INROADS SURVEY DATA REDUCTION

Bohannan Huston INC.

This document has been prepared for:

Colorado Department of Transportation
4201 E. Arkansas Ave.
Denver, CO 80222

This document has been prepared by:

Bohannan Huston, Inc.
Main Office:
Courtyard I
7500 Jefferson St. NE
Albuquerque, NM 87109

Bohannan Huston, Inc.
Denver Office:
Meridian One
9785 Maroon Circle
Suite 140
Englewood, CO 80112-5919

The Envision Group, Inc.
8517 Excelsior Dr.
Suite 102
Madison, WI 53717

Copyright

Disclaimer

Notice

Software Versions

The software products referred to in this publication are furnished under a license and may only be used in accordance with the terms of such license. This document intended for use with the following software versions:

MicroStation® version 08.05.02.55
InRoads® version 08.05.00.00 – Service Pack 5

0408 – Version 03.02 CDOT Configuration

Document Conventions

There are several conventions that are used throughout this document to indicate actions to be taken or to highlight important information. The conventions are as follows:

Example Item	Meaning
View Perimeter	a command name or a file that you are to select, including directory path
Name:	field name, button or icon in a dialog box
Dialog Header	dialog box name
Tools > Options	a command path that you are to select - usually from the pull-down menus
Dialog Area	heading for separated areas within a dialog box
Tab	heading for tabs found within dialog boxes
Key in	entering data with the keyboard or items selected from drop-down list
Document name	style used when referring to another document
Note: text	information about a command or process that you should pay particular attention to
Concept: text	detailed definition of a concept, procedure or process
Emphasis	an important word or phrase
Prompt	user prompt
1. Numbered Steps	actions that you are to perform as part of the lab activities
<D> or **Data**	press the data button on the mouse
<R> or **Reset**	press the reset button on the mouse
<T> or **Tentative**	press the tentative button on the mouse

Table of Contents

Course Overview and Introduction

The main purpose of the InRoads Survey program is to process raw survey data and then output it to a useable format. In InRoads Survey the user can add, delete, and edit the survey data to correct errors or omissions in the field coding and equipment settings.

When InRoads Survey is started, two applications are launched: The CAD platform (MicroStation) for viewing the data and generating the basemap (*.DGN file), and InRoads Survey for manipulating the survey data. The survey data is stored information and the CAD platform enables the user to see that “data”.

Items addressed in this course will be:

- Setting up InRoads Survey
- Importing Survey Data
- Working with the Survey Data Fieldbook
- Working with the Survey Feature Table
- Exporting the Fieldbook
- Survey data in InRoads
- Working with Surface Models (DTM)
- Working with Geometry Data (ALG)

Foundation

Intended Audience

The intent of this course is to provide education to the survey staff as it relates to importing, correcting, and processing field data.

Prerequisites

The attendees must have a basic understanding of MicroStation prior to attending this course.

Duration

Length of training for the Survey reduction, processing, and quality control is 32 hours.

Focus

- CDOT survey process
- CDOT standards and conventions
- Importing and editing field data
- Exporting a basemap drawing, surface, and alignments

Goal

- Provide the survey staff the work process for Colorado DOT.

Introduction

Introduction of course goals and content.

Instructor

Introduction of Instructor(s) and brief summary of credentials.

Students

Introduction of students and a brief summary of student knowledge as it relates to MicroStation and InRoads Survey.

Student Interests

Query as to specific interests of individual students and the class as a whole.

Schedule

Establish schedule for class breaks, lunch, and course termination.

Fundamental Concepts

Software Terminology

Understanding the difference between InRoads Survey, InRoads, and MicroStation.

InRoads

The name InRoads is a somewhat generic term that refers to a customizable Suite of software offered by Bentley Systems, Inc. The name InRoads, without an additional defining name, refers to a basic software suite that contains site and corridor modeling tools. A brief summary of the add-on/stand-alone modules follows:

InRoads Site – Specific module designed with a focus on site design (a sub-set of InRoads with limited corridor modeling tools)

InRoads Survey – Specific module designed for the reduction of survey data. (Limited commands from InRoads Site are included)

InRoads Rail – InRoads with additional functions unique to the design of railways.

InRoads Bridge – InRoads with additional functions unique to the design of structures.

MicroStation

A CADD platform that provides the ‘graphics engine’ for InRoads.

PowerDraft

A Bentley CADD platform that is a sub-set of MicroStation.
(Limited database linkage and elimination of visualization features)

PowerSurvey

InRoads Survey combined with PowerDraft
(bundled together for a reduced price with all the functions of InRoads Survey)

InRoads Survey vs. InRoads

InRoads Survey is a software application designed for the processing of survey data gathered by electronic data collectors. InRoads Survey 'reduces' this raw survey data to MicroStation graphics, surface models, and geometry projects as COGO points and alignments. InRoads Survey has a limited number of the commands available in the Bentley Systems, Inc.'s InRoads Site and InRoads modules.

MicroStation

InRoads Survey Functions	*InRoads Functions*
Survey data reduction	*Not available*
Editing survey data (fieldbook)	*Not available*
Exporting data for data collectors	*Not available*
Graphic display of survey data	*Not available*
Generating DTM's from survey data	*DTM creation from varied sources*
Limited to creating Geometry from survey data	*Comprehensive geometry creation & modification tools*
Some Cogo tools	*Access to full Cogo tools*
Limited DTM editing/modification tools	*Comprehensive DTM editing/modification tools*
Limited site design tools	*Assorted site design tools*
Not available	*Corridor modeling tools*
Multipoint Profile method only	*Generation of Profiles*
Not available	*Generation of Cross Sections*
Earthwork by grid method only	*Assorted earthwork computations*
Not available	*Plan/Profile sheet generator*
Not available	*Hydrology tools*

MicroStation is necessary to run the software applications of the InRoads software suite. InRoads software does not posses a CADD (graphics display) engine, a fundamental necessity for the software's operation.

Note: Adding additional InRoads functions (Application Add-Ins) to your interface will be covered in the following pages.

Survey Terminology

During this class a number of files will be created. Some of the files will be resource files to help follow standards and generate consistent graphics. Other files will be generated from the field data. Below is a list of file types utilized in class.

FWD – **F**ield**W**orks **D**ata
This files combines individually imported raw field data files and stores them in one file. In a *.FWD file the user can view, edit, and add survey data.

FWF – **F**ield**W**orks **F**eature Table
This file defines the graphic properties of features coded in the data collector. The Feature table sets how the coded items will be displayed in the CADD file, including line symbology, cell placement, and text sizes.

FXP – **F**ieldWorks e**X**tended **P**references
This file contains additional preferences that only apply to the Survey software, these include: audit trail, point seed numbers, and resolving code errors.

INI – **INI**tialization
There are two INI files that will be used.
The ***CDOT-Preference.ini*** file settings control the symbology of the graphics from DTM and ALG files and other similar settings. The ***CDOT-Styles.ini*** file controls the display format of geometry styles (alignments and COGO).

DTM – **D**igital **T**errain **M**odel
These files contain features: random, break lines, exterior, interior, and contour. Each feature is individually identifiable and contains a unique identifier that is used for controlling triangulation settings and parameters used for plan view, profile, and cross section displays. The files can include data on underground and/or overhead utilities, landlines, and other data not directly related to the surface model.

ALG – **AL**i**G**nment
These files store the horizontal and vertical geometry components that define an alignment in a Geometry project. The components can consist of lines, arcs, curves, and points. Multiple alignments can be stored in one geometry project but only one alignment can be active at a time.

RWK – **Projects**
These files contain the paths to different types of Inroads files. This allows the user to open just one RWK file to load a survey, surface, and geometry project at the same time. If the directory structure on a computer changes, the .RWK file is an ASCII file that can be opened and changed with a text editor such as Notepad.

TIW – **T**ext **I**mport **W**izard
Custom setup for importing varying formats of ASCII data. The setup can be saved and reused in the future. An example imported format would Point Name, Northing, Easting, Elevation, and Code.

TEW – **T**ext **E**xport **W**izard
Custom setup for exporting varying formats of ASCII data. The setup can be saved and reused in the future. An example exported format would Point Name, Northing, Easting, Elevation, and Code.

CDOT CADD Resources

There are many resources available to assist you when working on your CDOT CADD project. These resources can be found on the CDOT CADD & Engineering Innovation Web site.

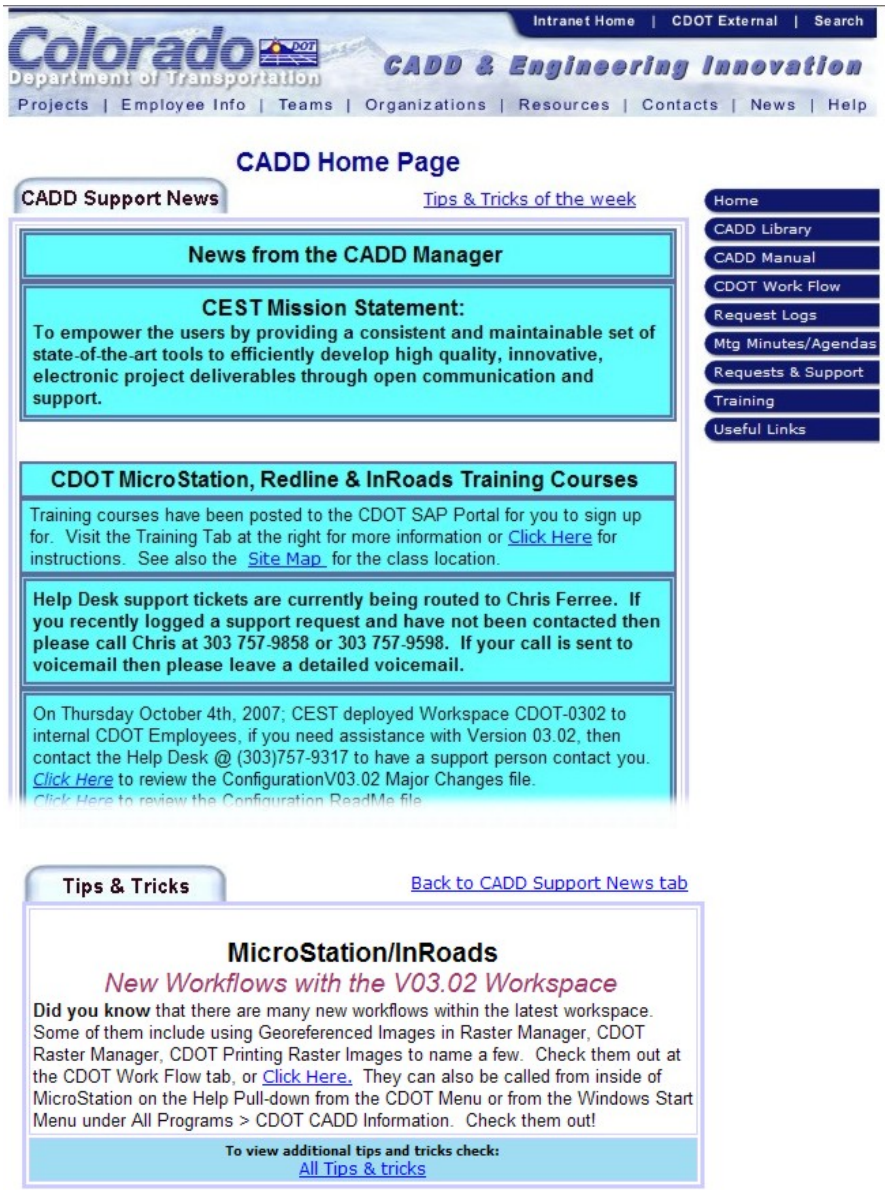
CDOT CADD & Engineering Innovation Web Site

The CDOT CADD & Engineering Innovation web page is available at:

http://internal/cadd/ It can also be found on the internal CDOT website:

Organizations > Project Development > CADD and Engineering Innovation.

