OpenRoads Designer Best Practice – *Terrain Modeling*

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Advancing Infrastructure

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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.

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Agenda

- *FAQ*
  - *The 64 Bit Difference*
  - *Terrain Feature vs. Element Template*
  - *XML Import Options*
  - *To Rule or Not to Rule?*
  - *Boundary Options*
  - *Terrains from Corridors*
  - *Image Draping*
- *NEW in 2018 for OpenRoads Designer*
  - *Aquaplaning.3sm*
  - *Scalable Mesh (Technology Preview)*
  - *Clear Active*

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FREQUENTLY ASKED QUESTIONS

The 64 Bit Difference

The 64 Bit Difference

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

- *@ 10 Million points = @ 300 mb*
- *Recommend tiling terrains*

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

- Terrains can be much larger.

BUT…

- 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.
- So terrain tiling is still necessary, however 3sm workflows will overtake this

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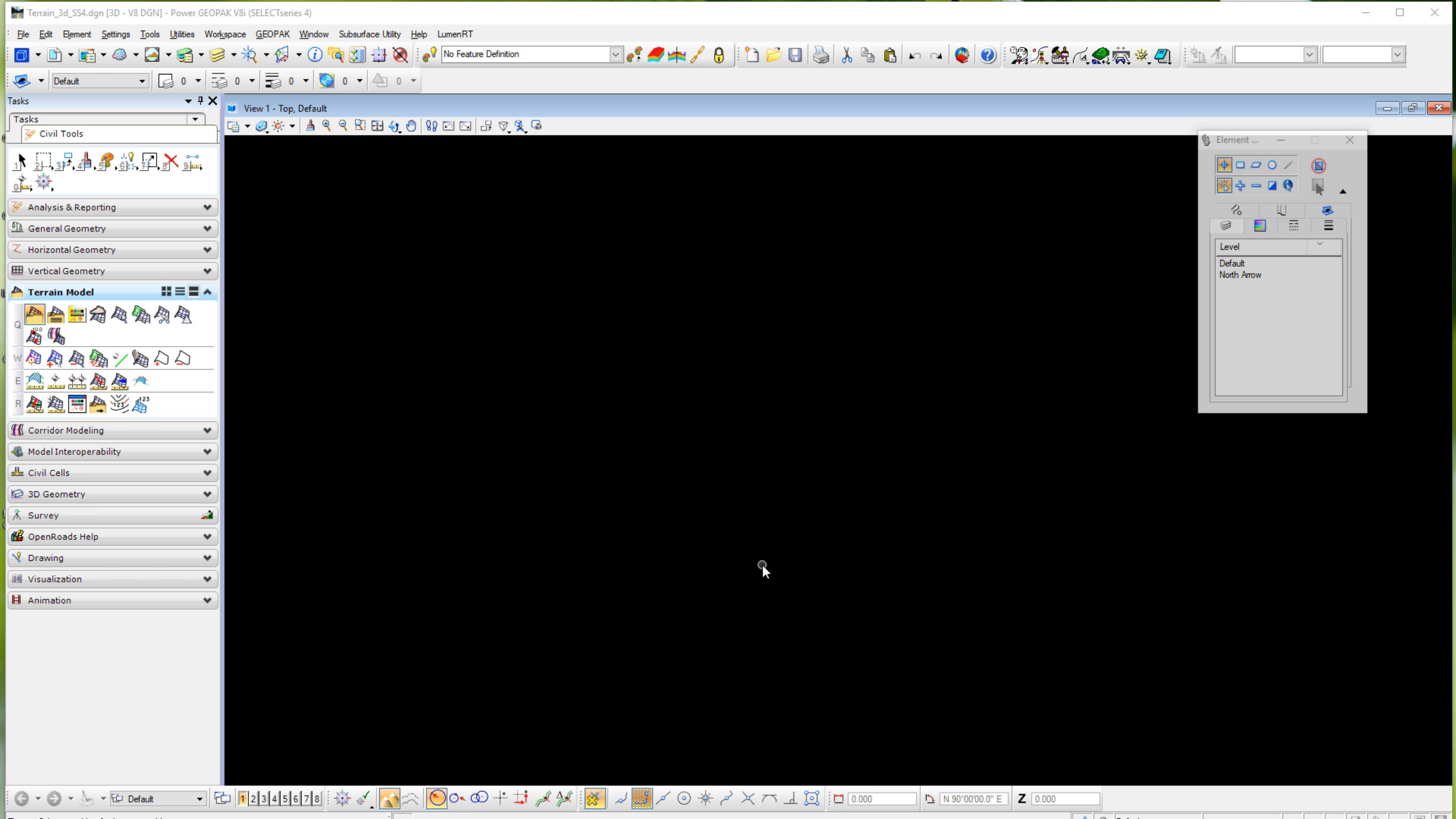
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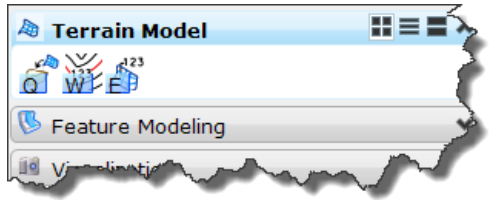
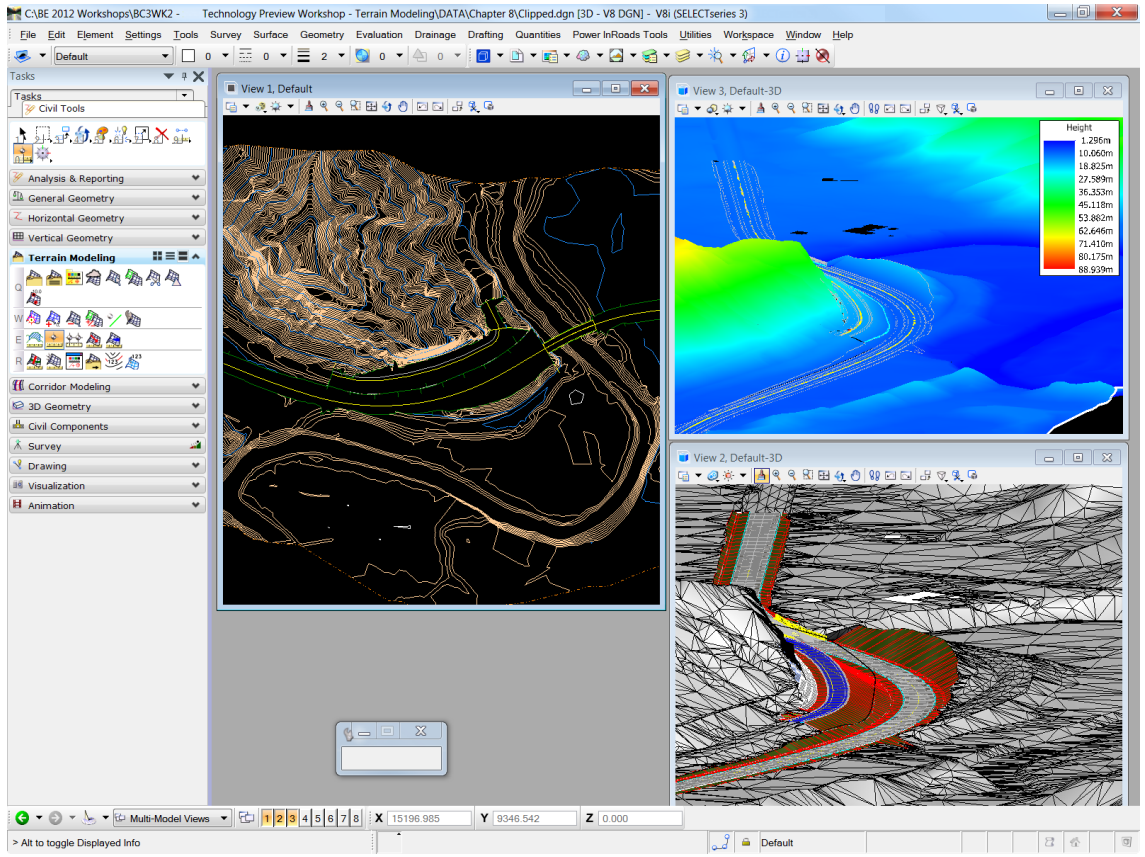
Terrain Feature Definitions vs. *Element Templates*

