**STATE OF FLORIDA**
**DEPARTMENT OF TRANSPORTATION**

# FDOT GEOPAK
# for Roadway Designers-Basic
# CE-11-0099

## Course Guide

**March 14, 2011**

**ENGINEERING / CADD SYSTEMS OFFICE**
**TALLAHASSEE, FLORIDA**

**http://www.dot.state.fl.us/ecso/**

# FDOT GEOPAK for Roadway Designers-Basic
# FDOT Course ID: CE-11-0099

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# FDOT GEOPAK for Roadway Designers-Basic

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***Description***

This Basic level course provides instruction in the use of GEOPAK, MicroStation, and the FDOT CADD standard resources and applications for roadway design. The basic course follows typical roadway design workflow to instruct students how to produce and present alignments, profiles and plan sheets for roadway projects.

***Topics Covered***

- FDOT Standards
- Starting a GEOPAK Project
- COGO & Horizontal Alignments
- Design & Computation Manager
- Existing Ground Profile
- Plan View Labeler
- Draw Cells with GEOPAK
- Plan and Profile Sheets

***Prerequisites***

- FDOT MicroStation Essentials - Part I (CE-11-0114)
- FDOT MicroStation Essentials - Part II (CE-11-0115)

***Duration:*** 16 Hours

***Professional Credit Hours:*** 14 PDHs

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This manual closely follows the Microsoft standards to standardize text for the user. Look at the sample and explanation of the formatting below.

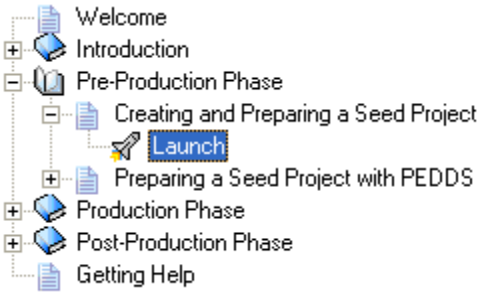
Each procedure is set up in sequential steps. Words written in bold type also appear on your screen. Words in Arial font are the names of windows, dialog boxes, or messages that open after you perform a step. These names are always located in the title bar at the top of the window or box in question.

Each procedure has a title statement beginning with the word “to”. Some exercises contain more than one procedure. When you are using this manual in class, you may not need the sort of detailed information in the procedures. However, the manual will guide you, after the course is over, when you are attempting these procedures in your office. Remember, the project shown in the graphics is for the training class only.

**Sample procedure**

➢ ***TO CREATE A SEED PROJECT***

In EDI2, in the Creating and Preparing a Seed Project folder, click **Launch** as shown below. Create New FDOT Project opens as illustrated on the following page.

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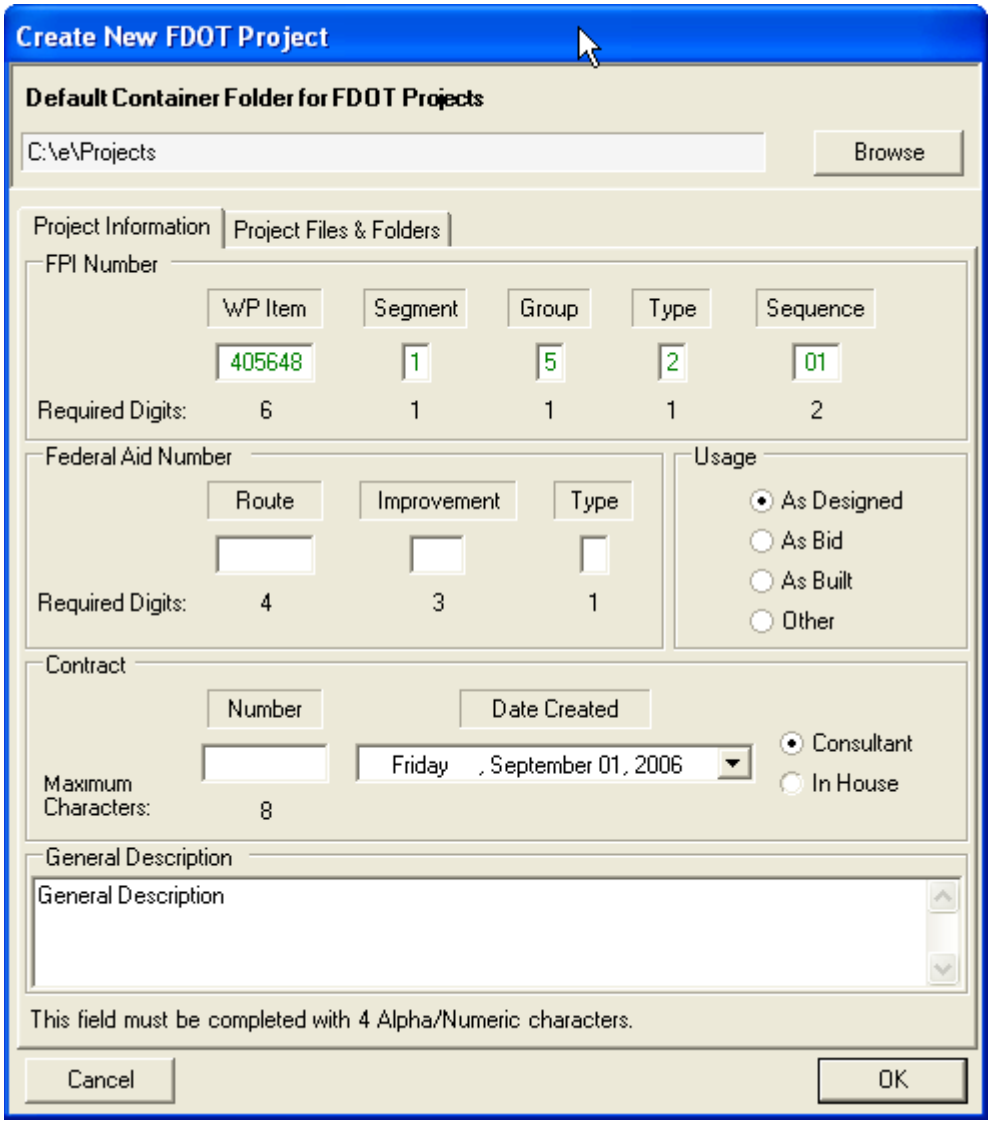



Notes, tips, or cautions, as applicable, may accompany each procedure.

- A **note** is additional useful information that is not necessary for performing the procedure.
- An **important** note contains information that you need to perform a procedure.
- A **tip** contains actions that supplement what you do in the procedure, usually a different way to do something that you may prefer.
- A **caution** indicates an action that may irreparably damage your data if performed incorrectly. Be sure to look for cautions and read them carefully.
- A **warning** indicates an action that could hurt you or damage your hardware. This manual does not contain any warnings.

# 1 FDOT STANDARDS

## FDOT/CADD STANDARDS OUTLINE

The Florida Department of Transportation (FDOT) Engineering/CADD Systems Office (ECSO) maintains the MicroStation and GEOPAK standards used to produce plans for the FDOT. These standards aid in the production of a design project. The Computer Aided Drafting and Design (CADD) standards keep file naming, symbology and directory structure consistent from project to project. Consistency is essential for successful automation of processes and the final Electronic Delivery of projects. The CADD tools and programs provided by the ECSO save time as work progresses on projects, while maintaining standards. The CADD Production Criteria Handbook (CPCH), a companion to the FDOT CADD Manual, outlines the minimum standards, conventions and formats necessary to ensure a usable CADD data set to the downstream customers. We highly recommend that you download and review this manual from the following website: www.dot.state.fl.us/ecso/downloads/publications/.

In some situations, the standards may not be sufficient, and you must vary from the standards. If variations from the FDOT CADD Manual or CPCH are necessary for a project, approval for such variations must be in writing by the FDOT Project Manager and documented in the project journal.

Each district office has a CADD Manager who is the primary contact for support for all CADD issues. The Central Office is available for further support. The ECSO support page, www.dot.state.fl.us/ecso/, provides access to download or open the CPCH for the FDOT CADD Standards and the CADD Customer Support Guide for primary contact personnel. The ECSO web page, www.dot.state.fl.us/ecso/main/version/version.shtm, lists the current versions of software used by FDOT.

FDOT has an internal support call logging and tracking system, which tracks your call and used by ECSO support staff to search other logged support calls to help solve your issue. Users may gain access to this system to submit an issue through the website:

http://www.surveymonkey.com/s.aspx?sm=vpH3GFrro8xuDfrcuBSVFw_3d_3d

Contact ECSO at (850-245-1600) or (866-374-3668), if you need to talk with a support analyst or email your issues and comments to: ecso.support@dot.state.fl.us.

# MICROSTATION STANDARDS

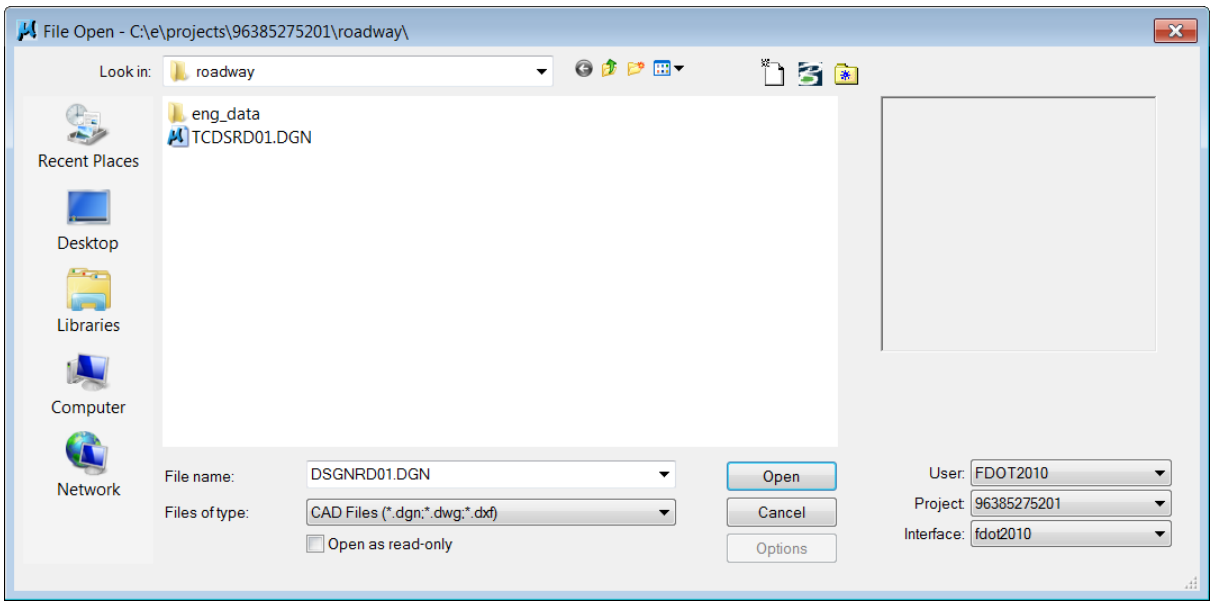
The FDOT CADD tools are available in the FDOT 2010CADD software package. Consultants can acquire the software from the FDOT Maps and Publications website. After installing the FDOT 2010 software, a FDOT2010 shortcut icon appears on your desktop.

## *TO START MICROSTATION*

From the desktop, double-click the FDOT2010 icon.

From the FDOT2010 folder, double-click the

icon. MicroStation Manager opens.




In MicroStation Manager, three list boxes are available: User, Project, and Interface.

The *User* list contains configuration files. FDOT only provides an English configuration file. When selecting the FDOT2010 icon on the desktop, set the User to FDOT2010 and the correct resource files will load ensuring that the text and lines look correct based on the units.

The *Project* list contains the project configuration file (PCF), which changes the current directory to the selected project directory. The information in this file supplies the title block information for Sheet Navigator.

The *Interface* list contains FDOT provided preferences in the form of a resource file that contains the toolboxes associated with the workspace. Modify these Workspace preferences by clicking Workspace and then Preferences within MicroStation. Exercise caution when modifying the Workspace.

The MicroStation support files delivered with the FDOT 2010 CADD software and their location in the FDOT2010 directory structure are as followed:

- Cell Libraries: **\FDOT2010\RESOURCES\Cell**
- Font Resource Files: **\FDOT2010\ RESOURCES\Fonts**
- Line Style Resource Files: **\FDOT2010\ RESOURCES\LineStyles**
- Color Table: **\FDOT2010\ RESOURCES\Data**
- Seed Files: **\FDOT2010\ RESOURCES\seed**
- Plot Drivers: **\FDOT2010\ RESOURCES\plot**

## GEOPAK STANDARDS

In addition to the MicroStation standard support files, there are several GEOPAK support files created to enable working compliancy with FDOT standards. The ECSO maintains these files and distributes them to the districts in the same manner as the MicroStation standards. The following are the standard folder locations for the different files:

- Cross Section Criteria Files: \FDOT2010\GEOPAK\typicals
- Drainage Criteria Files: **\FDOT2010\GEOPAK\criteria**
- 3pc Files: **\FDOT2010\GEOPAK\3pc**
- Plan and Profile Sheet Clipping Library: **\FDOT2010\GEOPAK\dat_files**
- Design & Computation (D&C) Manager Database:

  **\FDOT2010\GEOPAK\databases**
- Super elevation Tables: **\FDOT2010\GEOPAK\e_tables**
- K-Value Tables: **\FDOT2010\GEOPAK\bin**
- Plan Labeler Style Files: **\FDOT2010\GEOPAK\bin**
- Survey Manager Data Base: **\FDOT2010\GEOPAK\databases**

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GEOPAK creates and uses a number of important files during this training course. The following are common files used:

**job###.gpk** (Example: job527.gpk) This binary file is created when a coordinate geometry (COGO) session starts for the first time or through Project Manager. This file stores all coordinate geometry elements with users appending data throughout the design process. Multiple users can access this file at the same time, but only one file should exist for each project. The "###" represents the job number (up to three alphanumeric characters) unique to a project and is defined upon creation.

**fname###.ioc** (Example: main527.ijd) This is an ASCII input file for loading data during a COGO session. The ### represents the job number and oc is the operator code (usually the users initials). Filenames are limited to 15 characters (no spaces) plus the job number designation as indicated with the example. This file is a backup of stored alignments.

**fname###.ooc** (Example: main527.ojd) This is an ASCII output file created by GEOPAK during a COGO session. Variables are the same as defined above. Filename characters are limited to 15 characters (no spaces) plus the job number designation as indicated with the example. QC reviewers print this file through COGO to compare the geometry from COGO with the plans.

**fname.inp** (Example: earthxs.inp) Any ASCII input file for running GEOPAK processes. Name is user defined with an .INP extension.

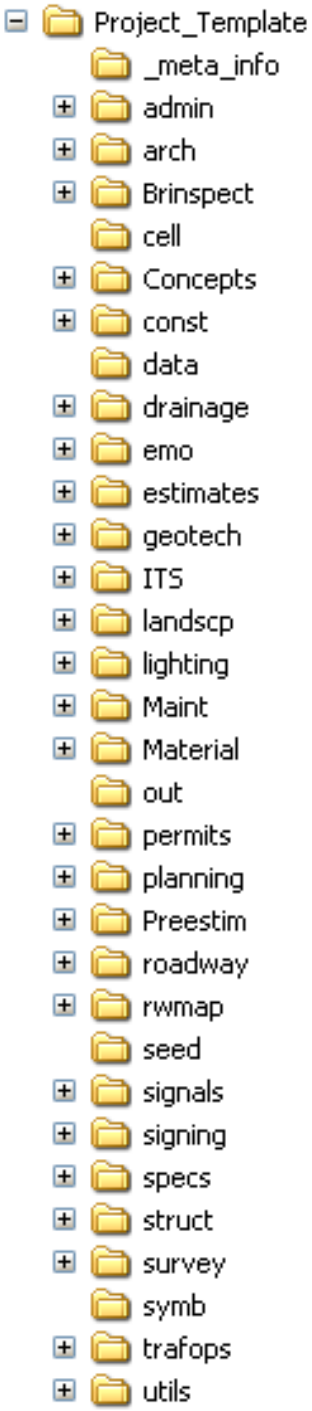
**fname.dat** A binary (preferred) or ASCII file, containing string and point information. The user utilizes this file to create the TIN file.

**fname.tin** A binary file, containing triangular surfaces, also known as the digital terrain model (DTM). The user utilizes this file to cut existing cross sections and profiles.

**Project-name.prj** A binary file created by GEOPAK Project Manager with a new project.

# FDOT DIRECTORY STRUCTURE

FDOT has a standard project directory (see chapter 4 in the CPCH for more details) and structure-naming convention. The project directory name is the eleven-digit FDOT Financial Project Identification number (FPID). A typical FDOT project directory structure displays below.



The project directory structure is a list of the required directories. These directories are required in the hierarchy as shown and must remain intact. Even when a directory is empty in a specific project, the directory shall remain intact.

The Discipline subdirectories define for the division of work by ownership, not necessarily by the type of work. As the various disciplines develop files, they store each file in the project subdirectories corresponding to the creator of the work. Roadway designers typically place their files (the files they create and own) under the Roadway subdirectory. Surveyors place their files under the Survey subdirectory, etc.

In some cases, work overlaps disciplines. For example, if a roadway designer develops the drainage sheets, using the above convention, then the roadway designer is the owner of the work and the Roadway directory stores those files, rather than the Drainage directory. There are situations causing files to be placed in the Drainage subdirectory, but users must consider directory permissions and electronic signing and sealing questions. For example, does the roadway designer have permission to write to the Drainage subdirectory, or is merging files across multiple disciplines (i.e., multiple copies of the files) a problem. Each user should be aware of the possible problems to encounter with duplicate file names. Reference file attachments may not work correctly due to the first occurrence of the file name is the actual file attached.

Proper location of working files within the project demands common sense. Contact the appropriate Project Management staff for advice or referral. Documentation is required for all deviation from standard practice in the appropriate discipline journal file (Section 1.7 Journaling).

Each discipline subdirectory contains an additional subdirectory named \eng_data. These designated subdirectories contain the PostScript image files of the plan sheets for that discipline, the QC reports, and the ASCII Engineering Data output files. For more information regarding the files stored in the \eng_data subdirectories, see Chapter 3 of the FDOT CADD Manual and an extensive description of the Engineering Data requirements in Chapter 8 of the CPCH. Some disciplines may require additional Engineering Data information, in which case, the additional requirements are in the discipline specific chapters of the CPCH.

The discipline specific subdirectories can create additional directories to accommodate additional segregation of work. Do not create additional directories at the same level as the standard discipline subdirectories. Custom subdirectory names shall not exceed 16 characters and shall contain only alphanumeric characters, dashes and underbars with no other characters allowed. Refer to chapter 4 of the CPCH for more detail.

## MICROSTATION FILE NAMING CONVENTIONS

All design files use the following file naming conventions, standard input files and GEOPAK criteria files. In the event a particular file type that is needed for the project is not addressed by this document, use the file naming convention as a template for selecting an appropriate name, or consult with either the Project Manager or the district CADD Manager to determine the proper file name. Document all files, both standard and project specific, in the Project Index and Journal files (Section 1.7 Journaling).

> ***Note*** The standard file names created for each discipline are located in the Standard File Name section of their respective discipline chapters of the CPCH.

Standard file names should follow the following format: **AAAABB##.ext**

**AAAA** = abbreviated file description, **BB** = discipline denotation, **##** = sequence number, **ext** = file extension indicating the type of file.

> **Example:** The first roadway cross section file name created in a project would have the name **rdxsrd01.dgn**.

Typically, the sequence is limited to two digits, except for large projects. There are occasions when additional descriptive information is necessary in the filename, this descriptive information should be inserted after the discipline denotation **BB** and preceding the sequence number **##**. However, the length of additional descriptors should be to a minimum.

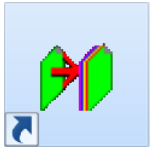
> **Example:** rdxsrd*rmpa*01.dgn, indicating this cross section file includes ramp A.

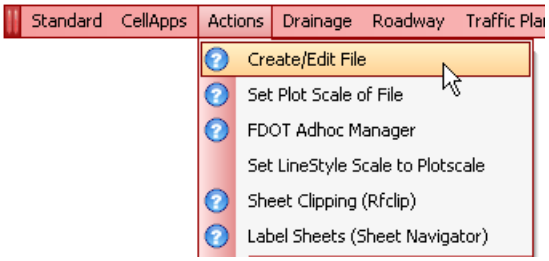
## CREATE FILE/PROJECT FILE

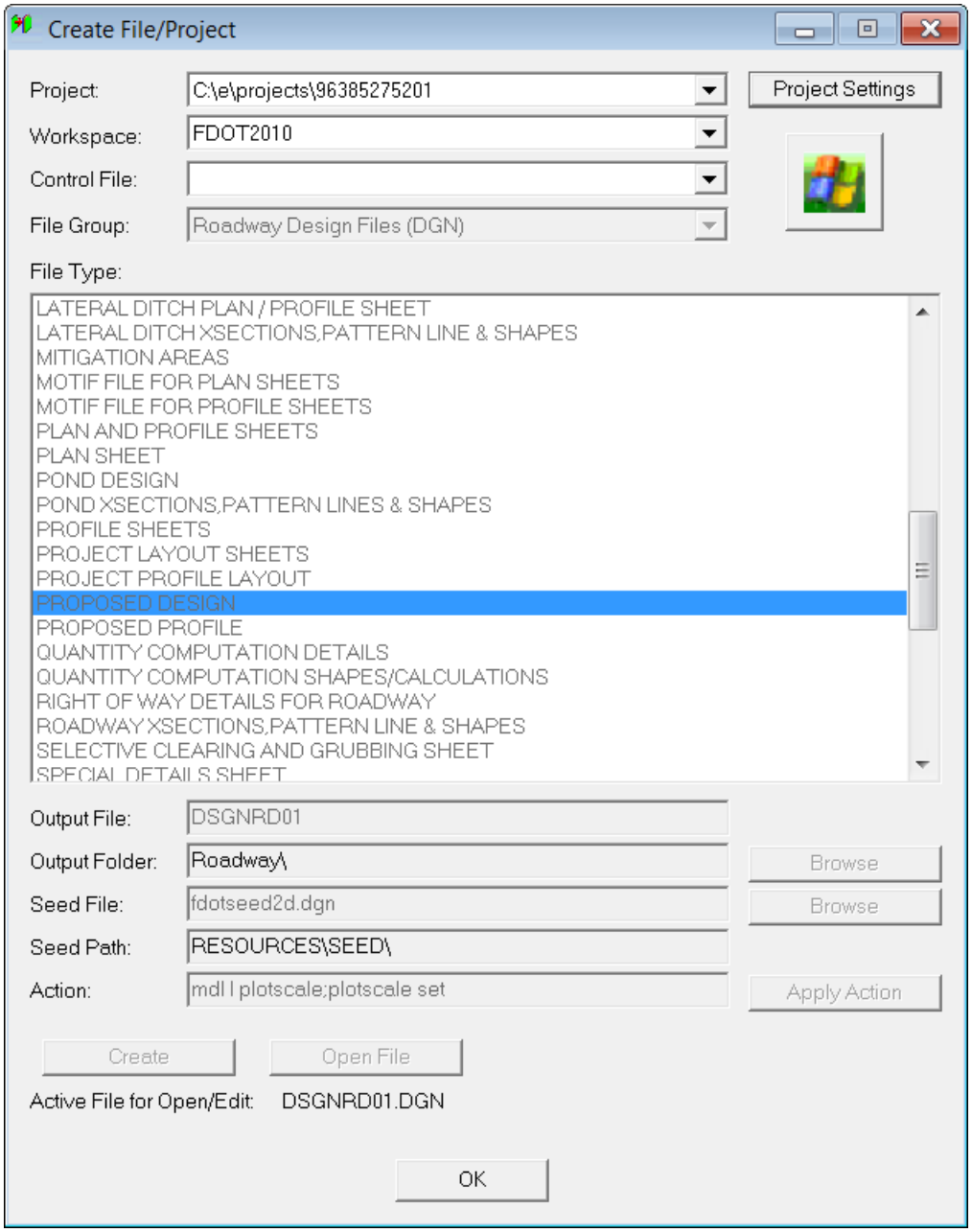
FDOT has a tool within FDOT Menu, **Create / Edit File**, to aid in the creation of standard files used on FDOT projects.

### *TO ACCESS CREATE / EDIT FILE*

In MicroStation, on the FDOT Menu, click Actions and then click Create/Edit File as shown in Figure 1-4 --or-- click Roadway and then click Create/Edit File --or-- double click the desktop icon for CreateEdit.exe as illustrated below. Create File/Project opens as shown below.



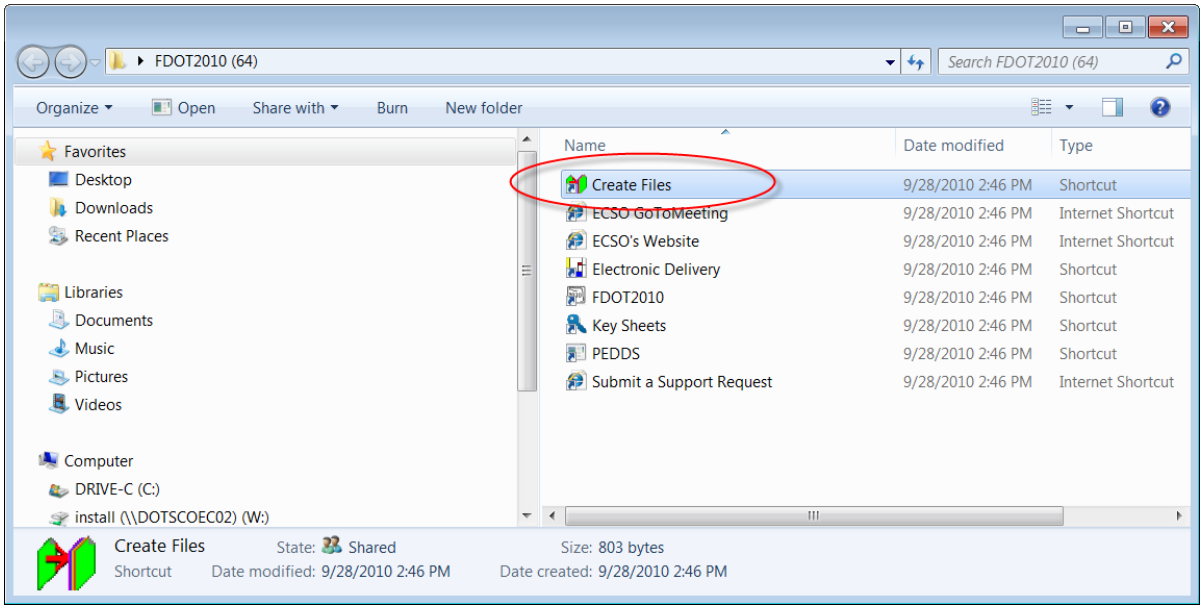


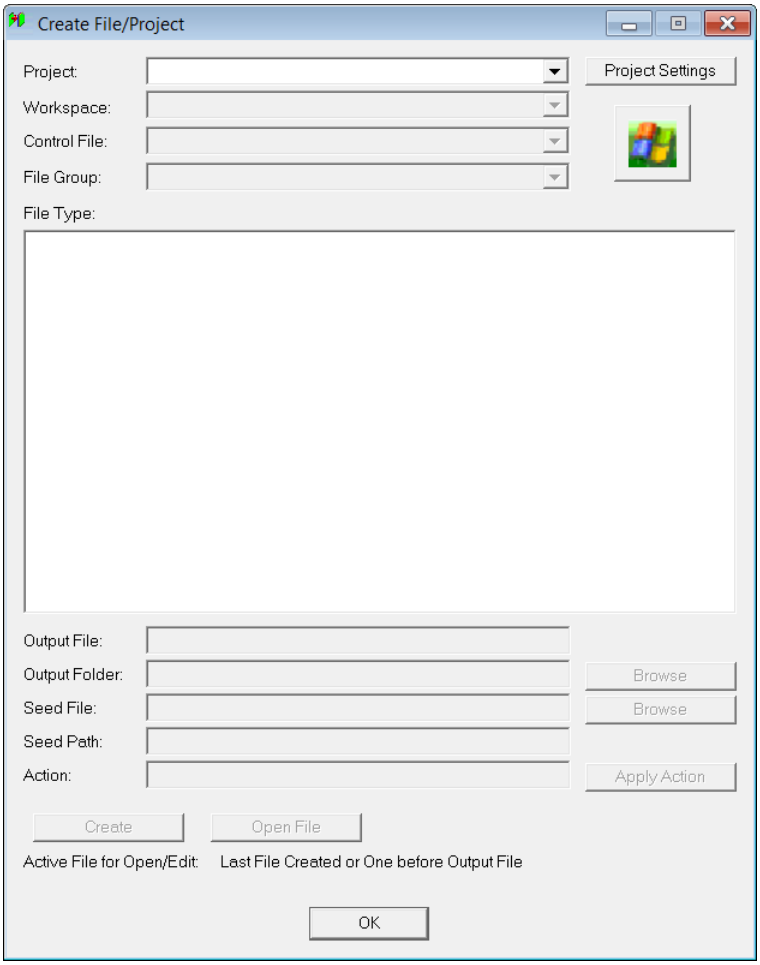

Create File/Project
Project:
C:\e\projects\96385275201
Project Settings
Workspace:
FDOT2010
Control File:
File Group:
Roadway Design Files (DGN)
File Type:
LATERAL DITCH PLAN / PROFILE SHEET
LATERAL DITCH XSECTIONS,PATTERN LINE & SHAPES
MITIGATION AREAS
MOTIF FILE FOR PLAN SHEETS
MOTIF FILE FOR PROFILE SHEETS
PLAN AND PROFILE SHEETS
PLAN SHEET
POND DESIGN
POND XSECTIONS,PATTERN LINES & SHAPES
PROFILE SHEETS
PROJECT LAYOUT SHEETS
PROJECT PROFILE LAYOUT
PROPOSED DESIGN
PROPOSED PROFILE
QUANTITY COMPUTATION DETAILS
QUANTITY COMPUTATION SHAPES/CALCULATIONS
RIGHT OF WAY DETAILS FOR ROADWAY
ROADWAY XSECTIONS,PATTERN LINE & SHAPES
SELECTIVE CLEARING AND GRUBBING SHEET
Output File:
DSGNRD01
Output Folder:
Roadway\
Browse
Seed File:
fdotseed2d.dgn
Browse
Seed Path:
RESOURCES\SEED\
Action:
mdl l plotscale;plotscale set
Apply Action
Create
Open File
Active File for Open/Edit:
DSGNRD01.DGN
OK

# Exercise 1.1 Creating MicroStation Design File and Setting Plot Scale

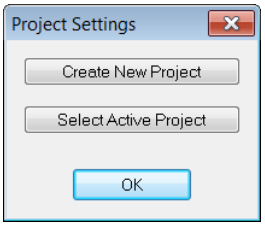
➢ ***TO CREATE A MICROSTATION DESIGN FILE AND SET PLOT SCALE***

1. Extract the project files by double-clicking on the file **C:\Chapter1_Ex1_1.exe**.
2. From the desktop, double-click the FDOT2010 folder icon. A window opens with the FDOT2010 icons.
3. Open Create/File Project by double-clicking the **Create Files** icon as shown below.

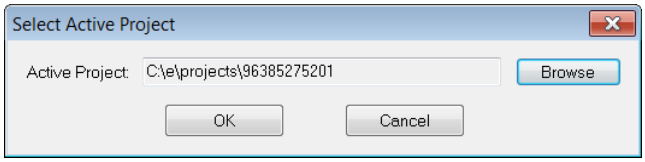





4 . From Create File/Project, click the **Project Settings** button. Project Settings opens as shown below.




5 . Click the **Select Active Project** button. Select Active Project opens.

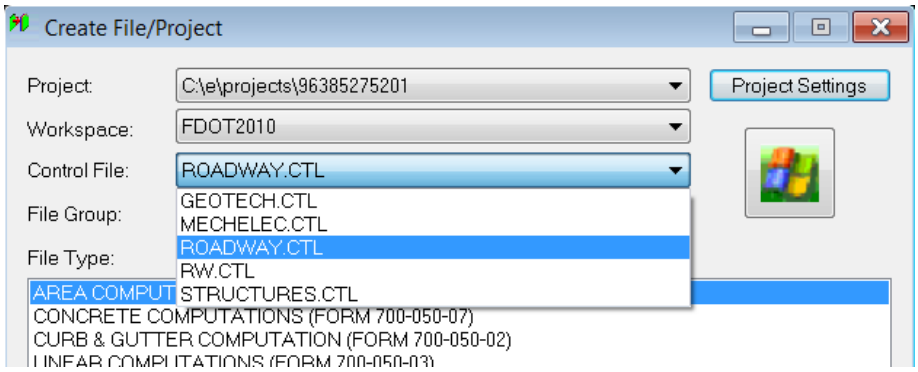



6 . From Select Active Project, click the **Browse** button, then navigate to **C:\e\projects\96385275201** on the Choose Folder dialog and click the **Select** button.

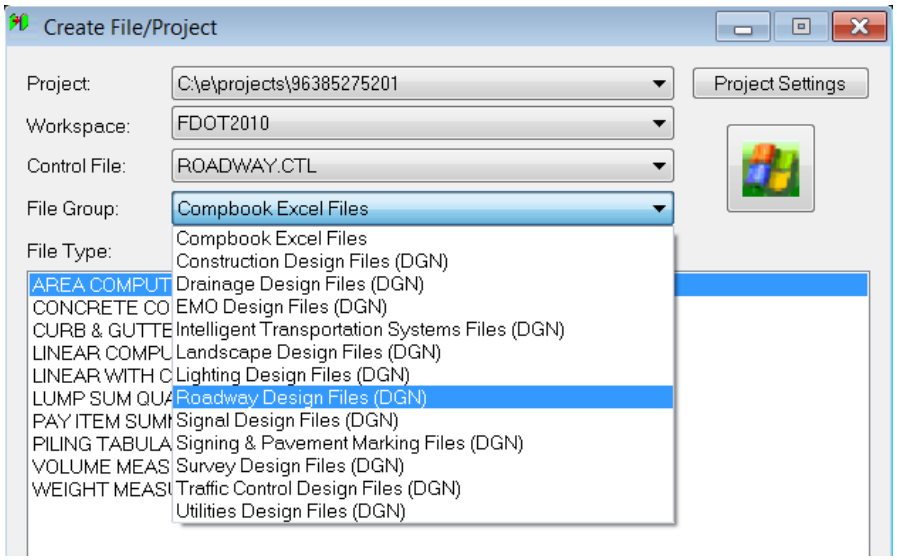
7 . From Select Active Project dialog, click the **OK** button. Select Active Project closes.

8 . From Project Settings dialog, click the **OK** button. Project Settings closes.

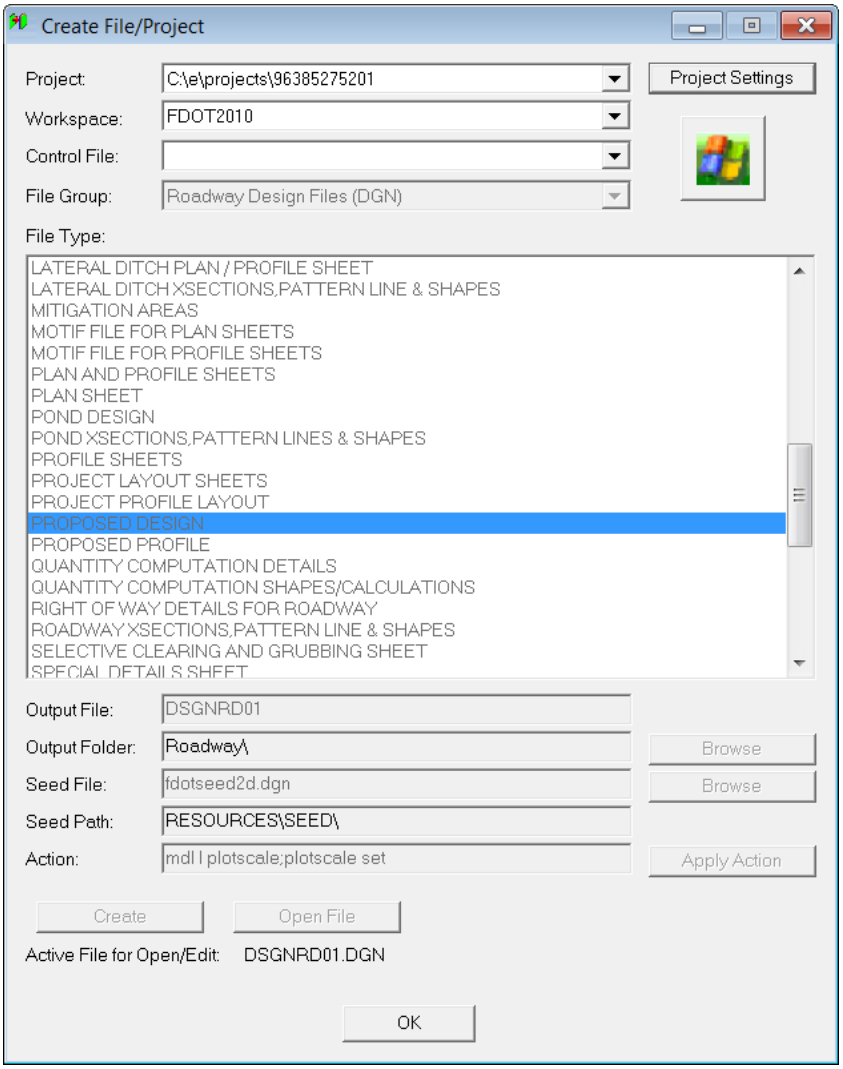
9 . From Create File/Project dialog, click on the *Control File:* list and select **ROADWAY.CTL** from the dropdown list as shown below.



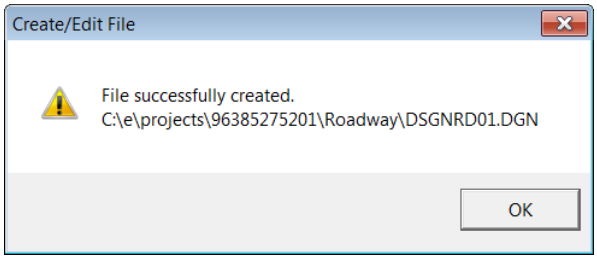

10 .On Create File/Project dialog, click on the *File Group:* list and select Roadway Design Files (DGN) from the dropdown list as shown below.



11 .In the *File Type:* list, click **PROPOSED DESIGN** as shown below.



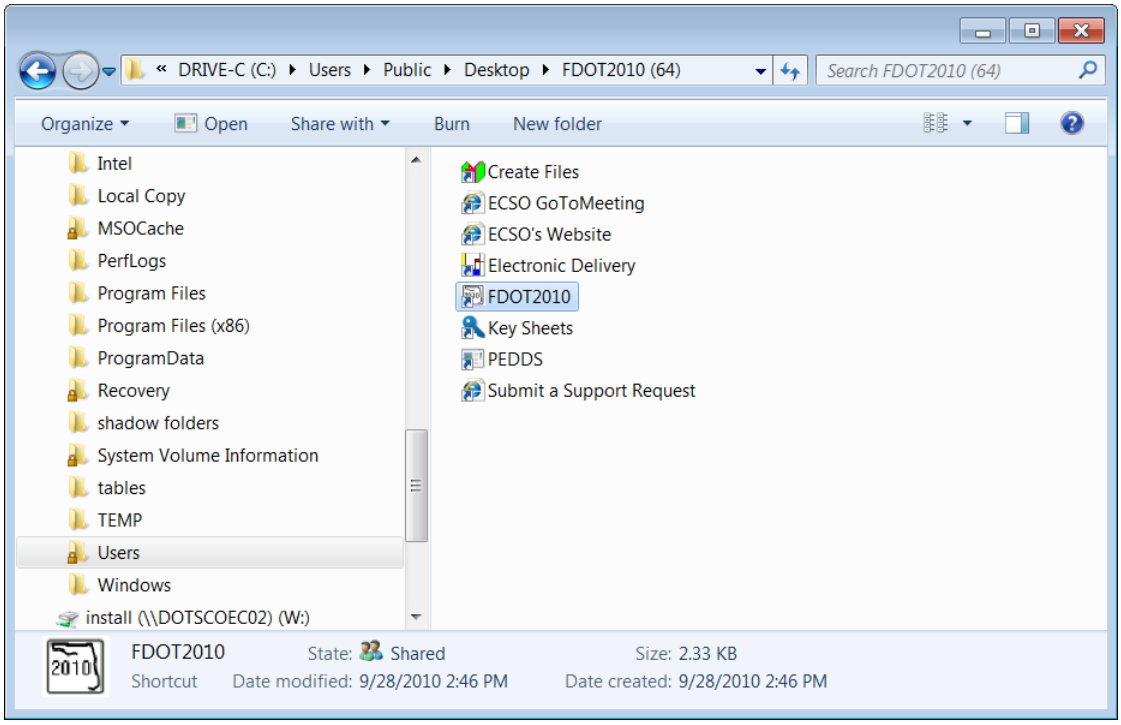

12 .Click the **Create** button. Create /Edit File displays the message "*File successfully created*".




13 .Click **OK** to close message and return to the Create File/Project dialog. The **Open DGN** button becomes available and the **Output Filename** increments by one.

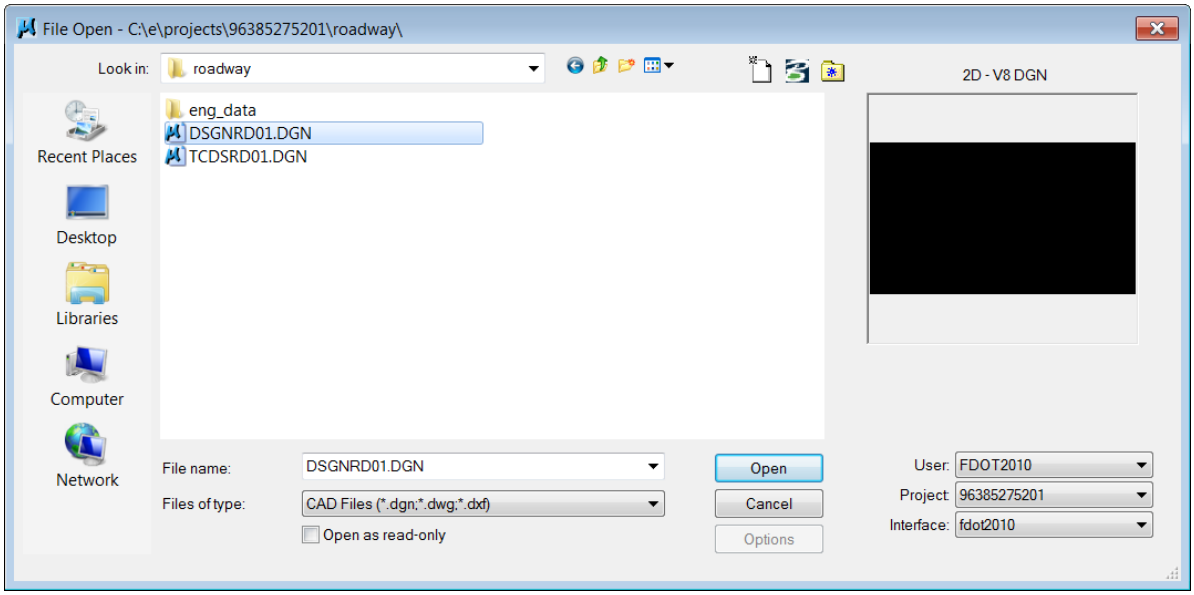
14 .Click **OK** on Create File/Project to close the Create File/Project dialog box.

15 .Within the FDOT2010 folder, double click on the **FDOT2010** icon to open MicroStation.



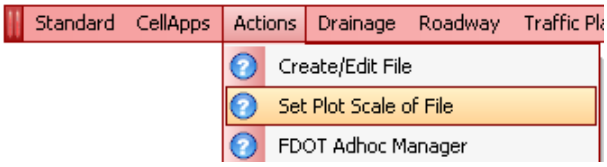

16 .From the MicroStation Manager navigate to:

*C:\e\projects\96385275201\roadway, select the file DSGNRD01.dgn* and click **Open**.

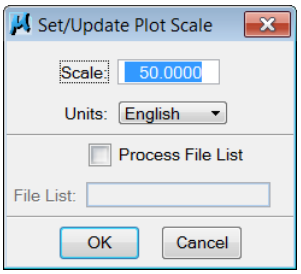


17 .From the FDOT Menu, click the menu option **Actions** > **Set Plot Scale of File**.

> ***Note*** When opening the design file using the Open DGN option in Create File/Project, Set/Update Plot Scale will automatically open. Set/Update Plot Scale opens.




18 .In the **Scale** box, type **50**, set the **Units** to **English**, and then click the **OK** button.




> ***Note*** Setting the plot scale writes a type 66 element defining the scale to the file. When selecting other items from the FDOT Menu, such as cells or text, their default size is set according to the plot scale. Selecting the Process File List allows the plot scale to be set for a group of files. For example, if PLANRD*.DGN is typed in the File List box, all plan sheets are processed. Likewise, if *.DGN is typed in the File List box, all .dgn files in the directory are processed.

19 .Exit MicroStaion.

## JOURNALING

The FDOT CADD software includes a Journal application to create and edit journal files, as part of the Electronic Delivery process. Each user shall maintain journal files during the life of the project and deliver them in accordance with the FDOT CADD Manual. The purpose of the Journal files is to detail design aspects and decisions made during the life of project.

Journal File entries should document methods employed, procedures used, decisions made, problems encountered, fixes included or other issues encountered during the design process. The user shall record any information that assists in the regeneration of CADD files and or plots. The user shall also record the geometry information, database, controlling alignment, profile names, relevant survey and cross section information and the methodology used to obtain the final geometric controls in the CADD product.

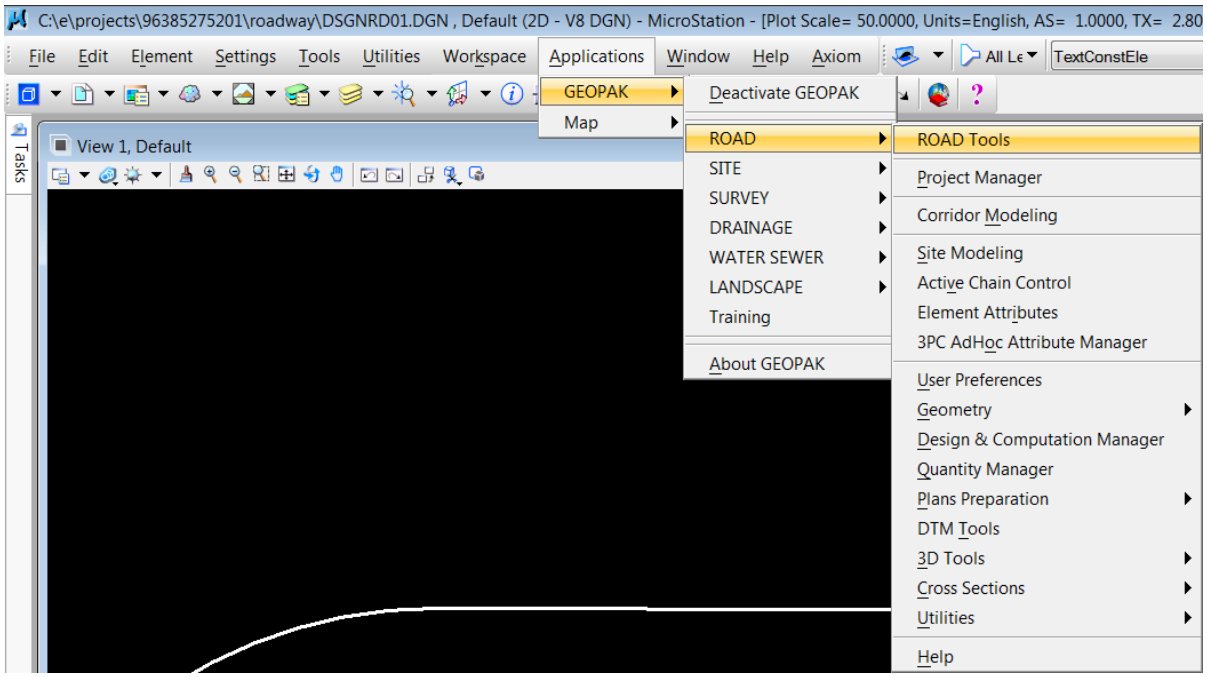
The participant in this class will create and maintain a journal file to keep with the normal workflow and documentation of GEOPAK processes of a project design. Refer to the Electronic Delivery training manual for additional information.

# 2 STARTING A GEOPAK PROJECT

## ACCESSING GEOPAK ROAD MODULE

The GEOPAK Road module provides tools to design roads including production of various sheets required in a construction set of plans. GEOPAK also provides means to produce drawings and output files that are in accordance to defined standards while increasing efficiency and the ability to automate processes.

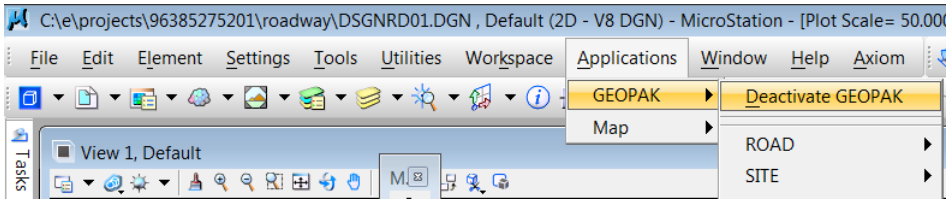
GEOPAK is loaded from within MicroStation and is not a stand-alone product. The GEOPAK Road Module from the Applications menu in MicroStation as shown below:




GEOPAK may not be active when MicroStation opens. If this is the case, the following steps will activate GEOPAK. GEOPAK will remain active in subsequent MicroStation sessions until manually deactivated, or if the GEOPAK resource files are deleted.

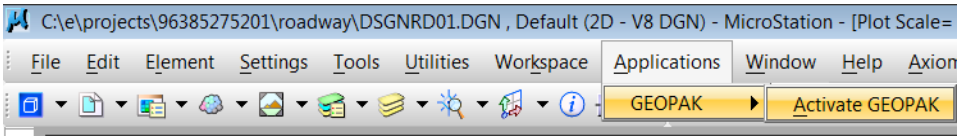
➢ *TO OPEN (ACTIVATE) GEOPAK ROAD*

1. **Deactivate** GEOPAK, if running by default, by selecting the MicoStation menu option: **Applications > GEOPAK > Deactivate GEOPAK.**



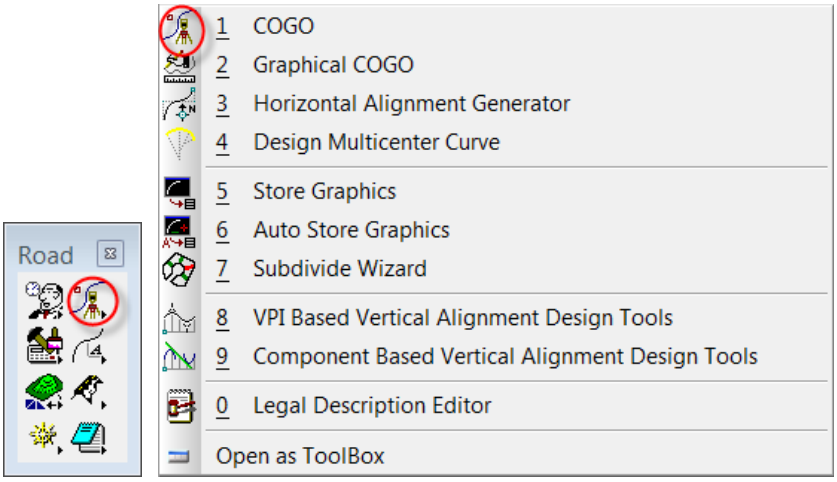

2. **Activate** GEOPAK by selecting the MicroStation menu option:

3. Applications > GEOPAK > Activate GEOPAK.




4. The Road toolbox allows access to associated GEOPAK tools. To activate this toolbox, click the Applications > GEOPAK>ROAD > ROAD Tools.

Each button on the Road toolbox has an associated toolbox. By clicking the small arrows located in the lower right corner of the buttons, a dropdown selection menu opens including an option to "**Open as Toolbox**". These toolboxes are dock-able and resizable. The exercises to follow describe each of these toolboxes.



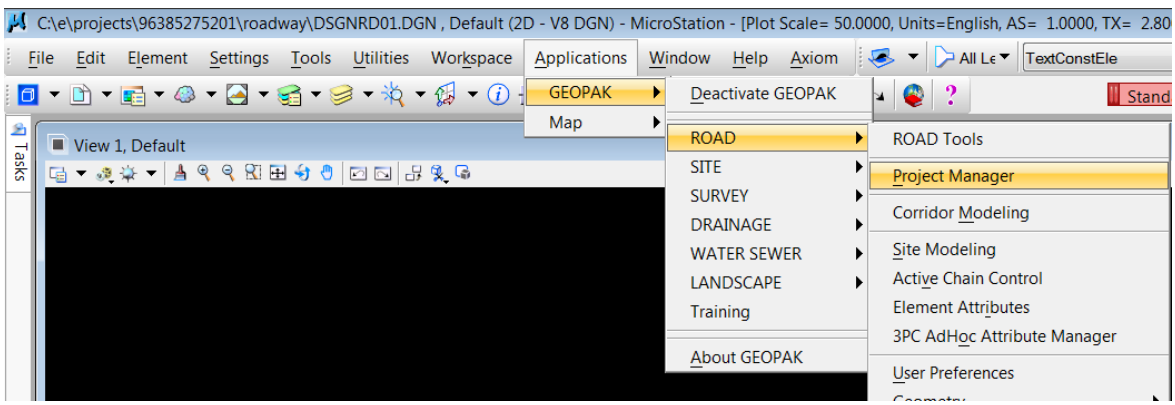
# PROJECT MANAGER

Project Manager is like a project filing cabinet for storage of project specific design standards. It organizes and records information for each specific design project, such as the project's user preferences, job number, working alignment, design files, coordinate geometry (COGO) information, DTM, and various other files as needed for the project. Location of the Project Manager files, defined by each site, should reside under the project directory structure in the appropriate discipline folder.

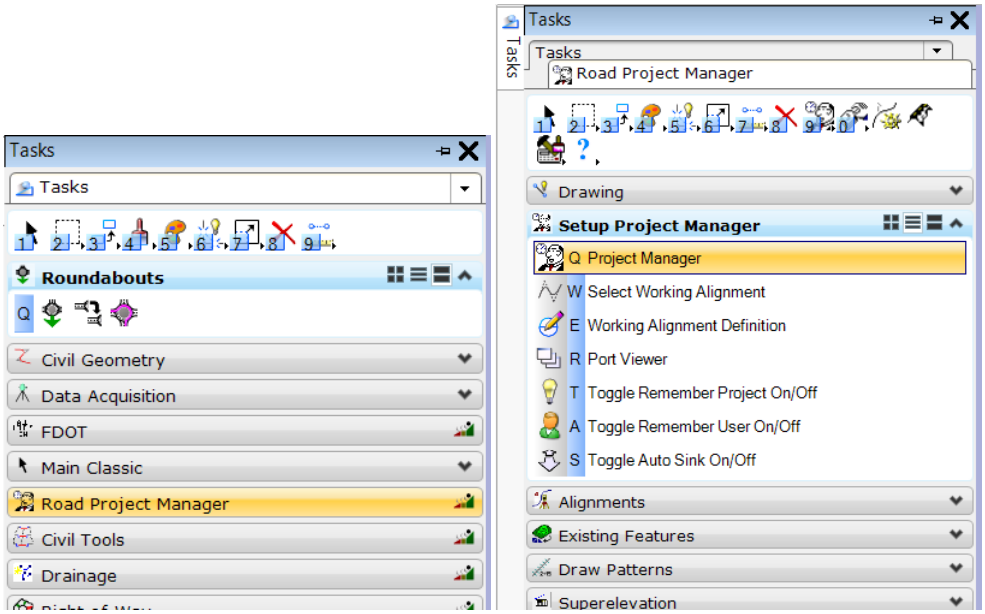
All disciplines use the information stored in the Project Manager Project file; therefore, the FDOT project has only one GEOPAK project. There is more discussion on this later in the chapter.

➢ ***TO ACCESS PROJECT MANAGER***

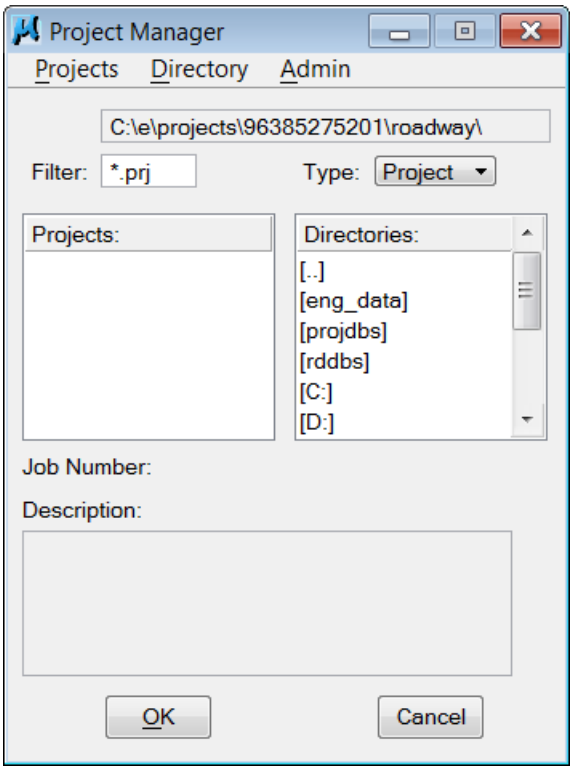
From MicroStation, click Applications > GEOPAK>ROAD > Project Manager.




**--or--**, from the MicroStation Task menu, select the Road Project Manager menu, then setup Project Manager



**--or--** from the Road toolbox, click the Project Manager button. The Project Manager opens.



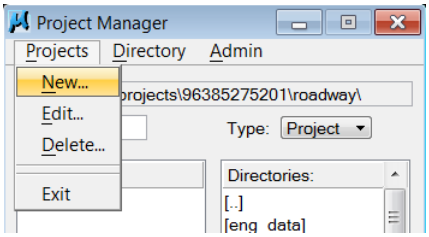

The Project Manager 'project file' ends in the extension .prj. In addition, each Project Manager project includes a project folder, projdbs, where the user files and run files are stored. Run files contain the information for individual processes such as creating the proposed cross sections for the mainline.

The Projects list display all projects found in the hard-coded directory shown above the Filter box and Type list.

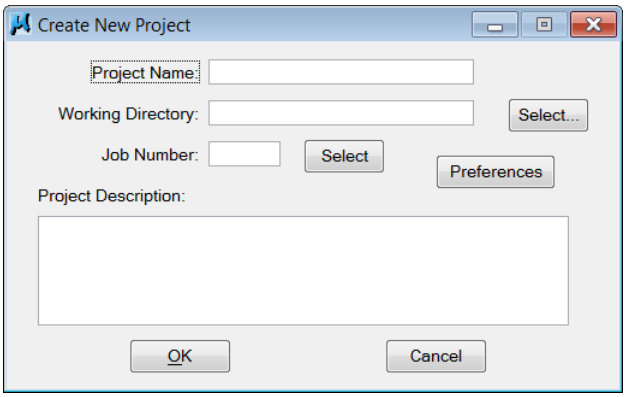
The Directories list allows you to navigate through your folders to find your project directory or to set the current working directory location for new projects.

## PROJECTS MENU

Creating a GEOPAK project is a multi-step process; the following dialog boxes describe the process. From the Project Manager dialog box creates a new project or allows a selection of an existing project to open.




**New** Create a New GEOPAK Project




*Project Name* The name of .prj file. The name should contain only alphanumeric characters, dashes and underbars. No other characters or spaces allowed. (FDOT recommends use of the project FPID number.)

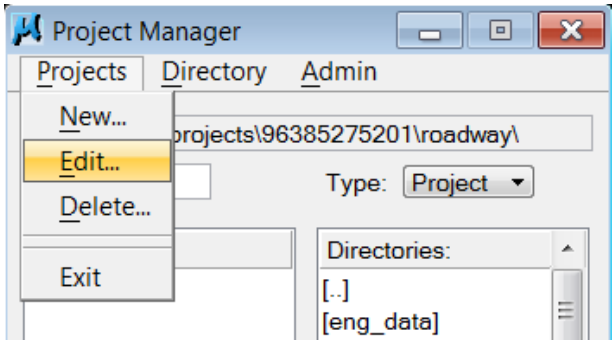
*Working Directory* Stores the GEOPAK project. An MDL program handles this location; do not type a location.

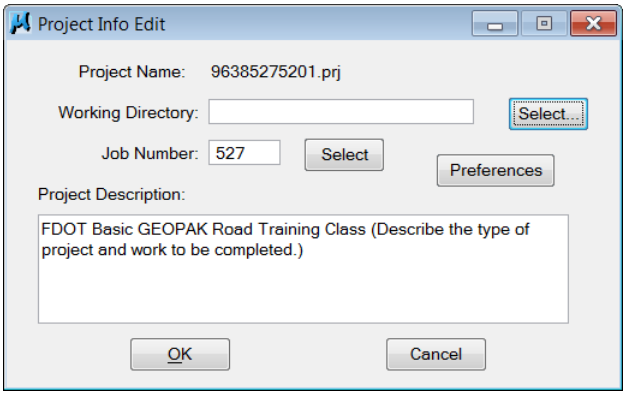
*Job Number* The job number defines the Project's COGO database, also known as the .gpk file. If you are creating the .gpk file, enter up to three alphanumeric characters in this box. To select an existing .gpk file, click on the Select button then highlight the .gpk file and click on OK.

*Preferences* Opens GEOPAK User Preferences.

**Edit**

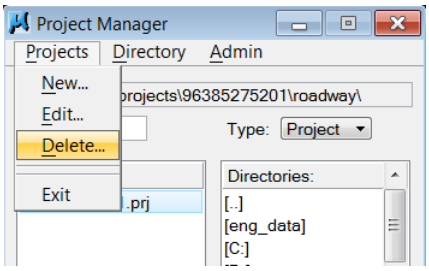
The **Edit** command allows editing any of the settings of an existing GEOPAK Project with the exception of the Project Name through Project Info Edit dialog box. The only difference between Project Info Edit and New Project is that Project Name is not an editable field.

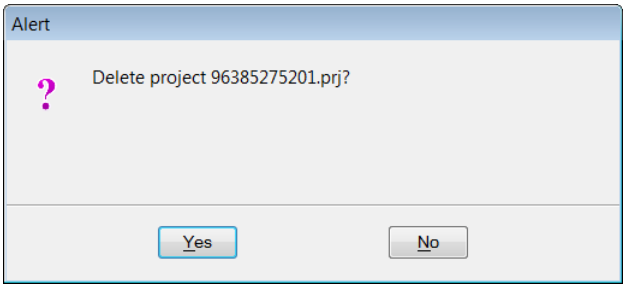



**Delete**

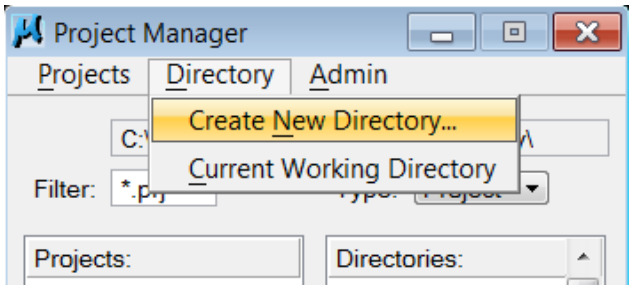
The **Delete** command allows deletion of the selected GEOPAK project. An Alert dialog displays when selected. Selecting **Yes** deletes the selected project. Selecting **No** closes the Alert without deleting the project.



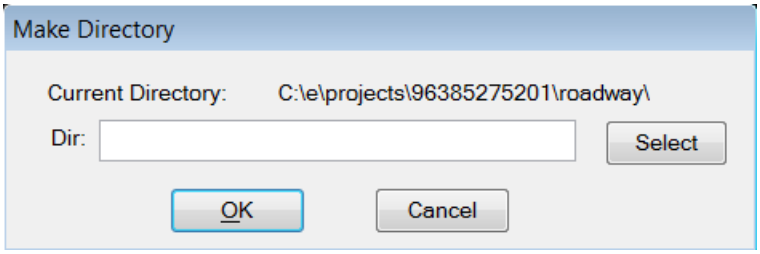



## DIRECTORY MENU

There are two options under this menu, Create New Directory and Current Working Directory.



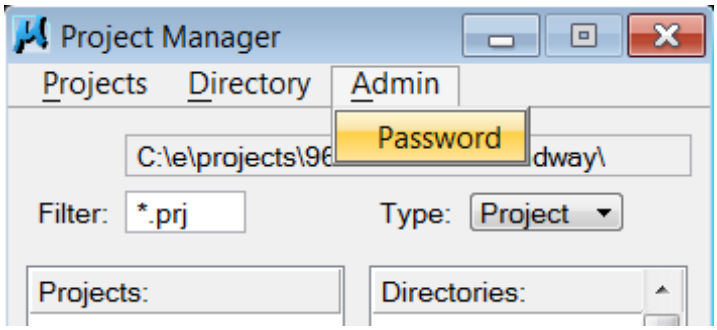

**Create New Directory** This tool creates a new directory under the current directory using Make Directory. The preferred method for creating directories is using the Electronic Delivery software, because the process automatically creates the eng_data folder.




**Current Working Directory** If selected, the Directories path in Project Manager is set to the directory in which the active design file is located.

## ADMIN MENU

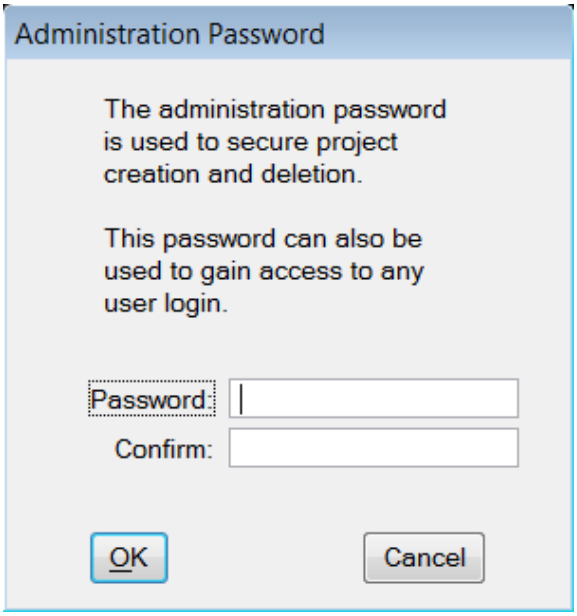
The Admin menu contains the tool to create a password for the project.




### ➢ *TO CREATE A PASSWORD*

FDOT does not recommend using of Passwords in this option.

1. Click **Admin** > **Password**, Administration Password opens.
2. From Administration Password, type a **password** and **confirm(ation)** of the password.



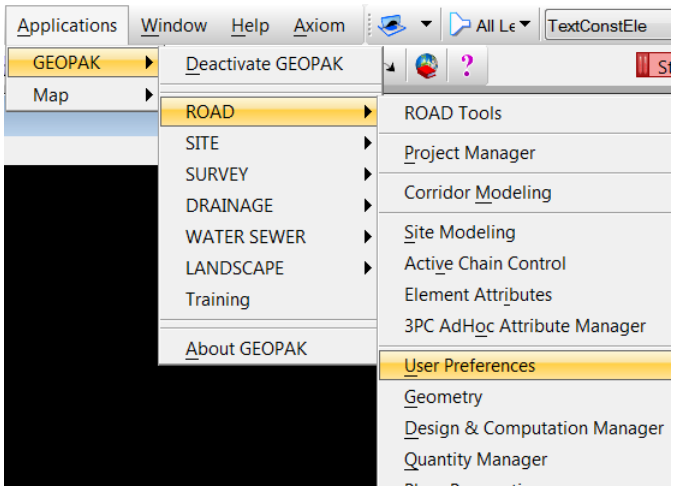

3. Click the **OK** button.

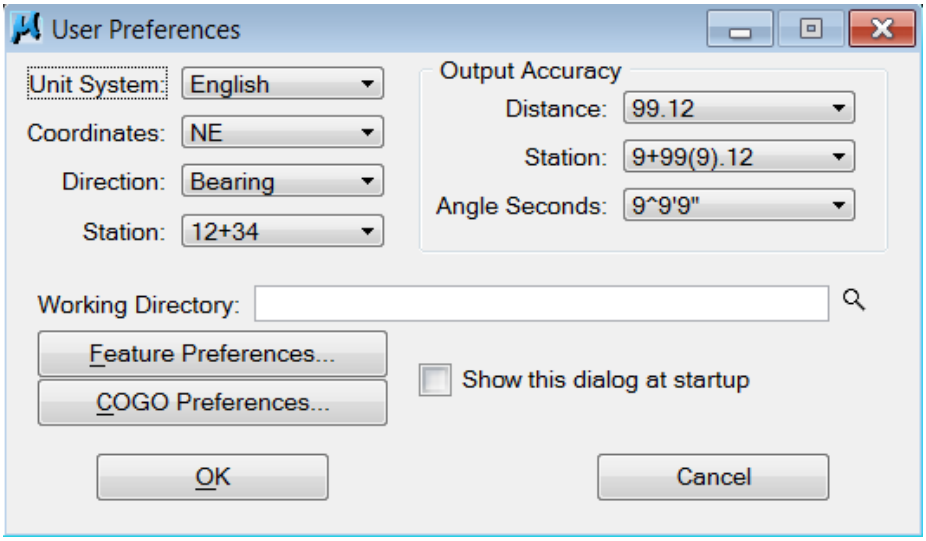
# PREFERENCES

The User Preferences allows for setting project parameters. GEOPAK provides numerous user definable parameters allowing the defining of number of decimal places for output files, station formatting, coordinate format, units, etc. These parameters are utilized not only by coordinate geometry, but by many of the other GEOPAK functions, such as plan view and cross section labeling, DP Station Offset, Design & Computation Manager, etc. The parameters can be set, when accessing GEOPAK, for the most commonly used options GEOPAK remembers. However, the GEOPAK User Preferences shown below allows for changes, when a particular application requires a change, or the default settings needs changed.

➢ ***TO OPEN PREFERENCES***

If creating a new project, click the **Preferences** button on Create New Project dialog, **--or--** if opening User Preferences after creating the project, click **Applications** > **ROAD** > **User Preferences**. The GEOPAK User Preferences opens.



**Unit System** Determines whether GEOPAK operates according to the English or Metric system of measurement. The Unit parameter affects every GEOPAK component.

**Coordinates** Sets NE (Northing/Easting) or XY coordinate values in Coordinate Geometry.

**Direction** Sets the direction format for such variables as line direction in Coordinate Geometry.

**Station** Sets the format for station variables in Coordinate Geometry and station labeling.

**Output Accuracy**

*Distance* The setting of the decimal places only affects rounding of the screen output. Internally, GEOPAK still computes to double precision accuracy.

*Station* The setting of the decimal places only affects rounding of the screen output. Internally, GEOPAK still computes to double precision accuracy.

*Angle Seconds* The setting of the decimal places only affects rounding of the screen output. Internally, GEOPAK still computes to double precision accuracy.

**Working Directory** This sets the directory where the GEOPAK project exists. An MDL application handles this directory selection. Users should not set the Working Directory unless the project only involves one discipline.

**Feature Preferences** Opens Feature Preferences, utilized when visualizing COGO elements and mapping survey data with assigned features. See more detail later in Section 2.3.2.

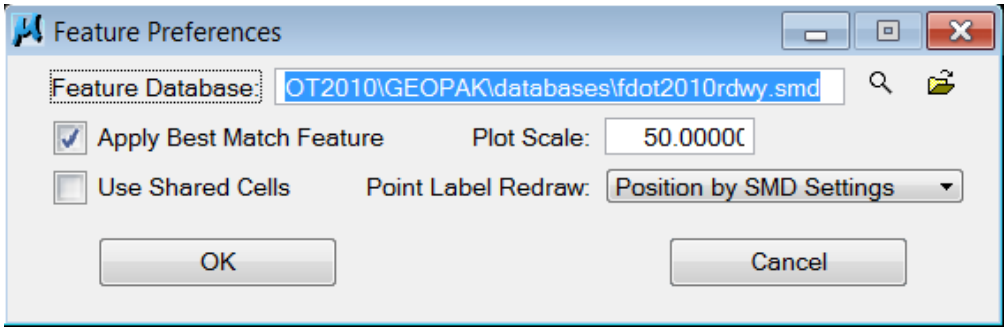
**COGO Preferences** Opens COGO Preferences, utilized for setting the .gpk file location, COGO Input File and COGO Output file directories. Redefinition of Elements has an on/off toggle options and to automatically force redefinition off when COGO is activated are available. It also allows modifications of handled the opening, creating or appending of .gpk files. See more detail later in Section 2.3.3.

**Show this dialog at GEOPAK startup** When using Project Manager, you do not need to select this check box. However, if Project Manager is not used, it would be a good idea to select to show the preferences at startup

## FEATURE PREFERENCES

Click the Feature Preferences button from the GEOPAK User Preferences dialog box. The Feature Preferences dialog will open. This dialog box allows the path to the Survey Manager Database (SMD) to be set. Visualizing coordinate geometry elements and mapping survey data assigns features into a design file utilize the SMD file. The feature code of the element as defined in the selected SMD file determines the symbology for the drawn elements.

FDOT delivers some standard Survey Manager Databases with the FDOT CADD software (fdot2010rdwy.smd and fdot2010.smd); located in the FDOT2010\GEOPAK\databases directory. The Survey discipline primarily uses the fdot2010.smd file to generate the topographics for the project, while the Roadway discipline uses the fdot2010rdwy.smd.




**Feature Database** Directory path and file name of the SMD file.

**Select SMD File** Browse to SMD location to select file.

**Edit SMD File** Access the SMD file for editing purposes.

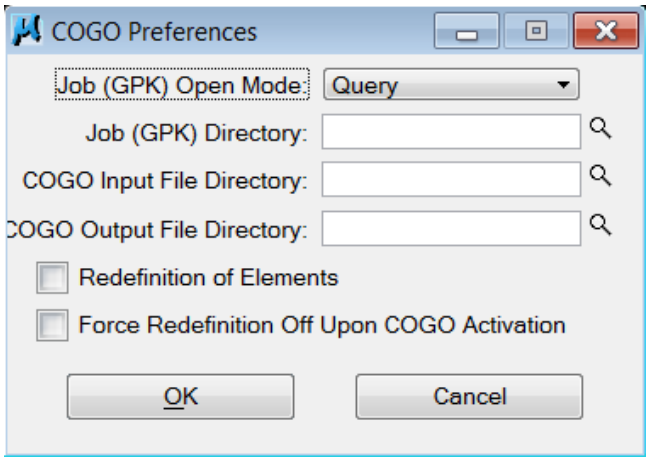
**Apply Best Match Feature** When selected, the process uses the best match feature from the feature SMD to allow placement of one feature in the database per item and locates derivatives of that feature from the field survey. Example: Assume that feature EP is the Edge of Pavement, but three different EP chains need to be located in the field. They can be located as EP1, EP2 and EP3. The mapping process matches these features to the Edge of Pavement feature EP in the database. Therefore, no need to define multiple EP features in the database.

**Use Shared Cells** Allows the use of shared cells when placing cells. FDOT does not recommend use of this option.

**Plot Scale** Defines a global scale utilized for drawing graphics into MicroStation. The roadway designer communicates the scale of the plan sheets to the surveyor to create the topo file from the SMD file with the cells and text set to the appropriate scale.

**Point Label Redraw** Options used to define how COGO will draw/redraw points. *Position by SMD Settings* uses the parameters set in the SMD file, and *Position Relative to Symbol* uses the same format as found in the MicroStation file relative to the point position.

## COGO PREFERENCES




**Job (GPK) Open Mode** Determines the file creation constraints imposed on creating new COGO database files if the named gpk file does not exist. There are three options:

*Create* Automatically creates a new COGO database file.

*No Create* Prevents creation of a new COGO database and displays a warning.

*Query* Queried to create a COGO database if specified database not found.

**Job (GPK) Directory** Location of the .gpk file, if not located in the current working directory. Example, if the .gpk file is in the Roadway folder and the working is in the Signing folder and needs to reference information in the .gpk, then the roadway folder will need to be set as the **Job (GPK) Directory** in order to access the information. Use the key-in ...\Roadway in the field so the entire path is not hard coded.

**COGO Input File Directory** Location of the GEOPAK input files. If left blank, GEOPAK searches for the files in the current working directory or the directory of the active file. However if they are stored in a directory other than the current working directory or the active file directory, use the select button and browse to the directory where they reside.

**COGO Output File Directory** Location of output files created in COGO. If left blank, the files a saved in the current working directory.

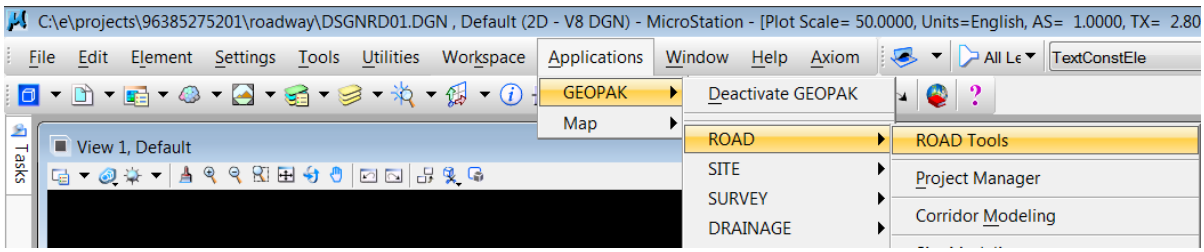
**Redefinition of Elements** Checking the box allows the redefinition or the over writing of existing elements in COGO. If **not** checked, an alert message will appear stating the element exists and cannot be re-defined. Leave this box cleared from within this dialog box.

**Force Redefinition Off Upon COGO Activation** Selecting the check box automatically turns off redefinition of elements, when starting COGO.

## Exercise 2.1 Accessing GEOPAK and Creating a Project

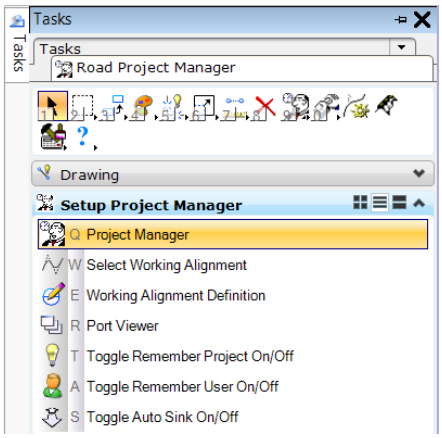
In this exercise, the user creates a GEOPAK project. To access GEOPAK and create a project

1. Extract the project files by double-clicking on the file **C:\Chapter2_Ex2_1.exe**.
2. Open **Dsgnrd01.dgn** located in **C:\e\projects\96385275201\roadway** and activate GEOPAK CIVIL Suite.
3. From MicroStation, click **Applications** > **ROAD** > **ROAD Tools**. Road toolbox opens.

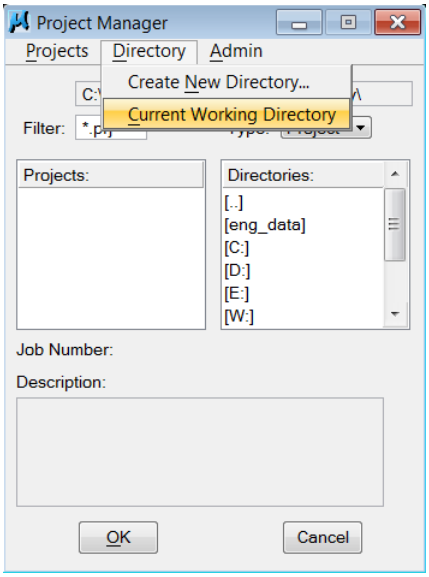



4. From the Road toolbox, click the **Project Manager** button. The Road toolbox is dockable to give more screen space.

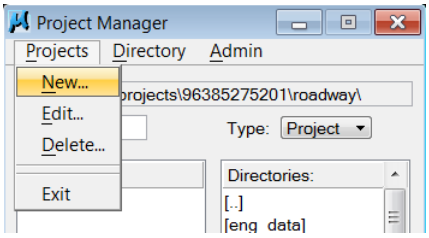
<OR> From the Task Menu

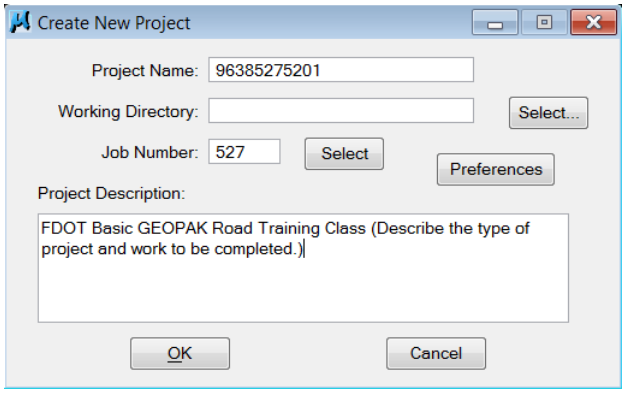


5 . From Project Manager, click **Directory** > **Current Working Directory**. The GEOPAK directory is set to the C:\E\Projects\96385275201\roadway\ folder.




6 . From Project Manager, click **Projects** > **New**. Create New Project opens.




7 . On Create New Project, type **96385275201** in the **Project Name** box.

***Important:*** Do not fill in the Working Directory. An MDL program delivered with the FDOT workspace handles this entry.

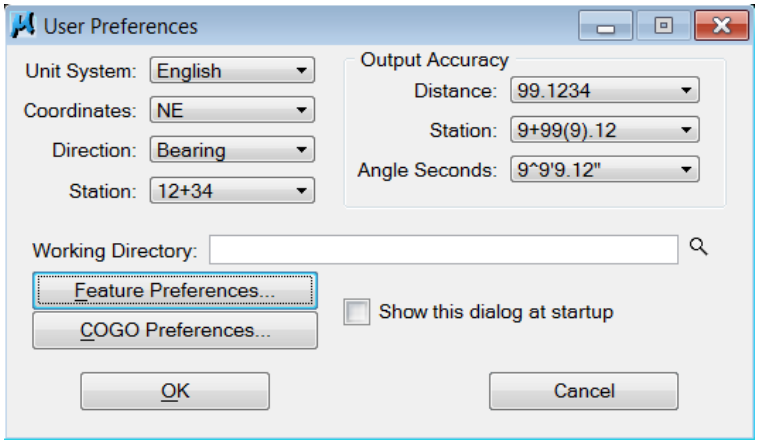
8 . On Create New Project, in the **Job Number** box, type **527**.

| | |
|---|---|
| ***Note*** | If the GPK file already exists, clicking the Select button will pop up a list box to select the .gpk file. The list of .gpk files is from the current working directory, if defined, or, if not defined, the list of .gpk file is from the active design file directory. |

9 . Under Project Description, type a brief description or summary of the roadway project.

10 .On Create New Project, click the **Preferences** button. User Preferences opens.

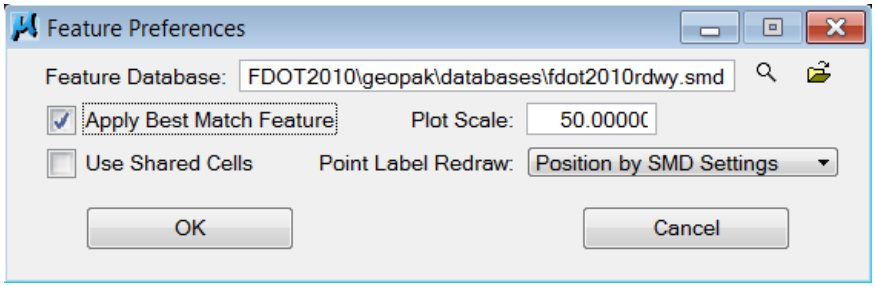
11 .On User Preferences, set all parameters as shown below.




***Note*** These preferences can be changed at any time during the course of the project.

12 .From User Preferences, click the **Features Preferences** button. Feature Preferences opens.

13 .From Feature Preferences, click the **Select SMD file** button to navigate to **C:\FDOT2010\geopak\databases\fdot2010rdwy.smd** for the SMD File.




14 .Select the **Apply Best Match Feature** check box.

15 .In the **Plot Scale** box, type **50.0**.

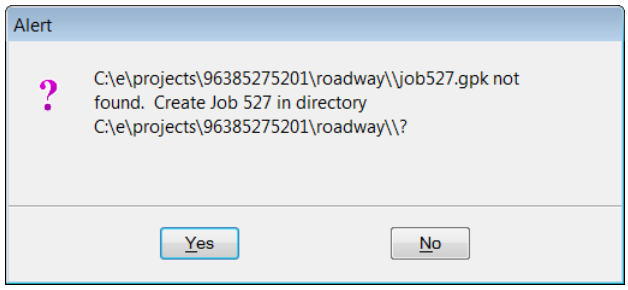
16 .Click the **OK** button to save settings and close Feature Preferences.

***Note*** It is not necessary to set any of the COGO Preferences.

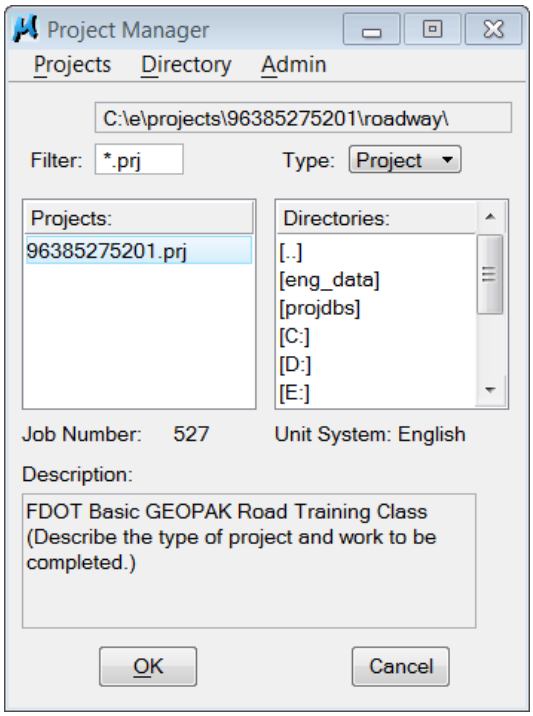
17 .From User Preferences, click the **OK** button.

