Tutorial 13 - The Scenario Manager

The Scenario Manager tool allows you to compare alternatives such as alternate model configurations, control strategies, or boundary conditions in a model. A model may contain up to 50 scenarios, which can be toggled on or off. Multiple scenarios are solved with a single command and results can be compared graphically in **Review Results** and in the **XP Tables**.

Scenarios may be defined as modifications to the base model. Child scenarios may then be developed from modifications to a previously defined scenario. The **Scenario Manager** stores model changes to the parent database for all modifications. These changes are stored in a Microsoft Access Database (*.mdb) file with the same base name as the xp project (.xp) file.

When the only difference between scenarios is rainfall, you should consider using the **Global Storms** tool described in Tutorial 10 - Creating Design Storms and Using Global Storms. We recommend that the **Global Database** should only be edited in the **Base Scenario**. Scenarios are not currently available in **Sanitary Mode**.

In this tutorial, the model is used to compare the performance of three culvert configurations:

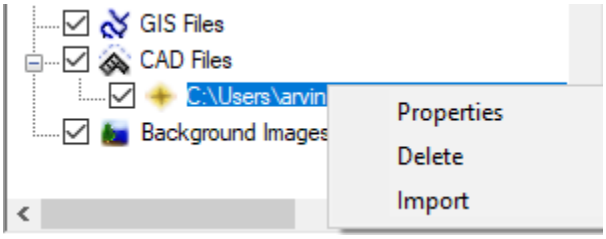
- Base Scenario - 1 m diameter pipes with 3 barrels
- Box culvert - 1 m high x 2 m wide box culvert
- Double Box culvert - 1 m high x 2 m wide box culvert with 2 barrels

Level	Novice
Objectives	• Use the Scenario Manager to evaluate alternative configurations of a culvert • Compare alternative configurations with Review Results and XP Tables
Time	1 hour
Data files	• **Culvert_scenario01.xp** (starter model) • **Yarra.dxf** (background image)

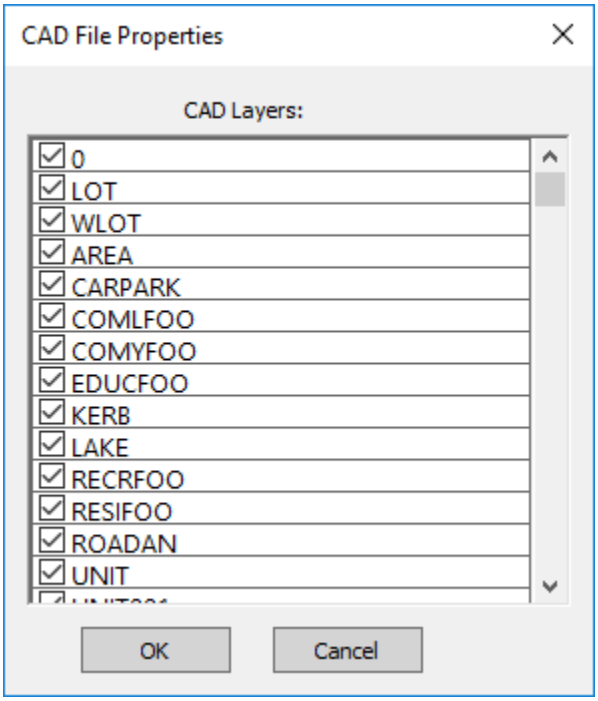
1. Launch the program and open the model.
    a. At the opening dialog, select **Browse** and navigate to the file *Culvert_Scenario01.xp*.
    b. Set the active mode to Hydraulics (**Hdr**).
    c. Navigate to the short network from node **US Flows** to node **Outlet**. Note that the network consists of a natural channel followed by a culvert under “Schlich Road” and then a downstream natural channel.
    d. Double-click the link **Culvert** to open the **Multiple Link** dialog. Note that the culvert is a **1** m diameter pipe and the over-topping of Schlich Road is represented as a broad crested weir. Click **OK**.

