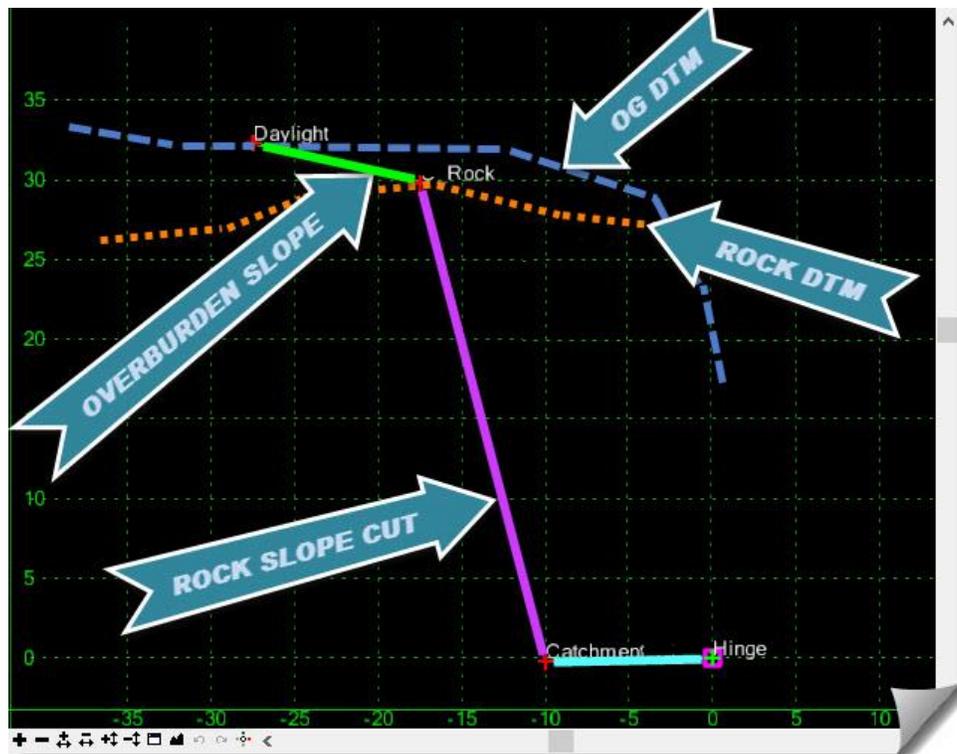# Module 05

OVERBURDEN END CONDITION Using InRoads

Introduction

This module, addressing a variant of the Rock Slope Benching design scenario, is another step toward learning how to leverage the power of InRoads and 3D modeling on your project.

The specific technical subject covered later will be addressing a modeling scenario where both a rock surface <u>and</u> soil surface exist, requiring the two-stage solution illustrated below.

This module is another demonstration that a large portion of the power of the modeling software is contained in the ability to use pre-configured design items. Using and reusing pre-created solutions that apply to 'typical' conditions can potentially arise on any project. The first thing to know is <u>that</u> a design item exists, but that's just awareness. Beyond that, the basic skill level that is *really* required of a user is to be able to understand the pre-created solutions, and know when and how to apply them on their specific project.

Purpose of this Module

The purpose of this module is to demonstrate an end condition (EC) that cuts into rock at a steep slope, and then flattens out when it reaches the rock-soil interface.

Objectives of this Module

At the end of this module you will be able to use the overburden End Condition found in the ODOT standard Template Library to model an overburden area where both a rock surface and soil surface exists along a roadway project.

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.

Skill Level / Prerequisites:

The modules within this training are expected to be performed in a specific sequence, with this being the 5th module. It is increasingly important that you have adequately covered and can apply the earlier modules and have the full prerequisites as identified here:

- Module 1 – Introduction to the Training Modules
- Module 2 – Visualization (beneficial, but not absolutely required)
- Module 4 – Rock Slope Benching
- MicroStation Basics
- InRoads Level 1 (see detailed breakdown of topics listed in Module 1)
- InRoads Level 2 (see detailed breakdown of topics listed in Module 1)

NOTE: Applying the Overburden EC identified in this module doesn't entail InRoads Level 2 knowledge; however understanding how it works, and why certain workflow steps exist does require a higher grasp of the software beyond the scope of an InRoads Level 1 class.
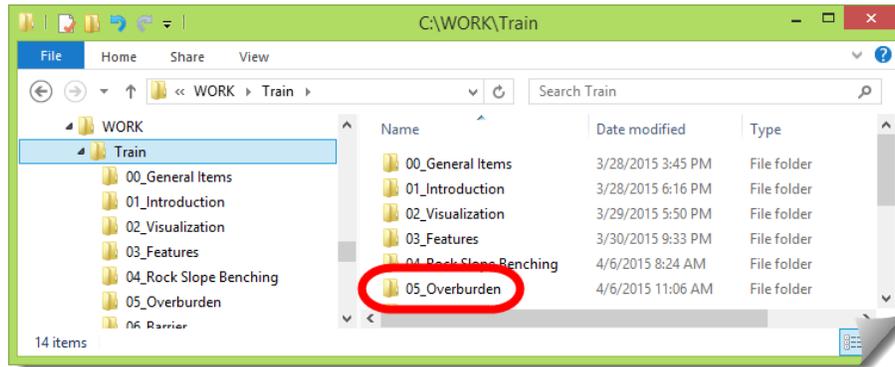
Module Files and Folders

The activities of this technical module will be a combination of study and hands-on. The hands-on will work you through the process so you see how it is accomplished by your own hand (with the guidance of the module material). The study portion is there to support the hands-on and explain what you are doing and why you are doing it. The study portion is there to strengthen the activities and ensure that you can apply it to your project, and not just the sample project.
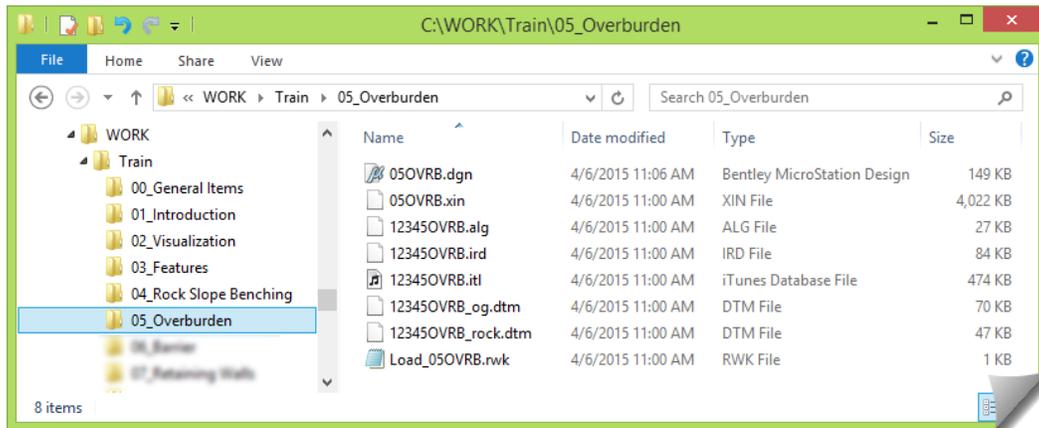
Training Folders

You will be working on your local hard drive during this training. The material within the modules will be expecting the training files and folders to be set up in a very specific way in order for them to align with the step-by-step module directions.

You should have a copy of the **05_Overburden** 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 **12345OVRB** 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 **05OVRB**, are files that will typically be opened during the launch of the hands-on work and include:

- **05OVRB.dgn**, the initial MicroStation file used at the start of the exercises
- **05OVRB.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 the **Project** file technique.

Technical Content of Training:

This module will be focusing on the application of a very specific **END CONDITION** that was built within InRoads to be used in a rock slope cut condition containing overburden (per the diagram shown on the first page).

The emphasis in the upcoming material will look at two different aspects of this work. First, it will cover the application of this particular EC where this condition exists. The intended result of this content is so that you can apply this EC on your project where it is applicable. A secondary aspect of this content will be to provide you with some basic insight into how this EC works. The information presented regarding the 'mechanics' of the EC construction will strive to be at an InRoads Level 1 understanding, but will be enough for someone who has completed the InRoads Level 2 training to do further personal investigation regarding the 'inner workings' of this EC to gain a greater insight into exactly how this EC works. Just as a side note, the sophistication of this EC is not as complex as the Rock Slope Benching EC.
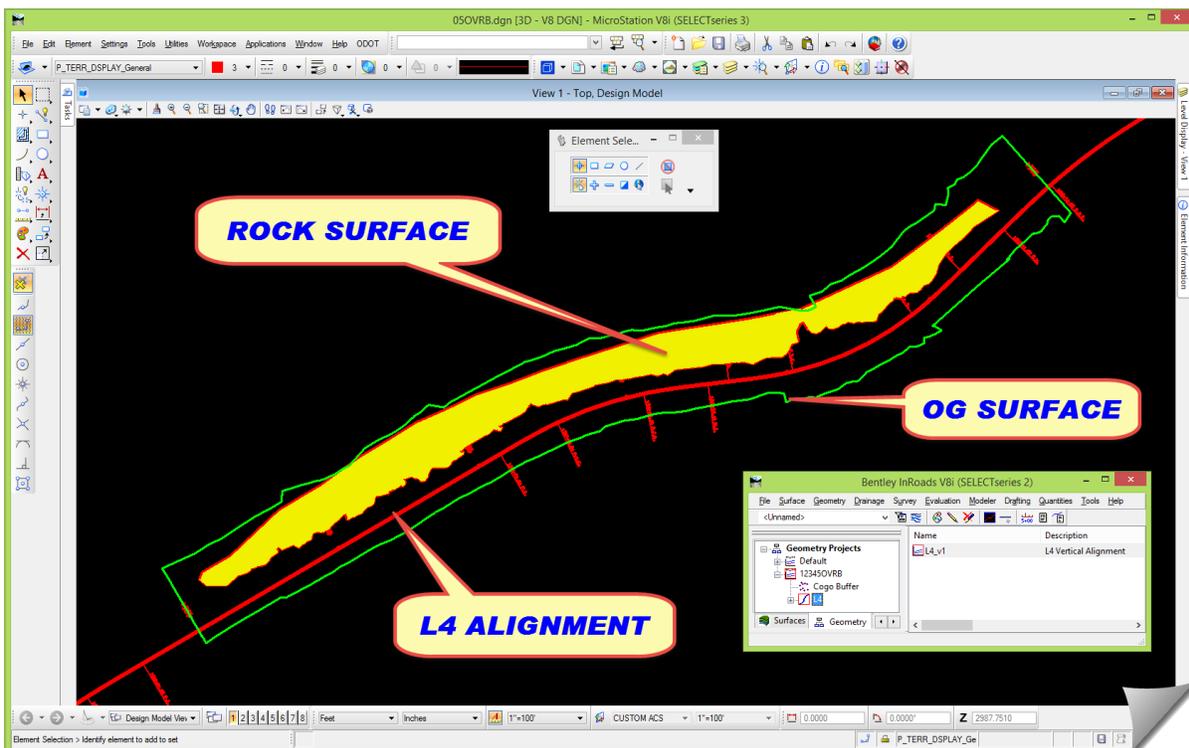
Project Orientation

REVIEW WORK AREA

This module will be using an existing surface (**OG**), a smaller rock-soil interface surface (**Rock**), as well as a main centerline alignment called **L4**. The general areas of coverage and locations for these are shown below. The main focus of the work will be where the **Rock** surface and **OG** surfaces overlap.

