



OpenRoads Designer Best Practice – *Terrain Modeling*

Best Practice: Terrain

This best practice session intends to cover some of the most frequently asked questions on the use and capabilities of terrains.

Hopefully, we'll expose you to some things that you may not know, so that everyone from the novice user to the expert will be able to take something away from this session that will be beneficial.

At the end, we'll look at a few “new” capabilities in OpenRoads Designer.

Agenda

- *FAQ*
 - *Terrain Feature vs. Element Template*
 - *XML Import Options*
 - *To Rule or Not to Rule?*
 - *Boundary Options*
 - *Terrains from Corridors*
 - *Image Draping*
- *NEW in OpenRoads Designer*
 - *The 64 Bit Difference*
 - *Aquaplaning (Technology Preview)*
 - *.3sm Scalable Mesh (Technology Preview)*
 - *Clear Active*





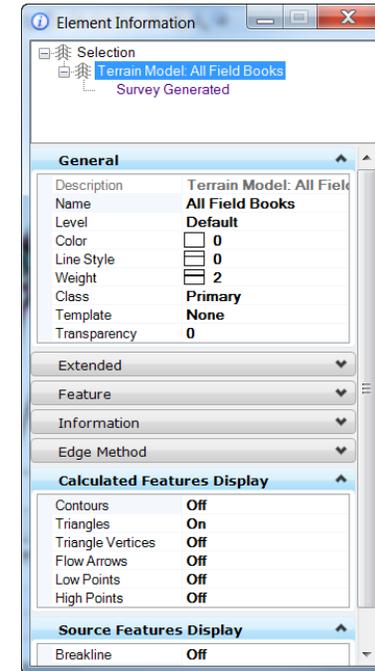
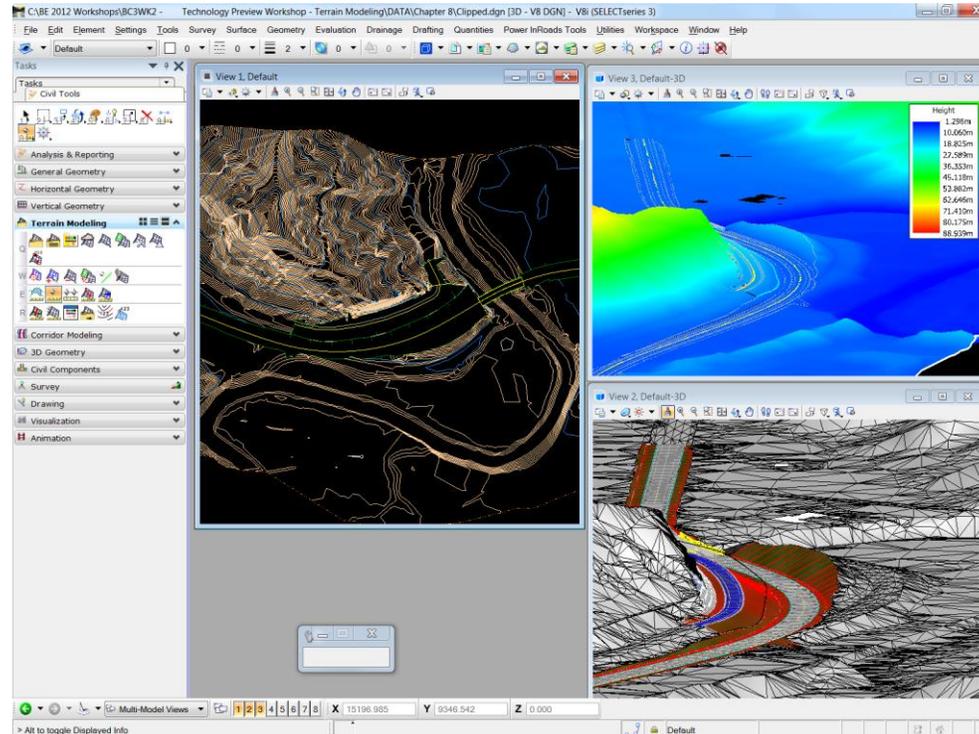
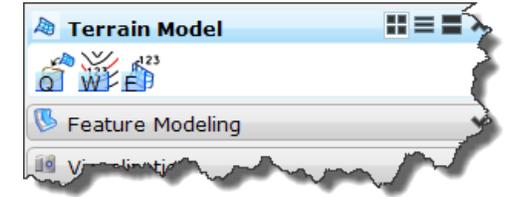
FREQUENTLY ASKED QUESTIONS

Terrain Feature Definitions vs. Element Templates

The OpenRoads Terrain

As I'm sure most are aware of by now, with SELECTseries 3, MicroStation created a new Terrain element type, creation methods and new display capability

- *LandXML import*
- *Element Templates*
- *Display Themes*
- *Annotation tools*



File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Existing_Contours E_Terrain_Contours

130 3 0 0 0

Attributes

Explorer Attach Tools Models Level Display

Primary

Element Selection

Selection

Reports Civil Analysis Corridor Reports

Model Analysis and Reporting

Terrain Import Import Geometry IRD

Model Import/Export

OpenRoads Help Open RSS Reader

OpenRoads Help

Element Selection



View 1 - Top, Default



Element Selection > Identify element to add to set

Terrain Model: ground, Level: E_Terrain

E_Terrain_Contours



Then why do we need terrain features?

Whereas Element Templates allow you to control the Symbology of a terrain, terrain feature definitions **give you additional properties.**

- *Surface Volume Type*
 - *None, Design, Existing, Subgrade, Substrata*
- *2D vs. 3D vs. Profile symbologies*
- *Annotation tools*

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Search Ribbon (F4)

Element Selection

From File From Graphical Filter From Elements

Additional Methods

Active Edit Model

Feature Management Boundary Options

Edit Complex Model

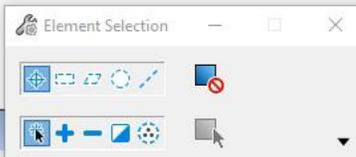
Points Volumes Hydraulic Reporting Aquaplaning

Graphical Filter Manager Export To File

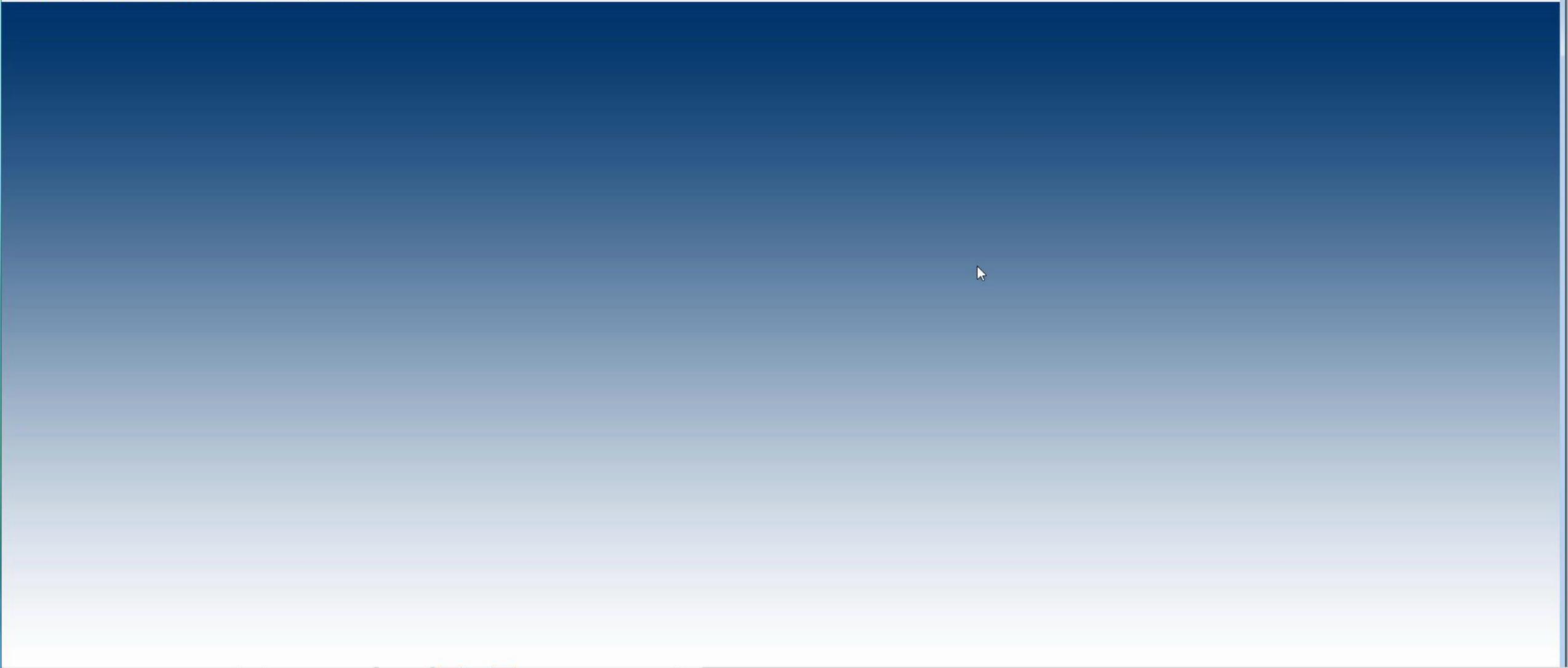
Label Terrain Contours Label Terrain Spots

Selection Create Edit Analysis Miscellaneous Labeling

Element Selection



View 1 - Top, Default



Element Selection > Identify element to add to set

Terrain Model: ground, Level: E_Terrain_Exterior

E_Terrain



Best Practice



The preferred method is to use **Terrain Features** to control your terrains, not element templates directly.

