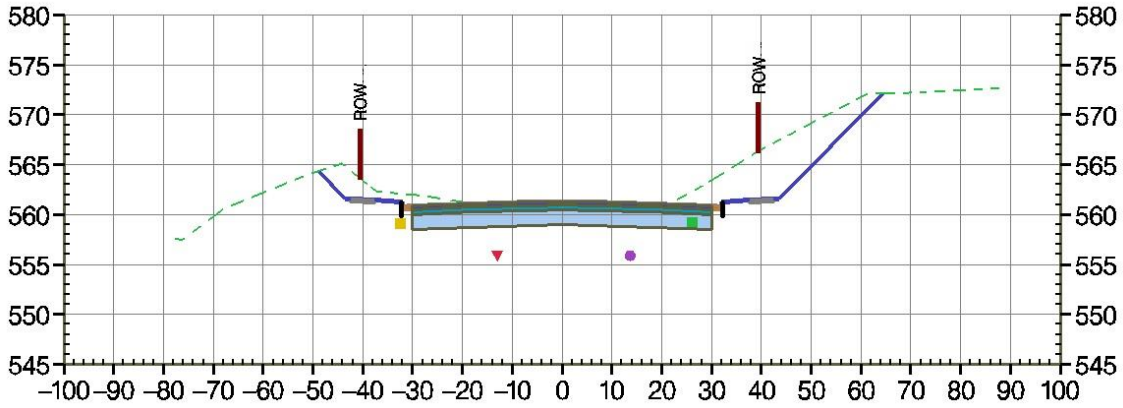
# Module 03

# WORKING WITH InRoads FEATURES

## Introduction

This module is another step toward learning how to complete various details of your project in 3D using the Bentley InRoads software.

When **Features** were first introduced into the InRoads DTM over a decade and a half ago in the first V8 version, they were positioned as the powerful evolution of the '*dumb*' DTM into the '*intelligent*' Surface model. That statement has held true ever since it was made and **Features** and their associated **Styles** have allowed InRoads users to place surface information in and out of Plan, Profile and Cross Section with an ease that was not obtainable before the V8 versions of InRoads.




There are two parts to this '*intelligent*' equation – the 3D **Feature** stored in the surface, and the InRoads unique **Style** that provides that **Feature** the intelligence to understand what it needs to do in Plan, Profile or Cross Section.

This is the subject of this module. And more specifically, it will cover how to utilize this intelligence for the placement of Right-of-Way lines on a set of Cross Sections. Once this is understood, the ability to apply this principle in other Plan, Profile or Cross Sectional applications is only limited by your imagination.

**NOTE**: A fair portion of the knowledge required to perform the operation to place Right-of-Way markers on your project Cross Sections is covered in the InRoads Level 1 course. For that reason, this module will be focusing more on the overall workflow details and process.

## Purpose of this Module

The purpose of this module is to demonstrate taking a 2D MicroStation graphic of a proposed ROW line, and importing it as a non-triangulated feature that is draped against the existing surface. It will also demonstrate changing the **Feature Style** to one that will display the ROW line location as a cell in the cross sections.

## Objectives of this Module

At the end of this module you will be able to take information from graphics (both 2D and 3D) as well as other information from the ALG Geometry Project and move it into the DTM Surface with the end goal of being able to take that information (such as a ROW) and display it on a set of InRoads Cross Sections.

## Definition of Audience for future Modules

Before moving forward, it needs to be stated that each module in this series will have its own prerequisites and skill level requirements. The skill level requirements will be based on instructor-led classes taught at ODOT and will be primarily focused on the InRoads series classes. Additional prerequisites may also include various modules within this series. Each individual module will list the applicable module requirements if there are any.

Do not take these prerequisites lightly, each module assumes that you have achieved a certain level of competency with the software tools and you may be asked to execute a command with very little instruction. If you are unable, you will likely not be able to successfully complete the module and achieve its intended objectives.

For example, after completing this module, it will be expected that you can perform displays of surface **Feature** data in plan, profile and cross sectional view on demand. If, in a later module, you are asked to do something related to the information presented in this module, and you cannot perform that step you will have to either skip that step (which may inhibit your ability to complete the module exercises), or you will have to return to this module and review how to accomplish the step being asked. For that reason, if you feel that after completing a module, that you are still unsure of your skill, simply go through the module again, and do some additional outside practice.

### Skill Level / Prerequisites:

The required prerequisites for this module are:

- Module 1 – Introduction to the Training Modules
- MicroStation Basics
- InRoads Level 1

Refer to the course content or description for each of the instructor-led classes above for a more detailed breakdown of the subject matter covered in each of those classes.

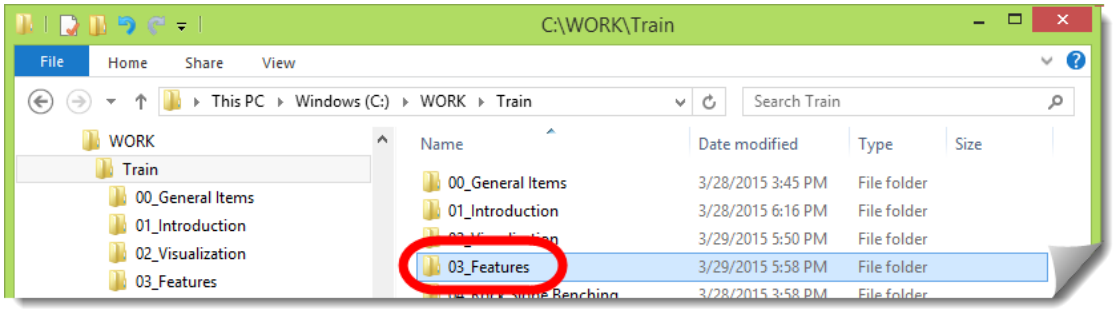
## Module Files and Folders

As usual, the activities of this module will be a combination of study and hands-on. This module however will have less study than most simply because much of the theory is covered in the InRoads Level 1 class. Therefore the main focus here will be with the hands-on which will walk you through the process so you see how it is accomplished. The minor study portion is there to support the hands-on activities and add an assurance, and in some instance little technical reminders, so that you will be able to apply this to your future projects.

## Training Folders

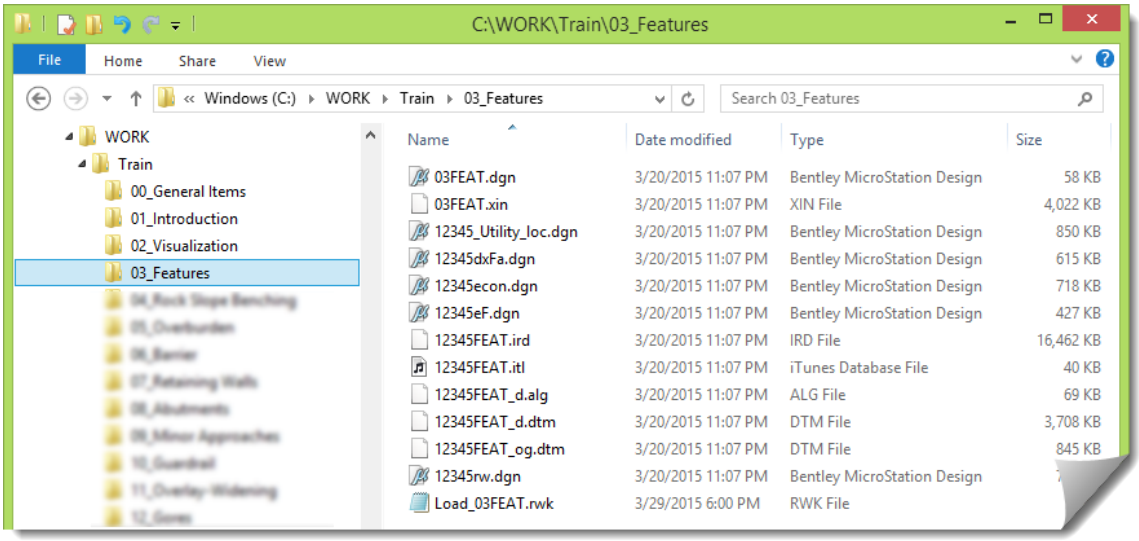
You will be working on your local hard drive during this training.

You should have a copy of the **03_Features** training folder and files on your local drive. The module folder and related files should be placed under the ***C:\WORK\Train*** folder, and look like this:




## Training Files

The module folder contains any training files (DGNs, DTMs, ALGs, ITLs, IRDs, XIN and so on) that might be used during the module exercises. In this module folder you should have these files:




Glancing at the files you should see familiar InRoads file types, as well as the DGN files for this module.

DGN files starting with **12345** are support files, or reference files. You will see these files, or similarly named files, in many of the modules. Likewise, InRoads files starting with **12345FEAT** are also support files that may be used within the hands-on exercises at some point as directed.

Files starting with the module identifier, in this case **03FEAT**, are files that will typically be opened during the launch of the hands-on work and include:

- **03FEAT.dgn**, the initial MicroStation file used at the start of the exercises
- **03FEAT.xin**, the InRoads configuration file for this work

All of the modules will have two similarly named files that will be opened at the start.

And there will oftentimes be an **RWK** file included in the module folder to assist in opening the InRoads files using that **Project** file technique.

# Technical Content of Training:

This particular module is going to specifically address the task of placing Right-of-Way markers onto a set of InRoads-based project cross sections. In the course of working through this process, various related technical items will be pointed out or expanded on as deemed appropriate.

There are two elements to this subject, one is addressing the data, in this case the Right-of-Way. And the other is the InRoads configuration, specifically the **Style** set-up and its related **Named Symbology**. As a designer, engineer, or technician your domain related to these two aspects is the first, the *data* – the Right-of-Way. The second piece of this puzzle, the InRoads configuration is really outside of the scope of your control and really lays in the hands of EAST and the CAD Support group. Nevertheless it will be covered so that you can debug any problems that might be occurring and be able to satisfactorily rule out the configuration as an issue.

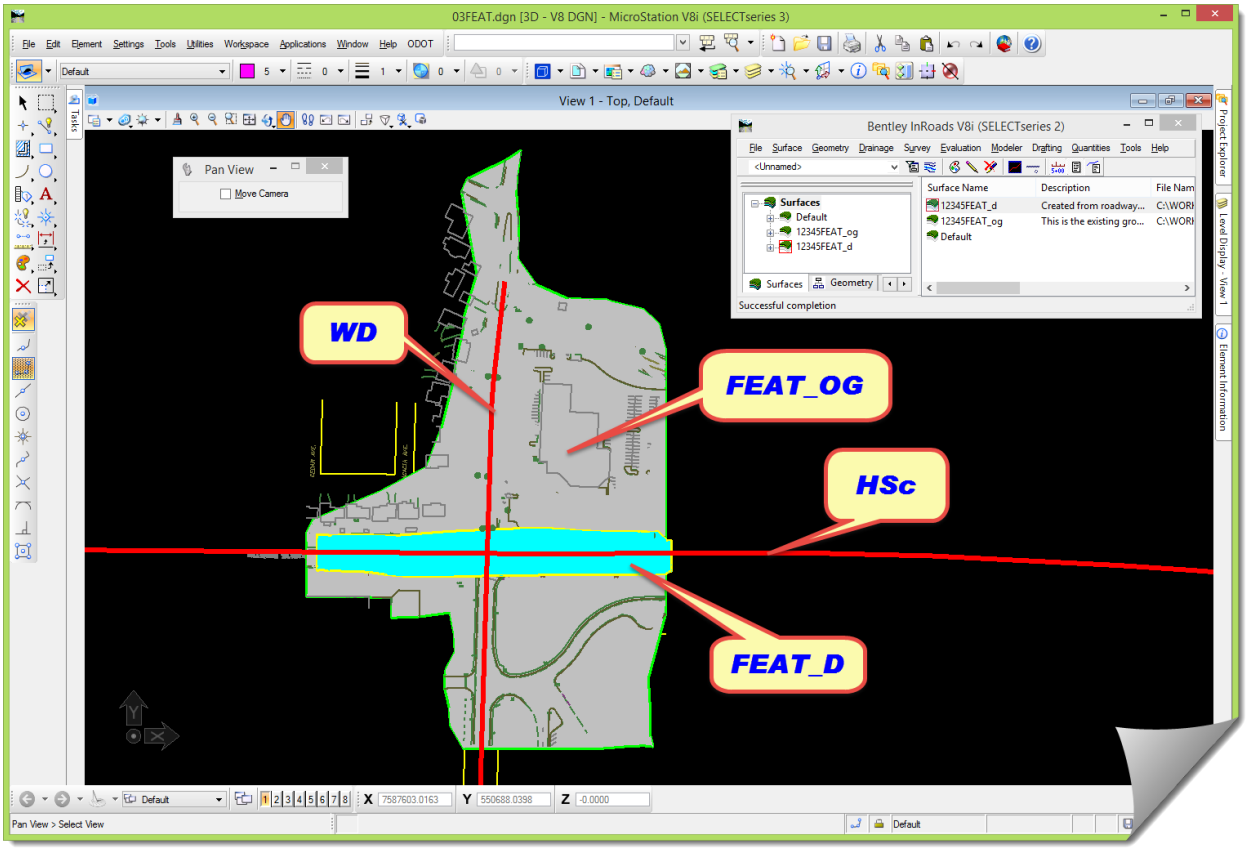
Both of these topics will be discussed in an upcoming section.

## Project Orientation

### REVIEW WORK AREA

This module will be primarily using a small existing surface DTM, a much smaller design surface, and an alignment called **HSc**. There is also another alignment called **WD** which can be used if you choose to work in that area on your own. The areas of coverages and locations for these are shown below.

These surfaces and alignments are already created and will just be used as is within this module. No modification will be made to them, except for the possible addition of some information to be discussed later.



