Florida Department of Transportation

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Tallahassee, FL 32399-0450

FDOTSS4 DESIGN SURVEY WORKFLOW

WITH BENTLEY'S

OPEN ROADS SURVEY

FOR 3D MODELING PROJECTS

FDOTSS4 MR3 (Version 01.03.01)

3D Design Survey for 3D Modeling Projects

- You have used **FDOTSS4** and your deliverables are 2D graphic elements. Those deliverables are being used by Designers. Why use the SURVRD as a one file 3D survey deliverable?

    1. Projects that use 3D Modeling can use the SURVRD. If Corridor Modeling is being used by the Project Designer a **Terrain Model** (Bentley DTM) of the existing conditions will be needed.

    2. 3D design requires a full DTM of the existing surface throughout the limits of the 3D design area. No gaps, no lapses in coverage, and not just any DTM will do. It must be a Bentley "**Terrain Model**". This Terrain Model will only be found in Bentley's "**Open Roads**" products.

    3. **FDOTSS4** has all of the Bentley **Open Roads** features needed to produce a 3D survey for the purpose of 3D Design.

OPEN ROADS SURVEY FDOTSS4 MR3

FDOTSS4 MR3 and Above:

- Previous to 3D design with Open Roads, survey elements mostly consisted of 2D graphic lines. Many survey features, even points and chains, shared levels. When passed to design, beyond labeling, much intelligence was lost simply because it was not needed.

- In FDOTSS4 MR3 and above each point and linear feature has a unique level name and number assigned to it.

- Functionality is enhanced in multiple ways

OPEN ROADS SURVEY FDOTSS4 MR3

FDOTSS4 MR3 and Above:

- Level Filters are now reliable

- Features/Graphics conversions are now reliable

- Surveying, Right of Way Mapping and Design all use the same features, levels, colors, weights and line styles

- The SURVRD.dgn has evolved beyond just a Design Survey. It now can serve as a complete Survey Database

OPEN ROADS SURVEY FDOTSS4 MR3

<u>FDOTSS4 MR3 and Above:</u>

- Because FDOTSS4 MR2 and below were not consistent across disciplines and features shared levels, it is advisable to convert any SURVRD MR2 Survey or below to FDOTSS4 MR3 standards.

- Below is a link to a short video on how to convert a SURVRD.dgn from MR2 to MR3

https://www.youtube.com/watch?v=tbUt_dWhJjE

THE SURVRD.DGN SURVEY DEVELOPMENT MODEL
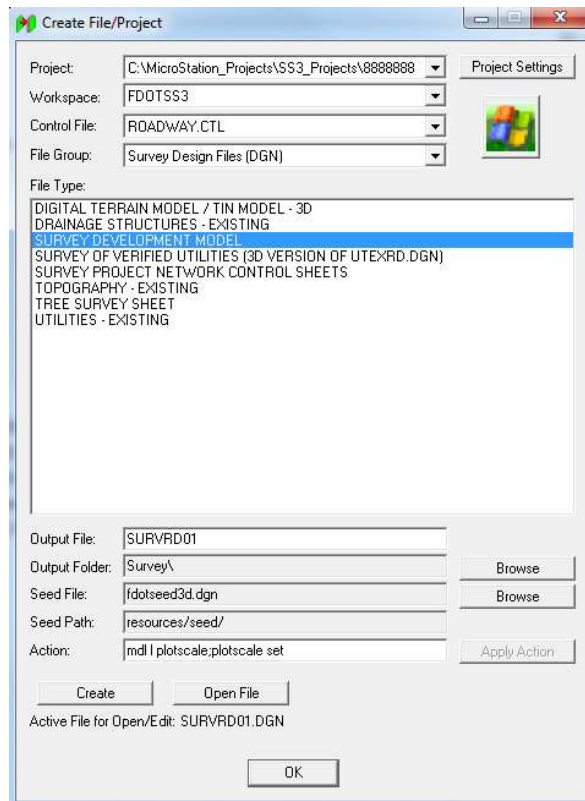
- Using the "Create File/Project" tool is a quick way to create your 3D Survey Development Model.

- The SURVRD.DGN file is your FDOTSS4 survey database containing Point and Linear Features

- Note that the fdotseed3d.dgn is the seed file used. This seed file has the appropriate filters built into the file.

SET GEOGRAPHIC COORDINATES (two different ways)
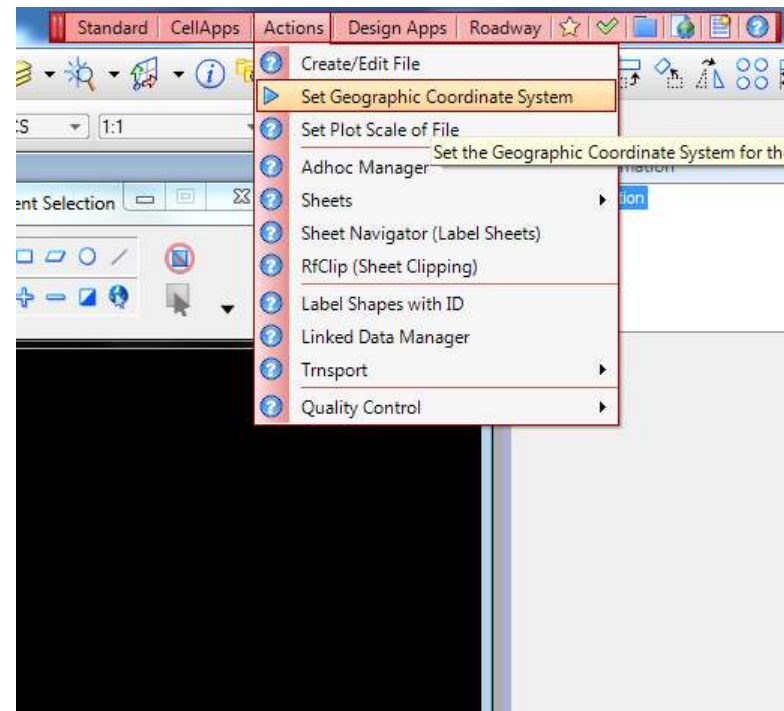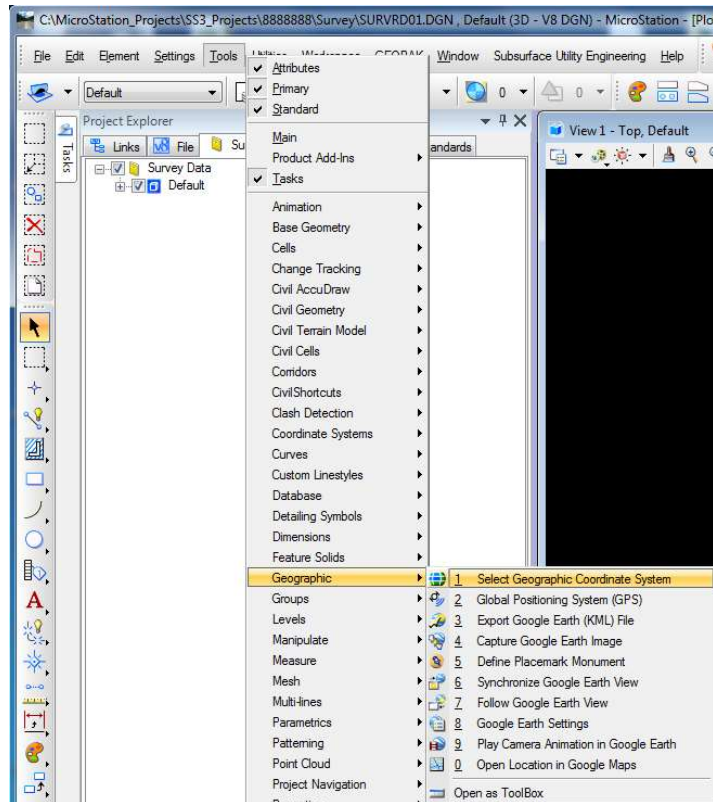
SET GEOGRAPHIC COORDINATES (two different ways)

- Set the Geographic Coordinate system manually from library. Choose one of the following State Plane Survey Foot Zones.
  1. FL83-NF North Zone
  2. FL83-EF East Zone
  3. FL83-WF West Zone

- Or Set the Geographic Coordinate system automatically by clicking on the Florida map.
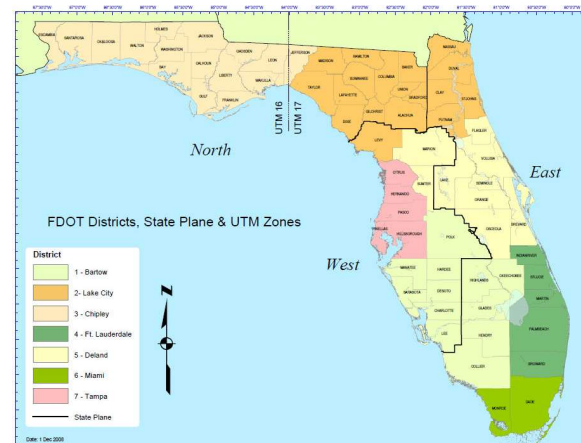
SET WORKSPACE CONFIGURATION
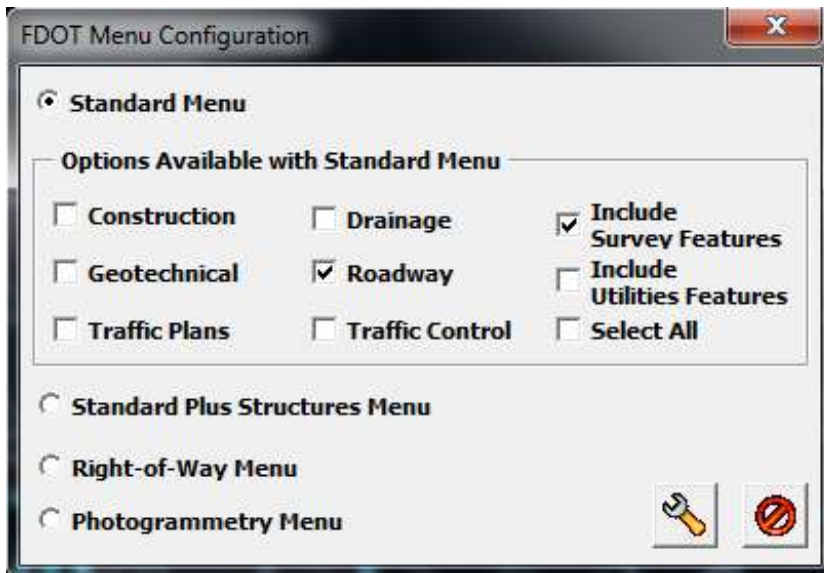
- "Include Survey Features" must be selected to set survey features and Bentley Civil configuration variables for Survey.

- **WARNING:** Reset after ALL INSTALLS and UPDATES (click wrench)

SET ANNOTATION SCALE LOCK AND THE DRAWING SCALE
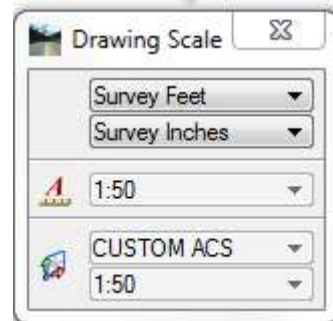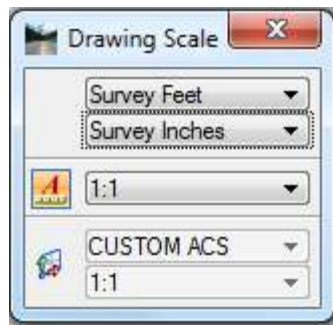
- Whenever data is added or changed or survey redraw is executed, Bentley Survey will update the drawing based on the Annotation Scale lock and the drawing scale.

- If the Annotation Scale Lock is on, set the drawing scale and then turn off the Annotation Scale Lock. The lock must be turned off for point labels to scale correctly in the FDOTSS4 Workspace.

BENTLEY SURVEY

- **WARNING:** We, in the past, have experienced that the Geographic Coordinate System dialogue box and the Drawing Scale dialogue box have the potential of causing random crashes. After settings are set in these dialogue boxes it is recommended to… **CLOSE THEM.**
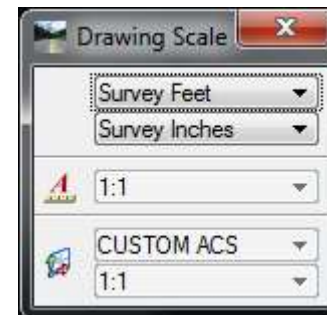
BENTLEY SURVEY

- Data Acquisition was introduced to the FDOT state kit with the implementation of FDOTSS2. However, at some point in the workflow the user would have to turn back to GEOPAK.

- In SS4 more functionality was added. That turn to GEOPAK is further down the road and Bentley renamed Data Acquisition to Survey.

BENTLEY SURVEY

- For the user **Bentley's Open Roads "Survey" has been added to the "PROJECT EXPLORER"** which has a tab for **Links, File, Survey, Civil Model, Utility Model** and **Civil Standards.** The Project Explorer Survey tab is where Survey data will be imported into the DGN file which also serves as a Survey Database.

PROJECT EXPLORER
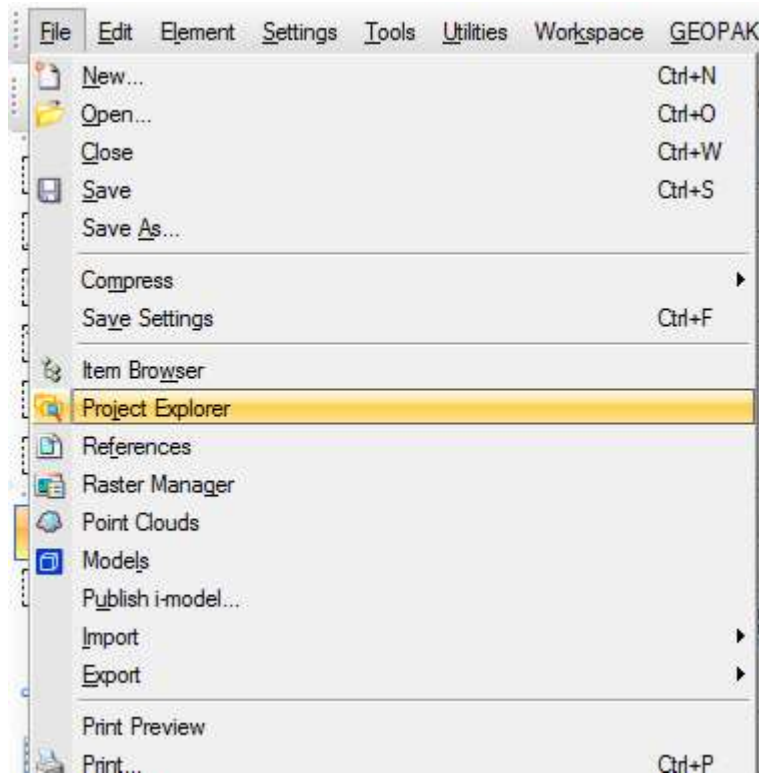
- One way to open the Project Explorer is under File > Project Explorer.

- Or in FDOTSS4 press **"F11"**.

PROJECT EXPLORER
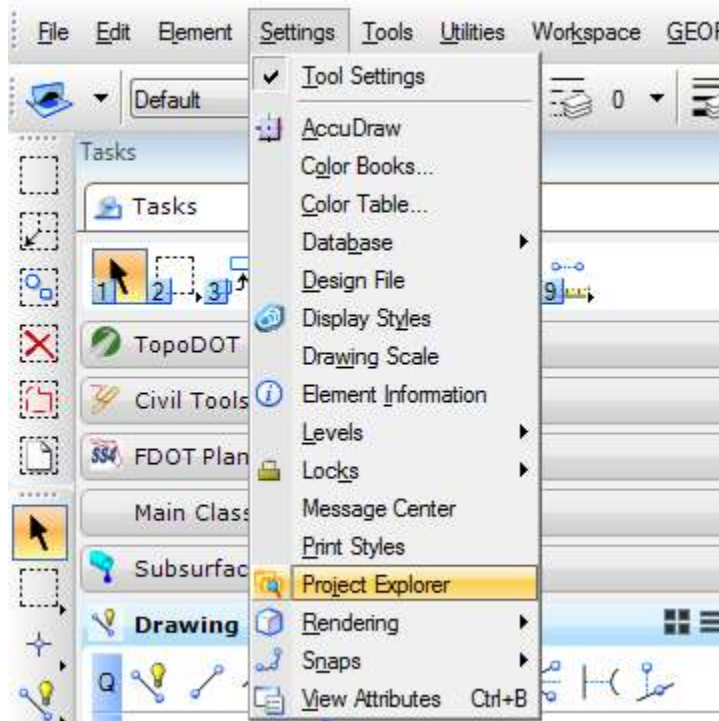
- To open and close tabs in the Project Explorer look under Settings > Project Explorer

PROJECT EXPLORER
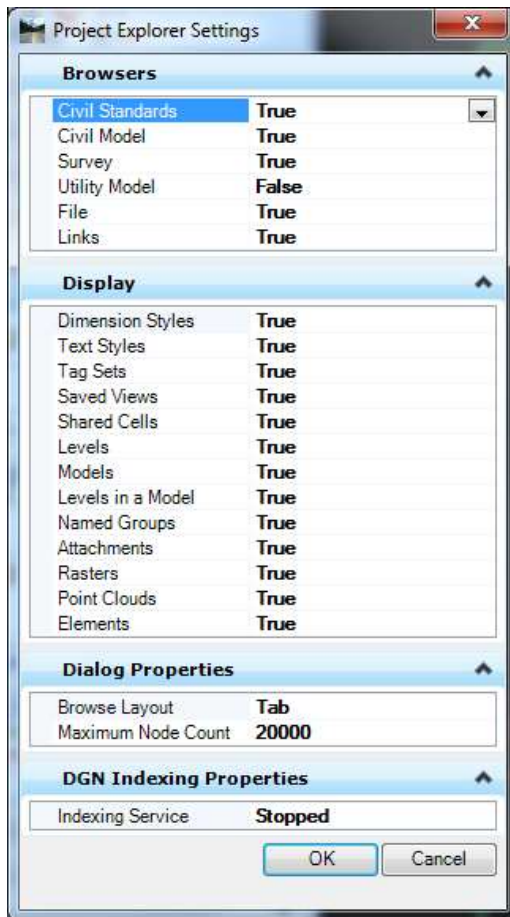
- If you want to see the tab set it to true.

- In this example you will not see the Utility Model tab.

PROJECT EXPLORER
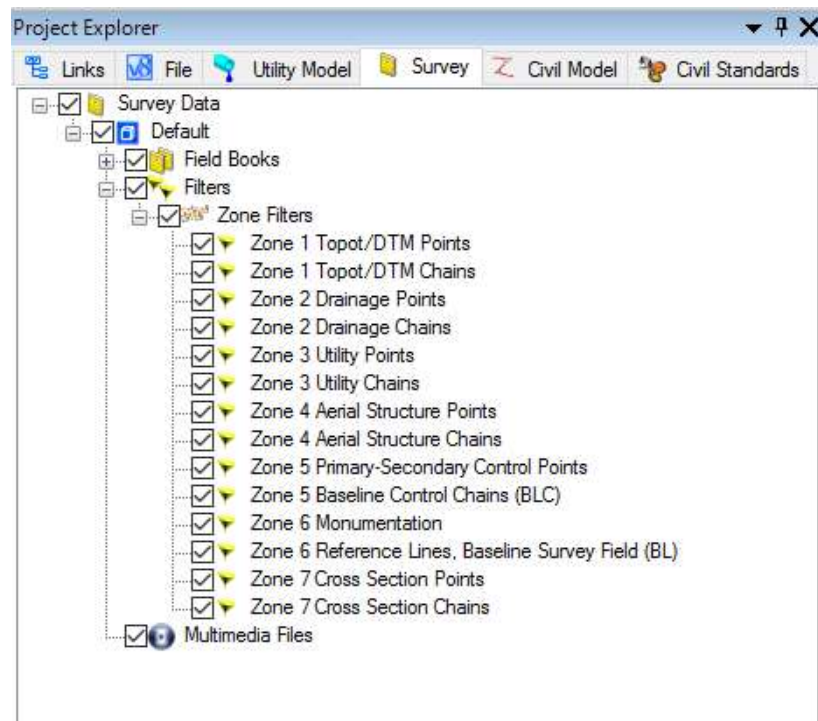
- The "Survey" tab is organized into a tree format with check boxes for visualization.

- When Survey data is added it will show under "Field Books".

- In FDOTSS4, Expanding the "Filters" category will reveal preset filters based on the FDOT standard zones.

PROJECT EXPLORER
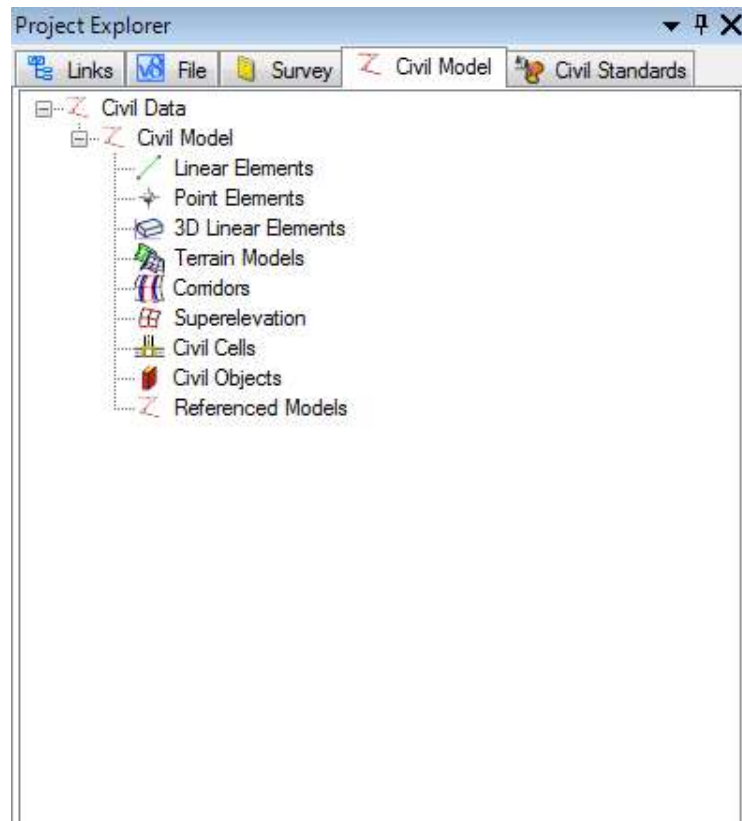
- Terrains Models created with Open Roads will display under the **Civil Model** tab as **"Terrain Models"**.

- Multiple terrains can be built and combined to form a "Complex Terrain Model."

- Terrains can be selected and properties changed like being renamed.

PROJECT EXPLORER
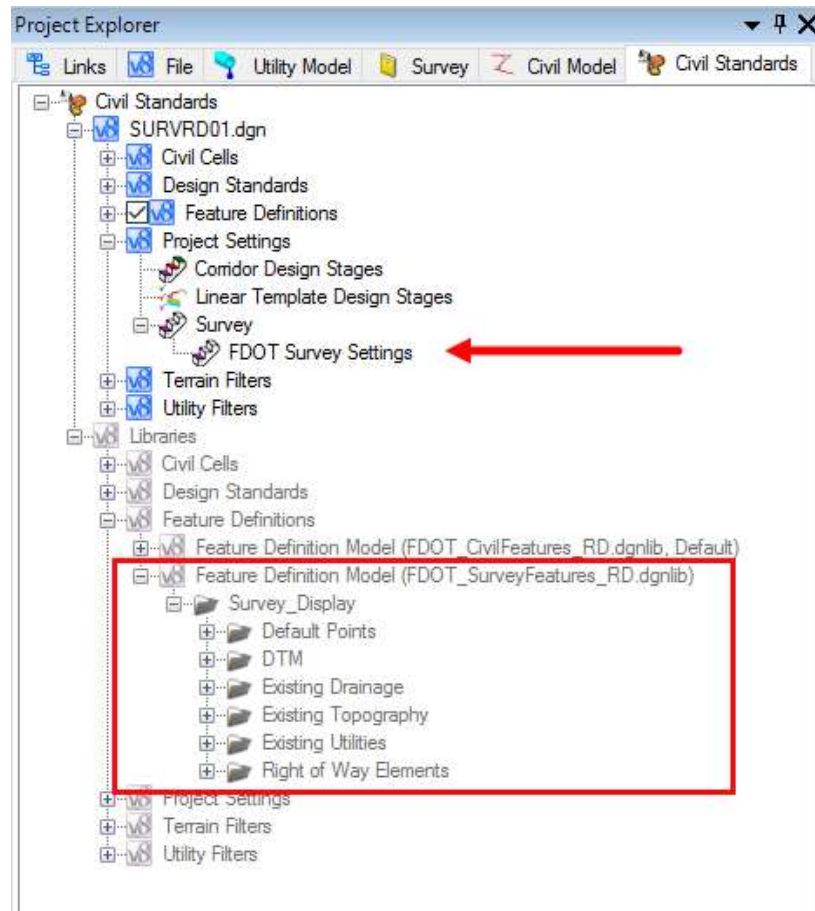
- The "Civil Standards" tab is where you will find the "**FDOT Survey Settings**". Right click and select "**Properties**" to activate the **Element Information** dialogue box where changes to the survey settings can be made.

- Under Libraries is where the active feature tables can be found. These libraries are set by selecting the **FDOT Menu Configuration**

PROJECT EXPLORER
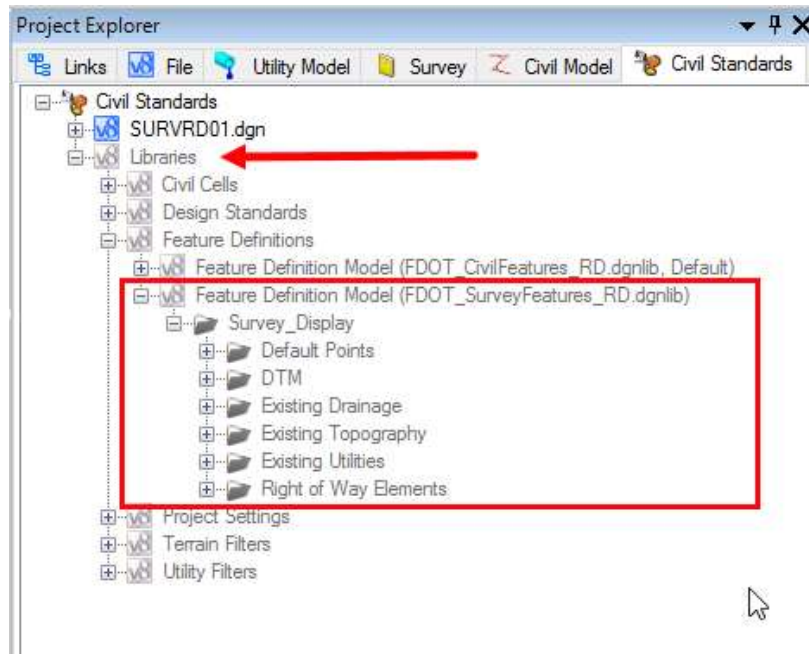
WARNING: To come into a Field Book Correctly, the Survey_Display or the ROW_Display feature definitions, must be in the Libraries **AND** Your features must match the definitions in these libraries.

PROJECT EXPLORER
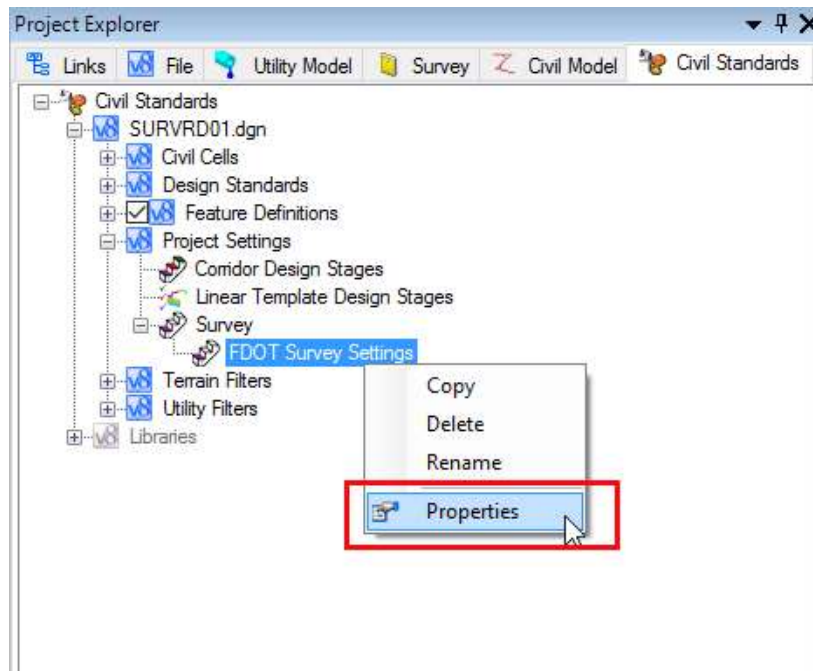
- Right Click on the FDOT Survey Settings to bring up the Properties dialogue box (Element Information box)

- Be aware of the various settings
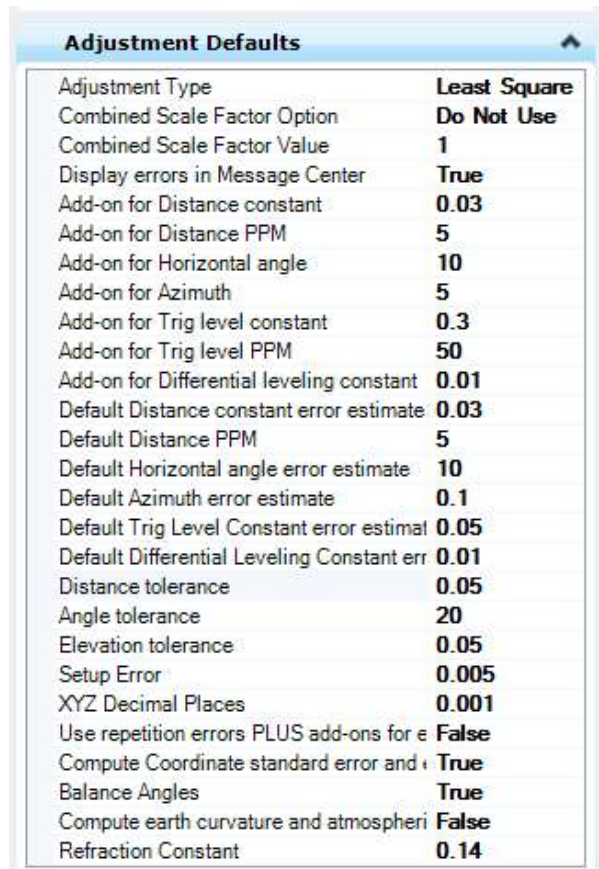
ELEMENT INFORMATION BOX

ELEMENT INFORMATION BOX

Adjustment Defaults	
Adjustment Type	Least Square
Combined Scale Factor Option	Do Not Use
Combined Scale Factor Value	1
Display errors in Message Center	True
Add-on for Distance constant	0.03
Add-on for Distance PPM	5
Add-on for Horizontal angle	10
Add-on for Azimuth	5
Add-on for Trig level constant	0.3
Add-on for Trig level PPM	50
Add-on for Differential leveling constant	0.01
Default Distance constant error estimate	0.03
Default Distance PPM	5
Default Horizontal angle error estimate	10
Default Azimuth error estimate	0.1
Default Trig Level Constant error estimat	0.05
Default Differential Leveling Constant err	0.01
Distance tolerance	0.05
Angle tolerance	20
Elevation tolerance	0.05
Setup Error	0.005
XYZ Decimal Places	0.001
Use repetition errors PLUS add-ons for e	False
Compute Coordinate standard error and (	True
Balance Angles	True
Compute earth curvature and atmospheri	False
Refraction Constant	0.14

- Survey will process raw data based on imported Control, control file, control features, scale factor, projection, and adjustment settings
- Survey will also import an XYZ file and automatically import chains from an OBS file in the same folder with the same file name as the XYZ file.

FIELD BOOK

- The Field Book created in the Survey Tab of the Project Explorer is the Survey database in a DGN

- Field Books can be created manually by right clicking on "Field Books" and selecting "New..."

- Field Books can be created automatically by dragging and dropping your data into the Survey Tab of the Project Explorer
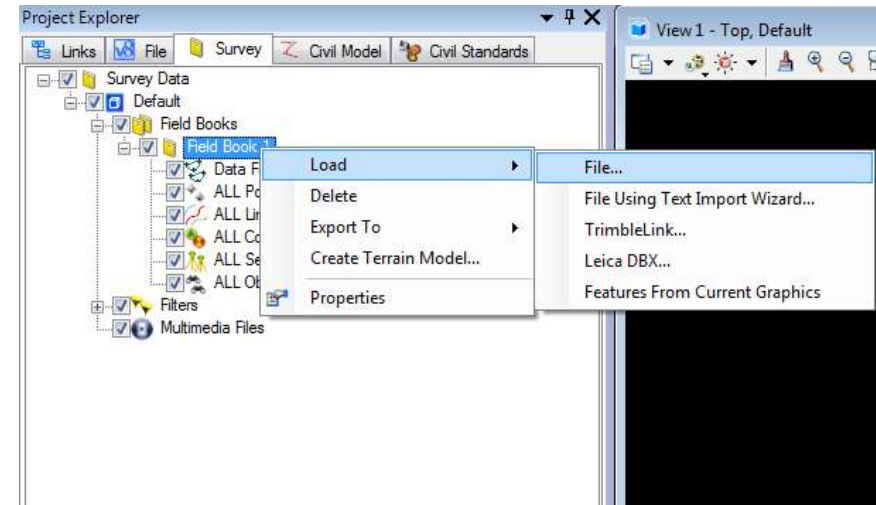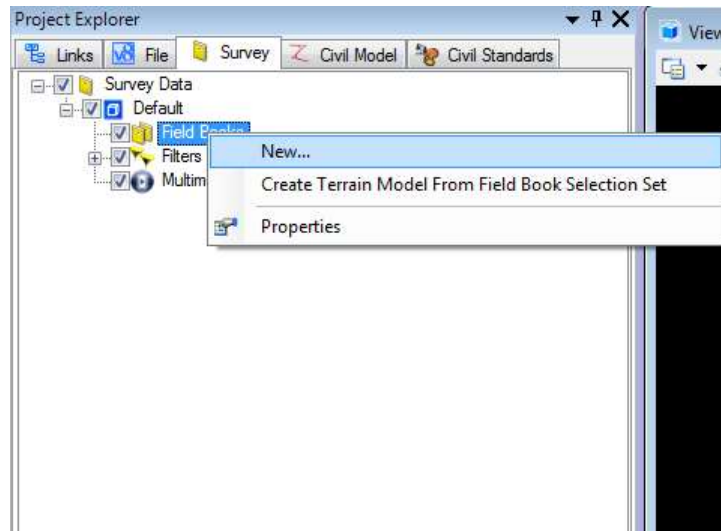
IMPORTING DATA INTO THE SURVRD.DGN FILE

- There are two ways to import data into Bentley Survey.

  1. **In project explorer, under the Survey tab, right-click on "Field Books", select "New…",** and a new field book will be created (Field Book 1). Right-click on the new field book, highlight "LOAD" and select "File…". From the Select File dialogue box, choose the file type from the drop down,

  2. **From your Windows Explorer, drag and drop the desired file** anywhere into the Project Explorer, Survey tab (i.e. in the blank area below the categories and filters)

IMPORTING CAiCE DATA INTO THE SURVRD.DGN FILE

- From the Select File dialogue box, choose the file type from the drop down, navigate to the CAiCE project directory and choose the file to be imported. If choosing a CAiCE PT4 file, the import CAiCE dialogue box will open. Choose "Combine Segments" or "Separate Segments" and then "Accept" to import into the field book. To rename the field book, select Field Book 1 and rename in the Element Information dialogue box.

- The **preferred method** is from your Windows Explorer, drag and drop the desired file

IMPORTING CAiCE DATA INTO THE SURVRD.DGN FILE

DRAG & DROP CAiCE DATA INTO THE SURVRD.DGN FILE

- When dragging and dropping a CAiCE PT4 file into Bentley Survey the field book automatically takes on the name of the CAiCE project.

  Note that the PT4 file is not a stand alone data file. It must be with the entire CAiCE project.

- Importing a CAiCE KCP file will also work however, note that curve and point geometry may require additional adjustment to get the desired graphics.

- A CAiCE SRV file can also be imported into Bentley Survey. Note CAiCE SRV files do not honor EFB chain gaps.

- CAiCE XML files have issues with Survey interpreting Comments and Descriptions fields as features. It is not best practice to import a CAiCE Points and Chains XML file.

DRAG & DROP CAiCE DATA INTO THE SURVRD.DGN FILE
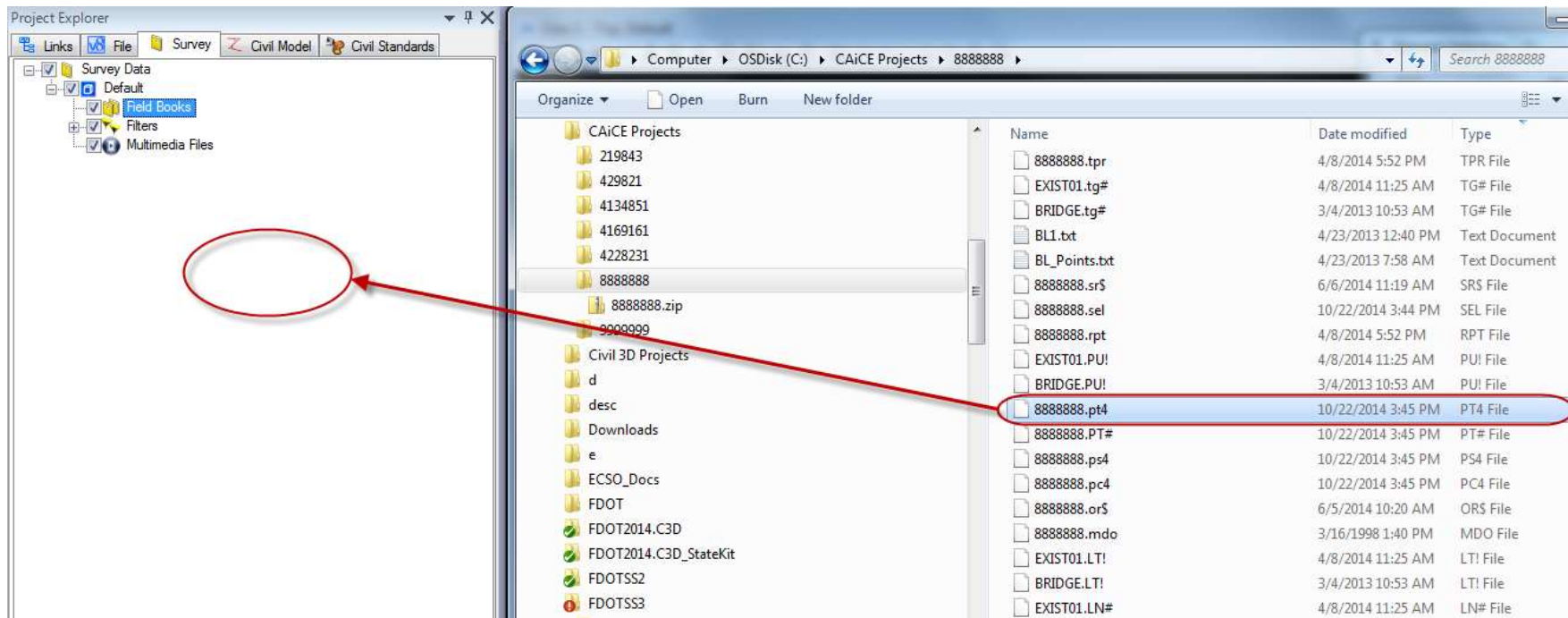
DRAG & DROP CAiCE DATA INTO THE SURVRD.DGN FILE
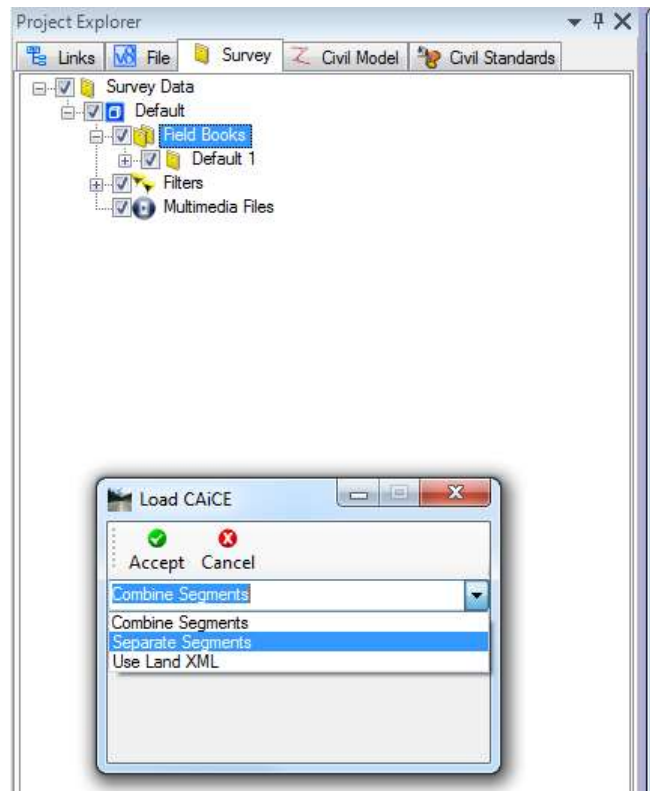
- After dropping the PT4 file into the Project Explorer Survey tab, the "Load CAiCE" dialogue box will open.

- Choose "Combine Segments" or "Separate Segments" if you wish to keep all segments separate.

- Choose "Accept" to load CAiCE into Bentley Survey.

- Graphics are automatically displayed

DRAG & DROP CAiCE DATA INTO THE SURVRD.DGN FILE
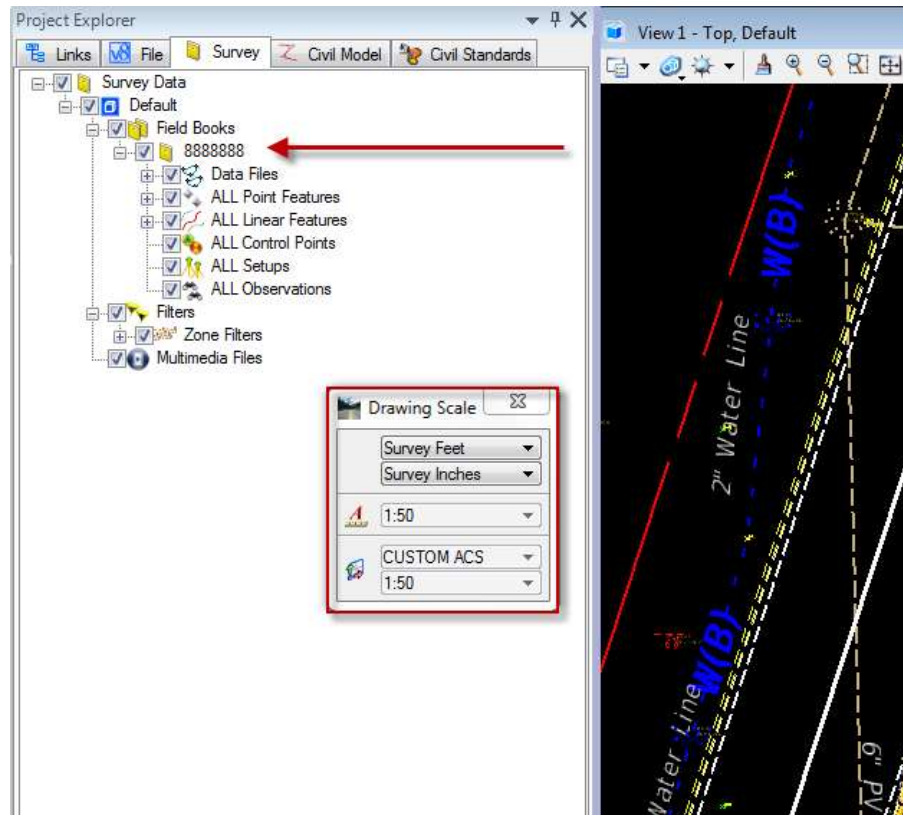
- Note that the CAiCE project is automatically named as the Field Book.

- This name can be changed in the Element Information dialogue box by selecting it.

- The drawing scale should already be set to the desired scale and the annotation scale lock should be "OFF". Whenever data is brought in or "Redrawn" make sure the annotation scale lock is set to "OFF".

IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE

- ASCII text files or point text files can be imported into a Field Book using a variety of preset or custom formats.

