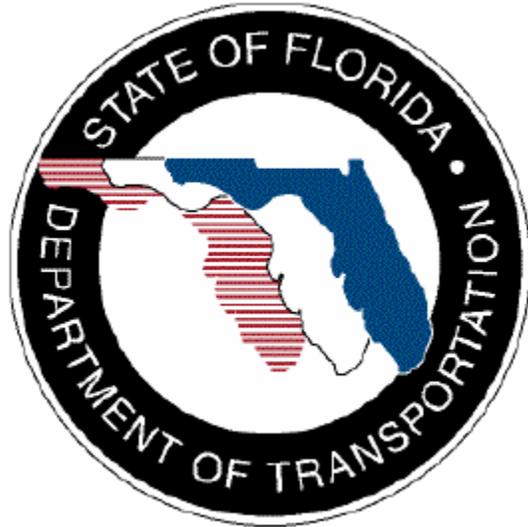


**STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION**



**FDOT CROSS SECTIONS
CE-11-0134**

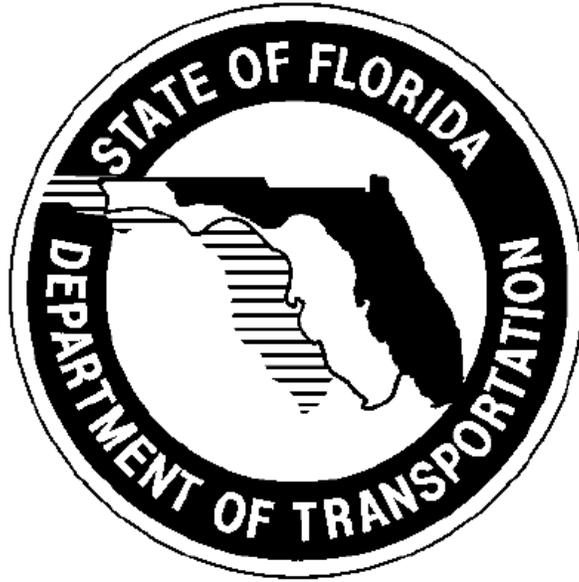
**Course Guide
March 2011**

**ENGINEERING / CADD SYSTEMS OFFICE
TALLAHASSEE, FLORIDA**

<http://www.dot.state.fl.us/ecso/>

FDOT CROSS SECTIONS

Course ID: CE-11-0134



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FDOT CROSS SECTIONS

CE-11-0134

Description

This course instructs on basic and advanced GEOPAK skills to teach Advanced GEOPAK users on the features supported in the Florida Department of Transportation (FDOT) criteria to generate roadway cross sections.

The objective of the course is to develop roadway cross sections using the FDOT criteria for MicroStation and GEOPAK to meet FDOT standards as defined in the Plans Preparation Manual, Computer Aided Drafting & Design (CADD) Manual, and the CADD Production Criteria Handbook (CPCH).

Topics Covered

This course includes, but is not limited to the following:

- Design and Computation (D&C) Manager
- GEOPAK Project Manager
- 3PC Adhoc Attribute Manager
- Typical Section Generator
- Superelevation Shapes
- FDOT Criteria

Prerequisites

To get the most from this course the user should have a basic understanding of CADD using MicroStation, a basic understanding of GEOPAK concepts and a solid understanding of the engineering necessary to design a roadway.

This course does not teach CAD drafting or engineering design. GEOPAK is simply a tool to facilitate the engineering design process. The following courses and some manual drafting or related CADD product experience is recommended:

- MicroStation
 - FDOT MicroStation Essentials Part I CE-11-0114
 - FDOT MicroStation Essentials Part II CE-11-0115
- GEOPAK
 - FDOT Basic GEOPAK for Roadway Designers CE-11-0099
 - FDOT Advanced for GEOPAK Roadway Designers CE-11-0101
- Engineering / Design
 - Solid understanding of road design process

Duration: 16 Hours

Professional Credit Hours: 16 PDHs

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1 INTRODUCTION

OBJECTIVES

This course is designed to give users hands-on instruction through the process of manipulating adhoc attributes and Criteria variables when creating cross sections using MicroStation V8i (Selects Series 2) and Bentley GEOPAK Suite – V8i (Selects Series 2). These versions are important. Many functions required for the Criteria to work correctly are not present in earlier versions. The students will create cross section components using the Criteria developed for Florida Department of Transportation (FDOT) (Version 2010.00.00).

FDOT CRITERIA

All the cross section components are contained in one file, *RDXS RD01.dgn*. The *fdotseedxs.dgn* file is set up with models. The models included are *Rdxsrd* (cross sections), *Xsshrd* (shapes), *Pattrd* (pattern lines), and *Rdxsrd_shg* (sheets). Separate files are recommended for each run of cross sections, i.e. mainline, side streets, etc.

The FDOT Criteria looks for elements contained in the design files to determine what cross section elements to draw. It also gathers adhoc attribute values attached to those elements found in the plan view to define how it is to draw those elements/features in cross section view. When elements are not present in the design files, then the Criteria does not draw those elements into cross section view. This makes it very important to use the Design & Computation (D&C) Manager. It has been designed to set the correct symbology for the many design files used with the FDOT software. Therefore, the Criteria look for the design elements based on the D&C Manager items (often referred to as ddb features). Along with the attribute tags the D&C Manager places, it also places pre-defined adhoc attributes on the necessary elements for the Criteria to read and use accordingly. It is highly recommended to read the Help documentation which clearly explains what the Criteria is looking for on the elements and how to set those elements correctly.

The Help documentation for the FDOT Criteria is in html format for easy navigation. In addition to the Description button on the Typical Section dialog, it can also be accessed from the FDOT Menu and from within the D&C Manager.

Five typicals are provided with the FDOT Criteria. They are *Existing Features*, *Proposed Features*, *DrawROW*, and the two *existing cross slope report* typicals.

- The *Existing Features* typical will draw the existing base under the existing features present in the topo file. This includes the existing pavement, shoulders, curb, sidewalk, driveways, miscellaneous pavement and guardrail. It also includes the use of a “GEOPAK Lines” file. This approach allows the users to “clean up” their topo files to run with the Criteria without modifying the original file from survey.
- The *Proposed Features* typical encompasses divided or undivided roadways, medians, milling, overlay, widening, new pavement, paved shoulders, curb and/or gutter, sidewalks, ditches/special ditches, berms, driveways, special profiles, tapering features, miscellaneous asphalt, guardrail, walls, etc all in the same typical.
- The *DrawROW* typical draws and labels the right of way elements found in the RWDTRD file along with fence and wetland limits.
- The *existing slope report* typicals, *Und_ExSlope* and *Div_ExSlope*, locate the existing edges of pavement from the TOPORD file and extracts the existing ground elevation from the cross sections. The Criteria generate a csv file with the existing elevation and slope information.

WARNINGS / HELPFUL HINTS

-  GEOPAK does not recognize models when searching DGN files. (i.e. Pattern lines, Design Files) Make sure to be in the correct model before executing drawing commands.
-  There must be an even number of existing edges of pavement for the existing features Criteria to function correctly.
-  When running cross sections, there will be a pause when it loads the define *DGN* elements. This is due to GEOPAK loading the ddb file in the background.
-  **Read the Help documentation!!**

PRE-REQUISITES

This course is designed for the more advanced Computer Aided Design and Drafting (CADD) user. It has been created with the emphasis on manipulating design elements, adhoc, and variables in order to produce the cross sections with the desired results. With this in mind, several steps to creating cross sections have already been processed and are provided for this class. These steps are:

1. Creating the cross section file (*RDXS RD01.dgn*).
2. Creating a project within GEOPAK's Project Manager.
3. Setting up the working alignment.
4. Creating the Pattern Lines and Existing Ground Cross Sections.
5. Creating Profiles.
6. Creating Superelevation Shapes.

ADDITIONAL INFORMATION

For more information on the GEOPAK tools used in the process of creating cross sections, please go to one of the following links. They contain training documentation as well as data sets.

<http://www.dot.state.fl.us/ecso/downloads/documentation/MicroStationEssentials/MSEssentials.shtm>

<http://www.dot.state.fl.us/ecso/downloads/documentation/MicroStationEssentials/MSEssentialsPartII.shtm>

<http://www.dot.state.fl.us/ecso/downloads/documentation/BasicGEOPAKforRWDesigners/BasicGEOPAKforRWDesigners.shtm>

<http://www.dot.state.fl.us/ecso/downloads/documentation/AdvancedGEOPAKforRWDesigners/AdvancedGEOPAKforRWDesigners.shtm>

<http://www.flugsite.com/Presentations.cfm>

<http://www.dot.state.fl.us/ecso/downloads/presentations/default.shtm>

DOCUMENT STYLE

Style conventions used throughout the course guide are shown in the following table.

Item	Convention	Example
Menu names and Commands	Bold, names separated with > symbol	<ul style="list-style-type: none"> • File > Open • File > Compress > Design
Software Name and Dialog box Title	Arial	<ul style="list-style-type: none"> • GEOPAK does not recognize models. • Set up the Proposed Cross Section Run - Exfeat dialog as shown below.
Dialog box Actions	Bold	<ul style="list-style-type: none"> • Click the Apply button. • Click the Graphic Select button to the right of the <i>Horizontal Alignment Include</i> box. • In the <i>Segment Type</i> list, click Lines.
Dialog box Field Names	Italic	<ul style="list-style-type: none"> • Key in Hemfield Road in the <i>Alignment Name</i> field. • Click the Graphic Select button to the right of the <i>Horizontal Alignment Include</i> field. • In the <i>Segment Type</i> list, click Lines.
Key-ins	Bold	<ul style="list-style-type: none"> • Key in Hemfield Road in the <i>Alignment Name</i> field.
File names	Italic	<ul style="list-style-type: none"> • Open the file <i>Working Graphics.dgn</i> in the • C:\Bentley Training\GEOPAK 101\Project Setup\Practice\<i>Working Graphics.dgn</i>
File paths	Non italic	<ul style="list-style-type: none"> • C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.
New Terms or Emphasis	Italic	<ul style="list-style-type: none"> • The Template Library contains <i>templates</i>, which represent typical sections of the proposed roadway.

2 EXISTING FEATURES

OBJECTIVES

- Identify supported Existing Features
- Existing Features Typical – Set up and Variables
- Proper Use of the GKLNRD file

EXISTING FEATURES

FDOT has provided two typicals to draw existing features on cross sections, Existing_Features and DrawROW. The Existing_Features typical will extend existing ground lines to the extent of the cross section cell and draw the base for the existing pavement, shoulders, curbs, sidewalks, driveways, traffic separators and miscellaneous asphalt as well as draw the existing guardrail. The DrawROW typical draws and labels existing R/W, wetlands and fence on the cross sections. It also draws and labels proposed R/W and fence.

REDEFINABLE VARIABLES

The Existing Features Criteria uses Redefinable Variables to set options that can be controlled by the designer for the entire cross section run or through varying station ranges. These variables control search distances, base thicknesses, the option to extend the existing ground to the limits of the cross section cell (pattern line), and whether to turn different features on and off. Included in these variables is the option to generate an error report. For more detailed information on the Redefinable Variables available see the Cross Section Criteria Help files.

Existing Features Redefinable Variables Summary

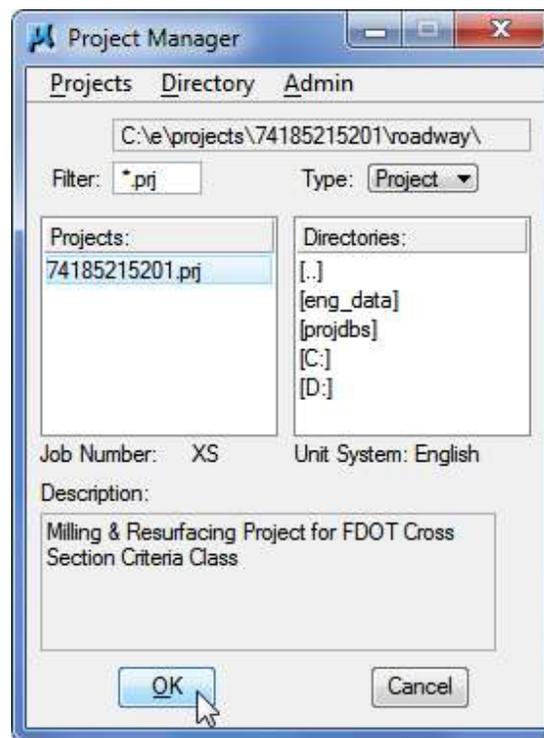
Redefinable Variable	Default Setting	Options
_d_ExistPavtThick	8/12	Setting to zero (0) will not draw.
_d_ExistMiscPavtThick	4/12	Setting to zero (0) will not draw.
_d_ExistShoulderThick	6/12	Setting to zero (0) will not draw.
_d_ExistCurbThick	8/12	Setting to zero (0) will not draw.
_d_ExistSidewalkThick	4/12	Setting to zero (0) will not draw.
_d_SidewalkSearchDistance	10	Any positive number will change the search distance.
_d_ExistTrafficSeparatorThick	8/12	Setting to zero (0) will not draw.
_d_CurbSearchDistance	3	Any positive number will change the search distance.
_d_ShoulderSearchDistance	15	Any positive number will change the search distance.

Redefinable Variable	Default Setting	Options
_s_EFTTL	Y (Yes)	Y (Yes) – Will draw Existing Feature Labels. N (No) – Will not draw Existing Feature Labels.
_s_ExtendExGrdLT	N (No)	N (No) – No Existing Ground Line Extension H (Horizontal) – Extend Existing Ground Horizontally 12 – Any positive number continues the Existing Ground at its current slope. The Value of the number represents the sample width for computing the slope.
_s_ExtendExGrdRT	N (No)	N (No) – No Existing Ground Line Extension H (Horizontal) – Extend Existing Ground Horizontally 12 – Any positive number continues the Existing Ground at its current slope. The Value of the number represents the sample width for computing the slope.
_d_eeopSearchDistance	24	Any positive number will change the search distance.
_d_MiscPavtSearchDistance	12	Any positive number will change the search distance.
_s_Error_File	N (No)	Y (Yes) – Generates a report of Stations with error messages and possible resolutions. N (No) – Will not generate the error report.
_s_Error_Filename	1	1 – Uses the default filename, Exfeat_Error_File.csv. 2 – Triggers a prompt for a filename when the Criteria runs.
_d_DrivewaySearchDistance	50	Any positive number will change the search distance.
_d_DrivewayThick	6/12	Setting to zero (0) will not draw.
_s_EGR	Y (Yes)	Y (Yes) – Draws guardrail cell onto the cross section when the Criteria encounters existing guardrail line. N (No) – Will not draw the guardrail cell. Note: Uses the level name to determine the correct cell to use (left or right).

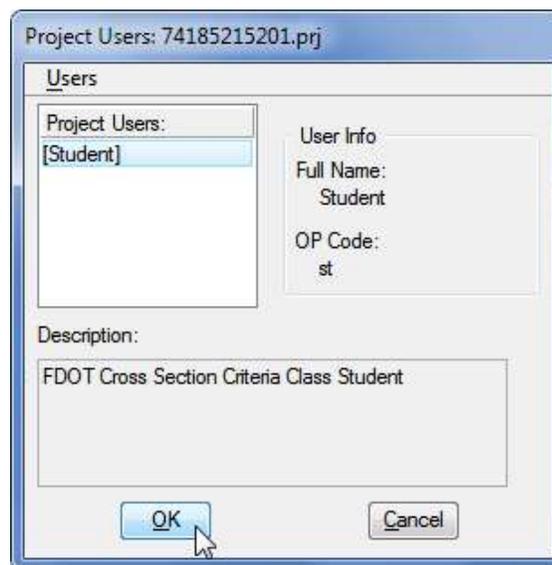
Exercise 2.1 Existing Features Criteria with Redefinable Variables

In this exercise the Existing Features typical will be used to draw the existing base on the cross sections. Redefinable variables will be modified to turn on the option to generate the Error report.

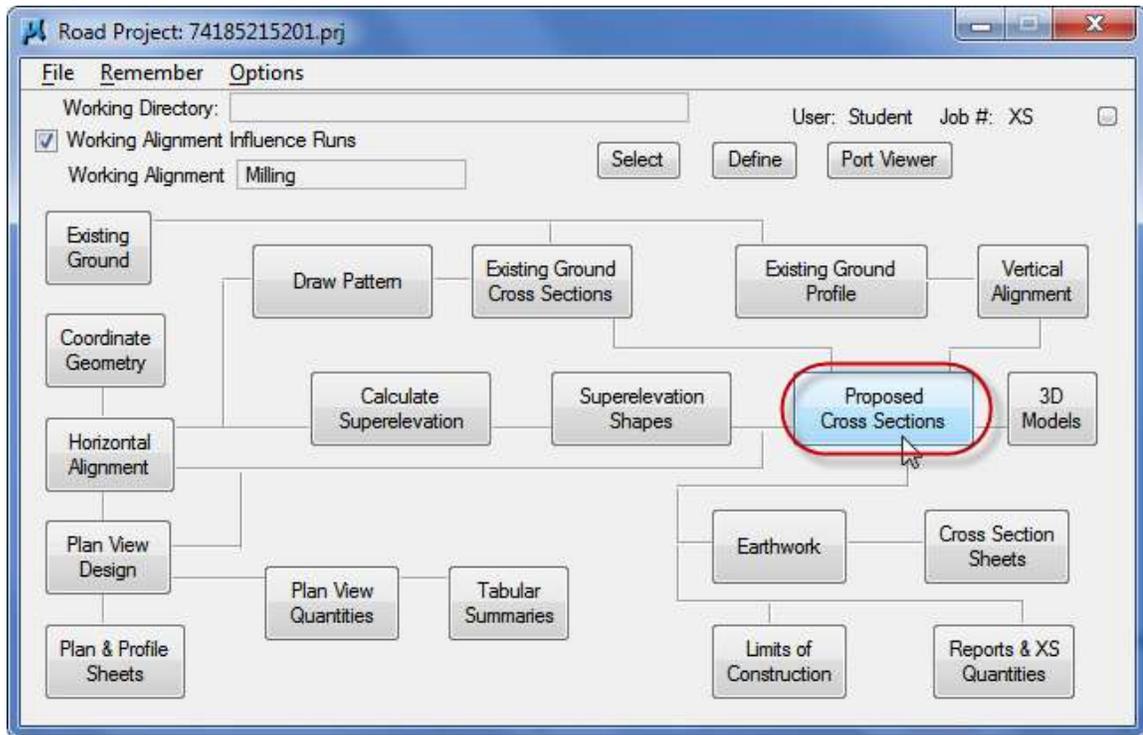
1. Open the file C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model Rdxsrd using the *FDOT2010 MicroStation* icon.
2. Open Road Project by going to **Applications > GEOPAK > ROAD > Project Manager**.
3. Select the *Project 74185215201* and click **OK**.



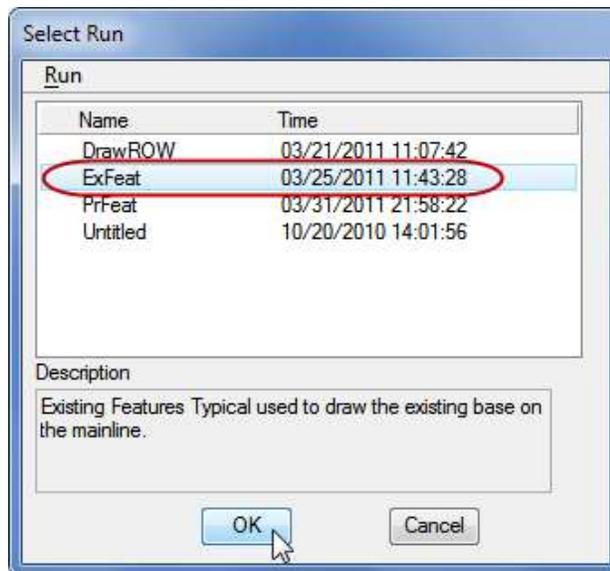
4. On the Project Users dialog, select **Student** from the list box and click **OK**.



5. On the Road Project dialog, select **Proposed Cross Sections**. The Run dialog will open.

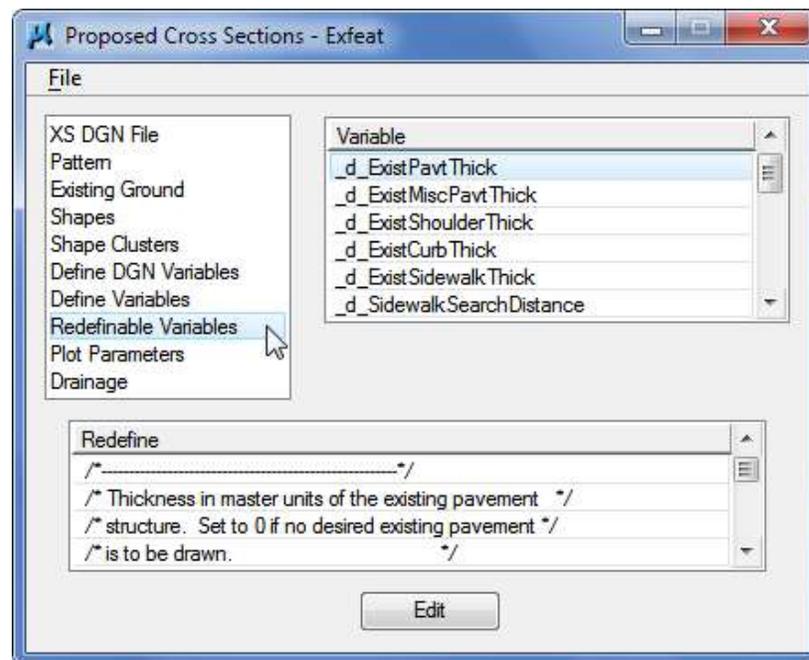


6. Select the run **ExFeat**. Click **OK**.



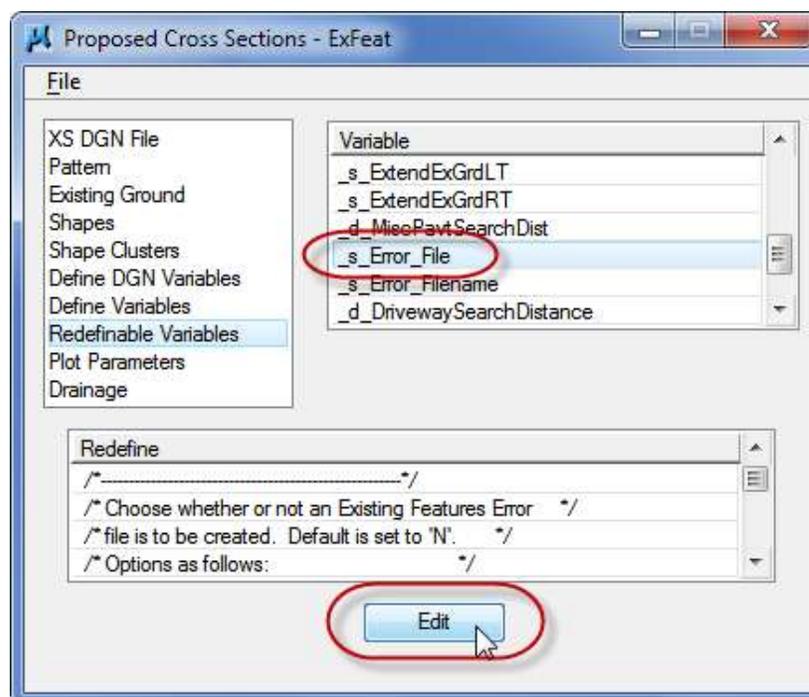
Note When working in Project Manager, always create a new run. Do NOT simply rename the Untitled run. When creating a new run, the program copies the untitled run to generate the new run. If this run gets corrupted, there is not a fresh run to use to generate the new run.

