Bentley Civil Workshop

2013 MACC Conference

BCR1WK2

Getting Started in SS3 Bentley Civil Power Products

BCR1WK2

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This hands-on, four-hour workshop empowers casual or new users to get productive in SELECTseries3 quicker! Learn the built-in CAD tools and how to navigate the new Civil data format - the dgn! Evaluate civil models! Import Existing Terrain! Learn "the Rules"! Intelligently and Directly Edit Designs by Click-and-Type! Build Roads! Create new corridors! Grade Pads, Save time with Civil Cells! For all Bentley civil users. 8

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Preface

In this workshop, you will explore how OpenRoads Technology exposes design data. You will review and create common roadway and site designs. You will understand how OpenRoads Technology works.

This workshop is equally applicable for the MX, InRoads or GEOPAK families of products. Each product contains the identical toolset and identical workflow. The only differences between the three products for the tools are slight differences in the use of feature definitions and some differences in the back-end interaction with other native toolsets, such as drainage. In this workshop, we will use Power InRoads V8*i* SELECT series 3 released version, along with the Civil Workspace.

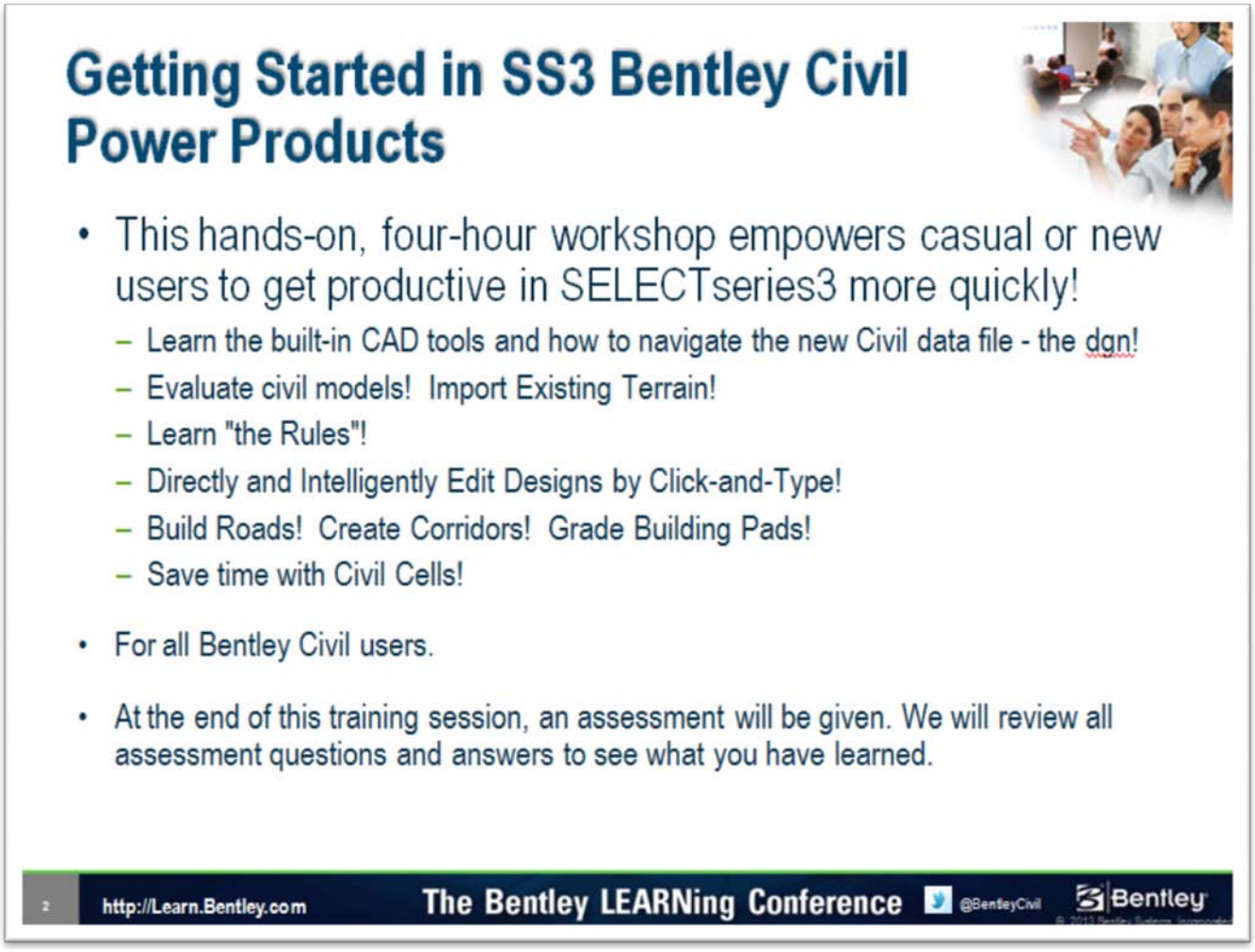
There are more exercises in this manual than we will have time to cover today. We will all complete the basic set of exercises, and for those veteran users in the group who complete them and still have time left in the exercise session, you are welcome to work on the optional.

In order for all participants to design the same layout and to stay on course and on time, we request that all participants utilize the files as listed in the workshop materials. At the beginning of each chapter, we will start with a fresh set of data. This ensures that everyone is using the same data. Plus, we have added data to avoid redundant work. For example, we draw some of the edges of pavement in the lab so you can understand the workflow, but have drawn the remainder in for expediency of time.

The workshop guide is yours to take with you.

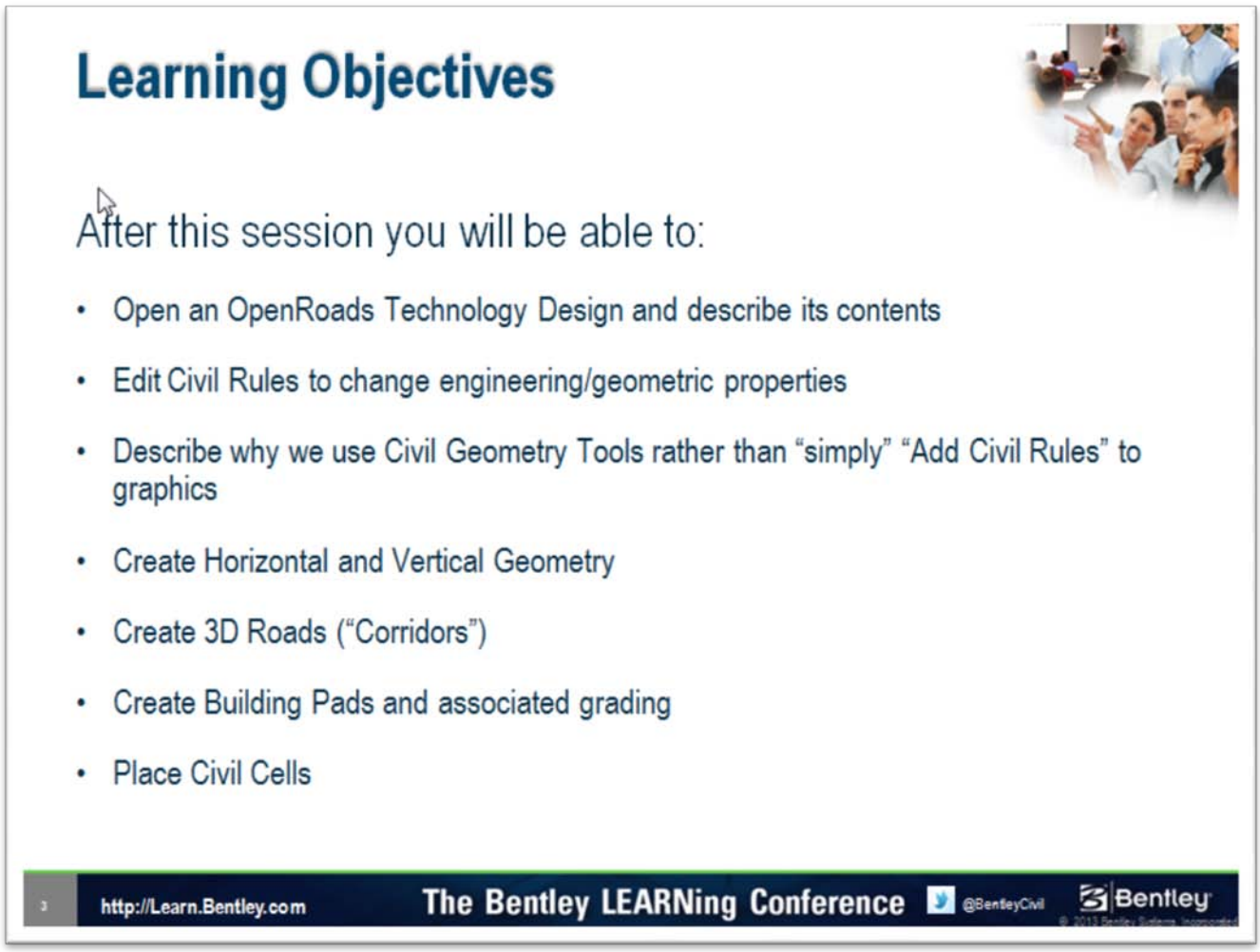
Note	Prerequisite Knowledge Level: Participant should have a basic understanding of road and/or site design principles and have some basic familiarity with civil engineering design software.

SESSION DESCRIPTION



This hands-on, four-hour workshop empowers casual or new users to get productive in SELECTseries3 quicker! Learn the built-in CAD tools and how to navigate the new Civil data format - the dgn! Evaluate civil models! Import Existing Terrain! Learn "the Rules"! Intelligently and Directly Edit Designs by Click-and-Type! Build Roads! Create new corridors! Grade Pads, Save time with Civil Cells! For all Bentley civil users.

LEARNING OBJECTIVES

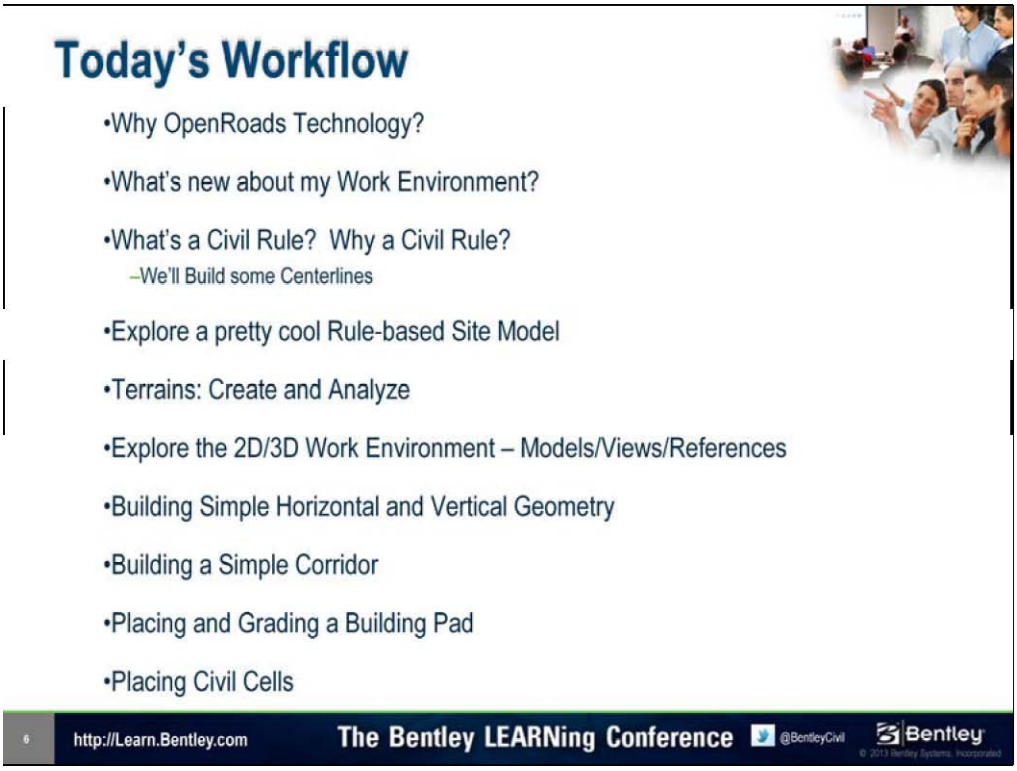


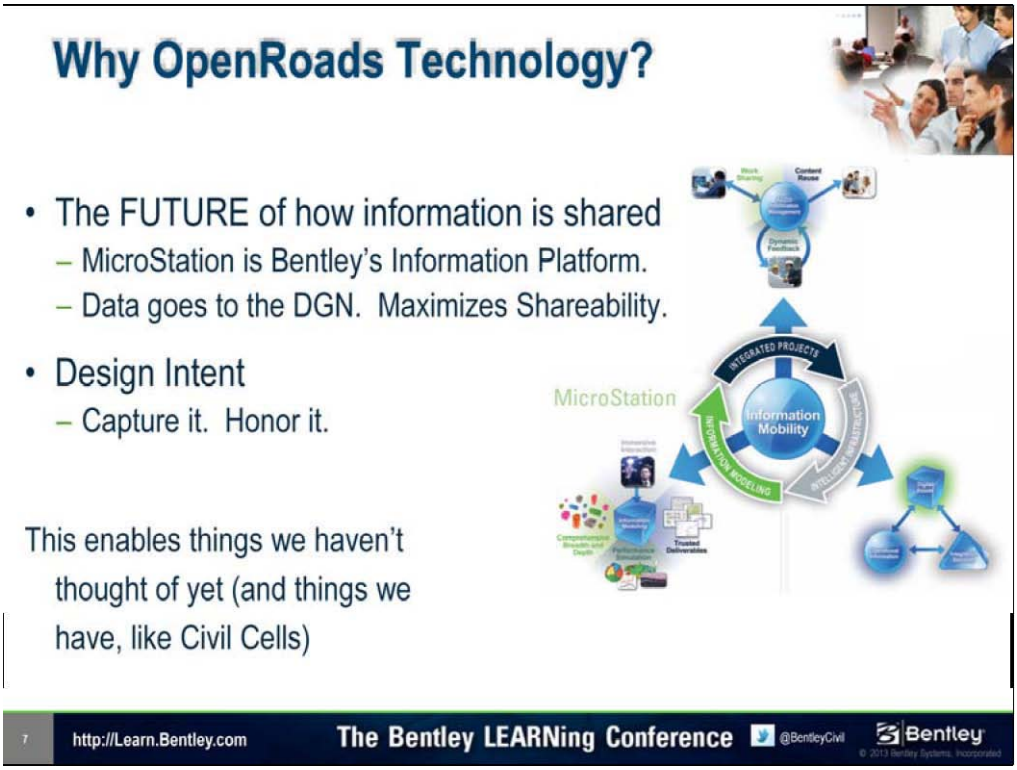
After this course you will be able to:

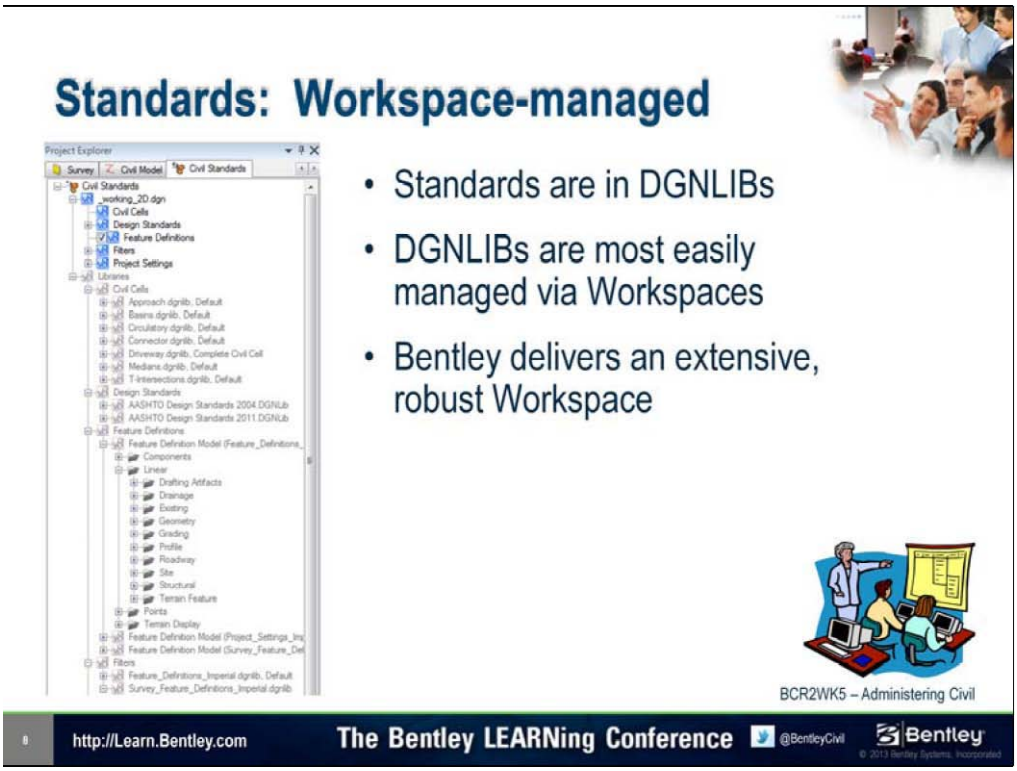
- Open an OpenRoads Technology Design and describe its contents
- Edit Civil Rules to change engineering/geometric properties
- Describe why we use Civil Geometry Tools rather than "simply" "Add Civil Rules" to graphics
- Create Horizontal and Vertical Geometry
- Create 3D Roads ("Corridors")
- Create Building Pads and associated grading
- Place Civil CellsAt the end of this training session, an assessment will be given. We will review all assessment questions and answers to see what you have learned.

Chapter 1: Exploring the Environment

Getting Started in SS3 Bentley Civil Power Products



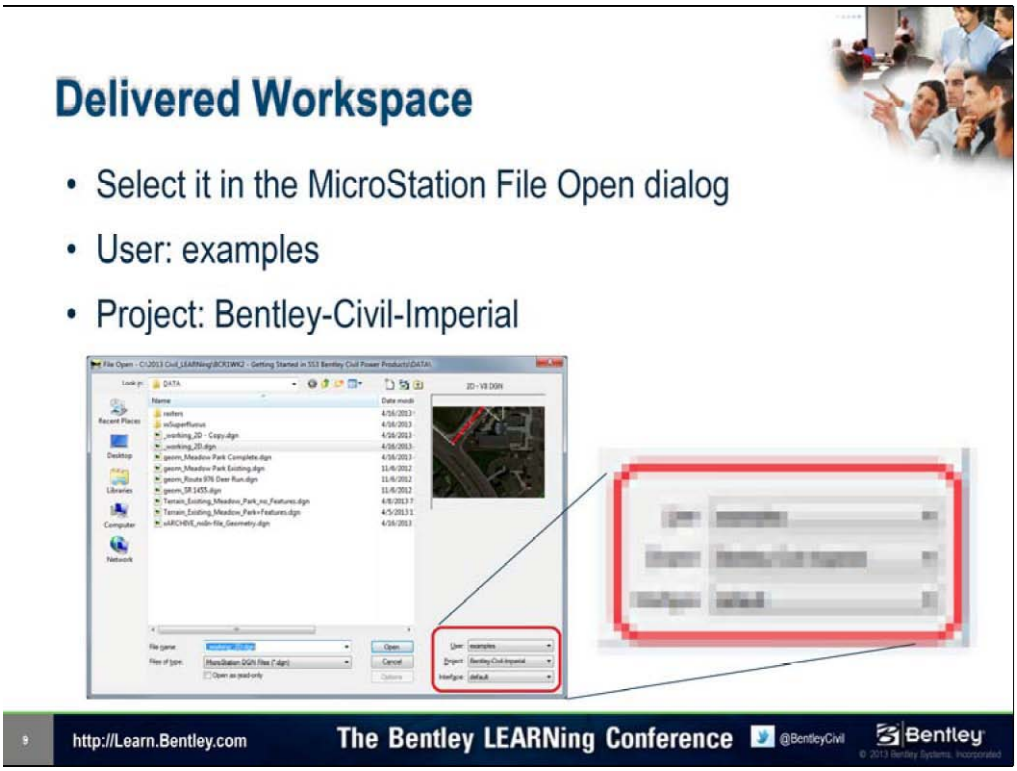




Standards are now in dgnlibs. Dgnlibs are best managed by MicroStation Environmental Variables

MicroStation Environmental Variable are best managed by Workspaces

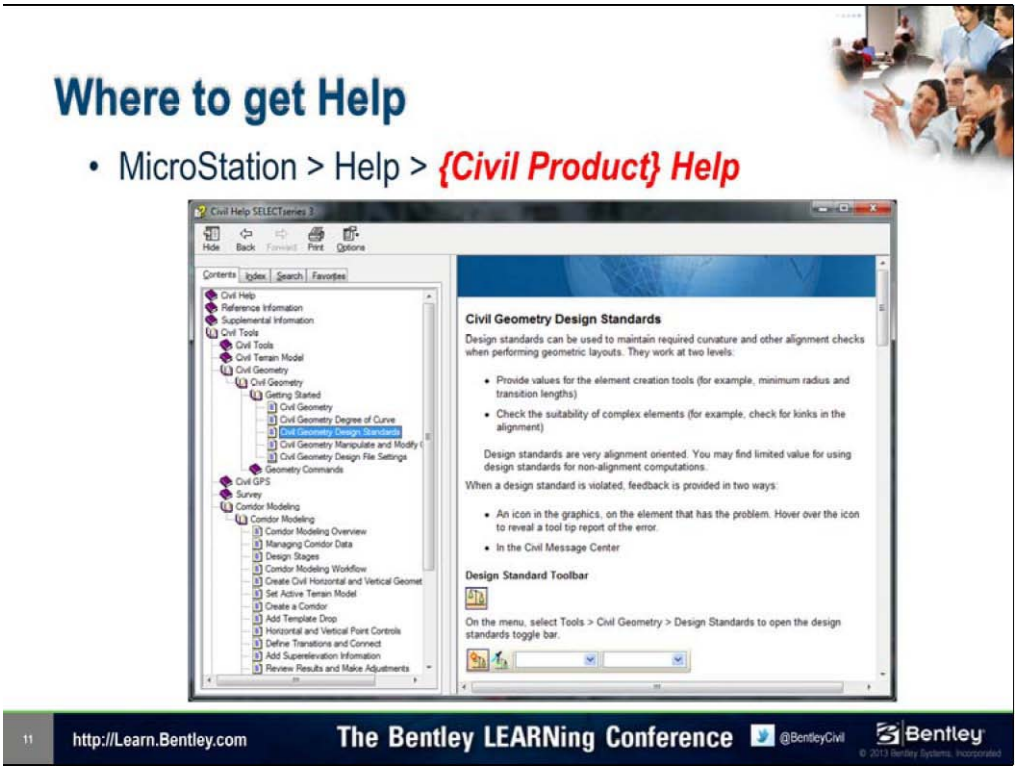
Bentley delivers an Imperial and a Metric Workspace with the product.

