LAB 3 - Geometry Annotation

This lab demonstrates how annotate horizontal geometry, set and display alignment stationing, and use horizontal alignment tracking tools.

Chapter Objectives:

- Display horizontal alignments.
- Annotate horizontal alignments and cogo points.
- Reset stationing on an alignment.
- Display stationing.
- Add a station equation.
- Use Tracking and Horizontal Alignments Tracking.

The following files are used in this lab:

- C: \Projects \12345 Design \Drawings \Reference_Files \12345 DES_Geometry-Annotation.dgn
- C:\Projects\12345\Design\InRoads\12345DES_Design.alg
- C:\Projects\12345\Design\InRoads\12345 existing ground.dtm

Lab 3.1 - Geometry Display

Section Objectives:

- Set the proper scale factors.
- Open a saved view in MicroStation.
- Display alignments using the View and Annotation commands.
- 1. Select Tools > Global Scale Factors and set the scales to *100* for *Text* and *Cell* and *1* for *Line Style*.

Scale F	actors	
Text:	100.0000	Apply
Cell:	100.0000	
Line Style:	1.0000	

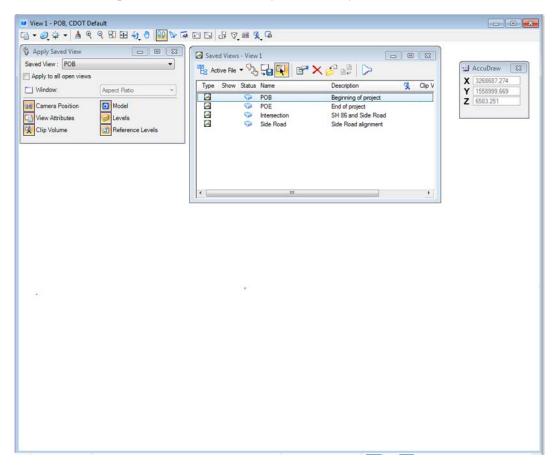
- 2. **<D> Apply** then **Close** to accept the changes and dismiss the dialog box.
- Using the *MicroStation* menus, select Utilities > Saved Views to open the saved views dialog box.

4. **<D>** on the name **POB**, **<D>** the **Apply Saved View** button, then **<D>** in **View 1**.

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🔄 😒 Sid	de Road Side Road alignme	ent
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5. Close the *Saved Views* dialog box.

Below is an example of the saved view. Only two small symbols are visible.



6. Display alignment **SH 86_West** from the Geometry Project *12345_Design* by rightclicking <**R**> on the alignment name and selecting **View** from the right click menu.

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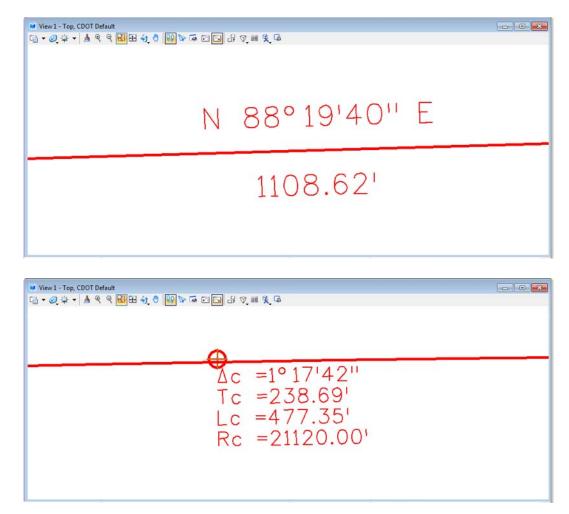
AccuDraw E3 X 3268968.861 Y 1559009.850 Z 6583.251 The alignment display is based on the geometry style assigned to the alignment. This display method does not allow the user to annotate of the geometry. The next steps illustrate how to display various types of horizontal alignment data.

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Display Points On-Alignment Off-Alignment Elements Radials	t Event Points t Station Equation Tangents Subtangents	ons] Points] Elements] Duplicates] Dual Dimens] Try Alternate	Styles

7. Select Geometry > View Geometry > Horizontal Annotation.

- 8. Key in *SH 86_West* in the *Annotate* field and *Tab* from the field.
- 9. Set options for the *Display* and *Annotate* sections of the dialog box as shown in the above illustration.
- 10. **<D>** the **Apply** button. The *SH86_West* alignment and its annotation are displayed.

