at the lower left corner
- For *Method*, enter *Outflow Curve*
- For Storage Method, select *Elevation-Storage-Discharge*
- Note that the Storage-Discharge and Elevation-Storage Functions are missing. This is the next step.

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Basin 1' selected, containing 'Unrestricted', 'Subbasin-1', and 'Reservoir-1'. The 'Reservoir' data entry tab is active, showing the following configuration:

- Basin Name:** Basin 1
- Element Name:** Reservoir-1
- Description:** (empty field)
- Downstream:** --None--
- Method:** Outflow Curve
- Storage Method:** Elevation-Storage-Discharge
- *Stor-Dis Function:** --None--
- *Elev-Stor Function:** --None--
- Primary:** Storage-Discharge
- Initial Condition:** Inflow = Outflow

A diagram in the top right shows 'Subbasin-1' connected to 'Reservoir-1'. The bottom of the window contains a log with the following notes:

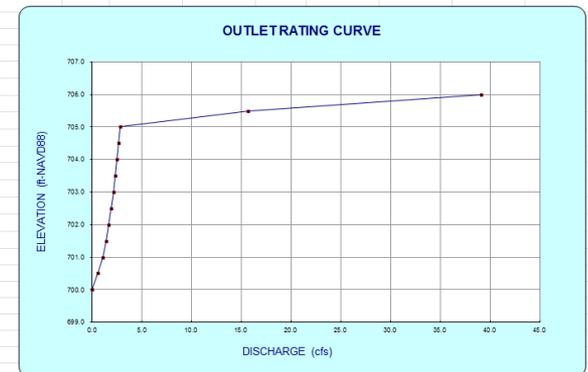
```
NOTE 10008: Finished opening project "Example 2" in directory  
"C:\Users\myounus\Documents\Example_2" at time 27Aug2014, 09:39:59.  
NOTE 10179: Opened basin model "Basin 1" at time 27Aug2014, 09:40:07.
```

ENTERING RESERVOIR DATA

- Using the spreadsheet available on the MWRD website, the following stage-discharge relationship was determined for the proposed detention basin:

Stage (ft)	Discharge (cfs)
700	0.00
701	1.09
702	1.69
703	2.13
704	2.49
705	2.81

PROPOSED CONDITIONS									
ORIFICE/WEIR STRUCTURE RATING ANALYSIS									
PROJECT NAME:	Example 2								
PROJ. NO.:	TGM								
DESCRIPTION:	Detention Basin 1								
FILENAME:	Orifice.xlsx								
DATE:	22-Aug-14								
OUTLET:	<table border="1"> <tr> <td>ORIFICE:</td> <td>6.96 IN. DIA. @ ELEV</td> <td>700</td> </tr> <tr> <td>WEIR:</td> <td>12 FEET WIDE @ ELEV</td> <td>705</td> </tr> </table>			ORIFICE:	6.96 IN. DIA. @ ELEV	700	WEIR:	12 FEET WIDE @ ELEV	705
ORIFICE:	6.96 IN. DIA. @ ELEV	700							
WEIR:	12 FEET WIDE @ ELEV	705							
ORIFICE FLOW EQUATION: $Q = C_d A \sqrt{2gH}^{1.5}$									
WEIR FLOW EQUATION: $Q = 3.0L(H)^{1.5}$									
HYDRAULIC DIMENSIONS									
			# 1						
ORIFICE AREA (ft ²)			0.2642						
ORIFICE DIAMETER (in)			6.96						
ORIFICE DISCHARGE COEFFICIENT			0.61						
ORIFICE ELEV. (ft-NAVD88)			700.00						
TAILWATER OR CENTROID (ft-NAVD88)			700.290						
WEIR LENGTH (ft)			12.00						
WEIR COEFFICIENT			3.0						
WEIR ELEV. (ft-NAVD88)			705.0						
ELEVATION-DISCHARGE RELATIONSHIP									
Elevation (feet)	Q-Orifice (cfs)	Q-Weir (cfs)	Q-Total (cfs)						
700.0	0.00	0.00	0.00						
700.5	0.59	0.00	0.59						
701.0	1.09	0.00	1.09						
701.5	1.42	0.00	1.42						
702.0	1.69	0.00	1.69						
702.5	1.92	0.00	1.92						
703.0	2.13	0.00	2.13						
703.5	2.32	0.00	2.32						
704.0	2.49	0.00	2.49						
704.5	2.65	0.00	2.65						
705.0	2.81	0.00	2.81						
705.5	2.95	12.73	15.68						
706.0	3.09	36.00	39.09						



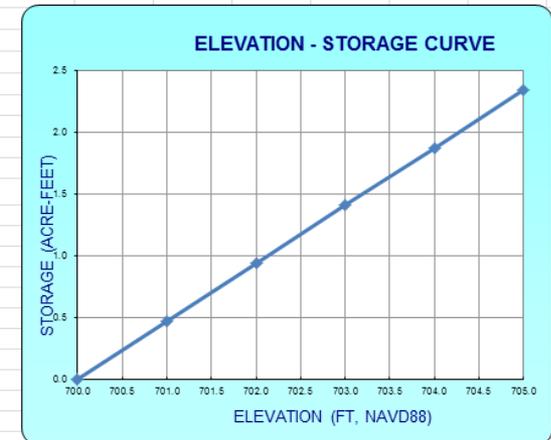
ENTERING RESERVOIR DATA

- Using the spreadsheet available on the MWRD website, the following stage-storage relationship was determined for the proposed detention basin:

Stage (ft)	Storage (ac-ft)
700	0.00
701	0.47
702	0.94
703	1.41
704	1.88
705	2.35

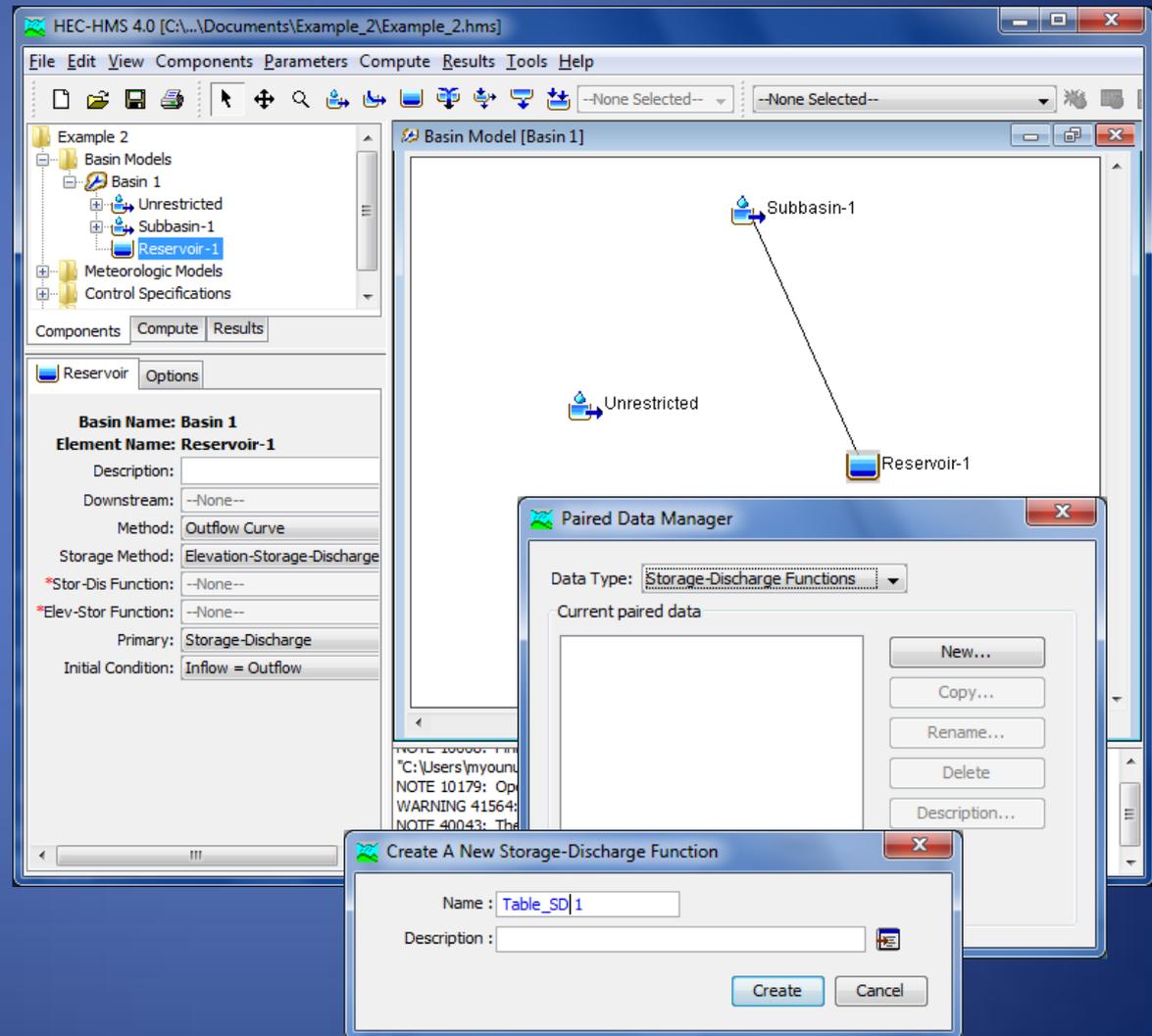
POND: Pond 1		Side Slopes			
JOB NO.:	TGM	1			
PROJECT:	Example 2	4			
FILE:	Storage.xls				
DATE:	8/22/2014				
Elevation (ft)	Area		Average Area (ac)	Incremental Storage (ac-ft)	Cumulative Storage (ac-ft)
	(ft ²)	(ac)			
700.00	6,120	0.470	0.470	0.47	0.000
701.00	7,436	0.470	0.470	0.47	0.47
702.00	8,879	0.470	0.470	0.47	0.94
703.00	10,451	0.470	0.470	0.47	1.41
704.00	12,151	0.470	0.470	0.47	1.88
705.00	13,978	0.470	0.470	0.47	2.35

Elevation (ft, NAVD88)	Storage (ac-ft)
700.00	0.000
701.00	0.47
702.00	0.94
703.00	1.41
704.00	1.88
705.00	2.35



ENTERING RESERVOIR DATA

- Under the **Components** tab, select **Paired Data Manager**
- Add a new **Storage-Discharge**. Enter Name as “Table_SD 1”



ENTERING RESERVOIR DATA

- Under the **Table** tab, enter the appropriate Storage-Discharge values

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled 'Basin Model [Basin 1]'. On the left, a tree view shows the project structure, with 'Table_SD 1' selected under 'Storage-Discharge Functions'. The 'Table' tab is active, showing a table with two columns: 'Storage (AC-FT)' and 'Discharge (CFS)'. The table contains the following data:

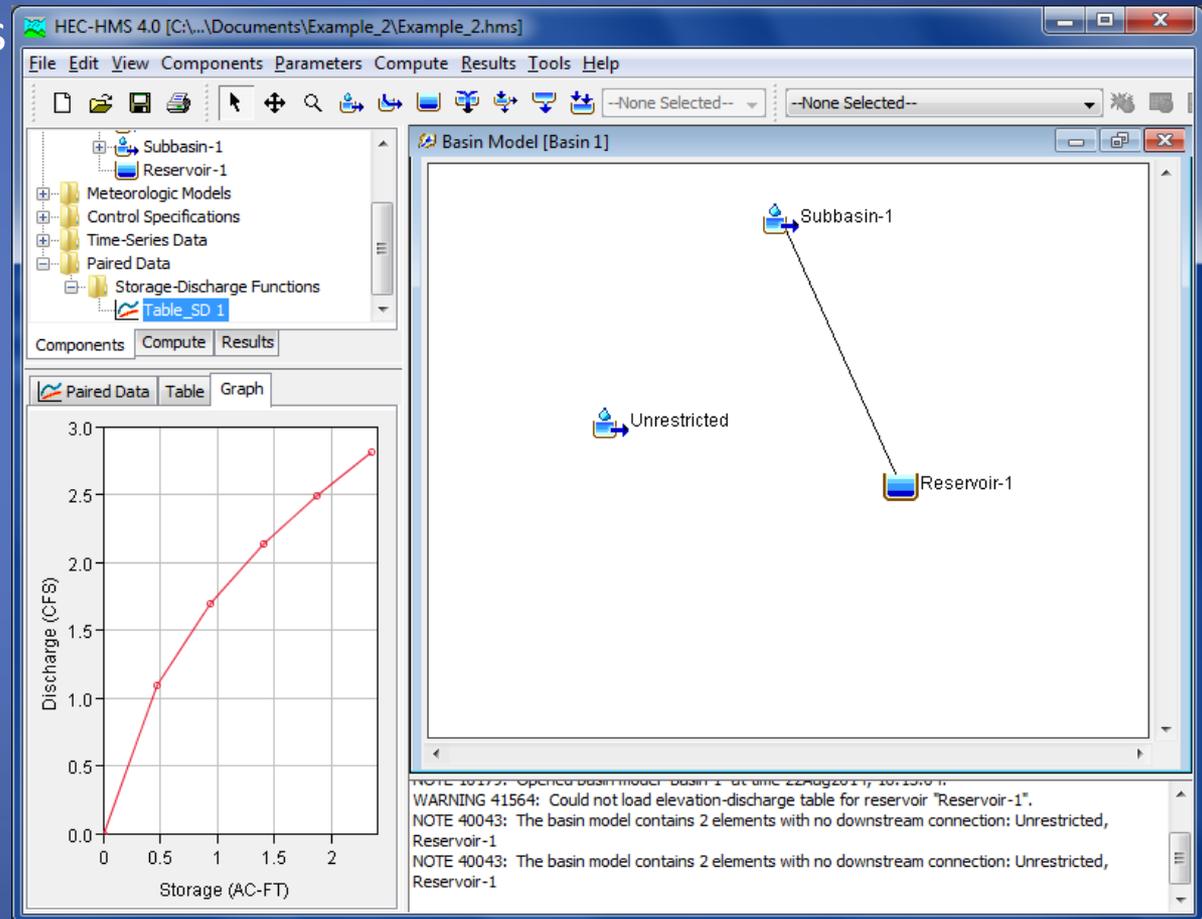
Storage (AC-FT)	Discharge (CFS)
0.00	0.00
0.47	1.09
0.94	1.69
1.41	2.13
1.88	2.49
2.35	2.81

The basin model diagram on the right shows three elements: 'Subbasin-1', 'Unrestricted', and 'Reservoir-1'. A line connects 'Subbasin-1' to 'Reservoir-1'. The 'Unrestricted' element is positioned between them. At the bottom of the window, a status bar displays the following messages:

NOTE 10175: Opened basin model 'basin 2' at time '2/24/2011 11:10:13 AM'.
WARNING 41564: Could not load elevation-discharge table for reservoir "Reservoir-1".
NOTE 40043: The basin model contains 2 elements with no downstream connection: Unrestricted, Reservoir-1
NOTE 40043: The basin model contains 2 elements with no downstream connection: Unrestricted, Reservoir-1

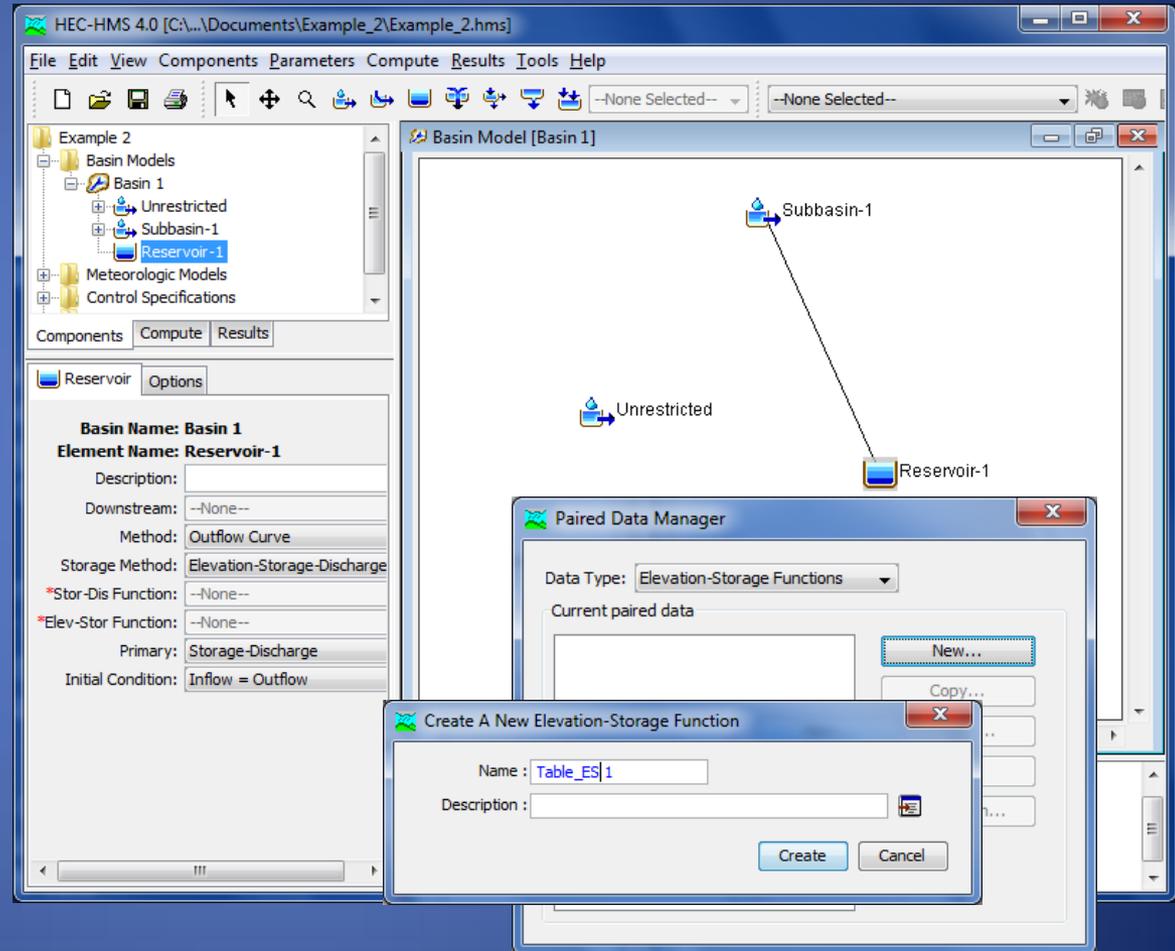
ENTERING RESERVOIR DATA

- Plots of the relationships are available under the *Graph* tab



ENTERING RESERVOIR DATA

- Under the **Components** tab, select **Paired Data Manager**
- Add a new **Elevation-Storage** function. Enter Name as “Table_ES 1”



ENTERING RESERVOIR DATA

- Under the **Table** tab, enter the appropriate elevation-storage values

The screenshot shows the HEC-HMS 4.0 software interface. The 'Table' tab is active for 'Table_ES 1', displaying the following data:

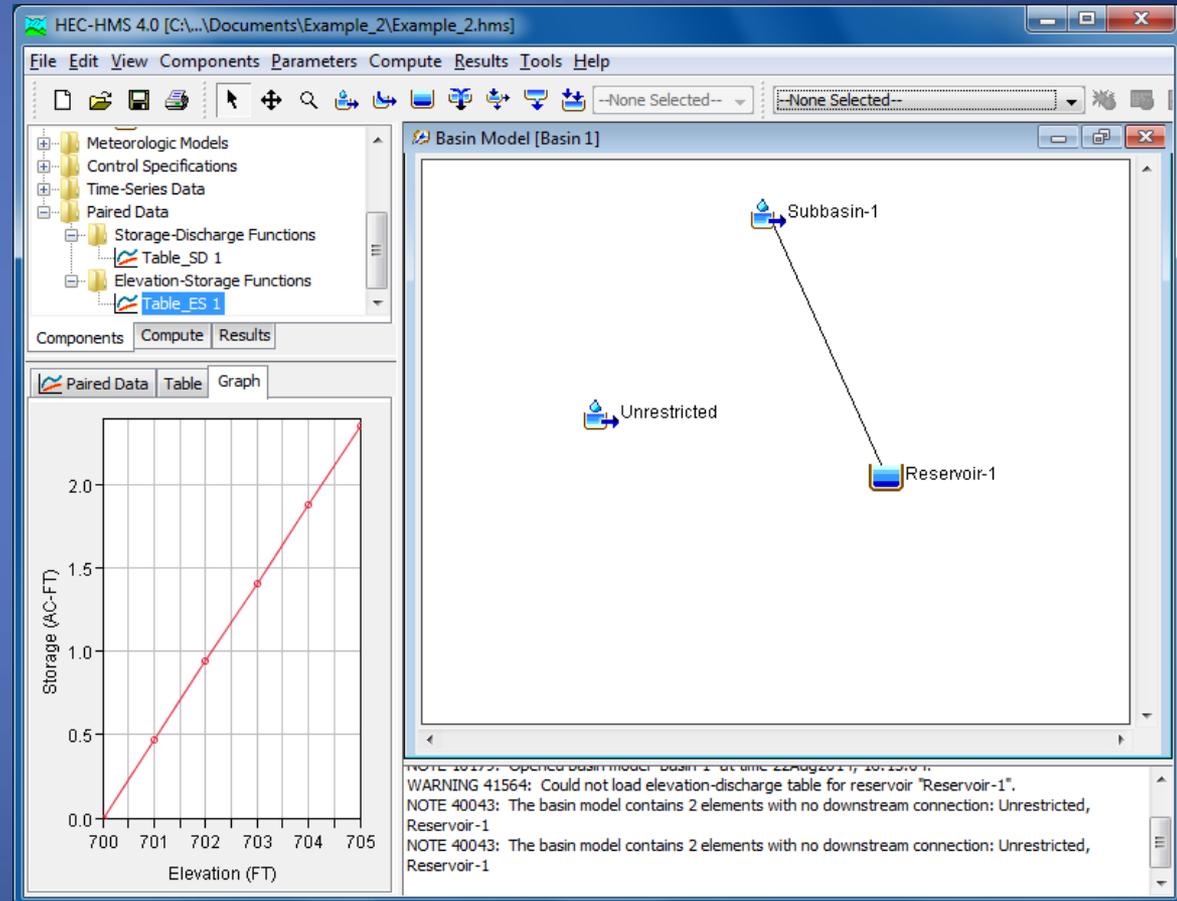
Elevation (FT)	Storage (AC-FT)
700.0	0.00
701.0	0.47
702.0	0.94
703.0	1.41
704.0	1.88
705.0	2.35

The basin model diagram shows three elements: 'Subbasin-1', 'Unrestricted', and 'Reservoir-1'. 'Subbasin-1' is connected to 'Reservoir-1'. 'Unrestricted' is also connected to 'Reservoir-1'. The 'Reservoir-1' element is highlighted with a blue border.