7. Select the *Redefinable Variables* category from the list.

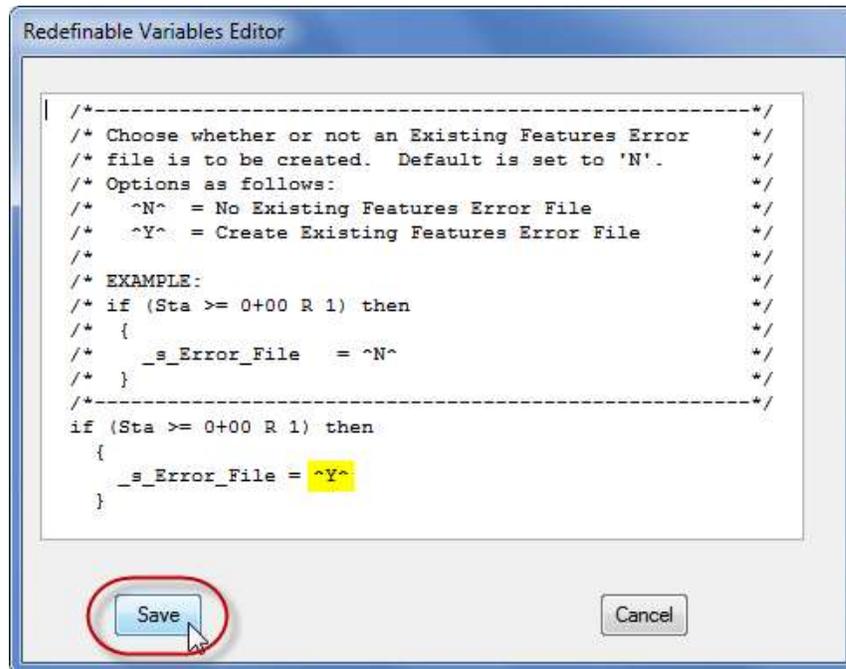


8. From the *Variable* list box, select **_s_Error_File** and click **Edit**.

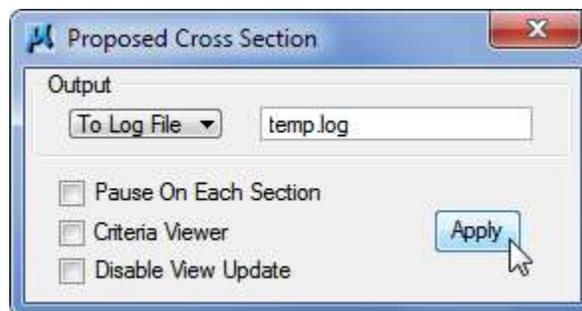
Note Double clicking on the variable will also open the Redefinable Variable Editor.



- On the Redefinable Variable Editor dialog change the **N** to a **Y** and click **Save**.

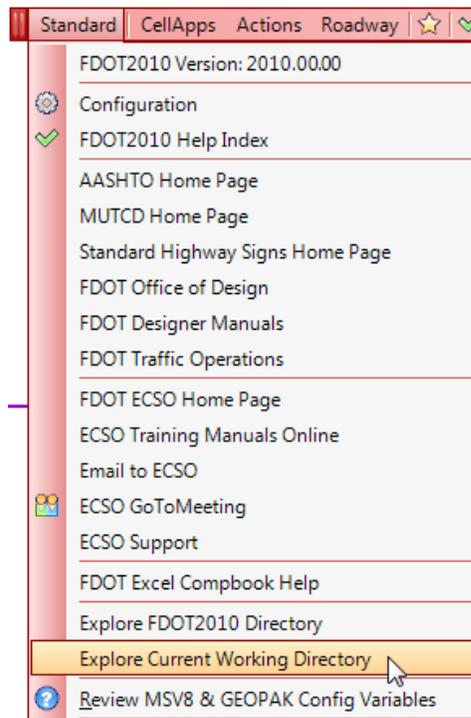


- From the File Menu, select **File > Save Settings** and then **File > Run**.
- On the Proposed Cross Section dialog, set the *Output* option to **To Log File** and then click **Apply** as shown below.

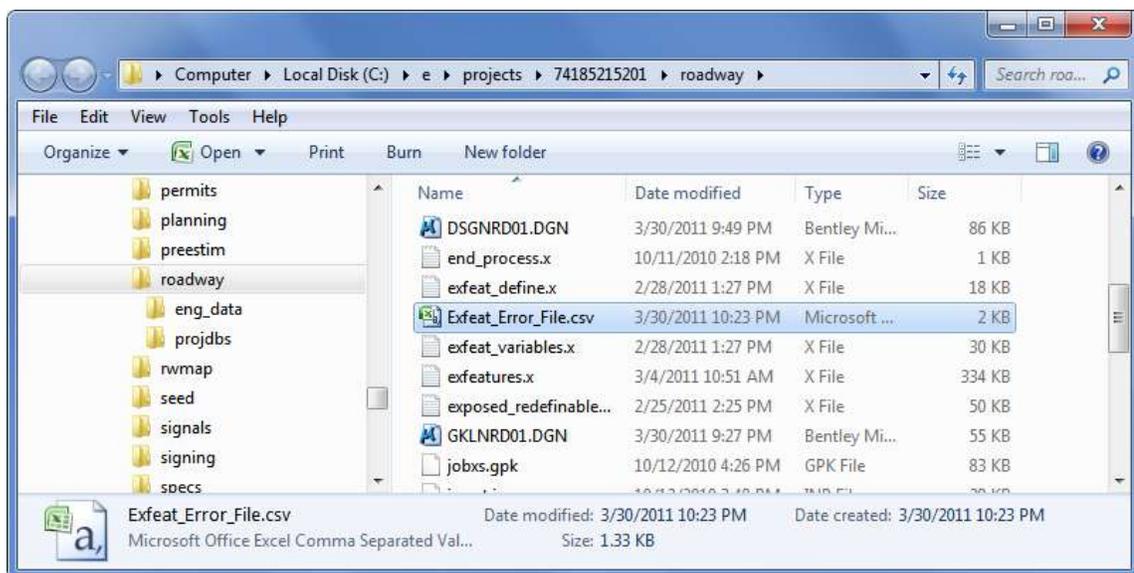


- The cross sections will run. When done, click **Exit**.
- Using the Cross Section Navigator, review the sections. Note that the sections did not run correctly. Many of the sections have the error *"Irregular Pavement Found"*.

14. On the FDOT Menu select **Standards > Explore Current Working Directory**.



15. From Explorer, open the Error Report file, **Exfeat_Error_File.csv**. Review the file. It contains the station, error message, and a notation to use the GKLNRD file and the TOPO Overrides to correct the errors found during the cross section run.



16. **Close** Excel.
17. **Close** Cross Section Navigator.
18. **Close** the Proposed Cross Sections – Exfeat dialog box. When prompted, click **Yes** to save settings to the cross section run.

GKLNRD FILE

The Existing_Features Criteria searches the topo file to locate the plan view elements defining the limits of the existing features. It also searches an optional supplemental design file, GKLNRD, referred to as the “GEOPAK Lines file”, for those same elements. This supplemental file is designed to be used in conjunction with the topo file in instances when the topo file is not entirely correct. Sometimes the topo file elements are not coded with the correct features or do not have the correct level symbology for the Criteria to locate. In these instances, the correct elements are drawn into the supplemental file for the Criteria resulting in correct cross sections without modifying the topo file received from survey.

Once a feature has been identified from the TOPORD and/or GKLNRD file, the Criteria will try to determine which element that it should be connecting to. These elements are called *closing components*. Many of the features have multiple *closing components*. If the Criteria cannot find the *closing component*, an error message will be drawn on the cross section at the point where the feature crosses the existing ground line. If there is an odd number of existing edges of pavement found in the files the Criteria will draw the error message, “*IRREGULAR PAVEMENT FOUND*” across the top of the cross section. The Criteria will try to draw what it can, however, without the pavement edges defined correctly many features will not be drawn.

When errors are encountered, the next step is to take a look at the TOPORD file. In many cases, an element will be found that was not coded correctly. Sometimes, the pattern line will cross one of the feature elements and won’t find a second element to tie it to, i.e. side roads. Some instances will require extra elements drawn into the GKLNRD file in order for the Criteria to resolve correctly, even though the TOPORD elements have been coded correctly. The Criteria includes the option to label existing features with the redefinable variable *_s_EFTTL*. The option is useful in determining what features the Criteria finds in the topo file, as well as the GKLNRD file. The labels include the type of feature, i.e. existing pavement or shoulder, and in which file the feature was found. Depending on the feature and the error message given, different corrective measures can be taken to get the cross sections to run. The designer has the ability to add the missing line work and/or override specific TOPO elements using the GKLNRD file. Elements found in the GKLNRD file will be considered the correct feature and will override any elements found in the topo file.

The following table lists some common errors encountered and corrective measures that can be applied.

Error	Corrective Measure
Pavement crown of the roadway has been coded as existing edge of pavement	Copy the incorrect existing edge of pavement line into the GKLNRD file and change the level symbology to the PavtCrown_ep, TopoMisc_ep, or LaneLine_ep.
Incorrect level symbology in the TOPORD, i.e. edge of shoulder that has been coded edge of pavement or vice versa, etc.	Copy the incorrect element into the GKLNRD file and change the level symbology
Patten line only crosses 1 element, i.e. at a side road or driveway that extends beyond the limits of the pattern line	Draw a line crossing the pattern line with the corresponding symbology where the designer would like to see the base close. Note: Do NOT draw the element at the exact end of the pattern line. This can cause errors.
Draws base under undesired location, i.e. a concrete slab or parking area	Copy the elements into the GKLNRD file and change the symbology of the element to TopoMisc_ep. Drawing an element using this level over any element from the TOPORD will negate that element from the TOPORD file.
All the sidewalk was drawn using the Back of Sidewalk symbology	Copy the element that should be coded Front of Sidewalk into the GKLNRD file and change the level to SidewalkFront_ep.

The Criteria searches for and will override elements for the following features.

- Existing Edge of Pavement
- Traffic Separators
- Existing Edge of Shoulder
- Curb
- Sidewalk
- Driveway
- Miscellaneous Asphalt
- Guardrail

For more information, please see the TOPO Elements Overrides HTML Help file. This help file contains several tables listing the overrides for each topo element. These elements are to be placed in the GKLNRD file coincident to the topo element they will override. By placing the override element in GKLNRD file the elements in the TOPORD file will be ignored and not utilized by the Existing Features Criteria.

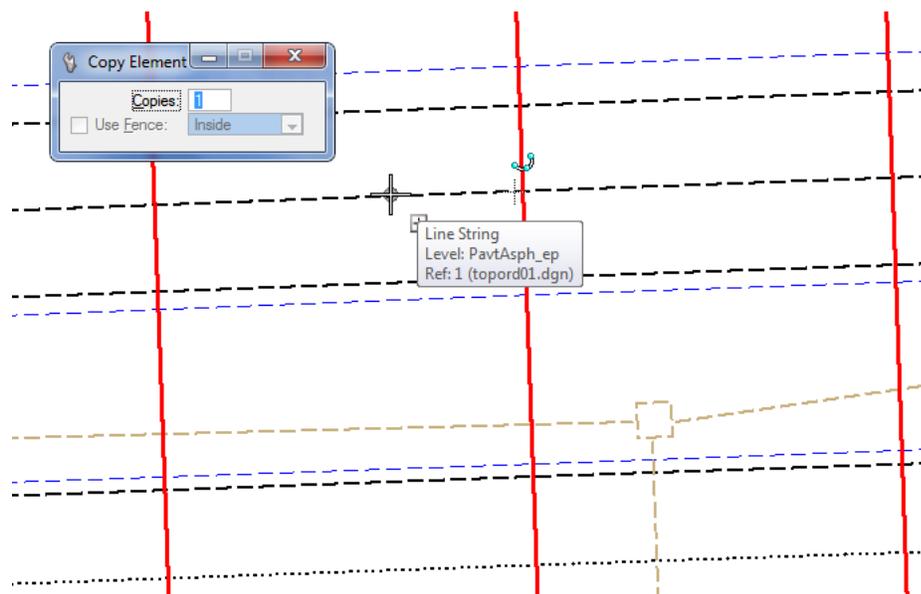
Important: There are a few important notes to remember:

- Do **NOT** copy ALL of the elements from the topo file into the GKLNRD file. Only the individual elements that are needed to correct the topo file to achieve the correct cross section features should be copied or drawn into this file.
- The GKLNRD file is **NOT** supported in the proposed features Criteria.

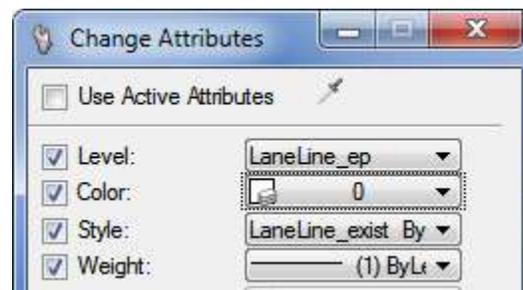
Exercise 2.2 *Using the GKLNRD file*

In this exercise, the GKLNRD file will be used to correct the existing features drawn on the cross sections. These corrections will include correcting the symbology for a lane line which was incorrectly drawn as an edge of pavement, adding elements that did not cross the pattern lines, and “turning off” base under a section of embankment that was drawn incorrectly as edge of pavement.

1. Open the GEOPAK lines file C:\e\projects\74185215201\roadway\GKLNRD01.dgn.
2. Using MicroStation’s Copy Element tool, copy the edge of pavement line located at the center of the travel lanes on the left side of the roadway in the TOPORD file into the current design file.

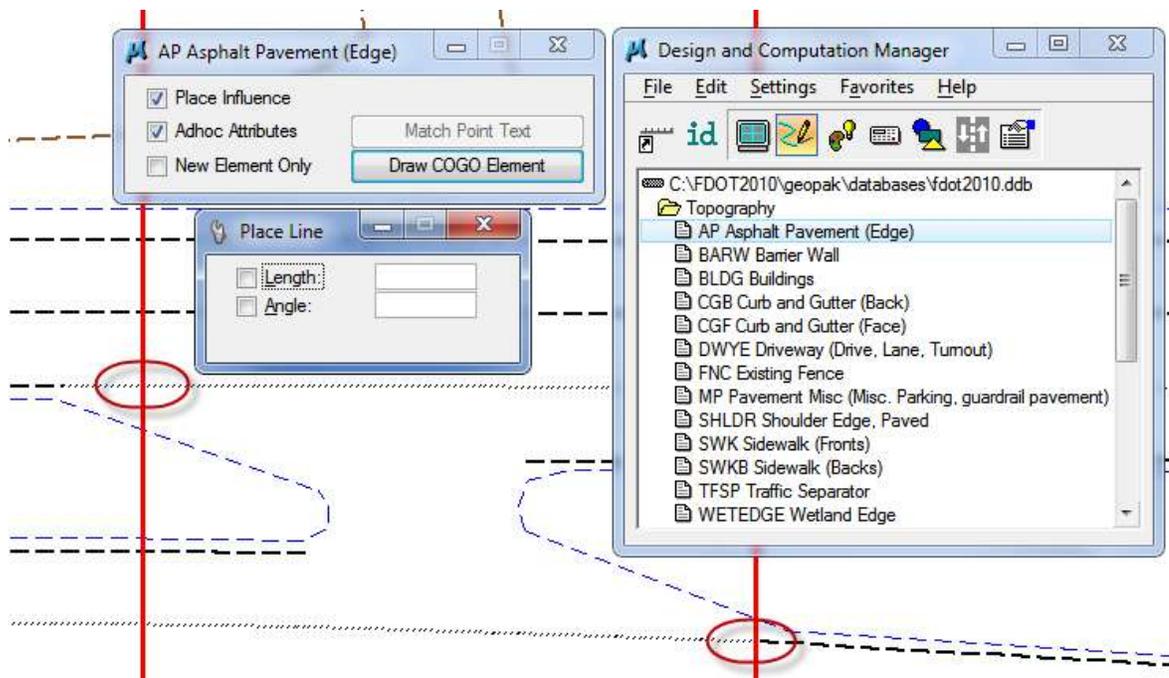


- Using the *Change Attribute* tool, change the element *level* to **LaneLine_ep**.

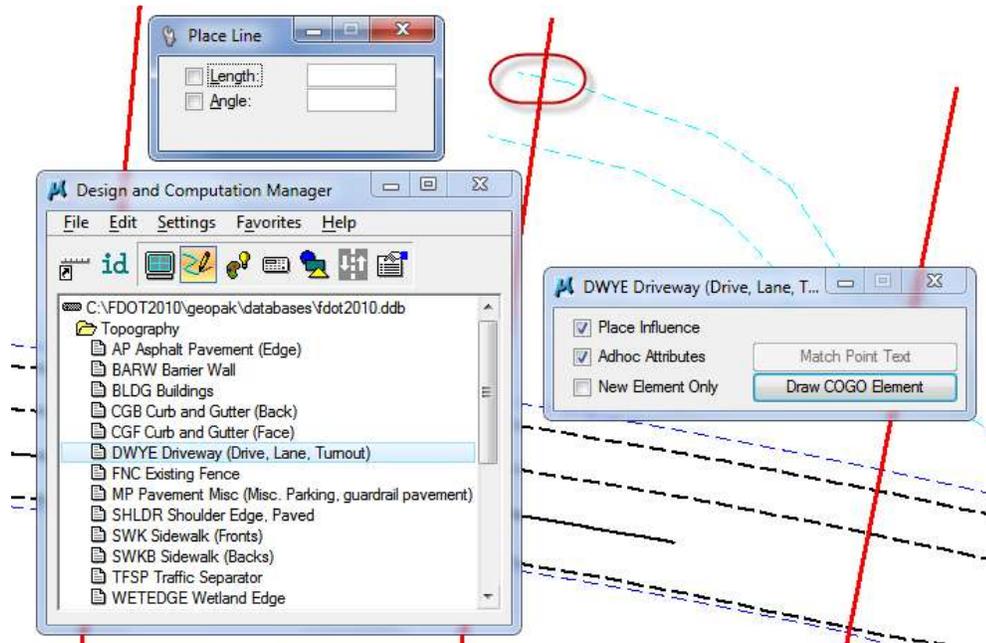


Note If the Existing Features were run using just the topo file, the 5 edges of pavement found would result in the warning "Irregular Pavement Found". By drawing this line into the GKLNRD file as a lane line, the Criteria will now find 4 edges of pavement and be able to draw the existing base.

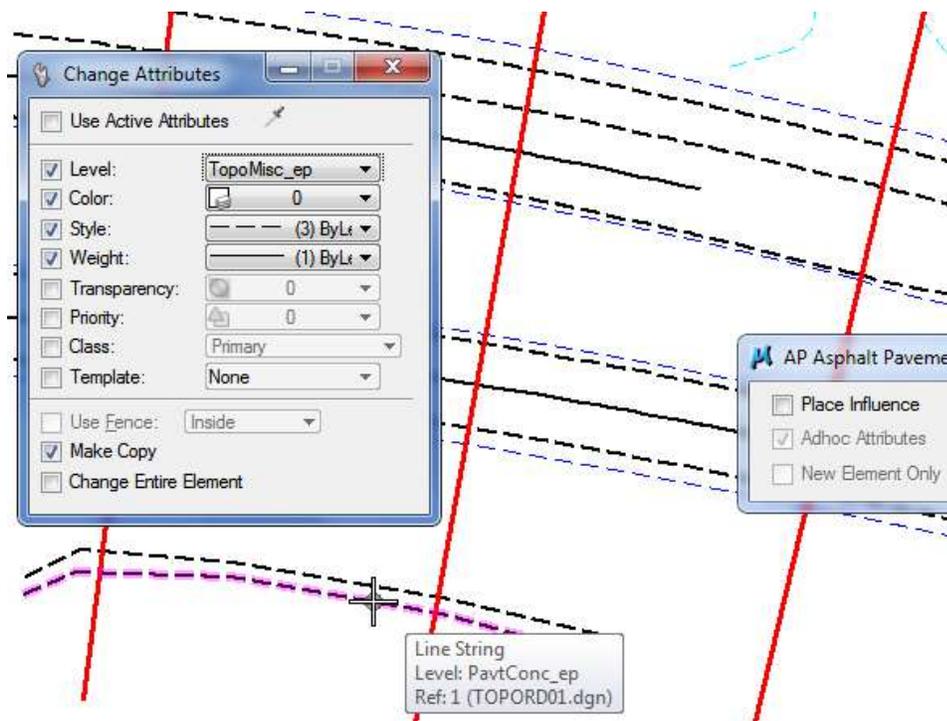
- Open the D&C Manager.
- Navigate to **Topography \ AP**.
- Zoom into the area of the cross over.
- With *Place Influence* turned **On**, place a short line segment crossing the pattern line on the inside edges of the roadway on top of the existing lane lines. (These are on the pattern lines just before and after the cross over as indicated in the picture below.)



8. In the D&C Manager, navigate to **Topography \ DWYE**. With *Place Influence* still turned **ON**, draw a line across the pattern line at the back of the driveways as shown below.



9. Uncheck **Place Influence**.
10. Zoom in to the **ditch area** on the right side of the roadway at the same station.
11. Using the *Change Attribute* tool, toggle **ON Make Copy** to copy the 2 concrete pavement elements into the current file changing the *level* to **TopoMisc_ep**.



12. **Close** the *GKLNRD01.dgn* file.

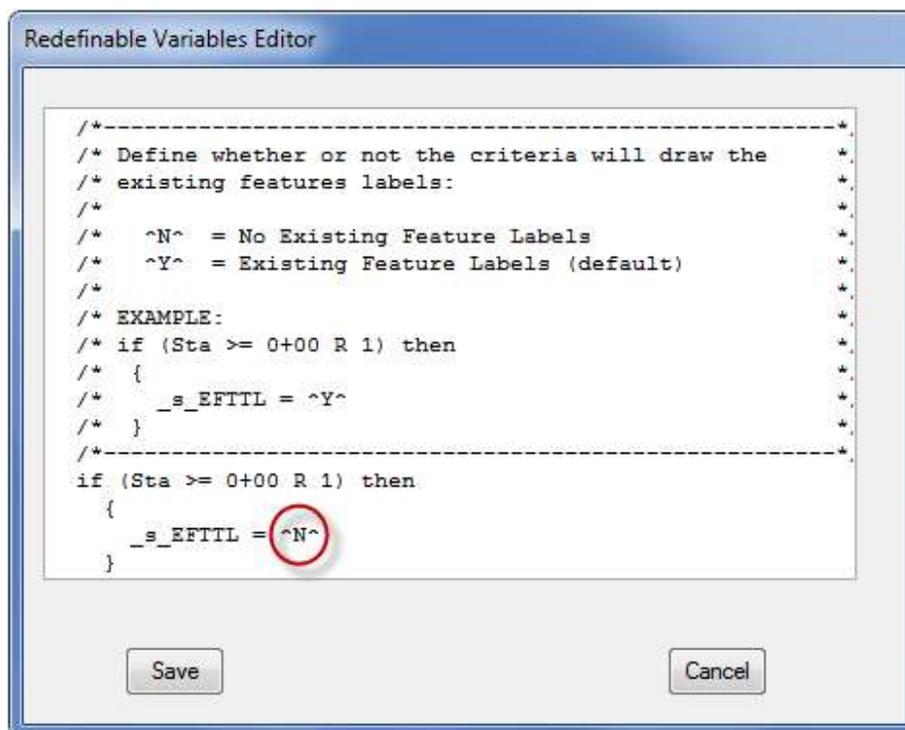
Exercise 2.3 Existing Features

In this exercise, the user will run the previous run of the cross sections, see Exercise 2.1, with the GKLNRD file and compare the results.

1. Open the file C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model Rdxsrd.
2. Open Road Project by going to **Applications > GEOPAK > ROAD > Project Manager**.

Note If the cross section run from Exercise 2.1 is still open, skip to step 6.

3. Select the project **74185215201** and click **OK**.
4. Select the user **Student** and click **OK**.
5. Open the previous *Run* from Exercise 2.1, **ExFeat**. Proposed Cross Sections - ExFeat opens.
6. On the *Redefinable Variables* section, double click on the variable **_s_EFTTL**. Modify the *value* to **^N^**. Click **Save**.



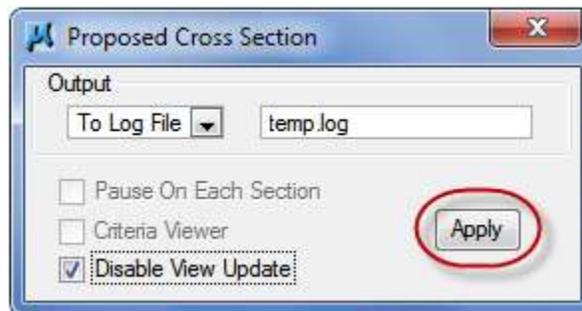
Note It is recommended to leave this variable set to Y (Yes) until the errors are corrected. The labels are useful in determining what features the Criteria is finding in the topo and GKLNRD files. Once the sections are running correctly, turn this feature off by modifying the variable to N (No).

