

South Carolina Department of Transportation

ROADWAY CADD MANUAL

Updated November 2019

Design Automation Office

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Disclaimer

The SCDOT makes this Roadway Cadd Manual available to the consulting community as a reference guide and for information only. This manual does not replace or supersede design standards, design manuals, or design policy that governs the development of roadway construction plans.

This manual is a work in progress subject to new technologies and processes, bug fixes, enhancements, etc. There is no one way to complete a set of plans in MicroStation and Geopak. The methods outlined here may be “preference” based and alternative solutions may exist. TBD (to be determined) in the index indicates that we are planning to develop additional documentation for these items at a later date.

Some processes are for internal SCDOT employees only and are shared to consultants as a reference or for information only. File paths may only work for internal SCDOT employees. File access to lidar tiles and aerial images may be available internally to SCDOT employees where a consultant may need to access NOAA, SCDNR, and county websites to obtain the same files.

SCDOT has adopted MicroStation and GEOPAK as its standard drafting and design software packages. The standards referenced in this manual have been developed and tested using the software versions listed on this page: <https://www.scdot.org/business/CADD-Design.aspx>

If you would like to contribute additional information to share with the Cadd community or any corrections that you may find, please contact us. We are always open-minded to new methods and willing to share information that will benefit SCDOT plan development.

Thank you!

Trademarks

MicroStation is a registered trademark of Bentley Systems, Incorporated. GEOPAK is a registered trademark of GEOPAK Corporation, now a wholly owned subsidiary of Bentley Systems, Incorporated. © 2012 Bentley Systems, Incorporated.

Other trade names, computer protocols, and file formats mentioned in this manual are the trademarks of their respective owners. In no event will the appearance of any graphic, description of any graphic, picture, screen display, or any other method of conveying meaning be considered to impair the rights of the respective owners.

MicroStation Introduction

Workspace

SCDOT created custom workspaces to direct users to the most up to date standards and design resources necessary to complete a plan set. This includes cell libraries, line style and font resource files, configuration files, reference attachments, and Geopak preferences by discipline (Roadway, Bridge, Traffic). To access the workspace, double click on the MicroStation icon and select the correct workspace for your design environment. (Roadway design workspace is depicted below.)



By default, the Consultant Workspace File Location is as follows: (can be customized for network)
C:\SCDOT\SCDOT_Design\

SCDOT Workspace File Location:

\\nts\hq\CaddStandards\SCDOT-Bentley\Standards\SCDOT_Design\

Seed Files

A seed file is a template file that contains default settings and attributes such as: the global origin, color table, cell library attachments, working units, views, etc. for all newly created design files. SCDOT has both a seed2d.dgn and a seed3d.dgn file for working in both plan and 3d dimensions. There is also a motif.dgn that is used to generate plan and profile sheets. (Topo, profiles, cross sections will be in 2d design files. DTMs, contours, and volumes will be in 3d design files.)

To create a new MicroStation file, select the white paper icon (New File) in the upper right portion of the File Open dialog. In the lower portion of the dialog, browse to select your seed2d.dgn file as the template. Enter a file name and press **Save**.

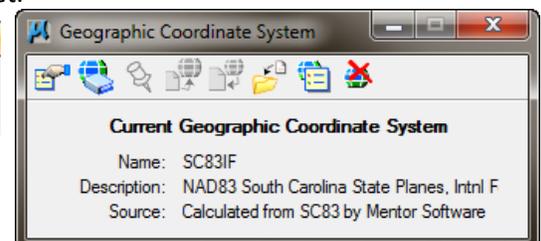


Geographic Coordinate System

SCDOT seed files are set to the correct coordinate system for South Carolina. To verify this information, select **Tools > Geographic > Select Geographic Coordinate System (GCS)** from the top menu bar. The default is SC831F – NAD83 South Carolina State Planes, International Feet.



To set the GCS to SC831F, press the “From Library” button (2nd icon) to expand the folders **Library > Projected > North America > United States of America > South Carolina > SC831F**. Right click on SC831F to **Add to Favorites**. With **SC831F** highlighted, press **OK** to accept.



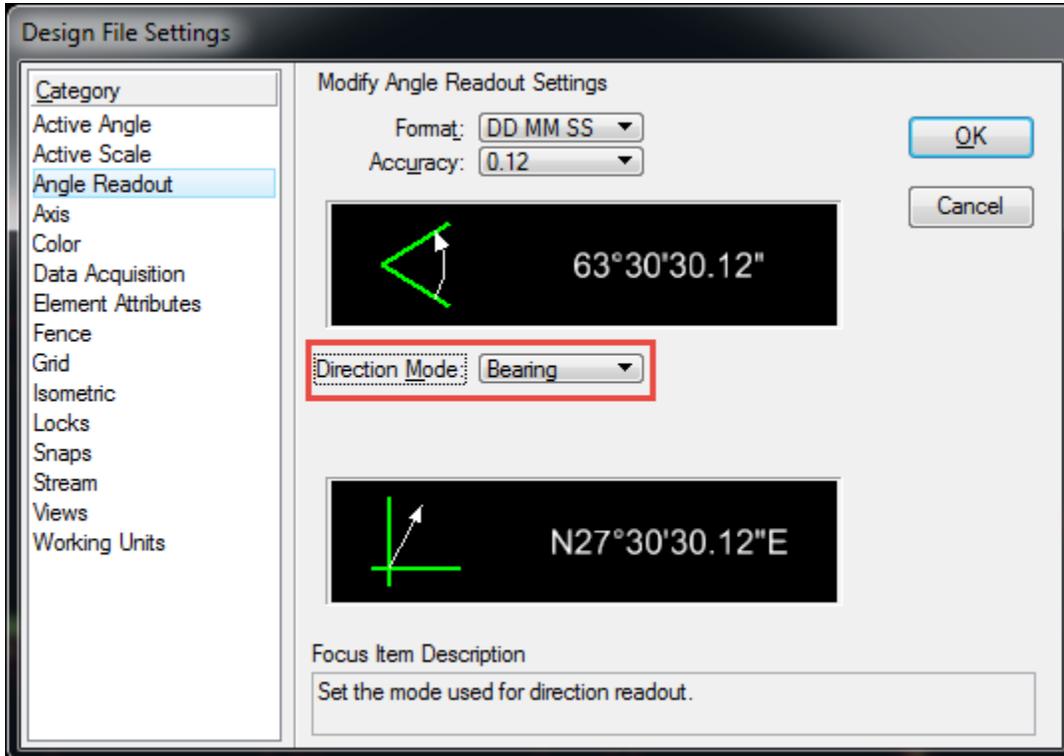
Color Table

The SCDOT Color Table can be accessed from **Settings > Color Table**. This file is contained in the Workspace folder **MSfiles > data > SCDOT_color.tbl**.

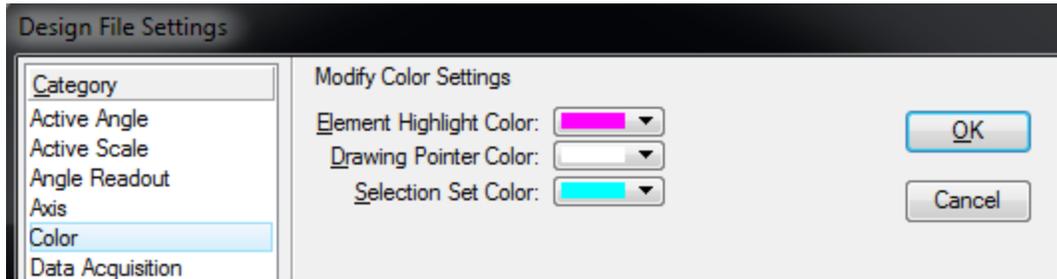


Design File Settings

The Design File Settings allow access to angle readout, highlight colors, locks, snaps, and working units, etc. Select **Settings > Design File** and highlight Angle Readout. Set the Direction Mode to Bearing.



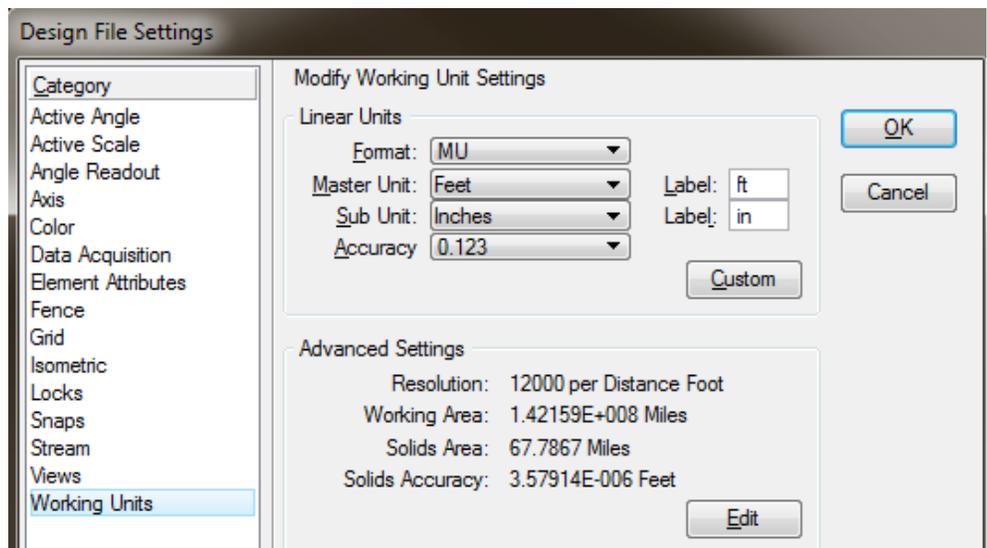
Highlight Color. The Element Highlight and Selection Set Color are set to Bright Pink and Bright Aqua by default. This will help you visualize elements when you are zoomed out.



Highlight Working Units. Verify that the Master Units are set to Feet, the sub unit is set to Inches and the resolution is set to 12000 per Distance Foot.

Working resolution defines how many units of resolution are going to be used to make up a specific unit of measure. The resolution setting defines the worst-case accuracy for the design environment, which occurs at the very outer limits of the (very large)working area/volume.

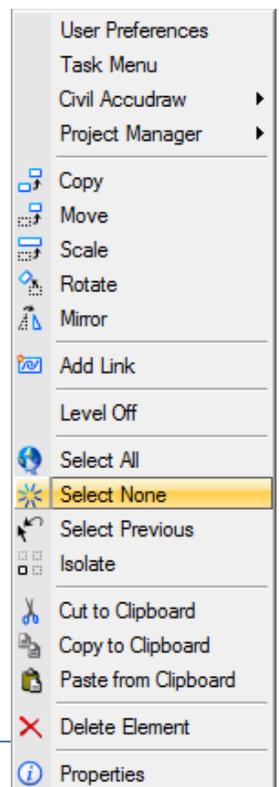
Master Unit: Feet
Sub Unit: Inches



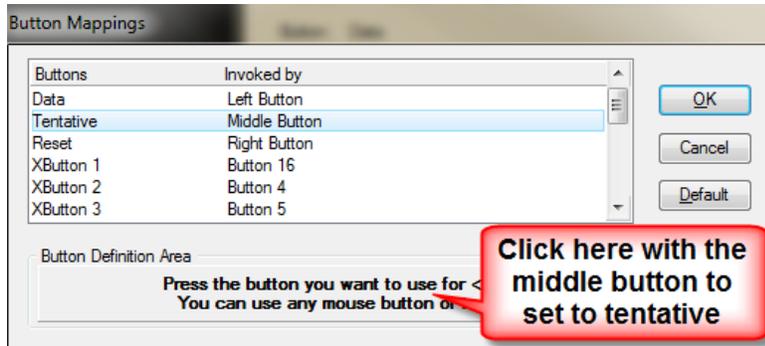
Resolution: There are 12 inches per 1 foot (12 sub units per 1 master unit) and there are 1000 Positional units per Sub Unit, thus $12 \times 1000 = 12,000$ parts per foot. Press **OK** to close the dialog.

Button Assignments

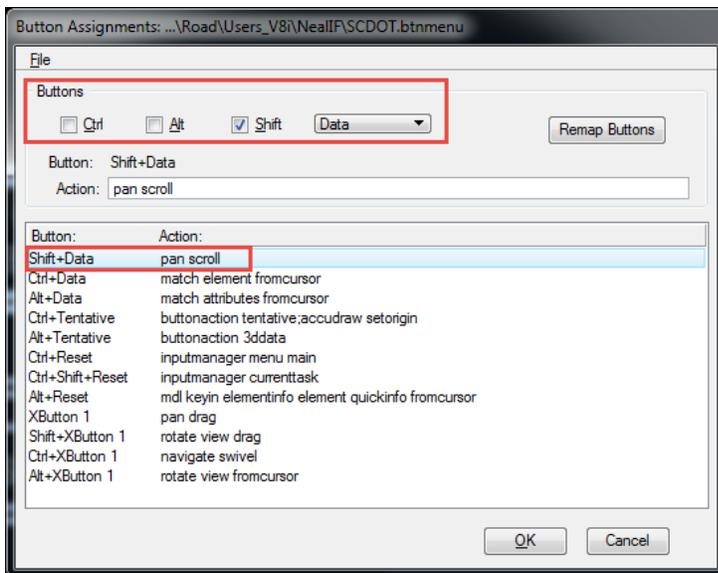
The mouse is used in MicroStation to data point, tentative snap, and reset. Pressing and holding the right mouse button in the design file brings an additional pop-up menu with selections.



To set the Button Assignments, select **Workspace > Button Assignments**. Press the **Remap Buttons** button. In the center of the dialog, highlight the **Tentative - Middle Button** row. Hover the mouse over the Button Definition Area and press the middle button on the mouse to set to tentative. Press **OK** twice to accept these settings and to close the dialog.



There are additional button assignments that can be set on the previous menu by toggling on/off the Ctrl/Alt/Shift plus the mouse click. (Example: Shift + Data allows the user to pan scroll in the design file.)

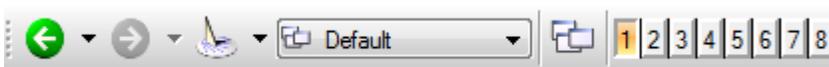


Viewing Tools

The View Control Toolbox allows you to navigate and manipulate views in the active design file. Tools available include: View Attributes, View Display Mode, Adjust View Brightness, Update View, Zoom In, Zoom Out, Window Area, Fit View, Rotate View, Pan, View Previous, View Next, Copy View, Clip Volume, and Clip Mask as depicted below. There are additional View Control tools in a 3d design file.



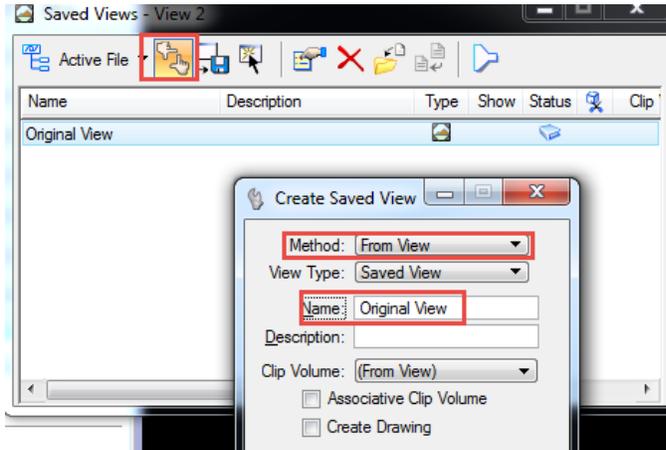
A view is a window area that allows you to set up your display preferences for the design file. MicroStation allows you to set up to eight (8) views. You can control these with the View Groups tool box in the bottom left corner.



To save the settings for a View, select **File > Save Settings**. This will retain your levels on/off, line weights on/off, etc.

You can also create Saved Views by selecting **Utilities > Saved Views**.

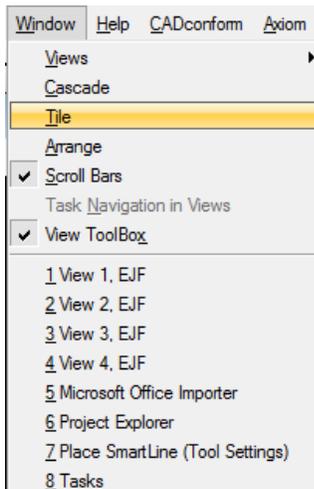
Press the two-hand icon and enter a name. If selecting by Method – From View – ensure you are zoomed all the way out. Data click in the design file to create.



Turn on or off levels as necessary, and repeat these steps for the different views required. This allows you to quickly revert back to a drawing or plotting view if levels have been turned on or off by others accessing the file.

Double click to activate a particular view from the list. Data click on the View window to apply it to any of the 8 different views. This allows you to keep all levels to be plotted in Iplot on in View 1, and to turn on/off levels in other views to not affect plotting. Iplot is defaulted to plot from View 1.

Views can be adjusted manually or by using the options under **Window** at the top of MicroStation’s menu bar. There are options to Cascade, Tile or Arrange the View windows. All of your open views and dialogs are listed in this menu. If a **dialog is missing or hidden** from view, click it in the drop down to bring it to the front.



View Attributes

The View Attributes are used to set how attributes are displayed in the design file. The Display Style allows different viewpoints to review 2d and 3d drawings such as Wireframe, Illustration, and Smooth. Most drawings are set to Wireframe.

Common attributes to review include:

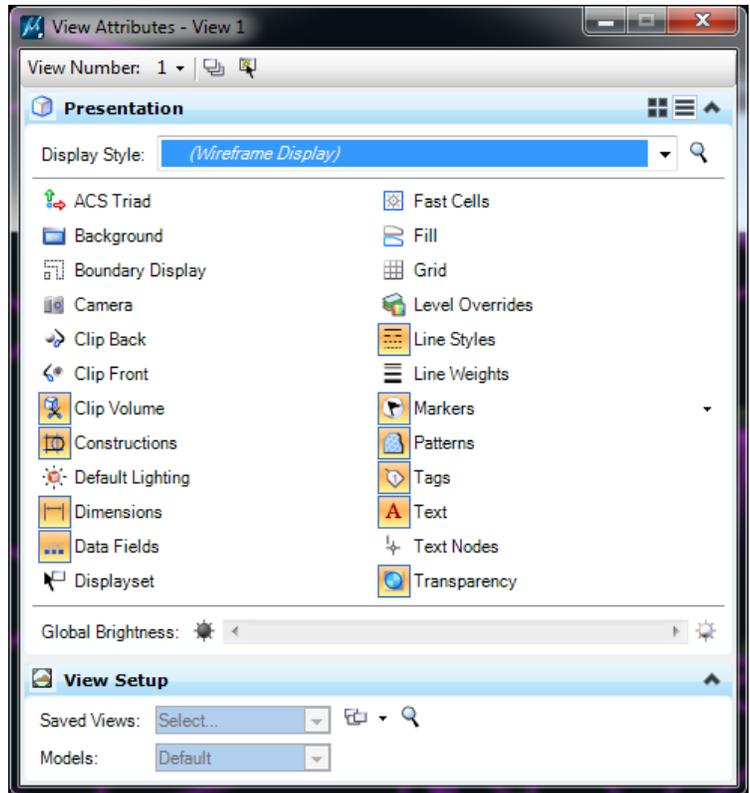
Constructions – temporary lines drawn in to a file that allow the user to snap to a certain location. These lines do not plot.

Level Overrides – everything showing up “white” in the drawing? This is most likely turned on.

Line Styles – this should always be on. If all lines are solid lines this is most likely turned off.

Line Weights – this varies between on/off. Line weights should be on to plot. However, viewing the thick lines in a drawing is difficult and is generally turned off while drafting.

Text – if placing text and nothing is showing up on placement, this is most likely turned off.



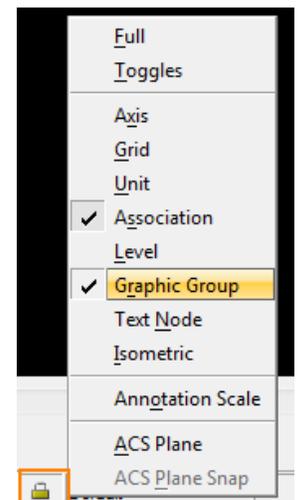
Snaps

Snap modes are utilized to connect design elements at key locations by hovering over elements and using Accusnap, or by using the tentative snap. There are snaps for Keypoint, Nearest, Midpoint, Center, Origin, Bisector, and Intersection. You can access the snap button bar in the lower right corner of the MicroStation dialog. (Tip: Double click to set a snap as active.)



Locks

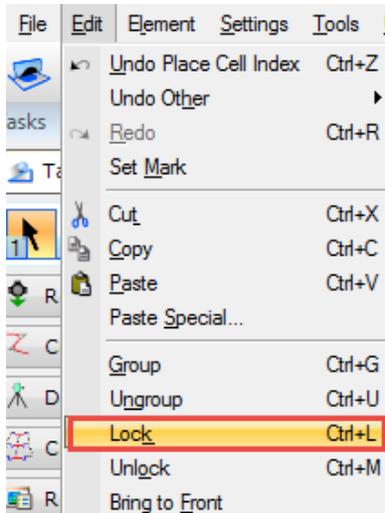
Locks can be accessed in the lower right corner of the MicroStation dialog. The most commonly used lock is the **Graphic Group** lock. It locks elements together in groups so that when turned on the elements can be moved, copied, and/or deleted as a single object. If turned off, the elements act independently of one another.





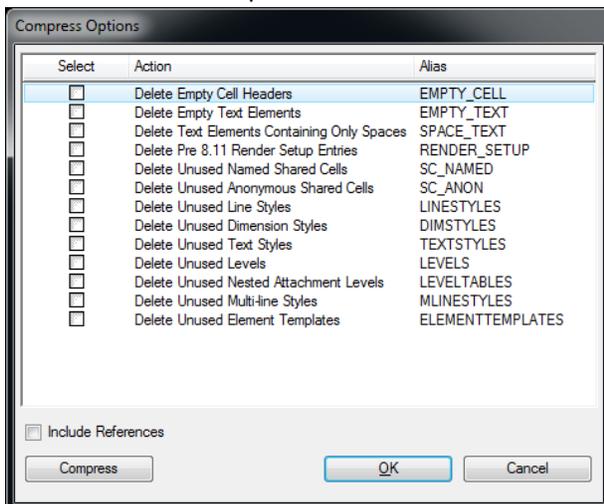
To create a group of elements, use the Element Selection tool to select the objects and then select **Edit > Group** from the top menu bar.

To lock a group of elements, use the Element Selection tool to select the objects and then select **Edit > Lock**. This is commonly used when generating existing cross sections in Geopak. Once the elements are locked, you can process additional runs of proposed cross sections and easily delete all newly modified elements without having to reprocess the existing. Select **Edit > Unlock** to unlock the elements.



File Compress and Repair

The File Compress Options is used to purge empty and unused data resources as well as deleted elements from the open DGN file. Select **File > Compress > Options**.



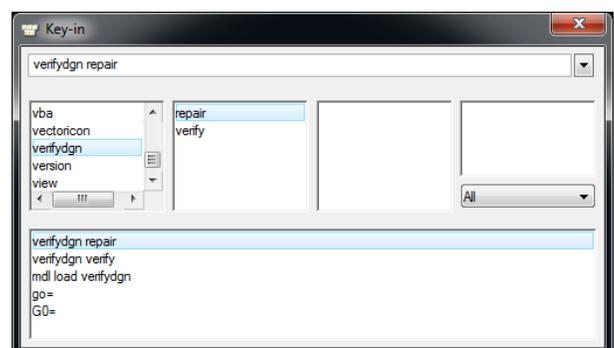
Check on all of the options and press the **Compress** button to complete the operation.

Press OK to close the dialog.

Be careful if you check on Include References as this may make modifications to other designers' files referenced to this drawing.

This series of key-ins may help repair a corrupted dgn file. Enter the following in the key-in dialog:

- mdl load verifydgn
- verifydgn verify
- verifydgn repair



Workspace Preferences

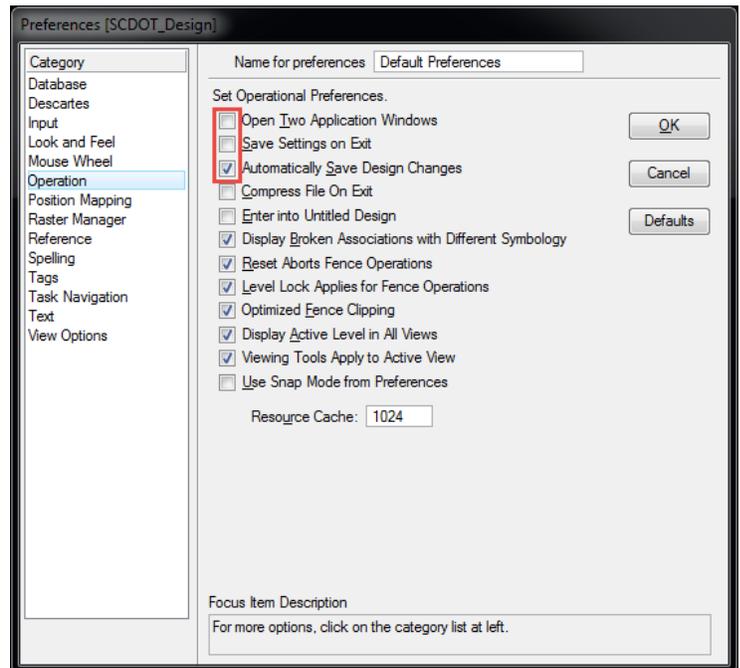
Workspace preferences are used to set user preferences that control how MicroStation operates. The following are a few common settings that SCDOT utilizes:

Workspace > Preferences > Operation

Open Two Application Windows: Uncheck. This keeps all of your toolbars and view windows in one screen that can be stretched across two monitors.

Save Settings on Exit: Check or uncheck. When checked on, if you turn levels on or off, the view settings will be saved upon exit. If this is not your file, please do not save settings on exit. The owner of the file will need to reset levels and it may affect their plotting. It is recommended to turn this off by default and use Ctrl +F or File > Save Settings to save the settings manually.

Automatically Save Design Changes: Check On. This saves changes to the design file repeatedly while work is being done to ensure you do not lose any important changes.

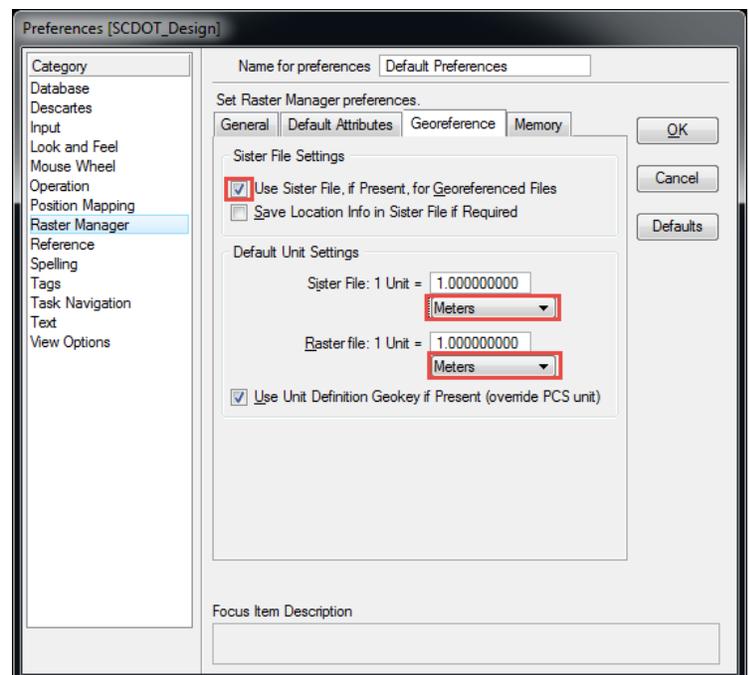


Workspace > Preferences > Raster Manager

On the Georeference tab, check on Use Sister File for tif files, topo maps, etc. that have a different Geographic Coordinate System than the SC83IF. The **sdw** (sister) file needs to be in the same folder as the tif file to provide the necessary georeferenced information.

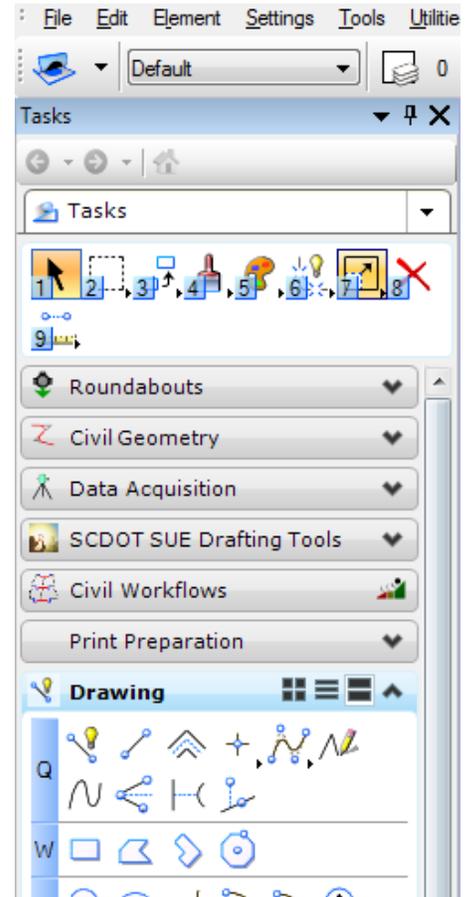
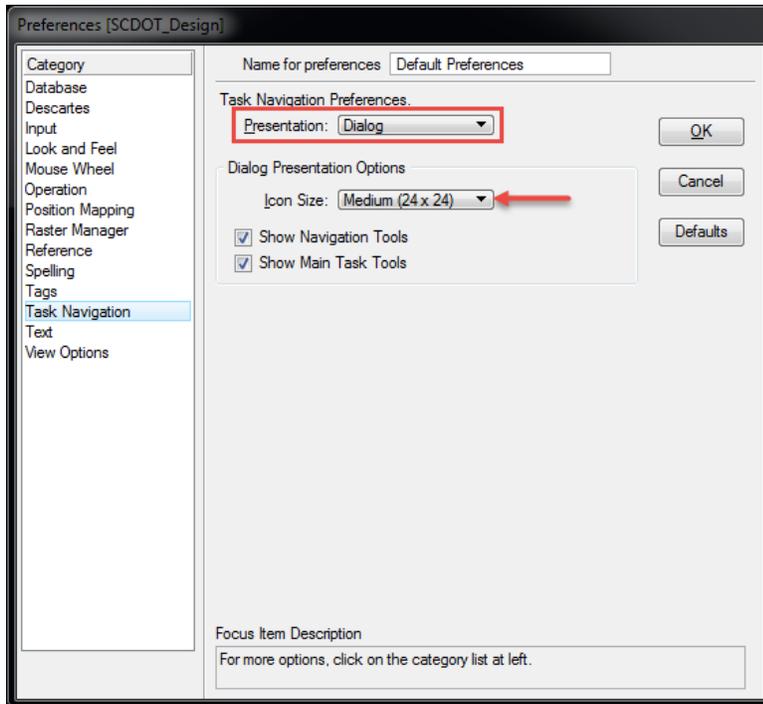
Change the Units to Meters or Feet depending on the units of the raster file. Press OK.

These settings allow you to reference raster image files with different coordinate systems without modifying your SC83IF project survey.



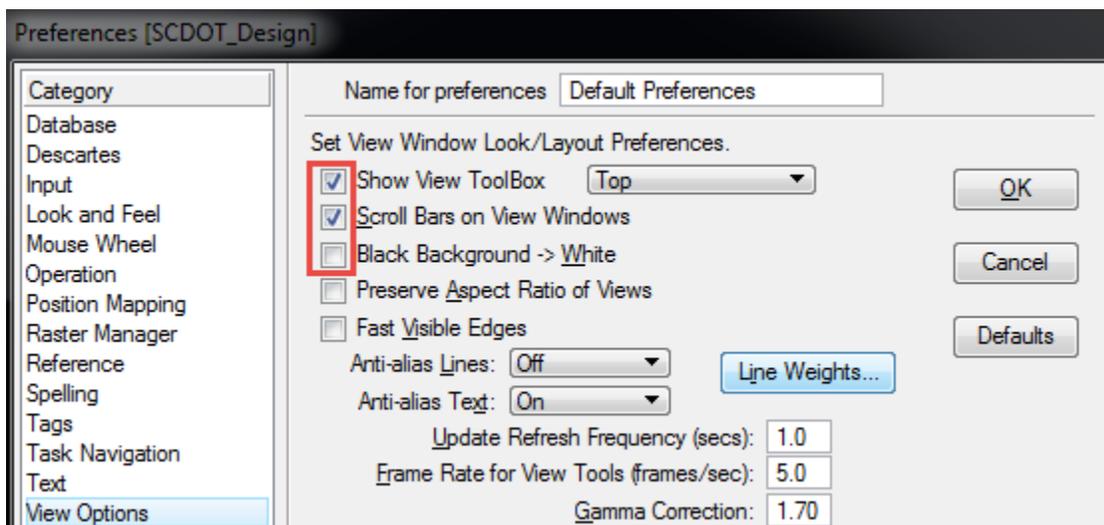
Workspace > Preferences > Task Navigation

On the Task Navigation option, set the Presentation to Dialog and select the size of icons. Press OK to accept. This option provides the Tasks and Main toolbars on the left in MicroStation.



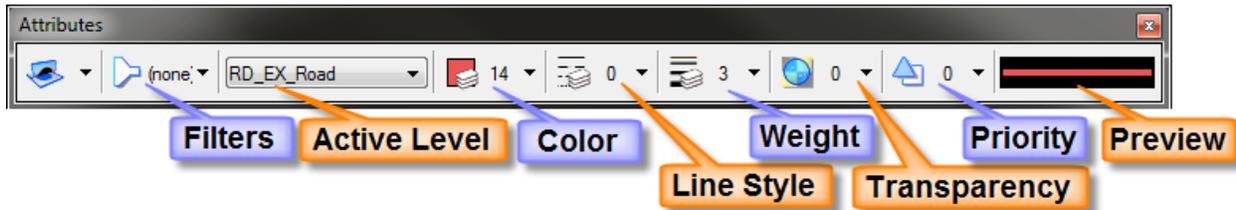
Workspace > Preferences > View Options

On the View Options, check on Show View ToolBox (Top/Bottom) and check on Scroll Bars on View Windows. Additional options on this menu allow you to toggle on the Black or White Background. Press OK to accept the modifications.



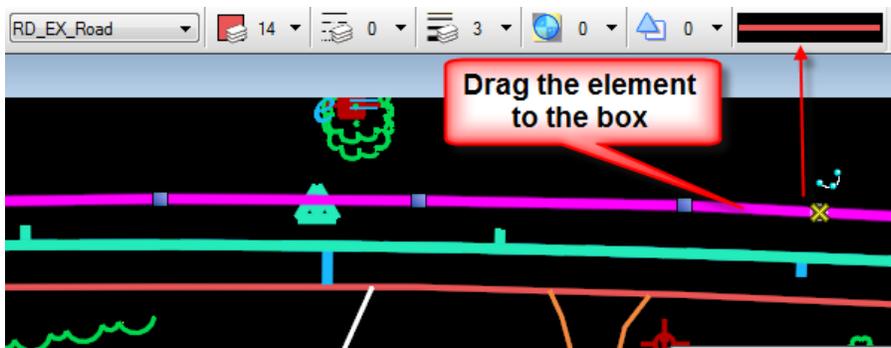
Element Attributes

Element Attributes are the settings for level, color, style, and weight for the drawn elements in your MicroStation design file.



SCDOT projects utilize Level Names for each category of design elements like RD_EX – existing design elements, RD_PD – proposed design elements, RD_XS – cross section design elements, etc. See the Primary Tools Section below for additional information on Level Names.

To quickly match symbology, with the Element Select tool active, left mouse click on an element and hold and drag into the Symbology Preview window. The new settings will change for the Level Name, Line Weight, Color, and Line Style.

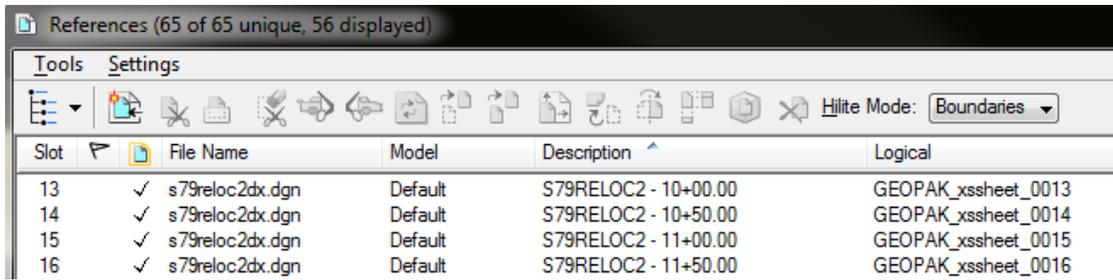


The Primary Tool bar contains some of the most important buttons that you will use in MicroStation. The Models, References, Raster Manager, Point Clouds, Saved Views, Level Manager, Level Display, Element Information, Items, Markups, Project Explorer, AccuDraw, Key-in, and Popset buttons are all included on this tool bar.

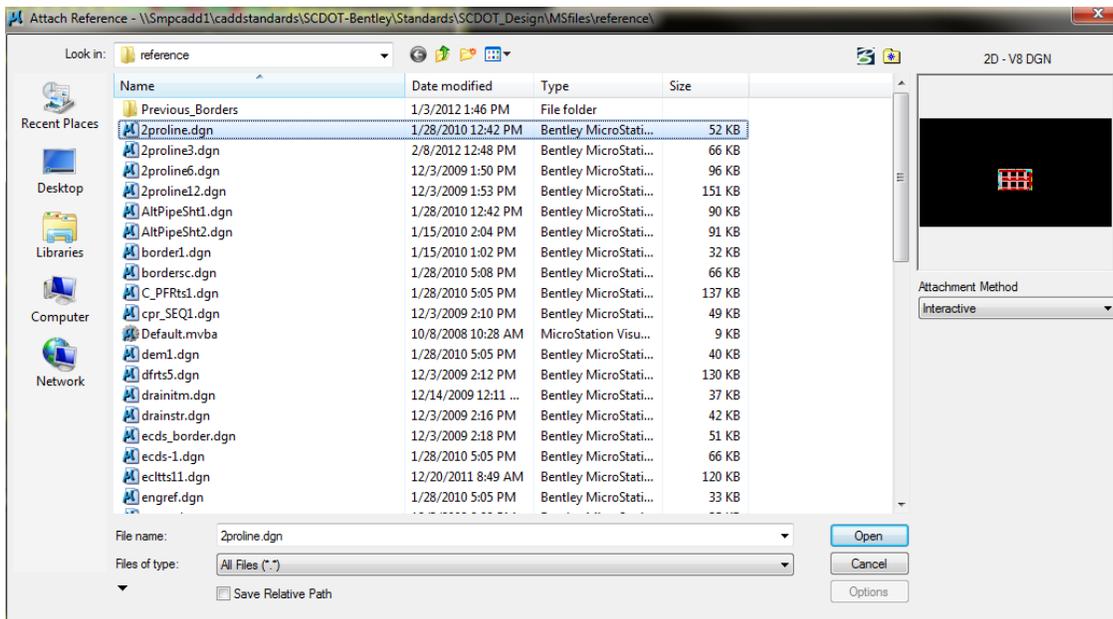


Reference Files

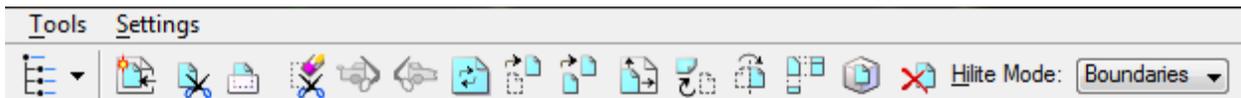
Reference files are design files that can be attached to the active design file. These files can be displayed, snapped, clipped and plotted, but cannot be modified. Reference files can be attached by selecting **File > References** from the top menu bar in a MicroStation file or by selecting the icon on the Primary Toolbar.



By selecting **Tools > Attach** on the References dialog, another dialog box will appear that will allow the user to attach a particular reference file. The dialog also allows the user to preview the file.



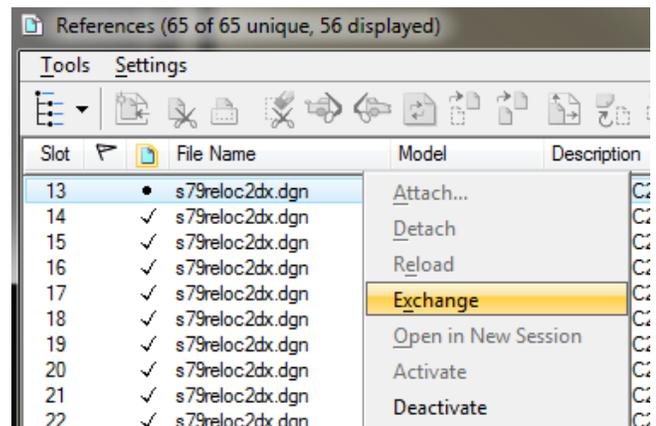
Reference files can also be accessed through the References dialog. These tools allow the user to attach, move, and manipulate the reference files.



Display, snap, and locate columns are represented by iconic buttons at the bottom of the References menu and are activated for all references by default. Use these buttons to turn features on / off for selected reference files.

The Reference dialog also allows the user to **Activate** a reference file and to **Exchange** – meaning to go to the reference attachment so that editing can take place.

Live Nesting allows attached references to have other references attached to them. The number of “nests” that you designate are similar to the number of layers of reference attachments.

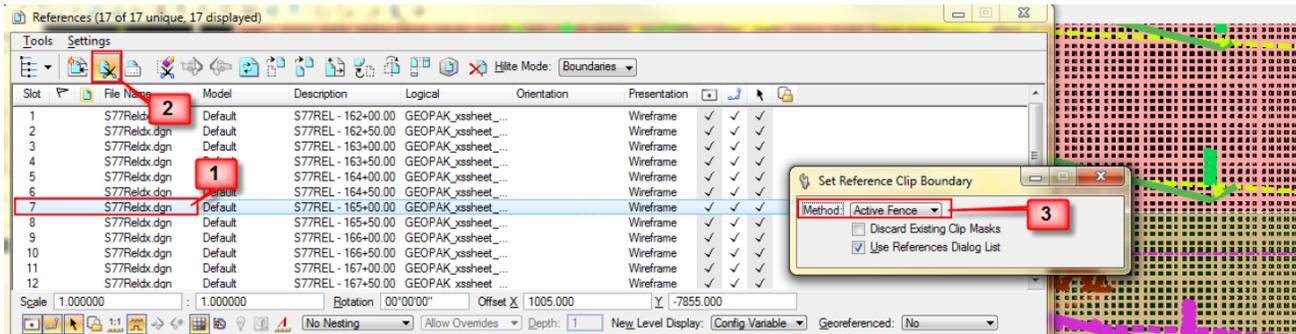


Georeferenced is turned on when coordinates in the reference file need to be reprojected to the coordinates in the active design file. This is common with metric to english attachments.

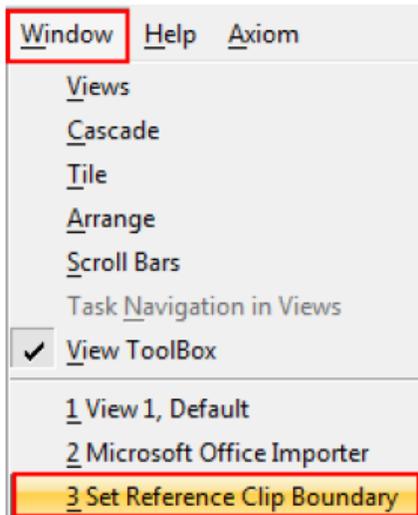


Reference Clip Boundary by Fence

To re-clip a reference file to extend the boundaries on a cross section sheet, draw a fence around the area of the reference attachment that you want to extend the clip to. In the reference dialog, highlight that reference attachment. Select **Clip Boundary**. Set the Method to **Active Fence** and data point in the fence region to accept.



If the small dialog is missing, select Window from the top menu bar and highlight the tool dialog that you are looking for. You can activate the dialogs here no matter what tool you are using in MicroStation and Geopak.



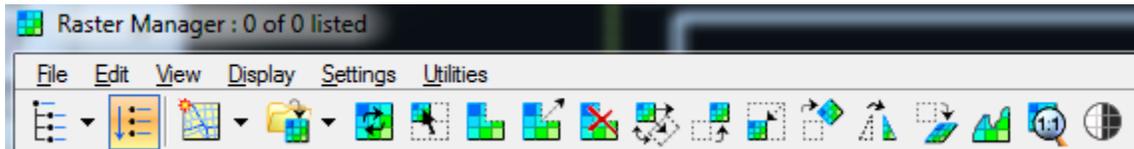
The following is a list of the Reference Border sheets maintained in the SCDOT Workspace for plan production:

Reference File Name	Description	Last Updated	Attachment Scale	Comments
2proline_20.dgn	Double Profile Sheet 20:1	3/27/2014	1:1	Included in geopaksheets_In.cel
2proline_50.dgn	Double Profile Sheet 50:1	3/27/2014	1:1	Included in geopaksheets_In.cel
01_Index_Layout_Sheet.dgn	Index Layout Sheet	4/6/2017	1:1	Included in geopaksheets_In.cel
04_Property_Strip_Map.dgn	Property Strip Map Sheet	4/6/2017	1:1	Included in geopaksheets_In.cel
05_Drainage_Data_Sheet.dgn	Drainage Data Sheet	4/6/2017	1:1	Included in geopaksheets_In.cel
05_Reference_Data_Sheet.dgn	Reference Data Sheet	4/6/2017	1:1	Included in geopaksheets_In.cel
05_Reference_Data_StationOffset.dgn	Station Offset Data Sheet	4/6/2017	1:1	Included in geopaksheets_In.cel
05_Staking_Plan_Sheet.dgn	Staking Plan Sheet	4/6/2017	1:1	Included in geopaksheets_In.cel
06_Drainage_Plan_Sheet.dgn	Drainage Plan Sheet	9/5/2017	1:1	Included in geopaksheets_In.cel
06_Plan_Profile_Sheet_20.dgn	Plan Profile Sheet 20:1 Scale	9/5/2017	1:1	Included in geopaksheets_In.cel
06_Plan_Profile_Sheet_50.dgn	Plan Profile Sheet 50:1 Scale	9/5/2017	1:1	Included in geopaksheets_In.cel
06_Plan_Sheet_20.dgn	Plan Sheet 20:1 Scale	9/5/2017	1:1	Included in geopaksheets_In.cel
06_Plan_Sheet_50.dgn	Plan Sheet 50:1 Scale	9/5/2017	1:1	Included in geopaksheets_In.cel
06_Profile_Sheet_20.dgn	Profile Sheet 20:1 Scale	9/5/2017	1:1	Included in geopaksheets_In.cel
06_Profile_Sheet_50.dgn	Profile Sheet 50:1 Scale	9/5/2017	1:1	Included in geopaksheets_In.cel
A_border1.dgn	Border Sheet w/ Title block	3/27/2014	1:1	
A_dem1.dgn	Moving Items, Removal & Disposal, New Fence Sheet	3/27/2014	1:1	Discontinued; use new Excel Sheet template
A_ecds_border.dgn	Erosion Control Data Sheet	3/27/2014	1:1	Discontinued; use new Excel Sheet
A_engref.dgn	Reference Data Sheet Border	3/27/2014	1:1	Discontinued; Use new 05* Series sheets listed above
A_mi2.dgn	Moving Items Sheet	3/27/2014	1:1	Discontinued; use new Excel Sheet
Drainage_dualplanpipe.dgn	Dual Plan Sheet w/ Pipe	6/30/2016	1:1	Replaces altpipe sheets
Drainage_planpipe.dgn	Plan Sheet w/ Pipe Chart	6/30/2016	1:1	Replaces altpipe sheets
Drainage_planprofilepipe.dgn	Plan & Profile Sheet w/ Pipe	6/30/2016	1:1	Replaces altpipe sheets
Drainage_profilepipe.dgn	Profile Sheet w/ Pipe Chart	6/30/2016	1:1	Replaces altpipe sheets
bordersc.dgn	Border Sheet	3/27/2014	-	
C_PFRts1.dgn	"C" Project Field Review	3/27/2014	1:1	
cpr_SEQ1.dgn	Construction Summary of	3/27/2014	1:1	Discontinued; use new Excel Sheet
dfrts7.dgn	Design Field Review Title	8/19/2015	1:1	
ecitrs13.dgn	Consultant Title Sheet	10/18/2016	1:1	
planref.dgn	Plan & Profile Sheet	3/27/2014	1:1	
prolong_50.dgn	Profile Grid for laying grade	3/27/2014	1:1	
PrwPFRts1.dgn	Preliminary Right of Way Field Review Title Sheet	3/27/2014	1:1	
qfolder_2007.dgn	Project Summary Sheet	3/27/2014	1:1	
rwddata3.dgn	Right of Way Data Sheet	3/27/2014	1:1	Discontinued; use new Excel Sheet
rwddata3_border.dgn	Right of Way Data Sheet Border Only	3/27/2014	1:1	Discontinued; use new Excel Sheet template
SCDOT_Road_Border_22x36.dgn	Border Sheet w/ Title block	3/27/2014	600:1	
SCDOT_Road_Border_Plan&Profile_22x36.dgn	Plan & Profile Sheet	3/27/2014	600:1	
sctyp1.dgn	Typical Section Border Sheet	3/27/2014	1:1	Discontinued; Use 03_Typical_Section cell in
std_form2.dgn	Summary of Estimated Quantities Sheet	3/27/2014	1:1	Discontinued; use new Excel Sheet template
std_form13.dgn	Title Sheet	10/18/2016	1:1	

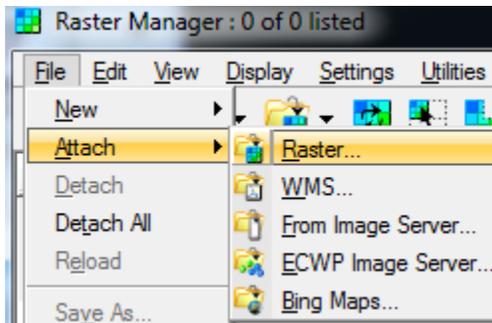
Raster Manager

Raster Manager is utilized to attach a rasterized image file in MicroStation. Attachments can be clipped, scaled, moved, or rotated while leaving the raster data intact.

To access Raster Manager, select **File > Raster Manager** from the top MicroStation toolbar or select the 3rd icon on the Primary Toolbar.

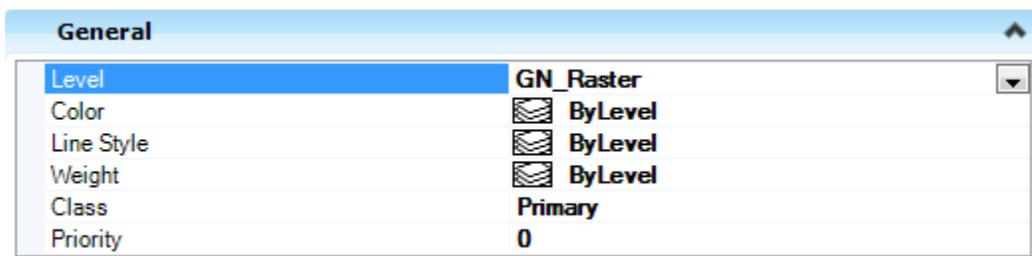


To attach a raster, select **File > Attach > Raster** from the Raster Manager dialog.



In the Attach Raster Reference dialog, Files of type can be toggled to other options including Common Raster Formats, Adobe pdf, JPEG, SID, and TIFF.

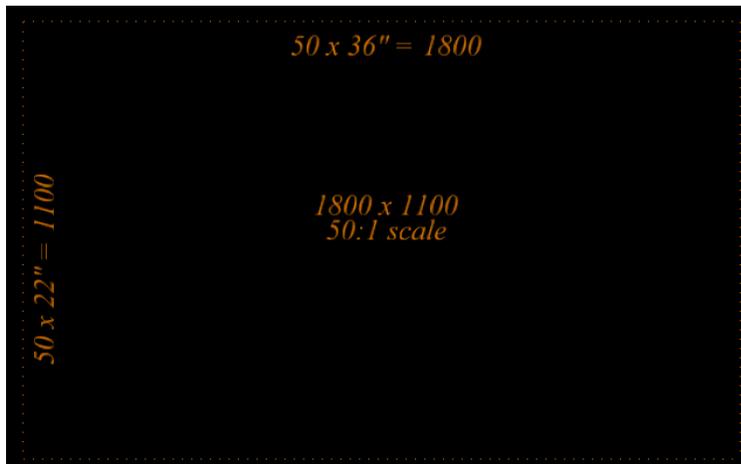
Highlight the raster file and select **Open**. Select a Level – **GN_Raster** to place the raster on a level. (This level will need to be turned on to plot.) Press the **Attach** button.



To attach plan sheets or other drawings to scale from Plans Library, draw a box that is the Scale x Length by Scale x Width of paper.

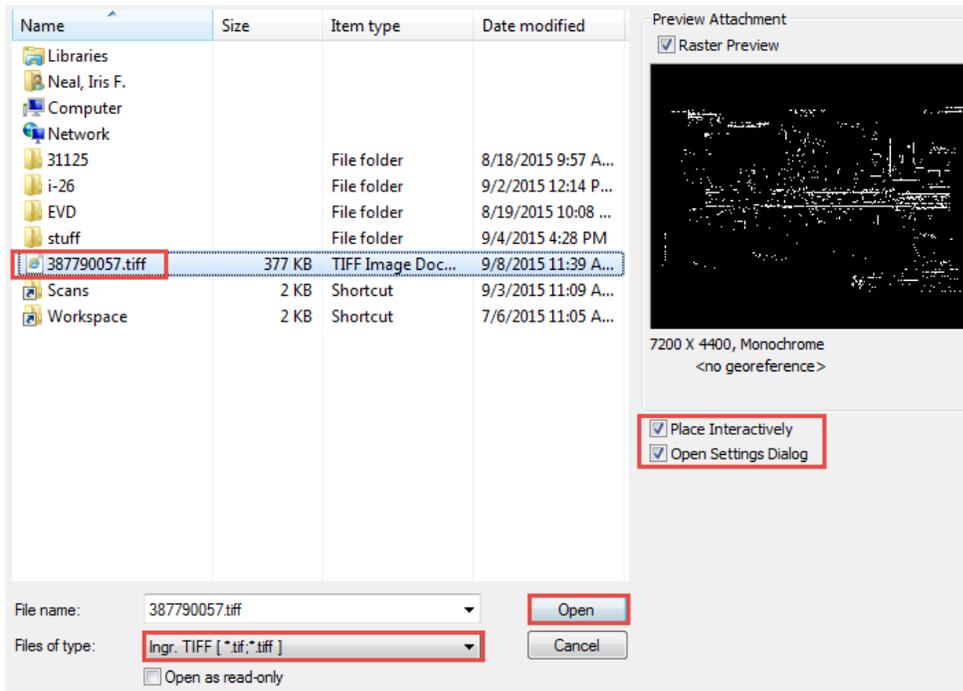
Scale	Length	Width	Dimensions
20:1	36"	22"	720 x 440
40:1	36"	22"	1440 x 880
50:1	36"	22"	1800 x 1100
100:1	36"	22"	3600 x 2200

Example: 50:1 plan sheet – draw the box 1100 x 1800 (50 x 22" = 1100 by 50 x 36" = 1800)



For convenience in plotting multiple sheets with IPLOT, draw the box(es) on the RD_SHT_IplotSHP level.

When attaching the pdf or tiff file, check on **Place Interactively**. This will allow the file to be snapped to the upper left and lower right corner of the box drawn.



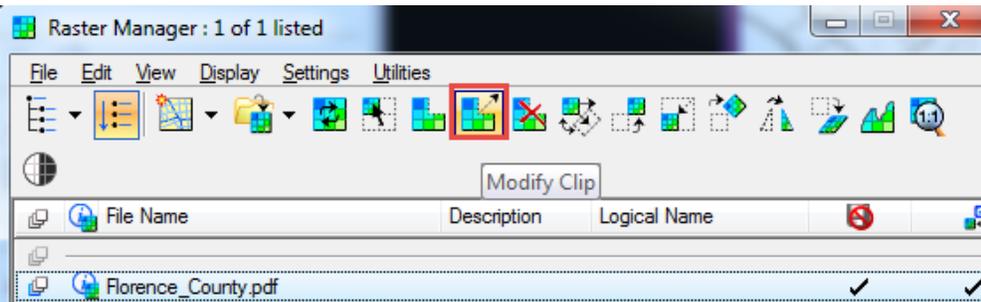
Use the MicroStation **measure tool** to measure a length of stationing in a tangent section to verify that the raster has been attached to scale.



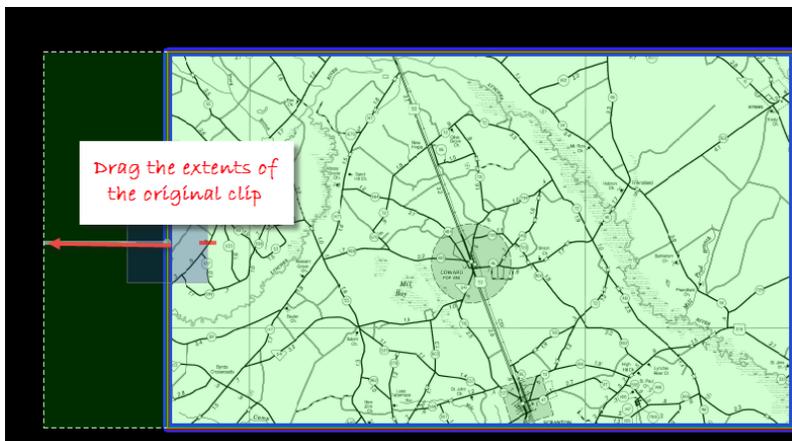
To **clip a map**, draw a fence with the approximate center location. Select the **Clip** tool, toggle Method: **Fence** and Mode: **Clip Boundary**. Data clip to accept the clip.



To modify a clip, highlight the raster file name in the Raster Manager dialog. Select the **Modify Clip** icon.



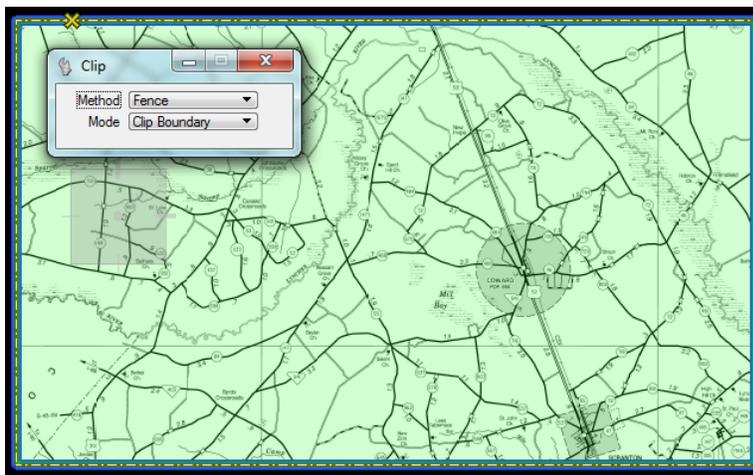
Drag the midpoints or corners of the clip to **expand the clip limits**.



Select the **Move** icon. **Move** the raster to re-center the image in the clip location.

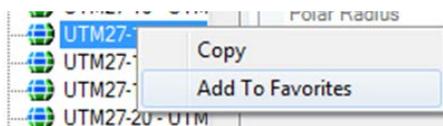
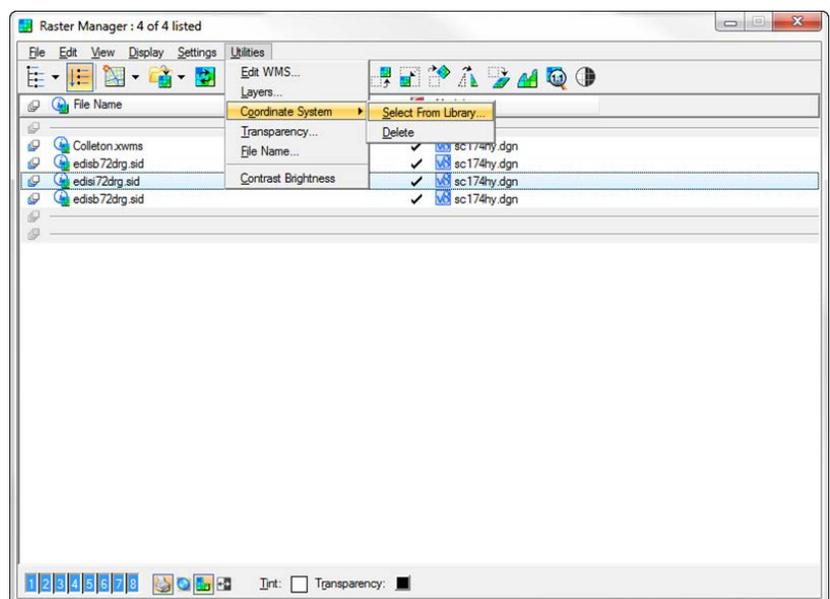


Draw a fence for the new boundary and select **Clip** to reclip the new extents of the raster.



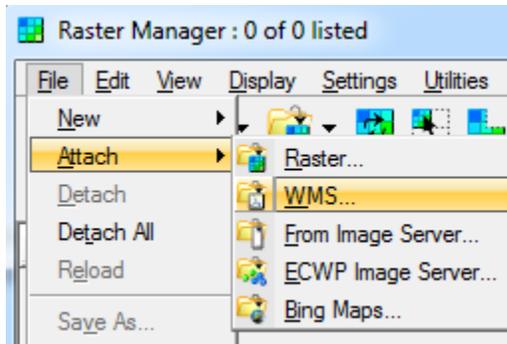
To attach a Mr. Sid file that is in a different (metric) coordinate system to your state plans coordinate design file:

- Select **File > Raster Manager**
- Select **File > Attach > Raster**
- Navigate to the raster file (.sid) to be attached, highlight, and press **Open**
- **Highlight** the raster attachment file in the Raster Manager dialog
- Select **Utilities > Coordinate System > Select from Library**
- Navigate to the associated coordinate system. (Library > Projected > North America > United States of America > Others > UTM27-17) Highlight and right-click on this file and **Add to Favorites**. Highlight again and press **OK** to set it for the raster image.



To attach an aerial image, in Raster Manager

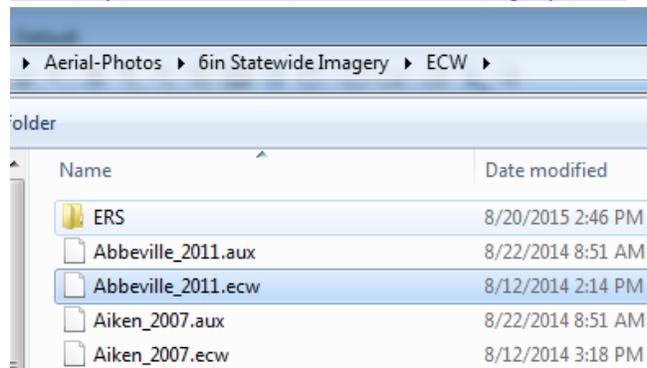
- Select **File > Attach > WMS**
- Navigate to <\\nts\hq\Aerial-Photos\6in Statewide Imagery\WMS>
- Highlight the Statewide WMS file and select **Open**
- Select **Attach**
- Fit View to review



Note: Aerial images are available to SCDOT employees only. Consultants may need to access aerials via county websites, Google Earth or alternative methods.

Note: Separate County ECW files are located in the ECW folder should the Statewide file be unavailable and are attached by selecting **File > Attach > Raster**.

<\\nts\hq\Aerial-Photos\6in Statewide Imagery\ECW>

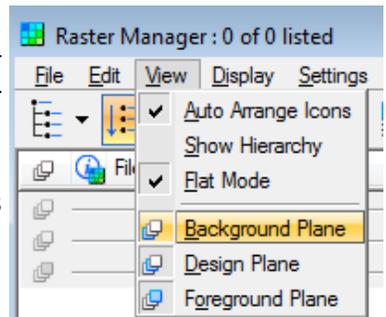


Common Issues with Raster Files:

If the Raster files are not showing in the Raster Manager dialog (and/or file), check that the Background, Design, and Foreground Plans are turned on under the **Raster Manager > View** dialog. Raster images are attached to planes for layering affects. One of these may be turned off in the file.

Also, check that the **level** assigned to the Raster files is **turned on** if the image is not displaying in the design file or not plotting.

If the file is **“greyed” out** in the Raster Manager dialog, it has most likely been attached using the Reference dialog. The raster should be detached from the Reference dialog and reattached using Raster Manager.



Level Manager

The Level Manager is used to maintain uniformity among different disciplines and users. A dgnlib called “RoadDesignLN.dgnlib” has been developed to save SCDOT standard levels and symbology for SCDOT plans. The level name format is as follows:

Category_Classification_Disposition

The Category and Classification are two (2) or three (3) letter codes used to group levels in categories. The different codes are listed below:

Category	Description
CO	Construction
RD	Road Design
SU, UC	SUE or Utility

Classification	Description	Number Range
HC	Horizontal Control	100-114,214,1625
EX	Existing Design	115-169,215,222
SU, UC	SUE – Subsurface Utilities	170-213,216, 900-920
PD	Proposed Design	184,226-374,1050-1061
TX	Text	375-394
SHT	Sheet – Borders	302, 400-418
DTM	DTM – Geopak Features	425-462
COGO	COGO – Geopak Features	475-481
DDB	DDB – Geopak Features	500-509
SMD	SMD – Geopak Features	515-516
DSG	Design Services Group	525-528
XS, XE	Cross Section Elements	549-617
Sketch	Misc. Drawings & Notes	650-659
GPK	Geopak	675-677
HY	Hydraulics	700-775
QTY	Quantities	850-872
AR	Architecture	950-961
GT	Geotechnical	1200-1212
EV	Environmental	1300-1312
CO	Construction	1400-1503

Each classification has a corresponding MicroStation filter to better facilitate setting the active level and turning on/off levels. Levels can be sorted by LevelName or number.

All level names consist of alphanumeric characters only. No special characters or spaces are used other than the underscore character “_”.

SCDOT’s standard user configuration is set so that the individual CADD users will not be permitted to create levels. Ten sketch levels have been established to allow users to draw items that would not normally be shown on a set of SCDOT construction plans. If you have any requests for additional levels,

they will be handled and approved by the Preconstruction Support Design Automation Group to be considered as a standard.

In general, most curvilinear features will have a level. This will allow users to take advantage of MicroStation V8's ByLevel attributes feature to set the proper symbology for an element when the level is selected. There are, however, a few exceptions to this rule as detailed below:

*The active cell cannot be set a part of the ByLevel functionality so we have elected to group like cells on the same level. For example, all existing electric utility cells are placed on the level RD_EX_UT. Also cells should be placed without the ByLevelStyle so they will not take on that level line style.

*The Levels RD_EX_RD, RD_EX_Veg, and RD_EX_Driveway will not use ByLevelStyle so that multiple linestyles can be placed on the same level, thus a paved road solid line vs. dashed dirt road line can both be drawn on the RD_EX_RD level. Similarly, multiple custom line styles can be placed on the RD_EX_Veg to facilitate the use of tree, woods and shrub lines on the same level. This was done to keep from creating numerous levels for like items. RD_EX_DV_Gov has similar characteristics to allow multiple linestyles for designation of divisional boundaries.

*Rather than create a level for each pipe size, all new storm sewer lines are grouped on one level RD_PD_DR_Pipe. Use the GEOPAK Design and Computation Manager or Geopak Drainage to facilitate placement of these MicroStation elements with attributes so individual pay items can be computed later.

Horizontal Control

The following levels are used to draw horizontal alignment centerlines, curve data to include bearings, control points, reference points, equalities, beginning and ending notes, station tic marks, station numbers, relocations, and all other features related to the projects horizontal control.

△ Name	Number					Description			
RD_HC									
RD_HC_CI	100		149		0		6	Survey Centerline	
RD_HC_Data	101		149		0		3	Curve Data	
RD_HC_Data_Tic	102		149		0		3	Tic Marks	
RD_HC_Points	103		149		0		2	Point Cell, Circle and Text for Horiz. Alignments	
RD_HC_TX_Sta20	104		149		0		2	Station numbers 20 scale	
RD_HC_TX_Sta50	105		149		0		2	Station numbers 50 scale	
RD_HC_TX_StaOther	106		149		0		2	Station numbers other scale	
RD_HC_txCode	107		0		0		0	Survey Code for RD_HC_Data	
RD_HC_CL_Rel	108		18		0	RELOCATION LINE		6	Relocation Centerline
RD_HC_Data_Rel	109		18		0		0	Relocation Curve Data	
RD_HC_Data_Tic_Rel	110		18		0		3	Relocation Tic Marks	
RD_HC_TX_Rel_Sta20	111		18		0		2	Relocation Station numbers 20 scale	
RD_HC_TX_Rel_Sta50	112		18		0		2	Relocation Station numbers 50 scale	
RD_HC_TX_Rel_StaOther	113		18		0		2	Relocation Station numbers other scale	
RD_HC_Survey	114		149		0		2	Survey Control	
RD_HC_Survey_txCode	214		0		0		0	Survey Control Text	
RD_HC_Survey_ELEV	1625		173		0		0	Survey Control Text Elevation	

Existing Design Levels

The following levels are used to draft all existing surveyed elements including buildings, bridges, concrete structures, driveways, pipes, property lines, fence, right of way, vegetation and any other existing features surveyed in the field.

△	Name	Number				Used	Description
	RD_EX						
	RD_EX_Bldg	115		6	0	6	Building Outlines
	RD_EX_Bldg_bxCod	116		0	0	0	Survey Code for RD_EX_Bldg
	RD_EX_BldgApp	117		6	0	2	Building Appurtenances
	RD_EX_BldgApp_bxCod	118		0	0	0	Survey Code for RD_EX_BldgApp
	RD_EX_BldgChurch	119		6	0	6	Church, Synagogue and Mosques
	RD_EX_BldgChurch_t...	120		0	0	0	Survey Code for RD_EX_BldgChurch
	RD_EX_BldgSchool	121		6	0	6	School
	RD_EX_BldgSchool_bx...	122		0	0	0	Survey Code for RD_EX_BldgSchool
	RD_EX_Bridge	123		27	0	2	Existing Bridges
	RD_EX_Bridge_bxCod	124		0	0	0	Survey Code for RD_EX_Bridge
	RD_EX_Conc	125		221	0	2	Existing Concrete Median/Curb&Gutter/Sidewalk
	RD_EX_Conc_bxCod	126		0	0	0	Survey Code for RD_EX_Conc
	RD_EX_Dam	127		223	0	4	Existing Dams
	RD_EX_Dam_bxCod	128		0	0	0	Survey Code for RD_EX_Dam
	RD_EX_Driveway	129		81	0	2	Existing Driveways
	RD_EX_Driveway_bxCod	130		0	0	0	Survey Code for RD_EX_Driveway
	RD_EX_DR_ErosCtrl	131		113	0	2	Existing Erosion Control Items
	RD_EX_DR_ErosCtrl_t...	132		0	0	0	Survey Code for RD_EX_DR_ErosCtrl
	RD_EX_DR_Inlet	133		106	0	2	Existing CATCH BASINS
	RD_EX_DR_Inlet_bxCod	134		0	0	0	Survey Code for RD_EX_DR_Inlet
	RD_EX_DR_Pipe	135		106	PIPE EXIST	2	Existing Storm System Pipes (all types)
	RD_EX_DR_Pipe_bxCod	136		0	0	0	Survey Code for RD_EX_DR_Pipe
	RD_EX_DV_Gov	137		87	0	2	City/ Town Limits
	RD_EX_DV_Prop	138		0	R/W OR PROPERTY LINE	2	Property Lines
	RD_EX_DV_Prop_bxCod	139		0	0	0	Survey Code for RD_EX_DV_Prop
	RD_EX_DV_PropPin	140		0	0	2	Concrete Marker
	RD_EX_DV_TX_Gov	141		87	0	2	City/County/State Text Identification
	RD_EX_DV_TX_Prop	142		0	0	2	Property Owner Text/Tract # Identification
	RD_EX_Fence_ChLk	143		6	FENCE LINE	2	Existing Chain Link/Woven Wire Fence
	RD_EX_Fence_ChLk_t...	144		0	0	0	Survey Code for RD_EX_Fnce_ChLk
	RD_EX_Fence_Other	145		245	FENCE LINE	2	Existing Fence (Non- Chain Link/Woven Wire)
	RD_EX_Fence_Other_...	146		0	0	0	Survey Code forRD_EX_Fnce_Other
	RD_EX_GuardRail	147		22	EX GR RT	2	Existing GUARDRAIL
	RD_EX_GuardRail_bx...	148		0	0	0	Survey Code for RD_EX_GrRail
	RD_EX_H2O	149		1	0	2	Pond,Lake,Creek, Stream & River Banks
	RD_EX_H2O_bxCod	150		0	0	0	Survey Code for RD_EX_H2O
	RD_EX_H2O_BlueLn	151		190	0	2	Existing BlueLine Stream
	RD_EX_H2O_BlueLn_t...	152		0	0	0	Survey Code for RD_EX_H2O_Blue
	RD_EX_H2O_WetLd	153		189	WETLAND	2	Existing Wet Land
	RD_EX_H2O_WetLd_t...	154		0	0	0	Survey Code for RD_EX_H2O_WetLd
	RD_EX_Misc	155		5	0	2	Misc. Points/Shots & North Arrows
	RD_EX_Misc_bxCod	156		0	0	0	Survey Code for RD_EX_misc
	RD_EX_RailRoad	157		7	RAIL ROAD LINE	2	Rail Road Tracks
	RD_EX_RailRoad_bxCod	158		0	0	0	Survey Code for RD_EX_RailRoad
	RD_EX_Road	159		14	0	3	Existing Edge of Pavement
	RD_EX_Road_bxCod	160		0	0	0	Survey Code for RD_EX_Road
	RD_EX_RW	161		4	R/W OR PROPERTY LINE	2	Existing Right of Way Lines/Easement Lines
	RD_EX_RW_bxCod	162		0	0	0	Survey Code for RD_EX_RW
	RD_EX_RW_TX	163		4	0	2	Existing Right of Way Text
	RD_EX_UT	164		3	0	2	Existing Utilities & PUPS Lines-SCDOT Location Survey
	RD_EX_UT_bxCod	165		0	0	0	Survey Code for RD_EX_UT
	RD_EX_VEG	166		2	0	2	Trees and Shrubs- All Types and Sizes
	RD_EX_VEG_bxCod	167		0	0	0	Survey Code for RD_EX_VEG
	RD_EX_VEG_TZ	168		158	0	2	Zoned Trees- Unique Vegetation Zoned by Types and Sizes
	RD_EX_VEG_TZ_bxCod	169		0	0	0	Survey Code for RD_EX_VEG_Z
	RD_EX_Control_Access	215		5	--- 3	2	Existing Control Access
	RD_EX_Easement	222		101	EASEMENT	2	Existing Property Easement
	RD_EX_Pavement_Mark...	223		0	0	2	(none) Existing Pavement Markings
	RD_EX_Survey_Limits	224		124	0	5	(none) Project Survey Limits

Existing SUE – Subsurface Utility Design Levels

The following levels are used to draft all existing surveyed Subsurface Utility (SUE) elements including electrical lines, boxes, manholes, gas lines, meters, valves, vents, underground water appurtances, powerpoles, lightpoles, guy wires, telephone poles, sanitary sewer, sweep limits, communication lines and any other existing utilities surveyed in the field.

△	Name	Number				Used	Description
	RD_EX_SU						
	RD_EX_SU_Dbank	170	194	0	2		Duct Bank Lines -Sue Survey
	RD_EX_SU_TX_Dbank	171	194	0	2		Text for Duct Bank Lines
	RD_EX_SU_Dbank_TxCode	172	0	0	0		Survey Code for RD_EX_SU_Dbank
	RD_EX_SU_Elec	173	127	0	2		Underground Elec. Lines -Sue Survey
	RD_EX_SU_TX_Elec	174	127	0	2		Text for Underground Elec. Appurtances
	RD_EX_SU_Elec_TxCode	175	0	0	0		Survey Code for RD_EX_SU_Elec
	RD_EX_SU_Eoi	176	28	0	2		End of Information-Sue Survey
	RD_EX_SU_Gas	177	231	0	2		Underground Gas Lines-Sue
	RD_EX_SU_TX_Gas	178	231	0	1		Text for Underground Gas Appurtances
	RD_EX_SU_Gas_TxCode	179	0	0	0		Survey Code for RD_EX_SU_Gas
	RD_EX_SU_H2O	180	155	0	2		Underground Water Lines-Sue Survey
	RD_EX_SU_TX_H2O	181	155	0	2		Text for Underground Water Appurtances
	RD_EX_SU_H2O_TxCode	182	0	0	0		Survey Code for RD_EX_SU_H2O
	RD_EX_SU_H2OTank	183	1	0	2		Existing Water Tank/Tower-Sue Survey
	RD_EX_SU_H2OTank_TxCode	185	0	0	0		Survey Code for RD_EX_SU_H2OTank
	RD_EX_SU_Misc	186	28	0	2		Misc. Underground Lines-Sue Survey
	RD_EX_SU_TX_Misc	187	28	0	1		Text for Underground Misc. Appurtances
	RD_EX_SU_Misc_TxCode	188	0	0	0		Survey Code for RD_EX_SU_Misc
	RD_EX_SU_Nonpot	189	194	0	2		Nonpotable Water Lines -Sue Survey
	RD_EX_SU_TX_Nonpot	190	194	0	2		Text for Nonpotable Water Lines
	RD_EX_SU_Nonpot_TxCode	191	0	0	0		Survey Code for RD_EX_SU_Nonpot
	RD_EX_SU_Ovhd	192	127	0	2		All Overhead Lines-SUE Survey
	RD_EX_SU_TX_Ovhd	193	4	0	1		Text for All Overhead Lines
	RD_EX_SU_Ovhd_TxCode	194	0	0	0		Survey Code for RD_EX_SU_Ovhd
	RD_EX_SU_Pole	195	127	0	2		Existing Poles-Sue Survey
	RD_EX_SU_TX_Pole	196	4	0	2		Existing Pole Text Descriptions - Sue Survey
	RD_EX_SU_Pole_TxCode	197	0	0	0		Survey Code for RD_EX_SU_Pole
	RD_EX_SU_Sewer	198	194	0	2		Underground Sanitary Sewer Lines -Sue Survey
	RD_EX_SU_TX_Sewer	199	194	0	1		Text for Underground Sewer Appurtances
	RD_EX_SU_Sewer_TxCode	200	0	0	0		Survey Code for RD_EX_SU_Sewer
	RD_EX_SU_SwpLmt	201	8	SUE SWEEP	2		Sweep Limit- Sue Survey
	RD_EX_SU_TX_SwpLmt	202	8	0	2		Sue Sweep Limit Text
	RD_EX_SU_Telecom	203	6	0	2		Underground Comm. Lines-Sue Survey
	RD_EX_SU_TX_Telecom	204	6	0	2		Text for Underground Telecom. Appurtances
	RD_EX_SU_Telecom_TxCode	205	0	0	0		Survey Code for RD_EX_SU_Telecom
	RD_EX_SU_THole	206	57	0	2		Test Holes-Sue Survey
	RD_EX_SU_TX_THole	207	57	0	2		Test Hole Text Labels
	RD_EX_SU_THole_TxCode	208	0	0	0		Survey Code for RD_EX_SU_Thole
	RD_EX_SU_Trfc	209	129	0	2		Traffic Control -Sue Survey
	RD_EX_SU_TX_Trfc	210	129	0	2		Text for Traffic Control Sue
	RD_EX_SU_Trfc_TxCode	211	0	0	0		Survey Code for RD_EX_SU_Trfc
	RD_EX_SU_TX_H2OTank	216	194	0	2		Text for Existing Water Tank/Tower
	RD_UC_AbnRmv	212	32	0	1		Utility Coordination Abandon Remove Utilities
	RD_UC_Reloc	213	3	0	5		Utility Coordination Relocate Utilities

Proposed Design Levels

The following levels are to draft all proposed design construction elements for the completion of plans. This section of levels include proposed centerline and alternates, proposed edges of travel way, lane lines and arrows, earth shoulder, asphalt removal, limits of construction, detours, NPDES lines, erosion control items, proposed drainage, guardrail, ditches, shoulders, proposed right of way, sidewalk, valley gutter and all other proposed design elements.

△	Name	Number				Used	Description	
	RD_PD							
	RD_PD_Final_TrvlWay	184		23	————— 0		6	Prop Design Edges of Travelway
	RD_PD_Final_Cl	226		23	————— 0		6	Prop Design Centerline
	RD_PD_AsphRem	231		25	————— 0		2	Asphalt Pavement Removal & Notes
	RD_PD_ConcMed	234		168	————— 0		4	Prop Design Concrete Median
	RD_PD_VG	262		16	————— 0		4	Prop Design Valley Gutter
	RD_PD_ALT1_CL	300		75	————— 0		6	Prop Design Centerline-Alternate 1
	RD_PD_ALT1_LnLine	301		75	--- -- 3		6	Prop Design Lanes Lines&Arrows/Raddii-Alternate 1
	RD_PD_ALT1_TrvlWay	303		75	————— 0		6	Prop Design Edges of Travelway-Alternate 1
	RD_PD_ALT1_TX	304		75	————— 0		2	Prop Design Text-Alternate 1
	RD_PD_ALT2_CL	305		15	————— 0		6	Prop Design Centerline-Alternate 2
	RD_PD_ALT2_LnLine	306		15	--- -- 3		6	Prop Design Lanes Lines&Arrows/Raddii-Alternate 2
	RD_PD_ALT2_TnTmp	307		15	————— 0		3	Prop Design Turn Template-Alternate 2
	RD_PD_ALT2_TrvlWay	308		15	————— 0		6	Prop Design Edges of Travelway-Alternate 2
	RD_PD_ALT2_TX	309		15	————— 0		2	Prop Design Text-Alternate 2
	RD_PD_ALT3_CL	310		58	————— 0		6	Prop Design Centerline-Alternate 3
	RD_PD_ALT3_LnLine	311		58	--- -- 3		6	Prop Design Lanes Lines&Arrows/Raddii-Alternate 3
	RD_PD_ALT3_TnTmp	312		58	————— 0		3	Prop Design Turn Template-Alternate 3
	RD_PD_ALT3_TrvlWay	313		58	————— 0		6	Prop Design Edges of Travelway-Alternate 3
	RD_PD_ALT3_TX	314		58	————— 0		2	Prop Design Text-Alternate 3
	RD_PD_ALT4_CL	315		88	————— 0		6	Prop Design Centerline-Alternate 4
	RD_PD_ALT4_LnLine	316		88	--- -- 3		6	Prop Design Lanes Lines&Arrows/Raddii-Alternate 4
	RD_PD_ALT4_TnTmp	317		88	————— 0		3	Prop Design Turn Template-Alternate 4
	RD_PD_ALT4_TrvlWay	318		88	————— 0		6	Prop Design Edges of Travelway-Alternate 4
	RD_PD_ALT4_TX	319		88	————— 0		2	Prop Design Text-Alternate 4
	RD_PD_ALT5_CL	320		130	————— 0		6	Prop Design Centerline-Alternate 5
	RD_PD_ALT5_LnLine	321		130	--- -- 3		6	Prop Design Lanes Lines&Arrows/Raddii-Alternate 5
	RD_PD_ALT5_TnTmp	322		130	————— 0		3	Prop Design Turn Template-Alternate 5
	RD_PD_ALT5_TrvlWay	323		130	————— 0		6	Prop Design Edges of Travelway-Alternate 5
	RD_PD_ALT5_TX	324		130	————— 0		2	Prop Design Text-Alternate 5
	RD_PD_EarthShd	325		118 6		2	Prop Design Earth Shoulder
	RD_PD_Final_LnLine	327		23	--- -- 3		6	Prop Design Lanes Lines/Arrows/Radii-Final
	RD_PD_Final_TnTmp	328		23	————— 0		3	Prop Design Turn Template-Final
	RD_PD_Final_TX	330		23	————— 0		2	Prop Design Text-Final
	RD_PD_BCA	332		87	BCA		2	Prop Design Bridge Construction Access Line
	RD_PD_Bridge	333		28	————— 0		2	New Bridges (all)
	RD_PD_CstrnLmt	335		20	----- 2		2	Proposed Limits of Construction Lines
	RD_PD_TX_CstrnLmt	336		20	————— 0		2	Cut and Fill Text
	RD_PD_Detour	337		237	————— 0		2	Proposed Detours
	RD_PD_DR_Ditch	338		55	OUTFALL DITCH		1	Proposed Roadway Ditch
	RD_PD_DR_ErosCtrl	339		55	NPDES		1	Proposed NPDES lines
	RD_PD_DR_FlowCtrl	340		108	OUTFALL DITCH		1	Proposed Flow Control Devices
	RD_PD_DR_Inlet	341		34	————— 0		2	Proposed CATCH BASINS & Inlets (All Types)
	RD_PD_DR_Joint	342		170	————— 0		1	Proposed Tee Joint, Wye Joint ,Bends
	RD_PD_DR_Pipe	343		107	PIPE NEW1		2	Proposed Pipes (all Sizes & Types)
	RD_PD_Fence	344		143	FENCE LINE NEW		2	Prop Design New Fence (all types)
	RD_PD_FOC	345		6	FOC	————— 0	0	Prop Design Face of Curb
	RD_PD_GeoTech	346		66	————— 0		2	Proposed Geo-Technical Data/Notes
	RD_PD_GR	347		10	NEW GR LT		2	Proposed GUARDRAIL
	RD_PD_MedBWall	348		17	————— 0		1	Median Barrier Wall Centerline-Plan View
	RD_PD_MedGR	349		1	————— 0		1	Median Guard Rail Centerline-Plan View

Proposed Design Levels (continued...)

△	Name	Number				Used	Description
	RD_pd						
	RD_PD_PatLn1	350	88	0	0		Pattern Lines # 1-Plan View
	RD_PD_PatLn2	351	112	0	0		Pattern Lines # 2-Plan View
	RD_PD_PatLn3	352	214	0	0		Pattern Lines # 3-Plan View
	RD_PD_PaveDit	353	169	0	2		Prop Design Paved Ditch
	RD_PD_PaveShd	354	165	0	4		Prop Design Paved Shoulder
	RD_PD_RW	355	35	0	6		New Right of Way Line
	RD_PD_RW_TX	356	35	0	2		New Right of Way Text
	RD_PD_SideStreet	357	28	0	1		Side Street Flag for Criteria
	RD_PD_SuperShp1	358	4	0	0		Geopak SuperElevation Shapes #1
	RD_PD_SuperShp2	359	7	0	0		Geopak SuperElevation Shapes #2
	RD_PD_SuperShp3	360	6	0	0		Geopak SuperElevation Shapes #3
	RD_PD_SW	361	19	0	4		Prop Design Sidewalk
	RD_PD_WallCut	363	86	0	2		Proposed Wall (Cut Section)
	RD_PD_WallFill	364	91	0	2		Proposed Wall (Fill Section)
	RD_PD_SW_CurbRamp	365	19	0	4		Prop Design Sidewalk Curb Ramps
	RD_PD_DR_Pipe_TX	367	107	0	0		Text for Proposed Pipes (all Sizes & Types)
	RD_PD_DR_FlowCtrl_TX	368	108	0	0		Text for Proposed Flow Control Devices
	RD_PD_DR_Inlet_TX	369	34	0	0		Text for Proposed CATCH BASINS & Inlets (All Types)
	RD_PD_Control_Access	370	130	3	2		Proposed Control Access
	RD_PD_Driveway	371	29	0	3		Proposed Driveway
	RD_PD_Driveway_TX	372	29	0	3		Proposed Driveway Text
	RD_PD_Slope_Over	373	12	2	2		Proposed Slope Override
	RD_PD_ALT1_TnTmp	374	75	0	3		Prop Design Turn Template-Alternate 1
	RD_PD_PatLn4	1050	75	0	0		Pattern Lines # 4-Plan View
	RD_PD_PatLn5	1051	76	0	0		Pattern Lines # 5-Plan View
	RD_PD_PatLn6	1052	91	0	0		Pattern Lines # 6-Plan View
	RD_PD_DitchBtm	1053	6	2	2		Prop Design Ditch Bottom
	RD_PD_TiePt	1054	120	0	2		Prop Design Tie Point
	RD_PD_NewEOP	1055	23	0	6		Prop Design New Edge of Pavement
	RD_PD_Easement	1056	85	EASEMENT	2		Prop Easement Property
	RD_PD_SuperShp4	1057	29	0	0		Geopak SuperElevation Shapes #4
	RD_PD_Clearing_Grubbing	1058	98	CLEARGRUB	1		Proposed Limits of Clearing and Grubbing
	RD_PD_PaintMed	1059	88	0	1		Proposed Design Painted Median & Hatching
	RD_PD_BOC	1060	80	0	2		Prop Design Back of Curb
	RD_PD_EOP	1061	214	0	6		Prop Design Edge of Pavement

Hydraulic Design Levels

The Hydraulic Design levels are intended to be used in the drainage design of a project which includes levels to be used by the Geopak Drainage program and also by the hydraulic designer. Land use, pipes, culverts, soils, text, discharges, storm sewers, bridge profiles, contours, and dummy nodes all have levels available for the proper depiction of drainage elements on the design plans.

△	Name	Number				Used	Description
	RD_hy						
	RD_HY_Area_Bridge	700	145	0	0		Drainage Areas for Bridges
	RD_HY_Area_Bridge1	701	202	0	0		Drainage Areas for Bridges#1
	RD_HY_Area_Cvlt	702	148	0	0		Drainage Areas for Culvert
	RD_HY_Area_Cvlt1	703	170	0	0		Drainage Areas for Culvert#1
	RD_HY_Area_Cvlt2	704	172	0	0		Drainage Areas for Culvert#2
	RD_HY_Area_Cvlt3	705	175	0	0		Drainage Areas for Culvert#3
	RD_HY_Area_Dtch	706	147	0	0		Drainage Areas for Ditches
	RD_HY_Area_Dtch1	707	135	0	0		Drainage Areas for Ditches#1
	RD_HY_Area_Dtch2	708	137	0	0		Drainage Areas for Ditches#2
	RD_HY_Area_Dtch3	709	140	0	0		Drainage Areas for Ditches#3
	RD_HY_Area_Dtch4	710	1	0	6		Drainage Areas for Ditches#4
	RD_HY_Area_Dtch5	711	2	0	6		Drainage Areas for Ditches#5

Hydraulic Design Levels (continued...)

△ Name	Number				Used	Description
RD_HY						
RD_HY_Area_PreQ	712		149	0	0	Drainage Areas for Pre Discharges
RD_HY_Area_PreQ1	713		215	0	0	Drainage Areas for Pre Discharges#1
RD_HY_Area_PreQ2	714		217	0	0	Drainage Areas for Pre Discharges#2
RD_HY_Area_PreQ3	715		220	0	0	Drainage Areas for Pre Discharges#3
RD_HY_Area_PreQ4	716		1	0	6	Drainage Areas for Pre Discharges#4
RD_HY_Area_PreQ5	717		2	0	6	Drainage Areas for Pre Discharges#5
RD_HY_Area_PreQ6	718		3	0	6	Drainage Areas for Pre Discharges#6
RD_HY_Area_PreQ7	719		4	0	6	Drainage Areas for Pre Discharges#7
RD_HY_Area_PreQ8	720		5	0	6	Drainage Areas for Pre Discharges#8
RD_HY_Area_PreQ9	721		6	0	6	Drainage Areas for Pre Discharges#9
RD_HY_Area_PreQ10	722		7	0	6	Drainage Areas for Pre Discharges#10
RD_HY_Area_SS	723		146	0	0	Drainage Areas for Storm Sewers
RD_HY_Area_SS1	724		246	0	0	Drainage Areas for Storm Sewers#1
RD_HY_Area_SS2	725		250	0	0	Drainage Areas for Storm Sewers#2
RD_HY_Area_SS3	726		253	0	0	Drainage Areas for Storm Sewers#3
RD_HY_Area_SS4	727		3	0	6	Drainage Areas for Storm Sewers#4
RD_HY_Area_SS5	728		4	0	6	Drainage Areas for Storm Sewers#5
RD_HY_Area_SS6	729		5	0	6	Drainage Areas for Storm Sewers#6
RD_HY_Area_SS7	730		6	0	6	Drainage Areas for Storm Sewers#7
RD_HY_Area_SS8	731		7	0	6	Drainage Areas for Storm Sewers#8
RD_HY_Area_SS9	732		8	0	6	Drainage Areas for Storm Sewers#9
RD_HY_Area_SS10	733		9	0	6	Drainage Areas for Storm Sewers#10
RD_HY_Bridge_CL	734		150	0	0	Bridge Profile - Centerline
RD_HY_Bridge_Gmtry	735		153	0	0	Bridge Profile - Geometry
RD_HY_Bridge_LT	736		152	0	0	Bridge Profile - Left
RD_HY_Bridge_Plan	737		154	0	0	Bridge Profile - Plan View
RD_HY_Bridge_RT	738		151	0	0	Bridge Profile - Right
RD_HY_Contour1	739		108	0	6	Contours
RD_HY_Contour2	740		109	0	6	Contours
RD_HY_Contour3	741		110	0	6	Contours
RD_HY_DumbNodes	742		157	0	7	Dummy Nodes
RD_HY_Gpkprofile	743		155	0	0	Geopak Drainage Profile
RD_HY_LandUse	744		159	0	0	Drainage Areas for Land Use
RD_HY_Misc	745		156	0	0	Misc. Drainage
RD_HY_Node_TX	746		248	0	2	Text for Hydro Nodes
RD_HY_Pipe_TX	747		253	0	2	Text for Hydro Pipes
RD_HY_PreArea_Cvlt1	748		244	0	6	Pre Area Culvert 1
RD_HY_PreArea_Cvlt2	749		79	0	6	Pre Area Culvert 2
RD_HY_PreArea_Cvlt3	750		128	0	6	Pre Area Culvert 3
RD_HY_PreArea_Cvlt4	751		158	0	6	Pre Area Culvert 4
RD_HY_PostArea_Cvlt1	752		247	0	6	Post Area Culvert 1
RD_HY_PostArea_Cvlt2	753		59	0	6	Post Area Culvert 2
RD_HY_PostArea_Cvlt3	754		134	0	6	Post Area Culvert 3
RD_HY_PostArea_Cvlt4	755		153	0	6	Post Area Culvert 4
RD_HY_PreLandUse_Woods	756		37	0	6	Pre Land Use Woods
RD_HY_PreLandUse_OpenSpace	757		9	0	6	Pre Land Use Open Space
RD_HY_PreLandUse_Residential	758		91	0	6	Pre Land Use Residential
RD_HY_PreLandUse_Impervious	759		21	0	6	Pre Land Use Impervious
RD_HY_PreLandUse_Combus	760		231	0	6	Pre Land Use Com Bus
RD_HY_PostLandUse_Woods	761		37	0	6	Post Land Use Woods
RD_HY_PostLandUse_OpenSpace	762		9	0	6	Post Land Use Open Space
RD_HY_PostLandUse_Residential	763		91	0	6	Post Land Use Residential
RD_HY_PostLandUse_Impervious	764		21	0	6	Post Land Use Impervious
RD_HY_PostLandUse_Combus	765		231	0	6	Post Land Use Com Bus
RD_HY_Soils_A	766		96	0	6	Soils A
RD_HY_Soils_B	767		99	0	6	Soils B
RD_HY_Soils_C	768		105	0	6	Soils C
RD_HY_Soils_D	769		107	0	6	Soils D
RD_HY_TX1	770		144	0	6	Text for Hydro
RD_HY_TX2	771		144	0	6	Text for Hydro
RD_HY_TX3	772		144	0	6	Text for Hydro
RD_HY_XS_Slope	773		3	0	2	Proposed Ditch Slopes
RD_HY_XS_Slope_TX	774		3	0	2	Text for Proposed Ditch Slopes
RD_HY_Area_SS_TX	775		146	0	0	Text for Drainage Areas for Storm Sewers

Cross Section Levels

The cross section group of levels provides many options for drafting the existing and proposed cross section elements for the existing ground, existing base, and the proposed pavement, shoulders, sidewalk, etc. for the construction plans.

△ Name	Number				Used	Description
RD_XE_Ground	549	4	---	3	6	Criteria Existing Ground
RD_XS_Base	550	16	---	0	6	Criteria Base
RD_XS_Box	551	134	---	0	3	Drainage Box on XS
RD_XS_Buildup	552	2	---	0	2	Criteria Buildup
RD_XS_CurbBase	553	18	---	0	6	Criteria Curb Base
RD_XS_CurbFront	554	7	---	0	6	Criteria Curb Front
RD_XS_CurbTop	555	6	---	0	6	Criteria Curb Top
RD_XS_Ditch	556	12	---	0	6	Criteria Ditch
RD_XS_EarthShd	557	15	---	0	6	Criteria Earth Shoulder
RD_XS_ExGround	558	4	---	3	6	Criteria Existing Ground
RD_XS_ExPaveRet	559	4	---	0	3	Criteria Existing Pavement (Retain) (Cross Hatched)
RD_XS_ExRW	560	244	R/W OR PROPERTY LINE		3	Criteria Existing Right of Way
RD_XS_EwShp	561	0	---	0	0	Criteria EarthWork Shapes
RD_XS_EwShp1	562	128	---	0	0	Criteria EarthWork Shapes#1
RD_XS_EwShp2	563	101	---	0	0	Criteria EarthWork Shapes#2
RD_XS_EwShp3	564	155	---	0	0	Criteria EarthWork Shapes#3
RD_XS_Greenside	565	12	---	0	6	Criteria Greenside
RD_XS_GR	566	10	---	0	6	Criteria GuardRail
RD_XS_MatchLine	567	3	---	0	3	Criteria Match Line
RD_XS_MedBbase	568	17	---	0	6	Criteria Median Barrier Base
RD_XS_MedBWall	569	6	---	0	6	Criteria Median Barrier Wall
RD_XS_Milling	570	3	----	2	6	Criteria Milling Symbolgy
RD_XS_Misc_Line	571	14	---	0	1	Criteria Miscellaneous Line
RD_XS_NewRW	572	2	---	0	3	Criteria New Right of Way
RD_XS_NPDES	573	2	----	2	2	Criteria NPDES Line on XS
RD_XS_OSBase	574	24	---	0	6	Criteria OutSide Base
RD_XS_Pave	575	3	---	0	6	Criteria Pavement
RD_XS_PaveOverlay	576	3	---	0	6	Criteria Pavement Overlay
RD_XS_PaveOverlay_CP	577	234	---	0	0	Criteria Pavement Overlay -Control Points
RD_XS_PaveShd	578	14	---	0	6	Criteria Paved Shoulder
RD_XS_Pipe	579	50	---	0	3	Drainage Pipe on XS
RD_XS_SideStreet	580	28	---	0	0	Pattern Line Side Street
RD_XS_SW	581	7	---	0	6	Criteria SideWalk
RD_XS_SWbase	582	16	---	0	6	Criteria SideWalk Base
RD_XS_SWfront	583	152	---	0	6	Criteria SideWalk Front
RD_XS_TieSlope	584	12	---	0	6	Criteria Tie Slope
RD_XS_VG	585	17	---	0	6	Criteria Valley Gutter
RD_XS_TX_Box	586	99	---	0	3	Drainage Box Text on XS
RD_XS_TX_Ditch	587	134	---	0	4	XS Elevation Text- Ditch
RD_XS_TX_Elev_EX	588	4	---	0	6	XS Elevation Text- Existing
RD_XS_TX_Elev_PR	589	3	---	0	4	XS Elevation Text- Proposed
RD_XS_TX_ExtEOP	590	95	---	0	0	XS Elevation Text- Existing Edge of Pavement
RD_XS_TX_MkPT	591	125	---	0	1	XS Text Marked Point
RD_XS_TX_MatchLine	592	3	---	0	1	XS Text Match Line
RD_XS_TX_Misc	593	145	---	0	4	XS Text Miscellaneous
RD_XS_TX_Notes	594	146	---	0	4	XS Text - Notes
RD_XS_TX_NPDES	595	147	---	0	4	XS Text - NPDES
RD_XS_TX_Offset	596	3	---	0	5	XS Text Offset
RD_XS_TX_Pipe	597	99	---	0	3	Drainage Pipe Text on XS
RD_XS_TX_Profile	598	3	---	0	4	XS Text Profile
RD_XS_TX_ShdSlope	599	2	---	0	4	XS Text Side Slope
RD_XS_TX_Slope	600	2	---	0	3	XS Text Slope
RD_XS_TX_Station	601	3	---	0	5	XS Text Station
RD_XS_TX_TOC	602	2	---	0	3	XS Text Top of Curb
RD_XS_TX_Warning	603	3	---	0	2	XS Text Warning
RD_XS_TX_Xsclose	604	2	---	0	3	XS Text Closure
RD_XS_Driveway	605	79	---	0	3	XS Driveway
RD_XS_TX_Driveway	606	79	---	0	6	XS Driveway Text
RD_XS_EXWetland	607	189	---	0	3	XS Wetland

Cross Section Levels (continued...)

RD_XS_Base_CL_BkLn	608		0	———— 0	———— 0	Criteria Base
RD_XS_Base_EP_BkLn	609		0	———— 0	———— 0	Criteria Base
RD_XS_Base_TP_BkLn	610		0	———— 0	———— 0	Criteria Base
RD_XS_CurbTop_BkLn	611		6	———— 0	———— 6	Criteria Curb Top
RD_XS_CurbBack_BkLn	612		6	———— 0	———— 6	Criteria Curb Top
RD_XS_EarthShd_BkLn	613		15	———— 0	———— 6	Criteria Earth Shoulder
RD_XS_DitchBtm_BkLn	614		15	———— 0	———— 6	Criteria Earth Shoulder
RD_XS_PAVE_CL_BkLn	615		15	———— 0	———— 6	Criteria Earth Shoulder
RD_XS_PAVE_EP_BkLn	616		15	———— 0	———— 6	Criteria Earth Shoulder
RD_XS_Binder	617		14	———— 0	———— 6	Criteria Earth Shoulder

Text Levels

The text levels are intended for all text labels applying to the existing or proposed design elements. All building notes, drainage, pipe, NPDES, profile notes, general construction notes, station offset text, title sheet text, typical sections, utilities, etc. are to be drafted on their respective text levels.

△	Name	Number				Used	Description
	RD_TX						
	RD_TX_Bldg	375		6	———— 0	———— 2	All Building Notes, Labels and Text
	RD_TX_Drainage	376		106	———— 0	———— 2	All Drainage, Pipe and NPDES Notes
	RD_TX_EndArea	377		183	———— 0	———— 2	Text for End Areas
	RD_TX_ErosCtrl	378		218	———— 0	———— 2	Text for Erosion Control Data
	RD_TX_Misc1	379		99	———— 0	———— 2	Miscellaneous Text #1
	RD_TX_Misc2	380		100	———— 0	———— 2	Miscellaneous Text #2
	RD_TX_PEShield	381		130	———— 0	———— 2	PE Shields
	RD_TX_Pipe_ElevEX	382		85	———— 0	———— 2	Pipe Text Existing Elevations
	RD_TX_Pipe_ElevPR	383		97	———— 0	———— 2	Pipe Text Proposed Elevations
	RD_TX_Profile	384		134	———— 0	———— 2	Profile Notes
	RD_TX_Qty	385		64	———— 0	———— 2	General Construction Notes/ Quantities
	RD_TX_RoadID	386		14	———— 0	———— 2	Road/Route Number or Name Text
	RD_TX_RW	387		231	———— 0	———— 4	Right of Way Data Text
	RD_TX_StaOff	388		200	———— 0	———— 2	Station Offset Text Label and Text
	RD_TX_TitleSht	389		4	———— 0	———— 2	Title Sheet Index//Notes/Labeling
	RD_TX_TypSect	390		30	———— 0	———— 2	Typical Sections TEXT
	RD_TX_Uilities	391		98	———— 0	———— 2	Text for Utilities
	RD_TX_Volume	392		143	———— 0	———— 2	Text for Volumes
	RD_TX_PESeal	393		130	———— 0	———— 2	PE Seal
	RD_TX_PESignature	394		2	———— 0	———— 2	PE Digital Signature Box for PDF

Sheet Levels

The sheet levels are used for the reference border sheet elements and lplot is set to recognize a plot shape for the rotation and size of the plan sheets. Other sheet levels are used to designate Major and Minor Grids which help with the dithering of plotted plan sheets.

△	Name	Number				Used	Description
	RD_SHT						
	RD_SHT_lplotShp	302		35	----- 1	———— 0	lplot Border shape
	RD_SHT_Bndy	400		0	———— 0	———— 2	Border Sheet Outside Boundary
	RD_SHT_ID	401		0	———— 0	———— 3	Border Sheet ID Cell
	RD_SHT_Logo	403		89	———— 0	———— 3	Border Sheet Logos
	RD_SHT_MatchLine	404		0	--- 3	———— 2	Match Line for Sheets
	RD_SHT_Misc1	405		0	———— 0	———— 0	Misc Border Sheets # 1
	RD_SHT_Misc2	406		4	———— 0	———— 0	Misc Border Sheets # 2
	RD_SHT_Misc3	407		28	———— 0	———— 0	Misc Border Sheets # 3
	RD_SHT_Misc4	408		18	———— 0	———— 0	Misc Border Sheets # 4
	RD_SHT_MjGrid	409		221	———— 0	———— 4	Border Sheet Major Grid Lines
	RD_SHT_MnGrid	410		221	———— 0	———— 2	Border Sheet Minor Grid Lines
	RD_SHT_ShtClip	411		67	--- 3	———— 3	Geopak Sheet Clip Borders
	RD_SHT_SubGrid	412		221	----- 1	———— 0	Border Sheer Sub Grid Lines
	RD_SHT_Snap	413		4	----- 2	———— 2	Border Sheet Snap Lines
	RD_SHT_TX	414		152	———— 0	———— 3	Border Sheet Text
	RD_SHT_Typical	415		198	———— 0	———— 4	Typical Sections Drawing
	RD_SHT_MjGrid_XS	416		221	———— 0	———— 4	Xsection Border Sheet Major Grid Lines
	RD_SHT_MnGrid_XS	417		221	———— 0	———— 2	Xsection Border Sheet Minor Grid Lines
	RD_SHT_SubGrid_XS	418		221	----- 1	———— 0	Xsection Border Sheer Sub Grid Lines

Sketch Levels

There are 10 sketch levels for design elements that do not have an assigned level and symbology.

△ Name	Number				Used	Description
RD_SKETCH						
RD_Sketch1	650	54	0	2		Misc. drawings& notes
RD_Sketch2	651	64	0	2		Misc. drawings& notes
RD_Sketch3	652	74	0	2		Misc. drawings& notes
RD_Sketch4	653	84	0	2		Misc. drawings& notes
RD_Sketch5	654	94	0	2		Misc. drawings& notes
RD_Sketch6	655	104	0	2		Misc. drawings& notes
RD_Sketch7	656	114	0	2		Misc. drawings& notes
RD_Sketch8	657	124	0	2		Misc. drawings& notes
RD_Sketch9	658	134	0	2		Misc. drawings& notes
RD_Sketch10	659	144	0	2		Misc. drawings& notes

DTM Levels

The DTM levels are used primarily by Surveys to show surveyed points and line work in a 3d design file. These features are mapped by the Geopak program. Breaklines, tin triangles and hull, lattices, major and minor contour lines, obscure areas, spot shots, and voids are depicted by these DTM levels.

△ Name	Number				Used	Description
RD_DTM						
RD_DTM_BkLn1	425	14	0	2		Geopak DTM Feature-Break Lines # 1
RD_DTM_BkLn2	426	119	1	2		Geopak DTM Feature-Break Lines # 2
RD_DTM_Bndy	427	2	0	1		Geopak DTM Feature-Boundary
RD_DTM_Final_Tin1	428	3	0	1		Geopak DTM Feature-Final Tin # 1
RD_DTM_Final_Tin2	429	19	0	1		Geopak DTM Feature-Final Tin # 2
RD_DTM_Holes	430	0	0	1		Geopak DTM Feature-Holes
RD_DTM_Islands	431	0	0	1		Geopak DTM Feature-Islands
RD_DTM_Latt	432	153	0	1		Geopak DTM Feature-Lattice
RD_DTM_LattX	433	84	0	1		Geopak DTM Feature-Lattice X Lines
RD_DTM_LattY	434	122	0	1		Geopak DTM Feature-Lattice Y Lines
RD_DTM_Major1	435	17	0	4		Geopak DTM Feature-Major Contour Lines # 1
RD_DTM_Major1_Lbl	436	17	0	2		Geopak DTM Feature-Major Contour Labels # 1
RD_DTM_Major2	437	30	0	4		Geopak DTM Feature-Major Contour Lines # 2
RD_DTM_Major2_Lbl	438	30	0	2		Geopak DTM Feature-Major Contour Labels # 2
RD_DTM_Minor1	439	21	0	1		Geopak DTM Feature-Minor Contour Lines # 1
RD_DTM_Minor1_Lbl	440	21	0	1		Geopak DTM Feature-Minor Contour Labels # 1
RD_DTM_Minor2	441	70	0	1		Geopak DTM Feature-Minor Contour Lines # 2
RD_DTM_Minor2_Lbl	442	70	0	1		Geopak DTM Feature-Minor Contour Labels # 2
RD_DTM_Obscure	443	191	0	0		Geopak DTM Feature-Obscured Areas
RD_DTM_Orig_Tin	444	2	0	1		Geopak DTM Feature-Original Tin
RD_DTM_Spot	445	144	0	0		Geopak DTM Feature-Spots
RD_DTM_TinHull	446	0	0	0		Geopak DTM Feature-TIN Hull
RD_DTM_Tri1	447	80	0	2		Geopak DTM Feature-Triangle #1
RD_DTM_Tri2	448	65	0	2		Geopak DTM Feature-Triangle #2
RD_DTM_Tri3	449	97	0	2		Geopak DTM Feature-Triangle #3
RD_DTM_Tri4	450	145	0	2		Geopak DTM Feature-Triangle #4
RD_DTM_VertEdge	451	0	0	1		Geopak DTM Feature-Lattice Vertical Edge
RD_DTM_Void	452	0	0	2		Geopak DTM Feature-Voids
RD_DTM_Spot_Elev	453	4	0	2		Geopak DTM Feature-Spot Elevation
RD_DTM_BkLn_txCode	454	0	0	0		Geopak DTM Feature-Break Lines Text Code
RD_DTM_Bndy1	455	5	0	1		Geopak DTM Feature-Boundary-1
RD_DTM_Bndy2	456	7	0	1		Geopak DTM Feature-Boundary-2
RD_DTM_Design_SG	457	4	0	2		Geopak DTM Feature-Break Lines # 1
RD_DTM_Design_SG1	458	4	0	2		Geopak DTM Feature-Break Lines # 1
RD_DTM_Design_FG1	459	220	0	2		Geopak DTM Feature-Break Lines # 1
RD_DTM_Design_FG	460	220	0	2		Geopak DTM Feature-Break Lines # 1
RD_DTM_Design_FG2	461	220	0	2		Geopak DTM Feature-Break Lines # 1
RD_DTM_Design_SG2	462	4	0	2		Geopak DTM Feature-Break Lines # 1

COGO Levels

Cogo levels are Geopak Cogo features that depict visibility of chain, curve, easement, lines, parcel, point, and take elements.

△	Name	Number					Description
	RD_COGO_ChainVis	475	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature
	RD_COGO_CurveVis	476	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature
	RD_COGO_EaseVis	477	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature
	RD_COGO_LineVis	478	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature
	RD_COGO_ParcelVis	479	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature
	RD_COGO_PointVis	480	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature
	RD_COGO_TakeVis	481	<input type="checkbox"/>	0	0	0	Geopak Cogo Feature

DDB Levels

The DDB Levels are utilized by the Geopak Design and Computation Manager and the Roadway Designer program to draft common design elements using the predefined symbology. These elements include elevation, grade, point, profile, station text, existing and proposed profiles and labels, strip grade elevations, and vertical curve labels.

△	Name	Number					Used	Description
	RD_DDB							
	RD_DDB_ElevTX	500	<input checked="" type="checkbox"/>	18	0	3		DDB Feature-Elevation Text
	RD_DDB_GradeTX	501	<input checked="" type="checkbox"/>	2	0	3		DDB Feature-Grade Text
	RD_DDB_PointTX	502	<input type="checkbox"/>	0	0	1		DDB Feature-Point Text
	RD_DDB_Profile_Elev	503	<input checked="" type="checkbox"/>	18	0	2		DDB Feature-Profile Text
	RD_DDB_Profile_EX	504	<input checked="" type="checkbox"/>	4	3	6		DDB Feature-Existing Profile
	RD_DDB_Profile_Lbl	505	<input checked="" type="checkbox"/>	18	0	3		DDB Feature-Profile Labels
	RD_DDB_Profile_PR	506	<input checked="" type="checkbox"/>	7	0	6		DDB Feature-Proposed Profile
	RD_DDB_StaTX	507	<input checked="" type="checkbox"/>	18	0	2		DDB Feature-Station Text
	RD_DDB_StripGrade	508	<input checked="" type="checkbox"/>	6	0	3		DDB Feature-Strip Grade Elevations
	RD_DDB_VCLbl	509	<input checked="" type="checkbox"/>	2	0	3		DDB Feature-Vertical Curve Labels

SMD Levels

The following SMD levels are used to show surveyed point locator shots and other miscellaneous surveyed shots from the existing survey. These levels are selectively turned off during plotting.

△	Name	Number	<input type="checkbox"/>				Description
	RD_SMD_Locator	515	<input type="checkbox"/>	0	0	0	SMD Point Locator
	RD_SMD_Misc	516	<input type="checkbox"/>	0	0	0	SMD - Miscellaneous

DSG Levels

The DSG (Design Services Group) levels were created for the quality control process of checking quantities, drainage, buildup, and property of construction plans.

△	Name	Number					Description
	RD_DSG_CkQuantity	525	<input checked="" type="checkbox"/>	215	0	0	Design Services Group Quantities Check
	RD_DSG_CkDrainage	526	<input checked="" type="checkbox"/>	230	0	0	Design Services Group Drainage Check
	RD_DSG_CkBuildUp	527	<input checked="" type="checkbox"/>	246	0	0	Design Services Group Buildup Check
	RD_DSG_CkProp	528	<input checked="" type="checkbox"/>	165	0	0	Design Services Group Property Check

Quantity Levels

These levels are provided to place the appropriate design elements used to calculate the quantities for the project. These levels include base course, clearing and grubbing, concrete for structures, drives, medians, sidewalks, erosion control, grading, guardrail, milling, asphalt, vegetation, reset fences, and any other commonly calculated quantity.

△	Name	Number				Used	Description
	RD_QTY						
	RD_QTY_Base_Course	850		19	————— 0	————— 2	All Base Courses
	RD_QTY_Clear_Grub	851		75	————— 0	————— 2	Clear & Grubbing
	RD_QTY_Conc4Struc...	852		24	————— 0	————— 2	Concrete for Structures
	RD_QTY_ConcDrive	853		74	————— 0	————— 2	Concrete Drives
	RD_QTY_ConcMed	854		80	————— 0	————— 2	Concrete Median
	RD_QTY_Curb_SW...	855		20	————— 0	————— 2	Curb&Gutter-Sidewalk-Medians
	RD_QTY_Erosion_Ctrl	856		17	————— 0	————— 2	Erosion Control
	RD_QTY_Fine_Grading	857		7	————— 0	————— 2	Fine Grading
	RD_QTY_GR	858		10	————— 0	————— 2	Guardrail
	RD_QTY_Intermediate	859		7	————— 0	————— 2	All Intermediate Courses
	RD_QTY_Milling	860		20	————— 0	————— 2	Milling
	RD_QTY_PermVeg	861		194	————— 0	————— 2	Permanent Vegetation
	RD_QTY_Prime_Coat	862		5	————— 0	————— 2	Prime Coat
	RD_QTY_RemExAsph	863		245	————— 0	————— 2	Remove Existing Asphalt
	RD_QTY_RemExConc	864		155	————— 0	————— 2	Remove Existing Concrete
	RD_QTY_RemPave	865		25	————— 0	————— 2	Pavement Removal
	RD_QTY_Reset_Fence	866		6	FENCE LINE	————— 2	Reset Fences
	RD_QTY_Steel4Struc...	867		36	----- 6	————— 2	Steel for Structures
	RD_QTY_Super_Pave	868		7	————— 0	————— 2	Super Pave
	RD_QTY_Surf_Course	869		14	————— 0	————— 2	All Surface Courses
	RD_QTY_SW	870		165	————— 0	————— 2	Sidewalks
	RD_QTY_ConcPave	871		218	————— 0	————— 2	Concrete Pavement
	RD_QTY_Bridge	872		28	————— 0	————— 2	Bridges & Approaches

Geopak Levels

There are currently two Geopak levels designated for the green dotted profile cell and the cross section cell that are used to hold the intelligence of the design elements utilized by the Geopak program.

△	Name	Number				Used	Description
	RD_GPK						
	RD_GPK_Profile_Cell	675		2	----- 1	————— 4	Geopak Profile Cell
	RD_GPK_XS_Cell	676		2	----- 1	————— 1	Geopak Cross Section Cell
	RD_GPK_XS_Text_Node	677		2	----- 1	————— 1	Geopak Cross Section Text Nodes

Architectural Levels

There are several Architectural Levels utilized for incorporating architectural design features into the roadway plans. The levels vary in color and line weight.

△	Name	Number				Used	Description
	RD_AR						
	RD_AR_00	950		0	0		Architecture Levels
	RD_AR_01	951		0	1		Architecture Levels
	RD_AR_02	952		0	2		Architecture Levels
	RD_AR_03	953		0	3		Architecture Levels
	RD_AR_04	954		0	4		Architecture Levels
	RD_AR_05	955		0	5		Architecture Levels
	RD_AR_06	956		0	6		Architecture Levels
	RD_AR_07	957		0	7		Architecture Levels
	RD_AR_08	958		0	8		Architecture Levels
	RD_AR_09	959		0	9		Architecture Levels
	RD_AR_10	960		0	10		Architecture Levels
	RD_AR_Text	961		0	0		Architecture Levels

Geotechnical Levels

There are several Geotechnical levels utilized for incorporating geotechnical information into the roadway plans.

△	Name	Number				Used	Description
	RD_gt						
	RD_GT_57Stone	1208		84	0	2	Geotechnical 57 Stone
	RD_GT_BiaxialGrid	1205		32	4	3	Geotechnical Biaxial Grid
	RD_GT_BorrowExcav	1203		84	0	2	Geotechnical Borrow Excavation
	RD_GT_EQDrains	1204		16	0	6	Geotechnical EQ Drains
	RD_GT_GeoSeparator	1207		2	0	3	Geotechnical Geo Separator
	RD_GT_MonitoringDevices	1211		134	0	6	Geotechnical Monitoring Devices
	RD_GT_Mucking	1201		130	0	2	Geotechnical Mucking
	RD_GT_RetainingWall	1212		10	0	6	Geotechnical Retaining Wall
	RD_GT_Surcharge	1209		17	0	2	Geotechnical Surcharge
	RD_GT_TXT	1200		30	0	4	Architecture Levels
	RD_GT_UnclassExcav	1202		35	0	6	Geotechnical Unclassified Excavation
	RD_GT_UniaxialGrid	1206		32	3	3	Geotechnical Uniaxial Grid
	RD_GT_WeldedWireForm	1210		32	0	4	Geotechnical Welded Wire Form

Environmental Levels

There are several Environmental levels utilized for incorporating environmental information into the roadway plans. These levels can also be used to complete Environmental Permits.

△	Name	Number				Used	Description
	RD_EV_Ditch	1312		36	3	3	Environmental Non-Regulated Ditch
	RD_EV_ESA	1302		24	EVS_ESA	3	Environmental Environmental Sensitive Area
	RD_EV_Hatch	1303		32	0	2	Environmental Hatch patterns
	RD_EV_JDitch	1301		251	EVS_JD	3	Environmental Jurisdictional Ditch
	RD_EV_JFlag	1306		251	0	0	Environmental Located Flag Numbers
	RD_EV_JTrib	1305		231	EVS_EJT	3	Environmental Jurisdictional Tributary
	RD_EV_JW	1304		79	EVS_EJW	3	Environmental Jurisdictional Wetlands
	RD_EV_OWater	1308		250	EVS_OW	3	Environmental Open Water Within Jurisdictional Area
	RD_EV_Shades	1309		24	0	0	Environmental Color fills
	RD_EV_TNW	1307		141	EVS_TNW	3	Environmental Traditionally Navigable Water/OCRM Critical Area
	RD_EV_TX	1300		250	0	4	Environmental Text for Plan Sheets
	RD_EV_TxCode	1310		0	0	0	Environmental Survey Code Data & Text
	RD_EV_Working	1311		175	0	0	Environmental Non-Plotting Working Level

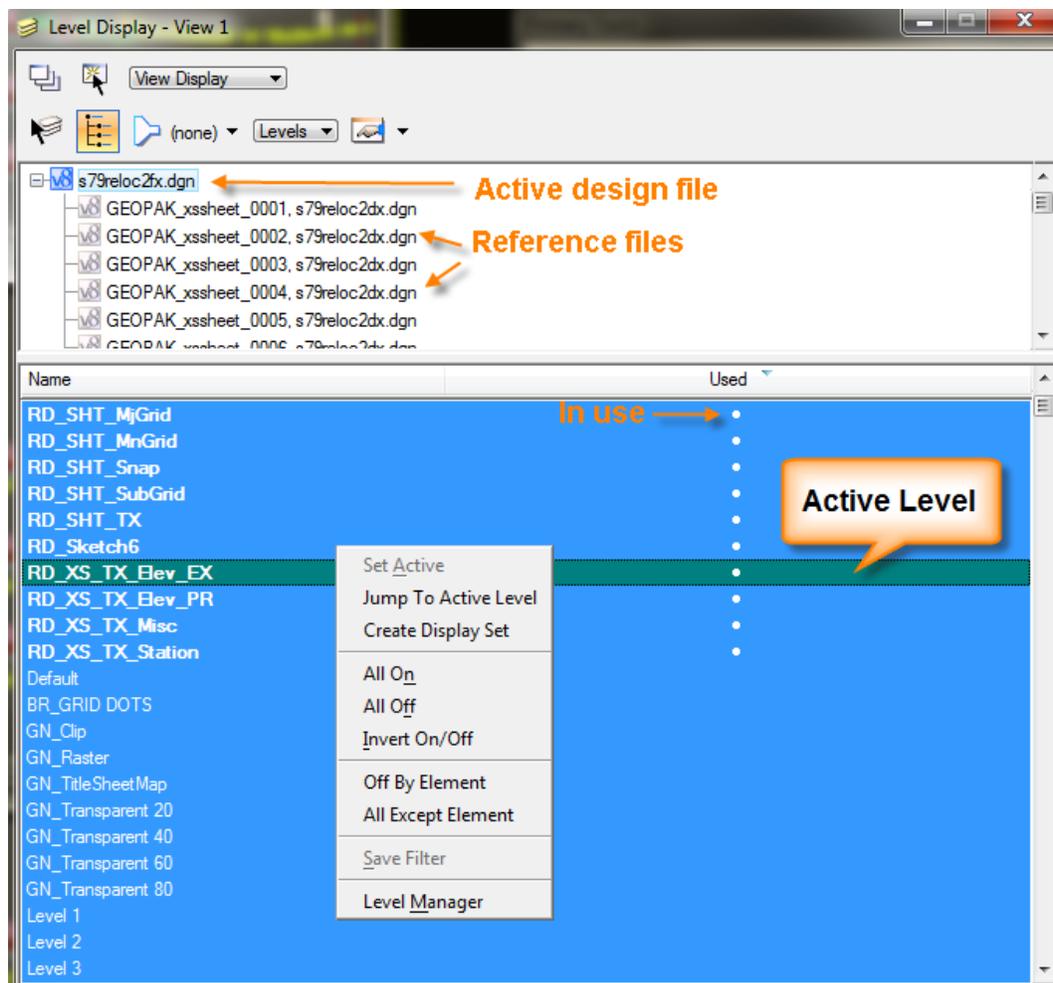
Level Display

The Level Display is used to turn on or off levels in the active design file or in the reference attachments. It can be launched by selecting **Settings > Level > Display**, Ctrl + E, or from the Primary Tool bar.

The level highlighted in **green** is the active level. You can set the active level by double clicking on a particular level in the level display box. The “dot” indicates that a level is in use and contains elements. To turn the level on or off, click on the level once. The active level display cannot be turned off.

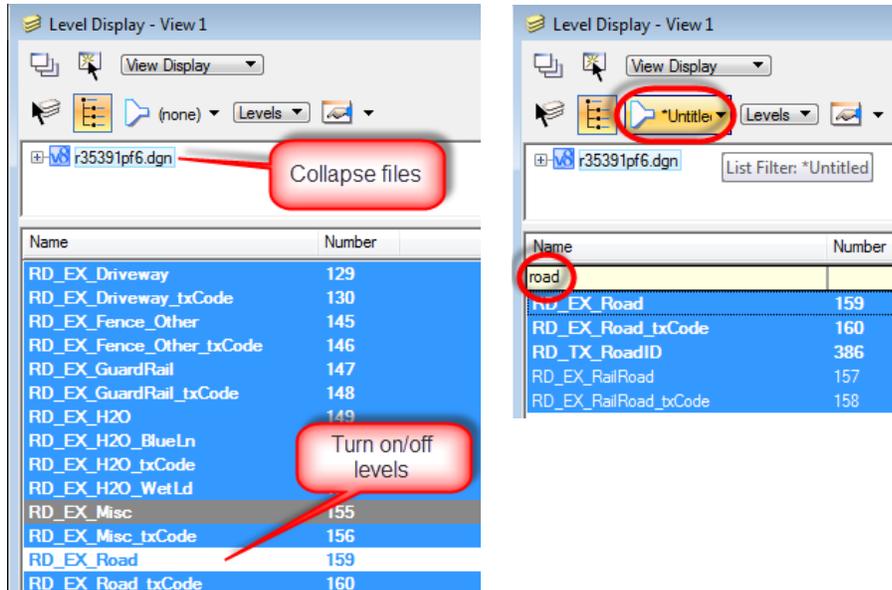
Right-clicking also provides additional controls such as All On or All Off, Off By Element and All Except Element.

There are also filters available to narrow down the list of available levels and a search filter to locate specific levels. You can also display levels by Views and save those settings as mentioned previously.

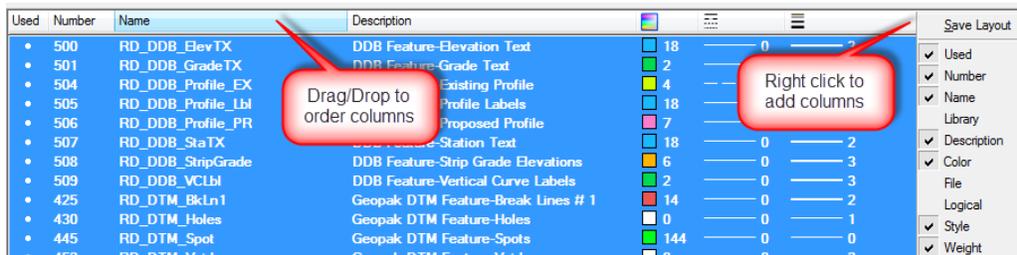


To turn on or off a level in all of the design files including references, collapse the list to the main design file. Toggle on or off the desired level display. This will be updated for all reference attachments.

To filter by entering a partial level name, change the filter toggle to Untitled. In the yellow box type part of the level name and press enter to filter those levels. (Switch back to none to see ALL Levels.)



You can drag/drop column headers to modify the arrangement. It takes up less room to put the Used and Number before the Name/Description. You can also add columns by right-clicking and turning on items such as Color/Weight/Style.

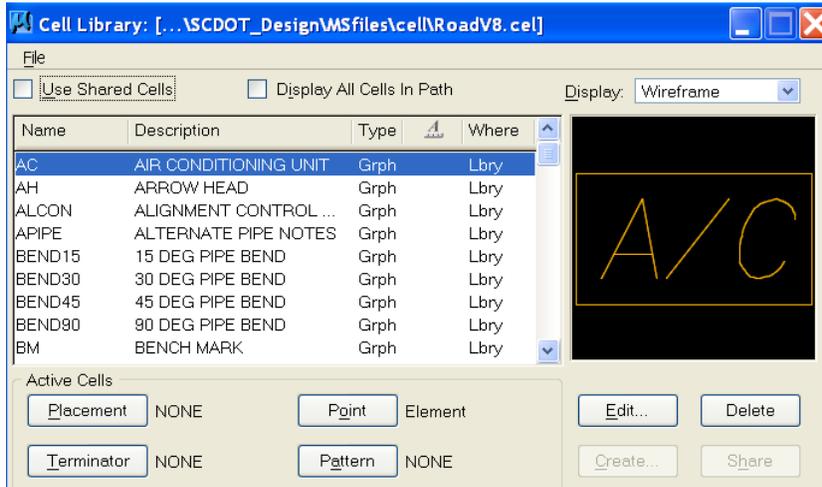


Cell Libraries

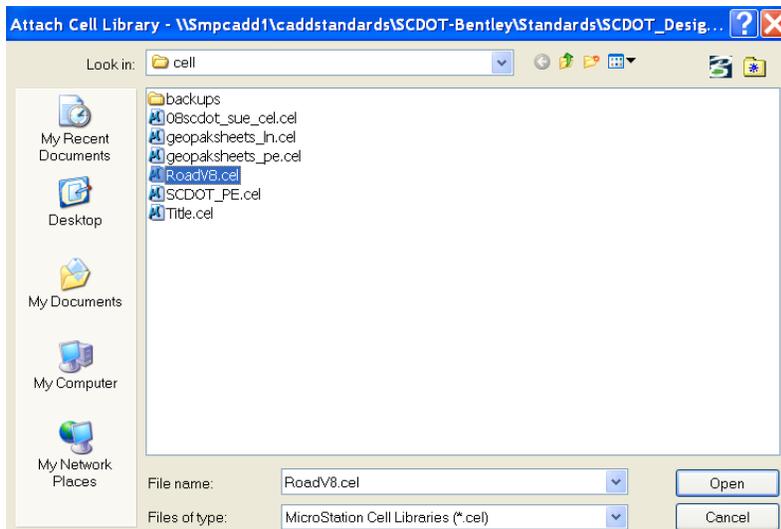
A cell is a small drawing, usually of a frequently used symbol, created in a MicroStation design file. Each cells is stored in a model to create a *cell library* with the file extension *.cel. Currently, SCDOT roadway design utilizes the following cell libraries:

Cell Library Name	Cell Library Description
Title.cel	Contains title sheet borders for use with the mapping application (available internally to SCDOT only)
RoadV8.cel	Contains graphical cell elements used to draft roadway plans
Geopaksheets_In.cel	Contains cross section and plan/profile sheet borders for use with Geopak sheet composition tools

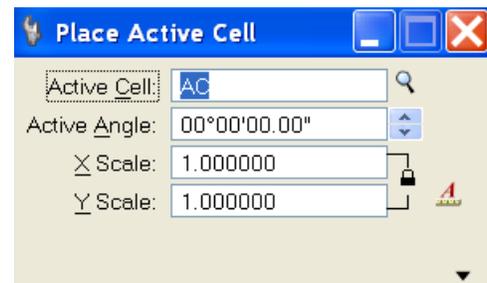
To access the cell library dialog, select **Element > Cells** from the top bar menu in a MicroStation design file.



To attach a cell library, choose **File > Attach** under the Cell Library File menu and the following dialog will appear. Highlight the cell library needed and press **OK**.



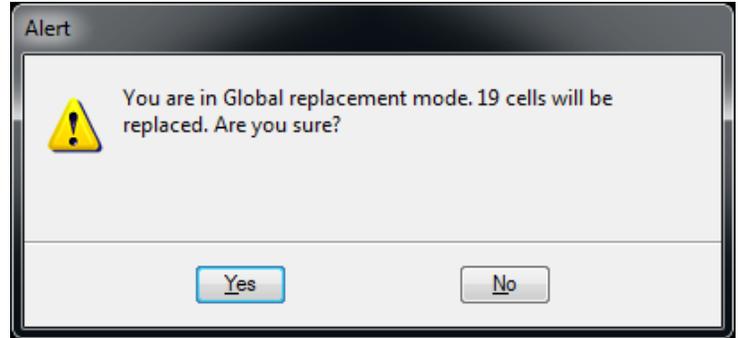
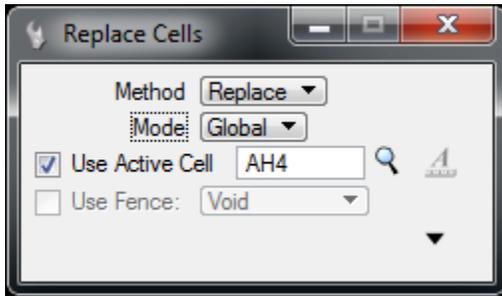
To place a cell, use the cell palette shown below. The size of the cells varies for the different drawing scales. Key in the following recommended values in the X and Y scale boxes for the project scale.



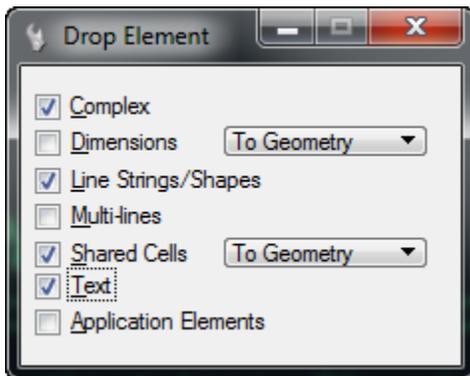
The cell toolbar can be accessed by going to **Tools > Main > Cells**

- 50:1 English = 1.000
- 20:1 English = 0.400

To replace a cell, select the Replace Cell icon. Select the Method for **Replace**. Select the Mode for Single cell or **Global** for all cells in drawing. Check on **Use Active Cell** and pick the new cell to replace the existing cell with. **Data click** on one of the cells to begin the process. Click **Yes** to accept the replacement of all cells in the drawing.



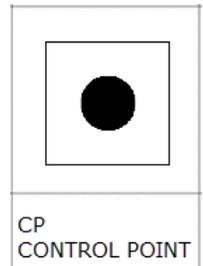
At times it may be necessary to modify a cell or cell text. Select the **Drop Element** icon. The cell can be dropped into individual elements for this purpose by selecting options such as Line Strings/Shapes and Text. Click on the cell to drop. Edit the contents as necessary.



The cells depicted on the following pages are located in the RoadV8.cel library in the SCDOT Cadd Workspace:

<i>12FT Dry 12FT Driveway</i>	<i>18RPR 18RipRap</i>	<i>24RPR 24RipRap</i>	<i>30RPR 30RipRap</i>
<i>36RPR 36RipRap</i>	<i>42RPR 42RipRap</i>	<i>48RPR 48RipRap</i>	<i>AC AIR CONDITIONING</i>
<i>AH ARROW HEAD</i>	<i>AH4 Line Terminator</i>	<i>ALCON ALIGNMENT CONTROL</i>	<i>APIPE ALTERNATE PIPE NOTE</i>
<i>BEND15 15 DEG PIPE BEND</i>	<i>BEND30 30 DEG PIPE BEND</i>	<i>BEND45 45 DEG PIPE BEND</i>	<i>BEND90 90 DEG PIPE BEND</i>

<i>BM</i> <i>Survey - Bench Mark</i>	<i>CA</i> <i>Control Access</i>	<i>CAP</i> <i>FILL CAP</i>	<i>CB</i> <i>CATCH BASIN</i>
<i>CG</i> <i>CURB GUTTER</i>	<i>CHANGE</i> <i>CONSTRUCTION</i> <i>CHANGE</i>	<i>CL</i> <i>CENTERLINE SYMBOL</i>	<i>CM</i> <i>CONCRETE MARKER</i>
<i>CNOTE1</i> <i>CONST NOTE UPPER</i>	<i>CNOTE2</i> <i>CONST NOTE LOWER</i>	<i>CNOTE3 RIPRAP</i> <i>CONST NOTE RIPRAP</i>	<i>COL</i> <i>COLUMN</i>
<i>CULTIVATED</i> <i>FIELD</i>			
<i>CULT</i> <i>CULTIVATED FIELD</i>	<i>DB</i> <i>DUMMY CB OR TEE</i>	<i>DI</i> <i>DROP INLET</i>	<i>DIRT</i> <i>DIRT SYMBOL</i>



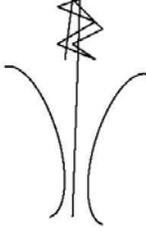
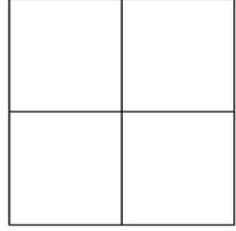
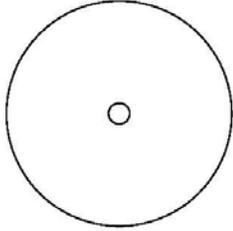
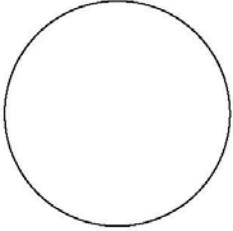
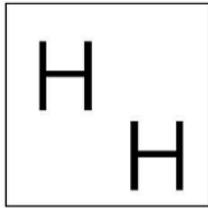
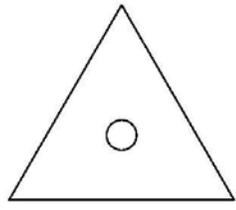
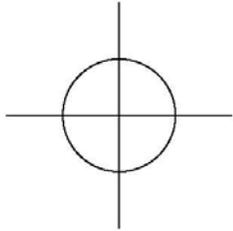
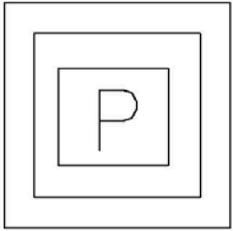
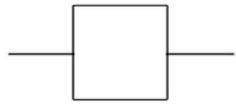
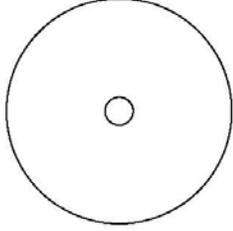
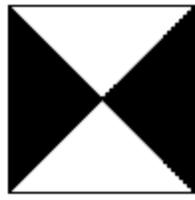
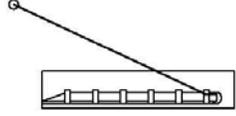
ECB <i>EXISTING CB_HYDRO</i>	EDI <i>EXISTING DI_HYDRO</i>	EJF <i>Environmental Flag</i>	ENDTB <i>END ANCHOR TYPE</i>
EOI <i>END OF INFORMATION</i>	EOUT <i>ELEC. OUTLET_RES</i>	ETB <i>ELEC TRANSFORMER</i>	EVH-JW <i>JURISDITONAL WETLANDS</i>
EVH-ESA <i>Environmental Hatch</i>	EVH-JT <i>JURISDITONAL TRIBUTARY</i>	EVH-OW <i>Environmental OpenWater</i>	EVH-Riprap <i>Environmental RipRap</i>
ExRWMarker <i>Exist RW Marker</i>	FENCE <i>FENCE SYMBOL</i>	FH <i>FIRE HYDRANT</i>	FLAG <i>FLAG POLE</i>

EVH-OCRm <i>CRITICAL OCRm AREA</i>

	<p>Design Reference for these plates is the: 2001 AASHTO "A Policy on Consistent Design of Highways and Streets"</p>	<p>Design Reference for these plates is the: 1990/1994 AASHTO "A Policy on Consistent Design of Highways and Streets"</p>	
<p>FLT FLOOD_GROUND Light</p>	<p>GB2001 GREEN BOOK 2001</p>	<p>GB9094 GREEN BOOK 1990_</p>	<p>GEO Survey - NGS Control</p>
<p>GM GAS METER</p>	<p>GMH GAS MANHOLE</p>	<p>GP GUY POLE</p>	<p>GR GAS PRESSURE REG</p>
<p>Road group designation for this FAS Rural Route or State "C" Road per EDM PC-3 Is Group 1</p>	<p>Road group designation for this FAS Rural Route or State "C" Road per EDM PC-3 Is Group 2</p>	<p>Road group designation for this FAS Rural Route or State "C" Road per EDM PC-3 Is Group 3</p>	
<p>GROUP1 GROUP DESIGNATION</p>	<p>GROUP2 GROUP DESIGNATION</p>	<p>GROUP3 GROUP DESIGNATION</p>	<p>GRV GRAVE</p>
			<p>Hydraulic Design Reference for these plates is the: 2000 Edition of SCDOT's "Requirements for Hydraulic Design Station"</p>
<p>GV GAS VALVE</p>	<p>GVT GAS VENT</p>	<p>GW GUY WIRE</p>	<p>HD2000 2000 "Requirements"</p>

	<p>HYDROLOGY DATA: D.A. = sq.mi. = ac. Q = cfs Vel. = ft/sec Year H.W. Elev. = ft. Including ft. Headwater 0100 = cfs Vel = ft/sec 100 Year H.W. Elev. = ft. Including ft. Headwater OVERTOPPING FLOOD: Q = cfs Probability = %</p>	<p>HYDROLOGY DATA: D.A. = sq.mi. = ac. Q = cfs Vel. = ft/sec Year H.W. Elev. = ft. Including ft. Headwater 0100 = cfs Vel = ft/sec 100 Year H.W. Elev. = ft. Including ft. Headwater OVERTOPPING FLOOD: Q = cfs Probability = %</p>	<p>HYDROLOGY DATA: D.A. = sq.mi. = ac. Q = cfs Vel. = ft/sec Year H.W. Elev. = ft. 0100 = cfs Vel = ft/sec 100 Year H.W. Elev. = ft. NOTE : Data from Bridge Section OVERTOPPING FLOOD: Q = cfs Probability = %</p>
<p><i>HD2009</i> <i>2009 "Requirements"</i></p>	<p><i>HDTBC</i> <i>HY DATA FOR BR</i></p>	<p><i>HDTBC Fill</i> <i>HY DATA FOR BR</i></p>	<p><i>HDTBR</i> <i>HY DATA FOR BRIDGE</i></p>
<p>HYDROLOGY DATA: D.A. = sq.mi. = ac. Q = cfs Vel. = ft/sec Year H.W. Elev. = ft. 0100 = cfs Vel = ft/sec 100 Year H.W. Elev. = ft. NOTE : Data from Bridge Section OVERTOPPING FLOOD: Q = cfs Probability = %</p>	<p>HYDROLOGY DATA: D.A. = sq.mi. = ac. Q = cfs Vel. = ft/sec Year H.W. Elev. = ft. 0100 = cfs Vel = ft/sec 100 Year H.W. Elev. = ft.</p>	<p>HYDROLOGY DATA: D.A. = sq.mi. = ac. Q = cfs Vel. = ft/sec Year H.W. Elev. = ft. 0100 = cfs Vel = ft/sec 100 Year H.W. Elev. = ft.</p>	<p>Project Contacts</p> <p>Name Telephone</p> <p>Program/Project Manager: _____</p> <p>Design Group Coordinator: _____</p>
<p><i>HDTBR Fill</i> <i>HY DATA FOR BRIDGE</i></p>	<p><i>HDTPC</i> <i>HY DATA FOR PIPE</i></p>	<p><i>HDTPC Fill</i> <i>HY DATA FOR PIPE</i></p>	<p><i>INFO</i> <i>PROJECT CONTACTS</i></p>
<p><i>IP</i> <i>Property Corner</i></p>	<p><i>JB</i> <i>JUNCTION BOX</i></p>	<p><i>LARRW</i> <i>LEFT TURN ARROW</i></p>	<p><i>LARRW2</i> <i>LEFT TURN ARROW</i></p>
<p><i>LB</i> <i>LAYOUT BORDER Sheet</i></p>	<p><i>LP</i> <i>LIGHT POLE</i></p>	<p><i>LSP</i> <i>CONSTRUCTION Layout</i></p>	<p><i>MAIL</i> <i>MAIL BOX</i></p>

MARKER <i>EOP_FOC MARKER</i>	MARSH <i>MARSH GRASS AREA</i>	MH <i>DRAINAGE MAN HOLE</i>	MP <i>METER POLE</i>
MSC <i>Survey - Main Survey</i>	MSP <i>MISCELLANOUS POINT</i>	NA <i>NORTH ARROW</i>	NA1 <i>NORTH ARROW</i>
NA2 <i>NORTH ARROW</i>	NCB <i>NEW GENERIC CATCH</i>	NCB15DOUBLE <i>NEW CATCH BASIN</i>	NCB16 <i>NEW CB TYPE 16</i>
NCB17 <i>NEW CB TYPE 17</i>	NCB18 <i>NEW CB TYPE 18</i>	NMH <i>NEW MANHOLE</i>	OP <i>OTHER USE POLE</i>

<p>OP</p>		<p>PARKING LOT</p>	
<p><i>OPD</i> <i>OUTLET PIPE DOWN</i></p>	<p><i>PAMPAS</i> <i>PAMPAS GRASS</i></p>	<p><i>PARK</i> <i>PARKING LOT TEXT</i></p>	<p><i>PBM</i> <i>Survey - Project</i></p>
			
<p><i>PC</i> <i>POINT OF TAN OF</i></p>	<p><i>PCOR</i> <i>Property Calculation</i></p>	<p><i>PHH</i> <i>POWER HAND HOLD</i></p>	<p><i>PI</i> <i>POINT OF INTERSECT</i></p>
			
<p><i>PK</i> <i>PARKING METER</i></p>	<p><i>PLT</i> <i>POWER LINE TOWER</i></p>	<p><i>PM</i> <i>POWER MANHOLE</i></p>	<p><i>PP</i> <i>POWER POLE</i></p>
			
<p><i>PPIN</i> <i>Property Corner</i></p>	<p><i>PSC</i> <i>Survey - Primary</i></p>	<p>NEW R/W Marker New Right of Way</p>	<p><i>QUADTREND 1</i> <i>Quadtrend End T</i></p>

<i>QUADTREND 2 Quadtrend End Tr</i>	<i>RARRW RIGHT TURN ARROW</i>	<i>RARRW2 RIGHT TURN ARROW</i>	<i>RRB RR SIGNAL BOX</i>
<i>RRM R R MILE POST</i>	<i>RRS R R SIGNAL</i>	<i>RRX R R CROSSING ARM</i>	<i>RWM R.W. Monument /</i>
<i>RelCLMarker Proposed Relocation</i>	<i>SAR SEWER AIR RELEASE</i>	<i>SARRW STRAIGHT ARROW O</i>	<i>SARRW2 STRAIGHT ARROW S</i>
<i>SAT SATELLITE DISH</i>	<i>SB1 SHRUB SURVEYED</i>	<i>SB2 SHRUB NOT SURVEY</i>	<i>SC S.C. ROUTE SHEIL</i>

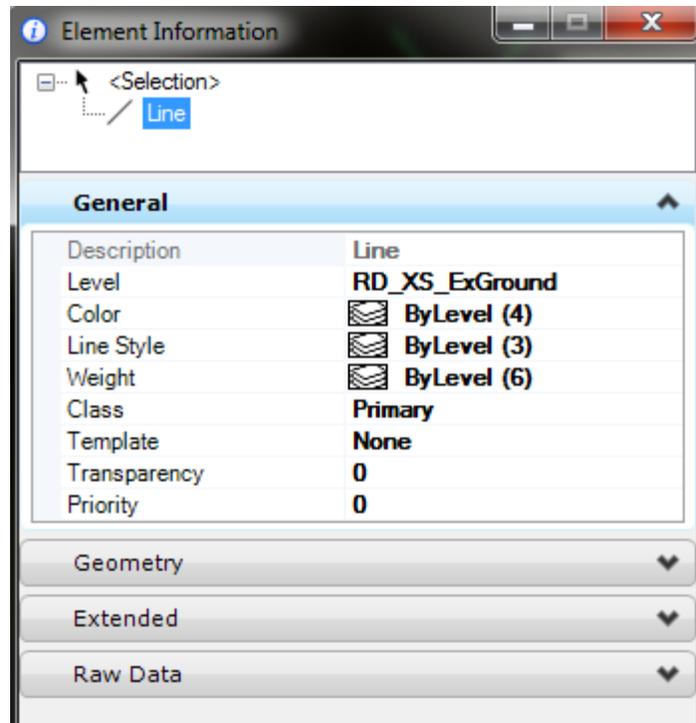
<p>SC0 SEWER CLEANOUT_V</p>	<p>SDAM SEDIMENT DAM</p>	<p>SFILT SEDIMENT FILTER</p>	<p>SIGN SIGN POST</p>
		<p><small>*NOTE: THE SLOPE MAY BE TURNED DOWN A DEEPER NOTCH IS NECESSARY FOR SHARPER TURNS. USE A MINIMUM SLOPE OF 2% AND A MAXIMUM SLOPE OF 4%. MAKE A DEEPER NOTCH TURN PROVIDED BY A SIGN NECESSARY. THE SIGN SHALL BE PLACED FARTHER FROM THE S, CONTAINING THE ARROWS TO PROVIDE FOR THE NECESSARY DEPTH. SEE PROFILE FOR THE SPECIAL NOTCH DIMENSIONS.</small></p>	
<p>SLARR ST_LT TURN ARROW</p>	<p>SLARR2 ST_LT TURN ARROW</p>	<p>SLOPE SLOPE NOTE</p>	<p>SLTRT ST_LT_RT TURN AR</p>
<p>SLTRT2 ST_LT_RT TURN AR</p>	<p>SPK SPRINKLER</p>	<p>SPR WATER SPRING</p>	<p>T1 TREE SURVEYED</p>
<p>T2 TREE NOT SURVEYED</p>	<p>TBC1 THRIE BRIDGE CON</p>	<p>TBC2 THRIE BRIDGE CON</p>	<p>TEE TEE JOINT</p>

<i>TH</i> TEST HOLE	<i>THH</i> TELEPHONE HAND H	<i>TMH</i> TELEPHONE MANHOLE	<i>TP</i> TELEPHONE POLE
<i>TPP</i> TELEPHONE PEDEST	<i>TREELN</i> TREE LINE	<i>TSJB</i> TRAFFIC SIGNAL J	<i>TSP</i> TRAFFIC SIGNAL P
<i>TV</i> CABLE TV PEDESTA	<i>TVHH</i> CABLE TV HAND HO	<i>TYPET1</i> TYPE T TREAT BEG	<i>TYPET2</i> TYPE T TREAT END
<i>UOT</i> UNDERGROUND OIL	<i>US</i> US ROUTE SHEILD	<i>VAC</i> VACUUM_ COMMERCIAL	<i>WAR</i> WATER AIR RELEASE

<i>WELL</i> <i>WELL HOUSE</i>	<i>WM</i> <i>WATER METER</i>	<i>WMH</i> <i>WATER MAN HOLE</i>	<i>WMW</i> <i>WATER MONITORING</i>
<i>WQS</i> <i>WATER QUALITY ST</i>	<i>WTS</i> <i>WITNESS POST_UTI</i>	<i>WV</i> <i>WATER VALVE</i>	<i>WYE</i> <i>WYE JOINT</i>
WETLAND Wetland Marker			

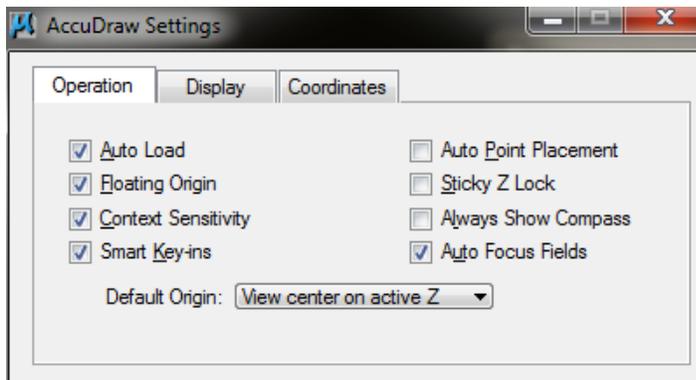
Element Information

The Element Information tool allows the user to review settings on a design element. Changes to the element attributes can be made in this dialog.