WARNING 41564: Could not load elevation-discharge table for reservoir "Reservoir-1".
NOTE 40043: The basin model contains 2 elements with no downstream connection: Unrestricted, Reservoir-1
NOTE 40043: The basin model contains 2 elements with no downstream connection: Unrestricted, Reservoir-1

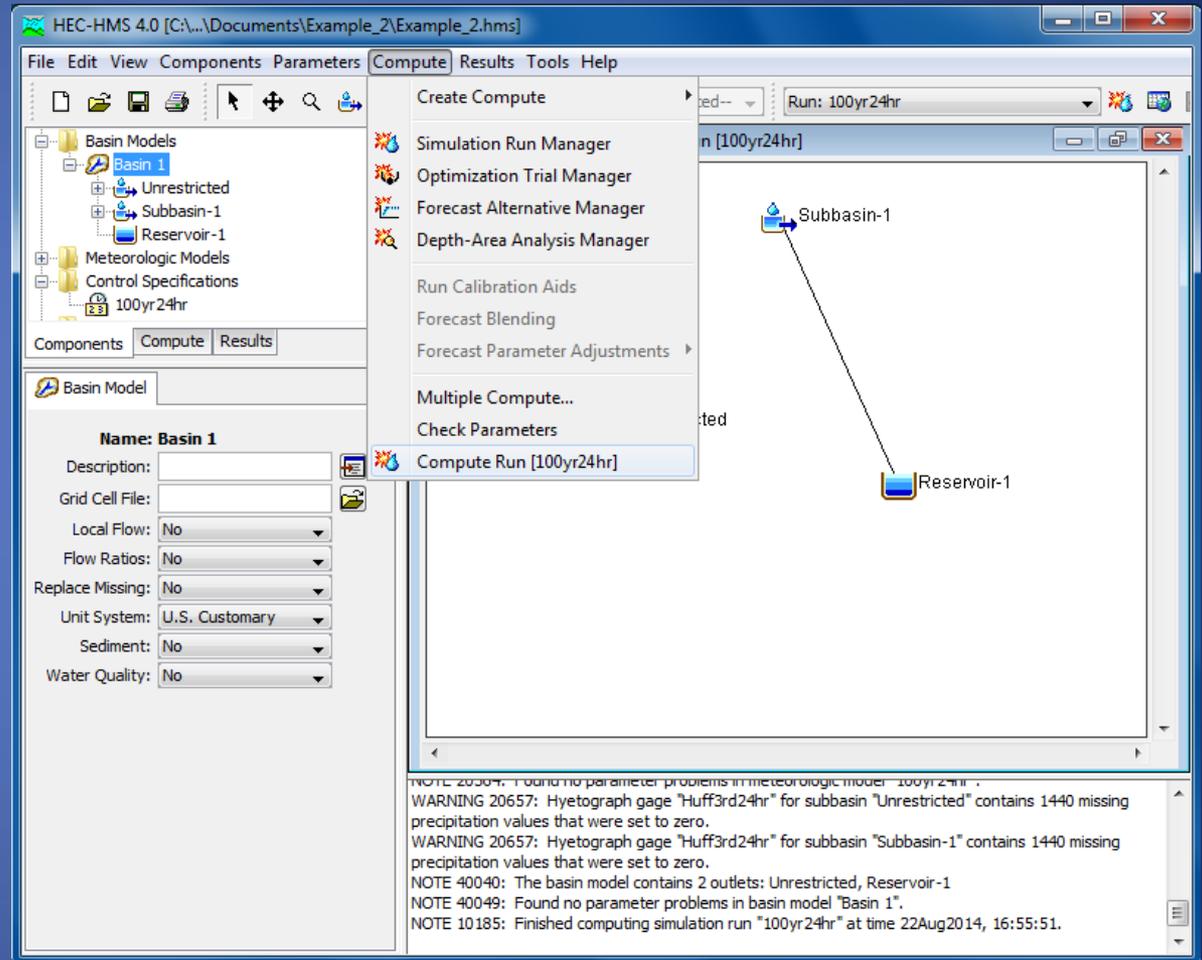
ENTERING RESERVOIR DATA

- Plots of the relationships are available under the *Graph* tab



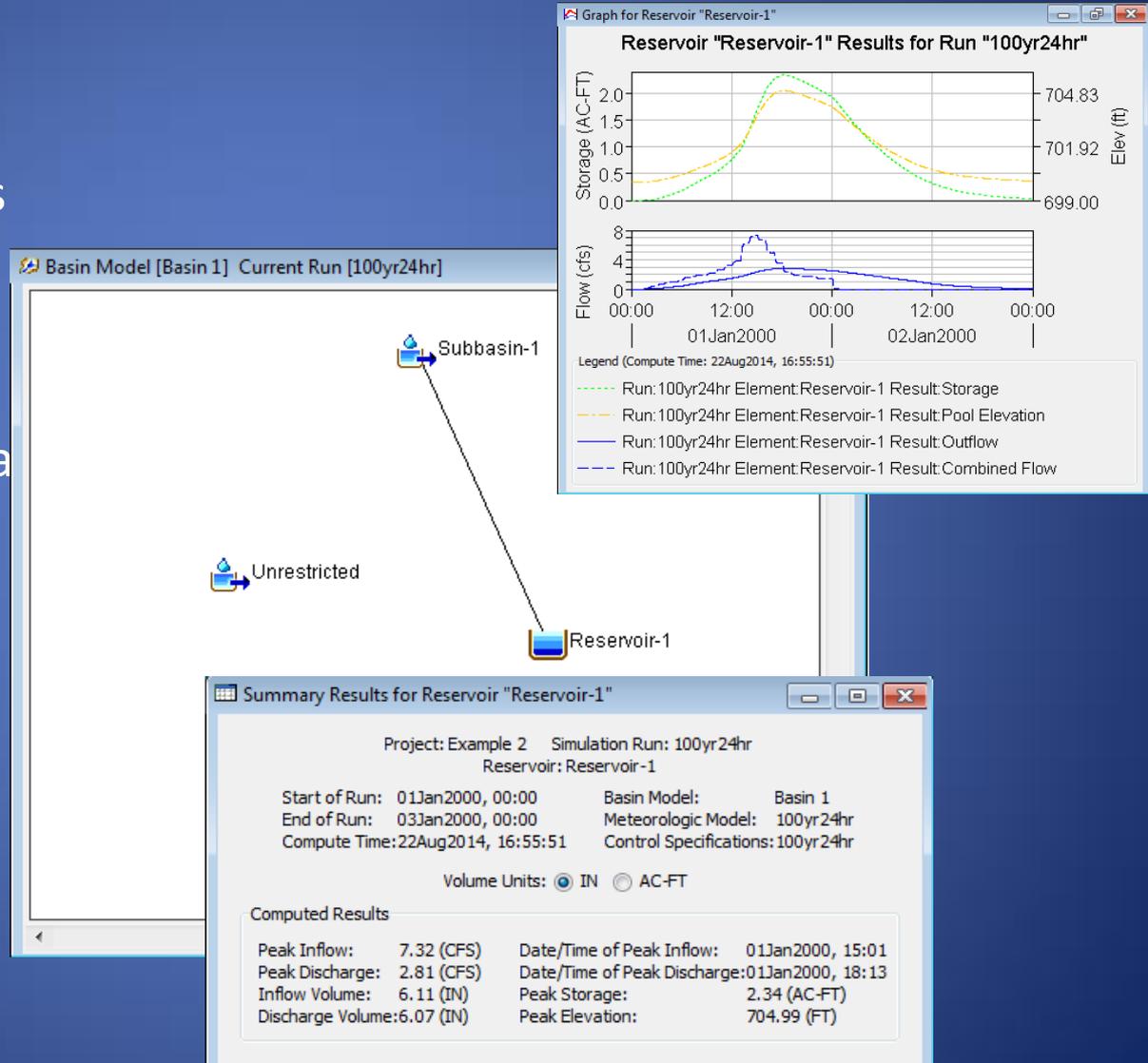
RUNNING THE SIMULATION

- Under the **Compute** menu, select **Compute Run [100yr24hr]**
- All errors, warnings, and notes are shown in the lower right hand window
- If there are errors, they will show up in red and the simulation will not run successfully



VIEWING RESULTS

- If the *Simulation Run* was successful, right-click on the components of the *Basin Model* to view individual results
- Results are available as a *Graph, Summary Table, or Time-Series Table*



VIEWING RESULTS

- To view the results for all model components at once, choose *Global Summary Table* under the *Results Menu*

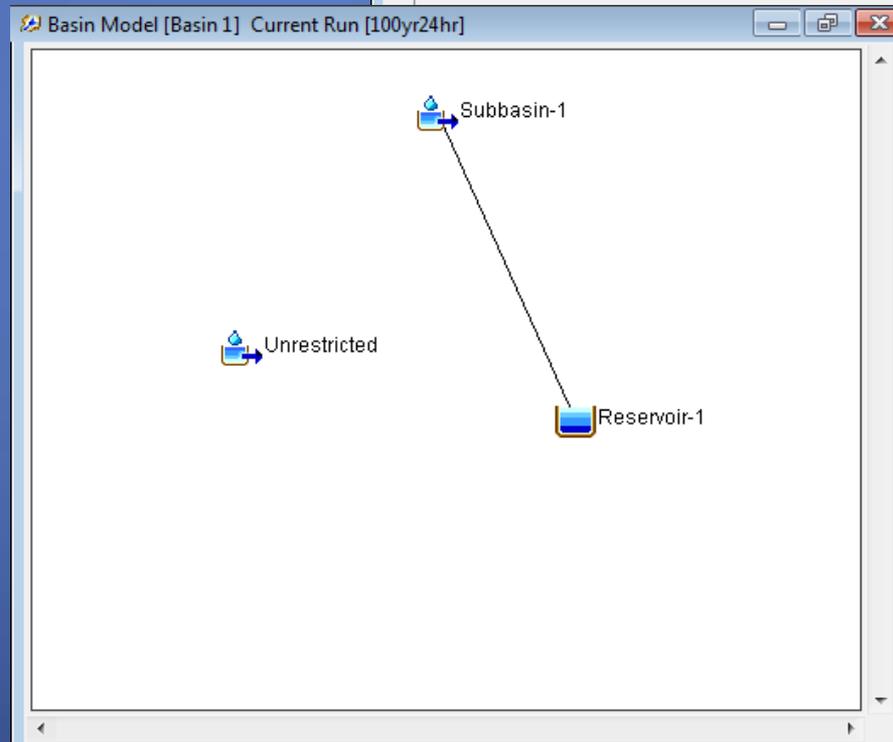
Global Summary Results for Run "100yr24hr"

Project: Example 2 Simulation Run: 100yr24hr

Start of Run: 01Jan2000, 00:00 Basin Model: Basin 1
End of Run: 03Jan2000, 00:00 Meteorologic Model: 100yr24hr
Compute Time: 22Aug2014, 16:55:51 Control Specifications: 100yr24hr

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Unrestricted	0.000469	0.19	01Jan2000, 15:01	4.55
Subbasin-1	0.015156	7.32	01Jan2000, 15:01	6.11
Reservoir-1	0.015156	2.81	01Jan2000, 18:13	6.07



EXAMPLE 2 RESULTS

- What is the peak elevation in the proposed detention basin for the 100-year, 24-hour storm event? 705 ft
- What is the peak 100-year, 24-hour release rate from the proposed detention basin? 2.81 cfs
- Does the proposed detention basin meet the requirements of the WMO? Yes

EXAMPLE PROBLEM #3 (INDIVIDUAL)

Assuming there are 20 acres of offsite tributary area to the site in Example #2, determine the peak 100-year flowrate (on-site and off-site) that must be bypassed through the detention basin overflow weir.

- Offsite Area = 20 Acres
- CN = 81
- Time of Concentration = 30 minutes

Run the 100-year, 1-, 12-, and 24-storm events

Storm Event	Peak Flowrate (cfs)
100-Year, 1-Hour	
100-Year, 12-Hour	
100-Year, 24-Hour	

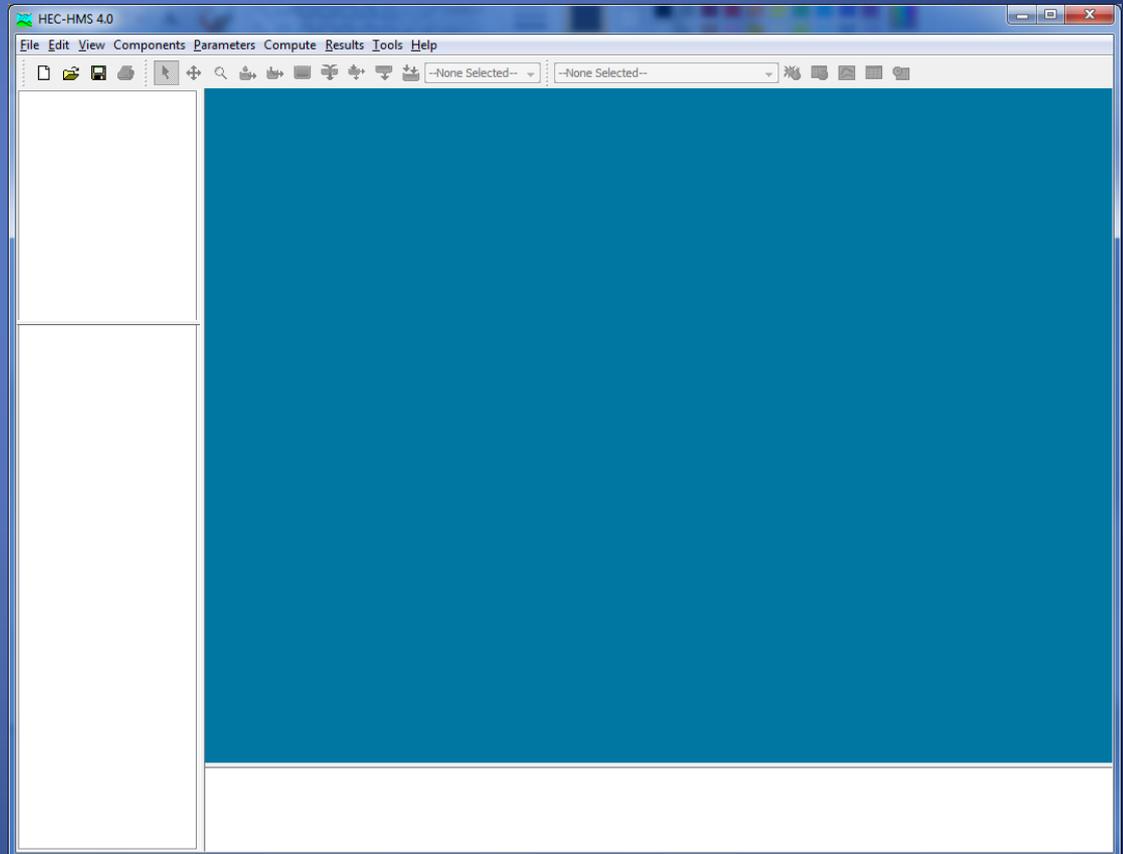
GETTING STARTED

THE INITIAL HEC-HMS SCREEN

- Double-click on the HEC-HMS icon on your desktop

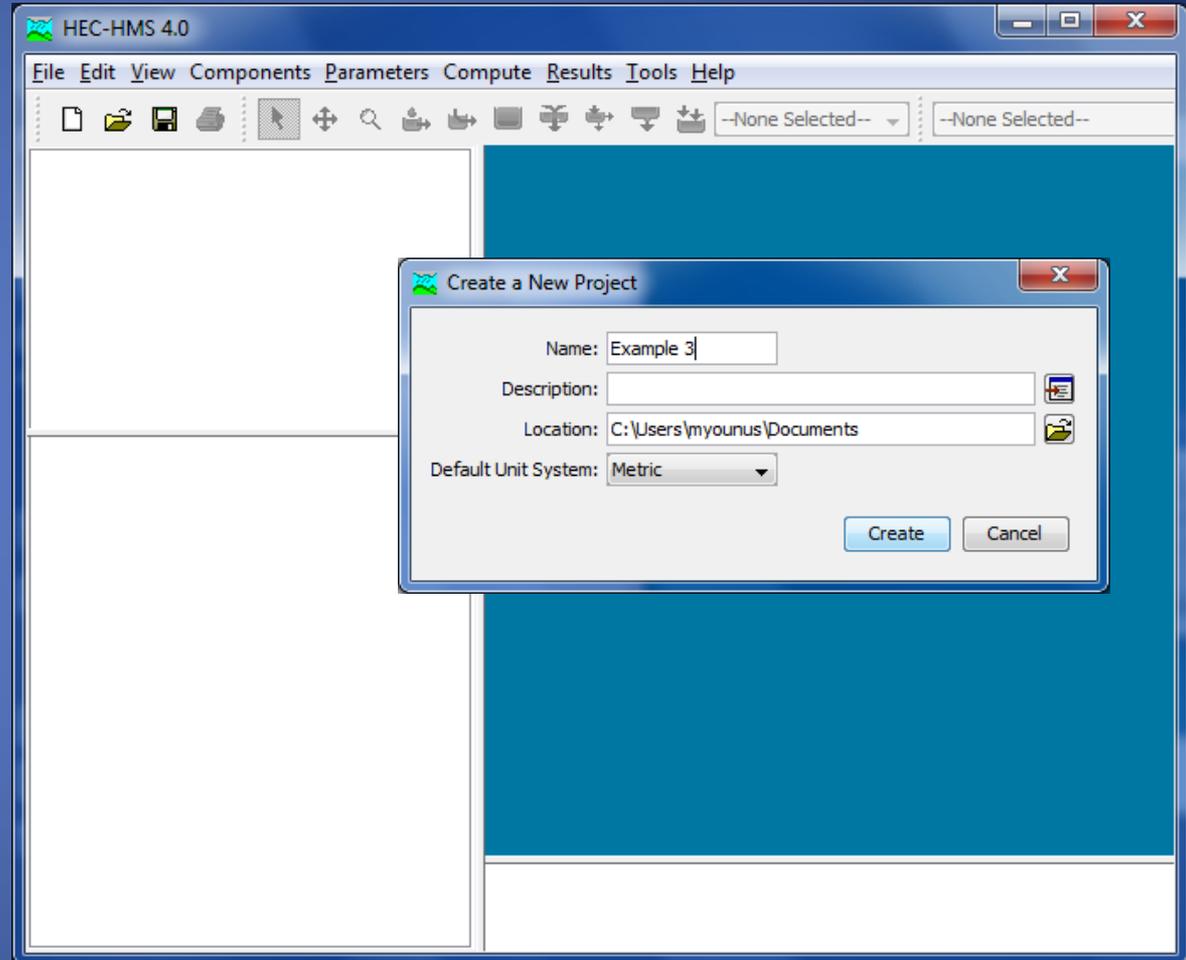


- The following HEC-HMS Screen comes up:



