

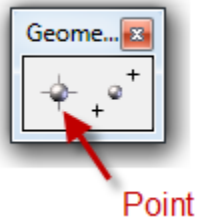
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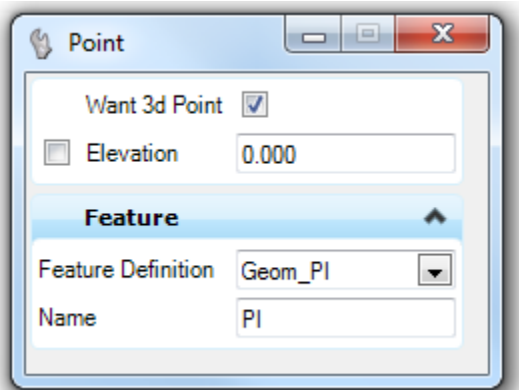
1. Horizontal Geometry Commands

A. Geometry Point

Constructs a civil point element



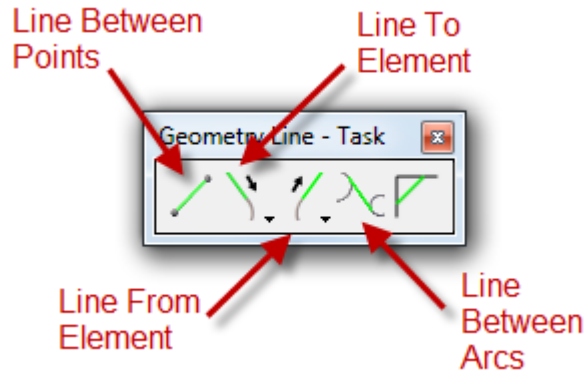
- Can be placed as 2D or 3D in either the Default or Default 3D model views
 - Placing a 3D point in the Default model also creates a second point in the 3D model.



- Any of the Civil AccuDraw ordinates can be used to accurately place points.
- Points can also be placed on a surface or terrain
- Points can be exported to a .csv file

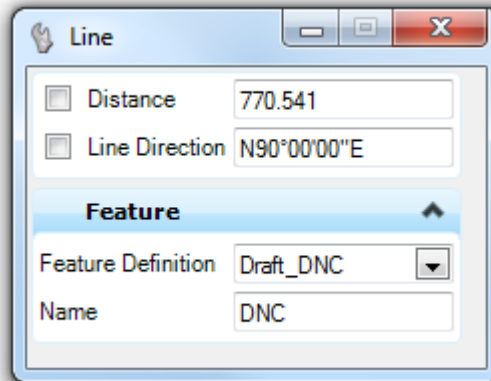
When the “Want 3d Point” option is checked, both a vertical and a horizontal Civil AccuDraw ordinate are active

B. Geometry Line

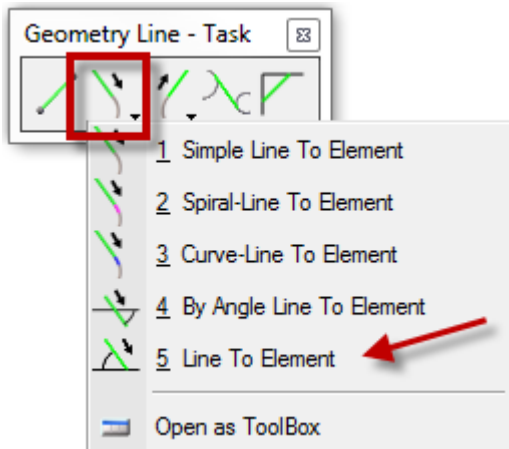


i. Line Between Points

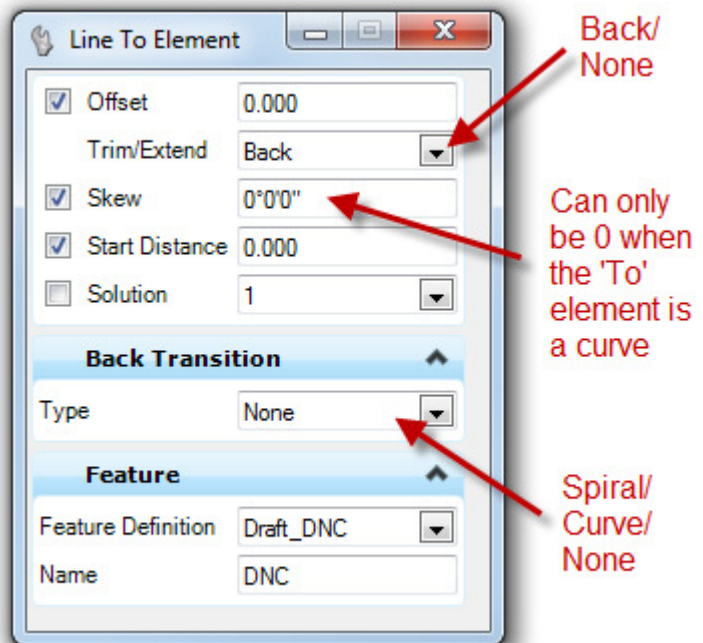
Creates a line between 2 user-defined points.

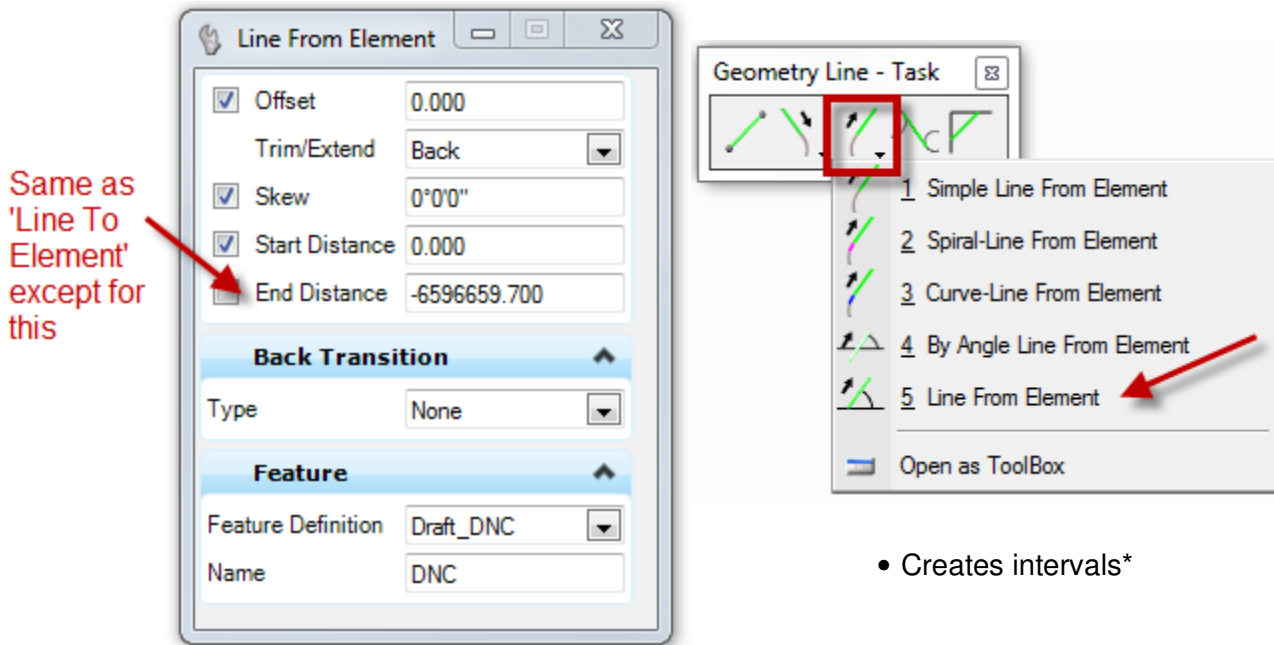


ii. Line To/From Element



- Creates intervals*





- Similar to creating MicroStation line segments using intersection, tangent or perpendicular snaps, **except** for the Design Intent

***Intervals** are the parts of the base geometry which are visible on a trimmed feature. They are created any time a command uses the Trim/Extend options.

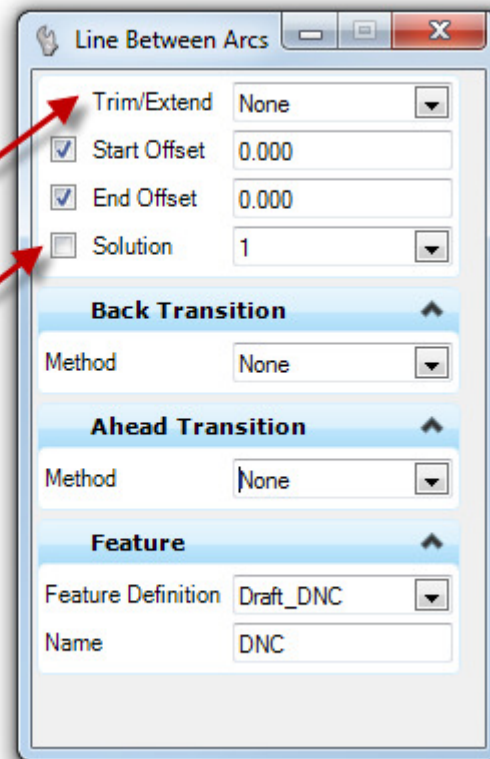


iii. Line Between Arcs

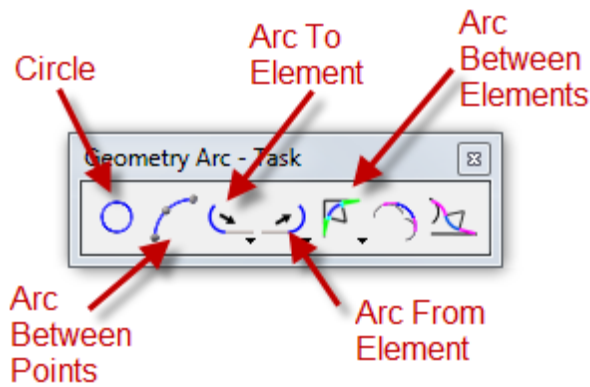
- Similar to the Tangent and Tangent Point MicroStation snaps

None/Back/Ahead/Both

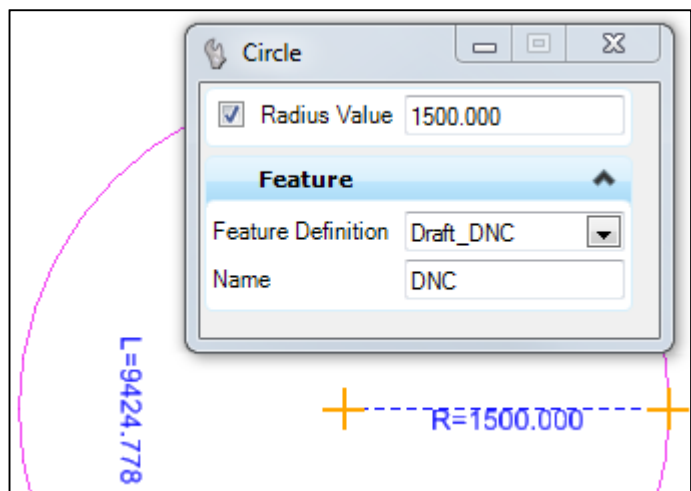
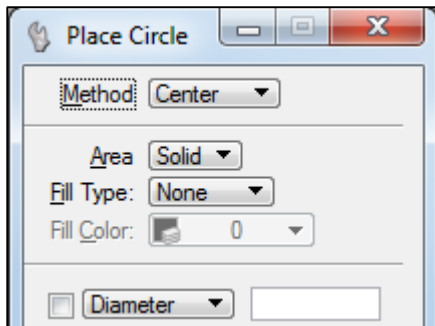
Up to 4 solutions



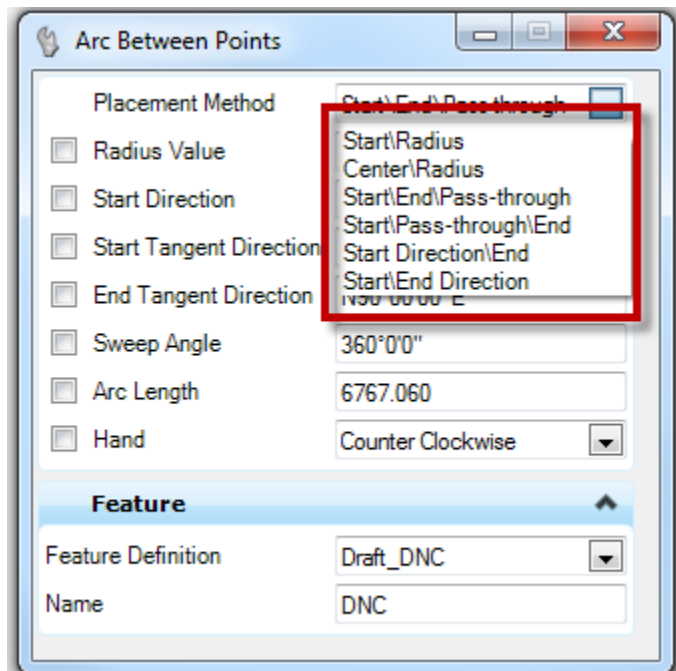
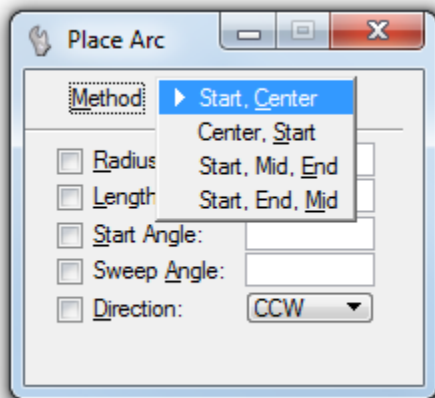
C. Geometry Arc



i. Circle



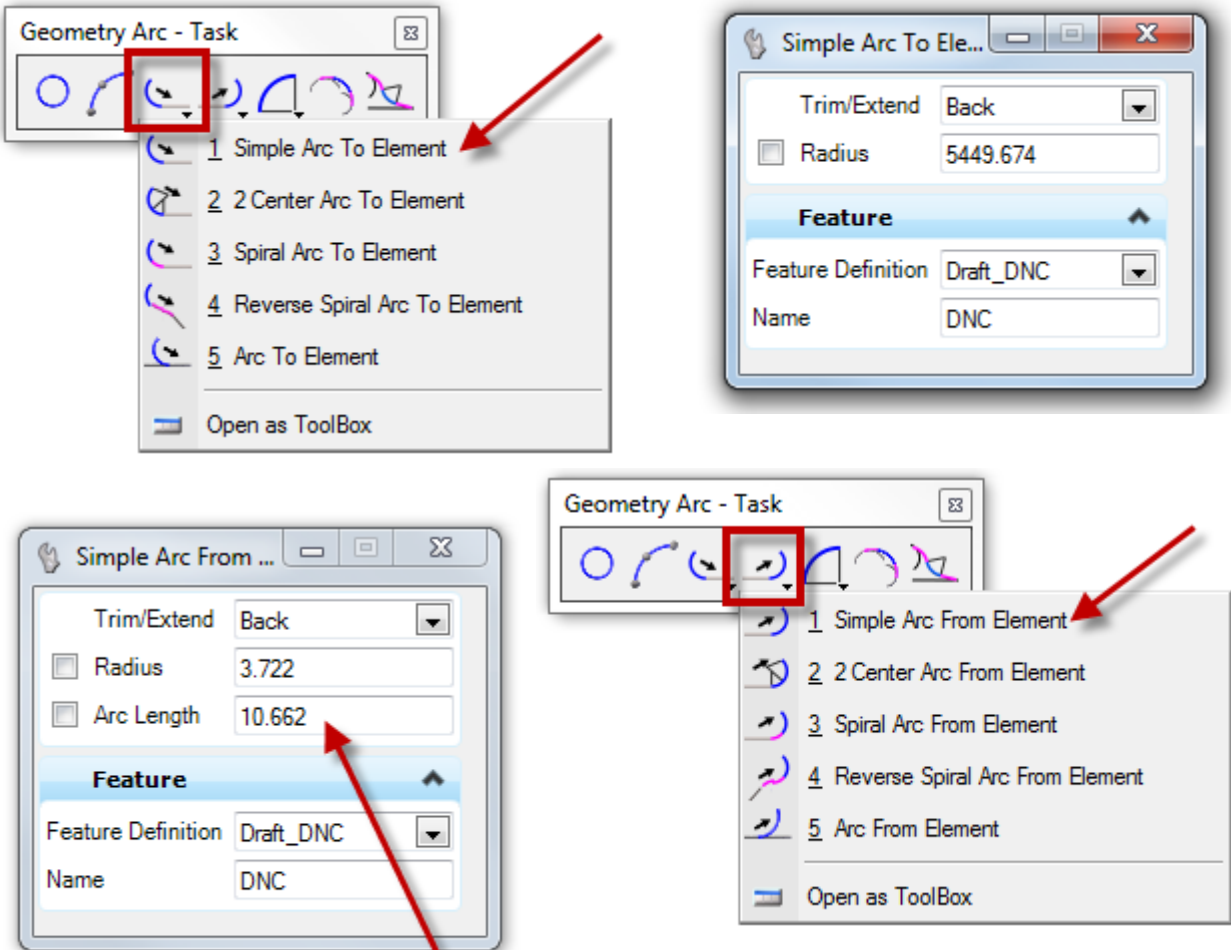
ii. Arc Between Points



MicroStation Command

iii. Arc To/From Element

Constructs an arc tangent to a selected base element



Only Difference
Between 'To' & 'From'

- Similar to the Tangent and Tangent Point MicroStation snaps



iv. Arc Between Elements

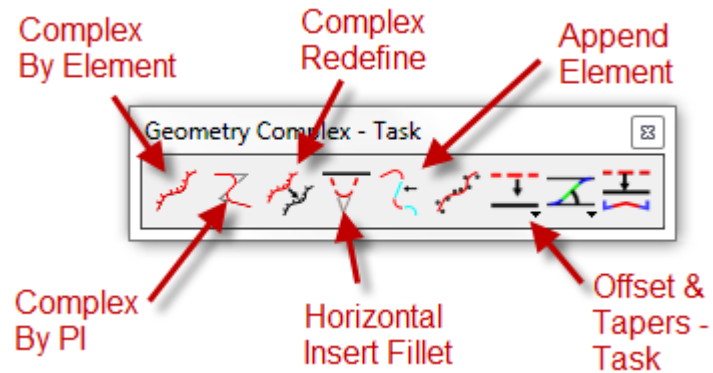
Constructs an arc between 2 previously placed elements

The image displays the 'Arc Between Elements' tool interface in a CAD application. At the top, a 'Geometry Arc - Task' toolbar shows the tool icon highlighted with a red box. Below it, a context menu lists several options: '1 Simple Arc', '2 Spiral-Arc-Spiral', '3 Taper Arc Taper', '4 3 Center Arc', '5 2 Center Arc', and '6 Arc Between Elements', with the last option highlighted by a red arrow. The main 'Arc Between Elements' dialog box is shown with various settings:

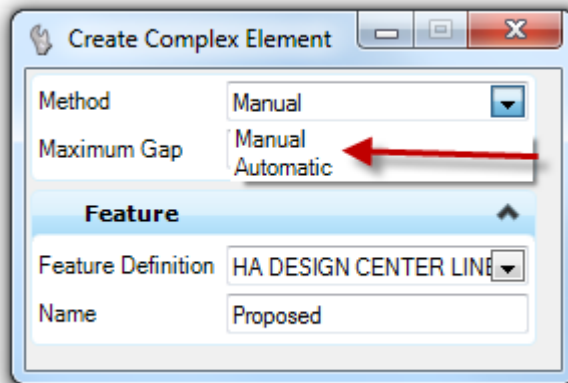
- Trim/Extend: None
- Radius: 0.000
- Back Offset: 0.000
- Ahead Offset: 0.000
- Loop:
- Back Taper: Method: None
- Back Transition: Type: None
- Ahead Taper: Method: None
- Ahead Transition: Type: None
- Feature: Feature Definition: Draft_DNC, Name: DNC

A detailed view of the 'Back Transition' section shows the 'Type' dropdown menu open, with options: None, None, Spiral, Curve, and Arc Ratio. The 'Arc Ratio' option is highlighted with a red box.

