





TENNESSEE DEPARTMENT OF TRANSPORTATION

Geopak Survey Training Manual



ISSUED BY THE DESIGN DIVISION

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CHAPTER 1 - INTRODUCTION TO GEOPAK® SURVEY FOR TDOT

This training course is intended to assist the surveyor with the setup, creation, and processing of survey data using GEOPAK® Survey to conform with the <u>TDOT Survey & Design Computer-aided Drafting and Design CADD Standards.</u> Please refer to the GEOPAK® help files for more specific information regarding GEOPAK® functions.

1.1 COURSE OUTLINE

As part of this course, we will process the survey data for a small TDOT project in Smith County. The dataset includes survey data from multiple days of data collection which contain RTK, Total Station, and Aerial Survey data. The following topics are covered in the course:

- Field Codes and COGO Element Names
- Standard Project Directory Structure
- Standard Design File Names
- Survey Project Preferences
- Creating a new survey project
- Creating and Processing a new Survey Dataset
- Survey Mapping and MicroStation® v8 Levels
- DTM Creation
- Processing Additional Datasets

1.2 CADD STANDARDS AND SUPPORT

TDOT CADD Standards for MicroStation® and GEOPAK® is maintained and distributed by the CADD Support section of the Design Division. This information is available on the TDOT website at the following URL:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/V8design.htm#Documentation

This manual is available online in Adobe Acrobat PDF format at the following URL:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/survey.htm

Support for GEOPAK® survey is provided through the TDOT Design Division. Questions or comments regarding the use of the GEOPAK® Survey Training Manual should be directed to the TDOT Regional Survey offices.

The following software versions were used in the development of this manual:

- MicroStation® 08.05.02.35
- GEOPAK® 08.08.02.73

1.3 COURSE DATA FILES

The data files provided for this course include:

- SM080-01.doc (Limits of project with GPS Control Information)
- SM080-01.ctl (GPS Control Point File output from TN DOT Geodetic Control Database)
- SmithSR80-topo.dgn (3D topographic DGN File from Aerial Survey)
- SmithSR80-dtm.dgn (3D graphic surface features from Aerial Survey)
- SM080-01TP1.txt (Day 1 Field Collected Data in ASCII format)
- SM080-01TP2.txt (Day 2 Field Collected Data in ASCII format)
- SM080-01CTL.txt (Control Point Data in ASCII format)
- Alg3o4.isu (SR 80 proposed alignment input file)
- Par3o4.isu (Parcel input file)

The files are available online at the following URL:

http://www.tdot.state.tn.us/Chief Engineer/assistant engineer design/design/survey.htm

The latest Standard TDOT Survey files for MicroStation® and GEOPAK® should be downloaded to the user's computer prior to the training course. These files and support documents are available at the following URL:

http://www.tdot.state.tn.us/Chief Engineer/assistant engineer design/design/survey.htm

It is recommended the user to allow the self-extracting executables to install in the default directories. This will allow the TDOT visual basic applications and interface to locate the designated files required to operate.

1.4 TDOT WORKFLOW

The workflow processes followed in this manual are recommended as a best practice. The following are examples of recommended workflow processes:

For New Projects:

- Create Project Directory
- Create Survey MicroStation® File
- Open new Survey MicroStation® File
- Activate GEOPAK®
- Access GEOPAK® Survey
- Set Survey Preferences
- Create New Survey Project
- Recheck Survey Preferences
- Create New Dataset
- Check and edit Dataset
- Import, Reduce and Map Dataset
- Visual checks of Points and Survey Chains

- Edit Points and Survey Chains as needed
- Run Crossing Chain
- Build DTM
- Visual checks of DTM and Contours

For Existing Projects:

- Open existing Survey MicroStation® File (if the user receives a "GEOPAK® Units Synchronization Alert" dialog about GEOPAK® Preferences Unit System being set to English while MicroStation® is set to meters, then simply select "Cancel". This is an issue with DGN files from the office of Aerial Survey's seed files due to their necessary software setup).
- Activate GEOPAK®
- Access GEOPAK® Survey
- Open Existing survey project
- Check Survey Preferences
- Create Additional Datasets
- Check and edit Dataset
- Import, Reduce and Map Additional Datasets
- Visual checks of Points and Survey Chains
- Edit Points and Survey Chains as needed
- Run Crossing Chain
- Build DTM
- Visual checks of DTM and Contours

The following screen capture shows the **Survey Project WorkFlow Toolbox** developed by TDOT that can be activated from the custom TDOT menu in MicroStation®. This toolbox allows for quick access to commonly used tools once the user obtains a basic understanding of GEOPAK® Survey.

TDOT Survey Project WorkFlow Toolbox						
Project Control	Project Control Dataset Processing					
Create Project Preferences		New Dataset		Open Dataset	Control Editor	
Open Project Save Project		Edit Dataset		Reduce	Review Reports	
Close Project		Import to GPK	U	pdate OBS/XYZ	Save Dataset	
			D	elete Dataset		_
Graphics Display Coordinate Geometry DTM Processing						
D & ⊂ Manager	Class	Classic COGO		Edit Crossing Chains/Breaklines		
Draw Profile	Horizontal A	Horizontal Alignment Tools		Build DTM from Survey		
Plan View Labeler	Graphi	ical COGO		Load DTM	Features	
Profile Labeler	Generate Gr	Generate Groundline Profile		Edit DTM		
Shift Line Style	Edit	Edit Points		TIN Tracking - Height Tool		
Flip Line Style Edit		Chains		TIN St	atistics	
Visualize Features						
UnVisualize Features						Cancel

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CHAPTER 2 - FIELD SURVEY AND RELATION TO COGO

2.1 CONTROL POINTS

TDOT maintains a database containing all Geodetic Survey Control Point data for the entire state. This information is typically supplied by TDOT when the project is assigned and will serve as the primary project control for field survey work. The database is available, if needed, online at the following URL:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/survey.htm

2.2 SURVEY POINTS

All survey data processed through GEOPAK® Survey is stored in a GEOPAK® Coordinate Geometry (COGO) database. The database is given a .gpk file extension. Each point must have a unique name. Point names can be alpha-numeric, but not numeric-alpha. For example, S2 is supported, however S2S is not. All points shall have an "S" as the prefix. Example: S2000, S2001, etc. No special characters or other naming conventions are allowed.

Field Codes (descriptors)

In order for data to be processed by GEOPAK® and displayed correctly in MicroStation®, the correct codes must be used when collecting data in the field. It is extremely important that field personnel be very careful about the proper use of point descriptors. Proper understanding will make the office processing much more efficient and prevent errors in the finished survey. The following rules should be observed:

- Use only those descriptors that are supported by our system. These are outlined in the TDOT Survey Manager Database (SMD) V8 Feature Codes document, found at the following website: (<u>http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/survey</u>.<u>htm</u>). Appendix A (Pages A1-A3) contains the current version of this document. If in doubt or if the identity of the point is unknown, use XMISC and make a note. NEVER INVENT OR MAKE UP A DESCRIPTOR.
- Additional information can be stored for any survey point by adding a comment to the point descriptor. For items below indicating a note, the note is necessary on one survey point in a given feature. The length of a note is limited only by the data collector. The specific codes documented below make use of field comments.
- The equal sign is the delimiter used by TDOT to indicate field notes. This is user definable. Also, TDOT uses "+" as the begin line code, "-" as the end line code, "*" as the curve code and "~" as a separator between double-coded points. These are also user definable.

Example Field Coding of Points

1. Drainage Structures

Pipes

PIPE=note

Where note contains description including size and type, for example a 15" concrete pipe would be coded **+PIPE=15**" **RCP** on one end and **-PIPE** on the other.

Pipes connected to manholes or catchbasins are located with the storm sewer code (STS) to properly generate the DTM. In the case where one end of pipe is in a manhole and one end is open, locate the pipe with storm sewer code and shoot an extra ground shot at the pipe outlet to properly generate DTM.

Box Culverts CV=note Where note contains description of culvert.

2. Utilities

To field code the size of utilities, precede the TDOT SMD code with the size of the utility in inches. This is applicable for all codes that are preceded by a question mark in the TDOT SMD Feature Code document. For example, code a 12" gas line as 12GL, an 18" water line as 18WL, and a 15" storm sewer as 15STS. Individual custom line styles exist for each size utility.

Water & gas valves, Water & gas meters

XWV=note XGV=note XWM=note XGM=note

Where note contains optional number for use when many valves or meters are very close and would be overlapping on the map.

Overhead wires

XLW=note

Shoot low wire at point directly over proposed centerline at true elevation. Note contains description of the various wires.

Utility Poles

XUP=note (utility poles without lights)
XLP1=note (utility poles with one light)
XLP2=note (utility poles with two lights)
XLP3=note (utility poles with three lights)
XLP4=note (utility poles with four lights)

Note contains abbreviations for types of wires hanging on pole, for example P, P/T etc.

3. Driveways (DR), field entrances (FE), business entrances (BE), and parking lots (PK)

DR=note

Where note contains description (width and surface material) placed on one point in line only.

4. Edge of Pavement

EP=note

Where note contains description of surface type (ie: GRAVEL). This should be used for the edge of traveled roadway only.

5. Property line information

XIP=note (existing iron pin property corner) Where note contains description of condition of iron pin, ie: 3/4" Rebar, Bent, etc.

XPL=note (other types of monumentation)
Where note contains description of monument (ie: Planted Stone, AXLE, Wood Post, etc).

XROWA (ROW monument in a straight line or near straight line break (Type A)

XROWB (ROW monument in 90 degree break (TYPE B or C)

6. Buildings

BC=note

Where note contains a description according to TDOT standards including type and number of stories. If building contains a business, include the business name.

7. Bridges

BRI=note

Where note contains description of structure.

8. Fences

FN=note

Where note contains description of the type of fence.

9. Edge of Pavements

EP=note

Shoulders (paved only) SH=note Where note contains description including width and surface material.

10. Underground Tanks

T=note

Where note contains description of tank including size and type of fluid stored.

11. <u>Trees</u>

XTREE=x type

Where x contains the diameter of the tree trunk in inches. Assumes 6" if blank Type contains the tree species (ie: Sweet Gum). This is optional.

2.3 SURVEY CHAINS

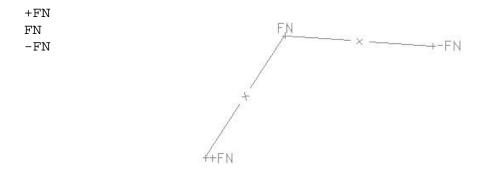
A series of Survey Points representing a linear feature can be connected together as a Survey Chain. Linking codes are used to designate how individual field shots are reconnected to form Survey Chains. Linking codes are special characters pre-pended to the feature in the field as the data is collected. TDOT utilizes the following linking codes:

- + Begin Line
- End Line
- * Close Figure

The following additional linking codes are available but not utilized by TDOT:

- PC* Begin Curve (tangent to previous line)
- OC* Point on Curve (begin/end non-tangent curve)
- PT* End Curve (tangent to next line)
- CC* Point of Compound or Reverse curve
- CF* Curve Fit (spline fit to irregular curves)

To collect a series of 3 points representing a fence line; each point would be coded as follows in the field (Note, the field code FN is used for a Fence Line):



When the survey data is processed, GEOPAK® will automatically generate the names for the Survey Chains. Therefore, there is not a standard definition for Survey Chain names in the TDOT CADD Standards manual.

Survey Chains are named according to the feature code name used to collect the shots defining the chain. In the above example, a Survey Chain named "FN" will be created in the .gpk file. If a second fence line is collected, GEOPAK® will increment the name by 1. For example, a second fence line would be named "FN-1" in the .gpk file. Subsequent fence lines would be incremented by 1.

IMPORTANT: Survey Chains are connected by the order of point numbers. The point numbers do not have to be sequential, but they must be in increasing order. Since the actual mapping is produced by the reduced coordinate file and not the raw data file, the point numbers determine the sequence, not the order of field location (order of shots in raw data file).

2.4 CROSSING BREAKLINES

When collecting field data, personnel should attempt to avoid crossing breaklines that have a DTM surface attribute of breaklines. This will facilitate proper creation of the TIN file by the office personnel. If this guidance is not followed, additional vertices will be inserted at the point of crossing in the TIN file.

2.5 DATASETS

A project can be comprised of multiple datasets. These can include different source formats, different areas of a project, or individual field crews. Typical TDOT practice is to create a dataset for each day's work.

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CHAPTER 3 - SETTING UP A GEOPAK® SURVEY PROJECT

3.1 DIRECTORY STRUCTURE

For the purpose of this training manual the directory structure will show a local directory from the user's personal computer (i.e. C:\Projects\SM080-01).

3.2 CREATING A DGN

The TDOT Survey Manual, Section 3.4.2.1 Filename, defines the standard MicroStation® design file names to be used on TDOT survey projects. The following paragraph was taken from that section.

This file shall have the form 11222-33filetype.DGN where:

- 11 = the county code (See Table A-7), and as shown in the CADD Guidelines
- 222 = the route number (if not a state route the surveyor's discretion is allowed.)
- –33 = GNSS project number (Contact the Regional Survey Supervisor for this number)
- Filetype = Survey (Survey Topography and Profile data)
 Example: DV155-01Survey.DGN
- Filetype = SurveySUE (Survey Subsurface Utility Engineering data)
 - Example: DV155-01SurveySUE.DGN

Open MicroStation® and create a new .dgn as shown in the dialog below.

8 New		\mathbf{X}
Directory		
Files	Directories:	
SM080-01 Survey.dgn	C:\Projects\SM080-01\	
SmithSR80-dtm.dgn SmithSR80-topo.dgn	C:\ Projects Projects SM080-01	<u>K</u>
r File <u>T</u> ype:	Dri <u>v</u> es:	Cancel
MicroStation DGN Files [*.dgn]	C:	<u>H</u> elp
Show File I <u>c</u> ons		
Seed File c:\program files\bentley\workspace\syste	em\seed\seed2d.dgn	Select

Use the **Select** Seed File button shown in the dialog above to select the seed file (or template file) to be used to create the new file. For the purpose of this training manual Survseed.dgn is to be used. The seed files can be downloaded through the following TDOT website:

http://www.tdot.state.tn.us/Chief Engineer/assistant engineer design/design/v8/V8design.htm# MicroStation®

Select Seed File		
Eile Directory Fijles: Survseed.dgn MetricDropoffNotes.dgn MetricEPSCNotes.dgn MetricGeneralNotes.dgn ModelSeed.dgn ModelSeed.dgn seed2d.dgn seed2d.dgn seedXS.dgn seedXS.dgn seedXS.dgn Survseed.dgn WEST2D.DGN WEST3D.DGN V	Directories: \Bentley\Workspace\system\seed\ C:\ Program Files Bentley Workspace System Seed	<u>D</u> K Cancel
List Files of <u>Type:</u> MicroStation DGN Files [*.dgn]	Drives:	

The **TDOT** Interface in the MicroStation® Manager Workspace should be selected in order for many custom applications to appear.

8 MicroStation Manager		
<u>File Di</u> rectory <u>H</u> elp		
Files:	Directories:	
SM080-01Survey.dgn	C:\Projects\SM080-01\	3D - V8 DGN
SM080-01Survey.dgn	C:V	
SmithSR80-dtm.dgn SmithSR80-topo.dgn	Projects	
List Files of <u>T</u> ype:	Drives:	
MicroStation DGN Files [*.dgn]	-	-T <u>DK</u>
□ Read-Only	-	Cancel
Show File I <u>c</u> ons		
Workspace	er: untitled	7
	-	
	default	
	newuser	
	TDOT New	

3.3 ACCESSING GEOPAK® SURVEY

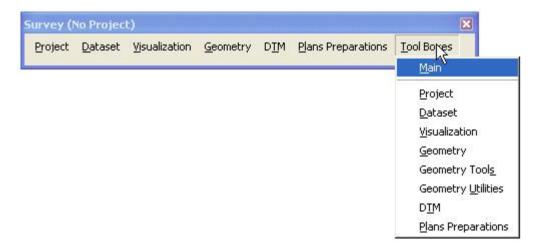
To access GEOPAK® Survey, open the survey MicroStation® File (the file created in Section 3.2) and select **Applications** \rightarrow **GEOPAK®** Survey \rightarrow Survey from the MicroStation® pull down menu as shown below.

Applications	<u>Wi</u> ndow	т.р.о.т.	Help
GEOPAK		- • [
GEOPAK BR	RIDGE	•	
GEOPAK DE	RAINAGE	- F	
GEOPAK LA	NDSCAPE	- P	
GEOPAK RO	DAD	•	
GEOPAK SI	TE	•	
GEOPAK SL	JRVEY		Survey
GEOPAK W	ATER SEWEI	R •	Help K
		2	About GEOPAK

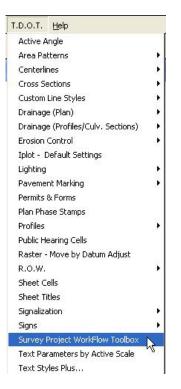
The **Survey** toolbar, shown below, is opened.

Survey (No Project)							
Project	<u>D</u> ataset	<u>Vi</u> sualization	<u>G</u> eometry	DIM	<u>Plans</u> Preparations	<u>T</u> ool Boxes	

To open the individual **Tool Boxes** for the items listed on the **Survey** toolbar, click on **Tool Boxes** and toggle on / off as shown below.



The **Main** tool box contains all the tool boxes listed in the **Tool Boxes** pull down menu. This training guide will document using the **Survey** toolbar to access the various GEOPAK® Survey functions. GEOPAK® Survey can also be opened through **TDOT Survey Project Workflow Toolbox** as shown below (Note: The TDOT Interface in the MicroStation® Manager Workspace must be selected in order for this option to appear).



The following screen capture shows the **TDOT Survey Project WorkFlow Toolbox** developed by TDOT that can be activated from the custom TDOT menu in MicroStation®. This toolbox allows for quick access to commonly used tools once the user obtains a basic understanding of GEOPAK® Survey.

Project C	ontrol		D	ataset Processin	a 🖉
Create Project	Preferences		New Dataset	Open Dataset	Control Editor
Open Project	Save Project		Edit Dataset	Reduce	Review Reports
Close F	Project		Import to GPK	Update OBS/XYZ	Save Dataset
				Delete Dataset	
Graphics	Display	Coordina	te Geometry	DTM Pro	ocessing
D & C Manager		Classic COGO		Edit Crossing Chains/Breaklines	
Draw P	rofile	Horizontal Alignment Tools		Build DTM from Survey	
Plan View	Labeler	Graphical COGO		Load DTM Features	
Profile L	abeler	Generate Groundline Profile		Edit DTM	
Shift Line	e Style	Edit Points		TIN Tracking - Height Tool	
Flip Line Style		Edit	Chains	TIN St	atistics
Visualize F	eatures			3-	
UnVisualize	Fachura				c

CHAPTER 4 - SURVEY PROJECT PREFERENCES

Before the user creates a new survey project, the user must first set the default Survey Preferences. This preference file will be used as a basis for individual project preference files. From the **Survey** toolbar, select **Project** \rightarrow **Preferences** to access the dialog shown below.

The dialog could differ from the one shown below depending on the past history of the user's machine. Select **Default** \rightarrow **Save As...** to save the default.sdp file in the C:\Program Files\Bentley\geopak\bin directory.

Important! Always close the active survey project to edit the default preference file.

Default Preferen	ces : C:\Progr	am Files\Bentley	geopak\bin\de	fault.sdp	
<u>D</u> efault					
Project	Dataset	Visualization	Geometry) DTM	1
Settings	Name :	Directory :		30 	
User	1	[- 의
Configuration	Description :				
	Job Number :	Job Directory :			- 01
	1				_ ସ
Global Working	Directory :				ৰ
	<u></u>	k j	<u>C</u> ancel		

4.1 PROJECT TAB

In the **Project** tab three options are listed on the left portion of the dialog box: **Settings**, **User**, and **Configuration**.

Settings

When the **Settings** option is selected, the dialog appears as shown above. <u>All fields in the</u> <u>setting group should be left blank</u> for the default survey preferences, but may be entered for the project specific survey preference file later.

Name:

This field is used to key-in the **Name** that will be used for the creation of a new survey project file. The survey project file (.prj file) associates projects with their respective job number, user, working directory, survey and Coordinate Geometry database, and other associated project files. The **Name** is assigned by the respective TDOT Regional Survey office.

Directory:

This key-in field is used to identify the Directory where the .prj file will be stored. By pressing the magnifier button the desired directory may be identified.

Description:

This field is used to specify an optional Description to be associated with the project.

Job Number:

This field is used to specify the Coordinate Geometry database (.gpk file) that will be used with this project. The GPK file is used to store all data that is processed through GEOPAK® Survey or GEOPAK® COGO commands. The **Job Number** is assigned by the respective TDOT Regional Survey office.

Job Directory:

This key-in field is used to identify the Directory where the .gpk file will be stored. By pressing the magnifier button the desired directory may be identified.

Global Working Directory:

The Global Working Directory should be left blank.

User

When the **User** option is selected, the **Project** tab should be completed as described below.

Default Prefere	nces : C:\Program Files\Bentley\geopak\bin\default	t.sdp
<u>D</u> efault		
Project Settings User Configuration	Dataset Visualization Geometry Name : Full Name : SU Survey Description : OP Code : Password : SU	DTM
	<u>O</u> k <u>C</u> ancel	

Name:

Key-in field to identify the **Name** of the survey project user. The name should consist of alphanumeric characters with no spaces or special characters.

Full Name:

The **Full Name** field further identifies project users and will be displayed when users are being selected as a project is opened.

Description:

The **Description** field further identifies the user by associating an optional description with a particular user.

OP Code:

The **OP Code** field sets the GEOPAK® Operator Code used for all coordinate geometry operations during this session. The Operator Code, along with the Job Number, will also be used whenever an input file is created by the software. The Operator Code can be a maximum of two characters.

Password:

Passwords are **NOT** to be used or set for any TDOT projects.

Configuration

When the **Configuration** option is selected, the **Project** tab should be completed as shown below.

Default Prefere	nces : C:\Prog	ram Files\Bentley	/\geopak\bin\de	fault.sdp	
<u>D</u> efault					
Project	Dataset] Visualization	Geometry) DTM	1
Settings User Configuration	Auto Ope	Survey Menu Bar n last project n first project found fault Project If None Fo ject Manager When Ex		•	
		<u>o</u> k	<u>C</u> ancel		

Interface:

The pull down menu allows the user to select how the Survey Menu is displayed.

Auto Open Last Project

The **Auto Open Last Project** toggle allows GEOPAK® to automatically open the last active project when GEOPAK® Survey was invoked. This command is useful if you are working on only one project at a time.

Auto Open First Project Found

The **Auto Open First Project Found** toggle allows GEOPAK® to automatically open the first project found in the working directory when GEOPAK® Survey is invoked.

Create Default Project If None Found

The **Create Default Project If None Found** toggle allows GEOPAK® to automatically create a project if no project is found in the working directory when GEOPAK® Survey is invoked.

Close Project Manager When Exiting

The **Close Project Manager When Exiting** toggle allows GEOPAK® to close the active project when GEOPAK® Survey is exited.

4.2 DATASET TAB

When the **Dataset** tab is selected, the dialog should be completed as described below.

Default Preferen	ces : C:\Program Files\Bentley\geopak\bin\default.sdp
<u>D</u> efault	
Project Settings Data Source Linking Codes Obs File Control File Reduction Configuration	Dataset Visualization Geometry DTM Name :
	<u>Ok</u> <u>C</u> ancel

Settings

When the **Settings** option is selected, the **Dataset** tab appears as shown above. Leave the fields blank for this class.

Name:

The **Name** field will set the default name when a new dataset is created. In this class, the name of the first dataset will be "TP1" (represents topography) and will be set when the dataset is created. The **Name** can be changed when each new dataset is created. The **Name** field should be limited to alphanumeric characters with no special characters or spaces used other than a hyphen "-" or an underscore "_" character.

Description:

The **Description** field provided. A description can be entered when a new dataset is created within a survey project

Output Directory:

The **Output Directory** is used to identify the directory where output information (i.e., reports, OBS and control files, etc.) related to the dataset is placed.

Use dataset name as output sub-directory

When toggled on, a directory of the same name as the dataset is created in the directory specified by the **Output Directory**, and used for all output files created by the reduction process. For this class, the option should be on.

Data Source

When **Data Source** is selected, the **Dataset** tab should be completed as shown below.

Default Preferen	ces : C:\Progr	am Files\Bentley\	geopak\bin\d	efault.sdp
<u>D</u> efault				
Project	Dataset	Visualization	Geometry) DTM)
Settings Data Source Linking Codes Obs File Control File Reduction Configuration	Data Source : I Process Lo	ASCII File(s) ▼ odePcode same as Ra		XYZ to Coordinates ▼
	🔲 Use this File	e Extension(s) instead c	of the default : 📔	i.cor;*.xyz;*.txt
	<u>_</u>	<u>k</u>	<u>C</u> ancel	

Data Source:

The drop down list contains options for importing / downloading files into GEOPAK®.

ASCII Type:

The drop down list contains options for different formats of ASCII types.

Linking Codes

When **Linking Codes** is selected, the **Dataset** tab should be completed as shown below. Linking Codes are explained in further detail in Section 2.3.

Default Preferen	ces : C:\Program File	s\Bentley\geopak\bii	n\default.sdp		
<u>D</u> efault					
Project	Dataset Visu	alization Geometry) ртм -)		
Settings	Begin Line : 🕇 +	PC Curve :	Continuation :		
Data Source Linking Codes	End Line : -	PT Curve :	Left Right :		
Obs File Control File	Beg/End Curve :	Curve Fit :	Front Back :		
Reduction Configuration	Close Figure : 🛛 *	PCC Curve :	Up Down :		
Store Linking Code as Point Description Duplicate Prefix : Linking Code Is After Feature Comment Char :					
	<u>Ok</u>	<u>C</u> ancel			

Obs File

When **Obs File** is selected, the **Dataset** tab should be completed as shown below.

Default Preferen	nces : C:\Program Files\Bentley\geopak\bin\default.sdp			
<u>D</u> efault				
Project	Dataset Visualization Geometry DTM			
Settings	Use String Substitutions			
Data Source Linking Codes	C:\win32app\geopak2004\bin\StringSub.txt			
Obs File	Remove Duplicate Shots from OBS when converting			
Control File Force Survey Chains to be Created with No GAPS				
Reduction Configuration	Auto Increment Duplicate Chain Names when converting			
	Renumber Points By : None 💌			
	Ot Consul			
	<u> </u>			

Auto increment Duplicate Chain Names when converting

Select this option to add a number to the end of the duplicate Survey Chain Names.

Control File

When **Control File** is selected, the **Dataset** tab should be completed as shown below.

Default Preferen	ces : C:\Program	Files\Bentley\g	eopak\bin\defaul	t.sdp		
<u>D</u> efault						
Project	Dataset	Visualization	Geometry	DTM]		
Settings Data Source		Import CTL points				
Linking Codes Obs File Q						
Control File Reduction Configuration	' ▼ Transfer Coordi	inate Records when	converting Raw data			
Jeoninguration						
	<u>0</u> k	J D	<u>C</u> ancel			

Reduction

When **Reduction** is selected, the **Dataset** tab should be completed as shown below.

Default Preferer	ces : C:\Program Files\Bentley\geopak\bin\default.sdp	
<u>D</u> efault		1
Project	Dataset Visualization Geometry DTM	1
Settings Data Source Linking Codes Obs File Control File <mark>Reduction</mark> Configuration	Adjustment Method : Network Least Squares ▼ Tolerances Image: Correct for earth curvature and atmospheric refraction. Distance 0.030 Image: Compute coordinate standard errors and error ellipses. Angle 30.00 Elevation 0.100 XYZ Decimal Places 4 Error Estimates Do not show reduce dialog when processing.	
	<u>O</u> k <u>C</u> ancel	_

Configuration

When **Configuration** is selected, the **Dataset** tab should be completed as shown below.

<u>D</u> efault					
Project	Dataset	Visualization	1	Geometry	DTM
Settings	 Auto Open Editor Delete Removes Data files Delete Removes From GPK 		 Import After Reduction Store Elements into GPK 		
Data Source Linking Codes					
Obs File			🗖 Scan GPK for Orphan datasets		
Control File Reduction	🗖 Auto Open last	dataset	🔽 Auto Open ASCII Dialog		
Configuration	🗖 Auto Open first	Auto Open first dataset found		✓ Show Other User Datasets	
	Auto Create de	fault dataset	🗖 Clear Raw File List When Dataset New		

4.3 VISUALIZATION TAB

When the **Visualization** tab is selected, and the **Settings** option is selected, the dialog should be completed as shown below.

Default Prefere	nces : C:\Program Files\Bentley\geopak\bin\default.sdp
<u>D</u> efault	
Project Settings Mapping Configuration Cross Section	Dataset Visualization Geometry DTM SMD Feature File : C:\Program Files\GeopakStandards\TNDOT.smd Q Plot Scale : 50.0000C Image: The State Colls Visualization
	<u>O</u> k <u>C</u> ancel

Settings SMD Feature File:

Specifies the SMD file to be used for mapping the survey field codes to MicroStation[®]. The latest TDOT .smd file can be downloaded through the following link:

http://www.tdot.state.tn.us/Chief Engineer/assistant engineer design/design/v8/V8design.htm

Plot Scale:

Indicates the scale at which Points, Symbols, Survey Chains, etc., will be mapped into the drawing. For TDOT surveys, the scale is always 50.00.

Apply Feature Best Match

When toggled on, GEOPAK® will match the field codes found in the raw data to the feature codes defined in the SMD file in the event there is not an exact match. For example, the SMD file contains the code "EP" for an edge of pavement. The field data may include multiple field codes named "EP1", "EP2", etc. With **Apply Feature Best Match** toggled on, each of these surveyed lines will be matched to the feature code "EP" in order to define how the lines will be visualized in MicroStation®.

Mapping

When **Mapping** is selected, the **Visualization** tab should be completed as shown below.

Default Preferen	nces : C:\Prog	ram Files\Bentley	/\geopak\bin\de	fault.sdp	
<u>D</u> efault					
Project Settings Mapping Configuration Cross Section	Dataset		Geometry) DTM	
		<u>D</u> K	<u>C</u> ancel		

Name / Number

When toggled on, the point name / number information is placed on the drawing on the appropriate level.

