# Chapter 8 - Defining Vertical Geometry

In InRoads, your project's vertical alignment is created after establishing the centerline "path" or horizontal alignment. This vertical geometry is stored in the InRoads geometry project (the **ALG** file).

In the geometry project hierarchy, the vertical alignment is a "child" to the horizontal alignment. Therefore, you must first create the project's horizontal alignment before creating a vertical alignment "child" underneath the horizontal "parent".
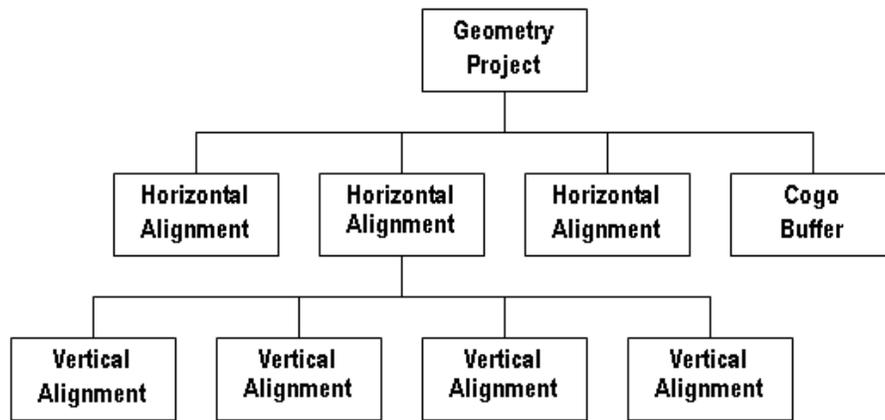
InRoads provides tools to help you design the vertical geometry within AAHSTO or CDOT project guidelines. You can also create multiple vertical alignments for each horizontal alignment if you wish to analyze different alternative alignments for cut/fill balancing or other design criteria (vertical curve designs, vertical grades, stopping sight distances, etc.)

This chapter explains how and when to use the **Vertical Curve Set** tools to create your vertical geometry, as well as other tools that you can use to display, modify and annotate this geometry.

Chapter Objectives:

- Explain how vertical alignments are created and their relationship to other project data in the CDOT process.

- Investigate different options for reporting on vertical alignment geometry data and learn when to use each option.

- Explain how to effectively maintain and manage vertical alignments with InRoads.

Creating Vertical Alignments

The process of creating a vertical alignment requires that you first create a horizontal centerline alignment. You can then create a profile of the existing ground conditions along this horizontal alignment. It is directly on this existing ground profile grid where you "lay out" or create your vertical alignment. This is done by locating and placing the VPIs for the entire alignment, then calculating and placing the vertical curves.

You can use the **Vertical Curve Set** tools to place vertical PIs and then define your vertical curves on the profile. You can then move/edit VPIs and curve data as necessary to meet your project's design criteria.

Once you've established your vertical geometry using the best InRoads tools for your design situation, you can:

- Display your vertical alignment on the profile grid

- Annotate critical geometry data and other information directly on the alignment.

- Produce geometry reports noting information like entrance and exit grades and lengths, PVC and PVT locations, high and low point locations, vertical curve lengths, k and r values, etc.

This information is not only critical for interim design checks, but also for final project documentation.

Section Objectives:<

- Demonstrate how vertical alignment slots are created in the geometry project.

- Explain how the Vertical Curve Set tools are used to create a vertical alignment.

- Explain how precision keyins are used for placing vertical alignment VPIs.

- Explain how to edit alignment points (adding, inserting, moving or deleting VPIs).

- Explain how to edit vertical curve data.

- Demonstrate how to add vertical events to the alignment.

Creating Profiles

A profile of the horizontal alignment showing the existing surface ground line is required before creating a vertical alignment. The vertical geometry is then created directly on this profile grid.

Select *Evaluation > Profile > Create Profile* and then select the appropriate profile preference.
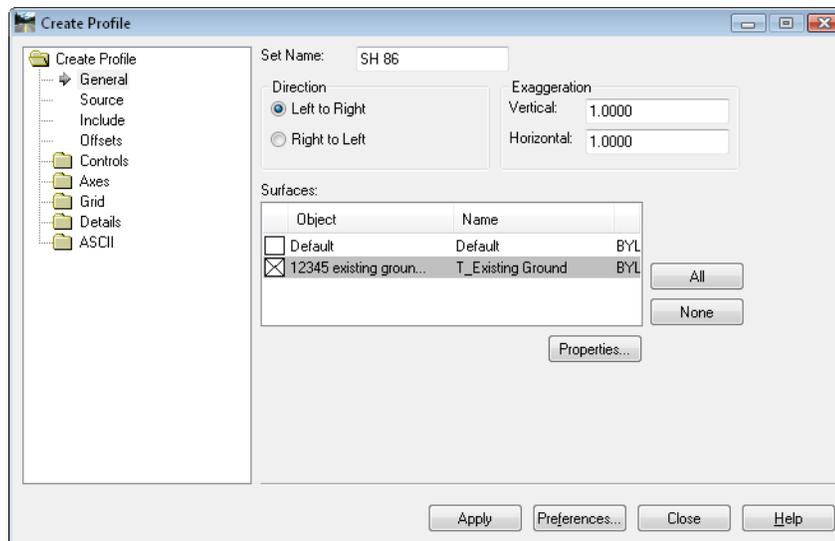
Make sure the correct horizontal alignment is active for profiling on the *Source* leaf. Multiple surfaces may be shown on one profile by selecting them in the *Surfaces* window on the *General* leaf. You may also show features that cross the alignment and projected features on the profile. These may be toggled on from the *Include* leaf before creating the profile.

Note: There is no option to select specific features from the Create Profile dialog box. Therefore, it may be better to display features from the ***Update Profile*** command.
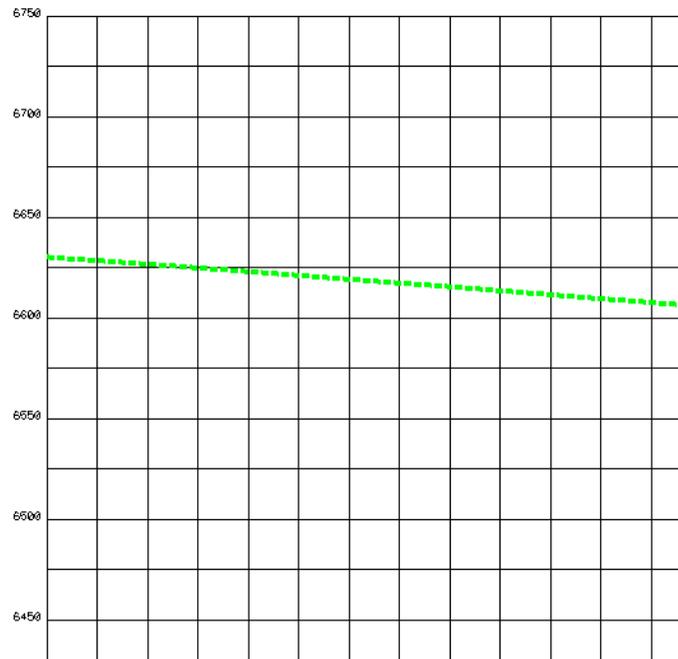
See the ***Profiles*** chapter for more information on creating profiles.

Creating a new Vertical Alignment Slot

In order to create a new vertical alignment, you must first have a geometry project loaded, with a parent horizontal alignment active.
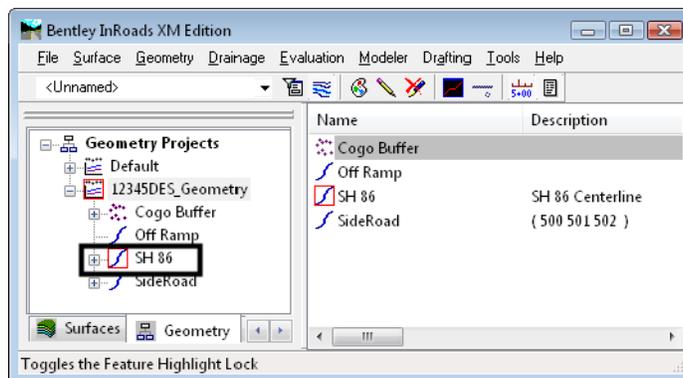
Once the geometry project is loaded (and correct horizontal is active), you may create a new alignment name using the *File > New > Geometry* command.
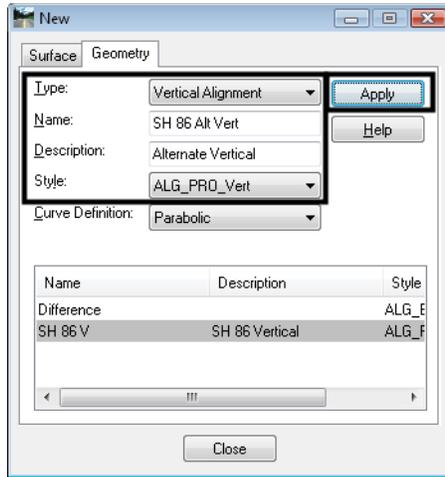
For additional information on creating new geometry, see the chapter *Initial Geometry Procedures*.

Using the Vertical Curve Set Commands

Use the *Vertical Curve Set* tools to create the initial vertical alignment. These tools consist of five primary commands described below.

- *Add Vertical PI* – used to create a VPI that begins a new alignment, or to add a VPI onto either end of an existing alignment.
- *Insert Vertical PI* – used to add a VPI to an alignment between two existing VPIs.
- *Move Vertical PI* – used to change the location of an existing vertical VPI.
- *Delete Vertical PI* – used to remove a VPI from an existing alignment. For removing more than one VPI, you must choose and accept each one individually. To remove all VPIs associated with an alignment, but leave the alignment name, right-click on the alignment name in the InRoads Explorer window and choose *Empty*.