## PREPARE MICROSTATION / INROADS DATA & FILES

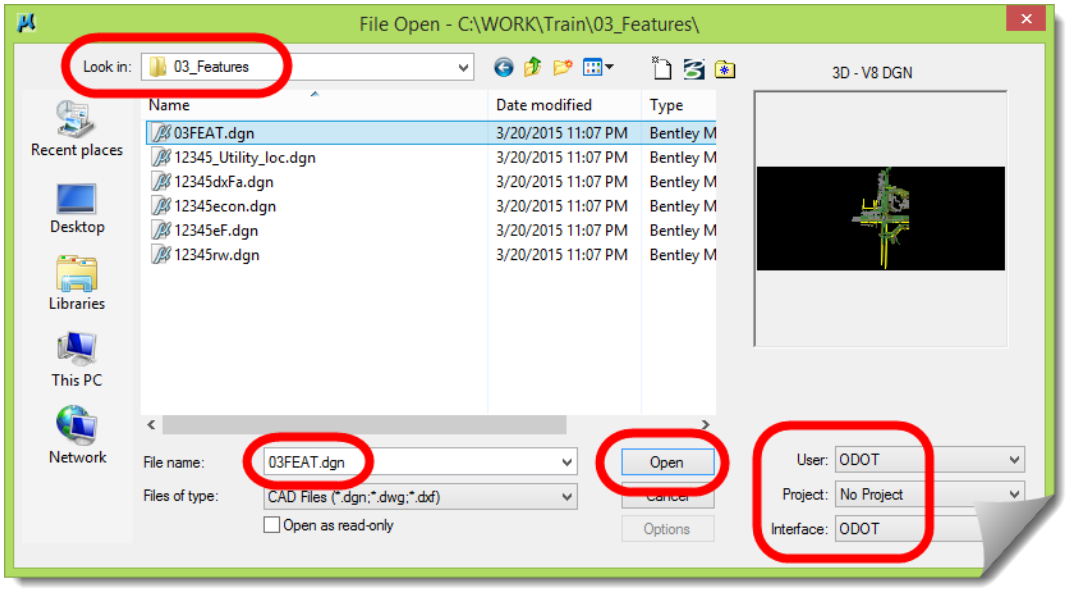
As part of the module start-up, get into the correct DGN, load the module specific XIN and other data files and make sure everything is ready to go.

1) Launch InRoads

   Use whatever mechanism you are familiar with to get the software started.

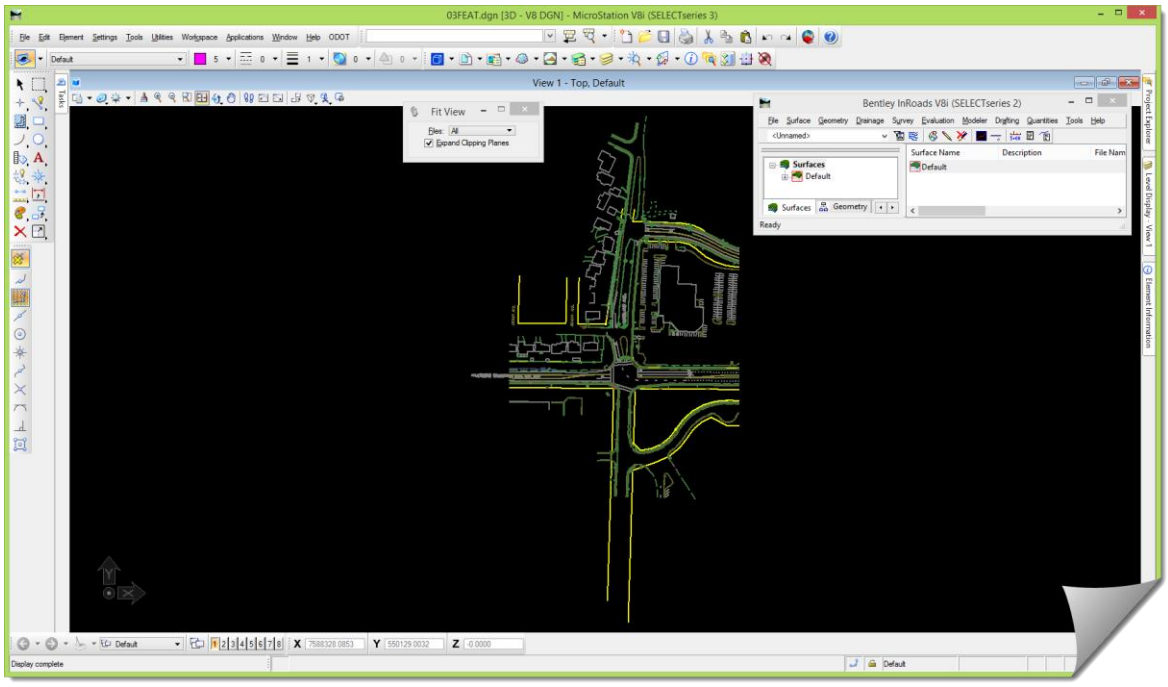
2) When the **MicroStation Manager** opens, set the **User** and **Interface** to **ODOT**.

3) Then browse to the ***C:\WORK\Train\03_Features*** folder and select the **03FEAT.dgn** file and click [**Open**].




Eventually, MicroStation and then InRoads will open.

4) When the drawing opens you should see something like this.



5) Open up a Windows **File Explorer** and browse to the **`03_Features`** folder.
6) Drag & drop the **`Load_03FEAT.rwk`** file into the InRoads interface to load the data files.
7) Verify inside InRoads that the following files have been opened:
   - **`03FEAT.xin`**
   - **`12345FEAT_d.dtm`**
   - **`12345FEAT_og.dtm`**
   - **`12345FEAT.itl`**
   - **`12345FEAT.ird`**
   - **`12345FEAT_d.alg`**

   The **IRD** and **ITL** are only included in case there is interest at some point within this module to access those files. There is currently no formal activity associated with that data in the module.
8) Move forward into the study portion of this module. Feel free to interact with the software as needed during your study in order to solidify any of the items under discussion.

   Following this upcoming study section, there will be a guided hands-on that will walk you through the application of the important tools and work processes.

## Theory - Study

This begins the section where you will usually do some background study to prepare you for what's to come in the practical hands-on section. In this module it's more of a review or refresher.

### PROCESS OVERVIEW

This section will discuss the concepts as well as the application process in anticipation of the later hands on section.

#### Things to Consider

There are a few key areas that should be understood and considered before driving the software along its work process and the first is the subject of **Features** and **Styles**. Following that is the specifics regarding the exact data involved and how it is made available. In this case it's the Right-of-Way. The rest of the subject matter is really woven around the mechanics of using the software and data relative to the functionality of certain select tools.

##### What is a Feature?

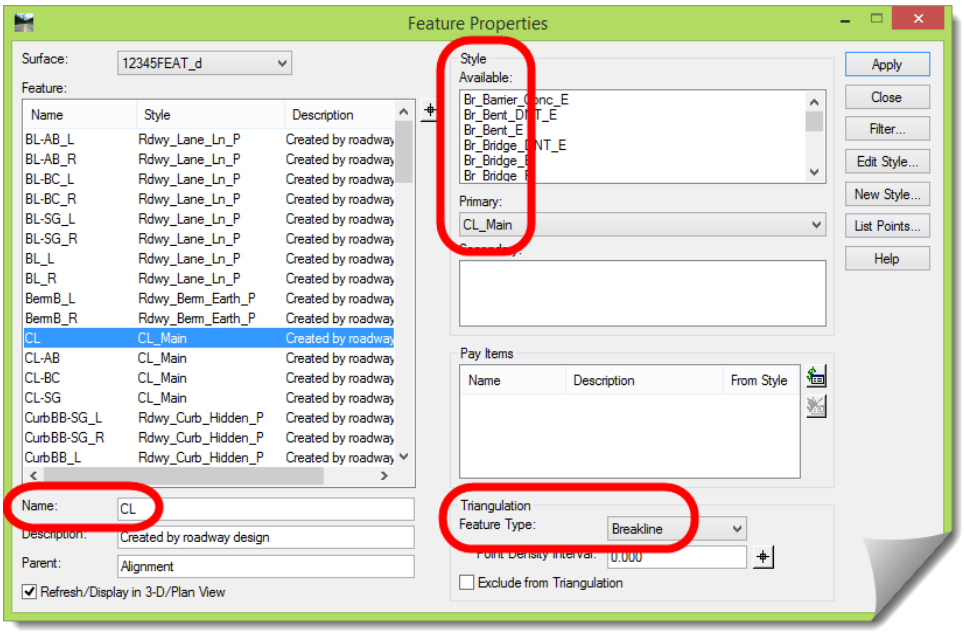
Generally speaking, a **Feature** is anything placed into an InRoads surface model DTM. It can be a single X, Y, Z point, an open line string, or a closed shape. A surface feature can also be at grade, above grade or below grade, and most of the time has some true elevation assigned to its Z axis.

In the "real world," a feature might be a manhole, catch basin, a gutter line, flow line, building footprint, stream bank, a right-of-way line, a domestic water line, a sanitary sewer, a culvert, overhead power lines, or any number of other real physical things.

A **Feature** in InRoads is always assigned three different characteristics or 'tags'.

- **Name** – The user-defined textual *identifier* uniquely assigned to differentiate the data within a surface from other data in that same surface.
- **Style** – A configuration item used for *display*, this tells InRoads where on the drawings this item should typically show up and if so, what its symbology is.
- **Type** – An assignment used for *Triangulation*, instructs InRoads on how to incorporate this particular piece of data into the triangle net formed by the process of **Triangulation**.

All of these characteristics can be seen in the **FEATURE PROPERTIES** dialog box.



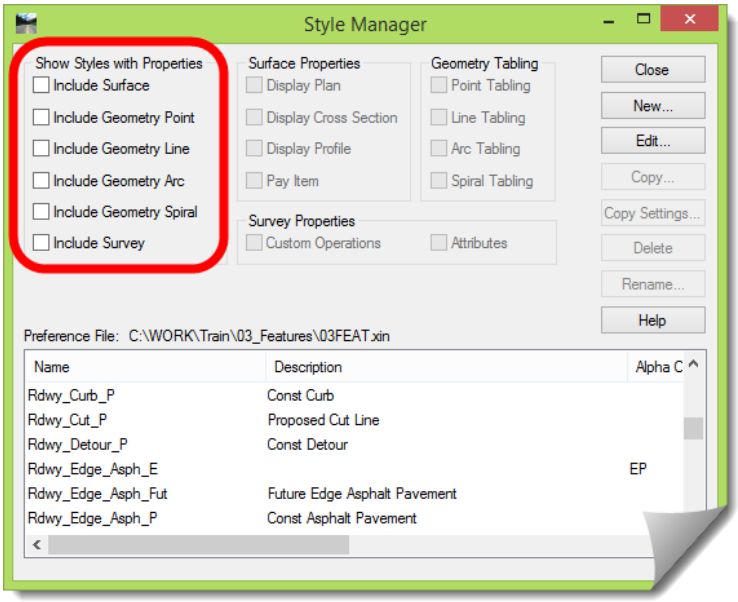

And not only can these characteristics be reviewed here, they can be changed directly in the **FEATURE PROPERTIES** dialog box and written back to the DTM after clicking [**Apply**] in the upper right corner of this tool.

Now let's dig down and take a quick glance at the **Style** characteristic.

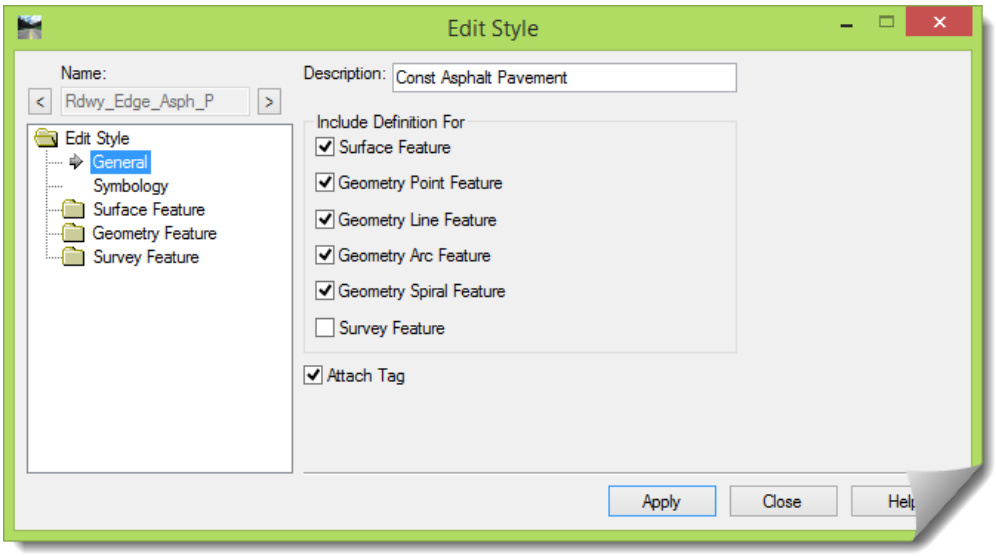
## Feature Styles

A **Style** is a general classification in the InRoads world because there are **Styles** for Geometry data contained in the ALG file, **Styles** for Survey data residing in the FWD file, and **Styles** for Feature data housed in the DTM. All of these **Styles** are stored in the XIN file.