AccuDraw

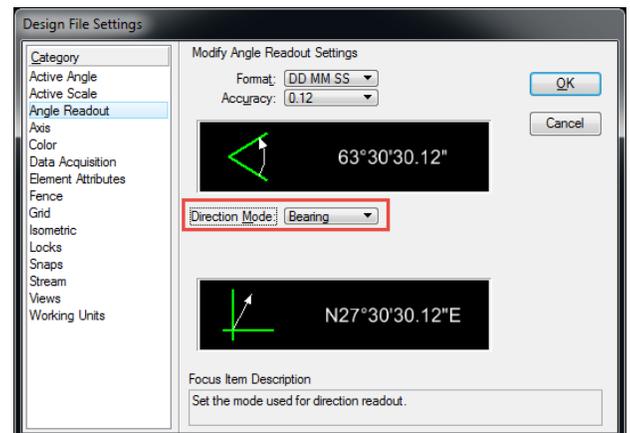
AccuDraw provides you with the tools to produce precision drawing of complex geometry in MicroStation.



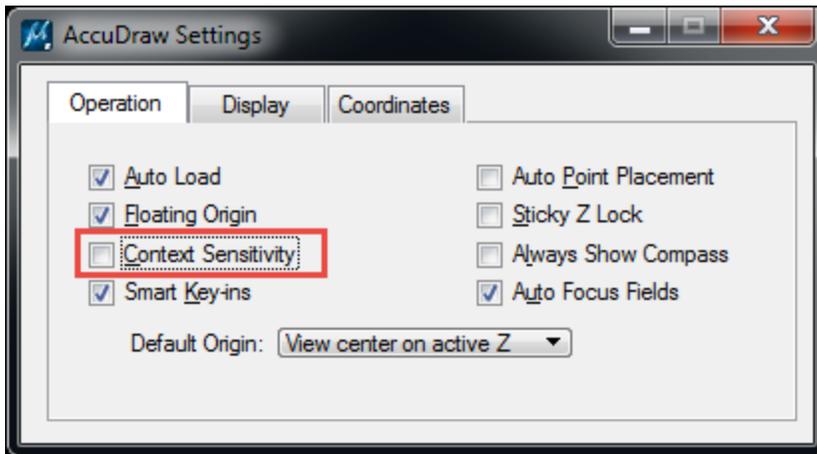
(If the drawing is not in true north orientation, the accudraw measurements may not appear accurate, simply use the keyin vi=top to rotate the drawing true north.)

To enter bearings in another quadrant, you can edit your settings as follows to allow you to save key-strokes when entering angles.

Select **Settings > Design File**. Tag the Angle Readout option and make sure the Direction Mode is set to **Bearing**.



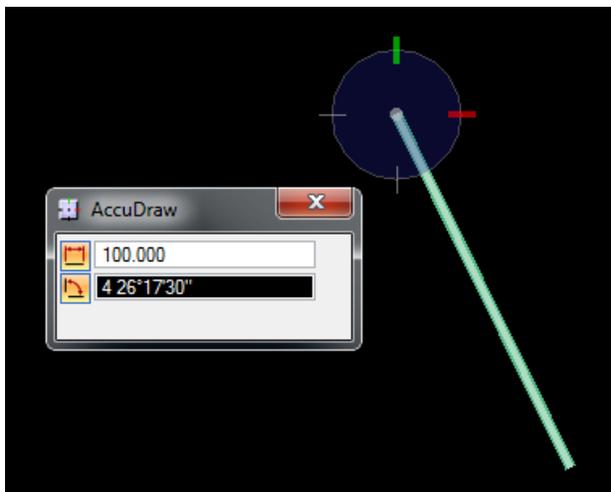
Select **Settings > AccuDraw** and turn off the check box for Context Sensitivity.



Make sure that AccuDraw is active and set to polar mode (press the space bar to toggle between Polar and Rectangular modes.) Polar mode activates the following shortcuts:

- Quadrant 1 – North East
- Quadrant 2 – North West
- Quadrant 3 – South West
- Quadrant 4 – South East

Rather than key-in in S26^17'30"E, you can key-in 4 26^17'30: for the same results. You can also use a semi colon ";" in place of the carrot ^ symbol.



Key-in

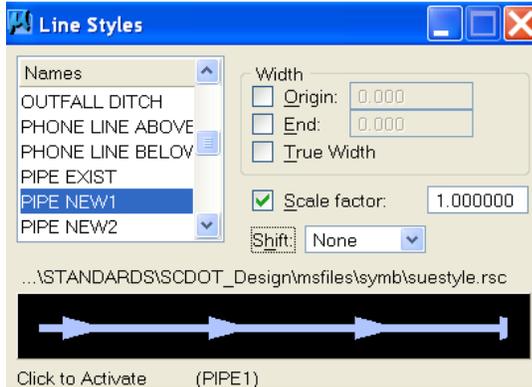
The key-in dialog allows the user to use shortcut text commands to activate MicroStation commands. (Example: **Vi=top** will rotate the drawing true North)

To access a list of key-ins, select Help > Contents. Select MicroStation V8i Help Keyin-in Index. You can search for key-ins by using the Find Field.



Line Styles

Custom *line styles* can consist of text and symbols that have been created in MicroStation. They can be accessed by selecting Elements > Line Styles > Custom from the top menu bar. Scroll through the line style options and double click on the style needed, or double click on the line display box to activate the attributes.



The line styles were developed for an English scale of 50:1. If using another scale, key-in the following values in the Scale Factor box of the line styles dialog.

50:1 English = 1.000

20:1 English = 0.400

Existing and new pipes are not drawn to scale. Therefore, the user may decide on a scale when using these. NPDES is typically scaled at 2.000 to make the text more legible.

Use the Change Attributes > Line Style tool to modify a selected line style such as NPDES.

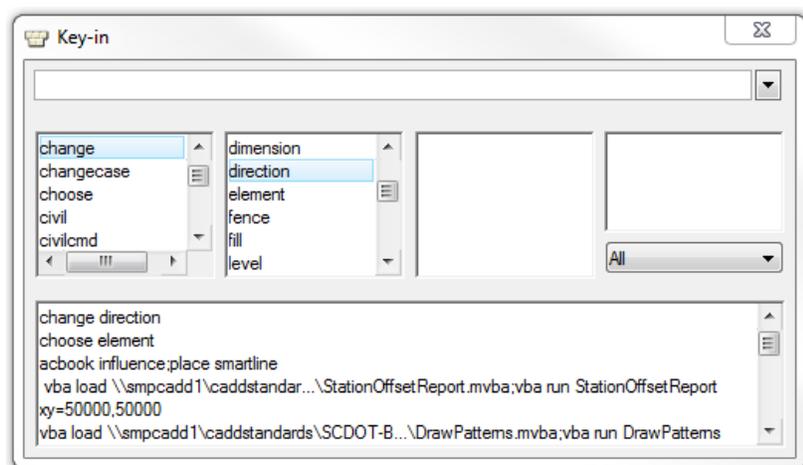
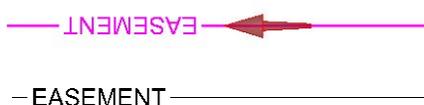


Use the Shift tool from the Modify Line Style Attributes menu to center or modify line styles. Enter a value and click the line to accept. Click again if it still needs adjusting.



When drawing lines with text as part of their line type, it's not unusual to discover that the text is initially reading out backwards and upside-down. Rather than redrawing the line, use the **"Change Direction"** command in the Key-In dialog box.

Clicking the highlighted arrow on the line will reverse the direction of the line the text that is part of it. Any features or calculations based on line direction will be affected, too.



Style Name	Level Name	Description	Line Appearance
BCA	RD_PD_BCA	Bridge Control Access	
CITY LIMIT	RD_EX_DV_Gov	City Limit/County Limit	
CLEARGRUB	RD_PD_Clearing_Grubbing	Clearing and Grubbing Limits	
CLOUD	RD_Sketch1	Cloud	
EASEMENT	RD_EX_Easement	Existing Easement	
EASEMENT	RD_PD_Easement	Proposed Easement	
ELEC LINE ABOVE	RD_EX_SU_Elec	Existing Overhead Electrical	
ELEC LN UNDER	RD_EX_SU_Elec	Existing Underground Elec.	
EX GR LT	RD_EX_Guardrail	Existing Guardrail Left	
EX GR RT	RD_EX_Guardrail	Existing Guardrail Right	
FENCE LINE	RD_EX_Fence_ChLk	Existing Chain Link Fence	
FENCE LINE	RD_EX_Fence_Other	Existing Other Fence	
FENCE LINE NEW	RD_PD_Fence	Proposed Fence	
FOC	RD_PD_FOC	Proposed Face of Curb	
FIBER OPTIC	RD_EX_SU_Telecom	Fiber Optic Line	
GAS LINE	RD_EX_SU_Gas	Gas Line	
NEW GR LT	RD_PD_GR	Proposed Guardrail Left	
NEW GR RT	RD_PD_GR	Proposed Guardrail Right	
NPDES	RD_PD_DR_ErosCtrl	Proposed NPDES	
OUTFALL DITCH	RD_PD_DR_FlowCtrl	Proposed Outfall Ditch Flow Line	
OUTFALL DITCH	RD_PD_DR_Ditch	Proposed Outfall Ditch	
PHONE LINE A	RD_EX_SU_Telecom	Overhead Telephone	
PHONE LINE B	RD_EX_UT	Underground Telephone	
PIPE EXIST	RD_EX_DR_Pipe	Existing Pipe	
PIPE NEW1	RD_PD_DR_Pipe	Proposed Pipe 1	
PIPE NEW2	RD_PD_DR_Pipe	Proposed Pipe 2	
R/W OR PROPERTY LINE	RD_EX_RW	R/W Line	
R/W OR PROPERTY LINE	RD_EX_DV_Prop	Property Line	

Style Name	Level Name	Description	Line Appearance
RAILROAD LINE	RD_EX_Railroad	Railroad Line	
RELOCATION LINE	RD_HC_Data_Rel	Relocated Centerline	
SHRUB LINE	RD_EX_VEG	Shrub Line	
STATE LINE	RD_EX_DV_Gov	State Line	
TR_RR	RD_EX_Railroad	Rail Road Tracks	
TREE LINE	RD_EX_VEG	Tree Line	
WETLAND	RD_EX_H2O_WedLd	Wetlands	
WOODED AREA LT	RD_EX_VEG	Wooded Area Left	
WOODED AREA RT	RD_EX_VEG	Wooded Area Right	
EVS_TNW	RD_EV_TNW	Environmental - Traditionally Navigable Water/OCRM Critical Area	
EVS_ESA	RD_EV_ESA	Environmental - Environmentally Sensitive Area	
EVS_JD	RD_EV_JDitch	Environmental - Jurisdictional Ditch	
EVS_EJT	RD_EV_JTrib	Environmental - Jurisdictional Tributary	
EVS_EJW	RD_EV_JW	Environmental - Jurisdictional Wetlands	
EVS_OW	RD_EV_OWater	Environmental - Open Water Within Jurisdictional	

Fonts

MicroStation contains two types of fonts – TrueType and RSC fonts. **TrueType** fonts are delivered with Windows and are always solid in appearance. True Type fonts cannot have additional weights applied to them when plotting. These fonts also export more uniformly with other products. **RSC** fonts are MicroStation specific and weights must be applied for plotting.

Some of the most common fonts that SCDOT uses for plan production are:

RSC Fonts

- 151 arial
This is 151 arial font.
- 201 ClearviewHwy-2-W
This is 201 Clearview-2-W font.
- 0 font000
This is 0 font000 font.
- 1font001
This is 1font001font.
- 23 font023
This is 23 font023 font.
- 43 font43
This is 43 font43 font.
- 190 times
This is 190 times font.
- 203 timesi
This is 203 times font.
- 3 USTN_ENGNRG
This is 3 USTN_ENGNRG font.

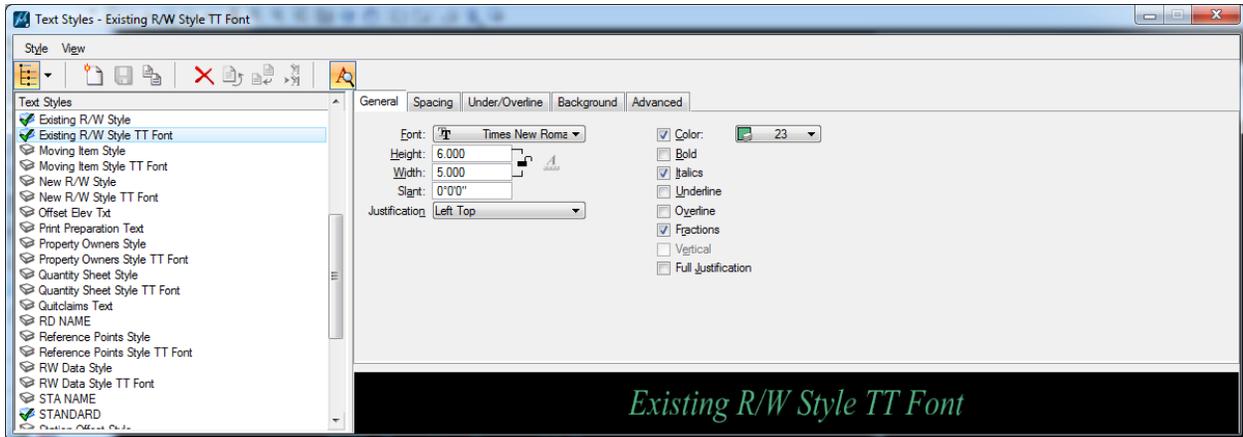
TrueType Fonts

- TT Arial Black**
This is Arial Black font.
- TT Comic Sans MS
This is Comic Sans MS font.
- TT Courier New
This is Courier New font.
- TT Συμβολ (Symbol)
Τηισ ισ Συμβολ φοντ.
- TT Tahoma
This is Tahoma font.
- TT Times New Roman
This is Times New Roman font.

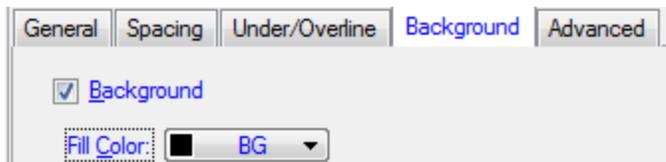
Font 107 will not display the “5” if it is the ending digit in text. Please use another font.

Font 203 timesi may display the “^” instead of the degree symbol. To correct, run option 6 in the Cadd Updates on your desktop (internal users) or consultants may add the MstnFontConfig.xml provided in the fonts.zip to the C:\ProgramData\Bentley\MicroStation V8i (SELECTseries) \Workspace \System \Fonts folder.

Text Styles are used to conveniently apply settings to standardize attributes for fonts including the font, Height, Weight, Justification, Spacing, and Background, etc. Elements placed with a text style are automatically updated when the style is modified. SCDOT has several text styles available in the CADD Workspace.



For a public hearing display, you will need to reverse the background color of the text from white to black so the color table will print it correctly.



Suggested Fonts.....The following chart depicts example levels, weights, and text height and widths for one plan production group. These standards can be adopted or modified as necessary to enhance legibility and standardization of plans.

							FOR 50:1 PLOT	
TITLE SHEET	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH	
INDEX OF SHEETS	RD_SHT_TX	152	BY LEVEL	BY LEVEL	151	7	7	
COUNTY NAME IN PROJECT DESCRIPTION	RD_TX_TITLESHT	4	0	3	109	25	25	
FILE#,PROJ#, PROJECT DESCRIPTION	RD_TX_TITLESHT	4	0	3	151	20	20	
MAP DESCRIPTION	RD_TX_TITLESHT	4	0	1	151	8	8	
TITLE BLOCK DATA	RD_TX_TITLESHT	4	0	1	151	6	6	
NPDES PERMIT INFORMATION	RD_SHT_TX	152	BY LEVEL	4	1175	7	7	
ENGINEER OF RECORD TEXT	RD_TX_TITLESHT	3	0	3	151	6	6	
PROJECT MILEAGE INFORMATION	RD_SHT_TX	152	BY LEVEL	BY LEVEL	1024	6	6	
EQUALITIES IN STATION	RD_TX_TITLESHT	4	0	1	151	8	8	
RPG/GROUP (DESIGN INITIALS)	RD_TX_TITLESHT	4	0	1	151	8	8	
TRAFFIC DATA	RD_TX_TITLESHT	3	0	1	1175	8	8	
PROJECT BEGIN/END AND BRIDGE NOTES	RD_SHT_TX	152	BY LEVEL	BY LEVEL	151	8	8	

							FOR 50:1 PLOT	
SUMMARY OF ESTIMATED QUANTITIES	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH	
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	4.5	4.5	
QUANTITY TEXT	RD_PD_FINAL_TX		0	4	3	5	5	

							FOR 50:1 PLOT	
TYPICAL SECTION	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH	
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	0.6	0.6	
LANE DIMENSIONS	RD_EX_MISC	5	BY LEVEL	BY LEVEL	23	0.75	0.75	
FINISHED GRADE POINT TEXT	RD_EX_MISC	6	BY LEVEL	BY LEVEL	23	0.5	0.5	
CROSS SLOPE TEXT	RD_EX_MISC	2	BY LEVEL	2	23	0.75	0.75	
PAVEMENT DESIGN CALL OUT LABELS	RD_EX_MISC	5	BY LEVEL	BY LEVEL	43	0.832	0.832	
TYPICAL SECTION STATION RANGE NOTES	RD_EX_MISC	4	0	4	3	0.8	0.8	
PAVEMENT DESIGN LEGEND	RD_EX_MISC	106	0	3	23	0.8	0.8	

							FOR 50:1 PLOT	
R/W DATA	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH	
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	1025	6	6	
TRACT #, PROPERTY OWNER, OBTAIN INFO, PERMISSIONS	RD_PD_FINAL_TX	23	BY LEVEL	BY LEVEL	23	6.25	6.25	
REVISION NOTES	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	4.5	4.5	

							FOR 50:1 PLOT	
PROPERTY STRIP MAP	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH	
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	12	12	
CENTERLINE LABELS	RD_EX_RW_TX	28	0	4	23	10	10	
PROPOSED R/W LABELS	RD_PD_RW_TX	35	BY LEVEL	BY LEVEL	1	10	10	
EXISTING R/W LABELS	RD_EX_RW_TX	4	BY LEVEL	BY LEVEL	1	10	10	
TRACT NUMBERS	RD_EX_RW_TX	28	0	4	203	15	15	
REVISION NOTES	RD_EX_RW_TX	28	0	4	1	10	10	
SHEET DESCRIPTION BOX	RD_EX_RW_TX	28	0	4	23	20	20	

							FOR 50:1 PLOT	
GENERAL CONSTRUCTION NOTE	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH	
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	5	5	
PROJECT CONTACTS	RD_TX_MISC1	99	0	2	128	5	5	
INCLUSION QUANTITIES	RD_TX_QTY	200	0	4	3	7.5	5	
SHEET DESCRIPTION BOX	RD_TX_MISC1	0	0	2	151	10	10	

						FOR 50:1 PLOT	
REFERENCE SHEET	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	6	6
REFERENCE TEXT	RD_PD_FINAL_TX	23	BY LEVEL	BY LEVEL	151	6.25	6.25
SHEET DESCRIPTION BOX	RD_EX_RW_TX	28	0	4	23	20	20
REFERENCE DESCRIPTION TEXT (BENCH MARK, CURVE DATA)	RD_EX_RW_TX	28	0	4	151	10	10
						FOR 50:1 PLOT	
PLAN & PROFILE	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH
GUARDRAIL NOTE	RD_PD_FINAL_TX	23	BY LEVEL	BY LEVEL	151	6	6
BRIDGE NOTE	RD_PD_FINAL_TX	23	BY LEVEL	BY LEVEL	151	6	6
EXISTING R/W LABEL	RD_EX_RW_TX	4	BY LEVEL	BY LEVEL	23	5	5
PROPOSED R/W TEXT	RD_PD_RW_TX	35	BY LEVEL	BY LEVEL	23	5	5
PROJECT BEGIN/END NOTES, TIE EQUALITY NOTES	RD_PD_FINAL_TX	23	BY LEVEL	6	151	7	7
PROPOSED DRAINAGE NOTES	RD_TX_DRAINAGE	106	BY LEVEL	3	151	5	5
ROAD NAMES SHOWN IN PLAN VIEW	RD_PD_FINAL_TX	149	0	4	23	7	7
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	6	6
LANE WIDTH, TAPER AND STORAGE LABELS	RD_PD_FINAL_TX	23	BY LEVEL	BY LEVEL	151	6	6
CUT/FILL LABELS	RD_PD_TX_CSTNLMT	20	BY LEVEL	BY LEVEL	151	5	5
TRACT NUMBERS	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	23	8	8
EARTHWORK TEXT	RD_TX_VOLUME	143	BY LEVEL	6	151	7	7
MISC PROPERTY TEXT	RD_EX_BLDG	6	BY LEVEL	BY LEVEL	23	5	5
REVISION NOTES	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	6	6
UTILITY DATA	RD_PD_FINAL_TX	3	BY LEVEL	BY LEVEL	23	8	8

						FOR 5:1 PLOT	
CROSS SECTIONS	LEVEL	COLOR	STYLE	WEIGHT	FONT	TEXT HEIGHT	TEXT WIDTH
TITLE BLOCK DATA	RD_PD_FINAL_TX	254	BY LEVEL	BY LEVEL	151	0.5	0.5
BEGIN/END AND SUPERELEVATION NOTES	RD_SHT_TX	152	0	4	151	0.765	0.765
EXISTING ELEVATIONS	RD_XS_TX_ELEV_EX	2	0	6	151	0.8	0.8
PROPOSED ELEVATIONS	RD_XS_TX_ELEV_PR	7	0	4	151	0.9	0.9
CROSS SLOPES	RD_XS_TX_SLOPE	2	0	2	151	0.75	0.75
FILL SLOPES	RD_SHT_TX	4	0	2	151	0.75	0.75
CUT/FILL VOLUMES	RD_TX_VOLUME	143	0	5	151	0.8	0.8
CUT/FILL END AREAS	RD_TX_ENDAREA	183	0	5	151	0.8	0.8

GEOPAK Introduction

GEOPAK is a comprehensive software package that covers every project phase from conceptualization to final quantities. The software works within the MicroStation graphic environment providing *true interactive design*. For example, a horizontal alignment can be created graphically; it can be calculated with the coordinate geometry component of GEOPAK or some interactive combination of the two. Dynamic on-screen design provides immediate interpretation of plan view geometrics for making design choices through visualization.

This section of the Cadd Manual highlights commonly used SCDOT Geopak processes. There is further documentation available in the Geopak Road I Training manual located on the website at:

<https://www.scdot.org/business/pdf/cadd/SCDOTCompleteRoadI.pdf>

Geopak Files

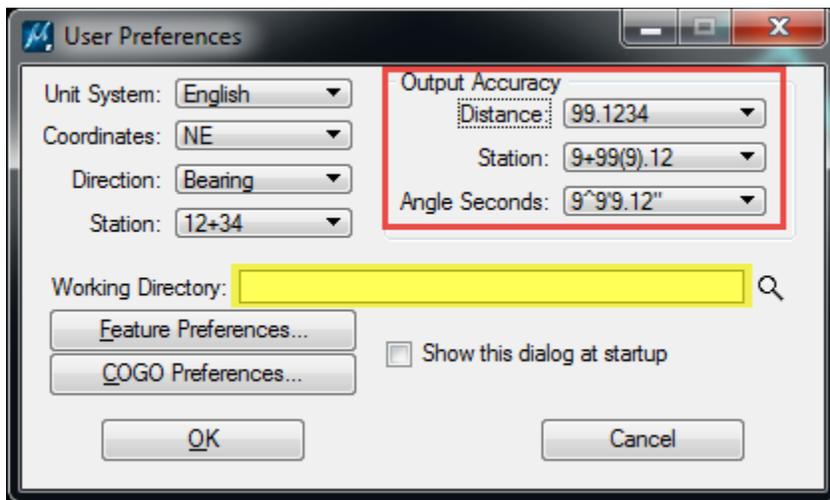
GEOPAK uses and/or creates files during the design process. The files are detailed in the table below:

Job###.gpk	This binary file is created when the user starts a coordinate geometry (COGO) session for the first time or through Project Manager and may be appended to during the design process. All coordinate geometry elements are stored in this file – points, chains, profiles, parcels, and survey chains. Multiple users can access this file at the same time, and only one file should be created for each project. The ### is the only variable in this name. It represents the last 3 digits of the job number (up to 3 alphanumeric characters) unique to a project and is defined by the user upon creation.
*.tin	A binary file containing triangular surfaces also known as the digital terrain model (DTM).
*.prj	Binary file resulting from the creation of a new project.
*.smd	This is the survey manager database file. This file is a database that contains all of the survey codes that are contained in the SCDOT Survey Code Manual. When ascii files are coded accordingly, the smd file graphically draws the points, cells, lines, and includes/excludes points in the dtm file.
.asc;.txt;*.inp	An ASCII file is used for input for running GEOPAK processes. Name is user defined with a *.asc or *.txt extension. This file can be opened in Notepad and edited. Typical format is PNEZD, Point Number, North, Easting, Elevation, and Description for point files.
*.csv	A CSV file is comma separated value format that can be opened in Excel. It is useful to use excel to make multiple changes to the file prior to processing in GEOPAK. An ascii file extension can be changed to .csv to open in Excel and a .csv file extension can be changed to .asc or .txt to open in Notepad.

User Preferences

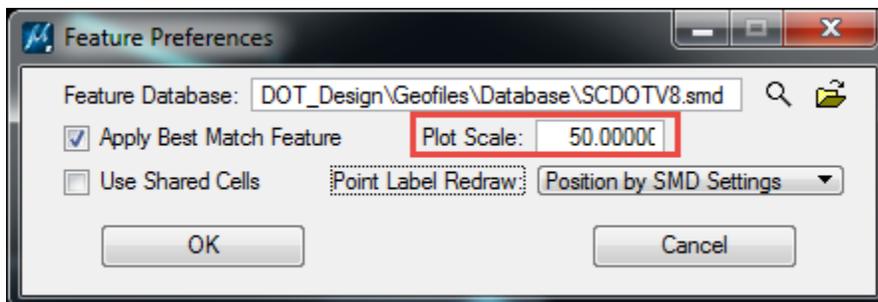
Select **Applications > Geopak Road > User Preferences** to open the User Preferences dialog to customize settings for the design file.

The Working Directory tells Geopak where to look for the gpk file. This field is recommended to always be **BLANK** – Geopak will default to the working directory of the project when left blank. The gpk file and the design file should be located in the same folder when running processes in Geopak. (If Geopak hangs up in the middle of a process, this is a good place to check first to ensure that it has not been set to a different project location by mistake.)



The **Output Accuracy** controls the number of decimal places in the different Geopak processes and reports. This includes the Coordinate Geometry (COGO) dialog that may be used to copy data from for plan sheet production.

Press the Feature Preferences button to review the current SMD location. Also, set the Plot Scale to 50.00 (or applicable scale). If you need to re-visualize elements such as pipe elevations, it is important to have the appropriate plot scale defined.



Road Tools

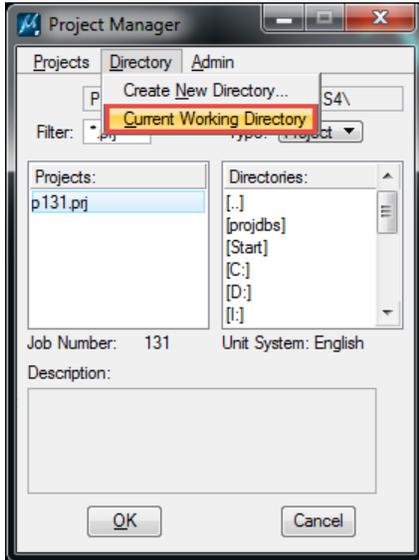
The Road Tools menu bar can be activated by selecting **Applications > Geopak Road > Road Tools**. The toolbar can be docked for ease of access to Geopak’s most commonly used tools for Roadway Design.



Select **File > Save Settings** for this tool to appear each time Geopak is activated.

Project Manager

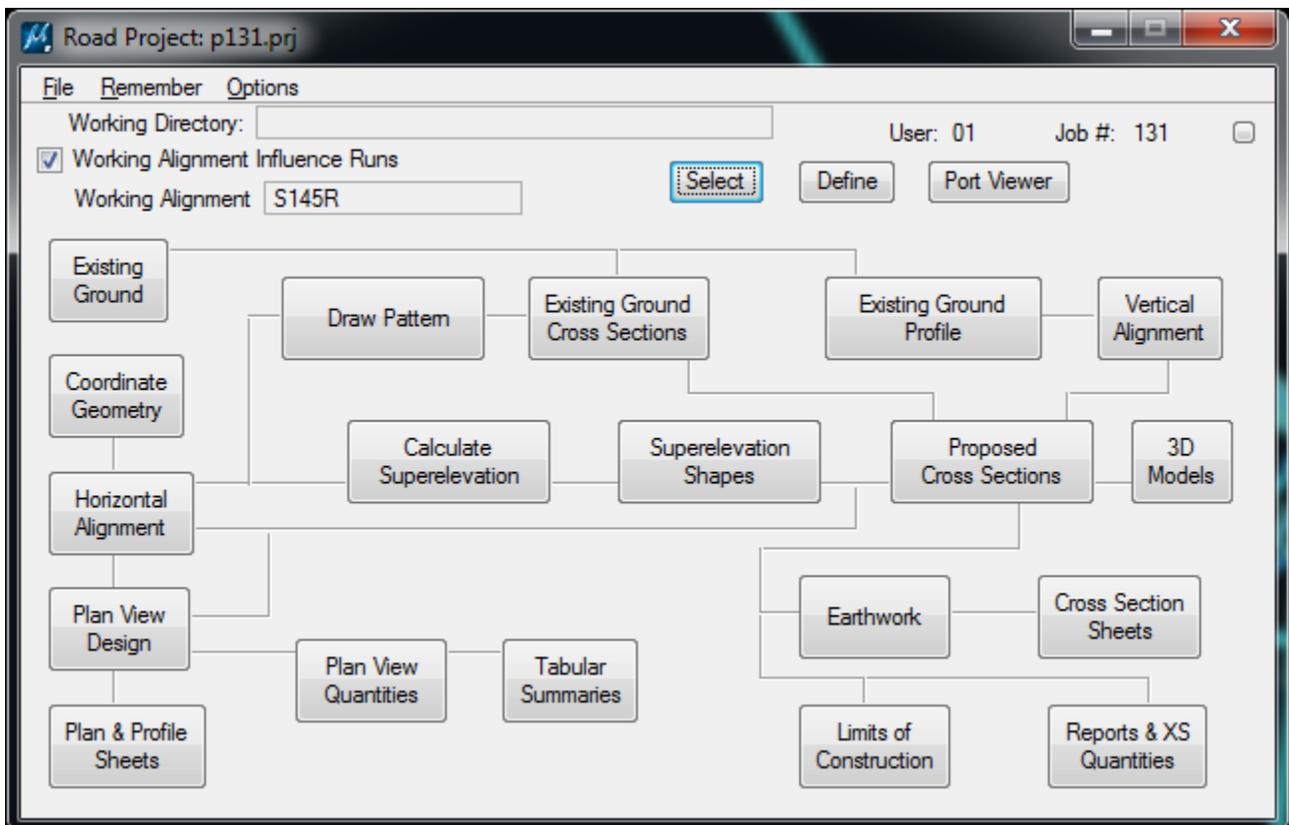
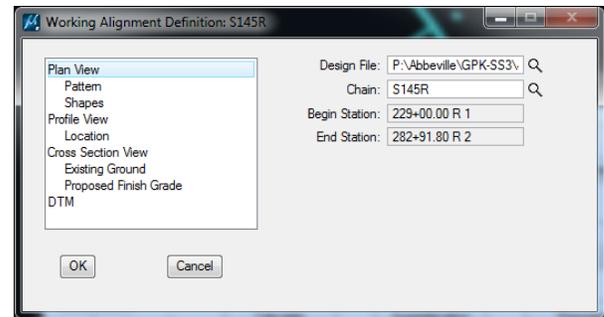
The **Project Manager** provides a workflow dialog to organize the Geopak processes for Roadway Plan Production. This tool saves project settings into a *.prj file containing multiple alignments associated with their respective plan view, chains and stationing, shapes, profile, tin file, pattern lines, element symbology for cross sections so the user does not have to continuously complete dialogs with the same information.



Select **Applications > Geopak Road > Project Manager** to open. Select **Directory > Current Working Directory** to ensure Geopak is pointing to the project location.

To create a new Working Alignment Run or to select an existing alignment run, press the **Select** button. Select **Run > New**.

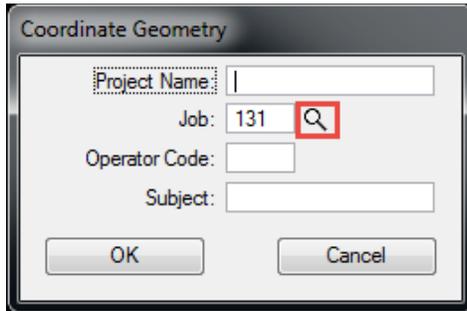
To define settings per alignment run, press the **Define** button.



COGO (Coordinate Geometry)

To access the COGO dialog, select **Applications > Geopak Road > Geometry > Coordinate Geometry**.

Press the magnifying glass to open the project *.gpk file provided by the Surveys Office. Press the **OK** button to continue.



Chain and Profile Naming Conventions

Disciplined folder and file naming conventions are a must for project organization. It is just as important to continue practices electronically in Geopak with Chain and Profile naming conventions. Electronic data is used by more than the original designer. Other design offices, construction inspectors, contractors, surveyors, and consultants access the electronic information during the life cycle of the project. It is imperative that consistent and logical naming conventions are followed. The electronic file name should also be carried to the plotted construction plans.

This information should be detailed in the EED_index.xlsx file and kept up to date at all times.

Most chains are provided by Surveys and are named with the **Route number** or **Road name**. The same convention should be used with relocated chains by Roadway designers. (Example, SC52 relocated chain should be named SC52R.) Also, you should **NEVER insert any special characters** into the chain names like #, @, ^, etc. The chain name should be limited to less than **15 characters** as well.

Profiles should be named consistently to correspond (MATCH) with the chain. If you run multiple iterations of profiles, be sure to go back and clean up your gpk of the ones that are no longer applicable.

Examples for Chains:

SC52 – existing centerline alignment
 SC52R – relocated centerline alignment
 OFD1 – outfall ditch 1 existing centerline alignment
 PINELN – existing centerline alignment
 PINELNR – relocated centerline alignment

Examples for Profiles:

SC52EP – existing profile
 SC52CP – critical points profile
 SC52REP – relocated existing profile
 SC52RFP – relocated proposed profile
 SC52RCGLT – relocated proposed curb & gutter left profile
 SC52RCGLR – relocated proposed curb & gutter right profile

The Reference Data Sheet and Plan and Profile Sheets should contain both the route or road name and number. Ensure that the electronic chain or profile name is also listed in the plan sheets.

S-02-145°Relocated Centerline (Storm Branch Road)

Beginning chain **S145R** description

Point 100 N 594,314.72100 E 1,738,836.53530 Sta 229+00.00

Course from 100 to PC S145R-1 S 67° 04' 58.79" E Dist 417.30317

Curve Data

Curve S145R-1

P.I. Station	234+12.21 N	594,115.26890 E	1,739,308.31390
Delta =	2° 48' 27.80" (RT)		
Degree =	1° 28' 46.34"		
Tangent =	94.90400		
Length =	189.77001		
Radius =	3,872.54320		
External =	1.16273		
Long Chord =	189.75103		
Mid. Ord. =	1.16238		
P.C. Station	233+17.30 N	594,152.22426 E	1,739,220.90068
P.T. Station	235+07.07 N	594,074.07602 E	1,739,393.81194

Utilize **COGO Navigator > Describe Chain** to copy and paste the chain information from the output window into the Place Text dialog on the Reference Data sheet using the **Reference Points Text Style**.

Provide the electronic chain and profile names on the Plan and Profile sheets in the lower left corner of the plan sheet. The "common" names are labeled in the upper right corner and do not always tell the electronic data user if the alignment is relocated or existing on the plan sheet. The electronic names should help the user distinguish between the two.

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	RD. NO.	SHEET NO.
3	S.C.	AIKEN	0042131	<i>S-145 & S-65</i>	7

*S-145 (STORM BRANCH RD.)
S-65 (PINE LOG RD.)*

Common Route or Road names and numbers are labeled in the upper right corner of the Plan and Profile Sheets.

410

400

S145R & S145RFP
S65R & S65RFP

250+00

Electronic chain and profile names should be labeled in the lower left corner of the Plan and Profile Sheets.

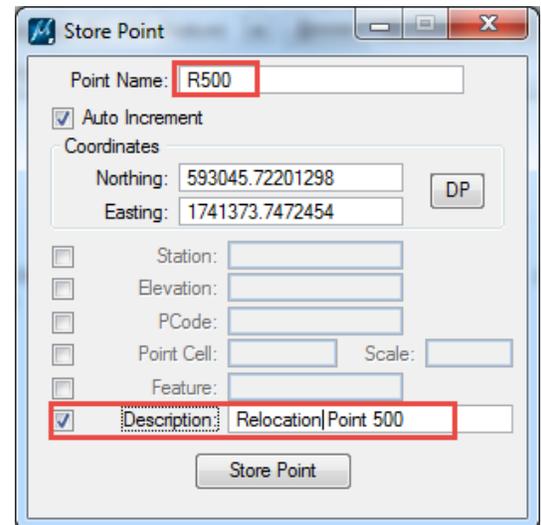
Point Naming and Ranges

The Surveys Office provides the original project **gpk** file to roadway designers containing the existing project surveyed points imported into Geopak.

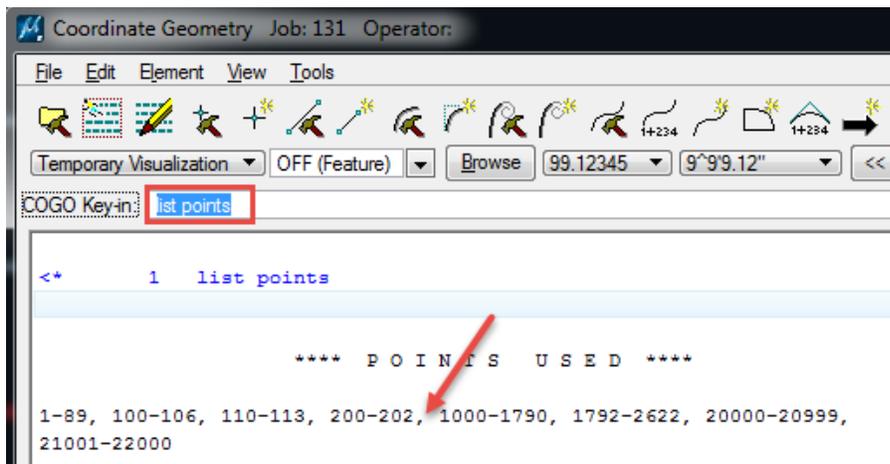
Control and alignments utilize the points beginning at point 1-999, etc. depending on the size and number of alignments on the project. Property corners and existing topography utilize the points beginning at point 1000-19999, etc. depending on the size and number of surveyed shots on the project. The DTM file utilizes the points beginning at point 20,000 and higher.

Roadway designers should be **conscientious** when storing new points not to overwrite existing point numbers. Also, designers should utilize gaps in the point ranges and use a **prefix “R”** (R to designate it was stored by roadway) for storing new points. It is helpful to also add a **Description** when storing points for design.

By following this convention, the integrity of the original project gpk can be maintained by allowing any additional surveys to utilize the point gaps sequentially. (Example: The original survey used points 1-89 for the existing control. The additional survey A will begin at point 90.) *Designers should not use point 90 for storing new points.* This causes confusion and requires the Surveys Office to renumber points manually. It could potentially lead to the unintended overwrite of the points in the gpk at the time of the additional survey.



To review the points utilized in the current gpk file, type “**list points**” in the COGO Key-in and press **Enter**.

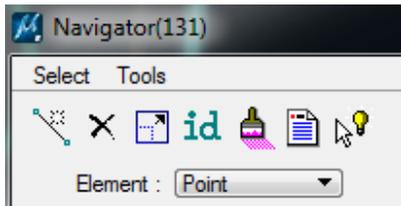


COGO Navigator

The COGO Navigator is one of the most frequently accessed tools in Geopak during design. To activate the dialog, select **Tools > Navigator** or select the “wheel” icon on the COGO toolbar.

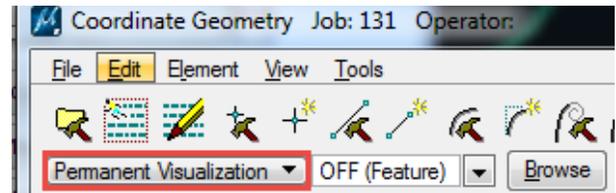


On the **Navigator** dialog, points, curves, chains, and profiles can be added, deleted, modified, identified, visualized, printed or selected.

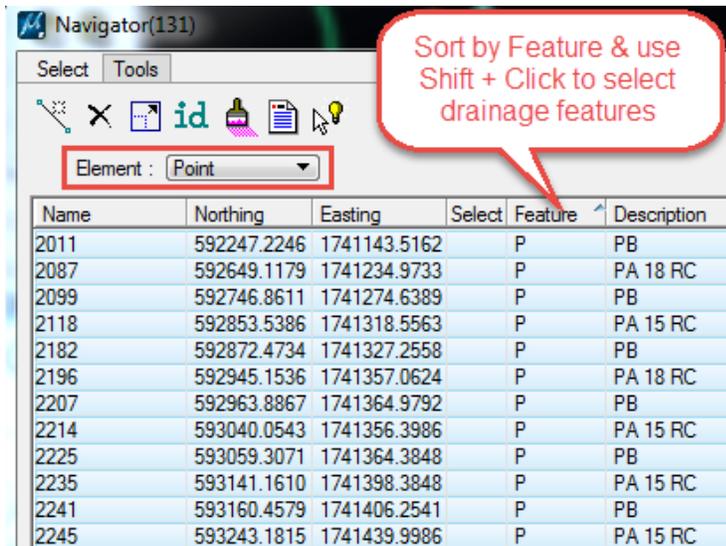


Redraw Visualized Elements

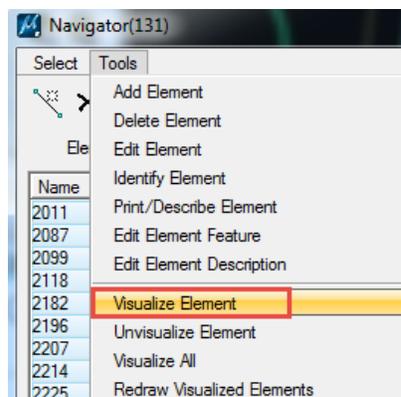
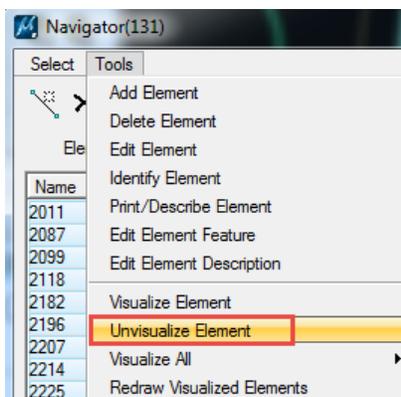
Visualize drainage points with elevations - If the description field was not turned on during the original survey process, the elevations may be missing for drainage items. To redraw with elevations, set the Visualization to **Permanent Visualization** on the COGO Dialog.



On the Navigator dialog, toggle the Element to **Point**. Sort the Points by Feature. Scroll down and Shift + Click to highlight drainage codes (DI, CBN, P).

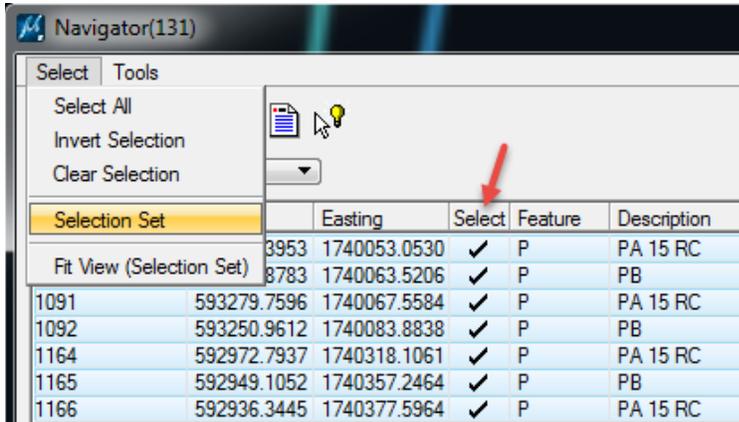


Select **Tools > Unvisualize Element** to remove the graphics for the highlighted points to avoid duplicates. Select **Tools > Visualize Element** to redraw the points with the elevations.

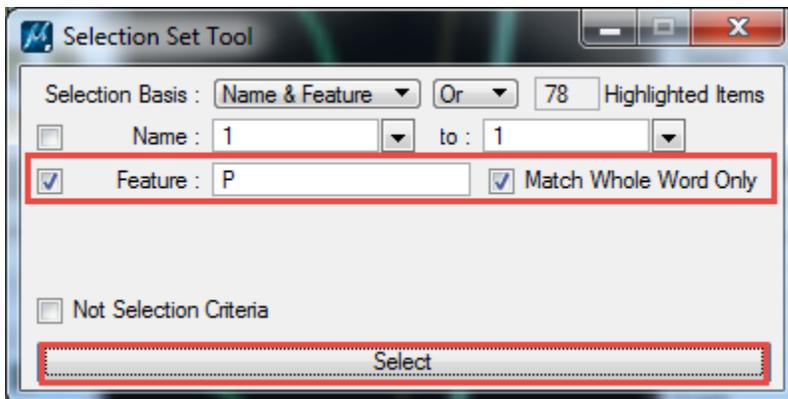


As an alternative to the above method for selecting a group of points by feature, you can use the Selection Set Tool to select the points by Feature.

Pick **Select > Selection Set** to open the dialog.



Toggle on **Feature** and check on **Match Whole Word Only**. Enter the **Feature code – P** and press the **Select** button to activate the Selection Set. Repeat to select additional point codes.

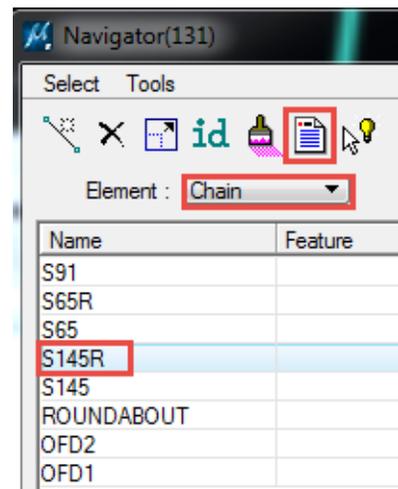


On the Navigator dialog, **sort by** the Select column to verify that only the P items are selected and not any Feature codes containing P, like CP, TP, PP, etc. Use the commands on the previous page to redraw the points with elevations.

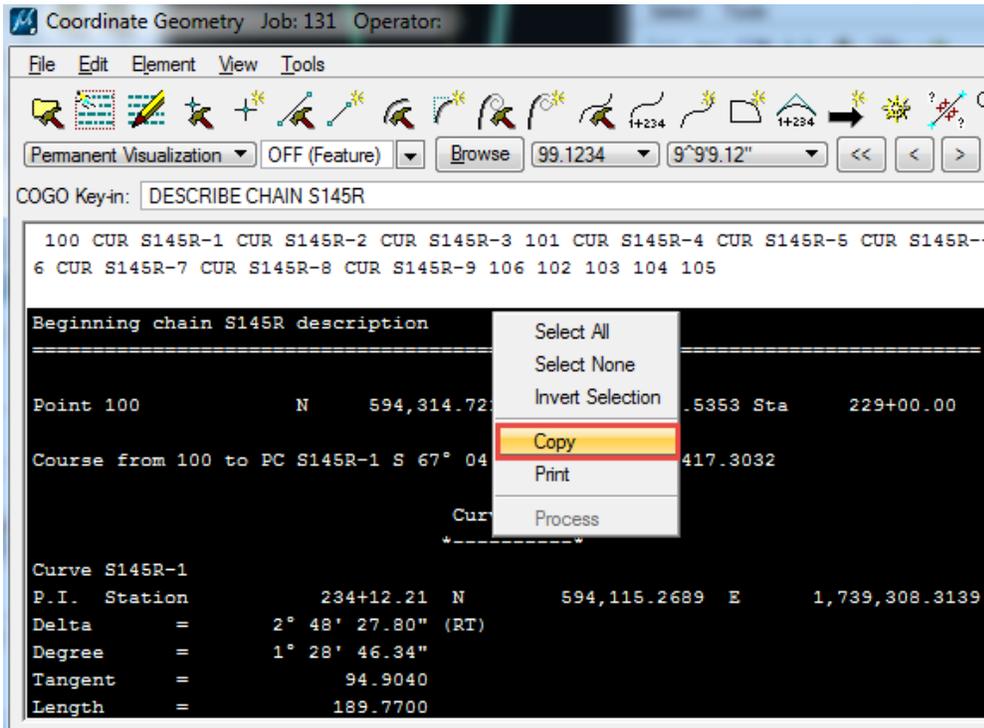
Describe Elements

The Navigator tool can be used to describe chains, profiles, points, etc. in a text format in the COGO output window. This text can then be copied and pasted into MicroStation or saved out as a text file.

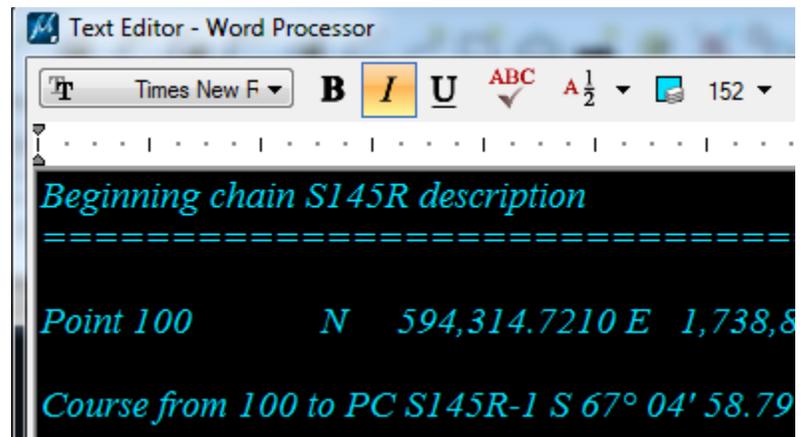
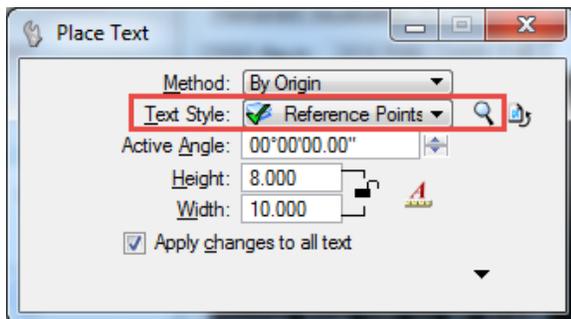
Toggle Element to **Chain**. **Highlight** a chain name and press the “paper” icon to **Print/Describe** the chain.



Click the 1st line of the text in the output window and hold the Shift key. Scroll down to the last line to be copied and data click to select the passage. Right click and select **Copy**.

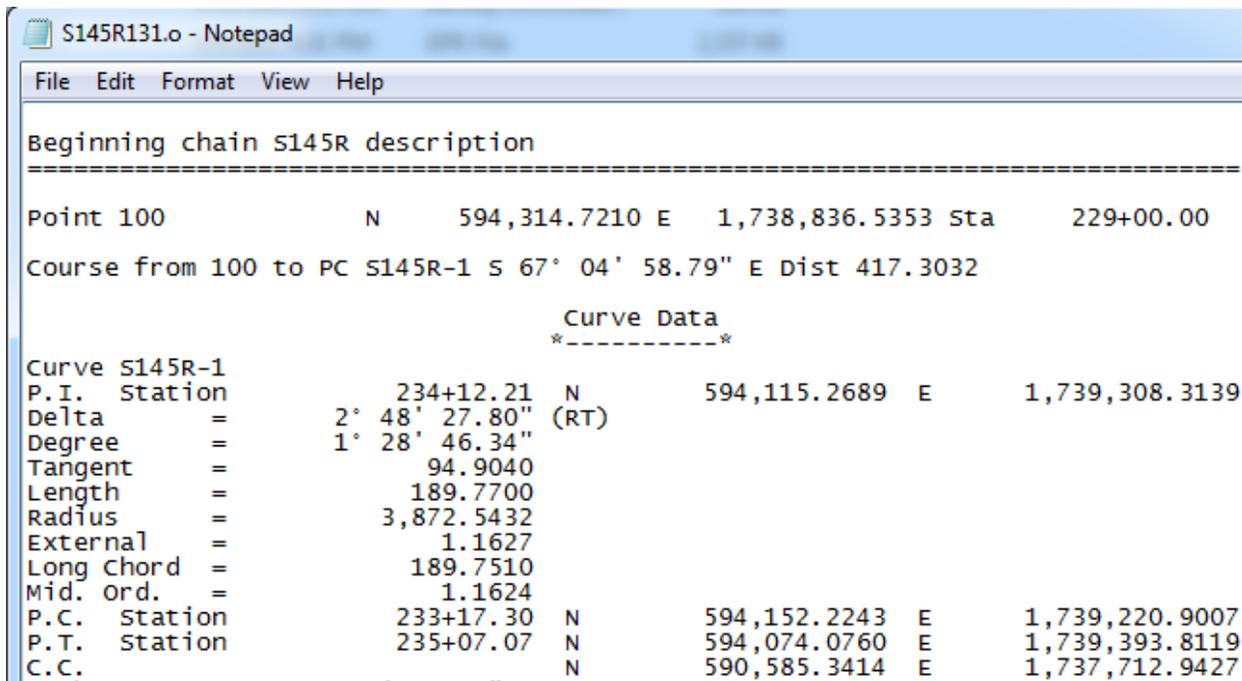
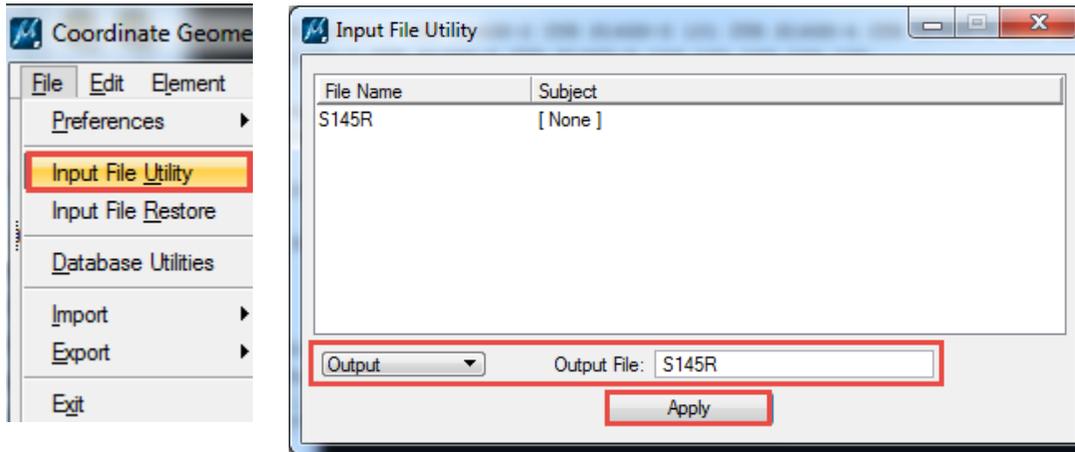


Set the level to **RD_SHT_TX**. Select the **Place Text** MicroStation tool. On the Place Text dialog, browse to select the **Reference Points Text Style**. In the Text Editor dialog, right click to **paste** the text into the dialog. **Data click** in the design file to place the text.



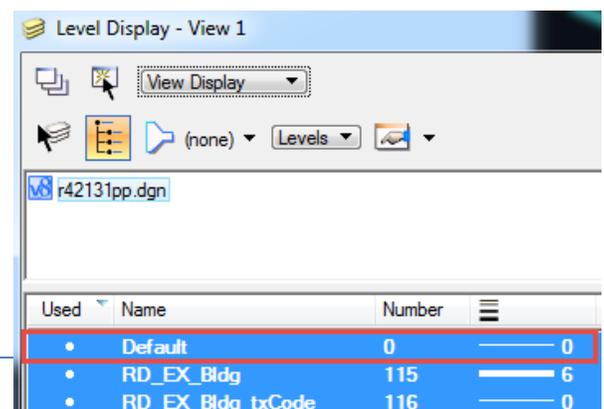
Output Files

Alternatively, after describing the chain, select **File > Input File Utility** on the COGO dialog. Change the toggle to **Output** and **enter** a file name. Press the **Apply** button. In the project directory, you will now have a file saved with an .O extension. This file can be opened in Notepad for review and later copied and pasted into MicroStation.

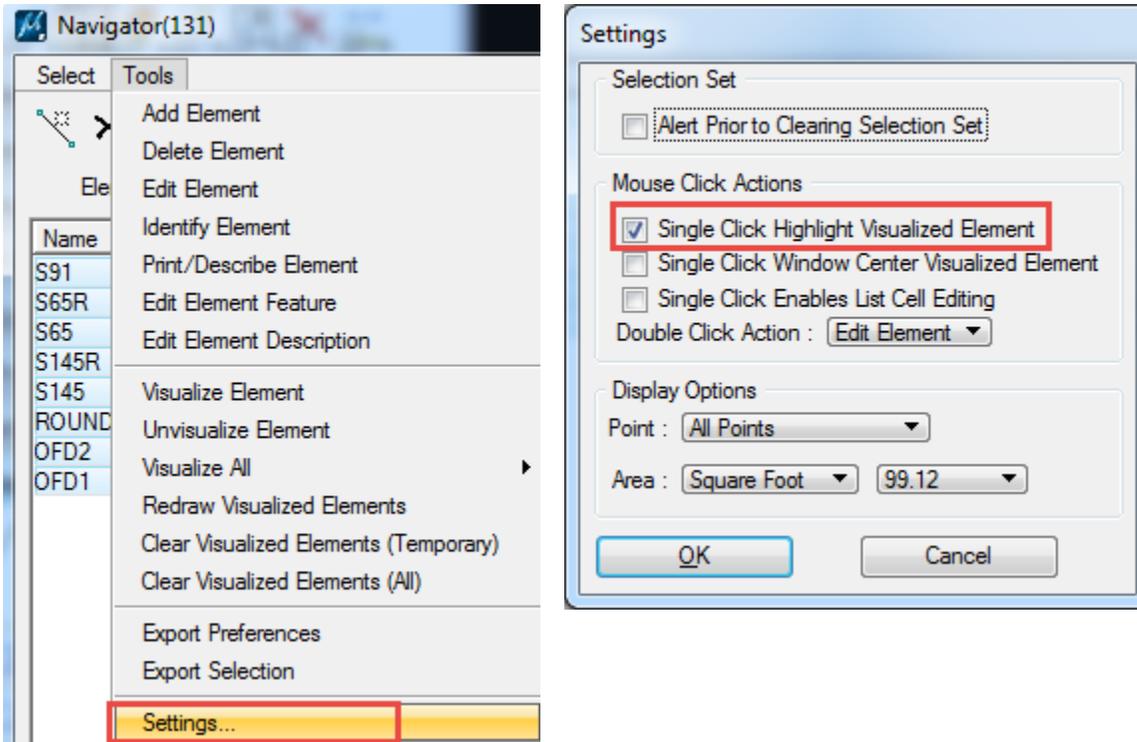


Highlighting and Visualizing Elements

The Navigator tool can quickly help you locate Geopak elements (chains and points) by temporarily visualizing them to the screen. To utilize this feature, ensure that the **Default** level is turned on.



Select **Tools > Settings** in the Navigator dialog. On the Settings dialog, check on **Single Click Highlight Visualized Element** and press **OK**. (If this is a very long project, it may benefit to also check on Single Click Window Center so it will zoom to the location on highlight below.)

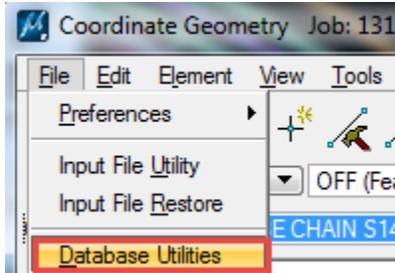


Highlight the chain(s) in the Navigator dialog. Press the “paint brush” icon to **Visualize Element**. Click once more on the chain name to highlight the visualized element in the design file.



Database Utilities

If the gpk file is slow to process or there is potential that the file is corrupted, there is an option in COGO to clean and compress the database. Select **File > Database Utilities** on the COGO dialog.



Press the **Validate** button. Press the **Clean and Compress** button. Any elements modified will be listed in red. (A backup will automatically be placed in the working directory should you need to revert back.)

COGO Key-in: DATABASE CLEAN

<+ 3 DATABASE CLEAN

Rebuild Database: P:\Abbevill...\job131.gpk

Record Type	Count
Points	3725
Point Feature	3709
Chains	8
Curves	28
Profile Header	30
Profile Data	42
Survey Chains	408
Survey Chains Feature	408
Survey Chains Points	408
Project	1
Data Sets	2

Dat... [Close]

Job: 131

Validate

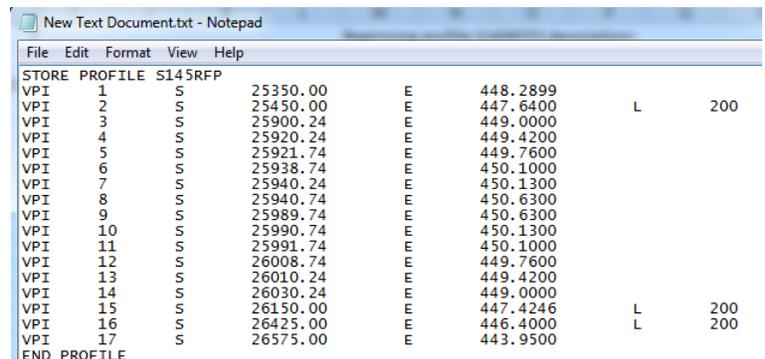
Clean and Compress

Backup GPK before Compression
GPK after compression

job131.b~k	9/9/2015 4:31 PM	B~K File	2,337 KB
job131.gpk	9/10/2015 8:36 AM	GPK File	1,818 KB

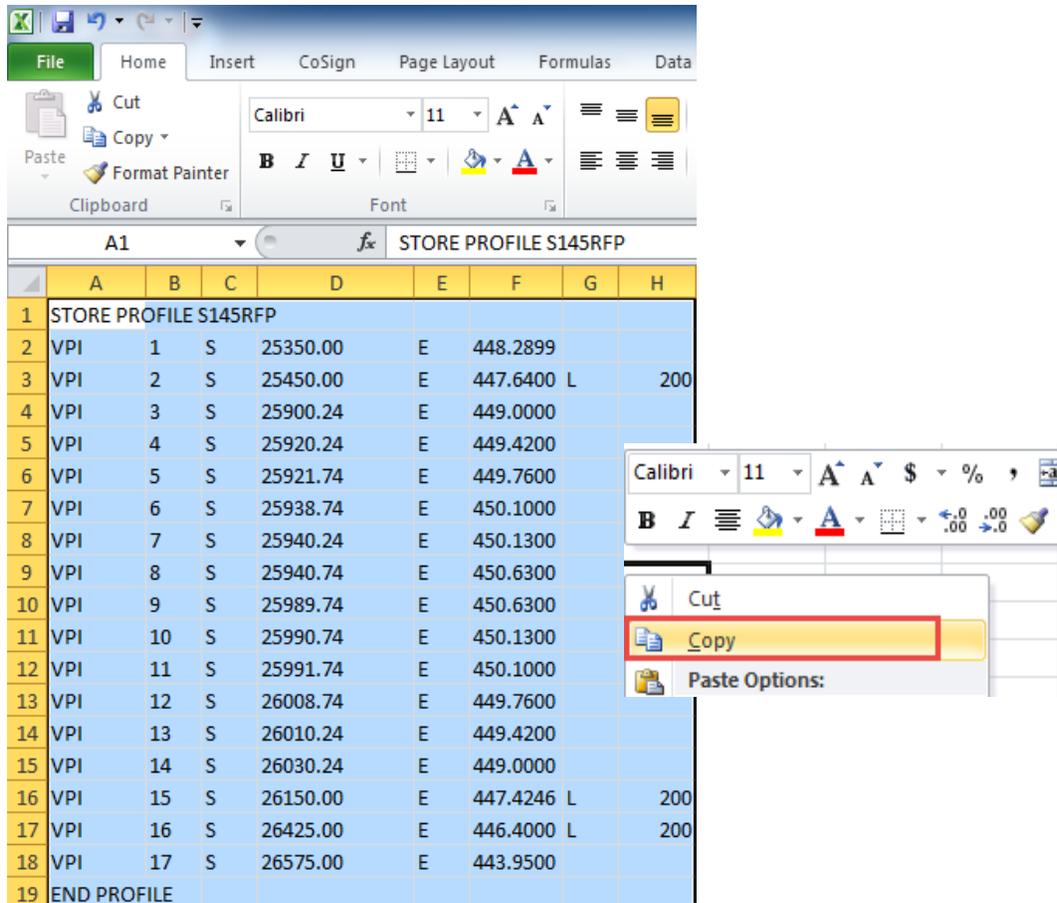
Store Profile by Input or Excel

The format for a profile from an input or Excel file is the same. The beginning line is **STORE PROFILE NAME** and the ending line is **END PROFILE**. The input for the profile columns is VPI, VPI #, S, Station, E, Elevation, L, Length of Vertical Curve.

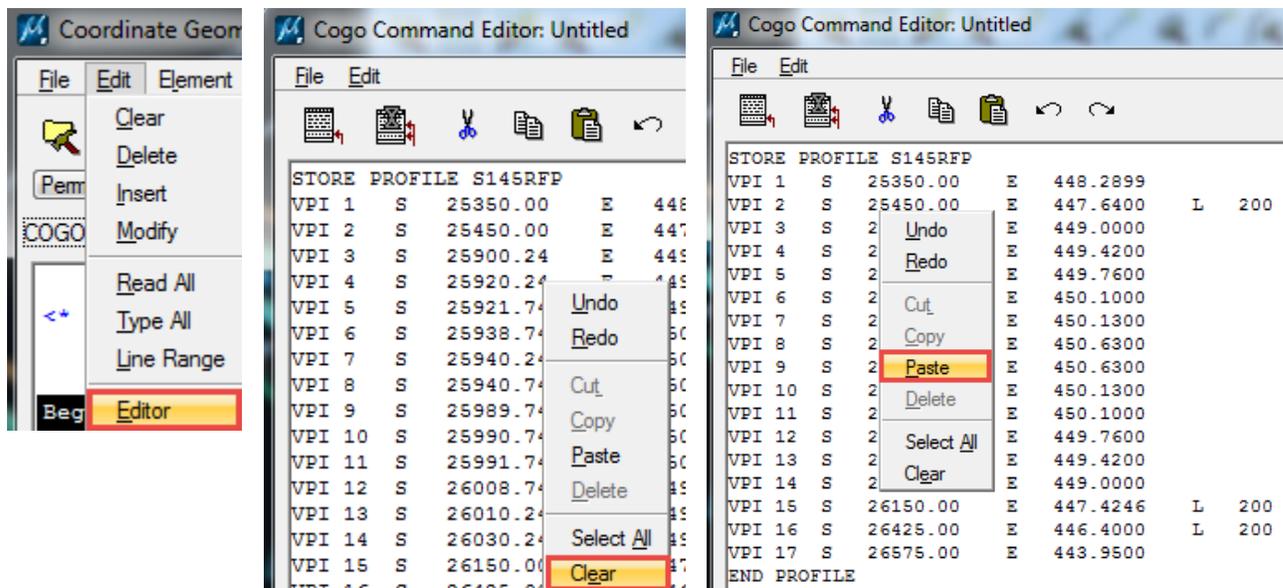


You can achieve this format by editing and typing in notepad (more difficult) or just typing and using auto fill in Excel. It is also helpful to make small grade changes to profiles currently in the gpk in this manner.

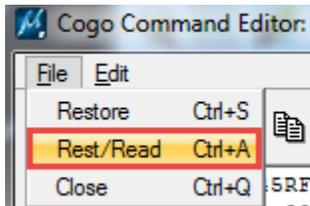
In the profile text file, press the **Ctrl + A** to select all of the information. Right click and select **Copy**.



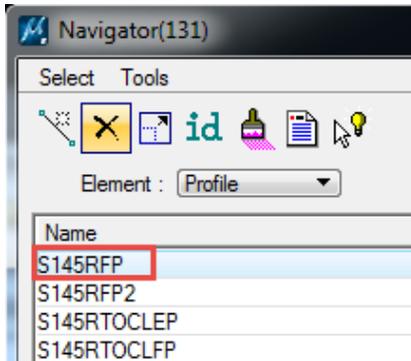
On the COGO dialog, select **Edit > Editor**. Right click in the Editor dialog and select **Clear**. Right click again to select **Paste** to paste the information from the input or Excel file.



Select **File > Rest Read** to store the profile into the GPK file.



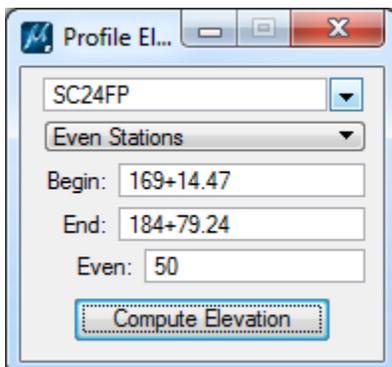
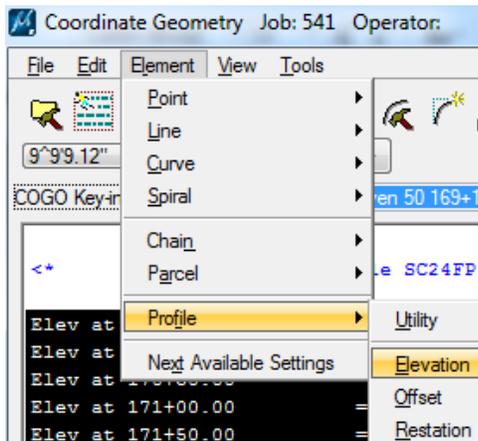
Open the **COGO Navigator** and verify that the profile was stored correctly. (Tools > Navigator or the “wheel” icon.)



Profile to Excel (Text to Columns)

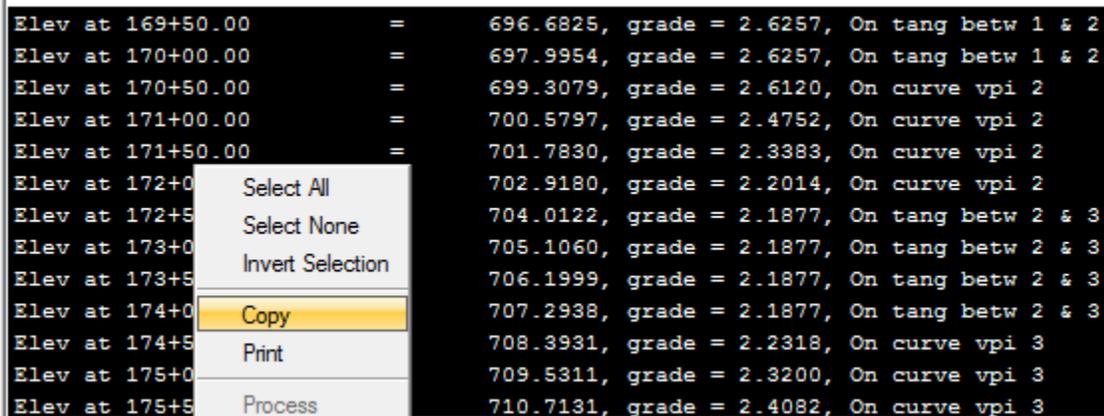
At times, the profile stored in the gpk file may need edited at vpi’s at specific stationing. The following shows how to take a profile elevation report from COGO to Excel for manipulation. You will manipulate the Excel file in the format above to re-import it as shown in the previous steps.

In COGO, select **Element > Profile > Elevation**

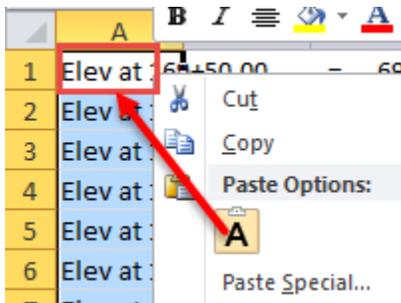


Complete the dialog as shown below, specifying the desired even stationing required. Press the **Compute Elevation** to print the elevations to the COGO window.

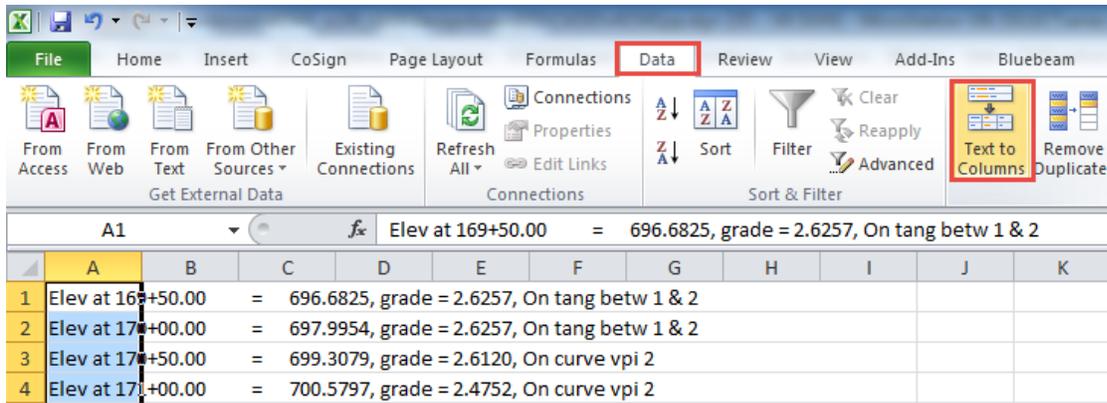
Highlight the text in the COGO window, right click to select Copy.



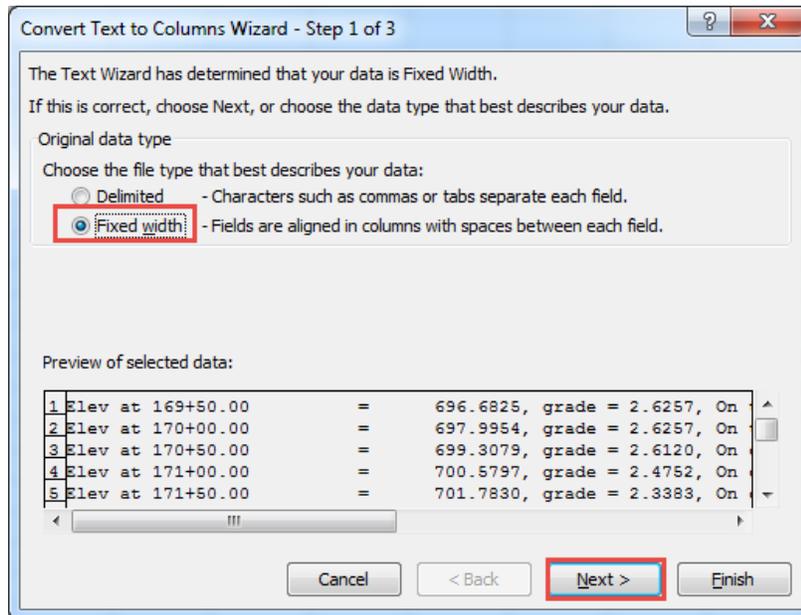
In Excel, paste the data into cell A1



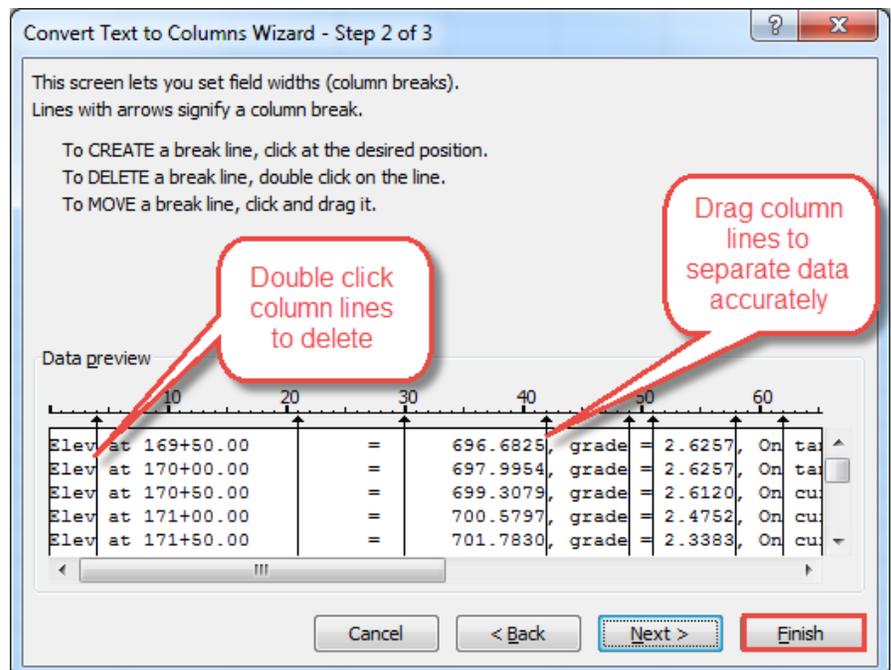
With the text highlighted in Excel, select the Data tab. Press the Text to Columns button.



Select Fixed Width and press the Next button.



Double click to remove any columns. Drag the column lines to the desired column width to accurately separate the data. Press Finish.



The elevations and stations should now be in the correct columns. Use the format cells to increase/decrease the desired decimal places. Manipulate the Excel file as shown in the previous steps to restore the Profile into the gpk by Editor > Rest/Read.

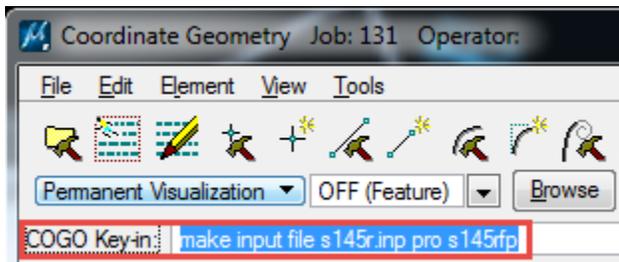
	A	B	C	D	E	F	G	H
1	Elev at	169+50.00	=	696.6825	, grade =	2.6257	, On tang	betw 1 & 2
2	Elev at	170+00.00	=	697.9954	, grade =	2.6257	, On tang	betw 1 & 2
3	Elev at	170+50.00	=	699.3079	, grade =	2.6120	, On curve	vpi 2
4	Elev at	171+00.00	=	700.5797	, grade =	2.4752	, On curve	vpi 2
5	Elev at	171+50.00	=	701.7830	, grade =	2.3383	, On curve	vpi 2
6	Elev at	172+00.00	=	702.9180	, grade =	2.2014	, On curve	vpi 2

COGO Key-Ins

COGO allows key-ins to perform the same functions as the toolbars. Some of the more popular commands are listed below.

- LIST POI Provides a list of point ranges contained in the GPK File
- LIST CH Provides a list of chains contained in the GPK File
- LIST PRO Provides a list of profiles contained in the GPK File
- DES CH name Describes the chain (where name is the name of the chain)
- PRINT PRO name Describes the profile (where name is the name of the profile)

To make an input file of a profile for editing, enter the following and press the enter key.



MAKE INPUT FILE s145rfp.inp PRO s145rfp

Where s145rfp.inp is the name of the file to be created in the working directory and where s145rfp is the profile to be exported. (Interchange CH for PRO to export a chain to a text file.)

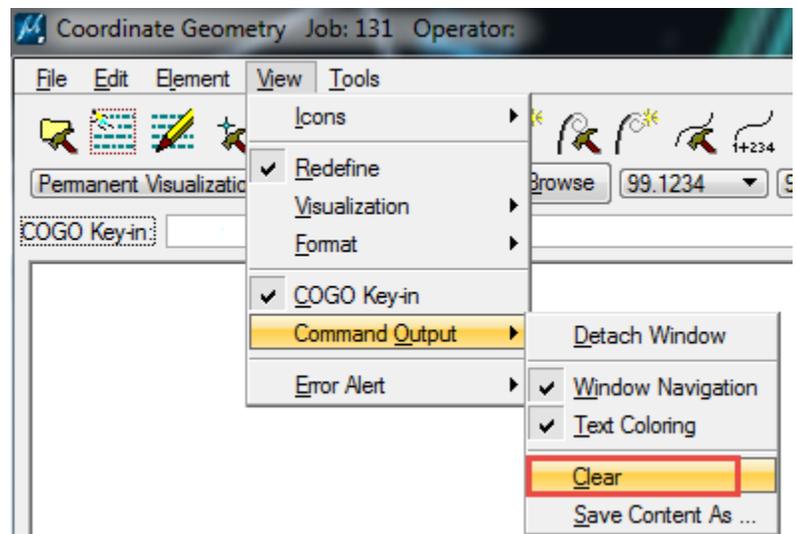
The sample input file below is available for editing in the project working directory. The edited file can be Rest/Read in the Editor of COGO as outlined above.

```

s145r.inp - Notepad
File Edit Format View Help
$ Job Name: 131
$
-- PROFILE COMMANDS -- generated by pattern: S145RFP
$
SET FEATURE OFF
SET DESCRIPTION OFF
STORE PROFILE S145RFP
VPI 1 S 25350.0000000000 E 448.2899000000
VPI 2 S 25450.0000000000 E 447.6400000000 L 200.0000000000
VPI 3 S 25900.2400000000 E 449.0000000000
VPI 4 S 25920.2400000000 E 449.4200000000
VPI 5 S 25921.7400000000 E 449.7600000000
VPI 6 S 25938.7400000000 E 450.1000000000
VPI 7 S 25940.2400000000 E 450.1300000000
VPI 8 S 25940.7400000000 E 450.6300000000
VPI 9 S 25989.7400000000 E 450.6300000000
VPI 10 S 25990.7400000000 E 450.1500000000
VPI 11 S 25991.7400000000 E 450.1000000000
VPI 12 S 26008.7400000000 E 449.7600000000
VPI 13 S 26010.2400000000 E 449.4200000000
VPI 14 S 26030.2400000000 E 449.0000000000
VPI 15 S 26150.0000000000 E 447.4246000000 L 200.0000000000
VPI 16 S 26425.0000000000 E 446.4000000000 L 200.0000000000
VPI 17 S 26575.0000000000 E 443.9500000000
$
END PROFILE
$
    
```

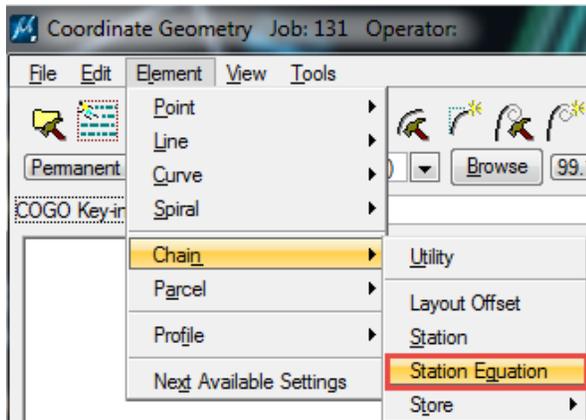
COGO Clear Dialog

To clear the COGO output dialog, select **View > Command Output > Clear**.

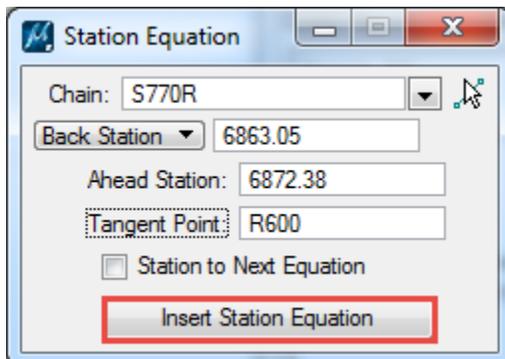


CHAIN – STATION EQUATIONS

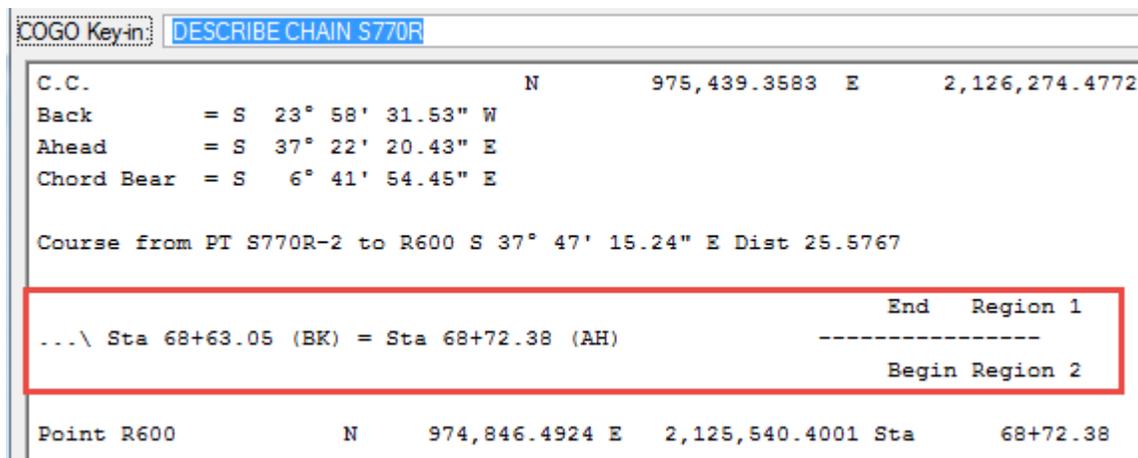
To insert a Station Equation into a chain, select **Element > Chain > Station Equation** from the COGO dialog.



Select the **Chain** from the drop down. Set the toggle to Back Station and enter the **Back Station**. Enter the **Ahead Station**. Enter a **Tangent Point** number with a "R" prefix to store a point. Press the **Insert Station Equation** button.



Use COGO Navigator to Describe the Chain in the output window to review the inserted **Station Equation**.

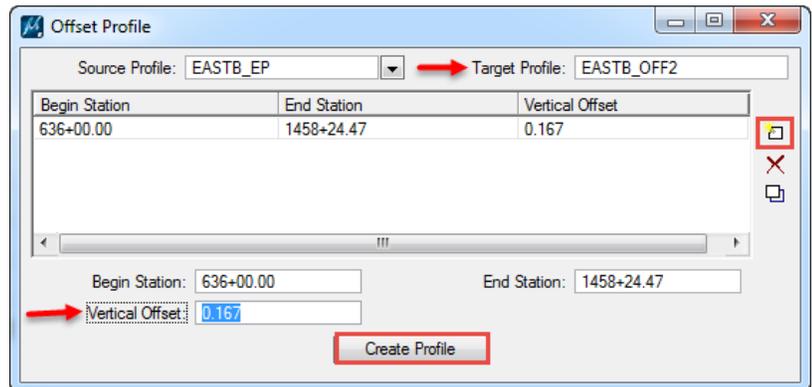


PROFILE - OFFSET

The Profile Offset tool may be used to store a profile with a +/- vertical offset or to make a copy of an existing profile without modifying the stationing and elevations.

Select **Element > Profile > Offset** from the COGO dialog.

Select the **Source Profile** and enter a name for the **Target Profile** to be stored. Enter a *station range* and a *vertical offset*. Enter a positive value to shift the profile up, negative to shift the profile down, and 0 to make a copy.

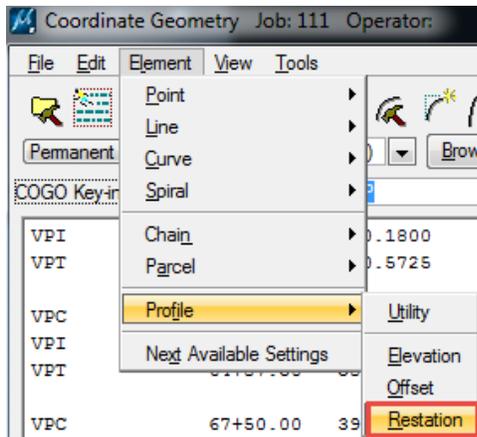


Press the **Add** button and then press the **Create Profile** button.

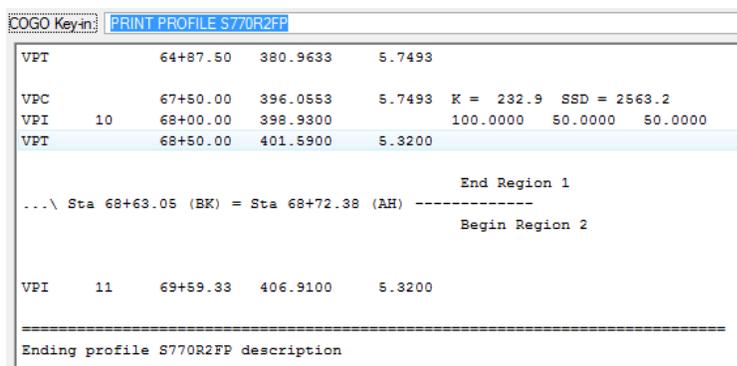
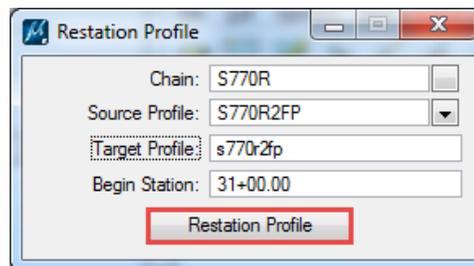
PROFILE - RESTATION

If you had a Profile stored in COGO that was based on the previous stationing of the Chain, the Profile will need to be updated. (Drawn alignments, profiles, shape files, existing, and proposed cross sections would also need to be revised.)

Select **Element > Profile > Restation** from the COGO dialog.



Select the **Chain** and **Source Profile** names from the drop downs. Enter a **Target Profile** name and Begin Station. Press the **Restation Profile** button.

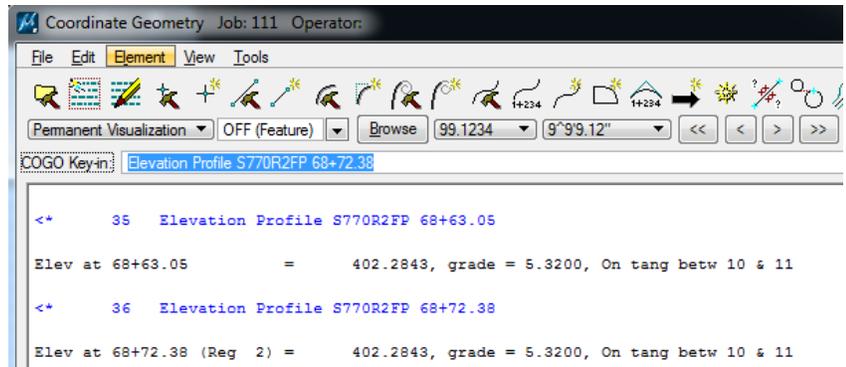


Use COGO Navigator to Describe the **Profile** in the output window to review the inserted **Station Equation**.

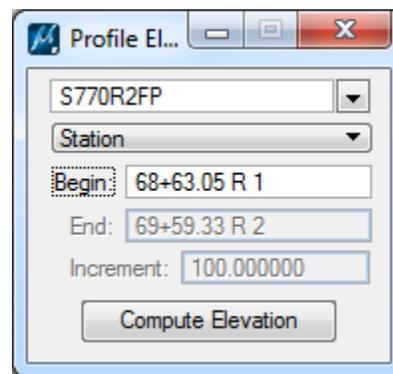
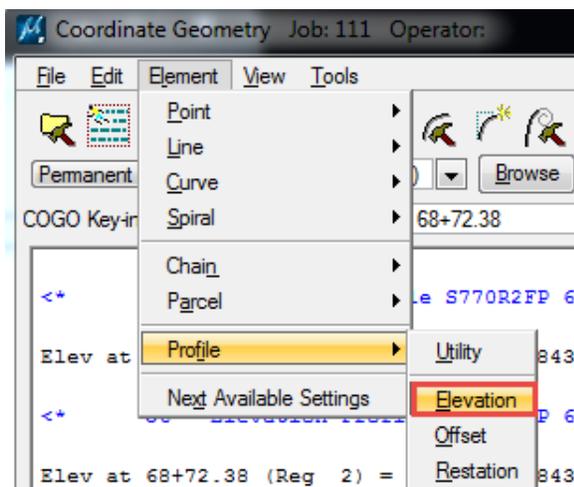
PROFILE - ELEVATION

To find the elevation at the Back and Ahead Stations (or any station), **Key In** the following statement in the COGO Key-in and press **Enter**.

Elevation Profile S770R2FP 68+63.05 (Enter)
 Elevation Profile S770R2FP 68+72.38 (Enter)



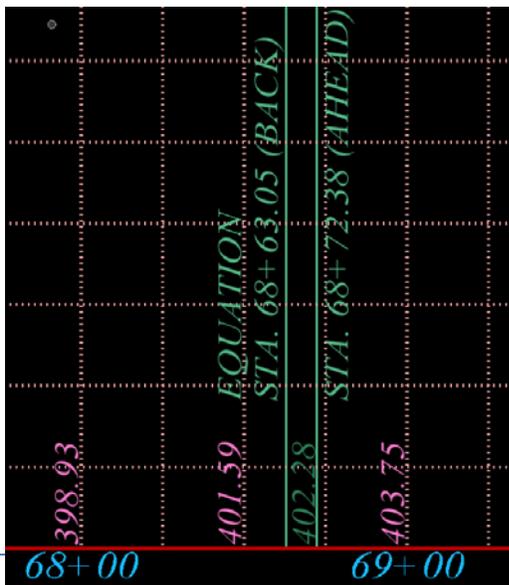
Alternatively, select **Element > Profile > Elevation** from the top menu. Select the Profile from the drop down. Toggle Station and enter a station. Press the Compute Elevation button. The information will be printed in the COGO output dialog.



The following math shows how to verify the calculations for the profile and verify the elevations are correct on the profile sheet.

$$\begin{aligned} \frac{\Delta Y}{\Delta X} &= \frac{Y_2 - 398.93}{6863.05 - 6800.00} = 0.0532 \text{ (solve for } Y_2) \\ \frac{\Delta Y}{\Delta X} &= \frac{Y_2 - 402.28}{6900.00 - 6872.38} = 0.0532 \text{ (solve for } Y_2) \end{aligned}$$

$$\begin{aligned} Y_2 &= 0.0532(63.05) + 398.93 = 402.28 \\ \text{Elevation at the Back Station } 68+63.05 &= 402.28 \\ \text{Elevation at the Ahead Station } 68+72.38 &= 402.28 \\ Y_2 &= 0.0532(27.62) + 402.28 = 403.75 \\ \text{Elevation at Station } 69+00.0 &= 403.75 \end{aligned}$$



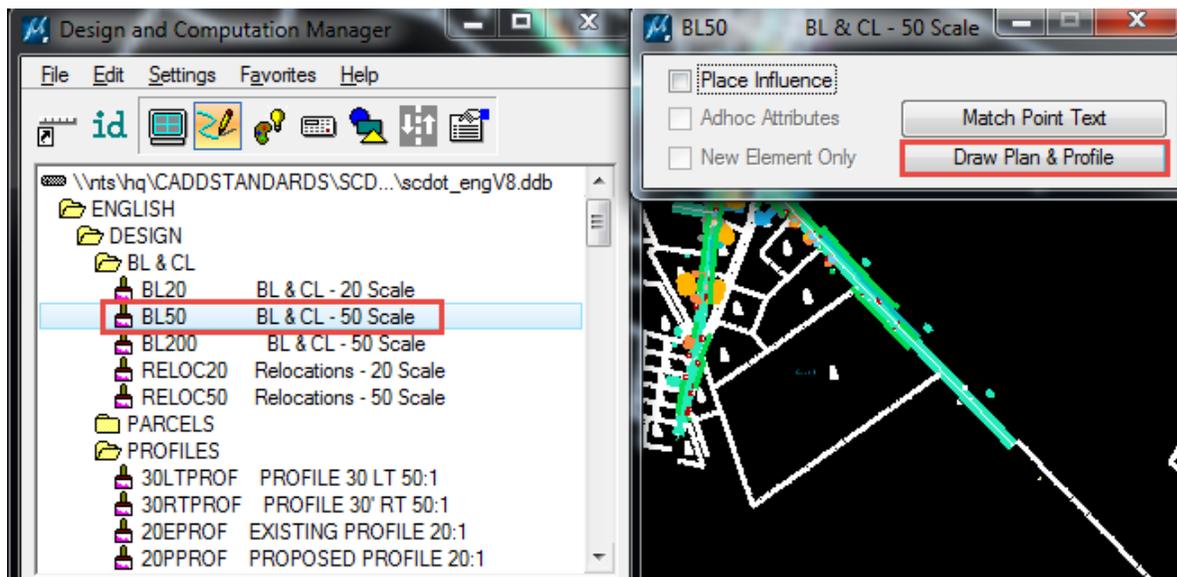
D & C Manager

The **D & C Manager** is utilized to standardize graphical elements for drafting and pay item quantities. SCDOT uses it for graphically drawing and labeling horizontal alignments, labeling tract numbers, and pipe quantities. The Draw Profile Tool and the Draw Cross Section tools can also utilize the symbology. The **VBA Applications** are also made available through the D & C Manager for Station and Offset Text, Buildup, GPK Merge, Draw Pattern Lines, Drainage Patterns, and XS Pipes for Sidelines and Crosslines.

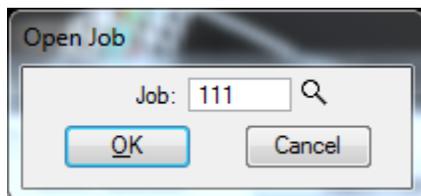
To access the D & C Manager, select **Applications > Geopak Road > Design & Computation Manager**. (It is also the 3rd icon on the Road Tools palette.)

Expand the English > Design > BL & CL folders to highlight the **BL50** and press the **Draw Plan & Profile** button.

Item	Description	Label Scale
BL20	Existing Centerline at 20 Scale	20.00
BL50	Existing Centerline at 50 Scale	50.00
BL200	Existing Centerline at 200 Scale	200.00
RELOC20	Relocated Centerline at 20 Scale	20.00
RELOC50	Relocated Centerline at 50 Scale	50.00



Select the project gpk file by browsing and pressing the **OK** button.

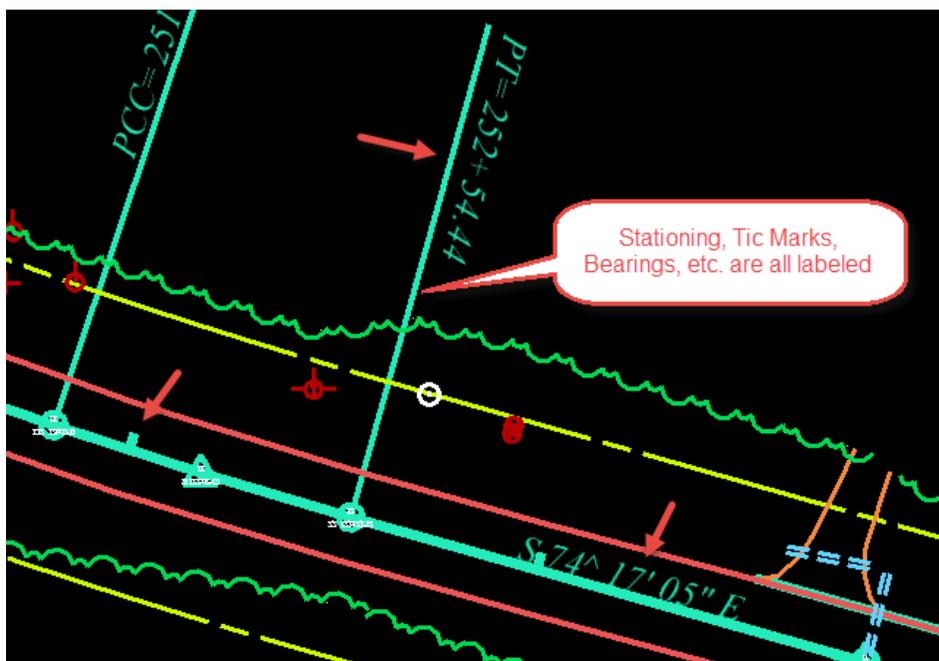
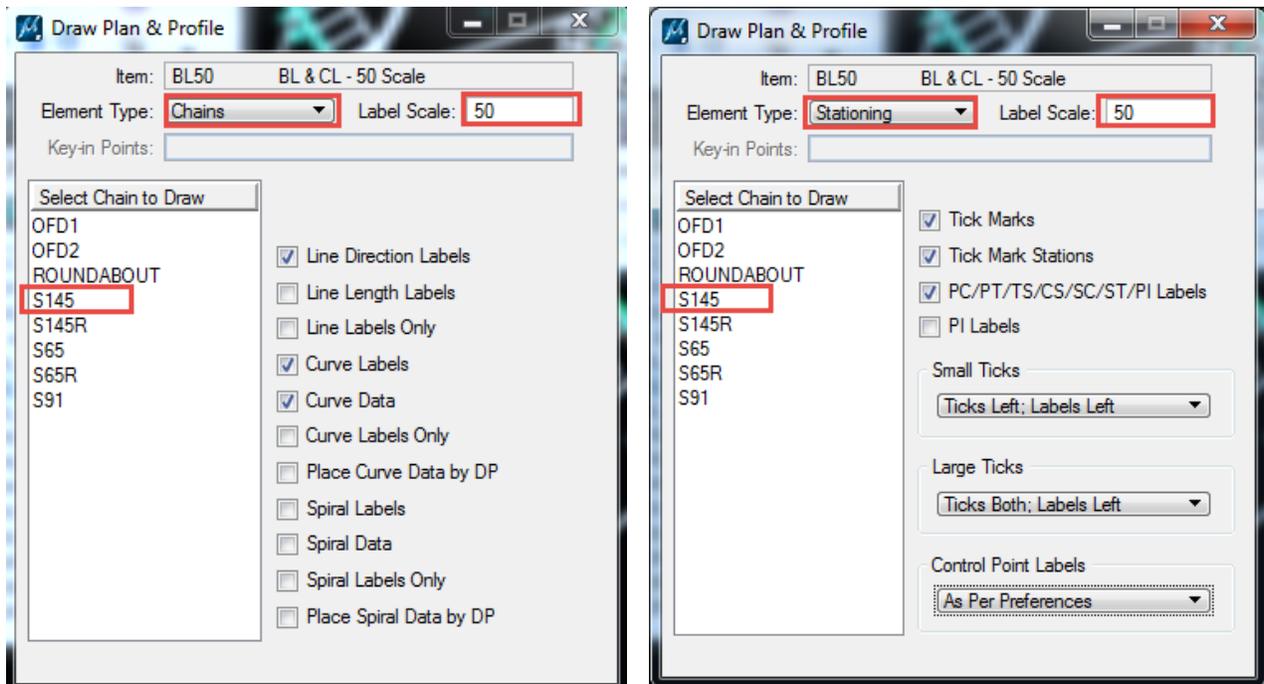


Toggle the Element Type to **Chains** and enter the **Label Scale** appropriately (50.00 for this example)

Click only **ONCE** on the chain to draw into the design file. (Clicking multiple times will result in duplicate elements.)

Toggle the Element Type to **Stationing** and click only **ONCE** on the chain name to draw the stationing into the design file.

Repeat these steps as necessary to draw all of the existing and relocated horizontal alignments into the design file. (Change the Item type to RELOC50 for relocated alignments at 50 scale.)



VBA Applications

VBA's provide automated tools to accomplish identification, calculation, and drafting tasks more quickly and effectively.

Station Offset Report

The Station Offset Report process provides location data for onsite points using station and offset data from the nearest or most important road alignment. After identifying the desired points, the alignments of interest, and the corridor width around each alignment to check, the process will sort the points based on their presence in those corridors and produce an excel file containing location data for each.

Reviewing Alignments in COGO for the Station Offset Report

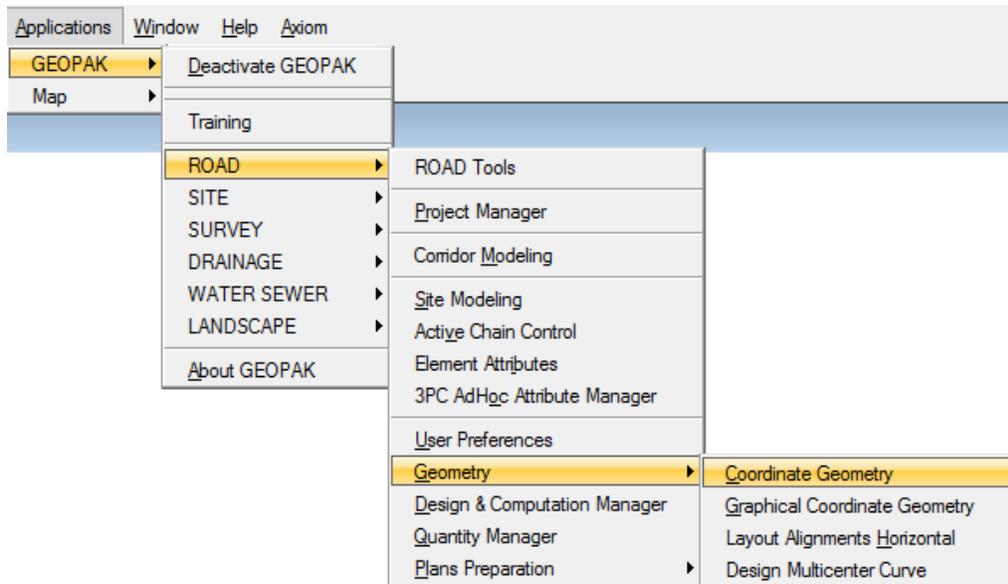
Files required for completing this process:

- "gpk" file
- "pp" file
- "sor" (newly created) design file

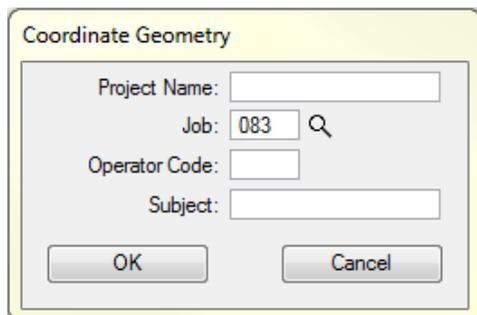
To determine the chains priorities and maximum offsets (Default = 75')

Open the project *pp.dgn design file

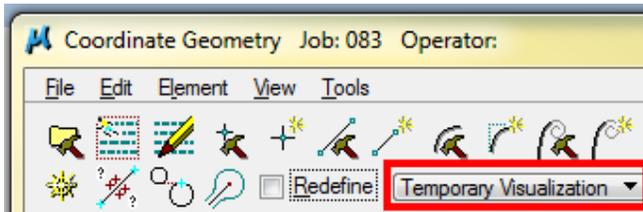
Open the COGO menu (Applications > Geopak > Road > Geometry > Coordinate Geometry)



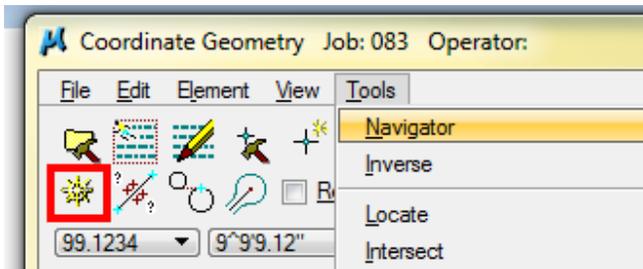
Browse and select the project "gpk" file and press **OK**



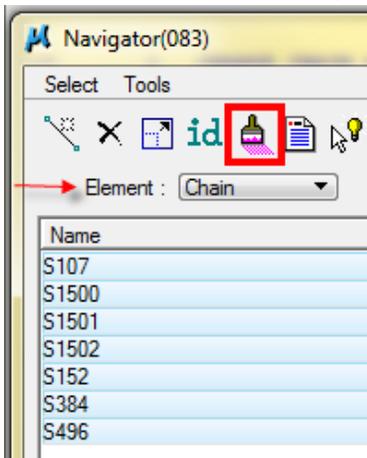
On the COGO dialog, set the toggle to **Temporary Visualization**



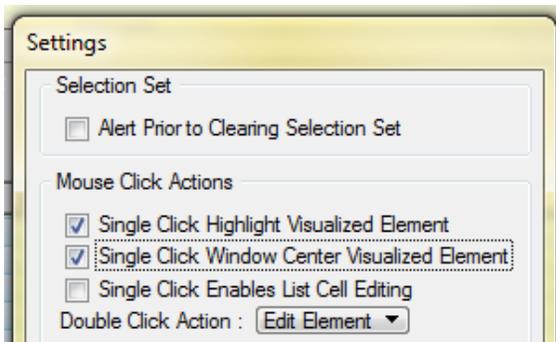
Select **Tools > Navigator** (or select the wheel on the toolbar)



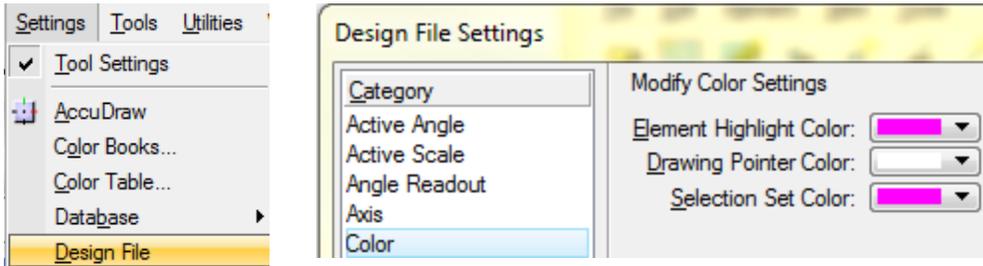
Change the Element toggle to **Chain**. Highlight all of the chains in the list and press the **Visualize** button (paintbrush) to draw the alignments into the file. Make sure the Default level is turned on.



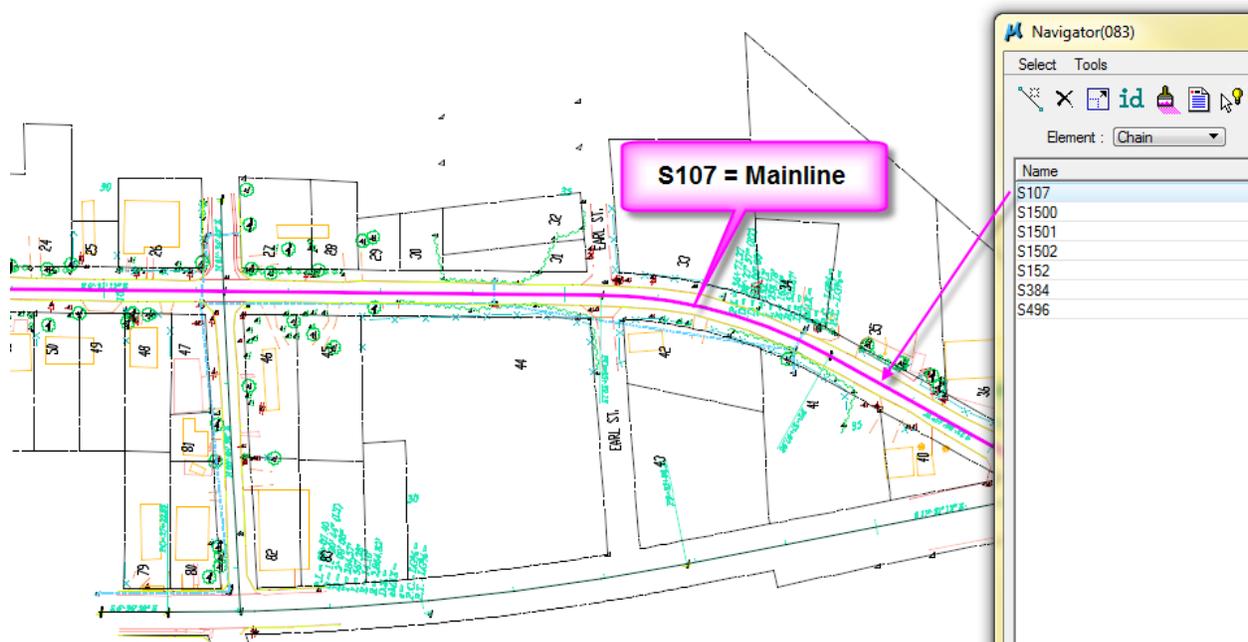
Tip: Select **Tools > Settings** on the Navigator menu to turn on the following features, **Single Click Highlight** and **Single Click Center**.



Tip: Select Settings > Design File > Color from the top MicroStation menu to make sure your element highlight color will stand out against the plan graphics.



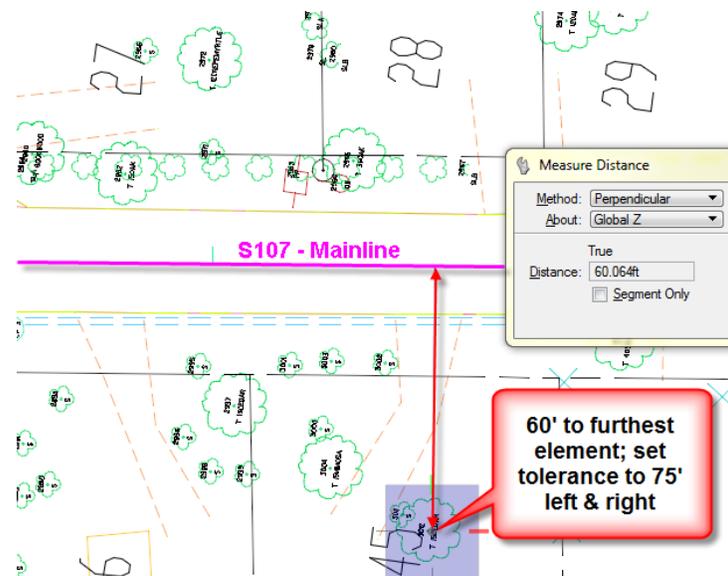
Highlight each chain individually to determine which is the mainline and side roads in order of importance to the project (or from left to right). Jot down the order if necessary.



Close the COGO menu.

Reviewing Topo Elements for Inclusion in the Station Offset Report

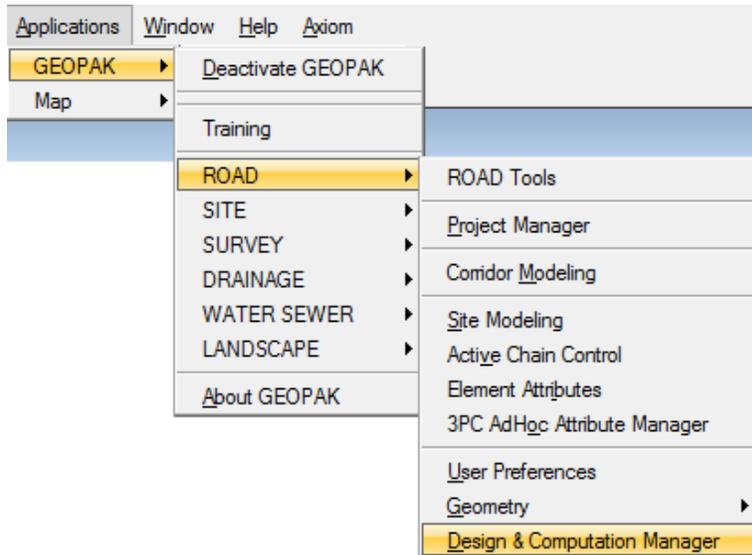
Zoom into each alignment and measure the distance left and right to the majority of the topographic elements that will be included in the Station Offset Report, for example, large trees or utilities. Jot down this distance along with each alignment above. Be sure to include a little further out for a buffer zone to make sure you capture all of the necessary points.



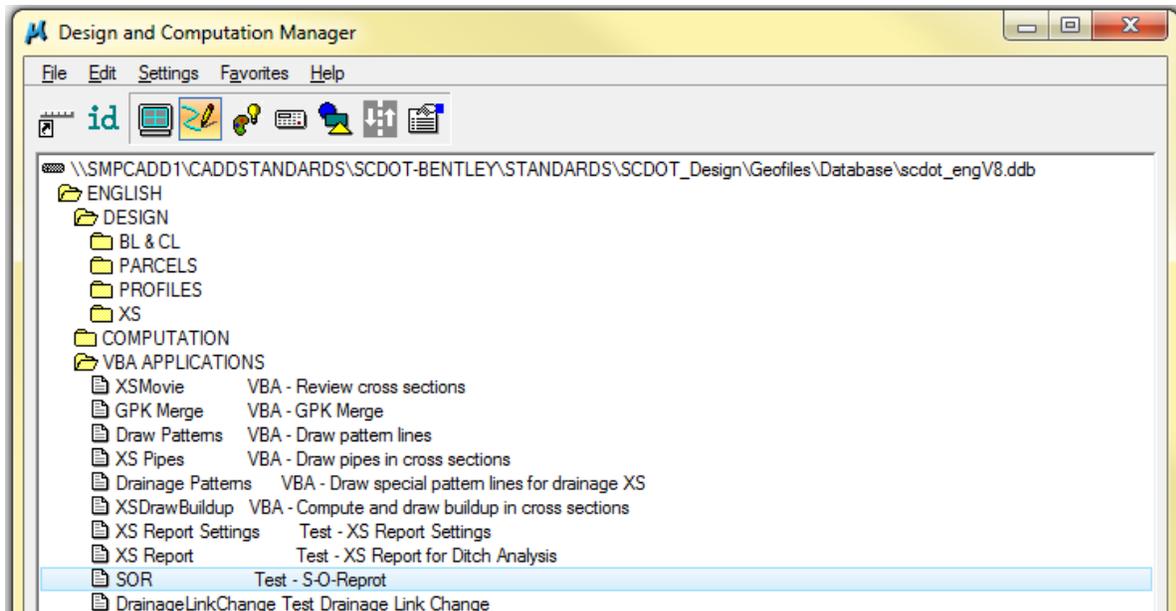
To run the Geopak VBA program for Station Offset Report

Create a new design file with the extension r#####_so.dgn (or you can place it in your reference sheet file)

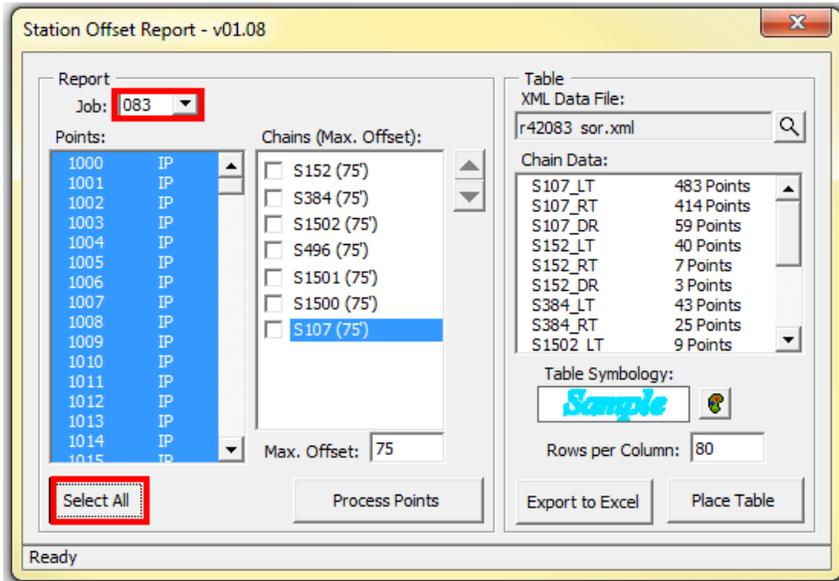
Open **D&C Manager** in Geopak (Applications > Geopak > Road > Design & Computation Manager)



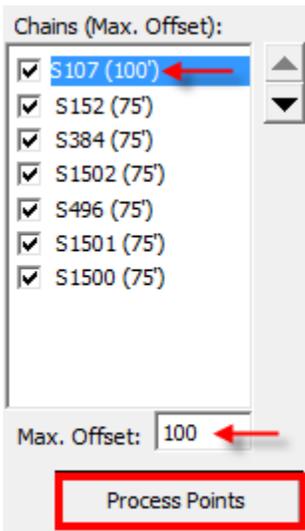
Expand the VBA Applications folder, if needed, and double click on the **SOR** to activate the Station Offset Report tool. (English > VBA Applications > SOR)



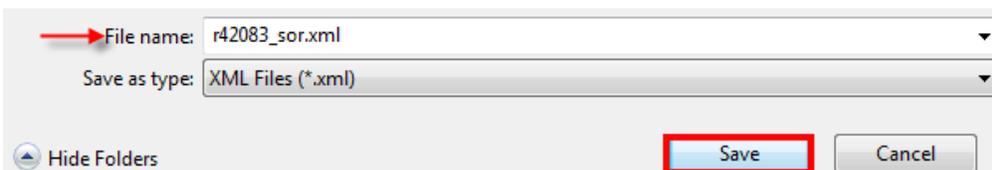
Select the correct “gpk” number if multiple GPK files used for the project. **Select points** needed or press the **Select All** button under Points



Highlight and click each individual Chain in the order of mainline, left to right, or project importance. Enter the left and right **Max. Offset** distance for each alignment. Press **Enter** to accept the changed offset input. Use the **Up/Down** buttons to adjust the priorities.



Press the **Process Points** button. You will be prompted to save a **project xml** report. **Enter** the file name and press **Save**.



To review, press the **Export to Excel** button. Enter a file name and click <Save>. This excel file will give you tabs for each alignment with a left, right, and drainage report.

Table
XML Data File:
r42083_sor.xml

Chain Data:
S107_LT 542 Points
S107_RT 480 Points
S107_DR 60 Points
S152_LT 39 Points
S152_RT 7 Points
S152_DR 3 Points
S384_LT 37 Points
S384_RT 20 Points
S1500_LT 1 Point

Table Symbology:
Sample

Rows per Column: 80

Export to Excel Place Table

	A	B	C	D	E	F
1	STATION	OFFSET	L/R	DESCRIPTION	FEATURE	
2	10+00	21.7	LT		GUY WIRE	
3	10+22	21.9	LT		P.POLE	
4	10+25	23.7	LT		PROPERTY CORNER FOUND	
5	10+27	27.6	LT		SHRUB ROW	
6	10+29	27.4	LT	48C	FENCE	
7	10+70	25.3	LT		PROPERTY CORNER FOUND	
8	10+75	37.1	LT	24BRADFORDPEAR	TREE	
9	11+02	59.4	LT		SHRUB	
10	11+05	20.8	LT	48C	FENCE	
11	11+08	61.3	LT		BUILDING	
12	11+45	60.8	LT		BUILDING	
13	11+73	21.7	LT		FENCE	
14	11+74	22.6	LT		WALL	
15	11+78	28.4	LT		WALL	
16	11+83	40	LT	15MIMOSA	TREE	
17	11+84	31.8	LT	36BR	WALL	
18	11+85	51.6	LT	60C	FENCE	
19	11+85	20.7	LT		P.POLE	
20	11+86	27.1	LT		FENCE	
21	11+86	27.1	LT	15MIMOSA	TREE	
22	11+86	27.1	LT		PROPERTY CORNER FOUND	
23	11+86	25	LT		PROPERTY CORNER FOUND	
24	12+03	21.3	LT		GUY WIRE	
25	12+55	27.5	LT		FENCE	
26	12+79	67.8	LT		LIGHT POLE	
27	13+21	21.2	LT		GUY WIRE	
28	13+28	21.3	LT		FIRE HYDRANT	
29	13+31	20.9	LT		P.POLE	
30	13+40	27.7	LT		FENCE	
31	13+58	28.2	LT		70C FENCE	
32	13+73	30.6	LT			
33	13+78	32.8	LT			
34	13+80	62.5	LT		POLE	
35	13+84	72.6	LT		ING	
36	13+84	72.6	LT		BUILDING	
37	13+85	35.9	LT		BUILDING	
38	14+08	36.2	LT		BUILDING	
39	14+09	30.8	LT		BUILDING	

Excel tabs: S107_LT | S107_RT | S107_DR | S152_LT | S152_RT | S152_DR | S384_LT

Speech bubble: **Tabs for left, right, & drainage for each alignment**

File name: r42083_sor.xlsx

Save as type: Excel Files (*.xlsx)

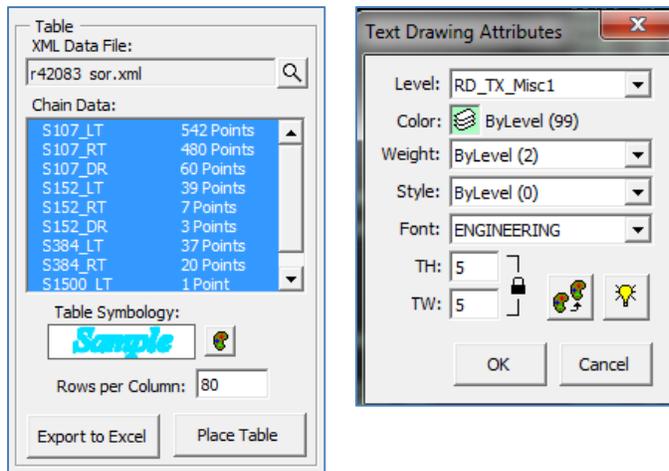
Hide Folders

Save Cancel

The tab for "None" reports all of the points that were not included in one of the alignment reports because they did not meet the station and offset criteria. You can review this information and determine its importance to the project. If points in the "None" tab are required, repeat Step 14 to extend Max. Offset and re-process.

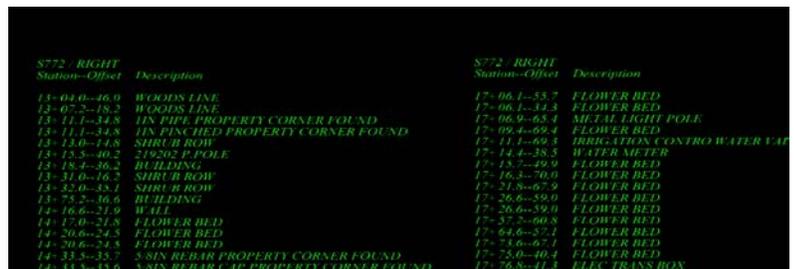
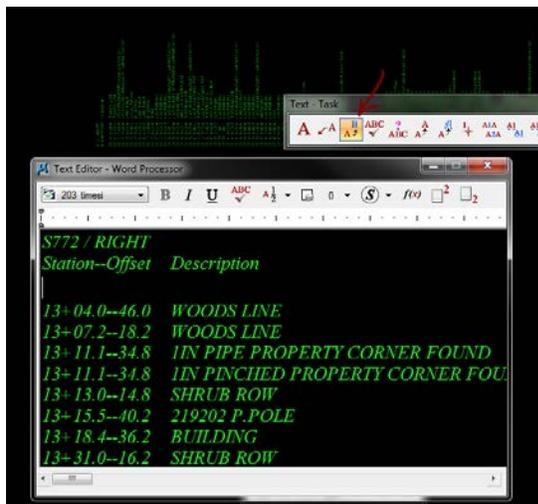
A	B	C	D	E	F	G	H
POINT #	NORTH	EAST	ELEV	CHAIN	STATION	OFFSET	L/R
1014	753324.92	2200377.399	0	S384	9+04	1124.8	LT
1016	753149.654	2200389.854	0	S384	8+86	950.1	LT

Select one Chain Data set to be placed on sheets. Adjust “Rows per Column” and text attributes in “Table symbology” if needed. Multiple Chain Data sets can be selected if you need to put into reference sheets.



To place your text, press the **Place Table** button and Data Point in the design file.

One Text Note element will be created for each column in the table. The text note can be moved, copied, or rotated in MicroStation. To modify the station offset text in the column, use MicroStation “**Edit Text**” command. To split up the column, use MicroStation “**Copy**” and “**Edit Text**” commands. To convert column text note into individual station offset note, use MicroStation “Drop Element – Complex” command. (See pages 322 for additional information to place the text on a Reference Data Sheet – Station Offset border sheet.)



Buildup

The Buildup process is used to correct slopes prior to new surfacing being applied. In this situation, the existing road is built up using paving material to the necessary elevation, rather than adding gravel or compacted fill.

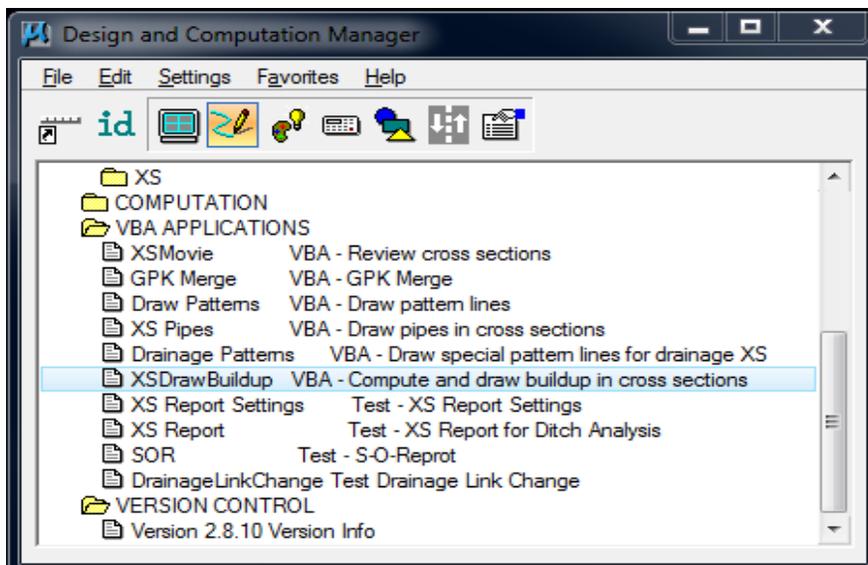
The Buildup VBA uses cross-section data from the DX.DGN files along with a Shape file defining the top of the buildup material to calculate the quantity of additional pavement required. This VBA works well for situations where the new roadway follows the centerline of the existing one, but requires significant time and effort to modify in cases where the new road deviates from the existing.

It is most useful, therefore, for projects such as road widening, shoulder paving, and other projects where the existing centerline is maintained.

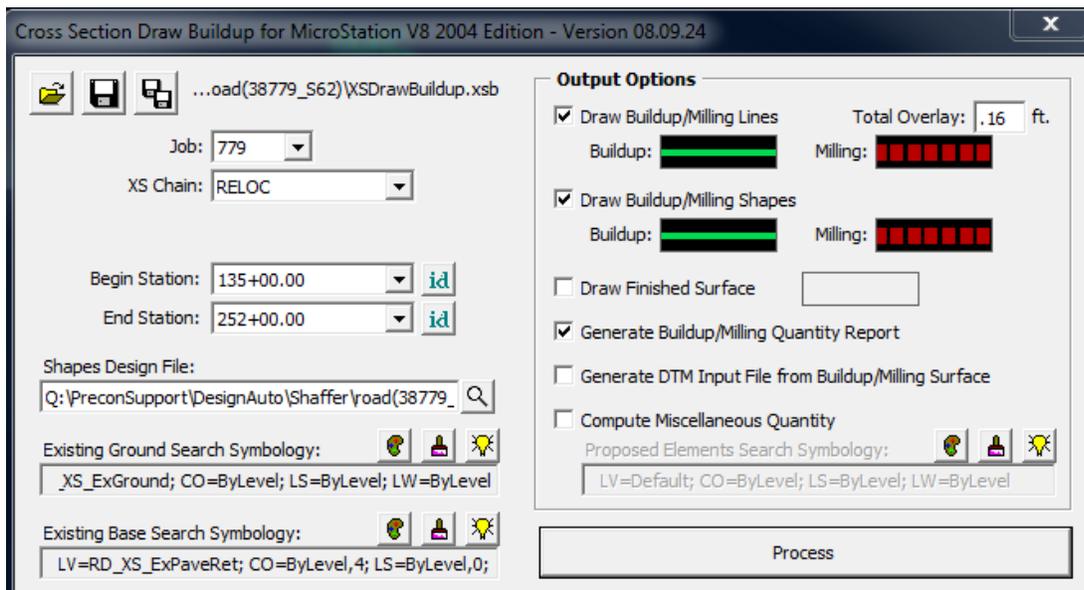
Running Buildup using the VBA application

Open a dx.dgn design file

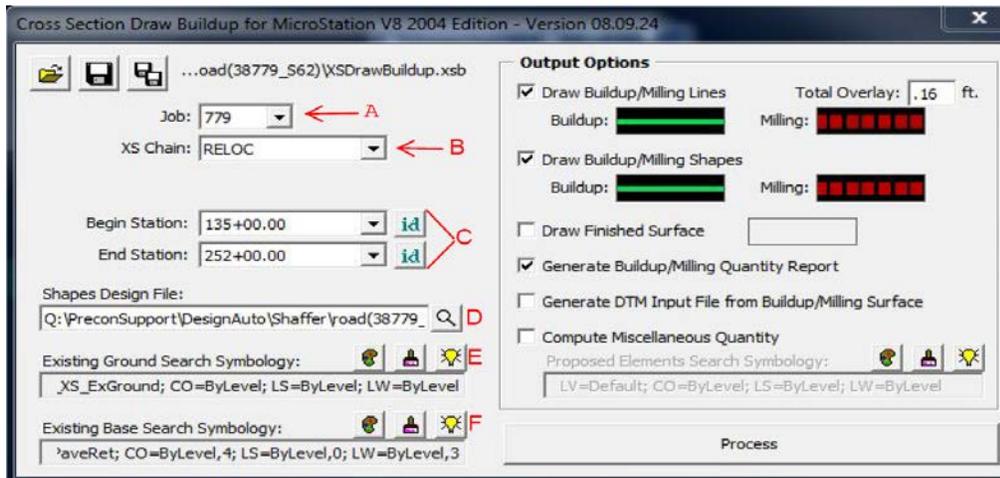
Inside the design file open the “Design and Computation Manager” and double click the “XSDrawBuildup”



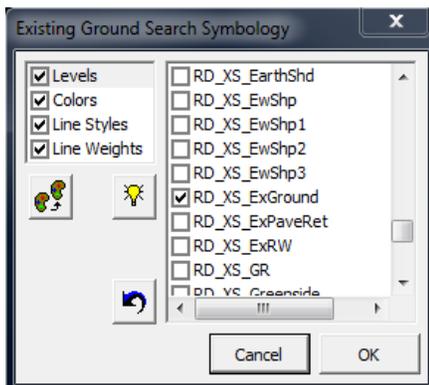
Once this is selected this Cross Section Draw Buildup dialog will Open



This is the information you will need to fill out this palette window: A-F

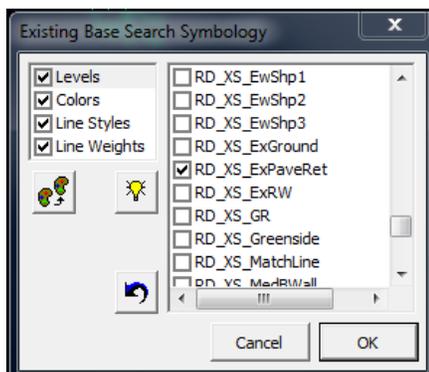


- A. GPK #
- B. Chain name
- C. Begin and End Station range
- D. Shape file – the .dgn file providing the proposed pavement slopes for the dx.dgn file
- E. Existing Ground – LV=RD_XS_ExGround; CO=ByLevel;LS=ByLevel;LW=ByLevel



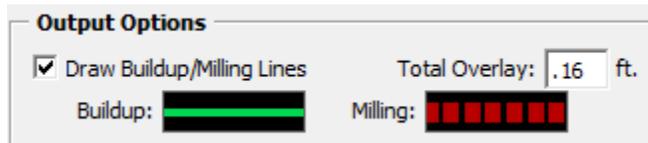
Verify the correct element is selected

- F. Existing Base – LV=RD_XS_ExPaveRet; CO=ByLevel,4;LS=ByLevel,0;LW=ByLevel,3



Verify the correct element is selected

Include your overlay amount in the “Total Overlay “ box located at the top right of the palette window. In this case the overlay is .16 ft.