D. Geometry Complex



i. Complex By Element



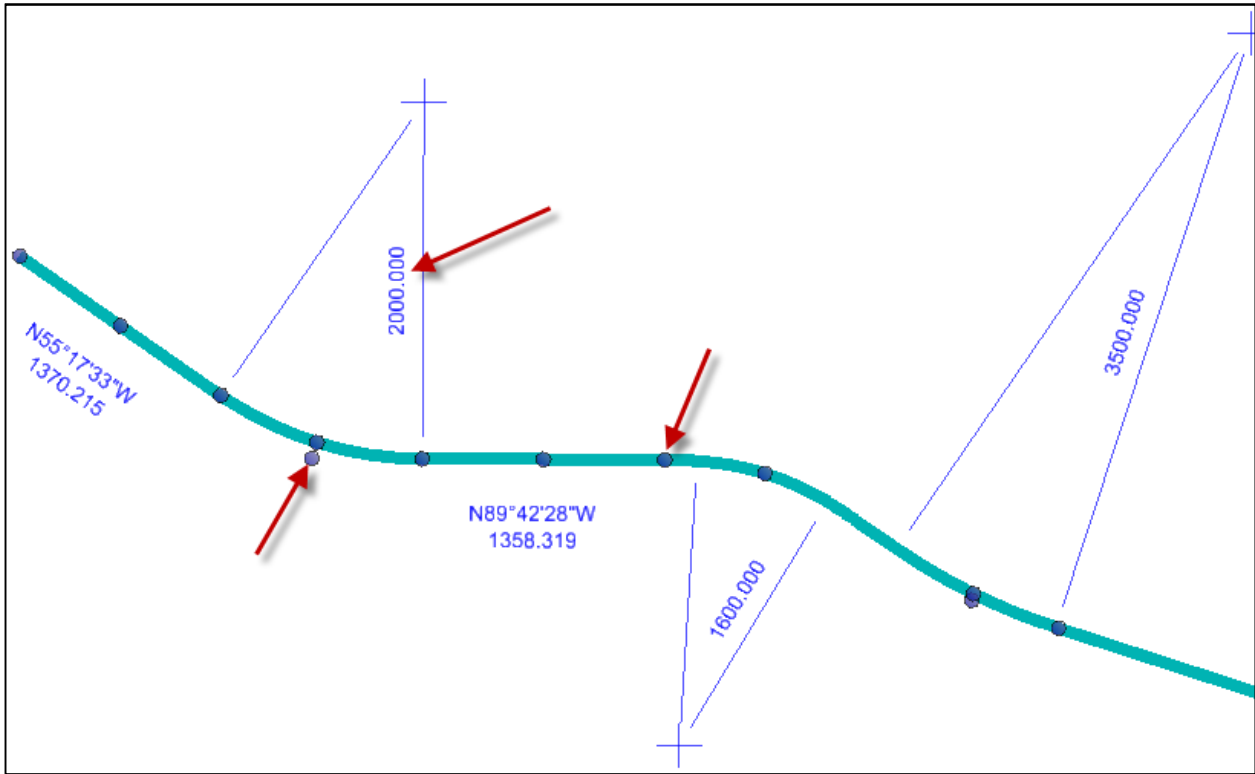
1. Manual

- Select elements in order one at a time
- Note directional arrow when selecting
- Once all elements are selected data point in a blank area to accept

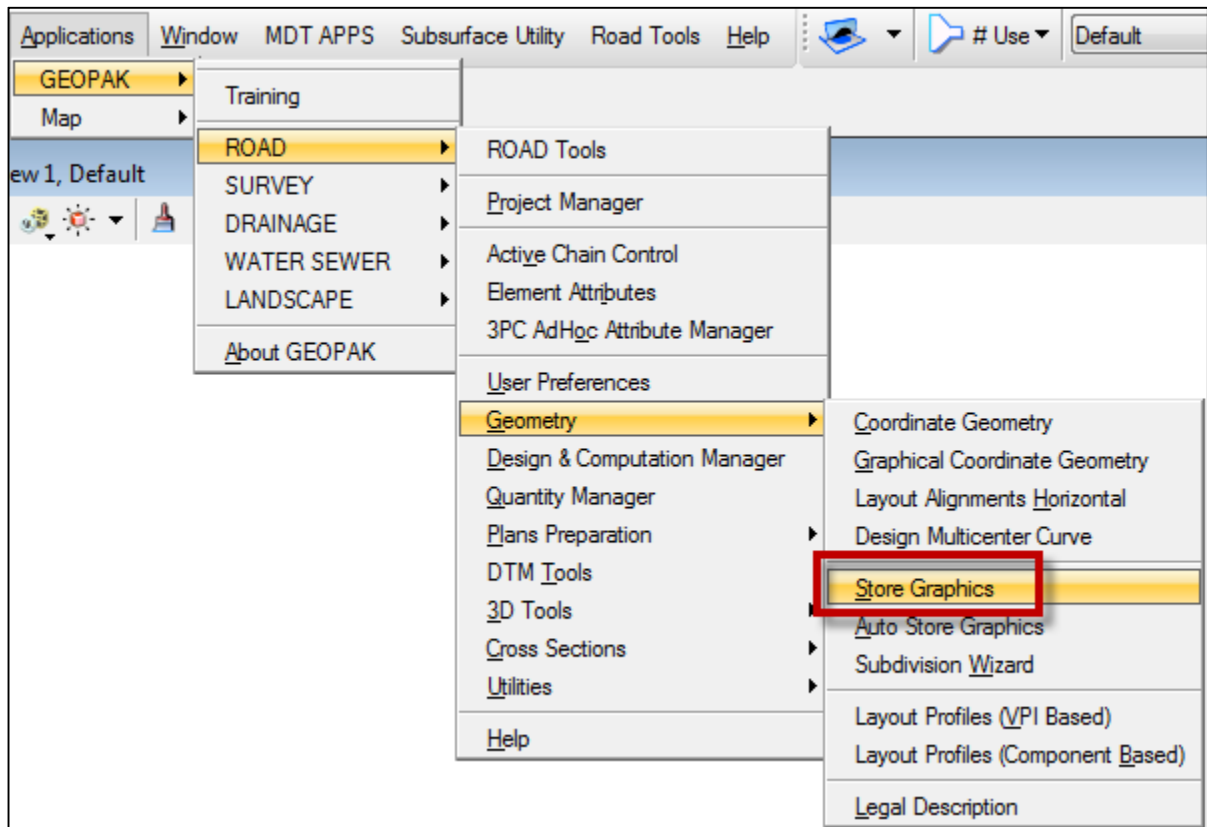
2. Automatic

- Select the first 2 elements with directional arrow in the desired direction
- Complex will be highlighted. Data Point in a blank area to accept

When elements become part of a complex element, they retain their individual rule data and element manipulators

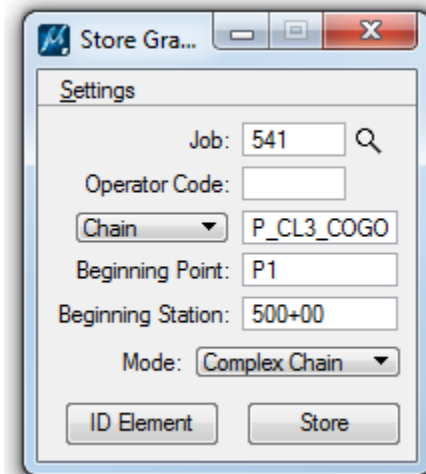


Criteria Equivalent: COGO – Store Graphics



Differences

- Criteria doesn't handle graphical spirals
- Criteria is not dynamic
- In OpenRoads, stationing is a separate command
- Storing Criteria elements doesn't create a Graphic element
- Criteria has no Design Intent





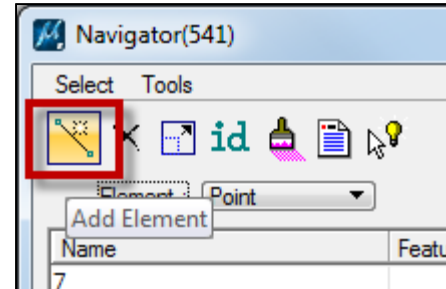
ii. Complex By PI

Constructs a complex linear element with curves based on user input of PI locations

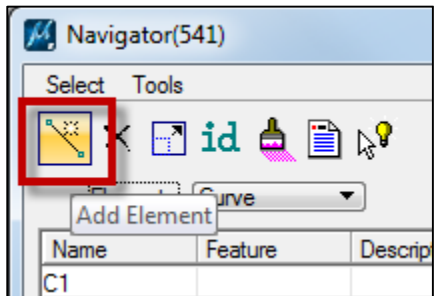
- Curves can include transitions
- Zero radius curves can be used to create angle points

Criteria Equivalent: COGO

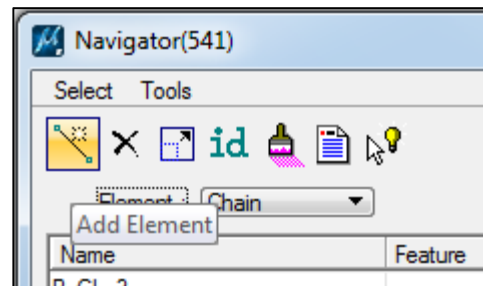
1. Locate and store PI points



2. Store curves



3. Store chain





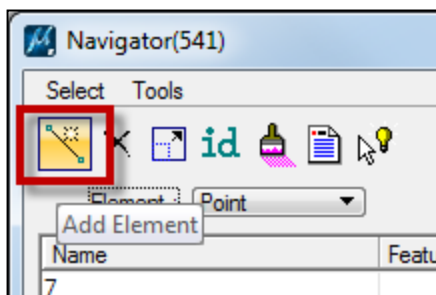
iii. Complex Redefine

Allows an existing complex alignment to be partially redefined by substituting new horizontal geometry

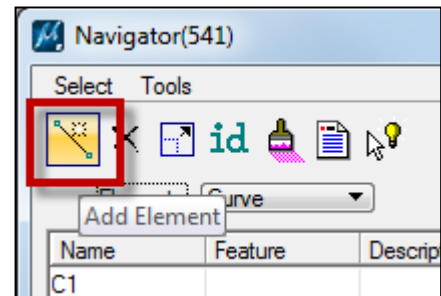
- Preserves the original alignment name, preserving all rules built off the original geometry
- All rules relating the alignment to other geometry (corridors, terrains, etc.) need to reprocess to update

Criteria Equivalent: COGO

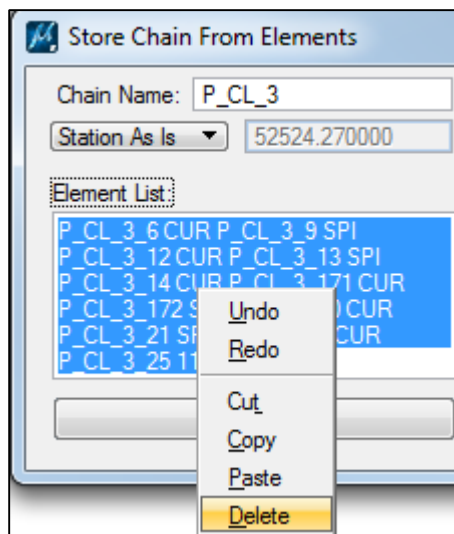
1. Locate/Relocate and store new PI points



2. Update and store new curves



3. Recreate chain



Differences

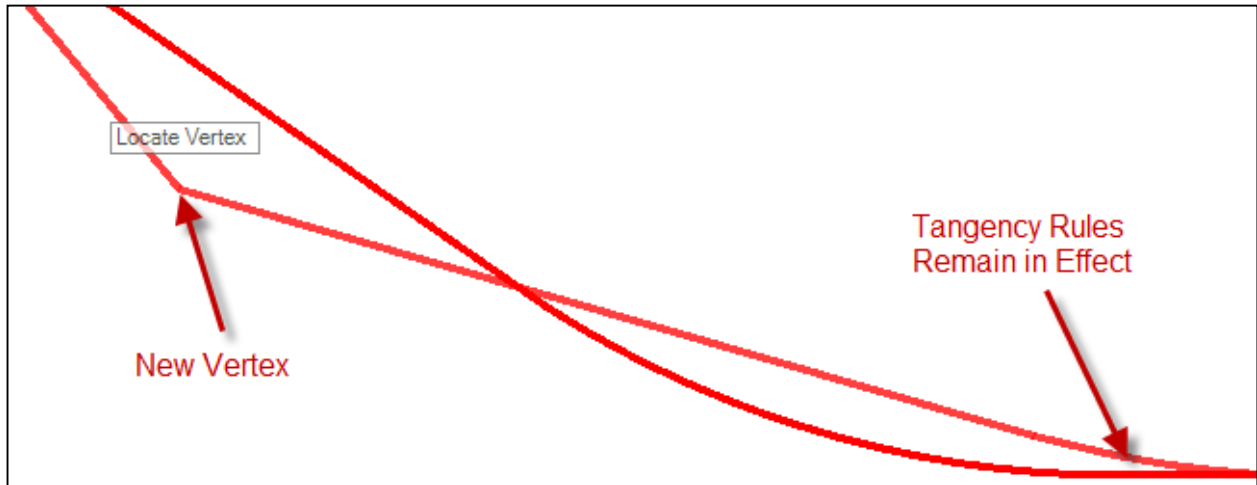
- In Criteria, existing elements must be manually rearranged to make room for the replacement geometry
- In Criteria, new elements must be stored before they can be added to the chain



iv. Insert Horizontal Fillet

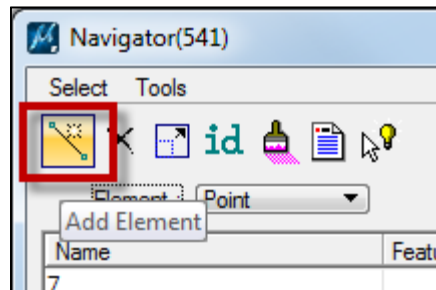
Inserts a curve into a previously created element

- Works similar to the MicroStation Modify > Insert Vertex tool
- Suggested only for short complex alignments, stability of command decreases

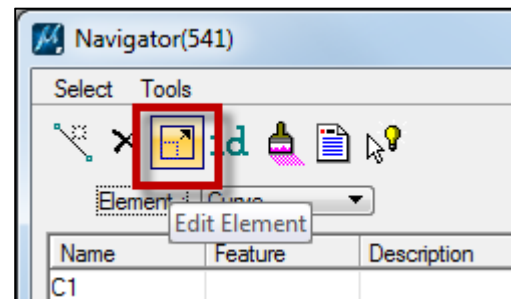


Criteria Equivalent: COGO

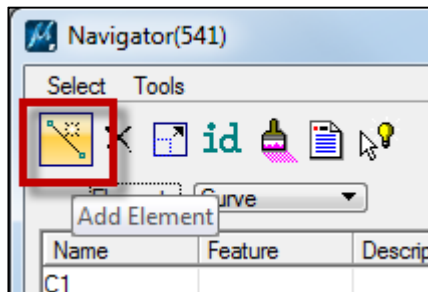
1. Locate and store new PI



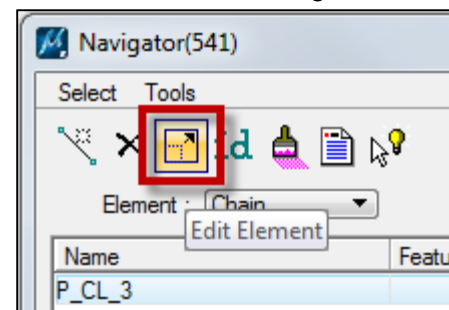
2. Edit preceding and following curves



3. Store new curve



4. Insert curve into existing chain

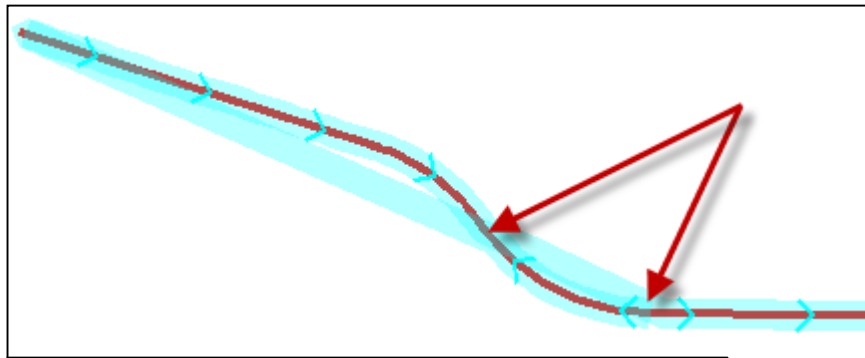
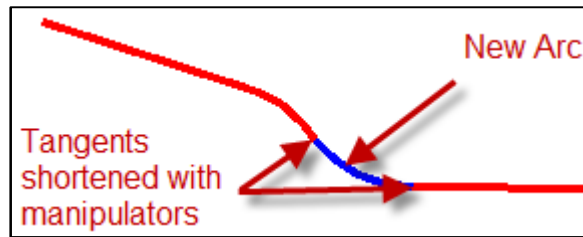
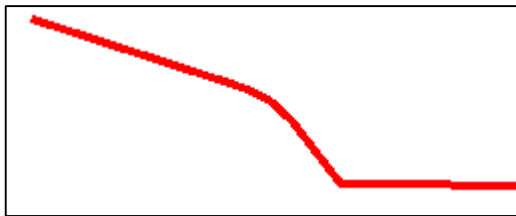




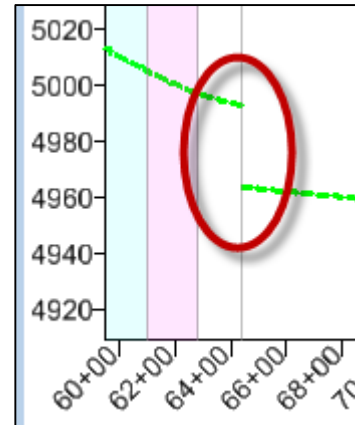
v. Append Element

Adds elements to the end of a previously created complex element

Note: In order for the command to work properly, additional elements must be added **at the end** of the established complex element. Below is what happens when an element is added in the middle of an established alignment.