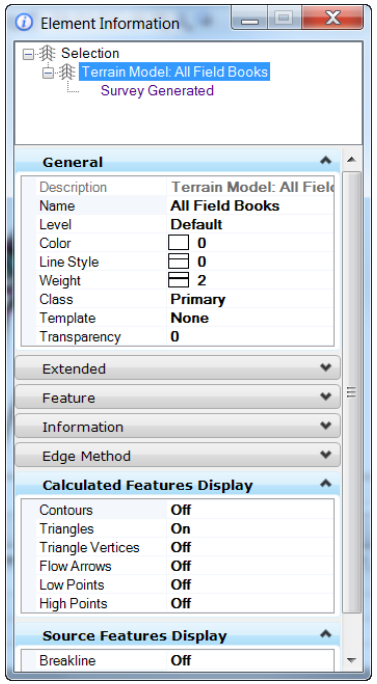
The OpenRoads Terrain



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

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





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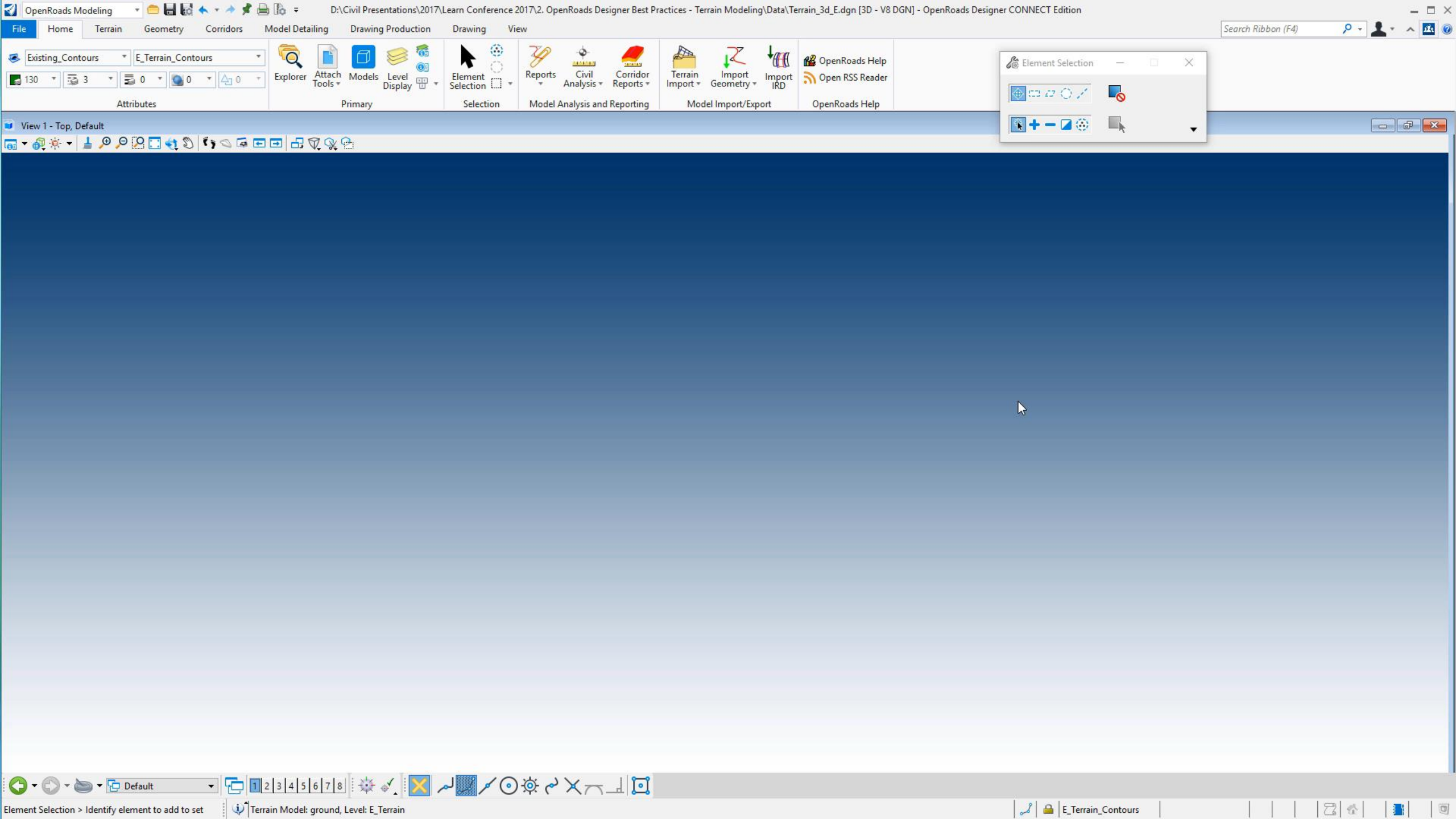
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OpenRoads Help
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Model Import/Export
OpenRoads Help
Element Selection
View 1 - Top, Default
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Element Selection > Identify element to add to set
Terrain 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*