11. Note how *Bearing* and *Distance* annotation is displayed along the tangents. If the alignment contains horizontal curves, curve data will be displayed.



12. Return to the **View Horizontal Annotation** dialog box.

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13. In the *Annotate* area of the *Main* tab, Toggle on *Points* and *<D> Apply*

In addition to annotation for tangents and curves, notice that alignment vertices are also annotated.



14. On the **Main** tab, click the **Help** button and review the descriptions for the various components that can be displayed.

Main Tabling Styles	
Apply Style Assigned Active Overwrite	Filter
Horizontal Alignment: ALG_EXISTING	- Help
Cogo Points: Default	v
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- 15. Experiment displaying an alignment with *Points* and *Elements* turned on or off in both the *Display* area and the *Annotate* area.
- 16. Close the View Horizontal Annotation dialog box.

Section Summary:

- InRoads displayed graphics are governed by the Global Scale Factor in InRoads. The MicroStation Annotation Scale has no affect on these elements.
- The view alignment commands (from the right click menu or from Geometry > View Geometry > Active Horizontal) only display the lines and arcs that make of the alignments path.
- Horizontal Annotation also displays the alignment's path and it can display other geometry data as well.

Lab 3.2 - Selecting Multiple Alignments for display and/or Annotation

Section Objectives:

- Illustrate how to display and annotate multiple horizontal alignments at one time.
- 1. Select Geometry > View Geometry > Horizontal Annotation.

- 2. **<D>** the *Main* tab.
- 3. Set the *Apply Style* to Assigned.
- 4. **<D>** in the *Include* field in the *Horizontal Alignments* area. The *Filter* button becomes active.

View Horizontal Annotati Main Tabling Styles Apply Style Assigned Active Horizontal Alignment: ALG Cogo Points: Defa	e 🗌 Overwrite _EXISTING	Fiter
Horizontal Alignments Include:	+ Inclu	Points de:
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	. .	Dual Dimensions
	Tangents	Try Alternate Styles
Display As Complex Linest	Subtangents	Extend Beyond Element Planarize
Apply Interactive		Preferences Close

5. **<D>** the **Filter** button to display the *Geometry Selection Filter* dialog box.

🚔 Geometry	Selection Filter						—
Name:	Included	•	•				ОК
Description:	Included	•	•				Cancel
Style:	Included	•	•				Preferences
Fence Mode:	Ignore	-					Help
Available:				_	Selected:		Пор
Name	Description	Style		Add ->	Name	Description	Style
SH 86_We	Proposed SH 86 Proposed SH 86 Side Road Alignm	_	'RO 'RO	<- Remove <- Swap -> All None			

Note: Available alignments are shown on the left, Selected (for display or annotation) alignments are shown on the right. This makes it possible to select multiple alignments for display or annotation.

- 6. Move the alignments SH 86_West and Side Road from the *Available* list to the *Selected* list by highlighting their names in the *Available* list and then <D> the ADD button (or <D><D> on the names).
 - **Note:** To sort the data in this dialog box, <D> on the column headers. To select multiple alignments use of the *<CTRL>* or *<Shift>* keys.

Name:	Included	- ·				ОК
Description:	Included	•				Cancel
Style:	Included	•				Preferences.
Fence Mode:	Ignore	-				
Available:				Selected:		Help
Name	Description	Style	Add ->	Name	Description	Style
Default SH 86	Proposed SH 86	Default ALG_PRO	<- Remove <- Swap -> All None	SH 86_West Side Road	Proposed SH 86 Side Road Alignm	-
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7. **<D>** OK to dismiss the *Geometry Selection Filter* dialog box and populate the *Horizontal Alignments Selected* field of the *View Horizontal Annotation* dialog box.

Main Tabling Styles Apply Style Image: Styles Image: Styles Image: Styles	Filter
Horizontal Alignment: ALG_EXISTING Cogo Points: Default	• •
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	me Descri Style
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Display Points On-Alignment Event Points Off-Alignment Station Equations Elements Radials Tangents	Points Bements Duplicates Dual Dimensions Try Attemate Styles

8. **<D> Apply** and the selected alignments are displayed in MicroStation.