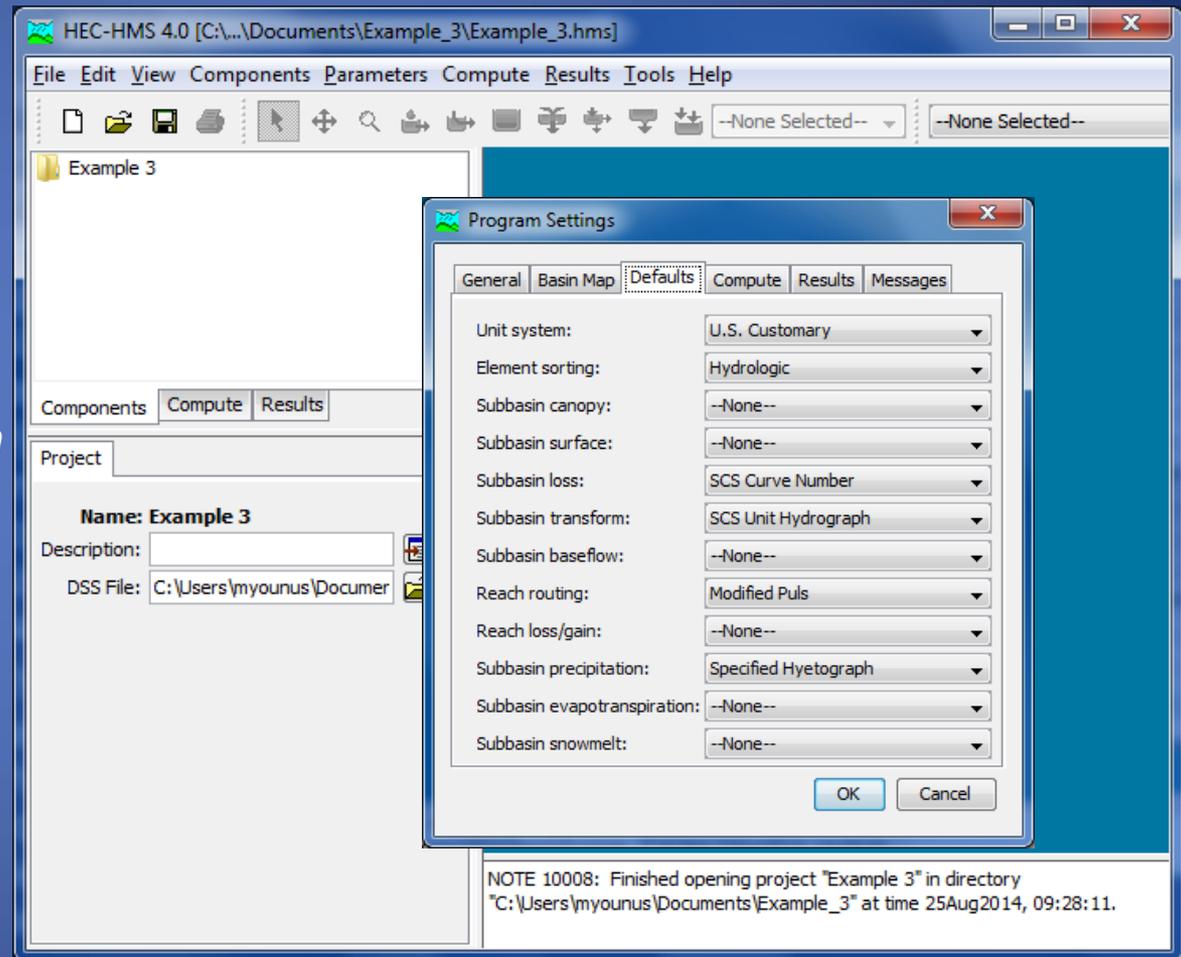
HEC-HMS – SETTING UP A NEW PROJECT

- Click on the “File” menu
- From the drop down menu, select “New”
- Name the new project “Example 2”
- Be sure to set the Default Unit System to “U.S. Customary”



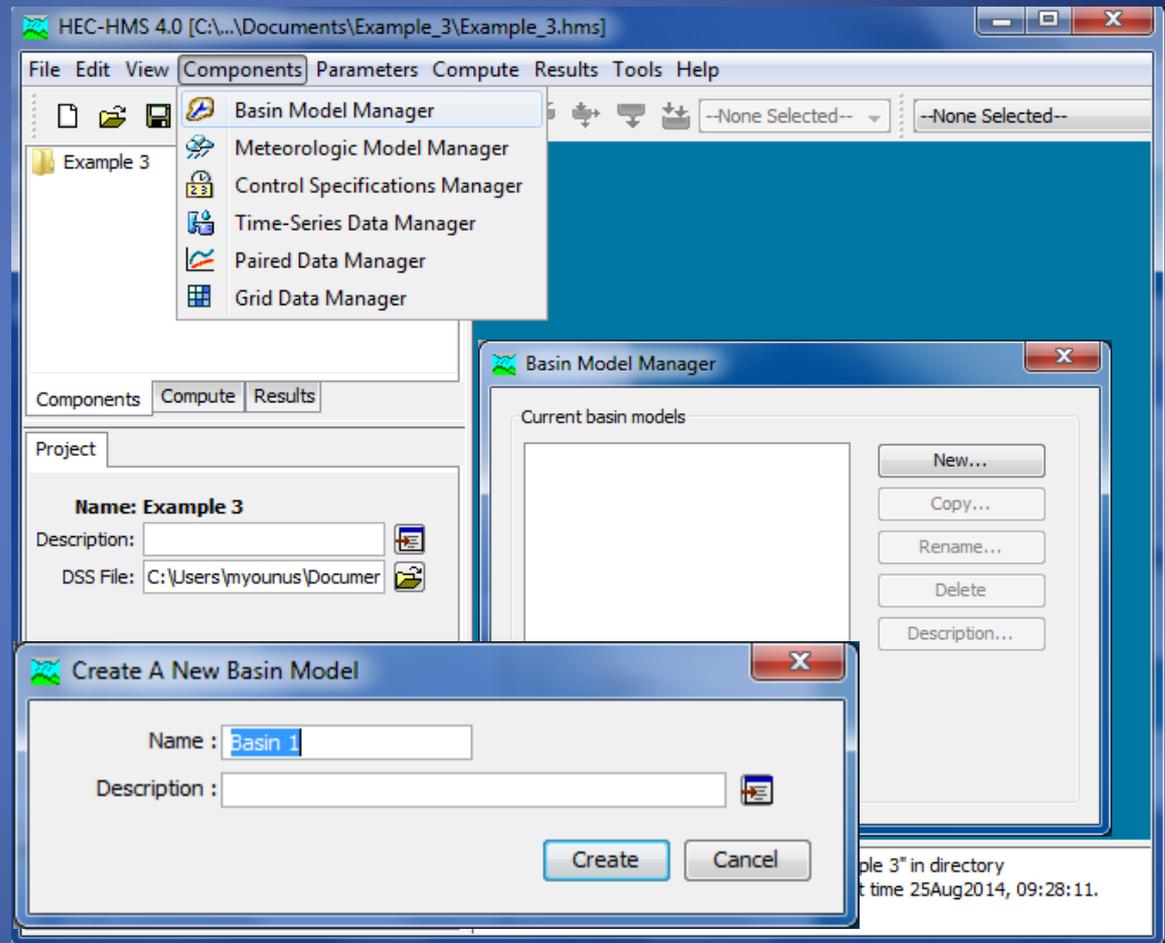
SETTING UP PROJECT DEFAULTS

- Under the *Tools* Menu, go to *Program Settings* and go to the *Defaults* tab
- Specify *SCS Curve Number* for *Subbasin loss*, *SCS Unit Hydrograph* for *Subbasin transform*, *Modified Puls* for *Reach routing*, and *Specified Hyetograph* for *Subbasin precipitation*
- Then go to the *Results* tab and make sure that the values for elevation, volume, flowrate, and depth are taken to 2 decimal places.



CREATING A BASIN MODEL

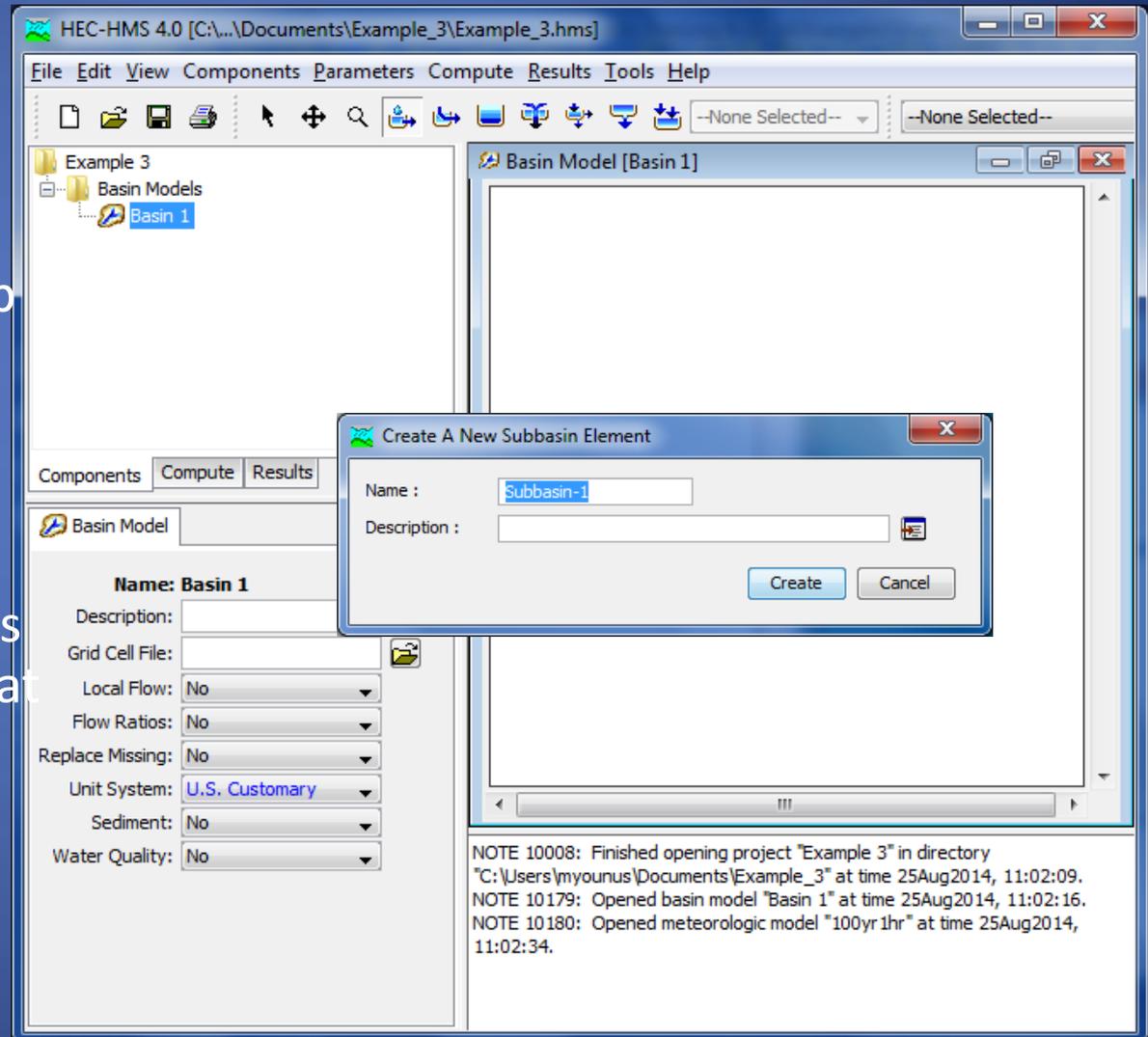
- Under the *Components* tab, go to *Basin Model Manager*
- Select “New” and name it “Basin 1”



ADDING BASIN MODEL COMPONENTS

Subbasin: "Subbasin 1"

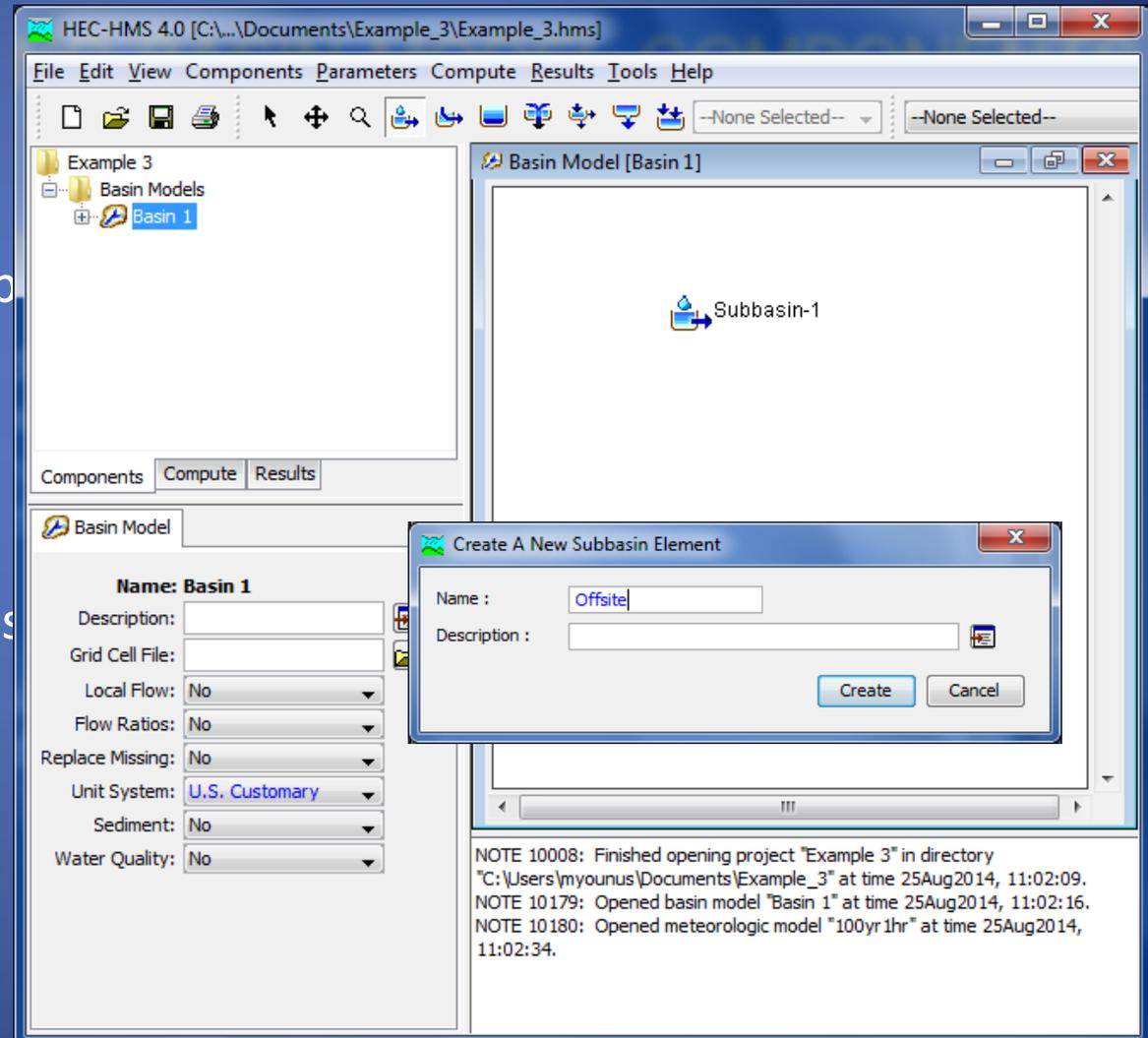
- Click on the *Subbasin Creation Tool* at the top of the screen to add a subbasin to the *Basin Model*.
- Enter Subbasin Name as "Subbasin 1", and click at Create.



ADDING BASIN MODEL COMPONENTS

Subbasin: “Offsite”

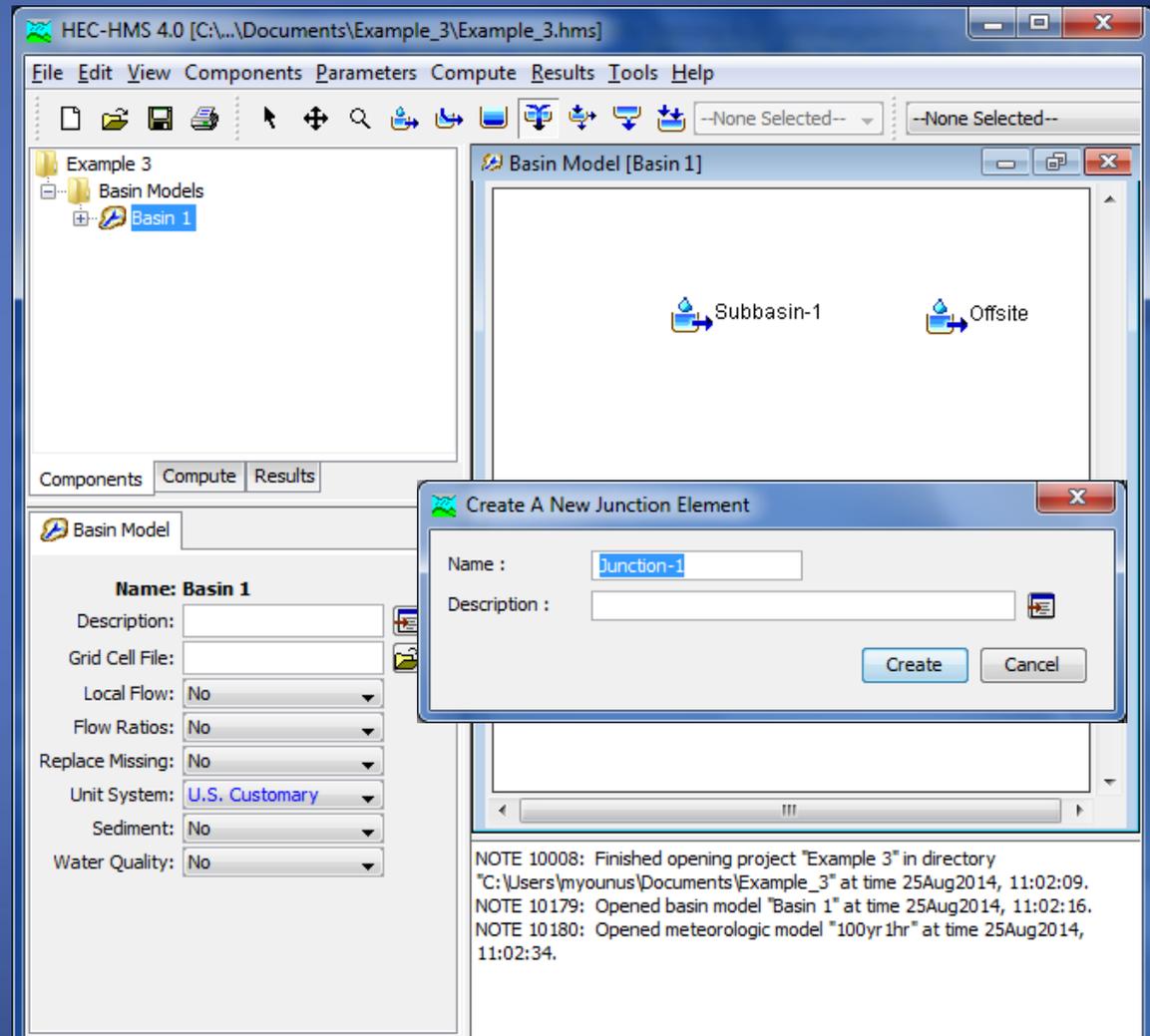
- Click on the *Subbasin Creation Tool* at the top of the screen to add a subbasin to the *Basin Model*.
- Enter Subbasin Name as “Offsite”, and click at Create.



