

GEOPAK PLAN AND PROFILE SHEET LAYOUT TOOL 2001+ NCDOT ROADWAY DESIGN UNIT IMPLEMENTATION



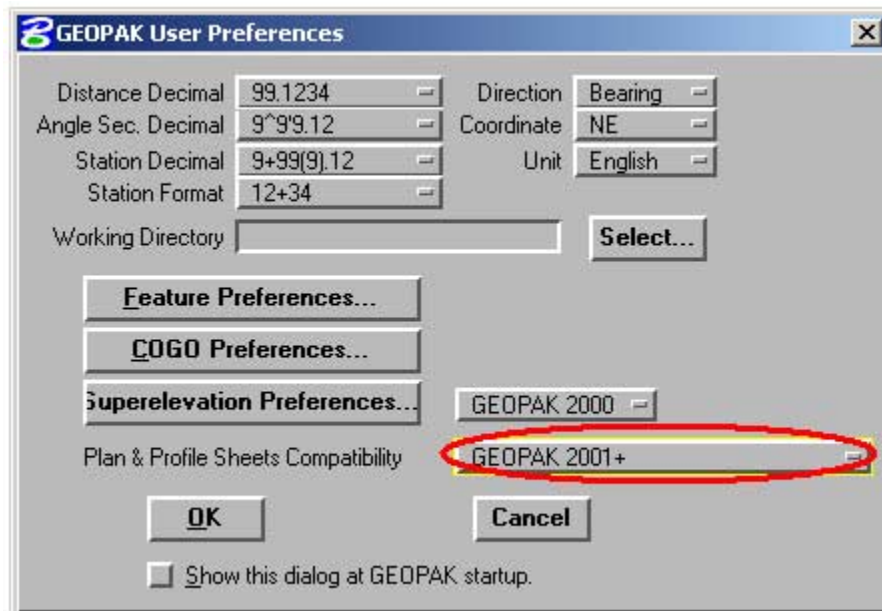
OVERVIEW:

Geopak Plan and Profile Sheet Layout Tool automates the process of generating our plan and profile sheets. This application will provide our designers the ability to efficiently and effectively create and clip our plan and profile sheets. In addition, Iplot Organizer works very well with this application once the sheets have been created. There is one major procedural practice that has to be agreed on Unit wide before we can implement this. Most Roadway Designers prefer to show the same range of stationing that is on the plan sheets on the corresponding profile sheets. For example, for our first plan sheet, sheet 4, we clipped an area on our design that encompasses station ranges for 10+00.00 to 24+00.00. On sheet 24, our first profile sheet, the station range should also be from 10+00.00 to 24+00.00. Some Roadway Designers prefer a 1300' stationing range for plan and profile sheets, and other prefers 1400'. For our initial evaluation of this application we will set up for 1400' stationing shown on our plans and profile sheets.

Recommend 1400' as standard and enforce.

REQUIREMENTS:

- ✓ Plan/Profile Sheet Library file (*.psl) – Provided and managed by Cadd Administrators.
- ✓ *.gpk
- ✓ Design file with all pertaining reference files (i.e. drn, row, and pln's)
- ✓ Profile file
- ✓ Updated Workspace for new sheet cells.
- ✓ **Plan & Profile Sheet Compatibility** set to **Geopak 2001+** (under Geopak User Preference).



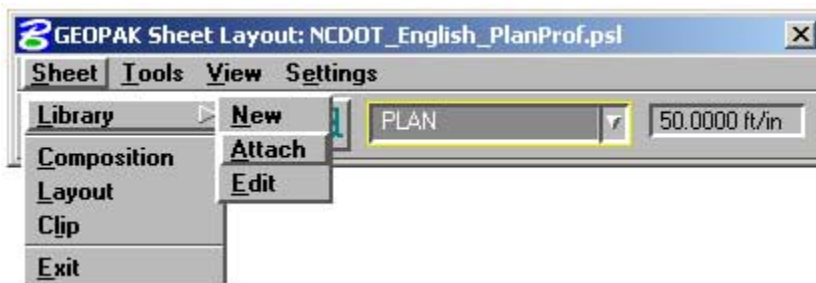
PROCEDURE:

Plan Sheet Layout

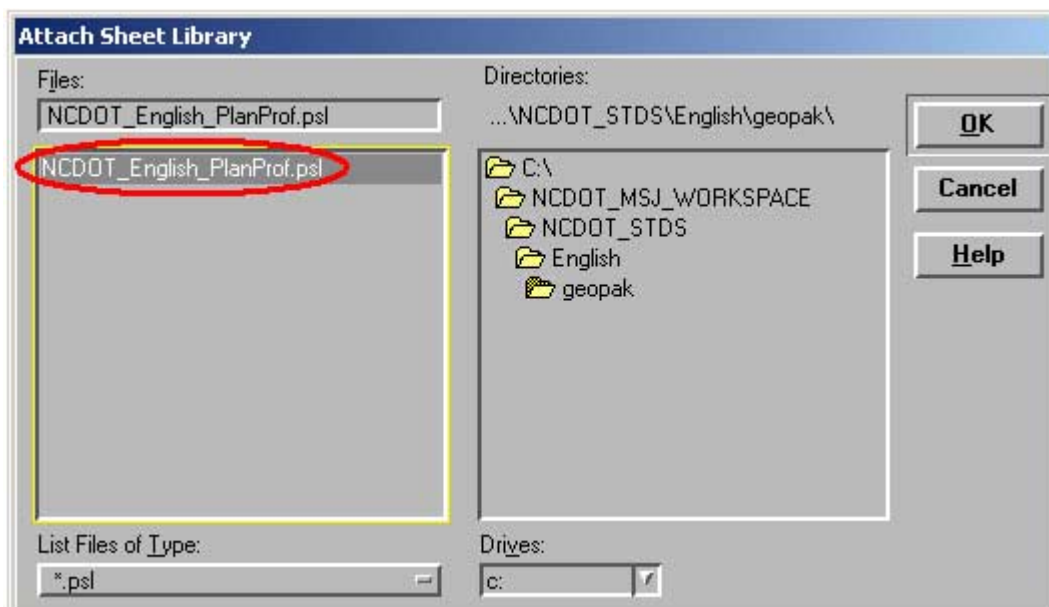
1. Open your design file (dsn). Make sure all the reference files are attached. Even though reference files can be added later, it would involve a little bit more work.
2. Activate the Geopak Sheet Layout tool. In the Geopak **Road** Tool Frame → **Plans Preparation** Family → **Plan/Profile Sheet Composition** Toolbox.



3. Attach Sheet Library (*.psl). **Sheet** → **Library** → **Attach**.



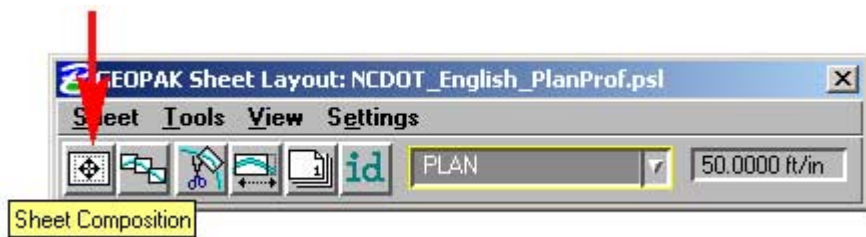
We will be using **NCDOT_English_PlanProfile.psl** in C:\NCDOT_MSJ_WORKSPACE\NCDOT_STDS\ENGLISH\geopak\ folder.



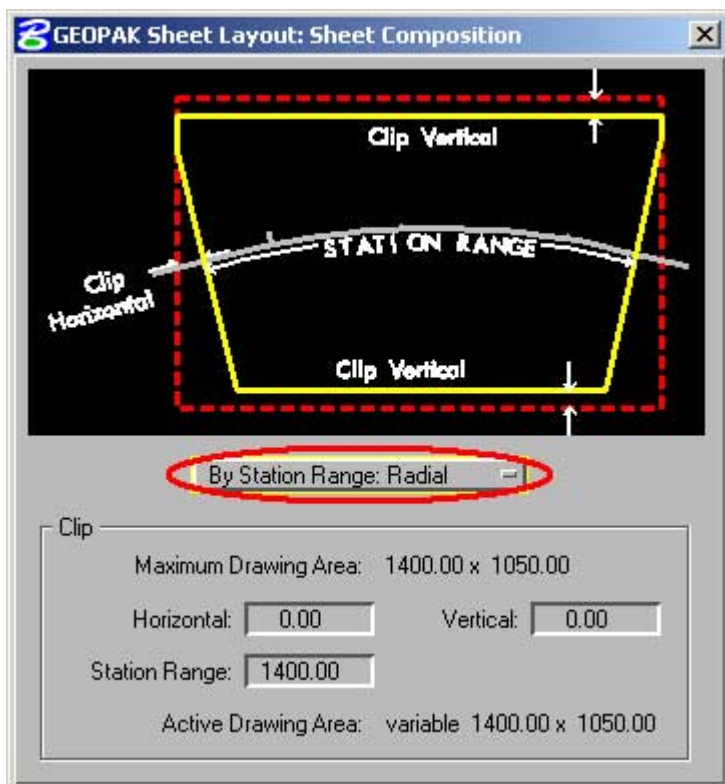
NOTE: Because this file is located in the NCDOT Workspace, the file will be overwritten with the Workspace Update Program.

4. Set sheet type to **PLAN**.
5. Set scale to **50 ft/in**.
6. Populate **Sheet Composition** dialog setting box.

→ **Sheet Composition** toolbox.



Choose clip mode **By Station Range: Radial**



Horizontal: 0.00
Vertical: 0.00
Station Range: 1400.00

Close dialog box

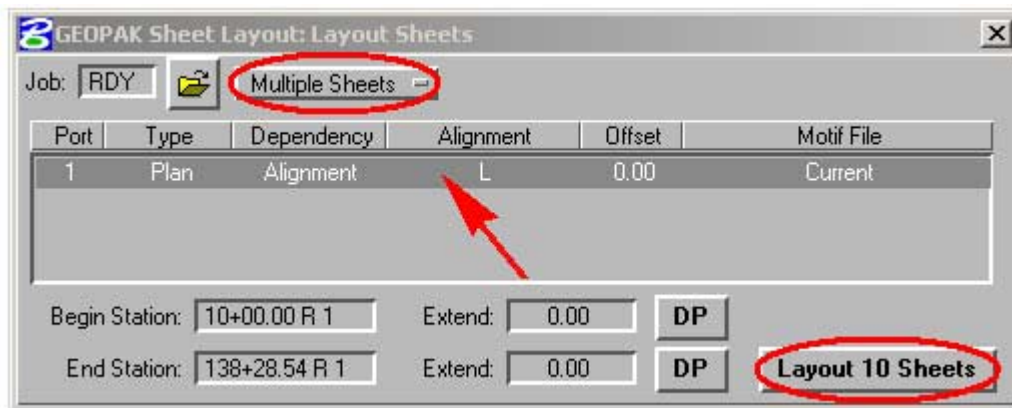
7. Layout sheets.

→ **Layout Sheets** toolbox.



Job: rdy (Select the location and name of your gpk file.)

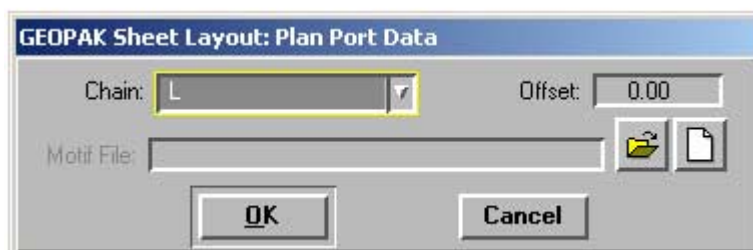
Choose **Multiple Sheets**



Double click inside the highlighted row in the settings window to set the **Plan Port Data** dialog box parameters.