9. Review the results in MicroStation.

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Section Summary:

- Alignments can be selected for annotation by key in, graphic selection using the \pm button, or by using the Filter options.
- The Display area is used to turn on or off the display of the geometry elements.
- The Annotate area is used to turn on and off the text data associated with the geometry elements.

Lab 3.3 - Display or Annotation of Cogo Points

Section Objectives:

• Illustrate a method for defining cogo points for display and/or annotation.

Note: Whether you are annotating Points or Alignments, keep in mind that the element

selection button to a be used to graphically identify the geometry of interest. This is universally true in InRoads whenever the selection button is displayed.

10. **<D>** the *Include* field in the *Cogo Points* area to activate the *Filter* button

ain Tabling Apply Style	Styles		Ch.	
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11. **<D>** the **Filter** button. The *Geometry Selection Filter* dialog box is displayed.

12. Select points **1001-1005 & 1010** from the *Available* field and add them to the *Selected* field.

Name:	Included						ОК
Description:	Included	•					Cancel
Style:	Included	•					Preferences
Fence Mode:	Ignore	-					
Available:					Selected:		Help
Name	Description	Style	*	Add ->	Name	Description	Style
1009		ALG_EXIST		<- Remove	1001		ALG_EXIST
1011		ALG_EXIST			1002		ALG_EXIST
1012		ALG_EXIST		<- Swap ->	1003		ALG_EXIST
1		ALG_EXIST	Ξ	Al	1004		ALG_EXIST
100		Default		All	1005		ALG_EXIST
101		Default		None	1010		ALG_EXIST
2		MON_Sect-c	or				
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- 13. **<D>** the **OK** button. The points populate the *Selected* field.
- 14. <D> OK to dismiss the *Geometry Selection Filter* dialog box and populate the *Cogo Points Selected* field of the *View Horizontal Annotation* dialog box.

Main Tabling Style	s				
Apply Style	Active Ove	erwrite	Filter		
Cogo Points: Horizontal Alignments Include: Selected: Name Descri	+	Cogo Points Include: Selected: Name Descri			
✓ Display As Comple	ex Linestring	1001 1000 1002 1003 1004 <	ALG_E ALG_E ALG_E ALG_E ALG_E		
Display Points On-Alignment Off-Alignments Radials Chords	Event Points Station Equation Tangents Subtangents	Annotate Points Elements Duplicates Dual Dimen Try Alternat Extend Bey	e Styles		
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15. **<D>** the **Apply** button in the *View Horizontal Annotation* dialog box.

- 16. Experiment displaying various *Alignments* and *Points* with the assorted settings.
- 17. Close the *View Horizontal Annotation* dialog box.

Section Summary:

- In the Display area, the Points toggle is used to turn on or off the display of the geometry points.
- The Annotate area is used to turn on and off the text data associated with the geometry elements.

Lab 3.4 - Displaying Stationing

Section Objectives:

- Display stationing and alignment keypoints.
- Use the Symbology toggles to turn on and off various items.
- 1. Prior to displaying the stationing, display the linework for the horizontal alignment SH 86_West.

Right-click on the alignment name in the InRoads explorer pane and select *View* from the right click menu.

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2. Select Geometry > View Geometry > Stationing. The *View Stationing* dialog box is displayed.

🐂 View Stationing		- • 💌
View Stationing General Regular Stations View Cardinal Stations Pls Station Equations Event Points Radius + A Transition Radii Vertical Stations	Horizontal Alignment: SH 86_West Limits Station Stat: 9+00.00 Stop: 32+50.00 Planarize Planarize	
	Apply Preferences Clos	e Help

- 3. **<D>** the *Preferences* button.
 - **Note:** The Preferences dialog box is used to load predefined settings for a particular tool. In the View Stationing dialog box the preference sets the interval and symbology of the display graphics.

The following steps load the Preference Proposed–100 Ft Interval as the active symbology.

Name:	Close
Existing-100 Ft Interval Right	Ciuse
Existing-500 Ft Interval	Load
Existing-500 Ft Interval Left	
Existing-500 Ft Interval Right	Save
OTHER-100 Ft Interval OTHER-500 Ft Interval ≣	
Proposed-100 Rt Interval	Save As
Proposed-100 Ft Interval Left	
Proposed-100 Pt Interval Right	Delete
Pronoced-500 Pt Interval	Help
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- 4. <D> Proposed-100 Ft Interval.
- 5. **<D> Load** then **Close** button.