After the information has been selected, check the “Generate Buildup/Milling Quantity Report” on the right side of the palette and click the Process bar. This will generate a buildup.txt document with the amount of Buildup in Cubic Yards.

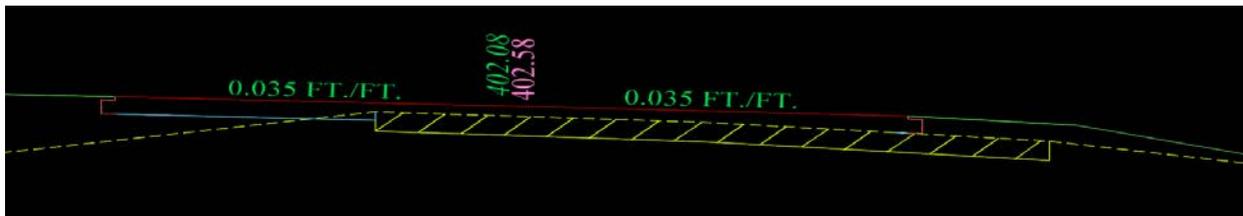
249+50.00	0.00	22.82	0.11	7026.08	17.54	0.44
250+00.00	0.00	30.61	0.11	7206.96	18.25	0.60
251+00.00	0.00	40.07	0.11	7353.92	17.60	0.93
252+00.00	0.00	39.29	0.11		18.08	0.85
Total Milling Volume = 0.11 CY						
Total Buildup Volume = 7353.92 CY						

Correcting for Altered Road Centerlines

In some situations the roadway will shift off the centerline of the existing roadway. In this situation the VBA needs to be manipulated into not following existing roadway for the relocated sections. To do this we use a combination of the “Place Fence” and “Change Attributes” tools.

A video explaining the process is located in the VBA Apps.zip file located on the internet at <https://www.scdot.org/business/CADD-Design.aspx>. See the pictures below for a before and after.

Before:

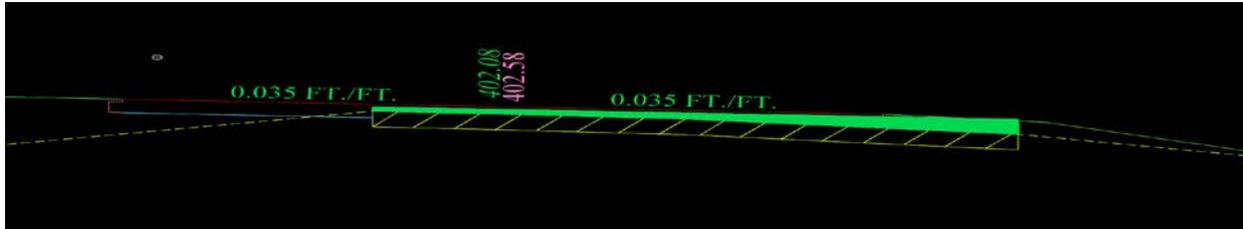


After:

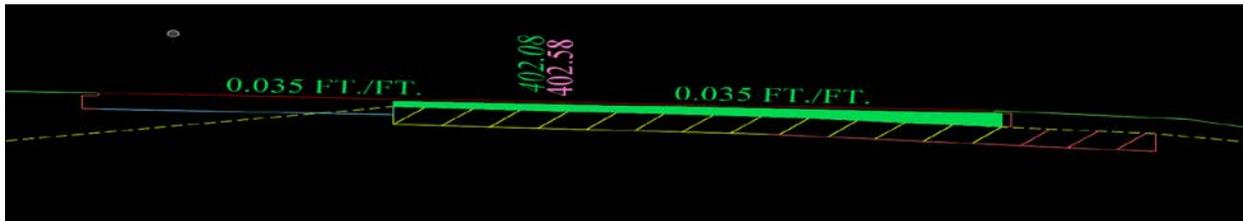


Once this is completed for each cross section that needs it, rerun the VBA. Here are the before and after pictures.

Before:



After:

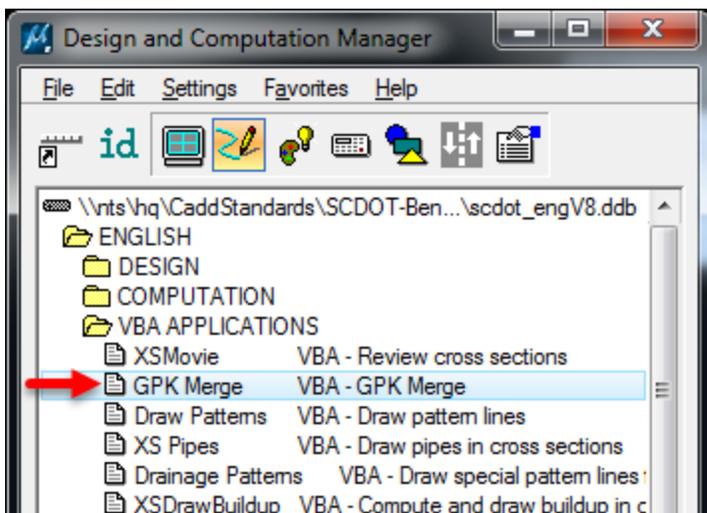


GPk Merge

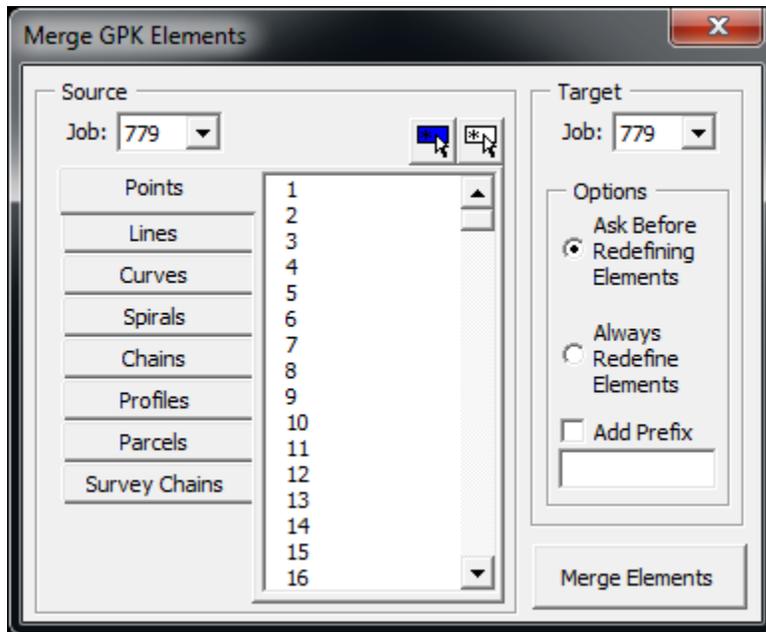
The GPk Merge process copies selected Cogo elements from one GPk file into another. It can overwrite or retain existing data as desired.

Combining GPk Data

Open the D&C Manager (*Applications -> GEOPAK -> ROAD -> Design & Computation Manager* on the menu bar), select *English -> VBA Applications -> GPk Merge*, and double click to start the macro.



In the Merge GPK Elements window, select the names of the GPK files you want to **copy from and to**. Click on the geometry elements you want to copy, using the **Shift and Control** buttons as you click to select multiple elements. The blue button above the elements list will select all elements of all types.



On the right side of the window, select whether to automatically overwrite any common elements with the new copies or to confirm each overwrite by prompting you.

The Add Prefix option allows you to enter a prefix that will be added to every copied element. You can select one set of elements and copy them with a prefix being added, then select other elements to copy without one.

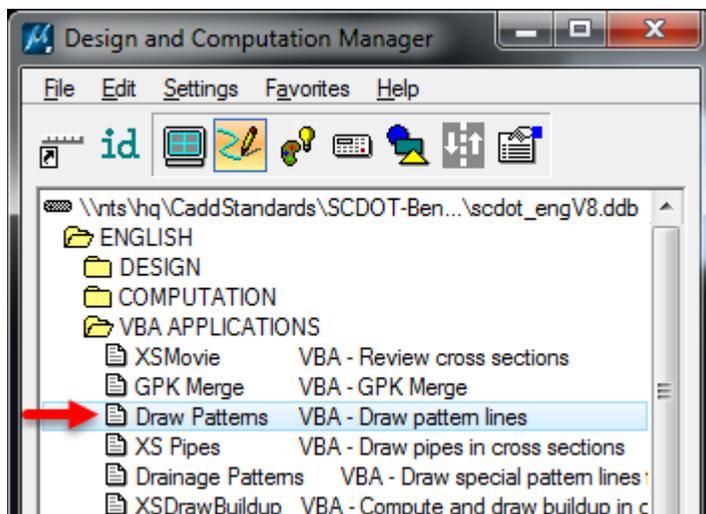
Click **“Merge Elements”** to merge the selected elements. Continue selecting and merging elements as required.

Draw Pattern Lines

The Draw Patterns draws pattern lines in the *.sh.dgn or *.pat.dgn file as graphical representations of where cross-sections will be cut at specified intervals. (Please see also the information in the Cross Section chapter about width of corridor, special cross sections, and railroads.)

Drawing Pattern Lines

Open the D&C Manager (*Applications -> GEOPAK -> ROAD -> Design & Computation Manager* on the menu bar), select *English -> VBA Applications -> Draw Patterns*, and double click to start the macro.

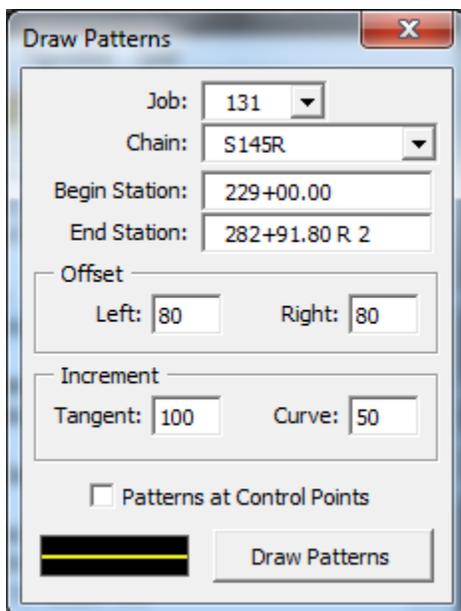


In the Draw Patterns window, enter the **Job number** of the project and select the **chain** of the road being crossed.

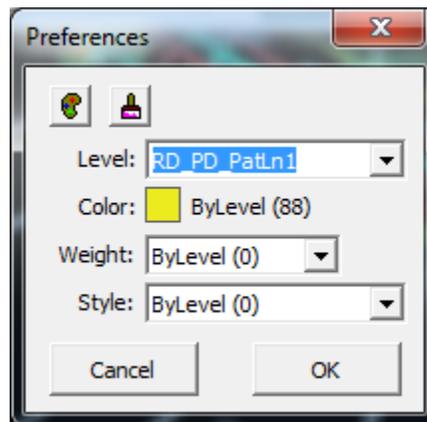
Fill in the **Begin Station** and **End Station** values (the start and end are automatically filled in) – change them if only a portion of the chain needs cross-sectioning.

In the **Offset** section, indicate how far the cross-sections should extend to the left and right of the centerline chain. Ensure the left and right extend far enough to cover the project, especially if a railroad or other features need to be captured in the cross sections. (Typical values are 80 feet or 160 feet to fit on the 5 x 5 or 10 x 5 cross section sheets.)

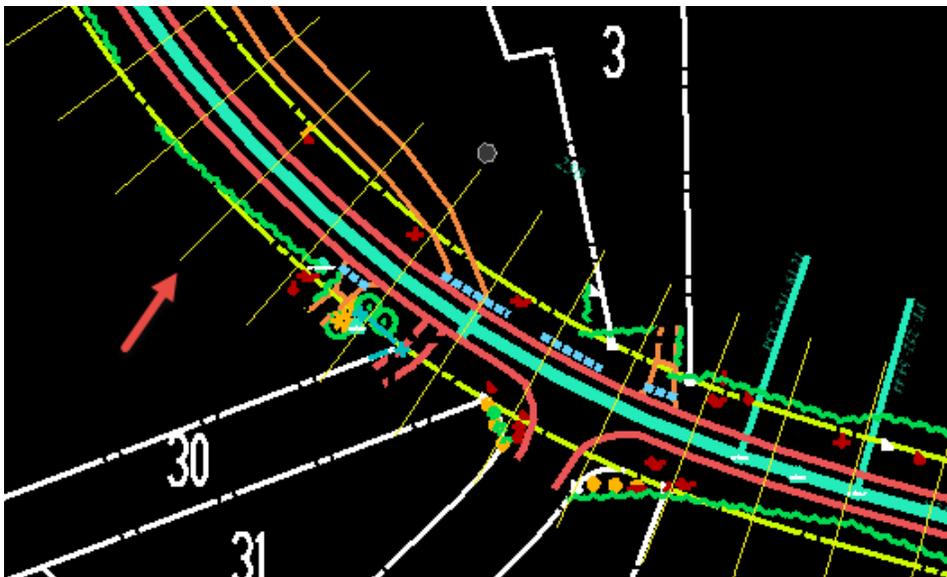
In the **Increment** section, enter how much separation should occur between cross-sections on the straightline (tangent) sections of the road and the curved sections. The default values are **100 feet for the tangents** and **50 feet for the curves**.



Double-click on the box showing the symbology to change the style. Press **OK**.



Press **Draw Patterns** to produce the pattern lines.

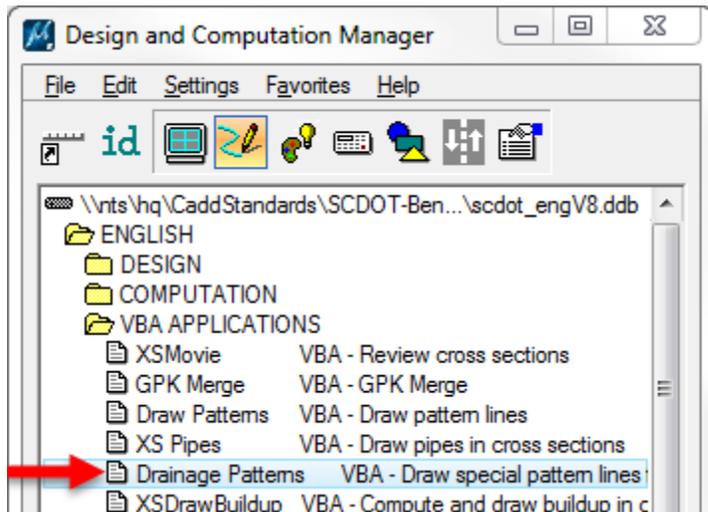


Drainage Patterns

The Drainage Patterns VBA draws special pattern lines for road cross-sections specifically needed to show cross-line pipes. You will need the drainage project database file (*.gdf); the drainage library if it is different from the standard (*.dlb); the plan view dgn file including drainage (Tools > Update Pay Items) (*.pp); and a newly created *.xp.dgn file to draw the special cross sections.

Drawing Special Pattern Lines

Open the D&C Manager (*Applications -> GEOPAK -> ROAD -> Design & Computation Manager* on the menu bar), select **English -> VBA Applications -> Drainage Patterns**, and double click to start the macro.



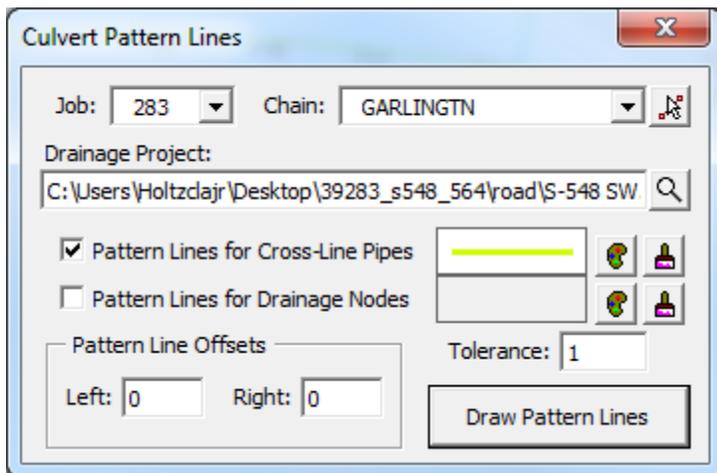
Note: If the VBA will not load in D&C, select Utilities > Macro > Project Manager at the top.

Open the CulvertPatternLines.mvba found in this folder: (change Files of Type to .mvba)

\\nts\hq\CaddStandards\SCDOT-Bentley\Standards\SCDOT_Design\MSfiles\vb

Highlight the CulvertPatternLines vba and press the Play button. Press the Run button to start the VBA shown below.

In the **Culvert Pattern Lines** window, enter the **Job number** of the project and select the **chain** of the road being crossed. Click the magnifying glass next to the "Drainage Project" space and browse to the **.GDF file** for the project. Check the box marked "**Pattern Lines for Cross-Line Pipes**" and enter **0** for the Pattern Line Offsets

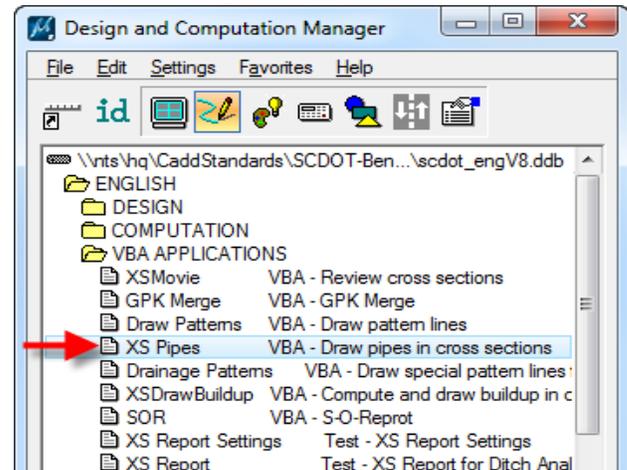


Open (or create) a *.xp.dgn file for the project. **Cut existing and proposed cross sections** using the new drainage pattern lines. Cross sections will be skewed.

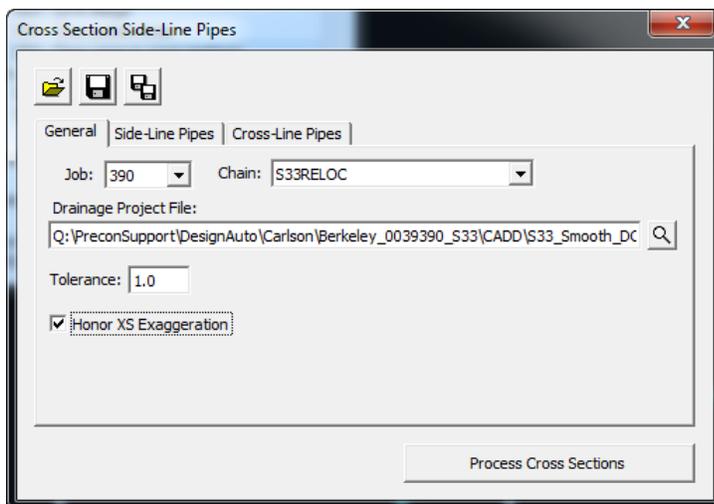
XS Pipes

The XS Pipes VBA program draws GEOPAK Drainage elements in cross section locations obtained from a GEOPAK Drainage file (.gdf).

Open the *.dgn design file and select *Applications -> GEOPAK -> ROAD -> Design & Computation Manager* from the menu bar. Select **English -> VBA Applications -> XS Pipes** and double click to start the macro.



On the **General** tab, select the Geopak COGO **Job** (.gpk) and **Chain**, then browse to select the *.gdf file in the project folder.



The **Tolerance** field indicates the distance within which a drainage object will be considered to fall on a cross section. If a drainage object is farther away than the distance from the cross section location (pattern line) it will not be drawn on the cross section.

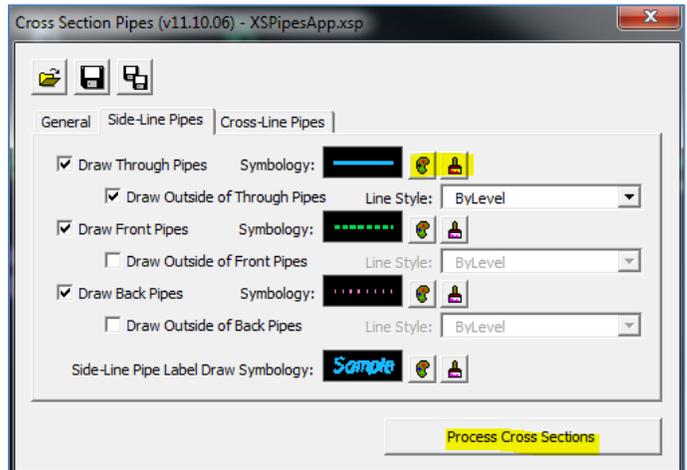
The **Honor XS Exaggeration** option is to distort the pipe drawn according to the exaggeration at which the cross section was originally drawn. (e.g. Cross section drawn in 10:5 scale results in ellipses drawn rather than circles for round pipes.)

The program provides icons across the top of the dialog to save and retrieve these settings. The file extension for XSPipes settings files will be **.xsp**. When the program starts it will automatically open the most recent settings file found in the current design file folder. When the program is closed the user will be prompted if they wish to save the settings.

Drawing Side-Line Pipes in Cross Sections

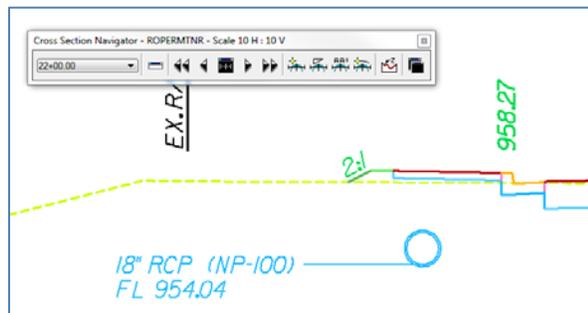
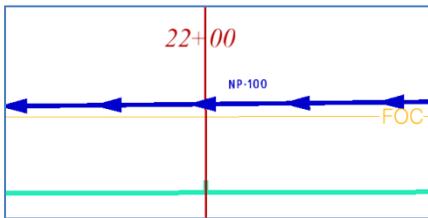
The first tab is used to draw **Side-Line Pipes** (longitudinal pipes) for all drainage pipes that cross the cross section pattern line. Users can select options to draw pipes that intersect the cross section (**Through Pipes**), end before the cross section (**Front Pipes**), or begin after the cross section (**Back Pipes**) with options to draw the outside of the pipe using a different line style.

Modify the options and press the **Process Cross Sections** button. (You can change the symbology by clicking the art palette and paint brush icons prior to processing.)

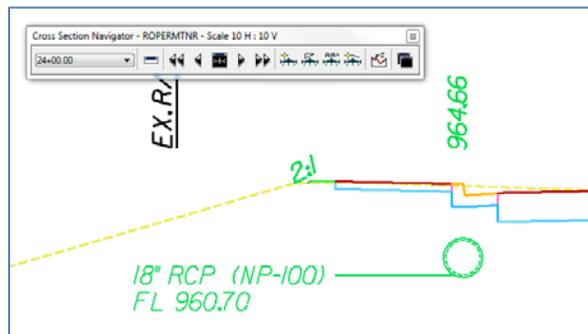
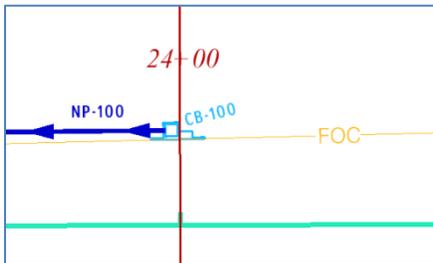


Press the **Process Cross Sections** button and **Begin** to process the cross sections. Select **Yes** to save a *.csv pipe report file. Pipe drawings in cross sections **should be reviewed by roadway and hydraulic engineers** after processing.

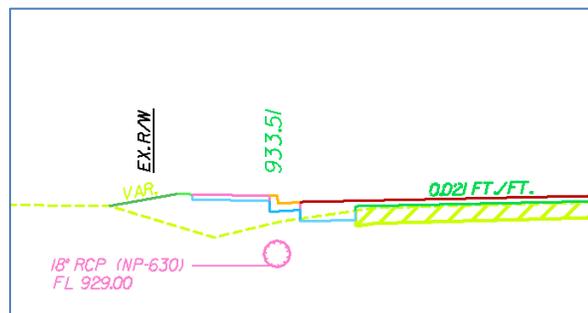
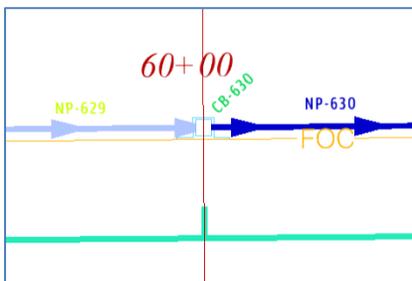
Through Pipe:



Front Pipe:

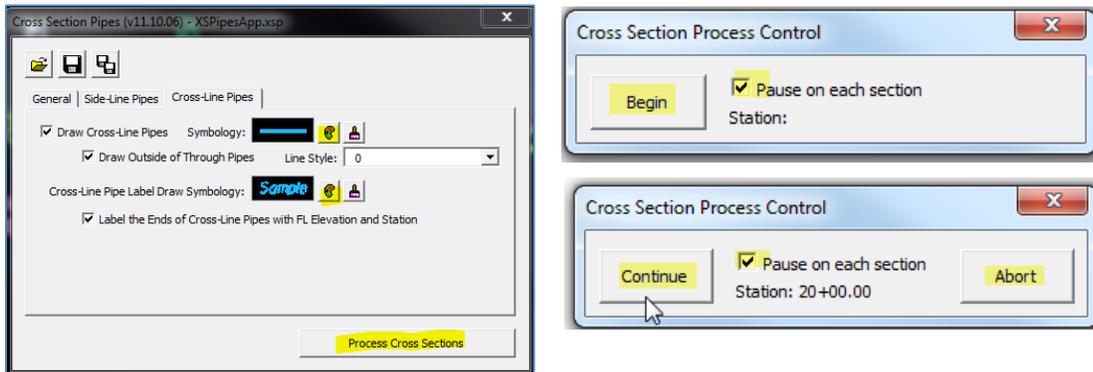


Back Pipe:

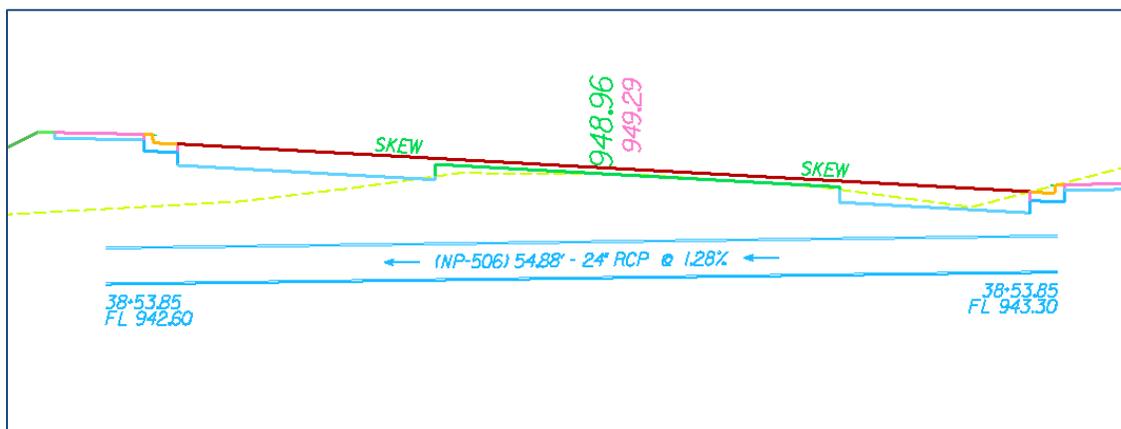
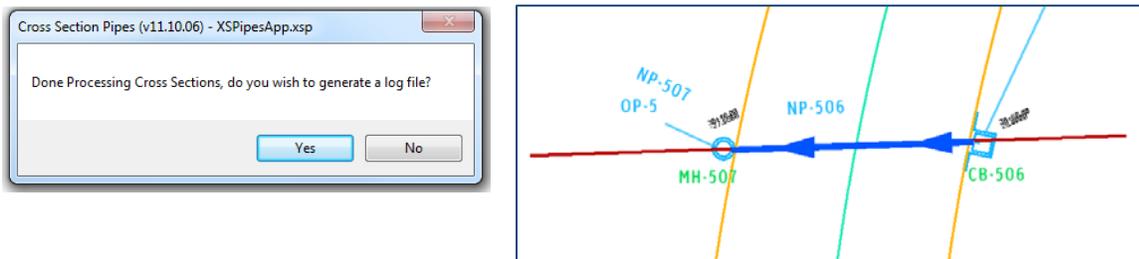


Drawing Cross Line Pipes in Cross-Sections

The second drawing tab is used to draw **Cross-Line Pipes** for drainage pipes that cross the roadway alignment and have both begin and end points that fall within the tolerance of the cross section pattern line. Typically the special cross section will be created from pattern lines generated using the **Drainage Pattern Lines VBA** tool (See page 96 for more detail.) Users can set options to draw cross-line pipes including the outside of the pipe and labeling.

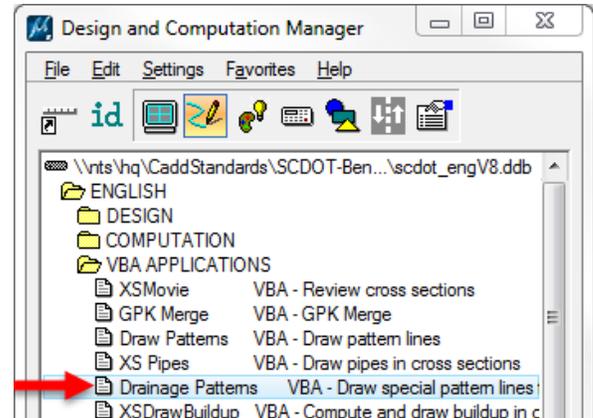


Once all settings have been established, users can click the **Process Cross Sections** button. If the user isn't in a design file containing cross sections for the indicated chain, they will be prompted to open the appropriate cross section file. If cross sections are found, a process dialog will appear. The user can click the **Begin** button to start processing the cross sections. If the **Pause** button is checked the first cross section will be processed and centered in the view. The user can review what has been drawn before continuing on to the next cross section or abort processing and return to the main dialog. If the **Pause** option is not checked every cross section will be processed in order and the user will be notified when it is complete. Select **Yes** to save a pipe report file in csv format.

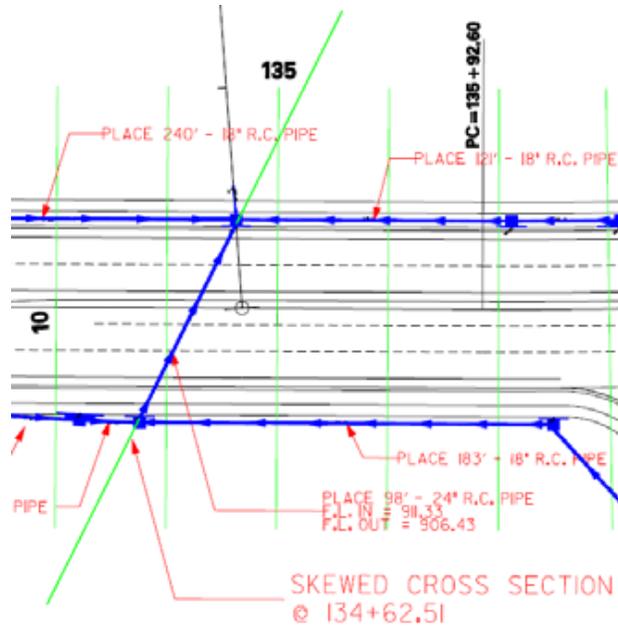


Preparing Special Cross Sections

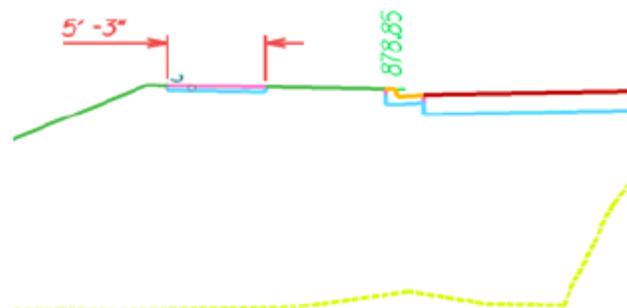
Open the DGN file that has the cross-line pipes. Draw drainage pattern lines along each cross line pipe using the MicroStation “draw line” command. Alternatively, use the **Drainage Patterns VBA** in the Design & Computation Manager as described above to create the needed pattern lines.



Pattern lines should extend a minimum of 20 feet beyond each end of the cross line pipe or to the construction limits.



Cut existing and proposed cross sections in *.xp.dgn using special drainage pattern lines. Cross sections will be skewed.



Special cross section sheets for skewed pipe can be added at the end of the plans. Label these sheets XP1, XP2, etc.

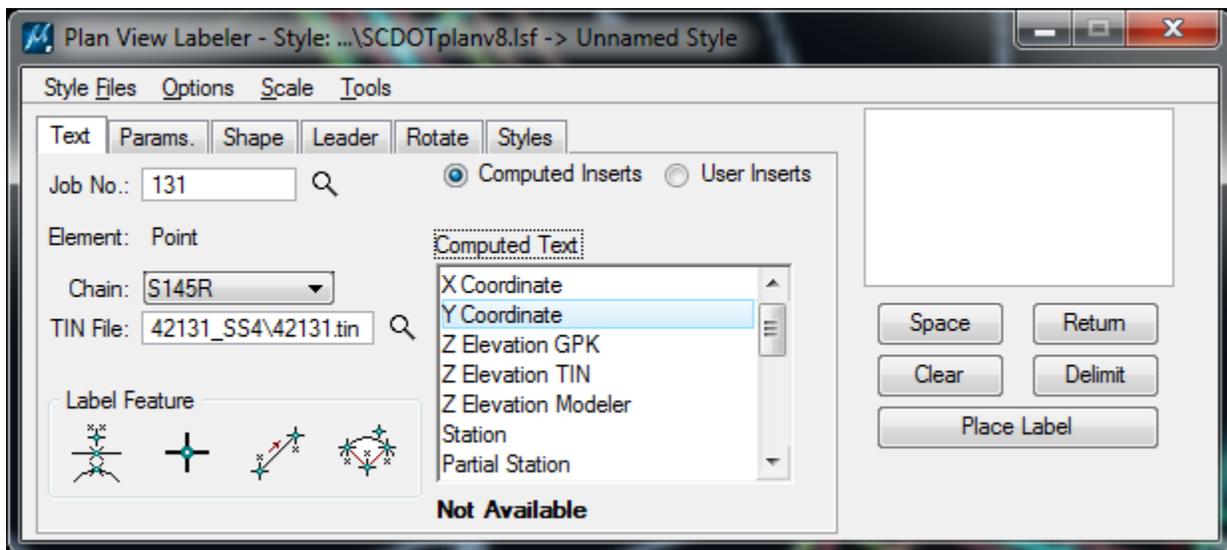
Plans Preparation

The Plans Preparation tools allow you to label and prepare sheet files for roadway construction plan production. This section includes information on Plan and Profile labeling, the Draw Profile tool, and Plan Sheet Clipper.

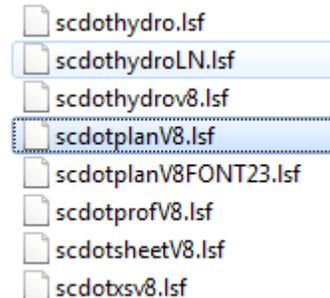
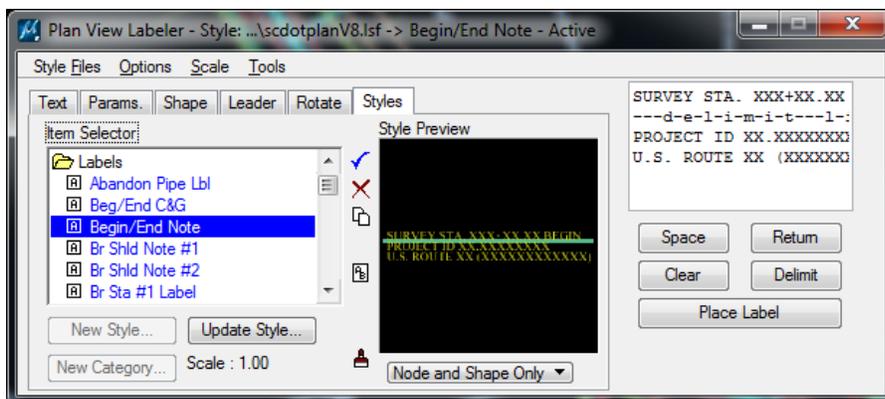
Plan Labeling

Plan Labeling can be accessed by selecting **Applications > Geopak > Road > Plans Preparation > Plan View Labeling**. (Additional information can be found in Chapter 17 of the Geopak Road I Training Manual.)

Select the **Job No (gpk), Chain, and Tin** file.

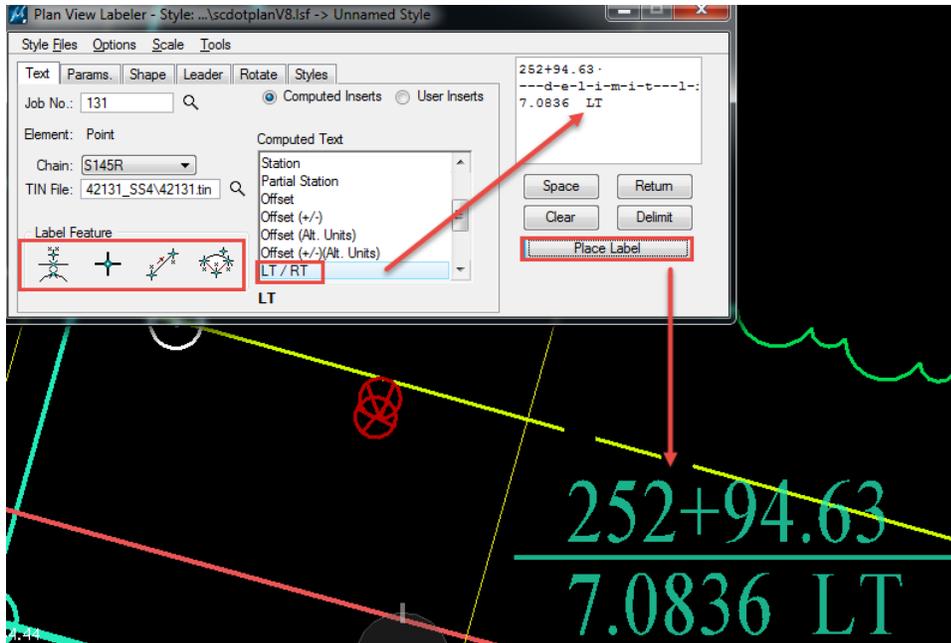


Select the **Styles** tab to review the available types in the SCDOTplanv8.lsf file. Pressing **Style Files > Open** will show the available style files for plan, profile, and cross section labeling. (Files in “LN or V8” format utilize True Type fonts. The “V8FONT23” contains the same styles except in the MicroStation RSC font23.)



Modify the **XX fields** manually with the appropriate text for stationing, length, or offset, etc.

After clicking the desired label style, select the **Text** tab again. Use the **Label Feature** to data point or select linear elements for labeling of XYZ Coordinates, Stations, or Offsets, etc. **Double clicking** in the Computed Text will add the calculated value into the Place Label dialog. Press the **Place Label** and follow the command prompts for leader information to place the labels in the design file.



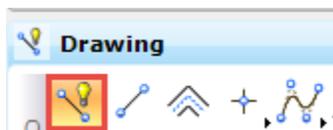
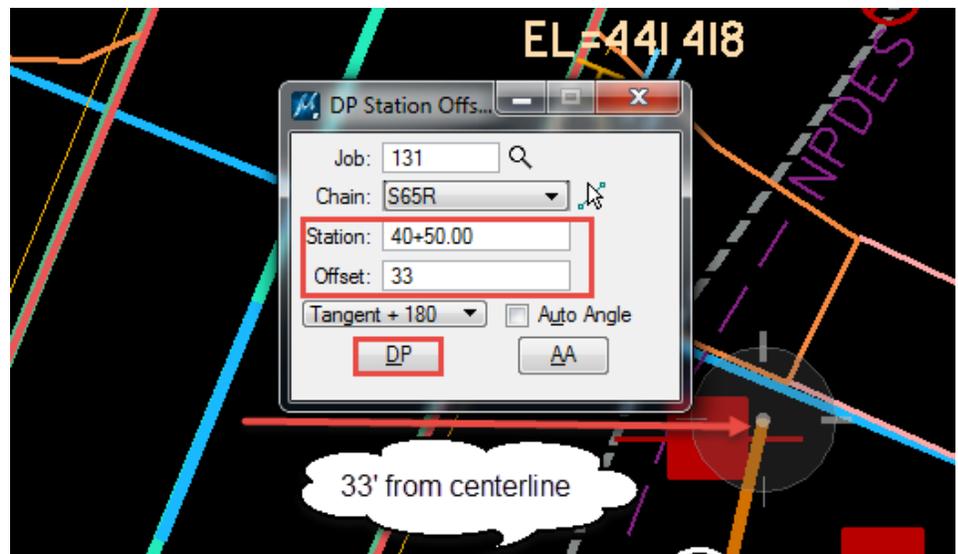
DP Station Offset

The DP Station Offset tool is useful when needing to offset graphical elements at a set station and offset from the horizontal alignment. An example could be transitional right of way or a site triangle at a particular station/offset.

To activate, select **Applications > Geopak > Road > Plans Preparation > DP Station Offset**.

Select the Job number (gpk) and Chain name. Enter a **Station** and **Offset**.

Activate the MicroStation **Place Line** command and press the **DP** button to begin drawing the line at the provided Station/Offset.

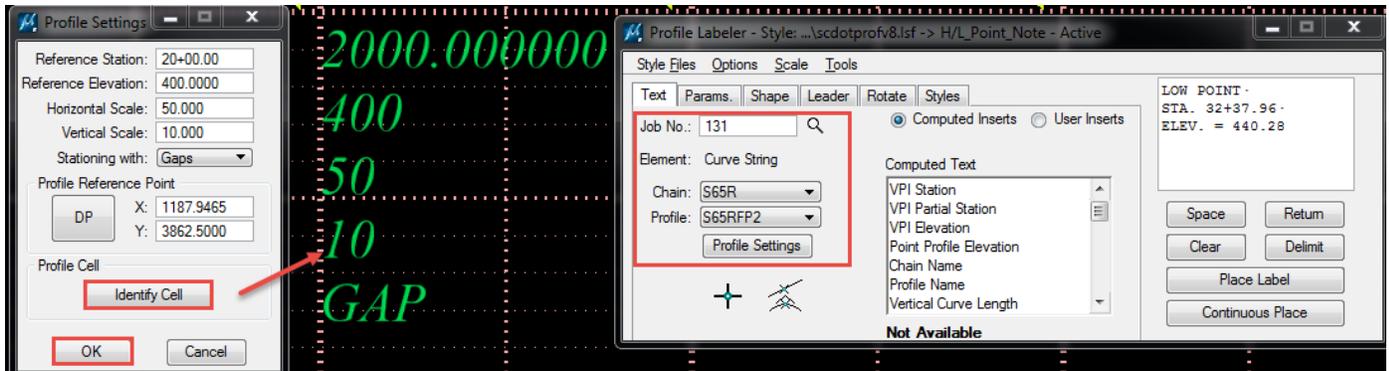


Profile Labeling

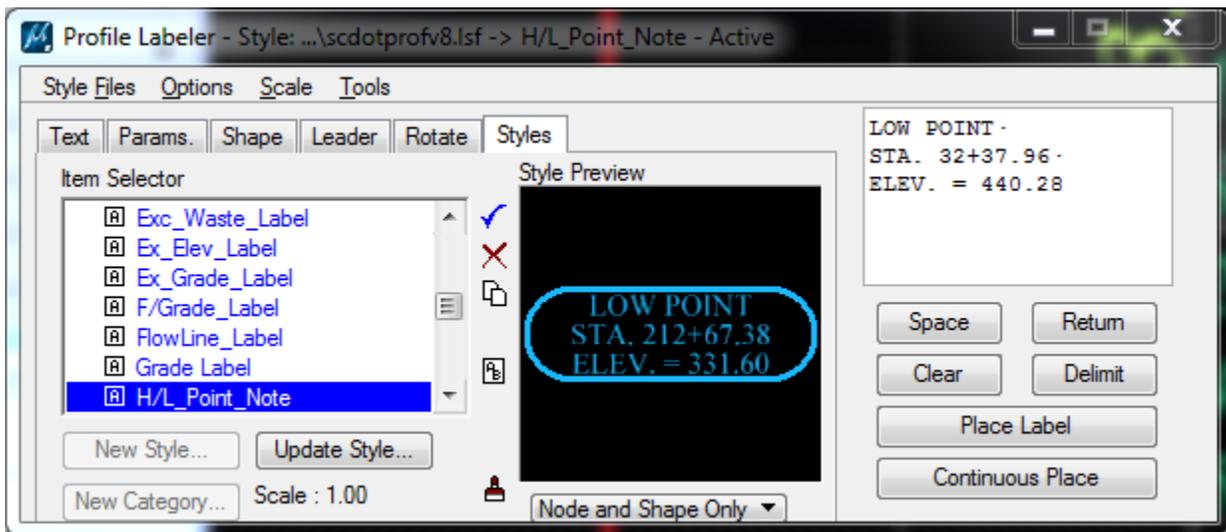
Profile Labeling can be accessed by selecting **Applications > Geopak > Road > Plans Preparation > Profile Labeling**.

(Additional information can be found in Chapter 17 of the Geopak Road I Training Manual.)

Select the **Job No (gpk), Chain and Profile** names. Press the **Profile Settings** button. Select the **Identify Cell** button and select the “green” profile cell to activate the reference. Press **OK**.



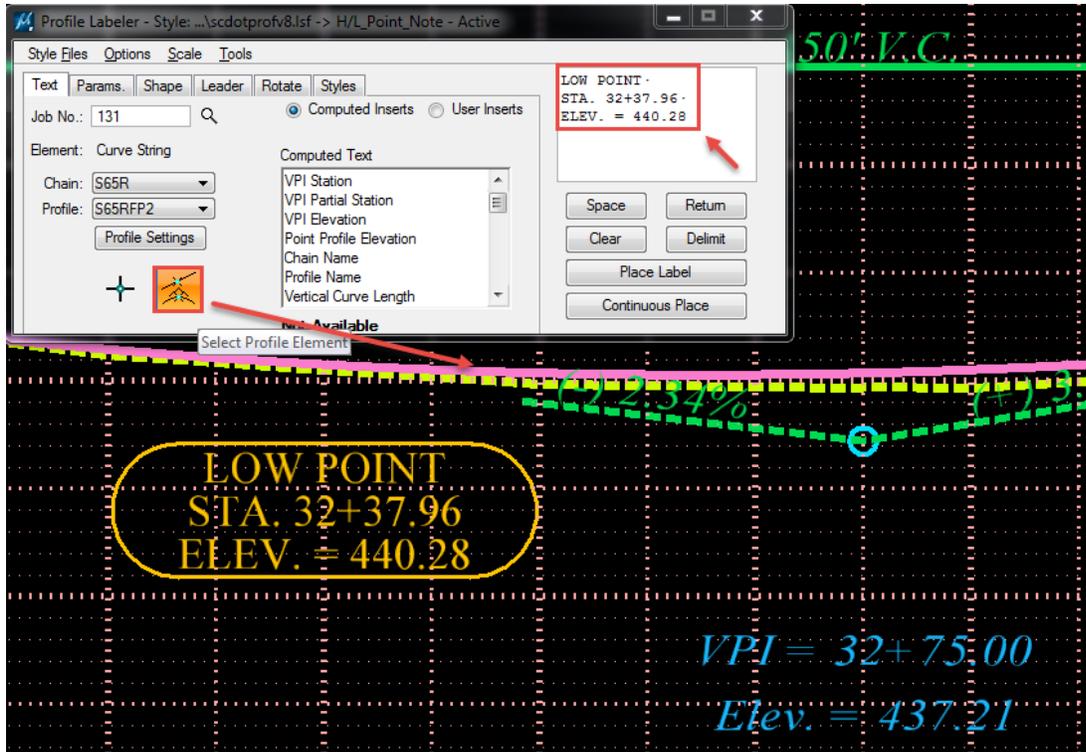
Select **Styles** and select the desired style (H/L_Point_Note for High or Low Point example below).



Click on the **Text** tab and press the Select Profile Element button.

Data click on the profile element (proposed pink line). The text information in the Label dialog will *automatically update* with the associated profile information.

Press the **Place Label** button and follow the command prompts to place the label and leader lines, etc.

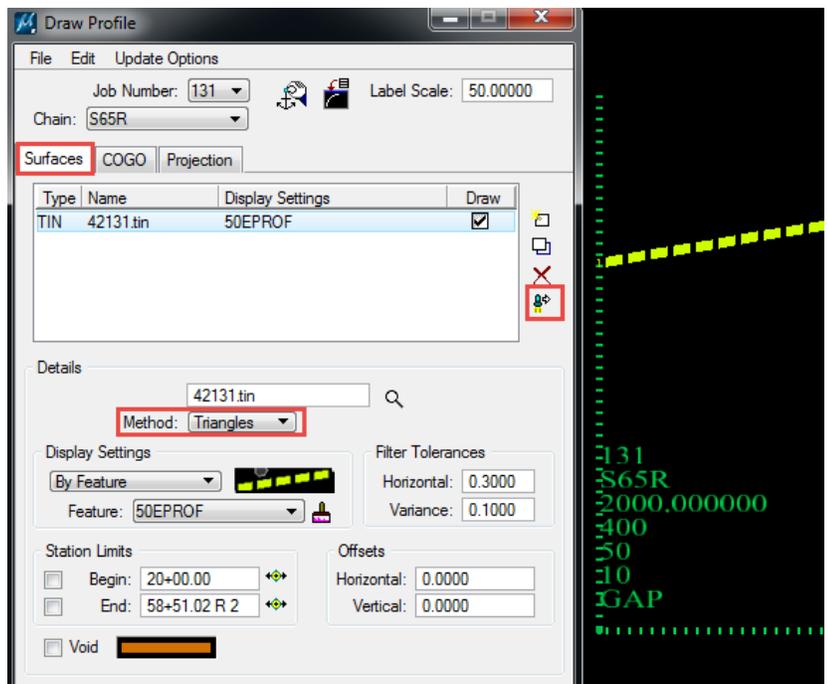


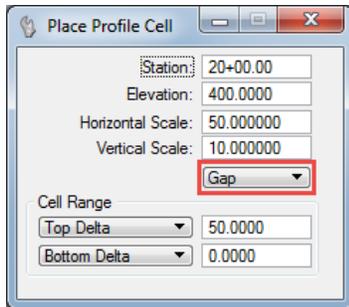
Draw Profile Tool

The Draw Profile Tool is used to both create the existing profile against the tin file intersecting “triangles” and for adding the profile to the plan sheets. [The Existing Ground profile button on the Project Manager dialog and the D&C Manager are alternatives to this tool.] Benefits to utilizing the Draw Profile Tool compared to other options are the ability to draw multiple profiles at once, control stationing begin and end for each, and to update the profile with a button click.

(The process to utilize this tool is also explained in Chapter 8 of the Geopak Road I Training Manual.)

To access the Draw Profile Tool, select **Applications > Geopak Road > Plans Preparation > Draw Profiles.**



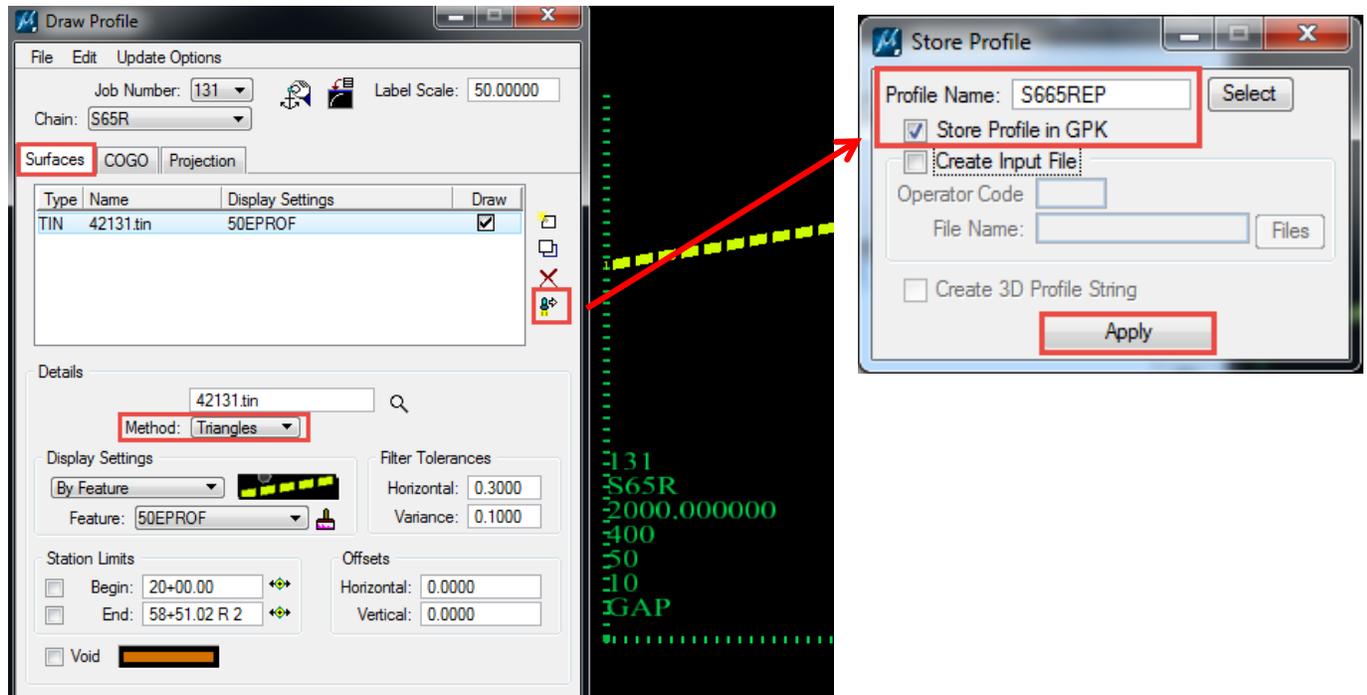


When placing the “green” Profile cell, if the alignment contains a station equation, toggle the method to include “**Gap**”. For the Elevation, set it to 30’-40’ below your lowest elevation for the profile to be approximately centered on the plan sheets.

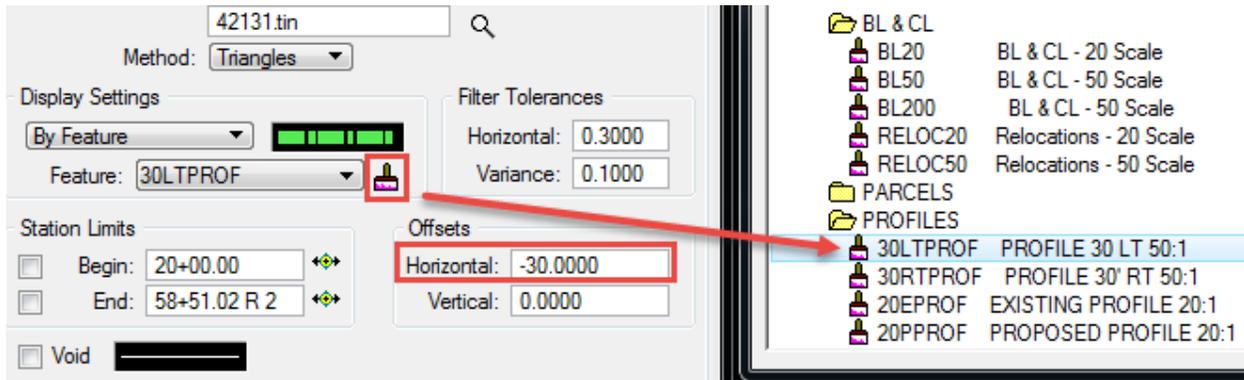
To create existing profiles against the tin file, select the **Surfaces** tab and the Method set to **Triangles**. This allows the profile to be calculated based on interpolation of the existing ground centerline. The centerline alignment and centerline profile are split pavement shots down the center of the roadway. The crown break of the pavement may not always be on center. Therefore it is best to utilize the triangle intersection points to best represent the existing profile elevations.



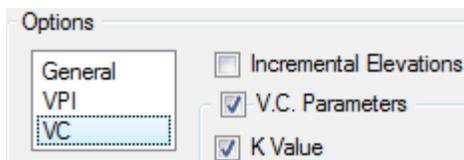
After completing the dialog as shown below for each existing profile (use the “**EP**” file naming convention), press the **Store to GPK** button on the lower right corner to store into the GPK file. Then press the “**X**” to delete the profile.



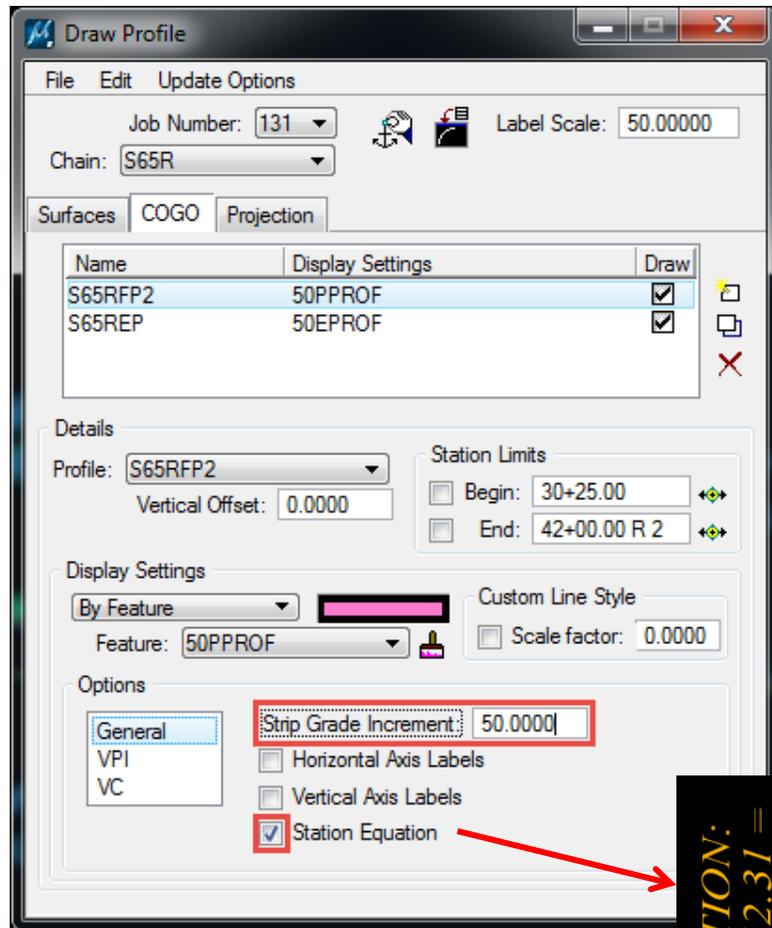
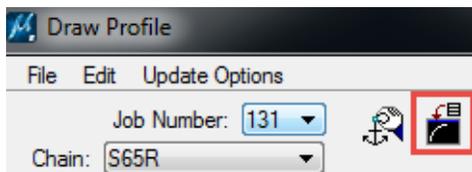
The **30' Left and Right Bridge** Profiles can also be created by selecting the appropriate symbology and the **Horizontal Offset**. (Note: If the existing centerline profile is ever really “jagged”, this is a good place to check to make sure the centerline offset is set to zero.)



Switch over to the COGO tab and redraw the **existing profile** with Horizontal and Vertical Axis Labels turned on (default settings), and **proposed profile** with strip grades at 50'. Check on the Station Equation if it exists for the alignment. On the VC tab, turn on the K Value.

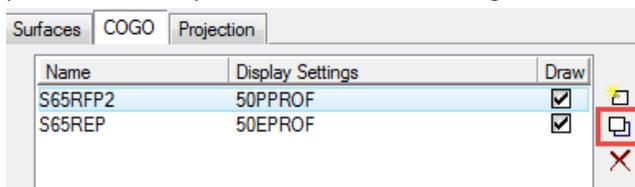


If the profile changes grade in the gpk file, press the **Update Profile** button to update the profile changes.



EQUATION:
BK 4052.31 =
AH 4054.65
VPI

To **update** the symbology of the profile, make the necessary changes and press the modify button on the middle right.



Plan/Profile Sheet Composition (Plan Sheet Clipper)

The Plan/Profile Sheet Composition tool allows the user to layout multiple plan and profile sheets in one process. For medium to large projects, it is ideal to utilize this tool for efficiency. On small projects, it is **still acceptable** (and preferred) to utilize referenced border sheets and referenced pp files.

[The steps to layout the plan and profile sheets are outlined in Chapter 18 of the Road I Training manual. There are a couple of modifications to those instructions that may be helpful explained below.]

Replace Step 1 with this process: To prepare to run the plan sheets, create a new design file *cogo.dgn. Attach both the *.pp.dgn and *prof.dgn as references. The purpose of this *cogo.dgn file is to contain the “sheet clip borders”. You could run the process from the *pp.dgn file, but often, when the “sheet clip borders” are drawn into the pp design file, the levels will start showing up on the plan/profile sheets. To avoid this, we typically create the *cogo.dgn file. This *cogo.dgn file can potentially be used for the IL1 – Index Layout Sheet preparation.

(Make sure when they are referenced, they are not on top of each other or the process will not work correctly. If they are in the same coordinate section of the dgn file, the profiles will need to be moved/redrawn to correct.)

For Step 7: Select the type of sheets that need to be created. Ensure the appropriate scale matches.



For the Motif File Setup: For the plan_motif.dgn, attach the *pp.dgn, *prop.dgn, and any other design files needed to be show in the plans (examples: wetlands, utilities, sue, etc.). Turn on all the levels that are to be plotted and off the non-plot levels. Be sure to select **File > Save Settings**.

Use the profile_motif.dgn for both the profile and the tabular ports. Attach the *prof.dgn to this file and turn on only the profile levels and the strip grade levels. The stationing and elevations will be recreated. Make sure these levels are turned off and be sure to select **File > Save Settings**.

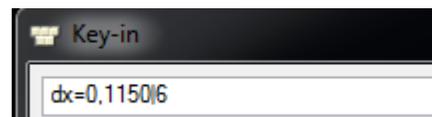
For the Auxiliary Sheet Annotations, change the Horizontal to -800.00 and the Vertical to 0.000.

In the *pf.dgn files, check the level settings for the stationing and elevations. Commonly, the levels in the reference files may be turned on again. Turn these off again and select **File > Save Settings**. Only the stationing and elevation levels for the main *pf.dgn should be turned on for plotting.

Open the planref.dgn file that was created in the working directory; add the title block information for County, Project ID, Route/Road, and Descriptions as necessary. Because this file is referenced to each sheet, the information will show on all plan and profile sheets.

Alternatively, you can pipe the title block information by selecting the text, selecting the copy command, then enter dx=0,x|y where x is the distance you want to move it and y is how many times to copy it.

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	FLORENCE	0037272	US 378	6



Cross Sections

The Cross Section process is the most labor intensive part of the design and plan production process. There are several steps required to produce the plan sheets with graphics from cross sections, quantity calculation, and cross section sheets with the Cross Section tools. SCDOT currently utilizes **Criteria** files to draw proposed cross sections.

The Cross Section process contains several steps:

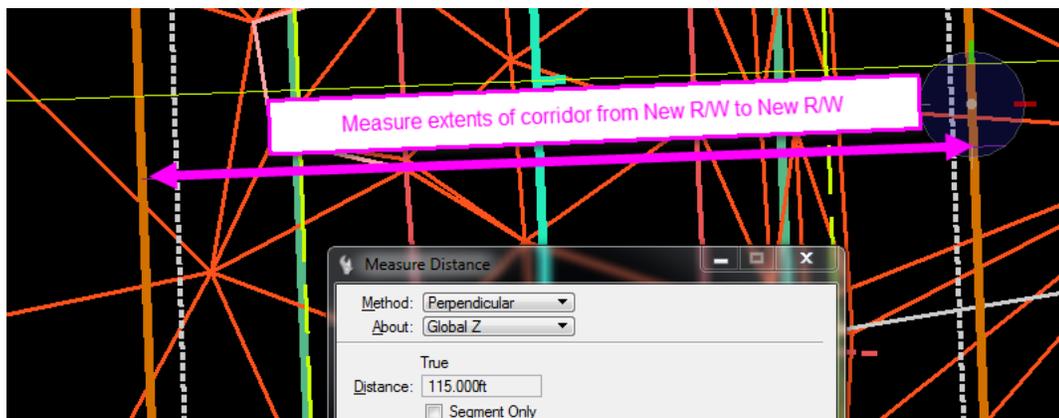
Existing Cross Sections	Superelevation	Proposed Cross Sections	Reports/Other	Plan Preparation
<ul style="list-style-type: none"> • Draw Pattern Lines from VBA • Clean up EOP graphics • Cut Existing Cross Sections using TIN file • Draw Existing Pavement • Lock Cross Sections • Review with Navigator 	<ul style="list-style-type: none"> • Calculate Superelevation • Create Edit Shape Files by Input File • Critical Points • Proposed Profile • Edit/Analyze Superelevation shapes 	<ul style="list-style-type: none"> • Proposed graphics (pavement, sidewalk, v&g, etc.) • Cut Proposed Cross Sections • Draw Right of Way limits • Draw Ancillary Features 	<ul style="list-style-type: none"> • Calculate Earthwork & EWBS • Draw Limits of Construction lines • NPDES lines • Curb Profiles • Seeding • Multiline (GEN files) • XS Pipes VBA • Buildup VBA 	<ul style="list-style-type: none"> • Cross Section Sheet Composition • Scaling Cross Sections • Double Stacked Cross Section Sheets • Cross Section Labeling

Existing Cross Sections

Existing cross sections are drawn utilizing the tin file provided by the Surveys Office with the “breakline” method. It is important to know the limits of the project to help determine the corridor width to define the pattern lines.

To determine the range of the corridor, **attach** the *dtm.dgn file to the *pp.dgn file (or *pd.dgn if available).

Use the **Measure Distance > Perpendicular** tool to measure the extents of the outer limits of the corridor.



If the corridor width is less than 160' total (80' left and right), and is not expected to be extended during design, use **one to one (5:5) scale** to cut the cross section cells. [This is because the cross section border sheets are pre-labeled 80' left and right.]

Scale

Horizontal:

Vertical:

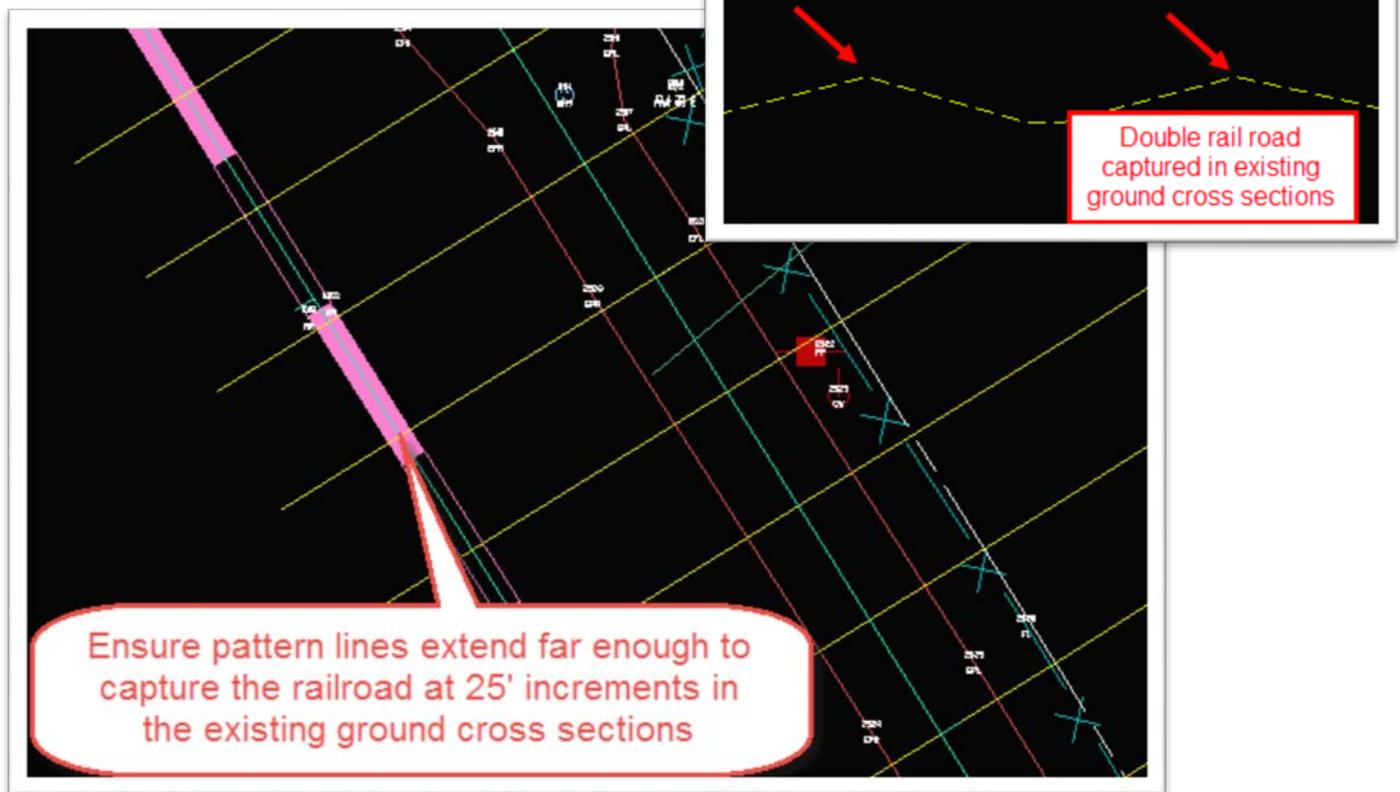
If the corridor width is greater than 160' total, it is helpful to draw the existing cross section cells at **two to one (10:5) scale** upfront. There are options to scale the cross sections at a later point when necessary, but it requires additional steps each time a revision is made to the cross sections.

Scale

Horizontal:

Vertical:

Also, if railroads are running parallel to the alignment, it is important to know the offset to **extend the pattern lines** to capture these details in the existing ground cross section. To provide the railroad with cross sections, you will need to draw additional pattern lines at **25' increments** compared to the standard 50' in curve and 100' in tangent recommendations.



Utilize the **VBA – Draw Pattern Lines (page 89)** to draw the pattern lines for each alignment. Depending on the complexity of the project, pattern lines are typically drawn in the ***sh.dgn** (shape) file or in a separate ***pat.dgn** file. For each alignment, utilize the 6 - RD_PD_PatLn# lines to simply dialog completion during the process.

[It is also acceptable to use the same level, but different colors, however, you will need to make sure the color is modified on each alignment cross section run to match.]

Name	Number		
RD_PD_Pat			
RD_PD_PatLn1	350	■ 88	0
RD_PD_PatLn2	351	■ 112	0
RD_PD_PatLn3	352	■ 214	0
RD_PD_PatLn4	1050	■ 75	0
RD_PD_PatLn5	1051	■ 76	0
RD_PD_PatLn6	1052	■ 91	0

It is also helpful before processing the existing cross sections to know if there are any special geotechnical, structural, or hydraulic areas of interest that need to be included. Asking the appropriate groups ahead of time for these key stations will save time not having to draw cells at these extra stations in the future.

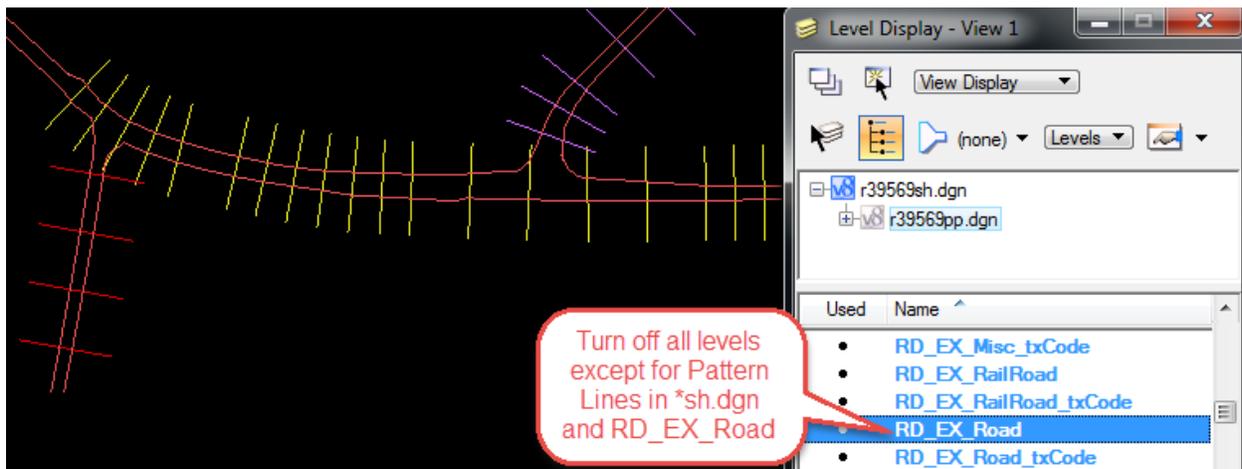
Pattern lines can be drawn at these key stations with the VBA tool or with the MicroStation Place Line tool as long as the symbology matches the other pattern lines for this alignment.

Clean up Existing Edge of Pavement lines

The Geopak Criteria is written to handle the intersection of the pattern lines with symbology drawn in the *.pp.dgn or *.sh.dgn file. Certain criteria statements look for instances where the pattern lines intersect one time or multiple times.

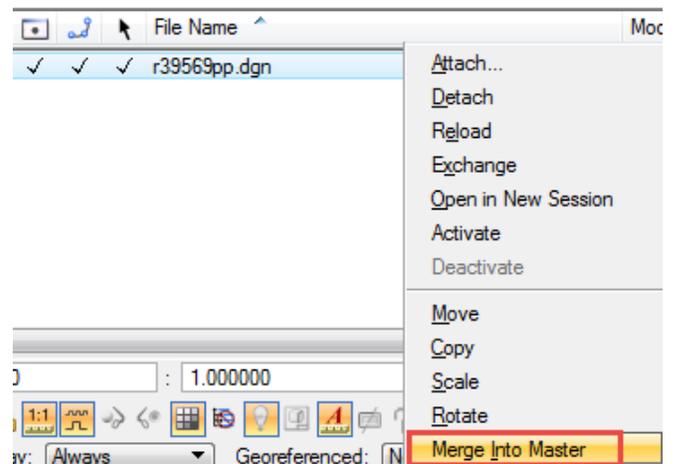
Example: Existing Edge of Pavement lines must intersect the pattern lines an **even number of times**, two, four, etc. for the criteria to understand how to draw the existing pavement on the cross sections. (If the intersection is an odd number of instances, the Geopak cross section run will crash. When troubleshooting existing cross section runs, this is a good place to begin to identify the issue.)

Attach the *.pp.dgn file as a **reference** to the *.sh.dgn file. (A separate eop.dgn file can be used.) **Turn off** all levels in the reference file except for the RD_EX_Road level. **Turn off** all levels in the *.sh.dgn file.

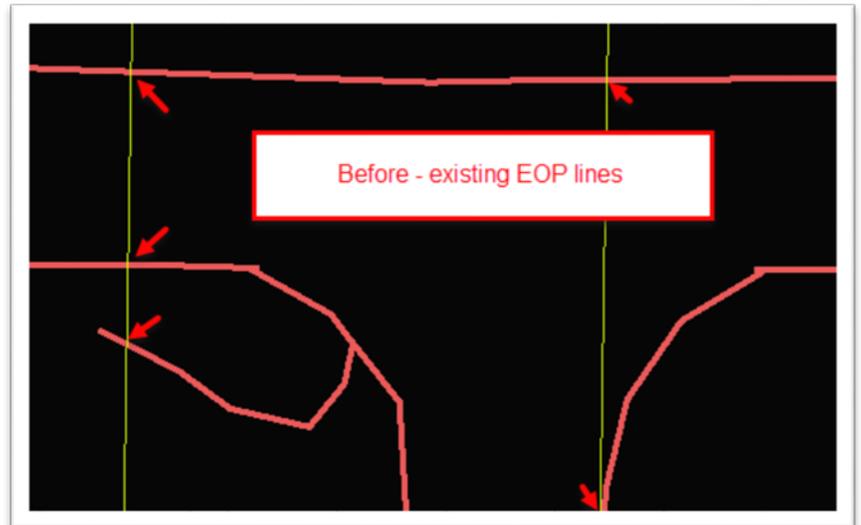


Copy the EOP elements into the active file by right clicking and selecting **Merge to Master** in the Reference Dialog. Data click in the design file to complete the merge.

It is recommended to create a separate *.eop.dgn file (or in the *.sh.dgn) for the mainline and subsequent eop/sh files for the side roads.

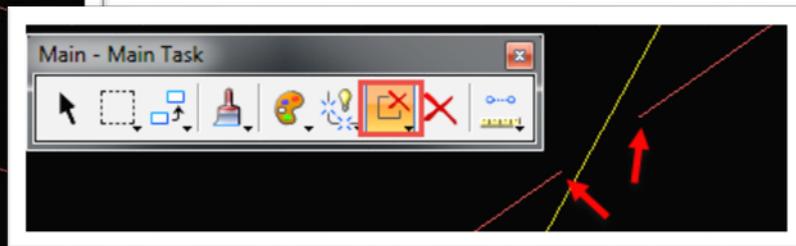
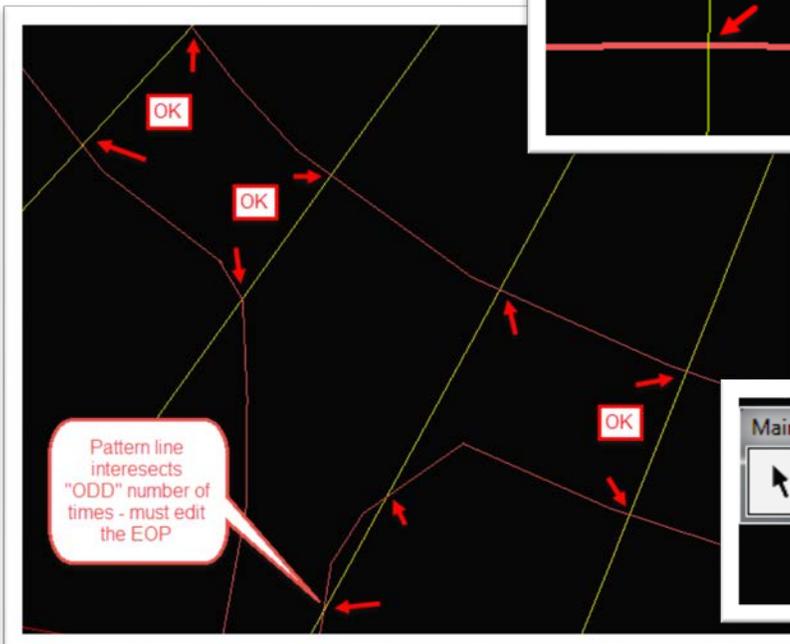
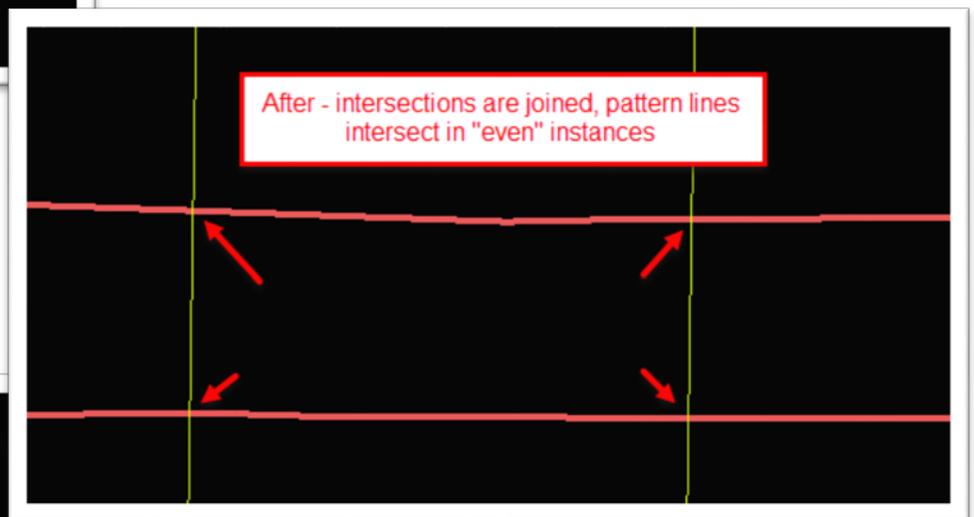


Scroll through and review the number of times the pattern lines intersect the existing edge of pavement lines. **Clean up** all of the areas that intersect in “odd” instances. If in a fork in the road or divided highway, the criteria will draw each of these pavement shapes as long as it is an even number of sides, two, four, etc.



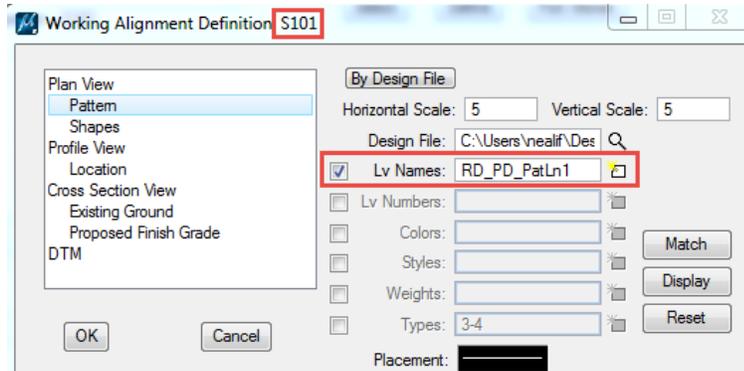
Edit the existing edge of pavement graphics further to connect lines and arcs for the edge of pavement. **Remove** drives and **join** lines through intersections. Close the shapes at the beginning and end of the project.

On smaller projects, you may be able to get away with “breaking” the EOP lines that cross the pattern lines at “odd” instances.

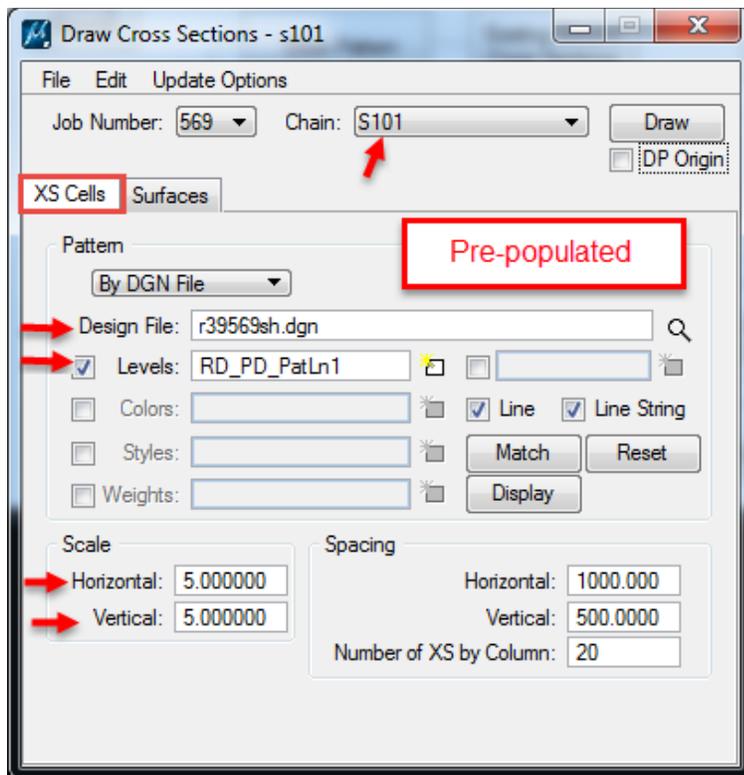


Cut Existing Cross Sections

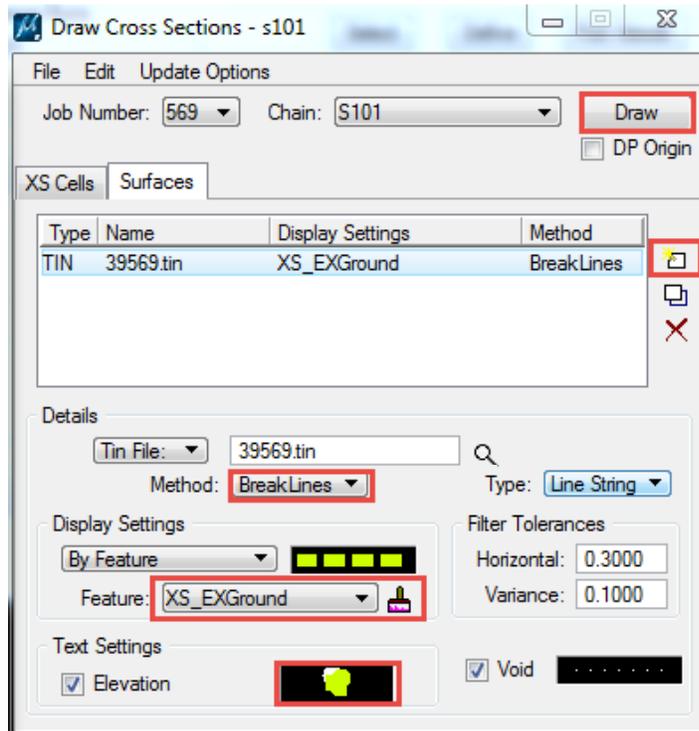
The Project Manager –Working Alignment Influence Runs plays a key role in the processing of cross sections. To avoid constantly resetting preferences for each alignment, it is ideal to update the Project Manager settings frequently.



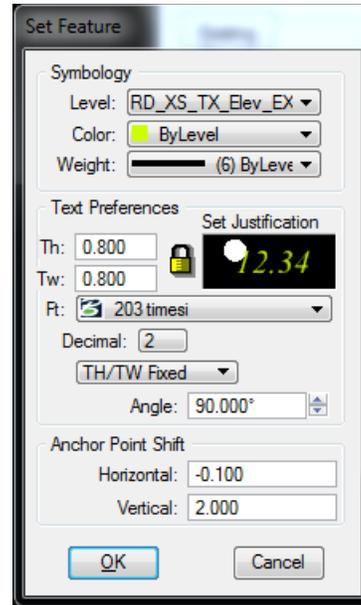
XS Cells tab - When utilizing the Cross Section workflows on the Project Manager dialog, the dialogs will have some of the setting pre-populated. If not utilizing Project Manager, complete the dialog as shown below with your project parameters.



Surfaces tab – On the Surfaces tab, select the project *.tin file and set the method to Breaklines. Set the Feature to XS_EXGround from the D&C Manager.



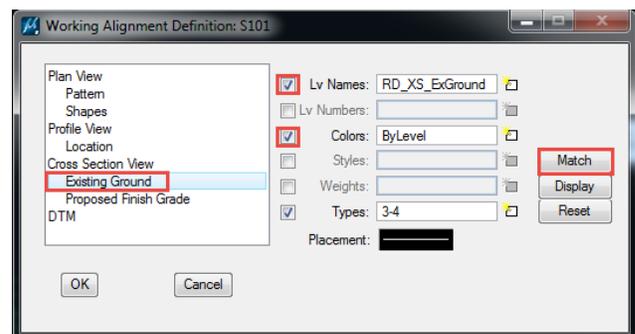
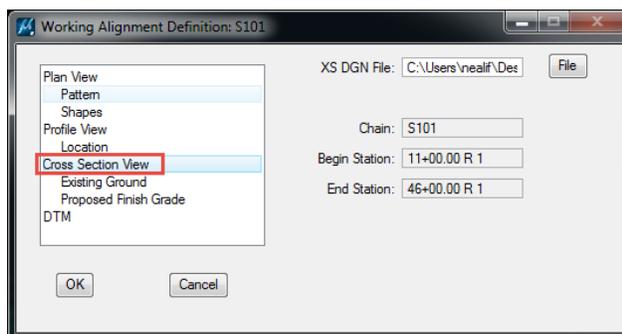
Double click to set the text elevation symbology as shown below.



Press the **Add** button to add the Surface to the list. (Multiple surfaces can be added for comparison of cross sections tin to tin. Settings can also be modified by selecting the “modify” button in the center.)

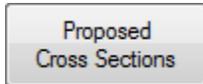
Press the **Draw** button to draw the existing ground cross sections in the *.dx.dgn file.

Update the Project Manager – Working Alignment – Define with the appropriate existing cross section information.



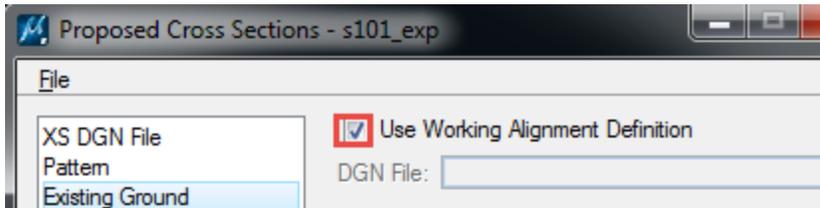
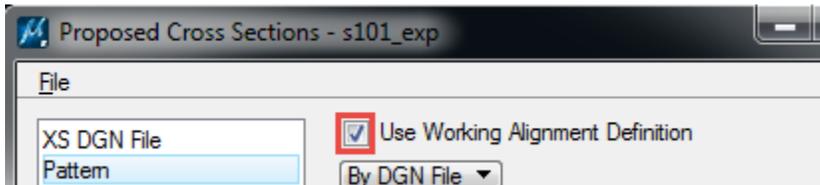
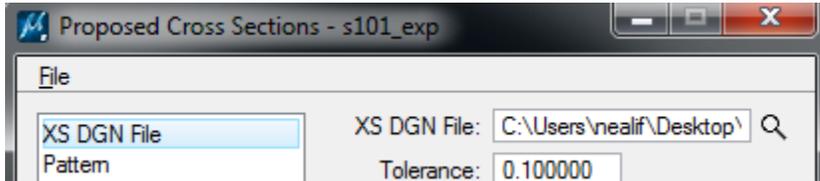
Draw Existing Pavement

This step corresponds with the above instructions on ensuring the pattern lines and the edge of pavement lines intersect at the appropriate points to depict where existing pavement exists on the cross sections.

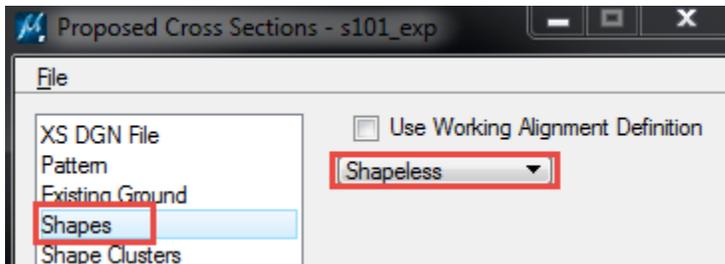


On the Project Manager dialog, select the **Proposed Cross Section** button and create a new run named **Road_exp**. Open the run.

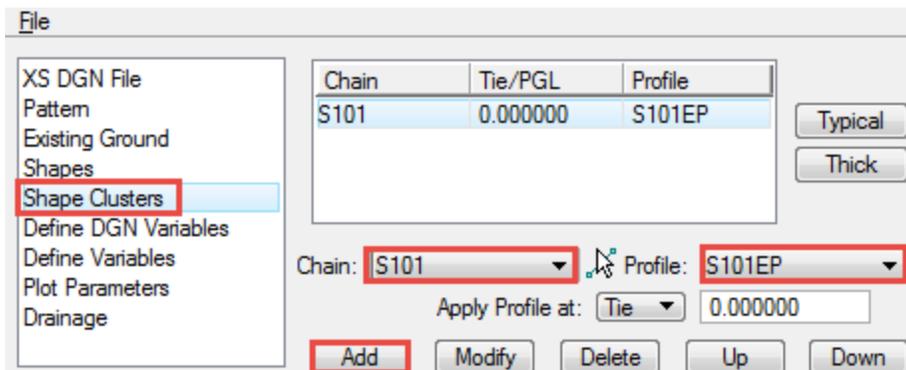
On the XS DGN File, Pattern, and Existing Ground, the menus should be pre-populated based on the Working Alignment. **Toggle** the check box Use Working Alignment Definition as appropriate. If necessary, complete the 3 dialog options per project requirements.



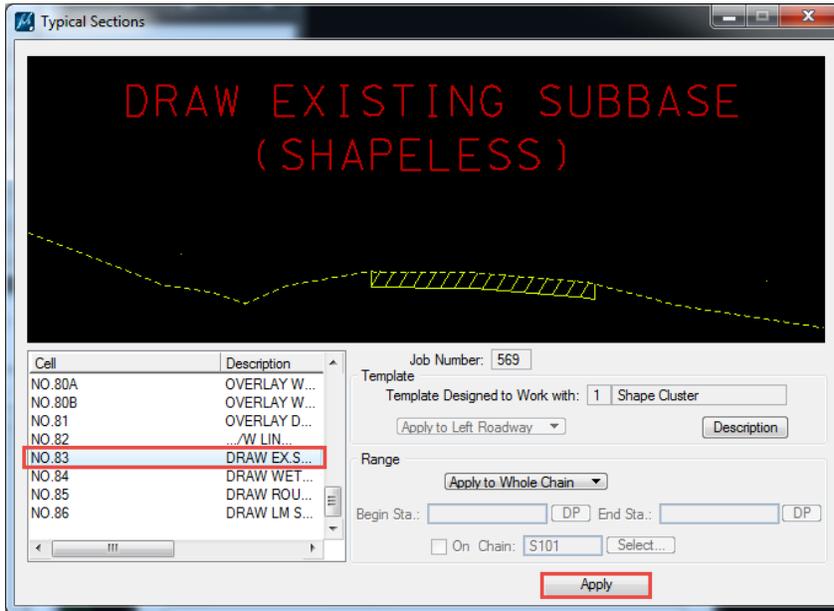
On the Shapes dialog, set to **Shapeless**.



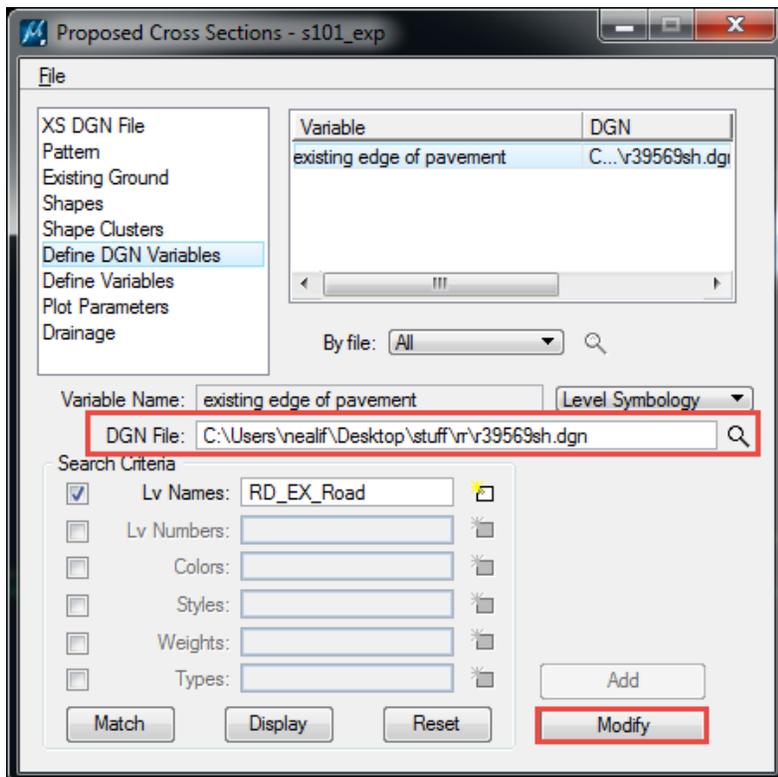
On the Shape Clusters dialog, set the Chain to the appropriate centerline (existing or relocated) and the Profile to the existing profile. Press the **Add** button.



Press the **Typical** button on the above dialog. Scroll down and select the **No. 83 Draw Existing Subbase** (Shapeless) typical and press the **Apply** button. (Press Ok to any dialog prompting shape vs. shapeless.)

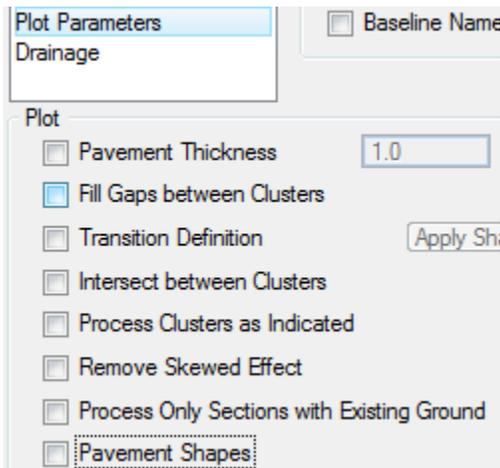


On the Define DGN Variables dialog, highlight existing edge of pavement and **browse** to select the *sh.dgn file cleaned up in previous instructions. Press the **Modify** button to accept the changes.

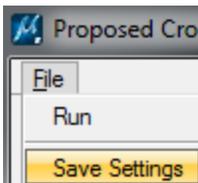


Accept the defaults on the Define Variables dialog.

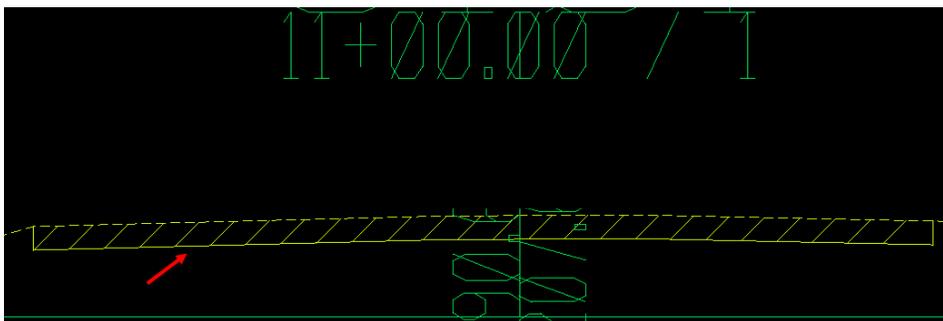
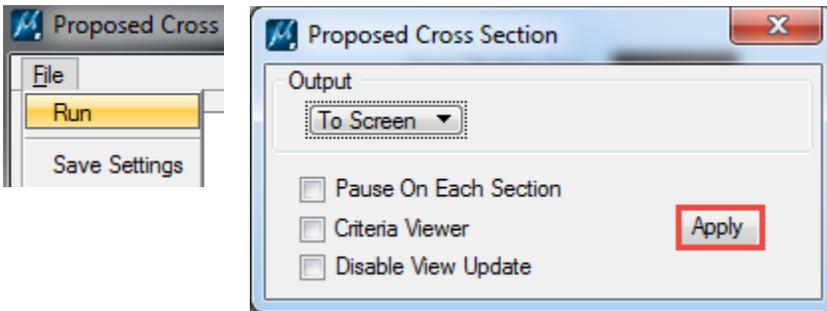
On the Plot Parameters tab, uncheck all of the items below Plot.



Select **File > Save Settings** to save the dialog settings.



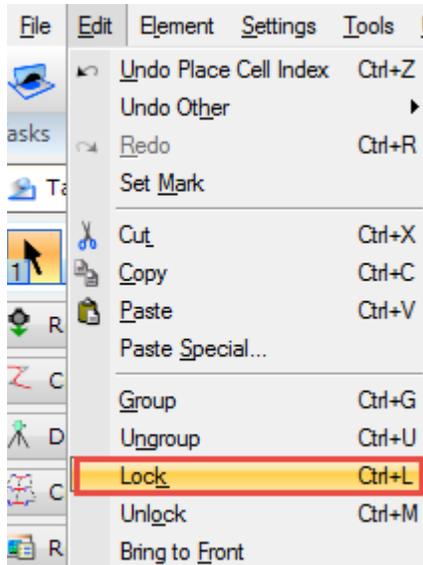
Select **File > Run** to process the existing pavement. Press the **Apply** button to process all.



Lock Existing Cross Section Elements

Fit View and press **Ctrl + A** on the keyboard to select all of the elements for existing ground, existing elevations, existing pavement, and cross section cells. Select **Edit > Lock** from the top MicroStation menu to lock the existing cross sections.

Once the elements are locked, you can process additional runs of proposed cross sections and easily delete all newly modified elements without having to reprocess the existing. Select **Edit > Unlock** to unlock the elements.



Cross Section Navigator

The Cross Section Navigator is utilized for reviewing the cross sections for any problems, making necessary edits, and for navigating during labeling, extending and trimming elements.

Select **Applications > Geopak > Road > Cross Sections > Navigator** to activate the tool. (There is also a “wheel” shaped icon on the Road Tools palette to activate.)

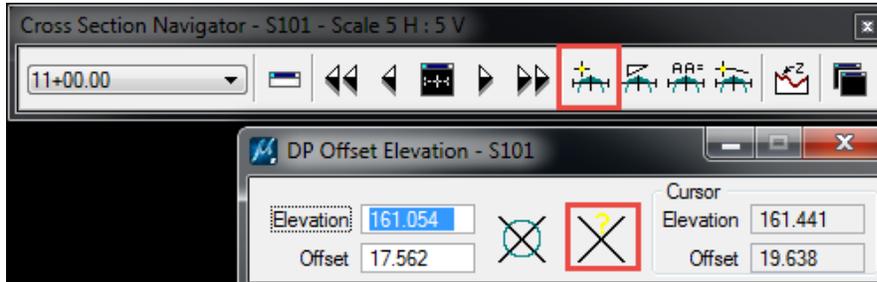


The dialog provides information to the user if the cross section cells were cut at 5:5 or 10:5 in the header.

On the left side of the toolbar, there is a drop down to quickly jump to a particular station and VCR buttons to quickly navigate through and to the beginning/end and re-center the cross section in the View window.

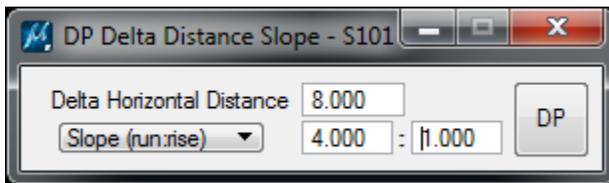
In addition to navigation, three of the provided buttons are commonly used for editing cross sections:

The DP Offset Elevation button allows the user to query the cross section by data pointing on a certain cross section element. The offset and elevation are returned.

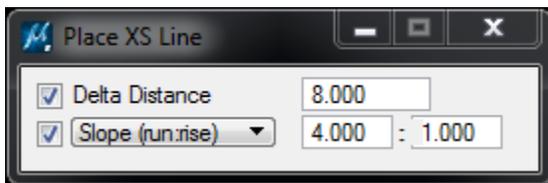


[An element (place line) can also be placed at an elevation/offset by selecting the appropriate command, entering the elevation and offset and press the Send Data Point button.]

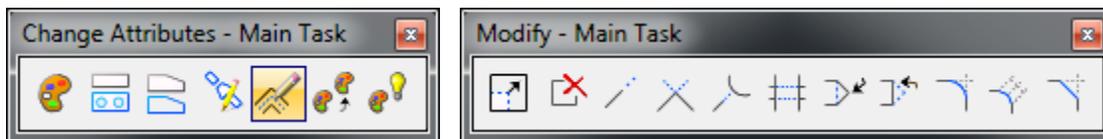
The DP Delta Distance Slope button allows the user to draw a line at a given horizontal distance and slope. This tool is used heavily when modifying ditch slopes to meet drainage elevations.



The Draw XS Line tool draws a cross section line at a specified length and slope.



The Navigator is also commonly used with the MicroStation Change Attributes and Modify toolbar.



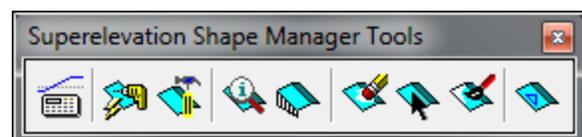
Calculate Superelevation

The SCDOT calculates superelevation both manually and with an excel spreadsheet in accordance with the SCDOT Highway Design Manual 2003 – Chapter 11. In Geopak, superelevation can be calculated using AASHTO tables and then modified for any variances to meet SCDOT requirements.

The SCDOT Superelevation spreadsheet is available internally for SCDOT employees only at:

<http://iwww.dot.state.sc.us/PreConstruction/Resources/DesignTools.aspx>

The Geopak Superelevation Tools can be accessed by selecting **Applications > Geopak > Road > Cross Sections > Superelevation Shape Manager Tools.**



In the Cadd Workspace, Geopak utilizes two files to generate automated superelevation:

\\nts\hq\CaddStandards\SCDOT-Bentley\Standards\SCDOT_Design\Geofiles\SE_tables\English

SCDOT_RadiusTable_e.csv

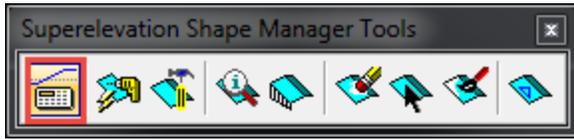
[4% e max]						
	20	25	30	35	40	45
r min NC	1443	2099	2875	3775	4801	5995
23000 NC	NC	NC	NC	NC	NC	NC
20000 NC	NC	NC	NC	NC	NC	NC
17000 NC	NC	NC	NC	NC	NC	NC
14000 NC	NC	NC	NC	NC	NC	NC
12000 NC	NC	NC	NC	NC	NC	NC
10000 NC	NC	NC	NC	NC	NC	NC
8000 NC	NC	NC	NC	NC	NC	NC
6000 NC	NC	NC	NC	NC	NC	NC
5000 NC	NC	NC	NC	NC	NC	RC
4000 NC	NC	NC	NC	NC	RC	RC
3500 NC	NC	NC	RC	RC		2.2
3000 NC	NC	NC	RC		2.1	2.4
2500 NC	NC	RC	RC		2.4	2.6
2000 NC	RC	RC		2.3	2.6	2.9
1800 NC	RC		2.1	2.4	2.7	3
1600 NC	RC		2.2	2.6	2.9	3.2
1400 RC	RC		2.4	2.7	3	3.4
1200 RC		2.2	2.5	2.9	3.2	3.6
1000 RC		2.4	2.7	3.1	3.8	3.8

SCDOT_e.sep

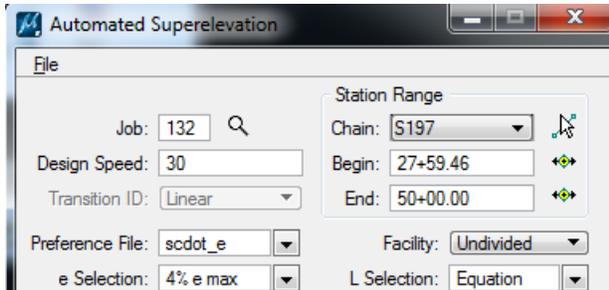
```

scdot_e.sep - Notepad
File Edit Format View Help
eMethod = E_RADIUS_TABLE
eTableName = SCDOT_RadiusTable_e.csv
eEquation = NULL
erminNCinterpolation = E_INTERPOLATE_WITH_NC
eSpeedInterpolation = E_LINEAR
radiusInterpolation = E_LINEAR
eRoundingIncrement = 0.010000
runoffSpiralOption = LS_RUNOFF_ONLY
runoffLengthMethod = RUNOFF_EQUATION
lengthTableName = NULL
runoffLengthEquation = (wn*e)/0.5
lengthSpeedInterpolation = E_LINEAR
eInterpolation = E_LINEAR
runoffLengthRoundingIncrement = 0.100000
totalLengthRoundingIncrement = 1.000000
widthBasis = ACTUAL_LANE_WIDTH
tangentRunoutLengthMethod = TANGENT_RUNOUT_EQUATION
fixedLength = 100.000000
trEquation = 2.08*wa/0.5
outsideLaneRotationMethod = ROTATE_TO_MATCH_INSIDE_LANE
adjustFactor3Lanes = -1.200000
adjustFactor4Lanes = -1.500000
adjustFactor5Lanes = -1.800000
adjustFactor6Lanes = -2.000000
adjustFactor7Lanes = -2.300000
adjustFactor8Lanes = -2.500000
adjustFactor9Lanes = -2.500000
adjustFactor10Lanes = -2.500000
adjustFactor11Lanes = -2.500000
adjustFactor12Lanes = -2.500000
    
```

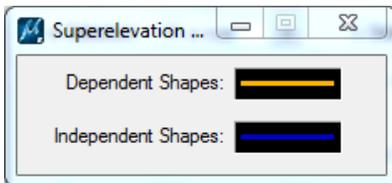
Select the first icon to activate “Automated Superelevation”. This can be used to create the original INPUT file that will be used for the superelevation of the project. [Note – this file MUST be modified to meet SCDOT HDM standards.]



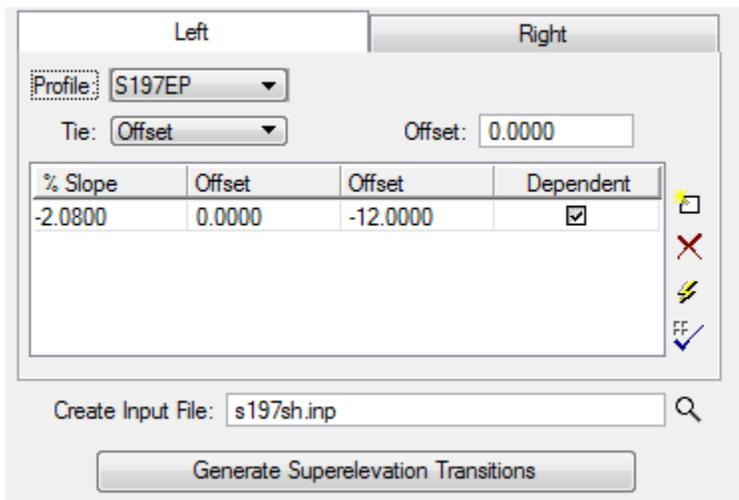
Complete the top section of the dialog with the appropriate project information (gpk, chain, station range, and design speed, etc). Select the appropriate Superelevation chart to be used for your project.



Select **File > Level Symbology** to set the symbology for the shapes.



On the bottom section of the dialog, select the **existing profile** and **offset**. Press the **New Lane** icon (top right) to add. Manually modify the % slope from -2.000 to **-2.0800** to meet SCDOT recommendations. Enter as many offsets and slopes as necessary for the number of lanes. (At least one shape must be dependent and one must be independent.) On the Right tab, **enter** the information and press the **New Lane** icon to add.



Enter a file name for the Create Input File and press the **Generate Superelevation Transitions**.

Close the Text Editor and Automated Superelevation dialog.

A ***sh.inp** file has been created in the Windows Explorer project directory. **Open** this file in Notepad and **edit** the station ranges according to the manual SCDOT Superelevation calculations and Excel sheet which may differ from AASHTO. Select **File > Save** to accept the changes.

```

s197sh.inp - Notepad
File Edit Format View Help
/* Superelevation Settings and Parameters:
unit system is english.
Created input file "s197sh.inp".
Created activity log file "s197sh.log".
Created on Tue, Sep 15, 2015 at 13:59.
Using Preference File "scdot_e".
Using e Selection of "4% e max".
Using Length Selection of "Equation"
Using Design Speed of 30.000000.
*/
auto shape
job number = 132
auto shape set
shape cluster baseline = s197
shape cluster profile = s197FP1
shape cluster tie = 0.0000
dependent shape
chain / offset
s197 -12.0000
s197 0.0000
filler line station / slope
27+59.460000 -2.0800
37+24.600000 -2.0800
38+24.700000 0.0000
38+74.700000 2.0800 /* Curve S197B */
39+34.800000 2.0800 /* Curve S197B */
39+84.800000 0.0000
40+84.900000 -2.0800
49+99.999359 -2.0800
    
```

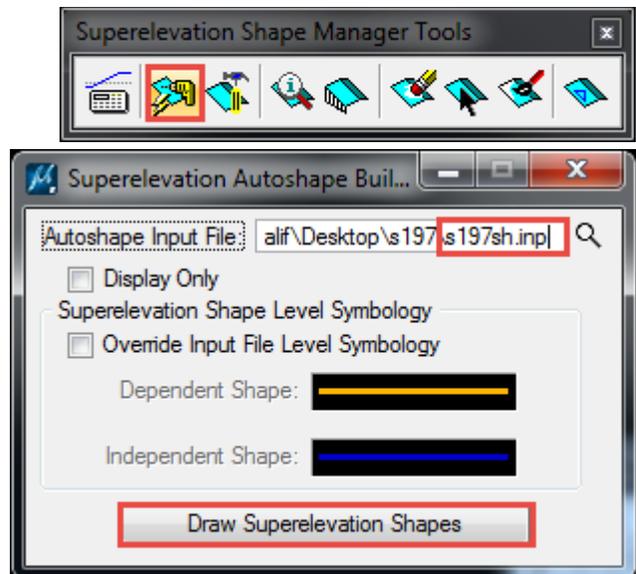
Edit to match calculations

Create/Edit Shape Files by Input File

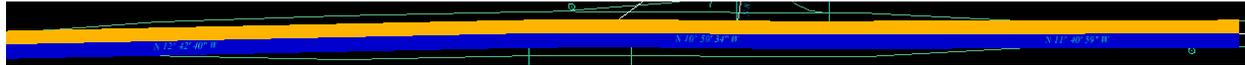
After the ***sh.inp** file has been modified, select the 2nd icon – “**Autoshape Builder**”. Browse to select the ***sh.inp** file. Press the **Draw Superelevation Shapes** button.

```

dependent shape
chain / offset
s197 -12.0000
s197 0.0000
filler line station / slope
32+00.000000 -2.0800
37+24.600000 -2.0800
38+24.700000 0.0000
38+74.700000 2.0800 /* Curve S197B */
39+34.800000 2.0800 /* Curve S197B */
39+84.800000 0.0000
40+84.900000 -2.0800
45+00.000000 -2.0800
auto shape set
shape cluster baseline = s197
shape cluster profile = s197FP1
shape cluster tie = 0.0000
independent shape
chain / offset
s197 0.0000
s197 12.0000
filler line station / slope
32+00.000000 -2.0800
45+00.000000 -2.0800
    
```



Review the shapes, stationing and slopes in the *.sh.dgn file.



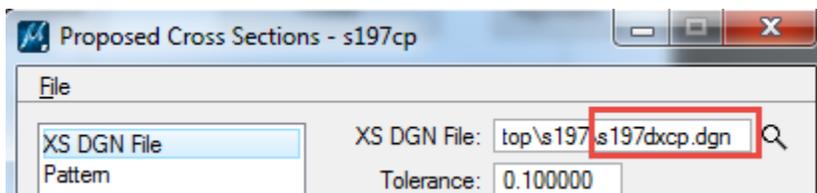
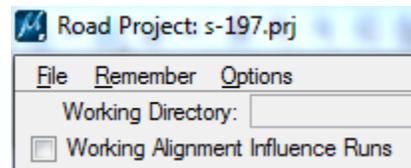
Critical Points

Critical points are calculated to determine the minimum pavement quantity over existing pavement and to assist with a target elevation for developing the proposed profile. The highest elevation point of the existing pavement is determined between the EOP – left, centerline, and EOP –right and then the minimum thickness is added to this highest elevation. This ensures that the new pavement thickness for the project will provide satisfactory cover for the new road.

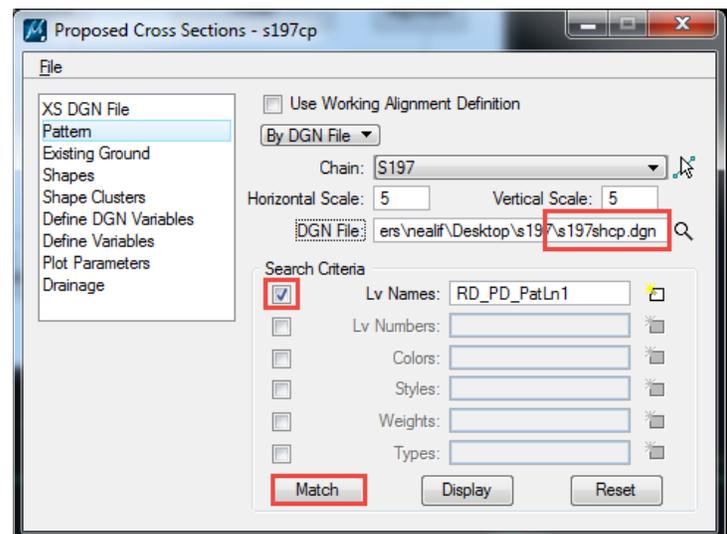
- Copy the *.sh.dgn file and rename the copy to *.shcp.dgn. **Open the *.shcp.dgn.** [The existing edge of pavement graphics and Superelevation shapes should be created for the existing profile in previous instructions.]
- Create a copy of the *.dx.dgn file and rename to *.dxcp.dgn file. [This file should contain the existing ground cross sections with the retain pavement drawn.]

If pavement design has not been received to date, assume a pavement design of 200 lbs for surface course and 200 lbs for intermediate course. **Assumed thickness = 0.32.** This is a good general starting point for developing the proposed profile.

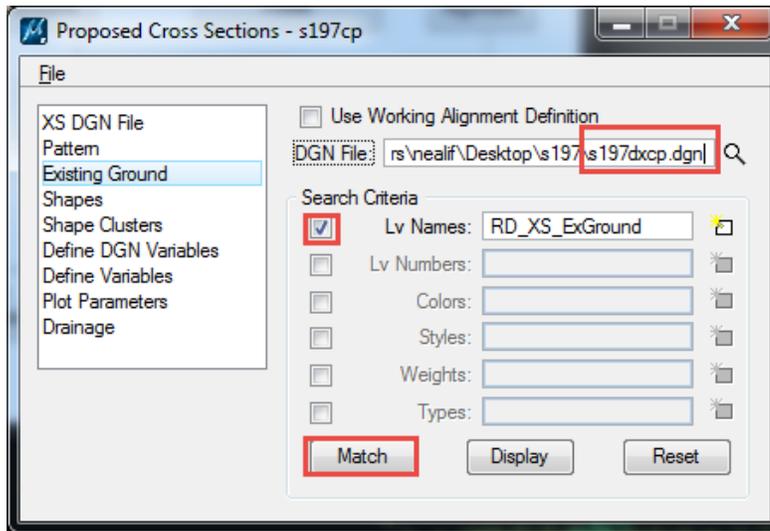
- In **Project Manager**, turn off Working Alignment Influence runs (or take the time to set up a *.cp run with appropriate information.)
- Select the **Proposed Cross Sections** button and create a new run named *.cp.
- Select the *.dxcp.dgn for the XS DGN File



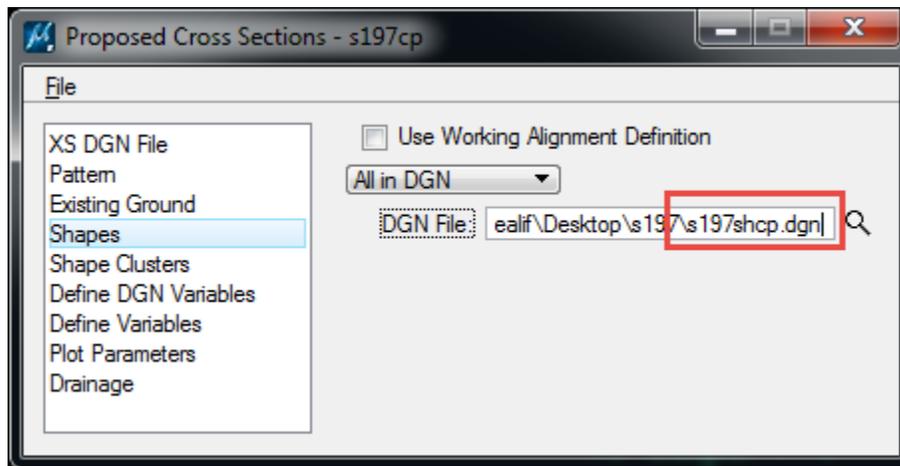
- Assign the Pattern attributes, BY DGN File, Chain, H/V Scale, browse to select the file, and match the pattern line symbology



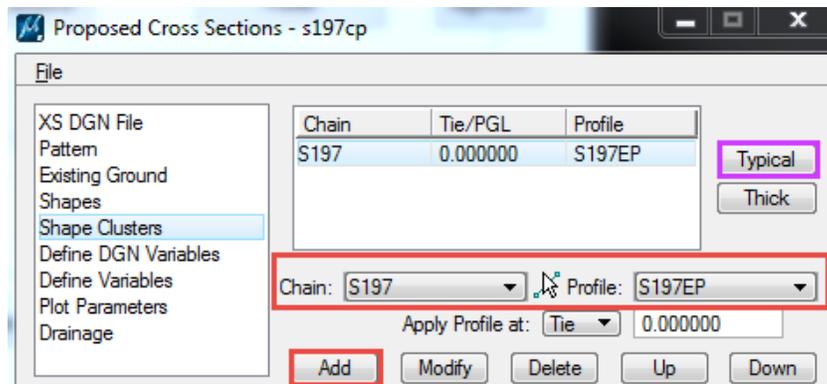
- For Existing Ground, select the *dxcp.dgn and match the existing ground symbology



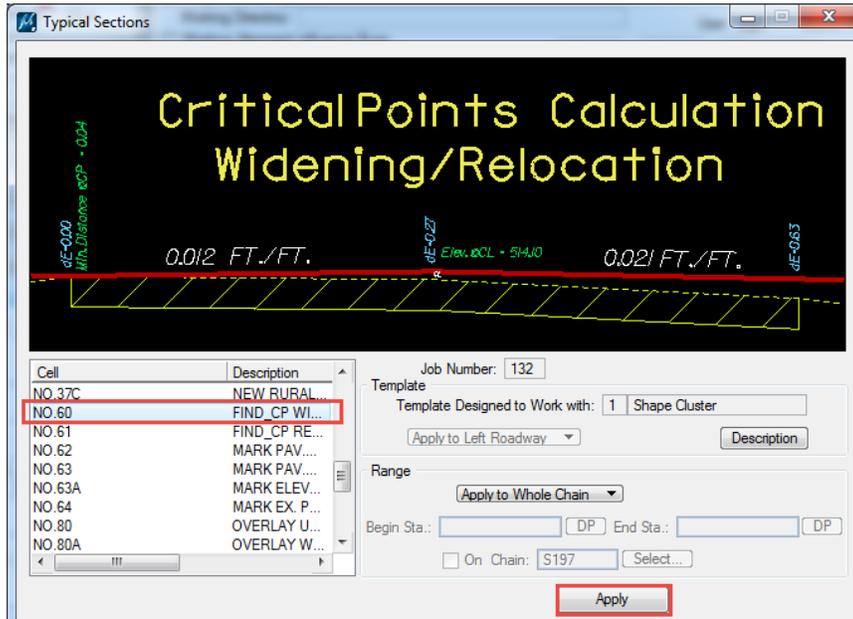
- For Shapes, select **All in DGN** and select the *shcp.dgn file



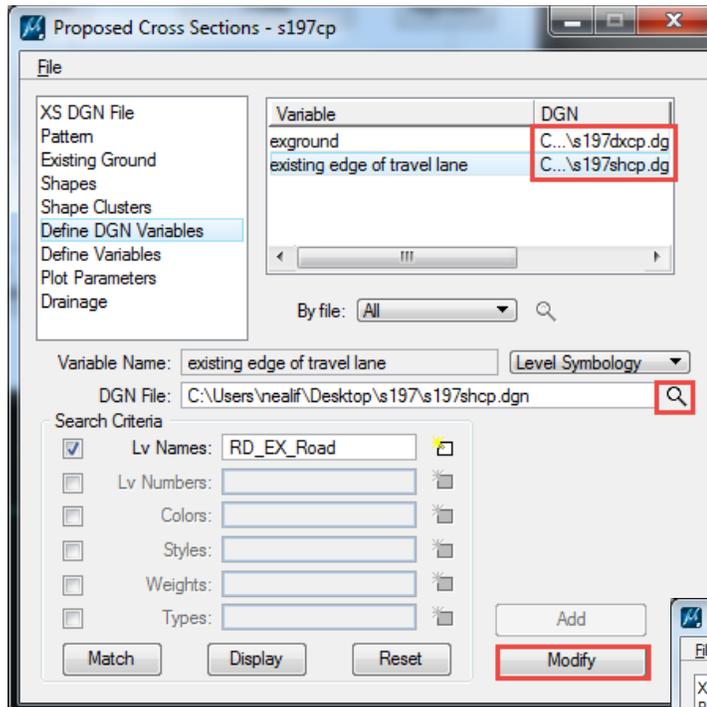
- For Shape Clusters, select the chain and the existing profile. Press the Add button



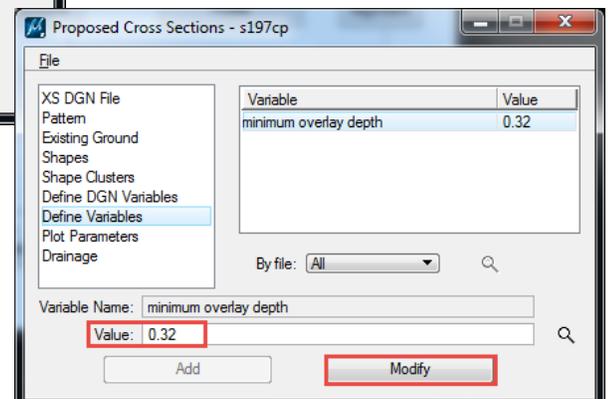
- Select **Typical** and scroll down to criteria **No. 60**
- Press the **Apply** to all chain



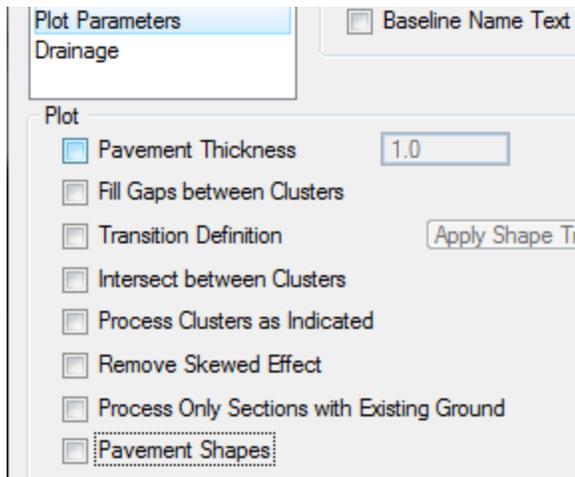
- On the Define DGN Variables dialog, set the exground to the *dxcp.dgn file and press **Modify**
- Set the Existing Edge of Travel Lane to the *shcp.dgn (or *eop.dgn if exists) and press **Modify**



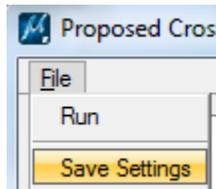
- On the Define Variables, set the thickness to 0.32 and press **Modify**



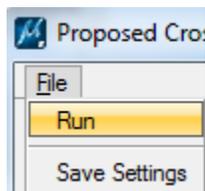
- On the Plot Parameters, turn off all options under Plot



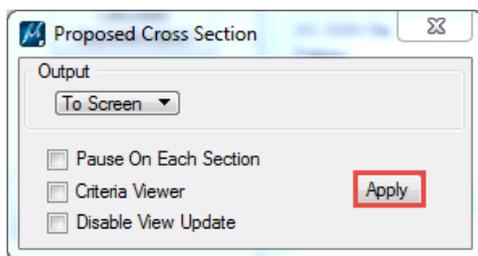
- Select File > Save Settings



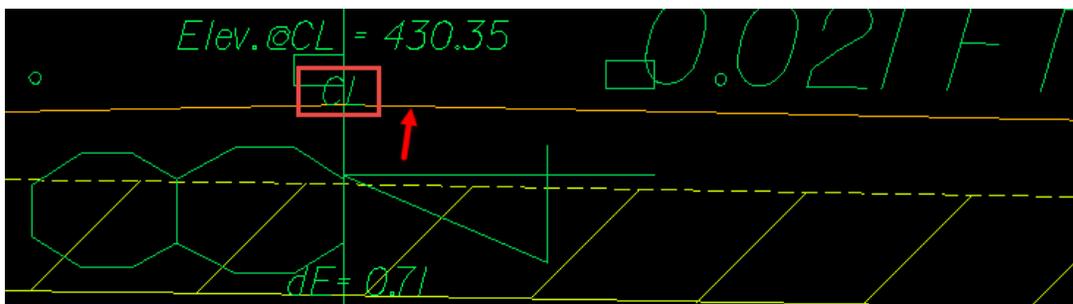
- Select File > Run



- Press the Apply button



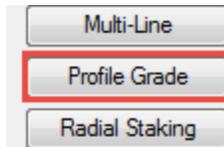
- Use Cross Section Navigator to review the Critical point text on the cross sections.



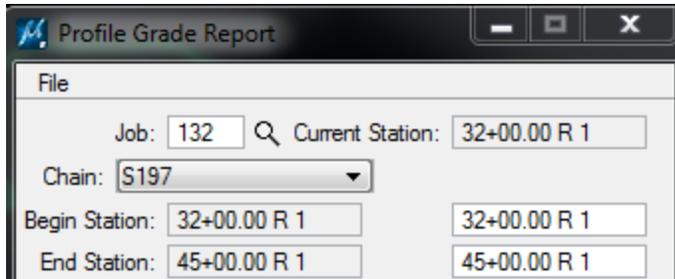
Reports – Profile Report for Critical Points

The Report tool is used to extract intersecting graphics, small pieces of text or other specified elements to generate a profile. The profile can be stored directly to the gpk and also exported to a *.inp file.

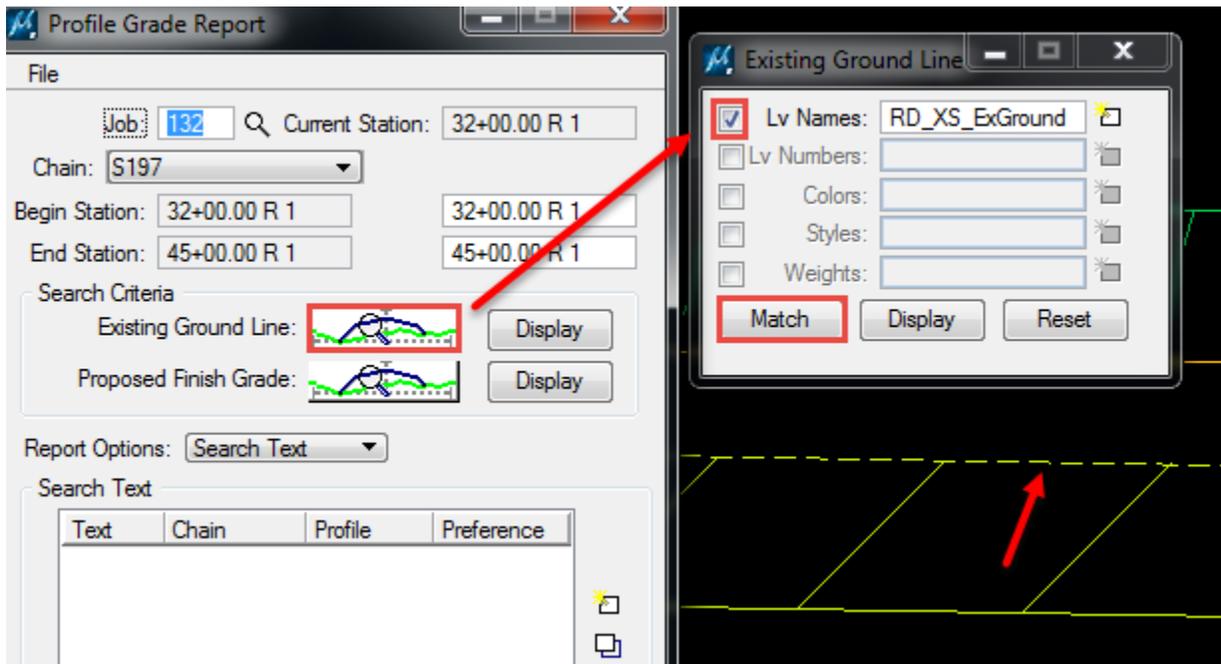
Select **Applications > Geopak > Road > Cross Sections > Reports** to access the Reports dialog. Select the **Profile Grade** button.



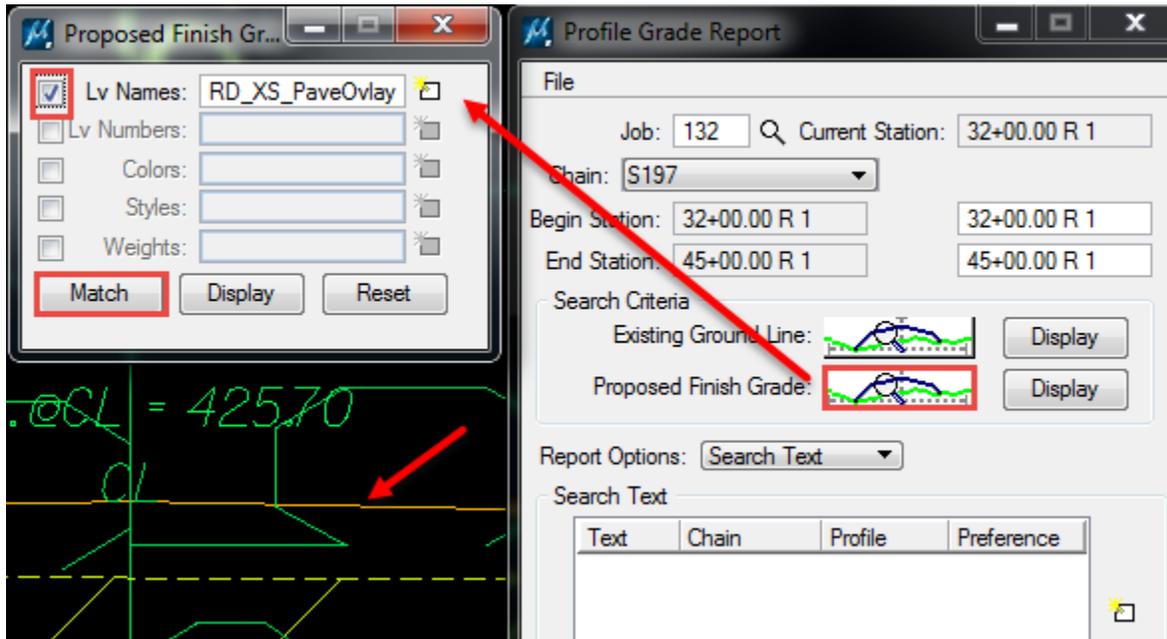
Select the gpk file when prompted. Select the **Chain** and **Station Range**.



For the Existing Ground, select the magnifying glass. Toggle on Level Names and Match the Existing Ground symbology in the *.shdx.dgn file. Press the "X" to close and accept the settings.



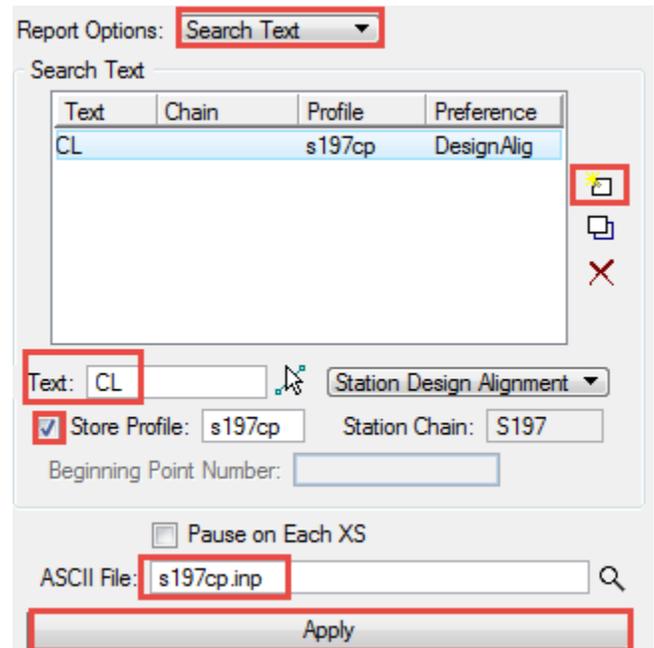
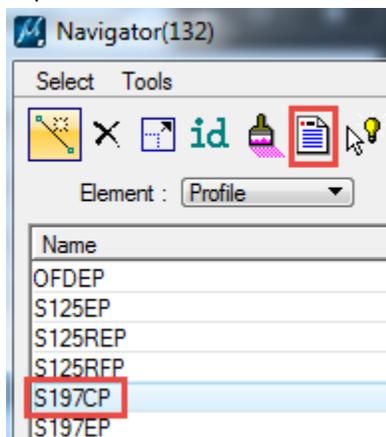
For the Proposed Finished Grade, select the magnifying glass. Toggle on Level names and Match the “orange” RD_XS_PaveOverlay_CP line. Press the “X” to close and accept the settings.



In the Reports Option section:

- Set Report Options to Search Text
- Set Text to CL
- Check Store Profile and enter a name S197cp to store into the gpk file
- Enter an Ascii file name s197cp.inp to write an input file
- Press the Add button
- Press the Apply button

Use **COGO Navigator**, to review the newly stored profile *cp



Draw Critical Point Profile

Open the *.prof.dgn file for the alignment the *.cp profile was created for. Select **Applications > Geopak > Road > Plans Preparation > Draw Profiles**.

On the COGO tab, select the **S197CP** Profile. Set the Display Settings to By Level Symbology and complete the dialog as shown below. Press the **Add** button to draw the profile with the existing profile.

This critical point profile provides a minimum buildup for the centerline to begin creating the proposed profile.



Vertical Alignment Generator

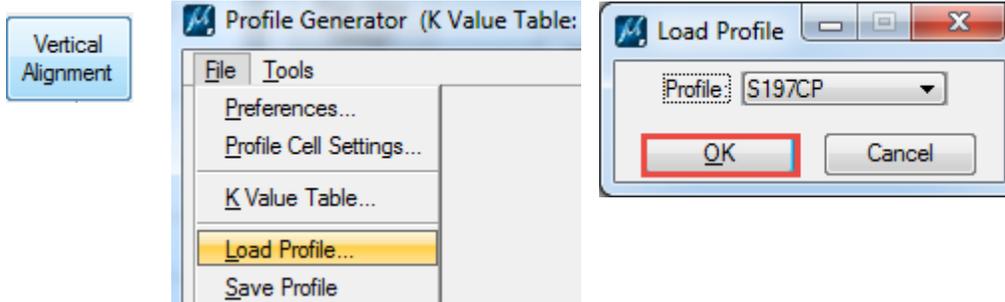
The Vertical Alignment Generator is used to graphically create, modify, and store the proposed profile by specifying grade, elevation, station values all while checking against AASHTO tables for SSD (stopping sight distance), DS (design speed), and K-Values. [See Chapter 12 of the SCDOT Highway Design Manual 2003. Additional documentation is included in Chapter of the Geopak Road I Manual.]

In the Cadd Workspace, the AASHTO Green Book 2001 table is used for K Values. ([aashto2001gb.kvl](#))

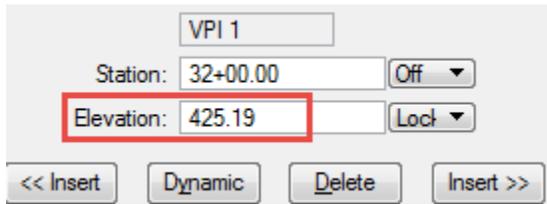
[\\nts\hq\CaddStandards\SCDOT-Bentley\Standards\SCDOT_Design\Geofiles\Profiles](#)

k value				
Speed	SagMin	SagMax	CrestMin	CrestMax
15	10.0	10.0	3.0	3.0
20	17.0	17.0	7.0	7.0
25	26.0	26.0	12.0	12.0
30	37.0	37.0	19.0	19.0
35	49.0	49.0	29.0	29.0
40	64.0	64.0	44.0	44.0
45	79.0	79.0	61.0	61.0
50	96.0	96.0	84.0	84.0
55	115.0	115.0	114.0	114.0
60	136.0	136.0	151.0	151.0
65	157.0	157.0	193.0	193.0
70	181.0	181.0	247.0	247.0
75	206.0	206.0	312.0	312.0
80	231.0	231.0	384.0	384.0

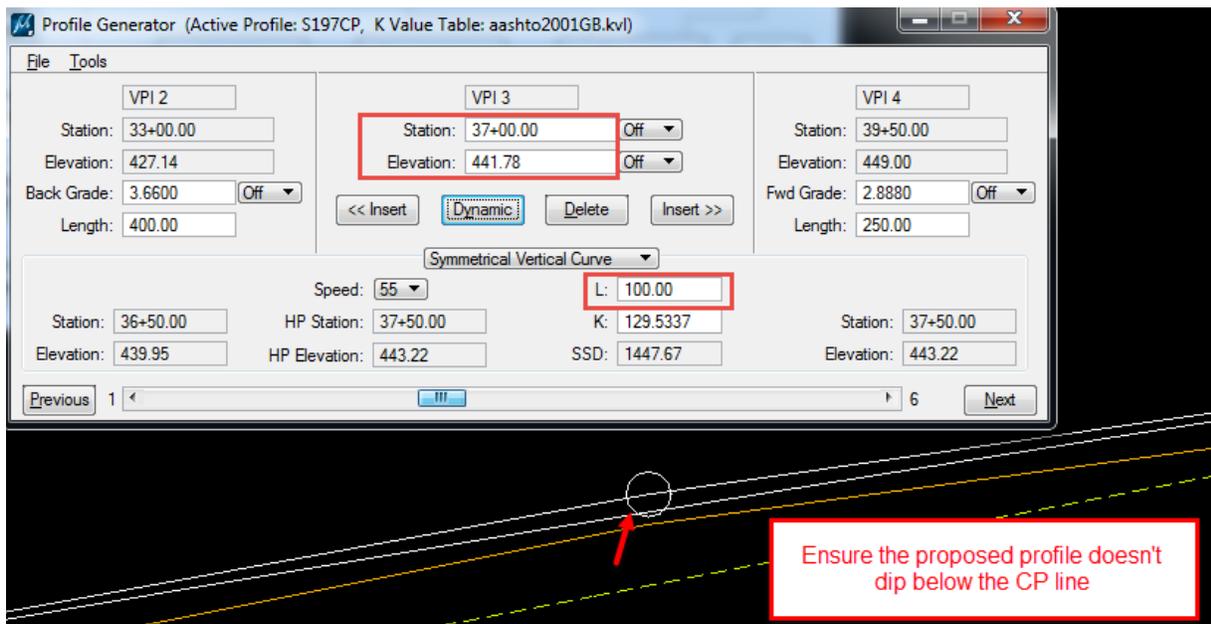
In Project Manager, with Working Alignment Influence Runs checked on, select the **Vertical Alignment** button. Select **File > Load Profile** and select the *.cp profile. Press **OK**.