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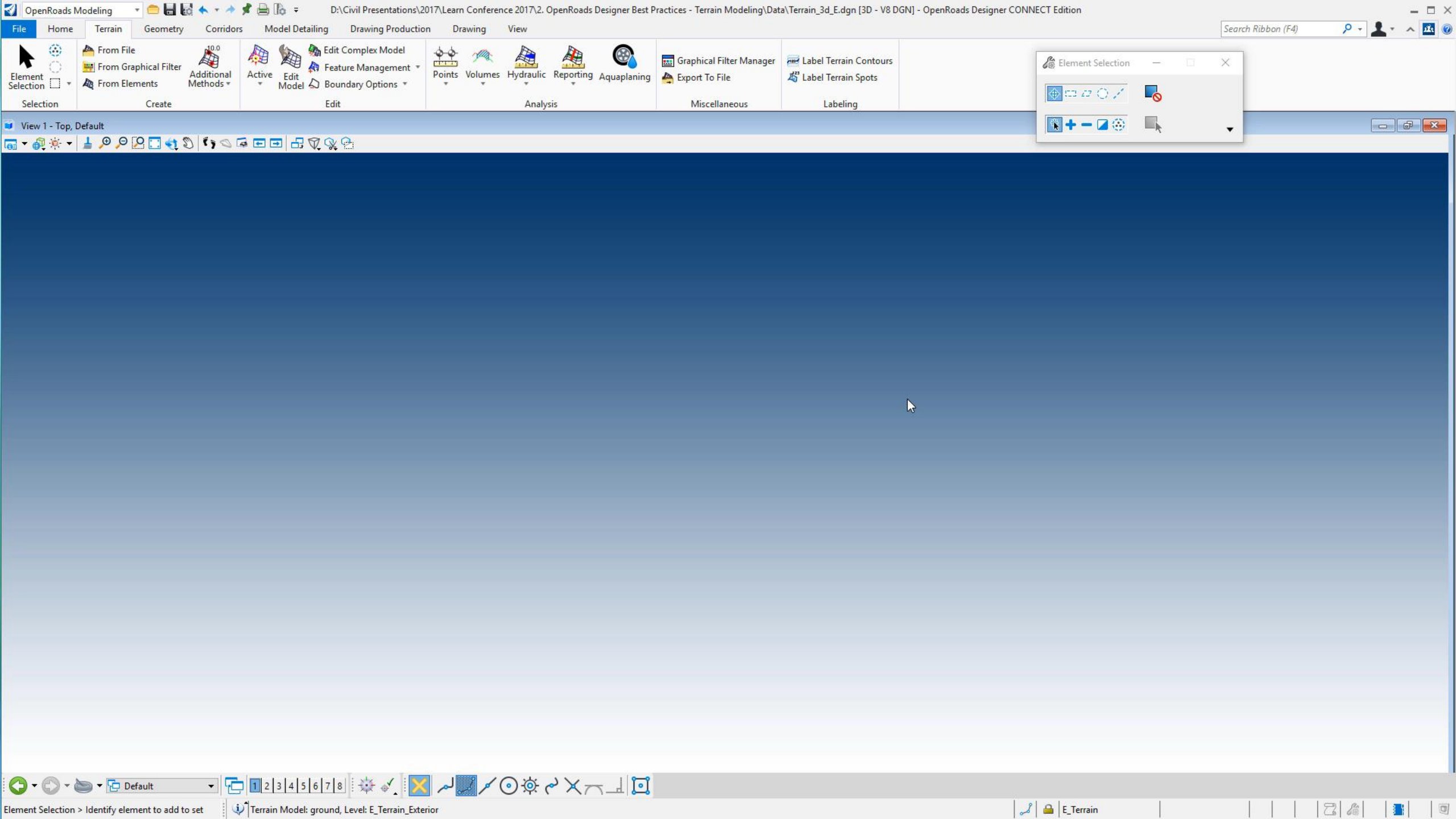
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E_Terrain

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 it's original symbology.

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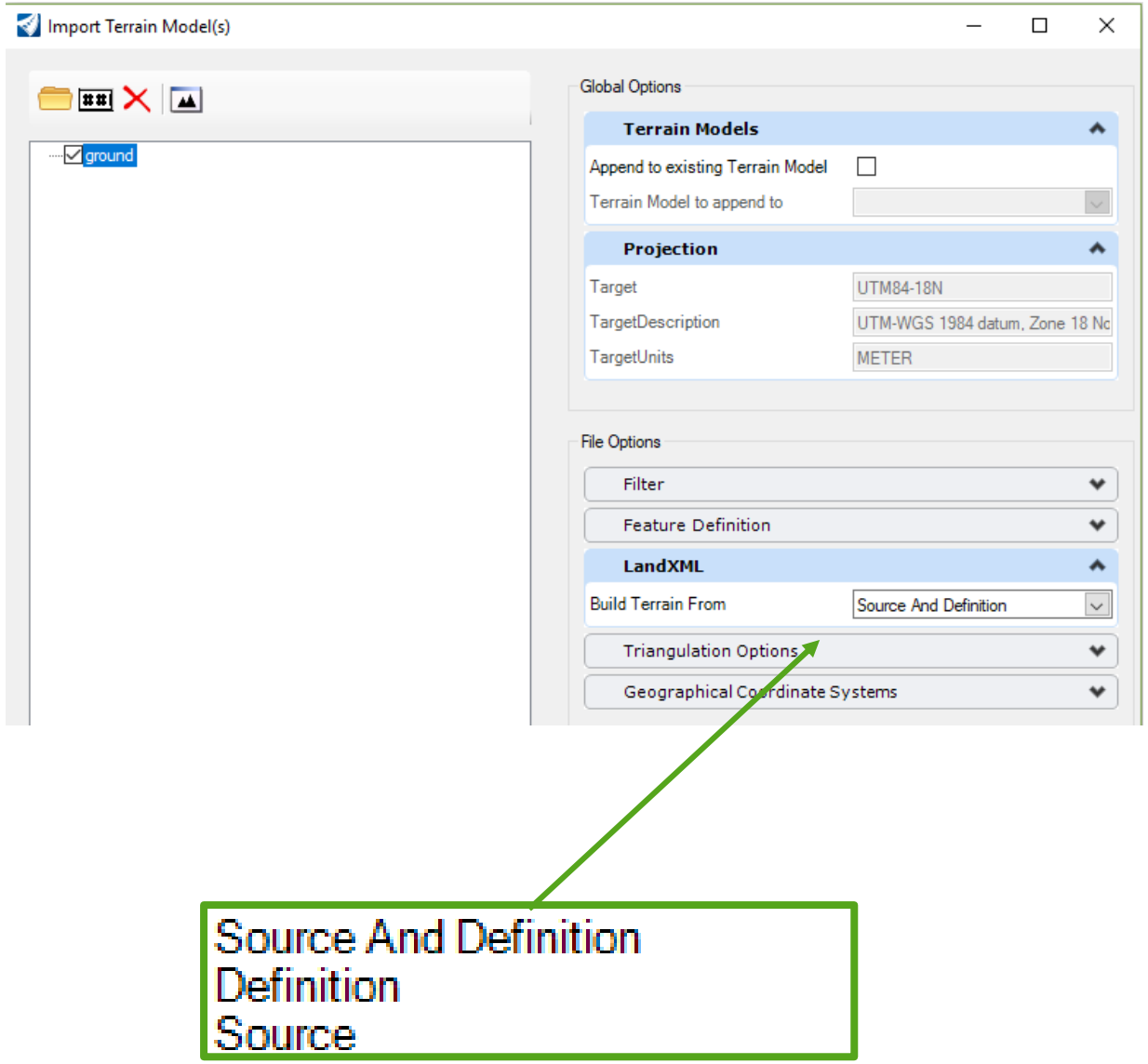
LandXML Import Options