- **WARNING:** In FDOTSS4 use a dash "-" as a separator between you feature code and your feature description, all in the same column of your text file data

- Use the Comma delimited PtNEZCodeCode option

IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE

- Drag and Drop the TXT file or
- Create a Field Book and Load a File...
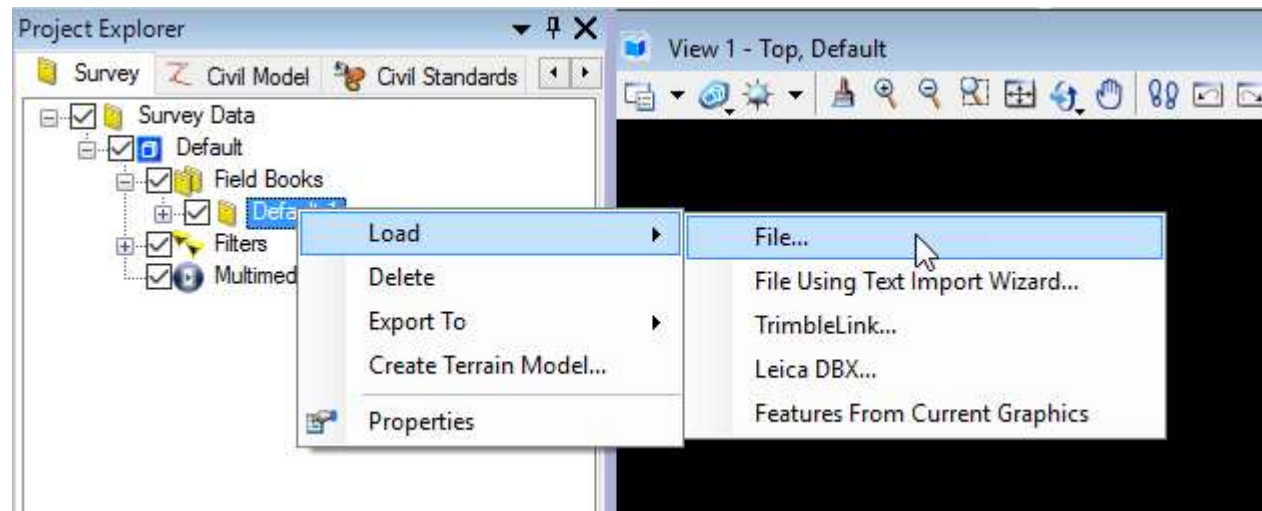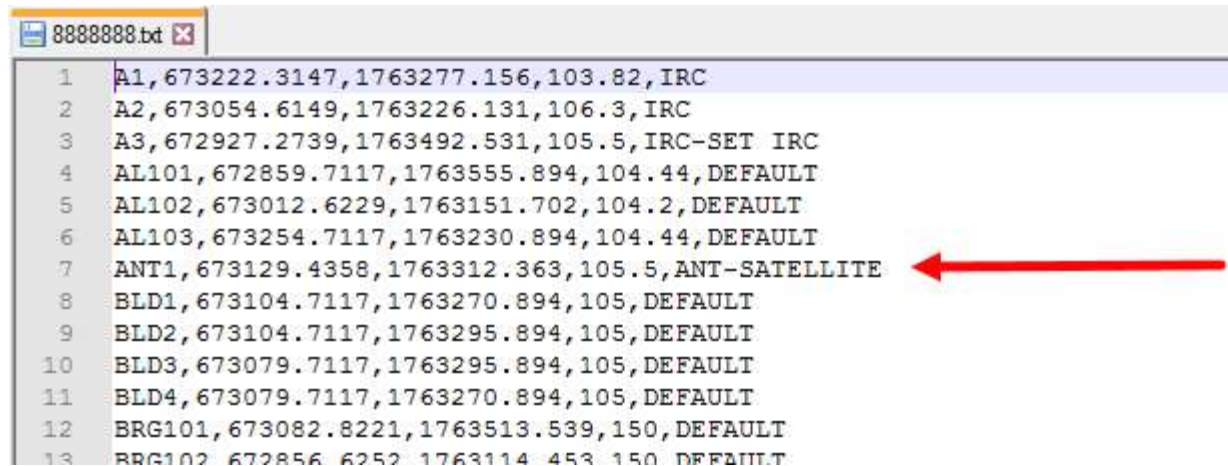
IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE

- Choose the Comma delimited PtNEZCodeCode option
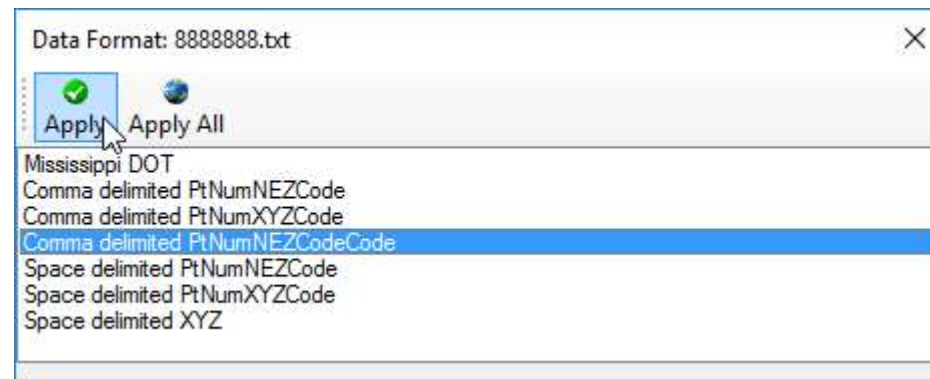
IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE

- The "Dash" in your text data will separate the feature and the description when you bring it into the Field Book

IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE

IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE – CUSTOM

- To create a custom text import, right click on the Field Book and Load File Using Text Import Wizard…
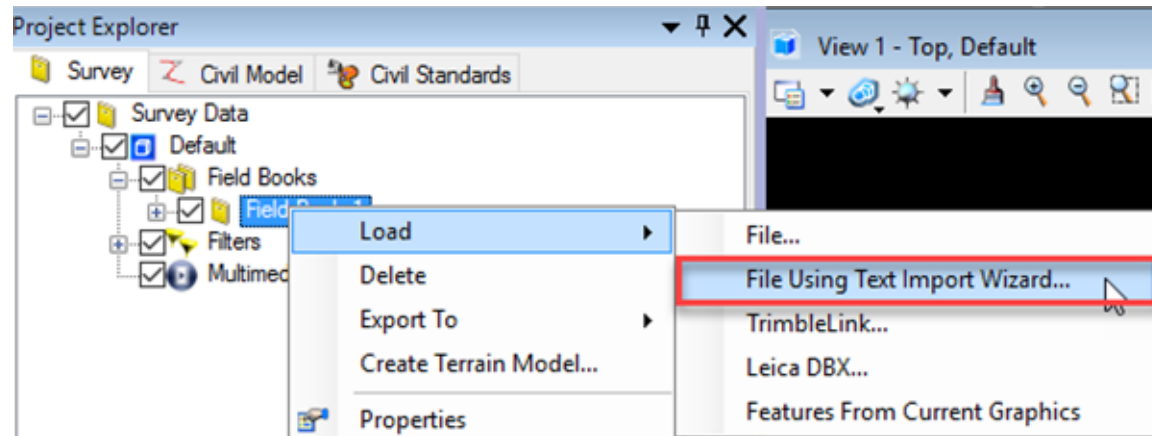
IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE – CUSTOM

- Select the text file for importing, make sure your data meets the defined text file type and click on "Next"
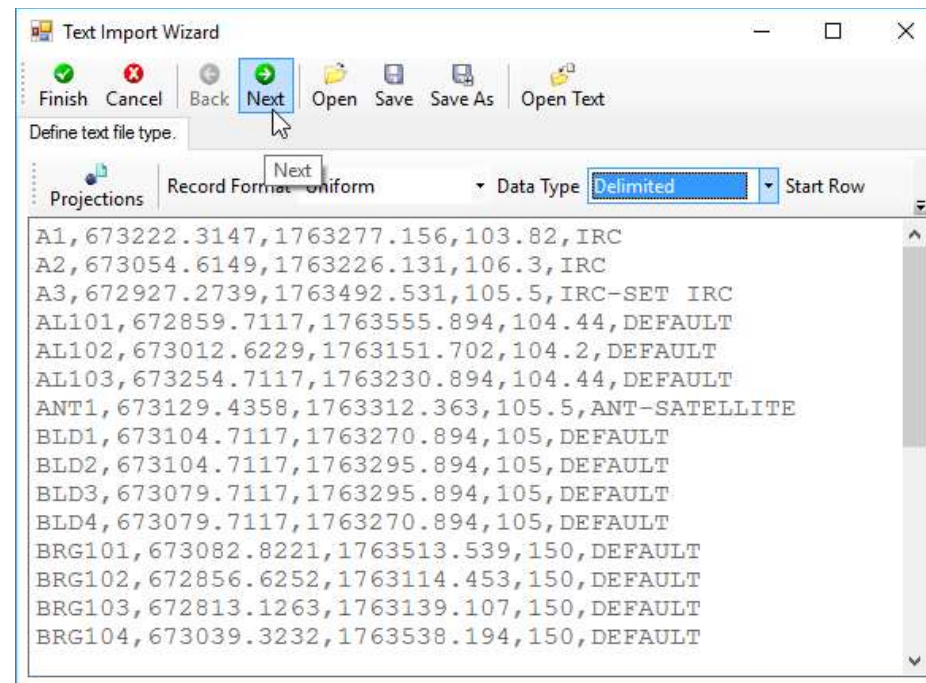
IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE – CUSTOM

- Define your delimiter and click on "Next"

IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE – CUSTOM

- Use the drop downs to define each column and click on "Finish"
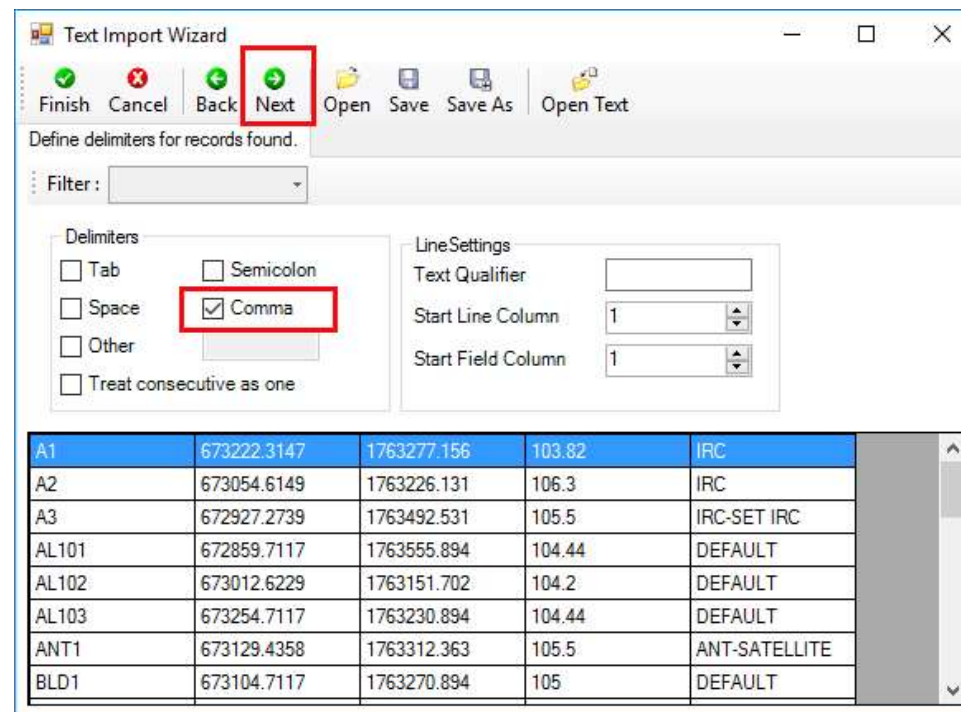
IMPORTING ASCII/TEXT INTO THE SURVRD.DGN FILE – CUSTOM

- The wizard will allow you to save your custom settings in a "tiw" file
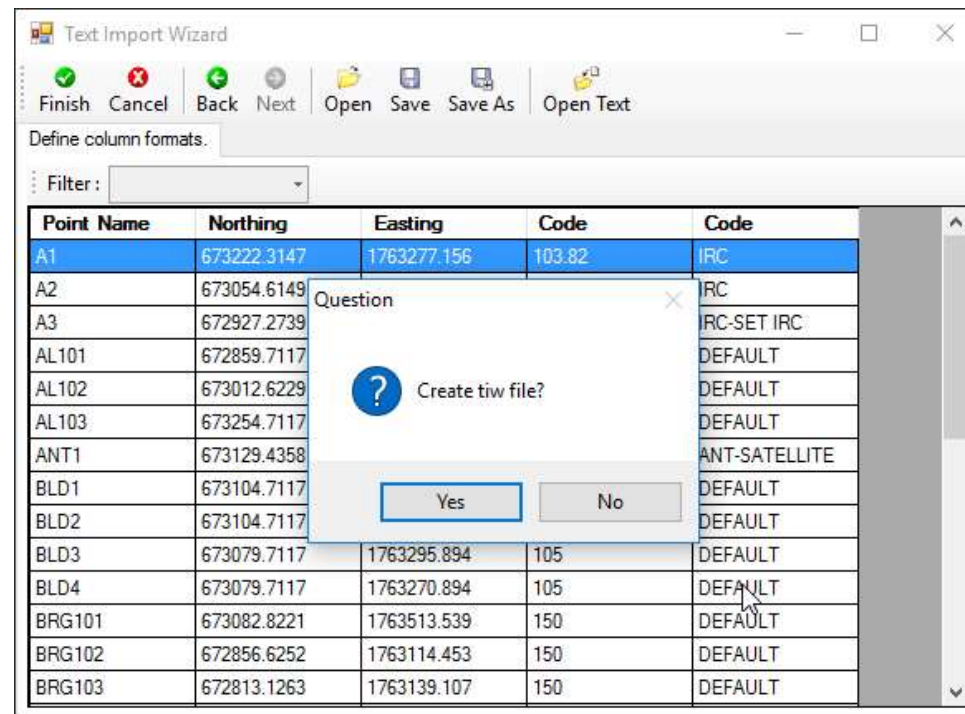
IMPORTING EFB DATA INTO THE SURVRD.DGN FILE

- Drag and Drop the processed segment "XYZ" file into Project Explorer Survey tab.

- Chains will automatically be extracted from the corresponding OBS file with the same name.
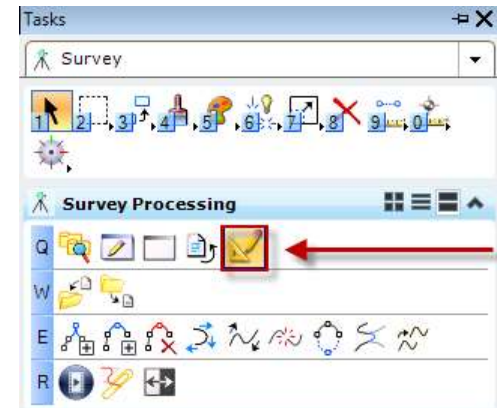
SURVEY REDRAW

- The "Survey Redraw" or "Redraw" command can be keyed in or selected from the "Survey Processing" task pane.

- "Redraw" will redisplay point and chain features based on the active feature table and drawing scale.

- Use survey redraw if point labels are out of placed due to annotation scale, features have been erroneously moved or deleted or if switching between the Roadway and Right of Way configurations. Always make sure the annotation scale lock is off before using survey redraw.
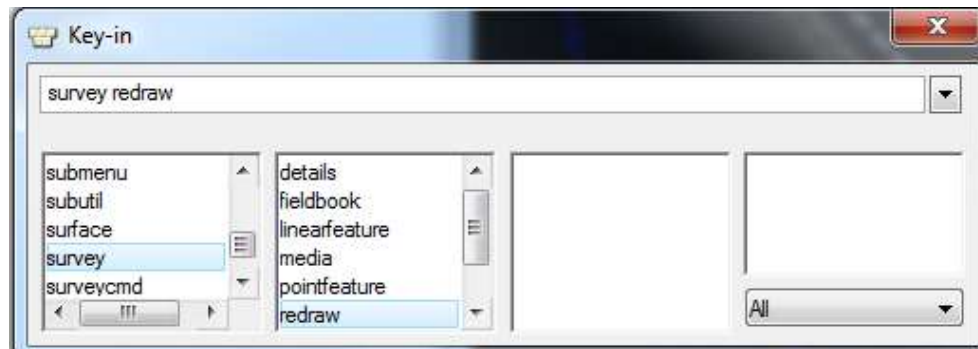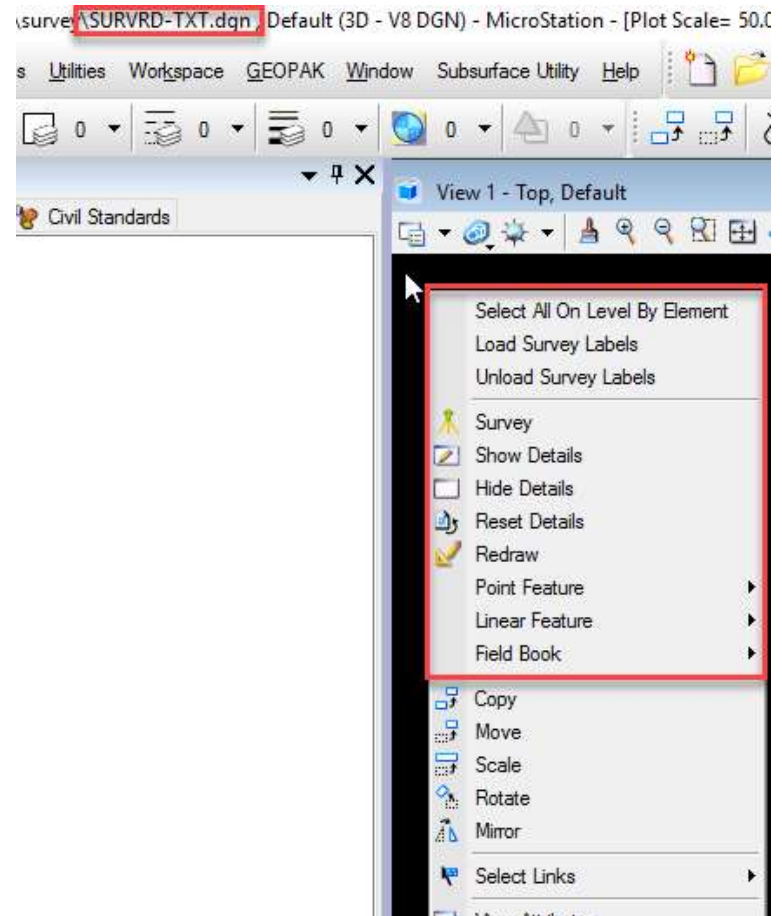
SURVEY REDRAW

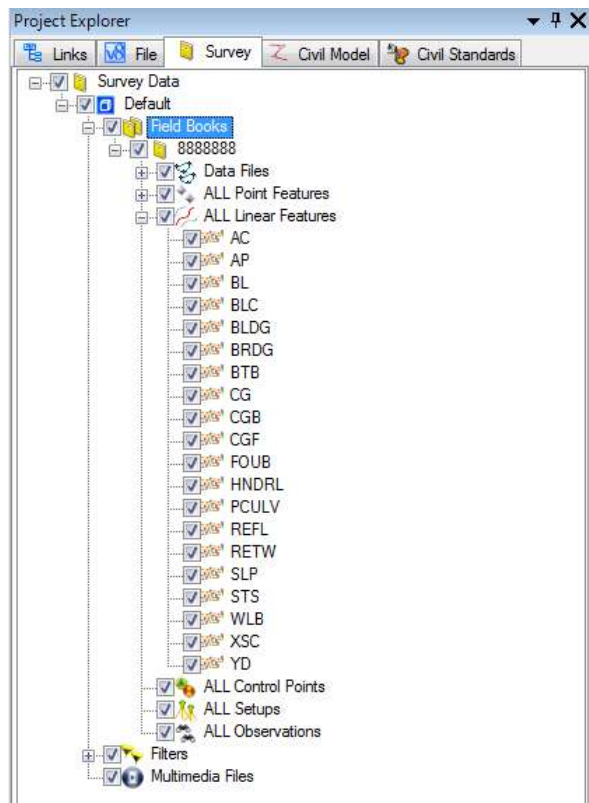- FDOTSS4 MR2 and above has right click in the view functionality, including Survey Redraw.
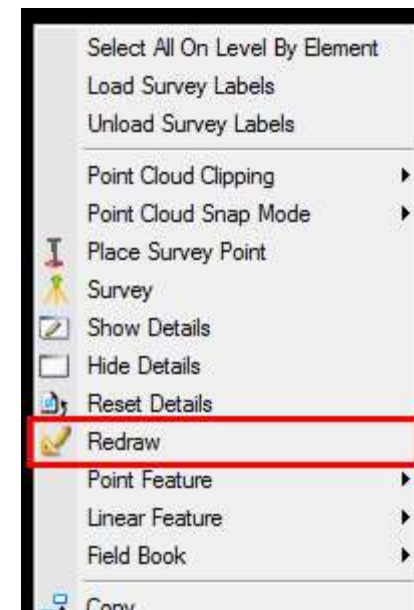
SURVEY REDRAW

- Redraw along with other surveying commands can be found by holding down the right click button on your mouse in the view… if the file starts with "SURVRD" or "SURVRW"
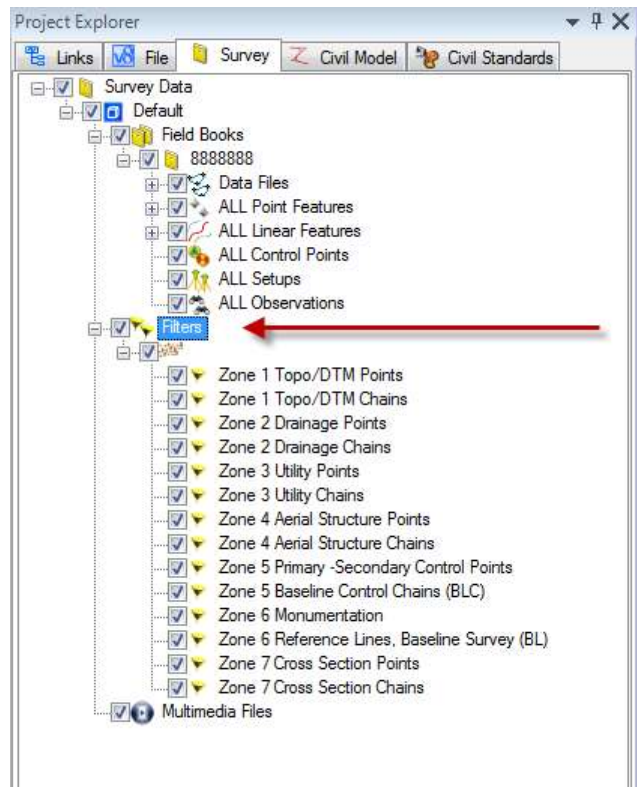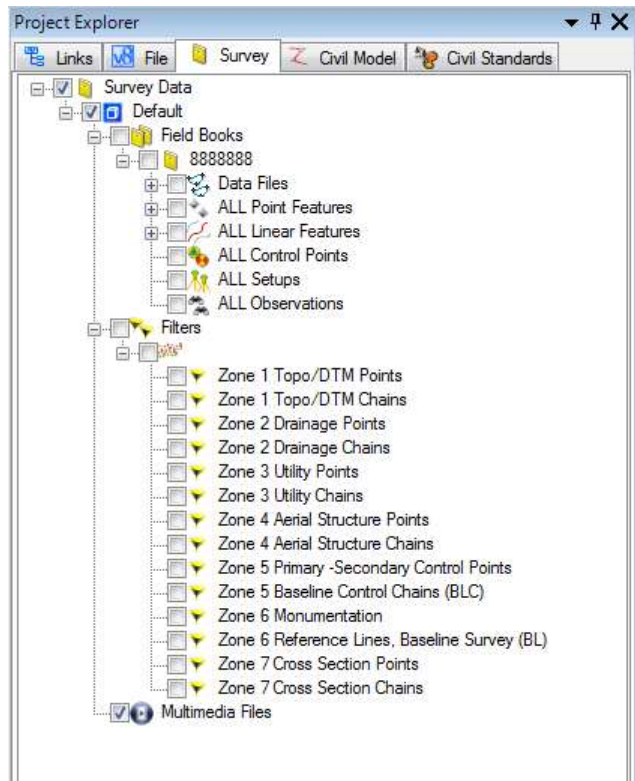
SURVEY VISUALIZATION

- Visualization of survey features can be controlled by checking or un-checking display boxes in the tree under Field Books.

- Expand the tree to see various options for visualizing survey data.

- In this example "All Linear Features" have been expanded.

- Check or un-check to change the visualization.

SURVEY VISUALIZATION

- Survey filters have been added to the fdotseed3D.dgn seed file that correspond to the FDOT standard zones.

- Expand the filters category to view the survey filters.

- The filters have been organized into point and chain zones. Use the filters to visualize points and chains by zone.

SURVEY VISUALIZATION

- To visualize point and chain features by zone, first all field book and survey filters must be turned off (un-checked).

- Once all features have been turned off, individual zones can be checked on to visualize.

SURVEY POINT FEATURE
VIEW ANNOTATION OPTIONS
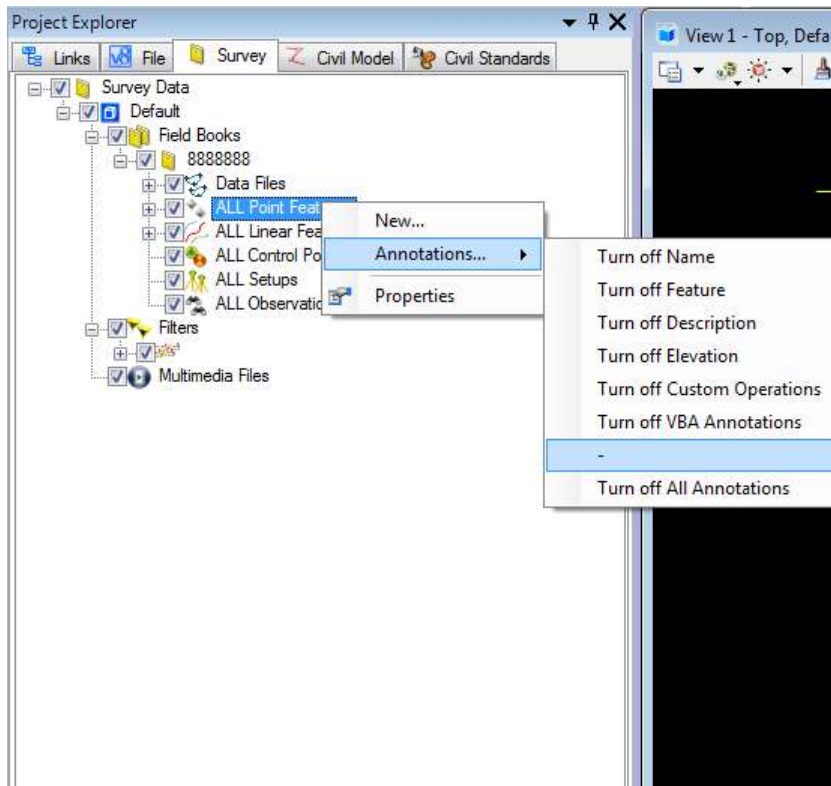
- Right-clicking on point features in the Field Book.

- Also right-click on a point feature in the view will reveal additional options
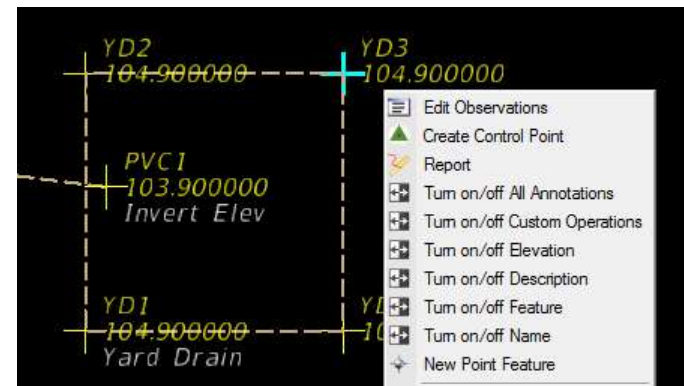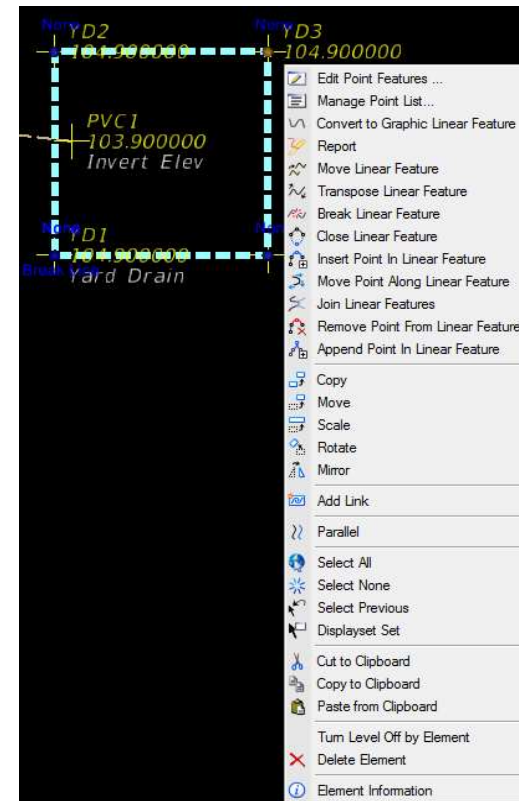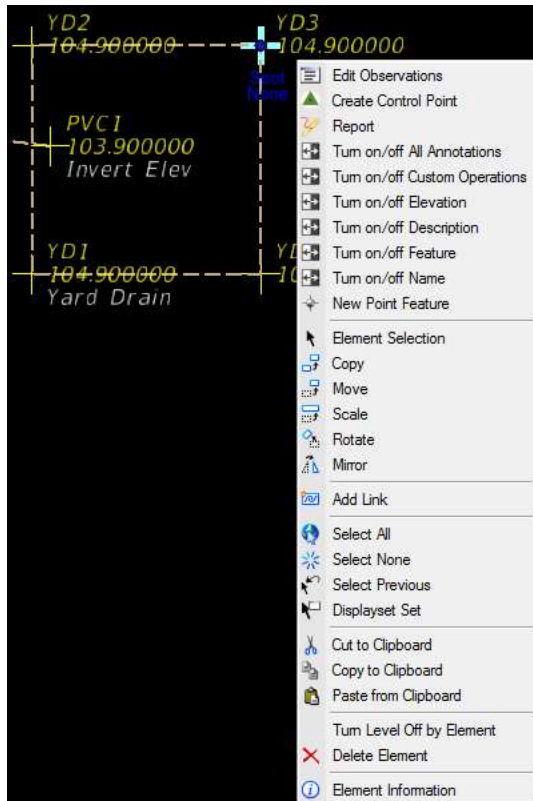
SURVEY POINT AND CHAIN FEATURE SELECTION OPTIONS

- Selecting a point or chain feature and then hovering will reveal information and various options related to the feature that can be selected.
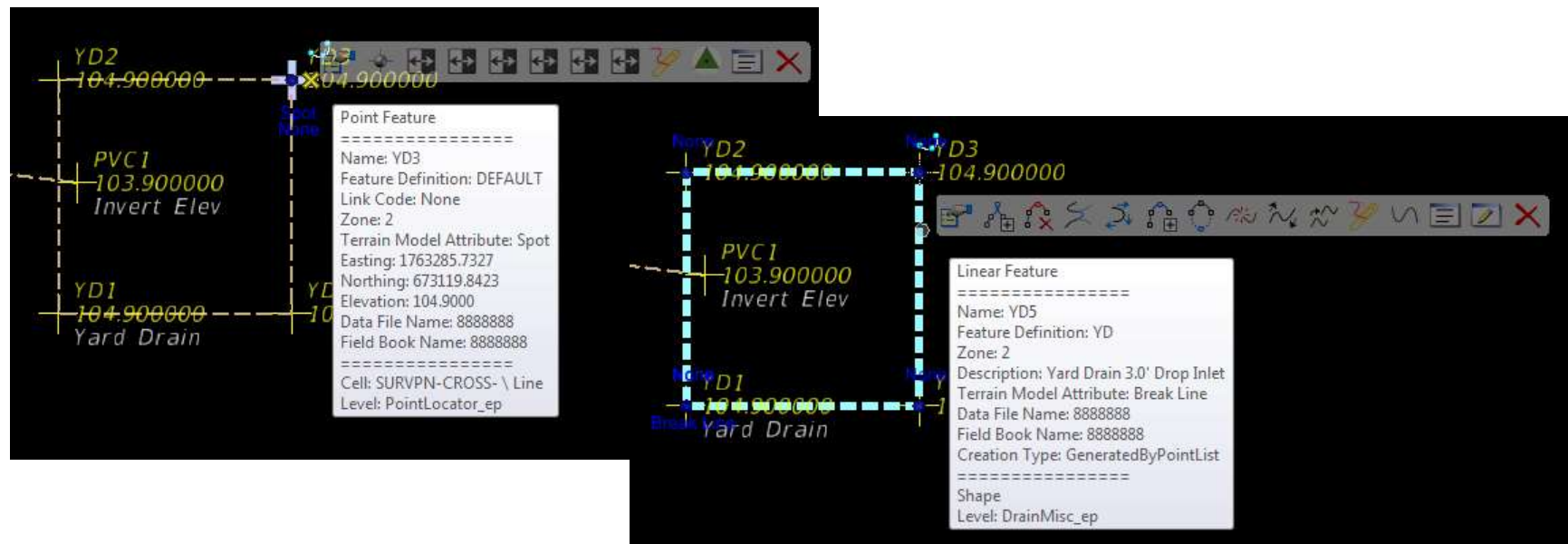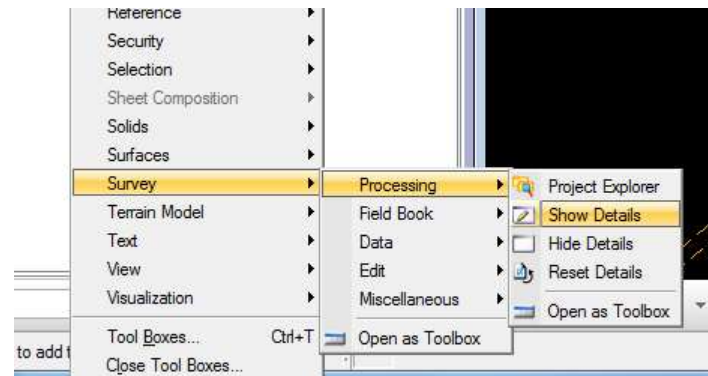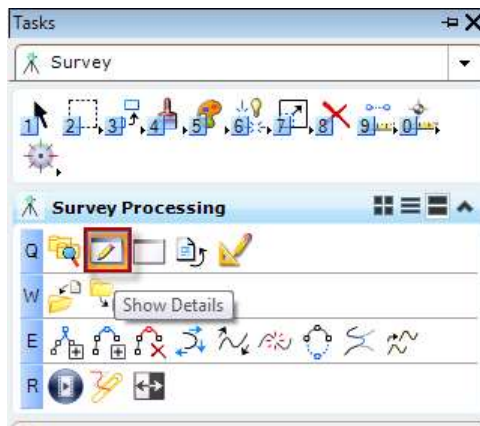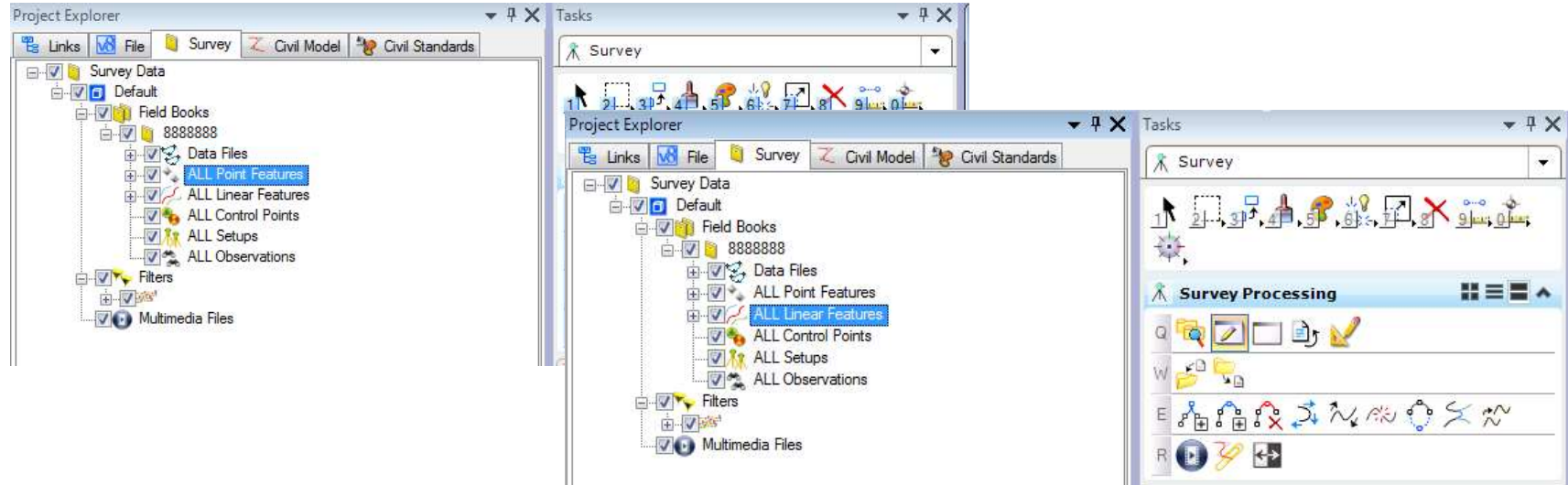
ADDITIONAL RIGHT-CLICK OPTIONS

THE SURVEY DATABASE

- The survey database is embedded in the DGN file. But where is it? How do you view/edit points and chains?

- The "Show Details" dialogue box was provided to interface with survey features and can be activated via the Task pane or under the MicroStation menu "Tools"

THE SURVEY DATABASE

- Highlighting a point(s) or chain(s) in the Survey Field Book and selecting "Show Details" will bring up the details dialogue box for those highlighted features. **NOTE: The Field Book is the Survey Database!**

THE SURVEY DATABASE

THE SURVEY DATABASE

SURVEY LABELS

Five "Survey" text levels have been added for labeling the survey and plans production purposes.

- TextDrainLabel_ep
- TextDrainInvElev_ep
- TextTopoLabel_ep
- TextUtilLabel_ep
- TextSubUtilLabel_ep

SURVEY LABELS

- Survey point features have annotation that is generated by the XML feature table. However, this annotation is for development of the survey and is not recommended for plans production labeling.

- To create labels for survey point and chain features on the survey text levels, Bentley has provided a macro that will visualize the point/chain description from the field book.

SURVEY LABELS

- The latest FDOT 3D Seed File (**fdotseed3D.dgn**) will contain examples of macro calls associated with features that a designer may want labeled for plans production purposes. These are examples only and should be expanded or condensed by the surveyor, depending on what features are to be labeled.

- When data is brought into a field book, these macro calls in the fdotseed3Df.dgn will automatically populate the "VBA Macro" attribute field in the matching field book point and chain features .

SURVEY LABELS
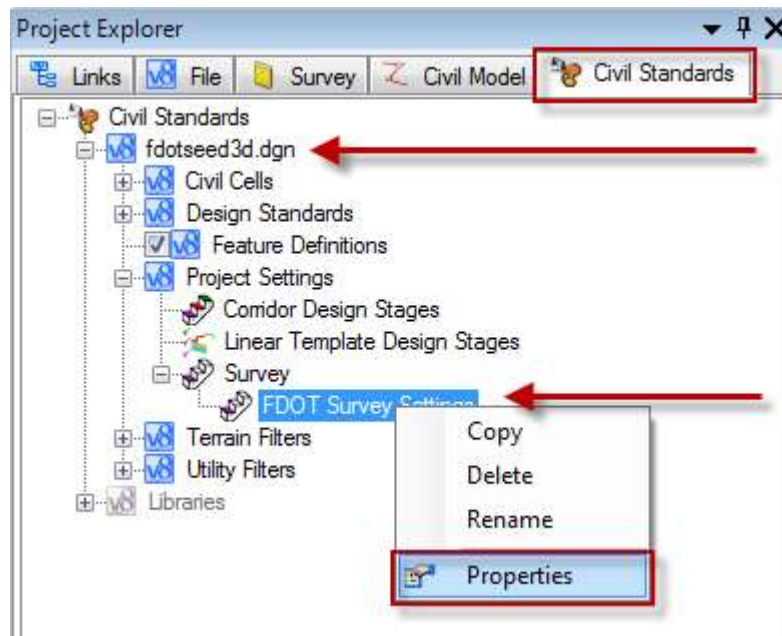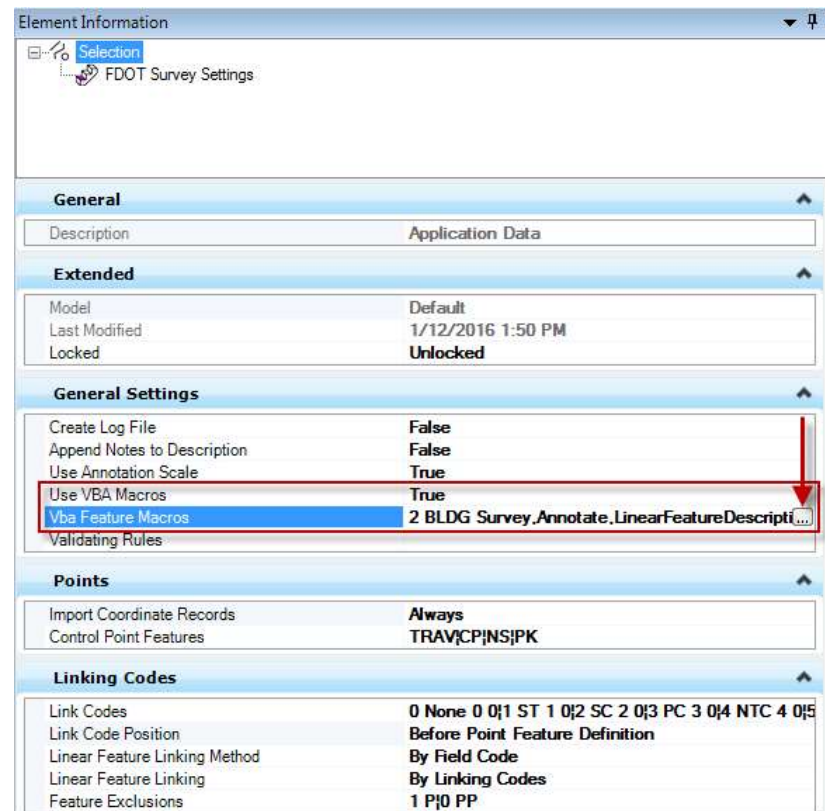
- In the Civil Standards tab of the Project Explorer under fdotseed3d.dgn choose...

"Project Settings"
- Survey
  - FDOT Survey Settings
    - Right Click and show Properties

SURVEY LABELS

- The Element Information (Properties) dialogue box will show the current survey settings.

- To use VBA Macros with Point Features and Linear Features, the "Use VBA Macros" must be set to "**True**".

- To view/edit point and linear macro calls for a limited selection of features, select the ellipsis at the end of the "Vba Feature Macros" line.

SURVEY LABELS

- Set the active Text Style to "Text Chain".

- The Height and Width of Text Chain is preset to 2.4'. This is NOT A STANDARD.

- If the Designer is using annotation scale with text then Text can be manually set to 0.07' and "Is Annotation" can be set to True later before delivery.

SURVEY LABELS
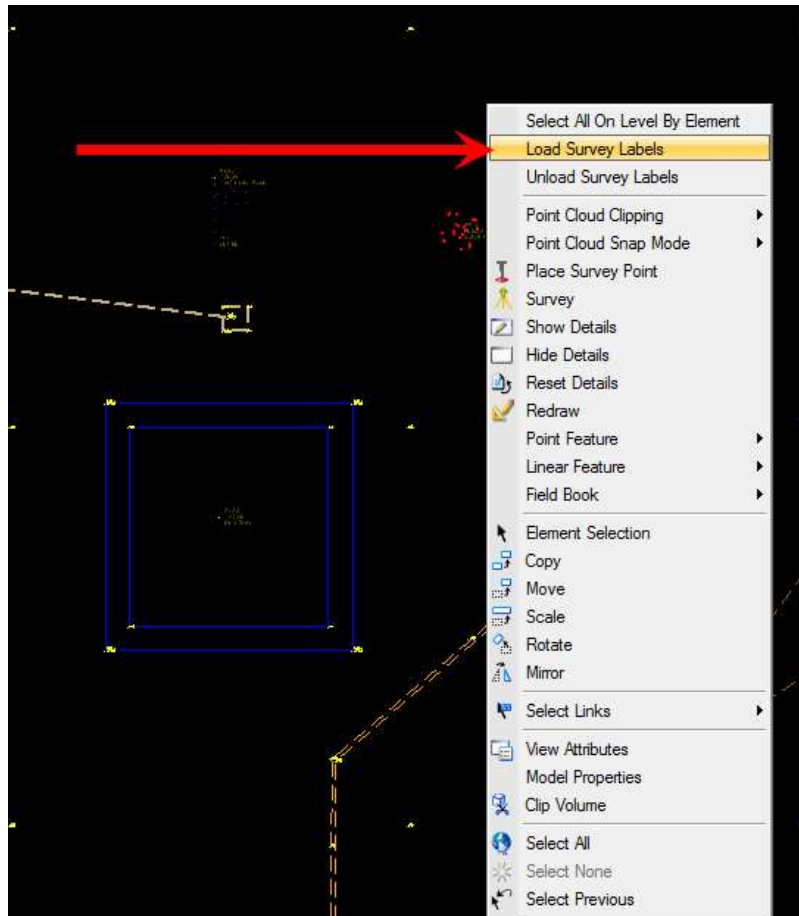
- Right Click on the view and select "Load Survey Labels".

- Any time data is brought in or survey redraw is run, the macro calls in the field book features will generate labels.

- Levels, significant digits, and distance from feature are parameters set in the various macro calls.

SURVEY LABELS
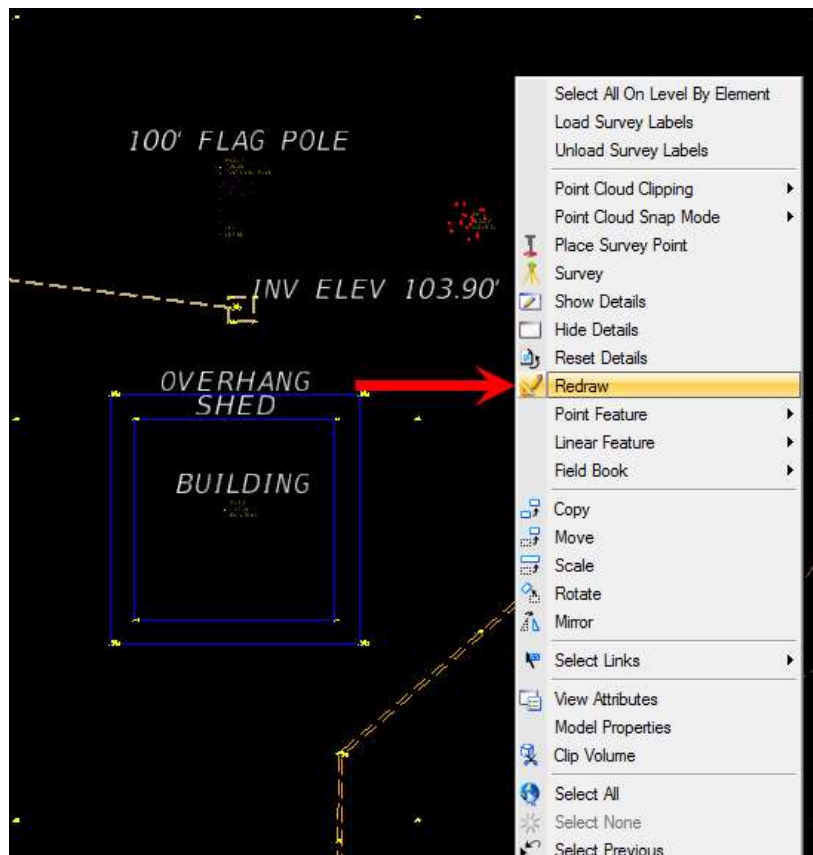
- Notice that additional right click functionality has been added to FDOTSS4 MR2.

- Show Details, Redraw and adding new point and linear features can all be accessed by right clicking in the view of a SURVRD or SURVRW file.

SURVEY LABELS
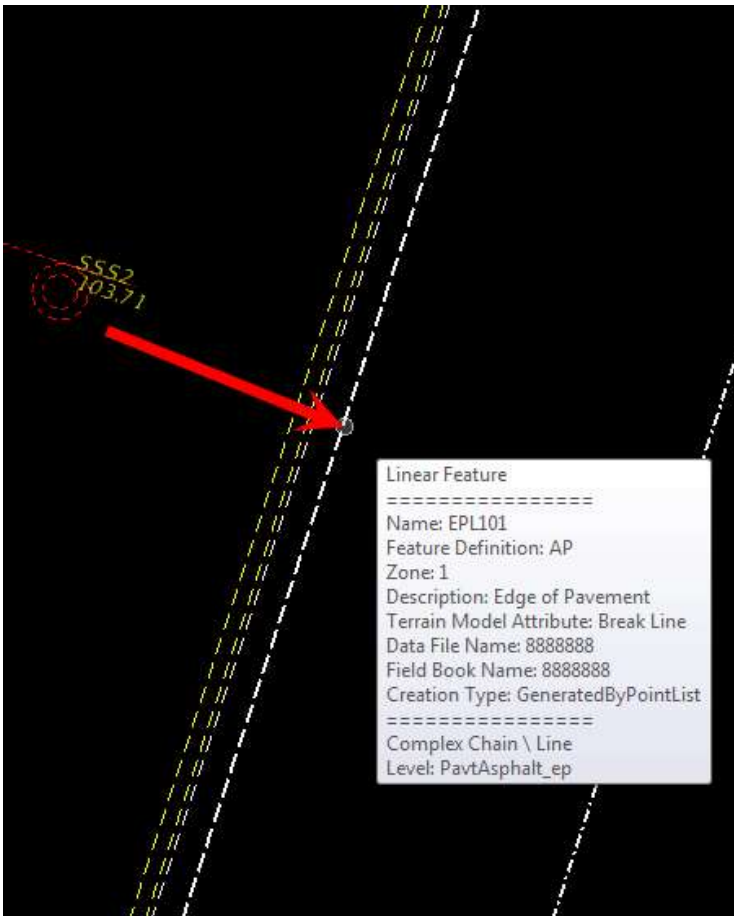
- Also note that point features like single support signs or guy anchors can be rotated perpendicular to a linear feature (i.e. AP) with a macro call.

- Additional rotation is a parameter at the end of the macro call (i.e. zero).

SURVEY LABELS

- Note that if the Designer is using annotation scale with text and many do, the text should be set to annotation scale late in the process.