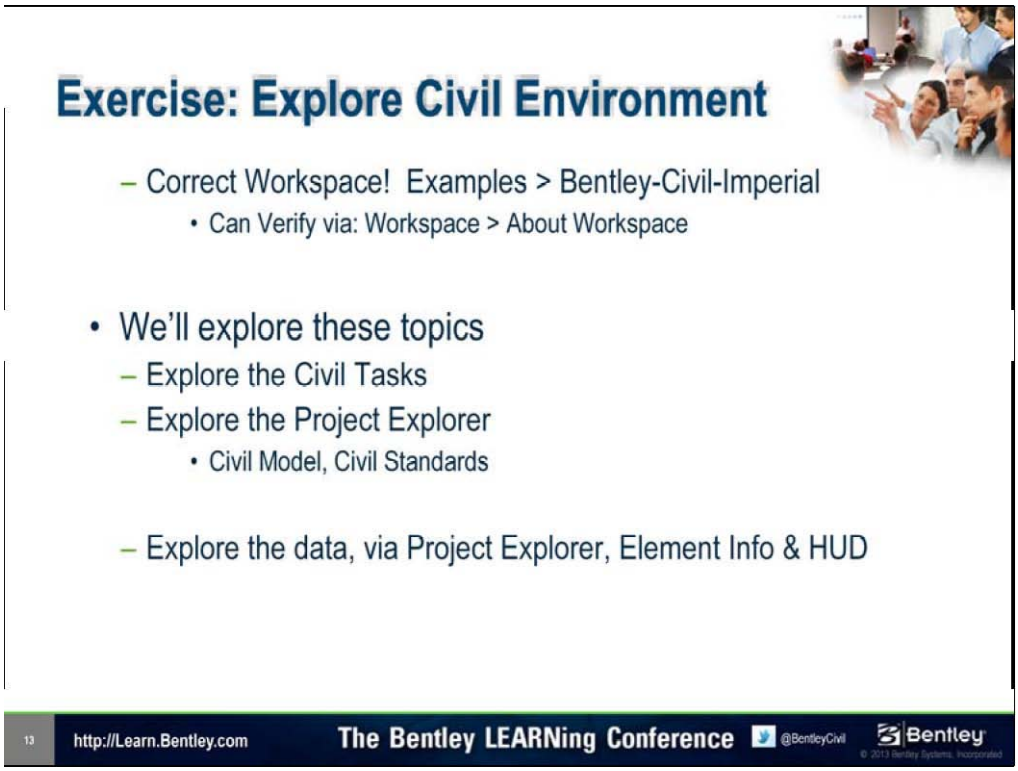


Throughout this Workshop and the LEARNing Conference, SS3 courses will utilize the Bentley-Civil-Imperial Workspace

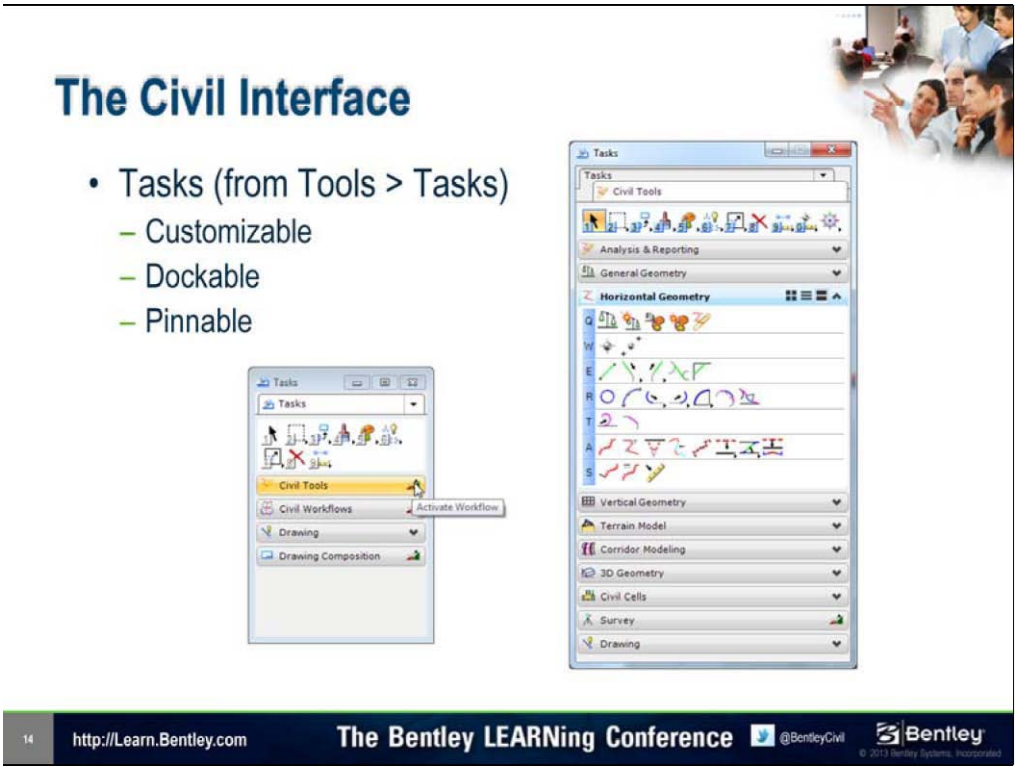
1. Use:
   User: examples
   Project: Bentley-Civil-Imperial

   1. Open **C:\2013 Civil_LEARNing\BCR1WK2 -Getting Started in SS3 Bentley Civil Power Products\DATA\10_2D-Exploring\SitePlan2D.dgn**





Dock the Project Explorer, Tasks, and Element Info dialog or pin them or move them around to be visible

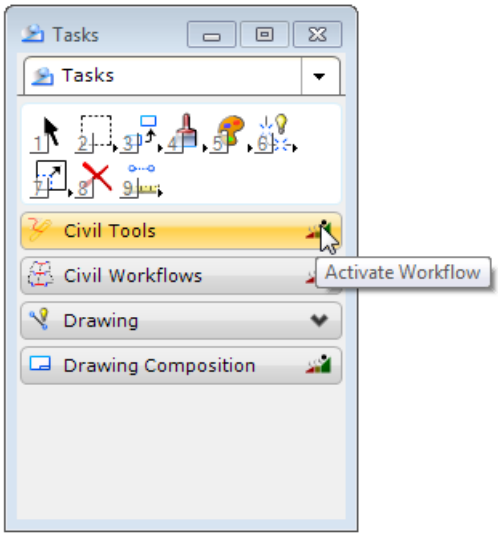


Ensure that your Task Menu is visible (it can be opened by Tools > Task) Move it somewhere.

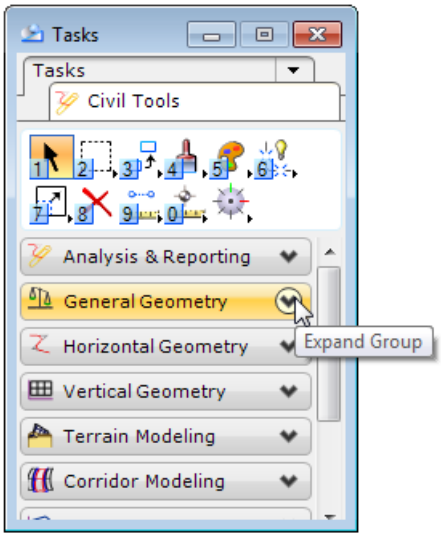
Consider docking it somewhere. Click the various Tasks Groups to see the tools.

NAVIGATING TASKS

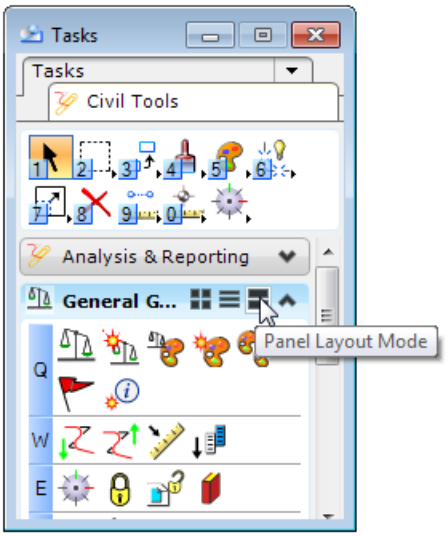
Within the Tasks dialog, the General Geometry and Vertical Geometry tasks are located in the Civil Tools Workflow. (Note your tabs may vary slightly, depending on what Bentley products are installed.)



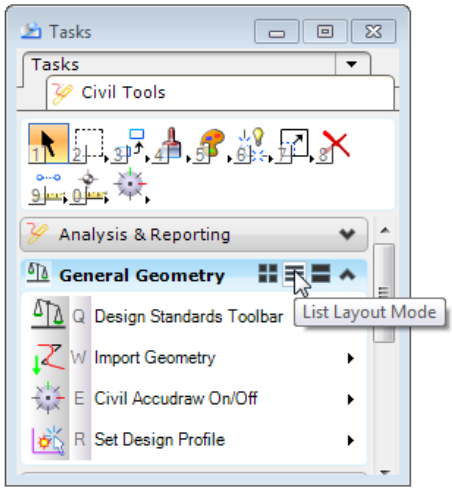
Click Activate Workflow to view the main tasks. To open the toolset, click Expand Group. Click the same icon to Collapse the Group.



There are several ways the Groups can be displayed. For this workshop, we'll use the Panel Layout Mode, which is the default.

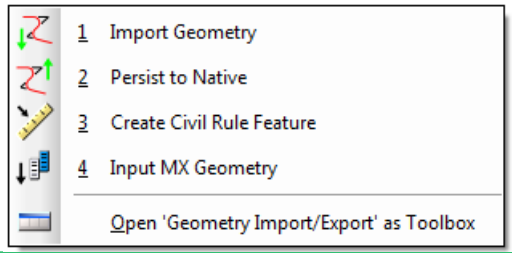


If you prefer listings rather than icons, you may prefer the List Layout Mode.

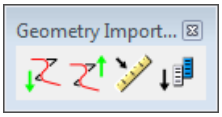


Your preference may be to not use the Task dialog. Other options include:

- Select any tool from Tools > Civil Geometry from the Power product main menu bar.
- Select <F2> from your keyboard, which opens the main workflows pop-up menu. This may vary depending on what products are installed and any task customization. Select Civil Geometry. Select <F2> from your keyboard and General Geometry from the pop-up menu. Then you can use Q, W, E, R, T, or A (corresponding to the letters to the left of the group). For example, selection of W opens the Geometry Import/Export pop-up menu.



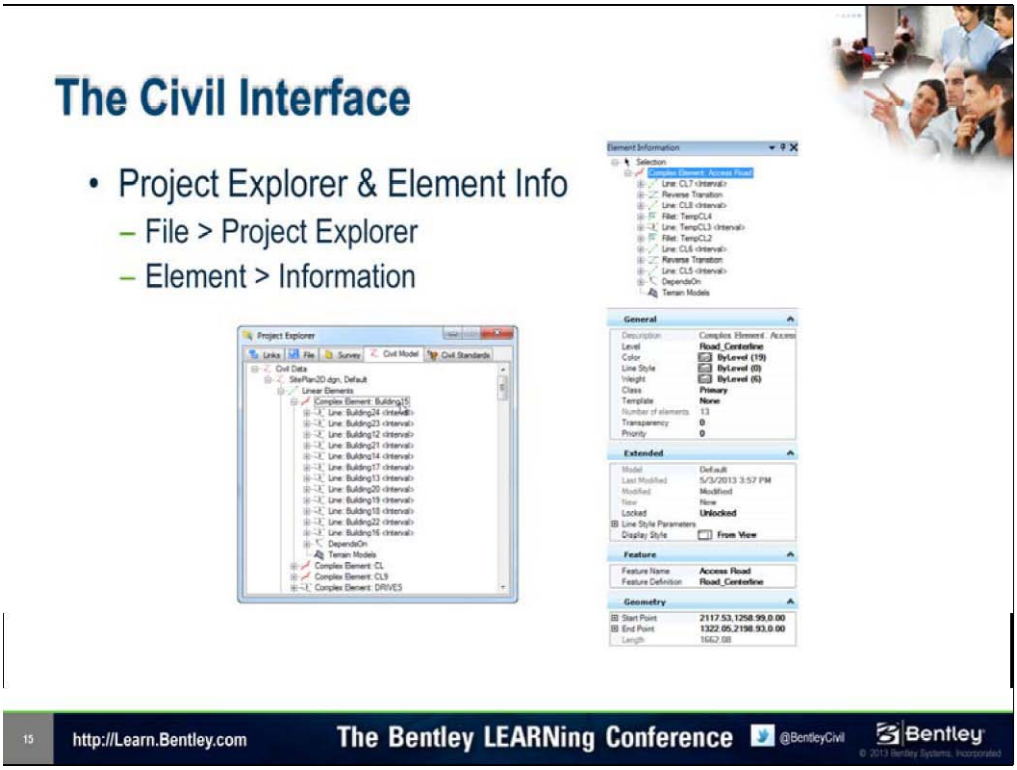
To use the classic toolbox for any sub-group, right-click on the line and select Open '…' as Toolbox.



You can also customize which tools are displayed. Other customizing options can be found by right-clicking on the navigation groups. Customization of task navigation is outside the scope of this workshop, but you may want to experiment in your spare time or after the workshop is concluded.

Hint	If the Task dialog disappears or you accidentally close it, select Tools > Tasks from the Power product main menu bar to bring it back.

In this section, we will review some of the tools and settings that will be used throughout the workshop. For easy accessibility, we will dock the tools within the MicroStation view.



Open the Project Explorer and the Element Information panels Position them somewhere.

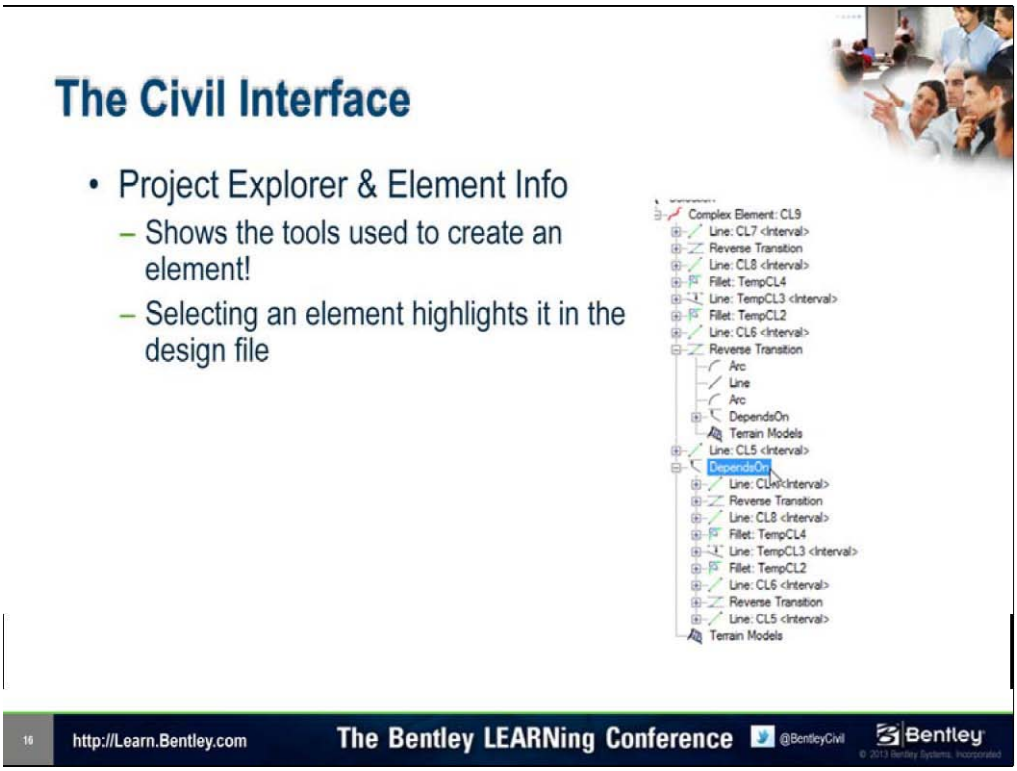
Consider docking them somewhere.

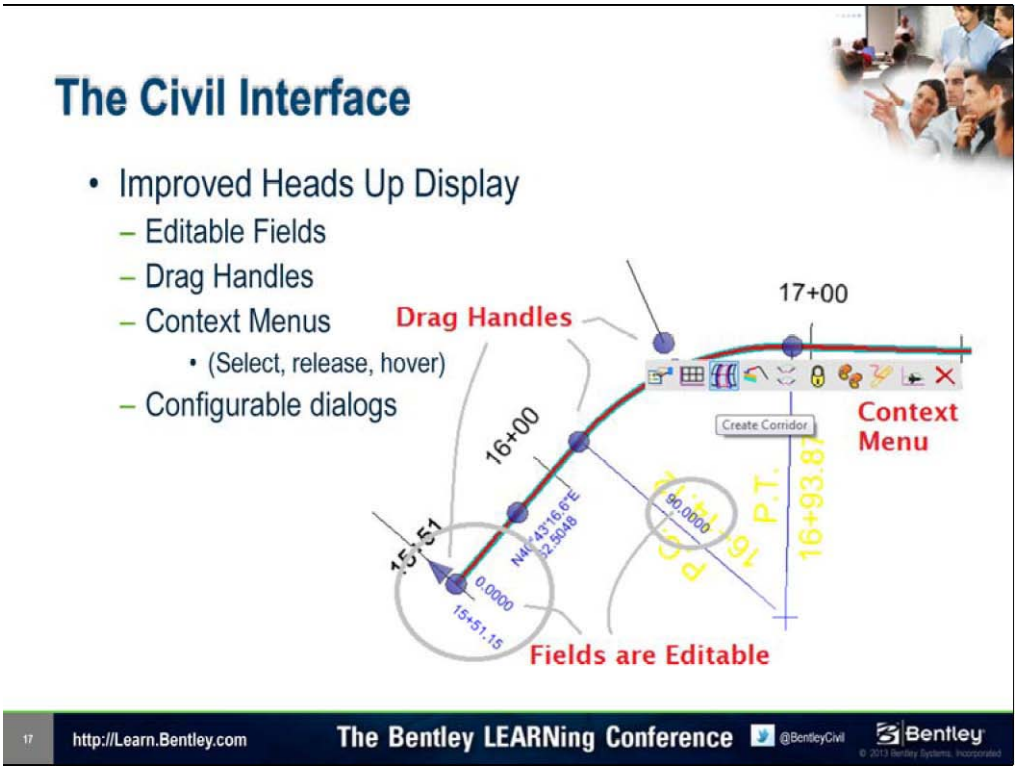
Explore the Project Explorer.

Review the Civil Standards tab.

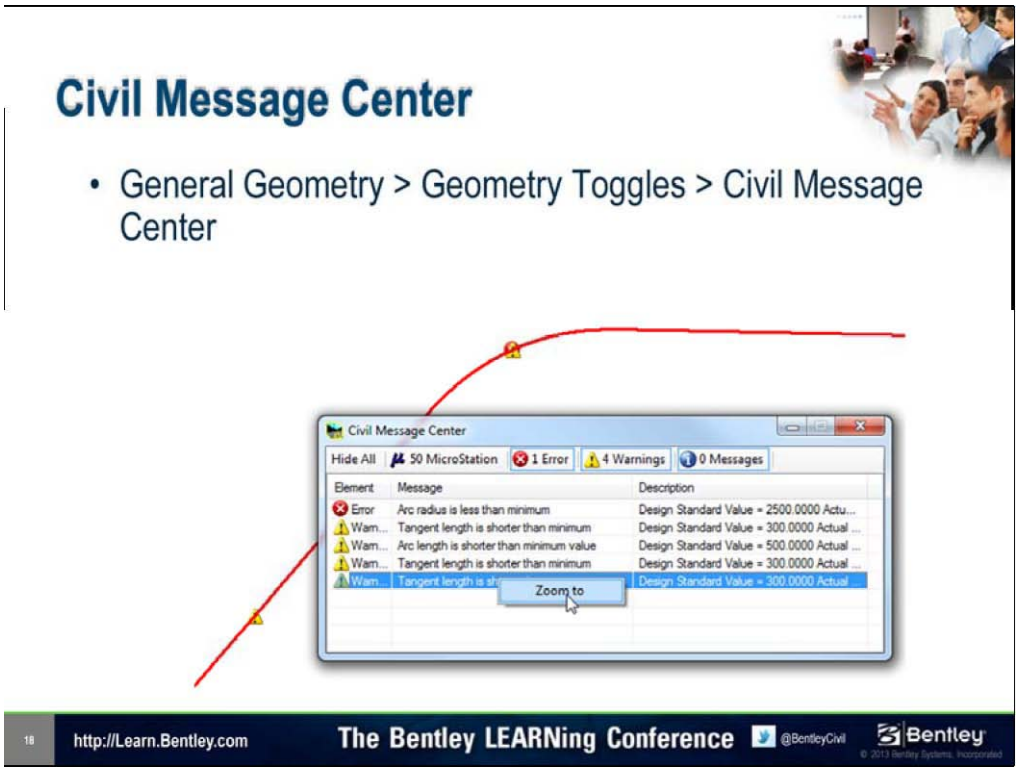
Review the Civil Model. Clicking on an item highlights it in the design and shows its properties in the Element Information dialog.

Select elements in the design. Review the Element's Information.

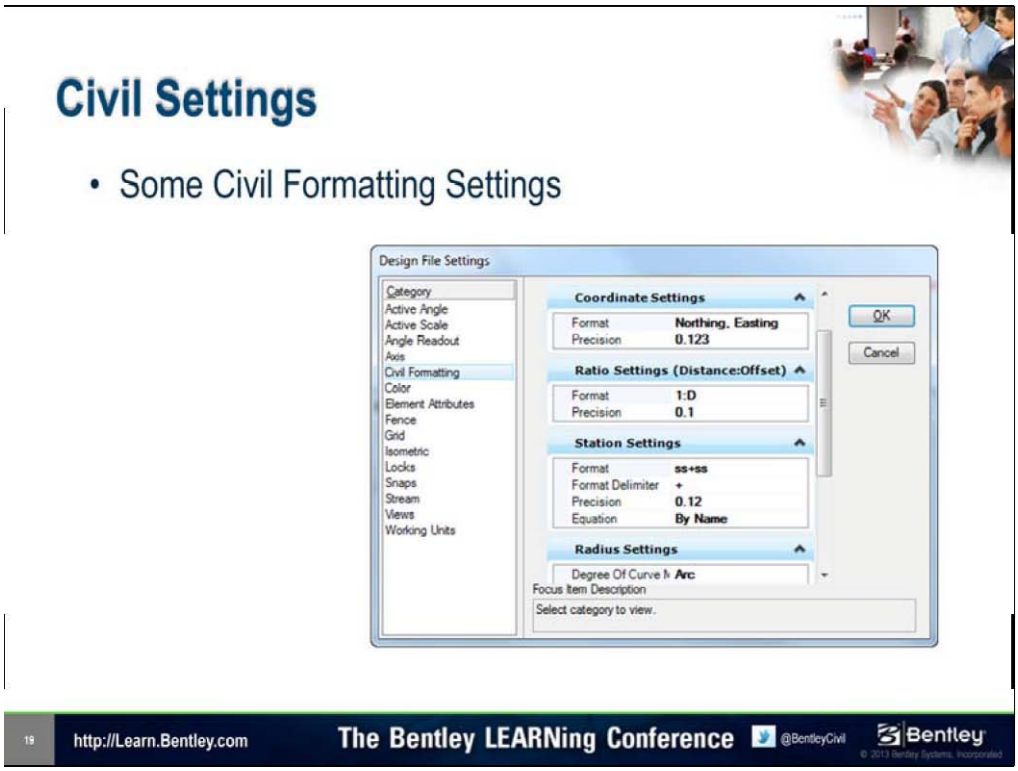




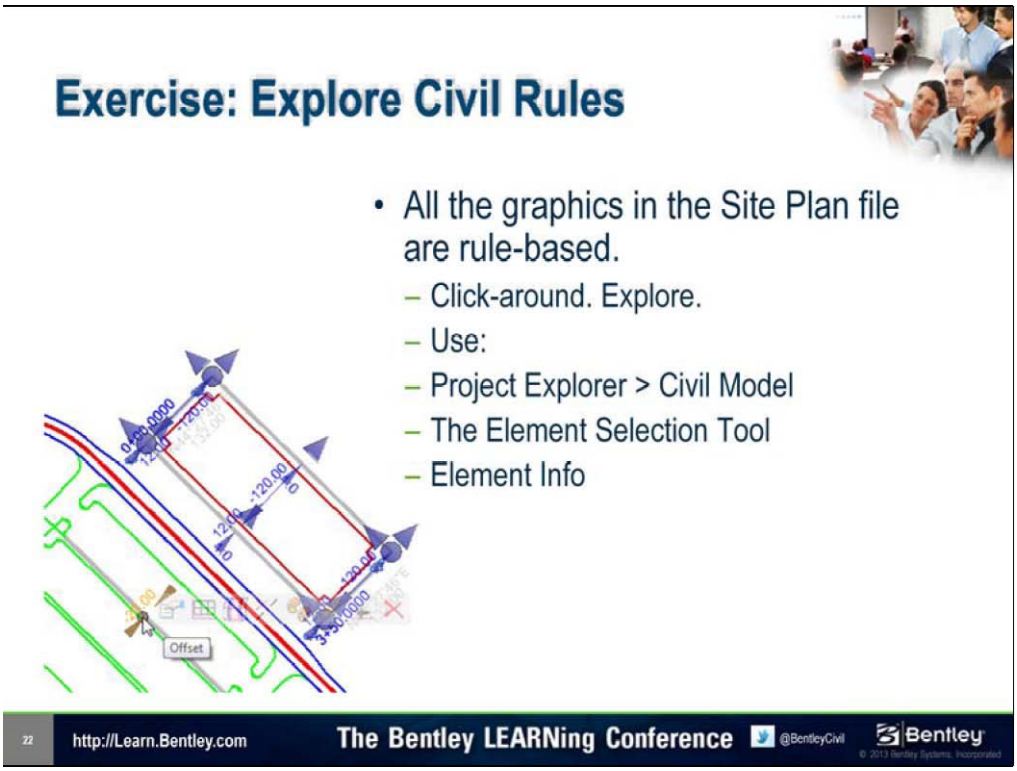
Selecting an Element shows its rules and Editability via the Interface (Manipulators, etc.).



We won't use this in class, but the Civil Message Center (General Geometry > Geometry Toggles > Civil Message Center) provides a manageable Error and Warning list.



This has been preset for us, but in Settings > Design File >> Civil Formatting, there are a variety of setting s for Civil-related input, display and output properties.



Select and inspect the Building and the Sidewalk around it.