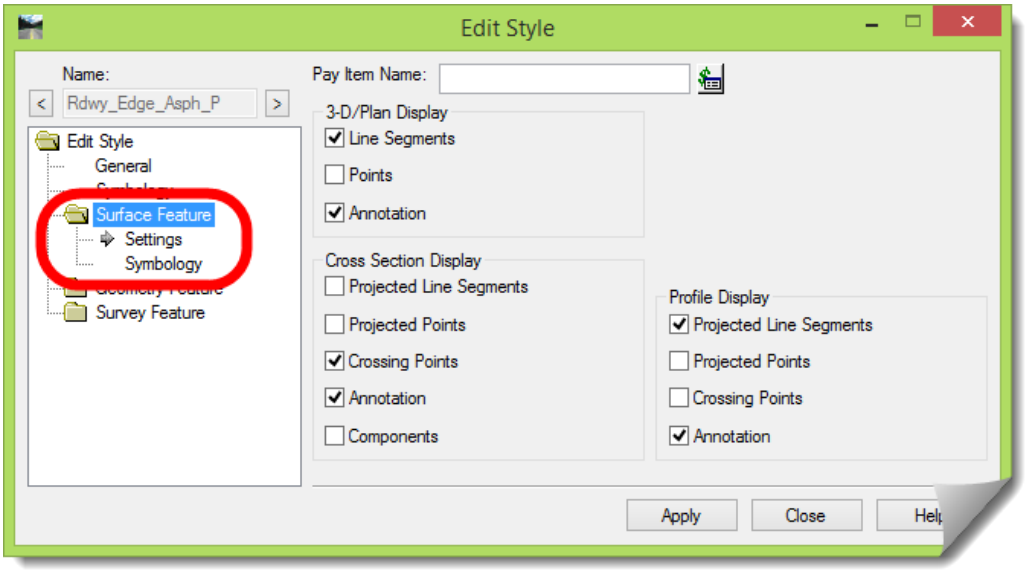
These **Styles** are all managed, not surprisingly, in the **STYLE MANAGER** found under ***INROADS > TOOLS***. And you can see from the dialog box that they involve **Surface**, **Geometry** and **Survey**.



Opening a specific **Style** continues to reveal its association with the 3 main file types – **Surface**, **Geometry** and **Survey**. For this module the focus will be on the Surface configuration since that is the route that will be taken to get the Right-of-Ways displayed on the Cross Sections.




Selecting the **SURFACE FEATURE** leaf (which defaults to opening the **SETTINGS** leaf) exposes the specific Surface **Display** settings.

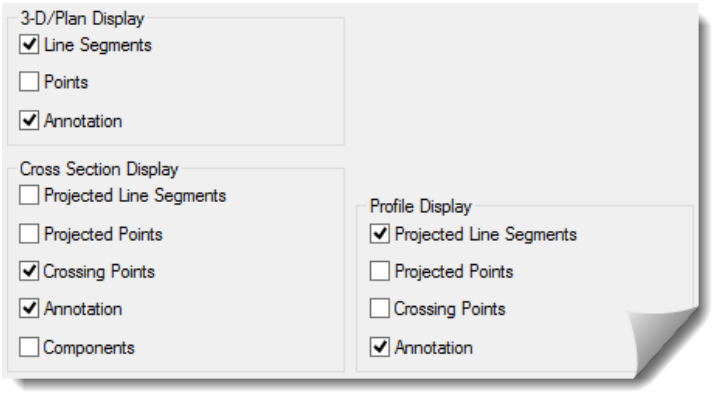



A close look at the toggle options on this dialog box reveals the capability, and expectations, that are designed into this particular **Style** as far as its use within a Surface.

At this stage it is expected that you can 'read' these settings and understand what each of them means to the assigning of this **Style** to a piece of surface data. Very briefly:

- **Annotation** means that there is, and will be text associated with the display of this item in whichever environment it is toggled *on*. In this case – Plan, Profile, and Cross Section
- When it is viewed, the **Plan Display** will be drawn as a **Line**
- This item, **`Rdwy_Edge_Asph_P`** has the capability to be a **Projected Line** in **Profile**
- This item has the capability to be drawn in **Cross Section** as a **Crossing Point**

At this stage of understanding, the expectation is that you understand the implications of each toggle on the **SETTINGS** leaf, except the **Pay Item** which is an advanced function and not currently used at ODOT at the time of this writing. If this is not the case, it is strongly suggested that you return to the InRoads Level 1 material and study the area of **Styles** in more depth.




The main thing to understand here is that InRoads has the capability to place information contained in the surface DTM into the Plan, Profile and Cross Section displays. If you have that desire, or expectation, the **Style** has to support that desire. If the **Style** is not optioned or configured to present itself in that environment it either has to be edited or acknowledged that it is not designed to do that.

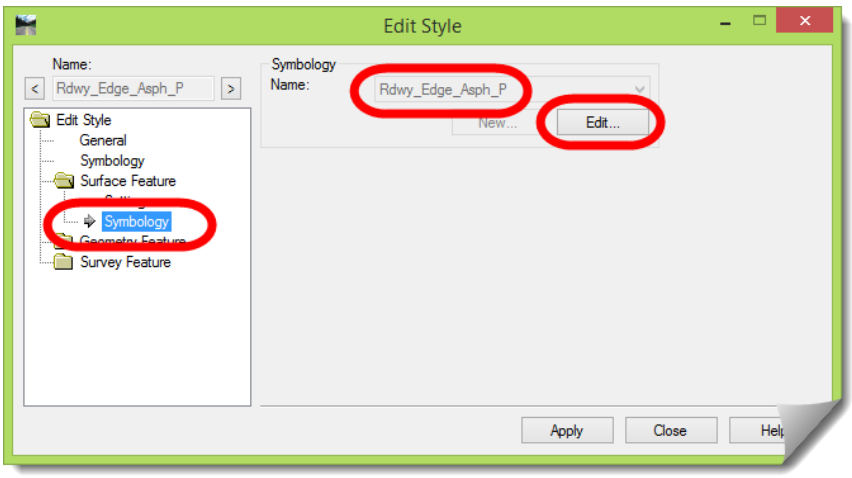
The thought process so far is:

- I have '*something*' in the surface DTM and need it or want it on my Cross Section
  - What is the **Style** that is assigned to that '*something*'?
  - Is that **Style** configured to **Display** on **Cross Section**?
  - Or is there a different **Style** set up for this that should be used instead?
  - If so, assign it to the '*something*' using the **FEATURE PROPERTIES** tool

## Named Symbology

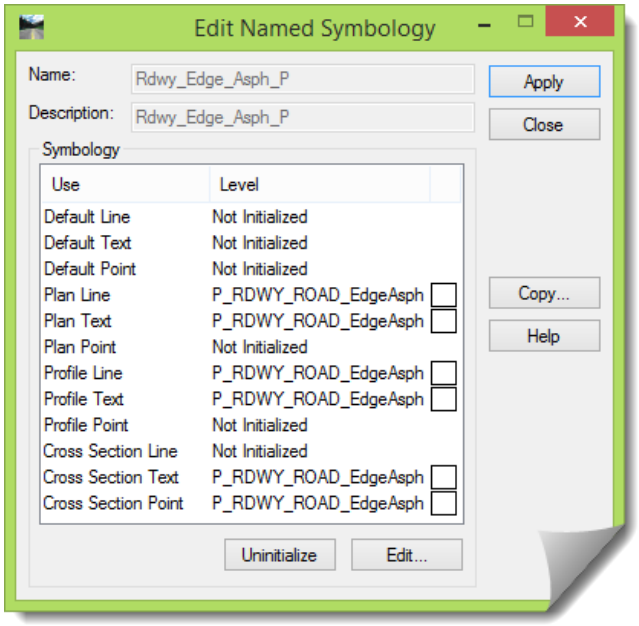
In the **EDIT STYLE** dialog box, below the **SETTINGS** that were just discussed, is the **SYMBOLOGY** leaf.

This area shows the **Named Symbology** that is used for this particular **Style** to control the CAD standards and MicroStation presentation settings. The [**Edit…**] button jumps you into the **NAMED SYMBOLOGY MANAGER** and specifically into **EDIT** mode for that **Named Symbology**.



The **EDIT NAMED SYMBOLOGY** defines all of the CAD standards for the display of this item in MicroStation if and when it is drawn by an InRoads view command.

When a piece of data contained in the Surface (DTM), Geometry (ALG) or Survey (FWD) is drawn by InRoads, this is the area that controls all of the CAD standards associated with that display. As you can see, and should understand, it embraces **Plan**, **Profile** and **Cross Section** display as well as the finer breakdown whether it's a **Line**, **Point** or **Text**.




Now let's incorporate this into the thought process:

- I have '*something*' in the surface DTM and need it or want it on my Profile
  - What is the **Style** that is assigned to that '*something*'?
  - Is that **Style** configured to **Display** on **Cross Section**?
  - If the **Style** is correctly configured to **Display** on **Cross Section**, then…
  - What is the **Named Symbology** that is controlling the CAD display?
  - How is the assigned **Named Symbology** configured to display the '*something*' on the Cross Section?

A single **Named Symbology** has 12 different **Use** settings. A discussion of these settings is typically a part of an *InRoads Level 1* class; however without repetitive interaction with these settings it is understandable that they may be a little fuzzy. If that is the case, then it is suggested that you return to your *InRoads Level 1* materials and study the **NAMED SYMBOLOGY MANAGER** section of that class.

The subject of **Styles** and **Named Symbologies** is a very critical one in the grand scheme of ensuring that the data in the surface, geometry and survey files are displayed properly. The fundamental nature of this topic cannot be stressed enough.

**ALERT**: If the area of InRoads **Styles** and **Named Symbologies** is still unclear, your ability to understand how InRoads is accomplishing and controlling the display of its data from the **Surface** and **Geometry** will be impaired. If this is the case, further study is recommended.

## Surface Data Creation

The most significant and important InRoads project data is contain in either the **Surface** DTM or the **Geometry** ALG. The other files like the ITL and IRD are merely stepping stones or intermediary files used to generate the final **Surface** DTM. This is not meant to minimize the importance of certain files, but to emphasize the value of the **Surface** DTM and **Geometry** ALG.

In this module the focus will be on the **Surface** DTM as this will be the InRoads project container that will be used to place the eventual information into the MicroStation display, namely the Right-of-Way into Cross Sections.

So the subject now turns to surface '*data*'.

There are a number of ways to get data into a surface:

- From MicroStation graphics that have been drawn
- Pulling it from the InRoads Geometry ALG file, and more or less doing a copy / paste from the ALG to the DTM.
- Placing it directly in the DTM with the **DESIGN SURFACE** category of tools found in InRoads

Each method has its work process and tools to accomplish the task.

This module will focus on the extraction of MicroStation graphics since that is a very common and powerful technique when the information needed has already been drawn in a DGN file.

In the case here, we'll be using the Right-of-Way graphics that have been drawn for this project in one of the reference files (shown here in yellow).


## Potential Uses

What's covered here is the ability to put '*something*' into the surface DTM and leverage the effort of that placement with the payback of being able to view that '*something*' in Plan, Profile or Cross Section at will, when and if you need it.

Where can this be applied? As a general subject this topic is only limited by the imagination.

But looking at it from a project perspective, one would only need to identify what is required from a sheet construction standpoint. What information do you need to put on your plans, profiles and cross sections? And then determining what could be automated through a display using InRoads. One aspect of this activity is just an attempt to minimize the amount of hand-work that has to be done. Beyond that, there is the 'bonus' pay-off that goes beyond what was only 'required' and can now extend into getting an even bigger bang for the effort buck. It's not doing something just because you can, it's doing something because of the added value.

The next question becomes how to most efficiently get the information into the surface DTM so that it can be utilized through the display process.

Here are some potential applications:

- Right-of-Way markers in Cross Sections
- Lane Striping shown in Plan view
- Guardrails shown in Plan view and on Cross Sections
- Underground Utilities viewable in Plan, Profile and Cross Section
- Overhead clearances from Bridges or Power lines shown in Profile or Cross Section

## Techniques and Tools

The specific tools and techniques are highly dependent on the location of the source information as well as the intended or desired outcome, or use.

Let's take our Right-of-Way, the subject of this module. How and where does it currently exist? Is it in a Legal Description? Is it in survey notes? Has it been drawn in MicroStation? Was it laid out as a Horizontal Alignment in an InRoads Geometry Project? Is it already in the InRoads surface DTM? So many questions, with the answer directing the subsequent course of the work process.

Moving forward with this module we will be assuming that we want the data from wherever it currently is, ultimately to reside in the surface DTM.

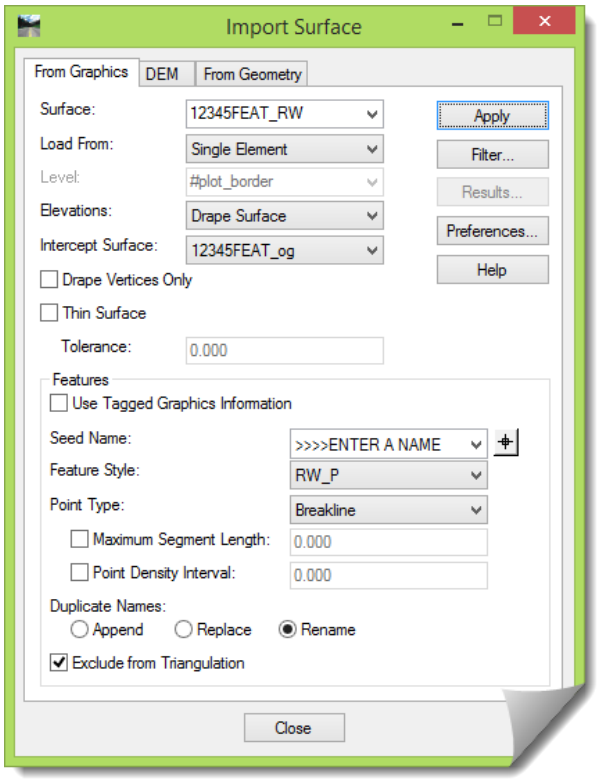
### Import from Graphics

If the information is contained in a DGN file, one approach to get it into the surface is to use the **IMPORT SURFACE** tool found under the InRoads menu ***FILE > IMPORT > SURFACE***, and more specifically, using the **FROM GRAPHICS** tab.

This specific tool will be identified in the workflow described later, as well as in the hands-on, but will not be covered in detail as it is covered already in the *InRoads Level 1* class.

This tool can be used to import graphics a variety of ways.