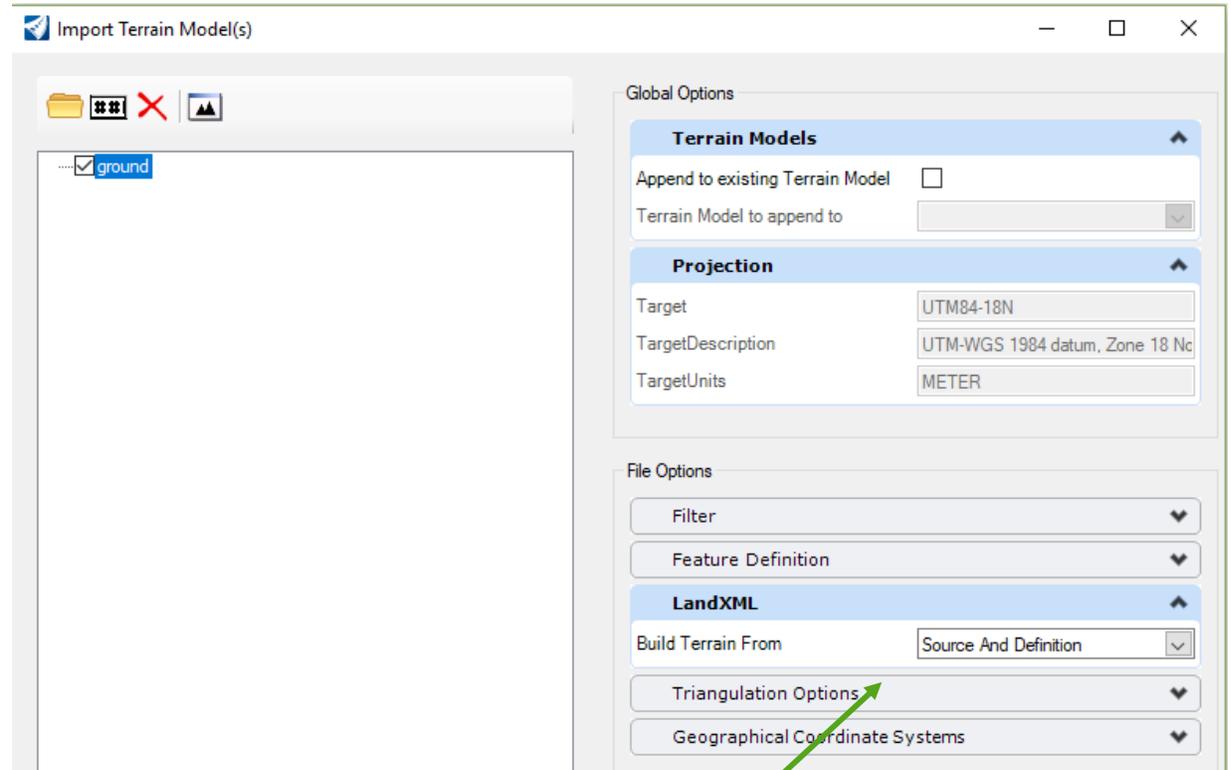
You can overwrite a Terrain Feature symbology with an Element Template.

However, keep in mind that if the terrain regenerates itself for some reasons (*e.g. change boundary option*), it will revert back to its original symbology.

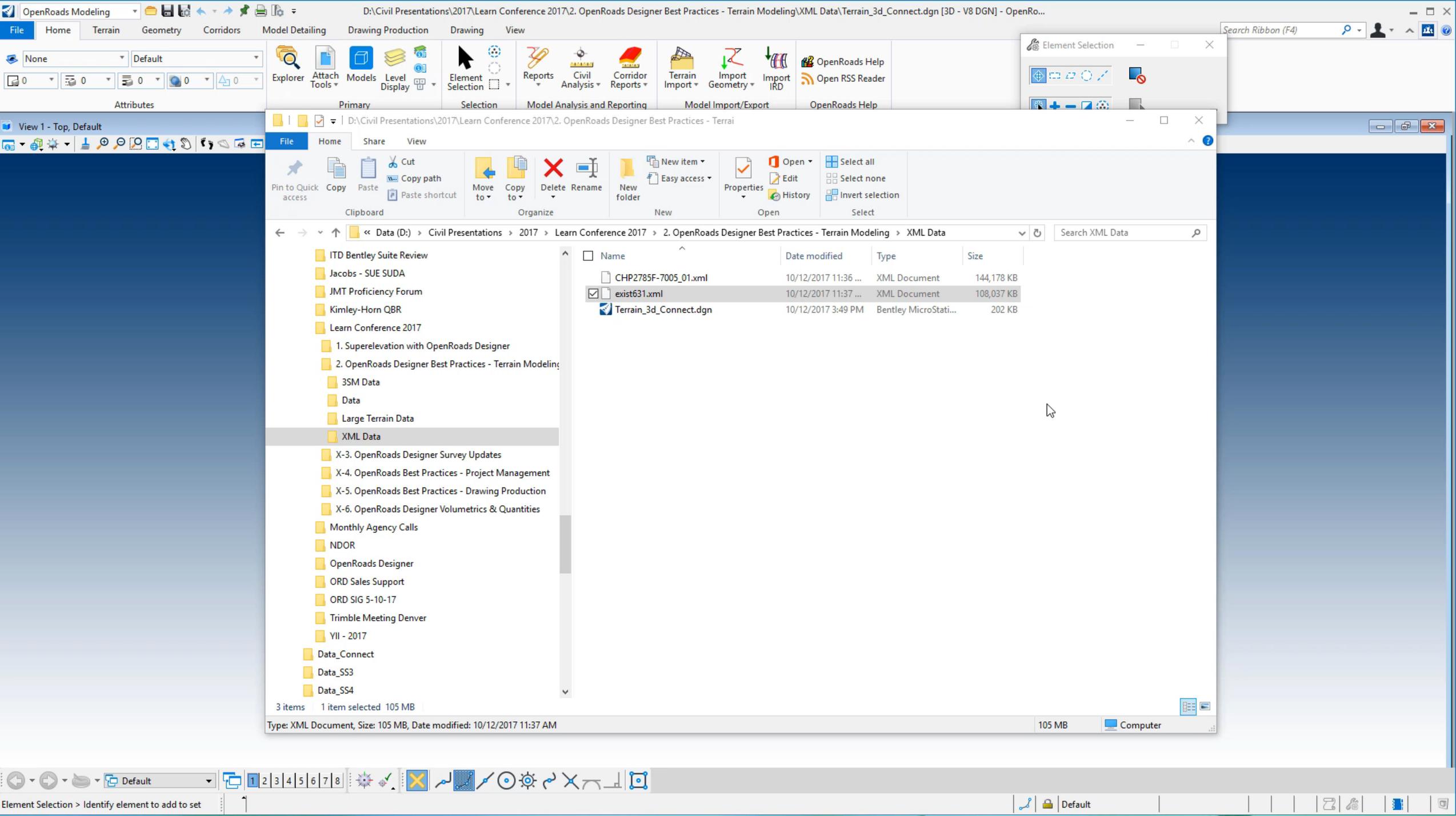
LandXML Import Options

LandXML Import Options

- **Definition**
 - Utilizes the stored triangulated faces to define the Terrain
- **Source**
 - Utilizes survey features such as breaklines, voids and points, then triangulates
- **Source and Definition** (default)
 - Utilizes both in creating the terrain and resolves
- **Unique to LandXML**



Source And Definition
Definition
Source



Best Practice



The method used will usually depend on the file and the situation.

If you do not want to re-triangulate (*i.e you want to duplicate the triangles from the terrain that generated the LandXML file*), then use the Definition method.

Otherwise, the default (and recommended method) is to use Source and Definition. This does re-triangulate, but uses both triangles and source data to produce a “best” triangulation.

To Rule or Not to Rule

Terrain Rules

- Civil adds 'intelligence' by ruling the terrain. This in effect creates a link between the terrain and the data/information used to create it.
- This rule capability comes in two forms:
 - **Dynamic**
 - Terrain model **automatically updates** when it's informed that a dependent element has changed.
 - **Static**
 - Terrain model has a link to it's original data, but must be **manually updated**.

Dynamic Rules

- Created by
 - Survey; Create from Elements; Complex Terrains; Clipped Terrains; Delta Terrains
- **Advantages**
 - Always up to date
 - Essential in site modeling type situations
- **Disadvantages**
 - Performance overhead for large amount of rules
 - Individually ruled elements limited to 10,000 (pre-checked)

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Element Selection | From File | From Graphical Filter | From Elements | Additional Methods | Active | Edit Model | Feature Management | Boundary Options | Points | Volumes | Hydraulic | Reporting | Aquaplaning | Graphical Filter Manager | Export To File | Label Terrain Contours | Label Terrain Spots