MANIPULATORS

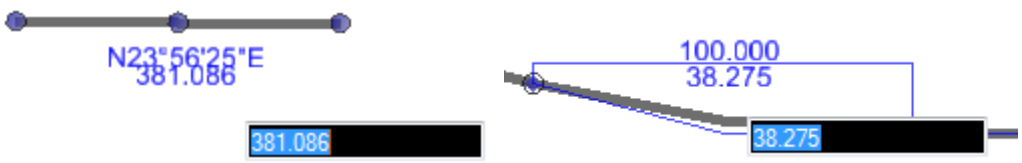
When any element created by a Civil Geometry tool is selected, certain manipulators are displayed dynamically. These manipulators vary by element type.

Manipulators fall into four main types:

- Text manipulators
- Normal Drag Handles
- Snap icons
- Civil AccuDraw drag handles

TEXT MANIPULATORS

These can be clicked to make them editable, which lets you type in new values. Examples include distance and direction text manipulators in horizontal geometry, and length and slopes in vertical geometry.

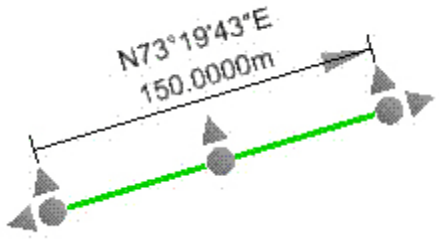


Examples of Horizontal (Left) and Vertical (Right) Text Manipulators

NORMAL DRAG HANDLES

These are handles that you can click and drag to redefine the element.

- An arrow shaped drag handle – redefines the point with one or more directions constrained. For example, the parallel arrows (that are parallel to the line) are constrained to change the distance only; the arrows that are perpendicular to the line are constrained to change the direction only.

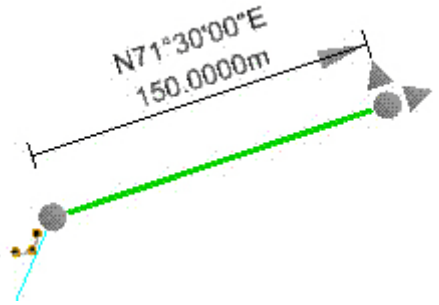


- A circular shaped drag handle – moves the points without constraint

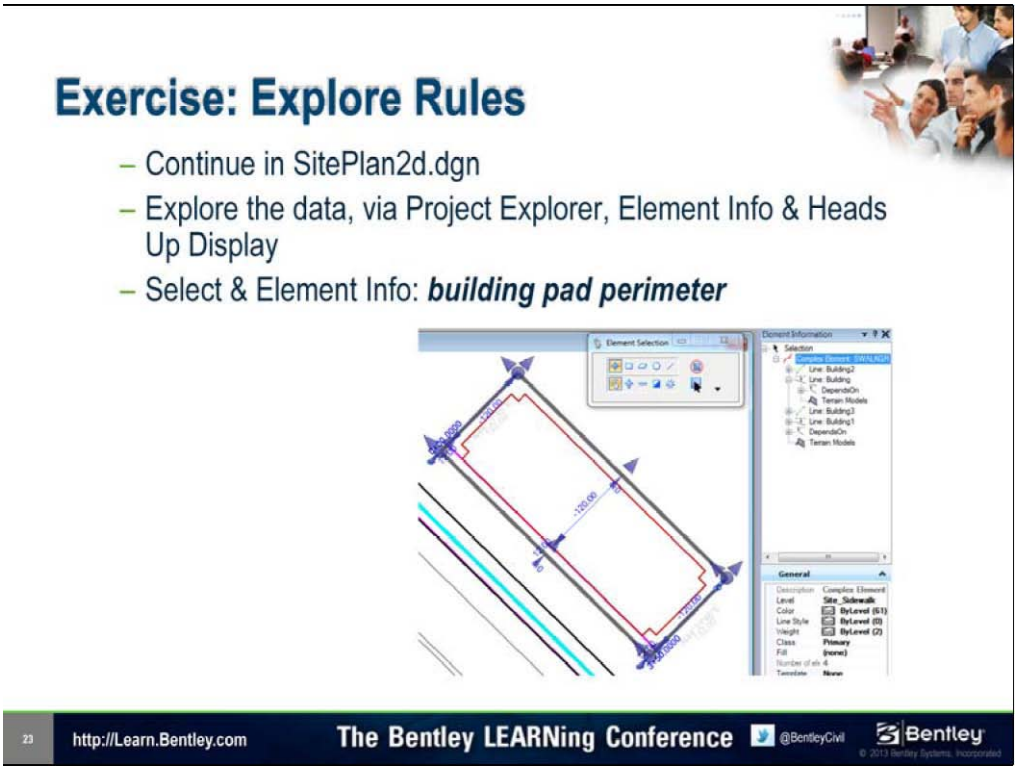
- Interval drag handle – This type of drag handle is present any time one of the MicroStation Modify commands are used on a civil element. This drag handle is used to change the location of the interval end point.

SNAP ICONS

If a point was created by a snap, the manipulator is shown as a circle with the appropriate snap icon next to it.



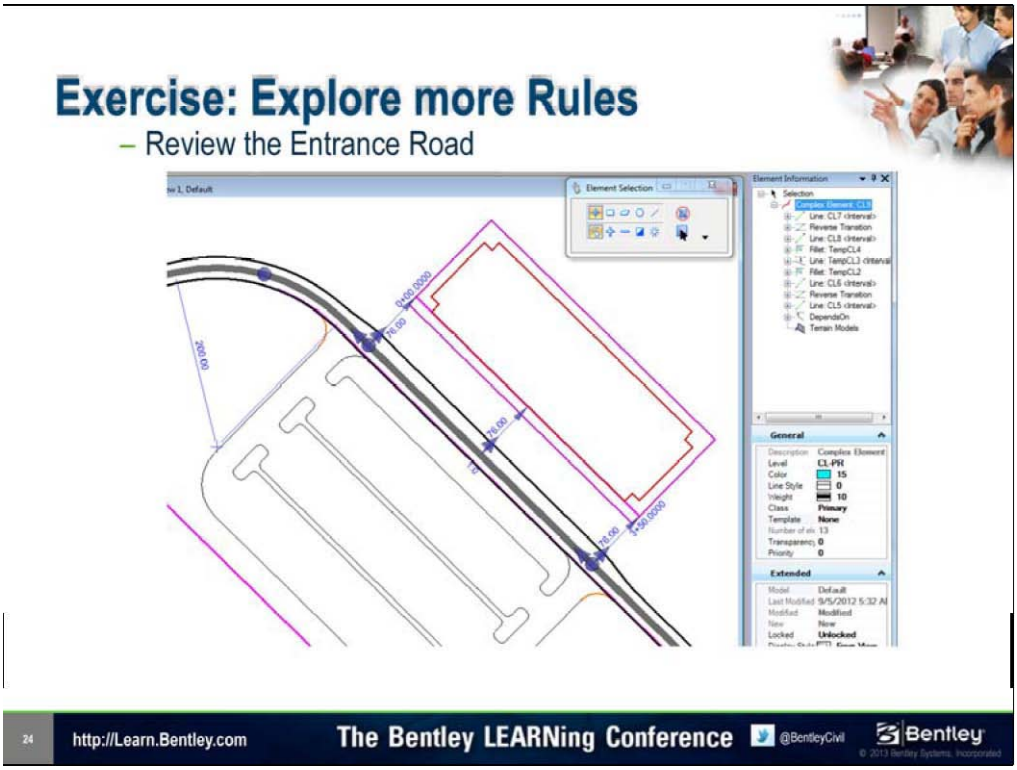
Hovering over the circle will change it to a normal manipulator. Click and move the dot to remove the snap constraint and replace with new constraints.



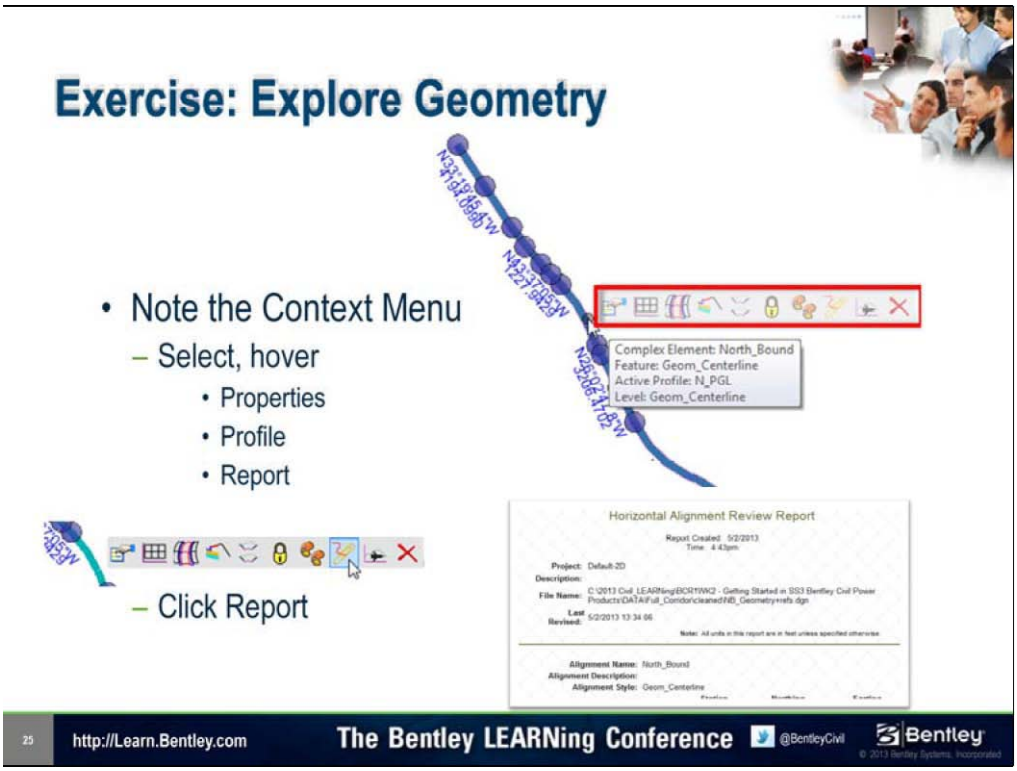
Additional information can be found in the “footprints” in Element Information how it was built: It’s based on the temp line offset Back wall is offset from front wall Side walls are snapped between front and back walls Then it was complexed

Change the width of the building

Change the width of the building. Change the offset between the building and the sidewalk.



Explore how the road is built Take a look at the parking



Let's invoke the Context menu Pick a Centerline
(Select, hover…)

Run a quick report

CHAPTER SUMMARY

In this chapter, we have learned how to explore the OpenRoads Technology interface and to explore the engineering relationships of engineering designs.

Bentley Civil Workshop

2013 Bentley LEARNing Conference

BCR1WK2

OpenRoads Technology Workshop: Introduction to Civil Rules

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Chapter 2: Using Rules

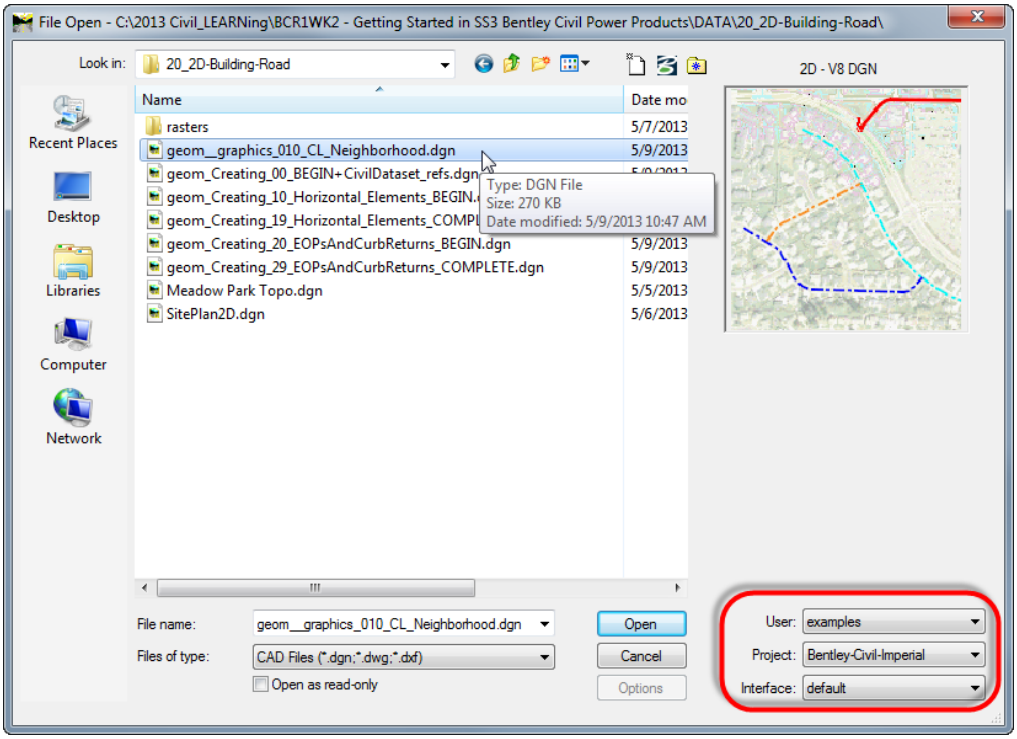
Using the Bentley Civil Standards

Exercise: Open a Design File.

Exercise Objective: In this exercise, we will take some LineStrings and make them Civil Smart.

Procedure:

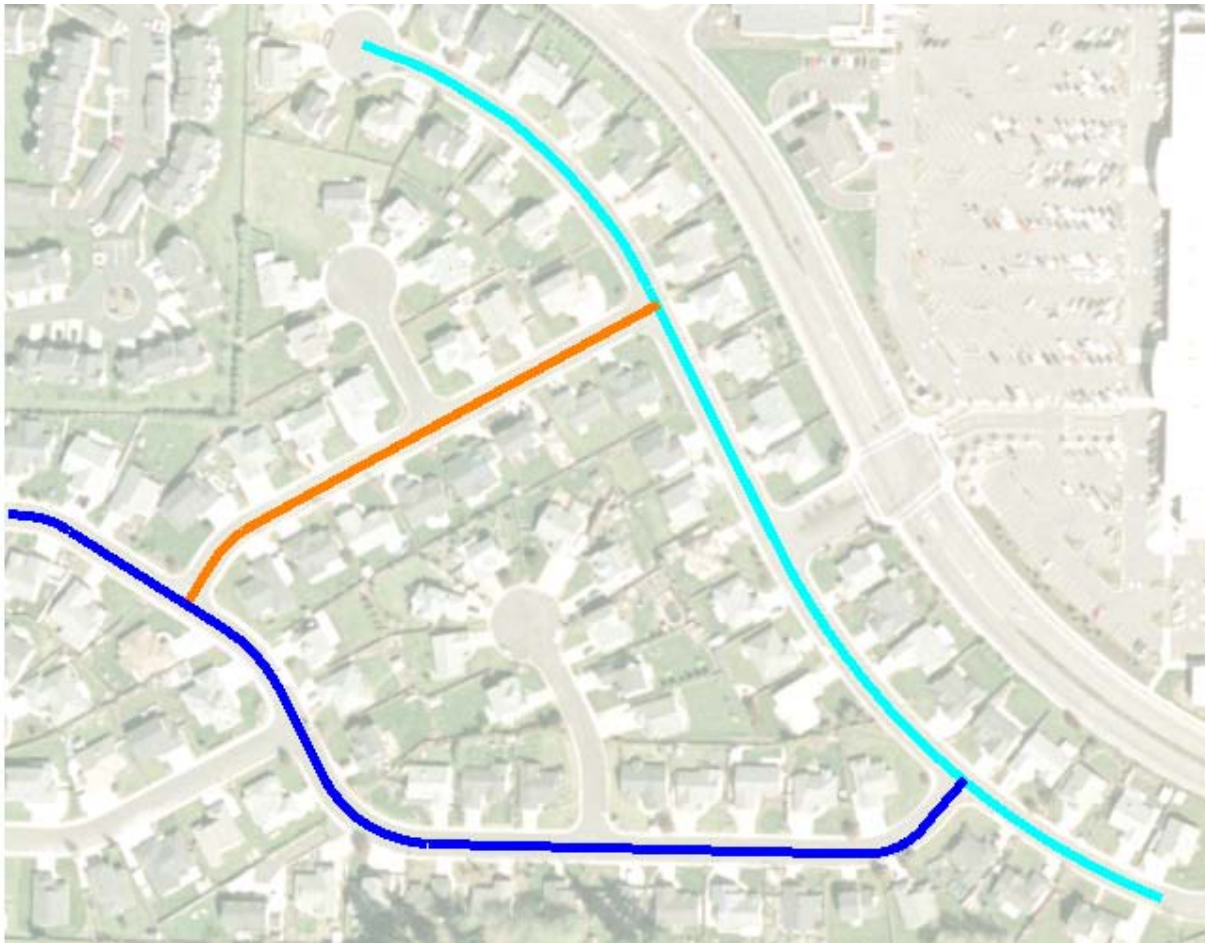
1. Double click the **Power GEOPAK** or **Power InRoads** icon on the Windows Desktop.
2. Make sure the Workspace ***User*** and ***Project*** are set to examples and ***Bentley-Civil-Imperial***.
3. Browse to C**:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\Data\20_2D-Building-Road** and select geom__graphics_010_CL_Neighborhood.dgn as shown below.



4. Click ***Open***.

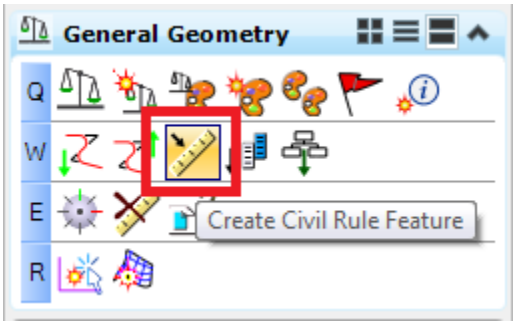
Exercise: Turn "dumb graphics" into Civil Graphics.

Exercise Objective: In this exercise, we will make three "ordinary" linestrings into Civil Ruled Features. This method is good practice: it is easy, but it is NOT a Best Practice.



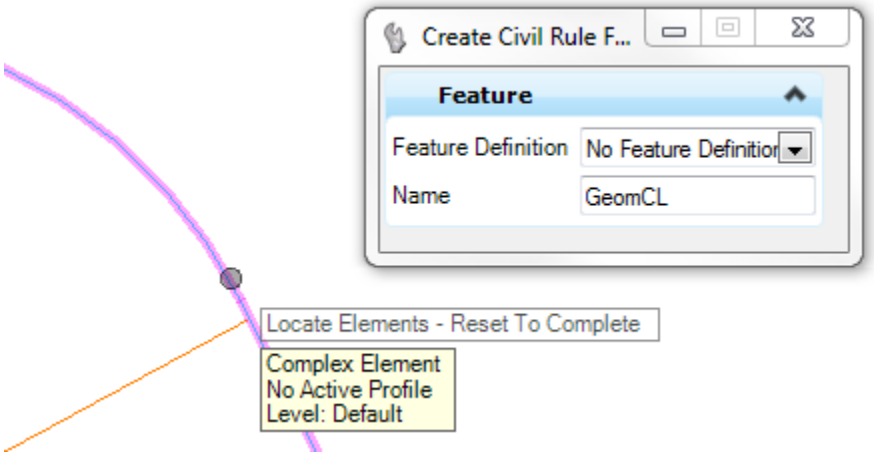
Procedure:

5. In the *General Geometry* workflow, select ***Create Civil Rule Feature***.

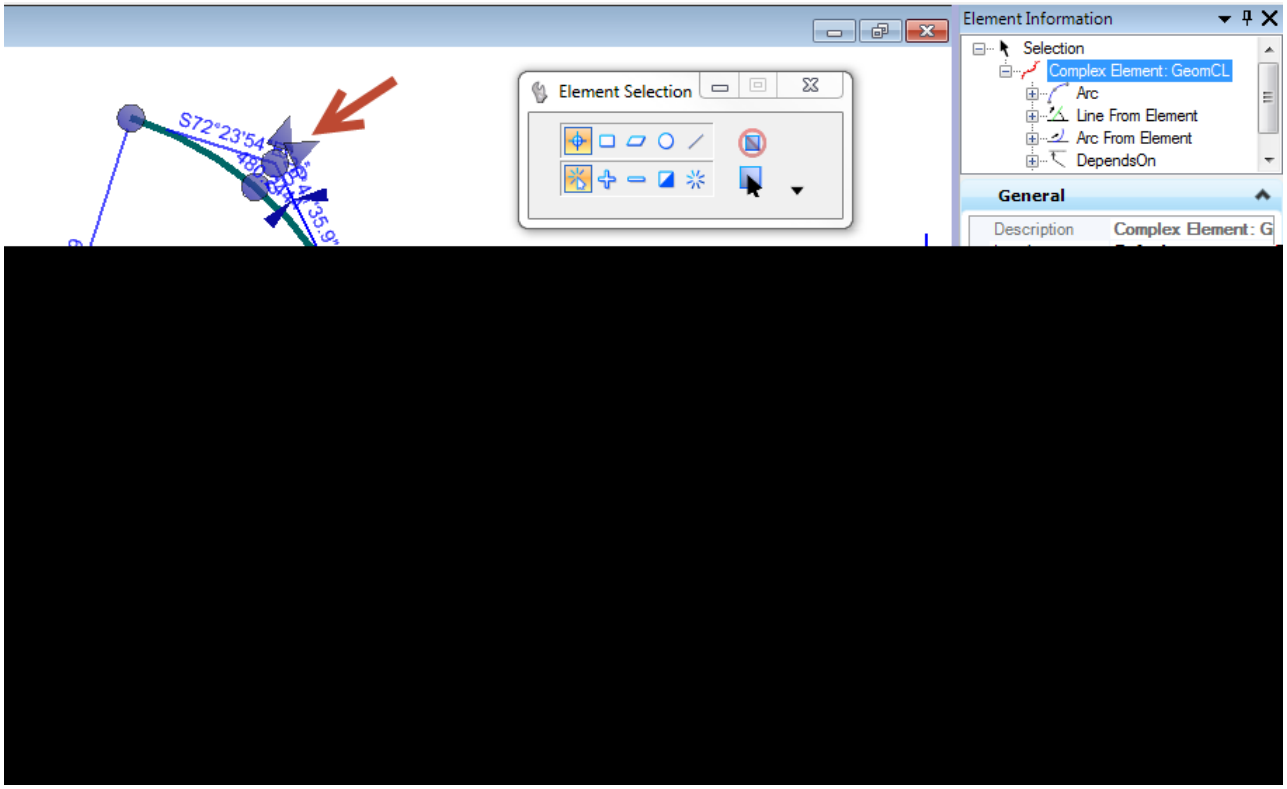


We'll do it the quickest and "dirtiest" way first (the way with the poorest technique)

6. Follow the Heads Up Display prompt and select the northeastern road centerline (cyan).



7. In the Name field of the tool settings, keyin GeomCL
8. Reset (right-click) to process the command.
9. There is no feedback (using our poor technique).
10. Use the selection tool and Element Information to analyze our results.



11. In the Feature c of the Element Info dialog, type a better name for the NorthEast Centerline (“NE_CL”?).
12. Change the Feature Definition to Geom_Centerline (it is under Linear > Geometry).

    Feature Definitions not only provide a data management benefit (object type), but they have settings and properties associated with them. For example, Geom_Centerline not only controls the element symbology (level, color, etc.), but also allows the automatic stationing and annotation that you should see on the screen.

13. Play around with some in-place editing.

Exercise: Continue turning "dumb graphics" into Civil Graphics.

Exercise Objective: In this exercise, let's create another Civil Centerline – this time with better technique.

Procedure:

14. Open the ***Feature Definition Toggles B***ar.

    This "pre-sets" the Feature Definition default when creating new features.

15. Select Geom_Centerline

    Ensure that the Use Active Feature Definition button is set.

16. In the General Geometry task, select **Create Civil Rule Feature**.
17. Notice that the Feature Definition to be assign is the Active Feature Definition shown in the Features Definitions Toggle Bar: Geom_Centerline.
18. Type *Central Lane* in the Name Field of the Tools Settings dialog.

    Follow the Heads Up Display prompt and select the central linestring.

This time, we get some visual feedback to confirm our success: the linestring changes level, color and gets stationed.

19. Add the southwestern road

Exercise: Place a Centerline.

Exercise Objective: The goal here is to place a centerline perpendicular to the road it tees into. The Central lane "dumb" graphic used perpendicular snaps to place its linear segments. As we'll see shortly, the perpendicular geometry was computed, but the perpendicular intent was not captured. Using the OpenRoads Technology Line Between Points and a perpendicular snap, the intent is captured and remembered for future edits.