Plan View

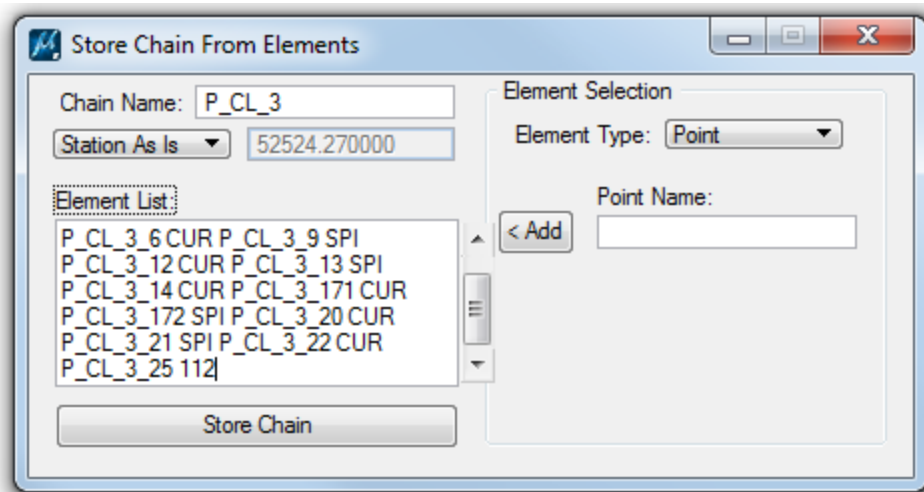
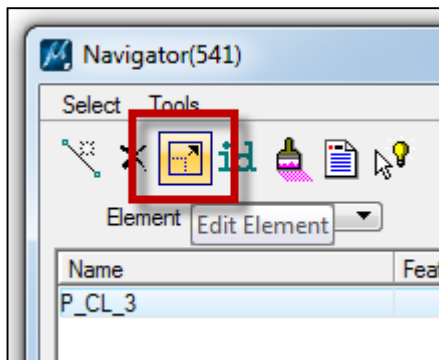


Profile View

PC	()	0+00.000
PI	()	9+24.471
CC	()	
PT	()	64+40.576
	Radius:	1920.000
	Delta:	51°25'16" Right
	Angle of Curvature (Arc):	2°59'03"
	Length:	1723.141
	Tangent:	924.471
	Chord:	1665.891
	Middle Ordinate:	190.086
	External:	210.973
	Tangent Direction:	N 89°23'12.8" W
	Radial Direction:	N 0°36'47.2" E
	Chord Direction:	N 63°40'34.7" W
	Radial Direction:	N 52°02'03.5" E
	Tangent Direction:	N 37°57'56.5" W
PT	()	17+23.141

Horizontal Geometry Report

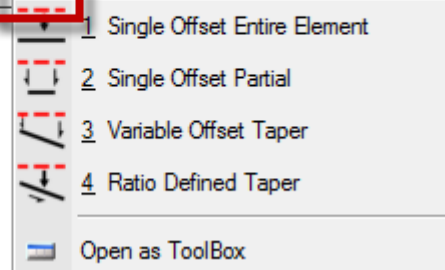
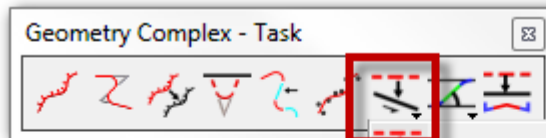
Criteria Equivalent: COGO



Differences

In Criteria, elements can be inserted anywhere in the chain

vi. Offsets & Tapers

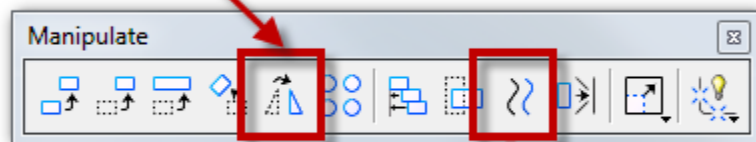


- Replaces MicroStation Mirror & Move Parallel Commands
- Replaces GEOPAK Draw Transition Command



Draw Transition

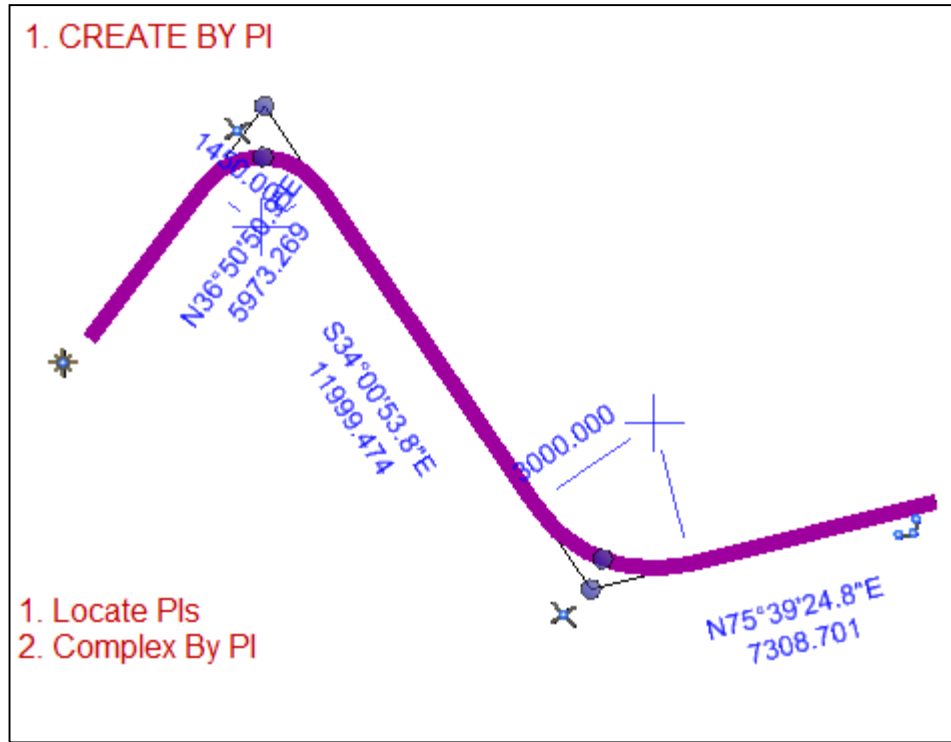
Mirror



Move Parallel

E. Design Intent: Rounding

- Affects bearing and distance rounding as well
- What effect rounding has on adjacent elements



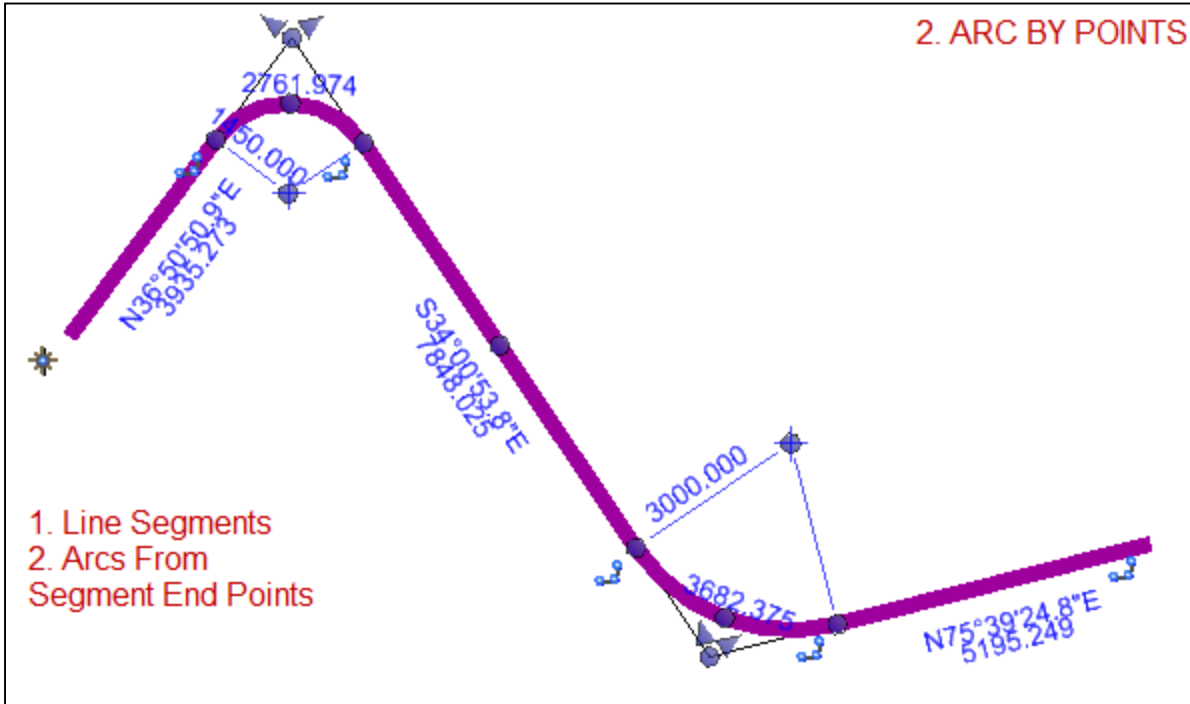
A. Round 1st Tangent: _____

B. Round Middle Tangent: _____

C. Round Last Tangent: _____

D. Move PI: _____

E. Change Radius: _____



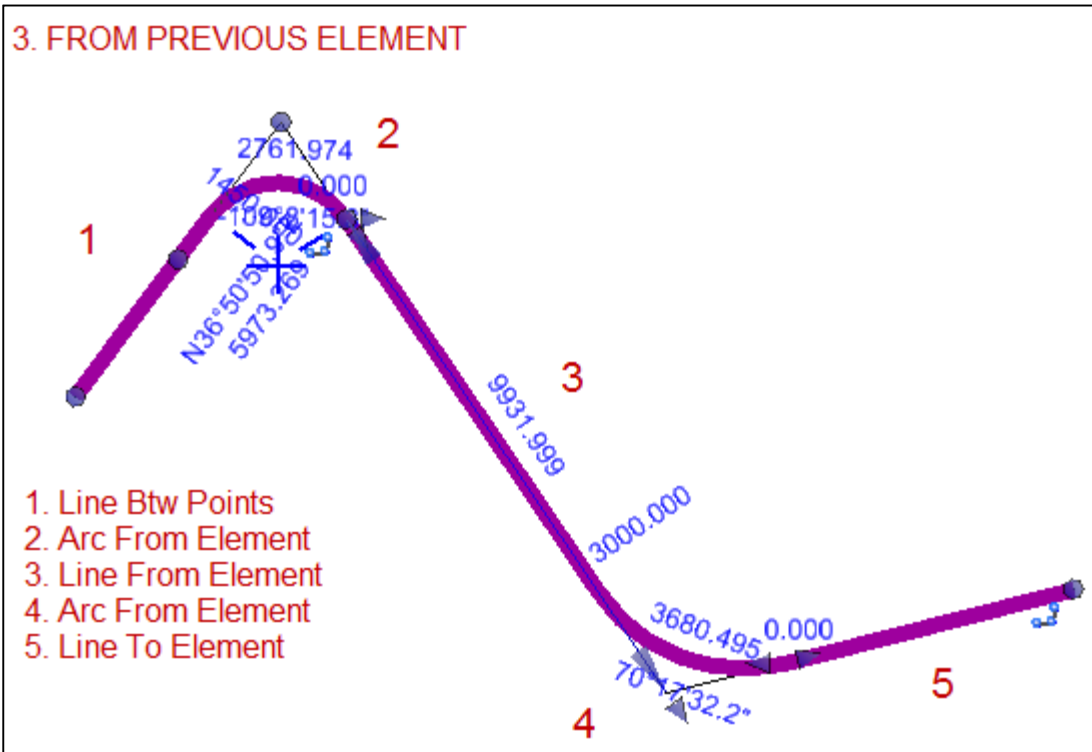
A. Round 1st Tangent: _____

B. Round Middle Tangent: _____

C. Round Last Tangent: _____

D. Move PI: _____

E. Change Radius: _____



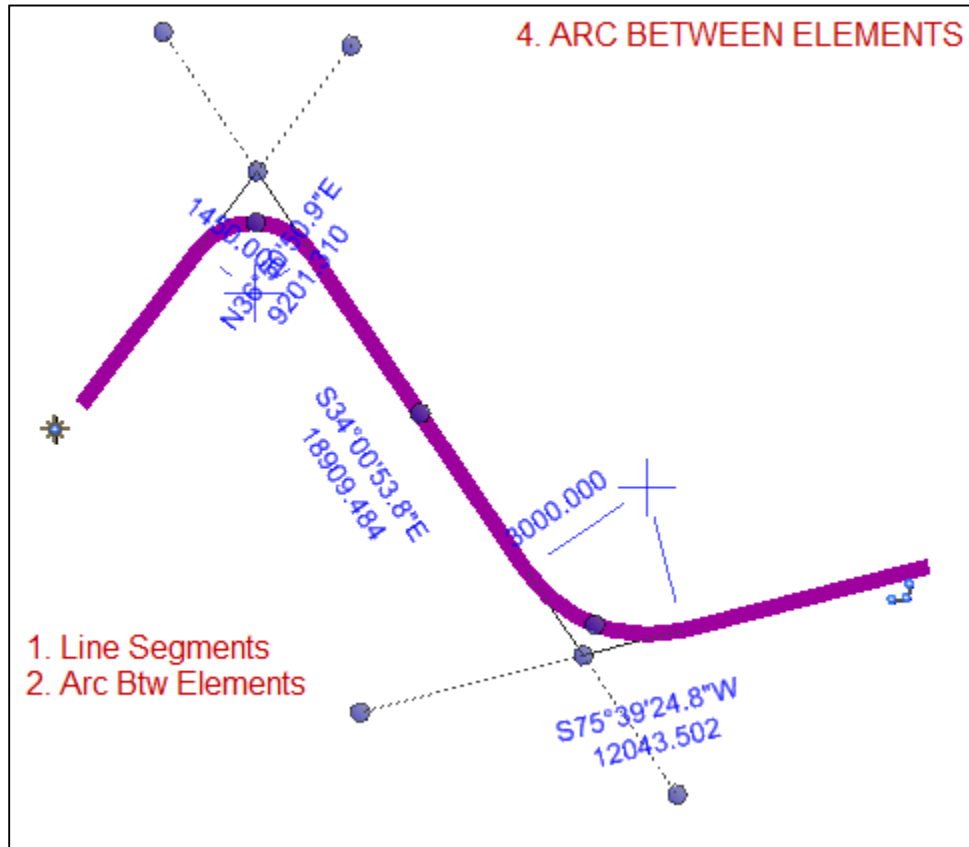
A. Round 1st Tangent: _____

B. Round Middle Tangent: _____

C. Round Last Tangent: _____

D. Move PI: _____

E. Change Radius: _____



A. Round 1st Tangent: _____

B. Round Middle Tangent: _____

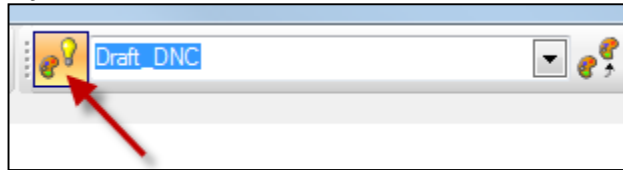
C. Round Last Tangent: _____

D. Move PI: _____

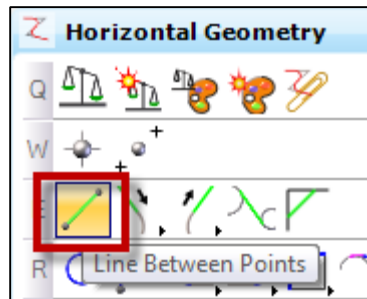
E. Change Radius: _____

Exercise 1: Creating a Horizontal Alignment: Complex By Element

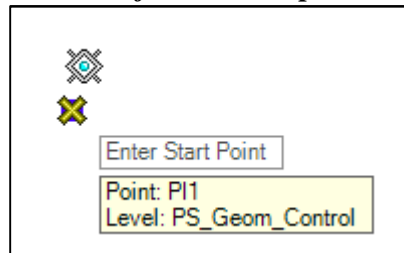
1. *Start OpenRoads using the Enhanced Workspace*
2. *Open file ComplexByElement.dgn*
3. *Set the Active Feature Definition to Draft_DNC and toggle on Use Active Feature Definition. Now all commands will automatically use this feature definition*



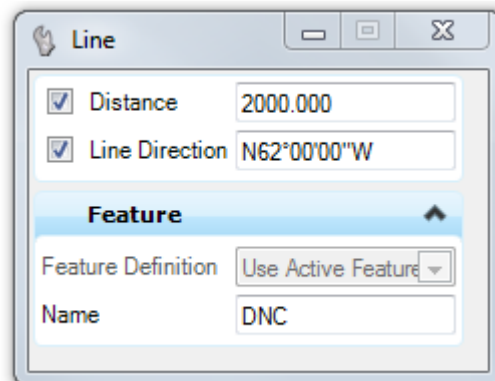
4. *Select the Line Between 2 Points command*



5. *Click on Point P11 for the start point*

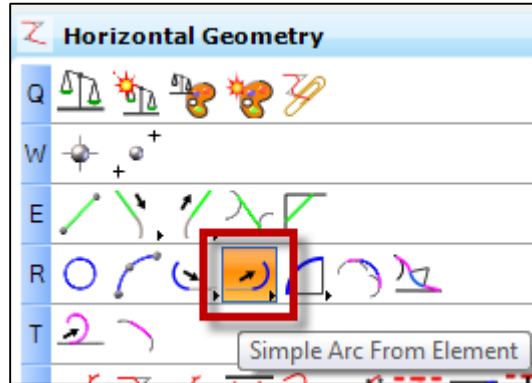


6. *Set Distance to 2000 and Line Direction to N 62 W*

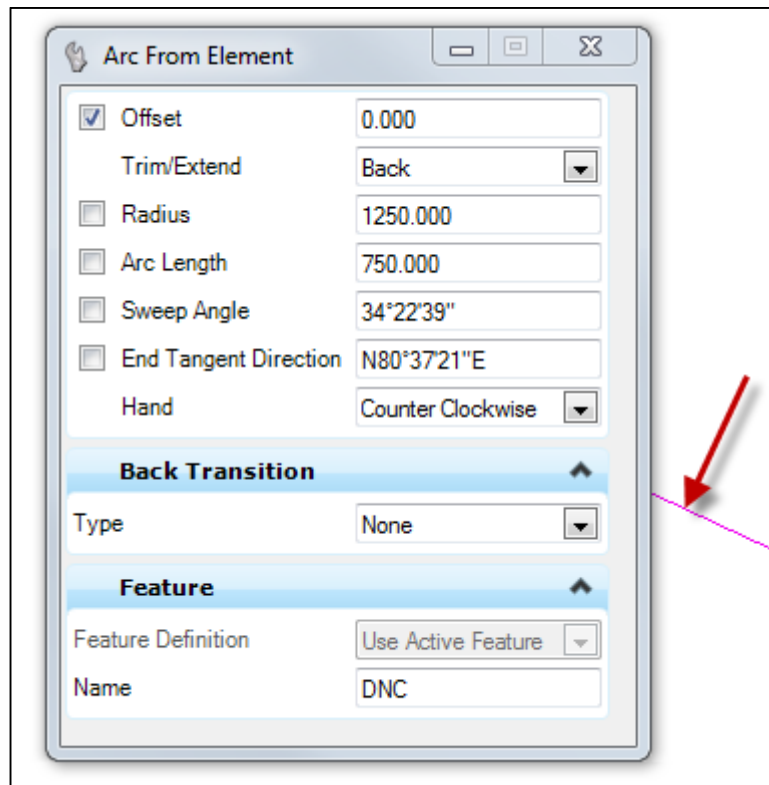


7. *Data Point to accept*

8. *Select the Arc From Element command to create an arc from the existing line segment*