- *Define Vertical Curve* – used to create a curve at a VPI on an alignment, or to revise an existing curve on an alignment. The *Previous* and *Next* buttons are used to step through the alignment. The tangents forming the VPI where the curve is to be defined will be highlighted graphically.
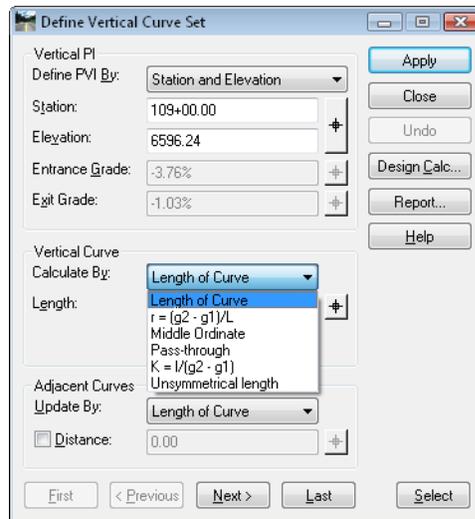
The *Vertical PI* section of this dialog box allows you to edit the edit the location of a vertical PI. For more information see the section *Editing Vertical Alignments*.

The *Vertical Curve* section of the dialog box is where you enter your vertical curve information. Options for defining vertical curves include:

- ♦ *Length of Curve* – specify the length of the vertical curve.
- ♦ *r=(g2-g1)/L*– specify the rate of change.
- ♦ *Middle Ordinate* – specify the middle ordinate or external distance.
- ♦ *Pass-through* – specify the pass-through point by station and elevation.
- ♦ *K=L/(g2-g1)* – specify the vertical curve K value.
- ♦ *Unsymmetrical Length* – specify the length from the PVC to the PVI and the distance from the PVI to the PVC.

Note: You must *Apply* after defining each VPI or curve. If you make a mistake and place a VPI in the wrong location or define a vertical curve incorrectly, you can select *Undo* to return the alignment to its previous values. Only one *Undo* action is available.

Dynamics

The *Dynamics* dialog allows you to set intervals for placement of the vertical PIs. It locks your cursor into the desired station, elevation and/or grade intervals. This is also useful when editing a VPI because you can lock on a station interval, for example, when moving a VPI.
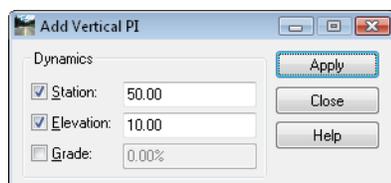
The Vertical Design Calculator

The *Vertical Design Calculator* is used to compute or look up curve data to ensure your design criteria are met. This tool uses the AASHTO green book design guidelines to compute your curve data based on values you input for:

- Design speed
- Headlight sight distance or
- Curve length.

When using the *Vertical Design Calculator*, ensure that you're using the correct *Vertical Design Checks.txt* table, which contains data from the *2001 AAHSTO* manual. The table file is located in the *C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Design Checks* folder in the CDOT workspace.

The table contents are:

```
* Table extracted from
* "A POLICY on GEOMETRIC DESIGN of HIGHWAYS and STREETS 2001", AASHTO
*
**
* DESIGN       |Crest - Upper| Crest - Lower| Sag - Upper| Sag - Lower| Passing Sight Dist.
* SPEED        |Stop    K    | Stop    K    | Stop    K   | Stop    K   | Minimum    K
* (mph)    f   |Dist  Value  | Dist  Value  | Dist  Value | Dist  Value | Dist     Value
* -----  ----  |----  -----  | ----  -----  | ----  ----- | ----  ----- | -------  -----
  20.    .40   115.    7.     115.    7.      115.   17.     115.   17.     710.     180.
  25.    .38   155.   12.     155.   12.      155.   26.     155.   26.     900.     289.
  30.    .35   200.   19.     200.   19.      200.   37.     200.   37.    1090.     424.
  35.    .34   250.   29.     250.   29.      250.   49.     225.   49.    1280.     585.
  40.    .32   305.   44.     305.   44.      305.   64.     305.   64.    1470.     772.
  45.    .31   360.   61.     360.   61.      360.   79.     360.   79.    1625.     943.
  50.    .30   425.   84.     425.   84.      425.   96.     425.   96.    1835.    1203.
  55.    .30   495.  114.     495.  114.      495.  115.     495.  115.    1985.    1407.
  60.    .29   570.  151.     570.  151.      570.  136.     570.  136.    2135.    1628.
  65.    .29   645.  193.     645.  193.      645.  157.     645.  157.    2285.    1865.
  70.    .28   730.  247.     730.  247.      730.  181.     730.  181.    2480.    2197.
  75.    .28   820.  312.     820.  312.      820.  206.     820.  206.    2580.    2377.
  80.    .28   910.  384.     910.  384.      910.  231.     910.  231.    2680.    2565.
```

Keyins

There are additional keyins that can be useful when creating a vertical alignment and using the *Add*, *Insert* or *Move PI* commands. These include:

- *SE=station,elevation*

     Example: *SE=34500,8421*

     Use this keyin to place a VPI at a specific station and elevation.

- *DG=distance,grade*

     Example: *DG=1500,-2.5%* or *DG=1500,-.025*

     Use this keyin to place a VPI at a specific horizontal distance and grade from the previous VPI. Specify the grade as either a decimal or use the percent sign as shown in the example.

To create a vertical alignment

The typical workflow for creating a vertical alignment once the horizontal alignment is established, is:

- Display a profile using the horizontal alignment that will contain the new vertical alignment.
- Create a place holder for the new vertical alignment under the desired horizontal alignment.
- Place the vertical PIs (VPIs) for the entire alignment.
- Define the vertical curves for the entire alignment.

This process is covered in detail below.

1. Select **File > Open** to load the geometry project into InRoads memory.

2. In the InRoads Explorer, select the *Geometry* tab, right click on the correct horizontal alignment and *Set Active*.
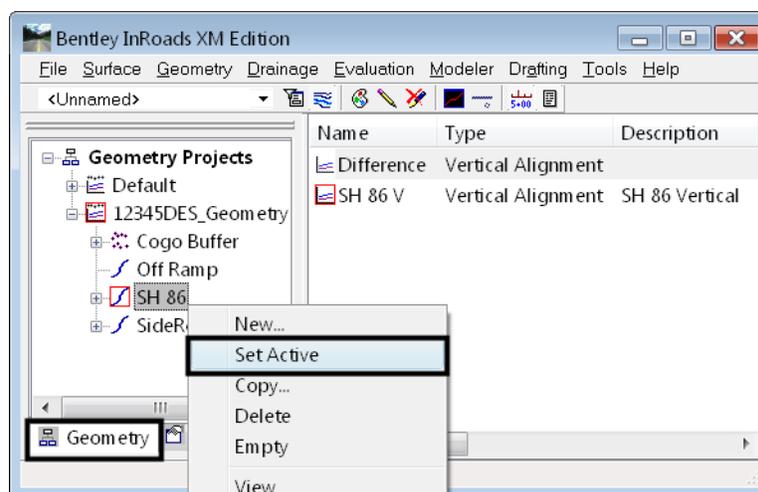
3. Select **File > Open** to load the existing surface into InRoads memory.