Procedure:

20. Click Horizontal Geometry > Geometry Line > Line Between Points.
21. Place the first point somewhere along the center of the cul-du-sac road.
22. Using the Perpendicular Snap, snap to the Central Lane Element.

23. Move the Alignments the Central Lane tees into. Notice that there is no relationship maintained between the alignments (even though the graphics were placed perpendicular to the roads).
24. Move the Central Lane. Notice that the Cul-du-Sac road remains perpendicular to it.

    This is one of the primary benefits to using OpenRoads Geometry tools: the design intent is captured, where, in MicroStation, it is lost.

25. Play around with the geometry. Get familiar with how things interact or do not. Make mistakes.

Bentley Civil Workshop

2013 Bentley LEARNing Conference

BCR1WK2

OpenRoads Technology Workshop:

Creating Horizontal Elements

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Chapter 3: Creating Horizontal Elements

CREATING HORIZONTAL ELEMENTS

Exercise: Set the Feature Definition.

Exercise Objective: Set the Feature Definition.

Procedure:

1. Browse to **C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\Data\20_2D-Building-Road** and select *geom_Creating_10_Horizontal_Elements_BEGIN.dgn* as shown below.Click Open.

2. Click the **Feature Definition Toggle Bar** icon from the *Tasks > Horizontal Geometry* menus.

3. In the **Feature Definition Toggle Bar**, click the **Match Feature Definition** icon.

4. Select a red alignment in the CAD View.

   This will set the Feature Definition to Geom_Centerline.

5. In the **Feature Definition Toggle Bar**, click the **Use Active Feature Definition** icon 

Exercise: Place Geometry Lines.

Exercise Objective: Use the Line Between Points Command.

Procedure:

6. Click the **Line Between Points** icon from the *Tasks > Horizontal Geometry* menus.

7. Snap to starting point of the alignment which is marked with a red circle and the number 6.
8. Click to accept the **Starting Point**.
9. Snap to ending point of the alignment which is marked with a red circle and the number 7.
10. Click to accept the **Ending Point**.
11. Snap to starting point of the alignment which is marked with a red circle and the number 8.
12. Click to accept the **Starting Point**.
13. Snap to ending point of the alignment which is marked with a red circle and the number 9.
14. Click to accept the **Ending Point**.

    Two lines have been created.

Exercise: Place Geometry Arcs.

Exercise Objective: Use the Simple Arc and Simple Arc From Element Commands.

Procedure:

15. Click the **Simple Arc** icon from the *Tasks > Horizontal Geometry* menus. 

16. Select the Line between the red circles labeled 6 and 7 as the **First Element**.
17. Select the Line between the red circles labeled 8 and 9 as the **Second Element**.
18. Snap to red circle labeled 10 as the **Through Point** and click to accept.

19. Use the Up and Down Arrow keys on your keyboard to change the **Trim/Extend Option** to **Both.**
20. Click to accept the **Trim/Extend Option**.

    An arc has been created between the two lines.

21. Click the **Simple Arc From Element** icon from the *Tasks > Horizontal Geometry* menus. 

22. Select the line between the red circles labeled 8 and 9.
23. Snap to red circle labeled 9 as the **Start Point** and click to accept.
24. Key-in **297.28** as the **Radius** and press the **Enter** key on your keyboard.
25. Snap to red circle labeled 11 as the **End Point** and click to accept.
26. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Trim/Extend Option** to **Back**.
27. Click to accept the Trim/Extend Option.

    An arc has been added to the end of the line.

    This time, we get some visual feedback to confirm our success: the linestring changes level, color and gets stationed.

28. Add the southwestern road

Exercise: Place Geometry Lines.

Exercise Objective: Use the Line Between Points Command.

Procedure:

29. Click the **Line Between Points** icon from the *Tasks > Horizontal Geometry* menus. 

30. Snap to starting point of the alignment which is marked with a red circle and the number 6.
31. Click to accept the **Starting Point**.
32. Snap to ending point of the alignment which is marked with a red circle and the number 7.
33. Click to accept the **Ending Point**.
34. Snap to starting point of the alignment which is marked with a red circle and the number 8.
35. Click to accept the **Starting Point**.
36. Snap to ending point of the alignment which is marked with a red circle and the number 9.
37. Click to accept the **Ending Point**.

Two lines have been created.

Exercise: Place Geometry Arcs.

Exercise Objective: Use the Simple Arc and Simple Arc From Element Commands.

Procedure:

38. Click the **Simple Arc** icon from the *Tasks > Horizontal Geometry* menus. 
39. Select the Line between the red circles labeled 6 and 7 as the **First Element**.
40. Select the Line between the red circles labeled 8 and 9 as the **Second Element**.
41. Snap to red circle labeled 10 as the **Through Point** and click to accept.
42. Use the Up and Down Arrow keys on your keyboard to change the **Trim/Extend Option** to **Both**.
43. Click to accept the **Trim/Extend Option**.

    An arc has been created between the two lines.

44. Click the **Simple Arc From Element** icon from the *Tasks > Horizontal Geometry* menus. 
45. Select the line between the red circles labeled 8 and 9.
46. Snap to red circle labeled 9 as the **Start Point** and click to accept.
47. Key-in **297.28** as the Radius and press the **Enter** key on your keyboard.
48. Snap to red circle labeled 11 as the **End Point** and click to accept.
49. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Trim/Extend Option** to **Back**.
50. Click to accept the Trim/Extend Option.

    An arc has been added to the end of the line.

Exercise: Place a Line From an Arc.

Exercise Objective: Use the Simple Line From Element Command.

Procedure:

51. Click the **Simple Line From Element** icon from the *Tasks > Horizontal Geometry* menus.
52. Select the arc between the red circles labeled 9 and 11.
53. Snap to red circle labeled 11 as the **Start Point** and click to accept.

54. Snap to red circle labeled 12 as the End **Distance** and click to accept.
55. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Trim/Extend Option** to **Back**.
56. Click to accept the **Trim/Extend Option**.

    A line has been added to the end of the arc

Exercise: Create Complex Elements

Exercise Objective: Use the Complex By Elements Command.

Procedure:

57. Select the **Complex By Elements** icon from the *Tasks > Horizontal Geometry* menus.
58. In the Settings dialog, change the **Method** to **Automatic**.
59. Key-in **Western Way** for the **Name**.
60. Click in the CAD View to accept the key-in.
61. Select the north-south line near the red circle labeled 6.
62. An arrow will appear pointing in the direction of the ahead stationing (north).
63. Click in the CAD View

FOR Bentley LEARNing Conference Session: STOP here!

You may continue if you're done early. The following additional tool practice will not be performed in class due to time constraints.

Exercise: Place Geometry Curves

Exercise Objective: Use the Arc Between Points Command

Procedure:

1. Select the *Line Between Arcs* icon from the **Tasks > Horizontal Geometry** menus.
2. Select the arc between the red circles labeled 13 and 15 as the **First Element.**
3. Key-in **0.0** as the **Start Offset** and press the **Enter** key on your keyboard.
4. Click the CAD View to accept the **Start Offset**.
5. Select the arc between the red circles labeled 16 and 17 as the **Second Element**.
6. Key-in **0.0** as the **End Offset** and press the **Enter** key on your keyboard.
7. Click the CAD View to accept the **End Offset**.
8. Move your cursor to select the **Solution** that shows the line going between the arcs.
9. Click the CAD View to accept the **Solution**.
10. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Trim/Extend Option** to **Both**.
11. Click to accept the **Trim/Extend Option**.

Exercise: Place a Line to an Arc

Exercise Objective: Use the Simple Line to Element Command

Procedure:

12. Select the **Simple Line to Element** icon from the *Tasks > Horizontal Geometry* menus.
13. Snap to red circle labeled 18 as the **End Point** and click to accept.
14. Select the arc between the red circles labeled 16 and 17 as the **Element**.
15. Move your cursor to select the **Solution** that shows the line going to the arc.
16. Click the CAD View to accept the appropriate **Solution**.
17. Use the Up and Down Arrow keys on your keyboard to change the **Trim/Extend Option** to **Back**.
18. Click to accept the **Trim/Extend Option**.

    A line has been added to the end of the arc

Exercise: Place Another Line to an Arc

Exercise Objective: Use the Simple Line to Element Command

Procedure:

19. The **Simple Line to Element** should still active.
20. Snap to red circle labeled 6 as the **End Point** and click to accept.
21. Select the arc between the red circles labeled 13 and 15 as the **Second Element**.
22. Move your cursor to select the **Solution** that shows the line going to the arc.
23. Click the CAD View to accept the **Solution**.
24. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Trim/Extend Option** to Back.
25. Click to accept the **Trim/Extend Option**.

    A line has been added to the beginning of the arc.

Exercise: Extend a Line

Exercise Objective: Use the Extend Line Command

Procedure:

26. Click the **Extend Line** icon from the *Tasks > Main* menus.
27. In the Settings dialog, enable the **Distance** option.
28. In the Settings dialog, key-in **210** for the **Distance**.
29. Select the line between the red circles labeled 6 and 13.

    A line has been extended.

Exercise: Create Complex Elements

Exercise Objective: Use the Complex By Elements Command

Procedure:

30. Select the **Complex By Elements** icon from the *Tasks > Horizontal Geometry* menus.

31. In the Settings dialog, change the **Method** to **Automatic**.
32. Key-in **Southern Street** for the **Name**.
33. Click in the CAD View to accept the key-in.
34. Select the west portion of the line just extended before the red circle labeled 6.
35. An arrow will appear pointing in the direction of the ahead stationing (east).
36. A **Fork** may be found at the intersection of **Fairway Road** and **Southern Street**.
37. Move your cursor to continue in the direction of the **Southern Street** and click to accept.
38. Click in the CAD View to accept the results.

Exercise: Starting Station

Exercise Objective: Setting the Start Station

Procedure:

39. Select the **Start Station** icon from the *Tasks > Horizontal Geometry* menus.
40. Select the **Southern Street** alignment.
41. In the Heads-up display, key-in **0.00** for the **Start Station Position** and press **Enter** on your keyboard.
42. Click in the CAD View to accept the key-in.
43. In the Heads-up display, key-in **117+22.65** for the **Starting Station** and press **Enter** on your keyboard.
44. Exit MicroStation.

Bentley Civil Workshop

2013 Bentley LEARNing Conference

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OpenRoads Technology Workshop: Creating EOPs and Curb Returns

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Chapter 4: Pavement Edges & Curb Returns

CREATING HORIZONTAL ALIGNMENT ELEMENTS

Exercise: Set the Feature Definition.

Exercise Objective: Set the Feature Definition.

Procedure:

1. Change design files:
2. Browse to C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\20_2D-Building-Road and select geom_Creating_20_EOPsAndCurbReturns_BEGIN.dgn.
3. Click ***Open***.
4. Click the **Element Selection** icon from the *Tasks > Main* menus.
5. Select each of the horizontal alignments.
6. Review the graphics of the Manipulators.
7. The blue Manipulators values can be modified and the white Manipulators values are informational

Exercise: Set the Feature Definition.

Exercise Objective: Set the Feature Definition.

Procedure:

8. Click the Feature Definition Toggle Bar icon from the *Tasks > Horizontal Geometry* menus. 
9.
10. Navigate to the Linear > Roadway folder and select the **Feature Definition** named **Road_EdgeOfPavement**.
11. In the **Feature Definition Toggle Bar,** click the **Use Active Feature Definition** icon. 

This will hold the Feature Definition when we use different commands.

Exercise: Create Edge of Pavement Geometries.

Exercise Objective: Use the Simple Line From Element Command.

Procedure:

12. Click the **Single Offset Entire Element** icon from the *Tasks > Horizontal Geometry* menus.
13. Select the horizontal geometry that runs from the circles labeled 6 and 12.
14. If the entire alignment doesn't highlight, press the **Alt** key on your keyboard.
15. Click to accept the selection.
16. Key-in **12.0** as the **Offset** and press the **Enter** key on your keyboard.
17. Click to accept the selection.
18. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Mirror** to Yes.
19. Click to accept the **Mirror** option.
20. Two horizontal geometries have been created.
21. Select the horizontal geometry that runs from the circles labeled 6 and 18.
22. Click to accept the selection.
23. The **Offset** should still be set to **12.0**.
24. Click to accept the selection.
25. The **Mirror** option should still be set to **Yes**.
26. Click to accept the **Mirror** option.
27. Two more horizontal geometries have been created.
28. Use the **Element Selection** tool to review the Manipulators.

Exercise: Create Edge of Pavement Radii at the Intersection.

Exercise Objective: Use the Simple Arc Command.

Procedure:

29. Click the **Simple Arc** icon from the *Tasks > Horizontal Geometry* menus. 

30. Select the blue Line between the red circles labeled 13 and 14 on the north side as the **First Element**.

31. Select the blue Line between the red circles labeled 6 and 7 on the east side as the Second **Element**.
32. Key-in **50.0** as the **Radius** and press the **Enter** key on your keyboard.
33. Move your cursor to the Northeast quadrant of the intersection and click to accept.
34. Use the **Up** and **Down Arrow** keys on your keyboard to change the **Trim/Extend Option** to **Both**.
35. Click to accept the **Trim/Extend Option**.

36. Select the blue Line again between the red circles labeled 13 and 14 on the north side as the **First Element**.
37. Select the blue Line between the red circles labeled 6 and 7 on the west side as the **Second Element**.
38. The **Radius** should still be set to **50.0**.
39. Move your cursor to the northwest quadrant of the intersection and click to accept.
40. The **Trim/Extend** Option should still be set to **Both**.
41. Click to accept the **Trim/Extend Option**.

Two arcs have been added

Exercise: Create Edge of Pavement Radii at the Intersection.

Exercise Objective: Use the Simple Arc Command.

Procedure:

42. Click the **Element Selection** icon from the *Tasks > Main* menus.

43. Select the last radius placed in the northwest quadrant of the intersection.
44. Click the radius value labeled **50.00**.
45. Key-in **60.00** and press the **Enter** key on your keyboard.

    The radius is now changed to 60.00 and the original **Trim/Extend Option** was honored.

46. Select the blue line again between the red circles labeled 13 and 14 on the north side.
47. Click the offset value labeled **-12.00** on the left end of the line.
48. Key-**in -30.00** and press the **Enter** key on your keyboard.

    The offset is now changed to -30.00 and the original radius at the intersection were maintained. Since the Civil Rule was based on an Offset command, changing the offset at the beginning, middle, or end of the line, changes the offset of the entire line. <<< It seems as if changing the middle keeps a constant offset. Changing an End seems to make it a variable offset.>>>

49. Select the blue line between the red circles labeled 8 and 10 on the west side.
50. Click the offset value labeled **-12.00** on the middle end of the line.
51. Key-in **-20.00** and press the **Enter** key on your keyboard.
52. Select the blue Line between the red circles labeled 8 and 10 on the east side.

53. Key-in **20.00** and press the **Enter** key on your keyboard.

Bentley Civil Workshop

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OpenRoads Technology Workshop:

Building Pads Horizontal

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Chapter 5: Building Pad Layout

OVERVIEW

Browse In this lesson we will create a design for a building pad on our commercial site project.

CREATING A BUILDING PAD LAYOUT - HORIZONTAL

Exercise: Design a Building Pad.

Exercise Objective: This exercise will guide you to create a building pad.

Procedure:

1. Change Design files.
2. Browse to **C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\30_2D-Building-Site** and select Open **SitePlan2D_Building_Layout-Horizontal.dgn**.
3. Click ***Open***.
4. To the south of the parking lot is construction line. We will use it as a reference for constructing a building pad. Zoom in to the area.

5. Click the *Horizontal Geometry > Geometry Complex > Single Offset Entire Element* tool.

6. Pick the construction line.

7. Offset the line **5** feet. Do NOT Mirror.

8. Offset another line **80** from the new line.
9. Click the *Horizontal Geometry > Geometry Complex > Single Offset Entire Element* tool.

10. Place two lines between the offset lines to make a rectangle.

11. Because the Feature Definition of the resulting Pad is important, select Site_Pad as the Feature Definition. It is found under *Linear > Site*. Ensure that the **Use Active Feature Definition toggle** is set.

12. Click the *Horizontal Geometry > Geometry Complex > Complex by Elements* tool.

13. Select the **Automatic** Method and select the first of the offset lines (the northwestern side).

    Note there is a “direction arrow”, which changes sides, depending which side of line midpoint you select. Callouts in the book assume that the direction of the pad is clockwise. If you select the other directions, some offsets may be opposite than the book

14. Accept the rectangular complex solution.

15. Select the new pad to see the rules.

16. Change some of the values. Drag an end to the reference line around. See the rules in action.

You may continue if you're done early. The following additional tool practice will not be performed in class due to time constraints.

Exercise: Extra Work (Time Permitting).

Procedure:

17. If you finish early, add a building footprint 10 feet inside the pad boundary.

18. If you're feeling bold, create a Civil Cell of the new building Pad.

19. If you're successful creating the Civil Cell, you can Place a Cell by right-clicking it in the Project Explorer Civil Model and selecting Place Civil Cell. You will need to identify a line in the design file.

Bentley Civil Workshop

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OpenRoads Technology Workshop:

Create and Analyze Terrain

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Chapter 6: Create and Analyze Terrain

CREATE AND ANALYZE TERRAIN

Exercise: Create Terrain Model from 3D Graphical Elements.

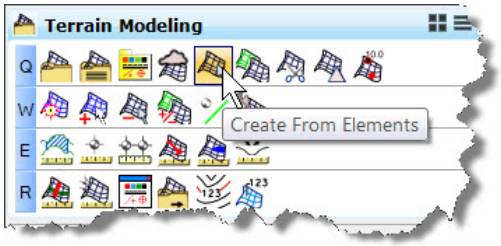
Exercise Objective: In this lesson, we will prepare a terrain model of the existing ground from graphical contours provided to us.

Procedure:

1. ***Browse to C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\30_2D-Building-Site and select Contours.dgn.***

2. Click ***Open***.

3. Using **Power Selector**, select all the contour graphical elements.
4. Start the **Terrain Model By Elements** command.



5. Populate the feature definition in the command dialog as shown below. You can also populate the feature type and edge method as shown if you wish but these will be prompted.

6. **Datapoint to accept** the selected elements.

7. Set feature type to **Contour**. Use **up/down arrows** on keyboard. Then **DP** to accept.

8. Set edge method to **slivers**. **DP** to accept. Note that max triangle length is also a valid option.

9. So we can tell the difference in the graphics we were given and our new terrain, **turn off** levels named **Exist_Contour_Major** and **Exist_Contour_Minor**.

Exercise: Using Element Information to Change the Terrain Model Display.

Exercise Objective: In this lesson, we will learn how to change the display of the Terrain Model for various needs. We will explore a long-hand method as well as a method that can be automated as part of your organizations standards.

Procedure:

10. **Select** the terrain model that we created above.
11. Open Element Information **(***Element > Element Information***)**

12. Notice the Display Toggles. These are divided into **Calculated Features** (those things which are used to represent the Terrain Model) and **Source Features** (those things which were used to create the terrain model). Try double click on the label to toggle various of these on and off.

NOTE: *we'll review symbology for these various features below.*

13. Review other settings.
    i. The edge method allows you to control the boundary determination. Methods are None, Sliver and Max Triangle Length. In this case, DEM files are rectangular so all edge methods would provide identical results.
    ii. The **Feature** panel allows editing of the terrain model name and feature definition.
    iii. The **Information** panel provides read-only data for the nature of the Terrain Model.

14. So what about the symbology for these various feature types (triangles, contours and such)? In the tree pane, **expand the tree** until you see **Triangles** as shown below.

15. By drilling into the tree, we can define the desired symbology for each feature type.
16. Make sure triangles display is ON and then change its color.
17. Notice the property titled "Thematic Display Style". Change this to "Thematic: Height".
18. Deselect the Terrain Model to see the effect.

NOTE: *Thematic display is a new concept in Microstation V8i (Select Series 3). It is available for a view attribute or as a property for an individual element*.

Exercise: Using Element Templates to Control Display.

Procedure:

19. **Select** the terrain model that we created above and open **Element Information**.
20. Notice the property for "Template" in the General panel.

21. The use of templates allows us to automate the change of display settings while also providing ability to save and reuse your organization standards.
22. Experiment with different templates. When finished set the template back to **Terrain\ Existing Ground**.
23. Now, deselect the Terrain Model and hover your cursor over the contours. The tooltip will report the elevations.

Exercise: Analyze Point.

Procedure:

24. In Task Navigation choose the *Analyze Point* Command

25. Select the Terrain Model
26. Now you get X,Y,Z information feedback at the heads up prompt.

Now look at the dialog and notice you can toggle on settings to show the contour, triangle or flow arrow. Try different combinations of this as you analyze.

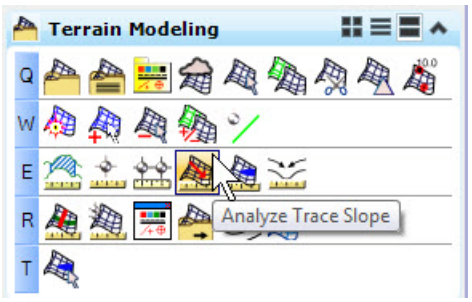
27. With one or more of these options toggled on, **DP** will draw the contour, slope label and/or triangle as graphic elements.

Exercise: Trace Slope

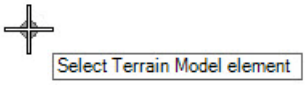
Exercise Objective: This exercise will guide you through the steps to get started.

Procedure:

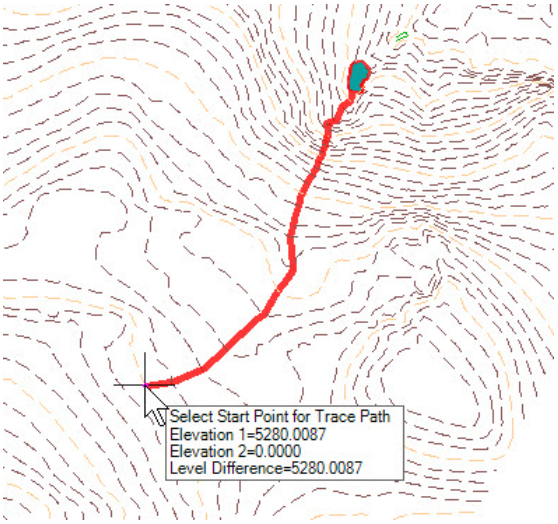
28. In Task Navigation choose the *Analyze Trace Slope* command



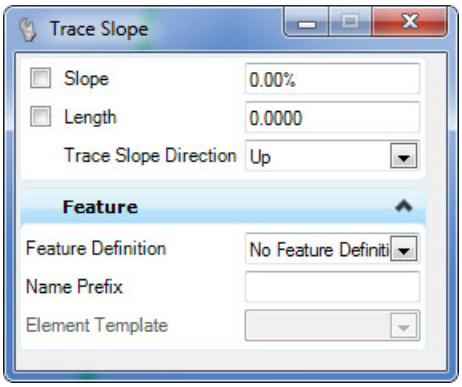
29. Select the Terrain Model.



30. The downstream flow path is traced from the cursor.



31. Take a couple minutes to experiment with the other options on the dialog.



- Slope – when locked forces the path to follow an exact slope instead of most direct slope.
- Length – when locked limits the length of the trace.
- Direction – trace can be upstream or downstream.

