

3.3 Reporting Results

An important feature in all water distribution modeling software is the ability to present results clearly. This lesson outlines several of Bentley WaterCAD V8i reporting features, including:

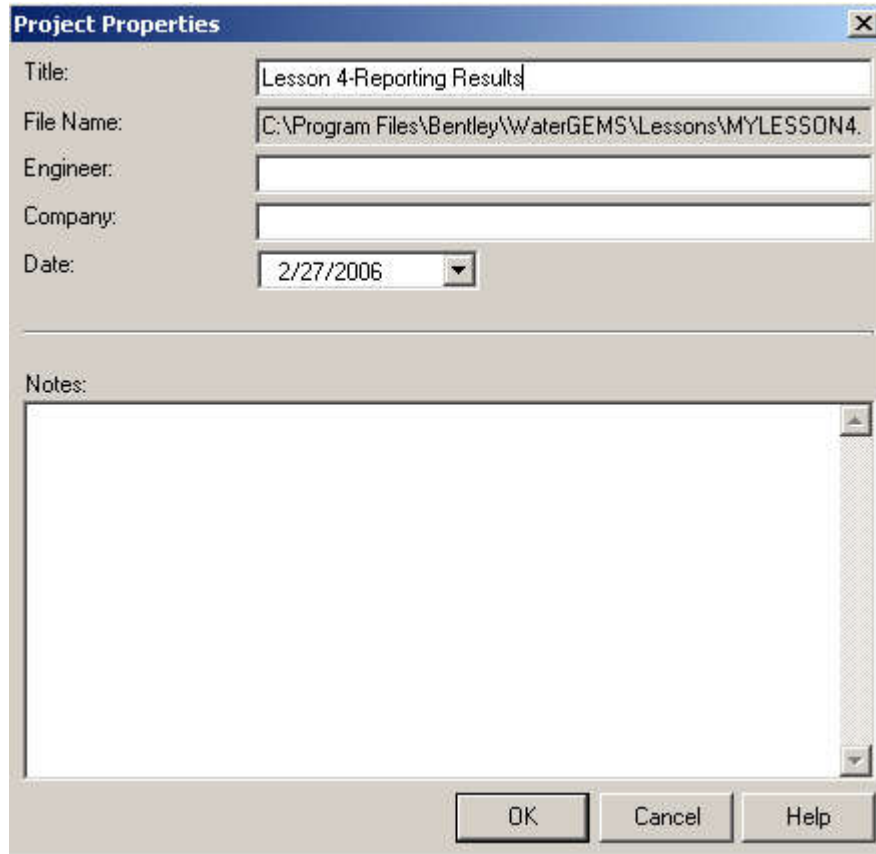
- **Reports**, which display and print information on any or all elements in the system.
- **Element Tables (FlexTables)**, for viewing, editing, and presentation of selected data and elements in a tabular format.
- **Profiles**, to graphically show, in a profile view, how a selected attribute, such as hydraulic grade, varies along an interconnected series of pipes.
- **Contouring**, to show how a selected attribute, such as pressure, varies throughout the distribution system.
- **Element Annotation**, for dynamic presentation of the values of user-selected variables in the plan view.
- **Color Coding**, which assigns colors based on ranges of values to elements in the plan view. Color coding is useful in performing quick diagnostics on the network.

For this lesson, you will use the system from the [Scenario Management](#) lesson, saved as **MYLESSON3** in the Bentley\WaterGEMS\Lesson directory. If you did not complete this lesson, you may use the file **LESSON4.WTG** (**LESSON4.DWG** in AutoCAD).

To open the existing project

1. Open **MYLESSON3.WTG**.
2. Select **File > Save As**.
3. Enter the filename **MYLESSON4**, and click **Save**.

4. Select **File > Project Properties**, and change the Project Title to **Lesson 4 - Reporting Results**.

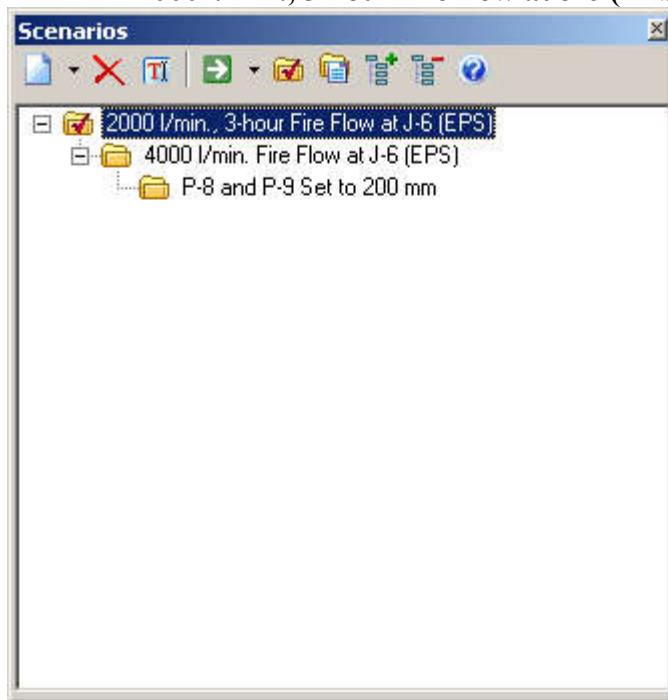


The screenshot shows a 'Project Properties' dialog box with a blue title bar and a close button. It contains several input fields: 'Title' with the text 'Lesson 4-Reporting Results', 'File Name' with the path 'C:\Program Files\Bentley\WaterGEMS\Lessons\MYLESSON4.', 'Engineer' (empty), 'Company' (empty), and 'Date' with a dropdown menu showing '2/27/2006'. Below these fields is a 'Notes' section with a large empty text area and a vertical scrollbar. At the bottom are three buttons: 'OK', 'Cancel', and 'Help'.