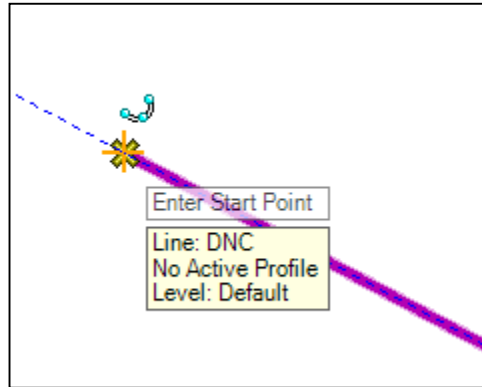


9. *Select the line segment you just created*



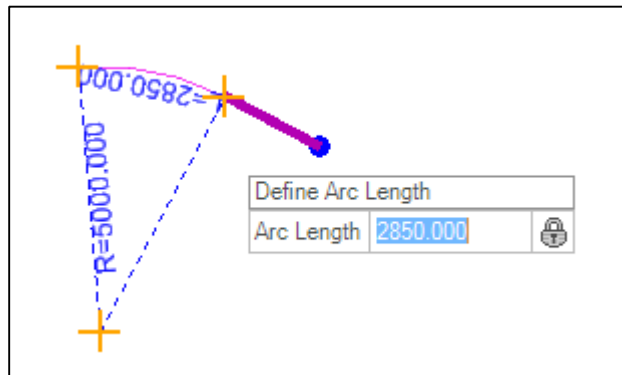
10. *Set Offset to zero*

11. Snap to the end point of the line segment for the arc start point



12. Set Radius to 5000

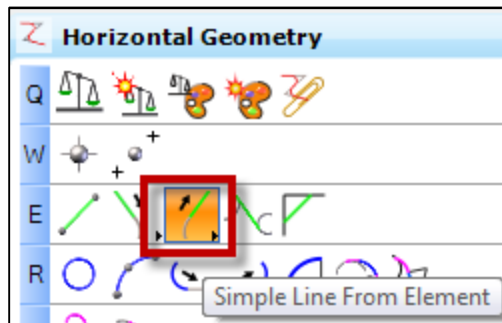
13. Enter 2850 for Arc Length



14. Set Trim/Extend to Back

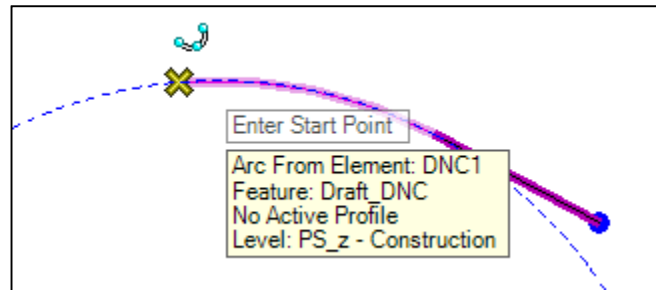
15. Data point to accept

16. Select Simple Line From Element to create a line from the existing arc

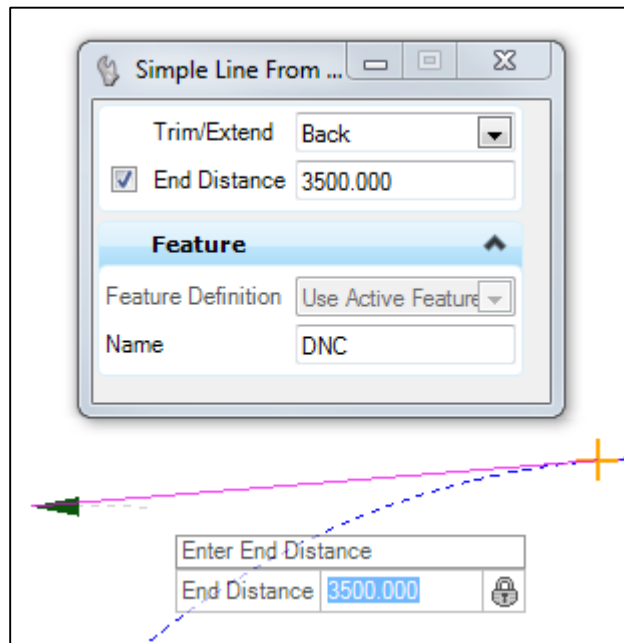


17. Select the previously created arc

18. Select the end point of the arc as the Start Point



19. Set End Distance to 3500

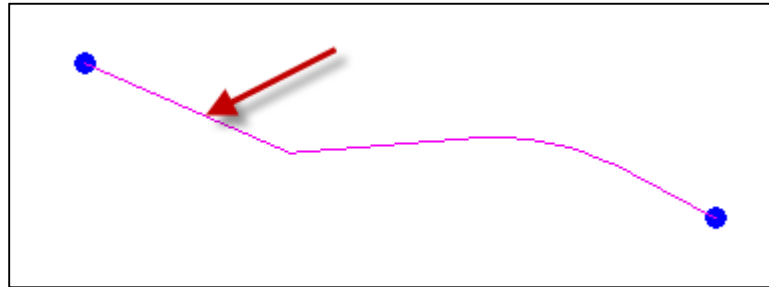


20. Set Trim/Extend to Back

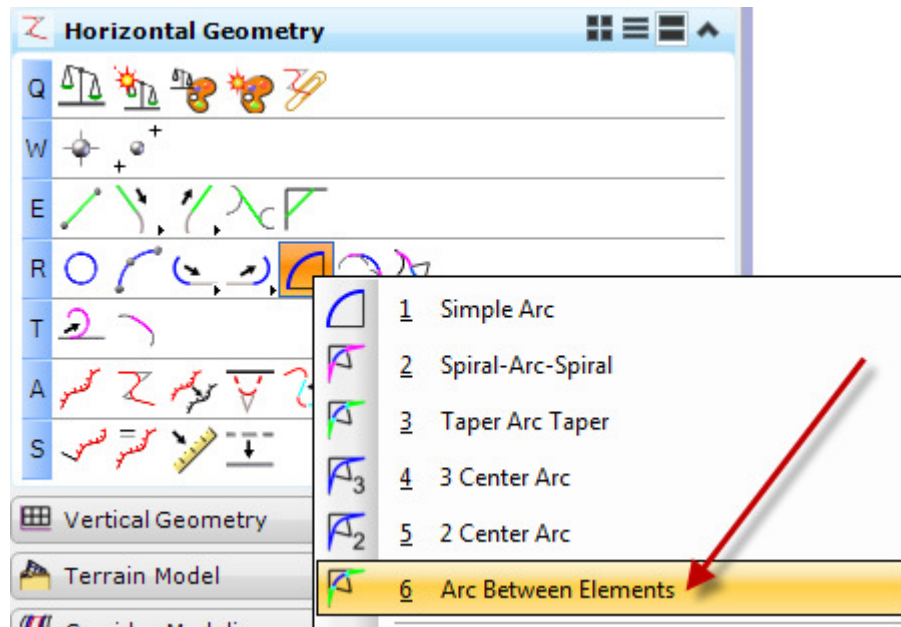
21. Data point to accept

22. Select the Line Between Points command to create a line between the existing line segment and the 2nd point

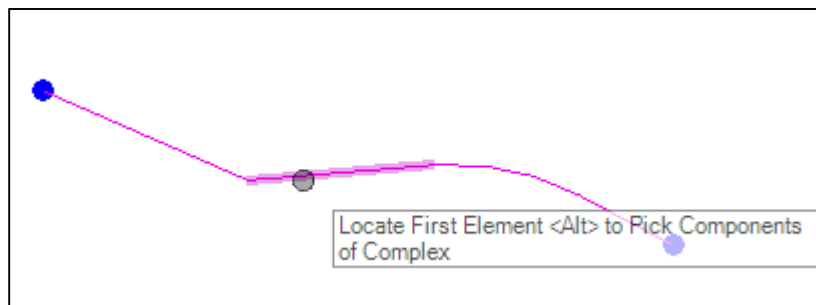
23. Create a segment between the end of the previous line segment and point PI2



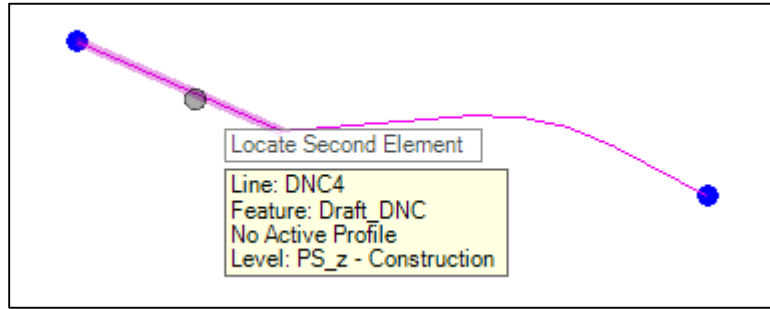
24. Select the Arc Between Elements command to create an arc between the last 2 line segments



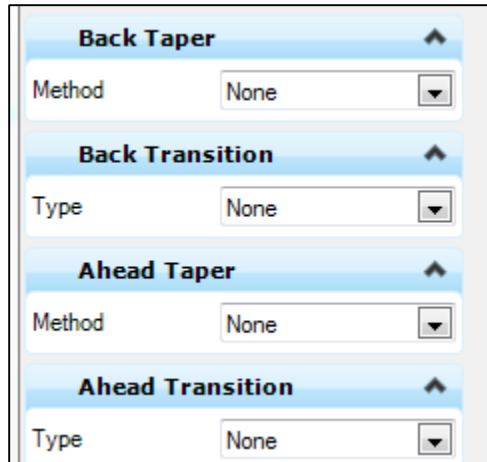
25. Select first element.



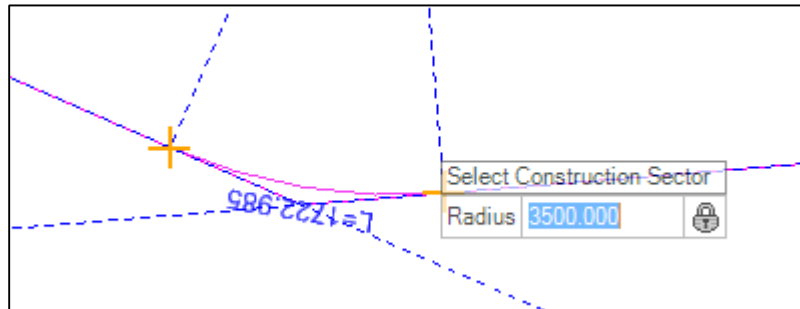
26. *Select second element.*



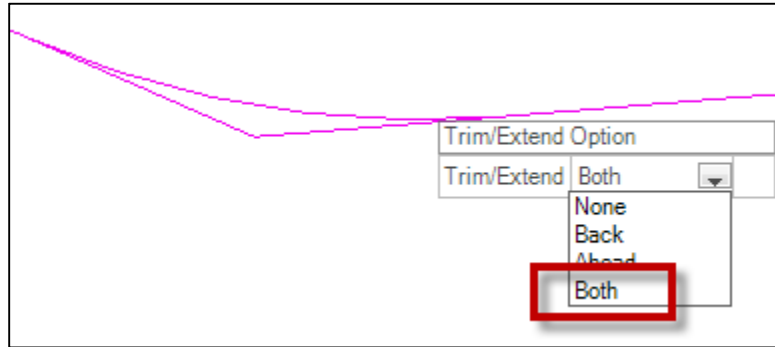
27. *Ahead and Back Tapers and Transitions should be set to None*



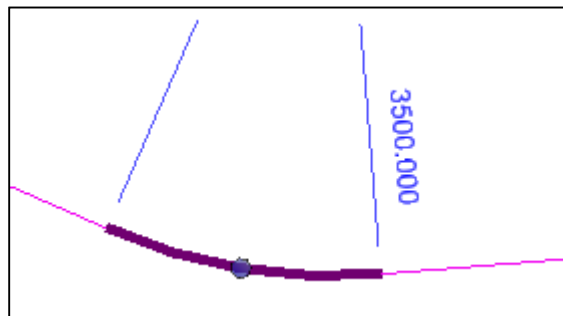
28. *Set Radius to 3500 and select the upper Construction Sector*



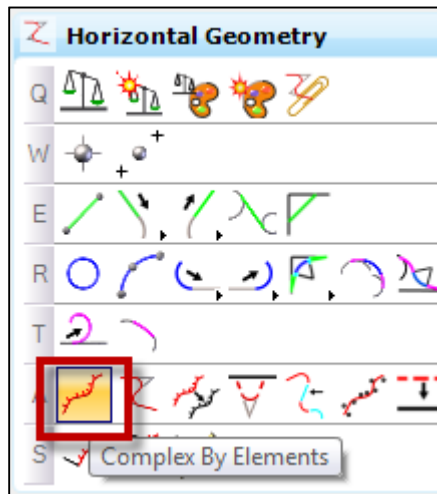
29. Set Trim/Extend Option to Both



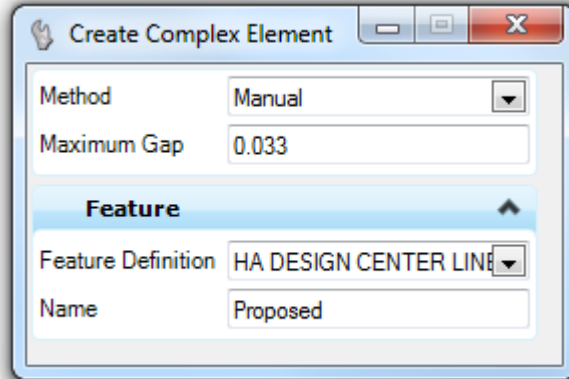
30. Data point to accept



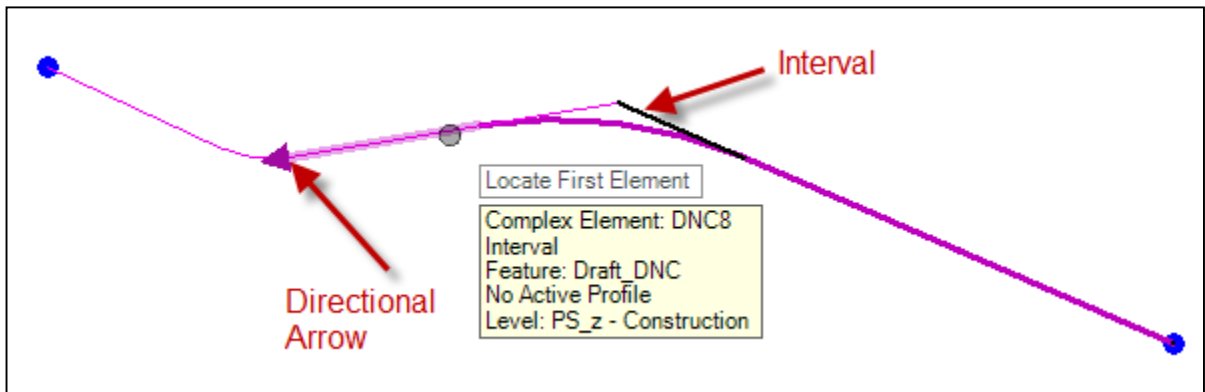
31. Select the Complex By Elements command to create a complex alignment from the geometric elements you just created



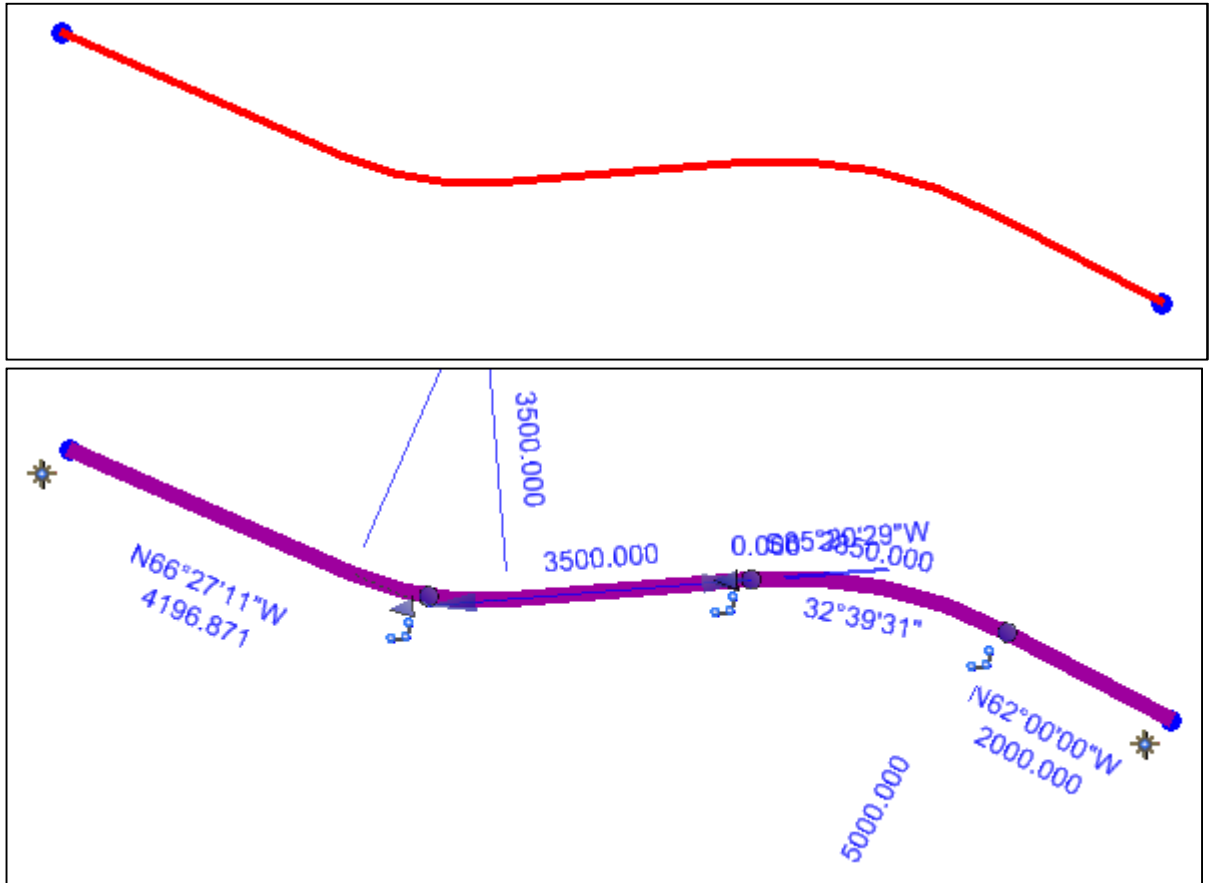
32. Set Method to Manual, Feature Definition to HA DESIGN CENTER LINE and Name to Proposed



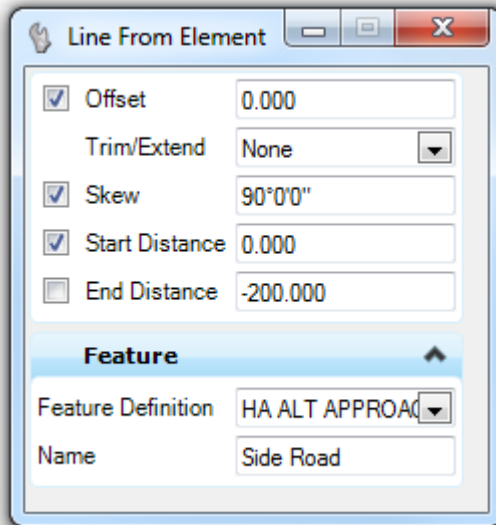
33. Select the alignment segments in order from Right to Left. Make sure the directional arrow is pointing to the left



34. Once all elements are selected, data point to accept



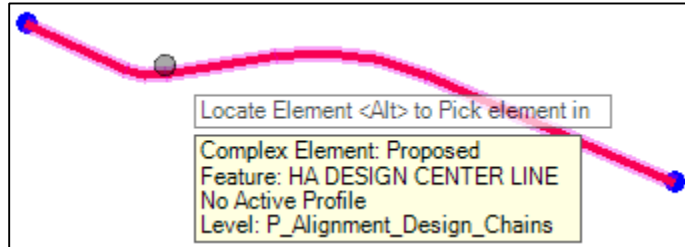
35. Select the Line From Element command to create an approach alignment perpendicular to the mainline alignment