Chain: L (Choose the chain name to place the plan sheets along.)

Offset: 0.00



→ OK

Begin Station: 10+00.00 R 1 (Accept or enter desired beginning station .)
 Extend: 0.00 (Enter desired distance or DP from beginning station to start clipping)
 End Station: 138+28.54 R 1 (Accept or enter desired ending station .)
 Extend: 0.00 (Enter desired distance or DP from ending station to stop clipping)

Select → **Layout [No. of] Sheets** button.

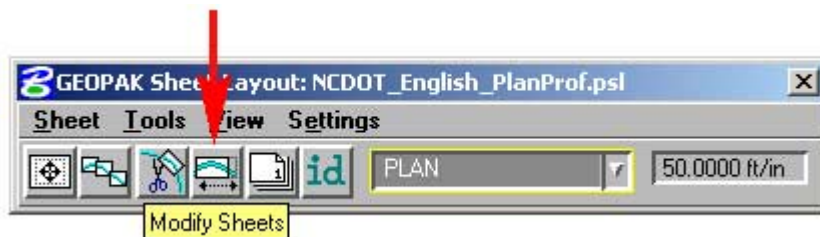
Close dialog box

Repeat this step if plan sheets are required for -Y- Lines.

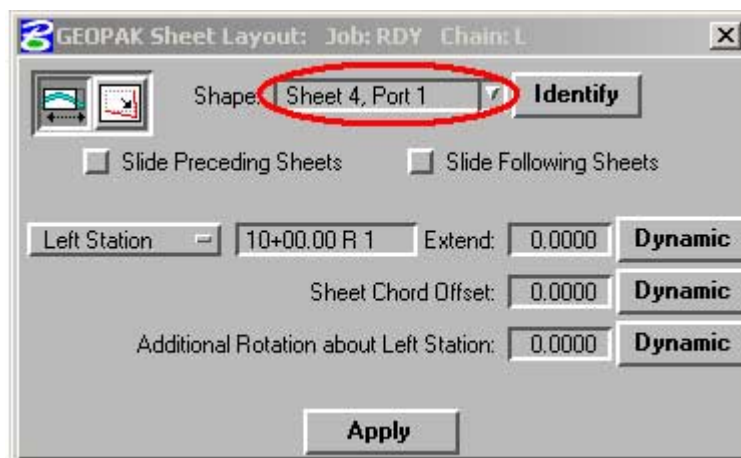
TIP! Use the **Begin Station** and **End Station** options to place clipping shapes for your -Y- Lines that overlap the mainline. See **Modifying Clipping Area for Overlapping -Y- Line Sheets** for more details.

8. Modify clipping area for each sheet (if needed).

→ **Modify Sheets** toolbox.



Use the **Shape:** field to highlight and navigate to the sheet you want to modify or view; else use the **Identify** button to locate the sheet to edit.



Types of modifications



Slide Sheets – Using a fixed station on the clipped sheet (**Left Station**, **Center Station**, or **Right Station**) as a point of reference, users can either key-in a distance in the **Extend:** field or manually (**Dynamic**) slide the clipped sheets laterally to the alignment. If the clipped sheet needs to slide perpendicular to the alignment, then use the **Sheet Chord Offset** option. Users can furthermore rotate the angle of the clipped sheet by using the **Additional Rotation about Left Station:** option.

NOTE: The **Slide Preceding Sheets** and **Slide Following Sheets** options will only work with sliding the clipped sheets laterally (**Extend:** option). They have no effect on the **Sheet Chord Offset** and the **Additional Rotation about Left Station** options. In addition to this type of modification, notice the shape area of the clipped sheets still maintains the 1400' station range to be shown.



Modify Drawing Area - Sometimes a sheet or two needs to be readjusted to show only a portion of a normal size sheet. Such is the case when creating an interchange sheet and having to adjust the sheet before and/or sheet after it. Users can use this type of modification to perform such a task. Using a fixed point on the clipped sheet (under **Hold To: Left Station**, **Center Station**, or **Right Station**) users can key-in a fixed distance (station) in the **Drawing Shown:** field and the **Horizontal:** clipped out field is automatically adjusted.

NOTE: The **Vertical:** field is not automatically adjusted. This is due to the fact that when we changed our parameter to show just station range we wanted shown, the program needs to adjust how much to clip out left and right of the sheet (horizontally). The offset distance to be clipped from top and bottom of sheet is disregarded in its automation. However, the user can manually key-in a fix offset distance in the **Vertical:** field and the program accepts that value. Also note that the **Slide Preceding Sheets** and **Slide Following Sheets** options are available. It is important to be aware of which sheets you want to move when you make the change and which sheets you want to stay static.

→ **Apply** to save the modification changes.

Close dialog box.

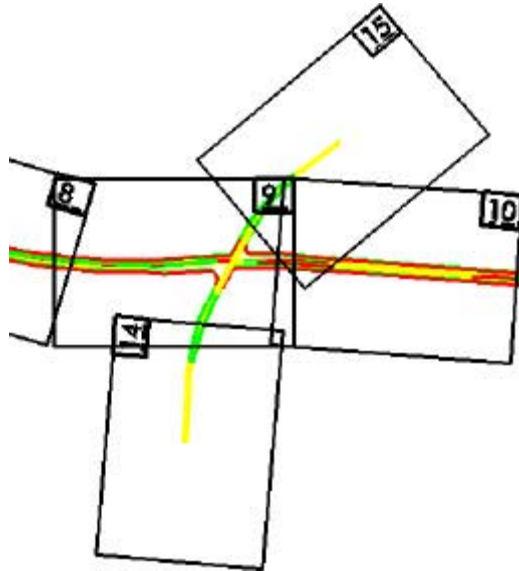


Modifying Clipping Area for Overlapping -Y- Line Sheets

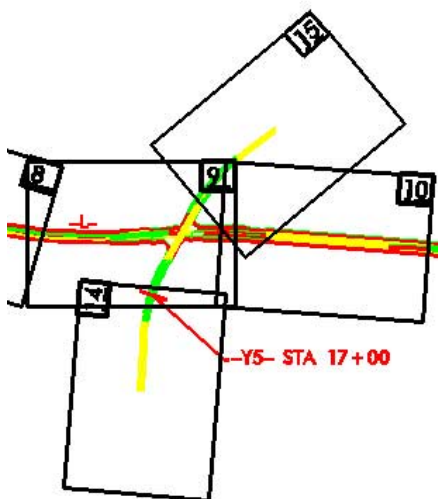


Do not use the **Modify Sheets** tool to modify the clipping area for overlapping -Y- Line sheets. When the modifications have been applied using the **Modify Sheets** tool, the clipping shape will be reset back to its original form. It is recommended that your basic Microstation edit tools be used to modify the shapes for clipping. The Modify Element, Insert Vertex, and Delete Vertex tools are very effective tools for this type of modification. Below is an example what to do when the user encounters the task of modifying the clipping area for -Y- Line sheets.

We have sheets 14 and 15 for our -Y- Line overlapping our -L- Mainline on sheet 9.



When laying out sheet 14, choose and key-in an even station on the -Y- Line that both alignments share in the **End Station** Field. Compensate for the 1400' station to be shown on each sheet by keying in the adjusted distance in the Begin Station Extend: field. This will put our match line exactly at station 17+00.



GEOPAK Sheet Layout: Layout Sheets

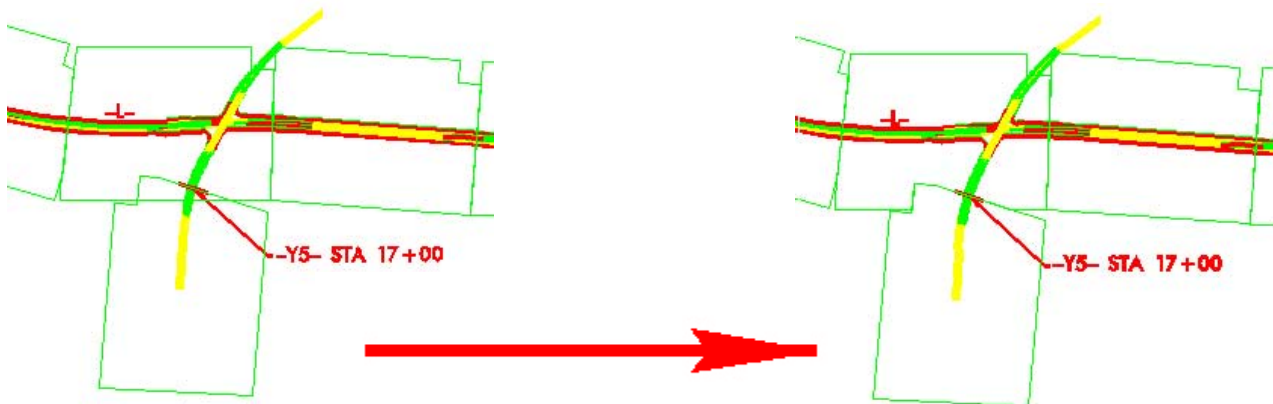
Job: RDY Multiple Sheets

Port	Type	Dependency	Alignment	Offset	Motif File
1	Plan	Alignment	Y5	0.00	Current

Begin Station: 10+00.00 R 1 Extend: -700.00 DP

End Station: 17+00.00 R 1 Extend: 0.00 DP Layout 1 Sheet

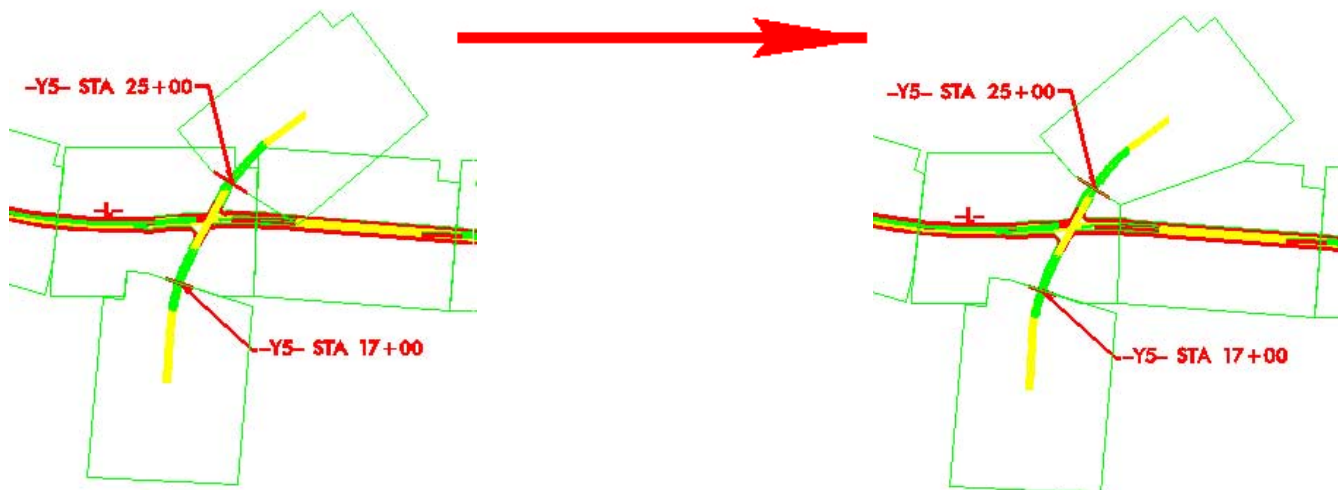
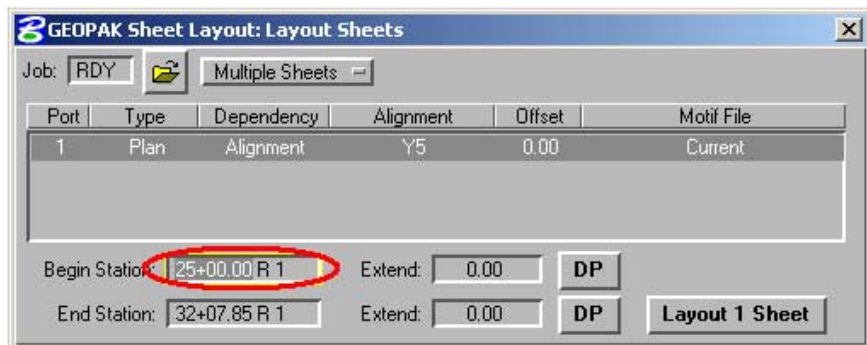
Now we have two clipping areas overlapping each other.