- 🖌 View Stationing - • × Data: 🔄 View Stationing Object Suffix Precision Format Name General Prefix Major Station ALG_PRO_Sta \Rightarrow Regular St 0 SS+SS.SS Cardinal Stations 🛛 Major Ticks ALG_PRO_Sta Pls Submajor Station 0 SS+SS.SS Station Equations Submajor Ticks Event Points sss+[ss.ss] ALG_PRO_Sta-Minor Station 0 Radius + A 🛛 Minor Ticks ALG_PRO_Sta 🕍 View Stationing - • • Data: Ciew Stationing General Obje Placement Prefix Suffix Precision Format Name Regular Stations Station 0.12 SS+SS.SS ALG_PRO_Can \Rightarrow Northing 0.12 Pls 0.12 🞽 View Stationing 🔄 View Stationing Data Format General Object Placement Prefix Suffix Precision Name Station Regular Stations Out 0.12 SS+SS.SS ALG_PRO_PI Cardinal Stations 🔶 Pls Station Equations Event Points Radius + A Display Curveset PI Transition Radii Vertical Stations Display Individual Element PI Display On: O Multiple Lines O Single Line Leaders: Object Relative To Name Length Angle Leader Line ALG_PRO_PI Segment 1 1.50 90^00'00'' Alignment Segment 2 100.00 0^00'00" Alignment Apply Preferences... Close Help
- 6. Using the dialog box explorer, select or de-select alignment stationing components for display.

7. **<D> Apply** to display the stationing.

00-00-001 100-001	00+101	102+00	103+00	104+00	105+00	106+00
a terret		<u></u>		<u></u>		<u></u>

The *View Stationing* dialog box is populated with the predefined settings from the preference. The display toggles define what will display; the name column identifies the named symbology used for that station type.

There are several standard CDOT preferences to choose from. These are based on the type of alignment and station interval. Choose the appropriate **Preference** and **<D> Apply** to see the stationing.

Keep in mind that text size is dependent on the active *Global Scale Factor* at time of display. If necessary, select File > Project Options [Factors] to change the value of the Global Scale factors.

- 8. Change the *Global Scale Factor* and redisplay stationing.
- 9. **Experiment** displaying stationing using various CDOT preferences.
- 10. **Experiment** with the various settings in the *View Stationing* dialog box and investigate what changes are made when stationing is redisplayed.

Section Summary:

- The stationing Preferences are set to CDOT standards and should be used in most cases.
- Using the Pencil mode automatically deletes old stationing when new stationing is displayed.

Lab 3.5 - Defining Stationing

Section Objectives:

• Change the beginning station of an alignment.

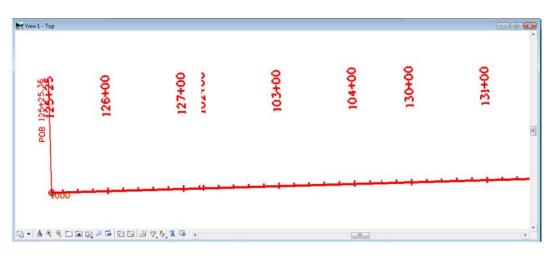
Upon creation, alignments are defined with a beginning stationing of 0+00. Stationing can be redefined from any location along the alignment.

1. Select Geometry > Horizontal Curve Set > Stationing. By default, this dialog box displays the beginning station value of the active alignment.

🐂 Stationing			E	- • 💌
Horizontal Alignment:	SH 86	•	+	Apply
Starting Station:	100+00.00			Import
Name:	1000			Report
Northing:	1558417.7	4	÷	Close
Easting:	3267409.4	D		Close
○ Vertical and Superel ○ Do Not Update	evation Alig	nments		Help
 Synchronize Star Maintain Station 	-			
Station Equations				
Back Station		Ahead Static	n	
	New	Edit		Delete

- 2. Verify that SH86_West is set as the *Horizontal Alignment*.
- 3. Select Synchronize Starting Stations in the *Vertical and Superelevation Alignments* section.

- *Important!* Do not use this option if any of the vertical alignments associated with the horizontal do not start at the beginning of the horizontal alignment. Using this option will move those vertical alignments that start after the beginning of the horizontal alignment to the beginning station of the horizontal alignment.
- 4. In the *Starting Station* field, key in *125+25.36* then *<D>* the Apply button.
- 5. **Verify** the change has been applied by redisplaying the stationing. Also, check the beginning station value of the associated vertical alignments by using the review command.