- Do not allow a Survey Redraw to take place after annotation scale for text is set or all text will be set back to 2.4' and will move back to its original positions.

SURVEY LABELS
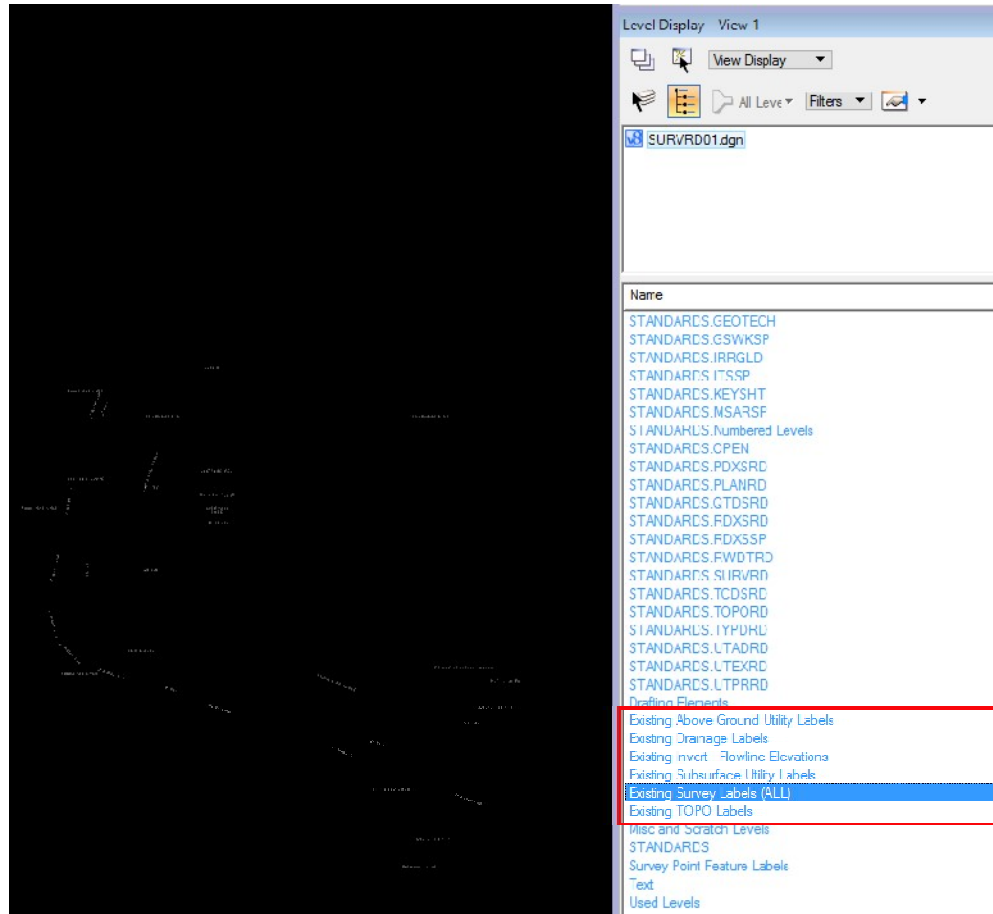
MAKE SURVEY LABELS ANNOTATION SCALE

- If using annotation scale on the Survey Labels the Survey Text Labels can be isolated using the level filters.

- Select the Survey Label Text and set the Text Height and Width. Also set "Is Annotation" to "True".

- Do not change the yellow point label text.

LINEAR FEATURE (CHAIN) EDITS
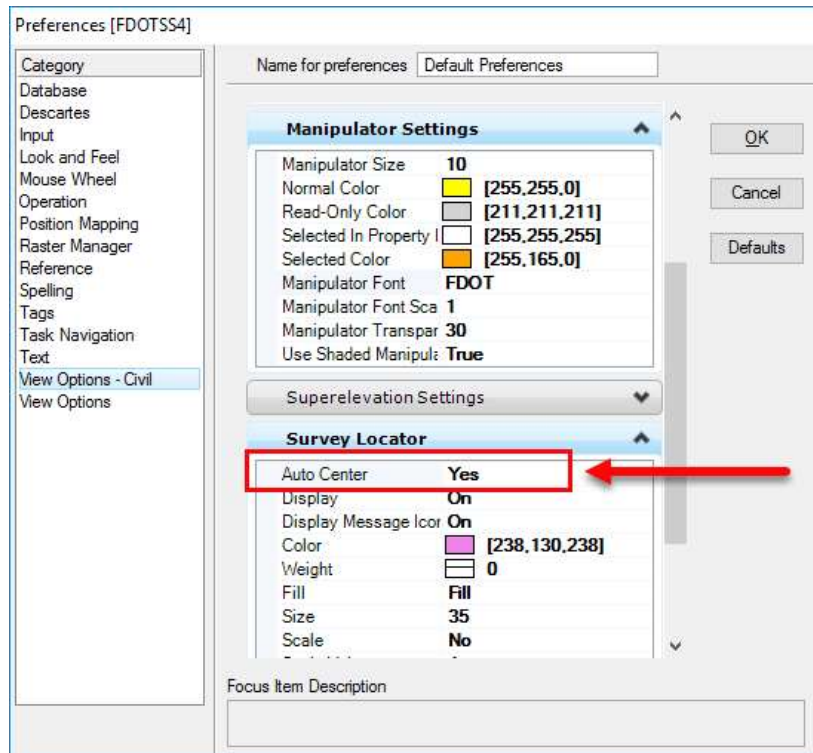
- When making chain edits you may find it beneficial to turn on your Survey Locator Auto Center

- In Workspace > Preferences Under View Options - Civil Select in the field to find the drop down or just double click on the word No to change it to Yes.

LINEAR FEATURE (CHAIN) EDITS
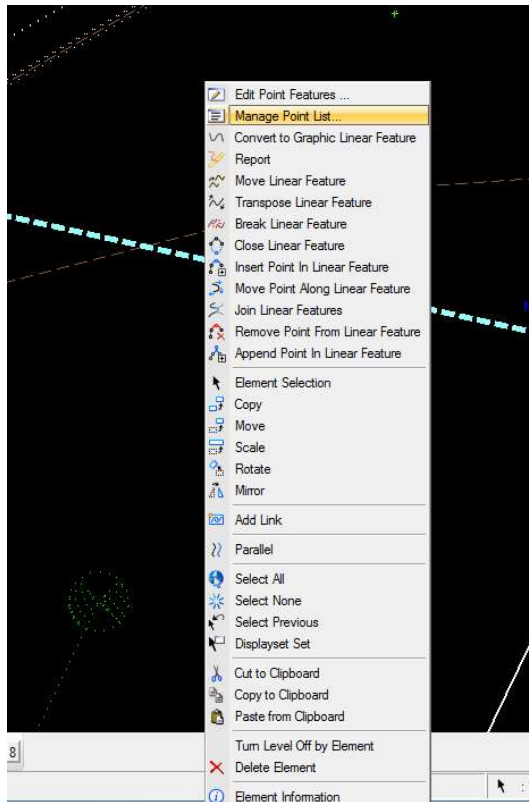
- There are various ways to perform chain edits. One is to manually manage the point list.
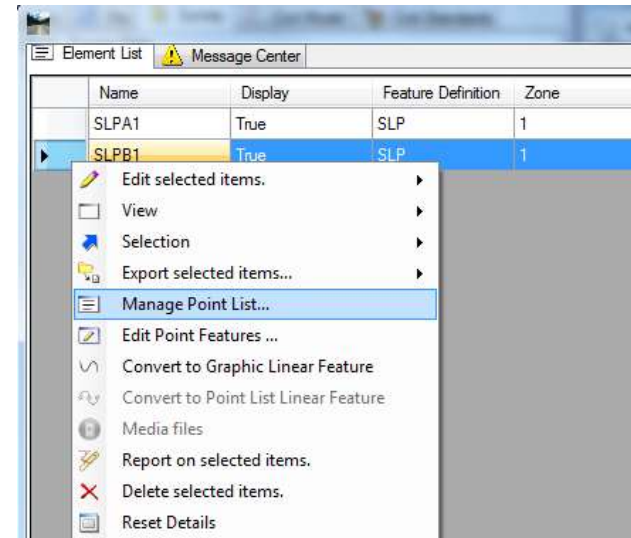
LINEAR FEATURE (CHAIN) EDITS
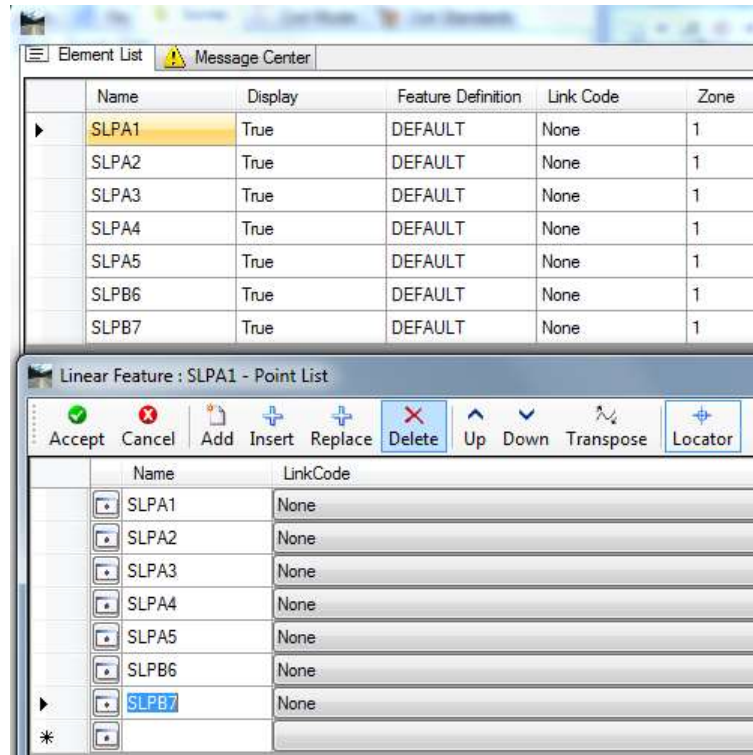
- Editing the Linear Features (chains) will update the graphics automatically. All changes are made directly to the survey Field Book.

- Points within a chain also can be edited. Again all changes are made directly to the survey Field Book.

OFFSET CHAINS - CONTROL CODES

Linear Feature
=================
Name: CGBL1
Feature Definition: CGB
Zone: 1
Description: Back of Curb
Terrain Model Attribute: Break Line
Data File Name: 8888888
Field Book Name: 8888888
Creation Type: GeneratedByPointList
=================
Complex Chain \ Line
Level: CGBack_ep
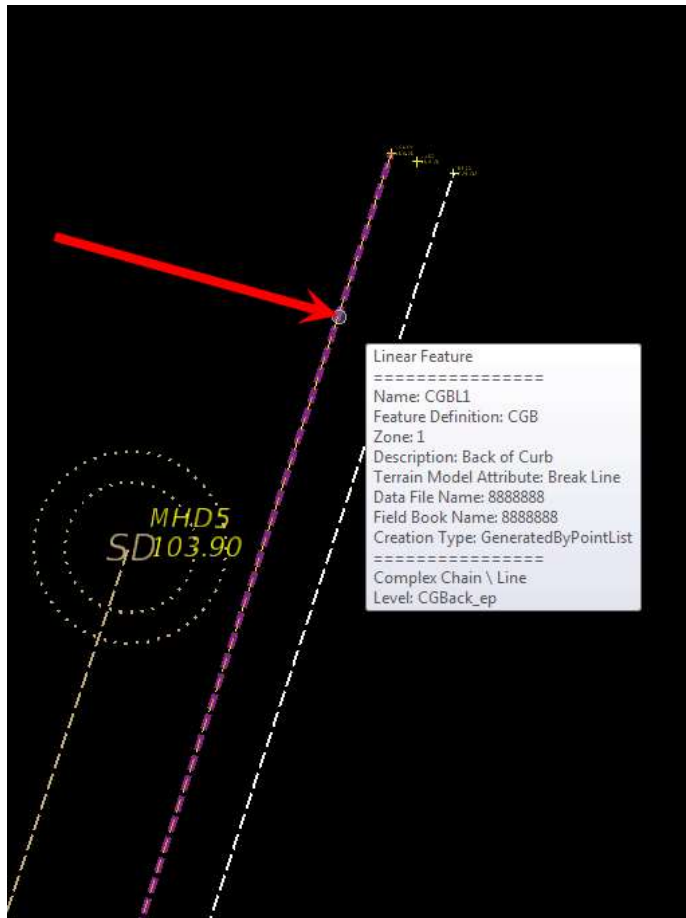
- It is common for a crew to locate only the back of curb and let the office offset to get the face of curb and flow line.

- This can be done with control codes added to the first point in the chain point list.

OFFSET CHAINS - CONTROL CODES

- Select the chain to be offset from and use the Edit Point Features tool.

OFFSET CHAINS - CONTROL CODES

OFFSET CHAINS - CONTROL CODES

- Note that multiple offset chains can be created. In this case the CGF and the CG.

- Use the ellipse to add a control code.

- Make the control code a "New Template".

- The value will be the feature for the new offset chain, the distance and the elevation offset from the original chain.
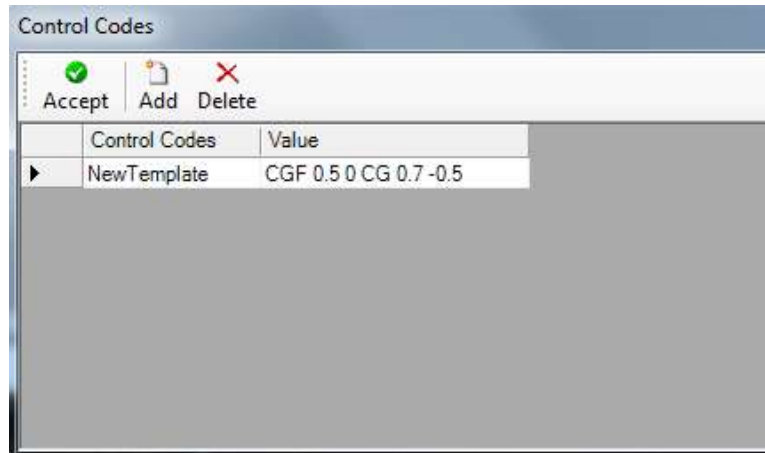
OFFSET CHAINS - CONTROL CODES
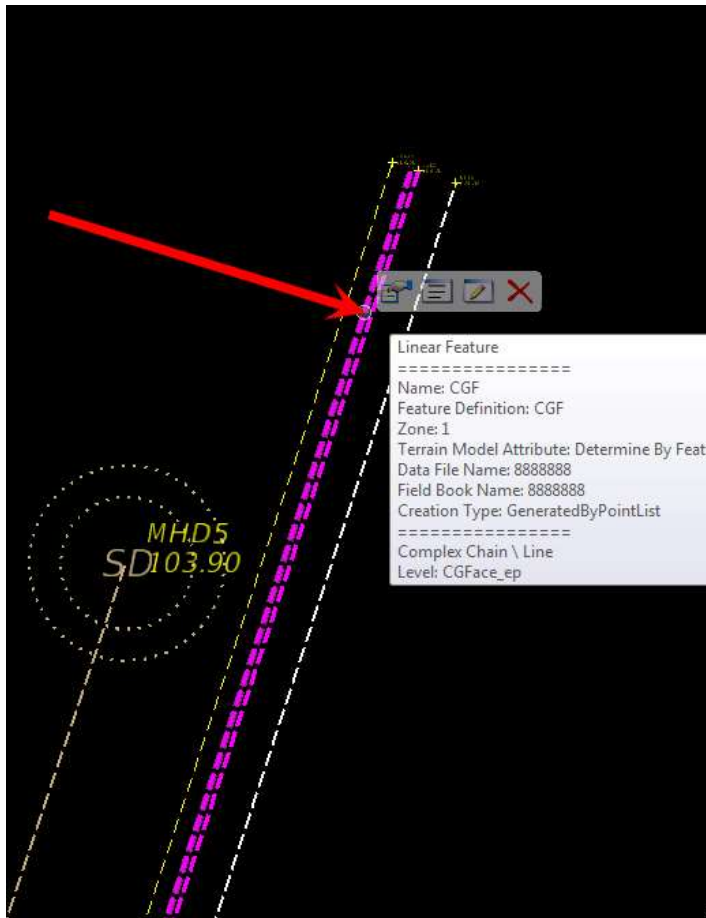
- Both the CGF and the CG linear features are shown.

- Edit these new offset chains to make them "Break Lines".

Linear Feature (Chain) Link Codes

- When coming from EFB or CAiCE the option to give a point a "Point" or "Curve" Attribute is carried with the data into SS4.

- SS4 interprets these attributes in each chain and assigns a Link Code to various points to make a B-Spline curve.

- SS4 generally assigns circular curve options however, the "Arc Toggle" option will turn on and off the B-Spline at desired points similar to the way CAiCE draws a B-Spline.

- Changing the first point in a chain's Link Code to "Arc Toggle" while the others read "None" will cause the B-spline to effect the whole chain.

Linear Feature (Chain) Link Codes

CUSTOM SURVEY FILTERS

- Clean up of the Survey Database (Field Books) is easily done by selecting large groups of like points or linear features and revising their attributes (**zone, feature definition, DTM attribute**) in the Element Information (Properties) dialogue box.

- The trick is to **visualize only what you want to select.**

- Using the **Field Book** visualizations is one way.

- Using the **Feature Definitions** in the Civil Standards Tab is another way.

CUSTOM SURVEY FILTERS

- However, **DEFAULT** point features that are on the wrong zone or have the wrong DTM attribute are particularly hard to isolate.

- One way to do this is with a custom Survey Filter.

CUSTOM SURVEY FILTERS
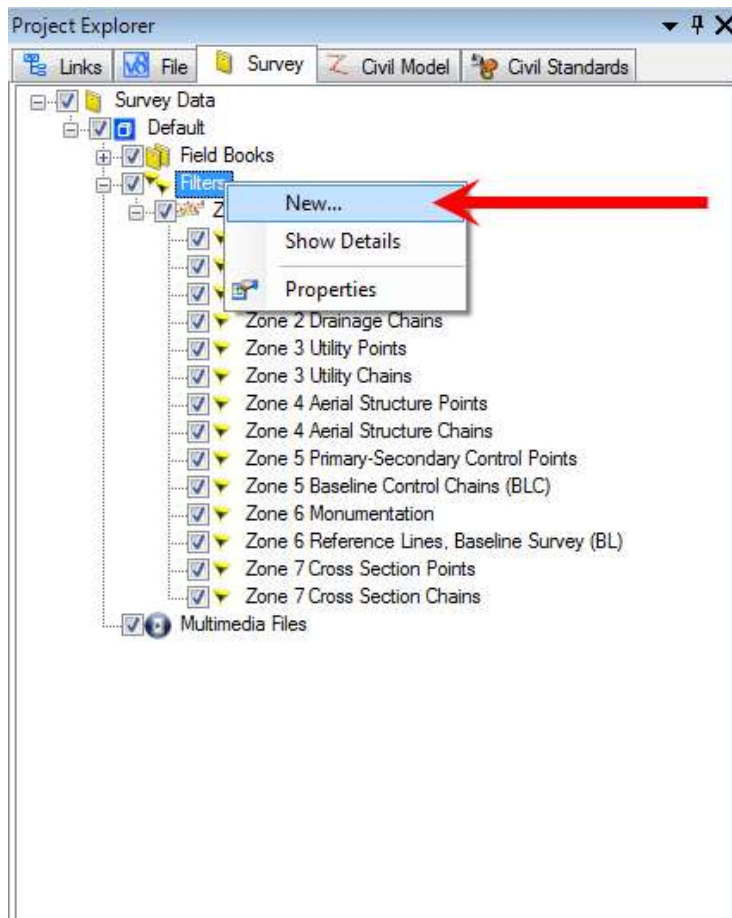
- Right Click on "Filters".
- Select "New…"
- In the Create New Filters dialogue box select the ellipse.
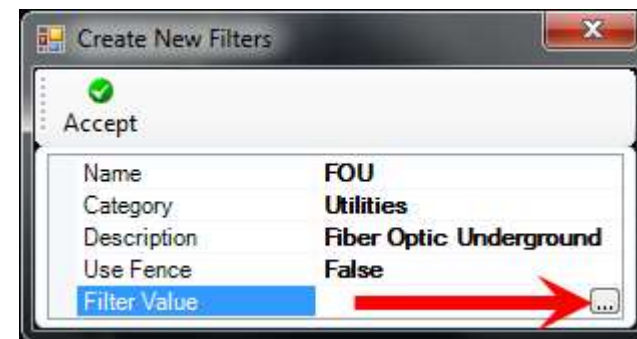
CUSTOM SURVEY FILTERS
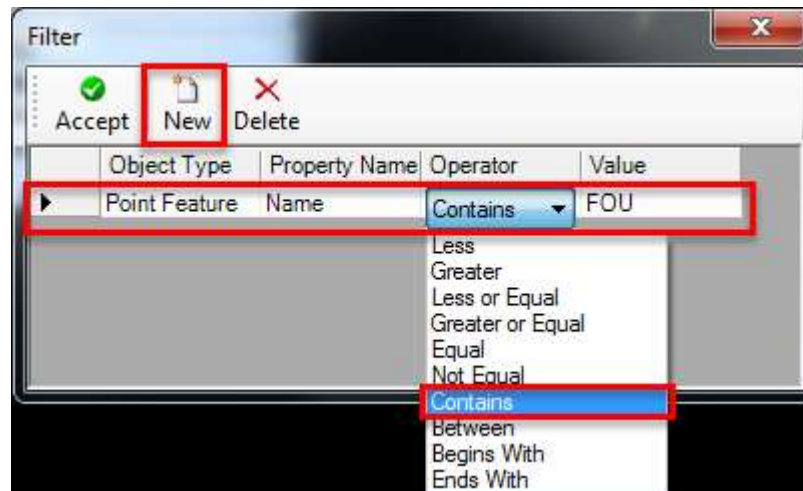
- Create a "New" filter

- Select Object Type – "Point Feature"

- Select Property Name – "Name" (point name)

- Select the Operator – "Contains"

- Type in the Value – "FOU" (looking for FOU in the point name)
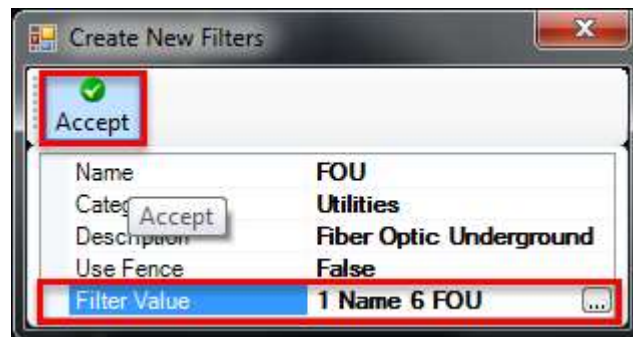
CUSTOM SURVEY FILTERS
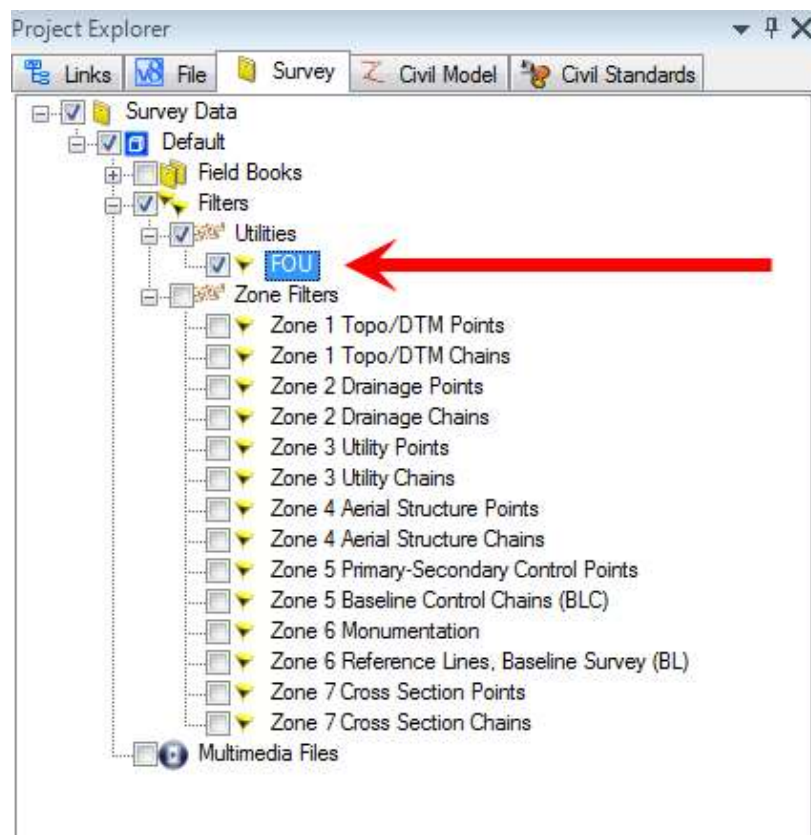
- Accepting the filter values and then Accepting the new filter will create the filter and put it under its own category.

- Uncheck all, then check this new filter to visualize (in this case all points with "FOU" in the name).

CUSTOM SURVEY FILTERS
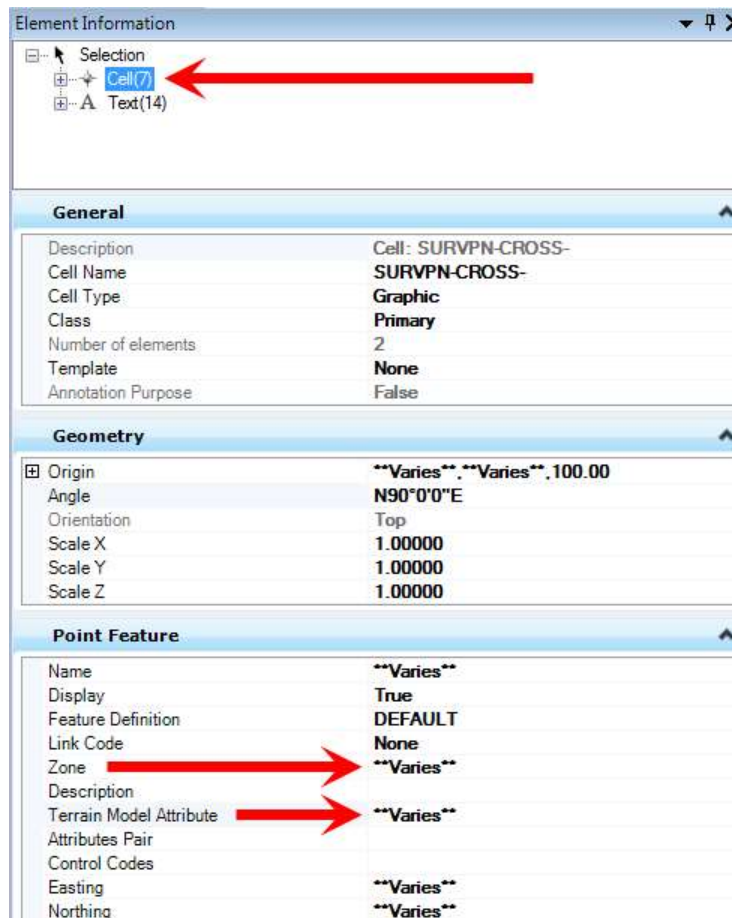
- Selecting all in the view will allow you to edit in the Properties.

- Choose the Cells under the selection (you are not editing Text)

- Note under Point Feature is the "Zone" and the "Terrain Model Attribute"

CUSTOM SURVEY FILTERS

- In this case your editing cell(7) (seven cells)
- Changing the Terrain Model Attribute will change it for all seven cells.
- Changing the Zone will change it for all seven cells.

VISUALIZE BY FEATURE DEFINITION
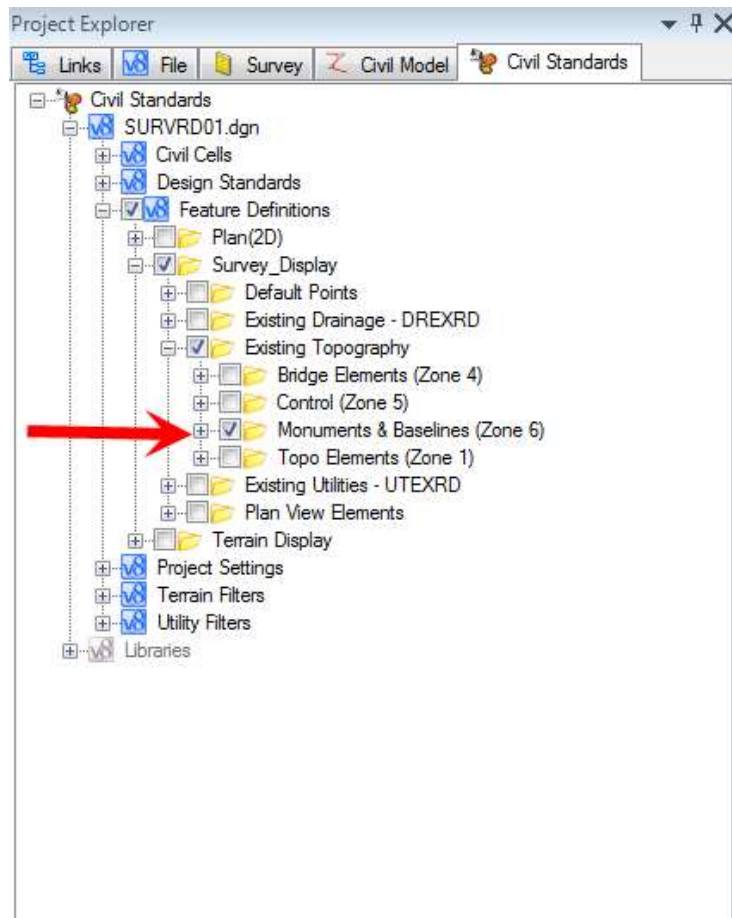
- Visualizing by Feature Definition under the Civil Standards tab is an easy way to edit zones by feature

- For example selecting only "Monuments & Baselines" is an easy way to move all monuments to zone 6.

TERRAIN MODEL STROKE TOLERANCE

- Before building a Terrain Model the Linear Stroke Tolerance and the Curve Stroke Tolerance should be considered. They are set to 50.0' and 0.01' respectively by a configuration variable. Both may vary depending on the density of the survey and the level of curve detail desired.

- Change both numbers in the MicroStation Menu Workspace > Configuration to make locale changes to these variables on your computer.

TERRAIN MODEL STROKE TOLERANCE

- For small structures with curves such as an open curb drainage inlet, the curve stroking may need be lowered to avoid spikes or dips in the DTM.
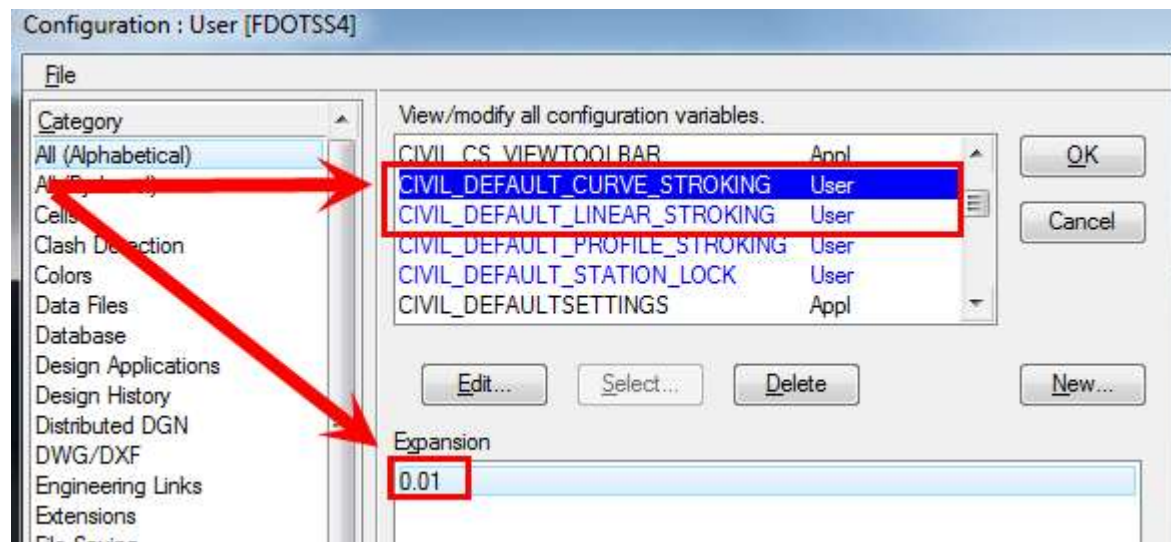
TERRAIN MODEL STROKE TOLERANCE

- Note that if the linear stroke distance is too large or small, spikes or dips may be introduced into the surface when none exist. However, 50.0' is similar to FDOT CAiCE settings and seems to work well for most FDOT projects.

- Only if the survey is generally larger or smaller than a 50.0' grid should this setting be changed.

- This is not to be confused with the Maximum Triangle Length.

BUILDING TERRAIN MODELS
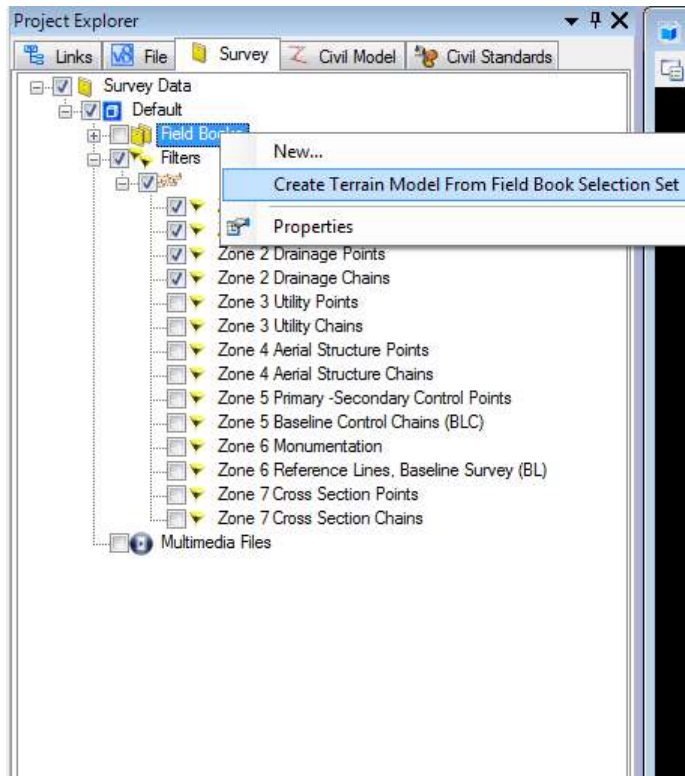
- Use the Survey Zone filter to visualize the features to be included in the Terrain Model.

- Select all visualized elements with the element selection tool.

- Right-click on "Field Books" and select "Create Terrain Model From Field Book Selection Set.

BUILDING TERRAIN MODELS

Terrain Model: Surface Selection
Triangles
Elevation 121.231531'
Slope 43.46
Aspect 312.58
Level: Default
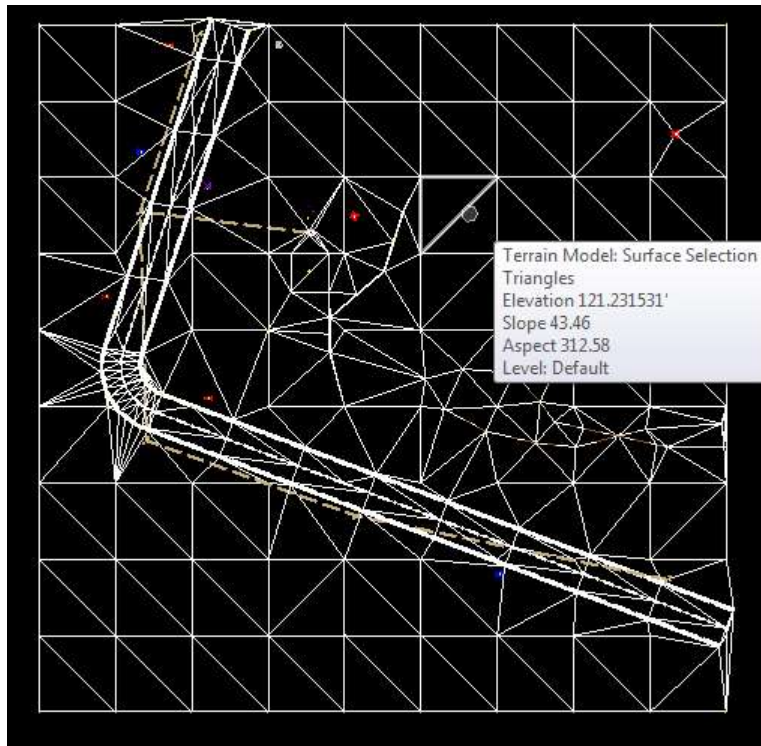
- The Terrain Model is built based on the DTM "G" attribute from EFB. If the DTM attribute is "F", "U" or "X", the feature will not be included in the Terrain Model. This gives the crew full discretion on what will and will not be included in the Terrain Model from the field.

- Manual changes can be made in SS4 to the DTM attributes and the Terrain will update.

BUILDING TERRAIN MODELS

Terrain Model: Surface Selection
Triangles
Elevation 121.231531'
Slope 43.46
Aspect 312.58
Level: Default
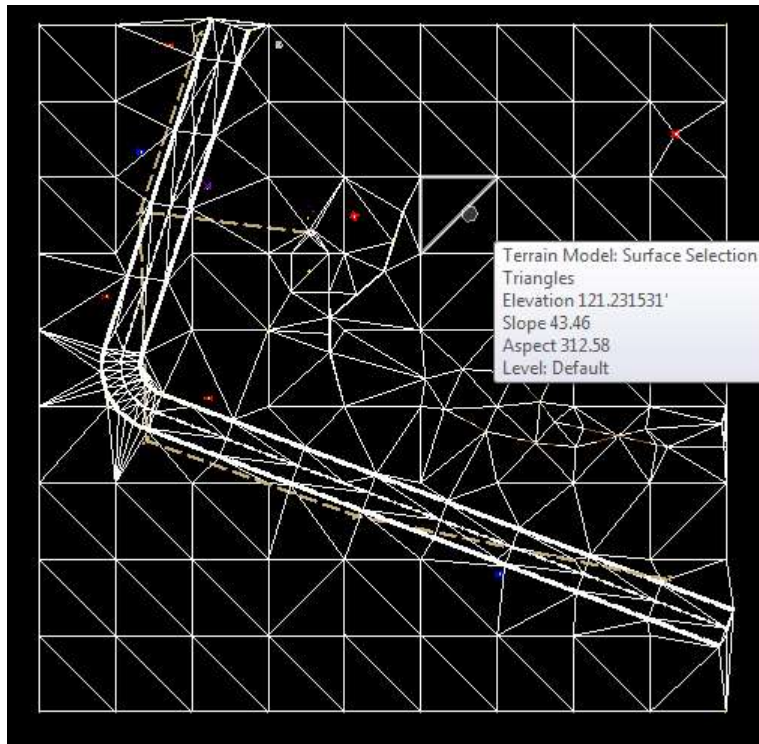
- Note that there is "No Feature Definition" attached to this Terrain

- Existing surface Terrain Models are represented by various Feature Definitions.

- In the Element Information dialogue box, Select the appropriate "Terrain Display" from the list of available Feature Definitions.

Feature	^
Feature Name	**Surface Selection**
Feature Definition	**DtmExisting**

Terrain Display
- DtmBottomMesh
- DtmDerivedExtended
- DtmExisting
- DtmExistingBelowStru
- DtmExistingFeature
- DtmExistingOnStructu
- DtmExistingWater
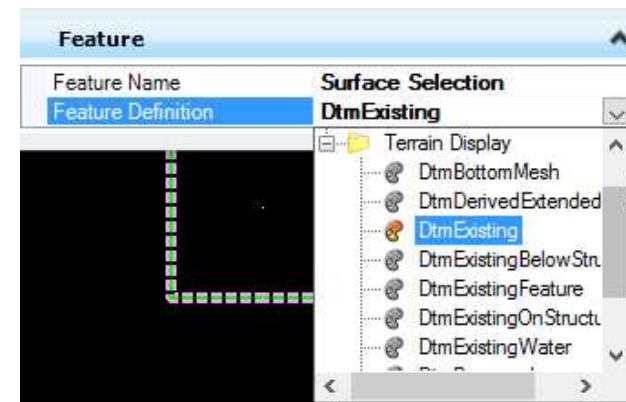
TERRAIN MODEL ATTRIBUTES
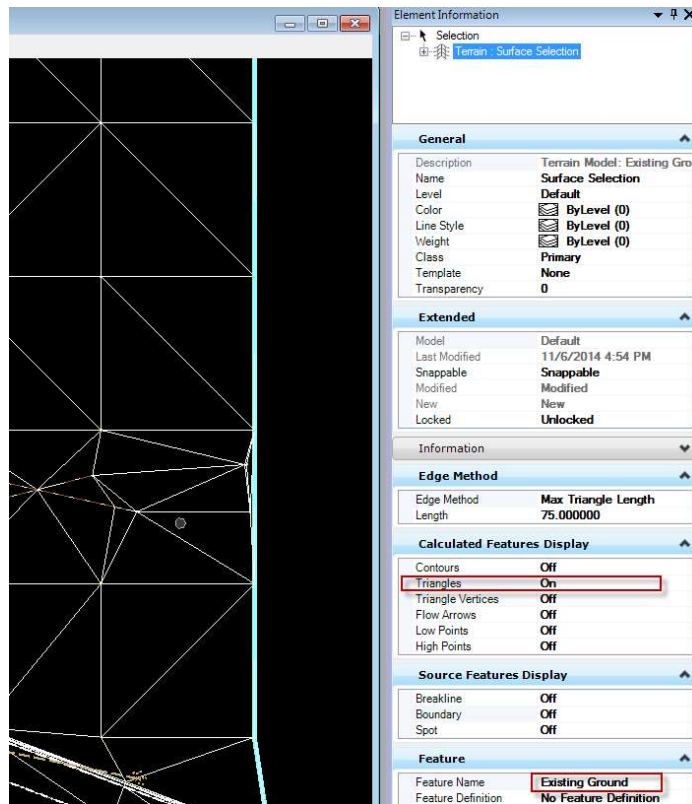
- Once the Terrain is selected, Terrain attributes can be modified.

  1. Edge Method: Max Triangle Length/Slivers.

  2. Calculated Feature Display (Contours, Triangles, Vertices, etc. can be turned on or off).

  3. Feature Name.

  4. Feature Definition.

TERRAIN MODEL ATTRIBUTES

- The Edge Method: Max Triangle Length/Slivers
  - ➢Bentley describes the <u>Max Triangle length</u> as… "External triangles whose external edge is longer in length than the user specified distance are deleted." This is the most powerful and useful edge method.
  - ➢<u>Sliver</u>: A pre-configured algorithm compares the triangle edge length and its included angle and, if the triangle meets the conditions it is deleted. Remember, that this process occurs starting with the outer edge of the Hull (Boundary) and works its way in." This option is good for bridge decks.

TERRAIN MODEL ATTRIBUTES
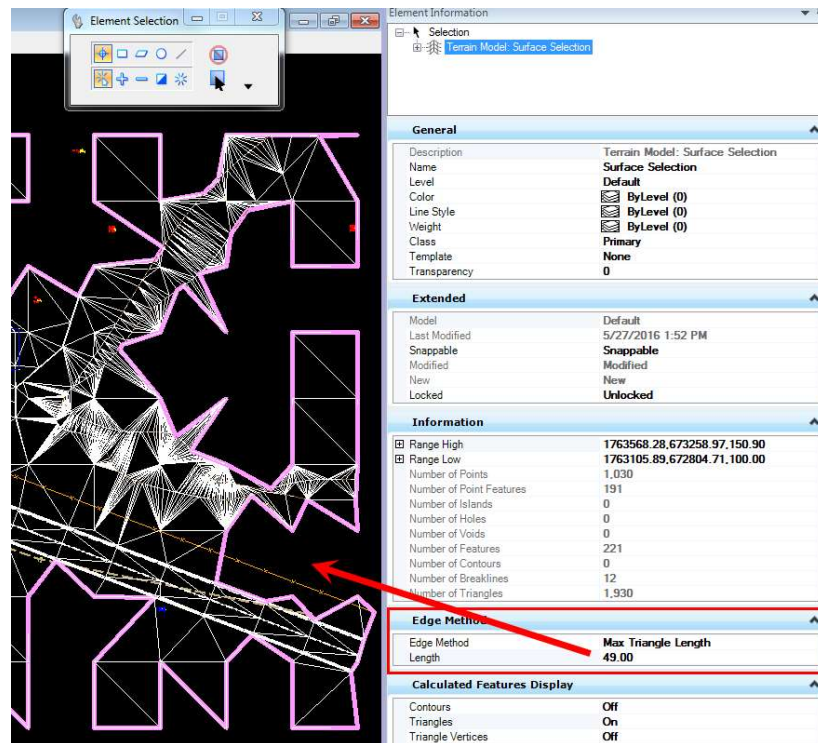
- Either method can be used to great effect however, keep in mind that for the Maximum Triangle Length, the user specified distance depends on the density of the survey.

- If the user specified distance is too small then gaps and holes will appear along the edge of and internal to the Terrain Model. Ideally the distance should be just large enough to prevent gaps and holes but not add extraneous edge triangles.

TERRAIN MODEL ATTRIBUTES

TERRAIN MODEL ATTRIBUTES

TERRAINS LISTED IN PROJECT EXPLORER
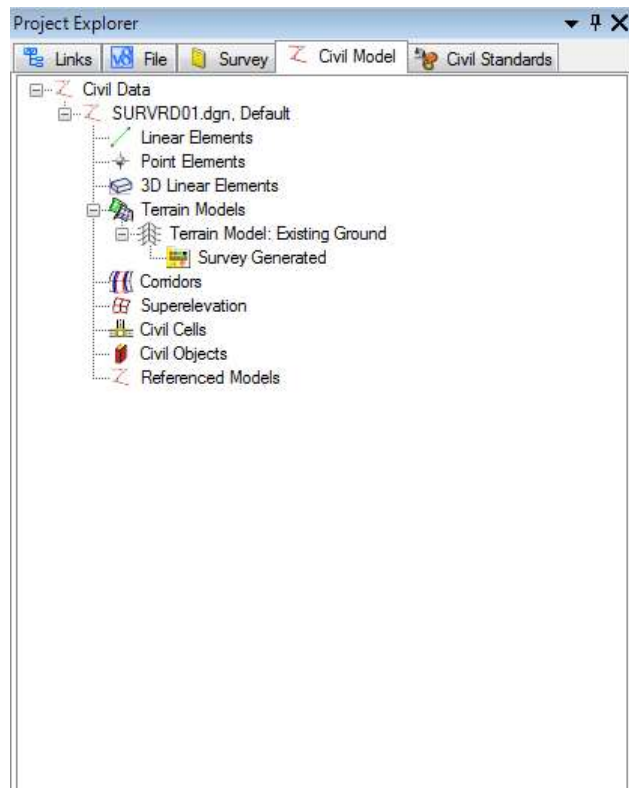
- When a Terrain is built it will show up in Project Explorer.

- Terrains generated from Survey Data will be noted as "Survey Generated".

- Survey Generated Terrains are not editable unless the Survey Processing Rules are deactivated.