Elevation

When toggled on, the point elevation information is placed in the drawing on the appropriate level.

Description Label

When toggled on, the point description information is placed in the drawing on the appropriate level.

Comment

When toggled on, the point attribute information is placed in the drawing on the appropriate level.

Configuration

When **Configuration** is selected, the **Visualization** tab should be completed as shown below.

Default Preferen	ces : C:\Program	Files\Bentley\ge	opak\bin\defa	ult.sdp	
<u>D</u> efault					
Project	Dataset	Visualization	Geometry) DTM)	
Settings Image: Auto Draw Mapping After Process or Import Mapping Image: Always Draw Mapping to this DGN file : Configuration Image: Cross Section Cross Section Image: Cross Section					
	Point Label Re-Maj Curve Geor	pping : <u>Position relat</u> netry : <u>P-C-P treate</u>	tive to symbol 💌 d as Line String 💌]	
	<u> 0</u> k		ancel		

Auto Draw Mapping After Process or Import

When toggled on, survey points and chains will be automatically placed into the drawing on the appropriate levels.

Cross Section

When **Cross Section** is selected, the **Visualization** tab should be completed as shown below.

Default Preferen	ces : C:\Prog	am Files\Be	ntley\ą	geopak\bin\def	fault.sdp
<u>D</u> efault					
Project	Dataset	Visualizati	on	Geometry) DTM -]
Settings	Plot Elevat	ion Text : 12	.34	Hori	izontal Scale 10
Mapping Configuration	-	24		V	/ertical Scale 10
Cross Section	Plot PCode	'S		Horizontal Distanc	ce Between : 1000.0
					e Between : 1000.0
Cross Se	ction Element Syn	nbology :		44.4	
		1			Tolerance : 0.01
				venica	I Tolerance : 0.01
		<u>k</u>		<u>C</u> ancel	
1					

4.4 GEOMETRY TAB

When the **Geometry** tab is selected, and the **Settings** option is selected, the dialog should be completed as shown below.

Default Preferen	nces : C:\Prog	ram Files\Bentle	ey\geopak\bin\de	fault.sdp	
<u>D</u> efault					
Project	Dataset	Visualization	Geometry) DTM	Ţ
Settings	Unit System :	English 🔻	Set Global Geode	etic Data	
Configuration	Coordinate :	NE 🔻	99.1234	•	
	Direction :	Bearing 🔻	<u>9^9'9.12</u>	<u>.</u>	
	Station :	12+34 🔻	9+99(9).12	·]	
			1 2 21		
		<u>2</u> k	<u>C</u> ancel		

Settings Set Global Geodetic Data

TDOT does not use this option.

Configuration

When the **Geometry** tab is selected and the **Configuration** option is selected, the dialog should be completed as shown below.

Default Preferences : C:\Program Files\Bentley\geopak\bin\default.sdp					
<u>D</u> efault					
Project	Dataset	Visualization	Geometry) DTM)	
Settings Configuration	Redefine Eleme	ional):		치	
			ancel		

Redefine Elements in GPK

When toggled on, sets the redefine parameter in the Classic COGO dialog in GEOPAK®. As a TDOT best practice recommendation, leave this option toggled off.

Input Directory (Optional)

This option is used to specify the directory where properly formatted COGO input files are located.

Output Directory (Optional)

This option is used to specify the directory to save COGO output files to.

4.5 DTM TAB

When the **DTM** tab is selected and the **Settings** option is selected, the dialog should be completed as shown below.

Default Prefe	ences : C:\Program Files\Bentley\geopak\bin\default.sdp	
<u>D</u> efault		
Project Settings Stroking	Dataset Visualization Geometry DTM Determine DTM Inclusion from : Point/Chain Attribute Field Dissolve Option : Side Side Length:	
	<u>Ok</u> <u>C</u> ancel	

Settings

Determine DTM Inclusion from:

Specifies how the **Build GEOPAK® DTM** (from Survey Data) dialog controls the inclusion or exclusion of survey points and survey chains collected in the field.

All Points/ Chains included - All surveyed points and chains will be included in the DTM. survey chains will be included as breaklines.

Feature Table (SMD) - The DTM inclusion is determined by feature definition in the SMD file.

Point/ Chain Attribute Field - The DTM inclusion is determined by the Attribute field of the individual survey points and survey chains.

Dissolve Option:

Specifies how the **Build GEOPAK® DTM** (from Survey Data) dialog controls the creation of individual triangles in the TIN model. Options are **None, Sliver** and **Side** (preferred). If the **Side** option is used the maximum triangle side length can be input.

Stroking

When **Stroking** is selected, the **DTM** tab should be completed as shown below.

Default Preferences : C:\Program Files\Bentley\geopak\bin\default.sdp				
<u>D</u> efault				
Project	Dataset]	Visualization Geometry) DTM	
Settings	🔽 Stroke Curves	Arc Stroke Tolerance 0.100	-	
Stroking	🗖 Stroke Linear	Linear Stroke Distance 75.000	-	
	<u>0</u> k	<u>C</u> ancel		

Once all of the preferences have been chosen, select the **OK** button to accept.

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CHAPTER 5 - CREATING A NEW SURVEY PROJECT

5.1 CREATING A NEW SURVEY PROJECT

After the Project Preferences have been set, you are ready to create a new GEOPAK® Survey project. This process will copy the default preference file (default.sdp) to your project working directory and it then becomes a project specific preference file (*.spp). From the **Survey** toolbar, select New and the following dialog is opened.

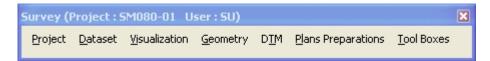
Populate the dialog with the appropriate values. Once the dialog is populated, select **OK** to create the new project.

8 Project New	
Name Sm080-01.pr Directory : C:\Projects\SM08 Job Number : 3o4 Q Description :	30-01\ Q
SR-80 Smith County	cel

After the survey project has been created, the user can change the Project Preferences to suit the user's needs. Select **Yes** in the dialog below to create the .gpk file.



The **Survey** toolbar should reflect the active project and user as shown below.



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CHAPTER 6 - PROCESSING SURVEY DATA

6.1 CREATING NEW DATASETS

To create a new dataset and process the raw data, select **Dataset** \rightarrow **New**... from the **Survey** toolbar and the following dialog is opened. Select the **Dataset Add Source File** to List button to add the SM080-01CTL dataset.

		Survey (I	Project : 9	5M080-01	User : 9	5U)		
		Project	<u>D</u> ataset	<u>Vi</u> sualizatio	on <u>G</u> eor	netry	D <u>T</u> M	
			<u>N</u> ew			_		
			Open်သ်. ငော					
			Edit					
	궁 Data	set New						
		Name: 🔽	TL	Create	•			
	Des	cription :	M080-01C	TL.txt				
	Data	Source : A	SCII File(s)	▼ X12	Z to Coord	linates	-	
	Output D	irectory : 🔽	<pre> c\projects\ </pre>	sm080-01\				۹
		v i	Use data	aset name a:	s output s	ub-dire	ctory	
	Source	e Format :	XYZ to C	oordinate	8			
						File(s) to Use	i 🔁
			C:\\	Projects\SM	080-01\S	M080-	01CTL.	xt 🗇
								\times
	1					1		+
			<u> 0</u> k		<u>C</u> ancel			
l					P			
2	to Coord	linates					eeaseoso	All and
						+ 		4-
					Datase	t Add	Source	File to List
					▲			-
						-		

Name:

The **Name** of the dataset is user definable. The **Name** will also be used as the name of the subdirectory if the **Use dataset name as output sub-directory** option is checked. Each set of raw data that is processed for the project should have a unique name assigned. The **Name** field should be limited to alphanumeric characters with no special characters or spaces used other than a hyphen "-" or an underscore "_" character.

Description:

This key-in field is used to enter an optional description for the dataset.

Data Source:

A variety of data source options are supported in GEOPAK® Survey. For this example the ASCII file was exported from the data collector to a coordinate file.

Output Directory:

Select the directory where output information for this dataset (i.e., reports, OBS and control files) is placed.

Use dataset name as output sub-directory

When toggled on, a directory of the same name as the dataset is created, and used for all output files. When not toggled on, the specified **Output Directory** is used. If the **Output Directory** field is left blank, the **Working Directory** is used.

Select the **OK** button to create the new dataset or **Cancel** to abort the operation.

Delimiter

The user must set the delimiter for the dataset when using ASCII format. The dialog shown below illustrates the use of a "," to separate columns in the ASCII file. Note: To begin select a line as shown below.

名 XYZ to Coordinates 🛛 U	lser : SU Dataset : CTL				
File C:\Projects\SM080-01\SM0	080-01CTL.txt <u>C</u> Linking Code Comment Delimiter Other	- =			
S01,733985.5914,1978941.717 S02,734560.97673,1979252.35 S03,734882.24741,1979702.47 S05,735471.98212,1980596.19	<pre>/ KCP=80-80-02 / KCP=80-80-03</pre>	▲ ▼			
S01 733985.5 PNum Y Reset Next >:		P odePCode ▼ Chain ▼			
 ✓ Load ASCII Dialog On Dataset Open ✓ Import After Process ✓ Open Editor After Processing ✓ Process LoodePcode same as Raw Data 					

Comment Delimiter

The dialog below shows the Comment Delimiter used for adding a comment to a field point.

\$02,734560.97673,1 \$03,734882.24741,1		L.txt 66,XCP=80-80-01 778,XCP=80-80-02 114,XCP=80-80-03	L Linking (Comment Delimiter	Dash / ; Space • Other None	
S01 PNum Reset Control ASCII Dialo	733985.5914 <u>Y</u> g On Dataset Open	1978941.71794 <u>×</u> ▼ <u>P</u> rocess	514.366 Z Import After P Store Element		

PNum identifies the first column in the ASCII file to be the point number.

名 XYZ to Coordi	inates User : SU	Dataset : CTL		
File C:\Projects\SM	4080-01\SM080-01CTL	.txt	Linking Cod	e
	Delimiter	- c	Comment Delimiter 🔃 🛛	ther 🔻 😑
len2 7245en 07e75 Х Ү	1978941.71794,514.36 1979252.35216,513.7 1979702.47035,511.1 1980596.19954,512.6	78×CP=80-80-02 14×CP=80-80-03		▲ ▼
Z PCode	733985.5914	1978941.71794	514.366	XCP
▶ PNum LCode Chain	<u>⊻</u>	<u>× •</u>	<u>z</u> •	LCodePCode ▼ Chain ▼
DTM Par Name Par Value Zones LCodePCode	og On Dataset Open er Processing Pcode same as Raw Da	<u>P</u> rocess ata	 Import After Proc Store Elements i 	
None				

名 XYZ to Coordina	ates User : S	U Dataset : CTI	L	
File C:\Projects\SM08 S01,733985.5914,193 S02,734560.97673,19	Delimiter	▼ 66,XCP=80-80-01	Linking Code	- ,
\$03,734882.24741,19 \$05,735471.98212,19	979702.47035,511.	114XCP=80-80-03		- -
S01	X	1978941.71794	514.366	XCP
PNum Reset	Z PCode	<u>× •</u>	<u>Z</u> •	LCodePCode ▼ Chain ▼
 Load ASCII Dialog Open Editor After Process LoodePc 	PNum LCode Chain DTM ParName	Process ata	 ✓ Import After Proce ✓ Store Elements in 	

Y identifies the second column in the ASCII file to be the northing.

X identifies the third column in the ASCII file to be the easting.

8 XYZ to Coordinates	User : SU	Dataset : CTL		
File C:\Projects\SM080-01\	SM080-01CTL.t	xt Q	Linking Co	de
Delim	iter 📜 🔻] (Comment Delimiter <u>C</u>)ther 🔻 😑
\$01,733985.5914,1978941. \$02,734560.97673,197925 \$03,734882.24741,197970 \$05,735471.98212,198059	2.35216,513.778 2.47035,511.114	3XCP=80-80-02 4XCP=80-80-03		▲ ▼
S01 7339	85.5914	1978941.71794	514.366	XCP
PNum V Reset	▼	▶× Y k	<u>z</u> •	LCodePCode ▼ Chain ▼
 Load ASCII Dialog On D Open Editor After Process Process LoodePcode sa 	sing -	PCode PNum LCode Chain DTM	Import After Pro Store Elements	

名 XYZ to Coordin	ates User : Sl	J Dataset : CT	l		
File C:\Projects\SM0		L.txt	Linking		
S01,733985.5914,19 S02,734560.97673,1 S03,734882.24741,1 S05,735471.98212,1	979252.35216,513.3 979702.47035,511.3	778×CP=80-80-02 114×CP=80-80-03	Comment Delimite	r Other 🔻	=
S01 PNum V Reset	733985.5914 <u>Y</u> ▼	1978941.71794 × ▼	X Y PCode PNum	k	ePCode ▼ hain ▼
C Open Editor After	g On Dataset Open Processing ode same as Raw D	<u>P</u> rocess ata	r LCode r Chain DTM Par Name Par Value	ess nto GPK	

Z identifies the fourth column in the ASCII file to be the elevation.

LCodePCode identifies the fifth column in the ASCII file to be the linking and feature code.

名 XYZ to Coordinates User : SU Dataset : CTL	Ŷ	×
File C:\Projects\SM080-01\SM080-01CTL.txt Comment Delimiter Other Delimiter Comment Delimiter Other \$01,733985.5914,1978941.71794,514.366 XCP=80-80-01 \$02,734560.97673,1979252.35216,513.778 XCP=80-80-02 \$03,734882.24741,1979702.47035,511.114 XCP=80-80-03 \$05,735471.98212,1980596.19954,512.607 XCP=80-80-05 \$05,735471.98212,1980596.19954,512.607 XCP=80-80-05 \$05,735471.98212,1980596.19954,512.607 XCP=80-80-05	LCode Chain DTM Par Name	
S01 733985.5914 1978941.71794 514.366 PNum Y Y Z Z Reset Z Image: Constraint of the process of the proces of the proces of the process of the proce		<u></u>

Linking Code

The dialog below shows the Linking codes used for **Begin Line**, **End Line** and **Close Figure**. Note: The **Linking Code** button is available after the **LCodePCode** field is selected.

	8 Linking
XYZ to Coordinates User : SU Dataset :	Begin Line : End Line : PC Curve : PT Curve : Continuation : Close Figure : *
File C:\Projects\SM080-01\SM080-01CTL.txt	
Delimiter 🔍 💌	Comment Delimiter Other 💌 😑
S01,733985.5914,1978941.71794,514.366XCP=80-80-01 S02,734560.97673,1979252.35216,513.778XCP=80-80-0 S03,734882.24741,1979702.47035,511.114XCP=80-80-0 S05,735471.98212,1980596.19954,512.607XCP=80-80-0)2)3
S01 733985.5914 1978941.7175	94 514.366 XCP
PNum V V X	▼ Z ▼ LCodePCode ▼ Chain ▼
 ✓ Load ASCII Dialog On Dataset Open ☐ Open Editor After Processing ☑ Process LcodePcode same as Raw Data 	☐ Import After Process ☐ Store Elements into GPK

Once the dataset format has been defined, the user can proceed with processing. Note: A point must be highlighted as shown in the dialog to be able to process the dataset.

SXYZ to Coordinates User : SU Dataset : CTL	×
File C:\Projects\SM080-01\SM080-01CTL.txt Comment Delimiter Other Delimiter Comment Delimiter	
\$01,733985.5914,1978941.71794,514.366,XCP=80-80-01 \$02,734560.97673,1979252.35216,513.778,XCP=80-80-02 \$03,734882.24741,1979702.47035,511.114,XCP=80-80-03 \$05,735471.98212,1980596.19954,512.607,XCP=80-80-05	
S01 733985.5914 1978941.71794 514.366 XCP	
PNum V V X V Z V LCodePCode V Reset Next>>	
 Load ASCII Dialog On Dataset Open Open Editor After Processing Process LoodePcode same as Raw Data 	

The dataset is mapped based on the SMD file selected in Section 4.3 Visualization tab.

The user should repeat the same process for the TP1 and TP2 datasets. Once the **Dataset New** dialog is invoked again, the user will have to remove the existing CTL (or TP1) information, replace with the new dataset information, then process.

6.2 COPYING DATASETS

Additional datasets can be created as described above or if the source format is the same, datasets may be copied under a different file name as shown below. Only the new source file would need to be defined. Select **Dataset** \rightarrow **Copy...** from the **Survey** toolbar. Sub directories will not be created using this method.

Survey (F	Project : S	im080-01 U	ser : SU)				×
<u>P</u> roject	<u>D</u> ataset	<u>Vi</u> sualization	Geometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool Boxes	
	<u>N</u> ew						
	Open						
	<u>E</u> dit						
	<u>S</u> ave						
	<u>C</u> opy Close		2				
	Delete.		Ĭ				
	<u></u>						
	2.						
	8 Dat	aset Cop	y				
	١	New Name :	TP1				
	New [Description :	SM080	01TP	1.txt		
	Selec	t Dataset to	Copy :				
	Nam	ne De	escription				
	CTL	SN	4080-01C1	FL.txt			
		<u> 0</u> k		<u>C</u> anc	el		

For the purposes of this class, the user should not copy a dataset.

6.3 DELETING A DATASET

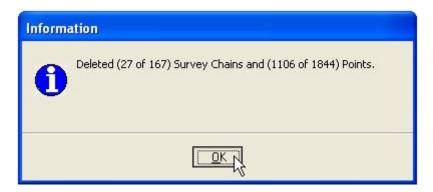
Note: The dataset being deleted has to be the active or open dataset. Only the information in this particular dataset is deleted. This is a useful tool since GEOPAK® creates various files that are associated with the dataset. This tool would be used if an incorrect source file was processed or if there was a major error in the source file making the dataset invalid. For the purposes of this class the user **should not** delete any datasets.

Survey (I	Project : S	m080-01 U	ser:SU D	atasel	::TP1)	Ð	3
Project	Dataset	<u>Vi</u> sualization	Geometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool Boxes	
1	<u>N</u> ew						
	Open						
	<u>E</u> dit						
	<u>S</u> ave						
	<u>С</u> ору						
	Close						
	<u>D</u> elete.	· 🗟 🚽					
	Properti						
	Control	Editor					
	<u>R</u> educe						
	Re <u>vi</u> ew	Reports	•				
	Import	To GPK					
	Update	OBS and XYZ					

By selecting the following toggles, the .obs and .xyz files are deleted as well as the elements removed from the .gpk file.



The dialog shown below will appear confirming the deletion of the survey chains and points. The **Information** dialog summarizes the points and chains from the active dataset that will be deleted and the total number of points and chains contained in the GPK file. The original dataset source file remains intact.



6.4 REDUCE DATASET

To reduce the dataset, populate the GPK file and map elements into MicroStation®, access **Dataset Reduce** as shown below. For the purposes of this class the user **should not** reduce any datasets.

Survey (F	Project : S	im080-01 U	ser : Sl	U)				×
<u>P</u> roject	Dataset	<u>V</u> isualization	Geome	etry D	DIM	Plans Preparations	<u>T</u> ool Boxes	
	<u>N</u> ew							
	Open							
	<u>E</u> dit							
	<u>S</u> ave							
	<u>С</u> ору							
	Rena <u>m</u> e	в						
	Close							
	<u>D</u> elete.							
	Propert	ies						
	Control	E <u>d</u> itor						
	<u>R</u> educe	N						
	Re <u>vi</u> ew	Reports	•					
	Import	To GPK						
	Update	OBS and XYZ						

The **Dataset Reduce** window will open, as shown below.

🛿 Reduce :m080-01\TP 🔳 🗖 🔀
Adjustment Method : No Adjustment 💌
Process
Do not show reduce dialog when processing.
Market Ma

Adjustment Method:

The **Adjustment Method** is selected by the **Project Preferences** dialog at the creation of the project; however, it can be modified at this point. The options shown below are supported by GEOPAK® Survey.

Adjustment Method :	 No Adjustment Compass Rule Transit Rule
	Network Least Squares

Import After Reduction

Select this option to automatically import the survey data into the .gpk file after the data is reduced. The value for this option is set in the **Project Preferences** at the creation of the project, but can be modified at this point.

Process

This starts the dataset reduction process.

When the **Process** button is selected, the following actions occur:

- The survey data is reduced according to the selected **Adjustment Method**.
- Several reports are generated in the sub-directory for the dataset. The Data Reduction Report (.rpt) is automatically opened in a MicroStation® text editor.
- If **Import After Reduction** is toggled on, the survey data is imported into the .gpk file.
- If Import After Reduction is toggled off, the user must select Dataset → Import to GPK from the Survey toolbar to initiate the import process.

6.5 REVIEW REPORTS

The user can now review the available reports. The reports can be reviewed by opening the **Survey Reports** dialog by selecting **Dataset** \rightarrow **Review Reports** \rightarrow **Dialog** from the **Survey** toolbar.

Survey (F	Project : Sm080-01 Us	er : SU Dataset : TP2)	×
Project	Dataset Visualization	Geometry DIM Plans Pre	parations <u>T</u> ool Boxes
	<u>N</u> ew		
	<u>O</u> pen		
	<u>E</u> dit		
	<u>S</u> ave		
	<u>С</u> ору		
	Close		
	<u>D</u> elete		
	Properties		
	Control E <u>d</u> itor		
	<u>R</u> educe		
	Re <u>vi</u> ew Reports	▶ <u>Di</u> alog N	
	Import To GPK	Tool Box	
	Update OBS and XYZ	Preliminary Analysis	
		Abstracted Hor <u>z</u> , Measu	urement
		Horz. Error E <u>s</u> timates	
		Vertical Adjustments	
		Horizontal Adjustments	
		Horz. <u>N</u> etwork Coordina	ites
		Horz. <u>G</u> eo-Coordinates	
		Adjusted <u>C</u> oordinates	
		Align. Ref. & <u>El</u> evations	
		Survey <u>R</u> eduction Repo	rt
		Sum <u>m</u> ary Report	
		<u>B</u> uild Manuscript	
		Activity Log	0
		Eeature Code Error Rep	ort

The Feature Code Error Report button can be selected to view the feature code errors (or unrecognized descriptors) as shown in the text editor window below.

名 Survey Reports 🛛 🗖 🔀
Original Source Data
Converted Raw Data (FL OBS Format)
Adjusted <u>C</u> oordinates
<u>A</u> ctivity Log
Eeature Code Error Report

S Text Editor: C:\Projects\SM080-01\CTL\feacode.err		
<u>File Edit Criteria</u>		
Unknown FeatureCodes that were found in XYZ file but are no Unknown Feature Code LW Unknown Feature Code 4"WL Unknown Feature Code GUY Unknown Feature Code SIGN1	ot stored :	in database.
	Line: 1	Col: 1

Once the incorrect Feature Code is known, open the Original Source Data file to determine which points were incorrectly coded.

名 Survey Reports 🛛 🗖 🔀
Driginal Source Data
Converted Raw Data (FL OBS Format)
Adjusted <u>C</u> oordinates
<u>A</u> ctivity Log
Eeature Code Error Report

8 Tex	ct Editor: (C:\Proje	ects\SM080-01\Sm080-01TP2.txt	
Eile E	Edit Criteria	a	*	
B	<u>U</u> ndo	Ctrl+Z		
	<u>R</u> edo	Ctrl+R		
S42 S42	<u>Fi</u> nd	Ctrl+F	1979259.9355,511.7104,+RD1=BISHOP HOLLOW LANE ASP. 1979236.0084,511.2061,+RD2	
S42 S42-	Find <u>N</u> ext	^V Ctrl+D	1979228.8634,512.7320,+BL 1979238.3893,512.0765,BL	
S42	Cu <u>t</u>	Ctrl+X	1979249.3270,511.3583,BL	
S42 S42	<u>С</u> ору	Ctrl+C	1979259.6951,511.5161,RD1 1979260.7984,511.3157,RD2	
S42	<u>P</u> aste		1979263.2047,511.1588,RD1	
			,1979267.3910,510.9888,RD1 ,1979274.2452,510.8406,RD1	
Comple	eted search		Line: 1	Col: 1

Find Text
Text to Find: GUY
Match Case
Cancel

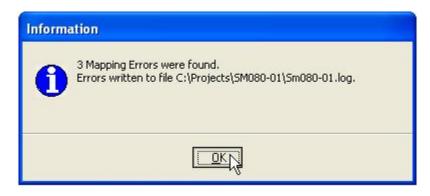
Cext Editor: C:\Projects\SM080-01\Sm080-01TP2.txt	
<u> Eile E</u> dit <u>C</u> riteria	
S10142,735224.5395,1980539.6477,524.1176,BL2 S10143,735227.2299,1980522.4013,521.3045,-BL3	<u>*</u>
S10144,735216.4824,1980525.4240,524.9373,BL2 S10145,735218.5446,1980513.2996,522.4684, <u>-BL</u> 2	
S10146,735207.6023,1980539.2059,531.2561, S10147,735226.9191,1980567.8897,529.7980,XP	
S10148,735239.7580,1980600.3916,531.3266,XP S10149,735219.9937,1980590.0011,538.1209,XP	
S10150,735233.3314,1980607.9720,537.4262,XP S10151,735188.0854,1980506.9067,533.3446,XSPUR	
Completed search	Line: 945 Col: 42

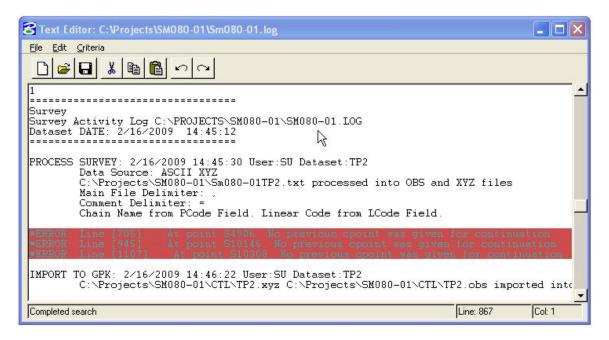
The feature codes will be corrected in Chapter 8. The point will be remapped to the correct settings as defined by the SMD file (Note: Redefine must be active in the COGO dialog). Once updated, the new information pertaining to the edited point is stored in the GPK file. The Original Source Data file remains intact.

The **Activity Log** tracks (all activity) the detailed history of the .gpk file including all the modifications, additions, or changes to the .gpk file.

名 Survey Reports 🛛 🔲 🔀
Original Source Data
Converted Raw Data (FL OBS Format)
Adjusted <u>C</u> oordinates
Activity Log
Eeature Code Error Report

If the following **Information** dialog appears after processing or importing the dataset into the GPK file, errors were encountered in chains being miscoded. These chains are displayed but the SMD file does not know how to interpret them. The user must review the Activity Log to determine which points need to be corrected.





Open and review the Activity Log for any errors in processing the dataset.

6.6 RAW DATA EDITOR

The user can review the obs file by selecting **Dataset** \rightarrow **Edit** from the **Survey** toolbar to open the GEOPAK® Survey Editor. The raw data editor is used to review and correct raw data prior to processing. For the purposes of this class, the Raw Data Editor will not be used to edit the raw data.

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CHAPTER 7 - VISUALIZING SURVEY DATA

7.1 TDOT SMD (SURVEY MANAGER DATABASE)

The SMD Database dictates various graphic and surface functions. To review the SMD settings choose Visualization \rightarrow Edit SMD File.

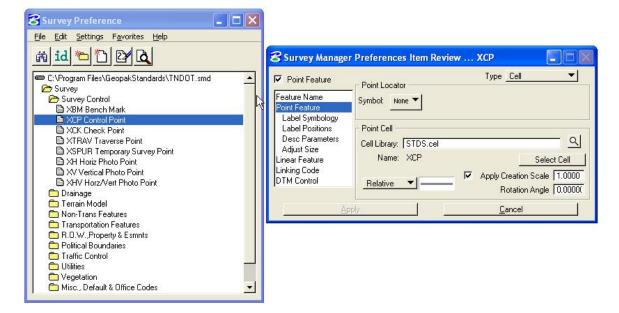
iurvey (Project :	Sm080-01 U	lser : SU)			
Project Dataset	Visualization	Geometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool Boxes
	<u>Vi</u> sualize <u>U</u> nVisualize				
	<u>E</u> dit SMD Fi				
	<u>D</u> isplay				

The TNDOT.smd file is password protected and cannot be modified, but can be viewed by selecting Cancel in lieu of entering a Password.

8 Password	
Password:	
<u>0</u> K	Cancel

Select the Feature or Item to Review and a full definition of the Feature can be viewed.

Survey Preference			
Eile Edit Settings Favori			
🖞 id 🍋 🎦 📴 🛕			
C:\Program Files\GeopakStandards\TNDOT.smd		Survey Manager	Preferences Item Review XCP
Survey Survey Control Survey Control Survey Control XCB Bench Mark XCP Control Point XCR Check Point XCR Or Traverse Point XCR Deck Point XCP Control Point Control Results		Feature Name Point Feature Label Symbology Label Positions Desc Parameters Adjust Size Linear Feature Linking Code DTM Control	Feature Feature Name XCP Feature Description Control Point JyCancel
Conness Conness Conness Conness Conness Conness Conness Conness	.		



Individual datasets can be visualized or unvisualized by using the **Visualization** menu. This command is writing or deleting the graphic information to the MicroStation® file. The command is not mapping new information. In order to visualize a dataset, the dataset must first be imported into the GPK file. For the purposes of this class, the user **should not** visualize or unvisualize any datasets.

Survey (Project : 9	5m080-01 User : Surve	еу)		×
<u>P</u> roject <u>D</u> ataset	Visualization Geometry	DIM	Plans Preparations	Tool Boxes
	UnVisualize			
	Edit SMD File			
	<u>D</u> isplay			
		E	3 Set Search	
			Select Datasets	ок
UnVisualize			TP1	
About to UnVisualize su	urvey from MicroStation file.	н	✓ TP2	Cancel
Set S	earch	П		More Detail
Process	Cancel			
			Mark All	
			Clear All	

The Set Search feature, which can be utilized in other applications, allows the user to identify which elements are to be used. Toggle TP2 in the **Set Search** dialog to unvisualize the elements in the TP2 dataset. Select **Process** from the **UnVisualize** dialog. The graphics will be removed from the drawing file. After unvisualizing the graphics, the graphics can now be visualized. Select **Process** as shown in the dialog below.