Note that in this module the external file name of the rock-soil interface surface is **12345OVRB_rock.dtm**; whereas the internal name is **Rock**. This is due to the need to standardize internal names when they are hard-coded into certain End Conditions.

These surfaces and the alignment are already created and will just be used as is within this module, and no modification will be made to them.

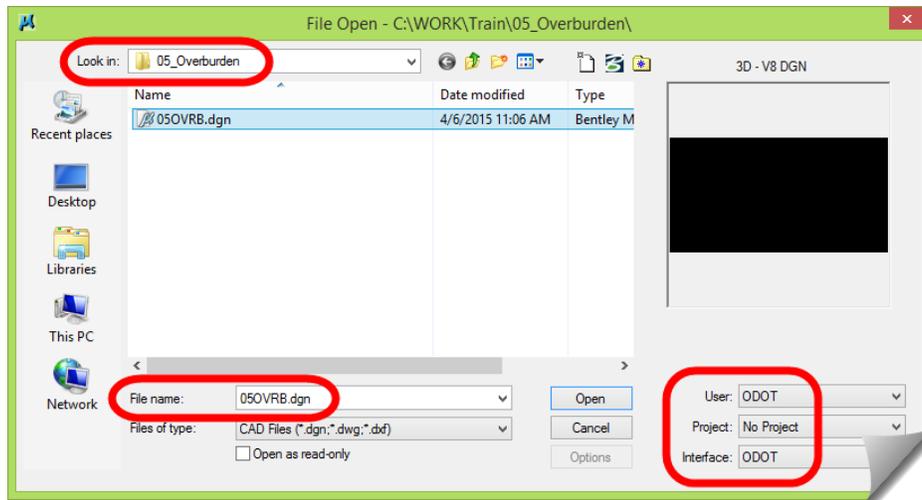## PREPARE MICROSTATION / INROADS DATA & FILES

As part of the module start-up, this section will get you 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.
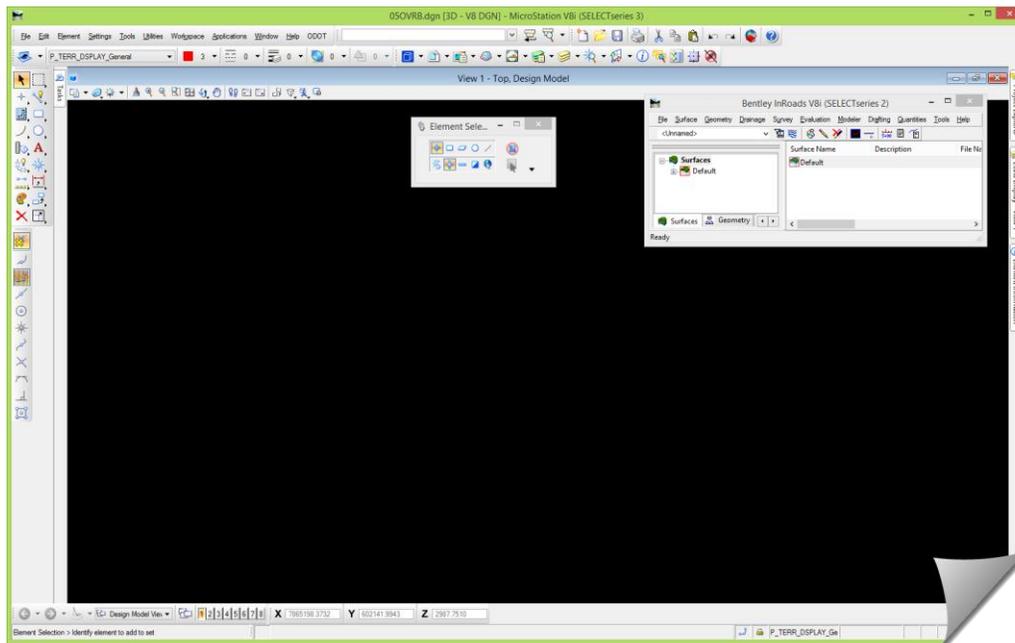
2) When the **MICROSTATION MANAGER** opens, set the **User** and **Interface** to **ODOT**.

3) Then browse to the *C:\WORK\Train\05_Overburden* folder and select the **05OVRB.dgn** file and click [**Open**].

Eventually, MicroStation and then InRoads will open.

4) When the drawing opens you'll see that it is completely empty.

5) Open Windows **File Explorer** and browse out to the **05_Overburden** folder.

6) Drag & drop the **Load_05OVRB.rwk** file into the InRoads interface to load the data files.

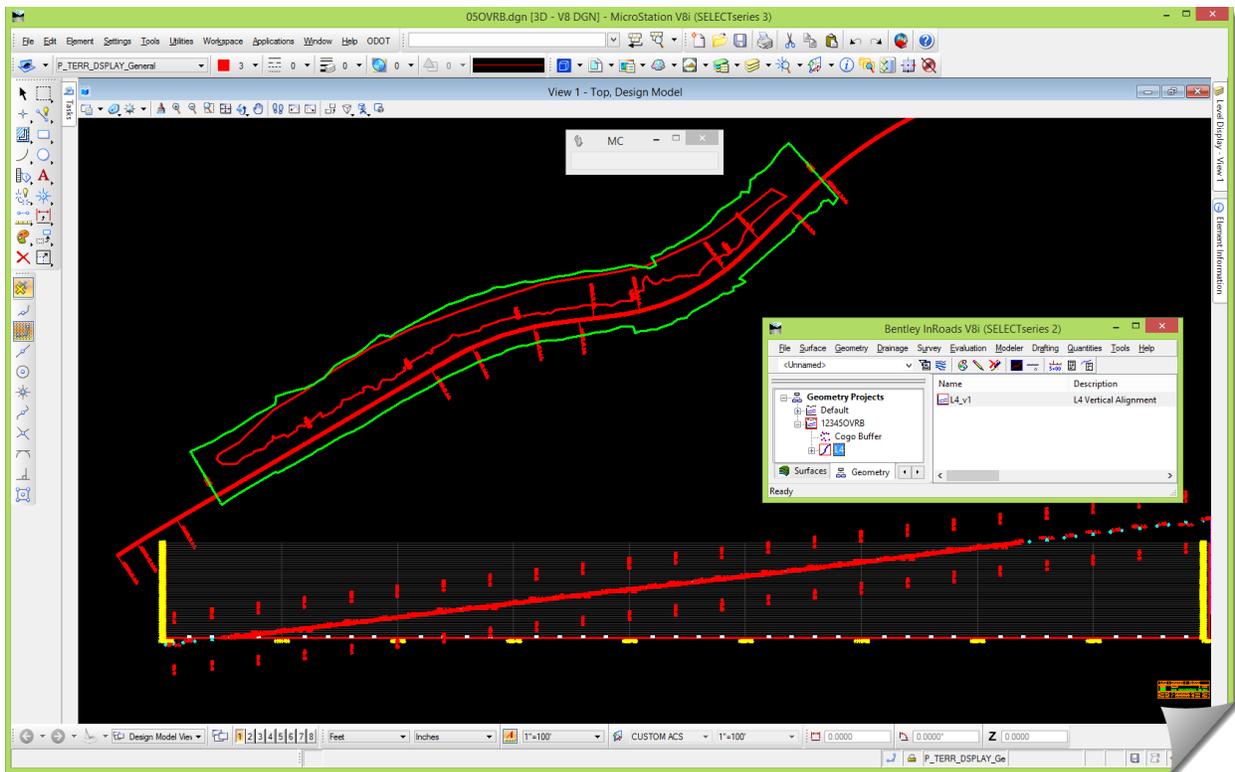7) Verify inside InRoads that the following files have been opened:

- **05OVRB.xin**
- **12345OVRB_rock.dtm** (internal name = **Rock**)
- **12345OVRB_og.dtm**
- **12345OVRB.itl**
- **12345OVRB.ird**
- **12345OVRB.alg**

Unlike some of the previous modules, in this module all of the files loaded will be used.

8) At this time, feel free to review the project data that was just opened by doing any or all of the following tasks:

a. View the **PERIMETER** of the **Rock** surface

b. View the **PERIMETER** of the **12345OVRB_og** surface

c. View the **HORIZONTAL ALIGNMENT L4**

d. View the **STATIONING** of the **HORIZONTAL ALIGNMENT L4**

e. Create a **PROFILE** and view the **VERTICAL ALIGNMENT L4_v1**

At this stage in the module, it is <u>not</u> suggested that you open either the **CREATE TEMPLATE** or **ROADWAY DESIGNER**. You will be guided into these files later in this module.

9) 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 do some background study on the subject of overburden, as well as the specific workflow and end condition used in this module in preparation for what's to come in the practical hands-on section.

PROCESS OVERVIEW

This portion of the module will be focusing on two aspects of the work to be done. First are the items to consider going into this activity (which includes understanding what is needed by InRoads) and second, ensuring that the work process and technical tools are properly used and understood.

Things to Consider

The main prerequisite, Module 4, covers the bulk of the information needed to prepare you for the content of this particular module, so the additional theory here will be fairly lean.

Overburden Defined

First, what is overburden?

In the area of mining, as well as archaeology, overburden is defined as the material that lies on top of an area of interest. As far as mining goes, overburden can be any soil or rock stratum that covers a seam of ore, or coal. Overburden, in the case of surface mining, is just material that is removed to expose a desired target material.

That definition is quite specific to those industries.

A more general definition of overburden would be: The term used to describe any secondary material or soil that is above a dissimilar primary material in a given area.

But the one most applicable here is probably: A layer of soil, gravel, or other earth material covering a given rock layer.
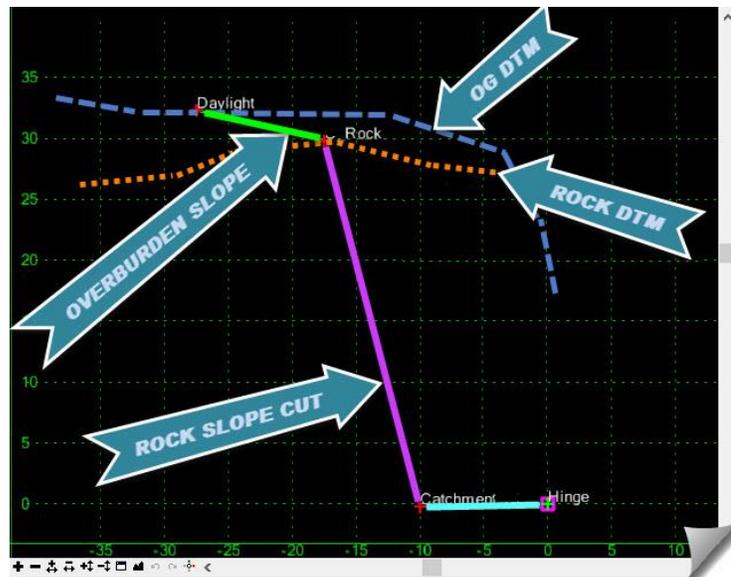
Defining the project overburden area

This is where the Geotechnical designer comes in, as each overburden area is custom designed for each specific site and depends on a number of factors beyond the scope of this document.

What <u>will</u> be discussed later are the values that need to be obtained from the Geotechnical designer, as well as how to incorporate these values into the InRoads design.