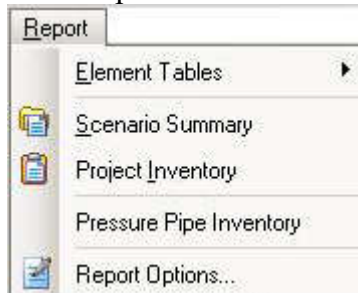
Reports

1. Choose Analysis > Scenarios or click  to open Scenarios.

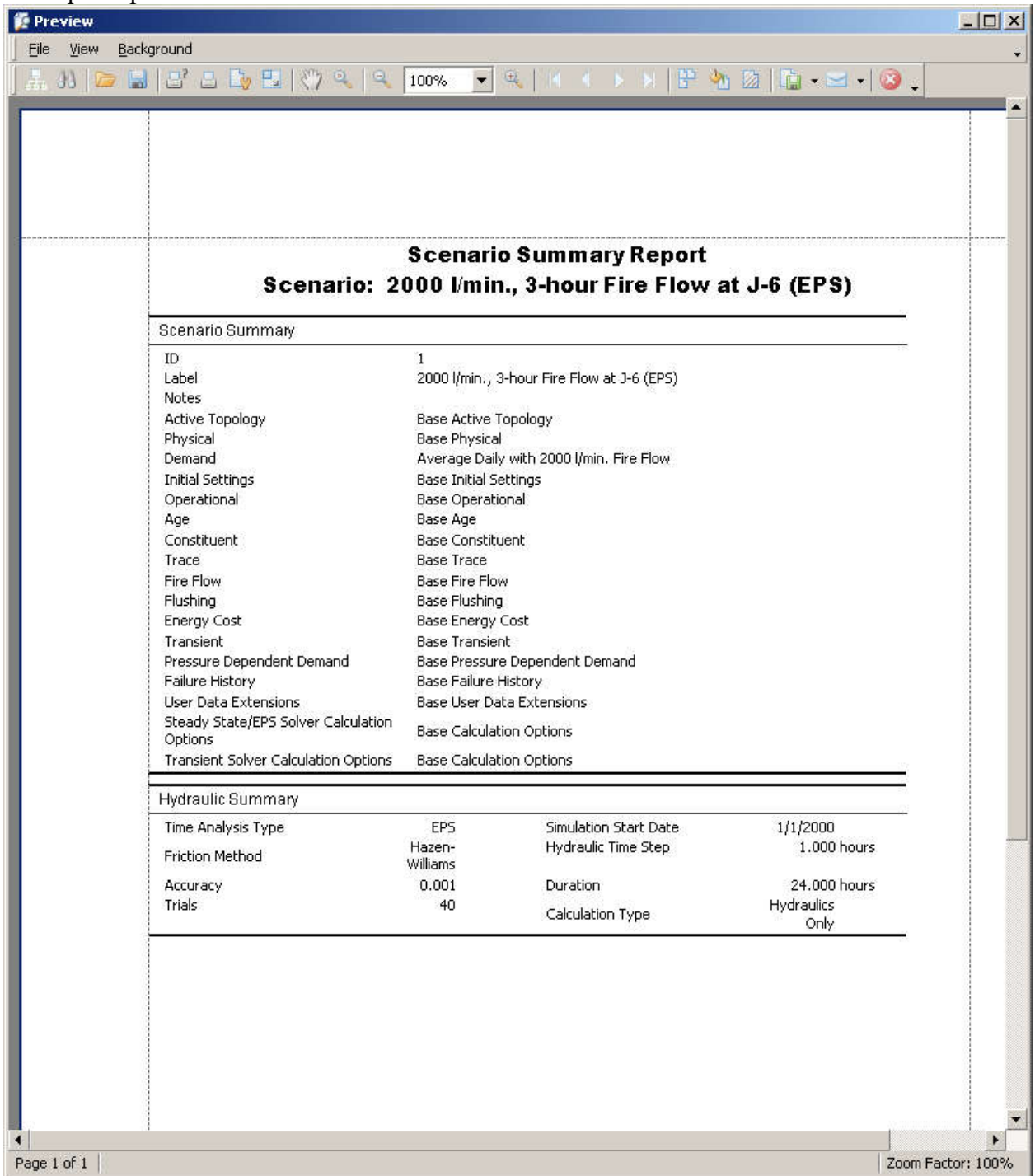
2. Select the **2000 l/min., 3 hour fire flow at J-6 (EPS)** scenario.



3. Click  to compute the Scenario.
4. Click Report > Scenario Summary



- The report opens.



- You can use the toolbar to save, print or copy the results to another program.
- Close the Scenario Summary.

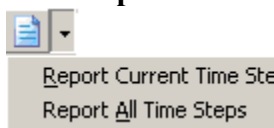
8. Choose Report > Element Tables > Tank.