ADDING BASIN MODEL COMPONENTS

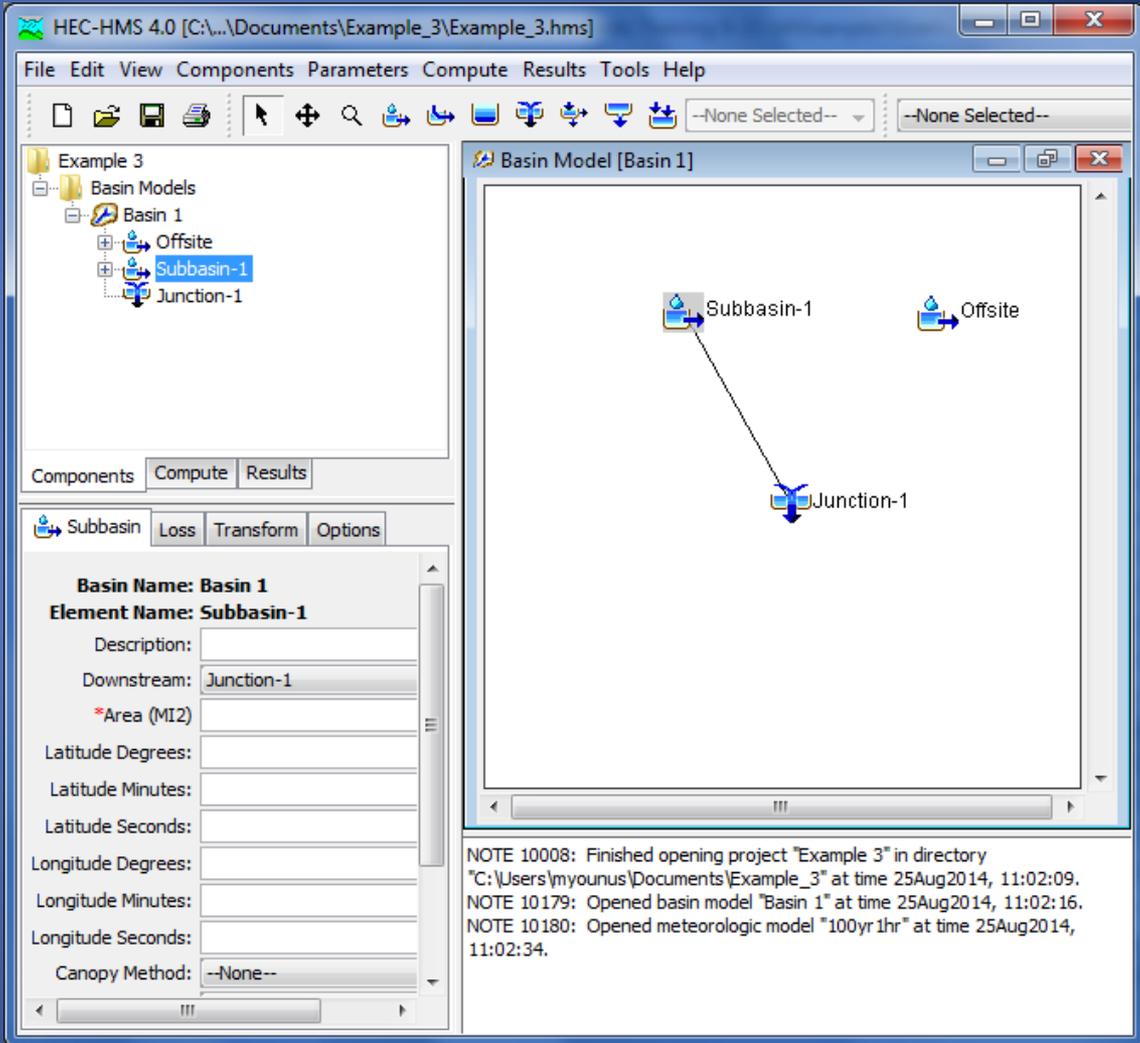
Junction: “Junction 1”

- Click on the **Junction Creation Tool** at the top of the screen to add a Junction to the **Basin Model**.
- Enter Subbasin Name as “Junction 1”, and click at Create.



CONNECTING SUBBASIN-1 TO JUNCTION-1

- Right-click on the subbasin-1 and select “Connect Downstream” and click on the Junction-1.



CONNECTING OFFSITE TO JUNCTION-1

- Right-click on the Offsite and select “Connect Downstream” and click on the Junctions.

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Example 3' containing 'Basin 1', 'Subbasin-1', 'Offsite', and 'Junction-1'. The 'Basin Model [Basin 1]' window on the right shows a diagram with 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. The 'Subbasin' tab is active, showing the 'Basin Name: Basin 1' and 'Element Name: Offsite'. The 'Downstream' field is set to 'Junction-1'. The 'Canopy Method' is set to '--None--'. A status bar at the bottom right contains the following notes:

```
NOTE 10008: Finished opening project "Example 3" in directory  
"C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:02:09.  
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:02:16.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
11:02:34.
```

ENTERING SUBBASIN DATA

Subbasin-1

- Click on *Subbasin-1* and the data entry tabs will appear at the lower left corner
- For *Area*, enter 0.015156 mi² (9.7 acres)

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Subbasin-1' selected under 'Basin 1'. The 'Subbasin' data entry tab is active, showing the following fields:

Basin Name:	Basin 1
Element Name:	Subbasin-1
Description:	
Downstream:	Junction-1
*Area (MI2):	0.015156
Latitude Degrees:	
Latitude Minutes:	
Latitude Seconds:	
Longitude Degrees:	
Longitude Minutes:	
Longitude Seconds:	
Canopy Method:	--None--

The 'Basin Model [Basin 1]' window on the right shows a diagram with 'Subbasin-1' and 'Offsite' as input elements connected to 'Junction-1'.

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:32:06.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:32:08.

ENTERING SUBBASIN DATA

Subbasin-1

Continue ...

- Under the *Loss* tab, enter the reduced CN of 87.59

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with a sub-tree for "Basin 1" containing "Offsite", "Subbasin-1", "No Canopy", "No Surface", "SCS Curve Number", "SCS Unit Hydrograph", "No Baseflow", and "Junction-1". The "Subbasin-1" element is selected. Below the tree, the "Components" tab is active, showing the "Loss" sub-tab. The "Loss" sub-tab displays the following data entry fields:

Basin Name: Basin 1	
Element Name: Subbasin-1	
Initial Abstraction (IN)	<input type="text"/>
*Curve Number:	<input type="text" value="87.59"/>
*Impervious (%)	<input type="text" value="0.0"/>

The right pane, titled "Basin Model [Basin 1]", shows a diagram of the basin model. It features three nodes: "Subbasin-1", "Offsite", and "Junction-1". Arrows indicate flow paths from "Subbasin-1" and "Offsite" to "Junction-1".

At the bottom of the interface, a status bar displays the following notes:

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:32:06.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:32:08.

ENTERING SUBBASIN DATA

Subbasin-1

Continue ...

- Under the *Transform* tab, enter the SCS Lag time of 9 minutes
(Lag time = $0.6 * T_c$)

HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]

File Edit View Components Parameters Compute Results Tools Help

Example 3

- Basin Models
 - Basin 1
 - Offsite
 - Subbasin-1
 - No Canopy
 - No Surface
 - SCS Curve Number
 - SCS Unit Hydrograph
 - No Baseflow
 - Junction-1

Components Compute Results

Subbasin Loss Transform Options

Basin Name: Basin 1
Element Name: Subbasin-1
Graph Type: Standard
*Lag Time (MIN) 9

Basin Model [Basin 1]

Subbasin-1 Offsite
Junction-1

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:32:06.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:32:08.

ENTERING SUBBASIN DATA

Offsite

- Click on *Offsite* and the data entry tabs will appear at the lower left corner

- For *Area*, enter 0.03125 mi^2 (20.0 acres)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled 'Basin Model [Basin 1]'. On the left, a tree view shows the project structure: 'Example 3' > 'Basin Models' > 'Basin 1' > 'Offsite'. The 'Offsite' element is selected, and its data entry form is visible at the bottom left. The form includes the following fields:

- Basin Name:** Basin 1
- Element Name:** Offsite
- Description:** (empty)
- Downstream:** Junction-1
- *Area (MI2):** 0.03125
- Latitude Degrees:** (empty)
- Latitude Minutes:** (empty)
- Latitude Seconds:** (empty)
- Longitude Degrees:** (empty)
- Longitude Minutes:** (empty)
- Longitude Seconds:** (empty)
- Canopy Method:** --None--

The main workspace shows a diagram with three elements: 'Subbasin-1', 'Offsite', and 'Junction-1'. Arrows indicate flow from 'Subbasin-1' and 'Offsite' into 'Junction-1'. The status bar at the bottom right contains the following notes:

- NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:32:06.
- NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:32:08.

ENTERING SUBBASIN-1 DATA

Offsite

Continue ...

- Under the *Loss* tab, enter the reduced CN of 81

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled 'Basin Model [Basin 1]'. On the left, a tree view shows the project structure: 'Example 3' > 'Basin Models' > 'Basin 1' > 'Offsite'. Below the tree, the 'Loss' tab is active, showing the following parameters:

Basin Name:	B	SCS Unit Hydrograph
Element Name:	Offsite	
Initial Abstraction (IN)	<input type="text"/>	
*Curve Number:	81	
*Impervious (%)	0.0	

On the right, a diagram shows the basin model structure with 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. At the bottom, a status bar contains the following notes:

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:32:06.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:32:08.

ENTERING SUBBASIN-1 DATA

Offsite

Continue ...

- Under the *Transform* tab, enter the SCS Lag time of 18 minutes
(Lag time = $0.6 * T_c$)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled 'Basin Model [Basin 1]'. On the left, a tree view shows the project structure: 'Example 3' > 'Basin Models' > 'Basin 1' > 'Offsite'. Below the tree, the 'Transform' tab is active, showing the following configuration:

- Basin Name:** Basin 1
- Element Name:** Offsite
- Graph Type:** Standard
- *Lag Time (MIN):** 18

The main workspace shows a diagram with three elements: 'Subbasin-1', 'Offsite', and 'Junction-1'. 'Subbasin-1' and 'Offsite' are connected to 'Junction-1' by arrows pointing towards it.

At the bottom of the window, there are two notes:

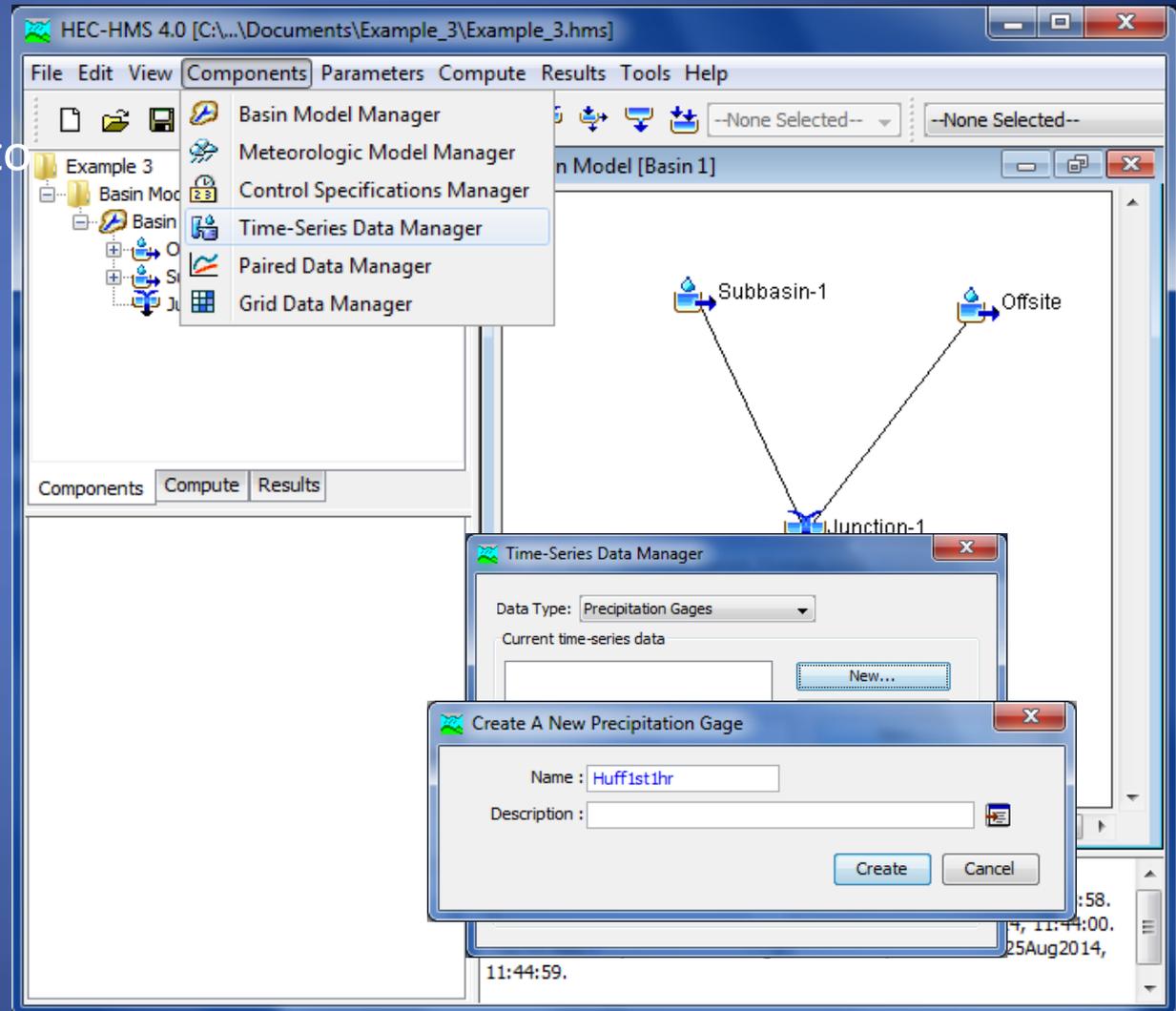
- NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 11:32:06.
- NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 11:32:08.

ENTERING RAINFALL DATA

- In HEC-HMS, rainfall data is entered as a combination of *Time-Series Data* and the *Meteorologic Model*
- The *Time-Series Data* reflects the rainfall distribution (Huff quartile distributions or actual rainfall records)
- *Time-Series Data* cannot be entered in user-specified increments, interpolation of points on the Huff curves may be necessary for some storm events
- The *Meteorologic Model* defines the rainfall depths and which subbasins those depths are applied

ENTERING TIME-SERIES DATA

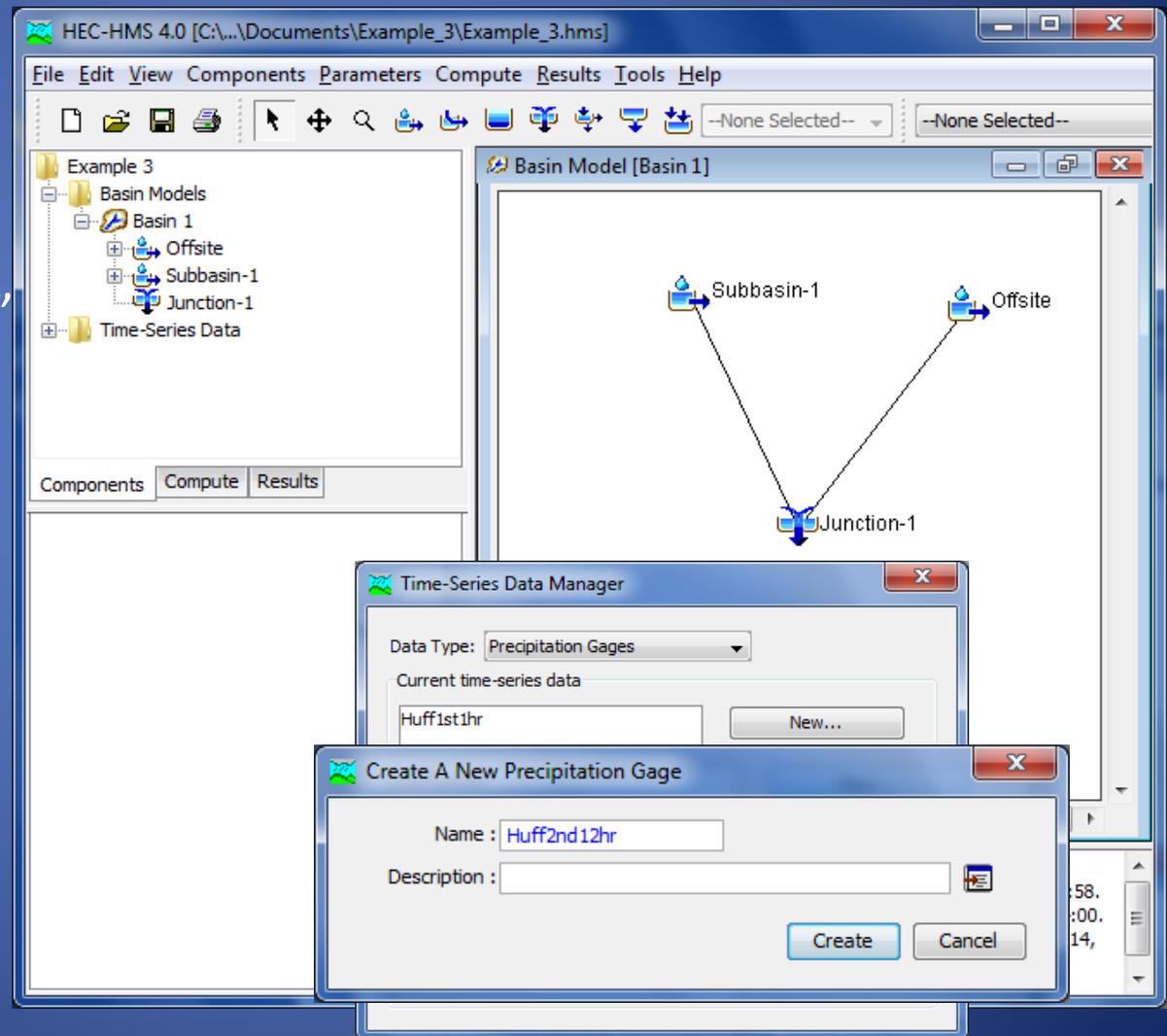
- From the **Components** menu, select **Time-Series Data Manager** to create a new **Precipitation Gage** named "Huff1st1hr"



ENTERING TIME-SERIES DATA

Continue ...

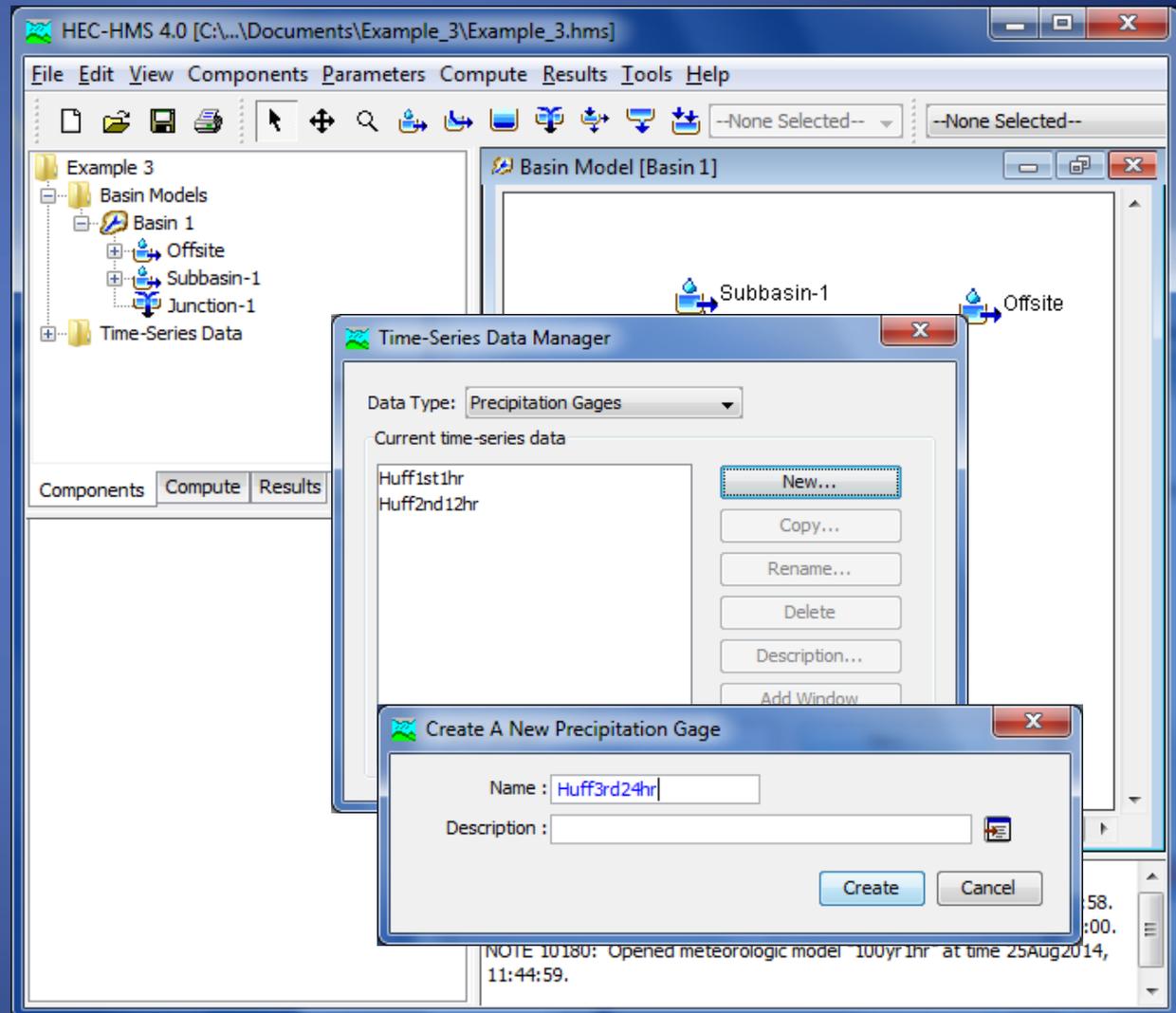
- From *Time-Series Data Manager* dialog box click new and enter name as “Huff2nd12hr”



ENTERING TIME-SERIES DATA

Continue ...