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***



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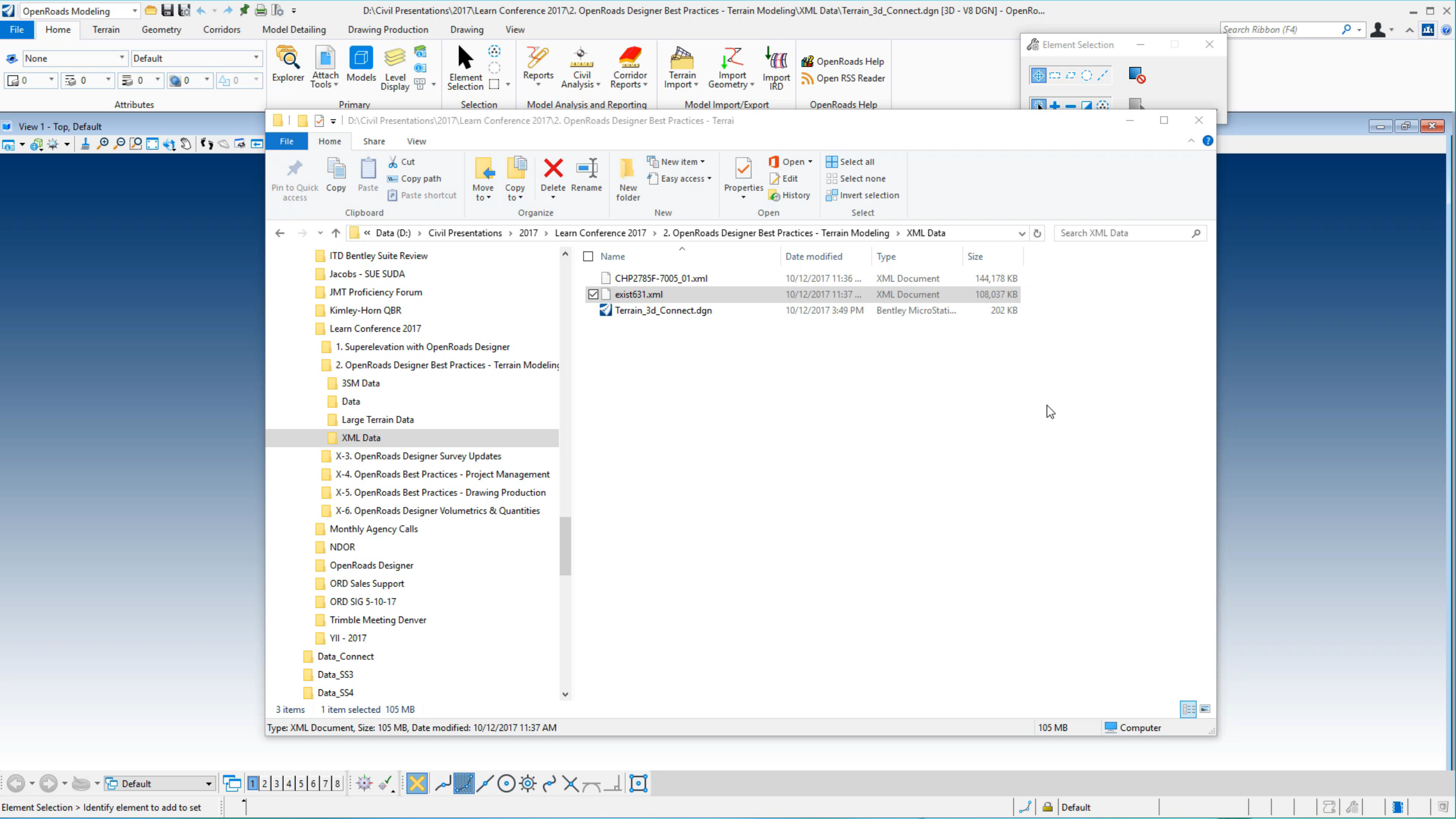
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Best Practice

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.

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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.

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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)

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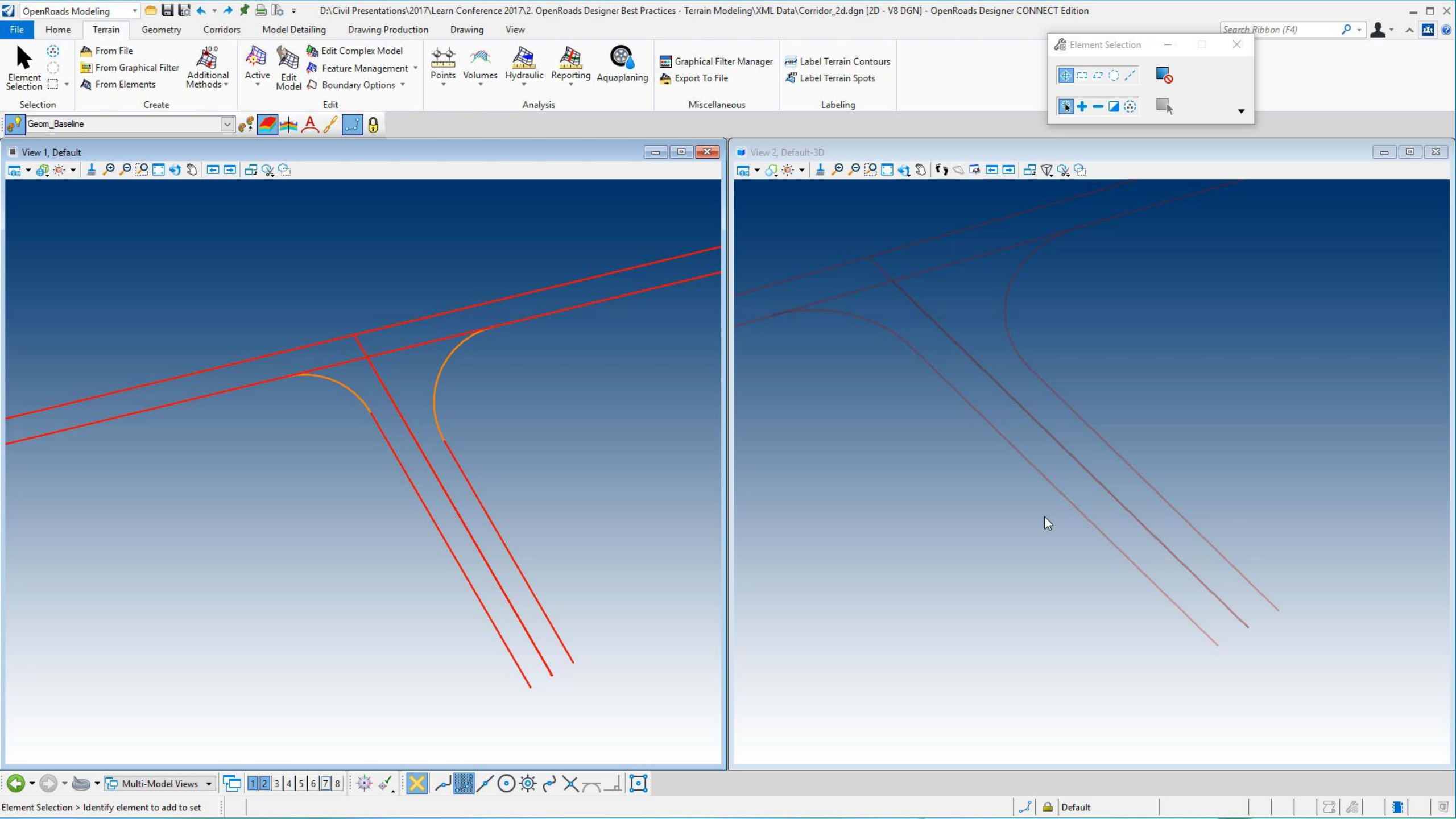
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View 1, Default
View 2, Default-3D
Multi-Model Views
Element Selection > Identify element to add to set
Default