Use your MicroStation editing tools to modify the clipping areas. There is really not a right or wrong way to modify these shape and to show how much of the drawing on each sheet. Most of time it is up to the designer's engineering judgement and preferences. There are, however, some few basic guidelines to follow to make your sheets more aesthetically pleasing. They are as follow:

1. The length of the match line should be the same on both sheets.
2. Your clipping shapes should extend at least the length of your match line or longer.
3. Match line and clipping shape should project radially from your alignment at an even station.
4. Clipping shape areas should not overlap each other once proper modification has been made.

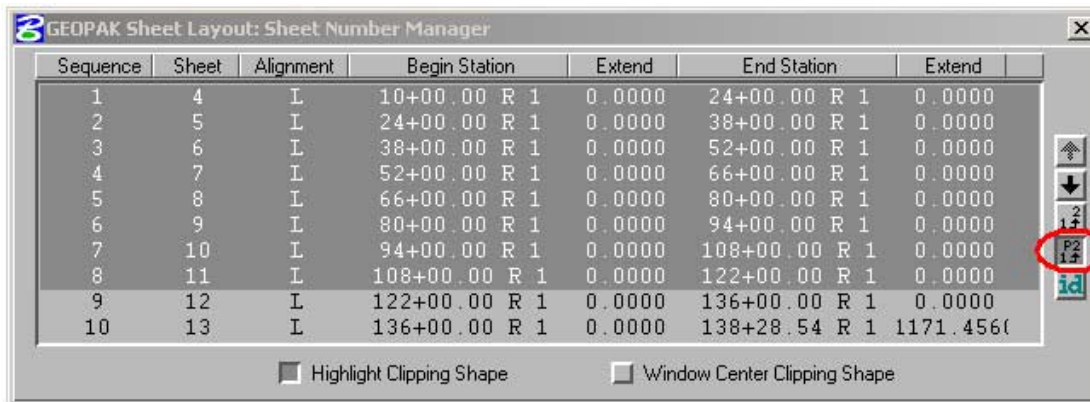
Here is one possible solution for placing and modifying sheet 15 clipping area.



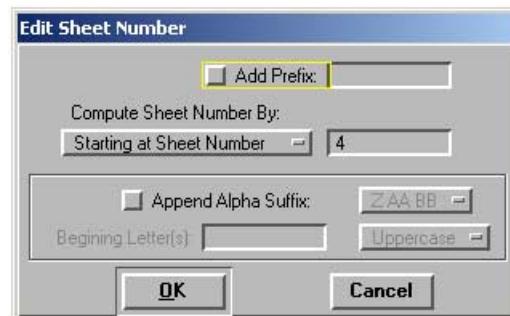
9. Change sheet number and sequence.



Bring up the Sheet Number Manager. → **Sheet Number Manager** toolbox. Start with sequence 1 and hold down the left mouse button and drag it down to the bottom of the last sequence number to select all sheets.



→ **Edit Sheet Number**. In the **Starting at Sheet Number** field key-in 4. → **OK**.



TIP!: It may be necessary to edit the sequence in some cases. When a sheet like our interchange is laid out after our regular sheets, the sequence number is after our last sheet. The interchange sheet is located somewhere in the middle. But our sequence and sheet number are both off. We need to renumber the sheet to correct sequence and sheet number, in this order. To accomplish this, first select the sheet to be renumbered. → **Edit Sequence Number**. Key-in the new sequence number in the **Beginning Sequence Number:** field. → **Ok**. Start with new sequence number and drag the cursor to the last sequence number. → **Edit Sheet Number**. In the **Starting at Sheet Number** field key-in the new sheet number. → **Ok**. Repeat the procedure if another sheet is to be renumbered.

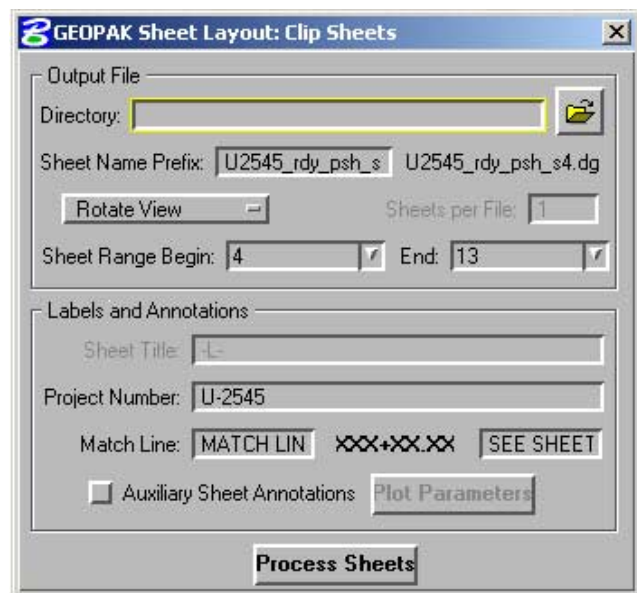
NOTE: The **Highlight Clipping Shape** and the **Window Center Clipping Shape** options are available when the sheet is selected.

Close dialog box and click **Yes** to save change.

10. Create plan sheets.



- → **Clip Sheets.**
- Key-in where the plan sheet files are to be placed in the **Directory:** Field.
- In the **Sheet Name Prefix:** Field key-in *TIP_rdy_psh_s*.
- Change the **Rotate Reference** option to **Rotate View.**
- Accept or Key-in the sheets to be generated in the **Sheet Range Begin: End:** fields.
- Key-in your TIP (with a dash (-)) in the **Project Number:** field.
- Key-in “MATCH LINE -L- STA” XXX+XX.XX “SEE SHEET ___” in the **Match Line:** field.
- → **Process Sheets.**

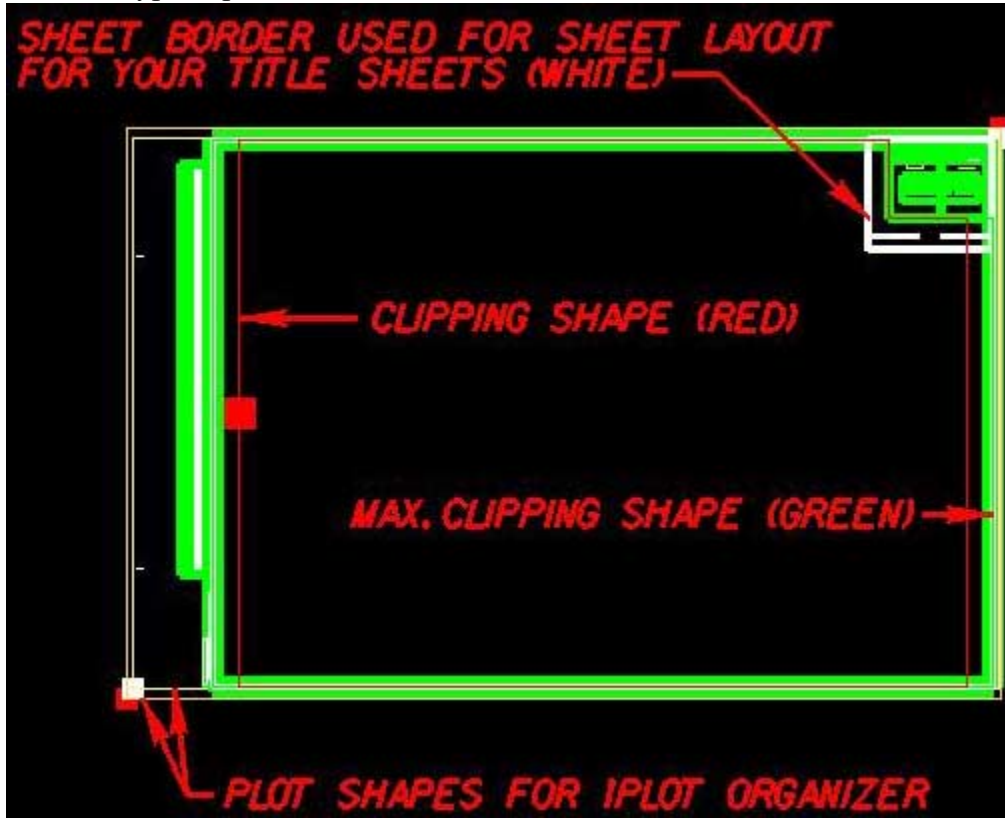


NOTE: The **Directory:** field may be left unpopulated. If this option is used, then the plan sheets will be created and placed in your current working directory or in the same directory where this MicroStation session was opened.

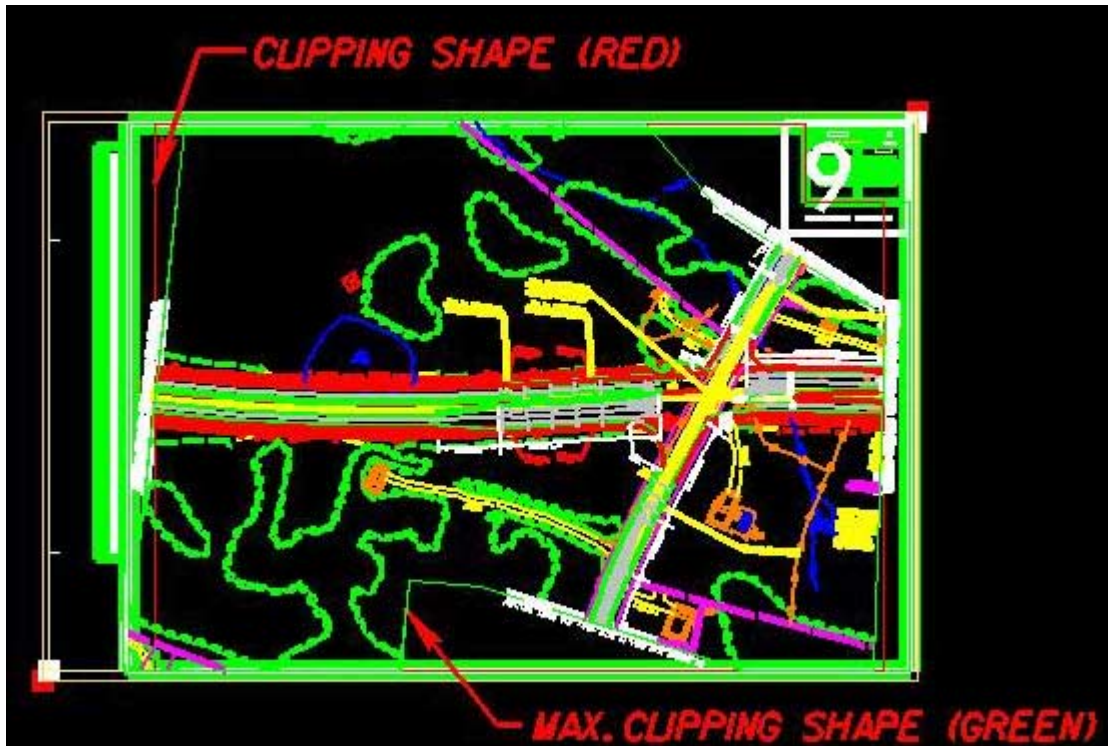
11. Edit clip area in each sheet (if needed).