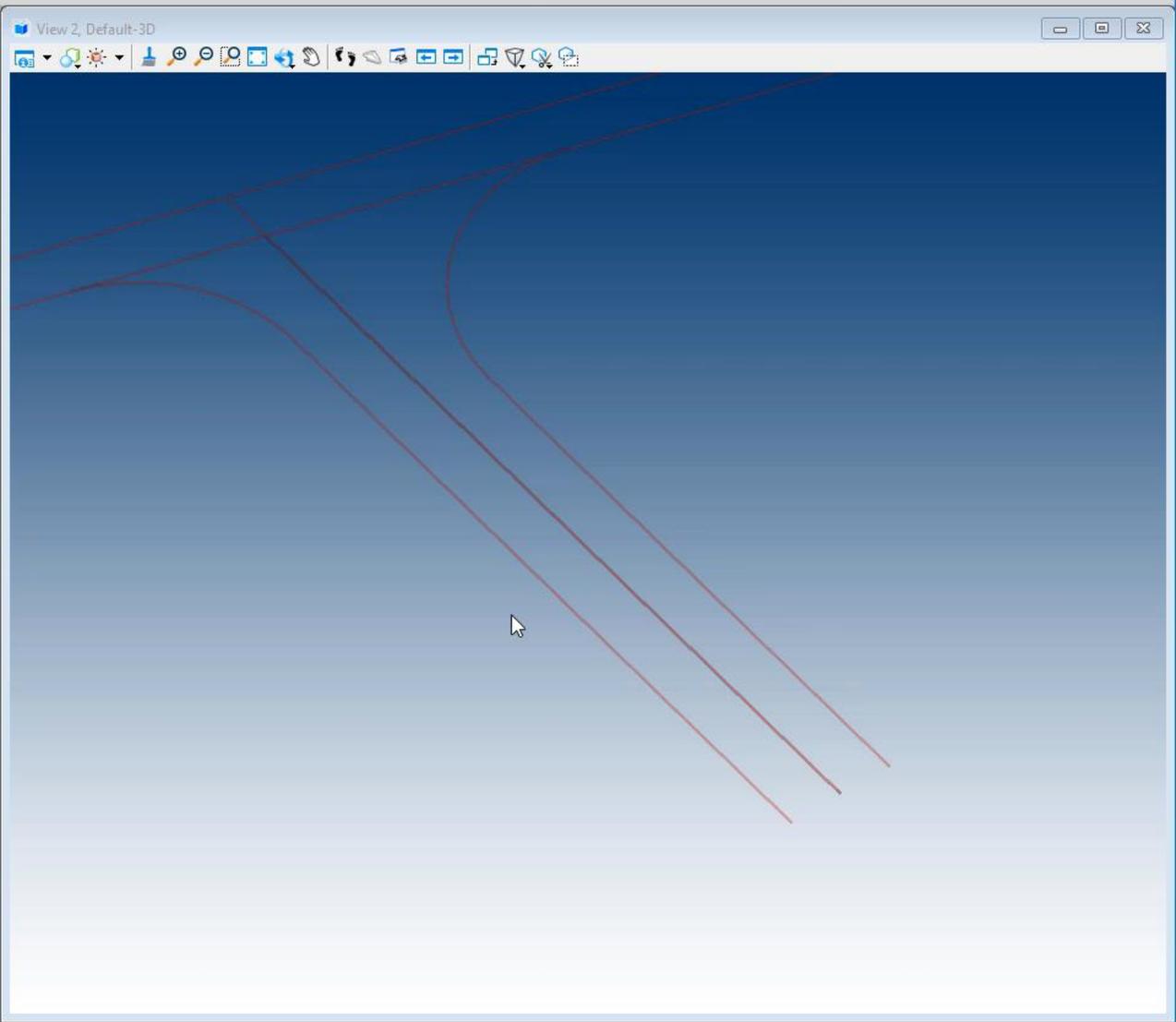
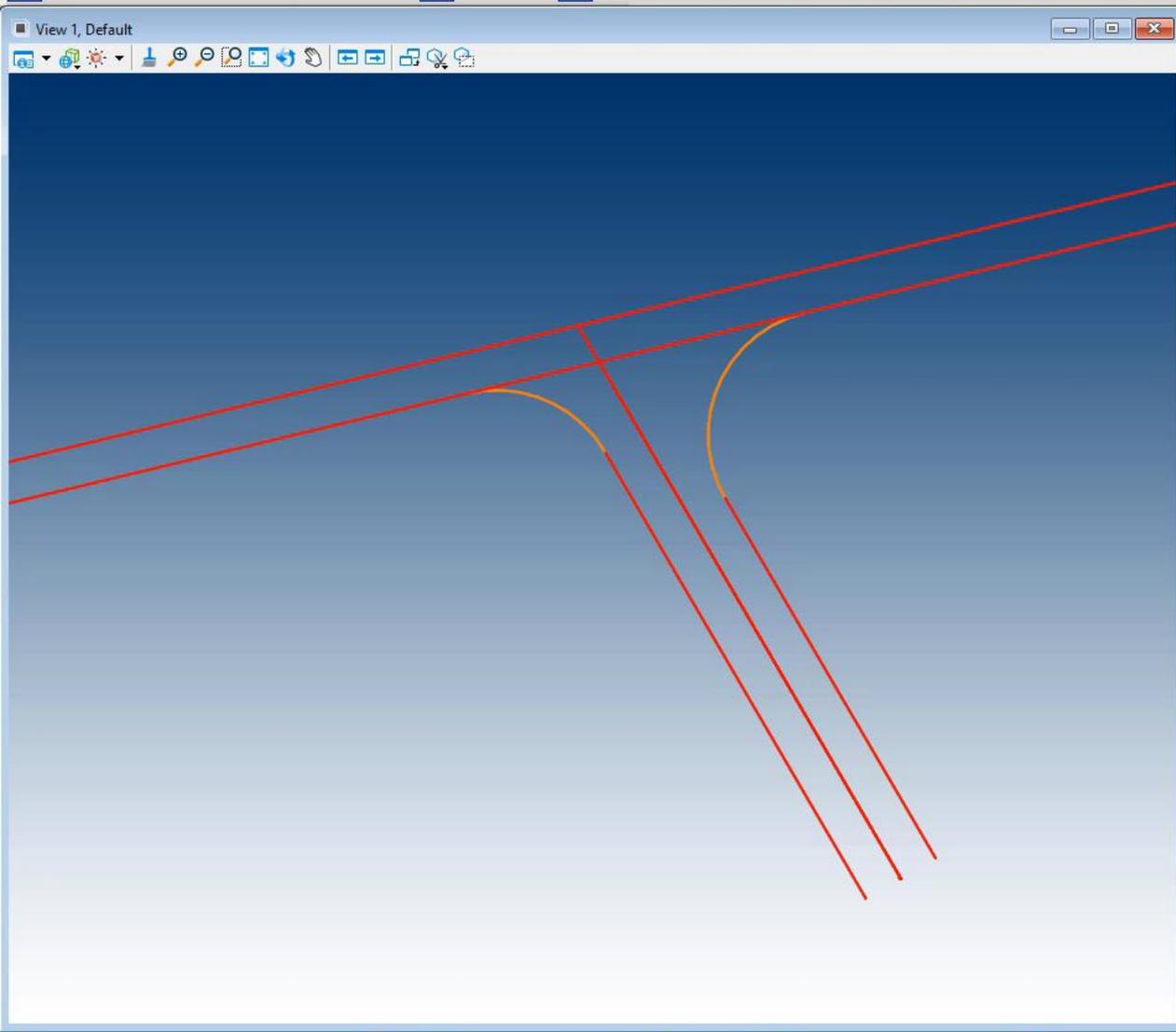
Selection | Create | Edit | Analysis | Miscellaneous | Labeling

Geom_Baseline

Search Ribbon (F4)

Element Selection

- +
-
- +
-
- +
-
- +
-



Static Rules

- Created by
 - Import from file; Ascii import; Graphical Filters; Point Clouds; Text Interpolation
- **Advantages**
 - User decision when to update
 - Overcomes overhead for large amount of rules
- **Disadvantages**
 - Change management notification

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Element Selection Selection

From File From Graphical Filter From Elements

Additional Methods

Active Edit Model Feature Management Boundary Options

Points Volumes Hydraulic Reporting Aquaplaning

Graphical Filter Manager Export To File

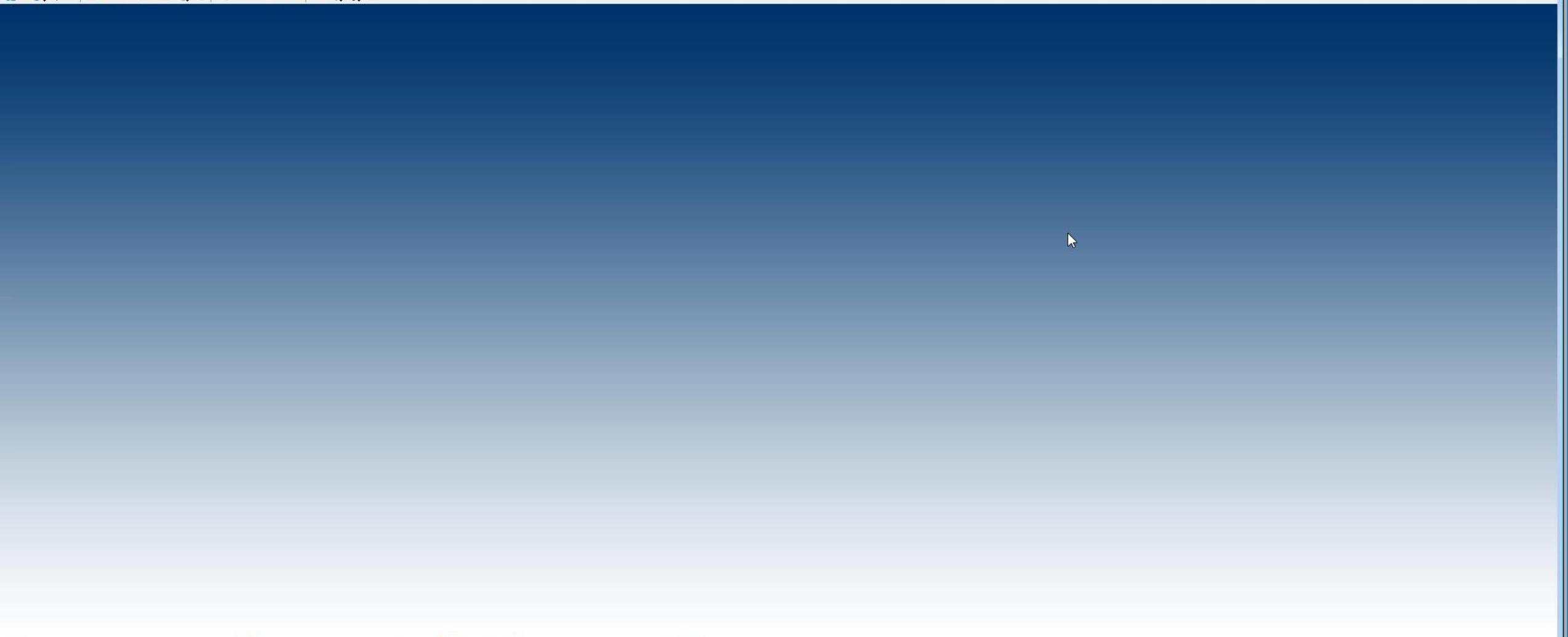
Label Terrain Contours Label Terrain Spots