- From *Time-Series Data Manager* dialog box click new and enter name as “Huff3r24hr”



ENTERING TIME-SERIES DATA

Continue ...

- Select Precipitation Gage “Huff1st1hr”
- Under the *Time-Series Gage* tab, select *Manual Entry*, *Cumulative Inches*, and 6-minute increments

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Example 3' expanded to 'Time-Series Data' > 'Precipitation Gages' > 'Huff1st1hr'. The 'Time-Series Gage' configuration panel is open, showing the following settings:

- Name: Huff1st1hr
- Description: (empty)
- Data Source: Manual Entry
- Units: Cumulative Inches
- Time Interval: 6 Minutes
- Latitude Degrees: (empty)
- Latitude Minutes: (empty)
- Latitude Seconds: (empty)
- Longitude Degrees: (empty)
- Longitude Minutes: (empty)
- Longitude Seconds: (empty)

The 'Basin Model [Basin 1]' window shows a diagram with three components: 'Subbasin-1', 'Offsite', and 'Junction-1'. Arrows indicate flow from 'Subbasin-1' and 'Offsite' to 'Junction-1'. The status bar at the bottom contains the following notes:

- NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
- NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
- NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Under the *Time Window* tab, run the storm from 01Jan2000 00:00 through 01Jan2000 01:00 (1-hour duration)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models", "Time-Series Data", and "Precipitation Gages". Under "Precipitation Gages", three gages are listed: "Huff1st1hr", "Huff2nd12hr", and "Huff3rd24hr". The "Huff1st1hr" gage is selected, and its time window is set to "01Jan2000, 00:00 - 01Jan2000". The "Time-Series Gage" dialog box is open, showing the "Time Window" tab. The dialog has fields for "Name: Huff1st1hr", "*Start Date (ddMMYYYY)" set to "01Jan2000", "*Start Time (HH:mm)" set to "00:00", "*End Date (ddMMYYYY)" set to "01Jan2000", and "*End Time (HH:mm)" set to "01:00". The right pane shows a "Basin Model [Basin 1]" diagram with a junction labeled "Junction-1" and two subbasins, "Subbasin-1" and "Offsite", connected to it. The bottom status bar contains the following notes:

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Under the *Table Tab*, Enter the Huff 1st Quartile Distribution for the 1-hour duration from the handout

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Example 3' expanded to 'Time-Series Data' > 'Precipitation Gages' > 'Huff1st1hr'. The selected file is '01Jan2000, 00:00 - 01Jan2000'. The 'Time-Series Gage' window is open, showing a table of precipitation data for the selected time window. The table has two columns: 'Time (ddMMYYYY...)' and 'Precipitation (IN)'. The data points are as follows:

Time (ddMMYYYY...)	Precipitation (IN)
01Jan2000, 00:06	0.33
01Jan2000, 00:12	0.52
01Jan2000, 00:18	0.66
01Jan2000, 00:24	0.75
01Jan2000, 00:30	0.82
01Jan2000, 00:36	0.86
01Jan2000, 00:42	0.90
01Jan2000, 00:48	0.94
01Jan2000, 00:54	0.97
01Jan2000, 01:00	1.00

The 'Basin Model [Basin 1]' window shows a diagram with three components: 'Subbasin-1', 'Offsite', and 'Junction-1'. Arrows indicate flow from 'Subbasin-1' and 'Offsite' to 'Junction-1'. The status bar at the bottom contains the following notes:

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Use the *Graph* tab to see a plot of the distribution

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with the following structure:

- Example 3
 - Basin Models
 - Time-Series Data
 - Precipitation Gages
 - Huff1st1hr
 - 01Jan2000, 00:00 - 01Jan2000 (selected)
 - Huff2nd12hr
 - 01Jan2000, 00:00 - 01Jan2000
 - Huff3rd24hr
 - 01Jan2000, 00:00 - 02Jan2000

The bottom-left panel shows a 'Time-Series Gage' window with the 'Graph' tab selected. The graph plots 'Precipitation (IN)' on the y-axis (ranging from 0.0 to 1.2) against time on the x-axis (ranging from 00:00 to 01:00 on 01Jan2000). The curve shows a smooth, increasing trend from 0.0 at 00:00 to approximately 1.0 at 01:00.

The right panel shows a 'Reach Creation Tool' window for 'Basin 1'. The diagram illustrates a basin structure with 'Subbasin-1' and 'Offsite' components connected to a central 'Junction-1'.

The bottom-right panel contains a log of system messages:

- NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
- NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
- NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Select Precipitation Gage “Huff2nd12hr”
- Under the *Time-Series Gage* tab, select *Manual Entry, Cumulative Inches*, and 30 minute increments

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models", "Time-Series Data", and "Precipitation Gages". Under "Precipitation Gages", "Huff2nd12hr" is selected. Below the tree, the "Time-Series Gage" configuration panel is visible, showing the following settings:

- Name: Huff2nd12hr
- Description: (empty)
- Data Source: Manual Entry
- Units: Cumulative Inches
- Time Interval: 30 Minutes
- Latitude Degrees: (empty)
- Latitude Minutes: (empty)
- Latitude Seconds: (empty)
- Longitude Degrees: (empty)
- Longitude Minutes: (empty)
- Longitude Seconds: (empty)

The right pane shows a "Basin Model [Basin 1]" diagram. It features a V-shaped network with "Subbasin-1" and "Offsite" at the top, both pointing to a "Junction-1" at the bottom. The status bar at the bottom of the window displays the following notes:

- NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
- NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
- NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Under the **Time Window** tab, run the storm from 01Jan2000 00:00 through 01Jan2000 12:00 (12-hour duration)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The left pane shows a project tree for "Example 3" with folders for "Basin Models", "Time-Series Data", and "Precipitation Gages". Under "Time-Series Data", the "Huff2nd12hr" gage is selected, showing a time window of "01Jan2000, 00:00 - 01Jan2000".

The bottom-left pane is titled "Time-Series Gage" and has tabs for "Time Window", "Table", and "Graph". The "Time Window" tab is active, showing the following configuration for "Name: Huff2nd12hr":

*Start Date (ddMMYYYY)	01Jan2000
*Start Time (HH:mm)	00:00
*End Date (ddMMYYYY)	01Jan2000
*End Time (HH:mm)	12:00

The right pane shows a "Basin Model [Basin 1]" diagram with a V-shaped network. The top left node is "Subbasin-1", the top right node is "Offsite", and the bottom node is "Junction-1". Arrows indicate flow from Subbasin-1 and Offsite to Junction-1.

The bottom-right pane contains a log window with the following text:

```
NOTE 10008: Finished opening project "Example 3" in directory  
"C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.  
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:18:52.
```

ENTERING TIME-SERIES DATA

Continue ...

- Under the **Table Tab**, Enter the Huff 2nd Quartile Distribution for the 12-hour duration from the handout

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The left sidebar shows a project tree with "Example 3" containing "Basin Models" and "Time-Series Data". Under "Time-Series Data", "Precipitation Gages" are listed, with "Huff2nd12hr" selected. Below the tree, the "Time-Series Gage" window is open, showing a "Table" tab with a data table. The table has columns for "Time (ddMMYYYY...)" and "Precipitation (IN)". The row for "01Jan2000, 12:00" is highlighted, showing a precipitation value of 1.000. The right pane shows a "Basin Model [Basin 1]" diagram with three nodes: "Subbasin-1", "Offsite", and "Junction-1". "Subbasin-1" and "Offsite" are connected to "Junction-1". A status bar at the bottom contains several notes, including "NOTE 10008: Finished opening project 'Example 3' in directory 'C:\Users\myounus\Documents\Example_3' at time 25Aug2014, 12:17:28." and "NOTE 10180: Opened meteorologic model '100yr 1hr' at time 25Aug2014, 12:18:52."

Time (ddMMYYYY...)	Precipitation (IN)
01Jan2000, 07:30	0.830
01Jan2000, 08:00	0.860
01Jan2000, 08:30	0.885
01Jan2000, 09:00	0.910
01Jan2000, 09:30	0.927
01Jan2000, 10:00	0.943
01Jan2000, 10:30	0.960
01Jan2000, 11:00	0.973
01Jan2000, 11:30	0.983
01Jan2000, 12:00	1.000

ENTERING TIME-SERIES DATA

Continue ...

- Use the *Graph* tab to see a plot of the distribution

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models" and "Time-Series Data". Under "Time-Series Data", there is a "Precipitation Gages" folder containing three gages: "Huff1st1hr", "Huff2nd12hr", and "Huff3rd24hr". The "Huff3rd24hr" gage is selected, showing a time window of "01Jan2000, 00:00 - 02Jan2000". Below the tree, the "Time-Series Gage" tab is active, with the "Graph" sub-tab selected. The graph shows "Precipitation (IN)" on the y-axis (ranging from 0.0 to 1.2) and time on the x-axis (ranging from 00:00 to 12:00 on 01Jan2000). A red curve represents the precipitation distribution, starting at 0.0 at 00:00 and rising to approximately 1.0 by 12:00. The right pane shows a "Basin Model [Basin 1]" diagram with three nodes: "Subbasin-1", "Offsite", and "Junction-1". "Subbasin-1" and "Offsite" are connected to "Junction-1". The bottom status bar contains the following notes:
NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Select Precipitation Gage “Huff3rd24hr”
- Under the *Time-Series Gage* tab, select *Manual Entry*, *Cumulative Inches*, and 1 hour increments

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models" and "Time-Series Data". Under "Time-Series Data", there is a sub-folder "Precipitation Gages" containing three gages: "Huff1st1hr", "Huff2nd12hr", and "Huff3rd24hr", which is currently selected. Below the tree is a "Time-Series Gage" configuration panel with the following settings:

- Name: Huff3rd24hr
- Description: (empty)
- Data Source: Manual Entry
- Units: Cumulative Inches
- Time Interval: 1 Hour
- Latitude Degrees: (empty)
- Latitude Minutes: (empty)
- Latitude Seconds: (empty)
- Longitude Degrees: (empty)
- Longitude Minutes: (empty)
- Longitude Seconds: (empty)

The right pane shows a "Basin Model [Basin 1]" diagram. It features a central "Junction-1" node with two arrows pointing to "Subbasin-1" and "Offsite" nodes. The bottom status bar contains the following notes:

- NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
- NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
- NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Under the *Time Window* tab, run the storm from 01Jan2000 00:00 through 02Jan2000 00:00 (24-hour duration)

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models" and "Time-Series Data". Under "Time-Series Data", there is a sub-folder "Precipitation Gages" containing three files: "Huff1st1hr", "Huff2nd12hr", and "Huff3rd24hr". The "Huff3rd24hr" file is selected, and its time window is displayed as "01Jan2000, 00:00 - 02Jan2000".

The right pane shows a "Basin Model [Basin 1]" diagram. It features a central "Junction-1" node with a blue arrow pointing upwards. Two lines connect "Junction-1" to "Subbasin-1" (top left) and "Offsite" (top right), both represented by blue water drop icons with arrows pointing towards the junction.

Below the diagram, a "Time-Series Gage" configuration window is open, showing the "Time Window" tab. The "Name" is "Huff3rd24hr". The configuration fields are:

*Start Date (ddMMYYYY)	01Jan2000
*Start Time (HH:mm)	00:00
*End Date (ddMMYYYY)	02Jan2000
*End Time (HH:mm)	00:00

At the bottom of the interface, a status bar displays the following notes:

```
NOTE 10008: Finished opening project "Example 3" in directory
"C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,
12:18:52.
```

ENTERING TIME-SERIES DATA

Continue ...

- Under the **Table Tab**, Enter the Huff 3rd Quartile Distribution for the 24-hour duration from the handout

The screenshot displays the HEC-HMS 4.0 software interface. The left pane shows a file tree for 'Example 3' with 'Time-Series Data' expanded to 'Huff3rd24hr'. The 'Time-Series Gage' window is open, showing a table with 'Time' and 'Precipitation (IN)' columns. The 'Table' tab is selected, and the data for '02Jan2000, 00:00' is highlighted with a value of 1.000. The right pane shows a 'Basin Model [Basin 1]' diagram with 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. A status bar at the bottom contains several notes.

Time (ddMMYYYY...)	Precipitation (IN)
01Jan2000, 15:00	0.635
01Jan2000, 16:00	0.730
01Jan2000, 17:00	0.800
01Jan2000, 18:00	0.850
01Jan2000, 19:00	0.883
01Jan2000, 20:00	0.910
01Jan2000, 21:00	0.935
01Jan2000, 22:00	0.957
01Jan2000, 23:00	0.975
02Jan2000, 00:00	1.000

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

ENTERING TIME-SERIES DATA

Continue ...

- Use the *Graph* tab to see a plot of the distribution

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Example 3' expanded to show 'Time-Series Data' and 'Precipitation Gages'. The 'Time-Series Gage' window is active, showing a 'Graph' tab with a plot of 'Precipitation (IN)' over time for '01Jan2000'. The plot shows a curve starting at 0.0 and rising to approximately 1.0. The 'Basin Model [Basin 1]' window shows a diagram with 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. The status bar at the bottom contains several notes:

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.

CREATING THE METEOROLOGIC MODEL

STORM EVENT: 100YR,1HR

- From the **Components** tab, create a new **Meteorologic Model** named "100yr1hr"

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows the 'Components' tab with a tree view on the left containing 'Example 3', 'Basin Model', 'Time-Series', 'Precipitation', and 'Huff3rd24hr'. A context menu is open over the 'Components' tab, listing options: 'Basin Model Manager', 'Meteorologic Model Manager', 'Control Specifications Manager', 'Time-Series Data Manager', 'Paired Data Manager', and 'Grid Data Manager'. The 'Meteorologic Model Manager' option is selected. A 'Create A New Meteorologic Model' dialog box is open in the foreground, with 'Name' set to '100yr 1hr' and 'Description' empty. The 'Create' button is highlighted. In the background, a 'Time-Series Gage' graph shows precipitation (IN) on the y-axis (0.0 to 1.2) and time on the x-axis (00:00 to 00:01 on 01Jan2000). A red curve shows a rising precipitation event. A 'Meteorologic Model Manager' dialog box is also visible, showing 'Current meteorologic models' and buttons for 'New...', 'Copy...', 'Rename...', 'Delete', and 'Description...'. The status bar at the bottom contains a 'NOTES' window with the following text: 'NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.' and 'NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.'

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,1HR

Continue ...

- Under the *Meteorologic Model* tab, make sure the *Replace Missing* is *Set to Default*

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree with "Example 3" expanded, containing "Basin Models", "Meteorologic Models", "Specified Hyetograph", and "Time-Series Data". The "100yr 1hr" meteorologic model is selected. The bottom pane is divided into "Components", "Compute", and "Results" tabs. The "Meteorology Model" tab is active, showing the "Basins" sub-tab. The configuration fields are as follows:

Met Name:	100yr1hr
Description:	
Shortwave:	--None--
Longwave:	--None--
Precipitation:	Specified Hyetograph
Evapotranspiration:	--None--
Snowmelt:	--None--
Unit System:	U.S. Customary
Replace Missing:	Set To Default

The right pane shows the "Basin Model [Basin 1]" diagram. It features a V-shaped network with "Subbasin-1" and "Offsite" at the top, both pointing to a central "Junction-1" at the bottom. The status bar at the bottom right shows the following log entries:

```
12:18:52.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:42:09.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:52:11.
```

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,1HR

Continue ...

- Under the *Basins* tab, select *Yes* under *Include Subbasins?*

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]". The left sidebar shows a project tree with "Example 3" expanded to show "Basin 1", which includes "Offsite", "Subbasin-1", and "Junction-1". Below the tree, the "Components" tab is active, showing a table for the "100yr 1hr" meteorologic model.

Met Name: 100yr1hr	
Basin Model	Include Subbasins
Basin 1	Yes

The main workspace shows a diagram with three nodes: "Subbasin-1", "Offsite", and "Junction-1". Arrows point from "Subbasin-1" and "Offsite" to "Junction-1".

At the bottom, a log window displays the following messages:

```
NOTE 10008: Finished opening project "Example 3" in directory  
"C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.  
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:18:52.
```

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,1HR

Continue ...

- Under the *Options* tab, select *Yes* for *Total Override*

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with sub-items: Basin Models (Basin 1, Offsite, Subbasin-1, Junction-1), Meteorologic Models (100yr 1hr, Specified Hyetograph), Time-Series Data, and Precipitation Gages. The "Components" tab is active, showing "Meteorology Model", "Basins", and "Options". The "Options" sub-tab is selected, displaying "Met Name: 100yr1hr" and "Total Override: Yes". The right pane, titled "Basin Model [Basin 1]", shows a diagram with "Subbasin-1" and "Offsite" at the top, both pointing to "Junction-1" at the bottom. The status bar at the bottom contains the following notes:

```
NOTE 10008: Finished opening project "Example 3" in directory  
"C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.  
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:18:52.
```

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,1HR

Continue ...

- Under the *Specified Hyetograph* tab, select the rainfall distribution that we previously created and enter the 100-year, 1-hour rainfall depth.

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with the following structure:

- Example 3
 - Basin Models
 - Basin 1
 - Offsite
 - Subbasin-1
 - Junction-1
 - Meteorologic Models
 - 100yr 1hr
 - Specified Hyetograph** (selected)
 - Time-Series Data
 - Precipitation Gages

The 'Components' tab is active, showing the 'Subbasins' section. The 'Met Name' is set to '100yr1hr'. A table below lists the subbasins and their gages:

Subbasin Name	Gage	Total Depth ...
Offsite	Huff1st1hr	3.56
Subbasin-1	Huff1st1hr	3.56

The 'Basin Model [Basin 1]' window shows a diagram of the basin model. It features three nodes: 'Subbasin-1' and 'Offsite' at the top, and 'Junction-1' at the bottom. Arrows point from 'Subbasin-1' and 'Offsite' to 'Junction-1', indicating the flow direction.