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

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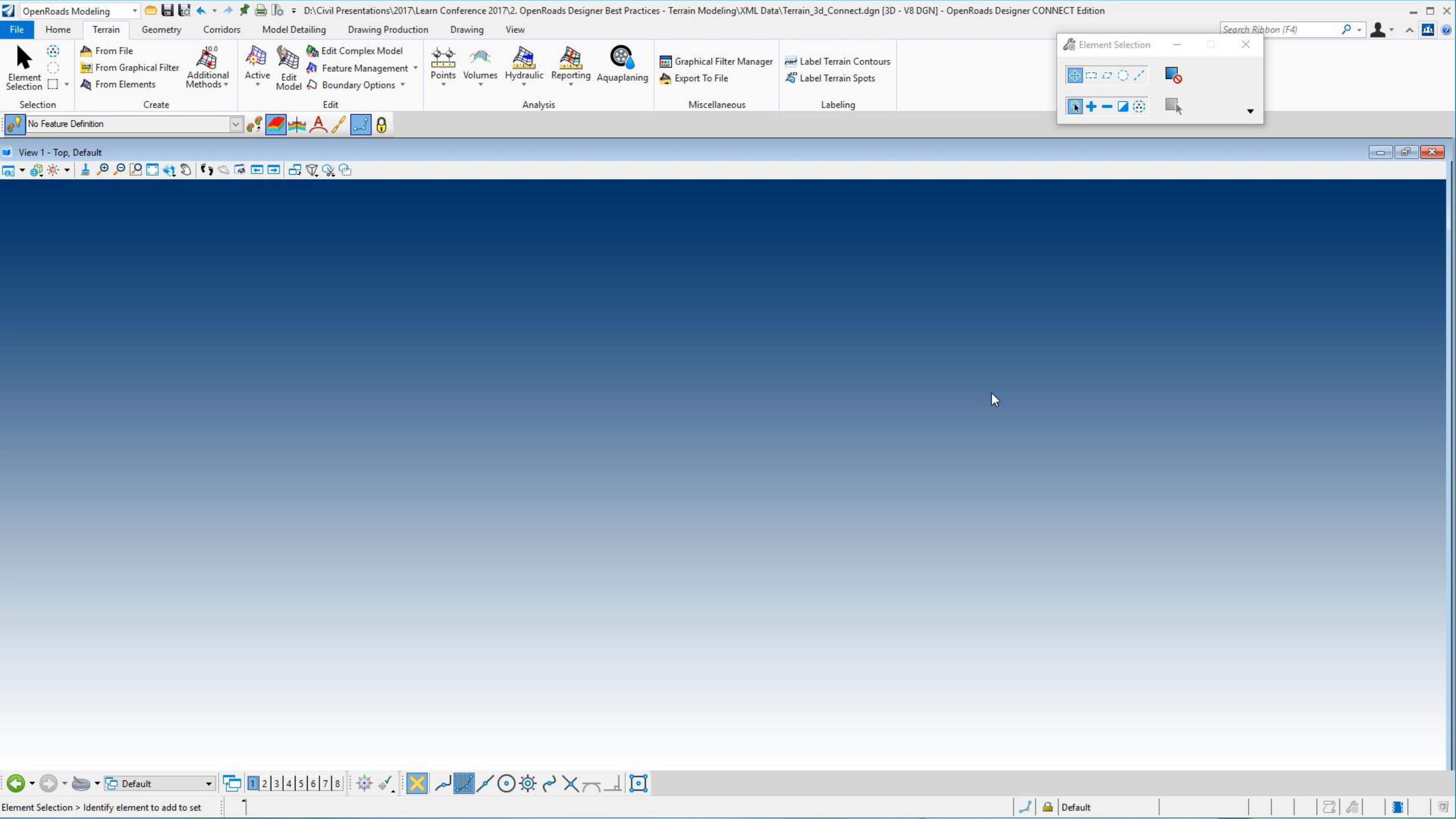
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Element Selection
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View 1 - Top, Default
Default
Element Selection > Identify element to add to set
Default

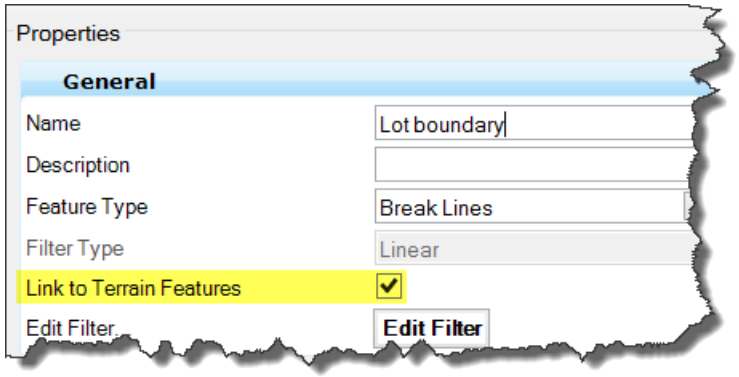
To Rule or Not to Rule?

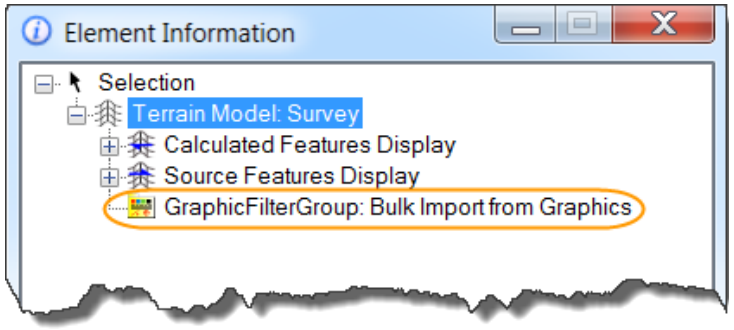
- In most cases, this decision of **dynamic** vs. **static** is made for you.

  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**.





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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

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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.

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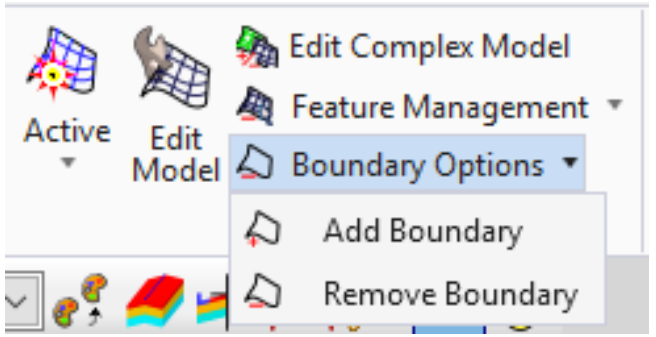
Boundary Tool Options



- **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.

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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.