No Feature Definition

Search Ribbon (F4)

Element Selection

View 1 - Top, Default



Element Selection > Identify element to add to set

Default

Default

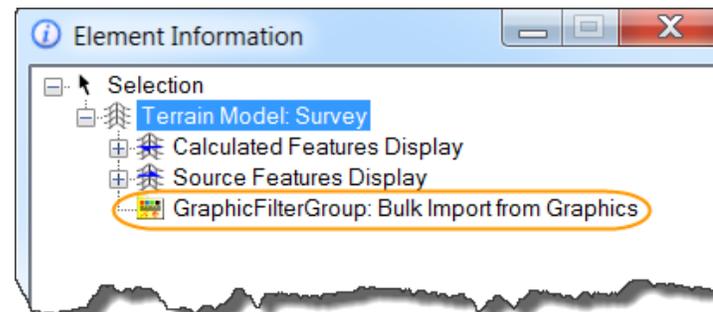
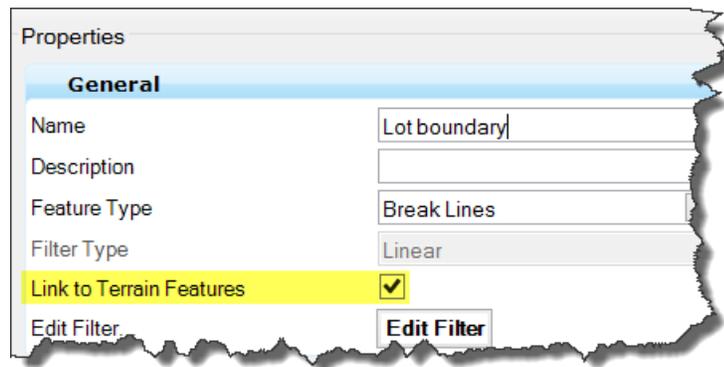
To Rule or Not to Rule?

- In most cases, this decision of **dynamic** vs. **static** is made for you.

For example, as we saw, *Import from File* creates a static rule, while *Create from Elements* creates a dynamic rule.

- But sometimes the decision is yours.

This happens in the case of **Graphical Filters**.



Best Practice

Dynamic rules are intended for smaller terrains.

Typical Use Case

- Think *'Proposed'* situations / site modeling
- Think 100's of elements as opposed to 1000's of elements

Static rules are intended for larger terrains.

Typical Use Case

- Think *'Existing'* or *'Legacy'* terrains
- Think 1000's of elements as opposed to 100's of elements



Boundary Options

Terrain Boundary Options

- **None** (least control)

- **Slivers**

Long, thin, external triangles are dissolved based on a formula hard coded within the software (*i.e. nobody really knows 😊*).

- **Max Edge Length**

External triangles longer in length than the user specified distance are deleted.

- **Boundary** (most control)

All triangles outside of the Boundary feature are removed.

Boundary Tool Options

- **Add Boundary**

- *Extract Graphic*

- Creates a graphical 3D line string. It is just a simple graphic and is not linked to the terrain in any way.

- *Add Boundary*

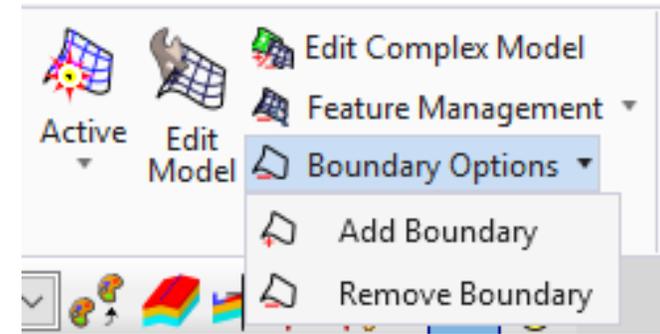
- Creates a non-graphical boundary feature within the terrain and overrules all other trimming methods.

- *Add Ruled Boundary*

- Creates an editable graphical boundary that is ruled to the terrain. It overrules all other trimming methods.

- **Remove Boundary**

- Removes any type of boundary (graphical or non-graphical) from the specified terrain.



Use Cases

- **Add Boundary**

- Adding a boundary overrides all other trimming methods
- Provides the greatest control over a terrain

- **Remove Boundary**

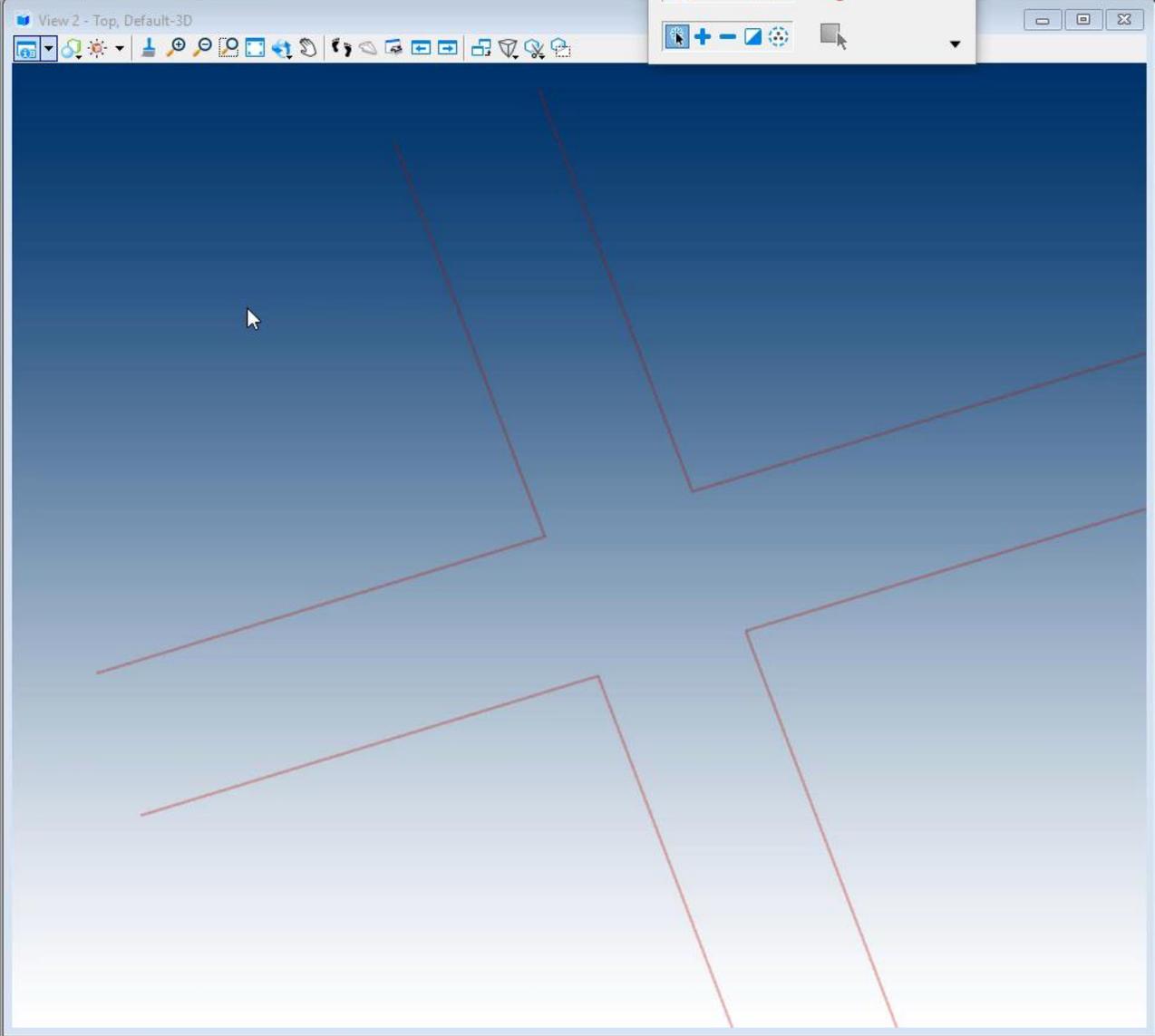
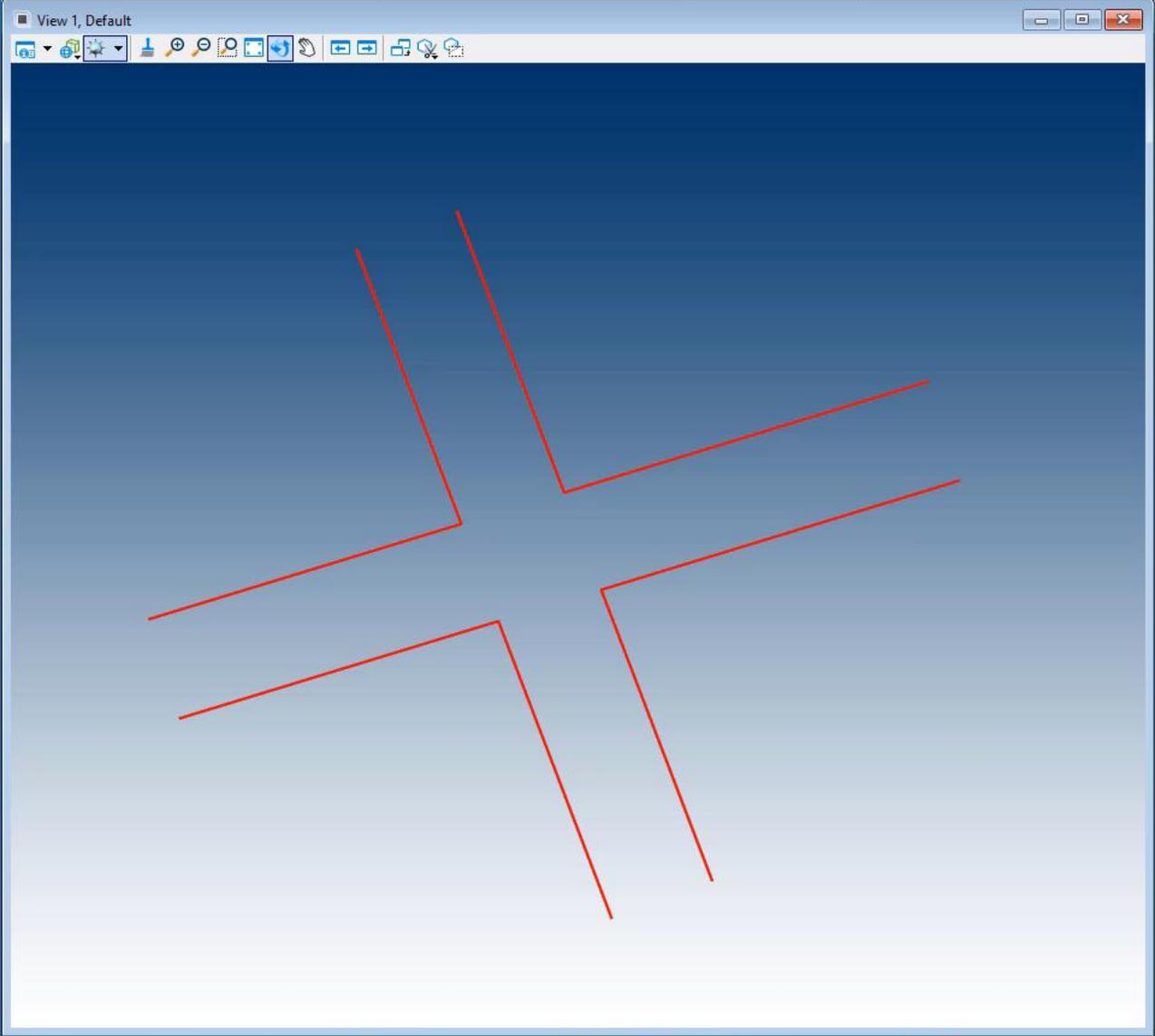
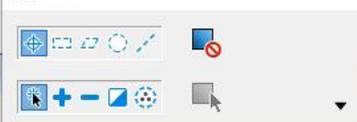
- Allows you to remove a boundary from a terrain in order to add additional data.