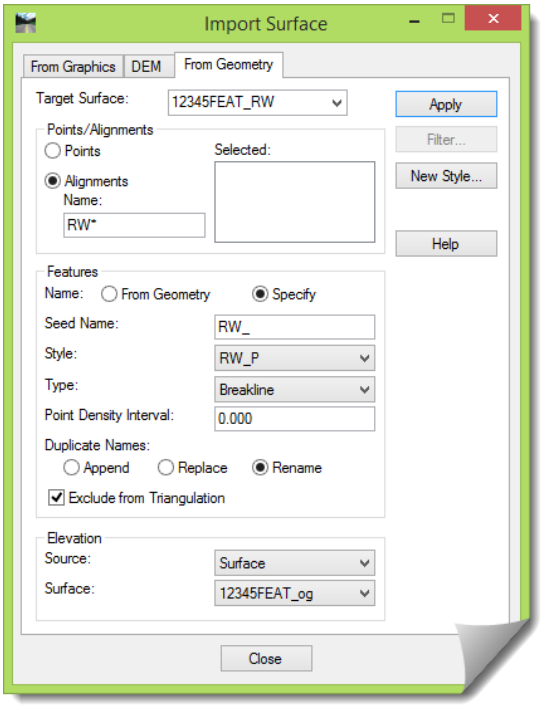
- 2D Graphics
- 3D Graphics
- From specific Levels
- By selecting it or pre-selecting it
- By using a Fence



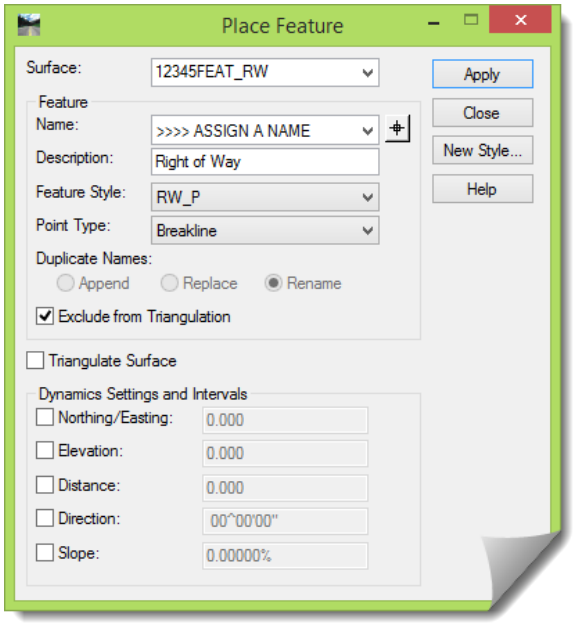
## Other Methods

Beyond the use of importing graphical information, there are other commands that are used depending on where the source data is, and the nature of that data along with its intended purpose.

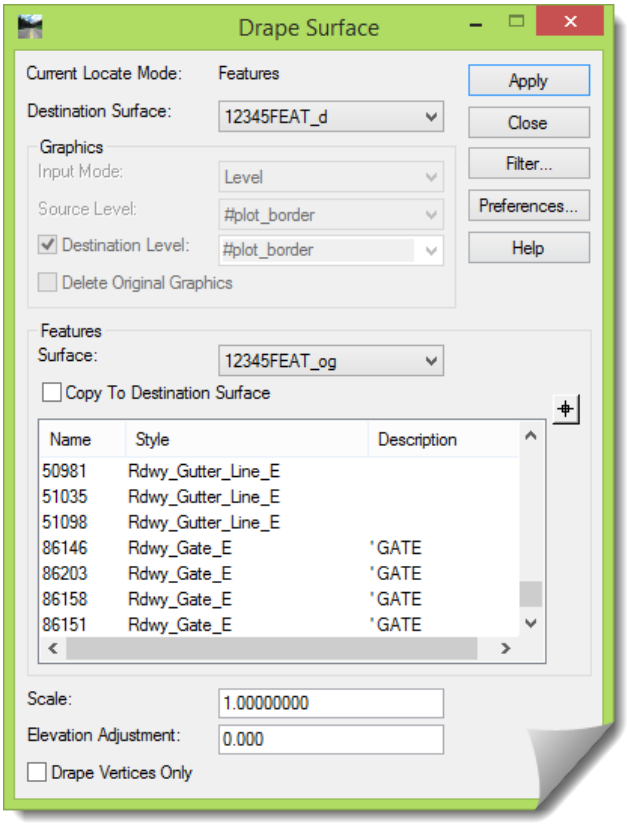
- **FROM GEOMETRY** – As mentioned earlier, if the information under consideration, as in our case the Right-of-Way, currently existed in the Geometry ALG, the From Geometry tool would be used to essentially copy that geometry directly from the ALG to the DTM.




- **PLACE FEATURE** – This is another tool, found as part of the ***SURFACE > DESIGN SURFACE*** tool set, which provides the capability to enter surface information directly into a DTM.



- **DRAPE SURFACE** – This particular tool, also found as part of the ***SURFACE > DESIGN SURFACE*** tool set, is not a method of pushing or pulling information into the surface like the other methods, but is a tool that is used within a specific workflow. Its application is to assign elevations to either graphical or surface data that already exists. It doesn't generate the data, but addresses the elevational side of the data, relative to a pre-existing surface. This is also covered in the *InRoads Level 1* class.




## Data Workflows

Here are the two key workflows for getting data into the InRoads Surface and into the DGN file.

- **Import From Graphics**
  - Have the DGN file with the graphics available as either the active DGN or Reference
  - Make sure the graphics are either in a large single piece or are chained together
  - Use the **FROM GRAPHICS** tab of the **IMPORT SURFACE** command to bring the graphics into a surface
  - Use the **FEATURE PROPERTIES** tool to verify that the data is properly stored in the surface and has the correct **Style** assigned to it.
  - If these cross sections are part of a set of construction drawings, then establish any required **Global Scale Factor** settings based on the scale of the final drawings. This command can be found under the InRoads **TOOLS** menu.
  - Use the **UPDATE CROSS SECTION** command, now combined with various other Cross Section related commands, found under ***EVALUATION > CROSS SECTIONS***, to display the data onto the Cross Sections.

- **Import From Geometry**
  - Have the ALG file with the alignments in it loaded into InRoads
  - Use the **FROM GEOMETRY** tab of the **IMPORT SURFACE** command to bring the Horizontal Alignments into a surface
  - Finalize the elevations of the ROW features using the **DRAPE SURFACE** command
  - Use the **FEATURE PROPERTIES** tool to verify that the data is properly stored in the surface and has the correct **Style** assigned to it.
  - If these cross sections are part of a set of construction drawings, then establish any required **Global Scale Factor** settings based on the scale of the final drawings.
  - Use the **UPDATE CROSS SECTION** command, now combined with various other Cross Section related commands, found under ***EVALUATION > CROSS SECTIONS***, to display the data onto the Cross Sections.

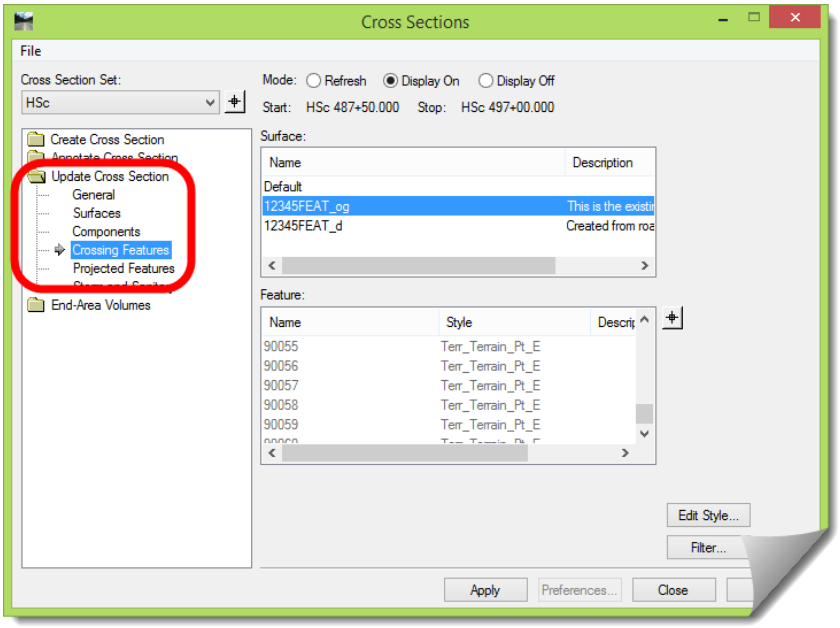
As you can see, the process of getting the Right-of-Way markers onto a set of cross sections is very similar, and the only variation is during the import process and finalizing the feature elevations using the Drape Surface tool.

## Update Plan / Profile / Cross Section tools

The last step in this process involving the Right-of-Way is to get it onto the cross sections. This can be done during the initial creation of the cross sections, or after they have been created. Placing them on the cross sections after they have been created is the recommended workflow since it provides the user with more control over the information that goes onto the cross sections. This is simply because there is no easy, intuitive way to control the display of specific surface features on a set of cross sections at the time of the creation of the cross sections.

The **UPDATE CROSS SECTION** command has recently been merged with three other cross section related commands. This combined set of commands is called **CROSS SECTIONS** and is found under **EVALUATION > CROSS SECTION**.

This is another command that is covered in the *InRoads Level 1* class, and essentially allows the user to move surface information in and out of a set of pre-created cross sections.



# Practical Application - Hands On Lab Exercises

This following section consists of the guided application of the tools and techniques. This will require you to use the applicable sample files and work through the exercise while studying any additional content integrated into the steps. Refer back to any earlier material as needed.

## UNDERSTANDING THE DETAILS

Now that you've gone through the brief study of the theory, this section will be taking that knowledge and correlating it with the hands-on activity and complete work process.

### Review any relevant project data

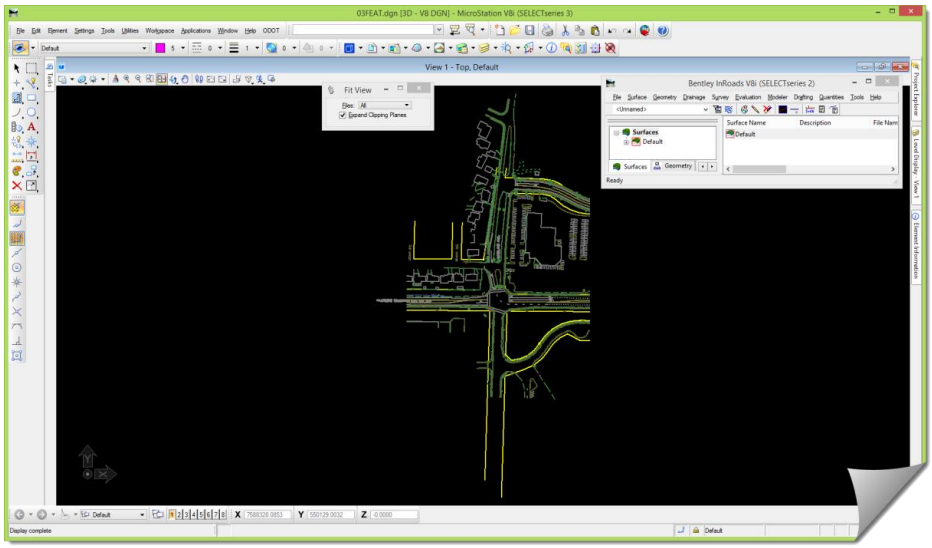
Let's start by doing a quick review of the relevant MicroStation and InRoads files.

At this point, just as a recap, you should be in MicroStation and have the **03FEAT.dgn** file open. You should also have InRoads open, and having loaded the RWK, should have the **03FEAT.xin** open, as well as the two surface DTMs and the **12345FEAT_d** Geometry Project.

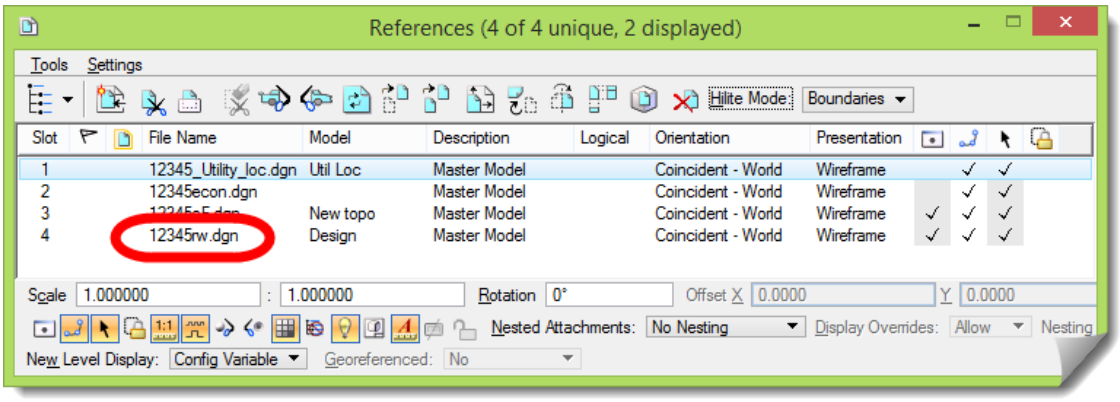
If you don't have these open, please open this information now.

1) You should be looking at something like this:

If you aren't, see what you can do to get into this position.



2) Open up the MicroStation **REFERENCE** dialog box and you'll see that there are a number of references attached to the drawing that you are in.



The references contain information about the base drawing, utilities, existing contours and the right-of-way. The one key reference used during this module is the **12345rw.dgn** that contains the Right-of-Way graphics. We will use these graphics as a launching point toward placing ROW markers on the Cross Sections for this roadway.

3) Toggle *on* and *off* the **12345rw.dgn Reference** so you can see which one it is. (It contains the yellow line work.) Leave it on once you know which displayed line work it contains, and [**Close**] the **References** dialog.