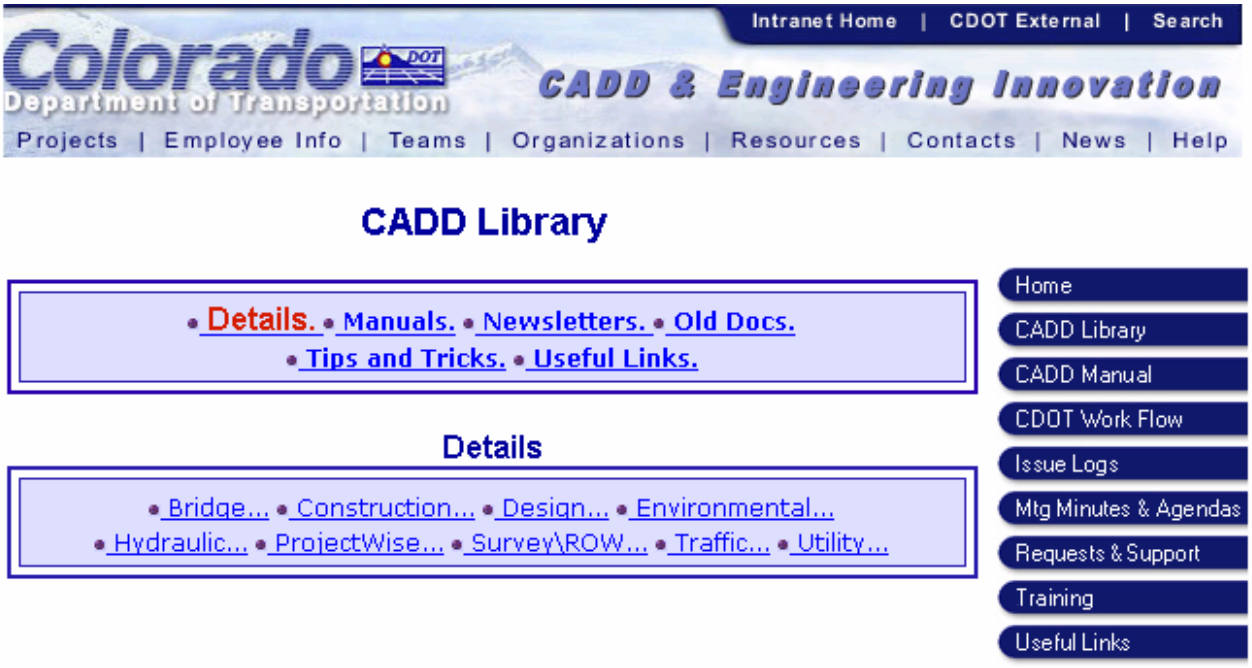
The website (presently only available to CDOT) provides CDOT users with up to date information, tools, and resources related to CADD and the Colorado Engineering Software Transition (CEST) project.



This website is a valuable resource for CADD users and includes:

CADD Library

The **CADD Library** page provides links to manuals, newsletters, standard details, *etc*. One extremely useful link is to the **Tips and Tricks** section for MicroStation and InRoads. This information changes daily, so check back often.



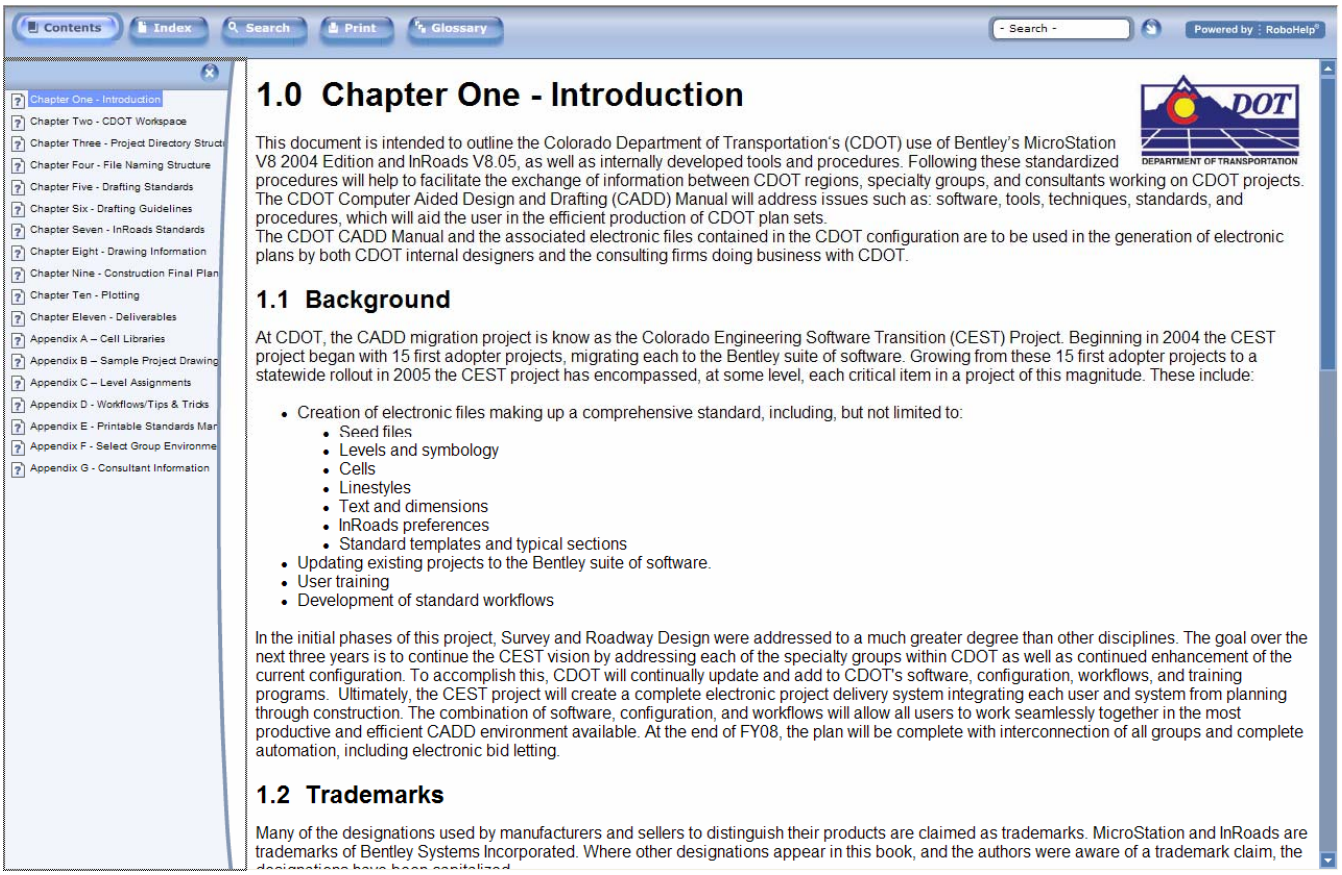
CADD Manual

The CDOT **Computer Aided Design and Drafting (CADD) Manual** outlines CDOT's use of Bentley's MicroStation and InRoads software. It documents standardized procedures for the exchange of information between CDOT regions, specialty groups, and consultants working on CDOT projects. The Manual also addresses software issues, tools, techniques, standards and procedures, etc. which will aid the user in the efficient production of CDOT plan sets.

The CDOT CADD Manual and the associated electronic files contained in the CDOT configuration are used in the generation of electronic plans by both CDOT internal designers and the consulting firms doing business with CDOT. The electronic version of the Manual provides hyperlinks to each chapter as well as context sensitive index and search functions. You can also print chapters or the entire manual.

The CDOT CADD Manual can be accessed several different ways including:

- From the CDOT internal CADD web site home page link;
- From the CDOT Design and Construction Project Support Page (external web site);
- From the CDOT Menu (**Help > CADD Manual**).



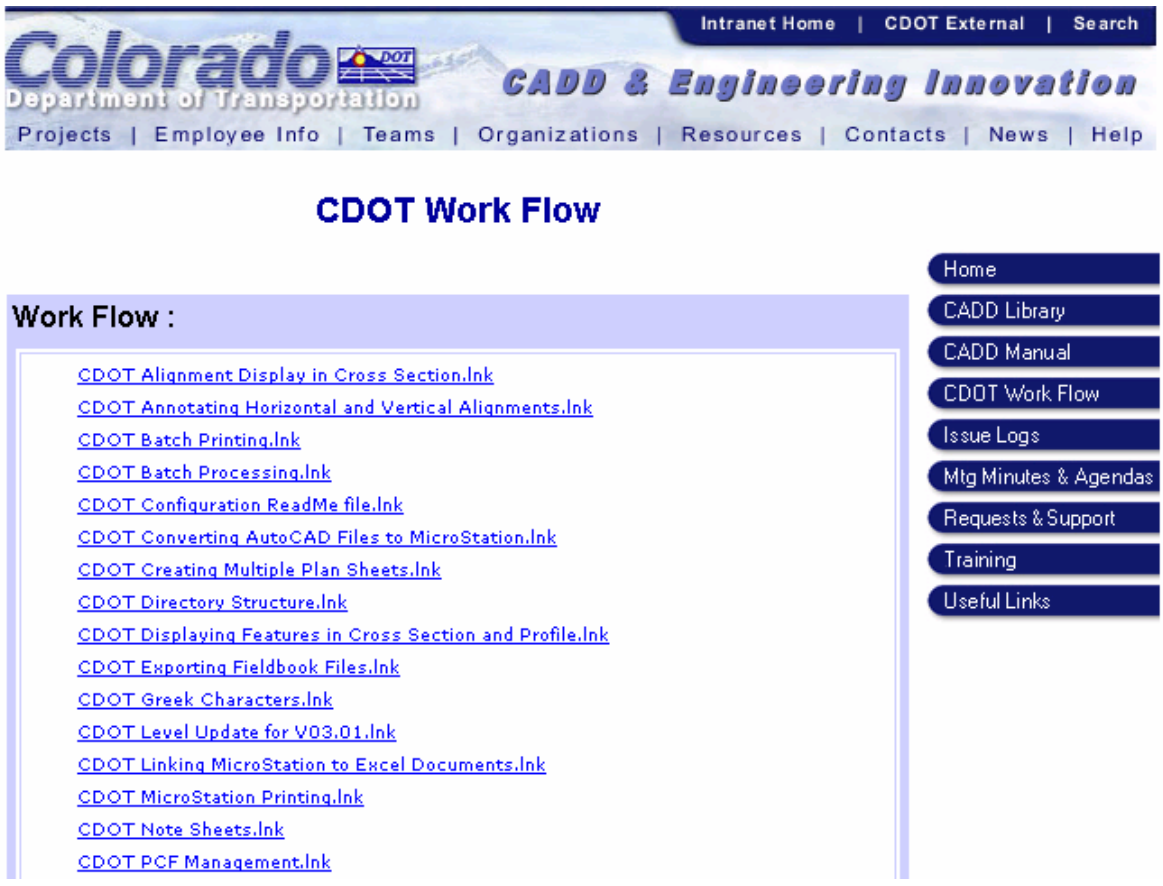
CDOT Workflows

There are several standardized MicroStation and InRoads workflows that CDOT has developed to assist you. These workflows are step-by-step CDOT-specific procedures for certain tasks that you may encounter when working in MicroStation or InRoads on a CDOT project. Many of these workflows are referenced throughout the course.