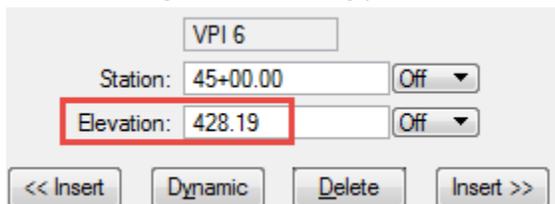
Enter the tie grade to existing pavement for the first station of the profile.



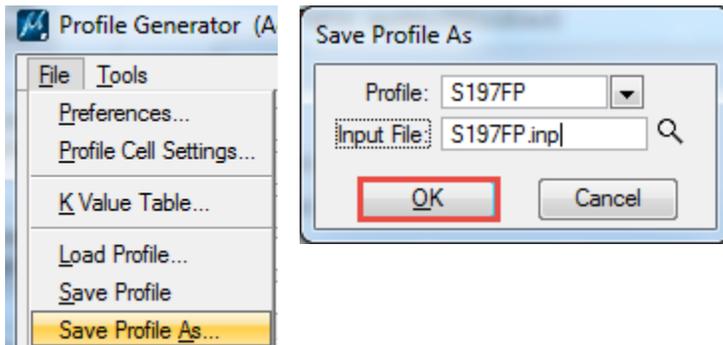
Use the Next, Insert, and Dynamic buttons to graphically create the proposed profile with vertical curves, careful not to drop below the minimum buildup line. [Ensure the vertical curves begin and end at even station numbers and the vertical curves are even lengths in multiples of 25.]



Enter the tie grade to existing pavement for the end station of the profile.



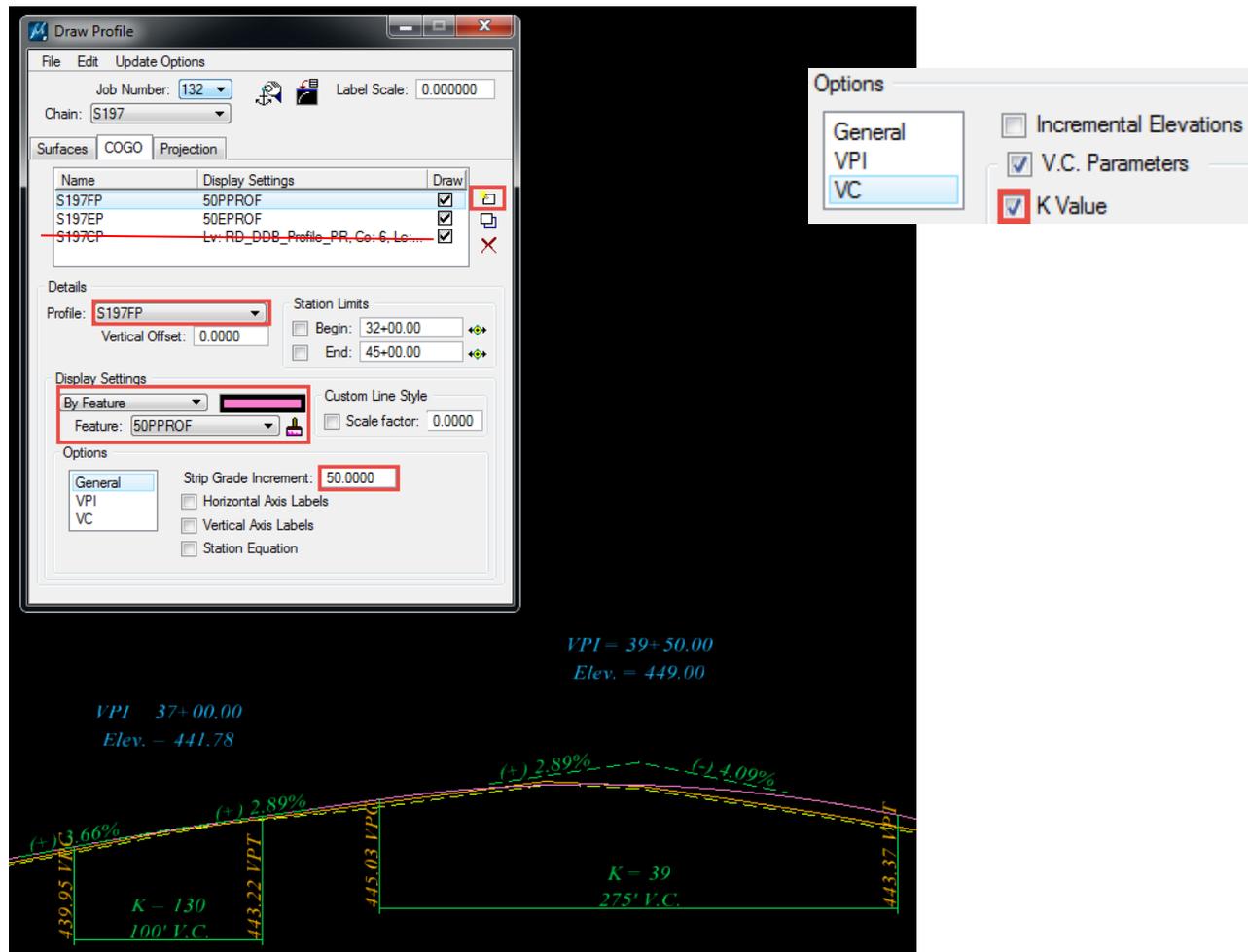
Select **File > Save Profile As**. Enter the **FP Profile** name for the gpk file and the **FP.inp** name to write out an input file. Press **OK**. Close the dialog and select Yes to any prompts.



Draw Proposed Profile

Open the *.prof.dgn file for the alignment the *fp profile was created for. Select **Applications > Geopak > Road > Plans Preparation > Draw Profiles**.

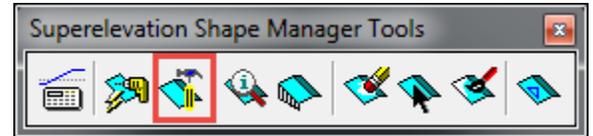
On the COGO tab, select the **S197FP** Profile. Set the Display Settings to By Feature and select the 50PPROF from the D&C Manager. Enter 50.00 on the General tab for **Strip Grade**. Make sure **K-value** is checked on the VC tab. Press the **Add** button to draw the profile with the existing profile. [The CP profile can be removed from the list at this point.]



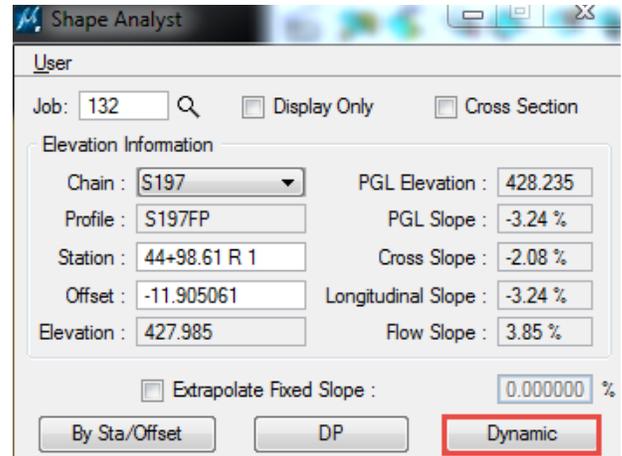
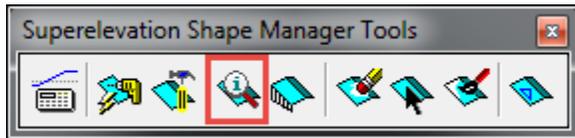
Edit/Analyze Superelevation Shapes

There are additional tools on the Superelevation Shape Manager Tools dialog to analyze and modify shapes. The most commonly used ones are:

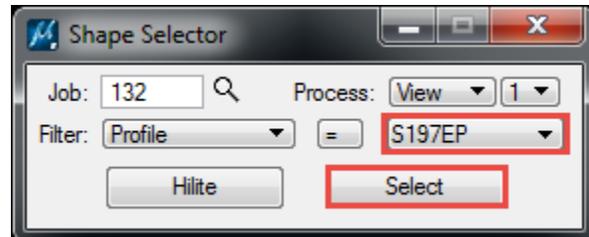
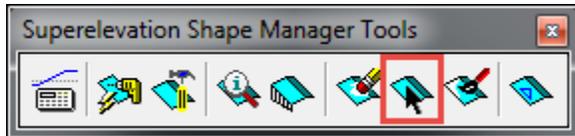
The **Shape Maker** tool manually creates shapes graphically by drawing irregular areas such as gore areas, turn lanes, etc. It is recommended to use an INPUT file for the majority of the project as this tool can be very time consuming to use.



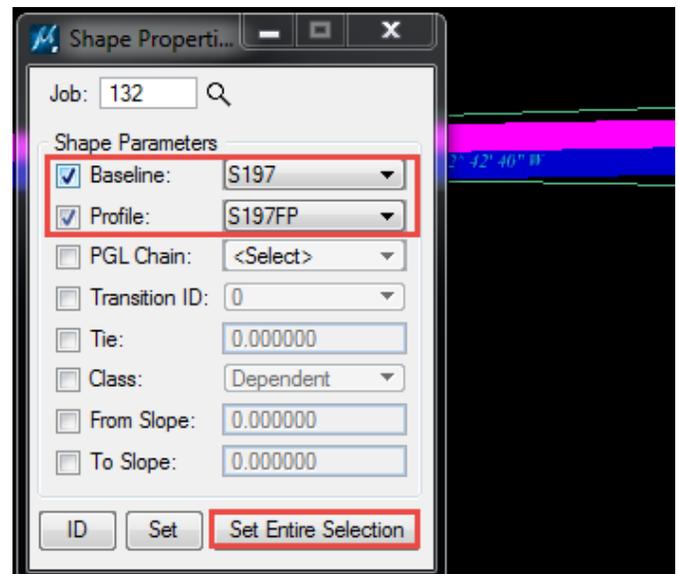
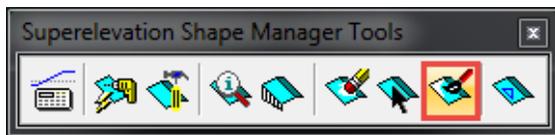
The **Shape Analyst** tool provides information on any point within a superelevation shape.



The **Shape Selector** highlights or selects shapes based on a wide range of properties for the shapes.



The **Shape Properties** tool provides information on any shape and allows the shapes to be modified individually or as a group. After creating the **proposed profile**, select the **Shape Properties** icon.



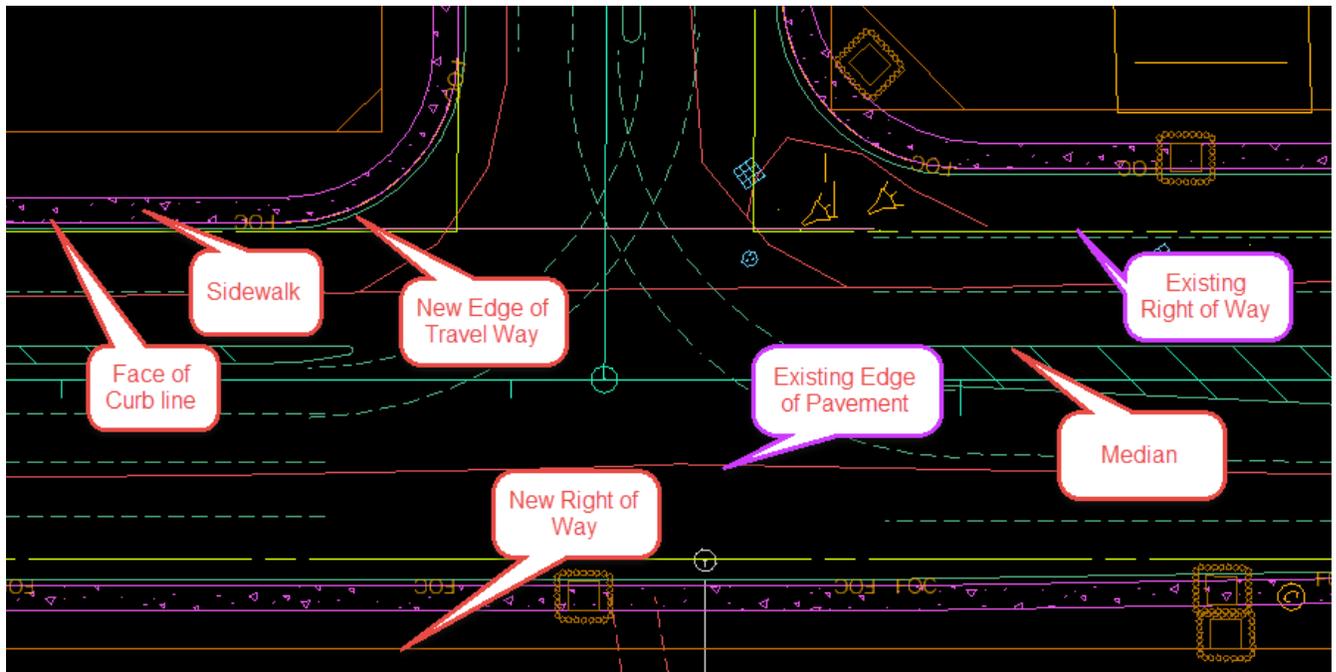
Use the **ID button** to identify a single shape to modify. (Alternatively, select all of the shapes with the **Shape Selector** tool above.) **Toggle** on Baseline and Profile. **Select** the correct Chain and Proposed Profile for the shapes. Press the **Set or Set Entire Selection** button to modify the new associations.

Select **Yes** to accept the changes.

Proposed Graphics

During preliminary design the majority of the proposed graphics for new right of way, new edge of travel way, medians, sidewalk, face of curb, and valley gutter lines, etc. should have been drawn in the *.pp.dgn file (or a *.pd.dgn file with the *.pp.dgn referenced). Existing graphics will also be utilized in the proposed cross section process.

The Geopak criteria files look for the plan view symbology for instruction on how to draw the proposed cross sections at the correct widths, slopes and with the correct elements such as curb and gutter and sidewalk.



Criteria Files

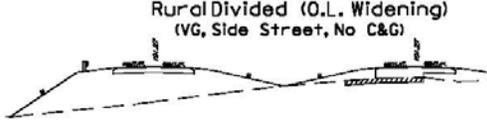
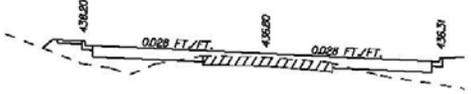
Criteria Files are ASCII files used for cross section design. Each criteria statement contains the criteria language for a separate roadway feature, and included information such as level symbology.

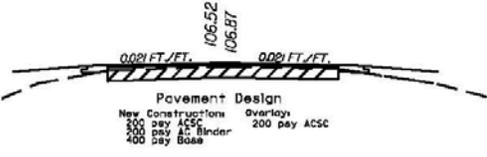
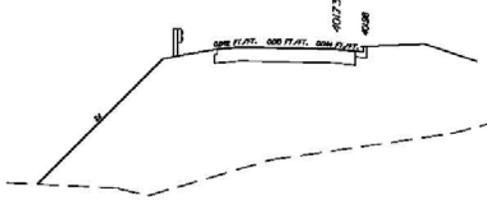
The Geopak Criteria files are located in the Cadd workspace folder:

\\nts\hq\caddstandards\SCDOT-Bentley\Standards\SCDOT_Design\Geofiles\Criteria_E

When a criteria file is selected, the files are copied to the local project directory to save project specific variables for pavement thickness, ditch widths, and plan view files, etc.

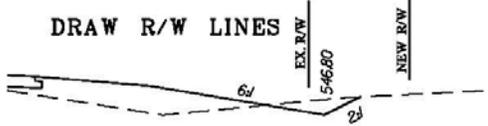
The following pages contain the criteria files available for SCDOT projects.

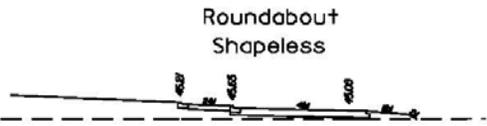
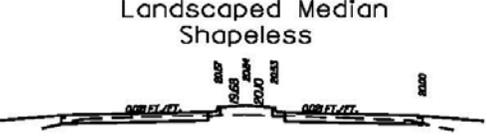
<p>Rural Undivided (O.L. Widening)</p>  <p>Name: NO.01 RURAL UNDIVIDED NO CG</p>	<p>Rural Divided (O.L. Widening) (VG, Side Street, No C&G)</p>  <p>Name: NO.02 RURAL DIVIDED NO CG</p>
<p>Urban Undivided (O.L. Widening) (C&G, SW, VG, S.St....)</p>  <p>Name: NO.03 URBAN UNDIVIDED</p>	<p>URBAN DIVIDED (Overlay/Widening) (C&G, SW, VG, Side St., Landsc. Med.)</p>  <p>Name: NO.04 URBAN DIVIDED</p>
<p>Urban/Rural Undivided (Widening) (C&G, SW, VG, S.St...)</p>  <p>Name: NO.05 RURAL URBAN UNDIVIDED</p>	<p>Urban & Rural Divided Widening, Slope Correction (C&G, SW, VG, S. Street)</p>  <p>Name: NO.06 RURAL URBAN DIVIDED</p>

<p style="text-align: center;">Urban-Undivided (O.L.Widening) (VG Only)</p>  <p style="text-align: center;">0.021 FT./FT.</p> <p>Name: NO.07 VG ONLY URBAN UNDIV.</p>	<p style="text-align: center;">Rural Secondary Road (Undivided)</p>  <p>Name: NO.07C SECONDARY OVERLAY WID</p>
<p style="text-align: center;">Rural Secondary Road (Overlay, Widening, Variable Thickness, Slope Correction)</p>  <p style="text-align: center;">Pavement Design New Construction Overlay 300 pay ACSC 200 pay ACSC 200 pay A1 Binder 400 pay Base</p> <p>Name: NO.07D SECOND.OVERLAY WIDEN.SPEC</p>	<p style="text-align: center;">Interstate On/Off Ramp</p>  <p>Name: NO.08 ON OFF RAMP</p>
<p style="text-align: center;">Interstate Widening, Median Barrier, Grass Median</p>  <p style="text-align: center;">TYPE 24 Barrier Wall (see 011 - 08P) Median width = 200'</p> <p>Name: NO.09 INTERSTATE WID. GRASS/BARRIER MEDI</p>	<p style="text-align: center;">Rural-Undivided, New Location</p>  <p>Name: NO.31 NEW RURAL UNDIVIDED</p>

<p style="text-align: center;">Rural Divided (New Location)</p>  <p><i>Name: NO.32</i> NEW RURAL DIVIDED</p>	<p style="text-align: center;">Urban Undivided (New Location) (C&G, SW, VG, S.St....)</p>  <p><i>Name: NO.33</i> NEW URBAN UNDIVIDED</p>
<p style="text-align: center;">URBAN DIVIDED (New Location) (C&G, SW, VG, Side St., Landsc. Med.)</p>  <p><i>Name: NO.34</i> NEW URBAN DIVIDED</p>	<p style="text-align: center;">Urban/Rural Undivided (New Location) (C&G, SW, VG, S.St....)</p>  <p><i>Name: NO.35</i> NEW RURAL_URBAN UNDIVIDED</p>
<p style="text-align: center;">Urban/Rural Divided (New Location) (C&G, SW, VG, Side St., Landsc. Med.)</p>  <p><i>Name: NO.36</i> NEW RURAL_URBAN DIVIDED</p>	<p style="text-align: center;">Rural Secondary Road (Undivided, New)</p>  <p><i>Name: NO.37C</i> NEW RURAL SECONDARY ROAD</p>

<p style="text-align: center;">Critical Points Calculation Widening/Relocation</p> <p><i>Name: NO.60 FIND CP WIDEN.RELOC.</i></p>	<p style="text-align: center;">Critical Points Calculation Resurfacing/Slope Correction</p> <p><i>Name: NO.61 FIND CP RESURF.</i></p>
<p style="text-align: center;">Mark Pavement Break and Slope (Undivided)</p> <p><i>Name: NO.62 MARK PAV.BREAK UNDIV.</i></p>	<p style="text-align: center;">Mark Pavement Break and Slope (Divided)</p> <p><i>Name: NO.63 MARK PAV.BREAK DIVIDED</i></p>
<p style="text-align: center;">Mark Elev. Differences and Pavement Slopes (Divided)</p> <p><i>Name: NO.63A MARK ELEV.DIFF. AND SLOPE</i></p>	<p style="text-align: center;">Mark Ex. Pavement Slopes</p> <p><i>Name: NO.64 MARK EX. PAV. SLOPES</i></p>

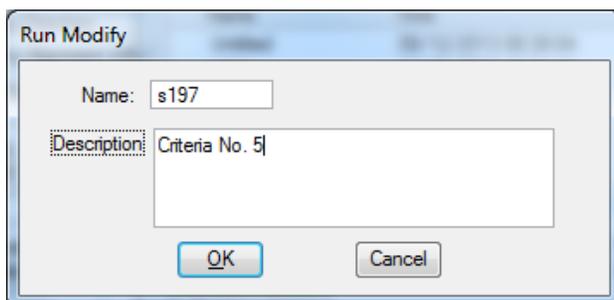
<p style="text-align: center;">Overlay Undivided (Match Existing Ground) Shapeless</p>  <p><i>Name: NO.80</i> OVERLAY UNDIV. SHAPELESS</p>	<p style="text-align: center;">Overlay & Widen Undivided (Match Existing Ground) Shapeless</p>  <p><i>Name: NO.80A</i> OVERLAY WIDEN UNDIV.SHAPE</p>
<p style="text-align: center;">Overlay & Widen Undivided (Match Existing Ground) Shapeless</p>  <p><i>Name: NO.80B</i> OVERLAY WIDEN CG SHAPELESS</p>	<p style="text-align: center;">Overlay Divided (Match Existing Ground) Shapeless</p>  <p><i>Name: NO.81</i> OVERLAY DIVIDED SHAPELESS</p>
<p style="text-align: center;">DRAW R/W LINES</p>  <p><i>Name: NO.82</i> DRAW R/W LINES SHAPELESS</p>	<p style="text-align: center;">DRAW EXISTING SUBBASE (SHAPELESS)</p>  <p><i>Name: NO.83</i> DRAW EX.SUBBASE SHAPELESS</p>

 <p>DRAW WETLAND</p> <p>Name: NO.84 DRAW WETLAND SHAPELESS</p>	 <p>Roundabout Shapeless</p> <p>Name: NO.85 DRAW ROUNDABOUT SHAPELESS</p>
 <p>Landscaped Median Shapeless</p> <p>Name: NO.86 DRAW LM SHAPELESS</p>	 <p>TRACE TOP SURFACE Shapeless</p> <p>Name: NO. 87 Trace Top Surface Shapeless</p>

Using Typical Section No. 05 (Urban/Rural Undivided) Widening with Cub & Gutter, Sidewalk, Valley Gutter options

Select the **Proposed Cross Sections** button in Project Manager.

Create a **Run > New**. In the **New Run Name** dialog, enter the Criteria File used for the alignment. If multiple typicals are used, enter additional information for criteria files, numbers, and stationing.

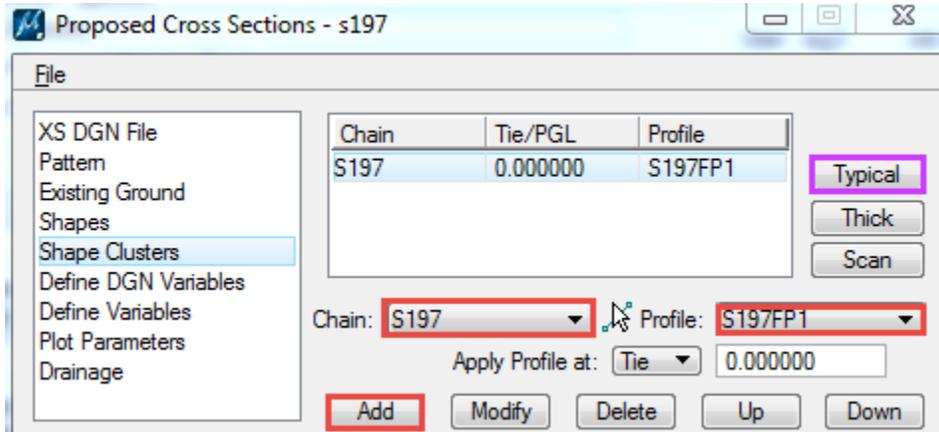


To access this information later, highlight the Run and select **Run > Modify**.

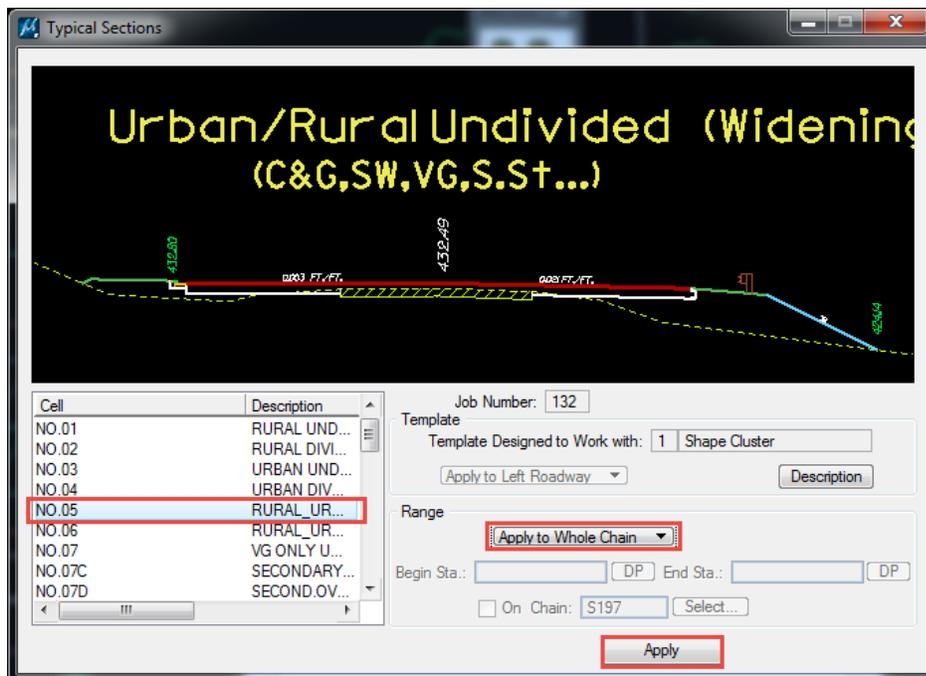
Complete the **Proposed Cross Sections** dialog from top to bottom utilizing Working Alignment Influence runs when available.

- XS DGN File: Select the *.dgn file and tolerance set to 0.100
- Pattern: Toggle on Use Working Alignment Definition
- Existing Ground: Toggle on Use Working Alignment Definition
- Shapes: Toggle on Use Working Alignment Definition

Shape Clusters: Select the **Chain** and **Proposed Profile**. Press the **Add** button.

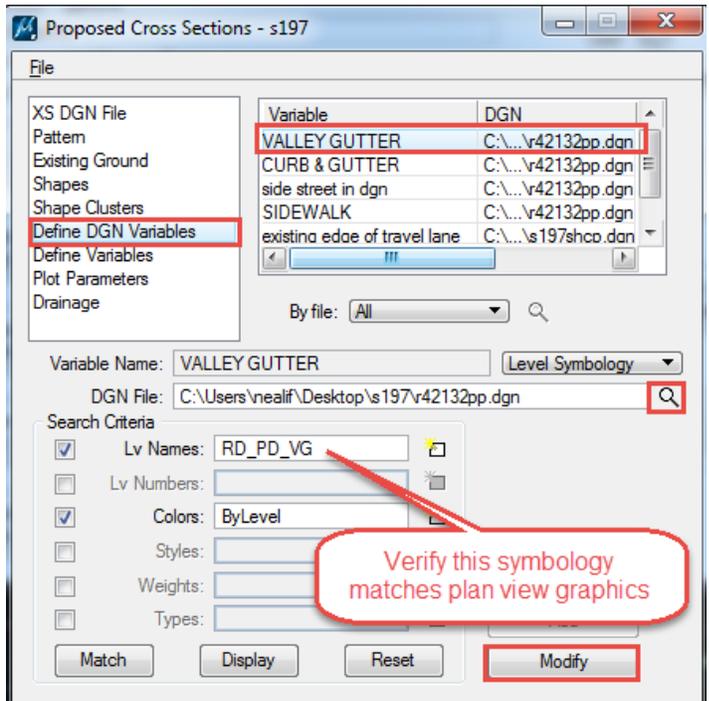


Press the **Typical** button and scroll down to **highlight** the typical most applicable to the project. (If necessary, toggle to Apply to Stations and enter a station range to apply the typical. Apply to Whole Chain if the same typical runs from beginning to end.) Press the **Apply** button.



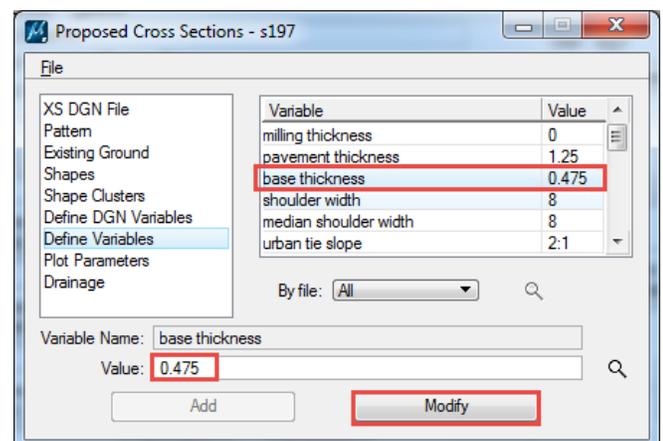
Define DGN Variables:

- Highlight **Valley Gutter**, browse to select the *.pp.dgn (or *.pd.dgn), and press Modify. Check that the symbology for the plan view graphics Valley Gutter line matches the Level Names and Colors specified – RD_PD_VG and ByLevel. If necessary, modify to match the plan symbology. If no VG exists, define the *.pp.dgn file anyway for the program to work – the criteria will skip this step if it does not find the necessary graphics. (This may also be your RD_PD_Final_TrvlWay plan graphic.)
- Highlight **Curb & Gutter**, browse to select the *.pp.dgn (or *.pd.dgn), and press Modify. Check that the symbology for the plan view graphics Face of Curb line matches the Level Names and Colors specified – RD_PD_FOC and ByLevel. If necessary, modify to match the plan symbology. If no C&G exists, define the *.pp.dgn file anyway for the program to work – the criteria will skip this step if it does not find the necessary graphics.
- Highlight **Side Street in DGN**, browse to select the *.pp.dgn (or *.sh.dgn or *.pd.dgn), and press Modify. Check that the symbology for the plan view graphics Side Street line matches the Level Names and Colors specified – RD_PD_SideStreet and ByLevel. This line is manually drawn across the intersections to be labeled in the cross sections as a side road tie in.
- Highlight **Sidewalk**, browse to select the *.pp.dgn (or *.pd.dgn), and press Modify. Check that the symbology for the plan view graphics Sidewalk line matches the Level Names and Colors specified – RD_PD_SW and ByLevel. If necessary, modify to match the plan symbology. If no SW exists, define the *.pp.dgn file anyway for the program to work – the criteria will skip this step if it does not find the necessary graphics.
- Highlight **Existing Edge of Travel lane**, browse to select the *.sh.dgn (or *.pd.dgn), and press Modify. Check that the symbology for the plan view graphics EOP line matches the Level Names and Colors specified – RD_EX_Road and ByLevel. If necessary, modify to match the plan symbology. Ensure this EOP line is the same line used to create the shape file and the retain existing pavement on the cross sections.

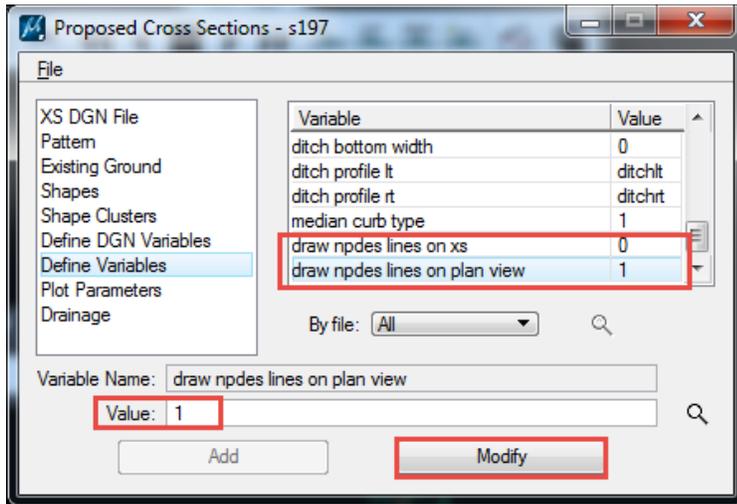


Define Variables: **Highlight** the Variable, **enter** the correct value for the project, and press the **Modify** button to update for each.

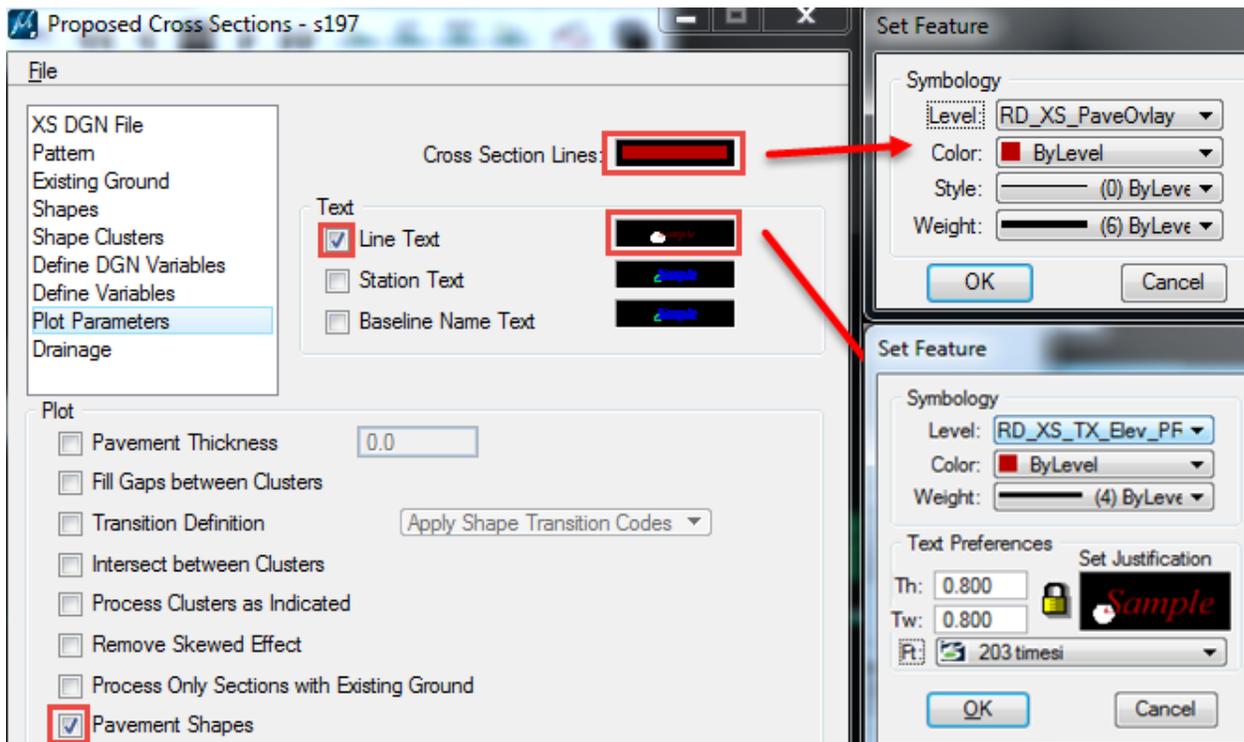
Note: Pavement Thickness is the combined thickness for the surface, binder, and base. The Base Thickness is the base only.



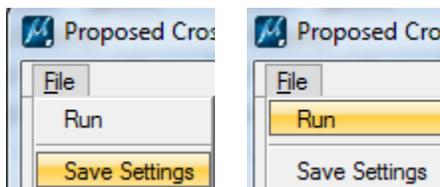
Note: To draw NPDES lines on XS or on Plan View, Change the 0 (no) to 1 (yes). Press the **Modify** button.



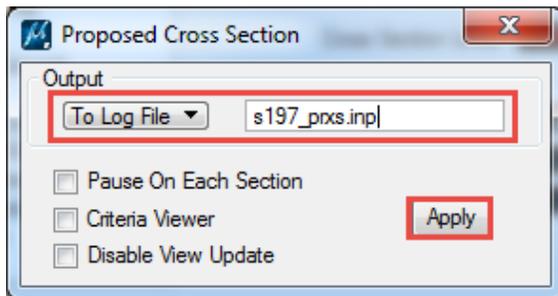
Plot Parameters: Toggle on **Pavement Shapes**. Set the Symbology for **Cross Section Lines** by double clicking on the symbology box. Toggle on **Line Text** and set the symbology by double clicking on the symbology box.



Select **File > Save Settings** and select **File > Run**

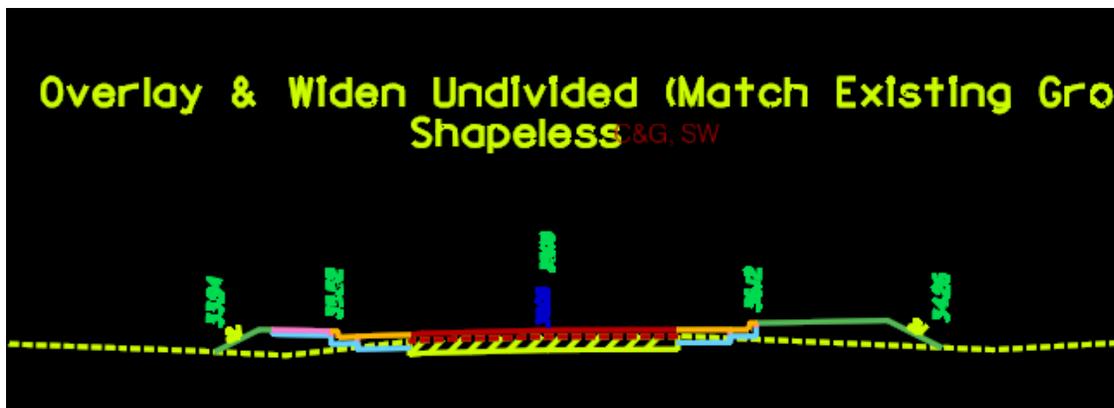


On the dialog, enter a *prxs.txt name to **Output** the cross section file as an input statement to be edited at a later time. Press the **Apply** button to process the cross sections.

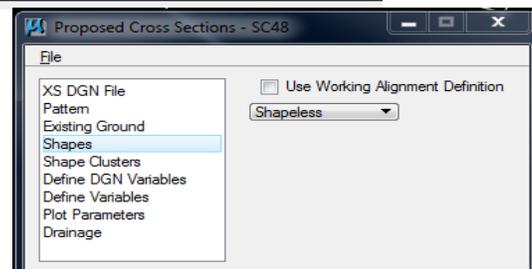


Using Typical Section No. 80B “Overlay and Widen Undivided (Match Existing Ground Shapeless C&G SW)”

Set up a run in the **Proposed Cross Sections** tab in Project Manager. The typical cell name is “No. 80B’”. This typical can be used in many different situations. In this example, typical 80B will be used to add 12’ of new pavement with 10’ sidewalks and C&G. This will be done on the left side of the road only. Below is a picture of typical 80B.

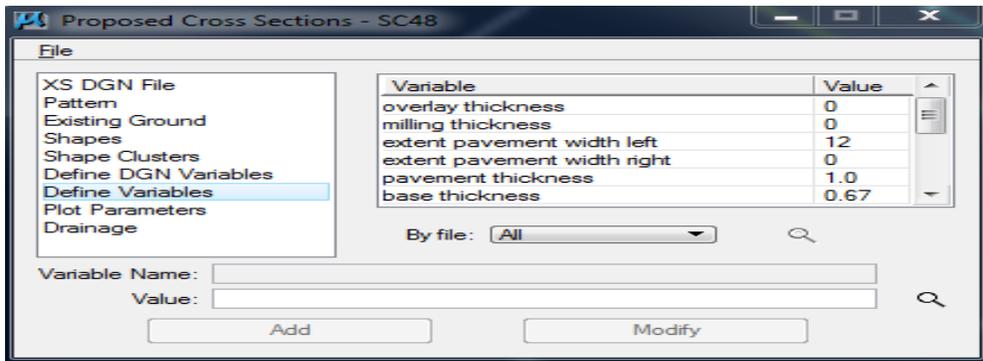


One of the benefits of typical 80B is the ability to match existing pavement slope. In this example the typical will match the existing pavement slope and add the new 12’ of pavement with Sidewalk and C&G. The Shapes tab in the Proposed Cross Section run can be set to Shapeless. (the sh.dgn is required.)

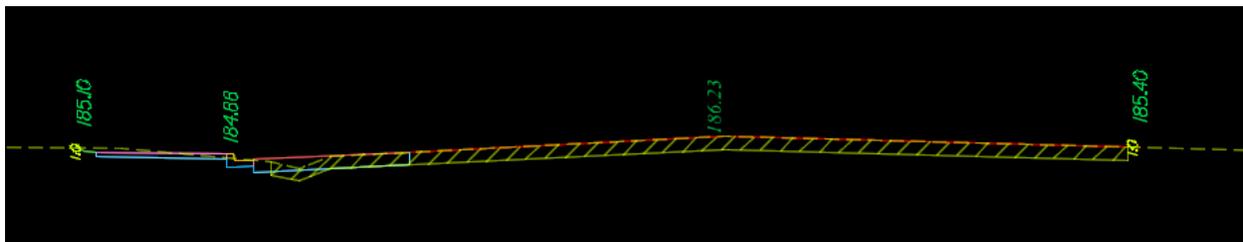


In the Define Variables tab, the designer has the ability to set tasks for specific needs of the project. In our situation, we need multiple tasks set. They are:

- Extend additional 12’ feet of pavement to the left side of the roadway
- Set the sidewalk to 10’, not the standard 5’
- No overlay, so set this to 0 (this is where you can set the overly thickness)
- New pavement thickness of 1.0’

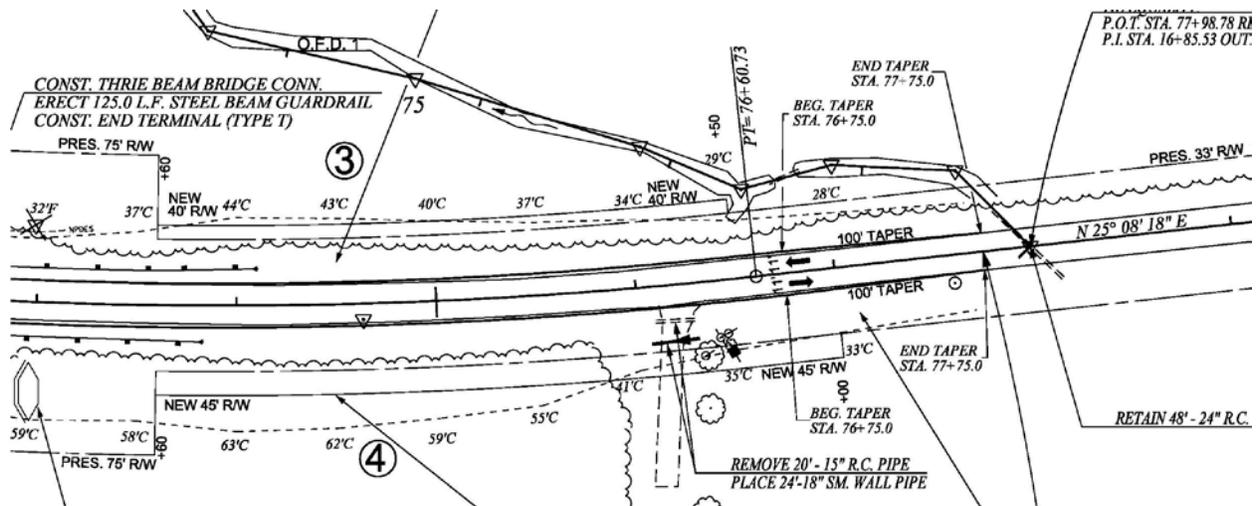


The end result of this Proposed Cross Section run is shown below.



Geopak Criteria to Place Right of Way on Cross Sections

In the *.pp design file, draft and verify the existing and proposed new right of way lines on the appropriate levels, **RD_EX_RW** and **RD_PD_RW**.



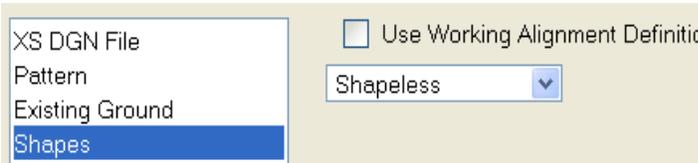
Open the *.dx design file. Open the Project Manager file and select the **Proposed Cross Sections** button.

Select **Run > New** and enter a run name. Press **OK** to continue. Highlight the newly created run and press the **OK** button.

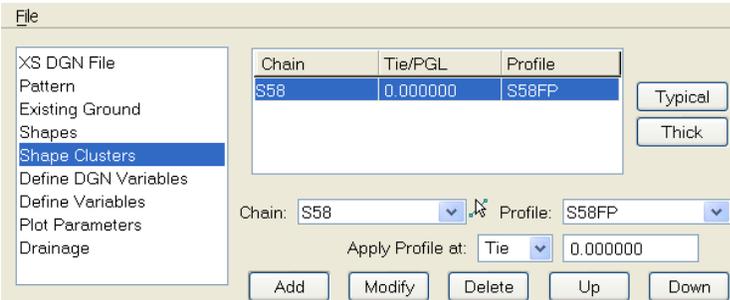
On the XS DGN File option, select the *.dx design file that you are currently in.

On the Pattern and Existing Ground options, select the **Use Working Alignment Definition** if defined. (Manually set them if they are not defined.)

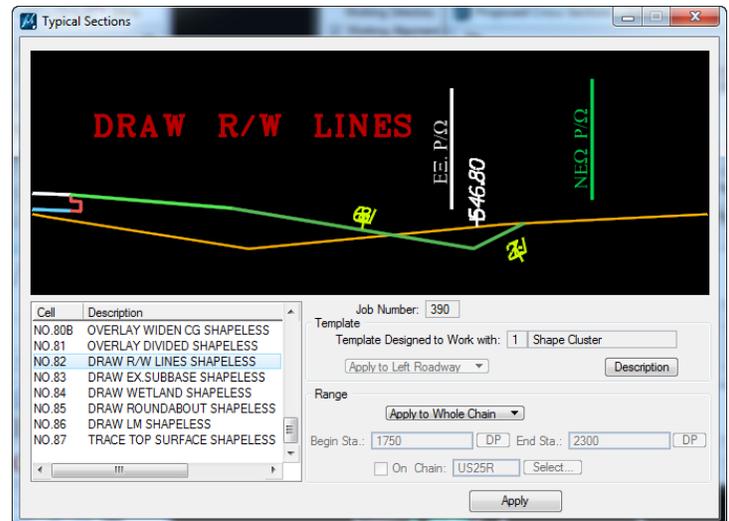
On the Shapes option, set the drop down to **Shapeless**.



On the Shape Clusters Option, select the Chain and Profile and press the Add button.

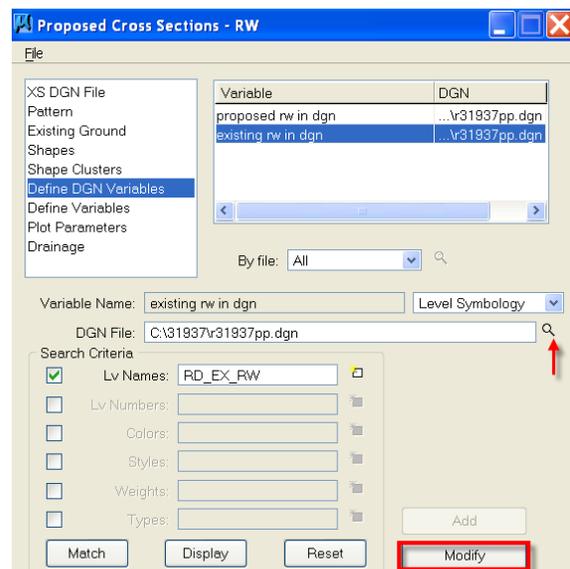


With the Chain highlighted at the top, press the **Typical** button. Scroll down and select template **No. 82 Draw R.W. Shapeless** and press the **Apply** button.

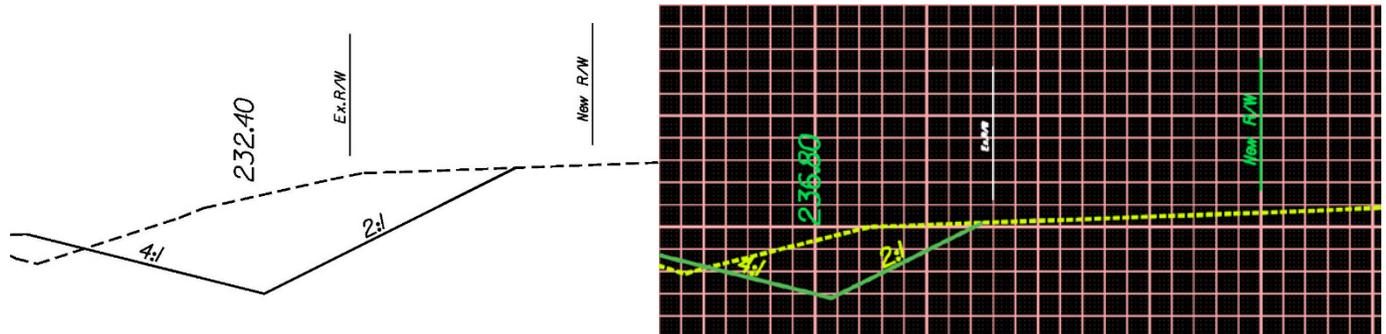


On the Define DGN Variables option, highlight the *proposed rw in dgn* line item. At the bottom, **select** the *.pp design file and press the **Modify** button to accept. Highlight the *existing rw in dgn* line item and at the bottom, **select** the *.pp design file and press the **Modify** button to accept.

On the Plot Parameters option, turn off all of the checks. Select **File > Save Settings** and then select **File > Run** to process the right of way on cross sections.



Verify the stationing and the existing/proposed right of way lines on the cross sections for distance and location versus the drafted lines in the *pp design file. Verify the newly placed text in the *fx design file.



Note: If the RW is referenced in the *prop.dgn file or another dgn, be sure to select it instead of the *pp.dgn file in the Define DGN Variables step above.

Note: If transitional RW exists and there are two lines in the *pp at the same instance of pattern lines, the outer most RW line will be drawn.

Note: If running this process after cross section sheets have been processed, the New R/W limits may not show up on the sheets due to the original cross section clip limits. You can either reprocess the cross section layout sheets or you can re-clip the references for the cross sections (see page 17).

Draw Ancillary Features (with Profile Grade Report)

The Draw Ancillary Features is a powerful tool to draw elevation text, cells, and lines for medians, NPDES, right of way, guardrail, or other ancillary data onto cross sections or profiles. It checks for features that intersect the profile or cross section and draws them at the specified elevation by intersecting the exact profile elevation or the tin elevation.

To access the Draw Ancillary Feature dialog, select **Applications > Geopak > Road > Cross Sections > Draw Ancillary Features**.

On the Draw Ancillary Features Dialog, under **Update Options**, set the Option to Query. This will prompt you to delete previously drawn elements and redraw on top of existing elements if this is the first instance the elements are drawn.

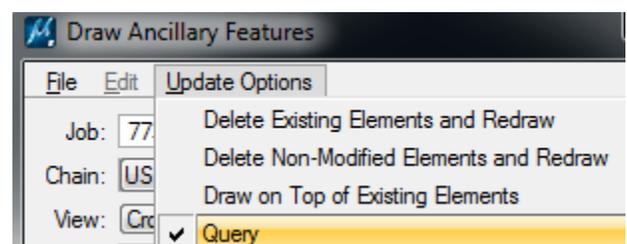
Update Options

Delete Existing Elements and Redraw – deletes all previously drawn elements (modified and non-modified) and redraws the elements.

Delete Non-modified Elements and Redraw – deletes only the non-modified elements and redraws the elements

Draw on Top of Existing Elements – does not delete any existing elements and draws the elements into the file.

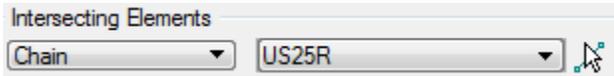
Query – pops up a dialog each time to choose the desired option each time the Draw button is processed.



Search Criteria for Draw Ancillary Features

Intersecting Elements – Horizontal Criteria

Chain – Uses the COGO chain in the GPK file to determine the horizontal location of the ancillary feature.

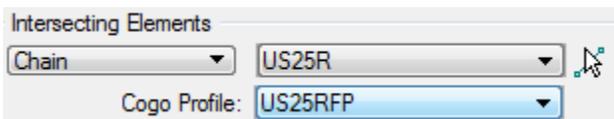


Level Symbology – scans the designated design file and locates the elements specified by the symbology if it crosses the profile or cross section cell. The location of the graphical element is used to determine the horizontal location of the ancillary feature.



Intersecting Elements – Vertical Criteria

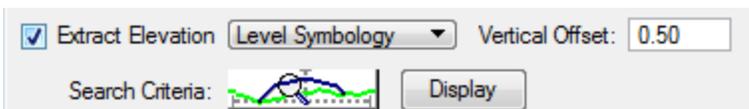
COGO Profile – determines the elevation from the intersecting horizontal location defined above with the COGO Profile



Extract Elevation Tin – elevation is determined from the existing ground tin file at the horizontal location defined above. Browse to select the *.tin file.



Level Symbology – scans the limits of the cross section cell and uses the intersecting elevation of the graphical element in the cross section file as it intersects with the horizontal location defined above.



Vertical Offset – the vertical offset draws the element at the specified height or depth from the determined elevation



Display Settings for Draw Ancillary Features

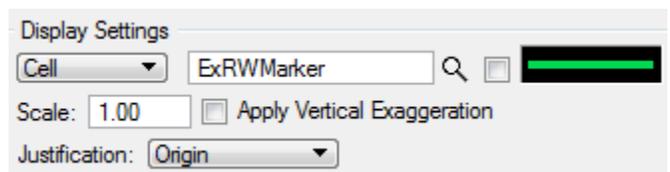
Cell – draws a specified cell to represent the ancillary feature

Symbology – activating this and defining will overwrite the symbology of the specified cell

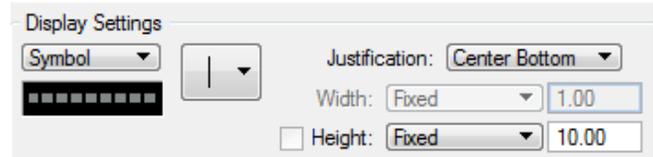
Scale – scale used for cell placement

Apply Vertical Exaggeration – will distort the cell scale if elements are not drawn 1:1

Justification – sets the justification of the cell placement as defined.



Symbol – Select the desired symbol from the list to draw
Symbology – defines the symbology of the symbol
Justification – sets the justification of the symbol placement as defined.
Width – Defines the width of the symbol
Height – Defines the height of the symbol



Text – places text labels as defined; both calculated or manually specified
Symbology – defines the symbology for the text
Angle – defines the angle of the text placement
Query – Allows selection of predefined calculated variables
Label – inserts the selected Query value or allows manual entry of text to be placed.

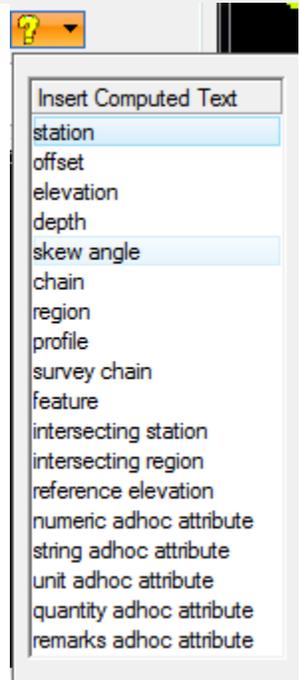
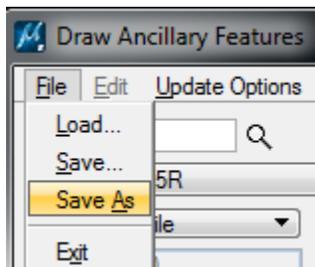


File Options

On the Draw Ancillary Features Dialog, there exists **File Options** for saving settings for the project and quickly creating settings files for new projects.

File Options

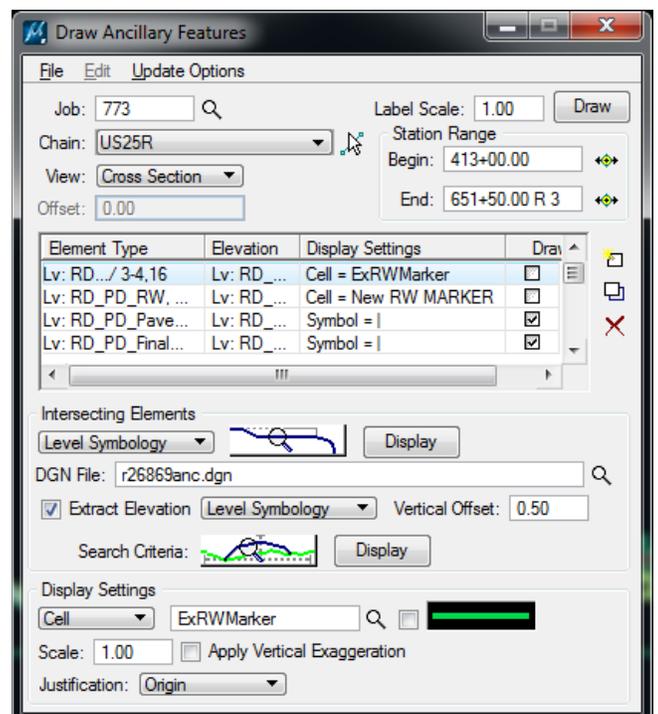
- Load** – Loads a previously saved setting file (*.afd)
- Save** – Saves the dialog settings into a settings (*.afd) file
- Save As** – Saves the dialog settings into a new settings (*.afd) file
- Exit** – Exits the dialog



In the workspace, there exists a **project.afd** file preconfigured with several options which can be quickly modified to specific projects. Select **File > Load** and navigate to the project.afd file in this folder:

\\nts\hq\CaddStandards\SCDOT-Bentley\Standards\SCDOT_Design\Geofiles\Labelers

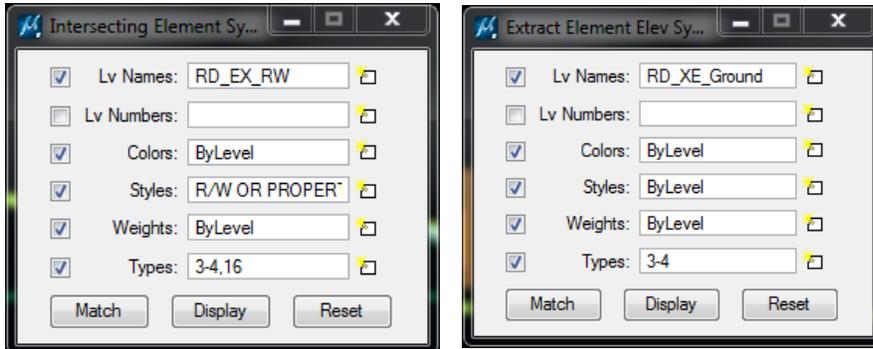
The dialog will look similar to the image below. Select the correct **Job #, Chain, and Station range** below. Change the View to **Cross Section** if in the *.dx.dgn file.



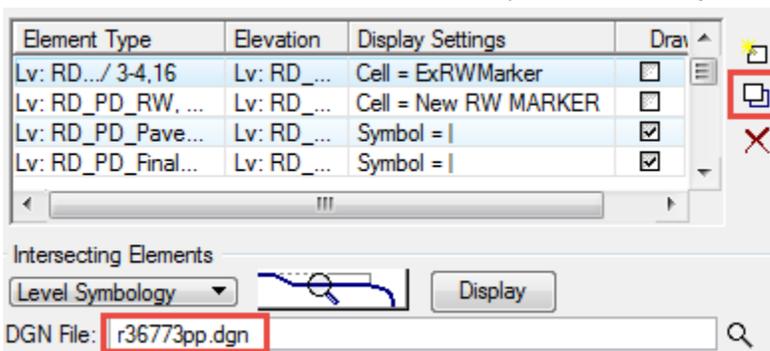
Line by line in the Element Type box, edit the **Level Symbology** and **Search Criteria** for the project specific settings. Select the correct **DGN File** for each item. Press the **Modify** button for each line as changes are made.

Example: The 1st line draws the Existing Right of Way onto cross sections.

For Level Symbology of Intersecting Elements, ensure your project meets the Cadd Standards for RD_EX_RW and line style R/W or Property – modify if necessary. For Extract Elevation – Level Symbology, ensure that it is set to RD_XS_ExGround or RD_XE_Ground.

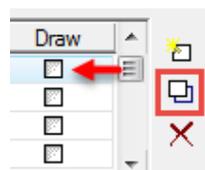


Browse to select the correct **DGN File** and press the **Modify** button to accept changes.



Repeat for each line under Element Type. Some Level Symbology will need to be set to the Earth Shoulder or Pavement Overlay levels in the cross section files.

Turn on the **Draw** toggle for each element to be drawn. Turn off the Draw box for those to skip at this time.



Press the **Draw** button at the top to draw the features into the Cross Section file.

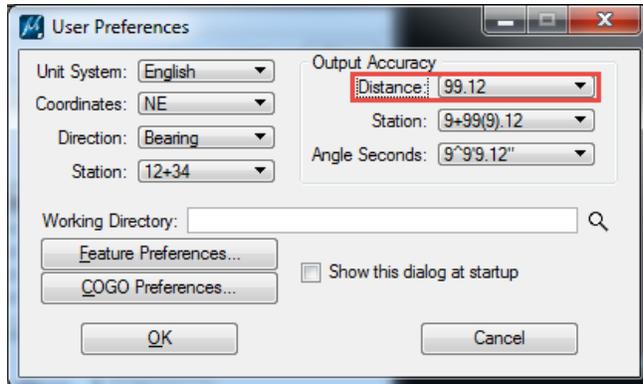
After completing the dialog for the project, select **File > Save As** to save the updated settings into an *.afd settings file in the project working directory.



This can be reloaded for reprocessing or use on other projects in the future by selecting **File > Load**.

For Ditch Labeling on Existing Cross Sections:

The User Preferences dialog will control the number of decimal places for the elevation text. Select **Applications > Geopak > Road > User Preferences** to set the Output Accuracy to **2 decimal places**.



Note: The process outlined below can be used to find the low point elevation on any criteria element in the cross section to create chains and profiles and subsequently label the elevations on the cross sections. It is not limited to only existing ditch elevations. It could also be used to label ditches in the middle of a divided highway, etc.

In the *dx.dgn file, select **Applications > Geopak > Road > Cross Sections > Reports**.

On the Reports dialog, press the Profile Grade button, and complete the dialog as shown below. Set the Existing and Proposed Ground line to match the existing ground in the cross sections.

Press the **Apply** button to store the chains and profiles into the gpk file and output to an inp file.

[Note: this locates the lowest elevation ditch point. If more than one ditch exists left or right, this will locate the lowest ditch bottom.]

Enter the correct Job# and Chain name

Toggle Criteria Elements

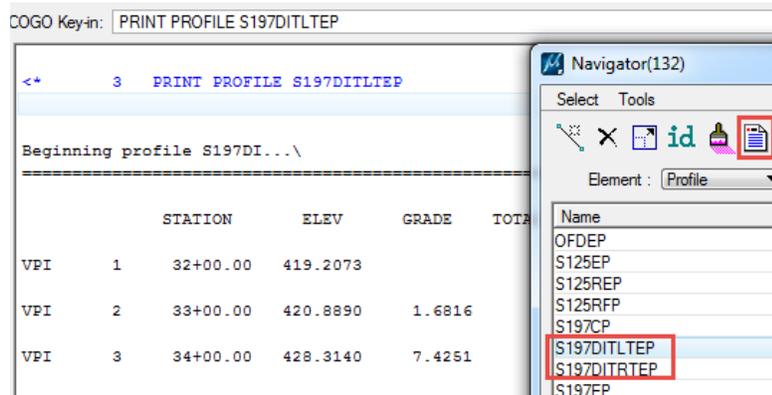
Choose a begin point# that isn't in the gpk with a "R" prefix

This creates a text file with the station and elevation info.

Enter the ditch chain name for left and right

Enter the ditch profile name for left and right

Close the Profile Report dialog, and verify the chains and profiles were created in the COGO > Navigator tool. Describe the chains and profiles to review.



Select **Applications > Geopak > Road > Cross Sections > Draw Ancillary Features** and complete the dialog as shown below:

Draw Ancillary Features

Job: 132 Label Scale: 50.00 **Draw**

Chain: S197 Station Range: Begin: 32+00.00 End: 45+00.00

View: Cross Section Offset: 0.00

Element Type	Elevation	Display St
Chain = S197DITLT Profile = S197DITLTEP		Text = {E
Chain = S197DITRT Profile = S197DITRTEP		Text = {E

Intersecting Elements Chain: S197DITLT Cogo Profile: S197DITLTEP

Extract Elevation Level Symbolology Vertical Offset: 0.50

Search Criteria: Display

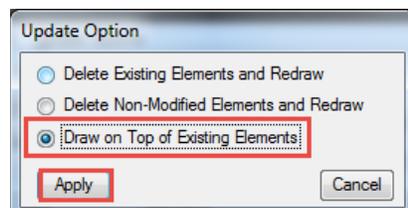
Display Settings Text Angle: 90° 0' 0" Label: {ELEVATION}

Insert Computed Text: station, offset, **elevation**, depth, skew angle, chain, region, profile, survey chain, feature

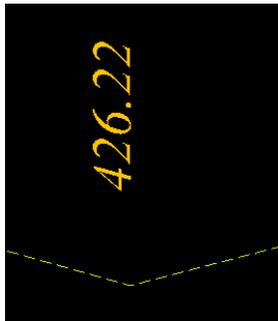
Annotations:

- Enter the correct Job# and Chain Name. Set the View to **Cross Section**.
- Edit everything in purple to get this line.
- Edit everything in green to get this line.
- Press the **Draw** button to place the labels on the cross sections.
- Press this button after completing everything for the left ditch bottom.
- Press this button again after completing everything for the right ditch bottom.
- Select the ditch left chain and ditch left profile.
- Change the ditch right chain and profile here before adding the right element above.
- By choosing the drop down arrow and selecting elevation, the Label box will be populated automatically.

After pressing the **Draw** button, select **Draw on Top of Existing Elements** and press the **Apply** button.



Use COGO **Cross Section Navigator** to review the ditch elevation text placed on the cross sections.



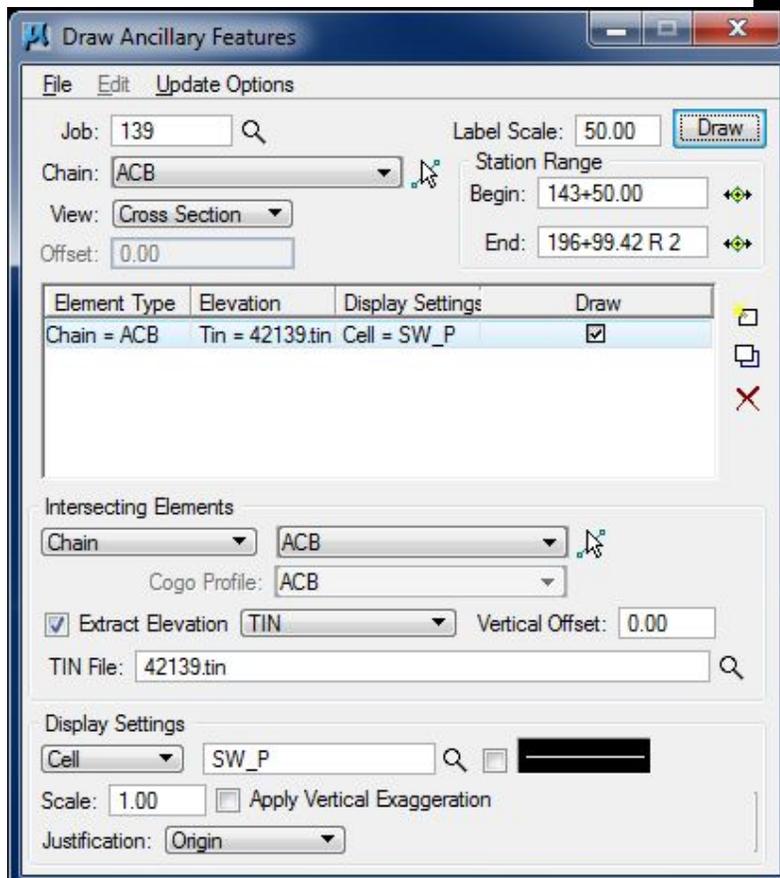
For Ditch Elevations on Existing Cross Sections and Sidewalk Cell placement:

Note: The process outlined below was used on a sidewalk project to tie into the existing ground elevation with a sidewalk cell template to keep from manually drawing each cross section.

The Chain depicted in the example below is a chain stored graphically from the front of sidewalk line in the *.pp.dgn file.



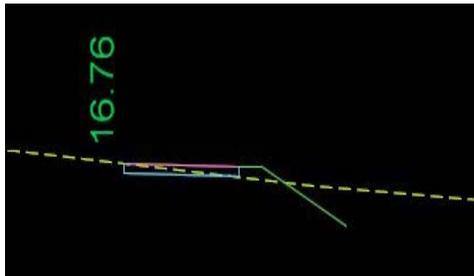
Select **Applications > Geopak > Road > Cross Sections > Draw Ancillary Features** and complete the dialog as shown.



Set the toggle to Cell and browse to select the sidewalk cell.

Press the **Draw** button to draw the cell onto the cross sections.

The back slope will need to be drawn manually to tie into existing ground.



For Medians, run the Draw Ancillary Features **twice** to draw the elevation text on both sides of the left and right sides onto the cross sections.

Change the **color** symbology in the ***pp.dgn** file for the left and right of the median. Set the Draw Ancillary Features as shown below and run the process twice for the left and right side. After running the text “MEDRT” and “MEDLT”, extract it as a profile into the gpk using the **Profile Grade Report** tool.

The image displays the MicroStation V8i software interface. The top window shows a cross-section view with three lines labeled "FOC" in purple, green, and yellow. A callout box points to these lines with the text: "Change color in pp file for left and right of median".

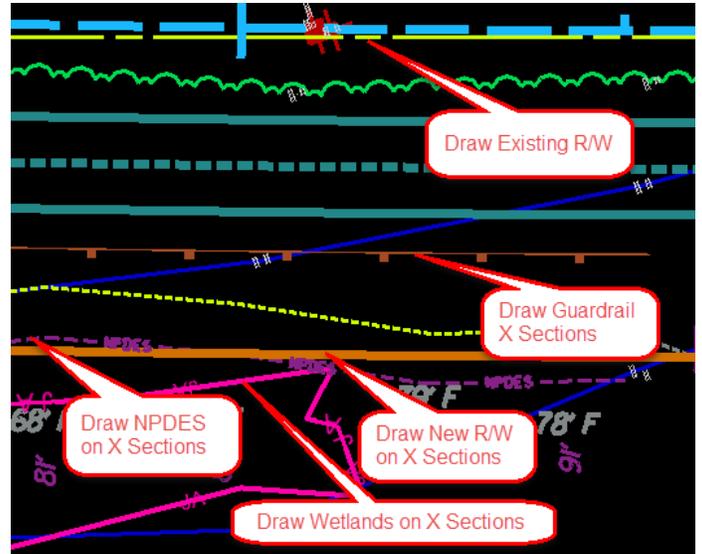
The bottom window shows the "Draw Ancillary Features" dialog box. A callout box points to the "View" dropdown menu, which is set to "Cross Section", with the text: "Use Draw Ancillary under Cross Sections".

Another callout box points to the "Intersecting Elements" section, specifically the "Level Symbology" dropdown, with the text: "Set this symbology to RD_PD_FOC and color for left - do again for right".

A third callout box points to the "Display Settings" section, specifically the "Text" dropdown, with the text: "Set this symbology to the median in the xsection".

A final callout box points to the "Label" field, which contains "MEDRT", with the text: "Add the text you want and color/size - press the add button - repeat for the other side".

The **Draw Ancillary** tool can also be used to label criteria features after that fact. **Right of Way** markers and **Guardrail** on the cross sections after criteria files have already been processed. It can also mark **NPDES** lines and **Wetlands** on cross sections. (Actually, it can mark anything on the cross sections based on a graphical 2d line in the plan view intersecting with a cross section element or existing ground elevation.)



To draw Existing and/or Proposed Right of Way, set the Draw Ancillary Features tool as shown below: (Note, you can combine the steps for Right of Way, Guardrail, NPDES, etc. into one process and save as an *.afd file as shown in the first documentation above regarding the preconfigured project.afd.)

1 Set the Job, Chain & Cross Section View

2 Toggle Level Symbology and set to match the RD_EX_RW

3 Set the Display to cell and select the ExRWMarker for existing

4 Toggle Extract Elevation & Level Symbology - set Search Criteria to RD_XE_EXGround

5 Press Add; change the information for the Proposed RW levels and cells and press Add again

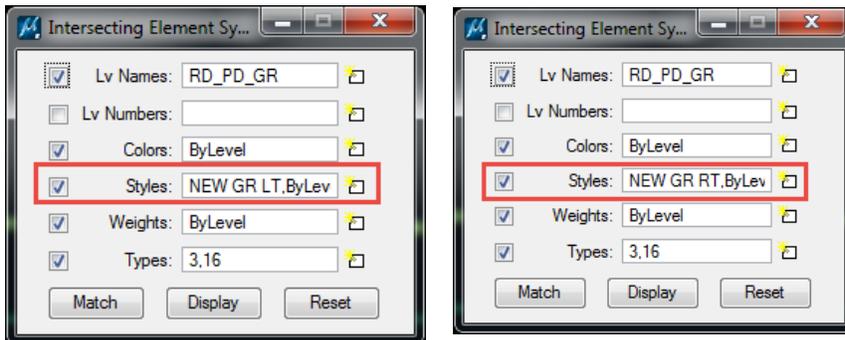
6 Press Draw to add the features

Element Type	Elevation	Display Settings	Draw
Lv: RD_EX_...	Lv: RD_XS_ExG...	Cell = ExRWMarker	<input checked="" type="checkbox"/>
Lv: RD_PD_...	Lv: RD_XS_ExG...	Cell = New RW MA...	<input checked="" type="checkbox"/>

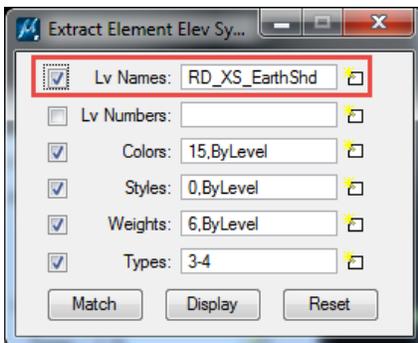
Be sure to use the NEW RW Marker and not the PR.RW Marker cell.



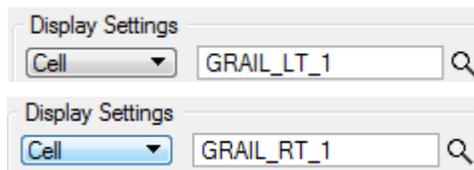
To draw Guardrail, set the Draw Ancillary Features tool in a similar fashion as above, only for the: Level Symbology, specify Styles to distinguish between left and right guardrail.



For the Extract Elevation, Level Symbology – Search Criteria, select the RD_XS_EarthShd level (both sides)

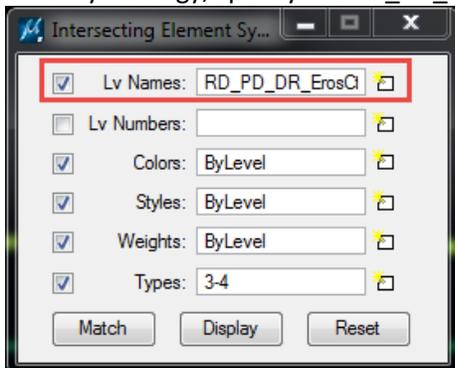


For the Display Settings – Cell, select the GRAIL_LT_1 and GRAIL_RT_1 for left and right, respectively.

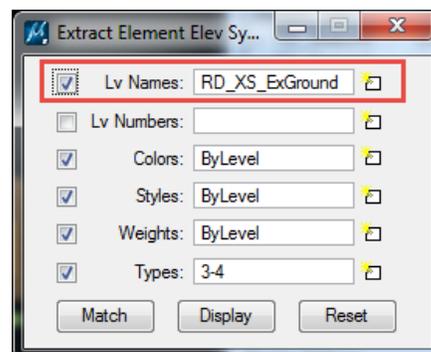


To draw NPDES lines on cross sections, set the Draw Ancillary Features tool in a similar fashion as above, only for the:

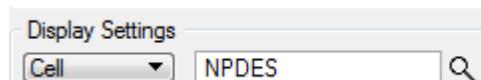
Level Symbology, specify the RD_PD_DR_ErosCtrl level to locate the NPDES line in the *.pp.dgn file.



For the Extract Elevation, Level Symbology – Search Criteria, select the RD_XS_ExGround level (both sides)



For the Display Settings – Cell, select the NPDES cell.

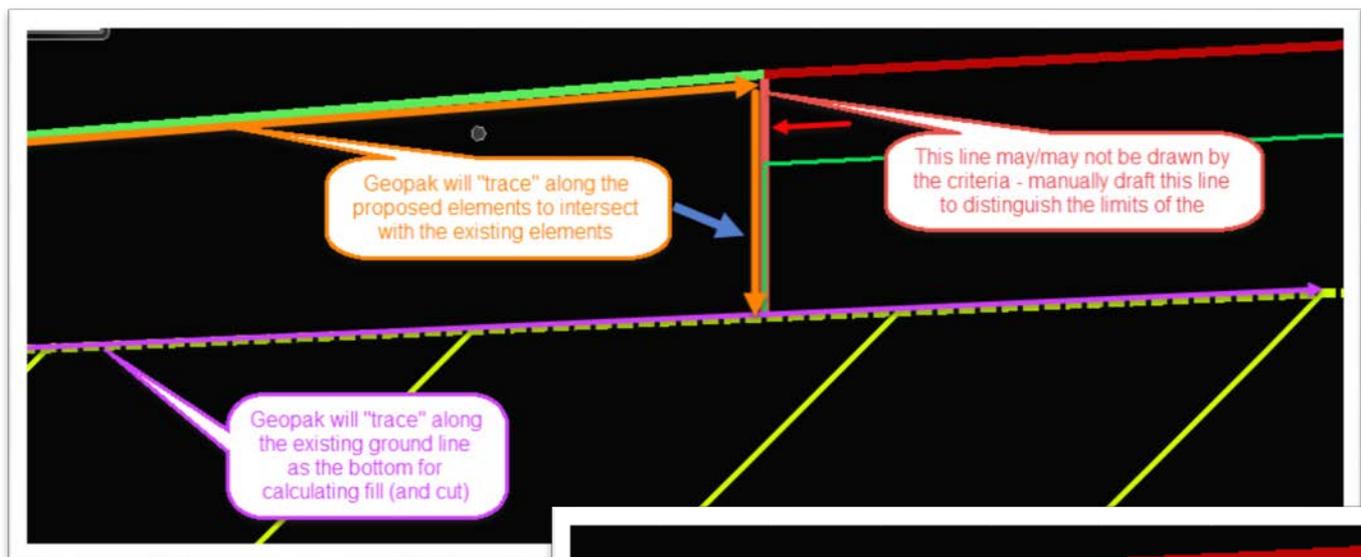


Earthwork

Geopak calculates earthwork using the Average End Area Method by comparing the proposed and existing graphical elements in the cross section file. Cut and Fill quantities are determined based on defined symbology search criteria.

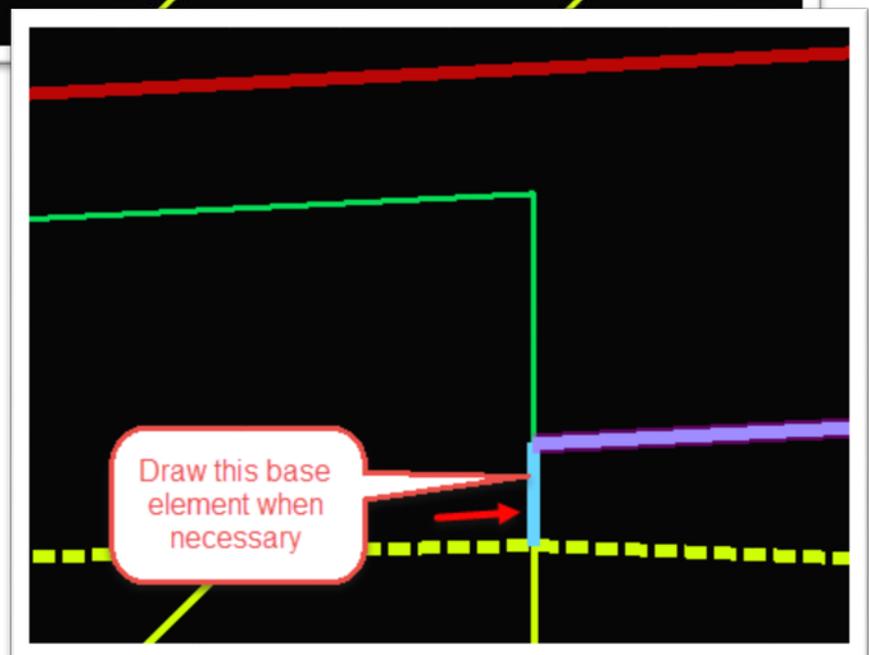
This tool can also be utilized to calculate subgrade, buildup, undercut, unsuitable materials and other types of volumes based on defined symbology. Shrinkage and expansion can be applied, skip areas for bridges, and ignore areas can be used to control the calculation of earthwork in certain areas of the project.

The elements in the cross sections will need to be **“traceable”** by Geopak. To calculate cut and fill between existing and proposed elements, there must exist a clear path along the bottom elements and the top elements. At times, manual drafting of a “line” must be drawn to complete the shapes on the proposed base or proposed pavement near the buildup line.

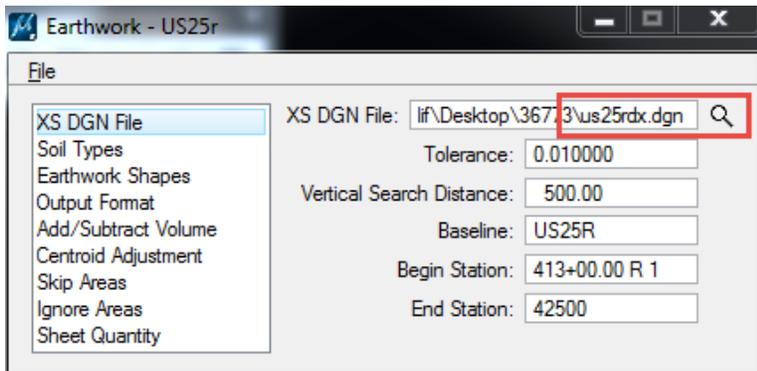


In Project Manager, under the **Define** for Working Alignment, ensure that the existing elements are defined. Note: If defining proposed, only the “top” elements of the proposed should be defined.

Select the **Earthwork** button on the Project Manager Dialog and create a **New Run**. (Or select Applications > Geopak > Road > Cross Sections > Earthwork.)



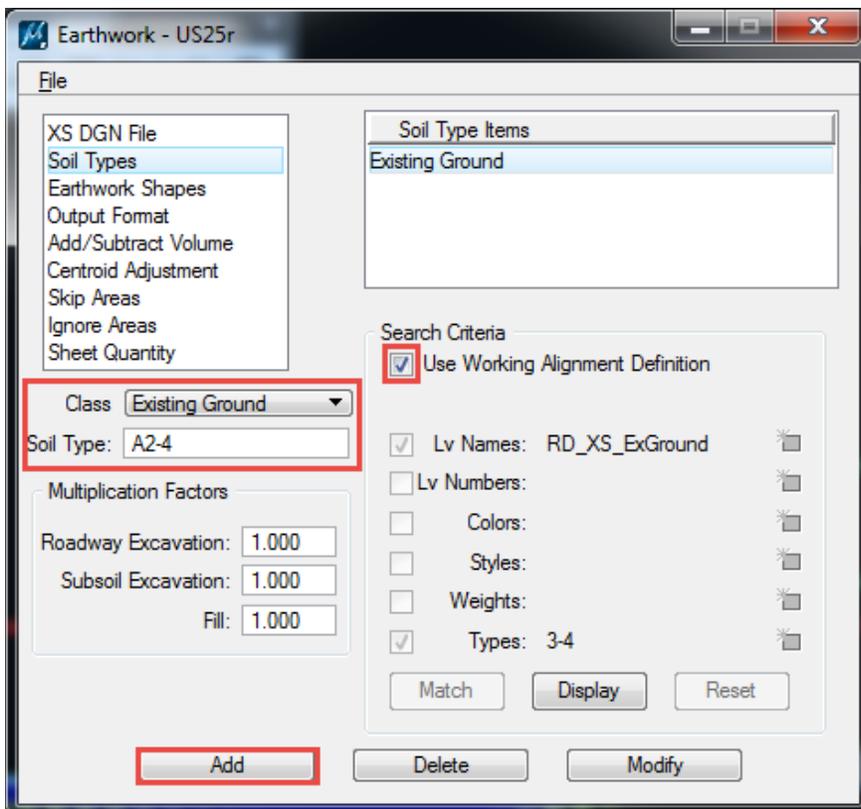
XS DGN File: Select the *.dgn file and appropriate station range.



The tolerance checks that intersecting graphical elements are closed within the tolerance 0.01 in this case.

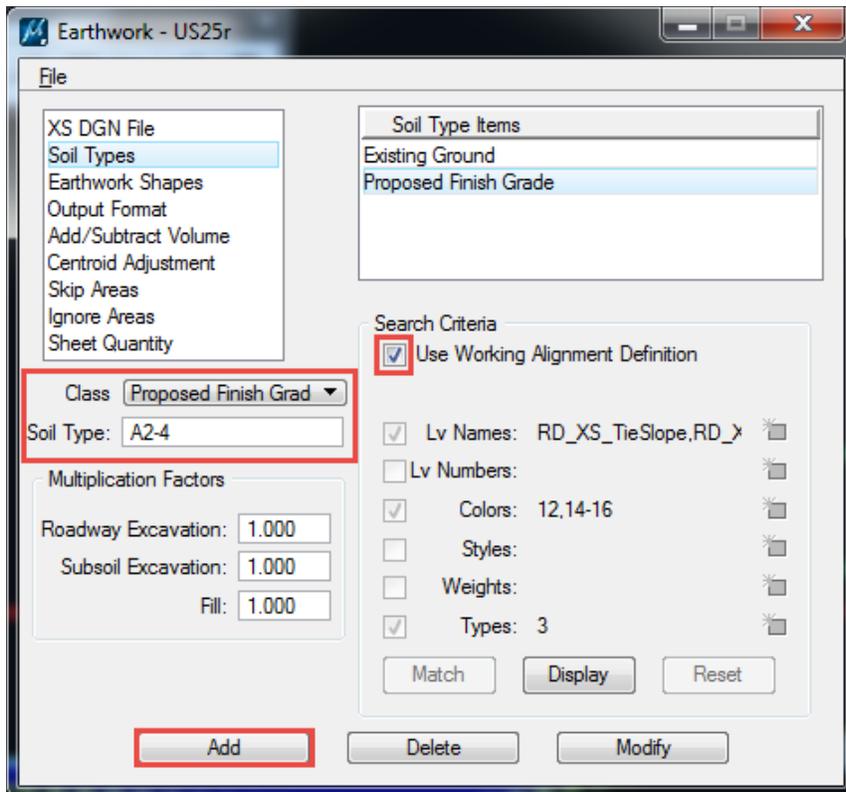
Soil Types: Add the appropriate symbology for the existing and proposed ground elements and press the Add button.

Toggle **Existing Ground** and enter a Soil Type – “A2-4”. [Do not enter any spaces or special characters in the Soil Type name or Geopak will crash.] Toggle “**Use Working Alignment Definition**” if defined, if not defined, set the Lv Names to **RD_XS_ExGround** by Matching the elements in the *.dgn file. Press the **Add** button to add the Existing Ground to the list.

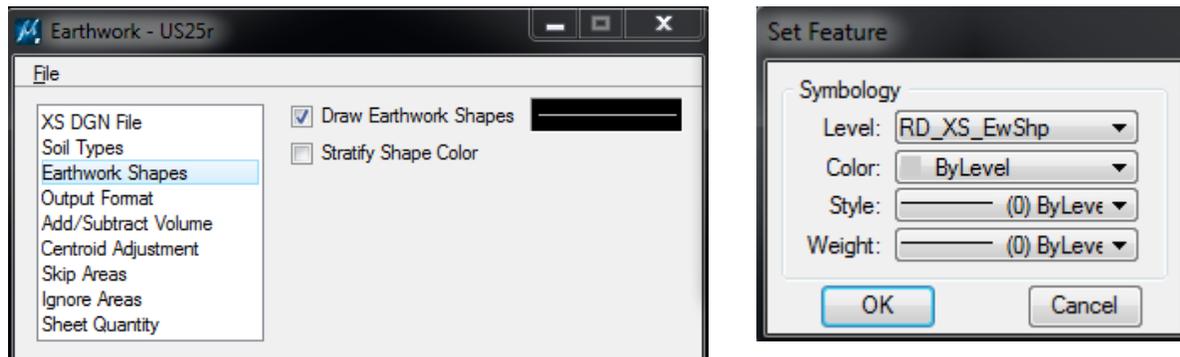


Note: If a closure report was run to tie existing ground, these levels will also need to be selected.

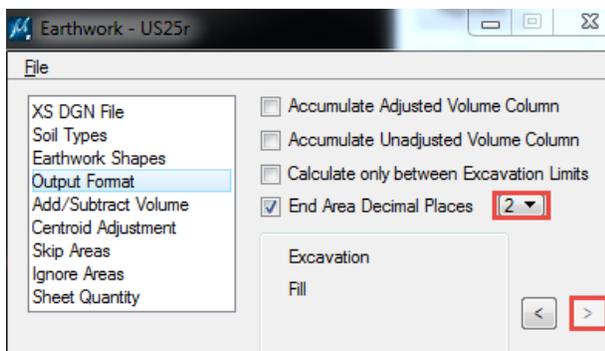
Toggle **Proposed Grade** and enter a Soil Type – “A2-4”. Toggle “**Use Working Alignment Definition**” if defined, if not defined, set the Lv Names to **RD_XS_ExGround** by Matching the elements in the *.dx.dgn file. Press the **Add** button to add the Existing Ground to the list.



Earthwork Shapes: Toggle on Draw Earthwork Shapes and double click to set the symbology.

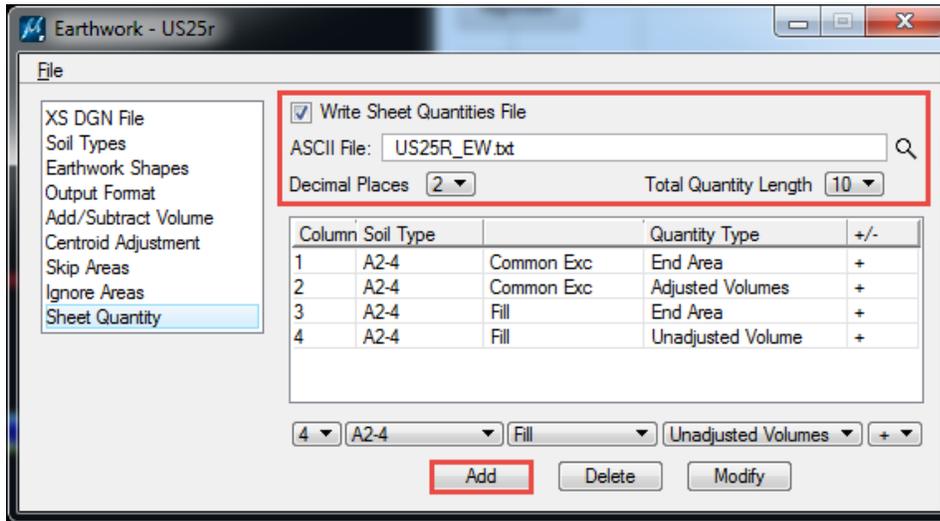


Output Format: Set **End Area Decimal Place** to 2 and press the Next button until only **Excavation and Fill** are displayed.



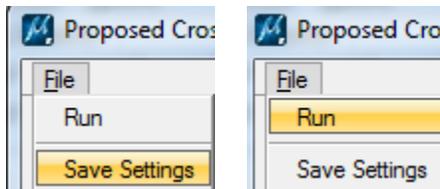
Skip the next 4 steps unless you need to enter the station ranges for a bridge for **Add/Subtract Volume**, **Centroid Adjustment**, **Skip Areas**, and **Ignore Areas**.

Sheet Quantity: Toggle on Write Sheet Quantities File and enter a file name *ew.txt file. Change Decimal Places to 2 and Total Quantity Length to 10. Toggle the bottom area to complete the box as shown below. **[Note: Use the outputted *EW.txt file to process in the EWBS program documented in a subsequent chapter. This file should not be used on the cross sections. The EWBS VXT output should be used instead.]**

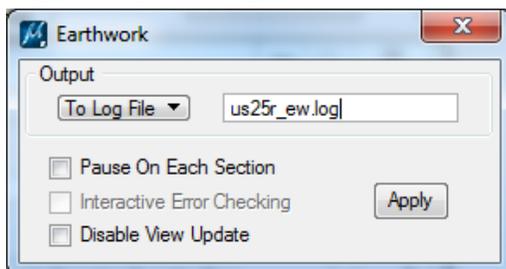


- Column 1** – set to Excavation End Areas (cut)
- Column 2** – set to Excavation Adjusted Volumes
- Column 3** – set to Fill End Areas (embankment)
- Column 4** – set to Fill Unadjusted Volumes

Select **File > Save Settings** and select **File > Run** to process the Earthwork.



Toggle **Output To Log File** and enter a file name. Press the **Apply** button.



Use the Cross Section Navigator to review the earthwork calculations provided. Be sure to check the areas around the buildup and base.



Turn OFF the **RD_XS_EwShp level** and select **File > Save Settings** (or Ctrl + F). This keeps the shapes from plotting on the cross section sheets.

Limits of Construction

The Limits of Construction tool draws graphical linear elements into the *.pp file for plan production by determined the tie point of the proposed roadway and existing ground in the cross section. They are used to depict the project limits. The cut and fill offset values are also labeled from the cross section to the plan view.

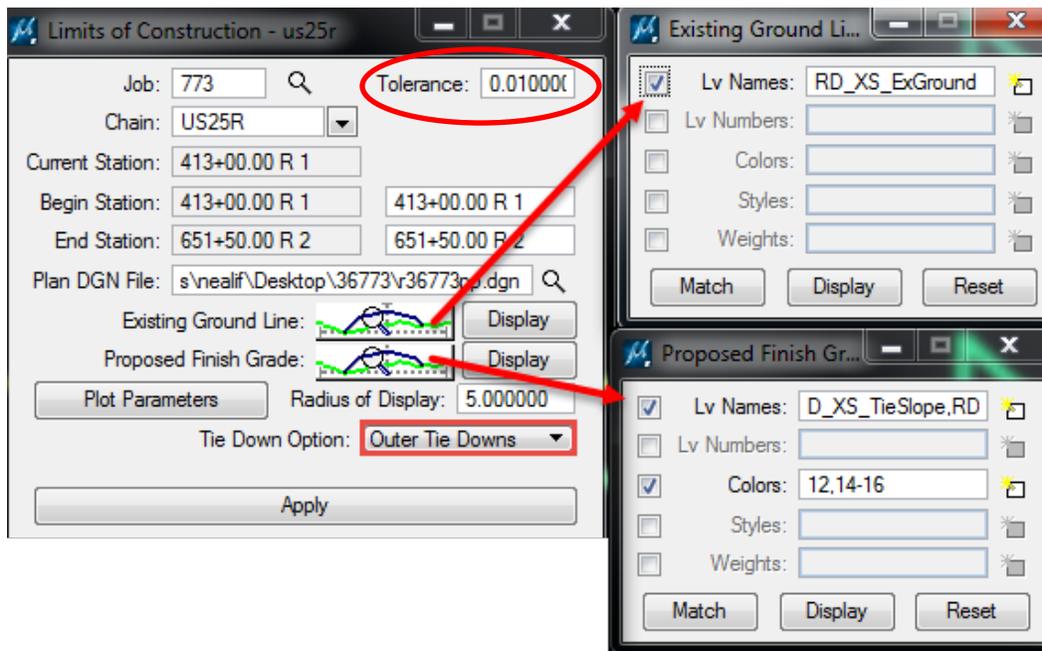
Select the **Limits of Construction** button on the Project Manager dialog and create a New Run. (Or select Applications > Geopak > Road > Cross Sections > Limits of Construction)

Select the **Job #**, **Chain**, and appropriate **Station** range. Browse to select the *.pp.dgn design file.

Click on the **Existing Ground Line** and set to the RD_XS_ExGround symbology. (This will be preset if Use Working Alignment is checked on.)

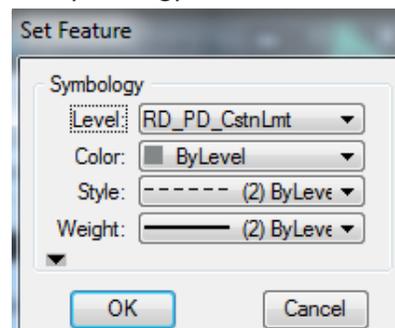
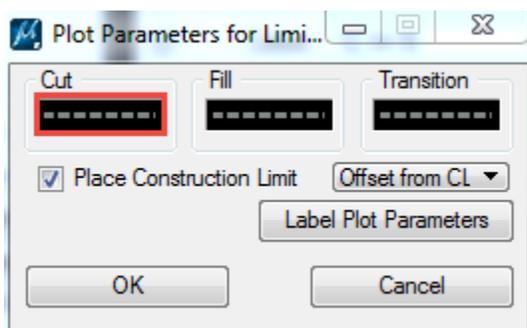
Click on the **Proposed Finish Grade** and match the “top” elements of the proposed finish grade. [Include the RD_XS_TieSlope level as this is the primary level it will be looking to intersect with the existing ground. Also, add the symbology for the top and front of the curb and top of pavement if not already included.]

Select **Outer Tie Downs**.

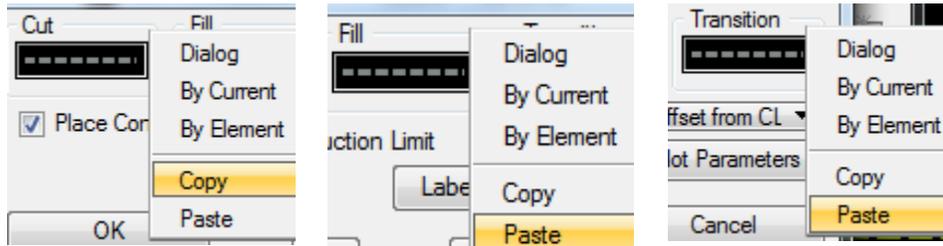


Change the **Tolerance** to a lower setting like 0.01 if elements are having problems connecting.

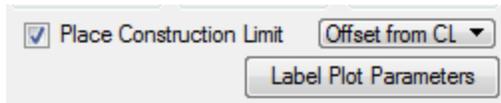
Press the **Plot Parameters** button. Double click to set the **Cut** symbology.



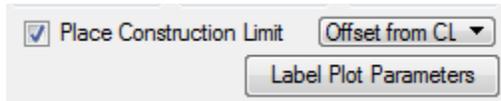
Right click on the Cut symbology and select **Copy**. Right click on both the **Fill and Transition** symbology and select **Paste**.



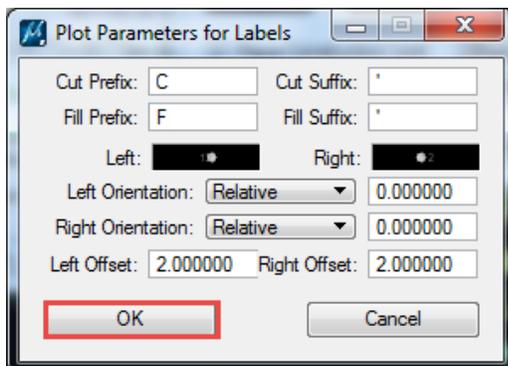
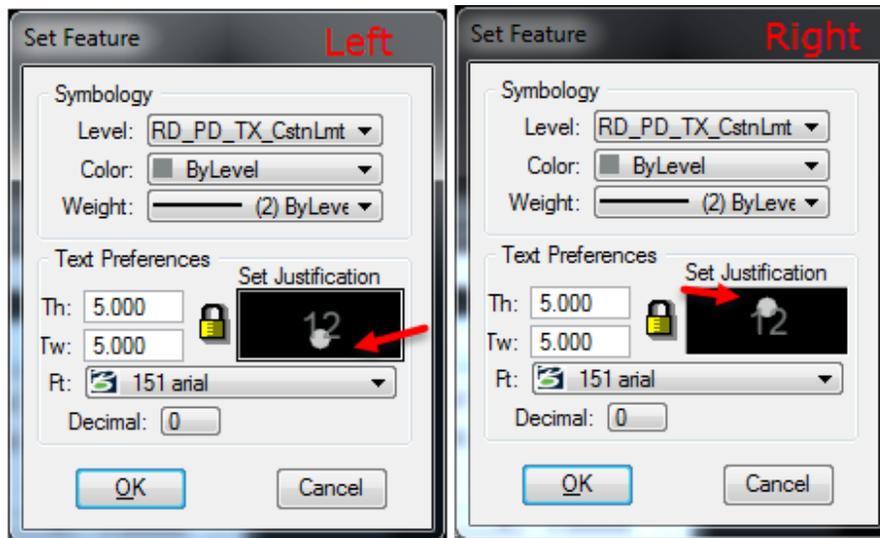
Toggle on **Place Construction Limit** and **Offset from CL**. Press the **Label Plot Parameters** button.



Enter a C and F for the Cut and Fill Prefix respectively and a ' (foot) symbol for the Suffix.



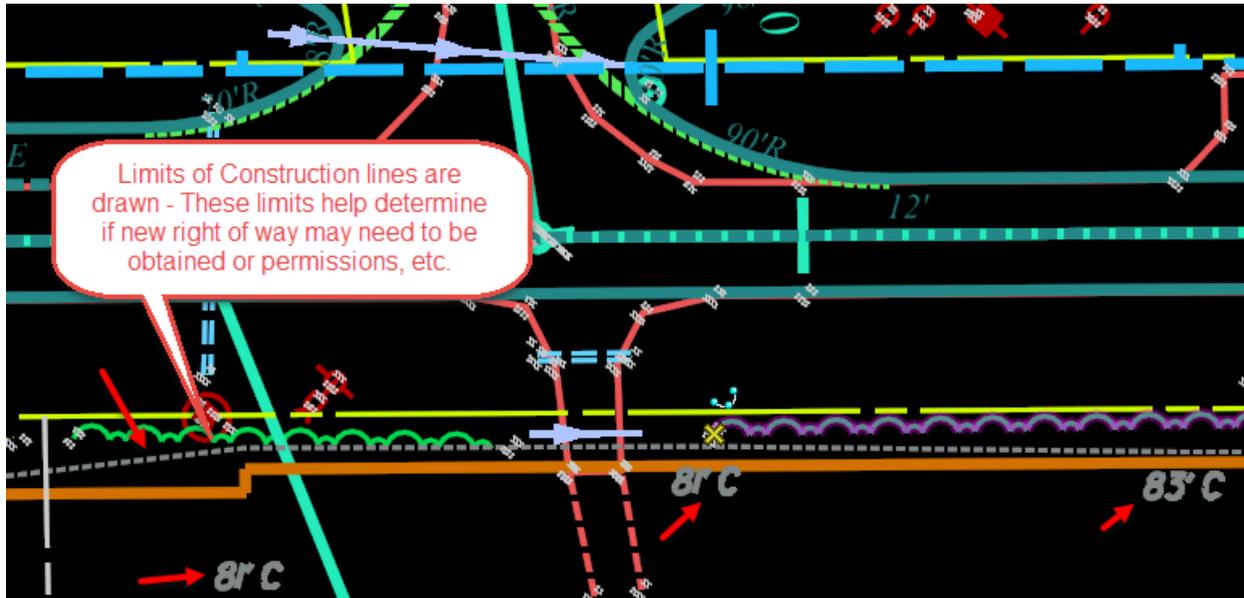
Double click on the **Left** symbology to set as shown below with center bottom justification. Use the **Copy/paste** to copy the symbology to the **Right** Symbology. Double click and change the Set Justification to center top for the Right offset.



Enter the **Left and Right Offset** set to 2.000 and press **OK** to accept. Press **OK** to return to the Limits of Construction dialog. Press the **Apply** button.

Review the Limits of Construction lines in the *pp.dgn file. These lines will help determine the areas that exceed the existing right of way where new right of way or permissions/easements may need to be obtained.

Manually draft the tie downs for the radii and the beginning and end of the project.



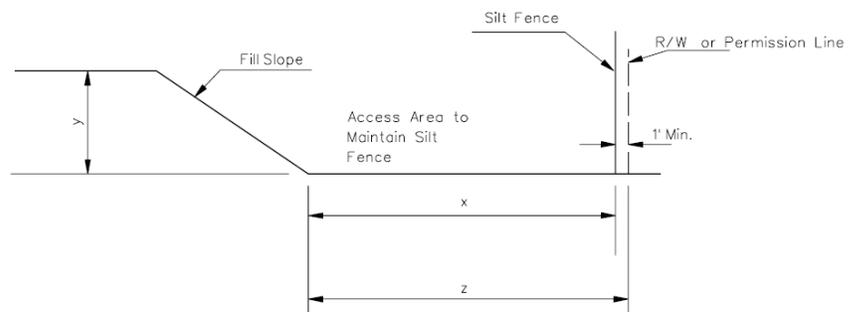
NPDES Lines

NPDES lines are to be placed on plans in areas where only fills exist. They are to be placed using the following parameters:

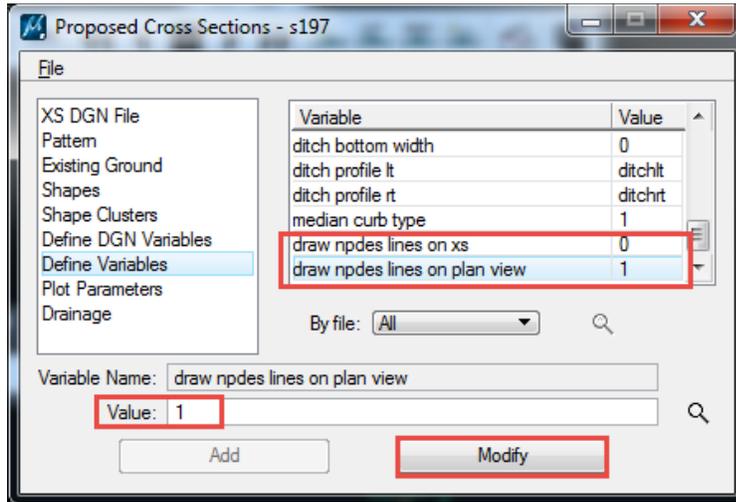
Level: RD_PD_DR_ErosCtrl
 Color: ByLevel (55)
 Style: ByLevel (NPDES)
 Weight: ByLevel (1)

Height of Fill (y) (feet)	Fill Slope	Minimum Silt Fence Offset from Toe of Slope (x) (feet)	Minimum Right of Way Offset from Toe of Slope (z) (feet)
<6	2H:1V	2	3
	4H:1V		
	6H:1V		
6-10	2H:1V	12	13
	4H:1V	3	4
	6H:1V	3	4
>10	2H:1V	12	13
	4H:1V	4	5
	6H:1V	4	5

The location of the NPDES lines is based on the chart in the Highway Design Manual (Chapter 30) and IB 2002-7.



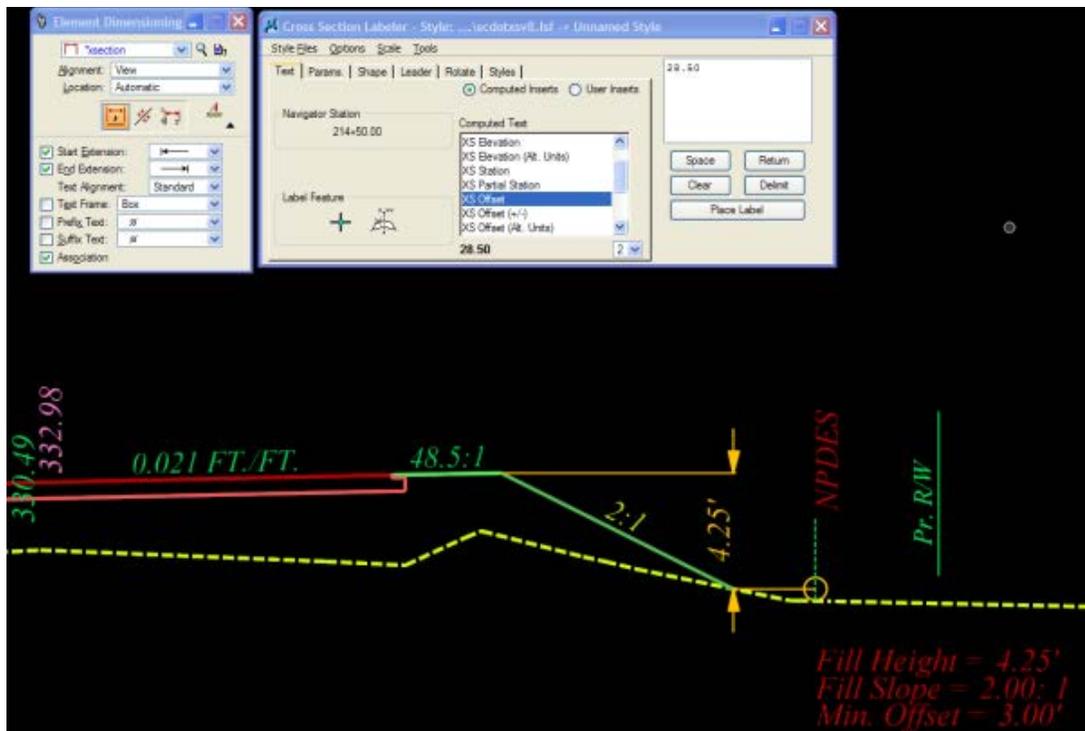
During the proposed cross section process, the options for Geopak Criteria to draw the NPDES lines exist for both the plan view and cross section view. Change the NPDES to “1” to draw the elements.



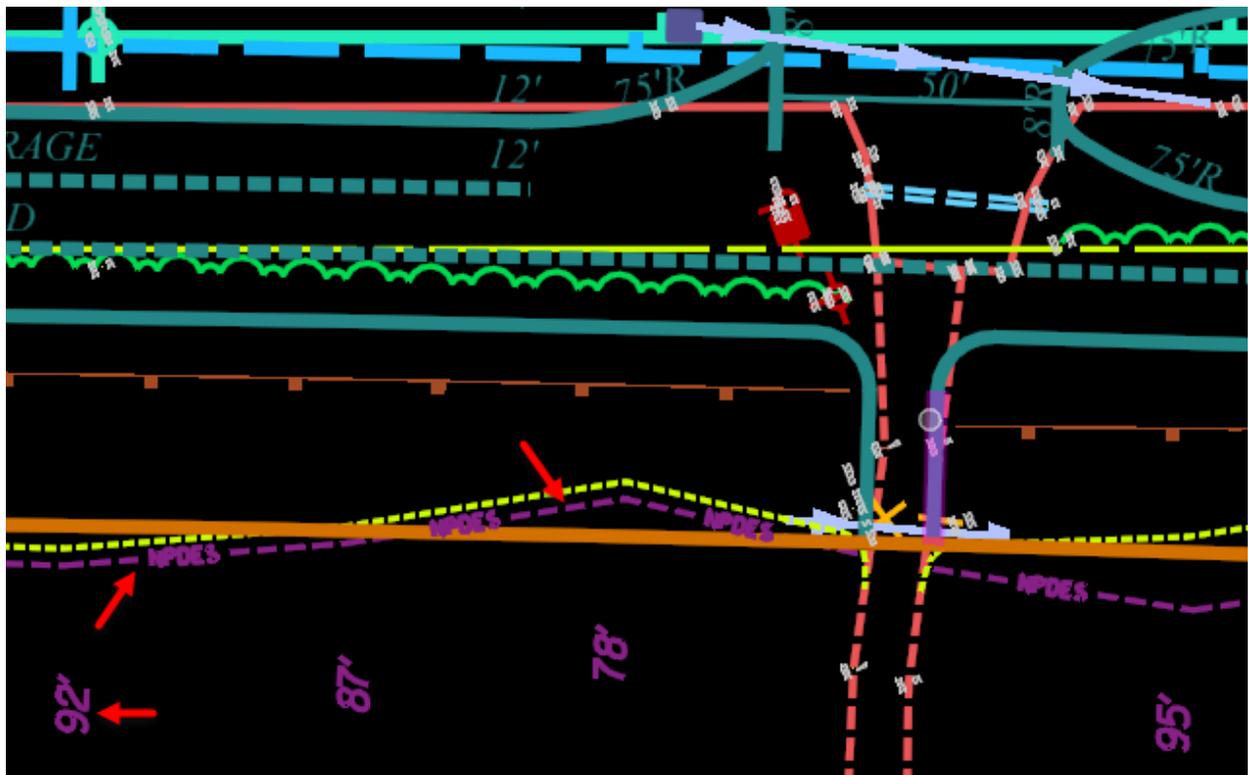
To manually draft the NPDES lines (because you have manipulated the cross sections after criteria for drainage changes), draw the NPDES lines based on height and offset from the chart onto the cross sections.

a) Cross Section Labeler

- Use the Cross Section Labeler in the *.dgn file to calculate the offset of the NPDES line
- Select the end of the sketch line drawn for the NPDES cell
- On the labeler, click on the data symbol and select the XS Offset from the “Computed Text” box and double click. This will place the information into the text box.
- Write down the Offset information. This will be used to draw the NPDES lines into the design file (*.pp.dgn)



- b) Dimension Tools
 - Select the Element Dimension from the tools.
 - Set the Dimension Style to “xsection”.
 - Select the fill slope and drag cursor to show the dimension from top of shoulder break to bottom of slope where it ties to the existing ground line.
- c) This information will be used to modify the NPDES cell.
- d) This needs to be reviewed when the designer makes changes to the cross section by adjusting slopes.
- e) Draw the information on the plans using the DP Station Offset tool and Place Line tool. Draw a line string on the correct level (RD_PD_DR_ErosCtrl) by entering the station/offset and pressing the DP button with the Place Line command active. A place holder can be used for the two end points to snap the line between if easier.
- f) Label the offset using the plan view labeler. Select the NPDES label. This will place it on the proper level of RD_TX_Drainage. The label should be rotated 90 degrees perpendicular to the centerline.



Profile Grade Report – Curb Profiles

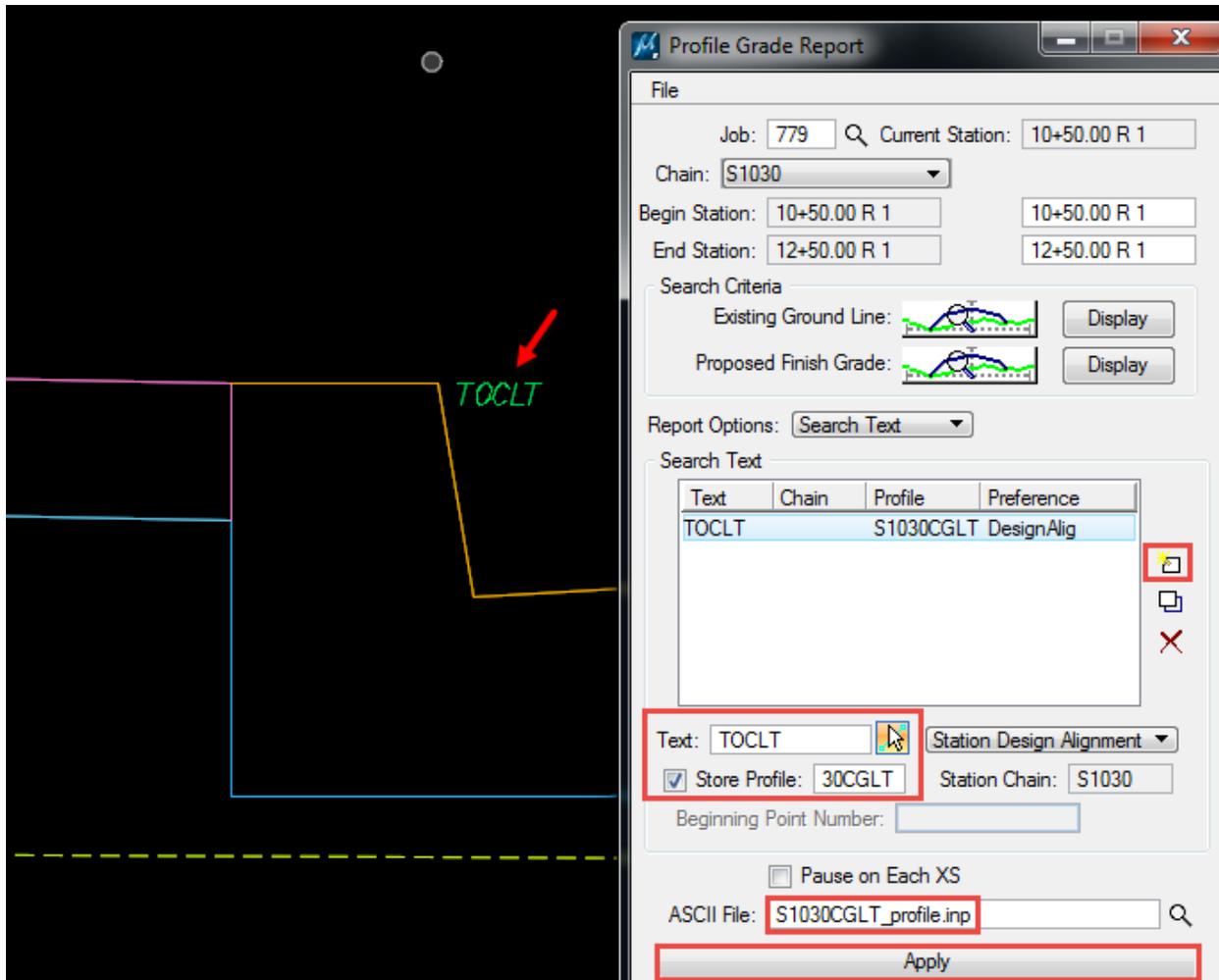
Earlier in the documentation, the critical points and ditch profile elevations were extracted using the Profile Grade Report tool. This tool is also used to extract the Top of Curb elevations to create the CGLT and CGRT profiles.

To access, select **Applications > Geopak > Road > Cross Sections > Reports** (or press the Reports & XS Quantities button on the Project Manager dialog).

Select the **Profile Grade** button. Select the **Job #, Chain, and Station Range**. Set the Report Options to **Search Text**.

Enter **TOCLT** in the Text field and set the toggle to **Station Design Alignment**. Toggle on the **Store Profile** and enter the ***CGLT** for the profile name. Enter an **ASCII file name** and press the **Add** button. Press the **Apply** button to generate the curb grade profile.

Repeat this procedure for the *CGRT profile.



Review the stored profiles using the **COGO Navigator**.

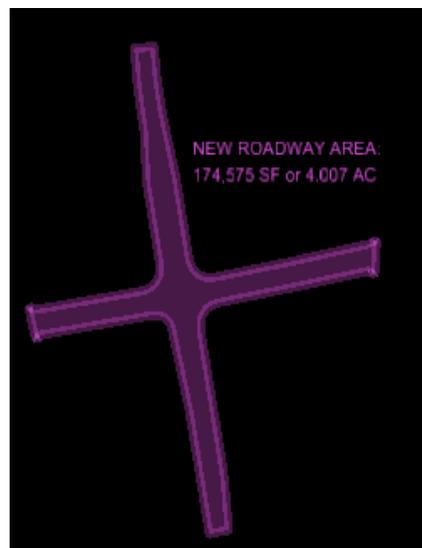
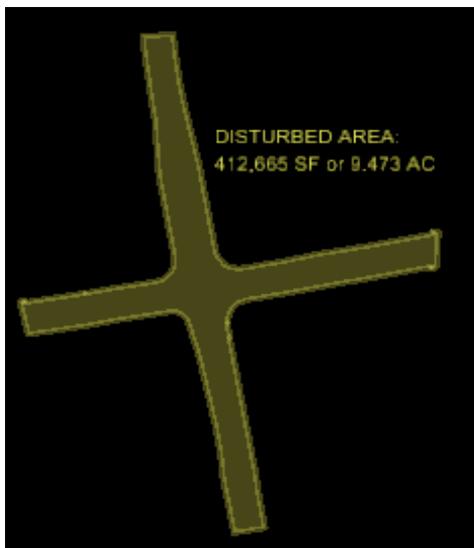
Next, load these profiles into the **Vertical Alignment Generator** to smooth the curb grades by adding vertical curves. (More documentation on curb grades to be provided soon.)

Reports – Seeding

The Reports & XS Quantities provides access to 16 different reporting capabilities in the Geopak cross section files. Seeding can be calculated by including the slope symbology or eligible elements in the cross section file and running the report to produce an output file for use in the plan quantities.

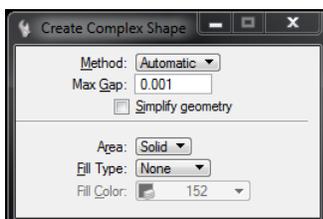
There are two methods to calculate seeding and users may elect to use one process over the other or a combination of the two methods to best represent the project seeding quantities.

By Area: To calculate seeding by area, the user will create shapes and flood to calculate. Isolate or create the disturbed area and the new roadway area. Once these areas have been measured, subtract the disturbed area from the new roadway area and the result will be the seeding area. See the example below.

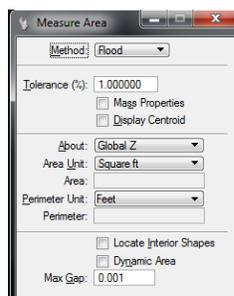


Note: Area calculations in plan view may or may not accurately calculate the best quantity for “steep slopes” that the Geopak seeding report tool may perform more accurately. Alternatively, the Geopak seeding report may not best represent the seeding quantities in intersections or tie roads due to cross sections not existing in these areas. This is why a combined method may be best for your project.

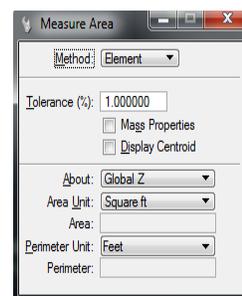
Take the disturbed area of 9.473 AC and subtract the new roadway area of 4.07 AC to get the total seeding area of 5.466 AC. To create the shapes, use the Create Complex Shape tool. Use this tool to create the boundary for the disturbed area and the new roadway area. After the shapes are created, you can measure the areas with the Measure Area tool. This tool can be set to Flood or element. These are the tool palettes to be used.



Create Complex Shape



Flood Area method



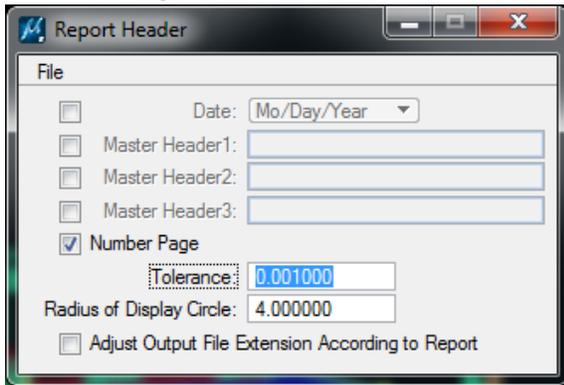
Element Area method

Geopak Seeding Report

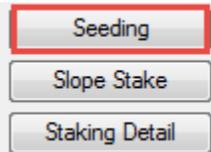


In the ***dx.dgn file**, click on the Reports & XS Quantities button in Project Manager (or select Applications > Geopak > Road > Cross Sections > Reports). Create a new run for the alignment.

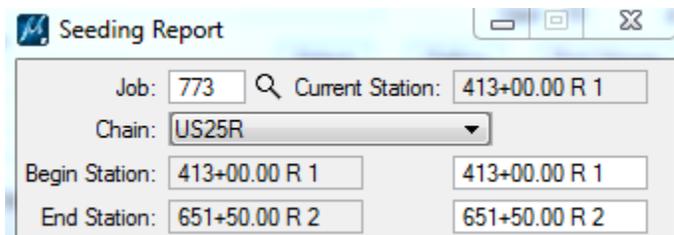
Select **User > Preferences** from the XS Reports dialog and set the Tolerance to 0.001. Close the Report Header dialog.



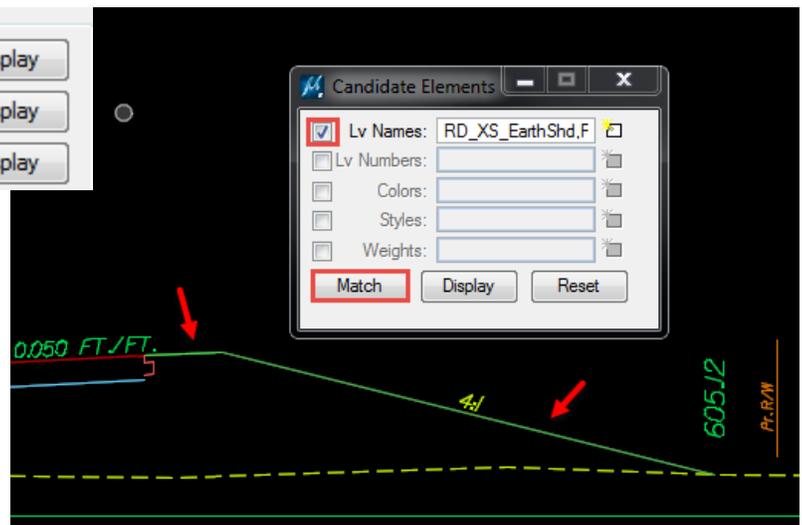
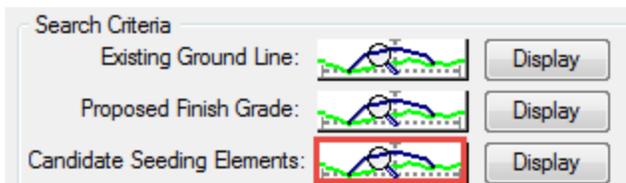
Press the **Seeding** button.



Enter the **Chain and Station** range.



Press the symbology button to identify the **Candidate Seeding Elements** (slopes in the *dx.dgn file).



For the Existing Ground – select the existing ground levels – RD_XS_EXGround

For the Proposed Finish Grade – select the top elements of the cross section – slopes and pavement only (no subgrade)

For the Candidate Seeding Elements – select the earth shoulder and tie slope elements where seeding will be place.

Enter a file name for the ASCII File name ***seeding.txt** and press the **Apply** button.

ASCII File:

Apply

In the project working directory, open the ***seeding.txt** file in Notepad to review the quantities.

SEEDING REPORT			
TOTAL	LEFT	RIGHT	BOTH
SF=	110745.0000	128194.0000	238089.0000
ACRES=	2.5424	2.9429	5.4658

Quantities calculated by either of the two above methods can then be inputted into the **Seeding Excel** file to total the quantities for all alignments totaled on the project.

<i>DATA</i>		<i>Items input by operator</i>
<i>Section 810 - Seeding Quantites</i>		
<i>Item No.</i>	<i>Pay Item</i>	<i>Quantity</i>
8100100	PERMANENT COVER	5.466
	TEMPORARY COVER 50%	50
8100200	TEMPORARY COVER	2.733
		Acre
		%
		Acre

Reports – Multiline (Gen) files

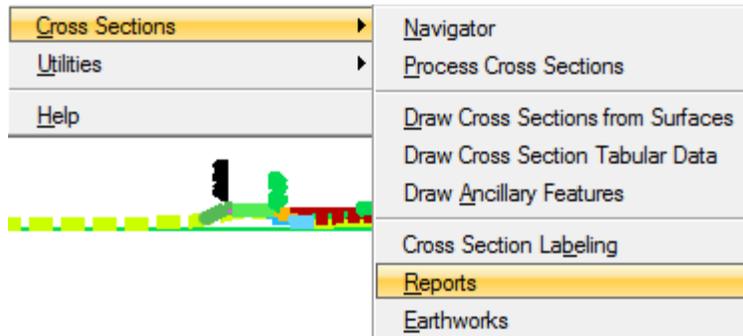
The Multiline (Gen) files are the electronic Geopak cross section report files used by the construction personnel to load the cross sections into their survey data collector. These electronic files increase the efficiency for the surveyor in the field saving time and reducing costs. It is important to recognize the downstream benefits of maintaining accurate electronic files for the surveyors, construction personnel, and contractors.

Exporting these files and reviewing also provides the designer an extra quality assurance check for their plans by allowing them to verify what the construction person is building via electronic files matches the paper plan sheets.

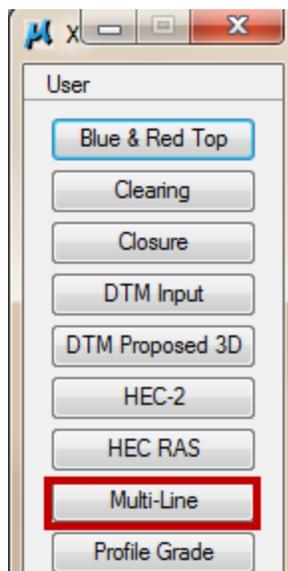
In a push to get the paper plan out, designers tend to edit the text of ditch elevations or curb grades and not modify the linear graphics of the cross sections. *This causes discrepancies in the electronic files for the construction personnel.* Manually editing survey text files is difficult and omissions or errors can compound.

It is recommended to **always modify both the linear graphics and the text elevations** in the cross section files to ensure better data integrity. {Should only the text be modified and not the linear graphics, please denote the stations in the EED_index.xlsx file where this has happened.}

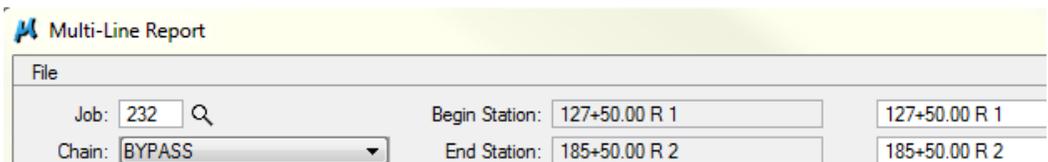
Select the **Reports & XS Quantities** button on the Project Manager and create a new run. (Or select Applications > Geopak > Road > Cross Sections > Reports)



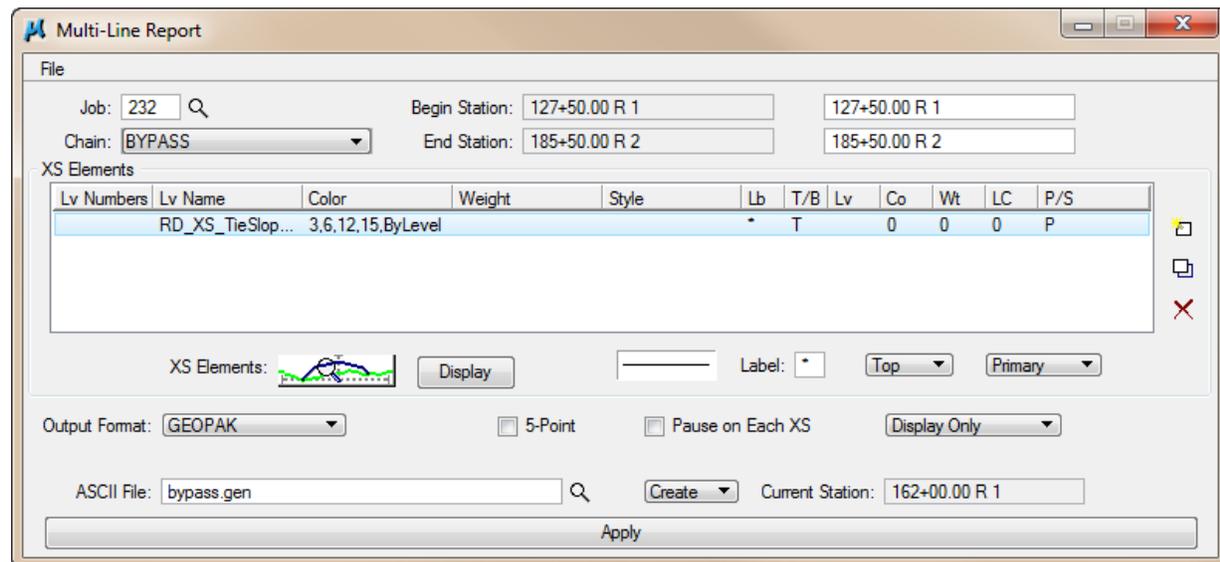
Select the **Multi-Line** button



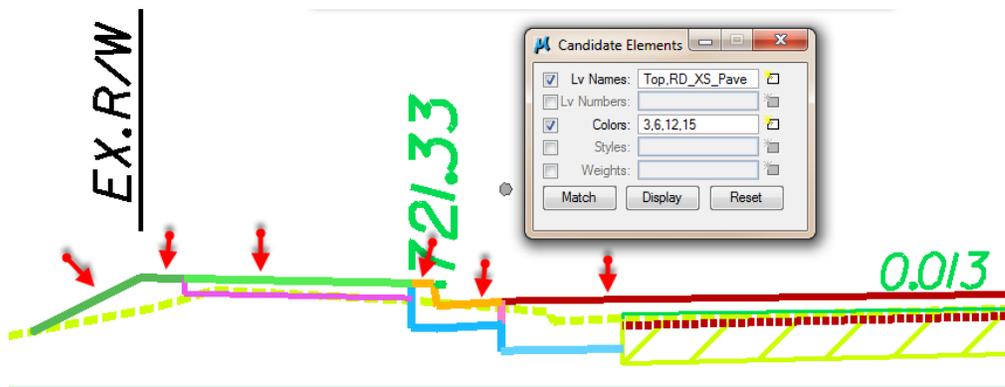
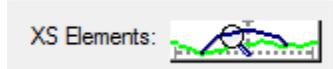
Refresh the **Job #** by browsing and select the **Chain** name. Notice the Begin and End Station refresh on the right hand side.



Perform the following steps to complete the dialog as shown below:



- Set the Output Format to **GEOPAK**
- Enter an ASCII File name – **bypass.gen** (extension should be gen)
- Set the toggle to **Create**
- Press the Symbology box next to **XS Elements** in the center of the dialog
 - Press the Reset button to clear previously set values
 - Check on Lv Names and Colors
 - Press the Match button
 - Zoom into the Cross Section and select the top elements of the proposed cross section like shoulders, ditches, roadway, etc.
 - Press the Display button to make sure you selected everything
 - Use the Cross Section Navigator to scroll thru the cross sections to check for any typical changes where other elements may need to be selected
 - Close the X button to save the settings selection when done



- Press the **Add** icon (upper right white icon next to the white box)
- Ensure that the toggle is set to Top
- Press the **Apply** button



The text can be reviewed in the *.gen file in Notepad (or in the Carlson SurvCE emulator program – see the Carlson Data Verification Instruction on the Construction Support site).

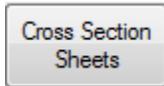
Scaling Cross Sections

Original cross sections may have been drawn at a 5x5 (1:1 scale) and need to be scaled to 10x5 (2:1) to fit a wider corridor project on the cross section sheets or to double stack cross sections to reduce the number of sheets required.

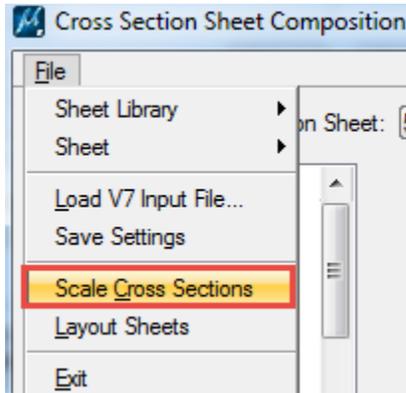
In the *.dx.dgn file, select the Cross Section Navigator tool to verify that the original cross sections were drawn at 5H:5V.



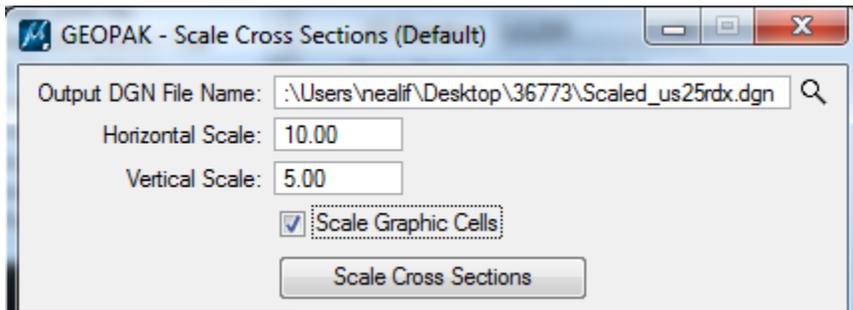
Select the **Cross Section Sheets** button on the Project Manager dialog (or select Applications > Geopak > Road > Cross Sections > Cross Section Sheet Composition). Create a new run.



Select **File > Scale Cross Sections**



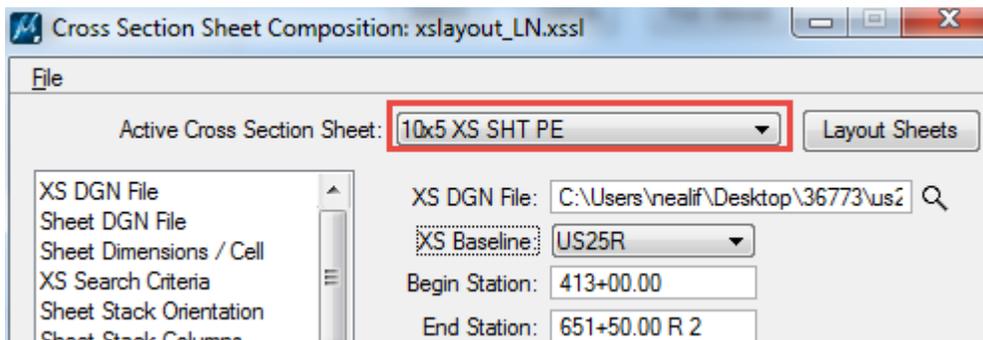
Edit the file name at the end of the Output DGN File name box to **Scaled_*.dgn**. Edit the **Horizontal scale to 10.00** and the **Vertical Scale to 5.00**. Toggle **ON** the Scale Graphic Cells box and press the **Scale Cross Sections** button.



Review the newly scaled cross sections with the Cross Section Navigator tool.



Layout sheets using the 10x5 sheet instead of the 5x5 sheet.

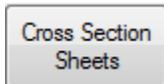


Cross Section Sheet Composition

The Cross Section Sheet Composition tool automates the process of creating cross section plan sheets. Each cross section is displayed as a reference file and labeling for chain, station, offsets, and elevation are added. Title block information is also automated. There are settings to control the spacing between sections, number of sections per sheet, labeling, and number of stacks.

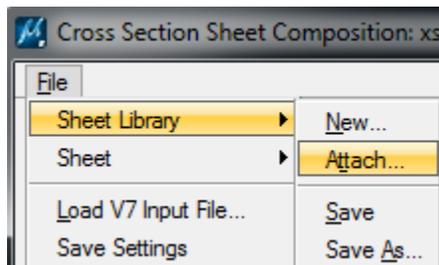
Create a new *.fx.dgn design file for the cross section sheets.

Select the **Cross Section Sheets** button on the Project Manager dialog (or select Applications > Geopak > Road > Cross Sections > Cross Section Sheet Composition). Create a new run.



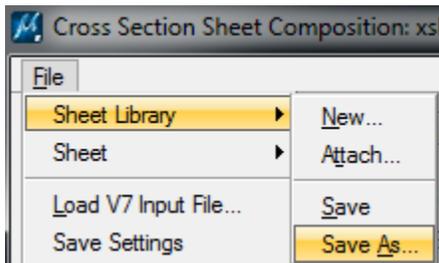
Select **File > Sheet Library > Attach** to attach the *.xssl file.

[Workspace: SCDOT-Bentley\Standards\SCDOT_Design\Geofiles\Sheets\Xsection]



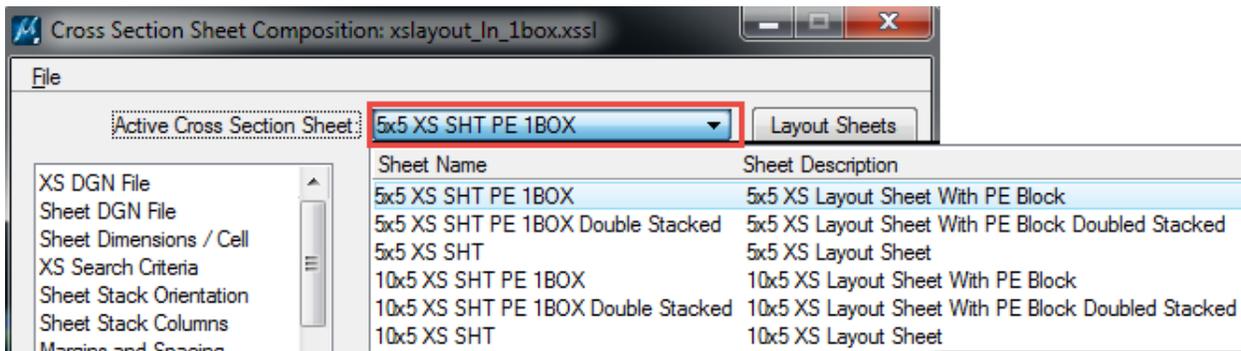
The xslayout_In.xssl file has already been set with preconfigured settings to assist getting started with the sheet layout.