32. DP in the view while this command is running will draw the trace as a graphic element.

Bentley Civil Workshop

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Exploring the 3D Environment

BCR1WK2

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Team Members: Dan Eskin, PE & Bob Rolle, PE

BCR1WK4

Team Leader: Mike Barkasi

Team Members: Robert Garrett, PE & Brandon Peterson, PE

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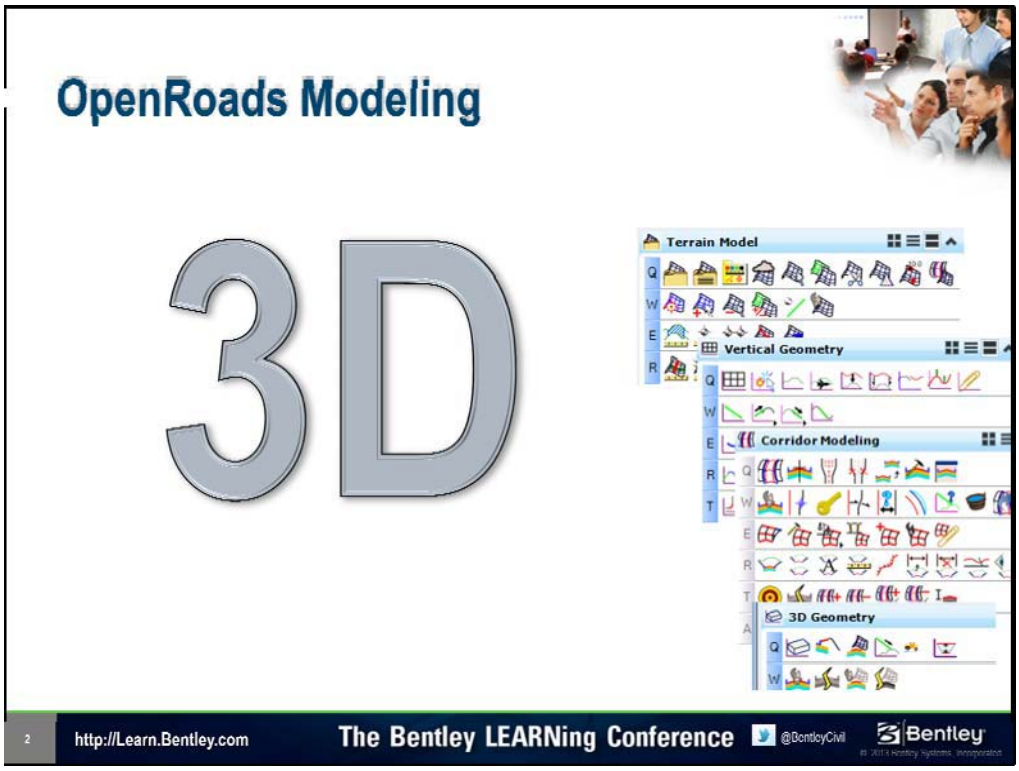
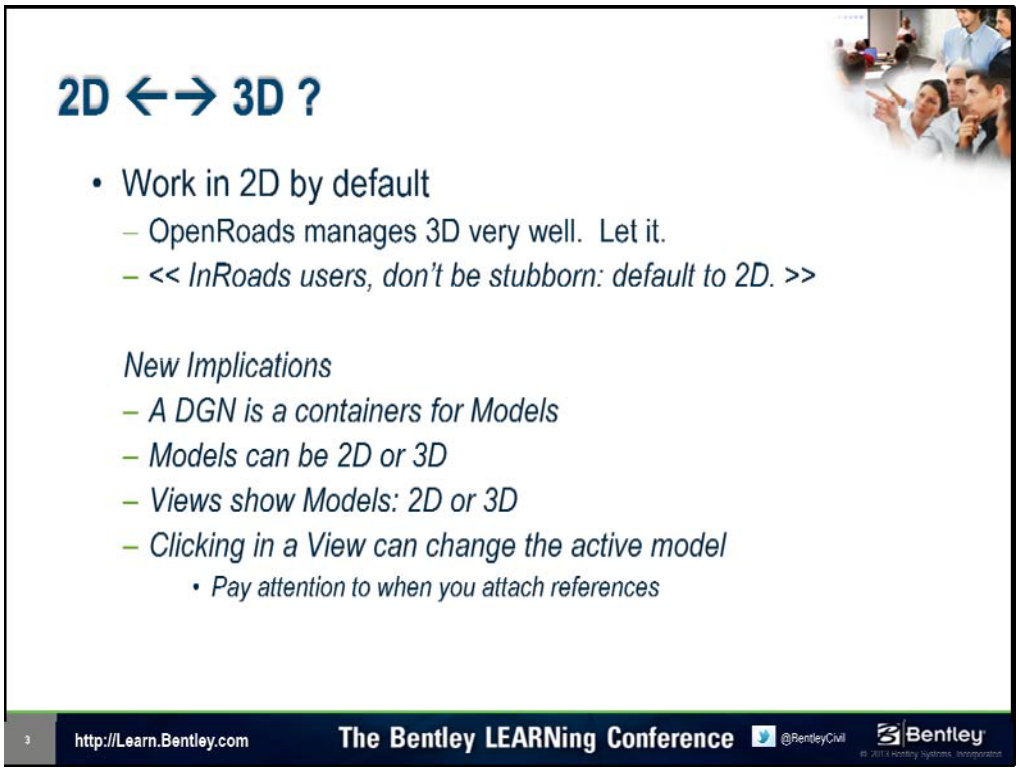
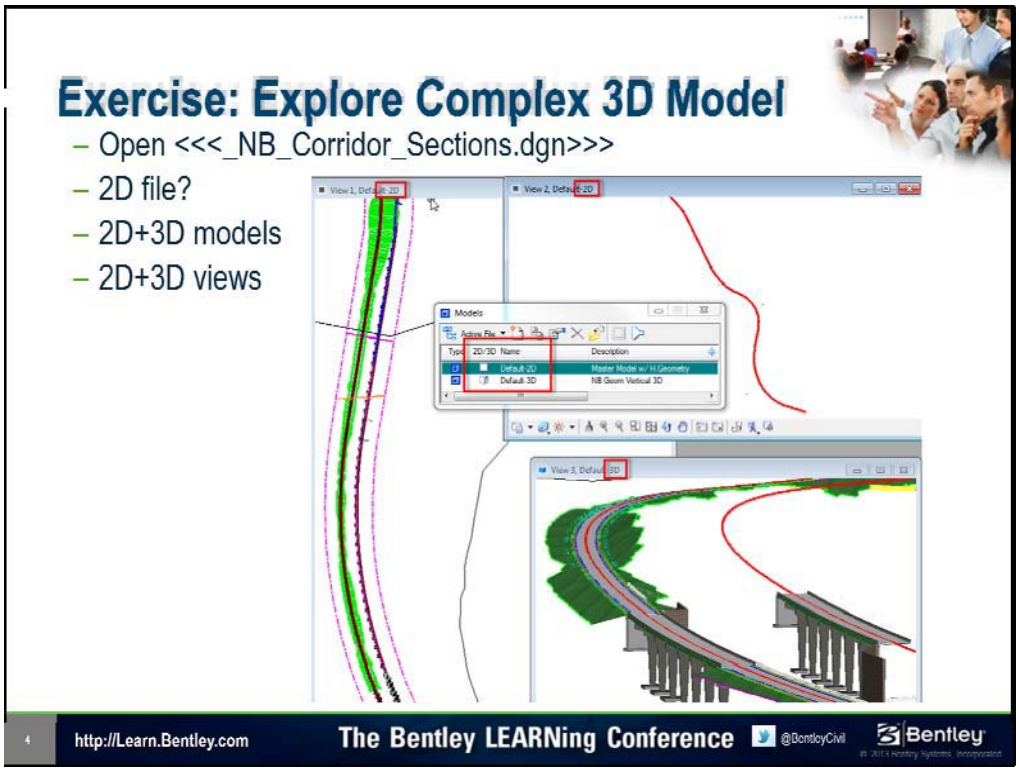
Chapter 7: Exploring the 3D Environment



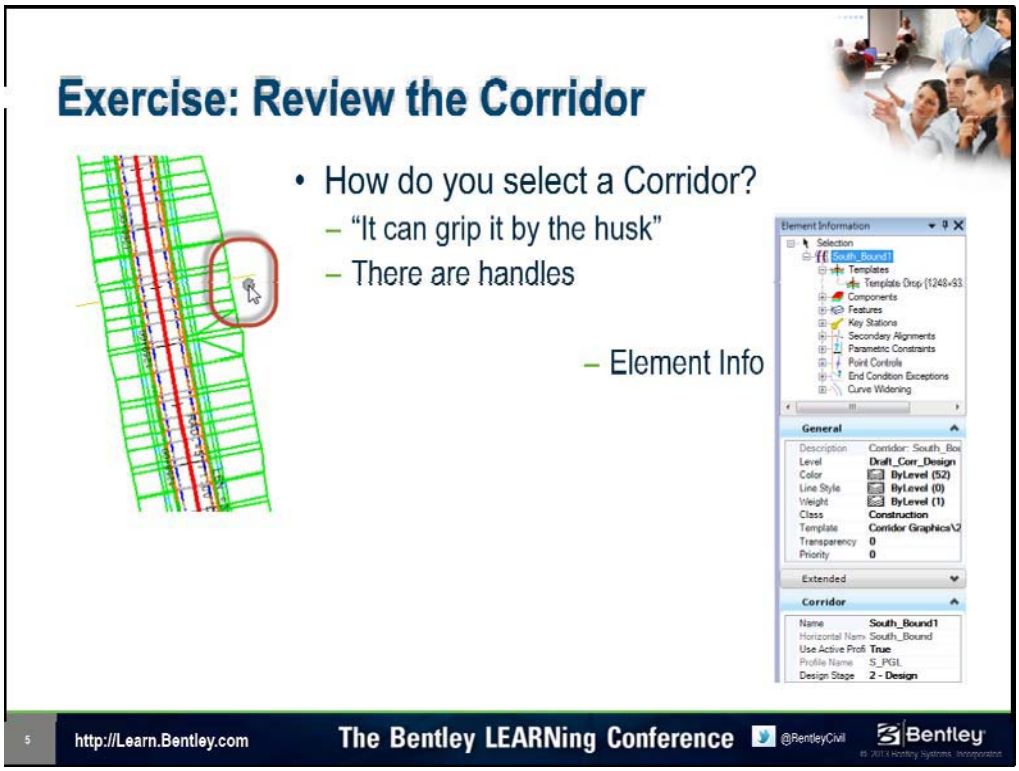




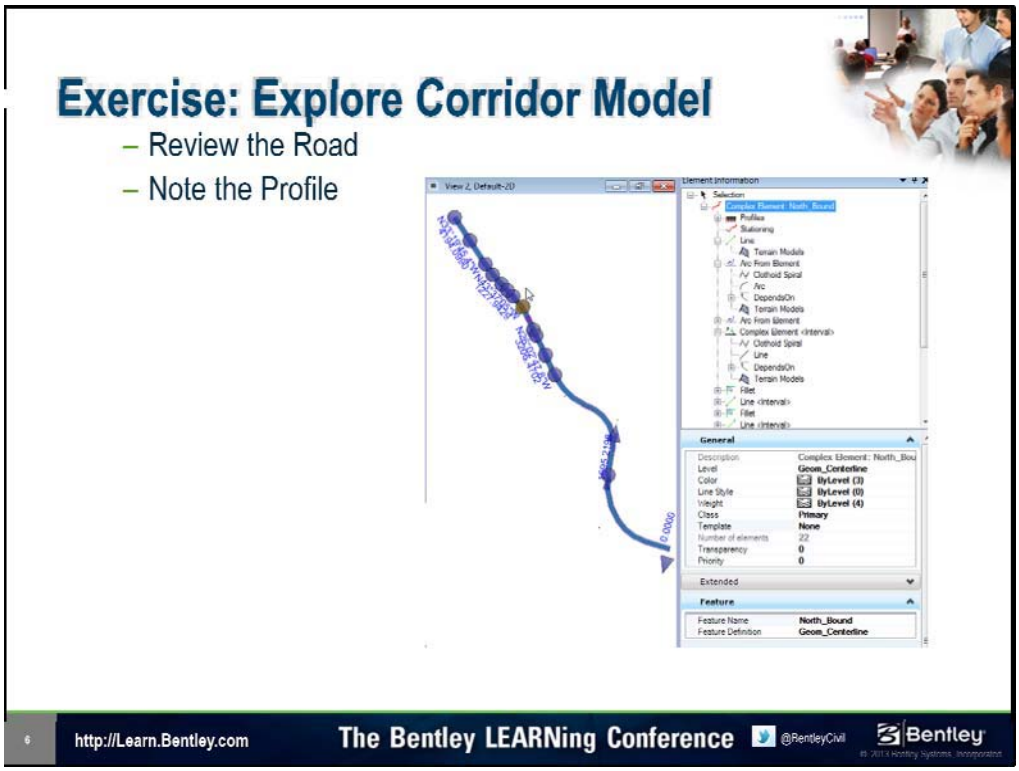
In the **C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\50_3D-Exploring\Sections** folder, open **_NB_Corridor_Sections_BEGIN.dgn**

Open the **Models** dialog (File > Models) **Open** the References dialog (File > Reference)
Click from one View to another.

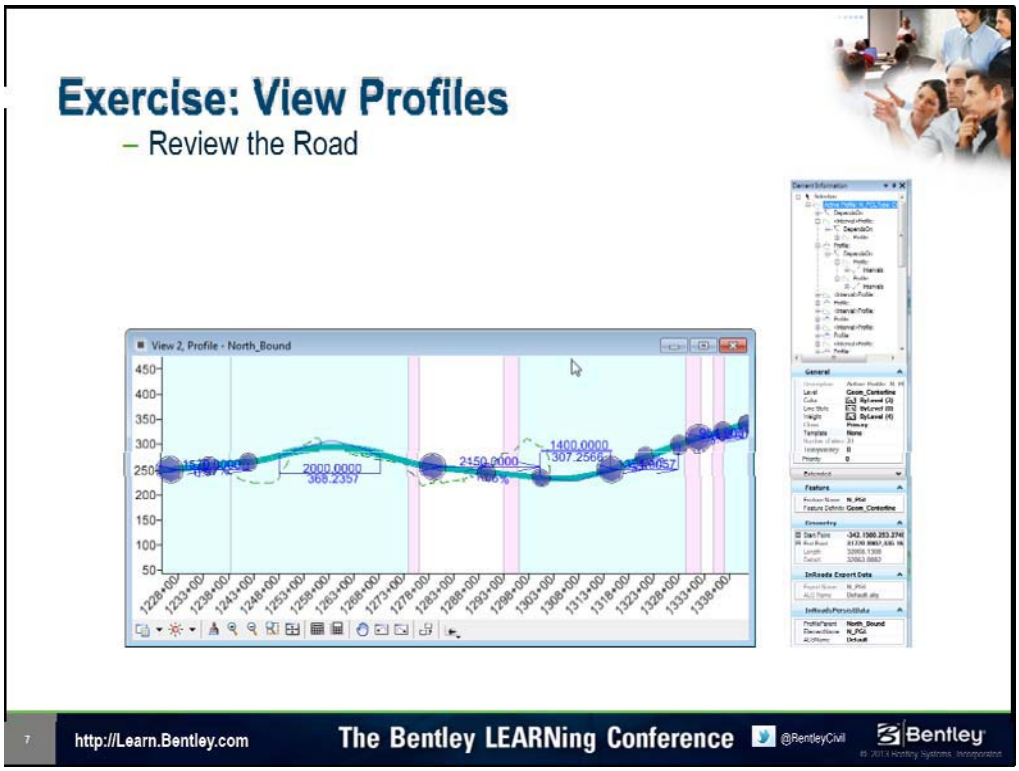
Note how the active Model changes.
Notice how the Reference File Attachments change.



In order to grip the Corridor, it must be displayed. In the NB_Geometry+refs.dgn, the 3D model has all references ON. In the 2D model the 3D stuff is turned OFF. Need to make sure the corridor reference is ON



In the Project Explorer Civil Model, explore a Corridor Notice that all the properties you're used to seeing in the old Roadway Designer are listed as Corridor properties. Lo



This is discussed more thoroughly in the Building Vertical sections of the workshop.

The shortcut is to right-click on ruled horizontal element and click **Open Profile Model.**

Bentley Civil Workshop

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OpenRoads Technology Workshop:

Creating Vertical Geometry

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Chapter 8: Creating Vertical Geometry

CREATING VERTICAL GEOMETRY

Exercise: Getting Started.

Exercise Objective: Starting Power InRoads V8i (SELECTseries 3) or Power GEOPAK V8i (SELECTseries 3).

Procedure:

1. Browse Launch MicroStation and set the following in the *File Open* dialog.

   User: examples
   Project: Bentley-Civil-Imperial
   Interface: Bentley-Civil

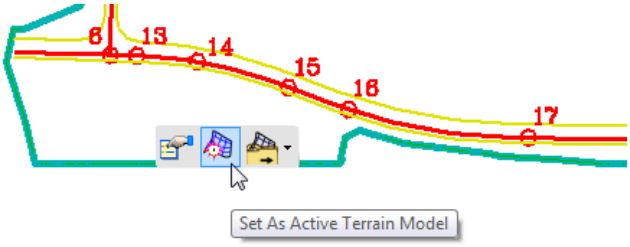
2. Open **geom_Creating_30_Vertical_Profiles.dgn** from the folder *C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Products\DATA\60_3D-Building-Road.*

Exercise: Set the Active Terrain Model.

Exercise Objective: When working in Vertical or other 3D, it is good technique to ensure that a Terrain Model is Active.

Procedure:

3. Click on the Terrain Model boundary, hover, and wait for the Context Menu.
   Select Set As Active Terrain Model.

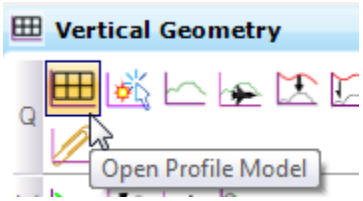


Exercise: Open a Profile Model.

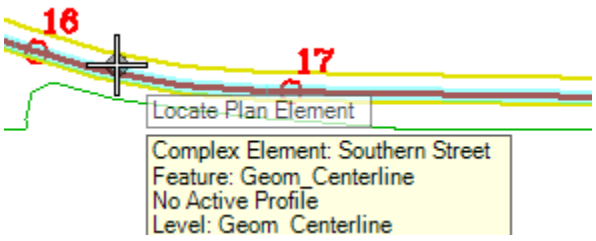
Exercise Objective: To prepare to create Vertical Geometry we need to open the Profile Model of the road we are working on.

Procedure:

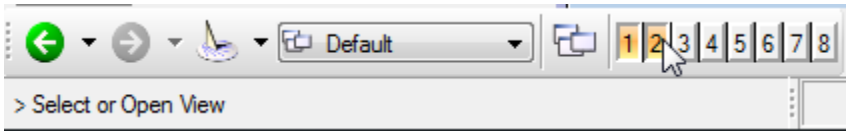
4. Click the **Element Selection** icon from the *Tasks > Vertical Geometry > Vertical Geometry Main > Open Profile Model* menu.



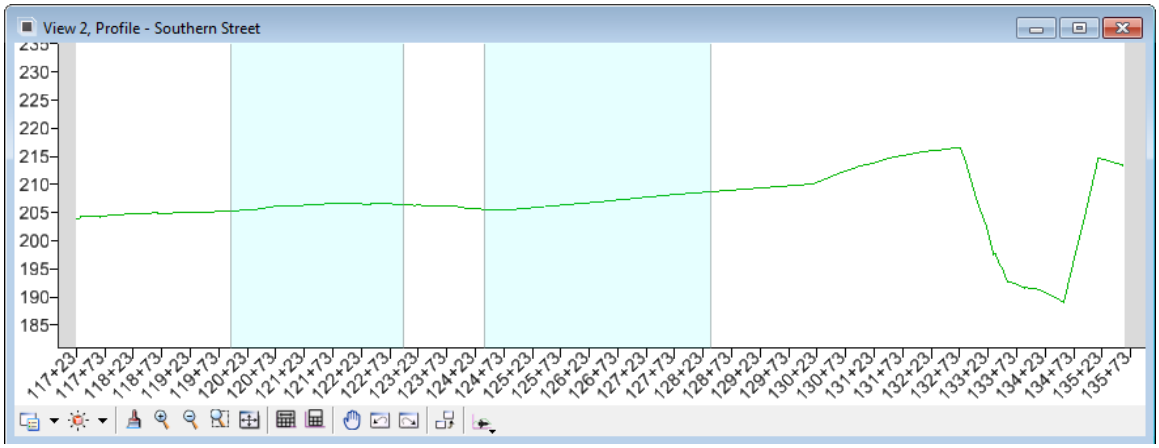
5. At the *Locate Plan Element* prompt, select the centerline of Southern Street.



6. At the *Select or Open View* prompt, click on View 2 (or place a datapoint in View 2 if it open).



A Profile View opens of Southern Street:

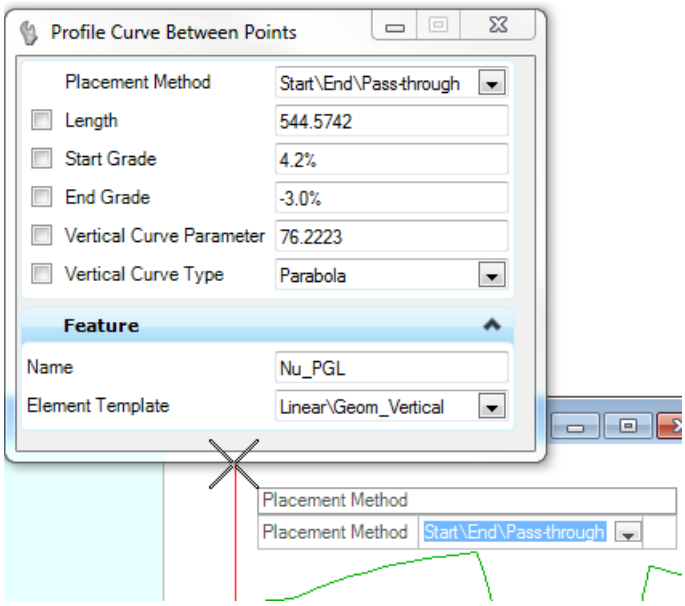


Exercise: Place Vertical Elements.

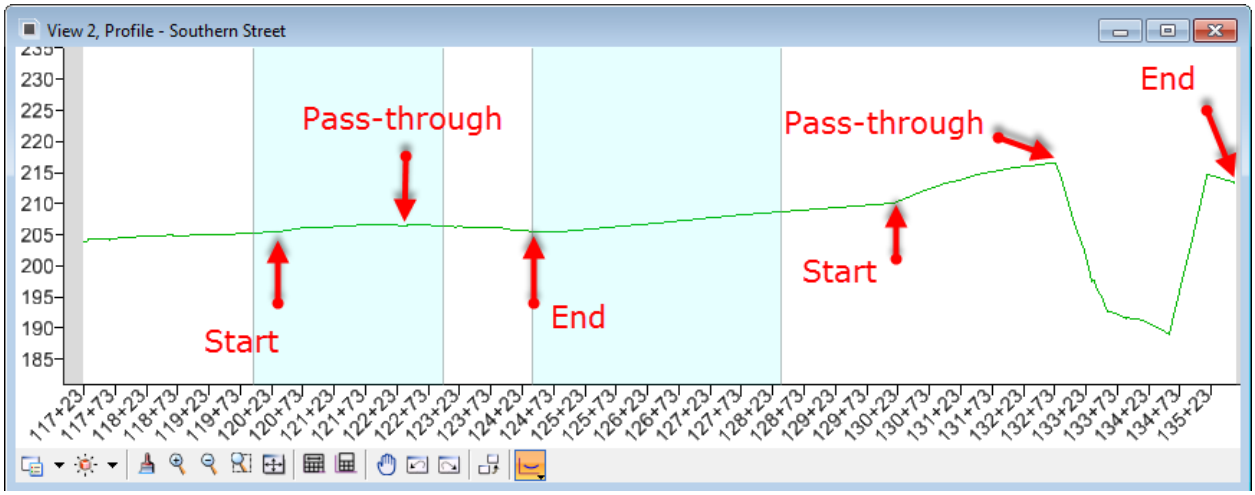
Exercise Objective: Place Individual Vertical Elements.

Procedure:

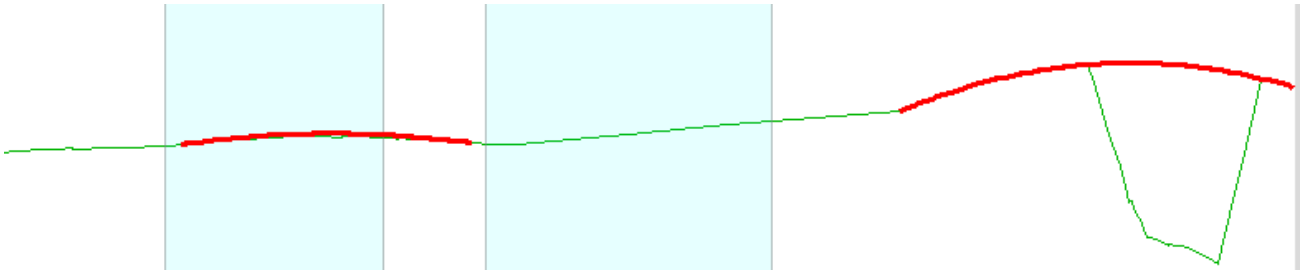
7. Click the **Profile Curve Between Points** icon from the *Tasks > Vertical Geometry* menu.
8. Clear all the check boxes, we will place two parabolas by snapping to three points each – no pre-defined parameters. We will want to use the **Start\End\Pass-through** Placement Method.