Surfaces required

The next item to discuss is that the condition this module addresses is a very specific design scenario where two surfaces are part of the roadway design. This leads to the first critical prerequisite for this work, a rock-soil interface surface and OG surface. Prior to applying this **END CONDITION** solution, both of these DTM surfaces have to be available. This is important as the overburden cut slope **END CONDITION** within InRoads is designed to seek both the rock-soil interface and OG surfaces. If InRoads cannot locate these surfaces, then the overburden EC slope won't function.

In the case of this module, the surface called `Rock` will be the rock-soil interface surface used.

Geotechnical Information

As mentioned earlier, a prerequisite needed before the design model can be finalized is obtaining the specific design criteria from the Geotechnical designer regarding the design details for your project. These include four specific areas of the design:

- Catchment Area Slope
- Catchment Area Width
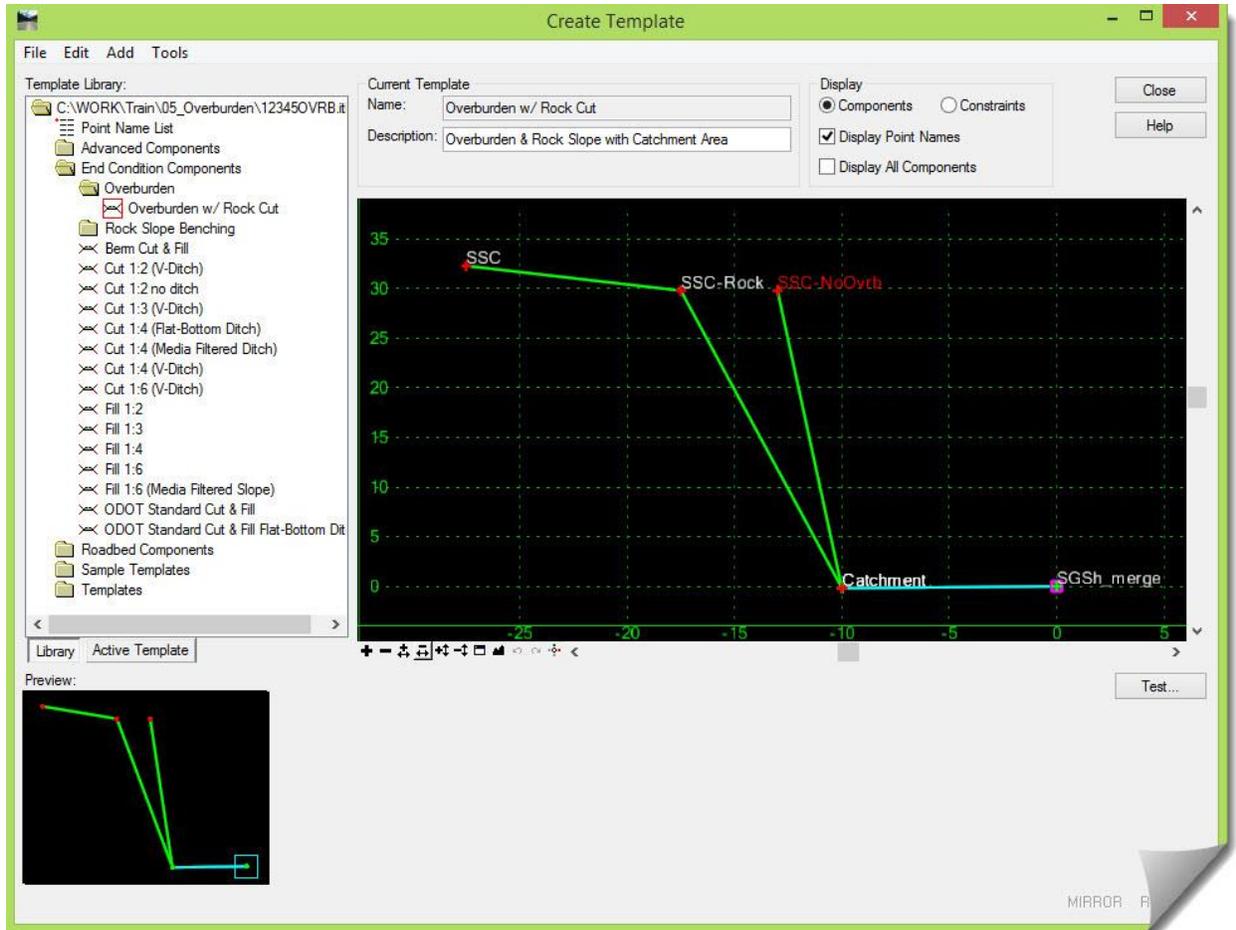- Rock Cut Slope
- Overburden Cut Slope

These project-specific design values are built into the overburden EC as user-defined variables and will be needed when you get into the **ROADWAY DESIGNER** in order to integrate this site-specific information into your corridor layout.

These are **PARAMETRIC CONSTRAINTS**, added in the exact same manner as they were added in the Rock Slope Benching covered in Module 4.

Techniques and Tools

Creating and Using Components

Like the use of an **End Condition**, or any other template **Component**, the simplicity of the Overburden EC rests in the comfort and ability of the user to construct templates from individual **Components**, and then be able to use those templates in the **ROADWAY DESIGNER** to develop the details of the **Corridor**. The majority of the skills to perform this work, aside from the actual construction of the EC, are covered in sufficient detail in the *InRoads Level 1* class. The *InRoads Level 2* class covers the information related to the actual construction details of the EC.

As mentioned earlier, this module will take the stance that the EC has already been created and will primarily be teaching someone how to simply use it. Beyond that, this module will reveal some of the inner workings and mechanics of this EC so that you understand enough of its construction to be able to **Test** it and know that it is working correctly.

Practical Application - Hands On Lab Exercises

The following hands-on section will consist of reviewing the Overburden EC and then using that EC in the **ROADWAY DESIGNER**, and eventually creating a design surface.
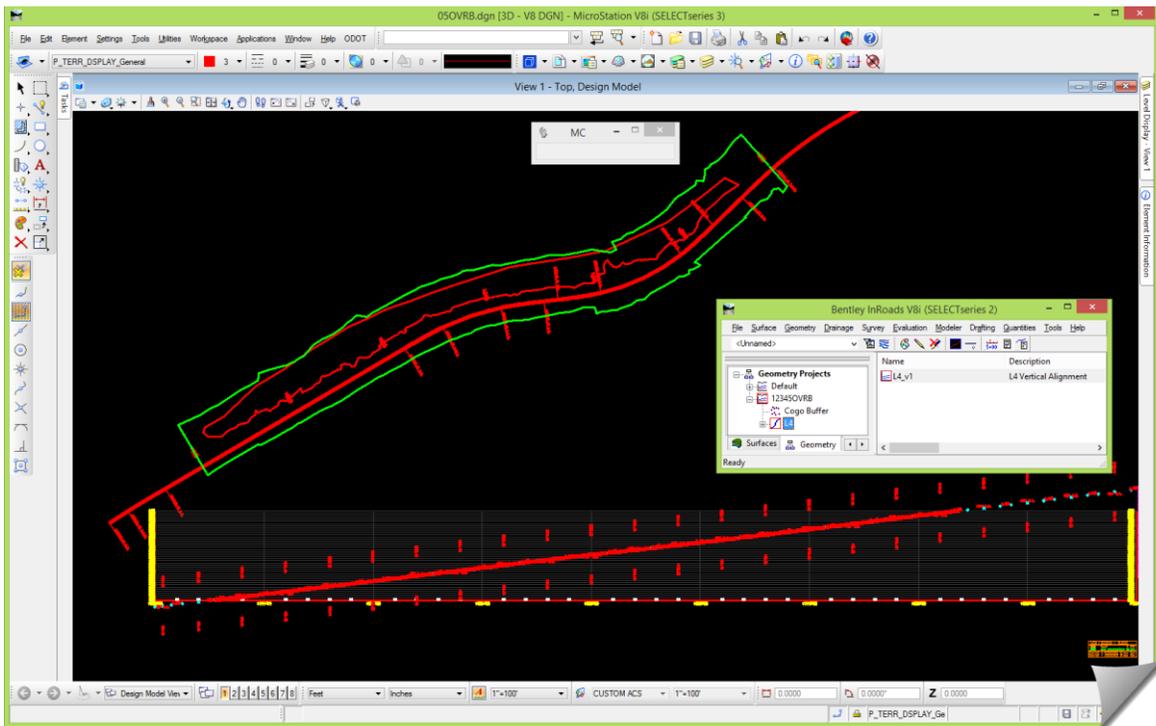
UNDERSTANDING THE DETAILS

At this point you should be fairly oriented as to what will need to be done, but let's get into the hands-on and cover some of the Overburden details, as well as the application workflow.

Review any relevant project data

At this point you should be in MicroStation and have the **05OVRB.dgn** file open. You should also have InRoads open, and having loaded the RWK, should have the **05OVRB.xin** open, the two surface DTMs (**12345OVRB_og** and **Rock**), the **12345OVRB** Geometry Project, and the **12345OVRB** template library ITL and **ROADWAY DESIGNER** IRD files.

If you don't have these open, please load these files now.

1) If you did a review of the project data as suggested earlier, you should be looking at something like this:

If you haven't yet reviewed the project data, it is suggested that you return to the **PREPARE MICROSTATION / INROADS DATA & FILES** section and do at least **a.** thru **d.** of the last step.
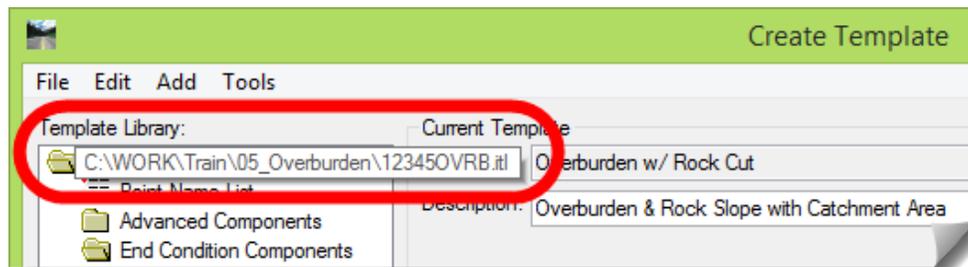
If you aren't seeing graphics as shown here it won't make a difference moving forward. The important part is that you understand the surfaces and geometry data that are associated with this module.