- **Note:** The options for **Vertical Alignments** should be considered carefully. **Do Not Update** will leave the stationing of vertical application stations as is, **Synchronize Starting Stations** will update their stationing to match that of the horizontal and **Maintain Station Difference** will keep any difference (delta) in the current starting stations.
 - InRoads does not require a '+' when keying in a station. The plus sign will be added automatically.
 - Stationing can be set from any alignment point. If the point selected is not the POB, the stationing is computed for the POB from the selected point.

Section Summary:

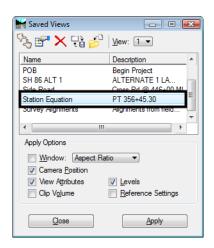
- When stationing is set for a particular point, the stationing for the remainder of the alignment (forwards and backwards).
- The reference to Superelevation in the Vertical and Superelevation Alignments area refers to geometry created in the 2004 edition of InRoads. It does not affect the superelevation contained in the Roadway Designer.

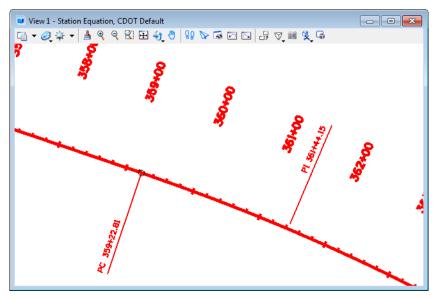
Lab 3.6 - Station Equations

If there are inequalities in the alignment, station equations may be required. These equations can be either gap or overlap equations.

Section Objectives:

- Add a station equation to an existing alignment.
- Redisplay stationing to show the station equation.
- 1. From MicroStation, select **Utilities > Saved Views**.
- 2. Highlight the Station Equation saved view and <D> Apply then Close the *Saved View* dialog box.





At the PT of the curve a station equation is necessary to tie to previous work. The values are:

```
Back = 359+22.81
Ahead = 359+27.81
```

- 3. Select Geometry > Horizontal Curve Sets > Stationing to display the *Stationing* dialog box.
- 4. Verify SH 86_West is the horizontal alignment.
- 5. At the bottom of the dialog box, choose **New**. The *Add Station Equation* dialog box is displayed.

🐂 Stationing				- • 💌
Horizontal Alignment:	SH 86_We	est 🔻	÷	Apply
Starting Station:	125+25.36			Import
Name:	1000			Report
Northing:	1558417.7	4	+	Close
Easting:	3267409.4	0		
Vertical and Superel	levation Alig	nments		Help
 Synchronize Star Maintain Station 	-	i		
Station Equations				
Back Station		Ahead Static	n	
	New	Edit		Delete

- 6. In the *Add Station Equation* dialog box, set the *Mode* to By Station.
- 7. Enter the *Back Station* and the *Ahead Station* as shown below.

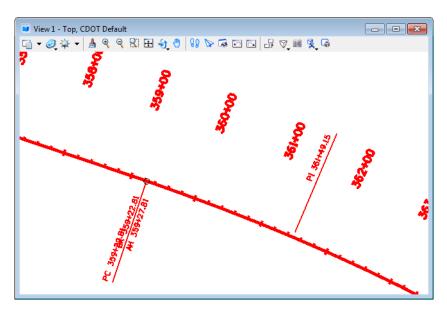
Add Station	n Equations		8				
Mode:	By Station		Apply				
	By Northing/Easting	_	Close				
Back Station:	359+22.81	+	Help				
Northing:	1553892.50		пор				
Easting:	3290221.86	Ψ					
Ahead Station:	A 359+27.81						
Add Horizontal Event Point							
Add Vertical	Event Point						

- 8. **<D> Apply**.
 - **Note:** The ahead station must be prefixed with an equation name. The name must consist of at least one alpha character.
 - An alignment can contain multiple station equations.

- Annotation of stationing lying within the range of a station equation will be prefixed with the equation name. The toggle *Drop Station Equation Name* in the *General* leaf of the *View Stationing* dialog box is on so that the equation name is not displayed.
- 9. **<D> Close** to dismiss the *Add Station Equation* dialog box. The station equation is shown in the parent dialog box.