What this application did was generate a plan sheet file for you with the maximum area shown on each sheet. We still can edit and clip the desired area to the way we’ve been doing it. The red clipping shape is still on our plan sheet cell. Let’s look at what we have just created.

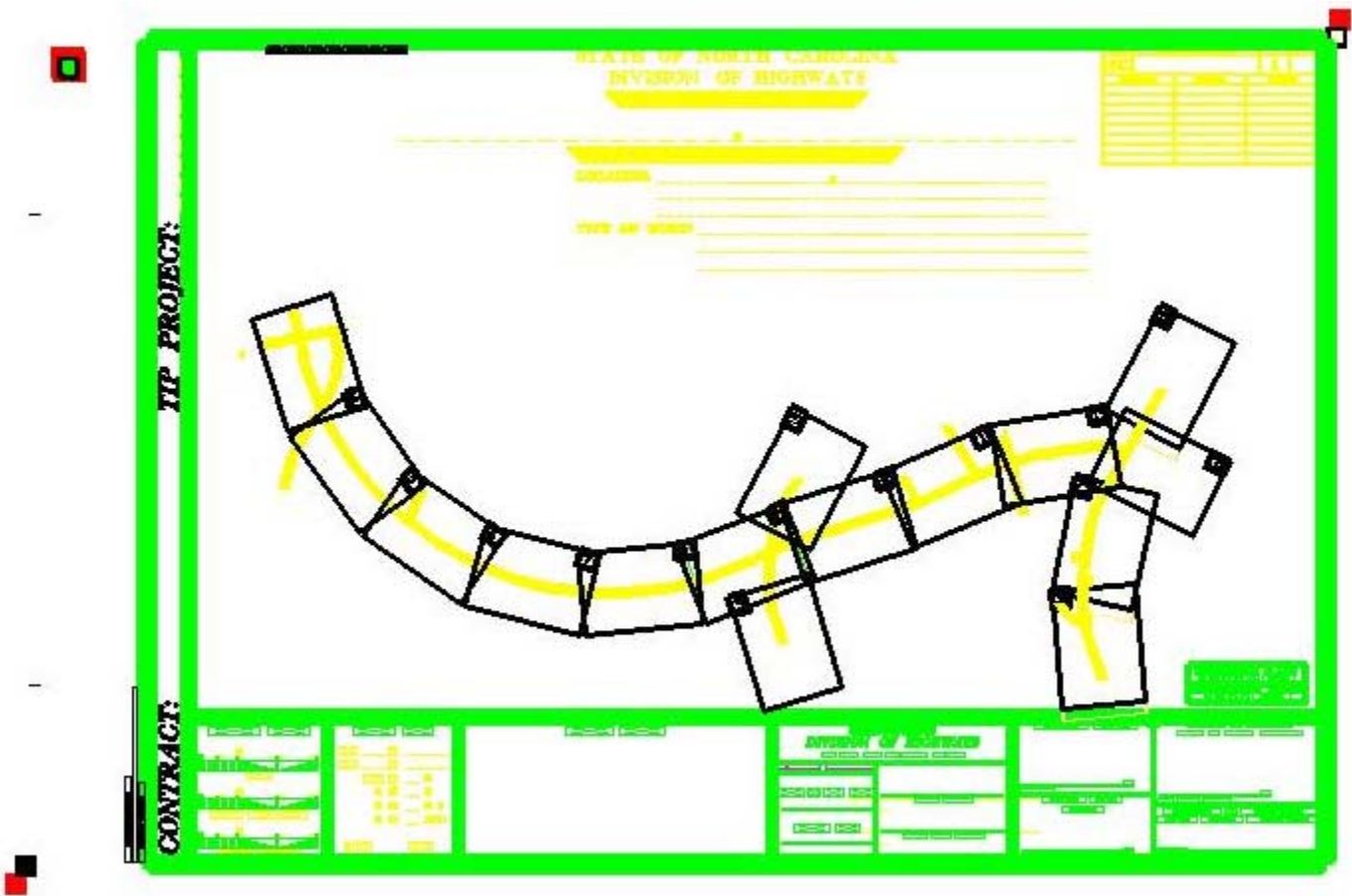
Here is a typical plan sheet cell.



Here is what we have just created.



Here is what we can do with the sheet border shapes in our title sheet.



Profile Sheet Layout

1. Open your profile file (pfl).
2. Lay out your existing profile and proposed grade.
→ **D&C Manager - NCDOT_Alignment.ddb** (the D&C button with the big “A”).



The entire existing profile and proposed grade should be laid out. If there are other profiles like -Y- lines, ramps, and loops to be laid out, they are to be laid out at this time. Each profile should be placed underneath each other in consecutive order to which they appeared on the project for manageability of multiple profiles.

Profile

EXL

Beginning Station	10+00.00
Ending Station	138+28.54
Beginning Elevation	730.1769
Ending Elevation	761.0834
Maximum Elevation	801.2005
Minimum Elevation	656.1662

Horizontal Scale

Vertical Scale

Beginning Station

Ending Station

Strip Grade Increment

DP Station

DP Elevation

DP X

DP Y

Profile Cell

PGL Chain

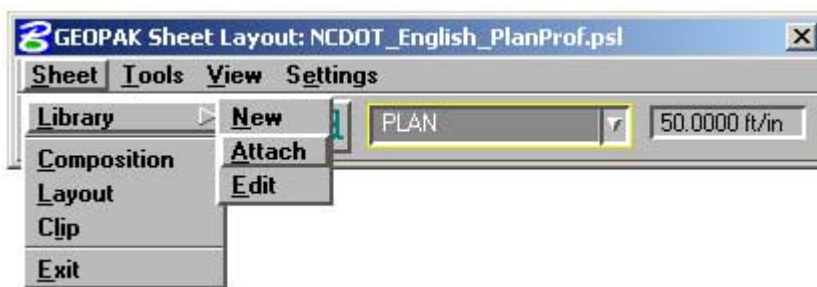
TIP!: Use the **Profile Cell** feature and select the **PGL Chain** to draw a profile cell to be used as a point of reference. In addition, the corresponding chain name, DP station and elevation, scale, and station equation treatment are also labeled.

TIP!: Use the minimum elevation in the profile information box to help you determine your elevation in the DP Elevation field. For example, if your minimum elevation is 656.1662 ft., then key-in 650 in the DP Elevation field.

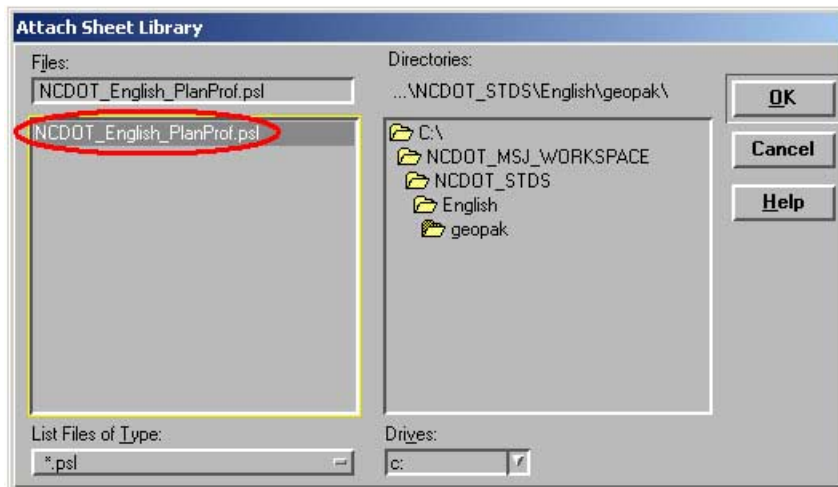
3. Activate the Geopak Sheet Layout tool. In the Geopak **Road** Tool Frame → **Plans Preparation** Family → **Plan/Profile Sheet Composition** Toolbox.



4. Attach Sheet Library (*.psl). **Sheet** → **Library** → **Attach**.



We will be using **NCDOT_English_PlanProfile.psl** in C:\NCDOT_MSJ_WORKSPACE\NCDOT_STDS\ENGLISH\geopak\ folder.



Set sheet type to **DUAL PROFILE**.
Set scale to **50 ft/in**.

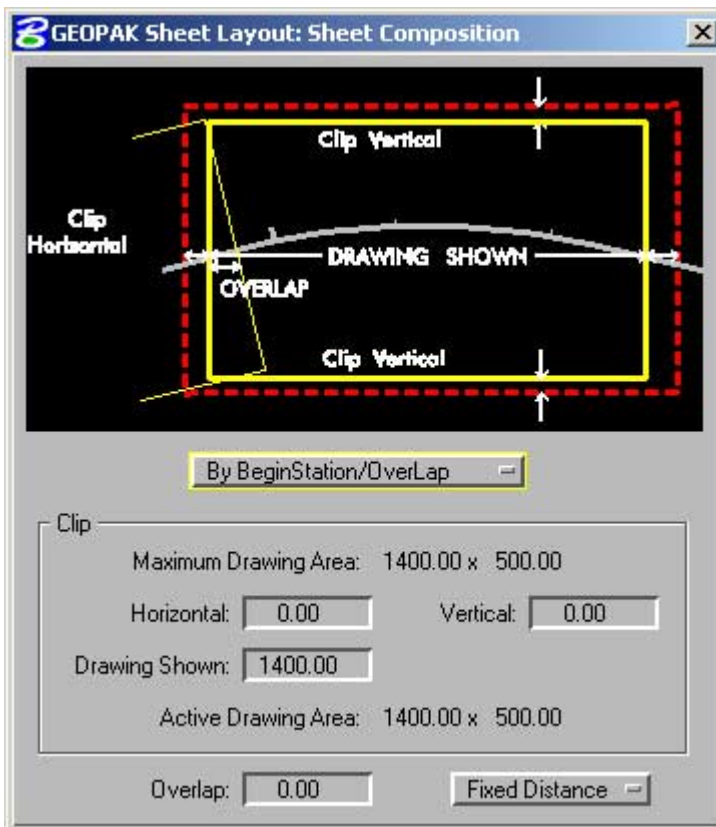


5. Populate **Sheet Composition** dialog setting box.

→ **Sheet Composition** toolbox.