7. Select all the elements and **Delete**.

Note The existing ground, elevation text, R/W labels, wetland limit labels and cross section cells are locked.

8. On the Proposed Cross Sections - ExFeat dialog, select **File > Save Settings**.
9. Select **File > Run**. Proposed Cross Section opens.

10. On the Proposed Cross Section dialog, select the *Output* option **To Log File**, check the option **Disable View Update** and click **Apply**.

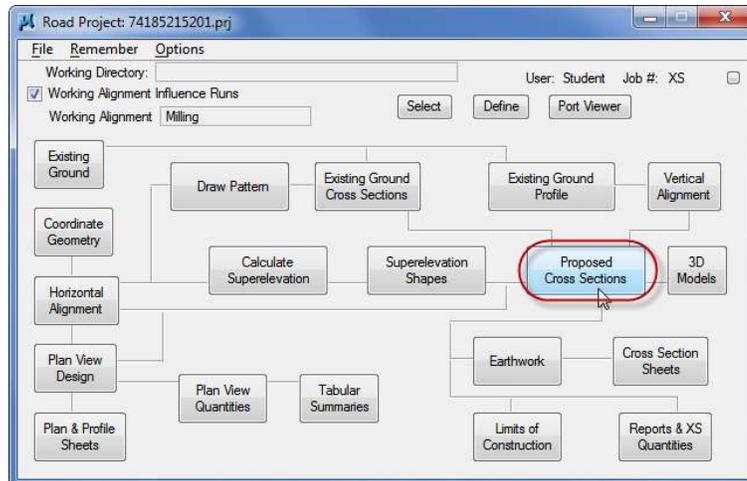


11. Once the cross sections complete, review the sections using the Cross Section Navigator.
12. **Close** Cross Section Navigator.
13. **Close** the Proposed Cross Sections – Exfeat dialog box. When prompted, click **Yes** to save settings to the cross section run.
14. Select all the elements and then select **Edit > Lock**.
15. **Exit** MicroStation.

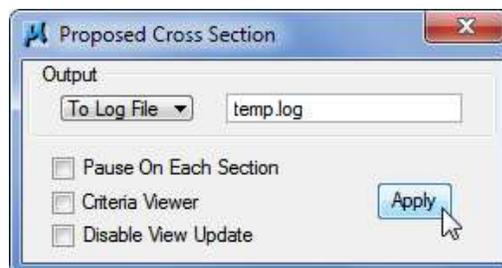
Exercise 3.2 *Proposed Cross Sections “Out of the Box”*

Students will run proposed cross sections without modifying any variables or making any changes to the graphic elements found in the DSGNRD file.

1. Open the file C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model Rdxsrd.
2. Open Road Project by selecting Applications > GEOPAK > ROAD > Project Manager.
3. Select the project **74185215201** and click **OK**.
4. Select the user **Student** and click **OK**.
5. On the Road Project dialog, select *Proposed Cross Sections*. The Run dialog will open.



6. Select the run **PrFeat**. Click **OK**.
7. Verify the *Tolerance* is set to **0.01** from the default setting of 0.1.
8. Select **File > Save Settings** and then **File > Run**.
9. On the Proposed Cross Section dialog, set the **Output** option **To Log File** and then click **Apply** as shown below.



10. The cross sections will run. When done, click **Exit**.
11. Using the Cross Section Navigator, review the sections.
12. Close Cross Section Navigator.

CONTROLLING PROPOSED CROSS SECTION FEATURES

The FDOT Criteria is designed with many variables set with default values that control what features are drawn into the cross section and how these features are drawn. These variables can be modified by the designer through multiple methods, *redefinable variables*, *plan graphic “trigger” elements*, and *ad hoc attributes* attached to the graphic elements. Using a combination of these options a user can control the output of the cross section run.

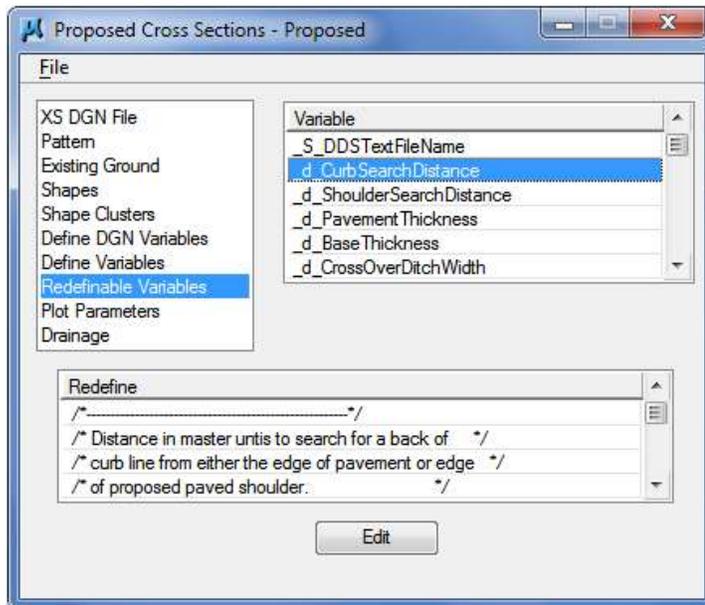
4 REDEFINABLE VARIABLES

OBJECTIVES

- Define Redefinable Variables and What They Control.

PROPOSE FEATURES REDEFINABLE VARIABLES

Redefinable variables are populated into the Proposed Cross Section run when a Typical is applied through the Typical Section Generator. These variables are designed to be used as typical settings over the length of the project. They may be modified for the entire run or with the use of additional “If/Then” statements to cover specific station ranges of sections. For more information on the Redefinable variables used in the Criteria, please see the Cross Section Criteria Help documentation.



Note It is important to note that a redefinable variable will be overwritten by any plan graphic elements and/or adhoc attributes found on plan graphic elements designed to control the same feature as the redefinable variable.

Proposed Features Redefinable Variables Summary

Variable Name	Default Setting	Description
<u>_s_DDSTextFileName</u>	SodSlope.csv	File name for the comma separated value (csv) file generated to report and calculate areas for slopes that are steeper than 1:3.
<u>_d_PavementThickness</u>	4.5/12	Thickness in feet for the proposed pavement layer.
<u>_d_BaseThickness</u>	0/12	Thickness in feet for the proposed base layer.

Variable Name	Default Setting	Description
_d_CrossOverDitchWidth	5	Width in feet of the pavement ditch in a cross over where the extended pavement forms a ditch.
_s_ExtendBaseUnderCurb	N	Set to Yes or No to have the Criteria draw the base extended under the proposed curb.
_d_Base_Ext_Width	0/12	Width in feet of how far to extend the base under the proposed curb.
_d_CurbSearchDistance	3	Distance in feet to search for the face of curb from the proposed edge of pavement or paved shoulder.
_d_CurbBufferDistance	1	Distance in feet to draw a slope behind the proposed curb before breaking to front slope 1. This buffer is ignored when there is sidewalk present behind the curb. The Criteria will use the utility slope instead.
_d_CurbBufferSlope	-6	The slope in percent format of the drawn curb buffer. Do NOT include the percent sign.
_d_UtilitySlope	2	The slope in percent format for the utility strip drawn between the back of curb and the front of sidewalk. Do NOT include the percent sign.
_d_SidewalkSlope	2	The slope in percent format for the proposed sidewalk. Do NOT include the percent sign.
_d_SidewalkThickness	4/12	Thickness in feet of the proposed sidewalk.
_d_SidewalkBufferDistance	2	Distance in feet to continue the sidewalk slope behind the sidewalk before breaking to front slope 1.
_d_OutsideShoulderSearchDistance	10	Distance in feet to search for a paved shoulder line from the edge of pavement.
_d_NormalOutsideShoulderSlope	-6	Normal shoulder slope in percent format when not in super elevation. Do NOT include the percent sign.
_d_OutsideShoulderWidth	8	Width in feet of the total outside shoulder. This includes the paved and unpaved shoulders.
_d_OutsideShoulderThickness	3/12	Thickness in feet of the paved shoulder pavement layer.
_d_ShoulderBaseThickness	4/12	Thickness in feet of the paved shoulder base layer.
_d_MaxRollOver	7	The maximum algebraic difference between the pavement slope and the shoulder slope.
_d_MedianShoulderSearchDistance	10	Distance in feet to search for a paved shoulder line from the edge of pavement in the median.
_d_NormalMedianShoulderSlope	-6	Normal median shoulder slope in percent format when not in super elevation. Do NOT include the percent sign.
_d_MedianShoulderWidth	4	Width in feet of the total median shoulder. This includes the paved and unpaved shoulders.
_d_MedianShoulderThickness	6/12	Thickness in feet of the median paved shoulder.

Variable Name	Default Setting	Description
<u>_d_FrontSlope_1_Slope_Left(Right)</u>	-1:6	Slope in rise:run format of Front Slope 1. This slope is NOT part of the ditch variables. It is intended for clear zone. Do NOT zero out this variable if this feature is not to be drawn. Turn this feature off by setting <u>_d_FrontSlope_1_WidthLeft(Right)</u> to 0.
<u>_d_FrontSlope_1_Width_Left(Right)</u>	10	Width in feet of Front Slope 1. This slope is NOT part of the ditch variables. It is intended for clear zone. Setting the value of this variable to 0 will turn this feature off.
* <u>_d_FrontSlope_2A_Slope_Left(Right)</u>	-1:4	Slope in rise:run format for Front Slope 2A. This is the front slope for the outside ditch. Do NOT zero out this variable if the feature is not to be drawn.
* <u>_d_FrontSlope_2A_Max_Ht_Left(Right)</u>	5	This is the maximum depth of the ditch in which the FrontSlope2A will be used.
* <u>_d_FrontSlope_2B_Slope_Left(Right)</u>	-1:3	Slope in rise:run format for Front Slope 2B. Do NOT zero out this variable if the feature is not to be drawn.
* <u>_d_FrontSlope_2B_Max_Ht_Left(Right)</u>	10	This is the maximum depth of the ditch in which the FrontSlope2B will be used. FrontSlope2B will start from the max depth of 2A.
* <u>_d_FrontSlope_2C_Slope_Left(Right)</u>	-1:2	Slope in rise:run format for Front Slope 2C. Do NOT zero out this variable if the feature is not to be drawn.
* <u>_d_FrontSlope_2C_Max_Ht_Left(Right)</u>	20	This is the maximum depth of the ditch in which the FrontSlope2C will be used. FrontSlope2C will start from the max depth of 2B.
* <u>_d_FrontSlope_2D_Slope_Left(Right)</u>	-1:1	Slope in rise:run format for Front Slope 2D. Do NOT zero out this variable if the feature is not to be drawn.
* <u>_d_FrontSlope_2D_Max_Ht_Left(Right)</u>	100	This is the maximum depth of the ditch in which the FrontSlope2D will be used. FrontSlope2D will start from the max depth of 2C.
<u>_d_DitchWidth_Left(Right)</u>	4	Width in feet of the outside ditch bottom.
<u>_d_DitchBackslope_Left(Right)</u>	1:3	Slope in rise:run format for the back slope of the ditch. Do NOT zero out this variable if this feature is not to be drawn.
<u>_d_StandardDitchDepth_Left(Right)</u>	4	Depth in feet of the outside ditch.
<u>_s_RightofWayConstrainedSlope_Left (Right)</u>	No	Tells the Criteria whether or not to consider the ROW when tying in the back slope of the ditch to existing ground. If set to Yes , the Criteria will analyze the tie point and adjust the slope of the back slope such that the ditch ties to existing ground before the ROW. If set to Adj , the Criteria will adjust the ditch bottom width to tie to existing ground before the ROW and then the back slope if adjusting the ditch bottom width does not work. The default of No will ignore the ROW location and tie to ground using the ditch variable settings.

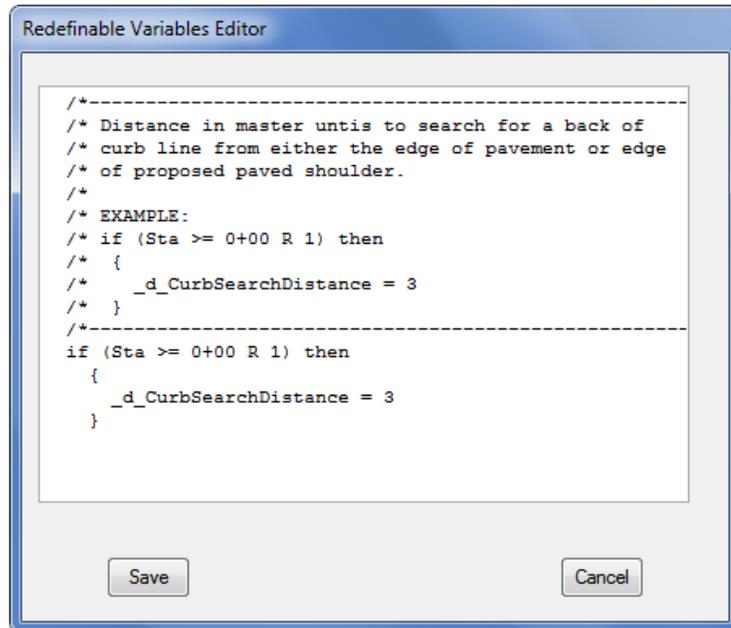
Variable Name	Default Setting	Description
<u>_d_ROW_Buffer_Width</u>	0	Distance in feet to tie inside of the ROW if the variable <u>_s_RightofWayConstrainedSlope_Left(Right)</u> has been set to Yes or Adj.
<u>_s_WetlandConstrainedSlope_Left(Right)</u>	No	Tells the Criteria whether or not to consider the Wetland Limits when tying in the back slope of the ditch to existing ground. If set to Yes , the Criteria will analyze the tie point and adjust the slope of the back slope such that the ditch ties to existing ground before the Wetland Limit. If set to Adj , the Criteria will adjust the ditch bottom width to tie to existing ground before the Wetland Limit and then the back slope if adjusting the ditch bottom width does not work. The default of No will ignore the Wetland Limit location and tie to ground using the ditch variable settings.
<u>_d_Wetland_Buffer_Width</u>	0	Distance in feet to tie inside of the Wetland Limits if the variable <u>_s_WetlandConstrainedSlope_Left(Right)</u> has been set to Yes or Adj .
<u>_s_ForcedSlopeLeft(Right)</u>	No	Tells the Criteria whether or not to force the slope to existing ground ignoring the ditch variables. The forced slope begins at the bottom of Front Slope 1.
<u>_s_ForcedSlopeLeft(Right)Value</u>	1:2	Slope value in rise:run format to use to force the slope to tie to existing ground. Will only be used if the corresponding variable <u>_s_ForcedSlopeLeft(Right)</u> is set to Yes. Do NOT zero out this variable if this feature is not to be drawn.
<u>_d_FeatherDistance_Outside_Left(Right)</u>	0	Distance in feet for the Criteria to tie to existing ground beyond the outside shoulder of the roadway. Setting this value to any positive number will turn this feature on. The slope will vary.
<u>_d_MatchLineChainSearchDistance</u>	50	Distance in feet from the outside edge of pavement to search for a match line. This feature will draw the sections at normal slopes until it encounters the match line in plan view. At the match line offset, the Criteria will draw straight up or down to tie to existing ground.

* The Front Slope 2 variables work together to provide “stair stepping” of the ditch front slopes. They work in conjunction with the Standard Ditch Depth variables. The Max Height variables run consecutive from the previous Max Height variable. I.e. For a ditch depth value of 30 feet, Front Slope 2A continues from 0 to 5 feet, Front Slope 2B continues from 5 to 10 feet, Front Slope 2C continues from 10 to 20 feet, and Front Slope 2D continues from 20 to 30 feet. If the ditch depth is set to less than the Max Height of Front Slope 2A, then only the slope value from Front Slope 2A will be used. The other variables do NOT need to be set to 0 so that they will not be used. They can be left at the default values.

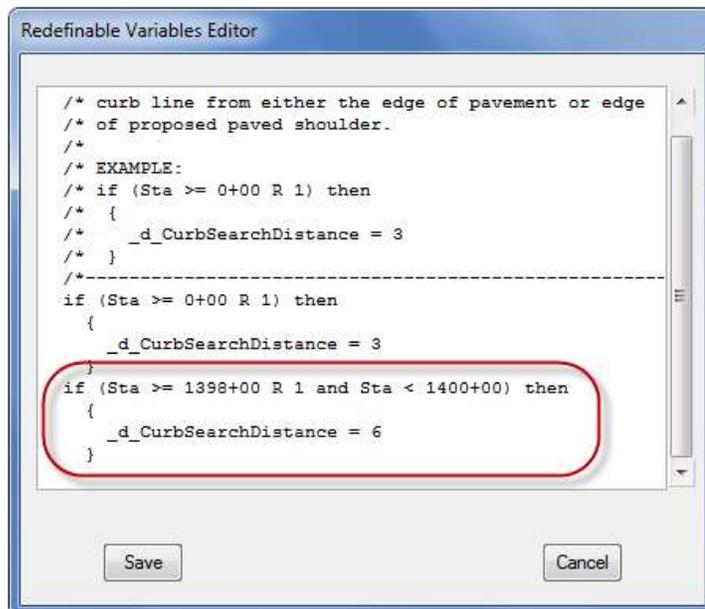
Note Do NOT eliminate slope features by setting the slope variable values to 0. This will result in errors within the Criteria. Set the corresponding depth, width, or height variable to 0.

MODIFYING REDEFINABLE VARIABLES

Double clicking on one of the variables in the proposed cross section run dialog, or selecting the variable in the list and clicking Edit will open the Redefinable Variables Editor dialog.



From this editor, the value may be modified for the entire run by typing in the new value and clicking Save. To maintain the value of the variable, but modify over a station range, the If/Then statement may be copied and pasted creating a new defining If/Then statement. See below for an example.



Note Care should be taken in the order in which the station ranges are defined in the list of If/Then statements. The Criteria will read all of the statements and reset the value of the variable if the If/Then statement is true. In some cases, this may set the value incorrectly when encountering overlapping station ranges.

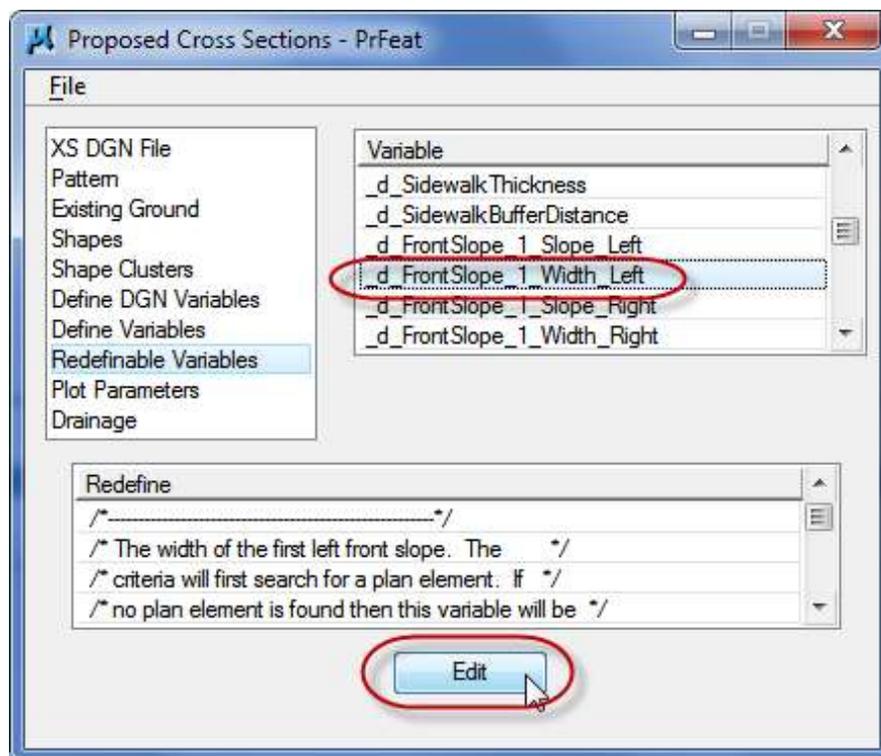
Exercise 4.1 *Modifying Redefinable Variables*

In this exercise, students will modify the redefinable variables for the cross section run.

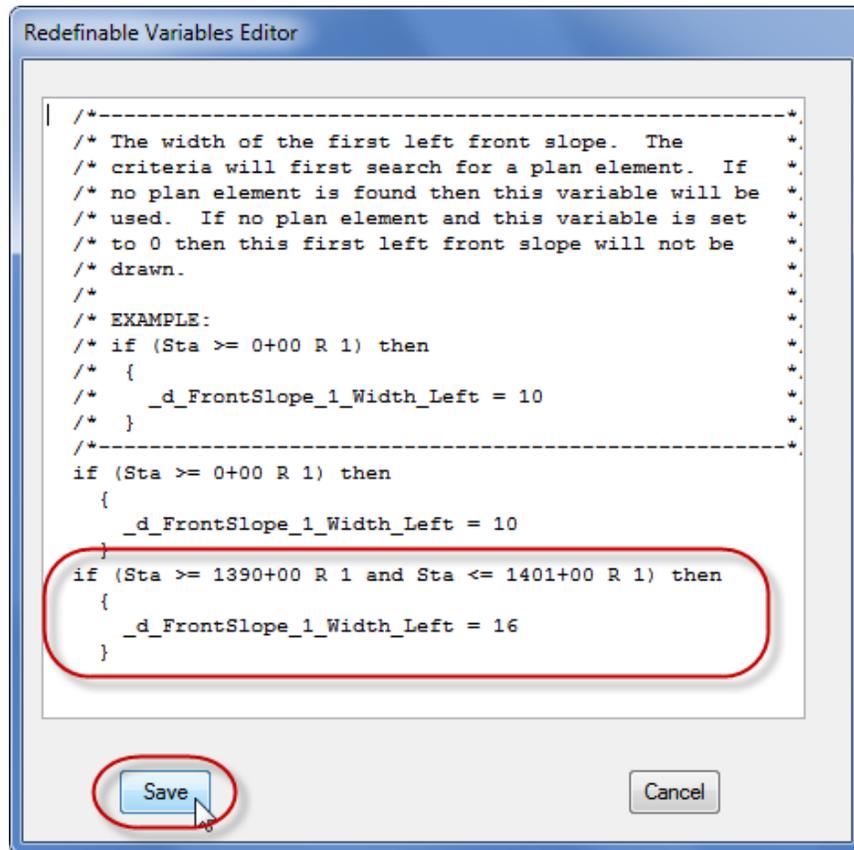
1. Open the file C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model Rdxsrd.

Note If the cross section run from Exercise 3.2 is still open, skip to step 7.

2. Open Road Project by going to **Applications > GEOPAK > ROAD > Project Manager**.
3. Select the *Project 74185215201* and click **OK**.
4. Select the *User Student* and click **OK**.
5. Click on the **Proposed Cross Sections** button.
6. Select the **PrFeat Run** on the Select Run dialog and click **OK**. (This is the same run used in Exercise 3.2.) Proposed Cross Sections – PrFeat opens.
7. Select the **Redefinable Variables** category.
8. Scroll down the list of *variables* and select **_d_FrontSlope_1_Width_Left**. Click on the **Edit** button.



- On the Redefinable Variables Editor, modify the entry as shown below.



- Click **Save**.
- Select the variable **_s_ForcedSlopeLeft**. Edit the variable value to **Yes** and then click **Save**.
- Select all the elements and **Delete**.