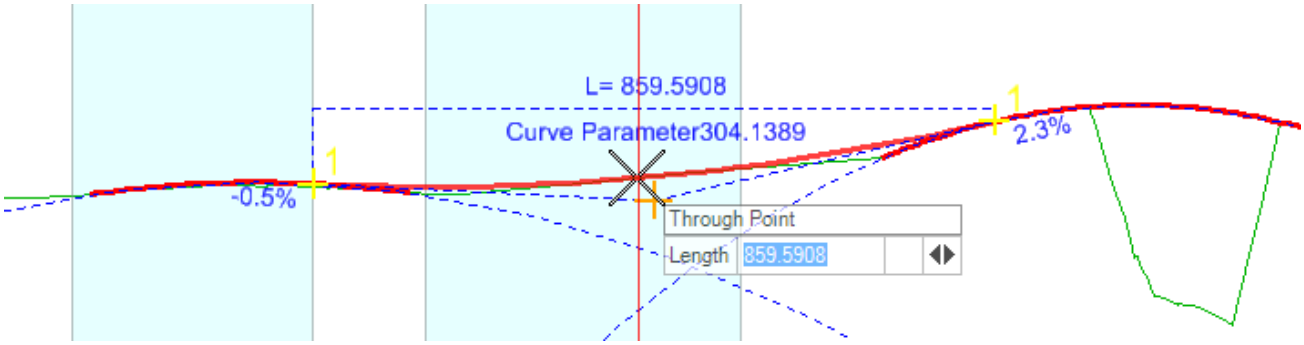
9. Place two Profile Curves by snapping to the existing terrain at the points indicated.



Your results should look like this (more or less).



10. Click the **Parabola Between Elements** icon  from the *Tasks > Vertical Geometry* menu.
11. We will want to *Trim/Extend* **Both** elements



Use any length you want (although 740 works well), trim both

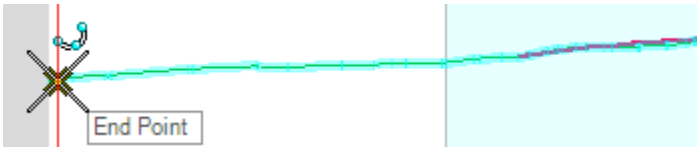
12. Click the **Parabola Between Elements** icon  from the *Tasks > Vertical Geometry* menu.

We will want to *Trim/Extend* **Both** elements.

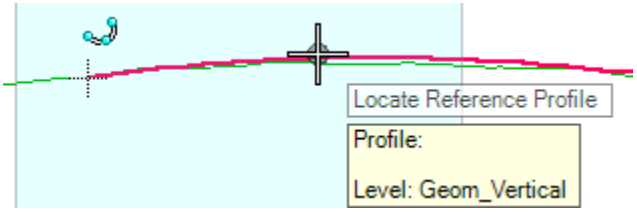
13. Click the **Tangent Profile Line to Element** icon  from the *Tasks > Vertical Geometry* menu.

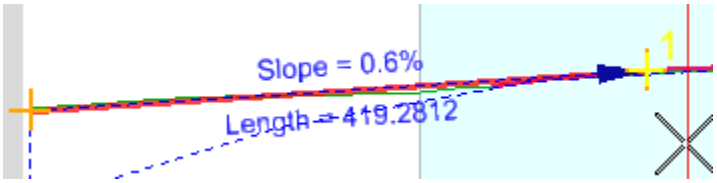
    We will want to *Trim/Extend* **Back** (the prompt really should be Yes/No).

14. At the *End Point* prompt, click on the left end of the existing terrain.

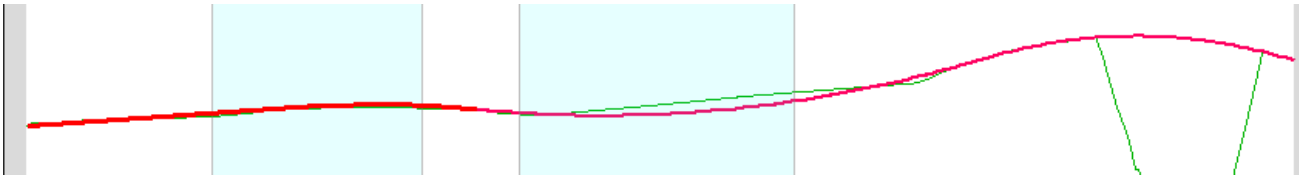


15. At the *Locate Reference Profile* prompt, we need to identify which of the profiles to connect to (the existing does count as a profile). Select the new curve.





After clicking through the prompts, we have a "solution," but it is made up of individual elements.



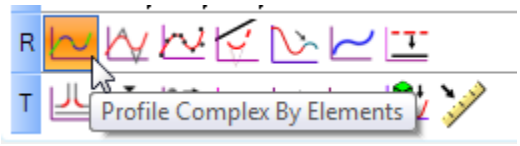
We will want to group them into a single unit.

Exercise: Make a "Full-Length" Vertical Solution.

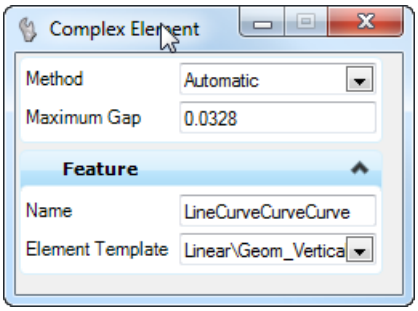
Exercise Objective: Use Profile Complex By Elements to make a single object that spans the full length of the profile.

Procedure:

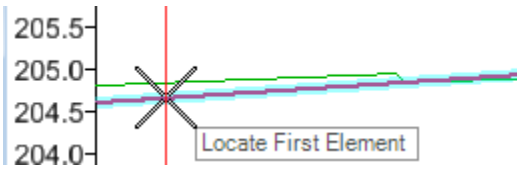
16. Click the **Profile Complex By Elements** icon from the *Tasks > Vertical Geometry* menu.



17. Try the **Automatic** *Method*. If it does not select the new four elements correctly, you can **Undo** and either increase the gap or use the **Manual** *Method*.

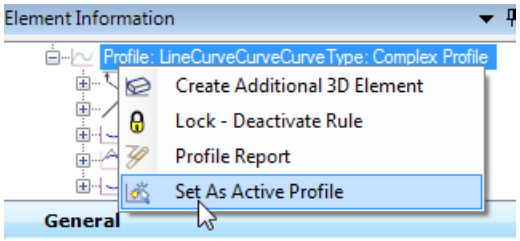


Note: at the *Locate First Element* prompt, make sure that you select the proposed element and not the existing:



18. Finally, make this the **Active Profile**, either by using the *Context Menu*.

Or by right-clicking in the Civil Model or Element Info and clicking Set As Active Profile



Bentley Civil Workshop

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OpenRoads Technology Workshop:

Creating a Corridor

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Chapter 9: Creating a Corridor

CREATING VERTICAL GEOMETRY

Exercise: Getting Started.

Exercise Objective: Starting Power InRoads V8i (SELECTseries 3) or Power GEOPAK V8i (SELECTseries 3).

Procedure:

19. Browse Launch MicroStation and set the following in the File Open dialog.

    User: examples

    Project: Bentley-Civil-Imperial

    Interface: Bentley-Civil

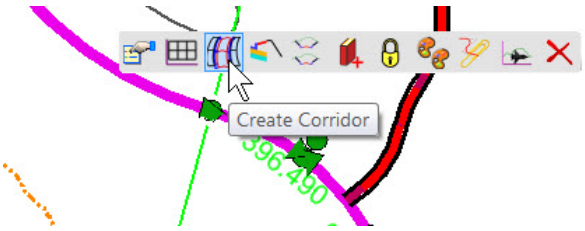
20. Open **geom_Creating_40_Corridors.dgn** from the folder *C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Products\DATA\60_3D-Building-Road.*

Exercise: Set the Active Terrain Model.

Exercise Objective: When working in Vertical or other 3D, it is good technique to ensure that a Terrain Model is Active.

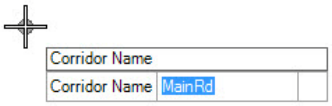
Procedure:

21. In view 1, select the main road alignment again. Hover over it and in the context toolbox select Create Corridor.

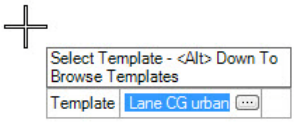


22. The second prompt is to choose profile. We have the option here of picking one from the profile model (view 2) or if we just click Reset Button then it will use whichever is active. Click Reset.

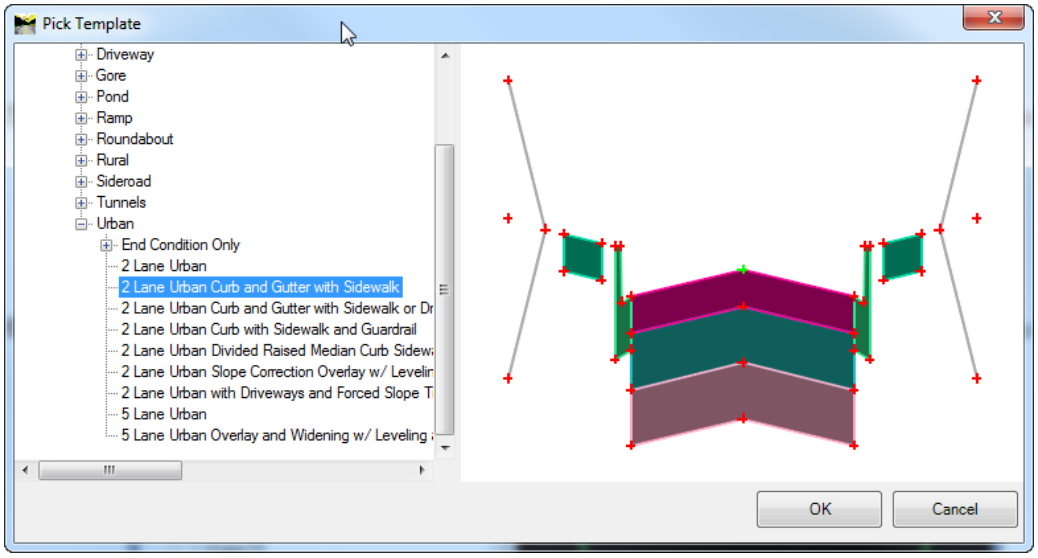
23. The corridor which we create needs a name. By default it uses the same name as the alignment. Just DP to accept this name or type a new one, then DP.



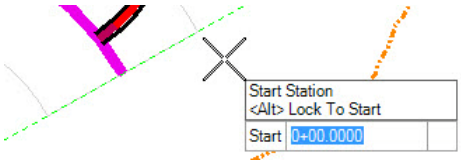
24. Next we need to choose which template to use. This prompt may be blank for you or It may list the wrong template.



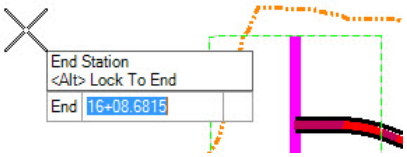
25. Click ALT>Down on keyboard to open the template library and choose **2 Lane Urban Curb and Gutter with Sidewalk** as shown below.



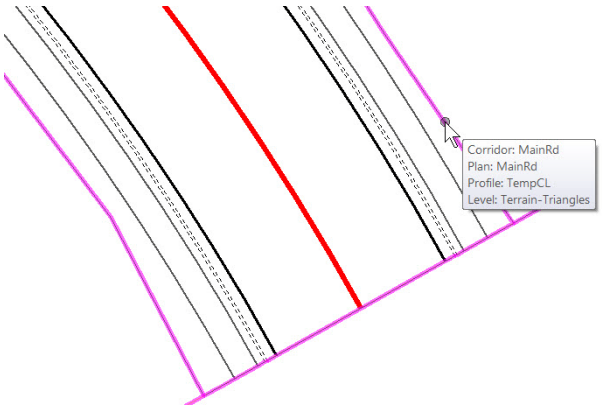
26. For start station, you can dynamically move cursor to the beginning (south end) or click ALT on keyboard to lock to the beginning.



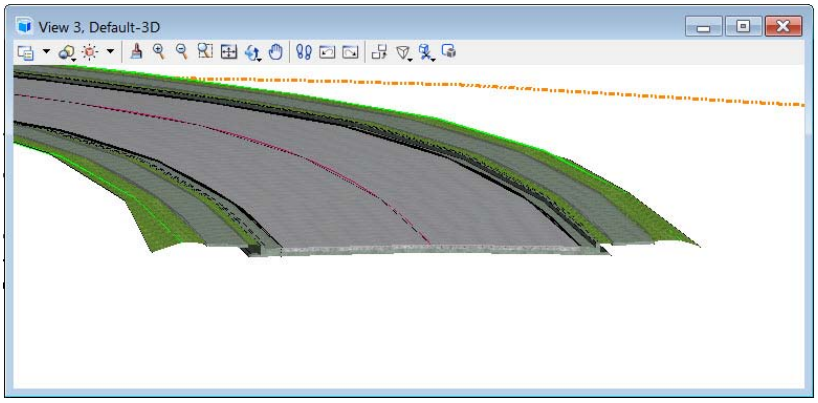
27. For end station, you can dynamically move cursor to the end (north end) or click ALT on keyboard to lock to the end.



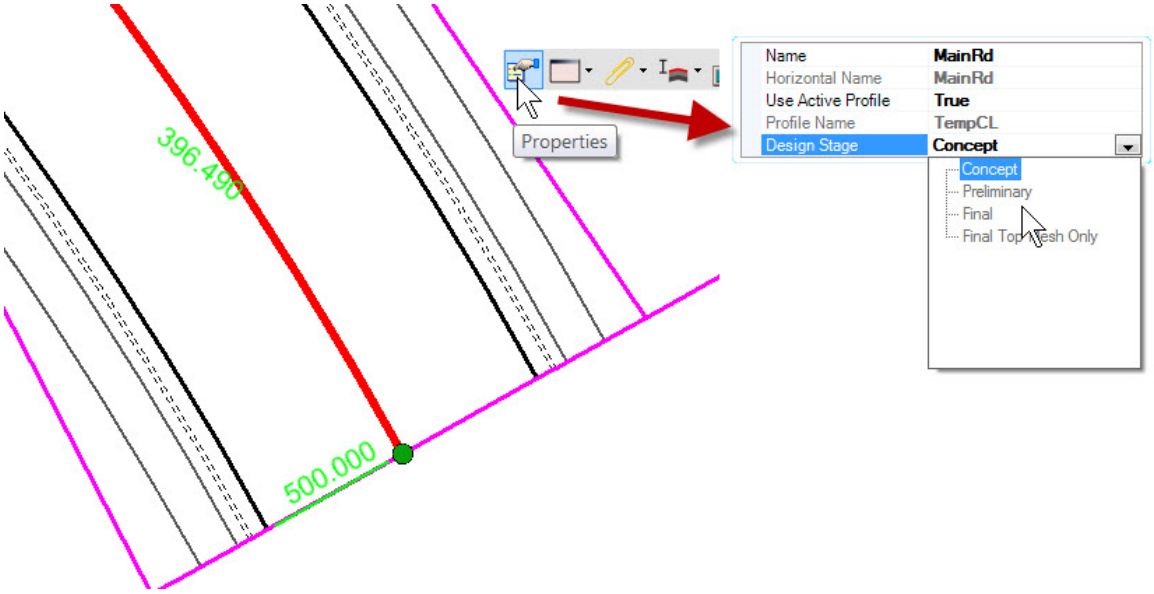
28. For drop interval use 25.
29. For minimum transition drop length enter zero for both prompts. This is used to transition between different templates which does not apply to this design.
30. Inspect view 1 to see the changes:
    i. A corridor was created – indicated by the green outline. This is what we will select in case any future edits are required.
    ii. The following features were created:
        1. Edge of Pavement left and right
        2. Curb lines left and right.
        3. Sidewalk left and right.



31. Open view 3 to inspect the 3D model.



32. You may notice that the 3d model is a little jaggy. The resolution is probably fine for this stage of development, but we can increase the resolution.
33. In view 1, select the corridor and open the properties.



34. In the Design Stage Property, change it to Final, which will improve the resolution of the 3d model.

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OpenRoads Technology Workshop:

Building Pads Vertical

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Chapter 10: Building Pads Vertical

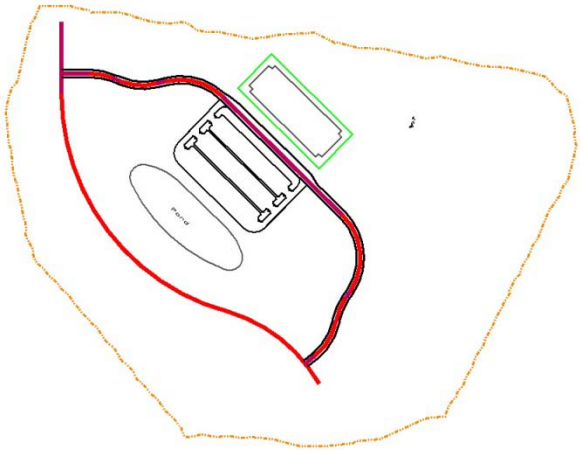
CREATING A BUILDING PAD

Exercise: Designate Existing Ground.

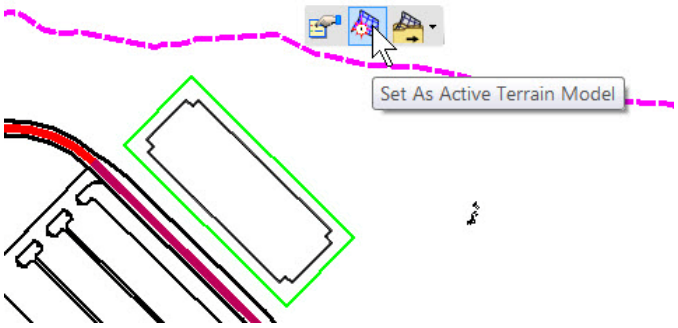
Exercise Objective: In this lesson we will create a design for a building pad on our commercial site project.

Procedure:

1. Open *SitePlan3D_BEGIN_CivilCells.dgn* in the **C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\70_3D-Building-Site** folder. Most of the horizontal geometry has been laid out for you. We'll inspect some of it as we go along while designing the site.



2. Notice too, that the existing ground terrain model we created above exists in a reference file and has been displayed with only the boundary shown.
3. Select the terrain model.



4. After you select it, hover the cursor over the terrain model and a toolbox will appear, as shown above.
5. The second command is Set As Active Terrain Model. Active Terrain Model is, for most projects, existing ground.

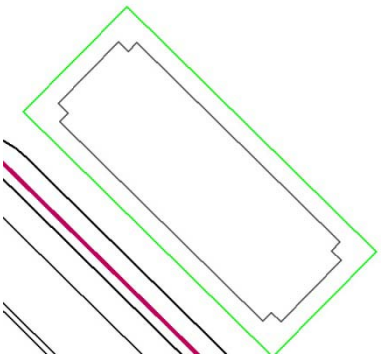
***Note**: The Active Terrain Model is used for a few different things. It is automatically shown in all profile views and is used by default as the target for commands which seek a surface..*

Exercise: Design a Building Pad

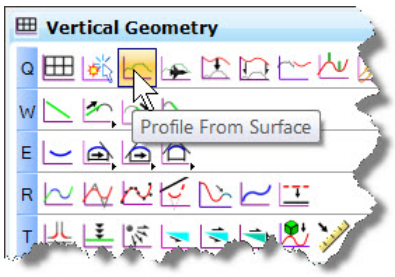
Exercise Objective: This exercise will guide you to create a building pad.

Procedure:

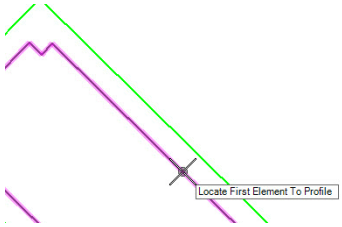
6. Zoom in on the building. Our goal is to set the building pad elevation at 2.0 feet above maximum existing elevation found under the pad.



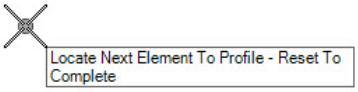
7. In Task Navigation, start the command, Profile From Surface



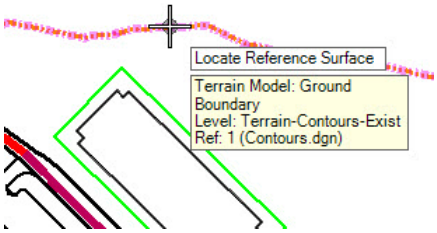
8. Pick the building pad element



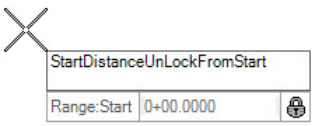
9. Reset to continue



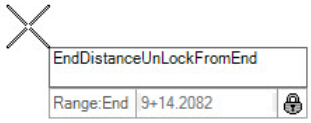
10. Then pick the existing ground surface, which will be used to determine elevation.



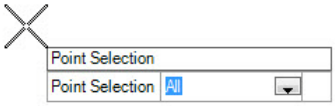
11. Click the ALT key on keyboard to lock start station to beginning



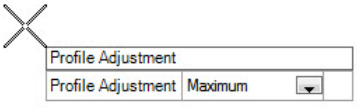
12. And ALT key to lock end station to end. This computes elevation for the entire perimeter of the pad.



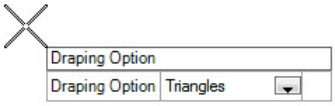
13. Set point selection to all. Use Up/Down arrow on keyboard to change this value if needed. This means that the pad is evaluated all around the perimeter.



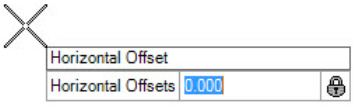
14. Set Profile Adjustment to Maximum, which means that after evaluating around the perimeter, it will use the maximum found value for the pad.



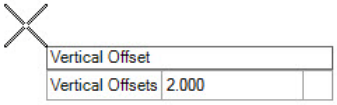
15. Set Draping option to triangles to evaluate at every triangle leg.



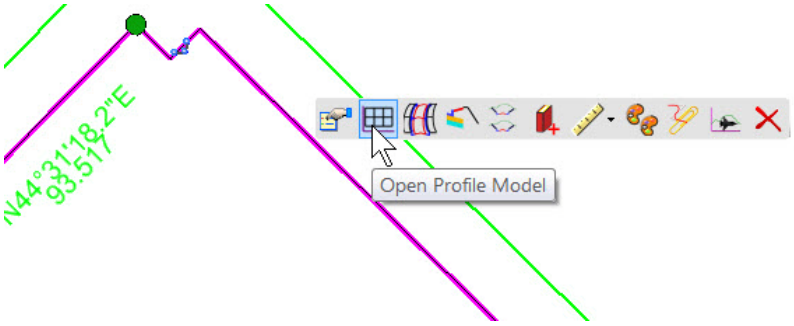
16. Set Horizontal Offset to zero.



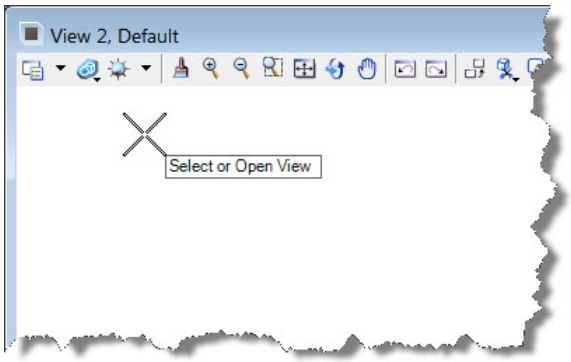
17. Set vertical Offset to 2.0, which will add 2 feet to the above noted maximum.



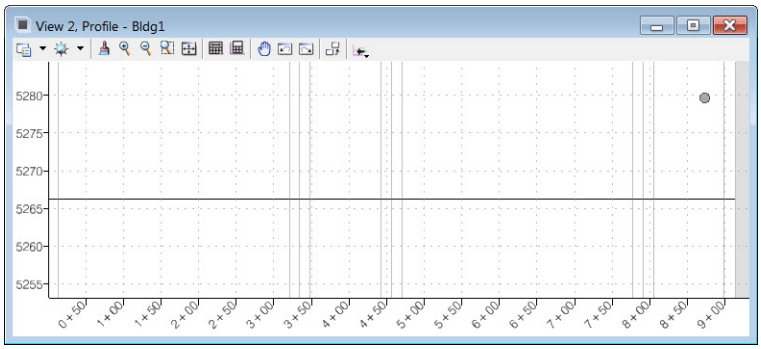
18. Let's inspect the computed profile. Select the building pad element, and on the context toolbox, click Open Profile.