36. Set Feature Definition to HA ALT APPROACH.

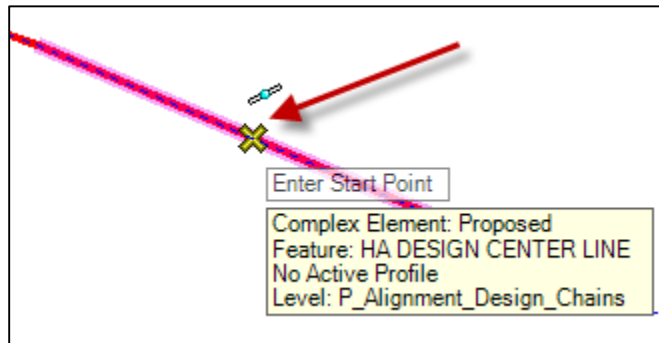
37. Change Name to Side Road

38. Select the Proposed alignment



39. Set Offset to 0

40. Snap to the midpoint of the first tangent section as the start point

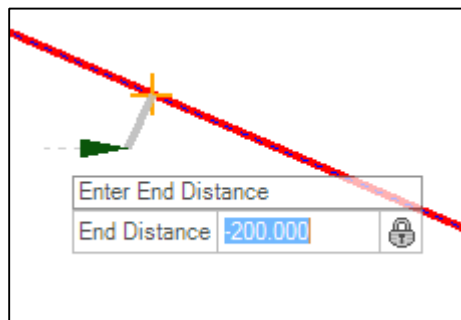


41. Set Skew to 90

42. Data Point

43. Hit the left arrow key and set the Start Distance to 0.

44. Set End Distance to -200/200 (whichever causes the alignment to display on the left side of the mainline alignment)



45. Set Trim/Extend option to None.

46. Data point to accept

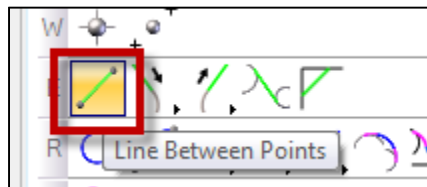
47. Close the file

Exercise 2: Creating a Horizontal Alignment: Complex By PI

1. Start OpenRoads using the Enhanced Workspace

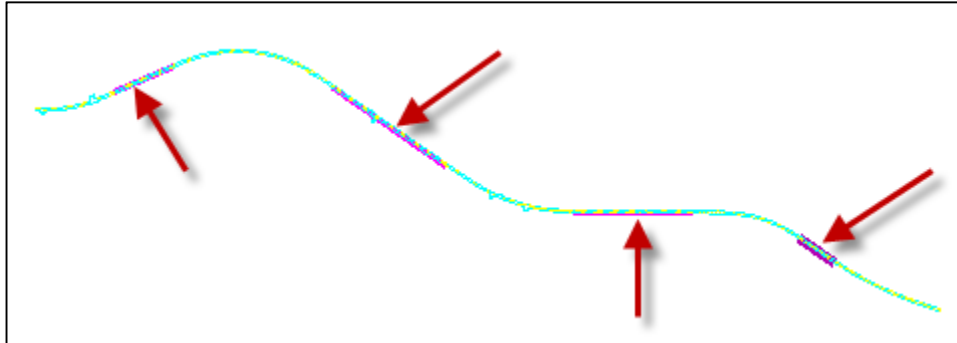
2. Open file 8541000RDALN003.dgn

3. Select the Line Between Points command

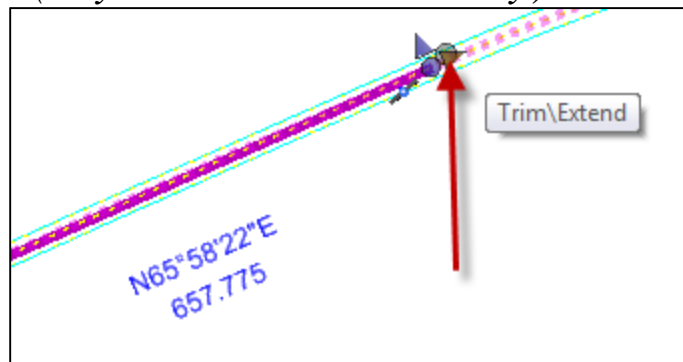


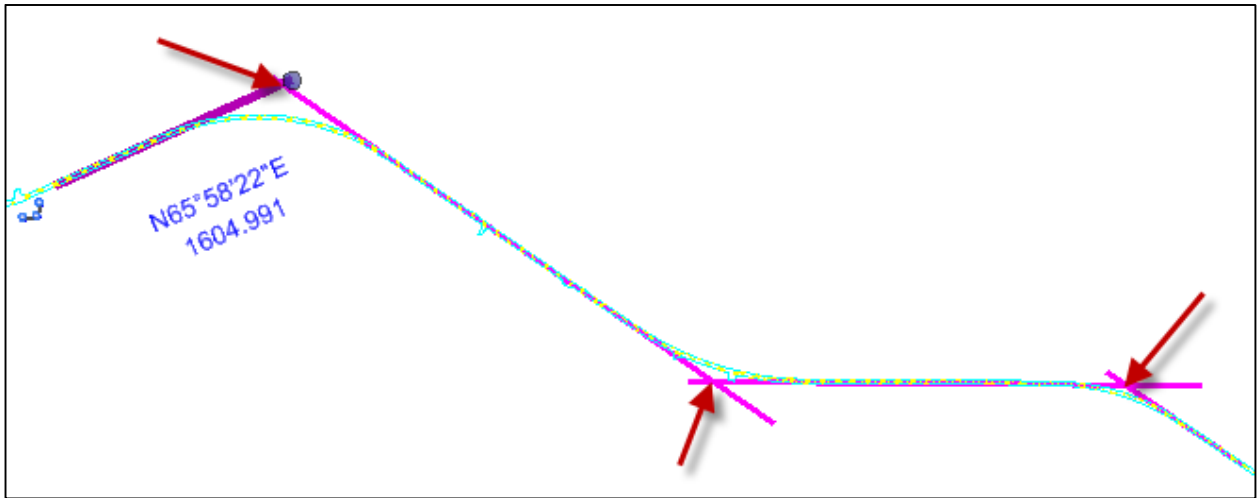
4. Set the Feature Definition to Draft_DNC

5. Sketch in the 4 tangent roadway segments based on the surveyed pavement markings, using the Line Between Points command

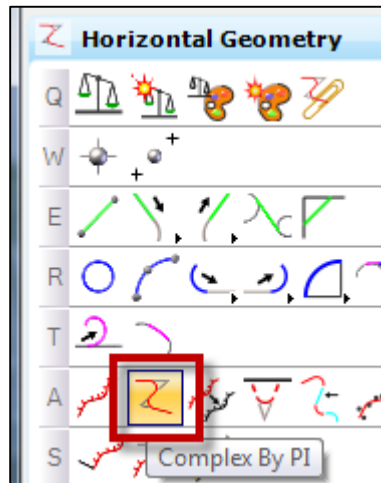


6. Using the element manipulators, extend the line segments so they overlap and create PIs. (They do not need to intersect exactly.)

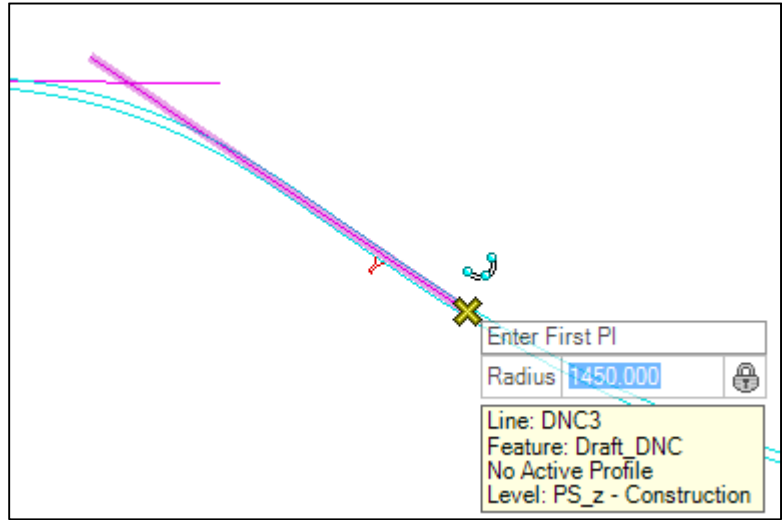




7. *Turn off the E_Road_RR_Misc_PavementMarkings level in the 8541000RDEFF001 file so those lines aren't accidentally selected when creating the complex*
8. *Select the Complex By PI command to create an alignment based on the tangent intersections*

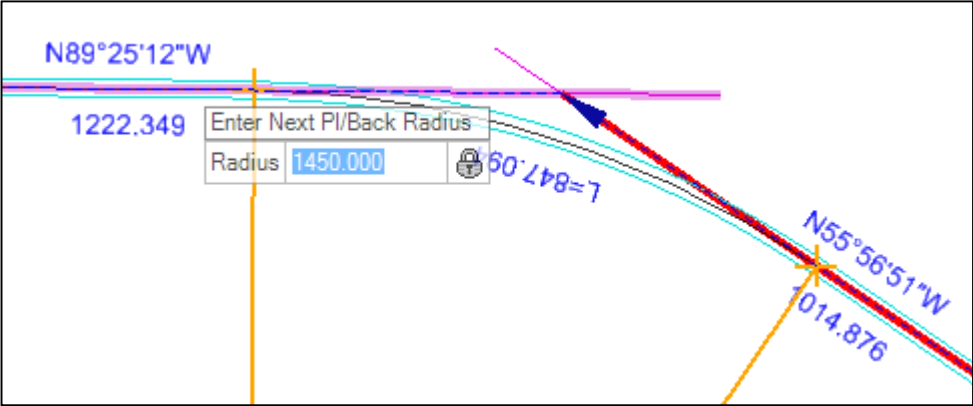


9. *Set Feature Definition to HA DESIGN CENTER LINE and Name to Proposed*
10. *Select the beginning of the right line segment (right end point)*



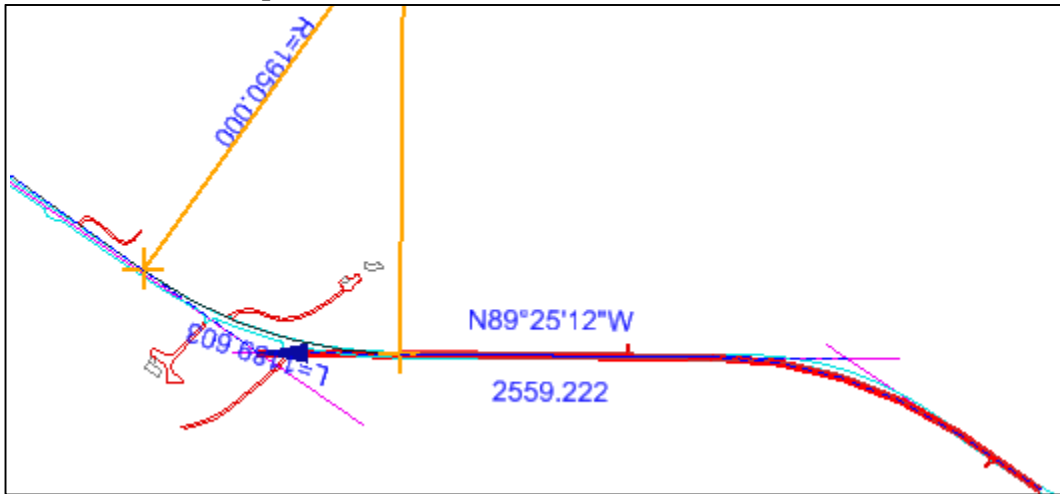
11. Set Radius to 1450

12. Select the 1st and 2nd PIs in order



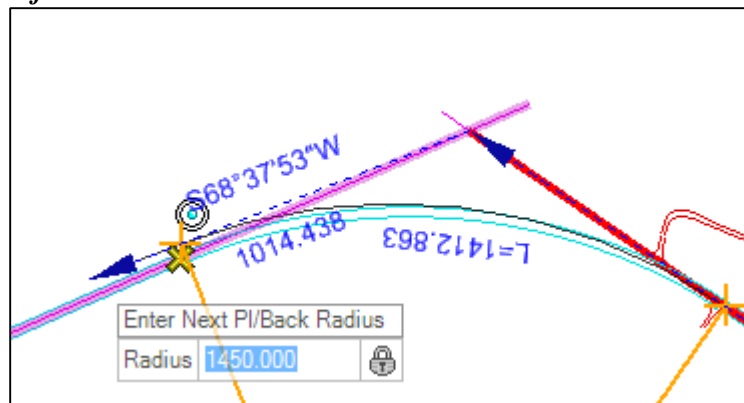
13. Set Radius to 1950.

14. Data point the next PI



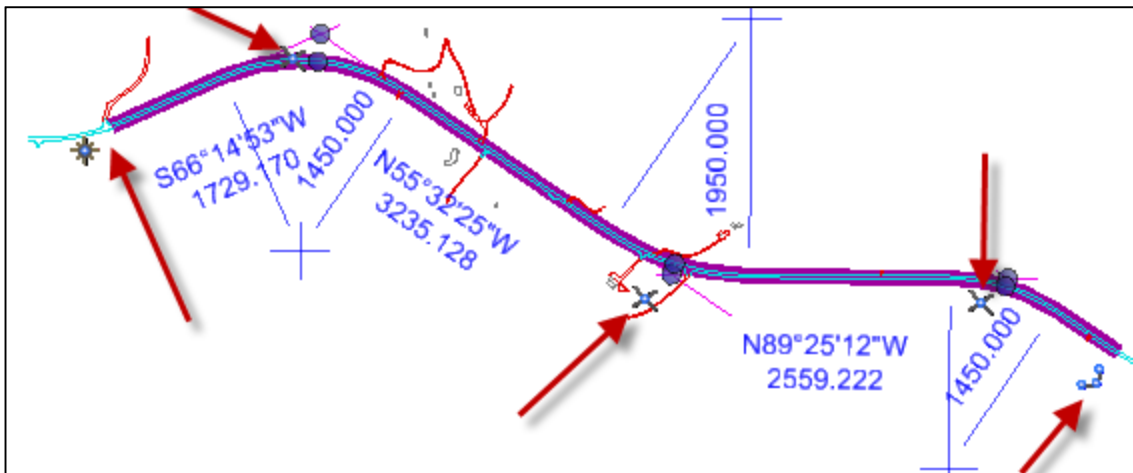
15. Set radius back to 1450

16. Data point final PI



17. Data point the end point of the last segment

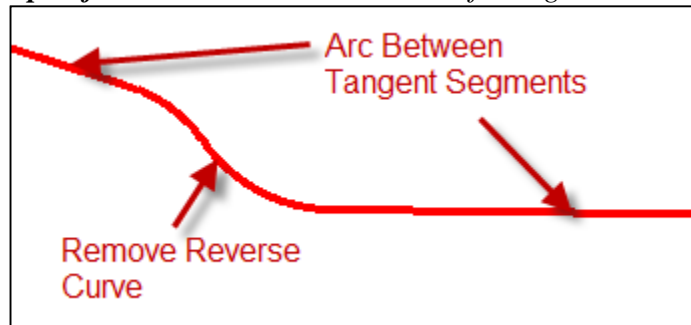
18. Reset to end command



Exercise 3: Editing a Horizontal Alignment: Complex Redefine

1. *Start OpenRoads using the Enhanced Workspace*

2. *Open file 8541000RDALN001-Redefine.dgn*

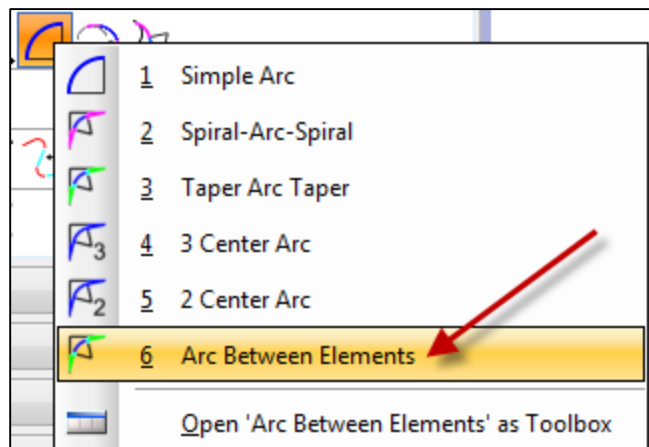


3. *Set the Active Feature Definition to Draft_DNC and toggle on Use Active Feature Definition*

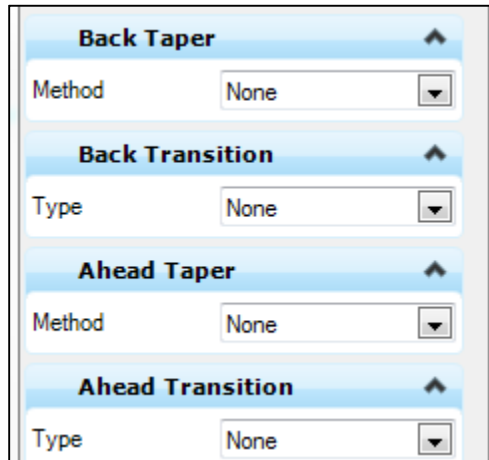


Construct alternate geometry:

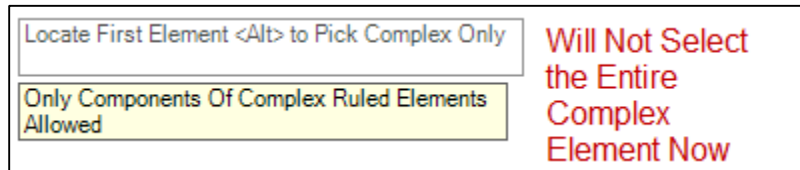
4. *Select the Arc Between Elements command to create new transition arc*



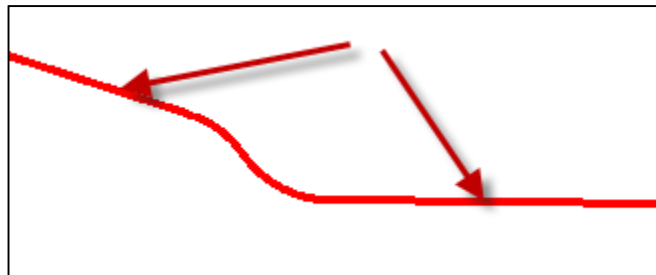
5. *Ahead and Back Tapers and Transitions should be set to None*



6. *Press the <Alt> key to pick components of the alignment instead of the entire thing*

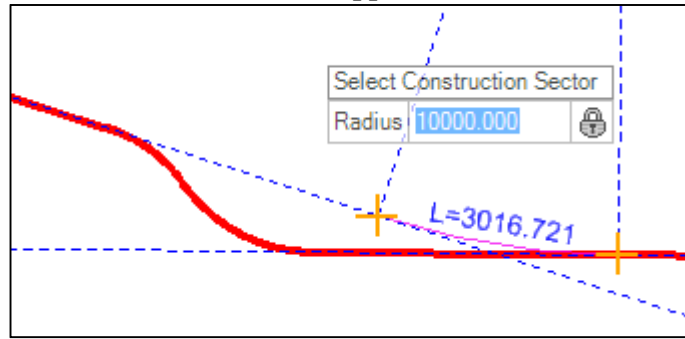


Note: Hitting the <Alt> key toggles the active setting to the second choice in the prompt.