18 .From Create New Project, click the **OK** button. Alert opens.

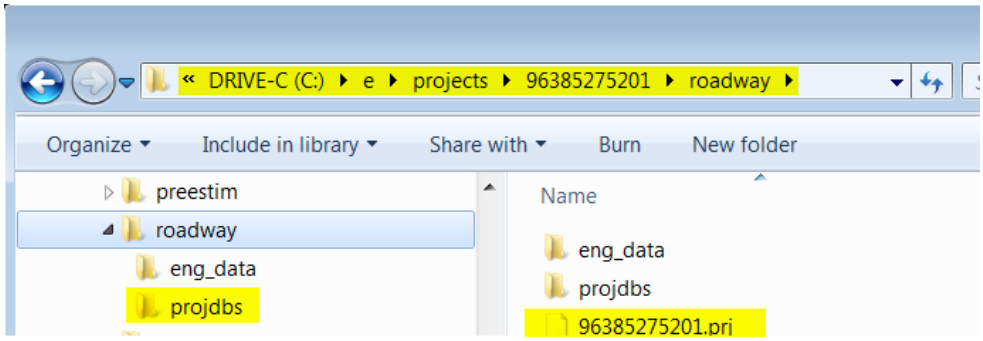
19 .From Alert, click the **Yes** button. Project Manager opens.




***Note*** Alert indicates that the Job Number or GPK number does not exist. Clicking the Yes button creates the GPK.




***Note*** At this point in the process, GEOPAK has created a new sub-folder under the Project\96385275201\Roadway folder called projdbs and a project file called 96385275201.prj in the 96385275201\Roadway folder.

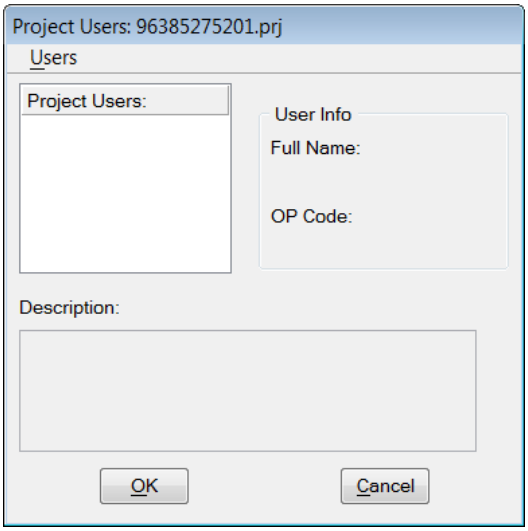


# PROJECT USER

Upon creating a GEOPAK project (**96385275201.prj**), one must establish users to access project through the Road Project dialog box. A user is a person assigned to work on the project. In most cases, there is more than one user on a project.

➢ ***TO ACCESS THE PROJECT USER DIALOG BOX***

Double click on the Project listed in the **Projects** window in Project Manager. The Project Users dialog box opens.

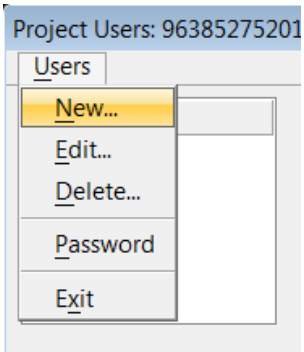



**Project Users** Displays any users created to work on this project.

**User Info** Displays the full name and Operator Code of the selected user.

**Description** Displays the description of the selected user, usually their title and department.

**Users Menu** Offers the options: *New*, *Edit*, *Delete*, *Password* and *Exit.*

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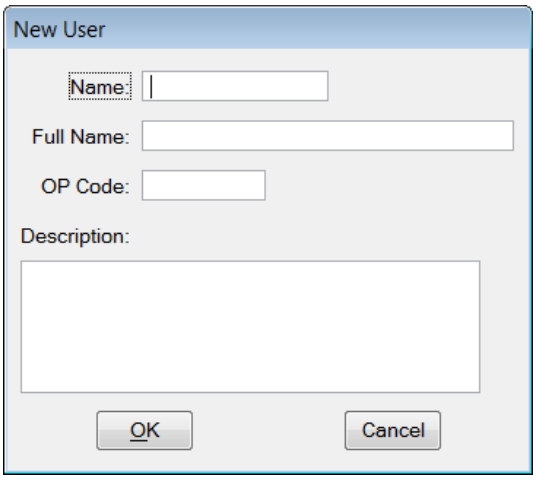
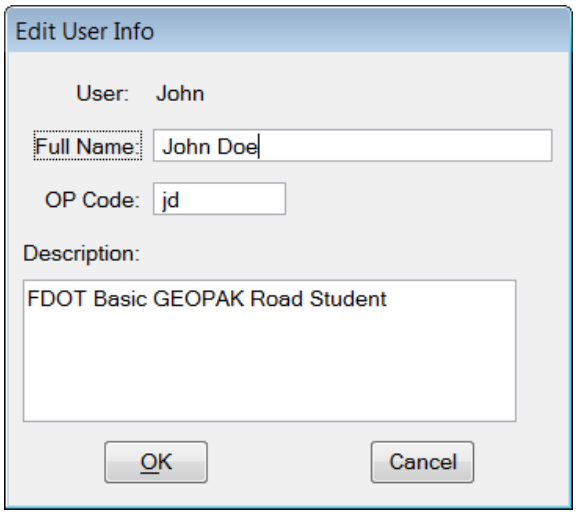
*New* Create a new user with 4 user inputs:



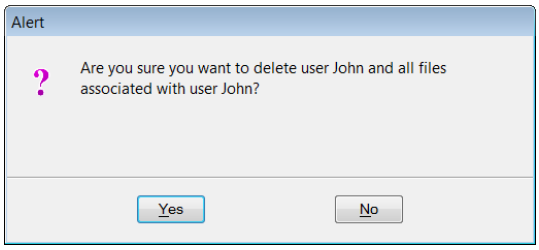

- Name — Your first name
- Full Name — Your first and last name
- OP Code — Operator Code, usually your initials
- Description — Optional field that can be used to enter title and department.

Edit — Allows changes to the Full Name, OP Code and Description of the currently selected user.

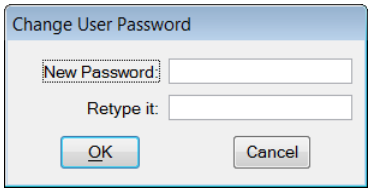
***Note*** User Name is hardcoded when created, as this is also the name of the folder created. User Name changes requires the creation of a new User Name. The Run files transfer from the old User Name folder to the new User Name, deleting the old upon completion. See more information of Run files later in this course.



*Delete* Allows deletion of the currently selected user. The following Alert displays. Selecting yes deletes the selected user and all the associated files for that user. There are no second chances.




*Password* Opens User Password to allow users to create or modify passwords for the selected user. FDOT discourages setting a password for the user.



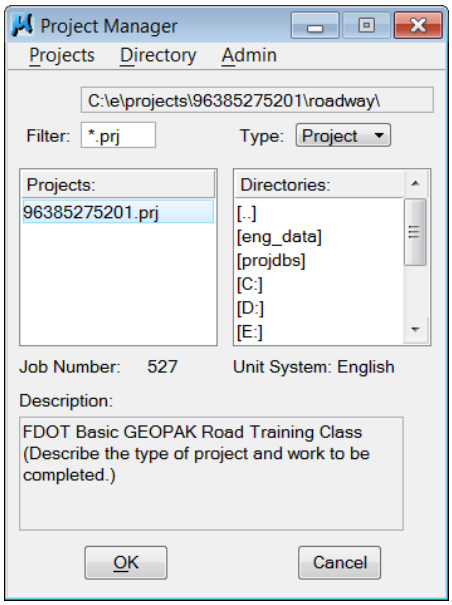

*Exit* Exits Project Users.

## Exercise 2.2 Creating a New

User In this exercise, you will create one new user.

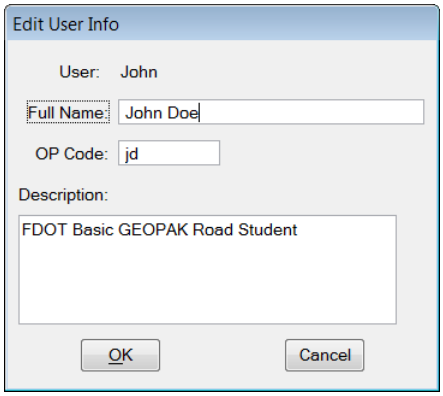
➢ ***TO CREATE A NEW USER***

1. Continuing from the previous exercise, on Project Manager highlight **96385275201.prj** and click the **OK** button. Project Users opens. See below.



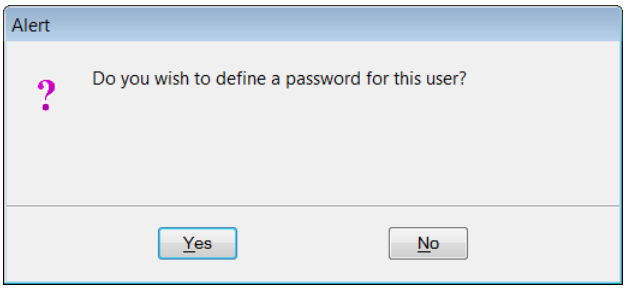

2. From Project Users, click **Users** > **New**.

3. Enter New User using the example shown below. The **Description** field is optional.

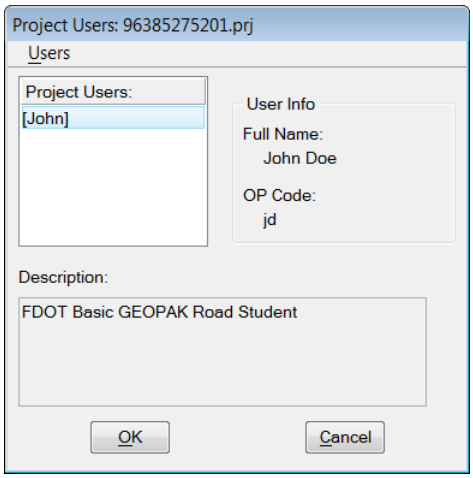



4. From New User, click the **OK** button. An Alert dialog opens asking if you wish to set a password.

5. From Alert, click the **No** button. Clicking **No** completes the New User process. The Project Users dialog box displays, listing the User created.

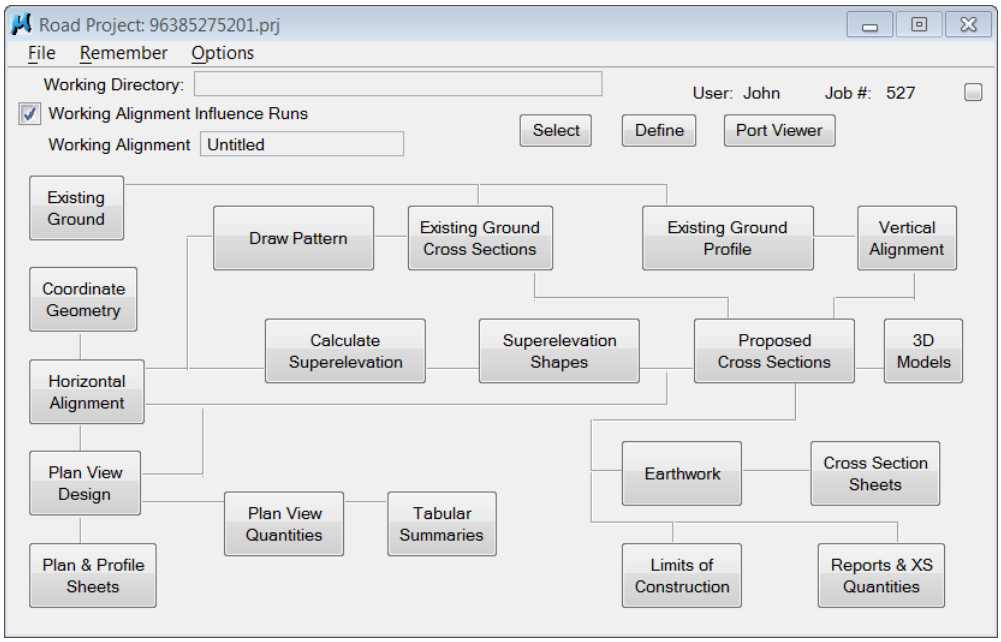



6. In Project Users, highlight the **User Name** and then click the **OK** button. Road Project opens.




7. From Road Project select the menu option **File** > **Close** to return to Project Manager.

# ROAD PROJECT DIALOG BOX




As previously stated in this chapter, the Project Manager likens to a project filing cabinet. In the past, users would have to document on paper the level symbology used to draw cross section pattern lines and the file used. Now, Road Project documents that information.

Road Project buttons liken to a filing cabinet drawer. Inside of the file cabinet drawer, there are file folders, represented by the **Runs**, created to accomplish certain tasks. The **Run** likens to a piece of paper in the file drawer, which has the information needed to accomplish the task. The **Run** is a name assigned to a process within GEOPAK that identifies specific information for processing so users can easily review the data utilized for a specific function.

Properly using the Road Project ensures ease in sharing of data between disciplines and users. Continuing a project is possible, even in the absence of the primary user, because **Runs** will recall all the files and associated settings used on a project. This lessens the chance for error and decreases the need for “tracking down” a user for this vital information.

Road Project also makes the process of creating input files for proposed cross sections, earthwork and sheet layout unnecessary. Road Project creates these processes through dialog boxes and saves them off to a **Run** for other users to use. No more having to know what criteria file goes with which input file.

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## ROAD PROJECT MENU BAR

The Road Project menu bar at the top has three menus:

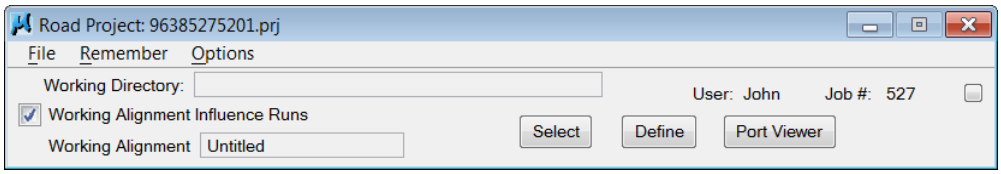
**File** Close closes Road Project and reopens Project Manager. Exit completely exits and does not reopen Project Manager.

**Remember** Tells GEOPAK to remember the **Project** and **User** of the last project opened. When selecting Project Manager with both items selected, Road Project opens automatically. If **Project** is the only selection, then opening Project Manager will display the Project Users dialog. If **User** is the only selection, then opening Project Manager will open to select an existing project. The active selections will have a check mark beside them. These are very useful for working on one project consistently for a long period.

**Options** Contains the option to select Auto Sink. Road Project sinks behind the working window when selecting a tool from the flow chart. Road Project returns to the top when the run is closed.

### ➢ *TO CONDENSE ROAD PROJECT*

To condense Road Project, click the button to the right of Job #. To display the full dialog box, click the same button again.

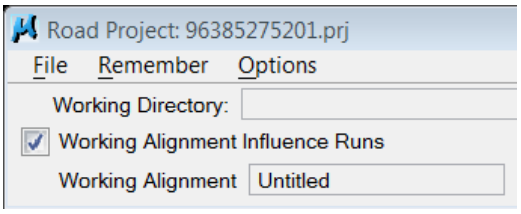



## WORKING ALIGNMENT

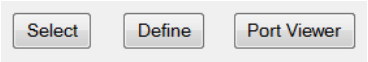
The concept of a working alignment is to allow the designer to organize a project and to have the ability to access project information without having to retype data once entered.

For example, once the user cuts existing cross sections, that information is stored in the working alignment. The user accesses the proposed cross section or earthwork dialog box with the existing ground information already filled in, saving time and the possibility of making a mistake entering the data. The process carries this information over to all of the GEOPAK tools that use the data. On simple projects, there may only be one working alignment, but complex projects may have an unlimited number of working alignments defined.

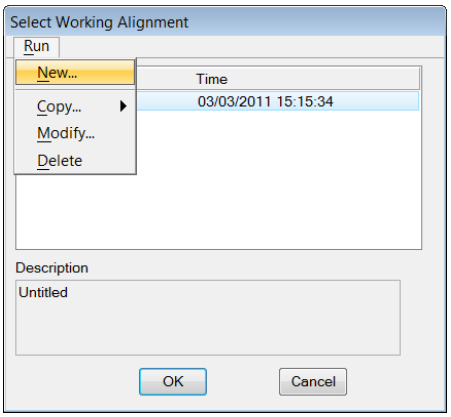
**Working Alignment Influence Runs** Check box tells GEOPAK to use the defined working alignment information in any of the Project Manager Runs and GEOPAK tools.




Road Project has three buttons related to the **Working Alignment**.

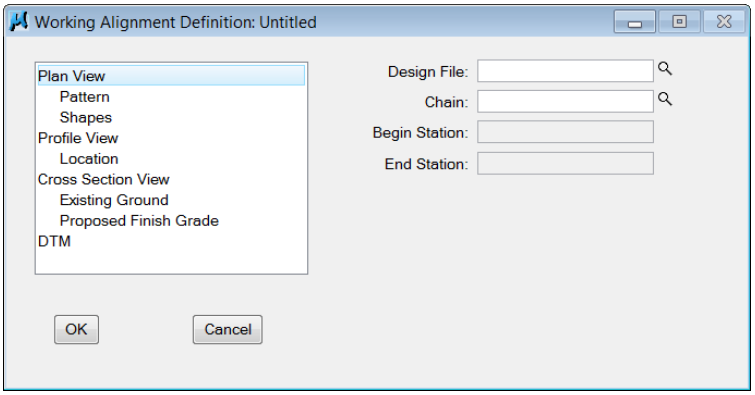



**Select** Opens the Select Working Alignment dialog to select an existing alignment or create a new alignment using the **Run** > **New** menu option.

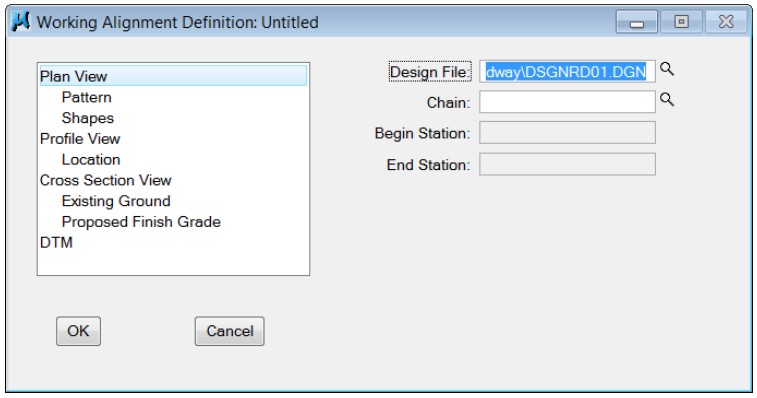



**Define** Opens Working Alignment Definition dialog box to define the working alignment information. This identifies and interacts between the various aspects of the project. Upon creation, the user defines the elements for the Plan, Profile and Cross Section Views and subsequently uses them for other tasks on the project.

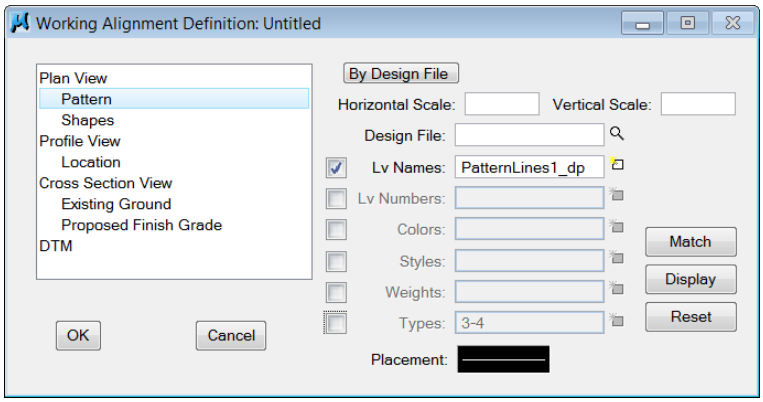
As shown in this course, defining the roadway information expedites the process of filling in dialog boxes with previously defined information in the working alignment.



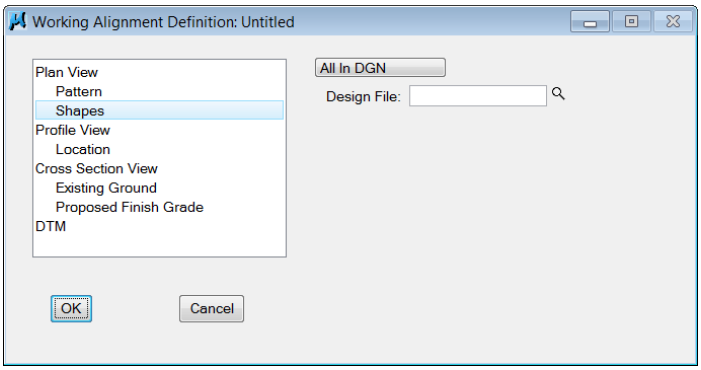
*Plan View* The Plan View defines the MicroStation file, dsgnrd01.dgn, where the proposed roadway items are drawn and the COGO chain name. The Begin Station and End Station fields populate automatically from the selected Chain.



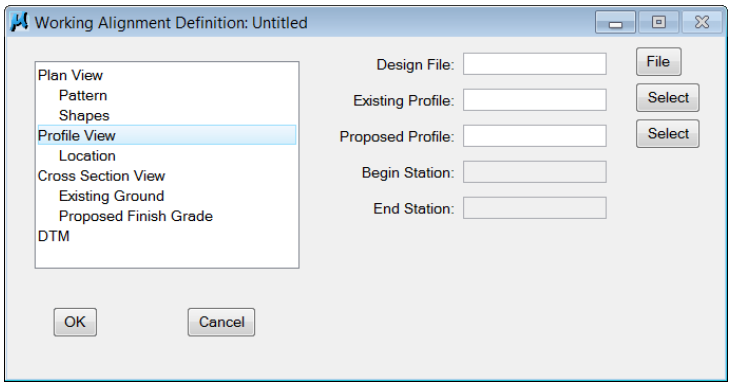

- Pattern Defines the MicroStation file, rdxsrd01.dgn, where the cross-section pattern lines are drawn and the level symbology used to find/draw them. Refer to CPCH chapter 13 for standards. There are two options when drawing the pattern lines, By Station or By Design File. The preferred method is By Design File. Because of the FDOT level structure, the Lv Names check box is the only option necessary.



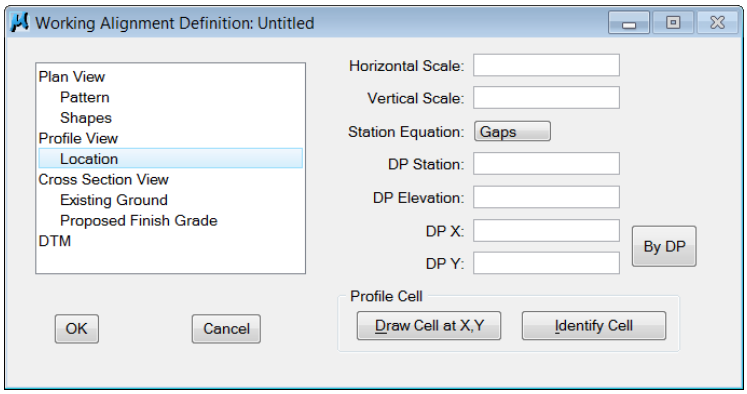
- Shapes Defines the MicroStation file, rdxsrd01.dgn, where the Super elevation shapes are drawn. There are two options with this tool, By Search Criteria or All in DGN. Either method is acceptable.



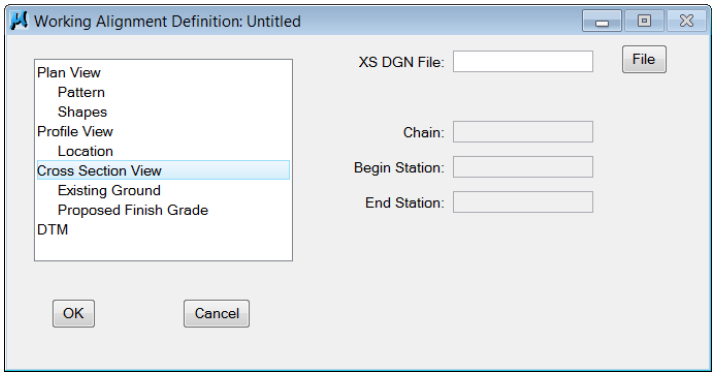

*Profile View* The Profile View defines the MicroStation file, dspfrd01.dgn, where the profile is drawn and the names of the Existing Profile and Proposed Profile that are stored in COGO. The Begin Station and End Station automatically populate from the selected profiles.



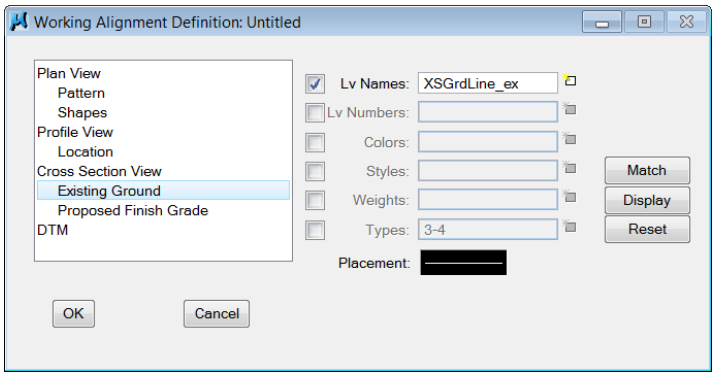

- Location Defines the location of the Profile Cell, which is a common reference point for all profiles. Click on the Identify Cell button to select an existing GEOPAK Profile Cell to fill in the entire dialog box. The Draw Cell at X, Y button places a Profile Cell at the DPX and DPY coordinates.



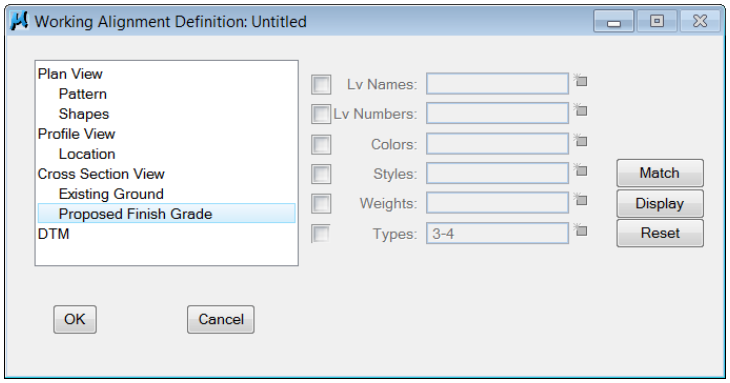
*Cross Section View* Cross Section View defines the MicroStation file, rdxsrd01.dgn, where the cross sections are drawn. The Chain and Stationing fields populate automatically if there are existing ground sections drawn in the selected file.



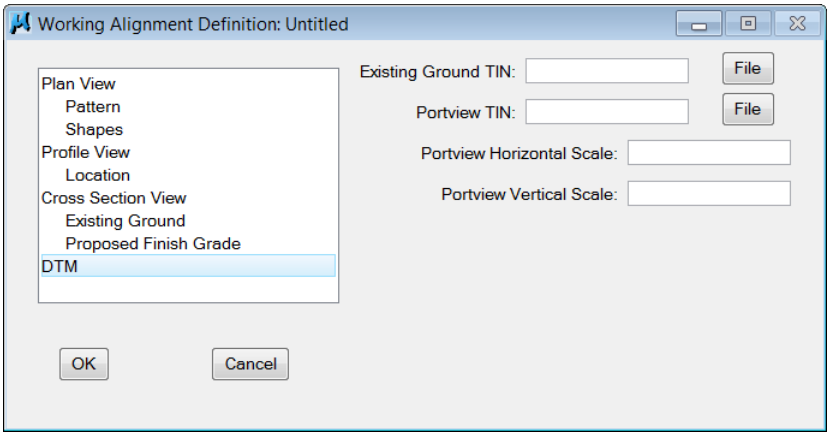

- Existing Ground Defines the level symbology of the existing ground elements. The Match, Display, and Reset buttons provide help filling in the symbology criteria. The buttons work much like the MicroStation match tool - select the options to match and pick the line in the MicroStation file. Because of the FDOT level structure, selecting only the Lv Names check box is necessary.



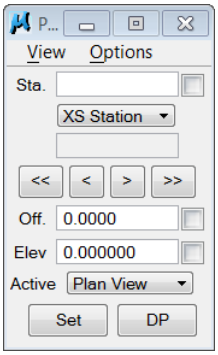

- Proposed Finished Grade Defines the level symbology of the proposed roadway cross section elements. Because of the FDOT level structure, it is easier to leave this section of the dialog blank.



*DTM* Defines the location of the Existing Ground TIN file and Portview TIN, allowing a different TIN file for use with Port Viewer along with the scale settings for the Port Viewer. The course covers this in more detail later.




**Port Viewer** Opens a tool that allows users to view the plan, profile, and cross section views at the same time. This is a good design review tool to aid the designer in comparing plan elements with cross section and profile elements.



## Exercise 2.3 Creating a Working Alignment

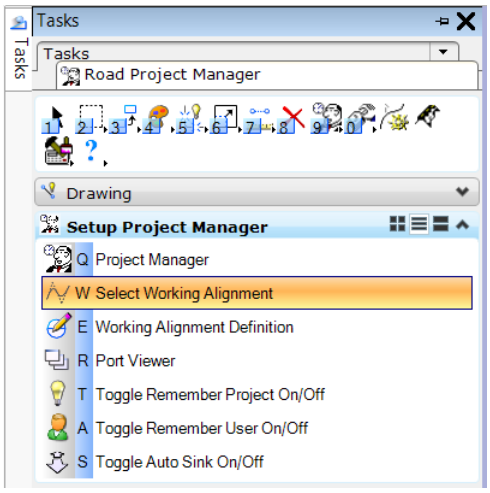
➢ ***TO CREATE A WORKING ALIGNMENT***

1 . Continuing from the previous exercise, from Project Manager, select the project, **96385275201.prj** and click **OK**.

2 . On the Project Users dialog, select the user, **John**, and click **OK**. Road Project opens.

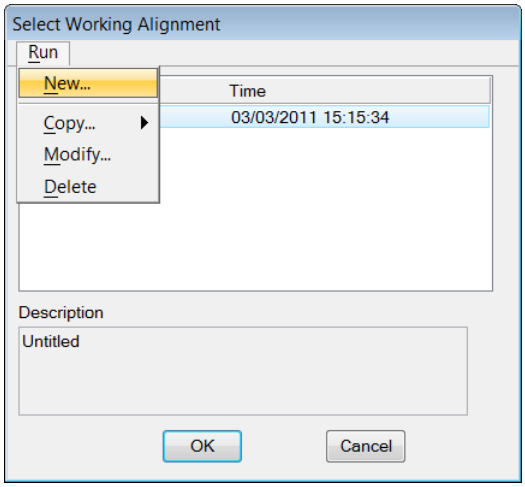
3 . Click the Select button. Select Working Alignment opens.

<OR> from the Task Bar Menus , Select Working Alignment

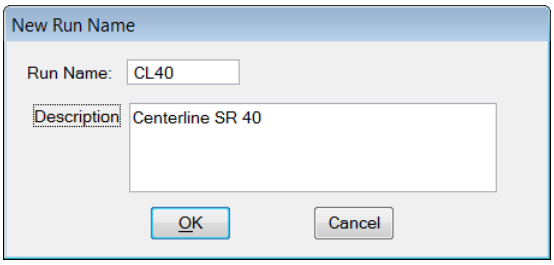



4 . Click the menu option Run> New. New Run Name opens.

*Tip: Always create a new Run instead of using the provided Untitled Runs. The Untitled Runs are templates, used to create a new Run, when a Run becomes corrupt.*

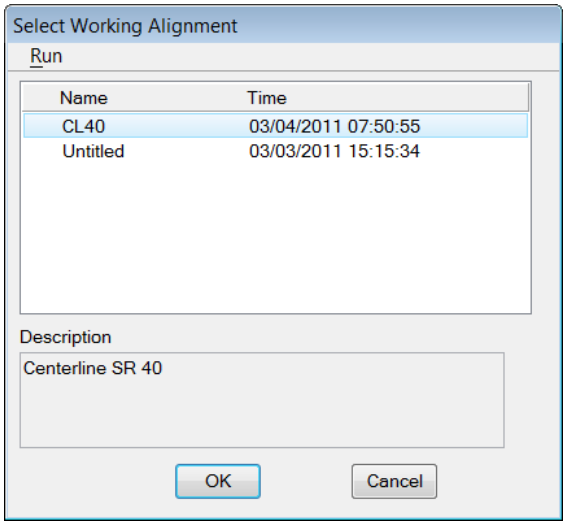


5 . In the **Run Name** field, type **CL40** and enter a brief description of the alignment.



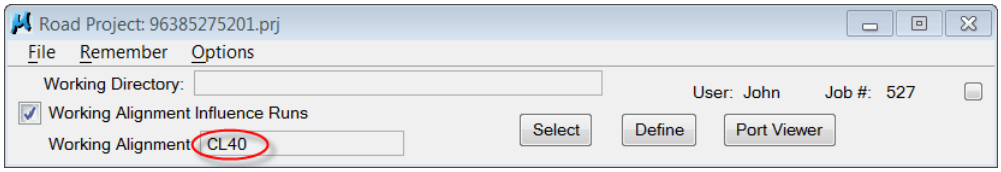

***Note*** In the COGO exercise for storing the proposed alignment, the alignment will be stored with the name **CL40** in COGO. Naming the working alignment the same name as the COGO chain simplifies entries and helps to eliminate confusion.

6 . Click the **OK** button. Select Working Alignment opens.



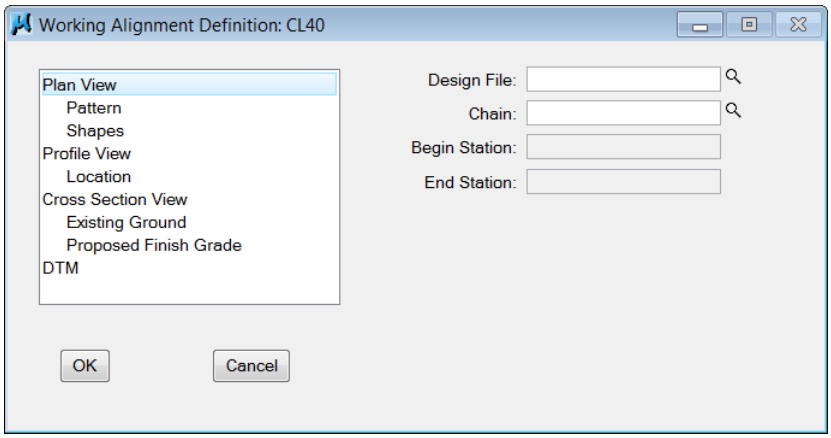

7 . Highlight the newly created Run, **CL40**, and click the **OK** button. Road Projects opens.

8 . In Road Project, the selected Working Alignment Run appears after **Working Alignment**.



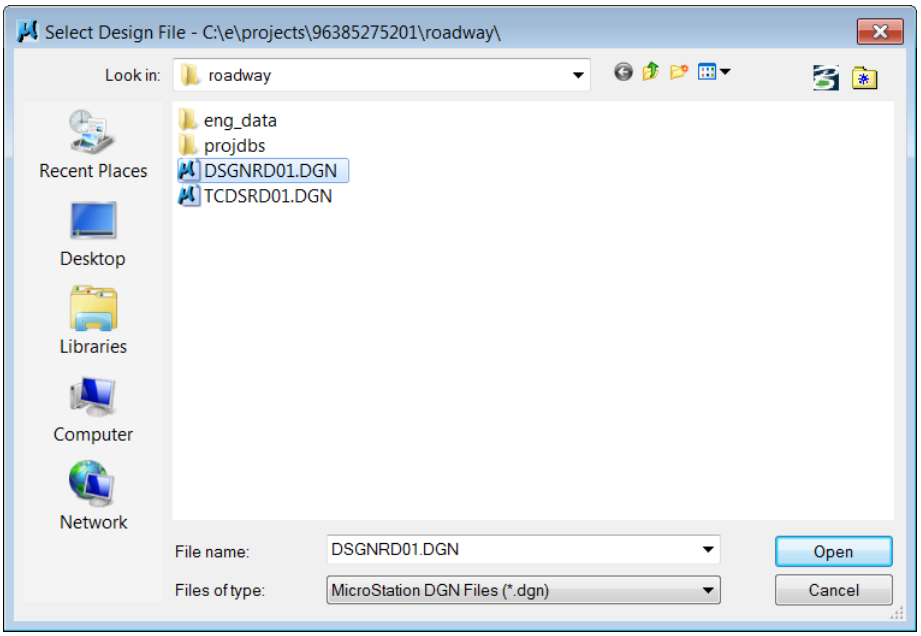

9 . Select the **Working Alignment Influence Runs** check box.

10 .Click the **Define** button. Working Alignment Definition opens.




11 .Click **Plan View**.

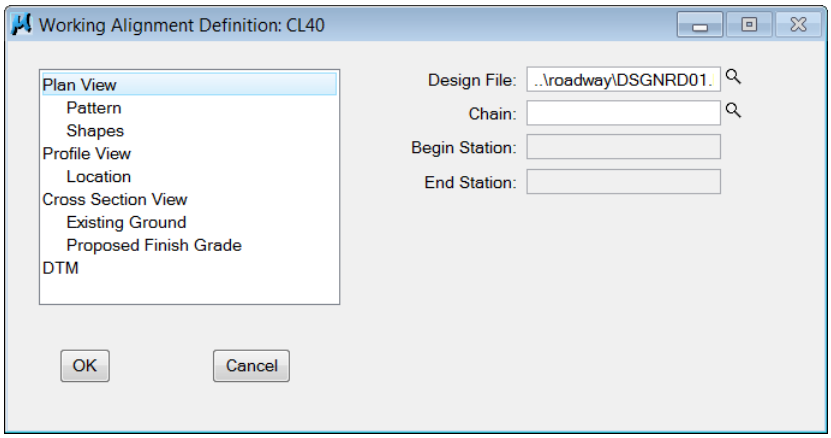
12 .Next to the **Design File** box, click the **Select** button. Select Design File opens.



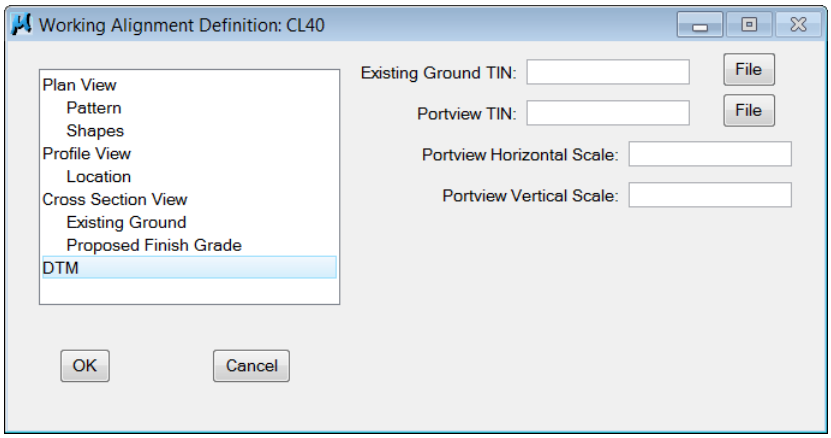

13 .Navigate to **dsgnrd01.dgn** in the **roadway** folder as shown above, then double-click the file --or-- click the file and then click the **Open** button.

14 .In the **Design File** box, replace the full path to **roadway** with "**..**\", as shown below.

***Note*** The ".." is the project directory path and is stored as a workspace configuration variable "_PROJDIR" for the selected PROJECT in Microstation Manager.




15 .Click **DTM**.

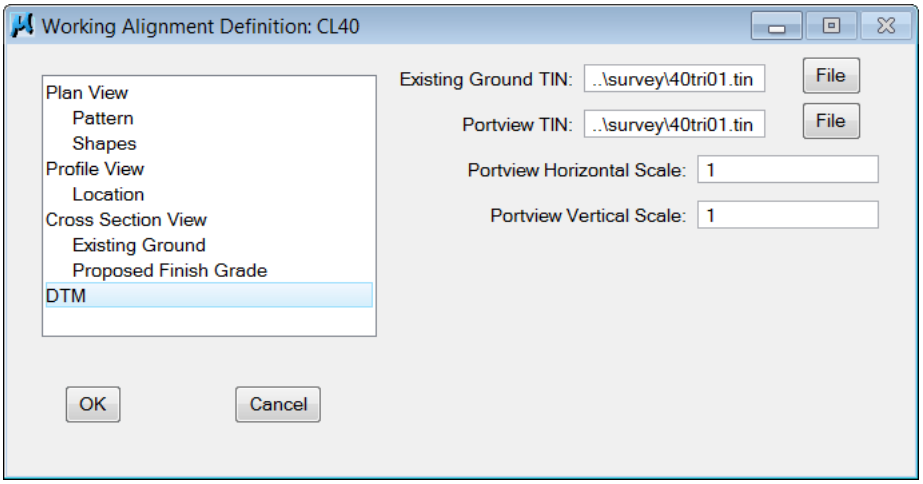



16 .Next to *Existing Ground TIN*, click the **File** button. Select TIN File opens.

17 .Navigate to the *Survey* folder and double-click the file **40tri01.tin**. Select TIN File closes.

18 .Next to *Portview TIN*, click the **File** button. Select TIN File opens.

19 .Navigate to the *Survey* folder and double-click the file **40tri01.tin**. Select TIN File closes.

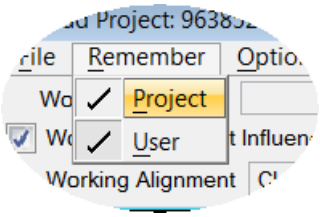



20 .In the *Existing Ground TIN* and the *Portview TIN* boxes, replace the full path to **survey** with "**..**" as shown above.

21 .Keyin the numeric value **1** for the *Portview Horizontal Scale:* and *Portview Vertical Scale:*.

22 .Click the **OK** button. The new settings save to the new **Working Alignment**.

23 .On Road Project, click **Remember** > **Project,** then **Remember** > **User**.




| | |
|---|---|
| ***Note*** | This exercise does not define all the options in the Working Alignment Definition. Each new project components have their definition set through revisiting the Working Alignment. |

24 .On Road Project, click **File** > **Exit**, then close MicroStation.

# 3 COGO & HORIZONTAL ALIGNMENTS

## INTRODUCTION TO COGO

The most important component of any GEOPAK design project is the Coordinate Geometry (COGO) database. The Coordinate Geometry database always uses a .gpk filename extension. Both GEOPAK Road and GEOPAK Survey use the .gpk file to store data.

The .gpk file is comprised of stored geometric elements such as points (both COGO points and Survey points), lines, curves, spirals, chains, parcels, profiles and survey chains. The Surveyor creates this database with GEOPAK or by the roadway personnel, if the .gpk file does not accompany the survey data for each project. Each project should have only one .gpk file placed in a folder that allows read/write access, because the user updates data to the .gpk file over the course of the project.

## OPENING COGO

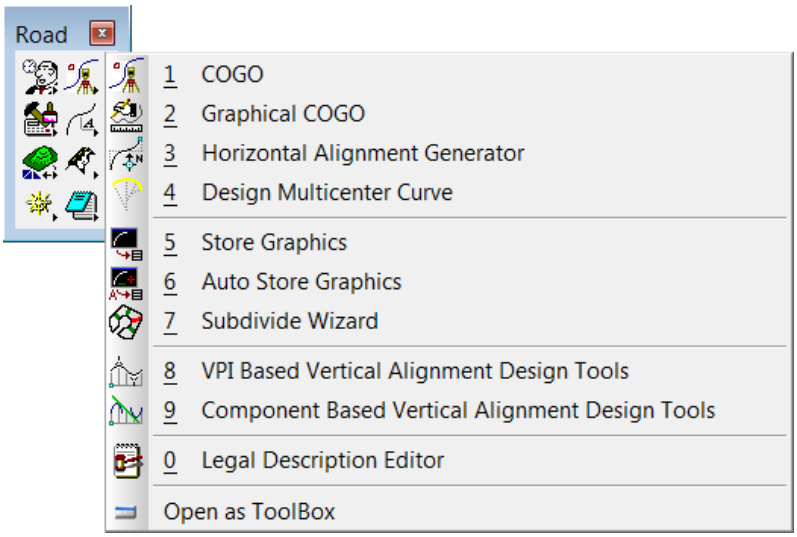
➢ ***TO ACTIVATE COORDINATE GEOMETRY***

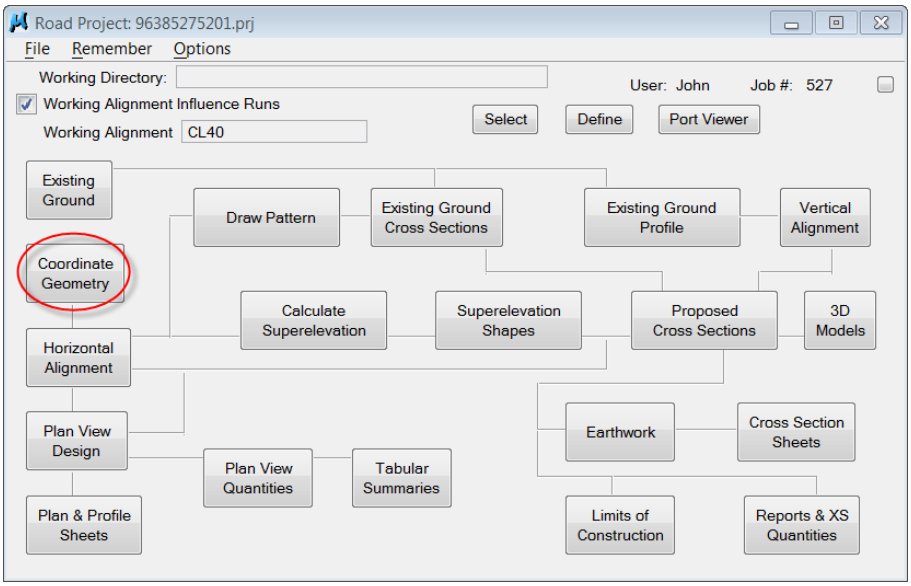
From Road toolbox, click the COGO button.

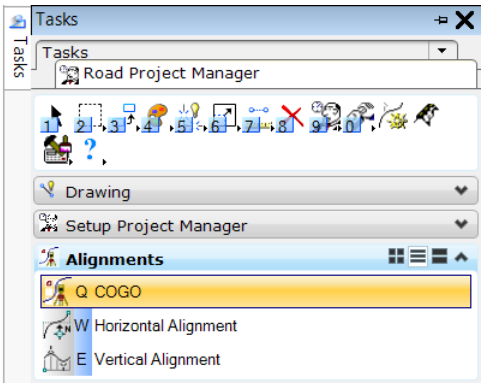
--or-- from the Road Project dialog, click the **Coordinate Geometry** button

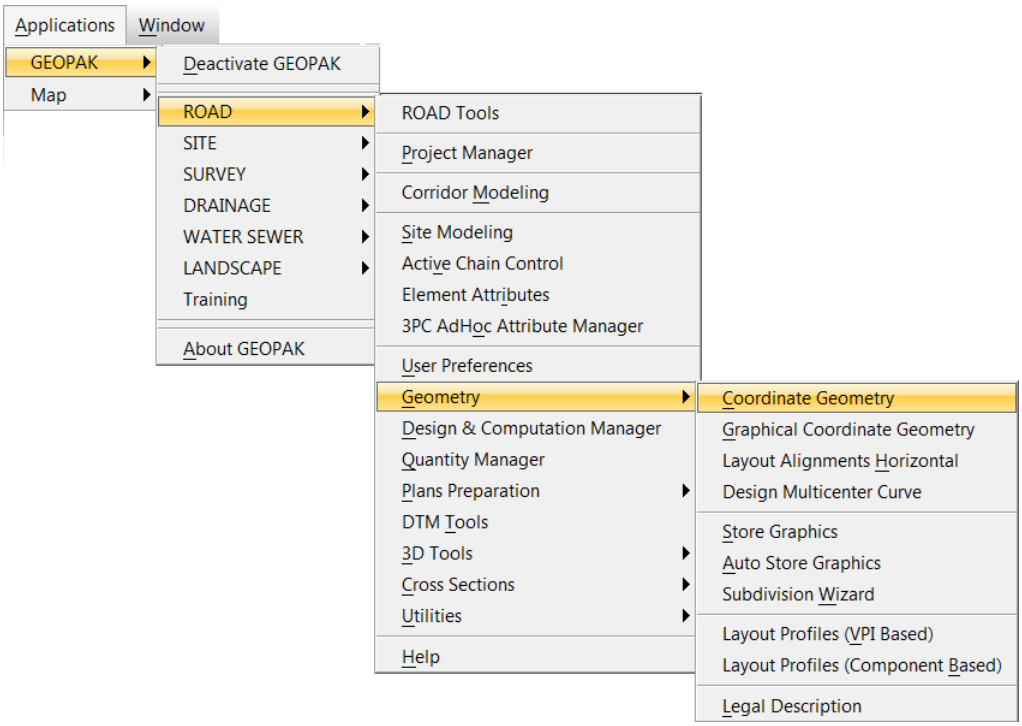
--or-- from the MicroStation Task Bar menu options

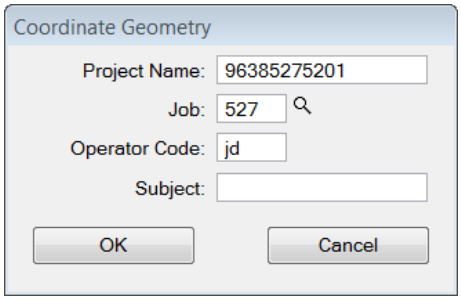
--or-- from the MicroStation menu options, click **Applications** > **ROAD** > **Geometry** > **Coordinate Geometry**. Coordinate Geometry opens.




Road Project: 96385275201.prj
File
Remember
Options
Working Directory:
User: John
Job #: 527
Working Alignment Influence Runs
Working Alignment
CL40
Select
Define
Port Viewer
Existing Ground
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Coordinate Geometry
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Horizontal Alignment
Plan View Design
Earthwork
Cross Section Sheets
Plan View Quantities
Tabular Summaries
Plan & Profile Sheets
Limits of Construction
Reports & XS Quantities


Tasks
Tasks
Road Project Manager
Drawing
Setup Project Manager
Alignments
Q COGO
W Horizontal Alignment
E Vertical Alignment


Applications
Window
GEOPAK
Map
Deactivate GEOPAK
ROAD
SITE
SURVEY
DRAINAGE
WATER SEWER
LANDSCAPE
Training
About GEOPAK
ROAD Tools
Project Manager
Corridor Modeling
Site Modeling
Active Chain Control
Element Attributes
3PC AdHoc Attribute Manager
User Preferences
Geometry
Design & Computation Manager
Quantity Manager
Plans Preparation
DTM Tools
3D Tools
Cross Sections
Utilities
Help
Coordinate Geometry
Graphical Coordinate Geometry
Layout Alignments Horizontal
Design Multicenter Curve
Store Graphics
Auto Store Graphics
Subdivision Wizard
Layout Profiles (VPI Based)
Layout Profiles (Component Based)
Legal Description




**Project Name** Name displayed on reports generated from COGO. This entry is optional, with a maximum of 60 alphanumeric characters. If Project Manager is active, **Project Name** automatically defaults to the name of the selected project.

**Job** A required identifier coordinate geometry database file with a maximum of three alphanumeric characters allowed. If Project Manager is active, **Job Number** automatically defaults to the selected job number. If the box is empty, click the **Magnifying Glass** to select the desired **.gpk** file. The list of files to choose from will be the .gpk files located in the current working directory unless the file path has been set inside User Preferences.

**Operator Code** Unique 2-character code which enables multiple users access to the database file. The user's initials are typically used. This information is not required for single user access, but is highly recommended.

**Subject** Description of coordinate geometry work completed in the current session of COGO with a maximum of 48 alphanumeric characters and used in the header information of output files generated by COGO. This information is optional.

**OK** Starts the COGO session using the selected job number. If none exists, a prompt appears to create the **.gpk** file.

**Cancel** Closes the start up dialog without a COGO session opening.

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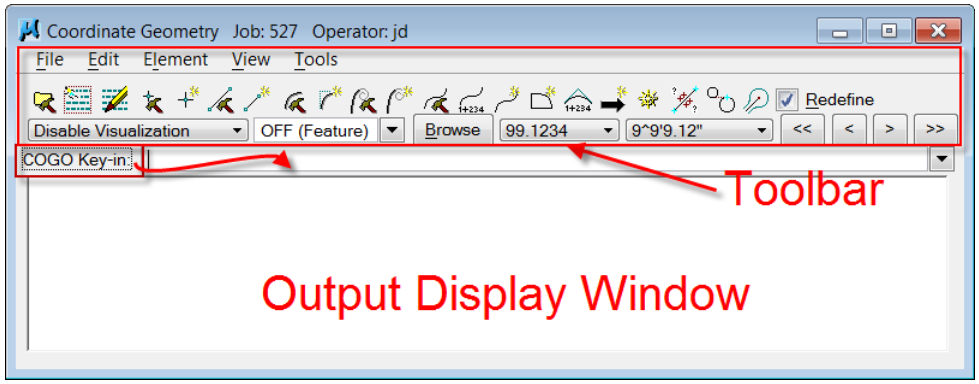
## COORDINATE GEOMETRY MENU BAR

After selecting **OK** on the previously described COGO start-up dialog, Coordinate Geometry opens. The job number and operator code displays in the title bar across the top of the Coordinate Geometry dialog box. As shown below, the **Job** is 527 and the **Operator** is jd.

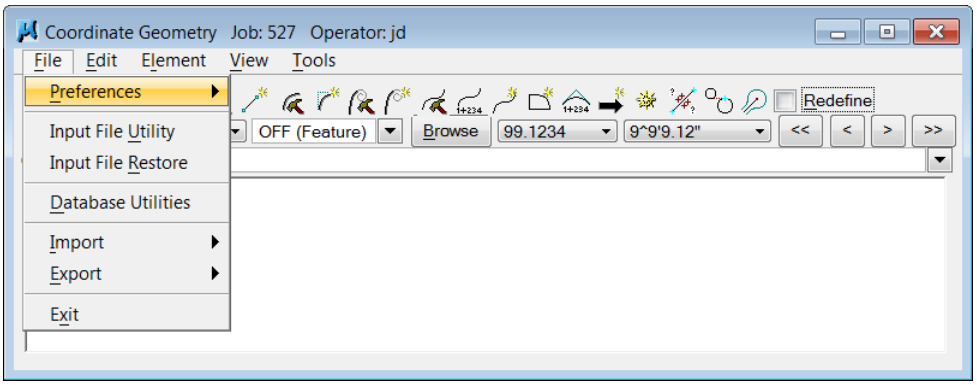



Coordinate Geometry has three separate display areas:

- **Tool Bar** consists of drop-down lists and buttons that are customizable to each user's preference.
- **COGO Key-In** field allows typed COGO key-in commands and displays commands generated by automated process when clicking on command driven icons.
- **Output Display Window** displays the audit trail consisting of input commands and the results generated by those input commands. Clicking on a command line in this window will place the command back in the COGO Key-In field to reprocess the command.

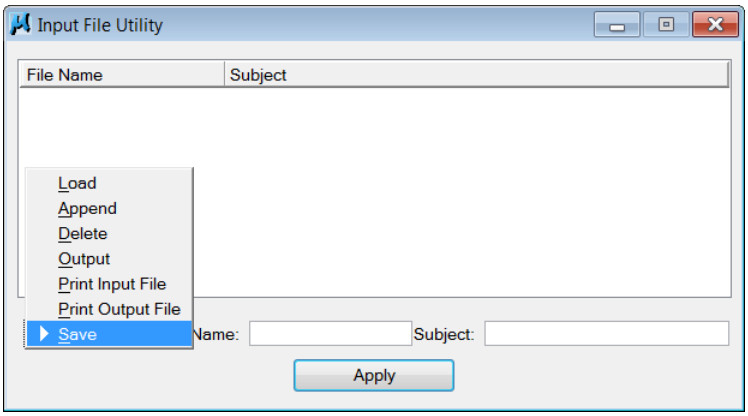
## FILE COMMANDS

The File commands control the file management of input and output files.




**Preferences** This menu option contains a group of options to set the display settings for COGO. Dialog opens COGO Preferences dialog box, Redefinition of Elements toggle, Visualization, Coordinate Display, and Angle Display.

**Input File Utility** This command opens the Input File Utility dialog box that contains a group of file utilities that includes the following commands; **Load, Append, Catalog, Delete, Output, Print Input File, Print Output File,** and **Save**.




*Load* Opens a dialog box listing all input files in the project directory. Selecting a **file**, then the **Apply** button clears the buffer and loads (into memory) the current contents of a previously stored input file. Once loaded, the COGO commands in the input file can be processed (read), edited, modified or deleted. Selecting **Allow Commands to be Added** adds the COGO commands to a previously loaded file.

*Append* For input files only, a new input file is created by appending the contents of an existing input file to the end of the currently opened input file; use the **Save** command to store this new file.

*Catalog* Opens a dialog box listing all saved input files in the specified project's directory for the current operator. No action takes place.

*Delete* Opens a dialog box listing all saved input files. Selecting a **file**, then the **Apply** button removes this file from your project directory. This only deletes the input file, any COGO elements (points, curves, chains, etc.) created by the deleted input file are still in the gpk file.

*Output* Opens a dialog box allowing the writing of an ASCII GEOPAK output file from the current output buffer session to a newly created file for review/print. (Example: name527.ojd)

*Print Input File* Sends selected input file to the printer.

*Print Output File* Sends selected output file to the printer.

*Save* Saves only current input command lines in memory, not all the lines in the output display box, as a permanent file on disk. Saves the current audit trail to a file, such as Fname527.ijd, where 527 is the current job number and jd is the operator code.

**Input File Restore** This loads a temporary ASCII file of GEOPAK commands into the Output Display Window. The correct file name convention is **j(###)O(oc).inp**. Where ### is the GEOPAK job number and **oc** is the operator code, the user's initials. This format is not the means by which to save input files. Files loaded into GEOPAK via the **Restore** command use the **Save** command to save into the GEOPAK cataloging system.

**Database Utilities** Opens the Database Utilities dialog box, which includes tools to **Validate** the .gpk file and/or **Clean and Compress** the .gpk file.

**Import** Imports horizontal and vertical alignments and points from GPK File, ASCII points, SDMS alignments and points, LandXML 1.0 geometry, RDS and VDOT PLT formats into the **GEOPAK .gpk** file.

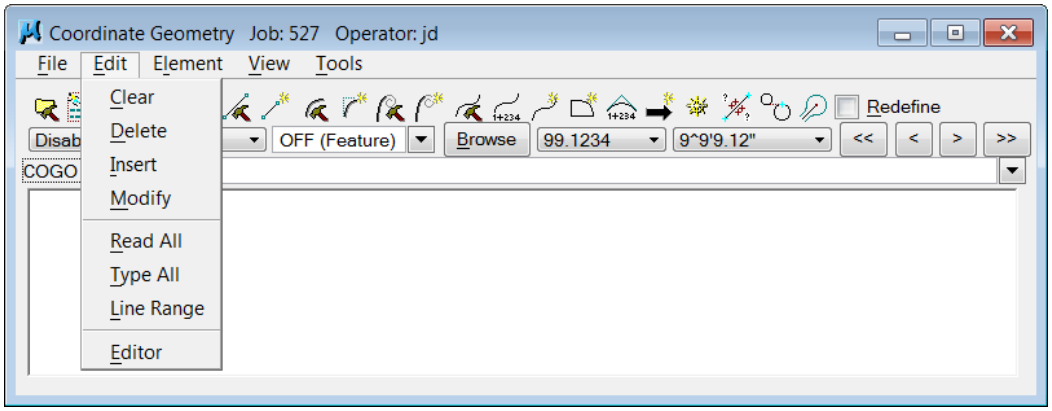
**Export** Exports ASCII points, SDMS alignments and points, LandXML 1.0 geometry, and alignments and profiles into formats for use in various data collectors.

**Exit** Closes Coordinate Geometry and ends the coordinate geometry session. A prompt appears upon exit. Selecting the **Yes** button saves the audit trail to a user-defined file name. (**point527.ioc** where ***point*** is the user-entered name, ***527*** is the gpk name, ***.i*** indicates an input file and ***oc*** is the operator code). Selecting the **No** button exits the session without saving an input file. Selecting the **Cancel** button returns the user to the COGO session.

***Note*** Regardless if the User elects to save; all items created in the COGO session are saved in the .gpk file.

## EDIT COMMANDS

The Edit commands control the content of the COGO command Buffer.




**Clear** Empties the memory of the current audit trail without saving and initializes the line numbers to begin a new sequence of commands. This command does not clear the display window.

**Delete** Deletes input commands in the input buffer by line number (or range of line numbers) and re-sequences the line numbers for the remaining commands.

**Insert** Adds a command line to the current input buffer before a specified line number; subsequent command lines shift down and line numbering is automatically re-sequenced.

**Modify** Changes a fragment in a command line. The user performs a Read command to process the modified command line.

**Read All** The input commands loaded into the buffer are processed.

**Type All** Displays the content of the current input file.

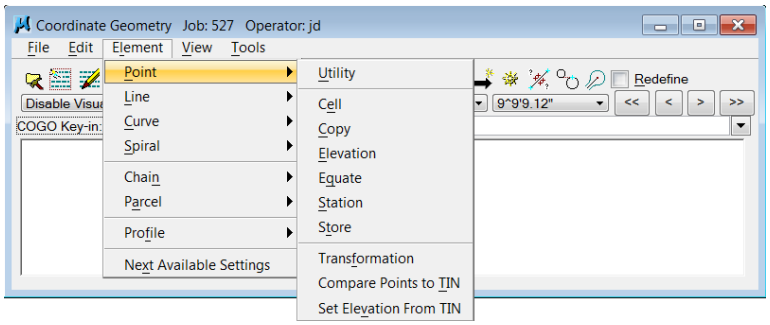
**Line Range** Allows a portion (line range) of the input file to be displayed (Type) or processed (Read).

**Editor** Opens COGO Command Editor, which enables you to edit the current input file.

## ELEMENT COMMANDS

The majority of the work performed in COGO involves commands in the **Element** menu. **Element** commands covered in this section include storing, stationing, adding additional data, deleting, etc.

### Point Commands




*Utility* Opens the Point Utility dialog box where you can **Delete**, **Print**, or **Display** any point number based on the current COGO visualization settings.

*Cell* Opens a dialog box to attaches a cell to a previously stored point.

*Copy* Copies points or a point range to a new point number or range within the same GEOPAK database file.

*Elevation* Assigns an elevation to a previously stored point.

*Equate* Stores a new point with the same values as a previously stored point. There are many different Equate From options to explore with this tool.

*Station* Allows you to specify a station for an existing point. In most cases, it is best not to associate a station with a point.

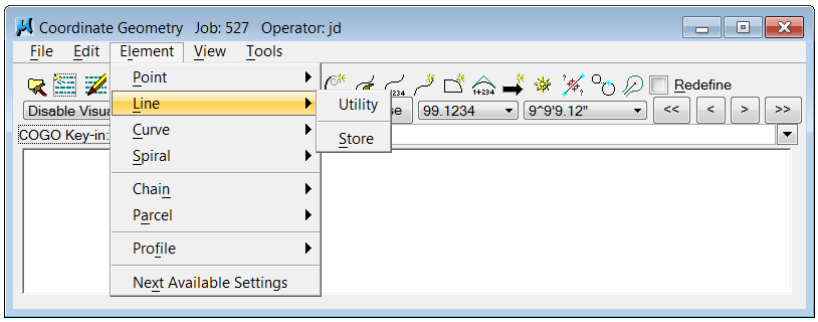
*Store* Enables the storage of points, utilizing either Cartesian coordinates (x, y, z or N, E, Z) or Curvilinear (station, offset, elevation). This stores points by keying in the coordinates or by selecting a location in the design file. A station, elevation, point code, cell, feature, or description can be optionally stored with the point.

*Transformation* Transforms one set of points into a new coordinate system.

*Compare Points to TIN* Utilizing a set of COGO points (with elevations), compares the COGO elevation to the TIN elevation and completes statistical analysis.

*Set Elevation From TIN* Utilizing this command, GEOPAK adds or updates an elevation to a previously defined point, based on a TIN model.

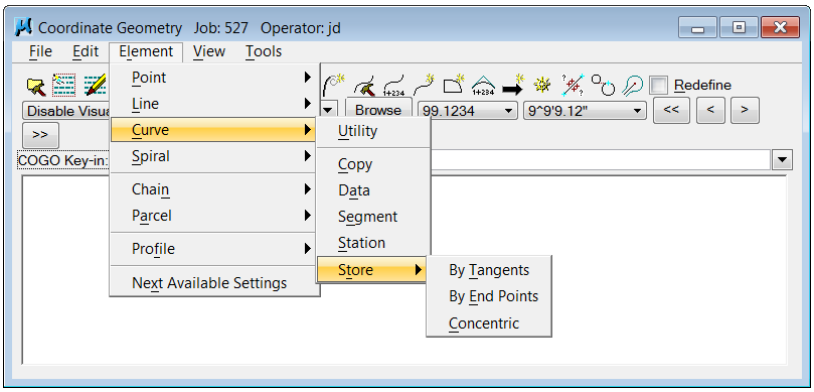
## Line Commands




*Utility* Opens the Line Utility dialog box listing all stored lines. You can Transpose, Delete, Print, or Visualize any selected line.

*Store* The Store Line tool is a dialog that allows you to store a line based on one point and a direction or two points. The line name can be alphanumeric (but not numeric-alpha) to a maximum of fifteen characters.

## Curve Commands




*Utility* Opens the Curve Utility dialog box listing all stored curves. You can **Reverse**, **Delete**, **Print**, or **Visualize** any selected curve.

*Copy* Opens the Copy Curve dialog allowing the copying of a user-selected curve to another curve name.

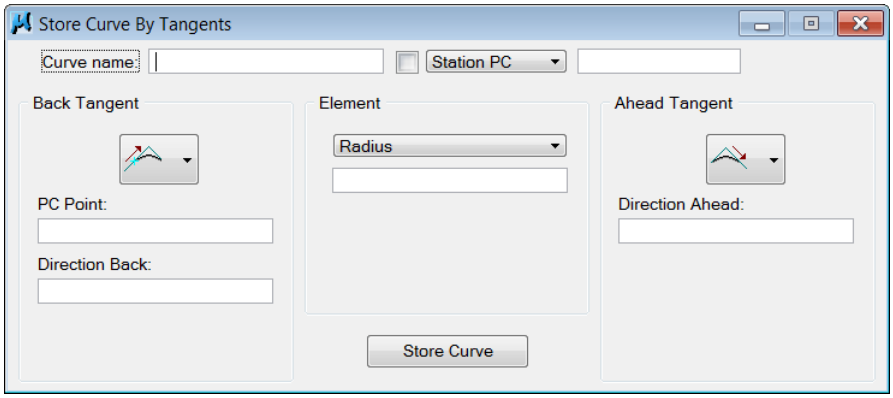
*Data* Opens a dialog allowing the calculation of curve geometry between two given points with a user specified radius or degree, displaying values for **Delta**, **Degree**, **Tangent**, **Length** and **Radius**. This dialog does not store a curve, nor does it give information for an existing curve.

*Segment* Defines new curves by dividing a stored curve into segments.

*Station* Opens the **Curve Station** dialog allowing the re-stationing of a previously stored curve with respect to the PC, PT, or PI station.

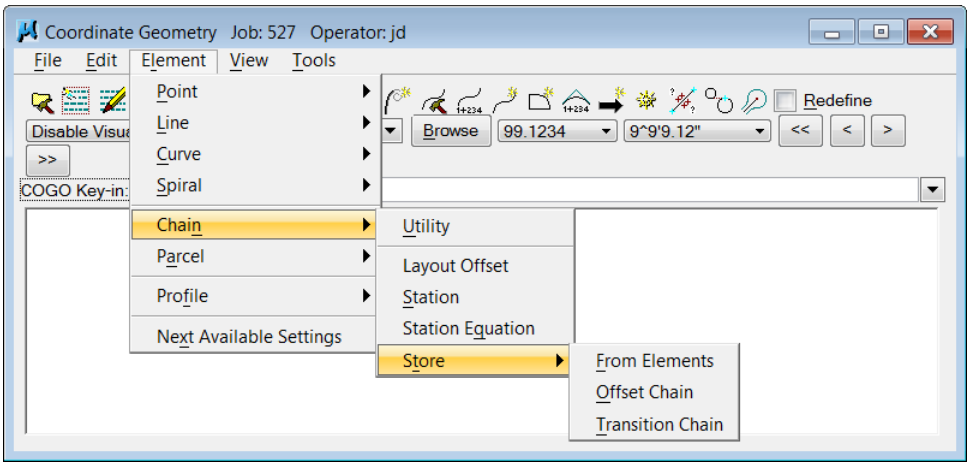
*Store* Allows three different options for storing curves, **By Tangents**, **By End Points**, and **Concentric**.

- By Tangents (command shown below) Defines and stores a circular curve using optional directions and curvatures.
- The Station option assigns a station value to the label PC, PI, or PT. Station option unselected assigns the PC a value of 0+00. The top of the dialog contains the **Curve Name** key-in field and the optional station label. To utilize the Station option, activate the toggle, key in the desired station in the key-in field and establish the location on the curve to apply the station via the PC/PI/PT option button.
- The groups: Back Tangent, Element and Ahead Tangent, support various options, providing a myriad of ways to store curves. The designer selects the options to apply to each situation.




**Spiral Commands** FDOT avoids spiral curves, if possible. If a spiral is necessary, submit specific justification to the District Design Engineer for concurrence prior to proceeding with the alignment. If approved, document the spiral curve in the project journal. Refer to PPM, Volume I, page 2-15, for more information. This manual does not address Spiral tools.

## Chain Commands



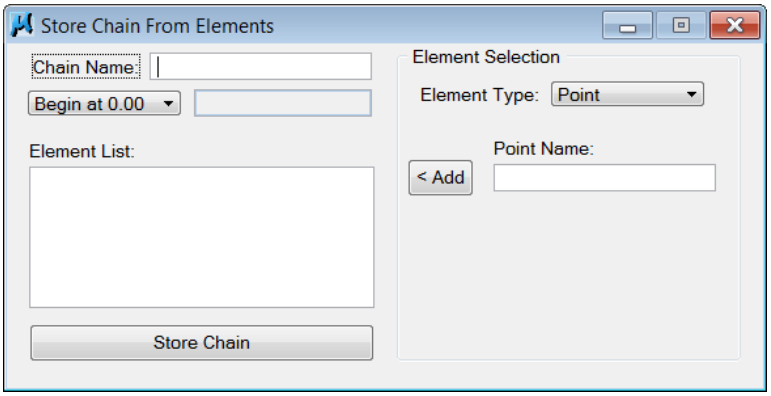

*Utility* Opens the Chain Utility dialog box where you can calculate the **Area**, **Delete**, **Print**, **Describe**, or **Visualize** any chains stored in the **.gpk** file.

*Layout Offset* Project points onto a chain or compute offset distance and direction between two chains at each control point or at user-defined intervals of a specified station range.

*Station* The **Station Chain** command contiguously re-stations the chain from the specified element. The previously stored element can be expressed as either a point (e.g., 10), curve (e.g., cur a-1) or spiral (e.g., spi a-3). The re-stationing can either progress ahead (AH) to the end of the chain, or back (BK) to the beginning of the chain.

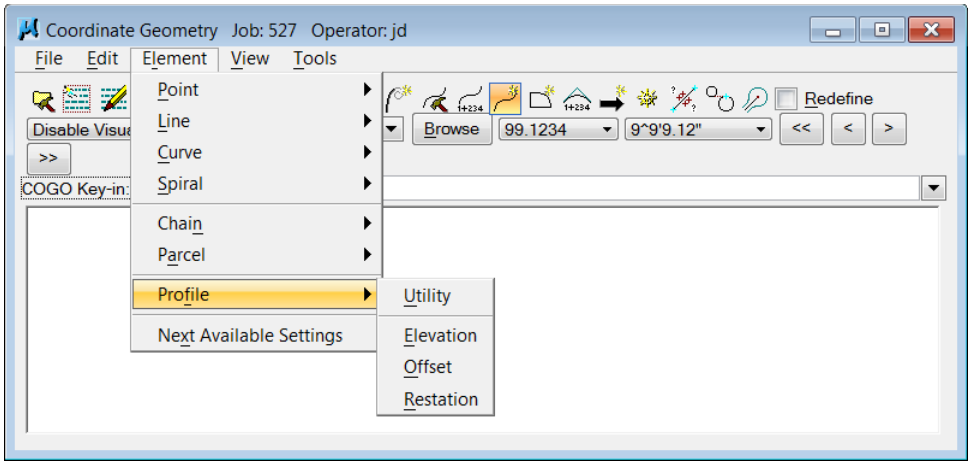
*Station Equation* Provides a method for applying a station equation to a chain by equating the back station to the ahead station, or equating the point of a curve (i.e.: PC, PT) to the station ahead.

*Store* Provides three options for storing a chain in the **.gpk** file: **From Elements**, **Offset Chain** and **Transition Chain**. (Chain name can be between 1-15 alphanumeric characters). Store Chain From Elements shown below.



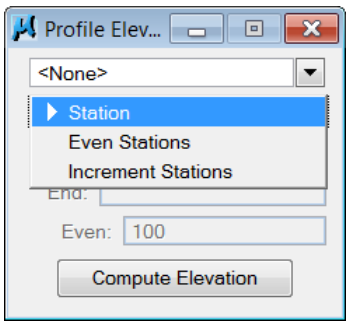
**Parcel Commands** Right of Way primarily uses **Parcel** commands and not generally used in Roadway Design, therefore, this class will not cover the Parcel tools.

**Profile Commands** Components used to store vertical alignments and to define a series of grade lines, each of which intersects at a Vertical Point of Intersection (VPI), with or without parabolic vertical curves. The Layout tools generate Profiles outside of Coordinate Geometry. The **DTM** tools, **Site Modeler**, or **Draw Profile** tool generate existing ground profiles. Therefore, there are no dialog tools within COGO for creation of profile. It does support **Key-in** commands.




*Utility* Opens the Profile Utility dialog box where you can **Delete** or **Print** any profiles stored in the .gpk file.

*Elevation* Provides three options for computing elevations along a selected profile: **Station**, **Even Stations**, and **Increment Stations**.

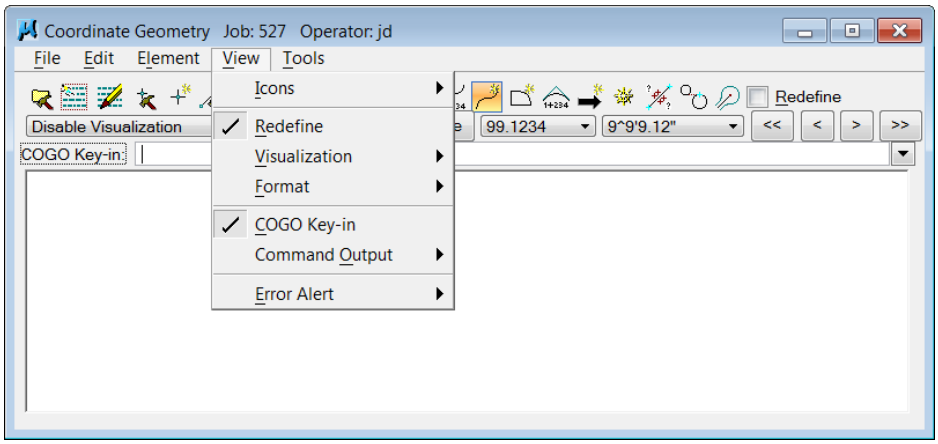



*Offset* Stores a new profile within a specified **Station Range** at a defined vertical offset from the original profile.

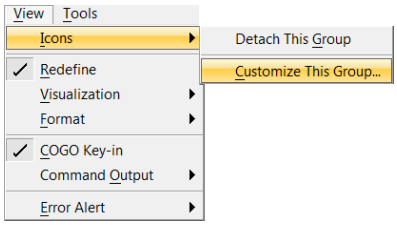
*Restation* Creates a new profile with different stationing from a previously stored profile.

## VIEW COMMANDS

The software supports wide varieties of options to customize the COGO window easily. This grants the ability to operate from pull down menus, select which icons (if any) to display on the screen, the option to display the COGO key-in command line, etc.

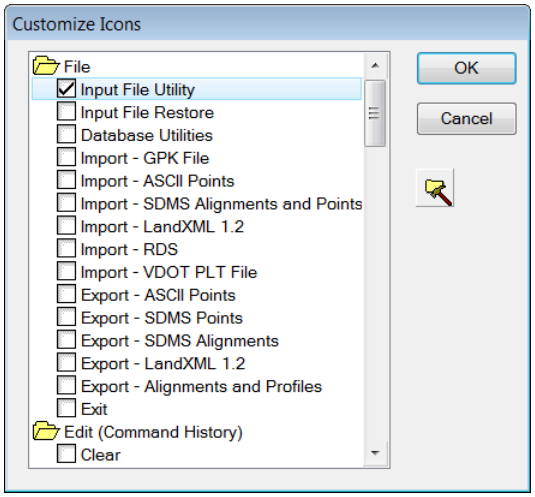



### Icons



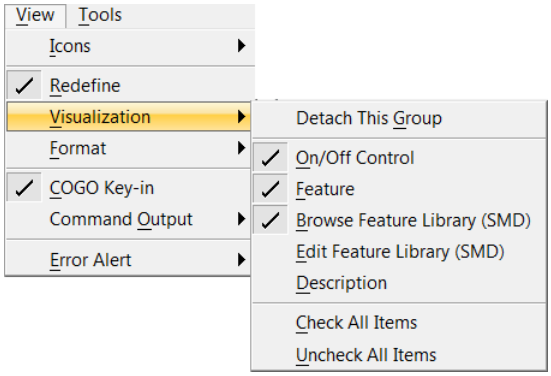

*Detach This Group* Acts as a toggle to turn the icons toolbar on the COGO dialog box on or off.

*Customize This Group* Enables the ability to choose which buttons appear in the tool bar. These can be selected by group, (i.e., file, edit, element, etc.) or individually. As one selects the individual tools, the corresponding button appears under the Cancel button as shown below.



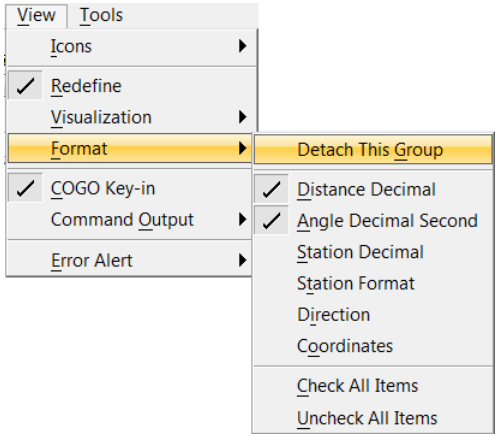
**Redefine** Toggles the display of the Redefine box on the tool bar.

**Visualization**




*Detach This Group* Acts as a toggle to turn the Visualization icons toolbar on the COGO dialog box on or off. The next section of the menu toggles the different icons shown on the toolbar. Check/Uncheck All Items turn all the icons on or off.

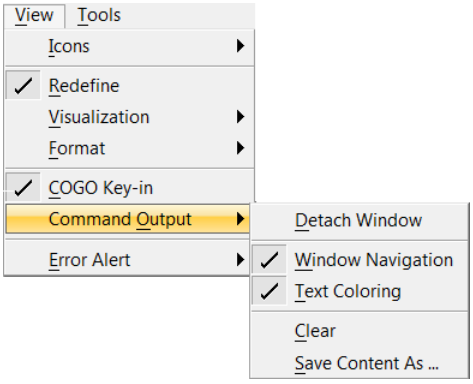
**Format**



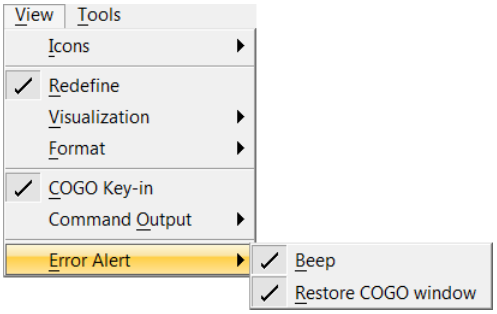

*Detach This Group* Acts as a toggle to turn the Format icons toolbar on the COGO dialog box on or off. The next section of the menu toggles the different icons shown on the toolbar. Check/Uncheck All Items turn all the icons on or off.

**COGO Key-In** Toggles the display of the COGO Key-in box for entering commands in the dialog.

**Command Output** Displays the command output window and controls associated options for the window. Use the Save Content As command to save to a text file. Other options include Detach Window, Window Navigation, Text Coloring, and Clear.




**Error Alert** This activates the audio and visual signals when GEOPAK encounters a syntax or operator error. The options activate a Beep and/or Restore COGO Window. If the COGO Output Display window is off, it will only display when encountering an error and the Restore COGO Window option is active.

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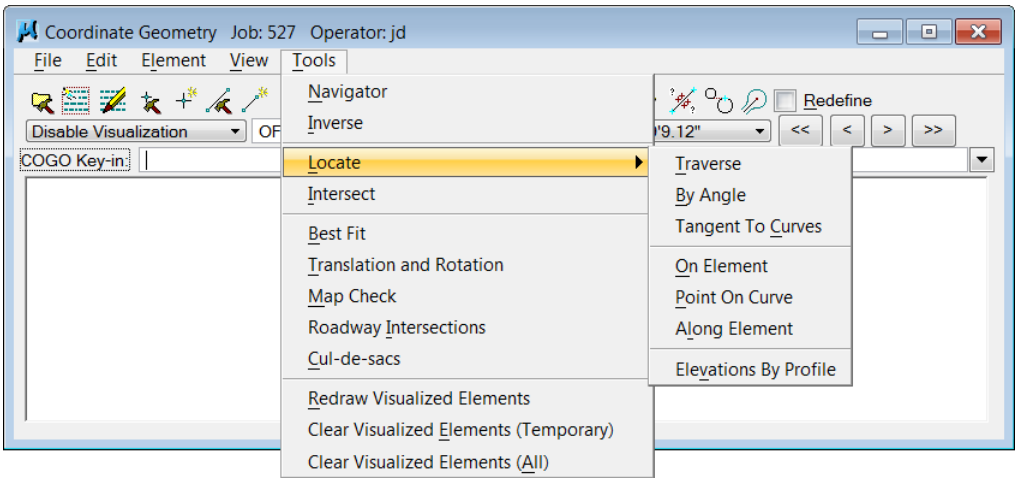
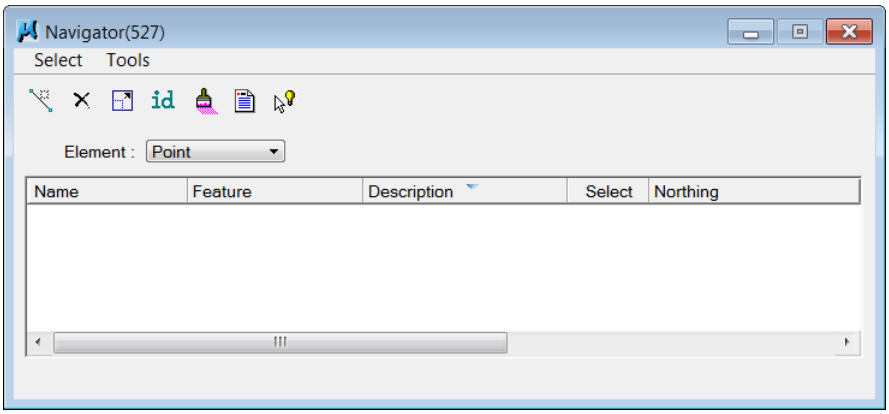
## TOOLS COMMANDS



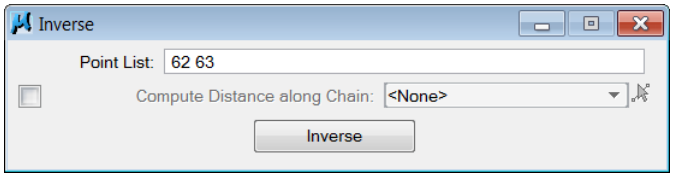

**Navigator** Opens Navigator tool to assist in viewing, manipulating, and editing coordinate geometry elements. Powerful selection tools support a variety of coordinate geometry elements, features, etc.

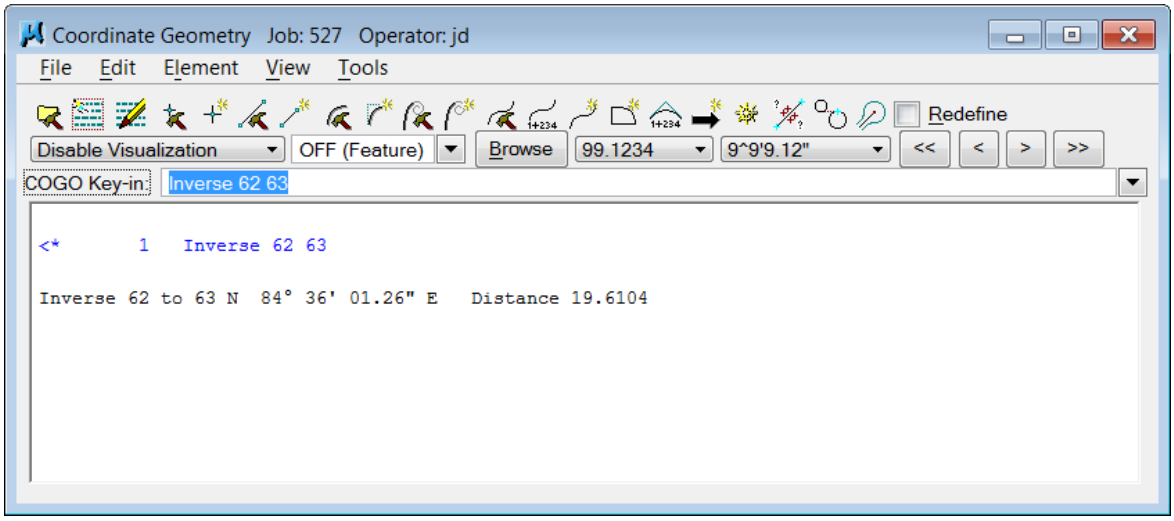



The following summarizes Navigator functions.