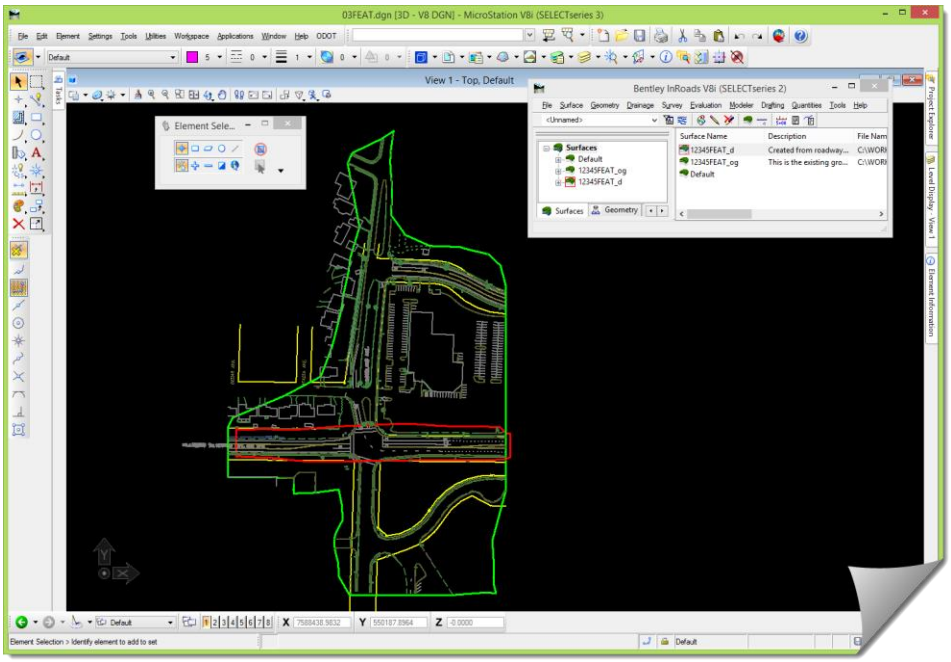
The MicroStation file that you are in right now is completely empty. And when it comes to the exercises coming up, it really won't matter much because there won't be too much important drawing activity in this module.

Now let's take a look at the InRoads data that is currently loaded.

4) Go to the **PERIMETER** command under ***SURFACE > VIEW SURFACE***.

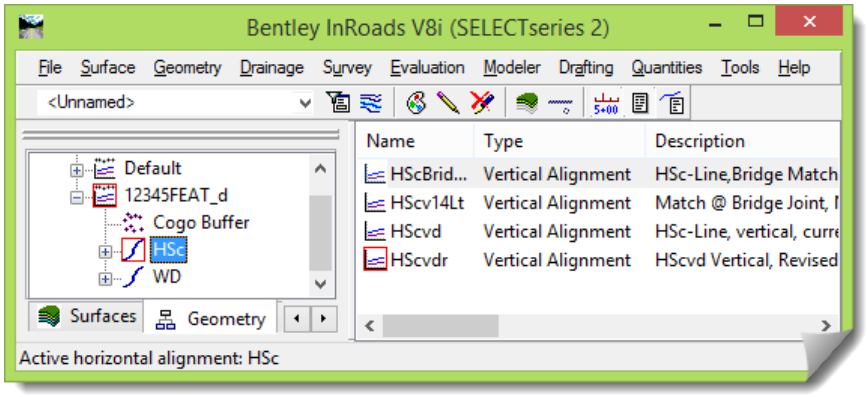
5) View the **PERIMETER** of the two surfaces that are loaded so you can see their extents.

It should look something like this once you are done.



Later in this module we'll need an alignment in the **Geometry Project**, so let's take a look at that.

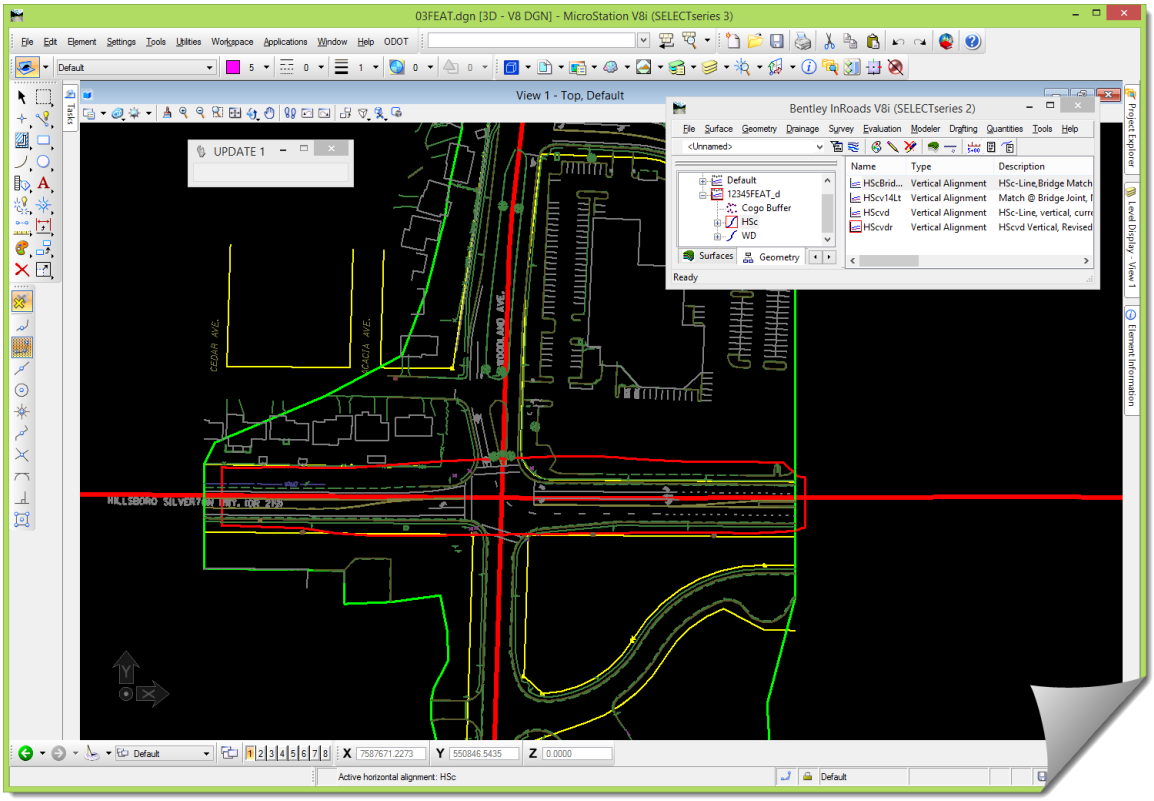
6) Go to the **GEOMETRY** tab on the **Workspace Bar** and expand **12345FEAT_d**.



7) Scroll down until you see the **HSc** alignment (Hillsboro-Silverton Hwy). Right-click on that alignment and **View** it.
8) There is also another alignment there that might be used named **WD** (Woodland Ave). Right-click on that alignment also and **View** it.

You should see an alignment running East-West, and also notice that it's running right through the **12345FEAT_d** surface. That surface is a design that was created along the alignment **HSc**.

The other alignment, **WD**, is running North-South.




9) Now that you know the areas of each surface, along with the alignments that we'll be using later, go ahead and delete those graphics.

## Review any relevant ODOT CAD / InRoads ITL / XIN information

In these exercises you will be using some premade surfaces and geometry that were created using the ODOT standards. These InRoads files have the usual **Styles** and **Named Symbologies** applied to them, and you will be just moving ahead with the work that has been done on these files.

If you have the interest to look at these models and their **Features** in more detail, feel free to review them in the **FEATURE PROPERTIES**, or **SURFACE PROPERTIES** tools.

Also, regarding the **Preferences** that were used earlier, or will be used later, they are of little importance in the grand scheme of what you need to learn from this module. It is expected that when you go to the **VIEW PERIMETER**, or **VIEW TRIANGLE** command, that you know what **Preference** to load to view a particular surface.

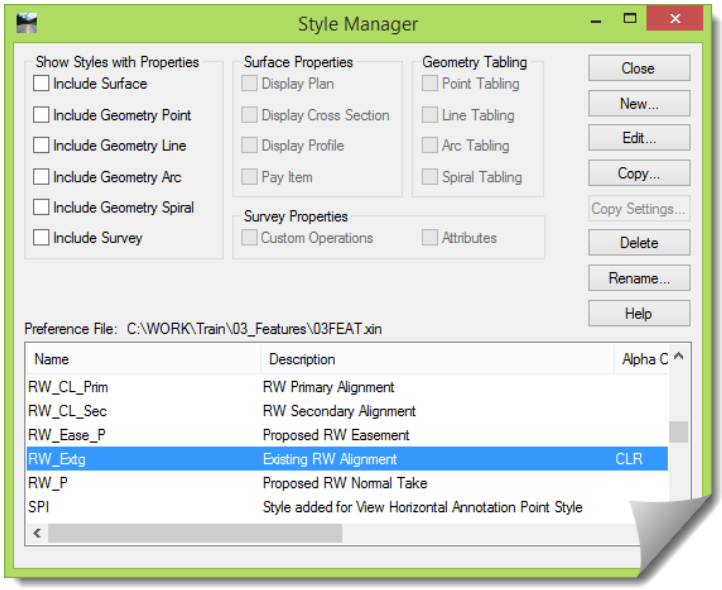
Because of the focus of this module, if there is any relevant correlation between the ODOT CAD Standards or a particular **Preference** or **Style** and the exercise or step that you are performing, it will be pointed out at that time.

With that said, this module is going to be focusing on the Right-of-Way, and will be using the ODOT **Style** and **Named Symbology** defined for this application. Therefore let's do a review of those settings now.

Let's follow the breadcrumb trail backwards by starting with the **Style**, leading to the **Named Symbology**, and ending at the **Cell** Library.

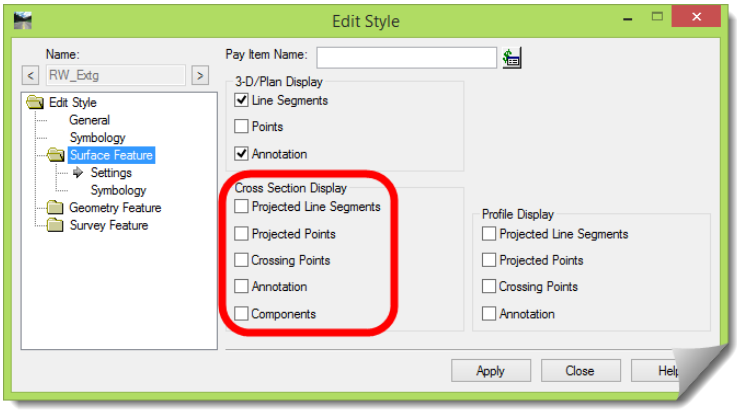
**TIP**: As a diagnostic breadcrumb trail – the **Style** assigned to a surface **Feature** tells it that it should display. The **Named Symbology** attached to the **Style** tells it how it should display. The **Named Symbology** is 'attached' or making 'calls' to the MicroStation CAD Standards to locate the actual Cell, Line Style, Font that should be used.

1) Open the InRoads **STYLE MANAGER** and find the **Style** called **`RW_Extg`** used for **Existing RW Alignments**.




2) Double-click on the **`RW_Extg` Style** to open it for review, then go to the **SETTINGS** leaf under **SURFACE FEATURE**.

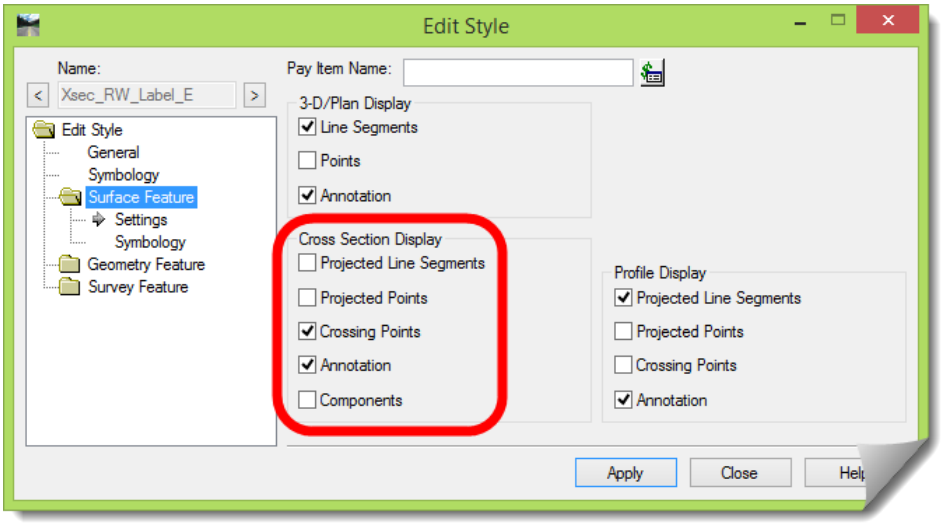
Notice how it is configured. Is this set up for markers on Cross Sections? No, it is not. This is only set up for **Plan Display**.



3) [**Close**] this **Style** and find one called **`Xsec_RW_Label_E`** and double-click on it to review it.

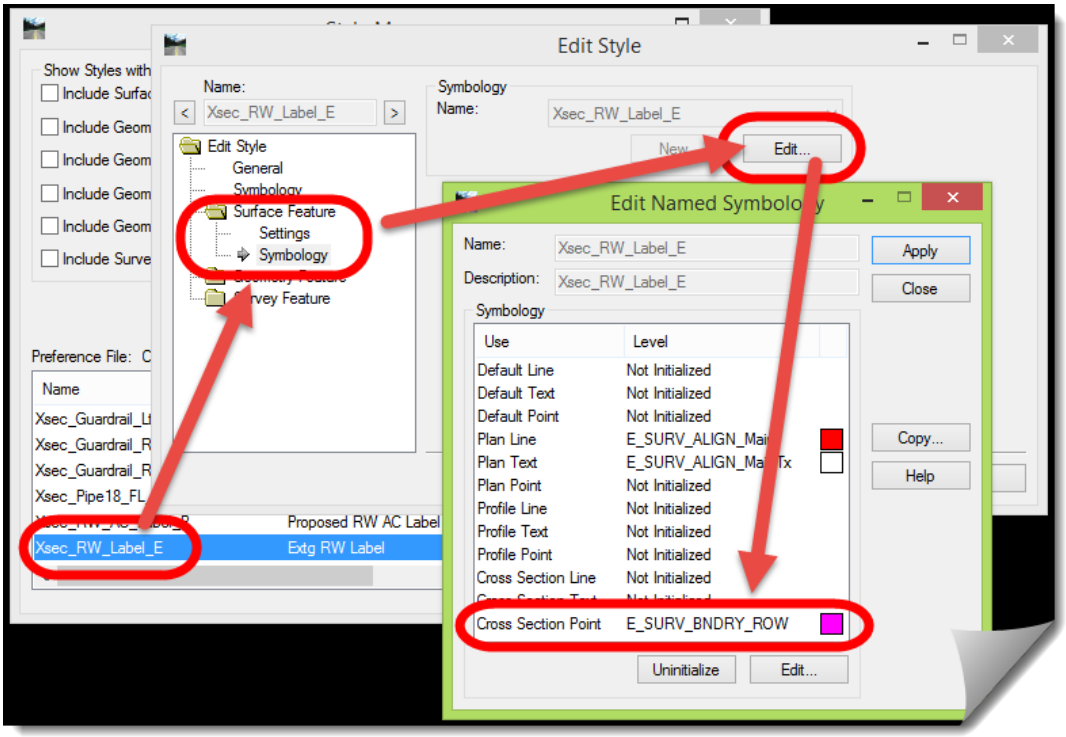
4) Go to the **SETTINGS** leaf under **SURFACE FEATURE**.