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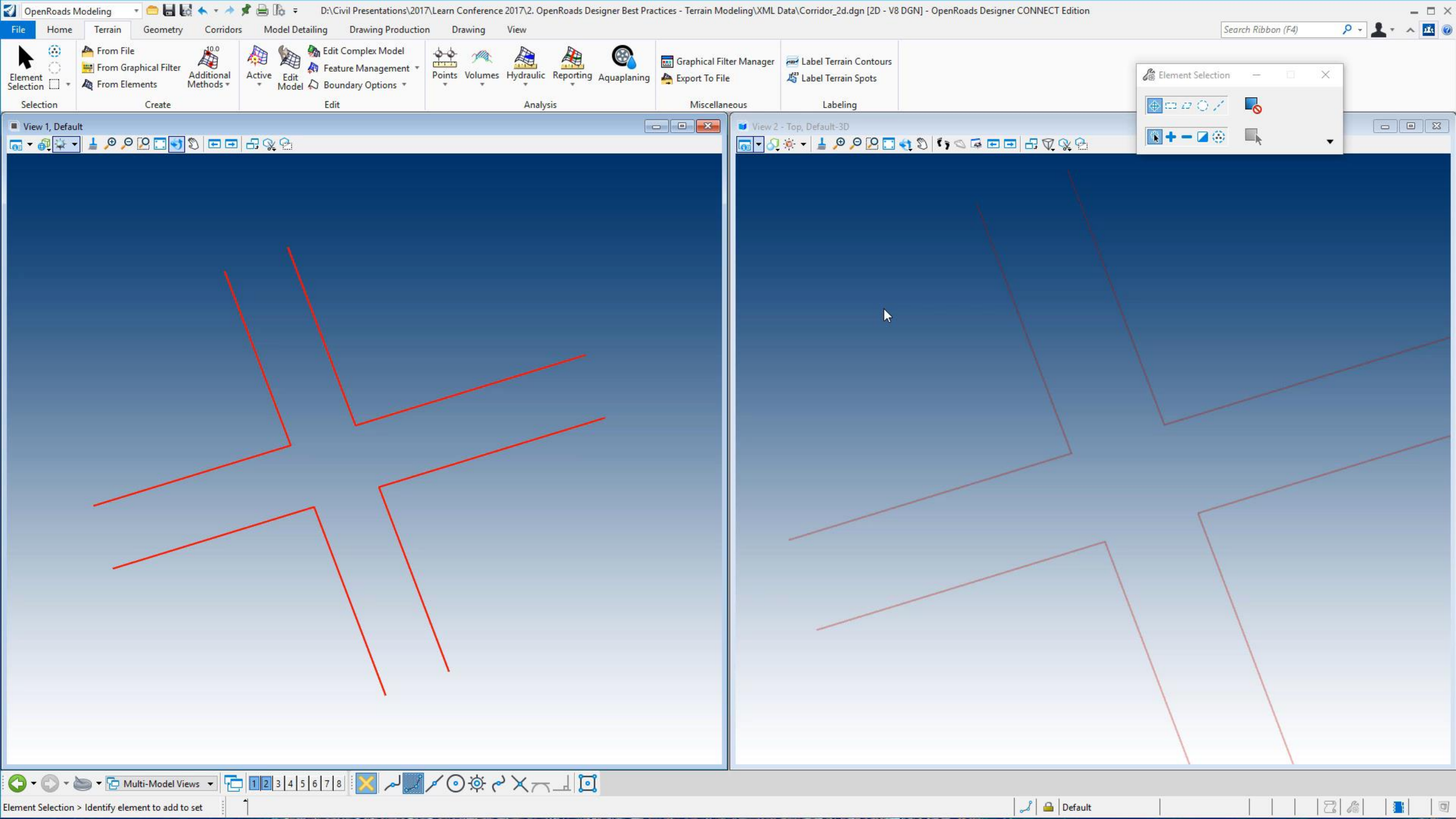
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View 1, Default
View 2 - Top, Default-3D
Multi-Model Views
1 2 3 4 5 6 7 8
Element Selection > Identify element to add to set
Default

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.

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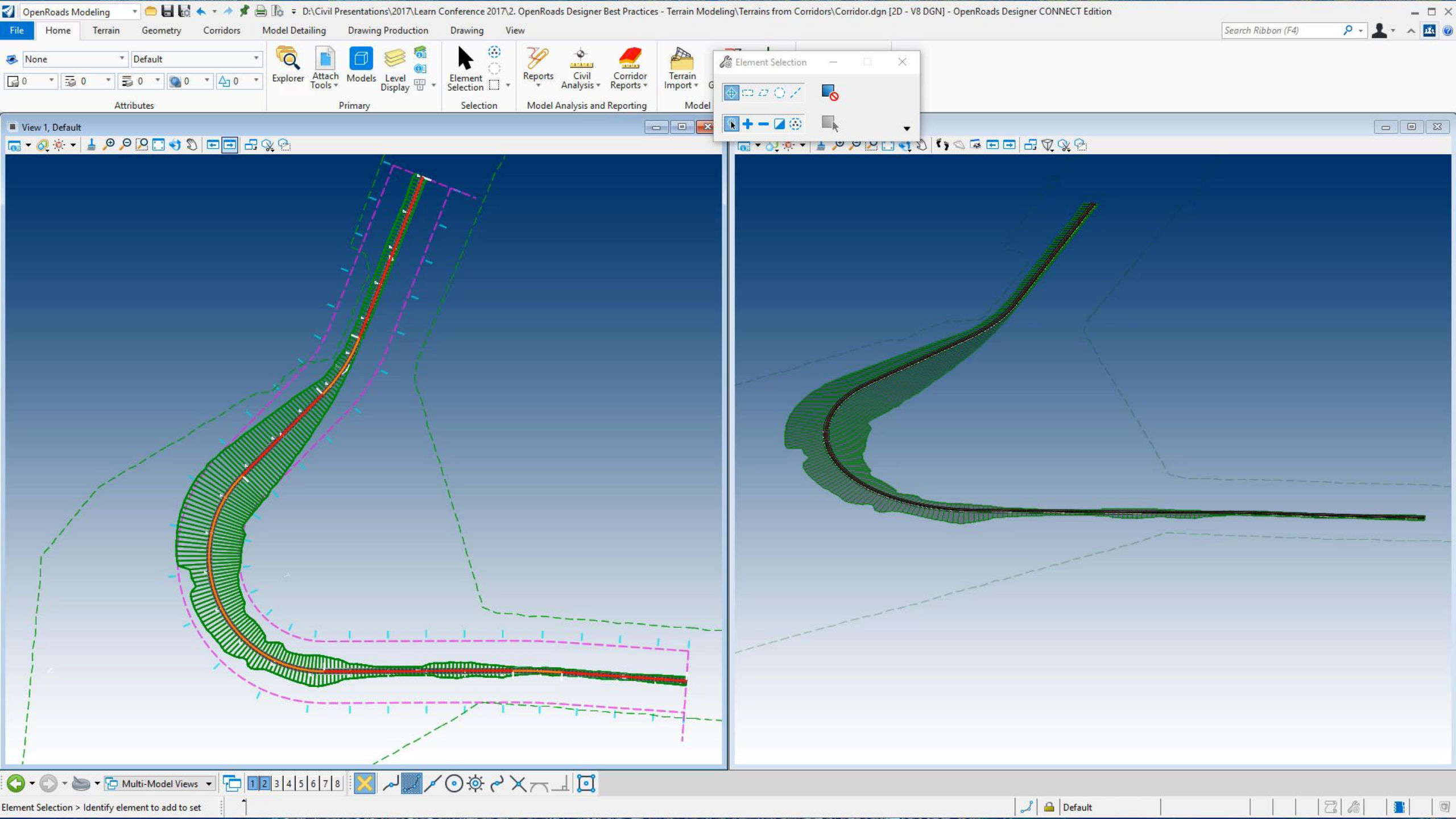
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Multi-Model Views
Element Selection > Identify element to add to set
Default

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.