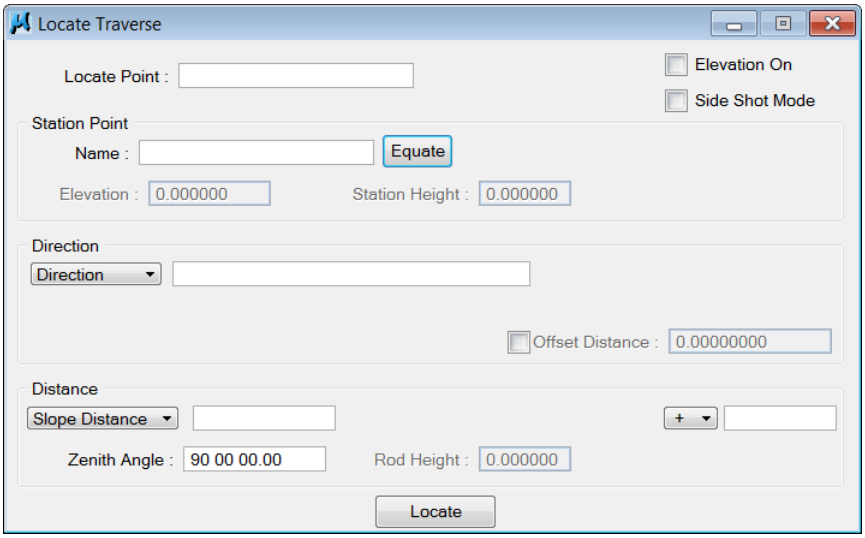
- Store new COGO elements
- Review/modify previously stored COGO elements
- Delete COGO elements
- Visualize individual or all COGO elements
- Describe COGO elements
- Select groups of elements based on a user definable search criteria for further manipulation

**Inverse** Calculates the distance and direction between pairs of points and displays the results in the COGO command output window as shown below.

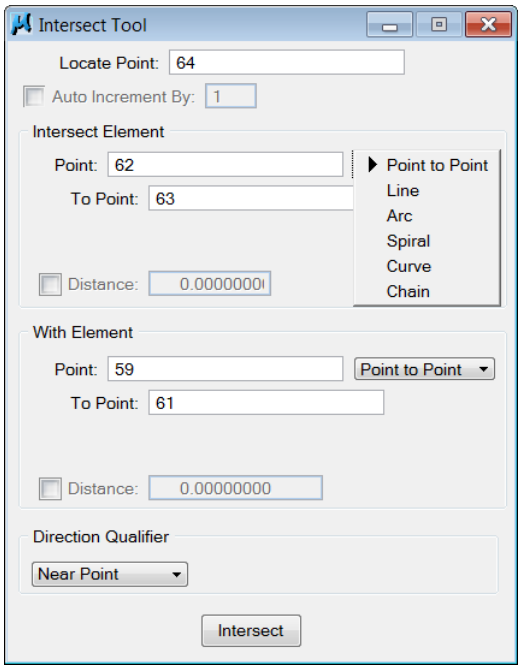


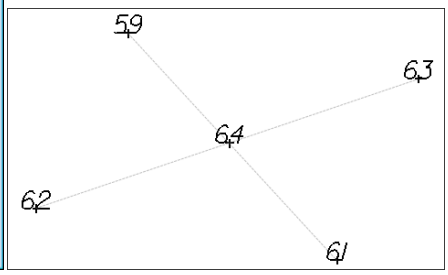




**Locate** Stores a point or series of points based on a previously stored point. To locate a point by distance and bearing, click **Tools**, point to **Locate**, and then click **Traverse**. Locate Traverse opens as shown below.



**Intersect** The **Intersect** commands locates and stores a point(s) by reading and processing from previously stored points, curves, lines, spirals and chains, all from Intersect Tool, shown in the figure below. The results of the Intersect Tool shows where point 64 is located and stored at the intersections of points 59, 61 and 62, 63.



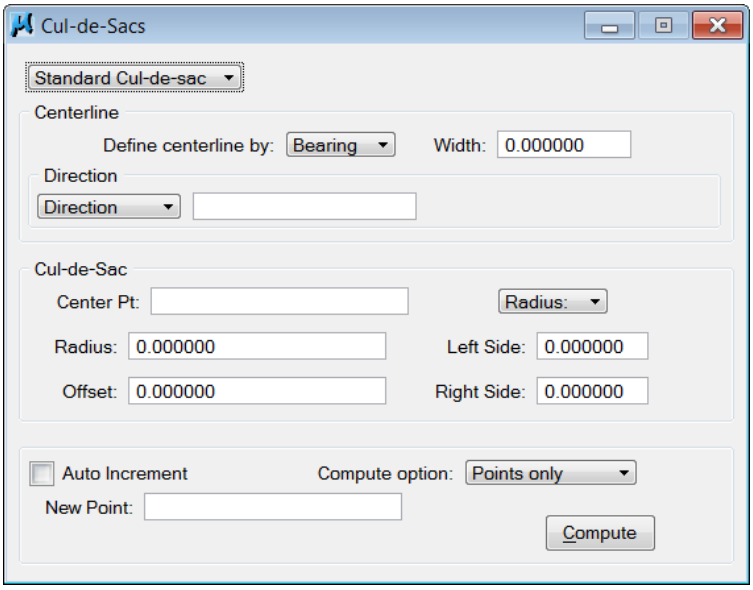

**Best Fit** Based on a series of points, the **Best Fit** tool determines the best fitting line, curve, or alignment using a combination of least squares methods and other residual computations.

**Translation and Rotation** Translates and rotates the coordinate's values of geometric elements within a coordinate geometry database.

**Map Check** Opens Map Check / Store Parcel Tool which stores or edits parcels (based on directions, distances, and curve data), and compute closure. Parcels can be loaded from the coordinate geometry database or manually typed in. Once a parcel is complete, clicking **Store Parcel** stores or updates the parcel in the database. This is a tool used mainly by Right of Way.

**Roadway Intersections** Opens Roadway Intersections, which uses a wide variety of user input to define the intersection of two COGO elements, usually chains. The results are the storage of COGO points defining radii points, curves, and other control information.

**Cul-de-sacs** Opens Cul-de-Sacs, which stores a variety of cul-de-sacs based on user-defined inputs.




**Redraw Visualized Elements** Synchronizes the visualized COGO elements in the MicroStation file with the coordinate geometry data by redrawing the element utilizing the database information, if the location of a visualized element in the design file does not correspond to its coordinates in the database.

**Clear Visualized Elements (Temporary)** Clears all temporary visualized elements from the MicroStation file.

**Clear Visualized Elements (All)** Clears all temporary and permanent visualized elements from the MicroStation file.

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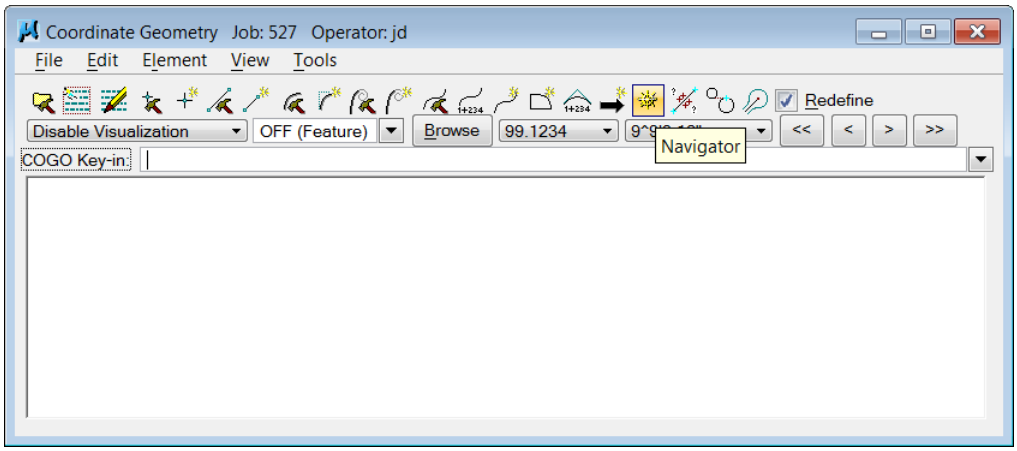
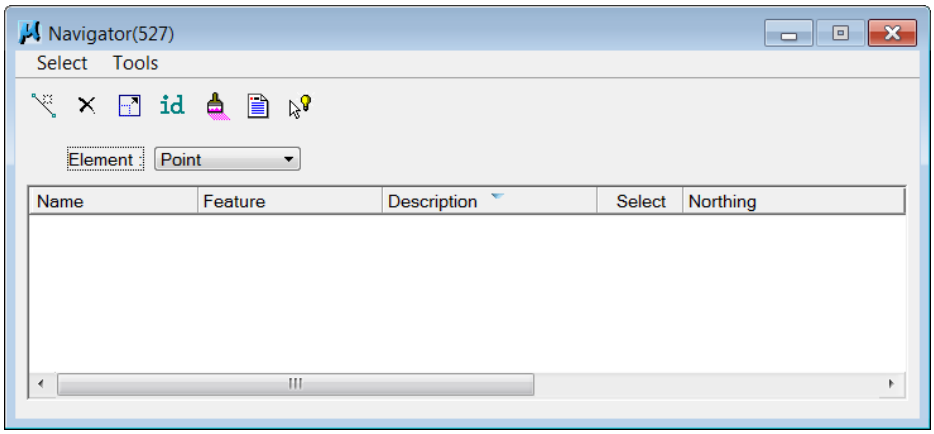
# NAVIGATOR

One of the most useful tools in the GEOPAK Coordinate Geometry software is the COGO Navigator. The Navigator is an excellent tool to assist in viewing, manipulating and editing coordinate geometry elements. This one tool has a variety of functions as summarized below.

### ➢ *TO ACCESS NAVIGATOR*

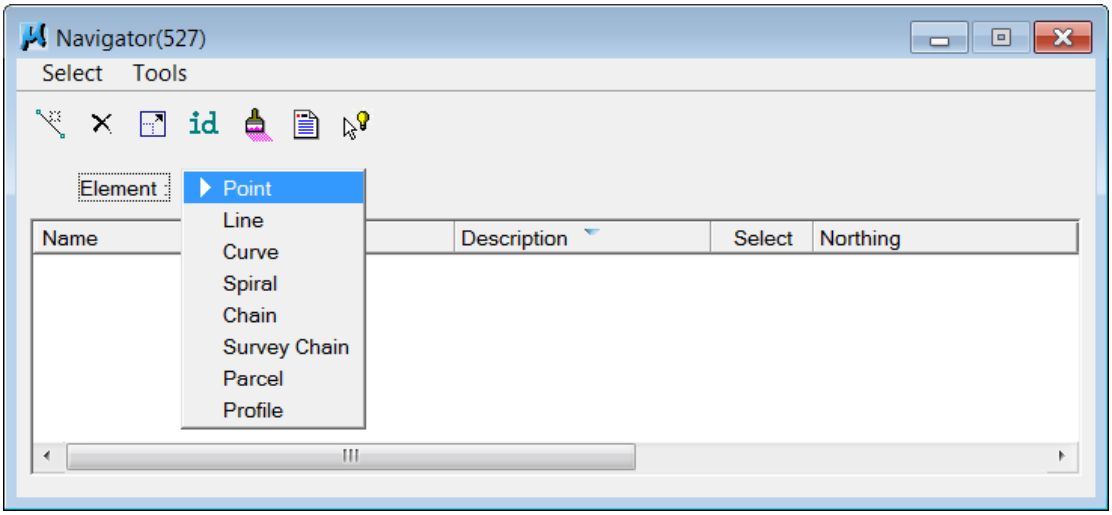
From Coordinate Geometry, click **Tools** > **Navigator** --or-- click the **Navigator** button to open Navigator.



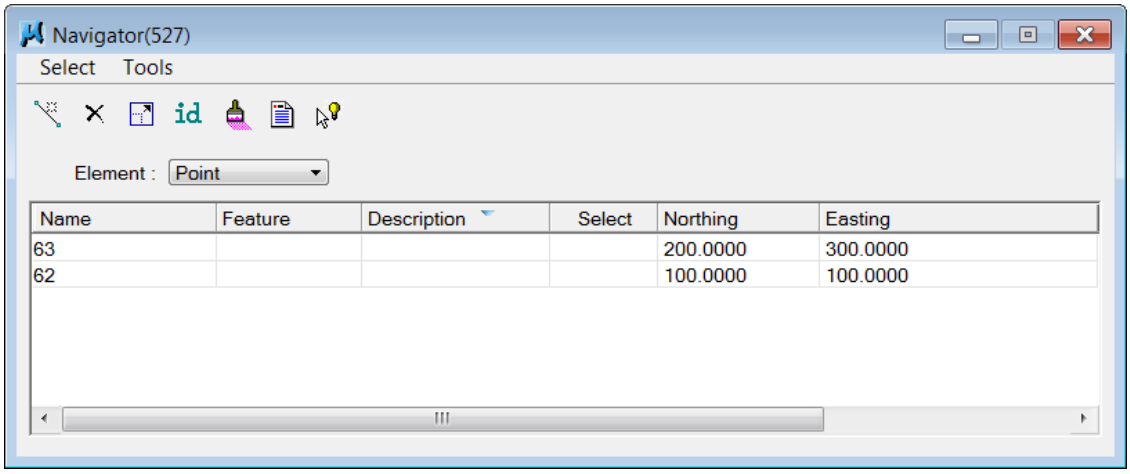



## ELEMENT TYPE

Selecting the type of element, edited or manipulated, from the Element dropdown list as shown below enables the utilization of Navigator.

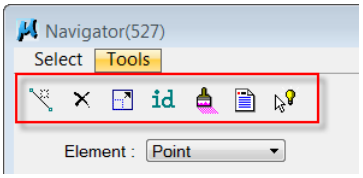



Upon selection of each element type, the list box displays all specified elements within the current coordinate geometry database. For example, if selecting Point, all of the COGO points stored in the .gpk file displays in the list box as shown below.



## NAVIGATOR TOOLBAR

Above the Element list, the Navigator toolbar is available for basic element storing and manipulation.



**Add Element** Invokes the appropriate Store Element dialog box.

**Delete Element** Deletes the selected COGO element and prompts to confirm the deletion of the element before executing the command.

**Edit Element** Opens the appropriate Store Element dialog box (based on the **Element** command) and supplies the associated data for selected element. After making the desired edits, click the **Apply** button to complete the modification. **Redefine** must be on to modify any COGO elements. Editing profiles does not use this tool.

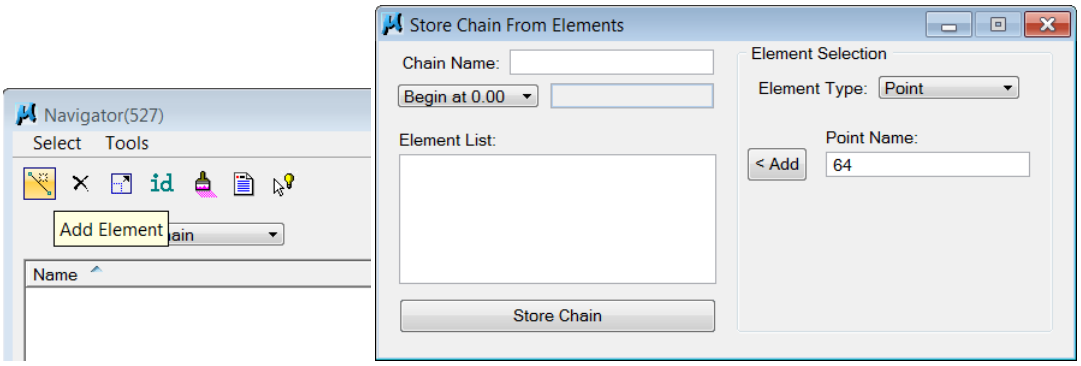
**Identify Element** Identifies an element by selecting a visualized COGO element displayed in MicroStation, that element highlights in the Name/Feature display within Navigator.

**Visualize Element** Visualizes any COGO element. If either temporary or permanent visualization is not active, an Alert message displays. If previously visualized, a second set of elements updates to reflect the current data stored within the database. The control points are also visible and utilized in subsequent COGO commands.

**Print/Describe Element** Prints the selected element's data into the COGO command output window.

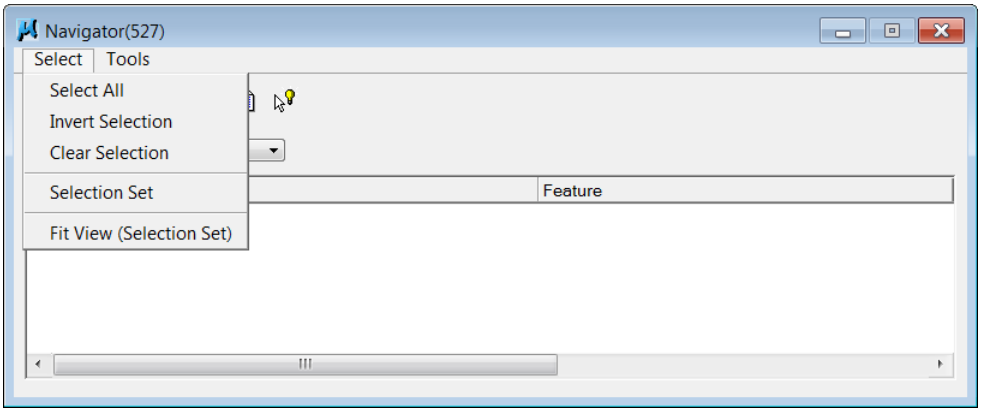
**Selection Set Tool** Used to select COGO elements based on user definable search criteria.

Each of these buttons within Navigator work in conjunction with the currently selected element types. For example, with the element *Chain* selected, clicking the Add Element button opens Store Chain from Elements as shown below.




## SELECT COMMANDS

Users utilize the **Select** menu individually or with the **Selection Set** tool. The following list explains the commands on the Select menu.




**Select All** Highlights all elements within the **Name / Feature** list box regardless of their status. For example, if **Element** is set to **Point, Select All** highlights/selects all of the points in the **.gpk**.

**Invert Selection** Reverses the highlighting. For example, elements previously highlighted are now un-highlighted, while those that were not previously highlighted are highlighted.

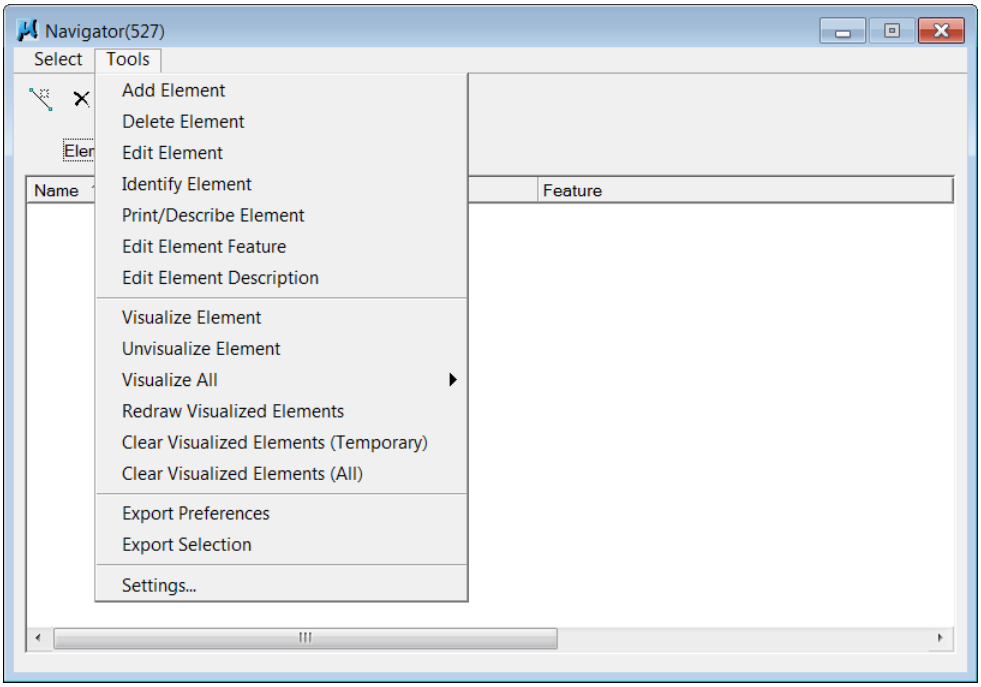
**Clear Selection** Removes the entire selection of elements from the selection set.

**Selection Set** Opens Selection Set Tool.

**Fit View (Selection Set)** Sizes any selected elements into the MicroStation view

## TOOLS COMMANDS

The Tools menu contains a variety of commands, as depicted below. The tool bar at the top of the Navigator represents many of the commands.




***Note*** The Navigator Tool buttons covering the first group of (7) tools are in the previously Navigator Tool Bar section.

**Visualize Element** Visualizes the selection of highlighted elements, based on the associated features. Visualization utilizes the default features, if no features are associated with the elements.

**Unvisualize Element** Deletes the visualization of the highlighted elements when selected. Note the element does not delete from the database and no longer visualizes in the design file.

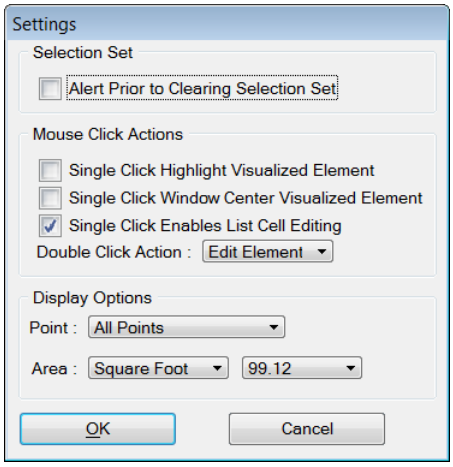
**Visualize All** (**Points**, **Lines**, **Curves**, **Spirals**, **Chains**, **Survey Chains**, **Parcels**, and **Elements)** Click the desired element type from the **Visualize All** menu to visualize all instances of that element type.

**Redraw Visualized Elements** Redraws all visualized elements. The command uses the database information to redraw the element if the location of an element in the design file does not correspond to its coordinates in the database.

**Clear Visualized Elements (Temporary)** Deletes all temporary visualized elements, but does not delete the elements from the database.

**Clear Visualized Elements (All)** Deletes all temporary and permanently visualized elements from the design file, but does not delete the elements from the database.

**Settings** Enables certain actions and behaviors of the Navigator.



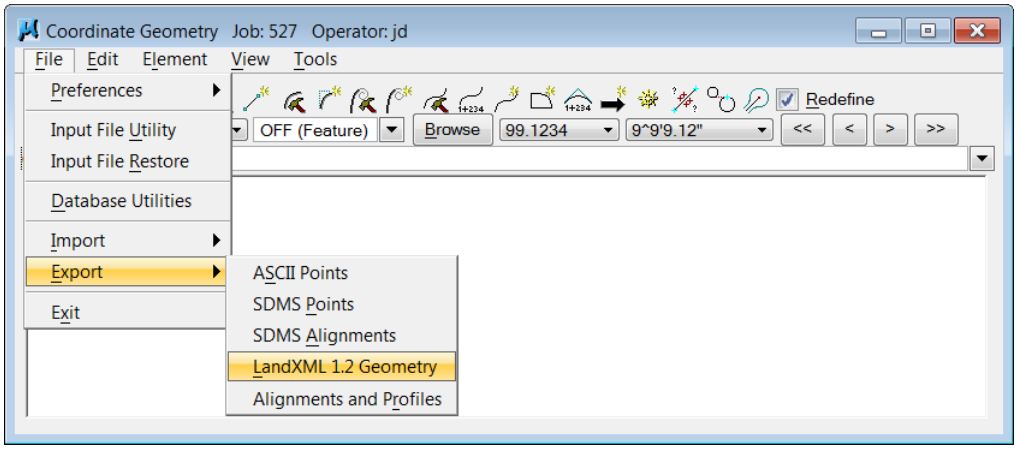

## EXPORTING TO LANDXML

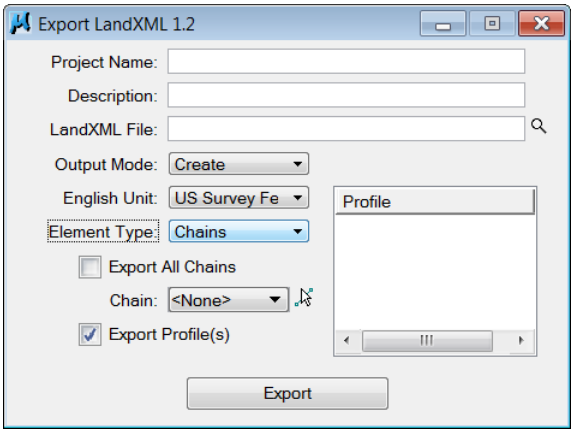
There is now support for LandXML formats through LandXML options added to the Tools, including: COGO points, horizontal alignments and vertical alignments. XML stands for eXtensible Markup Language. LandXML is a file type that easily transfers data between different brands of Architectural/Engineering software. It allows you to develop project data in a format easily exported to LandXML 1.2 Geometry format. Software other than that which created the original data understands the LandXML file.

***Note*** FDOT now requires the LandXML 1.2 Geometry format.

➢ ***TO EXPORT TO LANDXML1.2 GEOMETRY:***

1. From Coordinate Geometry, click **File** > **Export** > **LandXML 1.2 Geometry**. Export LandXML 1.2 opens.






2 . In the *Project Name* box, type the project name, if it has not appeared automatically from the working alignment definition.

3 . If the *Project Name* appears automatically, the *Description***,** entered at the time Project Manager created the GEOPAK Project (Road Project), will also appear automatically.

4 . In the *LandXML File* box, type a file name ***--or--*** click the **Select LandXML File** button and select a previously stored file.

5 . From the *Output Mode* list, click **Create** for a new file or **Append** for a previously stored file.

6 . Select **Element Type - Chains** or **Points**. The elements will display in the box to the right.

7 . If selecting **Chains** for *Element Type*, select the **Export All Chains** check box.

8 . Select the **Export Profile(s)** check box and select the chain. You will also need to highlight, using the **Shift** or **Ctrl** buttons, the appropriate profile(s) exported along the chain.

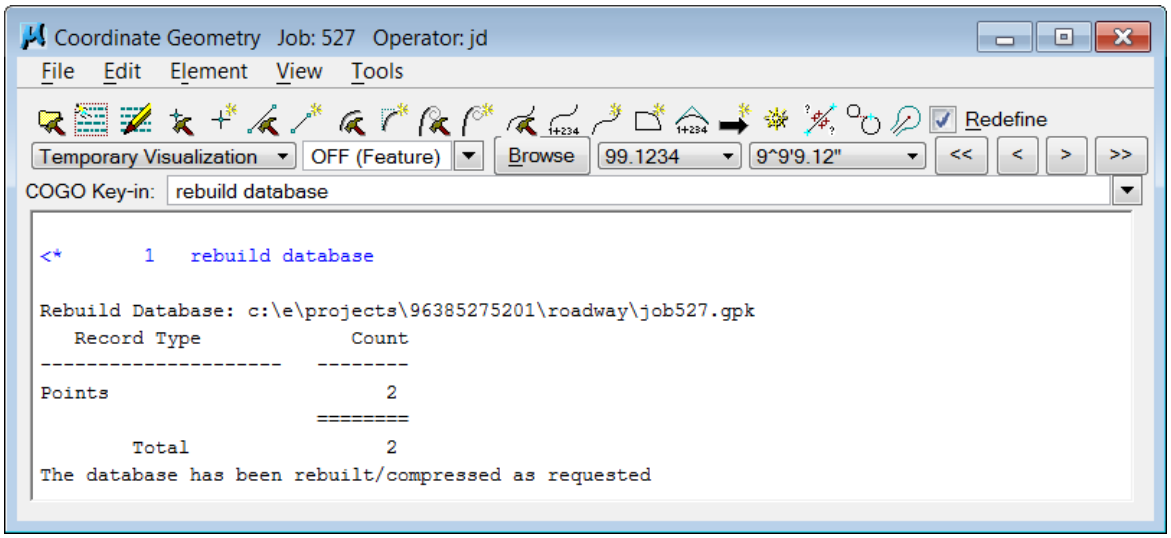
9 . Click the **Export** button. The XML file is stored in the working directory.

10 .Close Export LandXML 1.2.

# MISCELLANEOUS COGO KEY-IN COMMANDS

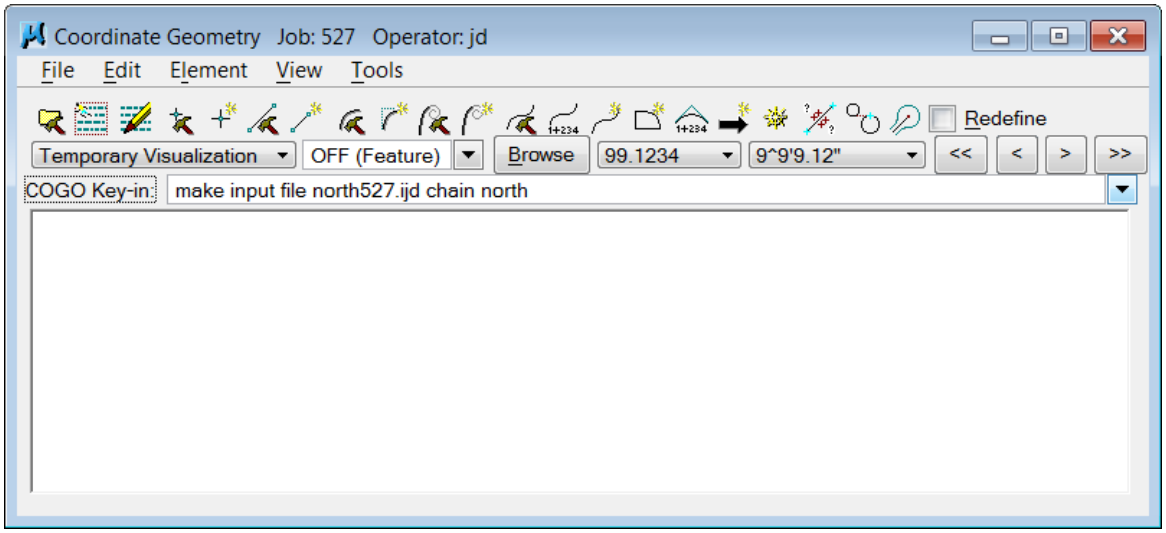
The following are undocumented commands, but may be useful.

- **Key-in: r**ebuild **d**atabase Compresses .gpk file. If you experience intermittent problems with the .gpk file, use this command to repair the file prior to corruption.




- **Key-in: make input file** Creates ASCII input file for stored COGO elements.

The first example (**make input file north527.ijd chain north**) is for creating an input file of a chain; use this same format for creating an input file for a profile by replacing the word chain with profile. This is the process used to create the ASCII geometry files for electronic delivery.

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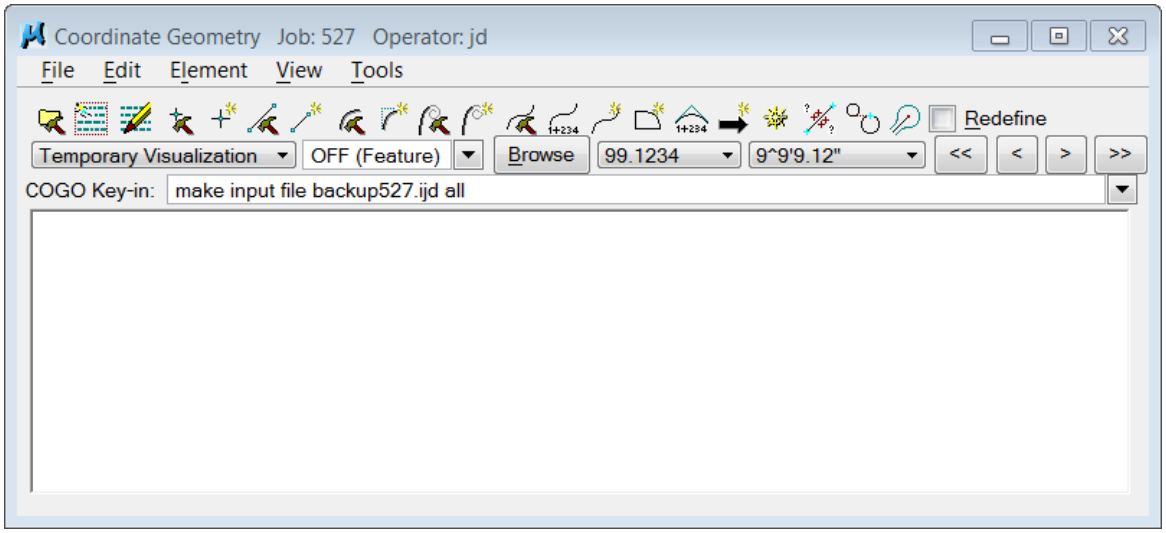
The second example (**make input file backup527.ijd all**) makes an input file of all of the data in the .gpk file.




Either one of these files could be loaded back into this **.gpk** file or into a new **.gpk** if the original is determined to have corruption.

If done to restore corrupted gpk's, then you should "run" 'make input file' on a regular basis to lessen the amount of data loss. This file restores points, chains, profiles, etc., including the original point descriptions and elevations to reproduce the original contents of the .gpk, but it in no way recreates the original input files that created the data in the beginning. Be sure and save the original input/audit files to aid in explaining why elements were stored in a certain manner.

| | |
|---|---|
| ***Note*** | This method is highly recommended for sharing data from your **.gpk** with other offices or companies. |

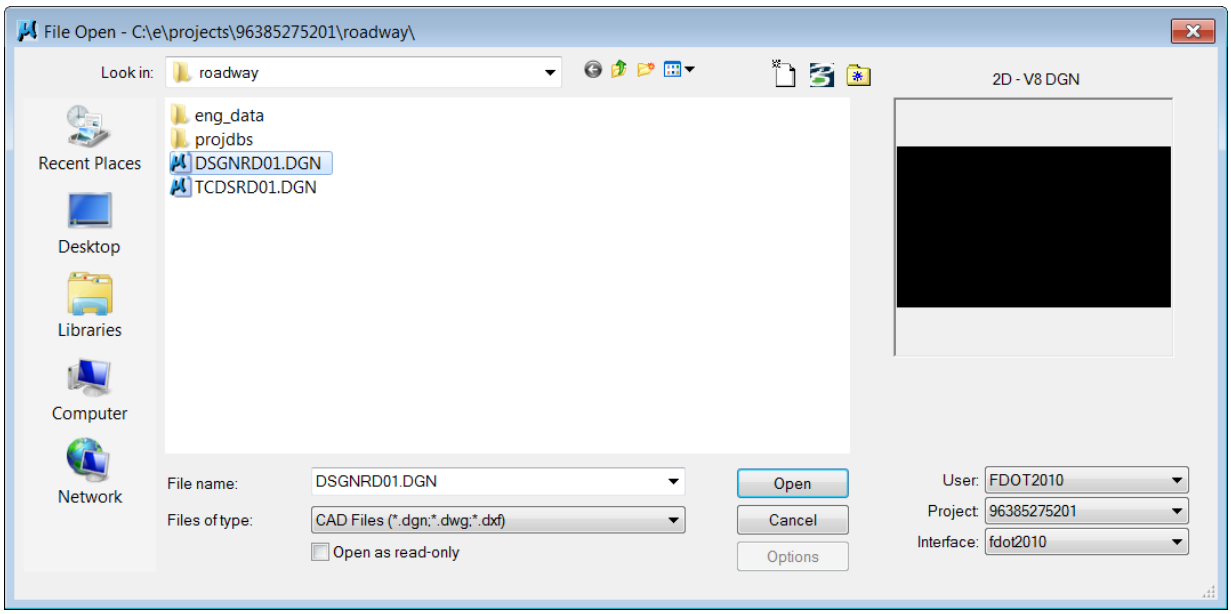
## Exercise 3.1 Opening COGO

In this exercise, COGO opens through Project Manager.

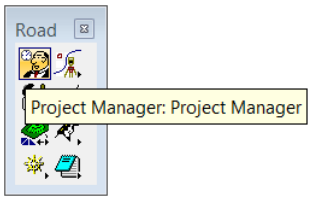
➢ ***TO OPEN COGO***

1. Extract the project files by double-clicking on the file **C:\Chapter3_Ex3_1.exe**.
2. Open DSGNRD01.dgn in C:\e\projects\96385275201\roadway and activate the GEOPAK CIVIL Suite.

***Important***: Use the FDOT2010 workspace, by double clicking on the FDOT2010 icon on the desktop, and project number 96385275201 to open this file. Refer to Chapter 1 for detailed information on starting MicroStation.

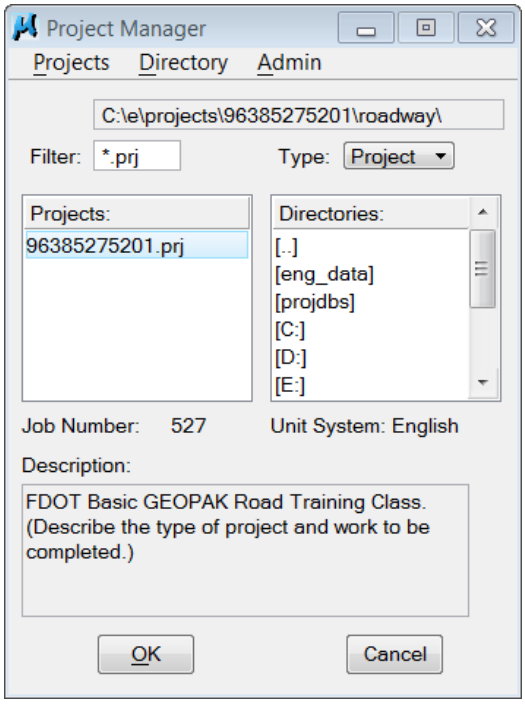



3. Reference the file topord01.dgn from C:\e\projects\96385275201\survey to show the location of the project.
4. In the Road toolbox, click the **Project Manager** button. Project Manager opens.

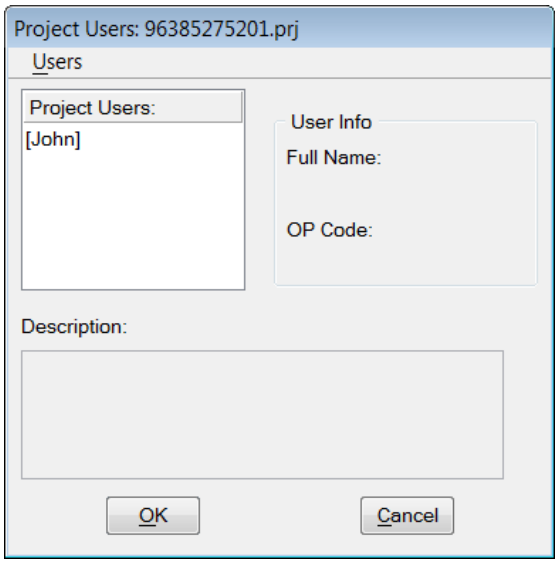



**Important:** If *Remember* options are on in Road Project, bypass steps 5 through 6.

5 . In the ***Projects*** list, open **C:\e\projects\96385275201\roadway\96385275201.prj**, and then click the **OK** button. Project Users opens.



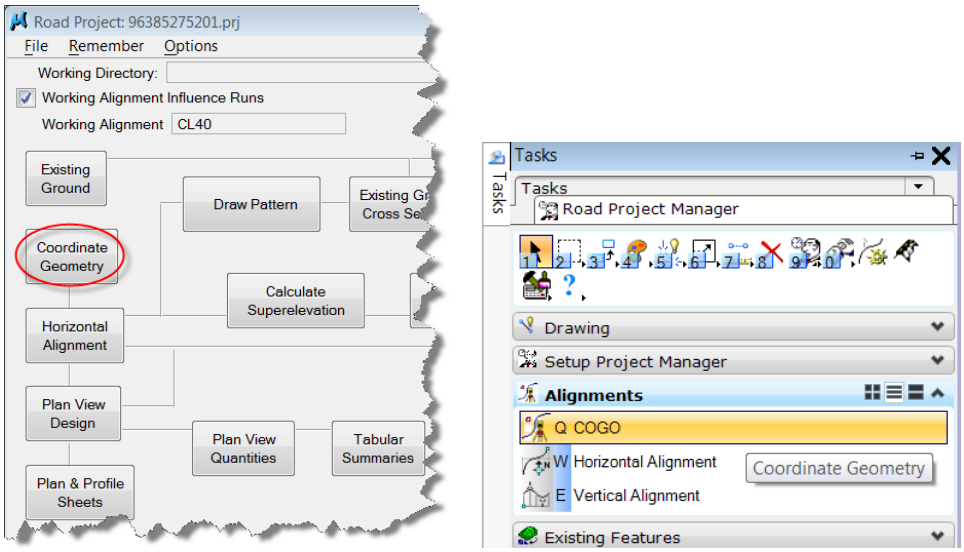

6 . From Project Users, click **John** in the **Project Users** list, and then click the **OK** button. Road Project opens.



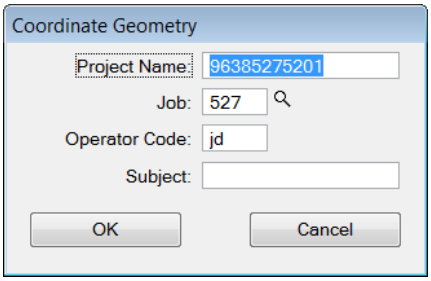
7 . From Road Project, click the **Coordinate Geometry** button.

<OR> from the Task Bar Menu *Alignments* tab select **COGO**

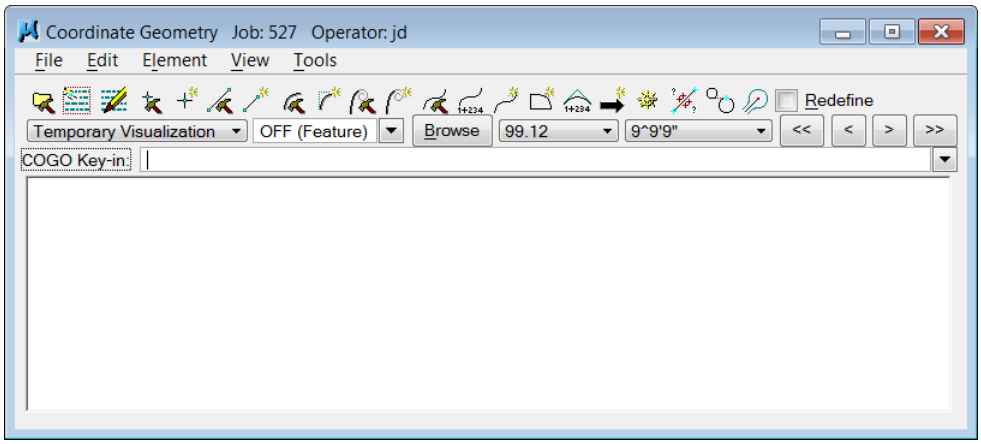
8 . Coordinate Geometry opens. The **Project Name**, **Job Number** and **Operator Code** information supplies automatically from the project information defined when creating the project.




***Note*** When Coordinate Geometry activates from the COGO icon in the Road toolbox or by clicking Applications > GEOPAK Road > Geometry > Coordinate Geometry, the following dialog displays.




9 . Click OK from this dialog box.

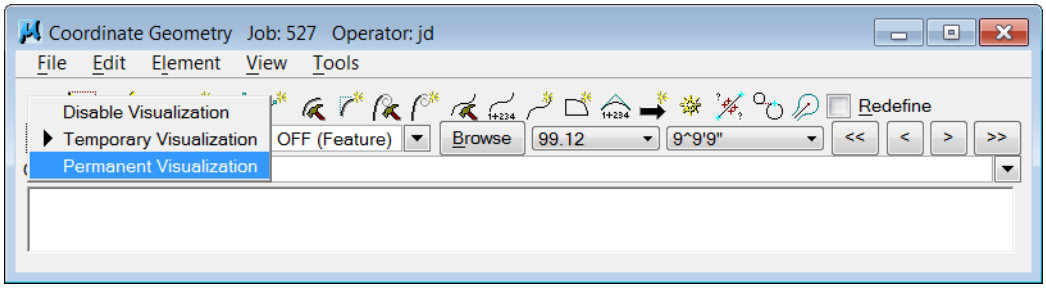


## Exercise 3.2 Storing a Point

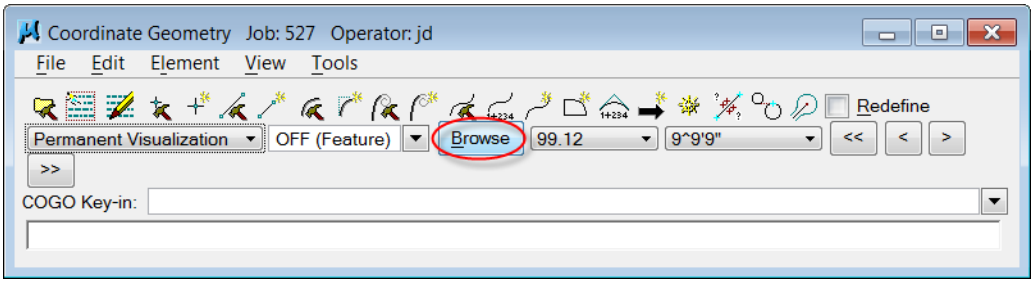
In this exercise, points are stored using COGO tools. The exercise utilizes these points to create the Chain representing the Center Line of Construction in a future exercise.

➢ ***TO STORE POINTS USING COORDINATE GEOMETRY***

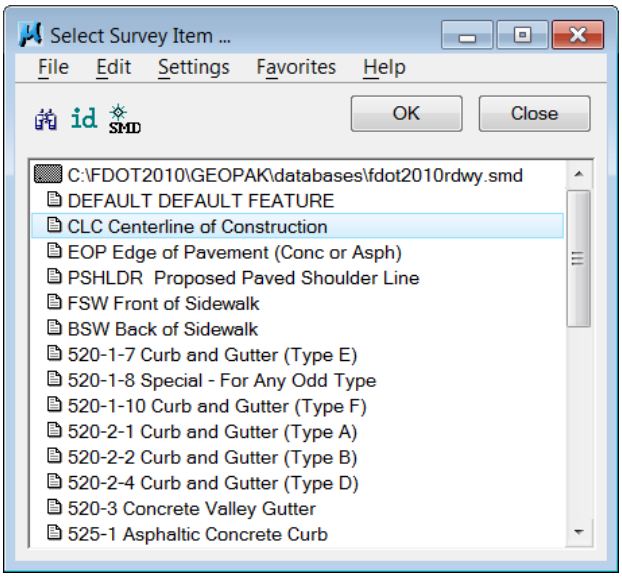
1 . In Coordinate Geometry, set **Visualization** to **Permanent Visualization**.



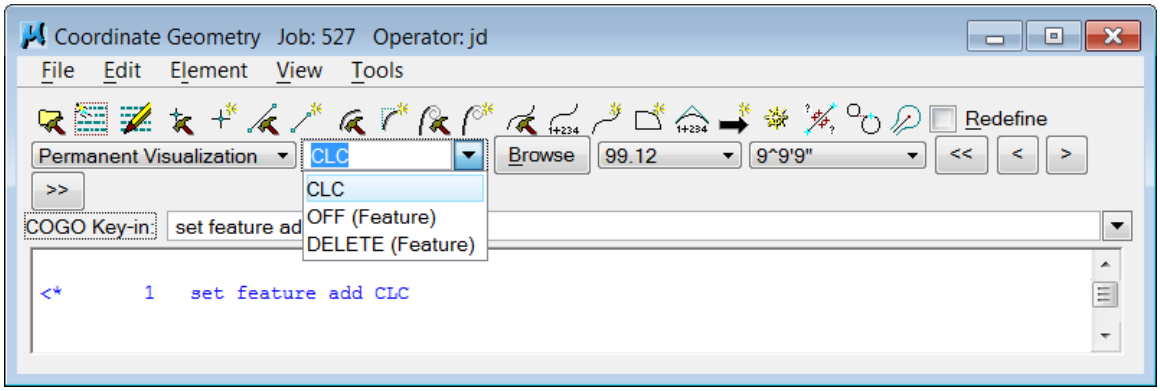

2 . Click the **Browse** button. Select Survey Item opens.




3 . In Select Survey Item …, click the **CLC Centerline of Construction**.

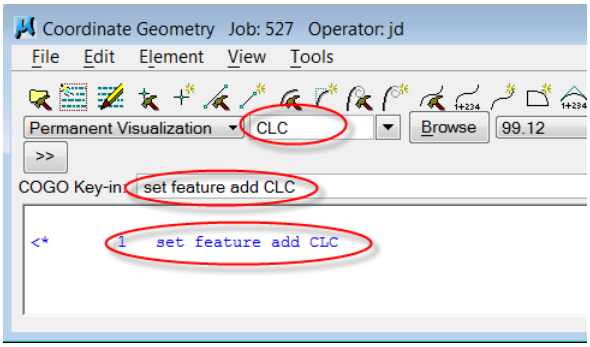


*Tip: Selecting the feature the first time, allows the user to skip the steps that include browsing to the SMD for that feature. Clicking the down arrow next to Browse opens the window to select the appropriate feature(s).*

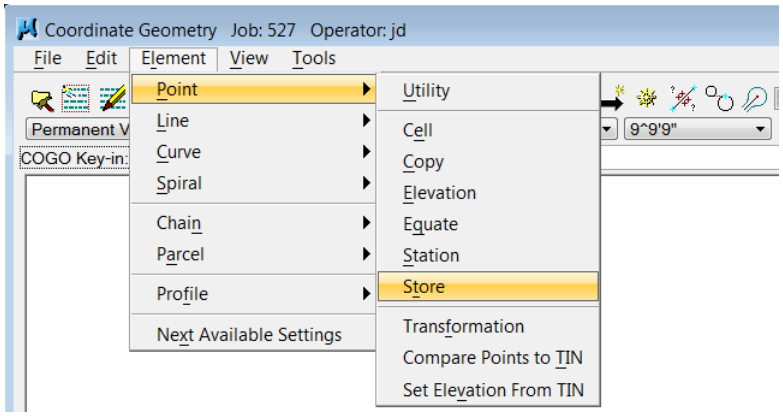


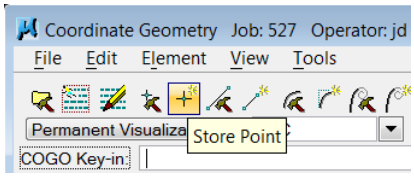

4 . In Select Survey Item, click the **OK** button.

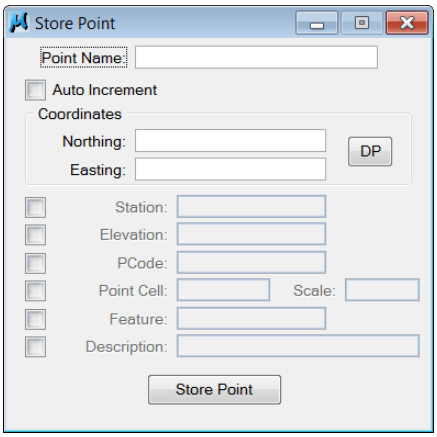
***Note*** Notice in Coordinate Geometry that the feature is set to CLC. Anything done in COGO or Graphical COGO visualizes into MicroStation with the CLC features for Level, Color, Weight and Style.




5 . From Coordinate Geometry menu, click the menu option **Element** > **Point** > **Store** --***or***-- click the **Store Point** button. Store Point opens.






6 . In the *Point Name* box, type **1**.

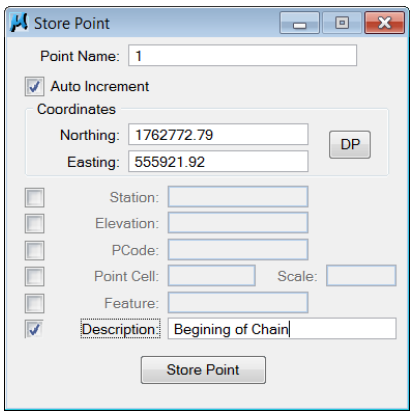
7 . Select the **Auto Increment** check box.

8 . In the *Northing* box, type **1762772.79.**

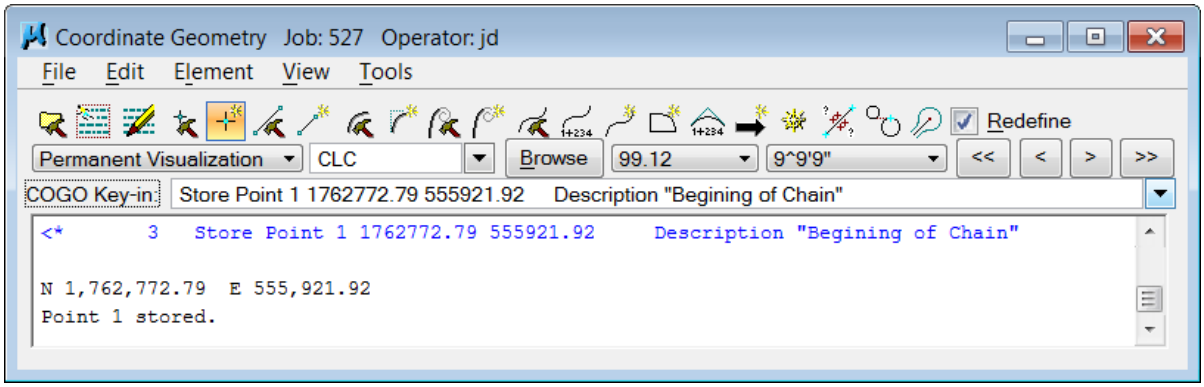
9 . In the *Easting* box, type **555921.92**.

10 .Select the **Description** check box and type in a description as shown below.

***Note*** The Description allows you to place a brief note describing the use of the point.



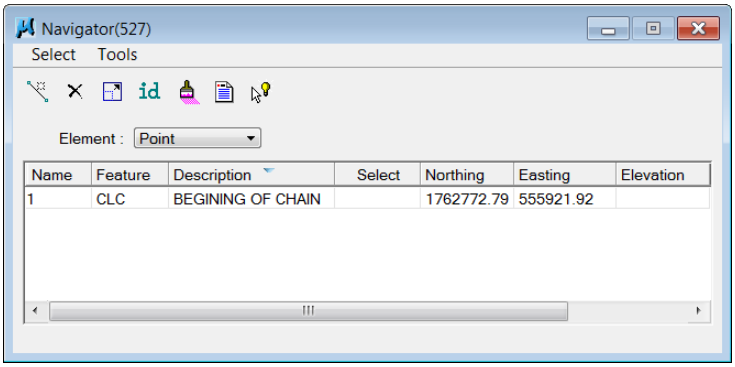

11 .Click the **Store Point** button. The point is stored in COGO and visualized into the MicroStation file. The point appears in the command output window in Coordinate Geometry.



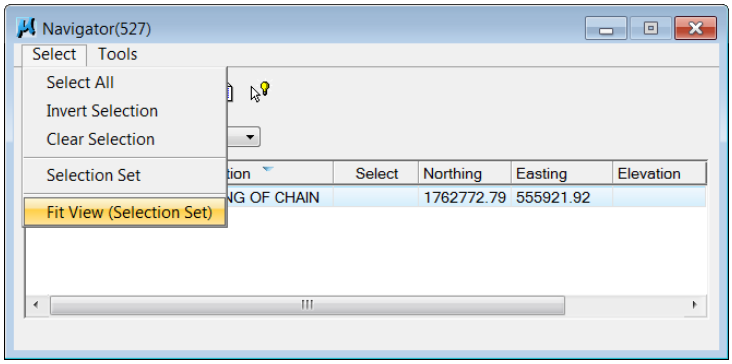
12 .Close the Store Point dialog box.

13 .From Coordinate Geometry, click the button. Navigator opens.

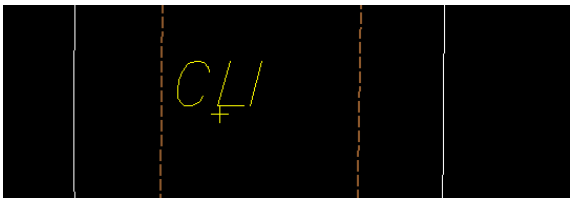
14 .In Navigator, set the *Element* type to **Point** and highlight point **1** in the *Name* list.




15 .In Navigator, click the menu option **Select > Fit View (Selection Set)**. MicroStation zooms in around point 1.

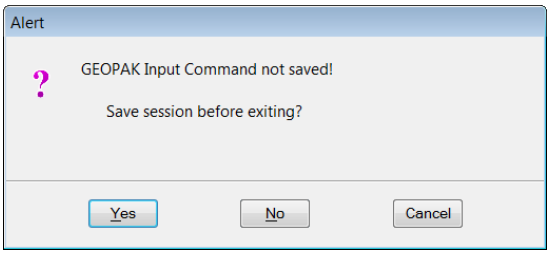
16 . 


***Note*** The point number 1 and point name associated displays below.




17 .Close Navigator and Coordinate Geometry. Alert will display.

18 .Do not save the input file. Select **No** from Alert box.

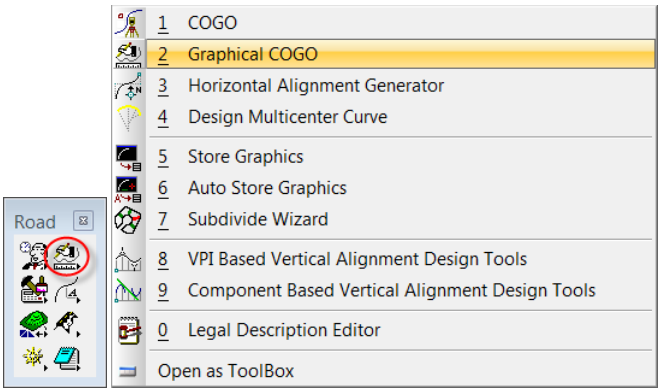


# GRAPHICAL COGO INTRODUCTION

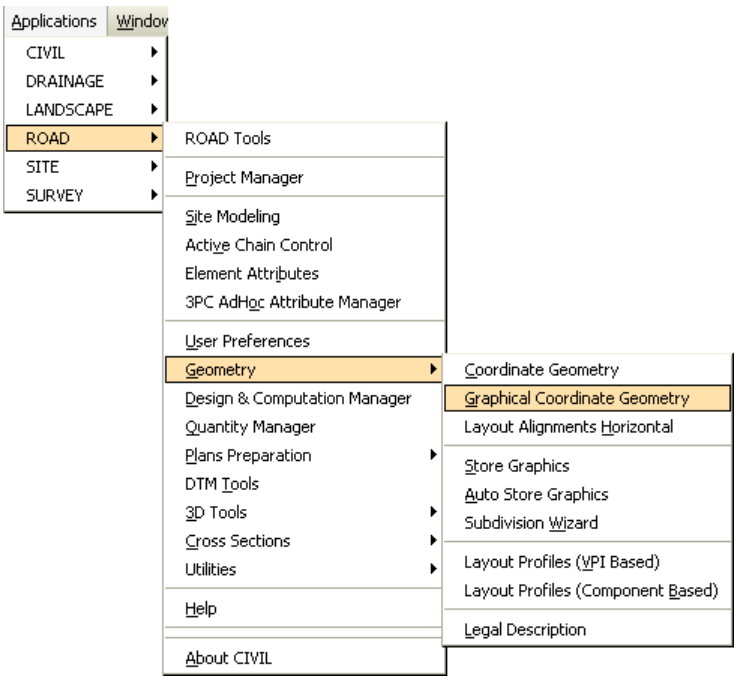
Graphical COGO is a tool that utilizes commands with the look and feel of MicroStation, yet maintains the double precision accuracy of traditional COGO elements. Points, curves, lines, spirals, chains, and parcels can be stored, modified, or deleted. Key-ins or a click of the mouse manipulate the COGO elements and store them directly into the COGO database. Graphical COGO does not read the exclusive MicroStation graphics.

### ➢ *TO ACCESS GRAPHICAL COGO*

From the *Road* toolbox, click the **Graphical COGO** button.




--or— From MicroStation, click **Applications** > **GEOPAK Road** > **Geometry** > **Graphical Coordinate Geometry**.




***Note*** If Road Project is not active; the dialog box to verify the Project Name, Job Number and Operator Code will open.

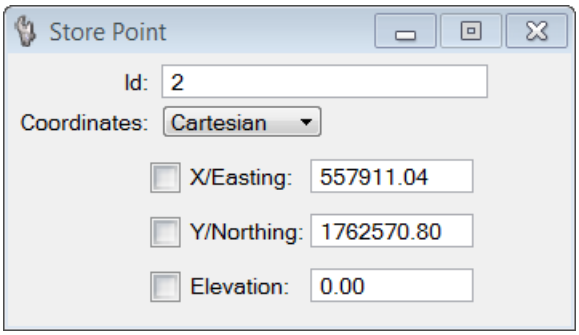
The Graphical COGO toolbox is dock-able and resize-able. The toolbox has four tool buttons (Store Elements, Modify Elements, Manipulate Elements, and Groups) with the option to open additional toolboxes that one can drag, dock, or resize. There is access to the tools by selecting from a fly-out menu.

Graphical COGO utilizes the following default naming convention when storing a new database item. These names are only defaults, which means, that you can select any valid geometric name in any command.

- Point P1
- Line L1
- Curve C1
- Spiral S1
- Chain CHN1
- Parcel PAR1

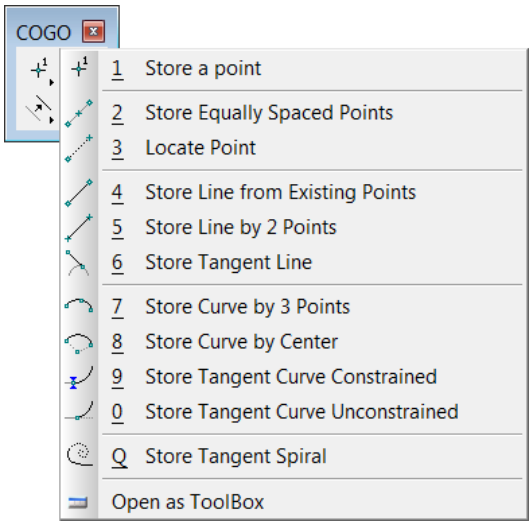
## STORE ELEMENTS TOOLBOX

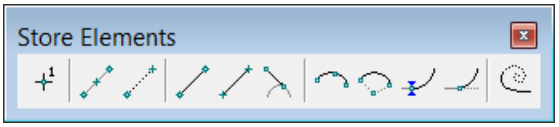
Storing elements utilizes the visualization parameters set in COGO from the SMD file (as defined in user preferences). Non-active temporary or permanent visualization does not allow elements to appear. Set visualization to Temporary Visualization when using this tool so the elements will appear on the screen. Permanent Visualization is typically not set due to the utilization of the Design & Computation Manager to display the roadway elements after they are stored. When selecting a **Store Element** command, the Store Point dialog box appears to enter data based on the tool selected as shown below.




***Important:*** Be careful to note the naming convention shown in the dialog of the element to be stored. The software will utilize the last used settings for naming convention to display and increment sequencing.

For example, if the last setting used for the naming convention for a series of points to be preceded by PNT (i.e., PNT1, PNT2, PNT3), then activating the Graphical COGO Store Point will increment to PNT4. If the intent is to store points with the point number such as 1, 2, 3..., then the Id number must be manually entered (i.e. 4). It will then increment to point 5. To go back to PNT, set the Store Point ID to PNT4, store the point, and it will increment to PNT5. When changing prefixes for Points, Lines, Curves, etc., the next number with that prefix will need to entered first, then those prefixed numbers will automatically increment.



**Store Point** Stores points utilizing either Cartesian coordinates (x, y, z or N, E, Z) or Curvilinear (station, offset, elevation).

**Store Equally Spaced Points** Stores a user-defined number of COGO points, on a line between two previously defined points or any two data points. A line is not drawn nor stored between the two previously defined points.

**Locate Point** Stores a point based on the distance and direction from a previously defined visualized point.

**Store Line From Existing Points** Utilizes two stored points to store a line.

**Store Line By 2 Points** Utilizes two new points, rather than existing points, to store a line. The command stores the line and the new points, utilizing the "next" available point and line names.

**Store Tangent Line** Stores a line and its two endpoints on a tangent to a curve in the coordinate geometry database.

**Store Curve By 3 Points** Stores a circular curve (using arc definition). The stationing is set to 0+00 at the P.C. The user can enter the Radius manually or define dynamically.

**Store Curve By Center** Stores a circular curve by defining the center point, radius, and Delta angle.

**Store Tangent Curve Constrained** Places a curve tangent to the specified curve or line.

**Store Tangent Curve Unconstrained** Places a curve through a specified point tangent to the specified curve or line.

**Store Tangent Spiral** Places and visually modifies spirals based on an initial line or curve. FDOT does not recommend the use of spirals.

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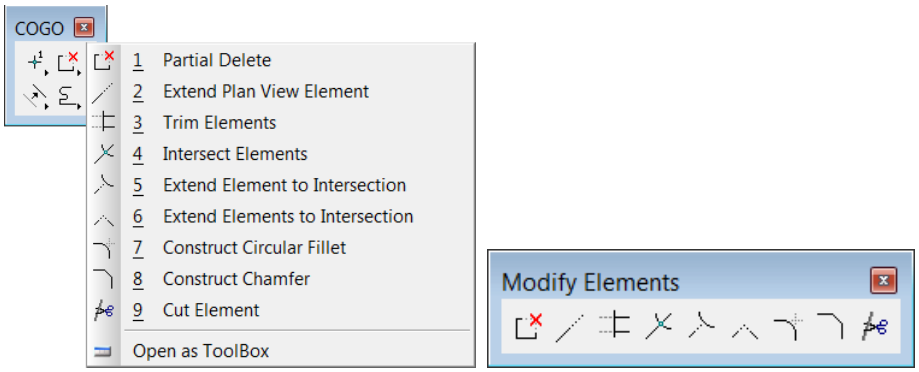
## MODIFY ELEMENTS TOOLBOX

The Modify Elements tools modify GEOPAK elements; they look and work much like the MicroStation tools. **Redefine** must be on in COGO, as these tools modify the elements already stored in the **.gpk**. If **Redefine** is off, a warning dialog box appears.



**Partial Delete** Deletes part of a COGO line or curve, creating two separate elements.

**Extend Plan View Element** Extends or shortens any COGO element.

**Trim Elements** Trims numerous elements to their intersection with another element.

**Intersect Elements** Stores a new point by trimming or extending one element to its intersection with another element. Note the two elements remain intact.

**Extend Element to Intersect** Extends an element to its intersection with another element.

**Extend Elements to Intersect** Extends two elements to the point of intersection.

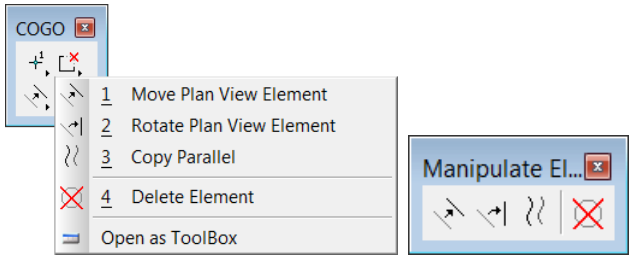
**Construct Circular Fillet** Stores a circular curve between two elements.

**Construct Chamfer** Stores a line between two elements. Both the line and two new endpoints are stored in coordinate geometry.

**Cut Element** Divides elements into segments.

## MANIPULATE ELEMENTS TOOLBOX

Like the Modify Elements tools, some of the Manipulate Element tools require that Redefine turned on in COGO. If Redefine is off, a warning dialog box appears.



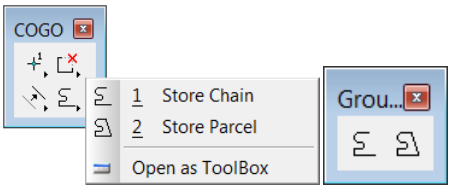
**Move Plan View Element** Moves or copies an element (or elements in a selection set).

**Rotate Plan View Element** Rotates the selected element about a user-defined point. The Angle may be manually entered and locked, or dynamically changing.

**Copy Parallel** Moves or copies an element parallel.

**Delete Element** Deletes COGO elements and removes the elements from the drawing and coordinate geometry database. This tool works with a MicroStation selection set if present. Caution: There is no undo for this command.

## GROUPS TOOLBOX



**Store Chain** Works in the same manner as the MicroStation **Automatic Create Complex Chain** with the additional benefit that the 1chain is automatically stored in the COGO database.

**Store Parcel** Stores parcels, takings, easements, and other types of right of way features. This tool is very similar to the **Store Chain** tool with many of the same options.

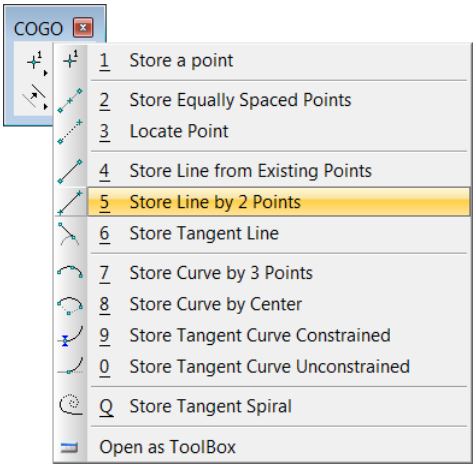
## Exercise 3.3 Using Graphical COGO

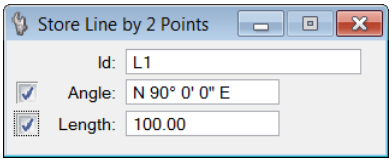
➢ ***TO STORE LINES AND CURVES, AND CREATE A CHAIN***

In this exercise, the user stores GEOPAK lines and Curves starting at point number 1, stored in the previous exercise, then create a chain from the stored points, lines and curves.

1. Extract the project files by double-clicking on the file **C:\Chapter3_Ex3_3.exe**.
2. In MicroStation, open DSGNRD**01.dgn** in **C:\e\projects\96385275201\roadway** and activate GEOPAK CIVIL Suite.
3. Open Project Manager. Road Project opens.
4. From Road Project, click the **Coordinate Geometry** button. Coordinate Geometry opens.
5. On Coordinate Geometry, set the *visualization* option to **Temporary Visualization**.
6. From the Road toolbox, click the **Graphical COGO** button. The COGO toolbox opens.

7. From the COGO toolbox, click the **Store Line by 2 Points** button. Store Line by 2 Points opens.

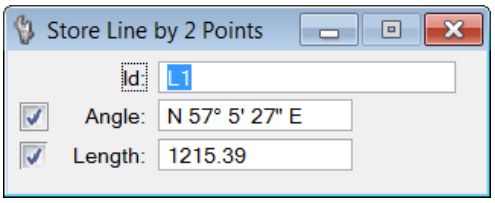


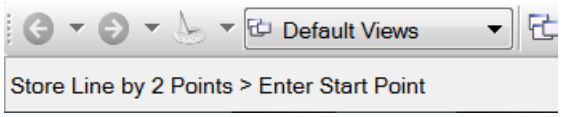

8. In the *ID* box, type **L1** if the box is empty.

9 . Select the **Angle** check box and then type **N 57 05 27 E** in the **Angle** box. Degree, minute, or second characters do not have to placed.

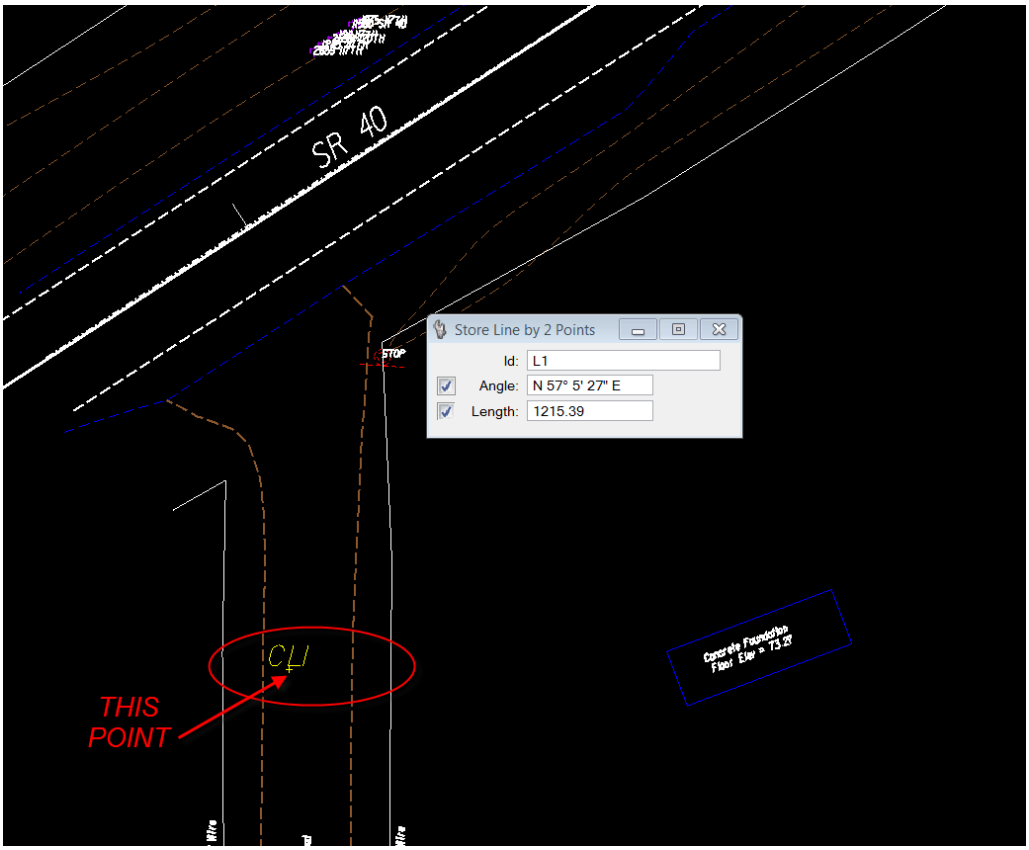
10 .Select the **Length** check box and then type **1215.3911** in the **Length** box. Length expressed in Master units, i.e., survey feet, meters, etc.



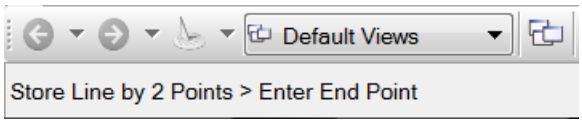

***Note*** In the next steps, read the commands in the status bar. The commands give you important information regarding the placement of elements.




11 .To pick the start point, set the MicroStation snap to **Origin**, snap to the origin of the cross hairs next to the number 1, and click a data point, as shown below.

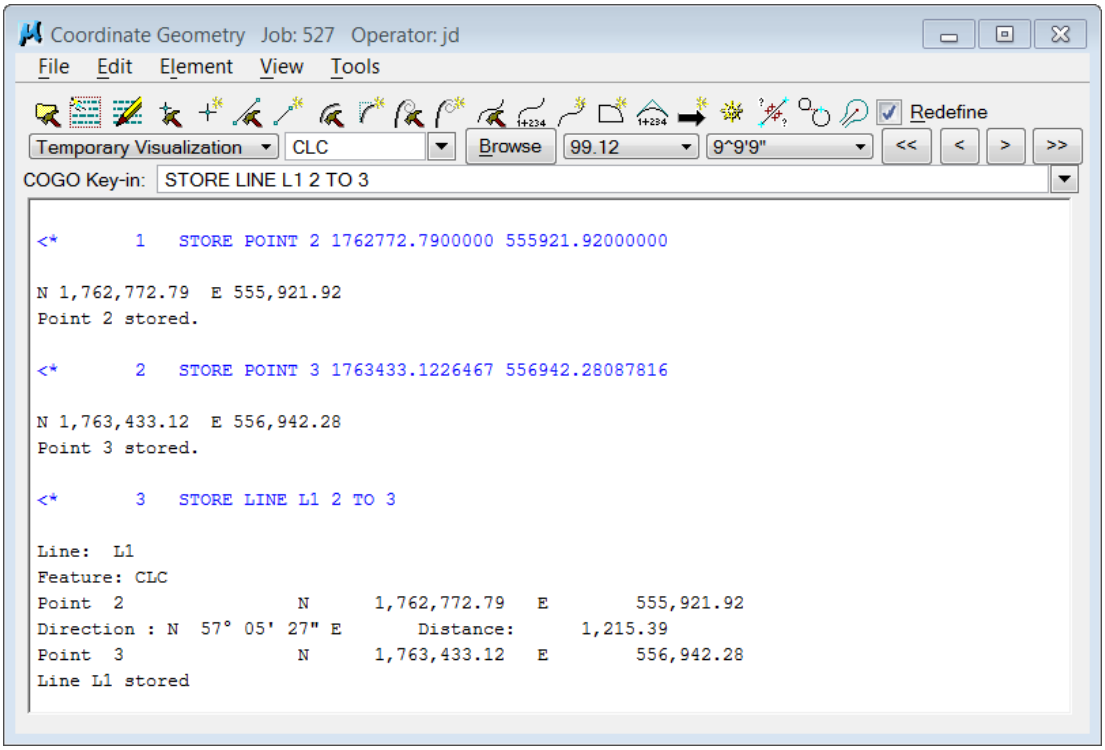


12 .Click a second data point to place the **End Point** of the line, as shown in the status bar. The line is now stored in COGO along with 2 points, point number 2 is equated to point 1, because that was the start point.

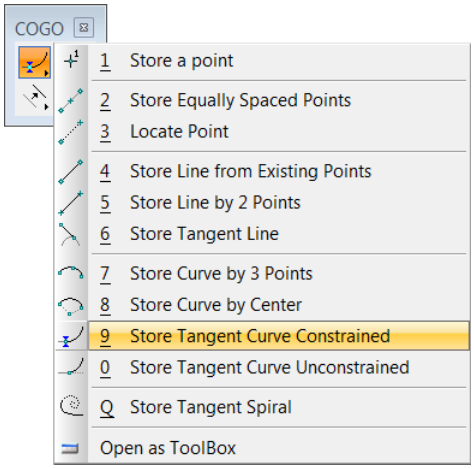


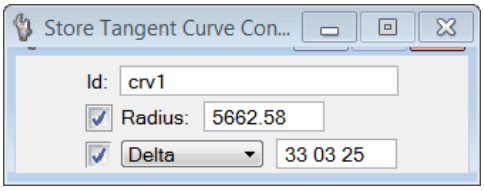

***Important:*** When creating the chain, in a later exercise, it will start at point 2, not point 1.

13 .Coordinate Geometry shows the geometry of the line stored as shown below. The line displays in the MicroStation file, because the visualization is set to Temporary Visualization.



14 .From the COGO toolbox, click the **Store Tangent Curve Constrained** button. Store Curve Constrained opens.



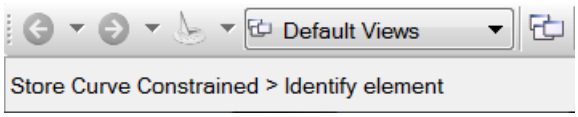




15 .In the *ID* box, type **crv1**.

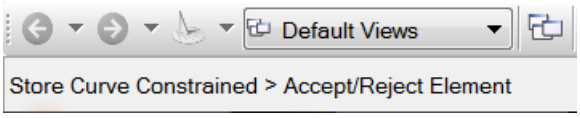
16 .Select the **Radius** check box, and then type **5662.5800** in the **Radius** box. The Radius expresses in Master units.

17 .Select the **Delta** check box, and then type **33 03 25** in the **Delta** box. Degree, minute or seconds characters are not necessary.

18 .Following the instructions in the status bar, click on the line near the **End Point** of the GEOPAK line just stored.




19 .Click again to accept the line **-or-** right-click to reset and cancel.




20 .Click on the right side of the GEOPAK line to indicate that the Delta Angle is to the right, not left.

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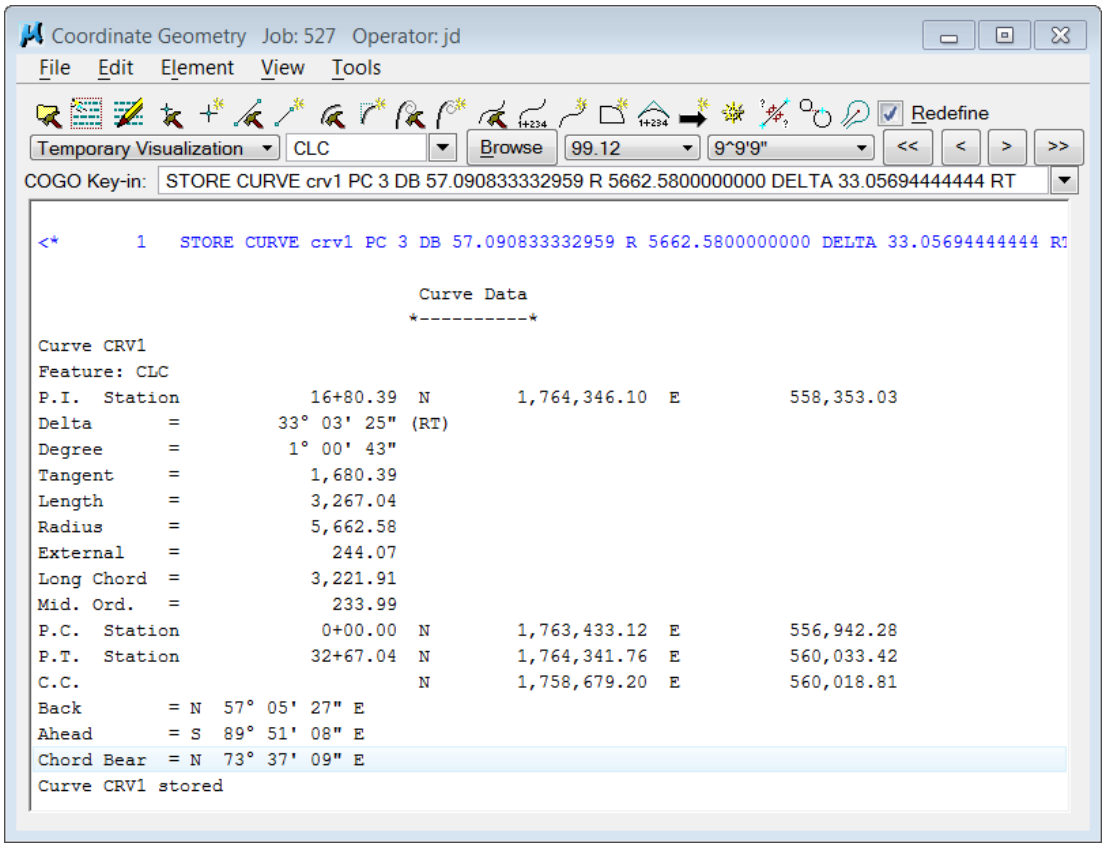
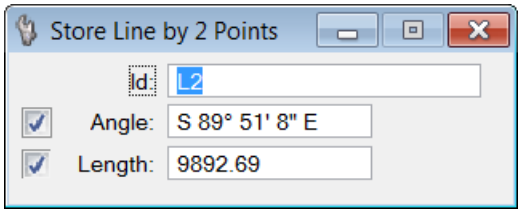
21 .Click again to complete the curve and set the End Point or PT. The Geometry of the curve displays in the Coordinate Geometry command output window as shown below.




22 .In MicroStation, zoom to the **PT** of the curve placed in the previous steps.

23 .From the COGO toolbox, click the **Store Line by 2 Points** button. Store Line by 2 Points opens.




24 .In the *Id* box, type **L2** if the box is empty.

25 .Select the **Angle** check box, and then type **S 89 51 08 E**.

***Important:*** The defined angle comes from Ahead Bearing found in the COGO output window. Using this angle will make the curve tangent.

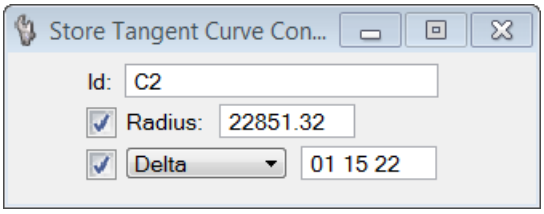
26 .Select the **Length** check box, and then type **9892.69**.

27 .Following the instructions in the status bar, snap to the end of the curve at the PT.

28 .Click to complete the command and place the line in COGO.

29 .Zoom to the end of the line stored.

30 .From the COGO toolbox, click the **Store Tangent Curve Constrained** button. Store Curve Constrained opens.




31 .In the *Id* box, type **crv2** if the box is empty.

32 .Select the **Radius** check box, and then type **22851.32** in the **Radius** box.

33 .Select the **Delta** check box, and then type **01 15 22** in the **Delta** box.

34 .Following the instructions in the status bar, click near the End Point of the GEOPAK line stored in the previous steps.

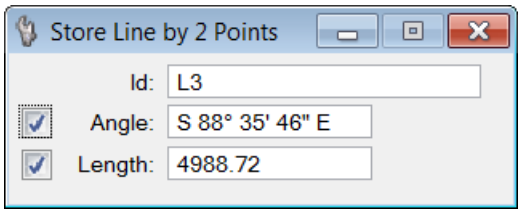
35 .Click again to accept the line ***--or--*** right-click to reset and cancel.

36 .Click on the right side of the GEOPAK line to indicate that the Delta Angle is to the right, not left.

37 .Click to complete the curve and set the End Point or PT.