TERRAIN MODEL FEATURE ATTRIBUTES
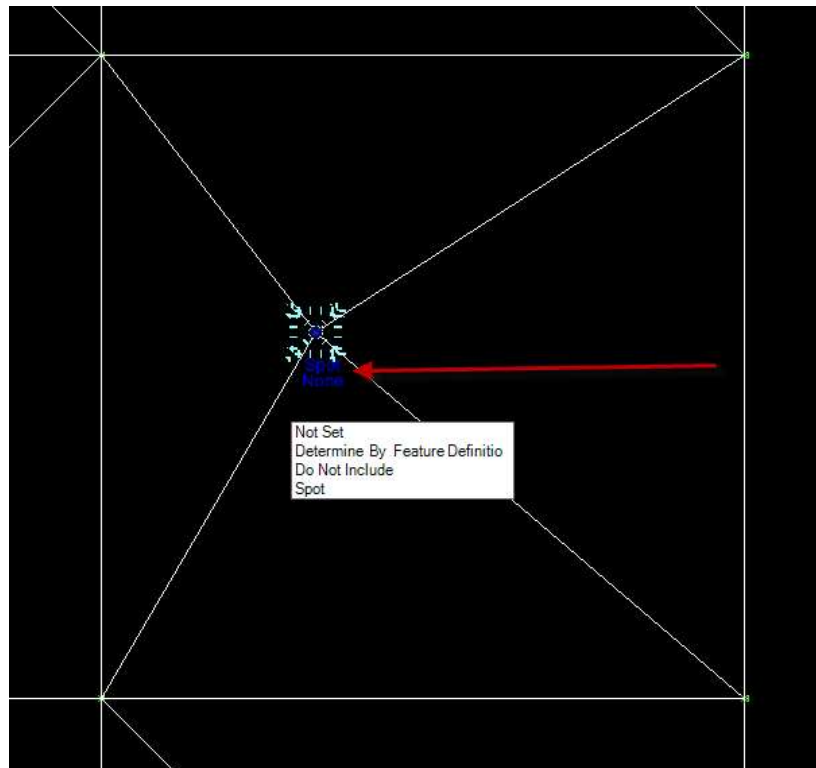
- Selecting either a Point or Linear feature will display the DTM and Link Code (curvature) attribute associated with the feature.

- Changing the DTM attribute will automatically update the Terrain Model.

TERRAIN MODEL FEATURE ATTRIBUTES
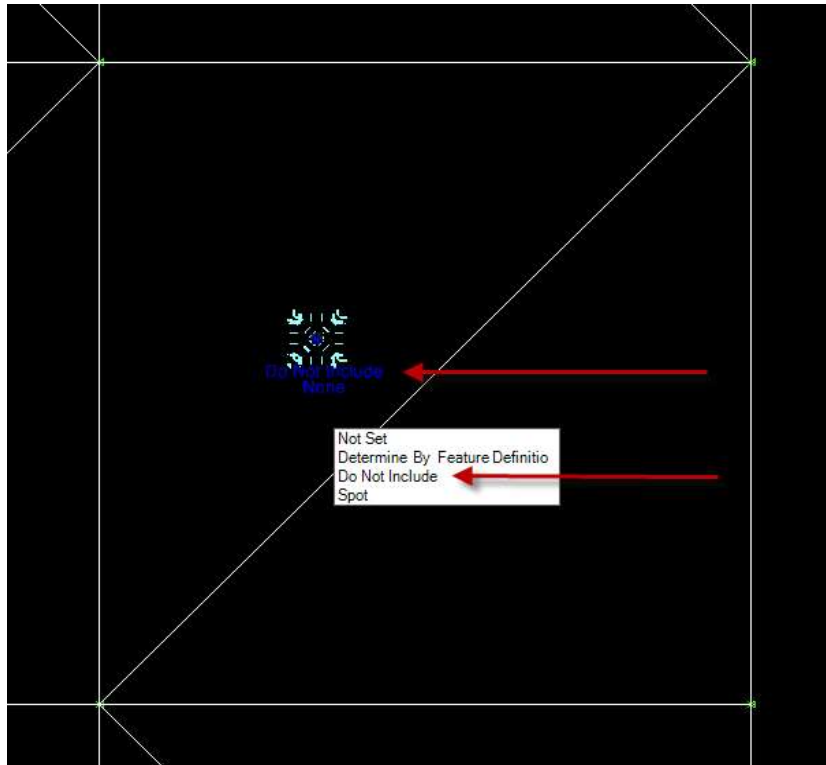
- Selecting either a Point or Linear feature will display the DTM and Link Code (curvature) attribute associated with the feature.

- Changing the DTM attribute will automatically update the Terrain Model.

TERRAIN MODELS: REPORT CROSSING FEATURE
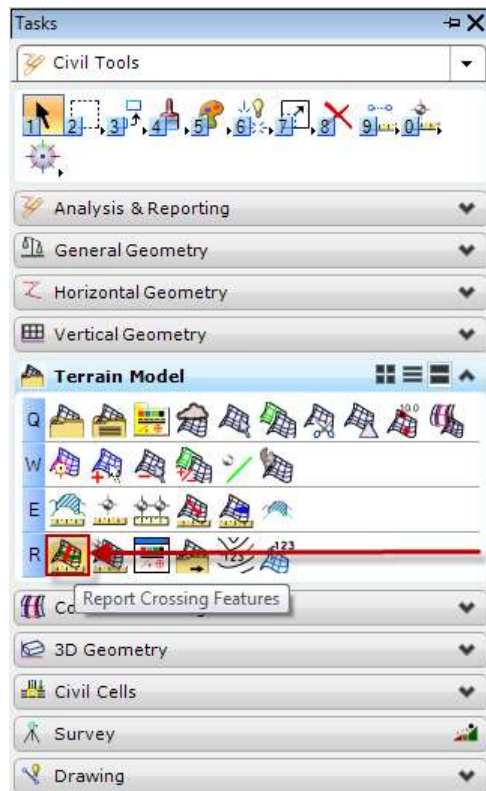
- SS4 has a "Report Crossing Features" tool for identifying and resolving crossing features (chains).

- Using the "Zoom To" tool will walk you through each crossing point. Use the feature editing tools to manually fix the crossing feature.

TERRAIN MODELS: REPORT CROSSING FEATURE
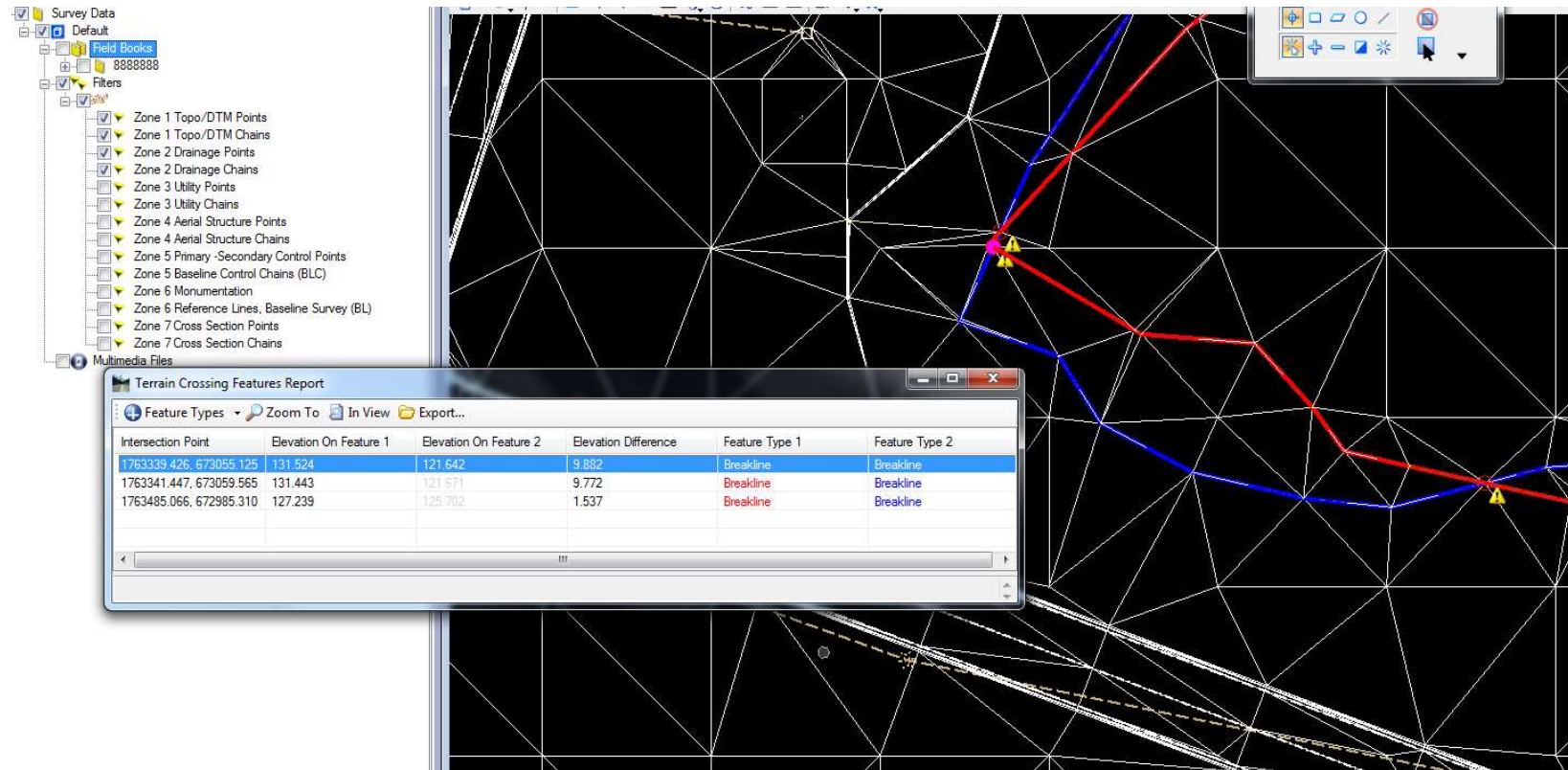
TERRAIN MODELS: FIX CROSSING FEATURES
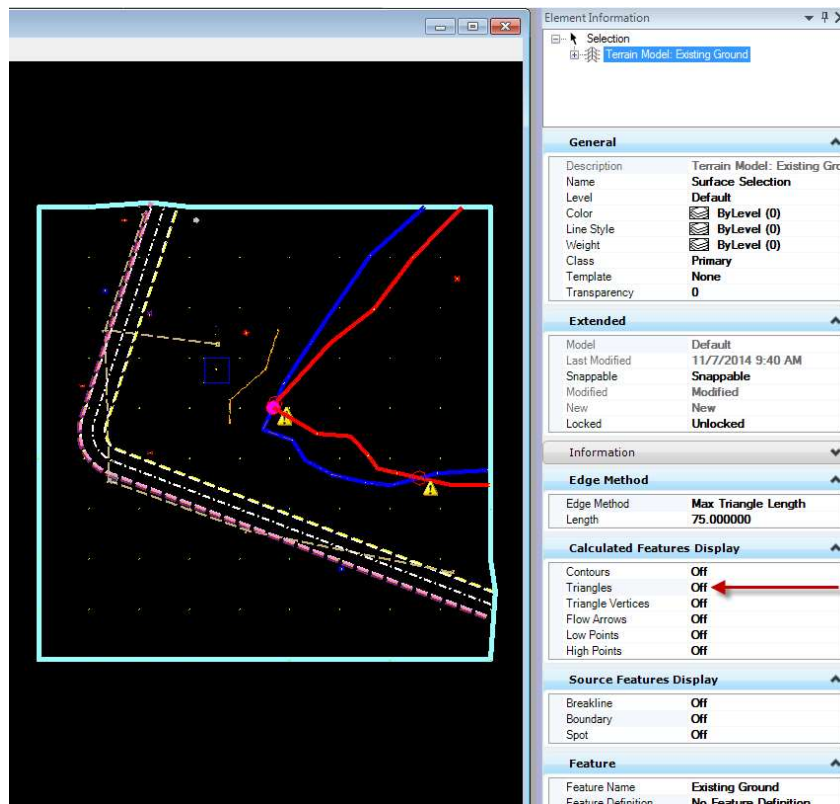
- Turning off triangles will allow you to work within the terrain without the visual clutter.

- When all Terrain Model display features are off. The boundary will still show.

TERRAIN MODELS: FIX CROSSING FEATURES
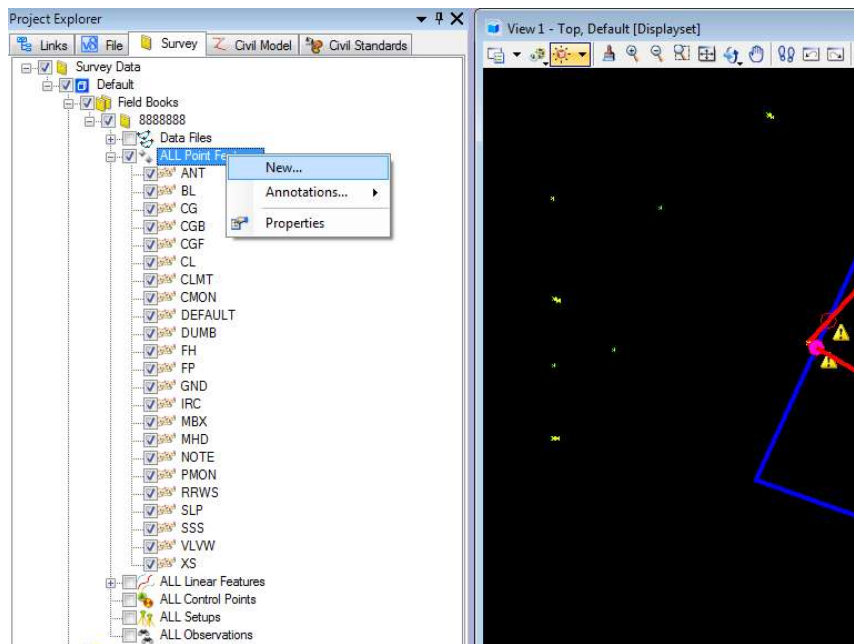
- Adding a point to the field book can be done manually by selecting the Point Features, right-clicking and selecting "NEW"

- If it is a ground shot, the Feature Definition (code) will be GND.

- Select the point position by clicking on the view.

- Pressing the F6 button will release you from the command.

TERRAIN MODELS: FIX CROSSING FEATURES
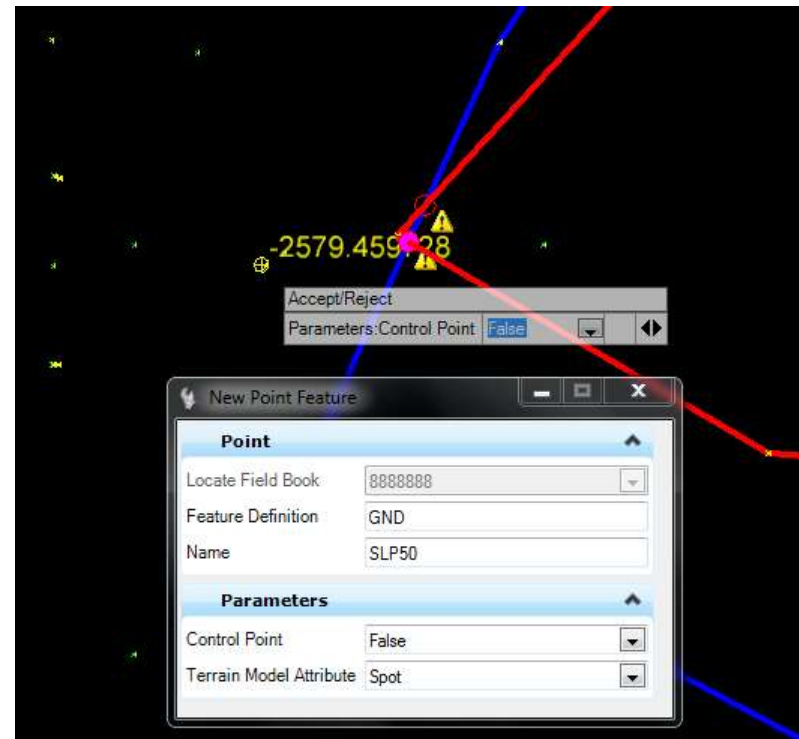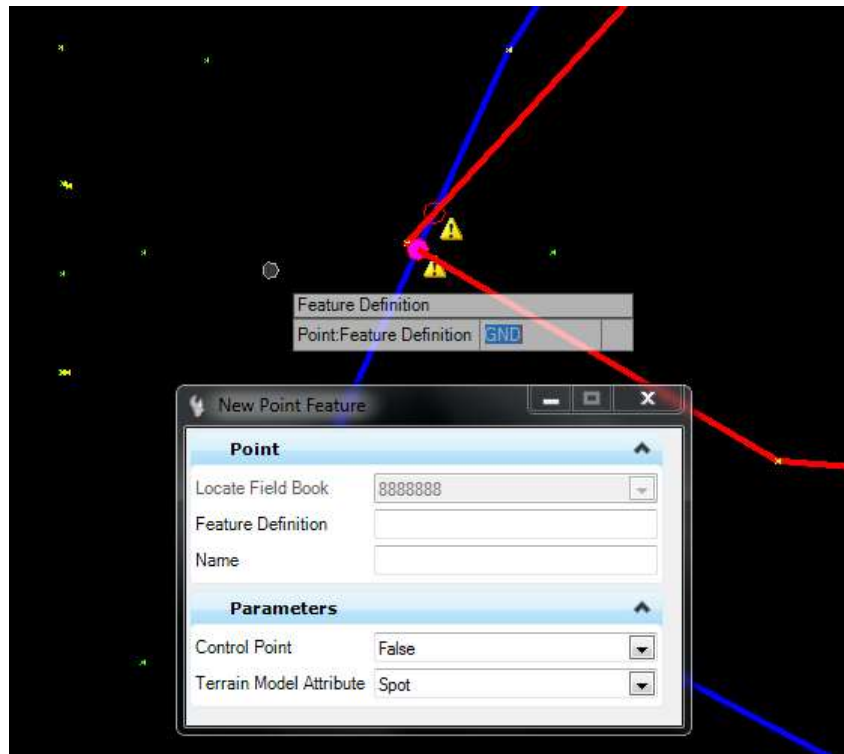
TERRAIN MODELS: FIX CROSSING FEATURES
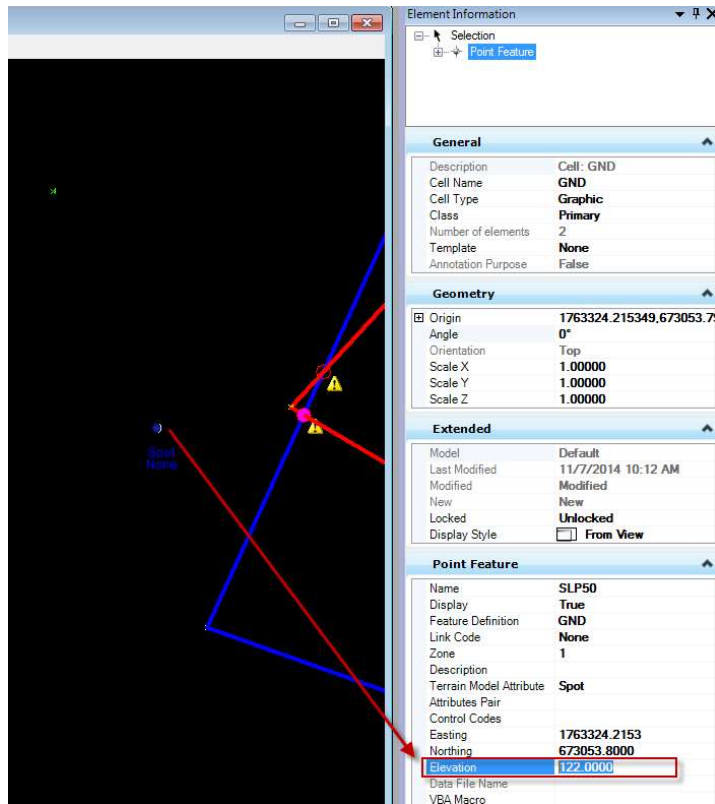
- The default elevation will be zero.

- Select the point feature and use the Element Information dialogue box to insert the desired elevation of the point.

- The point now can be used as a spot shot in the DTM and added to the Linear Feature with the feature edit tools.

TERRAIN MODELS: FIX CROSSING FEATURES
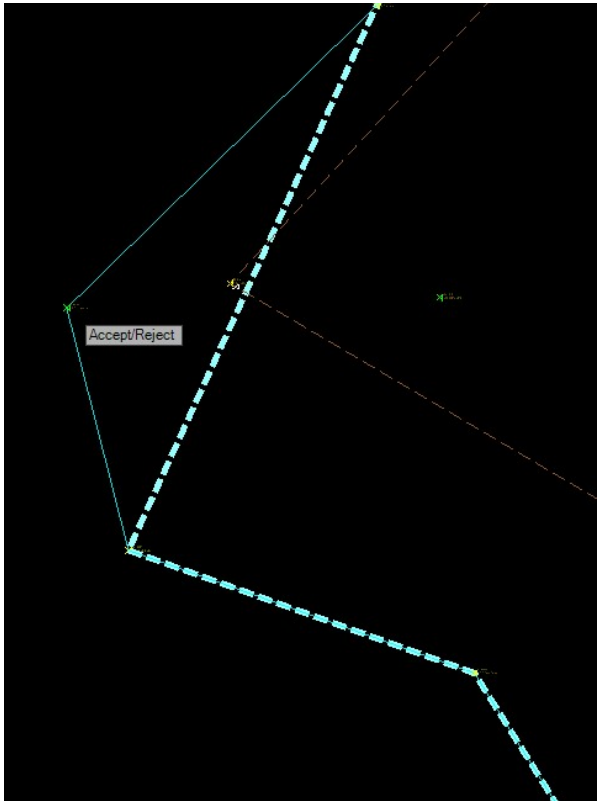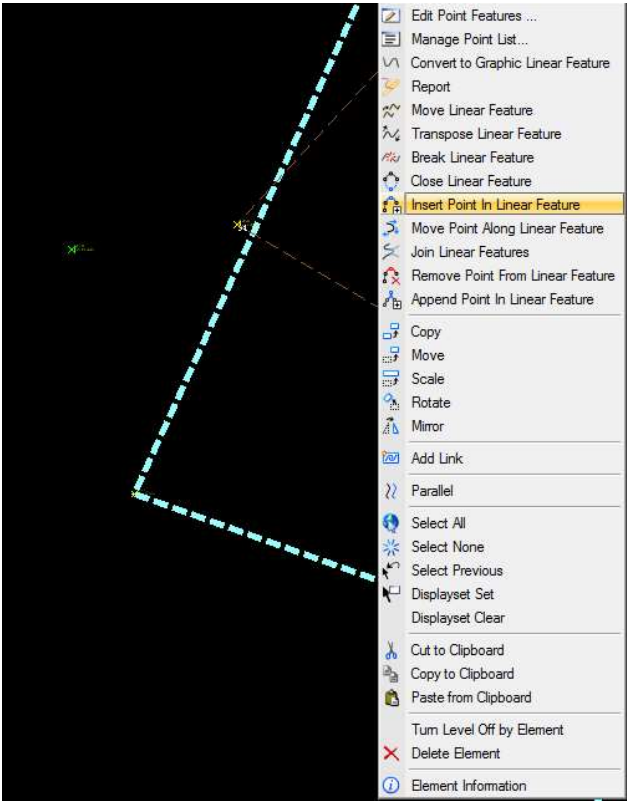
TERRAIN MODELS: FIX CROSSING FEATURES
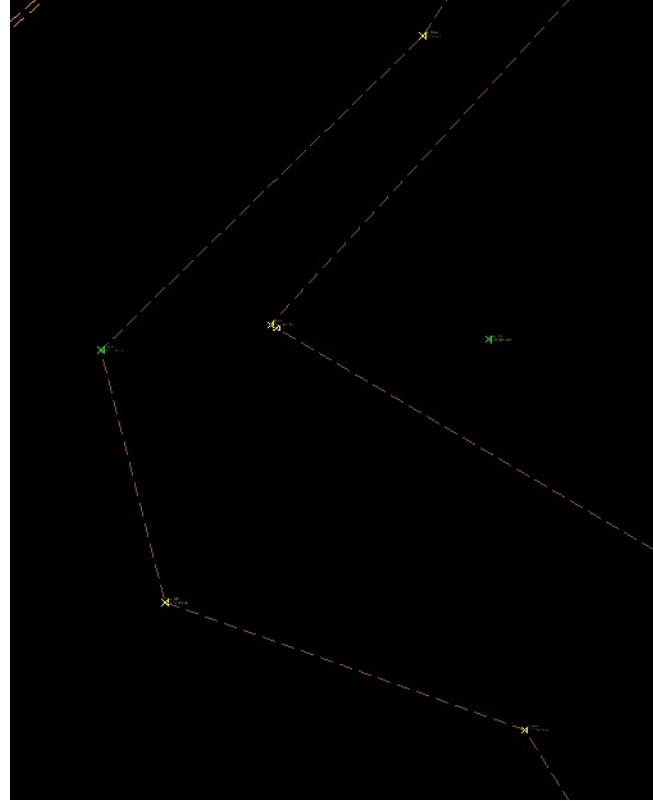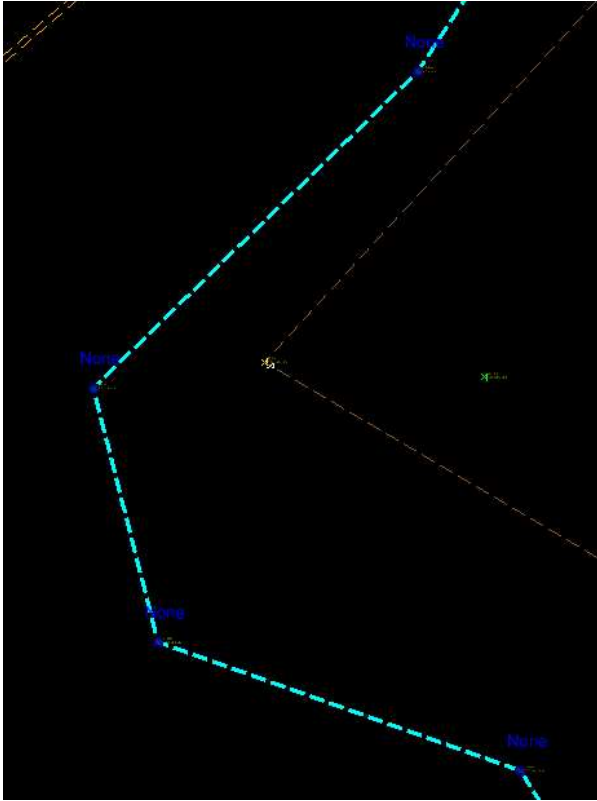
TERRAIN MODELS: FIX CROSSING FEATURES
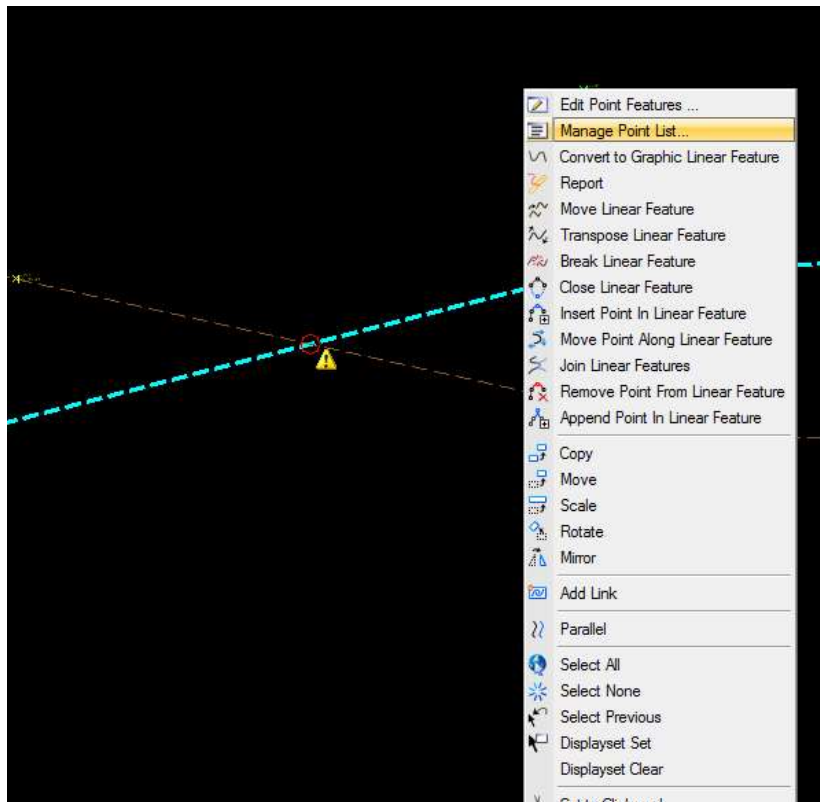
- Editing the point within a Linear Feature is often needed to correct misconnected Point Features.

- Choose "Manage Point List…" to edit the points within a chain.

- Note that a purple location circle appears in the view on the point selected in the Manage Point List dialogue box.

TERRAIN MODELS: FIX CROSSING FEATURES
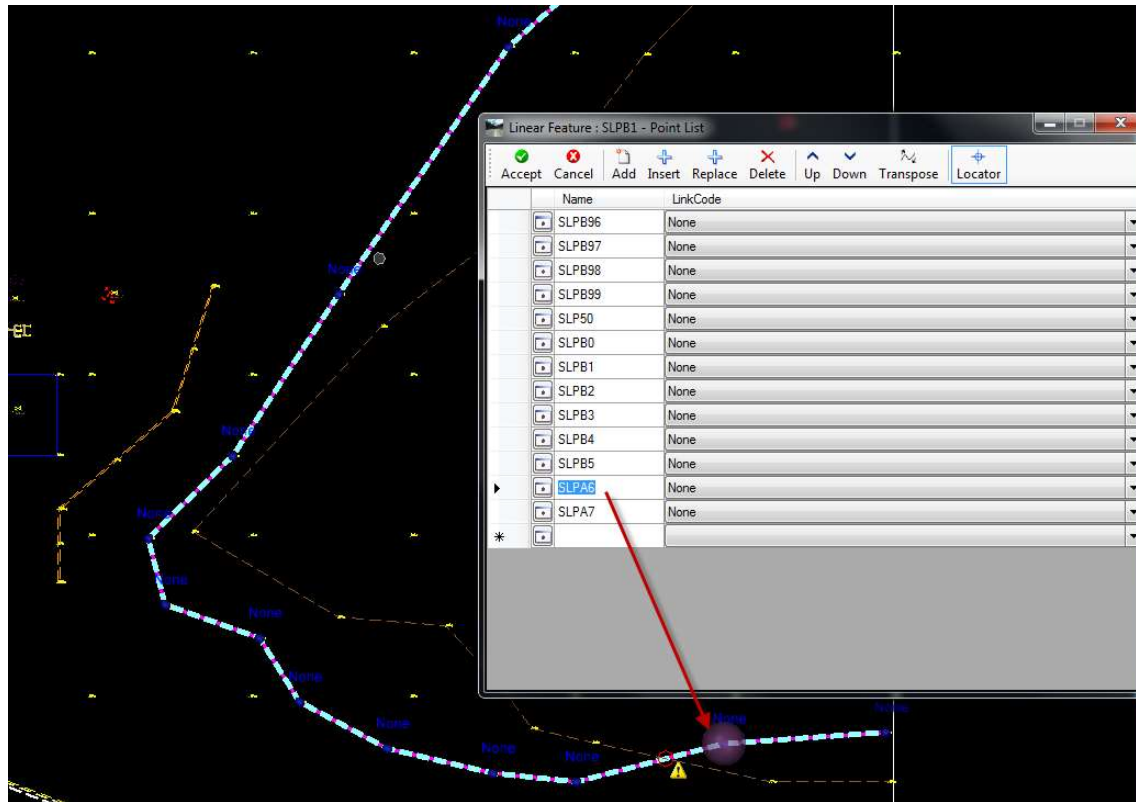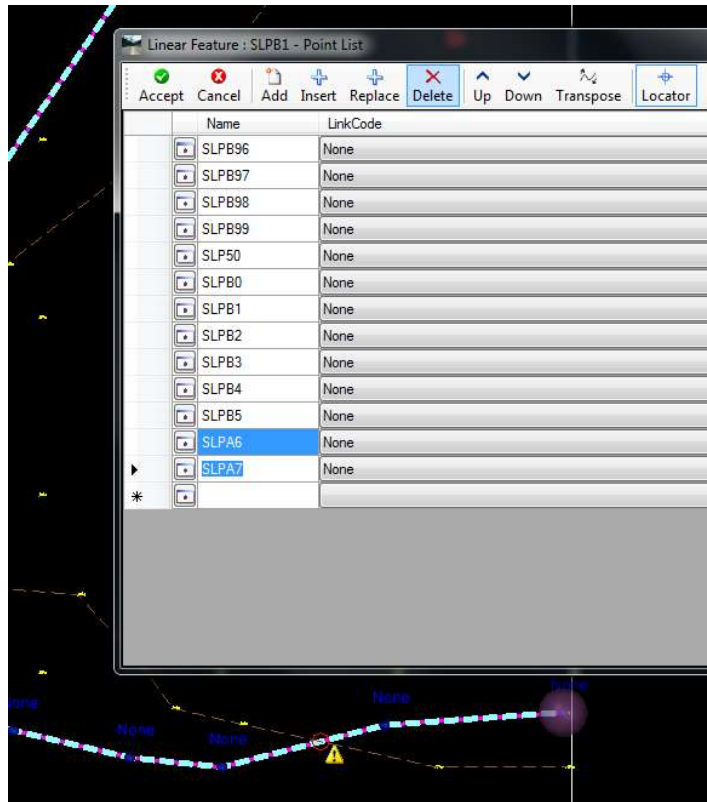
TERRAIN MODELS: FIX CROSSING FEATURES

- In this case, deleting the last two points of each crossing chain and adding the two correct points to each chain will fix the crossing features.

TERRAIN MODELS: FIX CROSSING FEATURES
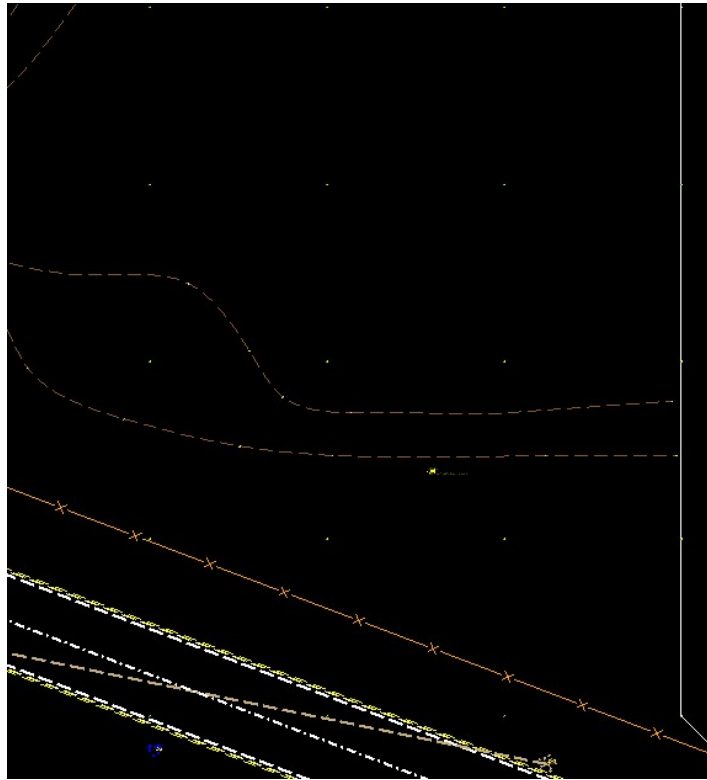
- In this case, deleting the last two points of each crossing chain and adding the two correct points to each chain will fix the crossing features.

EDITING A TERRAIN MODEL

- If a Terrain Model can't be edited it will display 🚫
    1. If it is from a Field Book, "Deactivate Survey Processing Rules"
    2. If the Terrain Model contains rules, use the "Remove Rules" tool
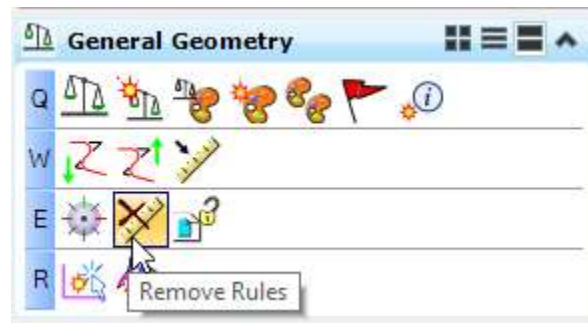
EDITING A TERRAIN MODEL

- "Features" such as points, break lines, voids, and boundaries can be added to a Terrain Model however, once triangle editing has begun, a feature cannot be added without undoing the previous triangle edits

- Order matters – ADD/CORRECT FEATURES then EDIT triangles

EDITING A SURVEY GENERATED TERRAIN MODEL
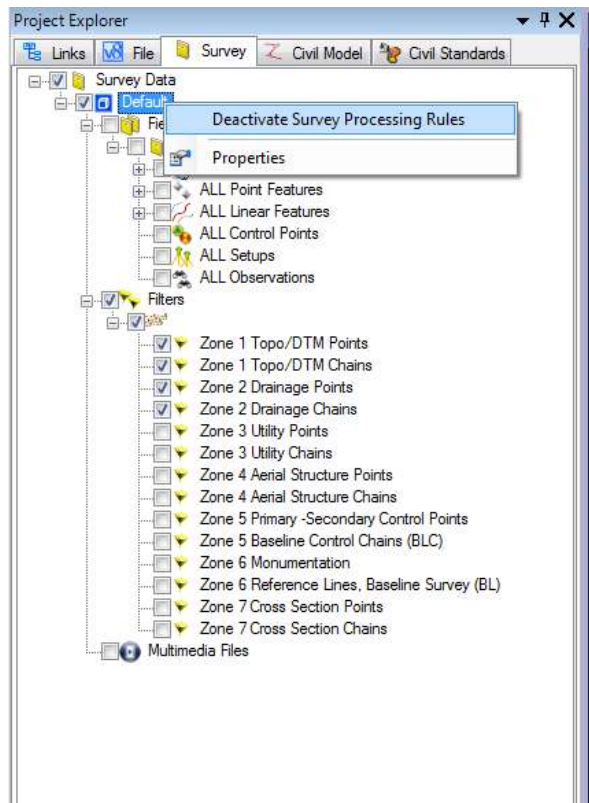
- NOTE: It is important to understand that all Point and Linear Feature issues must be resolved before editing any triangles.

- Bentley Survey continually updates the Terrain Model from the survey data. The only way to stop this process is to "Deactivate the Survey Processing Rules" from the Project Explore Survey tab.

EDITING A SURVEY GENERATED TERRAIN MODEL
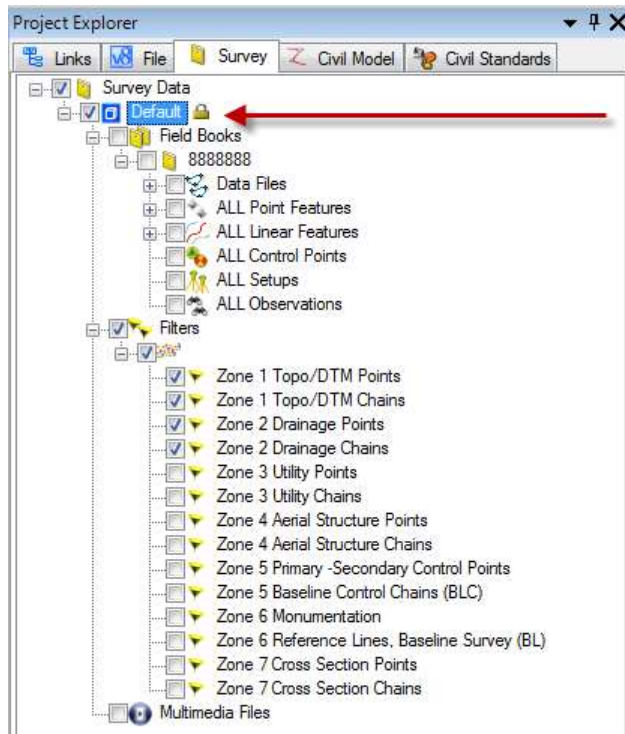
- Once the survey processing is deactivated a lock will appear in the Survey tab next to the category under "Survey Data".

- Only with the survey processing deactivated can triangles be edited.

- **WARNING** if the survey processing is reactivated it will reverse all triangle edits back to their original state.

EDITING A SURVEY GENERATED TERRAIN MODEL
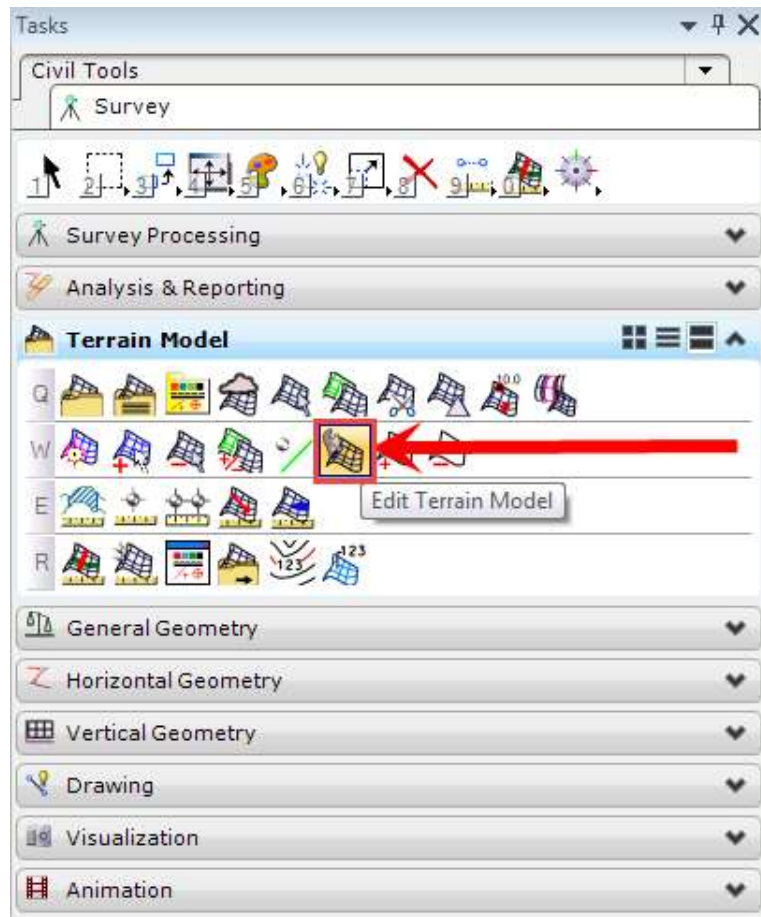
- Select the Edit Terrain Model tool from the Terrain Model task bar.

- Select the Terrain Model to edit with the element selection tool.