After the *.xssl is edited to meet project specific settings, this file can be saved and re-loaded for future runs into the project working directory by selecting **File > Sheet Library > Save As**. It is recommended to create a *.xssl for each alignment on the project that requires cross section sheets.

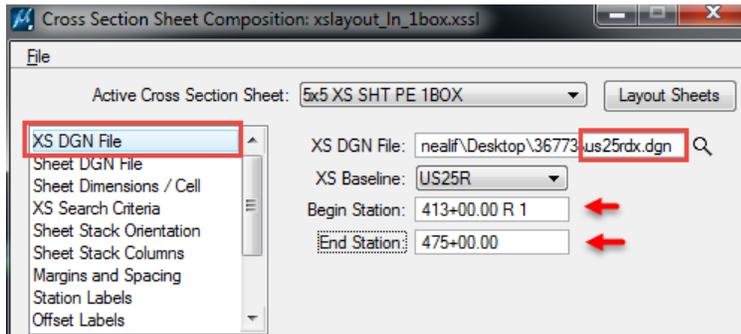


To re-load a previously saved library, select **File > Sheet Library > Attach** and navigate to the project working directory to select the project.xssl.

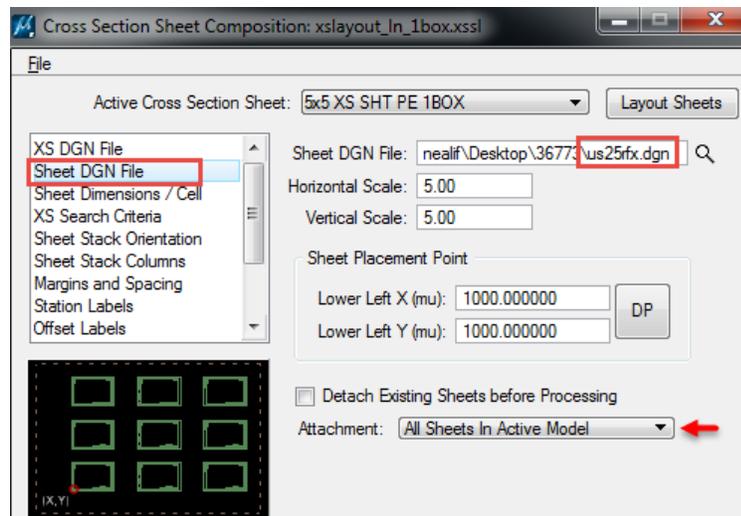
For the **Active Cross Section Sheet**, select the sheet type from the drop down box.



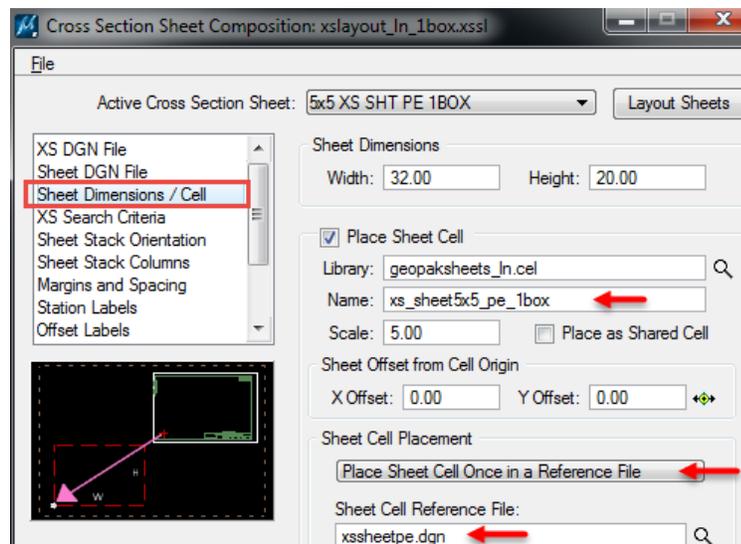
XS DGN File: Select the current ***dx.dgn** file, the chain and the station range to layout on the cross section sheets.



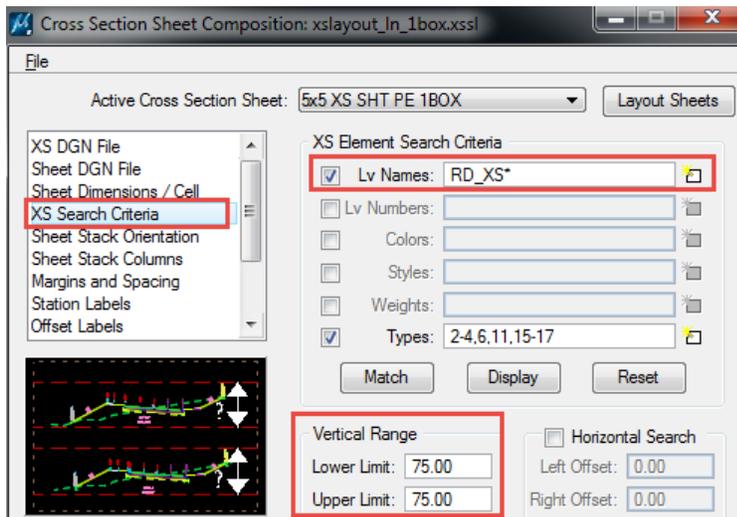
SHEET DGN File: Select the newly created ***fx.dgn** file, the chain and ensure All Sheets in Active Model is selected under Attachment.



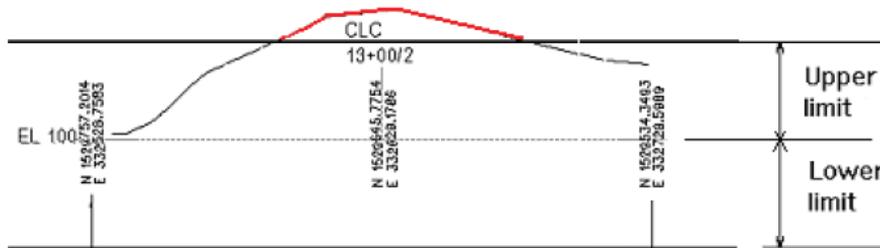
Sheet Dimensions/Cell: Check the Name of the cell set by the Active Cross Section Sheet. Toggle Place Sheet Cell Once in a Reference File. Accept the default name (rename if you have a mixture of types of sheets – single scale, double scale, double stacked, etc. so that you have use only one reference file per type of plan sheet.)



XS Search Criteria: The Search Criteria looks at the elements above and below the Geopak cross section cell. It will search for the highest and lowest graphical element on the levels specified. If cross sections are drawn on any other level than RD_XS* levels, add the additional levels to the Search Criteria.

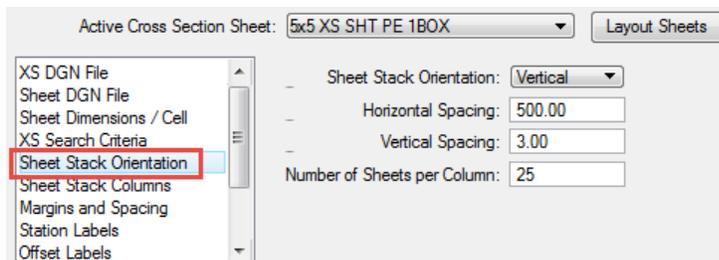


The Vertical Range is a “range” for searching, not a clip limit. It will look 75’ above and below the cross section cells to locate the highest and lowest graphical element. If the cross sections exceed those limits, then elements will be cut off in the sheet file. You will need to expand the range to greater values when this happens. (More likely in hilly terrain areas or large areas of fill.)

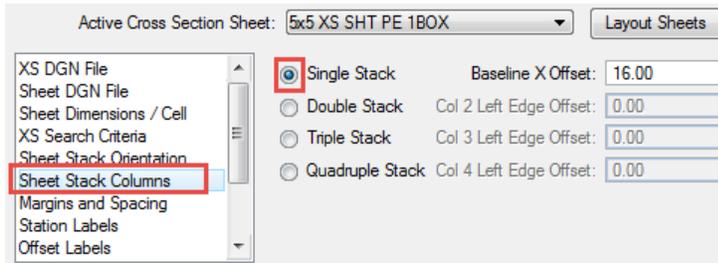


When ditches are modified after sheets have been produced, or right of way limits are extended horizontally, the “clip limits” may not allow all these elements to be shown on the sheet files. If possible, re-layout the cross section sheets again. If too many modifications have been made where it is not feasible to layout sheets again, use the process on page 17 to re-clip the cross sections to show all elements.

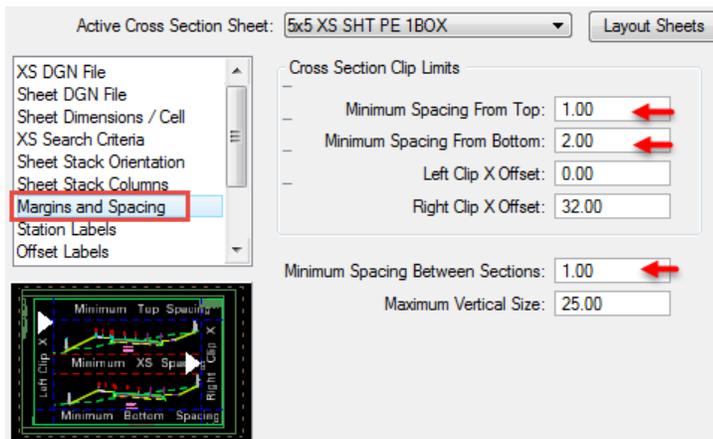
Sheet Stack Orientation: Accept the defaults for the sheet layout unless you have a particular need to change the number or spacing arrangements.



Sheet Stack Columns: Accept the defaults. (If running double stacked sheets, see settings in the next section of instructions.)



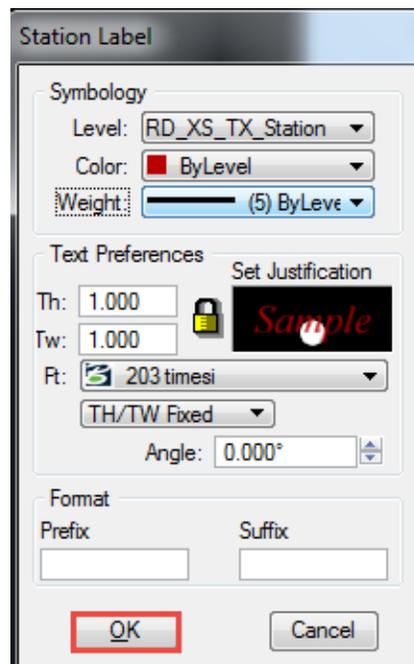
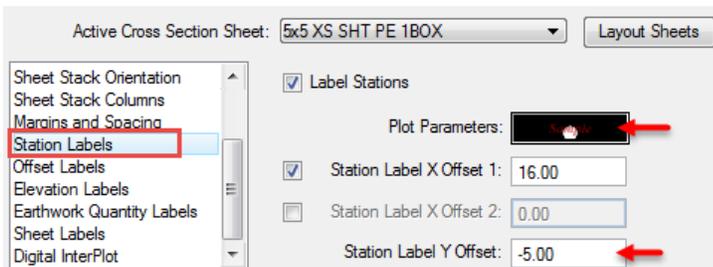
Margins and Spacing: Accept the defaults for the initial run.



If the cross sections are relatively flat, you can use a tighter spacing between sections. If the cross sections are more hilly/greater fill, you may need to increase the spacing to 2.00 or 3.00 to ensure the sections do not overlap each other.

If less room is needed for labeling, the minimum spacing from top and bottom can be set to 1.00.

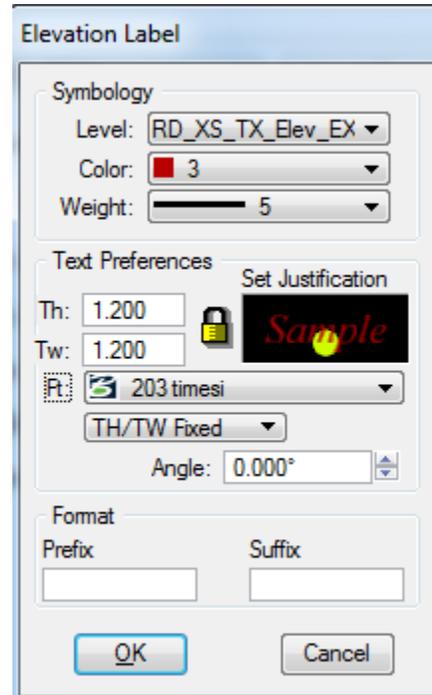
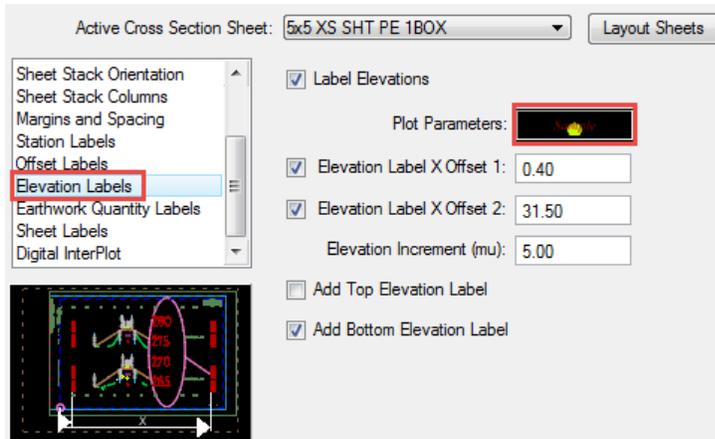
Station Labels: Double click to set the Station text as shown below. The Y Offset can be modified to place the text closer or further from the cross section itself.



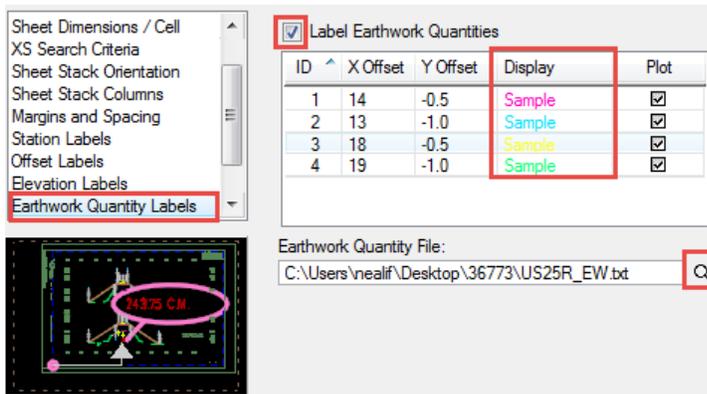
See the Clean up FX File instruction below for ensuring the labeling is legible on the plan sheets.

Offset Labels: Accept the defaults for offset labels to be turned off.

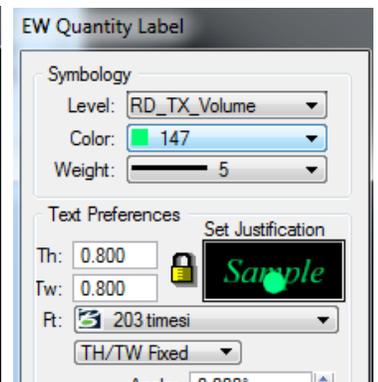
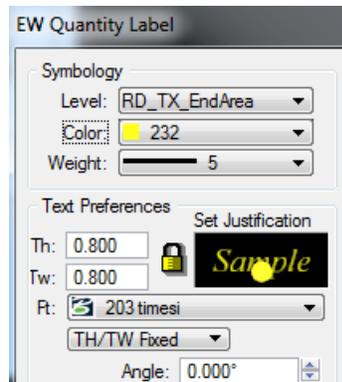
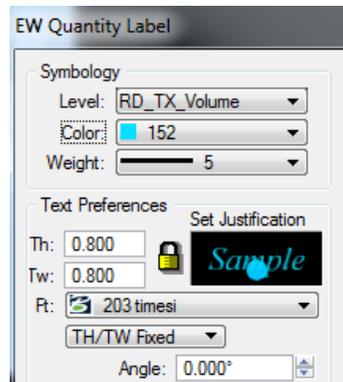
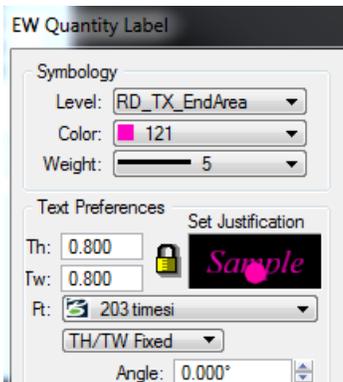
Elevation Labels: Set the Plot Parameter symbology for the Elevation Text as shown below.



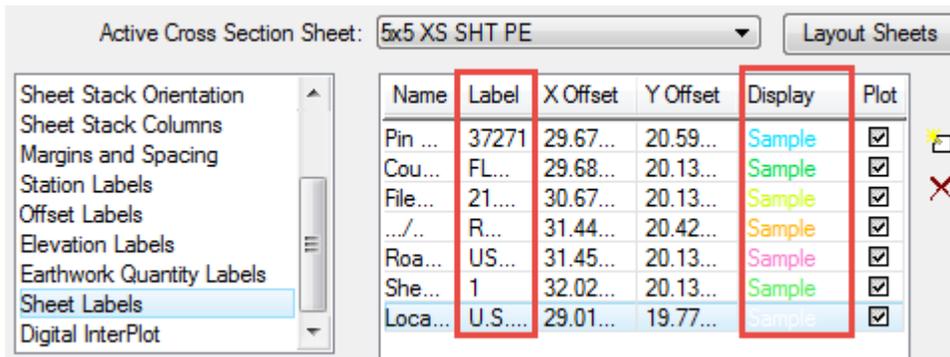
Earthwork Quantity Labels: Toggle ON to plot the Earthwork Quantities onto the plan sheets. Browse to select the *EW.txt file. Set the symbology for each of the offsets as shown below.



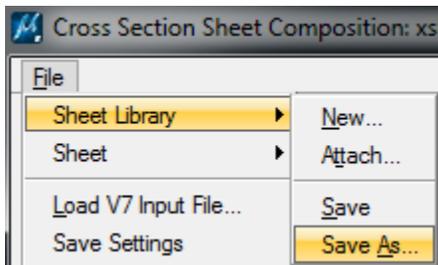
Use the Adjusted Earthwork numbers from the EWBS program output VXT, not the EW.txt from Geopak for plan sheets to accurately represent the Average End Method volumes accurately.



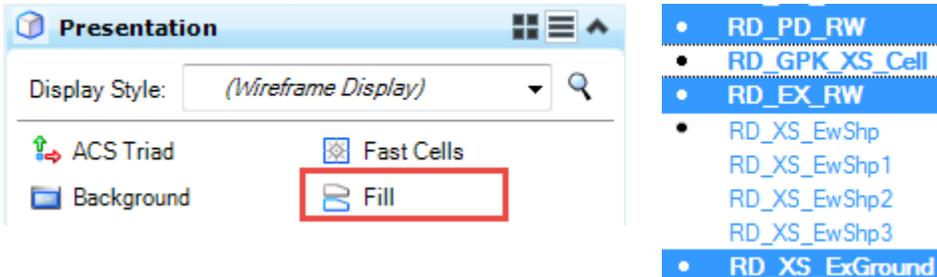
Sheet Labels: Click in each box to enter the **Project** information to be shown in the Title block. (In the Display section, edit the colors for each if desired. It is helpful when colors are assigned to use the Select by Attributes later to move the items around individually.)



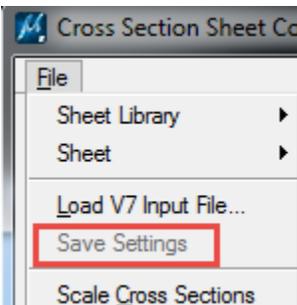
Select **File > Sheet Library > Save As** and save the *.xsl for the alignment.



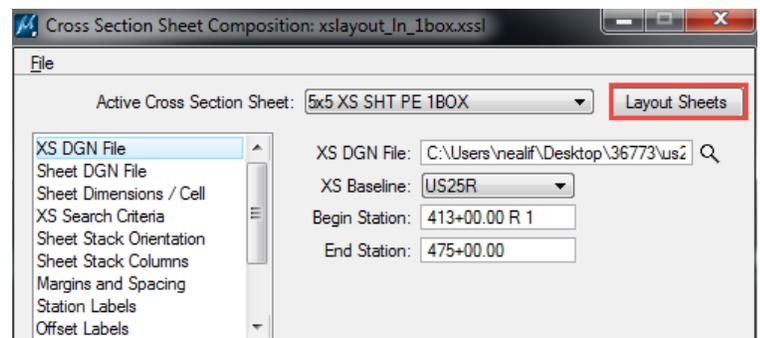
Make sure the **Fill** is turned off. Make sure the RD_GPK_XS_Cell & RD_XS_EwShp* levels are turned off. Select **File > Save Settings** from the top MicroStation tool bar (or press Ctrl + F)



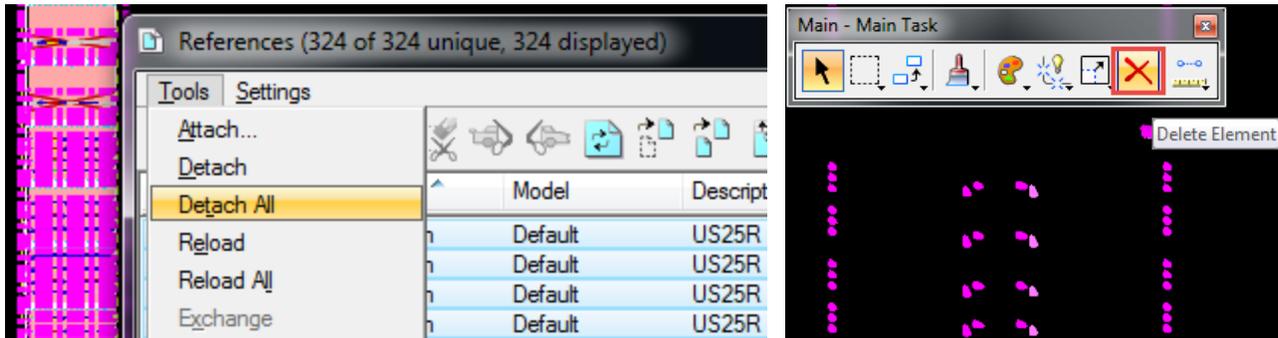
Select **File > Save Settings** to save the settings for the cross section run.



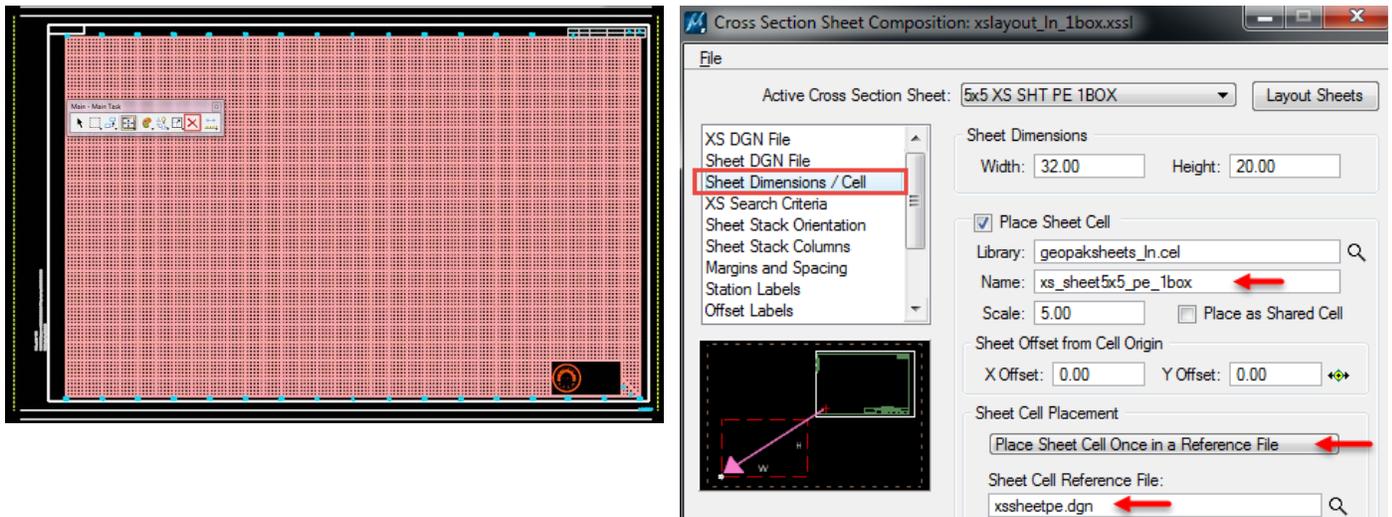
Press the **Layout Sheets** button to process the sheets.



To re-run cross sections into the same *fx.dgn file, select the References dialog and **detach** all of the references. Select **Ctrl + A** to select all elements inside of the fx file and press the **Delete X** to delete. Select **File > Compress > Design** to compress the file before re-running.



Each time the cross sections are run and the Sheet Cell Reference File name is the same, the cell is placed a 2nd time in the xssheetpe.dgn file. Open this file and **delete** one of the cells.



To place the Engineer of Record PE seal as a reference to each of the cross section sheets, open the xssheetpe.dgn file.

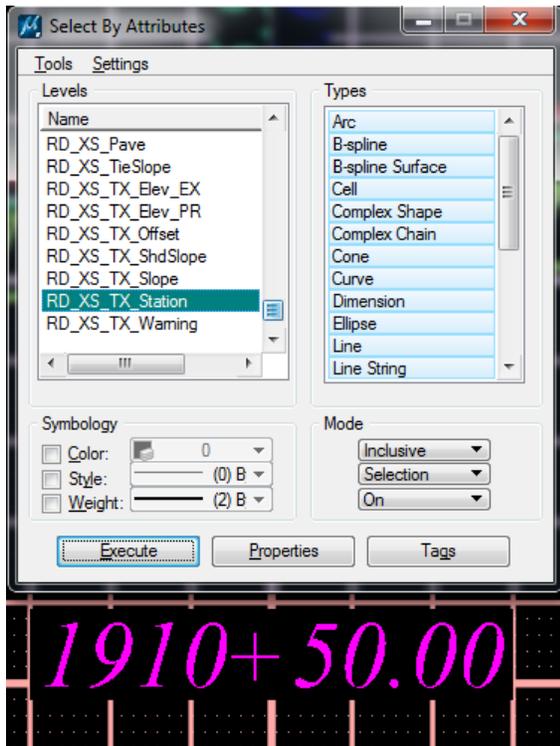
Select the **Place Cell** tool, browse to select a cell. Select **File > Attach File**. Select the SCDOT_PE.cel library. Enter a scale of 0.1 X/Y to place the cell in the center of the box in the lower right corner of the sheet.



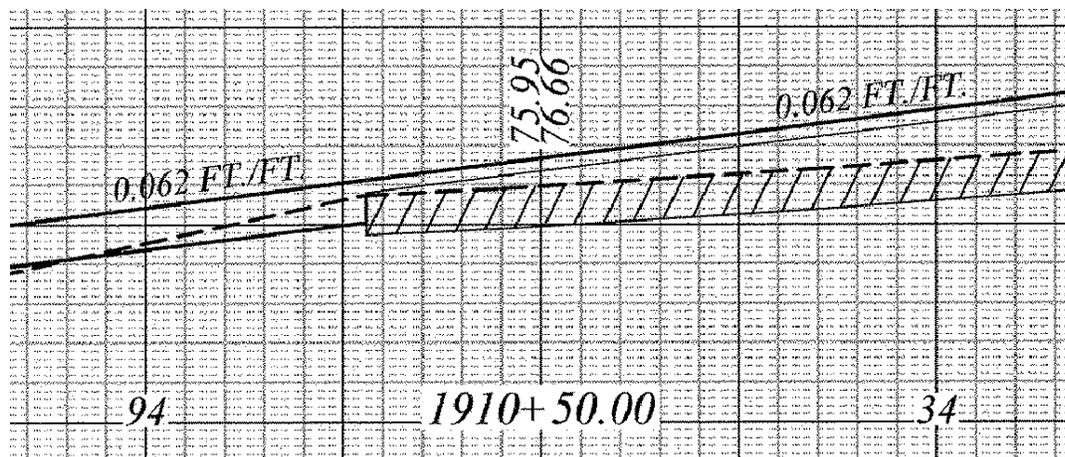
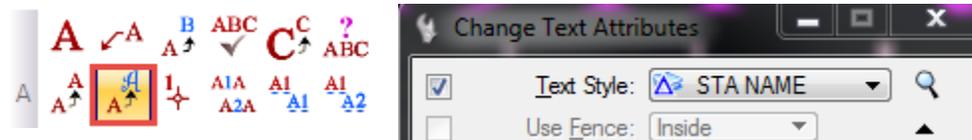
Clean Up Text in FX File:

For better legibility on the plan sheets, in the *fx.dgn file, select **Edit > Select by Attributes** after processing.

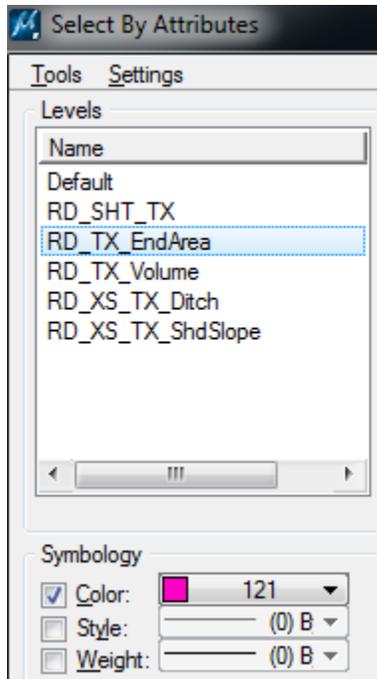
Select the **RD_XS_TX_Station** level. Press the **Execute** button to select all of the stationing text.



Select the Change Text Attributes tool and select the **STA NAME** text style to background out the grid lines behind the text.

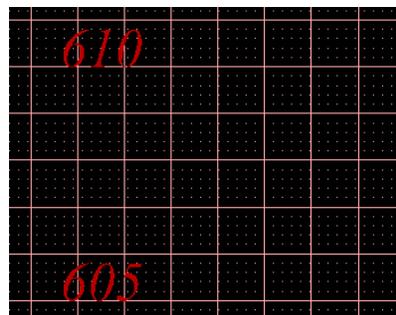
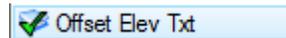


Repeat the Select by Attributes command to select the Earthwork text by both the Level & Color for each of the 4 texts. Use the Change Text Attributes to assign the appropriate Text Style to each.



- EW_END AREA
- EW_END AREA1
- EW_VOLUME
- EW_VOLUME1

There is also a text style **Offset Elev Txt** for the side elevations of each cross section.



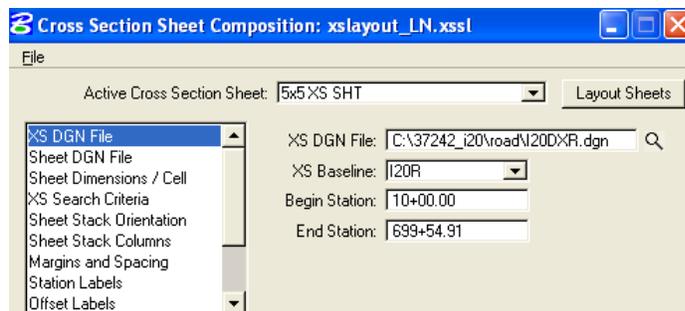
Double Stacked Cross Section Sheets

In order to conserve resources and reduce the number of sheets per plan set, designers may choose to use double stack cross section layout on applicable projects.



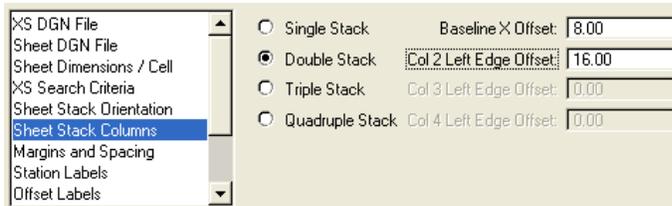
Open the *.dx.dgn file and start the Cross Section Composition tool.

On the **XS DGN File** tab choose the 5x5 or the 10x5 XS SHT for the type of cross sections you need to layout. Choose the *.dx file and set the baseline and begin/end station range.



On the **Sheet DGN File** dialog, choose the *.fx file. Accept the default settings on the **Sheet Dimensions / Cell**, **XS Search Criteria**, and **Sheet Stack Orientation** dialogs.

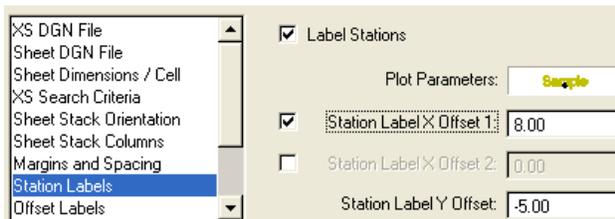
On the **Sheet Stack Columns** dialog, set the toggle to **Double Stack** and adjust the Baseline X Offset to 8.00 and the Col 2 left Edge Offset to 16.00.



On the **Margins and Spacing** dialog, set the Min. Spacing Form Top to 0.00. Min Spacing From Bottom to 1.00, and the Right Clip X Offset to 16.00.

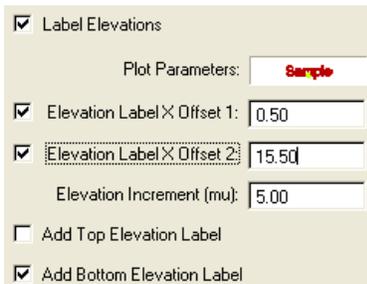


On the **Station Labels** dialog, set the Station Label X Offset 1 to 8.00 and the Station Label Y Offset to -5.00.

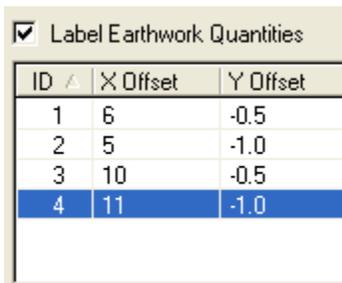


Accept the defaults on the **Offset Labels** dialog.

On the **Elevation Labels** dialog, set the Elevation Label X Offset 2 to 15.50.

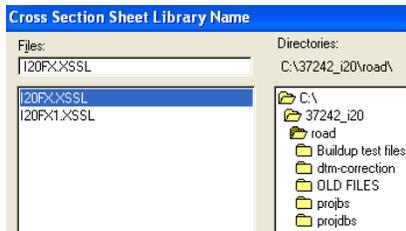


On the **Earthwork Quantity Labels** dialog, set the X Offsets as follows: 6, 5, 10, 11 for IDs 1-4.



Enter your project information on the **Sheet Labels** dialog as you normally would.

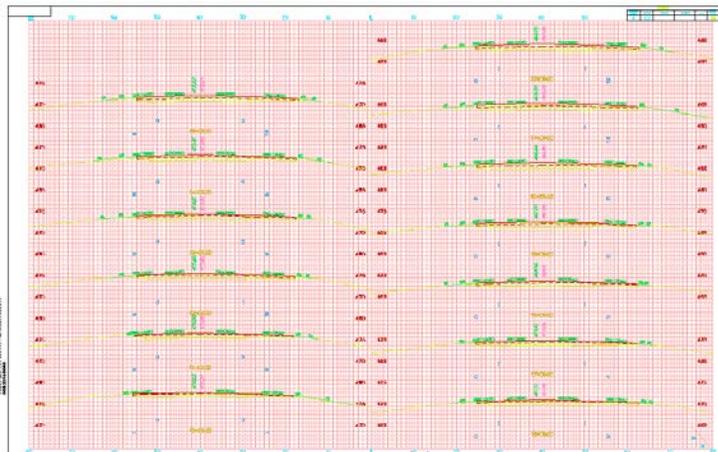
Select **File > Sheet Library > Save As** from the top menu bar to save the customized *.xssl file to your working directory.



Press the **Layout Sheets** button on the top right to generate your cross section sheets.



Open the *.fx design file and review the cross section sheets.

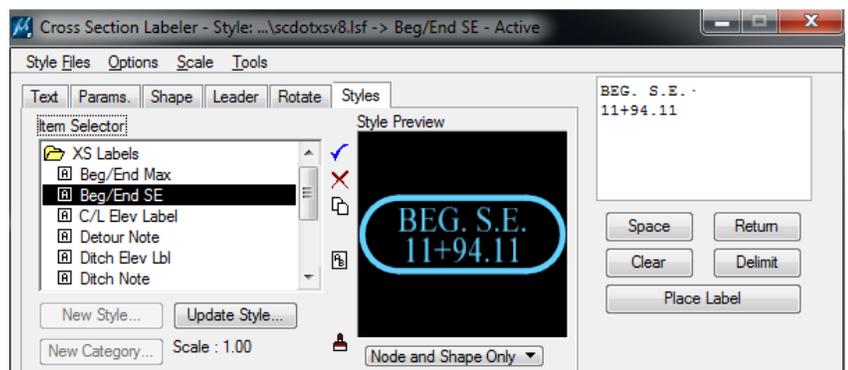


Cross Section Labeling

The majority of the cross section labeling will take place in the *.fx.dgn design file to ensure legibility on the cross section sheets. There are a few items that can be labeled directly in the *.dx.dgn file.

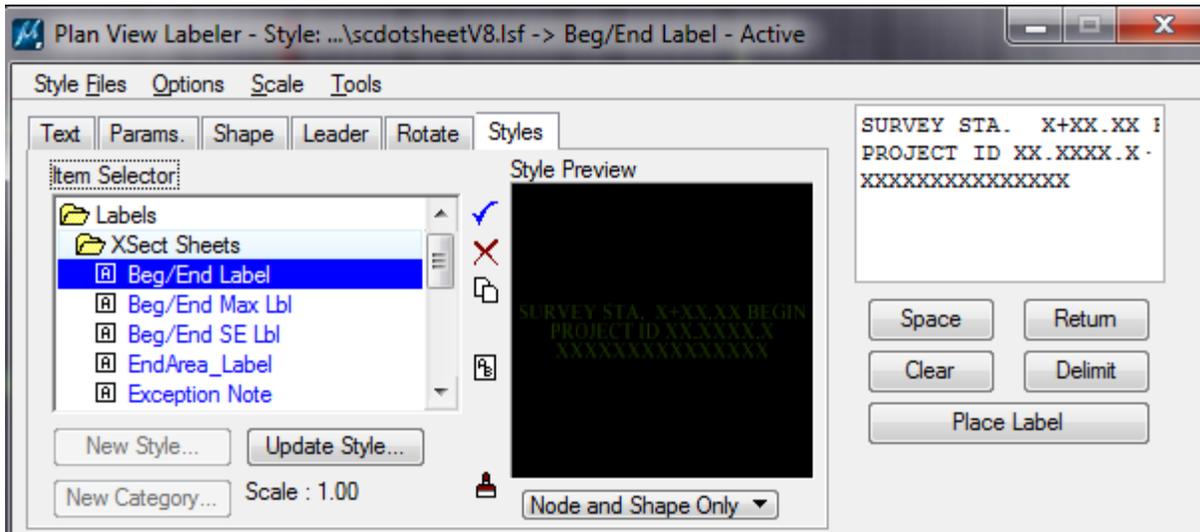
In the *.dx.dgn file, select the Cross Section Labeler tool from **Applications > Geopak > Road > Cross Sections > Cross Section Labeling**.

Select the **Styles** tab and then select **File > Attach** and select the **scdotxsv8.lsf** for cross section labeling. In the XS Labels folder, use the styles defined to label the Begin/End Max and SE (superelevation). Add the ditch notes. Use the styles for centerline elevation, slope, etc. if manually adjusting cross sections.

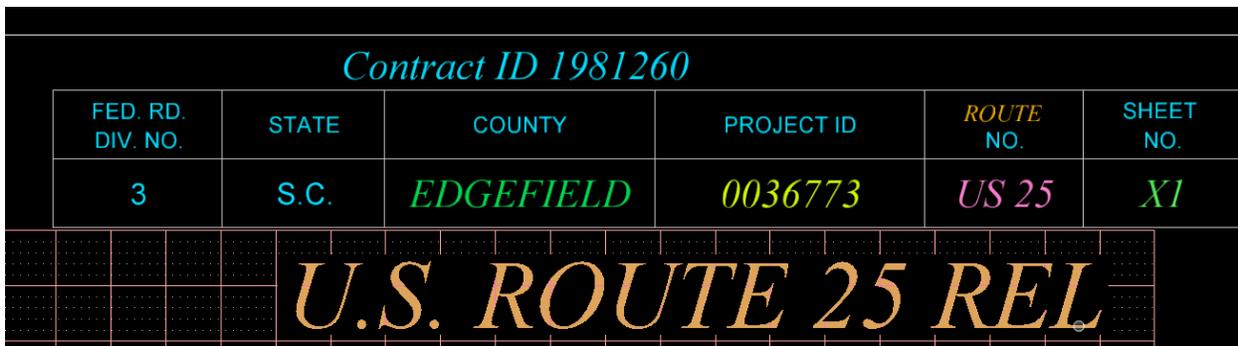


In the ***fx.dgn** file, select the Plan Labeler tool **Application > Geopak > Road > Plans Preparation > Plan View Labeling**.

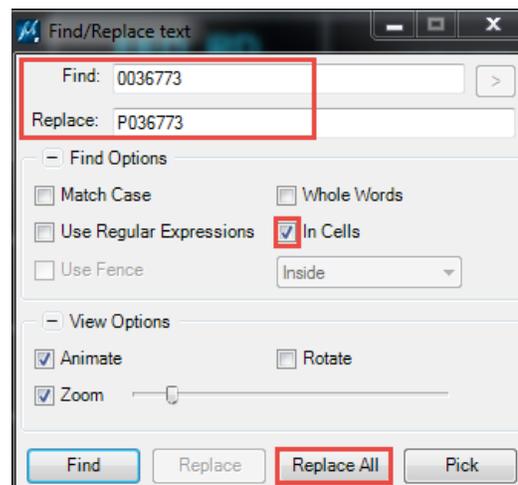
Select the **Styles** tab and then select **File > Attach** and select the **scdotsheetv8.lsf** for sheet labeling. In the Xsect Sheets folder, use the styles defined to label the Begin/End stationing labeling, begin/end superelevation, end area labels, ditches, exceptions, toe of fill, and volume labels.



If the Title block information has not previously been filled out, use the Sheet Labels folder to label the Title block information in the **xssheetpe.dgn** file to reference to each of the sheets.



If the Project information changes during the course of the plan production, use the **Edit > Find/Replace** MicroStation tool to replace the text.

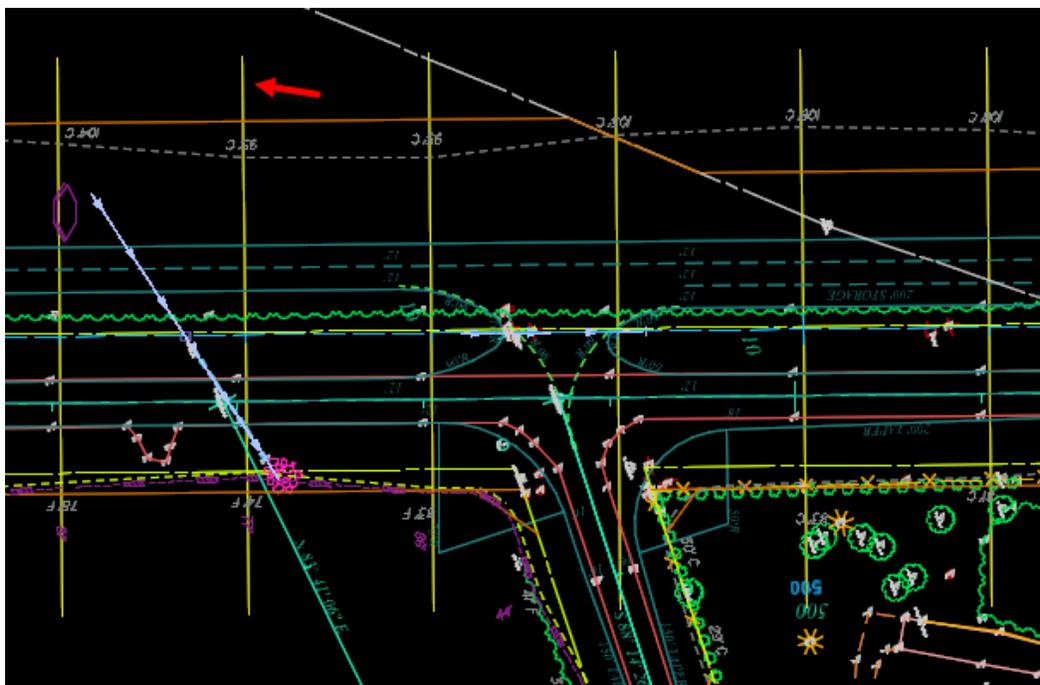
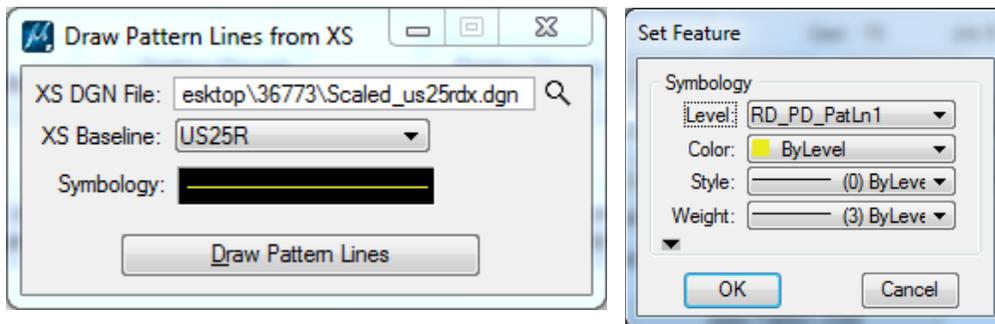


Draw Patterns from Cross Sections

At times you may receive a *.dgn file that was drawn by stationing or in another software program without the use of pattern lines. To create pattern lines for redrawing the cross sections, **open the file where the pattern lines will be drawn** (*.sh.dgn or *.pat.dgn).

Select **Applications > Geopak > Road > Cross Sections > Draw Patterns from Cross Sections**.

Select the *.dgn file to locate the Geopak cross section cells to draw the pattern lines. Select the **XS Baseline (chain)** and set the **Symbology** for the pattern lines. Press the **Draw Pattern Lines** button.

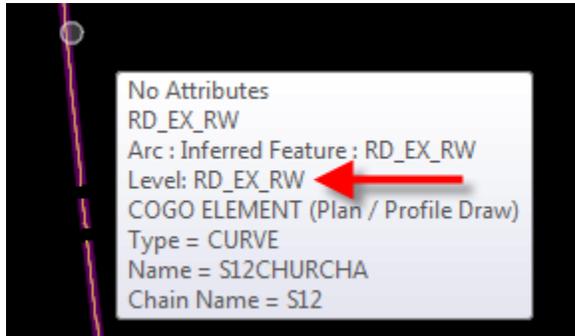


Bentley Map

The Bentley Map feature in MicroStation is utilized to import and export GIS data in the form of shapefiles (*.shp) of graphical elements from the design file.

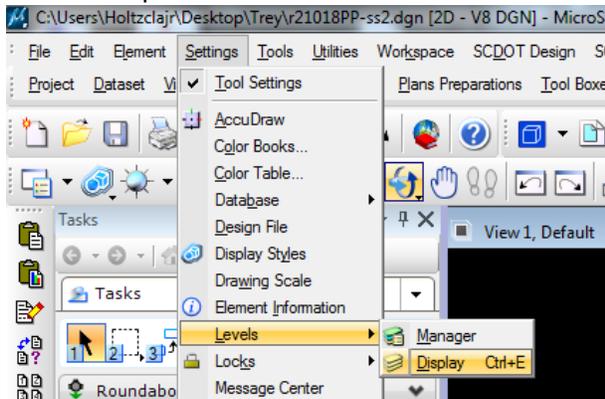
Export DGN Level to Shape File

Identify the level(s) the desired graphical objects are on. Hovering the mouse cursor over an object will display information about it.

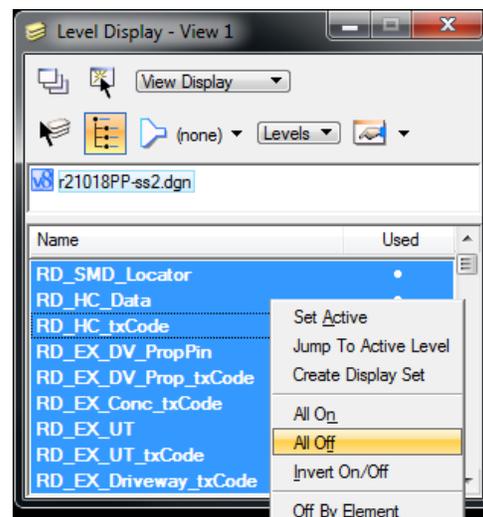


Only one level can be exported in a given shape file. If objects to be exported are scattered across several levels, they will need to be exported individually by repeating this process.

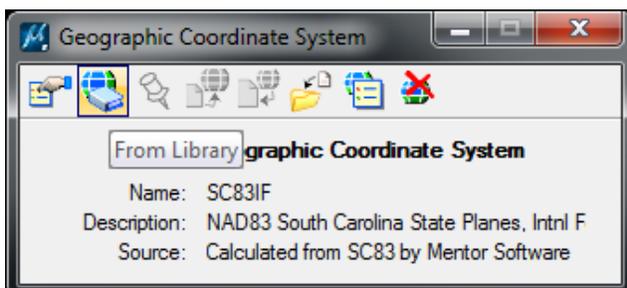
Isolate the level to confirm that only objects to be exported are on it. Select Settings > Levels > Display from the top menu bar.



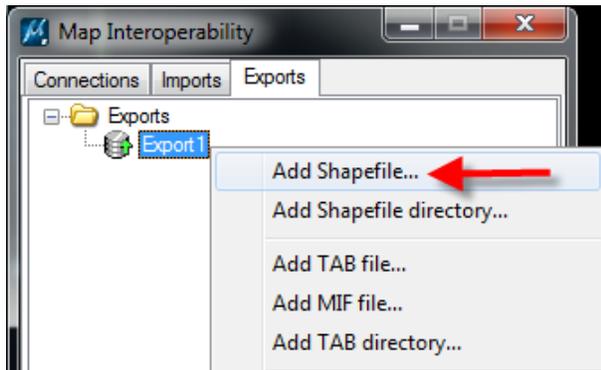
Right click the list of levels and choose **All Off**, then scroll through the list to the desired level and double click to turn it back on and activate it (highlighted).



In the menu bar, choose **Applications > Map > Activate Map** to activate the Bentley Map software. Then choose **Tools > Geographic > Geographic Coordinate System**. Verify it is set to the SC83IF.

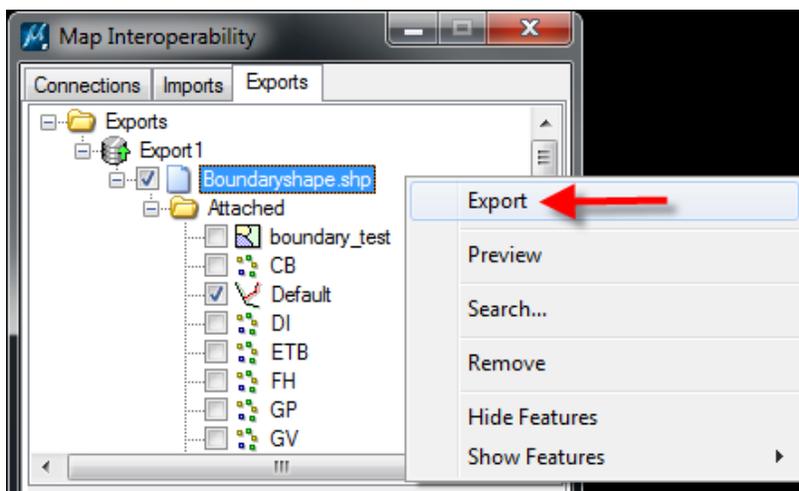


Select **File > Export > GIS Data Types** to begin the export process. In the Map Interoperability window, right click on the **Exports** folder and choose New Export. Then, right click on the Export1 icon that appears and choose **Add Shapefile**.



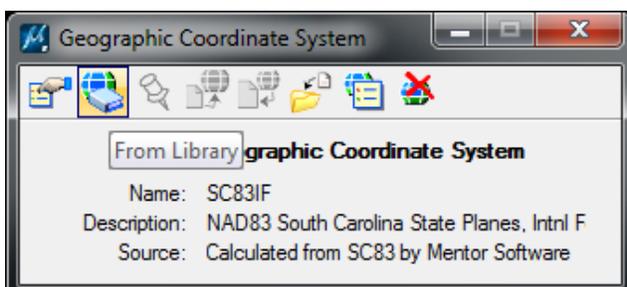
Navigate to the working directory the new shapefile will be stored in and type in a name for it. Then press **Save**.

Press the plus sign beside the **Attached** folder in your new shapefile to reveal a list of all levels used in the current file. Click the checkbox next to the level to be exported. Then right click on the new shapefile and choose **Export**.

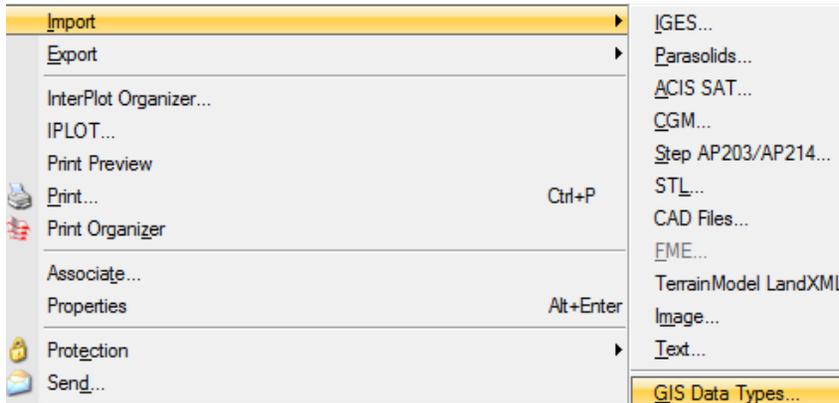


Import Shape File

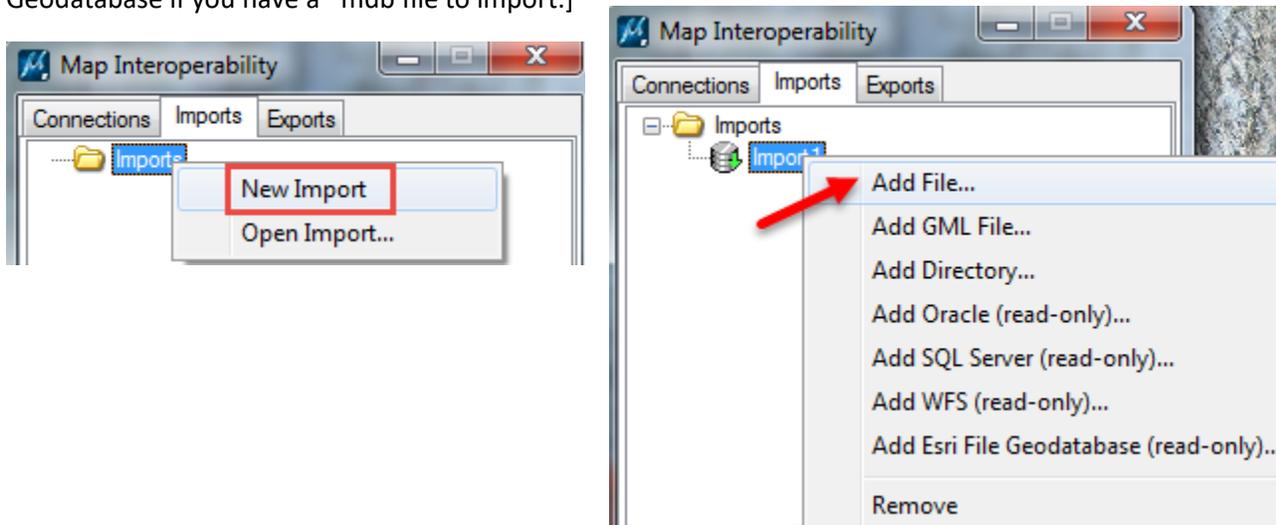
In the menu bar, choose **Applications > Map > Activate Map** to activate the Bentley Map software. Then choose **Tools > Geographic > Geographic Coordinate System**. Verify it is set to the SC831F.



Select **File > Import > GIS Data Types** to begin the import process.



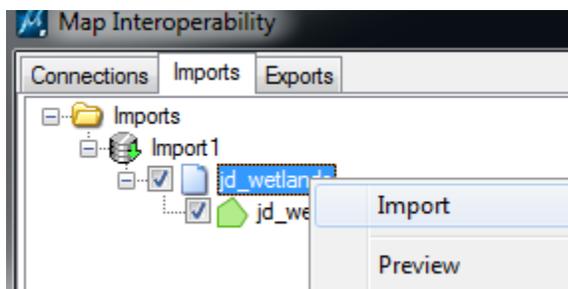
In the Map Interoperability window, right click on the **Imports** folder and choose New Import. Then, right click on the Import1 icon that appears and choose **Add File**. [Note: Select Add Esri File Geodatabase if you have a *.mdb file to import.]



Browse to select the *.shp file and press **Done** to open the file in MicroStation.



Right click on the Shape file name and select **Import**. Press the **Fit View** command to review the imported shape file. Repeat for additional shape files to import.



Data Acquisition Lidar Processing

In a partnership with several agencies including the SC Department of Natural Resources, SCDOT has acquired lidar data for the majority of the counties in South Carolina. This data is utilized to extend the existing ground survey data for hydraulic design.

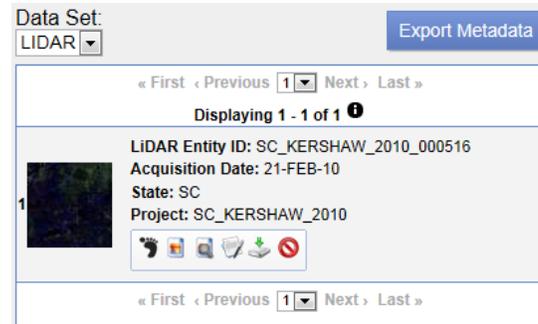
This data is available to consultants on these websites:

NOAA website:

<http://coast.noaa.gov/digitalcoast/data/coastallidar>

USGS website:

<http://earthexplorer.usgs.gov/>



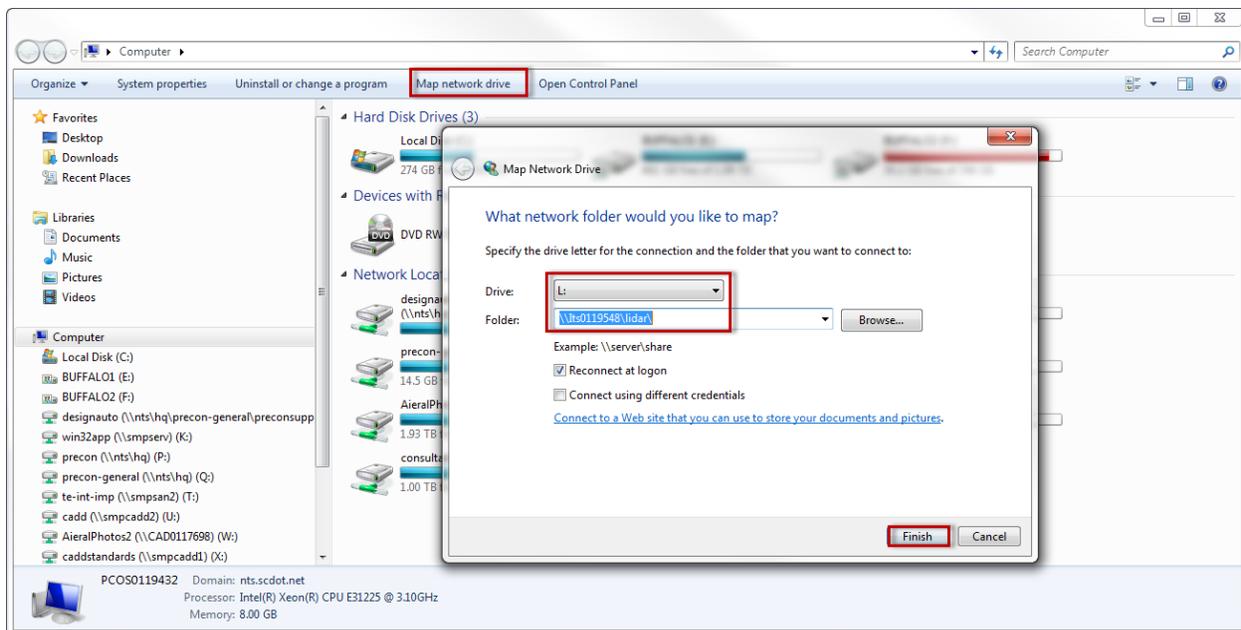
Lidar Usage Recommendations

- Map the Lidar Network Drive to your computer to eliminate the need to copy the large LAS data files to the network server. You can process them directly from here.
- Reduce the Lidar Tiles in MicroStation using Data Acquisition to a minimum of 50% and a recommended reduction of 60-65% to reduce the size of the Geopak tin file that will be created and to prevent the Data Acquisition tool from crashing.
- Create the Contours dgn file and remove the Geopak tin file from the server when finished processing.

How to Map the Lidar Network Drive:

Select Start > Computer

- Press the Map network drive button
- Select the letter L: and copy/paste or type <\\nts\hq\scdot-apps\scdot-lidar>
- Press the Finish button



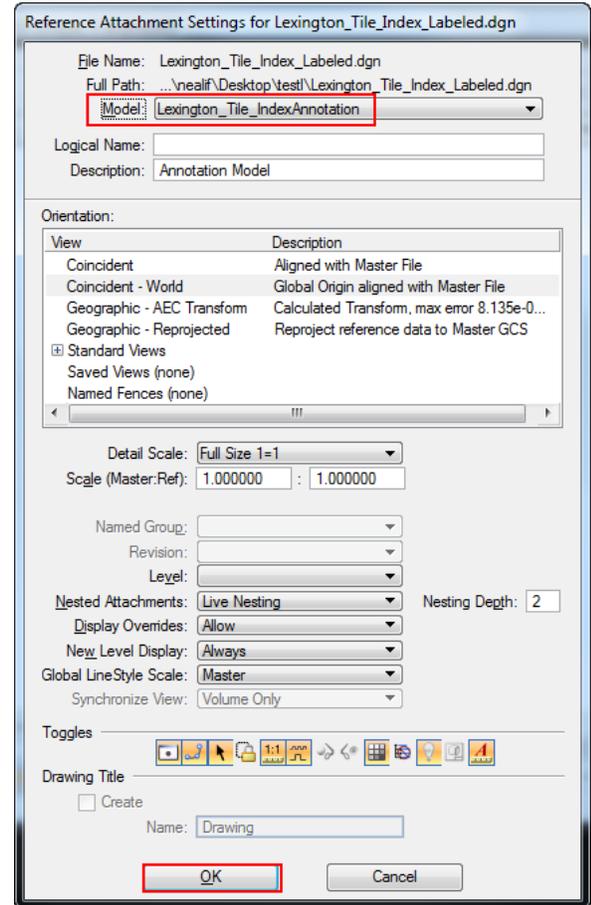
Available Lidar Data:

County	Year	Tiled	County	Year	Tiled	County	Year	Tiled
Abbeville	2012	County	Darlington	2008	RPG	Lee	2010	County
Aiken	2012	County	Dillon	2008	RPG	Lexington	2010	County
Allendale	2010	County	Dorchester	2009	County	Marion	2008	RPG
Anderson	2011	County	Edgefield	2012	County	Marlboro	2008	RPG
Bamberg	2010	County	Fairfield	2008	RPG	McCormick	2012	County
Barnwell	2012	County	Florence	2009	County	Newberry	2008	RPG
Beaufort	2013	RPG	Georgetown			Oconee	2011	County
Berkeley	2014	RPG	Greenville	2014	RPG	Orangeburg	2008	RPG
Calhoun	2012	County	Greenwood	2008	RPG	Pickens	2011	County
Charleston	2007	RPG	Hampton	2010	County	Richland	2010	RPG
Cherokee	2008	RPG	Horry			Saluda	2010	County
Chester	2008	RPG	Jasper			Spartanburg	2014	RPG
Chesterfield	2008	RPG	Kershaw	2010	County	Sumter	2010	County
Clarendon	2008	RPG	Lancaster	2008	RPG	Union	2008	RPG
Colleton	2007	RPG	Laurens	2008	RPG	Williamsburg	2008	RPG
						York	2011	County

Using the Referenced Tile Index Labeled MicroStation file:

Open your pp design file

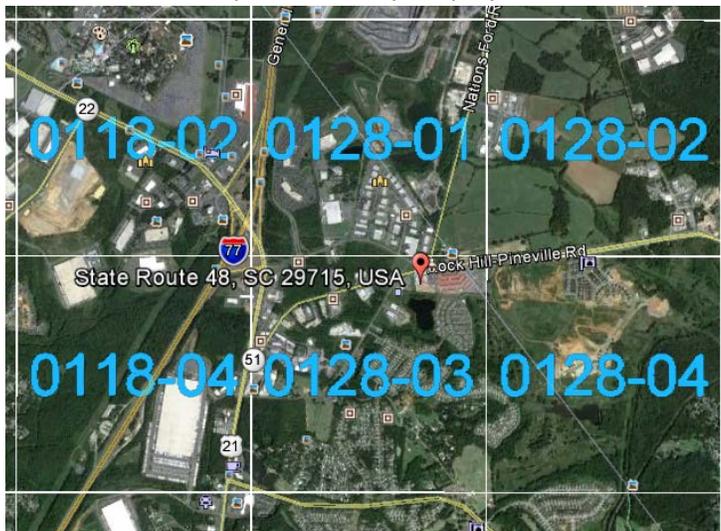
- a. Select File > References
- b. Select Tools > Attach
- c. Navigate to the mapped Lidar drive and the appropriate County folder for your project (Ex., L:\Lexington\)
- d. Highlight the **County_Tile_Index_Labeled.dgn** design file, where “County” is replaced with the name of the county you’re working in, and press Open
- e. On the Reference Attachment dialog, select the **County_Annotation** under Model and press OK to attach
- f. Fit View/Zoom in to review which tiles you need for your project



Using a Tile Index Labeled Google Earth KMZ file:

Navigate to the mapped Lidar drive and the appropriate County folder for your project

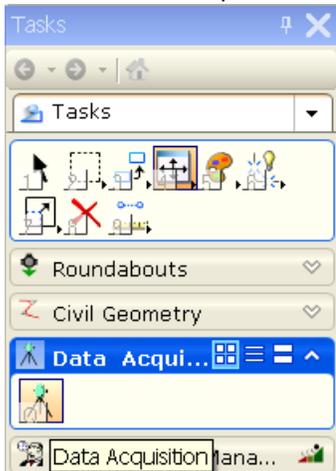
- a. Double click on the **County_Tile_Index_Labeled.kmz** file to open Google Earth
- b. Type in the location and press Search or Zoom in to your project Location
- c. Review which tiles you need for your project



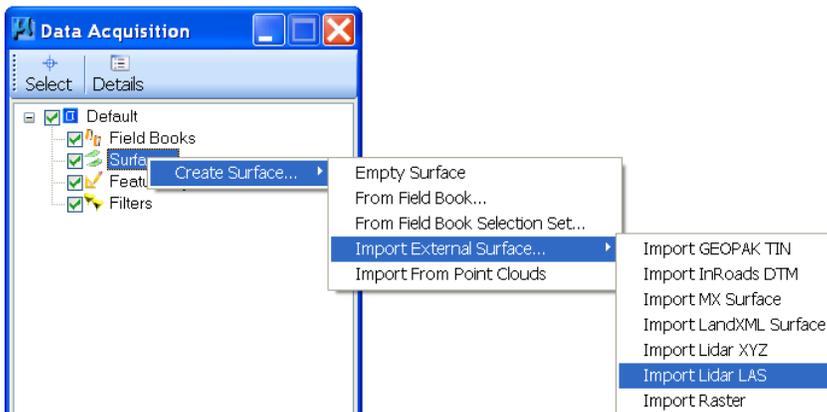
Trick: Turn off the Tile labels while it is zooming. It will zoom a lot faster! Turn them back on to see the tile numbers.

Managing Lidar Data with Data Acquisition in Geopak

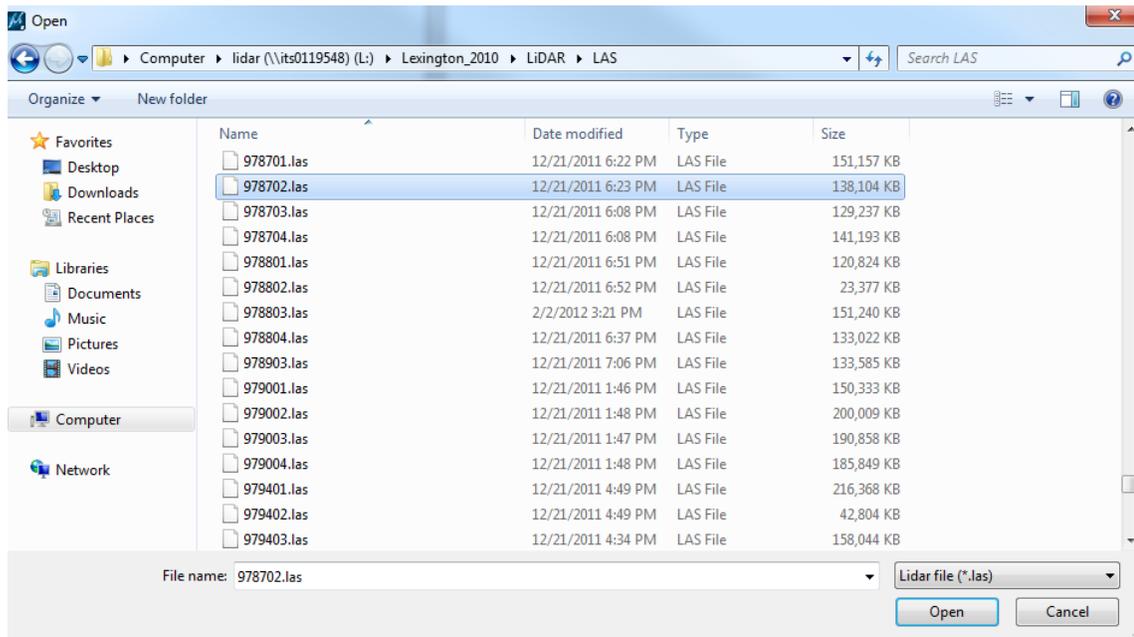
1. Determine which Lidar *.las files correspond with the project corridor (Ex. Lexington 978702 & 978704). The Data Acquisition tool can handle processing approximately 12 Lidar tiles per project.
2. Create a new 3D MicroStation file.
3. Expand the tool palette on the Task pane on the left to select Data Acquisition (Or select Tools > Data Acquisition from the top menu bar).



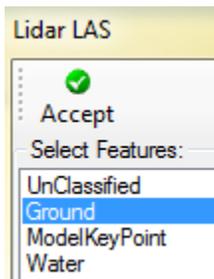
4. Right click on Surfaces and select Create Surface > Import External Surface > Import Lidar LAS.



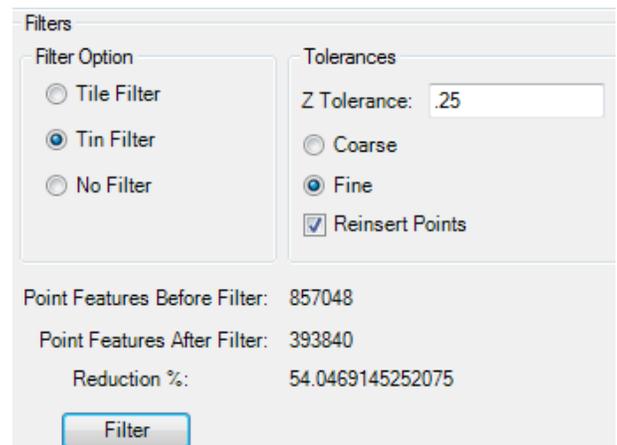
- Navigate to the folder location of the stored Lidar files and highlight the first Lidar .las tile (Ex. \\nts\hq\scdot-apps\scdot-lidar\lidar\Lexington_2010\LiDAR\LAS\978702.las).



- Select the Ground option if presented with more than one type of data.



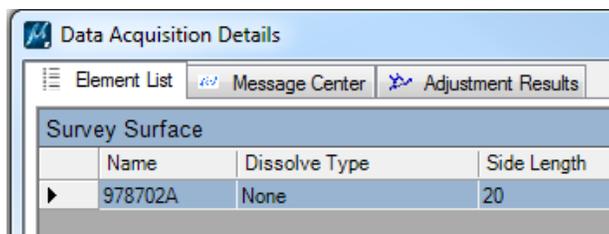
- Set the Filter Option to the following settings and press the Filter button to process. The Z tolerance will keep regenerating over and over until all points are within the range set. Midland and upstate areas will typically work well with Z tolerances of around 0.25 feet. Flatter areas, such as the Lowcountry and coastal regions, may require Z tolerances around 0.05 feet for accurate modeling. Higher filter rates may be acceptable for larger projects containing many lidar tiles, where precision modeling is less important than reducing file sizes to something Geopak can handle.



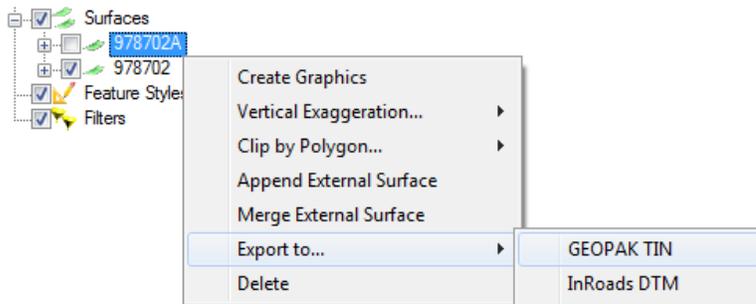
- Press the Accept button once an acceptable amount of filtering has taken place. Reductions of up to 65% will preserve most ground features with a minimum of distortion. Reductions between 65% and 80% may distort or eliminate terrain features and will increase the error in ground surface elevations, but are acceptable for larger projects.



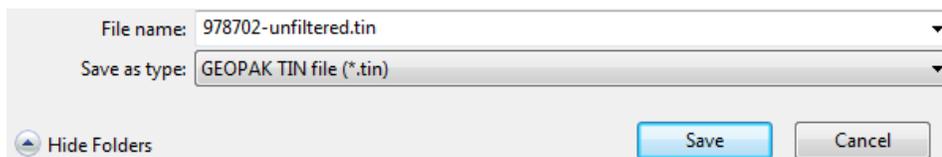
- To check for errors introduced during filtering, you can import the unfiltered surface and compare the two. If you don't need to check for errors, skip to step 25. Otherwise, select the new surface in Data Acquisition, then click the surface name in the Details panel to highlight it. Add the letter 'B' or another distinguishing character to the end of the name.



- Repeat Steps 4 to 9 for the same .las tile, choosing the "No Filter" option in step 7 instead of "Tin Filter", and adding a 'A' or similar character to the name of the new unfiltered surface. Remove the extra letter from the name of the filtered surface.
- Right click on the unfiltered surface and select Export to > Geopak Tin.

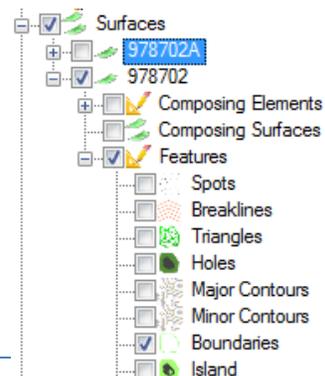


- Enter a file name and press Save.

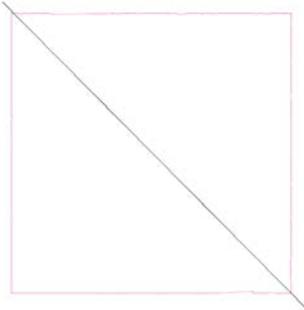


- Repeat steps 11 and 12 for the filtered surface.

- Expand the data tree for the unfiltered surface until Features is expanded. Click to turn on the Boundaries. Click "Fit View" in your toolbar to see the entire boundary.

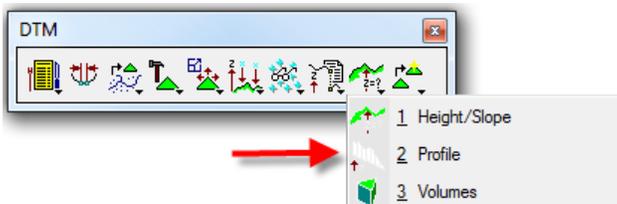


15. Draw a line across the area of the tiles.

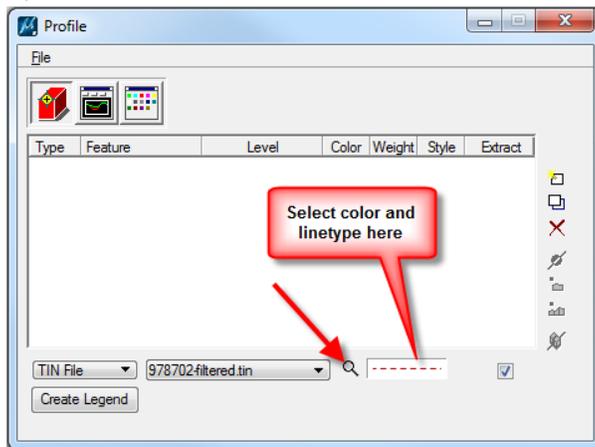


16. Select Applications > Geopak > Road > DTM Tools.

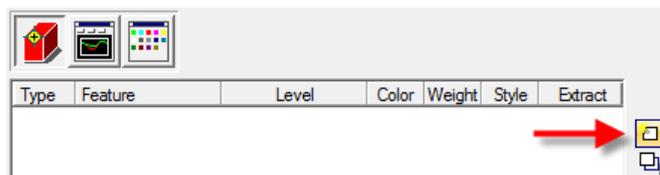
17. Click and hold the mouse button on “Analysis:Height/Slope”, the second icon from the right, to bring up the Analysis menu. Choose option 2, “Profile”, to bring up the Profile panel.



18. Choose a color and line type for the filtered surface, then click the magnifying glass icon and open the filtered .tin file.

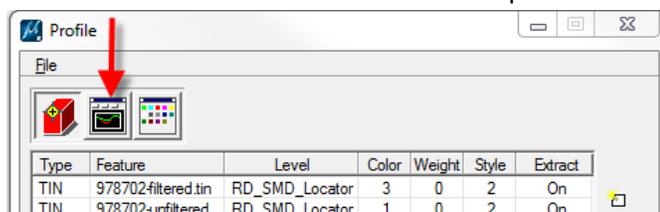


19. Click the Add List Item button to add the filtered surface to the profiles.

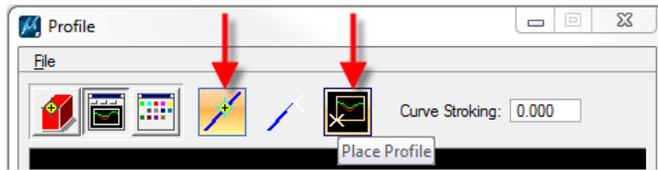


20. Repeat steps 18 & 19 for the unfiltered profile.

21. Click the Create Profile icon on the Profile panel.



22. Activate Select Profile Element and select the line drawn across the tile boundaries. Activate Place Profile and place the profile on the plan sheet.



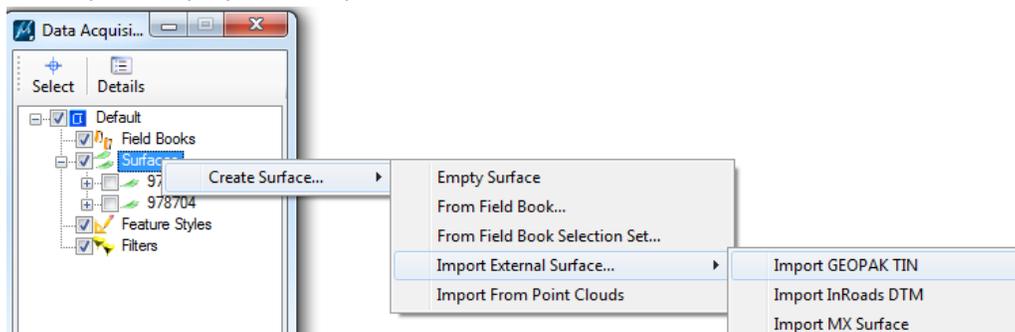
23. Compare the filtered and unfiltered profiles. If there are sufficient differences to make the filtered surface unsuitable for use, delete and reinsert it with a lower Z tolerance in the filter settings, then repeat steps 13 through 23 to re-evaluate it.

24. Delete the profile, the line from step 15, and the unfiltered surface in Data Acquisition.

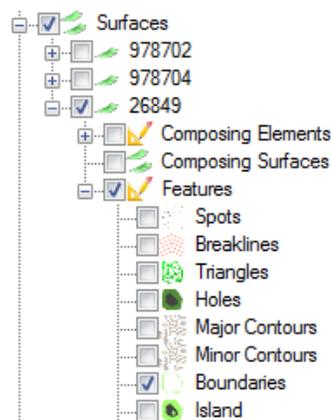
25. Repeat Steps 4 to 8 for any additional Lidar .las tiles. Repeat steps 9 to 25 as needed to evaluate filtering.

26. Locate and copy the project survey .tin file to the project directory (Ex. \\nts\hq\precon\Lexington\26849_s1431\survey\26849.tin).

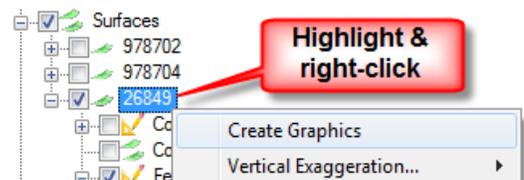
27. Right click on Surfaces and select Create Surface > Import External Surface > Import GEOPAK TIN. Open the project survey .tin file.



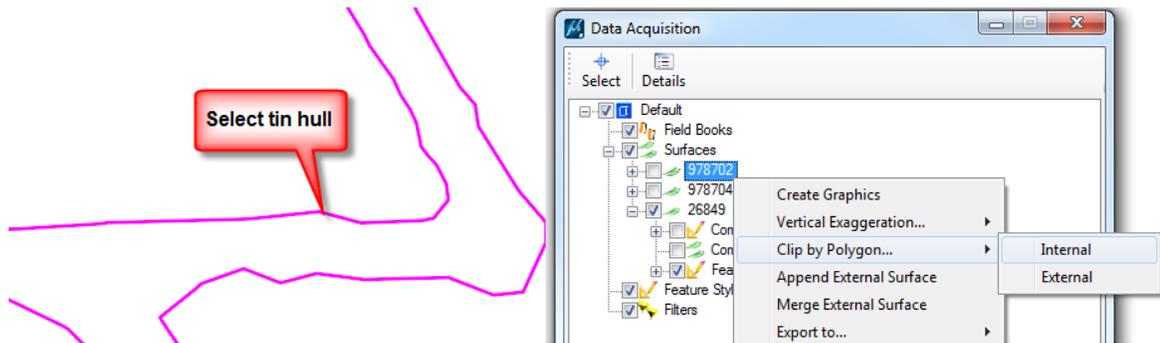
28. Expand the data tree for the project .tin until Features is expanded. Click to turn on the Boundaries.



29. Highlight the surface for the project. Right click and select Create Graphics. (This draws the tin hull into the design file.)



- Use the MicroStation selection tool to select the tin hull. Right click on the first Lidar .las tile and select Clip Polygon > Internal.



- Repeat right clicking on the remaining Lidar .las tiles and select Clip Polygon > Internal for each one.

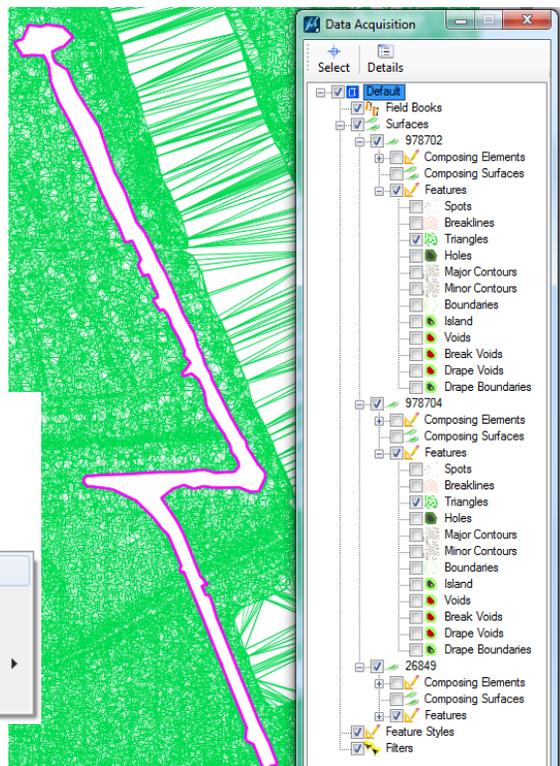
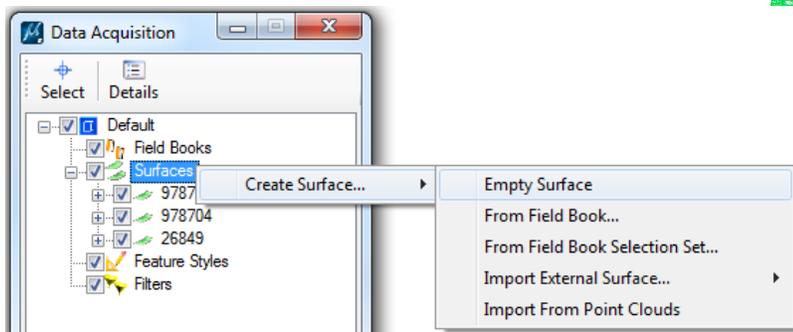
Special Note: If your project extends past the shape of the lidar file, you will need to do one of two things:

- Use additional lidar tiles to cover the entire project and apply step 31 to each one
- Close the shape of the tin hull within the boundaries of the lidar tile – break the line segments to complete the shape. You will also need to Clip by Polygon > External on the project tin to get rid of the project tin that extends past the lidar tile. This is in addition to Clipping the Lidar tile Internally.

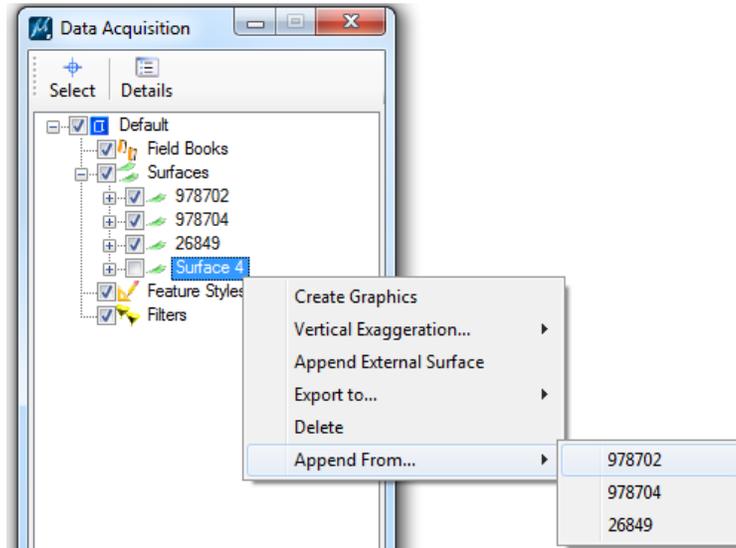
Failure to do so will make Geopak crash when you get ready to export the TIN file and you will have to start ALL OVER.

- Expand the data trees for each of the LAS Surfaces and turn on Features -- Triangles to verify that the tin hull has been clipped from each of the tiles. (You can turn the display back off).

- Right click on Surfaces and select Create Surface > Empty Surface.



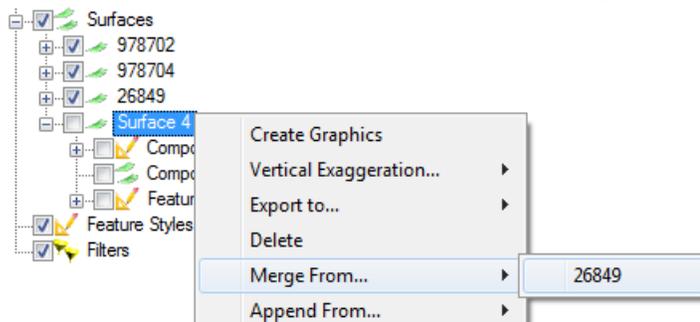
- On the newly created Surface, right click and select Append From > ##### (select your first .las surface in the list). Repeat until all of the las surfaces in the list have been added. (Do not add the project surface in this step).



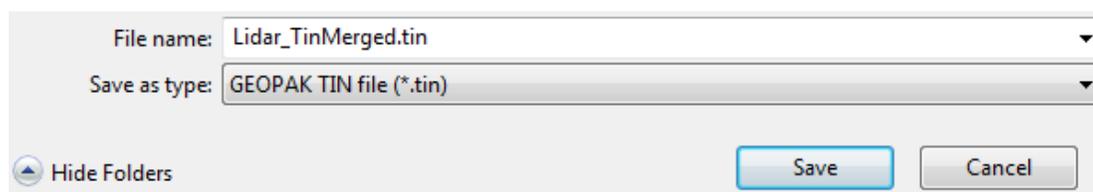
- Pay attention to the # of Triangles in the Details panel. Occasionally it will bomb out and reset to 0 and you will have to delete the surface and start over again.

	Name	Dissolve Type	Side Length	Triangles	Breaklines
▶	978702	None	20	783462	0
	978704	None	20	798644	0
	26849	None	20	3325	156
	Surface 4	None	20	1585257	0

- Right click on the new project surface, select Merge From, and select the project surface.



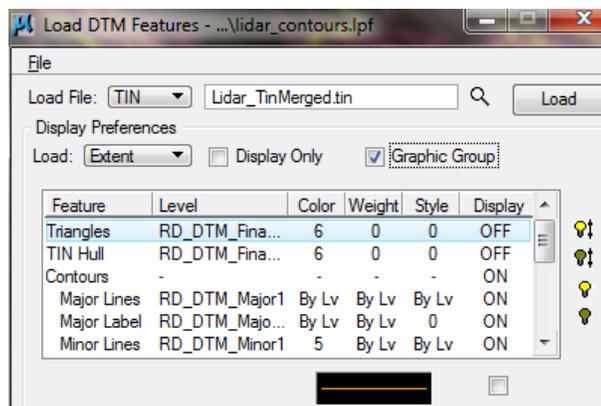
- Right click on the project surface and select Export to > Geopak Tin. Enter a file name and press Save.



38. Create a new MicroStation 2d file.
39. Select Applications > Geopak > Road > DTM Tools.
40. Press the DTM menu icon.



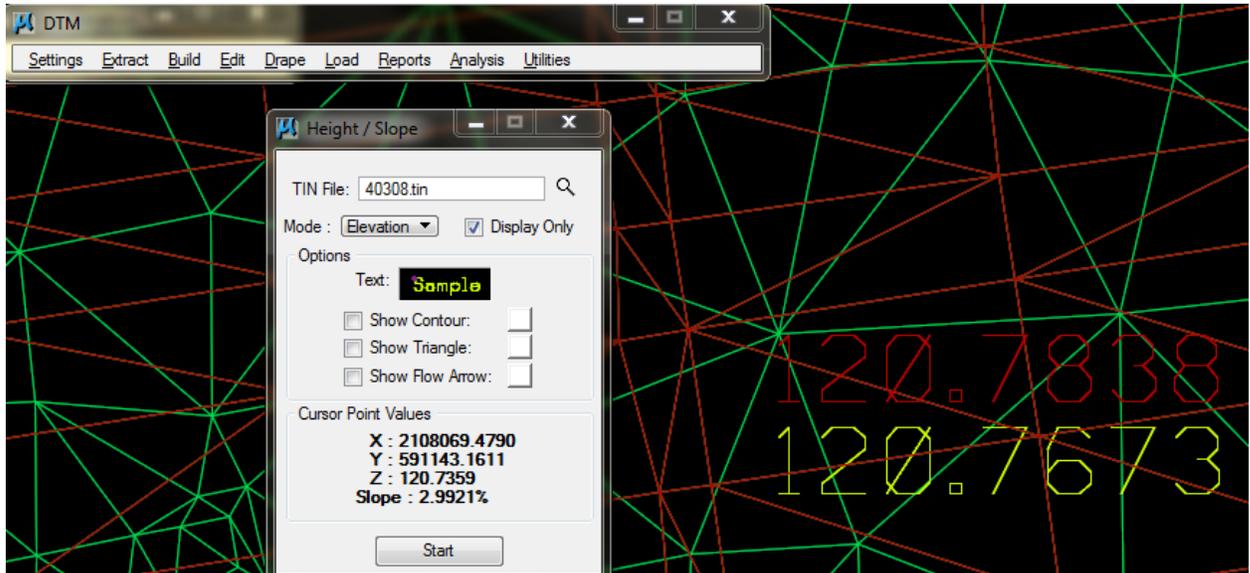
41. Select the Load > DTM Feature button.
42. On the Load DTM Features dialog, set the Load File to Tin and browse to select the Lidar_TinMerged.tin create above. Select File > Open and select the P:\Hydraulics\Geopak\lidar_contours.lpf file to set the symbology for the contours. (\\nts\hq\precon-general\Hydraulics\Geopak\lidar_contours.lpf)



Comparing the Lidar Tin to Existing Field Tin

1. Create a new 3d MicroStation file.
2. Activate the Data Acquisition tool.
3. Add the lidar tiles that directly correspond to the existing tin file. If only one tile encompasses the entire field survey, only add that one. If it overlaps add the number of tiles that overlap. If more than one lidar tile was added, create a new surface and select Append from and add all the tiles that correspond to the existing file to create one lidar surface. (See steps 4-9, and 17, 18)
4. Import the Geopak project tin file and turn on the boundaries. Draw it to graphics and select the tin hull. (See steps 10-14 above.)
5. Highlight the LAS file or the newly created surface and right click to select Clip by Polygon > External. This will give you a lidar version of the existing field survey extents.
6. Right click on this file and select Export To > Geopak Tin. Name the file Lidar_ClipperedExisting.tin.

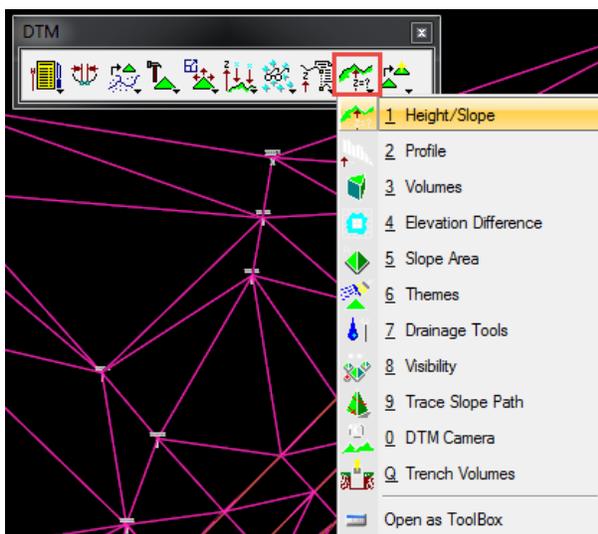
7. Turn on the display for the triangles. You can change one of the colors to a different color in the Data Acquisition Details panel.
8. Select the DTM Tools button and select Analysis > Height/Slope. Compare the elevations of data points along the two tin files.



DTM Tools

There are several DTMS tools that can be used for performing quality assurance of the location survey data and also for hydraulic design. Reviewing the Survey data is outlined below. For hydraulic design, please review the Geopak Drainage Manual.

In the *.dtm.dgn design file, attach the Statewide.xwms aerial as a raster attachment and the *.pp.dgn file as a reference attachment. Turn the view on/off as needed to help review the dtm.

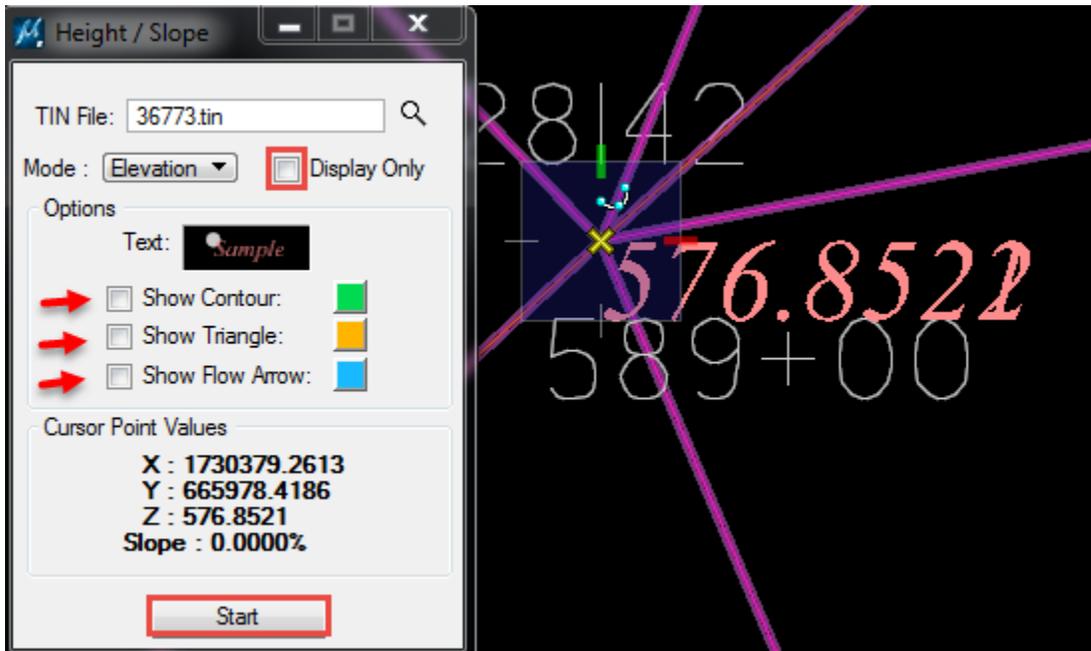


Select **Applications > Geopak > Road > DTM Tools**. Create a new run for the mainline. On the DTM toolbar, select the **Height/Slope** tool from the next to last icon.

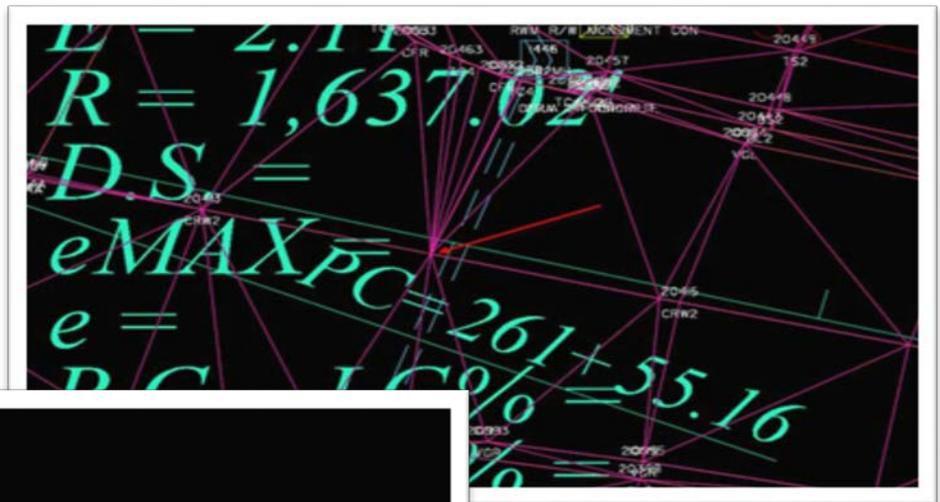
Browse to select the existing project *.tin file. Set the mode to **Elevation** and press the **Start** button. Pan through the dtm triangles to look for any irregularities in the triangles.

(Examples: jumps in elevations in short distances, missing point codes/shots in intersections, clusters of triangle legs intersecting, etc.)

Set the **Symbology** for the Text and turn ON the Contour, Triangle, or Arrow to review these options in the design file. Turn off the **Display Only** to place the Elevation text into the MicroStation file.

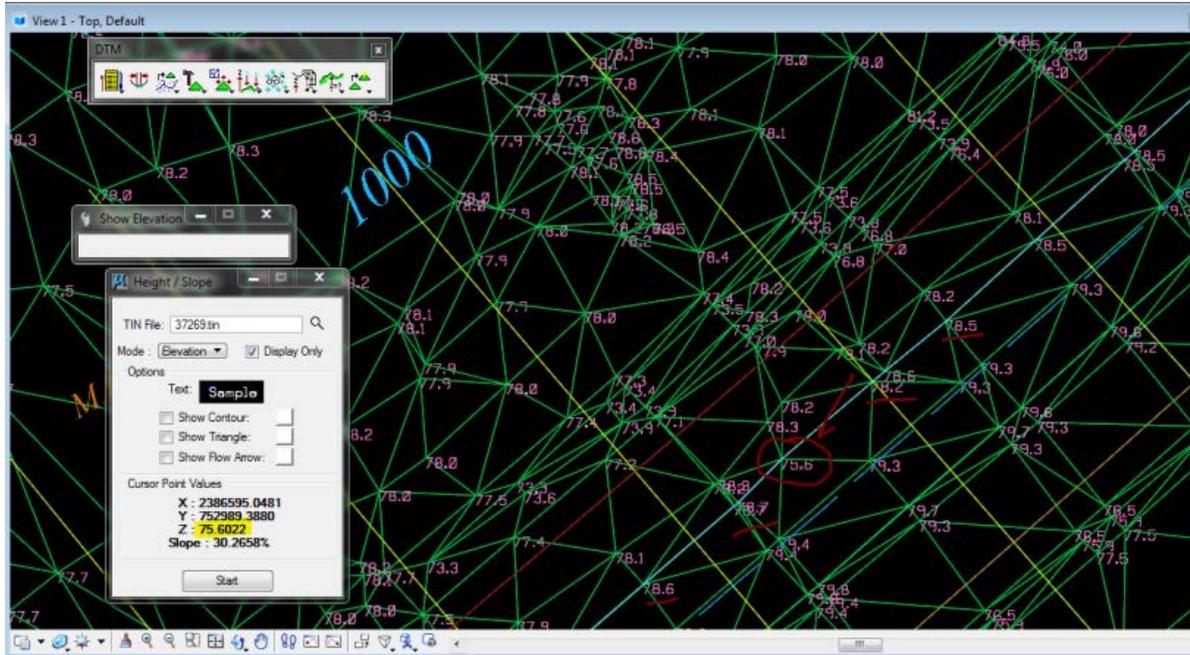


The following example shows an issue where **too many triangles** intersect in the curb radii in the dtm file. The curb shots, edge of pavement shots, and other shots in the vicinity are causing a “bad interpolation” on the centerline profile.

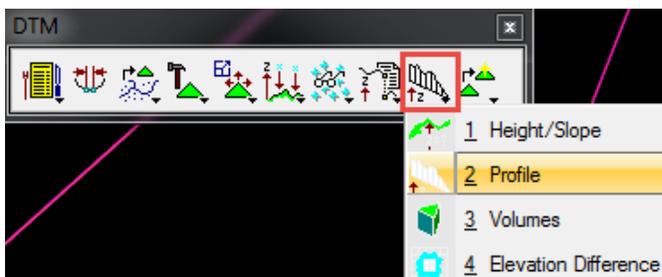


The following example shows a dip in the elevation along the left edge of pavement of the travel lane.

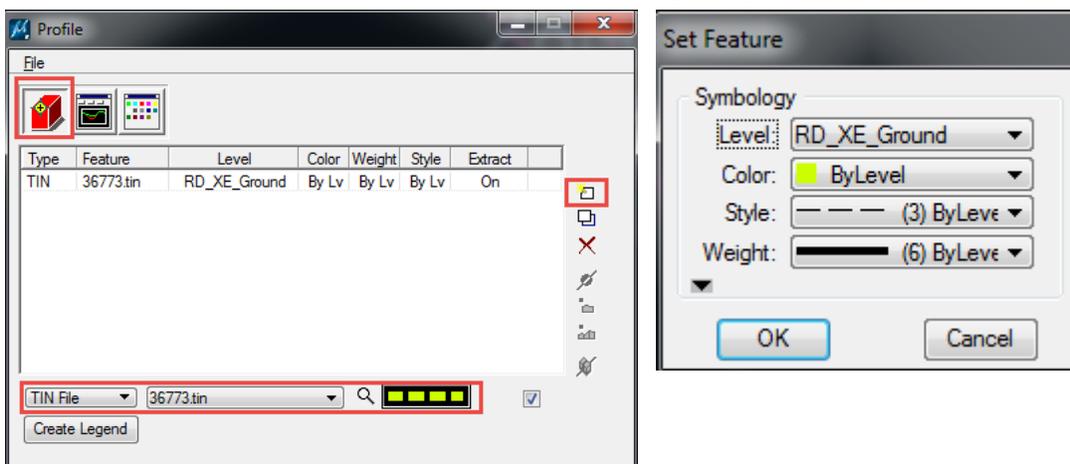
- Elevation at 1000+25 w/ 13' left offset (Ex. EOP-L) = 75.6'
- Elevation at 1000+00 w/ 13' left offset (Ex. EOP-L) = 78.7'
- Elevation at 1000+50 w/ 13' left offset (Ex. EOP-L) = 78.2'



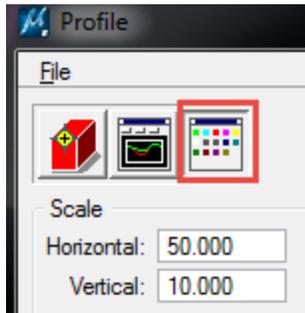
On the DTM toolbar, select the **Profile** tool from the next to last icon.



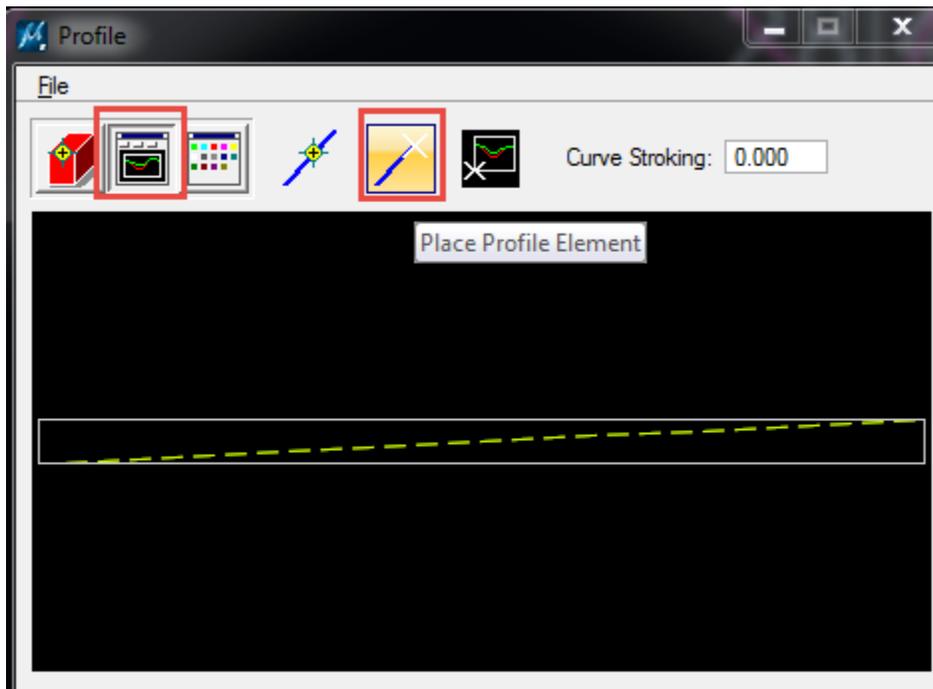
On the **Object Selection** tab of the **Profile** dialog, browse to select the Tin file and set the symbology as shown. Press the **Add** button to add the TIN to the list. (Multiple surfaces can be added and compared.)



On the **Profile Preferences** tab of the Profile dialog, set the **Horizontal and Vertical to 50 and 10** or a more exaggerated scale for reviewing the profile. [If you plan to place the profile into the drawing, set the Horizontal and Vertical Grid symbology as desired.]



On the **Create Profile** tab of the Profile dialog, select the **Place Profile Element** button. Draw a line directly down the centerline of the roadway to review the centerline profile in the dtm file. Draw a line perpendicular to the centerline to review a cross section of the dtm file. Repeat this process to review areas of interest in the dtm file.



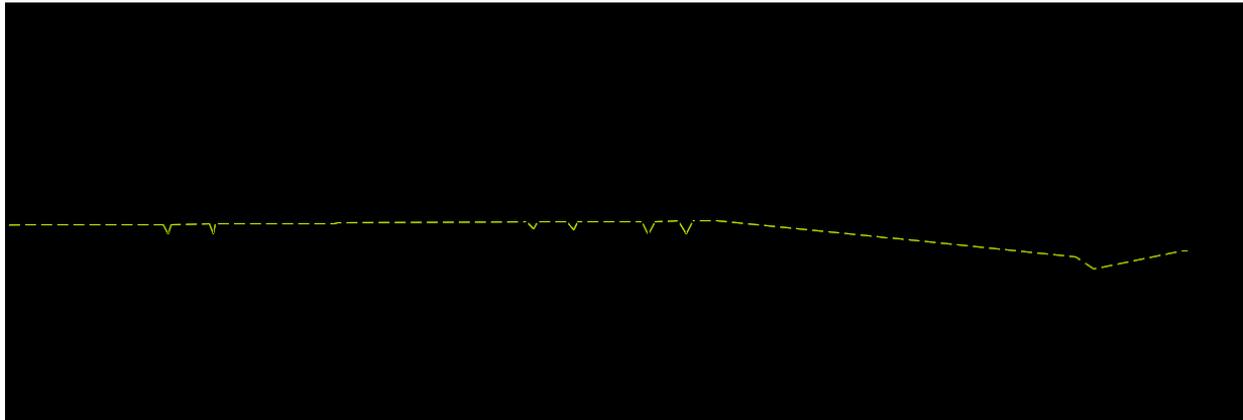
To place the profile into the design file, press the Place Profile button.



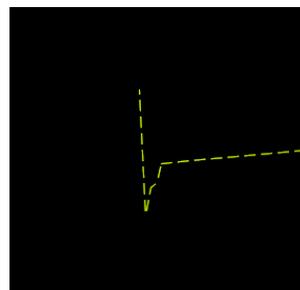
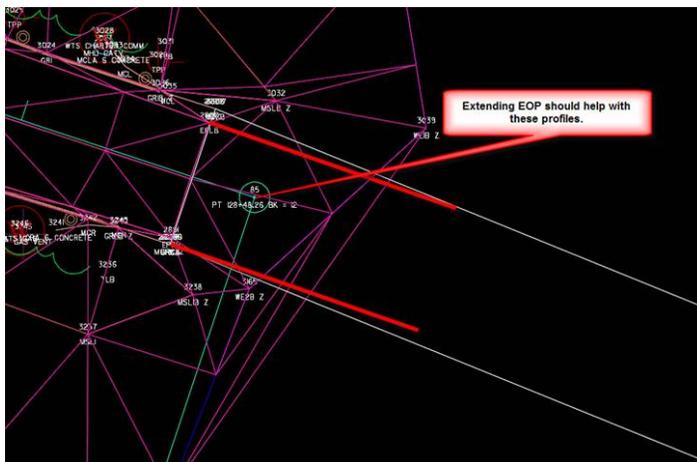
In addition to the quick profile method outlined above, **each of the existing profiles** should be checked for spikes and dips along the centerline. [Note: Relocated centerlines that cut across “unsmooth” terrain will have spikes/dips. However, an existing pavement should not have such extreme elevation changes unless there is severe rutting or another determined issue.]

Use the **Draw Profile** tool as demonstrated on page 98 to cut the existing profiles for each alignment of the project.

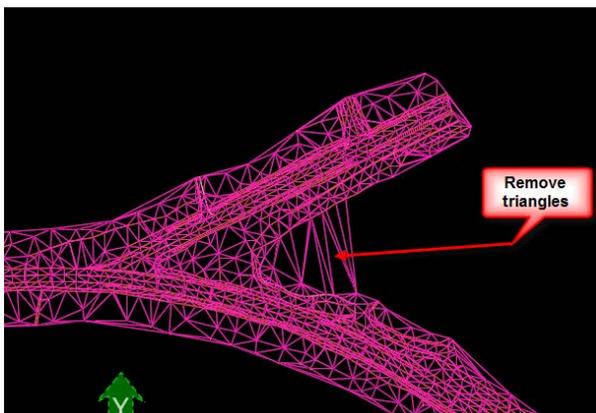
This example shows where the centerline of the roadway crosses over 3 railroad tracks. The top of rail should have been maintained in the dtm file and not included the shots in between the tracks.



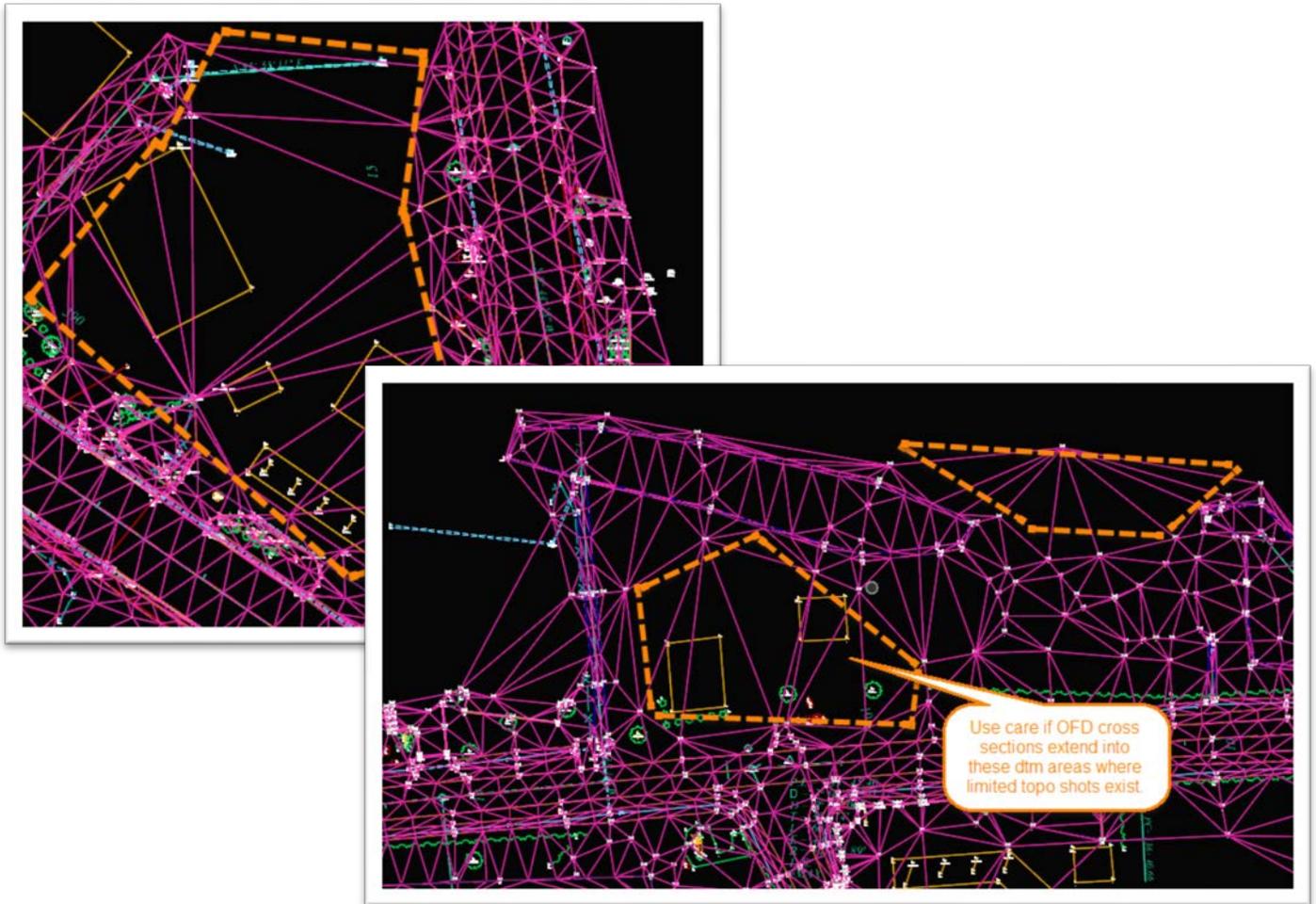
This example shows where the EOP lines do not extend past the centerline alignment, thus the TIN file interpolates with the ditch shots and produces incorrect centerline elevation numbers. If this happens, do not include the stationing in the profile. If this station must be included in the plans, ask Surveys to extend the EOP lines past the centerline to have a more accurate interpolation.



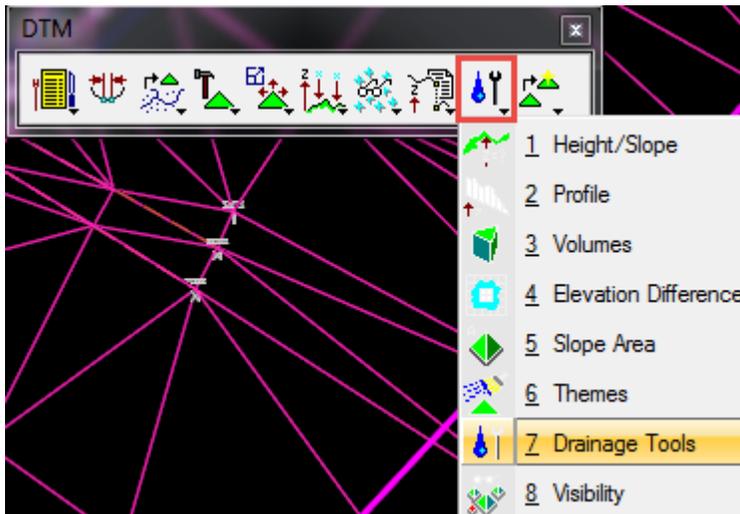
The designer should also note that if a relocated centerline profile or existing cross sections extend out into areas between intersections where there are limited topo survey shots, inaccurate interpolation may occur. These areas should be used with caution in the plans. If necessary, place a gap in the profile so as not to misrepresent the data. Surveys can also assist by removing unnecessary triangles in these areas.



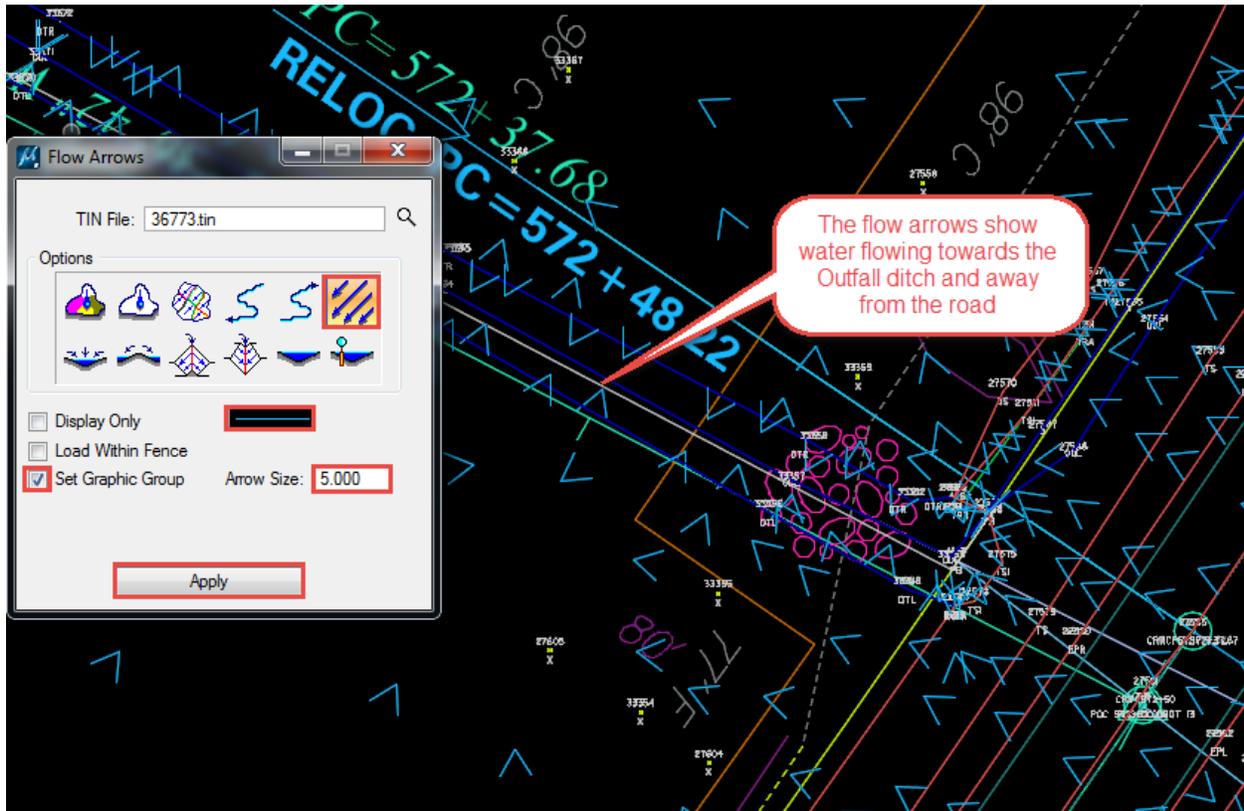
More examples where the designer should use caution with cross sections or relocated centerlines, etc.



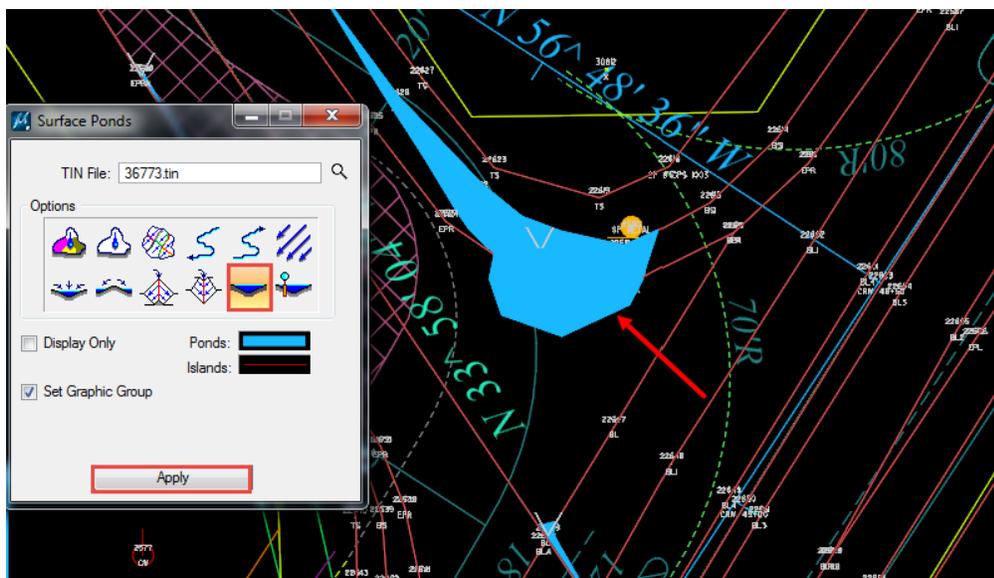
On the DTM toolbar, select the **Drainage Tools** tool from the next to last icon.



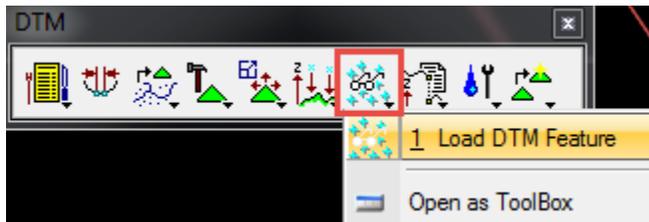
Flow Arrows can be drawn to review the flow of the water for existing ground conditions. Survey shot elevations in the Survey.xls can also be used in conjunction to locate any issues determined. Browse to select the *.tin file and press the **Flow Arrow** button. Toggle on **Display Only** and set symbology to a desired **color**. Enter an Arrow Size of 5.00. Press the **Apply** button. (To permanently draw the flow arrows, turn off Display Only and be sure to turn on Set Graphic Group before pressing the Apply button.)



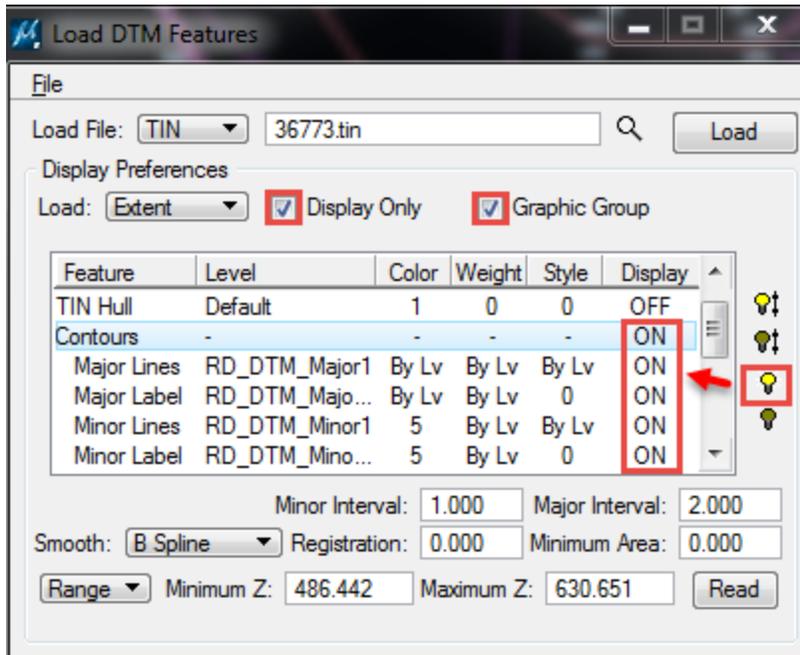
Select the **Ponds** Option and set the symbology as desired. Ensure **Fill** is turned on in the View Attributes. Turn on the Set Graphic Group and press the Apply button. Pan through the dtm file and review any ponding areas to look for during the design process, especially in intersections.



Select the Load DTM Feature option under the eyeglass icon.



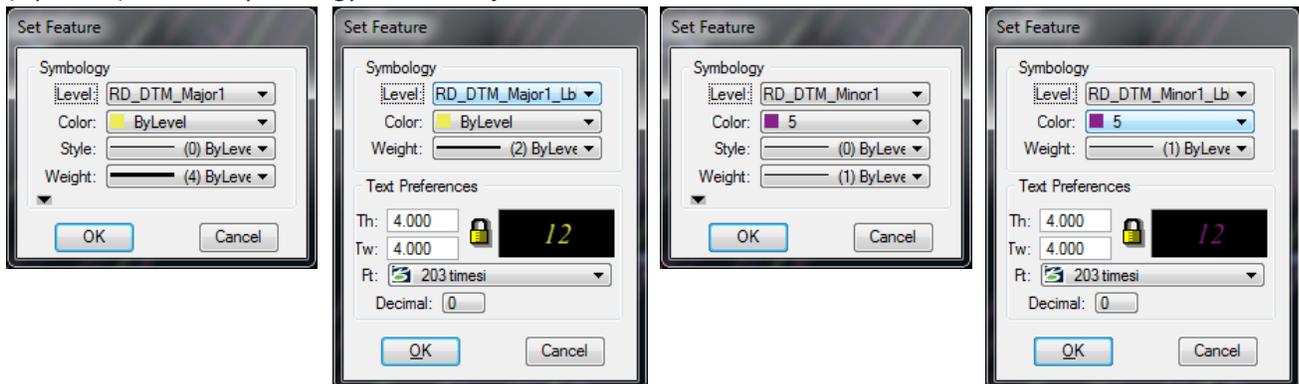
Browse to select the **TIN** file. Turn **ON Display Only** and **Graphic Group**. Use the **lightbulbs** on the right to turn **off** the Triangles and Tin Hull and to turn **ON** the **Contours** and Major Lines/Labels and Minor Lines/Labels.



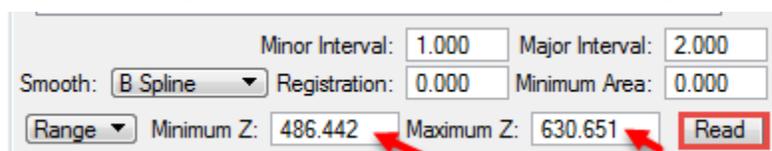
On the **Contours** option, set the **Minor and Major Interval**. For flat areas of the state use 1' & 2' for Minor and Major. For hilly areas, edit as necessary for 1' & 5' or 2' & 10', etc.



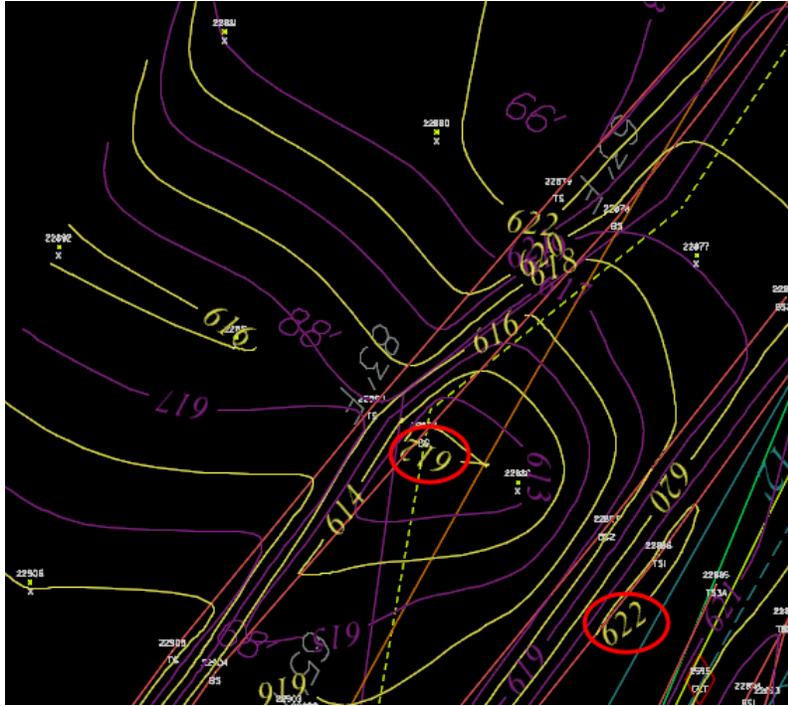
(Optional) Set the Symbology for the Major and Minor Lines/Labels as shown below.



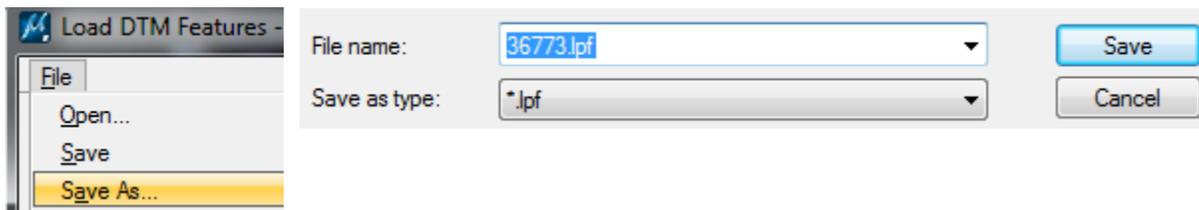
Press the **Read** button and review the elevation ranges for the project and verify that they make sense for the project location in the state. Any zeros, too high or too low elevations will be "red flags" that there are points in the dtm file that need further analysis.



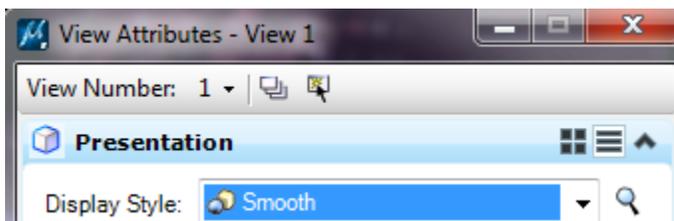
Press the **Load** button. Review the contours in the file. Look for areas where there are too many contours together – this signifies a large change in elevation. Investigate further to ensure there are no “zero” elevations or “issues” with this area found. The aerial, pp.dgn, or the Survey.xls may help determine further what is happening in this area.



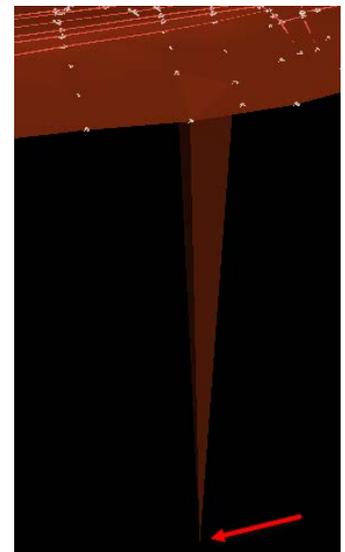
Select **File > Save As** to save the DTM Load Feature preferences as a *.lpf file. This can be reloaded by selecting **File > Open**.



Change the **View Attributes** to Smooth (can also try Monochrome).



Use the **3d Rotation** MicroStation tool to rotate the view of the dtm triangles to look for spikes in the dtm file. If any are found, investigate further to determine what is causing the elevation change.

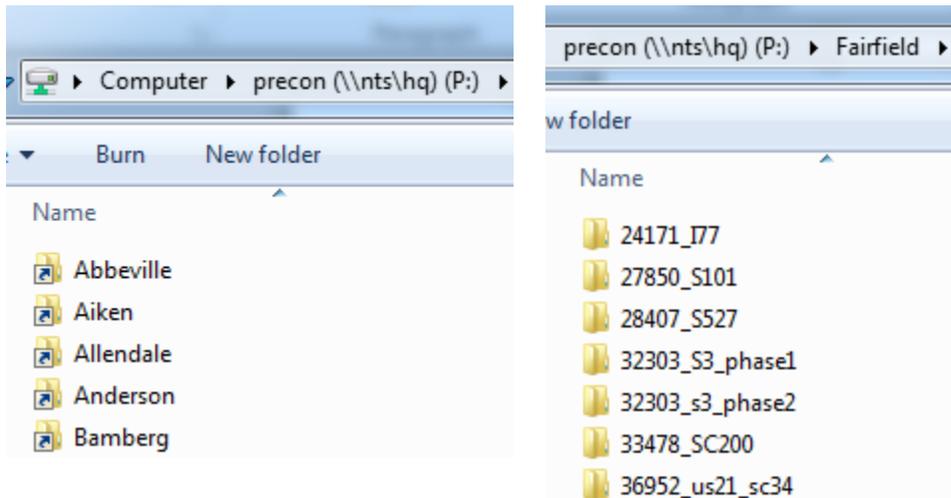


File & Plan Management

Folder Naming Conventions

An organized and well maintained project working directory is critical to plan production. Designers should take care to follow the folder and file naming conventions outlined below to keep their project organized, to maintain the integrity of the electronic data, and to assist others who receive the data downstream to easily follow the folder and file naming structure to locate the information they need to bid, survey, construct, and as-built the project.

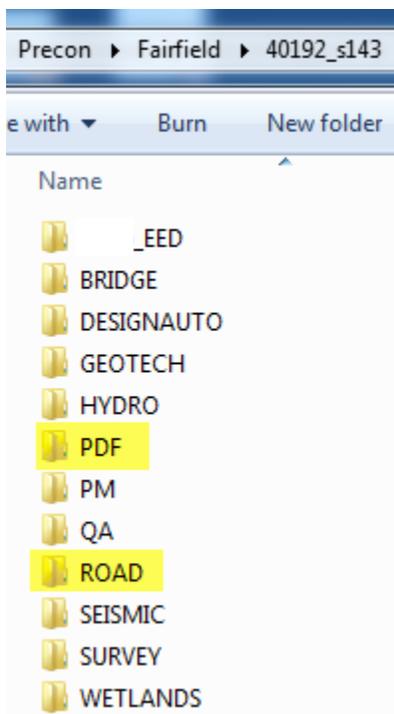
SCDOT utilizes the P:\ drive to store project design files. The P:\ drive is defined as [\\nts\hq\precon](#). Inside the Precon directory, the 46 County folders plus a Statewide folder subdivide the projects.



The Project working directory is typically named : **ProjectID_Route.**

Do not include spaces or special characters in the folder names.

Each **discipline** has a subfolder in the Project Working directory.



Roadway Design utilizes the **PDF and Road** folders and references information in the other disciplines by viewing or by copying into the road folder.

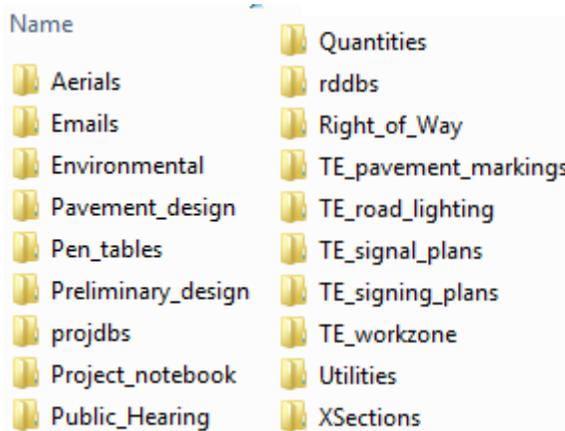
Original and additional surveys are copied from the **Surveys** folder to the road folder for manipulation and review.

Station offset and gpk merge information is referenced from the **DesignAuto** folder.

Wetlands files are referenced to the *.pp.dgn file for inclusion in the plan set.

Other discipline folders are referenced as detailed in correspondence during the project life cycle.

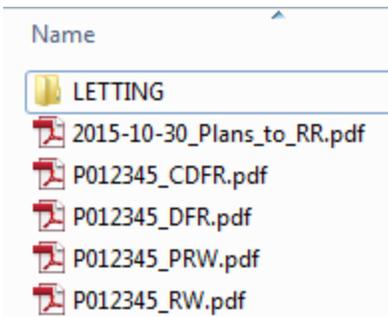
Inside the road folder, the following list depicts *some* of the most commonly named subfolders that are utilized. All folders may not be applicable to all projects. A logical, organized folder structure is ideal for maintaining the project files.



Inside the **PDF** folder, the following naming conventions are utilized for preliminary plans. All other intermediate plan sets will use the ProjectID_Description. Dates in the file name are acceptable in the **YYYY-MM-DD** format so the files will sort properly.

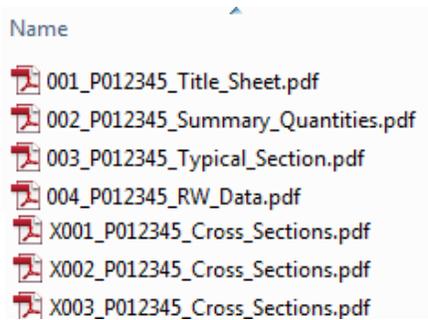
P012345_PRW.PDF	Preliminary Right of Way Plans
P012345_DFR.PDF	Design Field Review Plans (use _Before & _After)
P012345_RW.PDF	Right of Way Plans
P012345_CDFR.PDF	Construction Field Review Plans
2015-10-30_P012345_Plans_to_RR.pdf	Plan deliverables to other departments
2015-10-30_P012345_Plans_to_Hydro.pdf	Plan deliverables to other departments

A subfolder named **LETTING** will be used to contain the single page pdfs of the construction plans for the letting. These will be single page pdfs in order to comply with the **digital signature policy** for signing and sealing plans electronically.

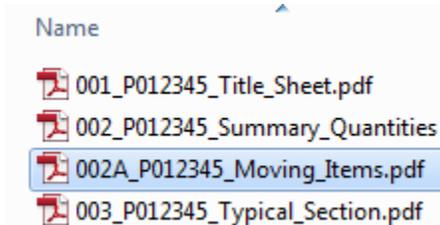


File names should contain *no spaces, using underscores* in their places. All files should include a prefix consisting of a three-digit sheet number, an underscore, and the project ID number (ex., **001_P012345_Title_Sheet.pdf**). Once this prefix is included, sheets can be named as desired to correspond with the plan set’s index of sheet descriptions.

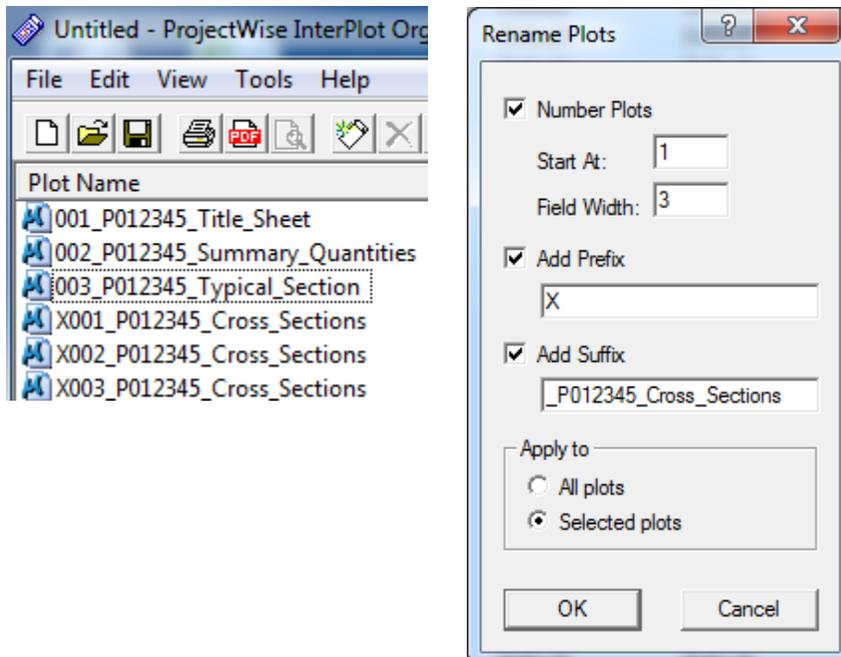
In order to separate cross section sheets from other plan sheets, they will be given a special prefix. Follow the same rules as above, but begin the name of cross section sheets with an “X” and number them separately from the rest of the plan set. Thus, if a plan set began with sheets **001_P012345_Title_Sheet.pdf** and **002_P012345_Summary_Qty.pdf**, the first cross section sheet in the set would be **X001_P012345_Cross Sections.pdf**.



In order to insert an additional sheet into an existing plan set, add a letter designator to the sheet number of the previous sheet. For example, if a Moving Item sheet needs to be added following the second sheet of the set, **002_P012345_Summary Quantities.pdf**, the Moving Items sheet would be named **002A_P012345_Moving_Items.pdf**.