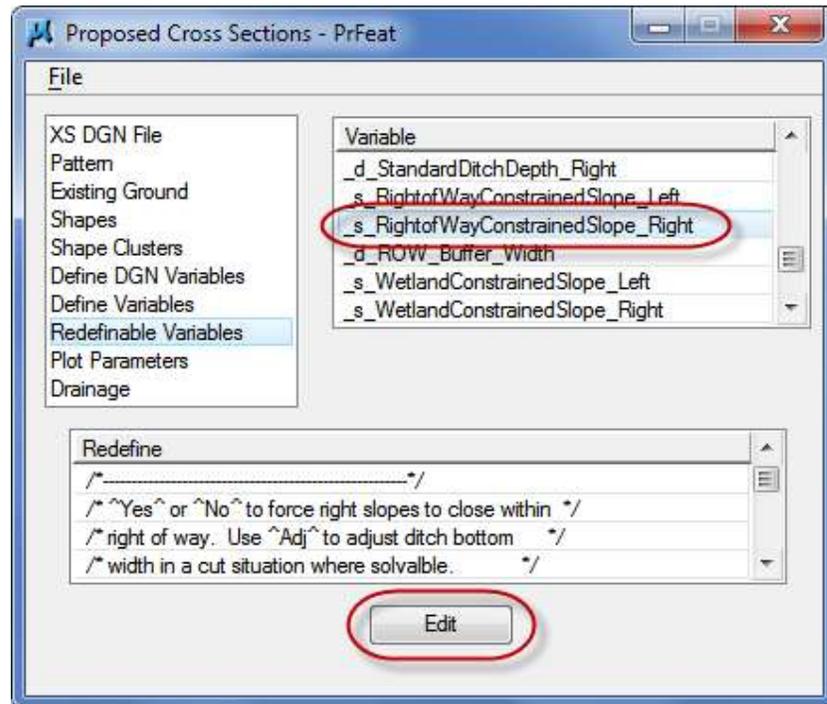
Note The existing ground, elevation text, R/W labels, wetland limit labels and cross section cells are locked.

- From the File Menu, select **File > Save Settings**.
- From the File Menu, select **File > Run**. Proposed Cross Section opens.
- On the Proposed Cross Section dialog, select the *Output* option **To Log File**, check the option **Disable View Update** and click **Apply**.
- The cross sections will run. When done, click **Exit**.
- Using the Cross Section Navigator, review the sections.

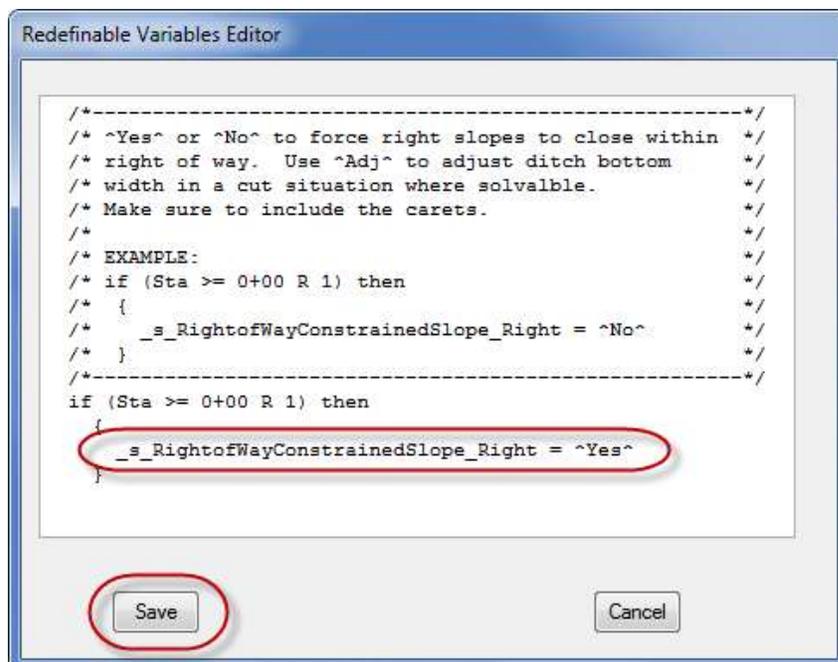
Exercise 4.2 *Right of Way Applications*

In this exercise, students will modify the Right of Way and Wetland Limit redefinable variables to have the Criteria consider the location of these features when tying the back slope of the ditch to existing ground.

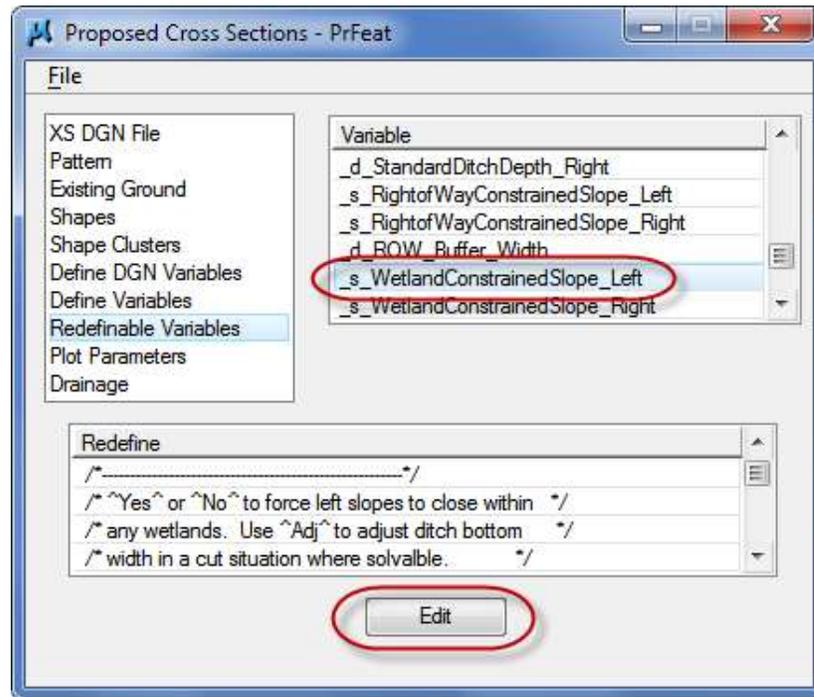
1. On the Proposed Cross Sections – PrFeat dialog, select the *Redefinable Variables* category.
2. Scroll down the list of variables and select **_s_RightofWayConstrainedSlope_Right**. Double click on the variable or click on the **Edit** button.



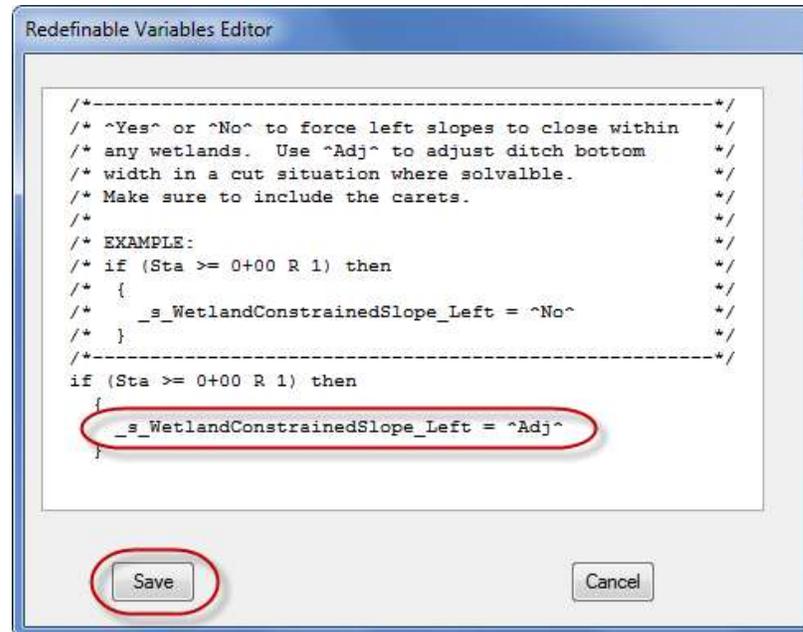
3. Modify the *variable value* to **Yes**. Click **Save**.



4. Select the variable ***_s_WetlandsConstrainedSlope_Left***. Double click on the variable or click on the **Edit** button.

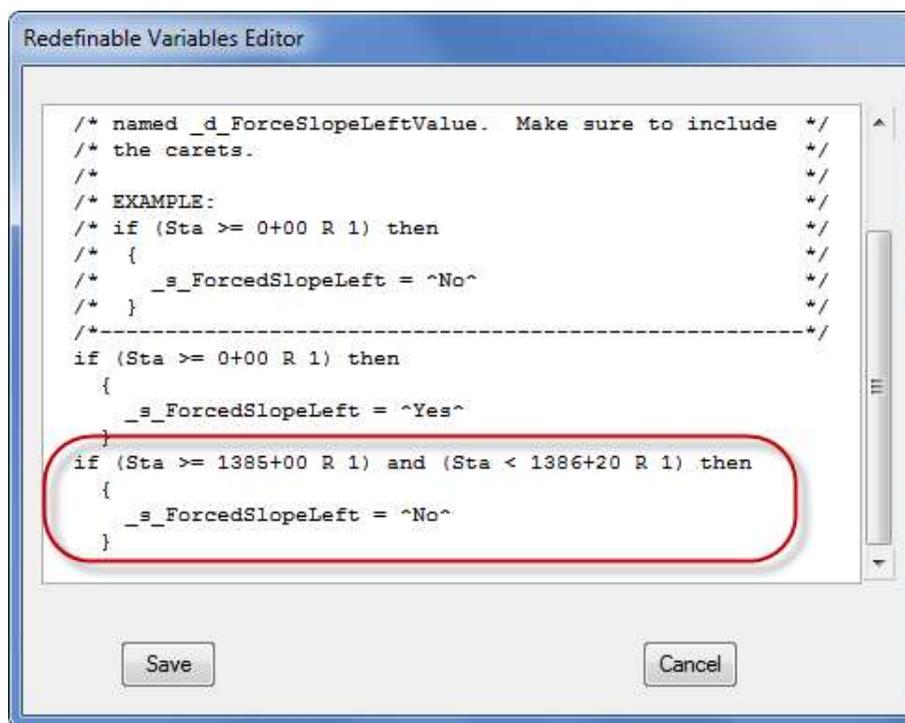


5. Modify the variable value to **Adj**. Click **Save**.



6. Select the variable ***_s_ForcedSlopeLeft***. Double click on the variable or click on the **Edit** button.

7. Modify the *variable values* as shown below. Click **Save**.



8. Repeat steps 6 – 7 for the *variable* **_s_ForcedSlopeRight**.

9. Select all the elements and **Delete**.

Note The existing ground, elevation text, R/W labels, wetland limit labels and cross section cells are locked.

10. From the File Menu, select **File > Save Settings**.

11. From the File Menu, select **File > Run**.

12. On the Proposed Cross Section dialog, select the *Output* option **To Log File**, check the option **Disable View Update** and click **Apply**.

13. When sections are done running, click **Exit**.

14. Using the Cross Section Navigator, review the cross sections.

5 PLAN GRAPHICS

OBJECTIVES

- Define Plan Graphic elements and What They Control.
- Define Adhoc Attributes and What They Control.

PLAN GRAPHIC ELEMENTS OVERVIEW

Plan graphics are elements drawn into the design file that, when found by the Criteria, tell the Criteria what to draw on cross sections. Some of these elements are required for design such as the proposed edge of pavement, curb and gutter, sidewalk, etc. Other elements are added to the design file strictly for the Criteria in order to control the cross section features. These elements are set up to be non-plottable. These elements include special ditch lines, median lines, berm lines, and graphic override lines.

Plan graphic elements are searched for using Define_DGN variables. The D&C Manager is used by the Criteria to define these variables. It is important to use the D&C Manager to draw the elements into the design. When searching for plan graphic elements, the Criteria is looking for elements that cross the pattern lines. They also must be placed in the area of the design file that the Criteria will be able to locate them. Simply placing a line into the file does not guarantee that it will be found by the Criteria. For example, a special ditch line needs to be placed outside the limits of the shoulder of the roadway where the ditch would be constructed. (This includes paved and unpaved shoulder.)

Finding the plan graphic elements in plan view will tell the Criteria which cross section features to draw. Additionally, some elements also have adhoc attributes which will tell the Criteria how to draw the features. Adhoc attributes used by the Criteria to define the necessary variables are set up in the D&C Manager. It is important to understand that only the adhoc defined by the delivered *FDOT2010.ddb* file will be recognized by the FDOT Criteria. New adhoc may not be introduced onto an element and then be expected to be read by the Criteria.

Some adhoc attributes have default values of none or 999. The Criteria considers these values to be undefined. If these values are changed so that they are recognized by the Criteria, then change them. However, if the feature is removed from the project or the value needs to be reset so that it does not draw in the cross sections any longer, change these values back to none or 999. Setting the values to 0 will result in errors.

Note The values shown in the adhoc box within D&C Manager do **NOT** represent the adhoc attached to an existing element. They may be modified to add to new elements drawn or set onto existing elements. To view the adhoc attributes on the elements, use GEOPAK or FDOT's Adhoc Attribute Manager.

Plan Graphic Elements Summary

Feature	Associated Adhocs?	Plan/Trigger?	Design File
Back of Sidewalk	Yes	Plan/Trigger	DSGNRD
Front of Sidewalk	No	Plan	DSGNRD
Driveway	Yes	Plan/Trigger	DSGNRD
Edge of Pavement	Yes	Plan	DSGNRD
Existing Ground	No	Plan	RDXSRD

Feature	Associated Adhocs?	Plan/Trigger?	Design File
Existing R/W	No	Plan	RWDTRD
Proposed R/W	No	Plan	RWDTRD
Wetland Limits	No	Plan	TOPORD
Milling Limits	Yes	Plan	DSGNRD
Median Line	Yes	Trigger	DSGNRD
Miscellaneous Asphalt	Yes	Plan	DSGNRD
Guardrail	No	Plan	DSGNRD
Proposed Traffic Separators	Yes	Plan	DSGNRD
Curb and/or Gutter (All types)	No	Trigger	DSGNRD
Paved Shoulder	Yes	Plan	DSGNRD
Side Road Tie Down Lines	Yes	Plan	DSGNRD
Match lines	No	Plan	DSGNRD
Curb and Gutter Wall	No	Plan	DSGNRD
Shoulder Barrier Wall (Cant. or L)	Yes	Plan	DSGNRD
Shoulder Barrier Wall (Retaining)	No	Plan	DSGNRD
Gravity Wall	No	Plan	DSGNRD
Median Barrier Walls	Yes	Plan	DSGNRD
Edge of Front Slope 1	No	Trigger	DSGNRD
Special Ditch Lines	Yes	Trigger	DSGNRD
Berm Lines	Yes	Trigger	DSGNRD
Front Slope 1 Slope Override	Yes	Trigger	DSGNRD
Front Slope 1 Width Override	Yes	Trigger	DSGNRD
Front Slope 2 Slope Override	Yes	Trigger	DSGNRD
Ditch Width Override	Yes	Trigger	DSGNRD
Back Slope Override	Yes	Trigger	DSGNRD
Ditch Depth Override	Yes	Trigger	DSGNRD
Force Slope Override	Yes	Trigger	DSGNRD
Feather Distance Override	Yes	Trigger	DSGNRD

For a detailed list of the graphic elements the Criteria searches for, consult the FDOT Criteria Help files. They may be accessed through the FDOT Menu under **Roadway > FDOT2010 Criteria Help Files**, in the D&C Manager on the Adhoc Attributes dialog by clicking on the “?” icon, or by clicking on the **Description** button on the Typical Sections dialog.

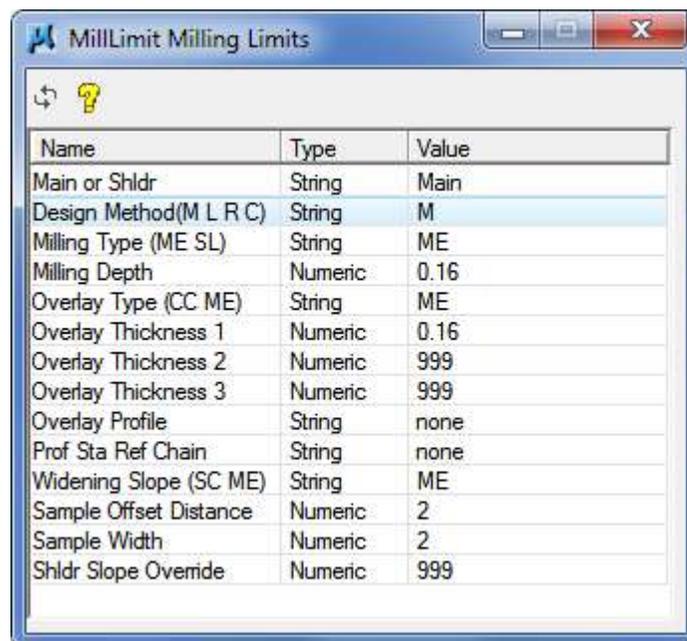
HINT It is recommended to extend elements beyond the limits of the pattern lines, at least 2 times tolerance, when they are to be used by the cross section Criteria. This also applies to superelevation shape and pattern line creation. There are issues with GEOPAK processing elements that intersect with one another exactly. Undesirable results can occur.

PAVEMENT GRAPHICS (TRAVEL LANES)

The intent of the work to be done on the project is communicated to the Criteria through the milling limit lines and proposed edges of pavement. Milling and overlay will only be drawn on the cross sections when the Criteria finds the milling limit lines in the design file. Likewise, the proposed edges of pavement represent the full depth pavement construction on the project. Full depth pavement can be found as widening, new construction, or reconstruction.

MILLING AND RESURFACING

Milling and Resurfacing is one of the more complex features of the Criteria. Milling Limit lines are required to be drawn into the design file for this operation to be reflected on the cross sections. The D&C Manager item location is **Roadway Design > Plan Features > MillLimit**. This item has been set up with several adhoc that will tell the Criteria how to process the milling and overlay layers of the cross sections.



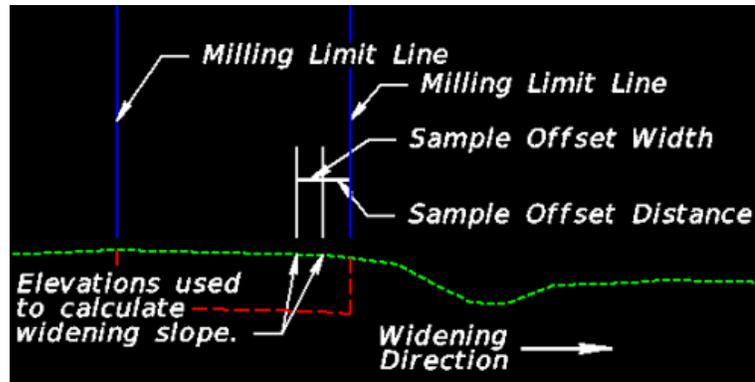
Name	Type	Value
Main or Shldr	String	Main
Design Method(M L R C)	String	M
Milling Type (ME SL)	String	ME
Milling Depth	Numeric	0.16
Overlay Type (CC ME)	String	ME
Overlay Thickness 1	Numeric	0.16
Overlay Thickness 2	Numeric	999
Overlay Thickness 3	Numeric	999
Overlay Profile	String	none
Prof Sta Ref Chain	String	none
Widening Slope (SC ME)	String	ME
Sample Offset Distance	Numeric	2
Sample Width	Numeric	2
Shldr Slope Override	Numeric	999

The first consideration is the *Design Method*. Simply put, this adhoc defines the milling control point for the cross sections. Four options are available, M, L, R, and C.

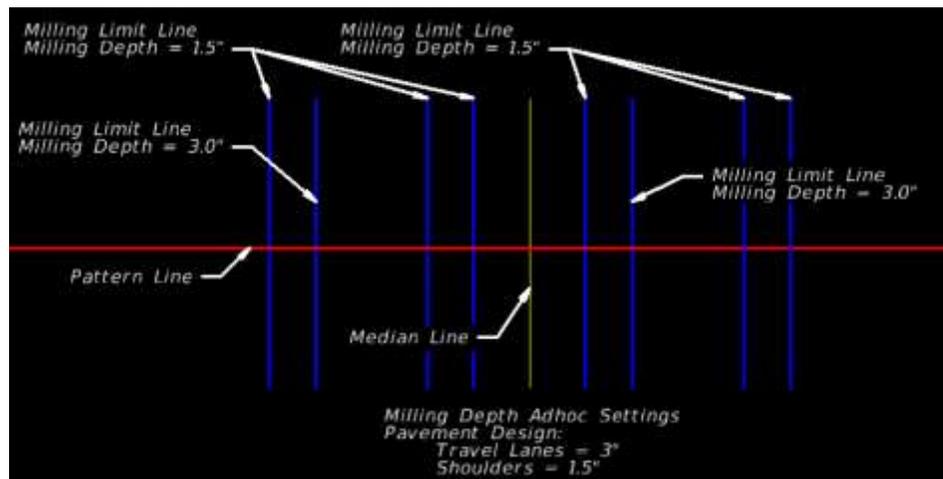
If the *Design Method* is set to M (minimum overlay), the Criteria will analyze the existing pavement area and the cross slope of the roadway to determine the point on the section where the minimum amount of overlay will be required for construction. By default, it will project the cross slope back to the pgl location and write the elevation out to an input file which can then be used to store a profile into COGO. The minimum overlay profile can then be used to develop a proposed profile for the roadway. The new proposed profile can then be used to control the cross sections by setting the profile name to the Overlay Profile adhoc. This process is optional and provided in the Criteria as an aid for designers. Using the option M will also trigger the Criteria to draw the milling as Match Existing, which will trace the existing ground. This results in a constant depth of milling.

Setting the *Design Method* to L (left), R (right), or C (chain) tells the Criteria that the milling control point needs to be fixed to the location indicated. The Criteria will hold the proposed top of pavement to the existing ground elevation. Using one of these options will trigger the Criteria to use the cross slope of the shapes to draw the milling, resulting in variable depth milling. The top of the proposed pavement can be raised or lowered from the existing ground elevation using the adhoc *Overlay Profile*. If the stationing of the profile defined on the *Overlay Profile* adhoc does NOT match the baseline stationing of the cross section, the adhoc *Prof Sta Ref Chain* must also be defined.

There are two methods used to draw the Overlay and Widening, ME (match existing) and CC or SC (crown or slope correction). The ME method traces the existing ground line while the CC or SC methods will use the slopes on the shapes. These methods can be set for the overlay using the adhoc *Overlay Type (CC ME)*. The method used for widening is set using the adhoc *Widening Slope (SC ME)*. When the option for the widening is set to ME, the adhocs, *Sample Offset Distance* and *Sample Width*, are used to calculate the existing cross slope of the roadway. From the edge of the existing pavement, the Criteria will move over the *Sample Offset Distance* toward the pavement and then locate the existing ground. Then it will move again, in the same direction toward the pavement, the distance defined by *Sample Width* and locate the existing ground. The elevations at these 2 locations are used to calculate a cross slope. This cross slope is used to draw any widening encountered on that side of the cross section.

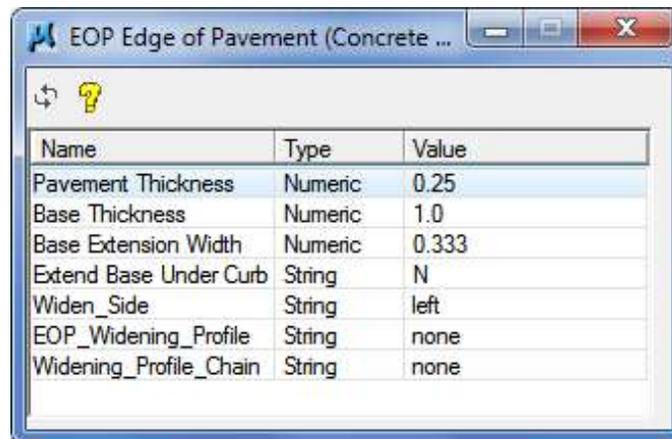


The Criteria reads the adhocs from the milling limit lines from left to right as it processes the elements that cross the pattern line. The adhocs found on the first milling limit line that it encounters will set the values for the milling variables to be used for that cross section or until the Criteria encounters a median line. Once a median line is found, the Criteria will search for the next milling limit line to reset the milling adhoc values. The only exception to this is the *Milling Depth*. The milling depth is reset each time a milling limit line is found. The value defined will be applied to the pavement to the right of the milling limit line. The value defined on the last milling limit line is not used since that element designates the end of the milling area.