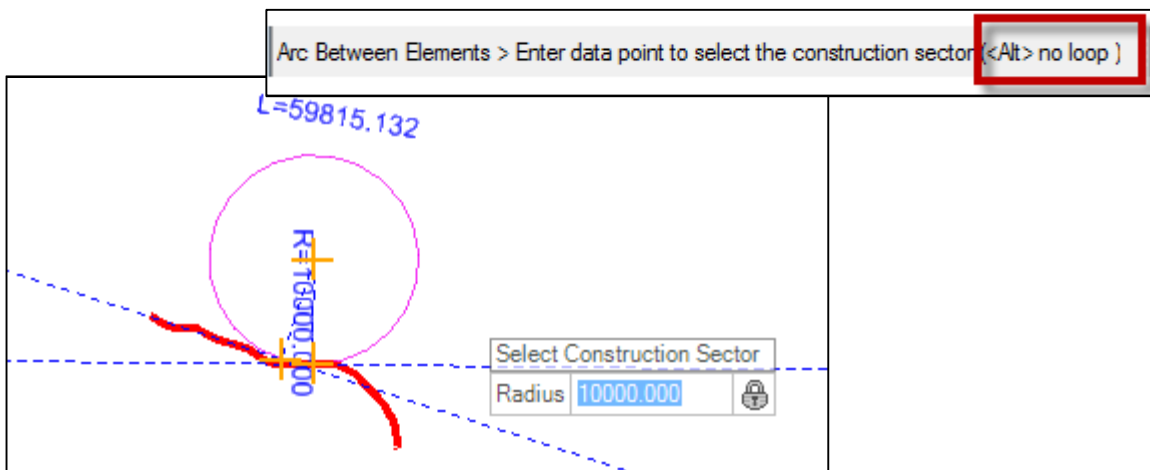


7. *Select the two tangent line segments shown above*

8. Set Radius to 10000 and choose the upper Construction Sector

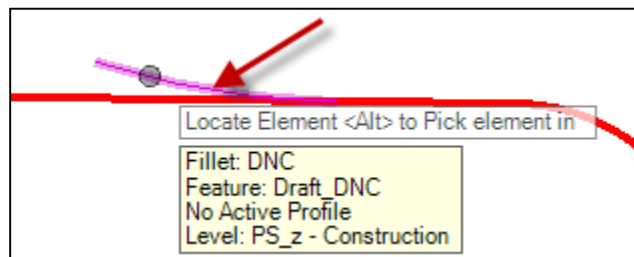


Note: If the arc sweep is in the wrong direction, press <Alt>

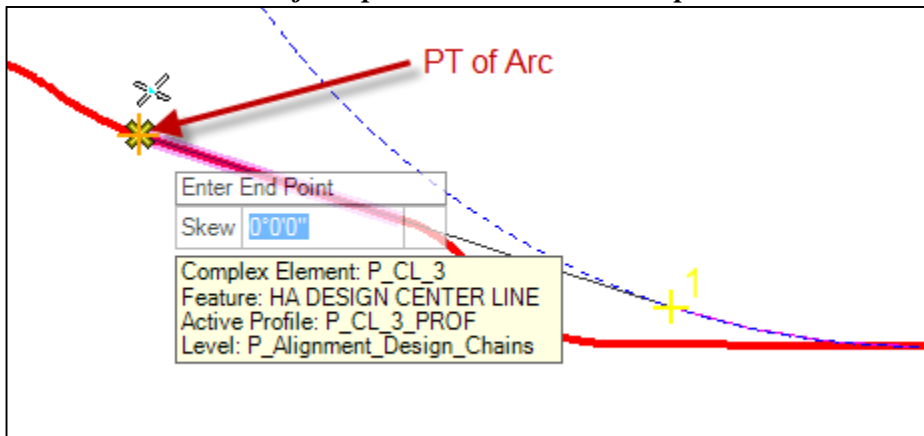


9. Select the Simple Line To Element command to create the extended tangent connecting the existing alignment to the new arc

10. Select the new arc



11. Select the PT of the previous arc as the end point



12. Set Trim/Extend to None

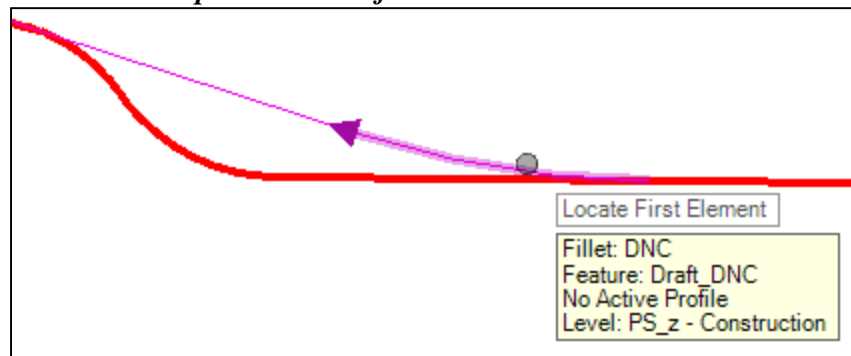
13. Data point to accept

14. Select the Complex By Element command to turn the new geometry into an alignment. (It can't be used to redefine as separate elements)

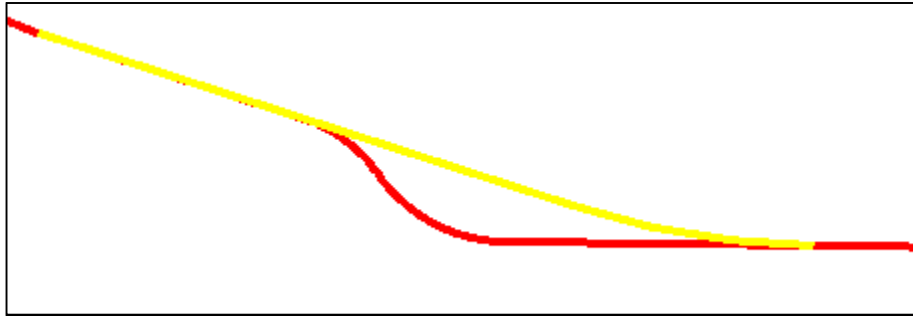
15. Set Method to Manual so the command doesn't pick up the existing alignment

16. Set Feature Definition to HA ALT X

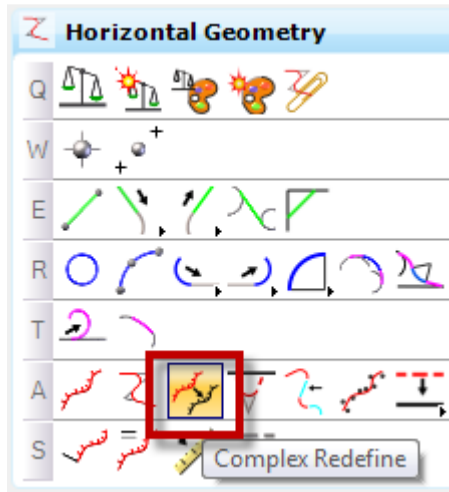
17. Select the new arc followed by the new tangent. Order is important. Make sure the directional arrows point to the left



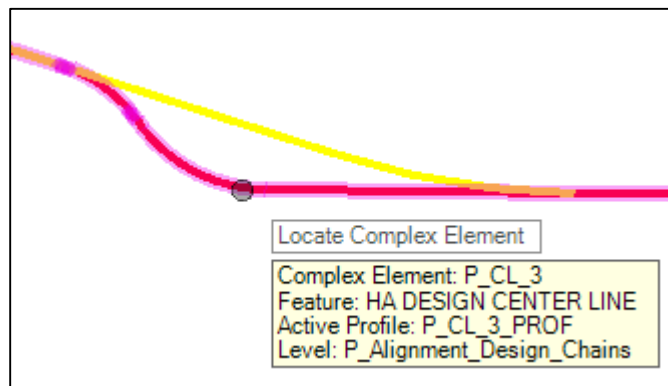
18. Data point to finish command



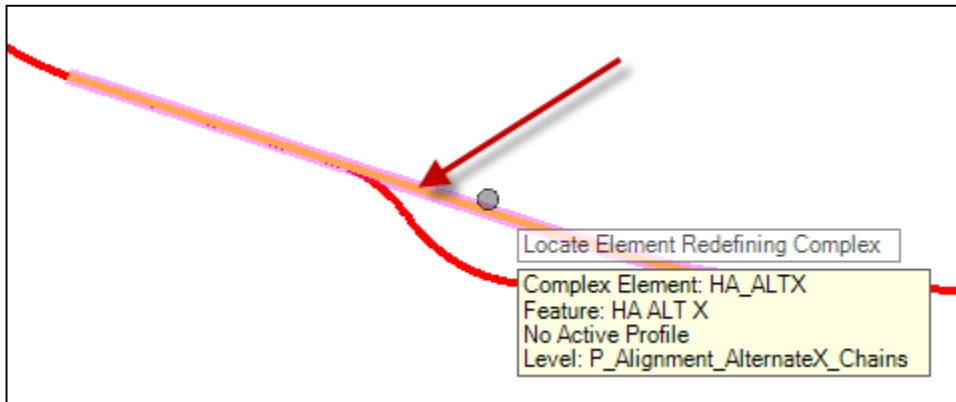
19. Select the Complex Redefine command to replace the reverse curve with the new geometry



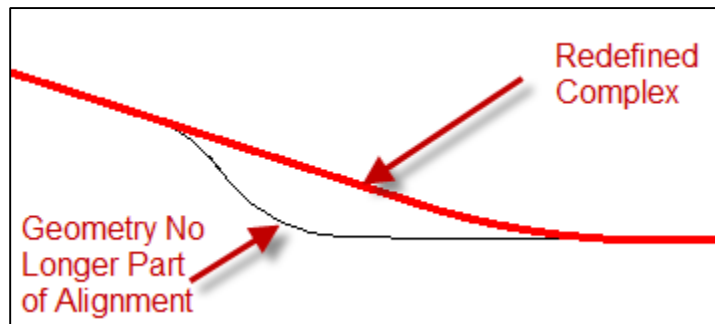
20. Select P_CL_3 as the complex element



21. Select HA_ALT X as the Element Redefining Complex



22. Wait Patiently. When the program crashes, retry. IF that doesn't work, abort, run KillTask, and reopen 8541000RDALN001- Redefine.dgn.



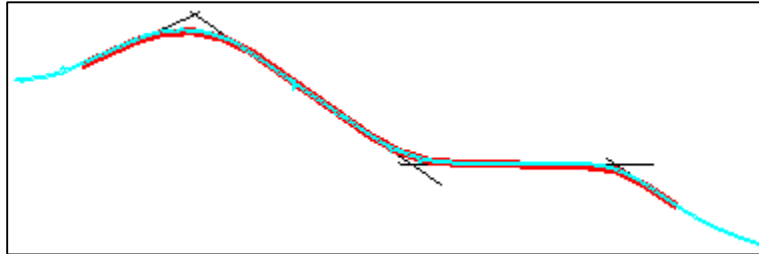
23. Close the file

Note: This command will affect any profiles associated with the alignment. Suggested to Lock (Deactivate Rule) profiles before using.

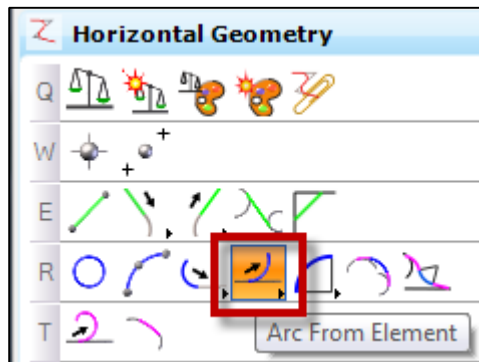
Exercise 4: Lengthening a Horizontal Alignment: Append Element

1. *Start OpenRoads using the Enhanced Workspace*

2. *Open file 8541000RDALN003 - Append.dgn*

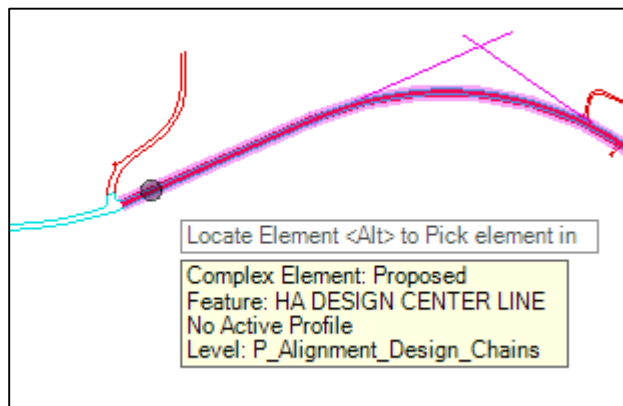


3. *Select the Arc From Element command to place an arc tangent to the last line segment*



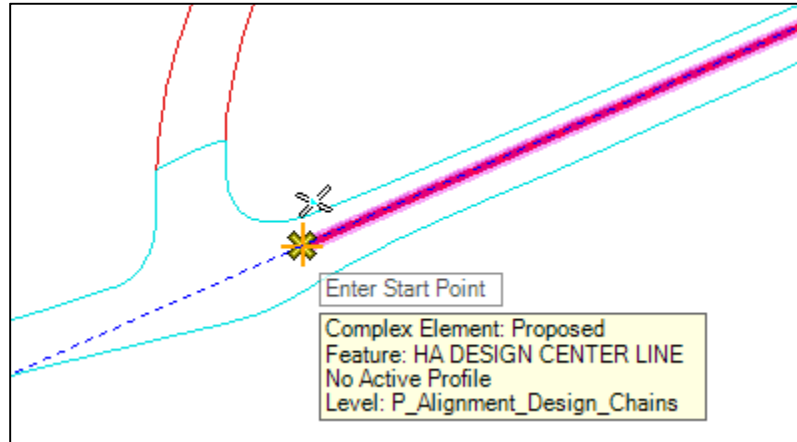
4. *Set the Feature Definition to Draft_DNC*

5. *Select the Proposed alignment*

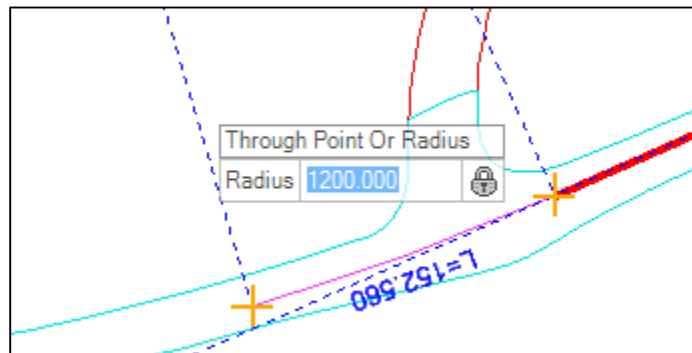


6. *Set Offset to 0*

7. Select the end point of Proposed as the Start Point



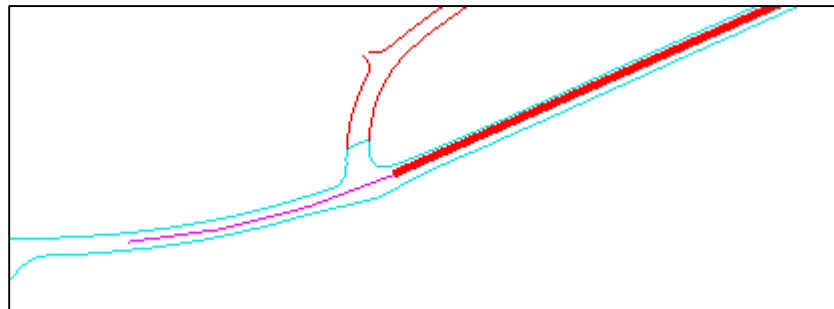
8. Set Radius to 1200



9. Set Arc Length to 400

10. Set Trim/Extend to None

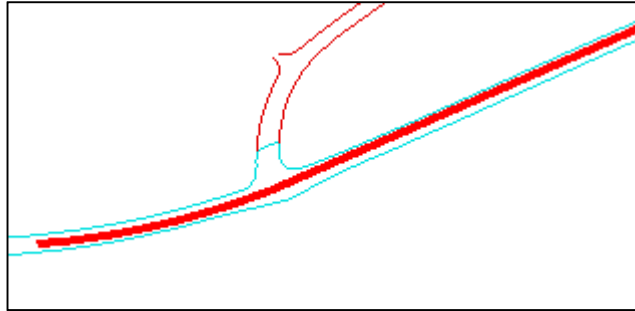
11. Data point to accept



12. Select the Append Element command to add the arc to the Proposed alignment

13. Select Proposed as the complex element

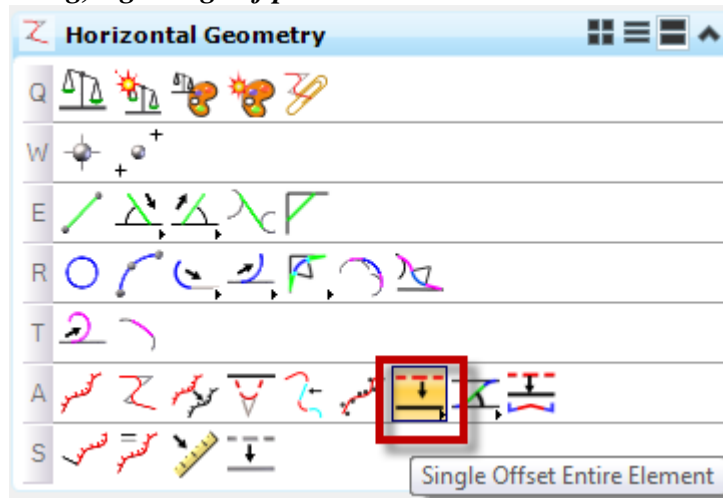
14. Select the new arc to add it to the alignment



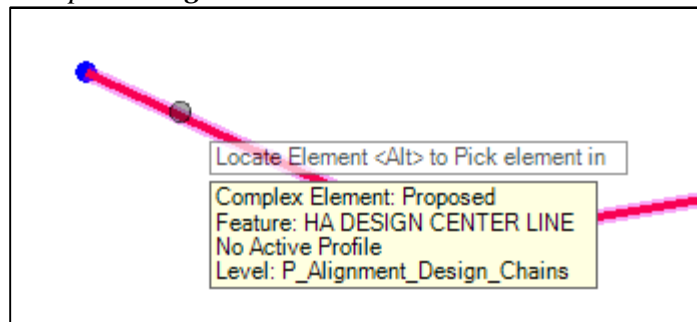
15. Close the file

Exercise 5: Creating Edge of Pavement Linework: Offsets & Tapers

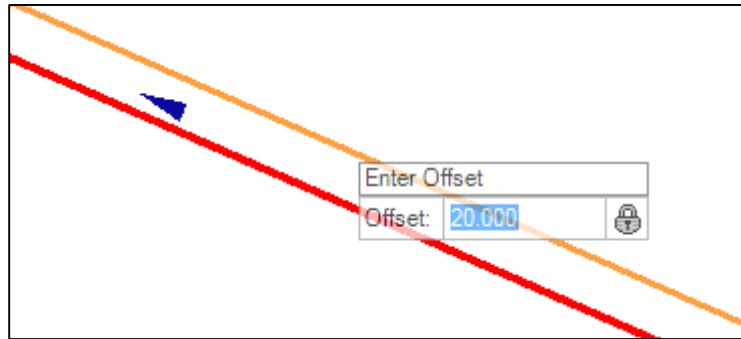
1. *Start OpenRoads using the Enhanced Workspace*
2. *Open file ComplexByElement - Offset.dgn*
3. *Set the Active Feature Definition to Road_EdgeOfPavement and toggle Use Active Feature Definition ON*
4. *Select the Offset Single Entire Element command to create the non-transitioning, right edge of pavement*