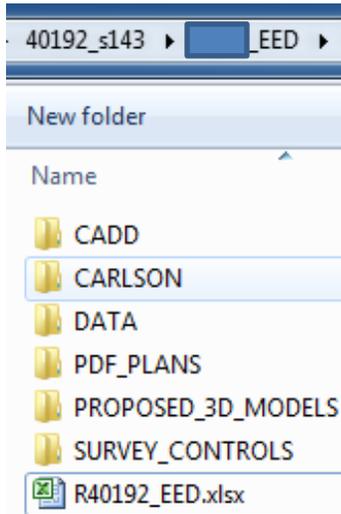


The Prefix/Suffix can be added in the IPS file to make renaming of the pdf files more efficient. (More instructions will be contained in the SCDOT Roadway Plotting Manual – to be written next.) Select Edit > Rename in Iplot Organizer to apply the Project information.



The Project_EED folder is primarily populated by the Design Automation Office by coordinating with the roadway designers for project specific information to be included in the bid package for the SCDOT construction office and the contractors. The electronic files are for **selected** projects or for **requested** construction survey stakeout. This is not available or applicable on every project. Please contact Design Automation to inquire further.

The contents of the Project_EED folder are as described:



CADD	Contains cadd files to provide for bidding to construction and contractor; dgn, gpk, gdf, tin
CARLSON	Contains the converted xml & gen files to Carlson formats; cl, pro, sct (for SCDOT Construction offices)
DATA	Contains horizontal & vertical alignments and cross sections files for contractors; xml, gen, rpt
PDF_PLANS	Contains the pdf construction plans at time of letting
PROPOSED_3D_MODELS	Contains proposed 3d models created for construction; dgn, dxf, xml
SURVEY_CONTROLS	Contains original location survey control, control plan sheet; csv or ascii, pdf
*_EED_INDEX.XLSX	Excel Index file of the contents of the Project_EED directories

File Naming Conventions

Equally as important as maintaining an organized project working directory is to properly follow file naming conventions. Designers should take care to follow file naming conventions outlined below to keep their project organized, to maintain the integrity of the electronic data, and to assist others who receive the data downstream to easily follow the folder and file naming structure to locate the information they need to bid, survey, construct, and as-built the project.

When possible, Roadway Designers should follow the standard file naming conventions and avoid creating design files that do not follow this method. Any deviations from the typical file names should be **logical** in name so the recipient can understand what the **file contents** are. (Ex. R12345_Alt4_US378.dgn is used for “alternative design #4 for US378”.)

All road design files will begin with the letter “r” for roadway. After the letter, add the 5 digits of the Project ID number, followed by a two or three letter file description. (Ex., **r12345ts.dgn**)

When a major revision is made, an unrevised copy of the file should be retained under the same name followed by the date of the revision. The new file will keep the name of the replaced file to keep the references intact.

Example for a revised PP file:

r12345pp_2014-08-25.dgn

The unmodified copy of pp file.

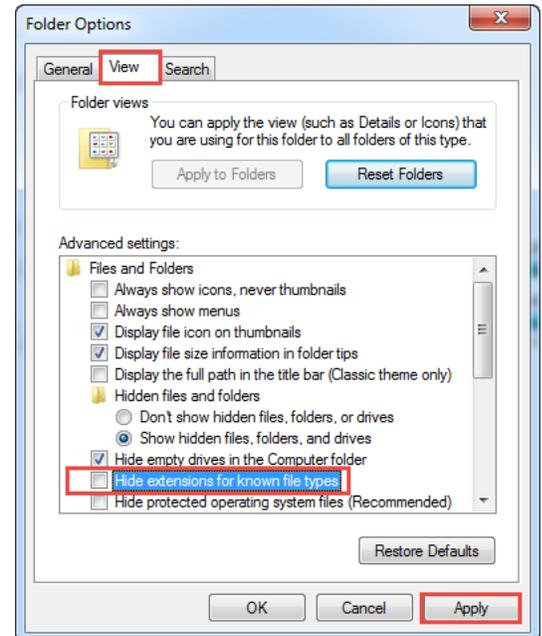
r12345pp.dgn

The revised copy of the file keeps the same name to maintain any references that it is attached to.

Do not include **spaces or special characters** in the folder names. Do not name files excessively long or bury files into subfolders greater than 7 levels deep.

Ensure that file extensions are turned on in Windows Explorer to avoid naming design files *.dgn.dgn with double extensions:

- In Windows Explorer, select **Organize > Folder and Search Options**
- Select the **View** tab and “uncheck” **Hide extensions for known file types**. Press the **Apply** button.



The following list depicts SCDOT Roadway File Naming Conventions:

Design File	Description
r12345ts.dgn	Title Sheet
r12345il.dgn	Index/Layout Sheet
r12345eq.xlsx	Summary of Estimated Quantities
r12345mi.xlsx	Moving Items/Disposal/Fence Sheets
r12345typ.dgn	Typical Sections and Miscellaneous Details
r12345rw.xlsx	Right of Way Data Sheets
r12345pc.dgn	Property Closure & Layout
r12345gcn.dgn	General Construction Note
r12345ref.dgn	Reference Data Sheets
r12345so.dgn	Station Offset Text file
r12345pf*.dgn	Plan and Profile Plotting File
r12345dr.dgn	Drainage Plan and Profile Sheets
r12345cg.dgn	Curb Grade Sheets
r12345ecds.xlsx	Erosion Control Data Sheets
r12345dx.dgn	Mainline Cross Section Design File
r12345fx.dgn	Mainline Cross Section Layout File
s123dx.dgn	Side road cross section file
s123fx.dgn	Side road cross section sheet file
us12xp_dx.dgn	Crossing pipe design cross sections
us12xp_fx.dgn	Crossing pipe final cross section layout
ofd1dx.dgn	Outfall ditch cross section file
ofd1fx.dgn	Outfall ditch cross section sheet file

r12345cp.dgn	Critical Points file
12345dtm.dgn	Digital Terrain Models
r12345pp.dgn	Plan and Property Design File
r12345sh.dgn	Shape File (may contain pattern lines)
r12345pat.dgn	Pattern line file
r12345eop.dgn	Proposed Edge of Pavement file
r12345prof.dgn	Profile Design file
planref.dgn	Created during plan sheet layout
r12345cogo.dgn	Created during plan sheet layout
xssheetpe.dgn	Created during cross section layout
prop345.dgn	Property file from Surveys
r12345pp_aerial.dgn	Aerial or Remote Sensing acquired survey Plan and Property Design File
12345dtm_aerial.dgn	Aerial or Remote Sensing acquired survey Digital Terrain Model
12345_aerial.tin	Aerial or Remote Sensing acquired survey tin file

Electronic Engineering Data Index File (EED_index.xlsx)

The Electronic Engineering Data Index file (EED_index.xlsx) should be completed for every project and updated as frequently as possible to maintain a table of contents of the electronic files found in the project working directory. By maintaining this file, you are helping other departments quickly and easily identify the pertinent files that are required for their job. By maintaining this file, you are helping yourself when you have not worked on the project for some time to be able to quickly locate the files you need to update. **THIS FILE** (or a file in similar format and content) **IS REQUIRED** for all in-house and consultant projects.

The first section of the Excel file will include the Project information, primary design files, plan and profile files, and the border sheet names.

ELECTRONIC ENGINEERING DATA INDEX			
COUNTY	ROAD/ROUTE NO.	PCN NO.	DESIGN GROUP
Florence	US 378 Part 5	37272	RPG 2
File Description	File Name	File Description	File Name
Geopak GPK COGO FILE	job272.gpk	DTM File -Existing	r37272dtm.dgn
Geopak TIN FILE - Existing	37272.tin	Exported TIN File - Existing	37272_ExistingGroundDTM.xml
Geopak GDF Drainage File	h378.gdf	Survey Excel File	37272_Survey.xlsx
Design File	r37272pp.dgn	Survey Control Points	37272_SurveyControl.csv
Property File	prop272.dgn	Survey Control Sheet	005A_0037272_ControlSheet.pdf
Typical Sections	r37272typ.dgn	Datum Description	37272_Datum_Description.pdf
		SCDOT Survey Control Plan Form	SCDOT_SurveyControlPlanForm.docx
PLAN AND PROFILE SHEETS			
Sheet Range	File Name	Sheet Range	File Name
Plan & Profile Sheets 6-24	r37272pf.dgn	Curb Grades Sheets 37-40	r37272cg.dgn
Side Road Profile Sheets 25-36	r37272pf1.dgn		
BORDER SHEETS			
File Name	File Name	File Name	File Name
border1.dgn	planref.dgn	xssheetpe.dgn	us378prof.dgn
borderref.dgn	planref6.dgn	sctyp1.dgn	r37272ofdprof.dgn

The second section will be indexed to include all of the GPK information. It is very important that the naming conventions are followed and the GPK is kept up to date so the electronic information “matches” the paper plans. Insert additional rows for additional alignments as needed. Leave blank the fields that are not applicable to each alignment. The Design Automation Office will fill in the Exported * information.

GPK Description	GPK Name	GPK Description	GPK Name
Existing Mainline Chain	US378	Cross Sections	us378rdx.dgn
Relocated Mainline Chain	US378R	Cross Sections (Scale 10H:5V)	scaled_us378rdx.dgn
Existing Mainline Profile	US378EP	Cross Sections Sheets	scaled_us378rfx.dgn
Existing Relocated Mainline Profile	US378REP	Shape File	r37272sh.dgn
Proposed Relocated Mainline Profile	US378RFP	Criteria File Used	Typical 5
Curb Grade Left Profile	US378RCGLT	Critical Points Profile	US378RCP
Curb Grade Right Profile	US378RCGRT	Pattern Line File	r37272pat.dgn
Exported EED File	us378r.xml	Exported Carlson File	us378r.cl
Exported EED File	us378r_top.gen	Exported Carlson File	us378r.pro
Geopak COGO Report	us378r_cogo.rpt	Exported Carlson File	us378r.sct
GPK Description	GPK Name	GPK Description	GPK Name
Existing Chain	s121	Cross Sections	s121dx.dgn
Relocated Chain		Cross Sections (Scale 10H:5V)	
Existing Profile	S121ep	Cross Sections Sheets	s121fx.dgn
Existing Relocated Profile		Shape File	s121sh.dgn
Proposed Profile	s121fp	Criteria File Used	Typical 3
Curb Grade Left Profile		Critical Points Profile	s121cp.dgn
Curb Grade Right Profile		Pattern Line File	r37272pat.dgn
Exported EED File	sideroads.xml	Exported Carlson File	s121.cl
Exported EED File	s121_top.gen	Exported Carlson File	s121.pro
Geopak COGO Report	sideroads_cogo.rpt	Exported Carlson File	s121.sct

The third section will be indexed to include all of the Proposed 3D Model information.

PROPOSED 3D MODELS FOR CONSTRUCTION	
Description	File Name
Proposed 3D finish grade surface (1/5)	US378_FG_DTM_PD_1735_to_1780.xml
Proposed 3D finish grade surface (2/5)	US378_FG_DTM_PD_1780_to_1815.xml
Proposed 3D finish grade surface (3/5)	US378_FG_DTM_PD_1815_to_1845.xml
Proposed 3D finish grade surface (4/5)	US378_FG_DTM_PD_1845_to_1895.xml
Proposed 3D finish grade surface (5/5)	US378_FG_DTM_PD_1895_to_eop.xml
Proposed 3D finish grade surface - Bridge End (1/2)	US378_FG_DTM_PD_BRIDGE-East.xml
Proposed 3D finish grade surface - Bridge End (2/2)	US378_FG_DTM_PD_BRIDGE-West.xml
Proposed 3D Break Lines in DGN format	US378_BreakLine_PD.dgn
Proposed 3D Break Lines in DXF format	US378_BreakLine_PD.dxf

Additional Surveys & Relocations

The original plan and property design file (pp.dgn) will follow the file naming convention described above. Additional surveys and relocations for a project will be coordinated through the Surveys Office and will be named according to the following guidelines:

P012345a.xlsx	Additional Survey "A" Excel File
prop345a.dgn	Additional Survey "A" Property File
12345.tin	The additional survey "A" tin file will be merged with the original tin file. This file should be copied to the Road folder.
r12345app.dgn	Additional Survey "A" Plan and Property File. This file should be referenced and merged to master into the original r12345pp.dgn file in the Road folder.
job45a.gpk	Additional Survey "A" gpk file. This file should be merged using the D&C Manager VBA "GPK Merge" into the job345.gpk in the Road folder. Ask the Design Automation Group for assistance if needed.
r12345soa.dgn	Additional Survey "A" station offset file. The station offsets in this file will need to be copied/pasted onto the r12345ref.dgn files.

The letter "A" signifies the first additional survey for the project, and b, c, d, etc. would be used, if needed for further additional surveys. Once an additional survey is received, the roadway design group should verify that it is correct and not a duplication of previous information. The new survey should then be merged into the original pp file by attachment as a reference file with the merge command.

The Surveys or Design Automation Office will also coordinate the new Geopak points and chains for the new surveys. They will verify previously stored Geopak points and chains and ensure that the Roadway Group has not used points reserved for the Surveys Office. **(Remember: Roadway Points should be stored with the "R" prefix.)**

Property/Utility/Sue/Wetland Files

There will always be additional design files that are provided to the Roadway Design Group for inclusion in the plan set. If the files are from an outside source such as a consultant, utility, or environmental group, these files should be referenced to the roadway design files.

It is highly recommended that these files **ARE NOT MERGED** into the main design file. As these files are updated, it become more difficult to distinguish what has been modified. The use of reference files makes this determination and update process easier.

prop345.dgn	This is the property file from the Surveys office. This file can be modified as right of way is researched and additional information is provided to the Surveys office. Attach this file as a reference to the r12345pp.dgn file for inclusion in the plan set.
u345pp.dgn	Utility and SUE Planimetry files. Turn on/off the appropriate levels and Save Settings in the design file. If the roadway pp.dgn file is attached as a reference, detach so not to confuse MicroStation. Attach the u345pp.dgn file as a reference to the r12345pp.dgn file for inclusion in the plan set.

e12345jw.dgn Jurisdictional Wetland Files. Turn off the location survey wetlands lines (light purple) in the r12345pp.dgn file and Save Settings. Attach the wetlands file as a reference to the r12345pp.dgn file for inclusion in the plan set. (Insert the date in the YYYY-MM-DD format for revised or updated wetland files.)

Additional file naming for Utility and SUE Files are as follows: (See the SCDOT SUE Manual for additional information.)

Design File	Description
u345ts.dgn	SUE Title & Reference
u345ul.dgn	SUE Legend
u345ud.dgn	Utility & Pole Data
u345th.dgn	Test Hole Data
u345pp.dgn	SUE Planimetry
u345thpp.dgn	SUE Test Hole Planimetry
u345md.dgn	Miscellaneous Detail
u345tbls.xlsx	SUE Table spreadsheet
u345pp.pdf	SUE Planimetry Plan Set
u345thrp.pdf	SUE Test Hole Reports

Environmental Standards

The following CADD elements have been developed with the SCDOT Design workspace to accurately depict Environmentally Jurisdictional areas for jurisdictional wetland mapping, environmental permit exhibits, and other environment submittals.

Additional file naming for Environmental Files are as follows:

Design File	Description
e12345jw.dgn	Jurisdictional Wetlands File
e12345evs.pdf	Sketch file
e12345evp.txt	Surveyed Environmental Point File in ASCII format
e12345evr.pdf	Surveyor Report
e12345em.dgn	Environmental Management CADD file

There are several Environmental levels utilized for incorporating environmental information into the roadway plans. These levels can also be used to complete Environmental Permits.

Name	Number			Used	Description
RD_EV_Ditch	1312	36	--- 3	3	Environmental Non-Regulated Ditch
RD_EV_ESA	1302	24	EVS_ESA	3	Environmental Environmental Sensitive Area
RD_EV_Hatch	1303	32	---	2	Environmental Hatch patterns
RD_EV_JDitch	1301	251	EVS_JD	3	Environmental Jurisdictional Ditch
RD_EV_JFlag	1306	251	---	0	Environmental Located Flag Numbers
RD_EV_JTrib	1305	231	EVS_EJT	3	Environmental Jurisdictional Tributary
RD_EV_JW	1304	79	EVS_EJW	3	Environmental Jurisdictional Wetlands
RD_EV_OWWater	1308	250	EVS_OW	3	Environmental Open Water Within Jurisdictional Area
RD_EV_Shades	1309	24	---	0	Environmental Color fills
RD_EV_TNW	1307	141	EVS_TNW	3	Environmental Traditionally Navigable Water/OCRM Critical Area
RD_EV_TX	1300	250	---	4	Environmental Text for Plan Sheets
RD_EV_TxCode	1310	0	---	0	Environmental Survey Code Data & Text
RD_EV_Working	1311	175	---	0	Environmental Non-Plotting Working Level

Of these levels, specific combinations are used in coordination with the various functions they will provide. The following chart details the visibility of the levels and graphics in accordance with general project functions with construction plan sets.

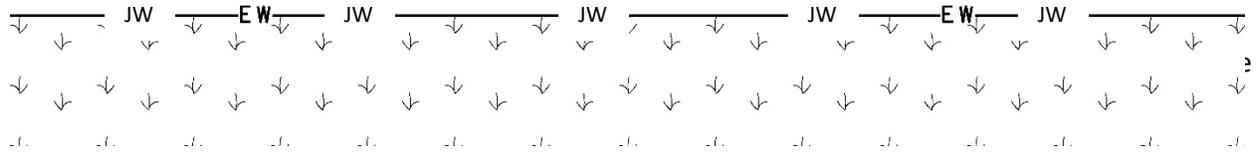
Level Name	Survey CADD Deliverable	Construction Plans		
		Property Strip Map	Plan & Profile	Drainage Sheet
RD_EV_Tx	ON	OFF	OFF	OFF
RD_EV_JDitch	ON	ON	ON	ON
RD_EV_Ditch	ON	OFF	OFF	OFF
RD_EV_ESA	ON	OFF*	OFF*	OFF*
RD_EV_Hatch	ON	OFF	OFF	OFF
RD_EV_JW	ON	ON	ON	ON
RD_EV_JTrib	ON	ON	ON	ON
RD_EV_JFlag	ON	ON	ON	ON
RD_EV_TNW	ON	ON	ON	ON
RD_EV_OWater	ON	ON	ON	ON
RD_EV_Shades	ON	OFF	OFF	OFF
RD_EV_TxCode	ON	OFF	OFF	OFF
RD_EV_Working	ON	OFF	OFF	OFF

For Army Corp Drawings and Permit Exhibits, all levels will be turned on in the list above with the exception of the RD_EV_TxCode and RD_EV_Working levels.

The Environmental information will be drafted using the following line-styles.

EVS_TNW	RD_EV_TNW	Environmental - Traditionally Navigable Water/OCRM Critical Area	
EVS_ESA	RD_EV_ESA	Environmental - Environmentally Sensitive Area	
EVS_JD	RD_EV_JDitch	Environmental - Jurisdictional Ditch	
EVS_EJT	RD_EV_JTrib	Environmental - Jurisdictional Tributary	
EVS_EJW	RD_EV_JW	Environmental - Jurisdictional Wetlands	
EVS_OW	RD_EV_OWater	Environmental - Open Water Within Jurisdictional	

These line styles may have additional labeling shown on the same level and the line style and should use the provided Environmental abbreviations as provided in these instructions. These additional labels will use the SCDOT Text-style **Environmental – Line Labels**. The following is an example of additional line labeling for the Environmental Office.



Approved abbreviations are shown in the following charts:

<u>Salt Water Habitats</u>	<u>Common Description</u>	<u>Abbreviation</u>
Marine Subtidal*	Open Ocean	MS
Marine Intertidal	Near shore	MI
Estuarine Subtidal*	Open-water/bay bottoms	ES
Estuarine Intertidal Vegetated		EIV
Estuarine Wetland		EW
Estuarine Intertidal Emergent	Salt marsh	EIE
Estuarine Intertidal Forested/Shrub	Mangroves / other estuarine shrubs	EIF
Estuarine Intertidal Non-Vegetated		EINV
Estuarine Intertidal Unconsolidated Shore	Beaches/bars/shoals	EIU
Riverine* (may be tidal or non-tidal)	River systems/channels	RS

<u>Freshwater Habitats</u>	<u>Common Description</u>	<u>Abbreviation</u>
Freshwater Vegetated		FW
Palustrine Wetland		PW
Palustrine Forested	Forested Wetlands	PF
Palustrine Shrub	Shrub wetlands	PS
Palustrine Emergent	Inland marshes/emergent wetlands	PE
Freshwater Non-Vegetated		FWNV
Palustrine Unconsolidated Shore	Shorelines/beaches/bars	PUS
Palustrine Unconsolidated Bottom	Open-water ponds	PUB
Palustrine farmed	Farmed wetland	PA
Lacustrine*	Deepwater lakes and reservoirs	LS

<u>Uplands</u>	<u>Common Description</u>	<u>Abbreviation</u>
Agriculture	Cropland, pasture, managed rangeland	AA
Urban	Cities and incorporated developments	UA
Forested Plantations	Planted or intensively managed forests; silviculture	FP
Rural Development	Non-urban developed areas and Infrastructure	RD
Other Uplands	Rural uplands not in any other category; barren lands	OU

In many cases, ESAs are bounded by an established Environmental Project Boundary (EPB), which is usually a consistent distance offset from the centerline of the project roadway. This project boundary line-work will be placed on the **RD_EV_Working** level and will be a solid, thin line.

All surveyed ESA data will be submitted using South Carolina State Plane Coordinates, referenced horizontally to NAD83 datum and vertically to NAVD88 datum. Elevations for the surveyed ESA boundaries and areas are not required and may be replaced by zero values. The Survey Deliverables for ESA projects must include the following files and information:

- A pdf of an ESA Sketch showing site location, ESAs, flag numbers, etc. (**e12345evs.pdf**)
- A comma delineated ASCII file containing the Survey Point data (**e12345evp.txt**)
- A Survey Statement describing the survey datum and location methodology. (**e12345evr.txt**)
- A MicroStation CADD file containing all applicable data (**e12345jw.dgn**)

ESA Sketch (e12345evs.pdf) - This sketch can be a scanned hand drawn, or digitally produced, drawing in an Adobe PDF format. At a minimum, this sketch must show the following information:

- Name and contact information of persons responsible for the delineation
- General area of site road along with road names, showing at least one intersection
- North Arrow
- General area and shape of delineated areas.
- Identifying numbers from flagging along with connectivity sequencing

The following is an example of an ESA sketch:



Survey Point Data (e12345evp.txt) - Surveyed ESA will be submitted in a comma delineated ASCII format that contains the following information:

- Survey Point Number (Point#)
- North Coordinate (Northing)
- East Coordinate (Easting)
- Elevation (these can be set to zero if elevations were not recorded)
- Feature Code & Description (separated by a "--")

Below is an example of the required information and format of the ASCII file.

Point#,	Northing,	Easting,	Elevation,	Feature Code-Description
1,	1234567.89,	12345678.90,	0.00,	EJA--A1
2,	1234567.89,	12345678.90,	0.00,	EJA--A2
3,	1234567.89,	12345678.90,	0.00,	EJA--A3

Surveyor Report (e12345evr.pdf) - A short description of the equipment, methodology, and expected accuracies associated with the location of the ESA will be submitted in either as a document file (.docx) of an Adobe pdf.

The following chart shows the Environmental colors to be used when shading Jurisdictional Areas:

TRUE COLOR	SCDOT COLOR	Jurisdictional Type
	99	Freshwater Forested & Shrub Wetland
	93	Freshwater Emergent Wetland
	108	Freshwater Pond
	68	Estuarine & Marine Wetland
	191	Riverine
	190	Lakes
	253	Estuarine & Marine Deep-Water
	85	Other Freshwater Wetlands

The following chart shows the hatch patterns used with the different Jurisdictional Areas:

	CELL NAME
JURISDICTIONAL WETLANDS	EVH-JW
JURISDICTIONAL TRIBUTARY	EVH-JT
ENVIRONMENTAL SENSITIVE AREA	EVH-ESA
CRITICAL (OCRM) AREA	EVH-OCRM
JURISDICTIONAL OPEN WATER	EVH-OW

Electronic File Policy

Providing Electronic Files to Non-Department Entities

It is the intent of the SCDOT to cooperate fully with all those with whom we do business. There are recognized shortcomings when the Department tries to provide electronic files to others in a format that is not native to the Department's operation. In light of the possible incomplete or errant electronic information that may be shared with other business affiliates, the Department will provide electronic information to non-Department entities only in the format the Department used to create the requested data. In the fullest degree of cooperation with the engineering community and the public, electronic vector files of plans, standards, specifications, or any other available electronic information may be provided through shared file sites, Internet and disks. Electronic files should only be provided with hard copies of the same information, unless the recipient has already obtained a hard copy of the information or the recipient obtains electronic raster images through shared files and/or the Internet. It is the responsibility of the recipient of the electronic files to verify the electronic files with the paper or raster copy. The paper or raster copy of all information provided shall be the governing document. The disclaimer shown below should be placed in every electronic document file prior to distribution.

Disclaimer

These electronic files were created by the South Carolina Department of Transportation (SCDOT) for the sole purpose of creating a set of plans for project development at the site shown. SCDOT believes that the information contained herein is reliable and generally accurate for the purpose intended. However, since physical conditions may vary and can change over time, SCDOT makes no performance guarantees, expressed or implied warranties and assumes no obligation or liability for the reliability or accuracy of the information contained herein; or for the accuracy of the information translated by the Department's software for use with end users' software. The paper copy of the electronic information, if available, shall govern over the electronic stored copy. Only the paper copy of the information may be used to determine errors and omissions in the documents. SCDOT assumes no liability for hardware or software damage that may result from the use of the electronic files provided on disk, tape or by electronic transfer due to unknown viruses that may reside on the electronic media when transferred to the end user.

Requesting copies of electronic files may incur costs if research, file manipulation and/or storage media is required. There is a cost for copies of paper documents. Delivery of electronic and hard copy files and plans to other government entities and public utilities is at no cost to those groups as long as sharing these files are deemed in the best interest of the Department. Files to be used to generate profit or to complete work for private interests will be charged the established rate. If the shared files are given to a Consultant in order to perform work at the request of the Department, there is no cost for the electronic or hard copy files and plans.

Electronic information is provided as employee time and availability permits. When large amounts of time are needed to gather data, a deposit from the requestor may be required.

Summary of Details

- 1) CADD drawing files are only provided in MicroStation Format.
- 2) Files are provided to Consultants working on projects in conjunction with SCDOT projects.
- 3) Files are provided to Cities, Counties, other government entities and utility companies at no charge when deemed in the best interest of the Department.
- 4) Files are provided to the Prime Contractor, if requested, only after they are awarded a project at no charge.
- 5) Files are provided to Property Owners, before letting, if the project impacts their property and authorized by the project manager at no charge.
- 6) Files are available to anyone after the project is let and awarded. (Fee Based)
- 7) Files are noted and labeled "Preliminary" if the project hasn't been let to contract.
- 8) Disclaimer is placed in electronic files directory or placed in the correspondence delivered to requestor except when provided to Consultants for a Department project.
- 9) Requestor should have a paper copy or raster image of the plan sheets being requested. (Fee Based on number of sheets)
- 10) Requestor can subscribe to SCDOT Plans Online system to access plans. (Fee Based)

Hard Copy Plan Prices

No Research -- \$1.00 per full size (22"x36") and \$0.50 per half size (12"x18") black and white
 Research Required --\$1.75 per full size (22"x36") and \$1.25 per half size (12"x18") black and white

Contact for Hard Copy Plan Sheets and/or access to SCDOT Plans Online System:

Attention: Mark Lorick, Room G-21
 South Carolina Department of Transportation
 Plans Storage Office
 Post Office Box 191
 Columbia, South Carolina 29202-0191
 Email: planstorage@scdot.org
 Telephone: (803) 737-7236

Electronic File Transfer Prices

Research and Transfer Fee -- \$30.00 per hour -- \$15.00 Minimum
 SCDOT Plans Online System -- \$60.00 yearly

Contact for Electronic Cadd Files:

Scott Shaffer	shafferss@scdot.org	803-737-1090
Iris Neal	nealif@scdot.org	803-737-9964
Brett Calcutt	calcuttbm@scdot.org	803-737-6873
Peter Yeh	yehnp@scdot.org	803-737-1904

South Carolina Department of Transportation
 Design Automation Office, Room G-19
 Post Office Box 191
 Columbia, South Carolina 29202-0191

Digital Imagery Non-Disclosure Agreement

Digital orthophoto imagery is provided to the South Carolina Department of Transportation (SCDOT) from the South Carolina Geodetic Survey (SCGS) for Department use only. In the event that any digital orthophoto imagery is used as a base map for projects conducted by non-Department entities working with the SCDOT, all SCDOT employees will require an electronically signed agreement form of non-disclosure from said non-Department entities.

By electronically signing and submitting this agreement form to SCDOT, you personally, and/or as a representative of the above entity, agree that any imagery used for a project in South Carolina will be used only for the project with which it is intended and will be destroyed once the project is completed. You agree not to resell or redistribute this imagery provided or derived in digital form to third parties.

The electronic form is to be submitted to the Program Manager for approval. The form is available on the Cadd Design website at: <https://www.scdot.org/business/CADD-Design.aspx>



SCDOT Digital Imagery Non-Disclosure Agreement

Digital orthophoto imagery is provided to the South Carolina Department of Transportation (SCDOT) from the South Carolina Geodetic Survey (SCGS) for Department use only. In the event that any digital orthophoto imagery is used as a base map for projects conducted by non-Department entities working with the SCDOT, all SCDOT employees will require an electronically signed agreement form of non-disclosure from said non-Department entities.

Project Information:

County Route Project ID
 Program Manager

Company Information:

Name of Company City
 Address 1 State
 Address 2 Zip

Company Information:

Name of Contact Phone
 Title Email Address
 Company Owner or Principal

Non-Department Entities:

By electronically signing and submitting this agreement form to SCDOT, I personally, and/or as a representative of the above entity, agree that any imagery used for a project in South Carolina will be used only for the project with which it is intended and will be destroyed once the project is completed. I agree not to resell or redistribute this imagery provided or derived in digital form to third parties.

Name (Please Print):
 Signature:
 Date:

Plan Covers

The Engineering Documents Office prepares the manila folders for the plan sets. The covers are available for pick up in room G-23 to SCDOT employees only.

Consultants are responsible for providing the covers for their plans. The labels are 8.5" x 5.5" (Half Sheet) Shipping Labels for Laser/InkJet printers – Avery 5126.



To create the **label** to stick onto the cover, complete the [word document template](#) with the correct project information. (You can change the Route/Road as appropriate and the To/From vs. Bridge Replacement description as necessary.) If needed, reduce the font size to ensure the text fits properly on ½ of the template file.

The information can be modified to fit as necessary, with the key objective being to create a legible and informative label for the plan set.

FLORENCE COUNTY

PROJECT ID. 0037272

ROUTE: US 378 (MYRTLE BEACH HWY)

FROM: WEST OF RD S-225 (SANDPIT RD)

TO: SC RTE 41 (KINGSBURG HWY)

Email the label to PlanStorage@scdot.org to be printed onto the label paper. Wait for notification from Plans Storage that the cover is ready for **pick up** on the counter in Room G-23.

If you have any issues completing the template, please feel free to contact:

Mark Lorick, Travis Huckabee, or Calvin Johnson

Plans Storage – Room G21

Phone: 803-737-1743 and 803-737-9981

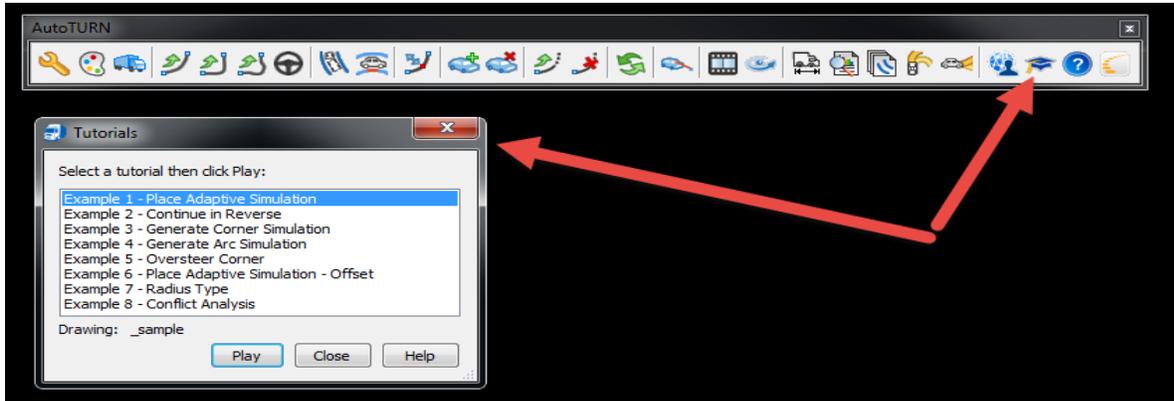
Email: PlanStorage@scdot.org

Note: If you have a large set of plans that needs to be drilled, please feel free to stop by the Plans Storage office in person and they will accommodate you with a specialized plan cover.

Application Programs

AutoTurn

AutoTurn software is utilized to analyze truck turning movements using Truck Turning Radius templates and cells. AutoTurn is a vehicle swept path analysis software. This software can analyze almost all vehicles in road and site design projects including intersections, roundabouts, bus terminals, loading bays and parking lots. It can provide detailed reports and visual analysis clearances, swept path maneuvers, clear sight triangles, and much more. For additional help using this software, see the tutorials located in the AutoTurn icon selection.



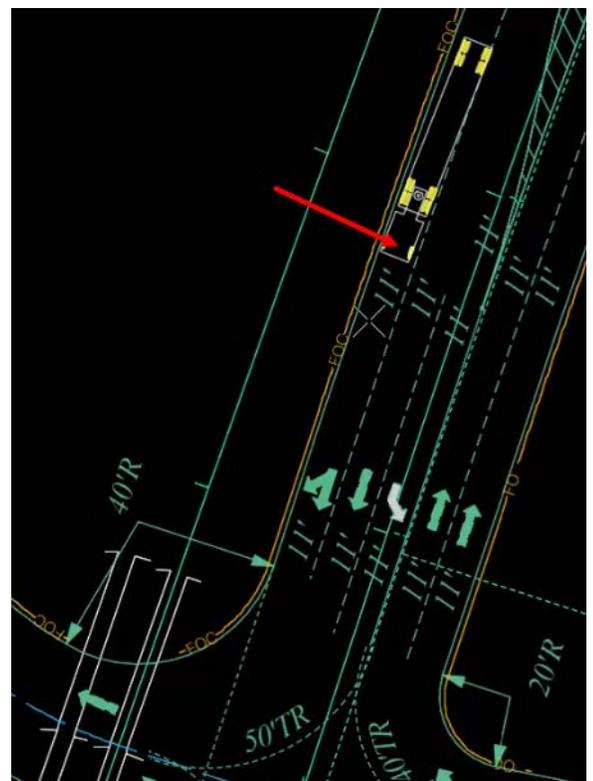
To load, select **SCDOT Interface > Load AutoTurn** from the top MicroStation menu.



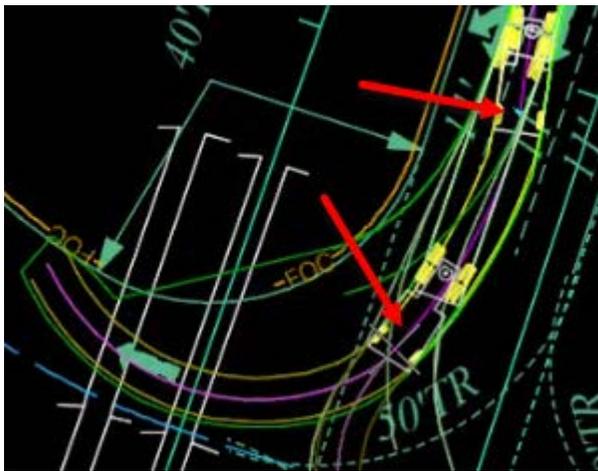
Press the **Vehicle** button to select the appropriate vehicle for the project. Press **OK**.



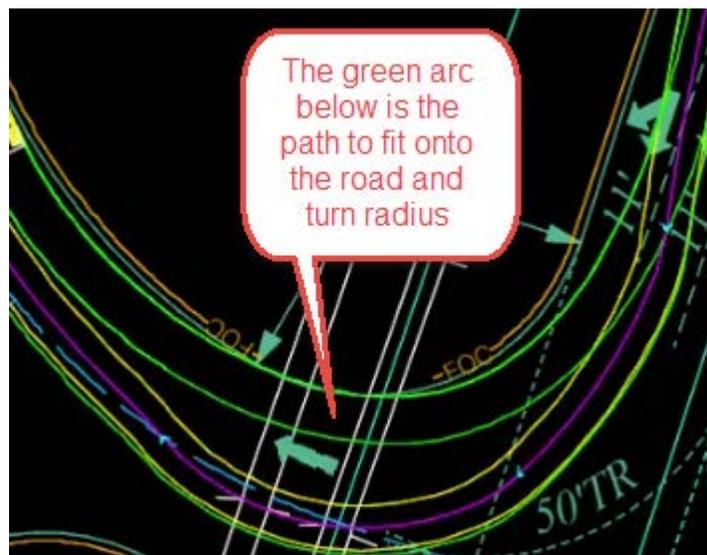
To create a turning path using **Path tools**, select the 4th icon, **Generate Arc Path**. **Data click** the vehicle into the lane approaching the intersection. Rotate the vehicle and data click again to place the vehicle in the correct direction.



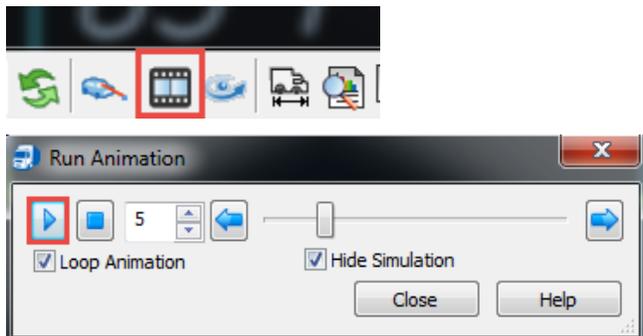
Drag the cursor and **data click** to define the truck path movement. Continue through the curve of the intersection. (Note: it does not have to be perfect the first time through, the curve path can be adjusted after drawn.)



After completing the path, press the **Path Control** icon. This will highlight the path with Nodes that can be moved (right image below). Use the mouse to drag/drop and fine tune the vehicle path to fit onto the road and turn radius of the intersection (bottom image).

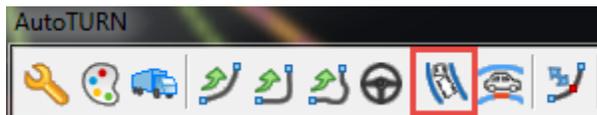


Press the **Run Animation** icon and select the path. The **Hide Simulation** can be checked on or off for viewing the vehicle movements. The **Loop Animation** button can be turned on to repeat the simulation again. Set the timing to 5 seconds and press the **Play** button to review the movements.

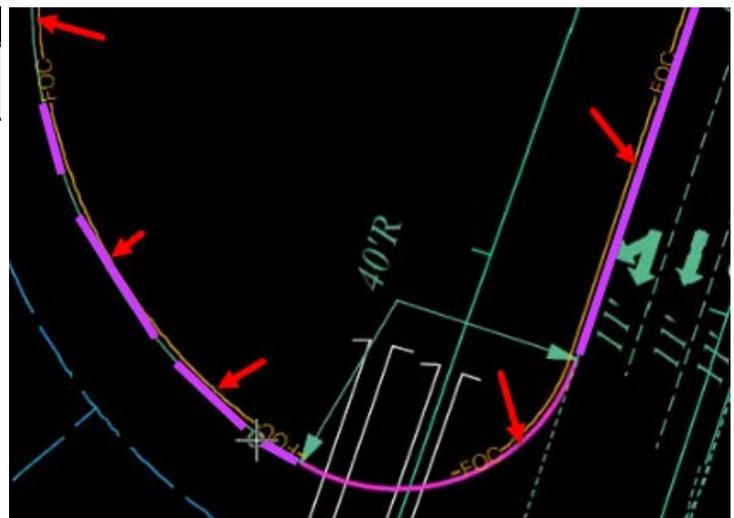
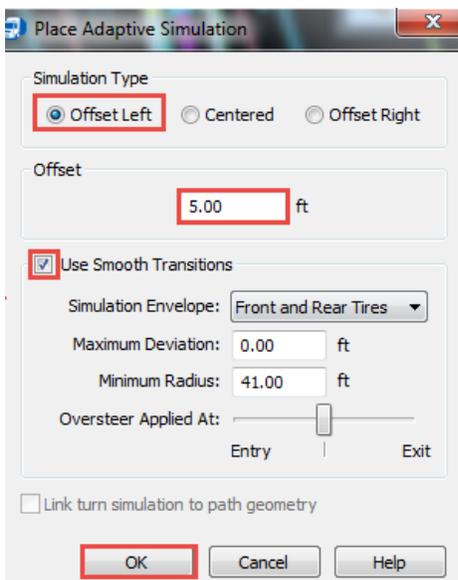


Modify the intersection design radius if necessary. **Modify** the truck turning path if necessary to ensure good movement.

To create a turning path using the **Place Adaptive tool**, select the 8th icon, **Place Adaptive Simulation**. **Data click** to select the proposed edge of travel way from the tangent approach path through the radius of the intersection to the tangent of the intersection path.



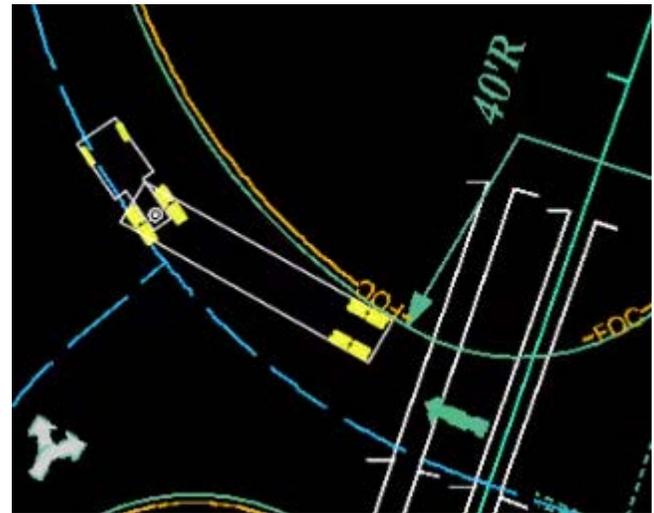
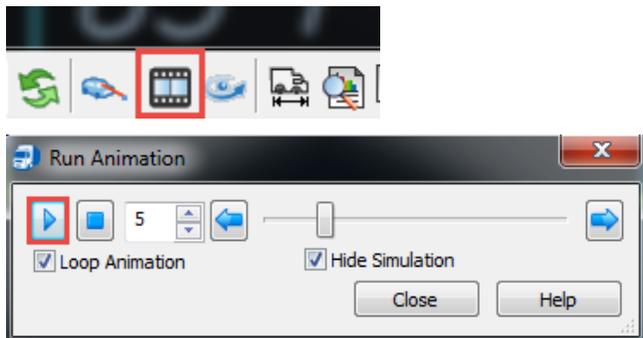
Toggle the **Offset Left** button and enter **5.00** to offset the path elements. Toggle on **Use Smooth Transitions**. Press **OK**.



From the AutoTURN help: *This tool generates turn simulations based on following selected path elements with the center of the steering axle group (traditional centerline path follow) or by offsetting the turn simulation a specified distance relative to the selected turn simulation envelopes (offset simulation).*

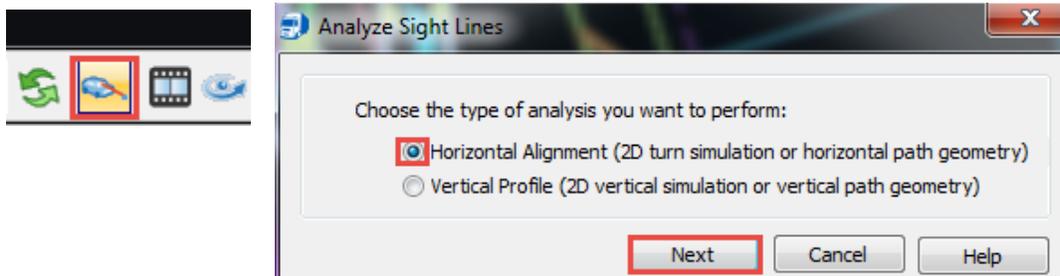
Offset turn simulations are measured from the selected path elements to the specified simulation envelopes: front and rear tires; vehicle body; or body clearance.

Press the **Run Animation** icon and select the path. The **Hide Simulation** can be checked on or off for viewing the vehicle movements. The **Loop Animation** button can be turned on to repeat the simulation again. Set the timing to 5 seconds and press the **Play** button to review the movements.

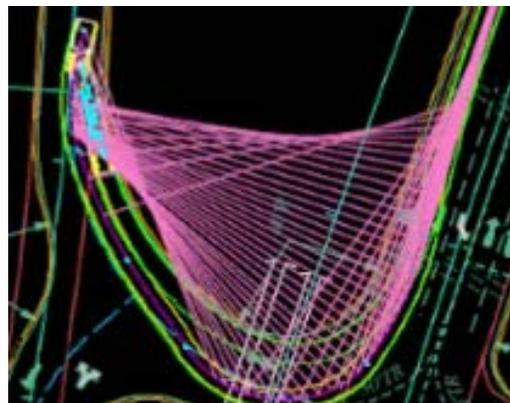
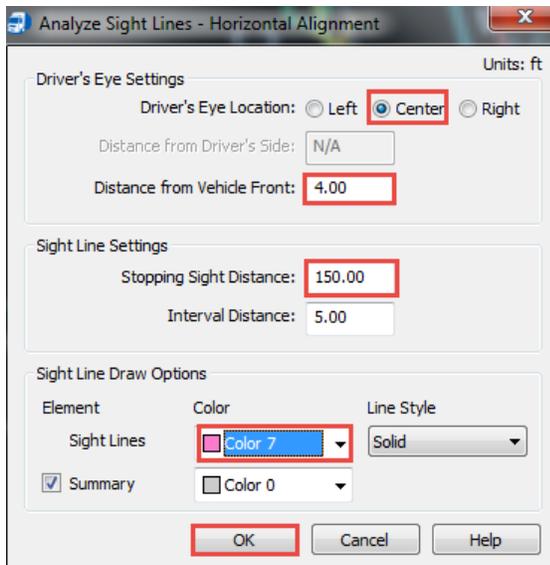


Modify the intersection design radius if necessary. **Modify** the truck turning path if necessary to ensure good movement.

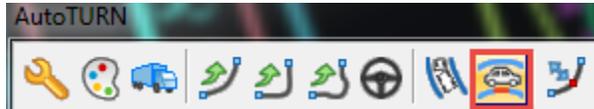
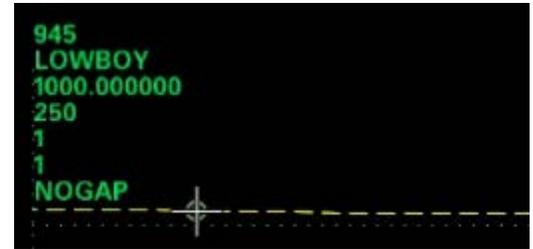
Press the **Analyze Sight Line tool** icon. Select the **Horizontal Alignment** option, and press the **Next** button.



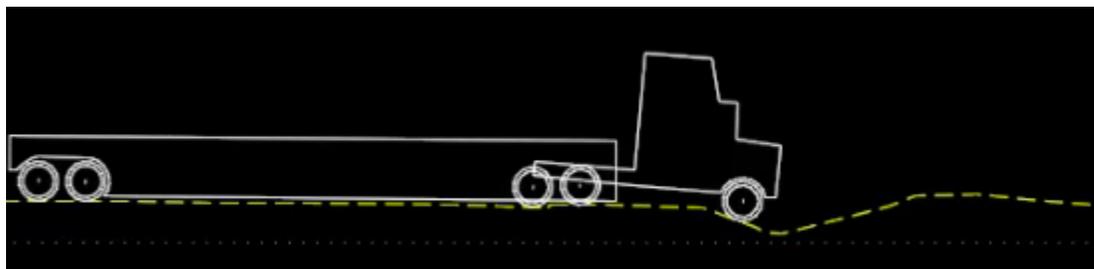
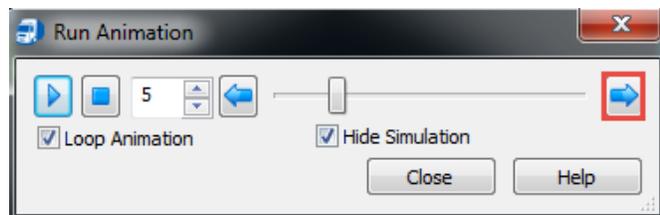
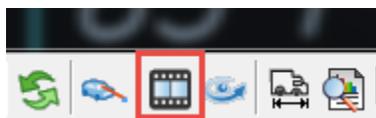
Data click to select the turn path. Set the Driver's Eye Location to **Center**. Set the Stopping Sight Distance and Sight Line Options. **Review** the line of sight for the intersection of the project. **Adjust** the design as necessary to meet design standards.



Select the **Place Vertical Simulation** icon to create a vertical path. **Data click** to select the profile. (Note: The following example depicts the centerline profile. This tool can be used anywhere an existing or proposed profile has been drawn – centerlines, edge of pavements, driveways, etc.)

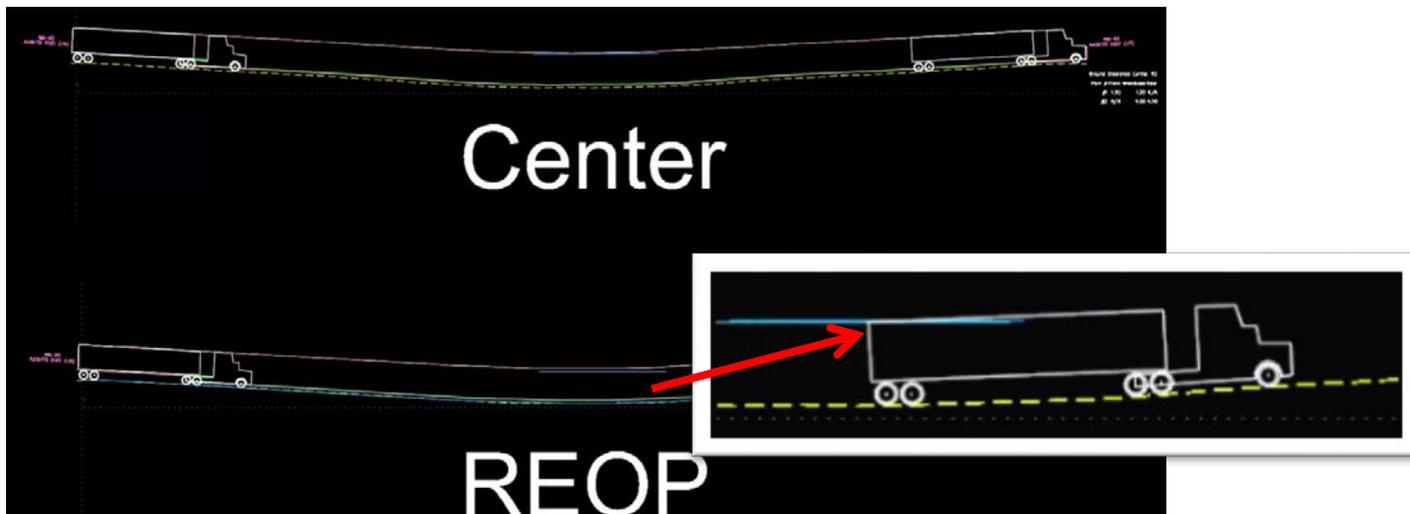


Press the **Run Animation** icon and select the vertical path. The **Hide Simulation** can be checked on or off for viewing the vehicle movements. The **Loop Animation** button can be turned on to repeat the simulation again. Set the timing to 5 seconds and press the **Play** button to review the movements. {The video can be paused to zoom in closer to review. Press the **Move Slider Right** button to slowly maneuver thru obstacles for review.}



Modify the proposed profile as necessary to ensure the vehicles have enough clearance height and also do not bottom out in dips or over railroad crossings.

This tool can also be used to check **bridge clearances**. On the profile have both the existing and/or proposed centerline elevation drawn with the bottom of the bridge deck profile. It can be checked for centerline and left and right edges of pavement profiles.



Alternatives to Axiom Software

Axiom software was phased out of roadway design plan production in April 2016. Alternative processes have been developed to accomplish all of the items previously completed with the Axiom software.

Axiom was primarily used to copy and paste formatted Excel data into MicroStation for plan production. Excel sheets for the Quantity Sheets, Moving Items/Removal Disposal, Erosion Control, General Construction Note, and Right of Way Data have been developed to create the plan sheets by printing Excel to pdfs.

- Excel Sheets** See page 242 for instructions.
- Index of Sheets** See page 286 for instructions.
- Utility Owners** See page 289 for instructions.

The additional tools utilized in Axiom are to be replaced with the following alternatives in MicroStation:

File Fixer

To recover or compress a potentially corrupted dgn file:

- File Compress and Repair** See page 13 for instructions.

File Backup

Files on the network server are backed up to tape on a nightly basis for modified files and a weekly basis for unchanged files. To recover a previous version of the file, submit a request using the SCDOT Help Desk ticket system at <http://apps.sharepoint.dot.state.sc.us/HelpDeskApp/default.aspx>.

Select **Create a Ticket** on the left. Enter your **nts user name** and the Short Description **File Restore**. Select the Category **Data Management** and specify the file name to be backed up (or files/folders), the date to be backed up from, and the location on the network. Include the **full path to the file**. Do not list a mapped drive such as P:\ drive. Specify if the file is to be overwritten or specify to name the file or folder *_backup.dgn for comparison to the existing file.

Service Requests : New Item

The screenshot shows the 'Service Requests : New Item' form. On the left, there is a navigation menu with 'Create a Ticket' highlighted. The form fields are as follows:

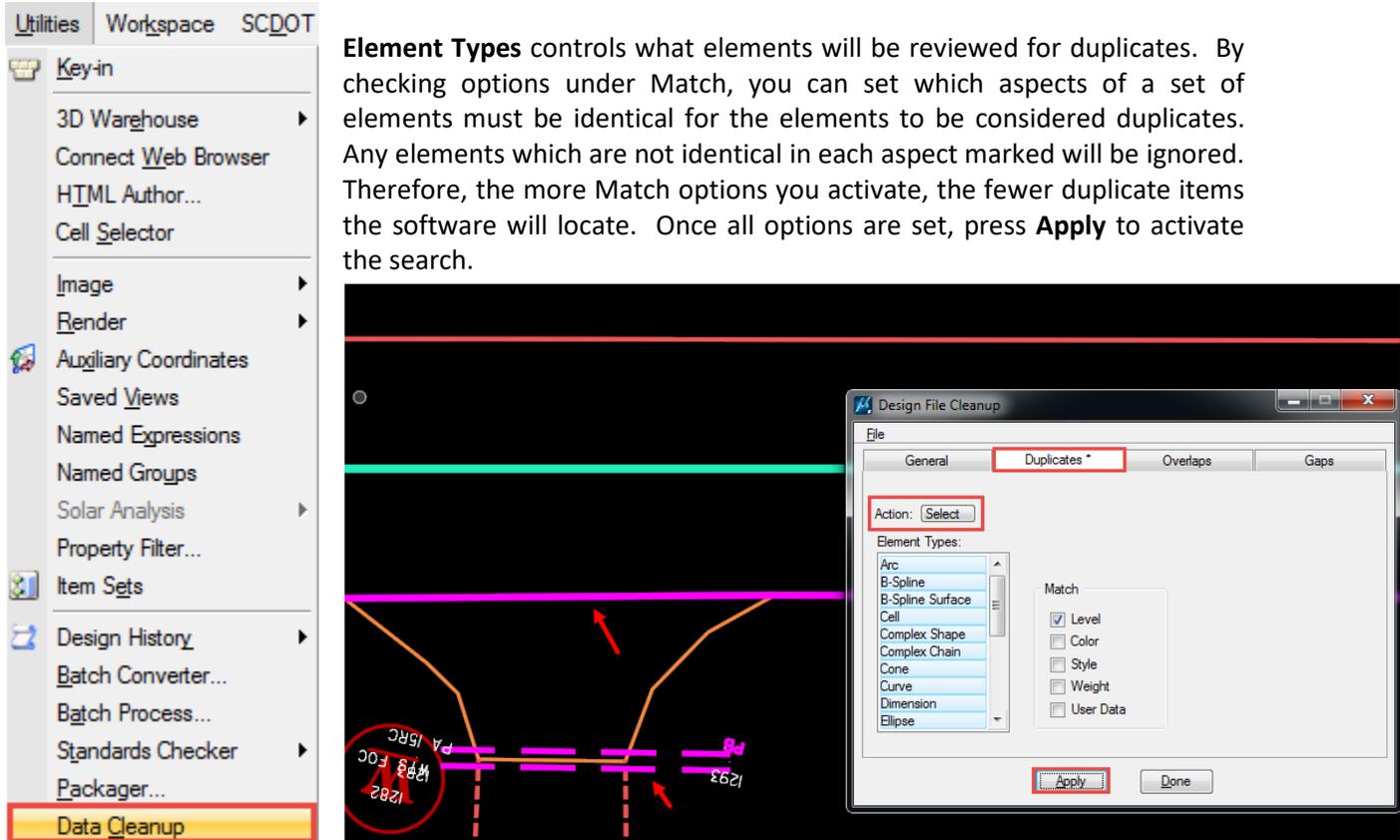
- Customer ***: nealif
- Category ***: Data Management
- Short Description**: File Restore
- Details**:


```
Please restore the following file:
r37272pp.dgn
\\nts\hq\Precon\Florence\37272_us378_part5\road
From 11/15/15 backup
Please rename the file r37272pp_backup.dgn so I can
compare the two files.
Thanks!
```

Duplicate Element Remover

When copying and pasting, moving, or applying elements, it can be easy to accidentally duplicate a single element. MicroStation has the ability to locate and select or delete duplicate elements. In the **Utilities** menu, select **Data Cleanup**.

In the **Design File Cleanup** dialog, select the **Duplicates** tab. In the Action pull down menu, choose whether to **select or delete** duplicate items.

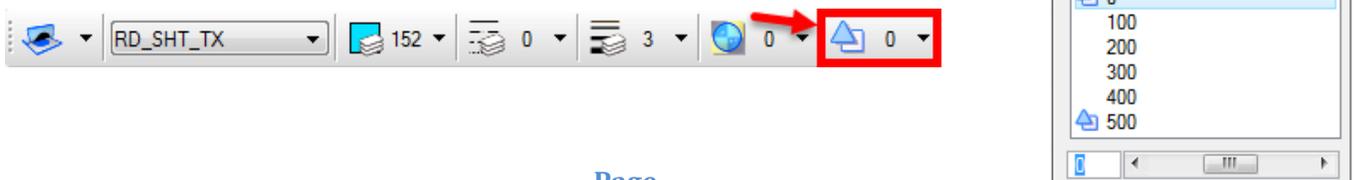


Element Types controls what elements will be reviewed for duplicates. By checking options under Match, you can set which aspects of a set of elements must be identical for the elements to be considered duplicates. Any elements which are not identical in each aspect marked will be ignored. Therefore, the more Match options you activate, the fewer duplicate items the software will locate. Once all options are set, press **Apply** to activate the search.

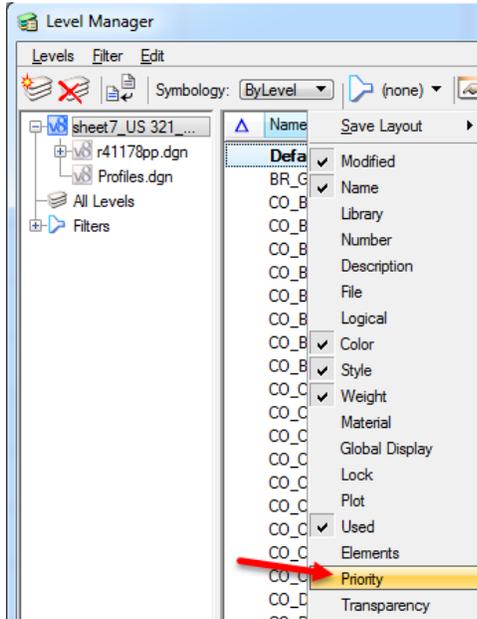
Element Priorities

When elements in a MicroStation file are overlaid or when a second file is referenced into a DGN, MicroStation can determine which element has “priority” – which one is “in front” of the other – for selection and printing.

For elements in a single file, priority can be set individually or by the Level the element is placed on. To set priorities for individual elements, simply select the element and click the **Active Element Priority** tool in the Attributes toolbox, typically docked at the top of the window. Levels with higher values will be ‘in front’ of those with lower values, making it easier to select and edit elements set to those priorities.

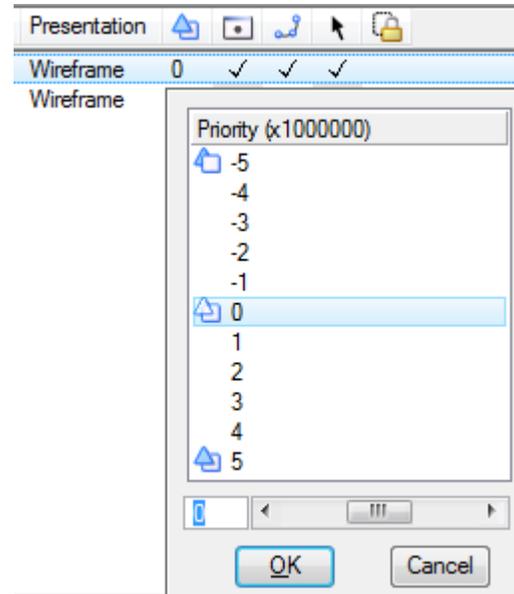
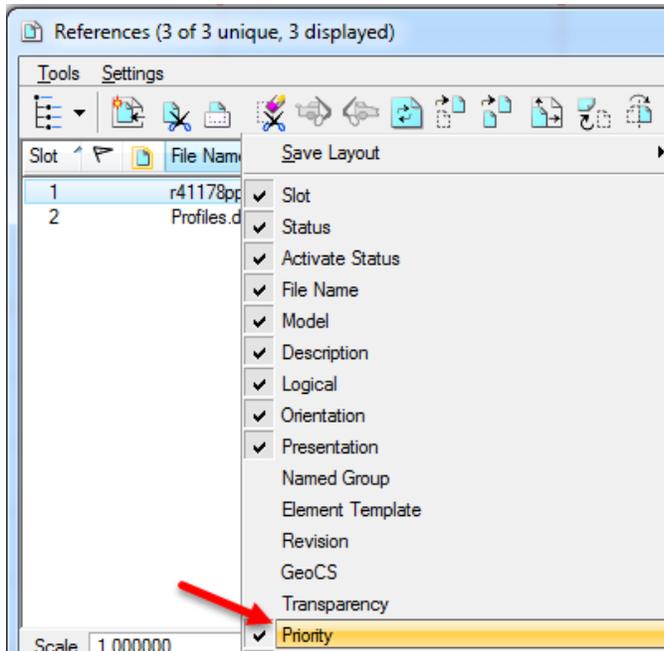


To set priorities by Level, open the **Level Manager** and review the factors listed at the top of the Levels list. If Priority is not shown, right-click on the bar and select “Priority”.



Once the level priorities are shown, you can simply click on the values and choose a new one.

Similarly, to set priorities for referenced files, open the **References** menu and activate the **Priority** option by right-clicking on the qualities bar and selecting ‘Priority’. Once the Priority of each reference is shown, the priorities can be set by clicking on them and choosing a priority level.

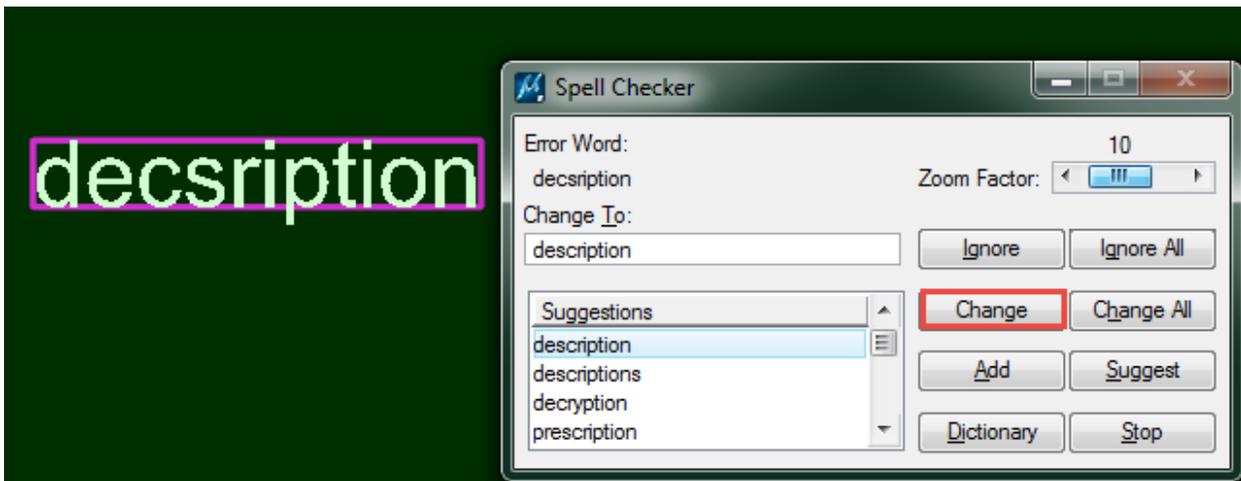


Spell Checker

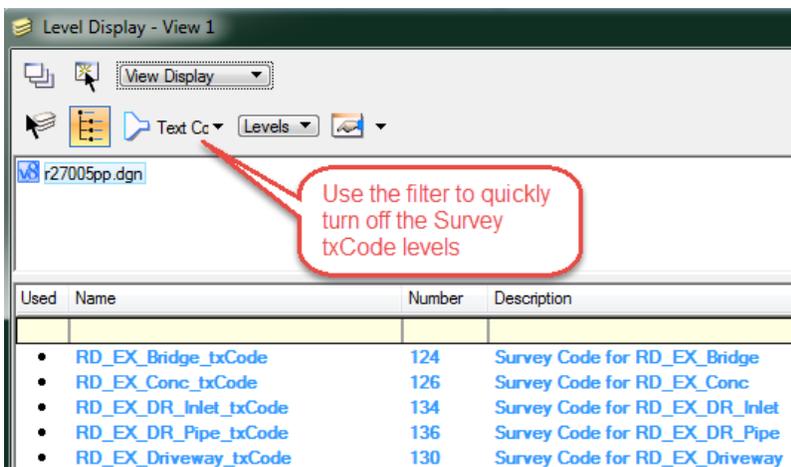
To spell check text in MicroStation, Fit View for the design file. Draw a fence around all of the elements. On the Text toolbar, select the **Spell Checker** tool, the fourth tool in the list. Check on **Use Fence**.



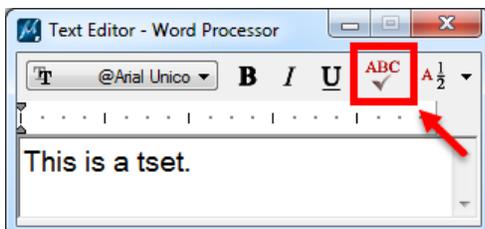
Data click in the design file to activate the spell checker. Review each word found and select the appropriate response to either Ignore, Change, etc.



*Tip: Turn off all of the Text Code – Location Survey Levels to avoid the spell checker stopping on each of these codes.



You can also spellcheck a line or paragraph of text prior to placing it. After typing or pasting the text, click the Spell Checker icon in the Text Editor window.



Pipe Spreadsheets (SCDOT only)

The Pipe Spreadsheet is used to organize drainage network data for inclusion in plan sets. The spreadsheet itself can be located on the Preconstruction intranet page under **Resources > Design Tools** listed as **Pipe Editor**. (This sheet is available internally to SCDOT only.)

The information for generating the necessary reports is located in the DrainReport4AltPipe2010.drf file found (internally only) here:

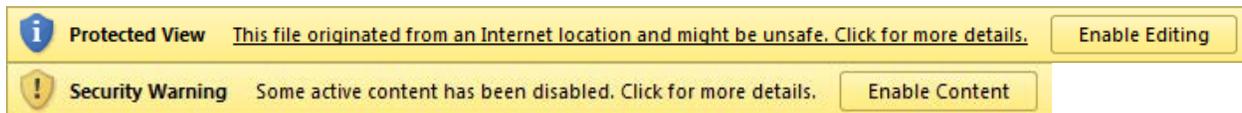
\\nts\hq\Precon-General\Hydraulics\Standard Files_GEOPAK_2009\GEOPAK Output\Output drf files

To export the drainage system data from Geopak, select **Drainage > Reports > Generate**. Make sure you have an active network selected. By **Drainage Report Format File**, choose the preset **DrainReport4AltPipe2010.drf**.

By **Output File Name** choose your working directory and name the file as desired. Change the extension to csv. Select **Generate** to produce the file. A message will appear stating the file has been generated.



Copy the Pipe Editor spreadsheet from the intranet page to your working directory and open the file. Select Enable Editing to authorize Macros and to confirm that files from the internet are allowed (if prompted).



Fill in the File Number (Contract ID) on the Input tab of the spreadsheet. The Joint Pressure cell should be 13 psi for coastal regions and 10 psi for all others unless otherwise indicated for the specified project. Set Smooth Data to Yes and Corrugated Data to No. If Driveway Pipes are to be included in the final report, set that field to Yes. Then enter the name of the .drf file created in the previous section next to the Smooth Data field under File Names.

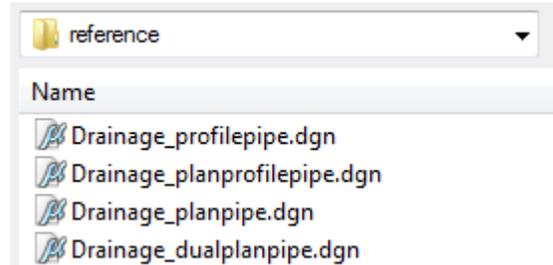
File Number:	21.038191B	
Date:	Apr-01-15	
Current User:	Holtzclaw, Bobby	
Joint Pressure:	10	psi

Type of Data Files To Import And Process	File Names	?
Smooth Data:	Yes	Smooth
Corrugated Data:	No	
Will Project Include Driveway Pipe:	Yes	

Press the “Import Geopak Data” button to fill in the network data from the .csv file. The left most column of data, System ID, must be filled in manually. For each Link, enter the point number of the outlet of its system. The SPT “N” values must be entered manually by the geotech. Once both columns

have been filled out, press the “Generate Road Output Results” button and enter a file name to create the final reports. This Excel file will be sent to the Roadway Design Group for inclusion in the plans.

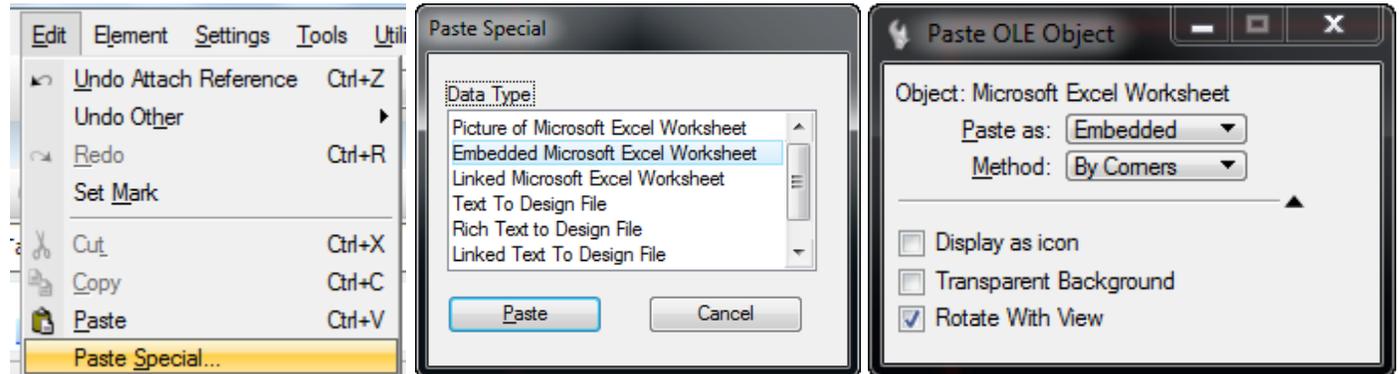
In MicroStation, select the most appropriate border sheet applicable for your project. Alternatively to displaying the information on the Drainage Plan, Plan & Profile, Dual Plan, or Profile sheets, you can elect to use a standard border sheet and copy and paste the entire chart at once instead of separating it per road or 1500 station range.



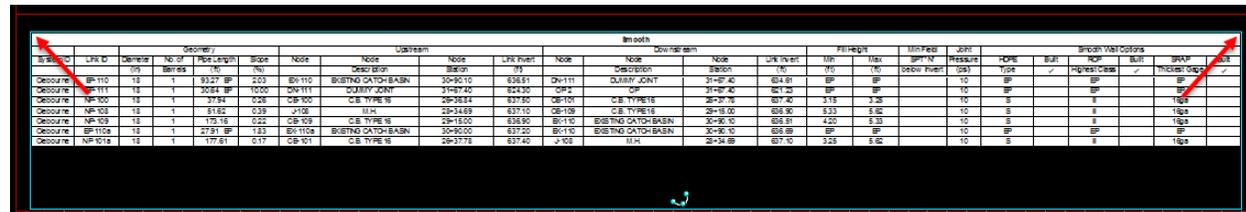
In the Excel file, highlight the headers and pipe data columns and rows. Right click to select **Copy**.

System ID	Link ID	Diameter (in)	No. of Bars	Smooth										Smooth Wall Options				
				Upstream		Node		Downstream		Link Invert		Fill Height		Min. Field	Joint	HDPE	Build	RCP
Description	Station	Station	Station	Description	Station	Station	Station	Min	Max	SPT-10'	Pressure (psi)	Type	Thick	Class	Thick	Gage	Thick	Gage
Clebourne EP-100	10	18	1	IG CATCH BASIN	20+80.00	636.51	DN-111	DUMMY JOINT	20+87.40	634.61	EP	EP	10	EP	EP	EP	EP	EP
Clebourne EP-111	10	18	1	DUMMY JOINT	21+67.40	624.30	OP-2	OP	21+67.40	621.23	EP	EP	10	EP	EP	EP	EP	EP
Clebourne NP-100	10	18	1	C.B. TYPE 16	26+38.84	637.50	CB-101	C.B. TYPE 16	26+37.78	637.40	3.15	3.25	10	S	II	15ga	II	15ga
Clebourne NP-100	10	18	1	M.H.	29+34.69	637.70	CB-102	C.B. TYPE 16	29+45.00	636.30	5.33	5.62	10	S	II	15ga	II	15ga
Clebourne NP-100	10	18	1	C.B. TYPE 16	29+50.00	636.50	EX-100	EXISTING CATCH BASIN	30+80.00	636.51	4.20	5.33	10	S	II	15ga	II	15ga
Clebourne EP-100a	10	18	1	IG CATCH BASIN	30+80.00	637.20	EX-100	EXISTING CATCH BASIN	30+80.00	636.89	EP	EP	10	EP	EP	EP	EP	EP
Clebourne NP-100a	10	18	1	C.B. TYPE 16	29+37.78	637.40	J-100	M.H.	29+34.69	637.70	3.25	5.62	10	S	II	15ga	II	15ga

In MicroStation, select **Edit > Paste Special**, select **Embedded Microsoft Excel Worksheet**, and ensure **Transparent Background** is not selected.

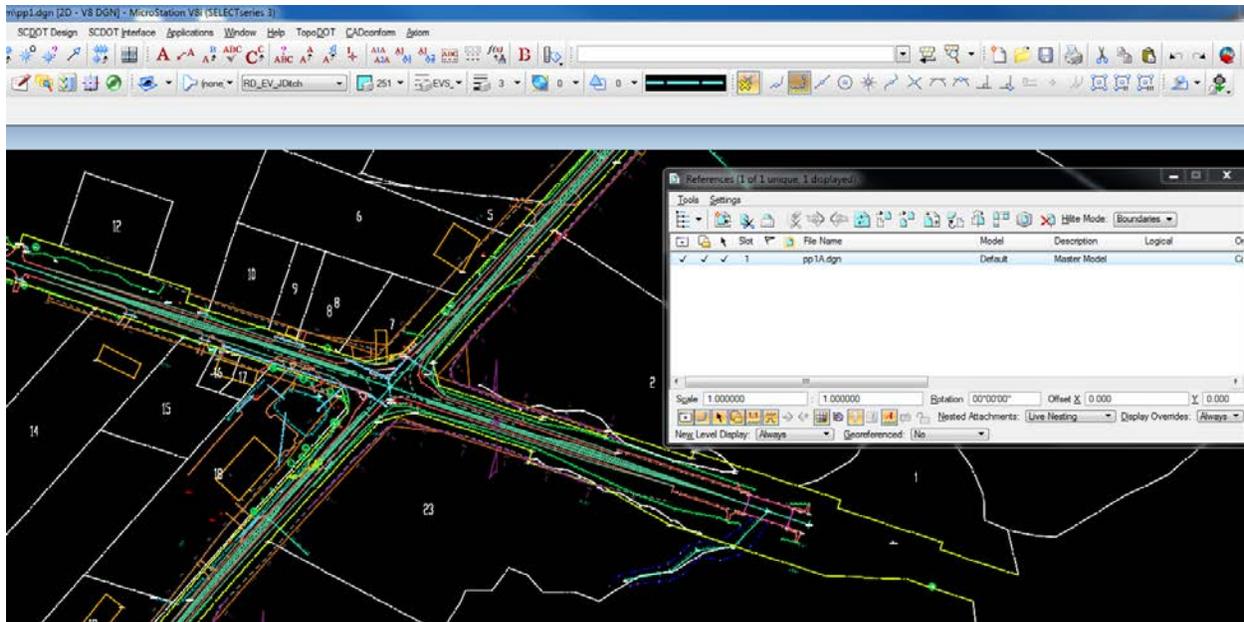


Left click in the upper left corner and then in the upper right corner to draw the extents of the chart.

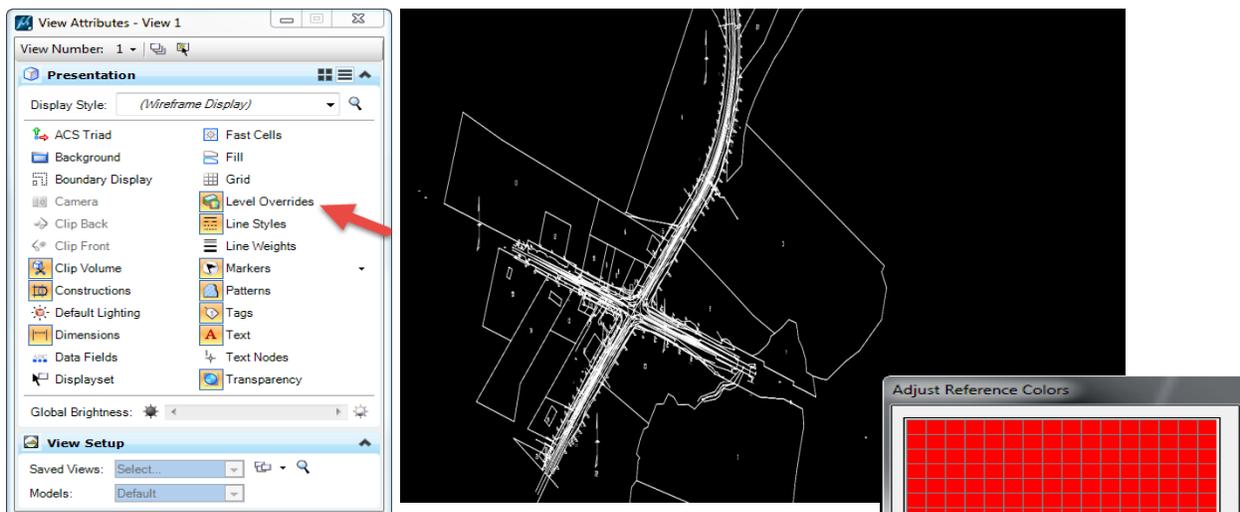


Compare DGNs

To compare two design files to one another to verify the modified content, **attach** the older file as a **reference** to the newer file. (The following example demonstrates referencing *pp1A.dgn to *pp1.dgn.)

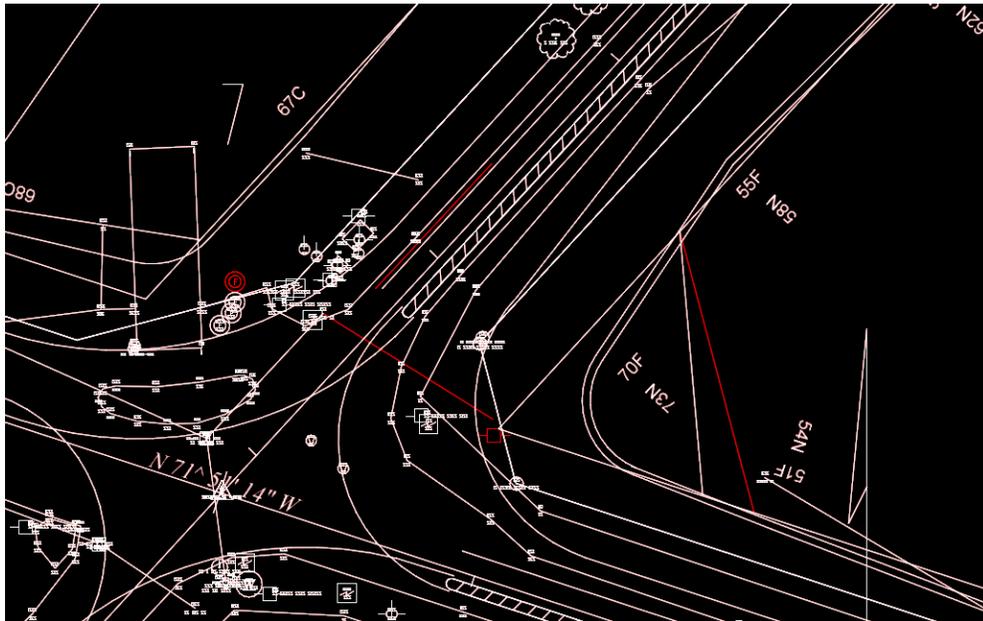


The two design files should be on top of each other. At this point, it is very difficult to notice the differences. To simplify the on screen colors, turn on **Level Overrides** in the **View Attributes** dialog box. All levels will now look the same.

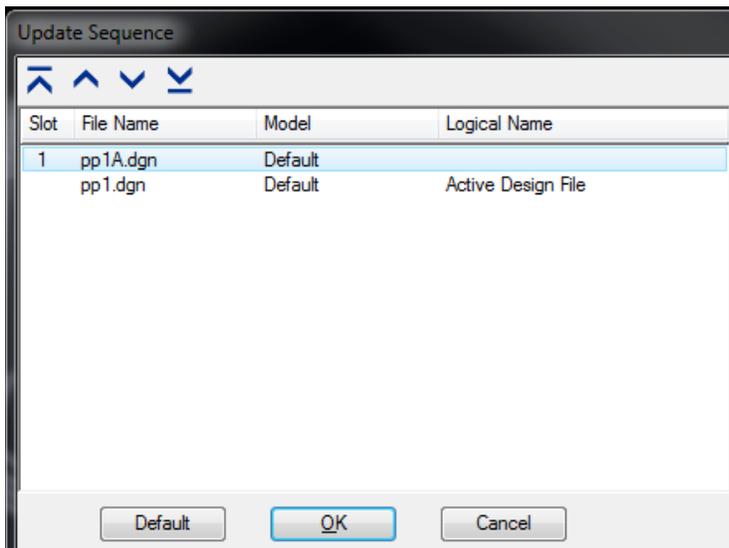


In the reference dialog box, select **Settings > Adjust Colors**. You can adjust the Values, Saturation, and Hue slide bars to make any color you would like for the reference file. The example depicts the color modified to **red**.

Once you do this, you can easily see the graphical difference in the design files.



If all of the colors turn red, you will need to change the sequence of how the elements are displayed. To do this, open the Reference dialog box and go to **Settings > Update Sequence** and move the referenced file to the top.



EWBS – Earthwork Balancing System (SCDOT only)

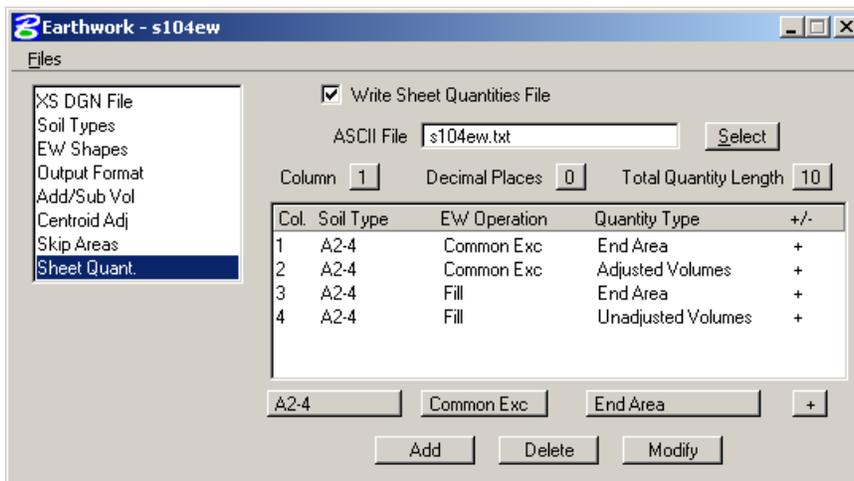
The Earthwork Balancing System Program (EWBS) processes exported Geopak earthwork data from cross sections to determine how much total fill to bring to a project site, or how much total waste to truck from the project site.

EWBS imports the Geopak earthwork text file and allows the user to edit and save it into a *.cnr file. The program uses either the original *ew.txt file or the edited *.cnr file to run and balance the earthwork for each alignment.

Geopak Setup for Earthwork

Run Earthwork in Geopak using the Project Manager.

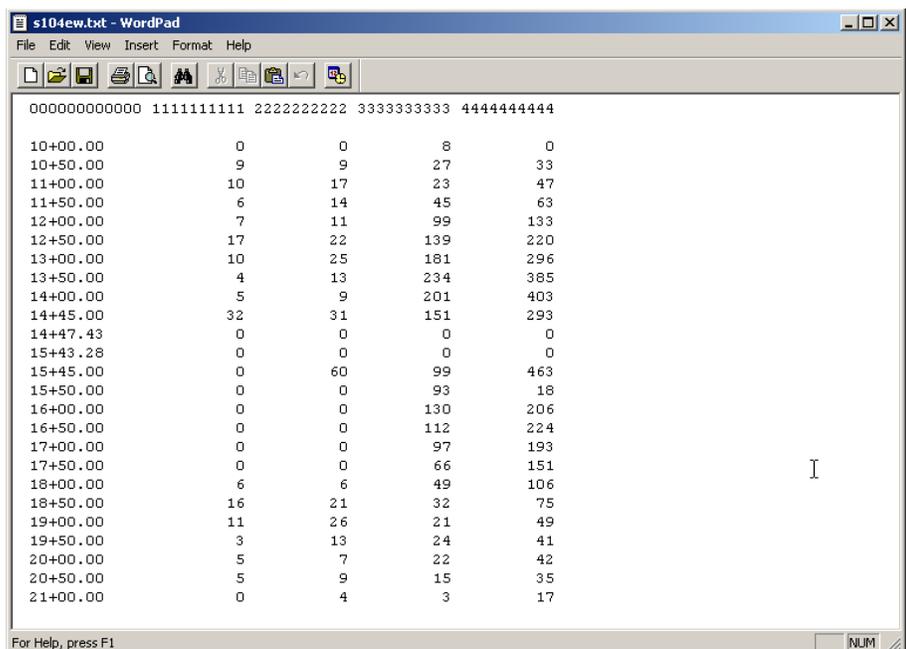
Ensure that the **column length is 10** for each column. [The program is set up to read the columns using this length. It will not work if a different value is used.]



Column 1 – set to Excavation End Areas (cut)
Column 2 – set to Excavation Adjusted Volumes
Column 3 – set to Fill End Areas (embankment)
Column 4 – set to Fill Unadjusted Volumes

Open the *ew.txt from the Geopak file created by the Project Manager Earthwork run.

- Enter a **zero “0”** where there is no cut or fill.
- **Add** any beginning and ending stations with the excavation and/or embankment in the correct columns. (Careful not to add/reduce the number of spaces.)
- If working on a bridge project, **add** the Bridge stations and volumes or toe of fills and volumes.
- Select **File > Save** to save the text file.

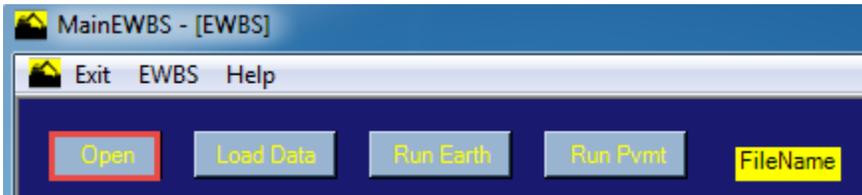


Double click on the **EWBS** icon on the desktop to start the program.

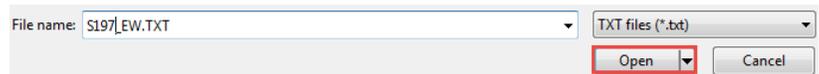
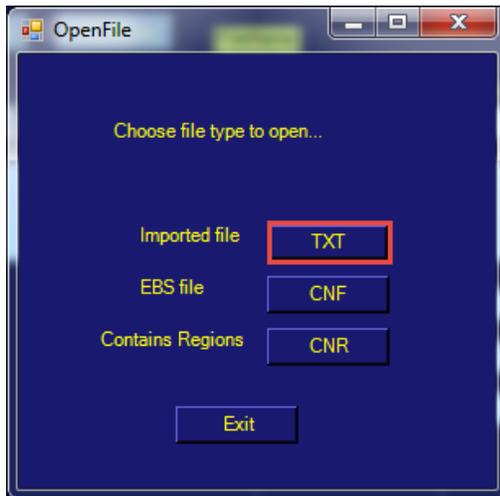


[If no icon, right click on EWBS.exe located in [C:\Program Files \(x86\)\SCDOT\EWBS](C:\Program Files (x86)\SCDOT\EWBS) and select Sent to > Desktop (create shortcut).]

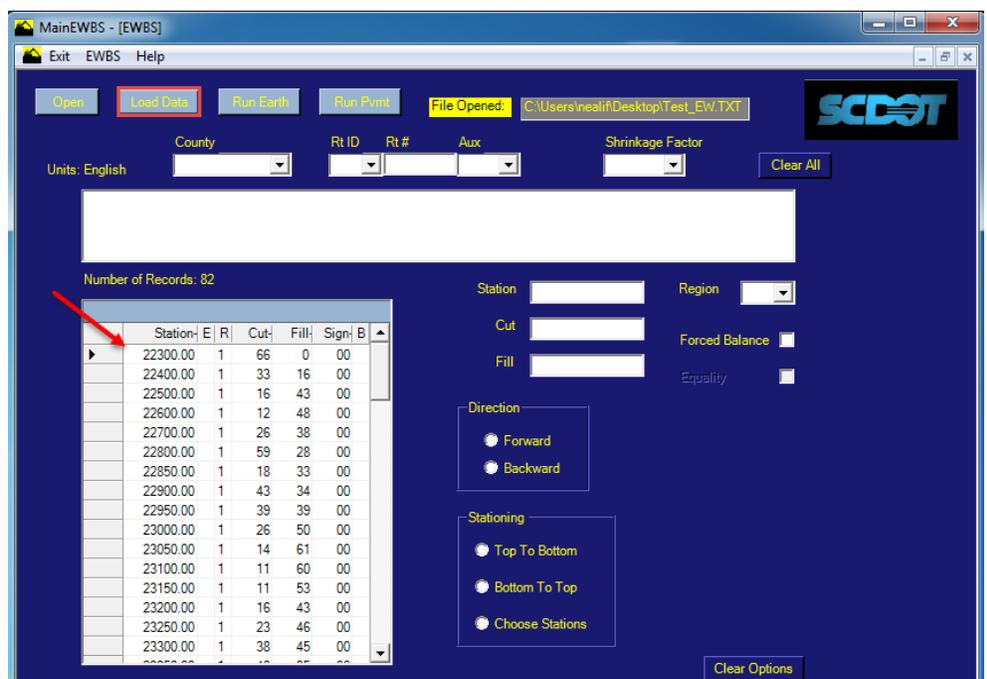
In EWBS, press the **OPEN** button at the top of the screen.



To import the *ew.txt file, press the **TXT** button. Navigate to locate the *ew.txt file in the project working directory. **Highlight** the file and press **Open**.



Press the **Load Data** button. The data will populate in the program below.

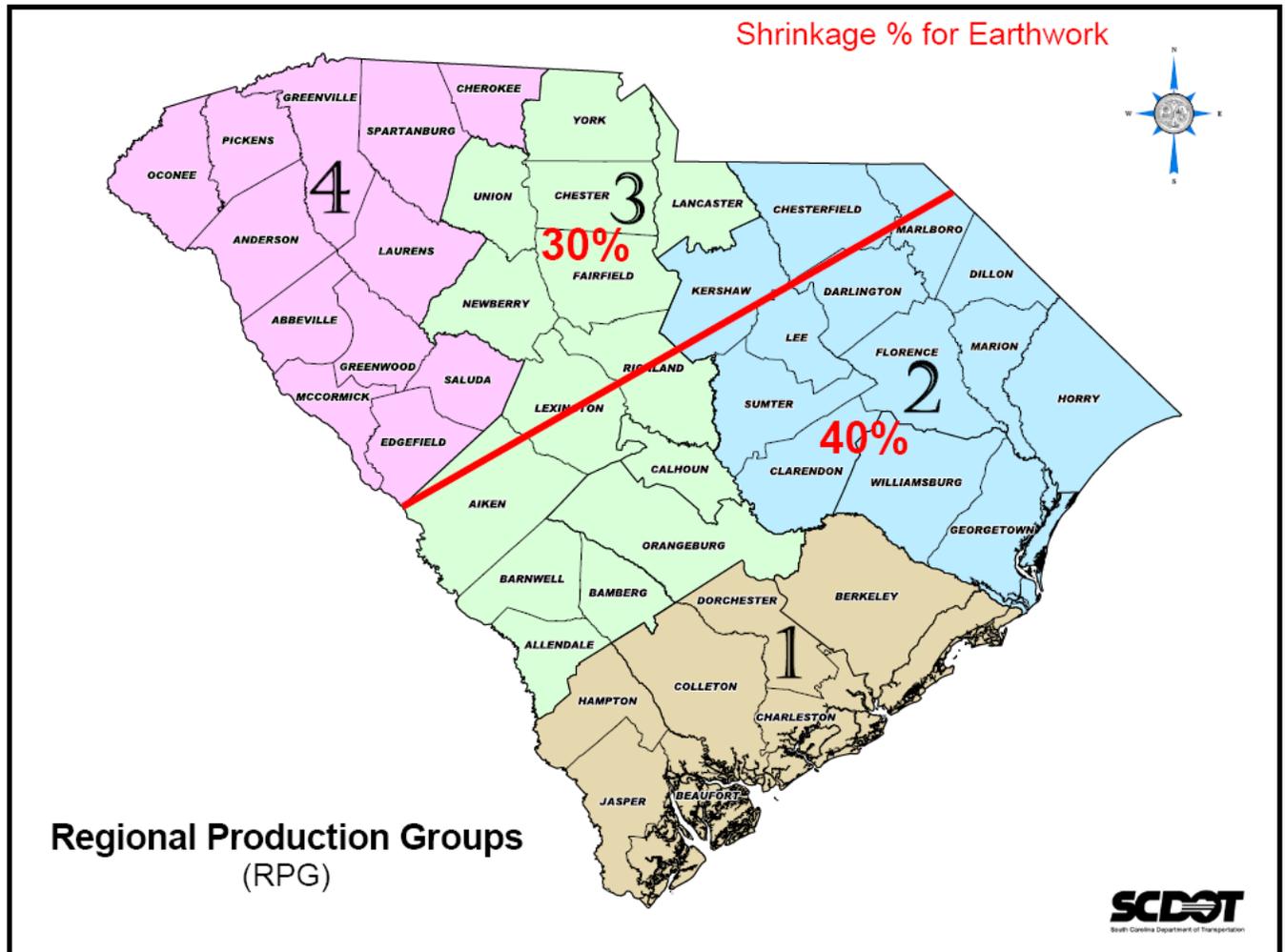


Enter the **County**, **Route ID**, **Route #**, and **Shrinkage Factor** to the headers at the top.



For the **Shrinkage Factor**, refer to the map area for the County to determine whether to use 30% or 40% unless otherwise directed by the Engineer of Record.

http://iwww.dot.state.sc.us/PreConstruction/Support/documents/shrinkage_map_earthwork.pdf



To edit data, **double click** on the grey tab next to the line of text which needs editing. In the **Station, Cut, and Fill** boxes, edit as necessary. Press the **Modify Record** button to update the data.

Number of Records: 22

Station-	E	R	Cut-	Fill-	Sign-	B
3050.00	1		8	0	00	
3100.00	1		9	0	00	
3150.00	1		8	0	00	
3200.00	1		10	6	00	
3300.00	1		1	17	00	
3400.00	1		0	37	00	
3500.00	1		0	11	00	
3600.00	1		11	7	00	
3700.00	1		11	7	00	
3800.00	1		56	0	00	
3850.00	1		39	0	00	
3900.00	1		33	1	00	
3950.00	1		19	0	00	
4000.00	1		1	8	00	
4100.00	1		61	13	00	
4150.00	1		73	10	00	

Station: 3200.00, Cut: 12, Fill: 6, Region: 1

Direction: Forward, Backward

Stationing: Top To Bottom, Bottom To Top, Choose Stations

Buttons: Add Record, **Modify Record**, Delete Record, Clear Options

Annotation: Double click grey tab

To add Equalities in Stationing, start by selecting the Back Station. **Double click** on the grey box to the left of the **Back Station**. This will load that station in the field to the right. Once loaded, check the **Equality** box and select **Add Record**.

Repeat the same process for the **Ahead Station**.

Number of Records: 23

Station-	E	R	Cut-	Fill-	Sign-	B
3050.00	1		8	0	00	
3100.00	1		9	0	00	
3150.00	1		8	0	00	
3200.00	1		10	6	00	
3300.00	1		1	17	00	
3400.00	1		0	37	00	
3500.00	1		0	11	00	
3500.00	E	1	0	11	00	
3600.00	1		11	7	00	
3700.00	1		11	7	00	
3800.00	1		56	0	00	
3850.00	1		39	0	00	
3900.00	1		33	1	00	
3950.00	1		19	0	00	
4000.00	1		1	8	00	
4100.00	1		61	13	00	

Station: 3500.00, Cut: 0, Fill: 11, Region: 1

Equality:

Direction: Forward, Backward

Stationing: Top To Bottom, Bottom To Top, Choose Stations

Buttons: Add Record, Modify Record, Delete Record, Clear Options

Annotation: Row appears after pressing

Once both equalities have been added to EWBS, delete the original Back and Ahead Stations. Double click to activate the original Back Station and press the **Delete Record** button. Double click to activate the original Ahead Station and press the **Delete Record** button.

Number of Records: 24

Station-	E	R	Cut-	Fill-	Sign-	B
3050.00	1	8	0	00		
3100.00	1	9	0	00		
3150.00	1	8	0	00		
3200.00	1	10	6	00		
3300.00	1	1	17	00		
3400.00	1	0	37	00		
3500.00	1	0	11	00		
3500.00	E	1	0	11	00	
3600.00	1	11	7	00		
3600.00	E	1	11	7	00	
3700.00	1	30	0	00		
3800.00	1	56	0	00		
3850.00	1	39	0	00		
3900.00	1	33	1	00		
3950.00	1	19	0	00		
4000.00	1	1	8	00		

Station: Region:

Cut: Forced Balance

Fill: Equality

Direction:

Forward

Backward

Stationing:

Top To Bottom

Bottom To Top

Choose Stations

This is how it should look after the Equality is inserted.

Station-	E	R	Cut-	Fill-	Sign-	B
3050.00	1	8	0	00		
3100.00	1	9	0	00		
3150.00	1					
3200.00	1					
3300.00	1					
3400.00	1	0	37	00		
3500.00	E	1	0	11	00	
3600.00	E	1	11	7	00	
3700.00	1	30	0	00		
3800.00	1	56	0	00		
3850.00	1	39	0	00		
3900.00	1	33	1	00		
3950.00	1	19	0	00		
4000.00	1	1	8	00		
4100.00	1	61	13	00		
4150.00	1	73	10	00		

After Equality is inserted

The above steps can be used for a **Forced Balance** as well. Instead of Equality, check Forced Balance and Add Record for the station. Remove the original station.

The distance between the balance stations cannot be greater than 3000 feet (or it is considered a pay item for overhaul). There will be occasions when you are required to force the balance. You will also need to include the **TOE OF FILL** on bridge projects and potentially force balances at either side to avoid transporting dirt from one side to the other.

To continue processing Earthwork, select the options based on the following:

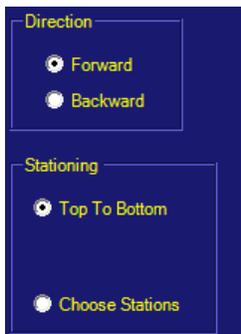
Forward

- Top to Bottom** – runs the txt file from top to bottom
- Choose Stations**– allows the user to choose the desired station range to balance

Backward

- Bottom to Top** – runs the txt file from bottom to top
- Choose Stations** – allows the user to choose the desired station range to balance

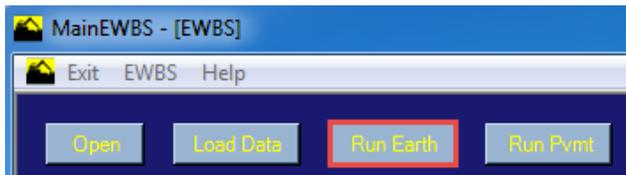
Forward/Top to Bottom



Forward/Choose Stations



Press the **Run Earth** button.



The **Earthwork report** will open and will also be saved to the project working directory.

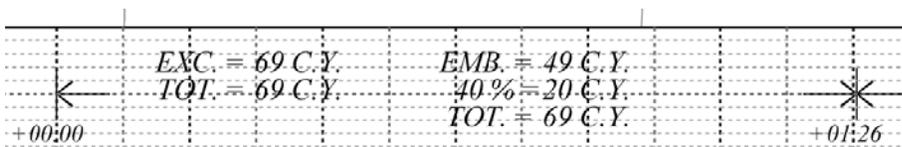
The Earthwork will also be saved in a *.vxt file. This file should be used on the cross section sheets.

SCDOT EARTHWORK BALANCING SYSTEM

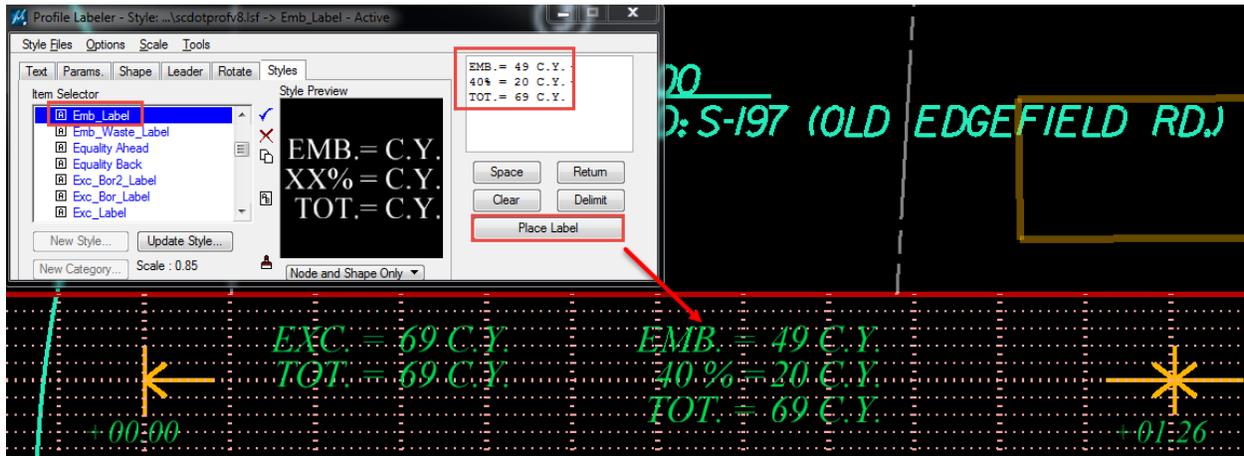
Date: 9/16/2015 12:22:37 PM
 Report for: 42132earth.cnr
 County: Aiken Route: S-197
 Units: English Calculation For: Earth

Station	Cut	Double Area	Distc	Volume	Balance Cut	Fill	Double Area	Distc	Volume	Balance Fill	Fill+ 40.0%
3050.00	8					0					
3100.00	9	17	50	16	16	0	0	50	0	0	0
3150.00	8	17	50	16	32	0	0	50	0	0	0
3200.00	10	18	50	17	49	6	6	50	6	6	8
3300.00	1	11	100	20	69	17	23	100	43	49	69
** 3301.26				(0)	69				(1)	49	69
3400.00	0	1	100	(2)	2	37	54	100	(99)	99	139
3500.00	0	0	100	0	2	11	48	100	99	188	263
3600.00	11	11	100	20	22	7	18	100	33	221	309
3700.00	30	41	100	76	98	0	7	100	13	234	328
3800.00	56	86	100	159	257	0	0	100	0	234	328
** 3840.26				(71)	328				(0)	234	328
3850.00	39	95	50	88	17	0	0	50	0	0	0
3900.00	33	72	50	67	84	1	1	50	1	1	1
3950.00	19	52	50	48	132	0	1	50	1	2	3
4000.00	1	20	50	19	151	8	8	50	7	9	13
4100.00	61	62	100	115	266	13	21	100	39	48	67
4150.00	73	134	50	124	390	10	23	50	21	69	97
4200.00	61	134	50	124	514	7	17	50	16	85	119
4300.00	0	61	100	113	627	12	19	100	35	120	168
4400.00	1	1	100	2	629	10	22	100	41	161	225
4500.00	3	4	100	7	636	5	15	100	28	189	265
4600.00	20	23	100	43	679	0	5	100	9	198	277
4650.00	12	32	50	30	709	0	0	50	0	198	277
** Finished Balance ** Waste: 432 C.Y.											
Page Total						1106				482	
Grand Total						1106				482	

Use the information in the EWBS report to add cut/fill volumes on the **plan and profile sheets.**



Use the information and place the balance points and volumes on the profile sheets.

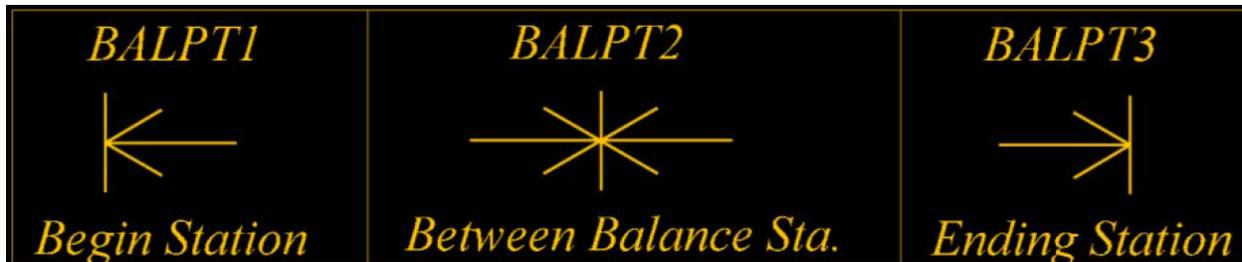


Use the cells from the cell library where needed:

BALPT1 – Beginning Station

BALPT2 – Use between begin and end stations

BALPT3 – Ending Stations



Continue labeling the plan/profile sheets for all of the earthwork information.

Excel Sheets for Plan Production

New data sheets have been developed using Microsoft Excel for plan production to make tabular format plan data easier. The Excel-based data sheets are intended to speed up data entry, calculations, and plan drafting. It is also intended to eliminate the need to retype or re-enter data sent in by consultants or other departmental offices.

The sheets can be printed directly to an Adobe PDF and included in the final plan set without the need to transfer the sheets into MicroStation via Axiom. The sheets reduce the manual calculations and repetitive data entry through Excel's tabular references and automatically calculated formulas.

Minor revisions and updates, centralization of data that was previously spread across many files and the ability to apply digital seals to the final plans are additional benefits to utilizing these Excel sheets.

There also exists the ability to import the data directly from the Excel sheet into the P2S and RWDMS systems.

Excel Templates and instructions can be located on the SCDOT Cadd Design internet page:
<https://www.scdot.org/business/CADD-Design.aspx>

The following sheets can be prepared using the Excel templates:

- Summary of Estimated Quantities
- Construction Plans Review Quantity Sheet
- Moving Items, Removal & Disposal, and New Fence Sheets
- Right of Way Data Sheet
- Erosion Control Data Sheet
- Survey Control Data Sheet
- General Construction Note Sheet

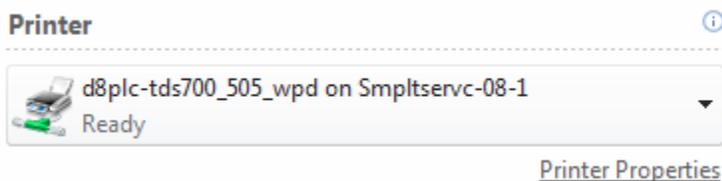
To begin each sheet for a new project, download the Excel file and add the 5-digit project number into its name.

Unless otherwise noted all text is to be entered on these sheets in ALL-CAPS to improve readability.

Converting Excel Sheets to Adobe PDF

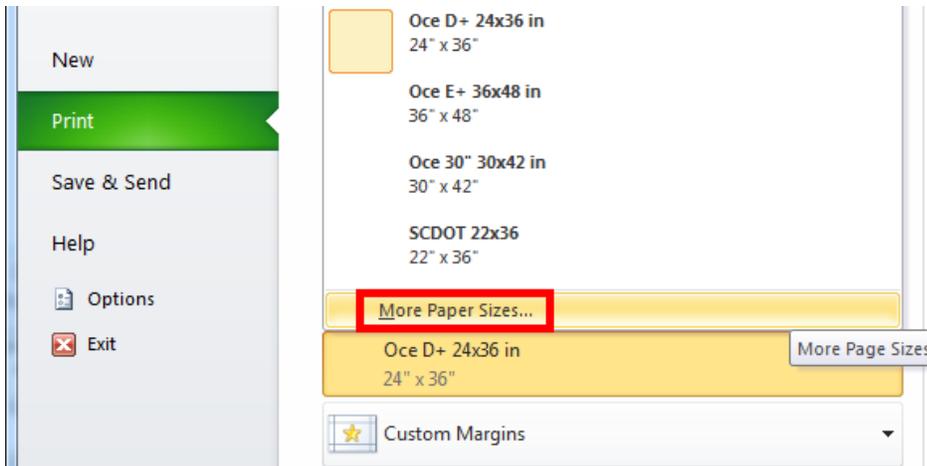
Select **File > Print** in Excel

Select the [\\smpltsevc-08-1\d8plc-tds700_505_wpd](#) plotter queue (or another Windows driver large format plotter.)

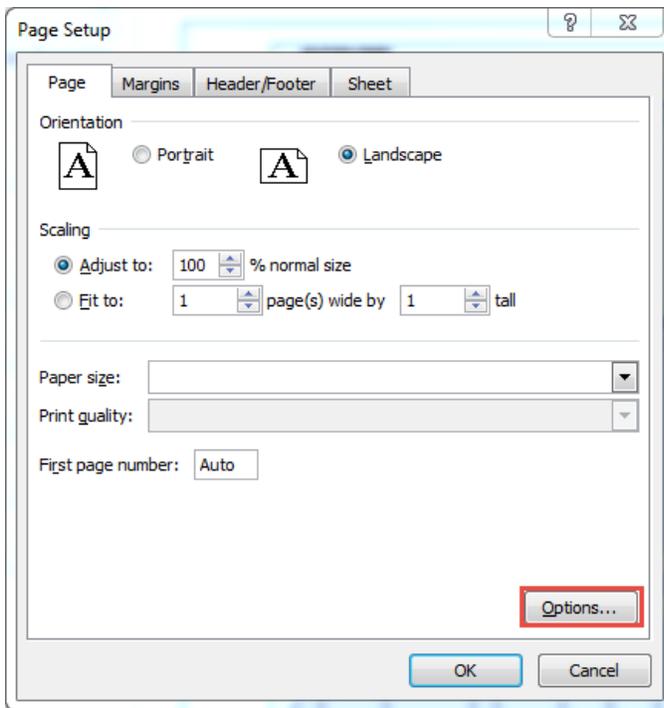


The first time this process is followed, a custom **22" x 36"** paper size must be created. After this has been done once, the local settings will be saved for future prints.

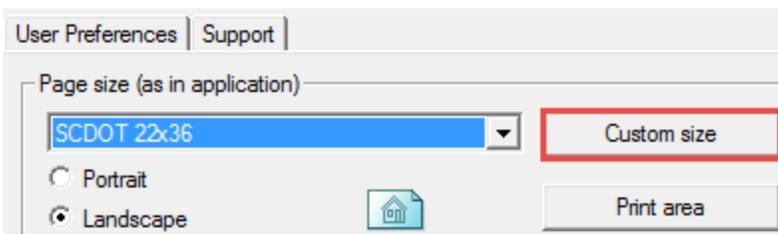
Click on the **Page Size** listing to expand. Choose **More Paper Sizes**.



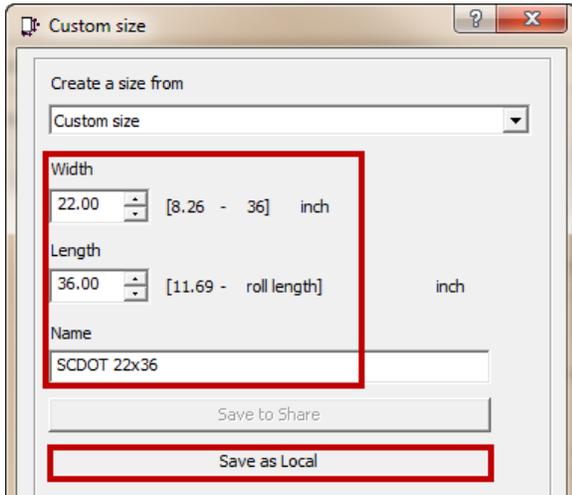
Select the **Options** button.



Press the **Custom Size** button.

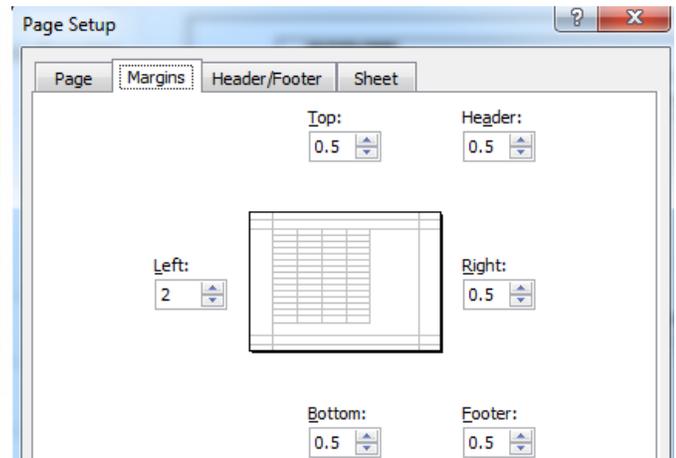
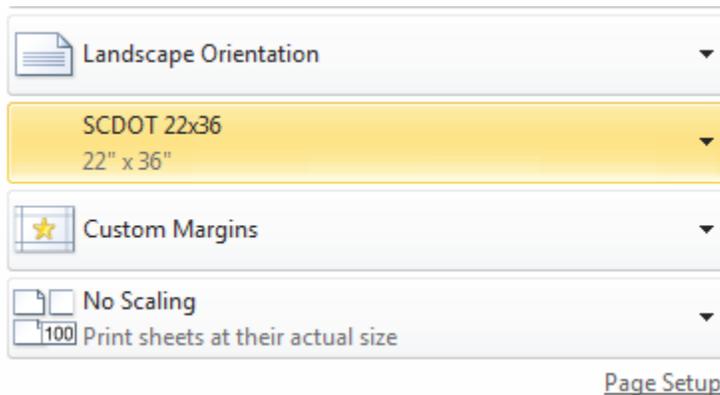


Set the **Width to 22"** and the **Length to 36"**, enter the name SCDOT22x36 and press the **Save as Local** button.

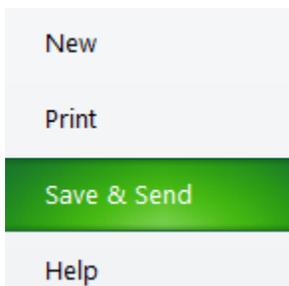


Under **File > Print**, change the settings as follows: (it should remember these the next time you print)

- Landscape Orientation
- Set paper size to SCDOT 22x36
- Custom Margins – Set Left to 2", Top/Bottom/Right to 0.5"
- No Scaling



Select **File > Save & Send** (on the left)



Select **Create Adobe PDF** (in center)

File Types



Change File Type



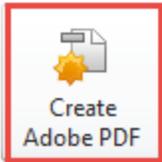
Create Adobe PDF



Create PDF/XPS Document

Select **Create Adobe PDF** (on top right)

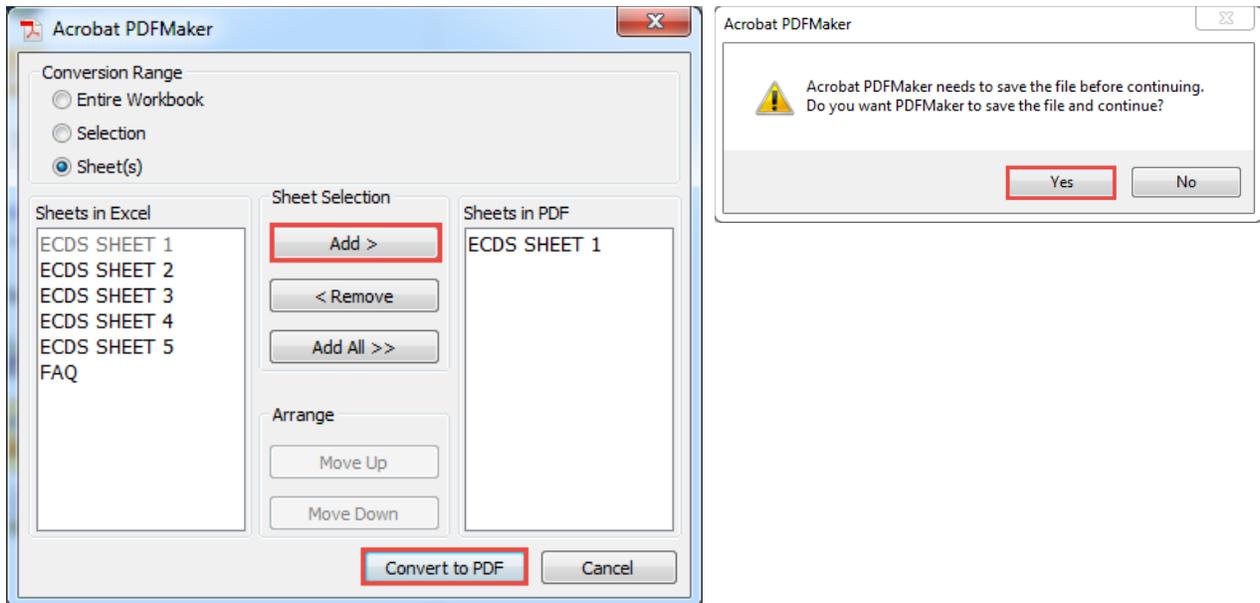
Create Adobe PDF



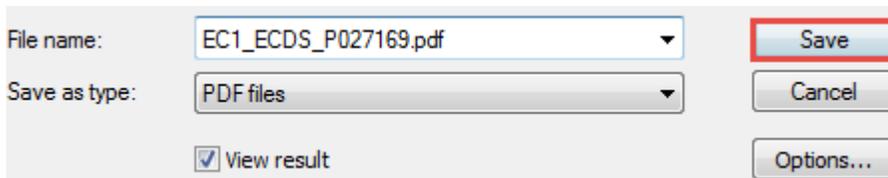
Convert to PDF using Adobe Acrobat

- Viewable and printable on most platforms
- Reliable and secure way of exchanging and archiving documents
- Preserves original document look and feel

On the Acrobat PDFMaker dialog, press the **Convert to PDF** button. Select **Yes** to save the file. [Repeat these steps for each individual ECDS Sheet # to create individual PDF files for each sheet.]



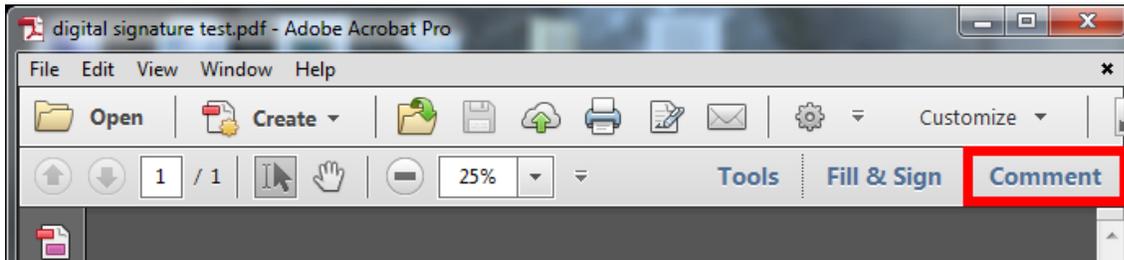
Enter a filename and press **Save**. [Note: For digital signatures and IPS files, extract each page of the pdf to single sheets and name them appropriately.]



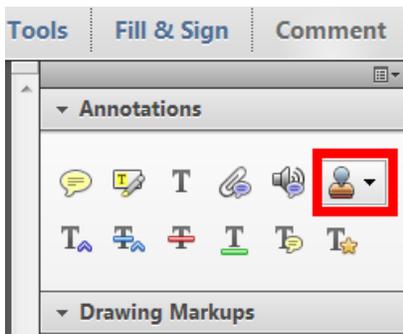
Apply PE Seal to Adobe PDF

Each plan sheet should be an individual single page pdf and named according to the File Naming Conventions for Roadway Plans.

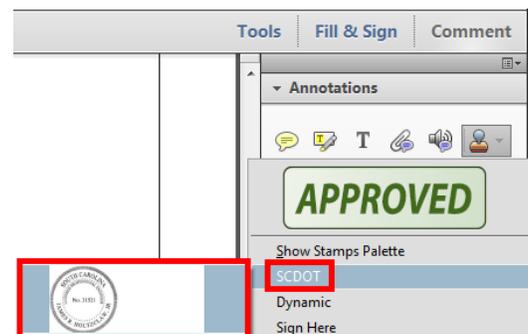
Open the pdf plan sheet in Adobe Acrobat. (Reader will work as well.) Expand the **Comment** tools in the upper right corner.



Click on the **Add Stamp** tool in the Annotations list to bring up the list of available stamps.



Highlight the **SCDOT** group to bring up SCDOT's stamps. Click on the **PE Seal** stamp to select it.

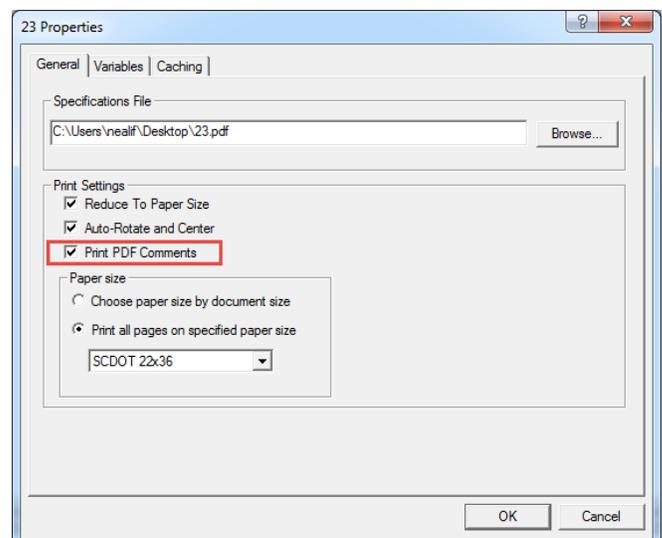
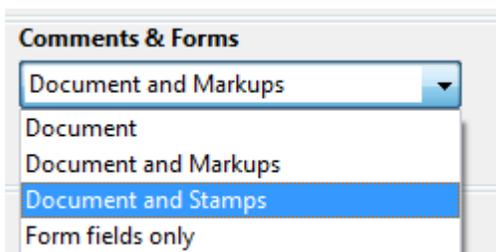


Click on the PDF document in the proper location to **place the seal**.



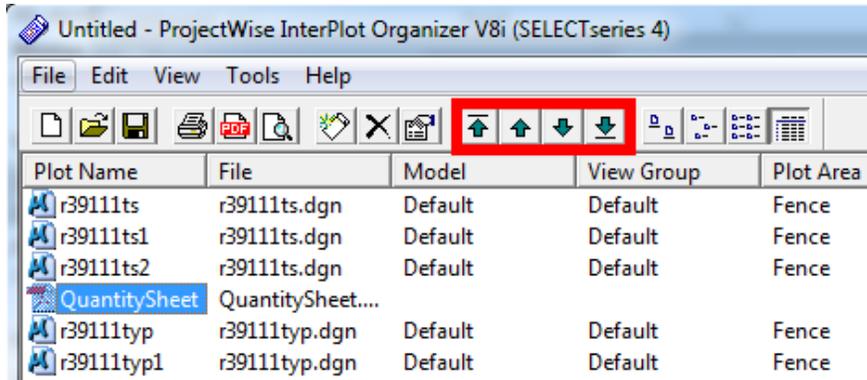
The sheet can now be added to the Iplot file for plotting in order to be manually signed and scanned back in as a PDF (and/or ready for digitally signing).

Note: Because the stamp is a "Comment", this option must be turned on when plotting. In Adobe is shown below and in Iplot is shown on the right.

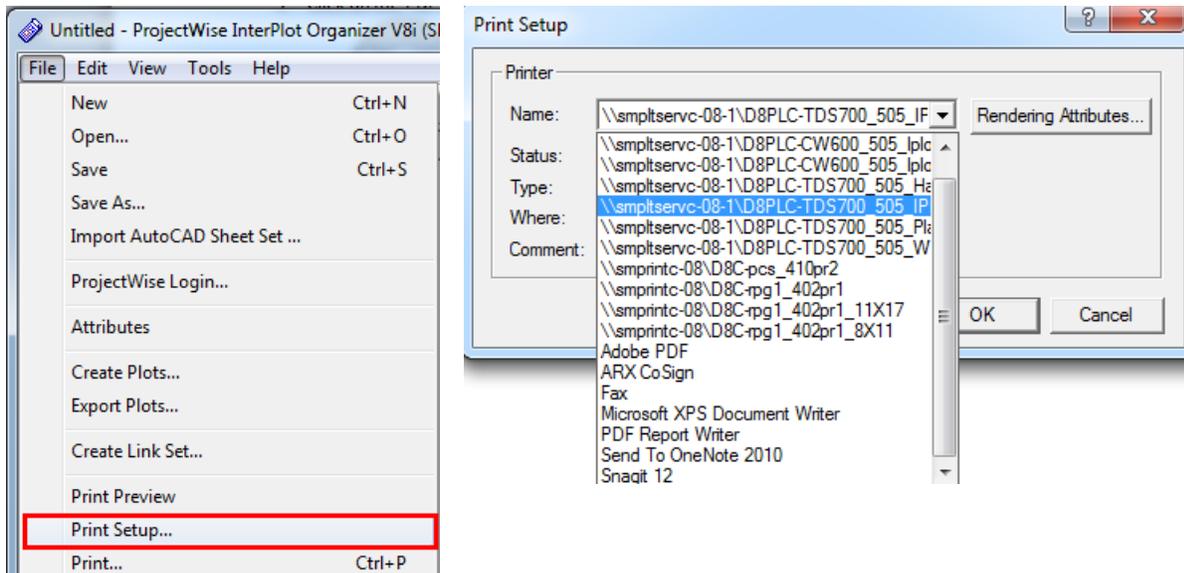


Adding PDF to Iplot IPS File

PDFs can be added to the Iplot IPS files in the same manner as DGN files. Open the IPS file and drag the PDF from the folder into the plotting list. Use the arrow keys to move the file to the correct location in the plan set for plotting.



Before plotting, check the plotter driver to ensure the correct driver is being used. In the File menu, select Print Setup. Check that either the Halfsize Iplot or the regular Iplot drivers are being used, NOT the WPD Windows driver.



Construction Changes after Letting

If changes are made after letting, the appropriate Excel files must be revised and re-exported as fresh Adobe PDF files. Before making changes, **create a copy** of the current excel file and rename the PDF file to include the **date it was printed** (e.g. "r37212_RWDS_2015-07-12.xlsm") so that an archive copy is kept. The printing date can be found in the bottom left corner of the sheet.

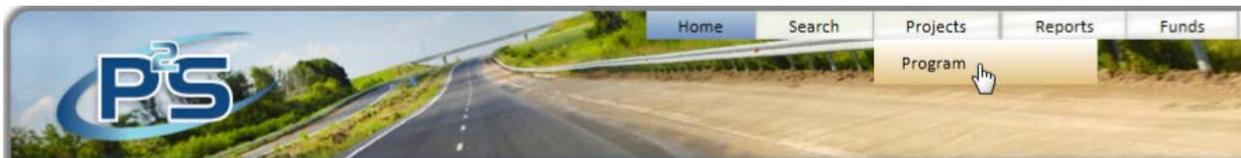
Make the necessary revisions to the Excel file. On the Images tab, locate the **Construction Change image**. Select **Copy** and activate the Excel plan sheet to **Paste** the image. Resize and move the image to the upper right corner.

Follow the Export to Adobe PDF instructions above to recreate a new plan sheet and re-apply the PE Seal. Remove the outdated plan sheet from the IPS file and add the revised sheet.

— CONSTRUCTION CHANGE —
SHEET PROVIDED AFTER LETTING

P2S Input Quantities Individually

Launch P2S and select **Project > Program** in the menu at the top of the screen.



Enter the Project ID and press **Search**. **Highlight** the project in the box below and press “Program Selected Project”.

Search Projects

Project Identity

Project ID:

Project Name: FMIS Project Number:

Description:

Project Phase: Project Status:

Work By: Consultant or LPA:

Project Type: Approval Status:

Program Manager: Approver:

Funding

Funding Type:

Obligation Date Between: and

Cost Estimate Less Than: Dollars

Cost Estimate Greater Than: Dollars

Location

District:

County:

Route Type:

ID	Name	Description
0041380	US 78/SC 781 Intesection Improvement	INTERSECTION AT US 78 WITH SC 781 IN WILLISTON (US 78/SC 781)

1 of 1 Projects

[Project Summary Report](#) | [Map Projects](#)

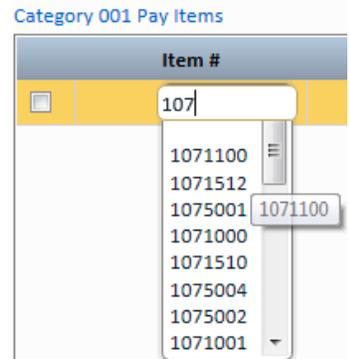
Select the appropriate **County** (If multiple counties exist on the project, repeat these steps for each project’s quantities.) Click the box under Pay Item Categories to create a new Category. Enter **Roadway Items**. Enter the Category Length and Federal Construction Class #. Press the **Save Changes** button.

Locations: Percent of Project Length: Spec Book Year:

Pay Item Categories

Category Number	Category Description	Bridge ID	Category Length	Federal Construction Class
<input checked="" type="checkbox"/>	→ ROADWAY ITEMS	<input type="text"/>	→ 0.68	2 ←

Click the **1st** row under the Category Pay Items to activate the row. **Begin typing** the Pay Item #. After 3 or more characters, the **drop down** of pay item numbers will appear. Keep typing the full pay item number or **select the pay item #** from the drop down.



The Item Description and Units will auto-populate. **Enter** the Estimated Quantity. Tabs and arrow keys can be used to navigate between the pay items.

Category 001 Pay Items

Item #	Item Description	Units	*Estimated Qty.
<input type="checkbox"/> 1071100	TRAFFIC CONTROL	EA	1
<input type="checkbox"/> 2012001	CLEARING & GRUBBING WITHIN ROADWAY	ACRE	1

Pressing the **magnifying glass** will allow you to search for a pay item and also select multiple pay items at once. Enter the first three numbers of the pay item and press the **Search** button. Scroll through the list and **check** the items required for the project in this pay item series. After selecting the desired pay items from the search screen, press the **Use Selected Items** button. **Enter** the Quantities for each pay item.

Filter Items

Item Number:
 Item Description:
 Units:
 Spec Year:

Item Number	Item Description	Units	Spec Year
<input checked="" type="checkbox"/> 2030010	FURNISH AND INSTALL MAILBOX	EA	2007
<input type="checkbox"/> 2030011	RELOCATE MAILBOX	EA	2007
<input checked="" type="checkbox"/> 2031000	UNCLASSIFIED EXCAVATION	CY	2007
<input type="checkbox"/> 2031100	ORGANIC TOPSOIL	CY	2007
<input type="checkbox"/> 2031200	SITE EXCAVATION	LS	2007
<input type="checkbox"/> 2032000	ROCK EXCAVATION	CY	2007
<input checked="" type="checkbox"/> 2033000	BORROW EXCAVATION	CY	2007
<input type="checkbox"/> 2033010	BORROW EXCAVATION - SPECIAL (FA-10)	CY	2007
<input type="checkbox"/> 2033011	BORROW EXCAVATION - SPECIAL (FA-10)	TON	2007
<input type="checkbox"/> 2033015	BORROW EXCAVATION - SPECIAL (FA-13)	CY	2007
<input type="checkbox"/> 2033020	BORROW EXCAVATION - LIGHTWEIGHT BORROW EXCAVATION	CY	2007
<input type="checkbox"/> 2033025	BORROW EXCAVATION - (AASHTO TYPE A-1 SAND)	TON	2007
<input type="checkbox"/> 2033030	BORROW MATERIAL - CONTROLLED FILL	CY	2007

After inputting all of the pay items, press the **Save Changes** button to save the pay items into the system.

Continue with the **P2S Export Quantities to Excel** instructions for completing the Quantity Sheet for plan production.

P2S Import Quantities from Excel

Review the data on the Quantity Sheet 1 and Quantity Sheet 2 tabs to ensure accuracy.

Open the tab labeled **MySheet** and confirm that all item numbers and quantities are shown accurately.

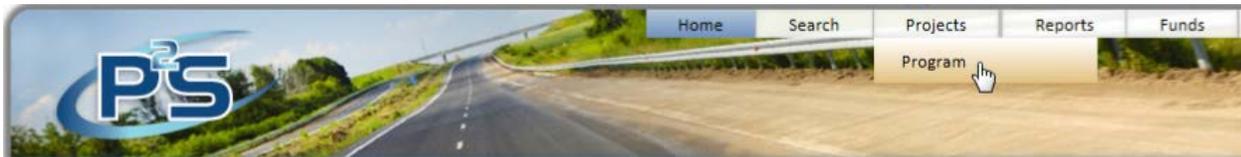
If any pay items have multiple entries with the same Item Number (such as items listed on the Moving Items, Removal & Disposal sheet), label them appropriately in the SA Desc column.

If any pay items are part of alternative options in the bid (such as if a contractor has included several possible base courses in the bid), number them appropriately in the Altitem column.

	A	B	C	D
1	Item#	Qty	SA Desc	Altitem
2	1071000	1		
3	2012000	1		
4	2023000	3332		
5	2027801	495		
6	2028605	10		
7	2031000	17581		
8	2033000	116828		
9	2033100	1		
10				

Save the document and **close Excel** entirely.

Launch P2S and open **Project > Program** in the menu at the top of the screen.



Enter the Project ID and press **Search**. **Highlight** the project in the box below and press the **Program Selected Project** button.

Search Projects

Project Identity

Project ID:

Project Name: FMIS Project Number:

Description:

Project Phase: Project Status:

Work By: Consultant or LPA:

Project Type: Approval Status:

Program Manager: Approver:

Funding

Funding Type:

Obligation Date Between: and

Cost Estimate Less Than: Dollars

Cost Estimate Greater Than: Dollars

Location

District:

County:

Route Type:

ID	Name	Description
0041380	US 78/SC 781 Intersection Improvement	INTERSECTION AT US 78 WITH SC 781 IN WILLISTON (US 78/SC 781)

1 of 1 Projects

[Project Summary Report](#) | [Map Projects](#)

Select the appropriate County and Category, and then press the **Import from Excel** link.

Pay Items - Project 0041380 Multiple Locations, Multiple Routes

Locations: **Barnwell** Percent of Project Length: 3% Spec Book Year: 2007

Category Number	Category Description	Bridge ID	Category Length	Federal Construction Class
001	ROADWAY ITEMS		0.068 miles	2

Category 001 Pay Items

Item #	Item Description	Units	*Estimated Qty.	SA	SA Description	Altitem

Click the **Browse** button that appears, then locate and open the Quantities Sheet **Excel** file in the project directory.

Select an Excel File:

Browse

Note: In order to import correctly, the selected file must include a worksheet labeled "MySheet" with "Item#", "Qty", "SA Desc" and "Altitem" as column headers. The rest of the information about each pay item (such as the item description and unit) will be populated by the system based on the Item#.

Review the Pay Items imported into the list.

Click twice on the checkbox labeled **"Pay Items Ready for Transmittal"** to first check, then un-check it. The program has a tendency to consider it checked otherwise.

Click **Save Changes**.

8100100 PERMANENT COVER ACRE 0.403 False

Total Pay Items: 0

Pay Items Ready for Transmittal **Save Changes** Discard Changes Print | View in Excel

Request Approval | Cancel Approval | Notify

P2S Export Quantities to Excel

Launch P2S and select **Projects > Program**

Home Search **Projects** Reports

Program

Waynesville Arden Hendersonville Huntersville Concord

Franklin Gastonia Charlotte

Enter the **Project ID** and press the **Search** button. **Highlight** the correct project and press the **Program Selected Project**.

Highlight the appropriate **Category** field if more than one quantity type exists. Determine the **Total Pay Items #** in the bottom left of the screen. Press the **View in Excel** button.

[Note: If the quantities are not currently sorted in order in P2S, press the Item # column heading to sort. Press the Save Changes button to save.]

Pay Items - Project 0039389 **Berkeley County, S- 136**

Locations: Percent of Project Length: Spec Book Year:

Pay Item Categories

Category Number	Category Description	Bridge ID	Category Length	Federal Construction Class
001	ROADWAY		3.177 miles	2

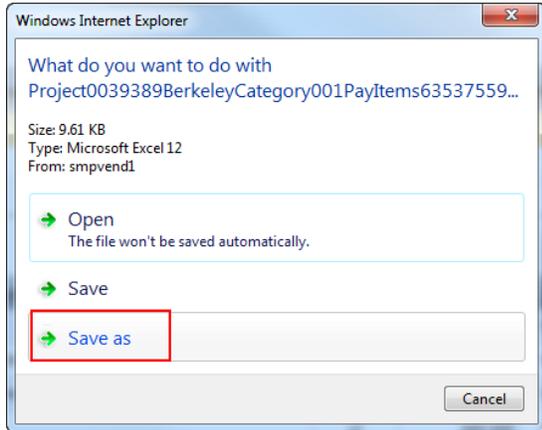
[Delete Selected](#)

Category 001 Pay Items [Import from Excel](#)

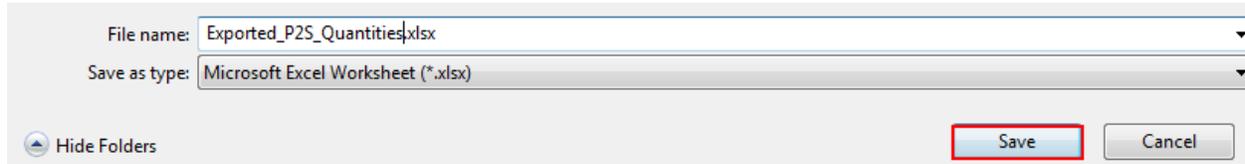
Item #	Item Description	Units	*Estimated Qty.	SA	SA Description	AllItem
<input type="checkbox"/>	1071000	TRAFFIC CONTROL	LS	1.000	False	
<input type="checkbox"/>	2012000	CLEARING & GRUBBING WITHIN ROADWAY	LS	1.000	False	
<input type="checkbox"/>	2023000	REMOVAL & DISPOSAL OF EXISTING PAVEMENT	SY	3332.000	False	
<input type="checkbox"/>	2027801	REMOVAL OF EXIST. GUARDRAIL	LF	495.000	False	
<input type="checkbox"/>	2028605	CULVERT EXTENSION PREPARATION	EA	10.000	False	
<input type="checkbox"/>	2031000	UNCLASSIFIED EXCAVATION	CY	17581.000	False	
<input type="checkbox"/>	2033000	BORROW EXCAVATION	CY	116828.000	False	
<input type="checkbox"/>	2033100	BORROW PIT SET-UP	LS	1.000	False	
<input type="checkbox"/>	2034000	MUCK EXCAVATION	CY	55971.000	False	
<input type="checkbox"/>	2034515	15" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	LF	10.000	False	
<input type="checkbox"/>	2034518	18" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	LF	10.000	False	
<input type="checkbox"/>	2034520	24" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	LF	10.000	False	
<input type="checkbox"/>	2034530	30" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	LF	10.000	False	

Total Pay Items: 156 [Delete Selected](#) Pay Items Ready for Transmittal

Press the **Save as** button to save the Excel file to your project directory.



Navigate to your project directory and enter a file name. Press the **Save** button. Open the newly saved Excel file.



Paste the data into the tab named **“Paste Data Here”** beginning with cell A1 in the Cadd Standard **“Quantity.xlsx”** Excel file located on the Cadd Support webpage.

[Note: Do not delete rows, move rows, sort, etc. in the Quantity Excel sheet because the formulas will not perform correctly. Any and all edits need to take place in the P2S Excel Export prior to copying and pasting.]

Item#	Description	Unit	Qty	SA	SA Desc
1071000	TRAFFIC CLS	CLS	1	False	
2012000	CLEARING	LS	1	False	
2023000	REMOVAL SY		3332	False	
2027801	REMOVAL LF		495	False	
2028605	CULVERT	EA	10	False	
2031000	UNCLASSI	CY	17581	False	
2033000	BORROW	CY	116828	False	
2033100	BORROW	LS	1	False	

Item#	Description	Unit	Qty	SA	SA Desc
1071000	TRAFFIC CLS	CLS	1	False	
2012000	CLEARING	LS	1	False	
2023000	REMOVAL SY		3332	False	
2027801	REMOVAL LF		495	False	
2028605	CULVERT	EA	10	False	
2031000	UNCLASSI	CY	17581	False	
2033000	BORROW	CY	116828	False	
2033100	BORROW	LS	1	False	
2034000	MUCK EX	CY	55971	False	
2034515	15" DIAM	LF	10	False	
2034518	18" DIAM	LF	10	False	

Review the results on the Excel tabs – **Quantity Sheet 1** and **Quantity Sheet 2**.