PROPOSED EDGE OF PAVEMENT (NEW CONSTRUCTION & WIDENING)

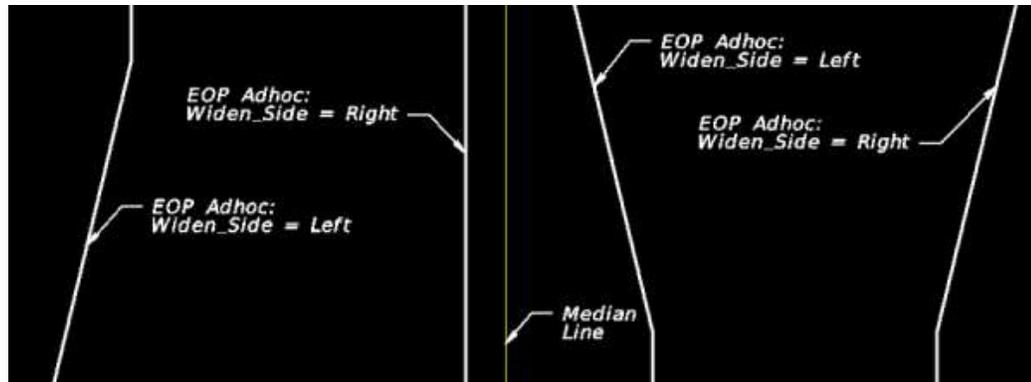
Use of the proposed of edge of pavement lines triggers the Criteria to draw full depth pavement. The D&C Manager item location is **Roadway Design > Plan Features > EOP**.



Name	Type	Value
Pavement Thickness	Numeric	0.25
Base Thickness	Numeric	1.0
Base Extension Width	Numeric	0.333
Extend Base Under Curb	String	N
Widen_Side	String	left
EOP_Widening_Profile	String	none
Widening_Profile_Chain	String	none

The adhoc have been set to give the Criteria the pavement design for the proposed pavement utilizing the adhoc *Pavement Thickness* and *Base Thickness*. If the base is to be shown constructed under the curb, the adhoc *Extend Base Under Curb* can be set to 'Y' and the *Base Extension Width* for the distance the base extends beyond the back of curb set. These values are measured in feet.

The adhoc *Widen_Side* is used to tell the Criteria which side of the pavement that the widening is extending from. This prevents the Criteria from drawing the pavement in the wrong location. See the example shown below.



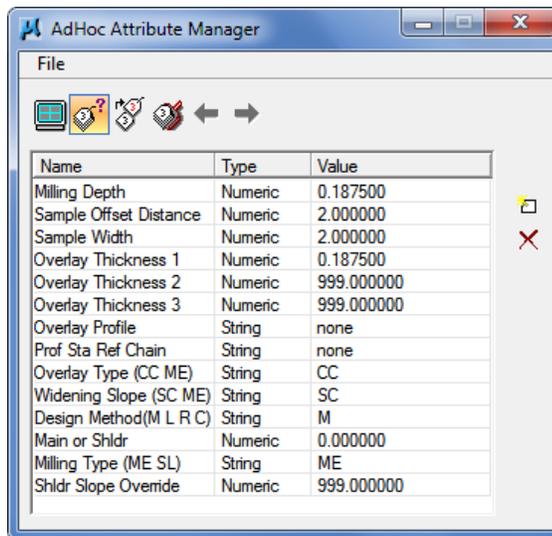
There may be situations on a project where the edge of pavement needs to be controlled by a profile. In these cases, the profile can be set using the *EOP_Widening_Profile* adhoc. The Criteria will use the cross slope defined by the shapes to the limits of shape and then vary the slope from the shape to the profile elevation at the horizontal location of the edge of pavement line drawn in the design file. The *Widening_Profile_Chain* should only be set when the profile stationing does NOT match the baseline stationing of the cross sections.

- Click the **Identify Element** icon and then click on one of the **Milling Limit** lines.

HINT Turn off the display for the TOPORD reference along with all the levels, except: **ShldrPaved**, **EOP**, and **MillingLimits**. This will make selecting the desired elements easier.

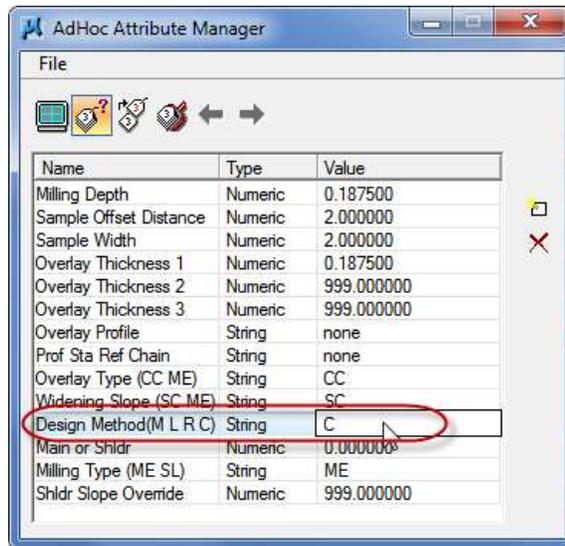


- Review the list of adhocs on the Milling Limit line.

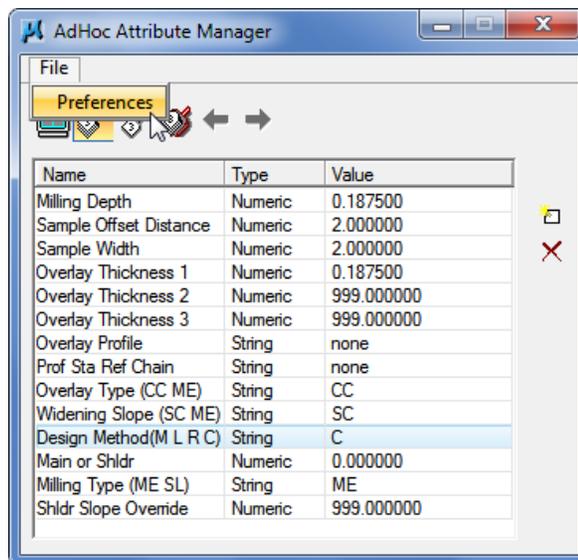


- Create a MicroStation **Selection Set** of the all the *Milling Limit* lines on the **left** roadway.

6. In the Adhoc Attribute Manager, click within the *Design Method adhoc Value* field and modify to C.



7. Click on **File > Preferences**. Preferences dialog opens.

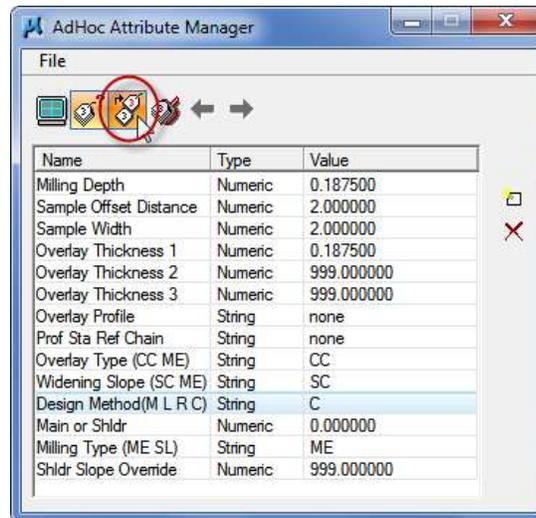


8. Set the *Set Mode* to **Replace**.

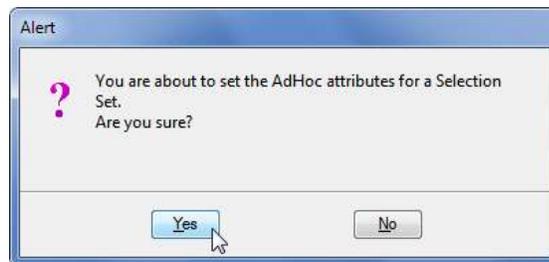


9. Close the Preferences dialog.

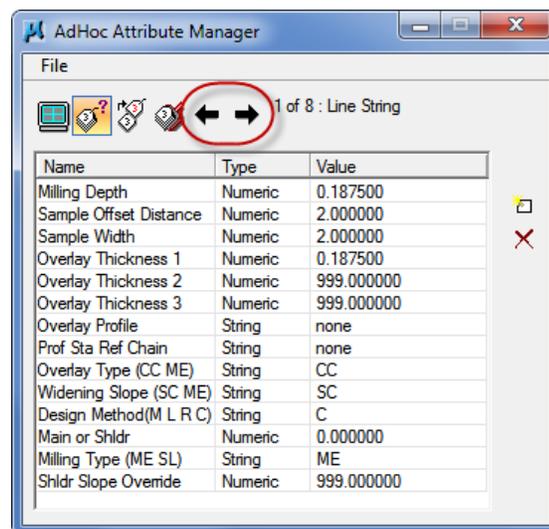
10. In the Adhoc Attribute Manager, click on the **Set Attributes** icon.



11. An Alert box will appear asking “Are you sure?” to set the attributes for a Selection Set. Click **Yes**.

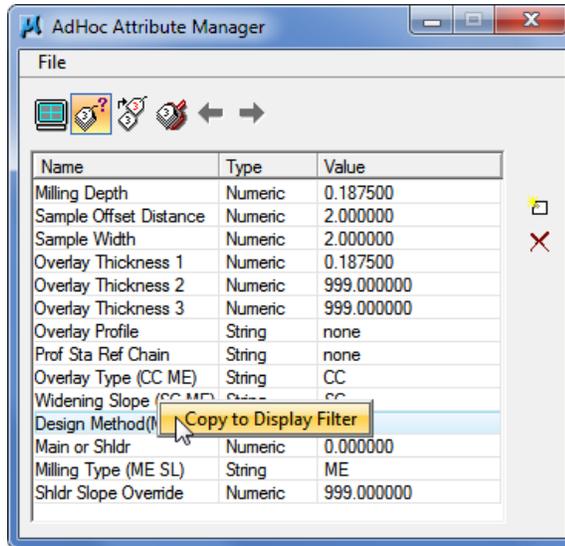


12. Click on the **Identify Element** icon. The elements from the selection set are dropped from the selection set and appear in the Adhoc Attribute Manager list box. Use the *Previous Element* and *Next Element* icons to toggle through the elements to verify that the adhoc were modified.

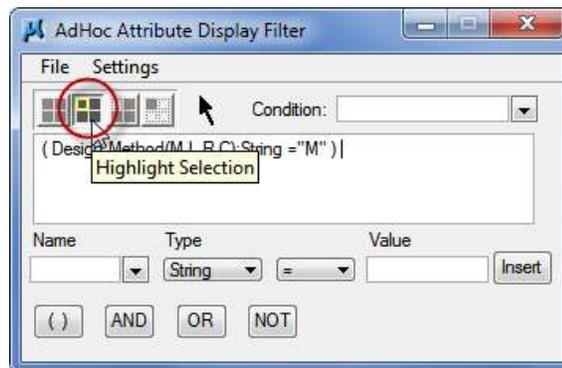


Note When there is a selection set brought into the dialog box, the tool is in a “review” mode. Using the **Set Attributes** button will not have any affect.

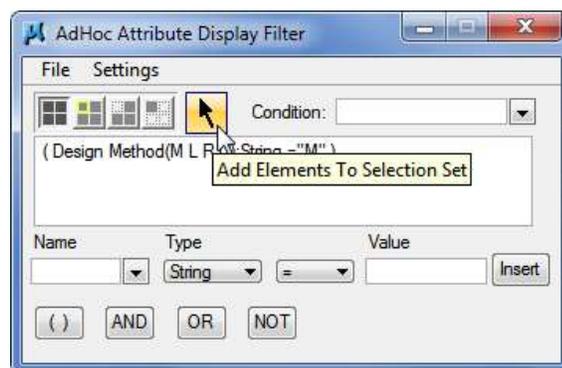
13. Click on the **Identify Element** icon. (This will clear the adhoc list box.) Select a *Milling Limit line* from the **right** roadway.
14. In the Adhoc Attribute Manager, highlight **Design Method** in the list box. Right click over the line and select **Copy to Display Filter**.



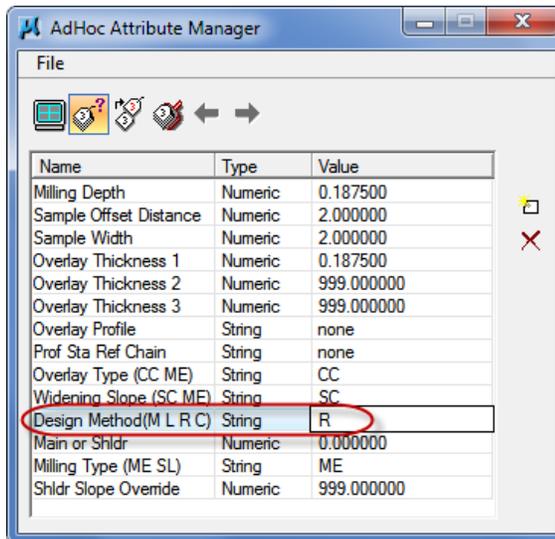
15. Click on the **Highlight Selection** button to see the highlighted elements that match the query. Switch back to **Normal Display**.



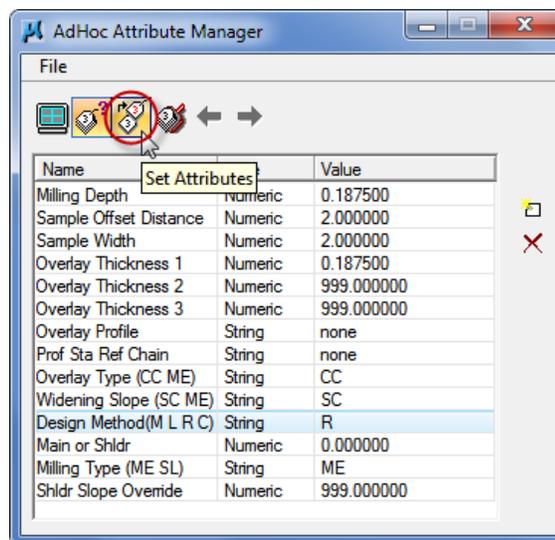
16. Click on the **Add Elements to Selection Set** button to place the highlighted elements in a MicroStation selection set.



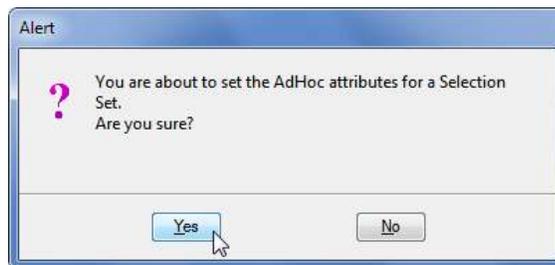
17. In the Adhoc Attribute Manager, click within the *Design Method adhoc Value* field and modify to **R**.



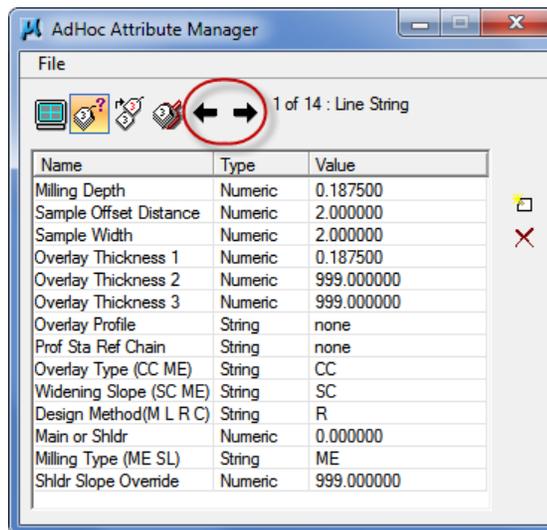
18. In the Adhoc Attribute Manager, click on the **Set Attributes** icon.



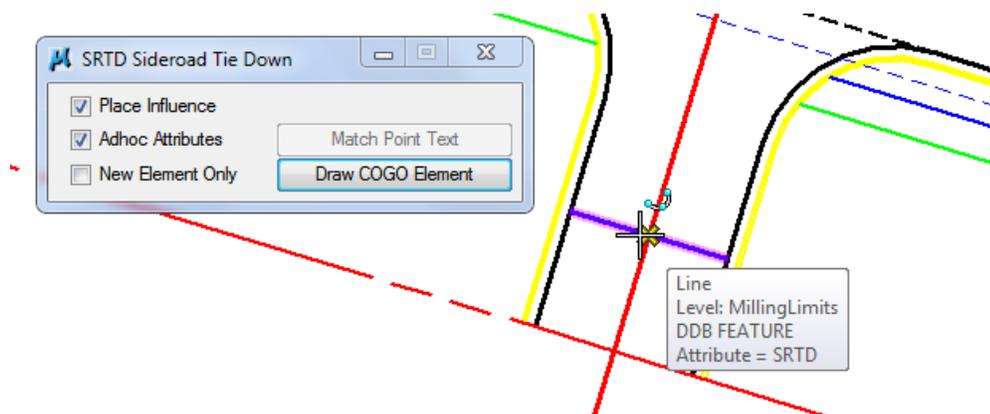
19. An Alert box will appear asking “*Are you sure?*” to setting the attributes for a Selection Set. Click **Yes**.



20. Click on the **Identify Element** icon. The elements from the selection set are dropped from the selection set and appear in the *Adhoc Attribute Manager* list box. Use the *Previous Element* and *Next Element* icons to toggle through the elements to verify that the adhoc were modified.

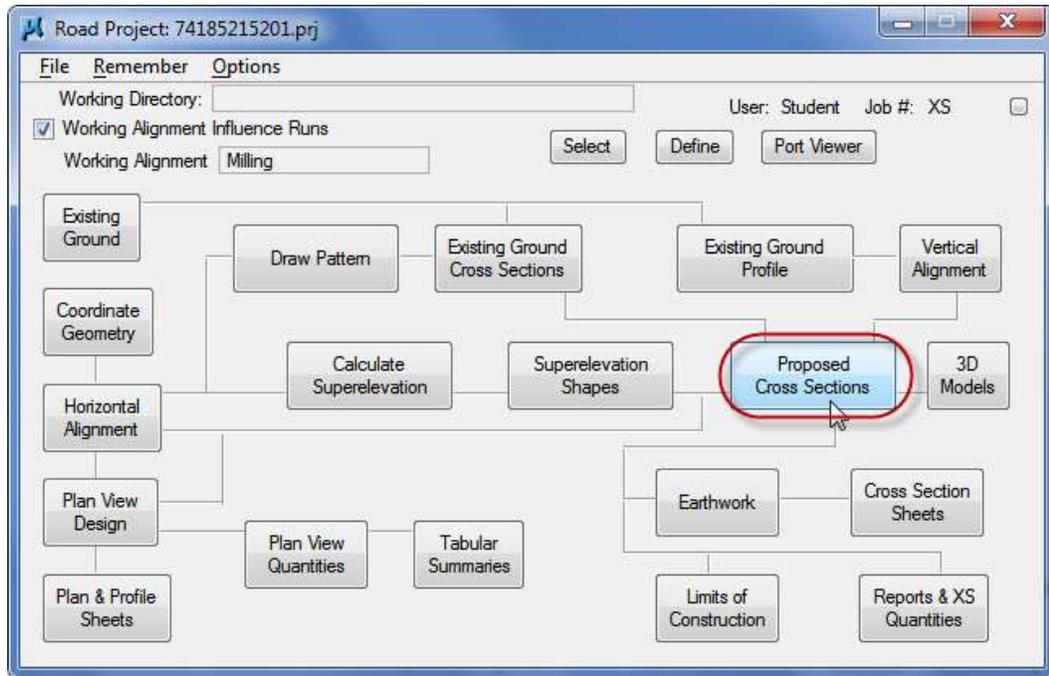


21. Close the AdHoc Attribute Manager.
22. Open the D&C Manager and navigate to the *side road tie down* item, **Roadway Design > Plan Features > SRTD**.
23. Turn on **Place Influence**.
24. Zoom into the area of the side road And place a line crossing the side road to indicate a location to tie into the existing pavement.

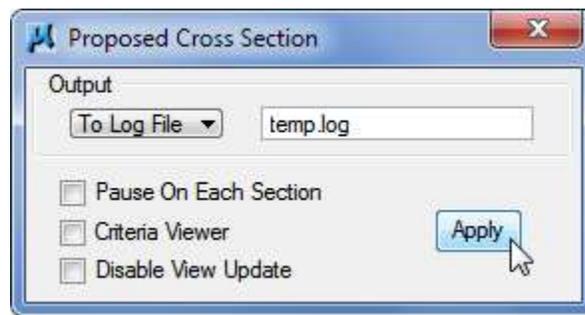


25. Turn off **Place Influence**.
26. Open the cross section file, C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model RDXS RD.
- Note** If the cross section run from Exercise 4.1 is still open, skip to step 31.
27. Open Road Project by selecting **Applications > GEOPAK > ROAD > Project Manager**.
28. Select the *project 74185215201* and click **OK**.
29. Select the *user Student* and click **OK**.

30. On the Road Project dialog, select **Proposed Cross Sections**. The Run dialog will open.



31. Select the *run* **PrFeat**. Click **OK**.
32. Select all the elements in the file and **delete**.
33. Select **File > Save Settings** and then select **File > Run**.
34. On the Proposed Cross Section dialog, set the *Output* option **To Log File** and then click **Apply** as shown below.



35. The cross sections will run. When done, click **Exit**.
36. Using the Cross Section Navigator, review the sections.
37. Close Cross Section Navigator.

SHOULDERS

Shoulders, in this context, consist of the area from the edge of pavement to the top of Front Slope 1. Shoulder treatments can consist of paved shoulders, curb & gutter, utility strips, sidewalks, urban ditches, driveways, and may include miscellaneous asphalt, guardrail and/or walls. Through various plan graphics and adhoc attributes, the shoulder features are defined for the Criteria.

PAVED SHOULDERS

Paved shoulder lines drawn into the design file triggers the Criteria to include paved shoulders on the cross sections. The D&C Manager item location is **Roadway Design > Plan Features > PSHLDR**. The exact location of the elements in the design file is used by the Criteria. If a paved shoulder line is not drawn and curb and gutter is not found, the Criteria will draw unpaved shoulder on the cross sections using the settings from the redefinable variables.



Name	Type	Value
Shoulder Thickness	Numeric	0.5
Paved Shld Begin Slope	String	999
Paved Shld End Slope	String	999
Unpaved Shoulder Width	Numeric	3.0
Unpaved Shoulder Slope	Numeric	999
Shoulder Base Thick	Numeric	0.5
Shoulder Base Ext	Numeric	0

The *Shoulder Thickness* and *Shoulder Base Thick* adhocs are used to provide the pavement design information to the Criteria. If the shoulder base needs to extend beyond the asphalt layer, the *Shoulder Base Ext* adhoc can be set to any positive number representing the distance, in feet, that the Criteria should extend the base layer.

Adhocs are also provided to help control the unpaved shoulder. The unpaved shoulder width and slope may be controlled through the adhocs *Unpaved Shoulder Width* and *Unpaved Shoulder Slope*. Typically, the slope would follow the paved shoulder slope. If the design requires this to be a different slope, change the value from 999 to the desired slope. A value of 999 is interpreted as undefined by the Criteria and ignored.

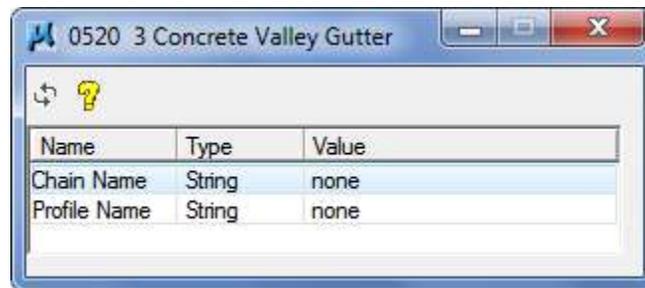
The paved shoulder slope is, by default, controlled through the Criteria to follow the standard shoulder slopes as defined in the Plans Preparation Manual, Chapter 2 using the cross slope of the shape. If the design intent of the shoulders should not follow the standard shoulder cross slope, the shoulder slope can be controlled using the adhocs *Paved Shld Begin Slope* and *Paved Shld End Slope*. These adhocs, when set to a value other than 999, will override the standard. They can also be used to taper the shoulder slope by setting the begin and end adhocs to different values. The transition is calculated over the entire length of the paved shoulder line making the location and length of the element drawn important. As an example, the paved shoulder may be constructed on a project that will later be widened. The shoulder slope needs to match the cross slope of the roadway, including through superelevated sections. The paved shoulder line can be drawn to match the transitions of the super elevation with the corresponding begin and end slopes defined on the adhocs.