In addition to accessing the workflows from the CDOT CADD Web site Home page link **CDOT Work Flow**, you can also access workflows:

- From the Windows Start menu (**Start > All Programs > _CDOT_CADD_Information > Workflows**);
- From the CDOT Menu (**Help > Workflows**).

New workflows are typically added with CDOT configuration updates, so check back often.



Issues Logs

Check the issues log to determine the status of submitted requests.

Requests & Support

This page provides CADD help solutions where you can:

- Learn how to get help;
- Submit a questions;
- Submit a request (e.g. request a new MicroStation level or InRoads preference), as well as
- Obtain InRoads, InRoads Survey and MicroStation support.

There is also a link to **IT Services** for hardware support, "how to" instructions, installation, training files, and work space setup.

Training

Use this link to sign up for training classes. You can also review online computer-based training (CBT) for MicroStation, InRoads and InRoads Survey.

Directory Structure

Review directory structure in *Chapter 3.2* of ***CADD Manual*** to see where files are located for ROW Survey (design and plan sets)

Note that the model files for ROW Survey are located in ***C:\Projects\12345\ROW_Survey\Drawings\Reference_Files***. Model files contain graphics for the designfile and are referenced by other groups. Since everyone places their design graphics at the same coordinates, they may be referenced so that each group can see one another's work.

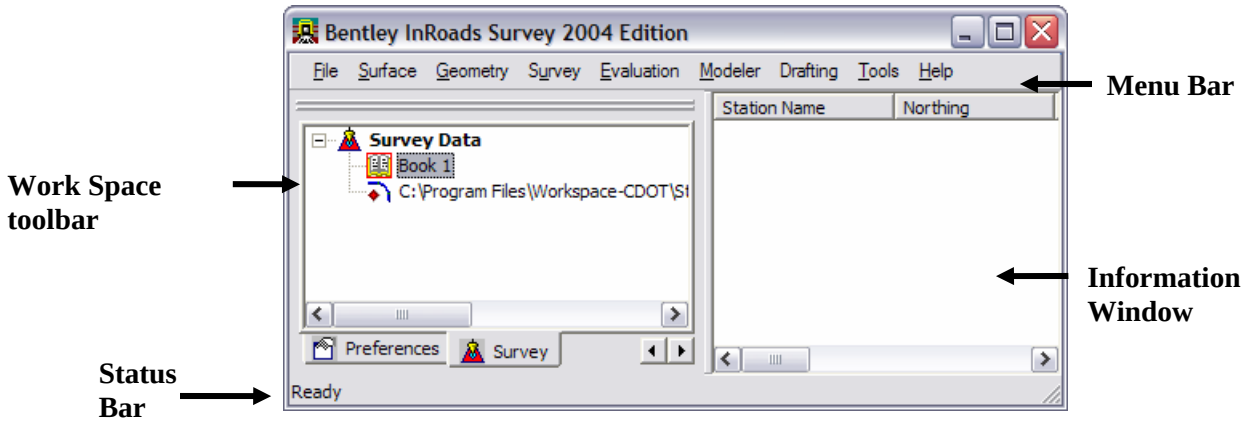
Section 1 - Overview

Chapter 1 Getting Started with InRoads Survey

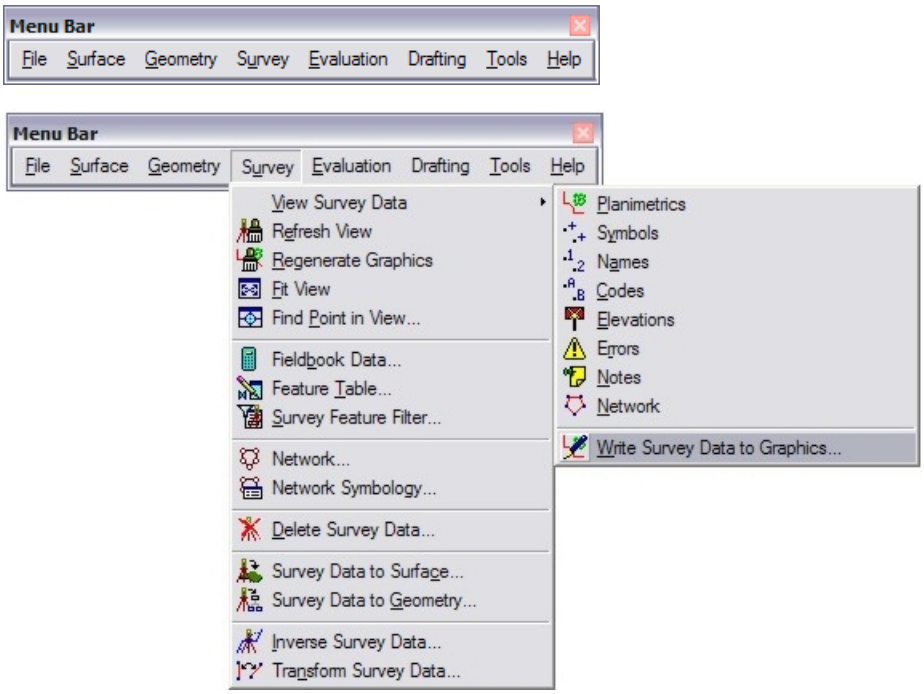
InRoads Survey Interface

Remember, InRoads Survey is running on top of MicroStation. That means the InRoads interface can be moved outside the MicroStation environment to another screen and that the InRoads interface may hide MicroStation dialog boxes.

There are four main parts to the InRoads Survey Interface, the **Menu Bar**, **Work Space toolbar**, **Information Window** and **Status Bar**.

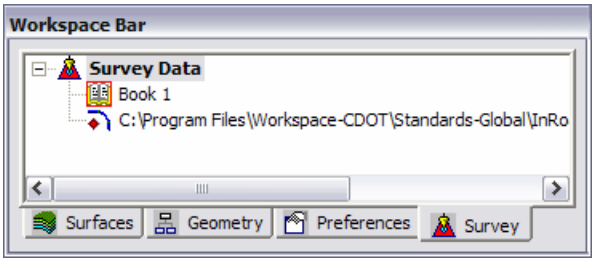


Menu Bar



- The Menu Bar pull-down menus are used to access commands, settings, and toolbars.
- An arrow **>** in the pull down will expand to a submenu.
- **...** In the pull down will open a dialog by that name.
- The pull-down menus will vary with the application add-ins that are loaded.

Work Space toolbar



- The Workspace Bar is used to manage and separate the different file formats of the program.
- Right clicking is allowed in the Workspace Bar. The active shortcut menu will vary depending on which Tab is selected.
- The Workspace Bar can be undocked as shown here but it is not recommended.
- To switch between tabs use the scroll arrows or right click to open a short cut menu.

Information Window

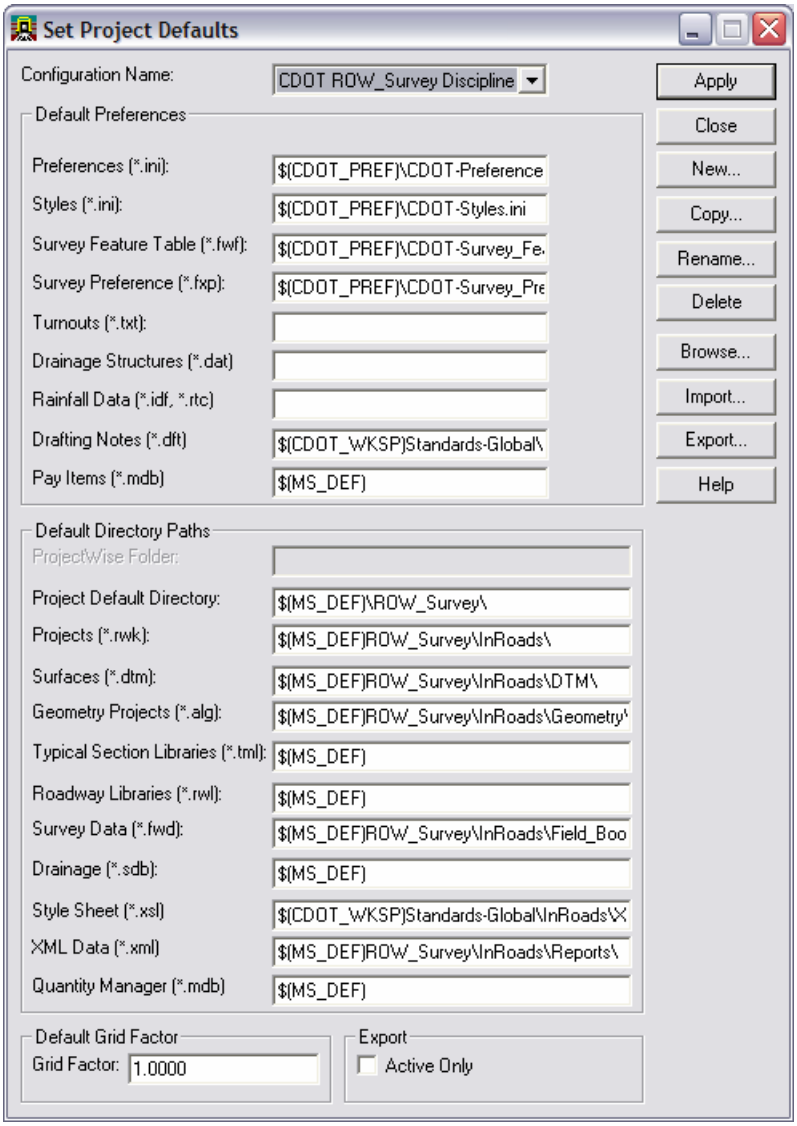
- The Information Window varies depending on which Workspace Bar tab is selected.
- Right clicking is allowed in the Information Window. The active shortcut menu will vary depending on what feature was selected.

Status Bar

- Located in the lower left hand corner of the InRoads Survey Interface, the status bar is used for file processing feedback and tool descriptions.

Project Defaults

Setting project defaults prior to working on any project will save time navigating to directories and will ensure the correct InRoads resources are loaded.



Dialog Items

- Configuration Name – Select from the drop down to change the current project directories and resources.

- Default Preferences

  In this section the user enters specific file names with extension names (types) InRoads will be using. The different file types and their uses are as follows:

  - Preferences (*.ini) – The main file used to define the symbology and dialog preferences.
  - Styles (*.ini) – File used to store geometry symbology.

- Survey Feature Table (*.fwf) – File used by Survey to store symbology
- Survey Preferences (*.fxp) – File used by Survey to store extra settings specific to the survey application.
- *Turnouts (*.txt) – File used to define turnouts.
- *Drainage Structures (*.dat) – File used by Storm and Sanitary software.
- *Rainfall Data (*.idf) (*.rtc) - File used to calculate rainfall.
- *Drafting Notes (*.dft) – File used by InRoads drafting tools.
- *Pay Items (*.mdb) – File used to calculate pay items and quantities.