	8 Set Search	
About to draw survey into the MicroStation file.	Select Datasets CTL TP1 F12	OK Cancel More Detail
Process Cancel		
	Mark All Clear All	

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CHAPTER 8 - MANIPULATING SURVEY DATA

8.1 POINT EDITING

Select **Geometry** \rightarrow **Points** \rightarrow **Edit** from the **Survey** toolbar to access the **Point Edit** dialog shown below.

oject	<u>D</u> ataset	<u>V</u> isualizat	tion <u>G</u> eometry DI <u>G</u> raphical Con <u>N</u> avigator Classic Cogo	go	ns Preparations <u>T</u> ool Boxe
			<u>P</u> oints <u>C</u> hains	•	Edit Inverse
			<u>T</u> ools	۰	Locate <u>T</u> raverse Locate Elevation By Profile
				•	
			E <u>x</u> port <u>I</u> mport		
			Inport	•	
	Point ♠ ₪	int Edit Name [Feature] Dataset [Descr]	S10146 Geor	Zone _ metry _	and the second se
	Point • • • • •	Name Feature Dataset Descr North : 73	S10146 XGW Geor TP2 Attr Set by DP F 5207.6023 80539.2059 Undo	metry [ibute _ dited	Point

The **Point Edit** dialog can be used to edit, create, and delete Survey Points.

Point S10146 was miscoded in the data collector so the user will have to edit the point. As described in Section 6.6 the incorrect feature code was "GUY". The user should enter S10146 in the **Name** field and press the TAB key. This will load the data for this point. Update the **Feature** field with the appropriate code XGW and change the **Attribute** field to **Spot** as shown above and select **Update**.

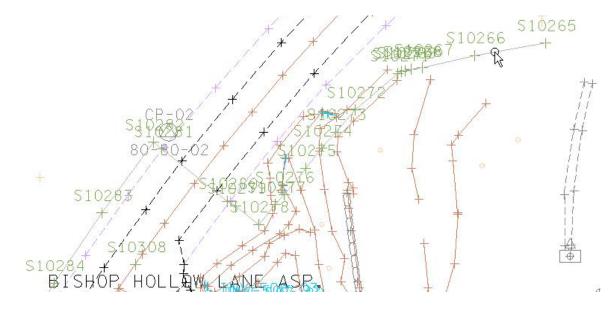
The user can use the same procedure described above for the additional miscoded points. All edits are made to the Survey Points stored in the .gpk file. See the GEOPAK® online help for complete information.

8.2 CHAIN EDITING

Select **Geometry** \rightarrow **Chains** \rightarrow **Edit** from the **Survey** toolbar to access the **Chain Edit** dialog shown below.

<u>G</u> raphical Cogo <u>N</u> avigator C <u>l</u> assic Cogo
Points >
<u>⊆</u> hains ▶ <u>E</u> dit
<u>I</u> ools <u>C</u> rossing Chains Copy Chain <u>P</u> arallel
Conversions Compute Batter
Export Convert Survey Chain Import Extrude Survey Chain

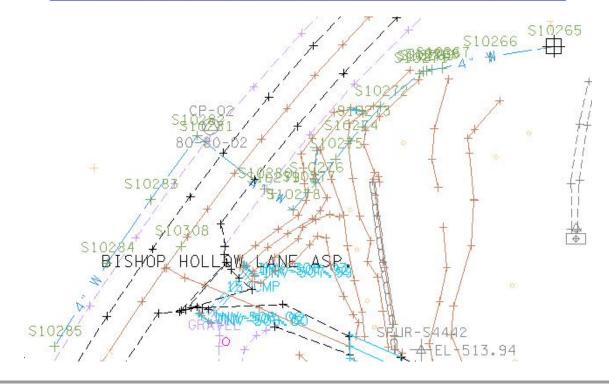
When the **Chain Edit** dialog appears, the 4" water line chain will not be selected. The user can graphically select the chain or choose from the chain pull down. Select the 4"WL chain beginning with point S10265 either graphically or from the Chain list in the dialog. The 4"WL chain is shown in the screen capture below. Once the chain is selected, the respective boxes to that chain will be populated and can be edited.



In this case, each of the points associated with the 4" Water Line were miscoded as 4"WL. The correct feature code should have been 4WL. Using the **Chain Edit** dialog, the user can edit the feature code for each individual point as well as the chain. Each point feature code should be corrected in order for the point locators, numbers, elevation, etc. to be mapped to the correct symbology. The **Attribute** setting will need to be manually corrected for each point. The dialog will not look to the SMD file to update this setting.

Edit or correct the feature code for the chain and select the **Update** button (paintbrush icon).

名 Chain Edit						
Chain						
4'WL - 4 >	💰 📥 💉 🗔 휪					
	Feature 4WL Station 0.0000 Dataset TP2 Edited					
	T TO.0000 Dataset T	FZ Edited				
Zone 1 Attribute Do No	t Include Descr					
Deine Line						
Point List						
S10265-S10285,						
Chain Points						
🔺 S10265 🔺 🔼	Name S10265	North: 734603.7710				
s10266	Feature 4"WL					
🗐 S10267 - 🗾 📶	Dataset TP2	Elev: 522.3533				
🖫 S10268 💾	Zone 1	Set by DP				
S10269	Geometry Point	Edited				
	Attribute Do Not Include	Project DP onto Chain				
🛄 🗖 Insert After 🙀						
	Descr					



名 Chain Edit		
Chain 4'WL Feature 4WL Zone 1 Attribute	Ground Feature X-Section User ▶ Do Not Include Spot	Descr
Point List S10265-S10285, Chain Points	Spot and Break Void Drape Void Break Void	
 ▲ \$10265 ▲ ▲ \$10266 ▲ \$10267 ▲ ④ \$10267 ▲ ● \$10268 \$10269 ▲ 	Island Boundary Contour L Zone 1	
S10270 S10270 S10270 S10270 S10270	Secondary Potential Attribute Dot Descr Descr	o Not Include Project DP onto Chain

Change the **Attribute** to Spot for the chain.

Anytime features or other information are edited, updating the chain is recommended. This procedure automatically remaps the chain and graphically updates the chain feature.

8 Chain Edit	
14'WL 🖃 🔶 🖌 🕷 🛃 🕺 🗔 .	£ 🗋 🗶 🖉 🗈 🗠
Feature 4WL Station 0.0000 VS Datas	set TP2 🔽 Edited
Zone <u>1</u> Attribute <u>Spot</u> Descr	
Point List	
\$10265-\$10285,	
Chain Points ▲ S10265 ▲ 四 Name S10265	▼ North: 734603.7710 ▲
-1 \$10266 Feature 4"WL	East: 1979435.2215
🕮 S10267 🚽 🖌 Dataset TP2	✓ Elev: 522.3533
Image: Big S10268 Image: Big S10269 Image: Big S10269 <thimage: big="" s10269<="" th=""> Image: Big S10269</thimage:>	Set by DP
S10200 V Geometry Point	🔽 Edited
Attribute Do Not Include	Project DP onto Chain
Auto Insert 94 Descr	

Now, edit each individual point to reflect the correct feature code and attribute settings as shown below. In this case, begin by selecting the first point in the chain. Correct the feature code and then change the **Attribute** setting.

🞖 Chain Edit	
Chain 4"WL I I I I I I I I I I I I I I I I I I I	Image: Second secon
S10266 Feature S10267 Data:	Feature one X-Section etry User Image: Set by DP etry User Image: Do Not Include Image: Project DP onto Chain

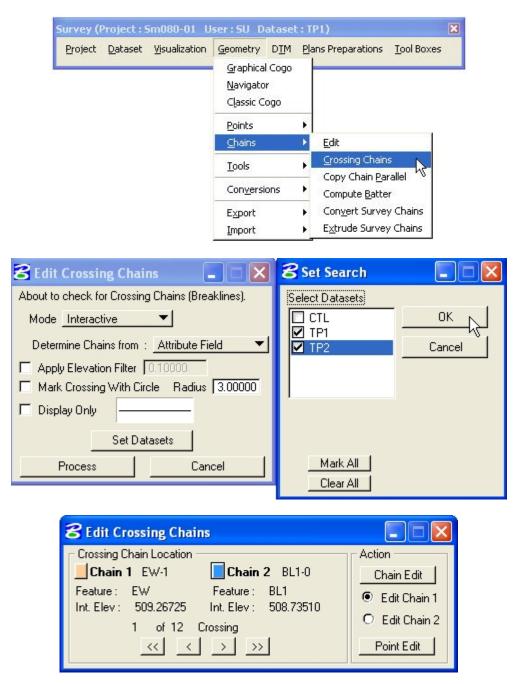
The paintbrush icon next to the list of chain points must be selected to update the point data.

8 Chain Edit	
Chain	
14 WL 🖃 📢 🕨 🦨 📕 💞 📢	1 🖸 🗶 🖉 🗊 🕤
Feature 4WL Station 0.0000 Da	taset TP2 🔽 Edited
Zone 1 Attribute Spot Descr	
Point List	
S10265-S10285,	
Chain Points	
▲ S10265 ▲ □ Name S10265	✓ North: 734603.7710 ▲ ✓ East: 1979435.2215
S10266 Feature 4WL S10267 Dataset TP2	Elev: 522.3533
S10267 S10267 Zone 1	
510269	Set by DP
	Edited
Auto Insert 🕶 Descr	

Repeat this process for each individual point in the chain.

8.3 CROSSING BREAKLINE DETECTION

Before creating the DTM File for a project, it is good practice to check for crossing break lines in the survey data. Crossing break lines can lead to unpredictable results in the completed DTM surface. To check for crossing break lines, select **Geometry** \rightarrow **Chains** \rightarrow **Crossing Chains** from the **Survey** toolbar to access the **Edit Crossing Chains** dialog shown below. Complete the dialogs as shown below. Once the datasets are selected, select the **Process** button from the **Edit Crossing Chains** dialog.



All edits are made to the Survey Chains stored in the .gpk file.

See the GEOPAK® online help for details running the Edit Crossing Chains dialog.

8.4 UPDATE OBS / XYZ

Edits preformed on Survey Points and Survey Chains are stored in the .gpk file and are not reflected in the raw data files for the dataset. The **Update OBS and XYZ** command should always be used to update the raw data after performing edits to the Survey Point and Survey Chain definitions. Select **Dataset** \rightarrow **Update OBS and XYZ** from the **Survey** toolbar to access the **Updating** dialog shown below.

Survey (F	Project : S	m080-01 U	ser:SU D	atasel	: : TP2)		×
Project	<u>D</u> ataset	<u>Vi</u> sualization	Geometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool Boxes	
	<u>N</u> ew						
	Open						
	<u>E</u> dit						
	<u>S</u> ave						
	<u>⊂</u> ору	1					
	Rename						
	Close						
	<u>D</u> elete.						
			_				
	Propert	les	_				
	Control	E <u>d</u> itor					
	<u>R</u> educe						
	Re <u>v</u> iew	Reports	•				
	Import	To GPK					
	Undate	OBS and XYZ					
		000 010 112					

Use the **Set Datasets** dialog to select the TP2 dataset. Select **Process Update** to update the **.obs** and **.xyz** files for the selected dataset.

8 Updating	
About to update	your [OBS & XYZ] files.
	et Datasets
Process Update	Create New Cancel

8.5 DISPLAY BY FEATURE

The **Display By Feature** option gives the user control to analyze the processed data according to features from the SMD file. When invoked, this opens the SMD file allowing for the selection and / or grouping of desired features.

urvey (Project : S	m080-01 User : S	U Dataset : TP1)	2
Project Dataset	Visualization Geo	metry D <u>TM Plans</u> Preparations	<u>T</u> ool Boxes
	<u>V</u> isualize <u>U</u> nVisualize		
	Edit SMD File		
	Display 🕨	By Named Groups 🕨	
	-	By <u>F</u> eature	
		By <u>S</u> etSearch	

Once selected, the feature editor opens as shown below.

8 Survey Display	
<u>File E</u> dit <u>S</u> ettings F <u>a</u> vorites <u>H</u> elp	
🛋 id 📰 📰 🜉 🎦 💌	
🗁 Survey Control	
XBM Bench Mark	
XCP Control Point	
XCK Check Point	
XTRAV Traverse Point XSPUR Temporary Survey Point	
XH Horiz Photo Point	
XV Vertical Photo Point	
XHV Horz/Vert Photo Point	
🛅 Drainage	
💼 Terrain Model	
💼 Non-Trans Features	
🗁 Transportation Features	
BE Business Entrance	
BIKE Bike Path	<u> </u>
-	
CP Control Point	
RD Edge of Road	

It is important to remember that no editing of the feature table can occur from the application, only selection for viewing. By selecting a category or an individual item and adding into the collection window on the bottom of the dialog, the user has the ability to control how the elements are viewed. The button selected above will only display the elements added to the collection. By selecting the **Settings** pulldown from the top of the dialog, a masking color to be applied to the entire file can be set. This simply shades all the elements to the selected color for viewing purposes.

8.6 DISPLAY BY SET SEARCH

The **Display By Set Search** is also a viewing tool that provides the capability to view project elements with the control over selecting Runs and then filtering based on Points, Chains, Feature, Zones, and Attributes just as the Multi Point Edit and various other survey tools do.

Project Dataset	Visualization Geo	metry D <u>T</u> M	Plans Prepara	ations <u>T</u> ool Boxes
	<u>Vi</u> sualize <u>U</u> nVisualize			
	<u>E</u> dit SMD File			
	<u>D</u> isplay ♪	By Named By <u>F</u> eatur By <u>S</u> etSea	e	
		8 Se	t Search	
Set Search Disp			t Datasets TL P1 P2	OK Cancel
0.10		and the second se		3. <u></u>
Set S Display Display Hilite ▼ O Hilite O Not		et		More Detail
Display Display <u>Hilite</u>		et		More Detail

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CHAPTER 9 - DIGITAL TERRAIN MODELS

A **Digital Terrain Model (DTM)** represents the topography of a project in the form of a triangulated network. The DTM can be drawn in a 2D or 3D file, and then rotated to see the existing surface of the project area.

Digital Terrain Models can be generated from various sources including MicroStation® Elements, survey data, photogrammetric data, GEOPAK® cross sections, and geometry data.

Triangulation is a mathematical process applied to stored elevation points and stored elevations along DTM break lines to create surfaces. The result of triangulation is the creation of a TIN file from which existing ground profiles and existing ground cross sections can be generated.

9.1 CREATING A DTM FROM SURVEY DATA

To create the DTM model for the existing field survey data, select $DTM \rightarrow Build DTM \rightarrow From$ Survey Data as shown below.

Note: This section is for field survey only and does not include aerial data. A similar process is used in Section 9.6 for combining field and aerial survey data.

Project <u>D</u> ataset	<u>Vi</u> sualization	Geometry	DIM	Plans Preparations	Tool Boxes
			DT	<u>1</u> Tools	
			<u>S</u> tro	king Options	
			<u>B</u> uil	d DTM 🔶 🕨	From Survey Re
				d DTM Features . 1 <u>C</u> amera	From <u>D</u> AT File ^N
			Buil	d Merge TINS d Clip TI <u>N</u> S DTM	
			⊻olu Viev <u>H</u> eiq	umes v <u>P</u> rofiles ght Query Statistics	

The **Build DTM** dialog opens as shown below. The user will name the .tin file by selecting the **Files** button and typing in the name of the TIN. The "F" in the name of the tin represents field survey.

🔁 Build DTM 📃 🗖 🗙	DTM TIN File	
TIN File Parameters DTM TIN File Files	Files: SM080-01FDTM.tin	Directories: c:\projects\sm080-01\
Dissolve Option : Side Side Length: 75.000		C c:\ C projects
DAT File Parameters		Projdbs
DTM Data File		
Stroking Parameters Arc Stroke Tolerance 0.100 🔽 Stroke Curves		Cancel
Linear Stroke Distance 75.000 Stroke Linear Determine DTM Inclusion from : Point/Chain Attribute Field	List Files of <u>Type:</u> 	Drives: E C: Help
Supplemental DAT File Dat File Files		
Set Search Process		

Select the **Set Search** button to open the following dialog. Select the TP1 and TP2 datasets and select **OK**.

🔁 Build DTM 📃 🗖 🗙	8 Set Search	
TIN File Parameters DTM TIN File \$\sm080-01\SM080-01FDTM.tin Files	Select Datasets	
Dissolve Option : Side Side Length: 75.000	✓ TP1 ✓ TP2	Cancel
DAT File Parameters		More Detail
DTM Data File Files		
File Open <u>Create File</u> File Mode <u>ASCII</u>	Mark All	
Stroking Parameters Arc Stroke Tolerance 0.100 IV Stroke Curves	Clear All	
Linear Stroke Distance 75.000 🗖 Stroke Linear		
Determine DTM Inclusion from : Point/Chain Attribute Field		
Supplemental DAT File Dat File Files		
Set Search Process		

Setting DTM Inclusions

Revisions made to points or chain surface attributes will only be recognized if Point Chain Attribute Field is toggled on. If not toggled, the DTM Inclusions will be determined from the SMD file and any revisions made to the point or chain DTM Attribute will be ignored. This should typically be set to **Point/Chain Attribute Field** for TDOT projects.

See the GEOPAK® online help for a complete description of all the dialog options. The options most commonly used are detailed below.

DTM TIN Files

Key-in the name and path for the new TIN file to be created. The TDOT CADD Standards manual details the standard file naming requirements for GEOPAK® Digital Terrain Model (.tin file).

Set Search

The Set Search dialog will allow you to select which datasets to process.

Select **Process** to start the build DTM operation.

Building Triangles from combined .dat file: **Build Triangles** processes the information stored in a DTM input file (.dat) to create a triangulated model (.tin). The file extension .tin represents a *triangulated irregular network*.

Data File is the DTM input file where the extracted topological features are stored.

TIN File stores the triangulated model in binary format.

The user does not have to enter the file extension with the file names. The user can always navigate to an existing file using the **Files** button. If the full path is not given, the files will be created in the working directory.

The **Dissolve Option** eliminates triangles that are not representative of the surface. These dialogs are populated by the settings initially set in the **Project Preferences** dialog. They can however be changed at this time.

The three options are:

- **None** no external triangles are dissolved
- Sliver long, thin triangles dissolved
- **Side** external triangles whose external side is longer than a user specified length are dissolved (recommended)

9.2 LOADING DTM FEATURES

To visualize the DTM information in MicroStation®, select $DTM \rightarrow Load DTM$ Features from the Survey toolbar.

Survey (Project : Sm080-01 User	; SU)			Ε
Project Dataset Visualization Ge	ometry D	IΜ	Plans Preparations	<u>T</u> ool Boxes
		DTM	Tools	
	2	Stro	king Options	
		<u>B</u> uild	IDTM 🕨	
		Load	DTM Features	
		DTM	Camera K	
		Build	Merge TINS	
		Build	l Clip TI <u>N</u> S	
		<u>E</u> dit	DTM	
		<u>V</u> olu	mes	
		View	Profiles	
		<u>H</u> eig	ht Query	
		<u>Τ</u> ΙΝ	Statistics	
		Drai	nage Tool	

The Load DTM Features dialog opens as shown below.

8 Load DTM F	eatures						
Eile							
Load File: Data	-			_	9	Lo	ad
⊢ Display Preferen	ces				×		
Load: Extent		Only	🗖 Gr	aphic G	iroup		
Feature	Level	Color	Weight	Style	Display	*	
Spots	Default	0	0	0	OFF		\$ ‡
Break Lines	Default	1	0	0	OFF		\$ ‡
Extd.Contours	Default	2	0	0	OFF		
Voids	Default	3	0	0	OFF		8
Islands	Default	4	0	0	OFF		•
Holes	Default	5	0	0	OFF	-	
		-		_	Г		

Load File:

Select the file type that you wish to use to load information from. Supported file types are **Data**, **TIN**, and **Lattice**.

Load Button

Select this button to start the drawing or displaying of DTM Features in the active MicroStation® design file.

Display Preferences

Load:

Features for an entire model can be drawn utilizing the **Extent** option, while partial model features can be accomplished by the **For Fence** option. Regardless of the MicroStation® Fence option selected, the overlap method will be utilized. When utilizing the **For Fence** option, the MicroStation® fence must be placed prior to pressing the Load button. The **For View** option draws only features with in the current view.

Display Only

When this toggle is activated, elements are not drawn into the MicroStation® file and disappear when an update or view control command is issued. When not activated, elements are drawn into the file at the specified element symbology.

Graphic Group

When activated, all elements placed with in a single processing (each pressing of the Load button) are placed into a graphic group for easy manipulation and /or deletion.

Level Preference File

To set the **Level**, **Color**, **Weight**, **and Style**, two display preference files have been configured according to TDOT standards:

- tdotEXIST.lpf Display preferences for plotting existing DTM features.
- tdotPROP.lpf Display preferences for plotting proposed DTM features.

To access these files, select **File** \rightarrow **Open...** from the **Load DTM Features** dialog. These files are maintained on the "c" drive at the following location:

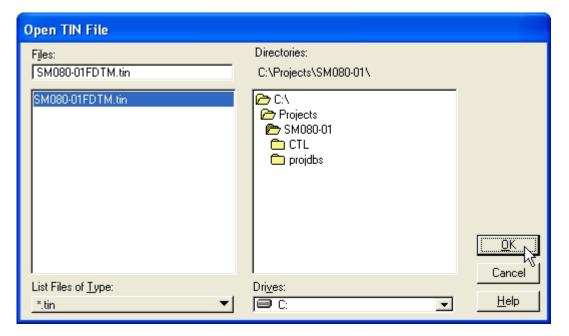
• C:\Program Files\GEOPAKStandards\

Load the tdotExist.lpf file to display the DTM features on the correct levels and symbology. After the preference file is loaded you will notice that the **Level, Color, Weight, and Style** parameters are now set according to TDOT standards as shown below.

	atures				Ŀ		⊐L×
File							
Open ta	-			_	9	Lo	ad j
Save 5	es				<u></u>		
S <u>a</u> ve As		Only	E Gr	aphic G	iroup		
		- Cring	,		p		
Feature	Level	Color	Weight	Style	Display		
Spots	Default	0	0	0	OFF		\$ ‡
Break Lines	Default	1	0	0	OFF		\$ ‡
Extd.Contours	Default	2	0	0	OFF		
Voids	Default	3	0	0	OFF		9
Islands	Default	4	0	0	OFF		•
Holes	Default	5	0	0	OFF	-	
				_	_		
					1		

Open Preferences File		
Fijles: [tdotEXIST.lpf	Directories: C:\Program Files\GeopakStandards\	
tdotEXIST.lpf tdotPROP.lpf	C:\ Program Files CeopakStandards 3PC ConstCriteria Criteria	
List Files of <u>Type:</u> lpf	Drives:	Cancel <u>H</u> elp

Load the appropriate tin by selecting the magnifying glass button from the **Load DTM Features** dialog.



The features of the **Load DTM Features** dialog are discussed on the following pages. See the GEOPAK® online help for more details not covered in this training course.

Different **DTM Features** can be loaded, depending on the type of source file selected.

The light bulb icons to the right of the dialog can be used to toggle on/off the display for all features, or selected features. The bright light bulb (top) activates the display for all features, regardless of their current status. The darkened bulb (second one down) deactivates the display for all features, regardless of their current status. The bottom two light bulbs activate and deactivate the current highlighted feature.

DTM Feature Symbology List Box

For each Feature, there are element symbology options (Level, Color, Weight, and Style) and **Display** mode (on/off). As each **Feature** is highlighted, its element symbology is displayed directly below the list box in the symbology box. Note the toggle to the right of the element symbology indicates whether the display is on (toggle is on) or off (not toggled). For example, when **Triangles** is selected, the dialog is displayed as depicted below.

play Preferer	nces	080-01FDTM.t			ର _	Lo	ad
d: <u>Extent</u> eature	Level	Display Only	l✔ Gi Weight		aroup Display	-	17
riangles	• DT	8	0	0	ON		₽ t
	T	0	0	0	OFF	_	
ontours	53	-	0.500	82	OFF		
Major Lines	CO	2	2	3	ON		<u> </u>
Major Label	CO	2		0	ON		2
Minor Lines		12	0	3	ON	-	
		E	1	LV: SUR Co: 8 Lc: 0	VEY - DTN	1 GR	APHIC

The symbology for the selected item can be changed by double-clicking the symbology box to access the **Set Feature** dialog shown below. Floating your cursor over the symbology box will reveal the current settings for the selected **Feature** as shown above.

Symbolog	· · ·		
Level:	SURVE'	Y - DTM I	GRA 💌
Color:	8		-
Style:		- 0	•
Weight:		- 0	-
Weight:		- 0	<u> </u>

If the selected feature requires text (i.e., Spots) the dialog dynamically changes as shown below when the feature is highlighted. Text parameters (Font, Text Height, Text Width, Number of Decimal Places and Justification) may be defined or modified by double-clicking on the symbology box.

B Load DTM Fea	atures\td	otEXI	ST.lpf					
Eile								
Load File: TIN	▼ SM080-01F	DTM.t	in	_	Q	Lo	ad	
Display Preference	es							
Load: Extent		Only	🔽 Gr	aphic G	quori			
Feature	Level	Color	Weight	Style	Display			
Minor Label		12	2	0	OFF		\$ ‡	
Spots D	Т	0	0	0	ON		\$ ‡	
Break Lines D)T	3	0	0	ON			
Extd.Contours - [DT	2	0	0	OFF		8	
Voids Y	- DT	6	0	0	ON		•	
Islands '-	DT	0	0	0	OFF	-		
				_				
			12	2				
			I	1		MCE		Spot Doin
				Co: 0	QET-DI	m Gh	CAPITICS	- Spot Poir
					OVMON			
				FC: LER Wt: 0	OYMON			

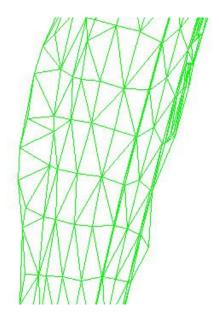
Contours require additional parameters as shown below.

名 Load DTM Features\tdotEXIST.lpf 🛛 🔲 🔲 🔀							
<u>Fi</u> le							
Load File: TIN	▼ SM080-01	FDTM.tir	1	_	Q	Load	ł
Display Preferer							
Load: Extent		Only		rankia G	10110		
		only	i∙ u	iapriic a	Toup		
Feature	Level	Color	Weight	Style	Display		
Contours	-	-	-	-	ON		\$ ‡
Major Lines	CO	2	2	3	ON		9 ‡
Major Label	CO	2	2		ON	_	0
Minor Lines		12	-	-	ON		
Minor Label		12	_		OFF		Υ.
Spots	DT	0	0	0	ON	•	
	Minor Inter	val: 2.0	000	Major In	terval:	10.000	
Smooth: Three	Point 💌 Registrat						
Range 🔻 Mir	nimum Z: 0.000	Ma	kimum Z:	0.000		Read	1
							_
							-

Plotting Triangles

Triangles can be plotted as shown in the example below right. Using the TDOT preference file tdotEXIST.lpf, the triangles are plotted on the level Survey-DTM Graphics-Triangles.

ad File: <u>TIN</u> isplay Preferer		SM080-	01FDTM.t	in		<u>a</u> [Load
bad: <u>Extent</u>	100000000	🗖 Disp	lay Only	₽ G	raphic G	iroup	
Feature	1	Level	Color	Weight	Style	Display	•
Triangles	- DT		8	0	0	ON	
TIN Hull	T		0	0	0	OFF	
Contours				53	0.00	OFF	20 - C-
Major Lines	CO		2	2	3	ON	-
Major Label	CO		2	2	0	ON	
Minor Lines			12	0	3	ON	-
						2	



Plotting Contours

Contours can be plotted at a user defined **Minor Interval** and **Major Interval** as shown in the example below. The intervals used will vary from project to project depending on the vertical extents of the project data. The **Read** button can be used to read the **Minimum Z** and **Maximum Z** values from the select TIN file.

名 Load DTM Featu	res\td	otEXIS	T.lpf				×
Eile							
Load File: TIN 💌	SM080-01F	FDTM.ti	n		Q	Load	1
Display Preferences -					_		
Load: Extent 💌	🔲 Display	Only	🔽 Gr	raphic G	roup		
			1			_	
Feature	Level	Color	Weight	Style	Display	*	
Contours					ON	- 1 S	21
Major Lines CO		2	2	3	ON		Pt
Major Label CO		2	2	0	ON		
Minor Lines		12	0	3	ON		8
Minor Label		12	2	0	OFF		•
Spots DT		0	0	0	ON	•	
	Minor Inter-	val 21	000	Maior In	terval:	10.000	-
					-		- 1
Smooth: Three Point	Hegistrati	on: [0.	000	Minimum	Area: 1	J.UUU	
Range 🔻 Minimum	Z: 498.159	Ma	ximum Z:	638.7	76	Read	R
	,			,			2
							-

Selecting the **Major Lines** option allows the user to define the level symbology for the major contour lines. Using the TDOT preference file tdotEXIST.lpf, the major contour lines are plotted on the level Survey-Contours-Index with Text as shown below.

Cload DTM F	eature	es\td	otEXIS	ST.lpf					
<u>Fi</u> le									
Load File: TIN	▼ [SM080-01F	DTM.ti	n		Q T	Loa	ad	
Display Preferen	ices								
Load: Extent	•	🗖 Display	Only	🔽 Gr	aphic Gi	roup			
Feature	L	.evel	Color	Weight	Style	Display	-		
Contours			-	-		ON		\$ ‡	
Major Lines	CO		2	2	3	ON		9 ‡	
Major Label	CO		2	2	0	ON			
Minor Lines			12	0	3	ON		8	
Minor Label			12	2	0	OFF		•	
Spots	DT		0	0	0	ON	-		
			-	<u>L</u>		◄			
				°	SURVEY	- CONTO		- Index	with T
				Co:					
				Lc: 3					
				Wt:					

Selecting the **Major Label** option allows the user to define the level symbology for elevation labels placed on the major contour lines. Using the TDOT preference file tdotEXIST.lpf, the major contour lines are plotted on the level Survey-Contours-Index with Text.

Double-click on the text symbology box to access the **Set Feature** dialog. This dialog is used to set the text values for the major contour elevation labels.