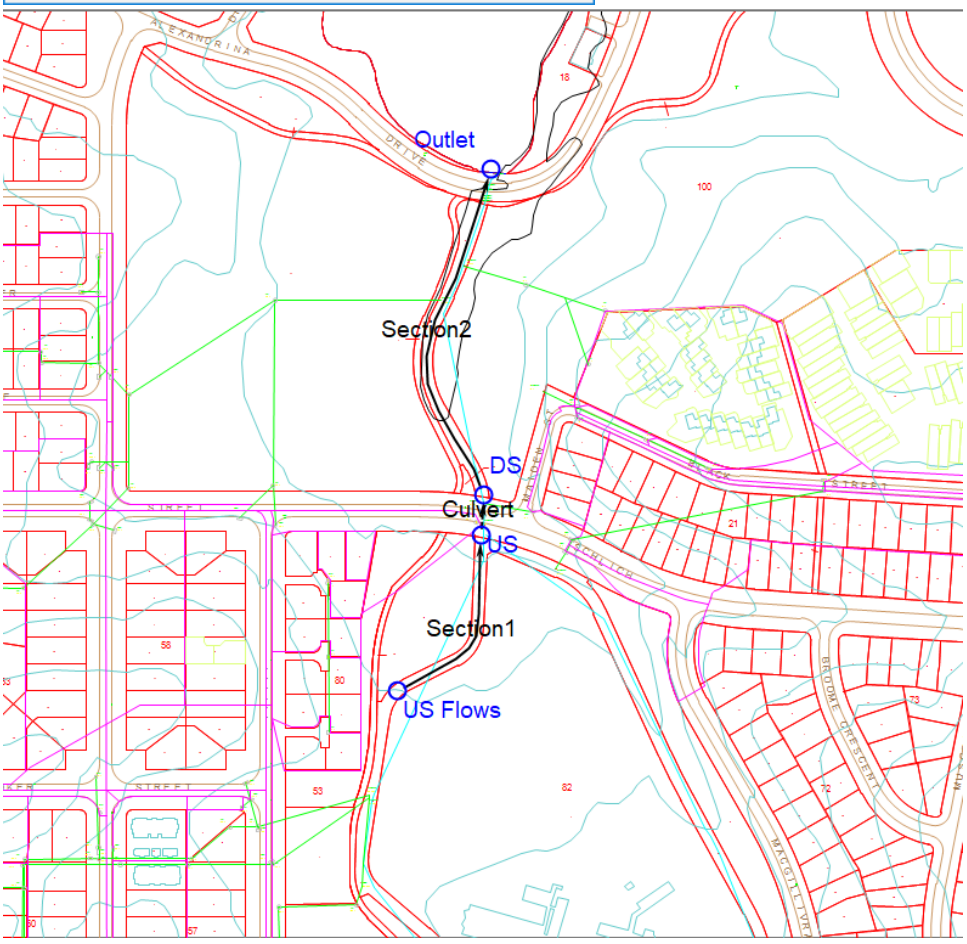
2. Add CAD file:
    a. Check the **visible** box in the **CAD Files** line in the **Layers** Control Panel.
    b. Right-click the **CAD Files** line and select **Load CAD File**.
    c. Navigate to the file *YARRA.dxf* and click **Open**.

    d. Right-click the **YARRA.DXF** layer and choose **Properties** from the menu.



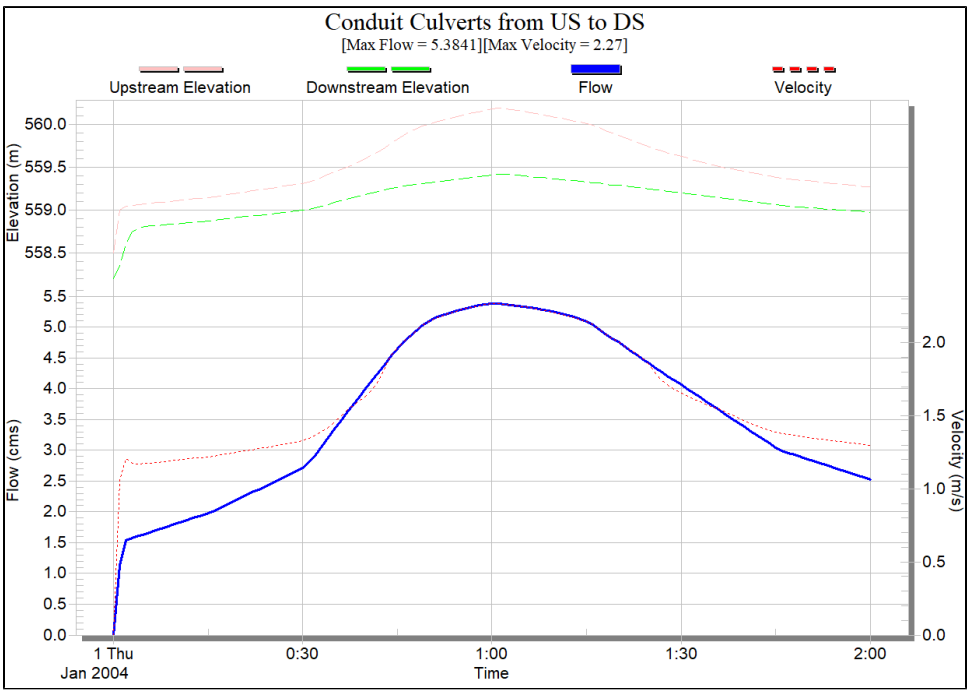
e. Toggle the check boxes to turn off the display of selected layers. Use the navigation tools to set the viewing area as shown in the figure below.