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Element Selection | From File | From Graphical Filter | From Elements | Additional Methods | Active | Edit Model | Feature Management | Boundary Options | Edit Complex Model | Points | Volumes | Hydraulic | Reporting | Aquaplaning | Graphical Filter Manager | Export To File | Label Terrain Contours | Label Terrain Spots

Selection | Create | Edit | Analysis | Miscellaneous | Labeling

Element Selection



Terrains from Corridors

Terrains from Corridors

- Design terrains can be valuable for a myriad of reasons.
 - *Drainage or Aquaplaning analysis*
 - *Final Contours*
 - *Merge with existing to create final terrain*
 - *Etc.*
- For a **single corridor**, the process is very straightforward.
 - Enable the Top Mesh display in the Corridor feature properties.
 - Re-process the corridor to create the Top Mesh
 - Using *Create Terrain from Elements*, create a terrain from the mesh.

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Attributes: None | Default

Primary: Explorer, Attach Tools, Models, Level Display

Selection: Element Selection

Model Analysis and Reporting: Reports, Civil Analysis, Corridor Reports

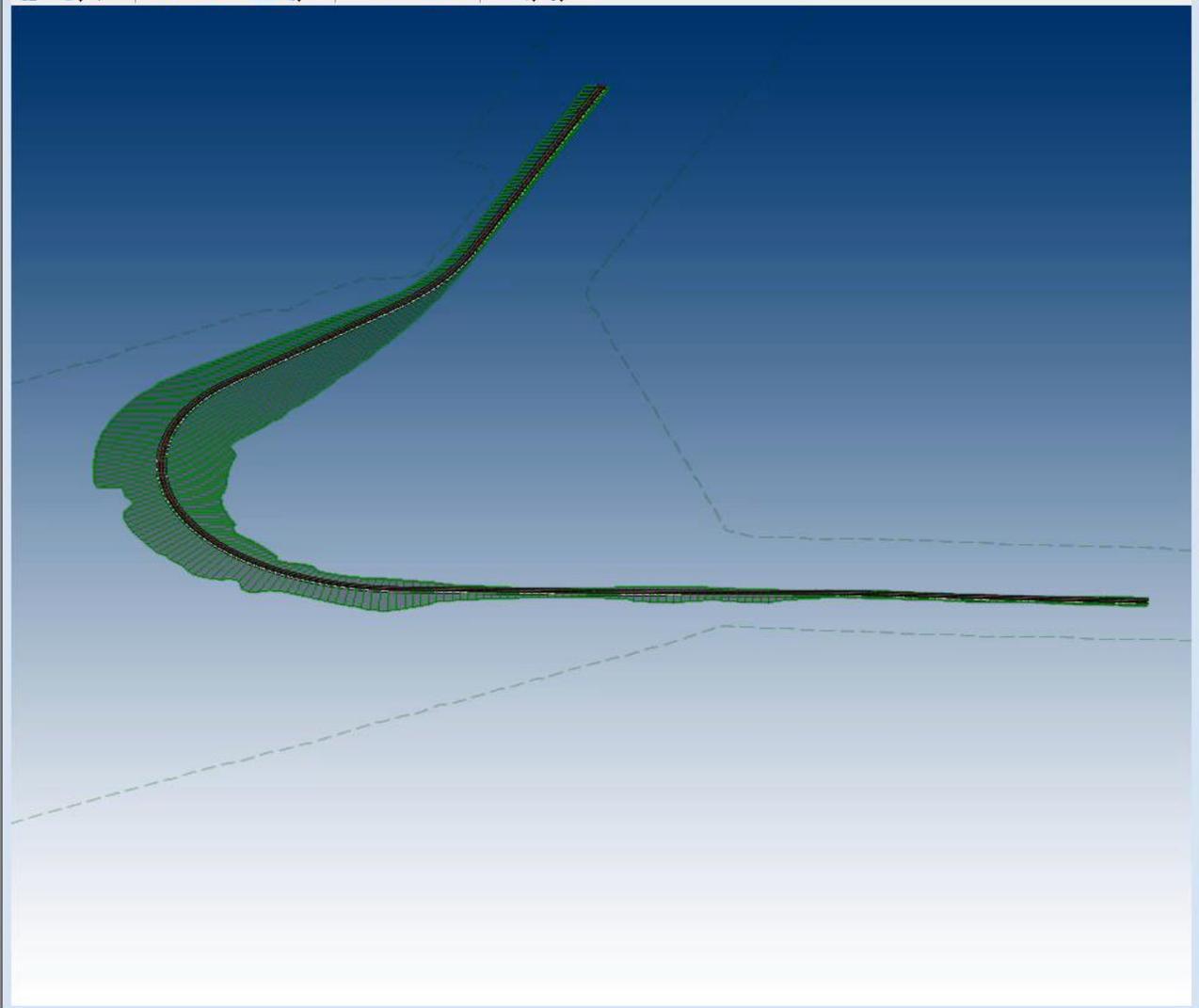
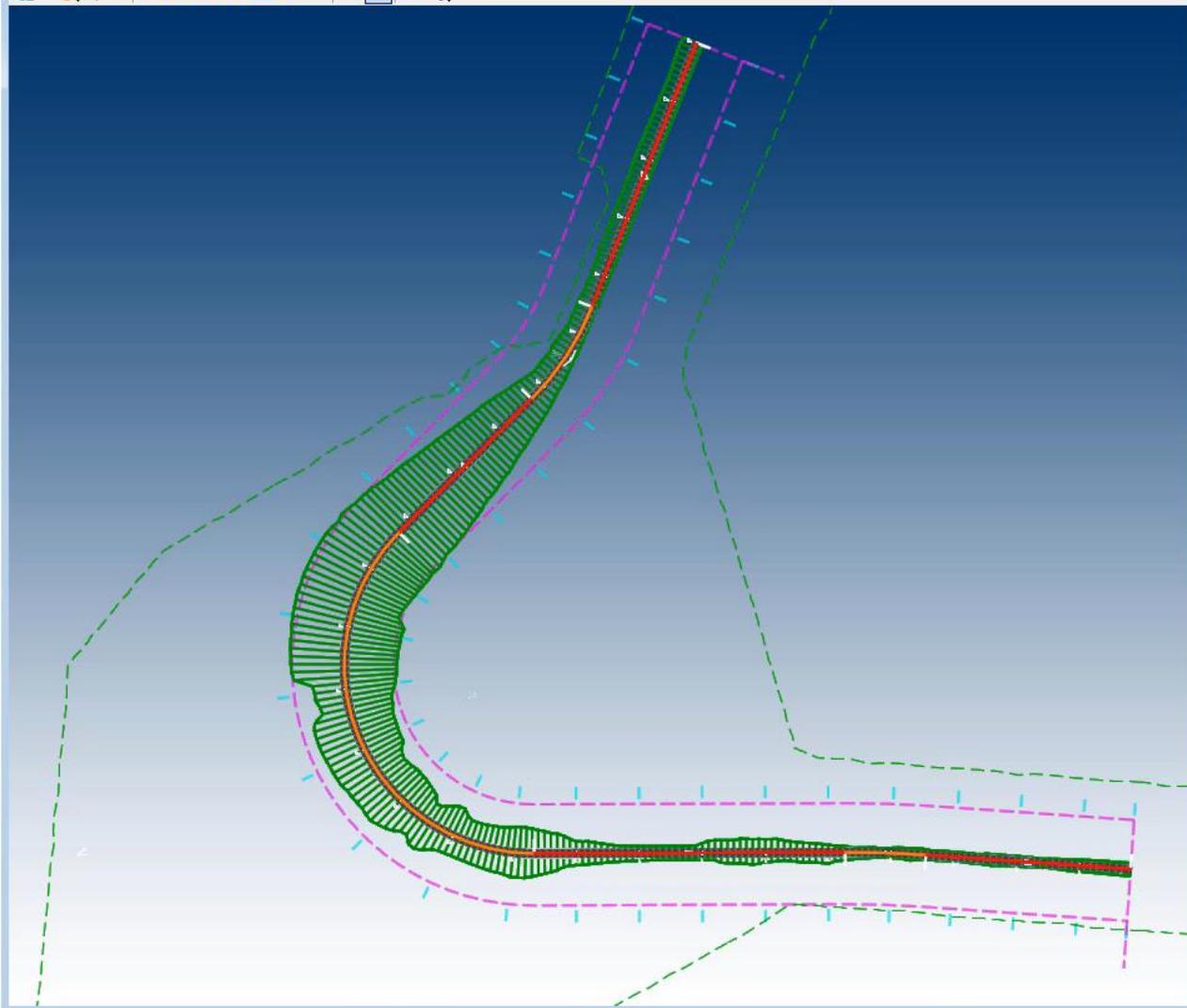
Model: Terrain Import