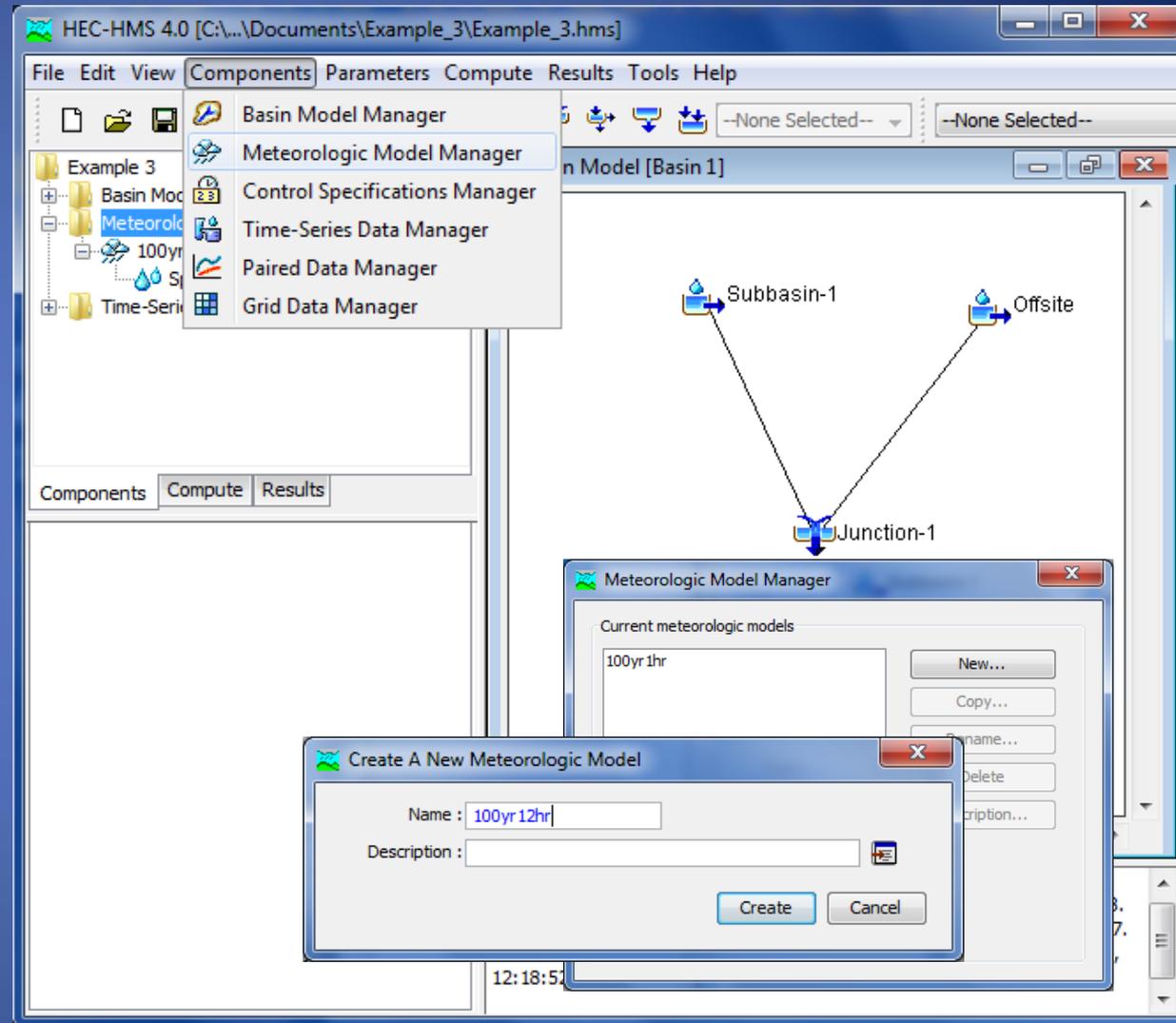
At the bottom of the interface, a log window displays the following notes:

```
NOTE 10008: Finished opening project "Example 3" in directory  
"C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 12:17:28.  
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:18:52.
```

CREATING THE METEOROLOGIC MODEL

STORM EVENT: 100YR,12HR

- From the **Components** tab, create a new **Meteorologic Model** named "100yr12hr"



CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,12HR

Continue ...

- Under the *Meteorologic Model* tab, make sure the *Replace Missing* is *Set to Default*

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models", "Meteorologic Models", and "Time-Series Data". Under "Meteorologic Models", the "100yr 12hr" model is selected, showing a "Specified Hyetograph" icon. The "Components" tab is active, showing the "Meteorology Model" configuration. The "Met Name" is "100yr12hr". The "Replace Missing" dropdown is set to "Set to Default". The "Basins" tab shows a diagram of "Basin Model [Basin 1]" with two subbasins, "Subbasin-1" and "Offsite", connected to a central "Junction-1". The "Results" tab shows a log of events: "12:18:52. NOTE 10180: Opened meteorologic model '100yr 1hr' at time 25Aug2014, 12:42:09." and "NOTE 10180: Opened meteorologic model '100yr 1hr' at time 25Aug2014, 12:52:11."

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,12HR

Continue ...

- Under the *Basins* tab, select *Yes* under *Include Subbasins*?

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The left pane shows a project tree for "Example 3" with folders for Basin Models, Meteorologic Models, and Time-Series Data. Under Meteorologic Models, "100yr 12hr" is selected. The bottom pane shows the "Meteorology Model" configuration with the "Basins" tab active. The "Met Name" is "100yr12hr". A table below shows the configuration for "Basin 1":

Basin Model	Include Subbasins
Basin 1	Yes

The right pane shows a "Basin Model [Basin 1]" diagram with a V-shaped structure. The top nodes are "Subbasin-1" and "Offsite", both with water drop icons. Arrows point from both to a central "Junction-1" node, also with a water drop icon. The bottom pane contains a log of system messages:

```
NOTE 10008: Finished opening project "Example 3" in directory
"C:\Users\myounus\Documents\Example_3" at time 26Aug2014, 08:39:17.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 26Aug2014, 08:39:34.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 26Aug2014, 08:39:35.
NOTE 10180: Opened meteorologic model "100yr 24hr" at time 26Aug2014, 08:39:36.
NOTE 10179: Opened basin model "Basin 1" at time 26Aug2014, 08:40:05.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 26Aug2014, 08:48:32.
```

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,12HR

Continue ...

- Under the *Options* tab, select *Yes* for *Total Override*

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and model management. The left pane shows a project tree with "Example 3" expanded to "Meteorologic Models", where "100yr 12hr" is selected. Below the tree, the "Options" tab is active, showing "Met Name: 100yr12hr" and "Total Override: Yes". The right pane, titled "Basin Model [Basin 1]", shows a diagram with "Subbasin-1" and "Offsite" connected to "Junction-1". The bottom status bar contains the following text:

NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:42:09.

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,12HR

Continue ...

- Under the *Specified Hyetograph* tab, select the rainfall distribution that we previously created and enter the 100-year, 1-hour rainfall depth.

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled 'Basin Model [Basin 1]'. The left sidebar shows a project tree with 'Example 3' expanded to 'Meteorologic Models', where '100yr 1hr Specified Hyetograph' is selected. Below the tree, the 'Subbasins' tab is active, showing a table with the following data:

Subbasin Name	Gage	Total Depth ...
Offsite	Huff2nd12hr	6.59
Subbasin-1	Huff2nd12hr	6.59

The main workspace shows a diagram of the basin model with two subbasins, 'Subbasin-1' and 'Offsite', connected to a central 'Junction-1'. The bottom status bar contains the following notes:

NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 12:17:47.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:18:52.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 12:42:09.

CREATING THE METEOROLOGIC MODEL

STORM EVENT: 100YR,24HR

- From the **Components** tab, create a new **Meteorologic Model** named "100yr12hr"

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Example 3' expanded to 'Basin Model Manager'. The 'Components' tab is active, showing a list of components including 'Meteorologic Model Manager'. A 'Create A New Meteorologic Model' dialog box is open in the foreground, with the 'Name' field set to '100yr24hr'. Below the main window, a 'Subbasins' table is visible, showing the following data:

Met Name: 100yr12hr		
Subbasin Name	Gage	Total Depth ...
Offsite	Huff2nd12hr	6.59
Subbasin-1	Huff2nd12hr	6.59

The background window shows a diagram of the basin model with 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. A 'Meteorologic Model Manager' dialog box is also open, showing 'Current meteorologic models' with '100yr 1hr' and '100yr 12hr' listed.

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,24HR

Continue ...

- Under the *Meteorologic Model* tab, make sure the *Replace Missing* is *Set to Default*

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The toolbar contains various icons for file operations and navigation. The left pane shows a project tree for "Example 3" with folders for "Basin Models", "Meteorologic Models", and "Time-Series Data". Under "Meteorologic Models", three "Specified Hyetograph" models are listed, with "100yr 24hr" selected. The "Components" tab is active, showing the "Meteorology Model" configuration. The "Basins" sub-tab is selected, displaying the following settings:

Met Name:	100yr24hr
Description:	
Shortwave:	--None--
Longwave:	--None--
Precipitation:	Specified Hyetograph
Evapotranspiration:	--None--
Snowmelt:	--None--
Unit System:	U.S. Customary
Replace Missing:	Set To Default

The right pane shows the "Basin Model [Basin 1]" diagram, which is a simple flow network with three nodes: "Subbasin-1", "Offsite", and "Junction-1". Arrows indicate flow from "Subbasin-1" and "Offsite" to "Junction-1". The bottom pane displays a log of system messages:

```
NOTE 10008: Finished opening project "Example 3" in directory
"C:\Users\myounus\Documents\Example_3" at time 26Aug2014, 08:39:17.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 26Aug2014, 08:39:34.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 26Aug2014, 08:39:35.
NOTE 10180: Opened meteorologic model "100yr 24hr" at time 26Aug2014, 08:39:36.
NOTE 10179: Opened basin model "Basin 1" at time 26Aug2014, 08:40:05.
```

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,24HR

Continue ...

- Under the *Basins* tab, select *Yes* under *Include Subbasins*?

HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]

File Edit View Components Parameters Compute Results Tools Help

Example 3

- Basin Models
- Meteorologic Models
 - 100yr 1hr
 - Specified Hyetograph
 - 100yr 12hr
 - Specified Hyetograph
 - 100yr 24hr
 - Specified Hyetograph
- Time-Series Data

Basin Model [Basin 1]

Subbasin-1

Offsite

Junction-1

Components Compute Results

Meteorology Model Basins Options

Met Name: 100yr24hr

Basin Model	Include Subbasins
Basin 1	Yes

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 26Aug2014, 08:39:17.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 26Aug2014, 08:39:34.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 26Aug2014, 08:39:35.
NOTE 10180: Opened meteorologic model "100yr 24hr" at time 26Aug2014, 08:39:36.
NOTE 10179: Opened basin model "Basin 1" at time 26Aug2014, 08:40:05.

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,24HR

Continue ...

- Under the *Options* tab, select *Yes* for *Total Override*

HEC-HMS 4.0 [C:\...\Documents\Example_3\Example_3.hms]

File Edit View Components Parameters Compute Results Tools Help

Example 3

- Basin Models
- Meteorologic Models
 - 100yr 1hr
 - Specified Hyetograph
 - 100yr 12hr
 - Specified Hyetograph
 - 100yr 24hr
 - Specified Hyetograph
- Time-Series Data

Components Compute Results

Meteorology Model Basins Options

Met Name: 100yr24hr

Total Override: Yes

Basin Model [Basin 1]

Subbasin-1

Offsite

Junction-1

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 26Aug2014, 08:39:17.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 26Aug2014, 08:39:34.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 26Aug2014, 08:39:35.
NOTE 10180: Opened meteorologic model "100yr 24hr" at time 26Aug2014, 08:39:36.
NOTE 10179: Opened basin model "Basin 1" at time 26Aug2014, 08:40:05.

CREATING THE METEOROLOGIC MODEL

STORM EVENT:
100YR,24HR

Continue ...

- Under the **Specified Hyetograph** tab, select the rainfall distribution that we previously created and enter the 100-year, 1-hour rainfall depth.

HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]

File Edit View Components Parameters Compute Results Tools Help

Example 3

- Basin Models
- Meteorologic Models
 - 100yr 1hr
 - Specified Hyetograph
 - 100yr 12hr
 - Specified Hyetograph
 - 100yr 24hr
 - Specified Hyetograph**
 - Time-Series Data

Components Compute Results

Subbasins

Met Name: 100yr24hr

Subbasin Name	Gage	Total Depth (IN)
Offsite	Huff3rd24hr	7.58
Subbasin-1	Huff3rd24hr	7.58

Basin Model [Basin 1]

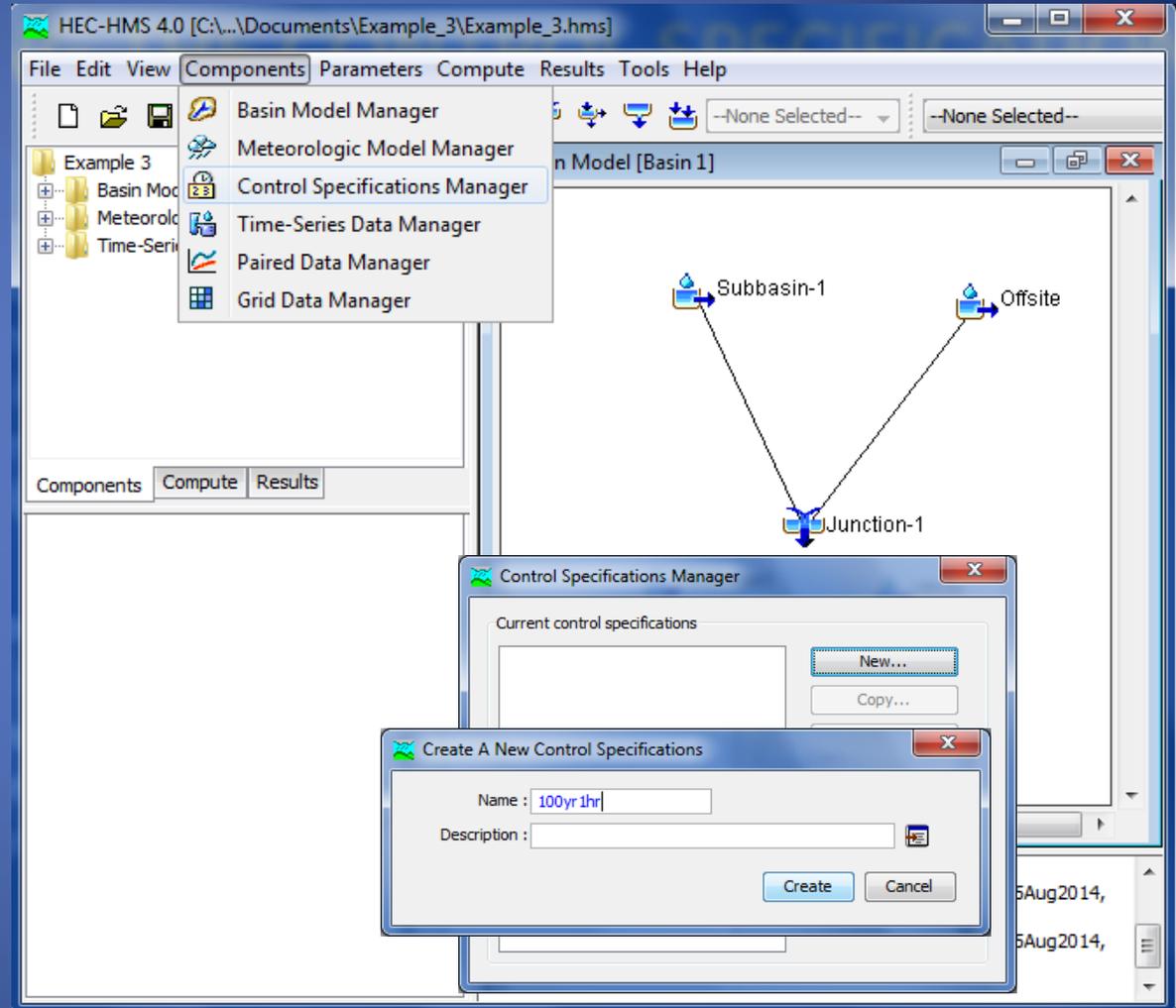
Subbasin-1 Offsite Junction-1

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 26Aug2014, 08:59:55.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 26Aug2014, 08:59:59.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 26Aug2014, 09:00:00.
NOTE 10180: Opened meteorologic model "100yr 24hr" at time 26Aug2014, 09:00:01.
NOTE 10179: Opened basin model "Basin 1" at time 26Aug2014, 09:01:06.

CREATING THE CONTROL SPECIFICATIONS

100yr,1hr

- We still need to specify how long to run the model for and how often we want to see output...this is performed under the *Control Specifications*
- Under the *Components* menu, select *Control Specifications Manager* to create a new one named "100yr1hr"



CREATING THE CONTROL SPECIFICATIONS

100yr,1hr

Continue ...

- Specify 01Jan2000 through 02Jan2000
- Under *Time Interval*, specify 3 minute

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]" and shows a diagram of a basin model with three components: "Subbasin-1", "Offsite", and "Junction-1". "Subbasin-1" and "Offsite" are connected to "Junction-1".

The "Control Specifications" panel is open, showing the following settings:

- Name: 100yr1hr
- Description: [Empty]
- *Start Date (ddMMYYYY): 01jan2000
- *Start Time (HH:mm): 00:00
- *End Date (ddMMYYYY): 02jan2000
- *End Time (HH:mm): 00:00
- Time Interval: 3 Minutes

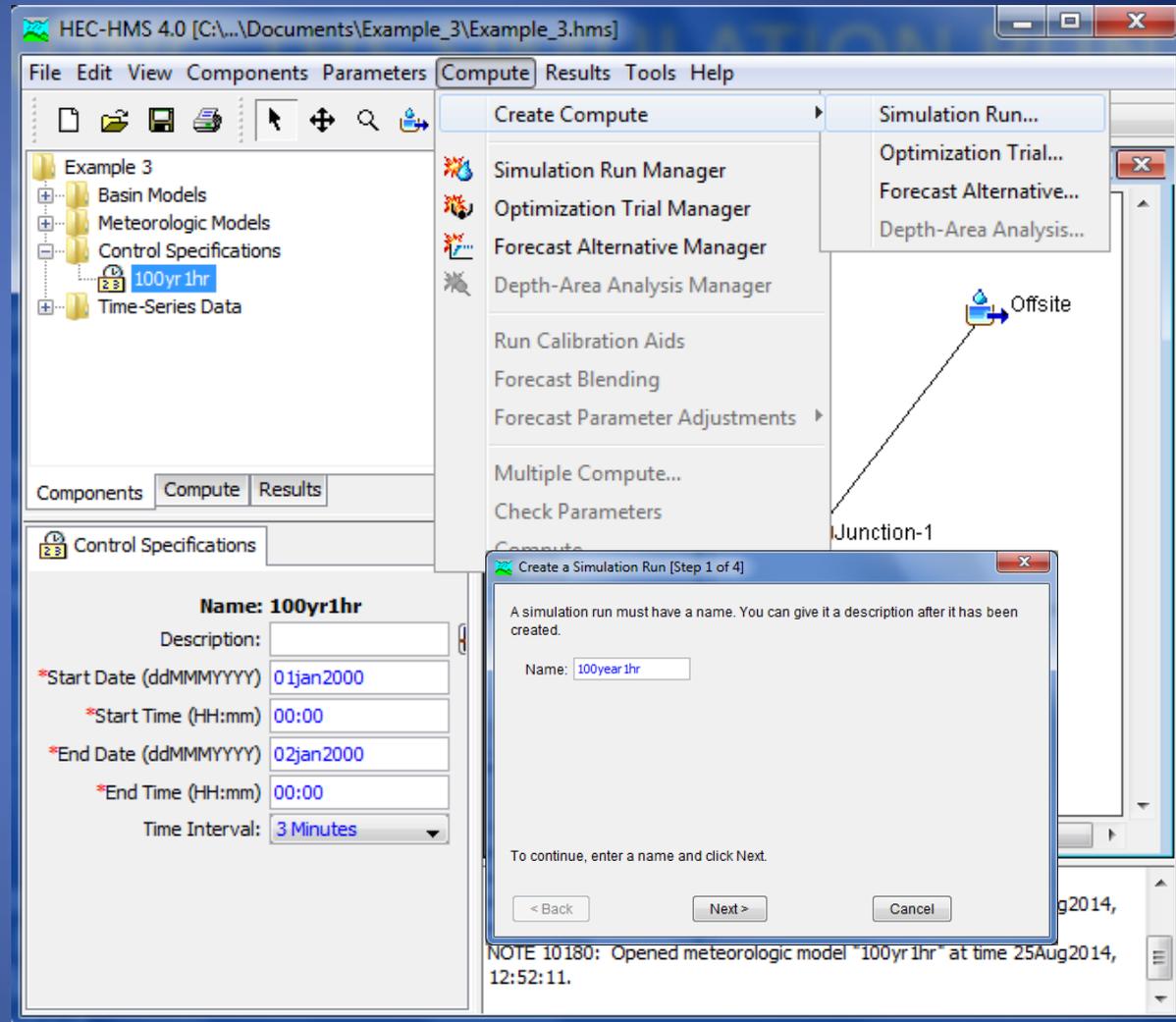
The status bar at the bottom shows the following messages:

```
12:18:52.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:42:09.  
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014,  
12:52:11.
```