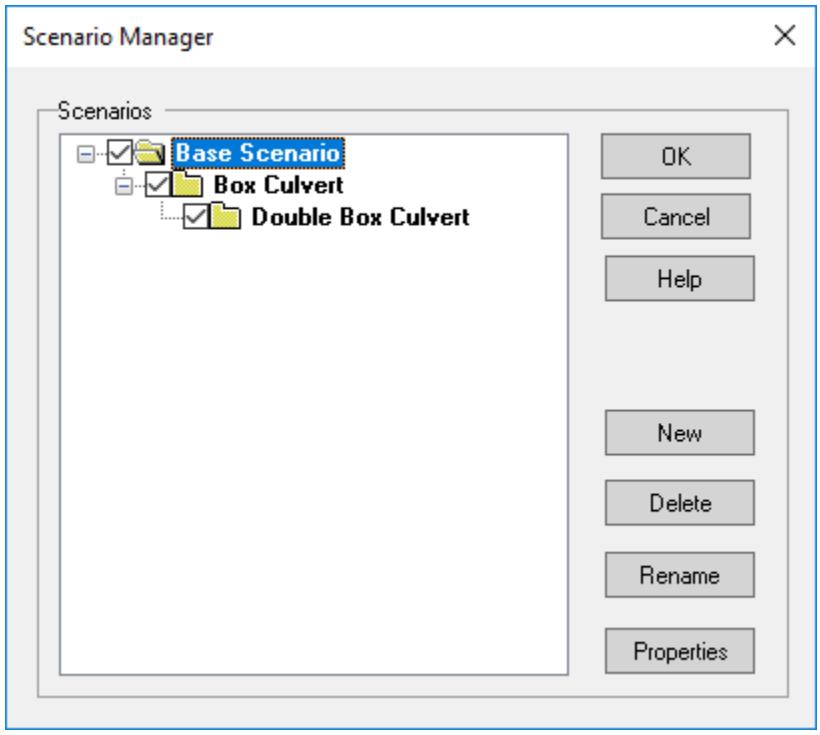
3. Solve the model and review results:
   a. In the **Analyze** menu, select **Solve**. The simulation dialog will appear. Use this dialog to monitor the progress of the calculation.

b. Right-click link **Culvert** and select **Review Results**. The first graph displays results for the 1 m pipe. To view the road over-topping, click the **Diversions** tool. Note that flow over-tops the roadway with a peak flow about 0.56 m^3/s at approximately 1:01 AM.



4. Add scenarios:

a. Click **Edit** next to the Scenario drop list to open the **Scenario Manager** dialog.
b. With the **Base Scenario** highlighted, click **New**. Change the title from **Scenario_1** to **Box Culvert.**

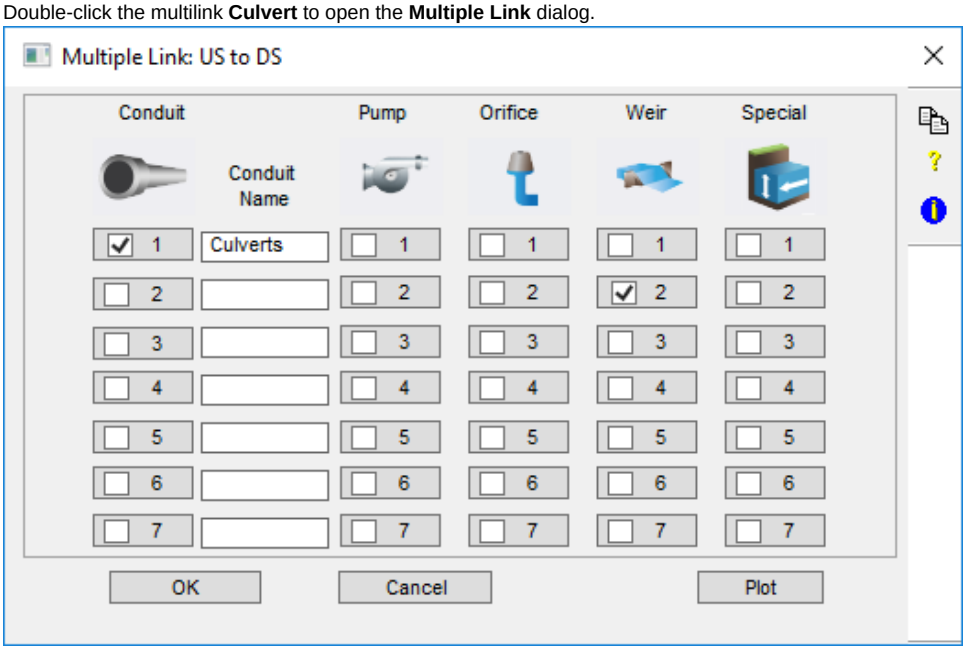


c. With the **Box Culvert** scenario highlighted, click **New** to add an additional scenario called **Double Box Culvert**.