Search Ribbon (F4)

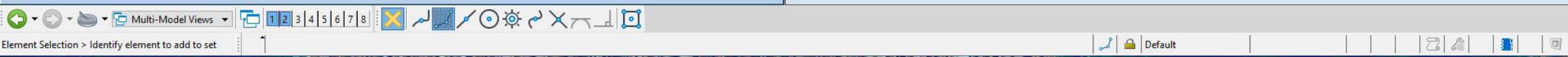
Element Selection



View 1, Default



Multi-Model Views | 1 2 3 4 5 6 7 8 | Element Selection > Identify element to add to set | Default



Best Practice



- But what if you have something more complicated, like multiple corridors with civil cells?
- In these more common scenarios, *Graphical Filters* become an indispensable tool to read the 3d linear features and create a terrain.
 - With well defined workspace features and templates, they provide a quick and efficient way to output a design terrain.
 - Can be built once and then work repetitively.
 - Can be saved to DGN Libraries and propagated across an organization.

Tasks

- Civil Tools
- Analysis & Reporting
- General Geometry
- Horizontal Geometry
- Vertical Geometry
- Terrain Model**
 - Q
 - W
 - E
 - R
- Corridor Modeling
- Model Interoperability
- Civil Cells
- 3D Geometry
- Survey
- OpenRoads Help
- Drawing
- Visualization
- Animation

Element Information

Project Explorer

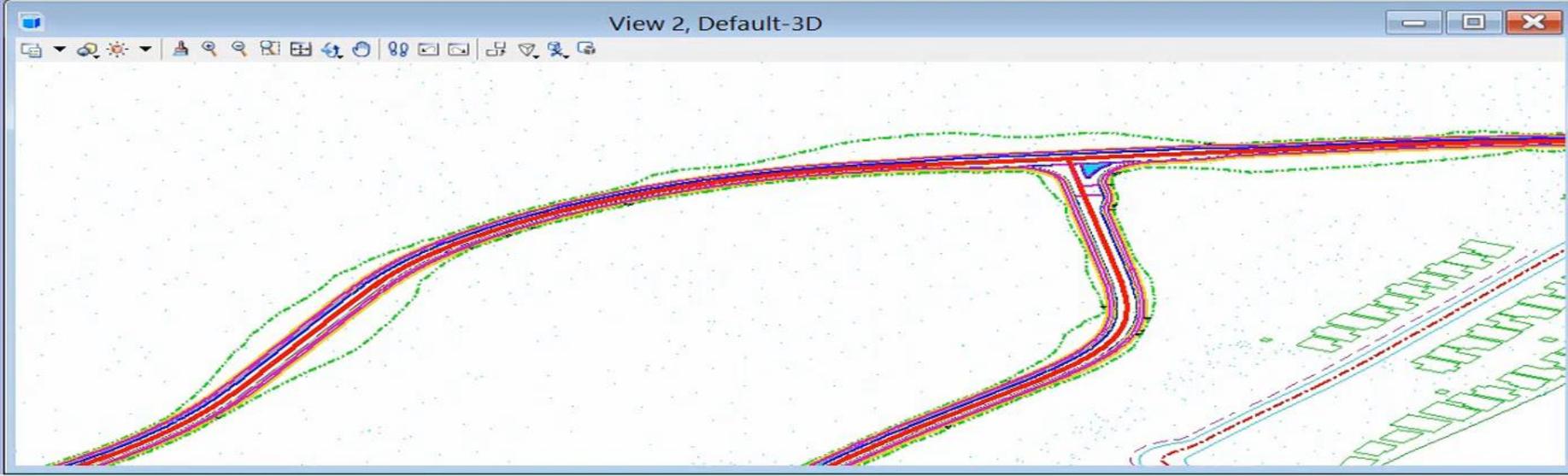
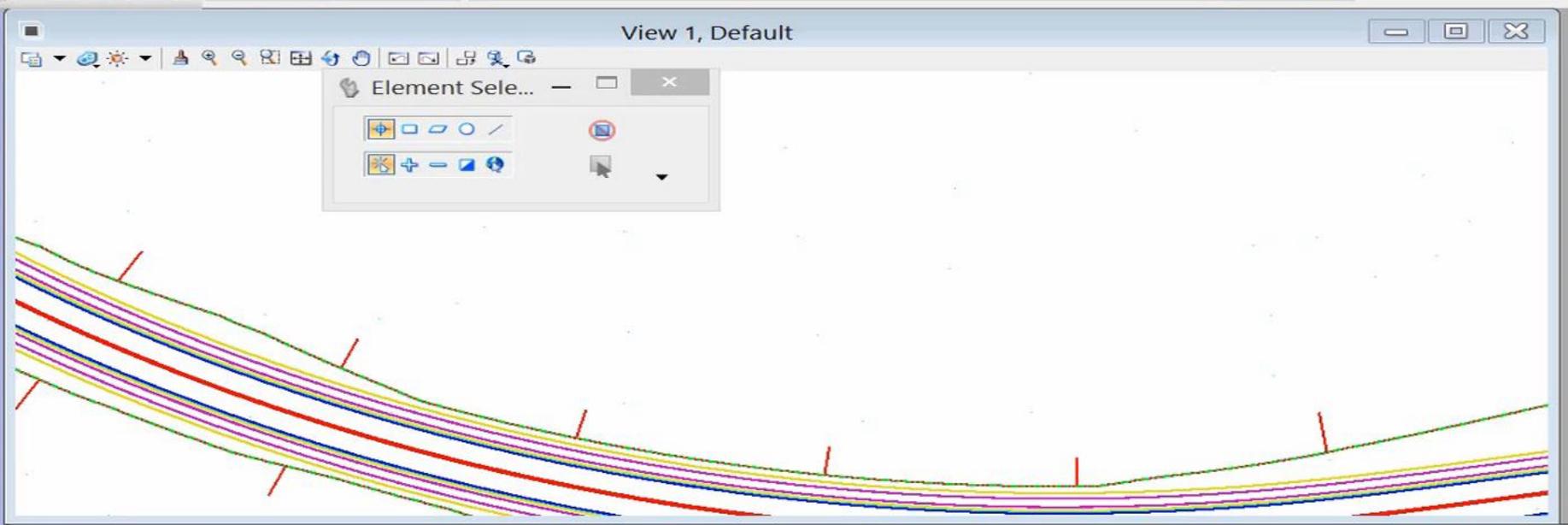
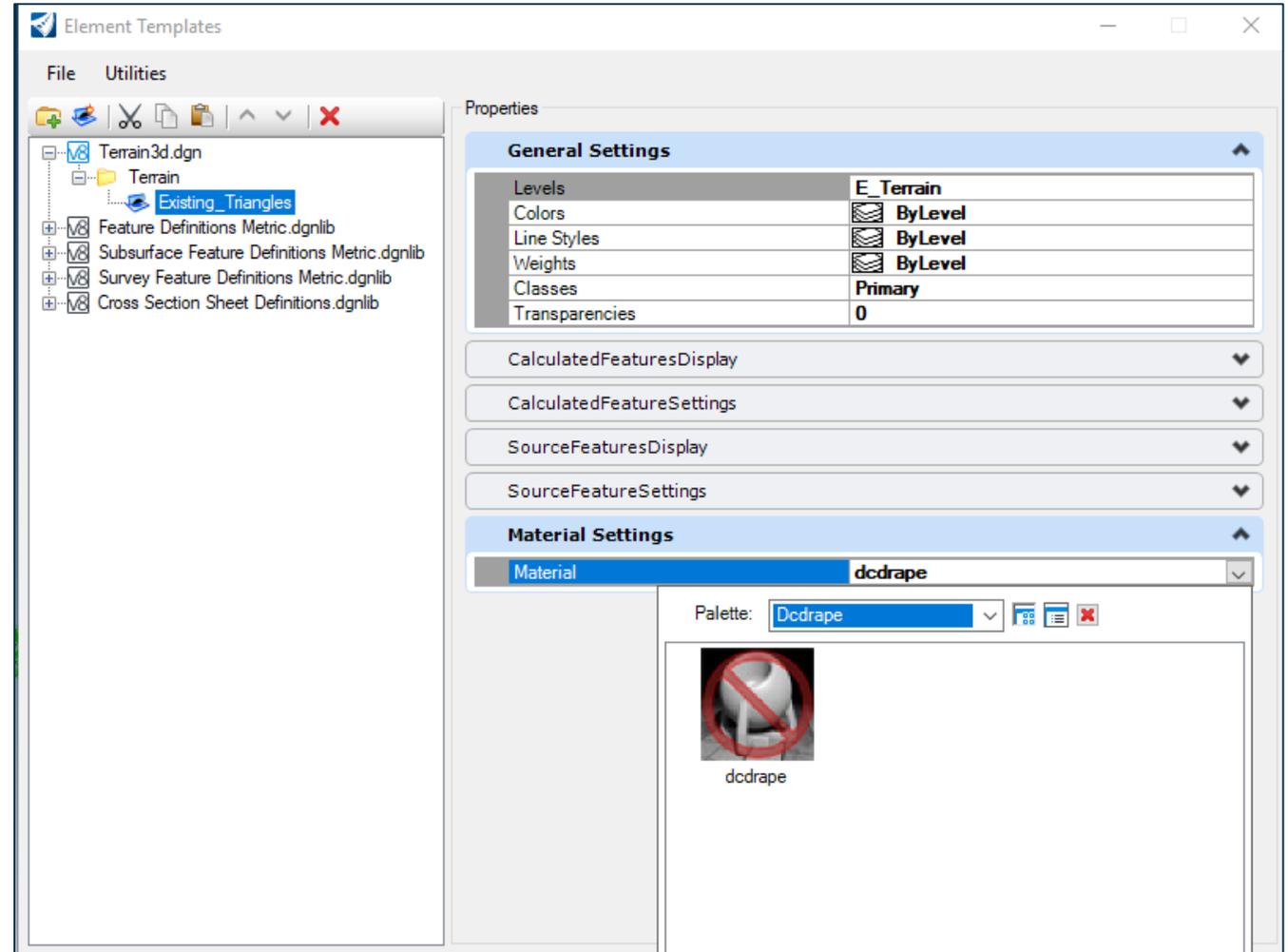


Image Draping

Draping Images on Terrains

- Remember, if you want to drape an image on a terrain, you must have the material *dcdrape* assigned to the terrain.
- *This is done through the element template.*



Best Practice

Even if you're not sure you'll need draped imagery, it's worth going ahead and adding the material to your terrain element templates.