38 .In MicroStation, zoom to the PT of the curve placed in the previous steps.

39 .From the COGO toolbox, click the **Store Line by 2 Points** button.




40 .In the *Id* box, type **L3** if the box is empty.

41 .Select the **Angle** check box, and then type **S 88 35 46 E** in the **Angle** box.

42 . Select the **Length** check box, and then type **4988.72** in the **Length** box.

43 .To store the line, snap to the PT of the curve and click a data point.

***Note*** At this point, all of the elements needed to create a chain in the next exercise are stored. Creating chains in this way makes modifying the individual elements and re-creation of the chain easier.

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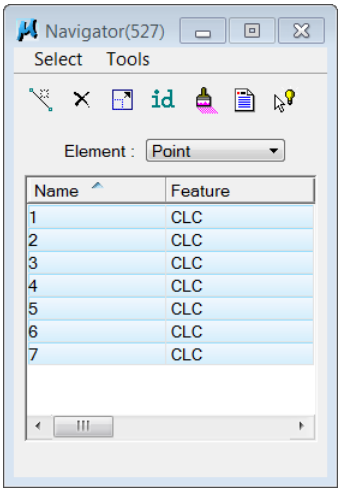
## Exercise 3.4 Storing a Chain

In this exercise, the user creates a GEOPAK Chain using Graphical COGO built from the Lines, Points and Curves stored in the previous exercise.

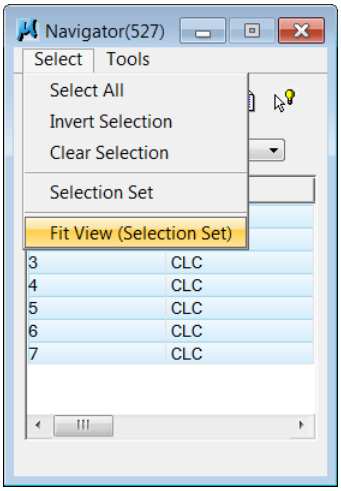
➢ ***TO STORE A CHAIN***

1. Open Navigator from Coordinate Geometry.
2. Set the Element to **Point.**
3. In the Name list, select all of the points 1-7.

*Tip: To select all points, pick point 1 and drag down the list to grab them all. The Shift and Ctrl keys in conjunction with the left mouse button also works, or click Select All from the Select menu.*

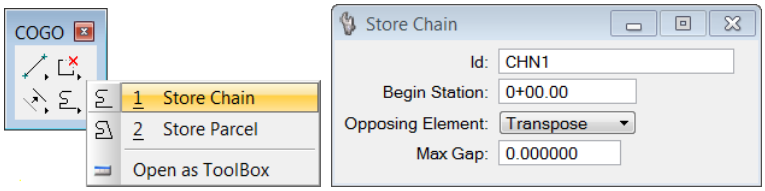



4. From Navigator, click **Select,** and then click **Fit View**. MicroStation performs a fit view around all of the selected elements.




*Tip: If it is hard to see the elements in MicroStation, turn the display off for the topord01 file.*

5 . From the Graphical COGO toolbox, click the **Store Chain** button. Store Chain opens.




6 . In the ***Id*** box, type **CL40**.

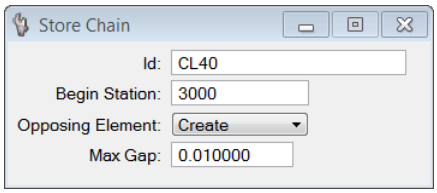
***Note*** CL40 is the name of the chain as it is stored in COGO.

7 . In the *Begin Station* box, type **30+00**.

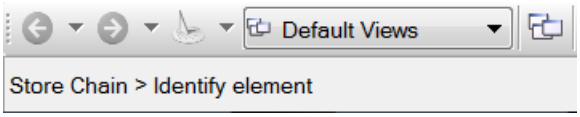
8 . In the Opposing Element list, click **Create**.

9 . In the *Max Gap* box, type the number 0.01.

***Note*** The Max Gap is a tolerance setting. If two endpoints used to create the chain are within this tolerance GEOPAK considers them touching.



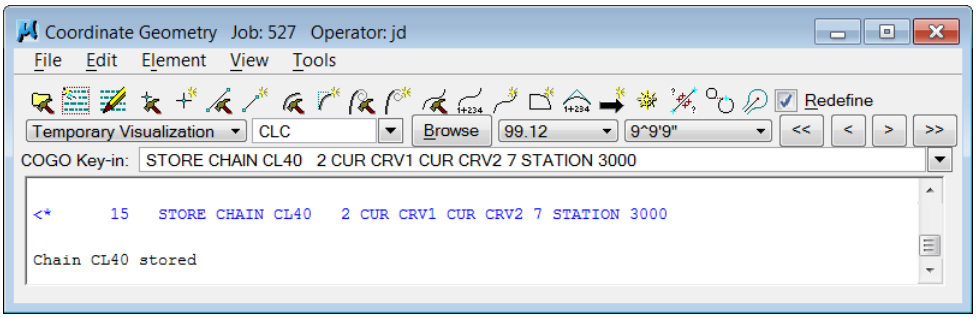

10 .Following the instructions in the status bar, click the first **GEOPAK line (L1)** stored in an earlier exercise.




11 .Click again to accept the line --or-- right-click to reset and cancel.

***Important:*** The 3 large arrows displayed on the screen represent the direction of stationing. Be sure the arrows are pointing left to right beyond line L1 before clicking a final time to accept the direction of stationing.

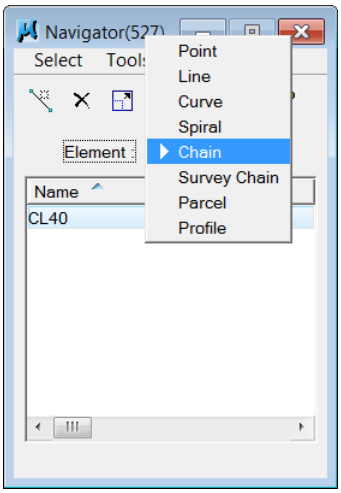
***Note*** Review the commands used to create the chain in the COGO output window.



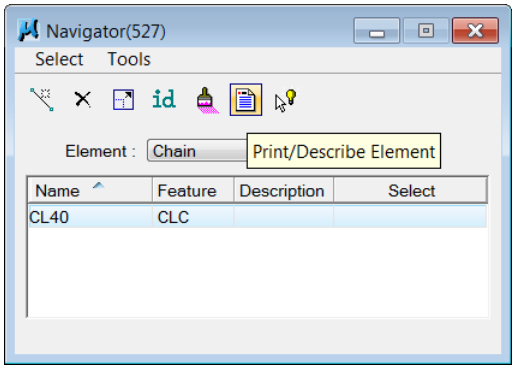
## Exercise 3.5 Describing a Chain

To describe the chain

1. From Navigator, set the **Element** to **Chain**.




2. Click the *chain* **CL40**.
3. Click the **Print/Describe Element** button. The geometry of the selected chain displays in the COGO window.



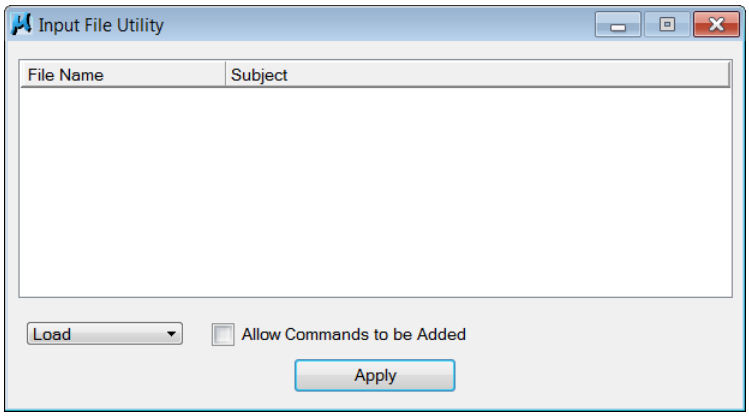

4. Using the scroll bar, move up or down to review the geometry.

## Exercise 3.6 Saving the Input Trail

In this exercise, the user will save an input trail of the commands used to create the above chain. This is not a substitute for the geometry file needed for Electronic Delivery.

➢ ***TO SAVE THE INPUT TRAIL***

1. From Coordinate Geometry, click **File** and **Input** File Utility. Input File Utility opens.




2. Change the *Load* option to **Save**.
3. In the *Name* box, type **SR40**.
4. In the *Subject* box, type **CL Chain**.
5. Click the **Apply** button. The file **sr40527.ijd** appears in the working directory.

| | |
|---|---|
| ***Note*** | This has an ASCII file format opened for review with a text editor or with COGO and used to re-store some or all of the data that is in it. |

## Exercise 3.7 Saving the Output File

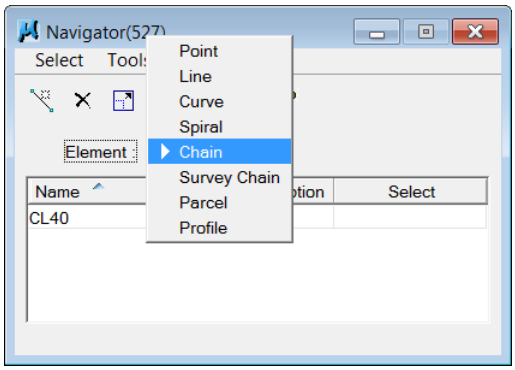
In this exercise, the user will save an output file or report of the actual geometry of the chain. This output file can be printed and submitted to your QC department as part of the Plans Quality Control.

➢ ***TO SAVE AN OUTPUT FILE***

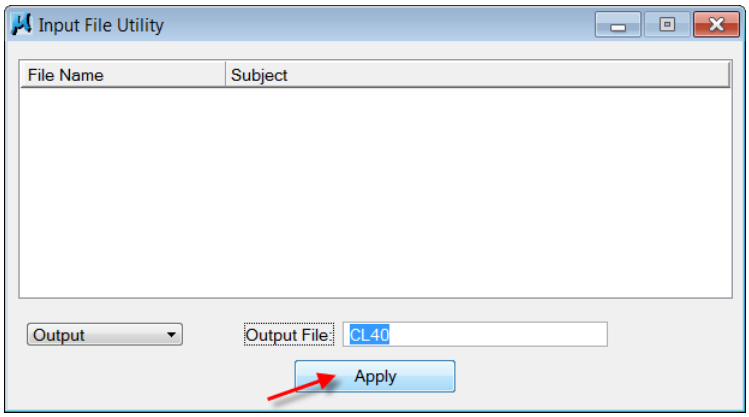
1. From Coordinate Geometry, click **Edit** and **Clear**. Coordinate Geometry is cleared.

***Important:*** Clear the session only after you have saved previous commands in an input file for backup purposes. The file must be clear to avoid unnecessary data created in an output file.

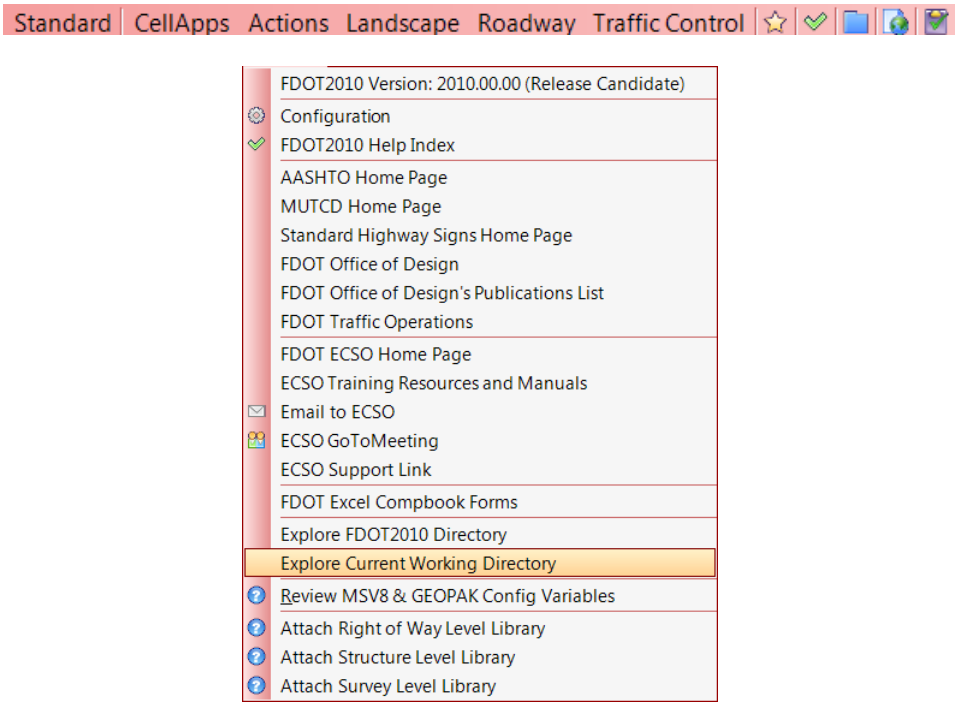
2. From Navigator, set the **Element** to **Chain**.

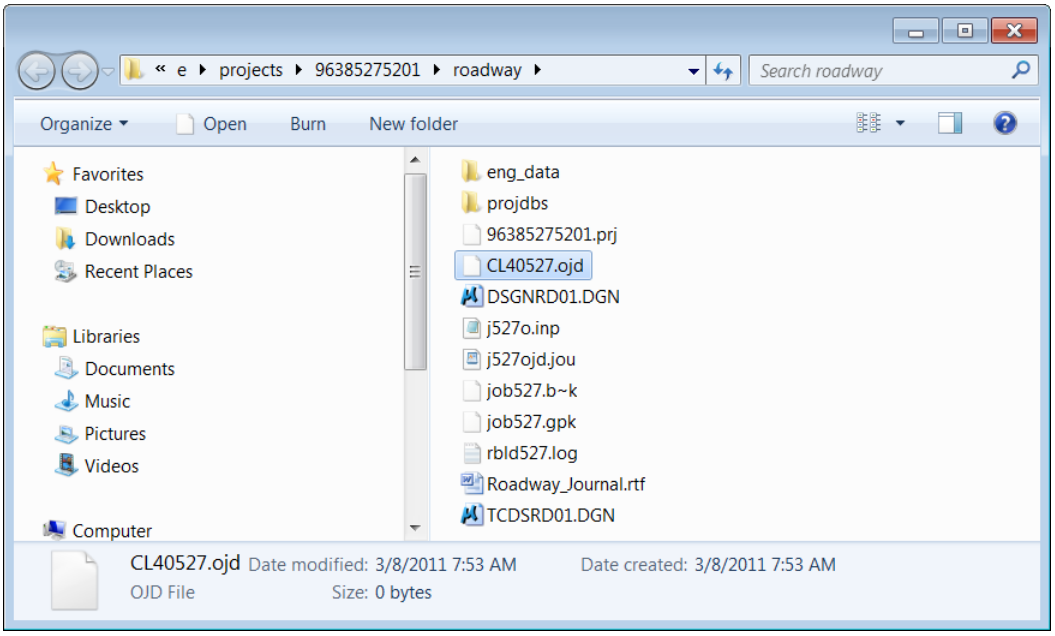



3. Click the *chain* **CL40**.
4. From Navigator, click the **Print/Describe Element** button. The Chain geometry displays in the COGO window.
5. From Coordinate Geometry, click **File** and **Input File Utility**. Input File Utility opens.
6. Change the *Save* option to Output. In the *Name* box, type CL40. Click the Apply button.



7 . The file **CL40527.ojd** appears in the working directory.




8 . This output file name reflects the chain, making file management easier. This is an ASCII file opened with a text editor and reviewed and/or printed.

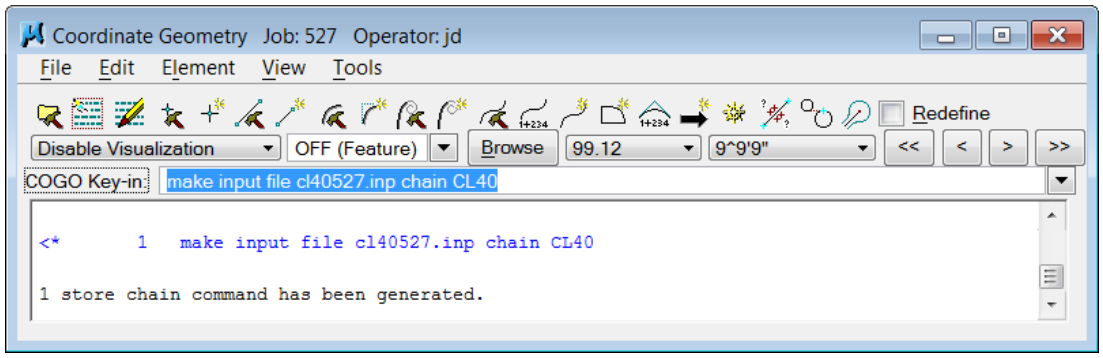
## Exercise 3.8 Creating the ASCII Geometry Input File

In this exercise, you will create the Engineering Data File required for Electronic Delivery. Refer to the CPCH chapter 8 for more details. This file is also a good backup of the geometry in case restoration is required for overwritten or deleted data. This is also the best way to share data between consultants or other users that need your geometry. Copying and e-mailing the .gpk can cause problems.

➢ ***TO CREATE THE ASCII GEOMETRY INPUT FILE***

1 . In the *COGO Key-In* box, type: **make input file cl40527.inp chain CL40**.

2 . Click the **Enter** key. The file **CL40527.inp** appears in the *Roadway* folder.




| | |
|---|---|
| ***Note*** | A text editor will open and allow reviewing of this ASCII file . FDOT requires this file to be compliant with the electronic delivery requirements. The designer must create this ASCII geometry file for all of the critical data stored in the .gpk to include all horizontal and vertical data. |

3 . Close Graphical COGO toolbox.

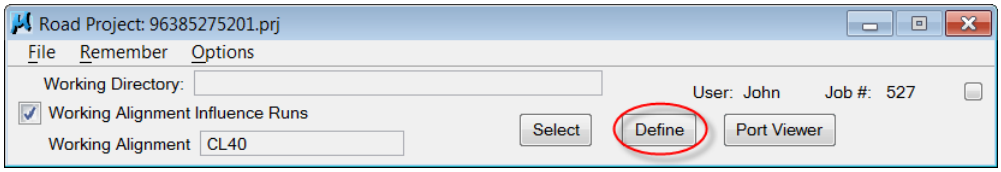
4 . Close Coordinate Geometry.

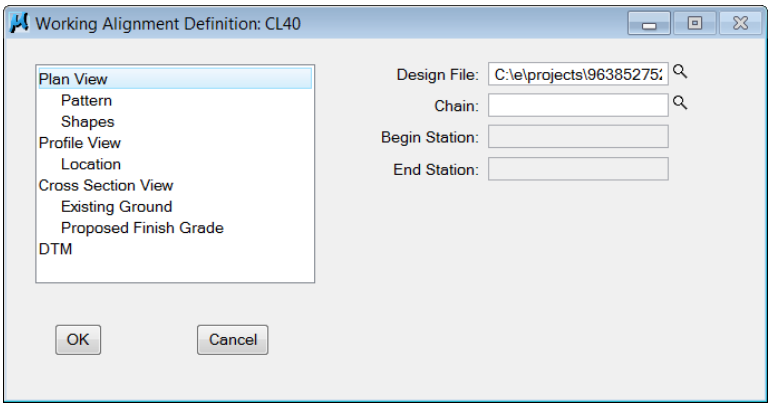
## Exercise 3.9 Updating the Working Alignment

Now that a chain is stored, the working alignment needs updating.

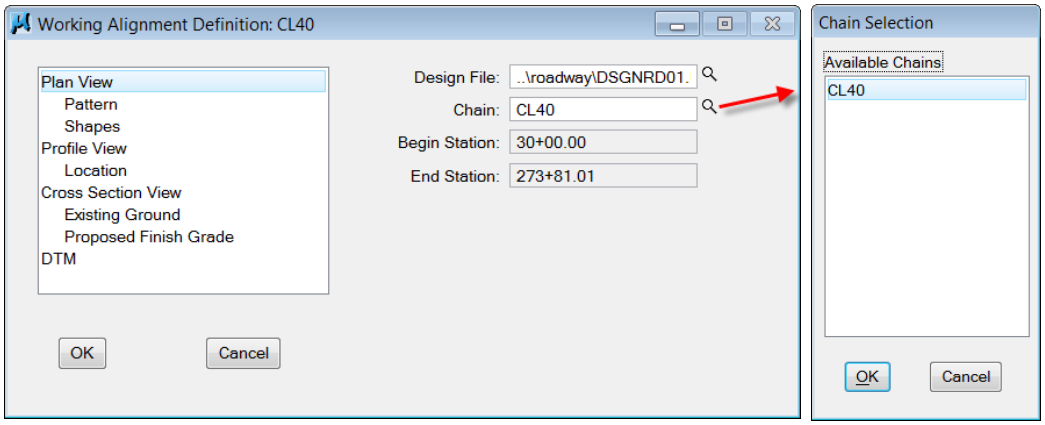
➢ ***TO UPDATE THE WORKING ALIGNMENT***

1. From Road Project, click the **Define** button. Working Alignment Definition opens.




2. From the View listing on the left, click **Plan View**
3. On the right side of the *Chain* box, click the **Select** button. Chain Selection opens.
4. From Chain Selection, click CL40 then click the **OK** button. The chain name and the station limits appear.




5. Click the **OK** button. The data saves into the Working Alignment.

*Tip: Whenever a GEOPAK dialog box provides the opportunity to select a name or item with a button, always use the button rather than typing the name. If the file does not appear, this indicates that there are issues with the GEOPAK directories that need to be resolved.*

# 4 DESIGN & COMPUTATION MANAGER

## OBJECTIVES

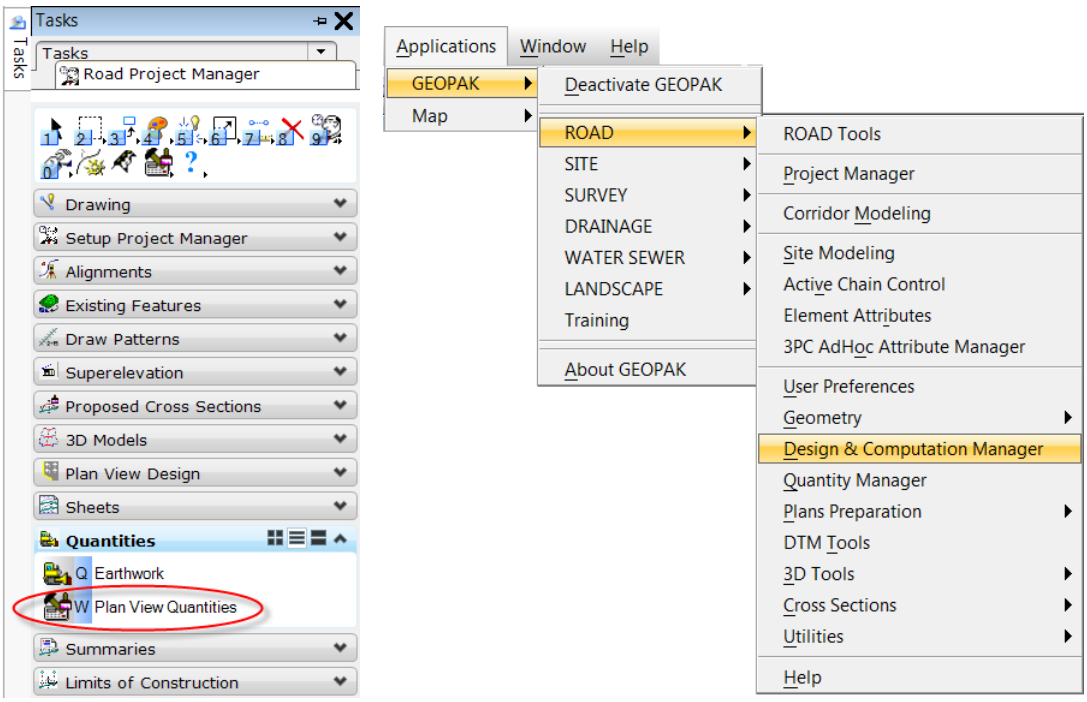
GEOPAK's Design & Computation Manager (D&C Manager) performs a variety of different operations.

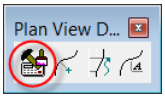
- D&C Manager calls upon established FDOT CADD standards to plot COGO elements into MicroStation or to associate MicroStation graphics with FDOT CADD standards.
- D&C Manager places MicroStation elements recognized by GEOPAK and used in quantity calculations.
- D&C Manager identifies the GEOPAK pay item attribute for MicroStation elements previously tagged by the D&C Manager.
- D&C Manager draws various pavement marking operations.
- D&C Manager draws shapes used to compute quantities.
- D&C Manager calculates automated quantities used by Quantity Manager.

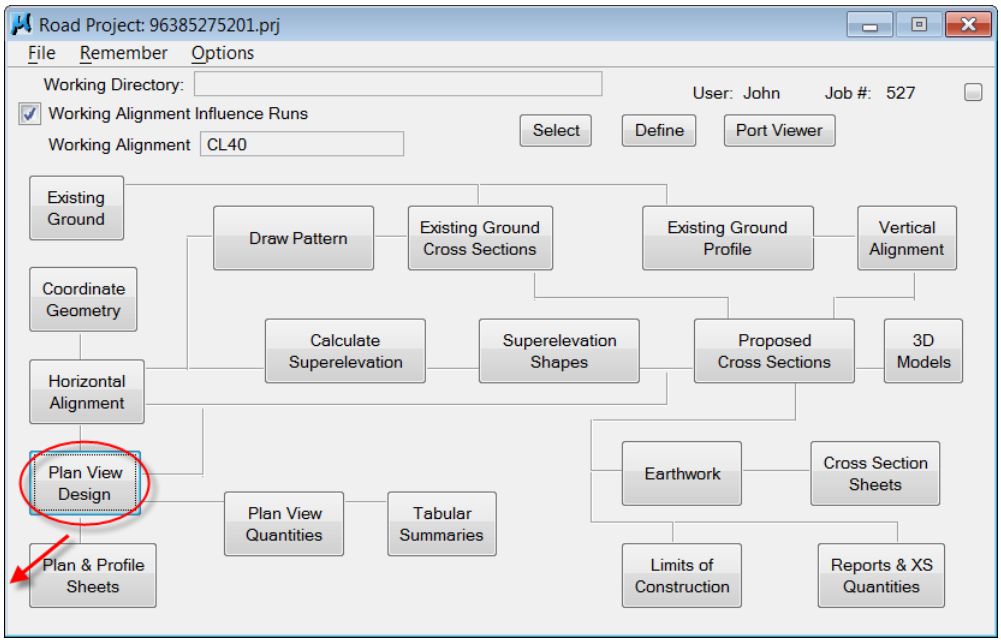
## ACCESSING THE D&C MANAGER

➢ ***TO ACCESS D&C MANAGER***

From the **Road** toolbox, click the **D&C Manager** button --or-- from MicroStation, click Applications, point to ROAD, then click Design & Computation Manager --or-- from Road Project, click the Plan View Design button then click the Design & Computation Manager button. D&C Manager opens.


Tasks
Tasks
Road Project Manager
Drawing
Setup Project Manager
Alignments
Existing Features
Draw Patterns
Superelevation
Proposed Cross Sections
3D Models
Plan View Design
Sheets
Quantities
Q Earthwork
W Plan View Quantities
Summaries
Limits of Construction
Applications
Window
Help
GEOPAK
Map
Deactivate GEOPAK
ROAD
SITE
SURVEY
DRAINAGE
WATER SEWER
LANDSCAPE
Training
About GEOPAK
ROAD Tools
Project Manager
Corridor Modeling
Site Modeling
Active Chain Control
Element Attributes
3PC AdHoc Attribute Manager
User Preferences
Geometry
Design & Computation Manager
Quantity Manager
Plans Preparation
DTM Tools
3D Tools
Cross Sections
Utilities
Help

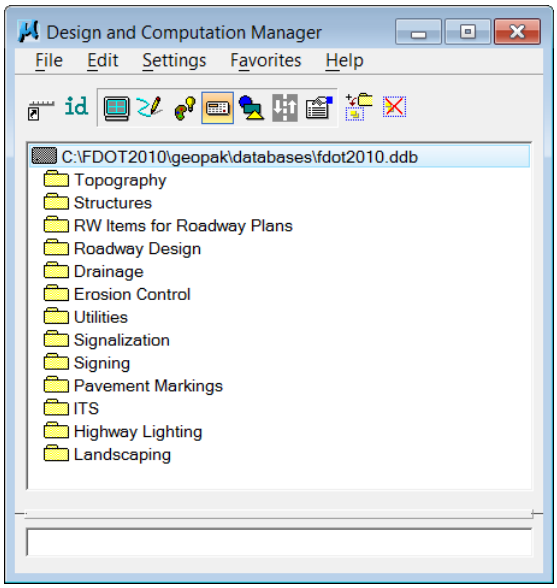

Plan View D...


Road Project: 96385275201.prj
File
Remember
Options
Working Directory:
User: John
Job #: 527
Working Alignment Influence Runs
Working Alignment
CL40
Select
Define
Port Viewer
Existing Ground
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Coordinate Geometry
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Horizontal Alignment
Plan View Design
Earthwork
Cross Section Sheets
Plan View Quantities
Tabular Summaries
Plan & Profile Sheets
Limits of Construction
Reports & XS Quantities

# D&C MANAGER DIALOG BOX

D&C Manager uses a hierarchical database, referred to as the .ddb file, to store information concerning functional classification and display preferences for each feature and item used in a MicroStation file.

The ECSO is responsible for the development of the FDOT standard GEOPAK D&C Manager databases. The Standard English database is fdot2010.ddb developed to comply with the CADD Standards as defined in the 2010 CPCH. Users modify this database to address project specific items or to comply with District standards. Users, with a customized database, save the database into the project directory under the symb folder and change the name of the file to the eleven-digit FPID number .ddb.




## D&C MANAGER MENU BAR

The D&C Manager has four menus.

**File** This menu has options to create a new .ddb file, open an existing .ddb file, save a .ddb file, save as, merge .ddb files, compress .ddb files, use a password for a .ddb file, and exit D&C Manager.

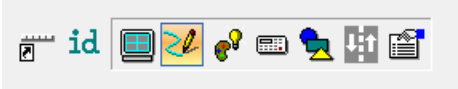
**Edit** Perform multiple edit functions to the .ddb file.

**Settings** Control settings from how items display in MicroStation to computing quantities properly. The training course covers these items individually later.

**Favorites** This menu allows users to store and recall frequently used items.

## D&C MANAGER OPERATIONAL MODES

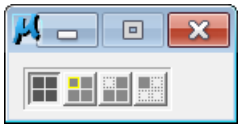
D&C Manager has a toolbar for quick access to different modes. The following summarizes the function of each button.



**Switch To Toolbox Mode** D&C Manager is set up to work in two different modes, dialog box or toolbox. This button opens the toolbox mode, which is resizable and dock-able. To change the display back to the whole dialog box, click the **Switch to Dialog Mode** button at the far right of the toolbox. The Place Influence check box is at the left end of the toolbox.

**Identify Item** The Identify Item button sets the D&C Manager item to match an existing MicroStation element previously drawn by the D&C Manager or elements drawn with Graphical COGO and the SMD file. If the item ID does not match an item in the opened database, a message appears in the status bar saying: No matching database item.

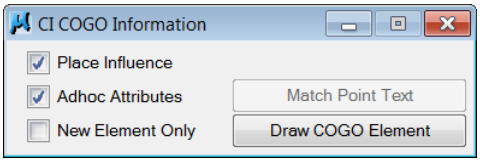
**Display** The **Display** button filters the MicroStation elements in the design file so only specific features display. This button expands D&C Manager to show a collection bin at the bottom of the dialog used for displaying multiple items at one time. To add items to the collection bin, double-click the item –or- right click on the item and select **Add to Collection**. This tool also opens a second toolbox with four buttons as seen below.



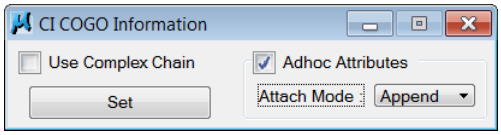
The tools from left to right are:

- Normal Display
- Highlight Selection
- Hide Selection
- Display Only Selection.

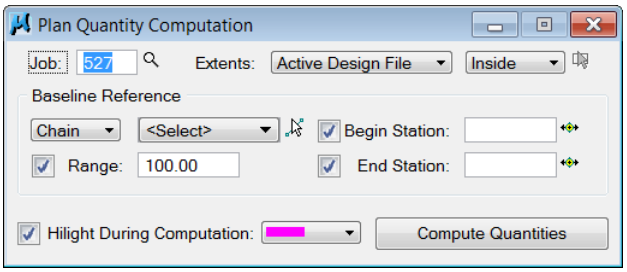
**Design** Plots COGO and MicroStation elements into MicroStation with the defined symbology by use of Draw Plan and Profile or in conjunction with MicroStation's element placement commands with Place Influence selected.



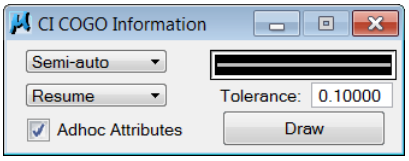
**Set** Sets the symbology of previously drawn MicroStation graphic elements in accordance with the parameters of a selected item in the database.



**Compute** Tabulates quantities of items placed as Pay Items by use of the Design, with Place Influence turned on, or Set mode. Drafting elements with QA Input or MicroStation tools disables the ability to run quantities on those elements. This tool also expands D&C Manager to show the collection bin; this allows processing of multiple pay items at one time. A second toolbox opens as shown **below.**



**Shapes** The **Shapes** button uses plan view MicroStation graphics to place shapes required for quantities. This tool opens a second dialog box as shown below.



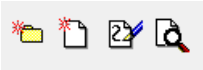
**Pavement Marking** This mode dynamically provides additional options for placing pavement striping and markings. This tool adds four additional tools to D&C Manager as shown below.

The four tools from left to right are:

- Striping
- Separation
- Chevron Diverge
- Chevron Merge

***Note*** The FDOT Traffic Plans Course covers the Pavement Marking tools in detail.

**Preference** The **Preference** button expands the toolbar to include four additional buttons to configure D&C Manager. These same tools are accessible through the **Edit** menu –or- right click on item or category.

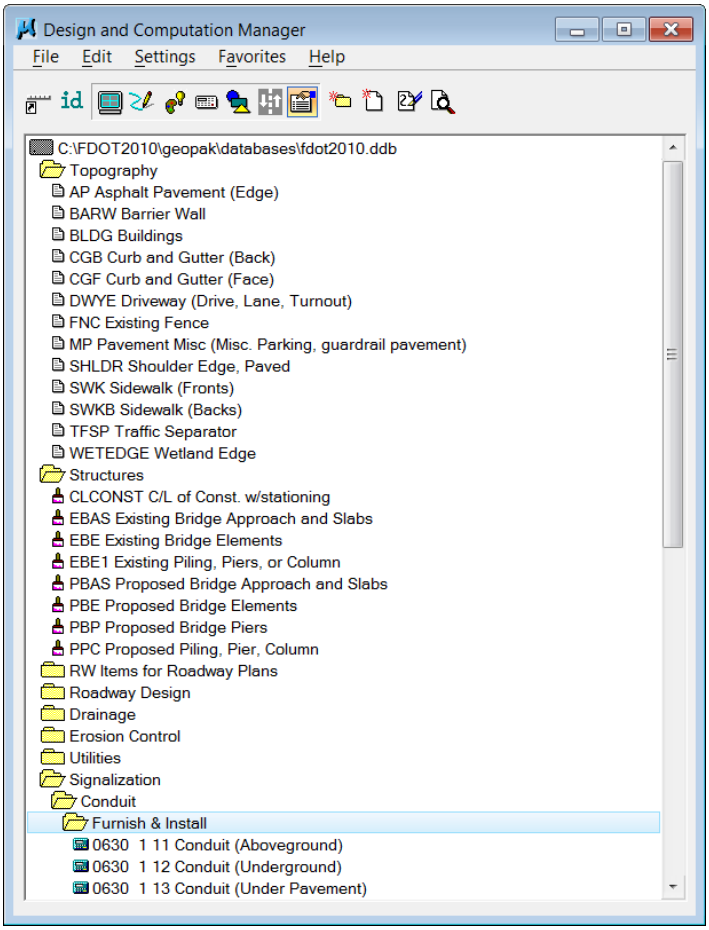


The tools from left to right are:

- Create A New Category
- Create A New Item
- Modify Item
- Review Item

## EXPLORING FDOT'S .DDB FILE

FDOT has created a database file, named *fdot2010.ddb*, in the directory *FDOT2010\GEOPAK\databases*. FDOT set up this database specifically to create elements with the correct level symbology according to FDOT CADD Standards. The *.ddb* file is set up with discipline folders called *Categories*. Each category has subcategories called *Items*.




Categories are the basic component of the hierarchical tree, represented by a folder icon and organized by discipline in the fdot2010.ddb database. Categories with a description relative to their discipline display below.

Items are subcategories of Categories represented by one of three icons as shown below. The Item icon correlates to the definition of the item. An item can be a drafting item, a compute item, a default item or a pavement item. (FDOT does not use pavement items). Items contain specific functions related to defined element symbology or quantity calculations.

**Default Icon** These items are used to set drafting standards for MicroStation commands or to draw COGO elements without annotation. In some cases, this is a 3PC routine.

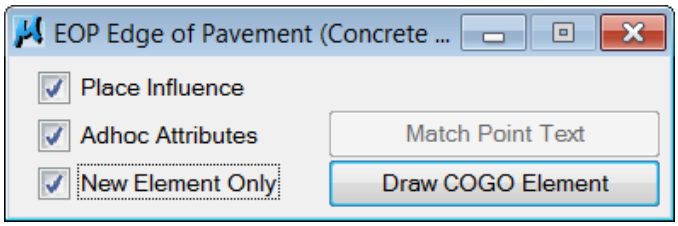
**Drafting Standards Icon** These items can be used to set drafting standards for MicroStation commands or to draw COGO elements with annotation.

**Calculator Icon** Sets drafting standards for MicroStation commands or to draw COGO elements. A pay item attribute tags the graphics used to identify the elements used to calculate plan quantities.

## DESIGN MODE

The **Design Mode** is how users place most, if not all, MicroStation elements. Design Mode is the default mode when D&C Manager opens and used for the following functions:

- **Set Drafting Standards** This function is for the placement of MicroStation elements using MicroStation commands by the **Place Influence** option.
- **Plot COGO Elements** Plots the COGO elements into the design file according to the Drafting Standards set by the selected D&C Manager item.




**Place Influence** Used to override the currently active MicroStation symbology settings. The **Place Influence** check box is located at the left of the dialog box.

By selecting the **Place Influence** check box, you can use MicroStation commands to place or modify elements utilizing the drafting standards established for the currently selected item in the D&C Manager database.

When finished placing the elements, turn off **Place Influence**. Any elements that are drawn or modified with **Place Influence** activated are set to the selected item's attributes.

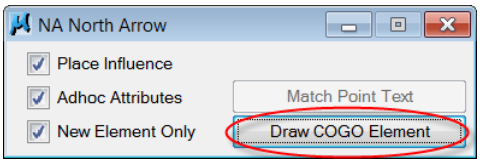
**Adhoc Attributes** Selecting this check box, along with the **Place Influence** check box, allows the user to add **Adhoc Attributes** to any new element that is drawn. When selected and a MicroStation command is invoked a table displays, enabling the user to modify the **Adhoc Attribute** value for the element to be placed.

**New Element Only** Selecting this check box sets the symbology for new elements and does not change the symbology of modified elements to the selected item in D&C Manager.

## PLOTTING COGO ELEMENTS THAT ARE DEFAULT OR CALCULATE ITEMS

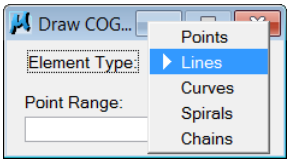
D&C Manager plots GEOPAK COGO elements into MicroStation with the defined element symbology. Items can be plotted from the COGO database using each of the different type of items as defined previously; default, compute, and drafting standard.

The process to plot COGO elements using default and compute items are identical. The only difference is the users tag "calculator" items with a pay item attribute allowing the D&C Manager to tabulate quantities from the graphics. When using a default or compute item to plot a COGO element, no annotation is placed in the design file. For example, use a North Arrow item to set the active MicroStation cell and symbology according to FDOT Standards by use of the Place Influence check box.




When launching D&C Manager from Road Project and clicking the Draw COGO Element button, no prompt appears to enter the GEOPAK job number. However, if not using Project Manager, user must enter the job number to begin.

Draw COGO Element option plots several COGO elements by selecting the desired COGO element from the **Element Type** menu. The options are:




**Points** Places cell at stored point locations. This option is not available and grayed out when a cell name is not defined for the selected item.

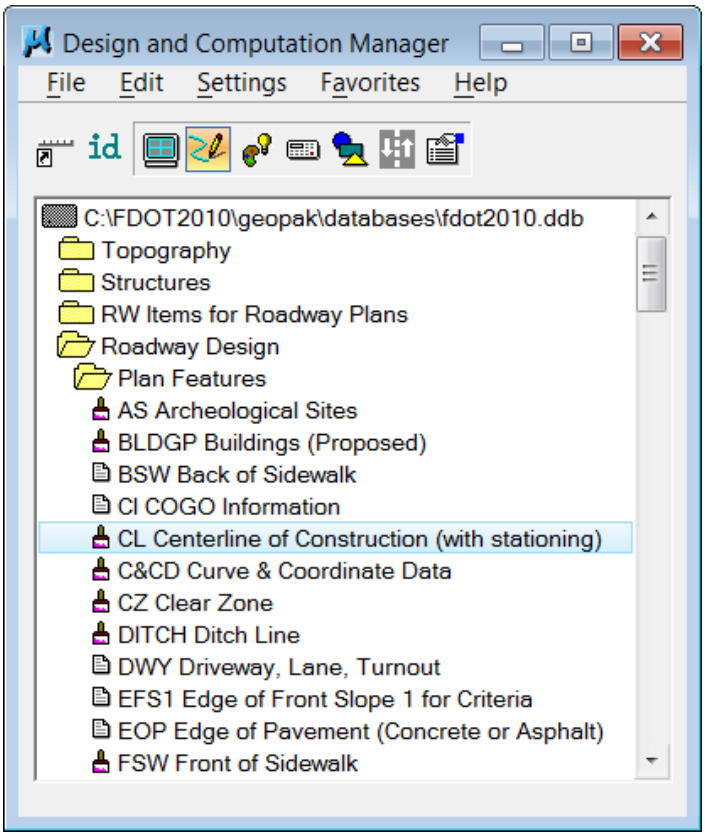
**Lines** Draw a line through a range of COGO points using the selected D&C Manager symbology. When a range of points is typed, all of the points connect in numeric order. To draw a line through a series of points in a specific order, use / to separate the point numbers.

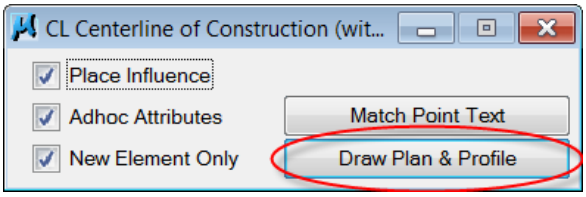
**Curves, Spirals or Chains** The user plots elements from the COGO Database by selecting the name from the list. When selecting one of these options in Draw, a listing of the Curves, Spirals, or Chains in the COGO database is included in the dialog box.

## PLOTTING COGO ELEMENTS USING DRAFTING STANDARD ITEMS

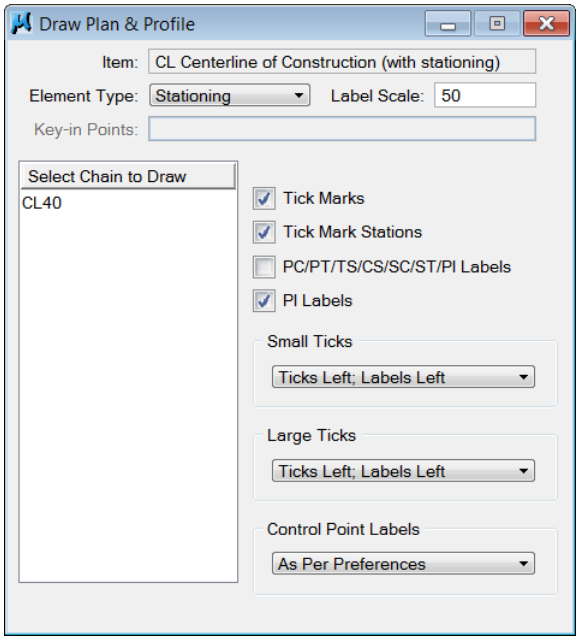
D&C Manager database items with the drafting standards icon set symbology for MicroStation commands by selecting the **Place Influence** check box or plotting COGO elements with annotation. The annotation includes curve data, stationing, bearings, distances, etc. The majority of the items in the **fdot2010.ddb** have no configuration to plot annotation. Upon selection of a drafting standard item, the Place Influence dialog box appears. Click on **Draw Plan & Profile** to open Draw Plan & Profile.

***Note*** After invoking this tool, double clicking on any other Drafting Standards item will open Draw Plan & Profile for the duration of the D&C Manager session.

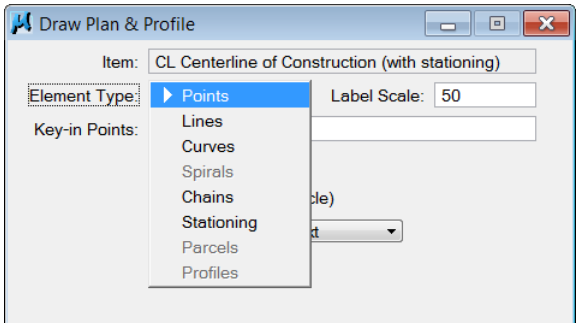



***Note*** Draw Plan & Profile will turn Place Influence off.




At the top of Draw Plan & Profile is the option drop down to select the **Element Type**. The options available from the menu are dependent on the defined settings for the specific item in the database. Above **Element Type** is the currently selected D&C Manager feature. The rest of the dialog box displays the various options for the selected **Element Type**.

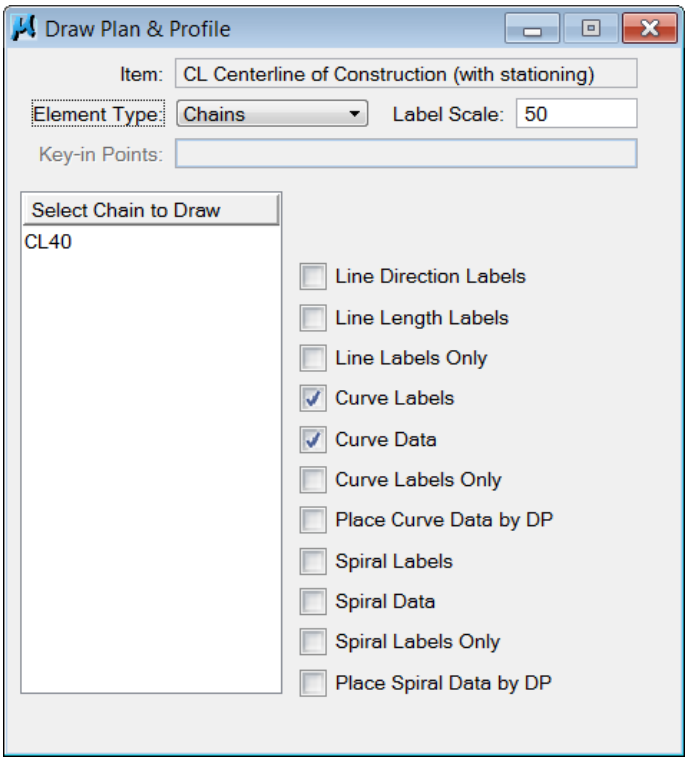



The following **Element Type** options are available.

- Points
- Lines
- Curves
- Spirals
- Chains
- Stationing
- Parcels
- Profiles

## PLOTTING COGO CHAINS

The list box displays the available chains in the selected COGO database on the left hand side of Draw Plan & Profile. The right side of Draw Plan & Profile contains a list of options for plotting the currently selected item. The D&C Manager database, **fdot2010.ddb,** already has the **Curve Label** and the **Curve Data** check boxes selected. Select other options as needed. With all options cleared, chain elements are plotted without any labels.




The **Label Scale** specifies the plotting scale for the text labels. The D&C Manager does not set the **Label Scale**. The GEOPAK default value is 100.

➢ ***TO PLOT A COGO CHAIN***

1. In Draw Plan & Profile, click **Chains** from the **Element Type** drop down.
2. Under *Select Chain*, click the *name of the chain* from the list box on the left. The chain will plot with the symbology of the selected D&C Manager item.

***Important:*** Selecting the Chain name more than once will result in duplicate graphics plotting in the MicroStation file.

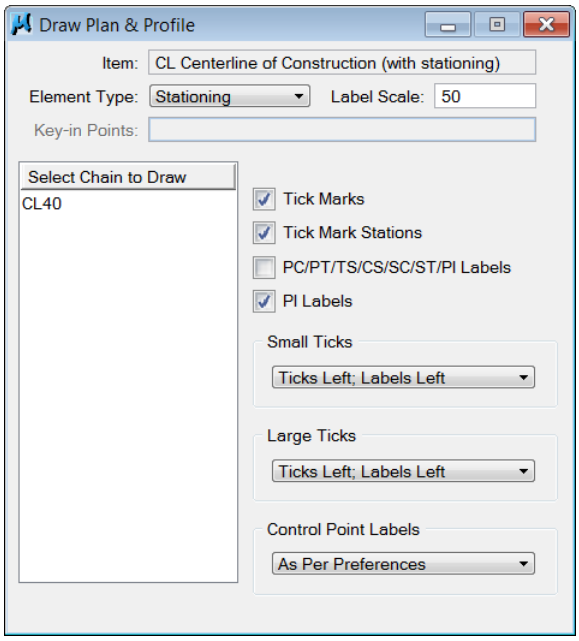
The curve data text places as a Graphic Group, easily moved as a group with the MicroStation Graphic Group lock turned on.

## PLOTTING STATIONING ON THE CHAIN

Plotting Stationing for COGO chains uses the D&C Manager database.

FDOT Standards has three levels in the MicroStation level library for Stationing and Tick Marks. To plot more than one scale, it is the intent of the FDOT Standards to create a separate model for each scale needed. Each model should contain the chain and stationing for the desired scale to reduce the number of reference attachments.

The list of available COGO chains displays on the left side of Draw Plan & Profile. The right side contains the options for plotting the stationing.




By default, the D&C Manager database, **fdot2010.ddb,** has the **Tick Marks**, **Tick Marks Stations** and **PI Labels** check boxes already selected.

The **Label Scale** specifies the plotting scale for the stationing text.

➢ ***TO PLOT THE STATIONING***

Under **Select Chain to Draw**, click the name of the chain. The stationing plots with the symbology of the currently selected D&C Manager item.

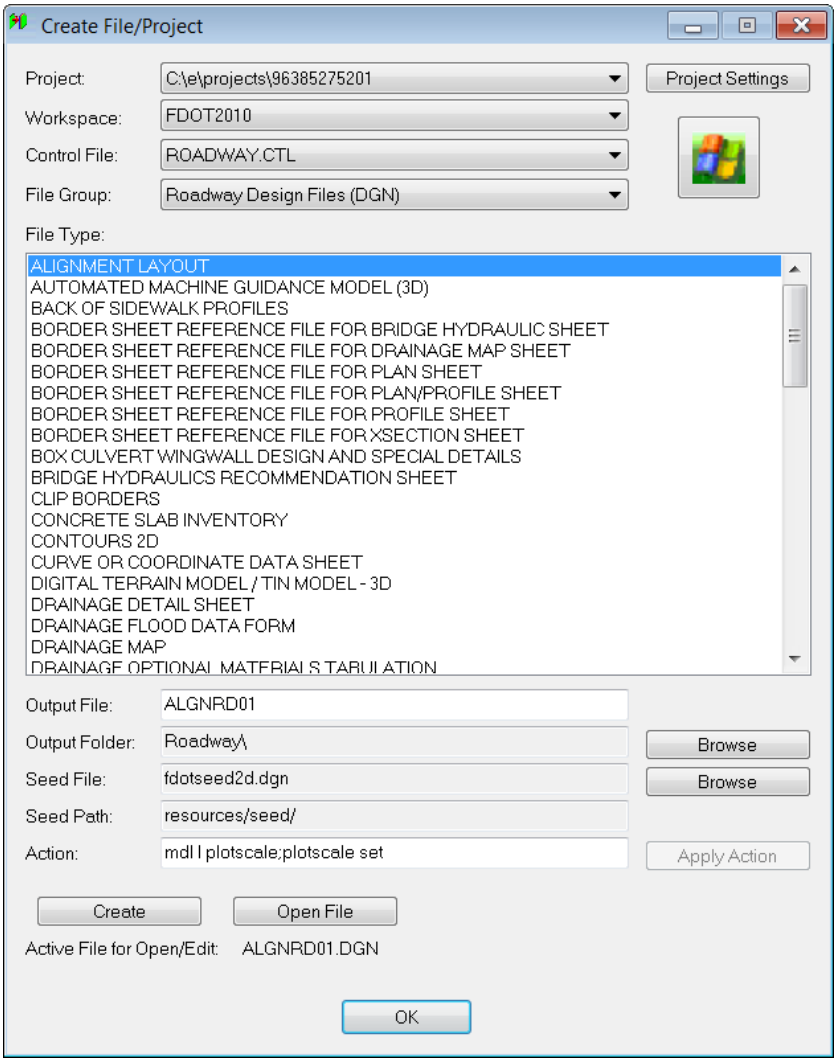
***Important:*** Clicking the chain name more than once will result in duplicate graphics plotting in the MicroStation file.

## Exercise 4.1 Plotting & Stationing the Horizontal Alignment or Chain

In this exercise, the user creates an alignment file and draws the alignment chain, station ticks and text of the previously stored chain.

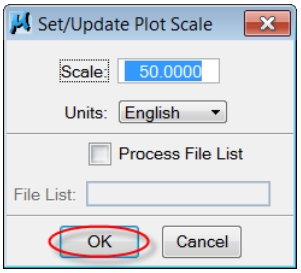
➢ ***TO STATION THE HORIZONTAL ALIGNMENT***

1. Extract the project files by double-clicking on the file **C:\Chapter4_Ex4_1.exe**.
2. Open **DSGNRD01.dgn** in **C:\e\projects\96385275201\roadway** and activate the GEOPAK CIVIL Suite.
3. From the FDOT Menu, open Create/Edit File by clicking on **Roadway** > **Create/Edit File**.



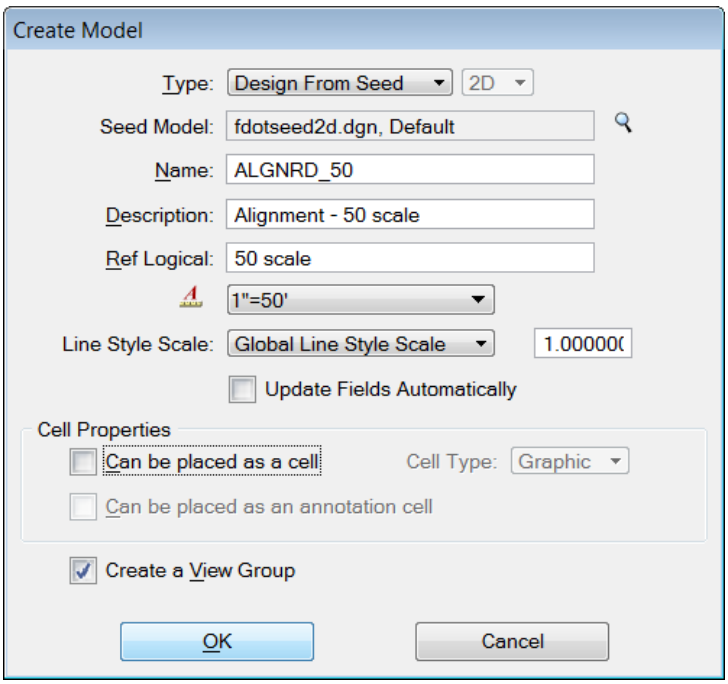

4. Click **Create** to create the file, **ALGNRD01.dgn**. Click **Open DGN**.

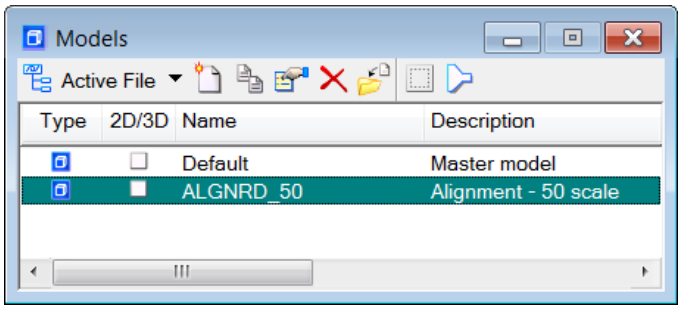
5 . *ALGNRD01.DGN* opens. Set/Update Plot Scale opens. Use the default settings and click **OK.**



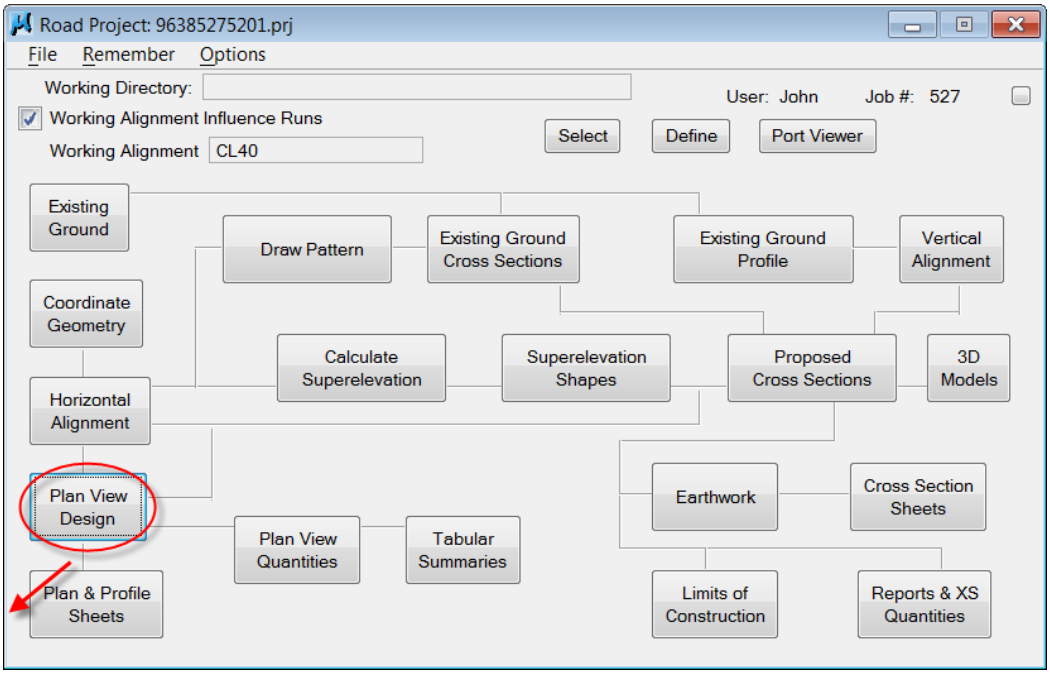

6 . Click **OK** to close the Create File/Project dialog.

7 . In MicroStation, open the Model dialog box. Create a new model, **ALGNRD_50**, using information shown below and select **OK** to open.

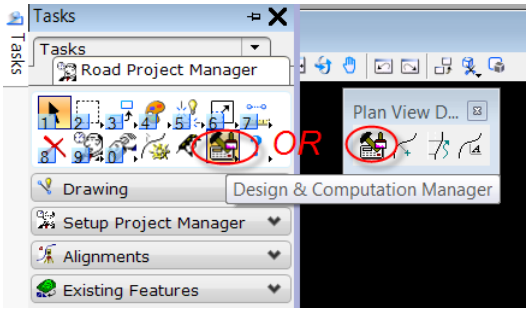


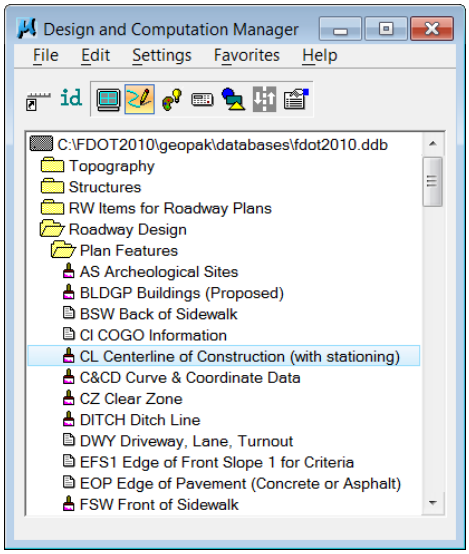



8. From Road Project, click the **Plan View Design** button. Plan View Design toolbox opens.

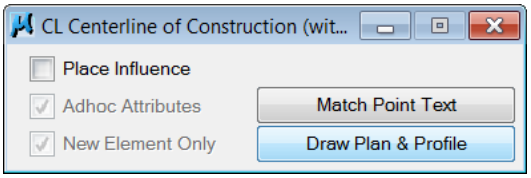



9. From the Task Menu OR Plan View Design toolbox, click the **Design & Computation Manager** button. D&C Manager opens. Navigate to **Roadway Design>Plan Features>CL Centerline of Construction (with stationing)**.

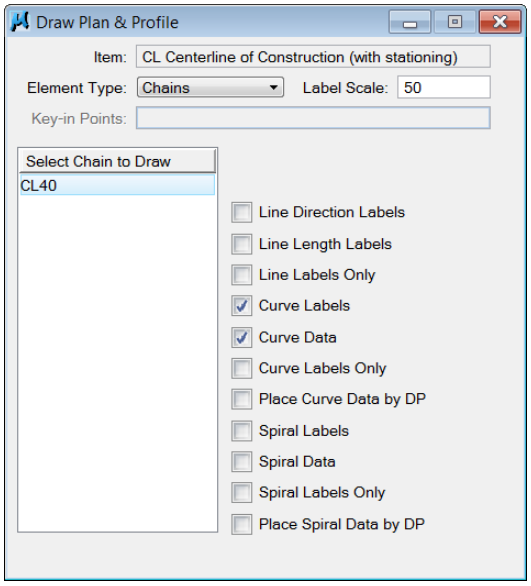


10 .Click the **Draw Plan & Profile** button from the Work Mode dialog box. Draw Plan & Profile opens.



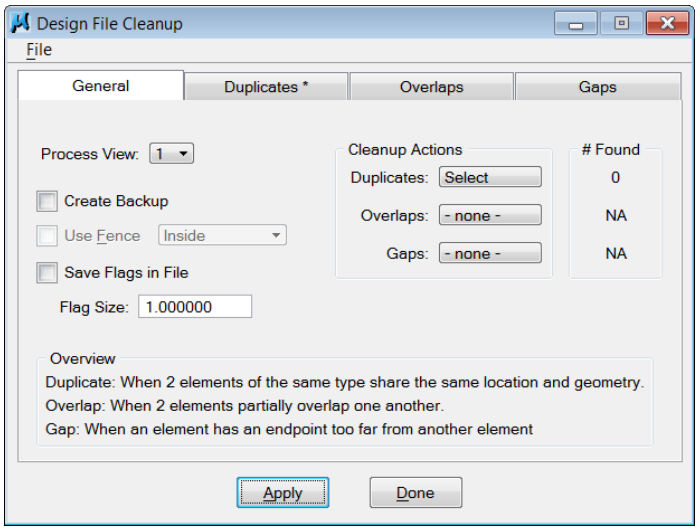

11 .From Draw Plan & Profile, set the *Element Type* to **Chains**. Set the *Label Scale* to **50**.



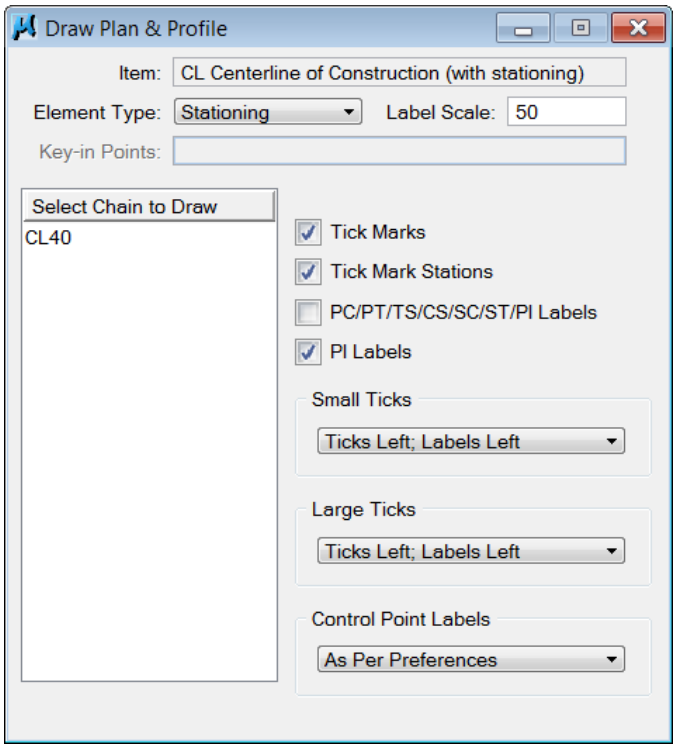

12 .Under *Select Chain to Draw*, click on **CL40**. The chain will then plot.

***Important:*** Click CL40 only once to eliminate placing duplicates.

***Note*** To check for and delete duplicates select from MicroStation Utilities>Data Cleanup. Design File Cleanup dialog opens .



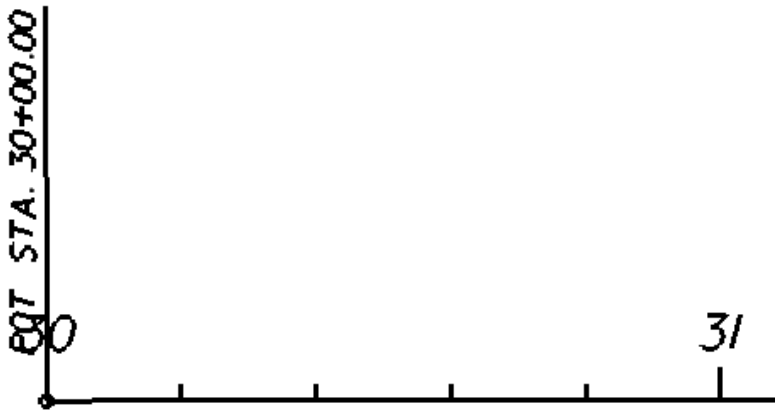
13 .From Draw Plan & Profile, set the *Element Type* to **Stationing**.




14 .Under *Select Chain to Draw*, click **CL40**.

***Important:*** Click CL40 only once.

15 .Zoom in on the beginning of the chain. The chain, stationing and tick marks display.




16 .Close Draw Plan & Profile and close MicroStation.

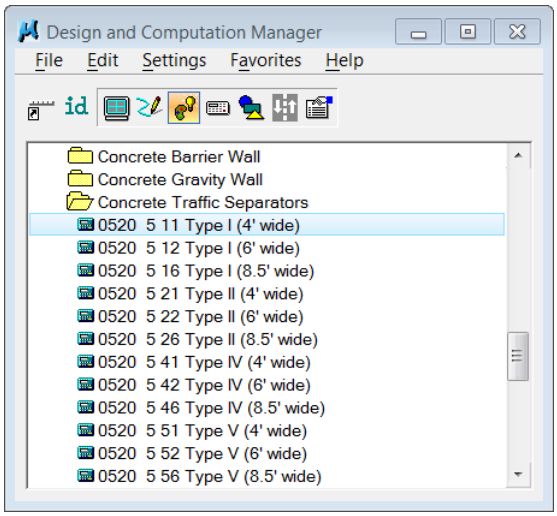
# ADHOC ATTRIBUTES

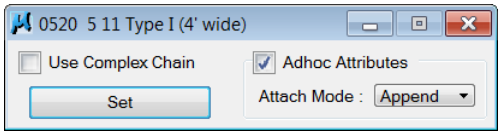
The GEOPAK proposed cross section criteria looks for elements contained in the design files to determine what cross section elements to draw. It also gathers adhoc attribute values attached to those elements found in the plan view to define how it is to draw those elements/features in cross section view. When elements are not present in the design files, then the criteria does not draw those elements into cross section view. This makes it very important to use the Design & Computation (D&C) Manager. It has been designed to set the correct symbology for the many design files used with the FDOT software. Therefore, the criteria look for the design elements based on the D&C Manager items (often referred to as ddb features). Along with the attribute tags the D&C Manager places, it also places pre-defined adhoc attributes on the necessary elements for the criteria to read and use accordingly.

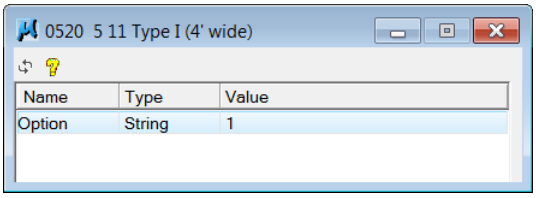
Adhoc attributes are comprised of three types of information that require definition: **Name, Type,** and **Value**. The **Name** is an identifying term used when GEOPAK is searching for a specific Adhoc Attribute. The **Type** identifies the nature of the information, and set to various options: String, Numeric, Unit, Remarks, and Quantity. The **Value** is the actual information used by GEOPAK, and is determined by the **Type**.

For example, if the **Type** has a setting of **Numeric** then the **Value** must be a number. The **Lock** option, used when defining the Adhocs, determines if the **Default Value** of the Adhoc is modifiable when placing or setting the element.

D&C Manager sets the Adhoc attributes of elements placed in the file by MicroStation commands or drawn with Graphical COGO as shown in the previous chapter. Criteria read these attributes to correctly draw elements into cross sections or calculate the quantities. For example, traffic separators have various options as to how they are constructed. Users assign Adhoc attributes to these Plan view elements to ensure compliancy to the Standard Indexes.





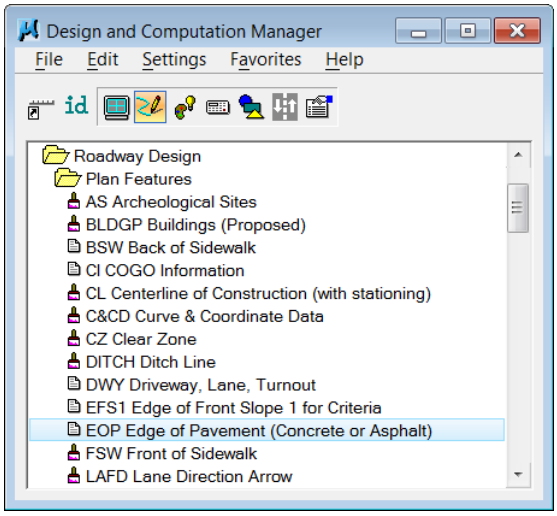




## Exercise 4.2 Drawing Plan Elements with Adhoc Attributes

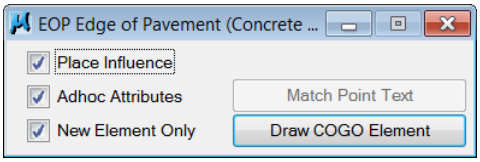
In this exercise, the user draws the edges of pavement using the D&C Manager to attach the Adhoc Attribute. There are two typical sections for this project with transitioning in between. The first typical section from Station 30+00 to Station 90+00 is a 4 lane divided rural section with a 48-foot median. The second typical section from station 101+00 to Station 228+00 is a 5 lane undivided urban section.

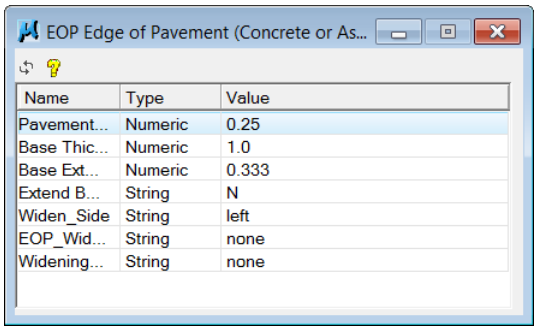
➢ ***TO DRAW EDGE OF PAVEMENT WITH ADHOC ATTRIBUTES***

1. Extract the project files by double-clicking on the file **C:\Chapter4_Ex4_2.exe.**
2. Open **DSGNRD01.dgn** in **C:\e\projects\96385275201\roadway** and activate the GEOPAK Road Project.
3. Open the D&C Manager. Navigate to **Roadway Design** > **Plan Features** > EOP Edge of Pavement (Concrete or Asphalt).



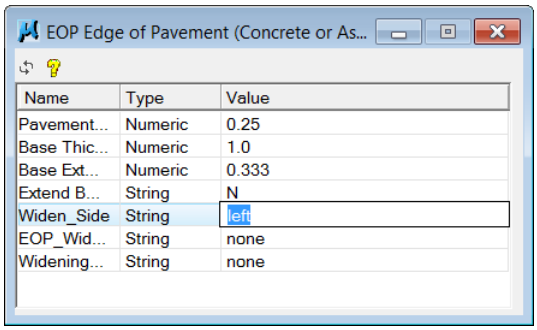

4. Click the check boxes for **Place Influence, Adhoc Attributes**, and **New Element Only**. EOP Edge of Pavement (Concrete or Asphalt) opens.





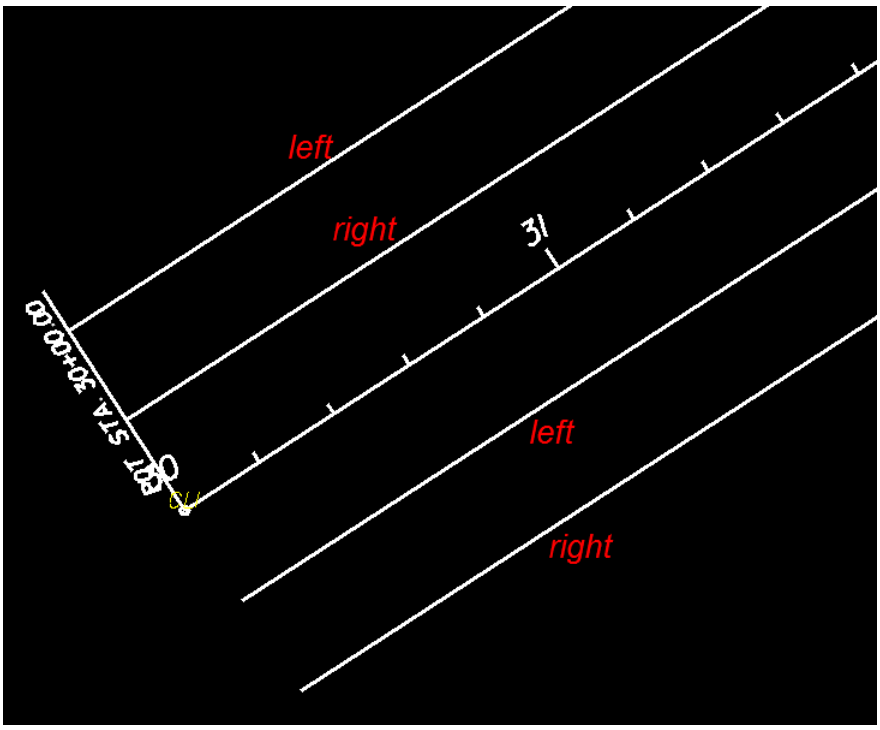

5 . Zoom into the beginning of the project.

6 . Using the MicroStation **Copy Parallel** command, copy the centerline of construction 24' to the right. (This will be the left side of the right shape cluster, therefore the *Widen_Side Adhoc* value will remain set to the value 'left'.) With copy parallel active, click on the centerline then data point to the right of the centerline.



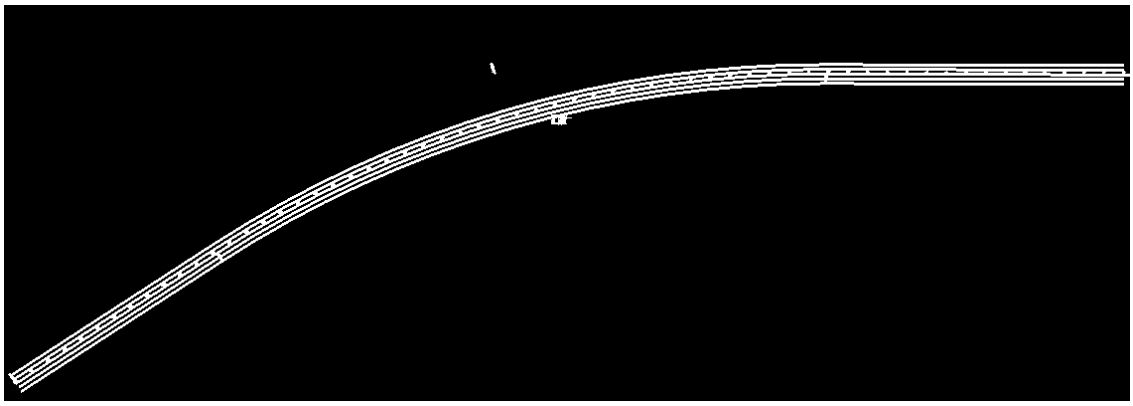

7 . Change the value of the *Widen_Side Adhoc* to **right**. Then data point again to the right to copy the EOP line another 24' to right. Right click to exit the Copy Parallel command.

8 . Repeat steps 6 and 7 to copy the centerline to **left** for the left shape cluster. Make sure the *Widen_Side Adhoc* value is set to the appropriate value.




9 . Repeat steps 6 – 8 to continue the edge of pavement through the curve to the next tangent section to Station 90+00. Again, pay attention the left and right values of the Widen_Side Adhoc value.

10 .Use the MicroStation **Trim to Element** command, select all the EOP edge of pavement lines left of the Station 90+00 tick mark, then use the station tick mark at Station 90+00 as the cutting element /edge element.



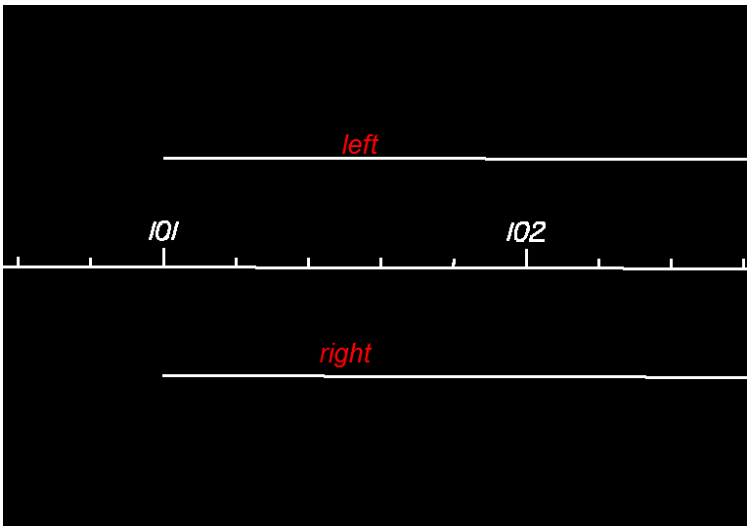
11 .The next section of the exercise you will be drawing the edge of pavement for the urban section at the end of the project.

12 . Move to **Station 101+00**.

13 . With the *Widen_Side Adhoc* value set to **left,** copy the centerline using the **Copy Parallel** tool. Set the *distance* to **30'**. Click on the **centerline** and then **data point** to the left of the centerline to indicate direction.

14 . Modify the *Widen_Side Adhoc* value to **right**.

15 . **Data point** to the right side of the centerline. Right click to exit the command.

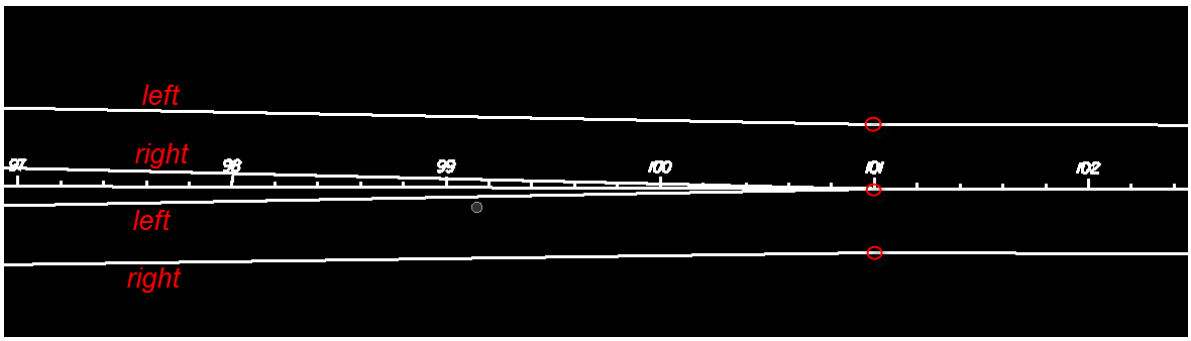



16 . Use the MicroStation **Trim to Element** command, select both the EOP edge of pavement lines right of the Station 101+00 tick mark, then use the station tick mark at Station 101+00 as the cutting element /edge element.

17 . Repeat steps 12 through 14 to continue drawing the edge of pavement to the end of project at Station 228+00.

## Exercise 4.3 Drawing Edge of Pavement through Transition

This exercise draws the edge of pavement through the transition area of the project using the DP Station Offset tool and D&C Manager.

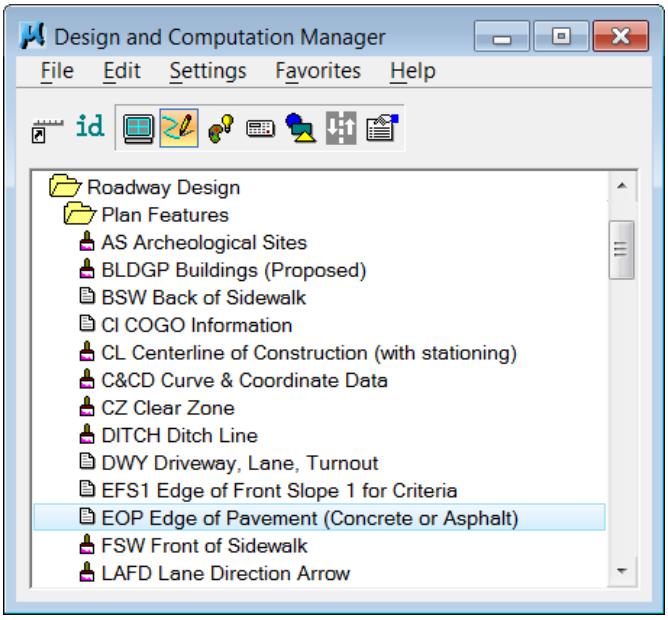



1 . Extract the project files by double-clicking on the file **C:\Chapter4_Ex4_3.exe.**

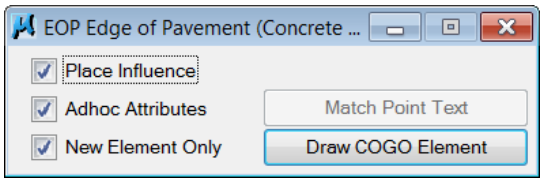
2 . Open **DSGNRD01.dgn** in **C:\e\projects\96385275201\roadway** and activate the GEOPAK CIVIL Suite.

3 . Zoom in to the area of the transition: **Station 90+00 to Station 101+00.**

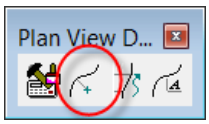
4 . Open the D&C Manager and navigate to **Roadway Design** > **Plan Features** > **EOP Edge of Pavement (Concrete or Asphalt)**.



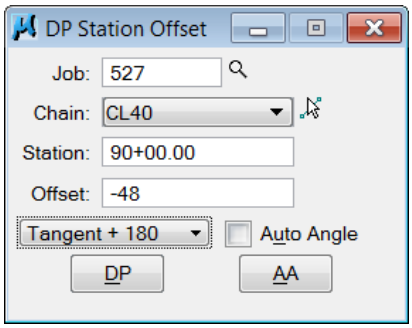

5 . Turn on **Place Influence** and **Adhoc Attributes**.




6 . Select the MicroStation menu option: **Applications** > **ROAD** > **Plans Preparation** > **DP Station/Offset.** DP Station Offset opens.



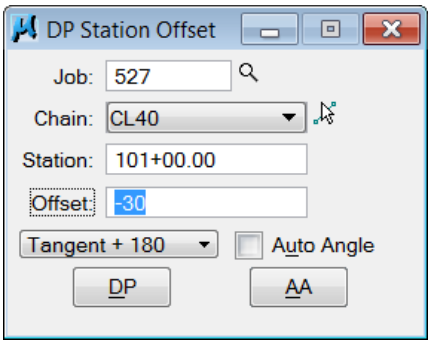

7 . Fill out the dialog as shown below.




8 . Set the value for the *Widen_Side Adhoc* to **left**.

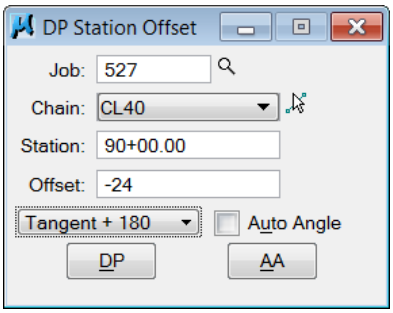
9 . Select the MicroStation **Place Line** tool. Click the **DP** button on the DP Station/Offset dialog.

10 .Modify the dialog settings as shown.




11 .Click the **DP** button on the DP Station/Offset dialog. Right click to cancel the place line command.

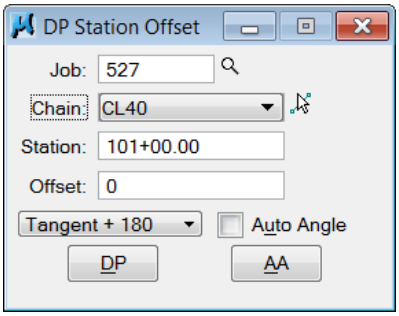
12 .Modify the dialog settings as shown.