The next section will be a review of the Overburden EC. This review will be emphasizing the important aspects of this EC. This section will be followed by the workflow necessary to apply this EC to your project template as well as in the **ROADWAY DESIGNER**.
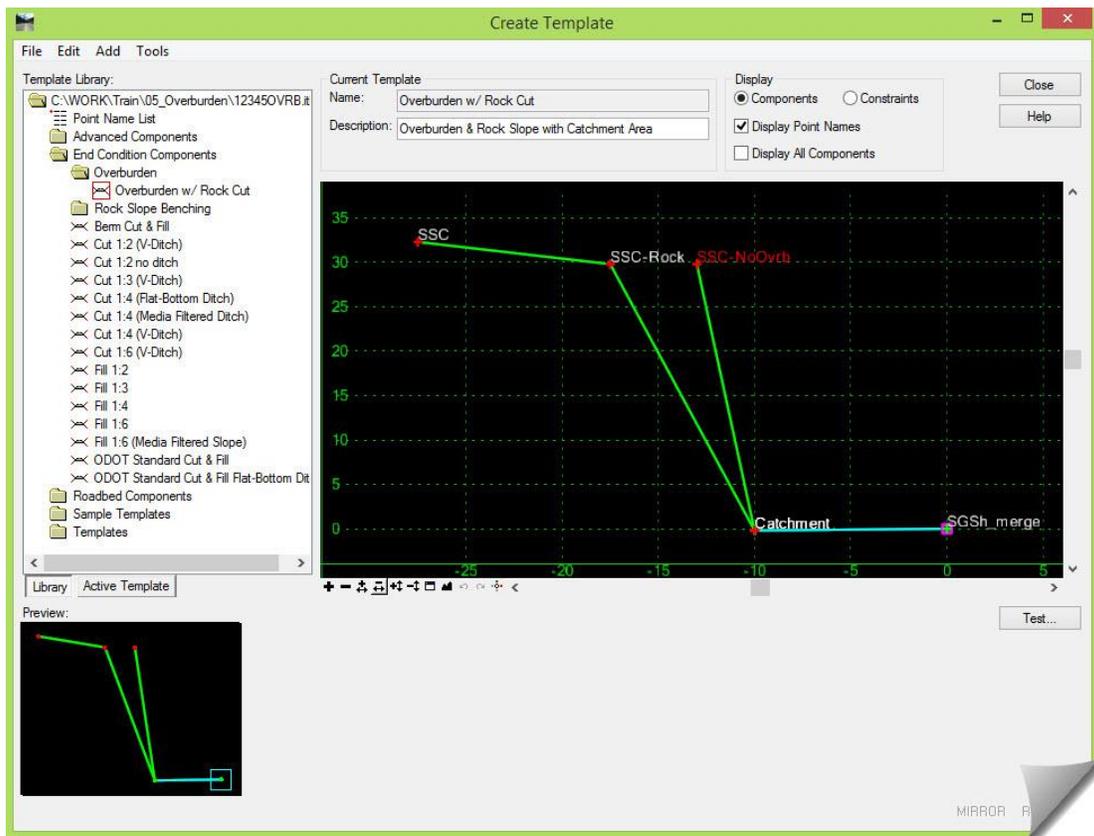
Review any relevant InRoads ITL information

The main part of this module activity surrounds the use of the EC **Component** constructed to produce the required intercepts and slopes when encountering a rock surface that is beneath an OG surface. With that in mind, let's take a look at this **EC Component**.

1) Go to the InRoads main menu and open the **CREATE TEMPLATE** tool.

2) The first thing is to simply verify that the correct **ITL** is opened by checking the path at the top of the Library window.

3) Now browse to the **Overburden** folder under the **End Condition Component** folder.

   You should see a component called **Overburden w/ Rock Cut**.

4) Double-click on that component to activate it and put it into editing / review mode.

   For clarity, feel free to turn *off* the **Display Point Names** toggle.

This component will not be edited during the module as it was designed to require a very minimal amount of editing, and in most cases, to require no editing.

Let's review the layout criteria for the cut slope in an overburden condition such as this:

a. Extend off of the aggregate shoulder wedge with a slope for the **Catchment Area**

   ● **Catchment Slope** and **Width** to be determined by the Geotechnical designer

b. Then cut up vertically at a **Slope** defined by the Geotechnical designer, until it intercepts the rock-soil interface surface
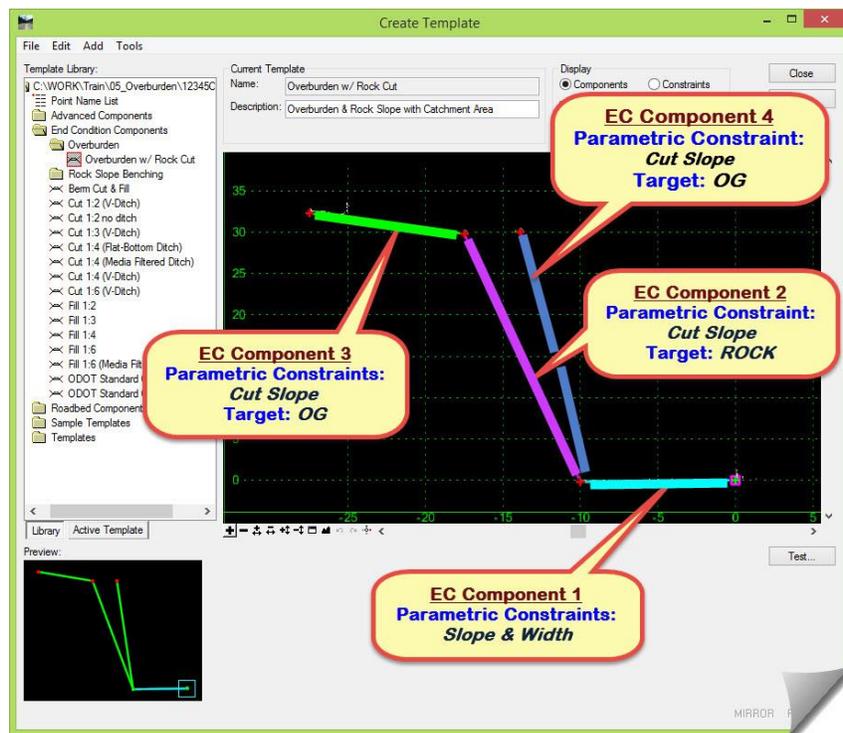
The above steps are used to locate the intercept on the rock-soil interface surface at the top of the slope. Then:

c. From the intercept point on the rock-soil interface surface, extend a flatter overburden cut slope up vertically to intercept the OG surface. Overburden **Slope** to be determined by the Geotechnical designer.

d. If the rock-soil interface surface isn't found, a rock cut without overburden is assumed and this second EC is applied.

There are four variables in this design condition that will be addressed:

   ● The Catchment Area slope

   ● The Catchment Area width

   ● The Rock Cut slope

   ● The Overburden Cut slope

Here are the basic components and a related diagram that will satisfy these requirements:

The specific **Component** details are these:

EC Component 1

Catchment – a single **EC** component with 2 points. Origin point called **SGSh**, the other point is approximately -10' @ 2% called **Catchment**. Both the **Slope** and **Width** have **Parametric Constraints** (**Labels**).

EC Component 2

RkCut – a single **EC** component with 2 points, chained in series onto the **Catchment** EC component; slope defined as 0.25H: 1V; Slope has a **Parametric Constraint** (**Label**). **Target**: `Rock` surface targeting an internal surface name called `Rock`.

EC Component 3

Cut-OverB – a single **EC** component with 2 points, chained in series onto the **RkCut** EC component; slope defined as 4H: 1V; Slope has a **Parametric Constraint** (**Label**). **Target**: **<Active>**.

EC Component 4

RkCut-NoOvbrd – a single **EC** component with 2 points, starting at the Catchment; Slope has a **Parametric Constraint** (**Label**). **Target**: **<Active>**.

EC Technical Application

This is not a sophisticated EC; however, fully understanding the mechanics behind this **End Condition** requires knowledge of:

- **END CONDITION** chaining – stringing EC's together to form a complete solution
- **PARAMETRIC CONSTRAINTS** – using **Values** to drive the component **Point Constraints**
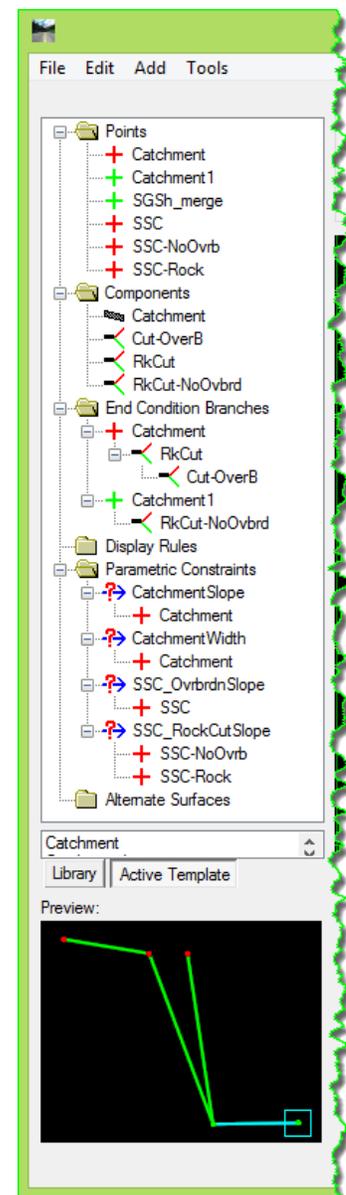- **EC Targets** – defining various **Targets** to an EC

This is all InRoads Level 2 knowledge and will not be covered in this module.

1) If you have this level of knowledge and wish to review the construction details, feel free to take some time to review the `Overburden` component. As a suggestion, these are the areas that will provide insight into its structure.

- Review the **ACTIVE TEMPLATE** tab for the following:
  - ❍ **Point Names**
  - ❍ **Components** used
  - ❍ **End Condition** chaining
  - ❍ **Parametric Constraints**

It should be noted, as it has been before, that this EC component, although mildly complex, does not need to be fully understood in order to use it on a project. Once the thought process has been worked out and integrated into the construction of the component, then it's only a matter of understanding those facets of the component that require input by the user.
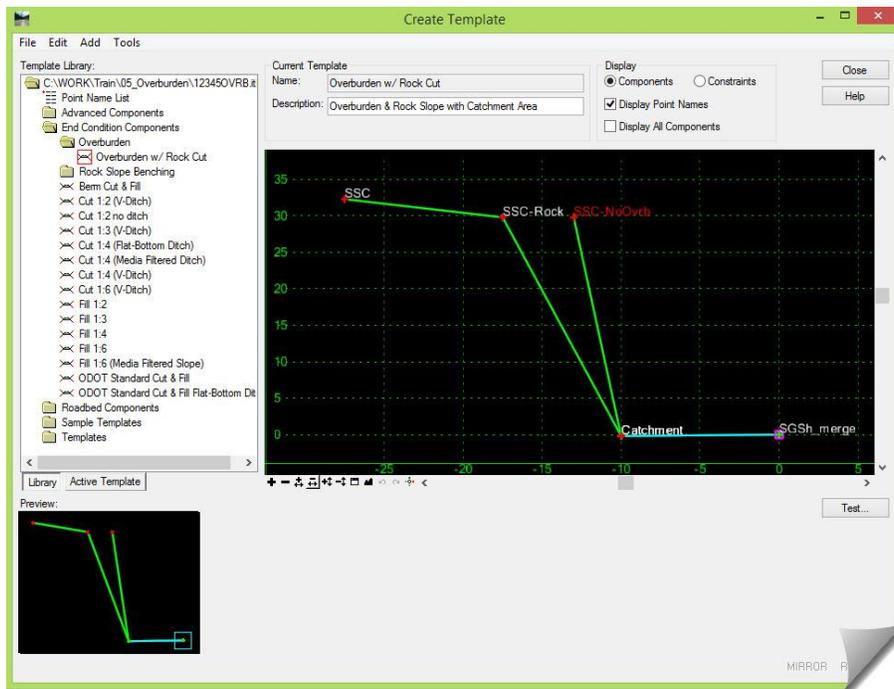
In this case, there is really only one area that is required by the user in order for this component to work correctly, and that is the **PARAMETRIC CONSTRAINT Values**.