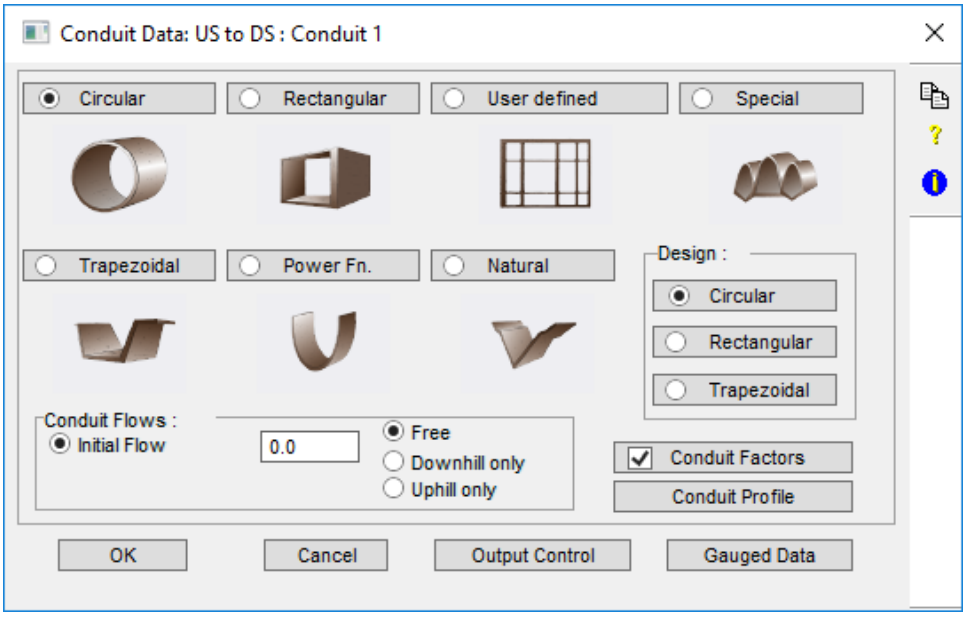
> ⚠ Note that **Box Culvert** is a derivative of the **Base Culvert** and that **Double Box Culvert** is a child of **Box Culvert**. Make sure that the boxes for all three scenarios are checked.

d. Click **OK** to close the dialog.

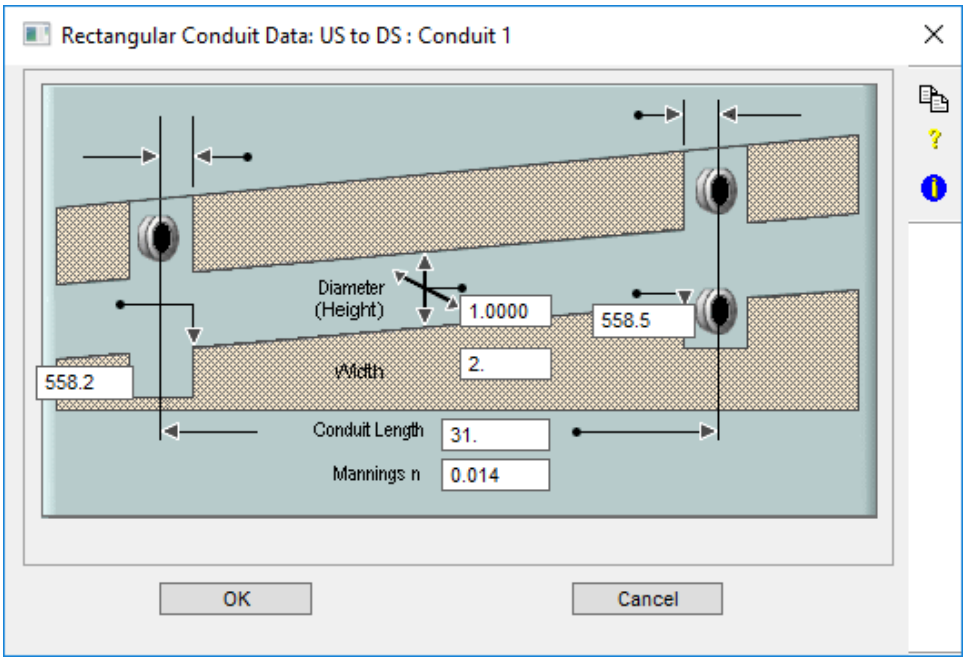
5. Edit **Box Culvert** scenario.
   a. Set the Scenario drop list to **Box Culvert**.
   b. Double-click the multilink **Culvert** to open the **Multiple Link** dialog.