13 .Set the value for the *Widen_Side Adhoc* to **right**.

14 .Select the MicroStation **Place Line** tool. Click the **DP** button on the DP Station/Offset dialog.

15 .Modify the dialog settings as shown.




16 .Click the **DP** button on the DP Station/Offset dialog. Right click to cancel the place line command.

17 .Repeat steps 7 through 16 to draw the transition on the right side of the alignment. Remember to use *positive offset distances* and to set the appropriate value to the *Widen_Side Adhoc*.

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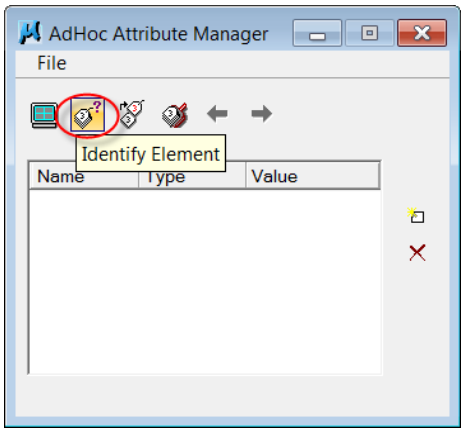
## Exercise 4.4 Checking Adhoc Attributes

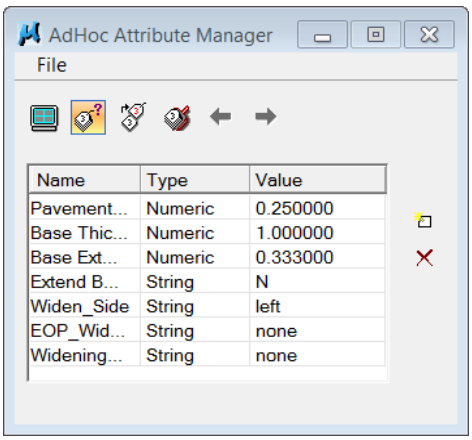
1. From MicroStation, click **Applications** > **GEOPAK** > **Road** > **3pc Adhoc Attribute Manager**. Adhoc Attribute Manager opens.

2. From Adhoc Attribute Manager, click the **Identify Element** button.




3. In the drawing, click the **Edge of Pavement line** previously drawn.

4. Click to accept. In Adhoc Attribute Manager, review the Adhoc attributes attached to the Edge of Pavement line.

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# DRAW TRANSITION TOOL

The Draw Transition tool draws elements into plan view using input station and offset information. One can use this tool in conjunction with the **Place Influence** tool in the D&C Manager.

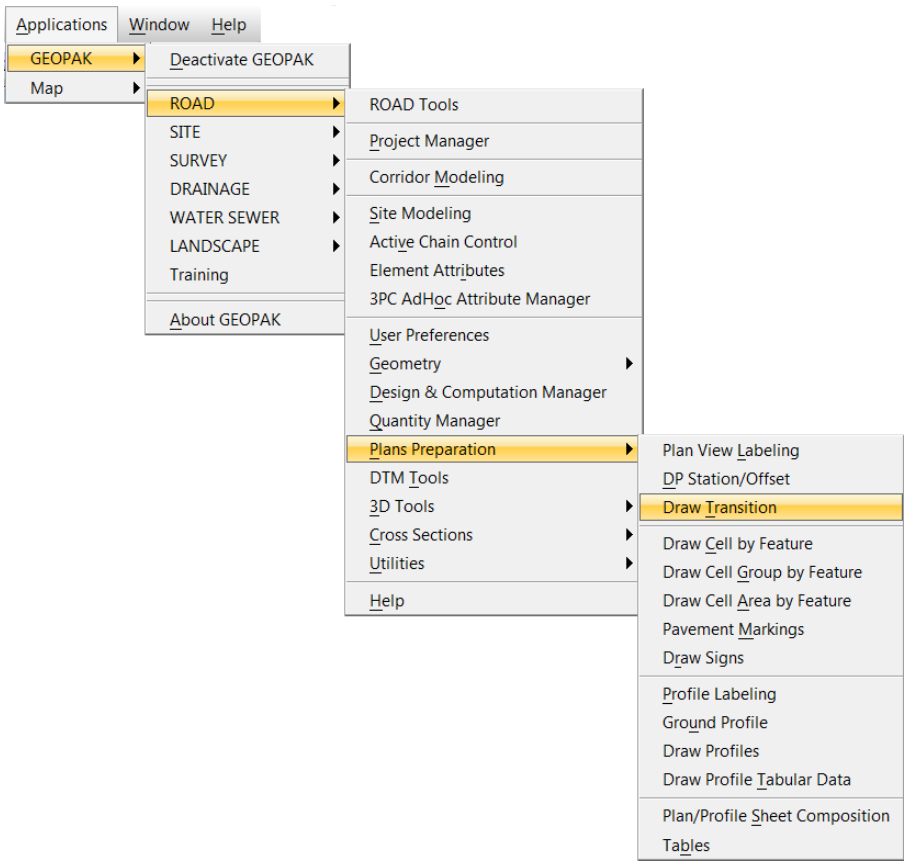
➢ ***TO ACCESS THE DRAW TRANSITION TOOL***

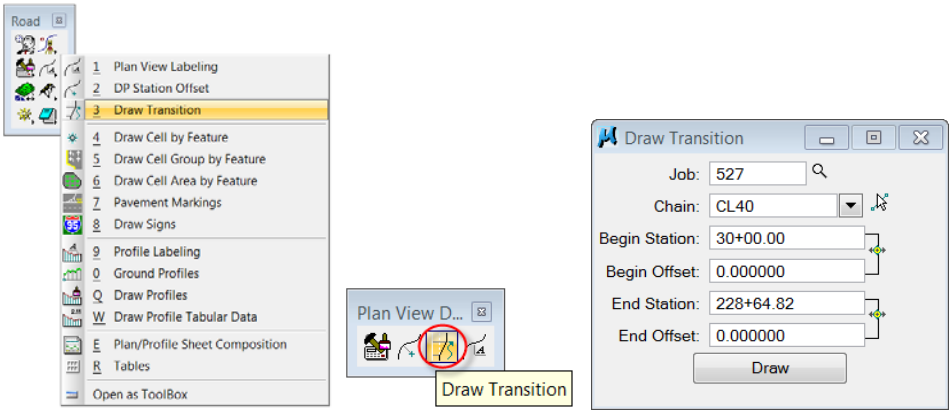
From MicroStation, click **Applications** > **ROAD** > **Plans Preparation** > **Draw Transition**

--*or*-- from the Road toolbox, click the **Draw Transition** button

--*or*-- from the Plan View Design toolbox, click the **Draw Transition** button.

Draw Transition opens.






**Job** and **Chain** Contain default information from the working alignment definition.

*Job* This is the **.gpk** file for the project and contains geometry information for the project.

*Chain* Reference chain or alignment used to associate the station/offset settings.

**Begin Station** Starting Station for the transition.

**Begin Offset** Starting offset for the transition.

*Tip: Negative offset distances will draw to the left side of the alignment.*

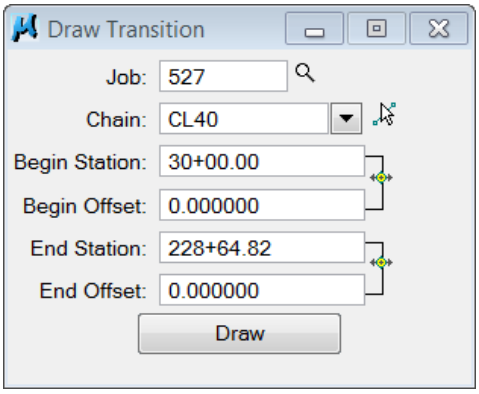
**End Station** Ending Station for the transition.

**End Offset** Ending offset of the transition.

**Draw button** Draws the transition into the active **MicroStation** file.

**Begin Station/Offset and End Station/Offset** Populates the dialog information from a data point in MicroStation.

If the Begin Offset and End Offset are the same, then the element drawn is parallel to the alignment. Use of the MicroStation Copy Parallel tool produces the same results.




*Tip: This is a very useful feature if station equations are on the chain to find the stations and fill in the boxes with the appropriate Region.*

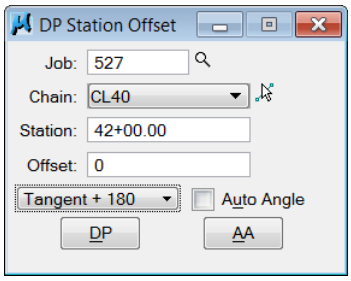
## Exercise 4.5 Drawing Guardrail

This exercise uses the **Draw Transition** tool along with D&C Manager to draw the guardrail.

➢ ***TO DRAW GUARDRAIL***

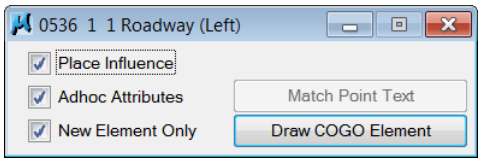
1 . In the drawing, zoom or pan to **Station 42+00**.

*Tip: Utilize the DP Station Offset tool in conjunction with MicroStation Zoom In/Out commands to move quickly through the project.*



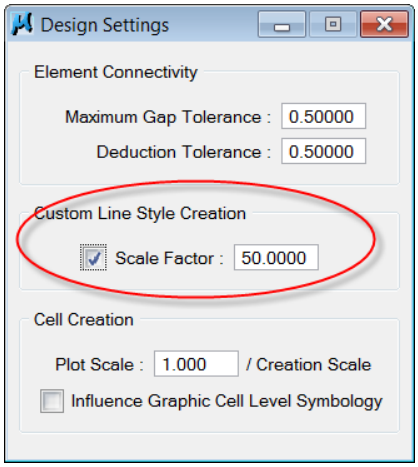

2 . Open D&C Manager. Navigate to **Roadway Design** > **Plan Features** > **Guardrail** > **Guardrail** and then double-click item **0536 1 1 Roadway (Left)**. 0536 1 1 Roadway (Left) opens.

3 . Select the **Place Influence** check box.

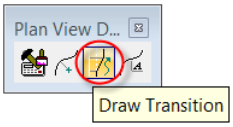



4 . In D&C Manager, select **Settings** > **Design**. Design Settings opens.

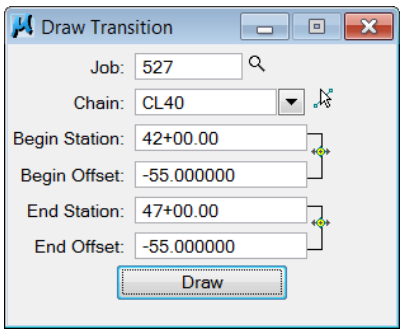
5 . On Design Settings, select the **Scale Factor** check box and type **50**. The scale is now set for custom styles. Close Design Settings.




6 . From the Plan View Design toolbox, click the **Draw Transition** button.




7 . In GEOPAK Draw Transition, enter the information shown below.



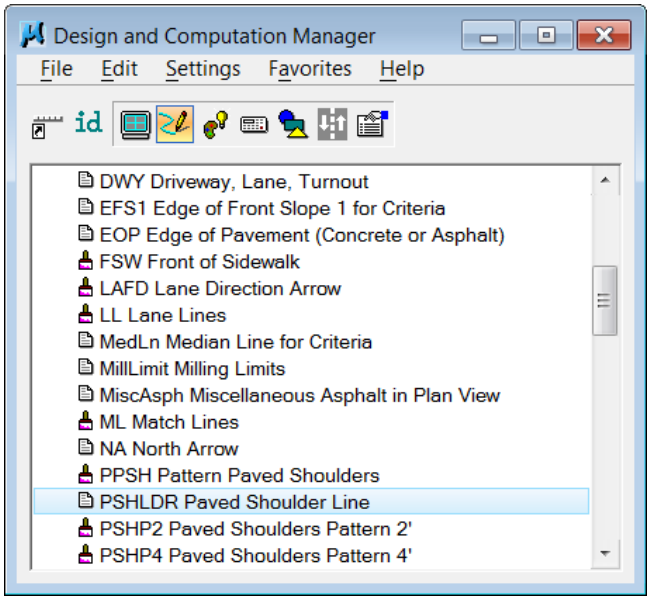

8 . Click the **Draw** button. The guardrails draw on the left side of the road.

9 . Close Draw Transition.

10 .Turn off **Place Influence**.

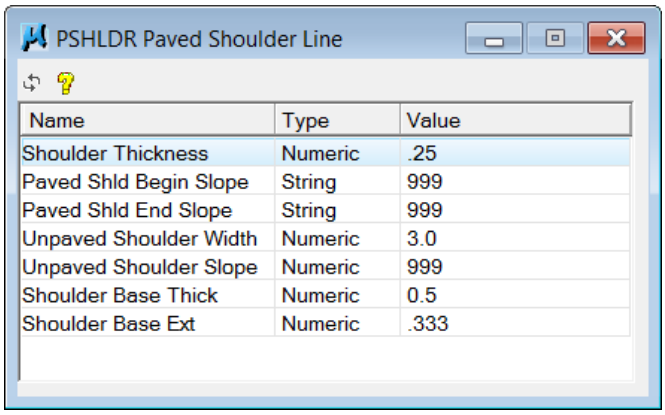
## Exercise 4.6 Drawing Paved Shoulder

1 . In the D&C Manager, navigate to **Roadway Design** > **Plan Features** > **PSHLDR**.




2 . Turn on **Place Influence** and **Adhoc Attributes.**

3 . Modify the *Adhoc values* as shown below.

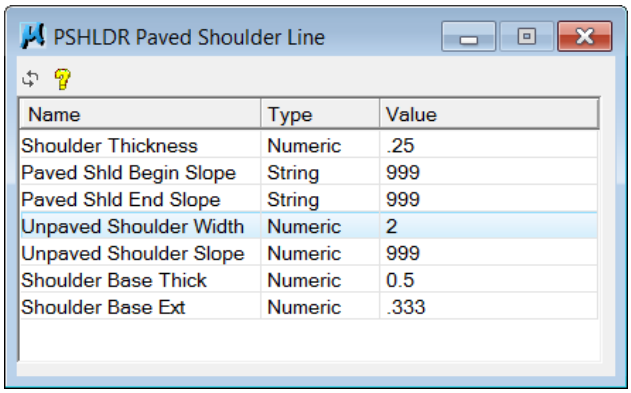



| Name | Type | Value |
|---|---|---|
| Shoulder Thickness | Numeric | .25 |
| Paved Shld Begin Slope | String | 999 |
| Paved Shld End Slope | String | 999 |
| Unpaved Shoulder Width | Numeric | 3.0 |
| Unpaved Shoulder Slope | Numeric | 999 |
| Shoulder Base Thick | Numeric | 0.5 |
| Shoulder Base Ext | Numeric | .333 |

4 . Zoom to **Station 30+00.** Using the MicroStation **Move/Copy Parallel** tool or **Draw Transition**, copy/draw the **outside edge of pavement** 5' to the outside. (Use the **Move/Copy Parallel** tool through the transition section.)

5 . Continue copying the edge of pavement elements for the outside (left and right) to **station 101+00**.

6 . Modify the *Adhoc values* as shown below.



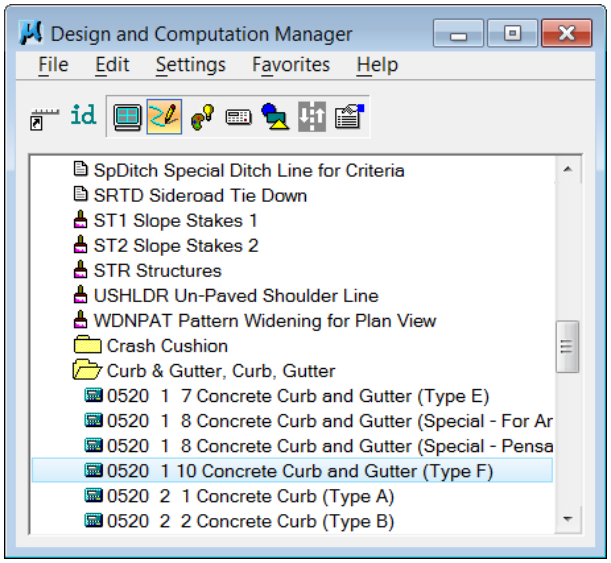

| Name | Type | Value |
|---|---|---|
| Shoulder Thickness | Numeric | .25 |
| Paved Shld Begin Slope | String | 999 |
| Paved Shld End Slope | String | 999 |
| Unpaved Shoulder Width | Numeric | 2 |
| Unpaved Shoulder Slope | Numeric | 999 |
| Shoulder Base Thick | Numeric | 0.5 |
| Shoulder Base Ext | Numeric | .333 |

7 . Using the MicroStation **Move/Copy Parallel** tool, copy the **median edge of pavement lines** 2' to the inside of the pavement for both sides of the roadway median.

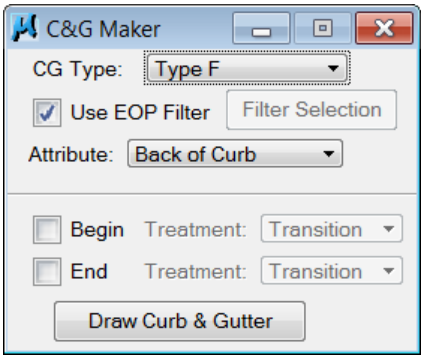
8 . Use the MicroStation **Extend Elements to Intersection** tool to clean up the paved shoulder lines at the end of the transition section.

## Exercise 4.7 Drawing Curb & Gutter

1. In the D&C Manager, navigate to **Roadway Design > Plan Features > Curb & Gutter, Curb, Gutter > 0520 1 10 Concrete Curb and Gutter (Type F)**.



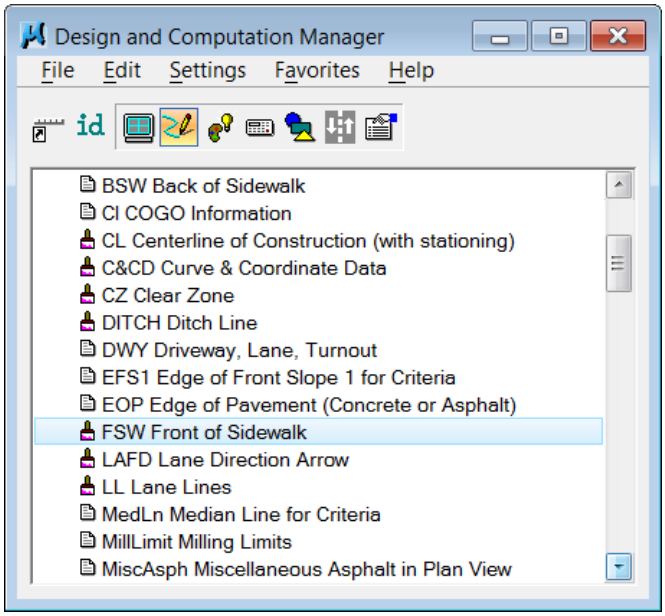

2. With the D&C Manager mode set to *Design Mode*, double click on the (**Type F)** curb item. The Curb and Gutter (C&G) Maker opens.



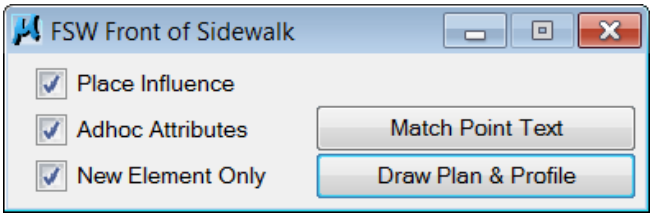

3. Verify the dialog settings above, and then click the **Draw Curb & Gutter** button.
4. Click on one of the **edges of pavement** in the undivided section. Click again to the left or right of the line to designate the side to draw the curb lines.
5. Repeat step 4 to draw in the curb & gutter to the end of project.

## Exercise 4.8 Draw Sidewalk

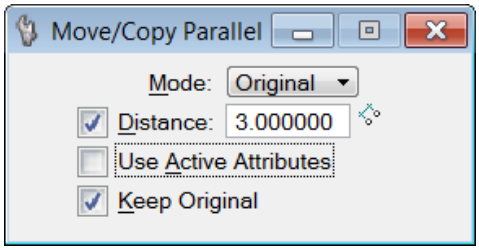
1. In the D&C Manager, navigate to **Roadway Design** > **Plan Features** > **FSW Front of Sidewalk**.




2. Turn on **Place Influence**.




3. Zoom in to **Station 101+00**. Using the MicroStation **Move/Copy Parallel** tool, copy the **back of curb line** 3'out, from **station 101+00** to the end of the project, for both the **left** and **right** side of the roadway.

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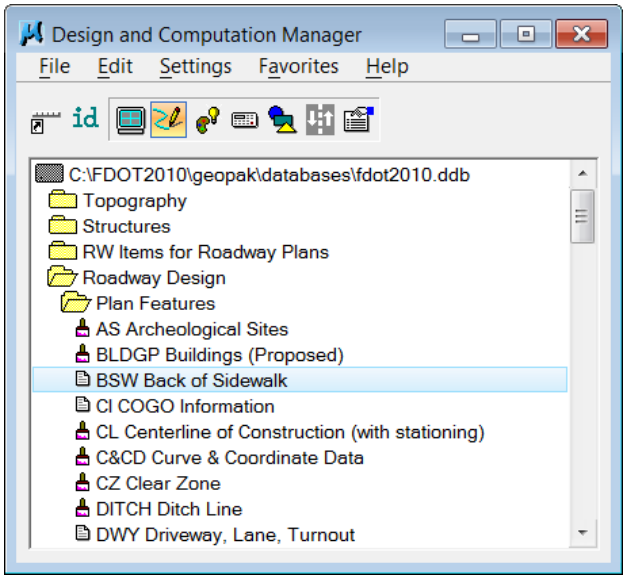
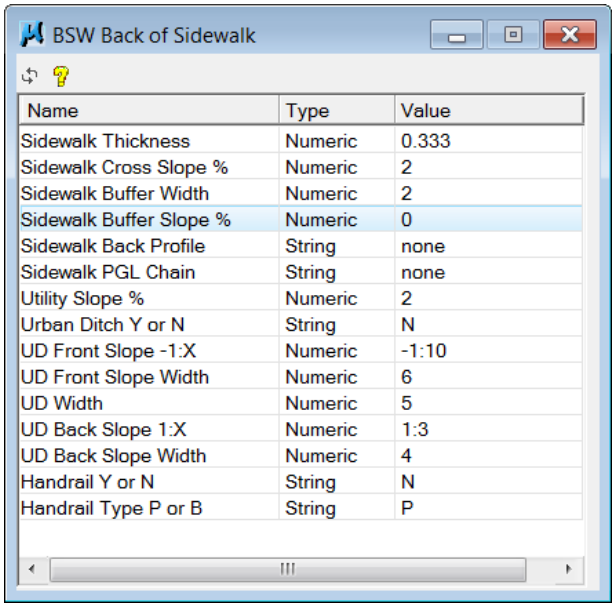
4 . In the D&C Manager, navigate to Roadway Design > Plan Features > BSW Back of Sidewalk.




5 . Review the Adhocs associated with item.

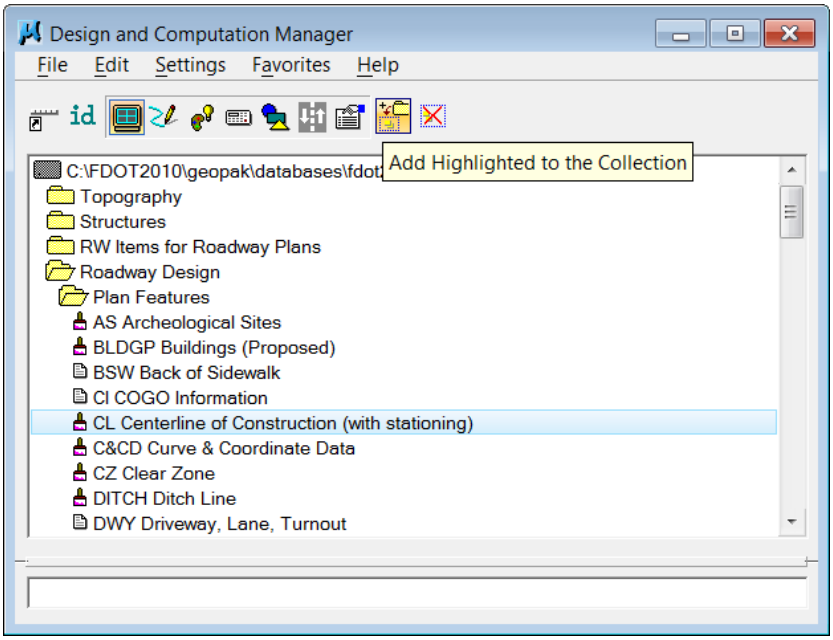
6 . Modify the Adhoc values as shown below.




| Name | Type | Value |
|---|---|---|
| Sidewalk Thickness | Numeric | 0.333 |
| Sidewalk Cross Slope % | Numeric | 2 |
| Sidewalk Buffer Width | Numeric | 2 |
| Sidewalk Buffer Slope % | Numeric | 0 |
| Sidewalk Back Profile | String | none |
| Sidewalk PGL Chain | String | none |
| Utility Slope % | Numeric | 2 |
| Urban Ditch Y or N | String | N |
| UD Front Slope -1:X | Numeric | -1:10 |
| UD Front Slope Width | Numeric | 6 |
| UD Width | Numeric | 5 |
| UD Back Slope 1:X | Numeric | 1:3 |
| UD Back Slope Width | Numeric | 4 |
| Handrail Y or N | String | N |
| Handrail Type P or B | String | P |

7 . Use the MicroStation **Move/Copy Parallel** tool to copy the **front of sidewalk** 5' out from **station 101+00** to the end of the project on left and the right side of the roadway.

# DISPLAY MODE




The designer utilizes the **Display** mode to filter the display and location of MicroStation elements in the design file so only specific features display or highlight. This mode functions as a check to help the designer verify the correct tagging of elements in a design file. This helps to insure that the D&C Manager finds the elements during calculations and running cross sections. This mode also affects what information is printed or computed, if activated when generating plots or quantities.

➢ ***TO ADD THE CURRENTLY SELECTED CATEGORY TO THE COLLECTION BOX***

Click the **Add Highlighted to the Collection** button. The item or category appears in the *Collection* box at the bottom of D&C Manager, as shown in the previous figure.

-- or -- Right click on an item, then click **Add to Selection**.

➢ ***TO REMOVE AN ITEM OR CATEGORY FROM THE COLLECTION BOX***

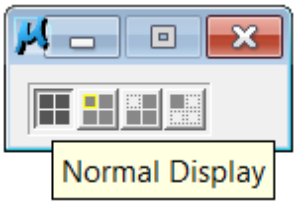
In the **Collection** box, click the item, and then double-click the item. The item will clear from the **Collection** box.

*Tip: Right-click on an item, then click **Clear Collection** will clear all items from the collection box*

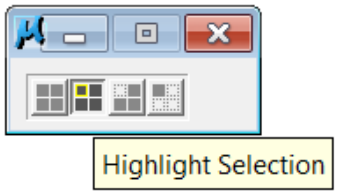
*--or-- Click the **Clear all items in the Collection** button to clear all items.*

There are four options to filter the MicroStation display:

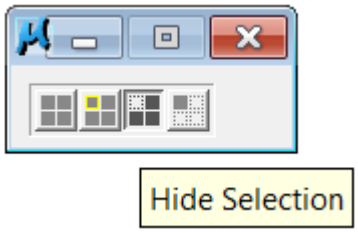
- **Normal Display** Displays all elements in the file. Display mode only recognizes the items that exactly match the symbology settings in the database, including the defined attribute.



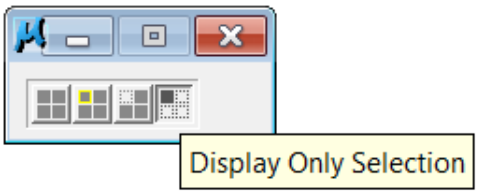

- **Highlight Selection** Changes those elements matching items stored in the collection area to the MicroStation highlight color.




- **Hide Selection** Only turns off the display of collection box items and leaves all else on.




- **Display Only Selection** Turns off everything, except the collection box items.

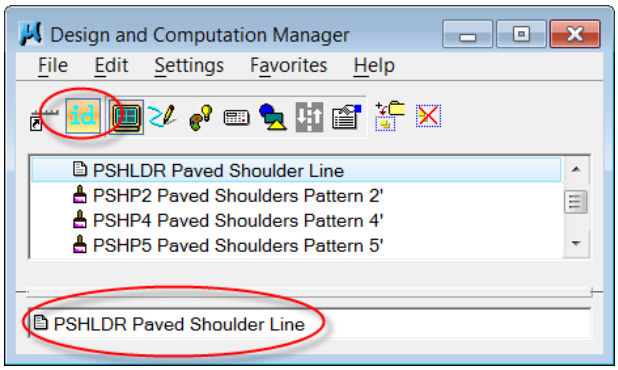


## Exercise 4.9 Checking elements using the Display Mode

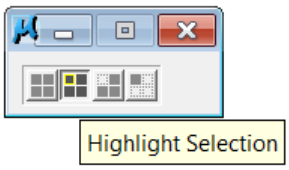
In this exercise, the user checks the elements drawn earlier to make sure they have the correct D&C feature.

➢ ***TO CHECK ELEMENTS USING THE DISPLAY MODE***

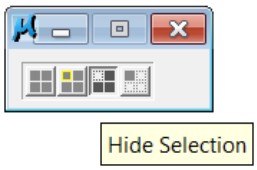
1. In the D&C Manager, navigate to **Roadway Design** > **Plan Features** > **PSHLDR Paved Shoulder Line**.
2. From D&C Manager, click the **Display mode** button. The D&C Manager expands to include the collection bin and the Display toolbox opens.
3. From D&C Manager, click the **Identify Item mode** button.




4. Click on the **PSHLDR Paved Shoulder Line** and then click again to accept the line. D&C Manager sets to the **PSHLDR** item.
5. From the Display toolbox, click the **Highlight Selection** button. All of the paved shoulder lines in the design file highlight.




6. In MicroStation, pan along the alignment to ensure selection of all paved shoulder elements.
7. From the Display toolbox, click the **Hide Selection** button. All of the paved shoulder lines in the design file turn off.

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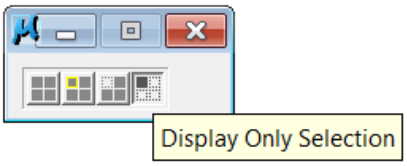
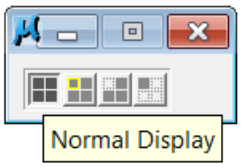
8 . From the *Display* toolbox, click the **Display Only Selection** button. Everything in the design file turns off, except the paved shoulder.




9 . From the Display toolbox, click the **Normal Display** button. Everything in the design file is set back to the way it was prior to using this tool.




10 .From D&C Manager, click the **Identify Item** mode button.

11 .Repeat the previous steps to check the other elements in the design file.

12 .When finished using the Display toolbox, click the **Normal Display** button and close the toolbox.

*Tip: To check all of the items at one time, add the items to the collection bin and then use the display tool. However, if using this method, items can be missed that are drawn very close to each other.*

# 5 EXISTING GROUND PROFILE

## OBJECTIVES

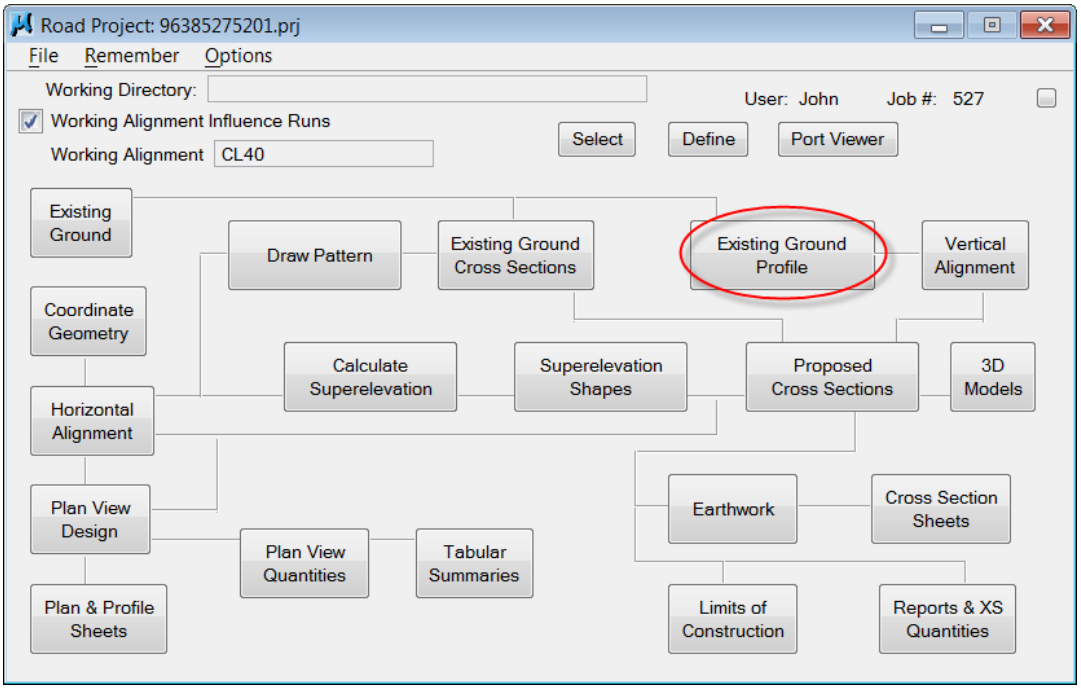
- Creation of existing ground profiles from a **.tin** file
- Displaying the existing ground profile through the D&C Manager
- Creating a profile cell
- Reviewing the profile in Coordinate Geometry
- Populate the working alignment

## ACCESSING GROUND PROFILE DIALOG BOX

The Ground Profile and Draw Profile tools create the existing ground profile.

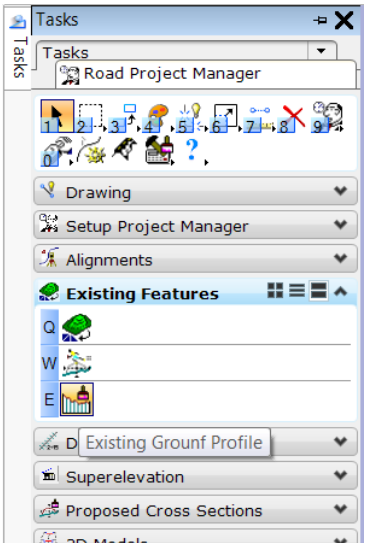
➢ ***TO ACCESS GROUND PROFILE DIALOG BOX***

From Road Project, click the **Existing Ground Profile** button. Ground Profile opens.



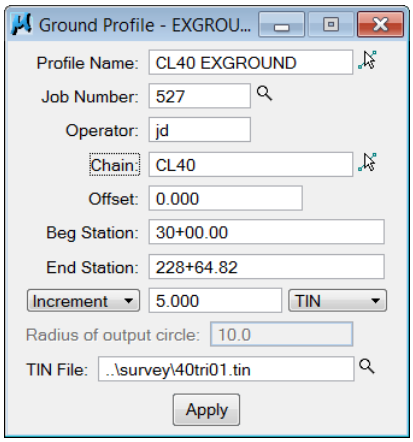
-OR-

From MicroStation Road Project Manager Tasks Menu, click the **Existing Features Menu** > **Existing Ground Profile** button. Ground Profile opens.




GEOPAK generates an existing ground profile based on a stored chain draped across either: a 3D graphic design file or from a **.tin** file. The profile information is stored in the COGO database file and an input file created at the same time.

***Note*** If accessing the tool from Project Manager, user must create a Run (i.e. EXGROUND).




**Profile Name** Name of the existing ground profile to be stored in the *.gpk*.

**Job Number** The *.gpk* file, defaults from the working alignment definition if Project Manager is used.

**Operator** Typically the operator's initials, defaults from the working alignment definition if the Project Manager is used.

**Chain** Chain used to cut the existing ground to define the PGL. Click the **Select** button to pick the chain name.

**Offset** Distance either right (positive value) or left (negative value) of the Chain that to extract a profile.

**Beg Station** Station where the profile is to start. Place the pointer in the **Beg Station** box and press the **Tab** or **Enter** key to populate box automatically. There is no requirement to cut profile for the entire length of the chain.

**End Station** Station where the profile is to end. Place the pointer in the **End Station** box and press the **Tab** or **Enter** key to populate box automatically.

**Extraction methods** Found below the **End Station**. There are four different types of extraction methods:

*Increment* Creates a profile where there is a specified incremental distance between successive VPI points on the existing ground. The first VPI is coincident with the begin station.

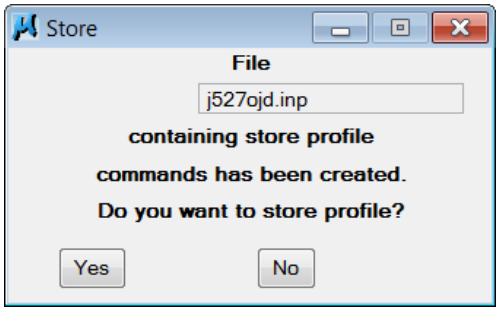
*Intersect* Creates a profile with VPIs at every PGL intersects of a topographic element. The software intersects elements visible in the active design file and reference files. Therefore, the MicroStation display must be set properly before clicking the Apply button. A 3D triangle file from CAiCE uses this method. When using this method, Ground Profile changes. The Radius of output circle controls the size of the circle displayed in the design file at every VPI extraction location.

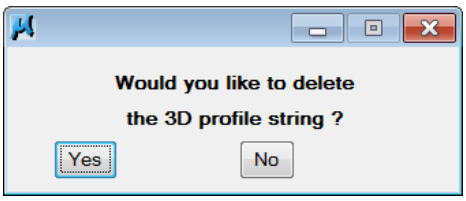
*Even* Specifies the incremental distance between successive VPI points on the existing ground profile. The first VPI point rounds to the next highest even station from the Beginning Station.

*POT* Creates a profile with VPIs at every location where a POT (Point Of Tangency) occurs in the referenced chain.

**TIN** The Triangulation file generated by the survey department. Using Project Manager with a supplied .tin file populates this automatically by the working alignment definition.

**Apply** Initiates the process of storing an existing ground profile. Upon selection, a prompt will appear to confirm the name of the input file, then a window appears displaying the station and elevation at every increment point from the beginning station to the end station. After extracting the elevations, the following prompts will display.



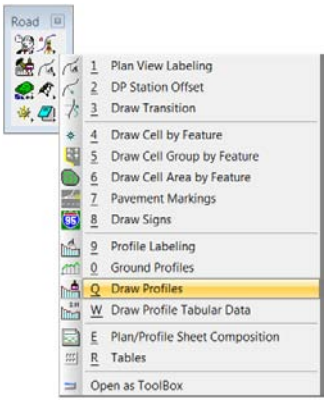
# DRAW PROFILE TOOL

Project Manager does not support the **Draw Profile** tool. The **Draw Profile** tool enables the ability to draw several profiles simultaneously from a variety of data sources.

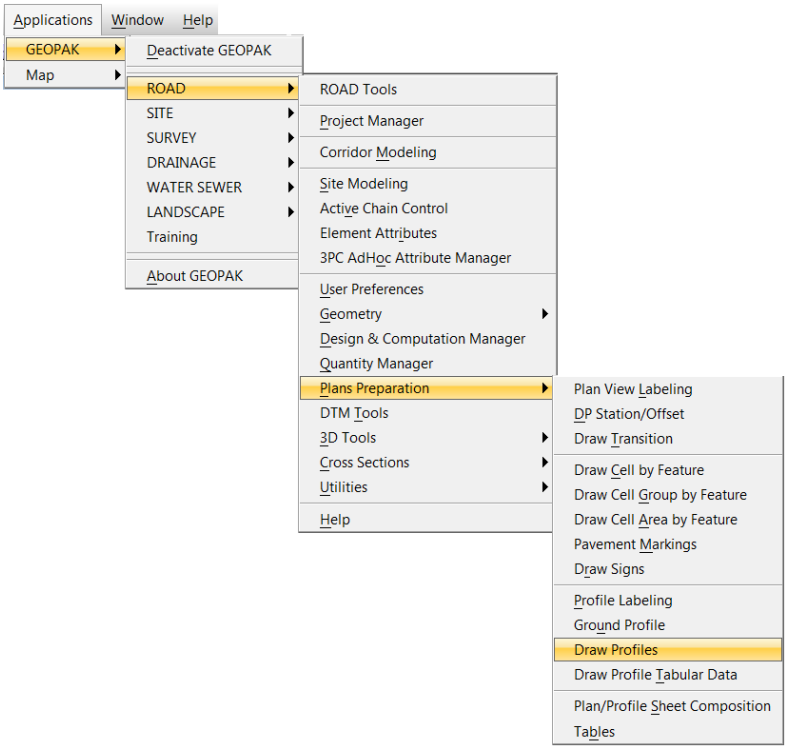
### ➢ *TO ACCESS THE DRAW PROFILE TOOL*

The Draw Profile tool can be accessed two ways.

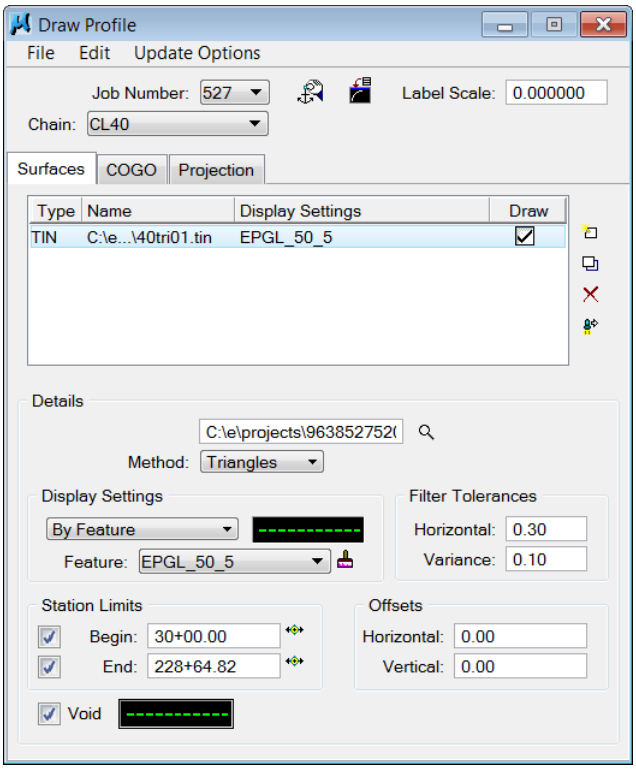
1 . From the *Road* toolbox, click the **Draw Profile** button.




2 . From MicroStation, click **Applications** > **ROAD** > **Plans Preparation** > **Draw Profiles**. Draw Profile opens.



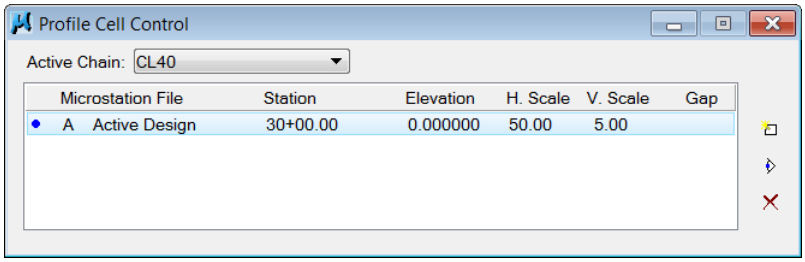

**Important:** A profile cell is required in order to make the majority of the Draw Profiles dialog available. Place the profile cell by any method within GEOPAK prior to drawing profiles.




**Job Number** Identifies the coordinate geometry database, .gpk file, wherein the chain for generating the profiles is stored.

**Chain** Chain stored in COGO to cut the profile.

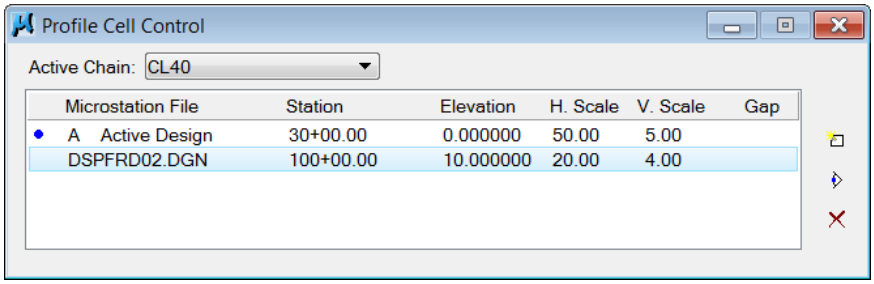
**Profile Cell Control Dialog** Opens Profile Cell Control dialog box to the current profile cells listing along with associated station, elevation, etc.




Profile Cell Control is comprised of two main parts:

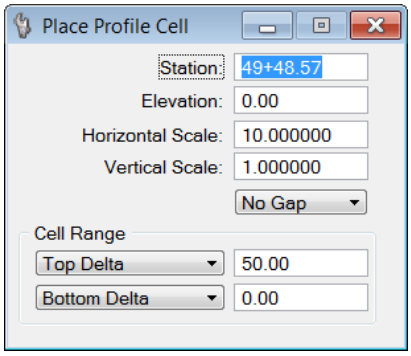
*Active Chain* Chain used when generating the selected profile cell. The example in the preceding figure shows one profile cell in the current design file that is associated to Chain CL40.

*MicroStation File, Station* This list box gives information about all the Profile Cells that are relative to the Active Chain. Notice in the preceding figure that one profile cell is in the Active Design file. The **A** indicates the cell is located in the active file. The Solid circle next to the **A** indicates which profile cell is active profile cell. Figure 5-10 shows a second profile cell drawn in a reference file and referenced to the active file.




Three action buttons are located on the right side of the dialog box.

*Place Profile Cell* – Opens Place Profile Cell which draws a new profile cell into the design file.



*Activate Profile Cell* – Makes the selected profile cell the active cell.

*Delete Profile Cell* – Deletes the selected profile cell from the list box.

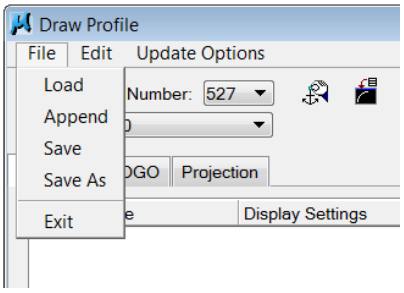
- ***TO CHANGE THE SELECTED PROFILE CELL***

Double-click on the desired profile cell or click on the Activate Profile Cell button. The solid circle moves to the selected cell, **DSPFRD02.dgn** in this example.

**Update Profile** Updates any previously drawn Profile.

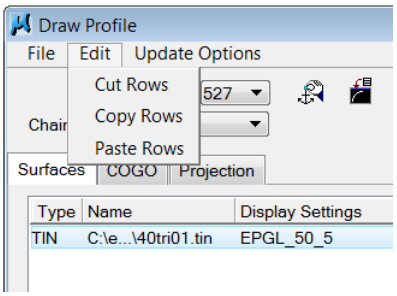
**Label Scale** Utilized when using the **By Feature Display** settings option and the text setting is set to scale, not fixed. Compares the specified **Label Scale** to the scale within the Design & Computation Manager Item and proportioned.

### File Commands




The **File** commands, *Load*, *Append*, *Save*, and *Save As*, are used to save the dialog settings, load the settings into the dialog, append to an existing settings file, or save the settings with another file name. The default file extension is *.xsd*. This file can remember more dialog settings than the resource *(.rsc)* files. All of the information in Draw Profile is lost when deleting the *.rsc* files from the *geopak\bin* folder. However if a file with all of the settings is saved in another location, then that file can be loaded and the information is restored.

### Edit Commands

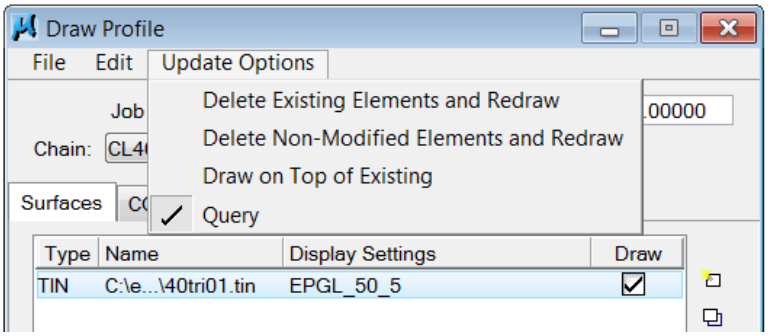



*Cut Rows* Cuts a row from the list box into the buffer. The list box is the area in the middle of Draw Profile.

*Copy Rows* Copies a row from the list box into the buffer. Use this command if several rows have similar information. Rather than manually entering every line into the list box, copy and paste a line, then modified.

*Paste Rows* Pastes a row from the buffer into the list box for subsequent editing.

## Update Options



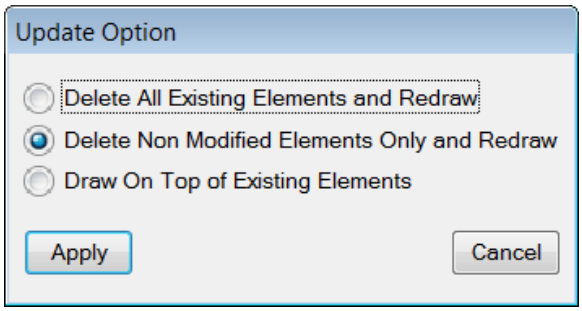

**Update Options** gives GEOPAK direction as to how to handle elements already drawn in the file. Click any Update Option to select the option. The check to the left of the option indicates the option is active. Only one option may be active at any given time. Therefore, selecting an option clears the previous active option.

*Delete Existing Elements and Redraw* Selecting this option deletes any profiles previously drawn with this tool and new ground lines are drawn.

*Delete Non-Modified Elements and Redraw* Selecting this option deletes any profiles previously drawn, but not manually modified and new ground lines are drawn.

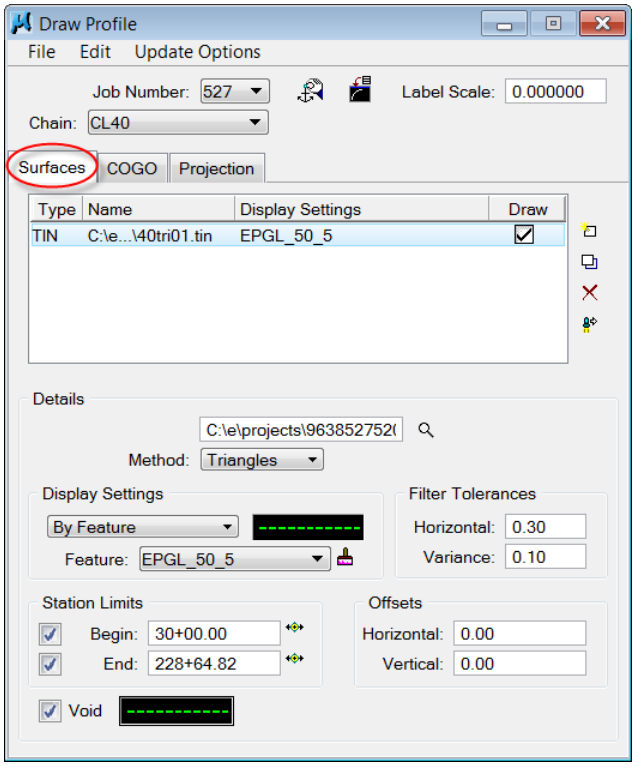
*Draw on Top of Existing* Selecting this option ignores any previously drawn profiles and draws a new set, resulting in two profiles.

*Query* Selecting this option causes a prompt to appear each time a profile is drawn or modified. Update Option opens, as shown below.



## SURFACES TAB

The *Surfaces* tab defines the surface utilized for drawing profiles. It is possible to draw multiple surfaces from a variety of sources in a single processing. Source data includes GEOPAK *.tin* files, Site Models, or Site Objects. There is a requirement to add each surface drawn to the list box using the action / edit buttons on the right side of the tab. Each surface draws a cross section line string or lines. For each line added to the list box, the profile is drawn. The following describes the buttons along the right side of the Surfaces tab.

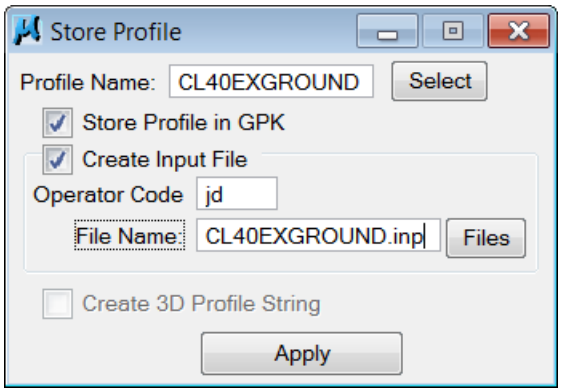


**Add Surface Settings** Places a new Profile Cell

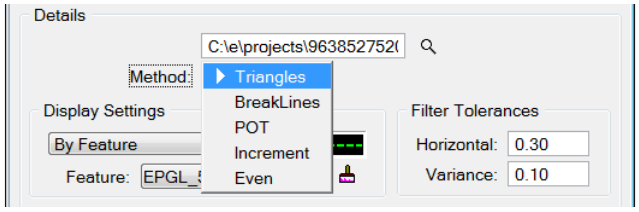
**Modify Line** Modifies selected Profile

**Remove Surface** Deletes selected Profile

**Store Surface in COGO** Stores selected Profile into COGO. Accesses the Store Profile dialog, which stores a profile in the GPK and create the Input file used as a backup and for the required ASCII data for Electronic Delivery.



## Details

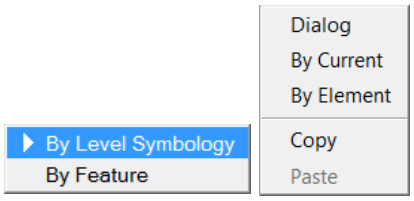



*Tin File* Name of the .tin file used to extract the existing ground elevations.

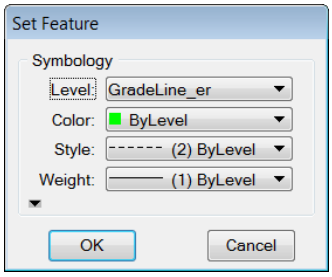
*Method* There are five methods:

- Triangles Extracts elevations by interpolating triangles. This is the recommended method, if selecting a .tin file.
- BreakLines Extracts elevations by interpolating between break lines. This is the recommended method, if utilizing a GEOPAK Site component.
- ***POT*** Creates a profile with VPIs at every location where a POT (Point Of Tangency) occurs in the referenced chain.
- Increment Creates a profile using the incremental distance between successive VPI points on the existing ground profile where the first VPI point is coincident with the Beginning Station.
- Even This method specifies the incremental distance between successive VPI points on the existing ground profile, where the first VPI point rounds to the next highest even station from the Beginning Station. For example, if the Beginning Station is 10+15 and the Even value is 25, the VPIs generates at 10+25, 10+50, etc.

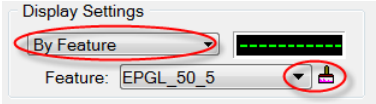
*Display Settings* Specifies the element symbology of the profile elements generated. Specify the symbology by using By Level Symbology or By Feature.

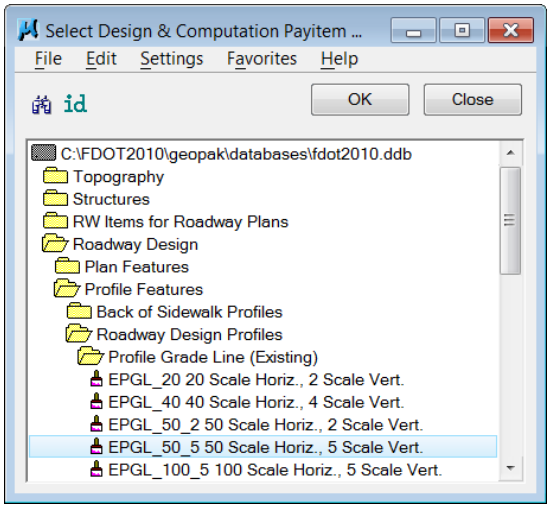


- <u>By Level Symbology</u> Uses GEOPAK Set Feature to set the level symbology and is accessed by double clicking the symbology box. Right clicking on the symbology box brings up different options to set the symbology: Dialog (brings up the dialog box), **By Current** (set the symbology to the active symbology settings), or **By Element** (set the symbology by clicking on an element in the design file). Once the symbology has been set, options to **Copy** and **Paste** the symbology settings in other settings un-ghost.



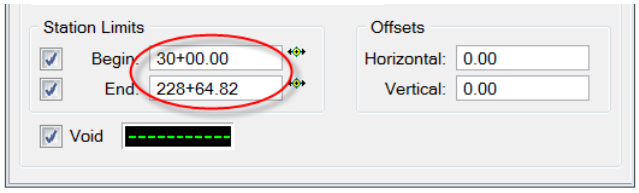

- <u>By Feature</u> Allows for the selection of an item from the current D&C Manager. Click the Paintbrush button to open the current D&C Manager where the appropriate item selected. This is the recommended method to assure compliancy with CADD standards**.**



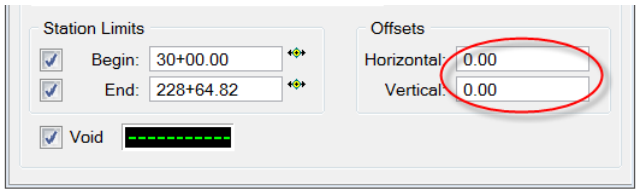




*Filter Tolerances* Consider both Horizontal and Variance Filter Tolerances together for each pair of profile segments. The middle point deletes if both segment lengths are less than the Horizontal Filter Tolerance. The projected distance, between the mid-point and the chord between the two endpoints, is less than the Variance Filter Tolerance. An example of when to use Tolerance would be when multiple triangle sides are on top of each other.

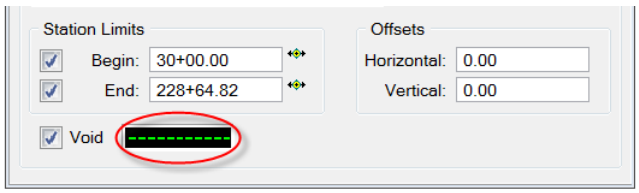
## Station Limits




*Offsets* Specifies Vertical or Horizontal Offsets in terms of master units (i.e., feet or meters). The Horizontal Offset is the distance offset from the chain. Once the horizontal location for the profile is determined, the profile can be determined by utilizing the data source. Any Vertical Offset applies after generating the profile from the source data.

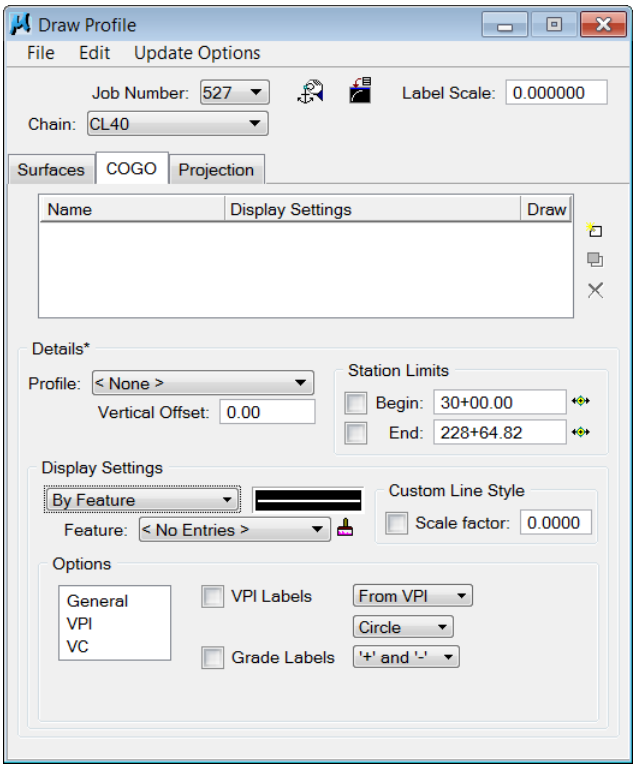



*Void* The Void Plot Parameters specify the element symbology of the existing ground lines generated, which are located within a void in the model. With the Void option toggled on, double-click the element symbology box and Set Feature opens, where the desired parameters can be set.

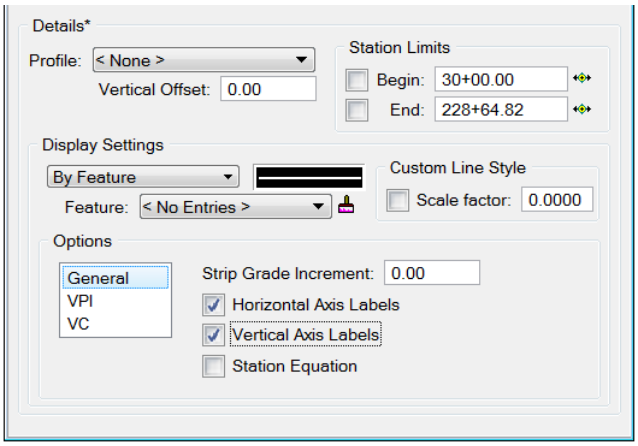


## COGO TAB

Profiles stored in the *.gpk*, such as a profile with other tools (or via an input file), display using the *COGO* tab, as long as the profile is in COGO. This tool works very much like the *Draw Plan & Profile* tool in D&C Manager. In the future, this will be the only method to display profiles.




### Details



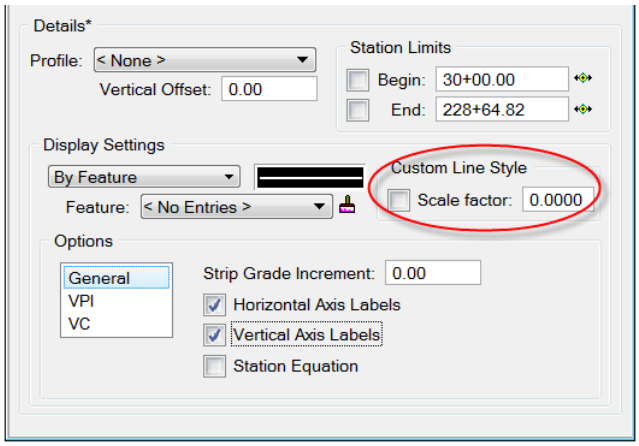

*Profile Name* This is a list of the profiles currently stored in the .gpk.

*Vertical Offset* Defines an offset in which to display the profile.

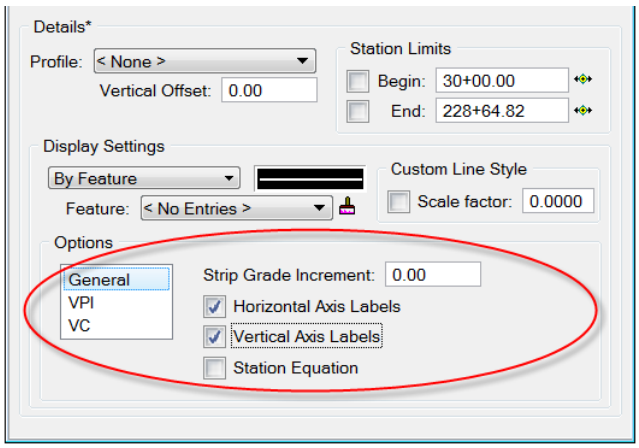
*Station Limits* The Station Limits on the COGO tab are the same as those described for the Surfaces tab.

*Display Settings* The Display Settings on the COGO tab are the same as those described for the Surfaces tab.

- Custom Line Style This option is available when setting Display Settings to **By Feature**. Because some items in D&C Manager use custom line styles, this check box applies the correct scale factor as they are drawn.



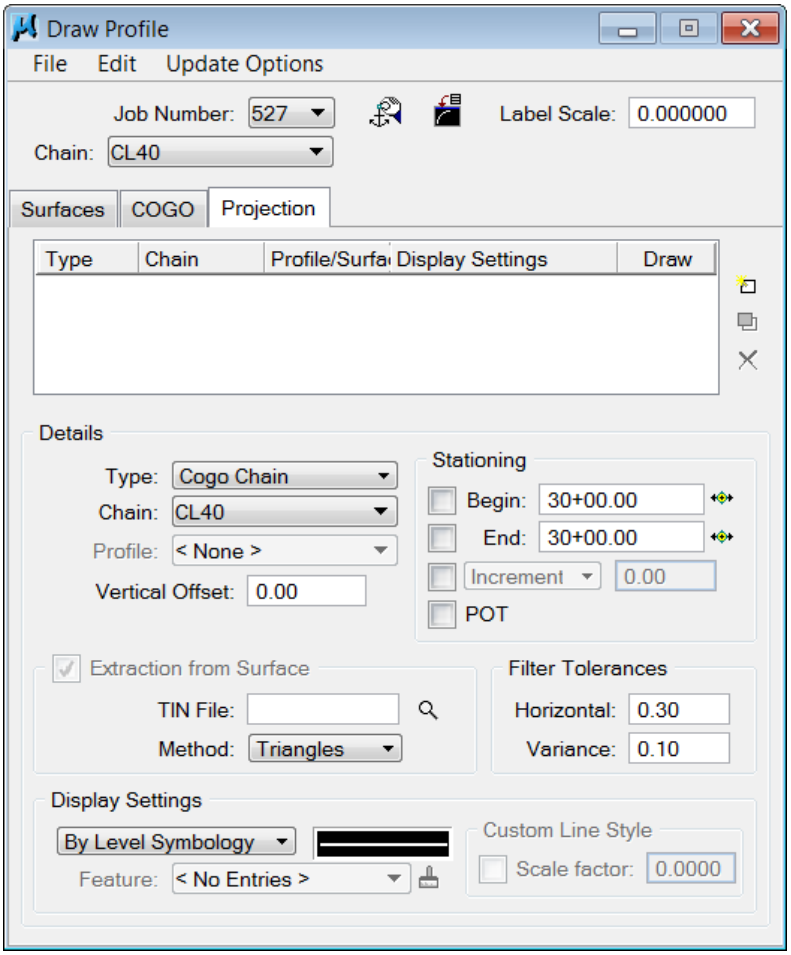

- Options This has many of the same options as those found on Draw Plan and Profile within **D&C Manager**. These options determine the information displayed with the profile. In the preceding figure, selecting **General** allows the **Horizontal** and **Vertical Axis Labels** to place or **Station Equation** when selected.



## PROJECTION TAB

The **Projection** tab can be used when the chain / profile to be drawn is different from the chain / profile used to create the profile cell.

There is a requirement to add each projected profile drawn to the list box by using the action / edit buttons on the right side of the dialog. Upon adding a line to the list box, the profile is drawn. Clicking **Draw** in the list box deletes or redraws the profile.




***Note*** This class will not utilize this tool, because there is only one alignment for the project.

# REVIEWING THE PROFILE

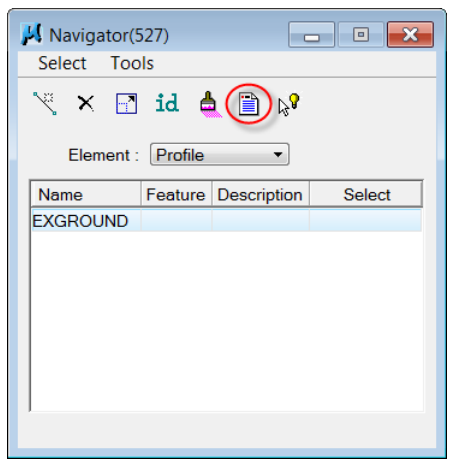
After creating the profile, review the information in one of two ways:

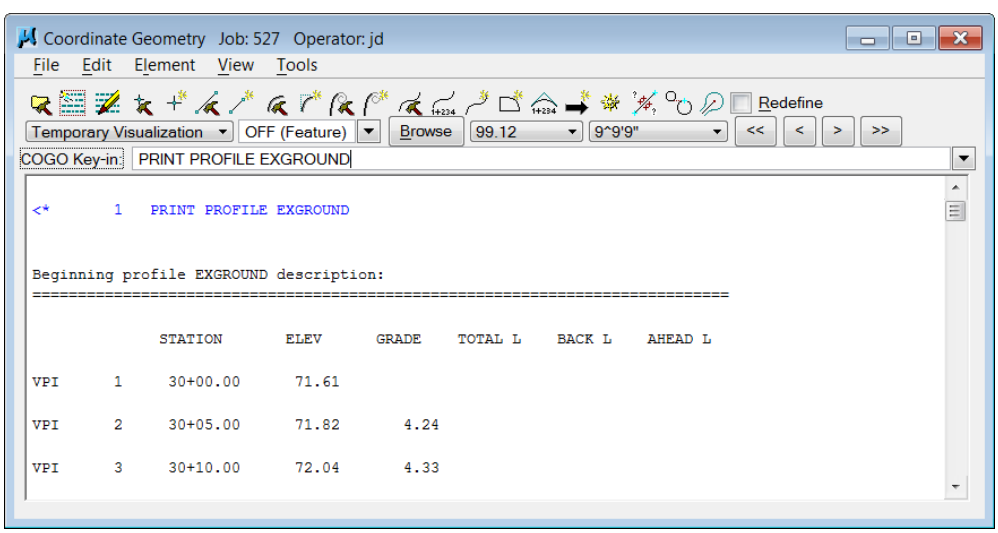
- Display the output in Coordinate Geometry.
- Use D&C Manager or Draw Profile to draw the graphics into a MicroStation file for reviewing.

## PROFILE REPORT

➢ ***TO REVIEW THE TEXT REPORT LISTING STATIONS AND ELEVATIONS OF A GROUND PROFILE***

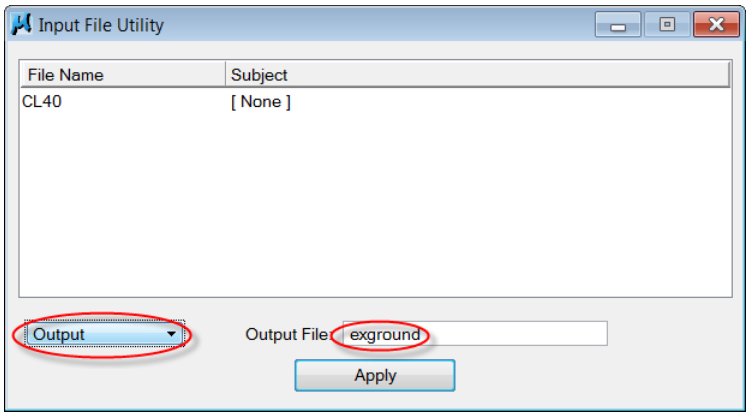
1. Open Coordinate Geometry.
2. Start Navigator.
3. From Navigator, set the **Element** to **Profile** as shown below.
4. Click the **Print/Describe Element** button to generate and display the output in Coordinate Geometry.



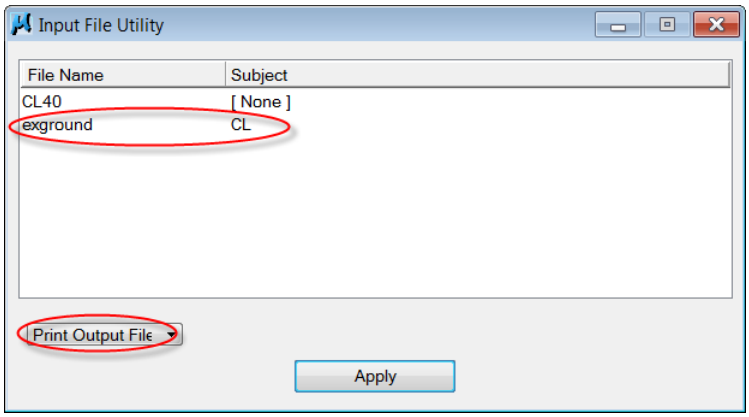



### ➢ *TO CREATE AN OUTPUT FILE*

1. From Coordinate Geometry, click **File** > **Input File Utility**. Input File Utility opens.
2. From Input File Utility, select **Output** from the drop down menu and type a file name in the *Output File* box as shown below.
3. Click the **Apply** button.




4. From Input File Utility, select **Print Output File** option.




5. Select the desired output file name and click the **Apply** button. The output is printed.

| | |
|---|---|
| ***Note*** | Use the default system printer. |

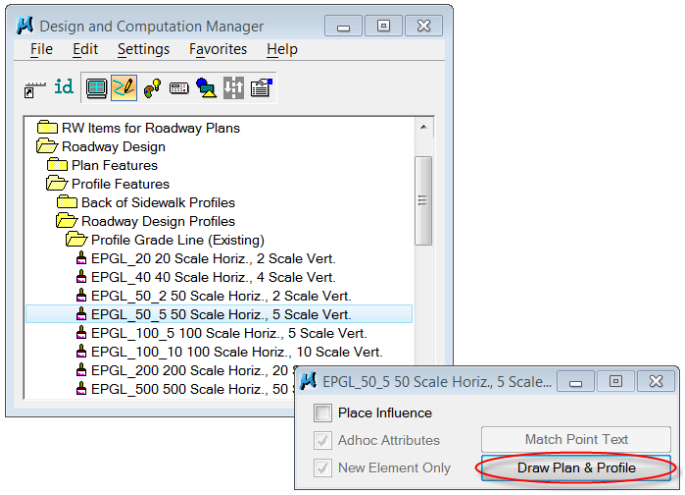
## DRAWING PROFILES WITH D&CMANAGER

Plot Profiles into MicroStation using the same method as plotting an alignment.

➢ ***TO DRAW PROFILES WITH DESIGN & COMPUTATION MANAGER***

1. From D&C Manager navigate to the Item established for Existing Ground Profiles and click the item.
2. Click the D&C Manager **Design** mode button. EPGL_50_5 50 Scale Horiz., 5 Scale Vert. opens.

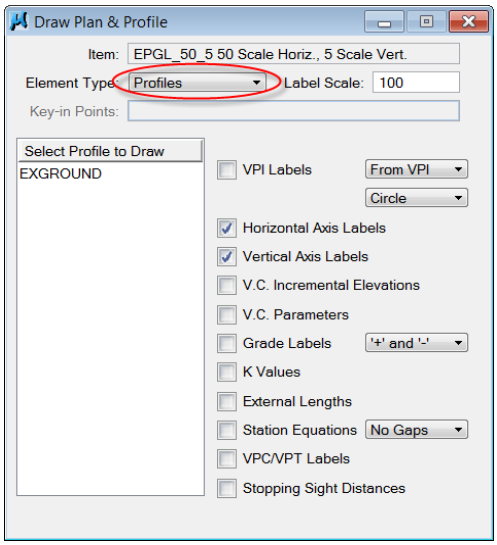
> ***Note*** The profile items in the fdot2010.ddb database are set up based on scale, horizontal and vertical.




3. From **EPGL_50_5 50 Scale Horiz., 5 Scale Vert.**, click the **Draw Plan & Profile** button. Draw Plan & Profile opens.

## DRAW PLAN & PROFILE

By default, when opening Draw Plan & Profile, the operation sets Element Type to *Profiles*. The list box on the left side of the dialog box shows a list of profiles that are stored in the *.gpk*. Along the right side of the dialog box are labeling options for the selected profile.




The selected items are the minimum labels required based on the PPM. These settings change when selecting a proposed profile item. The *Horizontal* and *Vertical Axis Labels* plot, upon the drawing of the existing ground profile, as seen in the preceding figure; however, when the proposed profile is drawn, the axis labels are not redrawn.

**VPI Labels** Draws a VPI label.

**Horizontal Axis Labels** Draws the stations along the bottom of the profile.

**Vertical Axis Labels** Draws the elevation labels along the left edge of the profile.

**V.C. Increment Elevations** Draws labels for elevations along each vertical curve at even station intervals.

**V.C. Parameters** Draws the dimensions and dimension lines on all vertical curves.

**Grade Labels** Draws the profile grade approaching and departing from each vertical curve. Based on the setting picked, draws the plus and/or minus sign in front of the profile grade.

**K Value** and **External Length** Display the information above (in a crest curve) or below the vertical curve length (in a sag vertical curve). No user-defined parameters position these labels and are set to on or off. These two labels only work with **V.C. Parameters** also selected.

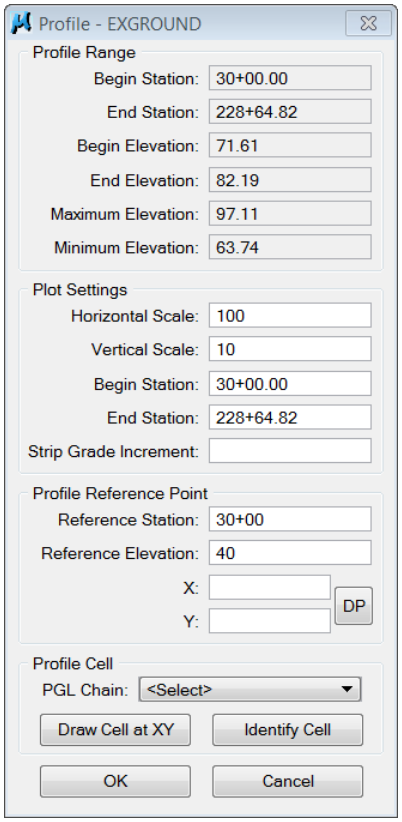
**Station Equation** If selected, the **Station Equation** label displays. Select one of the two options, **Gaps** or **No Gaps**, when labeling the equations. When selecting the **Gaps** option, a gap places at each station equation, so the next even station is placed on a major grid. If selecting the **No Gaps** option, the profile draws contiguous.

**VPC/VPT Label** Includes station and elevations at the V.P.C. and V.P.T. This setting has no control over the V.P.I. label.

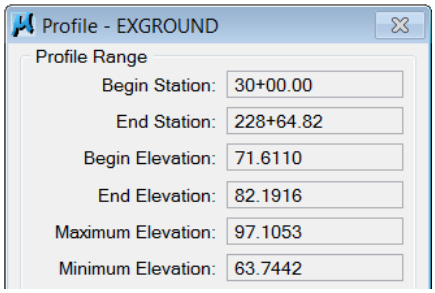
**Stopping Sight Distance** Draws the **Stopping Sight Distance** label for each vertical curve.

**Select Profile to Draw** When the labeling settings are set, click a profile from the list box and Profile opens as shown below.

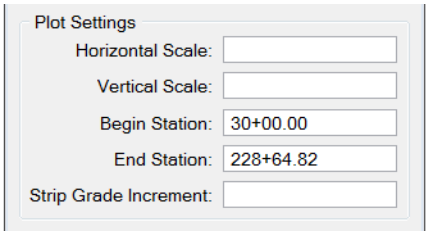
## PROFILE




**Profile Range** Provides useful profile information used to determine how to plot the profile. Minimum Elevation determines where to plot the axis or elevations and to reveal bad or erroneous survey shots. Unrealistic elevations display below.




**Plot Settings** Contains the scale and station information.



*Horizontal Scale* Sets the scale based on the item selected in D&C Manager. There is an option to change Scales manually.

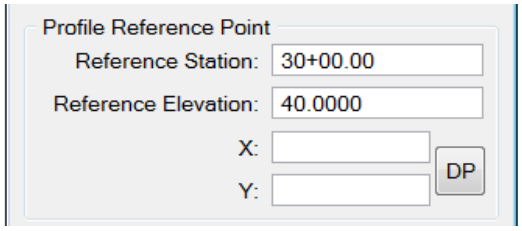
*Vertical Scale* Sets the scale based on the item selected in D&C Manager. There is an option to change Scales manually.

*Beginning Station* Controls the limits of the profile to plot. Place the cursor in the box and press the Enter key to fill in the appropriate station --or-- type the station. Remember to enter the region if station equations are on the selected chain.

*Ending Station* Controls the limits of the profile to plot. Place the cursor in the box and press the Enter key to fill in the appropriate station --or-- type the station. Remember to enter the region if station equations are on the selected chain. The syntax specifying regions as 37+00.00 r 2 tells the software that Station 37+00.00 is in Region 2 of the specified chain. The syntax specifying 30+00.00 tells the software that there is not a station equation; 30+00.00 r 1 means the same thing. If unsure where the station equations are on the alignment, go into COGO and describe the chain as discussed in chapter 3 of this training course.

*Strip Grade Increment* An elevation label at even stations as specified by the user. Florida projects do not typically use this option. Leave the box blank for no labels.

**Profile Reference Point** Contains information unique to the profile cell or a common reference point used by other profiles, like proposed, drainage or utilities.




*Reference Station* The Station assigned to the profile cell origin.

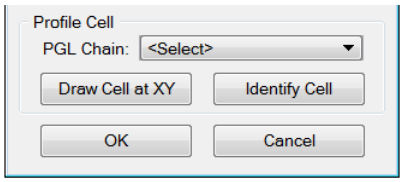
*Reference Elevation* The Elevation assigned to the profile cell origin, a whole number value to reflect the major grid. Use a lower elevation than the minimum elevation shown in Profile Range at the top of Profile to ensure that the profile does not dip into the horizontal axis labels at the bottom of the profile.

***Note*** Do not allow elements to fall below this elevation. The Profile Labeler tool has problems with the elevation labels if elements fall below the DP Elevation.

Example: If the minimum elevation is 27.39, set the DP Elevation to 25.00. This value is well below the lowest elevation, but not low enough to cause the proposed profile to encroach into the plan area. When placing the profile cell, these values are considered, as well as special ditch and utility profiles, when setting the elevation for the profile cell.

**X** and **Y** Sets the location in the MicroStation file where the profile cell origin is drawn and, consequently, where the profile is drawn. Type these values -- *or*-- click the *DP* button to populate the boxes. Locate the *X* and *Y***,** somewhere near the coordinates of the Proposed design, to make clipping Plan & Profile sheets easier, because both display in the same window.

**Profile Cell** Draws the cell defined earlier and then draws the profile –or—used to identify an existing profile cell. With the location defined and the profile cell drawn, user MUST NOT move the profile cell.




*PGL Chain* The chain used to cut the profile. The Select button selects the chain via a dialog.

*Draw Cell At XY* Draws the profile cell at the defined coordinates.

*Identify Cell* Selects a previously drawn profile cell and populates the top portions of the dialog box.

*OK* Draws the profile at the location of the cell.

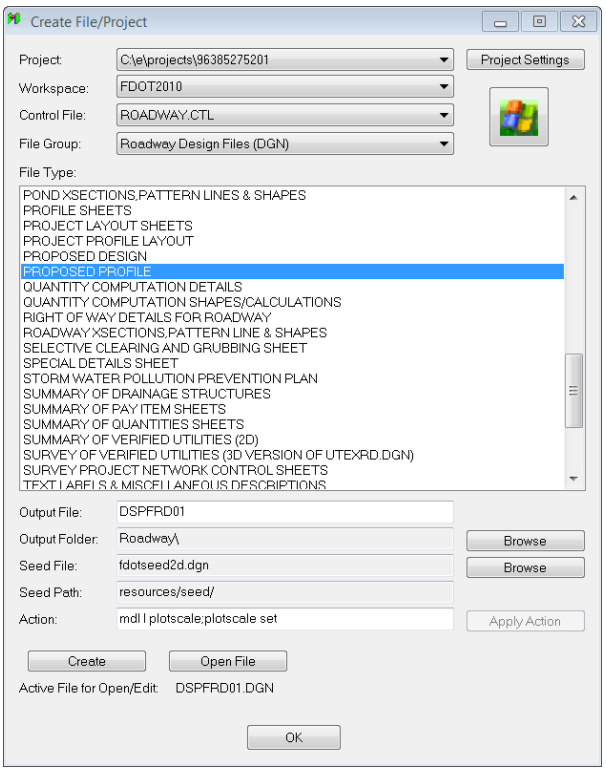
*Cancel* Closes the Profile tool without drawing the profile.

## Exercise 5.1 Creating Existing Ground Profile

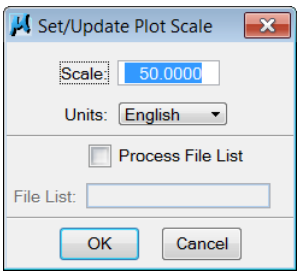
In this exercise, the user creates an existing ground profile using the Draw Profile tool.

➢ ***TO CREATE AN EXISTING GROUND PROFILE***

1. Run the executable file **C:\Chapter5_Ex5_1.exe** to extract the project files for this exercise.
2. Open the file **C:\e\projects\96385275201\roadway\DSGNRD01.dgn** using the FDOT2010 MicroStation icon.
3. Open Create File/Project from the FDOT Menu option **Roadway** > **Create/Edit File**.
4. Select **File Type: Proposed Profile** and click the **Create** button to create the file *DSPFRD01.dgn*.



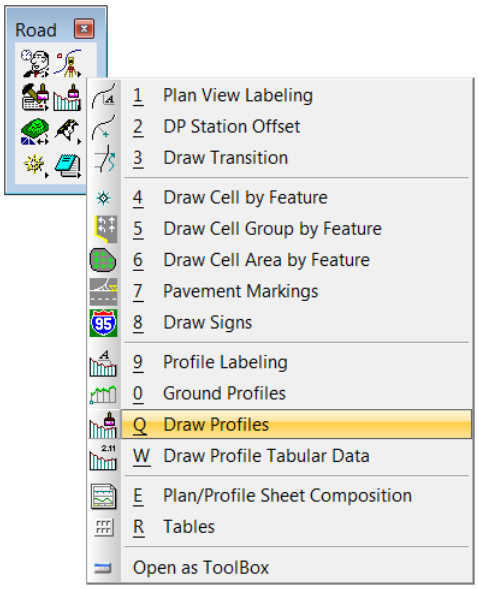

5. Click the **Open DGN** button.
6. Click OK to set the plot scale of the file.



7 . Click **OK** to close Create File/Project.

8 . Reference the design file **DSGNRD01.dgn** and **Fit View**.