FlexTable: Tank Table (Current Time: 0.000 hours) (MYLESSON4.wtg)

	ID	Label	Zone	Elevation (Base) (m)	Elevation (Minimum) (m)	Elevation (Initial) (m)	Elevation (Maximum) (m)	Volume (Inactive) (ML)	Diameter (m)	Flow (Out net) (L/min)	Hydraulic Grade (m)
48: T-1	48	T-1	Zone - 1	200.00	220.00	225.00	226.00	0.00	8.00	-734	225.00

1 of 1 elements displayed

9. Click **Report** and select for either the Current Time Step or All Time Steps.



10. Use the **Page** icons to navigate through the report.

Every element can generate a report in the same general format, which includes the name of the calculated scenario and information describing the element's properties and results in detail.

FlexTable: Tank Table (MYLESSON4.wtg)						
Current Time: 0.000 hours						
ID	Label	Zone	Elevation (Base) (m)	Elevation (Minimum) (m)	Elevation (Initial) (m)	
48	T-1	Zone - 1	200.00	220.00	225.00	
Elevation (Maximum) (m)	Volume (Inactive) (ML)	Diameter (m)	Flow (Out net) (L/min)	Hydraulic Grade (m)		
226.00	0.00	8.00	-734	225.00		

Current Time: 1.000 hours

You can print this report using these icons.

The report will print in the exact format seen on the screen.

11. Close the report, and then exit the Tank FlexTable.

FlexTable

When data must be entered for a large number of elements, clicking each element and entering the data can be time consuming. FlexTable elements can be changed using the global edit tool, or filtered to display only the desired elements. Values that are entered into the table will be automatically updated in the model. The tables can also be customized to contain only the

desired data. Columns can be added or removed, or you can display duplicates of the same column with different units.

FlexTables are dynamic tables of input values and calculated results. White columns are editable input values, and yellow columns are non-editable calculated values. When data is entered into a table directly, the values in the model will be automatically updated. These tables can be printed or copied into a spreadsheet program.

Global Edit and Filtering are very useful tools. For example, if you decide to evaluate how the network might operate in five years. Assume that the C factor for 5-year old ductile iron pipe reduces from 130 to 120. It would be repetitive to go through and edit the pipe roughness through the individual pipe dialog boxes, particularly when dealing with a large system. Instead, you will use the filter tool in this example to filter out the PVC pipes, and then use global edit tool to change the pipe roughness on the ductile iron pipes only.

To use Global Edit and Filtering

1. Set up a new Alternative and Scenario to capture the changes to the C values.
 - a. Click **Analysis > Alternatives**. Highlight the **P-8 and P-9 Set to 200 mm** Physical Alternative and click **New Child Alternative**.
 - b. Rename the new Alternative **5-yr.-old D.I.P.**
 - c. Close the Alternatives manager.
 - d. Click **Analysis > Scenarios**.
 - e. Select the **P-8 and P-9 Set to 200 mm** scenario.
 - f. Right click and select **New > Child Scenario**.
 - g. Rename the new scenario **5-yr.-old D.I.P.**

- h. Double-click the new scenario to open the Properties editor. Change the Physical alternative to **5-yr.-old D.I.P.**

Properties - Scenario - 5-yr.-old D.I.P. (61)

<Show All>

<General>

ID	61
Label	5-yr.-old D.I.P.
Notes	

Alternatives

Active Topology	<I> Base Active Topology
Physical	5-yr.-old D.I.P.
Demand	<I> 4000 l/min Fire Flow
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	<I> Base Fire Flow
Flushing	<I> Base Flushing
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand
Failure History	<I> Base Failure History
User Data Extensions	<I> Base User Data Extensions