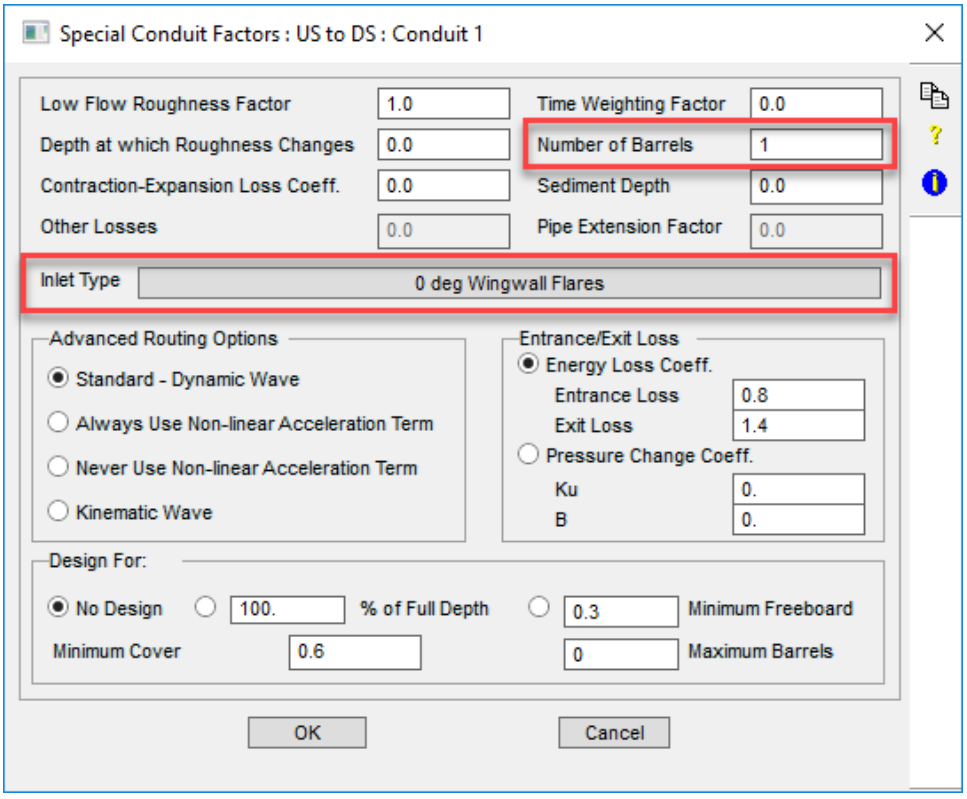
   c. Double-click **Conduit 1** to open the **Conduit Data** dialog.
   d. Click **Rectangular** to open the **Rectangular Conduit Data** dialog.



   e. Set the **Diameter** (**Height)** to **1** m and the **Width** to **2** m. Check that the remaining data is as shown below, and then click **OK**.



f. In the **Conduit Data** dialog, double-click **Conduit Factors** to open the **Special Conduit Factors** dialog.
g. Select **0 deg Wingwall Flares(Rect, Conc)** from the **Inlet Type** drop list.
h. Set the **Number of Barrels** to **1**.
i. Check that the remaining data is as shown in the following dialog.

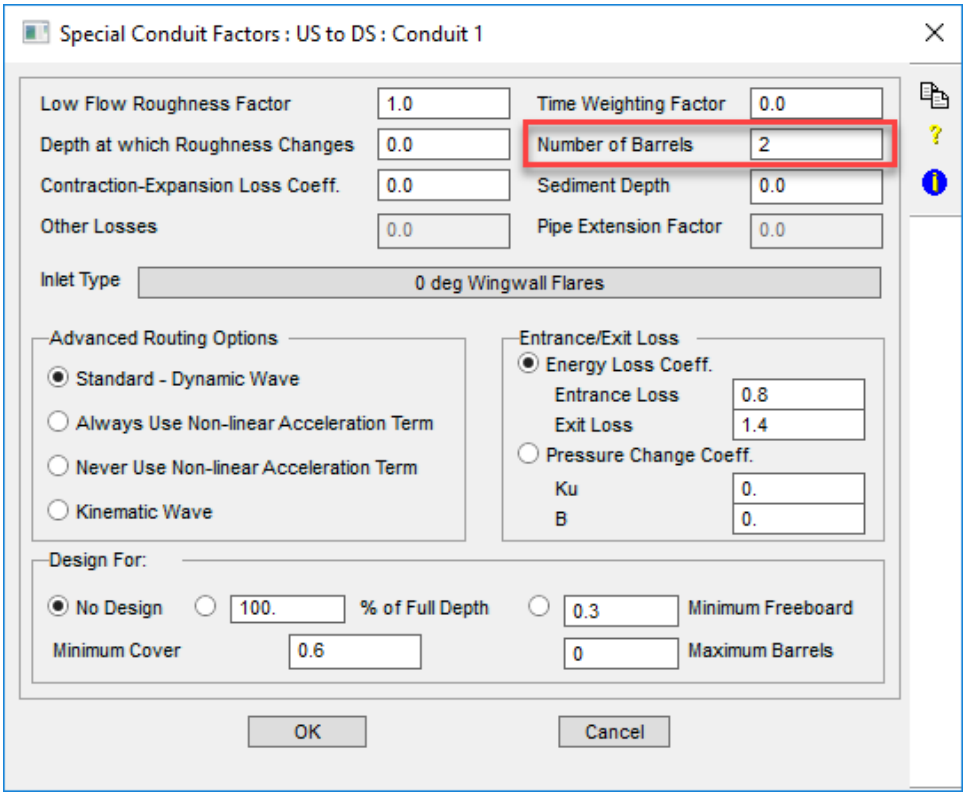


j. Click **OK** three times to return to the network view.