The TDOT DTM preference files have been configured with a default text size of 0.10 for any feature that places text. The user will need to modify the text size for **Spots** and **Contour** text placement depending on the plotting scale. For example, the user loads tdotEXIST.lpf preference file but needs to plot the text for a scale of 50:1. The user must change the key-in field from 0.10 to 5.0 (0.10 x 50=5.0) for both text values **Th** (text height) and **Tw** (text width).

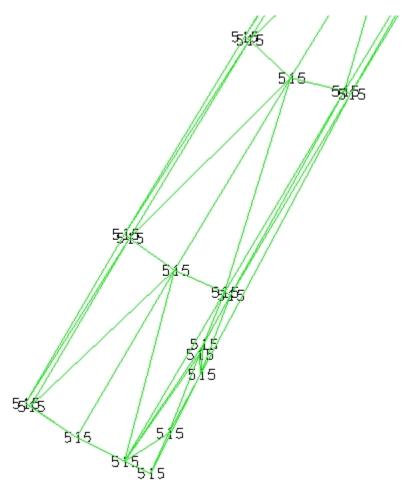
Selecting the **Minor Lines** option as shown above allows you to define the level symbology for the minor contour lines. Using the TDOT preference file tdotEXIST.lpf, the minor contour lines are plotted on the level Survey-Contours-Intermediate with Optional Text.

Contour elevation labels are not normally placed for minor contour lines, therefore the **Minor** Label option is toggled off in tdotEXIST.lpf.

Select the **Load** button from the **Load DTM Features** dialog once the following features are turned on:

- Triangles
- TIN Hull
- Contours (Major lines, Major labels and Minor lines)
- Spots
- Break Lines
- Voids

Use the DTM Graphics level filter in the MicroStation® **Level Display** dialog to view the graphics as shown below. By using the level filter option, the graphics are "filtered" to only show those graphics included in DTM graphics.



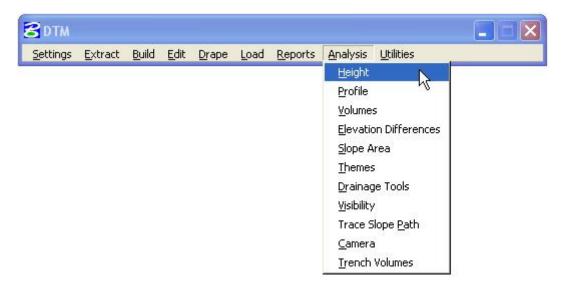
9.3 TIN TRACKING (HEIGHT TOOL)

Select **DTM** \rightarrow **DTM Tools** from the **Survey** toolbar. A **Select Run** dialog will appear. For the purpose of this class use an untitled run. The following tool palette will appear. Select **DTM Menu** from the following dialog.



The **Analysis** tools allow the user to utilize the digital terrain model in many different analyses such as a profile, height, and drainage.

The **Height** command shows the user the x, y, and z coordinates and the slope of a given data point. The contour at that elevation, the triangle the point lies within, and the direction of flow can be displayed.



Set the GEOPAK® Height / Slope dialog as shown below.

名 Height / Slope 🛛 🔲 🔀						
TIN File: SM080-01FDTM.tin ♀ Mode : Elevation ▼ ▼ Display Only Options Text: Sample ▼ Show Contour: ▼ Show Triangle:						
Image: Start Image: Start Image: Start Image: Start						

Use the Start button to show the Flow Arrow, Contour and Elevation of different areas of the DTM as shown in the dialog below. The text size can be changed by selecting Sample and choosing the appropriate text size.

Height / Slope TIN File: SM080-01FDTM.tin Mode: Elevation Options Image: Display Only Options Image: Display Only Options Image: Display Only Show Contour: Image: Display Only Image: Show Flow Arrow: Image: Display Only Cursor Point Values Image: Display Only Image: X: 19806666.7418 Y: 736211.2781 Z: 508.4839 Slope: 0.9040%	
Start	508 508 508 508 51 51 51 51 51 51 51 51 51 51 51 51 51

9.4 TIN STATISTICS

The TIN statistical data can give the user some information as to the size of tin with regards to number of triangles, points, breaks and other features that may have been written to the file. Select **Reports** \rightarrow **Triangle Statistics** from the **DTM** toolbar.

8 dtm									
<u>S</u> ettings	Extract	<u>B</u> uild	Edit	Drape	Load	Reports	Analysis	Utilities	
							ite Points 1g Features		
						Triangl	e Statistics	N	
						Lattice	Statistics	hr.	

Display the GEOPAK® **TIN Statistics** dialog as shown below. Change the **Decimal Points** to 2. Select the **Process** button to review the **TIN statistics**.

	Statistics				
TIN:	0-01\SM080-01	IFDTM.tin C	2		
Dec	imal Points: 2	•			
_ TIN St	atistics ———				
Numbe	er of Data Po	ints: 1529			
Numbe	er Of Lines:	4382			
Numbe	er Of Triangle	es: 2854			
Numbe	er Of Breaks:	135			
	er Of Contou				
	er Of Voids:	0			
	er Of Islands:	-			
Numbe	er Of Holes:	0			
	Minimum	Maximum	Range		
North	733960.58	736519.43	2558.84		
East	1978898.53	1980848.67	1950.15		
Elev	498.16	638.78	140.62		
Process					

9.5 EDITING DTM GRAPHICS

The digital terrain model used in this class consists of two parts, the aerial data and the field data. Open the aerial survey file (SmithSR80-dtm.dgn) containing DTM graphics.

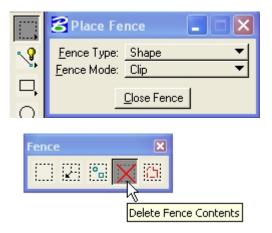
Open		
Eile Directory Fijes: SmithSR80-dtm.dgn SM080-01 Survey.dgn SmithSR80-dtm.dgn SmithSR80-topo.dgn	Directories: C:\Projects\SM080-01\ C:\ Projects SM080-01 CTL D projdbs	3D - V8 DGN
List Files of <u>Type:</u> <u>CAD Files [*.dgn,*.dwg,*.dxf]</u> <u>Read-Only</u> Show File I <u>c</u> ons	Drives:	Cancel

If the dialog below appears, select the option as shown and select **OK**.

웅 GEOP	AK Units Synchronization Alert
•	GEOPAK Preferences Unit System is set to English while MicroStation Storage units are set to Metric, resulting in unsynchronized units. Please select one of the below actions:
	 Change Preferences Unit System to Metric Proceed with GEOPAK Activated Proceed with GEOPAK Deactivated Activate GEOPAK then Launch DGN Element Conversion Tool Open Another DGN File Exit MicroStation
	Cancel

In order to preserve the original aerial DTM data, save the file as **SmithSR80-MDTM.dgn**. Reference the field survey file (SM080-01Survey.dgn) into this file. Turn off levels in the survey file not included in the DTM. The DTM Graphics level filter, described in Section 9.2, can be used for this purpose. The user must delete aerial DTM graphics that overlap field DTM graphics. In this class, the user will edit the aerial graphics, build a .dat from those graphics, create the field DTM, and supplement with the aerial .dat file.

To begin editing, carefully draw a fence shape with clip mode selected around the aerial survey graphics and delete the fence contents. The fence drawn should not be a duplicate of the hull, but should leave an area of overlap between the aerial and field DTM to be edited manually.



Use partial delete to delete part of a breakline or obscure line crossing a survey file graphic.



Use the delete command to erase the unwanted lines and points.

When editing of the aerial DTM graphics is complete, unvisualize the field survey reference file.

8 References (1 of 1 unique,	0 displayed)	
Tools Settings		
▤▾ <u>฿ง฿</u> ๙๛	(*) 🗗 🗗 🔂 🖓 👘	📑 🗊 🖈 Hilite Mode: Boundaries 💌
Slot File Name Model	Description Logica	al Presentation 🗖 🛷 📐
1 SM080-01Survey Default	Global Origin aligne	Wireframe 🙀 🗸 🗸
		Display
Scale 1.000000 : 1.000000	Rotation X 0*0'00'' Y 0*0'00''	Z 0°0'00''
▣◡◣≝‴ಾಂ;;▦⊵	No Nesting ▼ Depth: 1	c:\projects\sm080-01\sm080-01survey.dgn

9.6 COMBINING AERIAL AND FIELD DTM'S

From the **Survey** toolbar select **DTM** \rightarrow **DTM Tools** if the **DTM Menu** bar is not already loaded. Select **OK** on the **Run** dialog.

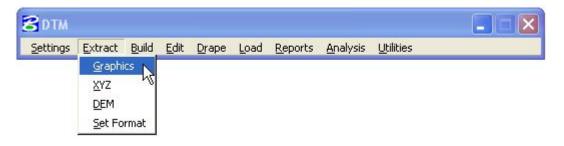
Note: The user should still be in the modified aerial survey file.

Survey (P	roject : 9	5m080-01 U	ser : SU)				8	×
Project	<u>D</u> ataset	<u>V</u> isualization	<u>G</u> eometry	DIM	<u>Pl</u> ans Preparati	ons	<u>T</u> ool Boxes	
				DT	1 Tools			_
				Stro	bking Options			
				<u>B</u> uil	d DTM	•		
				Loa	d DTM Features			
				DTM	1 <u>C</u> amera			
				Buil	d Mer <u>q</u> e TINS			
				Buil	d Clip TI <u>N</u> S			
				<u>E</u> dit	: DTM			
				<u>V</u> olu	umes			
				Viev	v <u>P</u> rofiles			
				<u>H</u> eig	ght Query			
				TIN	Statistics			
				Dra	inage Tool			

The following dialog will appear. Select **DTM Menu** as shown below.



From the **DTM Menu** select **Extract** \rightarrow **Graphics**.



The following dialog will appear. Select the magnifying glass button to create a new .dat file. The new file will represent the extracted aerial DTM graphics. Name the file SM080-01ADTM.dat. Complete the dialog as shown below. Select the appropriate Search Criteria as shown below. Select the SURVEY – DTM – Breaklines level. Zoom extents so the entire project is shown in View 1. Select the Stroking button and set as shown below. Then select Apply.

名 Extract Graphics 📃 🗖 🗙	BLevel Name Search Filter
File Name: SM080-01ADTM.dat Q File type: Binary Image: Create File open: Create Image: Create Feature: Breaks Image: Stroking Mode: Extraction Image: SURVEY - AERIAL SL Image: Lv Numbers: Image: SURVEY - AERIAL SL	SURVEY - DRAINAGE - Storm S SURVEY - DRAINAGE - Storm S SURVEY - DRAINAGE - Storm S SURVEY - DTM - Breaklines SURVEY - DTM - Breaklines - SURVEY - DTM - Breaklines - SURVEY - DTM - Breaklines - SURVEY - DTM - Spot Points SURVEY - DTM - Spot Points SURVEY - DTM - Spot Points
Curve Stroking Op Curve Stroke Toler ✓ Minimum Linear Dista	ance: 0.10000

The .dat file has now been created with breaklines. The user will append the .dat file with spots and obscured areas in the next two passes. Complete the dialog as shown below. Select the appropriate **Search Criteria** as shown below. In the second pass, the user will extract the spot points into the .dat file. Select the **SURVEY – AERIAL SURVEY – Collected Point** level. Assure the previously selected level for breaklines is unselected. Zoom extents so the entire project is shown in View 1. Then select **Apply** to append the .dat file.

😹 Extract Graphics 📃 🗖 🗙	BLevel Name Search Filter
File Name: SM080-01ADTM.dat Q File type: Binary ▼ File open: Append ▼ Feature: Spots ▼ Mode: Extraction ▼ Search Criteria ▼ ▲ ✓ Lv Names: Y - AERIAL SURVEY - ▲ ✓ Lv Numbers: ▲ ▲ ✓ Colors: ▲ ▲ ✓ Styles: ▲ ▲ ✓ Weights: ▲ ▲	 FUNCTIONAL - TRANSPORTATION - Pavement Mark FUNCTIONAL - TRANSPORTATION - Pavement Patt FUNCTIONAL - TRANSPORTATION - Preliminary E FUNCTIONAL - TRANSPORTATION - Preliminary E FUNCTIONAL - TRANSPORTATION - Roads Text SURVEY - AERIAL SURVEY - Automatic - Grid F SURVEY - AERIAL SURVEY - Automatic - Grid F SURVEY - AERIAL SURVEY - Automatic - Grid F SURVEY - AERIAL SURVEY - Automatic - Grid F SURVEY - AERIAL SURVEY - Collected Point SURVEY - AERIAL SURVEY - Contours - Major SURVEY - AERIAL SURVEY - Contours - Major T SURVEY - AERIAL SURVEY - Contours - Minor SURVEY - AERIAL SURVEY - Mapping Setup - MA SURVEY - AERIAL SURVEY - Mapping Setup - SE SURVEY - AERIAL SURVEY - Mapping Setup - wi

In the third pass, the user will extract the void / obscure areas into the .dat file. Complete the dialog as shown below. Select the **SURVEY – AERIAL SURVEY – Obscured Area** level. Assure the previously selected level for collected points is unselected. Zoom extents so the entire project is shown in View 1. Then select **Apply** to append the .dat file. The aerial DTM graphics have been extracted. Exit the aerial DTM dgn file and return to the survey file.

名 Extract Graphics 📃 🗖 🗙	BLevel Name Search Filter
File Name: SM080-01ADTM.dat Q File type: Binary ▼ File open: Append ▼ Feature: Void ▼ Mode: Extraction ▼	SURVEY - AERIAL SURVEY - Mapping Setup - SURVEY - AERIAL SURVEY - Obscured Area SURVEY - AERIAL SURVEY - Obscured Area F SURVEY - AERIAL SURVEY - Out of collecti SURVEY - AERIAL SURVEY - Photo Control - SURVEY - AERIAL SURVEY - Photo Control -
Search Criteria Lv Names: SURVEY - AERIAL SL	SURVEY - AERIAL SURVEY - Photo Control - SURVEY - AERIAL SURVEY - Photo Control w SURVEY - AERIAL SURVEY - Skipped Points SURVEY - AERIAL SURVEY - Uncollected Poi

On the Survey toolbar, select $DTM \rightarrow Build DTM \rightarrow From Survey Data$.

Project D	<u>ataset</u>	<u>V</u> isualization	<u>G</u> eometry	DIM	Plans Preparatio	INS	<u>T</u> ool Boxes	
1	_		_	DT <u>M</u> Tools]	
				<u>S</u> tro	king Options			
				<u>B</u> uik	d DTM	×	From <u>S</u> urvey [
				Loa	d DTM Features		From <u>D</u> AT File	ή

Set the dialog below as shown. The aerial data will be included as a Supplemental DAT File by checking the **Dat File** option. In the **DTM TIN File** field, type in the appropriate file name without the tin extension.

8 Build GEOPAK DTM					
TIN File Parameters DTM TIN File SM080-01 Files					
Dissolve Option : Side Side Length 75.000					
DAT File Parameters					
Create DAT File					
DTM Data File					
File Open <u>Create File</u>					
File Mode ASCII					
Stroking Parameters Arc Stroke Tolerance 0.100 🔽 Stroke Curves					
Linear Stroke Distance 75.000 🔽 Stroke Linear					
Determine DTM Inclusion from : Point/Chain Attribute Field					
Supplemental DAT File					
Set Search Process					

8 Set Search	
Select Datasets CTL TP1	ОК
✓ TP2	Cancel More Detail
Mark All Clear All	

Select the Set Search button and complete as shown below. Select OK.

In the Build GEOPAK DTM dialog, select Process to create the TIN.

The user can now refer to Section 9.2 for loading the DTM features from the new TIN. The previously loaded features for a field only survey will need to be deleted or the user can create a new dgn for DTM graphics.

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CHAPTER 10 - COORDINATE GEOMETRY

10.1 ESTABLISHING ALIGNMENTS (GEOPAK® CHAINS)

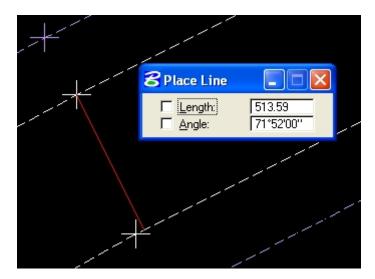
GEOPAK® chains can be created multiple ways. The **Classic COGO** method fits tangents to field located points, fits curves between the tangents, and creates a chain from the tangent and curve segments. By using the **Best Fit** command, GEOPAK® points are selected as event points (i.e. PC, PT, BP, etc.). The **Store Chain** from graphics allows the user to manually establish the alignment and then create as a chain. From **Input File Utility**, the user can regenerate an alignment previously created. For the purposes of this class, the input file method will be used and is explained further in this section.

Classic COGO Method

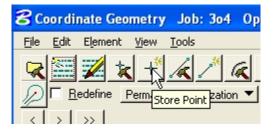
Select **Geometry** \rightarrow **Graphical COGO** from the **Survey** toolbar to access coordinate geometry.

Survey (Project : Sm080-01 User : SU Dataset : TF							
<u>Project D</u> ataset <u>Vi</u> sualizal		<u>V</u> isualization	<u>G</u> eometry	D <u>T</u> M	<u>Pla</u>		
			<u>G</u> raphical Cogo				
2 Floment Solo			Navidato	r			

To fit tangents the user may need to create points bisecting existing pavement or median. The user can use MicroStation® commands and snaps to accomplish this. Using the draw line command, set the snap to keypoint and snap to a point on an edge of road survey chain. Change the snap mode to perpendicular and snap to the opposite edge of roadway.



Select **Store Point** as shown in the dialog below.



Enter the starting point number as shown in the dialog below. Select **DP** and set snap mode to midpoint and snap to the MicroStation® line created above to draw a COGO point at the line's midpoint and accept. Once the data point is accepted, select Store to store the point in GEOPAK®. Repeat this procedure at other locations on tangent sections of roadway. These points will be used to create the tangent lines.

8 Store Point		
Point Name:	SP1000	
Coordinates		
Northing: Easting:		DP
Station: Elevation: PCode: Point Cell: Feature:	Scale:	
C Description:	J Store Point	

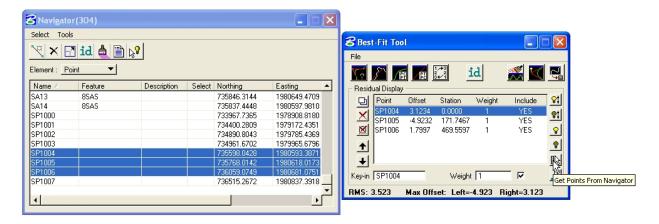
If only two good points exist which will control the tangent, draw a line between the points with the line command. The line should have prefix of SL. The first and second point can either be selected or typed in the space provided. Select **Store Line** after the proper points are selected.

名 Coordinate Geometry 🛛 Job: 304	Operator: SU
<u>File Edit Element View Tools</u>	8 Store Line 📃 🗖 🔀
Image: Store Point SP1000 733968	Line Name: SL1 Origin Point: SP1000 Direction V SP1001

If there are several points and would like a best fit line, use the power selector in MicroStation® to pick the points. Select **Tools** \rightarrow **Best Fit** from the **Coordinate Geometry** toolbar.

名 Coordinate Geometry	Job: 3o4 Operator: SU
<u>File E</u> dit E <u>l</u> ement <u>Vi</u> ew	Tools
D 🖾 📆 🕹 🦊	<u>N</u> avigator
	Inverse
Define Permane	Locate
$\langle \rangle \rangle$	Intersect
COGO Key-in Store Point SP	Best Fit
	Iranslation and Rotation
<* 3 Stor	Man Check

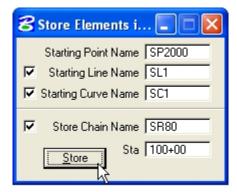
Select the button shown in the dialog below to add the points to the **Best Fit Tool**. A temporary line will be drawn on the screen for inspection. Points can be added or removed from the tool.



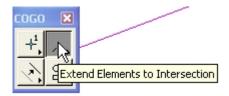
When satisfied, select the Store Elements into GPK button.

8 Best	t-Fit Too	ol					
File							
5			1,/+3 2 2 3+/1	id	1		
🛛 🗧 Residu	ual Display	y ———				Store Elements into GP	ж
모	Point	Offset	Station	Weight	Include	<u></u>	

Fill in point and line numbers and the information will be stored for later use.



To create curves select Extend Elements to Intersection on the COGO toolbar.



Select the tangent lines to connect with a curve or spiral. Select **Element** \rightarrow **Curve** \rightarrow **Store** \rightarrow **By Tangents** from the **COGO** toolbar.

8 0	pordi	nate Geo	metry	Job:	304	Operato	r: SU	
<u>Fi</u> le	<u>E</u> dit	Element	<u>Vi</u> ew	<u>T</u> ools				
	8:2	<u>P</u> oint			→	G 71	0.10	اہے ایہ ا
		Line			→		<u> «I</u>	/ 🔨 1+234
P		<u>C</u> urve			•	<u>U</u> tility		→ Brows
<	>	Spiral			•	<u>С</u> ору		
COGC) Key-ir	Chai <u>n</u>			≁	D <u>a</u> ta		
		P <u>a</u> rcel			►	S <u>eg</u> ment		
		Profile			•	<u>S</u> tation		
					-	Store	▶ By	Tangents
		Ne <u>x</u> t A	vailable	Settings			Ву	End Points

In the dialog below use the PB and PI option for the back tangent and the PA option for the ahead tangent option. Generally use radius or degree arc for the element. Type in or select on the screen the Point Back, PI Point, and Direction Ahead points. Type in a curve name that has not been used and then store the curve. The radius can be changed and the curve restored until the optimal curve is achieved.

名 Store Curve By Tangents 📃 🗖 🔀								
Curve name:	Station P							
Back Tangent	Element	Ahead Tangent						
	Store Curve							

To create the chains, delete the lines used to create the curves from the gpk file. This can be accomplished through the COGO Navigator.

8 (1	oordii	nate Geo	metry	Job:	304	4 Operator: SU		
<u>Fi</u> le	<u>E</u> dit	Element	<u>Vi</u> ew	<u>T</u> ools		_		
	AS:22	<u>P</u> oint			►		ی ایر ایر ا	۶L
		Line			►		1+234	
P	E B	<u>C</u> urve			►	on 🔻 XPOINT	▼ Browse	99.
<	\geq	Spiral			►			
COGO) Key-ir	Chai <u>n</u>			•	<u>U</u> tility		
		P <u>a</u> rcel			≁	Layout Offset	-	
		Pro <u>fi</u> le			≁	<u>S</u> tation		
		Next A	vailable	Settings		Station Eguation		

Store

<u>From Elements</u> Offset Chain

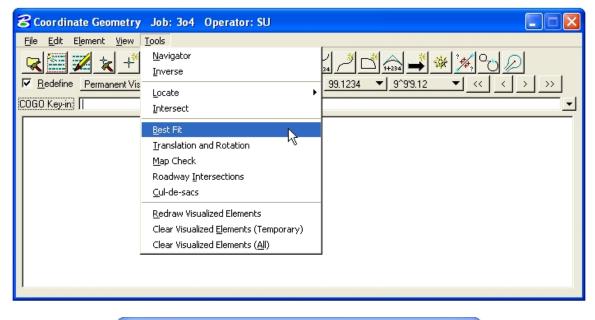
Select **Element** \rightarrow **Chain** \rightarrow **Store** \rightarrow **From Elements** from the **COGO** toolbar.

In the element list field, type in or graphically pick the elements to compose the chain. Type in a descriptive name for the chain and type in a beginning station. Select the store chain button to store the chain in the GEOPAK® file.

名 Store Chain From Elements	
Chain Name: Begin Station ▼ 0.000000	Element Selection Element Type: <u>Point</u>
Element List:	Point Name: < Add SP1001
Store Chain	

Best Fit Method

From the **Coordinate Geometry** dialog, choose **Tools** \rightarrow **Best Fit.**



😤 Bes	t-Fit	Tool							X
File									
5	8	/ F	PI	1,+3 2 2 3+/1	id	2	% [<	2
_ Resid	ual Dis								
면	Point	0	Offset	Station	n Weig	ght	Includ	le	\$ ‡
×									\$ ‡
×									•
+									
+									眿
Key-in				We	eight 1		◄		
									-0-

The following screen capture will appear once the user selects the button shown in the dialog above. The points selected must exist in the gpk file. The user can use the points created in the Classic COGO Method section for constructing the chain. The points to be used to construct the chain can be selected as shown in the dialog below. The user can key-in, ID, obtain from COGO navigator, or use a MicroStation® selection set to select the points. For this example, COGO navigator was used to select the points.

S Navigator (304)								
Select Tools	5							
📉 🗙 🔄 id 📥 🖹 🐶								
Element : <u>Po</u>	oint 💌]						
Name 🛆	Feature	Description	Select	Northing	Easting	Elevation		
SP1	EXCL			733968.3670	1978908.9460			
SP2	EXCL			734002.0165	1978928.7405			
SP3	EXCL			734041.7185	1978952.6740			
SP4	EXCL			734082.9650	1978977.7785			
SP5	EXCL			734111.2035	1978995.0330			
SP6	EXCL			734148.2015	1979017.6565			
SP7	EXCL			734184.0840	1979039.5910			
SP8	EXCL			734220.4690	1979061.8060			
SP9	EXCL			734256.8010	1979084.1215			
SP10	EXCL			734291.8030	1979105.5900		-	
•							•	

Note: The points in the dialog may be out of order and need rearranging to display the alignment ahead station.

The preferences can be set by selecting the button in the dialog shown below.

😤 Besi	t-Fit To	ol			_	
File						
				d	X	(🔜
- Resid	ual Displa	y ———				ences ,
민	Point	Offset	Station	Weight	Include	<u>-</u> 백
	SP1	-10.4135	0.0000	1	YES	•1
4	SP78	-18.5845	38.8738	1	YES	<u> </u>
×	SP2	-18.3404	39.2033	1	YES	<u> </u>
	SP3	-27.2643	85.5613	1	YES	•
Ť	SP4	-36.3576	133.8470	1	YES	
+	SP5	-42.5333	166.9398	1	YES	・
Key-in	SP1		Weight	1	N	
RMS: 1	160.191	Max Offs	et: Left=-	291.817	Right=3	04.844

<mark>8</mark> BestFit	Tool	Prefe	rences			
Feature	Level	Color	Weight	Style	Display	Max Radius 4000.0
Lines	1	3	0	0	YES	
Curves	1	2	0	0	YES	Pass Thru Points 5
PCPT	1	1	3	0	YES	Max Shot Dist 100.0
IDPoint	1	5	3	0	YES	
Max Offset	2	3	0	0	YES	
Min Offset	2	4	0	0	YES	
Good Fit	2	- 7	0	0	YES	✓ Display 12.€45

To temporarily display the alignment in the dgn select **Add Geometry (best guess)** as shown in the dialog below. The graphics are not written to the MicroStation® file and not stored in the gpk file.

웅 Bes	t-Fit To	ol				
File						
		y (best gue		d	<u></u>	(🔜
	Point	Ulfset	Station	Weight	Include	<u>▲</u> \$‡
	SP1	0.8303	0.0000	1	YES	
	SP78	-0.1141	38.8738	1	YES	<u> </u>
×	SP2	0.1670	39.2033	1	YES	Q
	SP3	-0.1219	85.5613	1	YES	
1	SP4	-0.2174	133.8470	1	YES	
+	SP5	-0.2254	166.9398	1	YES	ニ
Key-in	SP1		Weight	1	N	, k
RMS:	889.211	Max Offs	et: Left=-	27.262	Right=24	78.614

The elements displayed can be modified as shown in the dialog below.

诸 Bes	t-Fit To	ol			_		
File							
<u>7</u>	8			d	<u></u>	3 🖪	
Resid	lual Display	y ———				Modify Eler	nents (done with BestFit)
모	Point	Offset	Station	Weight	Include	<u>▲ 위</u>	
	SP12	-0.0280	454.6021	1	YES	🗣	웅 Modify Eleme 🔳 🗖 🔀
X	SP13	0.2198	495.9894	1	YES		
×	SP14	0.5666	538.2384	1	YES	♀	Modify> Point Of Intersection(PI)
	SP79	-0.1235	542.2577	1	YES		
	PC	Rad=	1000.250	Tan=	333.5149		Dynamic Offset Identify PI
+	SP15	1.2618	577.8213	1	YES	<u>_</u>	
Key-in	SP1		Weight	1	- F	, K	Lock Distance 0.000
Reyard	Jaci		weight	11		<u>_445</u>	🔲 Lock Back Tangent
RMS:	2.117	Max Offs	et: Left=-	7.990	Right=2.0	83	🗖 Lock Ahead Tangent

Once the alignment is modified select the Store button to store the alignment in the gpk file and permanently display in the MicroStation® file. The user will need to define the information shown below prior to storing the alignment.

8	Best	t-Fit Too	ι			_		
F	⁼ile							
	Residu	nal Display		1,↑3 2,22 3+√1 i	d	2		
	미	Point	Offset	Station	Weight	Include	<u>- 91</u>	名 Store Elements i 🔳 🗖 🔀
		SP12	-0.0280	454.6021	1	YES	l et	Starting Point Name SP1
	<u> </u>	SP13	0.2198	495.9894	1	YES		
	X	SP14	0.5666	538.2384	1	YES	Q	Starting Line Name SL1
		SP79	-0.1235	542.2577	1	YES		Starting Curve Name SC1
	Ť	PC	Rad=	1000.250	Tan=	333.5149	<u> </u>	
	+	SP15	1.2618	577.8213	1	YES	<u>-</u> B	▼ Store Chain Name SR80
	Key-in			Weight	<u> </u>	N	<u></u>	Sta 100+00.00
R	RMS: 2	2.117	Max Offs	set: Left=-	7.990	Right=2.08	83	

Store Chain by Graphics Method

From Applications select **GEOPAK®** Road \rightarrow Geometry \rightarrow Store Graphics to display the dialog shown below.

Note: The user must create the alignment in MicroStation® and then create a complex chain of the elements in the alignment (i.e. lines, curves, etc.). The complex chain must be linked ahead station.