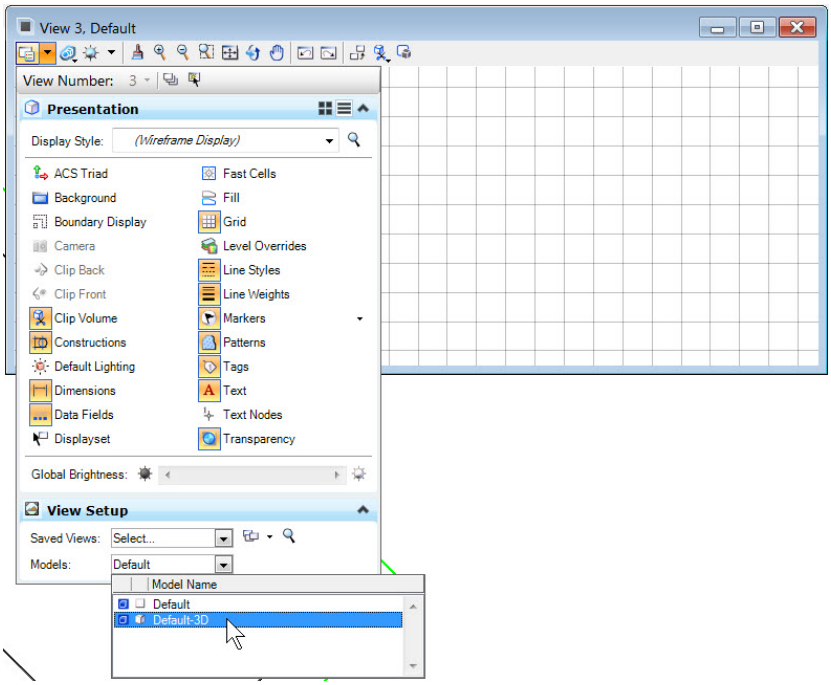
19. If view 2 is not already open, open it and click in the view, which opens the profile for the building pad.



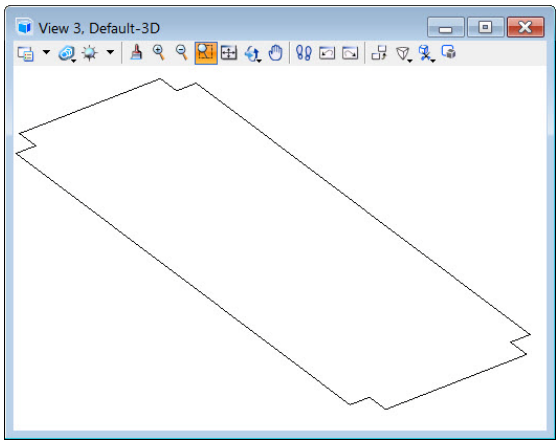
20. This will open the profile. You should have a flat profile at about elevation 5266.



21. Now, open view 3 and in view attributes, set the model to Default 3D

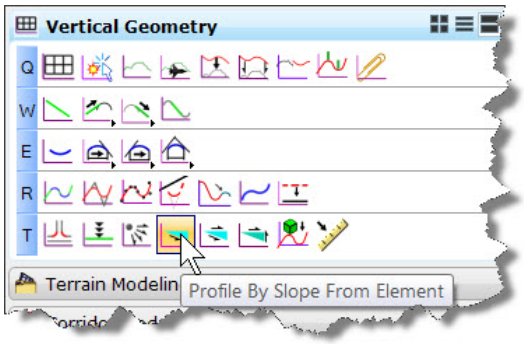


22. Rotate the view into isometric and see our building pad model. There are no side slopes yet and the pad is incomplete.

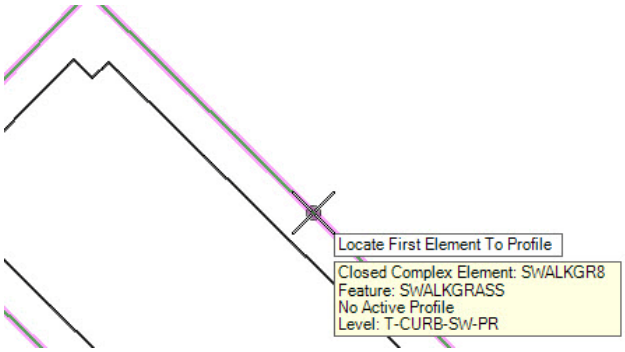


23. We'll return to view 3 from time to time to inspect the progress of our model.
24. Back in View 1, we need to compute a slope from the pad element out to the green rectangle which serves for sidewalks and etc.

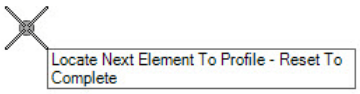
25. Start the command, Profile By Slope From Element



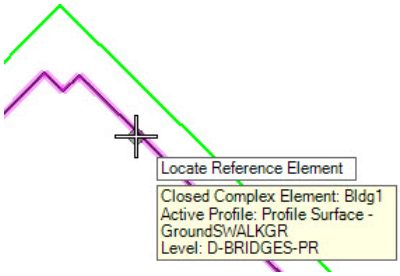
26. Pick the green sidewalk edge. This is the element we want to define vertically.



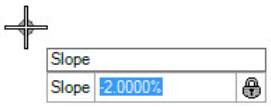
27. Reset to continue



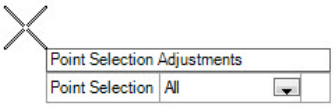
28. Pick the building as reference element. This is the element used to compute slope from.



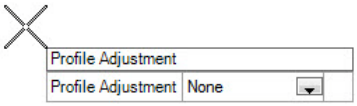
29. Set slope to -2.0%



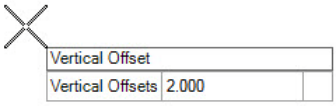
30. Point Selection is All.



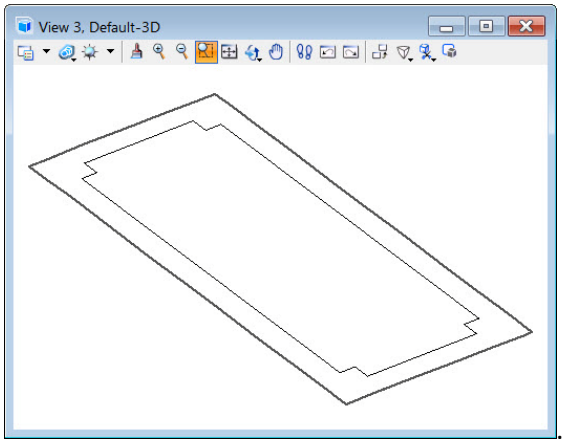
31. Adjustment is None



32. Vertical offset is zero.



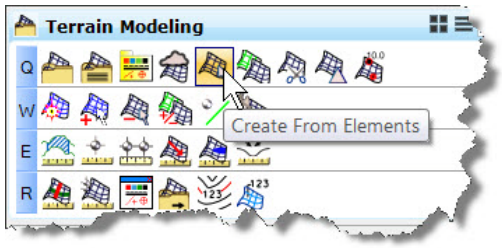
33. Review View 3 to see your progress.



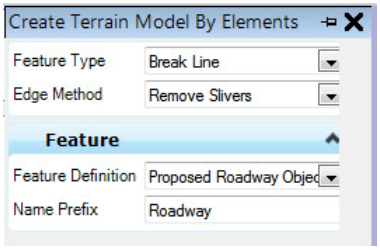
Exercise: Make a Terrain of the Building Elements.

Procedure:

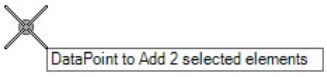
34. In view 3, Select the two 3D elements and create a terrain model like we did in Chapter 1, except the elements will be break lines instead of contours.
35. Start the Terrain Model By Elements command.



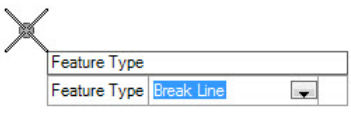
36. Populate the feature definition in the command dialog as shown below. You can also populate the feature type and edge method as shown if you wish but these will be prompted.



37. Datapoint to accept the selected elements



38. Set feature type to Break line. Use up/down arrows on keyboard. The DP to accept.

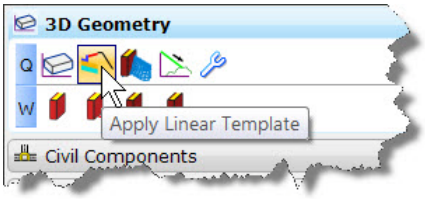


39. Set edge method to slivers. DP to accept. Note that max triangle length is also a valid option.

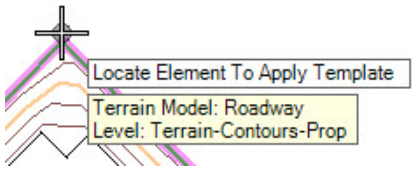
Exercise: Add tie slopes

Procedure

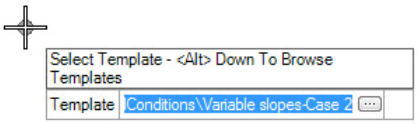
40. Start the Linear Template command.



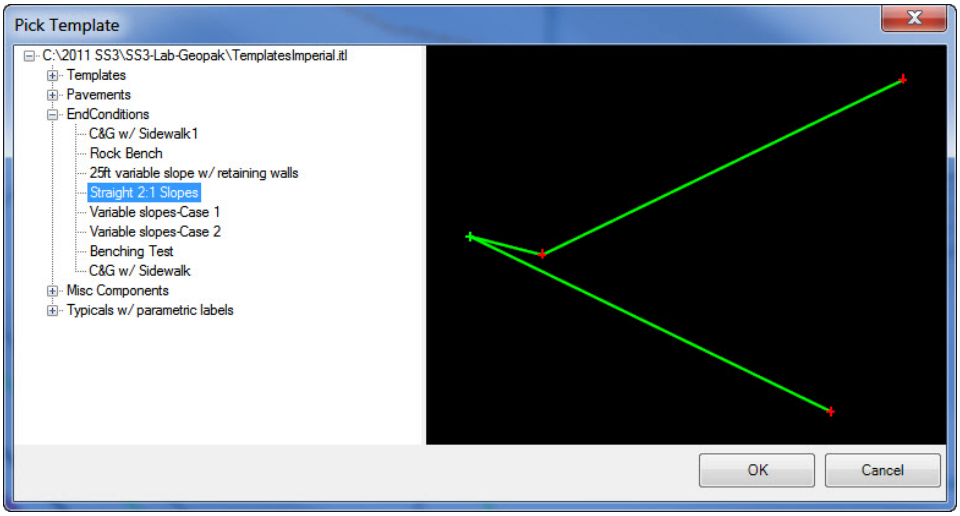
41. In view 1, Select the green sidewalk edge as the element to apply the template. You can also attach the linear template to the terrain model we created of building.



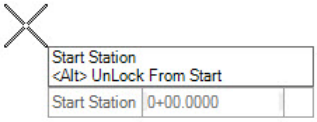
42. The template we need is probably not listed.



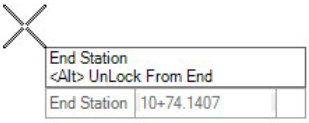
43. On keyboard, click ALT > Down Arrow, which will bring up the template library. Choose template named **Straight 2:1 Slopes** as shown.



44. For start station use the locked beginning station. Use ALT to lock it if it is not locked.

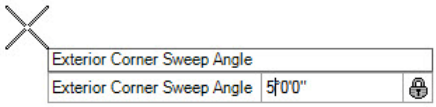


45. For end station lock to end.

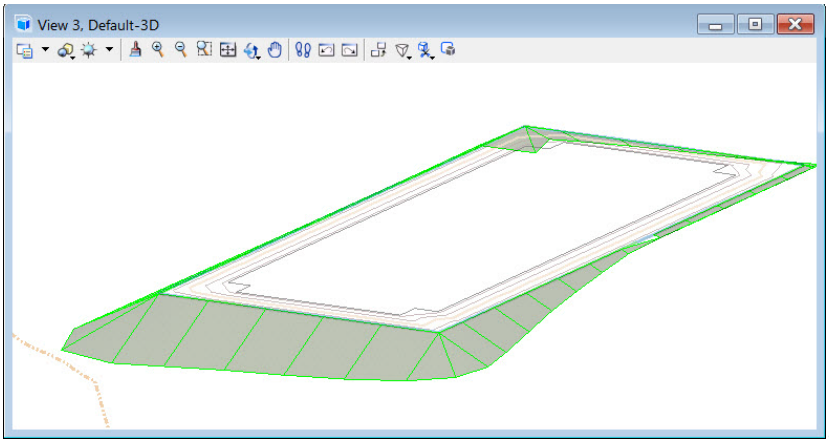


46. Use the cursor to set side on the outside of the element.

47. Set corner sweep angle to 5. This determines how to compute the tie slopes on sharp corners. If value of zero is used then side slope will be sharp. Non-zero makes rounded corners.



48. Now, inspect view 3 again and see our side slopes.



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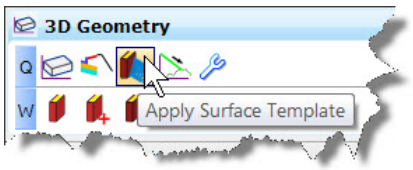
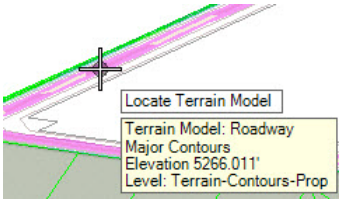
Exercise: Add Sub-layers

Procedure:

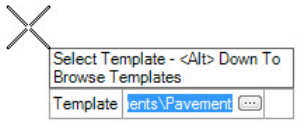
49. We lack one thing now for our building pad. We need some sort of layers of paving material. This might be just gravel, or perhaps multiple layers of bitumen or concrete. Start the Area Template command.



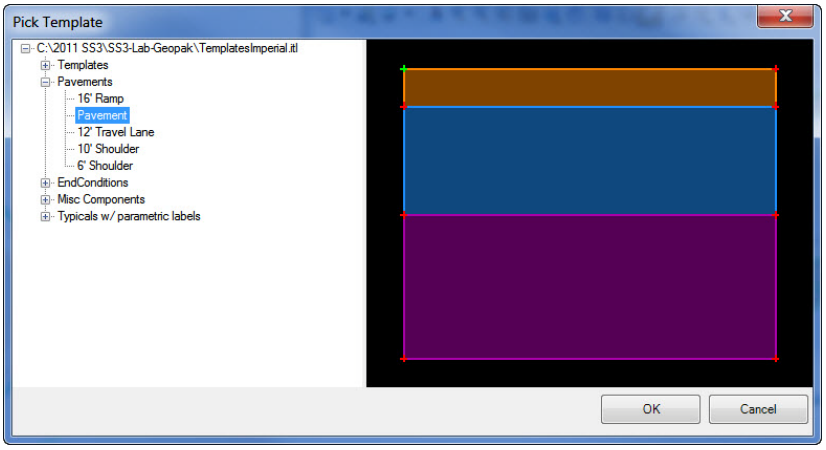
50. Select the terrain model we made of pad earlier.



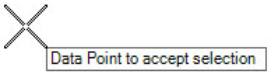
51. At the prompt for template, use ALT > Down Arrow…



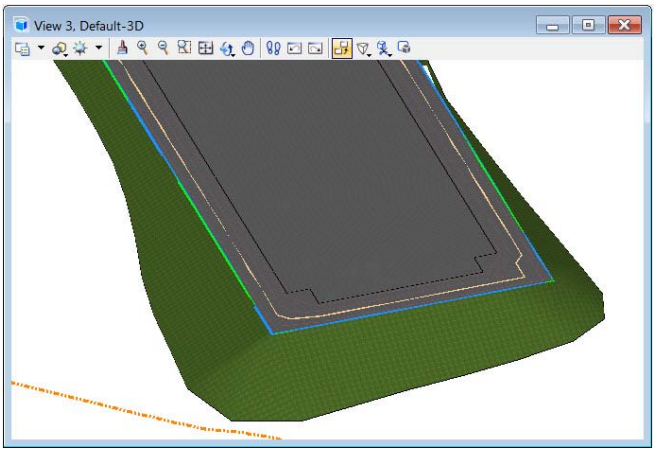
52. …to open template library and choose as shown below.



53. Then data point to accept.



54. With Smooth Shading t[RG1]urned on in view 3, we can now see our finished building pad.



Bentley Civil Workshop

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BCR1WK2

OpenRoads Technology Workshop:

Place Cells – Building Pads

Bentley Systems, Incorporated
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Exton, PA 19341
www.bentley.com

Chapter 11: Place Cells – Building Pads

CREATE A BUILDING PAD USING CIVIL CELL

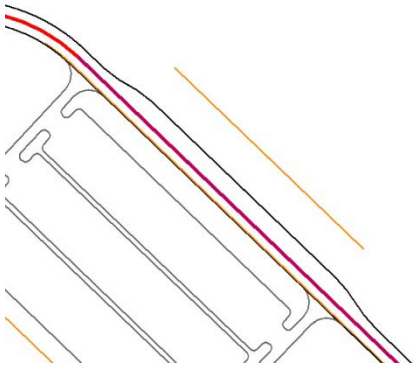
Exercise: Designate Existing Ground

Exercise Objective: In this lesson we will use an alternate method utilizing civil cells to design the building pad. A civil cell is pre-constructed set of geometry and model elements that can be reused across many projects. The complexity is as simple or complex as you choose to make it. The layout can be 2D geometry only or include profile and 3D designs as well.

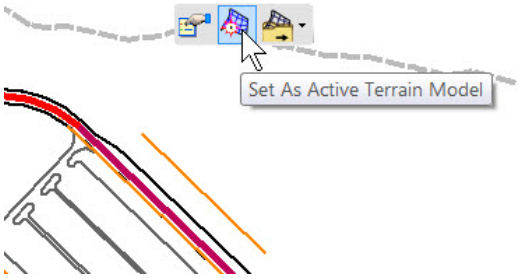
Procedure:

1. Open *SitePlan3D_BEGIN_CivilCells.dgn* ***in the*** **C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\70_3D-Building-Site** folder. Most of the horizontal geometry has been laid out for you. We'll inspect some of it as we go along while designing the site.

2. You will note that instead of a full building pad drawn in, we have only a line to indicate location and direction of the building.



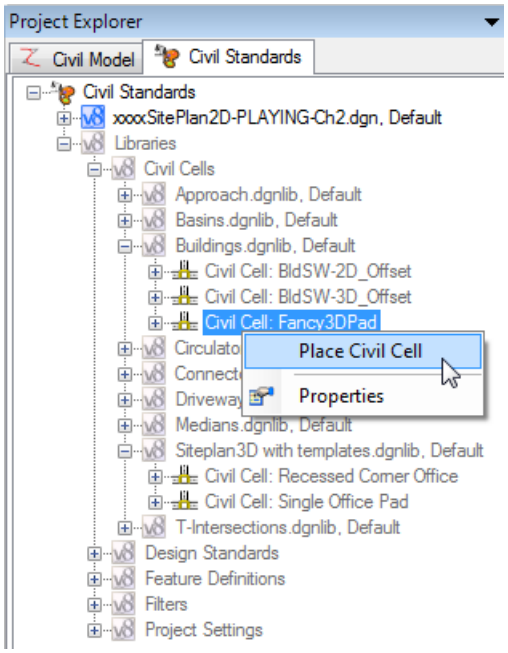
3. Select the terrain model.



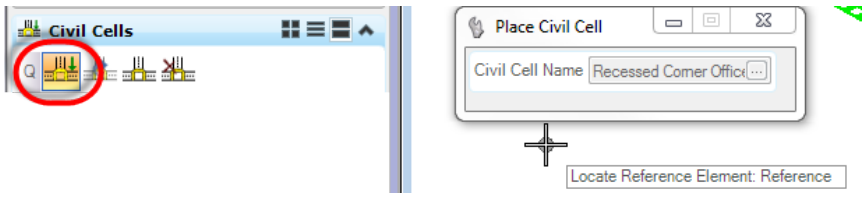
4. After you select it, hover the cursor over the terrain model and a toolbox will appear, as shown above.
5. The second command is Set As Active Terrain Model.
6. Open Project Explorer to Civil Standards (**File > Project Explorer**)

   ***Note**: If you do not see the Civil Standards tab as shown above, go to **Settings > Project Explorer** to turn it on.*

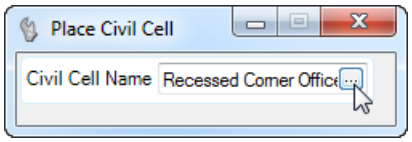
7. There are a number of function-specific Civil Cell Libraries, right click on the Civil Cell named **Fancy3DPad** in the **Buildings.dgnlib** and choose **Place Civil Cell**.



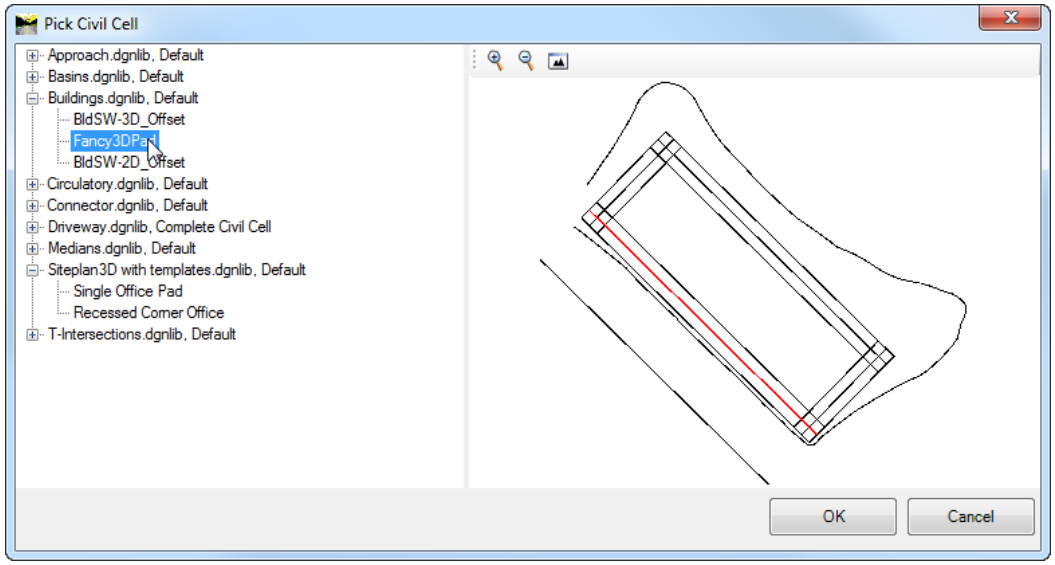
Alternatively, you can Place Civil Cells via the Civil Cells > Place Civil Cell task:



Note: the tool assumes that you are placing the previously-place Civil Cell. To select a different one, right-click once to enable the Browse button and then select it.

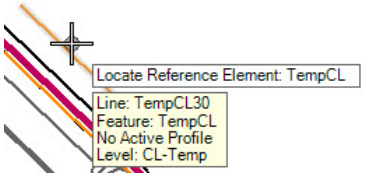


This opens the Pick Civil Cells dialog.

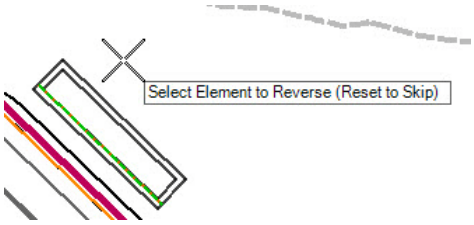


Select Fancy3DPad from the **Buildings.dgnlib**.

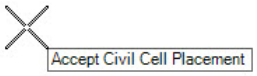
8. The first prompt is to select the reference element. In this case, the reference element is the orange line which defines the front face of the building. For any given civil cell, the number and type of reference elements will depend on how the civil cell is constructed.



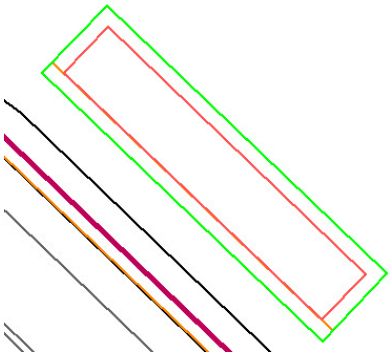
9. The next step is to choose elements to reverse. This is because the final reference elements may be drawn different direction than the cell elements. In order to properly construct the cell then these elements will need to operate in a reverse fashion. Note: the elements are not reversed. The rules from the cell are reversed.



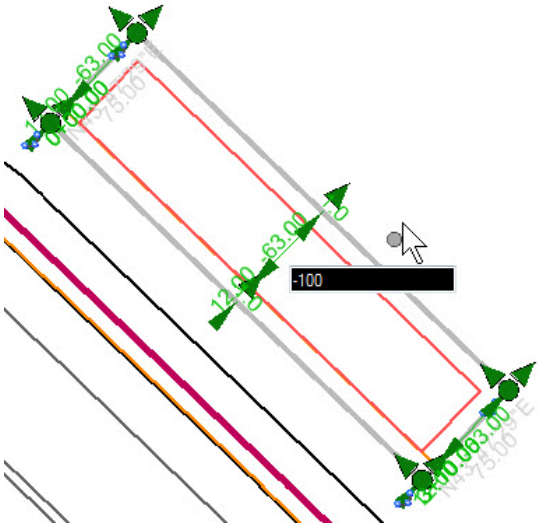
10. Once the element rules are properly configured then DP to accept the cell placement.