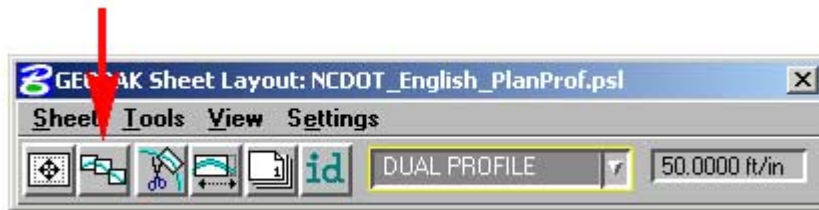
Choose clip mode **By BeginStation/Overlap**



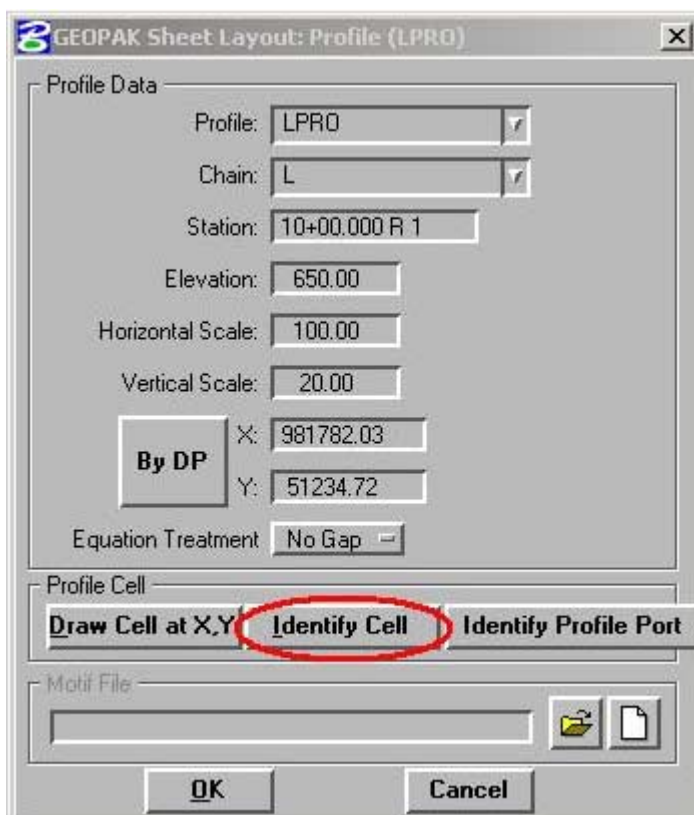
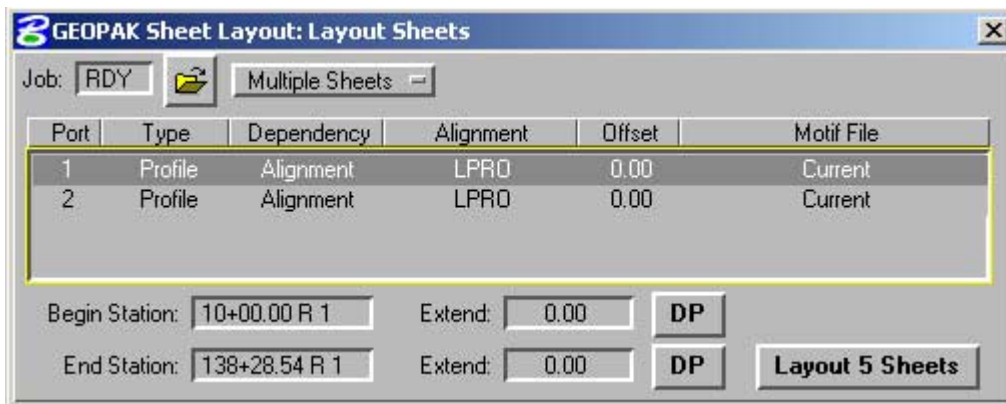
Horizontal: 0.00
 Vertical: 0.00
 Drawing Shown: 1400.00
 Overlap: 0.00

Close dialog box

6. Layout sheets.

→ **Layout Sheets** toolbox

Job: rdy (Select the location and name of your gpk file.)

Choose **Multiple Sheets**Double click on the 1st row to edit the settings for Port 1.

Profile: LPRO (Choose the profile name.)

Chain: L (Choose the chain name.)

Station: 10+00.00 R 1 (Accept or key-in DP station.)

Elevation: 650 (Accept or key-in DP elevation.)

Horizontal Scale: 100

Vertical Scale: 20

→ **By DP** – defines X and Y coordinates of reference DP point.

TIP!: The **Identify Cell** feature will auto-populate all the fields from **Chain:** down. That's very cool!

→ OK

Double click on the 2nd row to edit the settings for **Port 2**. In most cases, the settings for **port 1** is the same for **port 2**. If this is the case then just click **Ok**. If not repeat the procedure for changing the setting for Port 1.

Begin Station: 10+00.00 R 1 (*Accept or enter desired beginning station .*)

Extend: 0.00 (*Enter desired distance or DP from beginning station to start clipping*)

End Station: 138+28.54 R 1 (*Accept or enter desired ending station .*)

Extend: 0.00 (*Enter desired distance or DP from ending station to stop clipping*)

Select → **Layout [No. of] Sheets** button.

Repeat the procedure if other profiles are to be laid out.

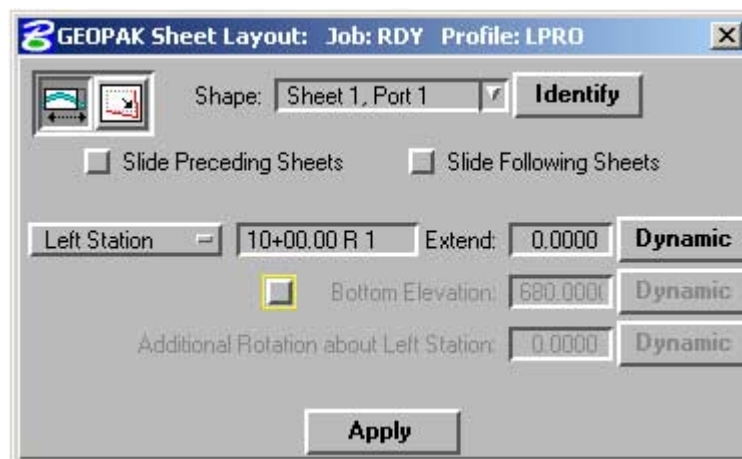
Close dialog box

7. Modify the sheet clipping area (if needed).


→ **Modify Sheets** toolbox.




Use the **Shape:** field to highlight and navigate to the sheet you want to modify or view; else use the **Identify** button to locate the sheet to edit.



Types of modifications

 **Slide Sheets** – Using a fixed station on the clipped sheet (**Left Station**, **Center Station**, or **Right Station**) as a point of reference, users can either key-in a distance in the **Extend:** field or manually (**Dynamic**) slide the clipped sheets laterally to the alignment. If the clipped sheet needed to slide perpendicular to the alignment, then use the **Sheet Chord Offset** option. Users can furthermore rotate the angle of the clipped sheet by using the **Additional Rotation about Left Station:** option. Note that the **Slide Preceding Sheets** and **Slide Following Sheets** options will only work with sliding the clipped sheets laterally (**Extend:** option). They have no effect on the **Sheet Chord Offset** and the **Additional Rotation about Left Station** options. In addition to this type of modification, notice the shape area of the clipped sheets still maintains the 1400' station range to be shown.

 **Modify Drawing Area** – Use this option only if the drawing area was modified in the plan sheets.

→ **Apply** to save the modification changes.

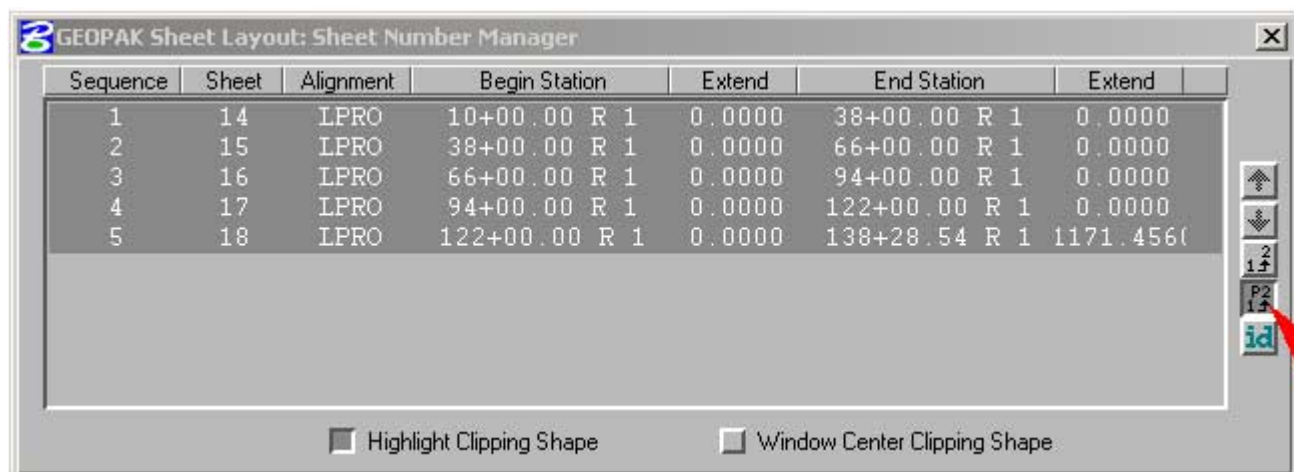
Close dialog box.

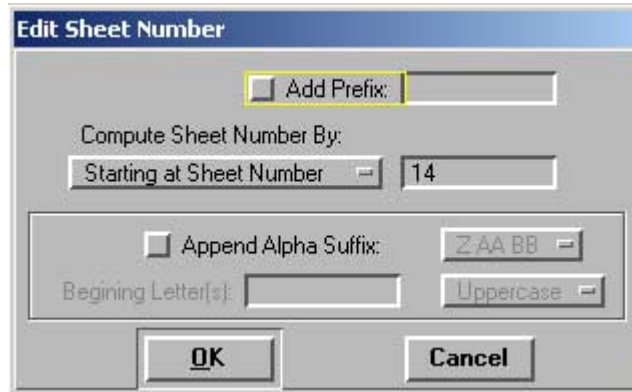
10. Change sheet number and sequence.

Bring up the Sheet Number Manager. → **Sheet Number Manager** toolbox.



Start with sequence 1 and hold down the mouse button and drag it down to the bottom of the last sequence number to select all sheets. → **Edit Sheet Number**.





In the **Starting at Sheet Number** field key-in first profile sheet number. → **OK**.
Close dialog box and click **Yes** to save change.

11. Create profile sheets.

→ **Clip Sheets**.



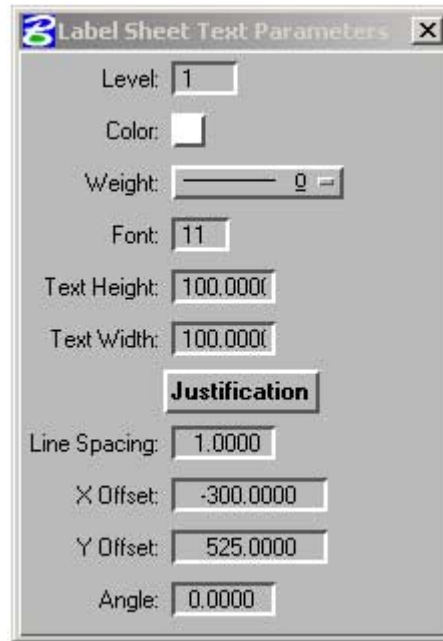
- Key-in where the profile sheet files are to be placed in the **Directory:** Field.
- In the **Sheet Name Prefix:** Field key-in *TIP_rdy_pfl_s*.
- Change the **Rotate View** option to **Rotate Reference**.
- Key-in 50 in the **Sheets per File:** field.
- Accept or key-in the sheets to be generated in the **Sheet Range Begin:** **End:** fields.
- Key-in your TIP (with a dash (-)) in the **Project Number:** field.
- **Process Sheets**.

TIP!: Notice that the sheet title may be entered in the **Labels and Annotations** frame. I recommend key-in your main line PGL chain name (-L-). This will work for most of your sheets. If the label name is



not correct, then manually edit it. Hopefully, the option to label the PGL chain name on profile sheets will be available in future Geopak updates.

TIP!: Select the **Auxiliary Sheet Annotations** option to label your sheet number and profile name next to your sheet. Use these parameters.



TIP! Turn level 63 off in your profile file and select Save Settings under the File menu. This will turn off the display of the brown and red port shapes in the file. After the profile sheets have been processed, level 63 will also be turn off and the port shapes are not displayed. Any view attribute setting can be inherited by the produced sheet file(s) from your original file using this method of creating plan and profile sheets.

Interplot Organizer

OVERVIEW:

With the automation of the plan and profile sheet layout tool, I feel compelled to incorporate the overall procedure with Interplot Organizer. Generating an Interplot Organizer set is also an automated process. Did you know that Roadway Design always had the ability to create an Interplot Organizer set in a matter of seconds? How would you like to create an Interplot Organizer set of 20 plan sheets in less than a minute? Sounds enticing don't it? With the placement of a construction shape element in our sheet cells, we have eliminated the process of having to open each file individually and define the fence area to be plotted and saving our Iparm files. Interplot Organizer will create our Iparm files for us automatically.