Applications Window T.D.O. GEOPAK GEOPAK BRIDGE GEOPAK DRAINAGE		
GEOPAK LANDSCAPE	GEOPAK ROAD Tools Project Manager	e I
GEOPAK SURVEY	<u>Si</u> te Modeling Acti <u>v</u> e Chain Control GEOPAK Element Attributes GEOPAK 3PC AdH <u>o</u> c Attribute Manager	
	User Preferences Geometry	<u>C</u> oordinate Geometry
	Design & Computation Manager Quantity Manager Plans Preparation DTM Tools 3D Tools	Graphical Coordinate Geometry Layout Alignments <u>H</u> orizontal Store Graphics Auto Store Graphics Subdivision <u>Wi</u> zard
	Cross Sections	Layout Profiles (<u>V</u> PI Based) Layout Profiles (Component <u>B</u> ased)
	Help 	Legal Description

<u>S</u> et	tings	
	Point	304
	Curve ▶ Chain →	SU SR80
	Parcel 🗟	SP194
Beg	inning Station:	100+00
	Mode: Sir	ngle Element
	D Element	Store

The following dialog will appear. Enter the information as shown below.

Store Gra	pines 🔳 🗖 🔽
Securitys	
J	lob: 304 Q
Operator Co	ode: SU
Chain	▼ SR80
Beginning P	Complex Chain
	Selection Set
Beginning Stal	Shape
Mode:	Single Element
	h
ID Element	Store

The Store Graphics function will create points along the alignment therefore the user must start with a point number that does not exist. If the redefine function is on in COGO and a point number already exists then the point will be overwritten in the .gpk file.

名 Store Graphics 🔳 🗖 🔀					
<u>S</u> ettings					
Job: 304 오					
Operator Code: SU					
Chain 🔻 SR80					
Beginning Point: SP194					
Beginning Station: 100+00					
Mode: <u>Single Element</u>					
ID Element Store					

The user will be prompted to identify the element. Accept the element and store the chain. The chain can now be viewed in the COGO navigator.

Input File Utility Method

From the COGO menu, select File \rightarrow Input File Utility.

B Coordinate Geometry Job: 304 Operator: SU	
Eile Edit Element View Tools	
$\frac{Preferences}{Input File Utility} \checkmark (FF (Feature)) \checkmark Browse 99.1234 \lor 9^9'9'.12 \lor (< > >>$	<u>R</u> edefine
Input File Restore	
Database Utilities	
Import •	
Export •	
Exit	

The input files should be placed in the project working directory for them to be displayed in the following list. Load the .alg input file. Then select **Apply**.

웅 Input File Utilit	y 💶 🛛
File Name Subject alg [None] par [None]	
Load <u>Append</u> <u>Catalog</u> <u>Delete</u> <u>O</u> utput <u>Print Input File</u> <u>Save</u>	Allow Commands to be Added

名 Coordina	te Geometry Job: 304 Operator: SU				
<u>Fi</u> le <u>E</u> dit Element <u>Vi</u> ew <u>T</u> ools					
Image: Second all pation Image: Second					
COGO Key-in:	Read				
<*	Load alg				
File:	'ALG' Project: 'Sm080-01'				
*	1 \$ JOB NAME: XXX				
*	2 \$				
*	3 \$ COGO CHAIN COMMANDS GENERATED BY PATTERN: SR80				
*	4 \$				
*	5 SET FEATURE ADD CL				
*	6 \$ CHAIN SR80				
*	7 STO POI SP194 N 734002.0165000000 E 1978928.4110000001 STA 10000.000 8 STO POI SP199 N 736515.2595000000 E 1980837.0800999999 STA 13404.113 ▼				

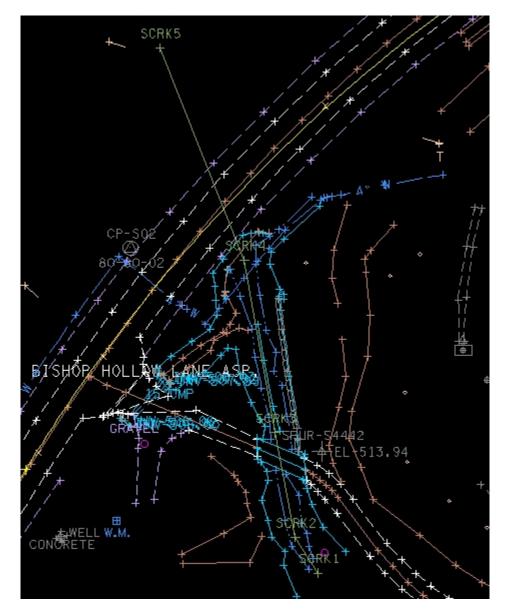
Select Read All from the COGO menu to display the chain elements.

If an alignment, points, curve, etc. already exists, the redefine option must be toggled on for points with the same name to be overwritten as shown in the dialog below.

名 Coordinate Geometry Job: 304 Operator: SU
<u>Fi</u> le <u>E</u> dit Element <u>V</u> iew <u>T</u> ools
Permanent Visualization ▼ OFF (Feature) ▼ Browse 99.1234 ▼ 9^9'9.12 ▼ << < > >>
COGO Key-in: Read
* 6 \$ CHAIN SR80
* 7 STO POI SP194 N 734002.0165000000 E 1978928.4110000001 STA 10000.0- 000000000 FEA CL
N 734,002.0165 E 1,978,928.4110 Sta 100+00.00 Point SP194 redefined.
* 8 STO FOI SP199 N 736515.2595000000 E 1980837.0800999999 STA 13404.1-
N 736,515.2595 E 1,980,837.0801 Sta 134+04.11 Point SP199 redefined.

10.2 STREAM ALIGNMENTS

The user must graphically create a line string following the centerline of the creek that passes under Bishop Hollow Lane, keeping the number of vertices to a minimum. Create the line starting in an upstream direction. Once the line is drawn, store the chain by using the store graphics command. The screen capture below shows the GEOPAK® points stored along the creek centerline. The aerial topo file was referenced into the survey file to determine the direction of the creek on the northwest side of the road.



From Applications select **GEOPAK®** ROAD \rightarrow Geometry \rightarrow Store Graphics to create the alignment for the existing stream.

Applications Window T.D.O.1	. <u>H</u> elp	
GEOPAK	0	
GEOPAK BRIDGE		
GEOPAK LANDSCAPE		
GEOPAK ROAD	GEOPAK ROAD Tools	
GEOPAK SITE	Project Manager	
GEOPAK WATER SEWER	<u>Si</u> te Modeling Active Chain Control	
	GEOPAK Element Attributes	
	GEOPAK 3PC AdHoc Attribute Manager	
	User Preferences	
	<u>G</u> eometry •	<u>C</u> oordinate Geometry
	Design & Computation Manager	<u>G</u> raphical Coordinate Geometry
	Quantity Manager Plans Preparation	Layout Alignments <u>H</u> orizontal
	DTM Tools	Store Graphics
	3D Tools	Auto Store Graphics
	Cross Sections	Subdivision <u>Wi</u> zard
	_ Utilities ►	Layout Profiles (<u>V</u> PI Based)
	Help	Layout Profiles (Component <u>B</u> ased)
		Legal Description
	About GEOPAK	

The **Store Graphics** dialog opens as shown below. Enter the information as shown below. The Store Graphics function will create points along the alignment therefore the user must start with a point number that does not exist. If the redefine function is on in COGO and a point number already exists then the point will be overwritten in the .gpk file. Select **ID Element**.

名 Store Graphics 🔳 🗖 🔀				
<u>S</u> ettings				
Job: 304				
Operator Code: SU				
Chain 🔻 CLCRK				
Beginning Point: SCRK1				
Beginning Station: 0+00				
Mode: Single Element 💌				
ID Element Store				

The user will be prompted to identify the element. Accept the element and then select **Store**. A notification will appear that the data is about to written to the GPK file. The chain can now be viewed in the survey file and COGO navigator.

10.3 ESTABLISHING TRACTS BASED ON PROPERTY RECORDS AND FIELD LOCATED EVIDENCE

Prior to creating individual parcels in GEOPAK®, property information must be obtained from the local courthouse and located in the field. By using a county tax map of the project area, the user can determine which properties adjoin or will be impacted by the project. Assign sequential tract numbers, in ascending order, to each individual parcel regardless of common ownership. Try to establish an organized method, since these Tract Numbers will be used throughout the project. The user should utilize the deed as a guide in creating parcels and should rely on field located evidence for storing the parcels in Coordinate Geometry. If the user encounters discrepancies between the deed and the measured parcel area, the measured area will be used in the right-of-way acquisition table.

A useful tool to research property deed information can be found on the State of Tennessee – Comptroller of the Treasury Real Estate Assessment Data web site found at the following link:

http://www.assessment.state.tn.us/

The website allows the user to search by various means but by Tax Map and Parcel Number would be the easiest since that information is at hand. The Tax Card information contains Owner, Owner Address, Deed Reference (Book and Page Number) and Approximate Acreage. This information will be used later to complete the Right-of-Way Acquisition Table. Print the Tax Card and note on it which assigned Tract Number it corresponds to. In this class we will be utilizing the property shown below.

State of Tennessee Comptroller of the Treasury Real Estate Assessment Data					
County Number: 080	County Name: SMITH	Tax Year: 2008			
Property Owner and M	ailing Address				
Jan 1 Owner: SLOAN OVAL ETUX					
PATTY E 737 PLEASANT SHADE H		offe d			
PLEASANT SHADE, TN 37 USA	/145 3 (6	(D)			
Property Location		(3)			

Address: PLEASANT SHADE HWY Map: 019 Grp: Ctrl Map: 019 Parcel: 039.00 Pl:

The latest Deed Reference for each Parcel will need to be obtained from the Register of Deeds Office for the county in which the project is in. Note: Some Parcels that are within a subdivision may have information on the Subdivision Plat that may not be reflected in the Deed (i.e. Revision to the Subdivision, Easements, or Right-of Way Dedication). A subdivision Plat may also encompass multiple Parcels within the project area which will facilitate inputting the information.

S/I: 000

Inputting the parcel based on the Deed Description

In GEOPAK®, open the **Coordinate Geometry** dialog and select **Element** \rightarrow **Parcel** \rightarrow **Editor**. The user should open the survey design file.

8 Coordinate Geometry Job: 3	3o4 Operator: SU 📃 🗖 🔀
Eile Edit Element View Tools Point Line Eine Curve Curve Curve	$\square \square $
COGO Key-ir Chain Parcel Profile	Utility Copy
Ne <u>x</u> t Available Settings	Store Subdivide Editor Default Attribute Preferences

Beginning on a stake at Highway 80 and a corner to Jolly Taylor and running with Taylor line up the hill S 40 E 300', S 60 E 56', N 82 E 226' to a Cedar Tree a corner to Billy Sloan; thence with Sloan's line N 83 E 800', N 72 E 116', N 62 E 184' stake a corner to the new line to Oval Sloan; thence with 0. Sloan N 5 E 60', N 23 E 70' Hickory; thence down the drain and with 0. Sloan N 87 W 160' Elm, N 65 W 200' Cedar, N 58 W 280' Elm, N 85 W 620' to a stake at Highway on the north side of a culvert; thence with a line of the Highway S 18 W 200', S 42 W 100', S 60 W 294' to the beginning stake. Containing 12.513 acres, more or less.

B Map Check / Store Parcel Name: 19-39.00 Type : Parent ▼ Course Description	Parcel Too			Owner: Improvement: e Parameters:	-] Radius 💌	Preferences Starting NEZ
Bearing \$ 40 00 0.00 E \$ 60 00 0.00 E \$ 82 00 0.00 E \$ 83 00 0.00 E \$ 82 00 0.00 E \$ 80 0.00 E \$ 90 0.00 E \$ 87 00 0.00 E	Distance 300.0000 56.0000 226.0000 800.0000 116.0000 184.0000 60.0000 70.0000 160.0000	Radius	Arc	Chord	Delta	Direction	Pt./Cur. Name ▲ SP100 SP101 SP102 SP103 SP104 SP105 SP106 SP107 SP108 ▼
S 40 00 0.00 E Bearing ▼ 1.000000] [300.0000 ale Factor		Clear Parce		Cir Inpt	Rt. ▼ 「	SP100

🗲 Enter Starting Coor 🗖	
Pt. Num: SP100 Coordinates North (Y):	
East (X):	UP V

The Parcel Name should be the respective Tax Map-Parcel (Map 019 Parcel 39.00) being input and the Starting NEZ, an arbitrary point in the MicroStation® file. This step can also be accomplished using MicroStation® commands but by using the GEOPAK® Coordinate Geometry input a record of the input is stored and can be edited if an incorrect call (bearing and distance) is entered. A portion of the deed is shown in the dialog.

SP100 will be the first point for the parcel. Once the first bearing and distance has been stored, the Starting Point will automatically increment with the next available point. Select the "...+" button to add the boundary segment. The deed descriptions will vary in detail and accuracy, so discretion should be used as to which the user should use to resolve discrepancies between adjoining parcels.

Once the Parcel has been created, it should be visualized and the graphic shape moved and/ or rotated to best fit any property monumentation (i.e. iron pin, row marker, existing fence) corresponding to the parcel that was field located. For this particular piece of property the parcel should be aligned with the existing fence near Station 121+00 Rt. The user should move the parcel with MicroStation® commands and not GEOPAK® commands. Also, if a parcel is created and does not close, the user should not close the parcel unless there is an obvious mistake (i.e., a bearing is reversed). (Note: The GEOPAK® Parcel still resides in the original location.)

If existing Right-of-Way plans exist, they should be input and taken into account since the property deed may have preceded the ROW plans and is not reflected in the deed description.

The individual properties are then assembled as a whole, resolving any discrepancies which may be encountered by taking fences, buildings and other features into account.

Once all of the ROW parcels have been relocated to the proper location and all discrepancies resolved, it is preferable to store new points at all of the ROW vertices to recreate the parcels in the correct location. In the GEOPAK® Coordinate Geometry, store points using the **Store Point** command. Store the points using SP1 as the first point and select Auto Increment. Select DP (data point) and set the feature to PL. Once the point has been selected, by snapping to the desired point in MicroStation®, select Store Point. Repeat this step for all vertices of the property lines. (Note: Vertices common to multiple Parcels should contain only one point, not duplicate points.) The dialog below describes how to store one of the points in a parcel.

For the purpose of this class the user should go through the following exercises to gain familiarity with the process. To allow all users to proceed with the same property information after the exercises, an input file will be loaded at the end of Section 10.2.

8 Coordina	ate Geometry Job: 3	o4	Operator: SU	
	Element <u>V</u> iew <u>T</u> ools <u>P</u> oint	Þ	<u>U</u> tility	
	Line <u>C</u> urve Spiral	+ + +	C <u>e</u> ll Copy <u>El</u> evation	<u>f+234</u> <u>→</u> <u>***</u> <u>**</u> <u>Browse</u> <u>99.1234</u> <u>9^9'9.12</u> <u>→</u>
COGO Key-ir	Chai <u>n</u> P <u>a</u> rcel	+	Eguate Station	<u> </u>
	Pro <u>f</u> ile	•	Store	
	Ne <u>x</u> t Available Settings		Trans <u>f</u> ormation Compare Points to <u>T</u> IN Set Ele <u>v</u> ation From TIN	
				3

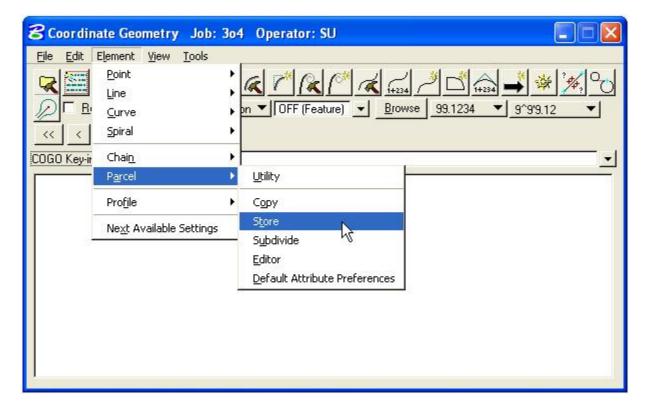
웅 Store Point		
Point Name: I⊽ Auto Increm ⊢ Coordinates -		
Northing:	736158.363397	DP
□ PCode:□ Pcode:□ Point Cell:□ Feature:	504.070000	
C Description:	I Store Point	

In **GEOPAK®** Coordinate Geometry, store curves using the Store Curve by Endpoints command. Store the curves by using SC1 as the first curve name. (Note: Be sure to give each curve a different name before storing or it may be overwritten if the redefine toggle is turned on in the Coordinate Geometry dialog.) Choose whether the curve is Clockwise or Counterclockwise and select Store Curve.

8 Coordinate Geometry Job: 3	Bo4 Operator: SU
Eile Edit Element View Tools Point Line Element Spiral Curve Spiral Chain Parcel Profile Next Available Settings	Utility Browse 99.1234 9'9'9.12 Gopy Data Segment Store By Iangents By End Points Concentric

名 Store Curve By En 🖃 🗖 🔀					
Name: SC1					
PC 💌 Station:					
PC Point Number: (enter point number)					
PT Point Number: (enter point number)					
Radius 🔻 (enter radius)					
_Clockwise 💌					
Store Curve					

In the GEOPAK® Coordinate Geometry store parcel using the Store Parcel From Elements. The Parcel Name at this point would be the Tract Number assigned earlier. The parcel can be made up of various Element Types (i.e. Points, Curves and Spirals). In the Element List, list the elements that make up the parcel starting at the first point encountered going up station to the project alignment and always in a clockwise direction. This may require entering a curve common to two properties twice, due to the clockwise direction. The parcel Owner Name may also be entered at this point or can be added later by either using a GEOPAK® Coordinate Geometry command or by creating and using an input file. (Note: Be sure that Feature in the GEOPAK® Coordinate Geometry dialog is set to PARCEL for the shape to be given to correct symbology.) Select Store Parcel, if redefine is toggled on, any parcel by the same name will be overwritten with no warning.



8 Store Parcel From Elements	
Parcel Name: 1 Parent Tract ▼ Element List: SP405 - SP413 SP426 SP425 SP271 SP270 SP269 SP268 SP227 SP357 SP358 - SP372 SP405 ✓ Owner Name: PHILLIP W. ANDEF Improvement:	Element Selection Element Type: <u>Point</u> Point Name: < Add SP2
Name Type	Value

For the purpose of this class the user will load the input file provided to create all of the parcels along this project. Load the parcel input file (Par3o4.isu) provided using the process detailed at the end of Section 10.1.

웅 Input Fi	ile Utilit <mark>y</mark>			
File Name	Subject			
alg	[None]			
par	[None]			
		3		

10.4 ROW AND PROPERTY LINES

In order to display the Right-of-Way and Property Lines correctly, they need to be stored in GEOPAK® as lines or curves. The Store Line or Store Curve From Elements commands can be used and the correct Feature must be defined (i.e. Property, ROW, Easement, etc.). If the incorrect Feature is selected, it can be edited without recreating the elements. The Navigator Tool will allow the user to display all of the various elements contained in the GPK file. One of the attributes listed is the element feature. By double-clicking on the desired element's active feature it can then be redefined. In this case, the redefine toggle will need to be toggled off and the user will be notified.

Name	Feature /	Description	Select Begin Point	1
SL271	PL		SP522	
SL272	PL		SP521	
SL273	PL		SP426	
SL54	PL		SP312	
SL55	PL		SP313	
SL68			SP450	
SL69			SP326	
SL100	ROW		SP357	
SL101	ROW		SP358	
SL102	ROW		SP359	
SL103	ROW		SP360	
4			•	Г
				ł,

Once all of the ROW and Property Lines have been created and properly displayed, they can be labeled with Bearing / Distances and Station / Offsets. In order to label Station / Offsets, alignments need to be available to reference to. **Plan View Labeling** techniques will be discussed in Section 11.3.

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CHAPTER 11 - PLAN DEVELOPMENT

The **Design and Computation Manager** (D&C Manager) is a tool that allows the user to standardize graphic elements for drafting and pay item quantities.

A hierarchical database is used with the **Design and Computation Manage**r. This database stores information concerning functional classification and display preferences for each feature and item used in a MicroStation® file. This file is commonly referred to as the .ddb file.

Survey (P	roject : 9	5m080-01 U	ser : SU)				E
Project	<u>D</u> ataset	<u>V</u> isualization	<u>G</u> eometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool Box	es
					D and C <u>M</u> anager		
					Plan ViewLabeling		
					<u>R</u> otate Point Sym	pols	

11.1 DISPLAYING AND LABELING CENTERLINES AND ALIGNMENT POINTS

From the **Design and Computation Manager**, select **Drafting Standards** \rightarrow **Roadway Horizontal Alignments** \rightarrow **HA Roadway Pre** (preliminary roadway horiz. alignment). Next, select **Draw Plan & Profile** button in the supplemental dialog (displayed on the screen but not attached to the main **D&C Manager**).

S Design and Computation Manager	
<u>File E</u> dit <u>S</u> ettings F <u>a</u> vorites <u>H</u> elp	
产 id 🔲 🜌 🧬 💷 🐂 👫 😭	
en C:\Program Files\GeopakStandards\tdot.ddb C Drafting Standards	A Roadway Pre prel 🔳 🗆 🗙
 Tools Cross Sections Roadway Horizontal Alignments 	Place Influence Adhoc Attributes Match Point Text
HA Roadway prop, roadway horiz, alignment HA Roadway_20 prop. rdwy horiz, alignment - 20 Scale (Offsets
HA Roadway Pre preliminary roadway horiz, alignment HA Roadway Ex existing roadway horiz, alignment HA Points place roadway horiz, alignment points	
CL Cells cells for horizontal alignments HA Intersection label horiz. alignment intersections & en Roadway Vertical Alignments	nds
Exist. Profiles Survey Control Des Back N/	
 Pres. R.O.W. Property Lines Parcels 	-
,	

Select the Chain operation and set the options as shown. Set the Label Scale to 50.

8 Draw Plan & Profile	
Item: HA Roadw Element Type: <u>Chains</u> Key-in Points:	vay Pre preliminary roadway horiz. aligr ▼ Label Scale: 50
Select Chain to Draw	
	Line Direction Labels
	Line Length Labels
	Line Labels Only
	Curve Labels
	🔽 Curve Data
	Curve Labels Only
	Place Curve Data by DP
	🔲 Spiral Labels
	🔲 Spiral Data
	🔲 Spiral Labels Only
	Place Spiral Data by DP

Draw the chain **SR80** by selecting it in the dialog.

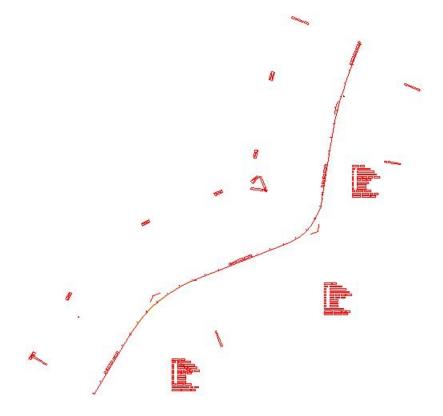
To Label Horizontal Alignment Stationing, change the **Element Type** to **Stationing**, set the options as shown below, and select the SR80 chain to draw it.

Item: HA Roadway Pre preliminary roadway horiz. aligr Element Type: Stationing Label Scale: 50 Key-in Points: Select Chain to Draw SR80
SR80 V Tick Marks
Image: With the second sec

To display the points, select **Drafting Standards** \rightarrow **Roadway Horizontal Alignments** \rightarrow **HA Points** (prop. roadway horiz. alignment). Populate the **Place Horizontal Alignment Points** dialog, set options and select **Place Points**.

名 Design and Computation Manager 📃 🗖 🗙	Place Horizontal Alignment Points
Eile Edit Settings Favorites Help	Job: 304 Chain: SR80 ID A
 C:\Program Files\GeopakStandards\tdot.ddb Drafting Standards Tools Cross Sections Roadway Horizontal Alignments HA Roadway_20 prop. roadway horiz. alignment - 20 Scale Offsets HA Roadway Pre preliminary roadway horiz. alignment HA Roadway Ex existing roadway horiz. alignment HA Roadway Ex existing roadway horiz. alignment CL Cells cells for horizontal alignments CL Cells cells for horizontal alignments HA Intersection label horiz. alignment intersections & ends Roadway Vertical Alignments Exist. Profiles Survey Control Pres. R.O.W. Property Lines Political Boundaries Prop. R.O.W. 	Place Points Cancel
Prop. Easements	

The screen capture below shows the finished results as defined by the **D&C Manager**.



Select Plans Preparation \rightarrow Rotate Point Symbols from the Survey toolbar.

When the dataset is mapped or visualized, the placement of the graphic information is defined in the SMD file. The angle of cells and text placed are at an active angle of 0 degrees by default. The Plan View of the finished design documents is typically rotated to fit parallel to the sheet in which case the cells and text in the survey should be rotated for a more appealing set of plans. This should be done as soon as possible and prior to adding any manual labeling since they would be rotated as well (i.e. bearings, text and manually added graphics would also be rotated).

Survey (P	roject : Si	m080-01 Us	er:SU Da	ataset :	TP1)	X
Project	<u>D</u> ataset	<u>Vi</u> sualization	<u>G</u> eometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool Boxes
				-	D and C <u>M</u> anager	_
					Plan View Labeling	1
					<u>R</u> otate Point Symb	ools
					Place SMD <u>F</u> eatur	e
					Place Legend	
					Place <u>G</u> rid	
					Place <u>B</u> order	
					Place North Arrow	ê 🔰
					Place <u>S</u> caleBar	
					Place Text In <u>O</u> bje	ect
					Place <u>C</u> oordinate	Table
					Place Calls <u>T</u> able	
					Place Sta <u>k</u> e Table	×

Use the MicroStation® Selection Set tool to chose multiple or all Point Symbols to be rotated or Point Symbols can be rotated by identifying each individually. Select the Baseline to rotate to, enter the Job and the Rotation method. Select **Start** to launch the command. The selected symbols are now rotated tangent with the SR80 chain.

名 Rotate P 📘					
Baseline <u>GEOPAK Ch</u>	ain 🔻				
Job 3o4	Select				
Chain SR80	Select				
Rotation Tangent	-				
<u>Start</u>					

11.2 PLAN VIEW LABELING

GEOPAK®'s labeling tools allow a user to place "intelligent" labels in a MicroStation® drawing. These labels have the ability to calculate XYZ coordinates, station, offset, direction, length, radius, degree of curvature, etc. of the associated element by using the gpk file. To access **Plan View Labeling**, select **Plans Preparation** \rightarrow **Plan View Labeling** from the **Survey** toolbar.

Survey (I	Project : 9	5m080-01 U	ser : SU)			×
Project	<u>D</u> ataset	<u>Vi</u> sualization	<u>G</u> eometry	DIM	Plans Preparations	<u>T</u> ool Boxes
					D and C <u>M</u> anager	
					Plan View Labeling	
					<u>R</u> otate Point Syml	bols
					Place SMD <u>F</u> eatur	e
					Place <u>L</u> egend	
					Place <u>G</u> rid	
					Place <u>B</u> order	
					Place <u>N</u> orth Arrow	,
					Place <u>S</u> caleBar	
					Place Text In <u>O</u> bje	ect
					Place <u>C</u> oordinate	Table
					Place Calls <u>T</u> able	CERTERNAL
					Place Sta <u>k</u> e Table	2

After selecting **Plan View Labeling**, the following dialog will appear.

2 Plan View Labeler - Style:\bin\def_plan.lsf -> Unnamed Style	• 📃 🗖 🛛
Style <u>Fi</u> les <u>O</u> ptions <u>S</u> cale <u>T</u> ools	
Text Params. Shape Leader Rotate Style Item Selector Style Style Preview Labels Arc Labels E E Point Labels E E E New Style Update Style E E New Category Scale : N/A Node and Shape Only Image: Node and Shape Only	Space Return Clear Delimit Place Label

The **Styles** tab allows a user to choose label symbology from a library of pre-defined styles. When the user chooses the style, all symbology, leaders, shapes, etc. is set up for the user. TDOT provides a file (tdotdef_plan.lsf) for the user with all the necessary styles for plan view labeling. The file can be found through the following TDOT website:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/V8design.htm# GEOPAK If the TDOT line style preference file did not load automatically, the user should open the file located in C:\Program Files\GEOPAKStandards as shown below. The user must be under the **Styles** tab in order to open a style library.

8 Plan View Labeler - Style:\bin\def_j	plan.lsf -> Unnamed Style	900	
Style Files Options Scale Tools New			
Open Save Save As	le Preview		
Exit c:\program files\bentley\geopak\bin\def_plan.lsf		Space	Return Delimit
New Style Update Style XA	Node and Shape Only 🔻	Place I	

Open Style File		
Fijles: tdotdef_plan.lsf tdotdef_drainage.lsf tdotdef_plan.lsf tdotdef_prof.lsf tdotdef_xs.lsf	Directories: c:\program files\GeopakStandards\ C c:\ P program files GeopakStandards 3PC ConstCriteria Criteria	
List Files of <u>T</u> ype: 	Drives:	OK Cancel <u>H</u> elp

yle <u>Fi</u> les <u>O</u> ptions <u>S</u> cale <u>T</u> oo	s		
ext Params. Shape Leader	Rotate Styles		
Item Selector	Style Preview		
🗁 Labels			
🛅 Design Labels			
Convey Labels Pres. ROW/PLs			
Survey Control		Space	Return
Drainage	R D	Clear	Delimit
New Style Update Sty		Plac	e Label

The following screen capture shows the results of opening the TDOT preference file.

The **Label Scale** menu allows the user to choose a plan scale. All labels will be adjusted according to the plan scale. The user simply keys in a scale, and chooses a **Labeling Style**. The corresponding label will be placed at the correct size for the scale that was chosen.

8 Plan View Labeler - Style:\t	dotdef_plan.lsf -> Unnamed Sty	le 💶 🗖 🔀
Style Files Options Scale Tools Text Params. Sh. Change Scale Item Selector Labels Design Labels Design Labels Survey Labels New Style Update Style	e Styles Style Preview	e E
New Category Scale : N/A	A Node and Shape Only ▼	
	Scale Style Current Scale: 1.000 New Scale: 50	

ŌΚ

Cancel

Navigate to **Text** tab as shown below.

8 Plan View Labeler - Style:\	tdotdef_plan.lsf -> Unnamed Styl	e 🔳 🛛 🛛
Style Files Options Scale Tools Text Params. Shape Leader Ro Job No.: 304 Q Element: Point Chain: SR80 V TIN File: Q		e Clear Delimit
***	Station Partial Station	Place Label

For data to be computed, the **Job Number** and the **Chain** need to be selected. If elevations are to be calculated, a TIN file needs to be chosen.

