HEC-HMS Lab 2 - Creating HMS Schematic for Multiple Sub-basins

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Learning outcomes

The objective of this lab is to learn how to create multiple sub-basins in HEC-HMS and connect them using a junction. The role of SCS loss and transform parameters on the flow hydrograph is assessed by comparing hydrographs for two sub-basins. By the end of this exercise, you will:

1) Know how to create a junction in HEC-HMS and establish connectivity between sub-basins
2) Understand the effect of SCS CN number and lag time on outflow hydrograph

Student Time Required: 60 minutes

Instructions

In this lab, you will create a watershed that has two sub-basins in it. The schematic of what you are going to create is shown below.
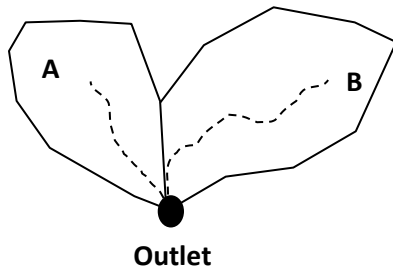
There are two sub-watersheds, A and B, that are adjacent to each other. Your goal is to model these two sub-watersheds and get the discharge at the outlet for a given rainfall event.

Create a new HMS project and save it as Lab3 in a new folder with an appropriate name.

Create a new basin model in this project.

Create sub-basin A (name: subbasin-A) with the following characteristics:

- Area = 150 km^2
- Use SCS method for computing rainfall losses with the following parameters: CN = 45, impervious cover = 0, Initial abstraction = 0
- Use SCS unit hydrograph for transformation with the lag time as 100 minutes.
- Use None for all other methods. (eg. Baseflow: None)

Create sub-basin B (name = subbasin-B) with the following characteristics:

- Area = 150 km^2
- Use SCS method for computing rainfall losses with the following parameters: CN = 85, impervious cover = 5, Initial abstraction = 0
- Use SCS unit hydrograph for transformation with the lag time as 60 minutes.
- Use None for all other methods. (eg. Baseflow: None)

Both sub-basins A and B are disconnected. The tool that will be used to connect them is the junction tool

 . Create a new junction (use default name) in the basin model the same way you create sub-basin. Click on the tool, and click on the basin model. A sub-basin or any other element in a basin model can be linked to a junction, by specifying the downstream element. Click on subbasin-A in watershed explorer, and then change the downstream element to Junction-1 in the component editor as shown below. Save your project.
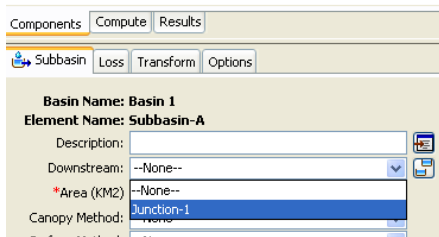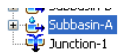
You will see that a link (line) will appear in the basin model to show the connectivity between subbasin-A and Junction-1. Similarly, link Subbasin-B with Junction-1. Save your project. Your final HMS-schematic should show both sub-basins connect at the junction as shown below.
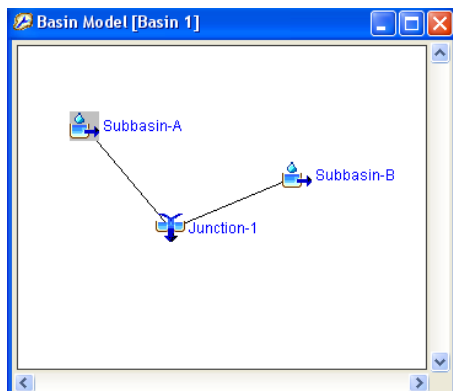
1. **Create one rain-gage each for sub-basin A and B. Name them as gageA and gageB.**

    The time series information for each gage is given below.

Gage A	
Time	P (mm)
1830	0.00
1900	1.00
1930	1.00
2000	1.75
2030	3.75
2100	7.50
2130	3.75
2200	2.00

Gage B	
Time	P (mm)
1830	0.00
1900	0.80
1930	0.80
2000	1.40
2030	3.00
2100	6.00
2130	3.00
2200	1.60

2. **Create a new Meteorologic model**
   Make sure you link Gage A to subbasin-A and Gage B to subbasin-B.
3. **Create a new control specification file**
   You need to run the model for at least one day with a time step of 10 minutes
4. **Create a new simulation run**
   Run the model.
5) Create Presentation quality Excel hydrograph for sub-basin A and sub-basin B
6) Change the value of CN for one of the sub-basins a few times to see how it is affecting the hydrograph. After few iterations, change the CN back to its original value. Now change the lag time for the same basin a few times to see how it is affecting the hydrograph.

Turn-in (Feb 07, 2020 by 1:30 PM)

A write-up describing what you have learned by doing this exercise. Just saying "I learned how to create a schematic or junction" is not adequate. Please write down the hydrologic behavior of the model you just created. Specifically, the behavior of the two sub-basins for the given rainfall event, and the reasons behind their different behavior. Based on the output, what can you tell about the parameters used in the model and how they affect the outflow hydrograph (peak value, time to peak and base time). Support your answers with appropriate numbers and graphs. For example, if the hydrograph changes after changing a parameter, show or discuss the change using numbers and/or plot. Try to write a good narrative including figures and parameter values instead of just answering the above questions.