- The Edit Terrain Model tools will automatically become active.
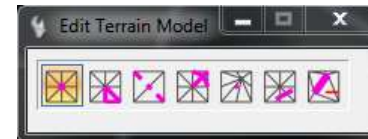
EDITING A SURVEY GENERATED TERRAIN MODEL
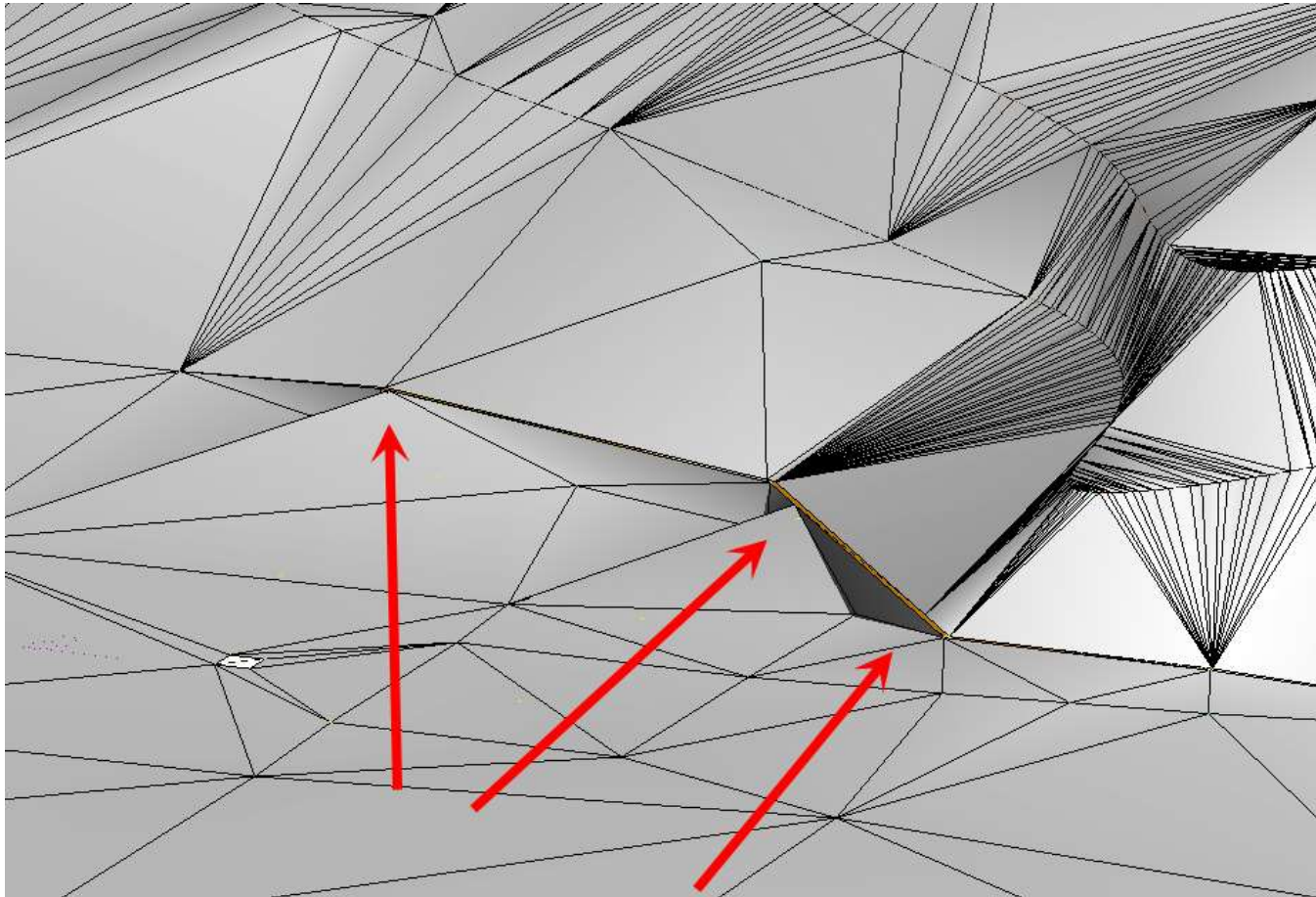
SWAP LINE
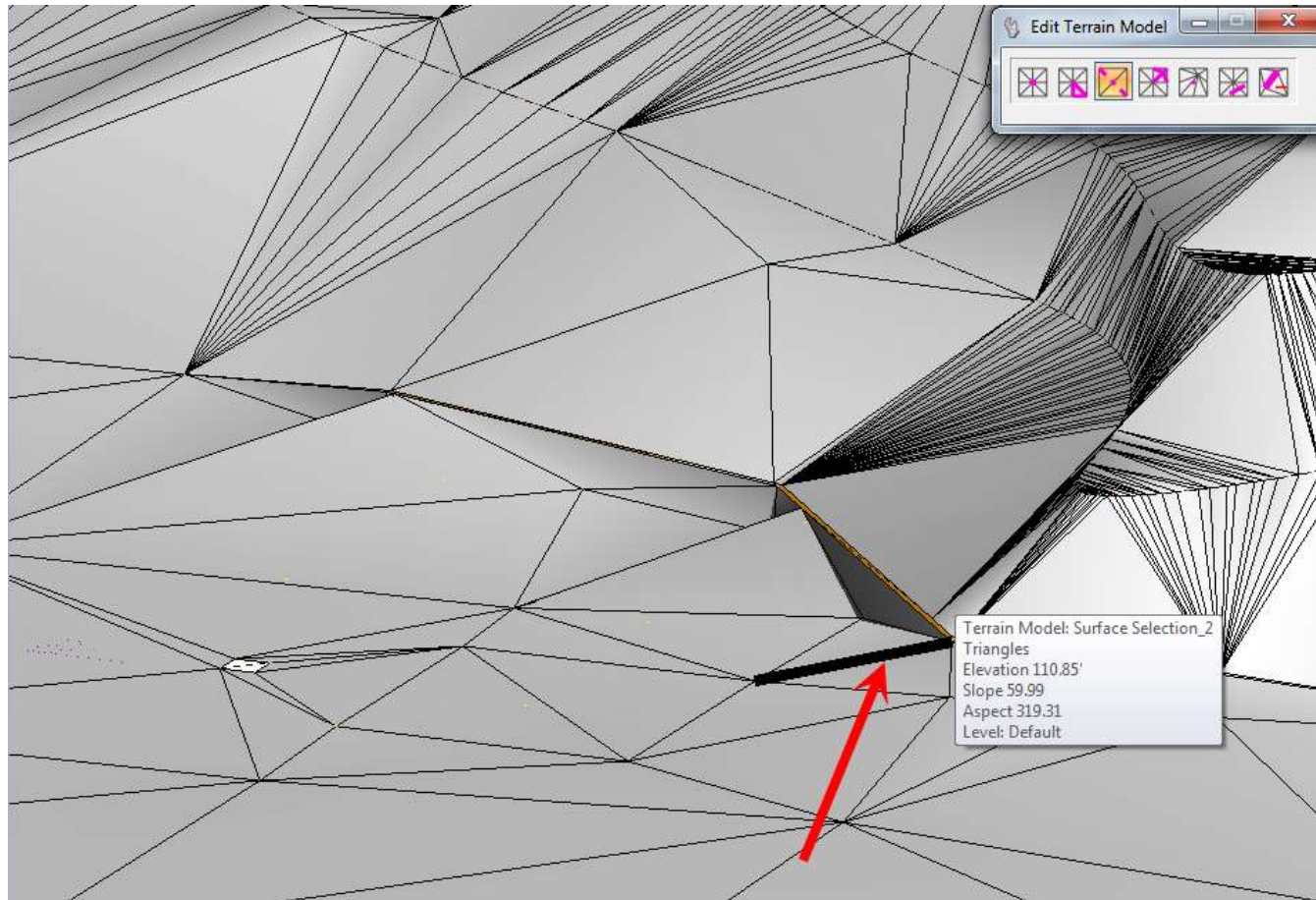
SWAP LINE
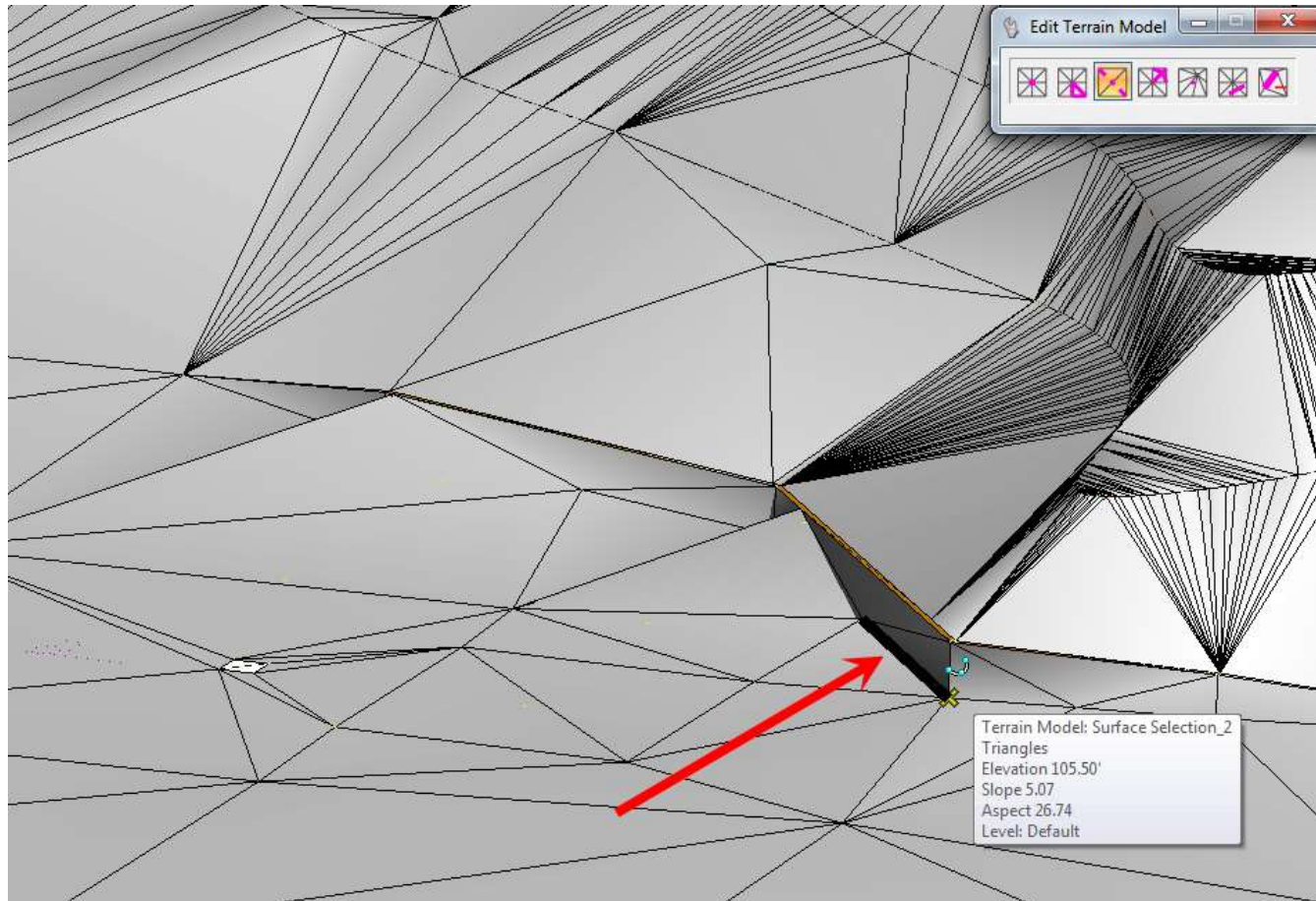
DELETE VERTEX
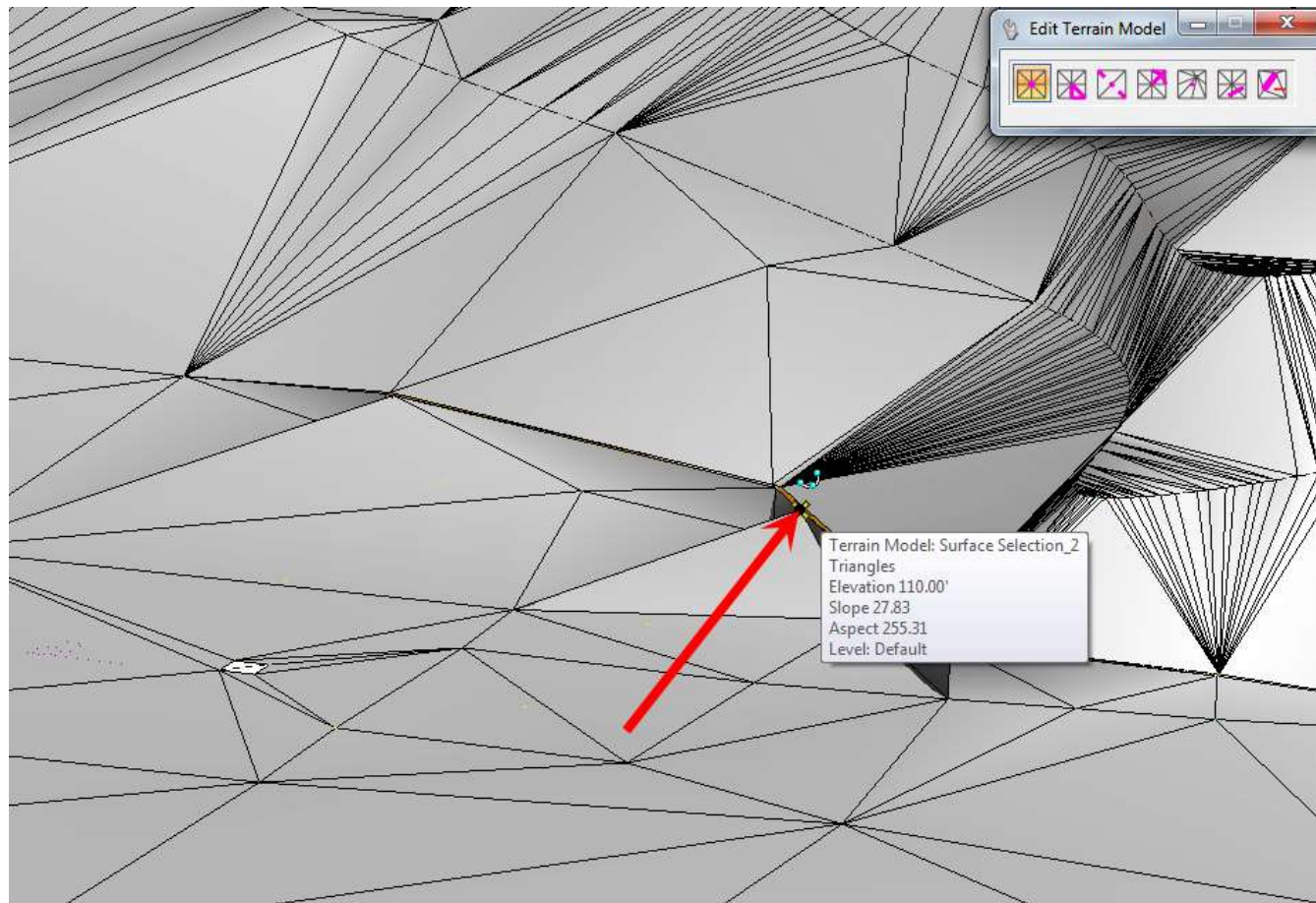
DELETE VERTEX
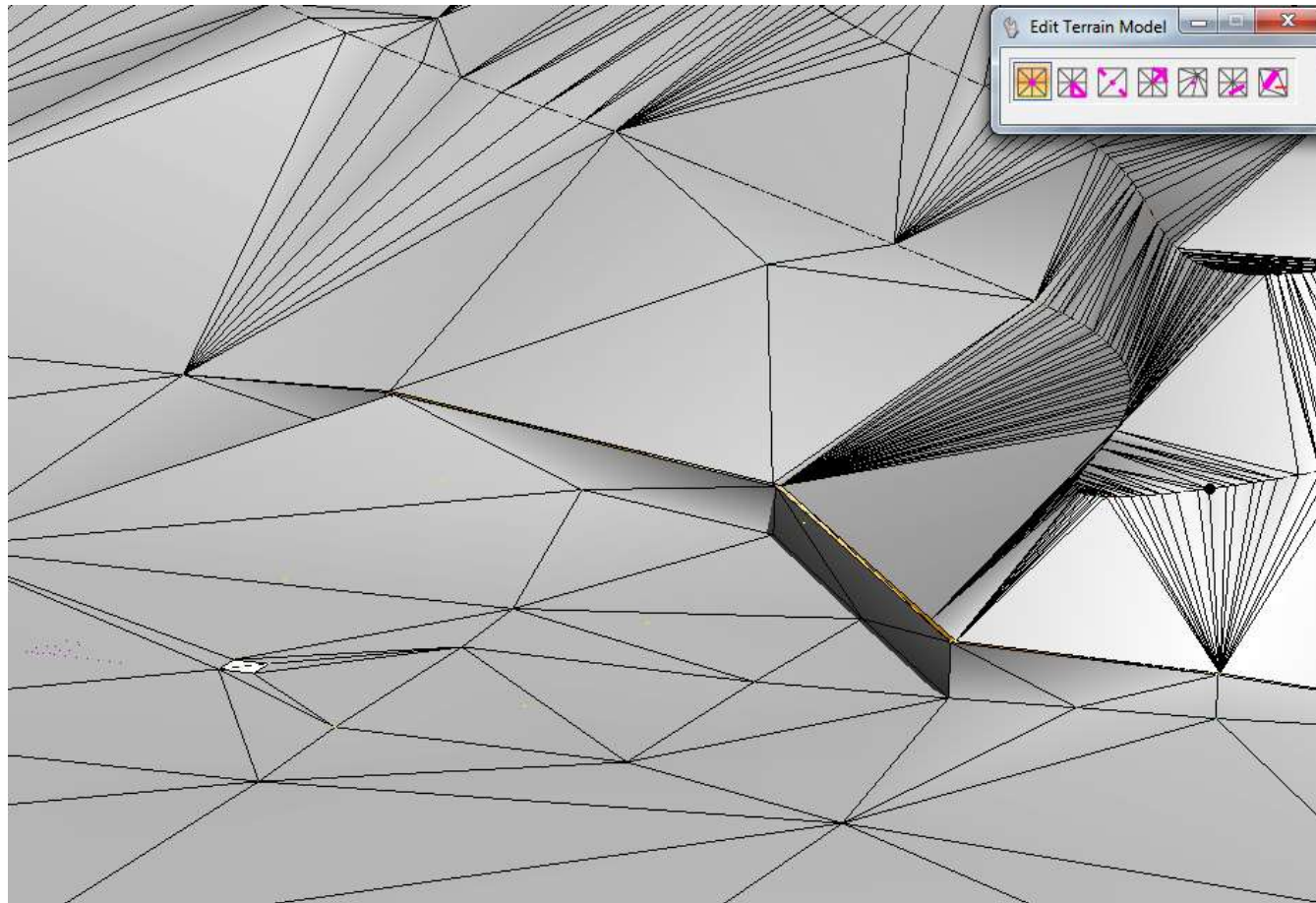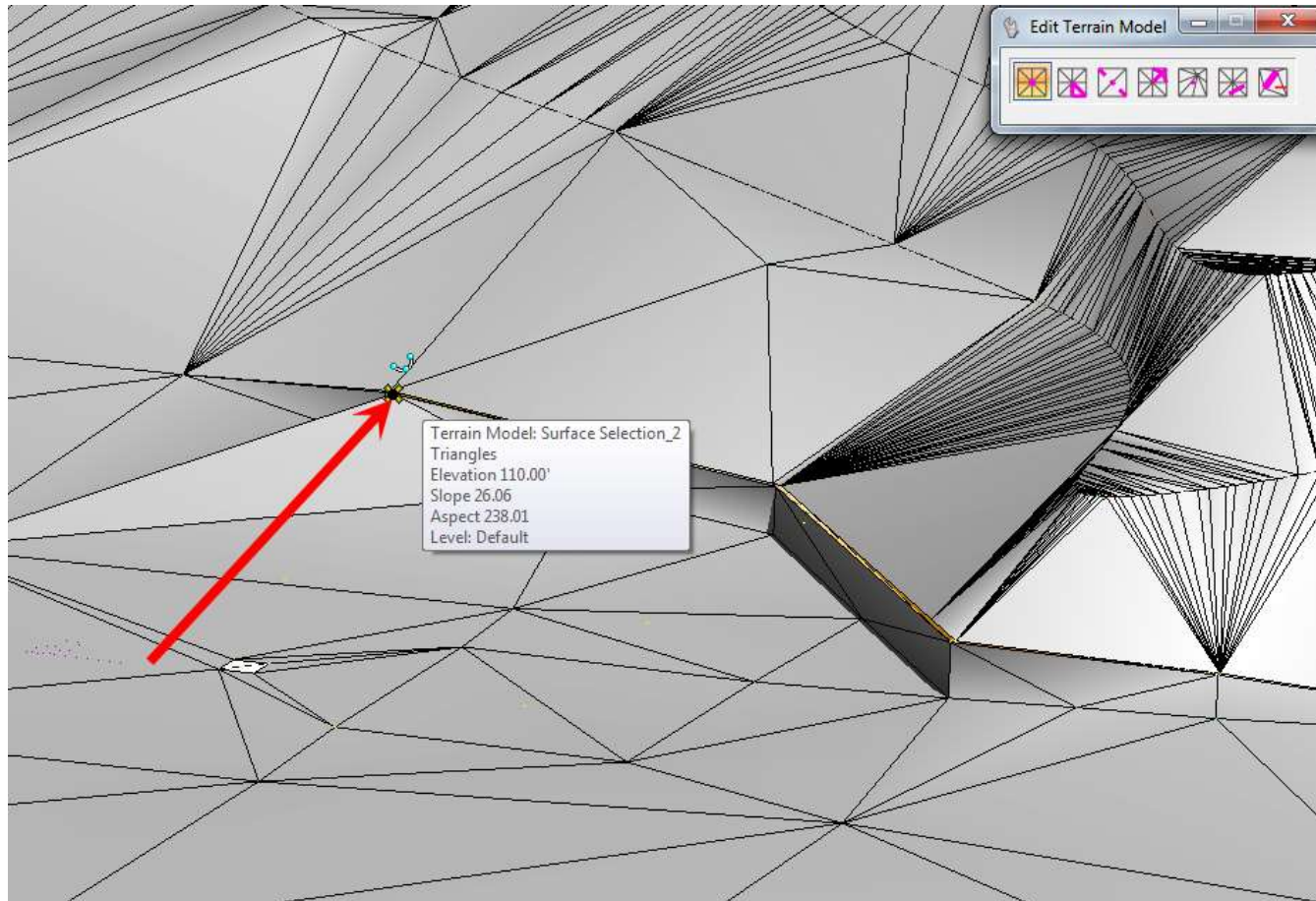
DELETE VERTEX

DELETE VERTEX
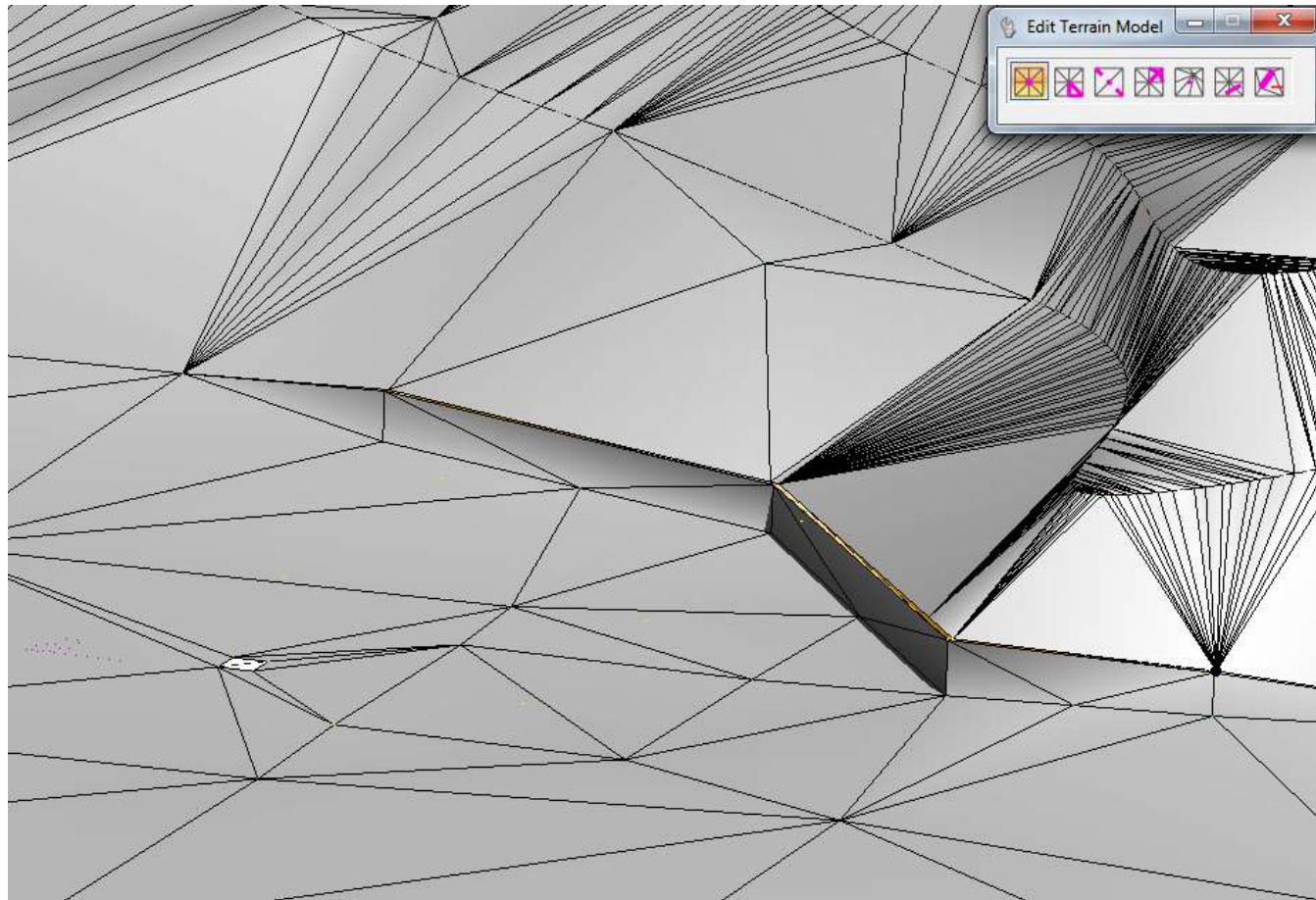
EDIT TERRAIN MODEL TOOLS
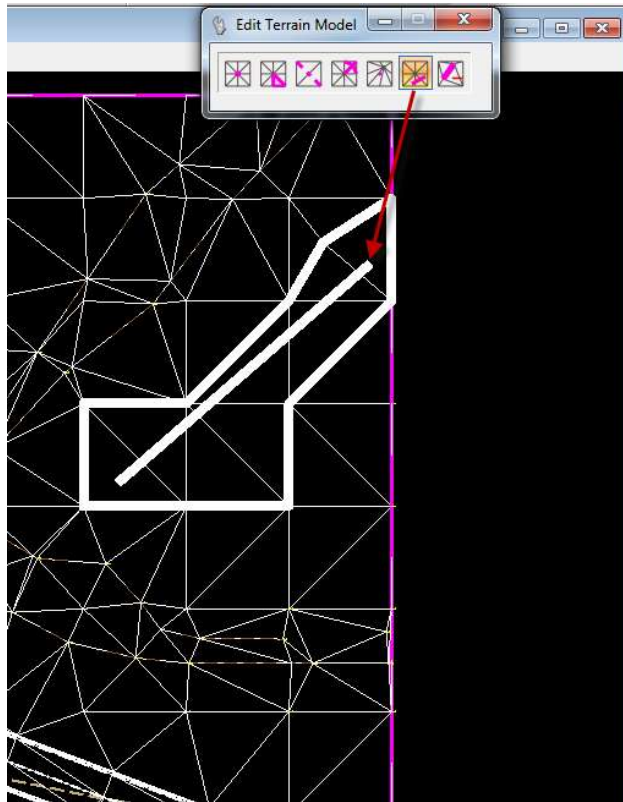
- Note that the "Delete Triangle By Line" tool only works if the line reaches an edge triangle.

EDIT TERRAIN MODEL TOOLS
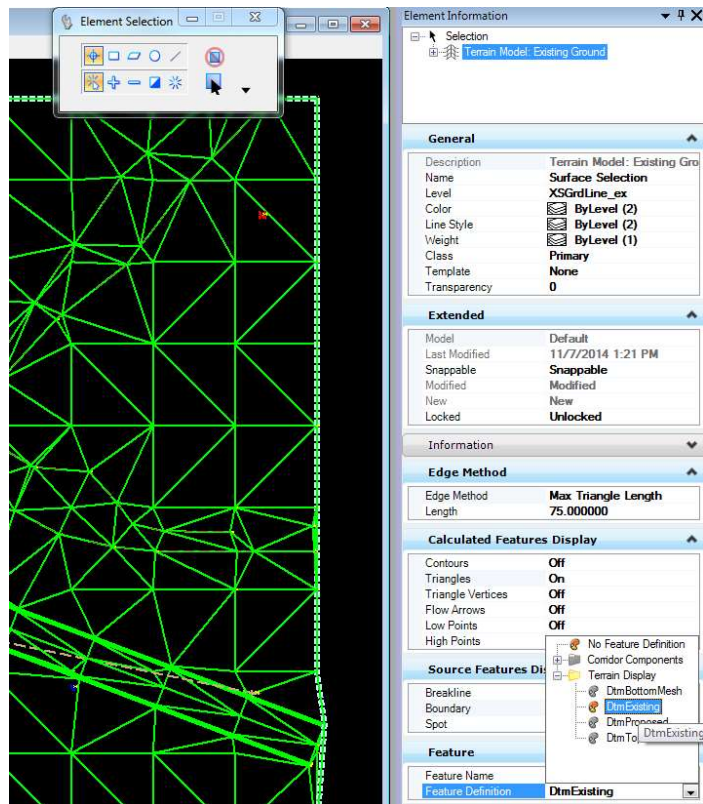
- When a feature definition is applied to a Terrain Model, The feature definition "Element Template" defines how the terrain will look. In this case the existing ground feature is "DtmExisting".

- Note the level shown for the Terrain Model: "DTM_ex". This is in order to show the correct green dashed line when cross sections are cut.

ELEMENT TEMPLATES
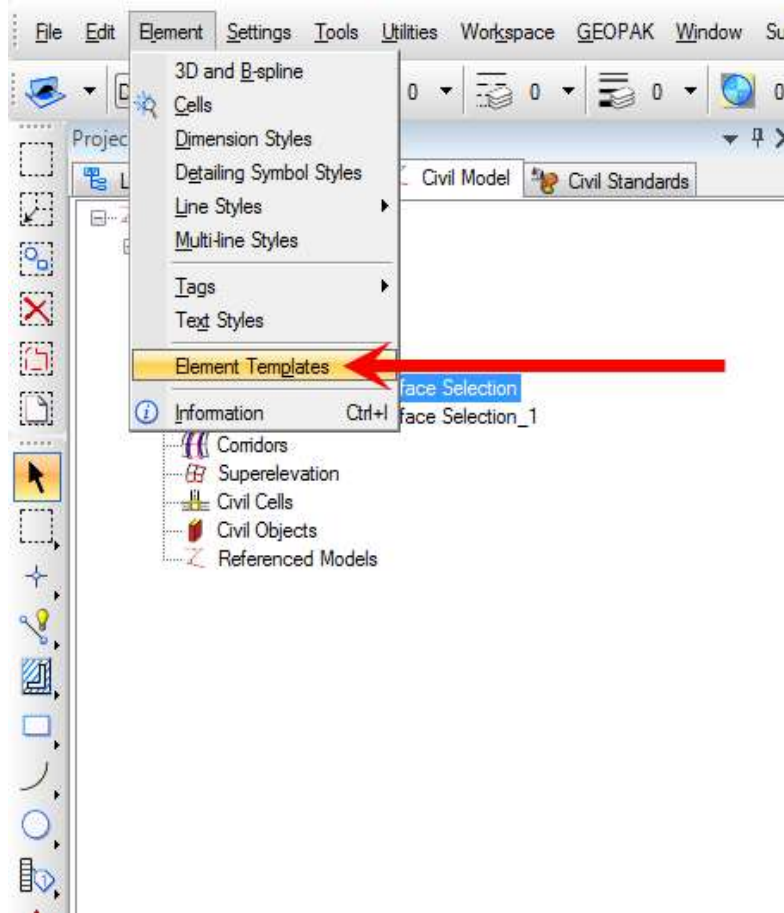
- An Element Template is like a style that will control how an element is visualized by default. For the "DtmExisting" Feature Definition Template all facets are turned off including the Triangles.

ELEMENT TEMPLATES
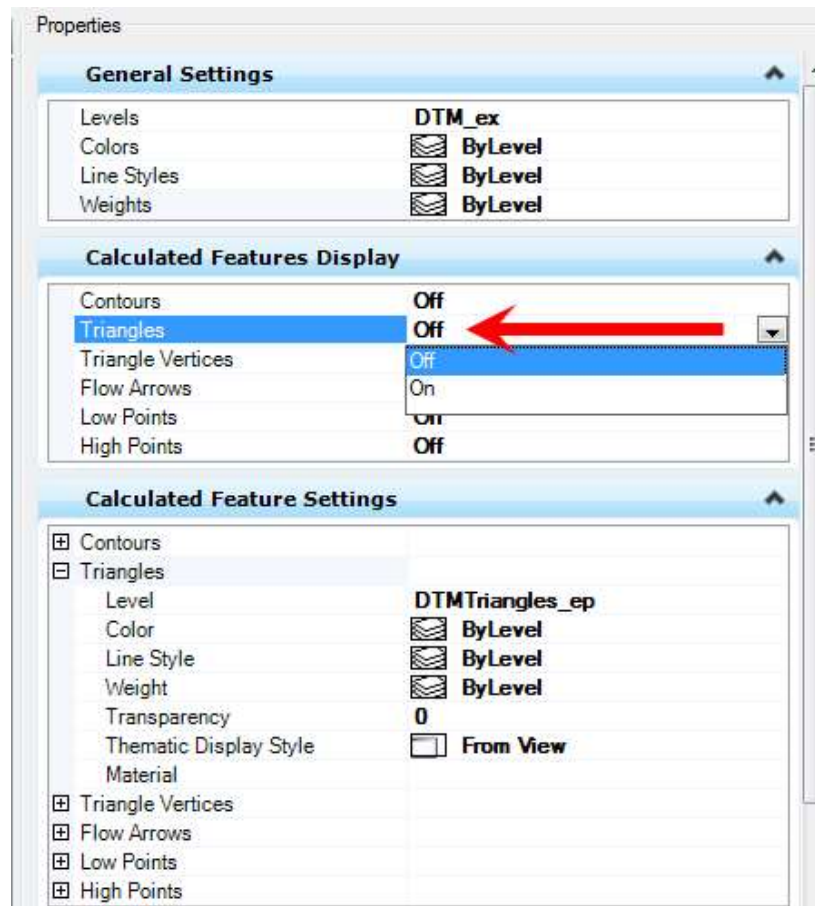
- When editing point and linear features the triangles in the "Calculated Features Display" should remain "off". This is to keep triangles from suddenly turning on during the edits.

ELEMENT TEMPLATES
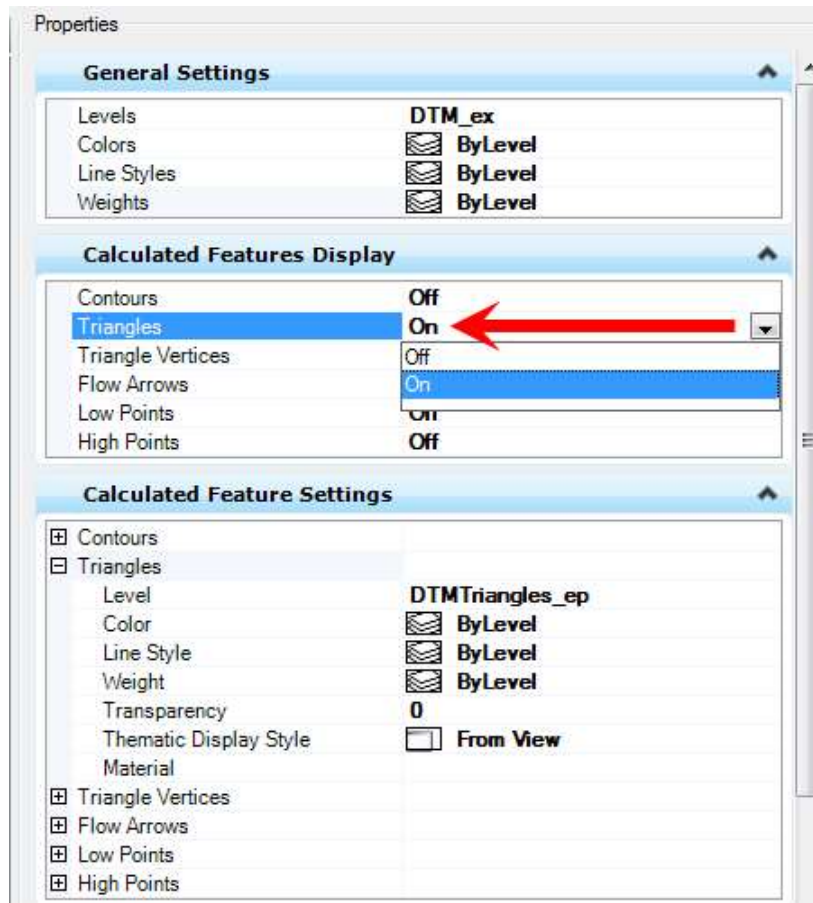
- When editing triangles or adding DTM features for triangulation the triangles in the "Calculated Features Display" should be turned on. This is keep triangles from suddenly turning off during the edits.

CREATING TERRAIN MODEL from LIDAR "LAS" file

- The LAS file must be classified with the existing ground surface segregated (typically Ground or Low Point).

- OR the point cloud within the LAS file must be existing ground points only

- Due to issues with direct LAS import into Terrain Models, a POD (Bentley point cloud format) must be used to build the Terrain Model.

- Open a new 3D file and attach the LAS file using the Bentley Point Clouds tools.

CREATE A BENTLEY POD FILE FROM THE LAS FILE

CREATING TERRAIN MODEL from LIDAR "LAS" file

- If fit view does not show the point cloud, It may be necessary to turn off in the View Attributes...
  - Clip Back
  - Clip Front
  - Clip Volume
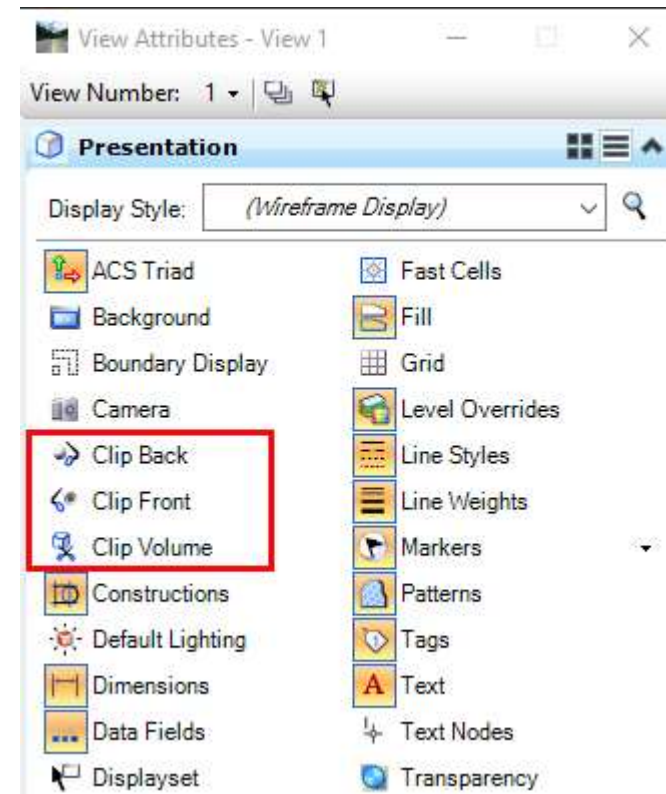
CREATING TERRAIN MODEL from LIDAR "POD" file

- In the Bentley Point Clouds dialogue box, under "Settings", select "Presentation"
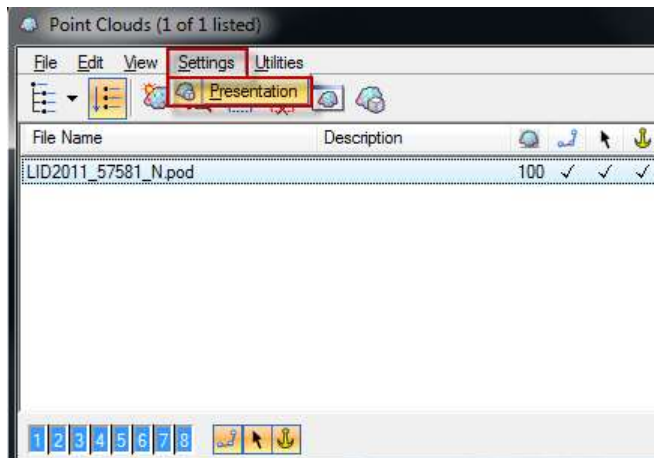
- Expand the classification category (choose style).

- Check box only the classification that represents the existing ground surface (usually "Ground").

- Click on the "Apply to Open Views" button to visualize only the existing ground surface.

- Close the Presentation dialogue box.

CREATING TERRAIN MODEL from LIDAR "POD" file
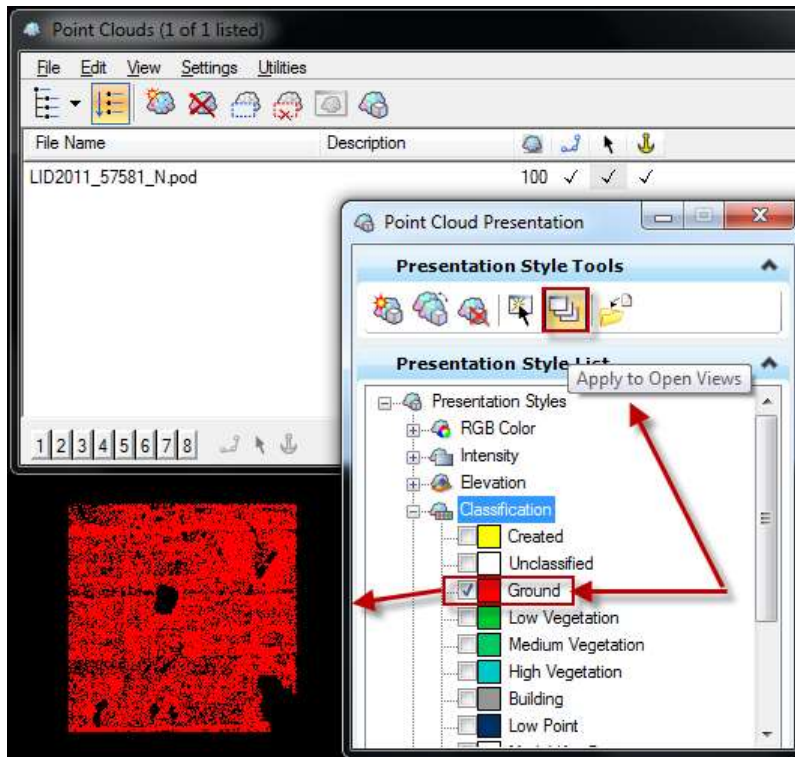
- After visualizing the existing surface with the POD file, the Terrain Model can be created.

- From the Terrain Models task pane select "Create from Point Cloud".
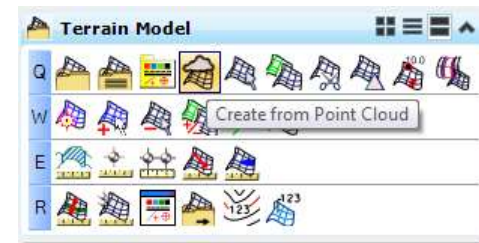
BENTLEY SUGGESTED SETTINGS FOR POD file IMPORT

➢ **In the Import Terrain Model From Point Cloud dialogue box**

• Always use the "Tin Filter".

• Input the "Z" Tolerance.

• Always use the "Coarse" Granularity option.

• Always check the "Reinsert Points" box.

• Click "Import" to create the Terrain Model from the visualized point cloud.
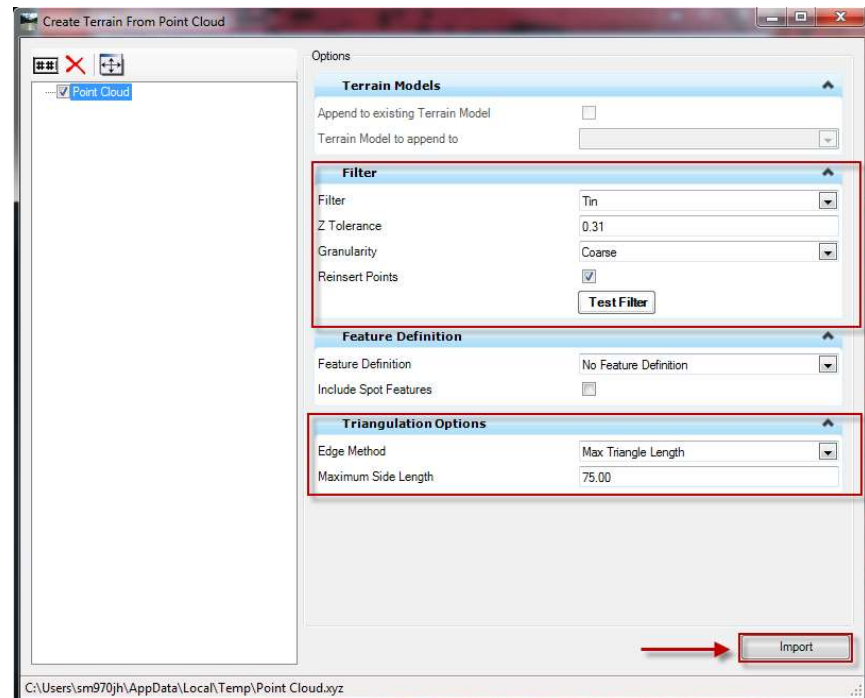
"Z" TOLERANCE

- What is the "Z Tolerance" ???

- An unaltered TIN (no filtering) will produce a huge file that could be difficult to work with. The Z tolerance is the amount of error that you are willing to accept in order to produce a TIN that is not too large to use.

- Bentley reports that if you want to be absolutely sure that your final filtered TIN is within a certain accuracy of your original unfiltered TIN, then Z tolerance should be ½ of that acceptable error (vertical accuracy).
  - ✓ The Survey Report should give you an idea of the vertical accuracy within a point cloud at a 95% confidence level.

CREATE FROM POINT CLOUD "Test Filter"

- The "Test Filter" button allows you to test various settings before actually creating the Terrain Model.

- Default Triangulation Options can be changed here, before the Terrain Model is created.
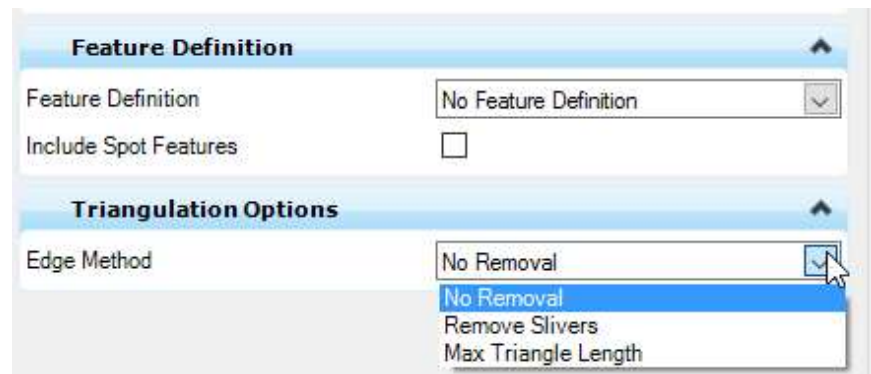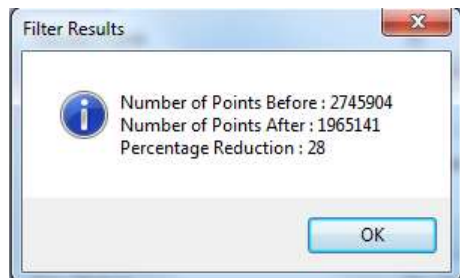
DETACH THE POD FILE and SELECT FEATURE DEFINITION

- After the Terrain Model has been created. The POD File is no longer needed and can be detached from the design file.
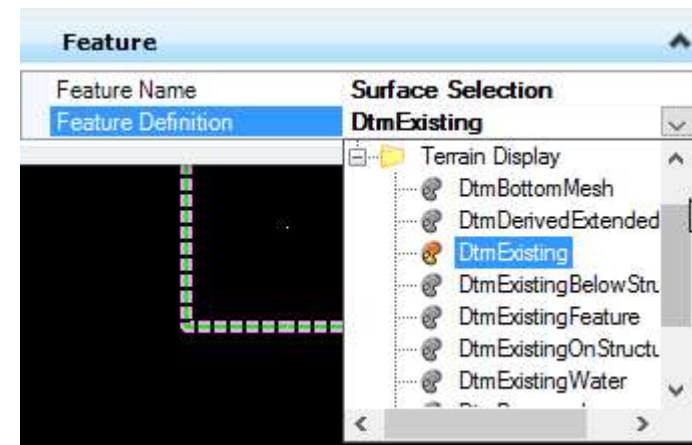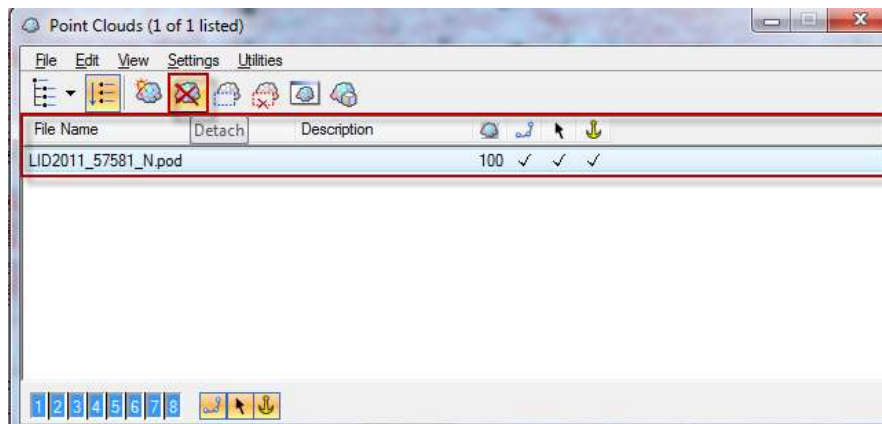
- Select the Terrain Model with the selection tool and apply the appropriate Feature Definition in the Element Information dialogue box.

EXAGGERATE A TERRAIN MODEL
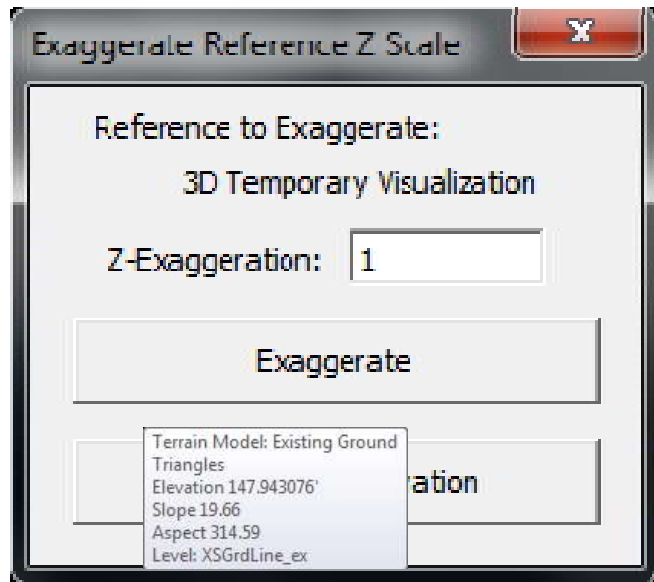
- Bentley has added a macro for exaggerating Terrain Models.