That way when you do need to drape, it will 'just work'.





**NEW in
OpenRoads
Designer**

NEW: *The 64 Bit Difference*

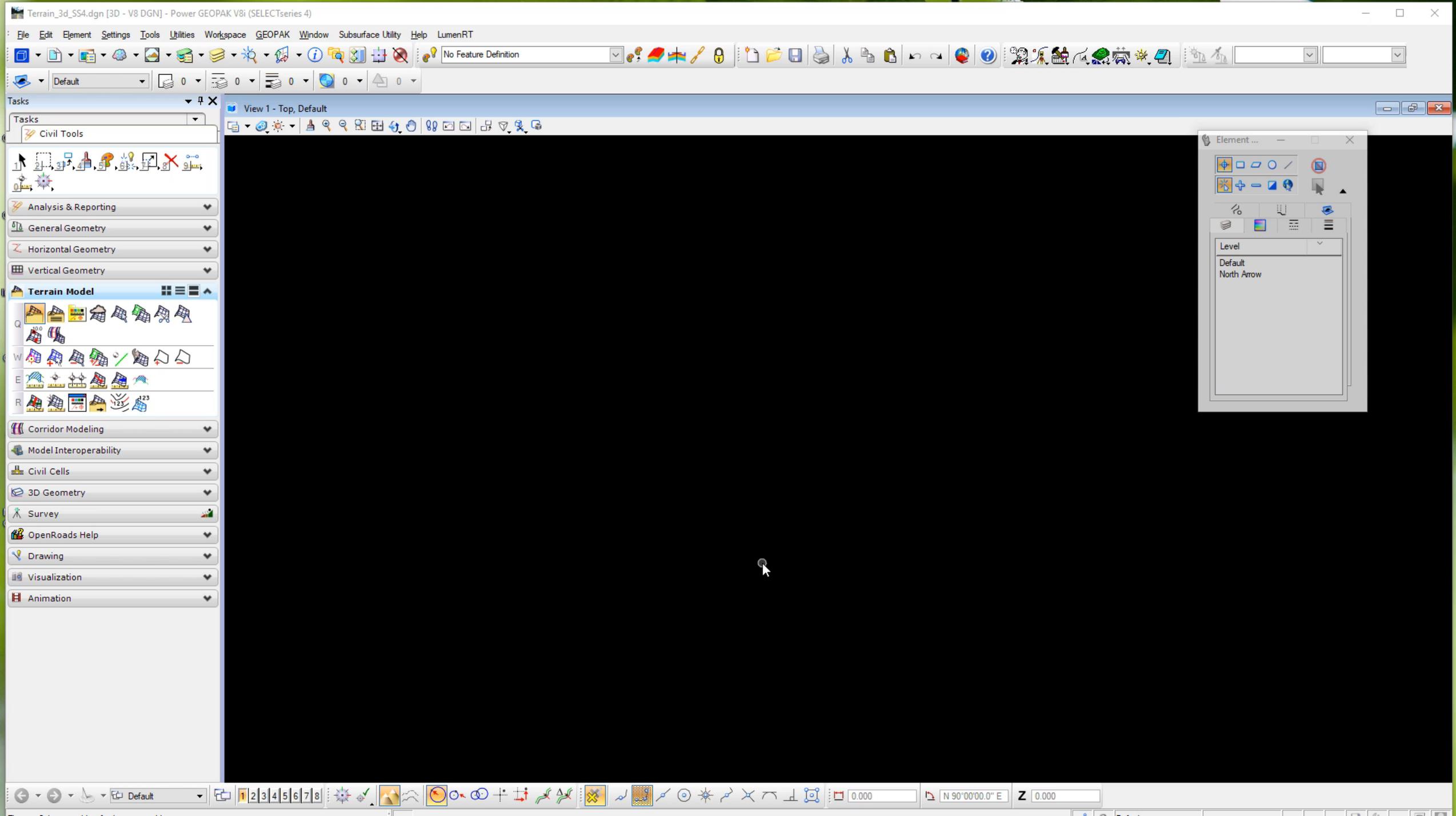
The 64 Bit Difference

In SS4, which is a 32 bit application, there are limitations on the size of terrains.

- +/- 8-9 Million points (+/- 300 mb)

In Connect, which is a 64 bit application, those limitations are removed.

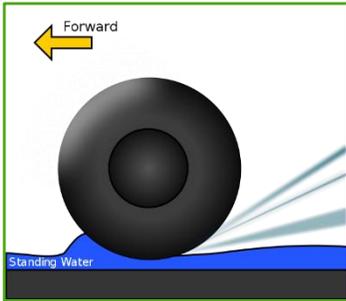
- Terrains can be much, much larger.
- How large depends on how much memory you have on your machine.
- How they operate graphically (e.g. *rendering, rotating*, etc.) will depend on your graphics card.



NEW: *Aquaplaning* (Tech Preview)

Aquaplaning

Aquaplaning occurs when a layer of water builds between the wheels of the vehicle and the road surface, leading to a loss of traction that prevents the vehicle from responding to control inputs.



In order to help analyze these potential situations, a new Aquaplaning analysis tool has been added to OpenRoads Designer Update 2.



File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Attributes: None | Default

Primary: Explorer, Attach Tools, Models, Level Display

Selection: Element Selection

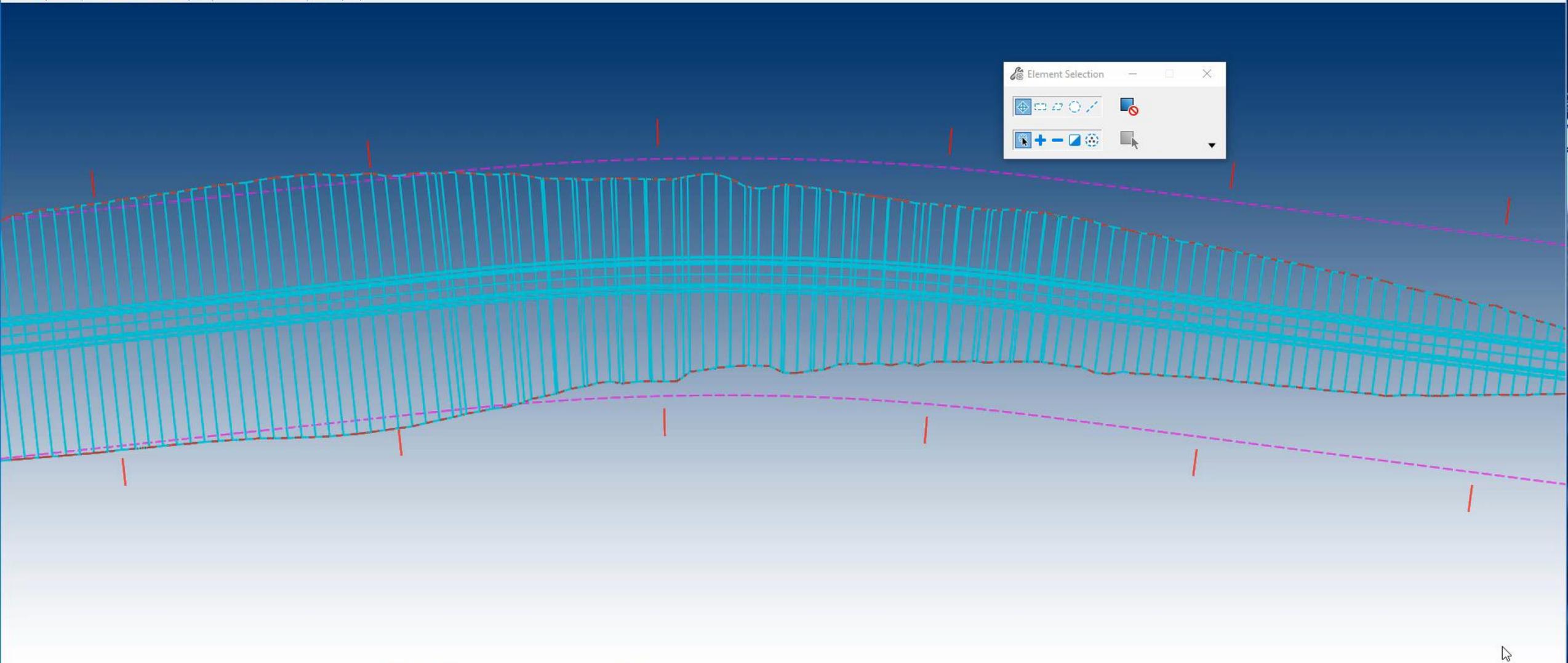
Model Analysis and Reporting: Reports, Civil Analysis, Corridor Reports

Model Import/Export: Terrain Import, Import Geometry, Import IRD

OpenRoads Help: OpenRoads Help, Open RSS Reader

View 1 - Top, Default

Navigation and View Control icons

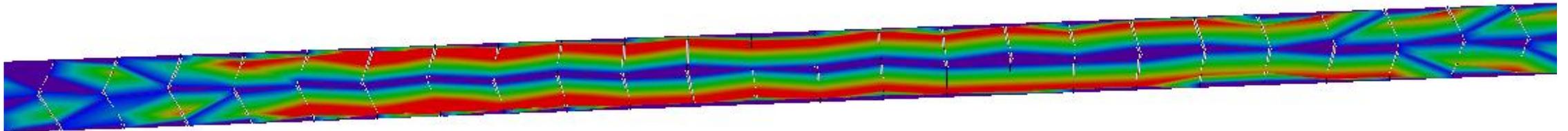


Element Selection

Selection tools: Box, Circle, Polygon, Lasso, Window, Pushpin, Erase, Undo, Redo, Select All, Select None, Select Invert

Best Practice

- *Limit the analysis to pavement only.*
- Avoid steep slopes such a curb faces as this will significantly increase your processing time.