CURB & GUTTER

Curb and gutter is drawn on the cross sections when the face of curb element is found in the design file. The D&C Manager item location is **Roadway Design > Plan Features > Curb & Gutter, Curb, Gutter**. The Criteria supports Type A, B, D, E, F, RA, Drop Curb, Valley Gutter and Shoulder Gutter. It is

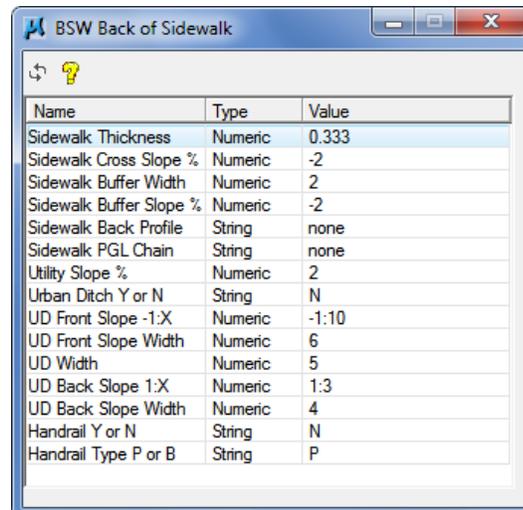
searched for from the edge of pavement or shoulder. The exact location of the face of curb does not matter. It acts as a trigger for the Criteria. If it is found within the search distance defined by the re-definable variable, *_d_CurbSearchDistance*, the curb will be drawn according to the specifications shown in the FDOT Design Standards. When using shoulder gutter, make sure the curb search distance is not set to a value which will find the curb from the edge of pavement. The curb will be drawn but not the paved shoulder. In the case of a driveway, the Criteria will automatically draw the curb as drop curb, eliminating the need to break the lines in the design file.

Valley gutter has adhoc to provide the designer the ability to control the gutter elevation through a profile. If a special gutter profile is required, set the profile name to the *Profile Name* adhoc. The chain name is not required unless the profile stationing does NOT match the baseline stationing of the cross sections.



BACK OF SIDEWALK

The back of sidewalk line when drawn in the design file will trigger the Criteria to draw sidewalk. The D&C Manager item location is **Roadway Design > Plan Features > BSW**. The exact location is used by the Criteria. In addition to the sidewalk, there are adhoc on the back of sidewalk line that will trigger other features to be drawn.



The sidewalk attributes are defined by adhoc on the back of sidewalk line. These adhoc will override the redefinable variables for the sidewalk. The sidewalk thickness, cross slope, buffer width, buffer slope and utility slope can all be defined through the adhoc. The back of sidewalk profile, if created, can also be set to the adhoc *Sidewalk Back Profile* to control the elevation at that back of sidewalk. The adhoc *Sidewalk PGL Chain* is only required if the stationing of the back of sidewalk profile does NOT match the baseline stationing of the cross sections.

An "Urban Ditch" is a ditch that is between the curb/shoulder and the sidewalk. It can be triggered to be drawn using the adhoc *Urban Ditch Y or N*. The adhoc with names that begin with 'UD' control how the ditch is drawn. Care should be taken with these values to insure the ditch will fit in the area before the sidewalk. Special ditch profiles are not supported for the urban ditches.

Handrail may also be triggered using the adhoc *Handrail Y or N*. When set to 'Y' the Criteria will draw handrail at the back of sidewalk. The sidewalk base is drawn according the FDOT Design Standards with the extra concrete under the handrail. The type of handrail drawn is controlled through the adhoc *Handrail Type P or B*. Set the adhoc to P to draw pedestrian handrail or B to draw bicycle handrail.

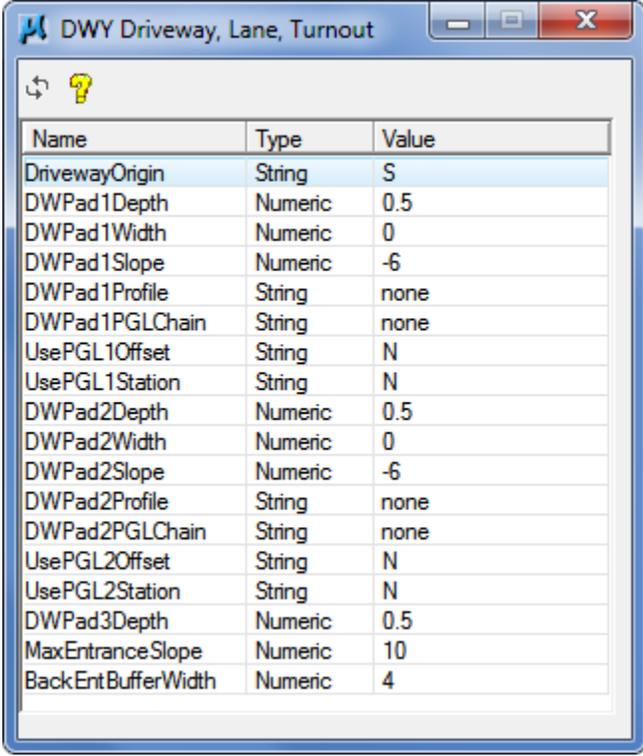
FRONT OF SIDEWALK

The front of sidewalk line is used to define the width of the sidewalk. The D&C Manager item location is **Roadway Design > Plan Features > FSW**. The exact location of this element is used by the Criteria. If it is not located in the design file, the Criteria will try to tie the sidewalk to the back of curb.

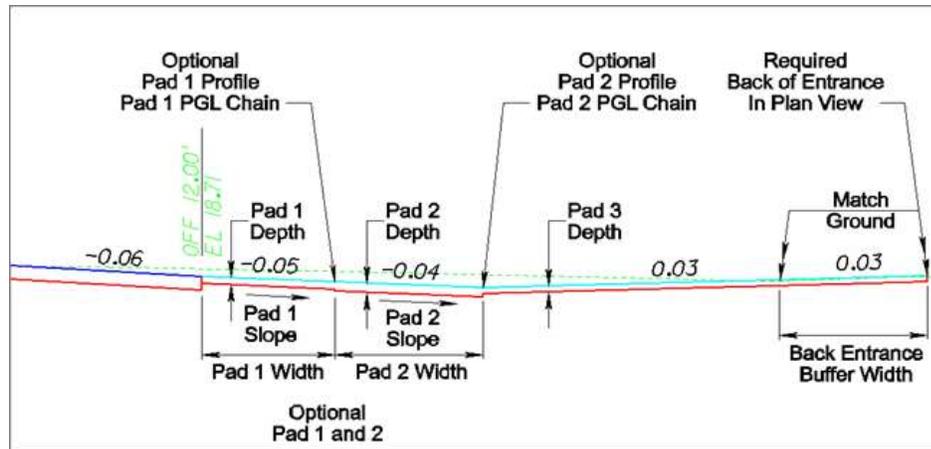
DRIVEWAYS

Driveways will be drawn in the cross section when a driveway line is drawn into the design file. The D&C Manager item location is **Roadway Design > Plan Features > DWY**. This line is searched for from the edge of pavement. It is only searched for once, therefore it is important that this line be located at the back of the driveway where it is to tie to existing ground. If more than one driveway line is used to depict the driveway for the plans, make sure to turn off **Place Influence** in the D&C Manager for all lines except the back tie in line so that the Criteria will not find the additional lines in the file.

Note The Remove Data tool can be used to remove the GEOPAK attribute tags from the undesired design elements. It can be accessed through the FDOT Menu under **Actions > GEOPAK VBA Utilities > Remove GEOPAK Attributes and Adhocs**.



Name	Type	Value
DrivewayOrigin	String	S
DWPad1Depth	Numeric	0.5
DWPad1Width	Numeric	0
DWPad1Slope	Numeric	-6
DWPad1Profile	String	none
DWPad1PGLChain	String	none
UsePGL1Offset	String	N
UsePGL1Station	String	N
DWPad2Depth	Numeric	0.5
DWPad2Width	Numeric	0
DWPad2Slope	Numeric	-6
DWPad2Profile	String	none
DWPad2PGLChain	String	none
UsePGL2Offset	String	N
UsePGL2Station	String	N
DWPad3Depth	Numeric	0.5
MaxEntranceSlope	Numeric	10
BackEntBufferWidth	Numeric	4

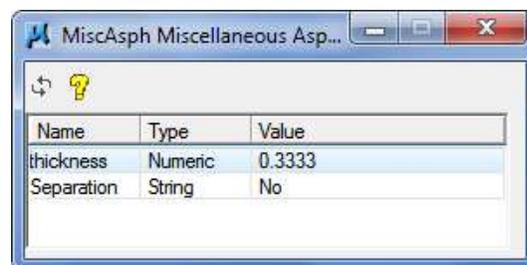


The Criteria provides 3 “pads” that can be controlled through the attached adhoc to draw the driveway in the cross section. Depending on the type of driveway, defined by the adhoc *DrivewayOrigin*, these pads will start at either the back of curb (*DrivewayOrigin* set to C for curb) or at the outside edge of the paved shoulder (*DrivewayOrigin* set to S for shoulder). For pads 1 and 2, the depth, width, and slope values can be controlled by setting the appropriate value to the corresponding adhoc. The back of each of these pads can also be controlled by a profile or offset. In order to use the profile, the profile name needs to be set to the adhoc *DWPad*Profile*. If the profile stationing does NOT match the baseline stationing, then the *DWPad*PGLChain* must be set to the appropriate chain name. When using the PGL chain stationing, the adhoc *UsePGL*Station* must also be set to ‘Y’. Setting the adhoc *UsePGL*Offset* to ‘Y’ tells the Criteria to use the PGL chain to set the horizontal location for the back of the pad. Pad 3 runs from the back of pad 2 to the existing ground at the horizontal location defined by the driveway line found in the design file. The slope of this pad will vary. The driveway can be made to tie to the existing ground before reaching the back of the driveway by setting the adhoc *BackEntBufferWidth* to a positive value. This value is measured in feet. The Criteria will finish the driveway from the start of the buffer to the back of the driveway by tracing the existing ground.

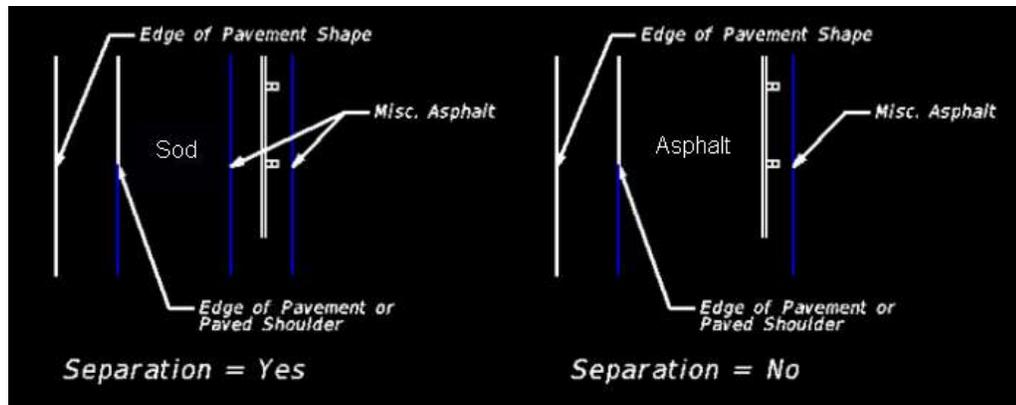
When drawing the driveway, the Criteria will also draw what would be a normal section on a non-plotting level. This is intended as an aid for designers. If there is a ditch section, a pipe would need to be constructed under the driveway. The additional drawing of a normal section helps the designer to locate the pipe as well as provide some guidance setting the flow line elevations.

MISCELLANEOUS ASPHALT & GUARDRAIL

Miscellaneous asphalt will be drawn on the cross sections outside the edge of pavement when found in the design file. The D&C Manager item location is **Roadway Design > Plan Features > MiscAsph**.



The adhoc *thickness* sets the depth of the miscellaneous asphalt drawn on the cross sections. There are 2 different applications for the miscellaneous asphalt. In the first scenario, there is a separation between the roadway pavement and the miscellaneous pavement. In this case, the adhoc *Separation* should be set to ‘Yes’. Two miscellaneous asphalt lines are required to define the area of the miscellaneous asphalt. If the miscellaneous asphalt should be constructed from the edge of the roadway pavement without the a separation, the adhoc should be set to ‘No’. Only one miscellaneous asphalt line would be required at the outside edge of the miscellaneous asphalt area.

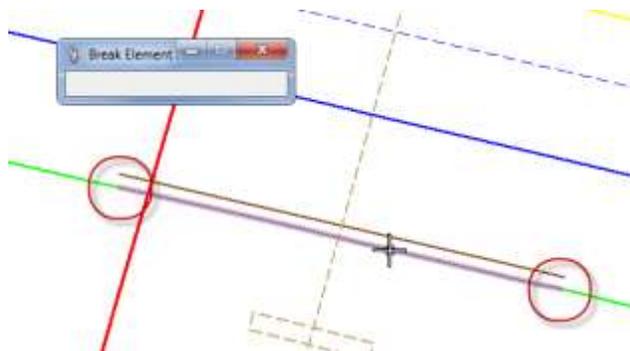


In many situations, guardrail is accompanied by the miscellaneous asphalt. The two features do not have to both exist in order to be drawn. The Criteria will draw whichever features that it finds in the design file, whether it is guardrail, or miscellaneous asphalt, or both. The D&C Manager item location for the guardrail is **Roadway Design > Plan Features > Guardrail > Guardrail**. All the guardrail types will be represented on the cross sections as a cell, either left, right, or double faced.

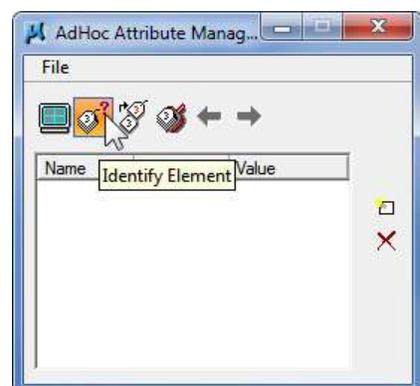
Exercise 5.2 *Shoulder Applications*

In this exercise, the students will modify the back of sidewalk line to add handrail and add guardrail with miscellaneous asphalt to the median.

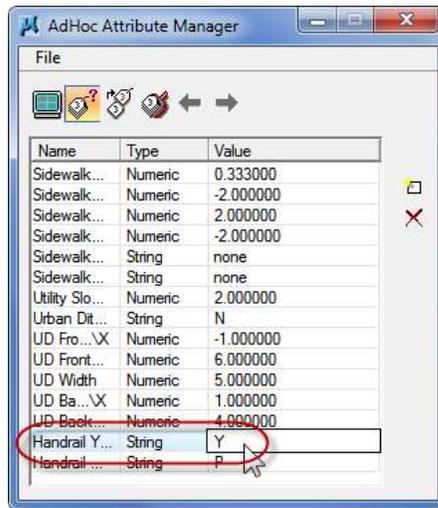
1. Open the MicroStation design file C:\e\projects\74185215201\roadway\DSGNRD01.dgn.
2. Zoom in to right side of the roadway at the pattern line at **station 1398+00**.
3. Using the MicroStation tool Break Element by Point, break the **back of sidewalk line** to create a separate **back of sidewalk line** matching the limits of the handrail.



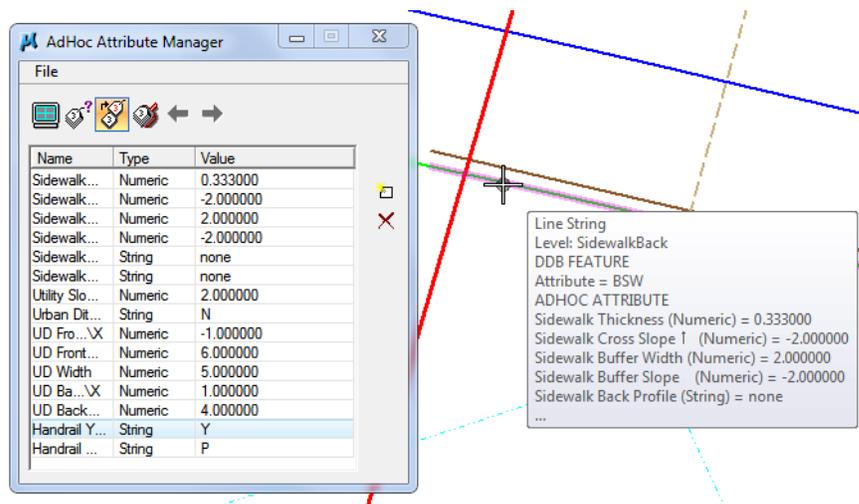
4. Open the Adhoc Attribute Manager. It can be accessed through **Applications > GEOPAK > ROAD > 3PC Adhoc Attribute Manager**, through the Road toolbox, OR from the Road Project Manager Task List.
5. Click on the **Identify Element** button and then select the **back of sidewalk line** crossing the pattern line with the handrail.



- Modify the adhoc *Handrail Y or N* value to **Y**.



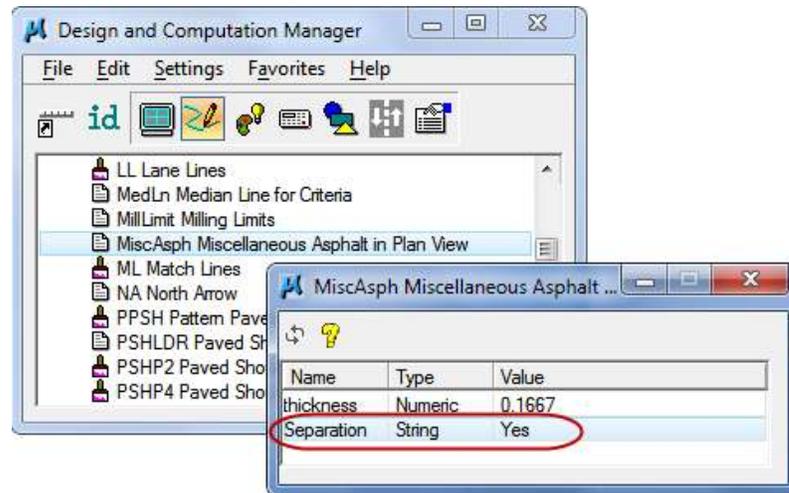
- Click on the **Set Attributes** button and then left click on the back of sidewalk line.



- Left click again to accept the selection.
- Zoom into the median area at **station 1395+00**.
- Open the D&C Manager and navigate to **Roadway Design > Plan Features > Guardrail > Guardrail** and select the item **0536 1 1 Roadway (Left)**.



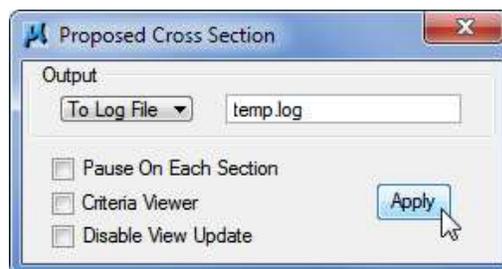
11. **With *Place Influence* turned on**, copy the paved shoulder line into the median **3.0** feet.
12. Navigate to **Roadway Design > Plan Features > MiscAsph**.
13. Set the adhoc attributes as shown below.



14. Copy the *guardrail line 3.0'* to the left and **1.5'** to the right of the guardrail.
15. Turn off **Place Influence**.
16. Open the cross section file, C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model RDXS RD.

Note If the cross section run from Exercise 5.1 is still open, skip to step 18.

16. On the Road Project dialog, select *Proposed Cross Sections*. The Run dialog will open.
17. Select the *run PrFeat*. Click **OK**.
18. Select all the elements in the file and **delete**.
19. Select **File > Save Settings** and then **File > Run**.
20. On the Proposed Cross Section dialog, set the *Output* option **To Log File** and then click **Apply** as shown below.



21. The cross sections will run. When done, click **Exit**.
22. Using the Cross Section Navigator, review the sections.
23. Close Cross Section Navigator.

SLOPES

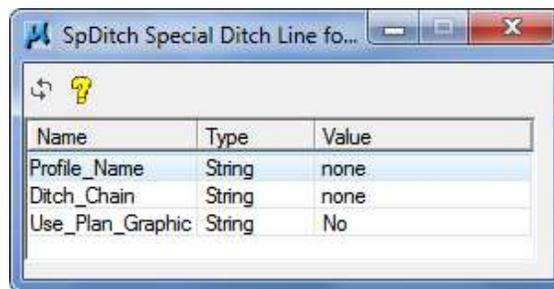
Slopes include all the areas outside the shoulders of the roadway. Roadway features may include sloped area for clear zone, roadside ditches, berms, gravity walls, or a simple forced slope to the existing ground.

EDGE OF FRONT SLOPE 1

Front Slope 1 is a sloped area located between the shoulder and the roadside ditch. The intent of this feature is to provide recoverable terrain, clear zone, for vehicles when they run off the road. The slope and width of this area is defined in the Plans Preparation Manual, Chapter 2. Front Slope 1 is controlled through redefinable variables, Plan Graphic Overrides and the EFS1 graphic element drawn into the design file. The D&C Manager item location is **Roadway Design > Plan Features > EFS1**. When this line is found, the *Front Slope 1 Width* redefinable variable is ignored and the slope is drawn to the intersection of the element found in the design file.

SPECIAL DITCHES

There are times when a special ditch profile is developed for the roadside ditch in order to insure capacity for drainage. One way to specify a special ditch profile is to assign them to the special ditch Define variables. They may also be added to a Special Ditch line in the design file. The D&C Manager item location is **Roadway Design > Plan Features > SpDitch**.

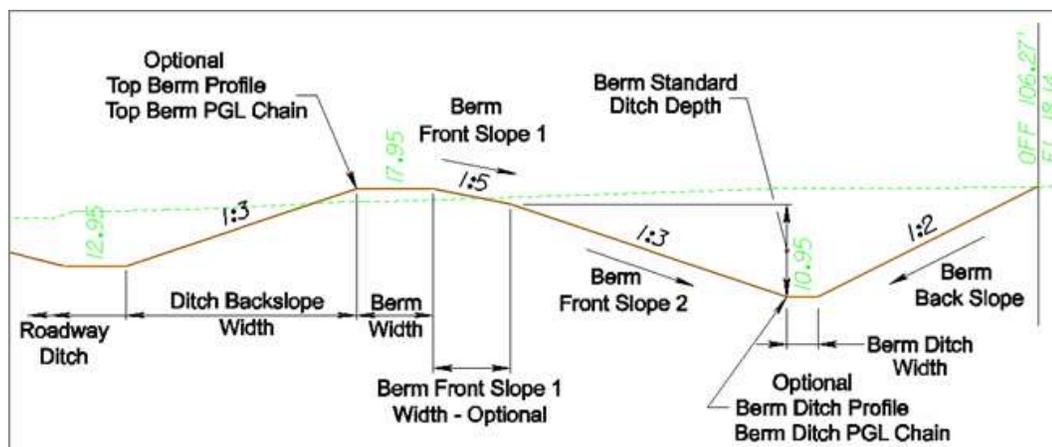


The profile name for the special ditch is assigned to the adhoc *Profile_Name*. If the stationing of the special ditch profile does NOT match the baseline stationing of the cross sections, then the adhoc *Ditch_Chain* needs to be assigned the correct chain name for the stationing of the profile. This chain is used for stationing purposes only. The Criteria will get the correct profile elevation and continue Front Slope 2 at the slope defined by the redefinable variable for Front Slope 2 until it reaches the proposed profile elevation. If it is desired to have the element in the design file control the horizontal location of the bottom of Front Slope 2, then the adhoc *Use_Plan_Graphic* needs to set to 'Yes'. Setting this to 'Yes' will override the Front Slope 2 slope making it vary.

BERMS

Berms are special features on the roadway that can only be triggered from a special Plan Graphic Override element drawn in the design file. The D&C Manager item location is **Roadway Design > Plan Features > Slopes Plan Graphic Overrides > Berm**. They are designed to draw off the back slope of the roadside ditch and will draw another ditch behind the berm.

Name	Type	Value
Top Berm Profile	String	none
Top Berm PGL Chain	String	none
Ditch Backslope Width	Numeric	10
Berm Width	Numeric	5
BermFrontSlope 1 Slope	String	1:6
BermFrontSlope 1 Width	Numeric	0.0
BermFrontSlope 2 Slope	String	1:4
Berm Std Ditch Depth	Numeric	2
Berm Ditch Width	Numeric	2
Berm Ditch Profile	String	none
Berm Ditch PGL Chain	String	none
Berm Backslope	String	1:3
UseTopPGLOffset	String	N
UseTopPGLStation	String	Y
UseBermDitchPGLOffset	String	N
UseBermDitchPGLStation	String	Y



The Criteria for the berm will extend the back slope for the roadway ditch using the value given for the adhoc *Ditch Backslope Width*. Then it will draw the top of the berm using the *Berm Width* adhoc followed by another ditch before tying to existing ground. The berm ditch is controlled through adhoc as shown in the picture above. They work the same as the corresponding redefinable variables for the roadway ditch.