Calculation Options

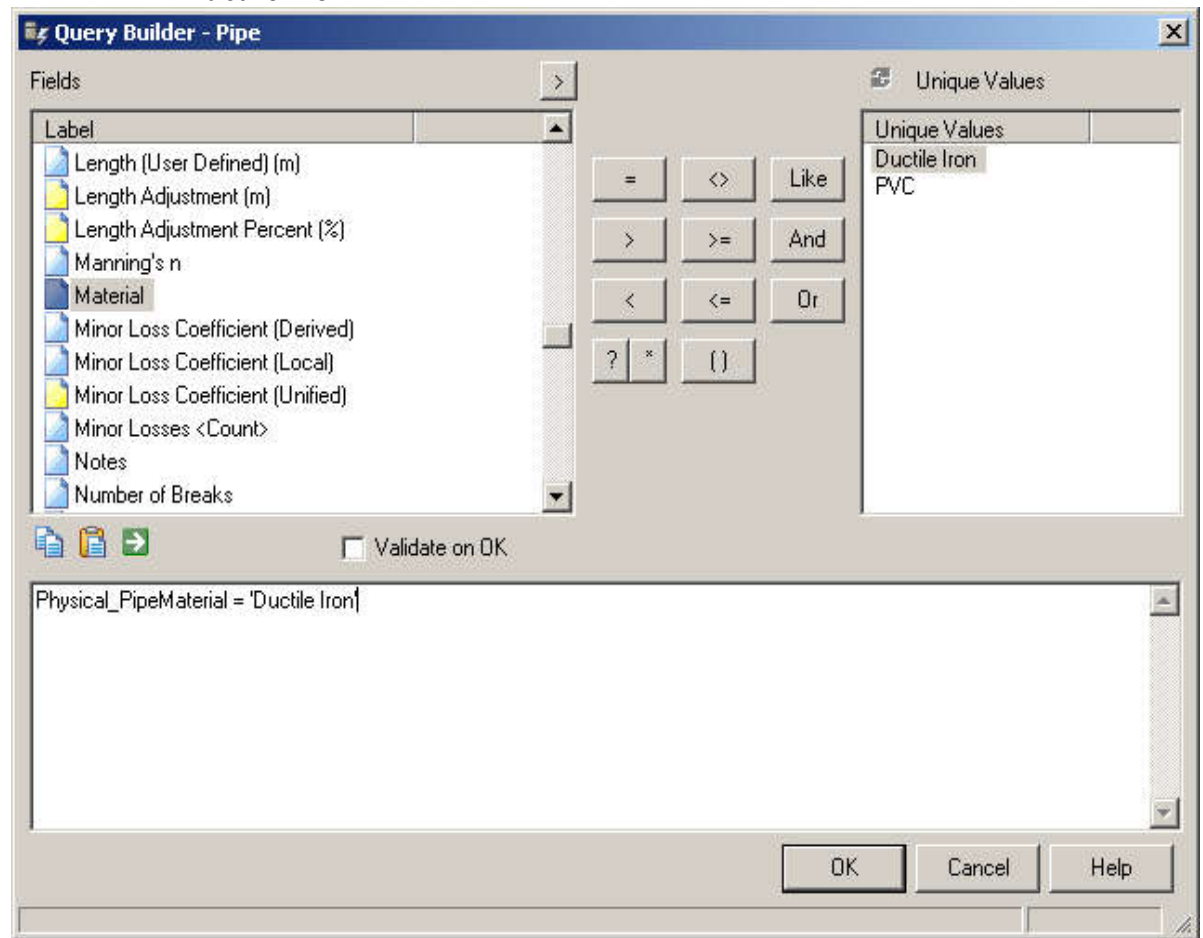
Steady State/EPs Solver Calculation Options	<I> Base Calculation Options
Transient Solver Calculation Options	<I> Base Calculation Options

Physical

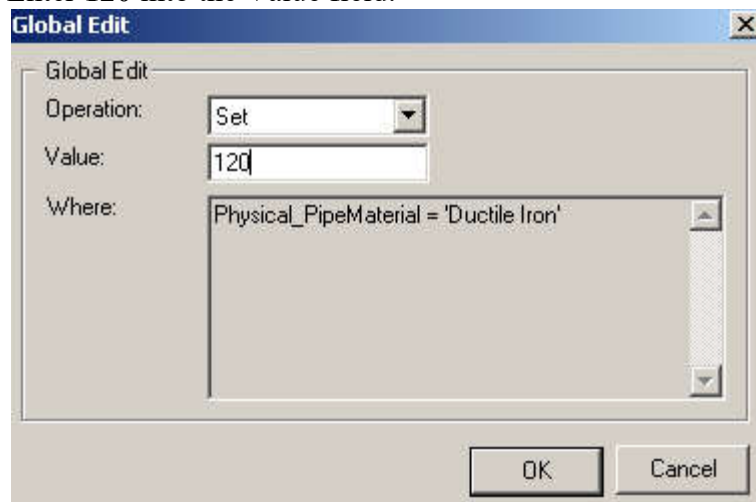
The Physical Alternative allows you to define varying physical characteristics for network elements.

2. Click Report > Element Tables > Pipe.
3. Right-click the **Material** column and choose **Filter > Custom** from the menu.
4. The query builder opens.
 - a. Double-click on **Material** in the **Fields** list.
 - b. Click the = equal sign.
 - c. Click  to select the Unique Values for Material

- d. Double-click **Ductile Iron**.