- Default Directory Paths.

  This section defines directory paths for loading and saving files inside InRoads.

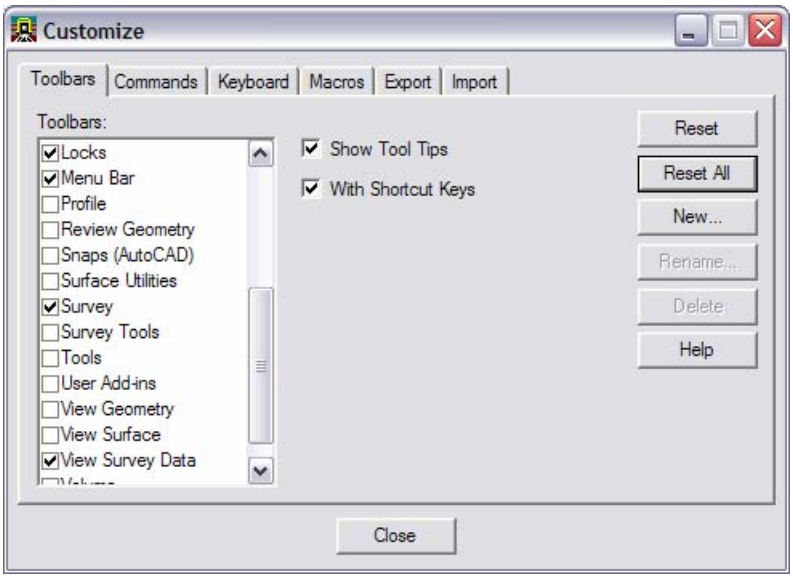
  - Project Default Directory: - default location for opening, saving, importing, and exporting general files.
  - Projects (*.rwk) – default location of Project's files.
  - Surfaces (*.dtm) – default location of Surface files.
  - Geometry Projects (*.alg) – default location of Geometry Project files.
  - *Typical Sections Libraries (*.tml) – default location of Typical Sections Library files.
  - *Roadway Libraries (*.rwl) – default location of Roadway Library files.
  - Survey Data (*.fwd) – default location of Survey Data files.
  - *Drainage (*.sdb) – default location of Drainage files.
  - Sheet Style (*.xsl) – default location of Sheet Style files for XML reports.
  - XML Data (*.xml) – default location of XML Data files.
  - *Quantity Manager (*.mdb) – default location of Quantity Manager Files.

* Files and directories that do not impact survey applications.

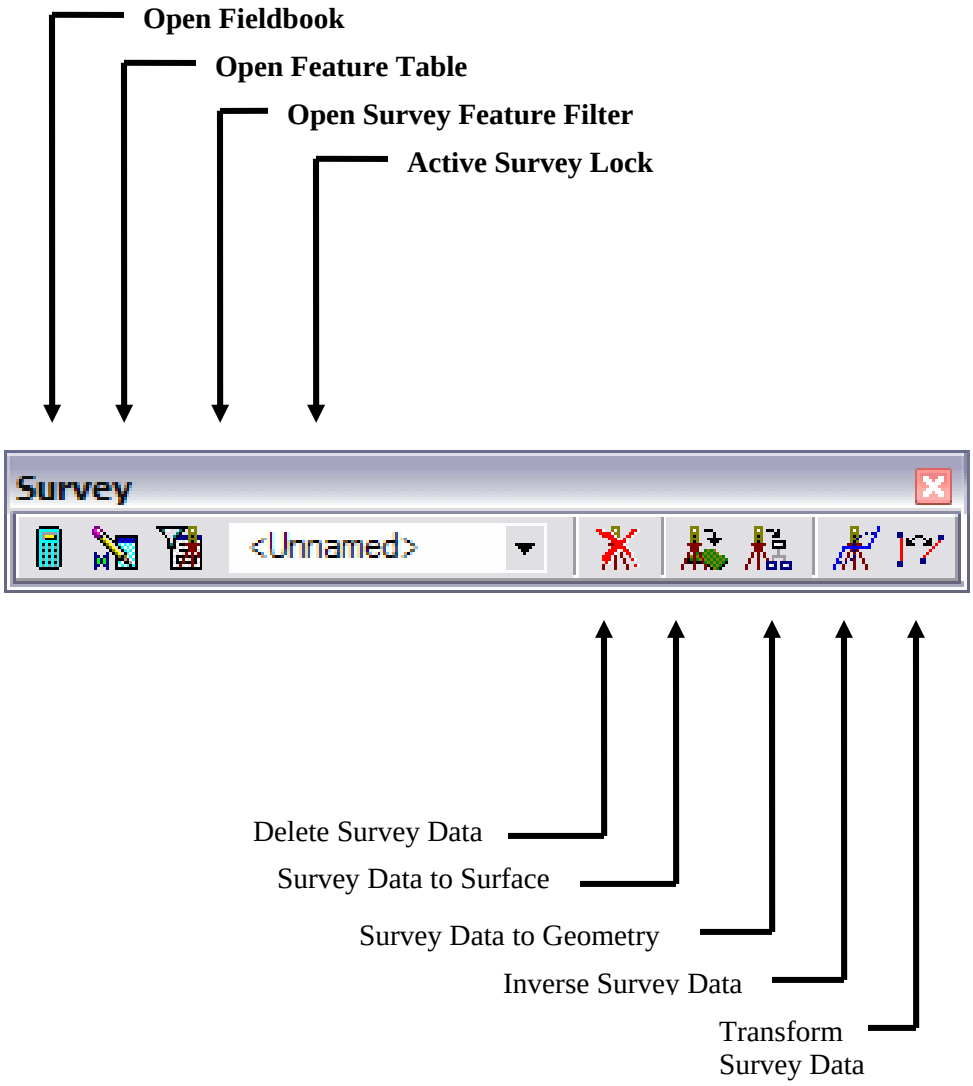
Toolbars

Toolbars can be opened and docked in the InRoads interface. Toolbars in InRoads Survey can be customized to fit the users workflow or personal preference.

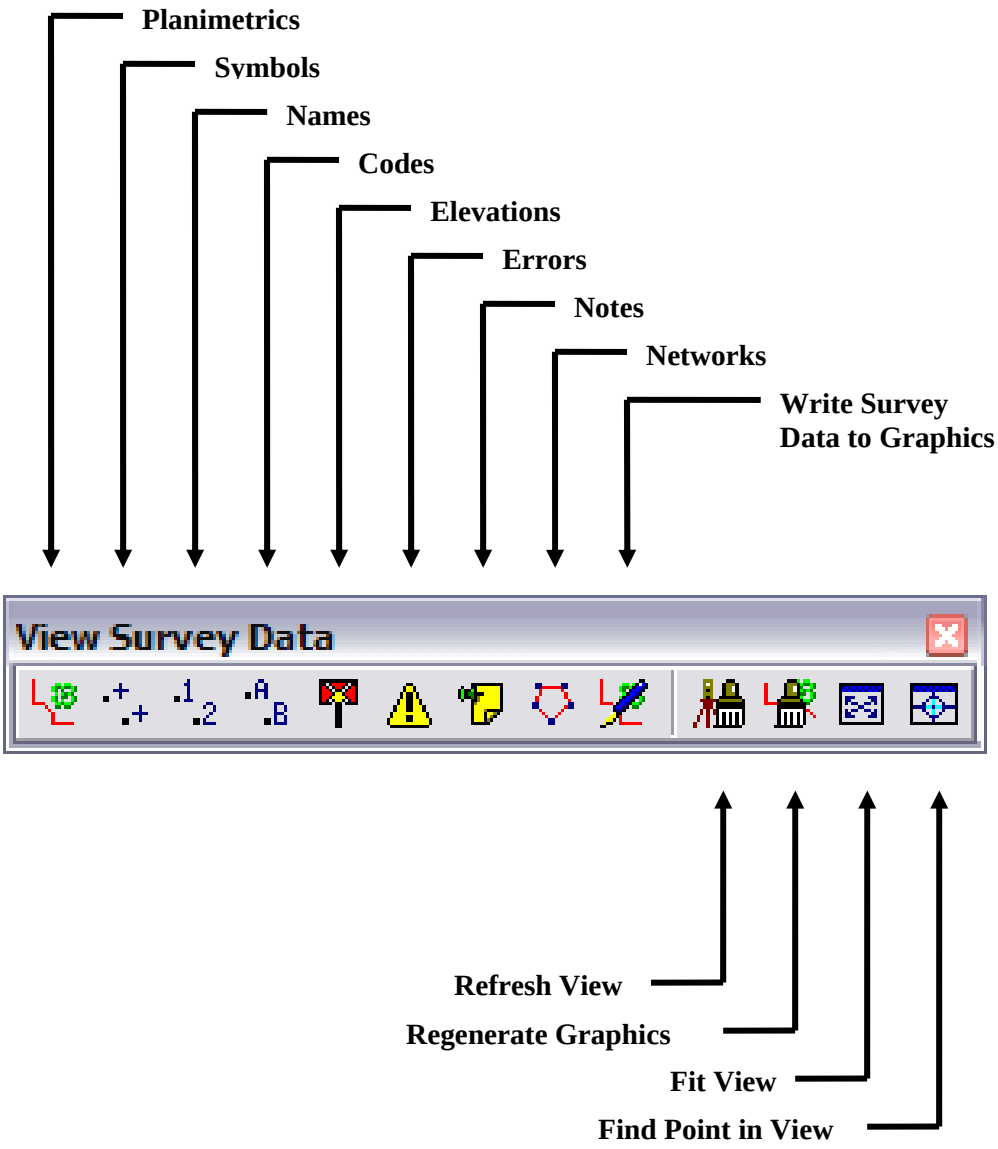
- From the pull-down menu, select **Tools > Customize**. The **Customize** dialog will appear.