Notice how it is configured. Is this set up for markers on Cross Sections? It looks like it is, but don't be too hasty. Remember the bread-crumb trail. The **Style** is only one part of this thread.




5) Go to the **SYMBOLOGY** leaf and click [**Edit…**] and notice the **Cross Section Point** in the **Use** area of that dialog box.

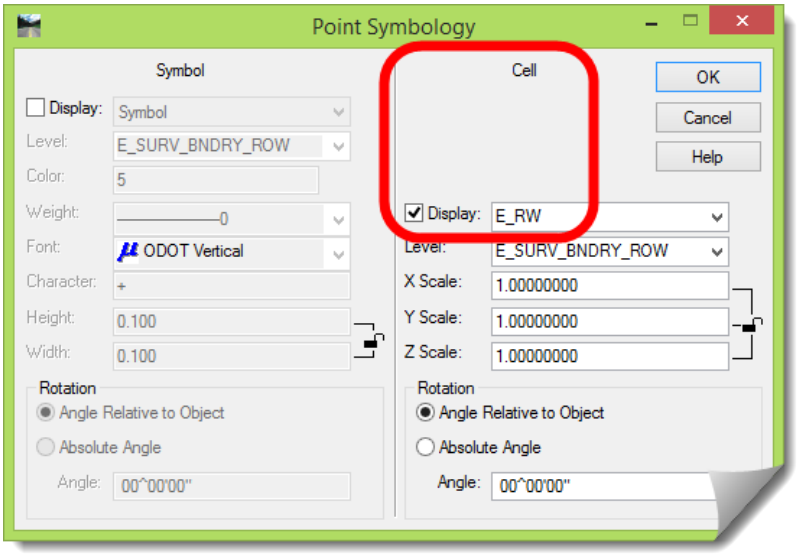
Now it is confirmed that the **Style** is set up to tell the surface Feature that it should display in Cross Section, and the associated **NAMED SYMBOLOGY** is designed to display something.




Now let's see what it's configured to display.

6) Double-click on the **Cross Section Point** row of the **EDIT NAMED SYMBOLOGY** dialog box.

Okay, it's set up to display a **Cell** called **`E_RW`**. That's good.



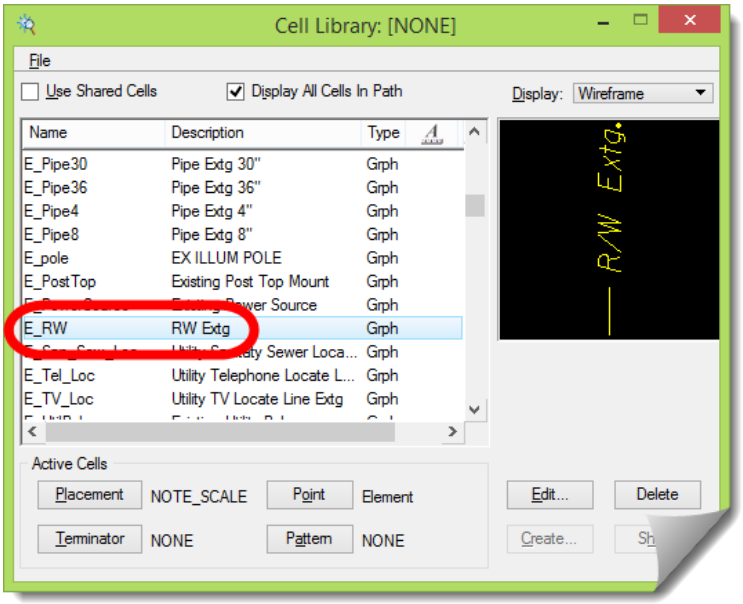

Now let's see what that **Cell** looks like, because if it's just a pinhead dot, it might not catch your eye as being the correct display.

7) Back your way out and [**Cancel**] or [**Close**] each dialog box that you just opened.

8) Go to the ***MICROSTATION MAIN MENU > ELEMENT > CELLS***

9) On the **CELL LIBRARY** dialog box, toggle *on* the option to **Display All Cells in Path**, and hunt down for the **`E_RW`** cell **Name**.

And that is what it looks like and now you know what to expect when you display your Right-of-Way onto your cross sections when you use the **Style** called **`Xsec_RW_Label_E`**.




Eventually, you will know what key **Styles** will display, and what they are designed to do. But until that time, this exercise can provide very valuable insight into the mechanics of the software along with the expected results.

## SCENARIO 1 - IMPORT FROM GRAPHICS

Continuing on from where the module just left off, the following steps will walk you through the process of placing Right-of-Way markers onto a set of InRoads cross sections.

### Import Surface - From Graphics

Let's first set up the MicroStation file in preparation for the initial steps below.

1) If you haven't yet done it, select all the graphics in the active DGN file and delete them

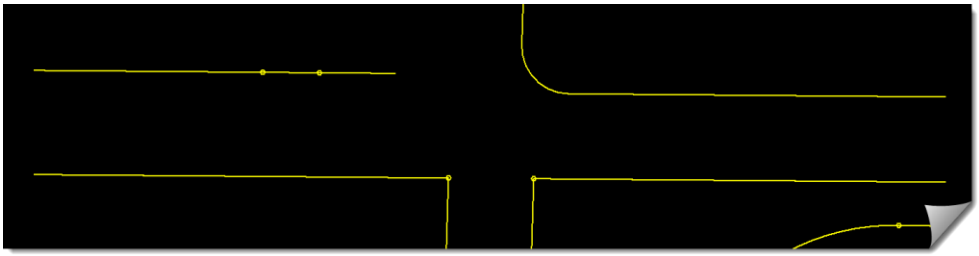
   We'll do one graphic to show the process, and then it can be repeated to reinforce the procedure.

2) Window into the East-West road.

   For our purpose here these will be referred to by their quadrant – **SW**, **NW**, **NE** and **SE**.


   You will do the **SW** piece of the Right-of-Way first.

3) Go to **REFERENCES** and turn all of them *off* except for the Right-of-Way reference so that it's very easy to select and you don't accidentally select another reference file graphic.



Once this tool is set up and [**Apply**] is selected, it's going to prompt you to select the element to import. For this reason you want to make sure your confidence is high relative to where your graphic is and which one(s) you will be selecting.

**TIP**: The **IMPORT SURFACE** tool, **FROM GRAPHICS** tab, can import graphics from either the active 'live' file or from a Reference file. For this reason it's a good idea to fully understand where your graphics are so that you don't select and import an inappropriate graphic.

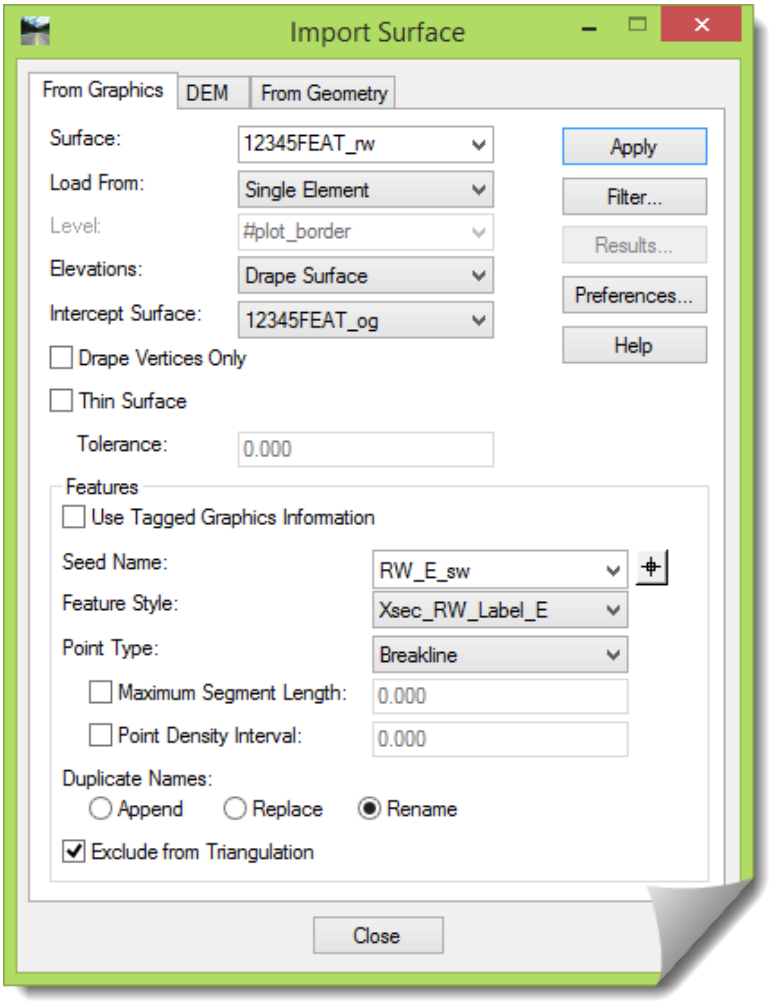
**TIP**: When using the **IMPORT SURFACE** tool, **FROM GRAPHICS** tab, with the **Load From** set to **Single Element**, you will be prompted to select the elements to import one at a time. If you have several elements you can use the MicroStation Selection tool to pre-select them all. Then, when you [**Apply**] the command, it will prompt if you want to "*Use the elements in the Selection Set*", instead of prompting for each element individually.

4) Go to the InRoads main menu ***File > Import > Surface*** and then to the **From Graphics** tab.

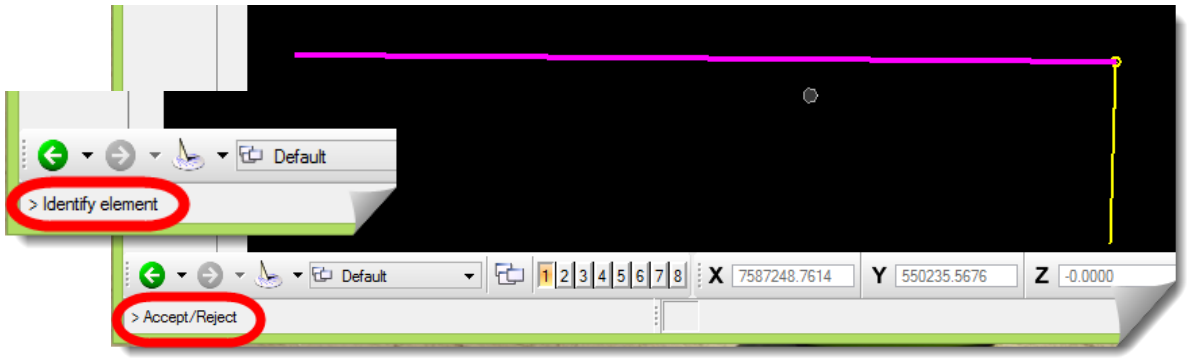
As mentioned earlier, this tool is covered in the *InRoads Level 1* class therefore will only be superficially explained.

5) Establish the settings per the listing below:

- Enter a **Surface:** as **`12345FEAT_rw`**, this will create a new surface that will contain these new Right-of-Way Features. You could have also selected one of the surfaces already loaded and it would have placed these new features into that surface. The exact surface that contains the features is not as important as the creation of the features themselves since they could easily be moved and copied between surfaces later.
- **Load From**: **Single Element** since you will be selecting the element to import.
- **Elevations: Drape Surface** because the desire is to have these new features drawn from the OG surface like the picture on the first page of this module. The design surface could have also been used; although that would mean that the ROW would have to be over the extents of that DTM which may not always be the case.
- **Intercept Surface:** Set this to **`12345FEAT_og`** which is the existing ground DTM
- **Seed Name:** Enter **`RW_E_sw`** for the south-west existing ROW
- **Feature Style:** As we have already reviewed should be **`Xsec_RW_Label_E`**
- **Exclude from Triangulation** should be toggled *on*

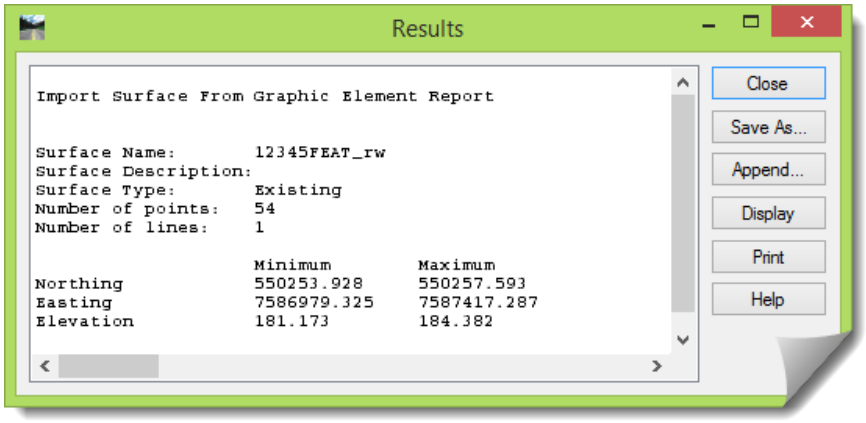


6) [**Apply**] the command and the dialog box will collapse. Follow the Prompts to > *Identify element* and then > *Accept/Reject* the selection.