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SUMMARY OF ESTIMATED QUANTITIES

ITEM NO.	PAY ITEM	QUANTITY	PAY UNIT	ITEM NO.	PAY ITEM	QUANTITY	PAY UNIT
1071000	TRAFFIC CONTROL	1.000	LS	4445711	PAV-2-WAY-SECT MANDMOUNTED BLEND PLEDGE TRIAN SIGNAL HEAD	2.000	EA
2002000	CLEARING & REMOVAL WITHIN ROADWAY	1.000	LS	4445714	PAV 1-WAY-SECT MANDMOUNTED PLEDGE SIGNMENT LT	2.000	EA
2002000	REMOVAL & DISPOSAL OF EXISTING PAVEMENT	3332.000	SY	4445715	PAV 1-WAY-SECT MANDMOUNTED PLEDGE SIGNMENT RT	3.000	EA
2027201	REMOVAL OF RUST GUARDRAIL	495.000	LF	4445747	FLIP UP SIGNPOST, SOLID STATE "MSP"	10.000	EA
2023400	CULVERT EXISTING PREPARATION	10.000	EA	4445824	REMOV EXISTING TRAFFIC SIGNALS FOR TRAFF. SIG.	20.000	EA
2033000	UNCLASSIFIED EXCAVATION	17581.000	CY	4445840	PAV PLEDGE TRIAN TRAF. SIGNAL HEAD MOUNTING ASSEMB FOR POST TOP	1.000	EA
2023000	BORROW EXCAVATION	116828.000	CY	4445842	FLIPPED TRAF. SIGNAL HEAD MOUNT. ASSEMB FOR DUAL POST TOP	1.000	EA
2033100	BORROW PIPE SET UP	1.000	LS	4445940	REMOVAL EXISTING GROUP OF EXISTING TRAF. SIGNAL EQUIPMENT	1.000	LS
2034000	MUCK EXCAVATION	55971.000	CY	4445942	TEMPORARY ADJUSTMENT OF TRAFFIC SIGNAL EQUIPMENT	1.000	LS
2034515	15" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	4445946	TEMPORARY TRING ADJUSTMENT PER SITE HIST	4.000	EA
2034518	18" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	4447241	REMOVE FOUNDATION FOR STEEL STRAIN POLE - 11" BELOW GRADE	2.000	EA
2034524	24" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	4448225	INST. CONTROLLER-BASE MNTD ON BASE W/ FOUND.	2.000	EA
2034530	30" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	7014602	CONG. FOR STRUCTURES - CLASS 4 MINIMUM CURT	418.000	CY
2034541	48" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	7021100	REIN. STEEL FOR STRUCTURES (ROADWAY)	10072.000	LB

Quantity Sheet Finalization

Enter the **County, Project ID, and Route/Road No.** onto the Quantity Sheet 1. It will be copied to the Quantity Sheet 2. Edit the **Sheet No.** as necessary for your plan set.

M	N	O	P	Q	R	S	T	U
	FED. RD. DIV. NO.	STATE	COUNTY		PROJECT ID	ROUTE/ROAD NO.	SHEET NO.	
	3	S.C.	BERKELEY		39389	S-136	2A	

Save the Excel file to your project directory.

Continue the **Export Excel Sheets to Adobe PDF** and add the pdf to the Iplot file for plotting and/or digital signatures.

Quantity Sheet Preparation Using Manual Input

If the Quantity data has not been inputted into P2S or if P2S is not accessible to the user, the quantities can be entered manually into the Excel sheet and sent to the appropriate party for import into P2S.

In the Quantities Sheet, open the **Paste Data Here** tab. Enter the quantity data into the four columns on the left.

1. Column A: Item Number
2. Column B: Pay Item
3. Column C: Pay Unit
4. Column D: Unit Quantity

	A	B	C	D	E	F	G
1	1071000	TRAFFIC CONTROL	LS	1		STEP 1:	
2	2012000	CLEARING	LS	1		DO NOT DELETE ROWS, MOVE ROWS, ETC. IN THIS FILE OR THE	
3	2023000	REMOVAL	SY	3332		FORMULAS WILL NOT PERFORM CORRECTLY.	
4	2027801	REMOVAL	LF	495			
5	2028605	CULVERT	EA	10		IF THE DATA IS NOT SORTED PROPERLY COMING FROM THE P2S	
6	2031000	UNCLASS	CY	17581		EXCEL FILE, ALL EDITS MUST BE DONE IN THE EXPORTED EXCEL	
7	2033000	BORROW	CY	116828		FILE PRIOR TO COPYING AND PASTING TO THIS FILE.	
8	2033100	BORROW	LS	1			
9						STEP 2:	

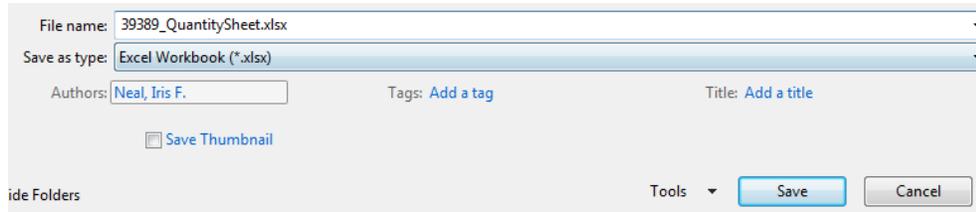
Review the results on the Excel tabs – Quantity Sheet 1 and Quantity Sheet 2.

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION											
SUMMARY OF ESTIMATED QUANTITIES											
ITEM NO.	PAY ITEM	QUANTITY	PAY UNIT	ITEM NO.	PAY ITEM	QUANTITY	PAY UNIT				
1071000	TRAFFIC CONTROL	1.000	LS	415711	PAV-2-1/2"AV-15ECT HANDMAINTENANCE PEDESTRIAN SIGNAL HEAD	3.000	EA				
2023000	CLEARING WITHIN ROADWAY	1.000	LS	415714	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2023000	REMOVAL OF EXISTING PAVEMENT	3332.000	SY	415715	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2027801	REMOVAL OF EXIST. GUARDRAIL	495.000	LF	415717	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2028605	CULVERT EXTERIOR PREPARATION	10.000	EA	415718	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2031000	UNCLASSIFIED EXCAVATION	17581.000	CY	415719	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2033000	BORROW EXCAVATION	116828.000	CY	415720	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2033100	BORROW PIT SET-UP	1.000	LS	415721	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024850	PAV. EXCAVATION	5541.000	CY	415722	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024855	12" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	415723	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024851	18" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	415724	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024854	24" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	415725	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024853	30" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	415726	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024852	36" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	415727	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
2024851	18" DIAMETER PIPE ADDITIONAL FOUNDATION WORK	10.000	LF	415728	PAV-1-1/2"AV-15ECT PEDESTRIAN SIGNAL HEAD	3.000	EA				
				701460	CONC. FOR STRUCTURE E-CLASS (EMULGERS)	435.000	CY				
				702100	REIN. STEEL FOR STRUCTURE (ROADWAY)	10727.000	LB				

Enter the **County, Project ID, and Route/Road No.** onto the Quantity Sheet 1. It will be copied to the Quantity Sheet 2. Edit the **Sheet No.** as necessary for your plan set.

M	N	O	P	Q	R	S	T	U
	FED. RD. DIV. NO.	STATE	COUNTY		PROJECT ID	ROUTE/ROAD NO.	SHEET NO.	
	3	S.C.	BERKELEY		39389	S-136	2A	

Save the Excel file to your project directory.



Continue the **Convert Excel Sheets to Adobe PDF** and **Applying the PE Seal** to create a pdf and add the pdf to the Iplot file for plotting and/or digital signatures.

Electronically submit the Excel file and the pdf file to the SCDOT personnel responsible for inputting the data into P2S and also for inclusion in the plan set.

Construction Quantity Sheet Preparation

The Construction Plans Review Excel sheet is to be utilized for field reviews and correspondence with the District Construction offices to obtain the “inclusion” quantities for the project. Quantities have most likely not been entered into P2S at this time.

To complete this sheet, manually enter the pay items on the QUANTITY SHEET tab. (If you can locate an older project to copy and paste from, this will save you time.)

ITEM NO.	PAY ITEM	COMPUTED QUANTITY	INCIDENTAL QUANTITY	PAY UNIT

Save and send the Excel spreadsheet to your District contact to receive the Incidental Quantity column numbers. You will use these items to include on the General Construction Note page.

This spreadsheet will also create a MY SHEET tab. This can be imported into P2S as outlined in previous sections.

Dual Quantity Sheet Preparation

The Quantities will be inputted into P2S as two separate Category items under their respective County header. Export each excel sheet from P2S.

Open the **first** County Excel file that was exported and **highlight** the appropriate columns by data clicking in the upper left corner and dragging to the end of the data in column D. Right click to select **Copy**.

	A	B	C	D
1	Item#	Description	Unit	Qty
2	1031000	MOBILIZATION	LS	1
3	1032010	BONDS AND INSURANCE	LS	1
4	1050800	CONSTR	EA	1
5	1071000	TRAF	LS	1
6	1080300	CPM PROGRESS SCHEDULE	LS	1
7	2011000	CLEARING OF WAY	LS	1
8	2025000	REMOVAL OF ASPHALT PAVEMENT	SY	3505
9	2031000	UNCLAS	CY	7320
10	2033000	BORR	CY	6420

Open the QuantitySheet_DualCounty.xlsx Excel spreadsheet. [Tip: Open a blank workbook and then drag this sheet into it to open. This will allow you to have 2 instances of Excel open at the same time.]

	A	B	C	D
1		COUNTY:	AIKEN	
2	Item#	Description	Unit	Qty
3	1031000	MOBILIZATION	LS	1
4	1032010	BONDS AND	LS	1
5	1050800	CONSTRUCTION	EA	1
6	1071000	TRAFFIC	LS	1
7	1080300	CPM PROGRESS SCHEDULE	LS	1

Click on the **PASTE DATA HERE** tab. Right click in **Cell A3** and select **Paste** to paste the data. Enter the **County** in **Cell C1**.

Open the **second** County Excel file that was exported and **highlight** the appropriate columns by data clicking in the upper left corner and dragging to the end of the data in column D. Right click to select **Copy**.

	A	B	C	D
1	Item#	Description	Unit	Qty
2	1031000	MOBILIZATION	LS	1
3	1032010	BONDS AND INSURANCE	LS	1
4	1050800	CONSTRUCTION	EA	1
5	1071000	TRAFFIC	LS	1
6	1080300	CPM PROGRESS SCHEDULE	LS	1
7	2011000	CLEARING OF WAY	LS	1
8	2031000	UNCLAS	CY	124
9	2033000	BORROW	CY	10
10	2081001	FINE GR	SY	325

In the QuantitySheet_DualCounty.xlsx Excel spreadsheet, click on the **PASTE DATA HERE** tab. Right click in **Cell F3** and select **Paste** to paste the data. Enter the **County** in **Cell H1**.

	F	G	H	I
1		COUNTY:	BARNWELL	
2	Item#	Description	Unit	Qty
3	1031000	MOBILIZATION	LS	1
4	1032010	BONDS AND	LS	1
5	1050800	CONSTRUCTION	EA	1
6	1071000	TRAFFIC	LS	1
7	1080300	CPM PROGRESS SCHEDULE	LS	1

The spreadsheet has comparison formulas to compare the Pay Item numbers and match them to one another and paste them to the Quantity sheet in the appropriate columns. The spreadsheet will put a value of 0.000 in the columns where a pay item exists in one county but not the other.

ITEM NO.	PAY ITEM	AIKEN	BARNWELL	PAY UNIT
1031000	MOBILIZATION	1.000	1.000	LS
1032010	BONDS AND INSURANCE	1.000	1.000	LS
1050800	CONSTRUCTION STAKES, LINES & GRADES	1.000	1.000	EA
1071000	TRAFFIC CONTROL	1.000	1.000	LS
1080300	CPM PROGRESS SCHEDULE	1.000	1.000	LS
2011000	CLEARING & GRUBBING WITHIN RIGHT OF WAY	1.000	1.000	LS
2025000	REMOVAL & DISPOSAL OF EXISTING ASPHALT PAVEMENT	3505.000	0.000	SY
2031000	UNCLASSIFIED EXCAVATION	7320.000	124.000	CY
2033000	BORROW EXCAVATION	6410.000	10.000	CY

Review the results on the Excel tabs – Quantity Sheet 1 and Quantity Sheet 2.

Enter the **County, Project ID, and Route/Road No.** onto the Quantity Sheet 1. It will be copied to the Quantity Sheet 2. Edit the **Sheet No.** as necessary for your plan set.

N	O	P	Q	R	S	T	U	V	W	X
FED. RD. DIV. NO.	STATE	COUNTY			PROJECT ID	ROUTE/ROAD NO.	SHEET NO.			
3	S.C.	AIKEN/BARNWELL			41146	S-19	2A			

Save the Excel file to your project directory.

Continue the **Convert Excel Sheets to Adobe PDF** and **Applying the PE Seal** to create a pdf and add the pdf to the Iplot file for plotting and/or digital signatures.

Electronically submit the Excel file and the pdf file to the SCDOT personnel responsible for inputting the data into P2S and also for inclusion in the plan set.

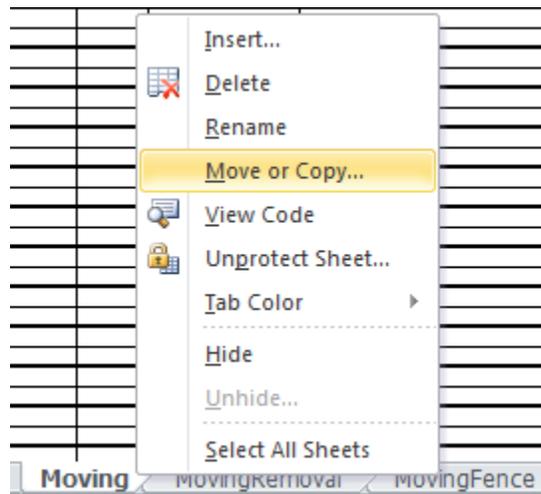
Moving Items, Removal & Disposal, New or Reset Fence Sheet

The Moving Items Excel file includes several customizable data sheets for recording items that must be moved on-site or removed and disposed of, as well as fences that must be constructed. Each numbered item has two rows for data entry. The first row is for the initial input by the Right of Way field agent. The second is provided for corrections or comments to be added by the District Construction personnel during the construction process.

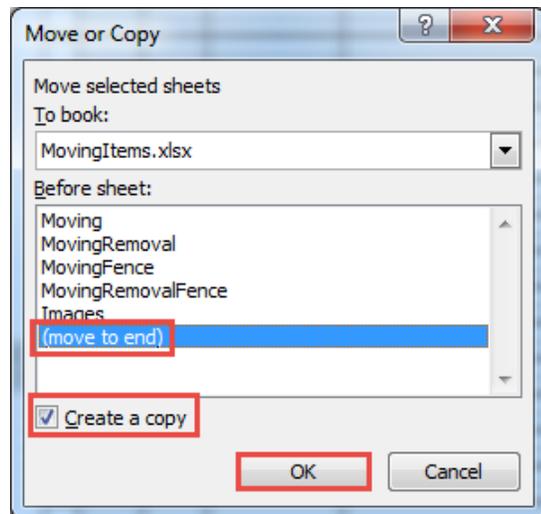
ITEM NO.	LOCATION		DESCRIPTION
	OFFSET	LI/RT STATION	
			Right of Way Agent completes this line
			Construction completes this line

To create a Removal & Disposal Only Sheet:

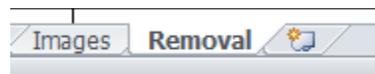
Right click on the **Moving** tab and select **Move or Copy**.



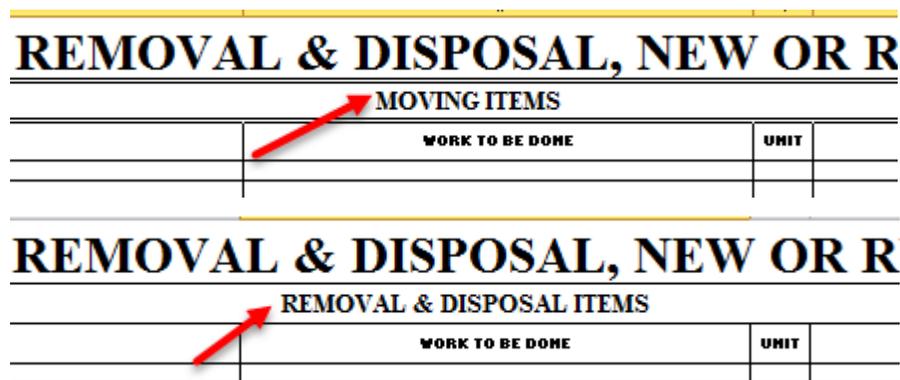
Toggle on **Create a copy**. Click **(move to end)** and press **OK** to create a new worksheet.



Double click the newly created tab and rename it to **Removal**.



Change the header from Moving Items to **Removal & Disposal Items**.



Enter the data for the sheet and the title block.

Continue creating additional sheets as necessary for the project.

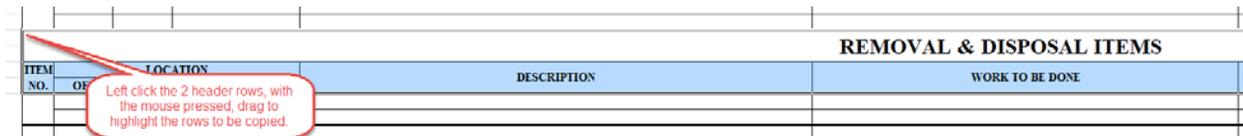
Next, follow the **Convert Excel to Adobe PDF** instructions to complete the plan sheets.

To add additional rows to a sheet:

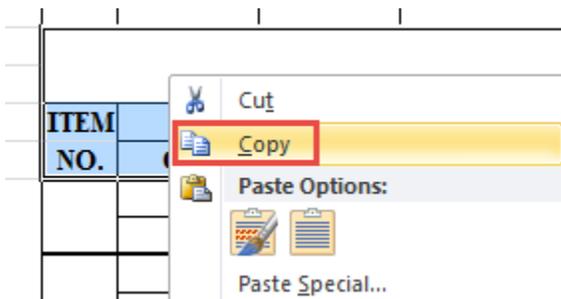
The following can be used to modify any of the headers and rows on any of the plan sheet layouts to make more room for projects that have more Removal & Disposal Items and few Moving Items, and vice versa.

Example: Six (6) additional Removal & Disposal Item rows are needed to avoid created a new plan sheet.

Left click to highlight the 2 header rows for Removal & Disposal Items. With the mouse continuously pressed, drag the cursor down until the 2 headers rows are selected.



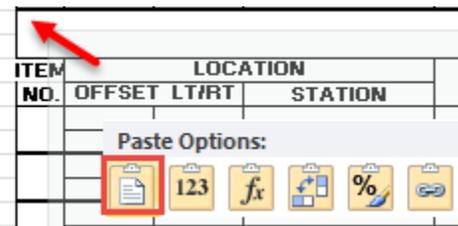
Right click to select **Copy**



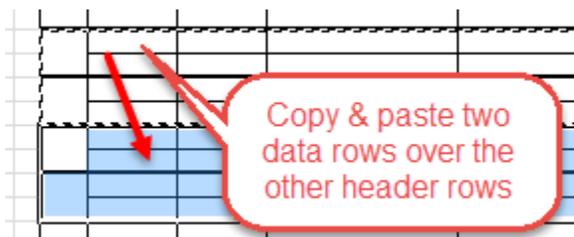
Click in the cell where the new header is to go to provide a sufficient number of rows above, starting at the bottom – up. (This example will be 6 rows – 2 header rows plus 4 data rows) Left click in the upper left cell.



Right click to select **Paste**. Select **Yes** to replace cells.



Copy two data rows and **paste** over the original header rows for Removal & Disposal (or other).

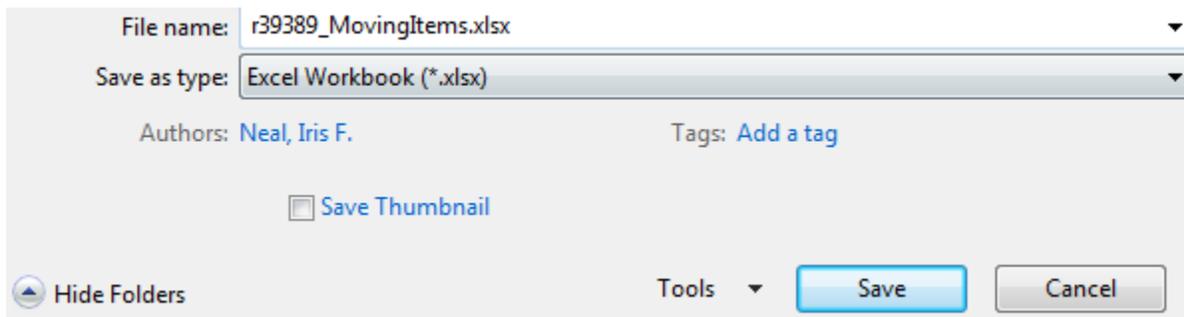


Moving Item Sheet Finalization

Enter the **County, Project ID, and Route/Road No.** onto the appropriate Moving Item Sheets. Edit the **Sheet No.** as necessary for your plan set. Repeat for all combination of sheets used in the Excel file.

M	N	O	P/Q	R	S	T	U
	FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE/ROAD NO.	SHEET NO.	
	3	S.C.	BERKELEY	39389	S-136	2A	

Save the Excel file to your project directory. Send the file **electronically** to the Roadway Design group for inclusion in the plan set.



Continue the **Export Excel Sheets to Adobe PDF** to create a pdf and add the pdf to the Iplot file for plotting and/or digital signatures.

Right of Way Data Sheets

Summary Sheet – Road Group

In the Right of Way Data Sheet, click on the SUMMARY worksheet tab. Enter the County, Road, and Project Id. This will be copied to the plan sheet Title blocks.

PROJECT PROPERTY DATABASE

COUNTY:

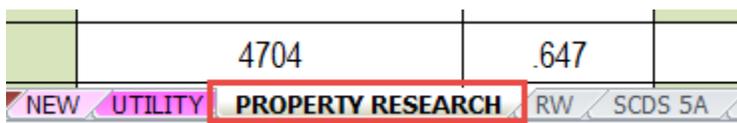
ROAD - ROUTE:

PROJECT ID:

CHARGE CODE:

PSG Sheet – Road Group

Locate the project’s **Preconstruction Survey Report Excel** file in the working directory or in the Surveys folder on the network. Open the file and go to the **PROPERTY RESEARCH** worksheet tab.



Select all completed cells on the worksheet beginning with the row of **Tract 1** (cell A12) to the end of the data in column DB/PB or TM. Right click to select **Copy**.

10	TRK	OWNERS' NAME	TAX-MAP	D.B. &	D.B.	P.B. &	P.B.	TRACT	DB/PB
11	No.	(LAST, FIRST)	REFERENCE	PAGE	AREA	PAGE	AREA	AREA	or TM
12	1	STOGNER, MARY ELLEN SCOTT	0068-00-043.01	C 6 / 2635		2697	1.0		
13	2	PELOT, SYBIL B. ETAL	68-00-043.00	874 / 83	30				
14	3	PELOT, SYBIL B. ETAL	69-00-001.00	874 / 83					
15	4	BLACKMON, JESSICA D.	69-00-001.03	874 / 97		9774	1.05		
16	5	EVANS, LONNIE EARL	69-00-002.01	A 6 / 4994		437	2.25		
17	6	EVANS, LONNIE EARL	69-00-002.04	78 / 328		5414	14.64		
18	7	LANE, GRACE C. % LANE, JOHN E. JR	69-00-002.00	771 / 201		5414	11.1		
19	8	LANE, GRACE C.	69-00-002.02	749 / 119		5414	1.292		
20	9	KNIGHT, SARAH J.	69-00-005.01	877 / 66		13250	11.59		
21	10	SMITH, WAYNE WILSON	69-00-006.00	L 9 / 203					
22	11	REDFEARD, JOE R. JR. ETAL	69-00-019.00	815 / 197	109				
23	12	PELOT, SYBIL B. ETAL	69-00-007.00	874 / 83	22.76				

Click in the **Tract 1 cell (A10)** in the RWDS.xlsm – **PSG** tab. Right click and select the command **Paste Special**. When the additional menu pops up beside it, choose **Paste Values**. This will insert the data from the survey sheet without affecting the formatting or function of the rest of this sheet.

8	TRACT	OWNER	TAX-MAP	DEED BOOK	DEED BOOK	PLAT BOOK	PLAT BOOK
9	No.	NAMES	REFERENCE	& PAGE	AREA	& PAGE	AREA
10	1	STOGNER, MARY ELLEN SCOTT	0068-00-043.01	C 6 / 2635		2697	1.0
11	2		0068-00-043.00	874 / 83	30		
12	3		0069-00-001.00	874 / 83			
13	4		0069-00-001.03	874 / 97		9774	1.05
14	5		0069-00-002.01	A 6 / 4994		437	2.25
15	6		0069-00-002.04	78 / 328		5414	14.64
16	7		0069-00-002.00	771 / 201		5414	11.1
17	8		0069-00-002.02	749 / 119		5414	1.292
18	9		0069-00-005.01	877 / 66		13250	11.59
19	10		0069-00-006.00	L 9 / 203			
20	11		0069-00-019.00	815 / 197	109		
21	12		0069-00-007.00	874 / 83	22.76		
22	13		0069H-0C-008.00	Q 10 / 226		9660	.732
23	14		0069H-0C-007.00	Q 8 / 329		4704	.661

These tracts and their details can be revised by hand if necessary. If a tract needs to be removed from the document, rather than deleting its data, simply place an X in the right-most cell on that line, in the column titled "RW SHEET TRACT No." Placing an X in that cell will remove the tract from the rest of the document.

26	17	HALL, JAMES	525-00-00-005	11281 / 318		29 / 99	1.89		X
27	18	PALMETTO FAMILY HOMES, LLC	525-00-00-002	4746 / 151		29 / 99	LOT		
28	19	GARRISON, AMANDA & McCURRY, RICHARD	525-00-00-006	5428 / 94		29 / 99	LOT		
29	20	LEWIS, BERTHA E.	525-00-00-007	967 / 260		29 / 99	LOT		
30	21	MCGUIRE, SCOTT	525-00-00-005	11281 / 318		29 / 99	1.89		17

16	McCLINTON, SHIRLEY F.	525-00-00-004
17	MCGUIRE, SCOTT	525-00-00-005
18	PALMETTO FAMILY HOMES, LLC	525-00-00-002

To split a tract, enter an "A" for the tract to be split in the appropriate column. Then scroll down to the bottom of the list and enter the Tract No., Owner Names, Tax-Map Reference, etc. Use the format A, B,

C in sequential order to split a tract. Example (Tract No. 4A, 4B, 4C, etc.) [Note: If additional tracts are added, restart the numbering back at the last available number – example below, restart at 118.]

8	TRACT		OWNER	TAX-MAP
9	No.	NAMES		REFERENCE
10	1	R&B Partners		024-07-17-001
11	2	Unable to verify ownership		024-07-13-001
12	3	Clear B.L. Inc.		024-07-11-009
13	4A	Palmetto Federal Savings		024-07-11-008
14	5	Paul B. Blackburn & Lori B. Baxley		024-07-11-007
15	6	Clear B.L. Inc.		024-07-11-006
123	114	R.C. Robison		023-09-02-001
124	115	Katherine L. Downs		023-18-09-001
125	116	R&B Partners		024-07-17-002
126	117	Ogles Allen Life Estate		024-07-12-002
127	4B	Investments LLC		024-07-11-008
128	119	← Renumber here if necessary		

Add split tract at bottom of list

Areas Sheet – Road Group

In the AREAS sheet, enter the areas of the outfall ditch, right, and/or left obtains required from each tract in **square feet** in the white cells. The outfall ditch area should also be included in the right or left obtain as appropriate. The tan-colored cells are filled in and calculated automatically. The cells beneath each obtain area convert that area to acres.

TAX-MAP REFERENCE	TOTAL TRACT AREA	OUTFALL DITCH (sf)	LEFT (sf)	RIGHT (sf)	TOTAL (sf)	REMAINDER LEFT (sf)	REMAINDER RIGHT (sf)
121-26-01-005-000	8.28	2000.00	100000.00		102000.000	260676.800	
		0.046	2.296	0.000	2.342	5.984	
121-26-01-011-000	0.88			9000.00	9000.000		29332.800
		0.000	0.000	0.207	0.207		0.673

In most cases, only a right OR a left obtain will be relevant and the remainder will be calculated automatically. In situations such as a new road passing through a tract, however, obtains and remainders may exist on BOTH sides of the road. In this case, the remainders must be entered manually in the white cells of the “REMAINDER LEFT (manual)” and “REMAINDER RIGHT (manual)” columns. The “VERIFY” column to the right will then show the total acreage of the obtains plus the remainders – this should equal the Total Tract Area in column D. If not, the remainders may have been entered incorrectly.

TOTAL TRACT AREA	OUTFALL DITCH (sf)	LEFT (sf)	RIGHT (sf)	TOTAL (sf)	REMAINDER LEFT (sf)	REMAINDER RIGHT (sf)	REMAINDER LEFT (manual)	REMAINDER RIGHT (manual)	TOTAL TRACT AREA (VERIFY)
8.28	2000.00	100000.00		102000.000	260676.800				2.30
	0.046	2.296	0.000	2.342	5.984		0.000	0.000	
0.88			9000.00	9000.000		29332.800			0.21
	0.000	0.000	0.207	0.207		0.673	0.000	0.000	
0.74		7500.00	1000.00	8500.000	15000.000	8700.000	15000.000	8700.000	0.74
	0.000	0.172	0.023	0.195	0.344	0.200	0.344	0.200	

PMNS – Road Group

In the Permissions sheet, click on the white cells in each Permission column to produce a little white arrow to the right of the cell.

Click that arrow to bring up the options **Yes** or **No** – click the one that is appropriate for each Tract. (Yes or No can also be typed directly into the cells in all caps if preferred.)

OWNER NAMES	TAX-MAP REFERENCE	TOTAL TRACT AREA	OUTFALL DITCH (sf)	LEFT (sf)	RIGHT (sf)	TOTAL (sf)	REMAINDER LEFT (sf)	REMAINDER RIGHT (sf)
NORA LEE R. HANNA, ETAL	00418-02-005	38.254		4665.00		4665.000	1661679.240	1666344.240
			0.000	0.107	0.000	0.107	38.147	38.254
ERNEST D. HANNA, ETAL	00418-02-097	9.554		5332.00		5332.000	410840.240	416172.240
			0.000	0.122	0.000	0.122	9.432	9.554
ROGER HOWARD HENRY, III, ETAL	00418-02-006	46.862			77170.00	77170.000	2041308.720	1964138.720
			0.000	0.000	1.772	1.772	46.862	45.090
SALEM INDEPENDENT METHODIST CHURCH	00418-02-036	1.584		3786.00		3786.000	65213.040	68999.040

INRMT Sheet – ROW Group

In the Instrument sheet, enter the dates of acquisition and instruments used for each tract in the white cells. If multiple dates and instruments need to be entered, two dates or instruments can be listed in the same cell, or white cells in the second row under each tract number can be used as well to provide more space.

1	WALLACE, SAM W. JR	526-00-00-058	05/15/07, 12/6/07	PERMISSION, FEE DEED
			9/21/09	CONDEM.

RWDS Sheet – ROW Group & Road Group

Enter the details of the right-of-ways involved in the project in the spaces provided in the bottom right of the sheet.

Road / Route #	File #	R/W Width	Year Acq'd.
Road S-62	8.338	66'	1956
US Route 17A	8.72	Variable	1999
Road S-61	8.382	66'	1962

Review the RWDS sheet(s) to confirm all data has been entered correctly. Each sheet can display data from up to 45 tracts, so projects involving more than that will use multiple sheets. Some cells may need to have their font size reduced to display correctly.

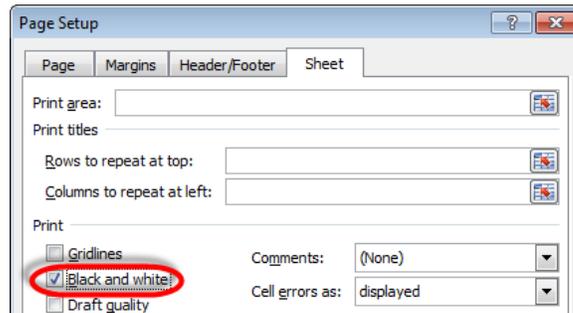
The white space on the right side of the sheet, under the revisions listings, can be used for any additional notes required. Type comments in all caps to ensure readability.

If revisions are made, the date of revision, tract(s) involved, and the nature of the revisions must be noted in the cells provided on the right side of the sheet. If necessary, the font size in the Remarks cells can be reduced to allow longer comments to be made, or multiple lines can be used for a single revision.

DATE	TRACT NO.	REMARKS

Continue the plan production process by following the **Export Excel to Adobe PDF** instructions.

- On the Sheet tab, check on **Black and White** and press **OK**



After completing the data entry for the Erosion Control Data Sheet, continue the process by **Converting the Excel Sheet to Adobe PDF** and **Applying the PE Seal** instructions.

General Construction Notes Sheet

To prepare the General Construction Notes sheet for printing directly to PDF, open the Quantity Sheet for the project and copy the pay items out of the tab named **“Paste Data Here”**. Only the *first three columns are needed* - Item#, Description, and Unit – not the actual Quantities. Paste the data into the tab named **“Paste Data Here”** beginning with cell A2 in the Cadd Standard **“General Construction Notes.xlsx”** Excel file located on the Cadd Support webpage.

[Note: Do not delete rows, move rows, sort, etc. because the formulas will not perform correctly. The spreadsheet will automatically sort the quantities in order by Item Number.]

	A	B	C
1	ITEM NO.	PAY ITEM	UNIT
2	1031000	MOBILIZATION	LS
3	1031000	MOBILIZATION	LS
4	1031000	MOBILIZATION	LS
5	1031000	MOBILIZATION	LS
6	1031010	MOBILIZATION	EA
7	1032010	BONDS AND INSURANCE	LS
8	1050800	CONSTRUCTION STAKES, LINES & GRADES	EA
9	1071000	TRAFFIC CONTROL	LS

Enter the Quantities and Use Descriptions for the Inclusion Items by hand into the Quantity column. You can prevent items from appearing on the General Construction Notes sheet by leaving their quantity blank. Items with any information filled in for quantity, including the number “0”, will appear; items with a blank Quantity cell will be filtered out. Only fill in quantities for items you wish to display.

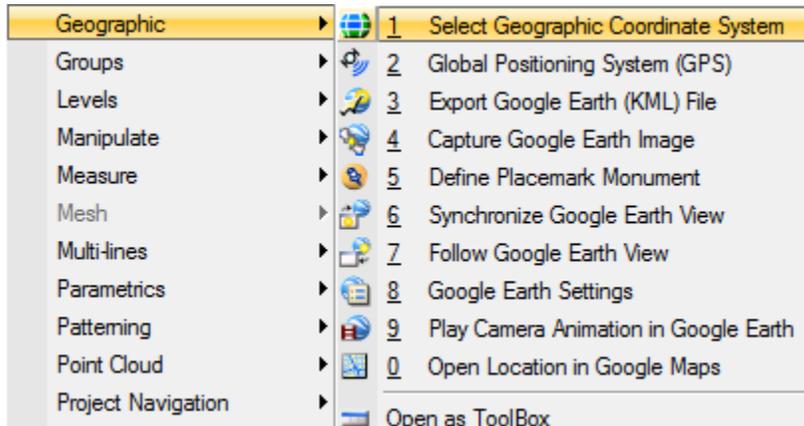
Addition items may need to be added to the quantities list, particularly if more than one inclusion item with the same Item Number must be included. Additional items can be added to the bottom of the list and will be automatically sorted into the correct position by their Item Number. Information can be copied and pasted from existing items if desired; do not cut and paste or insert/delete rows, however.

Review the results on the Excel tab – **GCN**. Fill out the Project Contacts information and add any additional notes required for the project.

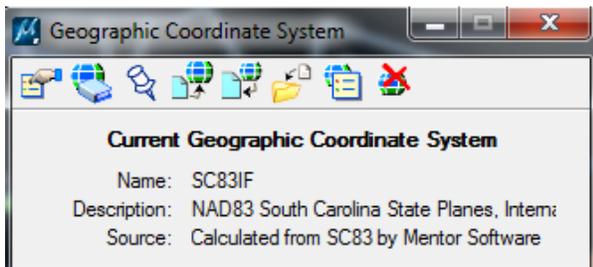
Google Earth Pro

Google Earth is used frequently in design for reviewing the existing topography of the project, for planning, for preliminary design, for land use identification and drainage patterns in hydrology, for public hearing displays, and many other purposes to provide the project scope in context to existing conditions.

Open the *.pp.dgn file and select **Tools > Geographic > Select Geographic Coordinate System**.



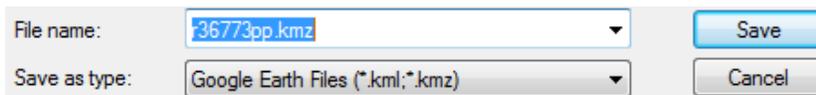
Verify it is set to the **SC83IF** – South Carolina State Planes Coordinates – International Feet. (See page 6)



Select **Tools > Geographic > Export Google Earth KML File**



Select the working directory and assign a file name. Press the **Save** button.



Review the kmz file in Google Earth.

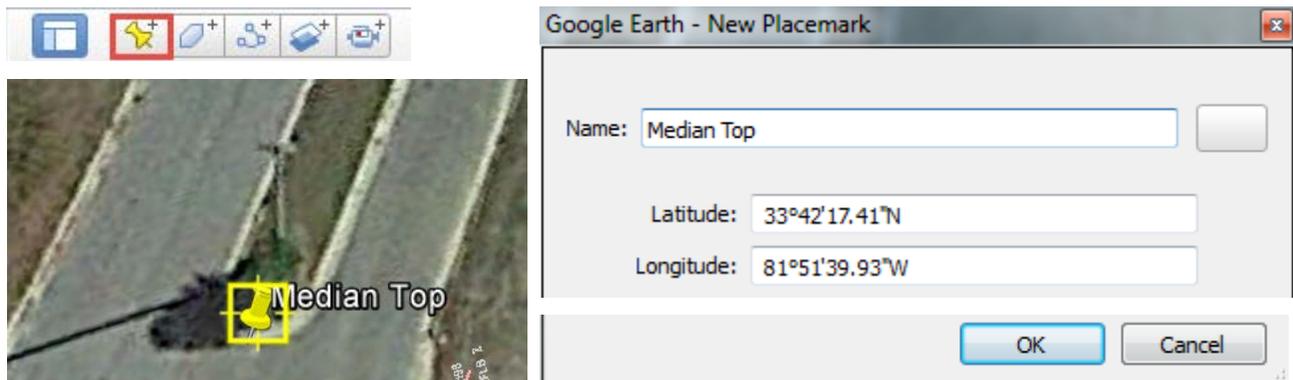


There still exist older projects that were not surveyed in State Plane Coordinates. In order to export these files to Google Earth, thumbtacks will need to be placed in Google Earth and MicroStation to match elements to images in the Google Earth.

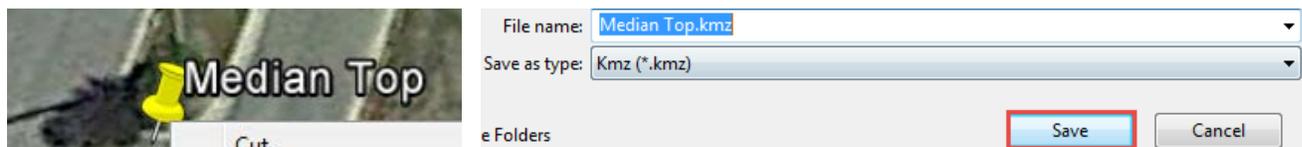
Thumbtacks should be placed on ground objects as opposed to building or other objects with height as shadows in the image could alter the transformation of the graphics to the image.

Open **Google Earth** and zoom into the project area. Locate a known feature such as a curb return, parking lot corner, etc. to add a placemark/monument.

Select the **yellow pushpin** icon at the top menu bar to **Add Placemark**. Enter a **Name** and move the push pin to a **recognizable** corner. Press the **OK** button.



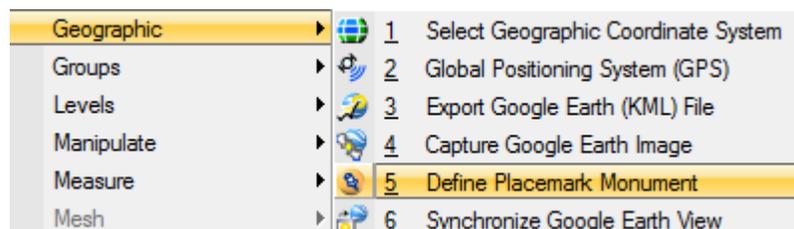
Right click on the pushpin to select **Save Place As**, enter a name and save the pushpin to the working directory.



Repeat the steps above to place additional pins on objects at the other end of the project to better transform the project.



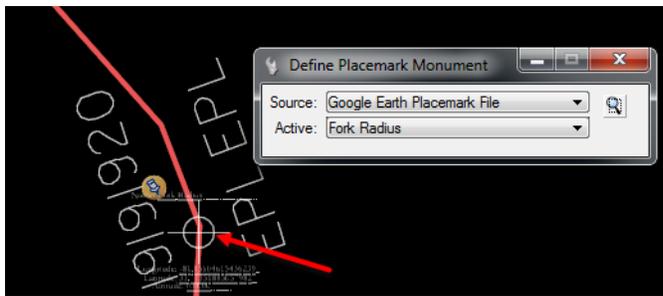
In the *.pp.dgn file in MicroStation, select **Tools > Geographic > Define Placemark Monument**.



Zoom into the same location in the design file that was located in the Google Earth location. **Browse** to select the Placemark.kmz file and **data click** as close as possible to transform the file correctly.



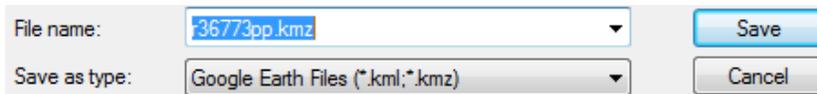
Repeat to add additional Placemark pushesins.



Select **Tools > Geographic > Export Google Earth KML File**



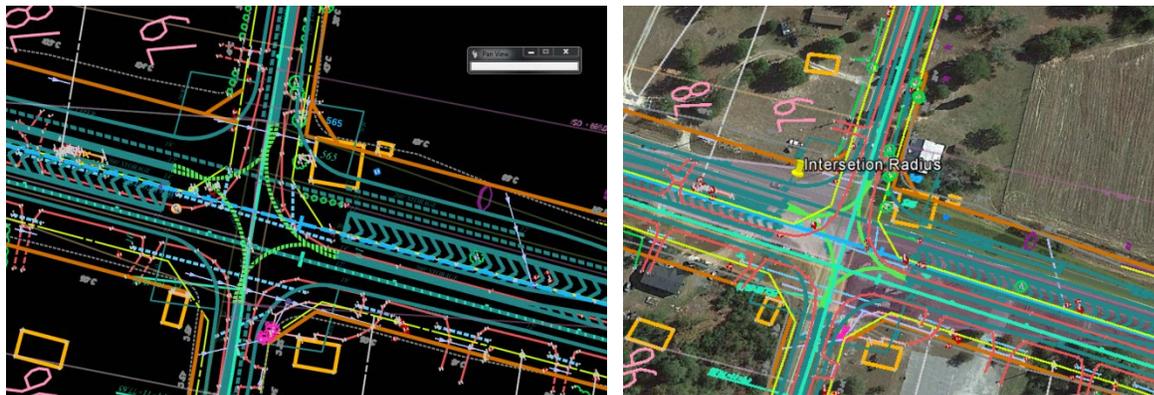
Select the working directory and assign a file name. Press the **Save** button.



Review the kmz file in Google Earth.



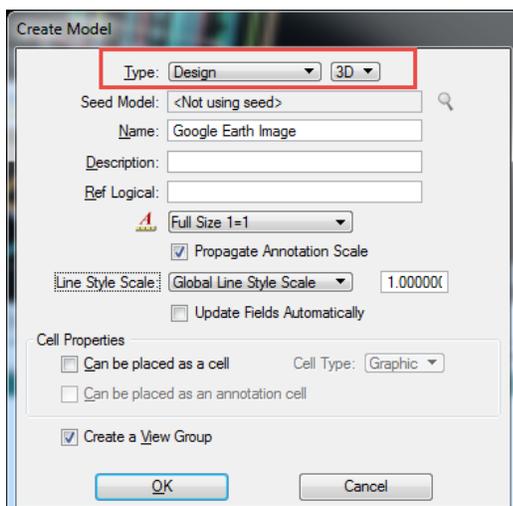
To **Synchronize Google Earth View**, select **Tools > Geographic > Synchronize Google Earth View**. This will zoom into the same area of the Google Earth image as is zoomed into the MicroStation drawing.



To **Capture Google Earth Image**, you must have a 3D model. To create a 3D DGN Model in the existing drawing, select **Model** on the Primary Tool bar. [Note: this procedure is used when aerial images are not available through WMS or ECW files or the imagery is more outdated than the Google Earth images.]

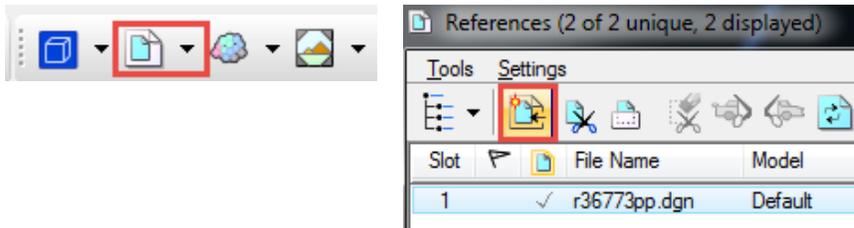


Select the **Create a new model icon**.

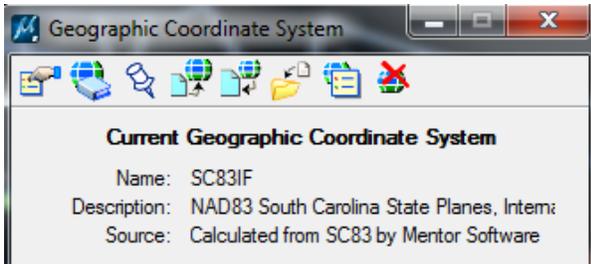


Create a **3D Model** as shown below by selecting **Design and 3D**. Press **OK** to create the model.

Select the **Reference File** button to attach the ***pp.dgn** file as a reference to the model.



Verify the **SC83IF** coordinate system is attached to the new model. Attach if necessary.



Adjust the view so that it contains the desired area to be captured. [Note: if the area is too large, the image will have a lower resolution due to Google’s compression techniques. For a large project, complete the image capture in a series of steps for multiple images.]



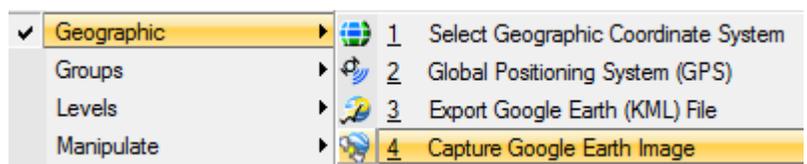
Select **Synchronize Google Earth View**.



In Google Earth, check and confirm the view. Do not alter the view in any way.



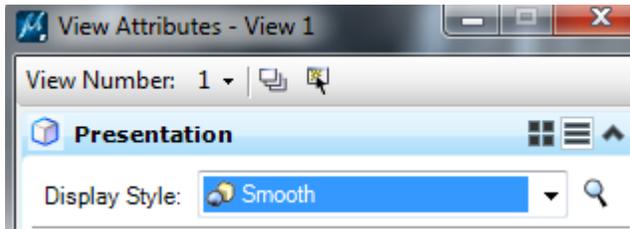
In MicroStation, select the **Capture Google Earth Image**.



Data click in the **center** of the MicroStation view. A **3D wireframe mesh** will appear in the drawing covering the view area.



Change the **View Attributes** to display style **Smooth** to view the Google Image.



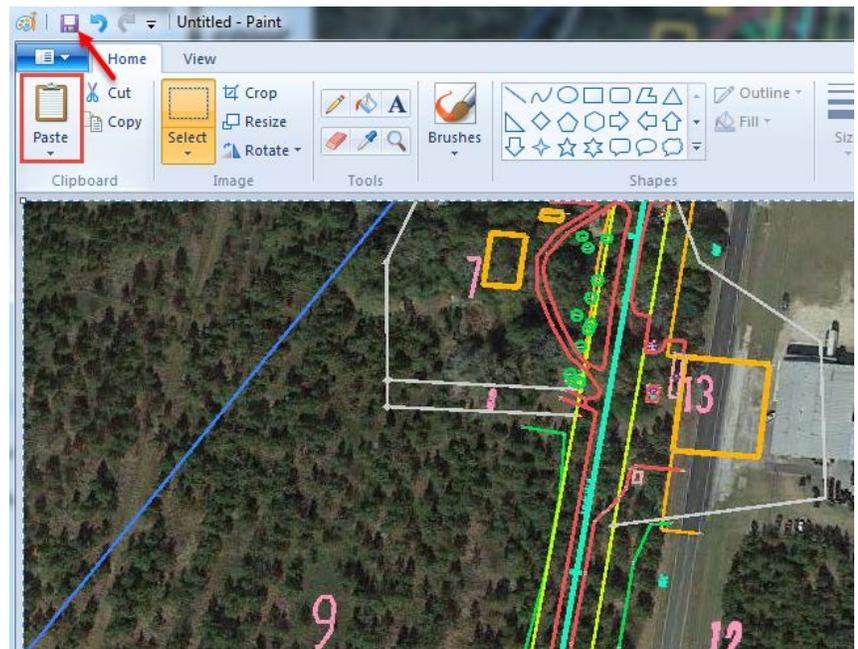
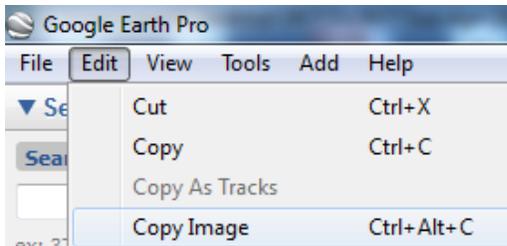
The Google image appears **black and white** and at a lower resolution.



The higher resolution image file is located in the working directory and can be attached as a raster image to the 2D *.pp.dgn file if needed. Tip: Draw a box along the edges of the view to attach the image by "Place Interactively" to snap to the corners for better alignment of the image.

Name	Date modified	Type
r36773pp.dgn	9/24/2015 12:15 PM	Bentley MicroStati...
r36773ppTerrainCapture1.jpg	9/24/2015 12:14 PM	JPEG image

To save the image in color, in Google Earth with the same view, select **Edit > Copy Image**.



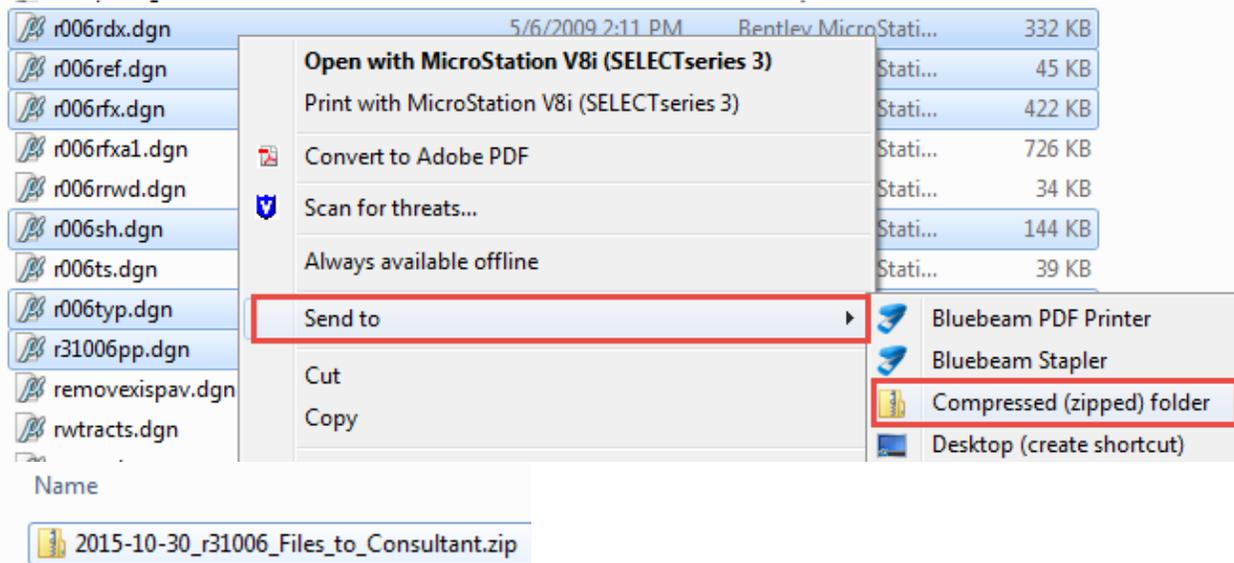
Select **Start > All Programs > Accessories > Paint** to open Microsoft Paint. Press the Paste button.

Select the **Save** icon and overwrite the black and white image from the previous step.

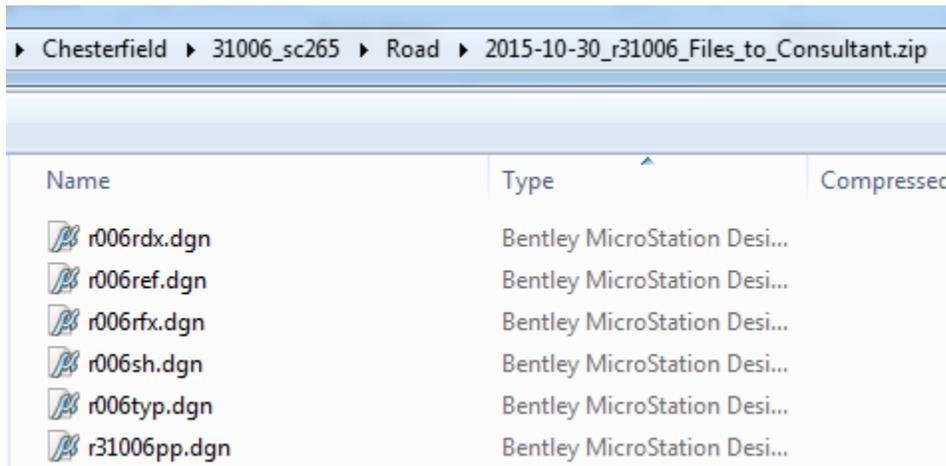
Close and restart MicroStation to view the image in color.

Zip Files

To bundle groups of files together into a compressed folder for electronic transfer, **highlight** the files in the folder and right click to select **Send To > Compressed Zip Folder**. The *.zip file will be located in the folder. Rename the file as necessary and then use this file when uploading to a file transfer site or attaching to an email.



To unzip files, double click on the *.zip file. Highlight the files and **drag/drop** the files out of the *.zip to the network server location.



FTP Options

SCDOT File Transfer (FTP) Interface

IT Services maintains the SCDOT File Transfer (FTP) solution which allows SCDOT employees or customers to upload/download data using either desktop installed software or a web browser interface.

<https://www.scdot.org/business/file-transfer.aspx>

Please contact the Design Automation Office to have the desktop client (for SCDOT employees) installed on your workstation or laptop. The Preconstruction Office shares a user account for internal SCDOT employees. This username and password cannot be shared with anyone outside of Preconstruction.

External customers should contact the SCDOT Program Manager they are currently working with to request a user account. The internal SCDOT employee will submit the Help Desk ticket on your behalf after your access has been approved.

The SCDOT File Transfer (FTP) User Guide is located here:

https://www.scdot.org/business/pdf/consultants/fileTransfer_UserGuide.pdf

The SCDOT File Transfer (FTP) web version can be accessed here:

<https://file.scdot.org/thinclient/>

ProjectWise

ProjectWise is the **preferred file sharing solution** of the Preconstruction Office for all project related files. ProjectWise provides several key benefits to both SCDOT employees and external customers:

- Centralized location for all engineering project files
- Securely connect SCDOT offices and engineering firms
- Multiple levels of security using access lists to determine proper user permission to folders and files
- Environments with custom sets of project and document attributes
- Powerful search engine
- Complete audit trail of user actions performed on folders and files
- Delta File Transfer (Only transfers file changes to and from the server)
- Improved interoffice communication by ensuring access to the most current version of a file
- Saves time locating files and reduces paper

The IT Services Office maintains the following website for updated documentation and the ProjectWise Account Form which is required to request access to projects through your SCDOT Program Manager.

<https://www.scdot.org/business/design-build-projectwise.aspx>

The Design Automation Office will assist internal Preconstruction employees by coordinating the creation of new projects and assigning the appropriate permissions to the projects.

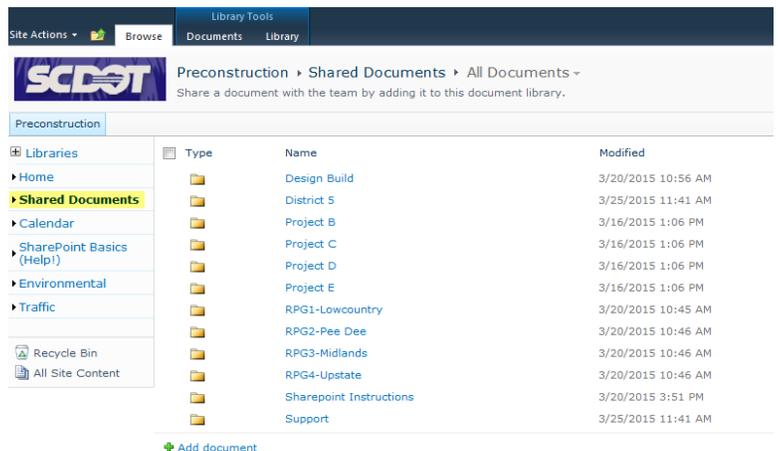
SharePoint

The Preconstruction Office maintains a SCDOT Preconstruction SharePoint site which allows SCDOT employees to upload and send files via an email link to external customers. This site is for *outgoing files only* and does not require the external customer to have an account. (If the external customer needs to deliver files to you, then either the SCDOT FTP Site or ProjectWise will need to be utilized.)

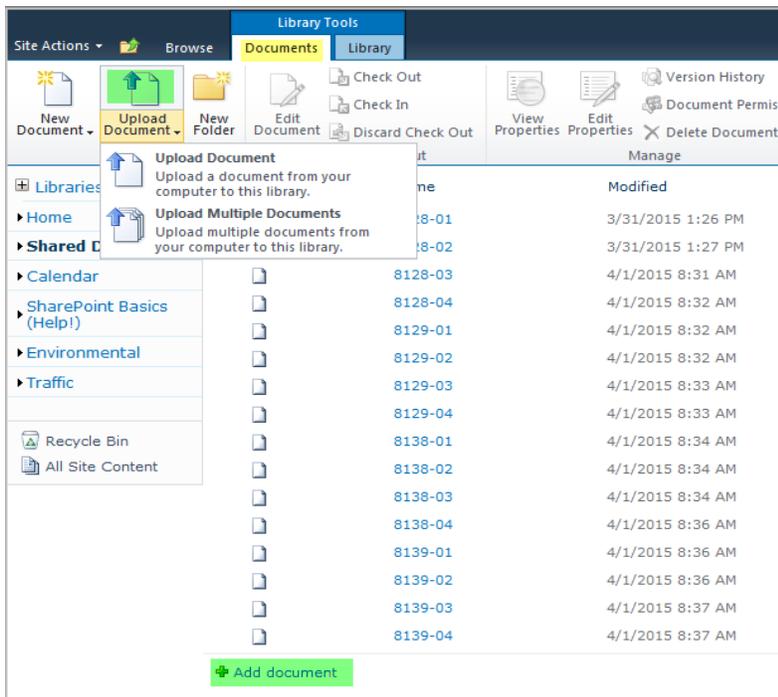
<http://files.sharepoint.dot.state.sc.us/Preconstruction/SitePages/Home.aspx>

Create a Zip/Compressed folder prior to uploading of the files to be sent. (Instructions in previous section.)

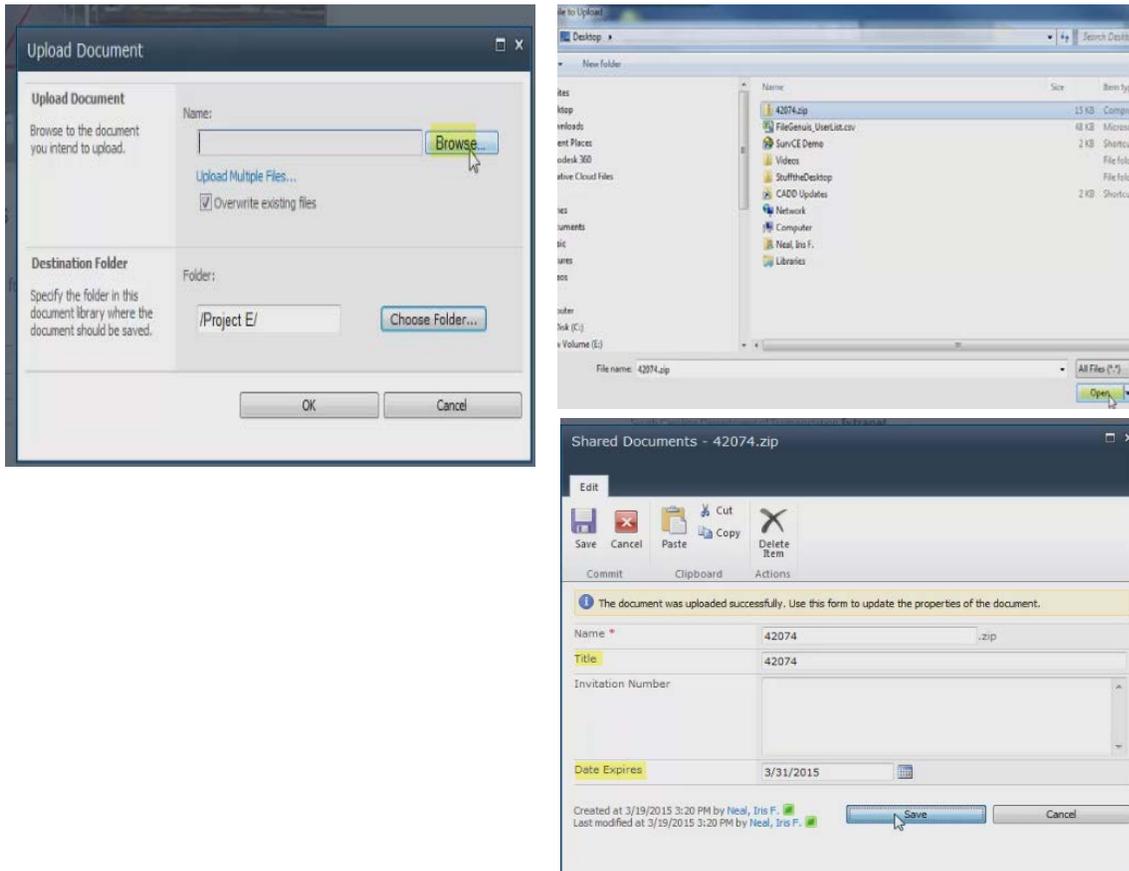
To upload the files to be sent, click on the **Shared Documents** on the left. In the center of the page, **click** on the designated group folder that you have access to. You may only see one or two folders from the list below.



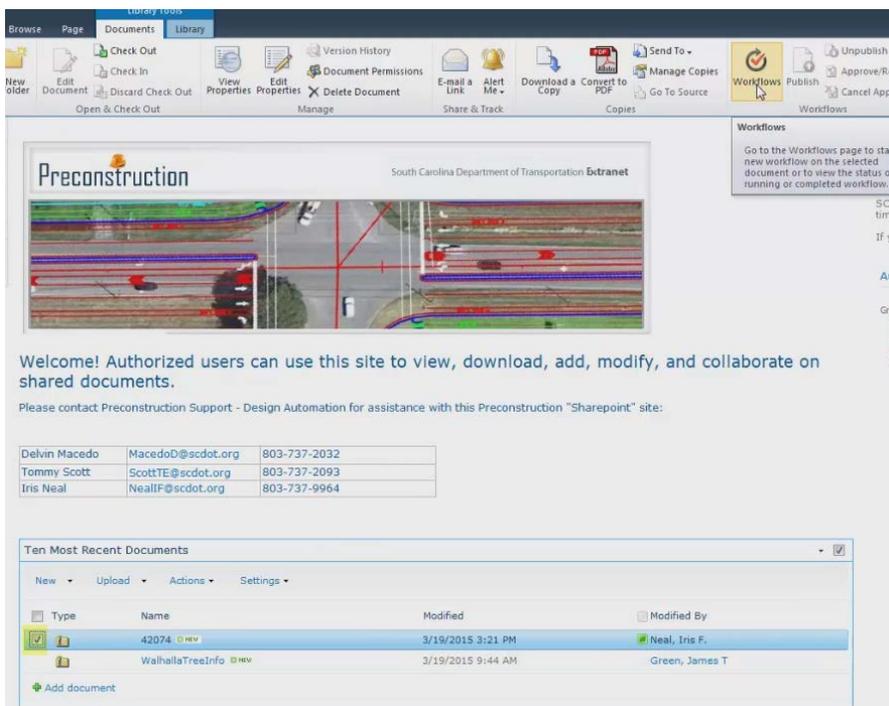
On the Documents tab at the top, press the **Upload Document** button. (Alternatively, press the +Add Document button.)



Browse to locate the Zip/Compressed folder and select **Open**. Click **OK**. Enter a title for the file being uploaded and press **Save**.



To send an external link via email, on the Documents tab, select the **Workflows** button.



Press the **Share This Document** link to start the workflow.

Preconstruction Shared Documents: Workflows: Palmetto Tree
Use this page to start a new workflow on the current item or to view the status of a running or completed workflow.

Start a New Workflow

Share This Document
This workflow will create a copy of a document for access by an anonymous user. An email containing an invitation number will be sent to the recipients entered on the initiation form.

Workflows
Select a workflow for more details on the current status or history. [Show my workflows only.](#)

Name	Started	Ended
Running Workflows		

There are no currently running workflows on this item.

It is recommended to enter your email address in the **Email Recipients(s)** box. This will send an invitation to your email address. Next, you can forward the invitation to external recipients.

Preconstruction Start "Share This Document": Palmetto Tree
To start the workflow, use the submit button in the form below.

Email Recipients: macedo@scdot.org
Enter email addresses for the intended viewers of this file. They will receive an invitation number required for viewing the file.

Expiration Date: This is the last date this file will be available to a [November, 2015]
Calendar view showing dates from 1 to 30.

Start Cancel

Select an expiration date (amount of days that the invitation will be active).

Press the **Start** button.

Note: This is a temporary location. Please clean and remove older files once the recipient has obtained the necessary files.

Once you receive the invitation, **forward the email** to the recipients. If you do not receive the invitation file in your email within approximately 10 minutes, retry the workflow again or contact the Design Automation Office for assistance.

In the email, there will be an **invitation number**. The entire number plus the { brackets should be selected and **copied/pasted**.

From: Preconstruction <SMPSPHT1001@dot.state.sc.us>
To: [Redacted]
Cc: [Redacted]
Subject: SCDOT Preconstruction Files: You have been invited to review a file.

<http://files.sharepoint.dot.state.sc.us/preconstructionpublicfiles/shareddocuments/forms/allitems.aspx>
Click to follow link

Direct consultant to click on **SCDOT Preconstruction** site link or SCDOT Icon above
They must copy and paste the invitation number including the { curly bracket

This is an automated alert from the SCDOT Preconstruction Public Files System. Please do not reply directly to this email.
You have been invited by Macedo, Delvin to review a file on the SCDOT Preconstruction site. You will need to enter your invitation number to view tl
Your Invitation Number is: {FOAAEC8C-9B4B-4A69-8CD6-88A13A52B710}
Thank you for your assistance!

Once the Invitation number is pasted and the **Search** button is pressed, the shared file will appear. The user can click on the file name to download the file. Select **Save As** to select the directory to save the Zip/Compressed files to.

The screenshot shows the 'Preconstruction Public Files > Shared Documents' interface. It includes a search bar for an invitation number, a table of shared documents, and a 'Save as' dialog box.

Name	Modified	Date Expires	Invitation Number
42074 <small>NEW</small>	3/19/2015 3:23 PM	3/21/2015	{F0AACE8C-9B4B-4A69-8CD6-88A13A52B710}

Do you want to save 42074.zip (14.7 KB) from files.scdot.org?

Save as

Plan Sheets

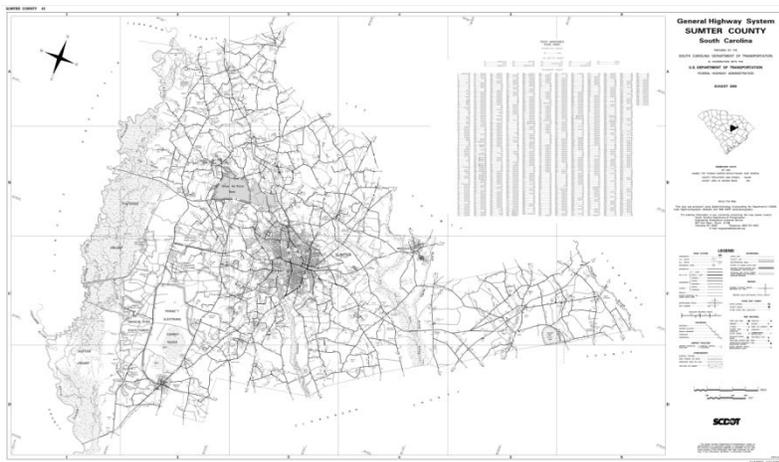
Title Sheet

The Title Sheet is to be completed in accordance with the Roadway Design Manual Chapter 22.

Create a new MicroStation design file “r12345ts.dgn” to contain the title sheet.

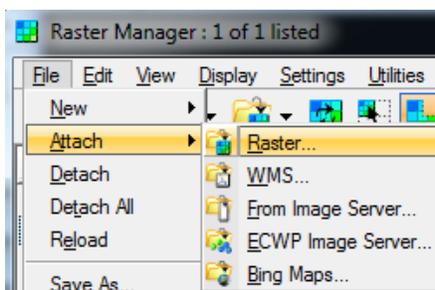
Navigate to the GIS Mapping internet site: <http://info.scdot.org/sites/GIS/SitePages/default.aspx>

Select **Maps > City** or **Maps > County** to locate the appropriate map for your project. Download the map and save it to your project working directory. In Adobe, select Tools > Pages > Rotate and rotate the pdf as necessary. Press the Save button.

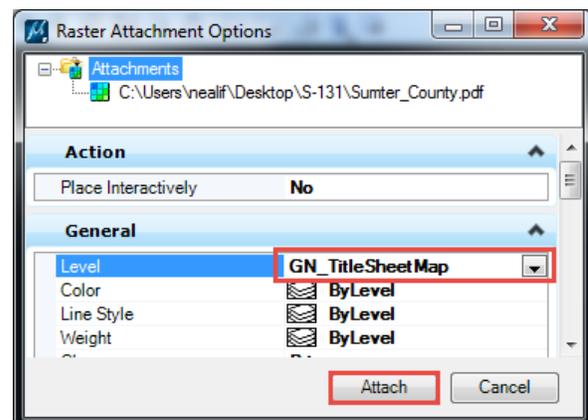


Note: If the city map crosses more than one pdf page or County line, contact the Design Automation Office to coordinate a “special” project map. (Alternatively, Google Maps can be used if both the street numbers and street names are available by clipping a jpeg image and attaching as a raster as outlined in the following steps shown for the pdf maps.)

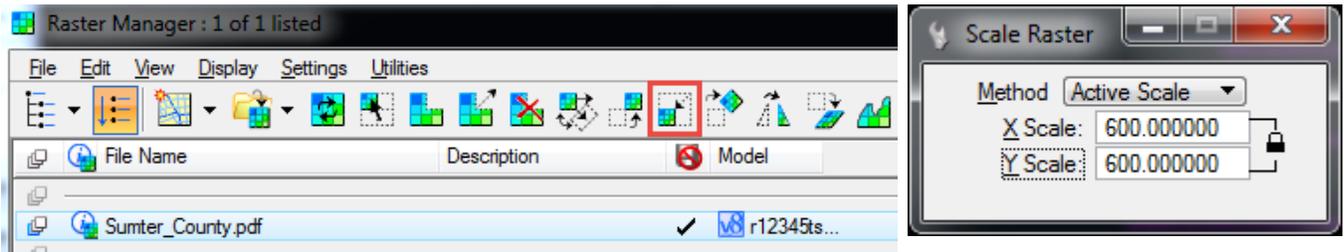
In the MicroStation Title Sheet file, select **File > Raster Manager**. Select **File > Attach > Raster**. Select the County or City pdf file to attach and press that **Open** button.



On the Attachment Option button, select the GN_TitleSheetMap level and press the **Attach** button.



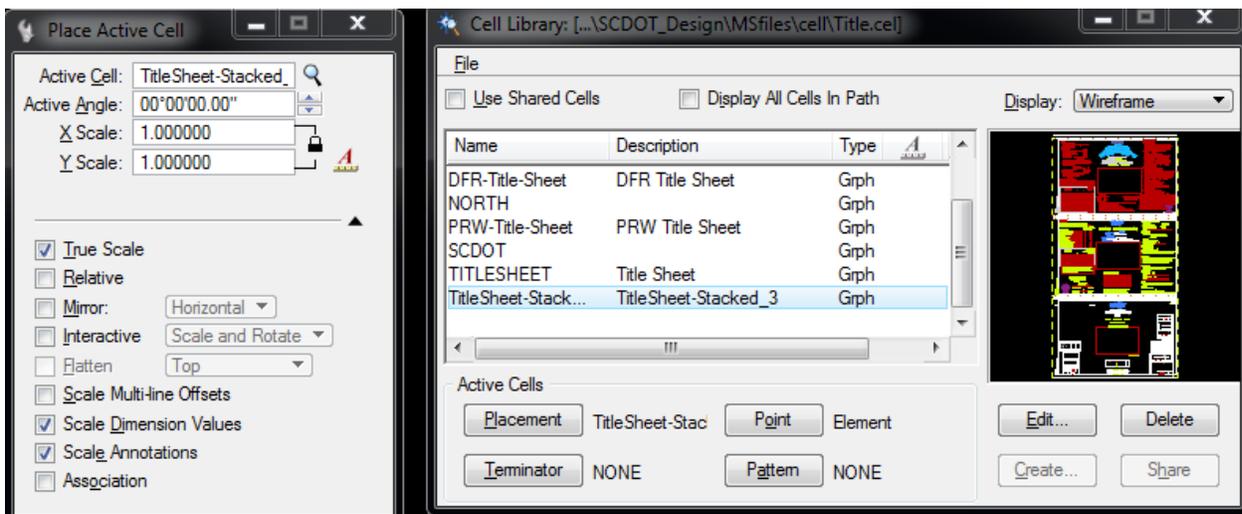
With the raster highlighted, select the **Scale** button on the Raster dialog and enter a Scale value of 600. Data point to scale the raster up 600. (This will make the 1" = 5280' when submitted as a 50:1 plot).



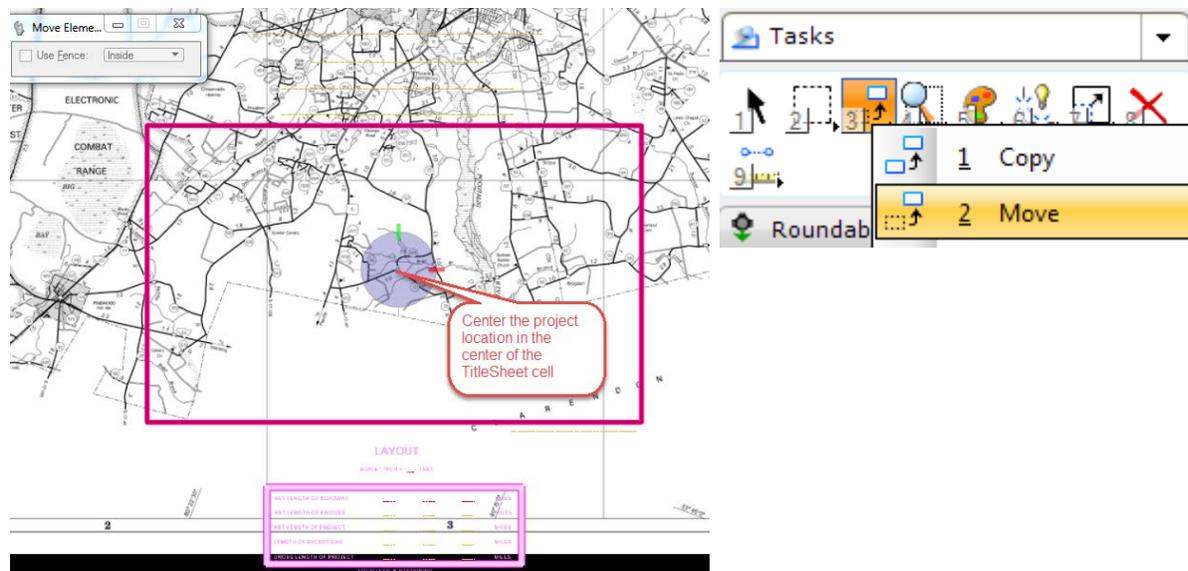
Select the **Place Cell** command. Attach the Title.cel library to locate the sheet cells required. (Consultants will attach the eclts13.dgn file as a reference border sheet instead.)



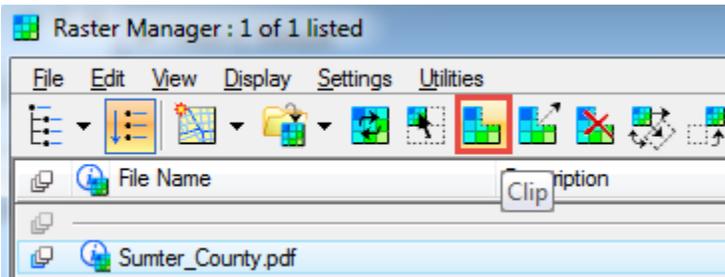
Select **TitleSheet** (or appropriate sheet) and press the **Placement** button. **Data point** in the design file to place the TitleSheet cell.



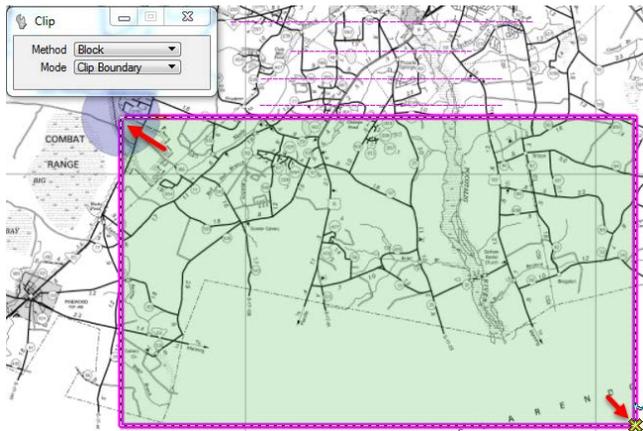
Use the MicroStation **Move** command to center the project location to the center of the map clip box in the center of the Title Sheet cell.



On the Raster Manager dialog, select the **Clip** button.

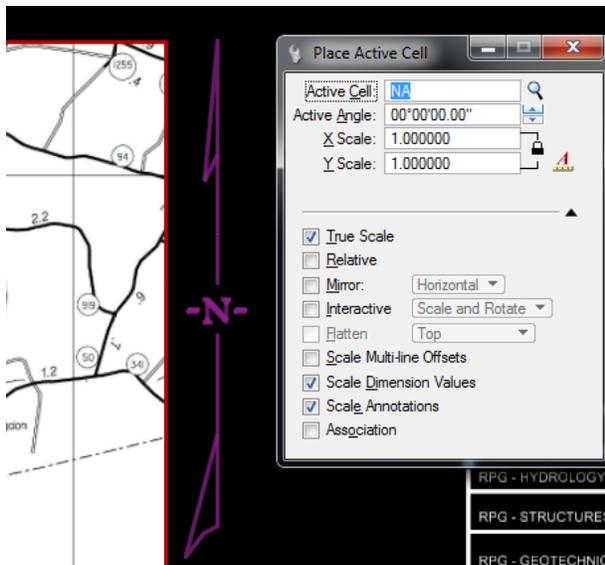


Data click the upper left and lower right corners of the Title Sheet Map block to create the fence clip boundary. Data click in the design file to accept the clip.



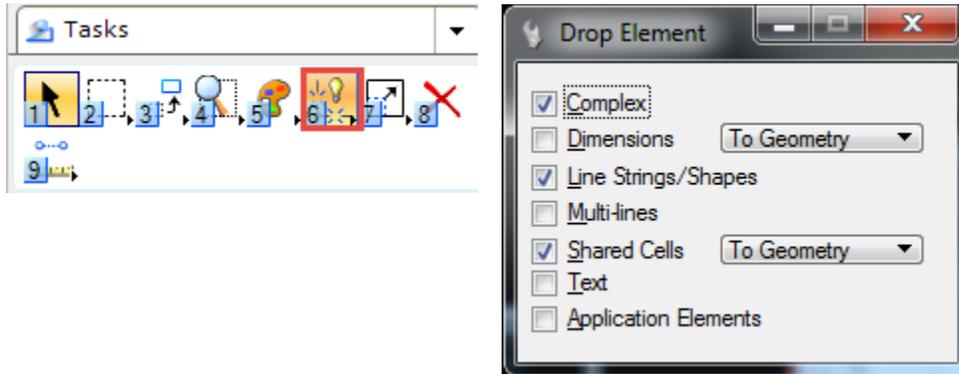
To modify the clipped map, see the Raster Manager section of this manual on page 22.

Attach the RoadV8.cel cell library and select the NA cell to place the **North Arrow** to the right of the Title Map block.

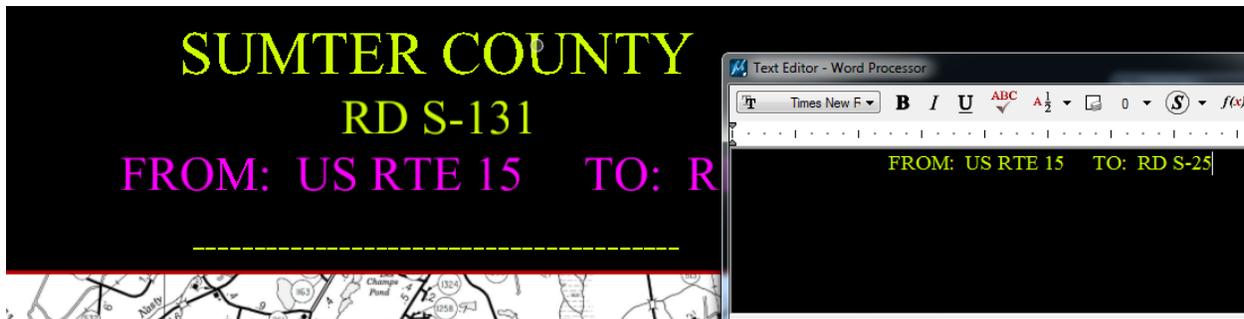
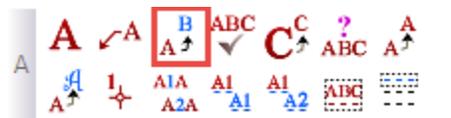


Note: If you are having issues with the map, please see raster settings on page 24.

Select the **Drop Element** command and check on the following options. Select the Title Sheet cell once to drop the status of the cell. This will allow you to utilize the text nodes to quickly place the Title Sheet fields without having to select the font sizes.



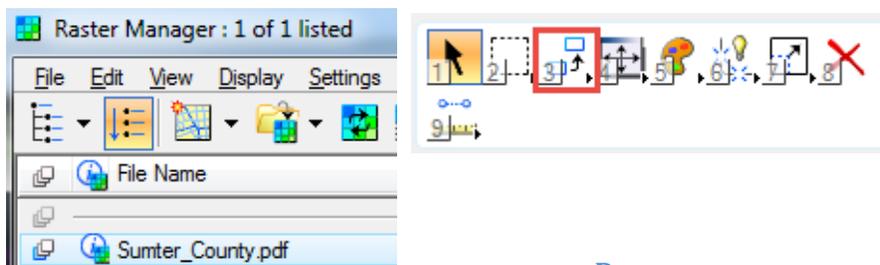
Use the **Edit Text** command to click on each of the text nodes to enter the Title Sheet data. (If text nodes do not exist for a field, copy a similar text to that area and use the Edit Text to modify as necessary – there are a few new fields that were not set up this way.) Use %%d for the degree symbol in the Lat/Long boxes.



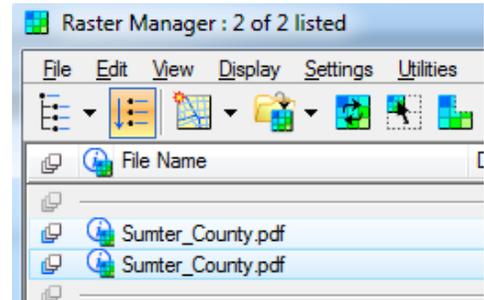
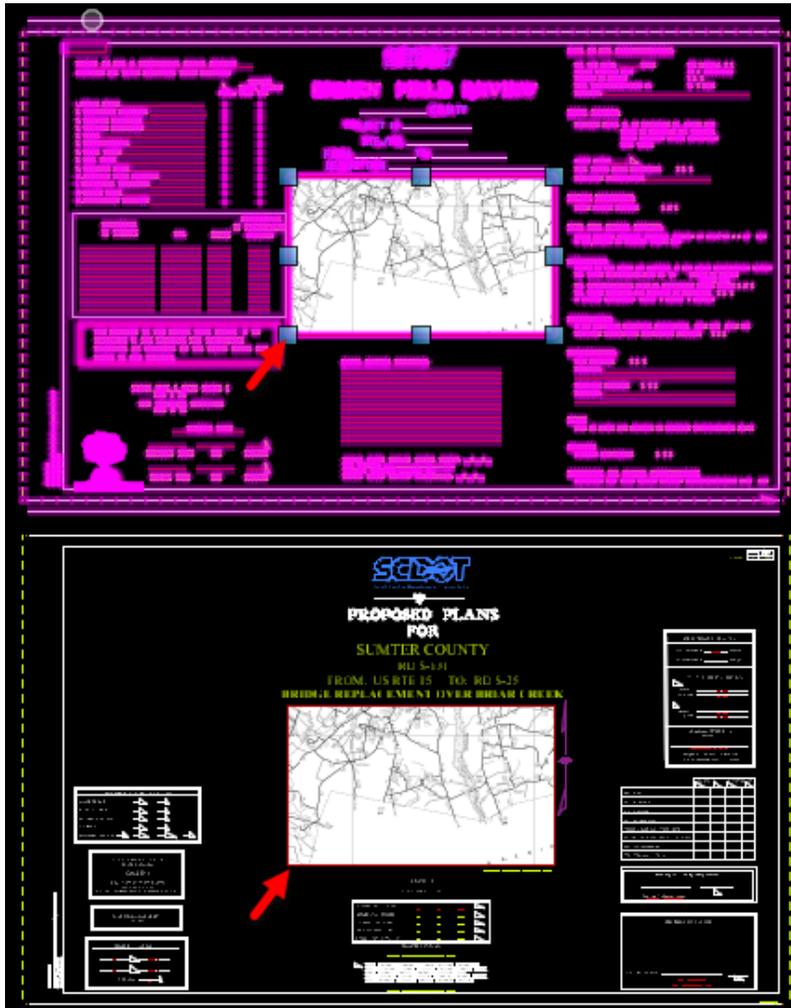
Special Note about plotting: Because the map is attached as a pdf, when converting back to pdf, lplot strips down the pdf and then recreates it. This may cause lplot to take 2-3 minutes to convert the title sheet. To speed up this process, you can save the original County or City map as a Jpeg or Tif in Adobe and attach it in the same manner in raster manager.

Copy the Raster Image to Multiple Title Sheet Cells

If multiple title sheets were attached as cells in this MicroStation file, in Raster Manager, highlight the raster file to select. Select the MicroStation command **Copy**.



Data click the **bottom left corner** of the image and then **click the bottom left corner** of the next title sheet to copy the image to. This will create another raster attachment to the file and can be repeated for as many title sheets that exist in the file.

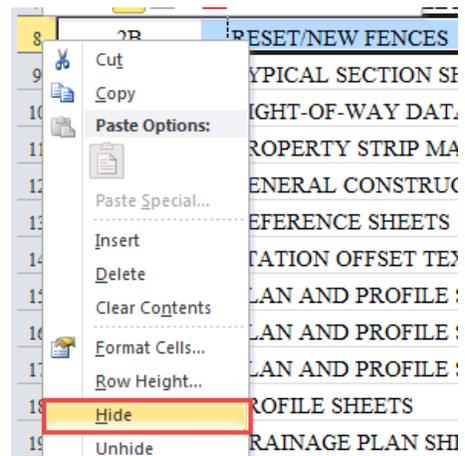


Index of Sheets (on the Title Sheet)

The Index of Sheets may be included in the upper left corner of the Title Sheet or in the upper right corner of the Index Layout Sheet (IL1) directly following the Title Sheet in the plans.

Open the Index of Sheets **Excel** file and update the Sheet No., Description, and Sheet Subtotals information to match the plans for your project.

Right click on the rows that do not apply to your project and select **Hide** to hide these rows, to keep them in case these sheets are added at a later date.



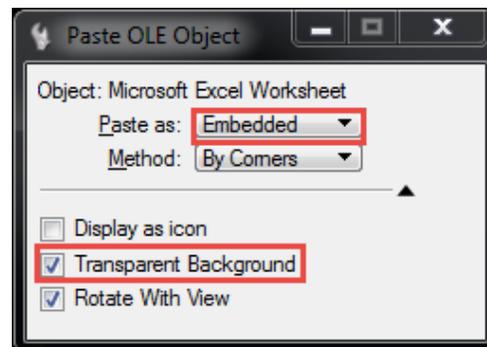
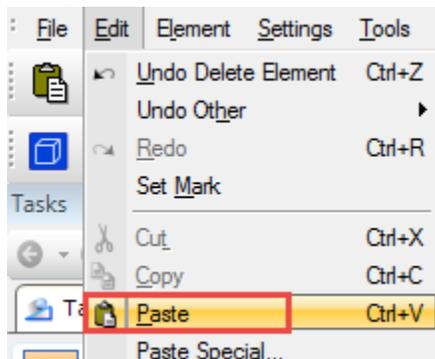
On the View tab, uncheck the **Gridlines** button. This will allow the pasted results in MicroStation to be more aesthetically pleasing.



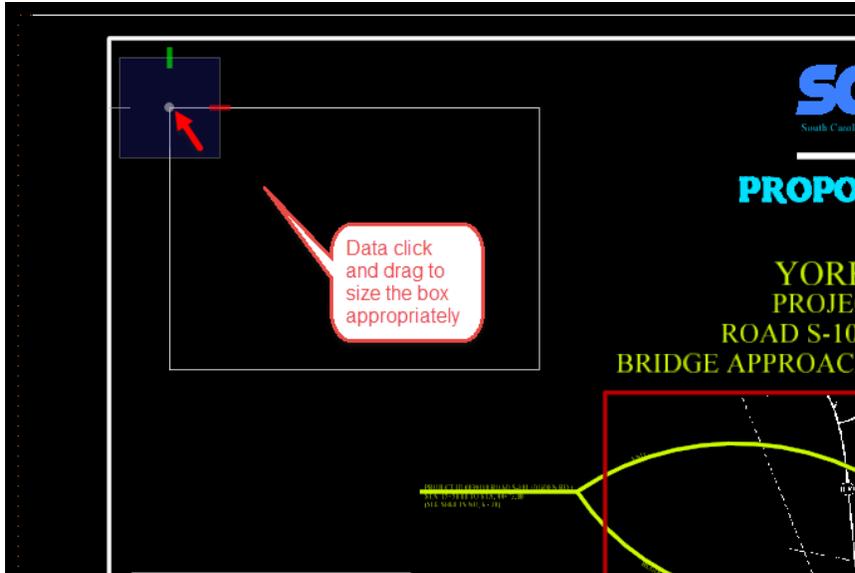
Highlight the rows and columns of the Index of Sheets and right click to select **Copy**. (Press Ctrl + C on the keyboard)

	A	B	C	D
1			INDEX C	
2	<u>SHEET NO.</u>	<u>DESCRIPTION</u>		<u>SHEET SUBTOTALS</u>
3	1	TITLE SHEET		1
5	IL1	INDEX/LAYOUT SHEET		1
6	2	SUMMARY OF ESTIMATED QUANTITIES		1
7	2A	MOVING ITEM SHEET		1
9	3 - 3A	TYPICAL SECTION SHEET		2
10	4	RIGHT-OF-WAY DATA SHEETS		1
11	4A	PROPERTY STRIP MAPS		1
12	5	GENERAL CONSTRUCTION SHEET		1
13	5A	REFERENCE SHEETS		1
14	5B - 5C	STATION OFFSET TEXT		2
15	6 - 8	PLAN AND PROFILE SHEETS (ROAD S-998)		3
16	9	PLAN AND PROFILE SHEETS (RD. S-998)		1
17	10	PLAN AND PROFILE SHEETS (WILDCAT CREEK)		1
28	G1	GEOTECHNICAL NOTES SHEET		1
29	EC1	EROSION CONTROL DATA SHEETS		1
31	X1 - X17	CROSS SECTION SHEETS (ROAD S-101)		17
32	X18 - X20	CROSS SECTION SHEETS (ROAD S-998)		3
33	X21 - X23	CROSS SECTION SHEETS (ROAD S-102)		3
34	X24 - X28	CROSS SECTION SHEETS (WILDCAT CREEK)		5
35	X29 - X30	CROSS SECTION SHEETS (O. F. DITCH No. 1)		2
38			SHEET TOTALS	50

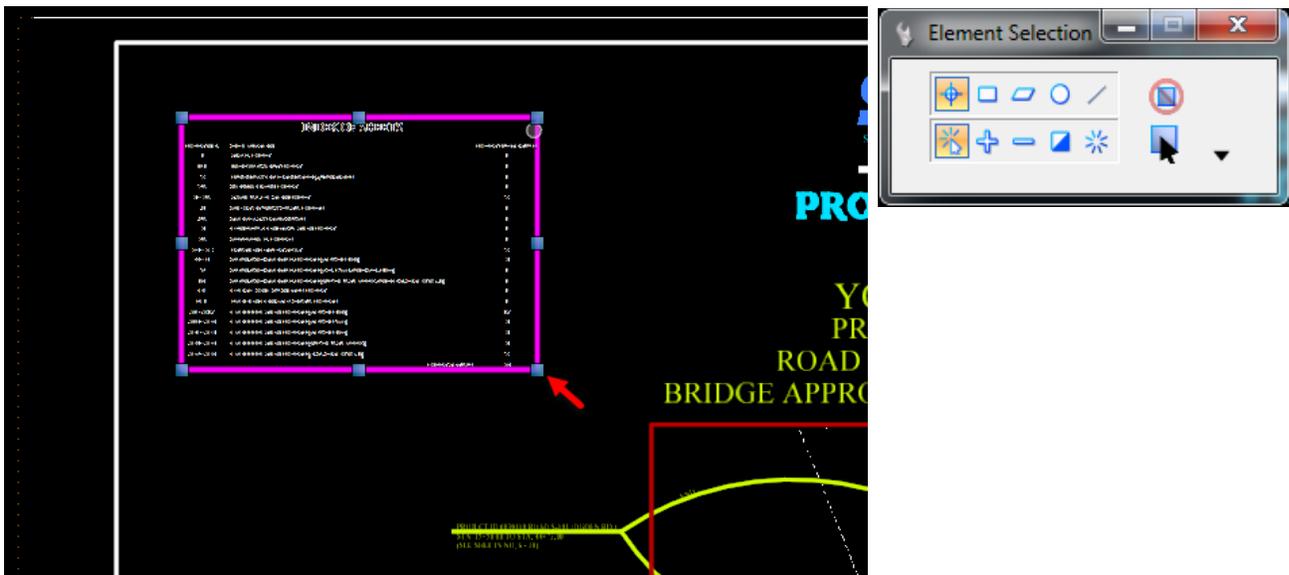
In MicroStation, select **Edit > Paste**. On the dialog, select **Embedded** and check on **Transparent Background**.



In the upper left corner of the Title Sheet (or in the upper right corner of the Index Layout sheet), **data click** to define the upper left corner of the box and drag to size the Index of Sheets box. (If updates are required, make modifications in the Excel file and repeat this process. The Excel data is embedded rather than linked. Linking causes the text to have a “grey” background when plotted.)



Once the box is pasted, you can use the **Element Selection** tool to select and manipulate the size by dragging and dropping the handles on the corners.



Index/Plan Layout Sheets

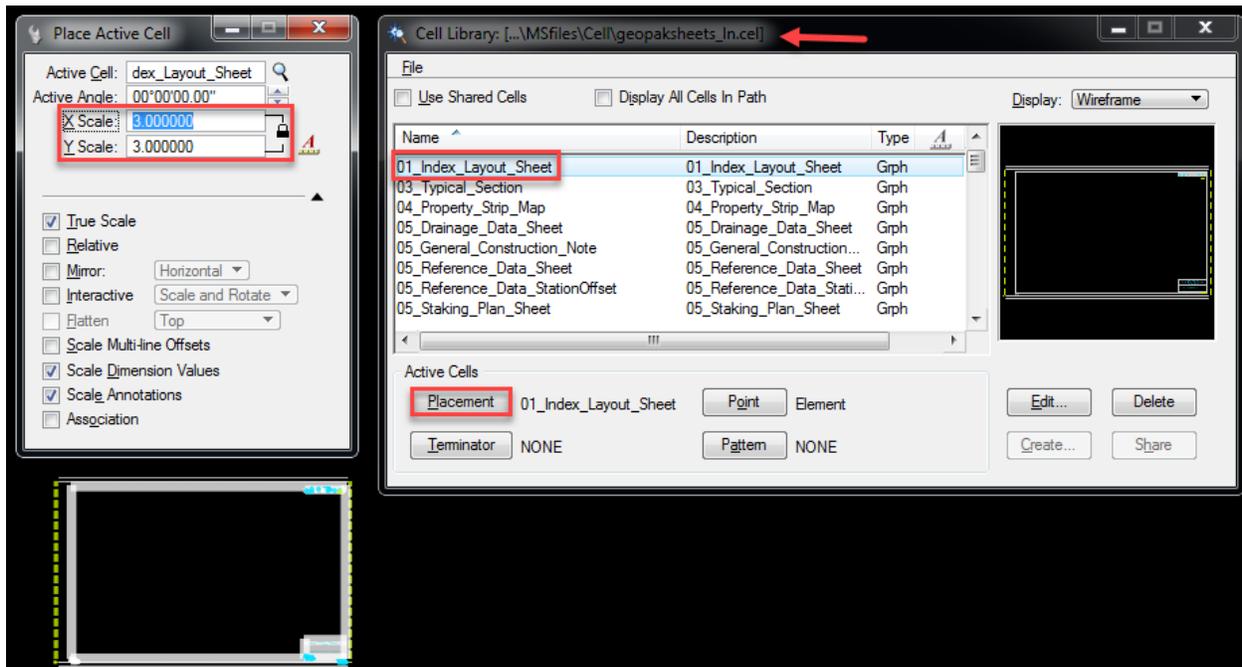
Create a new *.ildgn design file. Add the Index of Sheets as **outlined in the above steps** if you are including on the IL1 Sheet (preferred) instead of the Title Sheet. Most users paste this in the **upper right corner**, so thumbing thru the plans; it is more easily accessible on the page.

Determine the scale for the Index Layout sheets by length of alignment to show the layout of the plan sheets for the project.

Scale	Border Cell X & Y	Alignment Length	Minimum Font Size
50:1	1.00	1500 ft stationing	5
100:1	2.00	3000 ft stationing	10
150:1	3.00	4500 ft stationing	15
200:1	4.00	6000 ft stationing	20
400:1	8.00	12000 ft stationing	40

A 150:1 will fit approximately 3 plan sheets or 4500 lf of the alignment. The following example will demonstrate a 150:1 Index/Plan Layout Sheet.

Open the geopaksheets_In.cel cell library and select the 01_Index_Layout_Sheet cell. Adjust the cell scale to 3.00 for both the height and width (3 x 50 = 150). Place the cell additional times for the number of plan sheets you are including in the layout.



If plan sheet clipper was used to layout the plan sheets, attach the *cogo.dgn design file as a reference to the *.il.dgn. (If plan sheets were manually assembled, attach the *.pp.dgn design file as a reference.)

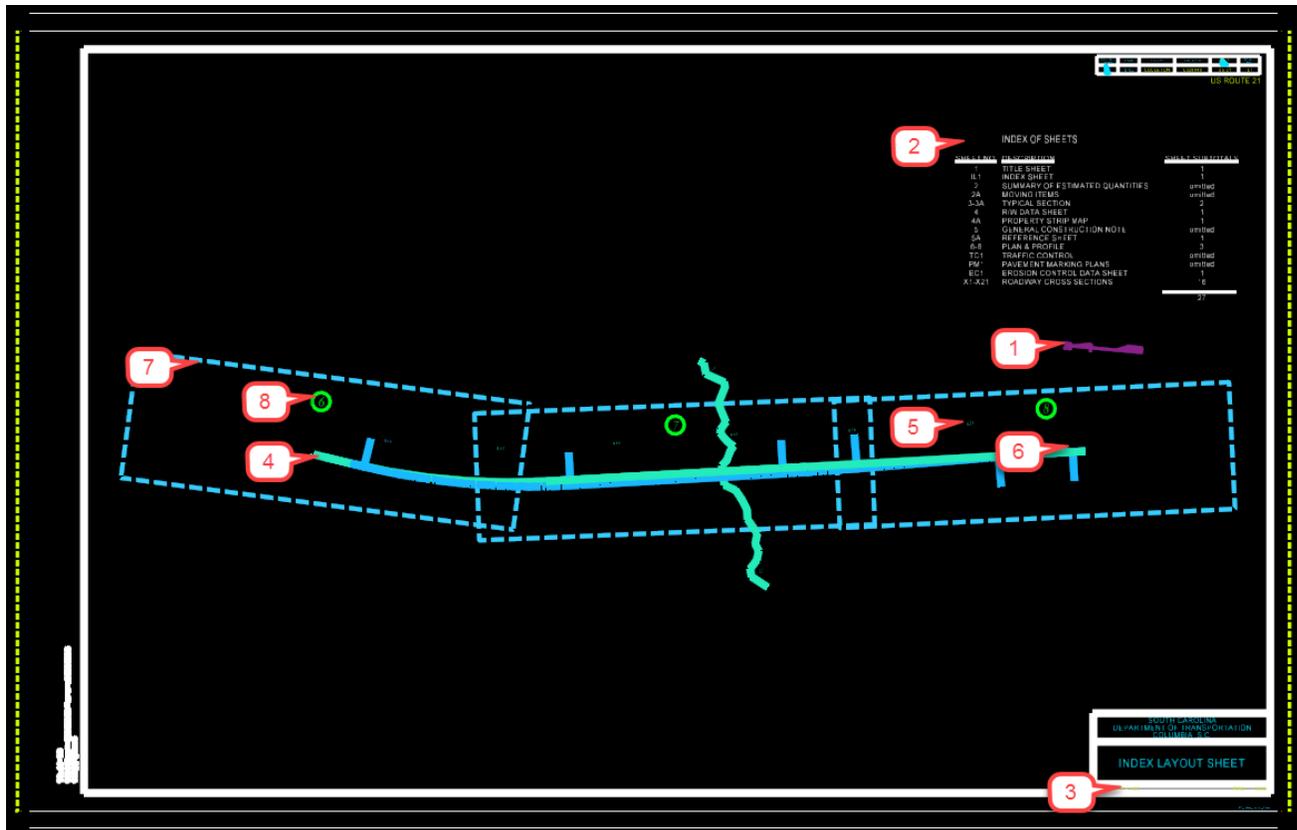
Move, rotate and clip the alignment where approximately 3 of the clipped border sheets fit on the one 01_Index_Layout_Sheet cell. Repeat attaching the *cogo.dgn for subsequent layout sheets as necessary to fit the entire length of the project onto sheets at 150:1 scale.

Turn on/off levels in the referenced *cogo.dgn to properly show the following items on the Index Layout sheets:

1. North Arrow in upper right corner
2. Index of Sheets in upper right corner

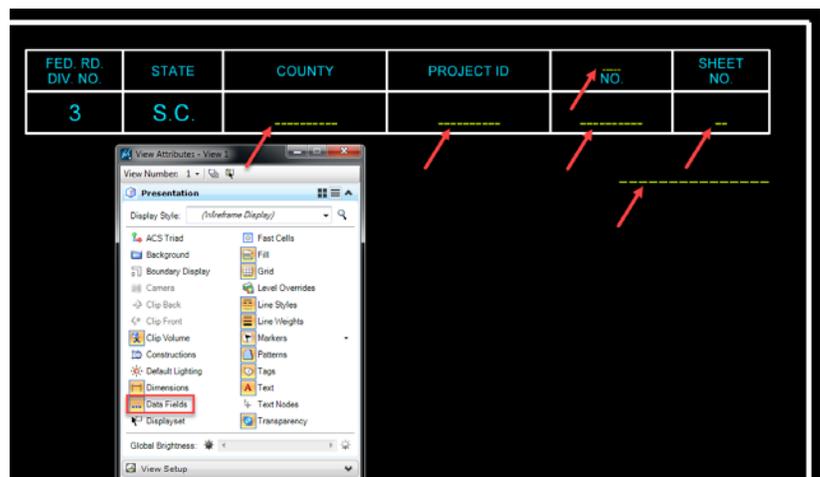
3. Scale in lower right corner
4. Existing and Proposed Alignments for both mainline and side roads including stationing
5. 500' Stationing
6. Road Names, Creeks and Outfall Ditches labeled
7. Border Sheet Outlines
8. Plan Sheet Numbers

Note: If the *.pp.dgn file was attached, you will need to manually draw the clipped border sheet shapes for the layout file.



Data Fields have been setup in the cell to ensure fonts choice, font sizes, levels, and justification are predefined for each Index Layout sheet.

To utilize, zoom into the upper right corner to complete the title block information. If you do not see the "Data Fields", select Settings > View Attributes and turn on "Data Fields".



If you are utilizing the reference border sheet, you will need to set the following attributes:

Level: RD_SHT_TX
 Weight: By Level (3)
 Font: Arial

- County, Project ID, Road No., Sheet No. use font size: 5 x Scale Multiple (5 x 3 for 150' scale = 15), Justification: Center Center
- Road/Route No. use font size: 3 x Scale Multiple, Center Center Justification
- Road Name use font size:: 8 x Scale Multiple, Right Top Justification

Press the “Edit Text” button to edit each of the data fields with the appropriate title block information.



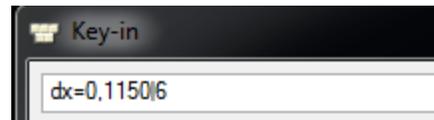
FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	COLLETON	0028448	US 21	IL1

US ROUTE 21

Repeat for additional sheets or pipe the title block information by selecting the text, selecting the copy command, then enter dx=0,x|y where x is the distance you want to move it and y is how many times to copy it.

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	COLLETON	0028448	US 21	IL1

US ROUTE 21



Enter the Scale and RPG/Initials in the lower right Sheet Block information. Repeat as necessary for additional sheets.

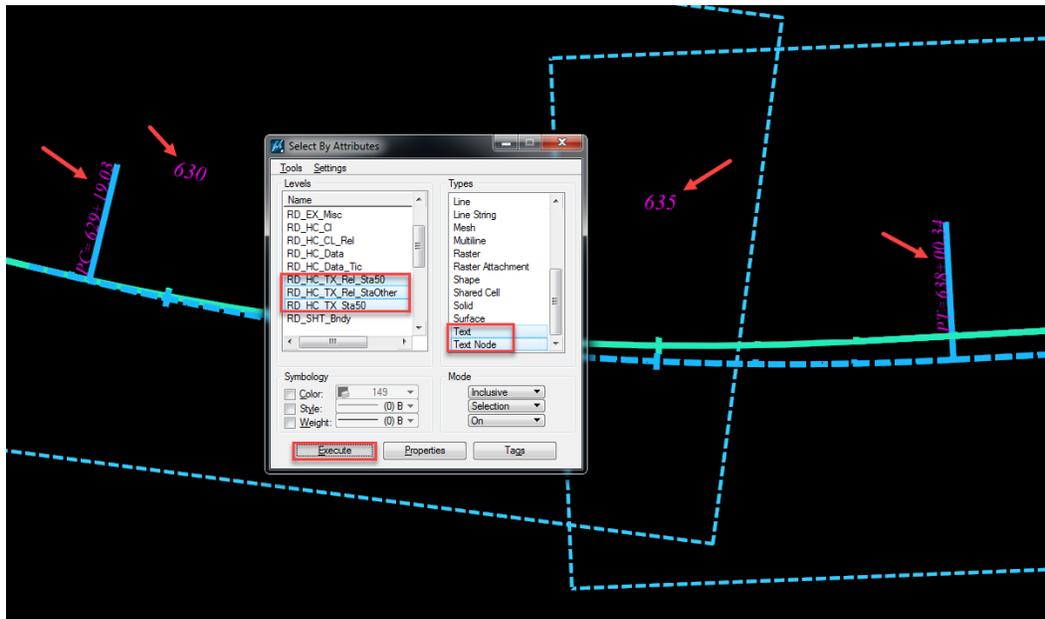
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION COLUMBIA, S.C.	
INDEX LAYOUT SHEET	
SCALE 1" = 150'	RPG 1 - SSS

To **scale the text** to a legible size when plotted, use the same multiple as used for the 01_Index_Layout_Sheet cell. In this example, you will need a minimum font size of 15. Larger fonts can be utilized to distinguish notes and labels.

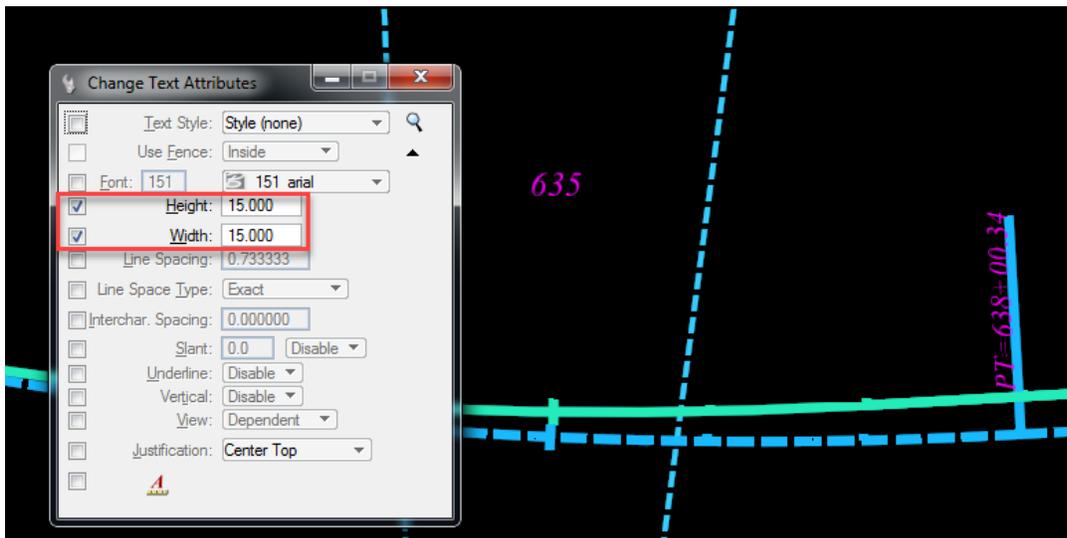
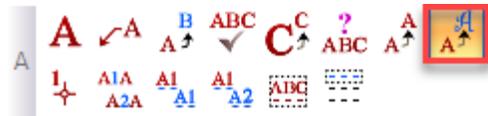
Text Height = 15 (normally sized 5 x 3 to scale)
 Text Width = 15 (normally sized 5 x 3 to scale)

Scale	Border Cell X & Y	Alignment Length	Minimum Font Size
50:1	1.00	1500 ft stationing	5
100:1	2.00	3000 ft stationing	10
150:1	3.00	4500 ft stationing	15
200:1	4.00	6000 ft stationing	20
400:1	8.00	12000 ft stationing	40

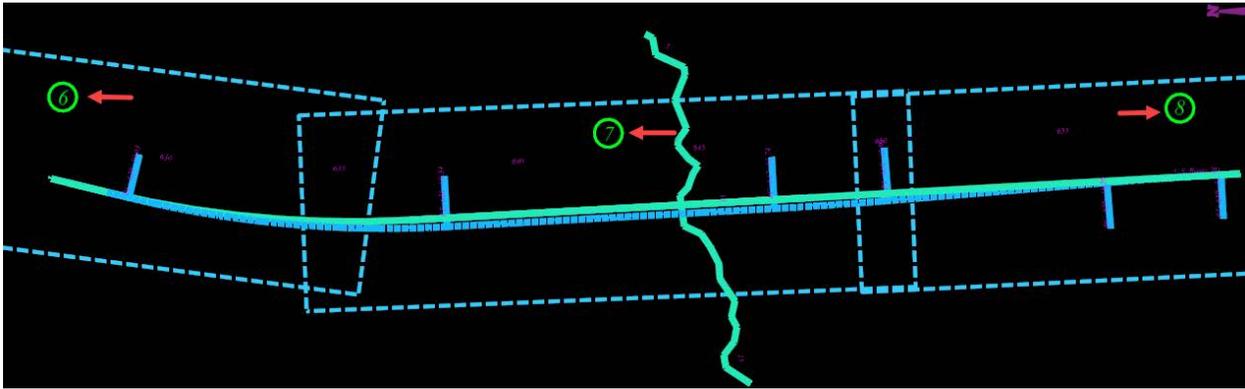
Use the Edit > Select By Attributes tool to select text on each of the levels.



Select the **Change Text Attributes** tool and check on Height and Width. Enter the Font Size and data click to accept the changes to the fonts. Realign and shift text as necessary to “clean up” and make the plan sheet as legible as possible. Repeat these steps for the other text levels and font sizes.



Label each clipped border sheet with the appropriate plan sheet number.



Select **File > Save Settings** to ensure all of the levels which are turned on/off are properly saved to the view for plotting.



RESERVED



RESERVED



RESERVED



RESERVED

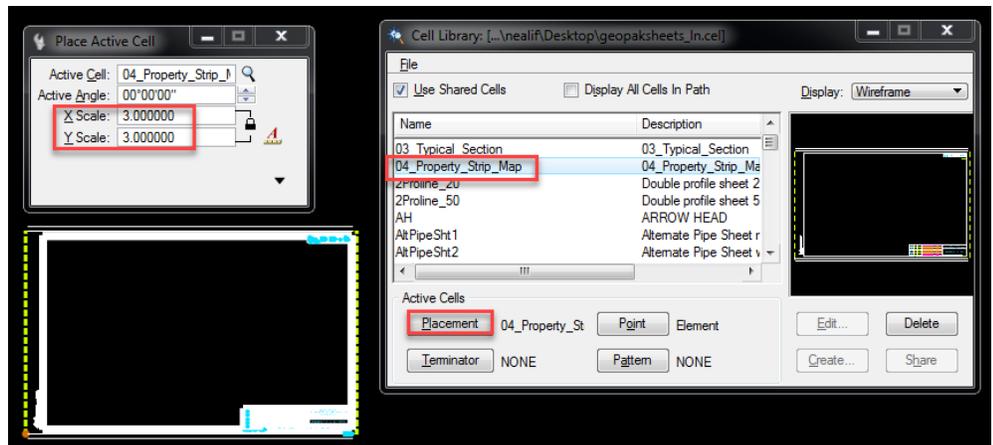
Property Strip Map/Property Closure Sheets

Create a new design file using the ***pc.dgn** naming convention. Determine the scale for the Property Strip Map sheets by length of alignment to depict and also the corridor width for the properties.

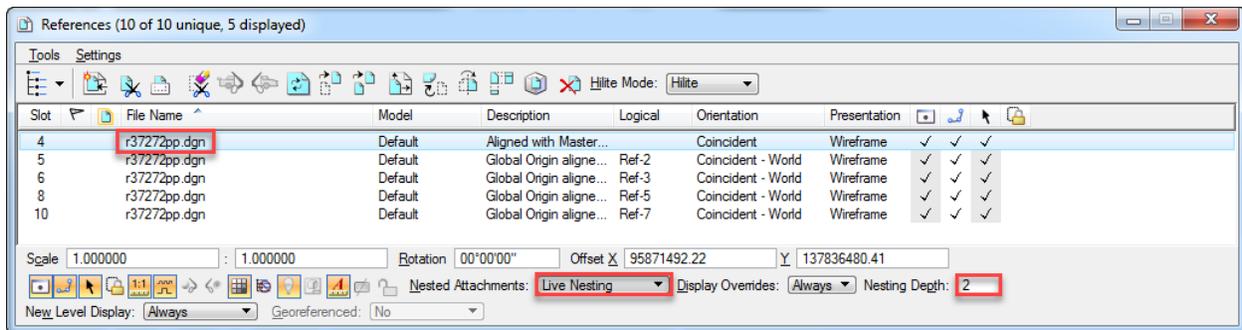
Scale	Border Cell X & Y	Alignment Length	Minimum Font Size
50:1	1.00	1500 ft stationing	5
100:1	2.00	3000 ft stationing	10
150:1	3.00	4500 ft stationing	15
200:1	4.00	6000 ft stationing	20
400:1	8.00	12000 ft stationing	40

A 150:1 will fit approximately 4500 lf of the alignment. The following example will demonstrate a 150:1 Property Strip Map Sheet.

Open the geopaksheets_in.cel cell library and select the 04_Property_Strip_Map cell. Adjust the cell scale to 3.00 for both the height and width (3 x 50 = 150). Place the cell additional times for the number of plan sheets you are including in the layout.

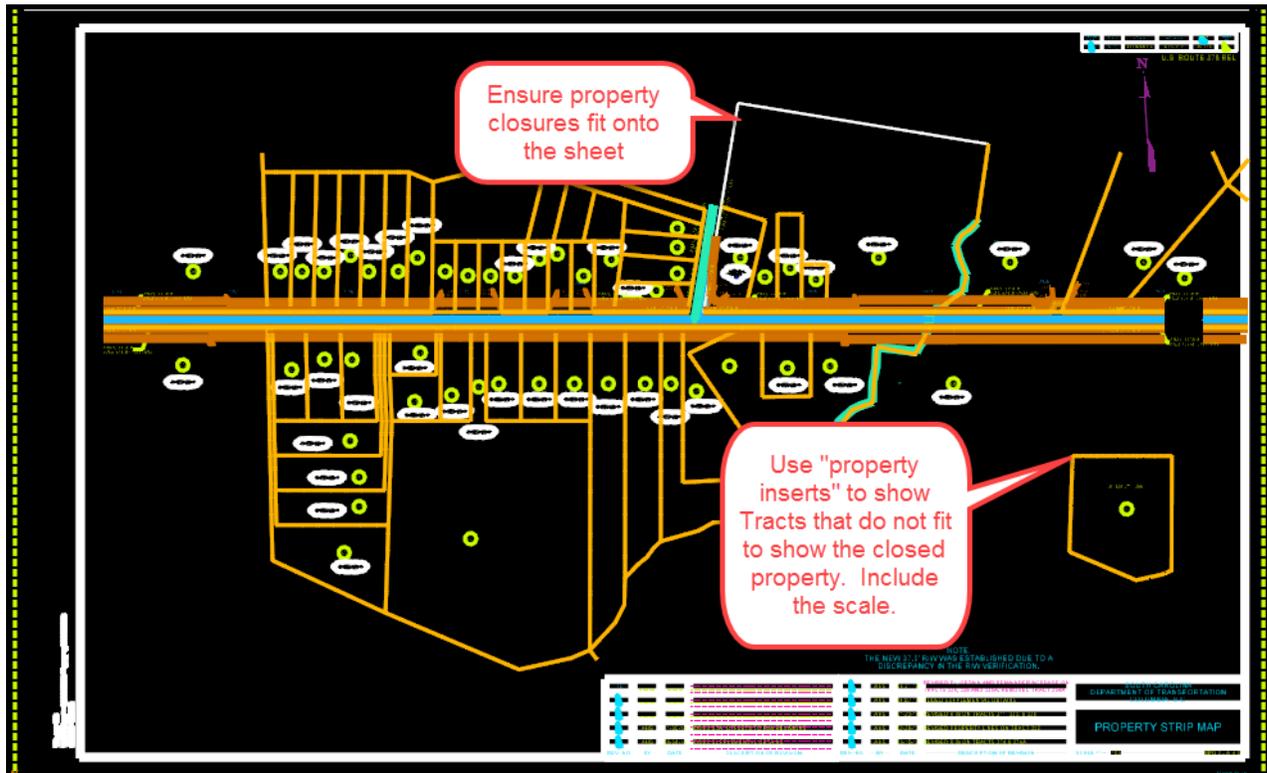


Attach the ***pp.dgn** design file as a reference. Ensure Live Nesting is turned on and set to a depth of 2 to include the ***prop.dgn** file attached.



Move, rotate and clip the reference file to fit as much of the alignment as possible onto the border sheet. Ensure that the **“closed” shapes** of the property are included. Any properties that are **“cut off”** and do not fit may require the sheet to be created at a different scale, example 400:1. The use of **“property inserts”**, with included scale, is also recommended to accomplish showing all of the property closures.

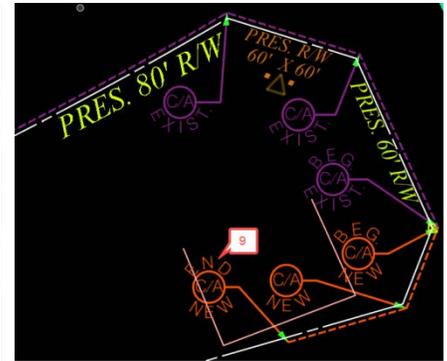
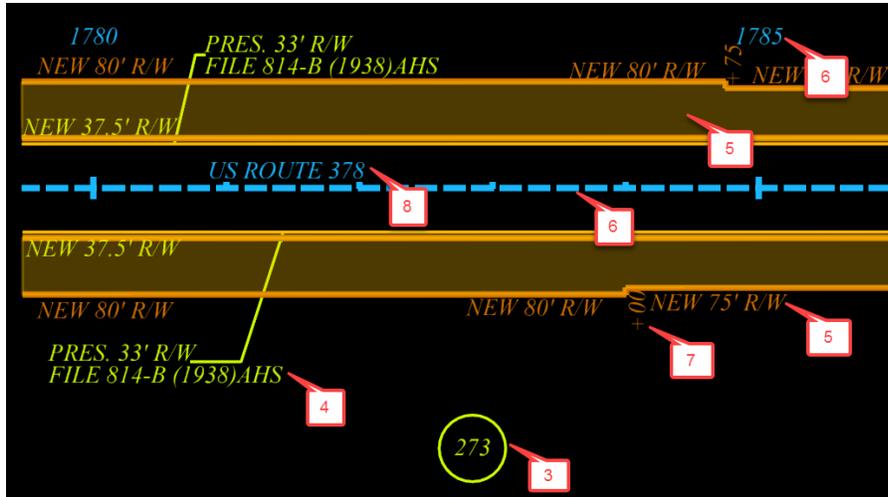
Repeat attaching the *.pp.dgn for subsequent layout sheets as necessary to fit the entire length of the project onto sheets at 150:1 scale.



Turn on/off levels in the referenced *.pp file to properly show the following items on the Property Strip Map sheets:

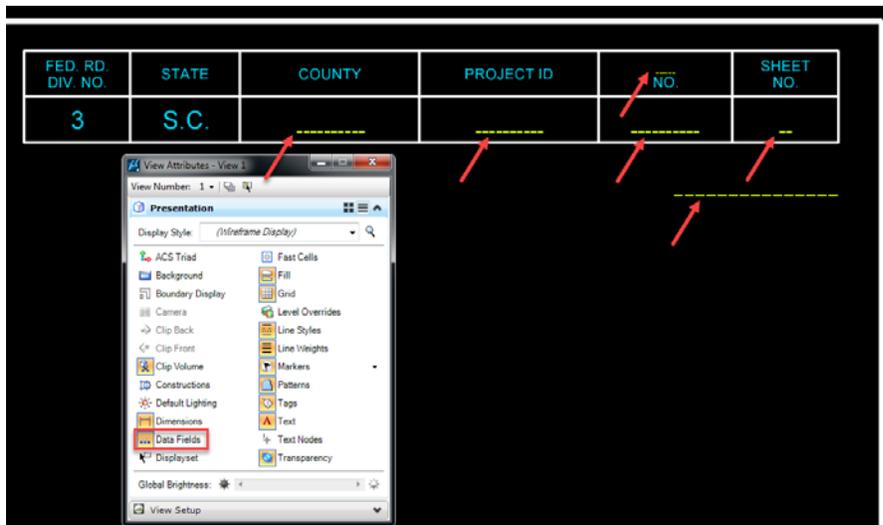
1. North Arrow in upper right corner
2. Scale in lower right corner
3. Tract Numbers
4. All Present Right of Way information and lines labeled
5. All New Right of Way information and lines labeled (including shading of areas)
6. Existing and proposed horizontal alignments for mainline and side roads including stationing
7. Stations and offsets where the Right of Way breaks
8. Road Names, Creeks and Outfall Ditches labeled
9. Any breaks in the Control Access or Limited Access Line





Data Fields have been setup in the cell to ensure fonts choice, font sizes, levels, and justification are pre-defined for each Property Strip Map sheet.

To utilize, zoom into the upper right corner to complete the title block information. If you do not see the “Data Fields”, select Settings > View Attributes and turn on “Data Fields”.



If you are utilizing the reference border sheet, you will need to set the following attributes:

Level: RD_SHT_TX
 Weight: By Level (3)
 Font: Arial

- County, Project ID, Road No., Sheet No. use font size: 5 x Scale Multiple (5 x 3 for 150' scale = 15), Justification: Center Center
- Road/Route No. use font size: 3 x Scale Multiple, Center Center Justification
- Road Name use font size:: 8 x Scale Multiple, Right Top Justification

Press the “Edit Text” button to edit each of the data fields with the appropriate title block information.



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	FLORENCE	P037272	US 378	4D

U.S. ROUTE 378 REL

Repeat for additional sheets or pipe the title block information by selecting the text, selecting the copy command, then enter dx=0,x|y where x is the distance you want to move it and y is how many times to copy it.

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	FLORENCE	P037272	US 378	4D

U.S. ROUTE 378 REL

Key-in

dx=0,1150|6

Enter the Scale and RPG/Initials in the lower right Sheet Block information. Repeat as necessary for additional sheets.

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION COLUMBIA, S.C.
PROPERTY STRIP MAP
SCALE 1" = 150' RPG 2 - A.H.S

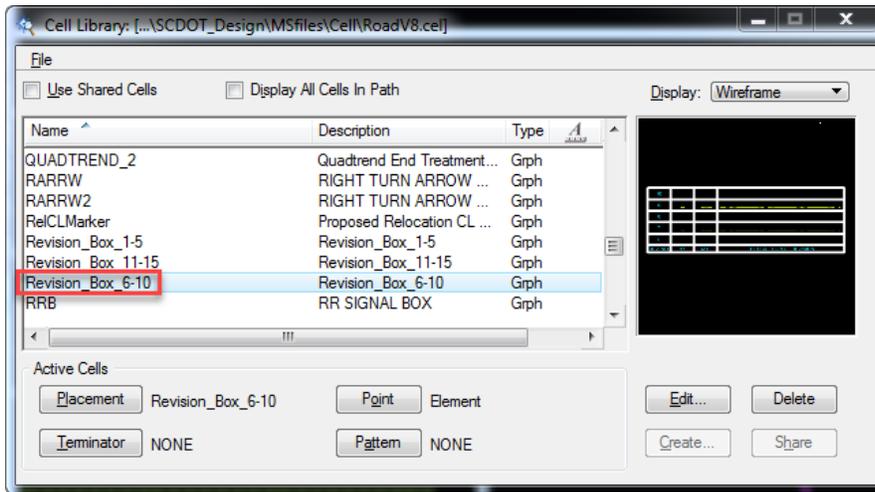
For revisions, utilize the data fields to input the Designer’s initials, date of revision, and a brief description of the revision. Press Enter to wrap the text for two lines of revision notes.

5	AHS	08-21-14	REVISED PL, OBTAIN AND REMAINDER ACREAGE ON TRACTS 334, 336 AND 336A. REMOVED TRACT 334A.
4	AHS	04-07-14	ADDED SUPPLEMENTAL OBTAINS
3	AHS	01-23-14	REVISED R/W ON TRACTS 311, 333, & 336
2	AHS	02-28-13	REVISED PROPERTY LINES ON TRACT 352
1	AHS	03-15-12	REVISED R/W ON TRACTS 374 & 374A
REV. NO.	BY	DATE	DESCRIPTION OF REVISION

If you are utilizing the reference border sheet, you will need to set the following attributes:

- Level: RD_SHT_TX
- Weight: By Level (3)
- Font: Arial
- Font size: 9 x Scale Multiple (9 x 3 for 150' scale = 18)

For additional revision blocks, utilize the “Revision_Box_6-10 or 11-15” cells from the RoadV8.cel library. Snap in the lower right corner to align with the current revision block. Continue along the bottom of the Property Strip Map Sheet as necessary.



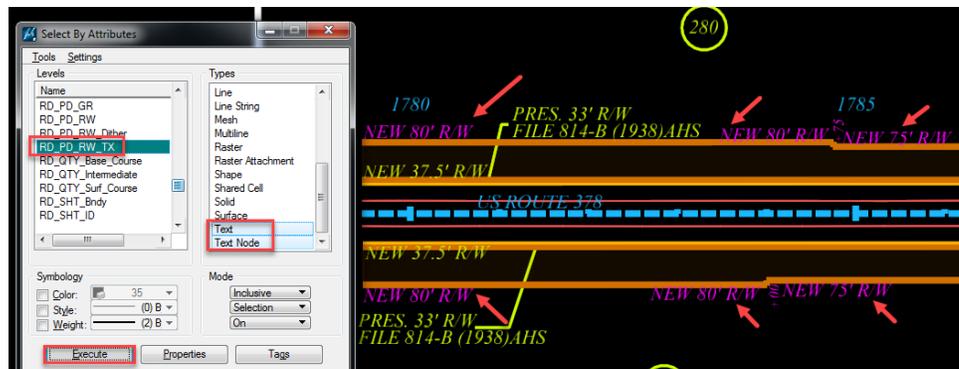
REV. NO	BY	DATE	DESCRIPTION OF REVISION	REV. NO	BY	DATE	DESCRIPTION OF REVISION
10				5	AHS	08-21-14	REVISED PL. OBTAIN AND REMAINDER ACREAGE ON TRACTS 334, 336 AND 336A. REMOVED TRACT 334A
9				4	AHS	04-07-14	ADDED SUPPLEMENTAL OBTAINS
8				3	AHS	01-23-14	REVISED R/W ON TRACTS 311, 333, & 336
7	AHS	11-20-14	REVISED R/W LABELS ON TRACT 311	2	AHS	02-28-13	REVISED PROPERTY LINES ON TRACT 352
6	AHS	09-24-14	ADDED STA. OFFSETS TO R/W REVISIONS	1	AHS	03-15-12	REVISED R/W ON TRACTS 374 & 374A

To scale the text to a legible size when plotted, use the same multiple as used for the Property_Strip_Map cell. In this example, you will need a minimum font size of 15. Larger fonts can be utilized to distinguish notes and labels.

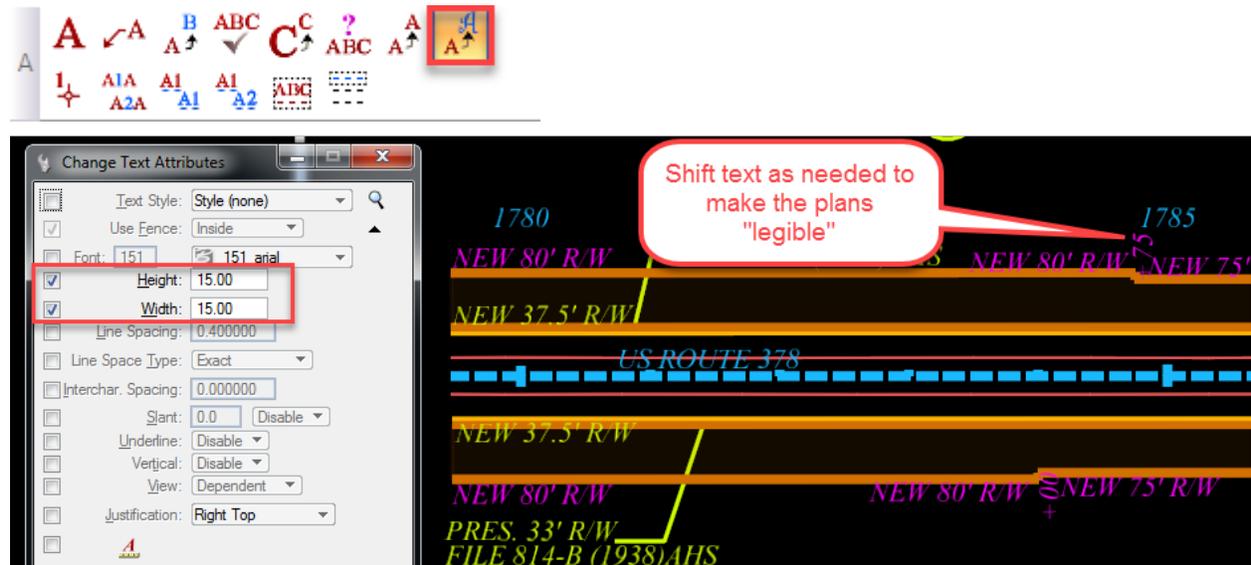
Text Height = 15 (normally sized 5 x 3 to scale)
 Text Width = 15 (normally sized 5 x 3 to scale)

Scale	Border Cell X & Y	Alignment Length	Minimum Font Size
50:1	1.00	1500 ft stationing	5
100:1	2.00	3000 ft stationing	10
150:1	3.00	4500 ft stationing	15
200:1	4.00	6000 ft stationing	20
400:1	8.00	12000 ft stationing	40

Use the Edit > Select By Attributes tool to select text on each of the levels.



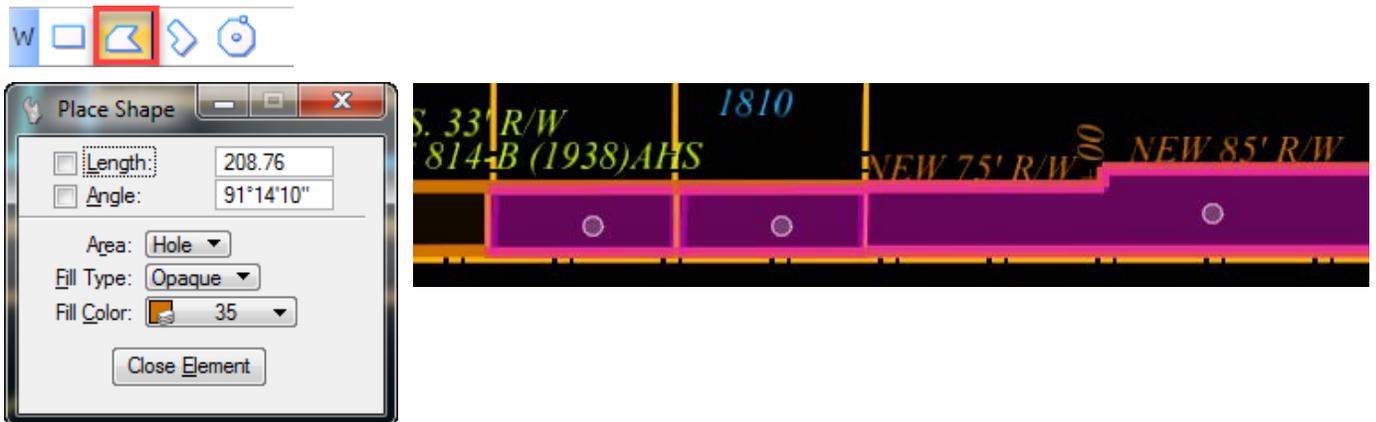
Select the **Change Text Attributes** tool and check on Height and Width. Enter the Font Size and data click to accept the changes to the fonts. Realign and shift text as necessary to “clean up” and make the plan sheet as legible as possible. Repeat these steps for the other text levels and font sizes.



Set the Symbology at the top of MicroStation to the following level “RD_PD_RW_Dither”.



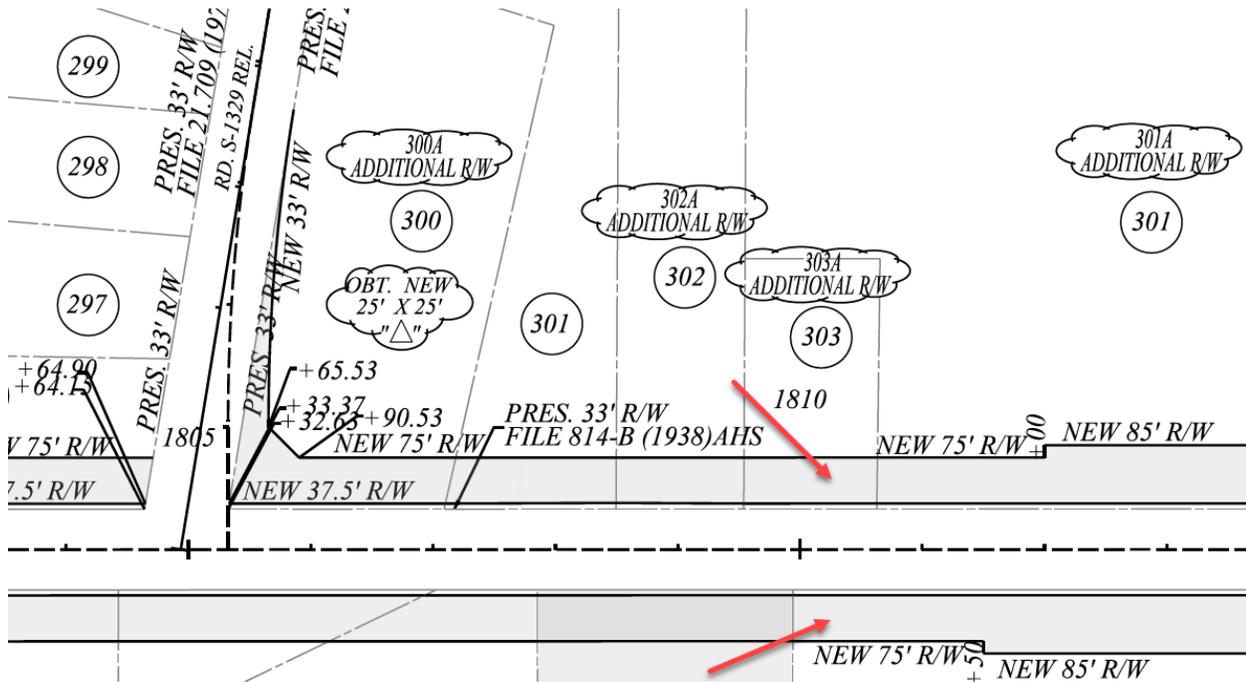
Select the Place Shape tool and trace the New R/W areas to be shaded on the Property Strip Maps. Repeat for each New R/W area.



In Iplot, attach the “Property_Strip_Map.pen” pen table to dither the areas drawn in the above image.

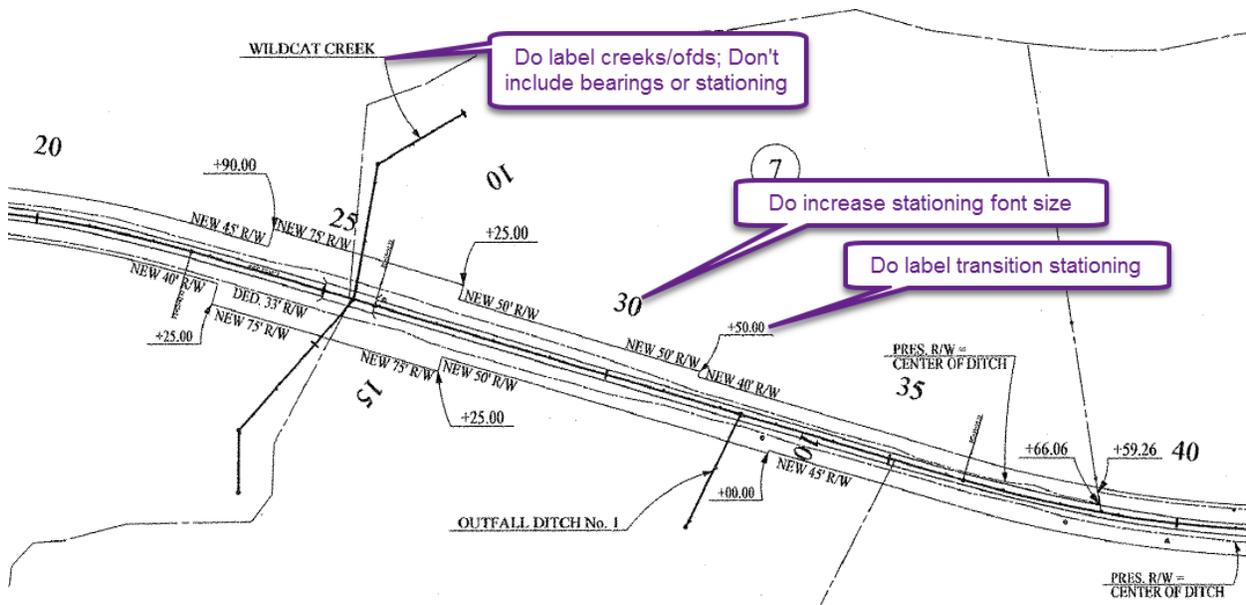


The New R/W Areas will be “dithered” or transparent as shown below in the pdf or plotted plan sheet.