Mationing								
Horizontal Alignment:	Horizontal Alignment: SH 86_West							
Starting Station:	arting Station: 125+25.36 Import							
Name:	1000			Report				
Northing:	1558417.7	4	+	Close				
Easting:	3267409.4	0						
Vertical and Supere	Vertical and Superelevation Alignments Help							
Synchronize Starting Stations Station Difference Station Equations								
Back Station		Ahead Statio	n					
359+22.81		A 359+27.81						
	New	Edit		Delete				

- 10. **<D> Close** in the *Stationing* dialog box.
- 11. Redisplay the stationing for alignment SH 86_West.

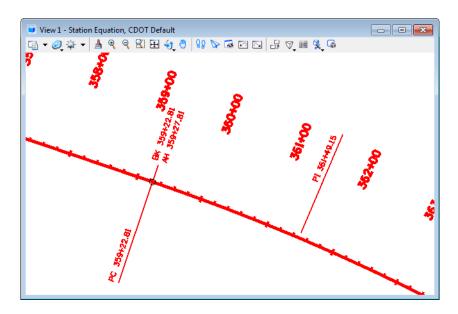


Notice that the station equation text is on top of the PC station text. To fix this problem:

- 12. Select Geometry > View Geometry > Stationing.
- 13. Select the Station Equation leaf.

- 14. Toggle the *Placement* to **Out**.
- 15. **<D> Apply** to redisplay the stationing.

🕌 View Stationing							- • ×
View Stationing General Regular Stations Cardinal Stations Pls \$\$ Station Equations Event Points Redus + A	Data: Object Station	Place Right Left Right Dut	ment Prefix	Suffix Pr 0.	ecision 12	Format ss+ss.ss	Name
Transition Radii Vertical Stations	Leaders:						
	Object Leader Line	Length	Angle	Relative		e PRO Can	
	Segment 1 Segment 2	-0.25 100.00	90^00'00'' 0^00'00''	Alignmen Alignmen	t		
			Apply	Prefere	nces	Close	Help



The equation is now displayed on the opposite side of the alignment from the PC stationing text.

Section Summary:

- Station equations are used to change the stationing from a given spot forward, along the alignment. Stationing prior to the equation retains its original stationing.
- The ahead station must have a prefix, containing at least 1 letter, followed by the new station number.

Lab 3.7 - Horizontal Alignment Tracking

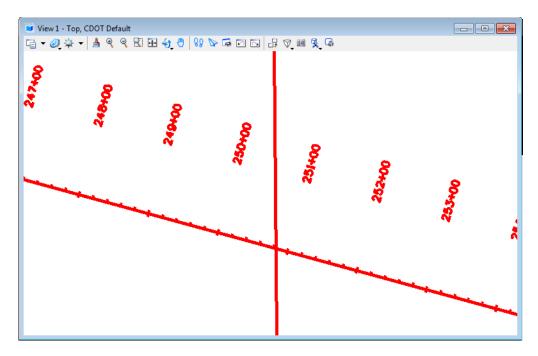
Two methods exist for receiving interactive information relative to a horizontal alignment. These are Tracking and Horizontal Alignment Tracking. Both methods report on stationing, offset, elevation, etc. Tracking reports the elevation of the active surface, Horizontal Alignment Tracking reports the elevation of the active vertical alignment.

Section Objectives:

- Demonstrate the Tracking command.
- Demonstrate the Tracking Horizontal Alignments command

Tracking (horizontal alignment and surface data)

- 1. Recall Saved View Side Road.
- 2. If the *Side Road* alignment is not visible, display it.



Tracking reports on station and offset information relative to the active alignment along with information relative to the active surface.

3. Select File > Open and load the surface 12345SURV_Existing_Ground.dtm from the C:\Projects\12345\ROW_Survey\InRoads\DTM folder.