4. Create a profile of the existing ground along the horizontal alignment. Select **Evaluation>Profile>Create Profile**.

5. On the *Create Profile* dialog box, select *Preferences* and **Load** the desired preference for the profile display.
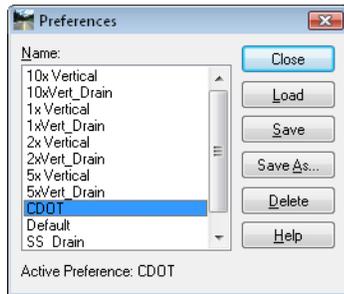
6. On the *Create Profile* dialog box *General* leaf, make sure the existing ground surface is toggled on.
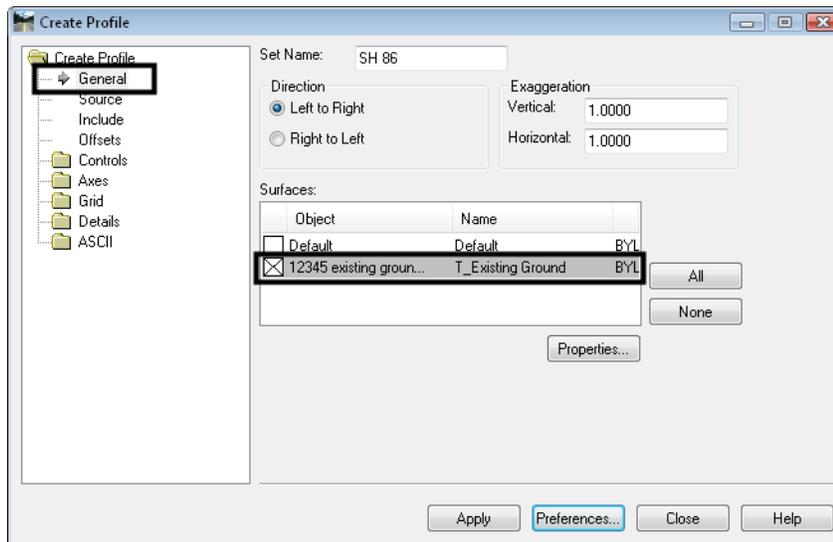
7. **<D> Apply** and then **<D>** to identify the location of the profile's lower left corner.
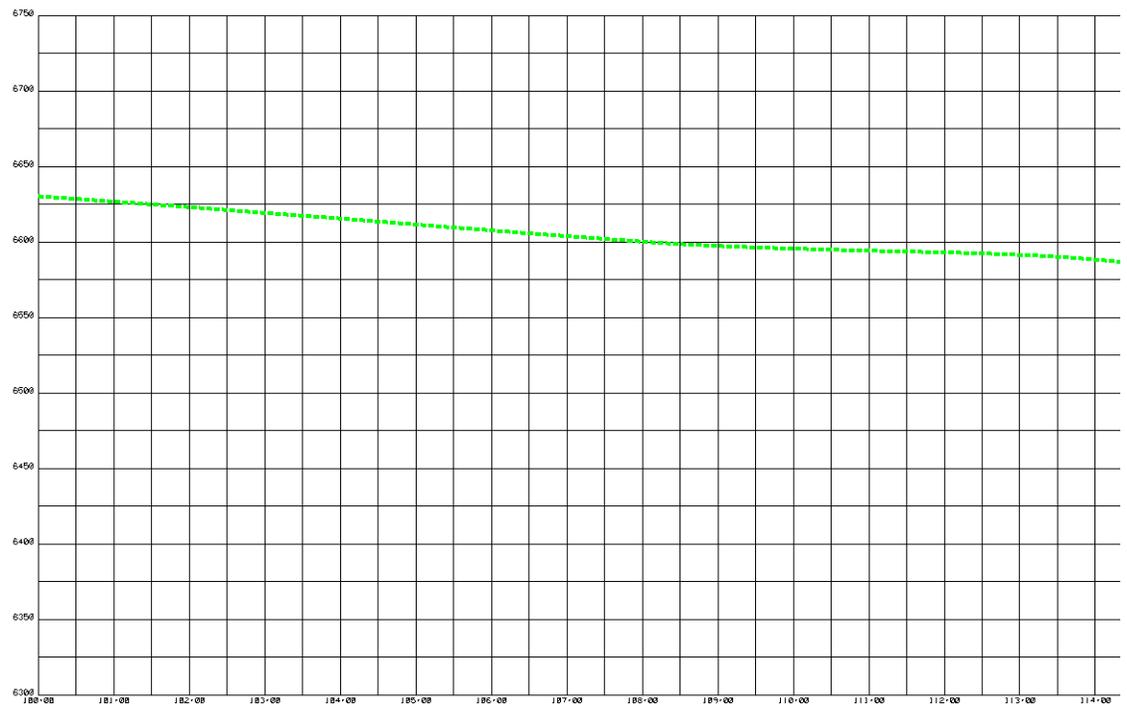
8. You're now ready to create a new vertical alignment. Select **File > New > Geometry** and select the *Vertical Alignment* tab.

9. Key-in a *Name* and *Description* for the alignment and then select the *Style*.
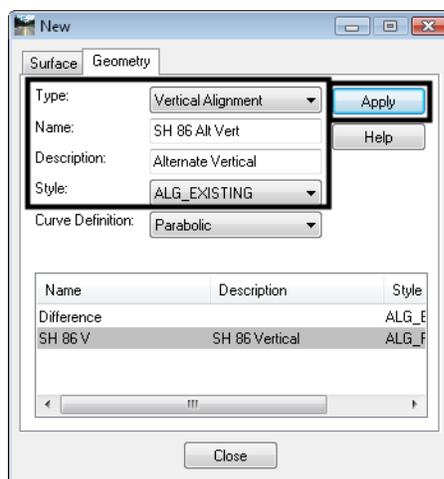
10. **<D> Apply**, then **<D> Close** to dismiss the dialog box.

11. Now input the alignment data. Select **Geometry > Vertical Curve Set >Add PI**.

12. Enable *Dynamics* locks for *Station*, *Elevation* or *Grade* (if desired).
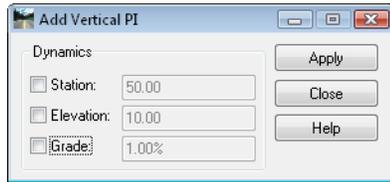
13. **<D>** **Apply**.

    Note: As you drag the cursor in profile window, Station, Elevation and Grade
                dynamically displays in InRoads status window
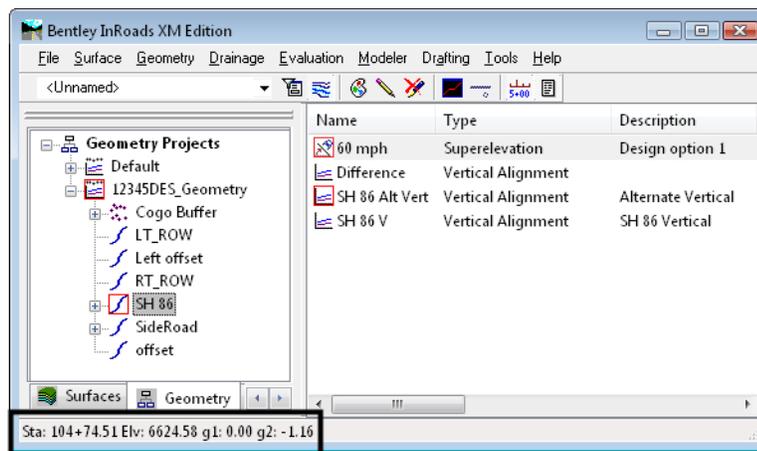
14. Enter a data point **<D>** or snap to a location to define the first VPI, or use the ***SE=*** keyin to
    place it at a specific Station, Elevation location.

15. Place additional VPIs with data points **<D>** or by using either ***SE=*** or ***DG=*** (Distance,
    Grade) keyins.
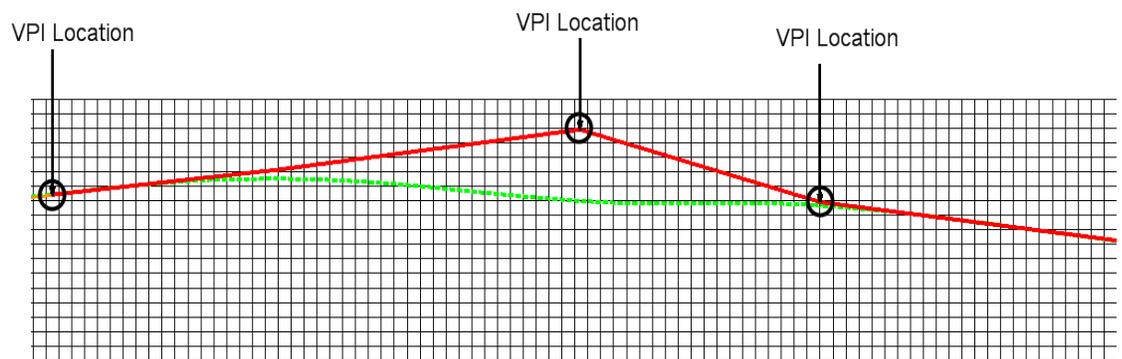
16. **<R>** when finished placing VPIs.

17. **<R>** again out of the **Add PI** command.

18. You're now ready to add Vertical Curves data. Select **Geometry > Vertical Curve Set > Define Curve**.

    Note: The first two vertical tangents are highlighted.

19. Set *Calculate By* to the desired method (***Length of Curve***, ***Unsymmetrical Length***, etc.) and enter the vertical curve value.

    Note: Select **Design Calc** to use AAHSTO design guidelines to look up or compute curve data.
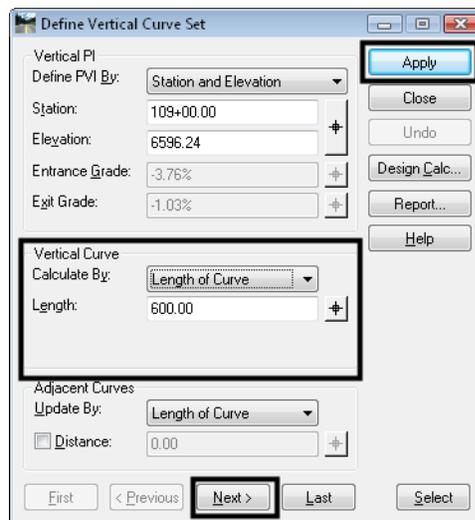
20. **<D> Apply** to define the curve.

21. Use the *Next* button to move to the next set of vertical tangents to define the next vertical curve.
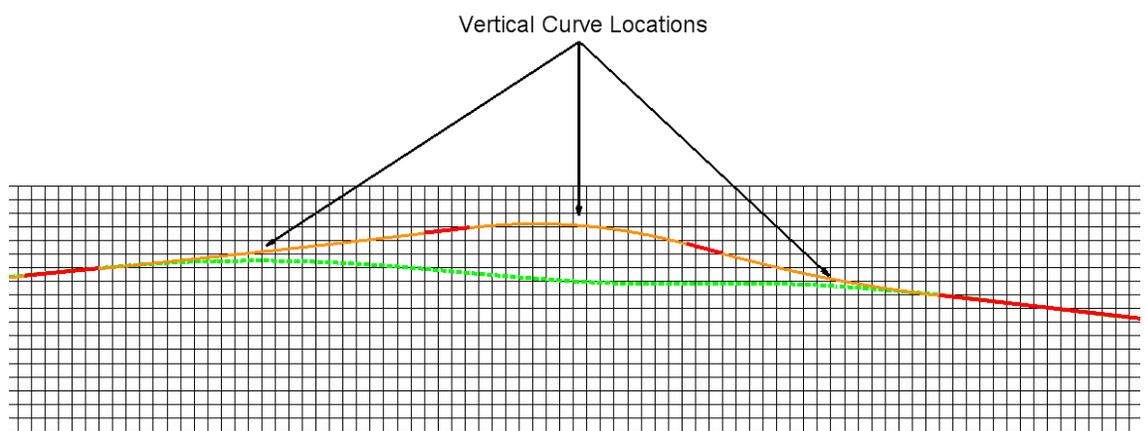
22. **Close** the *Define Vertical Curve* dialog box when done.