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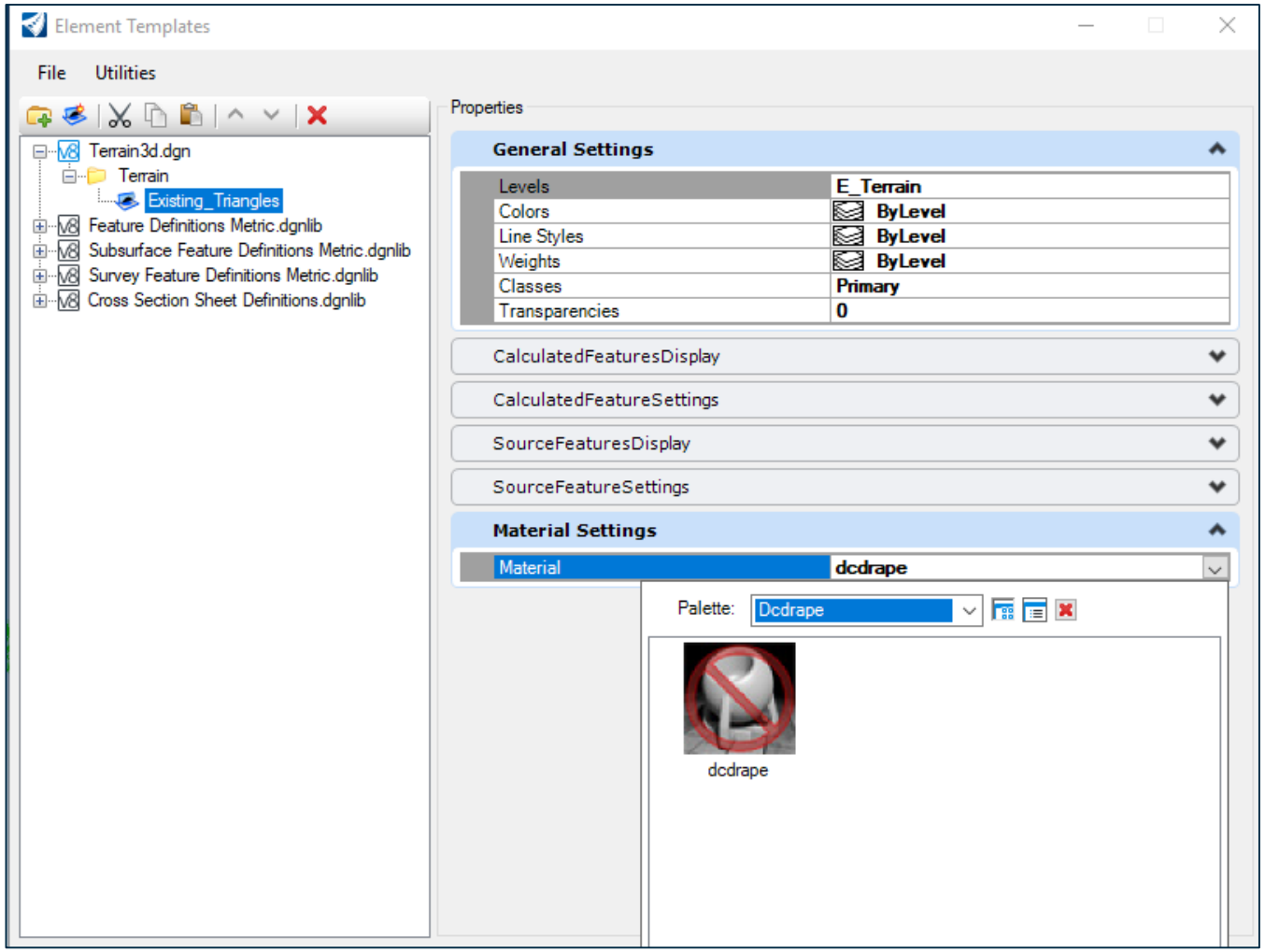
Image Draping

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.*



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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'.

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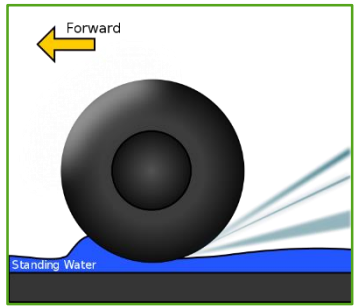
NEW in 2018 for OpenRoads Designer

Aquaplaning

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 2018 Release1.