NEW: .3sm Scalable Mesh (Tech Preview)

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Search Ribbon (F4)

Element Selection

Import/Export
Design Elements
Standards

Civil Toggles
Reports

Lines
Arcs
Point

Offsets and Tapers
Reverse Curves
Spirals

Modify
Complex Geometry

Open Profile Model
Set Active Profile
Profile Creation

Lines
Curves
Complex Geometry
Element Profiles

Simplify Geometry
Complex Redefine

Common Tools

Horizontal
Vertical

Element Selection

+

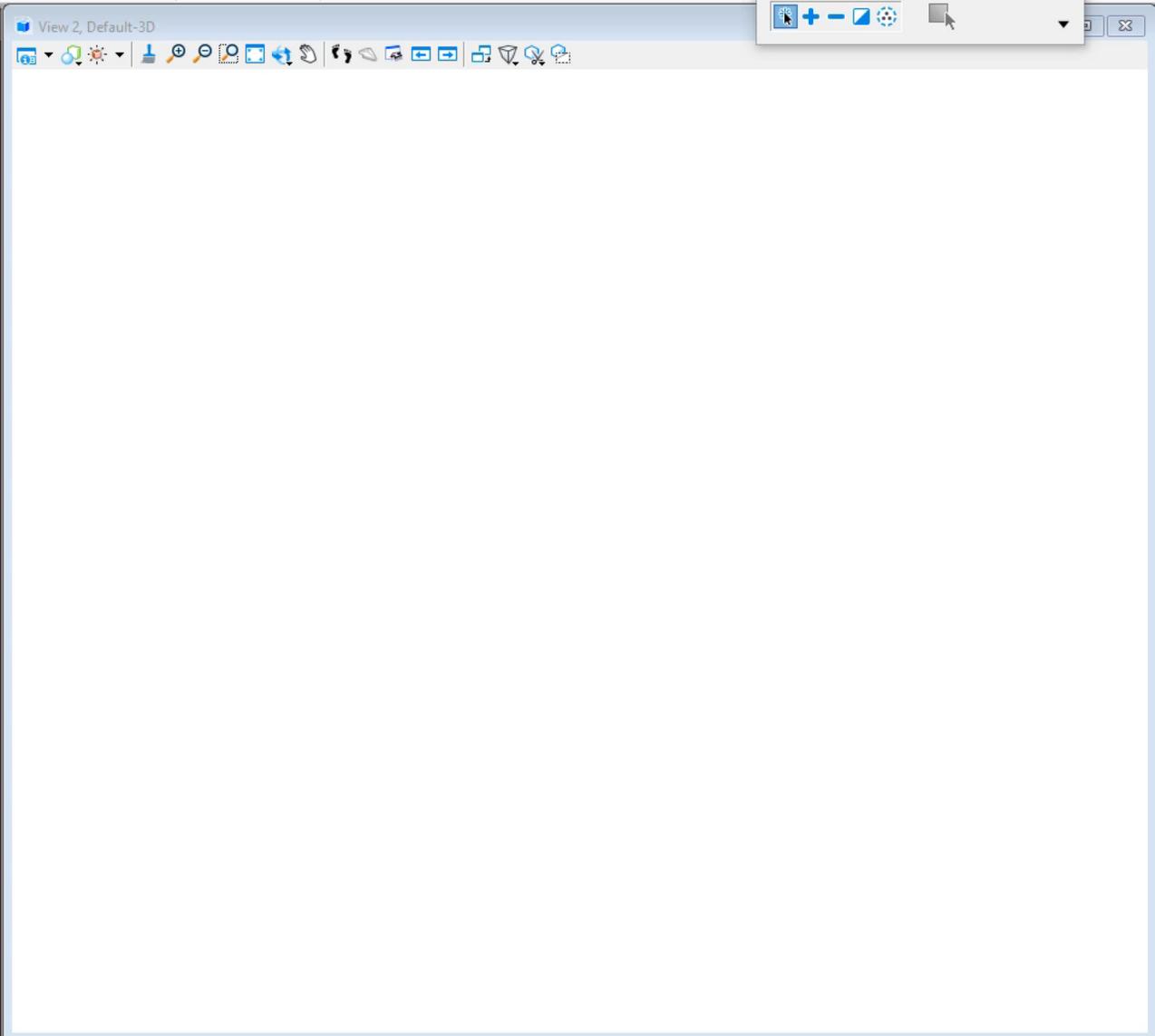
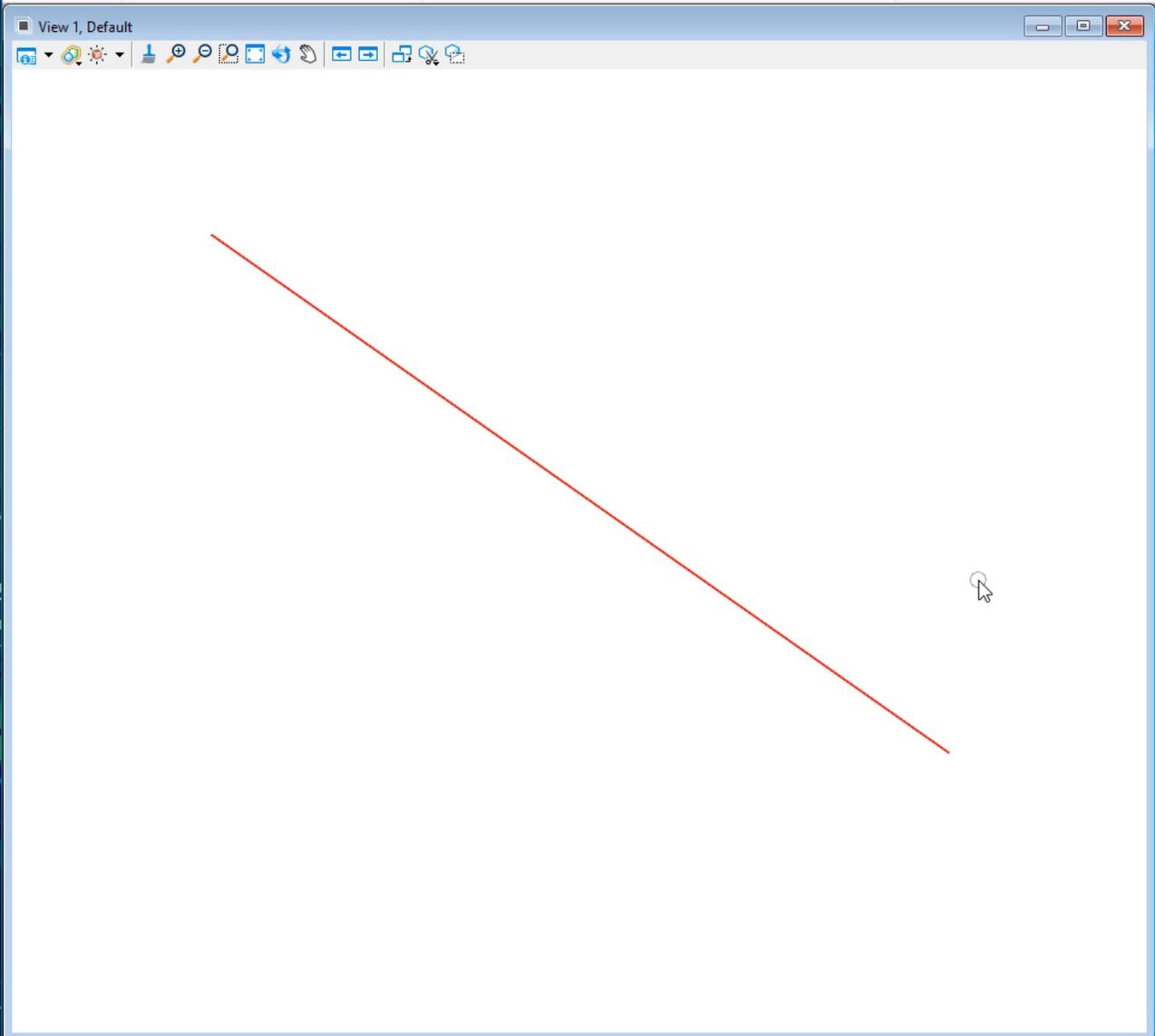
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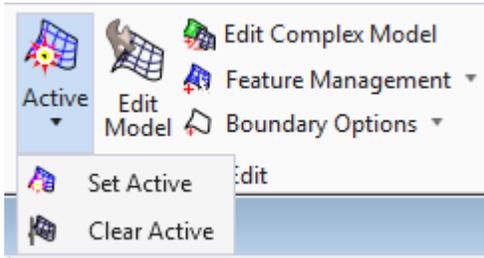
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NEW: Clear Active

Clear Active

In OpenRoads Designer Update 2, we have added a “Clear Active” command.



The reason we did this was because the .3sm has no element handlers.

Therefore the only way to **Set Active** and **Clear Active** is via commands.



Thank You

Have a great conference!