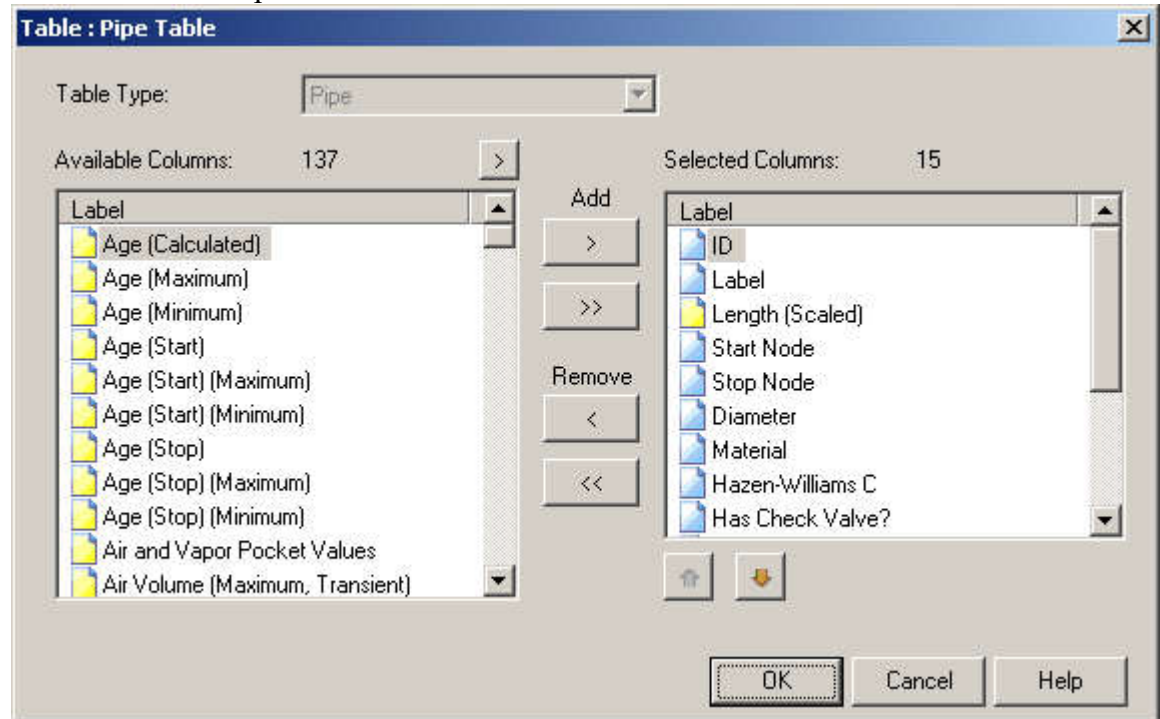


- e. Click **Apply** , then click **OK**.
5. Use the Global Edit tool to modify all of the roughness values in the table.
- Right-click the Hazen-Williams C column and select **Global Edit**.
 - Select **Set** from the Operation list.
 - Enter **120** into the Value field.



- d. Click **OK**. All of the values are now set to 120.

6. To deactivate the filter, right-click anywhere in the dialog box and click **Filter > Reset** from the menu. Click **Yes** to reset the filter.
7. You may also wish to edit a table by adding or removing columns using the Table Manager.
 - a. Click Edit  to open the table editor.



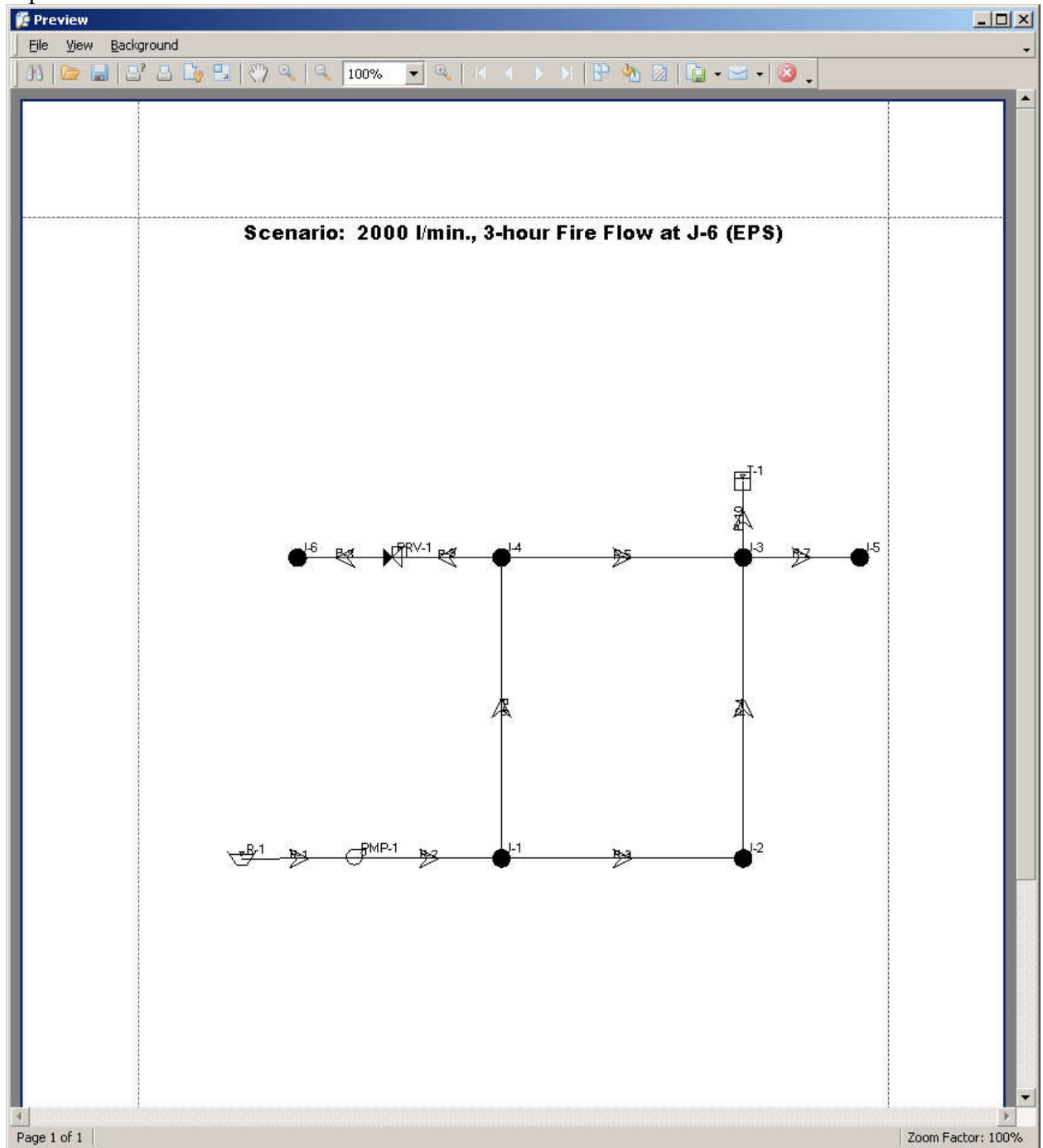
- b. Scroll through the list on the left to view the types of data available for placement in the table. You can select an item to add or remove from the table.
- c. You can adjust the order which the columns will be displayed by using the arrows  below Selected Columns.
 - d. Click Ok to save your changes or Cancel to exit the table without making change.
8. Click to exit the table.
9. Choose Analysis > Scenarios > Compute Scenario > Batch Run.
10. Check 5-yr.-old D.I.P., and then click Batch.
11. Click to exit the table when you are finished.