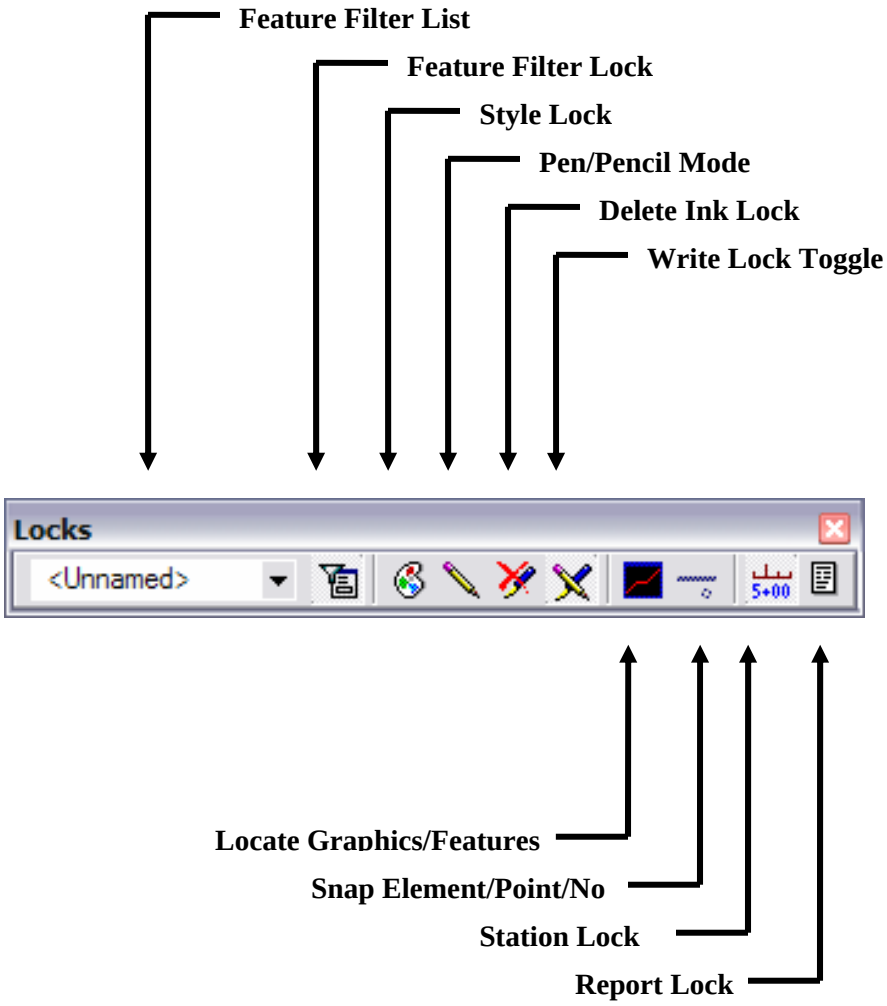
Survey Toolbar



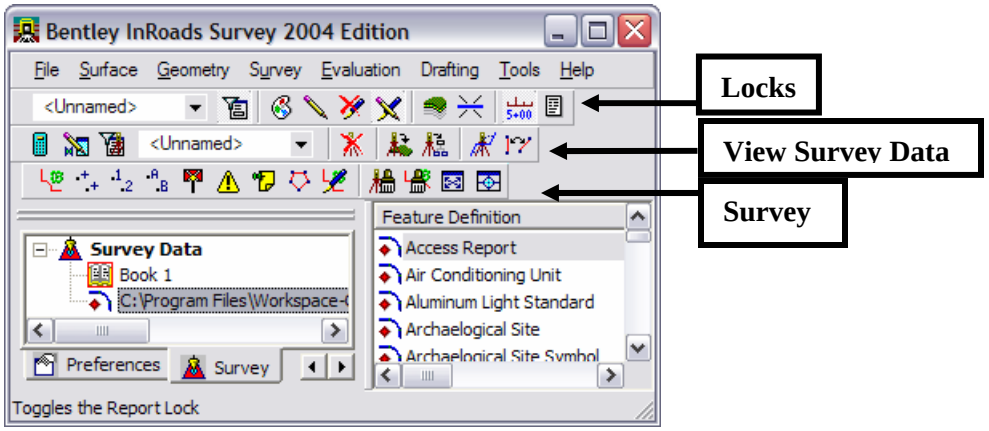
View Survey Data Toolbar



Locks Toolbar



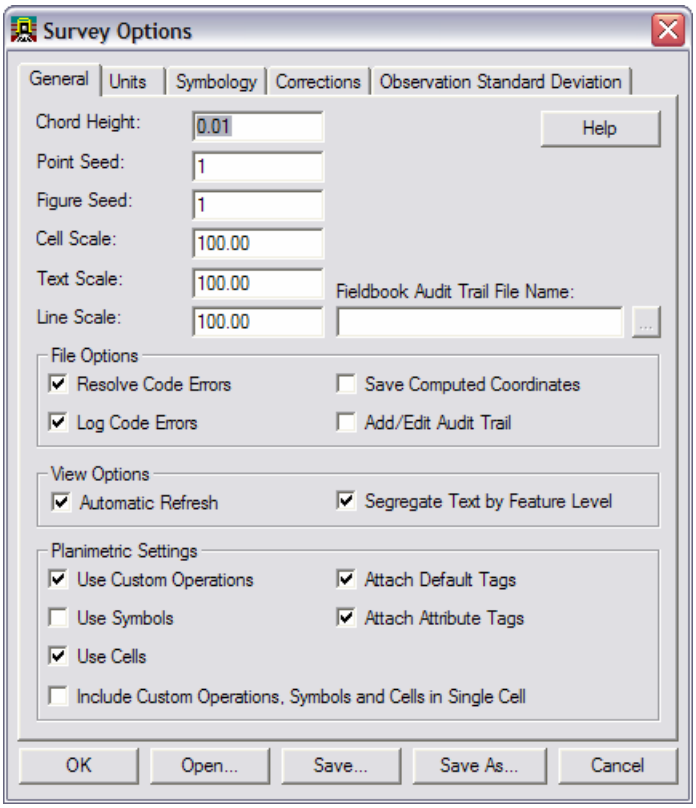
Docked Toolbars



Survey Options - General Tab

Survey Options dialog controls additional settings required by Survey. The Survey options can be modified by the user and are stored as an FXP file. Some of the main aspects of this dialog are the control of planimetric scale and the Fieldbook Audit Trail file which tracks changes to the fieldbook and features table.

- From the pull-down menu, select **Tools > Survey Options [General]**.



Dialog Items

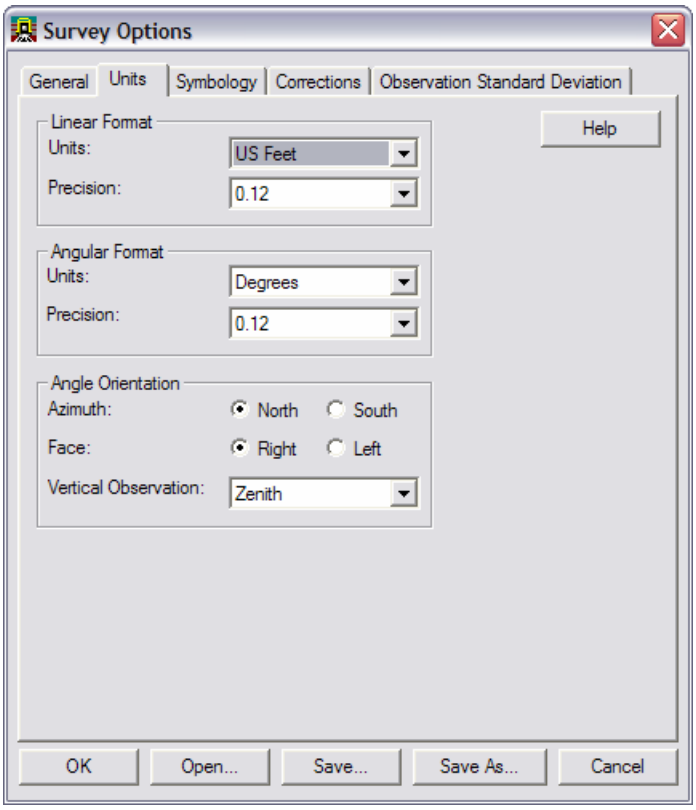
- **Chord Height:** Controls the curve stroking of elements when saved to graphics, surfaces, and alignments. The smaller the value, the greater number of vertices generated.
- **Point Seed:** Seed number used when adding points to the survey fieldbook.
- **Figure Seed:** Seed number used when saving linear planimetrics to a geometry project.
- **Cell Scale:** Scale factor used when writing survey feature Cells to graphics.
- **Text Scale:** Scale factor used when writing survey feature Text to graphics.
- **Line Scale:** Scale factor used when writing survey feature Line Styles to graphics.

- **Fieldbook Audit Trail File Name:** Text file that saves all edits from the fieldbook and feature table. The file will show the edits Before and After.
- File Options
  - **Resolve Code Errors** – If checked, all code errors found while importing will be taken care of by the **Resolve Code Error** dialog.
  - **Log Code Errors** – Will open the **Results** dialog at the end of the import allowing the errors to be saved to a text file.
  - **Save Computed Coordinates** – If checked, any computed coordinates will be saved to the fieldbook as individual points.
  - **Add/Edit Audit Trail** – If checked, displays the **Results** dialog after each edit is made. Even with it unchecked the file will still keep track of edits.
- View Options
  - **Automatic Refresh** – If checked, will regenerate the displayed graphics after each edit.
  - **Segregate Text by Feature Level** – If checked, will save the symbols, point names, codes, notes, errors, and elevations to the same level as the survey feature.
- Planimetric Settings
  - **Use Custom Operations** – If checked, all Custom Operations from the Survey Feature Table will be displayed.
  - **Use Symbols** – If checked, all symbols from the Survey Feature table will be displayed.
  - **Use Cells** – If checked, all Cells from the Survey Feature table will be displayed.
  - **Include Custom Operations, Symbols and Cells in Single Cell** – If checked, all items will be combined into a single cell called NULL.
  - **Attach Default Tags** – If checked, a default InRoads tag will be defined and attached to the MicroStation graphic when written to a design file.
  - **Attach Attribute Tags** – If checked, a tag, with attribute information and values will be attached to the MicroStation graphic when written to a design file.

Survey Options - Units Tab

Survey Options ***Units*** tab controls how raw, linear, and angular, survey data is read by the Fieldbook. The Survey units set in this dialog box have priority over InRoads units options set elsewhere when processing or manipulating Survey data.

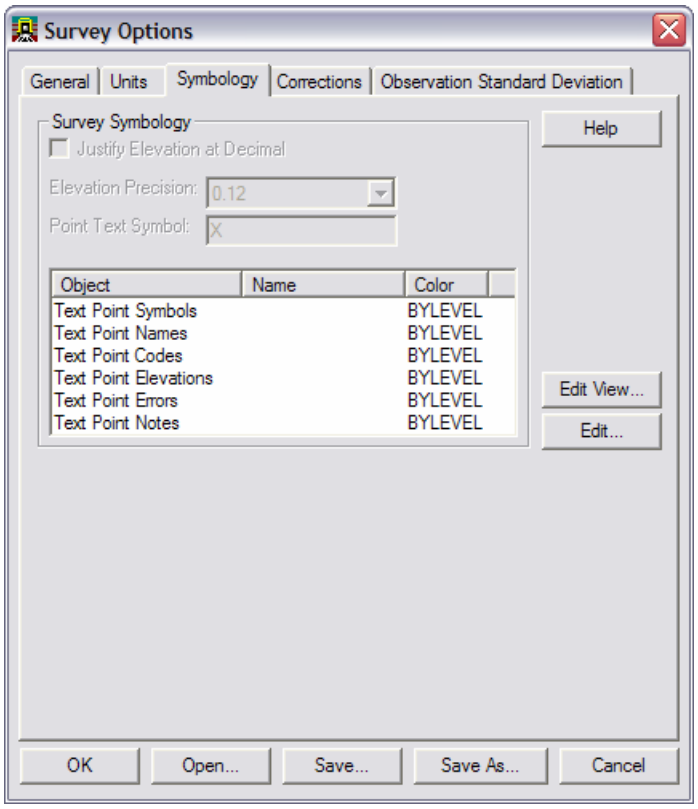
From the pull-down menu, select **Tools > Survey Options > [Units]**.



Survey Options - Symbology Tab

Survey Options ***Symbology*** tab controls view planimetrics such as Symbols, Point Names, Codes, Elevations, Errors, and Notes. There are two types of settings for each planimetric display. For the dynamic display of graphics the settings are opened with the **Edit View** button. For the design graphics written to the file the settings are opened with the **Edit** button.

- From the pull-down menu, select **Tools > Survey Options > [Symbology]**.