5. *Select the Proposed alignment*

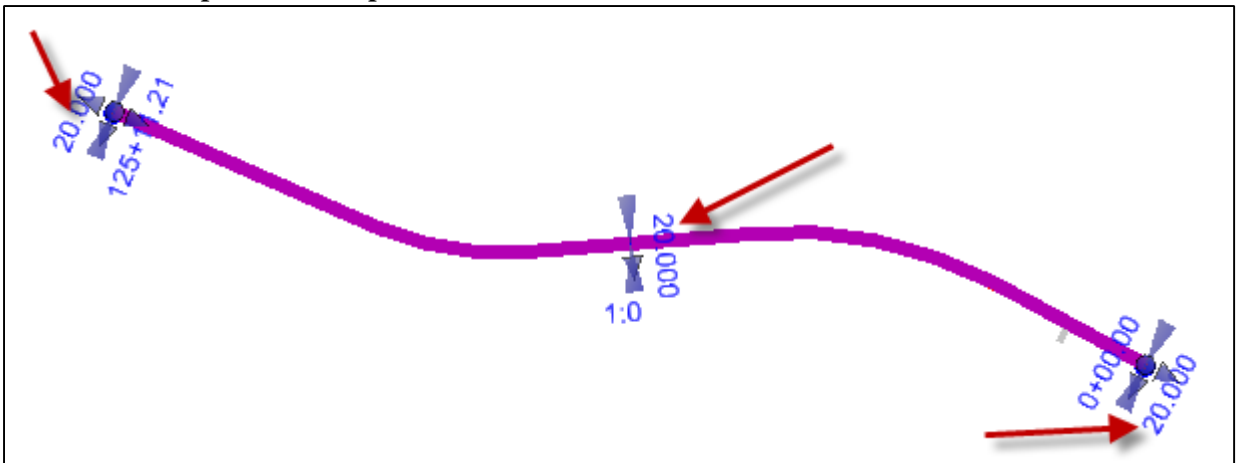


6. *Set Offset to 20*

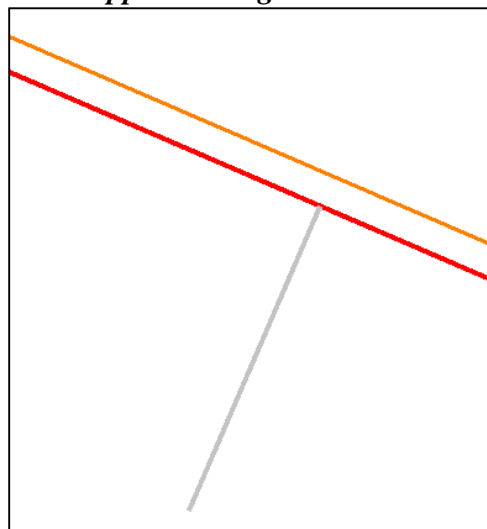


7. *Leave Mirror option No.*

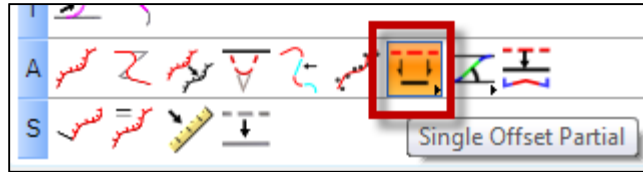
8. *Data point to accept*



9. *Zoom in to the Approach alignment*



10. Select the Single Offset Partial Command to create the approach edges of pavement

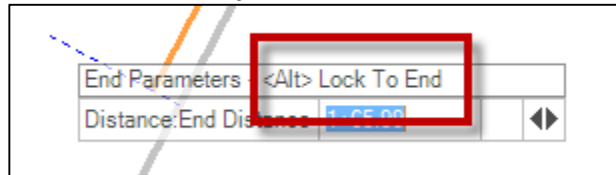


11. Select the Side Road Line

12. Set Start Distance to 25

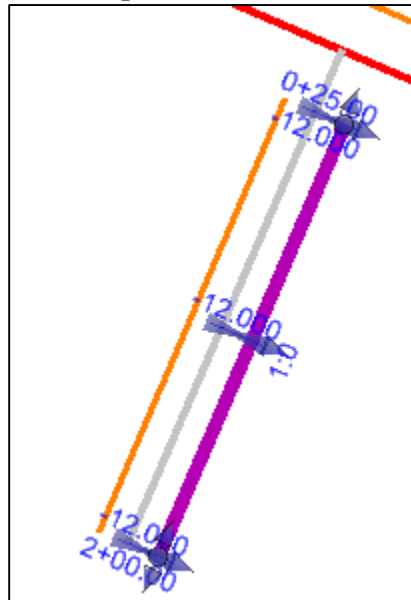
13. Set Offset to 12

14. Press <Alt> to Lock To End for the End Distance

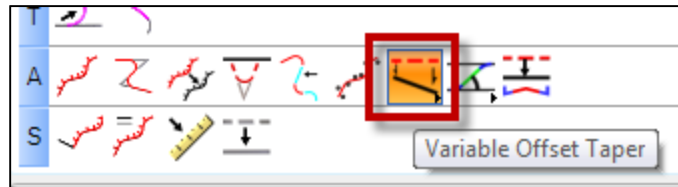


15. Set the Mirror option to Yes

16. Data point to accept



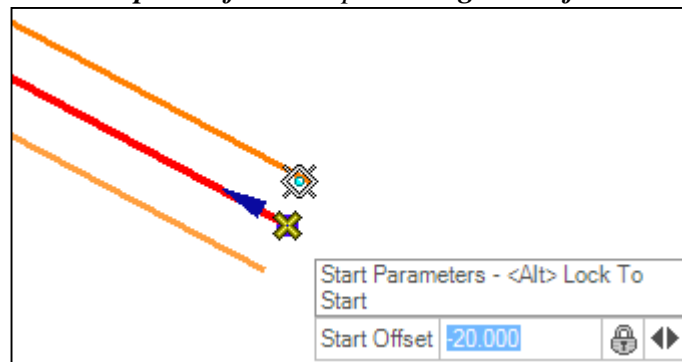
17. Select the *Variable Offset Taper* command to create a taper for the auxiliary lane



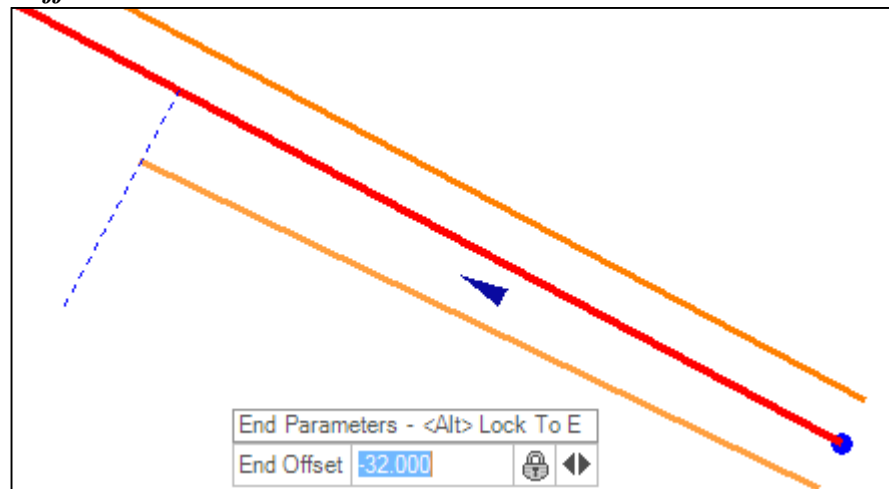
18. Select the *Proposed alignment*

19. Set *Start Offset* to -20 (<Enter> to lock. Do not data point)

20. Snap to the start point of the *Proposed alignment* for the start point



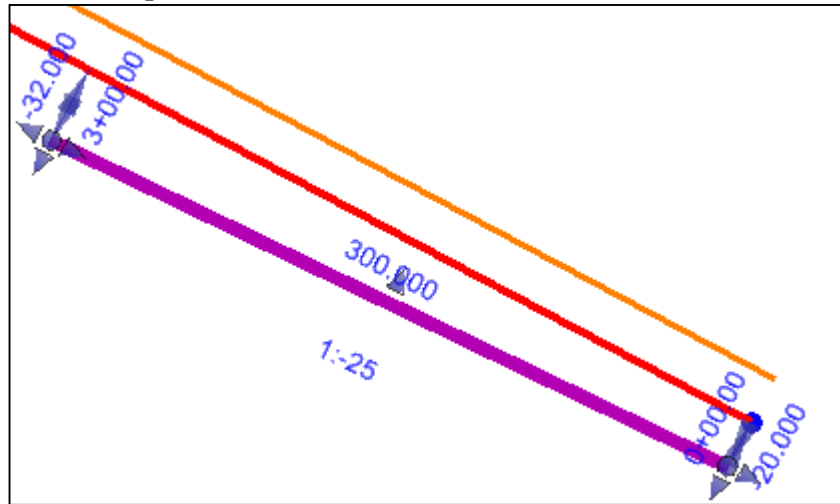
21. Set *End Offset* to -32



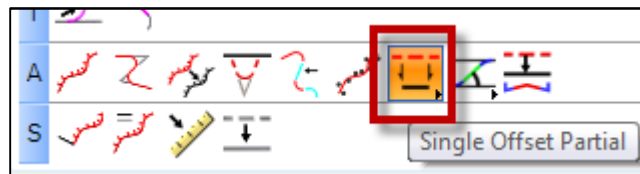
22. Set *End Distance* to 300 (Left arrow)

23. Set *Mirror* option to No

24. Data point to accept



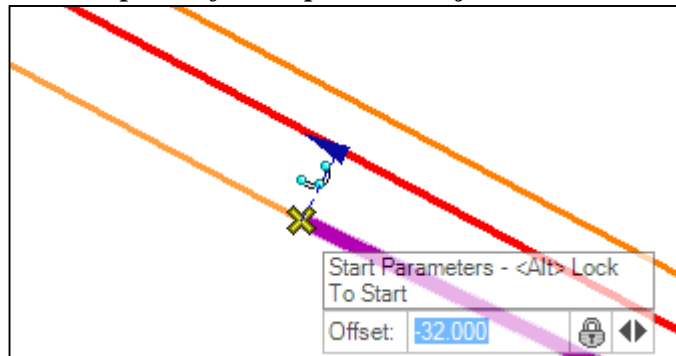
25. Select the Single Offset Partial Command to finish the auxiliary lane



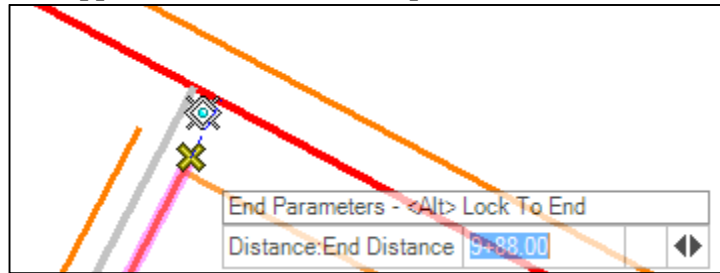
26. Select the Proposed alignment

27. Set Offset to -32 (<Enter> to lock. Do not data point)

28. Snap to the end point of the tapered EOP just created

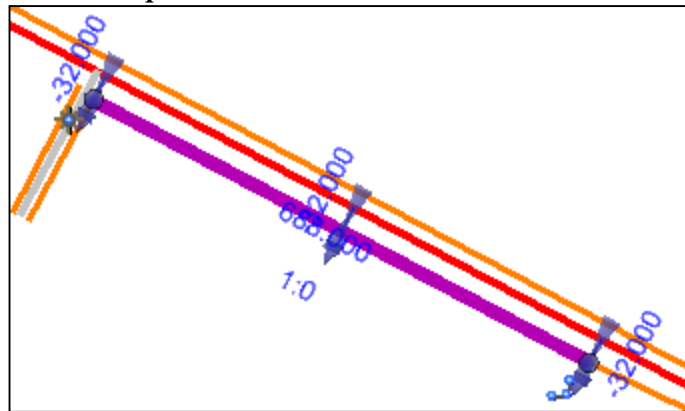


29. Snap to the approach EOP as the end point

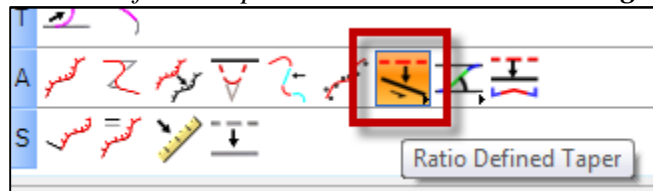


30. Change the Mirror option to No

31. Data point to accept



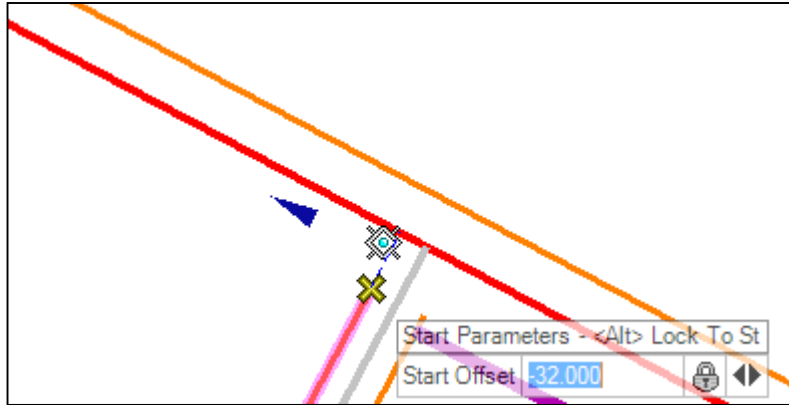
32. Select the Ratio Defined Taper command to create the right turn lane taper



33. Select the Proposed alignment

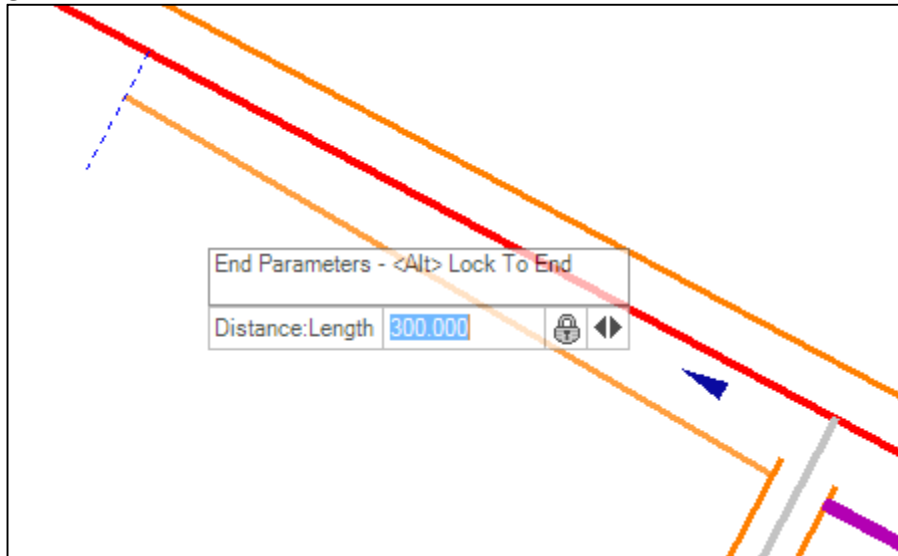
34. Set Start Offset to -32

35. Snap to the end point to the right edge of pavement on the approach



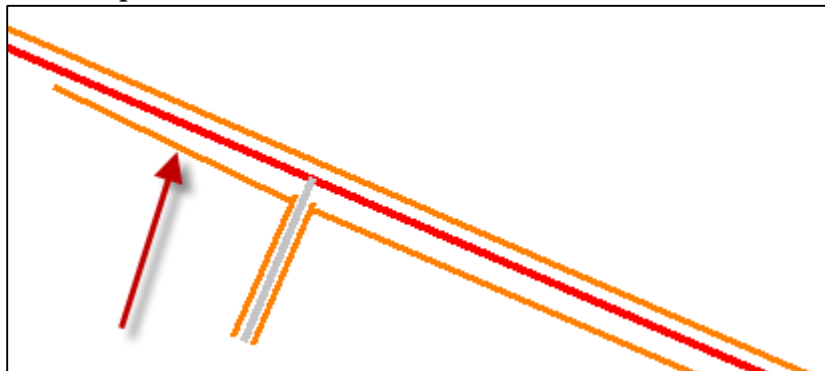
36. Set Ratio to 1:25

37. Set Length to 300



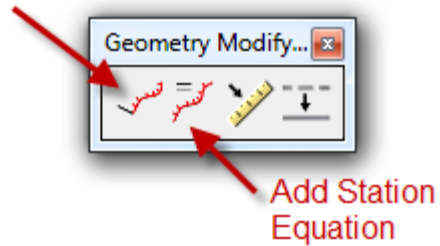
38. Set Mirror option to No

39. Data point to accept



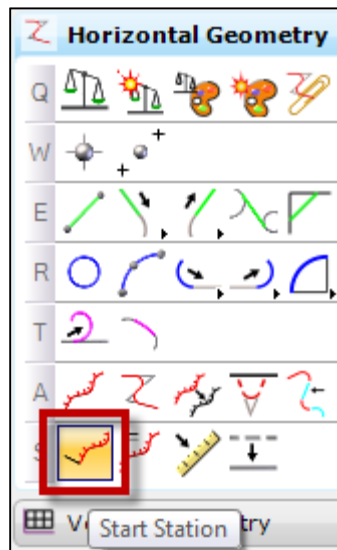
F. Geometry Modify

Start Station



Exercise 6: Stationing

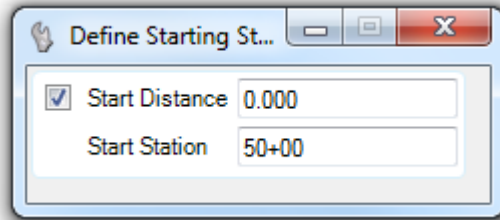
1. *Start OpenRoads using the Enhanced Workspace*
2. *Open file 8541000RDALN002 - Offset.dgn*
3. *Select the Start Station command*



4. *Select the Proposed alignment*
5. *Set Start Distance to 0*

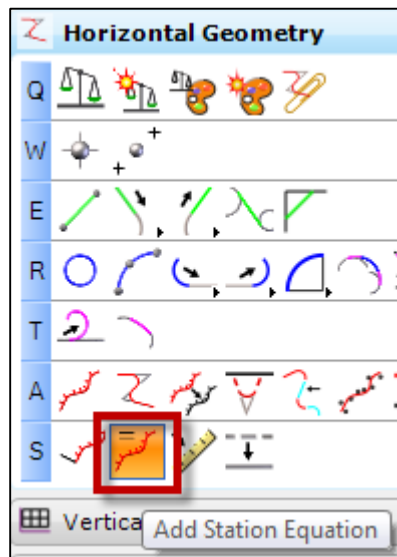
Note: *Start Distance is the distance from the beginning point, along the alignment, to the location where the Start Station is applied*

6. *Set Start Station to 50+00*

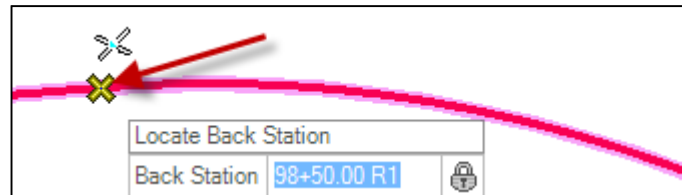


7. *Data point or <Enter> to accept*

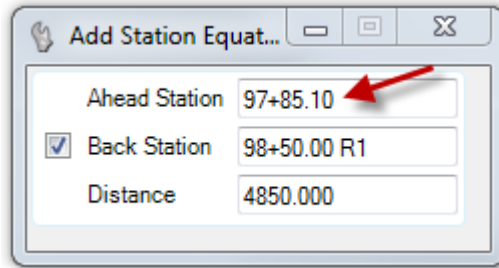
8. *Select the Add Station Equation command to insert an equation*