These will have to be obtained from the Geotechnical designer for your specific project. And once obtained, they will need to be entered into the **ROADWAY DESIGNER** so that they can be applied to this component. The way that this is done will be covered in a later section of this module.
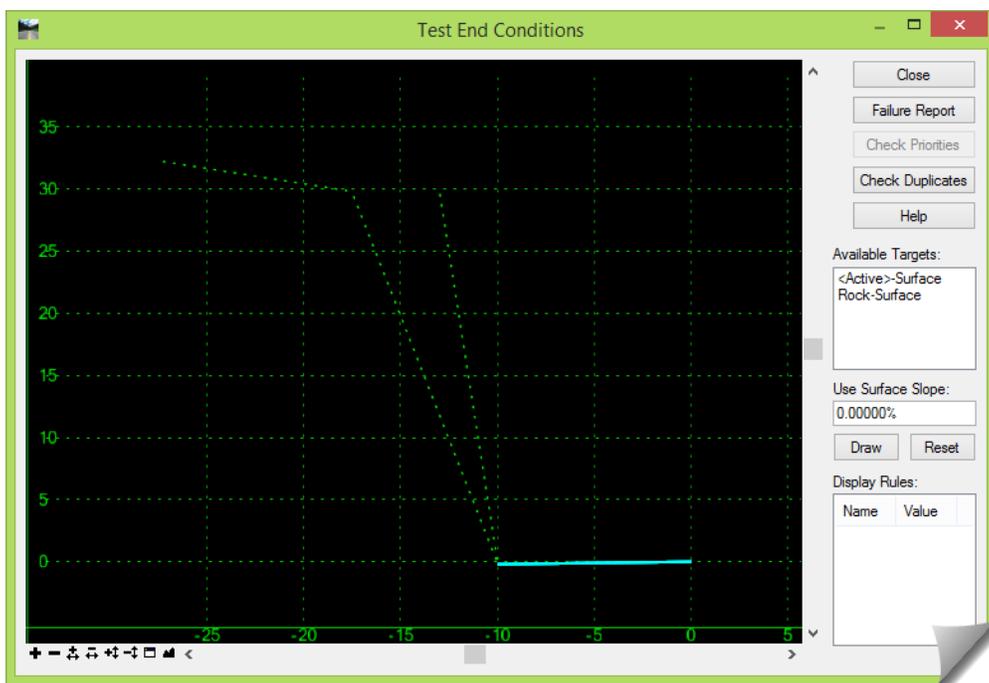
Before moving on, the one thing that will be done here is to run the standard **Test** of an EC.

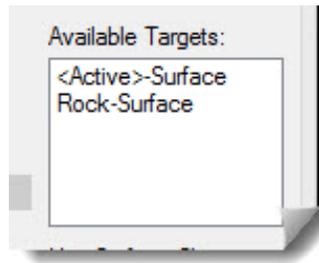2) Make sure that the `Overburden w/ Rock Cut` component is the active component.

3) Click the [**Test…**] button in the lower right corner.

This will open the **TEST END CONDITION** window.

4) Notice the **Available Targets** area on the right, and the identification of the **Rock – Surface** and **<Active>-Surface** in the list window.

There are two **Targets** listed there because this particular EC has several ECs chained together that contain different targets. One targets the Rock surface and another targets the OG (or in this instance the OG will be the **<Active>** surface).
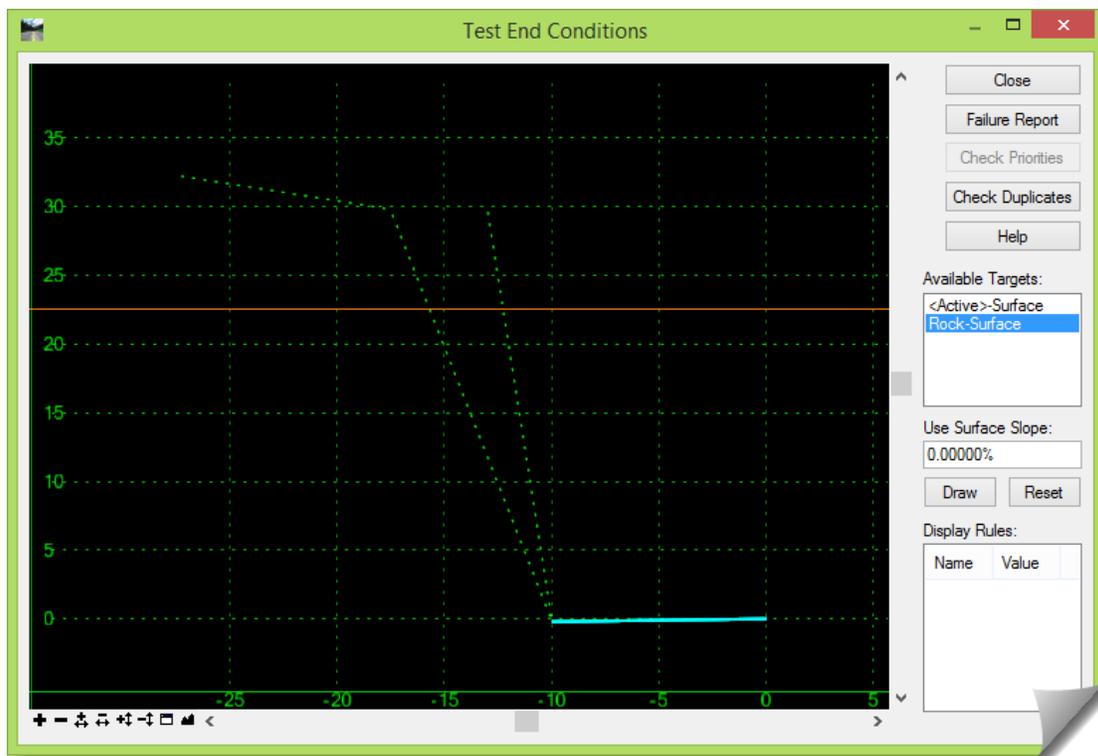
In order to test an EC with multiple targets, each target has to be placed in the test area.

💡 **TIP**: The more complex the **End Condition** the more elaborate the **Test** can become. This is especially true when several ECs are in a chain, each having a different **Target** type. All **Targets** must be defined when in **Test** mode. This requires a good understanding of the EC.

5) Select the **Rock-Surface** in the **Available Targets** list window and then click [**Draw**].
6) Hover the mouse in the grid window and left-click to place a test location for the rock-soil interface.

In this instance it really doesn't matter where it's placed, as long as it's above the cyan Catchment.

7) Now select the **<Active>-Surface** in the list window and then click [**Draw**].

This design scenario was built to work when the OG is above the Rock DTM. So as you move your mouse up and down, simulating the position of the OG surface, you should see the EC either work or fail dependent on its position.

8) Place a left-click to anchor the OG surface so that an EC solution is formed.

At this stage, you can highlight the **Rock-Surface** in the **Available Targets** list window, click **Draw** again, and reposition the Rock surface in the testing window. Feel free to experiment with other testing scenarios. Try it without the Rock surface and observe the solution.

9) Practice repositioning both surfaces in the testing window until you clearly understand what is happening and are confident that you can do this without effort.

TIP: Remember that the testing window has view controls in the lower left that provide windowing, zoom in / out, horizontal and vertical scaling as well as fit view capabilities. The mouse wheel also works in this window for panning and zooming.

Everything should be working as expected.

10) [**Close**] the testing dialog box when you are done.

It's time to move into the simulated project and attach the Overburden EC to a roadway template, and then follow through by creating a **Corridor** in the **ROADWAY DESIGNER** that will produce a design DTM that can be reviewed in both plan view and cross section.

SCENARIO 1 - THE OVERBURDEN END CONDITION

In this section the Overburden EC will be applied to a project template, used in the **ROADWAY DESIGNER** with the addition of the Geotechnical details, and then a final design surface will be created.

Here is the overall project workflow (starting with the templates and the assumption that there is a need for this overburden solution):
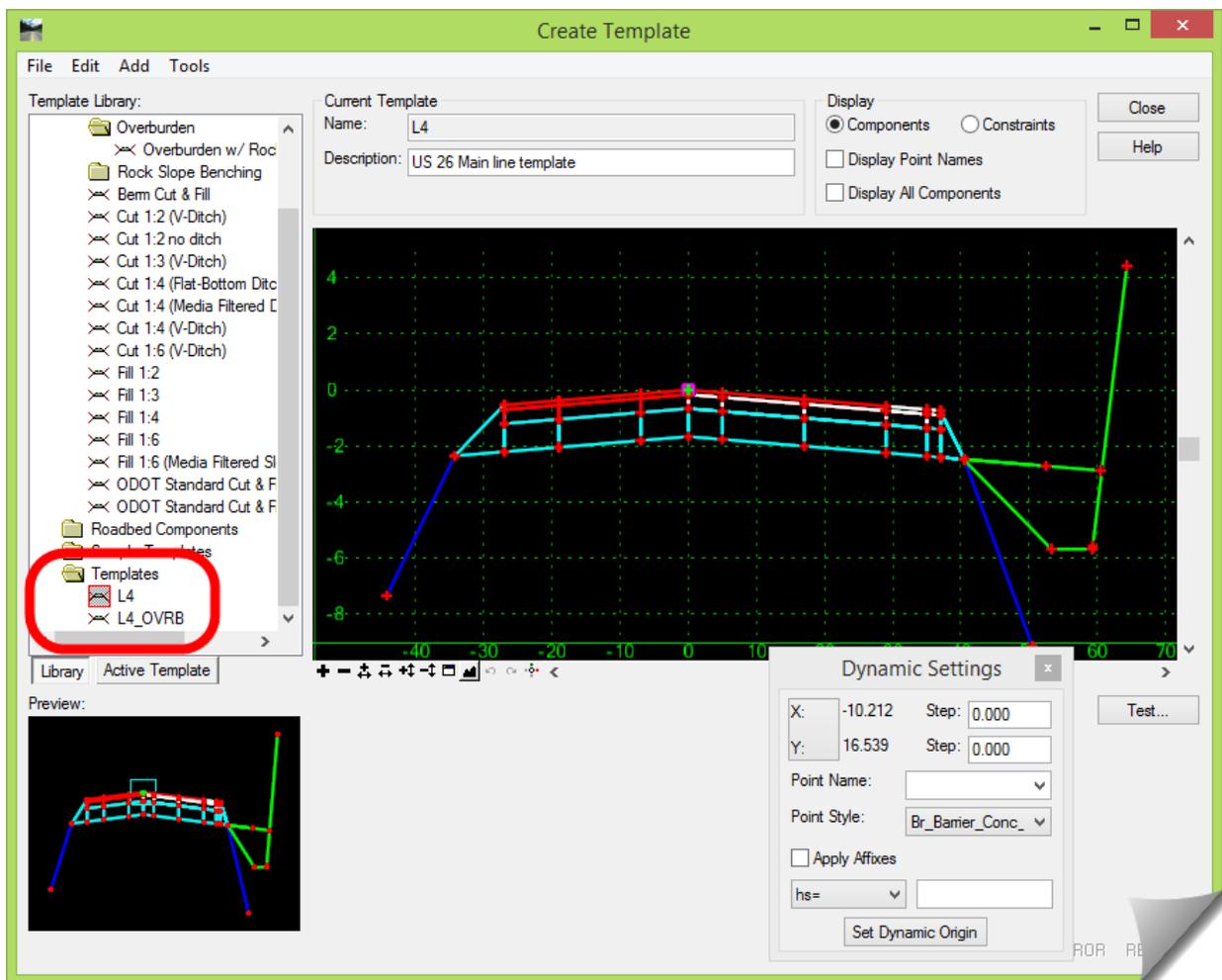
Prerequisites:

a. Rock Surface DTM

- In this example, the surface called **Rock** is the rock-soil interface surface.

b. OG Surface DTM

- In this example, the surface called **12345OVRB_og** is the OG surface.

c. Geotechnical details for the Catchment width & slope, and the rock & overburden slopes

- The information that will be used here for demonstration purposes is:

♦ Catchment Width = 40' (This may be a little excessive; however for this sample this distance is needed to intercept the rock surface. This value will be provided to you by the Geotechnical designer, so you will simply use what you are given.)