To display the surface features from the existing ground dtm:

4. Select Surface > View Surface > Features.

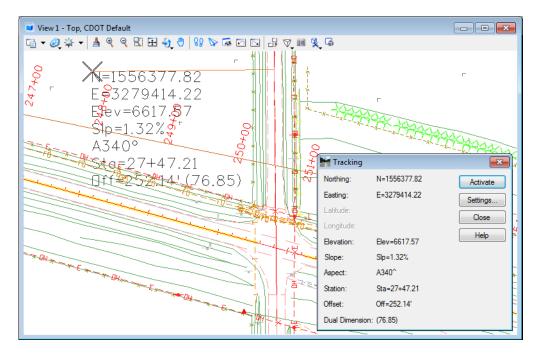
- Miew Features X Surface: 12345 existing groun 💌 Apply Fence Mode: Ignore ÷ Close Filter. Edit Style .. Help Features: † Name Style Description . Select All Ctrl+A Select None Ctrl+N Invert Selection Bin Wall Bin Walls Bin Walls -Bin Walls855 Bridge Abutment Bridge Abutment7
- 5. <R> in the *Features* list and <D> Select All.

6. **<D> Apply** then **Close**.

Displaying surface features is a good way to orient yourself to the location you are at in the model.

- 7. Select **Tools** > **Tracking** > **Tracking** to track both the active horizontal alignment and information relative to the active surface.
 - **Note:** This command will display information about any data that is present. Neither geometry or a dtm are required to get some feedback from this command.

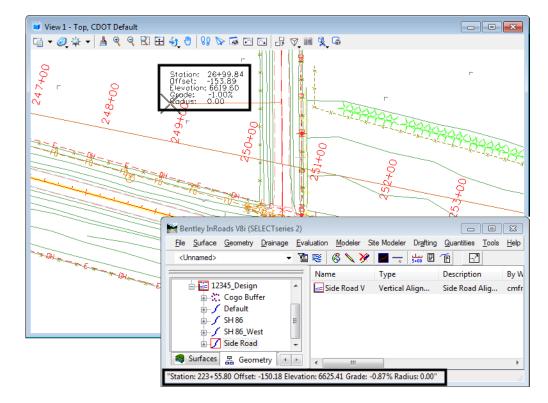
8. Select **Activate** to initialize the command. Slide the cursor along the alignment to interactively update the display in the *Tracking* dialog box. If a <D> (data point) is entered in the design file the information toggled on is displayed graphically.



Note: Select the **Settings** button in the *Tracking* dialog box to examine the attributes assigned to annotation placed in the MicroStation design file.

Horizontal Alignment Tracking (with vertical alignment data)

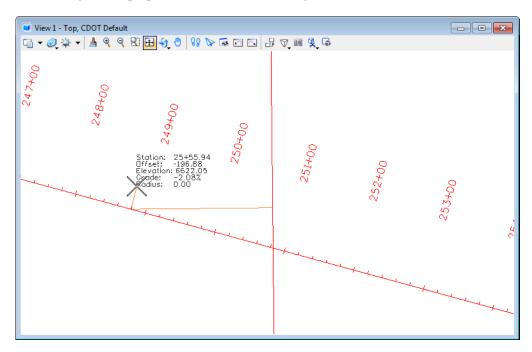
This tracks the station and offset relative to the active horizontal alignment along with the elevation of the active vertical alignment. Station, Offset, and Elevation information is displayed in the message field of the InRoads interface. Note: A horizontal alignment must be present for this command to work.



1. Select **Tools** > **Tracking** > **Horizontal Alignment** to track the active horizontal alignment.

The results display at the cursor and in the status bar of the InRoads interface.

Note: The readout interactively reflects the location of the cursor relative to the active alignment. If a second horizontal alignment is selected with a data point, the offset displayed will be the distance to intersect the selected alignment from the active alignment, perpendicular to the active alignment.



Section Summary:

- Use the Tracking command to get surface information in relation the horizontal alignment.
- The Tracking command can be used to display the information in its dialog box as MicroStation graphics.
- The tracking Settings options are used to enable and disable the graphic display of items in the Tracking dialog box.
- Use the Horizontal Alignments tracking to get vertical alignment information in relation the horizontal alignment.
- Horizontal Alignments tracking can not be displayed graphically.

Chapter Summary:

- Horizontal alignments can be displayed using the View and View All Horizontals from the right click menu or from the main tool bar, or by using the horizontal alignment annotation command.
- Use the preferences to set up the Stationing dialog box. Items in the Stationing dialog box should only be changed for special circumstances.
- Use the Stationing options under the Horizontal Curve Set commands to change the stationing for the entire alignment.
- Use station Equations to change the stationing from a point on the alignment to the end.
- Tracking is used to gain station and offset information at the cursors location.

• Tracking also collects surface data, while Horizontal Alignment tracking gets vertical alignment data.