6. Edit the Double Box Culvert scenario.

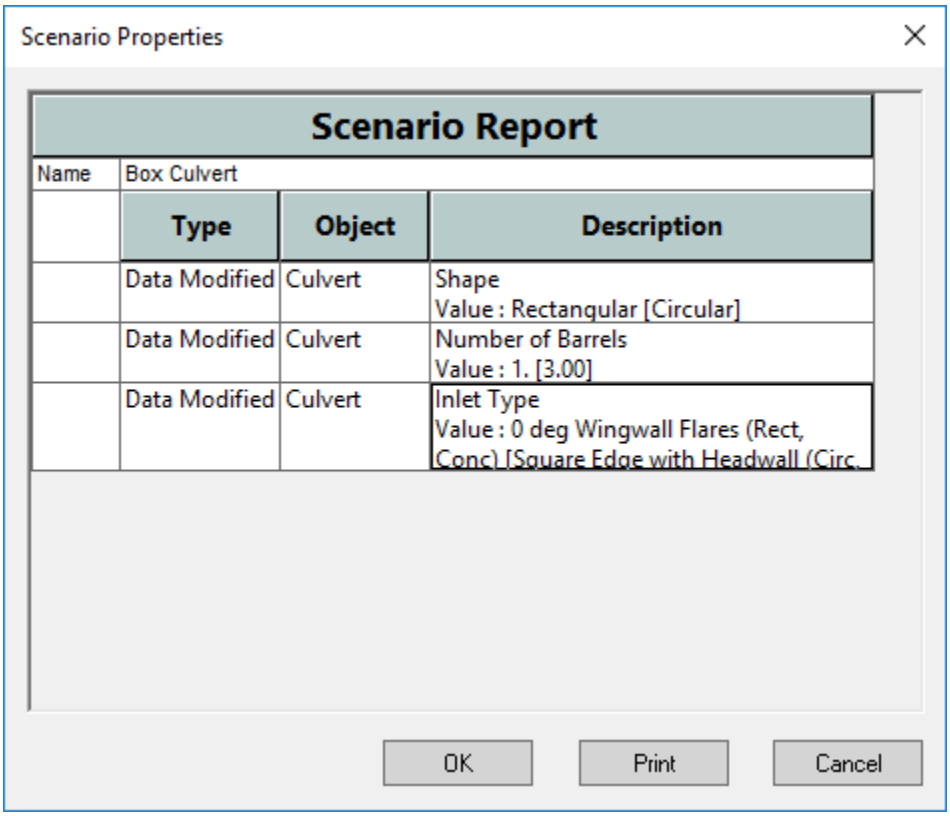
a. Set the **Scenario** drop list to **Double Box Culvert**.
b. Double-click the multilink **Culvert** to open the **Multiple Link** dialog.
c. Double-click **Conduit 1** to open the **Conduit Data** dialog.
d. Double-click **Conduit Factors**.