Editing Vertical Alignments

There are several options for editing or modifying a vertical PI or curve after it has been placed.

Editing a VPI using the Define Vertical Curve Set command

While the primary purpose of the ***Define Vertical Curve Set*** command is to define a curve between two vertical tangents, you can also use this command to edit the VPI between these two tangents. By default, the fields in the ***Vertical PI*** section of the dialog box are populated with values that describe the position of the current VPI relative to the previous and next VPIs. However, you can change these values and then ***Apply*** to redefine the location of the VPI.
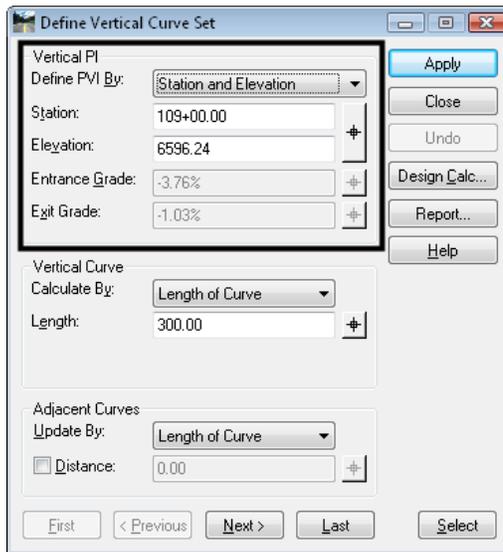
Set the ***Define PVI By*** option to the method you want to use to determine the PVI location. The four options are:

- ***Station and Elevation***
- ***Station and Entrance Grade***
- ***Station and Exit Grade***
- ***Entrance and Exit Grades***

You can move the PVI location using any of these methods.

To edit a VPI using the Define Vertical Curve Set command

1. Select **Geometry > Vertical Curve Set > Define Curve**.

2. Identify the curve set containing the VPI you want to move.

   Note: You can use the ***First/Last*** or ***Previous/Next*** buttons to highlight the curve or use the ***Target*** button to graphically select the curve on the profile.

   Note: You do not have to have a curve defined to edit the VPI. InRoads treats a VPI as a zero length curve. If no curve is defined, the entrance and exit tangents at the VPI are highlighted.

3. Set the *Define PVI By* to the desired option for specifying the move.
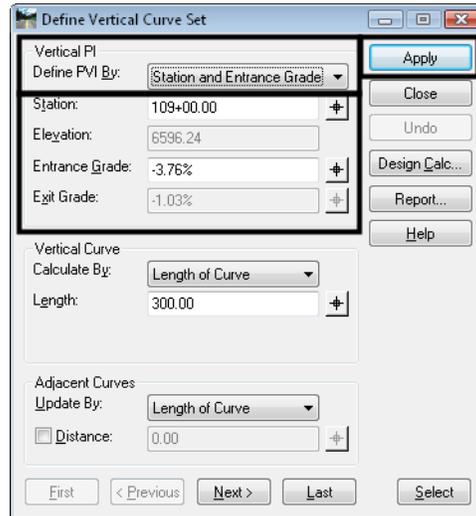
4. Key in the new values for either *Station*, *Elevation*, *Entrance Grade* or *Exit Grade* (depending on the method selected).

5. **<D> Apply**.

The VPI is moved to the new location. For example, if the *Define PVI By* option is set to *Entrance and Exit Grades* you can key in new *Entrance Grade* and *Exit Grade* values. the VPI is repositioned based on the intersection of those grades projected from the previous and next VPIs.

Editing a VPI using the Move Vertical PI command

This command repositions PVIs on the active vertical alignment. Any curves at the moved vertical PI are recomputed and updated.
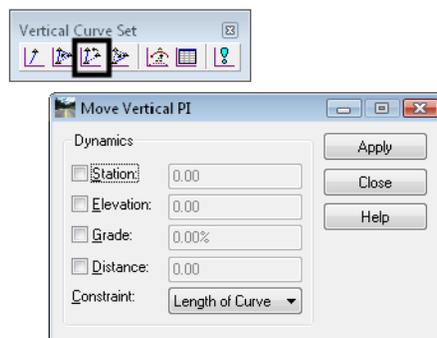
To edit a VPI using the Move Vertical PI command

1. Select **Geometry > Vertical Curve Set > Move PI** or the **Move PI** command from the *Vertical Curve Set* toolbar.

    Note: The dialog box appears, and you are prompted to identify the element.

2. Using the *Station*, *Elevation*, *Grade*, *Distance*, and *Constraint* options on the dialog box, you can you can set an interval to control the position of the VPI being placed while using this command. The cursor position is constrained or locked into the interval specified by the values you provide. If no options are selected, the VPI may be moved to any location between it's neighboring VPIs.
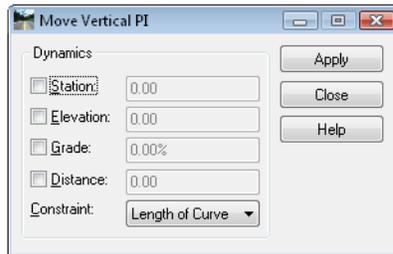
3. **<D> Apply**.

4. **<D>** near the VPI you want to move.

   Note: The VPI is attached to your cursor. The command only looks for vertical points (VPIs), therefore you do not have to snap to the VPI. Just place a data point and you will pick up the closest VPI.

5. Specify the new location, either graphically or by precision key-in.

   Note: You are prompted to *Accept* or *Reject* the overall solution. Depending on the specifications, the warning message *Solution Overlaps* may be displayed.

6. **<D>** to accept the new location.

Updating curves

Use the *Constraint* parameter when you make an edit that affects the adjacent curves.
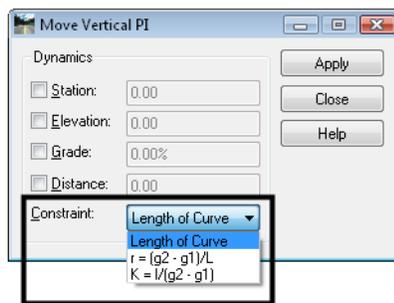
For example, changing the elevation of the current PVI would cause the following to be recomputed: exit grade of the previous curve, entrance and exit grade of the current curve, and entrance grade of the next curve. The previous curve would be recomputed by holding the original PVI station and elevation as well as the entrance grade. The exit grade would be recomputed by holding the length of curve. The next curve would be recomputed by holding the original PVI station and elevation as well as the exit grade. The entrance grade would be recomputed by holding the length of curve.

In adjacent curves, the length of curve is either preserved or recomputed, based on the setting of the *Constraint* parameter.

Adding a Vertical PI

If you need to add a vertical PI onto the *end* of the alignment, use the *Add Vertical PI* command. *Do not* use this command to add a VPI *between* two existing VPIs. If you need to do this, use the *Insert Vertical PI* command.

To add a VPI on to the end of a vertical alignment

1. Select Geometry > Vertical Curve Set > Add PI.

    Note: You can also select Add PI from the *Vertical Curve Set* toolbar.
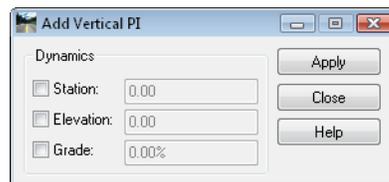
2. Using the *Station*, *Elevation*, *Grade*, *Distance*, and *Constraint* options on the dialog box, you can you can set an interval to control the position of the VPI being placed while using this command. The cursor position is constrained or locked into the interval specified by the values you provide. If no options are selected, the VPI may be moved to any location between it's neighboring VPIs.

3. <D> Apply.

    Note: You are prompted to *Identify Alignment End*.

4. <D> beyond the end of the alignment where you want to add a VPI (either at the beginning or end of the alignment).

    Note: The VPI is attached to your cursor. The command only looks for vertical points (VPIs), therefore you do not have to snap to the VPI. Just place a data point and you will pick up the closest VPI.

5. You are prompted to *Specify Point/Reject*. Specify a location for the new VPI, either graphically with a <D> or by precision keyin.

6. <D> to accept the new location.

7. <R> when done.

8. <R> again out of the *Add Vertical PI* command.

9. Close the *Add Vertical PI* box.

Inserting a Vertical PI

If you need add a VPI between two existing VPIs, you can insert the VPI on an existing vertical tangent using the *Insert Vertical PI* command.

To insert a vertical PI

1. Select **Geometry > Vertical Curve Set > Insert PI**.

    Note: You can also select **Insert Vertical PI** from the *Vertical Curve Set* toolbar.
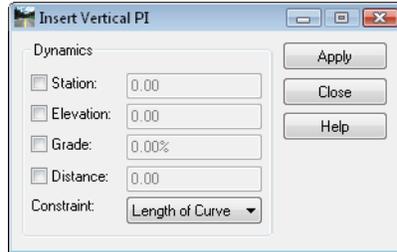
2. Using the *Station*, *Elevation*, *Grade*, *Distance*, and *Constraint* options on the dialog box, you can you can set an interval to control the position of the VPI being placed while using this command. The cursor position is constrained or locked into the interval specified by the values you provide. If no options are selected, the VPI may be moved to any location between it's neighboring VPIs.