- In FDOTSS4 press Alt + F3 to bring up the Exaggerate Reference Z Scale dialogue box

- This macro does not exaggerate the current Terrain, instead it creates a temporary model for visualization.
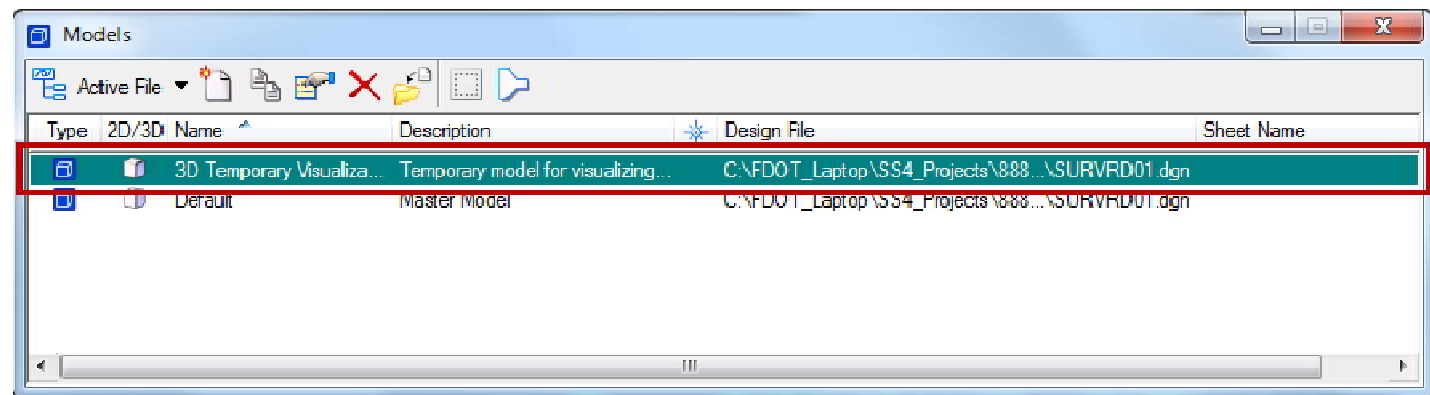
EXAGGERATE A TERRAIN MODEL
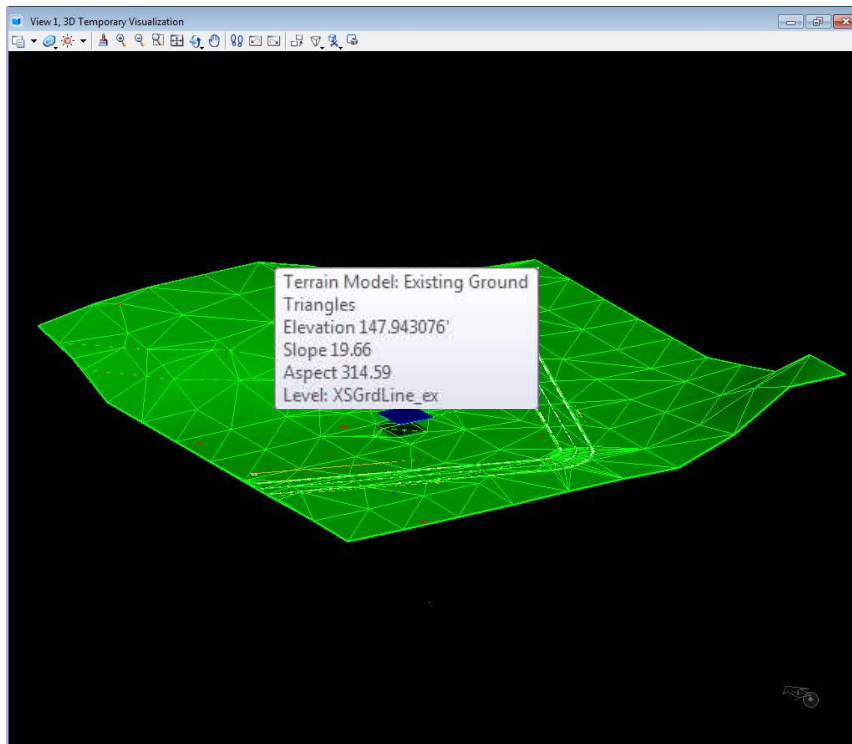
- Setting the Z-Exaggeration, pressing the Exaggerate button and selecting a point on the terrain will exaggerate the Terrain.

- Tip: Setting the Z-Exaggeration, pressing the Exaggerate button and key-in "xy=0,0,0" will exaggerate the terrain about 0,0,0 allowing simple math to calculate the actual elevation (divide the exaggerated elevation by the amount of exaggeration).

EXAGGERATE A TERRAIN MODEL
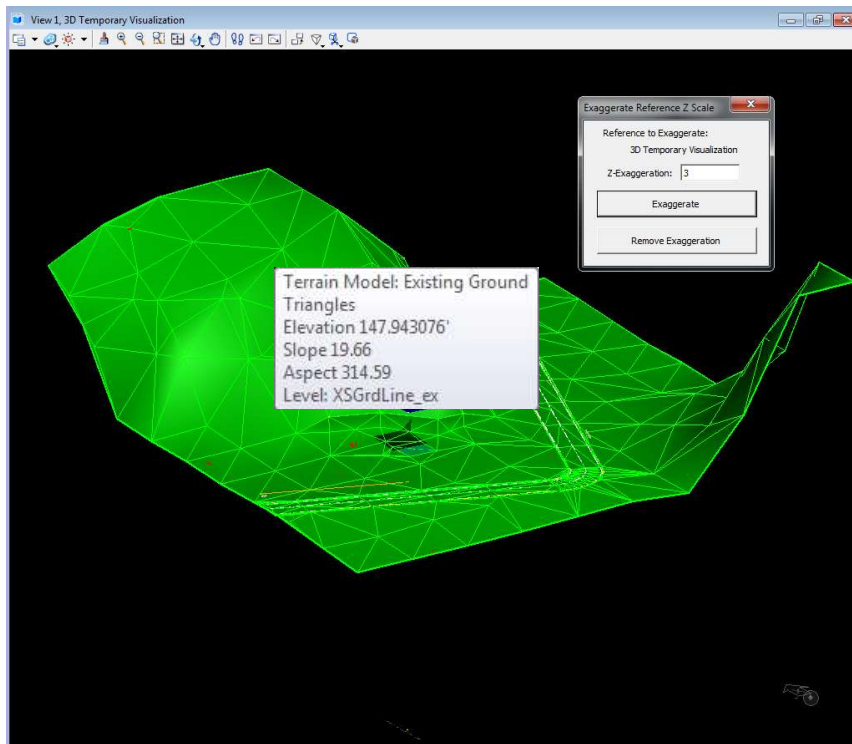
- Pressing the Remove Exaggeration button will remove the exaggeration but will not close the macro.

- Once the Exaggerate Reference Z Scale dialogue box is closed the temporary model will automatically be closed and deleted.

COMPLEX TERRAIN MODELS

- Terrain Models are stand alone elements for 3D Modeling

  ➢ Separate areas like these road intersections should have separate Terrain Models if no data exist between them.
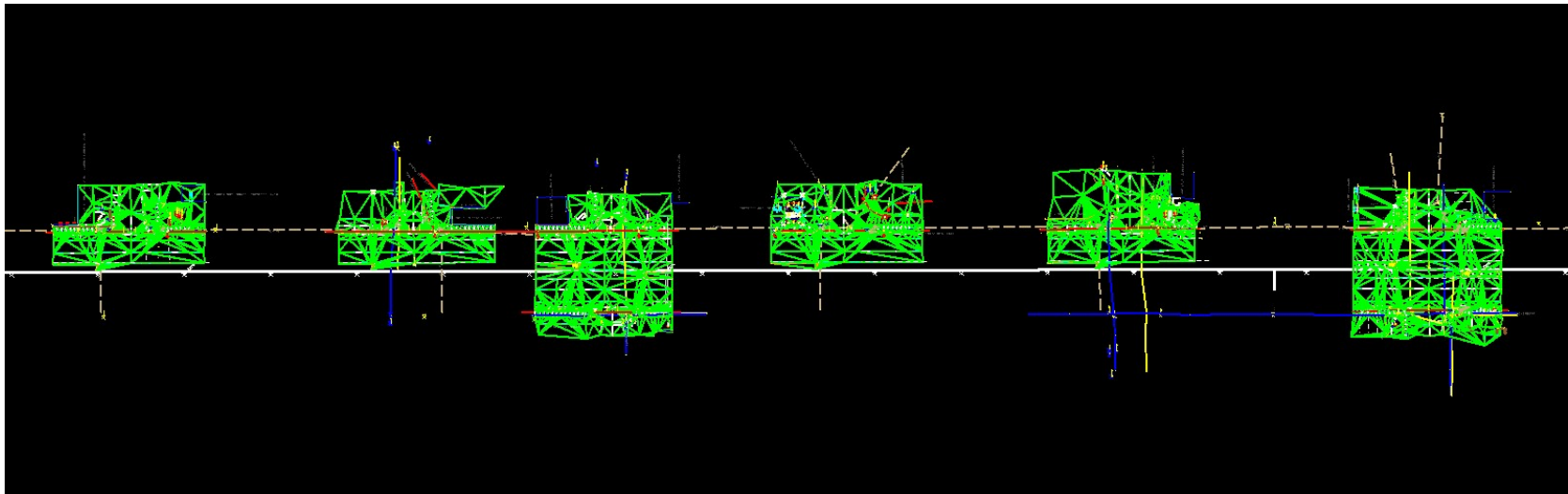
COMPLEX TERRAIN MODELS

- Complex Terrain Models may be created when Terrain Models are
  - ✓ Adjacent
  - ✓ Come into contact
  - ✓ Overlapping

- Complex Terrain Models can be
  - ✓ Merge – Replaces the overlapped area of the primary model (order matters)
  - ✓ Append – Uses all points and breaks in both models

COMPLEX TERRAIN MODELS

- In this example: The EXIST_EAST has a triangle that runs under the MAINLINE.
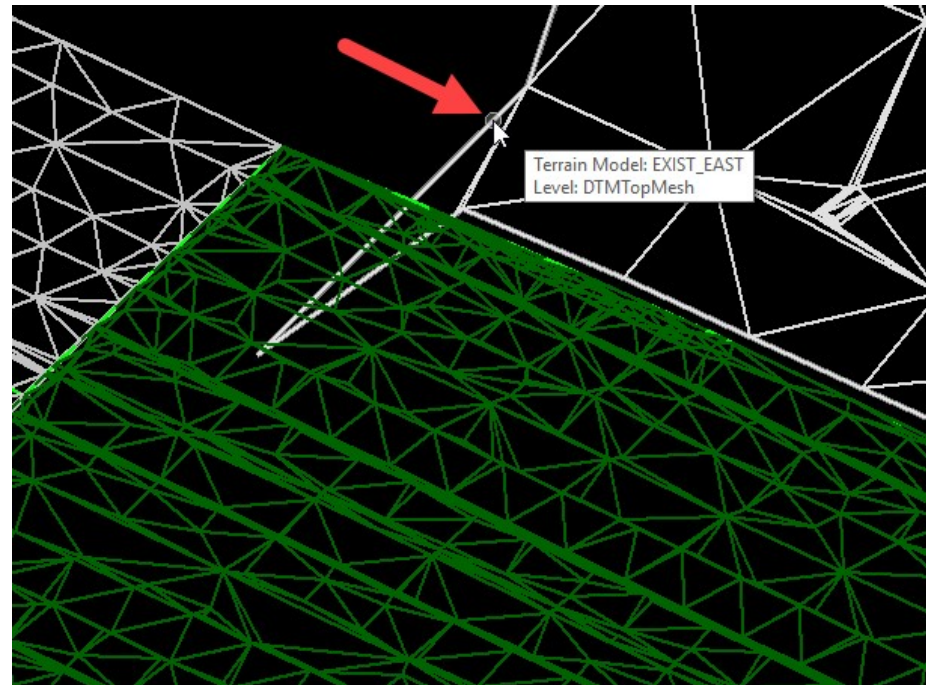
COMPLEX TERRAIN MODELS

- When the MAINLINE is primary, the EXIST_EAST triangle is merged and replaces the triangles over it.
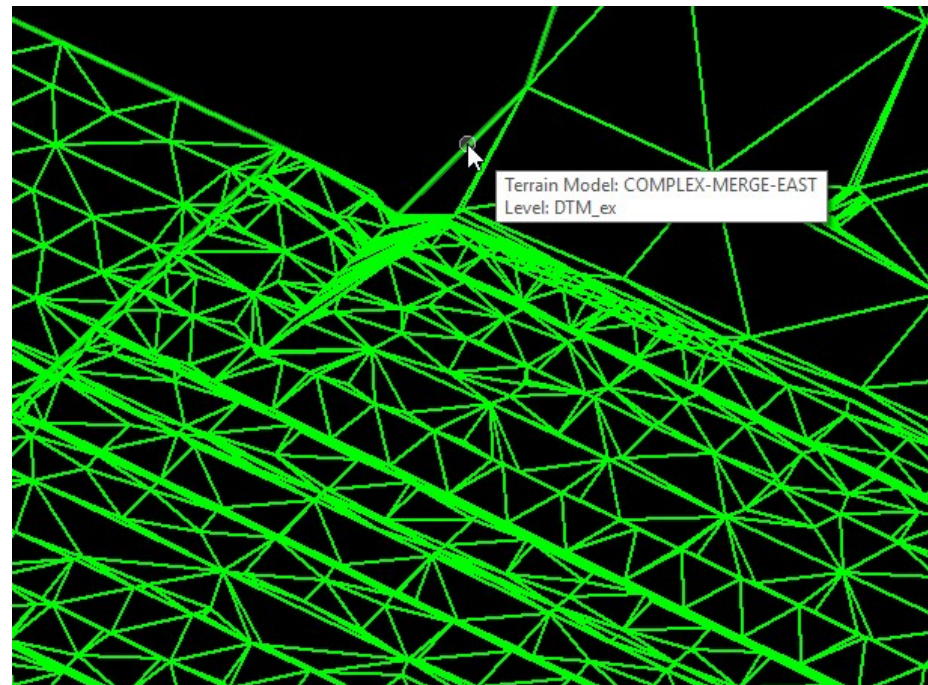
COMPLEX TERRAIN MODELS

- When the EXIST_EAST is primary, when merged the MAINLINE replaces the triangle under it.
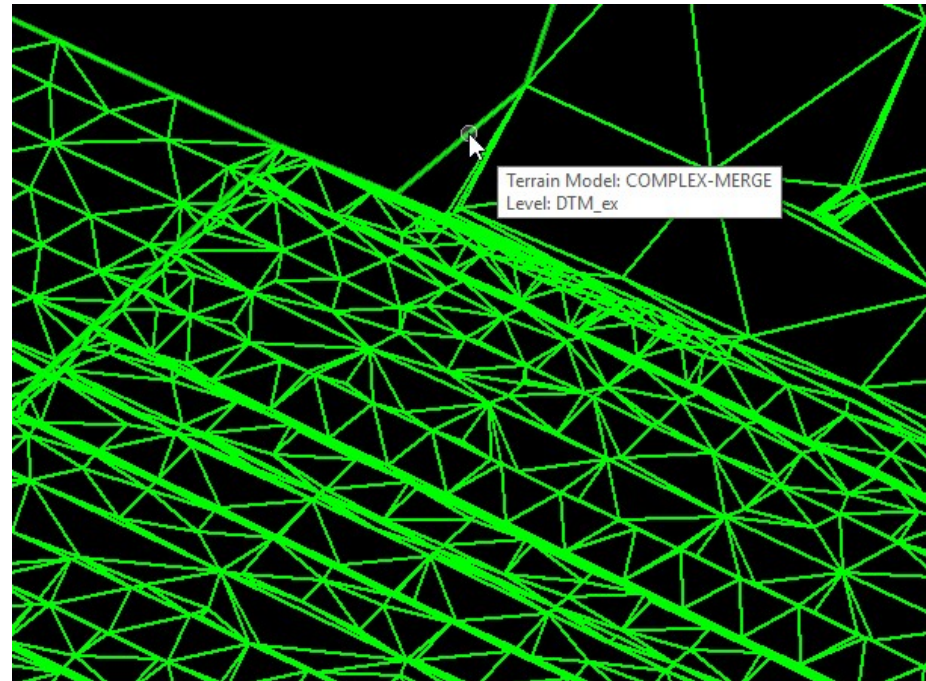
COMPLEX TERRAIN MODELS

- Complex Terrain Models when created
  - ➤ Dependent on the individual component Terrain Models used
  - ➤ Component Terrain Models if deleted will be removed from the Complex Terrain Model

- Components Append or Merge to create a Complex Terrain Model
  - ➤ Avoid long snaking boundaries they can be problematic. Instead use multiple Terrain Models
  - ➤ Avoid using "VOIDS" in a Terrain Model (they can't be filled).
  - ➤ Use "HOLES" for obscured areas or areas with no data. They can be filled later when making a Complex Terrain Model

- Complex Terrain Models can be exported to
  - ➤ TIN
  - ➤ LandXML

EXPORT THE TERRAIN MODEL
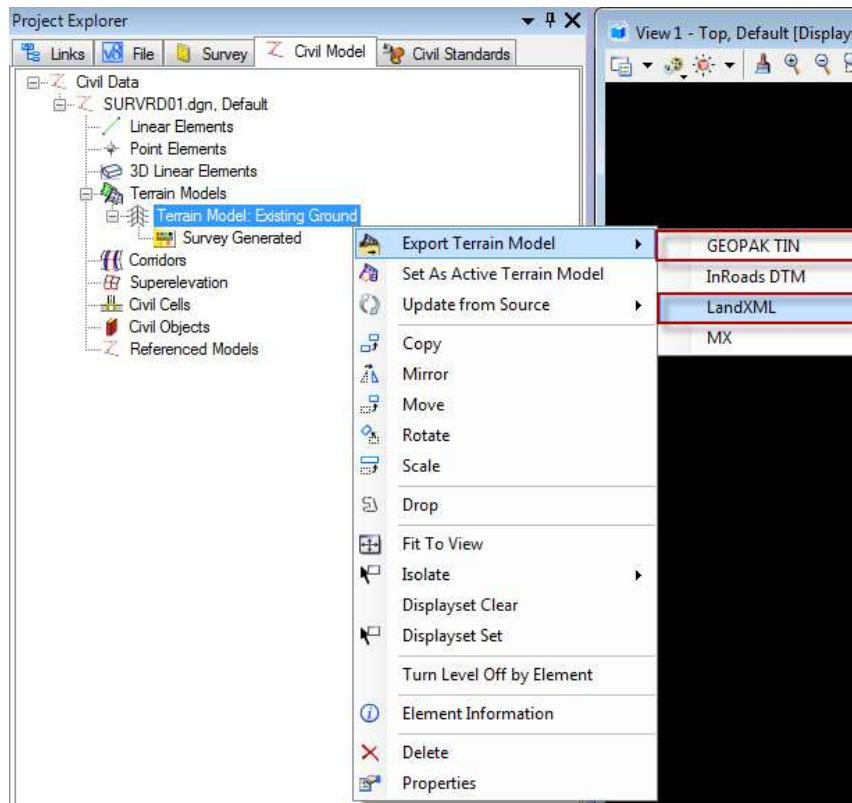
- Export the Terrain Model as a LandXML file or GEOPAK Tin.

- If for some reason the Terrain Model is deleted or corrupted it can be imported from a LandXML or GEOPAK Tin file.

- Use the Create From File tool from the Terrain Model task pane to import a Terrain Model.

EXPORT THE TERRAIN MODEL
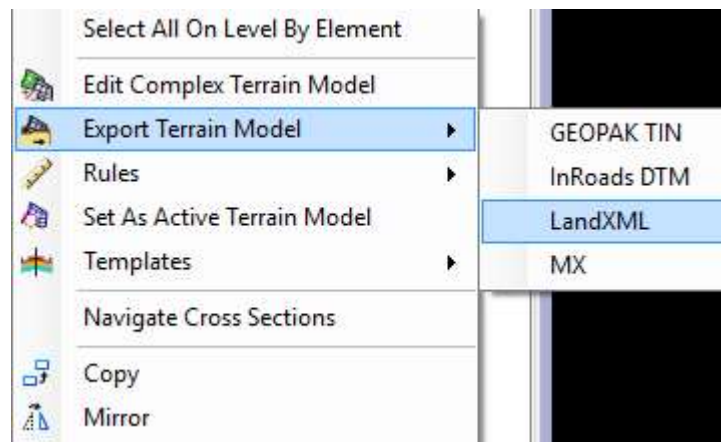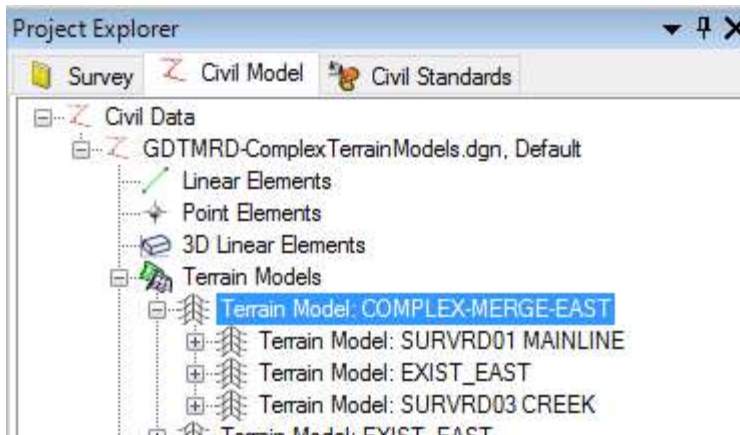
- If a single Terrain Model is desired as opposed to a Complex Terrain Model, then Export the Complex Terrain Model as a LandXML file.

- The XML can then be imported to create a single Terrain Model.

- Follow the SS4 Rules of Thumb of Exporting and Importing Terrain Models.

SS4 RULES OF THUMB WHEN EXPORTING AND IMPORTING TIN & LandXML FILES

- When exporting TIN files, features/break lines are automatically included (no option to exclude)

- When importing TIN files, "Import Terrain Only". The features will be used to create the model, but the graphic lines are not needed

- When exporting XML files, include "Export Both" (Triangles and Features)

- When importing XML files, "Import Terrain Only" (graphics lines are not needed but will be used in creating the Terrain Model), set to "Source and Definition", and set the projection (State Plane Zone)

TERRAIN MODEL WARNING

- It is possible to receive a Terrain Model warning. If an element that the Terrain Model is dependent on is removed, the Terrain Model will show as **Bold RED Dashes**. Undo if this happens.
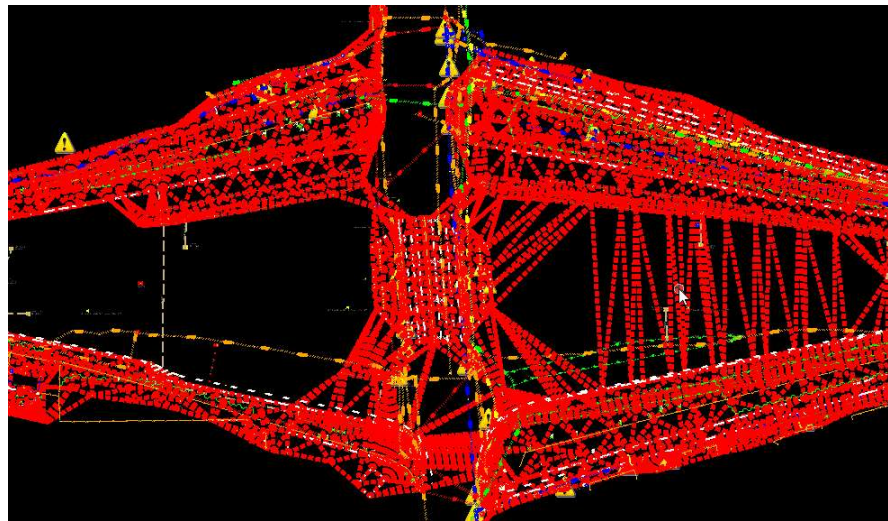
EXPORTING THE SURVEY DATABASE TO GEOPAK

- At some point there will probably be a need to use GEOPAK COGO functionality.

  ➢ Making GEOPAK "Chains" for Horizontal Geometry alignments and for applying annotations and station tics with the D & C Manager

  ➢ Visualizing graphic elements into the Design file

  ➢ Using COGO to generate new points and chains

  ➢ Using GEOPAK to label your survey

EXPORTING THE SURVEY DATABASE TO GEOPAK
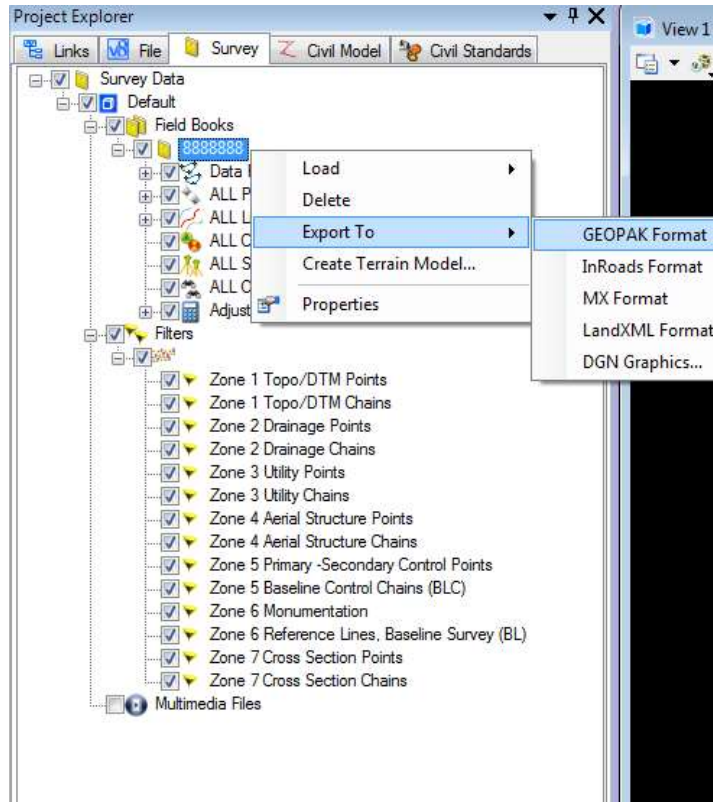
- Open a **NEW** GEOPAK file (GPK).

- Right-click on the Survey Project Field Book.

- Hover on the "Export To" and select "GEOPAK Format".

- Select the GPK file to export to.

CREATING AN ALIGMENT IN THE SURVRD.DGN FILE

- The alignment in OPEN ROADS is a "Civil Model" element and should be placed in the SURVRD file as a Horizontal Geometry Element.

- Most likely it will start as the Baseline Survey Field, Baseline Survey (Calculated) or a provided Centerline Construction.

- This alignment can be easily placed directly from the GPK file chain representing the alignment.

- Use the Import Geometry tool in the General Geometry task bar to create a "Civil Model" alignment.

CREATING AN ALIGMENT IN THE SURVRD.DGN FILE
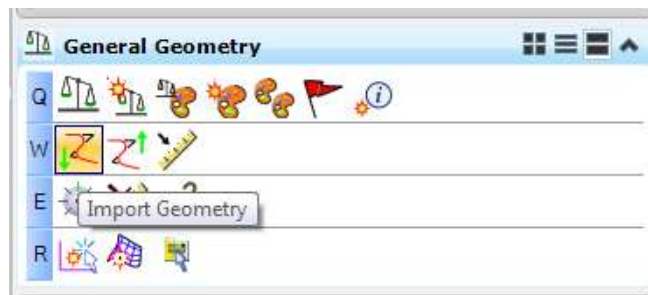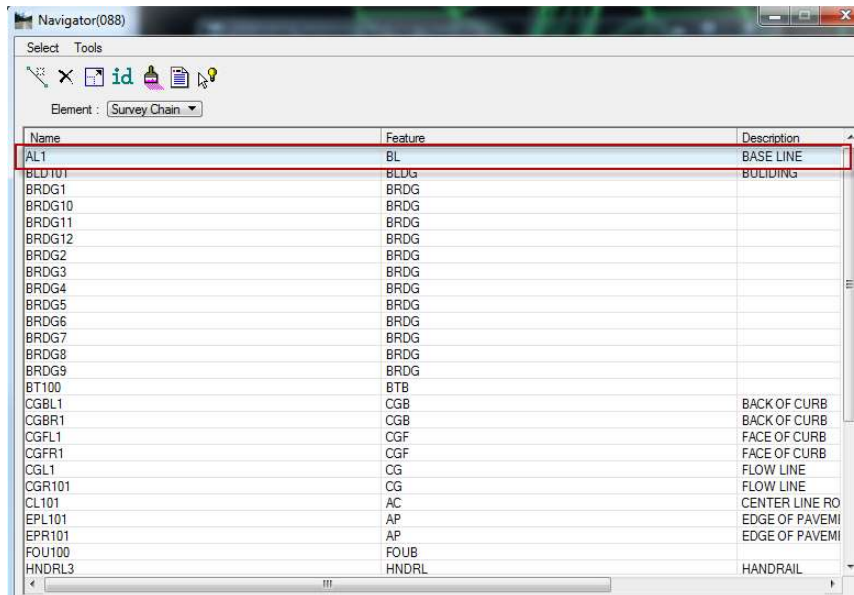
- When the GPK file contains your alignment as a chain, <u>use it</u>.
- In the Task Bar under General Geometry tools, use the "Import Geometry" tool to import a chain to use as an alignment.
- Select the chain and press "Import"
- View the alignment

CREATING A CAiCE ALIGNMENT XML FOR GPK IMPORT
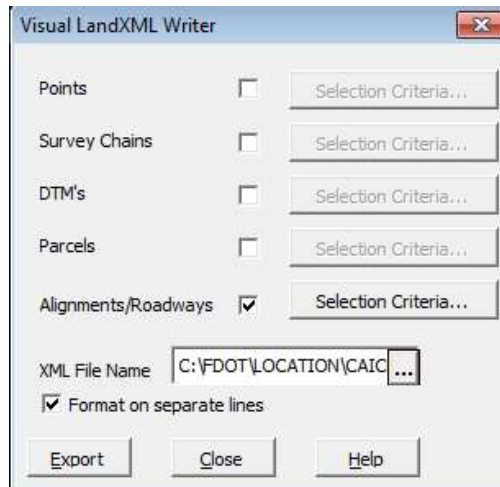
- Create an alignment XML with the CAiCE LandXML writer (Win32)
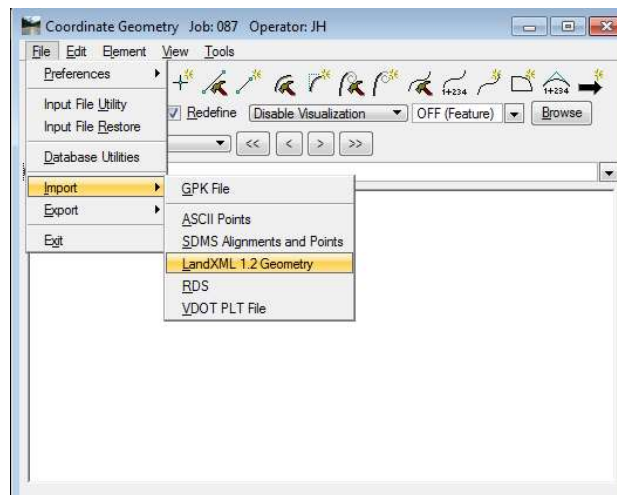
- Open a GPK file with GEOPAK COGO and use the Import LandXML 1.2 Geometry function to import a geometry chain.

LANDXML FILE LINEAR UNITS

- **WARNING:**
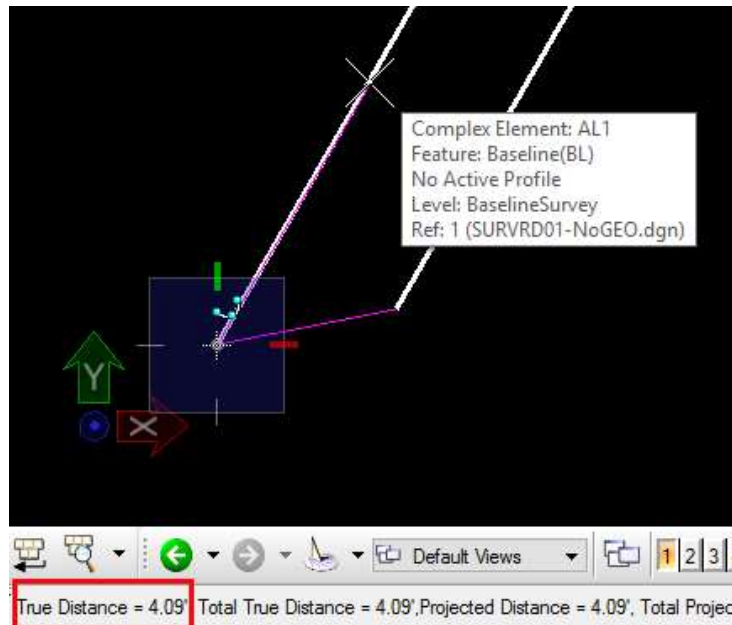LandXML files have linear Units defined in the file. If linearUnit="foot" then the units in the file are **"International" Feet".**

LANDXML FILE LINEAR UNITS

- **WARNING:** When using the "Import Geometry" tool to import a horizontal alignment directly from a LandXML file, the LandXML linear units must be in US Survey feet. Change to linearUnit="USSurveyFoot"

- If you do not the alignment will be off approximately 4 feet to the Southwest.

CREATING AN ALIGNMENT GRAPHCALLY FROM AN ELEMENT
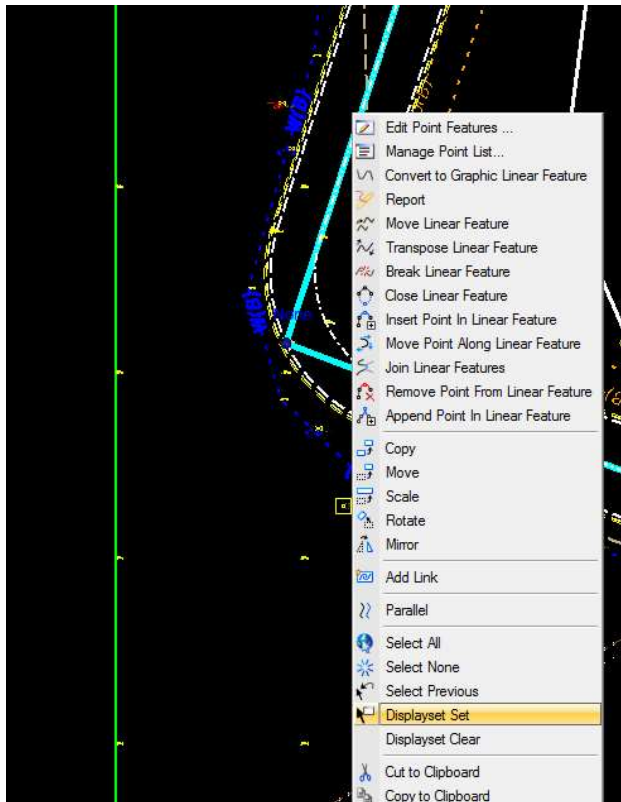
- Select the element such as the survey baseline field linear (chain) feature and right-clicking to bring up options.

- Select Display Set to isolate the baseline.

- From the Horizontal Geometry task pane, draw civil geometry lines and curves along the survey baseline.

CREATING AN ALIGNMENT GRAPHCALLY FROM AN ELEMENT
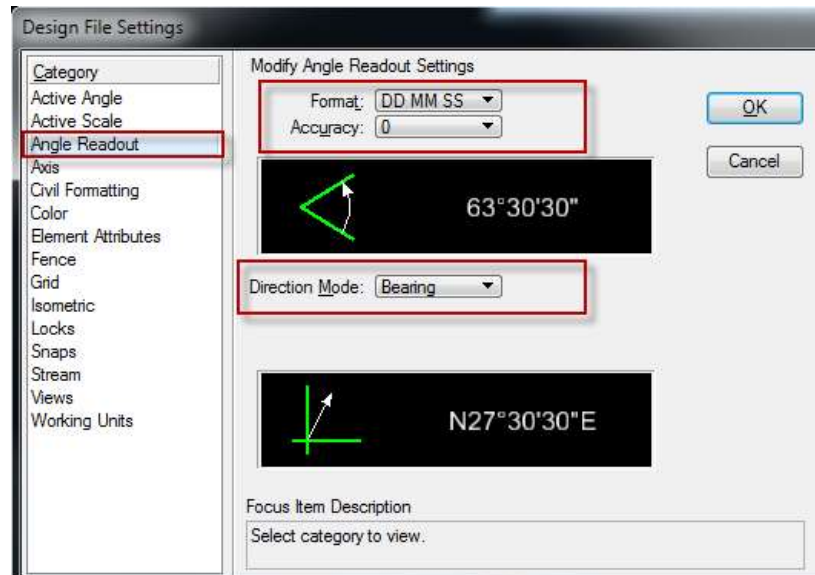
- For Horizontal Geometry; To set the Angle Readout to Bearing and Distance and to set the Precision, select Settings > Design File to open the Design File Settings dialogue box.

- Select Angle Readout and set the Format to DD MM SS.

- Set the Accuracy to desired decimal places.

- Set the Direction Mode to "Bearing".

CREATING AN ALIGNMENT GRAPHCALLY FROM AN ELEMENT
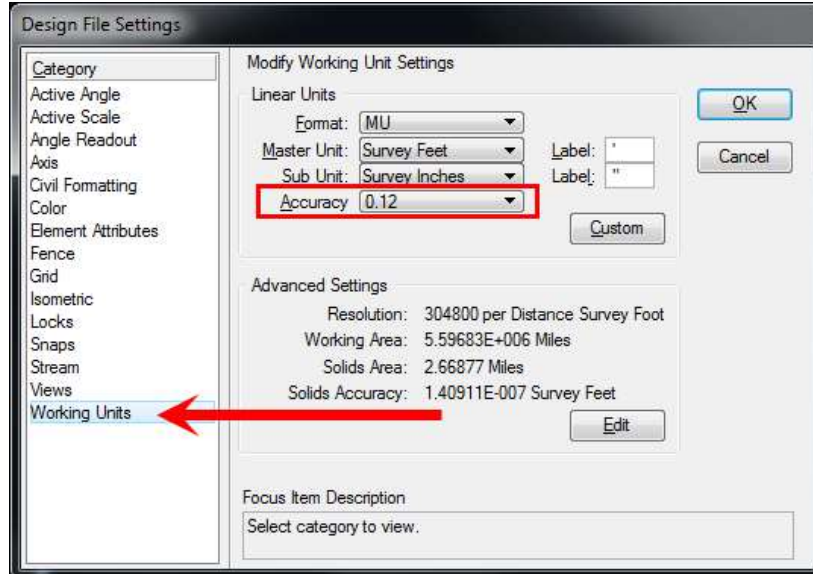
- Significant digits for the distance readout is controlled under your working units

CREATING AN ALIGNMENT GRAPHCALLY FROM AN ELEMENT
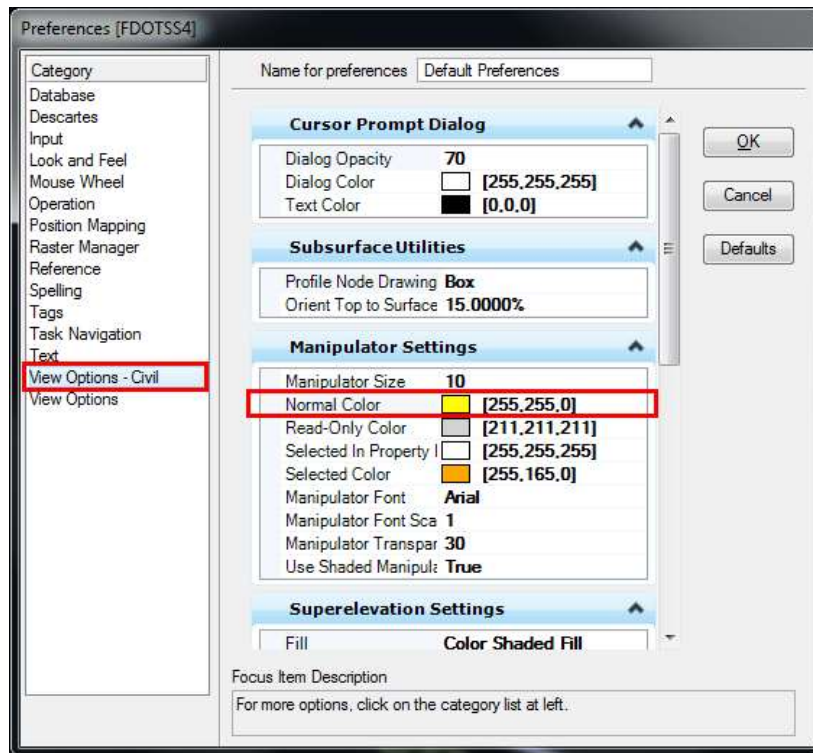
- The color of the selection annotation for horizontal geometry is controlled under Workspace > Preferences.

- Blue is hard to read on a black background. Try another color like yellow.

CREATING AN ALIGNMENT GRAPHCALLY FROM AN ELEMENT
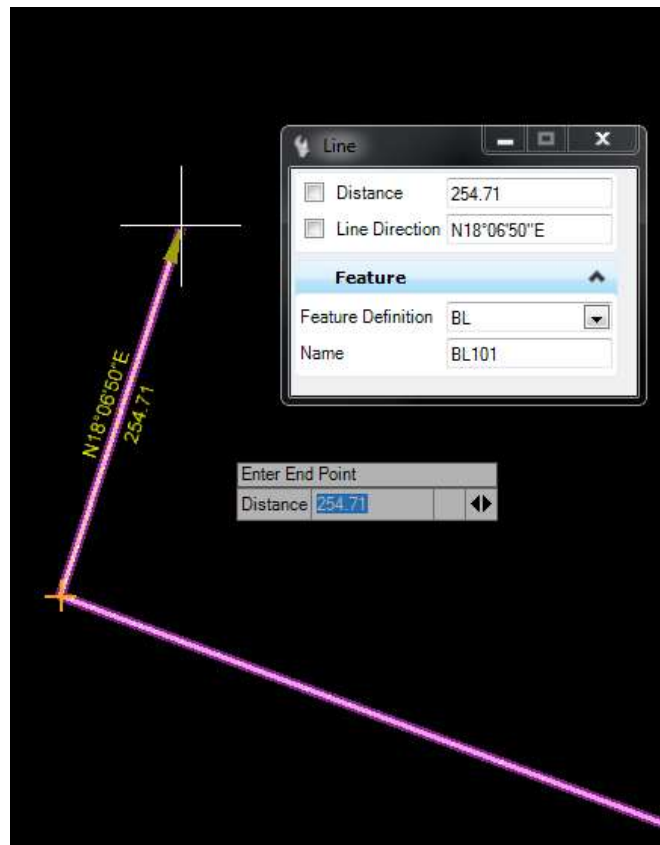
- Select "Line Between Points".

- Select a Feature Definition and Name.

- Draw the line. Each segment is drawn separately.

CREATE A HORIZONATAL GEOMETRY COMPLEX ELEMENT

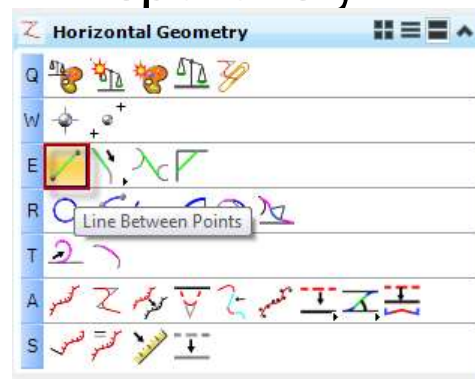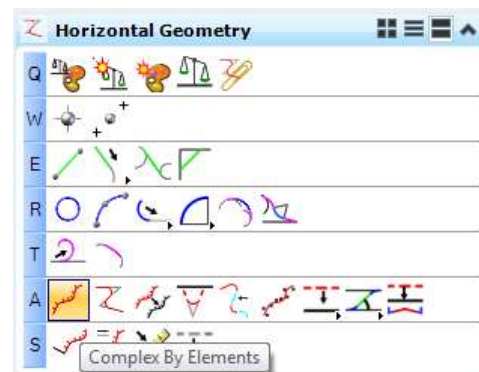

- Select "Complex By Elements"

- Select a Feature Definition.

- Give the Alignment a Name.

- Select the Lines previously drawn using Horizontal Geometry tools. Select near the starting end of each segment and watch the arrows.

CREATING AN ALIGNMENT GRAPHCALLY FROM AN ELEMENT
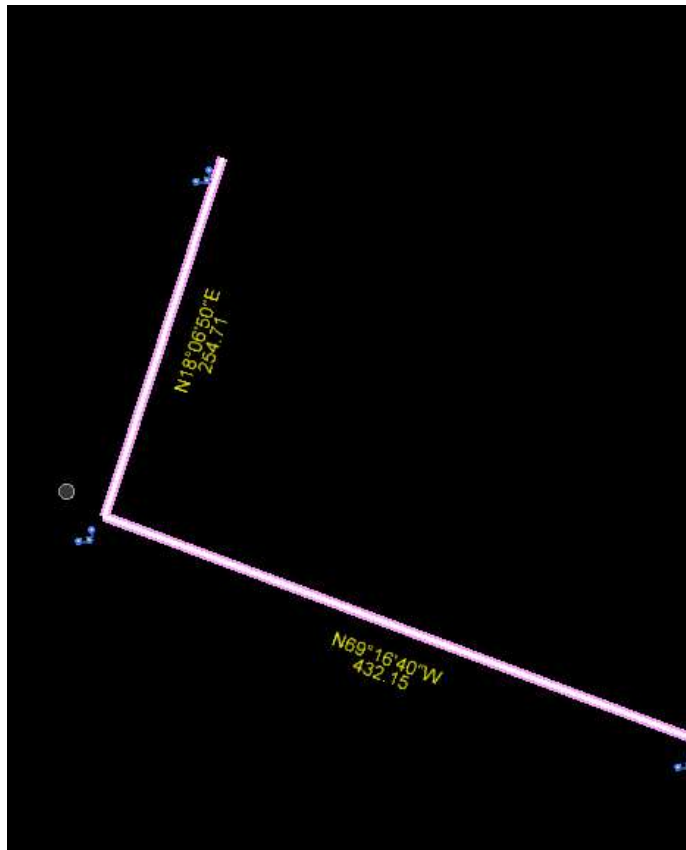
- After selections left click on the view and press F6 to release.