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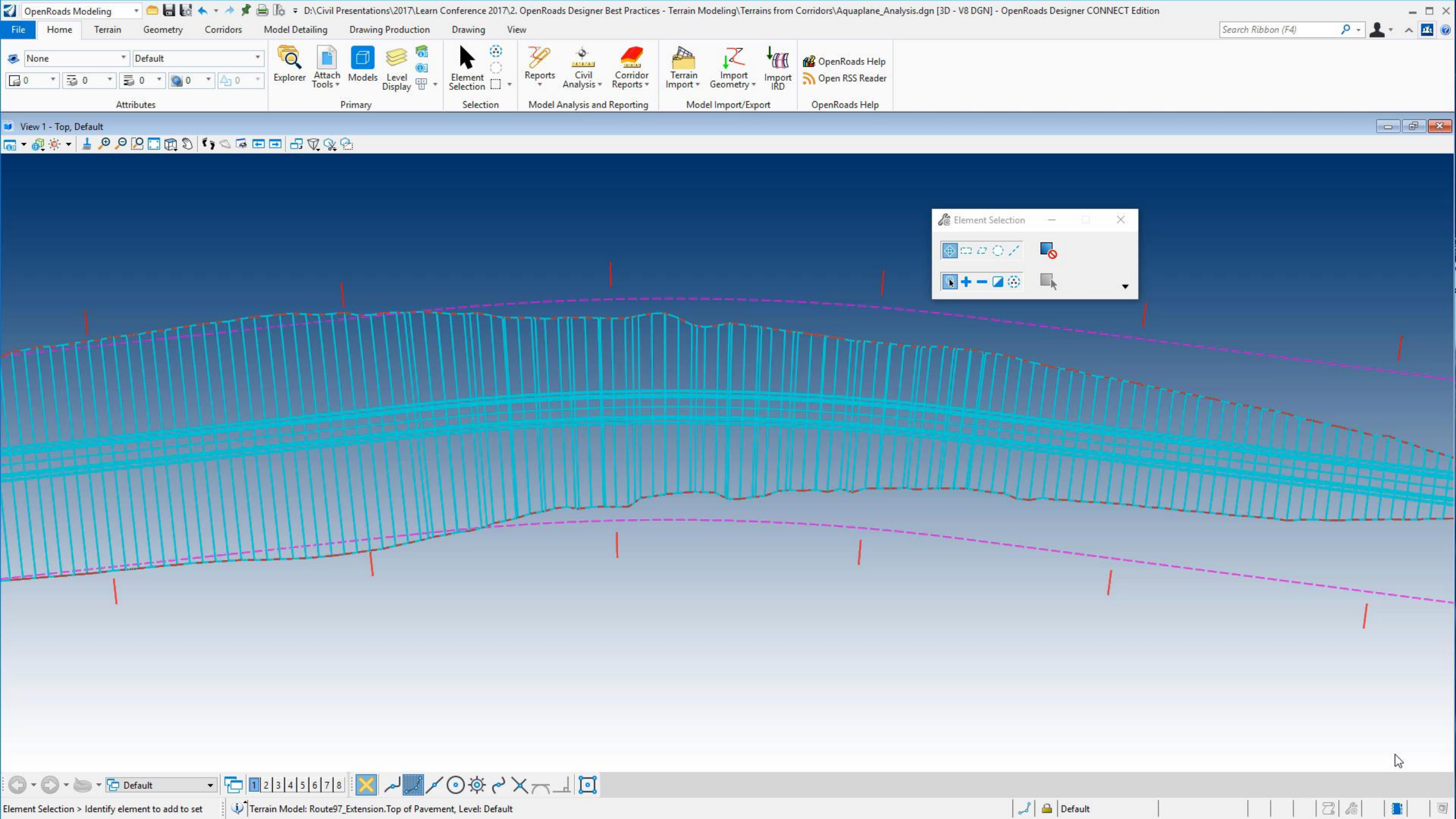
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Open RSS Reader
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View 1 - Top, Default
Element Selection
Default
Element Selection > Identify element to add to set
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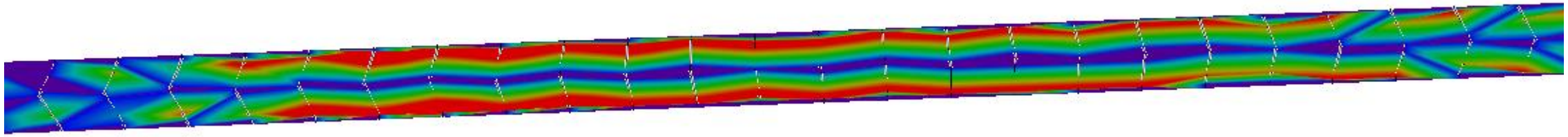
Best Practice

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



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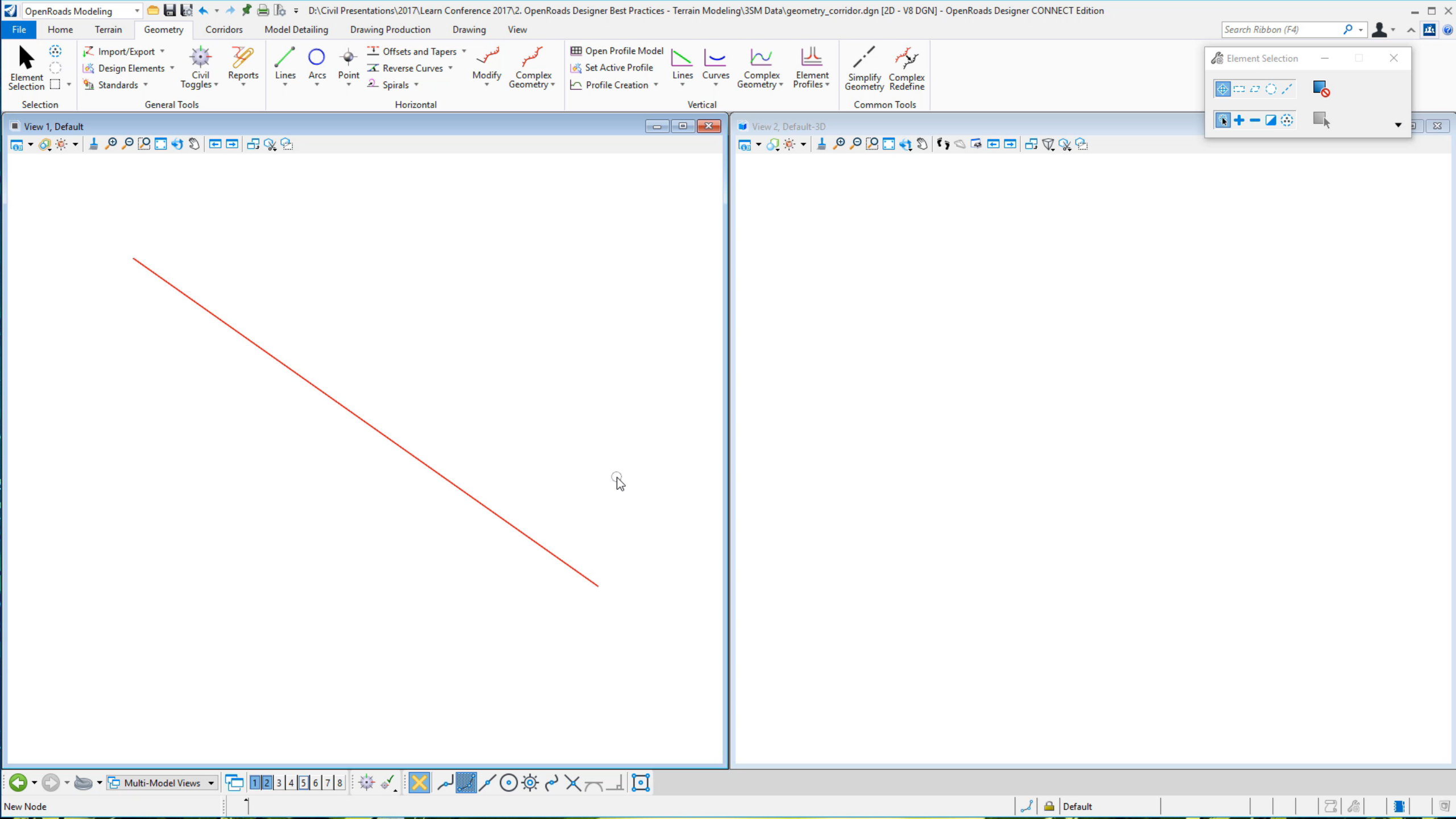
.3sm Scalable Mesh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Search Ribbon (F4)
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Standards
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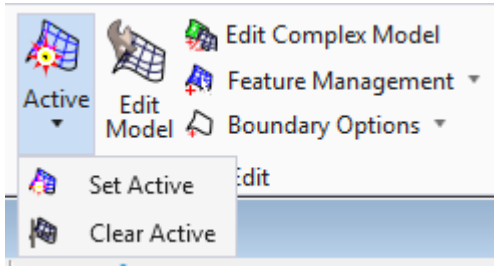
New Node
Default

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.

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Thank You

Have a great conference!

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