3. **<D> Apply**.

4. You are prompted to *Identify Element*.

5. **<D>** on the vertical tangent where you want to insert the new VPI.

    Note: As you move your cursor, it will "rubber-band" along the tangent.

6. You are prompted to **Specify Point/Reject**. Specify a location for the new VPI, either graphically with a **<D>** or by precision keyin.

    Note: Your are prompted to *Accept overall solution/Reject*.

7. **<D>** to accept the new location.

8. **<R>** again out of the *Add Vertical PI* command.

Adding Vertical Event Points

Vertical Events are any special location on the vertical alignment that you may want to display and annotate on the alignment, or where you may want to later cut a cross section. (for example, at a bridge approach or culvert). Later, when you create a corridor along this alignment, you have the option to drop templates at event points and cut a cross section at the events.

To add vertical events points to your alignment

1. Select **Geometry > Vertical Curve Set > Events**.

2. Set the *Define By* option to either *Single Station* or *Multiple Stations*.

    Note: *Single Station* is used to define one event point. *Multiple Stations* define multiple events over a station range.

3. Key-in the *Station* for the event or use the target button to graphically select it on the profile grid.

4. If creating multiple events, set *Locate By* to either *Segment Distance* (if event points fall at even increments along the alignment) or *Number of Segments* (for event points spaced equidistantly along the station range). Then, key-in the appropriate values.

5. Toggle on *Add Horizontal Event Points* if you wish to add an event point on the horizontal alignment (to show with horizontal stationing).
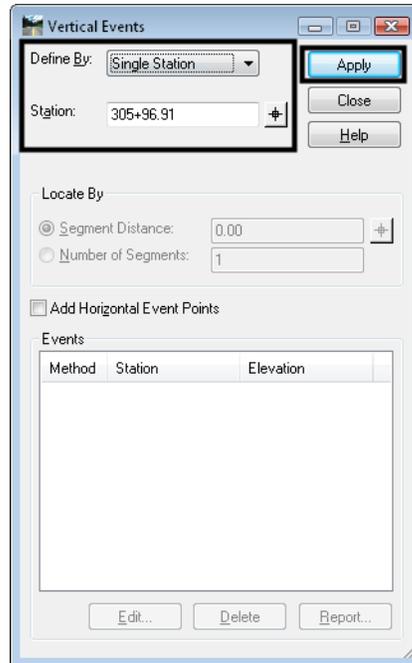
6. **<D> Apply**.
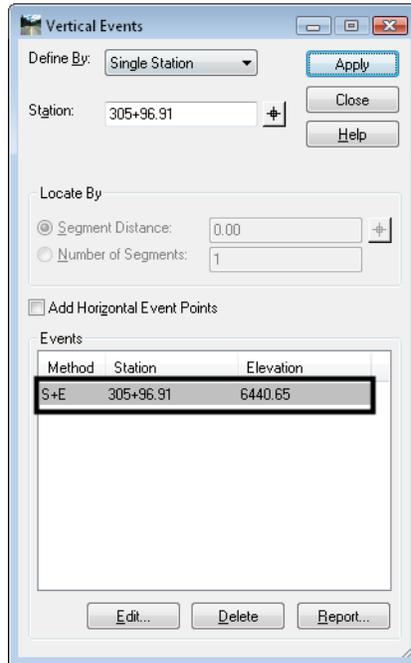
Note: This adds the event point(s) to the alignment. The vertical events can be displayed and annotated with the Vertical Annotation command. See the section ***Annotating Vertical Alignments*** for more information.

Section Summary:

- A profile must be created and displayed before you can create a vertical alignment.

- The *Vertical Curve Set* tools are used to lay out the initial VPI locations on the vertical alignment.

- The *SE=* and *DG=* precision keyins are used to define specific VPI locations.

- The *Define Vertical Curve* command is used to create a curve at a VPI location.

- There are several methods for creating vertical curves (length of curve, unsymmetrical length, r value, k value, etc.)

- The *Vertical Design Calculator* is used to look up or compute vertical curve data based on AAHSTO design guidelines.

- VPI locations can be edited using several different methods including the *Move Vertical PI* command and the *Define Vertical Curve* command.

- VPIs can be added or inserted on a vertical alignment after it has been created.

- *Vertical Event* points are special locations on the vertical alignment that can be displayed or annotated on the alignment. Cross sections can also be cut at these locations.

Exploring Vertical Alignments

After creating the vertical alignment, you can obtain all of the alignment's geometry data in report format. This information can be graphically annotated directly on the alignment graphics on the profile. You can also interactively track the alignment to obtain alignment information at a specific point location (station, offset, elevation, grade, etc.)

Section Objectives:

- Explain how to generate a vertical alignment geometry report.
- Demonstrate how to display the vertical alignment on the profile grid.
- Demonstrate how to annotate the vertical alignment point, tangent and curve data.
- Explain how to interactively obtain vertical alignment data at specific points.

Reviewing Vertical Alignments

Reviewing vertical alignments is similar to reviewing horizontal alignments. The ***Review Vertical Alignment*** dialog allows you to easily change between multiple Geometry Projects, Horizontal, and Vertical alignments.

To review a vertical alignment

1. Select **Geometry > Review Vertical**.
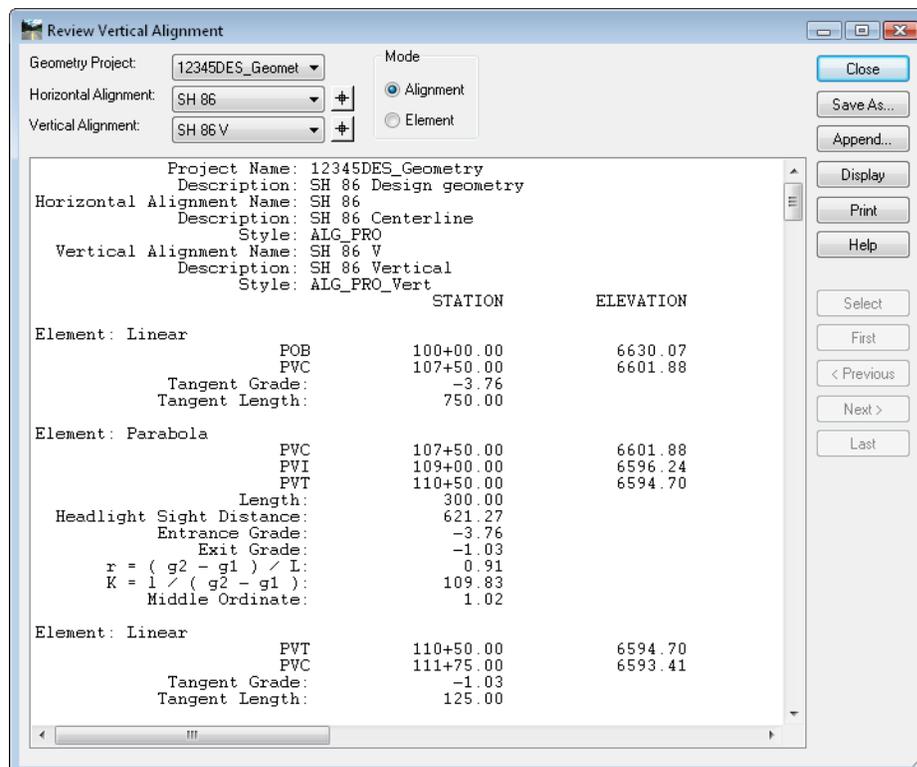
Note: The review dialog can also be opened by right-clicking on the alignment in the InRoads Explorer window.
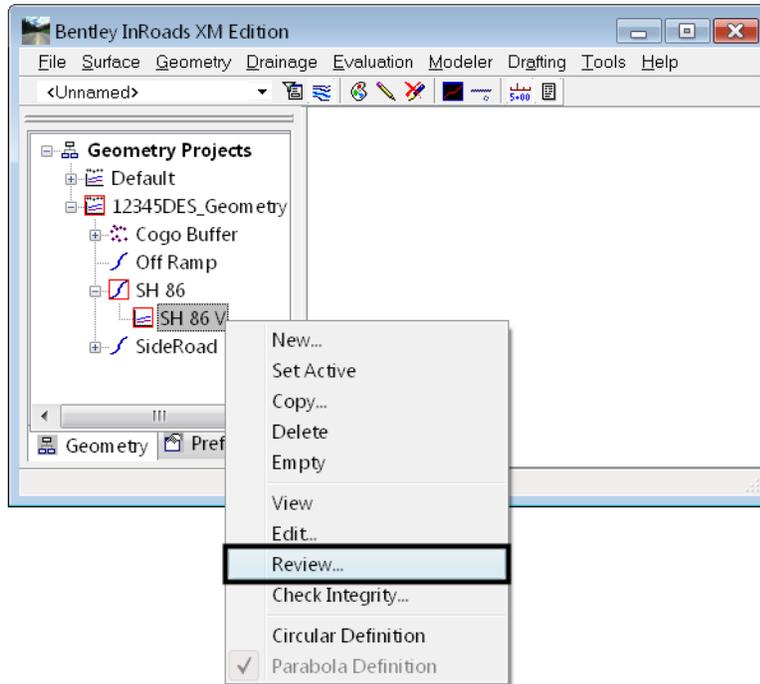
Displaying Vertical Alignments

There are several methods for displaying vertical alignments in InRoads. The method you choose is based on the desired display.

If you choose one of the methods other than ***Vertical Annotation***, a geometry style controls the level and therefore the symbology of the display. Geometry styles are associated with individual alignments when they are created. The CDOT standard styles have been pre-defined and are stored in the ***CDOT-Civil.xin*** file, accessed through the ***Tools > Style Manager*** dialog.