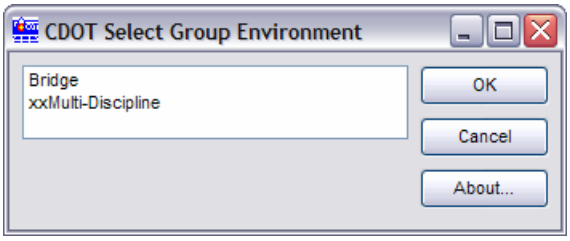
Lab 1: Getting Started in InRoads Survey

Objectives Lab1

After completing this exercise you will know how to:

- Create a new design file for use with Topo collection.
- Verify the correct MicroStation resources are in place for topo data reduction and exporting.

1. From the **CDOT Select Group Environment V3.01 dialog** select ***xxMulti-Discipline***

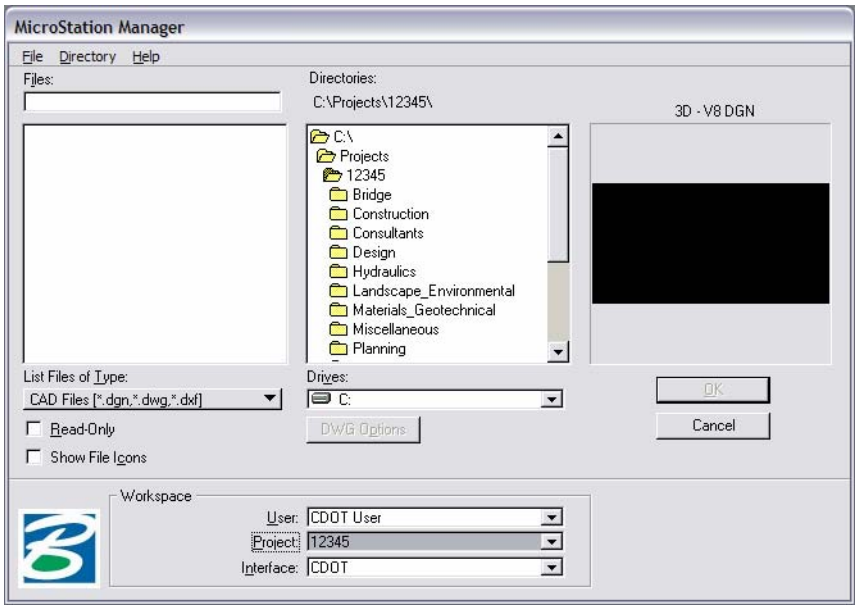


2. **<D>** the **OK** button. The dialog will close and the Workspace will be set.

   Note: By following these steps the correct MicroStation resources, such as the level and cell definitions have been defined.

3. Double-click on the InRoads Survey desktop button  or select **Start > All Programs > Bentley Civil Engineering > Bentley InRoads Survey**.

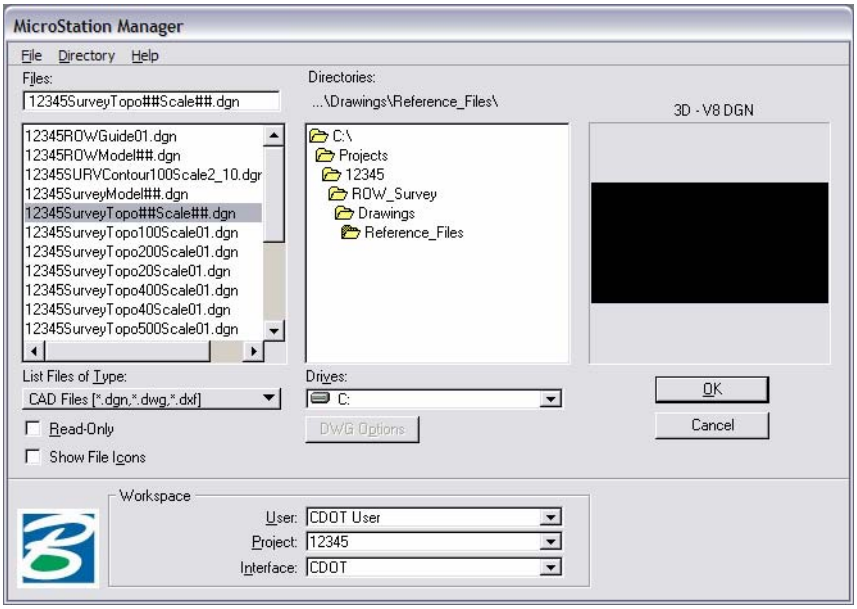
4. In the **MicroStation Manager** dialog go to the Workspace group section and change
   User: **CDOT User**
   Project: **12345**
   Interface: CDOT



In this class, the project name 12345 will be used as the 5 digit project code.This workspace setup will load the most current CDOT MicroStation environment.

5. In the **MicroStation Manager** dialog path to the directory: ***C:\Projects\12345\ROW_Survey\Drawings\Reference_Files***

6. Select the file **12345SurveyTopo##Scale##.dgn** from the **MicroStation Manager** dialog.



Note: The purpose of the files with "##" symbols are for creating new files with the correct naming convention.

7. **<D> OK** the **MicroStation Manager** dialog will close and open the file.

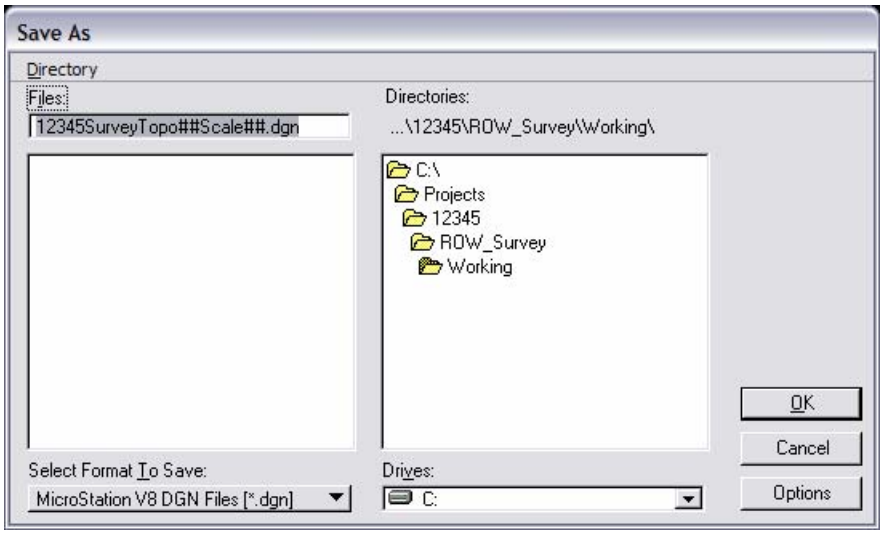
Note: Be patient, MicroStation will first load the DGN file and will work as the CAD engine. InRoads Survey will then load and will run on top of MicroStation.

8. Once both programs are loaded the **Tip of the Day** dialog may open containing a different tip each time the program is started. To suppress this dialog in the future uncheck **Show Tips on Startup**. To access the **Tip of the Day** dialog in the future, select **Help > Tip of the Day**

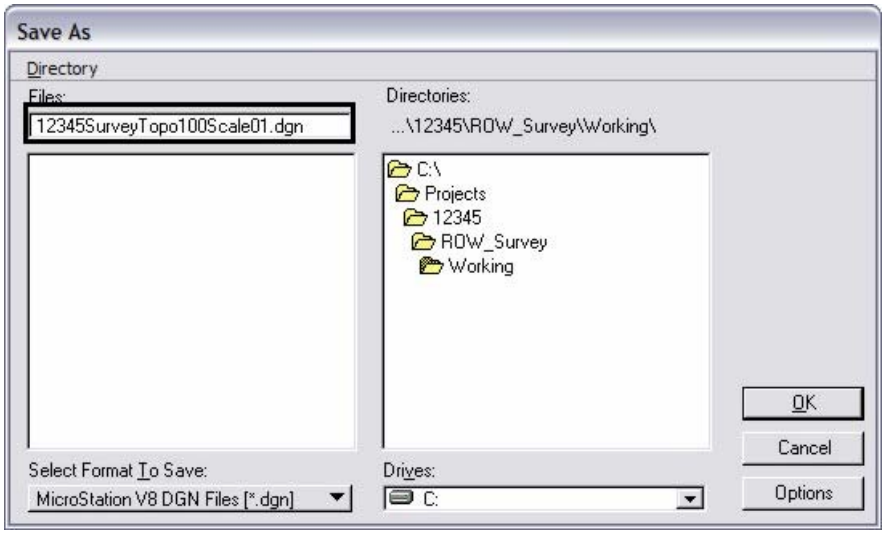
9. **<D>** the **Close** button on the **Tip of the Day** dialog.

10. From the MicroStation pull-down menu **File > Save As** The **Save As dialog** will appear.

11. Path to the folder C:\Projects\12345\ROW_Survey***Working***



12. Replace the ## symbols with ***100*** scale and ***01*** model.
    Type in ***Files: 12345SurveyTopo100Scale01.dgn***

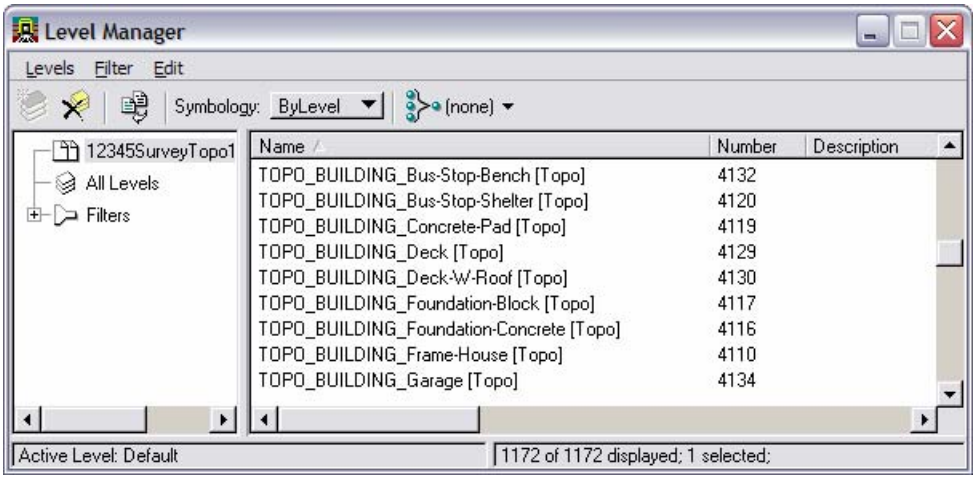


13. **<D>** the **OK** button the **Save As** dialog will close and MicroStation will open the file ***12345SurveyTopo100Scale01.dgn***

    Note: As shown at the beginning of this lab the steps for selecting the appropriate Group defined what MicroStation resources will be loaded. Before proceeding in InRoads, the level definition files ***Topo.dgnlib*** and ***ROW.dgnlib*** need to be attached.

14. From the MicroStation pull-down menu, select:
Settings > Level > Manager. The **Level Manager** dialog will appear. Look for **[Topo]** and **[ROW]** in the Level Name.

    - You can also use the **Level Manager** button from the **Primary Toolbar** to open the **Level Manager** dialog.