The ditch backslope width can also be controlled through the use of a profile. Set the name of the profile to the adhoc *Top Berm Profile*. If the stationing of the berm profile does NOT match the baseline stationing, the adhoc *Top Berm PGL Chain* will need to be set with the appropriate chain. The adhoc *UseTopPGLStation* must also be set 'Y'. Setting the adhoc *UseTopPGLOffset* to 'Y' will use the PGL chain defined by *Top Berm PGL Chain* to control the horizontal location to apply the profile. This option will override the back slope value for the roadway ditch.

Similarly, the berm ditch bottom elevation can also be controlled through the use of a profile. Set the profile name to the adhoc *Berm Ditch Profile*. If the stationing does NOT match the baseline stationing, use the adhoc *Berm Ditch PGL Chain*. To use the stationing of this chain, set the adhoc *UseDitchPGLStation* to 'Y'. Set the adhoc *UseDitchPGLOffset* to use the PGL chain to control the horizontal location for the profile elevation to be applied.

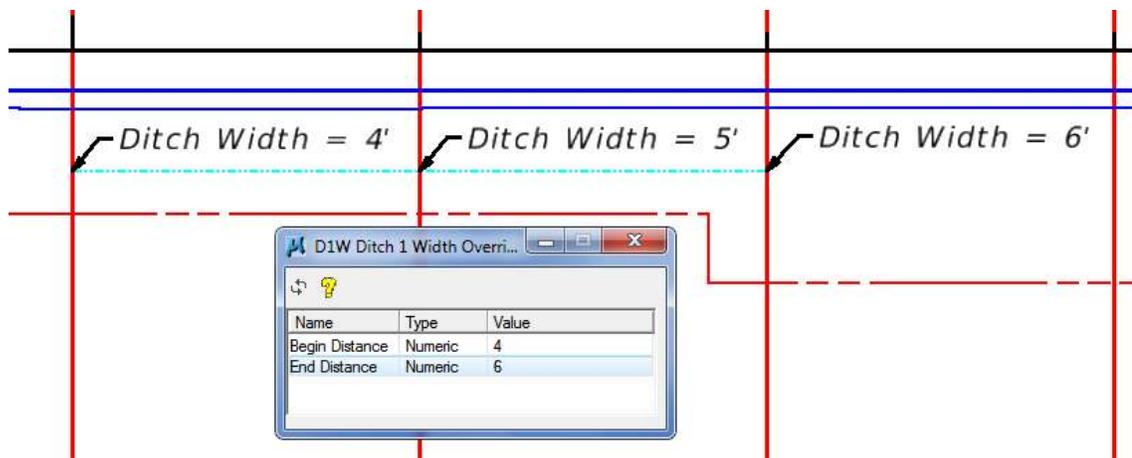
If the berm ditch is not desired, the adhoc values for the ditch must be modified. Set the *Berm Front Slope 1 Width* value to 0. Then modify the *Berm Standard Ditch Depth* to a very small value, i.e. 0.1. In this way the berm ditch elevation will remain above ground. When a ditch bottom elevation is above the existing ground elevation, the Criteria will extend the slope of Front Slope 2 until it ties to existing ground.

Note In order for the berm to be drawn by the Criteria, a roadway ditch must be valid. If the roadway ditch is above the existing ground elevation, a special ditch line must exist to provide a special ditch profile elevation for the roadway ditch to be drawn. Otherwise, the Criteria will extend the front slope until it ties to existing ground eliminating both the roadway ditch and berm.

PLAN GRAPHIC OVERRIDES

Plan graphic overrides were added to the Criteria to give the designer more control, graphically, over how the roadside slopes of the cross sections are drawn. The D&C Manager item location is **Roadway Design > Plan Features > Slopes Plan Graphic Overrides**. These graphics act as triggers for the Criteria. They must be located in the area of the slopes beyond the shoulders (paved and unpaved) in order to be found by the Criteria.

Each of the override lines has 2 functions. The first function is to override the corresponding redefinable variable with a different value. Some of these represent slopes, widths, or depths. Others will trigger features on and/or off with their values. The second function is to provide the option to taper the related feature across multiple cross sections. Each of the elements has 2 adhocs defining the beginning and end value for the element. The Criteria uses the length of the element and the distance along the element to the pattern line intersection to calculate the value for the given station. See the graphic below for an example.

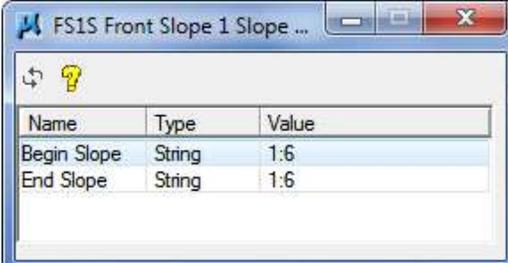


Note Elements drawn should not start and/or stop at the exact intersection with the pattern lines. This can cause incorrect results running the cross section Criteria. Extend the elements a minimum of 2 times tolerance, 0.02, beyond the pattern lines.

It is also important that the elements are NOT drawn outside the limits of the cross section baseline. The software uses the baseline stationing to reference the element and determine where the current station relates to the overall length of the element to calculate values for tapering.

Front Slope 1 Slope

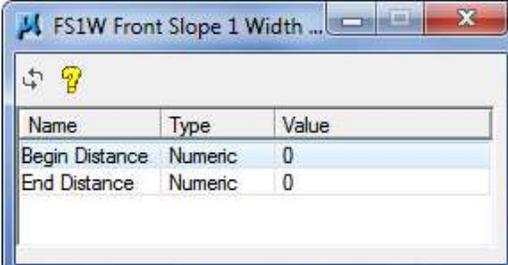
This element when found in the design file will override the redefinable variables *_d_FrontSlope_1_Slope_Left* or *_d_FrontSlope_1_Slope_Right* depending on the side slope in which it is drawn.



Name	Type	Value
Begin Slope	String	1:6
End Slope	String	1:6

Front Slope 1 Width

This element when found in the design file will override the redefinable variables *_d_FrontSlope_1_Width_Left* or *_d_FrontSlope_1_Width_Right* depending on the side slope in which it is drawn.



Name	Type	Value
Begin Distance	Numeric	0
End Distance	Numeric	0

Front Slope 2 Slope

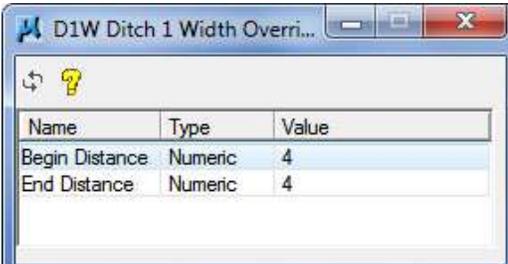
This element when found in the design file will override the redefinable variables *_d_FrontSlope_2_Slope_Left* or *_d_FrontSlope_2_Slope_Right* depending on the side slope in which it is drawn.



Name	Type	Value
Begin Slope	String	1:4
End Slope	String	1:4

Ditch Width

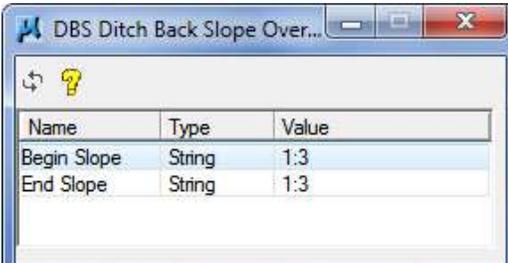
This element when found in the design file will override the redefinable variables *_d_DitchWidth_Left* or *_d_DitchWidth_Right* depending on the side slope in which it is drawn.



Name	Type	Value
Begin Distance	Numeric	4
End Distance	Numeric	4

Ditch Back Slope

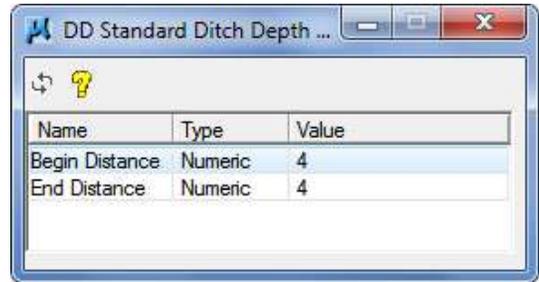
This element when found in the design file will override the redefinable variables *_d_DitchBackSlope_Left* or *_d_DitchBackSlope_Right* depending on the side slope in which it is drawn.



Name	Type	Value
Begin Slope	String	1:3
End Slope	String	1:3

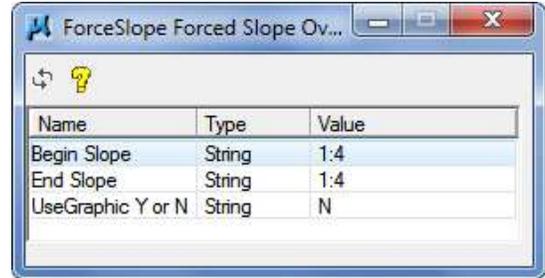
Ditch Depth

This element when found in the design file will override the redefinable variables *_d_StandardDitchDepth_Left* or *_d_StandardDitchDepth_Right* depending on the side slope in which it is drawn.



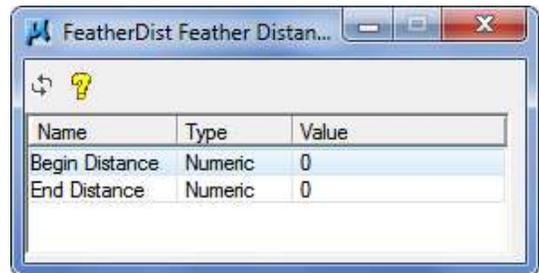
Forced Slope

This element when found in the design file will override the re-definable variables *_d_ForcedSlopeLeft* and *_d_ForcedSlopeLeftValue* or *_d_ForcedSlopeRight* and *_d_ForcedSlopeRightValue* depending on the side slope in which it is drawn. There is also an Adhoc named *UseGraphic Y or N*. This adhoc, when set to 'Y', will override the slope values and draw the tie down to the horizontal location of the graphic element resulting in variable slopes.



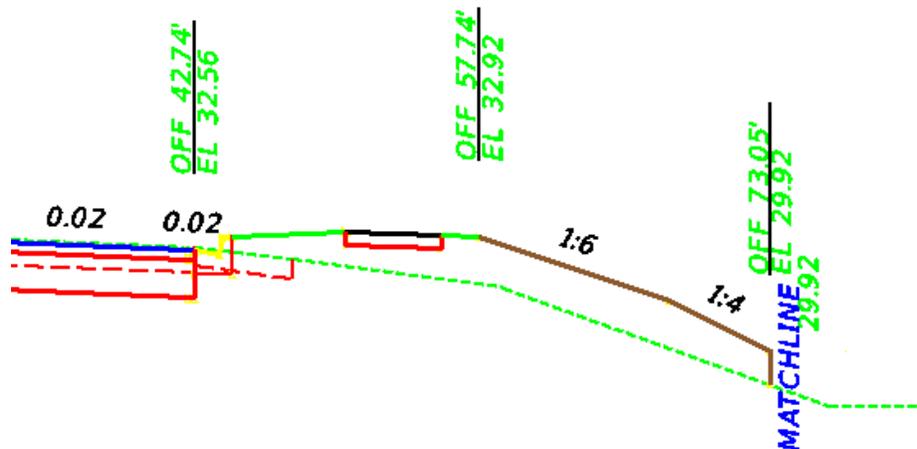
Feather Distance

This element when found in the design file will override the redefinable variables *_d_FeatherDistance_Outside_Left* or *_d_FeatherDistance_Outside_Left* depending on the side slope in which it is drawn.



MATCH LINES

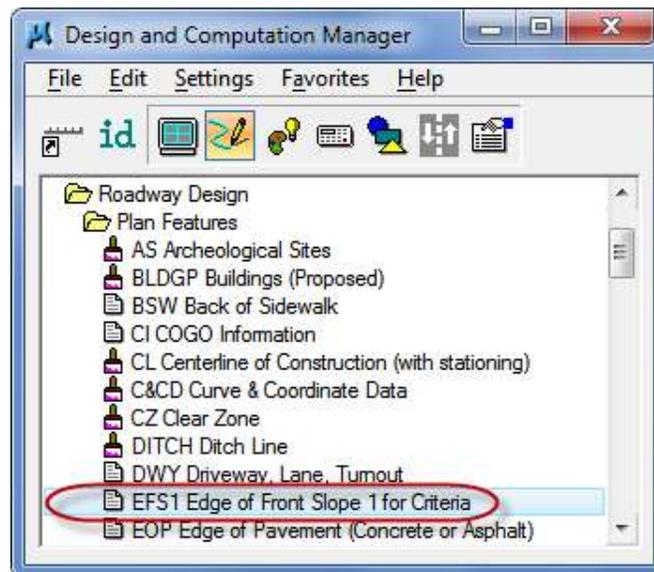
Match lines, when found in the design file, tell the Criteria to stop drawing and tie straight up or down to the existing ground. The D&C Manager item location is **Roadway Design > Plan Features > ML**.



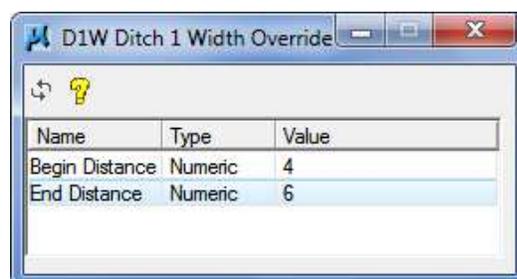
Exercise 5.3 *Slopes Applications*

In this exercise, the students will add the graphic element into the DSGNRD file to control the location of the edge of front slope 1 and add the *Plan Graphic Override* line **D1W** to taper the right roadway ditch width.

1. Open the MicroStation design file C:\e\projects\74185215201\roadway\DSGNRD01.dgn.
2. Open the D&C Manager and navigate to the item **Roadway Design > Plan Features > EFS1**.



3. On the **EFS1 Edge of Front Slope 1** dialog, click on the check box to turn on **Place Influence**.
4. Using the MicroStation *Move/Copy Parallel* command, copy the **right outside Paved Shoulder line 10'** to the right from Station 1384+90 to Station 1390+10.
5. Navigate to the item **Roadway Design > Plan Features > Slopes Plan Graphic Overrides > D1W**.
6. Modify the *adhocs* as shown below.



7. Place a line in the area of the ditch on the right side of the roadway from **Station 1389+00 to 1391+00**.

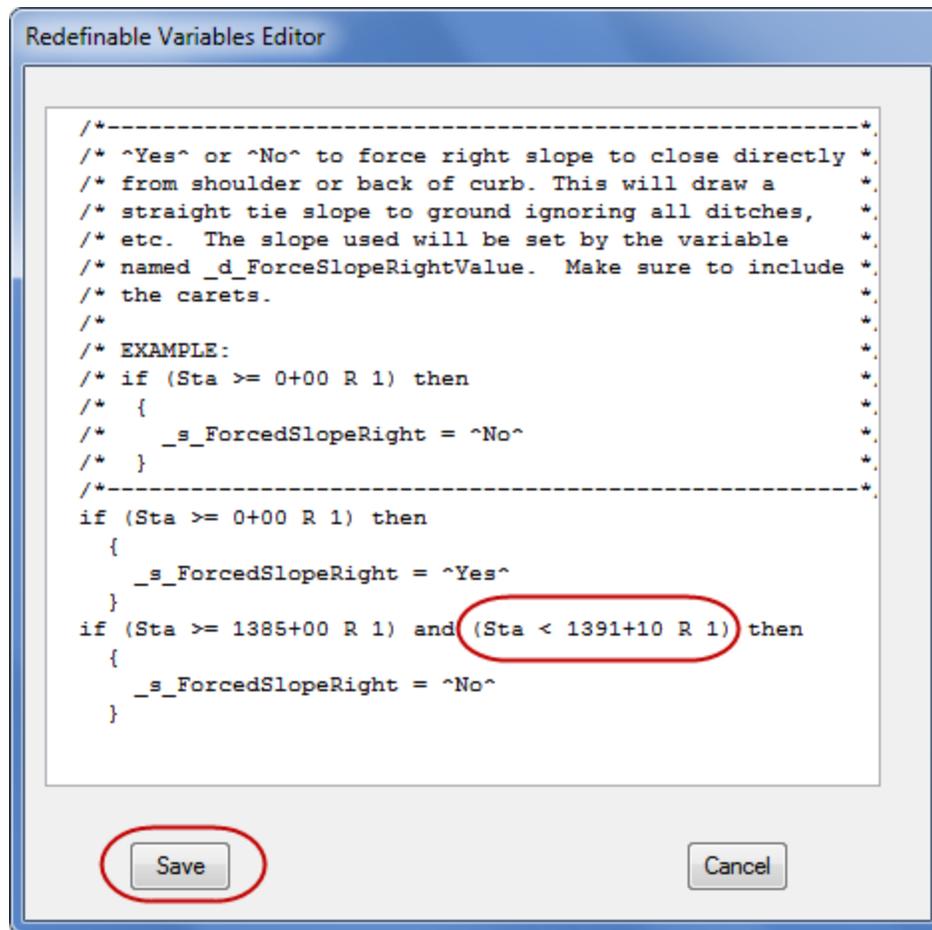
Note Make sure to extend the line past the pattern lines. A distance of 2 times tolerance, 0.02, is recommended.

8. Turn off **Place Influence**.
9. Open the cross section file, C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model *RDXS RD*.

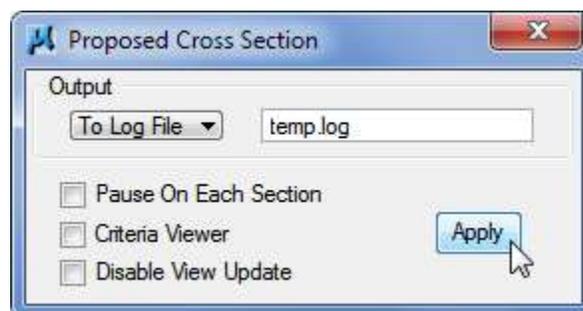
Note If the cross section run from Exercise 5.2 is still open, skip to step 12.

10. On the Road Project dialog, select **Proposed Cross Sections**. The Run dialog will open.
11. Select the *run PrFeat*. Click **OK**.

38. Select the **Redefinable Variables** category.
12. Scroll down the list of *variables* and select **_s_ForcedSlopeRight**. Click on the **Edit** button.
13. Modify the value as shown below. Click **Save**.



14. Select all the elements in the file and **delete**.
15. Select **File > Save Settings** and then select **File > Run**.
16. On the Proposed Cross Section dialog, set the *Output* option **To Log File** and then click **Apply** as shown below.



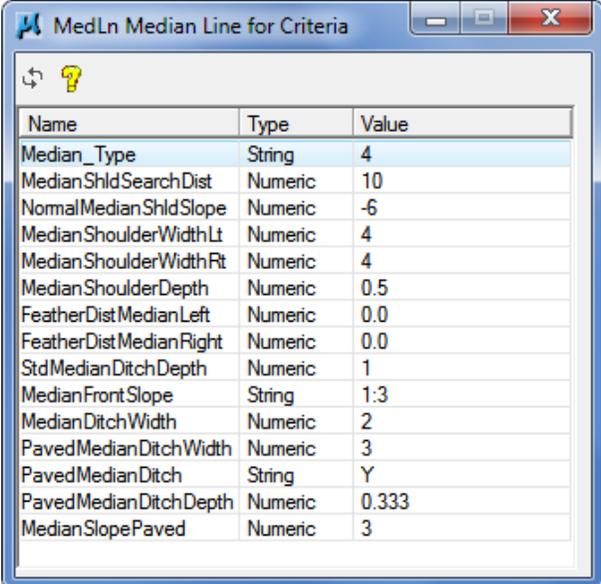
17. The cross sections will run. When done, click **Exit**.
18. Using the Cross Section Navigator, review the sections.
19. Close Cross Section Navigator.

MEDIANS

The median encompasses the area between shape clusters. This includes the crossovers, traffic separators, ditches, and filled sections between curb and gutter. The median is designated by the use of a Median line.

MEDIAN LINE

When found in the design file, the median line tells the Criteria that the neighboring shape clusters need to be connected. The D&C Manager item location is **Roadway Design > Plan Features > MedLn**. The median line MUST exist for ALL divided roadway sections. The exact location of this line is not important. It acts as a trigger for the Criteria to treat the side slope differently. The element simply needs to be placed in the design file somewhere in the middle of the median beyond the work to be done on each side of the median.



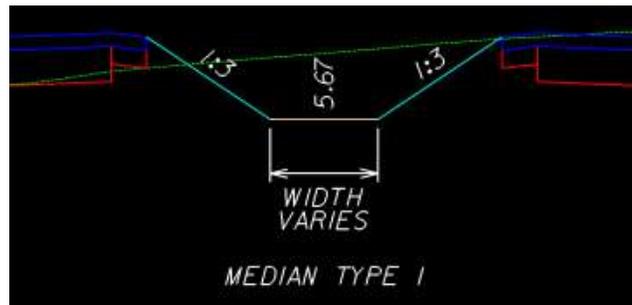
Name	Type	Value
Median_Type	String	4
MedianShldSearchDist	Numeric	10
NormalMedianShldSlope	Numeric	-6
MedianShoulderWidthLt	Numeric	4
MedianShoulderWidthRt	Numeric	4
MedianShoulderDepth	Numeric	0.5
FeatherDistMedianLeft	Numeric	0.0
FeatherDistMedianRight	Numeric	0.0
StdMedianDitchDepth	Numeric	1
MedianFrontSlope	String	1:3
MedianDitchWidth	Numeric	2
PavedMedianDitchWidth	Numeric	3
PavedMedianDitch	String	Y
PavedMedianDitchDepth	Numeric	0.333
MedianSlopePaved	Numeric	3

The adhoc *Median_Type* tells the Criteria how to draw the median. There are 8 median types:

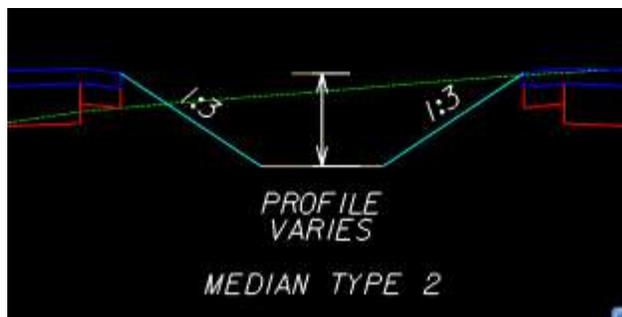
- **Type '0'** Designates that NO work is to be done beyond the pavement. This median line type can be used in the median or on the outside shoulders.



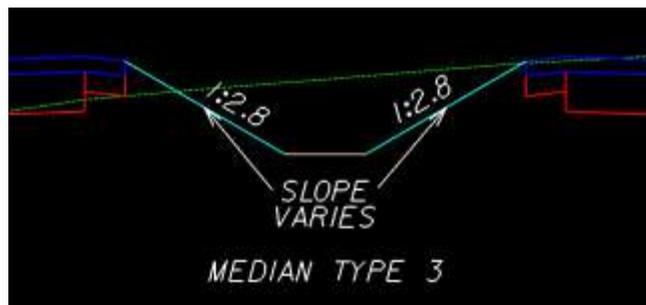
- **Type '1'** Designates a ditch with fixed slopes and a fixed depth is to be drawn in the median. The ditch bottom width will vary to fit the ditch within the limits of the median.



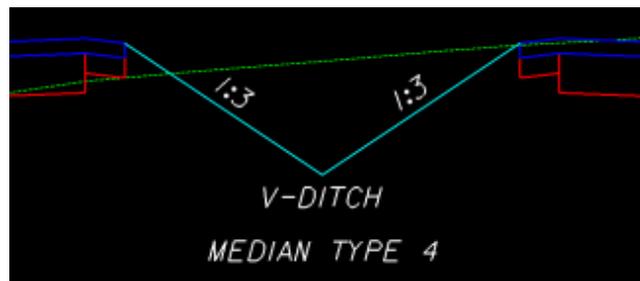
- **Type '2'** Designates a ditch with fixed slopes and ditch width is to be drawn in the median. The ditch depth will vary to fit the ditch within the limits of the median.