To display the active alignment, choose ***Geometry > View Geometry > Active Vertical*** and the active alignment will display on every profile (created from the vertical's parent horizontal) in the design file showing points and line work (no annotation).

To display any alignment, right-click on the alignment name in the Explorer window and choose ***View***. The chosen alignment will display on every profile (created from the vertical's parent horizontal) in the design file showing points and line work (no annotation).
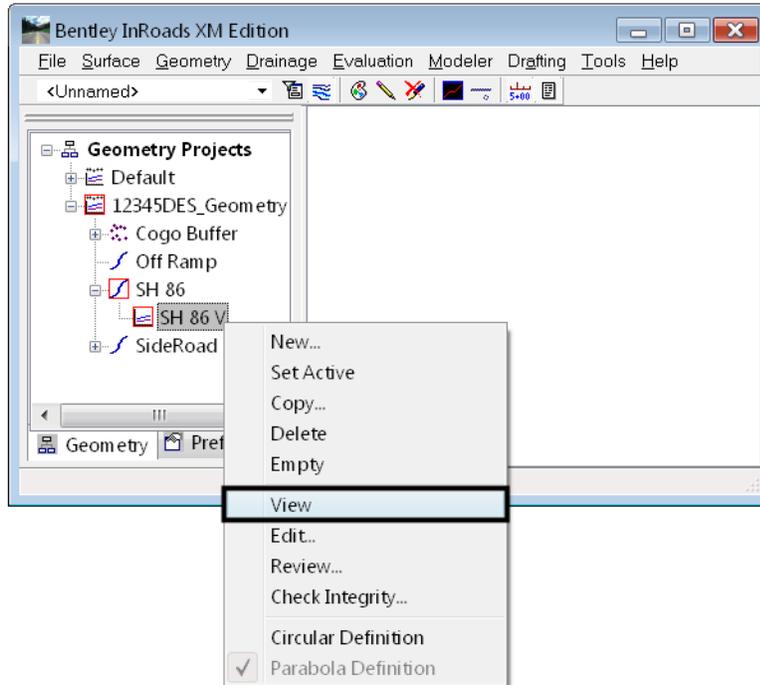
To display the alignment and annotate it at the same time, choose *Geometry > View Geometry > Vertical Annotation*. This command uses a preference to define the symbology of the vertical alignment and to define what and how the alignment is annotated. There are several CDOT preferences available for different types of vertical alignments.
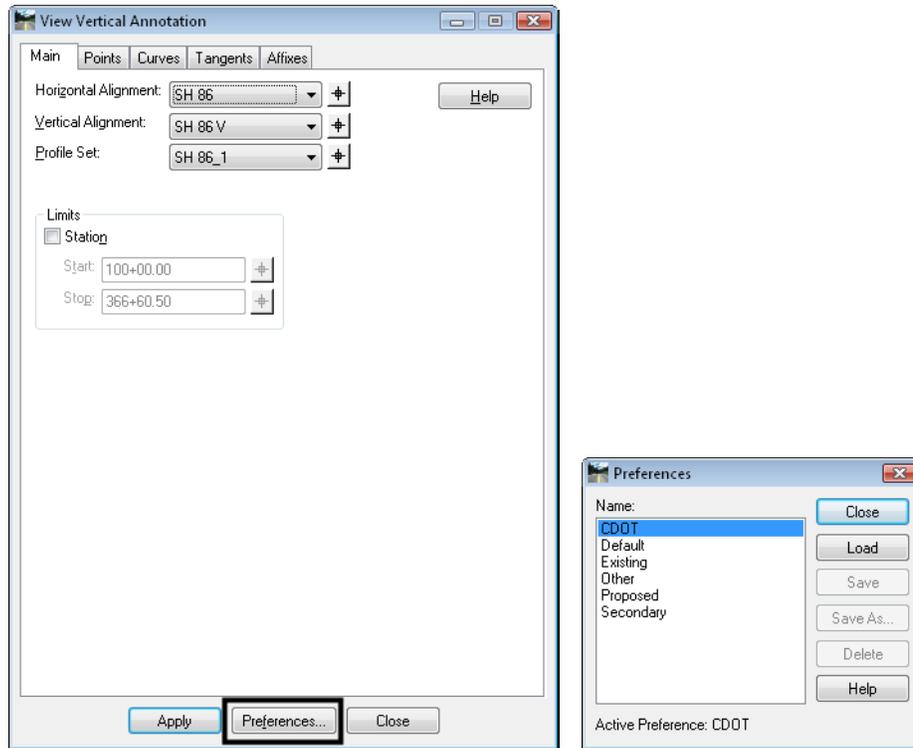
To Display a Vertical Alignment

1. Select **Geometry > View Geometry > Active Vertical** to display a graphic of the active vertical alignment.

   > *Note:* Alternately in the you can right-click on the vertical alignment in the InRoads Explorer window and select *View*.
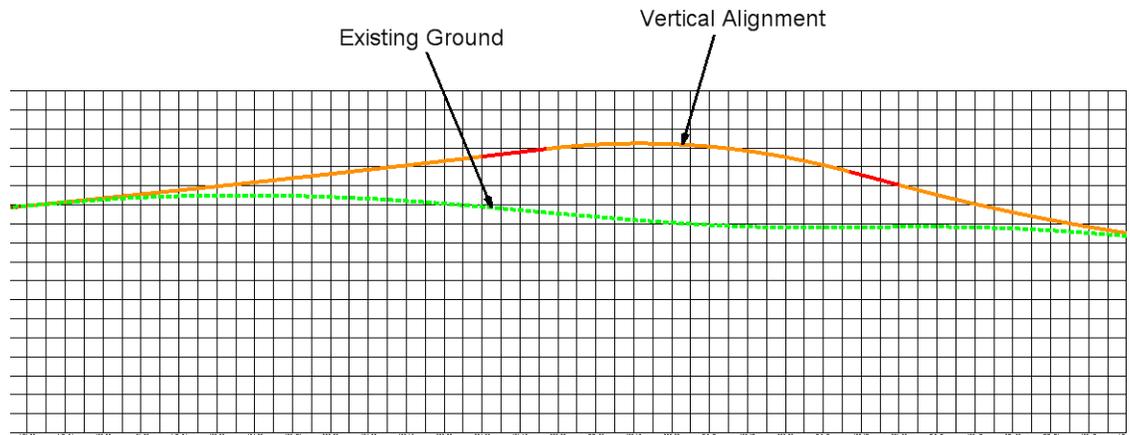
Annotating Vertical Alignments

If you wish to display and annotate the vertical alignment, you can use the *Vertical Annotation* command. This command does not use a geometry style to display the alignment. Instead, you select a preference to not only display the alignments points, tangent lines and vertical curves, but to annotate this geometry as well. The preference determines:

- Which points will be displayed (VPIs, VPCs, low points, high points, vertical event points, etc.) and what will be annotated (Station, Elevation, etc.).

- The display of the vertical tangents and what will be annotated (grade, slope length, etc.)

- The display of the vertical curves and what will be annotated (length, entrance grade, exit grade, sight distance, etc.)

- The location of the annotation along leader or witness lines.

To Annotate a Vertical Alignments

1. Select **Geometry** > **View Geometry** > **Vertical Annotation** to view vertical alignment annotation.
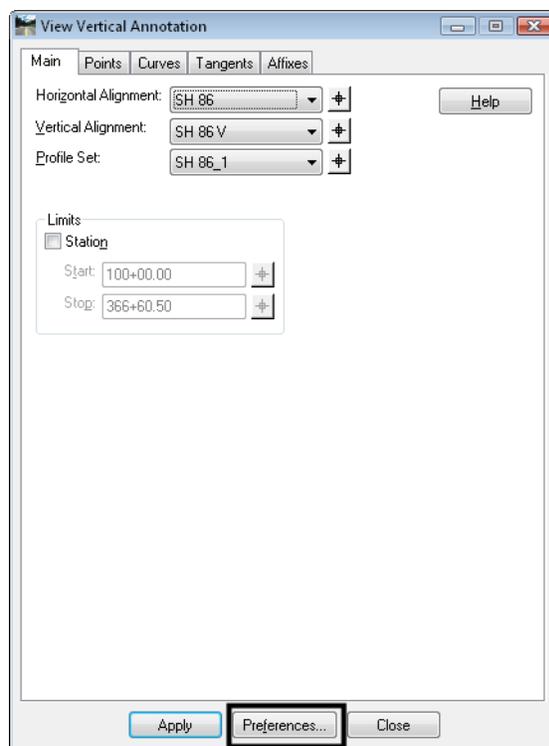
2. Verify the appropriate *Horizontal*, and *Vertical Alignments* are identified in addition to the *Profile Set*.