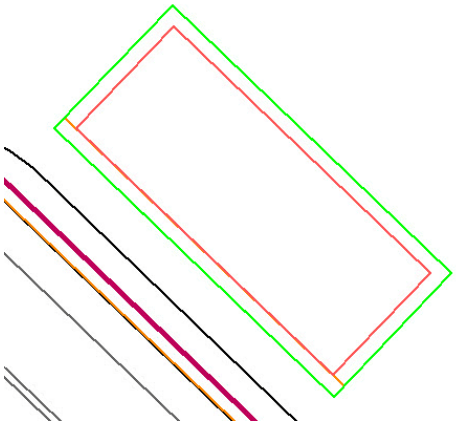
11. The building is designed in one step, 2D and 3D.



12. You'll notice that the dimensions are a little different than above. This is because, we created the cell to be fairly simple. But, we can adjust the dimensions. Select the green sidewalk element.

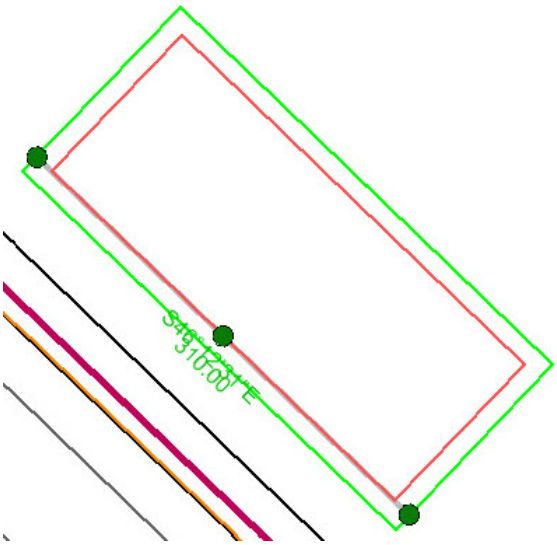


13. Notice the width of building is set to 63. Click on the text manipulator and type -100 in place of 63.



14. Now the proportions look more like our original design.
15. Lessons learned for discussion:
    i. The civil cell can automate complex geometry and modeling workflows.
    ii. In the cell we used above, we designed it to be simple. There was only required a single reference element pick. This control element defines the length and direction of the building.
    iii. We could have made the cell with a second control line to control width as well.
    iv. But, since it is easy to edit after the fact, our cell was kept simple.
    v. Editing the cell after placement does not negate the fact that it is a cell.
    vi. The exact nature and usage of a particular civil cell is dependent on how it is designed. System Administrators will need to document expected usage and required reference elements.

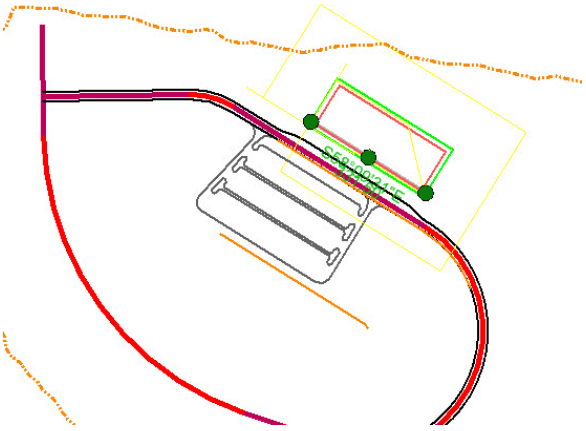
16. We can further edit the final building by editing manipulators, as we did above, or by editing the control element



In this case, the control element is a simple **Line Between Points**.

17. Place a new reference line anywhere within the terrain limits. Make it **150** feet long or so. Use g **Line Between Points**.
18. Place a new Building cell "on" the new reference line.
19. Move the new reference line of the new building.

Note that if you move the reference line of the *original* Building, you'll notice that a great many other things change. This is because the entrance road and parking lot are dependent on the reference line of the building.



Bentley Civil Workshop

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OpenRoads Technology Workshop: Corridor Modeling

Team Leader: Jeff Martin, PE

Team Members: Robert Garrett, PE & Joey LouAllen, PE

Bentley Systems, Incorporated
685 Stockton Drive
Exton, PA 19341
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Chapter 12: Dynamic Cross Sections

OVERVIEW

This section will cover the Cross Section View tool. The cross section view is powerful tool to aid the engineer to make design decisions. These sections use Dynamic Section Technology from MicroStation. This gives the sections the ability to cut through any Elements that are displayed in the DGN file. The graphics can be created from Bentley Civil or any other discipline, which makes this technology a valuable asset.

This section will also examine the 2D and 3D MicroStation models with the Civil Model particularly with use of the Dynamic Section tool.

OPENING A DYNAMIC CROSS SECTION VIEW

Exercise: Opening a Cross Section View.

Exercise Objective: In this exercise, the user will learn to open a view and set it to a cross section model view.

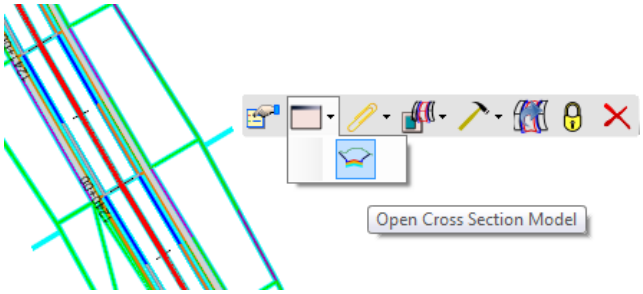
Corridor Modeling Tool Used:

CORRIDOR MODELING PANEL	ICON	TOOL
		Open Cross Section View

Procedure:

20. ***Open*** *SitePlan3D_BEGIN_CivilCells.dgn* ***in the*** **C:\2013 Civil_LEARNing\BCR1WK2 - Getting Started in SS3 Bentley Civil Power Products\DATA\70_3D-Building-Site** ***folder. Most of the horizontal geometry has been laid out for you. We'll inspect some of it as we go along while designing the site.***

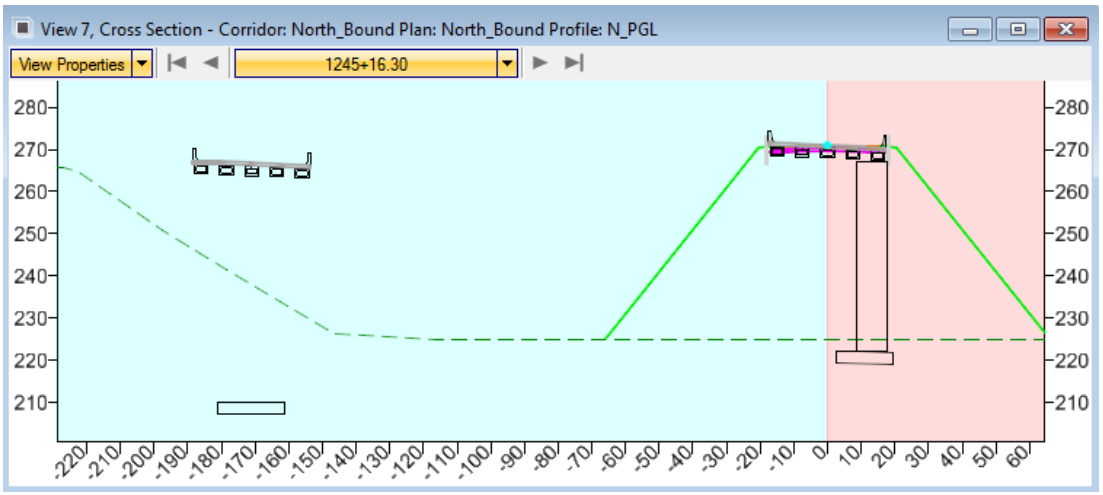
21. Using the MicroStation Select tool, Select the North_bound corridor south of the bridges by its green markers near the boundary of the corridor to Context Tool Bar and navigate to
22. **Open Cross Section Model**.



23. **Data Point** in View 7 to display the corridor's Dynamic Sections.

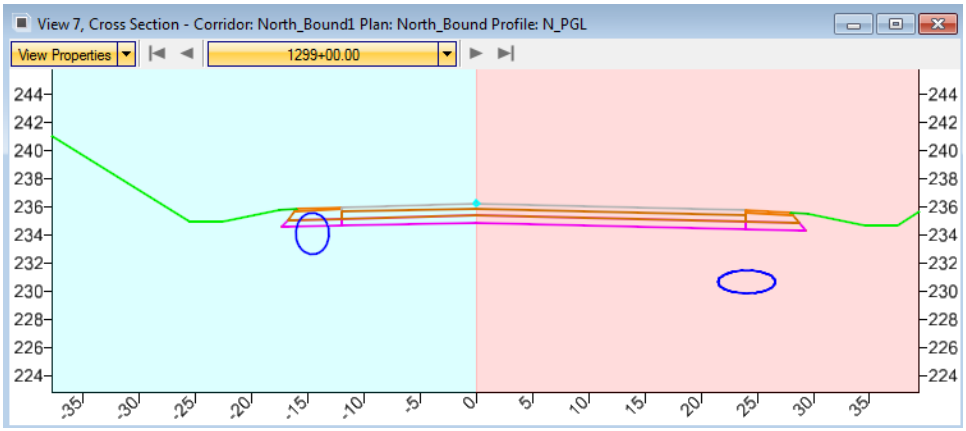
Note	The Civil Model managed the required 3D Model needed to accurately Cut dynamic Sections. This intelligence helps stream line the management of referencing of the 2D and 3D models that OpenRoads creates and uses.

24. Navigate and examine the section.



25. Make View 8 with Default-3D model active and then Reference in the Drainage.dgn
26. Cut Dynamic Sections for corridor **North_bound1**. Using the MicroStation Select tool, Select the northbound corridor, North_Bound1, north of the bridges by its green markers near the boundary of the corridor to Context Tool Bar and navigate to **Open Cross Section Model**.
27. **Data Point** in View 7 to display the corridor's Dynamic Sections.
28. Use the Navigation Tools at the top of the cross section view to examine the cross sections. Examine the area near the drainage structures on the northerly limits of the North_Bound1 corridor.
29. Navigate to 1299+00. Note the drainage structure's depth.

Hint	Right Clicking in the Cross Section View and selecting View Properties will display a variety of tools that are specific to Cross Sections.



Note	The Cross Section view instantly provides feedback to the designer; in this case the pipes do not have enough cover. Remember, superelevation has not been applied to this corridor so this condition will be made worse. This allows the issue to be rectified earlier in the design instead of waiting to do clash detection or publish cross section sheets to find issues.

30. Dismiss the Cross Sections by closing **View 7**.

CHAPTER SUMMARY

In this chapter, we have introduce and learned to use Open Cross Section View.

Learning Paths

All of our training through Bentley is accessible via learning paths, ready-made training plans that provide the recommended progression of skills training for a product, solution, job role, or experience level.

In developing your team, you can choose from Bentley-recommended learning paths or configure your own to meet your teams specific needs.

Learning paths help us:

- Develop our internal talent pool
- Make our employees more productive
- Prioritize learning topics by what is important to us as a company
- Reinforce our corporate culture of continuous learning

Assessment (original)

1. ***True or False: Civil Rules are the way that OpenRoads remembers your Design Intent.***

- True.

~~2. *What is the quickest way to change the cross slope of a simple road?*~~

~~- click the Edge of Pavement, key in a new value in the Slope field.~~

3. ***Which of the following are true about Profile from Surface?***

   a. ***It's a good way to create an existing Profile Grade Line for a road***

   b. ***It's a good way to drape a building at least 1' above ground***

   c. ***It's an easy way to create a ditch bottom that slopes directly from 2' below the ground at the upper end to 2' below the ground at the downstream end.***

All of the above

4. ***What time-saving Rule-based design technology minimizes re-work on similar objects?***

Civil Cells

Assessment (revised)

1. ***True or False: Civil Rules are the way that OpenRoads remembers your Design Intent.***

- True.

2. ***True or False: Adding Rules to MicroStation graphics is just as powerful as using OpenRoads Technology Tools from the beginning?***

False.

3. ***What is the quickest way to change the radius of a Curb Return?***

click the radius element, key in a new value for the radius.

4. ***True or False: A Complex Element has far more software features and dependencies associated with it than a single geometry element like one created from a tool like "Place Line Between Points".***

False.

5. ***True or False: Creating Vertical Geometry use very different software technology for Site workflows than for Corridor Workflows.***

False.

6. ***What time-saving Rule-based design technology minimizes re-work on similar objects?***

Civil Cells

Glossary

2D Point Feature	Contains no elevation (Z). 2D Point Features are defined and stored in plan model.
3D Geometry	3D geometry is created in 3D model by mathematically combining the horizontal and vertical geometry to create 3D elements. These 3D geometry elements in turn define a design model.
3D Model	This is created and managed automatically. User can interact with it but this is not usually required. The mathematical combination of Plan Geometry and Profile Geometry is stored in the 3D model.
3D Point Feature	3D points can be defined in plan model or 3D model. They are stored in 3D model but represented in both plan and 3D.
Active Object	The current object to which is added all geometry which is created.
Active Profile	Of the multiple possible profiles for an element, the active profile is the one used for design. The active profile is combined with the horizontal geometry to build a 3D element which is used in the 3D model.
Active Terrain Model	One terrain model can be designated as “Active”. The active terrain model is the one used to display “existing ground”; in other words the one which displays automatically in a profile model when it is opened. The active terrain model is also the one which is targeted by side slopes unless the template defines a different target by name.
ALG	A legacy (proprietary) InRoads file containing coordinate geometry information, superelevation, and alignment information for a specific geometry project.
Alignment	A linear feature which serves the special purpose of defining the centerline or baseline of a roadway.
Apply Linear Template	Applies a corridor template along a feature while hiding some of the complexity of creating a corridor.
Apply Surface Template	Applies a corridor template to a terrain model for the purpose of creating components (such as pavement layers) under the terrain model.
Arc Definition	Curve definition method generally used in roadway applications. The radius R is used to define the curve and is defined by the equation R=5729.58/D where the degree of curvature D is the central angle subtended by a 100-foot arc. Set in the Design File Settings > Civil Formatting under Radius Settings. *See also Chord Definition.*
Aspect	An angular measure of the direction that the face of a surface is oriented. The format of the value is dependent on angular settings In the DGN file.

Base Geometry	In many instances the geometry element will be trimmed. The original (or base), untrimmed element is always preserved as it is the storage for the rule.
Boundary (Terrain Model)	Used to constrain the external boundary of the terrain model. No triangles are created outside the boundary. In addition, any point data outside the boundary is ignored.
Break Line	A surface feature consisting of a collection of spatial coordinates that have an implied linear relationship. No triangle side (in the triangulated surface) can cross over a break line.
Break Void	A closed area of missing or obscured data that uses the elevations of each vertex, while the void lines between successive void coordinates are inserted as break lines. Therefore, break voids change the slope and elevations of the TIN surface.
Cardinal Points	One of the points used to define the geometry of an alignment. Cardinal points include PC, PT, PI, and CC points for horizontal geometry and VPC, VPI and VPT for vertical geometry.
Centroid (triangle)	Geometric center of a triangle in a terrain model.
Chord Definition	Curve definition method generally used in railway applications. The radius R is used to define the curve, and is defined by the equation R=50/SIN(0.5*D) where the degree of curvature D is the central angle subtended by a 100-foot chord. *See also Arc Definition.*
Civil Cell	Used as a mechanism to preconfigure commonly used complex geometric layouts. These layouts will commonly be stored in DGNLIB files for reuse across multiple projects but it is possible and sometimes useful to store directly in an active DGN file for use in that single location. The civil cell will contain horizontal geometry and can also contain the vertical geometry.
Civil Message Center	Used to display a continuous updating log of Civil messages, including warnings and errors. As errors and warnings are resolved, they are removed from the list. New messages are added whenever the conditions warrant. Most messages relate to civil geometry, superelevation, and corridor modeling.
Civil Template	A civil design concept used most often for corridor modeling but also has other applications. The Civil Template defines the cross-sectional shape of the object being modeled. This cross-section is then “extruded along” a 3D geometry element to form the final model. The corridor template can create or target features such as road edges. The result is the creation of a corridor.
Clipping Reference	Clipping allows you to remove areas of overlap when working with multiple corridors in a single surface. For example, in a corridor intersected by a crossing roadway, clipping would be used to remove all overlapped features within the intersection.
Complex Terrain Model	A terrain model created by merging or appending two or more terrain models.

Context Toolbox	When an element is selected, hovering over the element provide a heads-up and context sensitive toolbar which pops up at the cursor. This toolbar provides a few of the most commonly used tools which operate on the element selected element type. The first tool in this toolbar is always Quick Properties.
Contour	A linear symbol representing points of equal elevation relative to a given datum.
Contour, Isopach	Contours of a delta terrain model which represent cut and fill values as contours, not elevations. A positive contour represents fill, while a negative contour is cut.
Contour, Major	The primary elevation line indicating a specific elevation in a surface model. Usually major contours are drawn with a heavier line weight or using a different color. Elevation text labels are usually drawn in association with major contours.
Contour, Minor	A secondary elevation line indicating a specific elevation in a surface model. Minor contours are often drawn without special color or weight indexing and without elevation text labels.
Corridor	A civil object used for modeling a roadway and is automatically managed by the corridor modeling tools.
Cross Section Model	DGN models (extracted perpendicular to defined horizontal geometry) with special station elevation coordinates defined and other specialized capabilities such as view exaggeration. Cross section stations match the interval in the template drop when a corridor is used as the basis. When horizontal geometry is utilized, the left / right offsets and interval are user-defined.
Curve Stroking	Stroking is the process of automatically adding shots to the terrain model or corridor by interpolating new shots from the curved sections of the data. This distance is used to interpolate new shots along the curved element in corridor processing and applying linear templates. This value is used as a perpendicular minimum distance from chords generated along the arc. Chords are drawn along the arc and the perpendicular distance is measured from the middle of each chord to the arc. If this distance is larger than the Curve Stroking, the process is repeated with a shorter chord length. This process is repeated until the end of the curve is reached. The flatter the curve, the fewer number of points will be calculated. The steeper the curve, the greater number of points that will be calculated.
DDB File	GEOPAK file (Design DataBase) which contains features definitions, associated symbology and annotation settings.
Delta Terrain Model	A surface containing data derived from the difference in elevation between two terrain models or a terrain model and a plane.
Dialog	The tool settings box for the active command. The dialog shows all available options for a command. For most civil commands, most of the time, the dialog can be hidden and ignored since the user is given all necessary instruction and inputs by way of the cursor prompt. The dialog is necessary for configuring command customizations.
Drape	The process of vertically projecting elements onto a surface so that the element elevations are defined by the surface.

Drape Void	A closed area of missing or obscured data where the void coordinates are not included in the triangulation. Voids are inserted post triangulation. The void coordinates and lines are draped on the TIN surface. Even though a user must provide an elevation for the Drape Void vertices, the user elevations are changed to the elevation of the TIN surface at the XY Drape Void coordinate position.
Element Template	MicroStation concept which allows preconfigured definitions for symbology and other miscellaneous display of MicroStation elements and civil features.
End Condition	A specialized component of a corridor template which provides information tie into active surface.
End Condition Exception	Used to modify the behavior of an end condition solution without requiring the use of additional template drops. When an end condition exception is added, it must be edited to change its behavior.
Export to Native	Option to automatically or manually push horizontal and vertical geometry into native products (InRoads - ALG, MX - PSS and GEOPAK - GPK).
Feature	A Feature is anything that can be seen or located and is a physical part of your design, representing a real world thing. A feature's definition is one of its properties. At any given time in the design process, the feature will have a Horizontal Geometry, a Vertical Geometry, 3D Geometry or a combination to define its location.
Feature Definition	Used to define options when creating features. These are the items which are created in advance, usually used across multiple projects and define symbology, annotation and quantities. The feature definition is assigned (usually) in the plan model and profile/3D feature definitions follow from there.
Feature Name	Each Feature can have a name.
Gap	When a feature is trimmed the part(s) which are invisible on the base geometry.
GPK	A legacy (proprietary) GEOPAK database containing coordinate geometry information.
Graphical Filter	Using in developing terrain models, an automated way of storing search settings for graphic elements when creating terrain models using 3D element. A graphical filter can be created for each feature (i.e., spots, breaks, voids) then the filters can be defined as a Graphical filter group.
Heads Up Prompt	Command instructions are given in a heads up and dynamic prompt which floats at the cursor.
Horizontal Geometry	The elements which define the horizontal layout of the design. These elements are 2D elements even if the DGN model is 3D. Horizontal Geometry may be points, lines, arcs, spirals, splines or any combination in a complex element.
Interval	When a feature is trimmed the part(s) which are visible on the base geometry.
Island	Closed area used to place within a void, i.e., islands in the middle of rivers, lakes, etc.

Key Station	Additional station added to the corridor to force processing at the particular location.
LIDAR	(Light Detection And Ranging) is an optical scanning technology which scans ground and other physical features to produce a 3D model.
Linear Feature	In plan model, composed of lines, arcs, spirals, splines or combinations of these. In profile model, composed of lines, parabola, splines or combinations of these.
Linear Stroking	Stroking is the process of automatically adding shots to the terrain model or corridor by interpolating new shots from the linear sections of the data. Linear stroking is measured along the element. Interpolated vertices are added whenever the distance between the vertices is greater than the linear stroking value (in master units).
Manipulators	The heads up, on-screen editing interface. Only the most common properties are presented in manipulators. Manipulators are in two types: graphical and text
Overlay Vertical Adjustment	Within Corridor Model, tool used to develop a vertical geometry (based on milling and overlay parameters) and apply to the corridor.
Parametric Constraints	Used to set up constraint value overrides for specified station ranges.
Plan Model	The usual DGN model, used for laying out horizontal geometry. Best practices will dictate that this is a 2D DGN model but 3D DGN model can be used. This is where geometric layouts and corridor definitions are kept. The geometric layouts are not only alignments but also edges, parking, striping, sidewalks, etc.
Point Features	Defined by a single X, Y (Z optional) location. A point need not be a feature. It may be defined as a non-featurized point by way of AccuDraw, Civil AccuDraw, Snap or a data point. Non featurized points are use to control the construction of Linear Features.
Point Cloud	A set of vertices in a 3D coordinate system and these vertices are defined the by X, Y and Z coordinates. Point clouds are usually created by 3D scanners. These devices measure a large number of points on the surface of an object and output a point cloud as a data file. The point cloud represents the visible surface of the object that has been scanned or digitized.
Point Control	Used to modify the behavior of points in a template. These controls take precedence (they override) over existing constraints on the point.
Project Explorer	MicroStation's interface for browsing elements in a DGN file. Extended by civil to accommodate specialized civil needs.
PSS File	MX file (Plans Style Set) which provides the graphical representation for the MX string features.
Reference Element	The rule for some geometry is a calculation from another element. This other element is the reference element.

Secondary Alignment	Used to modify the direction of cross section processing. By default, as any given station, the cross section is created orthogonal to the main alignment/feature. If a secondary alignment exists, then that portion of the cross section which lies outside the secondary alignment will be orthogonal to the secondary alignment instead of the main alignment.
SEP File / Method	Uses the superelevation settings which originated in GEOPAK.
SMD File	GEOPAK file (Survey Manager Database) which contains survey features definitions and associated element and textual settings.
Spot Elevation	A set of X, Y, Z coordinates representing a point on the terrain model surface. There is no implied relationship between regular points.
SRL File / Method	Uses the superelevation settings which originated in MX
Superelevation Lane	The closed area defined by the superelevation tools used for the limits of transition calculations and pivoting location.
Superelevation Section	Area along a horizontal geometry element, where superelevation will be calculated.
Target Aliasing	Used to create the desired results when working with multiple surfaces without having to edit the template from the template library. Target aliases can also be used so that one corridor can target the solution of another corridor.
Template Drop	An area (usually defined by station limits) along a corridor to which a specific template is applied.
Template Library	A file that stores definitions for templates, generally with an ITL file extension.
Template Transition	The transition indicator occurs in the corridor between templates of differing names.
Terrain Model	A three-dimensional DGN element defined by spots, break lines, voids, holes, contours to model a surface on the earth.
Tooltips	When hovering the cursor over an element or a handle, a tooltip is shown which gives explanatory information.
Trace Slope	Upstream - The indicated path follows the steepest ascent from a user-defined point through the terrain model terminating at a high point or the edge of the terrain model. Downstream - The indicated path follows the steepest descent from a user-defined point through the terrain model terminating at a low point or the edge of the terrain model.
Vertical Alignment	A linear feature in profile model which serves the special purpose of defining the elevations of an alignment.
Vertical Geometry	The elements which define the vertical layout of a corresponding horizontal geometry element. These vertical elements are 2D and are stored in a profile model.

Void	Closed shape to demarcate areas of missing data or obscure areas. No point or break data located within the void area is utilized and no triangles are created inside the void areas. The Void coordinates are included in the triangulation and void lines between successive void coordinates are inserted as drape lines on the surface. Therefore, they do not change the slope or elevations of the surface.
Watershed	Defined by either a low point within the terrain model or a low edge point along the terrain model edge, it's the closed area wherein all water would drain to the low point.
XIN File	InRoads file which contains features definitions, associated styles, annotation, and other settings.