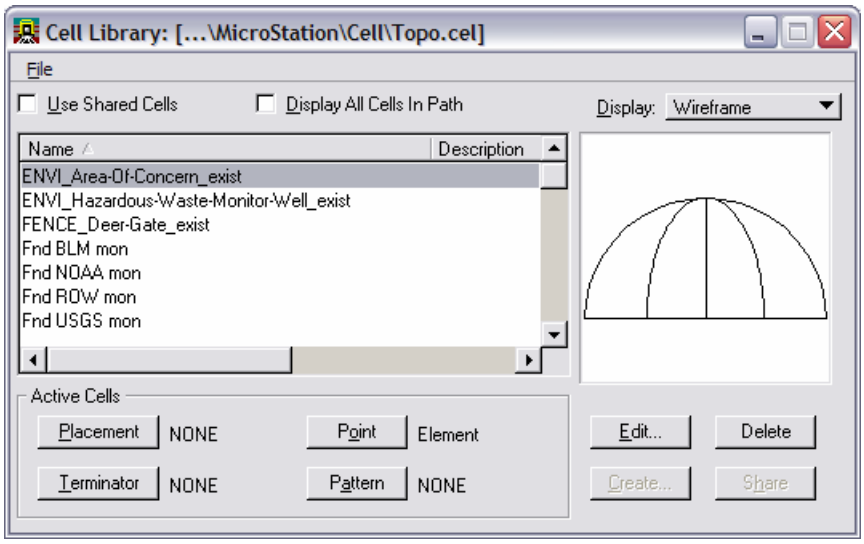


    - If one of the DGN libraries is not loaded close MicroStation and use the Select Group Environment utility to select the xxxMulti-Discipline environment.

15. Close the **Level Manager** dialog.

16. Verify that the cell library **CDOT-Topo cells.cel** is attached. From the MicroStation pull-down menu, select **Element > Cells** the **Cell Library** dialog box will appear.

    - You can also use the **Cell Library** button from the **Primary Toolbar** to open the **Cell Library** dialog.



17. From the **Cell Library** dialog select the **File** pull down menu and pick ***Topo.cel*** from the list of cell libraries.

    - If the Topo cell library is not loaded close MicroStation and use the Select Group Environment utility to select the xxxMulti-Discipline environment.

18. Close the **Cell Library** dialog.

19. From the Main MicroStation pull-down menu, select **File > Save Settings**

Note: From this point forward, unless specifically instructed to use MicroStation commands, all references to the selection of buttons, tools, or menu pull-downs refer to the InRoads interface.

Lab 2: Setting Project Defaults

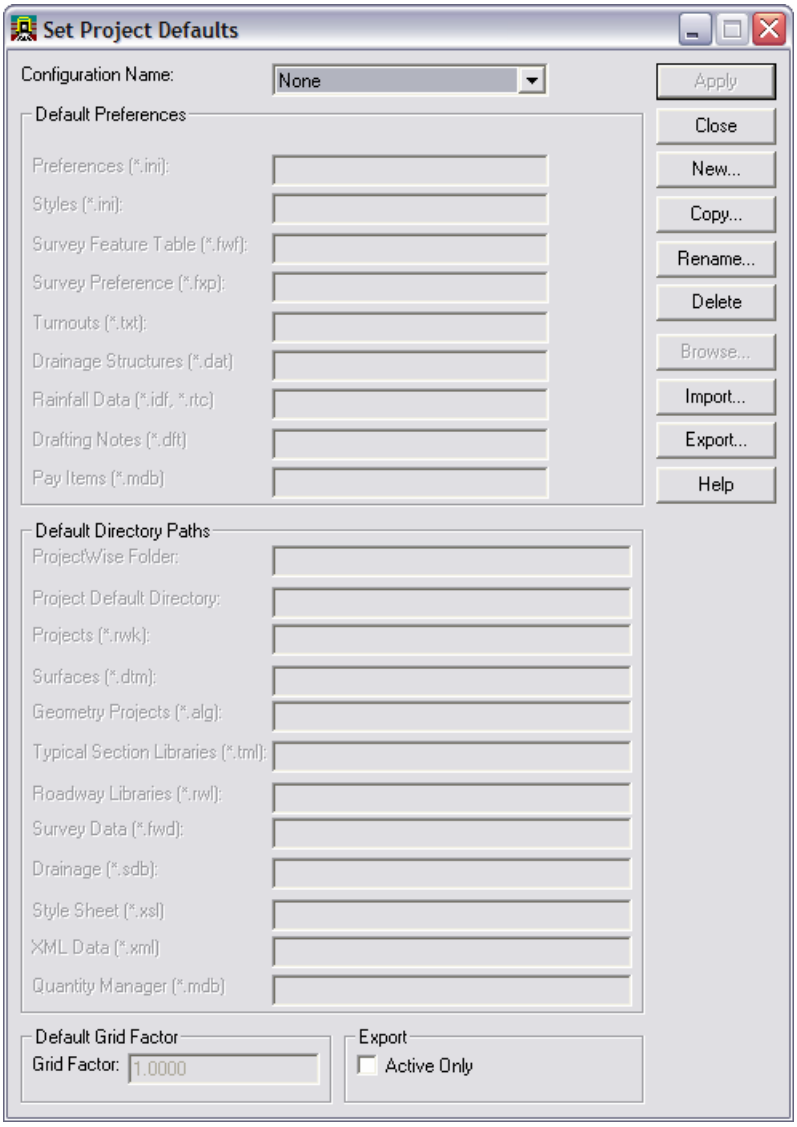
Setting default directories and resource files provides the user with quick access to project folders for opening files and then saving them to the correct location. It also ensures the correct CDOT InRoads resource files will be used.

Objectives Lab 2

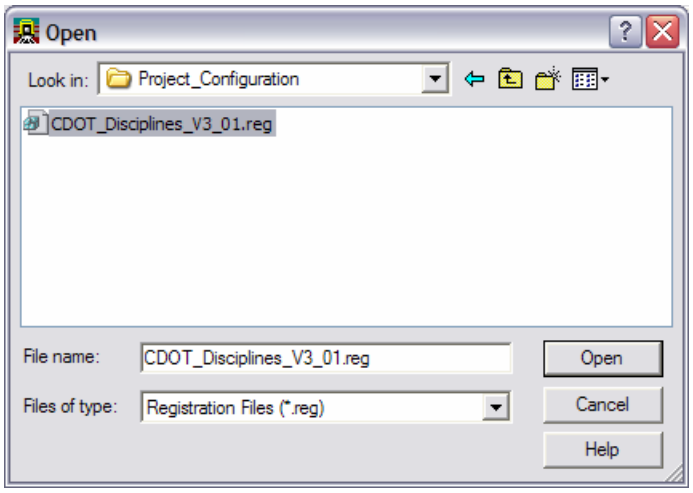
After completing this exercise you will know how to:

- Copy and create a new Project Default.
- Import and export Project Default settings.

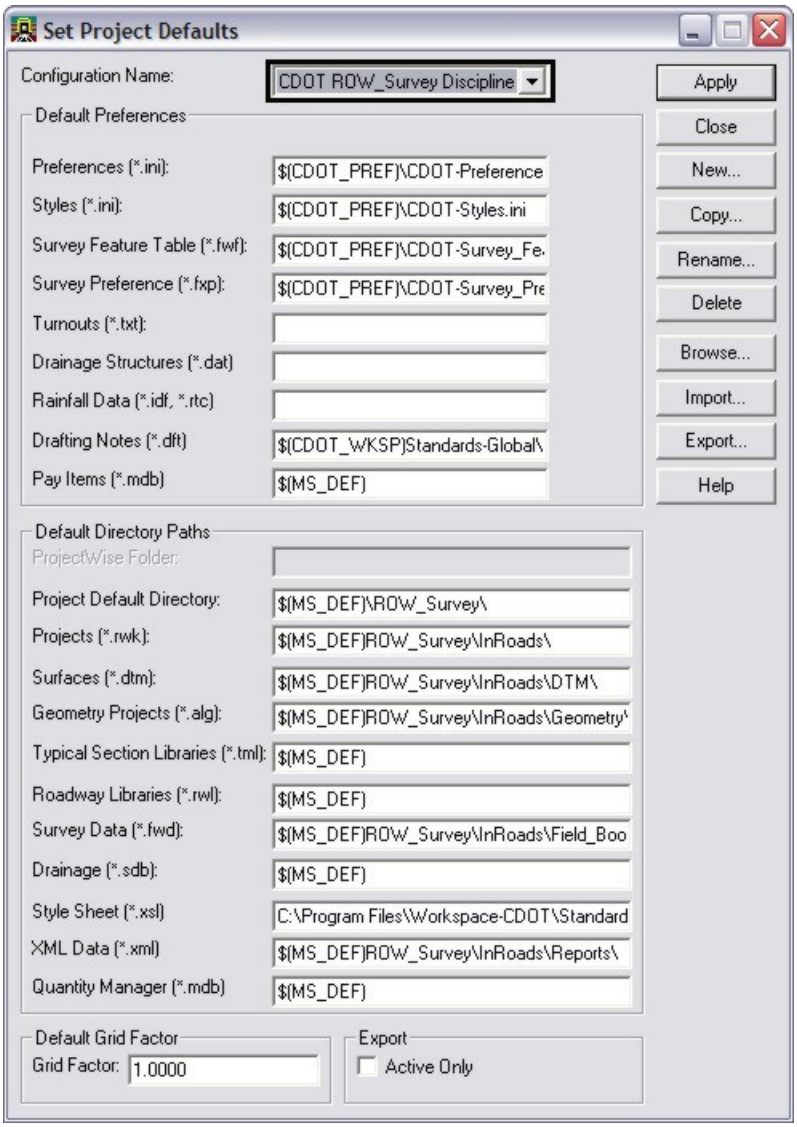
1. From the InRoads pulldown select **File > Project Defaults** the **Set Project Defaults** dialog will appear.



2. **<D>** the **Import** button. The **Open** dialog will appear.
3. Path to the folder C:\Projects\12345***Project_Configuration***
4. Select the file ***CDOT_Disciplines_V3_01.reg***
5. **<D>** the **Open** button. The **Open** dialog will close and default project settings are imported.



6. From the drop down list Configuration Name select the discipline ***CDOT ROW_Survey Discipline***



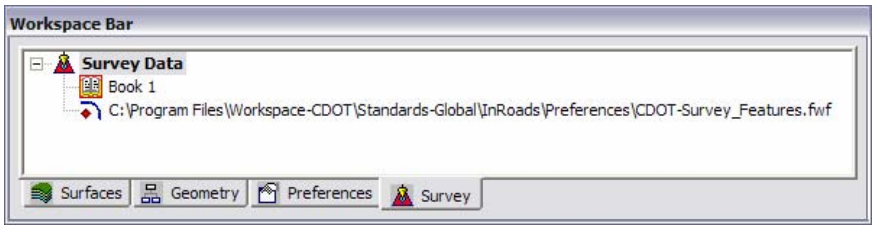
Note: The Default Directory Paths that are left blank are files that are not used by InRoads Survey.

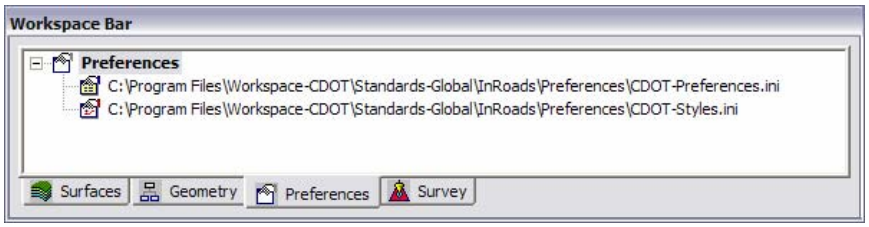
7. **<D>** the **Apply** button.