♦ Catchment Slope = 2.00%

♦ Rock Cut Slope = 0.25H : 1V (400%)

♦ Overburden Cut Slope = 2H : 1V (50%)

d. You are using the standard ODOT template seed file

e. Roadway Template backbones are created

- A template called **L4** will be used as the base roadway section

Overall Project Workflow:

a. Construct your template using the Overburden w/ Rock Cut EC as appropriate (make sure that the **APPLY AFFIXES** is appropriately defined before dragging and dropping any components during template construction)

b. [**Test…**] the template End Conditions in the **CREATE TEMPLATE** tool

c. Open the **ROADWAY DESIGNER** and create a **Corridor** for your roadway

d. Drop your templates based on your project requirements

e. Take the Geotechnical information and establish the **PARAMETRIC CONSTRAINTS** in the **ROADWAY DESIGNER** for each of the four different variables (Catchment width & slope, and the rock & overburden slopes)

f. Do a [**Process All**] in the **ROADWAY DESIGNER**

g. Review the resulting **ROADWAY DESIGNER** sections

h. Be alert to any EC transitional issues

i. Create **END CONDITION EXCEPTIONS** to address any EC transitions failures (if there are any)

j. Create the design surface

k. Review the resulting design surface in MicroStation

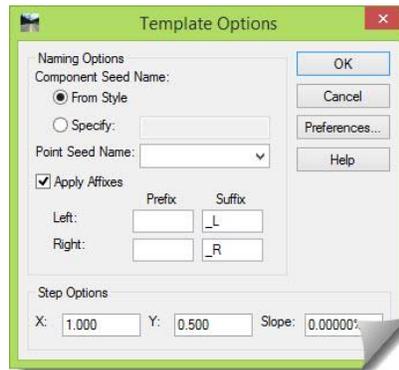l. Create Cross Sections for an additional review of the design surface

1) If you happen to have exited out, and are just now getting back into InRoads, make sure that you have opened the following InRoads project data at a minimum:

   - `05OVRB.xin`
   - `12345OVRB_rock.dtm`
   - `12345OVRB_og.dtm`
   - `12345OVRB.itl`
   - `12345OVRB.ird`
   - `12345OVRB.alg`

2) Open the CREATE TEMPLATE tool and browse to the **Templates** folder and expose `L4`.

3) Right-click on `L4` and **Copy**. Then right-click on the **Templates** folder and **Paste**.

4) Right-click on `L41` and **Rename** it to `L4_OVRB` and then double-click on it to make it the active template.

We are not going to concern ourselves with the construction details of source template `L4`. At this stage an assumption is being made that the base roadway component is constructed properly, and its details are beyond the scope of this module.

The next step will be to drag and drop the `Overburden w/Rock Cut` component onto `L4_OVRB`, so let's make sure that everything is set for this to be properly accomplished.

5) On the **CREATE TEMPLATE** tool, go to *TOOLS > OPTIONS* to open the **TEMPLATE OPTIONS** dialog box.

6) Go to [**Preferences**] and [**Load**] the **Preference** called **ODOT**. Then [**Close**] that dialog.

7) Open the **DYNAMIC SETTINGS** dialog box and set the **X Step** and **Y Step** to 0.00, and make sure that **Apply Affixes** is toggle *on*. Don't worry about any other settings on that dialog.

Toggling *on* the **Apply Affixes** will assign left and right designators, making the resulting surface DTM breaklines easier to locate and identify.

Let's identify exactly where the **Overburden w/Rock Cut** component will be attached on the **L4_OVRB** template.

8) Zoom in <u>very</u> close on the left side of the shoulder wedge, where the dark blue line comes off the cyan triangle.

The placement point for the **Overburden w/Rock Cut** component is on the **SGSh_L** point.

9) Single-click the **Overburden w/Rock Cut** component so it shows up in the preview window and make sure that the **L4_OVRB** template is positioned to accept the new EC.

10) Drag and drop the **Overburden w/Rock Cut** EC onto the left side of the **L4_OVRB** template onto point **SGSh_L**.

11) You can optionally delete the left fill slope (it does not apply in this exercise).

Do a visual check to make sure that everything looks correct.

12) **Save** the TEMPLATE LIBRARY at this point if you haven't already and then [**Close**] it.

13) Open the ROADWAY DESIGNER and set the **Corridor** to **L4**.

Also note the surface that is set for the **Active Surface**.

What should that be set to? The image above shows it set to **Rock**. Is that correct for this model?

> ⚠ **ALERT**: The **Active Surface** in the ROADWAY DESIGNER is reflecting whatever the 'active' surface was set to when the ROADWAY DESIGNER was opened. The 'active' surface is rarely, if ever, considered by the user before the ROADWAY DESIGNER is opened; however it is a setting that needs to be considered directly after establishing the **Corridor** because establishing the correct **Active Surface** is completely dependent upon how the template **Targets** were set up for the **Corridor** being worked on.

What were the **Targets** for the template that was set up?

If an EC **Target** was set to a specific named surface, like **Rock**, then that surface does not need to be defined as the **Active Surface** in the ROADWAY DESIGNER because that EC already knows that it has to seek a very specifically named surface. In this case, **Rock**.

The EC for the overburden, however, does not have a specifically 'hard-coded' named surface defined as its target. In this case, the EC component is going to attempt to seek whatever happens to be defined as the **Active Surface**.
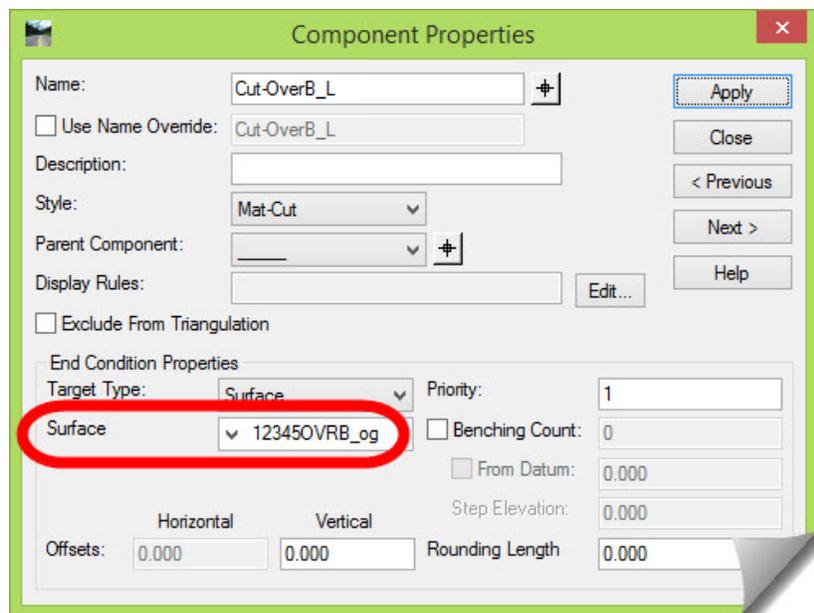

But, looking beyond what's *active* or not, what is the overburden EC component <u>actually</u> supposed to be seeking? Any surface can be set to be the '*active'* surface, so is this overburden EC <u>really</u> simply intended to target *whatever* surface the user just happens to decide is 'active' at that moment?

No.

It was really designed to target the **OG** surface. And there are two ways to tell it that:

a.　Just set the **Surface** to that specific named surface in the EC **COMPONENT PROPERTIES**.
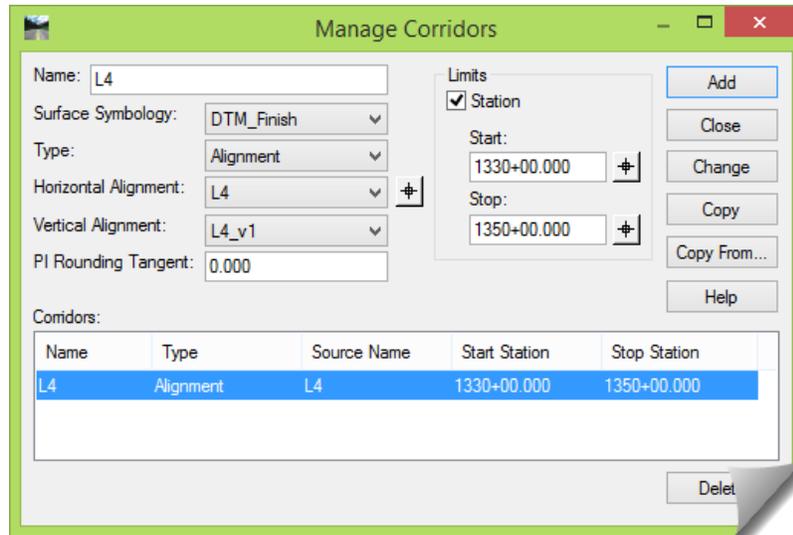

b.　Define it as **<Active>** in the EC **COMPONENT PROPERTIES** and then tell the **ROADWAY DESIGNER** exactly what the **<Active>** surface refers to.

Therefore, for this particular **Corridor**, the template being used (**L4_OVRB**) is expecting to be 'told' which surface to target. So this requires the **Active Surface** in the **ROADWAY DESIGNER** to be set to the **OG** surface.

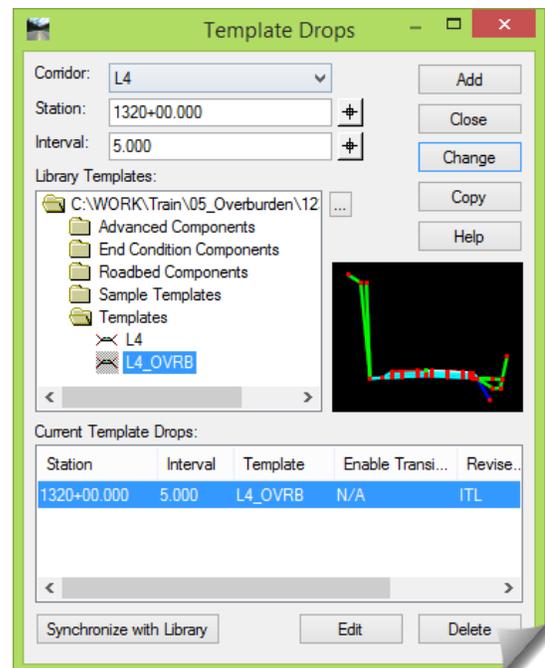14) Set the **Active Surface** in the ROADWAY DESIGNER to the `12345OVRB_og` surface.