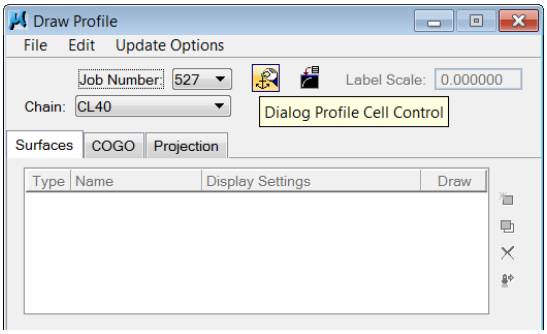
9 . From the Road toolbox, select the **Draw Profiles** tool. Draw Profile opens.




10 .Select **527** in the *Job Number* box, and set the *Chain* to **CL40**.

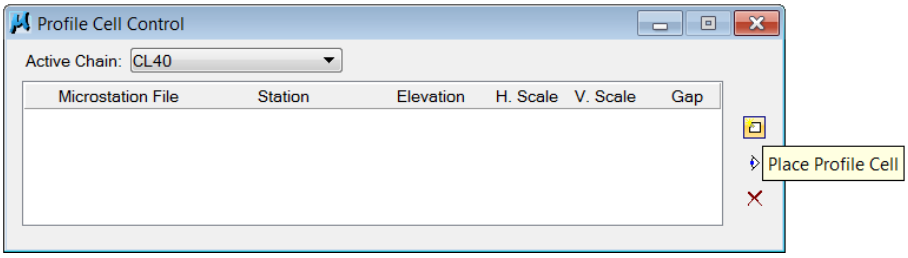
***Note*** Job 527 is the .gpk database.

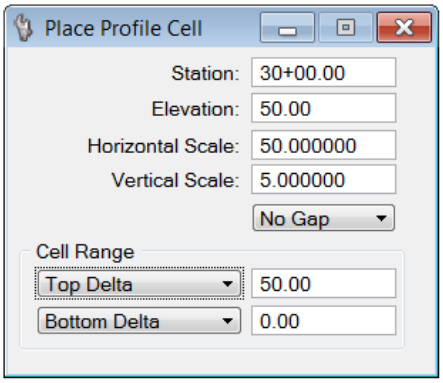
11 .Click the **Dialog Profile Cell Control** button. Profile Cell Control opens.




12 .On Profile Cell Control, in *Active Chain*, select **CL40**.

13 .Click the **Place Profile Cell** button on the right side of the dialog box. Place Profile Cell opens.






14 .In Place Profile Cell, complete the information shown in the preceding figure.

15 .Click near the Plan View reference file to place the profile cell in the design file. Place Profile Cell closes.

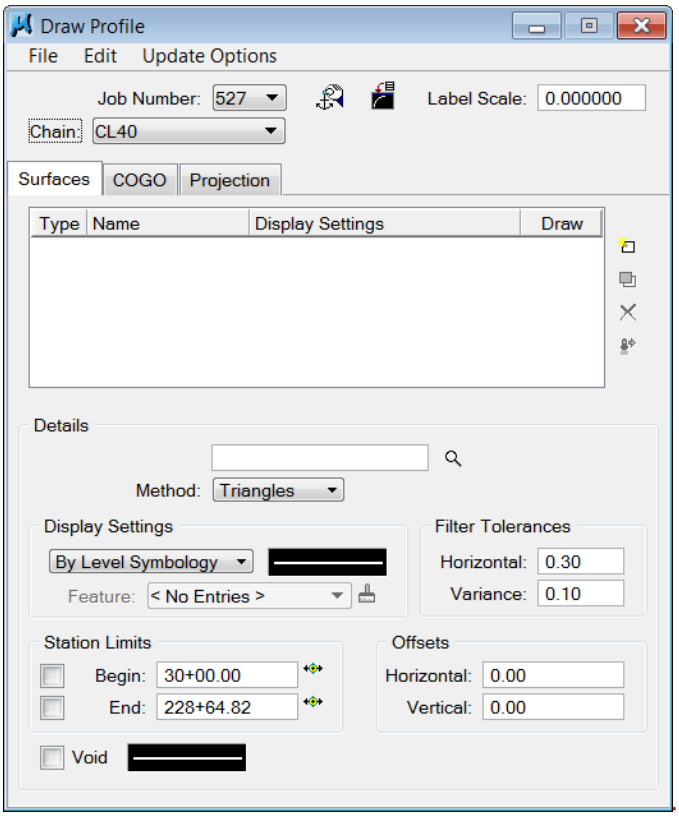
> ***Note*** Placing the profile cell near the plan view makes clipping the plan and profile sheets easier in a later chapter.

16 .Close Profile Cell Control.

17 .From MicroStation, click the **Fit View** button.

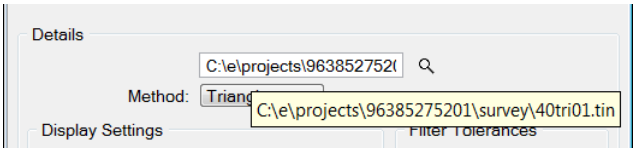
18 .From Draw Profile, select the **Surfaces** tab.

*Tip: If the dialog options are not available (grayed out), click the COGO tab and then click the Surfaces tab again. The dialog options will un-ghost.*



19 .Under **Details**, Browse to the TIN File at:

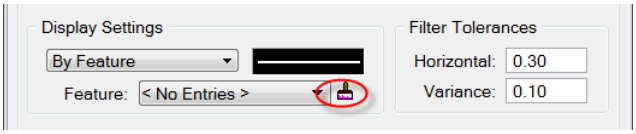
**C:\e\projects\96385275201\survey\40tri01.tin**.



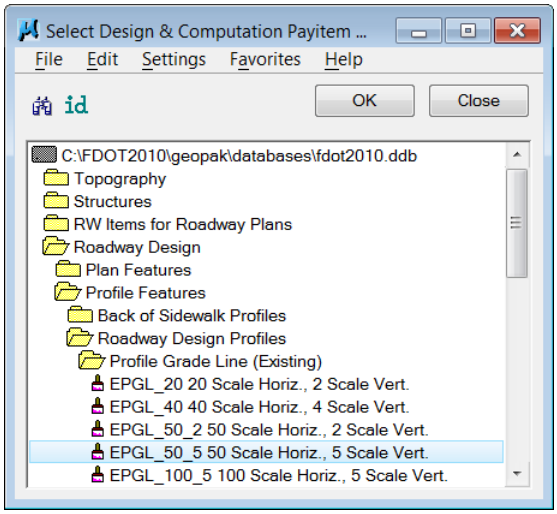

20 .Select **Triangles** as the *Method* for extraction.

21 .Set the *Display Settings* to **By Feature**.

22 .Click the *paintbrush* icon to the right of Feature. Select Design & Computation Pay item opens.



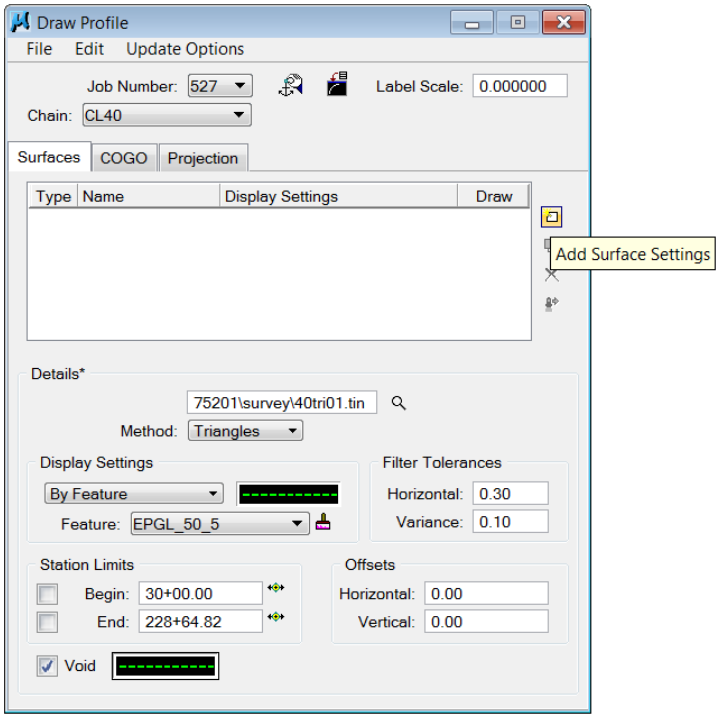

23 .In Select Design & Computation Pay item, navigate to: **Roadway Design** > **Profile Features** > **Roadway Design Profiles** > **Profile Grade Line (Existing)** > **EPGL_50b 50 Scale Horiz., 5 Scale Vert**.



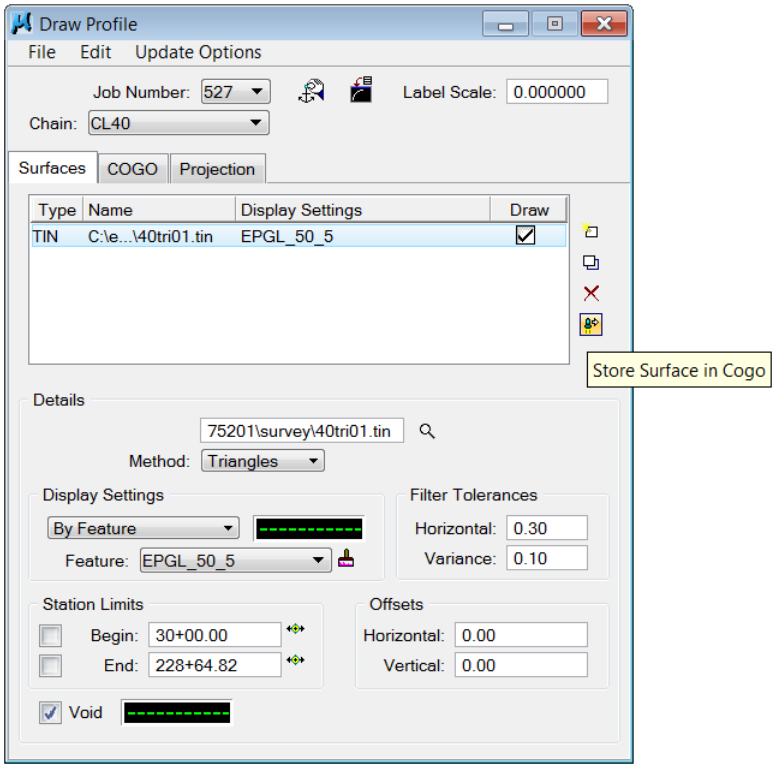

24 .With **EPGL_50b 50 Scale Horiz., 5 Scale Vert** highlighted in Select Design & Computation Pay item**,** click the **OK** button. *Feature* is set to the selected item's symbology and Select Design & Computation Pay item closes.

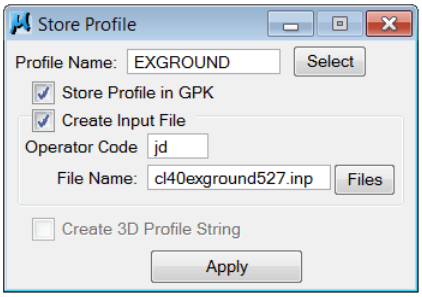
25 .Toggle on the **Void** check box. Right-click on the symbology box under *Display Settings* and click **Copy**. Right-click on the symbology box next to *Void* and click **Paste** to set the void symbology.

26 .On Draw Profile, click the **Add Surface Settings** button to add the profile to the list and to the design file.




27 .Click the **Store Surface in COGO** button. Store Profile opens.





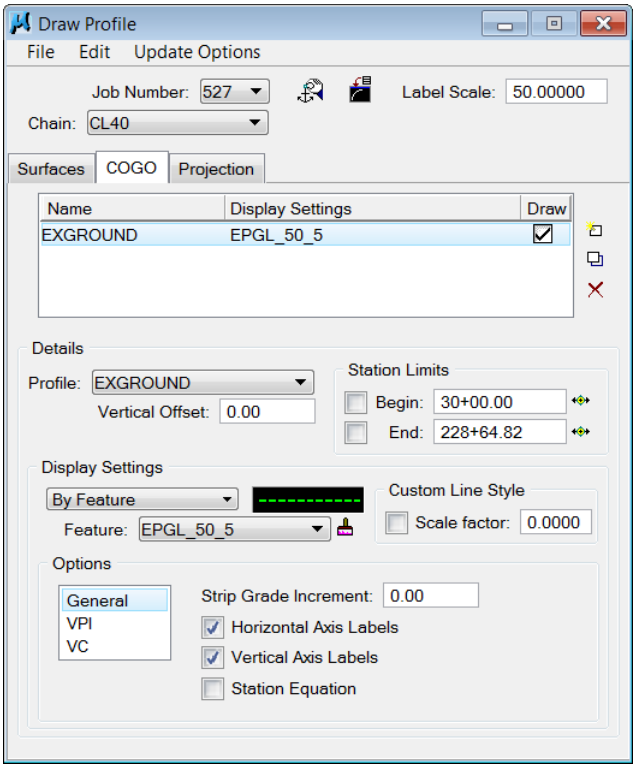

28 .From Store Profile, enter the information shown in the preceding figure.

29 .Click the **Apply** button. The profile is stored in the GPK file.

30 .Close Store Profile.

31 .Uncheck the **Draw** checkbox for *EXGROUND* in the list box.

32 .From Draw Profile, click the **COGO** tab.




33 .Under *Profile*, select **EXGROUND**. Enter the information shown in the preceding figure.

34 .Click the **Add COGO Profile Settings** button on the right side of the list box to draw the profile into the MicroStation design file.

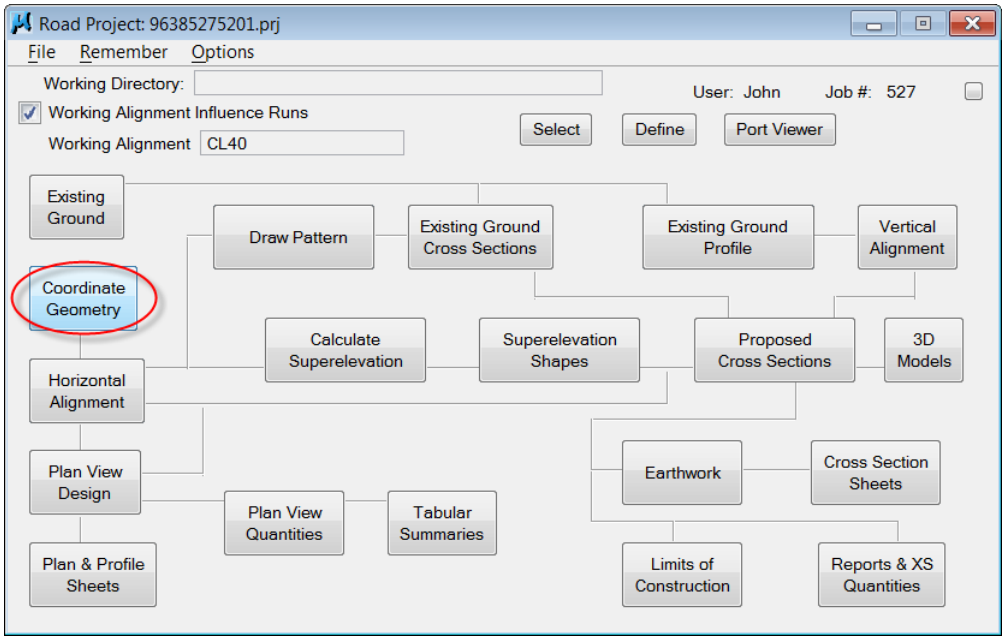
35 .Close Draw Profile.

## Exercise 5.2 Display Existing Ground Profile In COGO

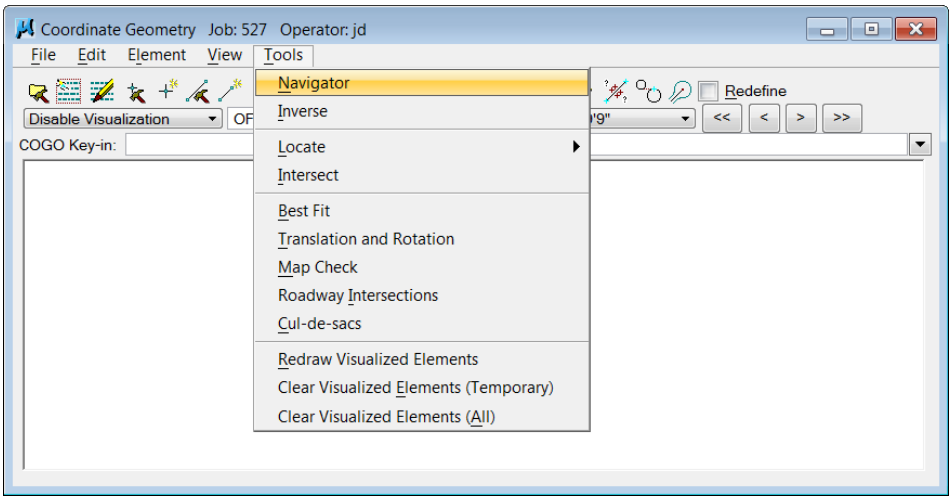
In this exercise, the user displays the profile and reviews the information using COGO.

➢ ***TO DISPLAY THE PROFILE IN COGO***

1. Run the executable file **C:\Chapter5_Ex5_2.exe** to extract the project files for this exercise.
2. Open the file **C:\e\Projects\96385275201\roadway\DSPFRD01.dgn** using the FDOT2010 MicroStation icon.
3. From Road Project, click the **Coordinate Geometry** button. Coordinate Geometry opens.

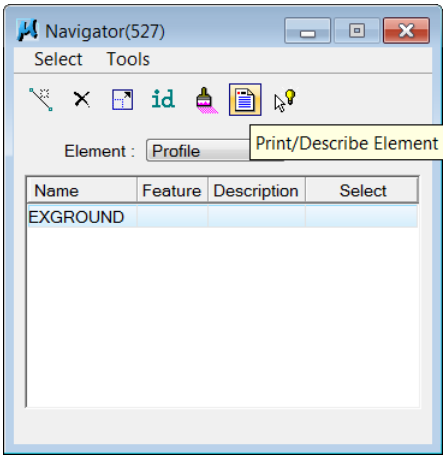


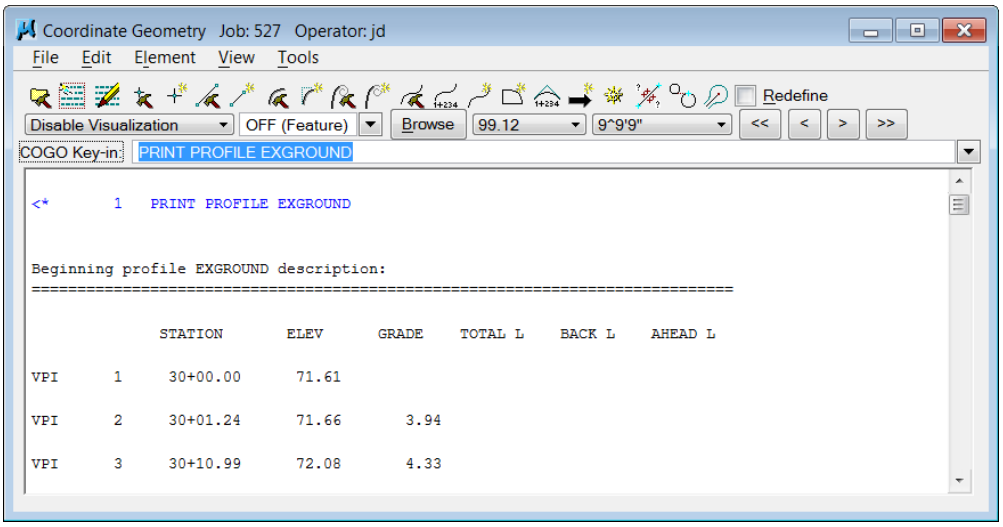

4. In Coordinate Geometry, select the menu option **Tools** > **Navigator**. Navigator opens.



5 . From Navigator, select **Profile** in the *Element* list.

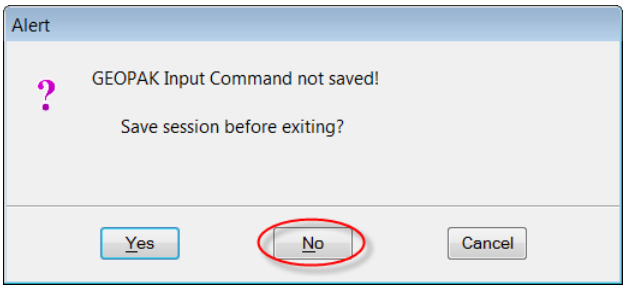
6 . In the *Name* list, select EXGROUND, and then click the **Print/Describe Element** button. The stations and elevations of each VPI used to store this profile appear in the Coordinate Geometry display window.




7 . Close Coordinate Geometry.

8 . Alert opens. Click the **No** button.



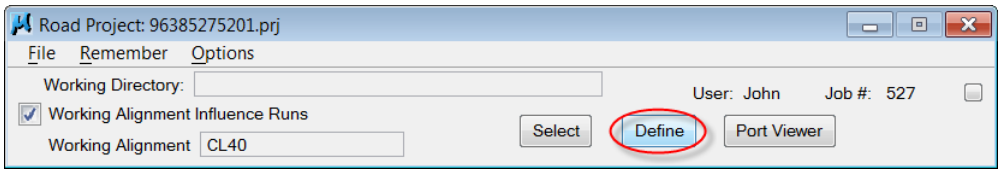

***Note*** The Yes button prompts the user to enter a file name to create an input file of the commands used in COGO.

## Exercise 5.3 Updating the Working Alignment

In this exercise, the user updates the Working Alignment in Project Manager.

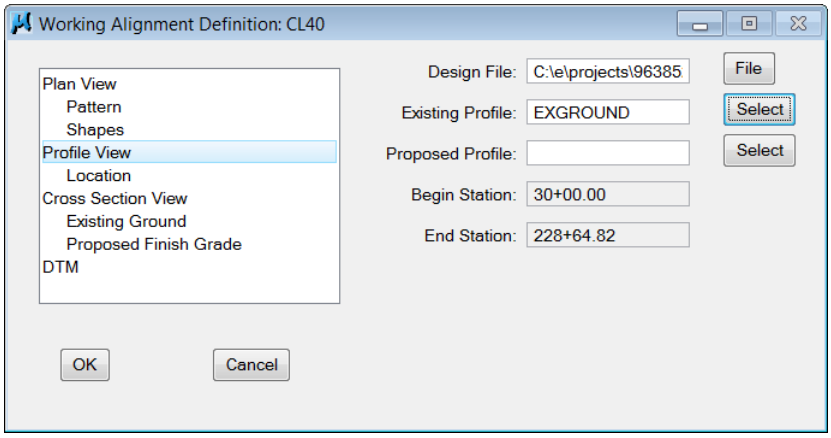
➢ ***TO UPDATE THE WORKING ALIGNMENT***

1. Open Project Manager.
2. From Road Project, click the **Define** button. Working Alignment Definition opens.



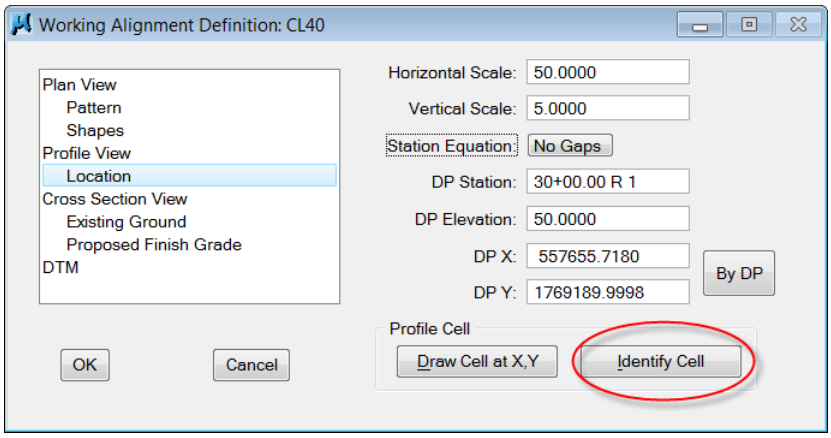

3. From Working Alignment Definition, click **Profile View** from the category list and type the information shown below.

***Note*** Design File is C:\e\Projects\96385275201\roadway\ DSPFRD01.dgn.




*Tip: Click the Select button to help fill in the Existing Profile box.*

4. From the *Category* list, select **Profile View > Location**.

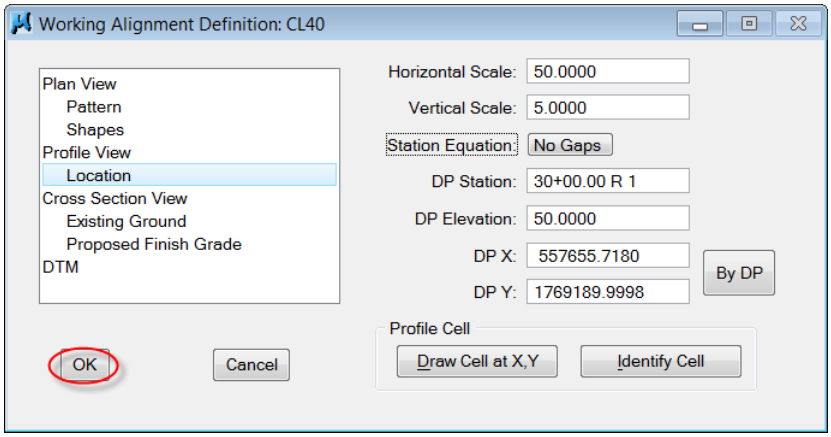


5 . Click the **Identify Cell** button.

6 . Click the **Profile Cell** drawn in *DSPFRD01.dgn*. All of the information required appears in Working Alignment Definition.

*Tip: To make selecting the Profile Cell easier, zoom in close to the Profile Cell origin.*

7 . Click the **OK** button. The Working Alignment Definition updates.



# 6 PLAN VIEW LABELER

## OBJECTIVES

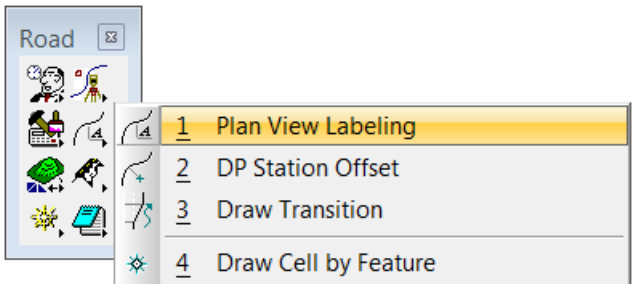
- Review all the tabs located inside the Plan View Labeler.
- Place a label with a FDOT style file.
- Create a new style file and label.

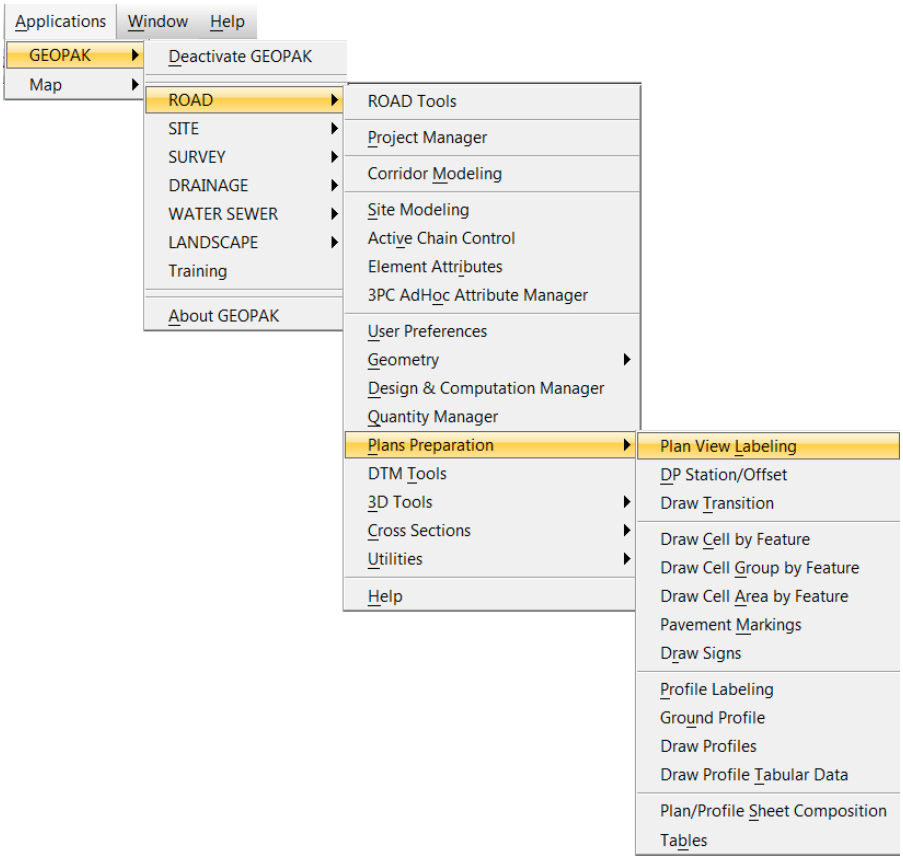
## ACCESSING THE PLAN VIEW LABELER

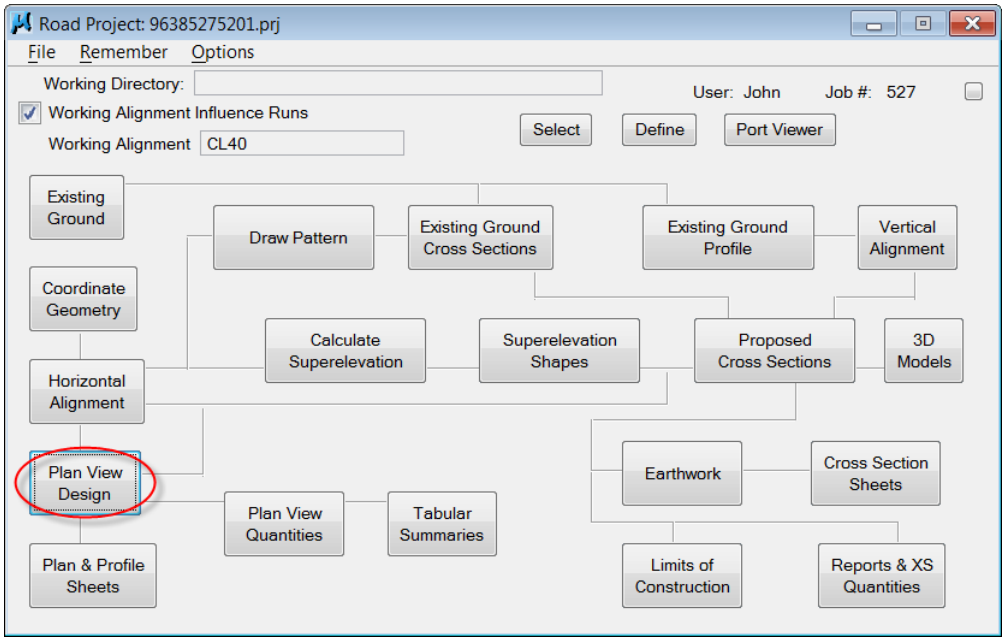
➢ ***TO ACCESS THE PLAN VIEW LABELER***

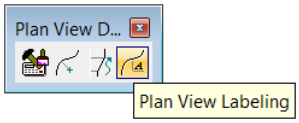
Access the Plan View Labeler by:

- From the Road toolbox, click the **Plan View Labeling** button --or--
- From MicroStation Menu option, click **Applications** > **ROAD** > **Plans Preparation** > **Plan View Labeling** --or--
- From Road **P**roject**,** click the Pl**an View Design button.** The Plan View Design toolbox opens. Click on the Pla**n View Labeling** tool**.**




Applications
Window
Help
GEOPAK
Map
Deactivate GEOPAK
ROAD
SITE
SURVEY
DRAINAGE
WATER SEWER
LANDSCAPE
Training
About GEOPAK
ROAD Tools
Project Manager
Corridor Modeling
Site Modeling
Active Chain Control
Element Attributes
3PC AdHoc Attribute Manager
User Preferences
Geometry
Design & Computation Manager
Quantity Manager
Plans Preparation
DTM Tools
3D Tools
Cross Sections
Utilities
Help
Plan View Labeling
DP Station/Offset
Draw Transition
Draw Cell by Feature
Draw Cell Group by Feature
Draw Cell Area by Feature
Pavement Markings
Draw Signs
Profile Labeling
Ground Profile
Draw Profiles
Draw Profile Tabular Data
Plan/Profile Sheet Composition
Tables

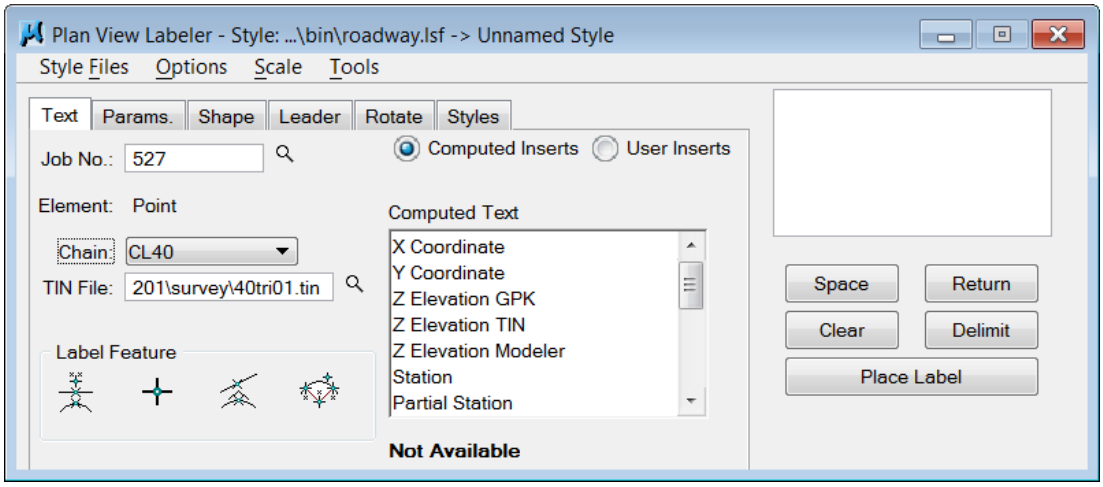

Road Project: 96385275201.prj
File
Remember
Options
Working Directory:
User: John
Job #: 527
Working Alignment Influence Runs
Working Alignment
CL40
Select
Define
Port Viewer
Existing Ground
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Coordinate Geometry
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Horizontal Alignment
Plan View Design
Earthwork
Cross Section Sheets
Plan View Quantities
Tabular Summaries
Plan & Profile Sheets
Limits of Construction
Reports & XS Quantities


Plan View D...
Plan View Labeling

# GEOPAK - PLAN VIEW LABELER OVERVIEW

The Plan View Labeler automates the composition and placement of plan labels onto drawings. Plan View Labeler allows placing "smart labels" on the drawing. These labels have the ability to calculate XYZ coordinates, station, offset, direction, length, radius, degree of curvature, etc. of the associated element.

Plan View Labeler, when customized, places many types of standard or non-standard labels in the design file. Plan View Labeler is a very powerful and easy-to-use tool, if custom styles are set up properly, which helps to maintain standards and consistency. It also allows for user defined frequently used text strings to appear and incorporate into labels.

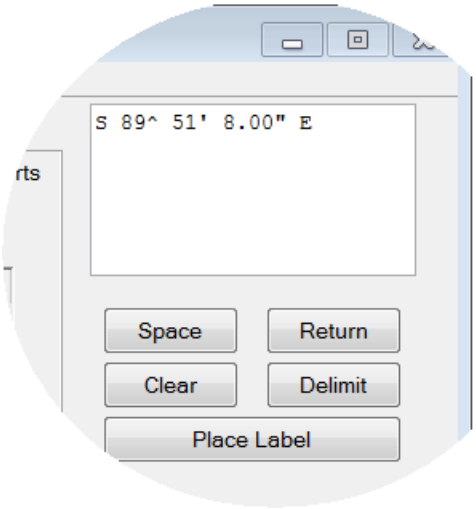



Plan View Labeler synchronizes with the D&C Manager for level symbology, saving time and effort as the symbology standards are already set up in D&C Manager. It can read geometry from the COGO database (**.gpk**) or measure lines drawn in MicroStation and retrieve the bearing or angle.

Plan View Labeler is set up to work with label style files (**.lsf**) provided by FDOT. Users can also create custom styles by providing information on the text, parameters, shapes, leaders and rotate tabs.

> ***Note*** The FDOT2010 Workspace loads the C:\FDOT2010\GEOPAK\bin\Roadway.lsf by default. This file is READ-only.

The label placed displays in the box on the right side of Plan View Labeler as shown below. A user can select the various tabs to define/modify the label appearance.




**Space** Places a space in the label at the position of the cursor.

**Return** Places a return to start a new line of text in the label.

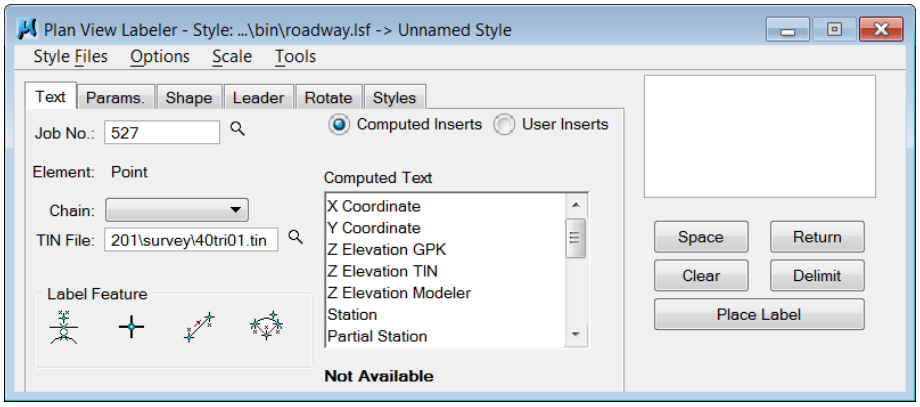
**Clear** Clears out the contents of the label to start a new label.

**Delimit** Places a line between lines of text.

**Place Label** Attaches the label to the pointer for placement in the drawing.

## TEXT TAB

The calculation of a location, like a station/offset or the geometry of a line or curve, primarily utilizes the Text Tab options.




**Job No.** The working alignment definition fills this option from the project **.gpk** file. Use the **Select** button to browse and pick the **.gpk** from a list.

**Chain** The alignment utilized for labeling, filled in by the working alignment definition.

**TIN File** GEOPAK binary TIN file name utilized for Z Elevation in the computed text options. Click the **File** button to open a TIN file dialog box and select the specified file.

**Label Feature** Four options are available for selection of the type of label for placement.

*Select or MS Element* Select a MicroStation or GEOPAK element and label based upon those parameters. The computed text inserts change to reflect labeling options appropriate for the selected element type.

*Data Point Location* Select a data point inside MicroStation and label based upon those parameters. The computed text inserts change to reflect labeling options appropriate for this element type.

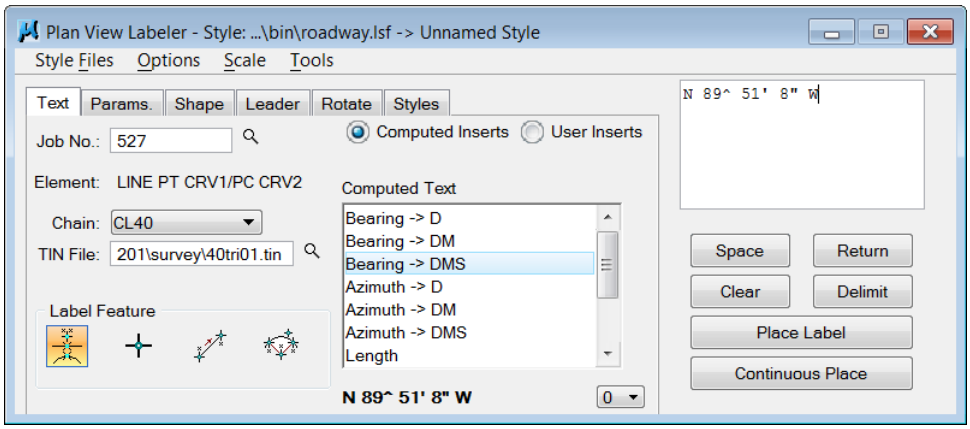
*2 GPK Point Line* Option to select two visualized GPK points and create a label based upon a line between those points.

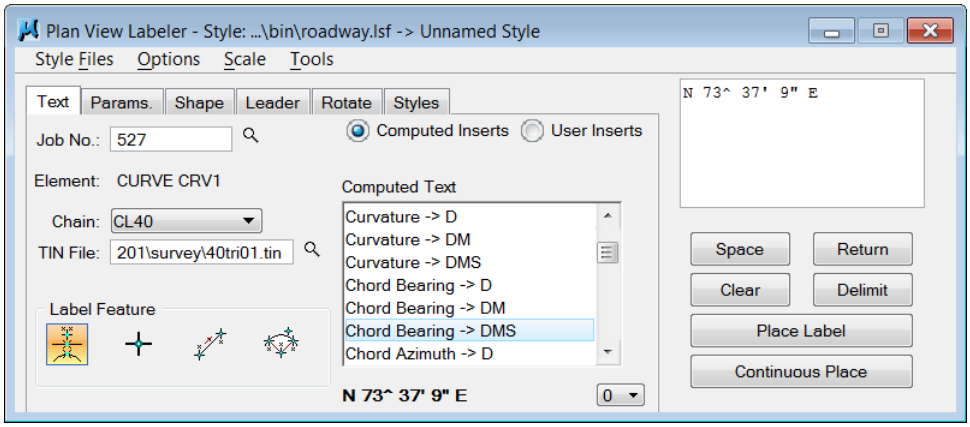
*3 GPK Point Arc* Option to select two visualized GEOPAK points representing the PC and PT respectively. GEOPAK then prompts for a center point, another visualized GEOPAK point or a point on the curve. A display curve is drawn and then a prompt for the Chord Direction Point, which is identified dynamically.

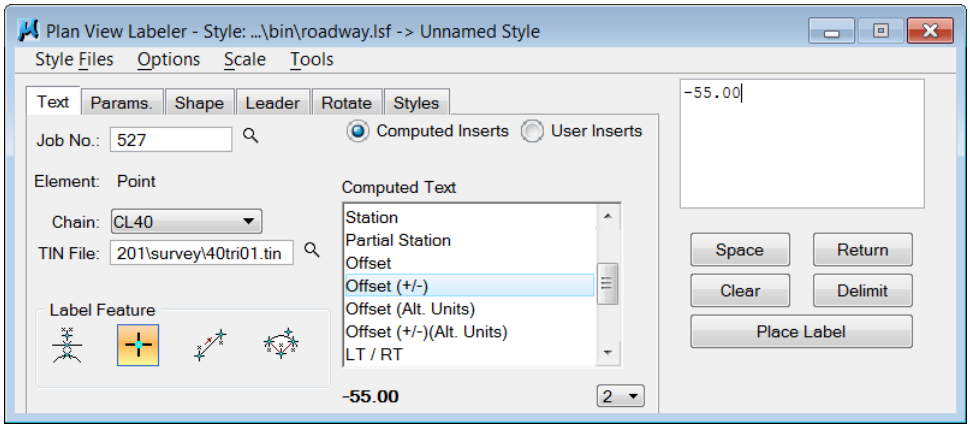
**Computed Text Inserts** The power of the Plan View Labeler is in the use of *Computed Text Inserts*. Based on the element type being labeled (i.e., point or line), there are numerous computed values, which can be included in a label. Once added to a label, the inserts values automatically re-compute for subsequent elements identified

*Computed Text Inserts* is a list of calculated values computed by the Plan View Labeler based upon the label feature chosen. Upon choosing the label feature, the Computed Inserts change to reflect the feature.

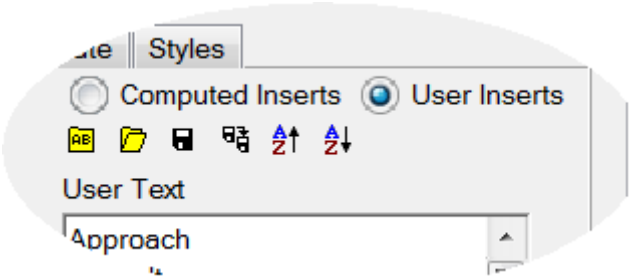
Selecting the number in the list at the bottom right corner of *Computed Text* controls the number of decimal places. Double clicking the list option places the computed value in the label text box. The figures below show examples using the **Select or MS Element** button and selecting different element types in MicroStation.



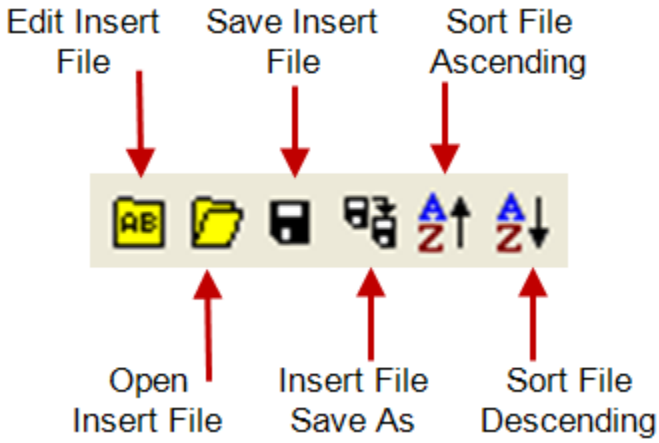






**User Text Inserts** Assists in populating the labels with frequently used words or phrases. An ASCII file created contains the commonly used words and used to select from in lieu of typing. FDOT provides a number of customized ASCII text files to use with Plan View Labeler, located in *\FDOT2010\GEOPAK\bin*.

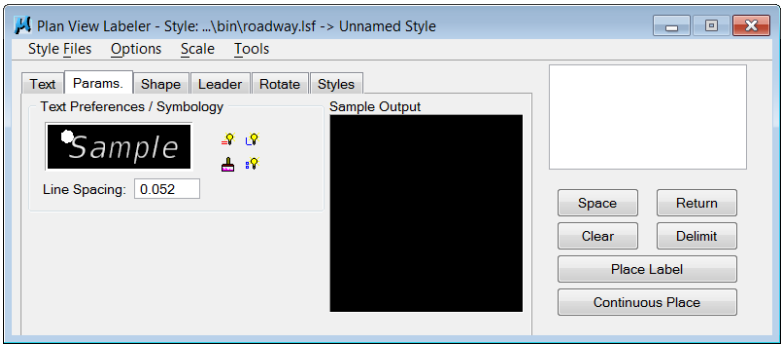


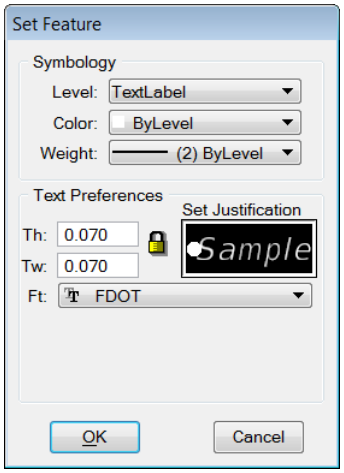

*File Manipulation Buttons* Upon selection of **User Inserts**, the buttons for file manipulation display. The following identifies each function.



## PARAMS. TAB

The **Params** tab sets up the label text preferences and symbology.




| | |
|---|---|
| **Th: Height** | Text height |
| **Tw: Width** | Text width |
| **Line Spacing** | Line spacing |
| **Ft: Font** | Font Type |

***Note*** Enter the text parameters at 1:1 as shown above to allow easy use of the custom label with any scale.

**Automated Set Buttons** Enter the level symbology manually or use one of the four buttons located at the bottom of the Plan View Labeler:

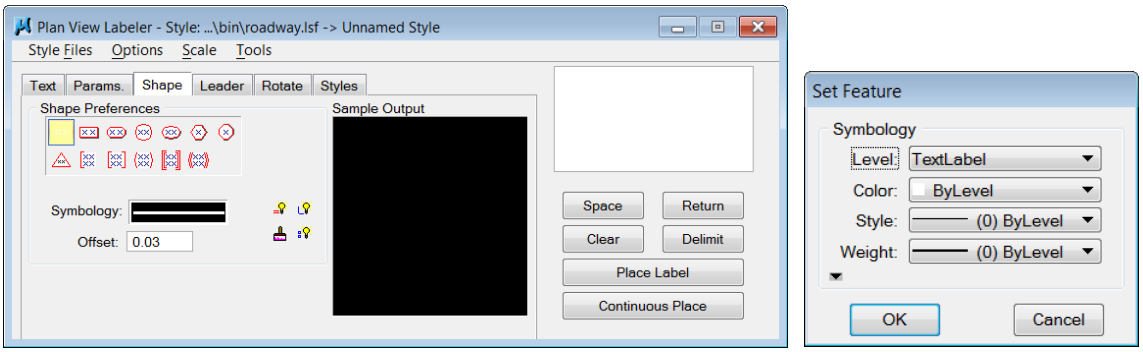
*Set By Current* Populates the Level, Color, and Weight from the active level symbology in MicroStation.

*Set By Element* Populates the Level, Color, and Weight from a selected element in MicroStation.

*D&C Symbology* Populates the Level, Color, and Weight from an item selected in Design & Computation Manager.

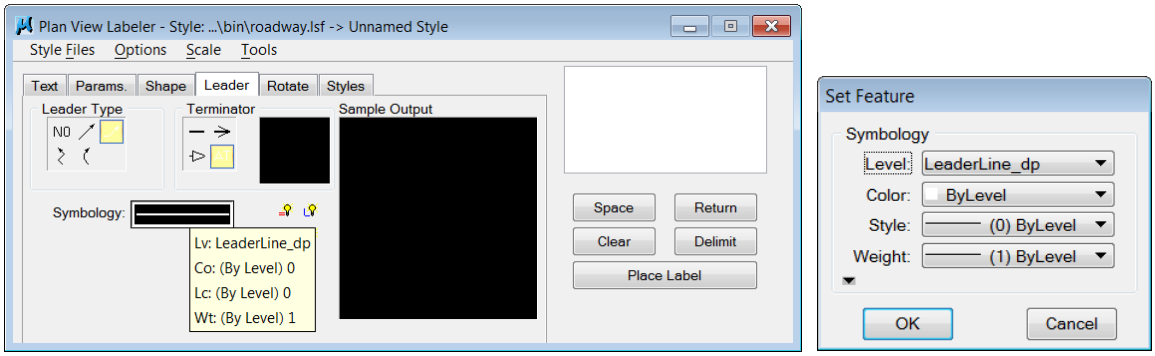
*Set All Parameters* Populates the current tab symbology settings to the other tabs, **Shape** and **Leader**, with the current settings. This saves having to repeat this process on the next two tabs.

## SHAPE TAB



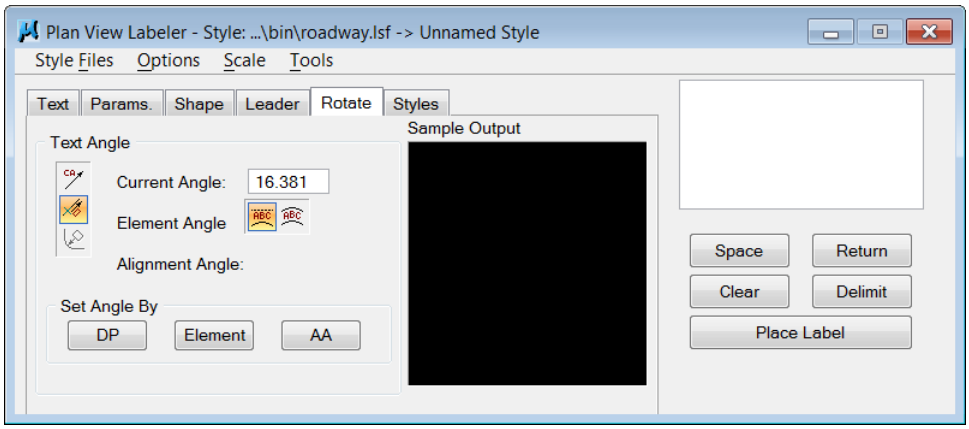

The *Shape* tab contains the settings to place a shape around the label and set the symbology of that shape. The first option shown sets no shapes to be drawn. **Offset** defines a margin between the shape and the text.

## LEADER TAB




The *Leader* tab contains the options to include a leader line and terminator with the text label. If no leader line is necessary, click the **NO** button under **Leader Type**. A number of different leader types and terminators are available. In the preceding figure, the **AT** (Active Terminator) has been selected. Double-click in the picture area to select a custom terminator from a cell library. The cells shown in the selection dialog box populate from the attached cell library, therefore attaching the correct library is required. Any of these options change on the fly, even if the selected style has a certain leader line already set up. The symbology options work the same way as in the **Params.** tab.

## ROTATE TAB




The **Rotate** tab selects the orientation for the label based upon the parameters defined in the tab.

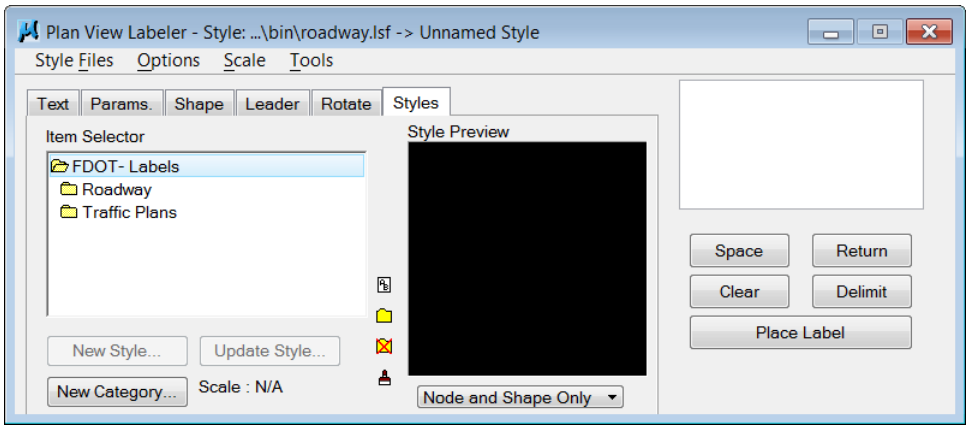
**Current Angle** Sets the angle at the current angle.

**Element Angle** Sets the angle based on a selected MicroStation element.

**Alignment Angle** Uses the chain specified in the text tab to rotate the label at an angle relative to the chain. Use this option before or during the placement of a label.

**Set Angle By** Sets the label angle by selecting two data points in the drawing using the (DP) option or picking a MicroStation element with the (Element) option or setting the rotation to the current angle with the (AA) option.

## STYLES TAB

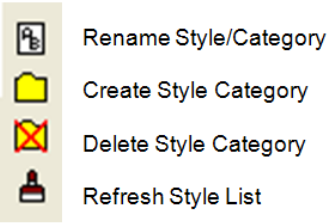



One of the most useful tools of the Plan View Labeler is the ability to store custom labels. The combination of computed and text inserts, shapes, leaders, element and text parameters of the label can all be stored under a unique name enabling you to create a complete library of labels to use in subsequent sessions. The styles are stored in **.lsf** files. FDOT delivers a number of custom .lsf files located in **FDOT2010\GEOPAK\bin**.

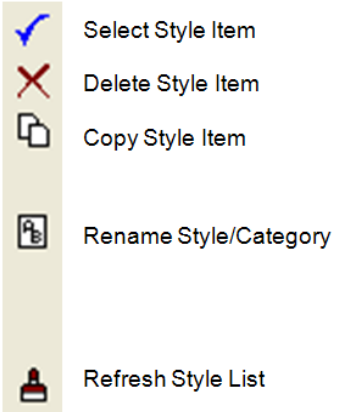
*TIP: When modifying the standard **.lsf** files from FDOT, copy the original **.lsf** file to the project **Symb** folder before making changes.*

The *Style Files* menu in the Plan View Labeler creates, opens, and saves new style files. Each style file employs a hierarchy system to easily and quickly organize and subsequently locate the desired label styles. Several supported utilities manage the categories, which likened to folder names.

The following displays the tools available upon selection of a category.



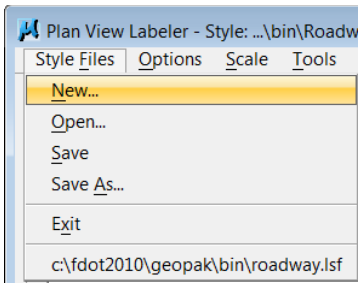

The following displays the tools available upon selection of a style.



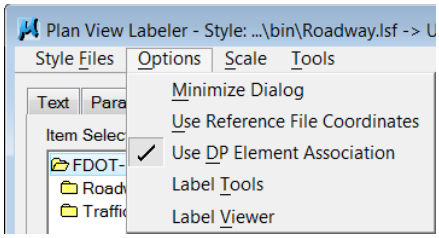
## PLAN VIEW LABELER MENU BAR

Plan View Labeler has four menus:

**Style Files** Menu to create, open, and save style (**.lsf**) files and exit the Plan View Labeler. Previously used **.lsf** files appear at the bottom of the menu.




**Options** This menu provides five commands to aid in the placement of labels:

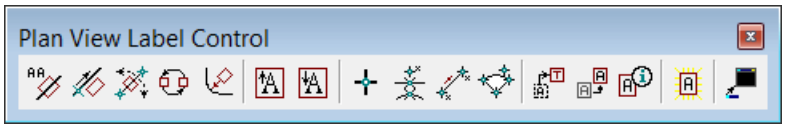



*Minimize Dialog* Minimizes the dialog box when selecting Place Label.

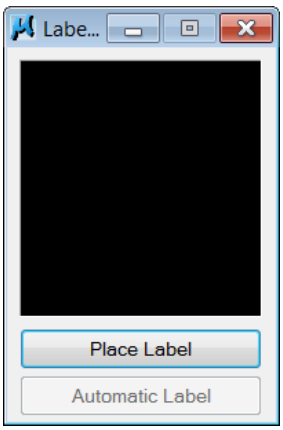
*Use Reference File Coordinates* Uses the coordinates from the master plan file when placing a label in a plan sheet that has rotated reference files not rotated view.

*Use DP Element Association* Enables the association between MicroStation elements and data point labels snapped to the element. If using this option to modify the element labeled, the point labels move with the element when the label update feature is used.

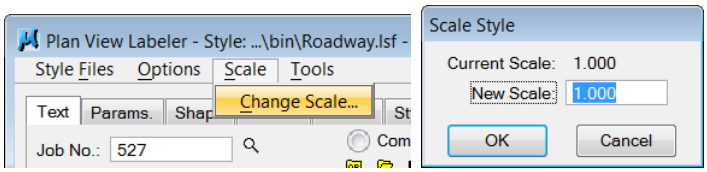
*Label Tools* Opens the Plan View Label Control toolbox, as shown below. This toolbox contains common tools for placing and modifying labels.



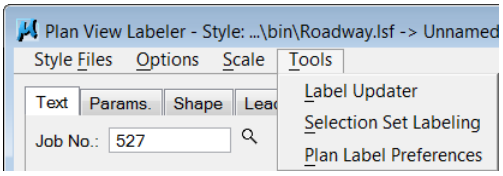

*Label Viewer* Activates Label View and displays a preview of the label with the ability to place the label from the dialog.



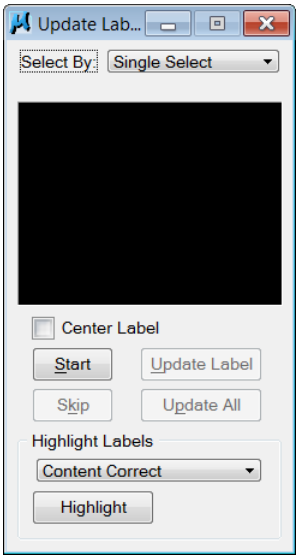
**Scale** Changes the scale of a label placed and uses the original creation scale to scale the label. For example, a label created with text set to 0.07 at a scale of 1.000 draws with text at 3.5 when changing the scale to 50.000.



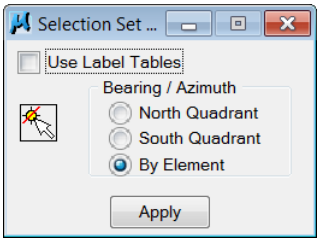

**Tools**




*Label Updater* Replaces any label that has been previously placed by Plan View Labeler with the Use DP Element Association option selected and corrects the label to the new contents based upon changed information.

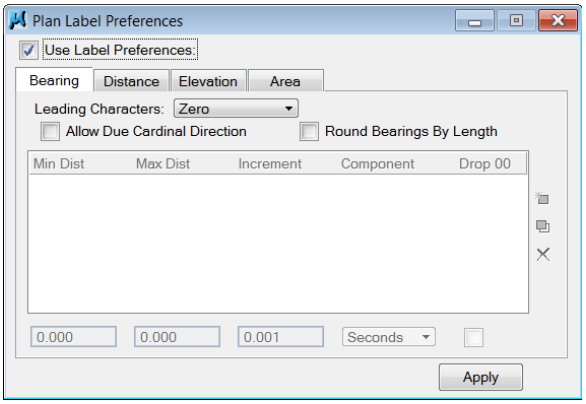



*Selection Set Labeling* Allows for placement of multiple elements that need labeling in a selection set and mass labeled at one time.




*Plan Label Preferences*

Customizes plan view labels. There are options for Bearing, Distance, Elevation, and Area.

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## Exercise 6.1 Placing a label using FDOT's style file

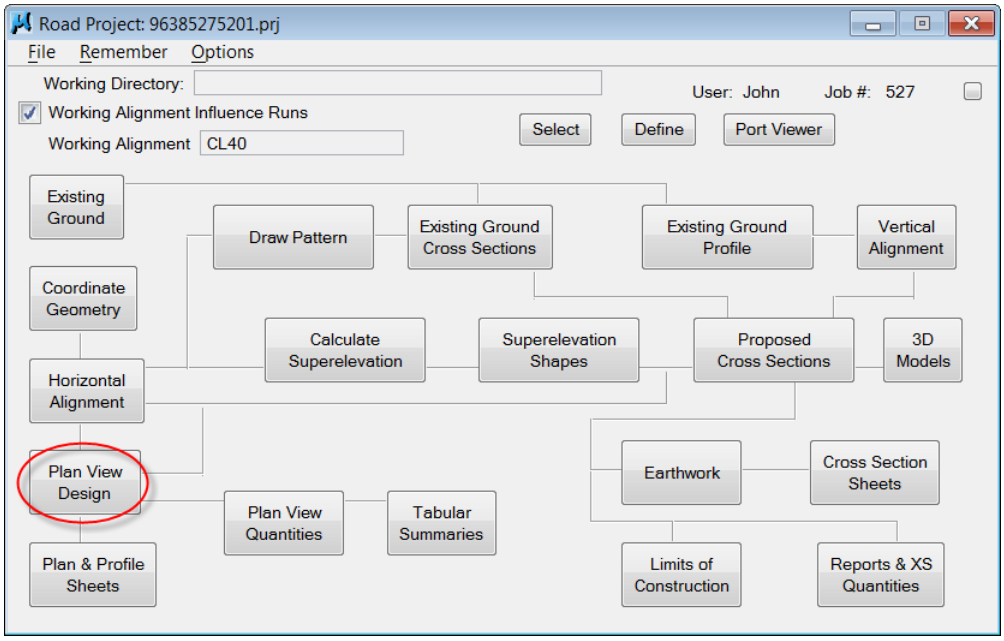
In this exercise, the user places a label created from an existing Library Style File or **.lsf**, library delivered with the FDOT 2010 software.

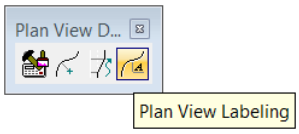
### ➢ *TO PLACE A LABEL USING FDOT'S STYLE FILE*

Perform labeling in the main design file for the discipline for which worked is done, not in the sheet files. FDOT also allows text in a separate text design file to use as a reference to all appropriate design files. The filename for the text design is *Textrd01.dgn***,** if not placing text in the main design file.

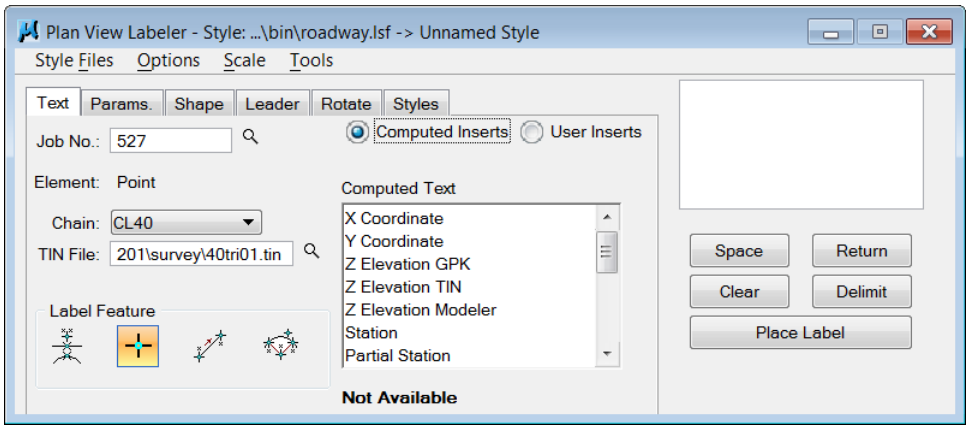
1. Run the executable file **C:\Chapter6_Ex6_1.exe** to extract the project files for this exercise.
2. Open **dsgnrd01.dgn** in **C:\e\projects\96385275201\roadway**.

   *Important:* From **MicroStation**, attach the Roadway.cel. Select **Element** > **Cells**. From the Cell Library dialog, select **File** and then select the **Roadway.cel** from the list. Close the Cell Library dialog.
3. Open Road Project.
4. From Road Project, click the **Plan View Design** button. Plan View Design toolbox opens.

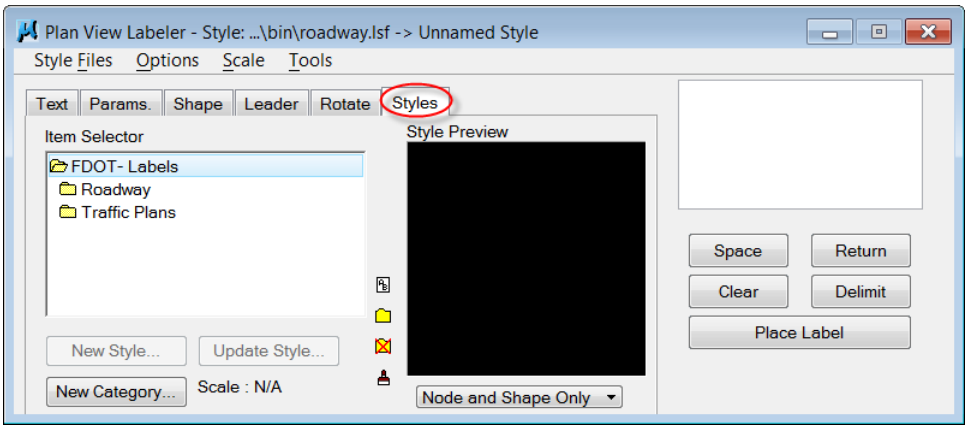


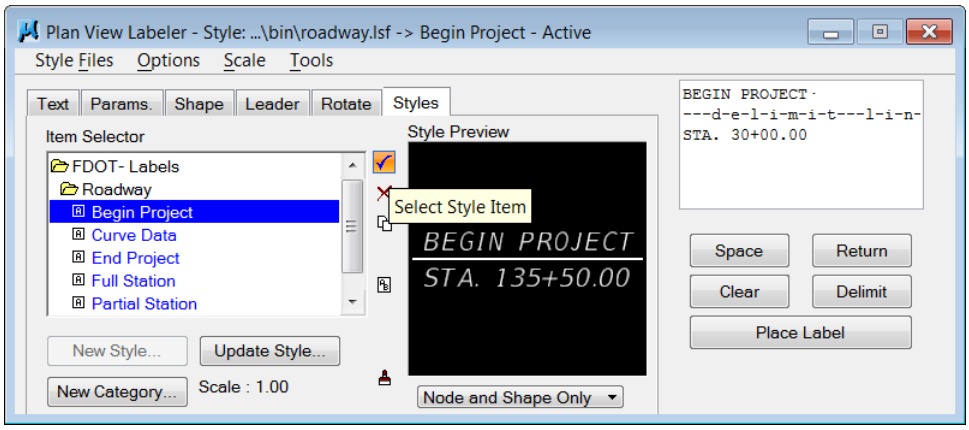
5 . From the Plans View Design toolbox, click the **Plan View Labeling** button. Plan View Labeler - Style opens. The roadway.lsf file is loaded from the workspace.




6 . From the *Styles* tab, under *Item Selector*, double-click the **FDOT-Labels** folder, and then double-click the **Roadway** folder.




7 . Click the **Begin Project** style, and then click the **Select Style Item** button. The style becomes active.




***Note*** Do not worry about the rotation of the display text in the Style Preview window; you will adjust this for each location based on the sheet rotation.

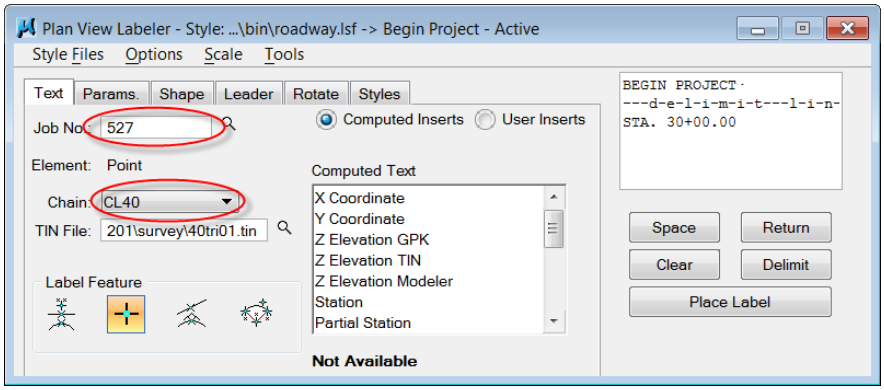
8 . In MicroStation, pan or zoom to the beginning of the project, near **Station 30+00**. Rotate the view such that the alignment is horizontal on the screen.

9 . From the Plan View Labeler menu, select **Scale** > **Change Scale**. Scale Style opens.

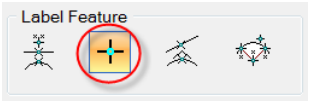
10 .From Scale Style, type **50** in the *New Scale* box and click the **OK** button.

***Note*** Creating this custom label at a 1:1 scale makes it very easy to use on any scale plan.

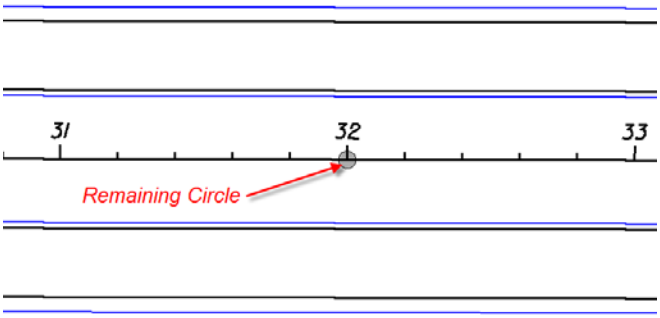
11 .From the ***Text*** tab, notice the **Job No.** and the **Chain** boxes contain default information from the Working Alignment.




12 .From the *Text* tab, click the **Data Point Location** button.

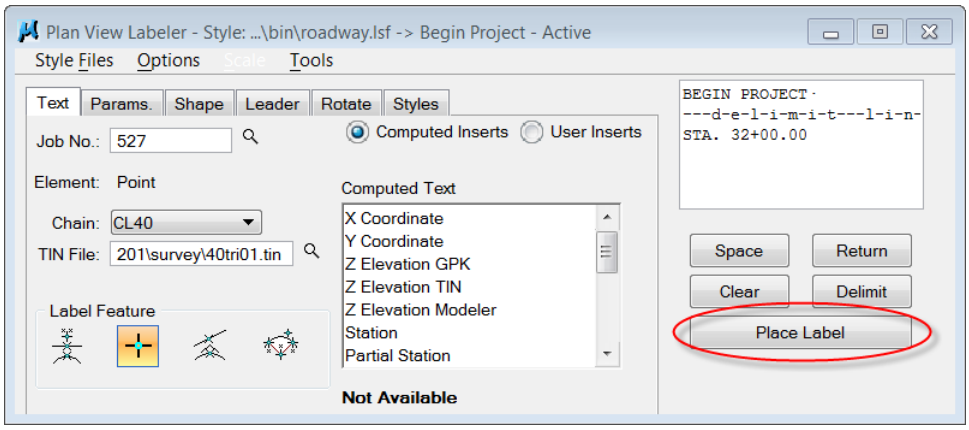



13 .In the design file, tentative snap and click the point at the beginning of the project, **Station 32+00**. as shown below.

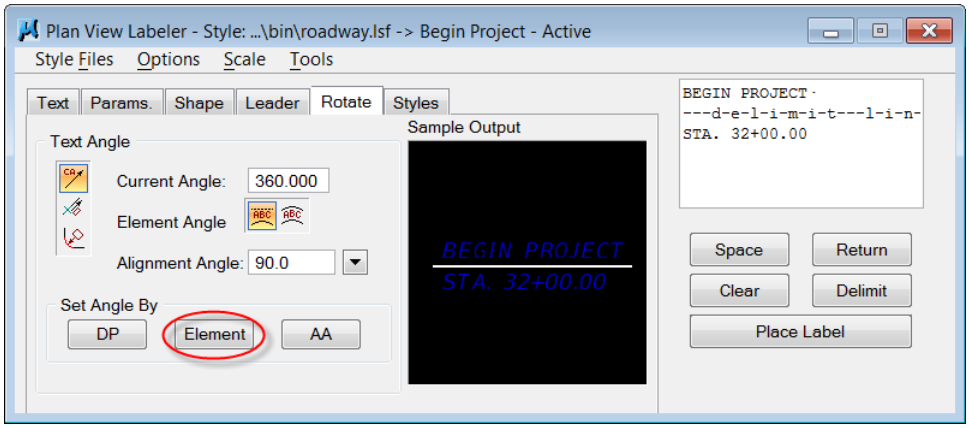



***Note*** The Plan View Labeler places the Remaining Circle and identifies it as the location of the data point.

14 .On Plan View Labeler, click the **Place Label** button. Notice the label attached to the pointer.




15 .From the *Rotate* tab, under **Set Angle By**, click the **Element** button.

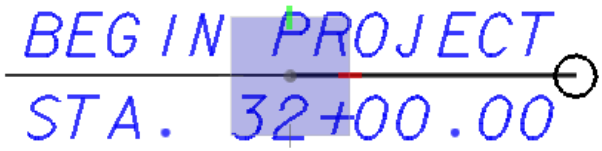



16 .In the drawing, click the **Center Line of Construction** or **Edge of Pavement line**. The text rotates parallel to that element.

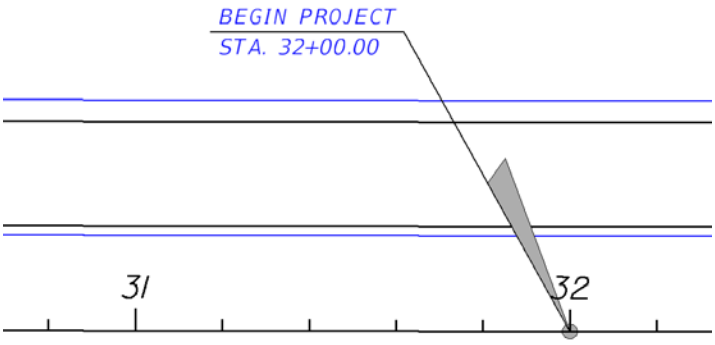
**Important:** Do not snap to an endpoint.

17 .Move your pointer into the MicroStation view and click to place the label in the file.

18 .To start the **leader line**, click on the right side in the middle of the text label.



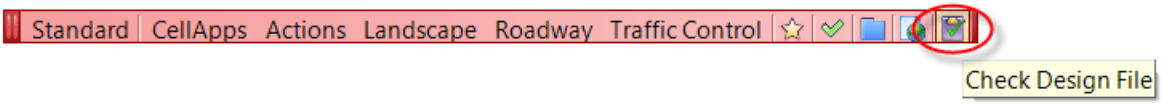
19 .To define the **length of the leader line**, click between the two lines of text on the right side of the label as shown below.

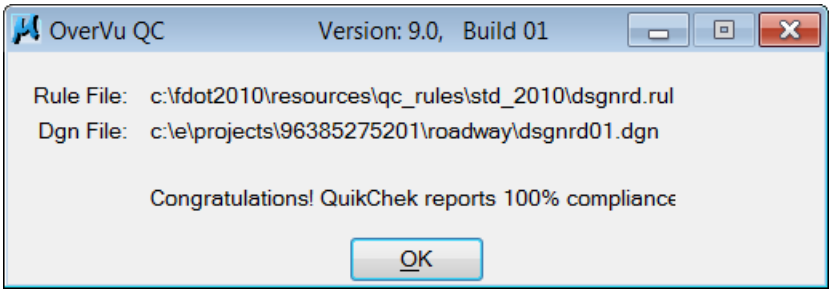



*Tip: The label displayed above, has the FDOT ArrTermEnd terminator built into it.*

*If the terminator is not correct, attach the\FDOT2010\RESOURCES\Cell\Roadway.cel cell library in MicroStation. From the Leader tab, double-click the preview window, and then select the ArrTermPrBeg terminator.*

20 .From the FDOT Menu, click the **Check Design File** icon to check the compliancy of the file, which should be 100% compliant.



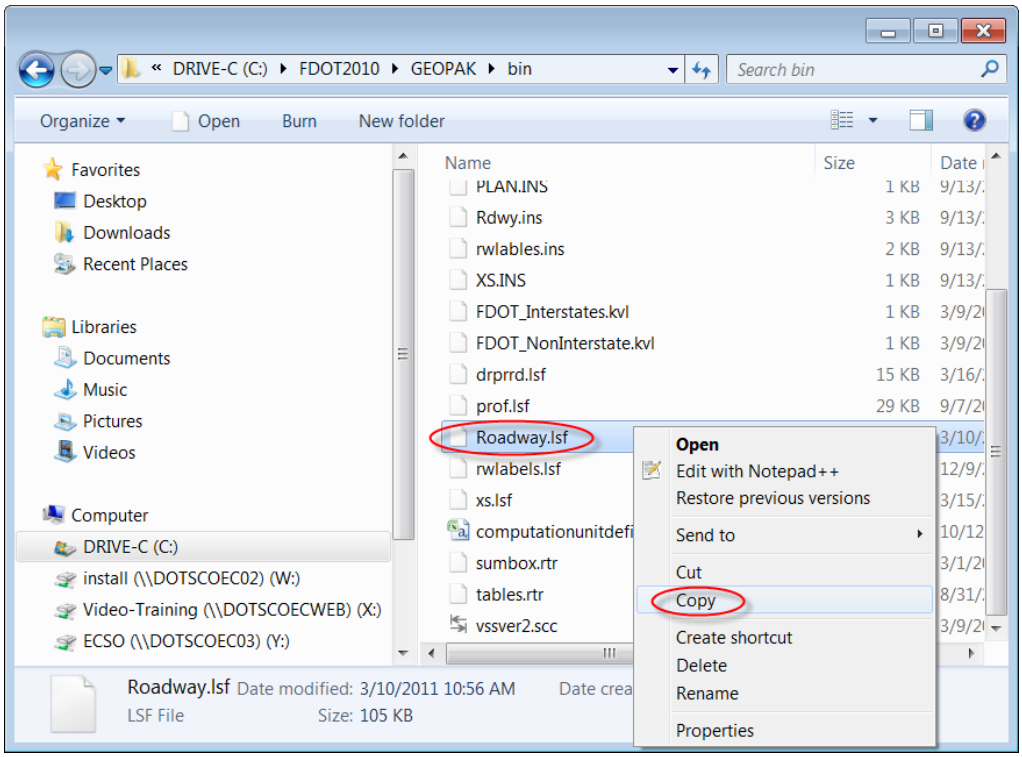



## Exercise 6.2 Creating a Custom Label

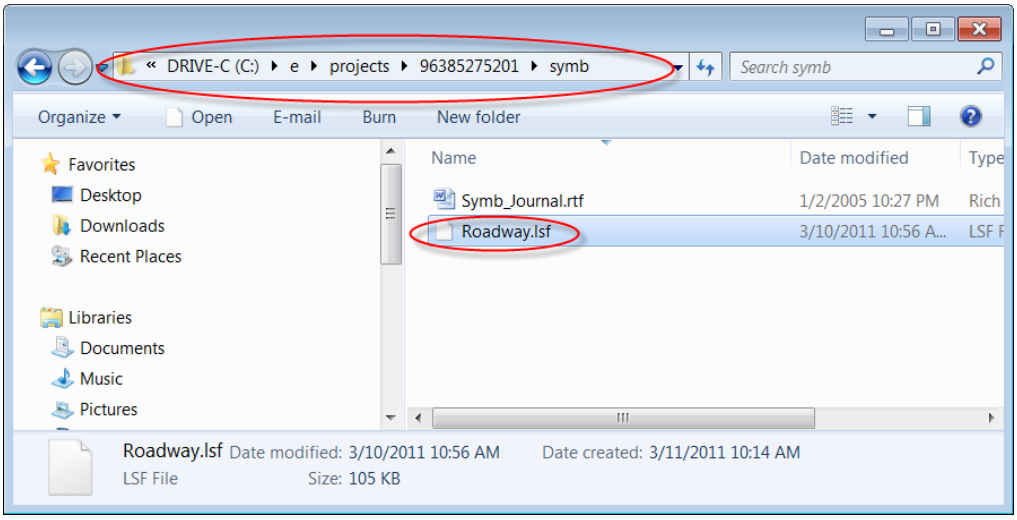
In this exercise, the user creates a custom label at a scale of 1:1 to label the beginning of the guardrail.

➢ ***TO CREATE A CUSTOM LABEL***

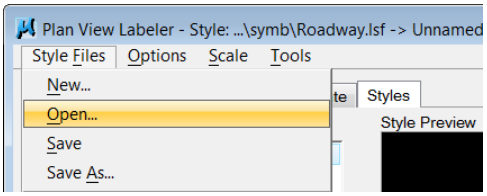
1. Open Explorer and navigate to **C:\fdot2010\GEOPAK\bin.** Right click on the **Roadway.lsf** and select **copy**.




2. In Explorer, navigate to the project directory, and paste the **Roadway.lsf** file in the **C:\e\projects\96385275201\symb** directory.

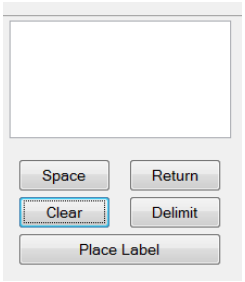


3 . Select the Plan View Labeler menu option **Style Files** > **Open**.



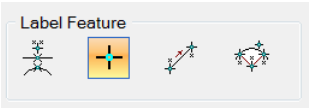

4 . Navigate to the project directory: **C:\e\projects\96385275201\symb**, select the **fdotlabels.lsf** file and click **Open**.

5 . From the Plan View Labeler *Text* tab, click the **Clear** button. This clears the last label used.

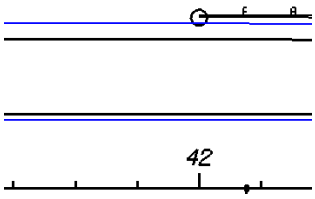



6 . In MicroStation, pan or zoom to the beginning of the guardrail, near **station 42+00**.

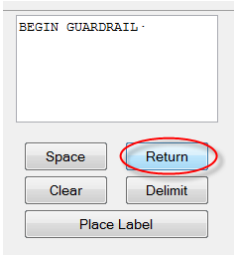
7 . From the *Text* tab, click the **Data Point Location** button.




8 . In the design file, snap to the end of the guardrail as shown below.

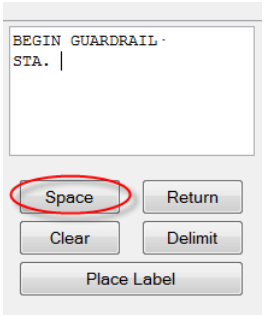



9 . Click in the label preview box, and type **BEGIN GUARDRAIL**.

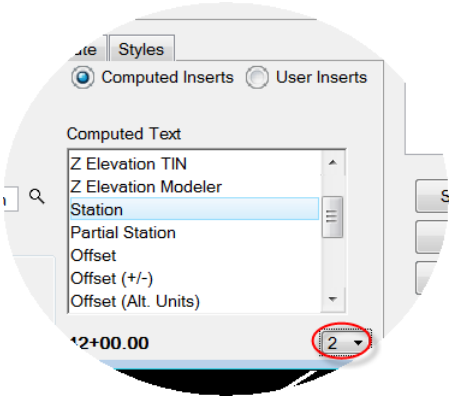


10 .Click the **Return** button. A return appears on the label.

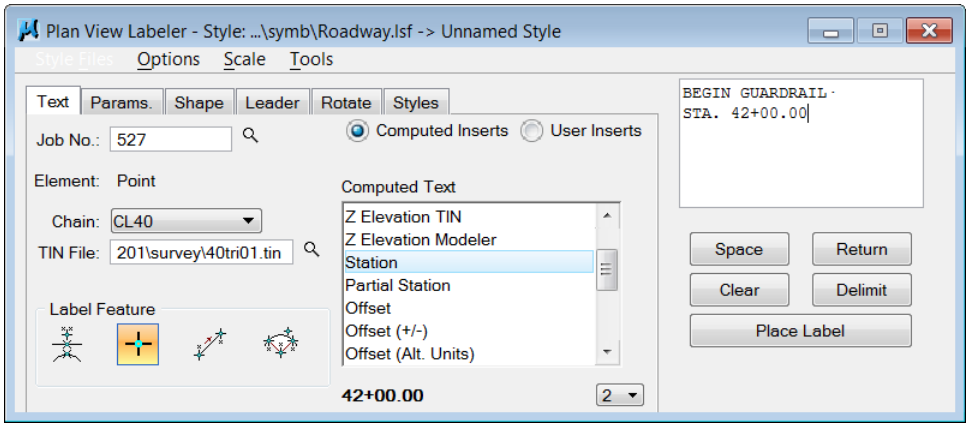
11 .Type **STA**. and click the **Space** button.