CREATING THE SIMULATION RUN

100yr,1hr

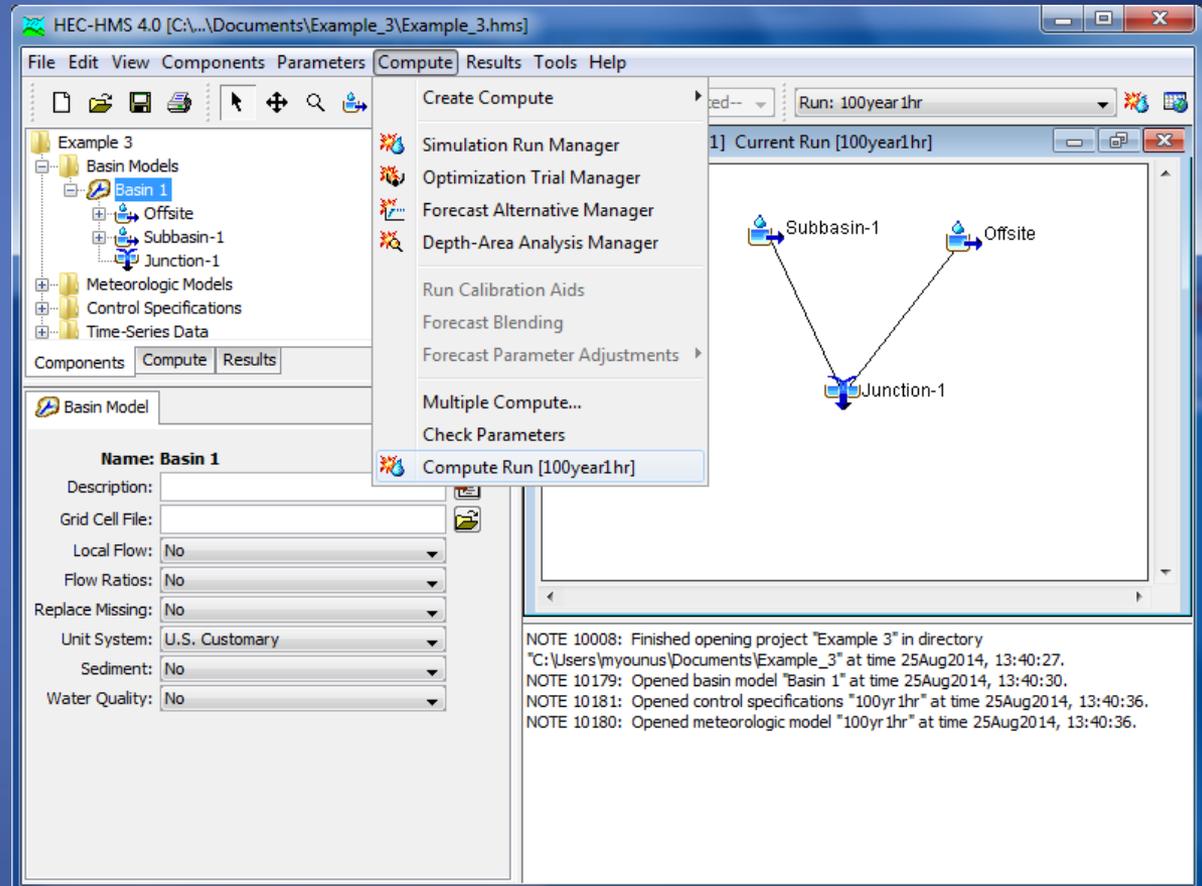
- A *Simulation Run* is a combination of:
 - *Basin Model*
 - *Meteorologic Model*
 - *Control Specifications*
- To create a new *Simulation Run*, select **Create Compute > Simulation Run** under the **Components** menu
- Name the run “100yr1hr” and click **Next**
- Specify the *Basin Model*, *Meteorologic Model*, and *Control Specifications* that we’ve just created for 100yr1hr storm event



RUNNING THE SIMULATION

100yr,1hr

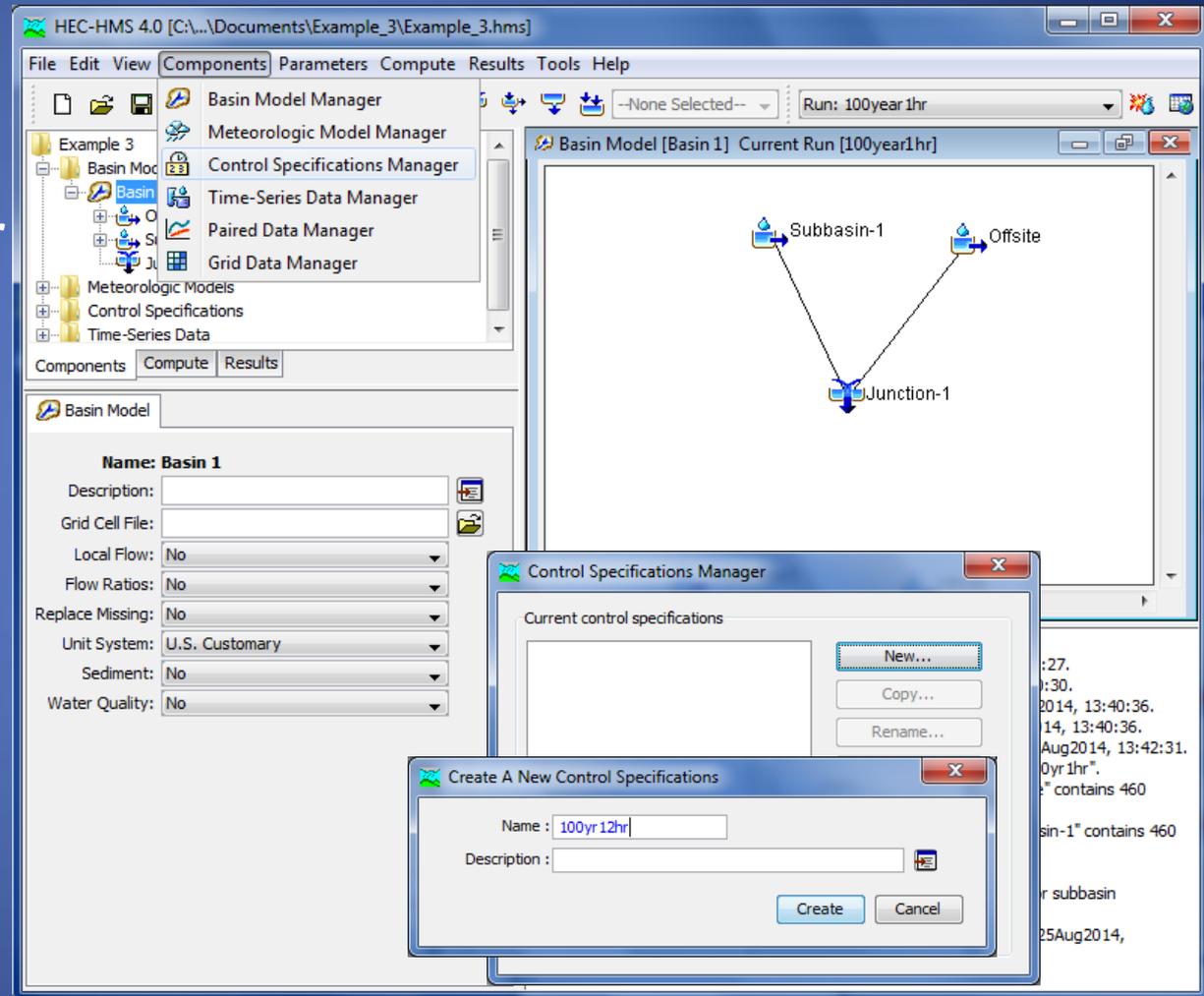
- Under the **Compute** menu, select **Compute Run [100yr1hr]**
- All errors, warnings, and notes are shown in the lower right hand window
- If there are errors, they will show up in red and the simulation will not run successfully



CREATING THE CONTROL SPECIFICATIONS

100-yr, 12-hr

- Under the **Components** menu, select **Control Specifications Manager** to create a new one named "100yr12hr"



CREATING THE CONTROL SPECIFICATIONS

Continue ...

- Specify 01Jan2000 through 02Jan2000
- Under *Time Interval*, specify 3 minute

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "Basin Model [Basin 1]" and shows a diagram of a basin model with two subbasins, "Subbasin-1" and "Offsite", both feeding into a central "Junction-1".

The "Control Specifications" panel is active, showing the following settings:

- Name: 100yr12hr
- Description: [Empty]
- *Start Date (ddMMYYYY): 01Jan2000
- *Start Time (HH:mm): 00:00
- *End Date (ddMMYYYY): 02Jan2000
- *End Time (HH:mm): 00:00
- Time Interval: 3 Hours

The "Components" panel on the left shows the project structure:

- Example 3
 - Basin Models
 - Meteorologic Models
 - Control Specifications
 - 100yr 1hr
 - 100yr 12hr (Selected)
 - Time-Series Data

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 13:40:27.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 13:40:30.
NOTE 10181: Opened control specifications "100yr 1hr" at time 25Aug2014, 13:40:36.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 13:40:36.
NOTE 10184: Began computing simulation run "100year 1hr" at time 25Aug2014, 13:42:31.
NOTE 20364: Found no parameter problems in meteorologic model "100yr 1hr".
WARNING 20657: Hyetograph gage "Huff1st1hr" for subbasin "Offsite" contains 460 missing precipitation values that were set to zero.
WARNING 20657: Hyetograph gage "Huff1st1hr" for subbasin "Subbasin-1" contains 460 missing precipitation values that were set to zero.
NOTE 40049: Found no parameter problems in basin model "Basin 1".
WARNING 41784: Simulation time interval is greater than 0.29 * lag for subbasin "Subbasin-1"; reduce simulation time interval.
NOTE 10185: Finished computing simulation run "100year 1hr" at time 25Aug2014, 13:42:31.

CREATING THE SIMULATION RUN

100-yr, 12-hr

- A *Simulation Run* is a combination of:
 - *Basin Model*
 - *Meteorologic Model*
 - *Control Specifications*
- To create a new *Simulation Run*, select **Create Compute > Simulation Run** under the **Components** menu
- Name the run “100yr12hr” and click **Next**
- Specify the *Basin Model*, *Meteorologic Model*, and *Control Specifications* that we’ve just created for 100yr12hr storm event

The screenshot displays the HEC-HMS 4.0 software interface. The 'Components' menu is open, showing the path: **Create Compute > Simulation Run...**. The 'Control Specifications' panel is visible, showing the following details:

- Name:** 100yr12hr
- Description:**
- *Start Date (ddMMYYYY):** 01Jan2000
- *Start Time (HH:mm):** 00:00
- *End Date (ddMMYYYY):** 02Jan2000
- *End Time (HH:mm):** 00:00
- Time Interval:** 3 Hours

A dialog box titled 'Create a Simulation Run [Step 1 of 4]' is open, prompting for a name. The 'Name' field contains '100yr12hr'. The dialog includes '< Back', 'Next >', and 'Cancel' buttons.

The background shows a project tree with 'Example 3' containing 'Basin Models', 'Meteorologic Models', 'Control Specifications', and 'Time-Series Data'. A diagram shows 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. A status bar at the bottom displays a warning: 'WARNING 41784: Simulation time interval is greater than 0.29 * lag for subbasin "Subbasin-1"; reduce simulation time interval.' and a note: 'NOTE 10185: Finished computing simulation run "100year 1hr" at time 25Aug2014, 13:42:31.'

RUNNING THE SIMULATION

100-yr, 12-hr

- Under the **Compute** menu, select **Compute Run [100yr12hr]**
- All errors, warnings, and notes are shown in the lower right hand window
- If there are errors, they will show up in red and the simulation will not run successfully

The screenshot displays the HEC-HMS 4.0 software interface. The main window title is "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The "Compute" menu is open, showing options such as "Create Compute", "Simulation Run Manager", "Optimization Trial Manager", "Forecast Alternative Manager", "Depth-Area Analysis Manager", "Run Calibration Aids", "Forecast Blending", "Forecast Parameter Adjustments", "Multiple Compute...", "Check Parameters", and "Compute Run [100yr12hr]".

The left sidebar shows a project tree for "Example 3" with folders for "Basin Models", "Meteorologic Models", "Control Specifications", "100yr 1hr", "100yr 12hr", and "Time-Series Data". The "Control Specifications" window is active, showing the following details:

- Name: 100yr12hr
- Description:
- *Start Date (ddMMYYYY): 01Jan2000
- *Start Time (HH:mm): 00:00
- *End Date (ddMMYYYY): 02Jan2000
- *End Time (HH:mm): 00:00
- Time Interval: 3 Hours

The right sidebar shows a diagram of the simulation model with "Subbasin-1" and "Offsite" feeding into "Junction-1". Below the diagram is a log window with the following text:

```
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 13:40:30.
NOTE 10181: Opened control specifications "100yr 1hr" at time 25Aug2014, 13:40:36.
NOTE 10180: Opened meteorologic model "100yr 1hr" at time 25Aug2014, 13:40:36.
NOTE 10184: Began computing simulation run "100year 1hr" at time 25Aug2014, 13:42:31.
NOTE 20364: Found no parameter problems in meteorologic model "100yr 1hr".
WARNING 20657: Hyetograph gage "Huff1st1hr" for subbasin "Offsite" contains 460 missing precipitation values that were set to zero.
WARNING 20657: Hyetograph gage "Huff1st1hr" for subbasin "Subbasin-1" contains 460 missing precipitation values that were set to zero.
NOTE 40049: Found no parameter problems in basin model "Basin 1".
WARNING 41784: Simulation time interval is greater than 0.29 * lag for subbasin "Subbasin-1"; reduce simulation time interval.
NOTE 10185: Finished computing simulation run "100year 1hr" at time 25Aug2014, 13:42:31.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 25Aug2014, 13:51:29.
```

CREATING THE CONTROL SPECIFICATIONS

100-yr, 24-hr

- Under the **Components** menu, select **Control Specifications Manager** to create a new one named “100yr24hr”

The screenshot displays the HEC-HMS 4.0 software interface. The main window shows a project tree on the left with 'Example 3' expanded to 'Basin Model Manager'. The 'Components' menu is open, highlighting 'Control Specifications Manager'. The main workspace shows a diagram of a basin model with 'Subbasin-1' and 'Offsite' connected to 'Junction-1'. The 'Basin Model [Basin 1] Current Run [100year1hr]' window is active, showing the current control specifications: '100yr 1hr' and '100yr 12hr'. A 'Control Specifications Manager' dialog box is open, showing the current specifications and buttons for 'New...', 'Copy...', 'Rename...', and 'Delete'. A 'Create A New Control Specifications' dialog box is also open, with 'Name' set to '100yr24hr' and 'Description' empty. The 'Create' button is highlighted. At the bottom of the main window, a status bar displays the following messages:

```
NOTE 40049: Found no parameter problems in basin model Basin 1 .  
WARNING 41784: Simulation time interval is greater than 0.29 *lag for subbasin  
"Subbasin-1"; reduce simulation time interval.  
NOTE 10185: Finished computing simulation run "100year1hr" at time 25Aug2014,  
13:42:31.
```

CREATING THE CONTROL SPECIFICATIONS

100-yr, 24-hr

Continue ...

- Specify 01Jan2000 through 02Jan2000
- Under *Time Interval*, specify 3 minute

The screenshot displays the HEC-HMS 4.0 software interface. The main window is titled "HEC-HMS 4.0 [C:\...Documents\Example_3\Example_3.hms]". The menu bar includes File, Edit, View, Components, Parameters, Compute, Results, Tools, and Help. The left sidebar shows a project tree for "Example 3" with folders for Basin Models, Meteorologic Models, Control Specifications, and Time-Series Data. Under Control Specifications, three items are listed: 100yr 1hr, 100yr 12hr, and 100yr 24hr (which is selected). Below the sidebar, the "Control Specifications" panel is active, showing the following details for the selected "100yr24hr" specification:

- Name: 100yr24hr
- Description: [Empty field]
- *Start Date (ddMMYYYY): 01Jan2000
- *Start Time (HH:mm): 00:00
- *End Date (ddMMYYYY): 03Jan2000
- *End Time (HH:mm): 00:00
- Time Interval: 3 Minutes

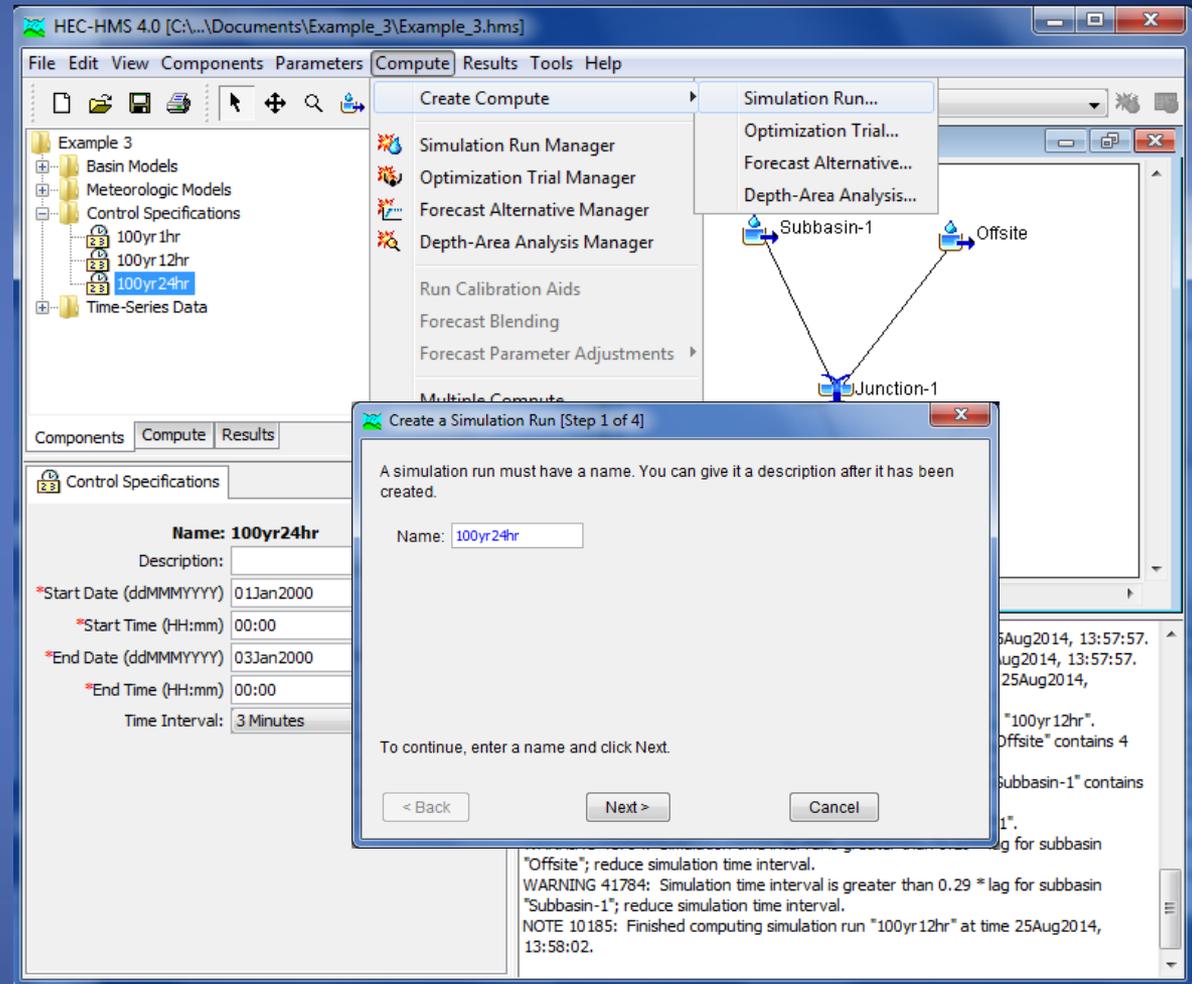
The right pane shows a "Basin Model [Basin 1]" diagram with three subbasins: Subbasin-1, Offsite, and Junction-1. Subbasin-1 and Offsite are connected to Junction-1. The bottom right pane displays a log of simulation results:

```
NOTE 10180: Opened control specifications "100yr 12hr" at time 25Aug2014, 13:57:57.
NOTE 10180: Opened meteorologic model "100yr 12hr" at time 25Aug2014, 13:57:57.
NOTE 10184: Began computing simulation run "100yr 12hr" at time 25Aug2014, 13:58:02.
NOTE 20364: Found no parameter problems in meteorologic model "100yr 12hr".
WARNING 20657: Hyetograph gage "Huff2nd12hr" for subbasin "Offsite" contains 4 missing precipitation values that were set to zero.
WARNING 20657: Hyetograph gage "Huff2nd12hr" for subbasin "Subbasin-1" contains 4 missing precipitation values that were set to zero.
NOTE 40049: Found no parameter problems in basin model "Basin 1".
WARNING 41784: Simulation time interval is greater than 0.29 * lag for subbasin "Offsite"; reduce simulation time interval.
WARNING 41784: Simulation time interval is greater than 0.29 * lag for subbasin "Subbasin-1"; reduce simulation time interval.
NOTE 10185: Finished computing simulation run "100yr 12hr" at time 25Aug2014, 13:58:02.
```