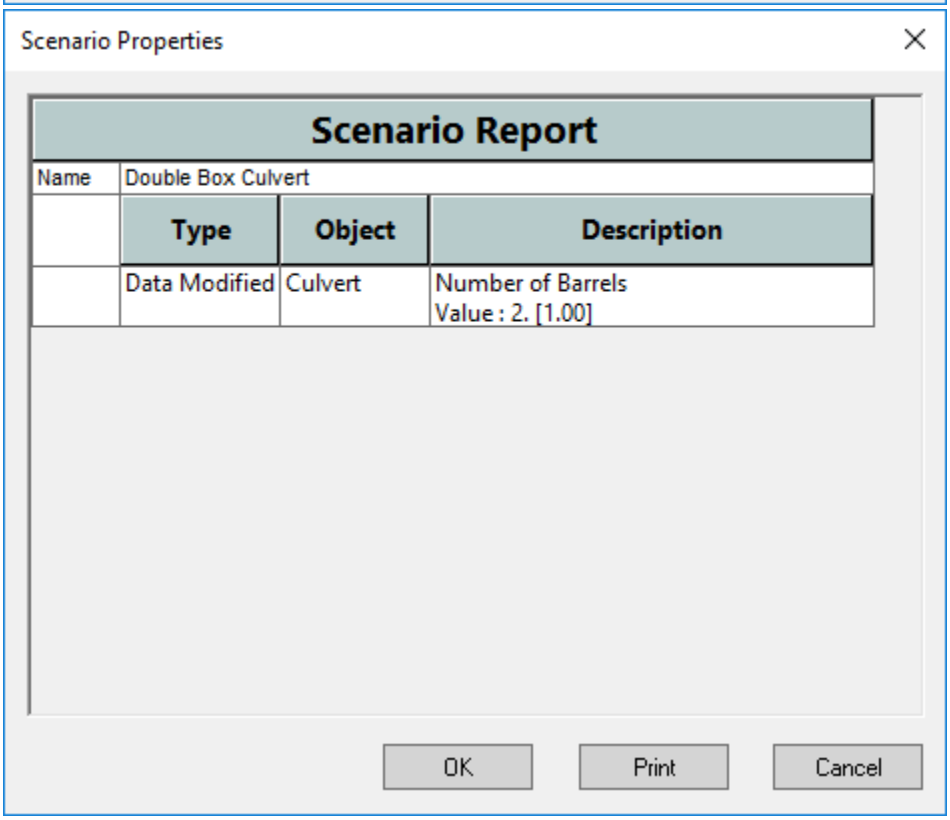
e. In the **Special Conduit Factors** dialog, set the **Number of Barrels** to **2**.



f. Click **OK** three times to return to the network view.

7. Review scenario data:
   a. Click **Edit** next to the **Scenario** drop list to open the **Scenario Manager** dialog.
   b. With the **Box Culvert** highlighted, click **Properties**.
   c. Review the **Scenario Properties**. This report lists the properties in a scenario that are different from the parent.
   d. Review the **Double Box** scenario report. Remember that **Double Box Culvert** is a child of **Box Culvert** so that it also has the properties of Box culvert and also those of the Base Scenario.
   e. Click **OK** twice to return to the network view.