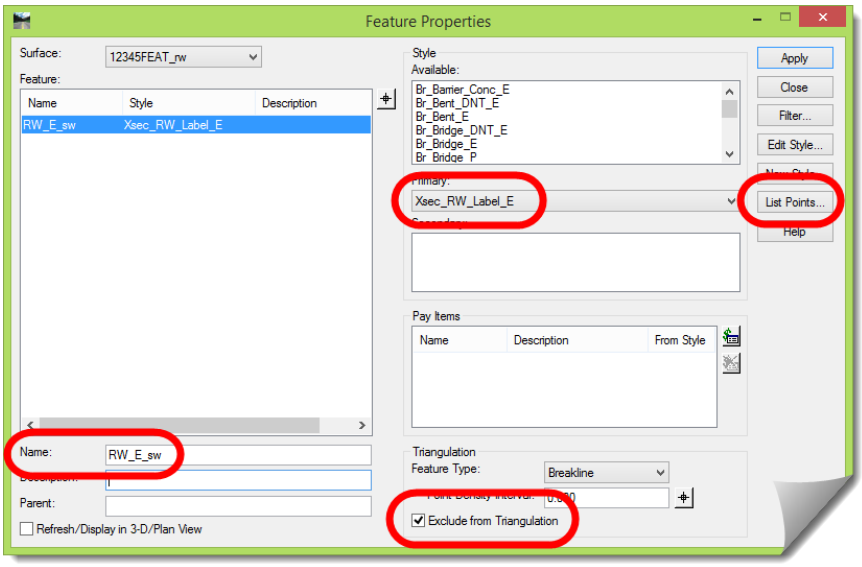



7) When the **Import Surface** tool returns, click the [**Results…**] button to verify the import.

Always click the [**Results…**] button directly after applying this tool. It's an excellent sanity check to verify that everything is moving forward reasonably.

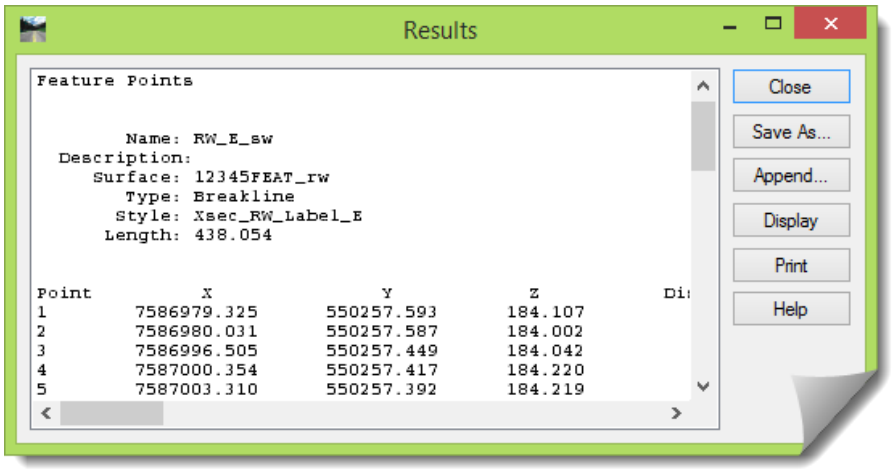



8) Do another verification of the import by going to ***Surface > Features > Feature Properties***.




The key items to verify are the **Name**, the **Style** and the **Exclude from Triangulation** option. Beyond that a **Description** can be added for improved clarity later, and lastly do a **List Points…**

9) On the **FEATURE PROPERTIES** dialog box, click the [**List Points…**] button to do a check of the elevations assigned to this **Feature**.




These elevations can be checked to be in the ballpark either by your understanding of the terrain elevations or by doing some quick **TRACKING** along the surface in that area.

10) [**Close**] any open dialog boxes and then [**Save**] the **`12345FEAT_rw`** surface to the module folder.

Now that the Right-of-Way has been imported, the next step is to put it on the cross sections.

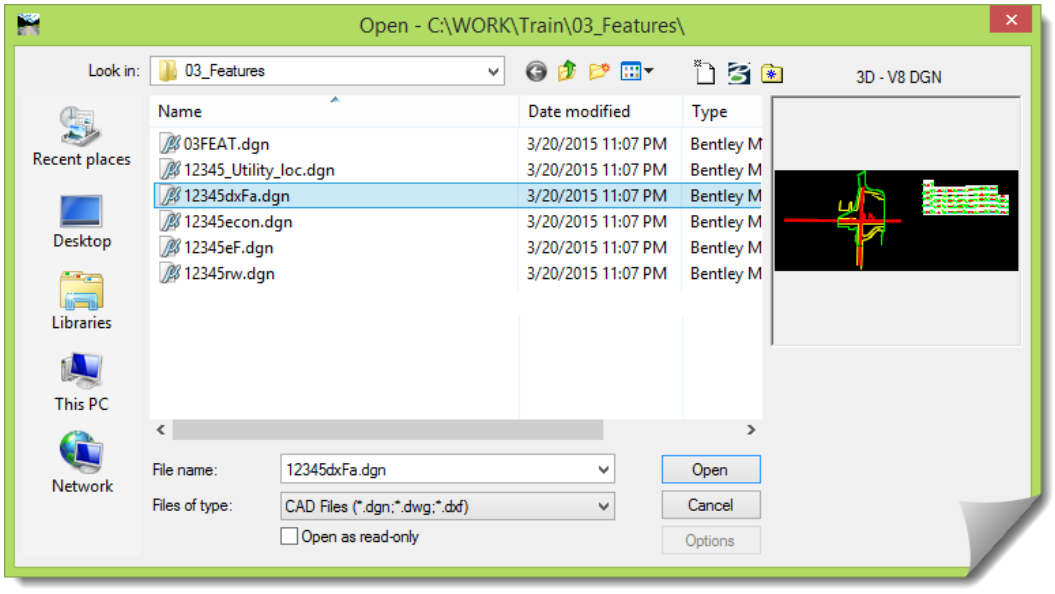
After that has been shown and the workflow has been completed, you will return and bring in, and display, the remaining Right-of-Way legs to reinforce the overall process with some practice.

## Updating the Cross Sections

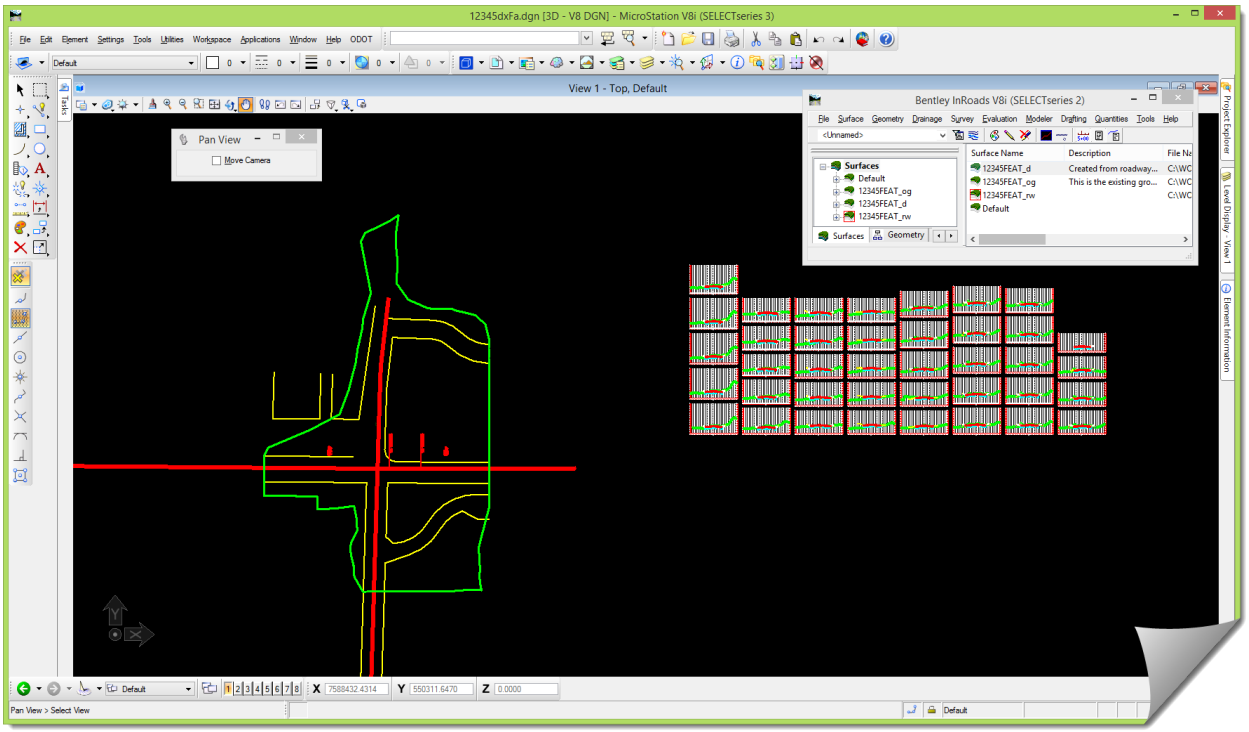
This module was constructed to simulate a scenario where the project cross sections were already created. So the next thing that will be done is to get into that DGN file.

Of course you can always just create a new set of cross sections to do this, and there is nothing special about this pre-created set.

1) Go to ***MICROSTATION > FILE > OPEN*** and open the Cross Section DGN **`12345dxFa.dgn`**

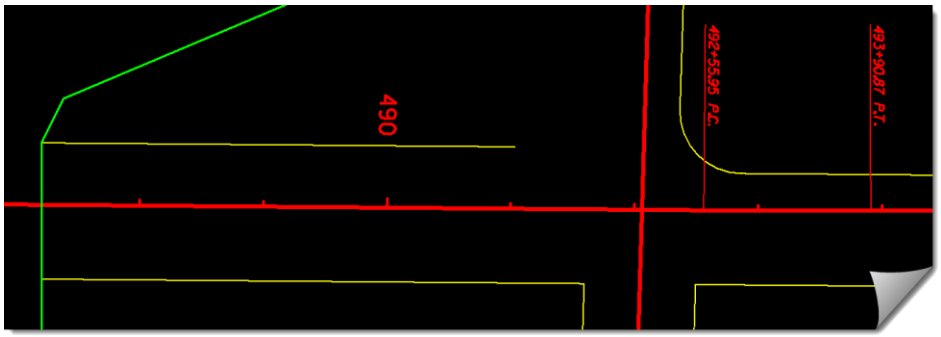


This file has the familiar display of the surface perimeters, horizontal alignments, ROW reference lines as well as a set of cross sections.

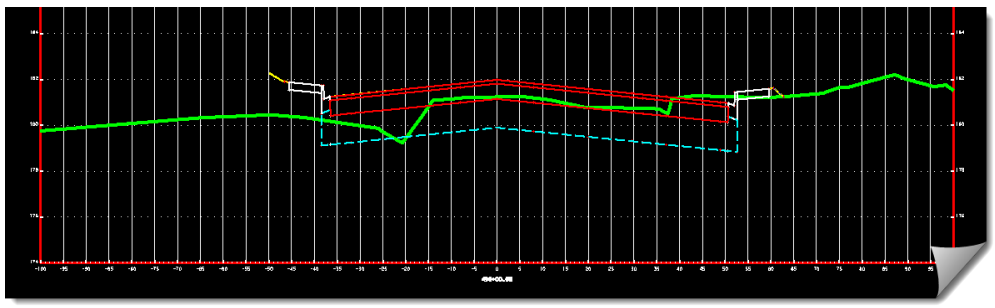



If you do a little **HORIZONTAL ALIGNMENT TRACKING**, or zoom into the plan graphics, you'll find that the area where the ROW was imported is around **Station 490+00** along the mainline alignment.

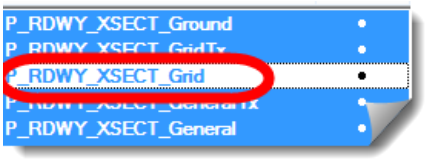
So let's move over and look at some cross sections in that area so when we put the ROW marker on the sections we'll see it, because we don't want to be looking at a cross section where it won't display and start believing that something in the process failed.

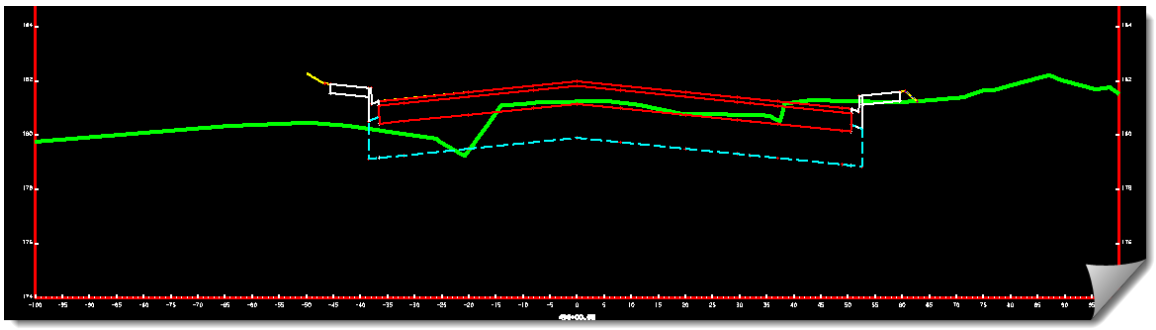



2) Window around the **490+00** cross section

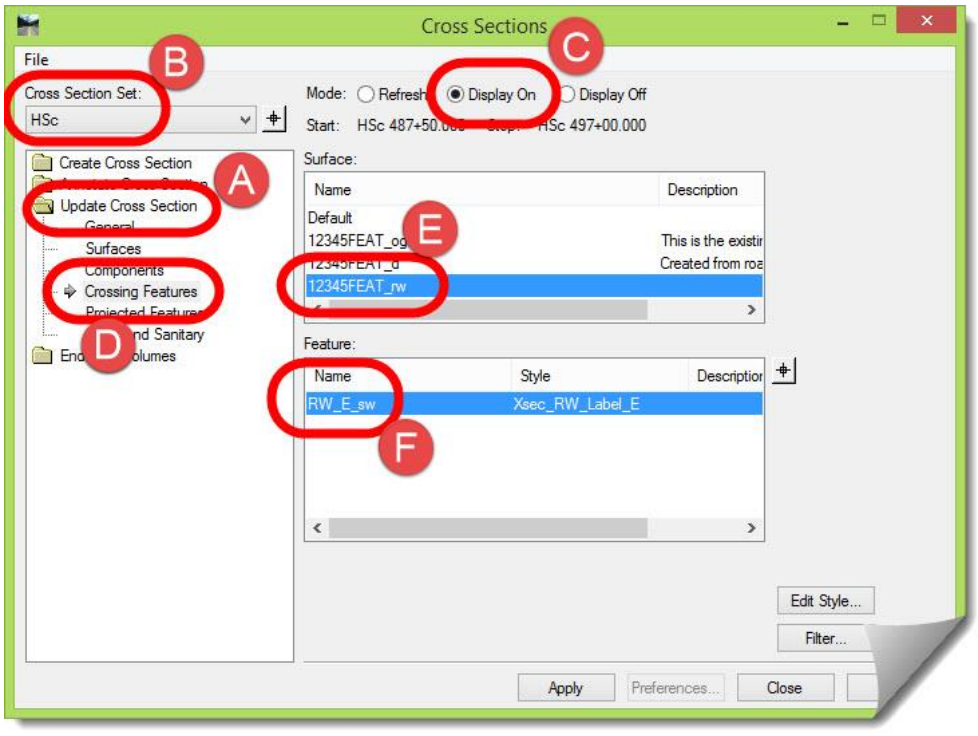


Now, just for clarity and you don't have to do this, the grid level will be turned off so that the ROW marker is easier to see when it appears.