CREATING THE SIMULATION RUN

100-yr, 24-hr

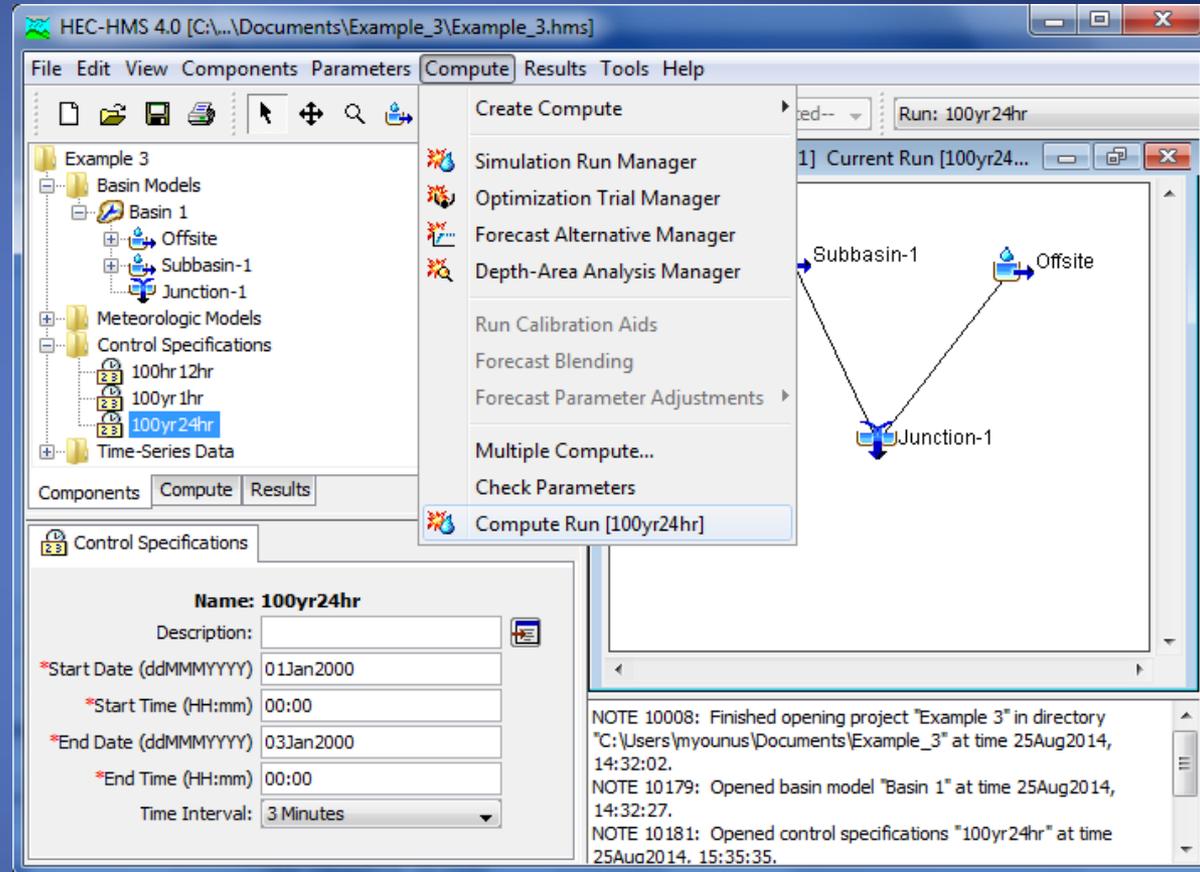
- A *Simulation Run* is a combination of:
 - *Basin Model*
 - *Meteorologic Model*
 - *Control Specifications*
- To create a new *Simulation Run*, select **Create Compute** > **Simulation Run** under the **Components** menu
- Name the run “100yr24hr” and click **Next**
- Specify the *Basin Model*, *Meteorologic Model*, and *Control Specifications* that we’ve just created for 100yr24hr storm event



RUNNING THE SIMULATION

100-yr, 24-hr

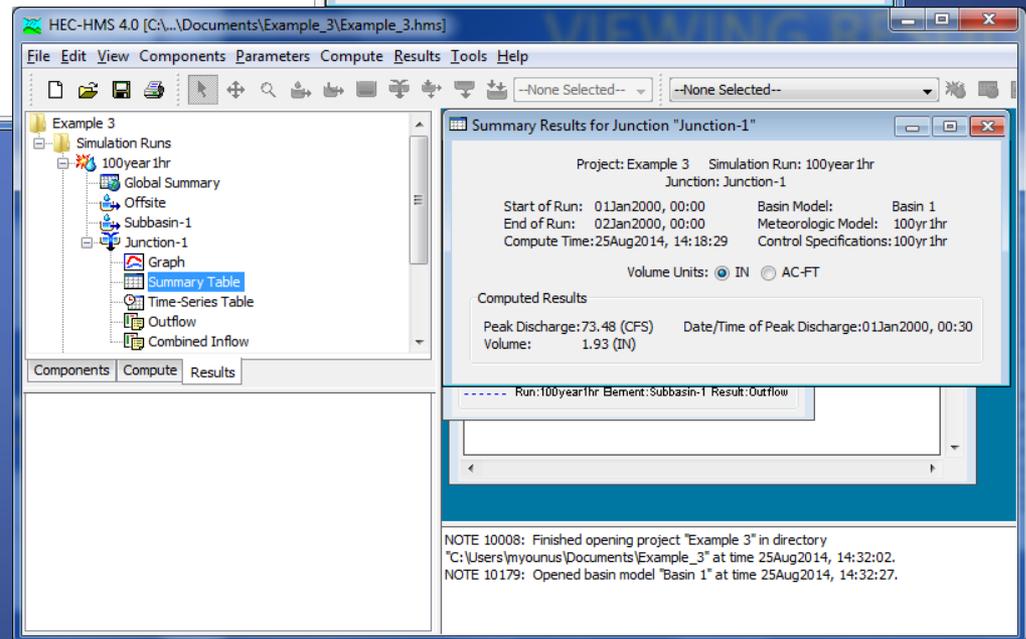
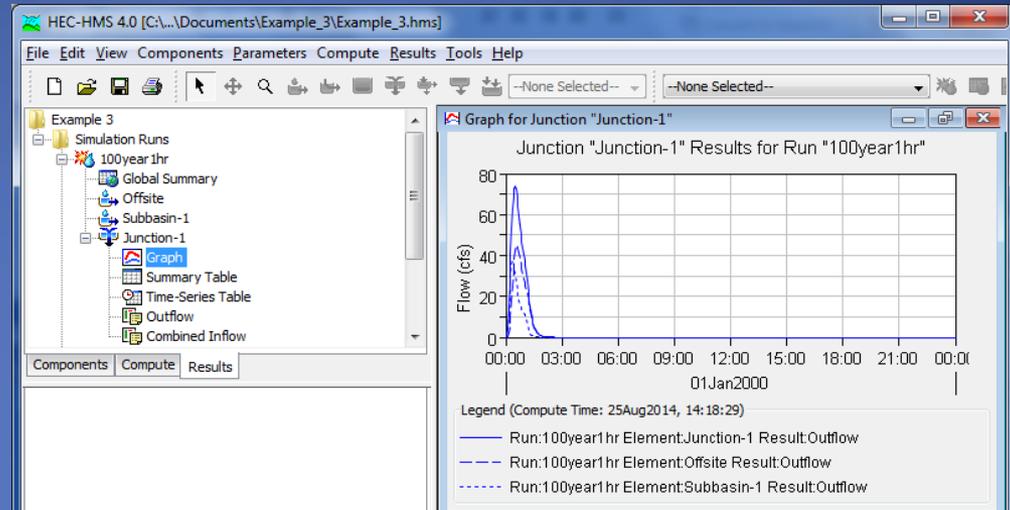
- Under the **Compute** menu, select **Compute Run [100yr24hr]**
- All errors, warnings, and notes are shown in the lower right hand window
- If there are errors, they will show up in red and the simulation will not run successfully



VIEWING RESULTS

100-yr, 1-hr

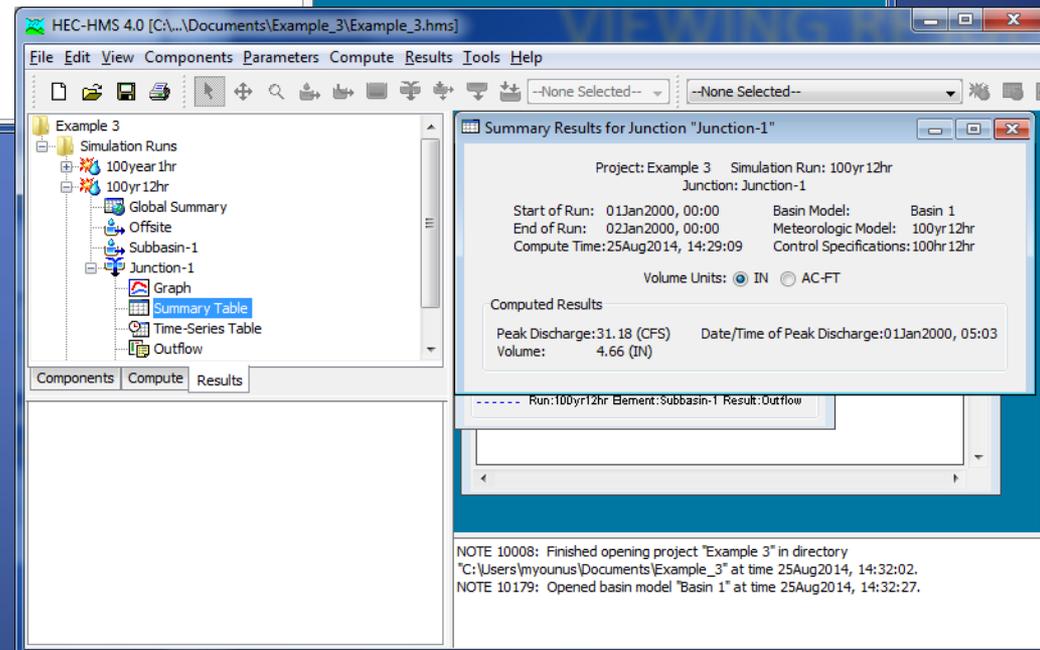
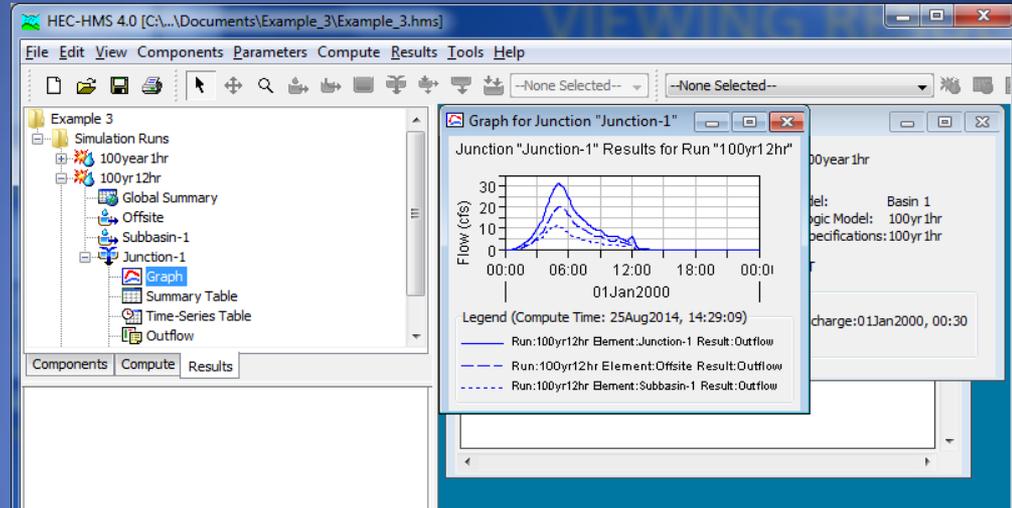
- If the *Simulation Run* was successful, right-click on the components of the *Basin Model* to view individual results
- Results are available as a *Graph*, *Summary Table*, or *Time-Series Table*, under **Result Tab**.



VIEWING RESULTS

100-yr, 12-hr

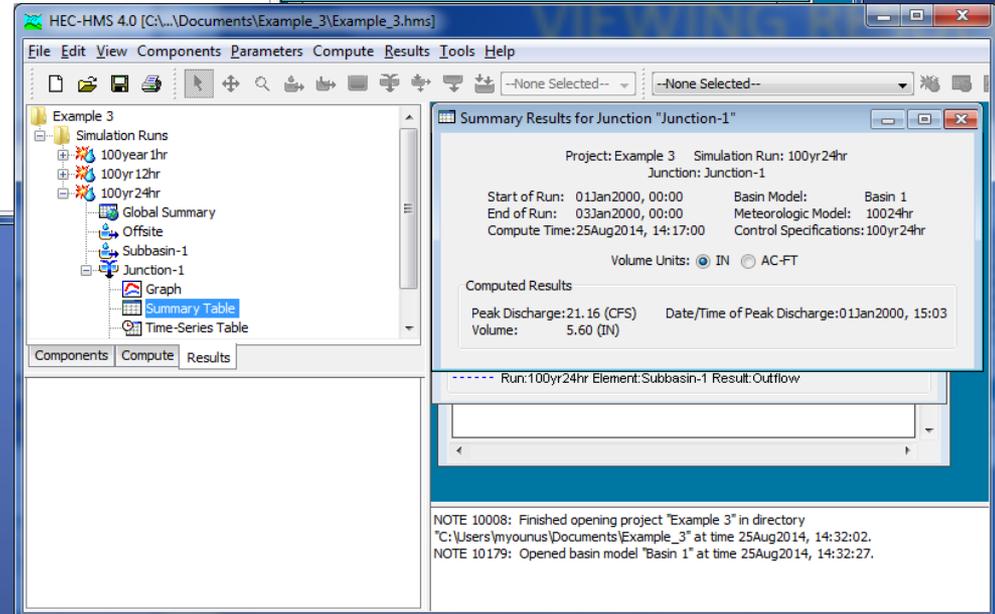
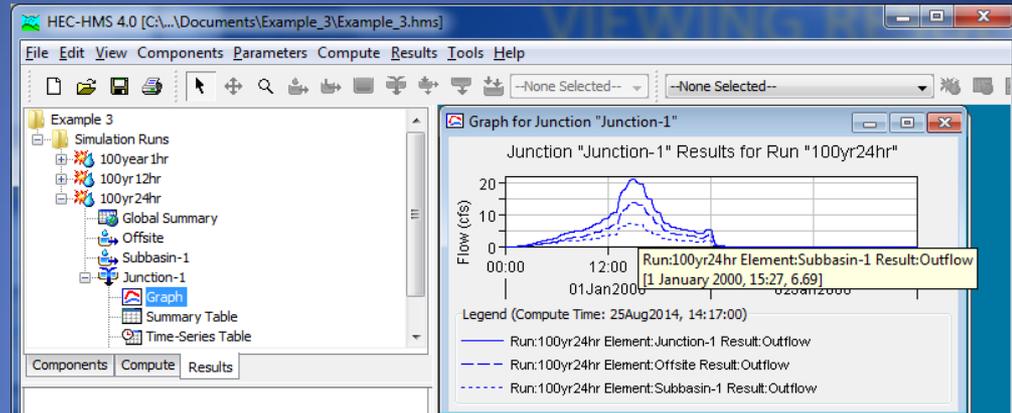
- If the *Simulation Run* was successful, right-click on the components of the *Basin Model* to view individual results
- Results are available as a *Graph*, *Summary Table*, or *Time-Series Table*, under *Result Tab*.



VIEWING RESULTS

100-yr, 24-hr

- If the *Simulation Run* was successful, right-click on the components of the *Basin Model* to view individual results
- Results are available as a *Graph*, *Summary Table*, or *Time-Series Table*, under *Result Tab*.



VIEWING RESULTS (GLOBAL SUMMARY)

100-yr, 1-hr

- To view the results for all model components at once, choose **Global Summary Table** under the Results Menu

The screenshot shows the HEC-HMS 4.0 interface. The 'Results' menu is open, and 'Global Summary Table' is selected. The 'Global Summary Results for Run "100year1hr"' window is displayed, showing project details and a table of hydrologic elements.

Project: Example 3 Simulation Run: 100year1hr

Start of Run: 01Jan2000, 00:00 Basin Model: Basin 1
End of Run: 02Jan2000, 00:00 Meteorologic Model: 100yr 1hr
Compute Time: 25Aug2014, 14:18:29 Control Specifications: 100yr 1hr

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.031250	44.97	01Jan2000, 00:36	1.76
Subbasin-1	0.015156	37.60	01Jan2000, 00:21	2.29
Junction-1	0.046406	73.48	01Jan2000, 00:30	1.93

NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 14:32:02.
NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 14:32:27.

VIEWING RESULTS (GLOBAL SUMMARY)

100-yr, 12-hr

- To view the results for all model components at once, choose **Global Summary Table** under the Results Menu

The screenshot displays the HEC-HMS 4.0 interface. The left pane shows a tree view of simulation runs, with 'Global Summary' selected under the '100yr 12hr' run. The main window shows the 'Global Summary Results for Run "100yr12hr"' dialog. The project is 'Example 3' and the simulation run is '100yr 12hr'. The start of run is 01Jan2000, 00:00, and the end of run is 02Jan2000, 00:00. The compute time is 25Aug2014, 14:29:09. The basin model is 'Basin 1', the meteorologic model is '100yr 12hr', and the control specifications are '100hr 12hr'. The 'Show Elements' dropdown is set to 'All Elements', 'Volume Units' is set to 'IN', and 'Sorting' is set to 'Hydrologic'. A table displays the summary results for three elements: Offsite, Subbasin-1, and Junction-1. Below the table, there are two notes: NOTE 10008: Finished opening project "Example 3" in directory "C:\Users\myounus\Documents\Example_3" at time 25Aug2014, 14:32:02. and NOTE 10179: Opened basin model "Basin 1" at time 25Aug2014, 14:32:27.

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.031250	20.13	01Jan2000, 05:09	4.43
Subbasin-1	0.015156	11.24	01Jan2000, 05:00	5.15
Junction-1	0.046406	31.18	01Jan2000, 05:03	4.66

VIEWING RESULTS (GLOBAL SUMMARY)

100-yr, 24-hr

- To view the results for all model components at once, choose **Global Summary Table** under the Results Menu

The screenshot displays the HEC-HMS 4.0 interface. The left pane shows a project tree with 'Global Summary' selected under the '100yr24hr' component. The main window shows the 'Global Summary Results for Run "100yr24hr"' dialog. The project is 'Example 3' and the simulation run is '100yr24hr'. The start of run is 01Jan2000, 00:00, and the end of run is 03Jan2000, 00:00. The compute time is 25Aug2014, 14:17:00. The basin model is 'Basin 1', the meteorologic model is '10024hr', and the control specifications are '100yr24hr'. The 'Show Elements' dropdown is set to 'All Elements', 'Volume Units' is set to 'IN', and 'Sorting' is set to 'Hydrologic'. A table displays the summary results for three hydrologic elements: Offsite, Subbasin-1, and Junction-1. Below the table, two notes are visible: NOTE 10008: Finished opening project 'Example 3' in directory 'C:\Users\myounus\Documents\Example_3' at time 25Aug2014, 14:32:02. NOTE 10179: Opened basin model 'Basin 1' at time 25Aug2014, 14:32:27.

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.031250	13.87	01Jan2000, 15:06	5.35
Subbasin-1	0.015156	7.32	01Jan2000, 15:00	6.11
Junction-1	0.046406	21.16	01Jan2000, 15:03	5.60

EXAMPLE 3 RESULTS

Storm Event	Peak Flowrate (cfs)
100-Year, 1-Hour	73
100-Year, 12-Hour	31
100-Year, 24-Hour	21