9. *Set Back Station to 98+50.00*

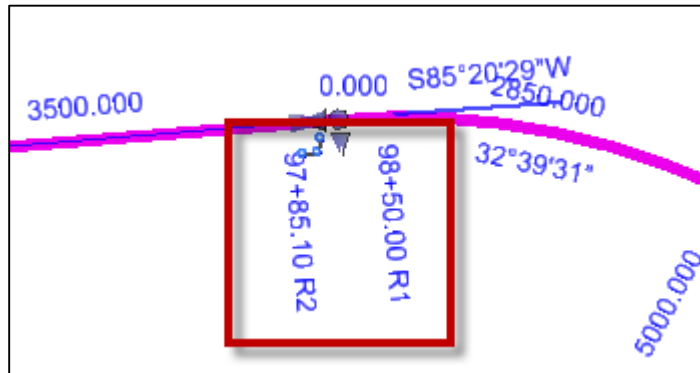


10. Set Ahead Station to 97+85.10



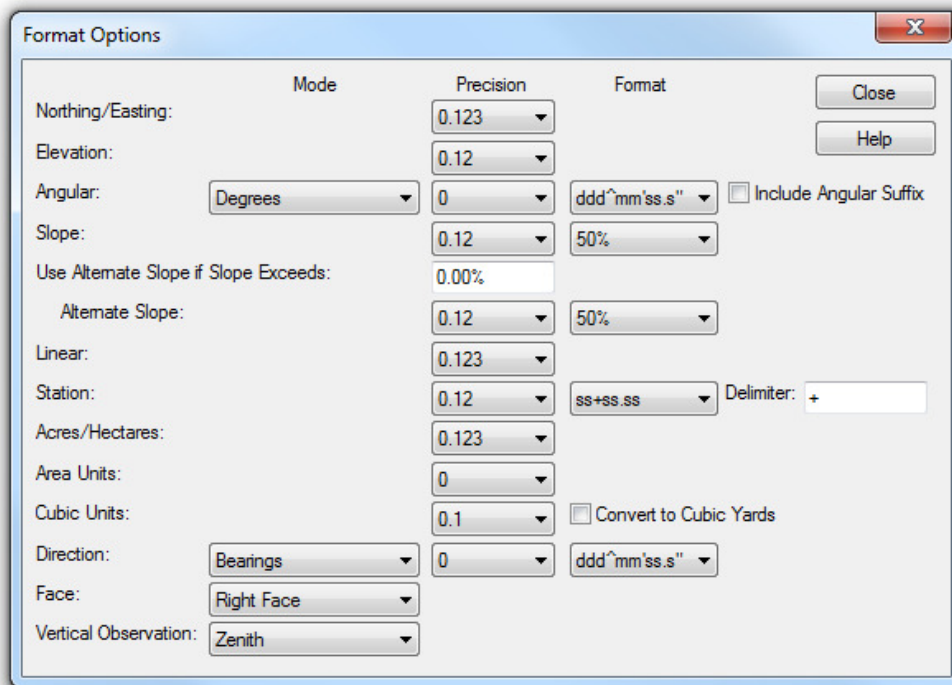
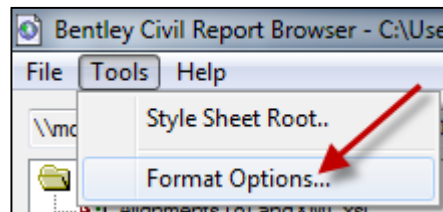
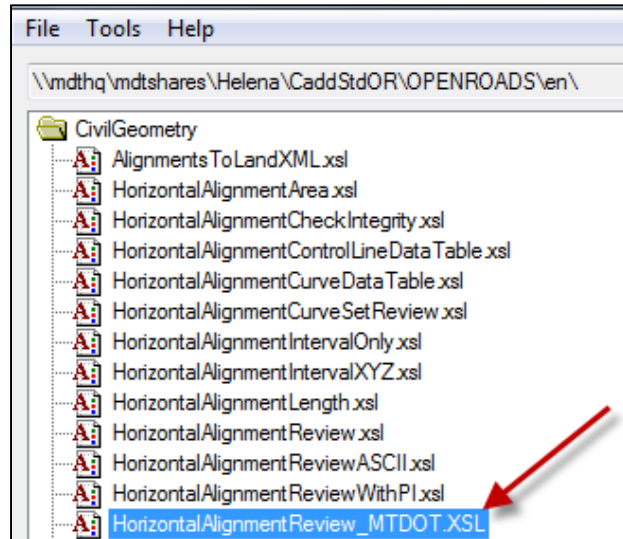
The screenshot shows a dialog box titled "Add Station Equat...". It contains three input fields: "Ahead Station" with the value "97+85.10", "Back Station" with the value "98+50.00 R1" and a checked checkbox, and "Distance" with the value "4850.000". A red arrow points to the "Ahead Station" field.

11. Data point or <Enter> to accept



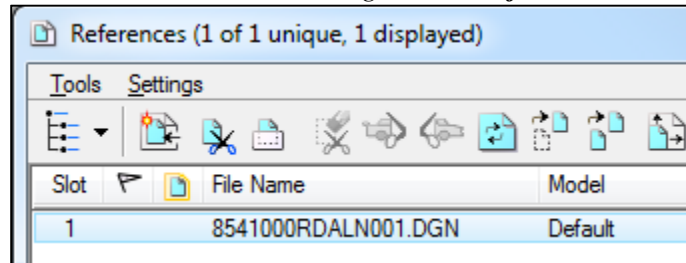
12. Close the file

2. Horizontal Geometry Reports

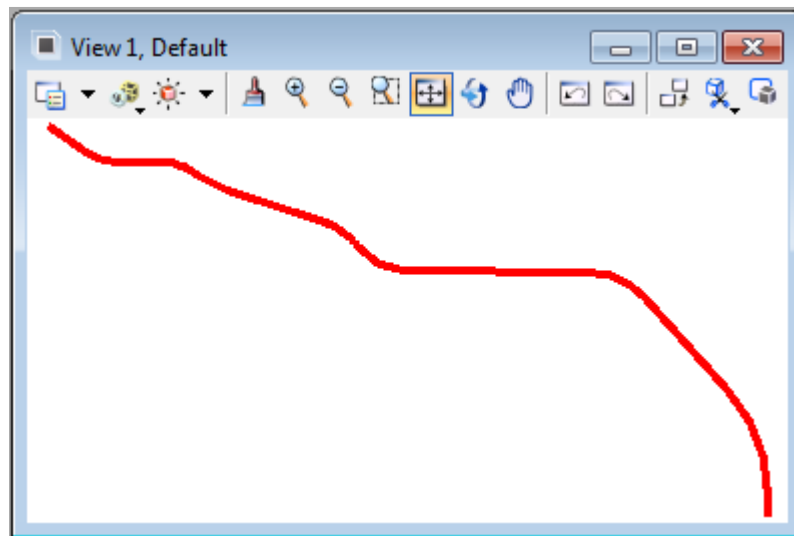


Exercise 7: Copied Centerline Alignment

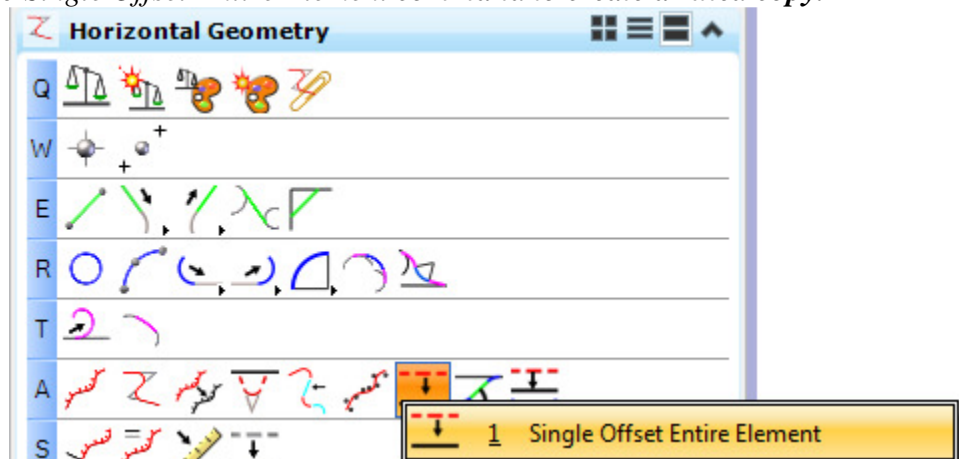
1. *Start OpenRoads using the Enhanced Workspace*
2. *Open file 8541000ROMAP001.dgn*
3. *Reference 8541000RDALN005.dgn into the file*



4. *Zoom Extents*



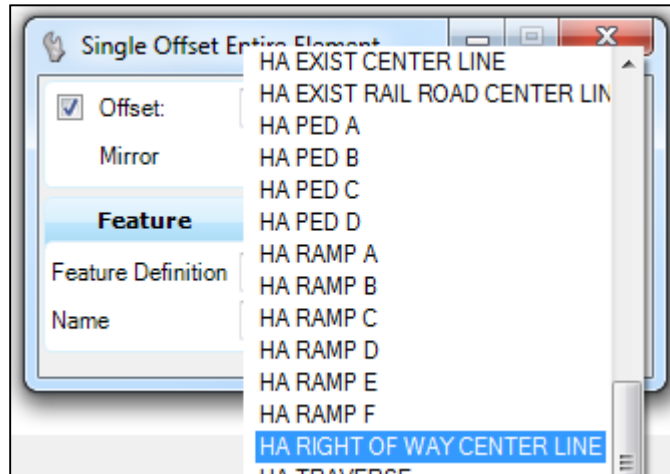
5. *Select the Single Offset Entire Element command to create a ruled copy.*



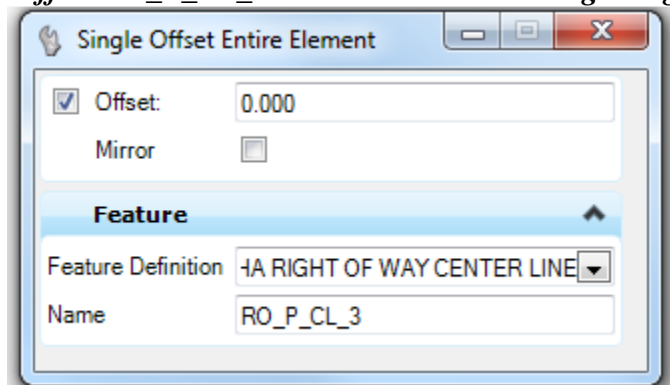
6. *Select the Road Design alignment P_CL_3*

7. *Set Offset to 0*

8. *Choose Feature Definition MDTStandard.ddb > Roadway > Alignments > HA RIGHT OF WAY CENTER LINE*



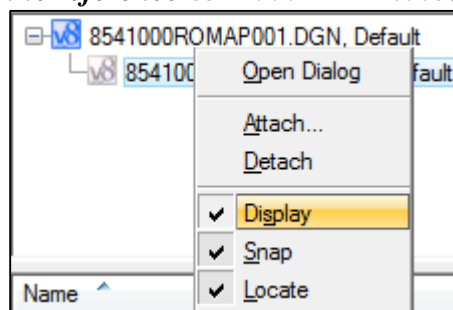
9. *Name the offset RO_P_CL_3 to match the Road Design Alignment*

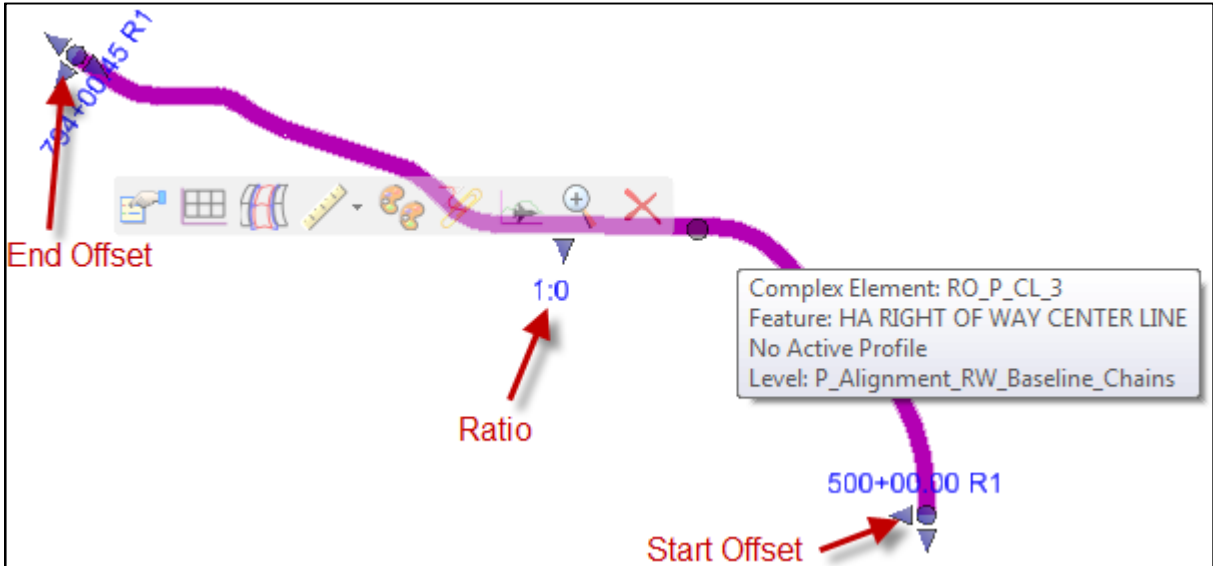


10. *Leave the Mirror option unchecked*

11. *Data point to accept*

12. *Turn off the reference 8541000RDALN005. **Do NOT** detach the reference.*





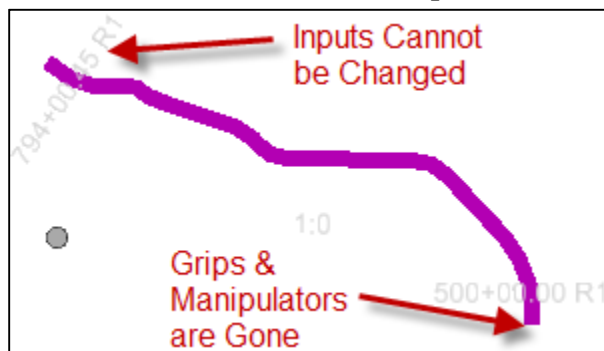
13. Select alignment RO_P_CL_3 and select the ruler icon from the context sensitive menu.



14. Select the Lock – Deactivate Rule option (closed padlock) to disable the update ability of the alignment

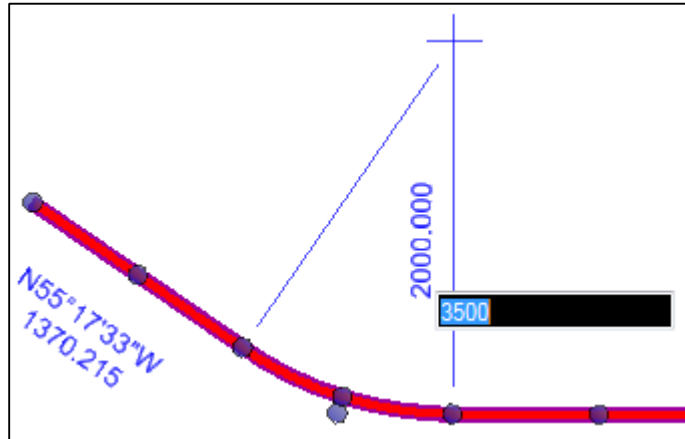


15. The alignment is now locked. It will not update until unlocked.



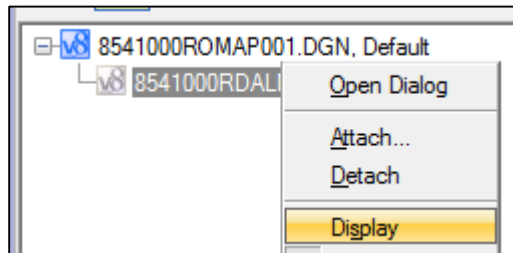
16. Open file 8541000RDALN005.dgn

17. Change the radius of the last curve to 3500 so it no longer matches the alignment in the ROMAP

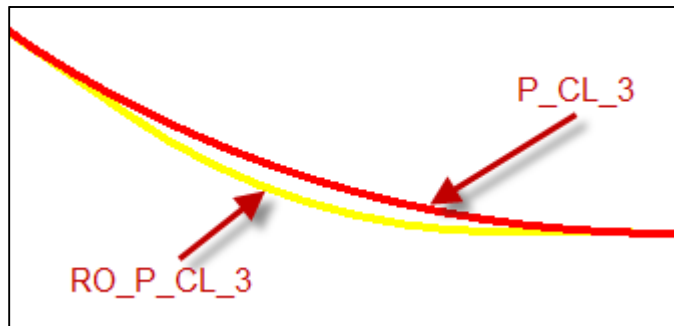


18. Open file 8541000ROMAP001.dgn

19. Turn on the display of the 8541000RDALN005 reference

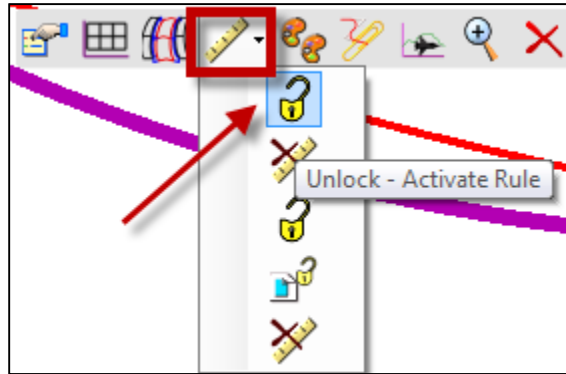


20. Zoom in to the first curve

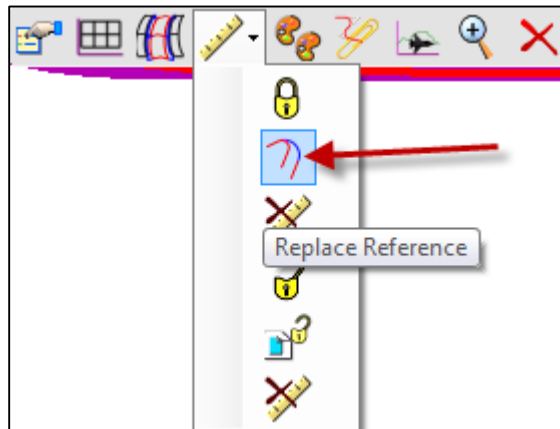


To Update the Copied Alignment:

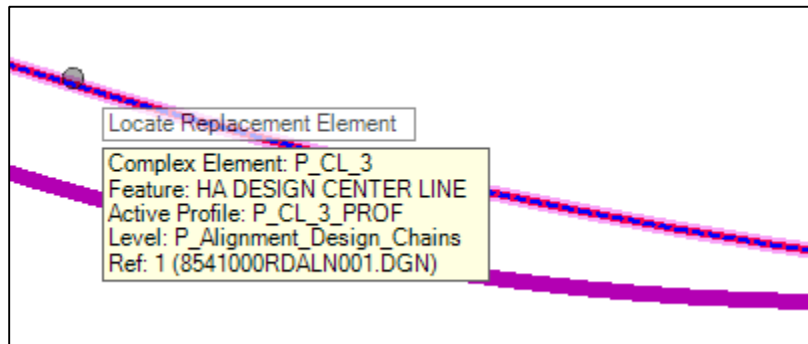
21. Select RO_P_CL_3 and select the Unlock – Activate Rules from the ruler icon on the context sensitive menu. Now the alignment is manipulatable.



22. With RO_P_CL_3 still highlighted, select Replace Reference from the ruler icon on the context sensitive menu to re-establish the relationship between the 2 alignments



23. Select P_CL_3 as the replacement element



24. Relock the updated RO_P_CL_3