REQUIREMENTS:

Interplot Organizer
Updated NCDOT plan and profile sheet cells

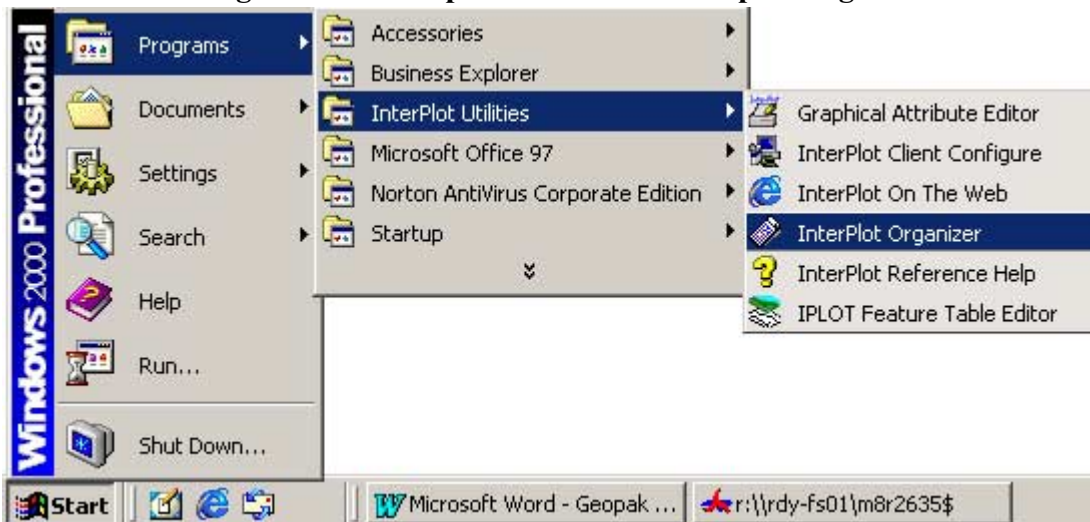
PROCEDURE:

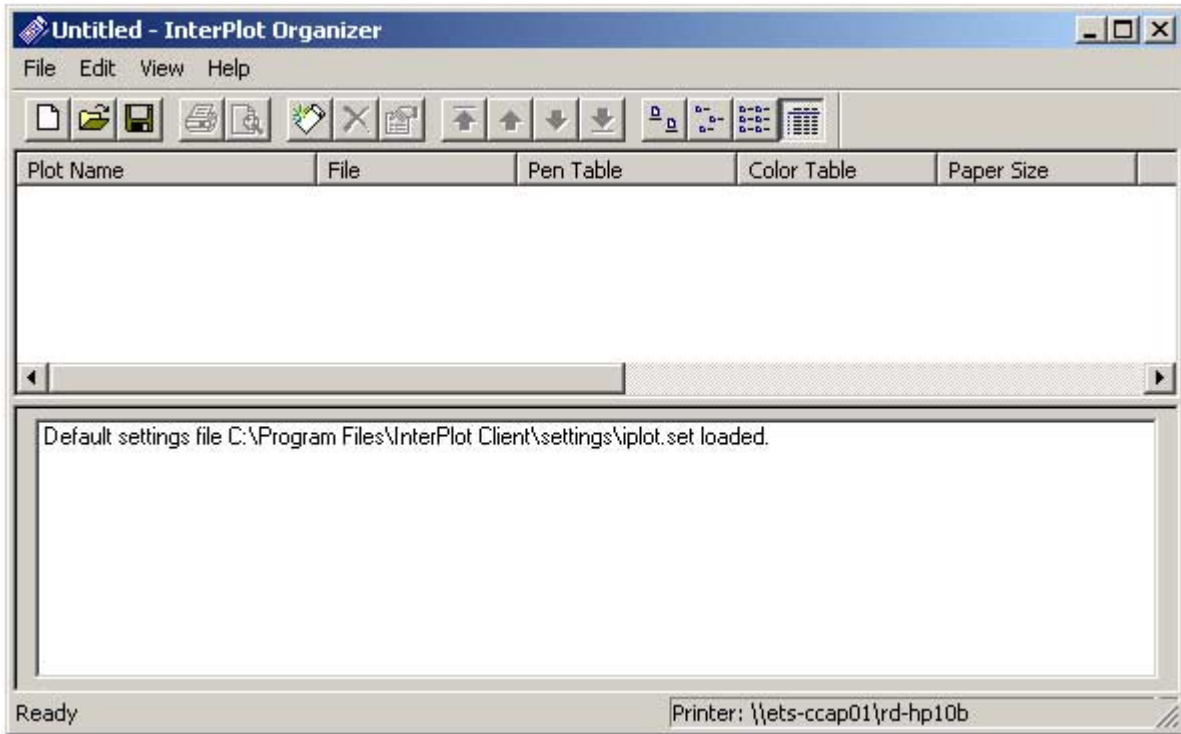
Plan sheets

1. Connect to your TIP as R: drive.

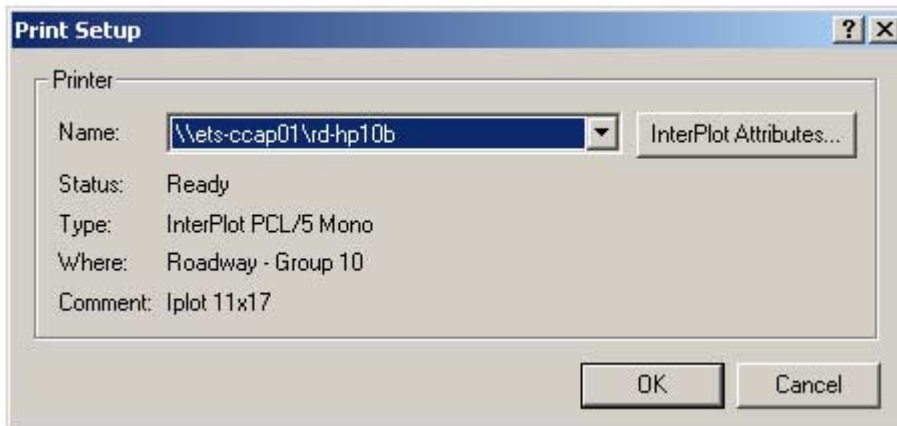


2. Launch an **Interplot Organizer** session.
→ **Start.** → **Programs.** → **Interplot Utilities.** → **Interplot Organizer.**





3. Set print setup.
→ File. → Print Setup.



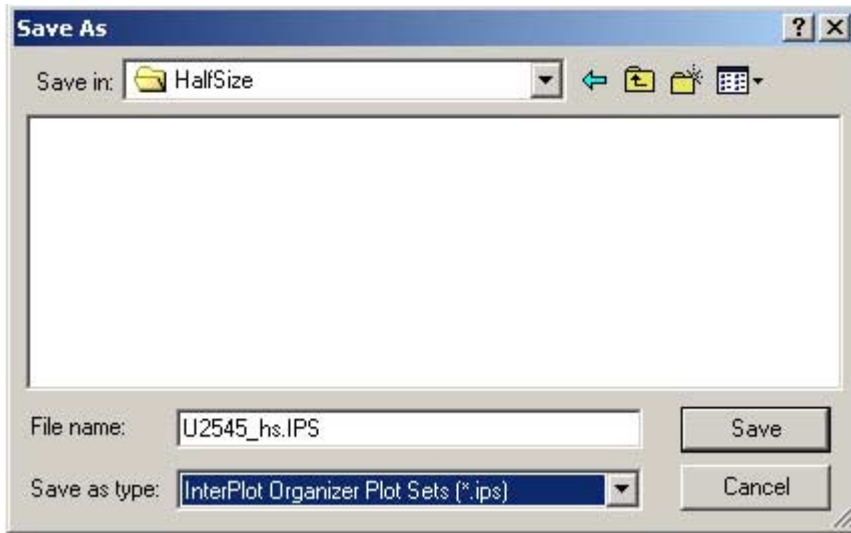
In the **Name:** field, choose your appropriate plotter.

rd-hp[*group number*]b – use this plotter for half-size plan and profile sheet plots.
rd-[*group number*]oce34- user this plotter for full-size plan and profile sheet plots.

4. Save your ips file.
→ File. → Save As.
In the **Save in:** field, choose the appropriate folder to save the ips file in.

R:\Roadway\iFiles\HalfSize\ – path to this folder for half-size plots.
R:\Roadway\iFiles\FullSize\ – path to this folder for full-size plots.

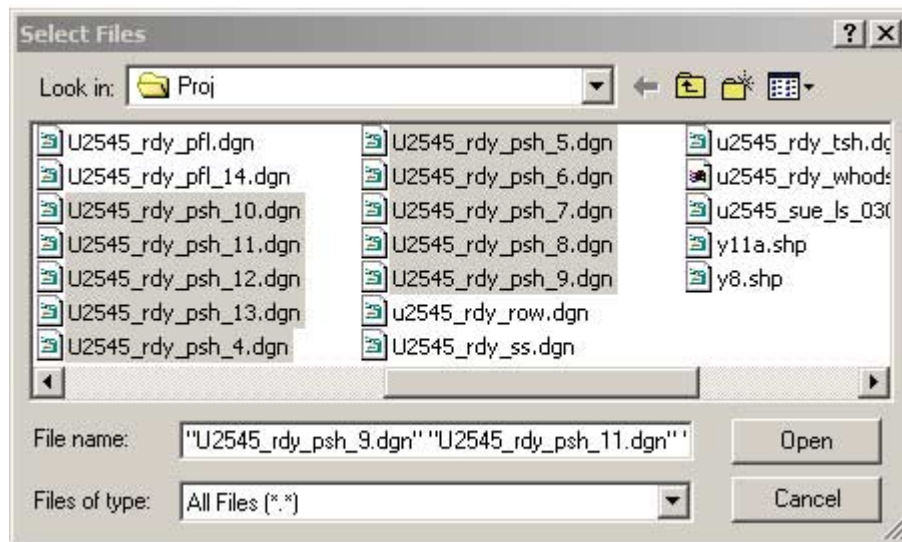
In the **File name:** field key-in your TIP_hs.ips for half-size plots, your TIP_fs.ips for full-size plots.



5. Create plots.

→ **File**. → **Create Plots...** → **Add...**

In the **Look in:** field, select the appropriate folder where the actual plan and profile sheet files are located.

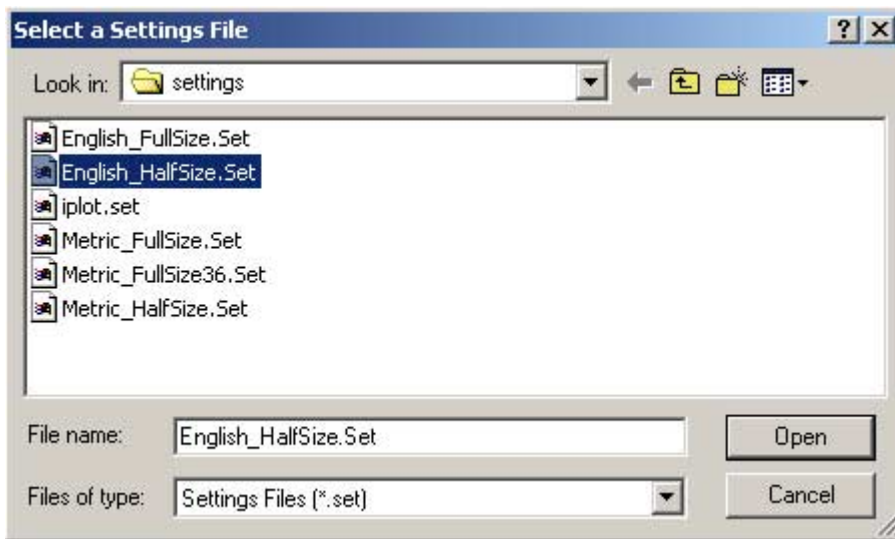


NOTE: Standard NCDOT cadd file naming convention and file structure mandates that all plan and profile sheets created by the Roadway Design Unit to be placed in the in the R:\Roadway\proj\ folder.