- Selecting the complex geometry element will show annotation on all segments. This way you know you have included all parts of the alignment.
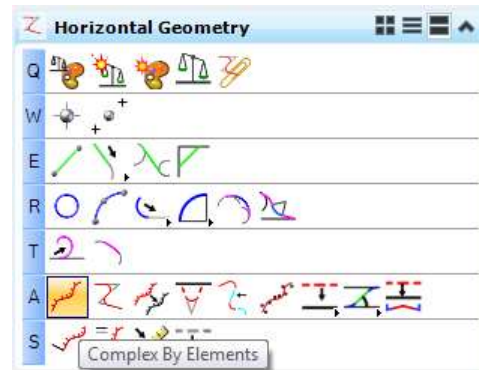
BUILD HORIZONTAL GEOMETRY ALIGNMENTS IN A 2D FILE

- Complex Horizontal Geometry elements can be built directly from Graphics in a 2D file

- If a graphic alignment is available, it can be turned into a Horizontal Geometry Alignment in a 2D file by:
    1. Adding "Rules"
    2. Making it a "Complex Element"
    3. "Starting a Station"
    4. Adding "Station Equation"

BUILD HORIZONTAL GEOMETRY ALIGNMENTS FROM GRAPHICS IN A 2D FILE
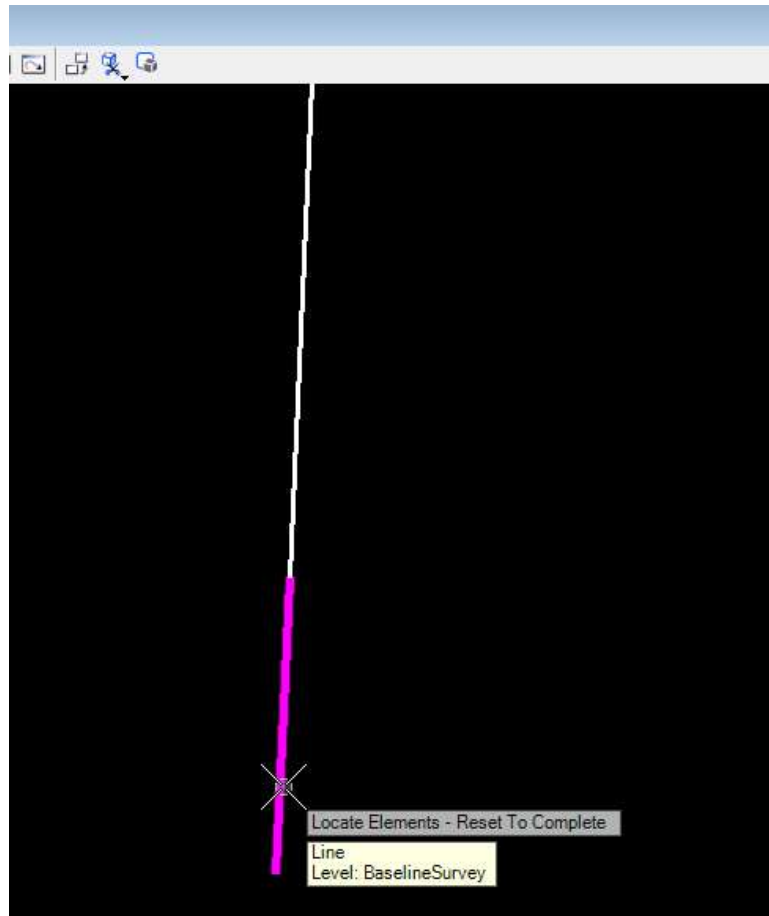
- Before a series of 2D lines and curves can be made into a Horizontal Geometry "Complex Element", it first must become a "Civil Rules Feature"

BUILD HORIZONTAL GEOMETRY ALIGNMENTS FROM GRAPHICS IN A 2D FILE
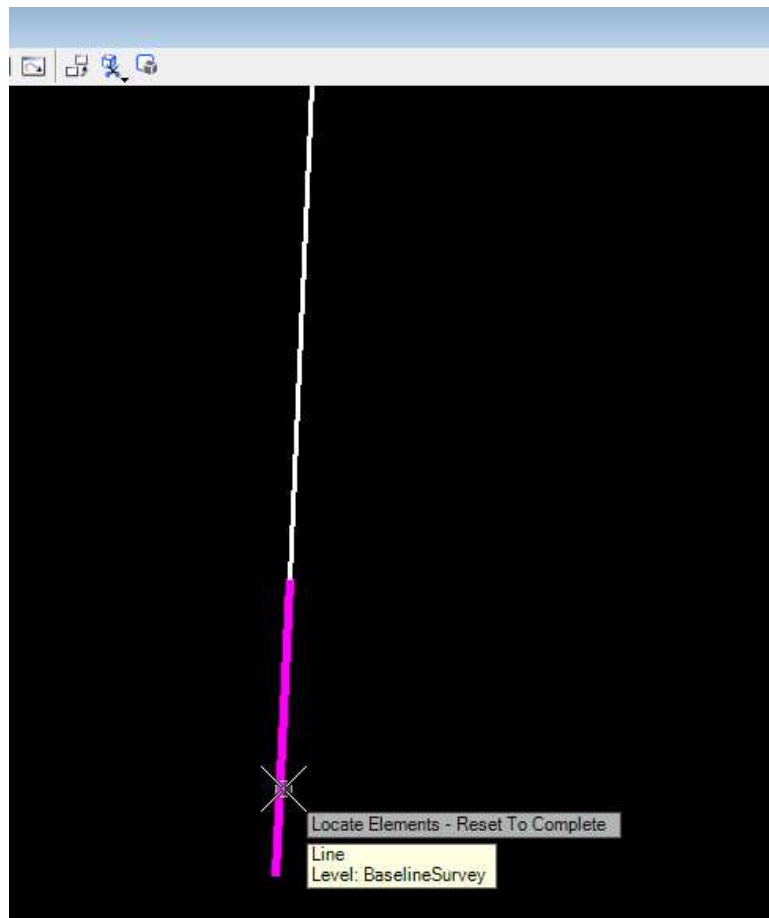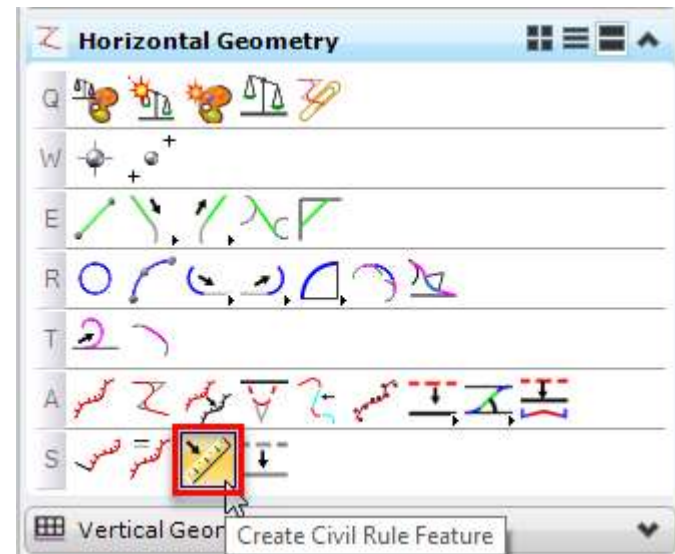

- Use the "Create Civil Rule Feature" tool to add rules to each segment of the alignment.
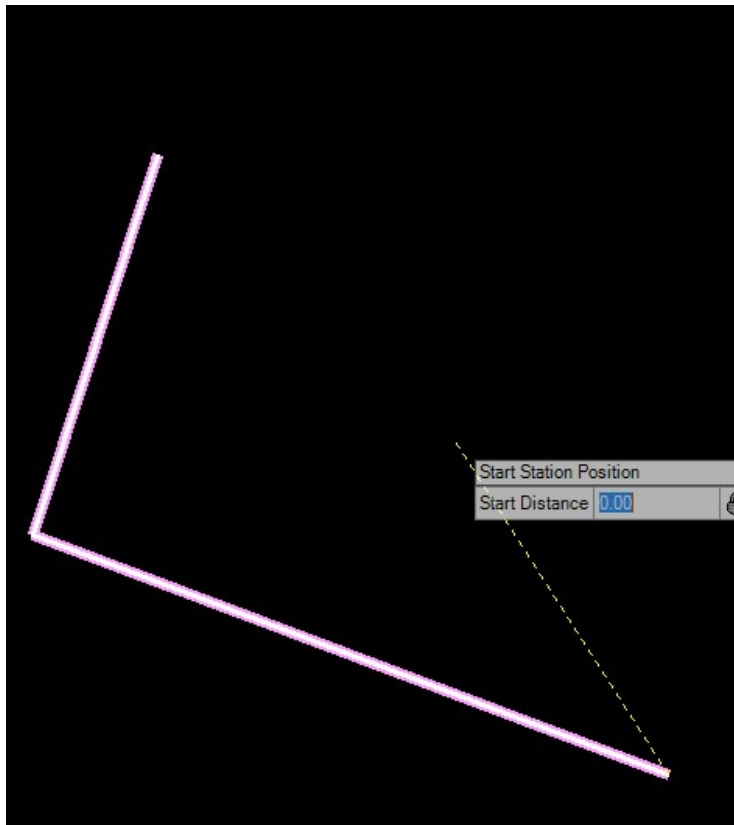
ADD HORIZONTAL GEOMETRY RULES TO 2D GRAPHIC ALIGNMENT
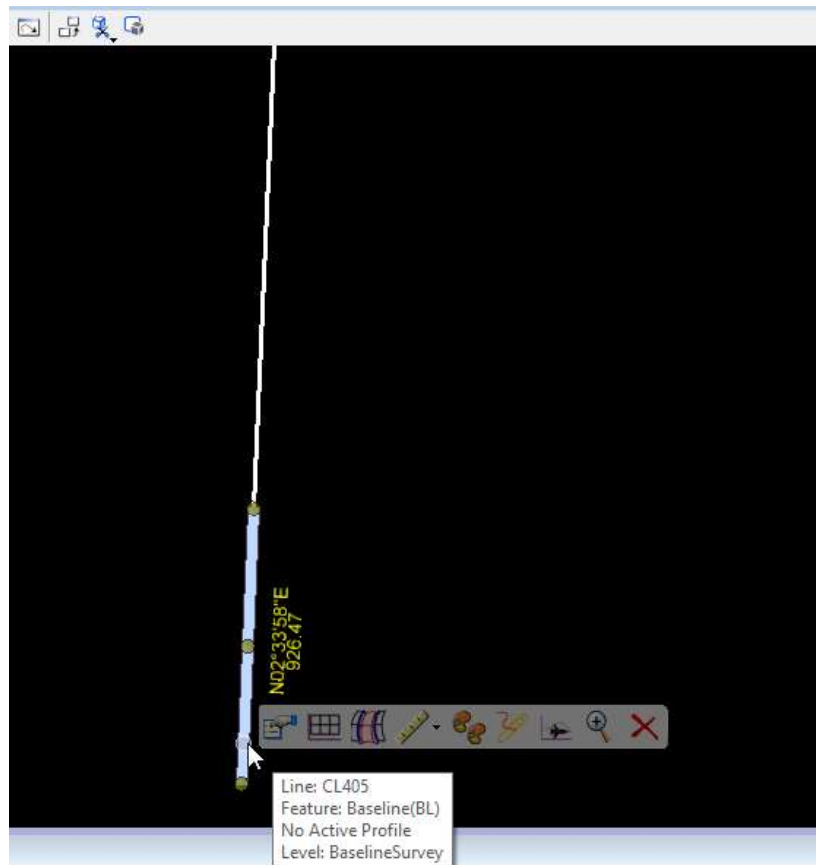
- Once rules have been added to a segment, selecting it will show annotations on the element (current geometry)

- Use the "Complex by Elements" tool to create a Horizontal Geometry Complex Element as noted previously

STATIONING AN ALIGNMENT

- Select "Start Station" and follow prompts.

- Stationing can begin at any point on the alignment ("Start Distance"). Generally the Start Distance will be at 0.00'

- Left click to accept Start Distance.

STATIONING AN ALIGNMENT

Enter Starting Station
Start Station | 10+00.0000
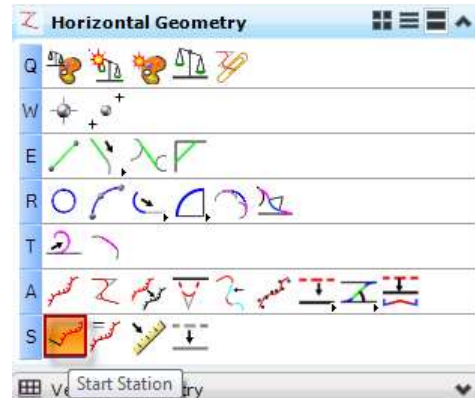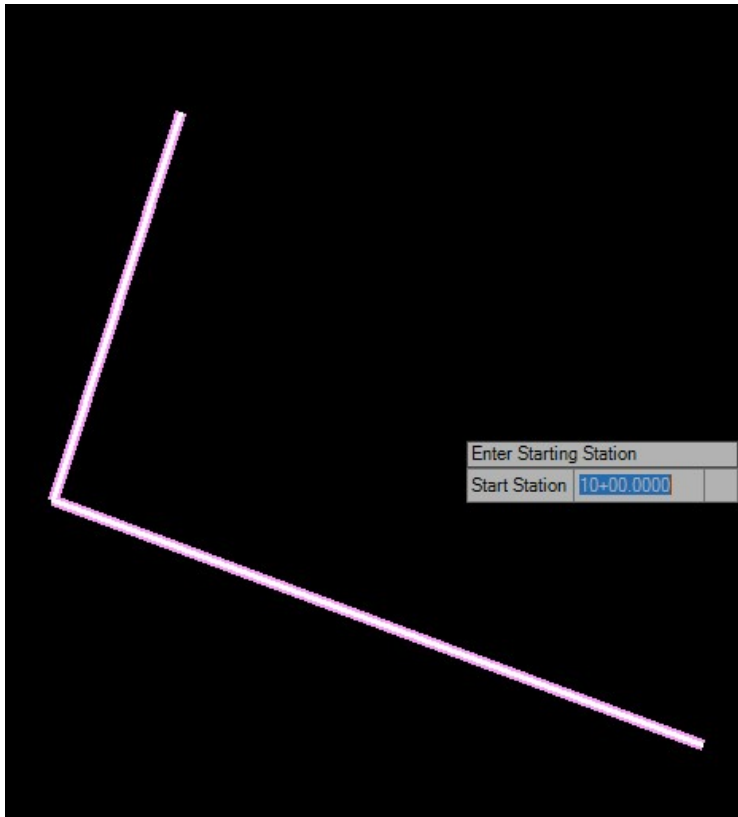
- After selecting the starting point (Start Distance) for stationing. Type in the Station for that point.

- REMINDER: Press the **F6** button to release the Civil Geometry tool.

STATION EQUATIONS

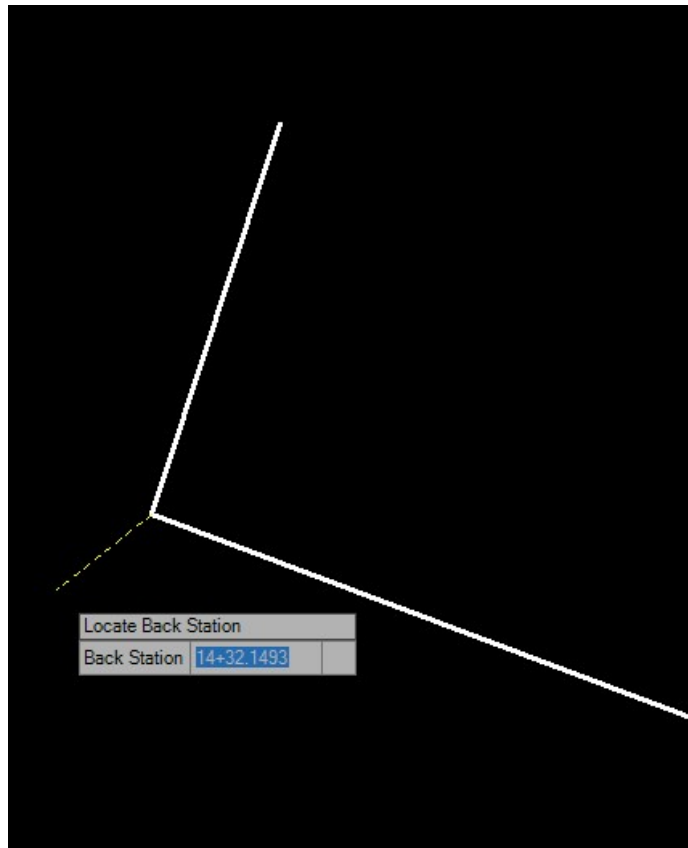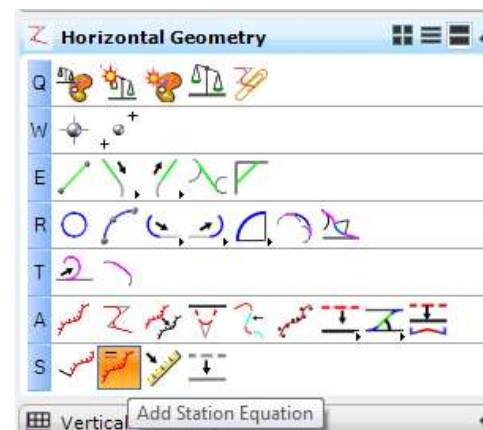- Select the add Station equation tool.

- Follow the prompts

STATION EQUATIONS
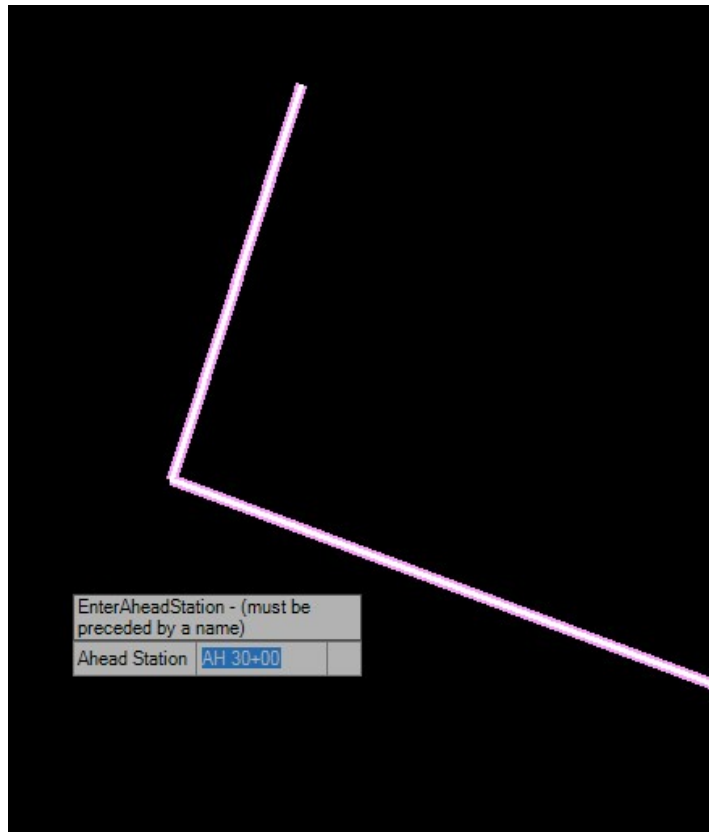
- You may have to type in a name in front of the ahead station number, for example "AH 30+00".

STATION EQUATIONS
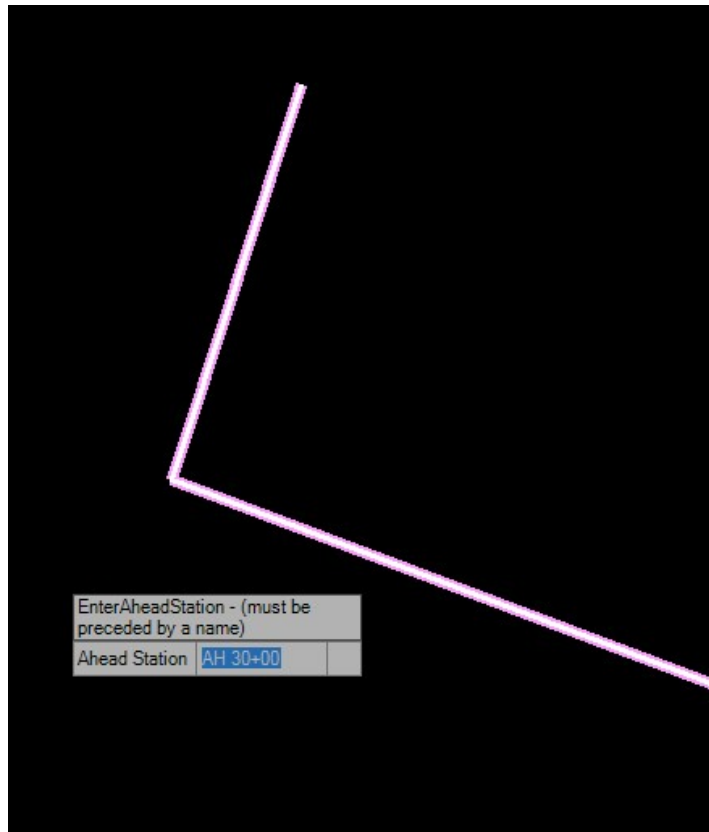
- WARNING: If prompted for a name, Do not put a number in the Ahead Equation name. It will increase the Station numbers erroneously
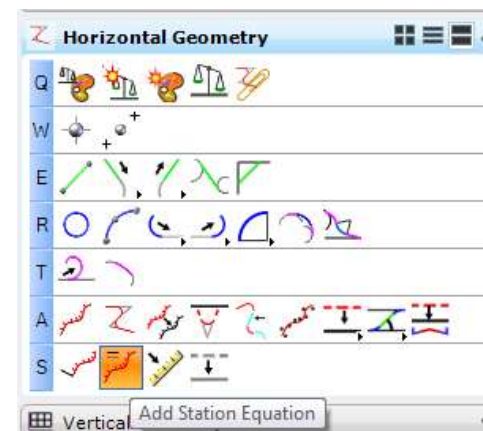
STATION EQUATIONS
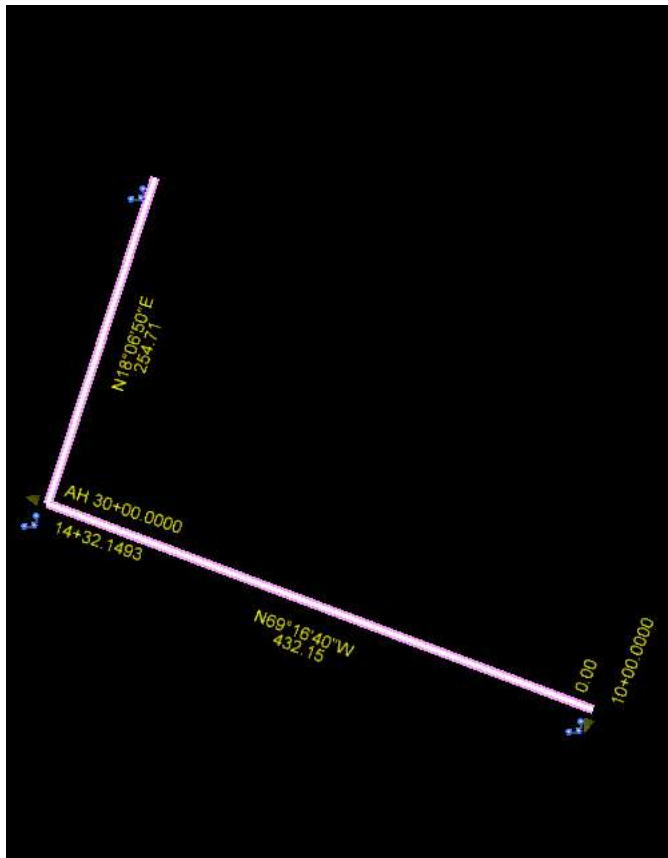
- Press F6 to release

- Select the stationed alignment to see annotations

COPY ALIGNMENT

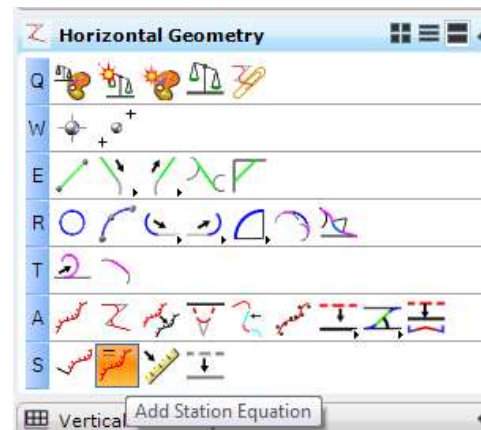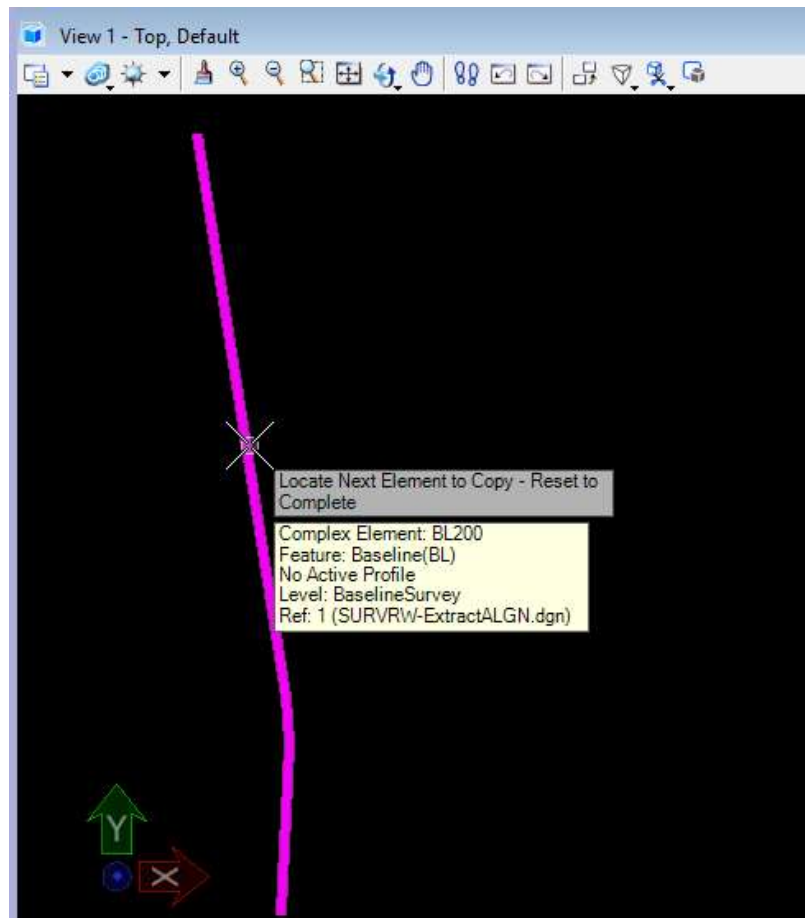- Reference the file with the Alignment in it.

- Use the Horizontal Geometry "Copy Element" tool to copy in a Civil Model
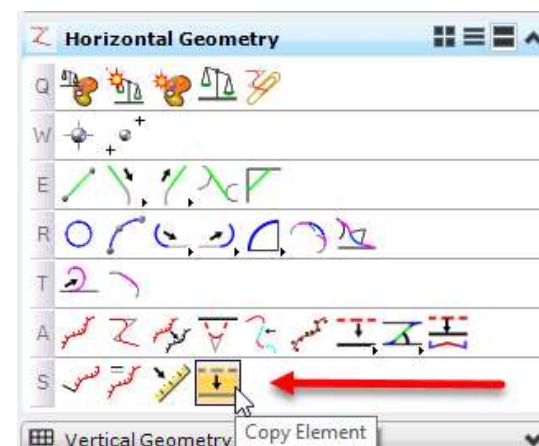
EXPORT ALIGNMENT TO GEOPAK
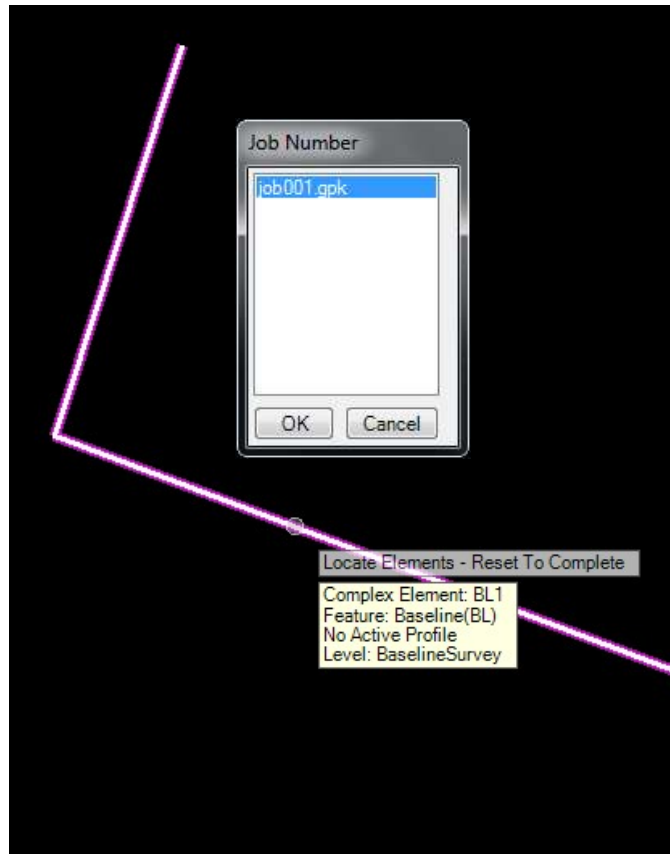
- Select the "Export to Native" tool on the General Geometry task bar

- Choose the Alignment.

- Reset To Complete (right-click)

- Select the GPK file to receive the exported geometry.
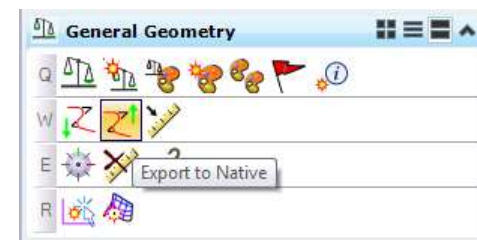
ALIGNMENT HORIZONTAL GEOMETRY REPORT
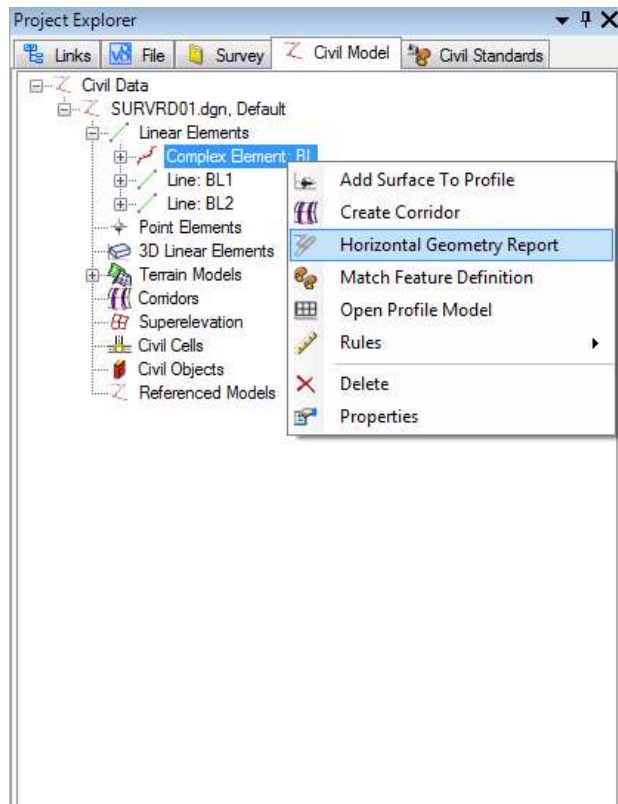
- Alignments will show up in the Project Explorer under the Civil Model Tab as "Linear Elements"

- Right-clicking on the element will activate options including the Horizontal Geometry Report

- Right-click directly on the alignment in the view pane will also bring up the option to view the Horizontal Geometry Report.

ALIGNMENT HORIZONTAL GEOMETRY REPORT

ALIGNMENT HORIZONTAL GEOMETRY REPORT

- Selecting the alignment and hovering will bring up the contextual menu.

- Horizontal Geometry reports can be generated from this menu.

HORIZONTAL GEOMETRY DISPLAYSET CLEAR
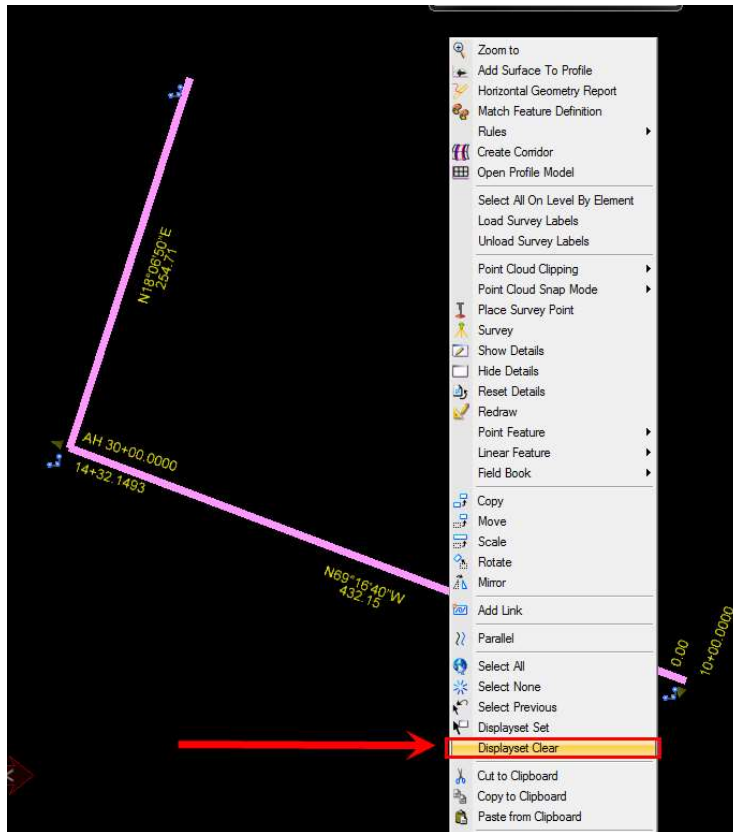
- Right-click on the alignment and bring up options.

- Choose "Displayset Clear" to remove the earlier alignment isolation set.

- Note that the Alignment is automatically put on an elevation of zero.

SURVRD.DGN 3D SURVEY DIGITAL DELIVERABLE
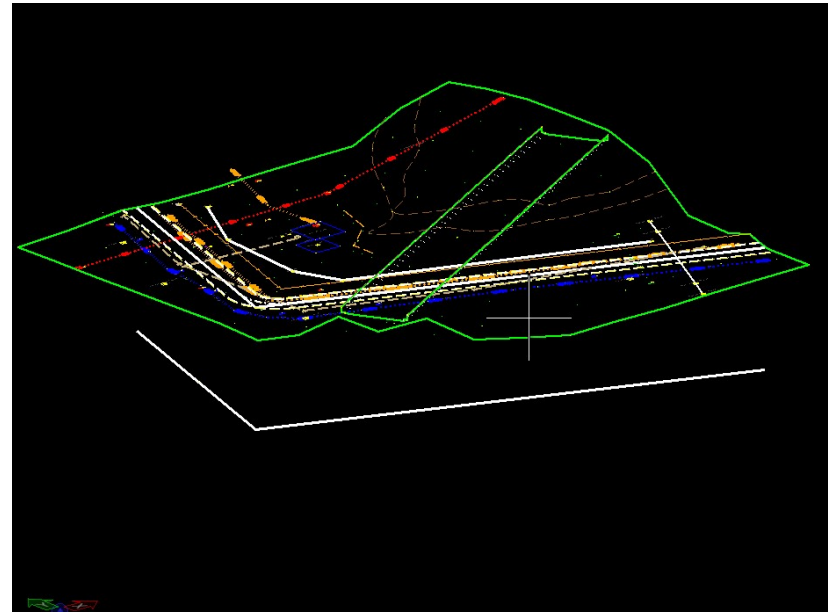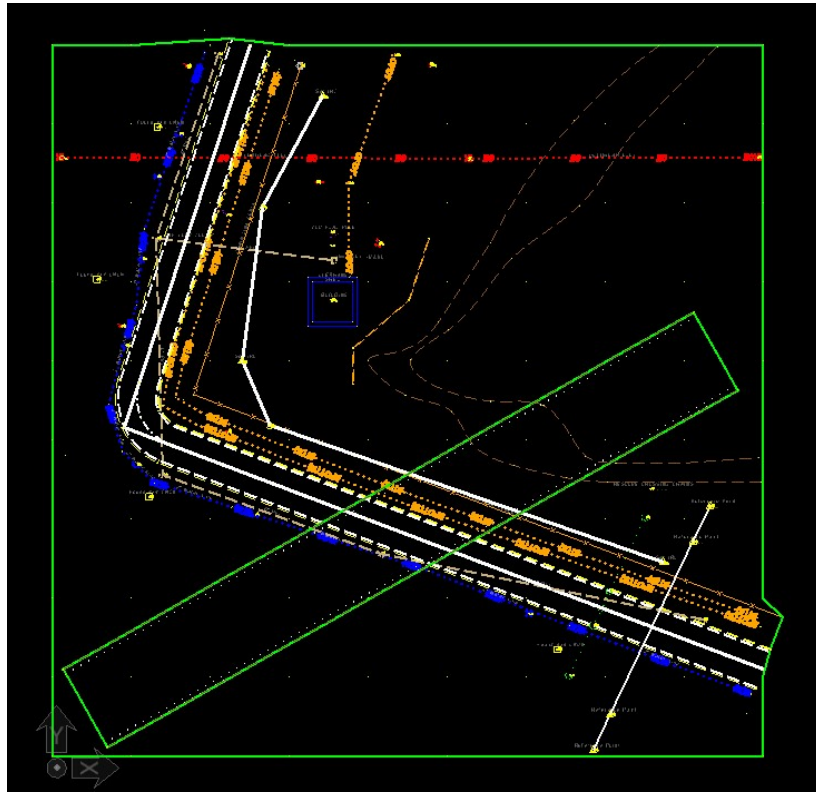
SURVRD.DGN 3D SURVEY DIGITAL DELIVERABLE
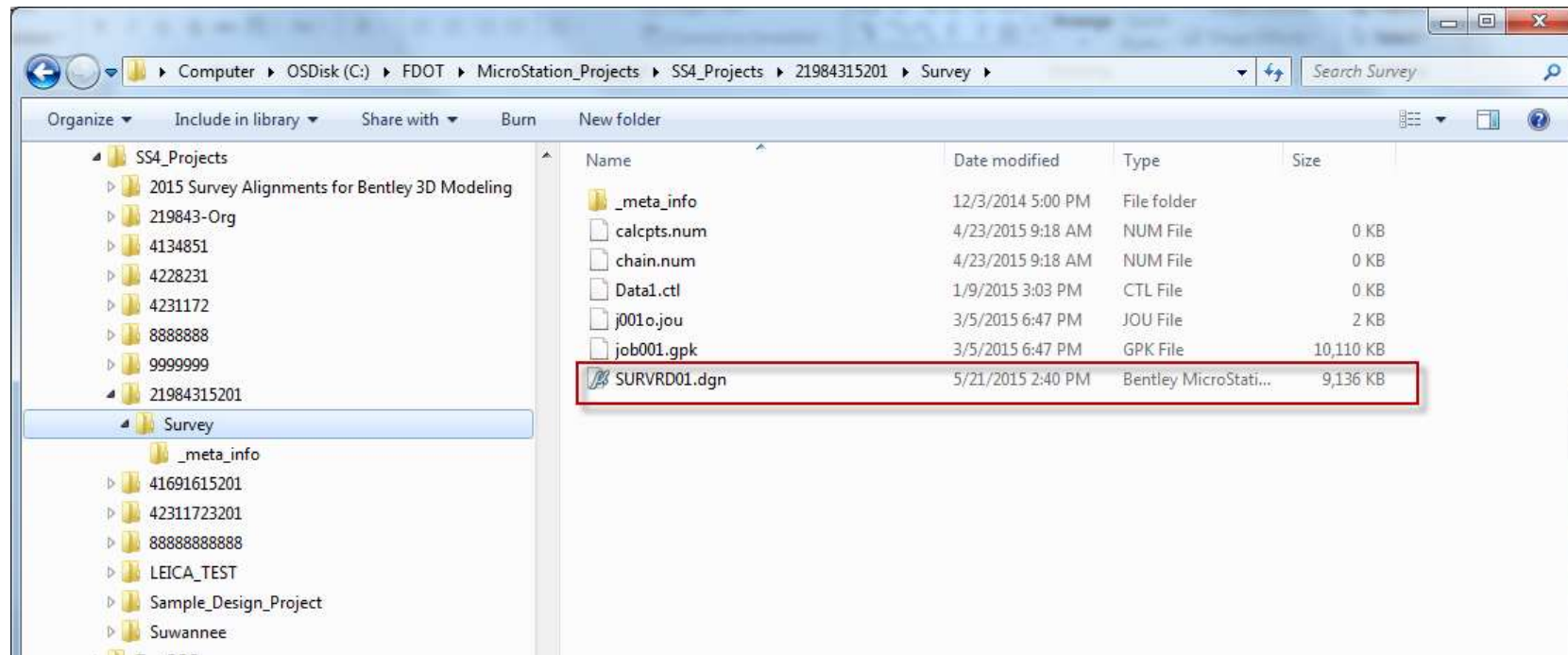
DRAINAGE – DREXRD LEVEL FILTER
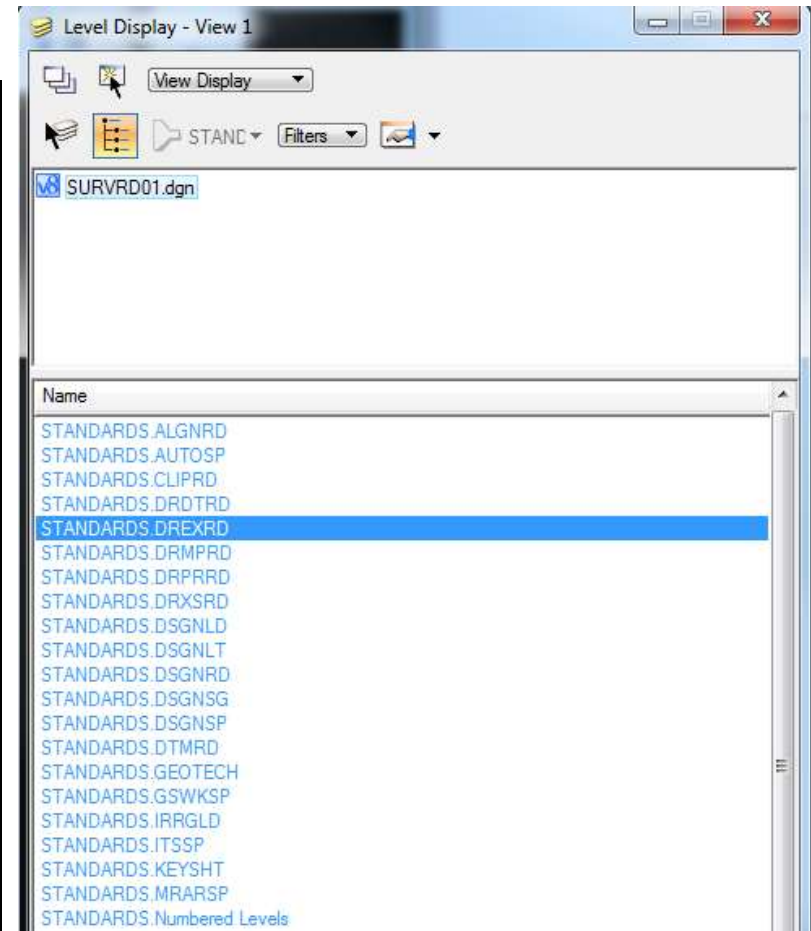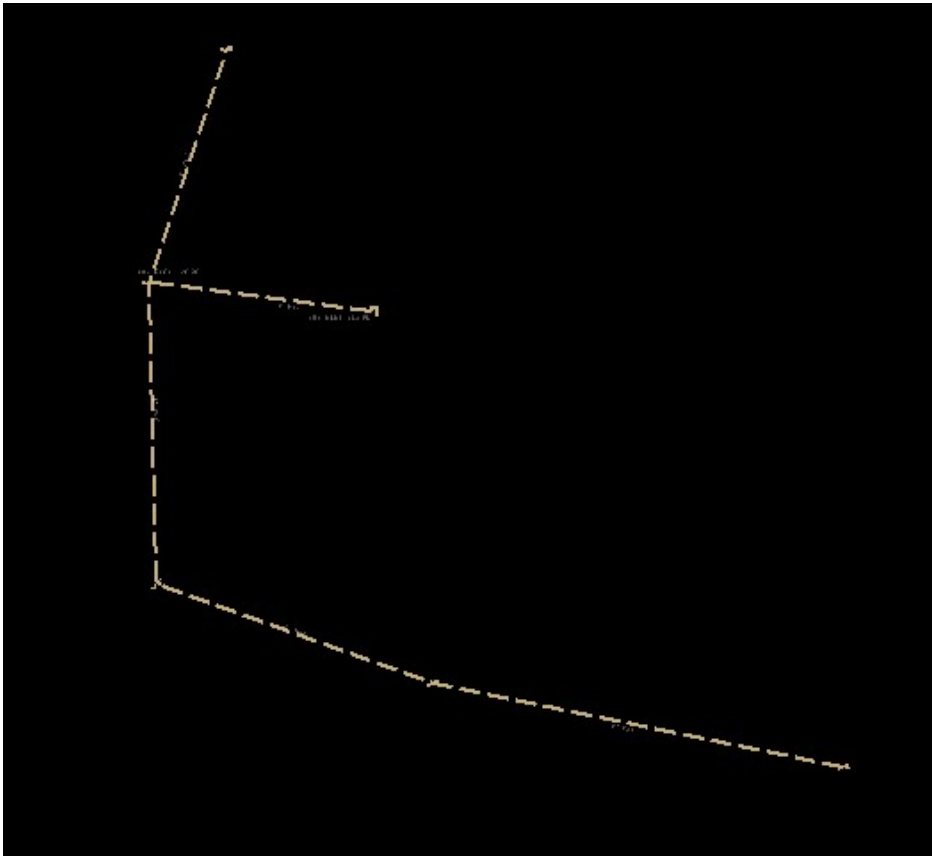
TOPOGRAPHY – TOPORD LEVEL FILTER
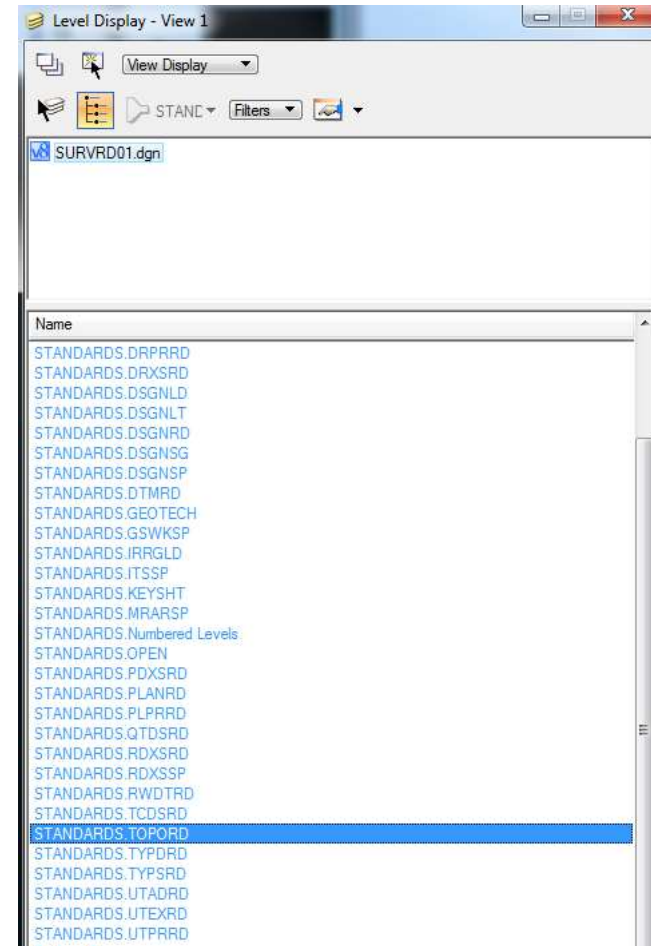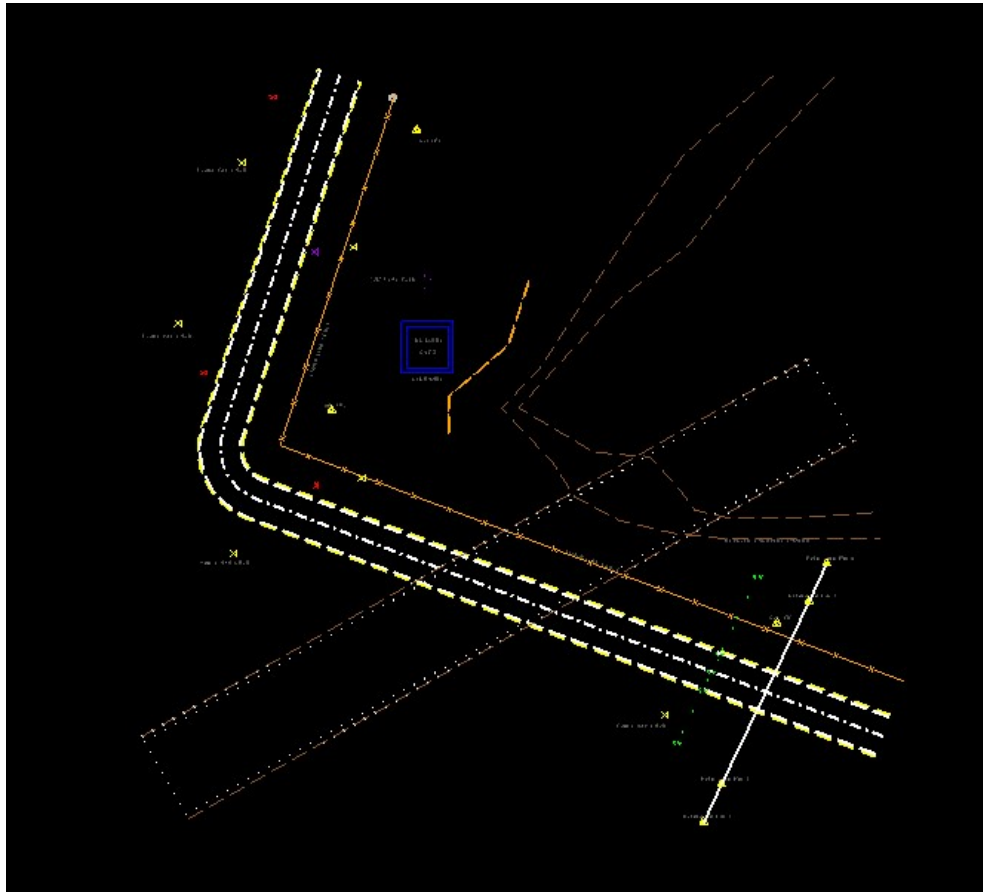
UTILITIES – UTEXRD LEVEL FILTER
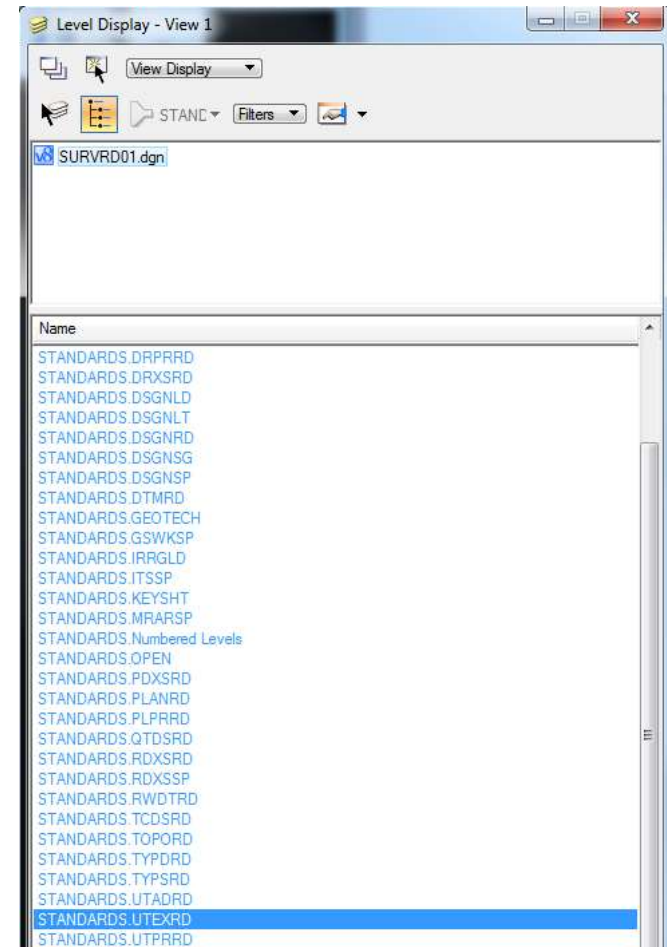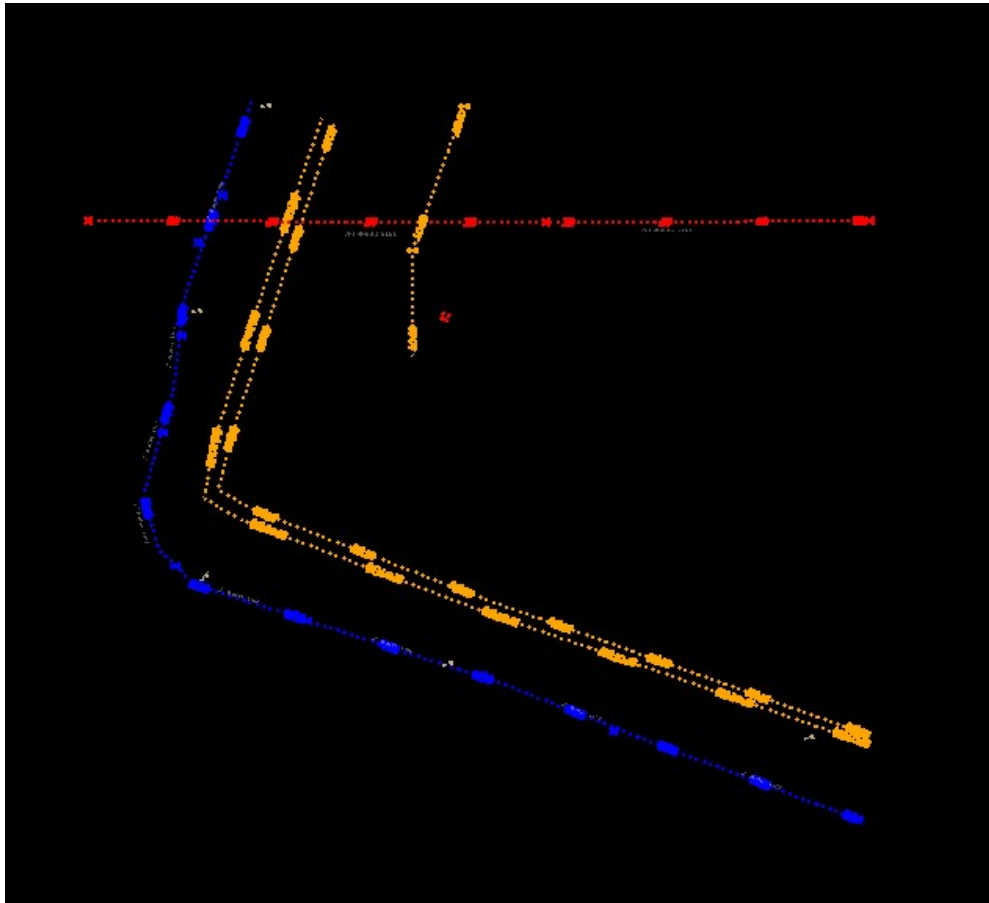
CREATING LEGACY DELIVERABLES

- The SURVRD.dgn is a complete survey that can be used as-is by design for 3D Modeling however, you may be asked by design to deliver the legacy files for criteria based design.