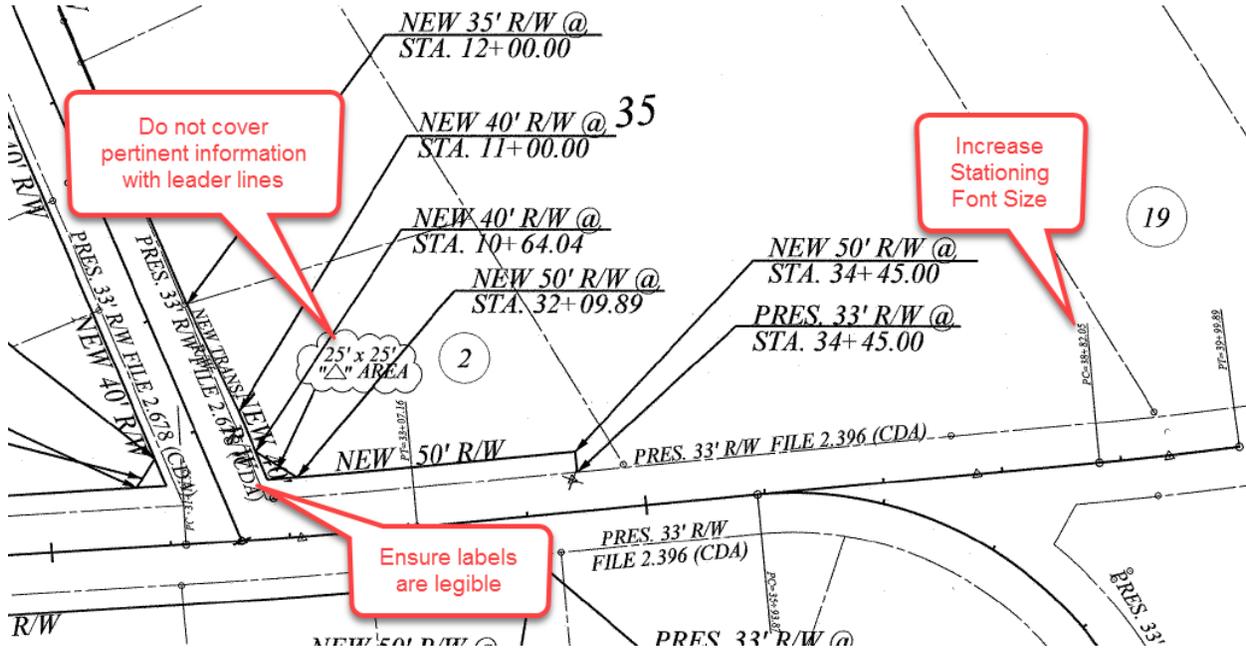


Do’s and Don’ts for Property Strip Maps

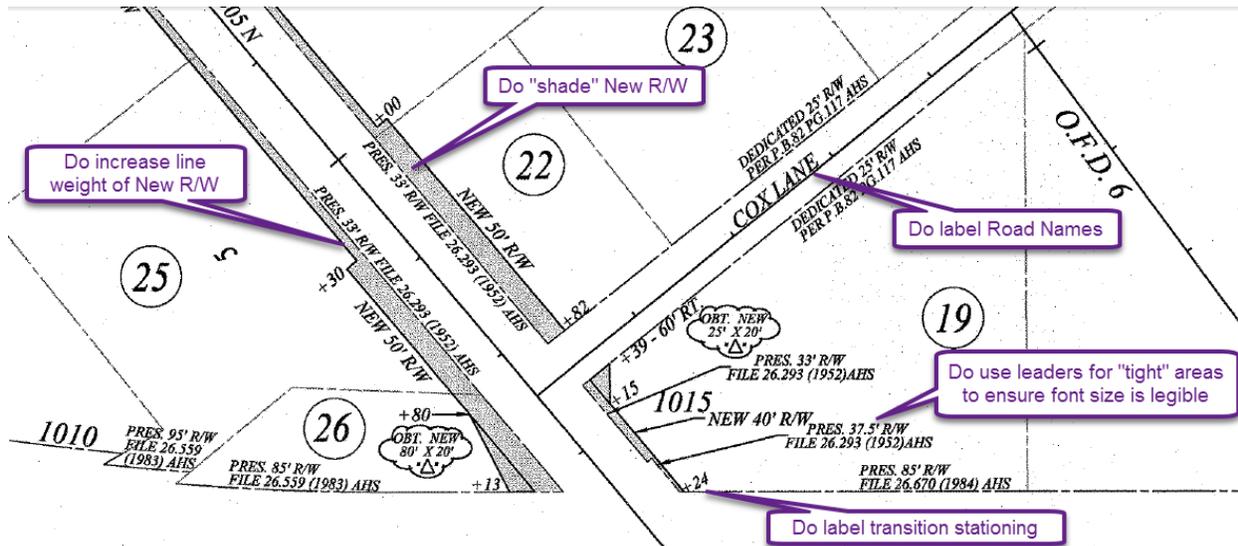
Example 1: Do label creeks and outfall ditches with the proper names. Do not include bearings or stationing on creeks or outfall ditches. Do increase stationing font size and do label transition stationing.



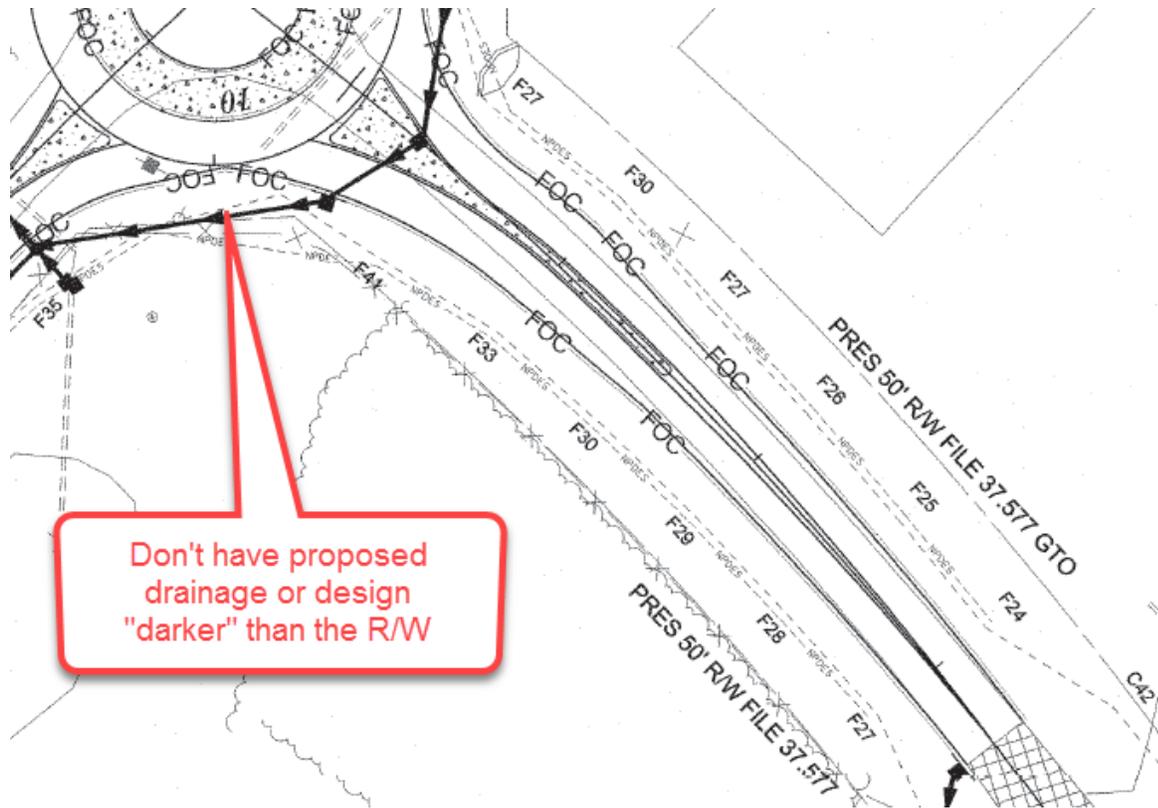
Example 2: Do not cover pertinent information with leader lines. Ensure all present and new right of way levels are legible. Do increase stationing font text size.



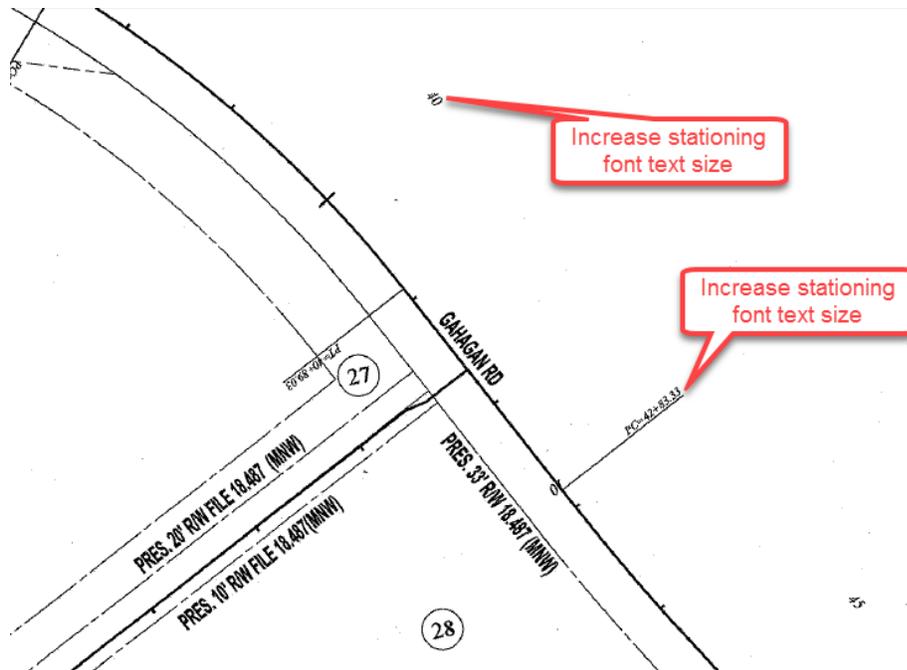
Example 3: Do increase the line weight of the New R/W. Do "shade" the New R/W areas. Do label Road Names. Do use leaders for "tight" areas to ensure font size is legible. Do label transition stationing.



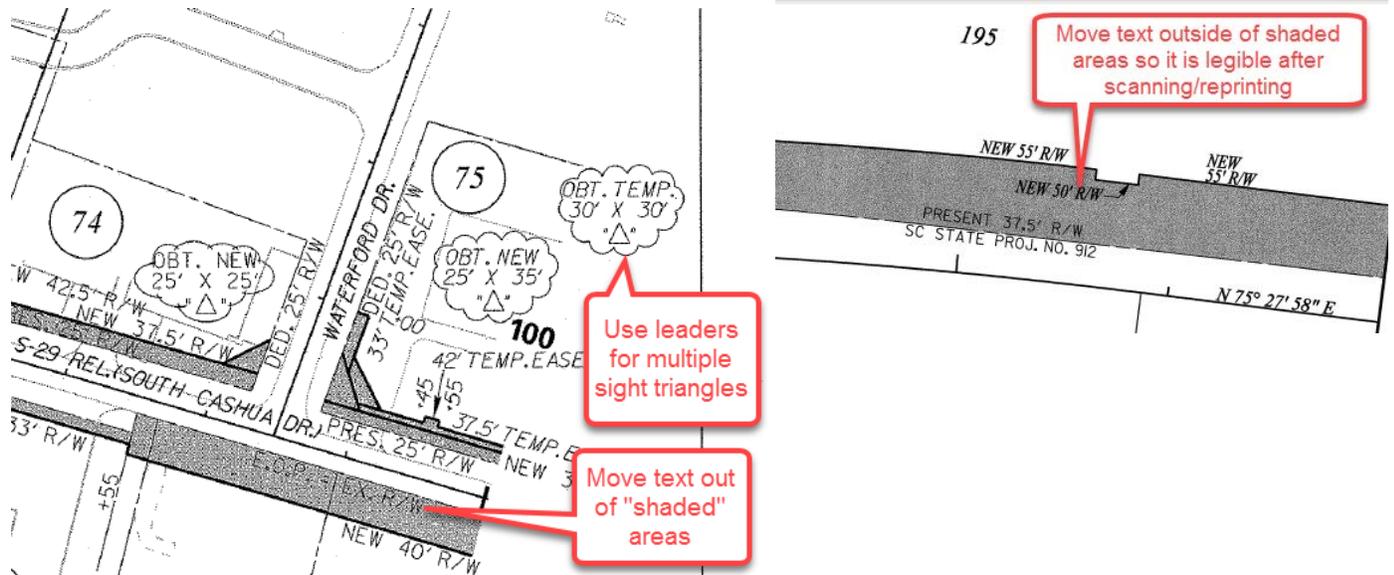
Example 4: Contrary to what the HDM specifies, most groups do not to include existing or proposed design or drainage on Property Strip Map sheets. If it is requested to be shown, do not have proposed or design information “darker” than the R/W information, use pen tables to ensure it is “dithered” to a weight of 1 and light grey in color.



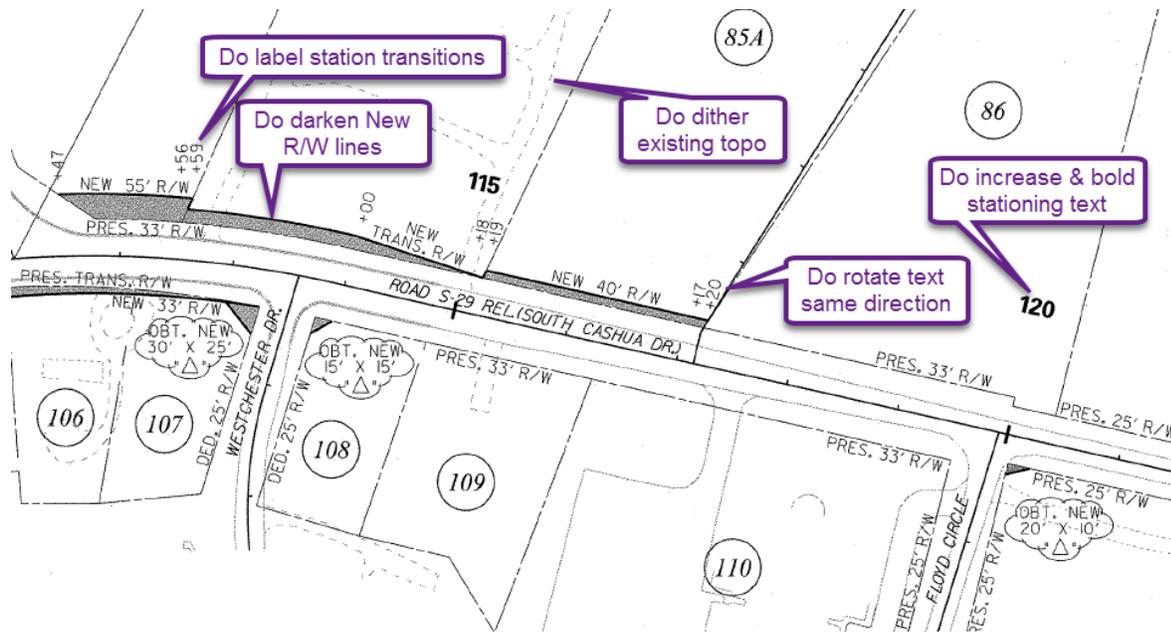
Example 5: Do increase stationing font text size for both the 500' stationing and alignment.



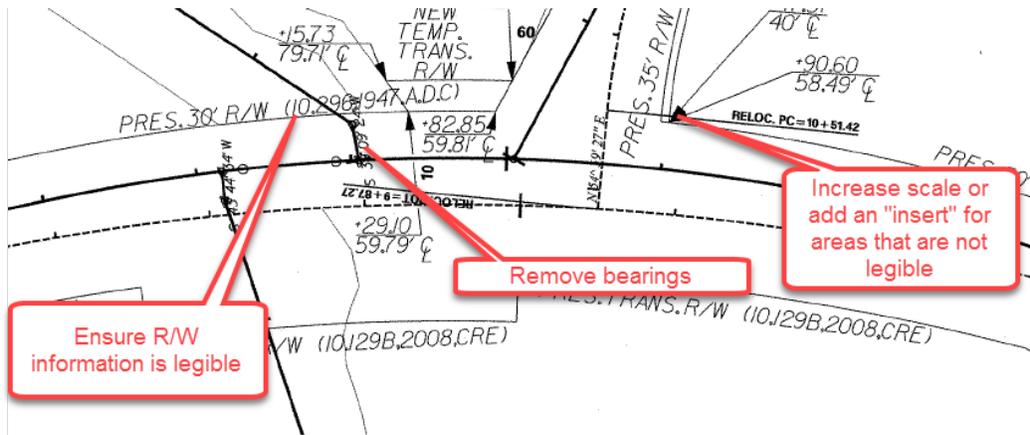
Example 6: Do use leaders for multiple sight triangles notes or to provide clarity for what the note is for. Do use True Type fonts or move text out of shaded areas for increased legibility.



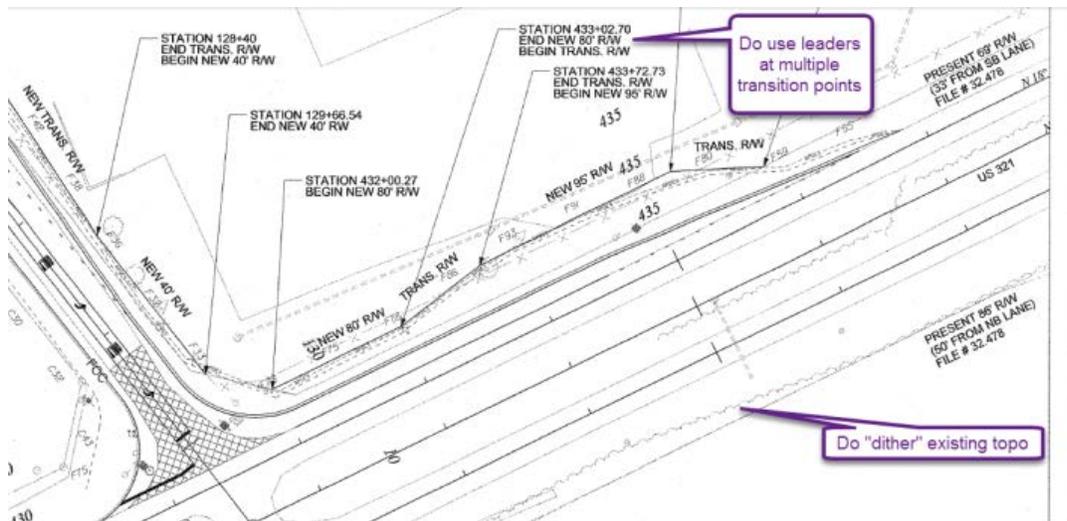
Example 7: Do label station transitions. Do darken New R/W lines. Do rotate text the same direction and do increase and bold stationing text. If required (see previous example), do dither the existing topo.



Example 8: Do relocate right of way text to split text with lines thru in the spaces. Do not show bearings on creeks or outfall ditches. Do increase the scale or add an insert for areas that are not legible.



Example 9: Do use leaders at multiple transition points. Do “dither” existing topo if required to include on Property Strip Map sheets by your supervisor.



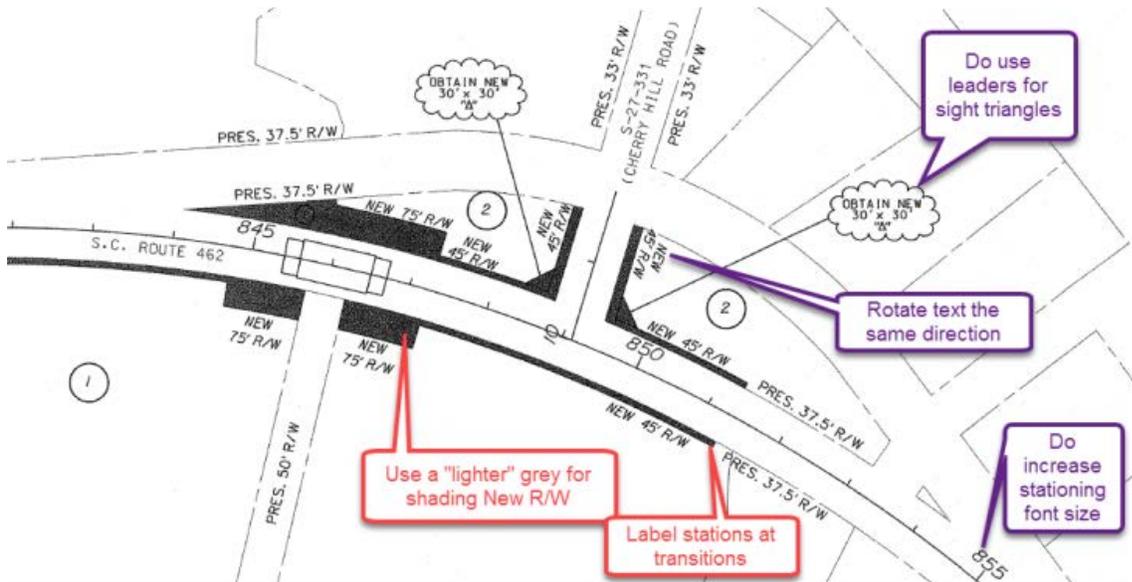
Example 10: Do add revision blocks to the left. (Use the new cells in the RoadV8.cel library). Do remember to renumber the additional revisions where needed.

REV. NO.	BY	DATE	DESCRIPTION OF REVISION	REV. NO.	BY	DATE	DESCRIPTION OF REVISION
4	BDH	9/4/15	Revised OFD R/W Tract 74 Left Sta. 373+75	4			
3	BDH	9/4/15	Revised R/W Labels Deanna & Jessen Lns. Right Sta. 352+66 & Sta. 355+77	3			
2			Revised New R/W Tract 76	2	MFS	2/9/16	Converted New R/W to Perms. Tract 80 Added R/W left Sta. 378+50
1			Removed New R/W Tract 67	1	BDH	1/11/16	Revised New R/W - Tracts 80 & 83
4	BDH	4/3/15	Revised Tract 54 Boundary Removed Tract 58	4	BDH	1/19/15	Added SCE&G Easement on left
3	BDH	4/3/15	Revised Tract 56 Revised Tracts 55 & 57 Boundary	3	BDH		
2	BDH	4/3/15	Revised New 55.5' R/W Tract 68	2	BDH		
1	BDH	4/3/15	Removed New 55.5' R/W Tract 59 Revised Triangle Area Tract 59	1	BDH	11/19/14	Revised New R/W Tract 74 Left Sta. 374+00
REV. NO.	BY	DATE	DESCRIPTION OF REVISION	REV. NO.	BY	DATE	DESCRIPTION OF REVISION

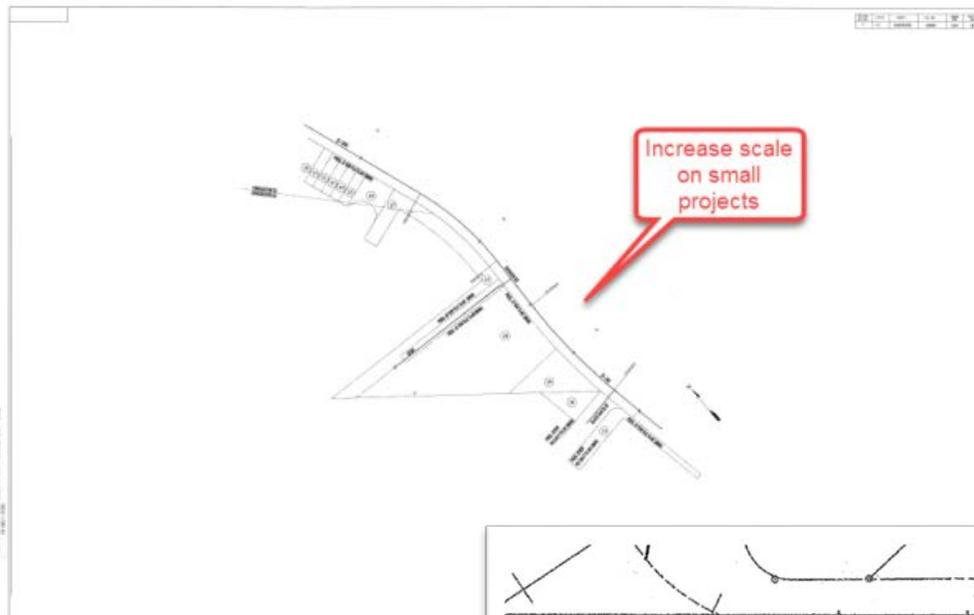
Callouts in the table:

- Do Renumber Revision No.:** Points to revision number 3.
- Do add revision blocks to the left:** Points to the right side of the table.

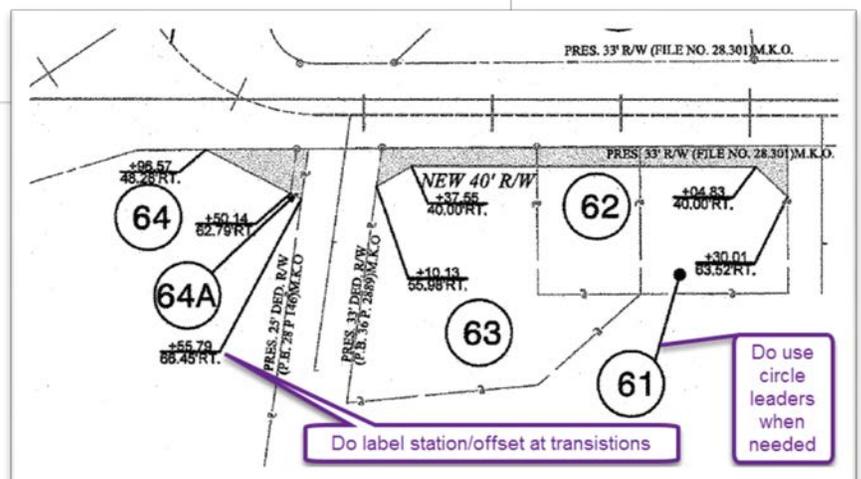
Example 11: Do user leaders for sight triangles. Do rotate text the same direction. Do increase stationing font size. Do label stations at transitions. Do use a "lighter" grey for shading New R/W areas.



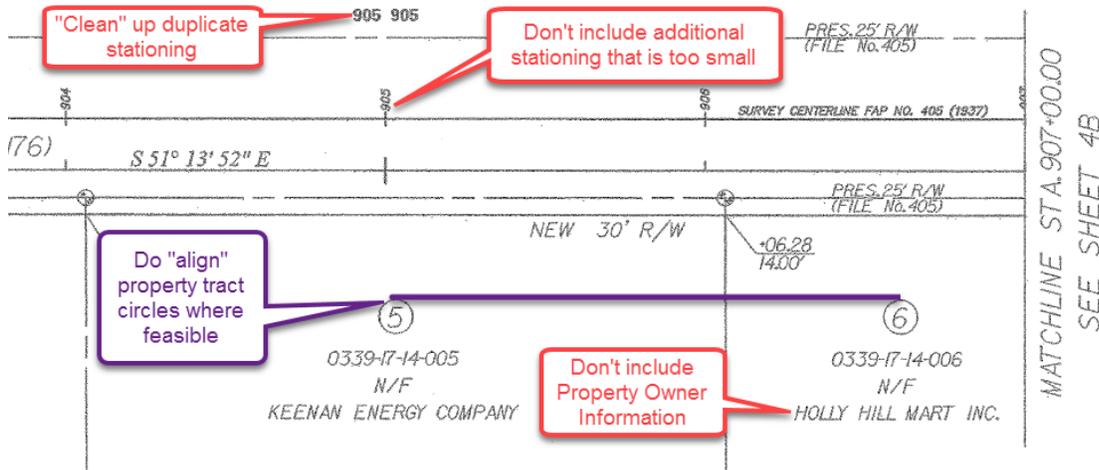
Example 12: Do increase the scale on small projects so the property strip map is legible.



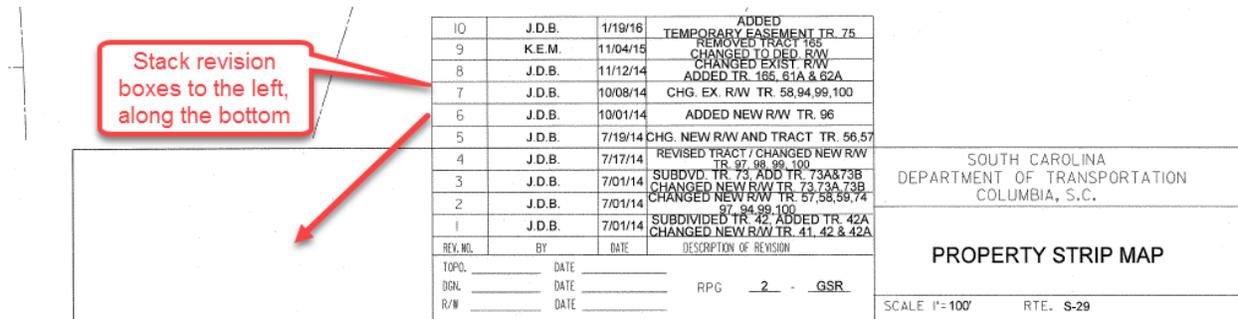
Example 13: Do use leaders when necessary for smaller tracts. Do label station/offset at transitions.



Example 17: Do clean up duplicate stationing. Do not include additional stationing that is too small. Do align property tract circles where feasible. Do not include the property owner information.



Example 18: Do not stack revision boxes, but run them along the bottom of the sheet. This will keep the boxes from conflicting with the strip map details.



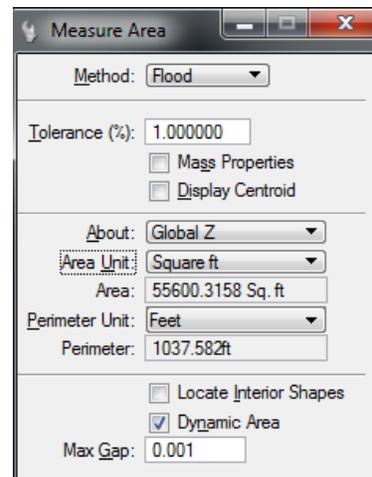
Right of Way Obtains

Open the *.pp.dgn file and turn off all levels but the following:

- RD_EX_DV_Prop
- RD_EX_RW
- RD_PD_RW

Select the **Measure Area** tool and set the following options:

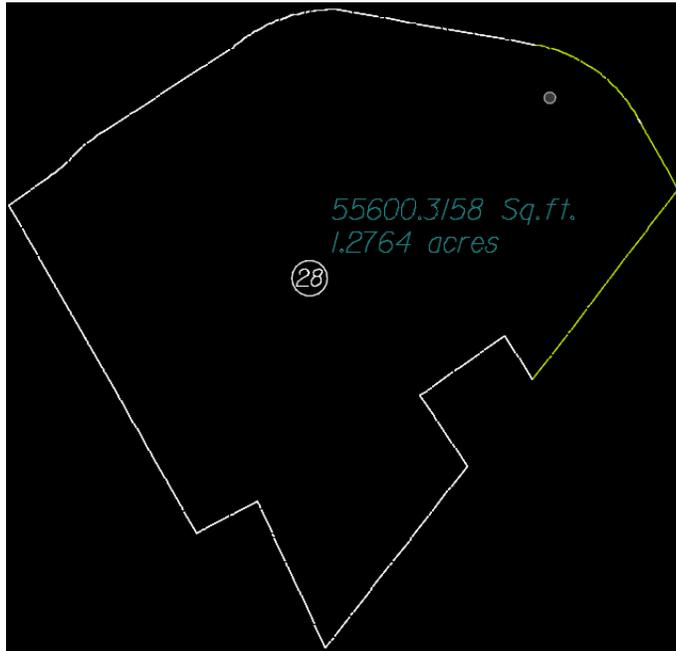
- Method – Flood
- About – Global Z
- Area Unit – Square ft
- Perimeter Unit (Feet)
- Dynamic Area – check on
- Max Gap – 0.001



For each tract, **data point to flood** the closed shape of the tract.

Make a note of the areas in both Square Feet and Acres. You can place text in the design file for future reference.

For obtain and remainder calculations, **ensure that the polygons are closed shapes** by checking every connection point. The slightest gap can cause differences in the calculations. A misrepresented value on a Right of Way obtain may cause several unintended consequences downstream. Please be very **conscientious** to your calculations and have a second person check these numbers behind you.



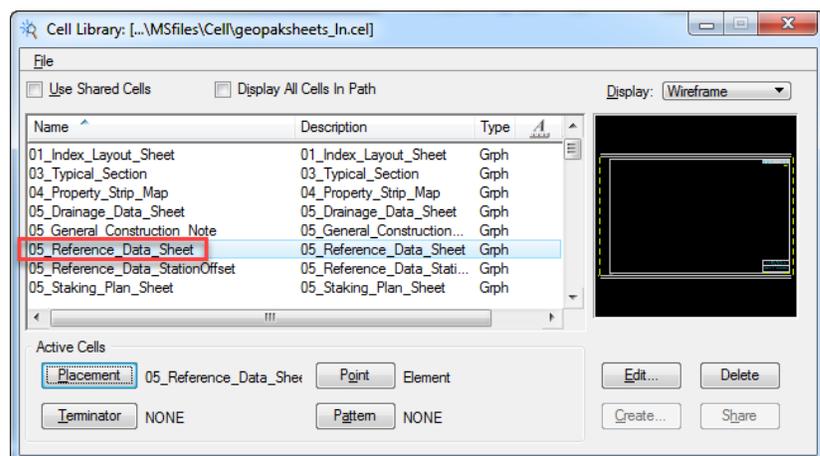
These numbers will be entered into the RWDS.xlsx Excel file to create the Right of Way Data Sheet.

Reference Data Sheet

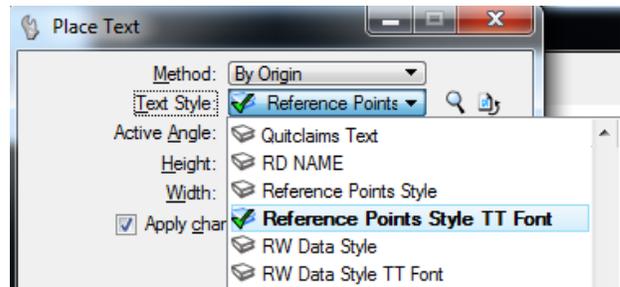
The Reference Data Sheet is a blank border sheet that allows the designer to paste the existing and relocated alignment information from Coordinate Geometry (COGO) and the curve data.

On older projects that have not received the new “Survey Control Data Sheet – 5A” in accordance with PCDM-08, the designer will also need to include this information in the reference data sheets. This would include the control points, bench marks, survey datum, combined scale factor, and property monuments (IP, PLC, RWM, etc.).

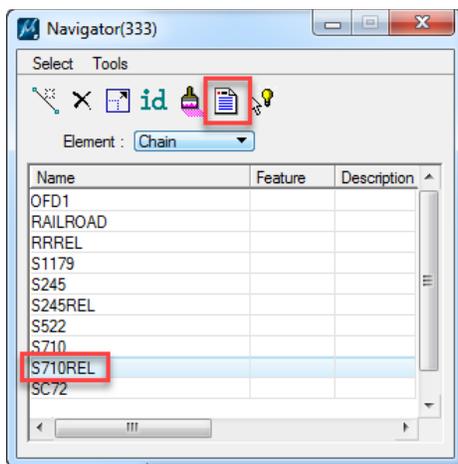
Place the 05_Reference_Data_Sheet cell into the *ref.dgn (Reference Data Sheet series).



Set the Level to “RD_SHT_TX” with a weight of 3. Select the “Place Text” and select the “Reference Points Style TT Font” Text Style.

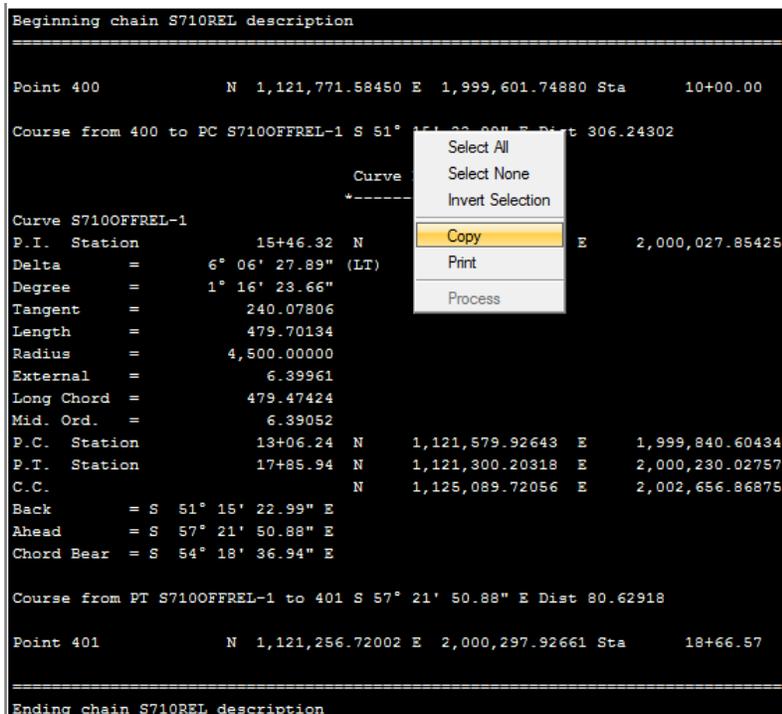


Open COGO and select Tools > Navigator. Highlight the **mainline** chain and press the “Print/Describe” icon to describe the alignment information into the COGO Window. If possible, go in order of the most important route/road (mainline) and then from left to right with the side roads.

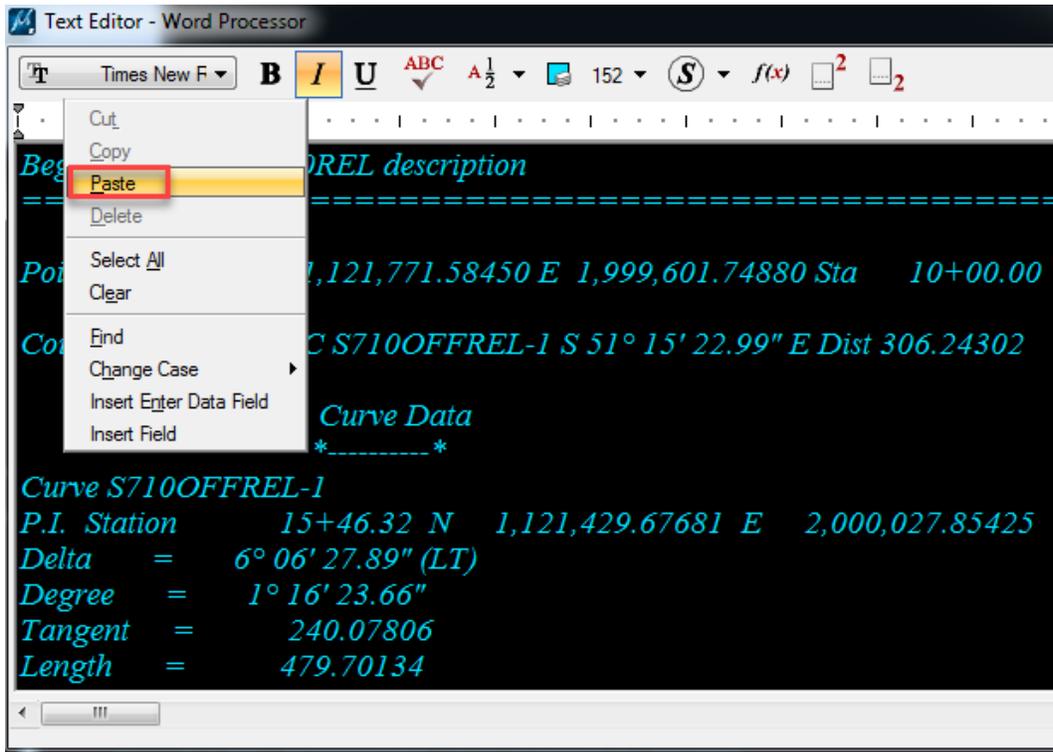


(Note: Both the existing and relocated alignments should be included in their entirety for the surveyors benefit during the project and years down the road when re-establishing right of way.)

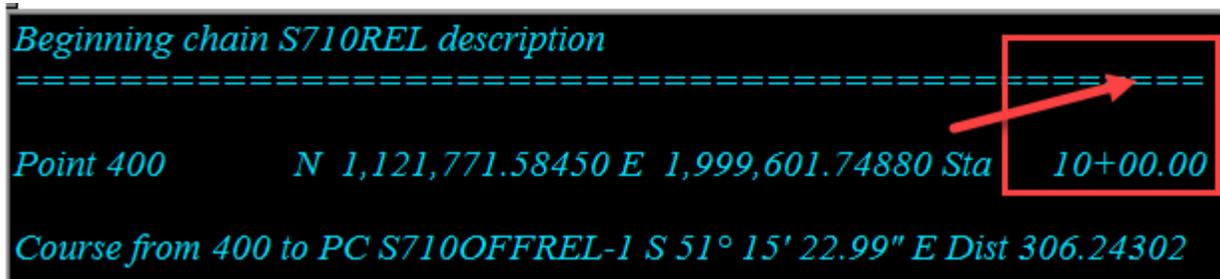
Highlight the text in the COGO Window starting with the “Beginning chain **** description” and ending with the “Ending chain **** description”. Right click to select **Copy**.



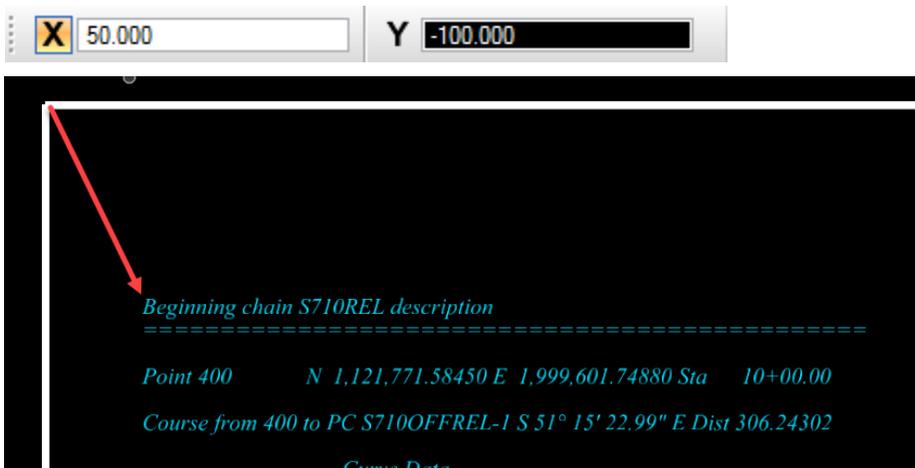
Paste this information into the “Place Text” command.



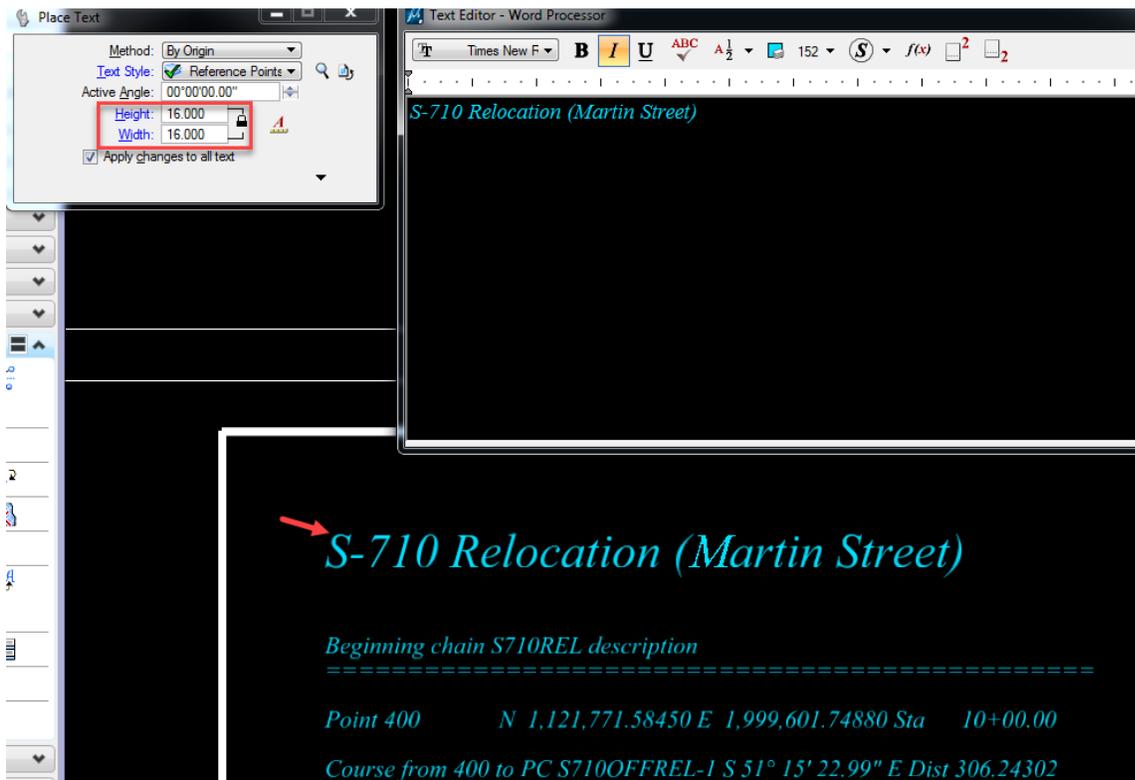
Delete a few of the “=” marks until it aligns with the edges of the alignment text to clean up the text.



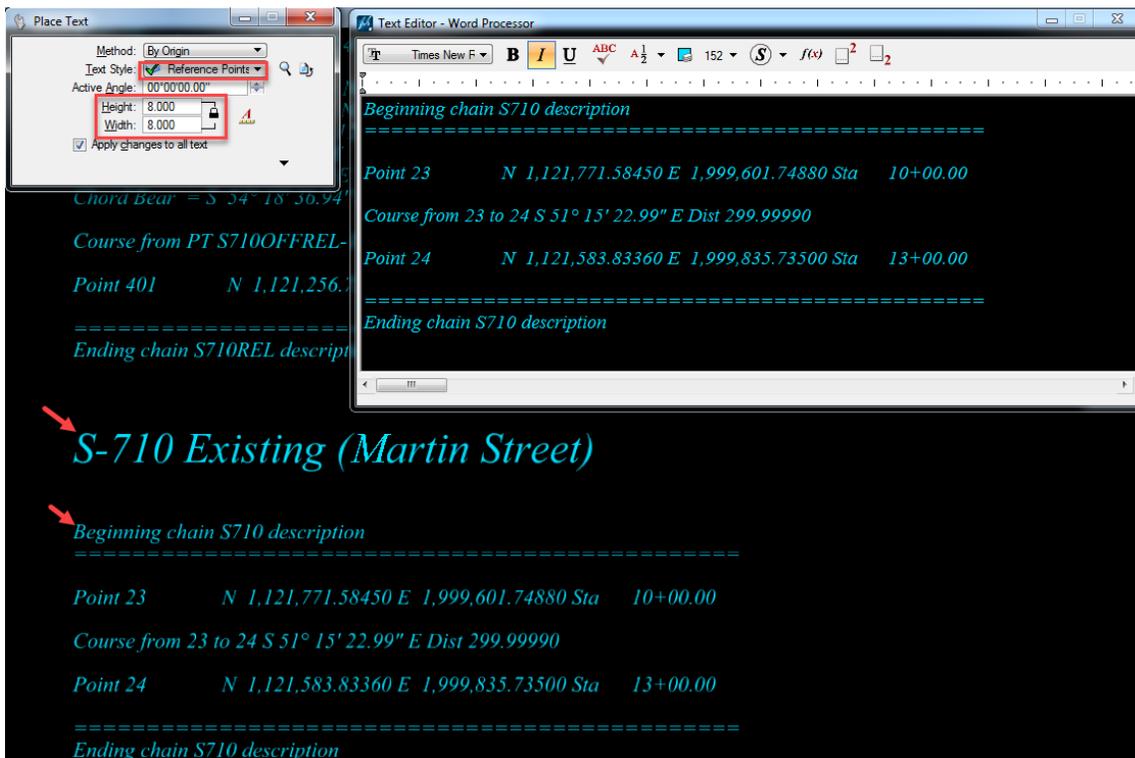
Place the text beginning in the upper left corner of the reference data sheet, approximately 50 units to the right and 100 units down.



Modify the text size to 16.0 and enter the alignment name as a header. Place the text approximately 50 units above the COGO data.



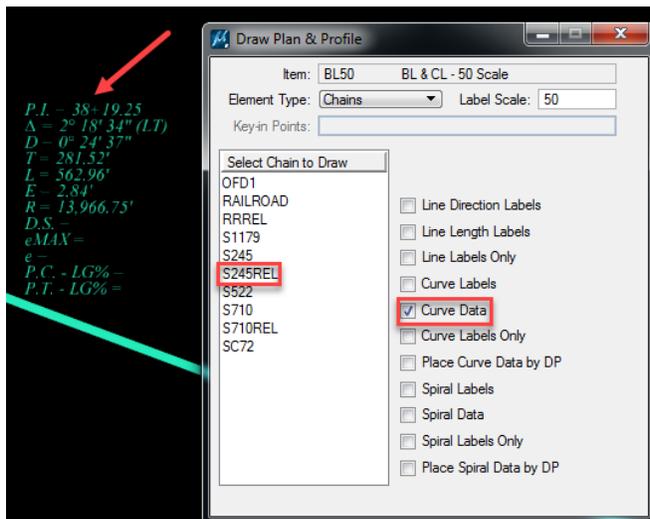
Repeat the process for each alignment on the project maintaining adequate spacing for legibility and ease of locating the pertinent information. Use additional reference data border sheets as necessary.



Use a recommended distance of 450 units between each column. This will leave enough room for two columns of curve tables on the far right.



For the curve data, use the D&C Manager to draw each alignment with the curve data. Copy and rotate the text as necessary. Use the space on the right of the reference alignment sheet to create two columns of curve tables, aligning the first with the title block left edge approximately 100 units down. The second column will be 125 units to the right of the first and a 50 unit spacing can be used between each curve data.



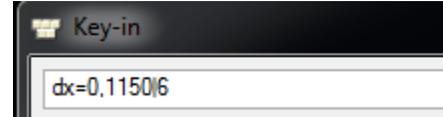
Press the “Edit Text” button to edit each of the data fields with the appropriate title block information.



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
3	S.C.	YORK	P038161	S-710	5B

Repeat for additional sheets or pipe the title block information by selecting the text, selecting the copy command, then enter dx=0,x|y where x is the distance you want to move it and y is how many times to copy it.

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
3	S.C.	YORK	P038161	S-710	5B



The final Reference Data Sheet will look similar to this. (For smaller projects, **AVOID** blowing up the text greater than a size 8.0 for text and 16.0 for headers. Align information on the right of the sheet for smaller projects and leave the left area blank.)

<p>S-710 Relocation (Martin Street)</p> <p>Beginning chain S710REL description</p> <p>Point 400 N 1,121,771.58450 E 1,999,601.74880 Sta 10+00.00</p> <p>Course from 400 to PC S710OFFREL-1 S 51° 15' 22.99" E Dist 306.24302</p> <p>Curve Data</p> <p>Curve S710OFFREL-1</p> <p>P.I. Station 174+65.32 N 1,121,429.67681 E 2,000,037.85425</p> <p>Delta = 6° 06' 23.86" (LT)</p> <p>Degree = 1° 18' 23.86"</p> <p>Tangent = 340.07806</p> <p>Length = 479.70154</p> <p>Radius = 4,500.00000</p> <p>External = 6.39981</p> <p>Long Chord = 479.47424</p> <p>Mid. Ord = 6.39952</p> <p>P.C. Station 174+06.24 N 1,121,579.82643 E 1,999,840.60424</p> <p>P.T. Station 174+65.94 N 1,121,380.20318 E 2,000,230.02757</p> <p>C.C. Station 174+36.09 N 1,122,009.72056 E 2,002,656.88875</p> <p>Back = S 51° 15' 22.99" E</p> <p>Ahead = S 57° 21' 50.88" E</p> <p>Chord Bear = S 54° 18' 36.94" E</p> <p>Course from PT S710OFFREL-1 to 401 S 57° 21' 50.88" E Dist 80.62918</p> <p>Point 401 N 1,121,216.72002 E 2,000,297.92691 Sta 18+66.57</p> <p>Ending chain S710REL description</p>	<p>Railroad Relocation</p> <p>Beginning chain RRREL description</p> <p>Point 100 N 1,121,804.42430 E 2,000,258.79289 Sta 10+00.00</p> <p>Course from 100 to PC RR OFFCEREL-1 N 75° 07' 09.00" W Dist 1,567.12986</p> <p>Curve Data</p> <p>Curve RR OFFCEREL-1</p> <p>P.I. Station 20+03.90 N 1,122,293.36317 E 1,998,418.74859</p> <p>Delta = 7° 00' 27.85" (RT)</p> <p>Degree = 1° 02' 30.27"</p> <p>Tangent = 358.79717</p> <p>Length = 672.69430</p> <p>Radius = 5,500.00000</p> <p>External = 10.30033</p> <p>Long Chord = 672.37529</p> <p>Mid. Ord = 10.24129</p> <p>P.C. Station 22+67.13 N 1,122,266.87815 E 1,998,744.22128</p> <p>P.T. Station 32+39.82 N 1,122,418.91088 E 1,998,106.25874</p> <p>C.C. Station 27+53.53 N 1,122,522.41957 E 2,000,156.67558</p> <p>Back = N 75° 07' 09.00" W</p> <p>Ahead = N 68° 06' 41.14" W</p> <p>Chord Bear = N 71° 30' 55.07" W</p> <p>Course from PT RR OFFCEREL-1 to 101 N 68° 06' 41.14" W Dist 175.70132</p> <p>Point 101 N 1,122,484.41288 E 1,997,945.22144 Sta 34+13.33</p> <p>Ending chain RRREL description</p>	<p>S-245 Relocation (George Street)</p> <p>Beginning chain S245REL description</p> <p>Point 305 N 1,122,449.64610 E 1,997,955.75590 Sta 34+37.73</p> <p>Course from 305 to PC S-245R-1 S 68° 06' 41.14" E Dist 100.00458</p> <p>Curve Data</p> <p>Curve S-245R-1</p> <p>P.I. Station 38+16.25 N 1,122,307.41420 E 1,998,309.77290</p> <p>Delta = 2° 18' 53.89" (LT)</p> <p>Degree = 0° 24' 36.83"</p> <p>Tangent = 291.21600</p> <p>Length = 562.95577</p> <p>Radius = 13,906.74510</p> <p>External = 2.83683</p> <p>Long Chord = 562.95766</p> <p>Mid. Ord = 2.83628</p> <p>P.C. Station 35+37.73 N 1,122,412.36412 E 1,998,048.55121</p> <p>P.T. Station 41+00.69 N 1,122,213.07570 E 1,998,575.01148</p> <p>C.C. Station 38+19.21 N 1,125,372.25545 E 2,003,255.39147</p> <p>Back = S 68° 06' 41.14" E</p> <p>Ahead = S 70° 25' 15.03" E</p> <p>Chord Bear = S 69° 15' 58.09" E</p> <p>Course from PT S-245R-1 to PC S-245R-2 S 70° 25' 15.03" E Dist 352.31362</p> <p>Point 306 N 1,121,563.39067 E 1,999,227.97202 Sta 48+00.00</p> <p>Course from 306 to PC S-245R-3 S 67° 12' 02.59" E Dist 253.74348</p> <p>Curve Data</p> <p>Curve S-245R-3</p> <p>P.I. Station 51+06.96 N 1,121,844.44214 E 1,999,510.94933</p> <p>Delta = 15° 50' 36.60" (RT)</p> <p>Degree = 15° 04' 40.31"</p> <p>Tangent = 53.21228</p> <p>Length = 105.74682</p> <p>Radius = 380.00000</p> <p>External = 3.76823</p> <p>Long Chord = 105.40594</p> <p>Mid. Ord = 3.07269</p> <p>P.C. Station 50+53.74 N 1,121,865.06405 E 1,999,461.89002</p> <p>P.T. Station 51+59.49 N 1,121,811.58682 E 1,999,524.45637</p> <p>C.C. Station 51+06.96 N 1,121,514.75421 E 1,999,314.63849</p> <p>Back = S 67° 12' 02.59" E</p> <p>Ahead = S 51° 15' 22.99" E</p> <p>Chord Bear = S 59° 13' 42.79" E</p> <p>Course from PT S-245R-3 to 307 S 51° 15' 22.99" E Dist 63.61827</p> <p>Point 307 N 1,121,771.58450 E 1,999,602.07571 Sta 52+23.11</p> <p>Ending chain S245REL description</p>	<p>CURVE DATA</p> <table border="1"> <tr> <td>CURVE 1 (S245)</td> <td>PI= 1005.48.50</td> <td>PT= 1005.48.50</td> </tr> <tr> <td>Δ= 37°39'22.69" (LT)</td> <td>Δ= 37°39'22.69" (LT)</td> <td>Δ= 37°39'22.69" (LT)</td> </tr> <tr> <td>D= 2929.908"</td> <td>D= 2929.908"</td> <td>D= 2929.908"</td> </tr> <tr> <td>T= 781.4617'</td> <td>T= 781.4617'</td> <td>T= 781.4617'</td> </tr> <tr> <td>L= 1200.2558'</td> <td>L= 1200.2558'</td> <td>L= 1200.2558'</td> </tr> <tr> <td>E= 129.5674'</td> <td>E= 129.5674'</td> <td>E= 129.5674'</td> </tr> <tr> <td>R= 2291.8369'</td> <td>R= 2291.8369'</td> <td>R= 2291.8369'</td> </tr> <tr> <td>MATCH EXISTING</td> <td>MATCH EXISTING</td> <td>MATCH EXISTING</td> </tr> </table> <table border="1"> <tr> <td>CURVE 2 (S710REL)</td> <td>PI= 1006.30.97</td> <td>PT= 1006.30.97</td> </tr> <tr> <td>Δ= 3°13'36.09" (LT)</td> <td>Δ= 3°13'36.09" (LT)</td> <td>Δ= 3°13'36.09" (LT)</td> </tr> <tr> <td>D= 170703.122"</td> <td>D= 170703.122"</td> <td>D= 170703.122"</td> </tr> <tr> <td>T= 161.2377'</td> <td>T= 161.2377'</td> <td>T= 161.2377'</td> </tr> <tr> <td>L= 322.3475'</td> <td>L= 322.3475'</td> <td>L= 322.3475'</td> </tr> <tr> <td>E= 2.2702'</td> <td>E= 2.2702'</td> <td>E= 2.2702'</td> </tr> <tr> <td>R= 5724.6221'</td> <td>R= 5724.6221'</td> <td>R= 5724.6221'</td> </tr> <tr> <td>MS = 40 MPH</td> <td>MS = 40 MPH</td> <td>MS = 40 MPH</td> </tr> <tr> <td>e=6.5'</td> <td>e=6.5'</td> <td>e=6.5'</td> </tr> <tr> <td>e = NC</td> <td>e = NC</td> <td>e = NC</td> </tr> <tr> <td>PC=LONG = NA</td> <td>PC=LONG = NA</td> <td>PC=LONG = NA</td> </tr> <tr> <td>PT=LONG = NA</td> <td>PT=LONG = NA</td> <td>PT=LONG = NA</td> </tr> </table>	CURVE 1 (S245)	PI= 1005.48.50	PT= 1005.48.50	Δ= 37°39'22.69" (LT)	Δ= 37°39'22.69" (LT)	Δ= 37°39'22.69" (LT)	D= 2929.908"	D= 2929.908"	D= 2929.908"	T= 781.4617'	T= 781.4617'	T= 781.4617'	L= 1200.2558'	L= 1200.2558'	L= 1200.2558'	E= 129.5674'	E= 129.5674'	E= 129.5674'	R= 2291.8369'	R= 2291.8369'	R= 2291.8369'	MATCH EXISTING	MATCH EXISTING	MATCH EXISTING	CURVE 2 (S710REL)	PI= 1006.30.97	PT= 1006.30.97	Δ= 3°13'36.09" (LT)	Δ= 3°13'36.09" (LT)	Δ= 3°13'36.09" (LT)	D= 170703.122"	D= 170703.122"	D= 170703.122"	T= 161.2377'	T= 161.2377'	T= 161.2377'	L= 322.3475'	L= 322.3475'	L= 322.3475'	E= 2.2702'	E= 2.2702'	E= 2.2702'	R= 5724.6221'	R= 5724.6221'	R= 5724.6221'	MS = 40 MPH	MS = 40 MPH	MS = 40 MPH	e=6.5'	e=6.5'	e=6.5'	e = NC	e = NC	e = NC	PC=LONG = NA	PC=LONG = NA	PC=LONG = NA	PT=LONG = NA	PT=LONG = NA	PT=LONG = NA
CURVE 1 (S245)	PI= 1005.48.50	PT= 1005.48.50																																																													
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T= 781.4617'	T= 781.4617'	T= 781.4617'																																																													
L= 1200.2558'	L= 1200.2558'	L= 1200.2558'																																																													
E= 129.5674'	E= 129.5674'	E= 129.5674'																																																													
R= 2291.8369'	R= 2291.8369'	R= 2291.8369'																																																													
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L= 322.3475'	L= 322.3475'	L= 322.3475'																																																													
E= 2.2702'	E= 2.2702'	E= 2.2702'																																																													
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MS = 40 MPH	MS = 40 MPH	MS = 40 MPH																																																													
e=6.5'	e=6.5'	e=6.5'																																																													
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PT=LONG = NA	PT=LONG = NA	PT=LONG = NA																																																													

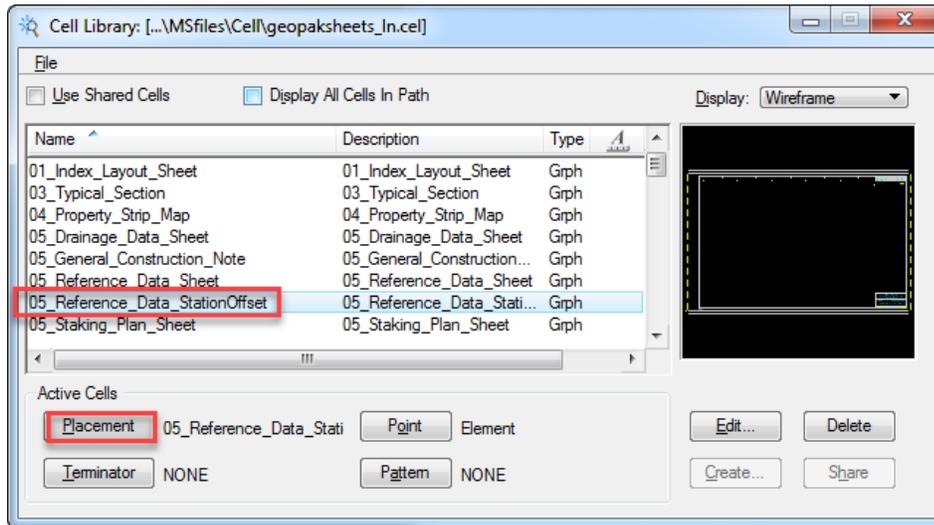
SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION
COLUMBIA, S.C.

REFERENCE DATA SHEET

Station Offset Sheet

The Station Offset Sheet is a blank border sheet that allows the designer to paste the station and offset information created by running the SOR VBA in the D&C Manager. (See pages 83 to 89 for instructions to run the VBA application.)

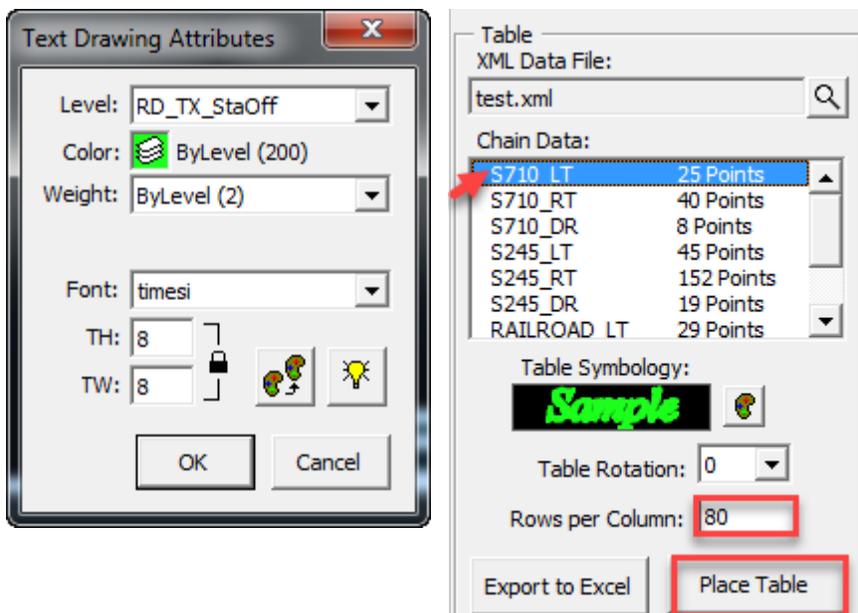
Place the 05_Reference_Data_StationOffset cell into the *ref.dgn (Reference Data Sheet series).



Set the Level to “RD_TX_StaOff” with a weight of 2.



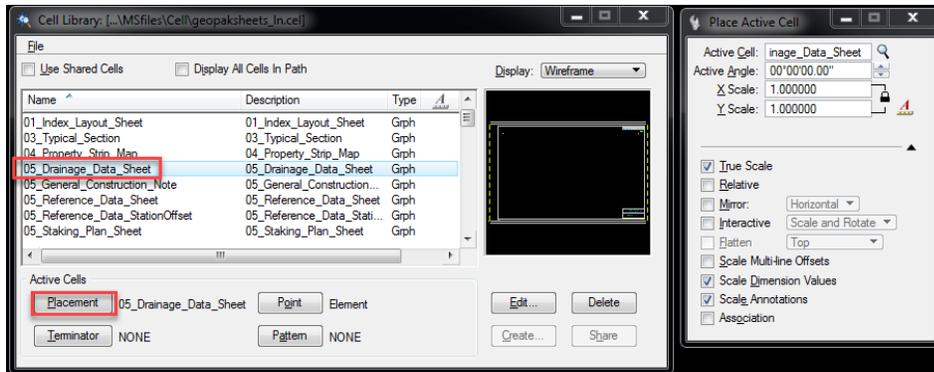
In the VBA, ensure the Table Symbology is set as follows and the the Rows per Column is set to 80. Highlight the first road and select “Place Table”. Snap to the upper left “construction line” in the border sheet.



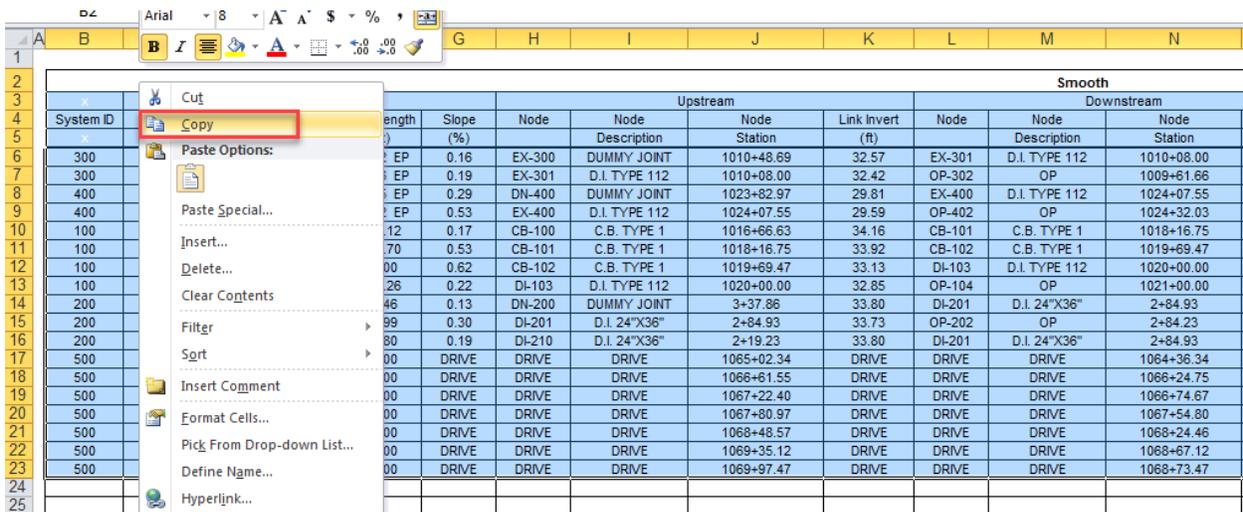
Drainage Data Sheet

The Drainage Data Sheet is a blank border sheet that allows the designer to paste the “spreadsheet” drainage information onto one or more reference data sheets in lieu of splitting the data based on stationing on the plan and profile sheets. This drainage summary sheet should be utilized when using “old school” pipe labels on the plan sheets. This will allow the additional information from the chart to be included in the plans for the contractor and construction, but will save the designer time from splitting the data across multiple sheets, especially if there are multiple revisions to the drainage design.

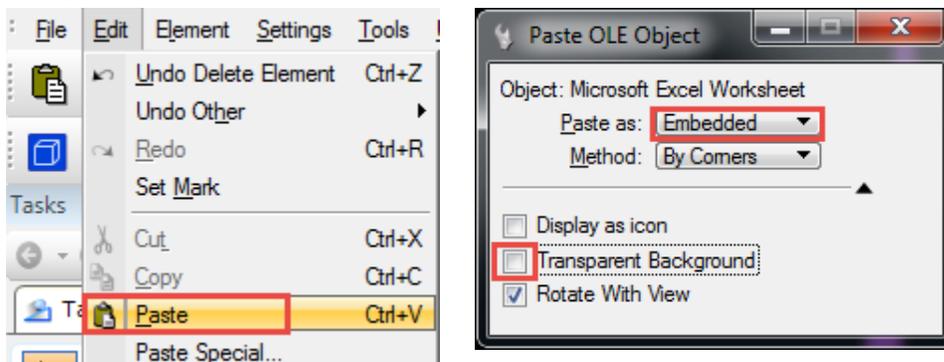
Place the 05_Drainage_Data_Sheet cell into the *ref.dgn (Reference Data Sheet series).



In the Excel file, copy the rows and columns of drainage data, including the header information.



In MicroStation, select **Edit > Paste**. On the dialog, select **Embedded** and turn off **Transparent Background**.



Staking Plan Sheet

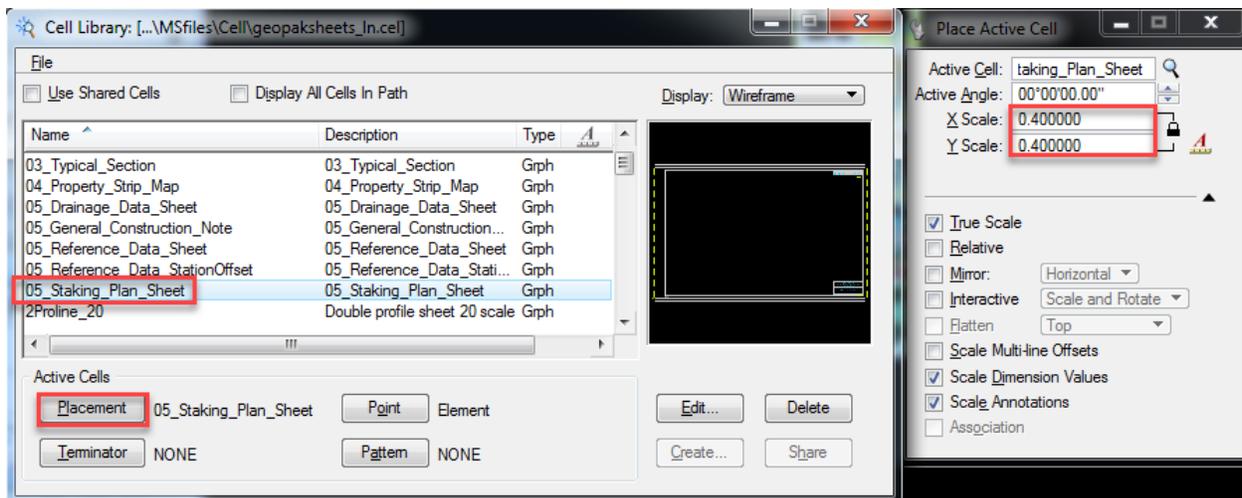
For complex projects, the Staking Plan Sheet is an additional reference sheet created for the benefit of the field surveyor and contractor to provide clarity for the centerline layout, major traverse control points, coordinate values of critical points and monument descriptions. The information may be expanded to show all centerlines, curve data, coordinated points, and survey baselines.

Determine the scale for the Staking Plan Sheet by length of alignment to show the layout of the plan sheets for the project.

Scale	Border Cell X & Y	Alignment Length	Minimum Font Size
20:1	0.40	700 ft stationing	5
50:1	1.00	1500 ft stationing	5
100:1	2.00	3000 ft stationing	10
150:1	3.00	4500 ft stationing	15
200:1	4.00	6000 ft stationing	20
400:1	8.00	12000 ft stationing	40

The following example will demonstrate a 20:1 Index/Plan Layout Sheet.

Open the geopaksheets_In.cel cell library and select the 05_Staking_Plan_Sheet cell. Adjust the cell scale to 0.40 for both the height and width (0.40 x 50 = 20). Place the cell additional times for the number of plan sheets you are including in the layout.



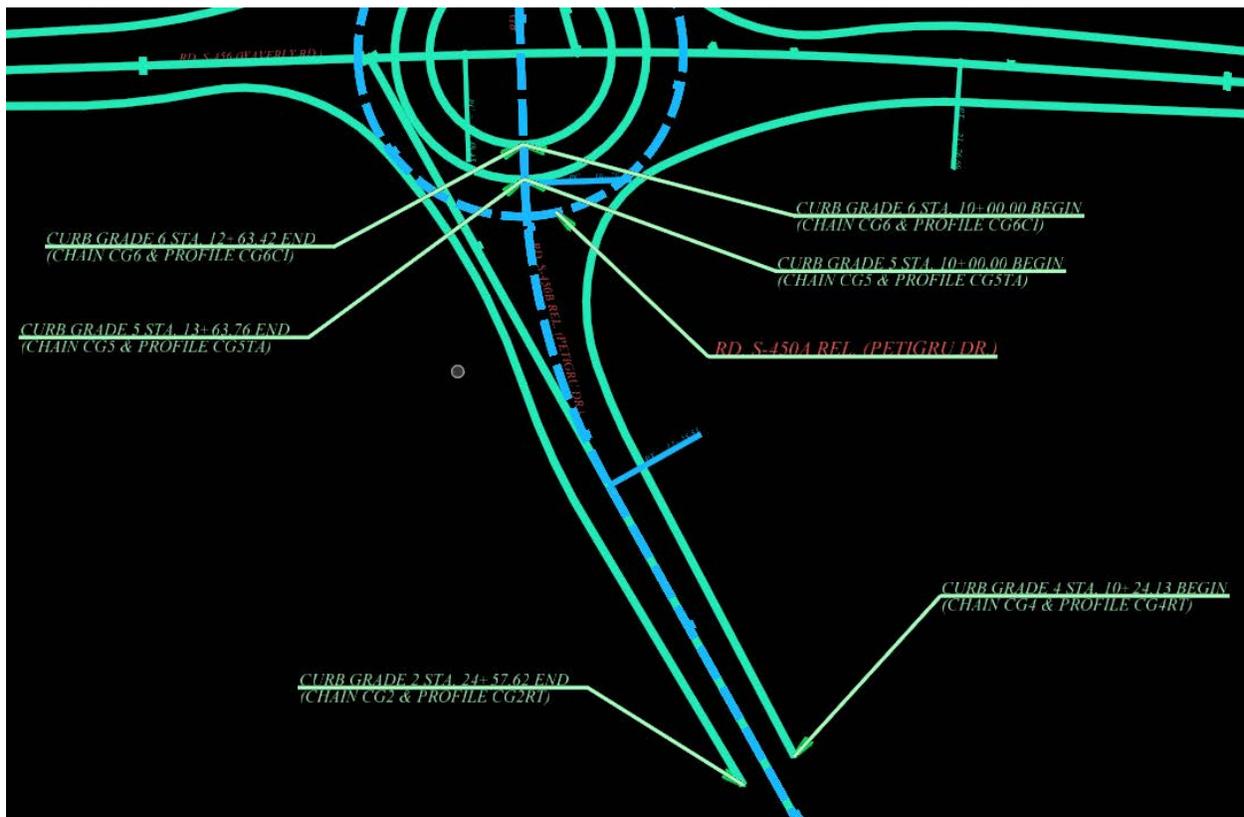
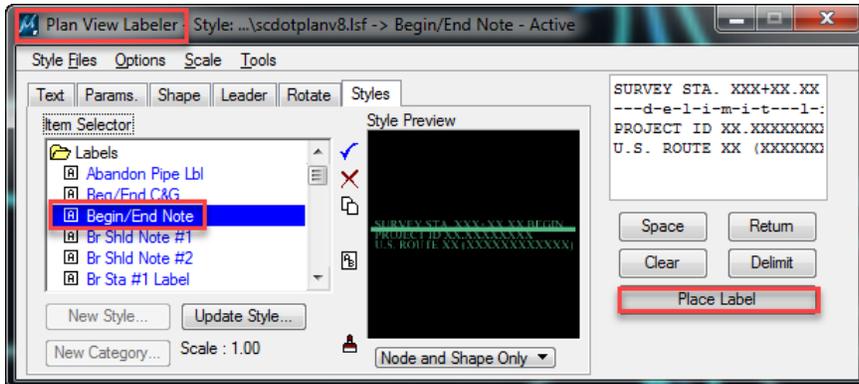
Attach the *.pp.dgn design file as a reference. **Move, rotate and clip** the alignment to fit on the Staking Plan Sheet. Repeat attaching the *.pp.dgn for subsequent layout sheets as necessary to fit the entire length of the project onto sheets at 20:1 scale for this example.

Turn on/off levels in the referenced *.pp.dgn to properly show the following items on the Staking Plan sheets:

1. North Arrow in upper right corner
2. Scale in lower right corner

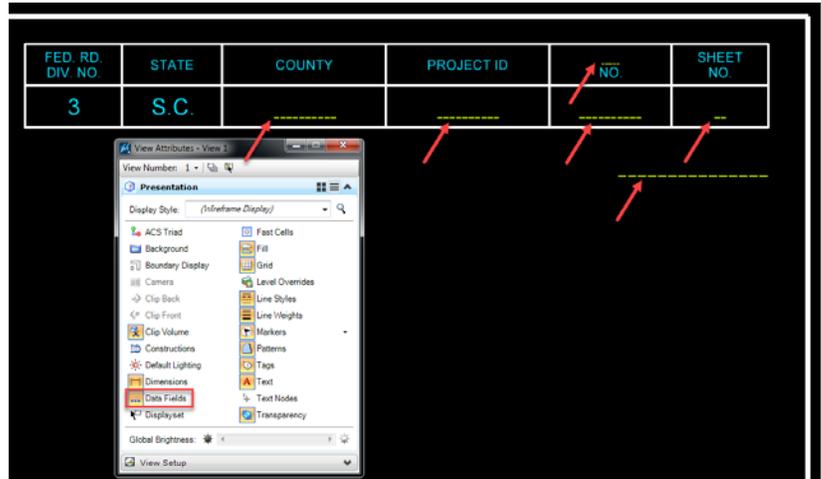
3. Existing and Proposed Alignments for both mainline and side roads including stationing
4. Road Names/Numbers
5. Begin/End Notes for each road with Northing/Easting Coordinates if not included on the Reference Data Sheet
6. 500' Stationing, Alignment Stationing, Curve Data, Bearings
7. Electronic Chain/Profile Names

Use the Plan View Labeling tool to label the road names and begin/end notes as necessary to convey the survey information for the Staking Plan Sheet.



Data Fields have been setup in the cell to ensure fonts choice, font sizes, levels, and justification are predefined for each Index Layout sheet.

To utilize, zoom into the upper right corner to complete the title block information. If you do not see the “Data Fields”, select Settings > View Attributes and turn on “Data Fields”.

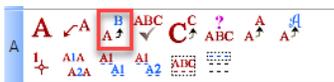


If you are utilizing the reference border sheet, you will need to set the following attributes:

Level: RD_SHT_TX
 Weight: By Level (3)
 Font: Arial

- County, Project ID, Road No., Sheet No. use font size: 5 x Scale Multiple (5 x 3 for 150' scale = 15), Justification: Center Center
- Road/Route No. use font size: 3 x Scale Multiple, Center Center Justification
- Road Name use font size:: 8 x Scale Multiple, Right Top Justification

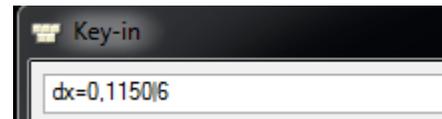
Press the “Edit Text” button to edit each of the data fields with the appropriate title block information.



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
3	S.C.	GEORGETOWN	0039004	S-456 S-450B REL	5E

Repeat for additional sheets or pipe the title block information by selecting the text, selecting the copy command, then enter dx=0,x|y where x is the distance you want to move it and y is how many times to copy it.

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROAD NO.	SHEET NO.
3	S.C.	GEORGETOWN	0039004	S-456 S-450B REL	5E



Enter the Scale and RPG/Initials in the lower right Sheet Block information. Repeat as necessary for additional sheets.

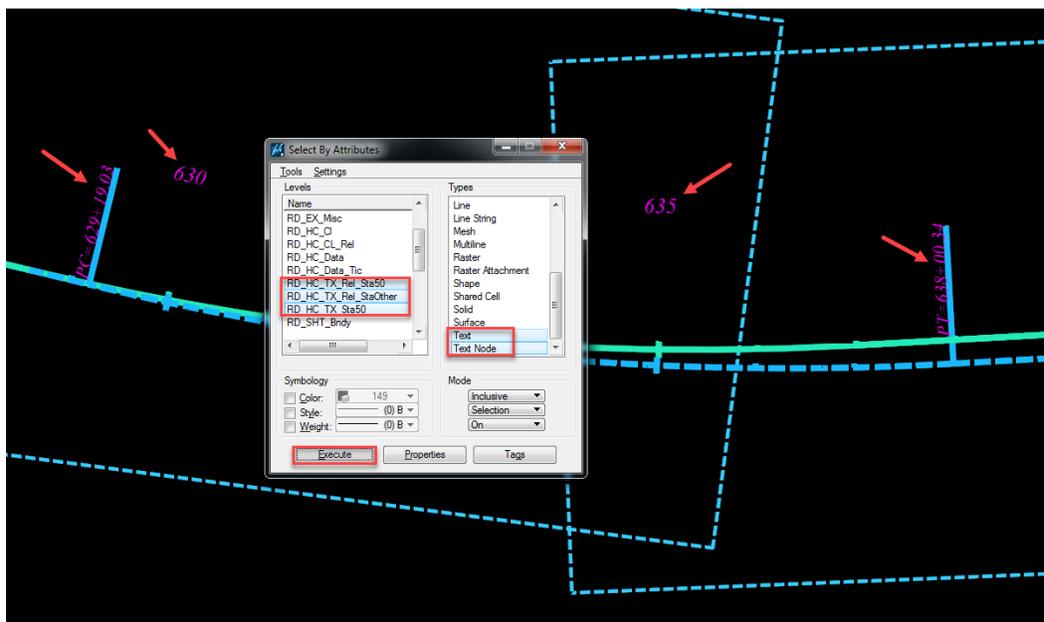


Scale the text to a legible size when plotted, use the same multiple as used for the 05_Staking_Plan_Sheet cell. In this example, you will need a minimum font size of 5. Larger fonts can be utilized to distinguish notes and labels.

Text Height = 5
Text Width = 5

Scale	Border Cell X & Y	Alignment Length	Minimum Font Size
20:1	0.40	700 ft stationing	5
50:1	1.00	1500 ft stationing	5
100:1	2.00	3000 ft stationing	10
150:1	3.00	4500 ft stationing	15
200:1	4.00	6000 ft stationing	20
400:1	8.00	12000 ft stationing	40

Use the Edit > Select By Attributes tool to select text on each of the levels.

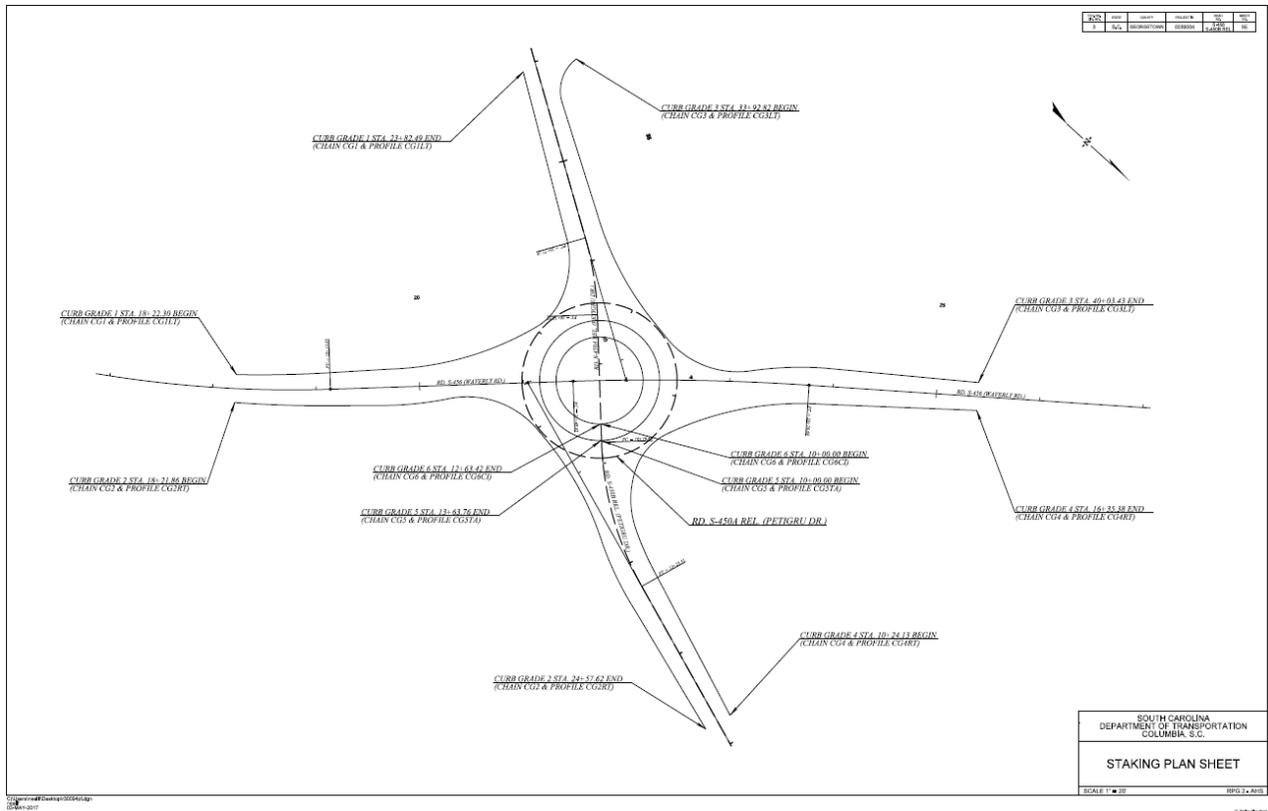


Select the **Change Text Attributes** tool and check on Height and Width. Enter the Font Size and data click to accept the changes to the fonts. Realign and shift text as necessary to “clean up” and make the plan sheet as legible as possible. Repeat these steps for the other text levels and font sizes.



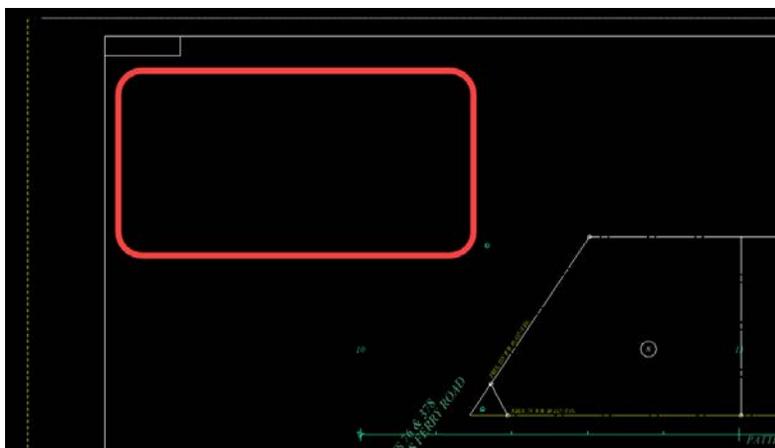
Select **File > Save Settings** to ensure all of the levels which are turned on/off are properly saved to the view for plotting.

The final Staking Plan sheet will look similar to this:

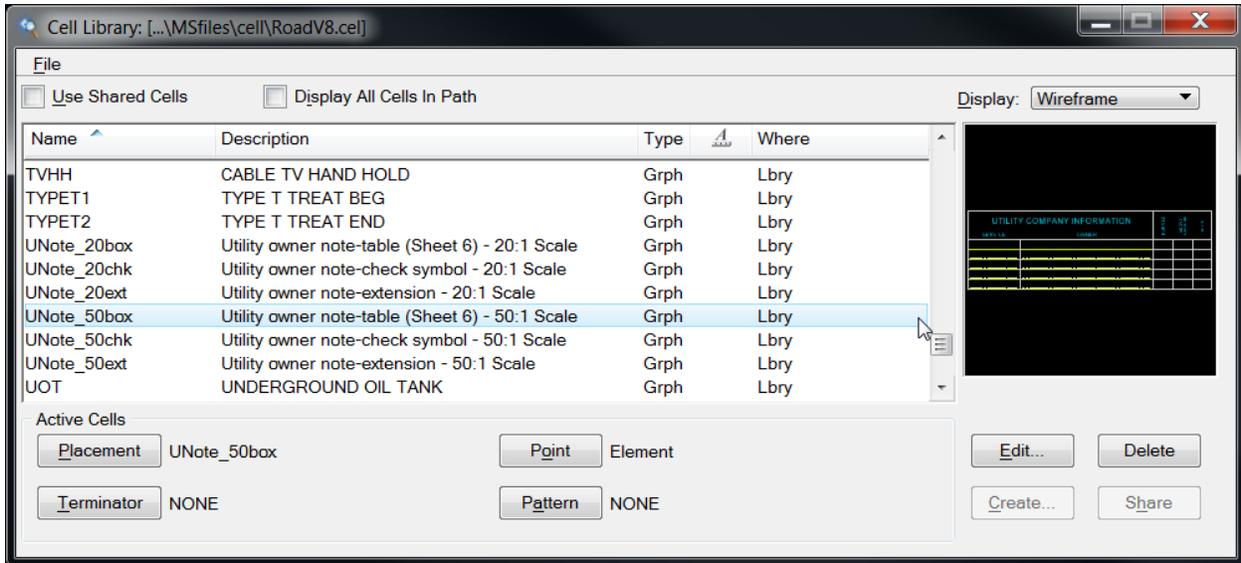


Placing Utility Property Owners

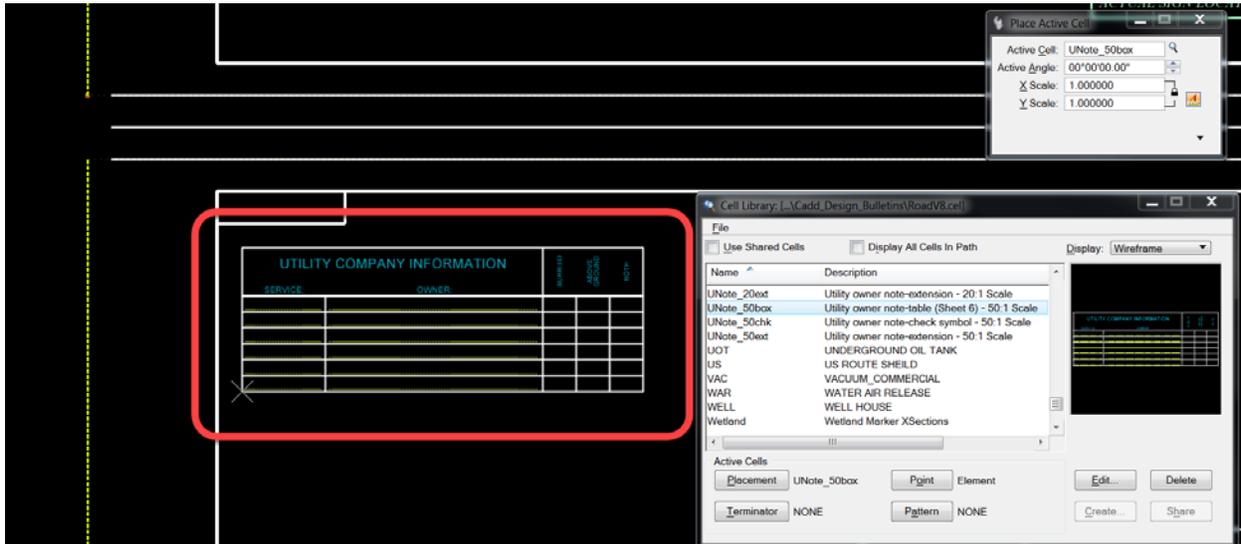
In the *.pf.dgn file, ensure there is room in the upper left corner of the plan section to place the Utility Property Owners information.



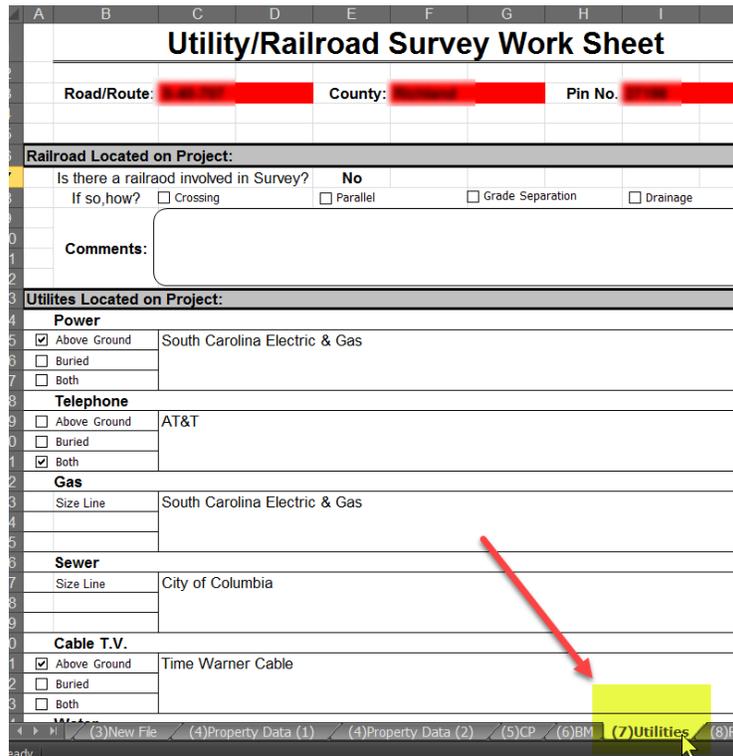
Open the **Cell Library** window and choose the “UNote_##box”. *Dependent upon the scale of your plan sheets, there are cells for 20:1 and 50:1 plans. These cells are located in the **RoadV8.cel** file provided with the SCDOT workspace.*



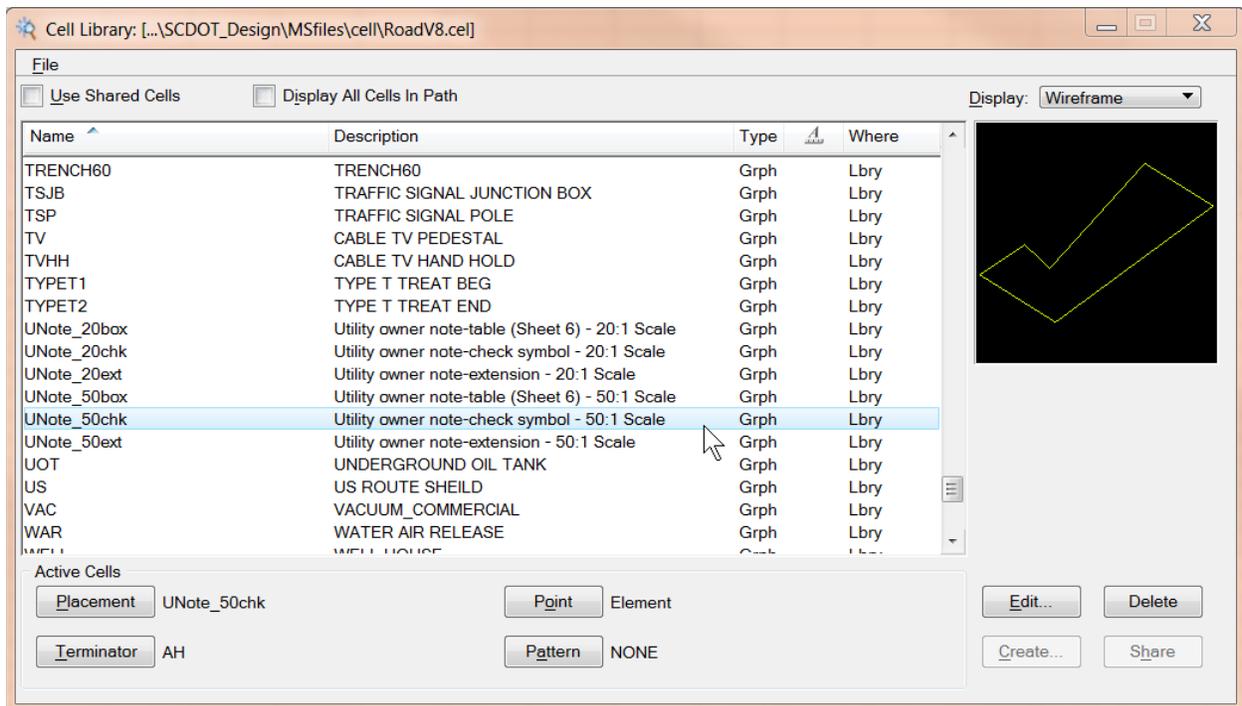
With the applicable cell selected data-click into your drawing and place the cell.



Next, open the **Survey Excel** file and locate the Utility tab. Copy the applicable data from the survey file into your Microstation drawing by “double-clicking” on each **SERVICE** and **OWNER** field.



Use the cell “UNote_##chk” to place a check symbol in the appropriate boxes for NA, above ground, below ground or both.



The check cell origin is aligned with the bottom left corner of each box.

UTILITY COMPANY INFORMATION		BURIED	ABOVE GROUND	BOTH
SERVICE:	OWNER:			
POWER	SOUTH CAROLINA ELECTRIC & GAS	<input checked="" type="checkbox"/>		
TELEPHONE	AT&T		<input checked="" type="checkbox"/>	
GAS	SOUTH CAROLINA ELECTRIC & GAS	<input checked="" type="checkbox"/>		
SEWER	CITY OF COLUMBIA	<input checked="" type="checkbox"/>		
CABLE TV	TIME WARNER CABLE		<input checked="" type="checkbox"/>	

Additional rows can be added using the "UNote_##ext" cell. The origin of this cell is aligned with the left most border line.

UTILITY COMPANY INFORMATION		BURIED	ABOVE GROUND	BOTH
SERVICE:	OWNER:			
POWER	SOUTH CAROLINA ELECTRIC & GAS			<input checked="" type="checkbox"/>
TELEPHONE	AT&T		<input checked="" type="checkbox"/>	
GAS	SOUTH CAROLINA ELECTRIC & GAS	<input checked="" type="checkbox"/>		
SEWER	CITY OF COLUMBIA	<input checked="" type="checkbox"/>		
CABLE TV	TIME WARNER CABLE		<input checked="" type="checkbox"/>	

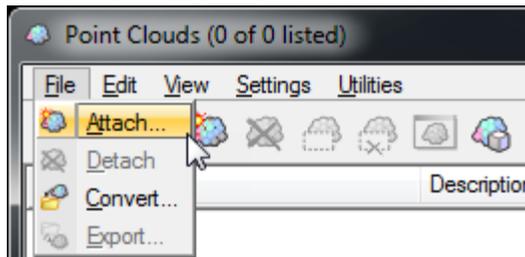
Point Clouds & Terrain Models in Geopak SS4

The following instructions can be utilized to process lidar tiles as point clouds and create terrain models when using the Geopak SS4 software version. This takes the place of the steps outlined (starting on page 187) using the Data Acquisition tools for Geopak SS2 or SS3 software versions.

1. Create a new 3d design file.
2. Select File > Point Clouds or choose the point cloud icon from the primary tool bar.



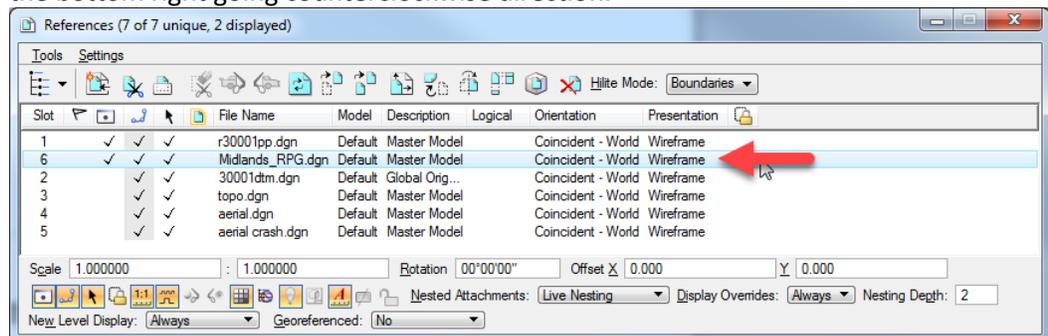
3. Select File > Attach from the Point Clouds dialog

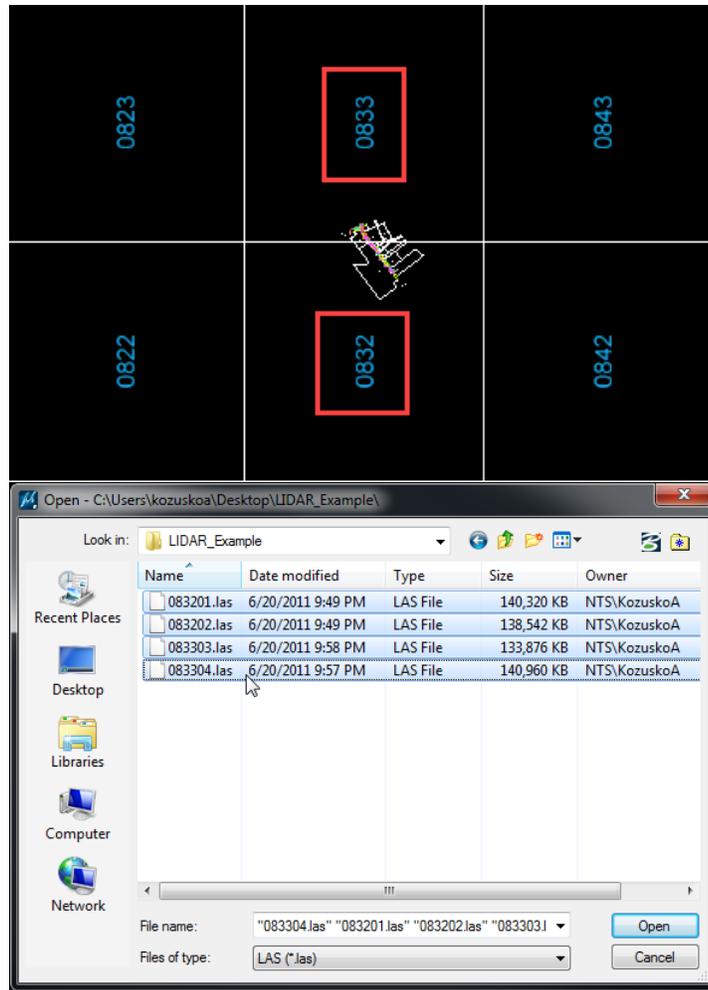


4. Browse to locate the *.las file and press Open.

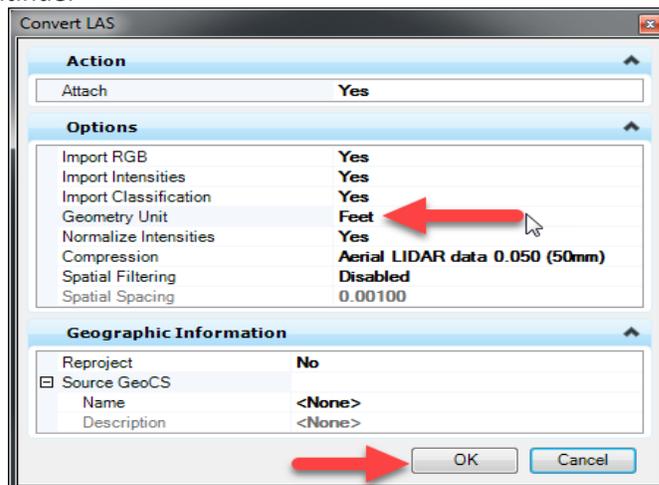
A few extra tips concerning this step are:

- Locate all necessary *.las files and copy the files to a temporary folder on your desktop. This will decrease the time to process the *.las files into a *.pod file.
- Close any unnecessary programs (word documents, outlook, adobe files, etc.). This will also decrease processing time.
- By including all necessary LIDAR files during this step, the user should not have to merge terrain models or *.tin files multiple times later.
- Locate which LIDAR tiles are needed by attaching *_RPG.dgn file into the *.pp.dgn file. \\nts\hq\SCDOT-APPS\SCDOT-LIDAR\LIDAR\Lidar_Documentation\RPGs Each tile is broken into four quadrants starting with 01 in the upper right and ending up with 04 in the bottom right going counterclockwise direction.

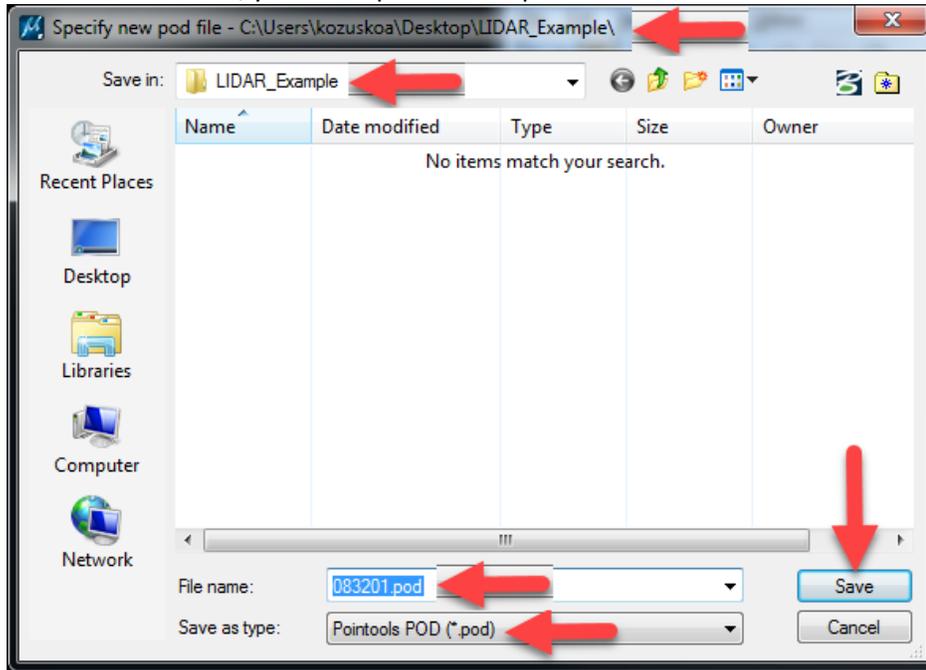




5. Verify Geometry Unit is in Feet and all other fields are defaulted to as shown below. Press OK to Continue.



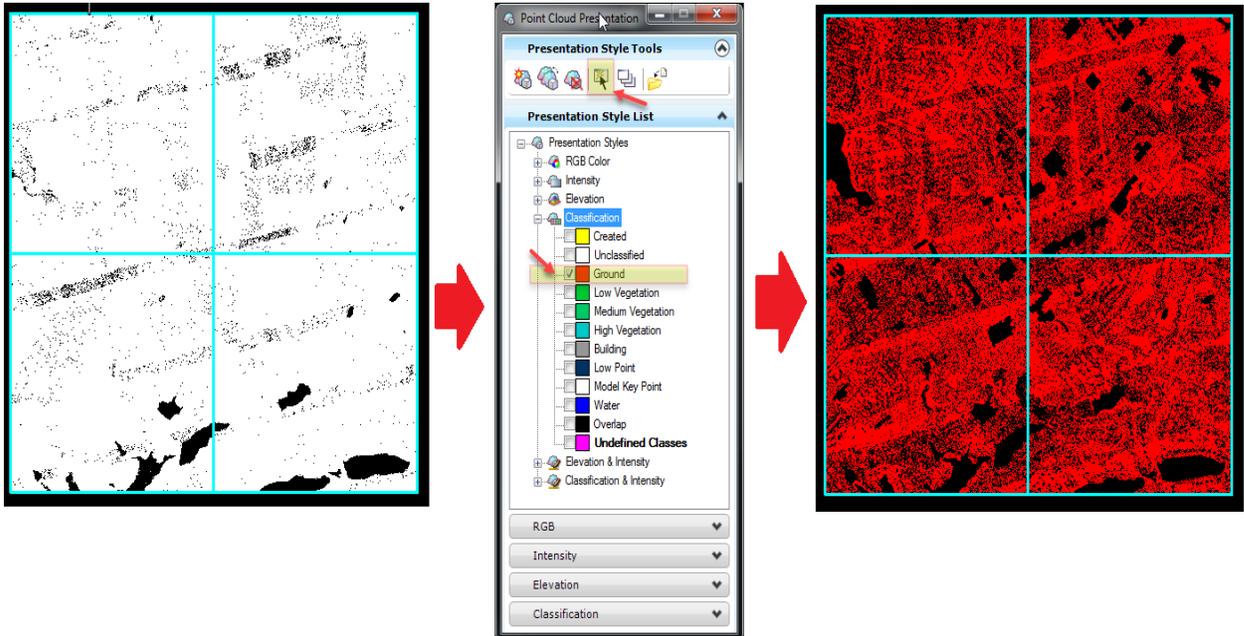
- When prompted, select a directory to save the *.pod file. The name should default to the same as the LIDAR tile name. The path should default to the same directory the *.las files were selected from (should be a temp folder on your desktop). Press the Save button to continue. If you have attached more than one *.las file, you will repeat this step for each file.



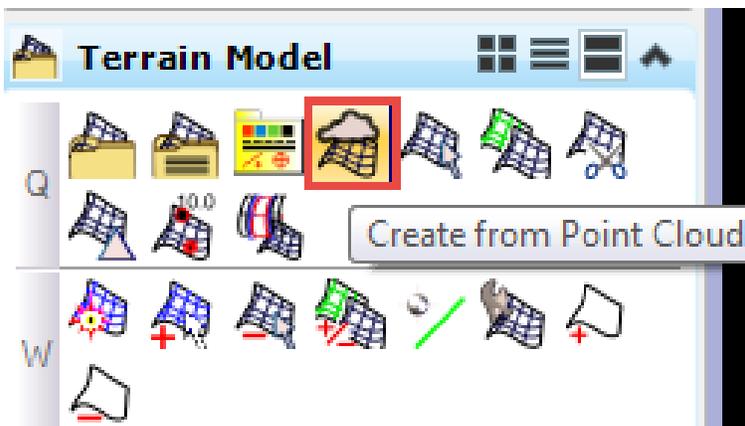
- Highlight the attached *.pod file and select Settings > Presentation.



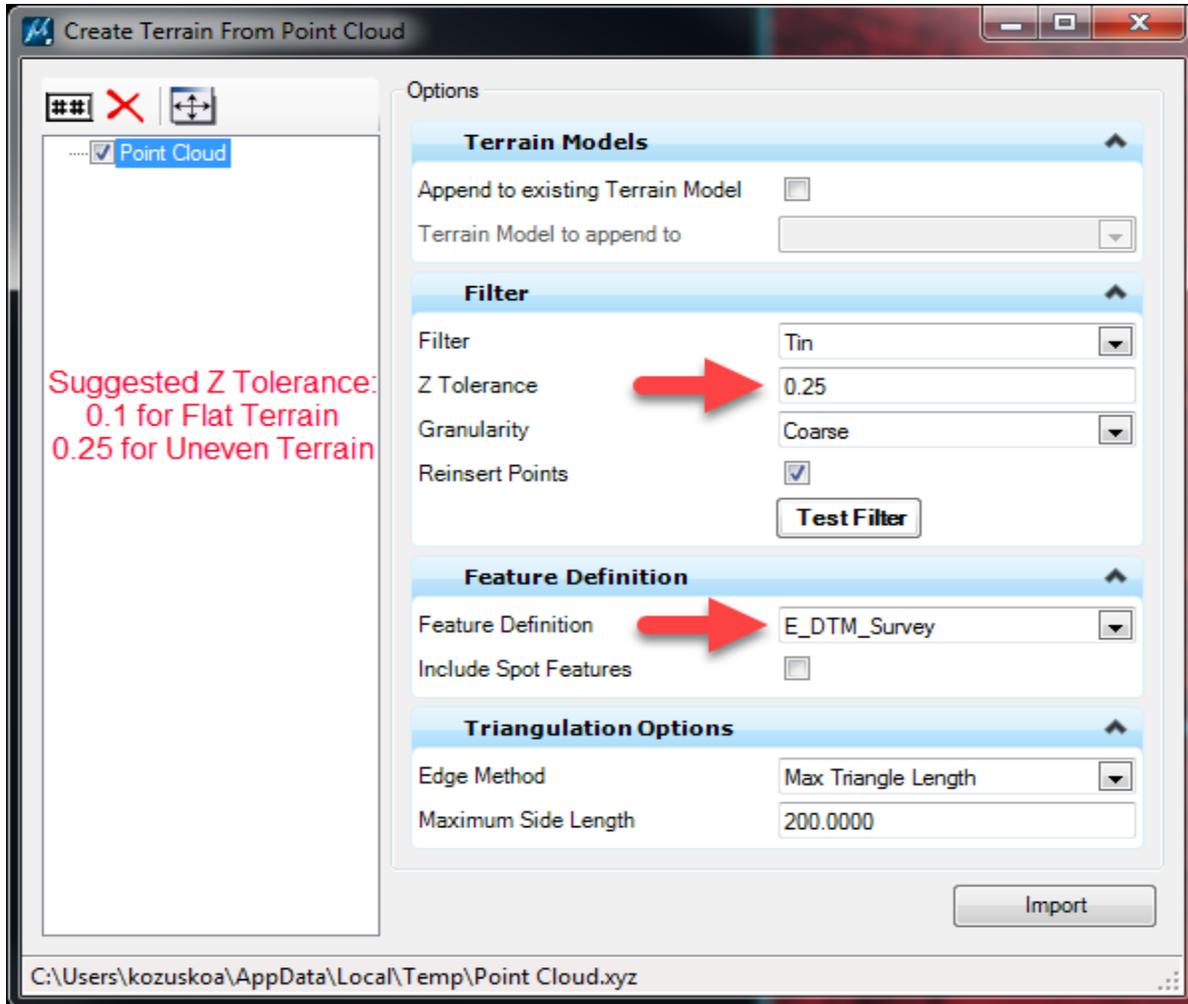
- Under Classification, “Uncheck” all of the classifications except for Ground. Highlight the word Classification in the list and press the Apply to Selected View button. You will need to data (left) click in MicroStation to apply the new view.



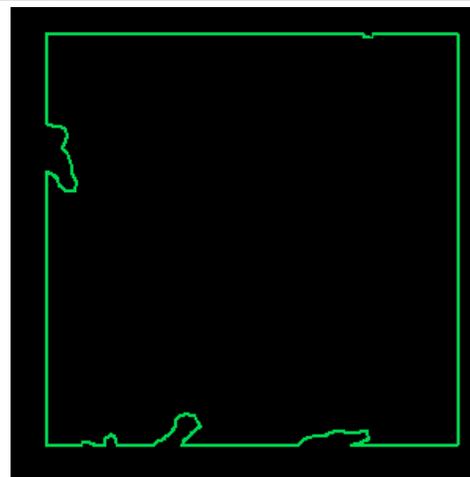
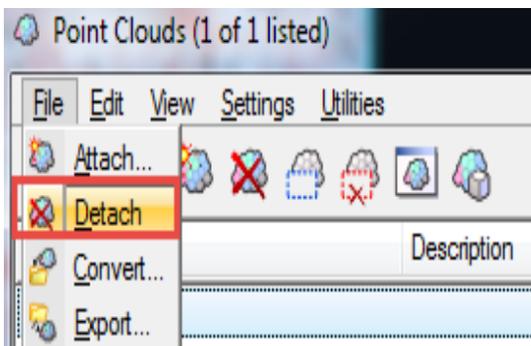
- Select the Create from Point Cloud icon from the Terrain Model task menu.

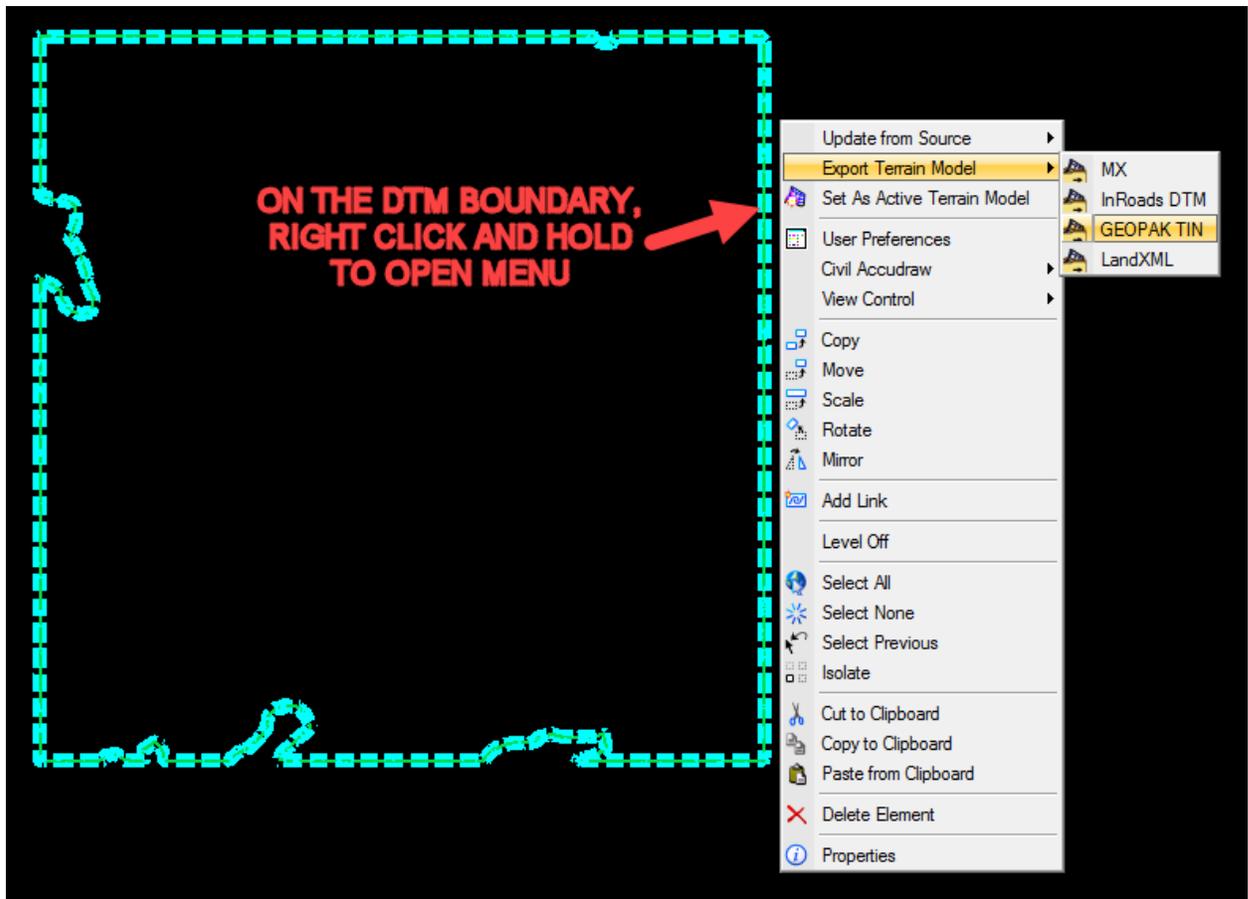


- Set the Filter, Feature and Triangulation Options as show below and press the Import button. By setting the Feature Definition to E_DTM_Survey (under the Terrain folder) only the boundary is displayed.

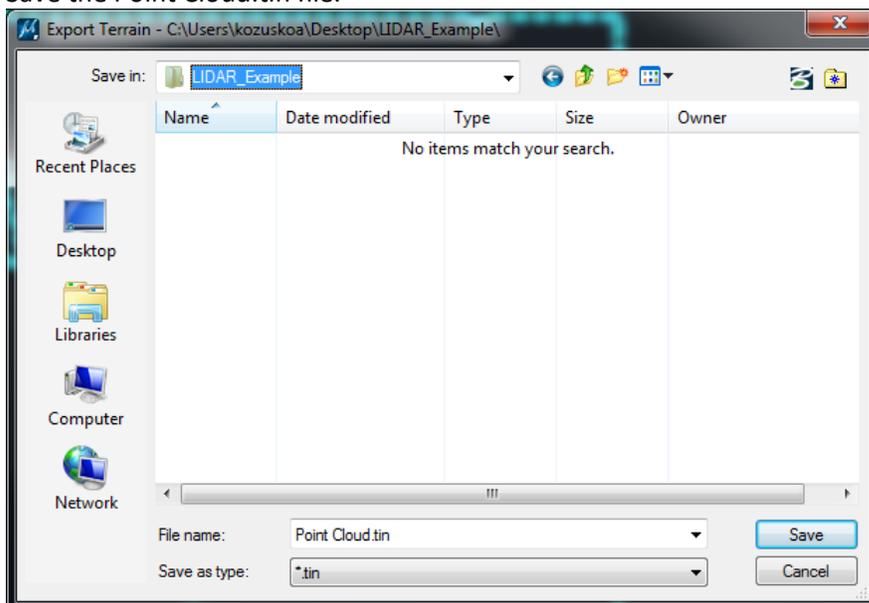


- Processing could take 1 to 2 minutes. Close the dialog when finished. Open point cloud manager and detach all Point Clouds from the menu by selecting File > Detach. The final product will be a green outline of the Terrain Model and now can be exported to a *.tin



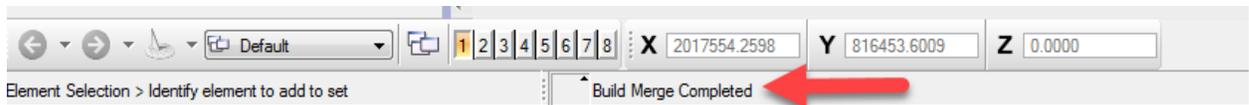
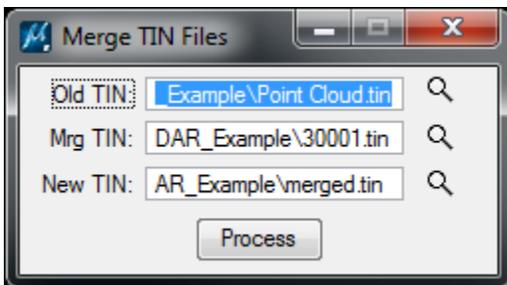
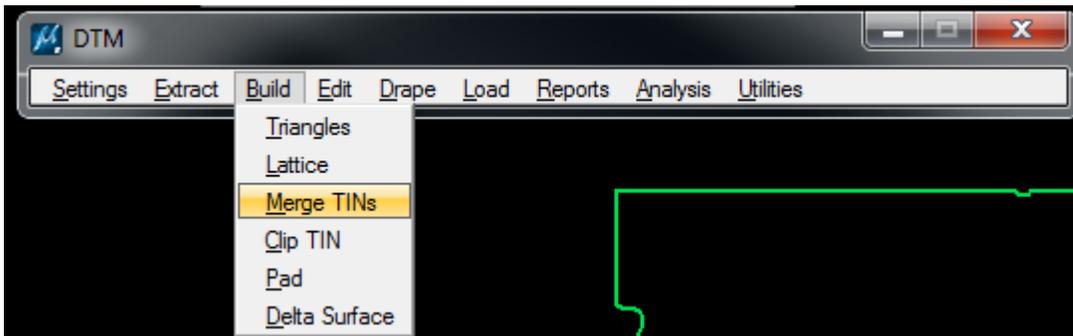


12. Save the Point Cloud.tin file.

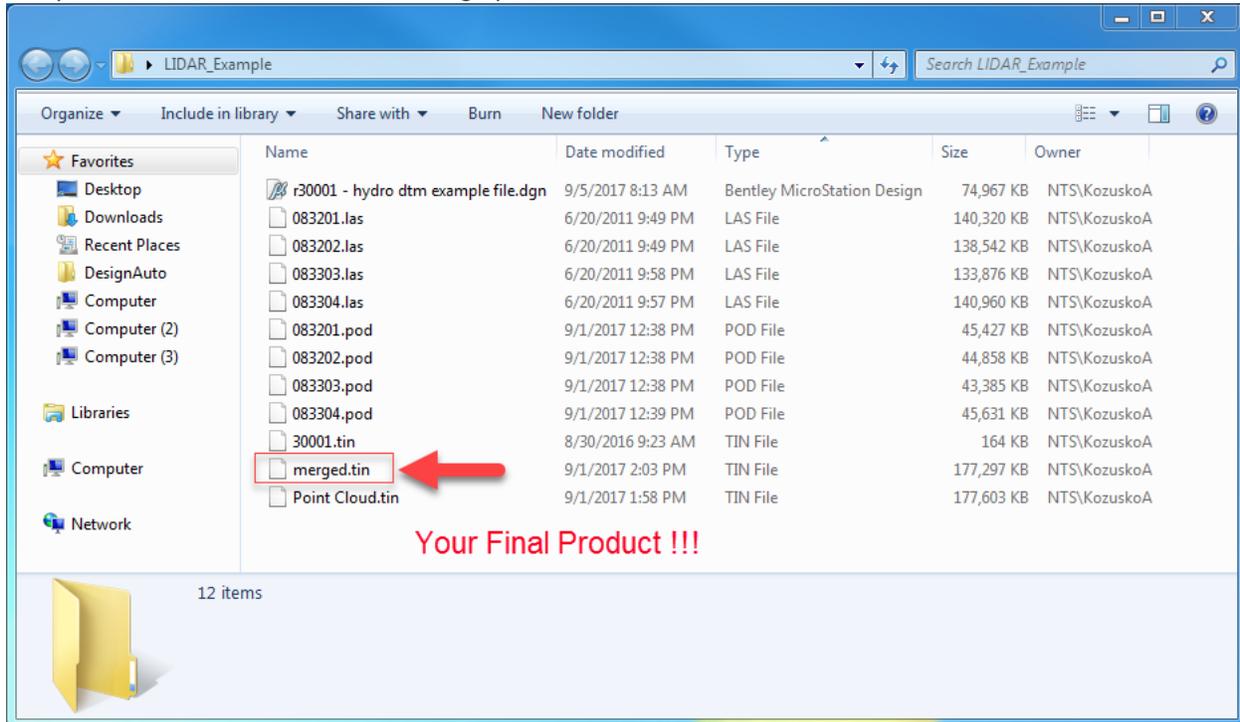


- Next merge your newly created point cloud .tin file with your project .tin file using the SS2 DTM toolbar. The toolbar is located Applications>GEOPAK>ROAD>DTM Tools. Click on the 1st Icon to launch the DTM Menu Bar. From here you want to select Build>Merge TINs. Next select your two .tin files to merge. The data found in the Mrg TIN will supersede the data of the Old TIN. Check your Status Bar at the bottom of the screen to see when your merge process is completed.

OldTIN := the newly created point cloud .tin file you made from the LIDAR data (less accurate data)
 MrgTIN:= the project.tin file (30001.tin used in this example) from survey data (more accurate data)



- Go to your temporary folder you made on your desktop and view your final product. The rest of the files in this folder (copies of files on the network) can be deleted. Create a new fresh 3d file and load your .tin file created from the merge process.



Consultant Workspace Installation Checks

Please check the following files to confirm the workspace is installed on your local pc. The workspace may be modified for a network configuration as necessary.

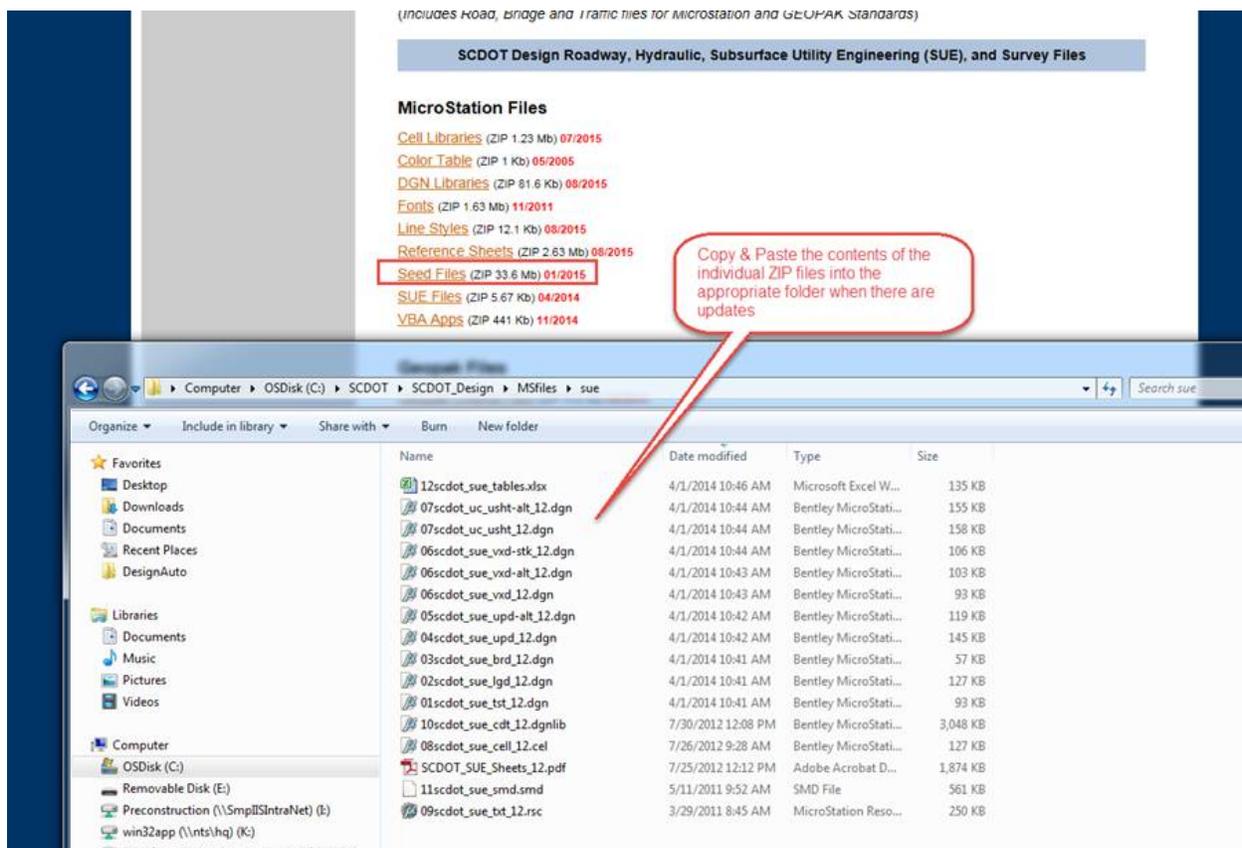
- 1) Run the Complete Workspace .EXE file the first time you are installing the SCDOT standards.

SCDOT Complete Microstation and Geopak Workspace

[Complete SCDOT Workspace in a self extracting .exe](#) (ZIP 25.8 Mb) **11/2015**

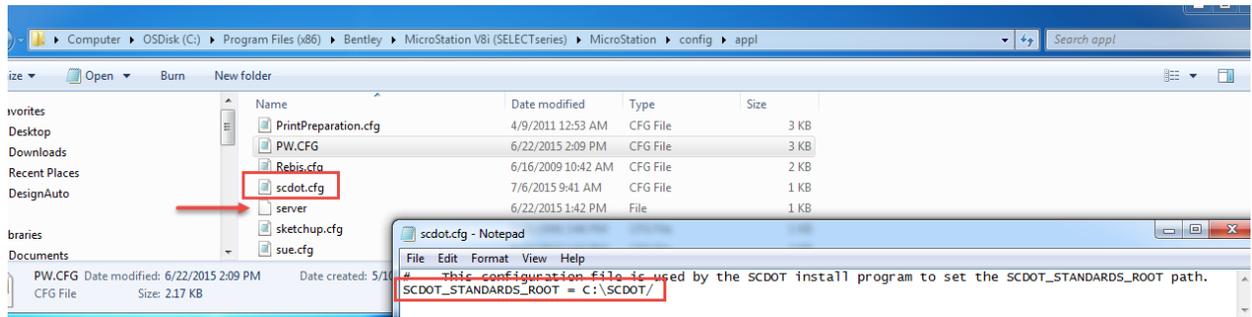
(Includes Road, Bridge and Traffic files for Microstation and GEOPAK Standards)

- 2) The ZIP files below the EXE are for updates to individual files so you do not have to re-run the entire EXE every time there are minor modifications. Simply download the updated zip file and paste the contents to the respective workspace folder.

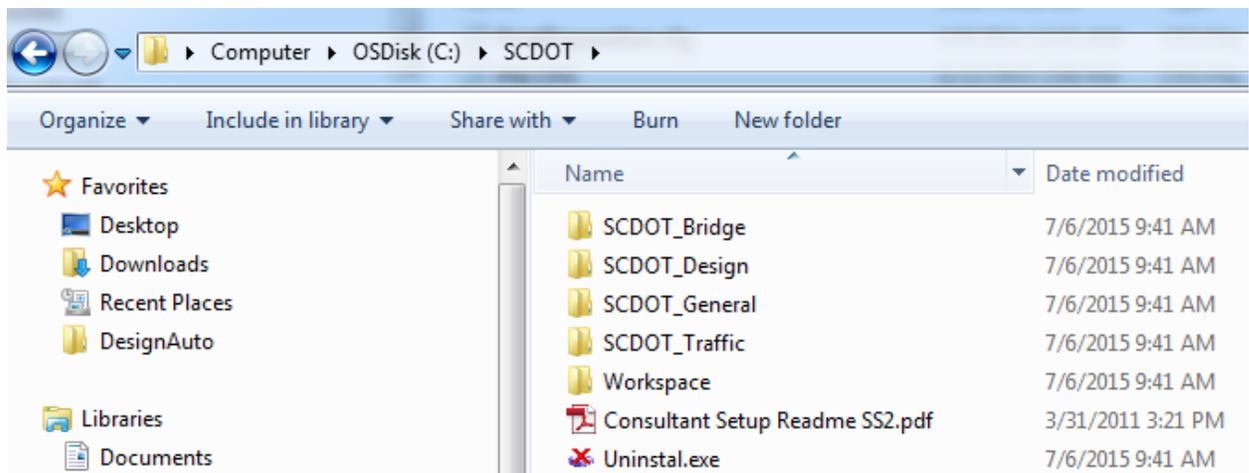


- 3) Confirm the scdot.cfg file is located in the folder
C:\Program Files (x86)\Bentley\MicroStation V8i (SELECTseries)\MicroStation\config\appl
- 4) Confirm the scdot.cfg file points to c:\SCDOT by opening it in Notepad. (Note: this is where the network path can be added to configure for a network workspace.)

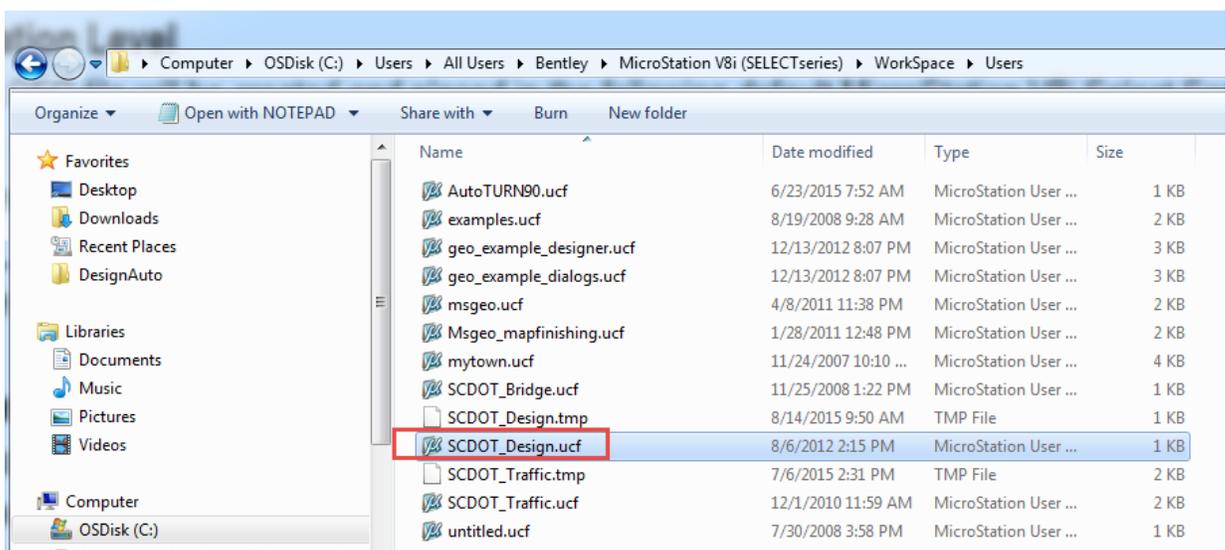
- If the user has another workspace for their company with a cfg, it will need to be renamed to “filename” without the cfg extension – see the “server” file below – if both have the cfg extension, they will conflict with each other and it would pic the first one based on abc orde

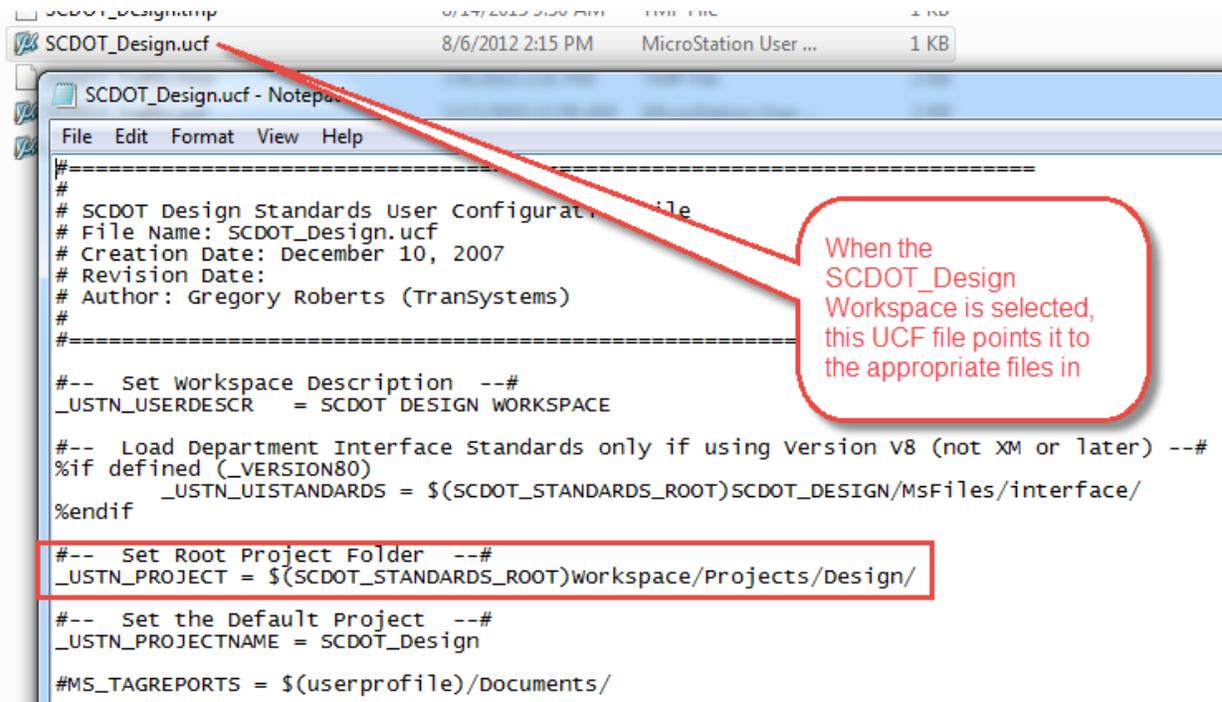


- Confirm the workspace files exist at c:\SCDOT (or network location)

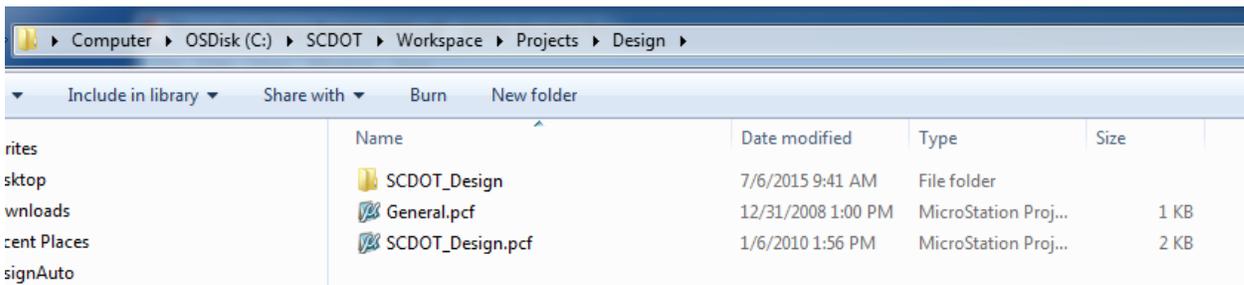


- Confirm the *.ucf file is located in the appropriate folder
C:\Users\All Users\Bentley\MicroStation V8i (SELECTseries)\WorkSpace\Users

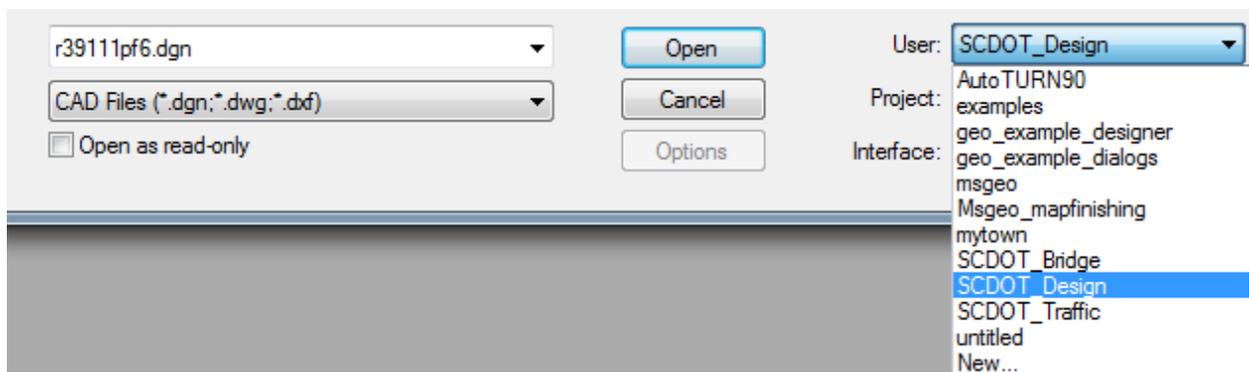




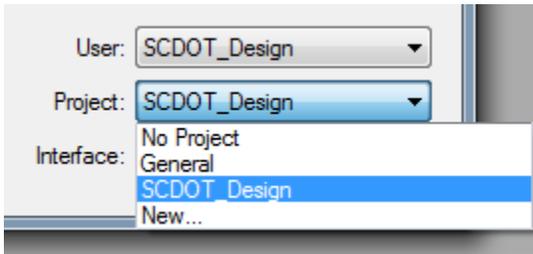
8) Confirm the *.pcf is located in the appropriate directory C:\SCDOT\Workspace\Projects\Design



9) Open MicroStation/Geopak from the icon – pick SCDOT_Design – this is showing up in the drop down based on the *.ucf file in step 5 above



10) The SCDOT_Design will auto select in the Project based on the ucf pointing to the pcf in step 6 above.



In the design file, check the levels, cells, seed files, etc. to ensure the workspace is working correctly.