Create a Print Preview and Profile

1. To create a print preview of the distribution system, click File > Print Preview > Fit to Page.

This option will create a preview of the entire system regardless of what the screen shows.

The print preview opens in a separate window, which can then be printed or copied to the clipboard.

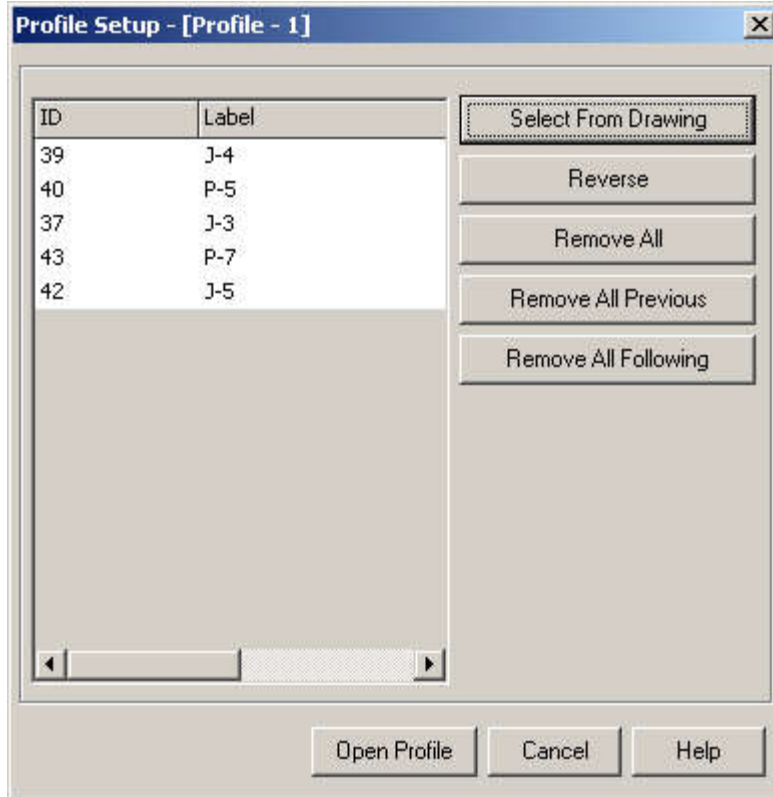


2. Close the print preview window.

3. To create a profile view, choose **View > Profiles**, or click **Profile**  in the toolbar. This activates the Profiles manager.
4. Click New to open the Profile Setup dialog box, and then click **Select From Drawing** to choose the element to profile.
5. The dialog box closes and select opens. Choose a few elements to include in the profile and click Done .



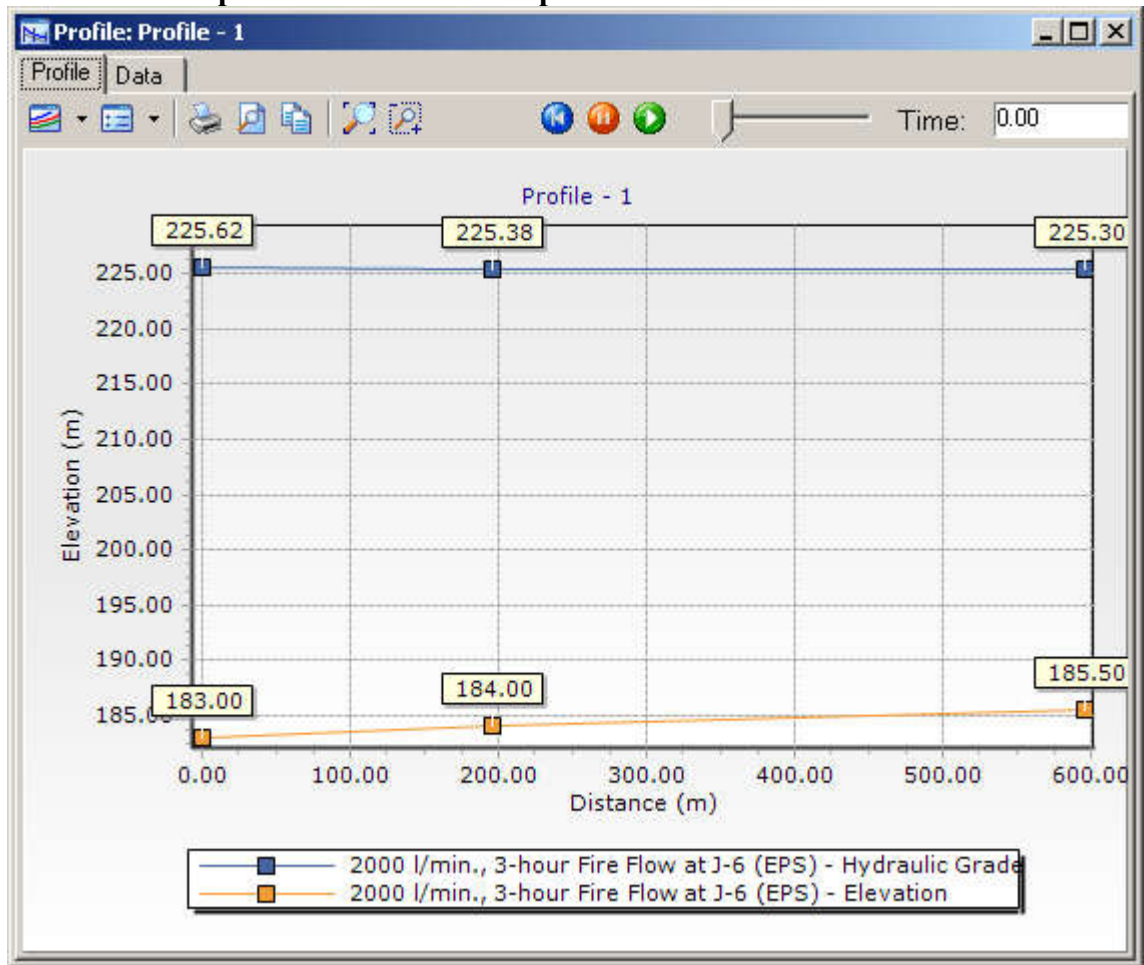
6. The Profile Setup dialog box opens with the selected elements appearing, in order, in the