NOTE: When we created our plan sheet files, the program named them in consecutive order and clusters them together. This has a significant impact when we want to select all plan sheet dgn's to be considered for creating our plots. We should also note that sheets number 4 through 9 will be last in order if plan sheets number 10 and greater have been created.

Select the first plan sheet dgn file. Hold the **Shift** key down, select the last plan sheet dgn file. This will highlight all plan sheet files. → **Open**.

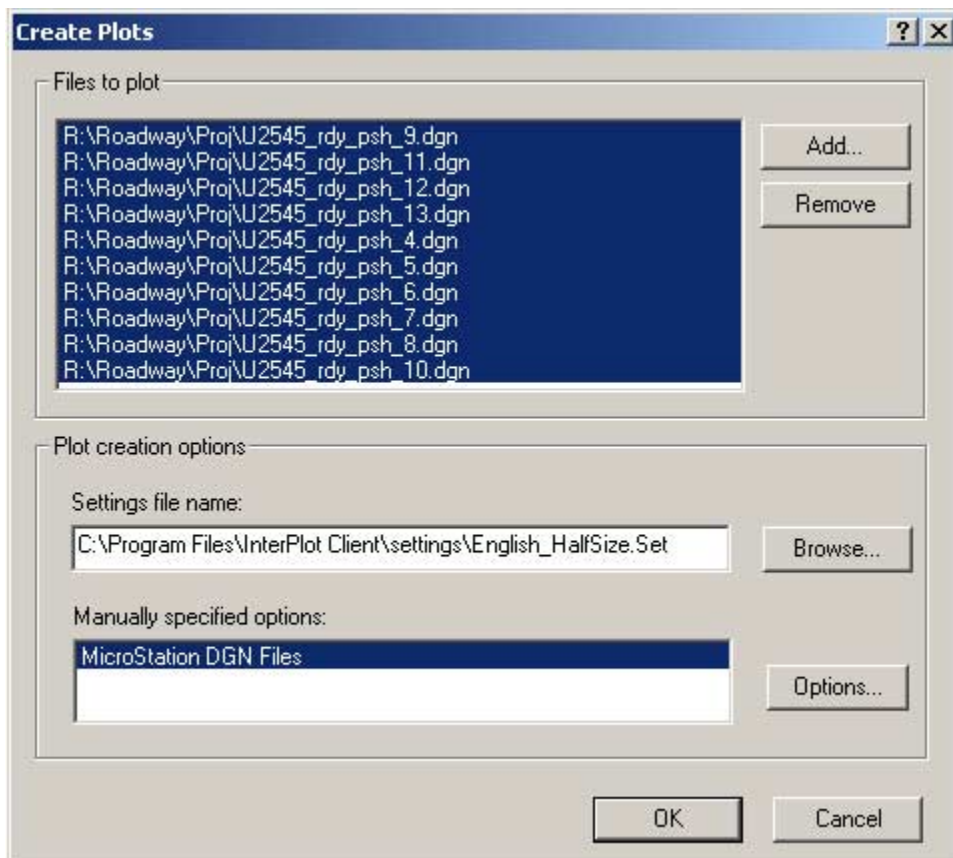
→ **Browse.** Select the appropriate Interplot setting file.

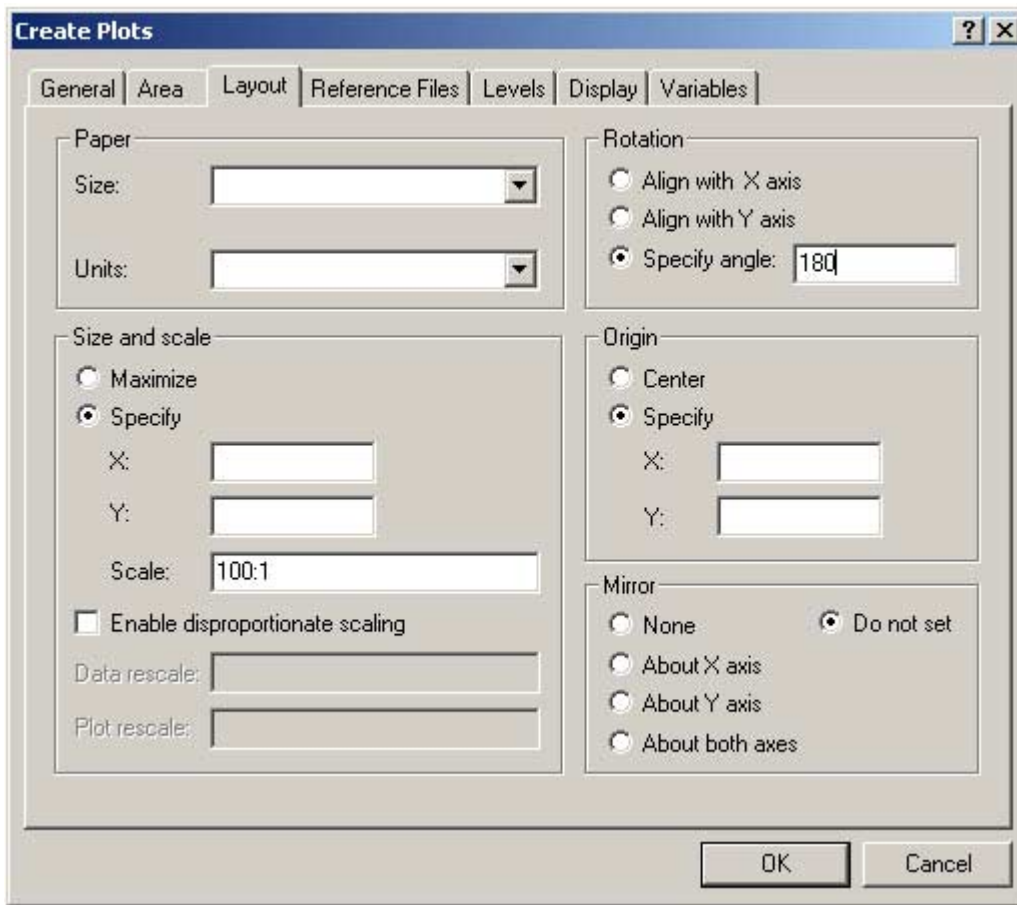


English_FullSize.set
 English_HalfSize.set
 Metric_FullSize.Set
 Metric_FullSize36.Set
 Metric_HalfSize.set

→ **Open**

Select **MicroStation DGN Files** in the **Manually specified options:** frame. → **Options...**





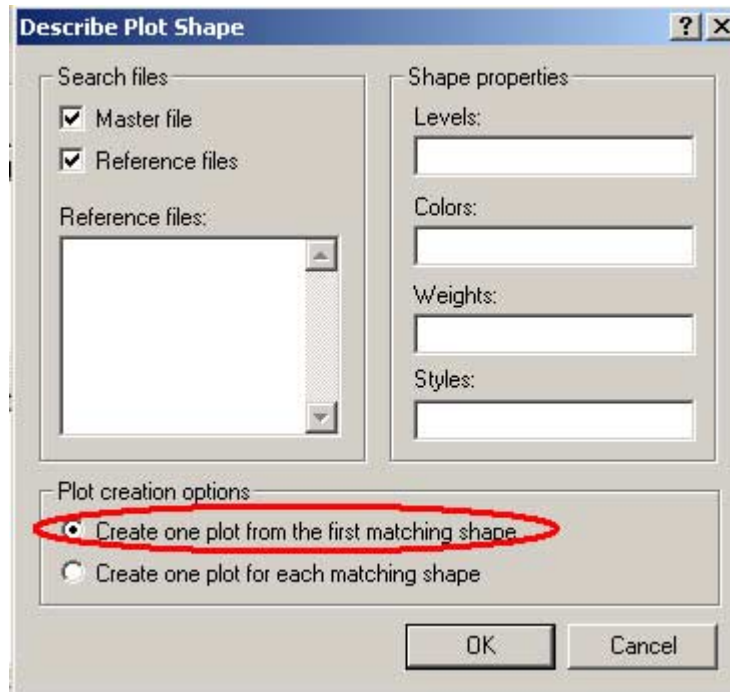
Under the **Layout** tab, key-in the appropriate plot scale in the **Scale:** field. Within the **Rotation:** frame, key-in 180 for half-size plots, 90 for full-size plots, in the **Specify angle:** field.

NOTE: Although our *.set file will set the right rotation for you and the scale is automatically determined by the software, it is good practice to key-in the desired rotation and scale. When plots are created from an existing Iparm file, it inherits the plotting properties of the resulting plot process. The rotation and scale values may be different. For example, we plot sheet 5 with a rotation of 0 and a scale of 50. We then create our plots from this existing Iparm file to the plots we've already made. Our Organizer set shows a rotation of 0 and scale of 50, while the rest of our plots are rotated 180 and have a scale of 100.

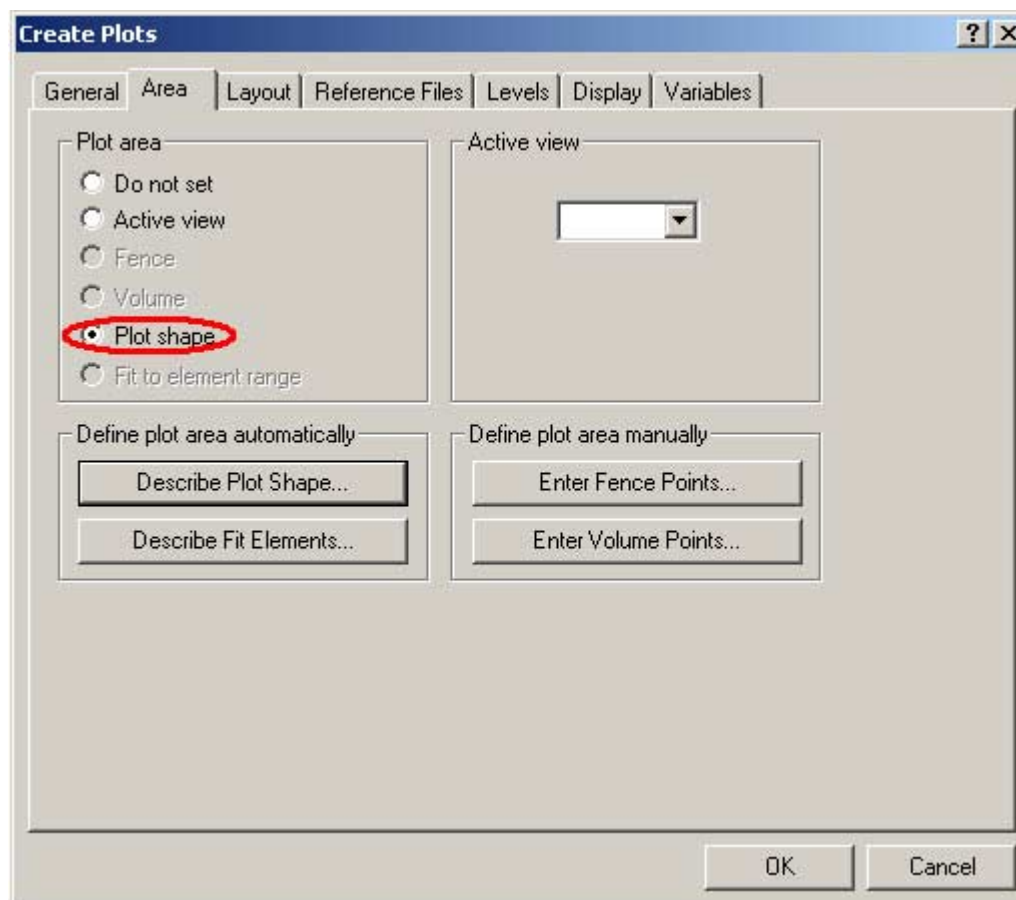
TIP!: Use a plot scale that works for most of your sheets when creating plots for multiple sheets with different plot scales. Then later manually change the plot scale of the few sheets to their respective scale. For example, if you have a project with 15 plan sheets with a full-size plot scale of 50:1, 2 interchange sheets of full-plot scale 100:1, a title sheet with plot scale of 1750:1, and typical sheets with full-size plot scale of 10:1, use a scale of 50:1. Once the plots have been created, change the scale of the sheets manually to their respective scale.