12 .In the **Computed Text** box, select **Station** and set the number of decimal places to **two (2)**.



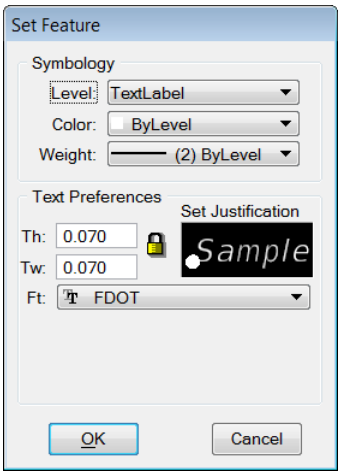

13 .Double-click **Station**. The station displays the **label preview** box.

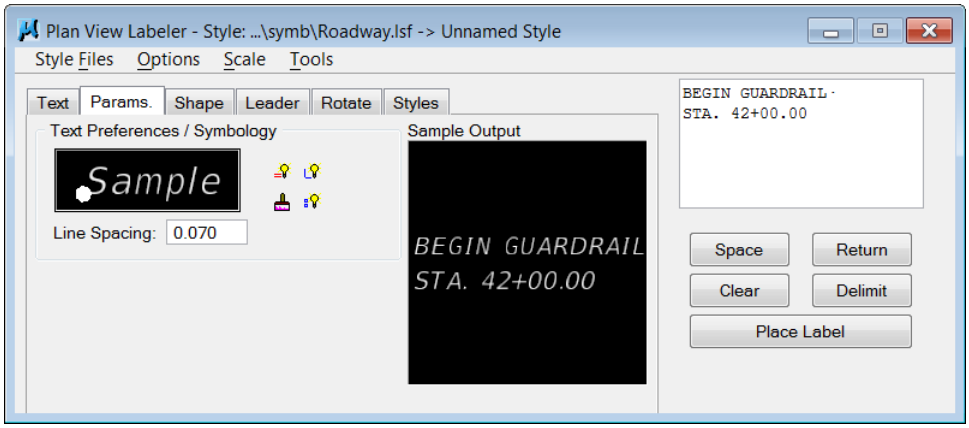



14 .From the Plan View Labeler menu, select **Scale** > **Change Scale** and set the *scale* to **1**.

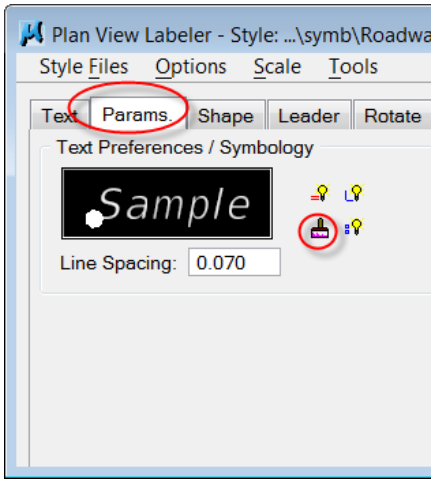
15 .From the *Params* tab, set the *parameters* as shown below.

***Important:*** The Height, Width, and Line Sp. are set to a 1:1 size. Refer to the CPCH chapter 3-4 for more detail.

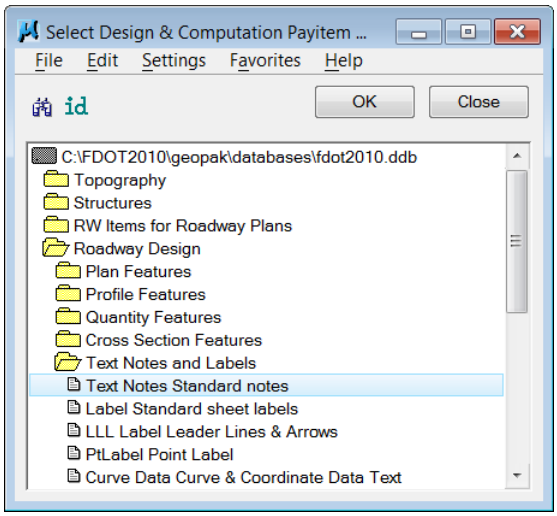


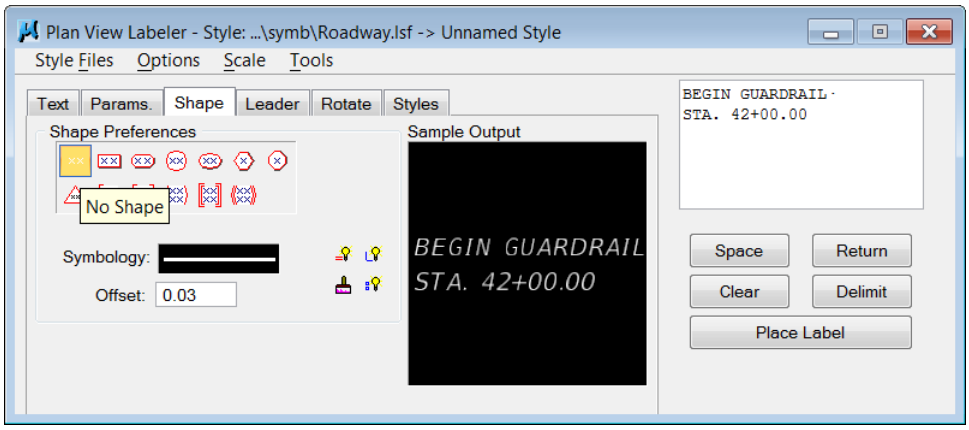

16 .From the *Params* tab, click the **D&C Symbology** button. Select Design & Computation Pay item opens.



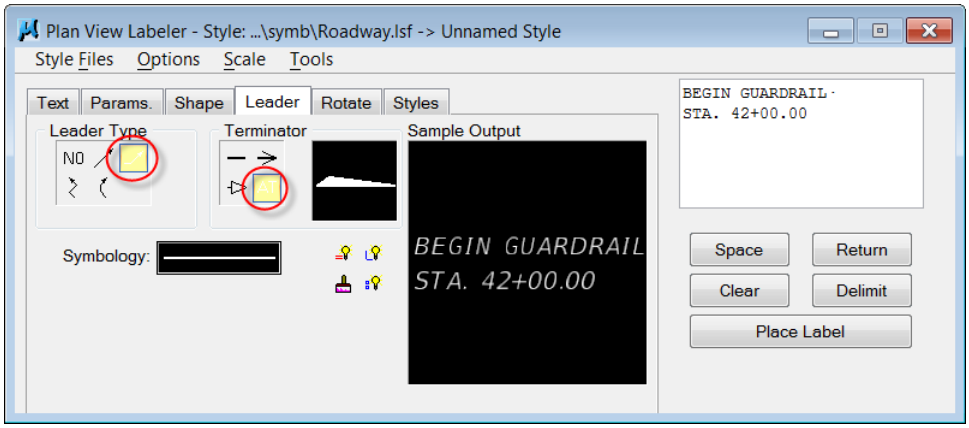
17 .In Select Design & Computation Pay item, navigate to the Label Standard sheet labels item as shown below and click the OK button. The *Level*, *Color* and *Weight* for the text are set.




18 .From the *Shape* tab, click the **No Shape** button.



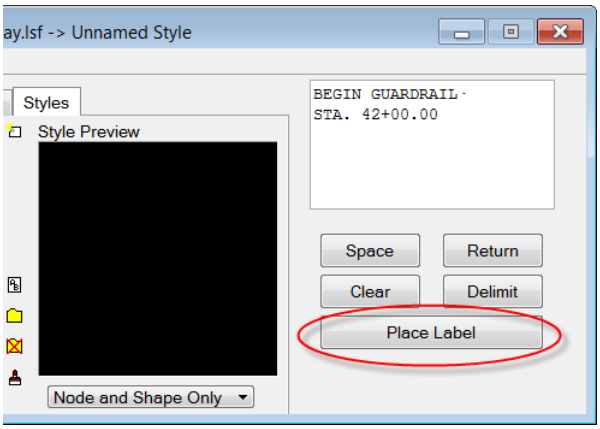

19 .From the *Leader* tab, click the **2-point Leader** button, and then click the **Active Terminator** button. Set the rest of the parameters as shown below.



20 .In the design file, zoom in very close to the end of the guardrail.

> ***Note*** The first label placed is very small, at 1:1. You have to place one label before you can create the new style.

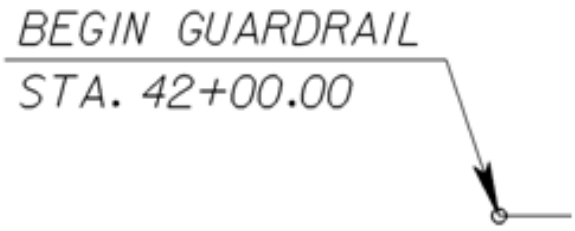
21 .On Plan View Labeler, click the **Place Label** button.



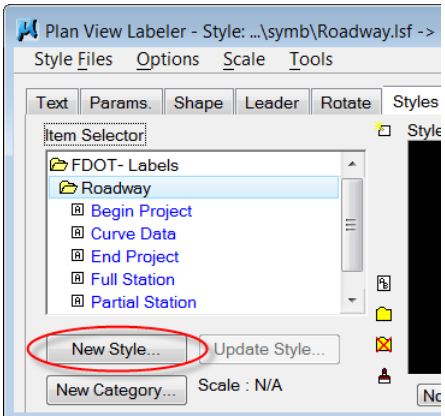

22 .In the design file, **data point** the location to place the label.

23 . On the right side of the label, click again centered between the two lines of text.

24 . On the left side of the label, click again centered between the two lines of text. Label at 1:1 shown below.



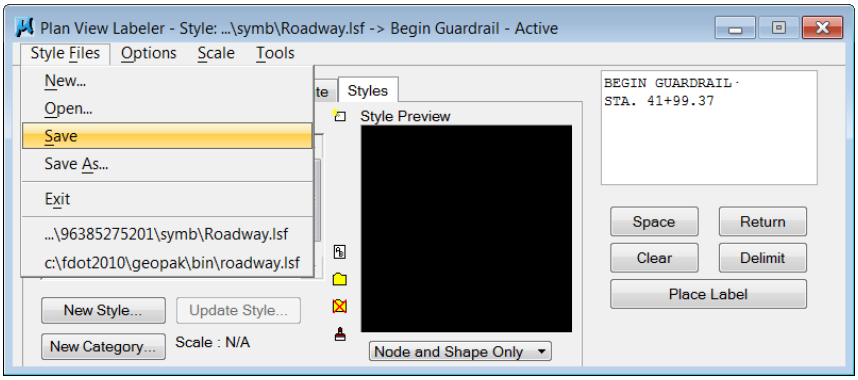

25 .From the *Styles* tab, click the **New Style** button. Create Style opens.



26 .In Create Style, type **Begin Guardrail** for **Style Name** as shown below.

27 .Set the *Style Scale* to **1.0** and click the **OK** button.

28 .From the Plan View Labeler menu, select **Style Files** > **Save**. The new label will save permanently to the attached library.

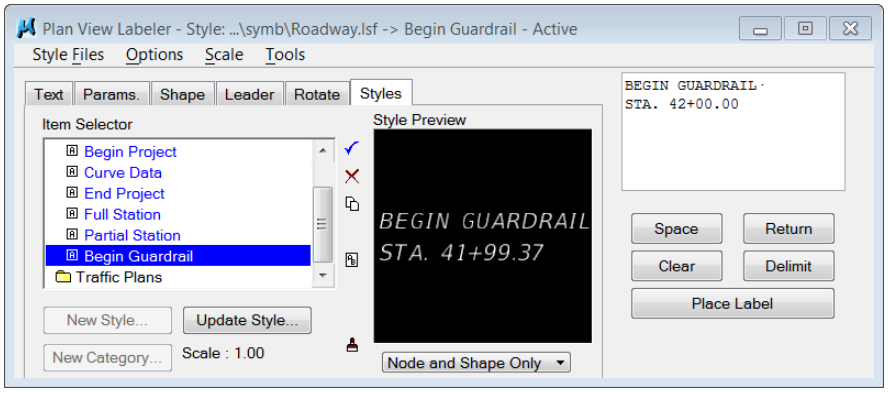



29 .Delete the **1:1 label** placed to build the new style.

30 .In MicroStation, zoom out twice.

31 .On Plan View Labeler, click the **Clear** button to clear the Label Preview window.

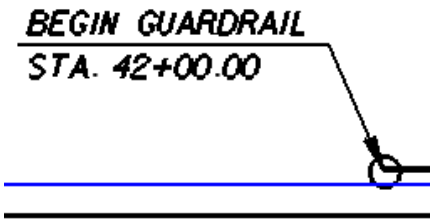
32 .From the *Styles* tab, select the **Begin Guardrail style**, and then click the **Select Style Item** button.



33 .From the Plan View Labeler menu, select **Scale** > **Change Scale**. Scale Style opens.

34 .Set the *New Scale* to **50** and click the **OK** button.

35 .From Plan View Labeler, click the **Place Label** button and place the label following the same procedure used previously in this exercise. The finished label displays below.

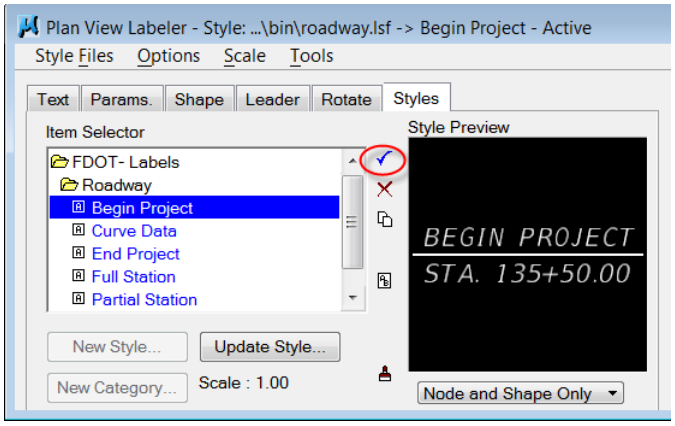



## Exercise 6.3 Modifying a Style

In this exercise, the user modifies an existing style having the wrong font built into it, which teaches how to update styles with errors.

➢ ***TO MODIFY A STYLE***

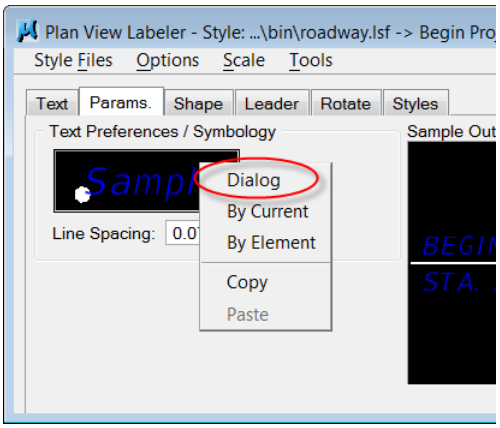
1 . From the *Styles* tab, select the style **Begin Project,** and then click the **Select Style Item** button.



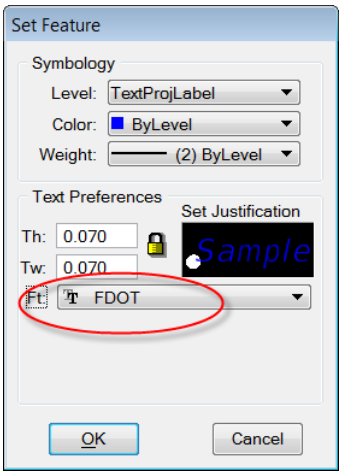

2 . From the Plan View Labeler menu, select **Scale** > **Change Scale**. Scale Style opens.

3 . Set the *New Scale* to **1**, and then click the **OK** button.

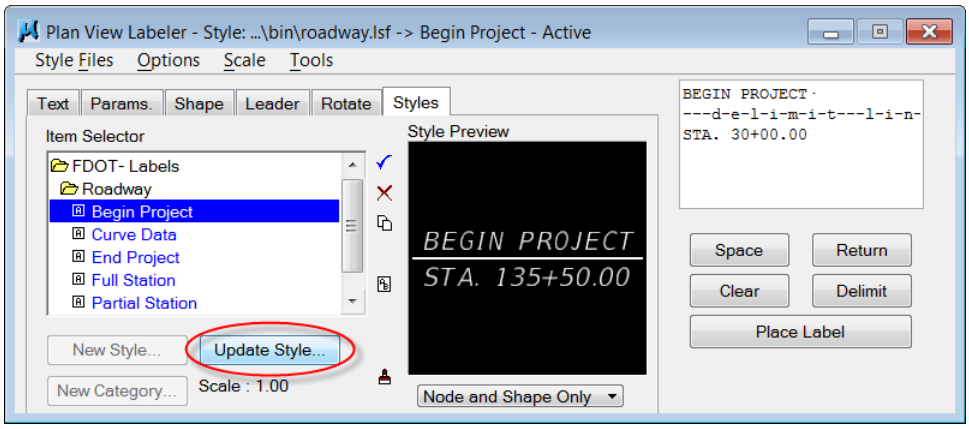
4 . From *the Params* tab, Right click on the **Text Preferences / Symbology** window, click the **Dialog** option.



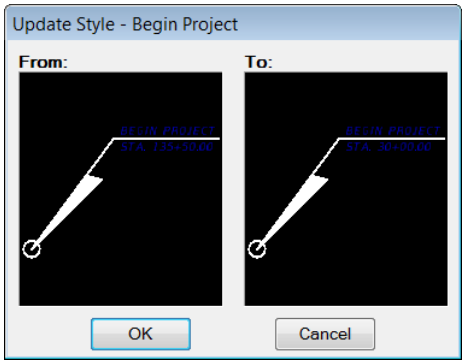

5 . From Set Feature, set the *Ft: (Font)* option to **FDOT** (correct font for general text labels) from the pull down list. Click **OK.**



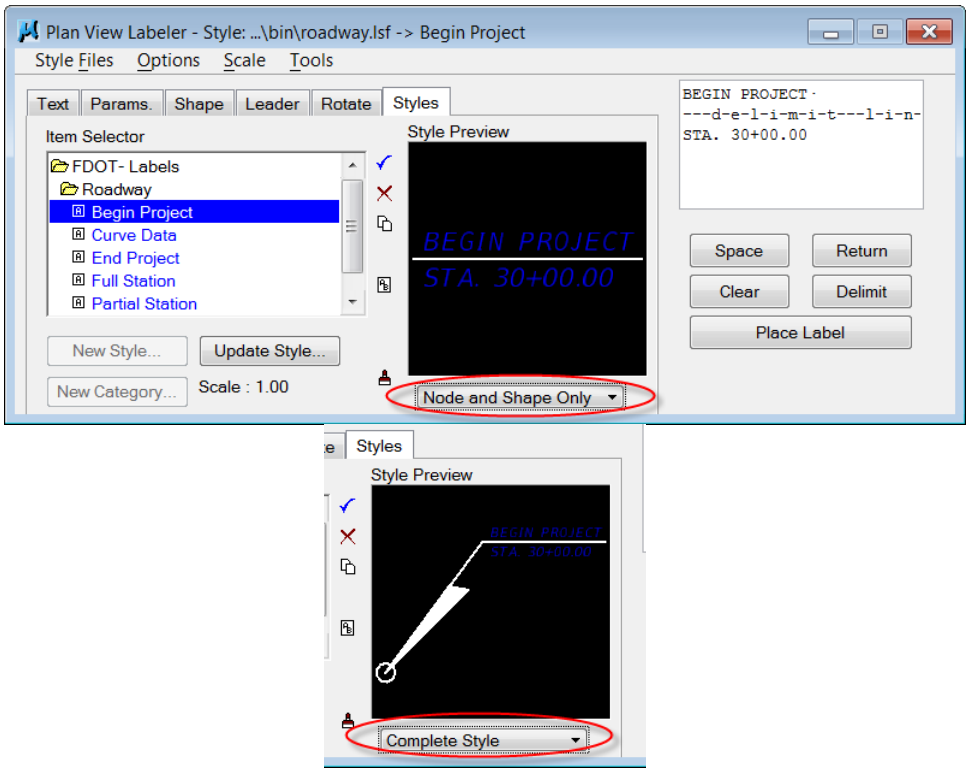

6 . From the *Styles* tab, click the **Update Style** button. Update Style opens.



7 . On Update Style, click the **OK** button.




8 . To change the *Style Preview* window, toggle between the **Node and Shape Only** and **Complete Style** options from the dropdown list.




***Note*** The preview may be different. When you place the label, the preview looks and works normally. You can also un-rotate the view and update the style again.

9 . In the design file, zoom to the beginning of the project and place this label.

*Tip: Set the label scale to 50.*

# 7 DRAW CELLS WITH GEOPAK

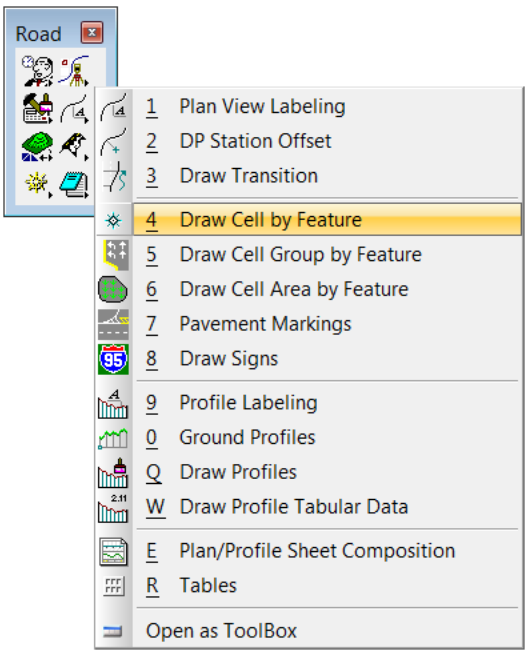
## DRAW CELL BY FEATURE

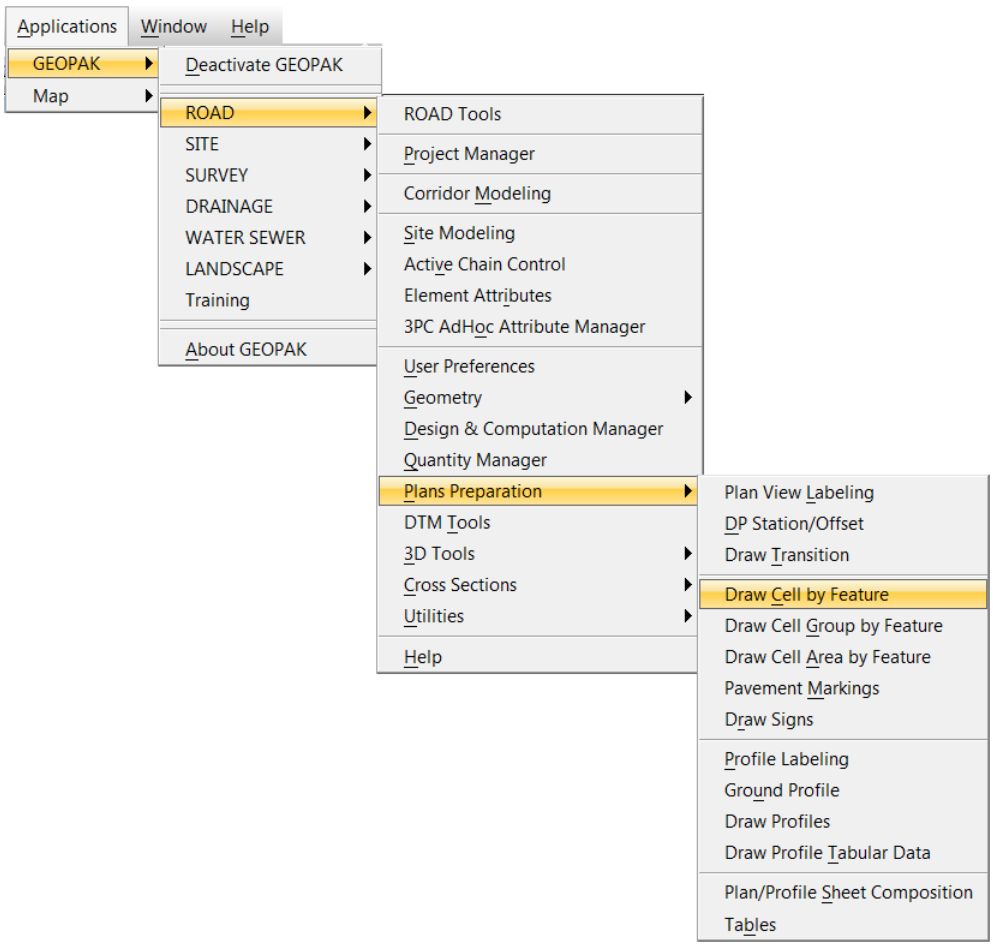
GEOPAK has tools for drawing cells using data stored in Coordinate Geometry or along MicroStation elements. One of these tools, called **Draw Cell by Feature**, draws cells with a variety of options for many types of project scenarios. One example is drawing light poles, which place at specific stations and offsets. The cells used draw at even intervals along MicroStation elements by Feature through the D&C Manager database, instead of searching through cell libraries.

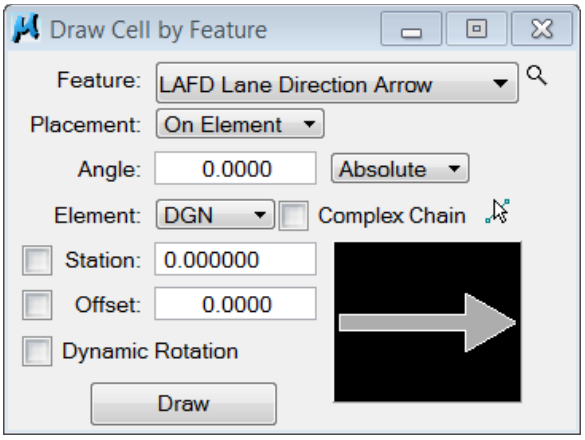
➢ ***TO OPEN DRAW CELL BY FEATURE***

From Road toolbox, click the **Draw Cell by Feature** button

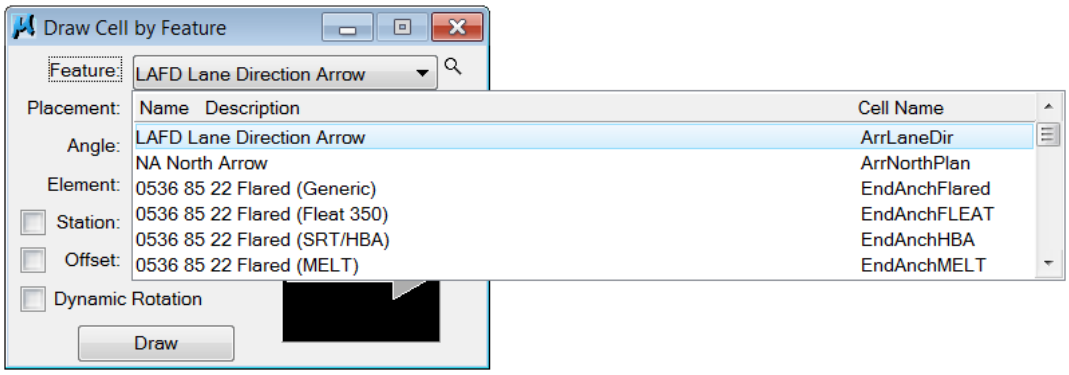
–or— From the MicroStation menu, select **Applications** > **Road** > **Plans Preparation** > **Draw Cell by Feature**. Draw Cell by Feature opens.






**Feature** D&C Manager item defining the cell placed. The **Feature** label button opens a Design & Computation Pay item list. Select the appropriate item in the list to change the preview window. The items list all have a cell name defined. The cell name displays by clicking on the item list.




**Placement** Defines how to place the cell. The options are **By Point** and **On Element**.

**Angle** Defines the rotation of the cell. If set to **Absolute**, the Angle is based on 0 degrees horizontal. If **Angle** has setting of **Relative**, then the angle is set relative to the selected element or chain.

**Element** Defines whether to use a MicroStation element or a COGO chain as a reference to place the cell when selecting On Element. Click the **Identify DGN Element** button to select a MicroStation element in the design file or choose the COGO chain from the drop down list.

**Station** Used for determining the placement of the cell, upon selection of a chain.

**Offset** Distance from the MicroStation element or COGO chain to place the cell.

**Dynamic Rotation** Allows the cell to rotate dynamically when placed. If not selected, the angle reads from the Angle box.

**Draw** Used to draw the cell into the MicroStation file. A prompt displays depending on the options selected in the dialog box.

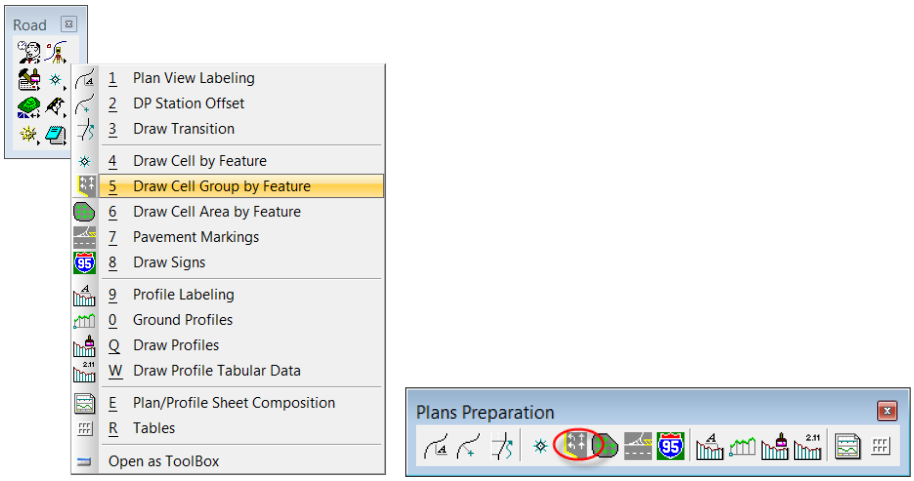
# DRAW CELL GROUP BY FEATURE

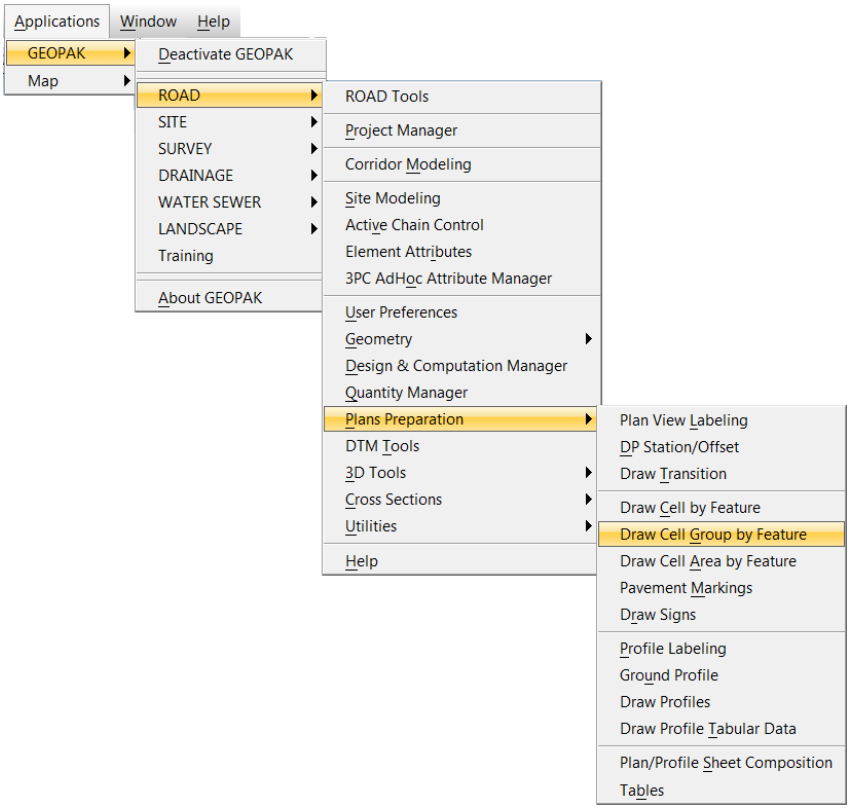
**Draw Cell Group by Feature** draws groups of cells into a MicroStation file. The group of cells places in a graphic group based on user-defined spacing and offsets from MicroStation elements or COGO chains.

### ➢ *TO OPEN DRAW CELL GROUP BY FEATURE*

From Road toolbox, click the **Draw Cell Group by Feature** button

–or— From the MicroStation menu, select **Applications** > **Road** > **Plans Preparation** > **Draw Cell Group by Feature**. Draw Cell Group by Feature opens.

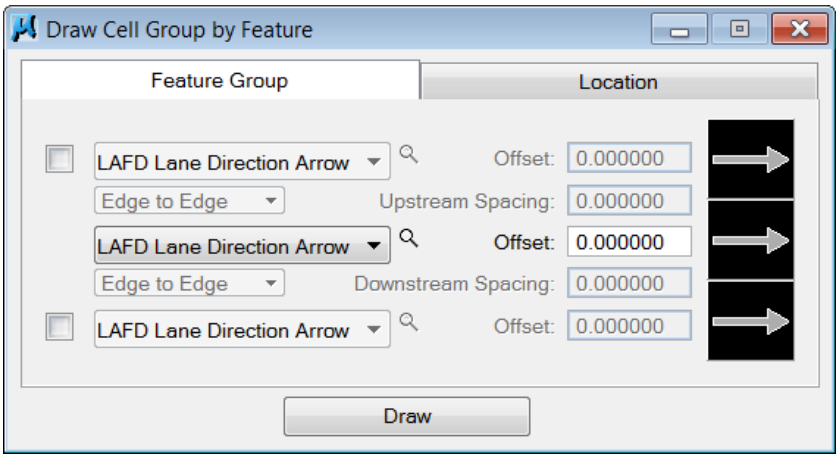


## FEATURE GROUP TAB

The **Feature Group Tab** defines the features, offset and spacing, and the selected cells from the Design & Computation Pay item selection.

For the placement of only one row of cells, click the **Browse** button in the center of the dialog and select the appropriate feature. There is no need to check the boxes if only in need of a single row of cells. Use the check boxes to add cells to the group of cells placed.




**Offset** Distance from the MicroStation element or COGO chain, defined on the *Location* tab, to draw the cell group.

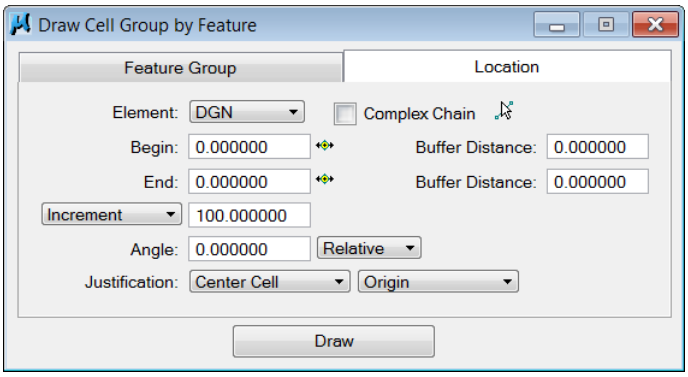
**Upstream Spacing** Distance from *Origin to Origin* or *Edge to Edge* point of the cells, depending on which option selected.

**Downstream Spacing** Distance from *Origin to Origin* or *Edge to Edge* point of the cells, depending on which option selected.

**Draw** Initiates drawing the cell group(s) into the design file. Another data point on the MicroStation view is required to set the direction to offset the cell group.

## LOCATION TAB

The *Location* tab controls the placement of the cells according to a MicroStation element or COGO chain.




**Element: DGN** Cells placed along a MicroStation element. Click the Identify DGN Element button to select the desired element.

**Element: Chain** Cells place along a selected COGO chain.

**Begin / End** Specifies beginning and end placement of cells. If selecting a Chain, these are stations. If selecting a DGN, these are lengths of the MicroStation element.

**Buffer Distance** Modifies the beginning and end stations or distance. The purpose is when the beginning or end station are known, but you must keep a certain distance inside the stationing.

> ***Note*** Example: If the begin = 100.00 and the end = 600.00, the cells are drawn from 100 to 600. If the buffer distance = 30.00 and 40.00, then the real stations are: 130.00 (100.00 + 30.00) to 560.00 (600.00 - 40.00).

**Spacing** Six options are available:

*Increment* Cells place at a set distance between cells.

*Even* Cells place at a set distance starting at the next even value between cells. (i.e. Begin Station = 10+10 set with an even offset = 25. The first cell placed at Station 10+25 then every 25' thereafter)

*Max Spacing* Maximum distance between cells placed between selected beginning and ending cells.

*Once* Places a single set of cells.

*Each Vertex* The origin of the cell placed at each vertex of the selected element.

*Each Endpoint* The origin of the cell placed at the endpoints of the selected element.

**Angle** Places the cells at a specific angle value. If set to Absolute, the Angle is based on 0 degrees as horizontal. If set to Relative, the Angle is based relative to the selected MicroStation element or COGO chain.

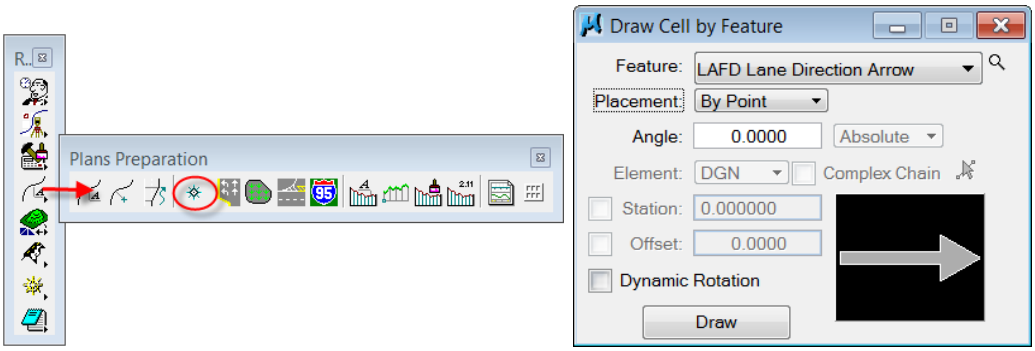
**Justification** The justification used for the placement of the cell. Options are center, upstream or downstream cell depending on the selections set on the Feature Group Tab.

**Draw** Draws the cell group into the MicroStation file. Prompts display depending on the options selected in the dialog box.

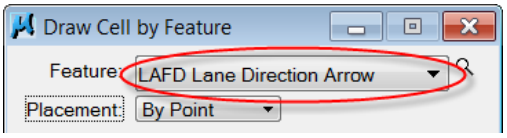
## Exercise 7.1 Drawing Cells by Feature

➢ ***TO DRAW THE CELLS BY FEATURE***

1. Run the executable file **C:\Chapter7_Ex7_1.exe** to extract the project files for this exercise.
2. Open **C:\e\projects\96385275201\roadway\TCDSRD01.DGN.**
3. From the Road toolbox, click the **Draw Cell by Feature** button. Draw Cell by Feature opens.

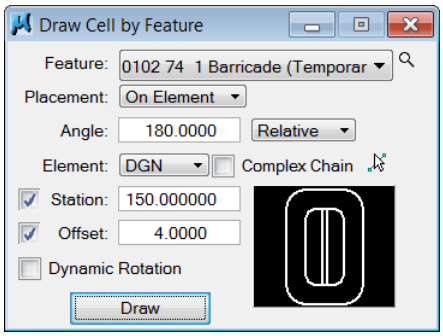



4. From Draw Cell by Feature, click the **Features** label list button. Select Design & Computation Pay item opens.




5. Navigate to the **0102 74 1 Barricade (Temporary - Type I, II, VP & Drum)Drum** item in the list.

6 . Modify the Draw Cell by Feature dialog as shown below.

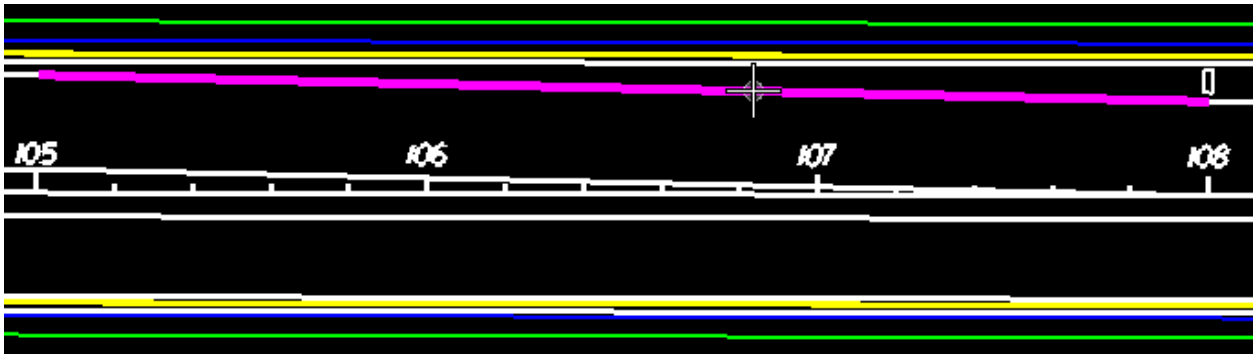



7 . Zoom in to the area from **Station 105+00** to **Station 108+00**.

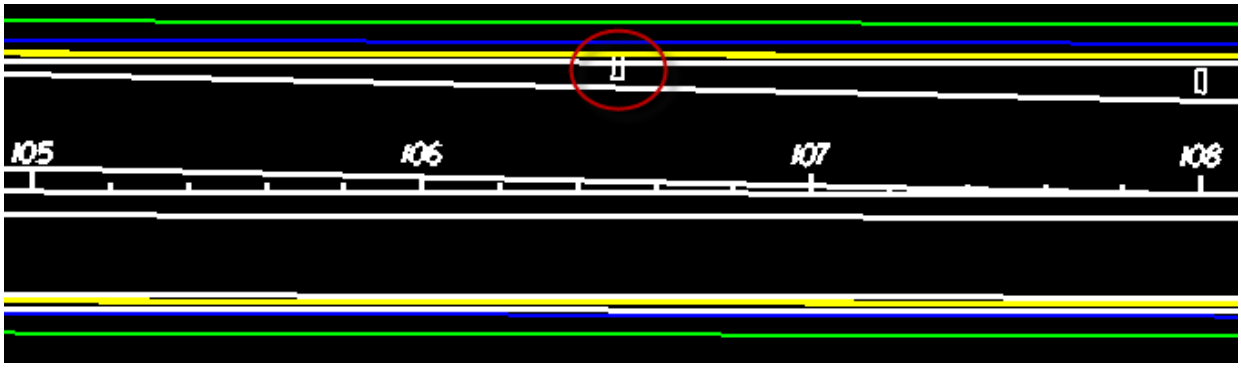
8 . Click the Identify DGN Element button beside *Complex Chain*.

9 . In the design file, click the **edge line** as shown below. **Data point** again to accept the element.

*Tip: Attach DSGNRD01.DGN as a reference file to match the illustration below.*




10 .From Draw Cell by Feature, click the **Draw** button.



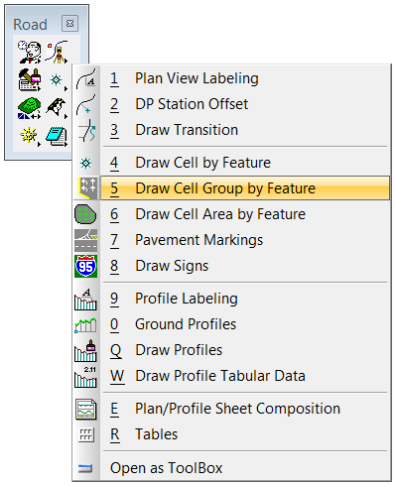

11 .Click again to accept the cell placement.

# Exercise 7.2 Drawing Cell Groups by Feature

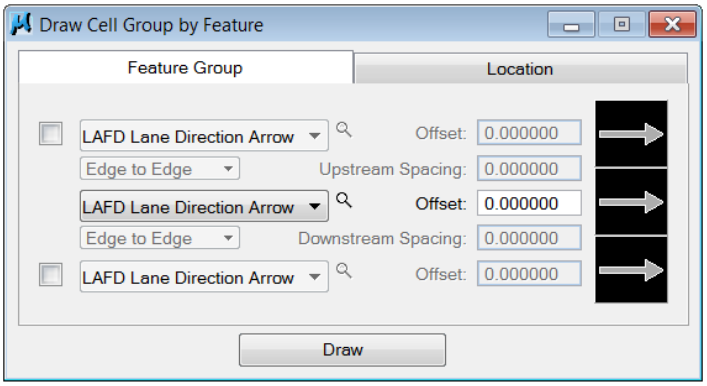
➢ ***TO DRAW CELL GROUPS BY FEATURE***

1 . Open **C:\e\projects\96385275201\roadway\TCDSRD01.DGN.**

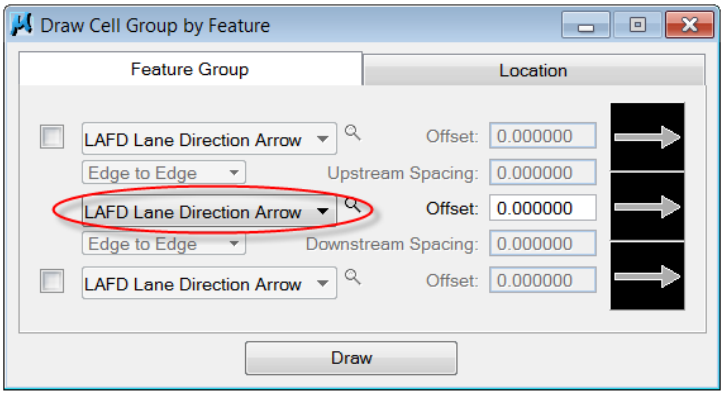
2 . From the Road toolbox, click the **Draw Cell Group by Feature** button.



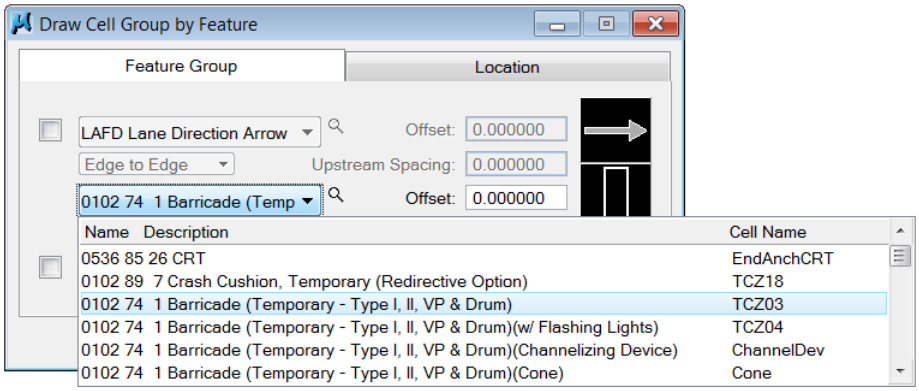

3 . From the *Feature Group* tab, uncheck the **check boxes** on the left as shown below.



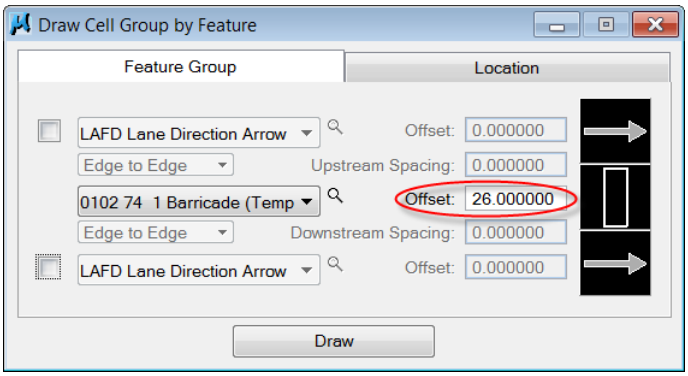

4 . Click the **Feature Group** list item button. .



5 . Select the item **0120 74 1 Barricade (Temporary - Type I, II, VP & Drum)**.

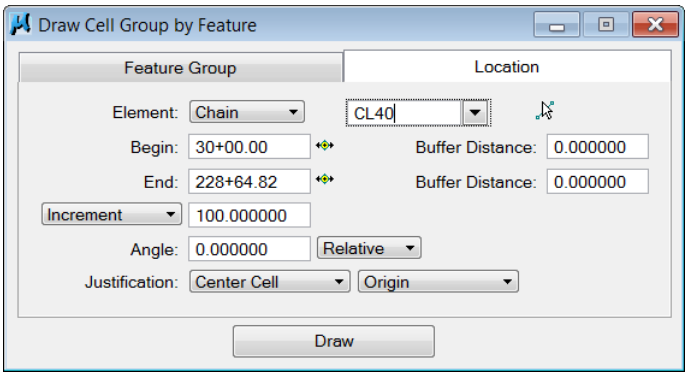



6 . From Draw Cell Group by Feature, type **26.00** in the *Offset* box.




7 . From the *Location* tab, select **Chain** from the *Element* dropdown list. A dialog will pop up to select the gpk file.

8 . At the right of the *Element* list, change the button to **Chain**. From the *Item* list select **CL40** as the *chain name*.




9 . In the *Begin* box, type **108+00.00.**

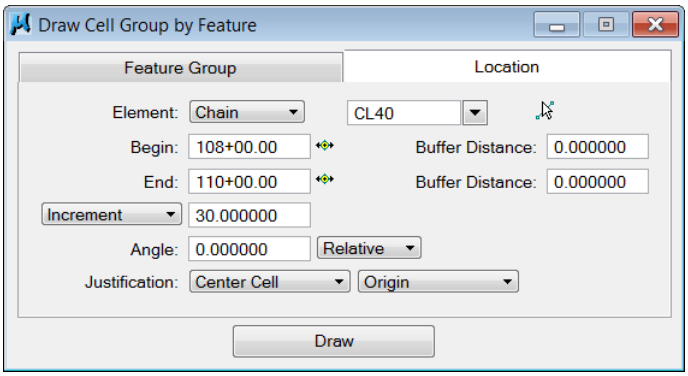
10 .In the *End* box, type **110+00.00**.

*Tip: Alternatively, click the buttons to the right of Begin or End, and then click in the drawing on the corresponding Begin and End Stations to fill these boxes.*

11 .Select **Increment** for the *Spacing* dropdown list and type **30.00** in the box.

12 .In the *Angle* box, type **0.00** degrees and select **Relative** from the dropdown list.

13 . Select **Center Cell** and **Origin** from the *Justification* dropdown lists.




14 .Click the **Draw** button. **Data Point** on the screen to accept the location to place the cells.

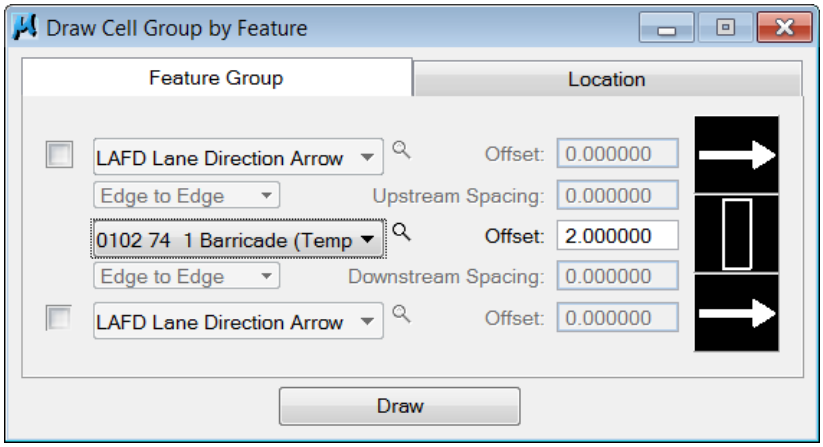
## Exercise 7.3 Drawing Cell Group by Feature (Transition)

For this exercise, you will draw the barricades along the transition.

➢ ***TO DRAW CELL GROUP BY FEATURE (TRANSITION)***

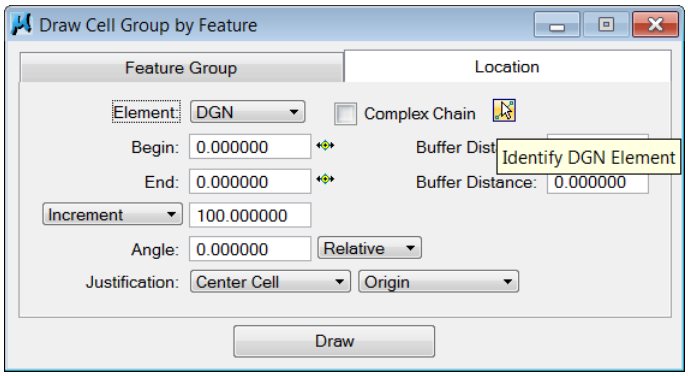
1 . From Draw Cell Group by Feature, select the **Feature Group** tab.

2 . In the *Offset* box, type **2.00**.

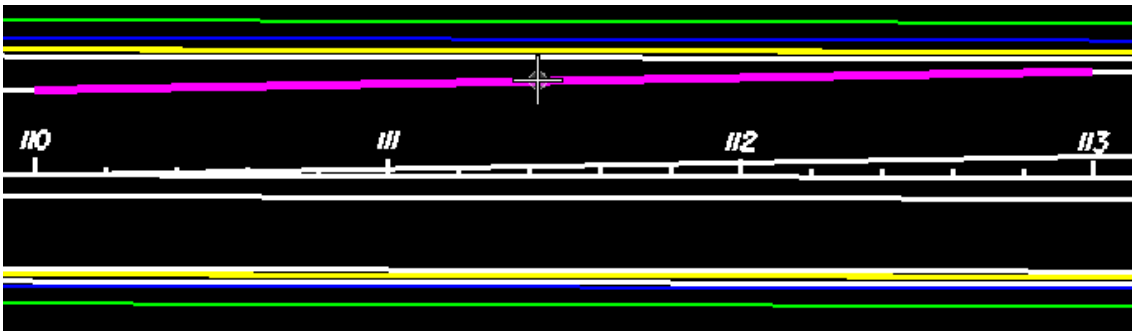



3 . From the *Location* tab, click **DGN** from the **Element** dropdown list.

4 . Click the **Identify DGN Element** button.




5 . In the design file, click the **transition line** and then again to accept.




6 . In the Draw Cell Group by Feature dialog, type **30** in the *Increment* box.

7 . Click the **Draw** button to draw the cells. **Data Point** to the left of the line to accept the direction of placement.

8 . Close the Draw Cell Group by Feature dialog.

# 8 PLAN AND PROFILE SHEETS

## OBJECTIVES

- Learn to create plan and profile sheets using the FDOT .psl file.
- Create Motif Files.

*Plan/Profile Sheet Composition* is the GEOPAK tool used to create Plan, Plan & Profile, or Profile sheets. It provides two methods for the handling of MicroStation reference files. Motif Files are similar to MicroStation seed files, in the sense that Motif Files are design files that contain previously saved design file settings that apply to the newly created sheet files during the clipping process. If there is no need for a motif file, the settings of the clip border file transfer to the newly created sheet files.

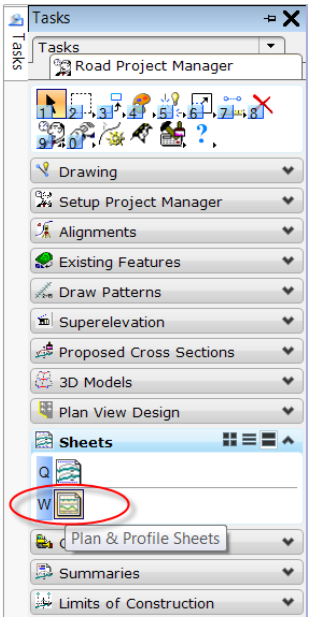
## ACCESSING THE PLAN/PROFILE SHEET COMPOSITION DIALOG BOX

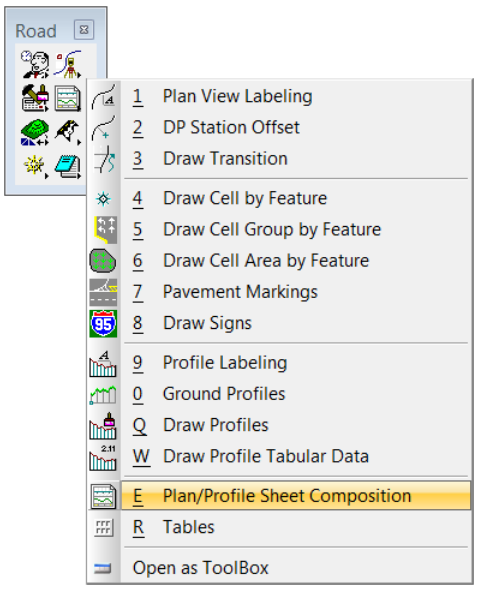
➢ ***TO ACCESS THE PLAN/PROFILE SHEET COMPOSITION TOOL***

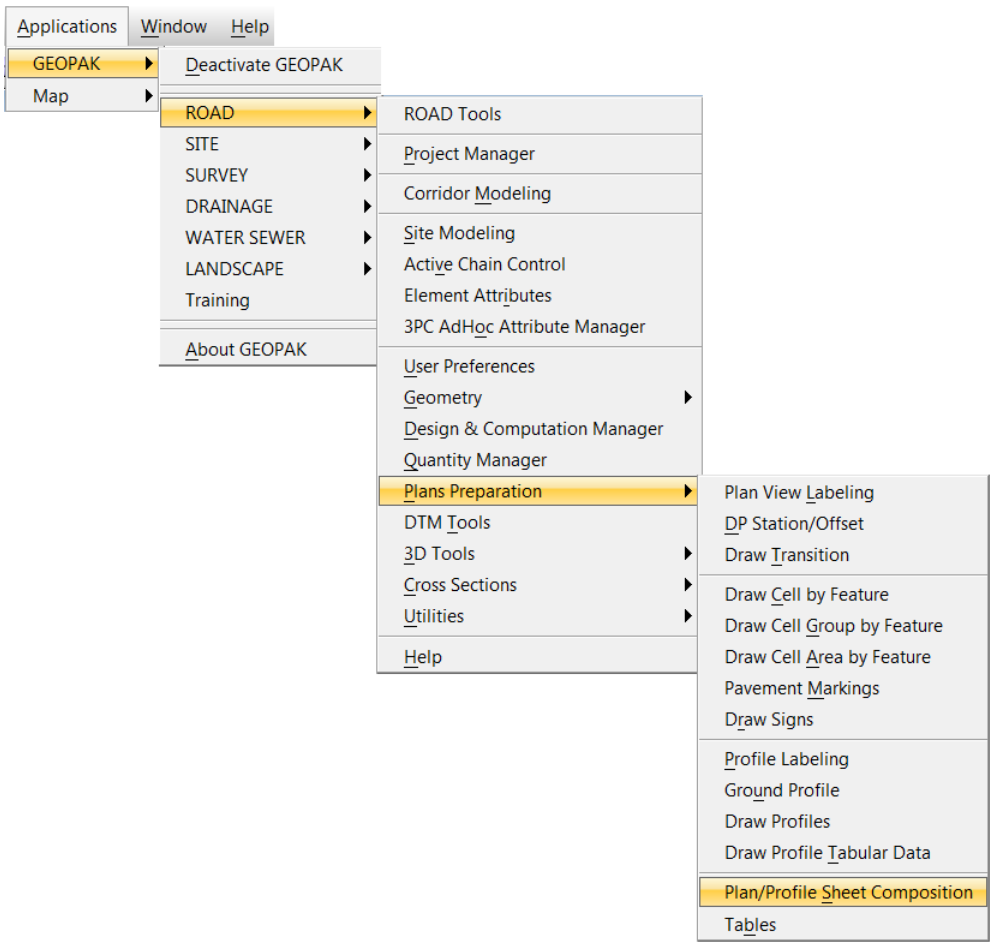
1 . From the *Road* toolbox, click the **Plan/Profile Sheet Composition** tool

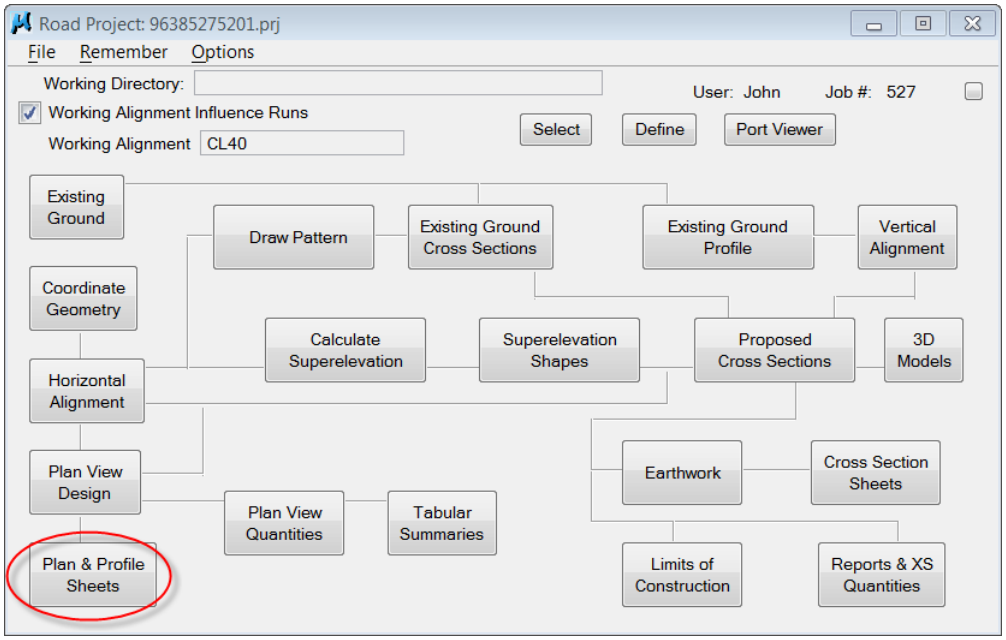
—or— From the MicroStation menu, select A**pplications** > **Road** > **Plans Preparation** > **Plan/Profile Sheet Composition**

—or— From Road Project, click the **Plan/ Profile Sheet Compostion** button.



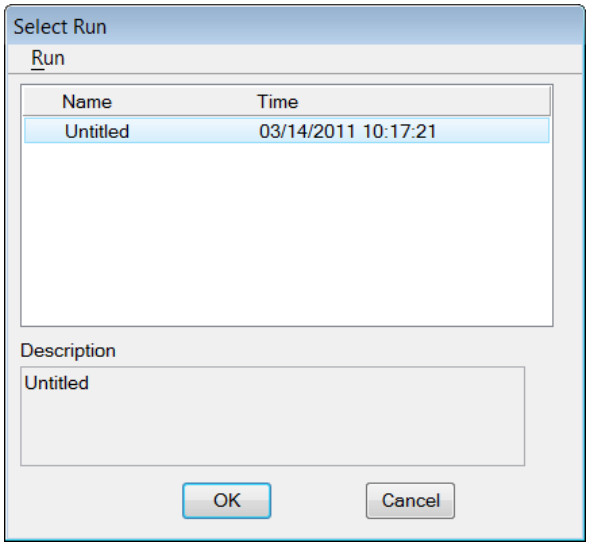




Applications
Window
Help
GEOPAK
Map
Deactivate GEOPAK
ROAD
SITE
SURVEY
DRAINAGE
WATER SEWER
LANDSCAPE
Training
About GEOPAK
ROAD Tools
Project Manager
Corridor Modeling
Site Modeling
Active Chain Control
Element Attributes
3PC AdHoc Attribute Manager
User Preferences
Geometry
Design & Computation Manager
Quantity Manager
Plans Preparation
DTM Tools
3D Tools
Cross Sections
Utilities
Help
Plan View Labeling
DP Station/Offset
Draw Transition
Draw Cell by Feature
Draw Cell Group by Feature
Draw Cell Area by Feature
Pavement Markings
Draw Signs
Profile Labeling
Ground Profile
Draw Profiles
Draw Profile Tabular Data
Plan/Profile Sheet Composition
Tables


Road Project: 96385275201.prj
File
Remember
Options
Working Directory:
User: John
Job #: 527
Working Alignment Influence Runs
Working Alignment
CL40
Select
Define
Port Viewer
Existing Ground
Draw Pattern
Existing Ground Cross Sections
Existing Ground Profile
Vertical Alignment
Coordinate Geometry
Calculate Superelevation
Superelevation Shapes
Proposed Cross Sections
3D Models
Horizontal Alignment
Plan View Design
Earthwork
Cross Section Sheets
Plan View Quantities
Tabular Summaries
Plan & Profile Sheets
Limits of Construction
Reports & XS Quantities

2. In Select Run, create a new run and click the **OK** button. Plan Sheet Layout opens.

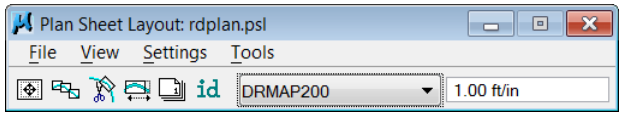
*Tip: Always create a Run based on the type and scale of sheets clipped, in case it is necessary to re-clip the sheets.*



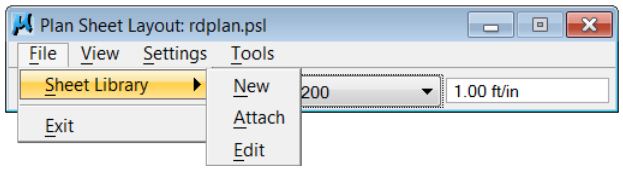

## GEOPAK SHEET LAYOUT OVERVIEW

The *Sheet Layout* tool uses the concept of ports to define the areas to display. A port is a window into the design. There are three types of ports: Plan, Profile, and Tabular Data. The Sheet Layout tool supports any combination of these three ports.

For example, users can double stack plan ports to accommodate Traffic Control plans where there is no profile. The **Sheet Layout** tool allows the automatic placement of borders used to define the boundaries of sheets along a GEOPAK alignment.




### FILE MENU



### ➢ *TO ATTACH A DIFFERENT SHEET LIBRARY*

From the Plan Sheet Layout menu, select *File* > *Sheet Library* > *Attach*. Attach Sheet Library opens.

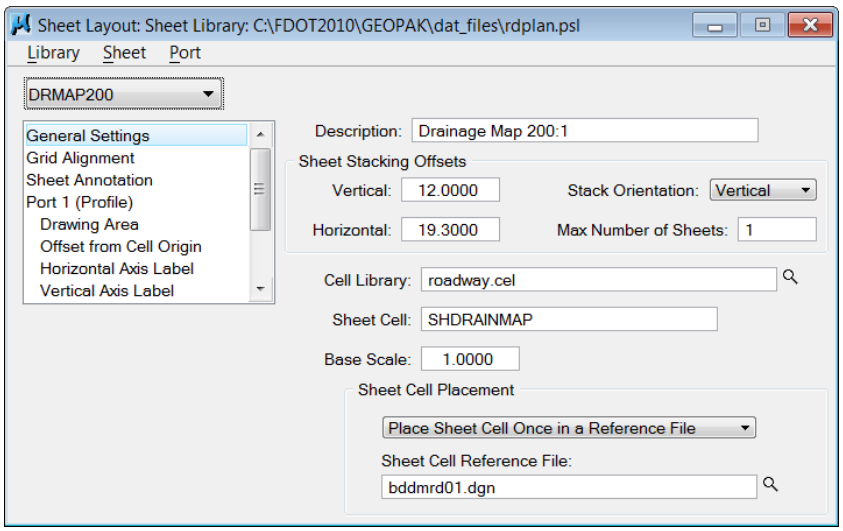
FDOT delivers Sheet Libraries with the FDOT2010 software. The Sheet Libraries are located in the directory *FDOT2010\geopak\dat_files*. When changes are necessary, FDOT recommends storing a copy of the delivered Sheet Library in the project directory under the *symb* folder.

Find detailed information on the set-up of the Sheet Library in the online help section entitled "Sheet Library Set-up."

### ➢ *TO REVIEW OR MAKE CHANGES TO THE SHEET LIBRARY*

To review or make changes to the Sheet Library, select the Plan Sheet Layout menu option **File** > **Sheet Library** > **Edit**. Sheet Layout: Sheet Library opens.

The Sheet Library defines the parameters for each project sheet. In order to layout, or clip, sheets, the user must attach a Sheet Library to the current session. The name of the currently attached Sheet Library displays in the title bar and has an extension of .psl. A number of different sheets can be stored within one library.

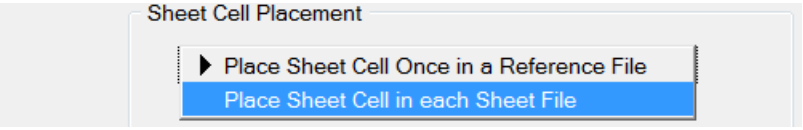



**Cell Library** Currently attached cell library.

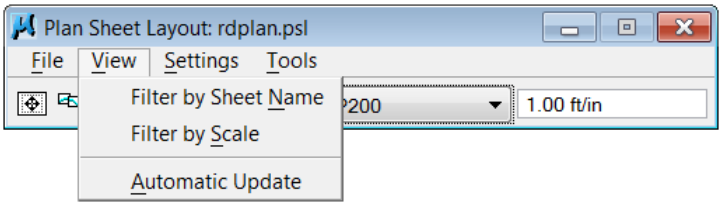
**Sheet Cell** This is a required sheet cell entry from attached cell library.

**Sheet Cell Placement** A user preference defining how to handle the sheet border, either placed in each sheet or placed in a reference file.

> ***Note*** FDOT provides standard sheet border files, BD*.dgn, depending on the type of sheet to be clipped.



## VIEW MENU

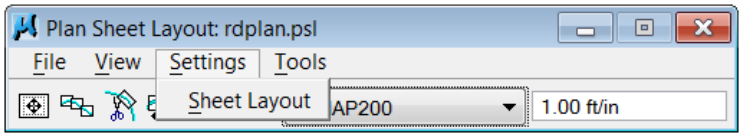



**Filter by Sheet Name** The clipping shapes of the currently selected sheet name will display. Use MicroStation update view, if Automatic Update is set to off.

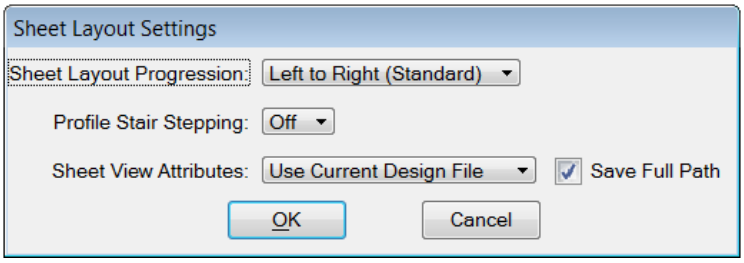
**Filter by Scale** The clipping shapes of the currently selected scale will display. One must use MicroStation update view, if Automatic Update setting is off.

**Automatic Update** When the Automatic Update setting is on and the Filter by Sheet Name or Filter by Scale selected, the view is automatically updated.

### Settings Menu




**Sheet Layout** Option to open the Sheet Layout Settings dialog.



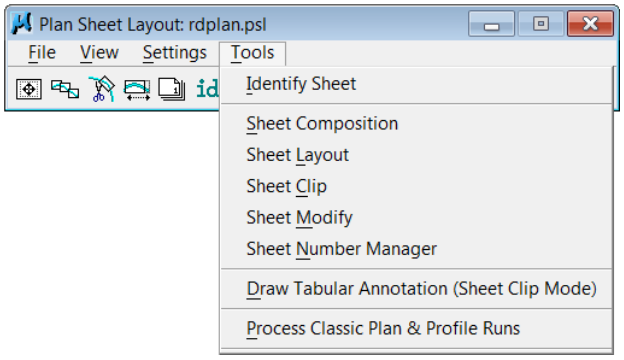

*Sheet Layout Progression* Includes two options, Left to Right (Standard) and Right to Left (Rail)

*Profile Stair Stepping* Select *On* if to stair step the profile in areas of great relief. If not, select *Off*.

*Sheet View Attributes* Two options described below:

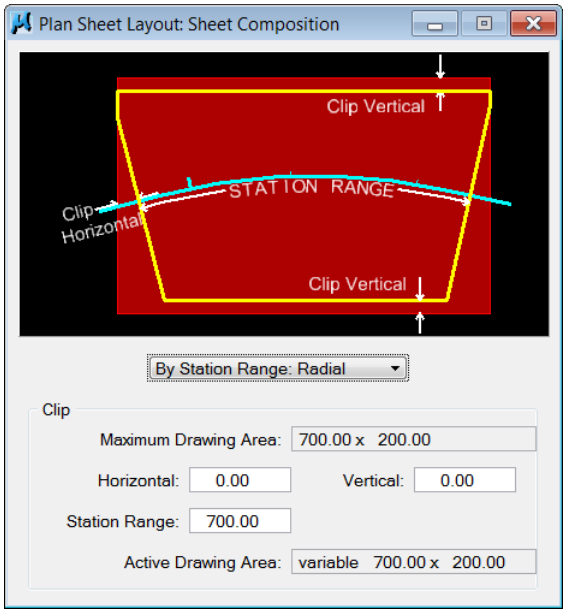
- Use Current Design File The reference files, attached to the completed plan and profile sheets, read from the current design file when the clipping sheets and uses the level symbology from the active file for each clipped sheet. The active design file attaches to each port in the clipped sheets as a reference file.
- Customize with Motif Files The motif file determines which files to attach, not the active design file, including reference level structure. The Motif file is a MicroStation design file the user creates.

## TOOLS MENU

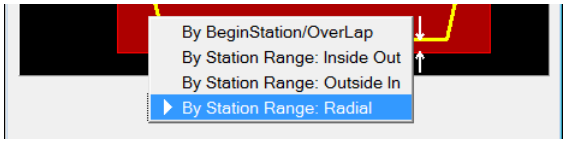



**Identify Sheet** Select a previously placed clipping boundary or border. GEOPAK determines the settings to use to place the original boundary or border and automatically populates the Plan Sheet Layout with the Sheet Name and Scale. In addition, the Sheet Name, Scale, Sheet Number and Port display in the MicroStation status bar.

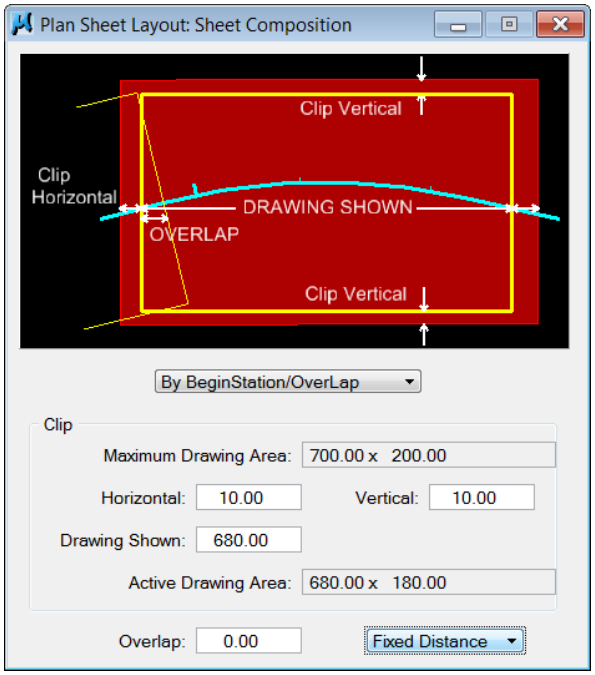
**Sheet Composition** Opens Plan Sheet Layout: Sheet Composition, wherein defines drawing area, overlapping options and other project specific variables. Sheet boundaries draw into the file using an alignment chain from COGO. Curves use the chord for any optional offsets defined. The graphic in the dialog box depicts the required variables defined in the Clip portion of the dialog.



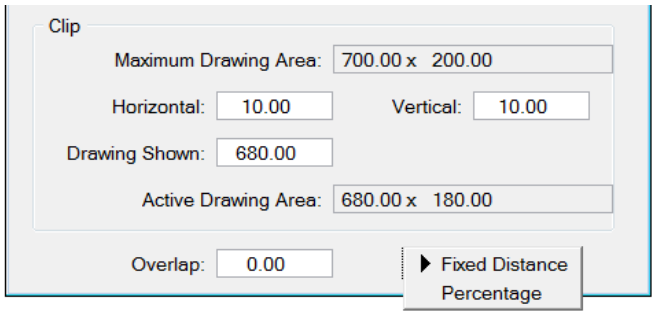

*Clipping Modes* There are four options for calculating how the sheet boundaries or borders are calculated and drawn.




*By Begin Station/Overlap* Mode that calculates the clipping area to include an overlap between the sheets.



- Maximum Drawing Area  Calculated by GEOPAK based on the **Sheet Name** library settings and the **Scale** selected in Plan Sheet Layout. In our example, the **Maximum Drawing Area** is 700.00 x 200.
- Horizontal  Computation subtracts twice, once for the right side and once for the left side. In this case, the calculation is 700.00 - 10 - 10 = 680.00, as shown in the *Drawing Shown* box and the *Active Drawing Area*.
- Vertical  Computation subtracts twice, once for the top and once for the bottom. In this case, the calculation is 200.00- 10 - 10 = 180.00, as shown in the *Active Drawing Area*.
- Drawing Shown  This is the distance along the alignment, shown on the plan sheet.
- Overlap  *Fixed Distance* option, the value is in master units, i.e., feet or meters. *Percentage* option, type the desired overlap in percent format in the *Overlap* box. The two options are shown below:

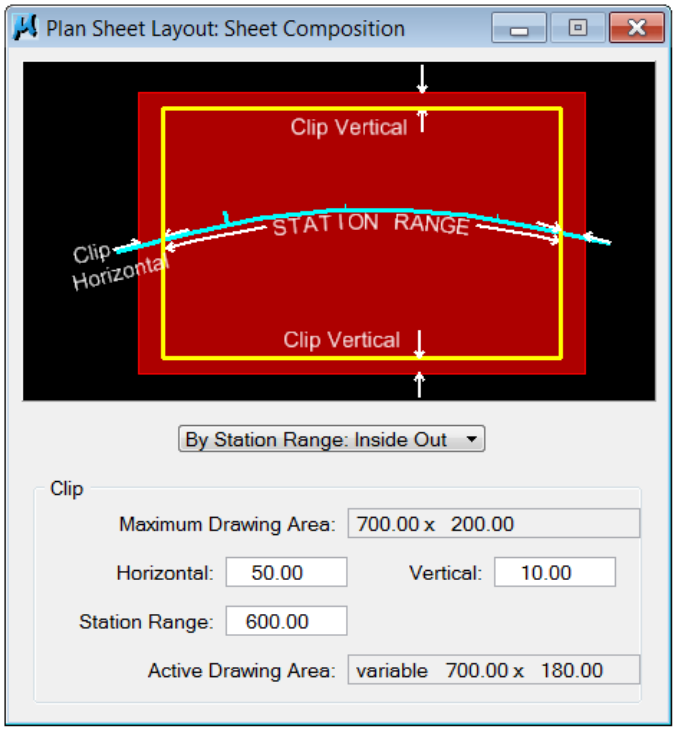



***Note*** The percent sign (%) is not required. The Percentage will calculate utilizing the Drawing Shown value. When placing sheets on a curve, the sheet orientation utilizes the intersection of the chord of the curve and the inside border.

Since the *By BeginStation/Overlap* option uses a chord distance to compute the length of the sheet, in the area of a curve more stationing is covered. On a Plan/Profile sheet, using this option means that unequal coverage occurs between the Plan and Profile. With this in mind, use *By Begin Station/Overlap* option for a *Plan only* case.

*By Station Range Inside Out* Orients sheets between rounded station intervals. One enters the interval in the *Station Range* box.

> ***Note*** The Station Range is a factor of the Clipping Scale. Look in the PPM, Volume 2, Chapter 10, for the values used. These values are filled in based on the scale entered, but may need to be adjusted to fix areas in sharp curves where portions of the design files are missed.

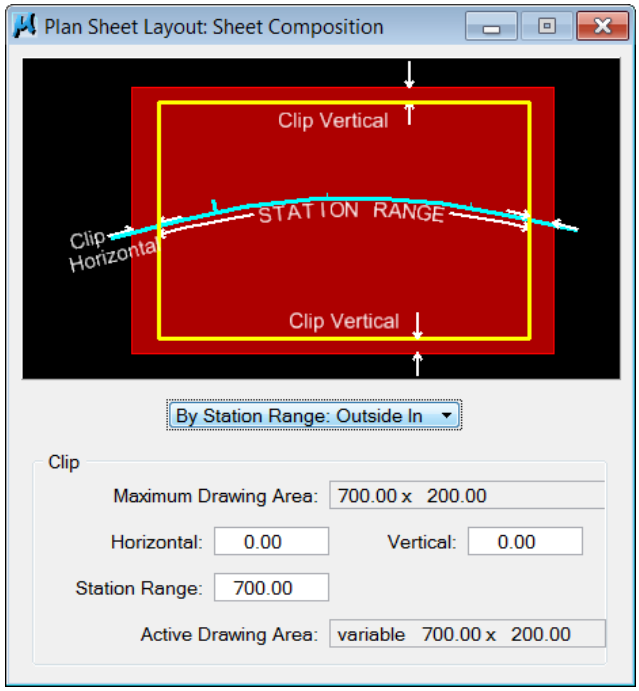



When computing a sheet length with a constant station range, the resultant sheet length varies when sheets place along a curve.

Now the *Active Drawing Area* is not constant, but displays *variable* in the output field. For each sheet, the length computes for all that are corresponding to station coverage of 600. The length increases by two times the horizontal value. Therefore, along a tangent section, the sheet length is 600 + (2 x 50) = 700.

Along a curve, the sheet length is shorter. Each sheet is individually constructed based on the *Horizontal*, *Vertical* and required sheet length to cover the desired station range.

*By Station Range: Outside In* Orients sheets between a rounded station interval. One enters the interval in the *Station Range* box.



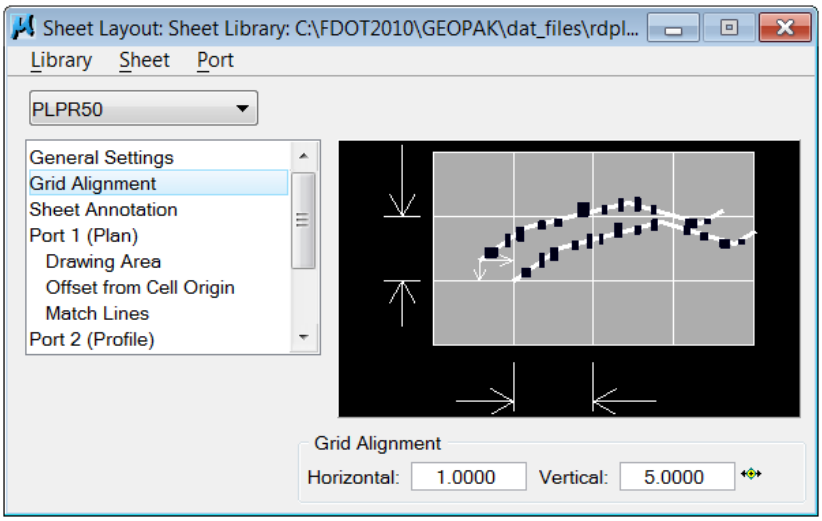

The difference between *Outside In* and *Inside Out* is in the usage of *Horizontal***.** For the Inside Out mode, the horizontal distance expands the lateral dimension of the clipping shape. For the *Outside In* option, the *Horizontal* distance trims the *Station Range* instead. The *Maximum Drawing Area***,** *Horizontal* and *Station Range* are inter-related.

In the preceding figure, Maximum Drawing Area: 700.00 x 270.00.

To trim the *Station Range* by 20.00 feet, type the value *10.00* in the *Horizontal* box. GEOPAK then re-calculates the *Drawing Area.*

*Station Range* = 700.00 – (2 x 10.00) = 680.00

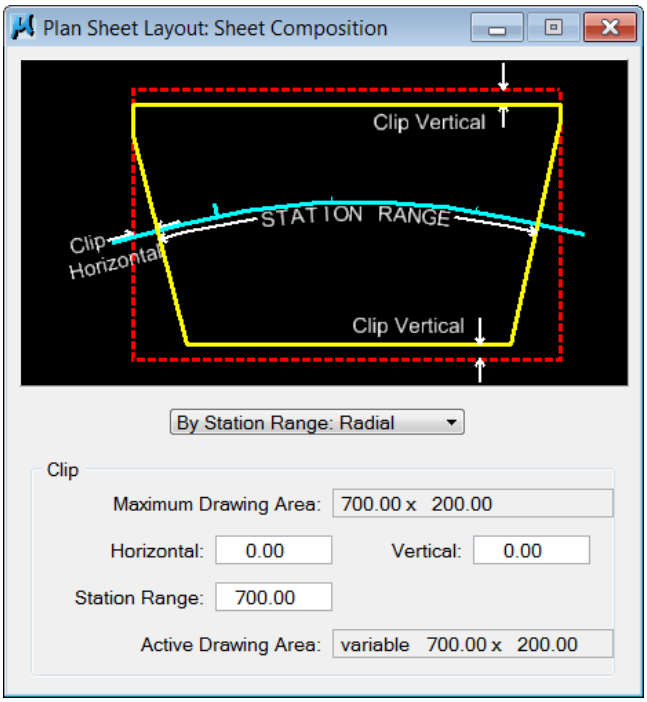
However, the *Horizontal* value must be an integer (based on the *Grid Alignment* value in the GEOPAK Sheet Layout: Sheet Library). Therefore, the *Horizontal* value needs to round to the nearest integer and the *Station Range* adjusted accordingly.




If the **Grid Alignment** values are set to 0, no adjustment occurs. The preceding figure shows the **Horizontal** value set to **1.0**.

Clipping shapes computed with the **Outside In** option never overlap along tangent sections, but do have slight overlap (or gaps) on the top and bottom of the sheets along curves due to the wedging effect.