There is an existing **Corridor** in this IRD that was set up using the `L4` template. Feel free to review it, or just note the settings in the picture below.
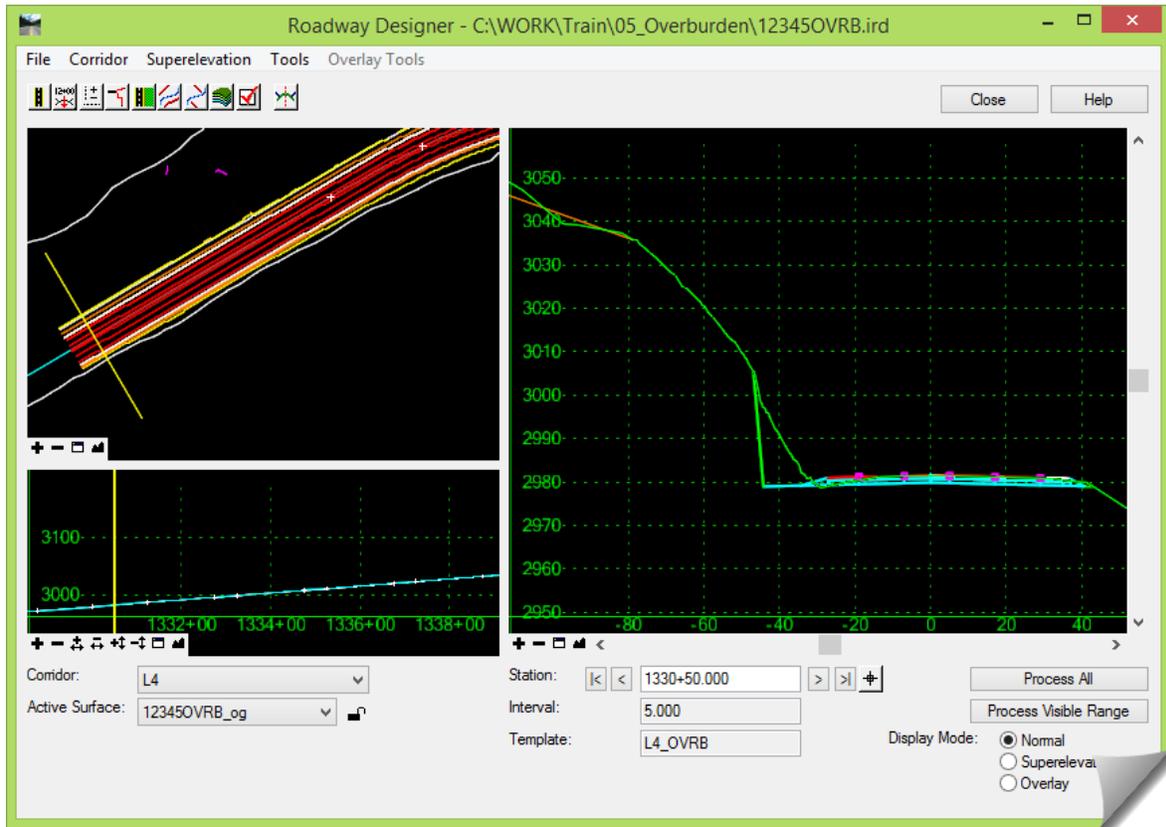

The **Limits** defined in the **Station** area **Start** and **Stop** along the horizontal alignment in the location of the rock-soil interface surface, since this is the area that this module is focusing on.

What will be done next is to go into the TEMPLATE DROPS for the `L4` Corridor and just change the template from the original `L4` template to the latest `L4_OVRB` template.

15) Go to the TEMPLATE DROPS dialog box and select the single entry listed in the **Current Template Drops** list window at the bottom of this dialog box.

16) Browse into the **Library Templates** and locate the **Templates** folder.

17) Select the `L4_OVRB` template.

18) Select [**Change**] and verify the setting in the **Current Template Drops** list area.

19) [**Close**] the TEMPLATE DROPS dialog once it has been updated to reflect the new settings.

20) Select **Process All** to see the current results.

At this point you should see some results with its default slope and width values.

The last thing to do as far as entering the design details is to address the variable conditions that were specifically defined by the Geotechnical designer for this specific project.
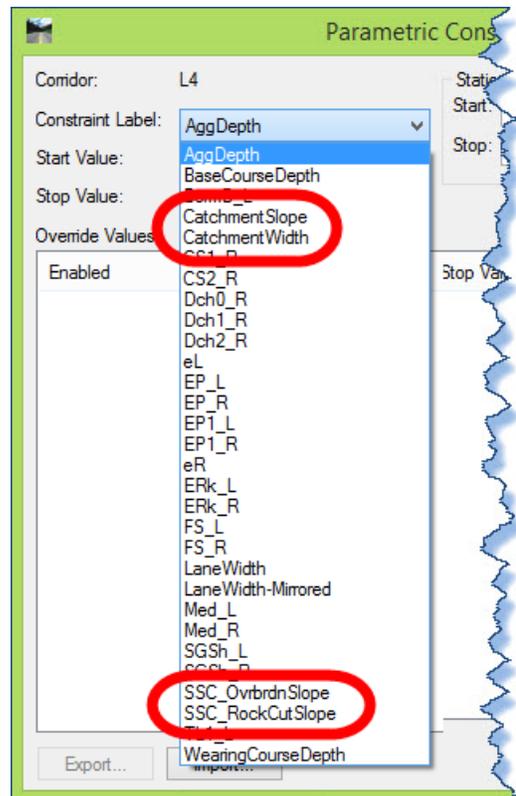
21) On the **ROADWAY DESIGNER**, go to *TOOLS > PARAMETRIC CONSTRAINTS*.

The **L4** template that was used in this module had a number of its own **PARAMETRIC CONSTRAINTS** assigned to it. For this reason, when you select the **Constraint Label** dropdown list, there will be several items coming from other areas of the template that was used.

22) Select the **Constraint Label** dropdown list.

The **Overburden w/Rock Cut** EC uses four specific **Labels** to define its variable conditions:

- **CatchmentSlope**
- **CatchmentWidth**
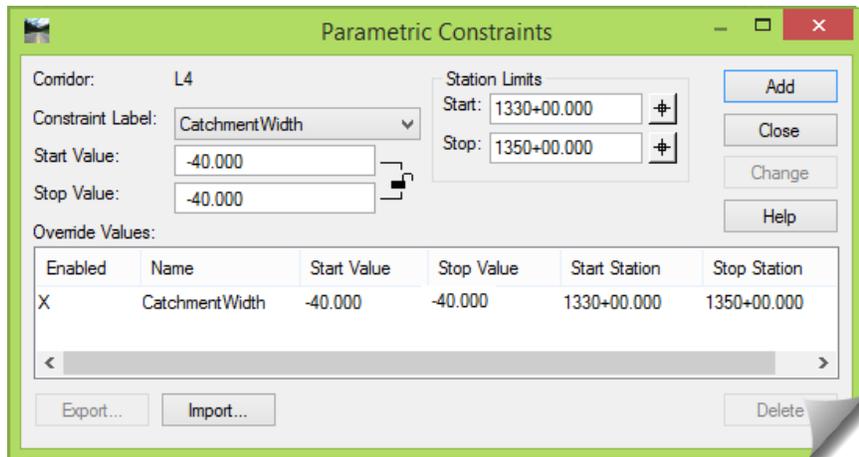- **SSC_OvrbrdnSlope**
- **SSC_RockCutSlope**

As a reminder, the values provided by the Geotechnical Engineer were:

- Catchment Width = 40'
- Catchment Slope = 2.00%
- Rock Cut Slope = 0.25H : 1V (400%)
- Overburden Cut Slope = 2H : 1V (50%)

Since these values will be applied to the entire project for this rock slope condition, only a single entry needs to be created for each **Constraint Label**.

23) Set the **Constraint Label** to **CatchmentWidth** and define the **Start Value** and **Stop Value** as **–40.00** and then [**Add**].
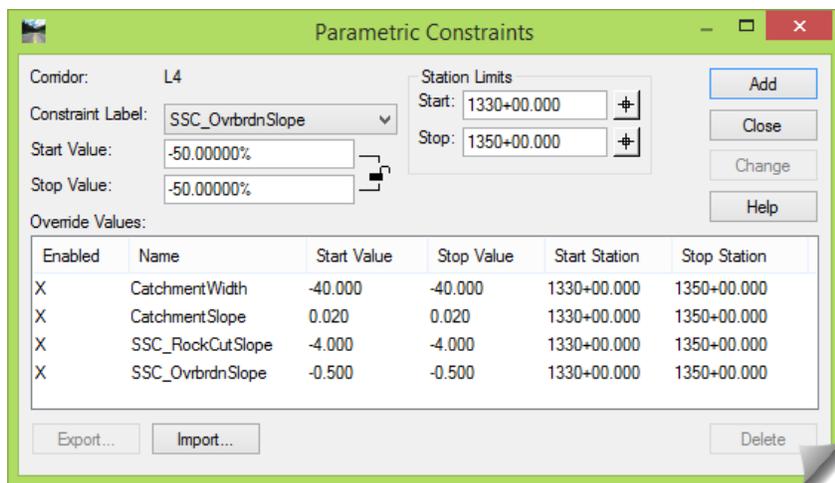

24) Set the **Start Value** and **Stop Value** for the **CatchmentSlope** as **2.00%** and [**Add**].

25) Set the **Start** and **Stop Values** for the **SSC_RockCutSlope** as **–400%** and [**Add**].

> **TIP**: When establishing the **PARAMETRIC CONSTRAINTS** in the **ROADWAY DESIGNER**, the initial **Start Value** and **Stop Value** will reflect the hard-coded **Values** defined during the Template construction. If the Geotechnical values are the same, then an entry is not needed.

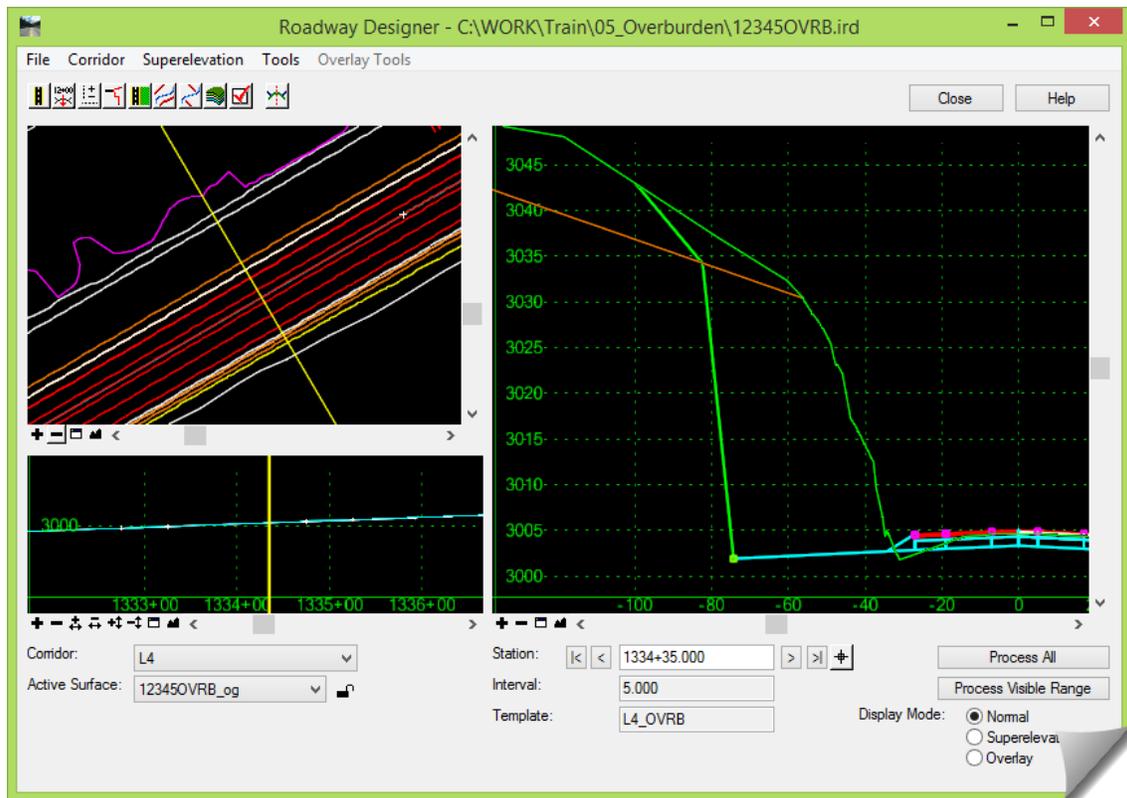26) Set the **Start** and **Stop Values** for the **SSC_OvrbrdnSlope** as **–50.00%** and [**Add**].