The **Computed Inserts** are items that GEOPAK® has the ability to calculate for the chosen item. The list of **Computed Inserts** changes with the type of element that is chosen. If a line is chosen, the list of **Computed Inserts** will show inserts of bearing, and length. If a curve is chosen the list of **Computed Inserts** will change to show inserts of radius, curvature, chord length, etc.

The **User Inserts** are inserts that a user may use on a regular basis. This list can be customized for a specific user's needs.

Label Feature

The Label Feature allows a choice of methods to use to select elements to be labeled. The first two options are the most commonly used. They are **Select GEOPAK® or MS Elements** (in the event a line or curve is to be labeled) or **Data Point Location** (in the event the label is for a specific point such as a property corner). Select **Place Label** once the correct information is displayed in the information window. Be sure the proper information is selected if computed inserts are being used. If an incorrect chain or alignment is designated, the Station / Offset label may not have the desired information.

Note: Be sure to review the label placed for accuracy and format. For instance, the bearings are usually computed based on which half of the line is picked when selecting. Some 3-D line segments may not follow this rule and will require manual editing. TDOT wants all bearings to be placed ahead station and away from the proposed alignment.

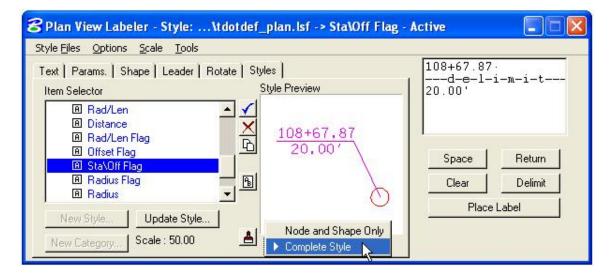
8 Plan View Labeler - Style:\tdotdef	_plan.lsf -> Unnamed Styl	e 💶 🛛 🔀
Style Files Options Scale Tools Text Par Minimize Dialog Use Reference File Coordinates Item Seler Use DP Element Association De: Label Tools Sur Label Viewer Pres. ROW Survey Control Drainage Pres. PLs New Style Update Style	les Style Preview	Space Return Clear Delimit Place Label
New Category Scale : N/A	Node and Shape Only 🔻	

Toggle Use DP Element Association in the Options Menu.

From the Style tab select **Survey Labels** \rightarrow **Pres. ROW** as shown in the dialog below.

8 Plan View Labeler - Style:\tdotdef_plan.lsf -> Unnamed Styl	e 💶 🗖 🔀
Construction of the second	Space Return Clear Delimit
New Style Update Style New Category Scale : N/A Node and Shape Only	Place Label

From the Pres. ROW folder select **Sta\Off Flag** and toggle Complete Style as shown in the dialog below.



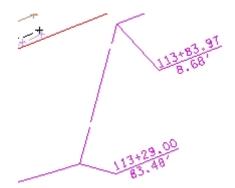
The user can now label ROW Station and Offsets using the appropriate style. Double-click **Sta\Off Flag** to populate the dialog shown above. Return to the **Text** tab, and choose the **Data Point Label Feature** button.

名 Plan View Labeler - Style:\tdotdef_plan. lsf -> Sta\Off Flag - Active 📃 🗖 🗙			
Style Files Options Scale Tools			
Text Params. Shape Leader Ro	otate Styles	108+67.87. d-e-l-i-m-i-t	
Job No.: 304 Q	Computed Inserts O User Inserts	20.00'	
Element:	Computed Text		
Chain: SR80 💌	X Coordinate	· · · · · · · · · · · · · · · · · · ·	
TIN File: 1\SM080-01MDTM.tin Q	Y Coordinate Z Elevation GPK	Space Return	
	Z Elevation TIN	Clear Delimit	
	Z Elevation Modeler	Place Label	
ž + 🔬 🕸	Station Partial Station		
	Not Available		

Select the ROW point at Station 113+29 RT in the dgn file and accept the locations. The computed insert should update to reflect the data point selected. Select **Place Label** to insert the label into the plan sheet. Select the desired location for the label and accept then select the side of label the leader should attach to and accept.

8 Plan View Labeler - Style:'	\tdotdef_plan.lsf -> Sta\Off Flag -	Active 📃 🗖 🔀
Style <u>Fi</u> les <u>O</u> ptions <u>S</u> cale <u>T</u> ools		
Text Params. Shape Leader R	otate Styles	113+29.00. d-e-l-i-m-i-t
Job No.: 304 Q	Computed Inserts O User Inserts	83.48'
Element: Point	Computed Text	
Chain: SR80 💌	X Coordinate	
TIN File: 1\SM080-01MDTM.tin Q	Z Elevation GPK	Space Return
	Z Elevation TIN	Clear Delimit
	Z Elevation Modeler	Place Label
<u>₹</u> + <u>₹</u> ‡	Station Partial Station	
	Not Available	

Repeat the labeling process for another ROW point. The display should look similar to the following screen capture.



The user can label the radius and length of a curved portion of ROW. From the Item Selector in the **Styles** tab, double-click the **Rad/Len** item.

8 Plan View Labeler - Style:\tdotdef_plan.lsf -> Rad/Len - A	ctive 🔳 🗖 🔀
Style <u>Fi</u> les <u>O</u> ptions <u>S</u> cale <u>T</u> ools	
Text Params. Shape Leader Rotate Styles Item Selector	R=1348.14' L=574.06'
B Rad/Len B Distance B Rad/Len Flag B Offset Flag B Sta\Off Flag B Radius Flag B Radius New Style:	Space Return Clear Delimit Place Label
New Category Scale : 50.00	

Return to the Text tab and choose the GEOPAK® or MS Element Label Feature button.

名 Plan View Labeler - Style: \tdotdef_plan. lsf -> Rad/Len - Active 📃 🗖 🔀			
Style Files Options Scale Tools		1	
Text Params. Shape Leader Ro	otate Styles	R=333.10'· L=256.35'	1
Job No.: 304	Computed Inserts User Inserts	1.200.00	
Element: CURVE SC22	Computed Text		
Chain: SR80 💌	Radius 🔺	· · · · · · · · · · · · · · · · · · ·	
TIN File: 1\SM080-01MDTM.tin Q	Radius (Alt. Units)	Space	Return
	Delta -> DM	Clear	Delimit
	Delta -> DMS Curvature -> D	Place L	abel
	Curvature -> DM	Continuou	s Place
	Not Available	-	

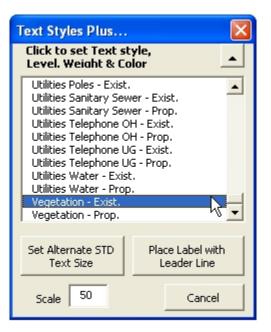
Select the curved portion of ROW near Station 121+00 LT. When the user accepts the element the label should appear. Data point again to accept the location of the label.

Text Styles Plus... (Placing new text)

From T.D.O.T. select Text Styles Plus...

T.D.O.T.	Help					
Active Angle						
Area Pal	tterns	►				
Centerlir	nes	►				
Cross Se	ections	•				
Custom	Line Styles	►				
Drainage	e (Plan)	•				
Drainage	e (Profiles/Culv. Sections)	►				
Erosion	Control	•				
Iplot - D	efault Settings					
Lighting		►				
Pavemer	nt Marking	•				
Permits a	& Forms					
Plan Pha	ase Stamps					
Profiles						
Public He	Public Hearing Cells					
Raster -	Move by Datum Adjust					
R.O.W.		•				
Sheet C	0.12					
Sheet Ti						
Signaliza	ation	•				
Signs		•				
	Project WorkFlow Toolbox					
	ameters by Active Scale					
	/les Plus					
	ch Text Editor					
Title She	et Cells					
Tools		•				

The **Text Styles Plus...** dialog opens as shown below. Highlight the appropriate text style.



In the MicroStation® main toolbox, select the **Place Text** command. The text style will be automatically set as shown in the dialog below.

8 Plac	e Text			
	Method: B	y Origin	-	
	Text Style: 🕅		Exist	9
	Active <u>A</u> ngle: 0°	'0'00''	5	
	Height: 5.		A	
	<u>W</u> idth: 5.	00		
				◄

In the text editor box, type in the appropriate text as shown below. The text should be capitalized and use the enter key to use multiple lines of text.

8 Text Editor - Word Proces 🔳	
S LEROYMON 💌 B I 🖳	ABC
GRASS	~
]	\sim

The user can then place the text in the desired locations throughout the project. Click a data point to place the text.

GRĄSS

11.3 SURVEY CONTROL: CONTROL POINT TABLE, COORDINATE GRID TICKS Control Point Table - Survey Toolbar Method

From the Survey toolbar select Plans Preparation \rightarrow Place Coordinate Table.

Survey (I	Project : 9	5m080-01 U	ser : SU)				×
<u>P</u> roject	<u>D</u> ataset	<u>Vi</u> sualization	<u>G</u> eometry	D <u>T</u> M	Plans Preparations	<u>T</u> ool E	loxes
					D and C Manager Plan View Labeling Rotate Point Syml Place SMD Feature Place Legend Place Grid Place Border Place North Arrow Place ScaleBar Place Text In Object	e e , ect	
					Place Calls <u>T</u> able	ĥ	\$

If COGO was not activated, the following **Alert** will appear. Select **Yes**. Verify the information in the Coordinate Geometry dialog and select **OK**.

Alert	
STOP	This application requires COGO to be activated. Would you like to invoke COGO now?
	<u>Y</u> es <u>N</u> o
	Coordinate Geometry
	Project Name: SM080-01 Job: 304 Q
	Operator Code: SU
	Subject:
	Cancel

8 Place Coordinate Table						
Settings						
Table Format/Column Order	🔲 Write to Output File : Create File 💌					
Prefix Text Suffix	C:\Projects\SM080-01\coord.txt					
Point# ▼						
North(Y)	Replace "No Elevation" With : 0.0000					
East(X)	Replace "No Feature" With : DEFAULT					
Elev[Z] Feature						
	Use GPK Point Station value stored with Point 💌					
	Chain to measure Station and Offset from : SR80					
Station ▼ Offset ▼	E Use Duelieste Film Televene v 10.01.0000					
	Use Duplicate Filter Tolerance : 0.010000					
Select Points for Table or Export	t:					
Point# North(Y) East(X)	Elev(Z) Station Offset Feature Desc 🔺					
S01 733985.5914 1978941						
S02 734560.9767 1979252	· · · · · · · · · · · · · · · · · · ·					
S03 734882.2474 1979702	Ĩ.					
S05 735471.9821 1980596	HNI					
S06 735958.7492 1980677	N D					
S07 736444.4080 1980834	513.4110 0+00.00 23.1179 XCP 80					
S08 736936.4198 1980998	519.6610 0+00.00 Off Chain XCP 80 💌					
· · · · · · · · · · · · · · · · · · ·	A Horz. Lines:					
Header: Somple	Table Text: Sompio					
Text Spacing (% of Text Size) : 75.00000 Vert. Lines:						
	Elevation: Feature: Description: Station: Offset:					
POINT NORTHIN(EASTING	ELEV. FEATURE GPS POIN' STATION OFFSET					
Disco						
	Place					

The following dialog will appear. Complete the table as shown below.

To adjust the formatting of the text in the table, double-click **Sample** from the Header menu. The Level should be set to **SURVEY – CONTROL with Text** and the justification is center bottom. Complete the same process for the Table Text formatting. The Header and Table Text formatting should match the dialog as shown below.

Set Feature
Symbology Level: SURVEY - CONTROL Color: 1 Weight: 2
Text Preferences Th: 5.000 Tw: 5.000
Ft: S LEROYMON

Once the formatting is complete, select **Place** from the **Place Coordinate Table** dialog.

Note: Make sure the appropriate levels are on to view the control point table once the table is placed.

The following table will be created and placed in the MicroStation® file. The user will have to manually place a box around the points, place the "CONTROL POINTS" title, and draw the horizontal lines shown below.

	CONTROL POINTS								
POINT	NORTHING	EASTING	ELEV.	FEATURE	GPS POINT	STATION	OFFSET		
S01	733985.5914	1978941.7179	514.3660	XCP	GPS80-80-01	0+00.00	Off Chain		
502	734560.9767	1979252.3522	513.7780	XCP	GP580-80-02	0+00.00	-25.5582		
S03	734882.2474	1979702.4704	511.1140	XCP	GPS80-80-03	0+00.00	-38.9446		
S05	735471.9821	1980596.1995	512.6070	XCP	GPS80-80-05	0+00.00	21.3382		
S06	735958.7492	1980677.0324	510.7080	XCP	GPS80-80-06	0+00.00	21.1459		
507	736444.4080	1980834.5176	513.4110	XCP	GP580-80-07	0+00.00	23.1179		
S08	736936.4198	1980998.9468	519.661D	XCP	GPS80-80-08	0+00.00	Off Chain		
S09	734340.2961	1979430.4115	517.7650	XCP	GPS80-80-09	0+00.00	250.3108		

Control Point Table - D & C Manager Method

From the Survey toolbar select Plans Preparation \rightarrow D and C Manager.

Survey (Project	: Sm080-01 U	lser : SU)				×
<u>P</u> roject <u>D</u> atas	et <u>V</u> isualization	<u>G</u> eometry	D <u>T</u> M	Plans Preparations	Tool Boxes	
				D and C Manager Plan View Labeling Rotate Point Syml Place SMD Featur Place SMD Featur Place Grid Place Grid Place Border Place Border Place SodeBar Place ScaleBar Place Text In Obje Place Colls Table Place Stake Table	e e v ect Table	

Utilize the Level Display to turn off everything except the control point level.

Level Display		×
1 2 3 4 5 6 7 8 View Display 🔻		
Ne E (none) - Levels		
Name 🛆	File	Logical L 🔺
SURVEY - CENTERLINE - Preliminary - Develop	SM080	Master •
SURVEY - CENTERLINE - Preliminary Curve Text	SM080	Master •
SURVEY - CENTERLINE - Preliminary Text	SM080	Master •
SURVEY - CONTOURS - Index with Text	SM080-0	Master
SURVEY - CONTOURS - Intermediate with optional Text	SM080-0	Master 🔄
SURVEY - CONTROL - Grid	SM080-0	Master
SURVEY - CONTROL - Grid Text	SM080-0	Master
SURVEY - CONTROL - Points - Elevations	SM080	Master •
SURVEY - CONTROL - Points - Locators	SM080-0	Master
SURVEY - CONTROL - Points - Numbers	SM080-0	Master
SURVEY - CONTROL - Temporary with Text	SM080	Master •
SURVEY - CONTROL with Text	SM080	Master •
SURVEY - DRAINAGE - Area Shapes	SM080	Master • 🖵
•		

Once all the levels are turned off except for the control points, the result should resemble the following screen capture.

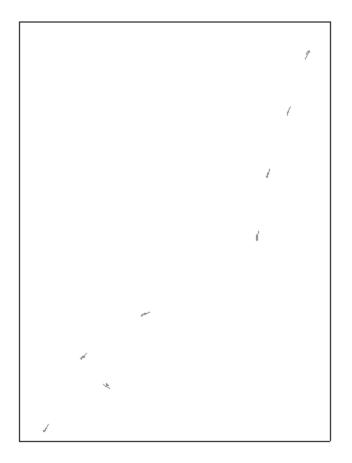
1

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7

ć.

Select all of the control points.



From the **D&C Manager**, Select **Cntrl Pt Table** to draw the control point table in the plan view.

B Design and Computation Manager	×
<u>Fi</u> le <u>E</u> dit <u>S</u> ettings F <u>a</u> vorites <u>H</u> elp	
j id 🔲 🔽 🚱 💷 🐂 🔛 😭	
 C:\Program Files\GeopakStandards\tdot.ddb Drafting Standards Tools Cross Sections Roadway Horizontal Alignments Roadway Vertical Alignments Exist. Profiles Survey Control 	
Cort Pt Table draw control point table in plan view Coor Grid Tick place single coordinate grid tick Grid Tick Range place coordinate grid ticks by range Pres. R.O.W. Property Lines Parcels Political Boundaries Prop. R.O.W. Prop. R.O.W. Prop. Basements Roadway Linework Private Drives Exist. Drainage	
Prop. Drainage	<u> </u>

The user will be prompted to keyin job number and chain name. Keyin the job number and chain name shown below.

8 c 💶		Prompt			
Go	Step	Keyin Job Numbe 304	21		
		<u>0</u>	ĸ	Cancel	
	Prompt				
	Keyin Cha	in Name			
) <u>etnici</u>	<u>o</u> k (Cancel		

The following dialog will appear. Click a data point in the DGN to place the control point table.



Select **OK** once the control point table is placed.

Prompt	
DONE: Use MicroStation to Edit I	Point #, etc. as needed
<u> </u>	Cancel

The user will have to manually number the control points using the MicroStation® text editor.

		CONTE	ROL POI	NTS	
POINT	NORTH	EAST	ELEV.	STATION	OFFSET
S	734560.9770	1979252.3520	513.78	106+42.64	25.56′ (LT)
S	734882.2572	1979702.4651	511.11	111+86.74	38.964 (LT)
S	735471.9821	1980596.1995	512.61	123+27.56	21.34′ (RT)
S	735958.7532	1980677.0711	510.71	128+22.89	21.18′ (RT)
S	734340.2961	1979430.4115	517.76	105+67.28	250.314 (RT)
S	736444.4080	1980834.5176	513.41	133+37.09	23.12′ (RT)

Coordinate Grid Ticks

From the Survey toolbar select Plans Preparation \rightarrow Place Grid

Survey (Project : Sm080-01 User : SU)		×
Project Dataset Visualization Geometry DIM	Plans Preparations Too	Boxes
	D and C Manager Plan View Labeling Rotate Point Symbols Place SMD Feature Place Legend Place Grid Place Border	

The following dialog will appear. Place a fence around the project area. Complete the dialog as shown below and select **Place**.

		名 Place Gr	id 🔳		
		Grid Paramet	ers	=1	
		Grid Inte	rval 500.000		
		Method _	Fence	_	
		Grid Style	Ticks	-	
		Tick Length	10.00000000		
			rval 500.000 uadrant <u>NE</u>		
		Label Directio	on <u>West-East</u> Suffix		
			uadrant <u>NE</u> on <u>South-Nor</u> Suffix		
			Place		
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CHAPTER 12 - PROFILE DEVELOPMENT

12.1 DRAWING AND STORING PROFILES

From the Applications menu, select GEOPAK® ROAD \rightarrow Plans Preparation \rightarrow Draw Profiles.

Applications Window T.D.O.1	. <u>H</u> elp	
GEOPAK •	8 ?	
GEOPAK BRIDGE		
GEOPAK DRAINAGE		
GEOPAK LANDSCAPE		1
GEOPAK ROAD	GEOPAK ROAD Tools	
GEOPAK SITE	Project Manager	
GEOPAK SURVEY	Site Modeling	
GEOPAK WATER SEWER	Active Chain Control	
	GEOPAK Element Attributes	
	GEOPAK 3PC AdHoc Attribute Manager	
		-
	<u>U</u> ser Preferences	
	<u>G</u> eometry	
	Design & Computation Manager	
	Quantity Manager	L
	Plans Preparation	Plan View <u>L</u> abeling
	DTM <u>T</u> ools	DP Station/Offset
	<u>3</u> D Tools	Draw <u>T</u> ransition
	Cross Sections	Draw <u>C</u> ell by Feature
	Utilities	Draw Cell Group by Feature
	Help	Draw Cell <u>A</u> rea by Feature
		Pavement <u>M</u> arkings
	<u>A</u> bout GEOPAK	Draw Signs
		Profile Labeling
		Draw Profiles
		Draw Profile <u>T</u> abular Data 🤟
		Plan/Profile Sheet Composition
		Ta <u>b</u> les

Select the **Job Number** and **Chain**, and then select the **Dialog Profile Cell Control** button from the **Draw Profile** dialog.

8 Draw Profile	×
File Edit Update Options	
Job Number: 304 Chain: SR80 Surfaces C0G0 Projection Dialog Profile Cell Control	-
Type Name Display Settings Draw	
Details TIN File: Q Method: Triangles Pilter Tolerances By Level Symbology Filter Tolerances Horizontal: 0.3000 Feature: No Entries > Image: Control of the second secon	

Select the Active Chain, and then select the **Place Profile Cell** button as shown in the dialog below.

8 Profile Cell Control							
Active Chain: SR80	•						
Microstation File	Station	Elevation	H. Scale	V. Scale	Gap	Place	e Profile Ce

Complete the **Place Profile Cell** dialog as shown below. The Station field populates automatically. Select an Elevation less than the lowest element on the profile. The Top Elevation represents the upper limit in the profile cell. The Bottom Elevation represents the lower limit in the profile cell.

웅 Place Profile Cell	
Station:	100+00.00
Elevation:	480.0000
Horizontal Scale:	
Vertical Scale:	5.000000
	No Gap 🔻
Cell Range	
Top Elevation 🔹	560.0000
Bottom Elevation 🔻	480.0000

Click a data point outside the area of the survey to place the profile cell in the drawing.

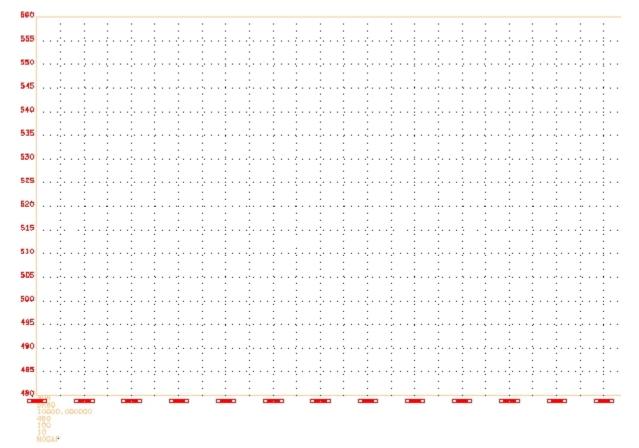
	_
304	
JV4	
CDQA	
SR80	
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50	
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Once the profile cell is placed the profile grid can then be placed. From T.D.O.T select **Profiles** \rightarrow **Draw Profile Grid.**

T.D.O.T. <u>H</u> elp		
Active Angle		
Area Patterns	►	
Centerlines	►	
Cross Sections	►	
Custom Line Styles	→	
Drainage (Plan)	►	
Drainage (Profiles/Culv. Sections)	►	
Erosion Control	►	
Iplot - Default Settings		
Lighting	►	
Pavement Marking	►	
Permits & Forms		
Plan Phase Stamps		
Profiles	•	Draw Profile Grid
Public Hearing Cells		DP Profile Station Elevation W/Tracking
Raster - Move by Datum Adjust		Vertical Curve Design Tool
R.O.W.	►	Vertical Alignment Labeler
Sheet Cells	1	

The **Draw Profile Grid** dialog will appear. Complete the dialog as shown. Then select **Draw Profile Grid**.

Draw Profile Grid	
Horizontal Scale	50
Vertical Scale	5
Minimum Elevation	480
Maximum Elevation	560
Beginning Station	10000
Ending Station	13400
Draw Profile Grid	Cancel

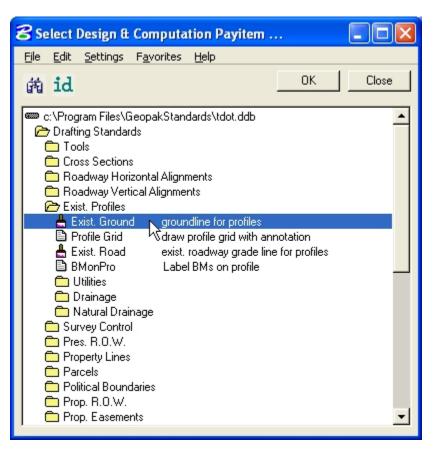


Place the profile grid in the drawing on the appropriate cell. Snap to the origin of the cell.

The **Surfaces** tab defines the surfaces utilized as source data when drawing profiles. Multiple surfaces from a variety of sources can be drawn on a profile in a single dialog. Each surface to be drawn must be added to the list box. This is accomplished via the **Action / Edit buttons** on the right side of the dialog. When a row is added to the list box, the profile is drawn immediately. Use the merged tin file, SM080-01.tin, to populate the **TIN File:** dialog. Select the proper feature by pressing the paintbrush icon as shown in the dialog below.

8 Draw Profile	
File Edit Update Options	
Job Number: 304 💌 🧟 🖆 Label Scale: 50.00000	
Surfaces COGO Projection	
Type Name Display Settings TIN C:\Projects\SM080-01MDTM.tin Exist. Ground	Surface Settings
<u>*</u>	
Details* TIN File: C:\Projects\SM080-01\S Method: Triangles ▼	
Display Settings Filter Tolerances By Feature Horizontal: 0.0100 Feature: Exist. Ground Variance: 0.0100	
Station Limits Offsets Begin: 100+00.00 End: 134+04.11 Void Vertical: 0.0000	

Select the Exist. Ground feature as shown below.



Populate the **Draw Profile** dialog as shown on the previous page. Once the desired settings are selected in the bottom of the dialog, press the **Add Surface Settings** button to draw the profile in the active cell.

The dialog below shows the existing ground displayed on the profile grid.

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The profile can now be stored in COGO. Select the **Store Surface in COGO** button from the **Draw Profile** dialog.

File Edit Update Options Job Number: 304 Image: Station Limits Surfaces C0G0 Projection Label Scale: [0.000000] Chain: [SR80 Image: Station Limits Image: Sta	8 Draw Profile		
Chain: SR80 Surfaces COGO Projection Type Name Display Settings TIN C:\Projects\SM080-01MDTM.tin Exist. Ground Details TIN File: C:\Projects\SM080-01\S Method: Triangles Display Settings By Feature Filter Tolerances Horizontal: [0.0100 Variance: [0.0100] Station Limits Begin: 100+00 End: 134+04			
Type Name Display Settings TIN C:\Projects\SM080-01MDTM.tin Exist. Ground Store Surface in Coge Details TIN File: C:\Projects\SM080-01\S Method: Triangles Display Settings By Feature Feature: Exist. Ground Feature: Exist. Ground Station Limits Offsets Horizontal: 0.0000 Vertical: 0.0000	Job Number: 304 💌 🧟 Label Scale: Chain: SR80 💌	0.000000	
IN C:\Projects\SM080-01MDTM.tin Exist. Ground Store Surface in Coge Details TIN File: C:\Projects\SM080-01\S Method: Triangles Display Settings Filter Tolerances By Feature Horizontal: 0.0100 Variance: 0.0100 Station Limits Offsets Begin: 100+00 Horizontal: 0.0000 Vertical: 0.0000 Vertical: 0.0000	Surfaces COGO Projection		
Details TIN File: C:\Projects\SM080-01\S Method: Triangles Display Settings By Feature Feature: Exist. Ground G Filter Tolerances Horizontal: 0.0100 Variance: 0.0100 Variance: 0.0100 Variance: 0.0100 Vertical: 0.0000	Type Name Display S	ettings	
Details TIN File: C:\Projects\SM080-01\S Method: Triangles Display Settings By Feature Feature: Exist. Ground Station Limits Begin: 100+00 End: 134+04 C:\Projects\SM080-01\S A Filter Tolerances Horizontal: 0.0100 Variance: 0.0100 Vertical: 0.0000 Vertical: 0.0000			
Details TIN File: C:\Projects\SM080-01\S Q Method: Triangles Image: Triangles Image: Triangles Display Settings Filter Tolerances By Feature Image: Triangles Image: Triangles Feature: Exist. Ground Image: Triangles Image: Triangles Feature: Exist. Ground Image: Triangles Image: Triangles Station Limits Image: Triangles Image: Triangles Image: Triangles Station Limits Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles Image: Triangles		Store Surface in Cogo	
Method: Triangles Display Settings By Feature Feature: Exist. Ground Station Limits Begin: 100+00 End: 134+04 Method: Triangles Filter Tolerances Horizontal: 0.0100 Variance: 0.0100 Variance: 0.0000 Vertical: 0.0000			
Display Settings Filter Tolerances By Feature Horizontal: Feature: Exist. Ground Station Limits Offsets Begin: 100+00 End: 134+04			
By Feature Horizontal: 0.0100 Feature: Exist. Ground Horizontal: 0.0100 Station Limits Offsets Begin: 100+00 Horizontal: 0.0000 End: 134+04 Horizontal: 0.0000			
Feature: Exist. Ground Image: Constraint of the sector of the secto			
Station Limits Offsets Begin: 100+00 End: 134+04 Vertical: 0.0000			
□ Begin: 100+00 ↔ Horizontal: 0.0000 □ End: 134+04 ↔ Vertical: 0.0000	Feature: [Exist. Ground 🔄 📥 Variance:	10.0100	
End: 134+04 Vertical: 0.0000	Station Limits		
Void Void	End:] 134+04 Vertical:] 0.0000		
	└ Void		

Complete the dialog as shown below to store the profile.

8 Store Profile	
Profile Name: SR-80 ✓ Store Profile in GPK ✓ Create Input File Operator Code SU File Name: j304oSU.inp	Select
Create 3D Profile String	1

12.2 PROJECT UNDERGROUND UTILITIES USING DRAW PROFILE TOOL

From the Applications menu, select GEOPAK® ROAD \rightarrow Plans Preparation \rightarrow Draw Profiles.

Applications Window T.D.O.T GEOPAK FRIDGE		
GEOPAK DRAINAGE		-
GEOPAK ROAD GEOPAK SITE GEOPAK SURVEY GEOPAK WATER SEWER	GEOPAK ROAD Tools Project Manager Site Modeling Active Chain Control GEOPAK Element Attributes GEOPAK 3PC AdHoc Attribute Manager	
	User Preferences Geometry Design & Computation Manager Quantity Manager Plans Preparation	Plan View <u>L</u> abeling
	DTM <u>T</u> ools <u>3</u> D Tools	<u>D</u> P Station/Offset Draw <u>T</u> ransition
	Cross Sections	Draw <u>C</u> ell by Feature Draw Cell <u>G</u> roup by Feature Draw Cell <u>A</u> rea by Feature
	Help About GEOPAK	Pavement <u>M</u> arkings Draw Signs
		Profile Labeling Draw Profiles Draw Profile <u>Tabular Data</u> Plan/Profile <u>Sheet Composition</u> Ta <u>bl</u> es

In the **Projections** tab, choose the Job Number, Chain, Label Scale, and specific survey chain as shown below.