*By Station Range: Radial* Option identical to the **Outside In** option, except the resultant clipping shapes are not rectangular. Instead, the **Vertical** edges are oriented perpendicular to the alignment, which results in rectangular shapes along tangent sections and more of a trapezoidal shape along curved sections.



As shown in the preceding figure:

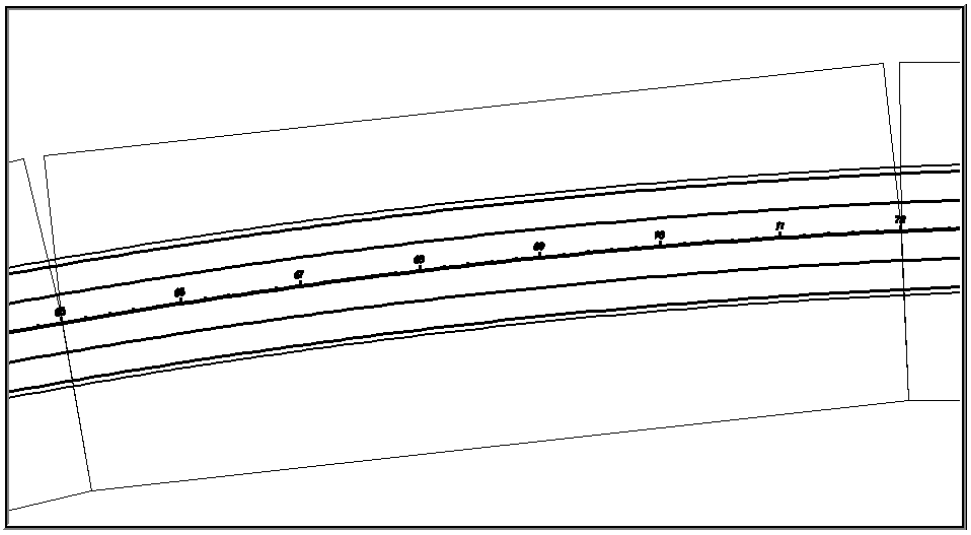
- **Maximum Drawing Area** = 700 x 200
- **Horizontal** = 0.00
- **Station Range** = 700.00 – 0.00 = 700.00

If, instead a **Station Range** of 600.00 is entered, the **Horizontal** value is readjusted to

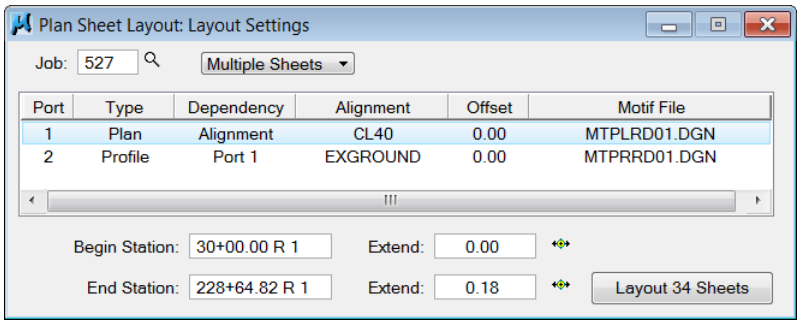
- **Horizontal** = (700.00 – 600)/2 = 50.00

When the clipped sheets lay out, a rectangular area equivalent to the *Maximum Drawing Area* (700.00) will construct. Then radial lines at the match lines compute and the region of the maximum drawing extents, within the radial station lines, compute, forming the finished clipping shape.

The clipping shapes constructed with this mode never overlap. However, take care in computing the maximum drawing area in that gaps do not result on the outside of curves, referred to as the pie shaped wedges as shown below. To fix this condition, decrease the *Station Range* until the wedges disappear.



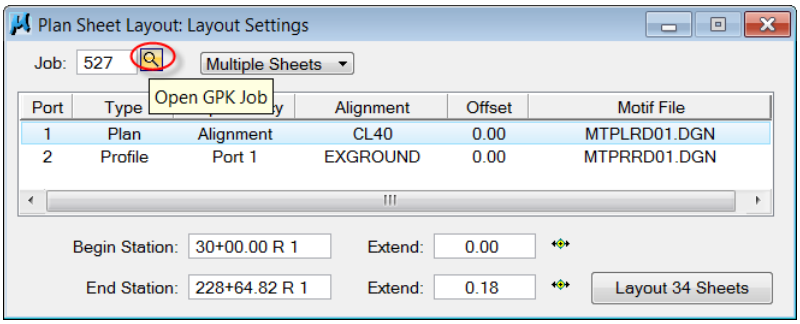
**Sheet Layout** This menu option opens the Plan Sheet Layout: Layout Settings dialog and used to define the GEOPAK Job Number, alignments, and/or profiles for the desired sheets.



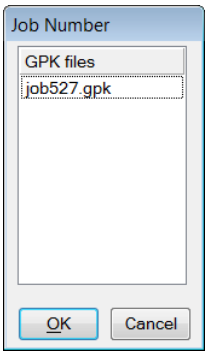

Used to place clip borders in the current design file along a GEOPAK alignment specified by the user. This requires defining a GEOPAK COGO database job file.

### ➢ *TO SELECT A GEOPAK JOB (.GPK FILE) AND LAYOUT SHEETS*

1. From Plan Sheet Layout: Layout Settings, click the **Open GPK Job** button beside the Job box. Job Number opens.




2. From Job Number, click the **.gpk** file number that will be used to layout the sheets.
3. Click the **Ok** button. The Job Number selects and Job Number closes.




4. From Plan Sheet Layout: Layout Settings, select the **Single Sheet** or **Multiple Sheets** option.

> ***Note*** The large list box in the middle of Plan Sheet Layout: Layout Settings displays the Port information.

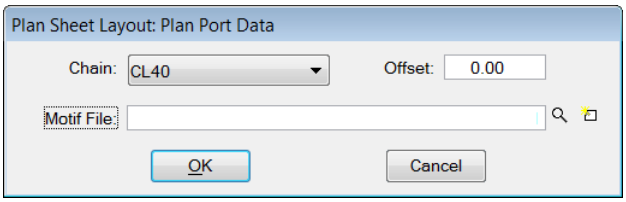
5 . Double-click one of the ports displayed in list. Plan Sheet Layout: Plan Port Data opens.

6 . From Plan Sheet Layout: Plan Port Data, select a chain from the *Chain* list.

7 . In the *Offset* box, type an **offset** from the chain.

8 . In the *Motif File* box, type in the **name** of the motif file or browse to select or create the file.

> ***Note*** The default settings are to use the active design file settings.




9 . Click the **OK** button to save the settings and dismiss the dialog.

10 .(Optional) If the sheet has more than one port, then steps 4 through 8 repeat for each port.

11 .From Plan Sheet Layout: Layout Settings, Enter the **Begin Station**

--or-- click the **Select Begin Station** button at the right, then click in the design file to graphically select the station.

12 .Enter the **End Station**

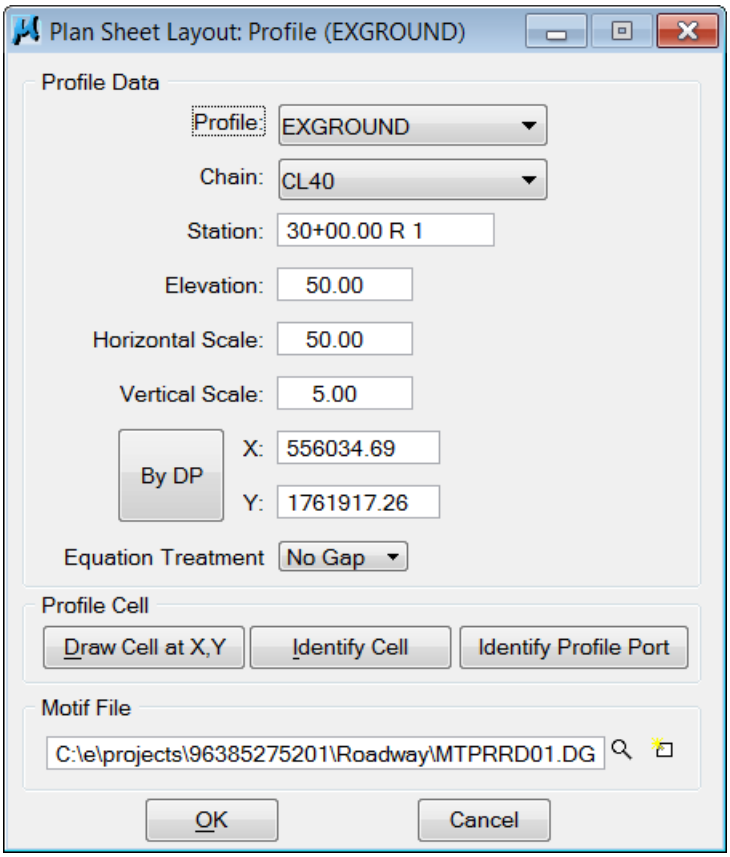
--or-- click the **Select End Station** button at the right, then click in the design file to graphically select the station.

13 .If the sheet laid out has more than one port, repeat the steps to define the required ports.

14 .To lay out the borders, click the **Layout Sheet** button.

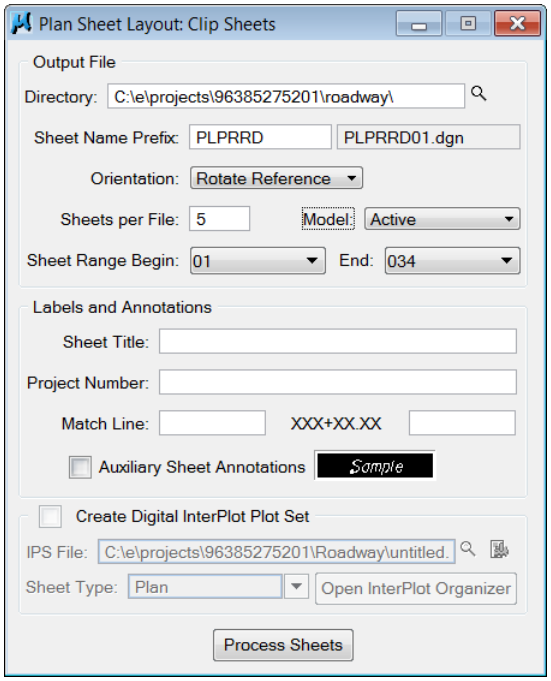
***Note*** If placing multiple sheets, the number of sheets placed displays on the button.

***Important:*** There may be times that require laying out the clip borders again, because of intersections or alignment changes. Delete the original clip boundaries, and then compress the MicroStation design file before running layout a second time.




***Important:*** Reference the Profile design file to the clipping file in order for the profile cell to be recognized.

**Sheet Clip** Option to open Sheet Layout: Clip Sheets dialog and used to clip sheet borders out to sheet files. The dialog box has three sections, as shown below: Output File, Labels and Annotations, and Create Digital InterPlot Plot Set. FDOT does not support InterPlot.




*Output File* Settings define where and how to create the sheet files.

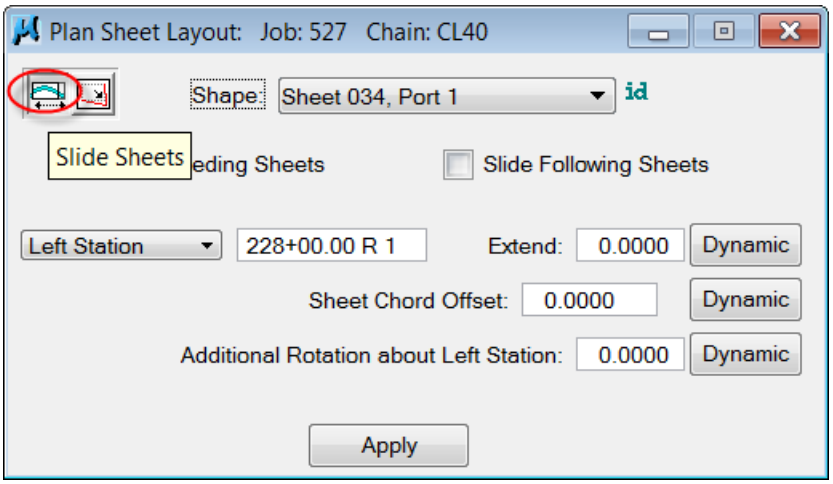
- o <u>Directory</u> Sets the path where to create the new sheet files.
- o <u>Sheet Name Prefix</u> File name to use to create new sheet files. Type only the first part of the file name; the software supplies a numerical suffix that corresponds with the sheet number. For example, if "**plprrd"** is entered as the prefix, as the sheets are clipped the files are named plprrd1.dgn, plprrd2.dgn, etc.
- o <u>Orientation</u> *Rotate Referenc***e** option rotates all of the references files attached to the clipped sheets. Use only if you want to stack sheets in one file. *Rotate View* option rotates the MicroStation view.
- o <u>Sheets per File</u> Sets the number of sheets to place in a file before creating another sheet file. Note: FDOT does not recommend placing more than 10 sheets per file.
- o <u>Sheet Range Begin/End</u> Select the range of sheets created from the clip borders.

*Labels and Annotations* Defines labels placed on the sheets. The sheet library defines the placement of the labels. If not defined in the sheet library, the option will not be available and ghosted out.

- Sheet Title Title drawn on the sheets.
- Project Number Project number drawn on the sheets.
- Match Line Text added with the station value on match lines.
- Auxiliary Sheet Annotations Plots additional sheet information into the clipped sheets if selected. The additional information is Sheet Number, Rotation Angle and Chain Name. This is an optional setting.
- Process Sheets Starts the clipping process. During this process, new design files create and the sheets clip according to the clip border boundaries. When the clipping process finishes, MicroStation goes back into the clipping file not the clipped sheet.

*Create Digital InterPlot Plot Set* Allows the creation of the Digital InterPlot Plot Set during the Layout Sheets process.

**Sheet Modify** This command opens Plan Sheet Layout: Modify, which operates in two modes, Slide Sheets or Modify Drawing Area, represented by the two buttons in the upper left corner. The figure below shows the Slide Sheets mode.



*Slide Sheets* Used to move the clip borders along the alignment. For example, the sheets shift so that an intersection displays all on one sheets instead of broken up onto two sheets.

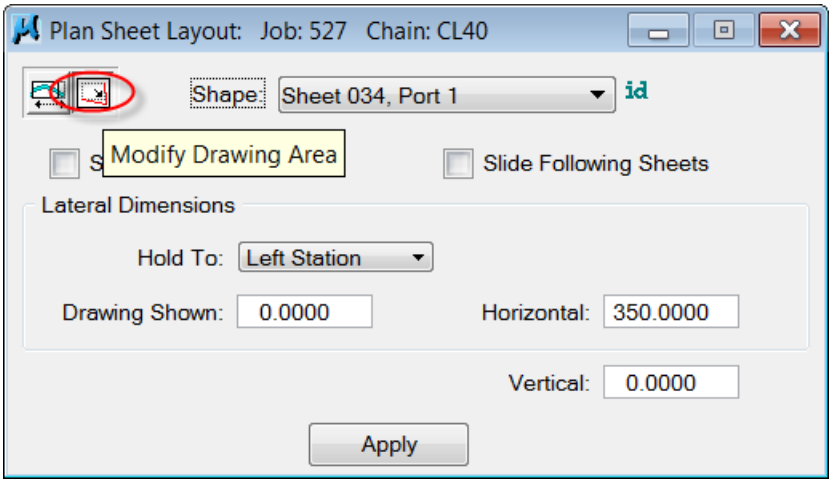
- Shape Identifies the active clip boundary modified.
- Id Selects the boundary from the MicroStation element and sets it to the active Shape.
- Slide Preceding Sheets Makes the preceding sheets slide along with the current sheet if selected.
- Slide Following Sheets Makes the following sheets slide along with the current sheet if selected.
- Station Defines the location of the displayed station:

*Left Edge Station, Center Station or Right Edge Station*. To move the boundary along the alignment to the new station type a new station value into the station display box.

These options refer to the portion of the clip border that is located at that station:

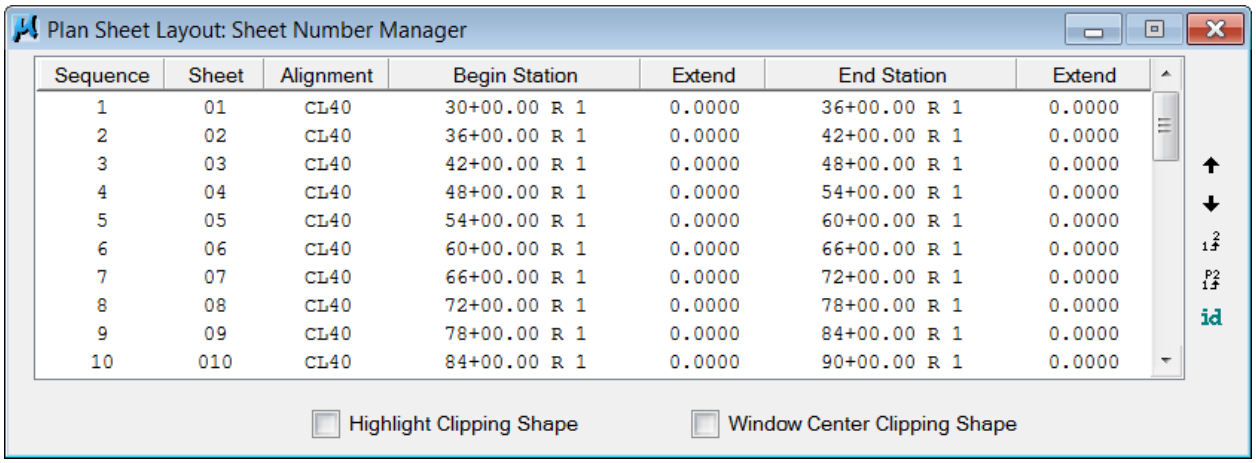
- Extend Value In master units, used to move the boundary along the alignment.
- Sheet Chord Offset Allows the movement of the sheet parallel to the alignment in either direction for a given distance.
- Additional Rotation This angle is a measurement from the left station and is in reference to the alignment.
- Dynamic This button performs Extend, Sheet Chord Offset, or Additional Rotation about Left Station dynamically.
- Apply Processes the change.

*Modify Drawing Area* Changes the composition of the borders. An example of when this tool is used is if a sheet needs to show less than the standard 700 feet of coverage. Set the **Drawing Shown** value to 500 and the sheet clip boundary adjusts to that value.




- Lateral Dimensions
  - ***Hold To*** Maintains the position of the sheet Left Station, Center Station, or Right Station and adjusts in other directions.
  - ***Drawing Shown*** Value for the total length of drawing shown on the sheet.
  - ***Horizontal*** This is the value to extend the sheet horizontally.
- Vertical This is the value to extend the sheet vertically.
- Apply Processes the changes.

**Sheet Number Manager** The user utilizes the *Sheet Number Manager* tool to adjust the sheet numbering and sequencing. The list box contains sheets to clip. In the case of dual clip borders for a single sheet, i.e. Plan/Profile sheets, the borders group together and only list once in this window.




| Sequence | Sheet | Alignment | Begin Station | Extend | End Station | Extend |
|---|---|---|---|---|---|---|
| 1 | 01 | CL40 | 30+00.00 R 1 | 0.0000 | 36+00.00 R 1 | 0.0000 |
| 2 | 02 | CL40 | 36+00.00 R 1 | 0.0000 | 42+00.00 R 1 | 0.0000 |
| 3 | 03 | CL40 | 42+00.00 R 1 | 0.0000 | 48+00.00 R 1 | 0.0000 |
| 4 | 04 | CL40 | 48+00.00 R 1 | 0.0000 | 54+00.00 R 1 | 0.0000 |
| 5 | 05 | CL40 | 54+00.00 R 1 | 0.0000 | 60+00.00 R 1 | 0.0000 |
| 6 | 06 | CL40 | 60+00.00 R 1 | 0.0000 | 66+00.00 R 1 | 0.0000 |
| 7 | 07 | CL40 | 66+00.00 R 1 | 0.0000 | 72+00.00 R 1 | 0.0000 |
| 8 | 08 | CL40 | 72+00.00 R 1 | 0.0000 | 78+00.00 R 1 | 0.0000 |
| 9 | 09 | CL40 | 78+00.00 R 1 | 0.0000 | 84+00.00 R 1 | 0.0000 |
| 10 | 010 | CL40 | 84+00.00 R 1 | 0.0000 | 90+00.00 R 1 | 0.0000 |

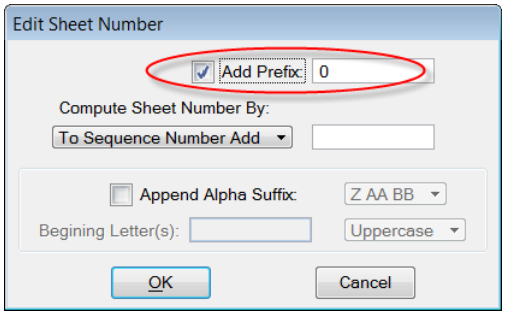
*Move Sheet Up* Moves a selected sheet up in the order. This is useful if placing a sheet using the *Place Single Sheet* option and others using the *Place Multiple Sheets* option. Reorganizing sheets can be before clipping them to the *plprrd.dgn* file.

*Move Sheet Down* Select a sheet and then click this button to move the sheet down in the order.

*Edit Sequence Number* Opens Edit Sequence Number used to edit the sequence number of the drawing.

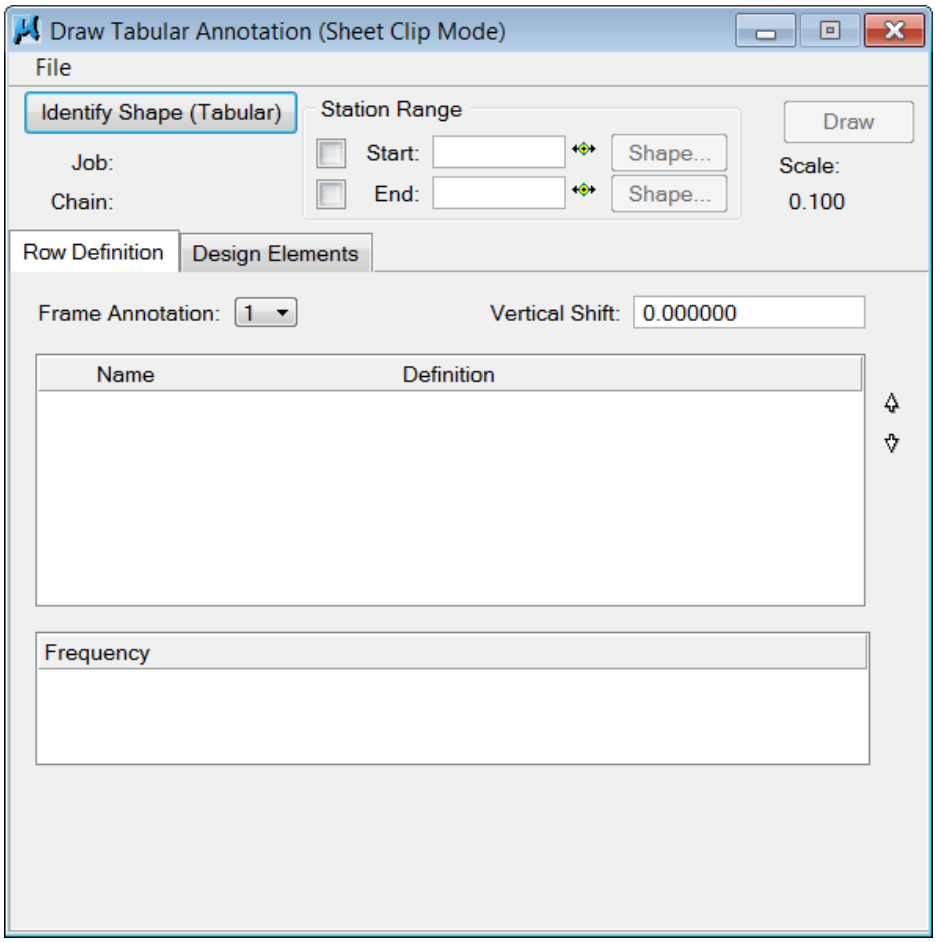
*Edit Sheet Number* Opens Edit Sheet Number used to modify the sheet number, add prefix and suffix, and perform other labeling options.

The actual sheet file name is set during the clipping process. For example, use this tool to number the sheets prior to clipping by adding the sheet number prefix to each sheet, i.e., *Plprrd01.dgn* where **0** is the prefix, as shown below. When clipping the sheet, the *Plprrd* comes from Clip Sheets and the Sheet Number Manager tool adds the prefix.



*Identify Sheet* Selects a sheet graphically to modify. Select the *Highlight Clipping Shape* check box or *Window Center Clipping Shape* for highlighting or centering selected sheets in your MicroStation window.

**Draw Tabular Annotation (Sheet Clip Mode)** Setting the Port Type to Tabular utilizes the Draw Tabular Annotation (Sheet Clip Mode) tool. The tool defines the clipping shape to include the tabular data on the sheets.



## GEOPAK SHEET LAYOUT BUTTONS

These buttons open the same tools discussed and detailed earlier in this chapter.

Sheet Composition **(Tools > Sheet Composition).**

Layout Sheets **(Tools > Sheet Layout).**

Clip Sheets (**Tools > Sheet Clip).**

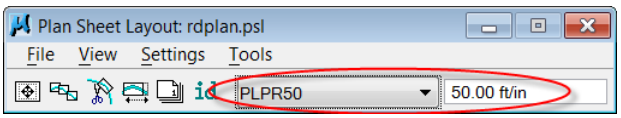
Modify Sheets (**Tools > Sheet Modify).**

Sheet Number Manager (**Tools > Sheet Number Manager).**

Identify Sheet **(Tools > Identify Sheet).**

## SHEET NAME SELECTOR AND PLOT SCALE

Plan Sheet Layout has two global parameters: *Sheet Name Selector* and *Plot Scale*.




**Sheet Name Selector** Drop-down list displays all sheets in the currently attached Sheet Library.

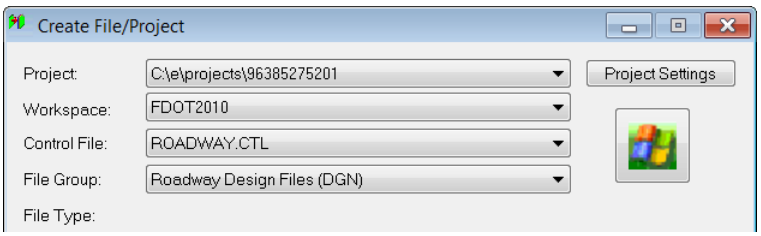
**Plot Scale** Sets the scale for placing sheets in the layout file.

## Exercise 8.1 Creating Motif Files

In this exercise, the user creates the Plan and Profile Motif design files and attaches references to clip with the sheet sheets.

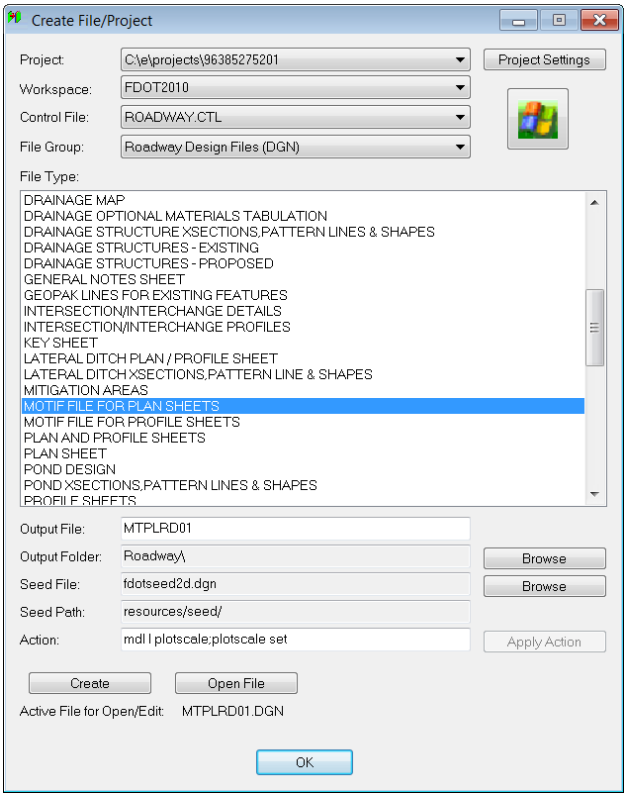
➢ ***TO CREATE MOTIF FILES***

1. Run the executable file **C:\Chapter8_Ex8_1.exe** to extract the project files for this exercise.
2. Open **DSGNRD01.dgn** in **C:\e\projects\96385275201\roadway**.
3. Select the FDOT Menu option **Actions** > **Create/Edit File**. Create File/Project opens.
4. Verify that the Project and Control File are set as shown below.



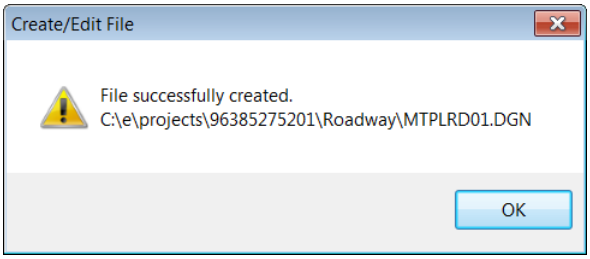

5. In the File Group field, click the down arrow and select **Roadway Design Files (DGN)**.

| | |
|---|---|
| ***Note*** | Output Folder, Seed File, and Seed Path are automatically set when setting the File Group field. |



6 . Under *File Type*, select **MOTIF FILE FOR PLAN SHEETS**. The file name **MTPLRD01** appears in the *Output File* box.

7 . Click the **Create** button. Create/Edit File information box opens.



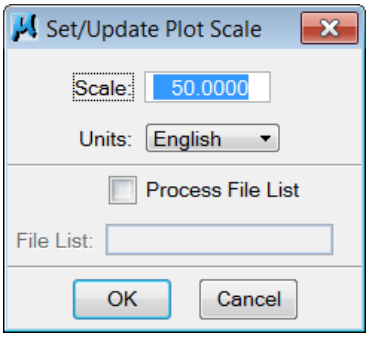

8 . From Create/Edit File, click **OK** to close and the **Open DGN** button becomes available.

***Note*** The file name entered in the Output File box increments to **MTPLRD02**.

9 . Click the **Open DGN** button. The file **MTPLRD01**.dgn opens.

10 .Click the **OK** to close Create File/Project.

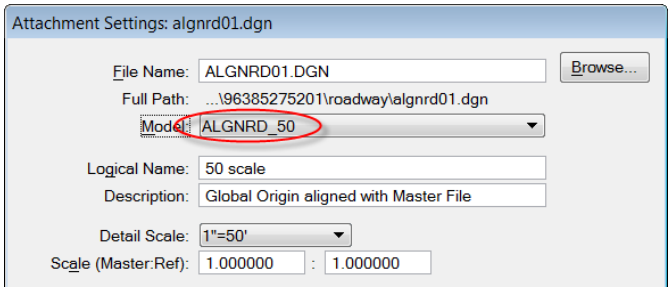
11 .Set/Update Plot Scale automatically opens. Set the *Plot Scale* to **50**.




12 .Click **OK**. The plot scale of the file is set and Set/Update Plot Scale closes.

13 .Attach the following **Reference Files** for the Plan View:

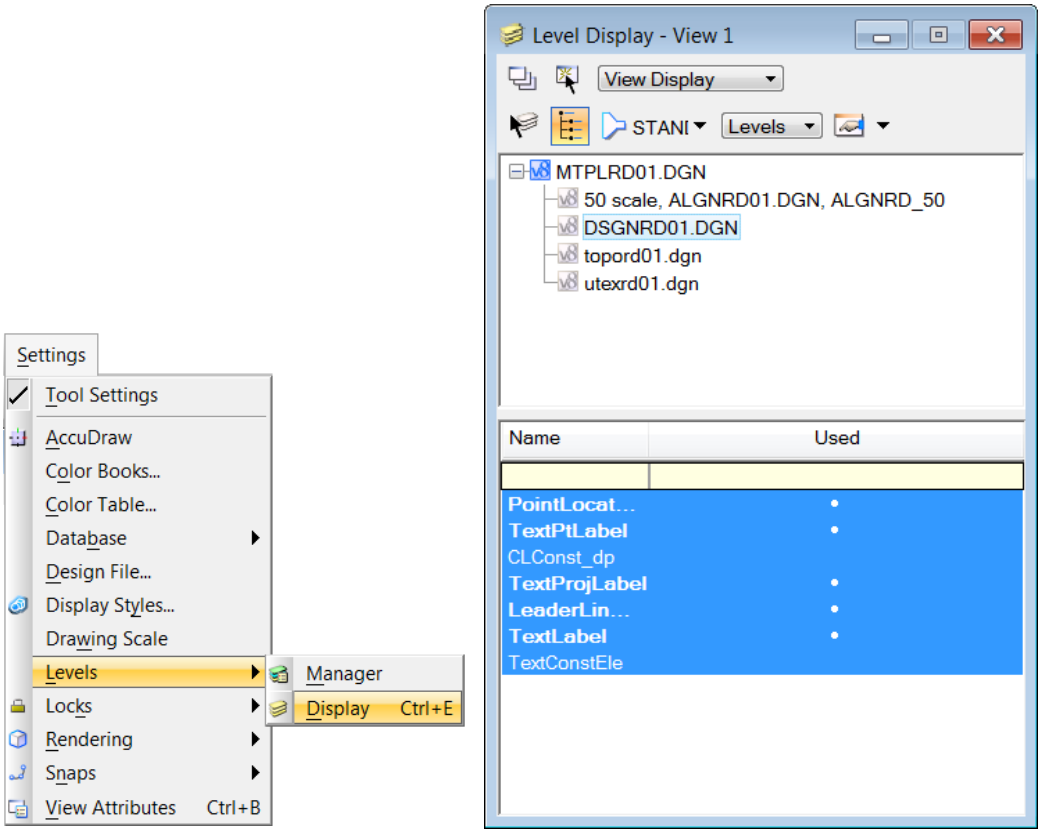
- **C:\e\projects\96385275201\roadway\ALGNRD01.dgn;model ALGNRD_50**




- **C:\e\projects\96385275201\roadway\DSGNRD01.dgn**
- **C:\e\projects\96385275201\survey\TOPORD01.dgn**
- **C:\e\projects\96385275201\survey\UTEXRD01.dgn**

***Note*** If no raster images are included, turn off the Display Raster References option.

14 .Select from **MicroStation, Settings** > **Levels** > **Display**. The Level Display dialog appears.




15 .Set the level structure for each reference file as shown below:

- <u>Dsgnrd01</u> – Turn Off Level: PointLocator_ep.
- <u>Topord01</u> – Turn Off Levels:
  - BLSurveyField_ep
  - BLSurveySymbl_ep
  - Default
  - Pavemk_ep
  - PavtCrown_ep
  - SignalMisc_ep
  - SignSupport_ep
  - Slopes_ep
  - TextBLStation
  - TextMisc
  - TopoMisc_ep
  - Tower_ep

- Utexrd01 – Turn Off Levels:
  - Default
  - LeaderLine_dp
  - SignalMisc_ep
  - SignalSupport_ep
  - SignSingle_ep
  - Slopes_ep
  - TextMisc
  - Trash_ep

16 .In MicroStation, **Fit View**, and then select the menu option **File** > **Save Settings**.

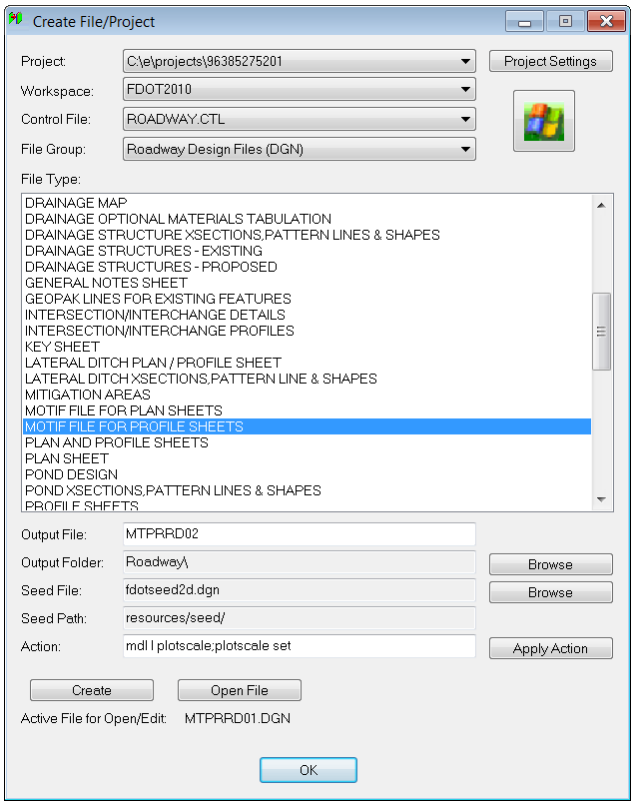
17 .Select the FDOT Menu option **Actions** > **Create/Edit File**. Create File/Project opens.

18 .In the *File Type***,** select **MOTIF FILE FOR PROFILE SHEETS**. The file **MTPRRD01** appears in the *Output File* box.

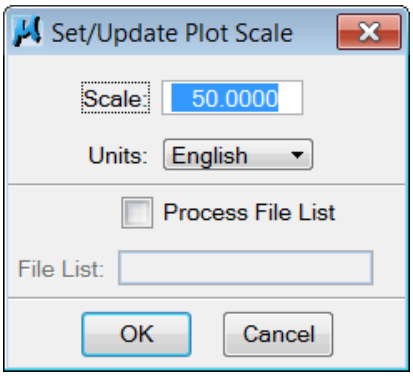
19 .Click **Create**. Create/Edit File opens.

20 .From Create/Edit File, click **OK** to close. The *Open DGN* button becomes available and the file name in the **Output File** box increments to **MTPRRD02**.

21 .Click the **Open DGN** button. The file *MTPRRD01.dgn* opens. Click **OK** to close Create File/Project.



22 .Set/Update Plot Scale automatically opens. Set the *Plot Scale* to **50**.




23 .Click the **OK** button. The plot scale of the file is set and Set/Update Plot Scale closes.

24 .Attach the Reference File for the Profile View.

**C:\e\projects\96385275201\roadway\DSPFRD01.dgn**.

25 .Turn off Level **XSCell** in the profile reference file.

26 .From MicroStation, **Fit View** and then click **File** > **Save Settings**.

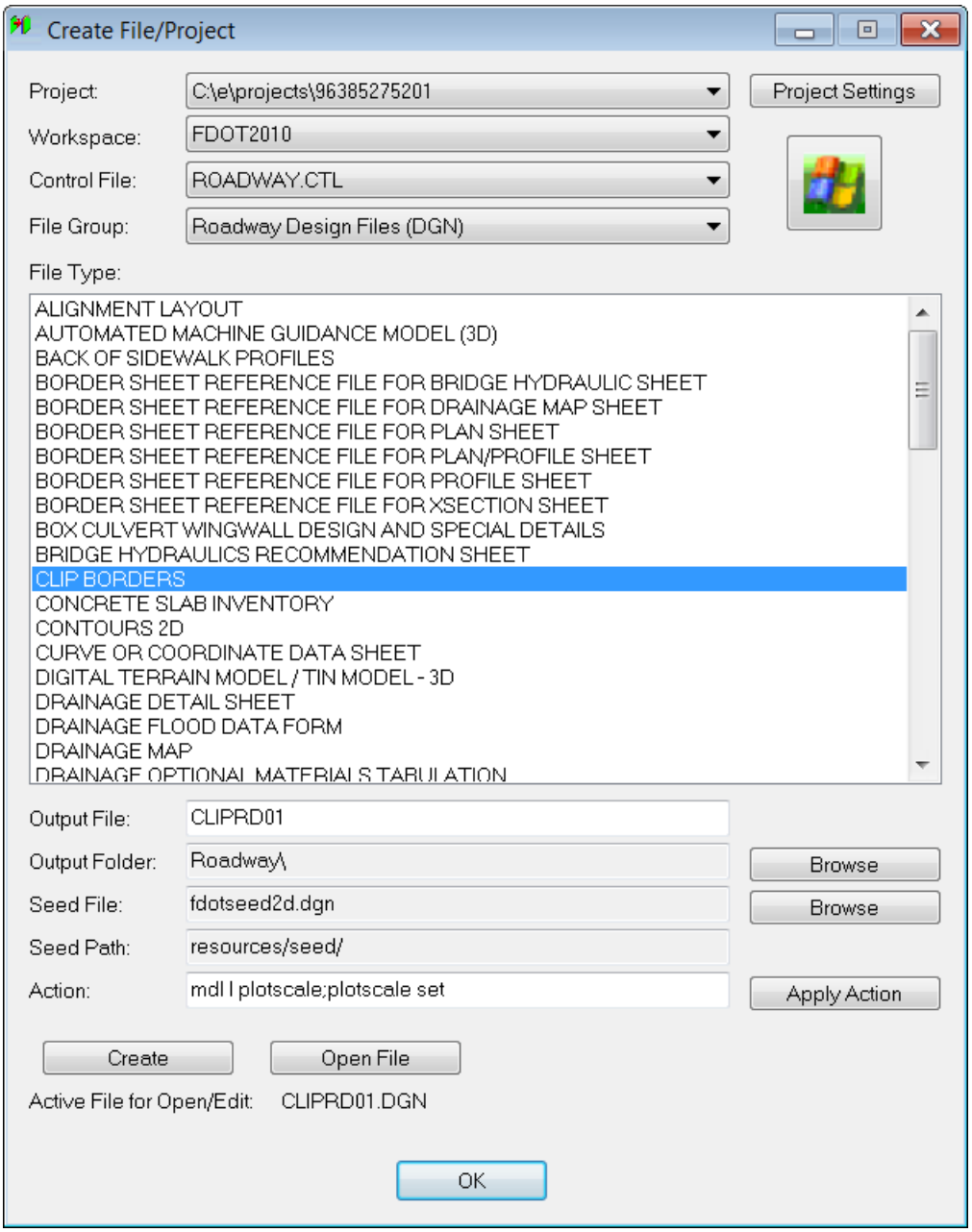
## Exercise 8.2 Creating the Clip Borders Design File

In this exercise, the user creates the design file for the GEOPAK Clip borders.

➢ ***TO CREATE THE CLIP BORDERS DESIGN FILE***

***Important:*** Do not create the GEOPAK Clip borders in the main design file.

1. Select the FDOT Menu option **Actions** > **Create/Edit File**. Create File/Project opens.
2. In Create File/Project, select **Roadway Design Files (DGN)** in the *File Group* list.
3. In the *File Type* list, select **CLIP BORDERS**.



4 . Click the **Create** button to create the clip border file.

5 . Click the **Open DGN** button to open the clip border file.

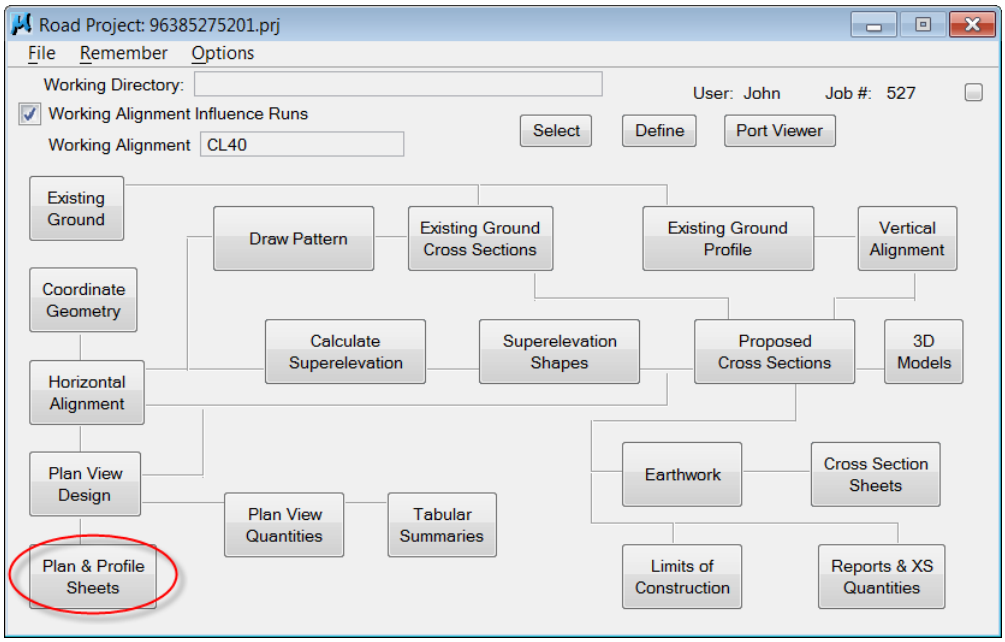
6 . Set/Update Plot Scale opens and is set to **50.0**, click **OK** to close.

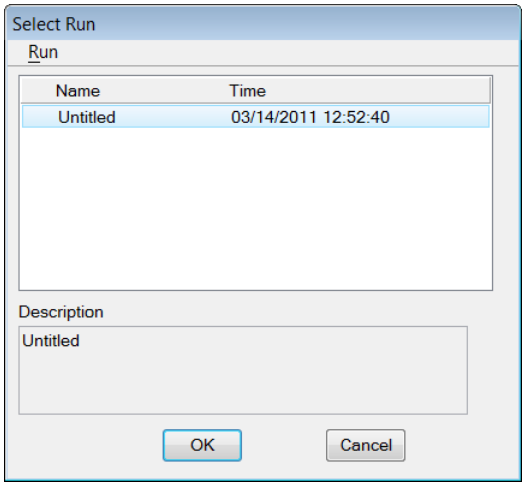
7 . From Create File/Project. click the **OK** button to close.

8 . Reference in the following drawings:

- **C:\e\projects\96385275201\roadway\DSGNRD01.dgn**
- **C:\e\projects\96385275201\roadway\DSPFRD01.dgn**

9 . From Road Project, click the **Plan & Profile Sheets** button. Select Run opens.

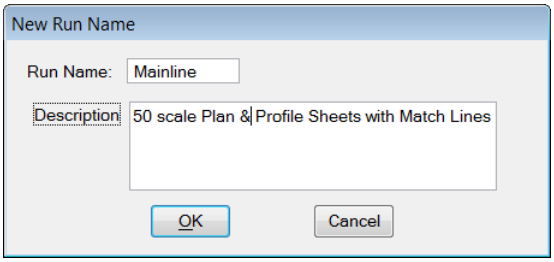


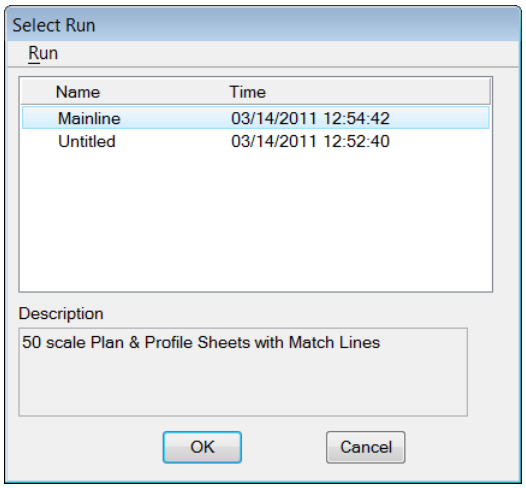




10 .To create a run, select menu option **Run** > **New**. New Run Name opens.

11 .In the *New Run Name* box, type **Mainline** along with a *description* as shown below.

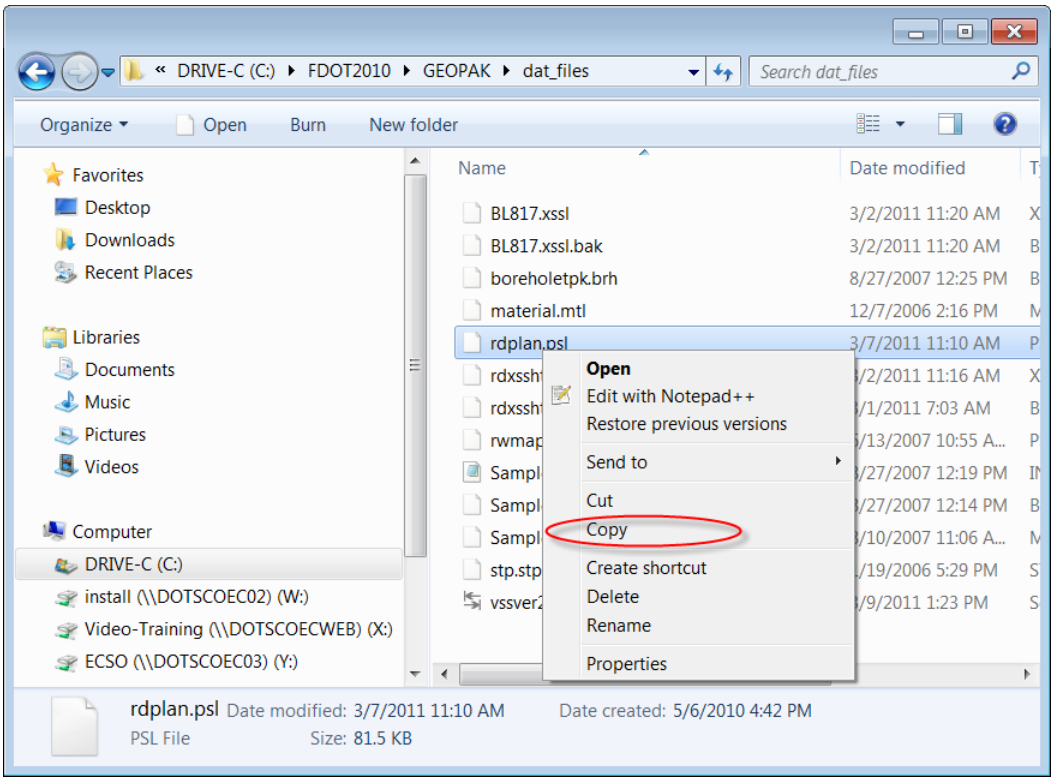
12 .Click the **OK** button. **New Run** displays in Select Run.



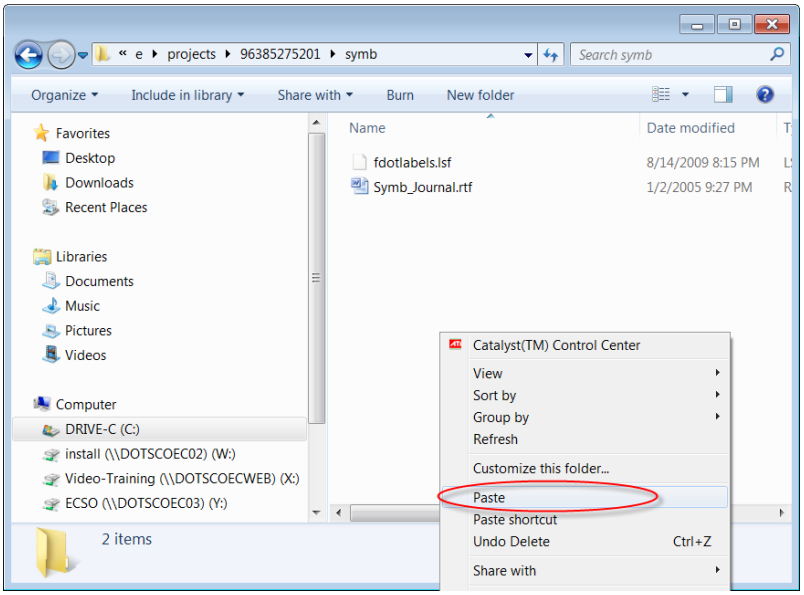




13 .In Select Run, select **Mainline,** and then click the **OK** button. Plan Sheet Layout opens.

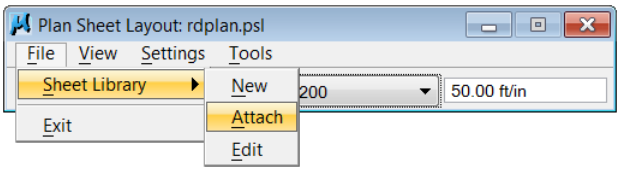
14 .On the FDOT Menu, click **Standard** > **Explore FDOT2010 Directory**. In Explorer, navigate to **C:\fdot2010\GEOPAK\dat_files**. Right click on the file **rdplan.psl** and select **Copy**.



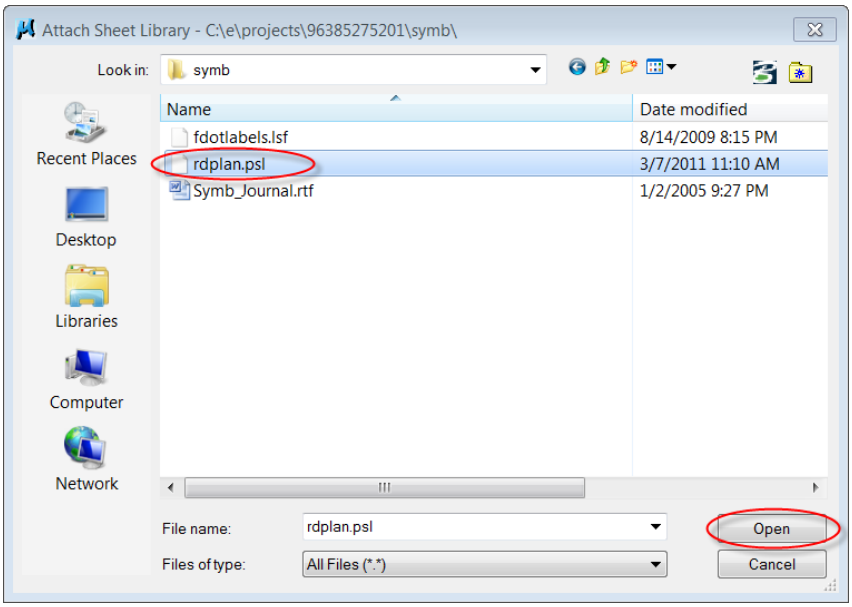
15 .Navigate to the project directory, **C:\e\projects\96385275201\symb**. Paste the **rdplan.psl** file in the *symb* directory.



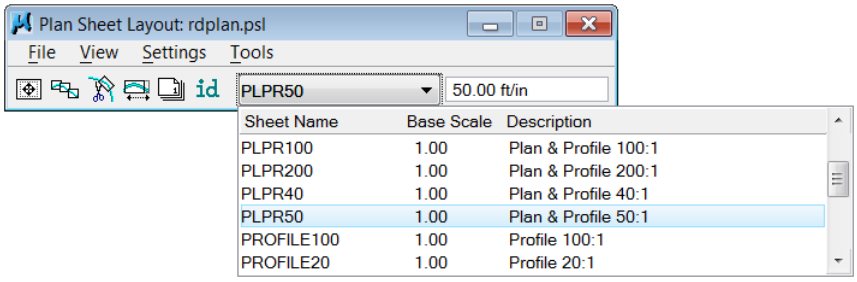

16 .In Plan Sheet Layout, select the menu option **File** > **Sheet Library** > **Attach**. Attach Sheet Library opens.



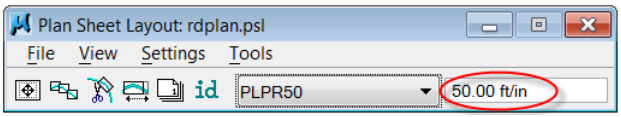

17 .In Attach Sheet Library, navigate to the *symb* folder in the project directory. Select **rdplan.psl** and click **Open**.



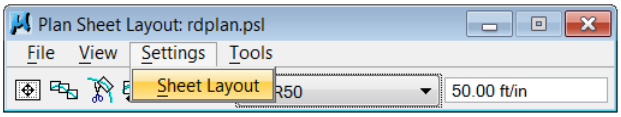
18 .In Plan Sheet Layout, select the *Sheet Name* **PLPR50**.



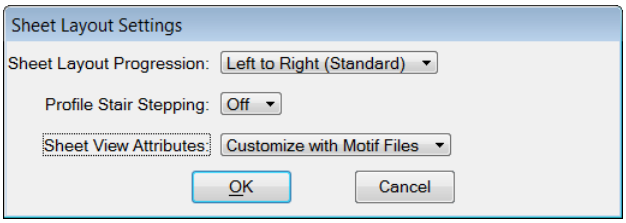

19 .Set the *Scale* to **50.00ft/in**.



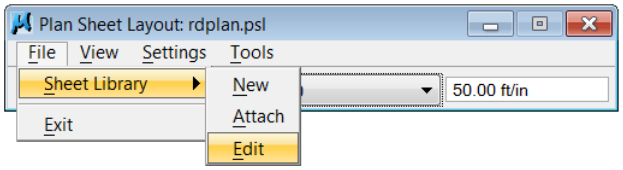

20 .Select the Plan Sheet Layout menu option **Settings** > **Sheet Layout.** Sheet Layout Settings opens.




21 .Change the settings to match the figure below, and then click the **OK** button.

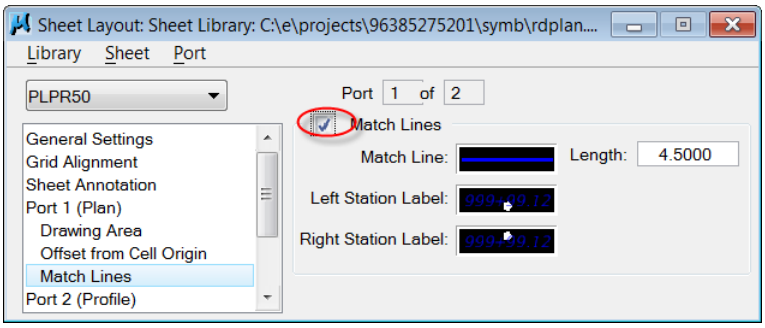



22 .Select the Plan Sheet Layout menu option **File** > **Sheet Library** > **Edit**. Sheet Layout: Sheet Library opens.



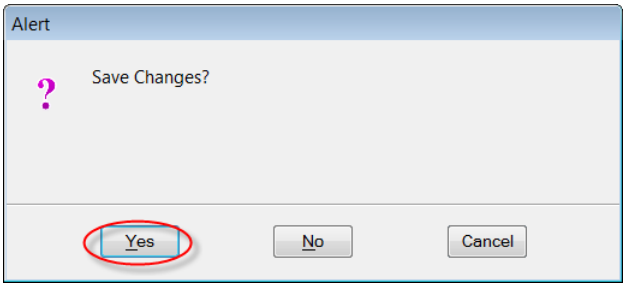

23 .In Sheet Layout: Sheet Library, select the category **Port 1 (Plan)** > **Match Lines**.

24 .Toggle on the check box for **Match Lines**.

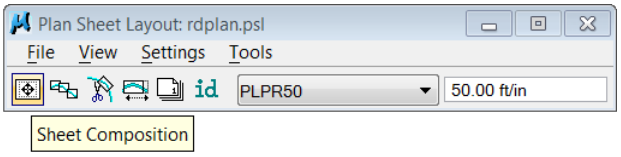



25 .Click the **Close** button in the upper right hand corner of the dialog box. Alert opens.

26 .From Alert, click the **Yes** button to save the changes made to the Sheet Library.

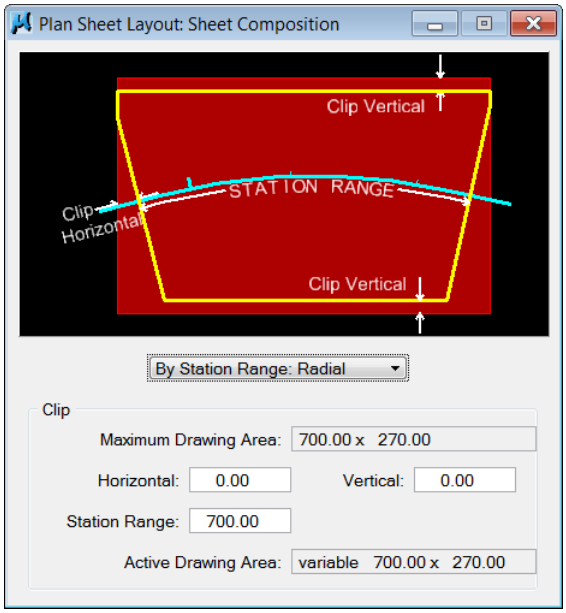



27 .In Plan Sheet Layout, click the **Sheet Composition** button. GEOPAK Sheet Layout: Sheet Composition opens.




28 .From Plan Sheet Layout: Sheet Composition, click the **By Station Range: Radial** option.

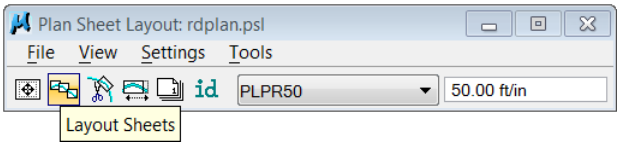
29 .Change the information on Plan Sheet Layout: Sheet Composition to match as shown below.



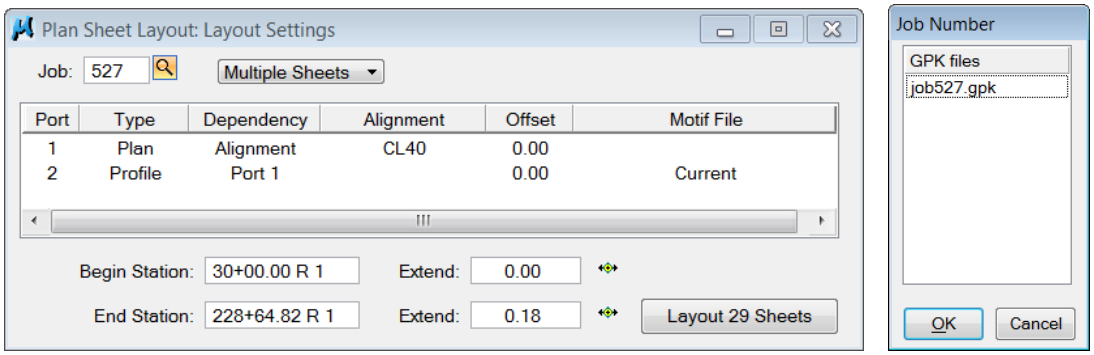

***Important:*** Ensure that the Station Range sets to 700.00 for a 50 scale Plan and Profile sheet. If it is set any larger, the profile clips will come out wrong.

30 .Click the **Close** button in the upper right hand corner of the dialog box.

31 .In Plan Sheet Layout, click the **Layout Sheets** button. Plan Sheet Layout: Layout Sheets opens.




32 .Click the **Open GEOPAK Job** button next to the *Job* box. Job Number opens.

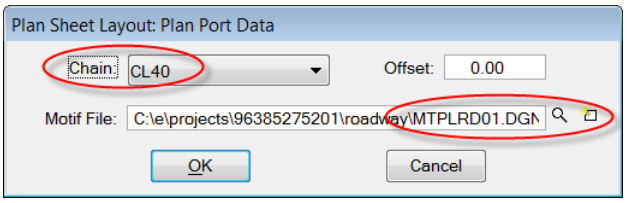



33 .On Job Number, select **job527.gpk** and click **OK**. The Job is set and Job Number closes.

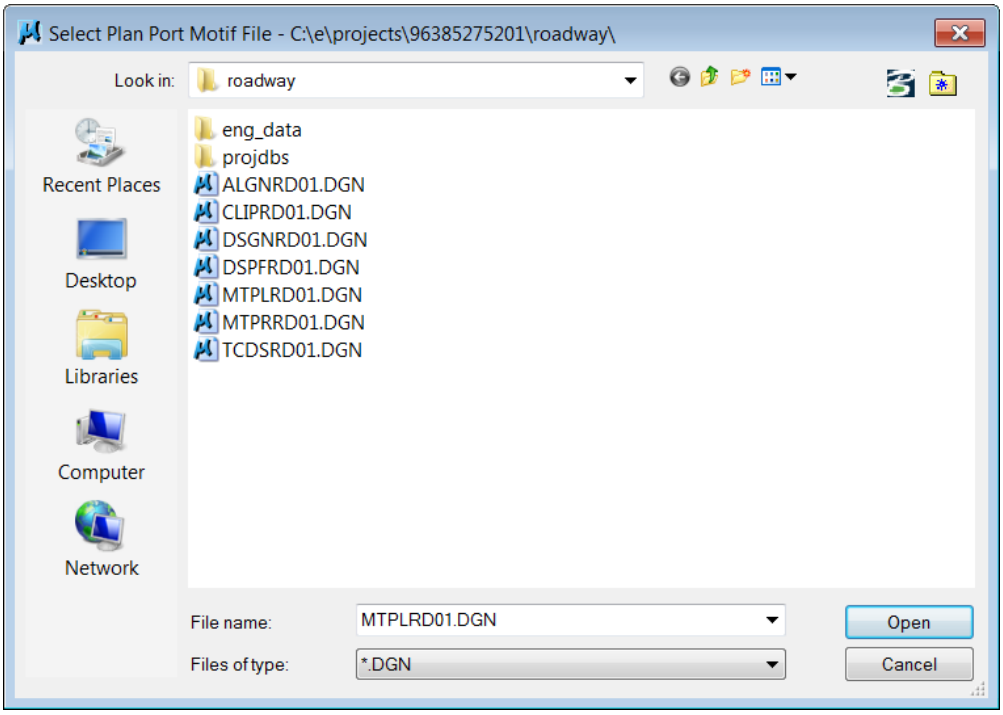
34 .Set the *method* to **Multiple Sheets**.

35 .Double-click **Port 1**. Plan Sheet Layout: Plan Port Data opens.

36 .From the *Chain* dropdown list, select **CL40**.



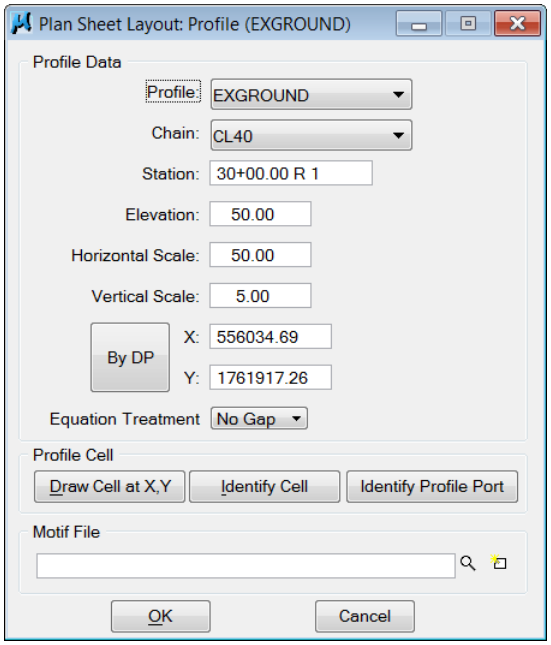

37 .For the *Motif File*, click the **Select Motif File** button. Select Plan Port Motif File opens.




38 .Select the **MTPLRD01.dgn** file and click **Open**.

39 .Click **OK** on the Plan Sheet Layout: Plan Port Data dialog box.

40 .In Plan Sheet Layout: Layout Sheets, double-click **Port 2**. Plan Sheet Layout: Profile (PGL) opens.



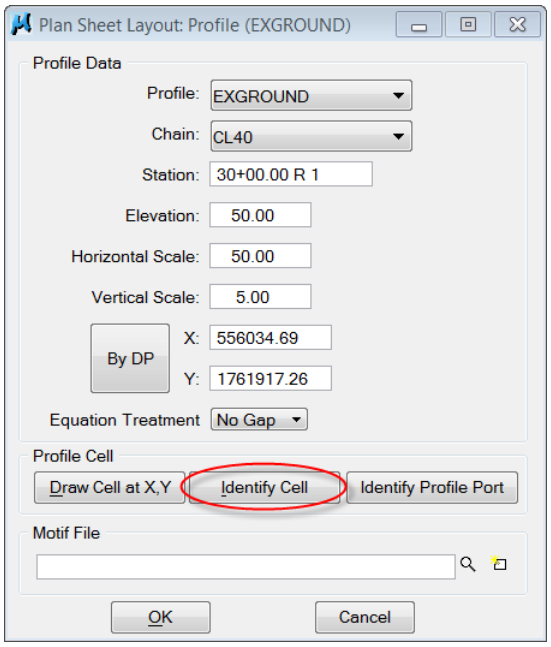

41 .In Profile, select **EXGROUND**.

42 .From the *Chain* dropdown list, select **CL40**.

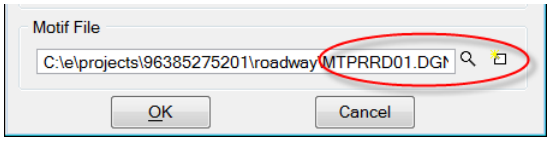
43 .In MicroStation, zoom to the Profile Cell.

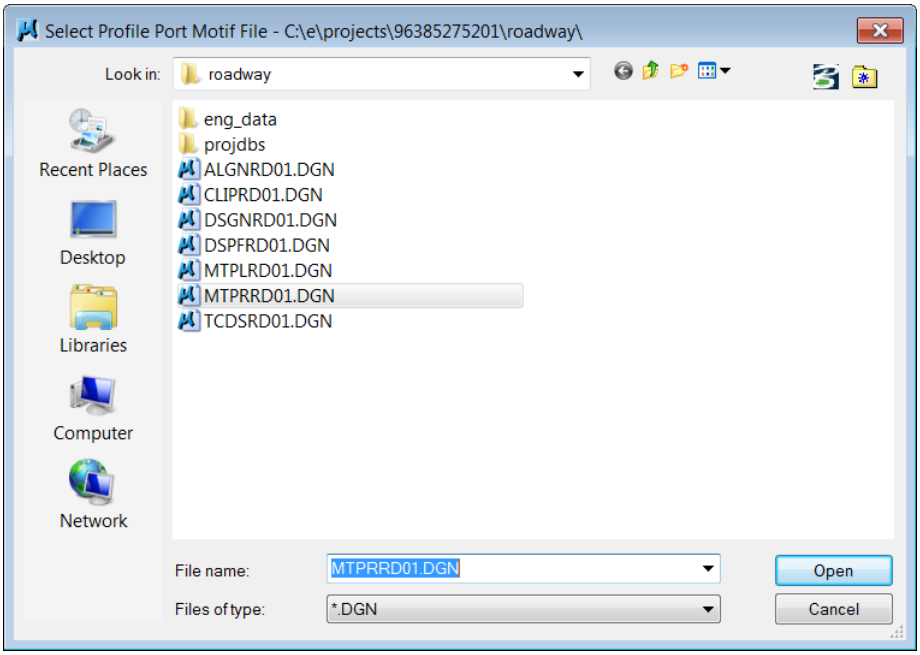
44 . In Plan Sheet Layout: Profile (EXGROUND), click the **Identify Cell** button.

45 .Click the **purple profile cell**. The remaining data appears in the dialog box.



46 .Under *Motif File*, click the **Select Motif File** button. Select Profile Port Motif File opens.

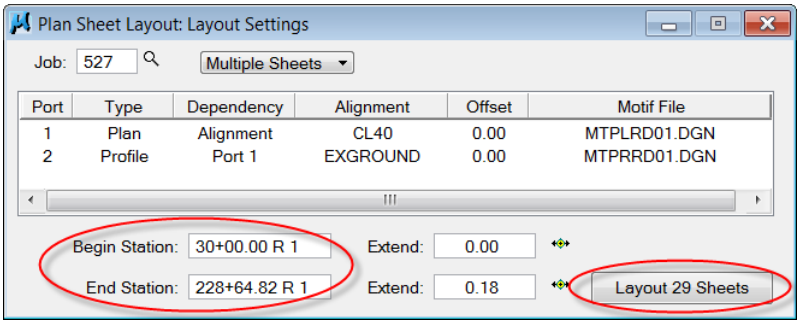



47 .Select **MTPRRD01**.dgn and click **Open**.

48 .Click the **OK** button. Plan Sheet Layout: Profile (EXGROUND) closes.

***Note*** The station range and number of sheets calculates as shown below.



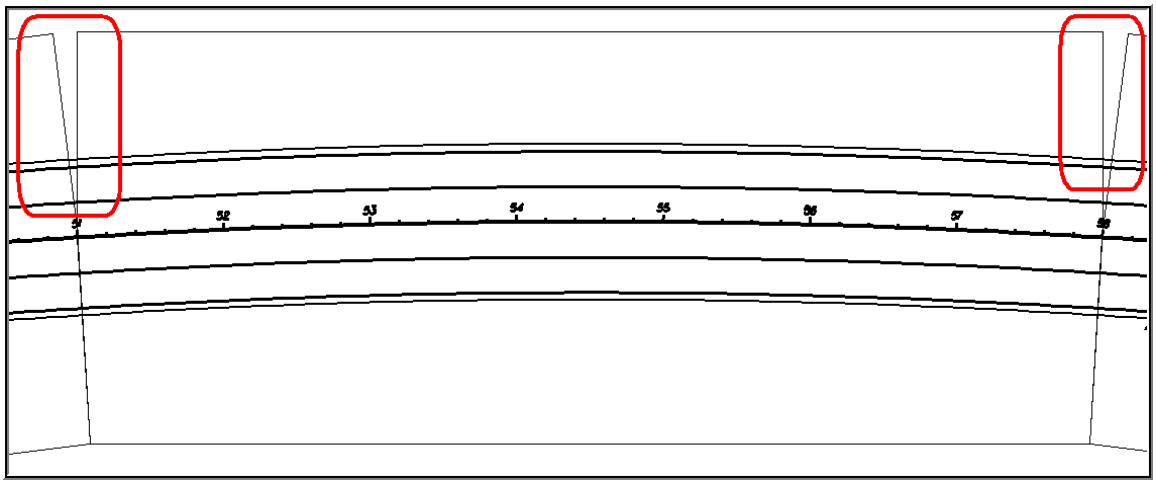

49 .From Plan Sheet Layout: Layout Sheets, click the **Layout 29 Sheets** button.

50 .Click the **Close** button.

51 .In MicroStation, review the **Plan and Profile clip borders**.

52 .In the plan area, zoom to the first curve and notice the **clip borders** and the **pie-shaped wedge of missing data**.

*Tip: To fix situations like this, open **Sheet Composition**, set the **Station Range** to a smaller value(i.e. 660), and lay out the clip border again. Delete the first clips and compress the design file. For the training class, we will leave these as they are.*

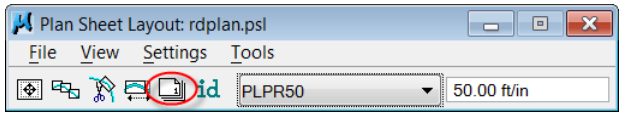


## Exercise 8.3 Creating Plan & Profile Sheets

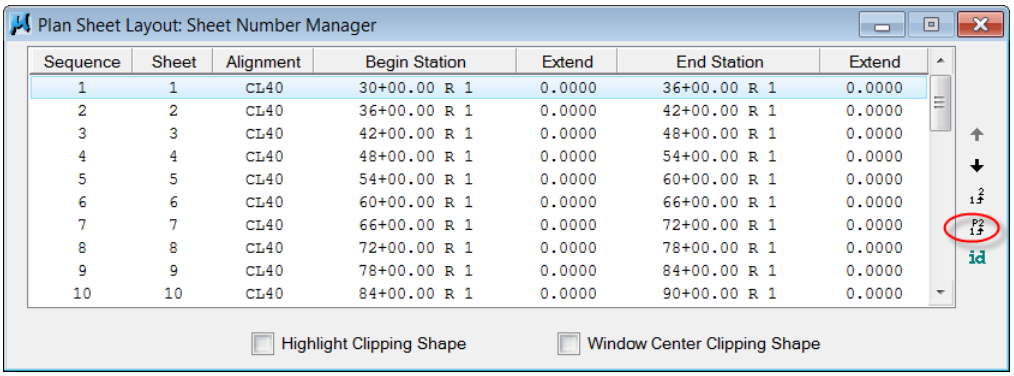
In this exercise, the clipping process continues by setting up the sheet naming and numbering, then creating the sheets.

➢ ***TO CREATE PLAN & PROFILE SHEETS***

1 . From Plan Sheet Layout, click the **Sheet Number Manager** button. Plan Sheet Layout: Sheet Number Manager opens.

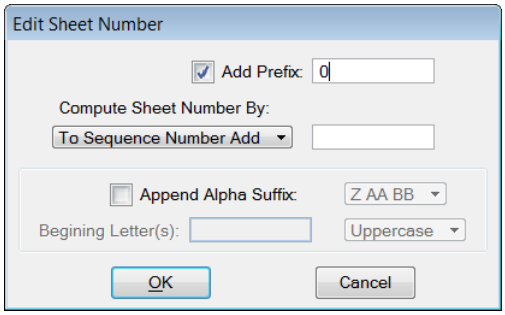



2 . On Plan Sheet Layout: Sheet Number Manager, select the first sheet in the list, and then click the **Edit Sheet Number** button. Edit Sheet Number opens.




| Sequence | Sheet | Alignment | Begin Station | Extend | End Station | Extend |
|---|---|---|---|---|---|---|
| 1 | 1 | CL40 | 30+00.00 R 1 | 0.0000 | 36+00.00 R 1 | 0.0000 |
| 2 | 2 | CL40 | 36+00.00 R 1 | 0.0000 | 42+00.00 R 1 | 0.0000 |
| 3 | 3 | CL40 | 42+00.00 R 1 | 0.0000 | 48+00.00 R 1 | 0.0000 |
| 4 | 4 | CL40 | 48+00.00 R 1 | 0.0000 | 54+00.00 R 1 | 0.0000 |
| 5 | 5 | CL40 | 54+00.00 R 1 | 0.0000 | 60+00.00 R 1 | 0.0000 |
| 6 | 6 | CL40 | 60+00.00 R 1 | 0.0000 | 66+00.00 R 1 | 0.0000 |
| 7 | 7 | CL40 | 66+00.00 R 1 | 0.0000 | 72+00.00 R 1 | 0.0000 |
| 8 | 8 | CL40 | 72+00.00 R 1 | 0.0000 | 78+00.00 R 1 | 0.0000 |
| 9 | 9 | CL40 | 78+00.00 R 1 | 0.0000 | 84+00.00 R 1 | 0.0000 |
| 10 | 10 | CL40 | 84+00.00 R 1 | 0.0000 | 90+00.00 R 1 | 0.0000 |

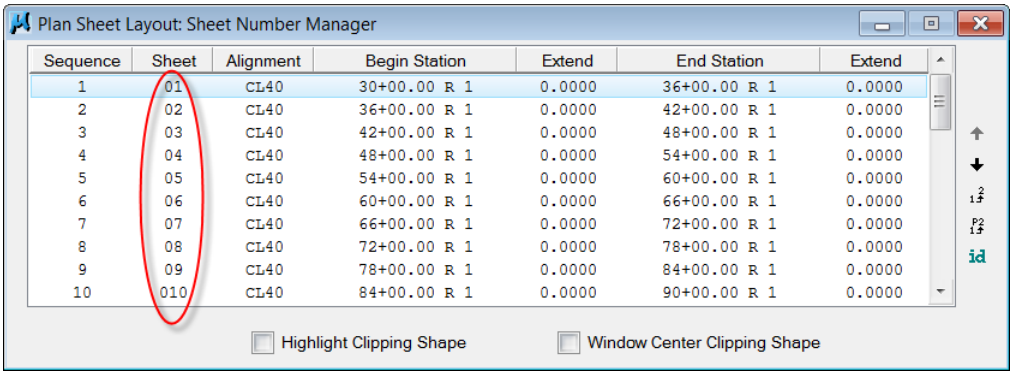
3. On Edit Sheet Number, toggle on the **Add Prefix** check box and enter **0** in the box. Click the **OK** button.




4. Repeat this process for sheets 2-9.

*Tip: Select the first sheet, hold the* Shift *key, and then click sheet 9 to hightlight all of the sheets at one time.*

***Note*** The following shows the completed task. Notice sheets 1 through 9 now have a **0** in front of the number.

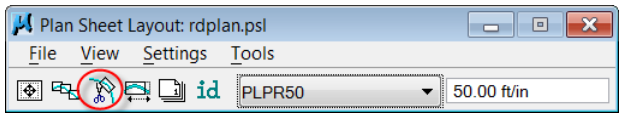



| Sequence | Sheet | Alignment | Begin Station | Extend | End Station | Extend |
|---|---|---|---|---|---|---|
| 1 | 01 | CL40 | 30+00.00 R 1 | 0.0000 | 36+00.00 R 1 | 0.0000 |
| 2 | 02 | CL40 | 36+00.00 R 1 | 0.0000 | 42+00.00 R 1 | 0.0000 |
| 3 | 03 | CL40 | 42+00.00 R 1 | 0.0000 | 48+00.00 R 1 | 0.0000 |
| 4 | 04 | CL40 | 48+00.00 R 1 | 0.0000 | 54+00.00 R 1 | 0.0000 |
| 5 | 05 | CL40 | 54+00.00 R 1 | 0.0000 | 60+00.00 R 1 | 0.0000 |
| 6 | 06 | CL40 | 60+00.00 R 1 | 0.0000 | 66+00.00 R 1 | 0.0000 |
| 7 | 07 | CL40 | 66+00.00 R 1 | 0.0000 | 72+00.00 R 1 | 0.0000 |
| 8 | 08 | CL40 | 72+00.00 R 1 | 0.0000 | 78+00.00 R 1 | 0.0000 |
| 9 | 09 | CL40 | 78+00.00 R 1 | 0.0000 | 84+00.00 R 1 | 0.0000 |
| 10 | 010 | CL40 | 84+00.00 R 1 | 0.0000 | 90+00.00 R 1 | 0.0000 |

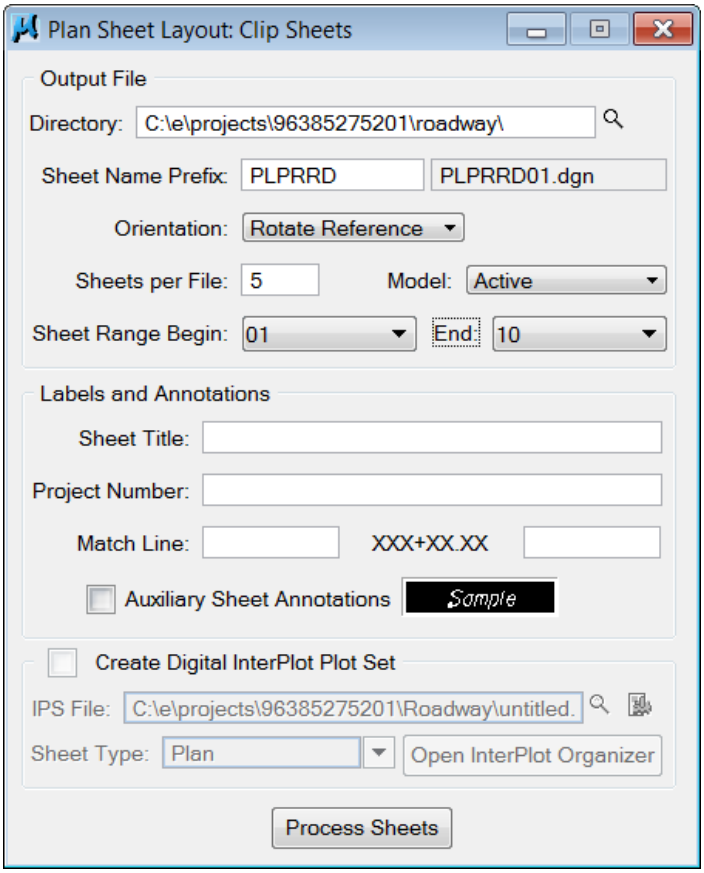
5. Click the **Close** button to close Plan Sheet Layout: Sheet Number Manager. Alert opens.

6. In Alert, click the **Yes** button to save the modifications.

7. From Plan Sheet Layout, click the **Clip Sheets** button. Plan Sheet Layout: Clip Sheets opens.



8 . To set the *Directory*, click the **Open** button next to the entry box and navigate to the Roadway folder as shown below.



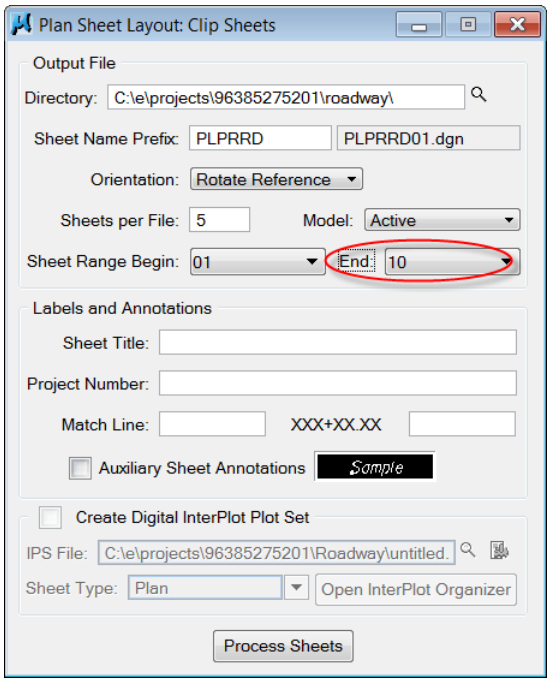

9 . In the *Sheet Name Prefix* box, type **PLPRRD** and click the ***Tab** key*.

***Important:*** This tool reads in the modifications in Sheet Number Manager and names the files PLPRRD01, 02… up to number 10. This step replaces renaming the files through Windows Explorer. In addition, if Sheet Number Manager was not used, but instead a 0 typed in the Sheet Name Prefix box on this dialog box, all of the sheets including 10 through 29 will include a 0 in the name.

***Note*** Labels and Annotations is not used. These fields on the plan sheet fill in with Sheet Navigator.

10 .From the *Orientation* dropdown list, select the **Rotate Reference** setting.

11 .From the *Sheet Range End* dropdown list, select **10**.




*Tip: Process only a few of the sheets the first time to make sure everything looks good, then go back and clip the remaining sheets.*

***Note*** Step 12 included to save time in the class.

12 .Click the **Process Sheets** button. When the processing is finished, close Sheet Layout: Clip Sheets.

13 .Close Plan Sheet Layout.

14 .In MicroStation, open **PLPRRD01.dgn** in the Roadway folder and review the file.