list.

Click Open Profile to view the profile.

- After you create the profile, you can make adjustments to its appearance by clicking **Profile Series Options**  or **Chart Options** .



- The graph can be printed or copied to the clipboard.
- Close the Profile window.
- Close the Profile manager.

To Create a Contour

The contouring feature in Bentley WaterCAD V8i enables you to generate contours for reporting attributes such as elevation, pressure, and hydraulic grade. You can specify the contour interval, as well as color code the contours by index values or ranges of values. In this lesson, you will contour based on hydraulic grade elevations.

- Choose View > Contours or click Contours .
- Click New in the Contour Manager.
- Choose Hydraulic Grade from the Field menu.
- Choose All Elements in the Selection Set menu.
- Click **Initialize** and select **Full Range** to update the Minimum and Maximum HGL elevations.
- Make sure **Color by Index** is selected

7. Select Smooth Contours to improve the overall appearance of the drawing.

Contour: Contour Definition - 1

Contour

Field: Hydraulic Grade >

Selection Set: All Elements

Minimum: 198.00 m

Maximum: 227.76 m

Increment: 0.30 m

Index Increment: 1.52 m

Smooth Contours: ☒

Line Weight: 1.000

Label Height Multiplier: 1.000

☐ Color By Range ☒ Color By Index

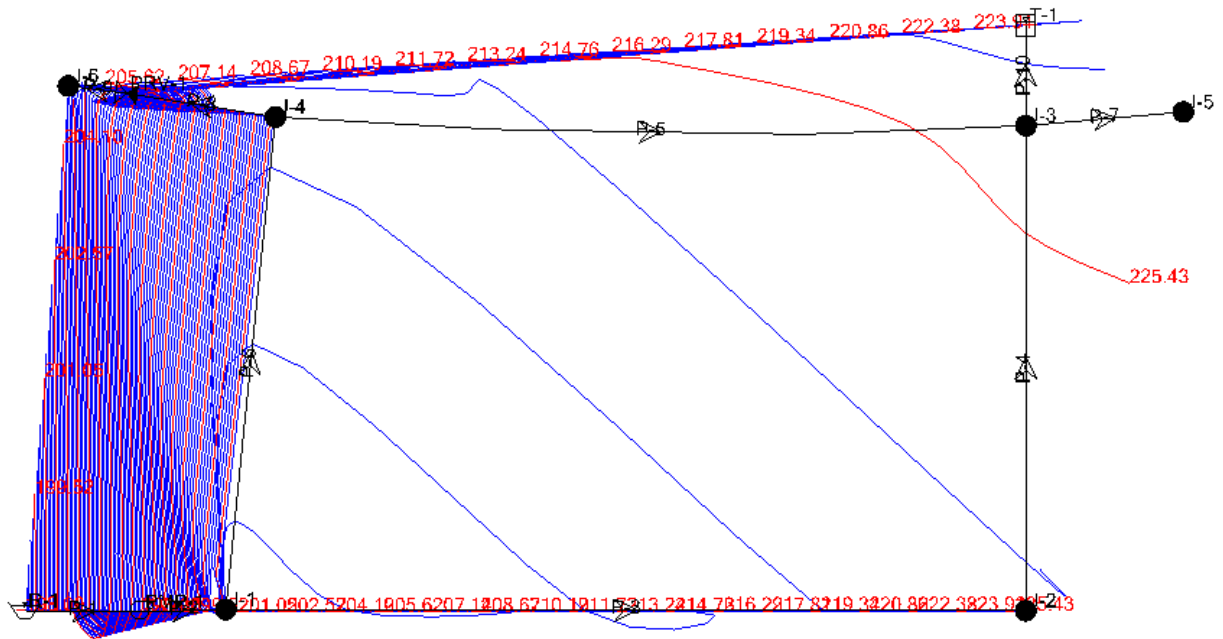
Color: [Blue bar] ...

Index Color: [Red bar] ...