8 Draw Profile
File Edit Update Options
Job Number: 304 💌 🧩 🚰 Label Scale: 50.00000 Chain: SR80 💌 Surfaces COGO Projection
Type Chain Profile/Surfa Display Settings Draw
Details Type: Survey Chain Cha

To draw the gas line on the appropriate level, select the paintbrush icon in the **Display Settings** area of the dialog. Select the feature from the **D & C Manager**.

File Edit Settings Favorites Help	8 Se	elect	Design &	Computa	tion Payitem		
id Close	File	<u>E</u> dit	<u>S</u> ettings	F <u>a</u> vorites	<u>H</u> elp		
N2	的	id				СК	Close
 C:\Program Files\GeopakStandards\tdot.ddb Drafting Standards Construction Supers Functional Utilities - Plan Proposed Existing UG Water Exist UG Gas Exist UKnown'' Gas exist unknown size underground gas 1/2'' Gas Ex existing 1/2'' underground gas 5/8'' Gas Ex existing 5/8'' underground gas 3/4'' Gas Ex existing 1'' underground gas 11/2'' Gas Ex existing 2'' underground gas 3'' Gas Ex existing 3'' underground gas 3'' Gas Ex existing 4'' underground gas 4'' Gas Ex existing 4'' underground gas 6'' Gas Ex existing 6'' underground gas) Draft) Cons) Func 7 Utiliti Pro 2 Ex 2 Ex 2 C	ing Standar struction Su stional es - Plan oposed jundergroun UG Wate UG Gas E Unknow 1/2" Gas 5/8" Gas 1/2" Gas 1/4" Gas 1/4" Gas 1/2" Gas 1/4" Gas 1	nds pers rExist ixist is Ex exis is Ex exis is Ex existin Gas Ex existin Gas Ex existin Ex existin Ex existin Ex existin	exist unknown sia ting 1/2" underg ting 5/8" underg g 1" undergroun sisting 1-1/4" und isiting 1-1/2" und g 2" undergroun g 3" undergroun	round gas round gas round gas d gas derground gas derground gas d gas d gas	as

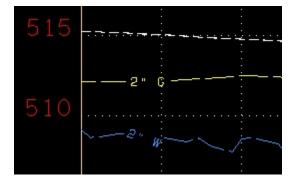
The user can now select Add Line to add the survey chain to the profile.

File Edit Update Options Job Number: 304 Job Number: 304 Chain: SR80 Surfaces C0G0 Projection Type Chain Profile/Surfa Display Settings Details Type: Survey Chain Chain: Stationing Begin: 100+00.00 End: 103+81.97 Vertical Offset: -3.0000 POT Extraction from Surface TIN File: POT Vertical Offset: -3.0000 POT Display Settings By Feature: 2'' Gas Ex Custom Line Style Scale factor: 0.0000	名 Draw Profile	
Chain: SR80 Surfaces COGO Projection Type Chain Profile/Surfa Display Settings Draw Add Line Details Type: Survey Chain Chain: 2GL2 Vertical Offset: -3.0000 POT Extraction from Surface TIN File: Method: Triangles By Feature Custom Line Style By Feature Custom Line Style Custom Line Style Custo		
Type Chain Profile/Surfa Display Settings Draw Details	Chain: SR80	: 50.00000
Details Type: Survey Chain Chaim 2GL2 End: 100+00.00 End: 103+81.97 Vertical Offset: -3.0000 POT Filter Tolerances TIN File: POT Variance: 0.1000 Display Settings Custom Line Style By Feature Custom Line Style	Surfaces COGO Projection	
Details Type: Survey Chain Chain 2GL2 Wertical Offset: -3.0000 Pot Increment Extraction from Surface Filter Tolerances TIN File: Pot Method: Triangles Display Settings Custom Line Style	Type Chain Profile/Surfa Display Settings	Draw
Type: Survey Chain Chain: 2GL2 Vertical Offset: -3.0000 Pot		
Type: Survey Chain Chain: 2GL2 Vertical Offset: -3.0000 End: 103+81.97 Increment 0.0000 POT Filter Tolerances TIN File: Pot Method: Triangles Display Settings Custom Line Style	🗆 Details	
Chain: 2GL2 Vertical Offset: -3.0000 End: 103+81.97 Increment 0.0000 POT Extraction from Surface TIN File: Method: Triangles Display Settings By Feature Custom Line Style	Iype: Survey Chain ▼	
Vertical Offset: -3.0000 POT Filter Tolerances TIN File: Horizontal: 0.0000 Variance: 0.1000 Varian	Chain: 2GL2	
TIN File: A Horizontal: 0.3000 Method: Triangles Variance: 0.1000 Display Settings Custom Line Style By Feature Custom Line Style	Vertical Offset: -3.0000	
Method: Triangles Variance: 0.1000 Display Settings	Extraction from Surface	ances
Display Settings By Feature Custom Line Style	TIN File: Q Horizontal	: 0.3000
By Feature Custom Line Style	Method: Triangles 💌 Variance	: 0.1000
	Display Settings	
	By Feature	Style
		or: 0.0000

Once the **Add Line** button is selected the survey chain will be added to the **Projection** dialog. Multiple survey chains can be added to the **Projection** dialog. Repeat the process for the other gas line and water line on the project.

名 Draw Profile 📃 🗖 🔯
File Edit Update Options
Job Number: 304 💌 🦧 🚰 Label Scale: 50.00000 Chain: SR80
Surfaces COGO Projection
Type Chain Profile/Surfa Display Settings Draw
Survey 2GL2 < None> 2''GasEx ☑ ☑ ☑ ★
r Details
Type: Survey Chain Stationing Chain 2GL2 Begin: 100+00.00 +++ Chain 2GL2 End: 103+81.97 ++++ Vertical Official 2.0000 Increment 0.0000
Vertical Offset: -3.0000
Extraction from Surface Filter Tolerances
TIN File: Q Horizontal: 0.3000
Method: Triangles Variance: 0.1000
Display Settings
By Feature Custom Line Style
Feature: 2"Gas Ex 💽 📇 🔽 Scale factor: 0.0000

The survey chain will be drawn into the profile cell as shown in the screen capture below.



8 Dra	w Profile				
File 8	dit Update (Options			
Load	pop ivum	ber: 304 💌	2	Label Scale: 50.0	0000
Appe -		-			
Save		Projection			
Save					
Exit	Chain 2GL2	<pre> Profile/Su < None ></pre>	ufa <mark> Display</mark> 2'' Gas I		
Janve	y zucz	< NONE /	2 4631	-0 💌	
					×
I					
- Detai	\$. – Stat		
Type: Survey Chain Stationing Chain E Begin: 100+00.00					
Chain: 2GL2 Chain: 2GL2 Chain: 100+00.00 Chain: 103+81.97 Chain: 103+81.97 Chain: 103+81.97 Chain: 103+81.97 Chain: 103+81.97 Chain: 103+81.97 Chain: 103+81.97 Chain: 103+81.97 Chain: 103					
				Increment V 0.000	
V	ertical Offset:	-3.0000	E F		
	Extraction from	Surface —		– Filter Tolerances –	
	TIN File		- a	Horizontal: 0.30	00
		s J f: Triangles	= ~	Variance: 0.10	
L		I. Thangles		valiance. 0.10	
	lay Settings —			- Custom Line Style —	
F	eature: 2"Ga	as Ex	- ₽		

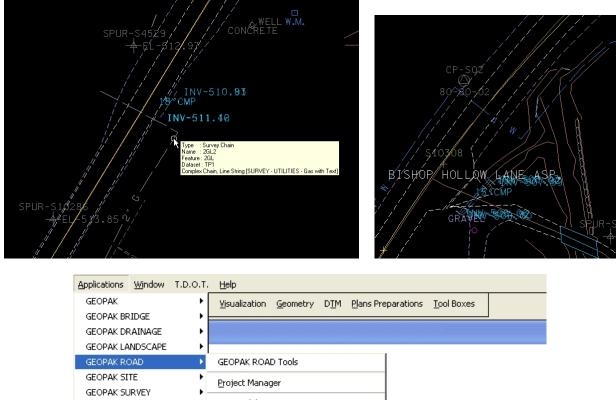
Save the profile settings to the project file. File \rightarrow Save As.

Save Profile File		
Files: SR080-01 SR80.prd	Directories: c:\projects\sm080-01\ C:\ Composition of the sm080-01 CTL CTL projdbs	Cancel
List Files of <u>Type:</u> *.prd	Drives:	<u>H</u> elp

12.3 UTILITY CROSSINGS

To place or draw points at which utilities cross a centerline, select **Applications** \rightarrow **GEOPAK® ROAD** \rightarrow **Cross Sections** \rightarrow **Draw Ancillary Features**.

Note: There are two utility crossings on this project: one gas line and one water line. Locate the crossings on the survey and determine the name of the survey chain for each. The gas line is 2GL2, and the water line is 4"WL.



Applications Window L.D.O.I	. <u>H</u> eip	
GEOPAK	<u>Vi</u> sualization <u>G</u> eometry D <u>T</u> M <u>Plans</u> Pr	reparations <u>T</u> ool Boxes
GEOPAK DRAINAGE		
GEOPAK LANDSCAPE		1
GEOPAK ROAD	GEOPAK ROAD Tools	
GEOPAK SITE	Project Manager	
GEOPAK WATER SEWER	<u>Si</u> te Modeling Acti <u>v</u> e Chain Control GEOPAK Element Attributes GEOPAK 3PC AdH <u>o</u> c Attribute Manager	
	User Preferences <u>G</u> eometry Design & Computation Manager Quantity Manager Plans Preparation	•
	DTM <u>T</u> ools 3D Tools	
	<u>C</u> ross Sections	<u>N</u> avigator
	Utilities 🕨	Process Cross Sections
	Help	Draw Cross Sections from Surfaces Draw Cross Section Tabular Data
	About GEOPAK	Draw Ancillary Features
		Cross Section La <u>b</u> eling

The settings typically used for a gas line are shown in the dialog below. Complete the dialog as shown. Double-click the symbology bar and set the appropriate level, color, linestyle, and weight. Once the dialog is complete, the user can select the **Add Element Set** button to add the settings for the symbol.

名 Draw Ancillary Features 📃 🗖 🔀
Eile Edit Update Options
Job: 304 Q Label Scale: 50.00 Draw Chain: SR80 Image: Station Range Station Range Begin: 100+00.00 Image: Station Range View: Profile Image: Station Range Image: Station Range Image: Station Range Image: Station Range Offset: 0.00 Image: Station Range Image: Station Range Image: Station Range
Element Type Elevation Display Setting Drave Drave Display Setting
4 >
Intersecting Elements Survey Chain ▼ 2GL2 ▼ _K
Extract Elevation TIN Vertical Offset: -3.00
TIN File:
Display Settings Symbol Justification: Center Center Width: Fixed Uv: SURVEY - PROFILE - Utilities - Gas with Text Co: (By Level) 7
Lc: (By Level) 0 Wt: (By Level) 2

The user can now complete the settings for the text. Double-click the symbology box to change the text symbology to match the settings shown in the dialog below.

	😤 Draw Ancillary Features 📃 🗖 🗙
	File Edit Update Options
	Job: 304 Q Label Scale: 50.00 Draw
	Chain: SR80 Station Range Begin: 100+00.00
	View: Profile 💌 🔤
	Offset: 0.00 End: 134+04.11
Text Symbology	Element Type Elevation Display Setting: Drav
	Element Type Elevation Display Setting: Dray Survey Chain = 2GL2 Same Element Symbol = Circle I
Symbology	X
Color: ByLevel	
Weight: ByLevel	
	Intersecting Elements
Text Preferences Set Justification	Survey Chain 🔻 2GL2 💌 🔣
Th: 5.000	
Tw: 5.000	Extract Elevation TIN Vertical Offset: -3.00
Ft: SIEROYMON	TIN File:
TH/TW Fixed	Display Settings
Traverse Offset: 0.000	Text ▼ Angle: 90° 0' 0.00 ÷ ♀ ↓
Radial Offset: 150.000	
<u> </u>	Label:
	·

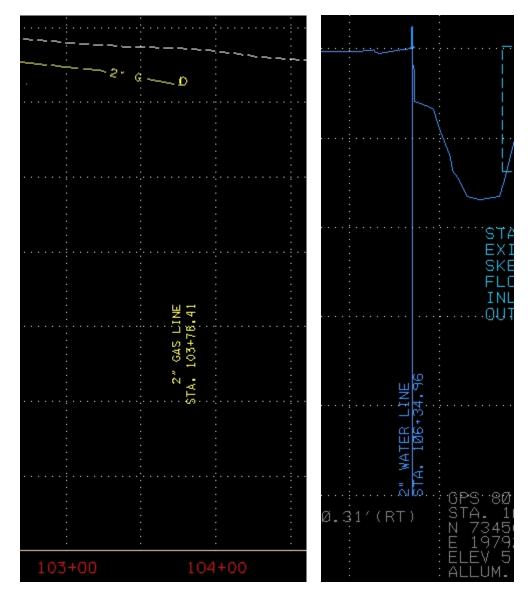
For this class, the user will place the station of the centerline at the point of the utility crossing. Manually type "2" GAS LINE" and "STA." in the Label: box. Select **station** from the Insert Computed Text box. The Angle is set to 90°.

名 Draw Ancillary Features	
File Edit Update Options	
Job: 304 Q Label Scale: 50.00 Draw	
Chain: SR80 Station Range Begin: 100+00.00	
View: Profile 💌 🔤	
Offset: 0.00 End: 134+04.11	
Element Type Elevation Display Setting: Dray	1
Survey Chain = 2GL2 Same Element Symbol = Circle	1
×	
	<u>.</u>
Survey Chain 🔻 2GL2 💽 💽	
Extract Elevation TIN Vertical Offset: -3.0	
	ert Computed Text
	et VS
	ation
Text Comple: 90° 0' 0.00 Complex Angle: 90° 0' 0' 0.00 Complex Angle: 90° 0' 0' 0.00 Complex Angle: 90° 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0' 0'	n v angle
Label: 2" GAS LINE chai	
STA. regio	

Once the dialog is complete, the user can select the **Add Element Set** button as shown in the dialog below to add the settings for the text. The completed dialog is shown below. Select the **Draw** button to draw the symbol and text onto the profile.

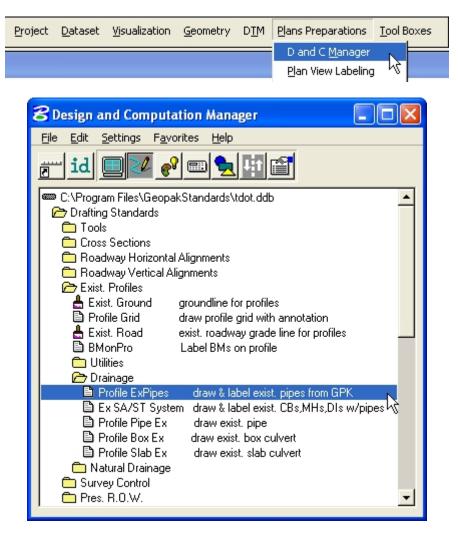
名 Draw Ancillary Features 📃 🗖 🔀
Eile Edit Update Options
Job: 304 Chain: SR80 Image Chain: SR80 Image Station Range View: Profile Image Offset: 0.00 Image
Element Type Elevation Display Setting; Drai Survey Chain = 2GL2 Same Element Symbol = Circle Image: Comparison of the comparis
Intersecting Elements
Extract Elevation TIN Vertical Offset: -3.00 TIN File: Q
Display Settings Text ▼ Scolt Angle: 90° 0' 0.00 ÷ ♀ ↓ Label: 2" GAS LINE STA. {STATION}

The screen capture below shows the placement of the symbol and the text. A vertical line may be placed from the crossing symbol down through the text if desired. Repeat the entire process for the water line, changing the symbology and labeling accordingly. The completed water line label is shown below.

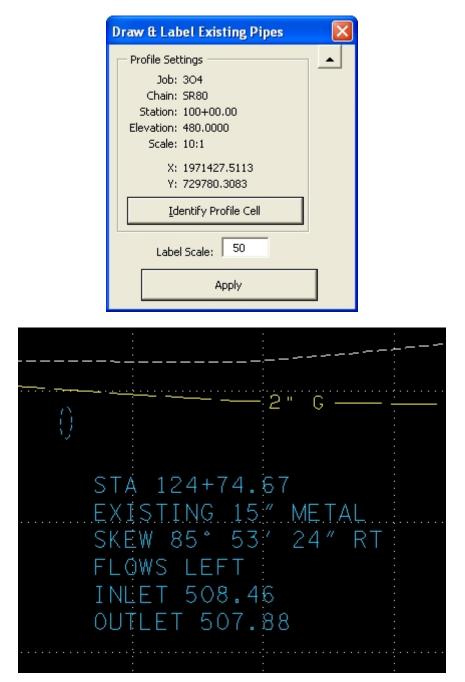


12.4 DRAINAGE CROSSINGS

To place pipes on the profile, the **Design and Computation Manager** will be used. TDOT has developed a routine to perform this task. Manual editing of the pipe descriptions might be necessary after the routine is complete to note a unique shape, pipe material, or the condition of the pipe. Select **Plans Preparations** \rightarrow **D&C Manager.** Then select the **Profile ExPipes** command.



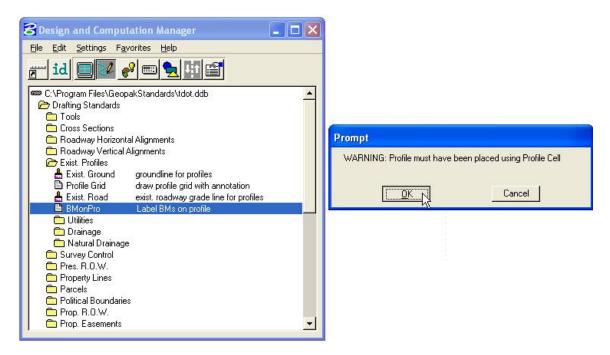
The following dialog will appear. Select **Identify Profile Cell** and select the profile cell. Edit the pipe information at Station 124+74.67 to reflect the screen capture shown below.



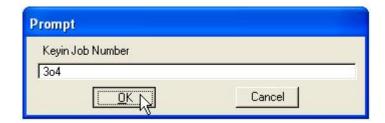
12.5 BENCHMARK & CONTROL POINTS

To draw Benchmarks and Control Points in the profile, select the **BMonPro** option from the **D & C Manager** shown below. This routine requires that the Profile must have been placed using Profile Cell as discussed in Section 12.1.

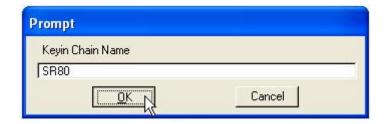
Note: All desired Benchmarks and Control Points that are to be drawn need to be selected in the plan view, using the selection set tool in MicroStation®.



The user will be prompted to Keyin Job Number.



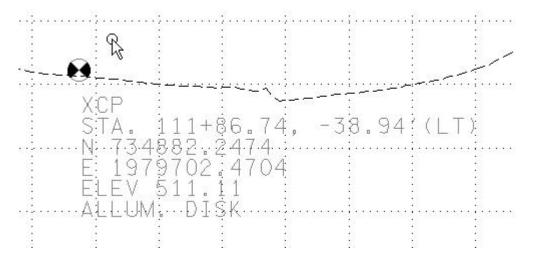
The user will be prompted to **Keyin Chain Name**. This is used to compute the Station and Offset relative to the selected Chain or alignment.



A log file (bmonpro.log) is created in the project directory which should be reviewed for possible errors.

Prompt		
Please Check I	Log File (bmonpro.	log) For Error Messages.
	OK N	Cancel
Prompt		
	Use MicroStation	to Edit "BM" Text on Profile
	Use MicroStation	to Edit ''BM'' Text on Profile

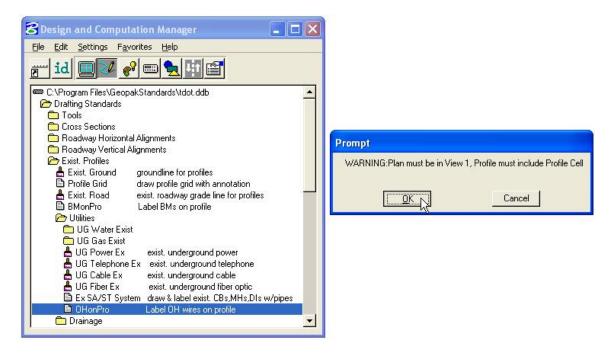
The information shown below is drawn in the selected profile. Some information such as the Control Point Number and Description will need to be manually edited.



12.6 OVERHEAD UTILITY CROSSINGS

To draw Overhead Utility Crossings in the profile, select the option from the **D & C Manager** shown below. This routine requires that the Profile must have been placed using Profile Cell as discussed in Section 12.1. The routine also has a maximum distance of 5 feet from the selected Chain or alignment for it to be recognized. The user may need to move the position of the XLW point, using the GEOPAK® Point Editor, to position it closer to the selected Chain (Note: If the point is moved be sure not to edit the elevation of the point.)

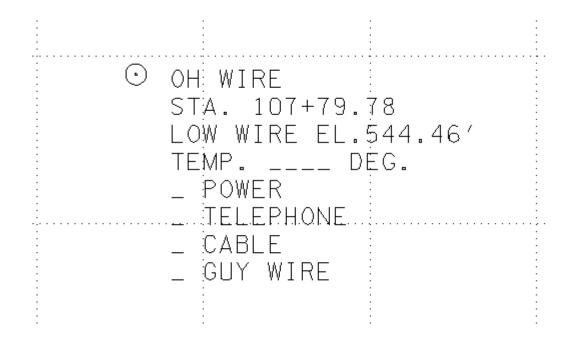
Note: Ensure all levels are visible prior to selecting. All elements can be selected at one time. All desired Crossings that are to be drawn need to be selected in the plan view, using the selection set tool in MicroStation®. The low wire crossings need to be properly coded (XLW) and be at the proper elevation for the information to be correct.



The user may be prompted for job number and chain name.

Prompt	
3PC Complete: Use MicroStation	n to Edit ''OH'' Text on Profile
	Cancel

The information shown below is drawn in the selected profile. Some information such as the Temperature (on the day the field work was done) and the number and types of wires crossing the Chain will need to be manually edited.



12.7 STREAM PROFILES

In this section, the section of stream alignment created in Chapter 10 will be used to create a profile showing the top of bank, top of water, and streambed. A process similar to Section 12.1 will be used to draw the profile cell and grid. Then, the top of bank, top of water, and streambed lines will be projected onto this profile.

From the Applications menu, select **GEOPAK®** ROAD \rightarrow Plans Preparation \rightarrow Draw Profiles.

Select the **Job Number** and **Chain**, and then select the **Dialog Profile Cell Control** button from the **Draw Profile** dialog.

- Job Number: 304
- Chain: CLCRK

Select the Active Chain, and then select the Place Profile Cell.

Complete the **Place Profile Cell** dialog as shown below.

8 Place Profile Cell	
Station:	0.00
Elevation:	480.0000
Horizontal Scale:	50.000000
Vertical Scale:	5.000000
	No Gap 🔻
Cell Range	
Top Elevation 🔻	530.0000
Bottom Elevation 🔻	480.0000

Click a data point outside the area of the survey to place the profile cell in the drawing.

Once the profile cell is placed the profile grid can then be placed. From the **T.D.O.T** menu, select **Profiles** \rightarrow **Draw Profile Grid**. The **Draw Profile Grid** dialog will appear. Complete the dialog with the following settings. Then select **Draw Profile Grid**. Snap the profile grid to the origin of the CLCRK profile cell.

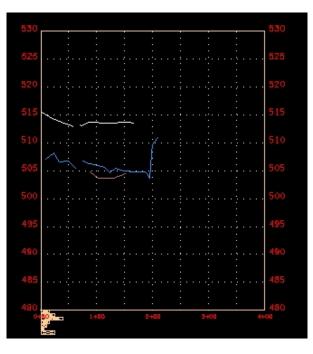
Draw Profile Grid	
Horizontal Scale	50
Vertical Scale	5
Minimum Elevation	480
Maximum Elevation	530
Beginning Station	0+00
Ending Station	4+00
Draw Profile Grid	Cancel

Return to the **Draw Profile** dialog and populate with the following survey chains set to the appropriate feature types in the **Drafting Standards** \rightarrow **Exist. Profiles** \rightarrow **Natural Drainage** category.

- Top of Bank: TB-0, TB-3
- Top of Water: CRK, CRK-2
- Creekbed: CRKB

The com	pleted	dialog	box an	d the	results	are	shown	below.

8 Draw	Profile					
File Ed	it Update Op					
Chain: CL	.CRK	-	£	Label Scal	e: 50.000	00
Surfaces	COGO Pro	jection				_
Туре	Chain TB-3	Profile/Surf		Display Settings]
Survey Survey Survey Survey	TB-0 CRKB	<none> <none> <none> <none> <none></none></none></none></none></none>		Top of Bank Top of Bank Creekbed Top of Water		
- Details Type: Chain: Ver	Survey Chain TB-3 tical Offset: 0.	0000		ationing Begin: 2 End: 57 Increment V POT	0,0000	↔ ↔
F E	ktraction from S TIN File: Method:				rances — al: 0.3000 e: 0.1000	
By F	y Settings eature ature: Top of f	▼ Bank	J 🖶	Custom Line	·	0



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CHAPTER 13 - EXPORTING ALIGNMENTS FOR STAKING

This chapter will describe how to create points at even 50' interval along the SR80 alignment and export them into a text file that can used for staking in the field. Note: This section does not cover how to import the points into the data collector. The procedure in this section can be used to export any points to an ASCII file for staking.

From the main COGO dialog, set feature to XPOINT by using the **Browse** command and navigating to **XPOINT HiVis Office Informational Point**, then select **Tools** \rightarrow **Locate** \rightarrow **Along Element** as shown below.



🛿 Select Survey Item
<u>File E</u> dit <u>S</u> ettings F <u>a</u> vorites <u>H</u> elp
id id mode and the state of th
c:\program files\GeopakStandards\TNDOT.smd
Survey Control
🔁 Drainage
🗖 Terrain Model
🔁 Non-Trans Features
Transportation Features
R.O.W., Property & Esmnts
Political Boundaries Traffic Control
Cuincies Connection
Misc., Default & Office Codes
CL Proposed CenterLine development
🖹 DASH Dash Line
DBDRY Drainage Area Boundary
DEFAULT_SPIRAL default item
DEFAULT_CURVE default item
DEFAULT_PARCEL default item
DEFAULT_CHAIN default item
DEFAULT_LINE default item DEFAULT_POINT default item
DOT Dotted Line
EXCL CenterLine Existing Roads
LD Long Dash Line
MISC Miscellaneous Line
🖹 SOLID Solid Line
STRCL Stream Baseline
X_PROPERTY Property development-pt & linear
XMISC Miscellaneous unknown point
XPOINT HWis Office Informational Point
Design 🔨 🔽

80	ordinate G	ieometry	Job: 3o4 Operator: SU		
<u>Fi</u> le	Edit Elemer	nt <u>Vi</u> ew	Tools		
	×== ==//	اقد امخ	<u>N</u> avigator	김 케너케스티 3	🕺 🔆 🖓 🖓 💭 🗖 <u>B</u> edefine
<u> </u>		<u>×</u> –	Inverse	34 1+234	
Perm	anent Visualiz	ation 🔻 🖡			< < > >>
COCO		6 1	<u>L</u> ocate	<u>T</u> raverse	
LUGU	Key-in: set	reature add	Intersect	By Angle	<u> </u>
	-		<u>B</u> est Fit	Tangent To <u>C</u> urves	▲
<*	1	set	Translation and Rotation	On Element	
			<u>M</u> ap Check	<u>P</u> oint On Curve	
<*	2	set	Roadway Intersections	Along Element	
			<u>C</u> ul-de-sacs	Elevations By Profile	
<*	3	set	Redraw Visualized Elements		•
			Clear Visualized Elements (Temporary)		

The following dialog will appear. Complete the dialog as shown below. Be sure to use ST9000 as the starting point number. The ST indicates a stakeout point and using 9000 will prevent point number conflicts in the data collector. Set the name of the centerline chain. Set **Distance** to stakeout interval. Press **Locate** to create the points. However, the curve points still need to be created.

名 Locate Points along Element 📃 🗆 🔀
Mode Element Chain Locate Point ST9000 Inc Pt# By 1
Chain Information Chain SR80 Chai
Distance
Offset Distance 0,0000 Right
Station Range To Station
Locate

Ejle Edit Element Vjew Tools Point Utility Line Cell Copy Spiral Equate Chain Equate 0.0 BEG ST9000 STEP 1 N 734, (Profile Store 0.00	🖁 Coordin	ate Geometry Job	: 304	Operator: SU	
Line Cell Permanent Cell Permanent Copy COGO Key-in Spiral Elevation F1 Chain Station 0.0 BEG ST9000 STEP 1 0.00 N 734, (Profile Store 0.00	<u>File E</u> dit	Element <u>View</u> <u>T</u> ools			
Line Cell Permanent Curve Curve Copy Elevation P1 Chain Equate N 734, (Profile Store 0.0 BEG ST9000 STEP 1		<u>P</u> oint	•	<u>U</u> tility	
Permanent Curve COGO Key-ir Spiral Spiral Copy Elevation Elevation Chain Equate Parcel Station N 734, (Profile	<u> </u>	Line	•	Cell	
COGO Keyir Spiral Elevation Chain Elevation Elevation <*	Permanent	<u>C</u> urve	•		▼ 9^99.12 ▼ << < > >>
Chain Equate <*	COGO Key-ir	Spiral	•		EP 1
<** Parcel Station 0.0 BEG ST9000 STEP 1 N 734,(Profile 0.00				-	
N 734, (Profile <u>Store</u> 0.00	1.84	-		.2	
	< *	P <u>a</u> rcel	•	Station "N	0.0 BEG SI7000 SIEF I
Point 6	N 734,(Pro <u>fi</u> le	•	Store	0.00
N 734, <u>Next Available Settings</u> Point ST9001 stored.		Ne <u>x</u> t Available Setting	s	Transformation Compare Points to <u>T</u> IN	0.00
N 734,087.3395 E 1,978,9 Set Elevation From TIN 0.00			8,9	Set Ele <u>v</u> ation From TIN	0.00

From the main COGO dialog select **Element** \rightarrow **Point** \rightarrow **Equate** as shown below.