- If legacy files are required it is recommended to not include the field book (survey database).

SURVRD GRAPHICS FILE

- Bentley recommends using the Export to DGN Graphics functionality to create a copy of the Survey without the field book.

- This option will not only remove the field book but it will strip all points and chains down to graphic elements.

- This option saves the visible graphics out to a file so make sure survey data is visible (checked).
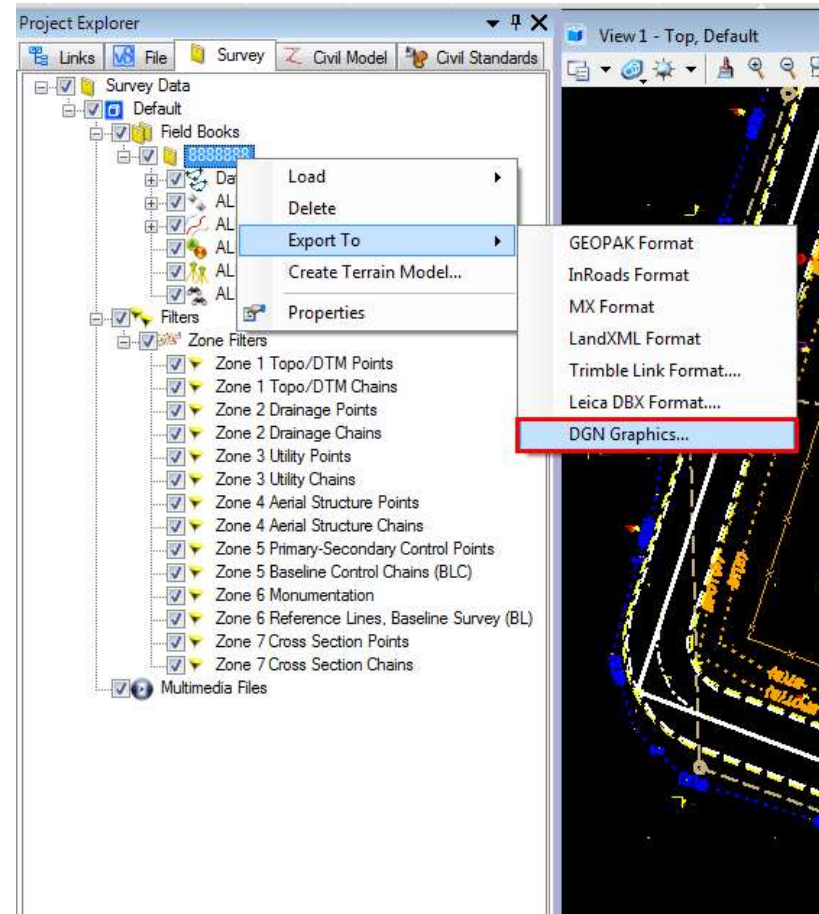
SURVRD GRAPHICS FILE
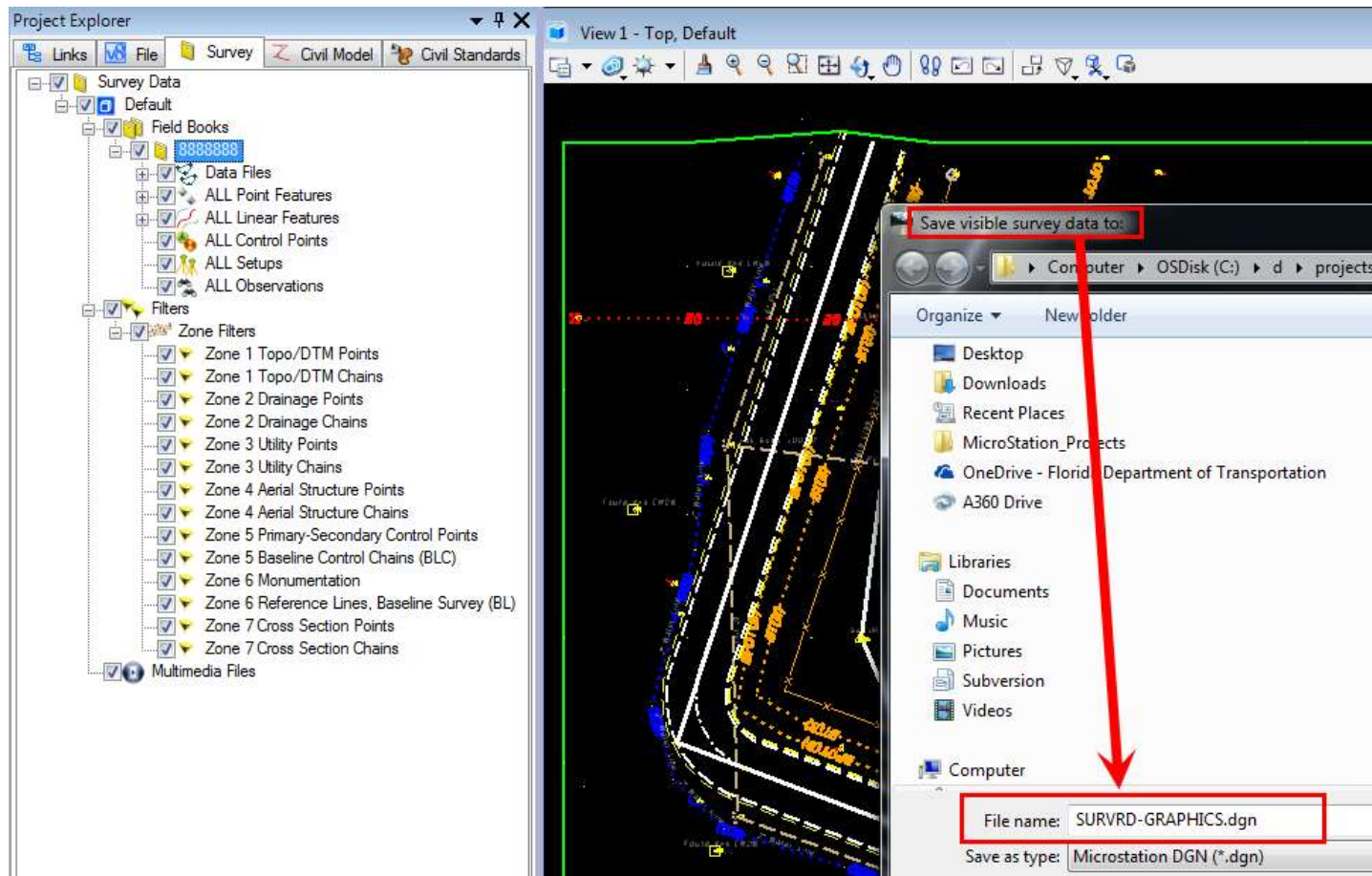
SURVRD GRAPHICS FILE

- The SURVRD.dgn "Graphics File" was originally intended for Design to use in Corridor Modeling until Bentley accommodated the use of a DGN that includes the Field Book.
  - ➢ The SURVRD.dgn "Graphics File" retains civil models such as Horizontal Geometry (alignments) and Terrain Models
  - ➢ All Point Features are converted to graphic cells and will retain their rotation
  - ➢ All Point and Linear Feature annotations will be converted to graphic text if not turned off
  - ➢ The SURVRD.dgn "Graphics File" can still be used by Design for 3D Modeling projects

CREATING LEGACY DELIVERABLES
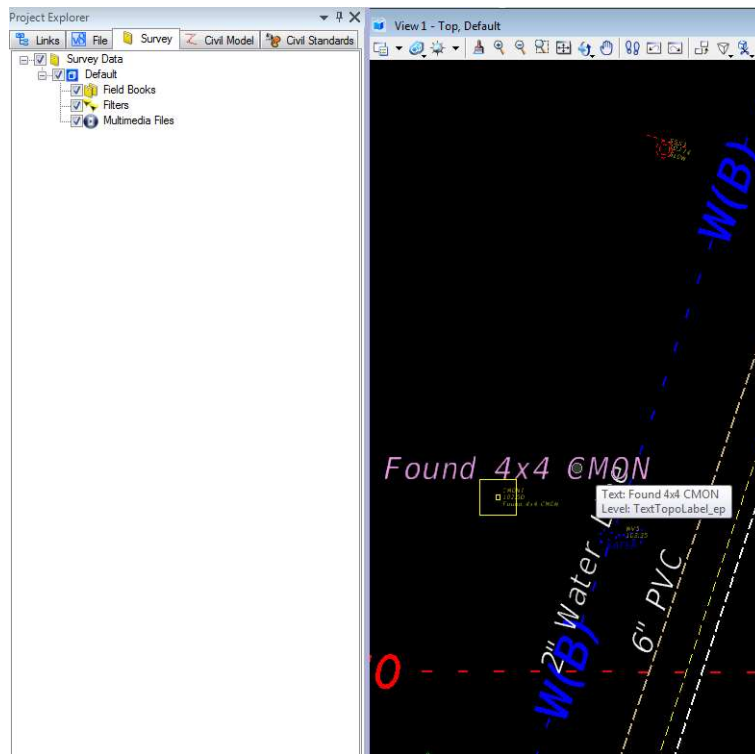
- After the Export To DGN Graphics the text is no longer associated with a feature.

- Point features become cells however, they will stay rotated.

- The Terrain Models and Alignments remains intact.

CREATING LEGACY DELIVERABLES

- The DGN Graphics version of the SURVRD file is not normally a deliverable however, it can be used to create the Legacy Deliverables.

- Use the Level Display filters to display the standard file elements.
  - ➢ ALGNRD
  - ➢ DREXRD
  - ➢ GDTMRD
  - ➢ TOPORD
  - ➢ UTEXRD (UTVHRD is 3D version)

CREATING LEGACY DELIVERABLES

1. In the SURVRD graphics DGN file select the TOPORD Standard Level Display filter.

2. Put a fence around all elements.

3. Type "fence file" into the key-in dialogue and press enter.

4. Save the TOPORD01.dgn and click on the view. Note that a file will not be created unless you **click on the view after the fence file is saved**.
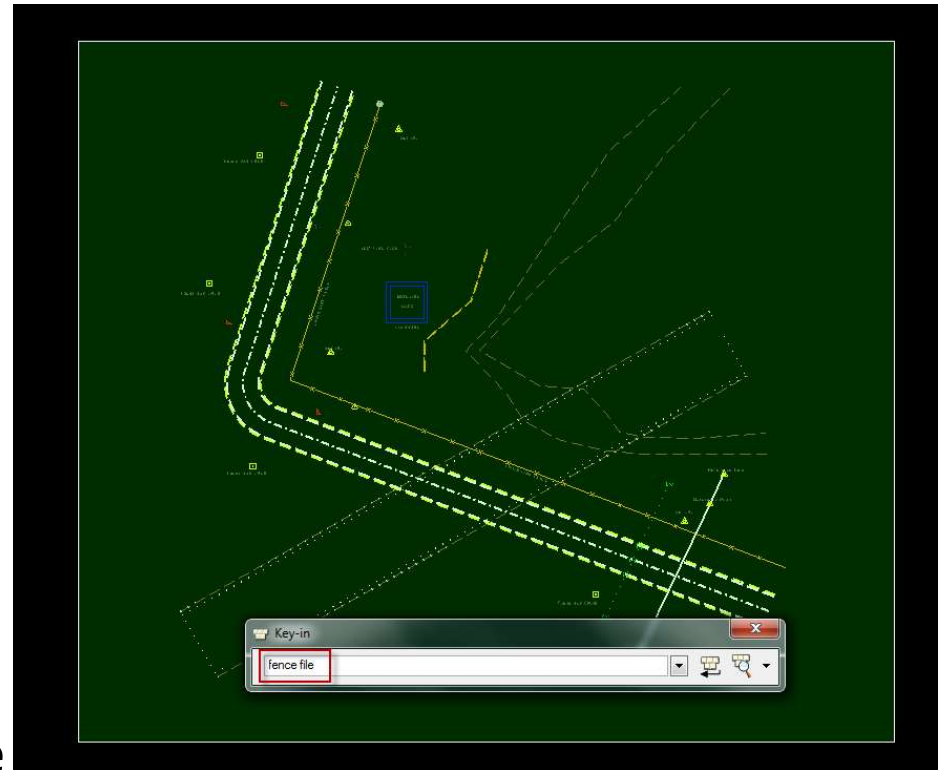
CREATE TOPORD01.dgn 2D FILE DELIVERY IF NEEDED

- Most other Legacy Deliverables are created in the same way.

- Note that these are still 3D files. If a 2D version is desired, create a new 2D file from FDOT seed, reference in the TOPORD-3D file and use "Merge into Master".

- WARNING: using the export to 2D file functionality will crash the 2D file if a Civil Model is included.
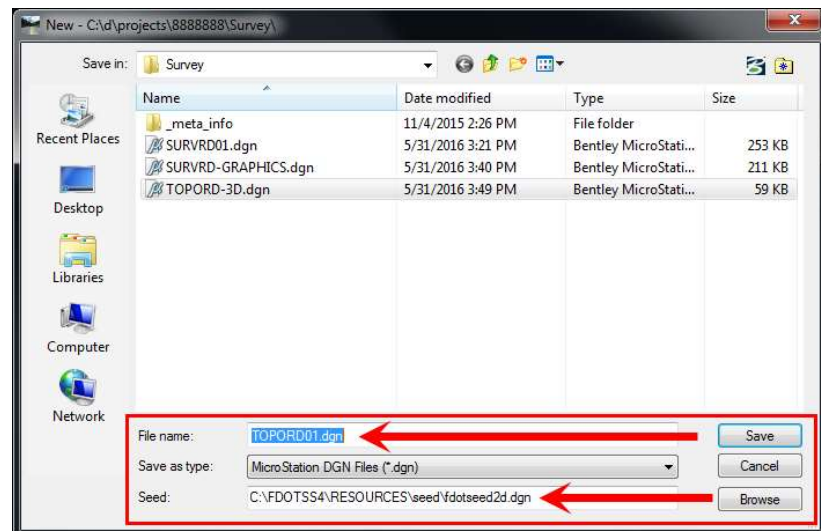
MERGE INTO MASTER

- Note that for FDOTSS4 MR2 and above a configuration variable has been added to allow the Merge into Master command in the reference file dialogue box to transport the Field Book **ONLY IF** the user is in the <u>Right of Way configuration</u>.

- ROADWAY CONFIGURATION
  - ➤ Merge Into Master does not transport the Field Book.

- RIGHT OF WAY CONFIGURATION
  - ✓ Merge Into Master transports the Field Book to the Active File.

RETAIN SURVEY ON COPY CONFIGURATION VARIABLE

- The configuration variable used to transport a field book and data with Merge into Master or a copy commands is:

  ➢ **CIVIL_SURVEY_RETAIN_SURVEY_ON_COPY=1**

- If the Field Book is not wanted make the value of the configuration variable = 0

  ➢ **CIVIL_SURVEY_RETAIN_SURVEY_ON_COPY=0**

RETAIN SURVEY ON COPY CONFIGURATION VARIABLE

- This retain survey configuration variable can be set manually in the Workspace>Configuration variables if needed in the Roadway configuration
    - ➢ Note: if manually added as below, it will override the automatic setting in the Right of Way configuration
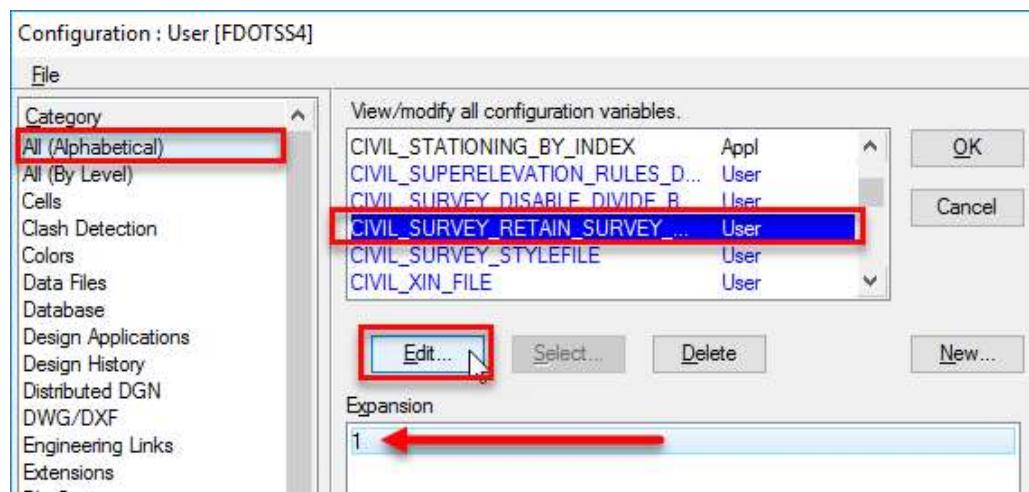
MERGE INTO MASTER

- NOTE: When Merge Into Master is used to transport the field book, all visualized Point and Linear Feature annotation (text) will be "copied" to the active file as unassociated text. This will effectively double your text for all Point and Linear features.

- It is recommended that you turn "off" all annotations first.

CREATING LEGACY GDTMRD

- WARNING: The legacy GDTMRD mesh created from a CAiCE CDG that Design uses to create a TIN file is not a "Terrain Model" and therefore will not be created within FDOTSS4

- However, a file containing only a Terrain Model should be acceptable as a GDTMRD.dgn. Design can easily create a TIN from a Terrain Model

CREATING LEGACY GDTMRD

- An alternative to providing a GDTMRD.dgn with a Terrain Model or Mesh would be to deliver the TIN file itself

- Right click on the Terrain Model in the view or in the Project Explorer under the Civil Model tab to export a "GEOPAK TIN"

PREPARE FOR RIGHT OF WAY PRODUCTS AND DELIVERABLES

Creating a Right of Way version of the SURVRD will be helpful in preparing for Right of Way products

1. Create a 3D SURVRW file by using "Save <u>A</u>s..."
   - Note that the SURVRW file is not a deliverable but will have right click functionality for Surveyors

2. Change to the Right of Way Configuration
   - This will attach the ROW_Display feature definitions

3. Load Survey Labels and Redraw
   - This will redraw all features with the ROW_Display feature table

SURVRW.DGN FILE

- Note that when switching to the Right of Way configuration, the right of way survey features are automatically attached.

- Using "Survey Redraw" will re-visualize features.
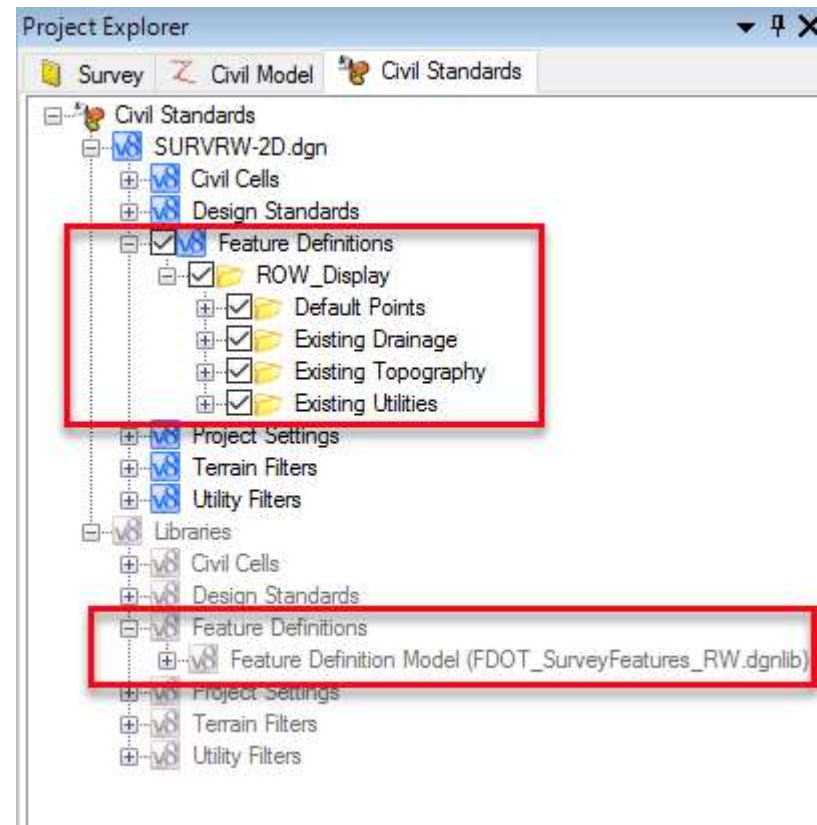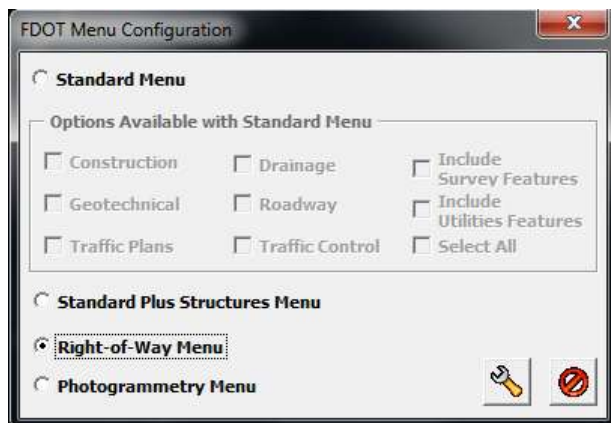
SURVRW.DGN FILE

- WARNING: When switching to the Right of Way configuration the feature definitions in the Civil Standards may continue to show the Survey_Display definitions instead of the ROW_Display definitions even though the ROW definitions are being used and visualized by the software correctly. Eventually the Civil Standards will show the correct definitions attached but the file may need to be closed and reopened repeatedly before that happens.

CREATING RIGHT OF WAY DELIVERABLES

- The SURVRW.dgn file is not a deliverable. However, it has the Field Books, Monumentation and all other points and linear features from the field survey, along with right-click survey functionality.

- The SURVRW can serve as the bases for producing Right of Way Mapping products such as the Control Survey, Right of Way master DGN file, parcel sketches, TIITF sketches or the TOPORW file by using level filters.

CREATING RIGHT OF WAY DELIVERABLES
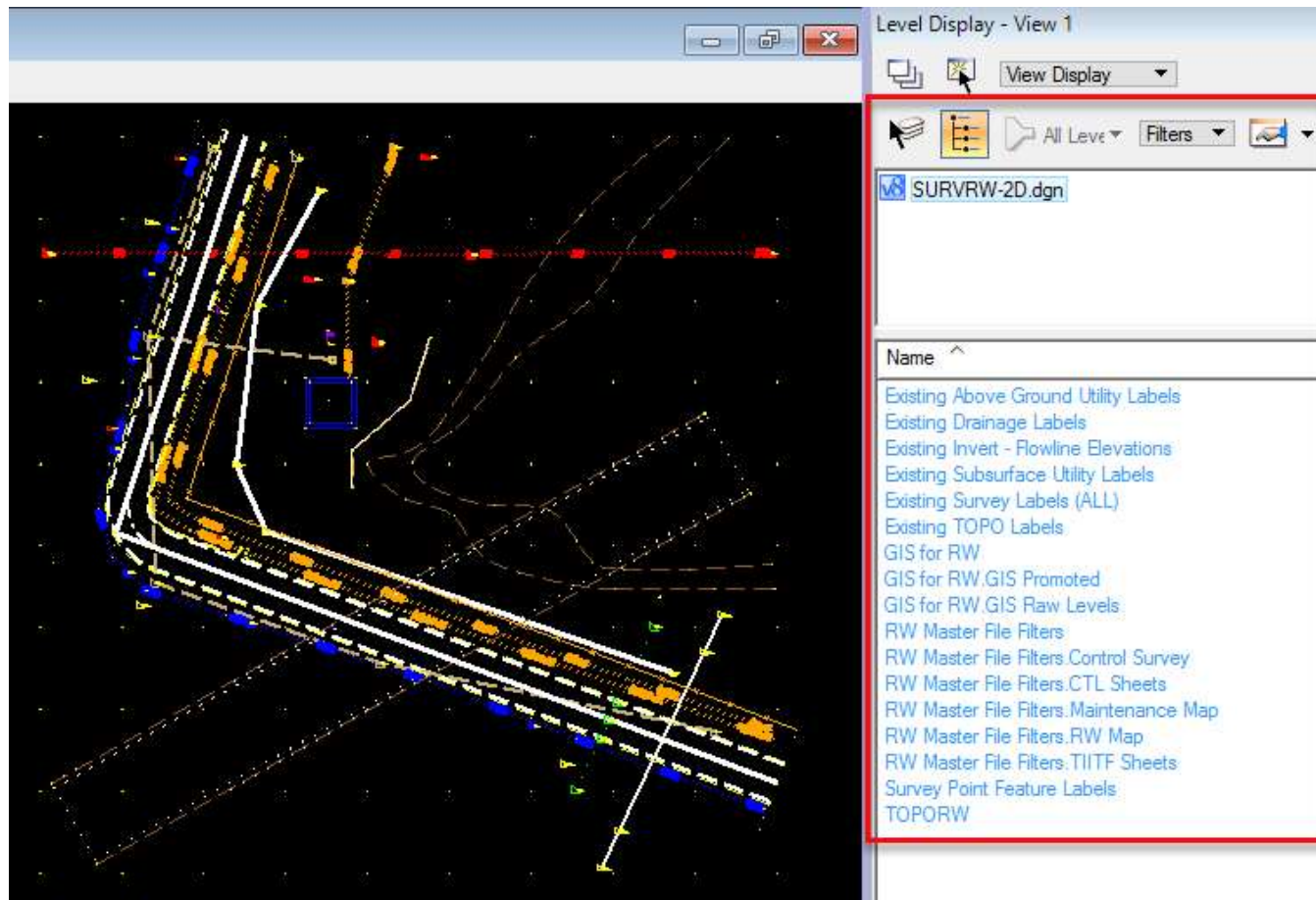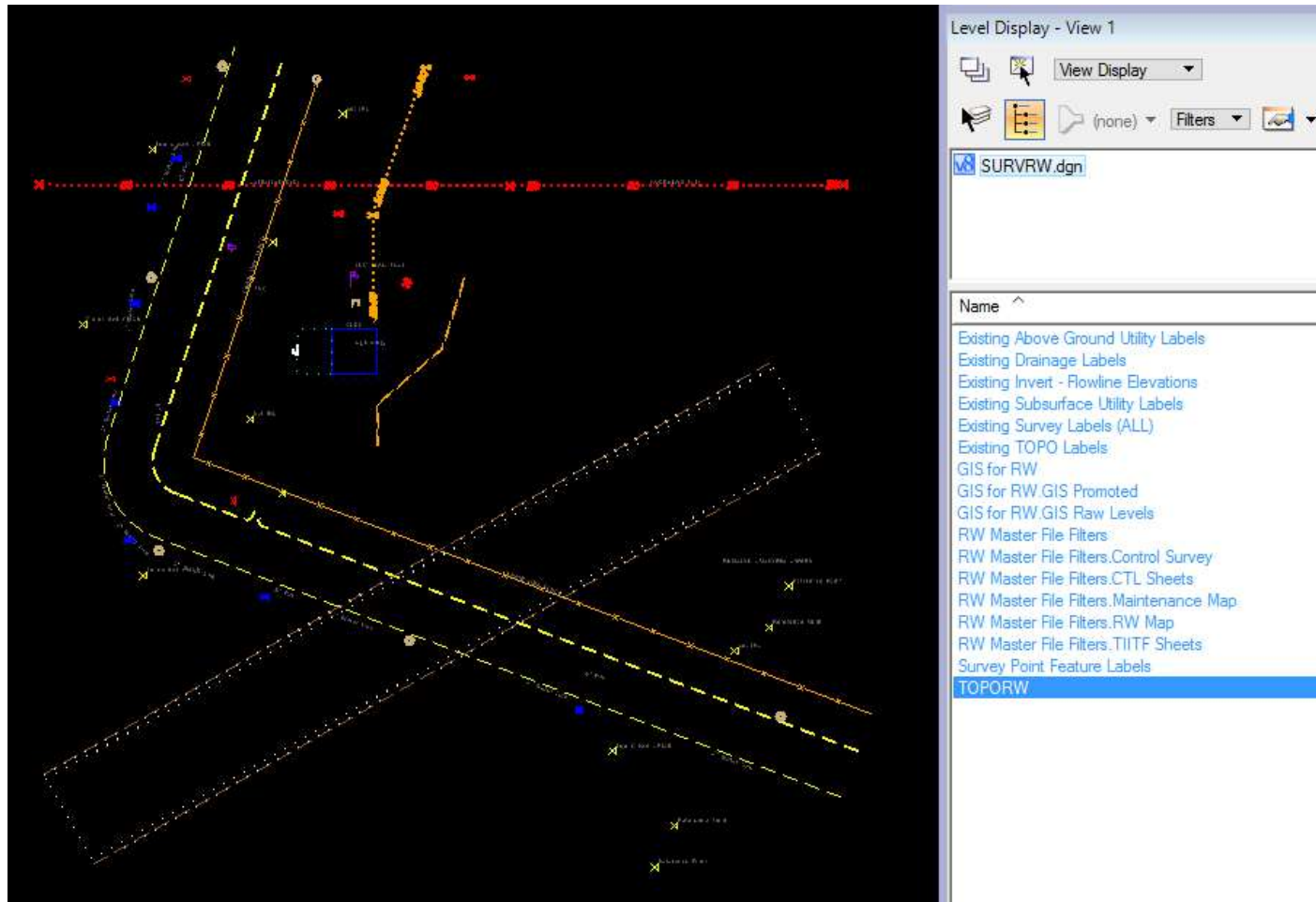
CREATING THE TOPORW FILE

- The TOPORW file is used as a reference file to represent topography in Right of Way Mapping products.

- Export the SURVRW file to DGN graphics as was done with creating legacy Design Survey products.

- NOTE: Only what is checked **on** in the Field Book/Civil Standards will export to graphics.
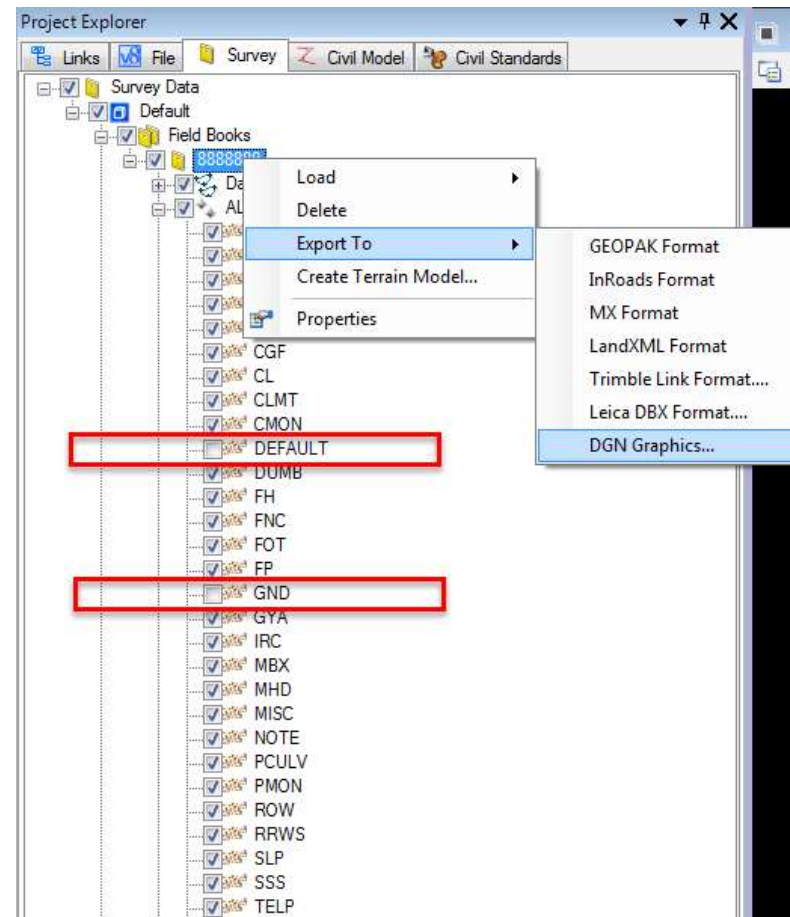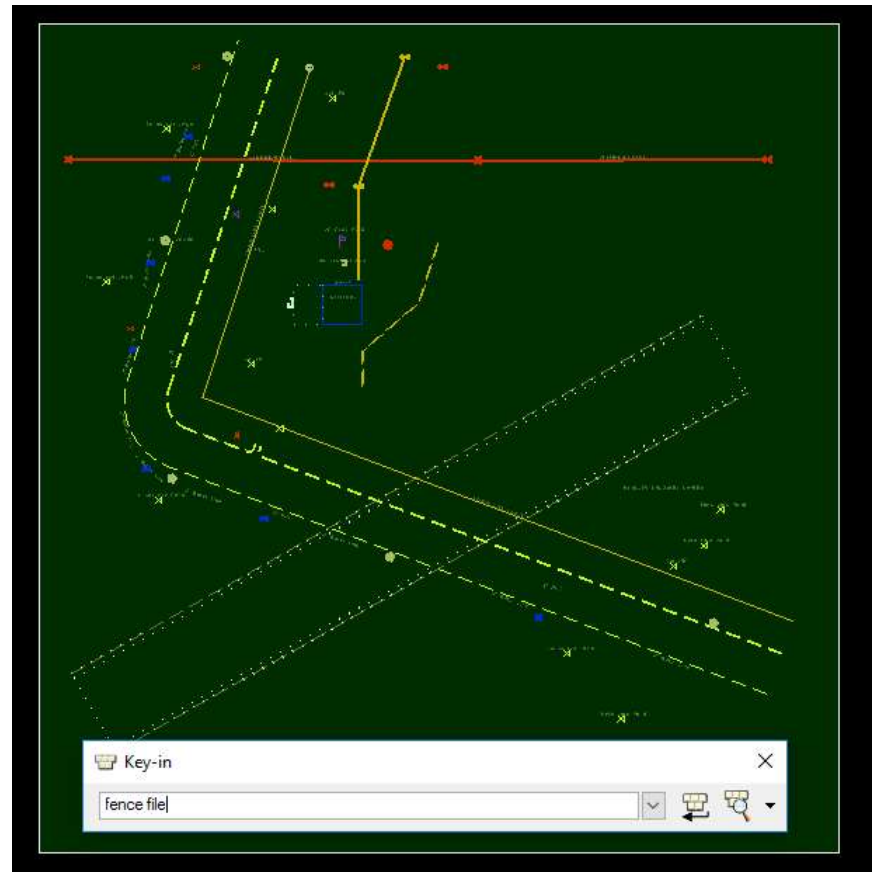
CREATING THE TOPORW FILE
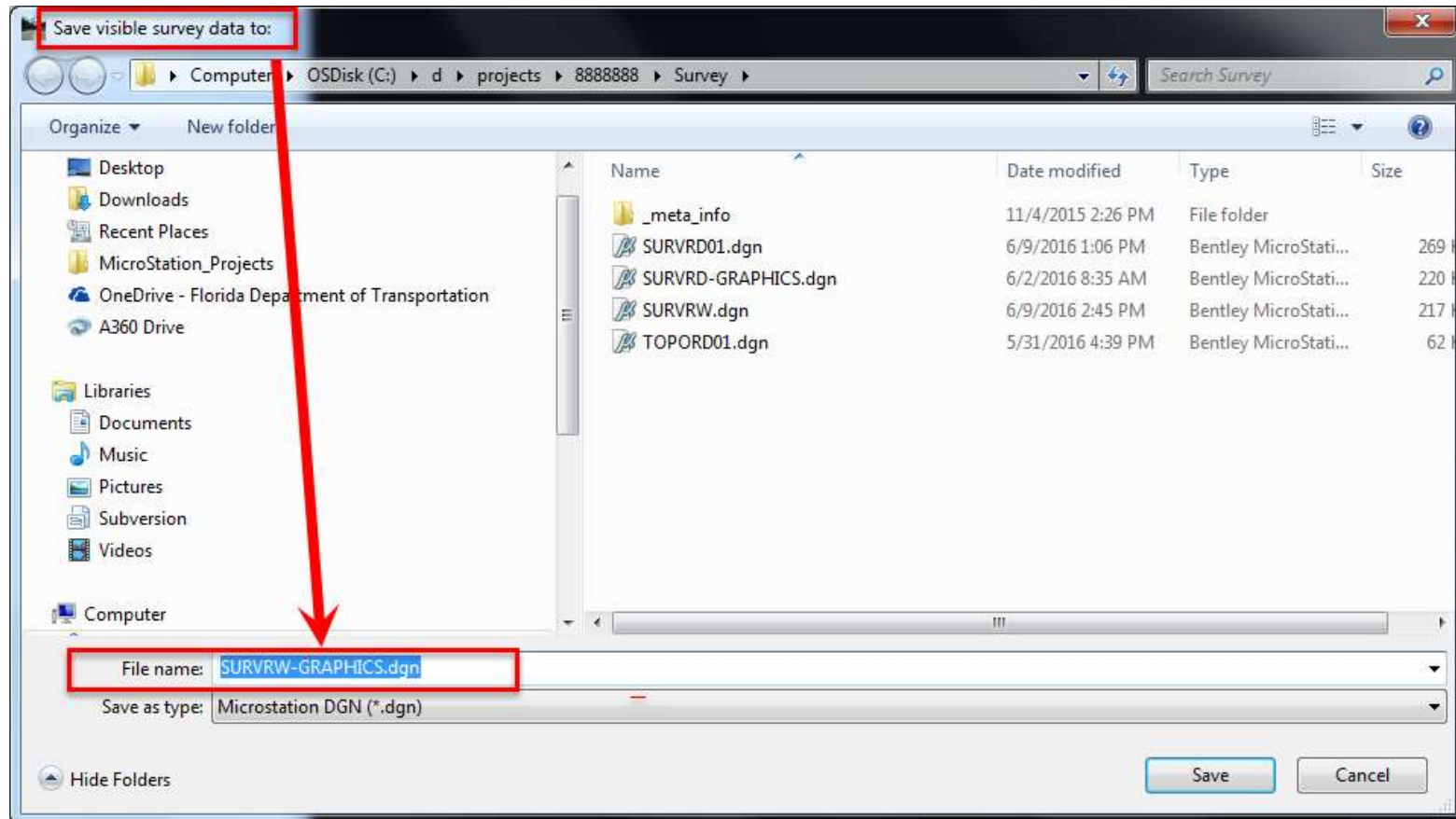
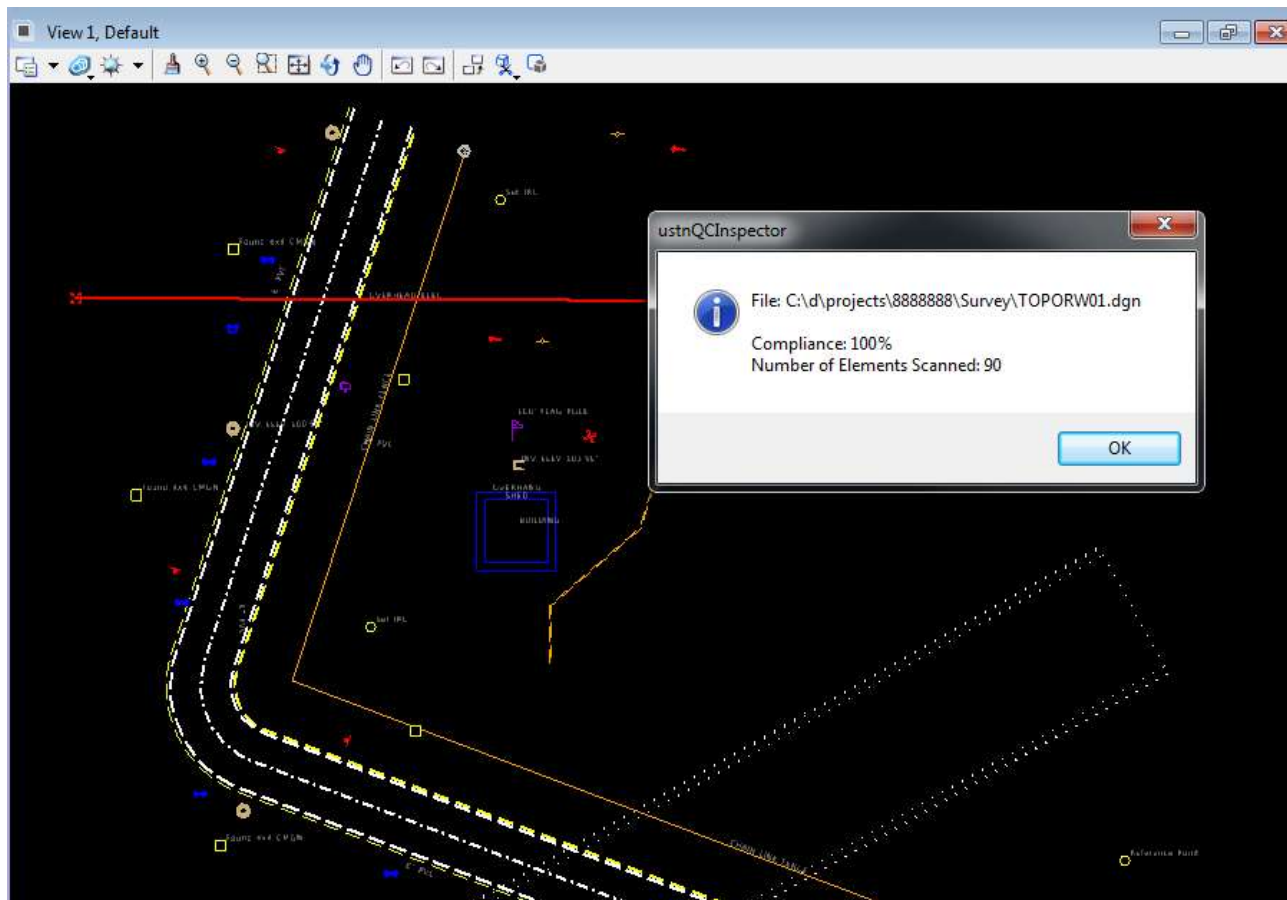# VISUALIZE THE DESIRED TOPORW ELEMENTS

CREATE TOPORW.DGN

1. The TOPORW file can be created exactly the same as the TOPORD described above

2. Open a 2D Right of Way file, reference and use the "Merge to Master" to create a 2D version

THE TOPORW RULE FILE IS NOW OPEN, ALL ELEMENTS PASS

Florida Department of Transportation

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FDOTSS4 DESIGN SURVEY WORKFLOW

DIRECT QUESTIONS TO:

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FDOTSS4 MR3 (Version 01.03.01)