Buttons: OK, Initialize, Apply, Cancel, Help

8. Click OK.

9. View result in the drawing pane.

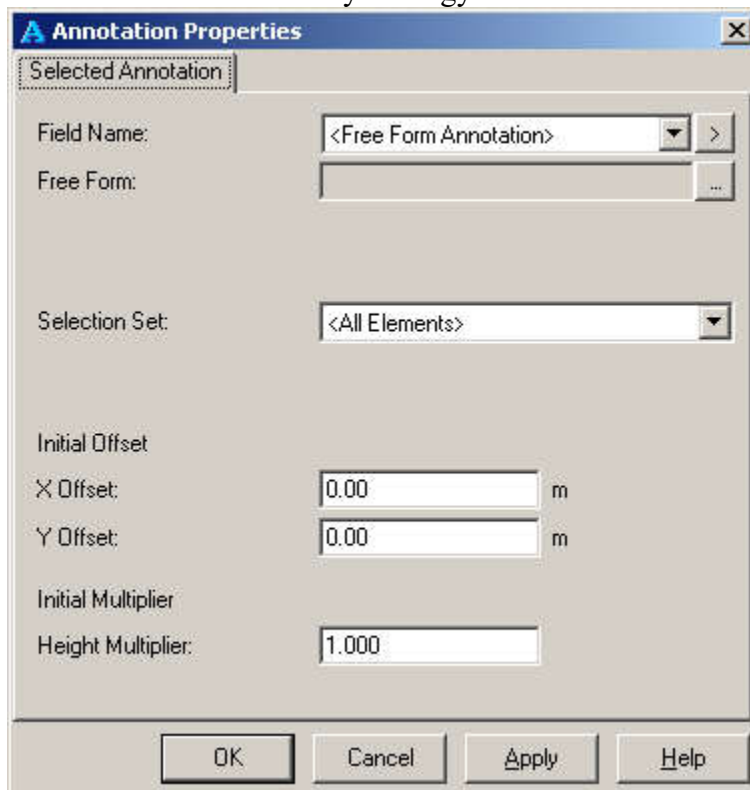


10. Close the Contour Manager.

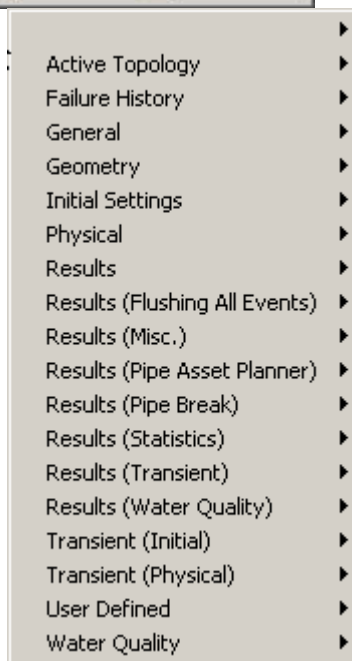
Element Symbolology

When you want to label network attributes use the Annotation feature. With it, you can control which values are displayed, how they are labeled, and how units are expressed.

1. Choose View > Element Symbology > New > New Annotation.



The 'Annotation Properties' dialog box is shown. It has a title bar with a blue gradient and a close button. The main area is divided into sections. The 'Selected Annotation' section at the top has a dropdown menu for 'Field Name' set to '<Free Form Annotation>' and a text box for 'Free Form'. Below this is a 'Selection Set' dropdown menu set to '<All Elements>'. The 'Initial Offset' section has two rows: 'X Offset' and 'Y Offset', both with text boxes set to '0.00' and a unit 'm'. The 'Initial Multiplier' section has a 'Height Multiplier' text box set to '1.000'. At the bottom are four buttons: 'OK', 'Cancel', 'Apply', and 'Help'.



2. Select the Field Name to annotate.
3. Enter additional information into the other fields as needed.
4. Click Apply.
5. The drawing will now display all of the annotations. You can try changing the properties of an element and recalculating. The annotations will update automatically to reflect any changes in the system.
6. If the annotation is crowded, you can click and drag the annotation to move it.

7. Click OK.

Color Coding

1. Choose View > Element Symbology and click an element to create a new color coding for that element type.
2. Right-click the element and choose New > Color Coding or click New > New Color Coding from the toolbar.
3. The Color Coding dialog box allows you to set the color coding for links, nodes, or both.
 - a. Select Diameter from the Field Name menu.
 - b. In the table, enter values of **150**, **200**, and **1000 mm** with colors of **red**, **blue**, and **green**, respectively.

	Value (mm)	Color
0	150.0	255, 0, 0
1	200.0	0, 0, 192
2	1,000.0	0, 128, 0
*		

- c. Click **Calculate Range > Full Range** to get the minimum and maximum values for the variable displayed at the top of the dialog box. The maximum must be higher than the minimum.
 - d. Then, click **Initialize**  and the model will select the color coding ranges in the table automatically.
- | | Value
(mm) | Color |
|---|---------------|-------------|
| 0 | 156.4 | 0, 255, 0 |
| 1 | 160.4 | 0, 255, 255 |
| 2 | 164.4 | 0, 0, 255 |
| 3 | 168.4 | 255, 0, 255 |
| 4 | 172.4 | 255, 0, 0 |
- e. Click **OK** to generate the Color Coding.
4. You can add a legend to the drawing. Right-click on the color coding and select Insert Legend from the menu. You can move the legend in the drawing by clicking the mouse and dragging the legend.
 5. Close any open dialog boxes.
 6. Save  the project.