3. Select *Preferences*, **Load** the desired preference then **Close** the *Preferences* box.
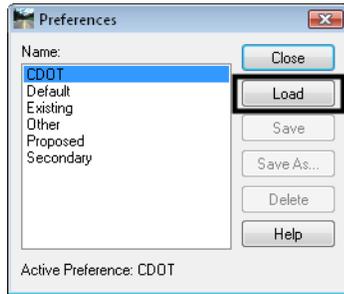
4. Take some time and along the top of the *Vertical Annotation* dialog investigate the remaining tabs and the individual settings loaded by the preference for each tab. Note that vertical event points can be displayed and annotated on the *Points* tab.
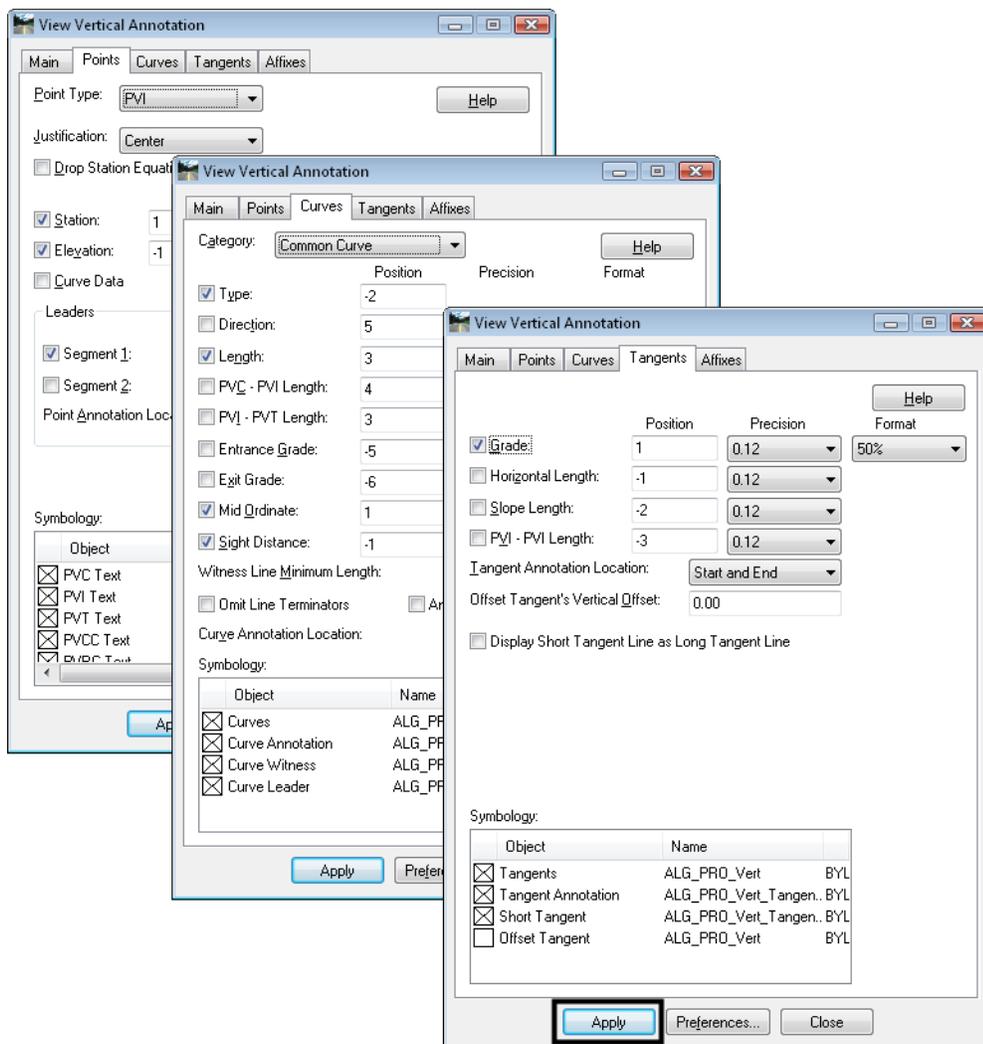
5. **<D>** Apply
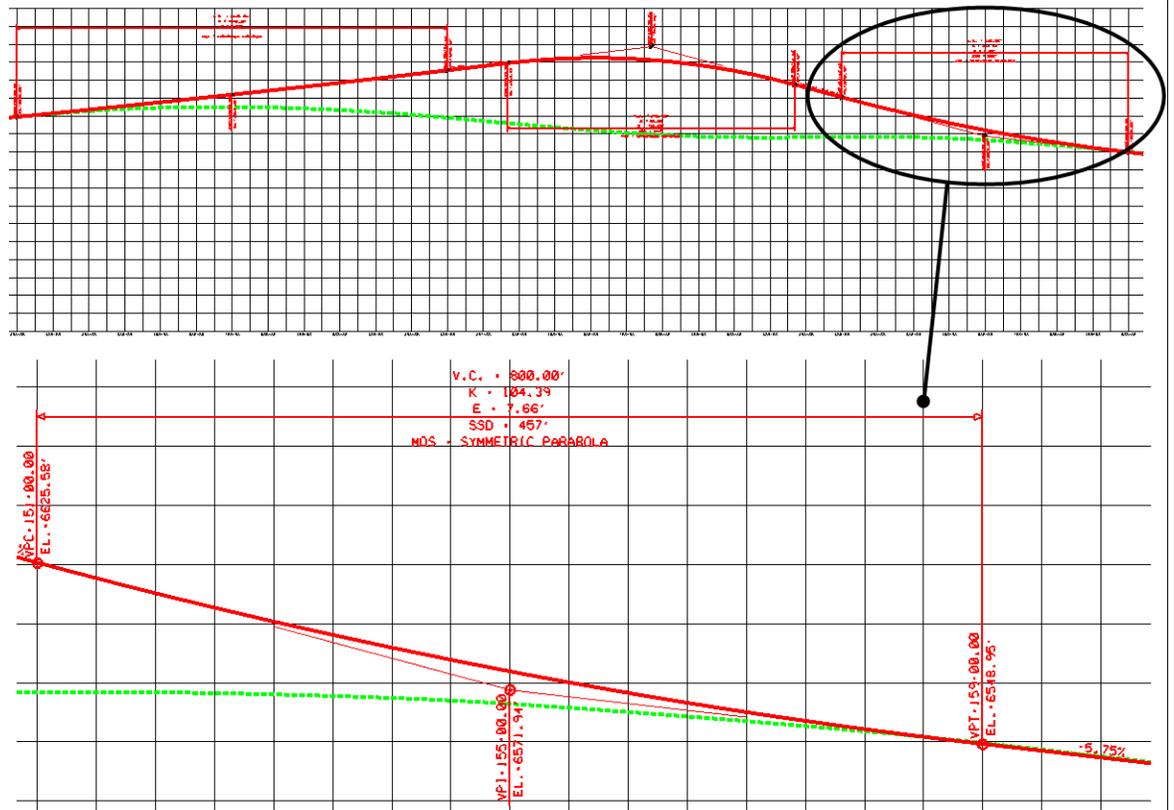
> *Note:*   Edit the MDS text on the vertical curve annotation to show the actual design speed.

6. Close the *Vertical Annotation* dialog box when done.

Tracking

Vertical alignments can be interactively queried similar to horizontal alignments using the *Tracking* commands. There are two tracking options:

- ***Tools > Tracking > Horizontal Alignment*** – tracks the horizontal alignment with a perpendicular line to your cursor. It gives a Station, Offset, Elevation readout in the message field, where the elevation shown is that of the active vertical alignment at the given station.
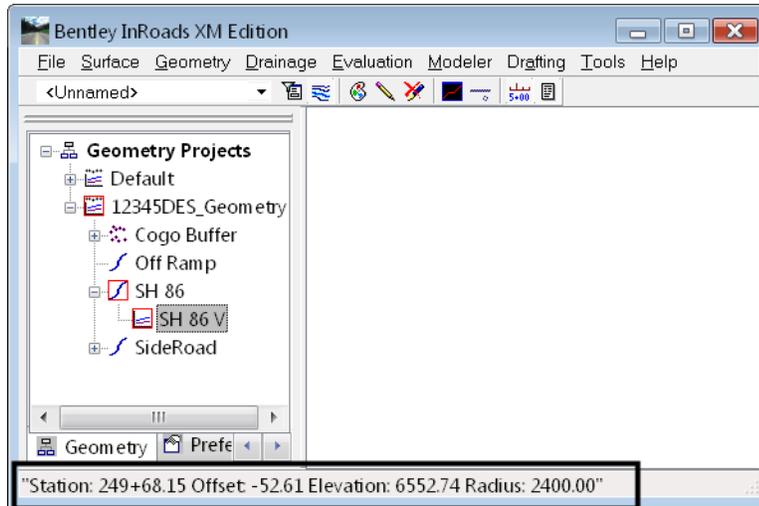
- ***Tools > Tracking > Vertical Alignment*** – tracks the vertical alignment on the profile grid with a vertical line to your cursor. It gives a Station, vertical Offset, Elevation and vertical alignment Grade readout at the location of your cursor.
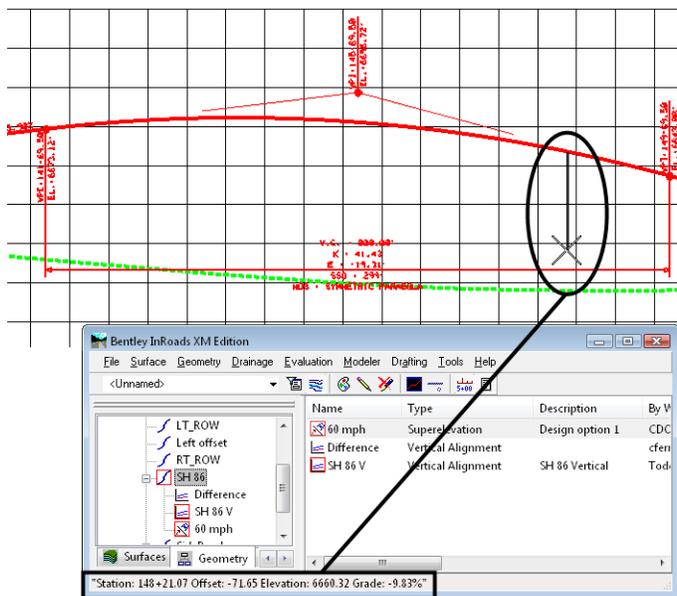
Section Summary:<

- Use the ***Review Vertical Alignment*** report to generate standard point, tangent and curve data on the vertical alignment.