27) [**Close**] the PARAMETRIC CONSTRAINTS dialog box when this is complete.

> TIP: PARAMETRIC CONSTRAINTS have the capability to be **Enabled** or disabled. This allows the user to define a Label, like `Slope_Daylight` to `3:1` for one entry, `4:1` for another entry, and `5:1` for even another entry. Only one of these should be **Enabled** at a time, but these multiple entries allow you to look at the results for various slope conditions by simply disabling or enabling the **Label** that you want to activate.

28) Select [**Process All**] to generate the corridor.

You should now see an accurate Geotechnical-driven overburden cut slope in the ROADWAY DESIGNER. (But keep in mind that we are only focusing this modeling on the left side of the roadway and there may be modeling errors and anomalies on the right side that are beyond the scope of this module.)
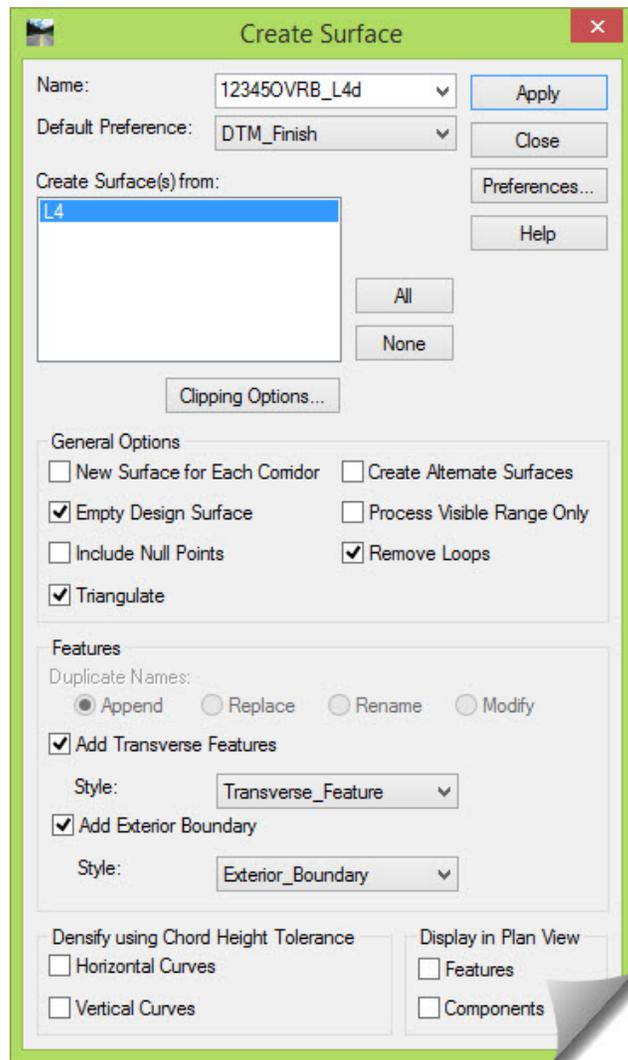

29) If you haven't already done so, **Save** the ROADWAY DESIGNER.

At this point you can walk through the Cross Sections in the ROADWAY DESIGNER and review the results, looking for anything that seems out of place or incorrect.

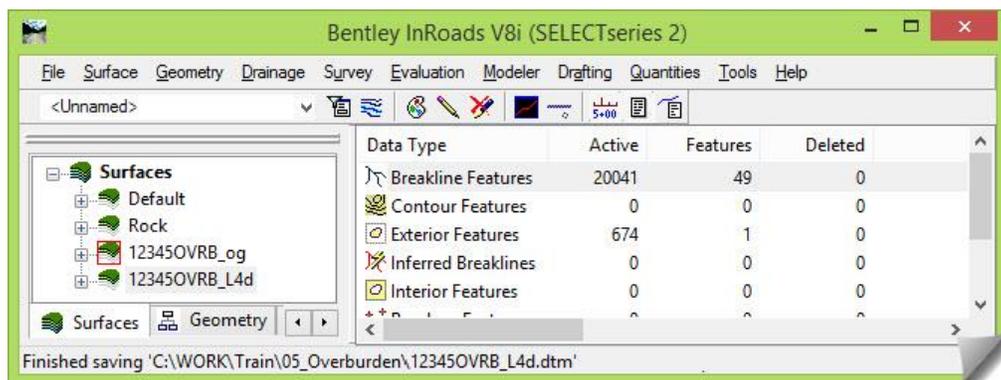Once that is done to your satisfaction the design surface can be created.

30) Go to CREATE SURFACE and create the design model using the ODOT **Preference**.

You can always optionally enter the **Name** of the surface manually, **Add Transverse Features**, and toggle on or off other options if the surface model requires it.
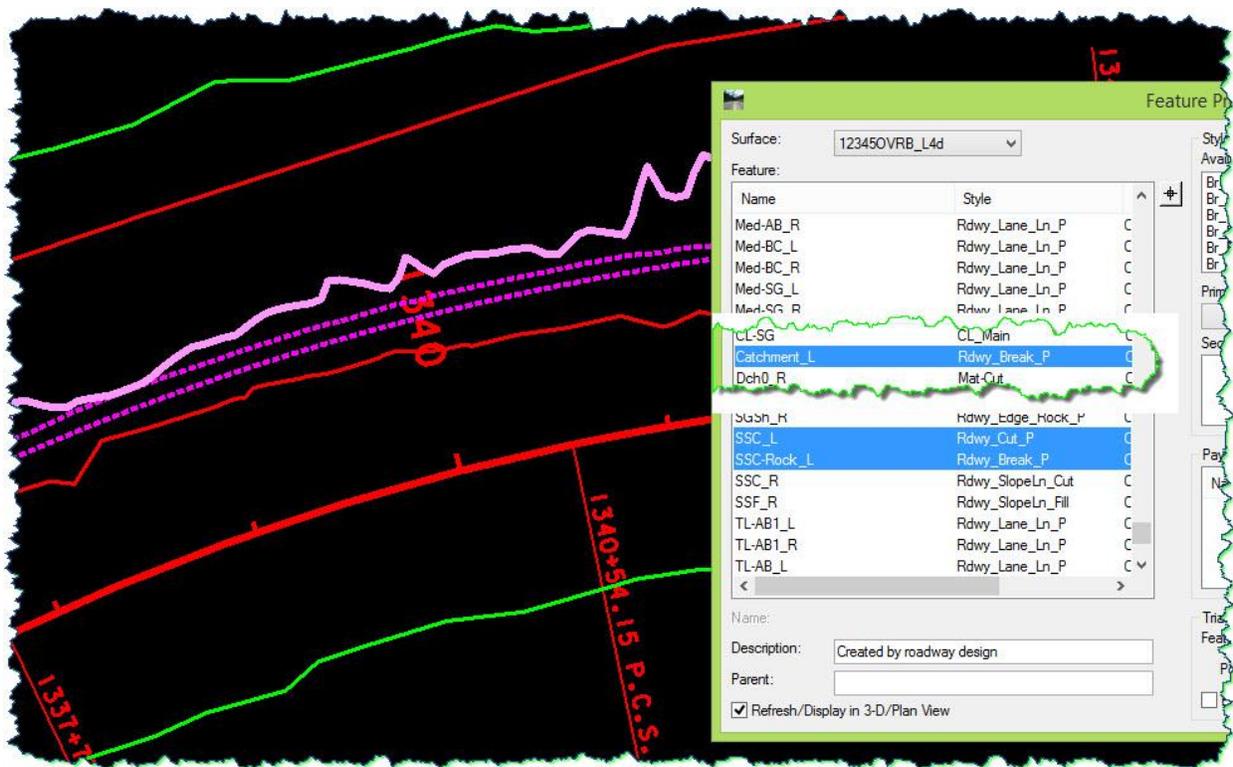

31) Once this surface is created [**Close**] the ROADWAY DESIGNER.

32) Verify that your design surface has been created and then **Save** it to the module folder.
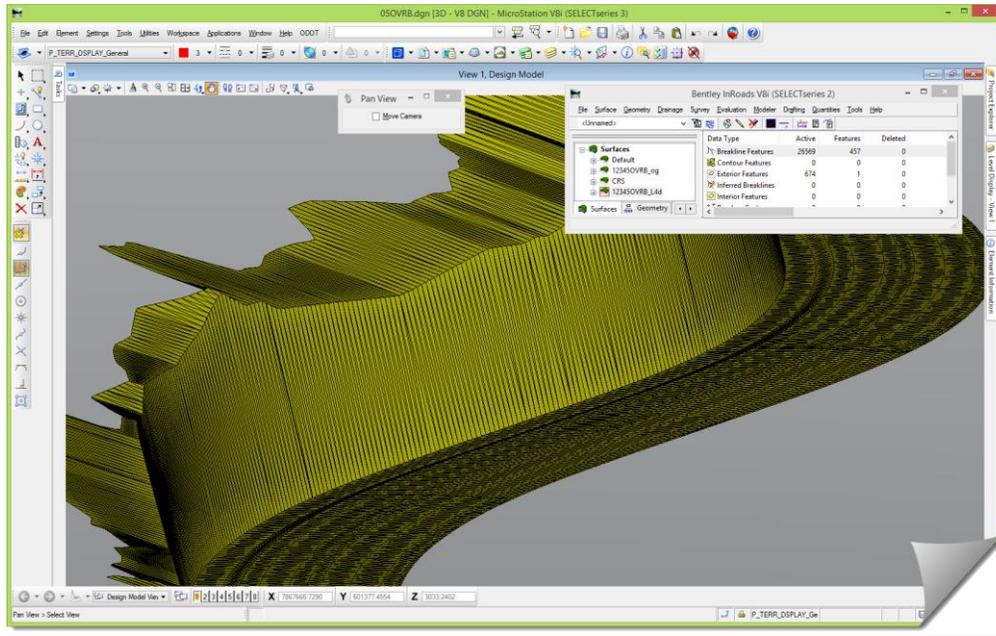
33) Review the surface feature data in the Feature Properties to verify that it's as expected.

There were three specific **Features** that were related to this overburden EC, and you should see them in the design model. It's very important to be able to correlate the template point construction with the resulting surface model features.

34) To conclude this module you can:

- Review the resulting design surface in MicroStation any way that you feel like
- Create Cross Sections for an additional review of the design surface

Conclusion

Congratulations, you have completed the Overburden End Condition module and are continuing to improve your modeling skills with InRoads.

We leave you with our encouraging 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.