Select the **Area** tab. Select **Describe Plot Shape** option in the **Define plot area automatically** frame.

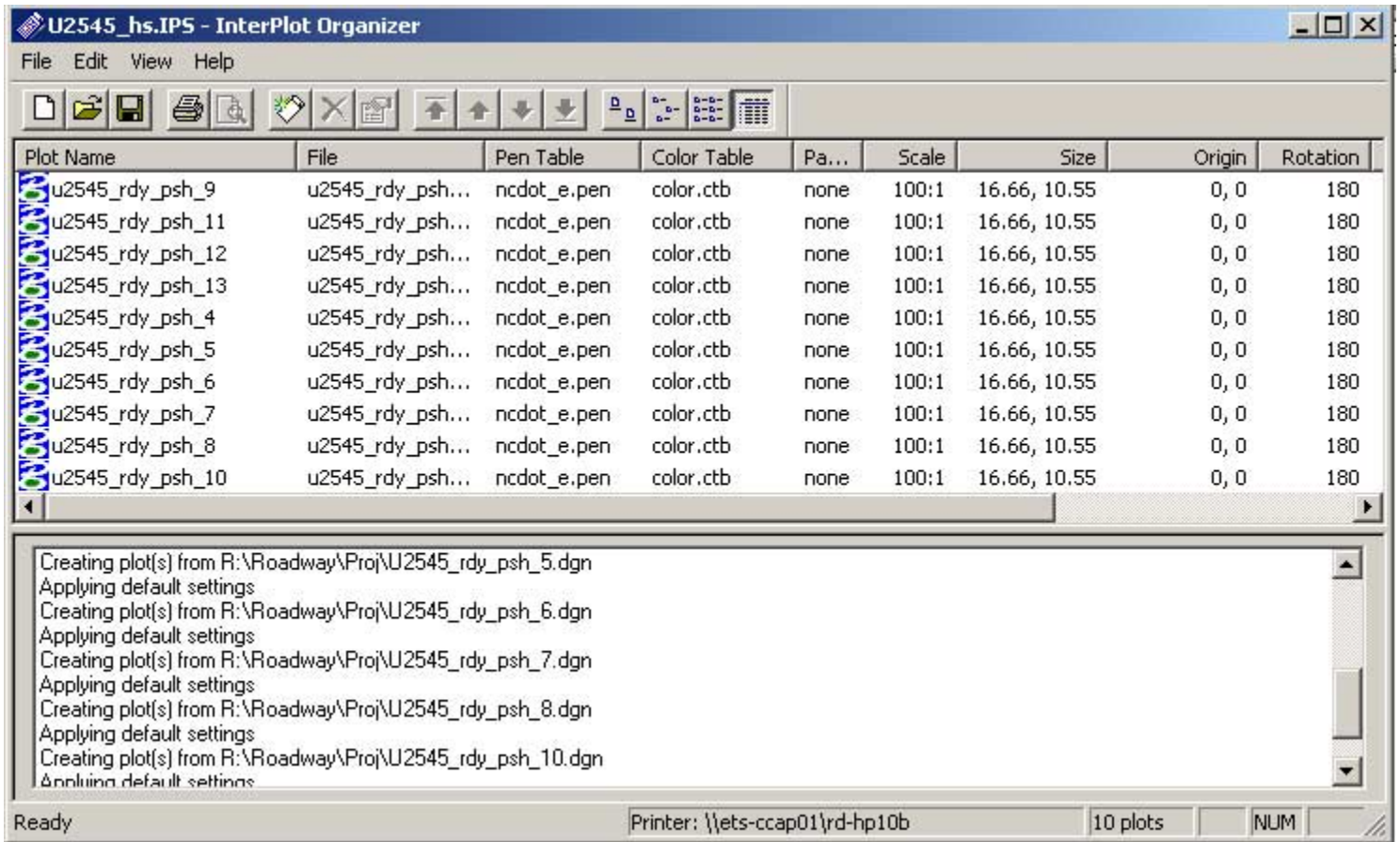
Check to see if **Create one plot from the first matching shape option** is selected. → **OK**.



Notice that the **Plot shape** option is automatically selected in the **Plot area** frame.



→ OK. →OK.



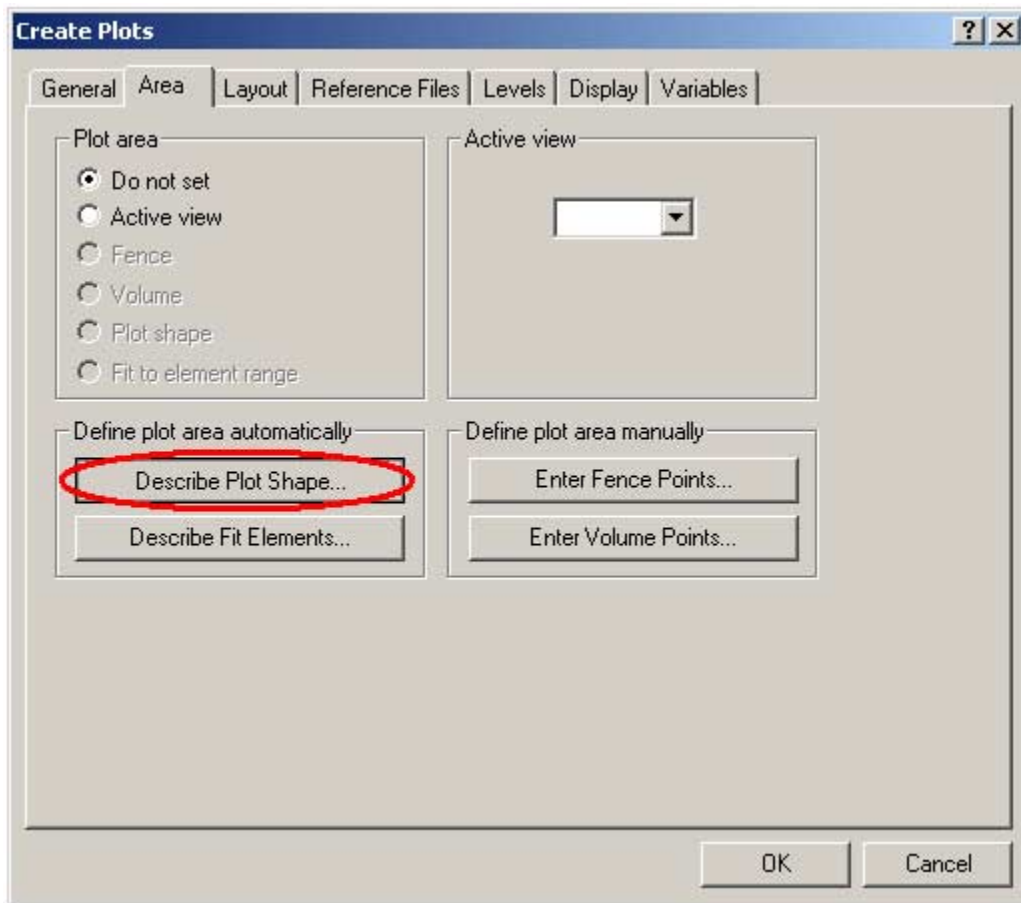
6. Edit plot properties, plot name, sheet number, or plot sequence (if needed).

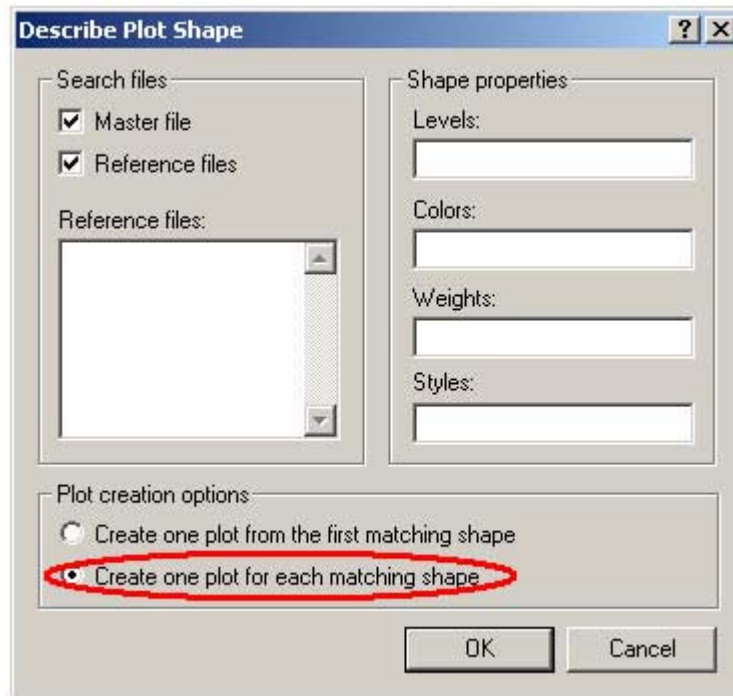
TIP!: When selecting a group of plots for editing, use the **Shift** key to include all the plots in between your selection. If just wanted to include only the selected plots then use the **Ctrl** key.

TIP! When you have sheets number greater than 10, I recommend putting a zero "0" in front of plot sheet number 4 through 9. Then use your **Plot Name** sort button to arrange the sequence of the plotting order. Use the up and down arrows to individually or in a selected group move the order of the plots. For full-size plots only I would recommend moving the last sheet number to be the first sheet to be plotted. The full-size sheet plotter will collate them in this manner resulting in the last sheet plotted on top. I hope that makes sense.

Profile sheets

Pretty much there are not that many setting changes from creating plan sheet plots to profile sheet plots. As matter of fact, there is only one keynote to be aware of. When we created the profile sheet file we placed multiple sheets in one file. As a result of this action, we have to change the way we instruct the program to find our construction shape element in our sheet cells. In step 5 for creating plots for plan sheets, after we selected the **Area tab**, within the **Describe Plot Shape** dialog box, we must change our selection from **Create one plot from the first matching shape** to **Create one plot for each matching shape**. This will tell the program to create plots from all of the shapes in that file.





NOTE: The plot shapes using this method will create and number the plots in the order of when the sheet was placed in the file. For example, if our profile sheet file is U2545_rdy_pfl_s24.dgn. Then the first plot the program creates is U2545_rdy_pfl_s24. The next will be U2545_rdy_pfl_s241, then U2545_rdy_pfl_s242, and so on.

TIP!: Use the name of the first plot to start on the organization of your plot. In the above example, rename and renumber each plot to how much was added to the first plot. For example, if our plot name is U2545_rdy_pfl_s245, then 24+5 is 29. This plot should be renamed to U2545_rdy_pfl_s29. I know that this is a “clumsy” work around for now. Hopefully future Interplot Organizer updates will allow a more flexible naming option.

NOTE: There is a limitation in Interplot Organizer worth mentioning. Once a plot has been created, if the user attaches a new file, then a new plot for that sheet has to be created and the old plot has to be overwritten.

End of Section

Credits:

Thanks to the NCDOT IT Unit for their valuable insight on this program. Especially Mary Tripp for creating and developing the NCDOT sheet library file to be used with this program.

Ross McDowell for engineering the implementation of this program in the NCDOT Roadway Design Unit.