- Use ***Geometry > View Geometry > Active Vertical*** to display the vertical alignment on the profile grid using the assigned geometry style (line work only).

- Use *Geometry > View Geometry> Vertical Annotation* to display and annotate the vertical alignment using a CDOT preference.
- Use *Tools > Tracking > Horizontal Alignment* to obtain vertical alignment elevation at any point on the alignment.
- Use *Tools > Tracking > Vertical Alignment* to obtain offset and grade information between your cursor and point on the profile.

# Vertical Geometry Management Tools

While working with vertical alignment, there are several tools that can help you manage your data. Also, after you have created your alignment, it is important to save the geometry project with the new vertical alignment data.

Section Objectives:<

- Explain how to manage your vertical alignment data.
- Demonstrate how to save your vertical geometry.

Managing Vertical Alignment

There are several utilities that can help manage your vertical geometry.
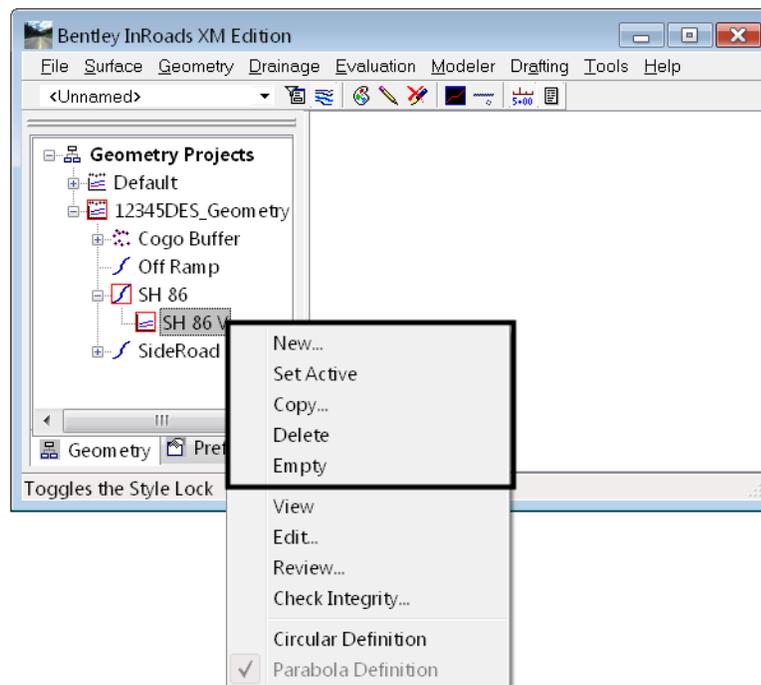
These options, which are accessed from the right-click shortcut menu in the InRoads Explorer, include:

- *New* – to create alignment slot information (name, description, style, etc.)
- *Set Active* – to select the vertical alignment for creating and editing.

- *Copy* – to copy a vertical alignment from the same or different geometry project (e.g. when creating alternative vertical alignments, you can copy a previously created alignment and edit the copy to create the alternate alignment).

- *Delete* – to delete a vertical alignment from the geometry project.

   Note: This command works in memory. Be sure to save the geometry project if you no longer want the alignment in the geometry project.

- *Empty* – to empty the data out of a vertical alignment but keep the alignment slot information (name, description, style, etc.)

In addition, use the ***Geometry*** pull-down menu to access the following:
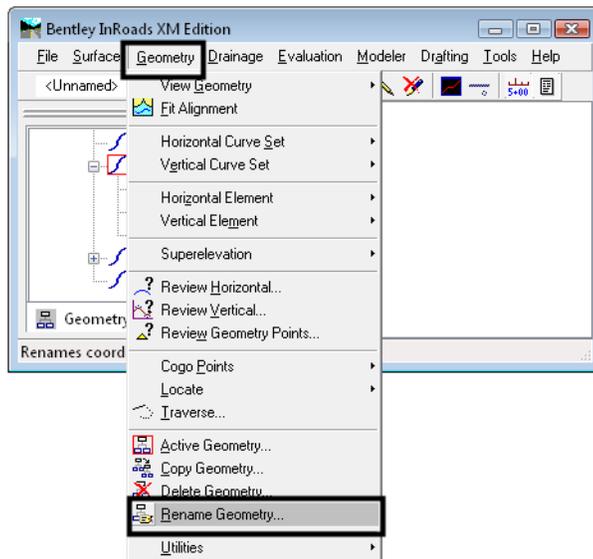
- *Rename Geometry* – to rename a vertical alignment. For example, when you are using an existing geometry project with alignments from Survey, you can use the ***Rename Geometry*** command to give the alignments project specific names.

Saving a Vertical Alignment

Alignments are not saved individually. Instead, they are saved when the geometry project is saved. Since you are working on a copy of the geometry project that is loaded in memory, saving is a good idea whenever you make changes to your alignment, and mandatory before exiting – assuming you want to save your changes.

Geometry projects can be saved using two options.

To save a geometry project (option 1)

1. Make sure the geometry project you want to save is active. If not, right-click on the geometry project from the InRoads Explorer window and choose ***Set Active***.

2. Choose **File > Save > Geometry Project**.

Note: The active geometry project is saved.

To save a geometry project (option 2)

1. Right-click on the Geometry Project in the InRoads Explorer window and chose *Save*
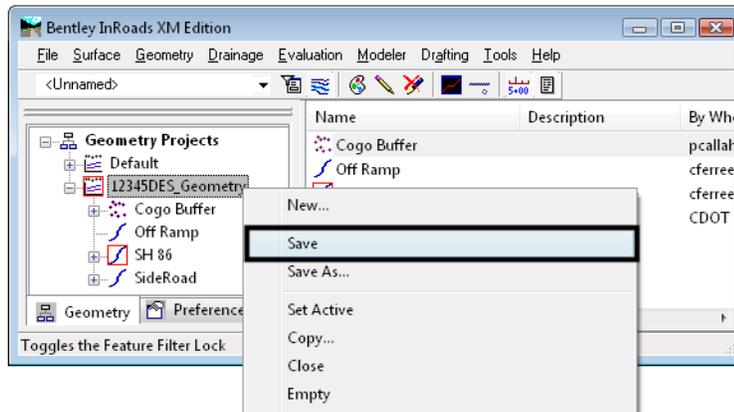
Note: The geometry project you highlighted is saved.

2. If the geometry project has never been saved, either of the previous methods will bring up the *Save > As* box shown below.
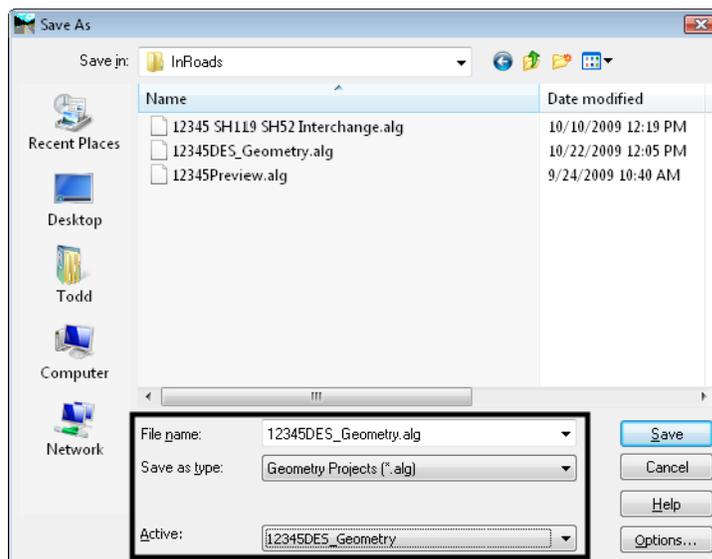
3. Set the *Files of Type* to *(*.alg)*

4. Choose the geometry project you want to save (from the *Active* list)

    Note: After choosing the name from the *Active* list, the *File name* field is populated with the internal name of the geometry project. The *File name* is the hard drive name.

5. If you want to change the name, key in a new file name or keep the default (the default is recommended).

Note: Geometry projects have both an internal name that appears in the dialog boxes in InRoads and a name on the hard drive that has an *.alg* extension. Care should be taken to make certain you have chosen the correct geometry project name to match the file name you specify. Otherwise, you could accidentally save over a file on the hard drive with the wrong geometry project. *It is recommended that your hard drive name match your internal (active) name.*

6. **<D> Apply** and the file is saved.

Section Summary:

- Use the InRoads Explorer right-click short cut menu to manage your vertical alignment data.

- The *Delete Geometry* command deletes vertical alignment (and other geometry data) from InRoads memory. Be sure to save the geometry project on the hard disk if you no longer want the alignment in the project.

- The *Empty* command will empty all alignment data, but keep the slot information.

- Alignments cannot be saved individually. You must save the entire geometry project with the new alignment data.

- It is recommended that your geometry project's hard drive name match your internal (active) name to avoid confusion and the possibility of overwriting data.

Chapter Summary:<

- A general understanding of how to create an InRoads profile is required before creating and working with vertical alignments.

- Vertical alignments are part of the InRoads geometry project and stored in the *.alg file.

- Vertical alignments are "children" to the "parent" horizontal alignment. Therefore, you must have created a horizontal alignment before creating a vertical "child" underneath it.

- You can create multiple vertical alignments underneath one horizontal for different design scenarios.

- A vertical alignment can be used along with a horizontal to define a corridor in Roadway Designer.

- After creating the vertical alignment, you can obtain geometry data from the alignment from several different sources including reports, interactive tracking, and graphical annotations.