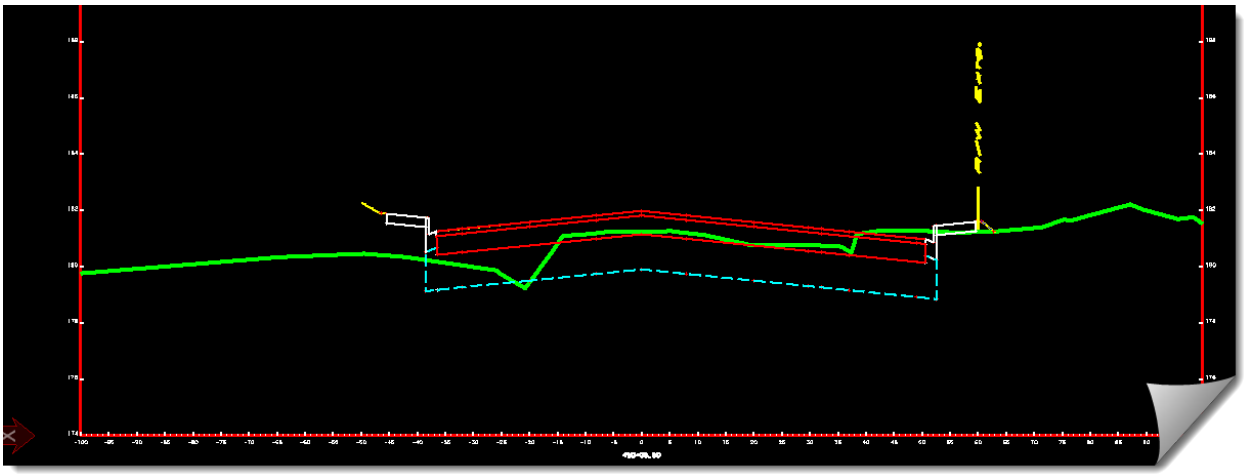



3) Open the **CROSS SECTION** command under ***EVALUATION > CROSS SECTIONS…***
4) Perform these steps in the sequence:
   a. Click on the **UPDATE CROSS SECTION** folder
   b. Select the **Cross Section Set** from the list box. There will be as many **Set** names in the list as there are collections of Cross Sections displayed. In this case there is only one.
   c. Chose an available **Mode**, depending on what you want to do. In this case **Display On**.
   d. Select the **CROSSING FEATURES** leaf since the ROW markers are crossing these sections
   e. Select the **`12345FEAT_rw` Surface** since that is where the ROW features are stored
   f. In the lower **Features** pane highlight the **`RW_E_sw`** feature



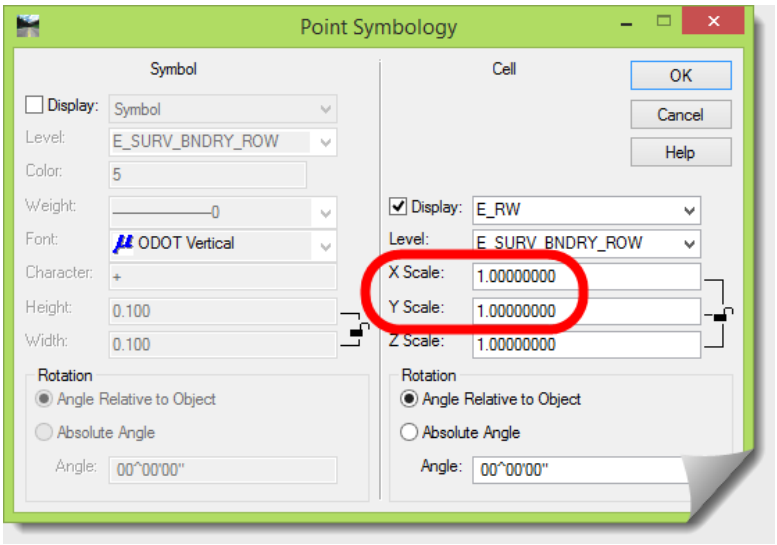
5) [**Apply**] this command and see if the ROW marker appears on the cross section

You should be seeing something like this on the cross section.



Now, you might observe that this ROW marker appears vertically stretched. That is correct, it is. That's because these cross sections were created with a little vertical exaggeration.

Take a quick look back at the **Named Symbology** for this ROW marker, we saw this:




Notice the **X Scale:** and **Y Scale:** settings. They are both set to **1.00**. This is fine for a cross section display at 1H:1V. But if a **Vertical Exaggeration** is applied to the cross sections then the Cell, in order to be proportional, has to be scaled to compensate for the **Vertical Exaggeration**.

It's time for some practice.

6) Bring in the three remaining Right-of-Way lines along this stretch of roadway, and Update the cross sections so that they are shown like the one that was just done.

After the rest of the Right-of-Ways have been imported into the **12345FEAT_rw** DTM and the Cross Sections have all been updated, make sure you save your new surface to the module folder. Then you can continue on and finish the material of this module.

The upcoming section will provide a variation of this process using pre-existing geometry from the ALG instead of from graphics.

## SCENARIO 2 - IMPORT FROM GEOMETRY OVERVIEW

This section has the same objectives as the first but instead of having MicroStation graphics as a starting point, the assumption is that an InRoads **Geometry Project** exists with the Right-of-Ways stored in it as **Horizontal Alignments**.

Referring back to the **Data Workflows** covered earlier, the basic process if you are working with MicroStation graphics is this:

### Import From Graphics

a. Have the DGN file with the graphics available as either the active DGN or Reference
b. Make sure the graphics are either in a large single piece or are chained together
c. Use the **FROM GRAPHICS** tab of the **IMPORT SURFACE** command to bring the graphics into a surface
d. Use the **FEATURE PROPERTIES** tool to verify that the data is properly stored in the surface and has the correct **Style** assigned to it.
e. If these cross sections are part of a set of construction drawings, then establish any required **Global Scale Factor** settings based on the scale of the final drawings. This command can be found under the InRoads **TOOLS** menu.
f. Use the **UPDATE CROSS SECTION** command, now combined with various other Cross Section related commands, found under ***EVALUATION > CROSS SECTIONS***, to display the data onto the Cross Sections.

### Import From Geometry

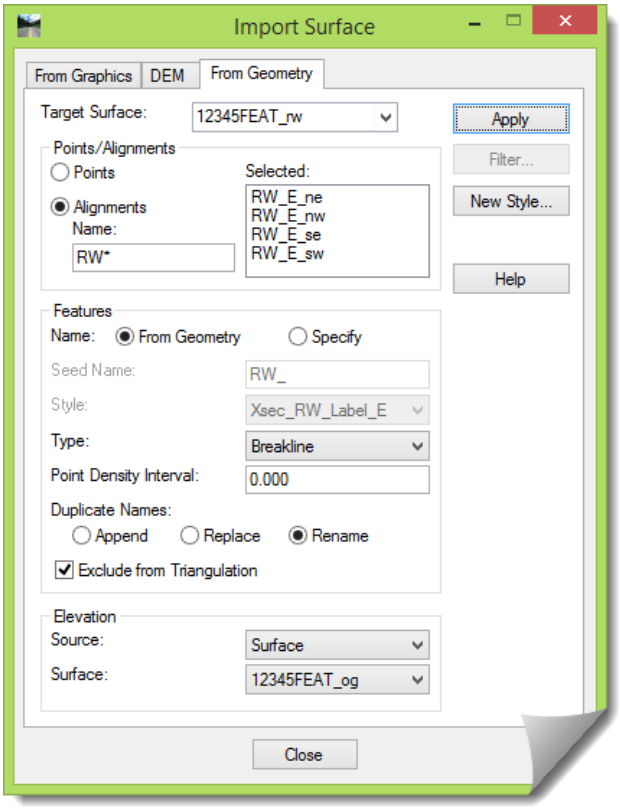
The workflow if you have the Right-of-Way in an ALG is this:

a. Have the ALG file with the alignments in it loaded into InRoads
b. Use the **FROM GEOMETRY** tab of the **IMPORT SURFACE** command to bring the Horizontal Alignments into a surface
c. Finalize the elevations of the ROW features using the **DRAPE SURFACE** command
d. Use the **FEATURE PROPERTIES** tool to verify that the data is properly stored in the surface and has the correct **Style** assigned to it.
e. If these cross sections are part of a set of construction drawings, then establish any required **Global Scale Factor** settings based on the scale of the final drawings.
f. Use the **UPDATE CROSS SECTION** command, now combined with various other Cross Section related commands, found under ***EVALUATION > CROSS SECTIONS***, to display the data onto the Cross Sections.

As you can see, the process of getting the Right-of-Way markers onto a set of cross sections is very similar, and the only variation is during the import process using the **FROM GEOMETRY** instead of the **FROM GRAPHICS**, and finalizing the feature elevations using the **DRAPE SURFACE** tool.

**ALERT**: When using the **FROM GEOMETRY** tab on the **IMPORT SURFACE** tool, the **Elevation** is established using a **Source Surface**. Unfortunately, this method only establishes the elevations for the PI's along the horizontal alignment. And although those points will be set correctly, there will be no elevations defined between them along the alignment. Therefore to complete this, the **DRAPE SURFACE** tool has to be used to lay the entire alignment (between the PI's) along the surface triangles.

Here is snapshot of how the **FROM GEOMETRY** would be set up: (it's fairly self-explanatory and the items that it calls out for should have already been seen by you somewhere before.)



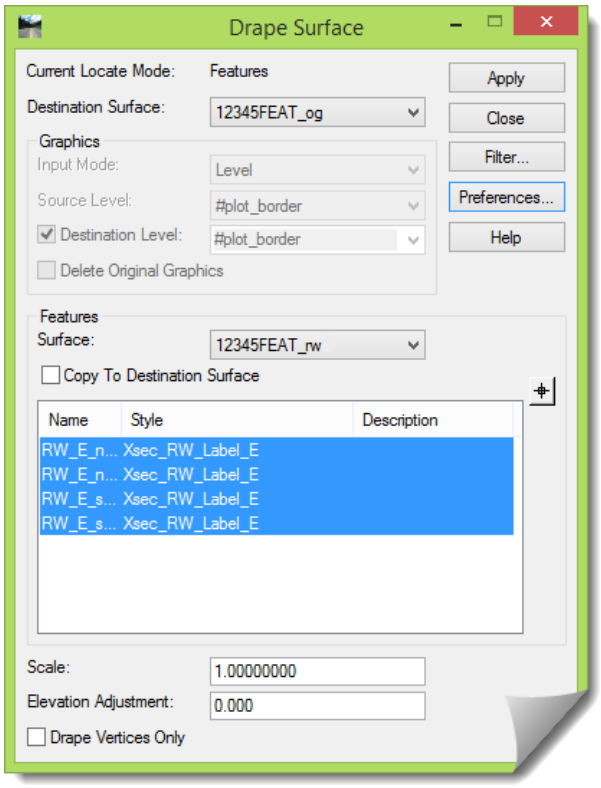

The only unique item of note about this tool is the way it establishes the **Elevation** when the **Source** is set to **Surface** as mentioned earlier. So after this command is used, the next step of finalizing the elevations along the new Right-of-Way features has to be done using the **DRAPE SURFACE** tool under ***SURFACE > DESIGN SURFACE***.

This is the **DRAPE SURFACE** process.

a. ***SURFACE> DESIGN SURFACE> DRAPE SURFACE***
b. Set the **LOCATE LOCK** to **LOCATE FEATURES**.
c. The **Destination Surface** is the OG
d. The **Features Surface** contains the ROWs

A different **Destination Surface** and **Feature Surface** allows draping features from one surface onto the triangulation of another.

e. Select all **RW** Features in the list window
f. No vertical **Scale:** would be applied here
g. **Elevation Adjustments** will place the Feature elevations a distance above or below the surface triangulation.
h. **Drape Vertices Only** would be *off* for this application since the purpose here is to drape the entire ROW onto the triangles of the surface, not just the vertices.
i. [**Apply**] and then [**Close**].



## Conclusion

Congratulations, you have completed the Features module.

Again, you are left with a final thought – Do these modules with an attitude of application. Study them with the viewpoint that you are going to apply these new skills on your current or future project. Look into and beyond the exercise steps and motivate yourself to momentarily pause and consider past, present and future projects and how this information could be put into practice.