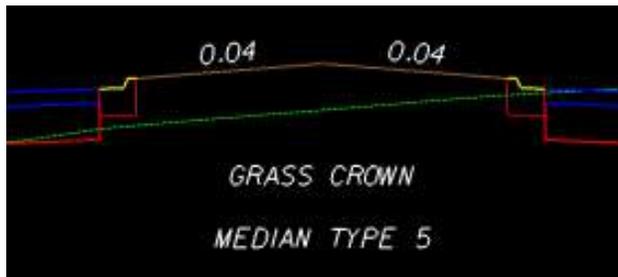
- **Type '3'** Designates a ditch with fixed depth and width is to be drawn in the median. The slopes will vary to fit the ditch within the limits of the median.



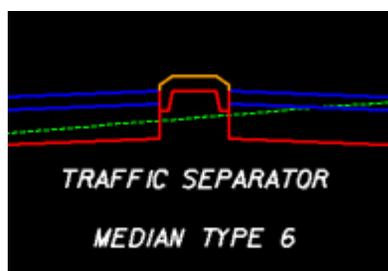
- **Type '4'** Designates a "V" bottom ditch.



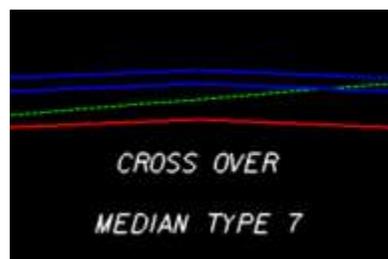
- **Type '5'** Designates a filled median with 4% slopes. This median type is intended for use in urban sections with curb and gutter.



- **Type '6'** Designates that a traffic separator (Type I or IV Option 1, or Type II or V) is to be drawn in the median. These traffic separator options “cut” the pavement with no asphalt or base beneath them.



- **Type '7'** Designates a cross over where the pavement is to be extended to meet in the middle. This median type is also to be used when a traffic separator Type I or IV Option 2 is to be drawn in the cross section. This is so that the asphalt and base are carried under the traffic separator.



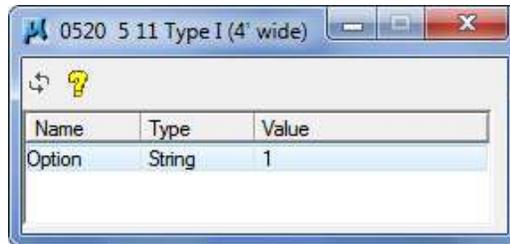
If the section is rural with shoulders, paved and/or unpaved, the Criteria will use the shoulder adhoc to define the feature attributes such as the shoulder slope, width (both left and right independently) and the shoulder depth. The shoulder depth will be overridden by the adhoc on the paved shoulder line.

If the median type selected is one of the options for a ditch (Types 1 – 4), then the adhoc for the ditch variables will be used to define the slope, width, and ditch depth. The option to control the median ditch depth with a profile is not supported. The option to pave the ditch can be turned on with the adhoc *PavedMedianDitch*. The options to set the paved ditch width and the depth of the concrete can be defined with the adhoc *PavedMedianDitchWidth* and *PavedMedianDitchDepth* respectively.

The Criteria also has the option to tie to existing ground instead of drawing a ditch, similar to the outside roadway ditch. By setting the adhoc *FeatherDistMedianLeft* and *FeatherDistMedianRight*, the Criteria will tie the section to existing ground from the outside edge of shoulder. This will result in varying tie down slopes. The Forced Slope option is not supported in the median.

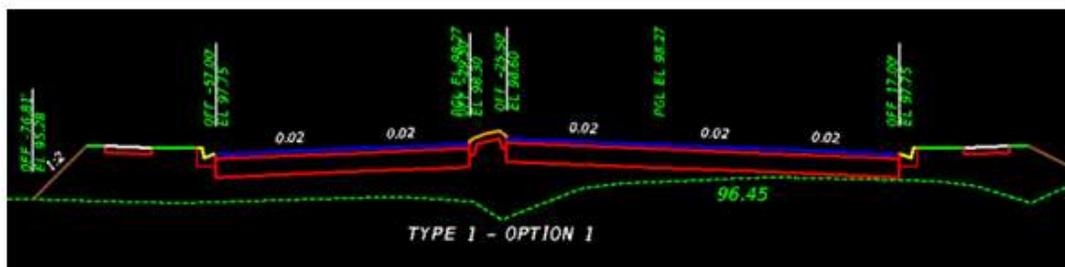
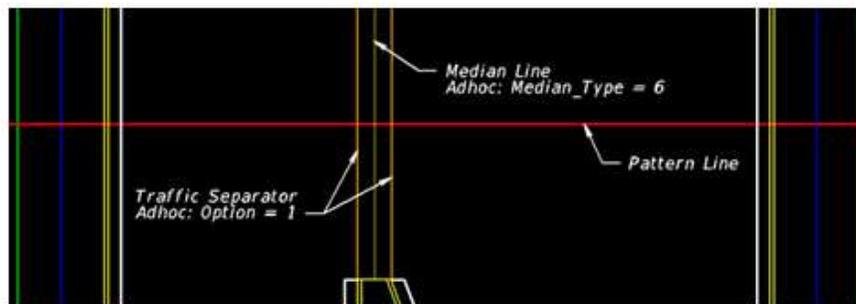
TRAFFIC SEPARATORS

Traffic separators will be drawn in the cross section when the Criteria encounters traffic separator lines in the design file. The D&C Manager item location is **Roadway Design > Plan Features > Concrete Traffic Separators**. The exact location of the traffic separator lines is reflected on the cross sections.

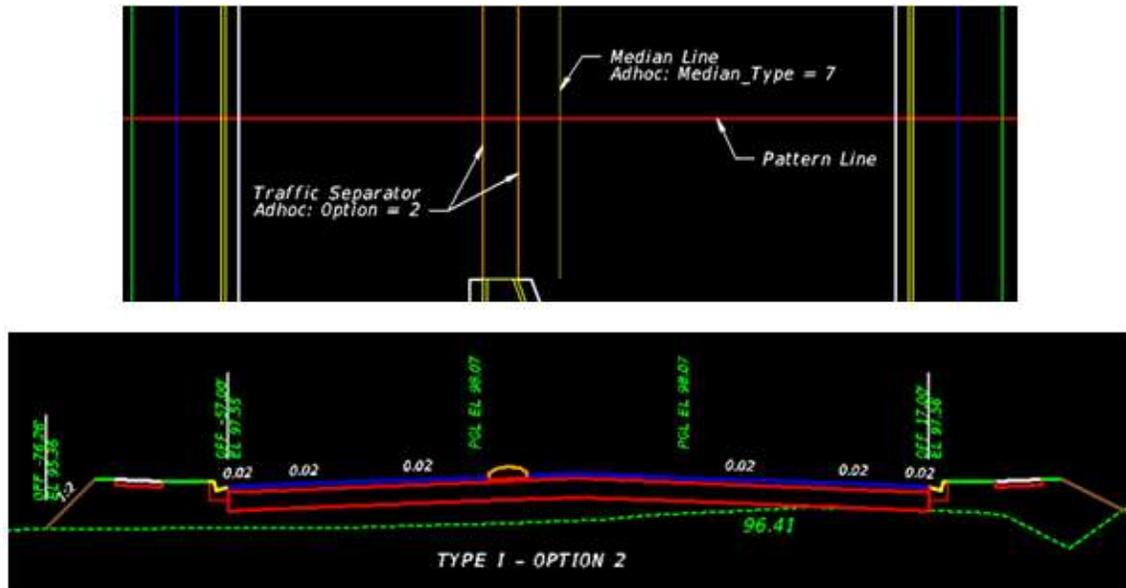


The type of traffic separator to draw is conveyed to the Criteria by the D&C Manager item used to draw the traffic separator. The option for the traffic separator, for types I and IV, are defined for the Criteria by the adhoc *Option*. Option 1 traffic separators cut or break the pavement while Option 2 traffic separators are constructed on top of the pavement. (See Standard Index 302 for more details)

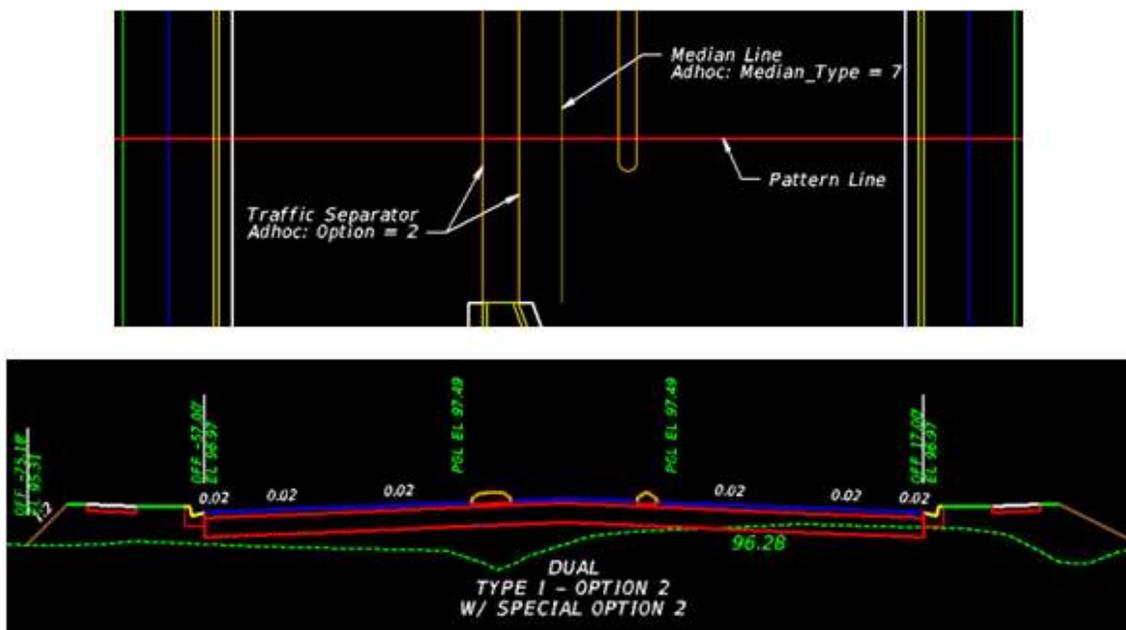
The type of traffic separator to be constructed will determine not only how the traffic separator is defined in plan view, but also the median line, since the traffic separator is considered a median feature. The exact location of these elements is reflected in the cross sections. For *Option 1* traffic separators, a median line needs to be drawn down the middle of the traffic separator (exact location is not important) with the *Median_Type* adhoc set to 6 for Traffic Separators. Turn lane superelevation shapes are not required, unless the cross slope of the turn lane is different from the main line shape cross slope, nor are additional proposed edge of pavement lines. The Criteria considers the traffic separator elements as proposed edges of pavement and will widen from a milling limit line or edge of pavement to the traffic separator line using the slope from the superelevation shapes or as defined by the milling widening adhocs. If widening is to be drawn and additional proposed edge of pavement lines are NOT drawn, the widening will be drawn using the values from the redefinable variables.



If the traffic separator is a Type I or IV, Option 2, the traffic separator should be drawn into plan view using the appropriate D&C Manager item with the adhoc *Option* set to 2. The exact location is reflected in the cross section. A median line needs to be drawn anywhere in the turn lane area between the two shape clusters. The adhoc *Median_Type* should be set to 7 for a cross over to trigger the Criteria to draw the base and asphalt layers under the traffic separator.

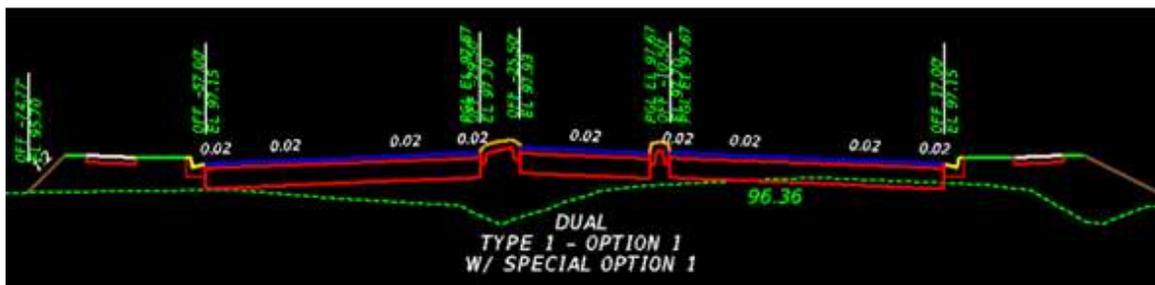
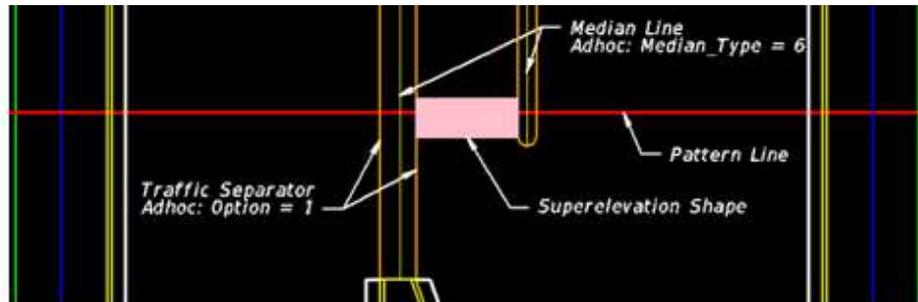


For dual traffic separators, if *Option 2* traffic separators are to be drawn, both traffic separators should be drawn in plan view and the type 7 median line drawn in the turn lane between the traffic separators. Nothing further is required.



However, for dual *Option 1* traffic separators, both traffic separators should be drawn with a type 6 median line drawn down the center of each traffic separator. In addition, since *Option 1* traffic separators break the asphalt, a shape will be required in the turn lane area between the traffic separators, to define the elevation and cross slope of the pavement. These additional shapes are only required where the pattern line crosses 2 *Option 1* traffic separators.

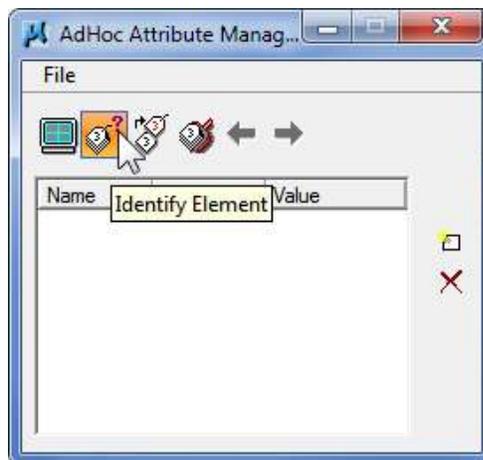
Note Note, since these shapes do not touch any other shape, these shapes are considered a separate shape cluster and must have a different tie in order to differentiate from the other shape clusters. If the turn lane shape parameters match the mainline shape clusters, an error will occur when running the cross sections.



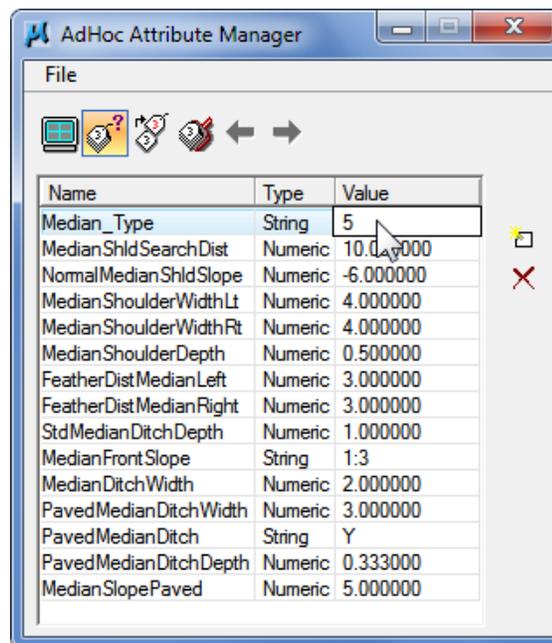
Exercise 5.4 Median Applications

In this exercise, the students will modify the median line in the urban section to a type 5 for the filled median at 4% slopes.

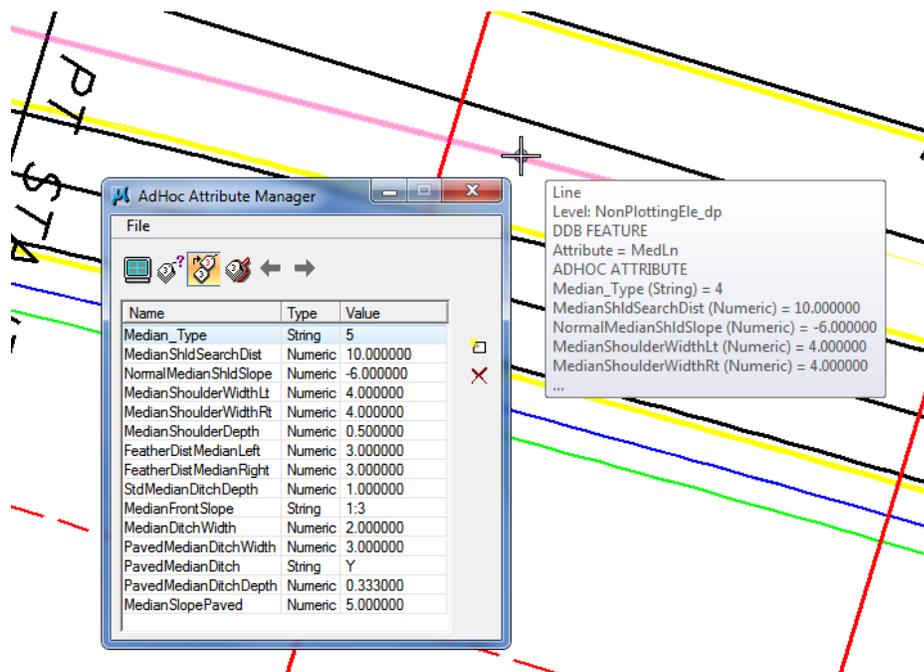
1. Open the MicroStation design file C:\e\projects\74185215201\roadway\DSGNRD01.dgn.
2. Open the Adhoc Attribute Manager.
3. Zoom into the urban section of the project, from **station 1398+00 to station 1403+00**.
4. Click on the **Identify Element** button and then select the **median line**.



- Modify the adhoc *Median_Type* value to 5.



- Click on the **Set Attributes** button and then left click on the median line.

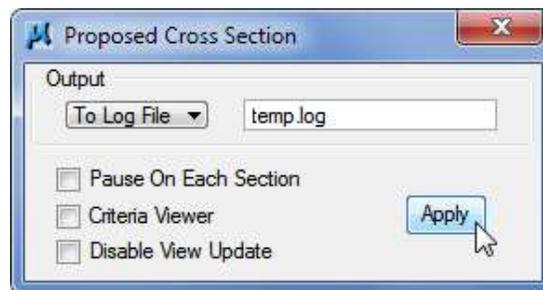


- Left click again to accept the selection.
- Open the cross section file, C:\e\projects\74185215201\roadway\RDXS RD01.dgn; model RDXS RD.

Note If the cross section run from Exercise 5.3 is still open, skip to step 11.

- On the Road Project dialog, select **Proposed Cross Sections**. The Run dialog will open.
- Select the *run PrFeat*. Click **OK**.
- Select all the elements in the file and **delete**.

12. Select **File > Save Settings** and then select **File > Run**.
13. On the Proposed Cross Section dialog, set the *Output* option **To Log File** and then click **Apply** as shown below.



14. The cross sections will run. When done, click **Exit**.
15. Using the Cross Section Navigator, review the sections.
16. Close Cross Section Navigator.

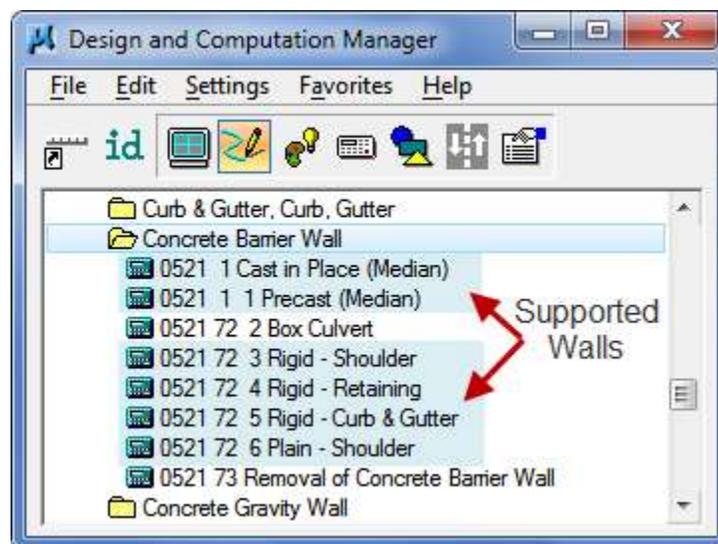
Note By placing all of the desired median lines into a MicroStation selection set all of the elements can be set at one time.

WALLS

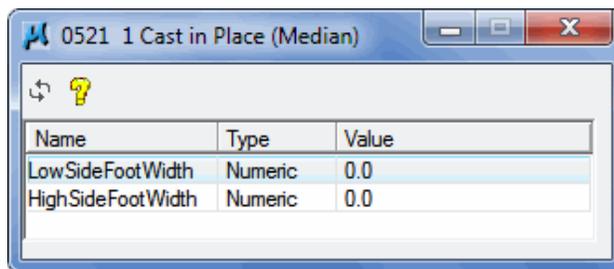
Various walls are supported by the Criteria. These walls include the smaller retaining walls, median barrier walls, and gravity walls. The large MSE walls are not supported by the Criteria.

CONCRETE BARRIER WALLS

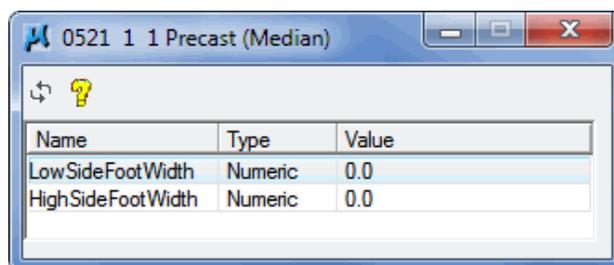
The D&C Manager item location is **Roadway Design > Plan Features > Concrete Barrier Wall**. All the walls under this category are supported except the Box Culverts.



Some of the concrete barrier walls include adhoc with additional information used to draw the wall. The footer widths are intentionally set to a default of 0. These widths should be determined by the designer/structures engineer.

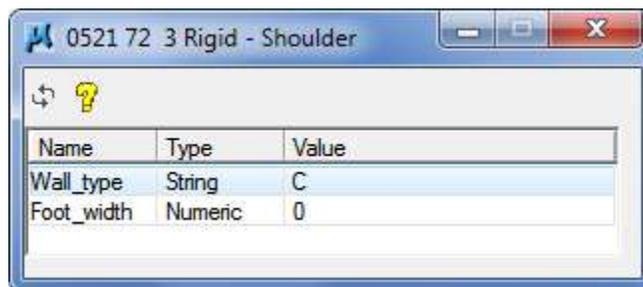


Name	Type	Value
LowSideFootWidth	Numeric	0.0
HighSideFootWidth	Numeric	0.0



Name	Type	Value
LowSideFootWidth	Numeric	0.0
HighSideFootWidth	Numeric	0.0

The Rigid – Shoulder wall has adhoc for the footer width and the wall type. The available options are C, cantilever, and L, L wall.



Name	Type	Value
Wall_type	String	C
Foot_width	Numeric	0

GRAVITY WALLS

Gravity walls can be located in the D&C Manager under **Roadway Design > Plan Features > Concrete Gravity Wall**. Note that the adhoc attributes set up for the gravity walls are for quantity purposes ONLY. The Criteria does not use these adhoc.

Note Once a gravity wall is found and drawn in the cross section, the Criteria considers the section complete and will not look for a draw any other features beyond the gravity wall.