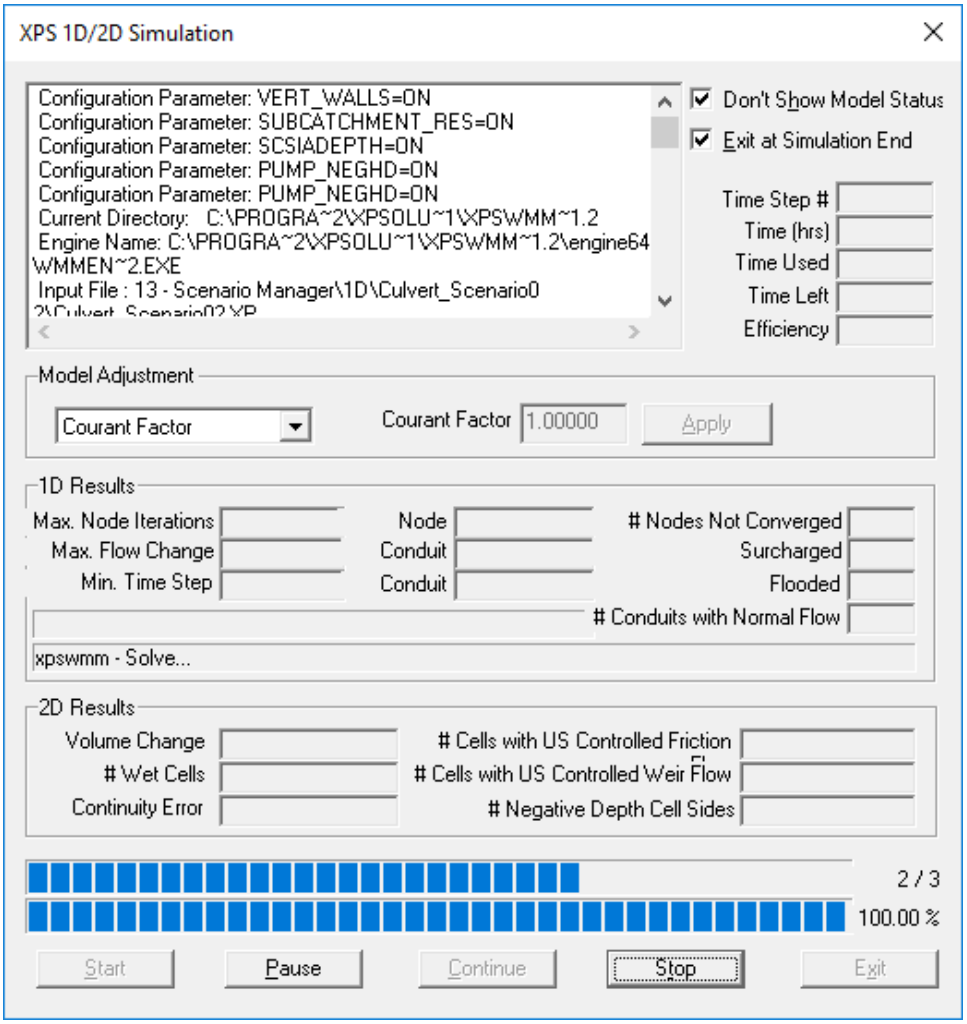


f. Save your model as *Culvert_Scenario02.xp.*

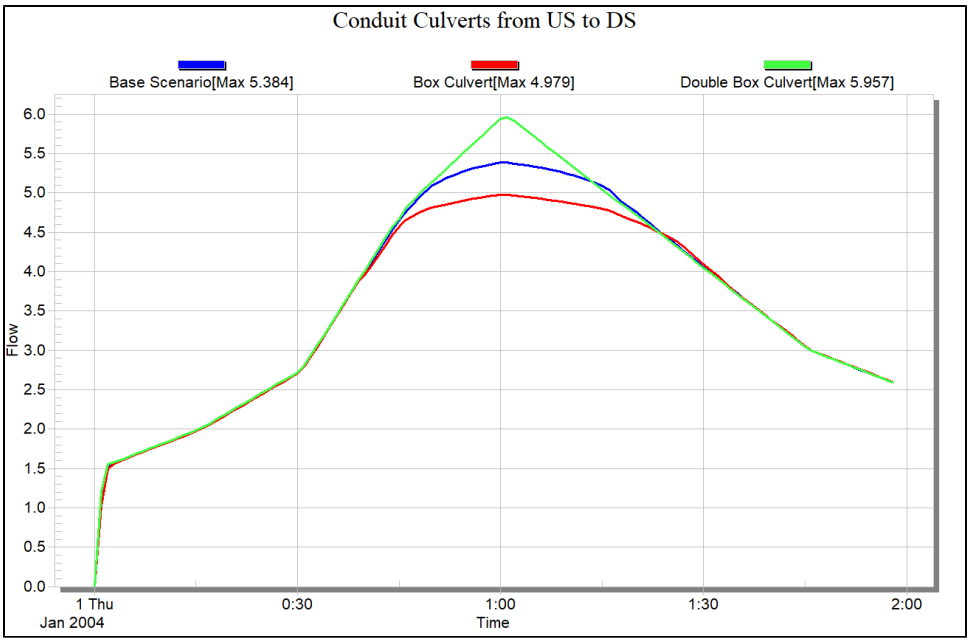
8. Solve and compare results:

a. In the **Analyze** menu, select **Solve**.

b. Click **OK**. Three output files will be automatically created with one for each scenario and one for the base. The scenario output files will be named with the scenario name appended to the output file name. The XPS 1D/2D Simulation dialog will appear. All three scenarios will be solved. Note that the lower progress bar represents a single scenario. The upper progress bar represents the complete solution.



c. Right-click the link Culvert and select **Review Results**. The first graph displays results for the 1 m pipe. To view the road over-topping, click the **Diversions** tool.



9. Use XP Tables:
   a. Launch the **XP Tables** by clicking the **XP Table List** tool.

b. Review the **Culvert Detail** table. On the scenario drop list, select **All Scenarios**. Note the maximum flow over the weir (link Overtop) for each scenario. The maximum water surface elevation at Schlich Street is obtained from the last column. It is the upstream elevation for the Culverts link and the Overtop link.

Name	Scenario	Shape	Diameter (Height) m	Number of Barrels	Length m	Max Flow cms	Weir Name	Weir Crest Elevation m	Max Water Upstream Elevation m
Culverts	Base Scenari	Rectangu	1.00	2.0	31.0	5.39			560.19
Culverts	Box Culvert					4.98			560.27
Culverts	Double Box					5.97			559.73
Overtop	Base Scenari					0.56	Overtop	560.00	560.19
Overtop	Box Culvert					0.97			560.27
Overtop	Double Box					0.00			559.73
Section1	Base Scenari	Natural	0.75	1.0	150.0	5.99			561.94
Section1	Box Culvert					5.99			561.94
Section1	Double Box					5.99			561.94
Section2	Base Scenari	Natural	1.50	1.0	270.0	5.94			559.42
Section2	Box Culvert					5.95			559.42
Section2	Double Box					5.96			559.42

c. Save your model as *Culvert_Scenario02.xp*.

Questions

1. What is the hydraulic loading at node US Flows?

Constant flow ____ m^3/s

Inflow hydrograph ____ m^3/s peak, at ____ hours

2. What is the maximum depth on Schlich Street for each scenario?

Base _____ m

Box Culvert _____ m

Double Box Culvert _____ m

3. What is the total flow over the weir in each scenario? (Hint: see table E15a in the output files for each scenario).

Base _____ m^3

Box Culvert _____m^3

Double Box Culvert _____ m^3