The following dialog will appear. Complete the dialog as shown below. Set **Begin Point** as next available ST point number. Select the chain name and highlight the curves as shown. Press **Apply**. More points will be created.

8 Equate Poi	nt		
Equate From: Begin Point: Filter By:	ST9069	• •	
SC7 SC8 SC6	131100		
Control Point I Curves PC CC PI PT Do not d	▼ ▼ ▼ ▼	Spirals TS/CS PIS SC/ST	▼ ▼ ▼ ntrols

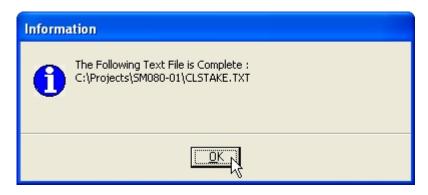
8	Coordinate Geo	metry Job: 3o4 Operator: SU
	File Edit Element	<u>Vi</u> ew <u>T</u> ools
-	Preferences	
	Input File <u>U</u> tility Input File <u>R</u> estore	▼ XPOINT ▼ Browse 99.1234 ▼ 9^99.12 ▼ << < > >>
-	Database Utilities	- 19080 To PT SC6
	<u>I</u> mport	▶ ruate ST9078 To CC SC6
L	<u>E</u> xport	ASCII Points
	Exit	SDMS Points 5 Sta 0+00.00
Т		- SDMS <u>Alignments</u>
	<* 16	E LandXML 1.0 Geometry I SC6
		Alignments and Profiles

Revert back to the main COGO menu and select File \rightarrow Export \rightarrow ASCII Points.

Set the Output File, Output Format, and other inputs as shown below. Highlight the points just created (ST9000 through ST 9080) in the bottom window and press **Apply**.

名 Export GPK Points to ASCII Coordinate File						
Prefix	Format Text _Point# ▼	Suffix	put File: \Projects\SM0	80-01\CLSTAKE	<u>File Cr</u> E.TXT	eate ▼
	North(Y) ▼ East(X) ▼ Elev(Z) ▼			ace ''No Elevati place ''No Featu		000
STA-	Feature ▼ Station ▼			on value from Ch		
	None 🔻			e Station and Of		
Select F	None None None None	t :	I Usel	Duplicate Filter T	olerance : [0,0	00010
Point#	North(Y)	East(X)	Elev(Z)	Station	Offset	Feature 🔺
ST9074 ST9075 ST9076 ST9077 ST9078 ST9079 ST9080	735461.5830 735168.2298 735402.3642 735725.4852 735292.9309 736056.7985 736369.1820	1980159.505 1980530.214 1980564.453 1980611.706 1983569.590 1980660.156 1980780.707	3 NoElev 5 NoElev 0 NoElev 5 NoElev 5 NoElev	118+25.00 120+39.54 122+54.08 125+80.64 125+80.64 129+14.09 132+47.54	-409.2556 63.4826 -0.0000 0.0000 2989.3450 -18.6942 0.0000	XPOINT XPOINT XPOINT XPOINT XPOINT XPOINT XPOINT
🗖 Inclu	ide Header		Apply		<u> </u>	

Once the user selects **Apply** the following dialog will appear.



The CLSTAKE.txt file has been created in the project directory. Open the created file in Notepad or any other text editor to view the data.

🗖 clstake.txt - Notepad	
File Edit Format View Help ST9000,734002.0165,1978928.4110,1000,Sta100+00.00 ST9001,734044.6780,1978954.4878,1000,Sta100+50.00	<u>^</u>
<pre>ST9002,734087.3395,1978980.5645,1000,sta101+00.00 ST9003,734130.0010,1979006.6413,1000,sta101+50.00</pre>	
<pre>ST9004,734172.6625,1979032.7180,1000,Sta-102+00.00 ST9005,734215.3240,1979058.7948,1000,Sta-102+50.00 ST9006,734257.9854,1979084.8715,1000,Sta-103+00.00</pre>	=
<pre>st9007,734300.6469,1979110.9483,1000,sta103+50.00 st9008,734343.3084,1979137.0250,1000,sta104+00.00 st9009,734385.9699,1979163.1018,1000,sta104+50.00</pre>	
<pre>st9010,734428.6314,1979189.1786,1000,sta105+00.00 st9011,734470.6786,1979216.2244,1000,sta105+50.00 st9012,734511.2557,1979245.4293,1000,sta106+00.00</pre>	
<pre>st9013,734550.2487,1979276.7179,1000,sta106+50.00 st9014,734587.5507,1979310.0043,1000,sta107+00.00 st9015,734623.0596,1979345.1974,1000,sta107+50.00</pre>	
<pre>st9016,734656.6779,1979382.2006,1000,sta108+00.00 st9017,734688.3136,1979420.9125,1000,sta108+50.00 st9018,734717.8798,1979461.2271,1000,sta109+00.00</pre>	
<pre>st9019,734745.2957,1979503.0338,1000,sta109+50.00 st9020,734770.4860,1979546.2180,1000,sta110+00.00 st9021,734793.3816,1979590.6614,1000,sta110+50.00</pre>	
<pre>st9022,734813.9199,1979636.2422,1000,sta111+00.00 st9023,734832.5107,1979682.6566,1000,sta111+50.00</pre>	
<pre>st9024,734850.9239,1979729.1426,1000,sta112+00.00 st9025,734869.3371,1979775.6287,1000,sta112+50.00 st9026,734887.7503,1979822.1147,1000,sta113+00.00</pre>	

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CHAPTER 14 - DRAINAGE MAPS

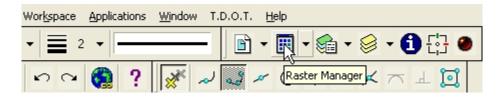
The user must graphically create a shape outlining each drainage area to create a drainage map. The user must attach an image of the appropriate quad map. Quad maps can be obtained from the following website.

http://www.tngis.org/data.html

Download the zip file and unzip the files into the project directory. Several georeference files will be included with the quad image in the zip file. Before attaching the raster image the appropriate settings must be checked. From the MicroStation® toolbar select **Workspace** \rightarrow **Preferences...** and the following dialog will appear. Complete the **Preferences** dialog as shown below and select **OK**. The **Use Sister File, if Present, for Georeferenced Files** option should be toggled on, and the **WorldFile Default Units** should be set to **Survey Feet**.

BPreferences [untit	led]
Category Database Input Look and Feel Mouse Operation Paster Manager Reference Spelling Tags Text View Options	Name for preferences Display Border Around Selected Raster Display Border Around Selected Raster Eile Georeference Has Priority when Raster Is Loaded Use Sister File, if Present, for Georeferenced Files Cancel Save Location Info in Sister File if Required Open Raster Files Read-Only Update MS_RFDIR Automatically for Raster Attachments List Raster Attachments From Self References Geotiff Settings Use Unit Definition Geokey if Present (override PCS unit) Geotiff Default Unit: 1 Unit = 1.000000000 WorldFile Default Unit: 1 Unit = 1.000000000 WorldFile Default Unit: 1 Unit = 1.000000000 Survey Feet Recent Files List Contains: 4

From the Primary toolbar in MicroStation® select the Raster Manager button.



The following dialog will appear. Select File \rightarrow Attach... from the Raster Manager dialog.

8 Raster Manager : Files (0)				
File Edit Display	Settings			
<u>A</u> ttach		Description	Read-Only Model	
Detach 🤟				
De <u>t</u> ach All				
R <u>el</u> oad				

Highlight the CARTHAGE.tif file as shown below. Do not check the **Place Interactively** option and select **OK**. If the image is geo-referenced, then the quad should display in the correct location. The quad used for this class is geo-referenced. If the image is not geo-referenced, then the user will have to move the quad to the correct location. Find a feature on the quad such as a road or intersection and move the quad to that same point on the graphics.

名 Attach Raster Reference			\mathbf{X}
Eile Directory Attachment File Files: C:\Projects\SM080-01\CARTHAGE.tif CARTHAGE.tif	C:\	Preview Attachment ▼ <u>Raster Preview</u> 4681 × 5781, 256 Colors , GeoTIFF Origin: 1968495.94, 697714.34, 0.00	<u>OK</u> Cancel
	SM080-01 CTL projdbs TP1 TP2		<u>H</u> elp
List Files of Type: All Supported Raster Files	Dri <u>v</u> es: C:		
Attachment Settings: View: 12345678 Logical Name: D <u>e</u> scription:	Place Interactively Imporary Attachment Open Raster Files Read-Only		

Note: If the image is placed interactively or the scale is incorrect, the user must modify the pixel size. From the **Raster Manager** dialog select **Settings** \rightarrow **Attachment...** and choose the **Location** tab. The pixel size should be 7.87 for both the X and Y.

When the image is positioned correctly, save the image and position by selecting $File \rightarrow Batch$ Convert on the Raster Manager toolbar. Complete the dialog as shown below and select the Options button.

名 Raster Conv	ert	
Raster Selection		
File Name	Color Mode Pixels	
		<u>A</u> dd
		<u>R</u> emove
1		
C Output		
<u>F</u> ormat	Georeferenced TIFF [*.tif;*.tiff]	OptionsN
Color <u>M</u> ode		
<u>C</u> ompression	PackBits Compression 💌	
🗖 <u>R</u> esize:	0 X 0 M Proportional	
<u>G</u> amm	a Correction: 1.0000 🗖 Invert	
Directory:	C:\Projects\SM080-01\	Select
		Co <u>n</u> vert

Complete the **Conversion Options** dialog as shown below and select **OK**.

8 Conversion Opt	tions	\mathbf{X}
	Resampled	<u>0</u> K
Number of Colors:	256 Tiled	Cancel
Georeference		
Coordinate System		
Projection	Take From Input	_

Select Add from the Raster Convert dialog. Highlight the quad and select OK.

名 Add File(s)	\times
Eile Directory Attachment File Files: C:\Projects\SM080-01\CARTHAGE.tif CARTHAGE.tif CARTHAGE.tif CARTHAGE.tif CTL projdbs TP1 TP2	<u>O</u> K Cancel <u>H</u> elp
List Files of Type: Drives: All Supported Raster Files ▼ C: ▼]

Return to the **Raster Convert** dialog and select the Convert button. The following dialog will show the results of the conversion.

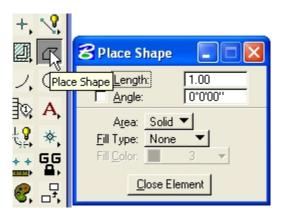
Batch Conversion Progress	\mathbf{X}
Converting: C:\Projects\SM080-01\CARTHAGE.tif Success -> C:\Projects\SM080-01\CARTHAGE_01.tif 1 file(s) successfully converted	
<esc> to Cancel Conversion</esc>	
<u>0</u> K	Save Log

The converted file has the same name, CARTHAGE_01.tif. A backup of the unconverted file is saved with the old name, CARTHAGE.tif. The backup file should be deleted.

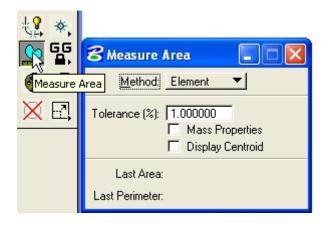
The user will now draw the drainage boundaries manually by interpolating ridges from the quad map contours. From the **Survey** toolbar, select **Plans Preparation** \rightarrow **Place SMD Feature**. Choose the **DBDRY Drainage Area Boundary** and toggle the **Place Linear Influence** option on.

2 Place SMD Symbol and Linear Feature	
<u>File E</u> dit <u>S</u> ettings F <u>a</u> vorites <u>H</u> elp	
产 🛱 id 🎆 📰 📰 🥳 💏 🧬 🔽 Place Linear Influence	
Transportation Features	_
C R.O.W., Property & Esmnts	
Political Boundaries	
Traffic Control	
Contraction Contraction	
📄 🦳 Misc., Default & Office Codes	
🕒 CL Proposed CenterLine development	
🗋 DASH Dash Line	
DBDRY Drainage Area Boundary	
DEFAULT_SPIRAL default item	
DEFAULT_CURVE default item	
DEFAULT PARCEL default item	

Draw a MicroStation[®] shape using the Place Shape command from the main MicroStation[®] toolbox. Bound the contours with the new shape. Select **Close Element** once the shape is complete.



Select the shape using the **Measure Area** tool. The area is reported in the status bar in square feet.

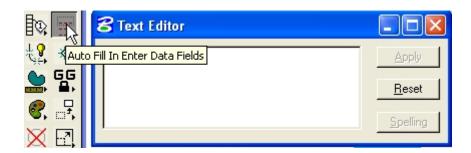


Drainage Info

Bridge and pipe cell are provided in the Survey seed file. The user can copy the cells to the vicinity of the appropriate bridge and drainage areas. The drainage cells for bridges and pipes are shown below.

DRAINAGE/ HYDRAULIC DATA FOR BRIDGE
STATIONSTREAM_NAME
STREAM BED LINING:
BIRECTION OF FLOW
DRAINAGE AREA (_) FLAT (_) ROLLING (_) HILLY (_) MINS.
PRESENT STRUCTURE: SPAN HEIGHT STRUCTURE
BEGIN STATION-OFFSETEND STATION-OFFSET
LOW BEAM ELEV LOCATION
INLET INVERT ELEY OUTLET INVERT.
NORNAL WATER ELEY EXTREME HIGHWATER ELEY DATE
HOW OBTAINED.
BACKNATER FROM WHAT STREAM (IF APPLICABLE)
EXISTING STRUCTURE CONDITION:
SEE STREAM CROSS-SECTIONS FOR VEGETATIVE COVER, SEE PRESENT LAYOUT ILEVEL 40) FOR STREAM AI
SEE CENTERLINE PROFILE OR FIELD BOOK FOR EXISTING BRIDGE OPENING SKETCHES.
REMARKS:
DRAINAGE RATA FOR DIDE
DRAINAGE DATA FOR PIPE
STATION
DIRECTION OF FLON
DRAINAGE AREA, (_)FLAT; (_)RDLLING; (_)HILLY; (_INTNS.
PRESENT STRUCTURE
EXISTING STRUCTURE CONDITION
REMARKS

Use the **Auto Fill In Enter Data Fields** in the MicroStation® text toolbar to fill in the text fields contained in the cell. Click a data point until the first blank in the block above is highlighted and continue to fill in each blank by clicking data points.



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Appendix A TDOT Survey SMD Feature Codes

For current TDOT feature codes please refer to the following website:

http://www.tdot.state.tn.us/Chief Engineer/assistant engineer design/design/survey.htm

Appendix A - TDOT Survey SMD V8 Feature Codes

TRANSPO	DRTATION FEATURES	IN DTM
BE	Business Entrance	Y-2
BIKE	Bike Path	Y-2
CU	Curb (At Bottom W/BL At Top)	Y-2
	. Driveway	
	Edge Of Pavement	
FE	Field Entrance	Y-2
GRM	Guardrail Median	NO
GRL	Guardrail Left	NO
GRR	Guardrail Right	NO
IMP	Impact Attenuator	Y-1
JB	Jersey Barrier	Y-2
MED	Median	Y-2
PK	Parking Lot	Y-2
	Edge Of Road	
	Railroad	
RRSS	Railroad Sw. Stand	Y-2
RWAY	Airport Runway	Y-2
RWT	Ret. Wall (At Bottom W/BL At Top)	Y-2
	Ret. Wall W/Fence(At Bottom W/BL A	
SWT	Sidewalk	Y-2
SH	Edge Of Shoulder	Y-2
	Trail	
	Tunnel	
	Handicap Curb Opening	
	Railroad Switch	
	NS FEATURES	
	Building	

AFLD	Athletic Field	Y-2
BC	. Building	Y-4
CG	. Cattle Guard	Y-1
CEM	. Cemetery	Y-1
FN	. Fence	Y-1
GATE	. Gate	Y-1
GRAVE	. Grave	Y-1
PAD	. Miscellaneous Pad	Y-2
PIT	. Quarry or Pit	Y-2
ROCKW	. Rock Wall	Y-2
RWP	. Ret. Wall (Private) (AT BOTTOM W/BI	L
	AT TOP)	Y-2
RWPWF	. Ret. Wall W/Fence (AT BOTTOM W/B	L
	AT TOP)	
SEP	. Septic Field Line	
	. Sign (Private)	
	. Sidewalk (Private)	
TANK	. Tank (UG or Above Ground)	NO
	. Tower	
XBLDR	. Boulder	Y-1
XFE	. Floor Elevation	NO
XFLAG	. Flag Pole	Y-1
XFP	. Fence Post	Y-1
XMB	. Mail Box	Y-1
XSATLIT	. Satellite Dish	Y-1
	. Septic Tank	
	. Well	

DRAINAGE	IN DTM
ABUT Bridge Abutment	<u></u>
APRON Paved Apron	Y-2
BEAM Bridge Bottom Beam	NO
BRI Bridge	NO
CRK Creek	Y-2
CRKB Creek Bed	Y-2
CV Culvert	Y-1
DAM Dam	Y-2
DECK Bridge Deck breaklines	NO
DIKE Dike	Y-2
DIT Paved Ditch	Y-2
DOWN Downstream Flood Section	NO

	End Wall (At Bottom W/BL At Top)	
	Stream Gage	
	Lake	
	Levee	
	Bridge Pier	
	Pipe	
	Pond	
	River	
RPDS	Rapids/Waterfall	Y-2
	Rip-Rap	
SINK	Sinkhole	Y-2
SPILL	Spillway	Y-2
?STS	Storm Sewer	NO
SKE	Bridge Sketch	NO
	Top Of Bank	
UP	Upstream Flood Section	NO
WFT	Wetland Boundary	Y-2
	Bottom Of MH, CB, Etc.	
	Catch Basin	
	Bridge Deck	
	Drop Inlet	
	High Water Elevation Point	۲-۱
	Normal Water Elevation Point	t-2
	Spring	
XMHSTS	Storm Sewer Manhole	Y-1
	POPERTY	
R.U.W./FI	ROPERTY Easement	IN DTM
	Drainage Easement	
	Parcels	
PL	Property Line	NO
	PL W/Fence	
	ROW Line	
ROWWF	ROW W/Fence	NO
XIP	Iron Pin Existing	
XIP XMON	Concrete Marker	NO
XIP XMON XPL	Concrete Marker	NO NO
XIP XMON XPL XROW	Concrete Marker Property Corner R.O.W. Monument	NO NO NO
XIP XMON XPL XROW	Concrete Marker Property Corner R.O.W. Monument	NO NO NO
XIP XMON XPL XROW XROWA	Concrete Marker	NO NO NO NO
XIPXMON XPLXPL XROW XROWA XROWB	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner)	NO NO NO NO NO
XIPXMON XPLXPLXROW XROWA XROWA XROWB	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner)	NO NO NO NO NO IN DTM
XIP XMON XPL XROW XROWA XROWB POLITICA CITY	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) L BOUNDARIES City Limits	NO NO NO NO NO <u>IN DTM</u> NO
XIPXMON XMON XROW XROWA XROWB XROWB COLITIC COUNTY	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) L BOUNDARIES City Limits County Line	NO NO NO NO NO <u>IN DTM</u> NO
XIPXMON XMON XROW XROWA XROWB XROWB COLITIC COUNTY	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) L BOUNDARIES City Limits	NO NO NO NO NO <u>IN DTM</u> NO
XIPXMON XPLXROW XROW XROWB ROULITICA CITY COUNTY STATE	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line	NO NO NO NO <u>IN DTM</u> NO NO
XIPXMON XPLXROW XROW XROWB XROWB POLITICA CITY COUNTY STATE UTILITIES	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) L BOUNDARIES City Limits County Line State Line	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u>
XIPXMON XPLXROW XROWA XROWB XROWB COUNTY STATE UTILITIES 7GL	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) 	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u>
XIPXMON XMON XROW XROWA XROWB POLITICA COUNTY STATE UTILITIES QGL OHW	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line State Line Gas Line Overhead Wire	
XIPXMON XMON XROW.XROWA XROWB XROWB CITY COUNTY STATE UTILITIES ?GL OHW PTOW	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line State Line Gas Line Overhead Wire Trans. Tower	
XIPXMON XPLXROW XROWA XROWB XROWB CITY COUNTY STATE UTILITIES 7GL OHW PTOW ?SAS	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line Gas Line Overhead Wire Trans. Tower Sanitary Sewer	
XIPXMON XPLXROWXROWA XROWB XROWB XROWB POLITICA CITY COUNTY STATE UTILITIES ?GL OHW. PTOW ?SAS ?FMS	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line State Line Gas Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO
XIPXMON XMON XROW XROWB XROWB COUNTY STATE YGL OHW PTOW 7SAS 2FMS UGF	Concrete Marker Property Corner R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line State Line Gas Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG)	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO NO
XIPXMON XMON XROW XROWB XROWB CITY COUNTY STATE YATE PTILITIES GL PTOW ?SAS 2FMS UGF	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line State Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG) Power (UG)	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO NO NO
XIPXMON XMON XROW XROWB XROWB COUNTY STATE OHU PTOU SAS 25AS 25AS 25AS UGP UGP	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO NO NO
XIPXMON XROW XROW XROWB XROWB COUNTY. COUNTY. STATE OHW. PTOW ?SAS 2FMS UGP UGPT UGT	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG) Power (UG) Telephone (UG)	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO NO NO
XIPXMON XROW XROWA XROWB XROWB CITY COUNTY STATE OHW PTOW PTOW PTOW PTOW YFMS UGP UGP UGC	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line Gas Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO Y-1 NO NO NO NO NO NO
XIPXMON XROWXROW XROWA XROWB POLITICA CITY COUNTY STATE STATE QL PTOW PTOW PTOW PTOW PTOW PTOW PTOW PTOW PTOW UGP UGP UGC ?WL	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line Gas Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG) Power (UG) Power (UG) Cable (UG) Cable (UG)	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO NO NO NO
XIPXMON XROWXROWA XROWA XROWB XROWB CITY COUNTY STATE STATE YILLITIES 2GL PTOW 2FMS JGP JGP JGC 2WL	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line Gas Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG) Power (UG) Power (UG) Cable (UG) Cable (UG)	NO NO NO NO NO <u>IN DTM</u> NO NO <u>IN DTM</u> NO NO NO NO NO NO NO NO
XIPXMON XROWXROWA XROWB XROWB COUNTY STATE UTILITIES GL PTOW PTOW PTOW PTOW PTOW UGP UGP UGP UGT UGT UGT XFH	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) ROW Monument(corner) County Line County Line County Line State Line	NO NO NO NO NO NO NO NO NO NO NO NO NO N
XIPXMON XMON XROW XROWB XROWB CITY COUNTY STATE YGL COUNTY STATE UTILITIES COUNTY STATE YGL COUNTY SAS PTOW YGF UGP UGP UGP UGP YWL XGAA XGAA XGM	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) City Limits. County Line State Line State Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG) Power (UG) Power (UG) Rower/Tel. (UG) Telephone (UG) Cable (UG) Water Line Fire Hydrant Guy Device Angle Anchor Gas Meter	NO NO NO NO NO NO NO NO NO NO NO NO NO N
XIPXMON XMON XROWA XROWB XROWB CITY COUNTY STATE YGL OHW PTOW YGSAS 2FMS UGP UGPT UGC YWL XGH XGAA XGM	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) City Limits. County Line State Line State Line Overhead Wire Trans. Tower Sanitary Sewer Force Main Sanitary Sewer Fiber Optic (UG) Power (UG) Power (UG) Rower/Tel. (UG) Telephone (UG) Cable (UG) Water Line Fire Hydrant Guy Device Angle Anchor Gas Meter	NO NO NO NO NO NO NO NO NO NO NO NO NO N
XIPXPI XMONXPL XROWXROWB XROWB XROWB POLITICA CITY COUNTY STATE STATE QUILITIES ?GL OHW PTOW YGF UGP UGF UGP UGT UGC YGA XGA XGM XGV	Concrete Marker Property Corner. R.O.W. Monument ROW Monument(inline) ROW Monument(corner) ROW Monument(corner) ROW Monument(corner) County Line County Line State Line	NO NO NO NO NO NO NO NO NO NO NO NO NO N

 XGVA.......Guy Device Vertical Anchor
 Y-1

 XGW......Guy Wire
 Y-1

 XLP1......Light Pole 1 Light
 Y-1

 XLP2.....Light Pole 2 Lights
 Y-1

 XLP3.....Light Pole 3 Lights
 Y-1

 XLP4.....Light Pole 4 Lights
 Y-1

XLW	Low Wire Crossing	NO
XMH	Manhole	Y-1
XMHC	Cable Manhole	Y-1
	Fiber Optic Manhole	
	Manhole Gas	
	Manhole Power	
	Sewer Manhole	
XSM	Sewer Meter	NO
	Sewer Valve	
	Misc. Utility Feature	
UM	. Misc. Utility Line	NO
XMHT	. Telephone Manhole	Y-1
XMHW	Manhole Water	NO
XPB	. Utility Boxes (pull box)	NO
	Utility Pole	
XUPL	Utility Pole with Light	Y-1
XHMPLH	. High Mast Light (half)	Y-1
XHMPLF	High Mast Light (full)	Y-1
	Lighting Control Center	
XOFTLP	. Offset Type Luminaire & Pole	Y-1
XTBOOTH.	Telephone Booth	Y-1
	Telephone Box	
XTGP	Telegraph Pole	Y-1
	Tele. Pedestal	
	Radio/TV Tower	
XCPED	Cable Pedestal	Y-1
	. Water Meter	
XWV	. Water Valve	NO

VEGETATION	IN DTM
TREE Tree Drip Line	Y-1
HEDGE Hedge Line	Y-1
XBUSH Bush	
XTREE Tree	Y-1
(COMMENT: ??" TREE TYPE)	

TRAFFIC CONTROL	IN DTM
BARR Barricade	
LDECT Loop Detector	NO
LLD Lane Line Dashed	Y-1
LLS Lane Line Solid	Y-1
SIGNT Transportation Sign	NO
XOHS Overhead Sign EX: SCHOOL X	NO
XPDMC Pad Mounted Controller	
XPDSHN Pedestrian Signal	
XPLMC Pole Mounted Controller	
XPPH Pedestrian Pushbutton	NO
XPULLB Pull Box	NO
XRRFS RR Flashing Signal Crossing	NO
XRRFSG RR Flashing Signal Crossing W/Gate	NO
XRRSIG Railroad Signal	
XSHN Traffic Signal Head	
XSHNB Signal Head W/Backplate	
XSIGN1 Small 1-Post Sign	
·····	
XSIGN2 Small 2-Post Sign	Y-1
X2SIGN Small 2-Faced Sign	
XSPSS Strainpole	
XWPSS Wood Signal Pole	

TRAFFIC CONTROL (PAVT. MARKING) IN DTM

NOTE: LOC. ALL PVMT ARROWS AT CENTER	OF
TRAFFIC LANE RELATIVE TO BOTTOM OF AR	
CWALKCrosswalk	
STOP Stop Bar	NO
XLAR Left Arrow Pave. Mark	
XLRARLT & RT Arrow	NO
XONLY Only Pave. Mark	NO
XPVTXTPave. Marking Words (CENTER)	NO
XRARRight Arrow Pave. Mark.	NO
XRRPAVRailroad Xing Pave. Mark.	NO
-	
XSARStraight Arrow	NO
XRARIRight Arrow Interstate	NO
XSARI Straight Arrow Interstate	
XSRARI Straight & Right Arrow Interstate	NO
XHOV HOV Diamond	NO
XSLAR Str & Lt Arrow	NO
XSLRAR Str.Lt & Rt Arrow	
XSRAR Str & Rt Arrow	NO
TERRAIN MODEL	IN DTM
BL Breakline	Y-2
OLObscure Line	
XPGROUND POINT	Y-1
SURVEY CONTROL	IN DTM
XBMBench Mark	NO
XCP Control Point	
XCK Check Point	
XTRAV Traverse Point	
XIRAV Haveise Politi	
XSPUR Temporary Survey Point	NO
XH Horz. Photo Point	Y-1
XVVert. Photo Point	
XHV Horz/Vert Photo Point	Y-1
MISCELLANEOUS & DEFAULT CODES	IN DIM
DEFAULT_CHAINdefault item	NO
DEFAULT_CURVEdefault item	NO
DEFAULT_LINEdefault item	
DEFAULT_PARCELdefault item	NO
DEFAULT_POINTdefault item	NO
DEFAULT SPIRALdefault item	NO
DASHDash Line	NO
DOT Dotted Line	NO
LDLong Dash Line	NO
MISCMiscellaneous	
SOLIDSolid Line	
XMISC Misc. unknown point	NO
	NO
OFFICE CODES CL Proposed Centerline	IN DTM
DBDRY Drainage Map Boundary	
EXCL Existing Centerline	
STRCL Stream Baseline	NO
X_PROPERTYProperty development	
XPOINT HiVis Generic Office Pt	NO

DTM CODES		
NO Do Not Include in DTM	Y-5 Include as a Break Void in DTM	
Y-1 Include as a Spot in DTM	Y-6Include as a Island in DTM	
Y-2 Include as a Spot and a Break Line in DTM	Y-7 Include as a Boundary in DTM	
Y-3 Include as a Void in DTM	a Void in DTM	
Y-4 Include as a Drape Void in DTM		

CURRENT REVISION LIST		
DATE	FEATURE CODE	REVISION
04/27/05	ALL	UPDATED FOR V8
	NA	CHANGED LAYOUT, CHANGED DESCRIPTION FOR XMHC
02/17/06	CU, SWT, XHRAMP	CHANGED COLOR TO 64
	XPL	CHANGED LOCATOR
04/19/06	CV, PIPE	CHANGED ELEVATION LEVEL
04/19/00	20GL	ADDED 20" GAS LINE
	EP, RD, XBM, XCP,	
09/22/06	XTRAV, XSPUR,	CHANGED TEXT SIZE TO MATCH CADD MANUAL
	XH, XV, XHV	
11/03/06	XTREE	CORRECTED SIZE ADJUSTMENT FEATURE
12/05/07	XCK	ADDED XCK FEATURE CODE
03/25/08	XMISC	CHANGED LEVEL
05/19/09	CV & PIPE	CHANGED ELEVATION TO TEXT LEVEL