   Note: The settings that have been created are stored in the Windows registry on your PC. To share this Project Default setup with other project staff export to a Registry file (REG).

8. **<D>** the **Close** button on the **Set Project Defaults** dialog.

9. Select the **Survey** and then the **Preferences** tab on the Workspace bar and verify that the correct InRoads Project resource files are now loaded.





Lab 3: Toolbars

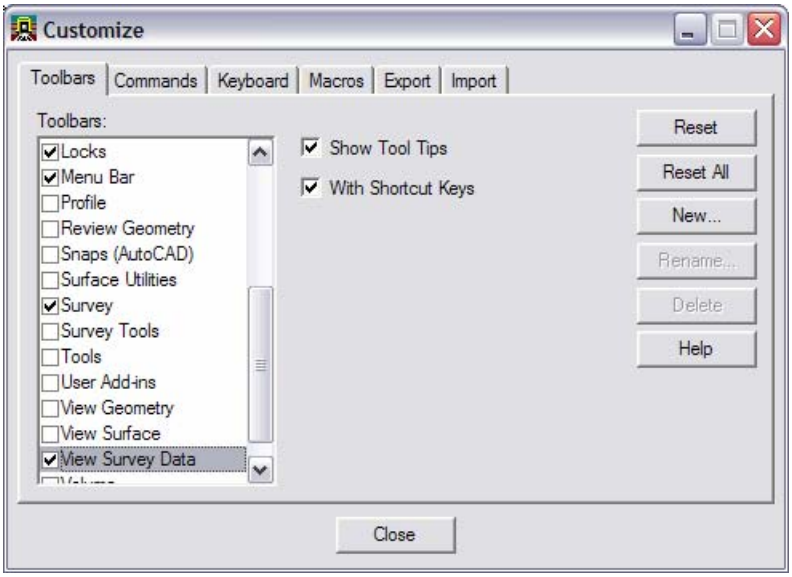
Toolbars can be added from the pull-down menus. All InRoads Survey toolbars can be customized to fit your workflow or personal preferences. Start by opening Toolbars that will be used in class.

Objectives Lab 3

After completing this exercise you will know how to:

- Open an InRoads Survey toolbar.
- Dock, undock, and resize toolbars.

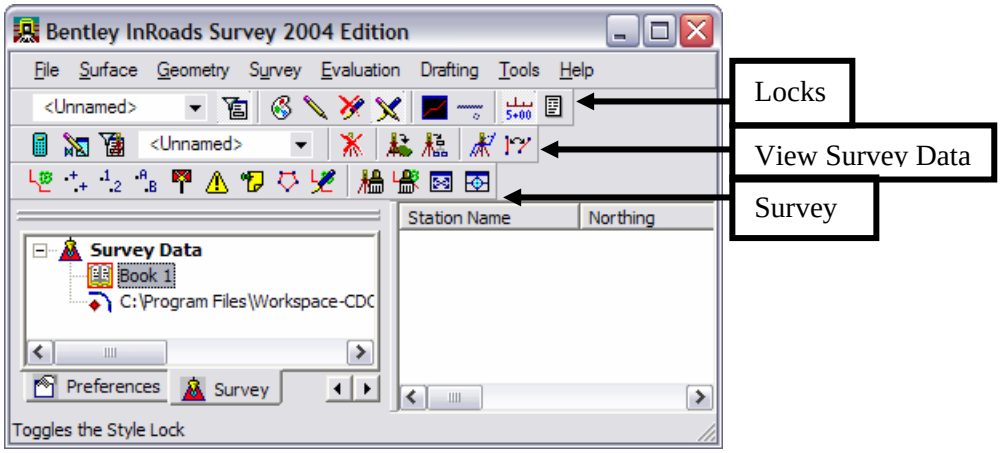
1. From the pull-down menu select **Tools > Customize**. The **Customize** dialog will appear.



2. Under the **Toolbars** tab check that the boxes for **Locks**, **Survey**, and **View Survey Data** are selected. The toolbars will appear.

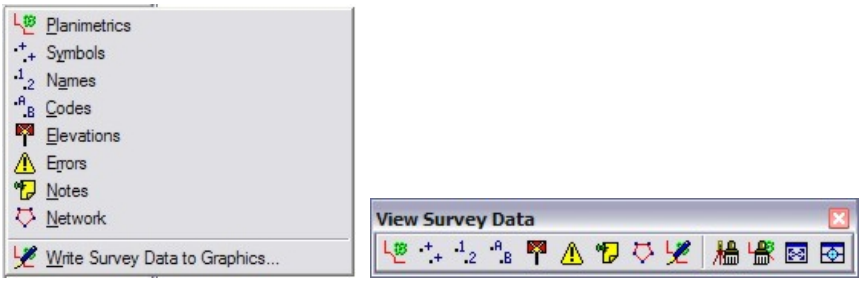
3. **<D>** the **Close** button.

4. **Dock**, **Undock,** and **Resize** the toolbars to become comfortable with the procedure. Notice how you cannot dock the toolbars into the MicroStation environment.



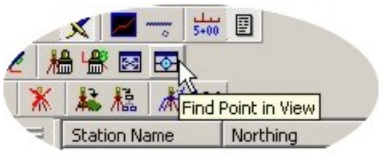
5. From the pull-down menu, select **Survey > View Survey Data** look at each command and the image to the left; now look at the **View Survey Toolbar**. Notice the correlation of the graphics.

   - This should help with recognizing button graphics more quickly.



6. Move your cursor over a button and hover. A **Tool Tip** will appear at the lower right of your cursor.

   - This feature is controlled in the **Customize** dialog box **Show Tool Tips** checkbox and is turned on by default.



Lab 4: InRoads Survey Options - Overview

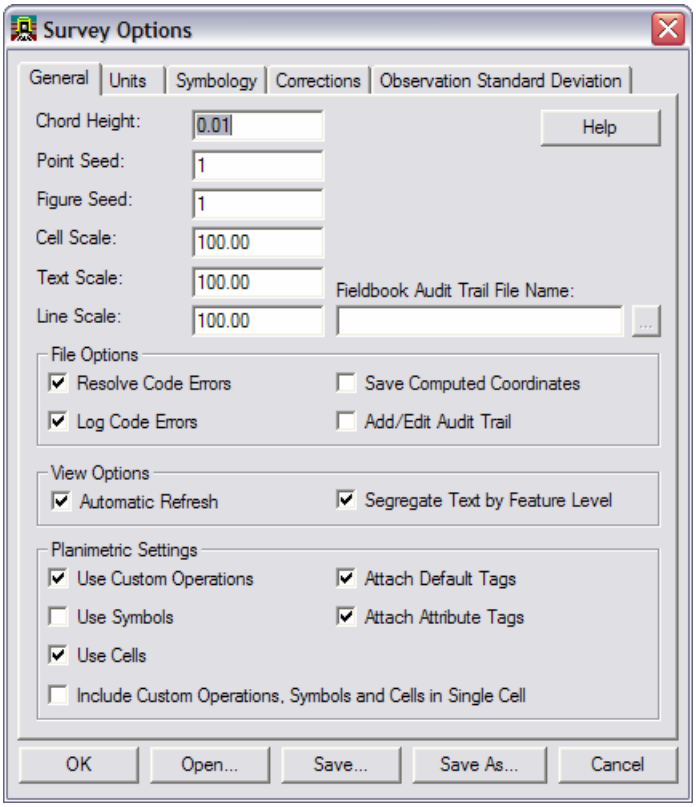
The **Survey Options** dialog contains added preferences specific to the Survey commands. The file loaded from the **Project Defaults** Dialog is *CDOT-Survey_Preferences.fxp*

Objectives Lab 4

After completing this exercise you will know how to:

- Create an Audit Trail file.
- Setup up the Survey Options General tab.

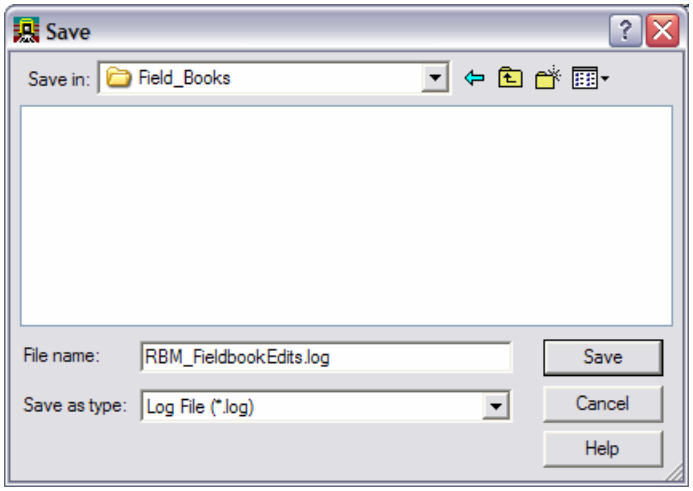
1. From the pull-down menu, select **Tools > Survey Options** the **Survey Options** dialog will appear.



The first setting to look at will be the **Audit Trail**. The Audit Trail is useful for keeping track of any changes made to the Survey Fieldbook or Survey Feature Table.

2. Under the General tab move your cursor to the **Fieldbook Audit Trail File Name:** field and **<D>**. The Browse button will become active.

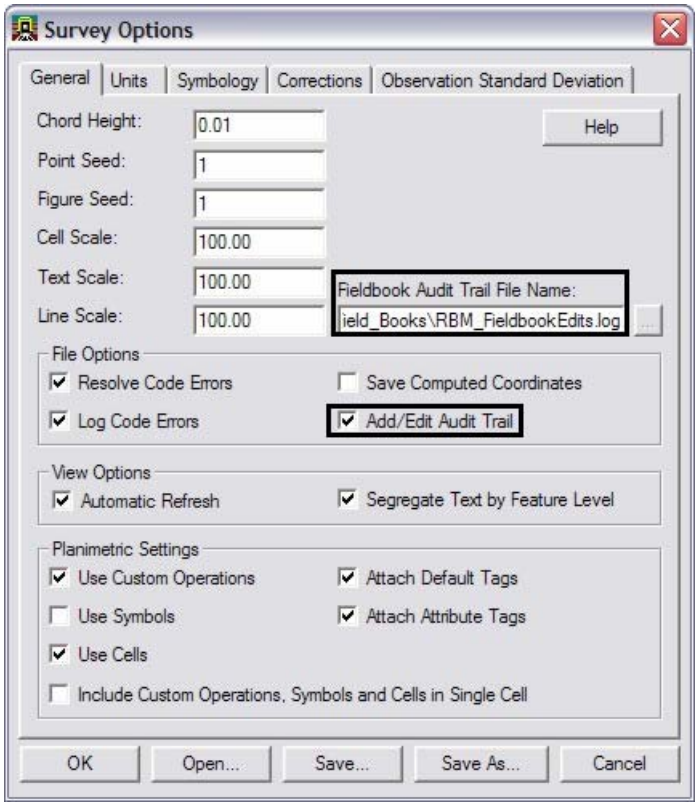
3. **<D>** the **Browse** button. The **Save** dialog will appear. Verify the correct directory.
   C:\Projects\12345\ROW_Survey\InRoads **Field_Books**



4. Key in ***"UserInitials"_FieldBookEdits***

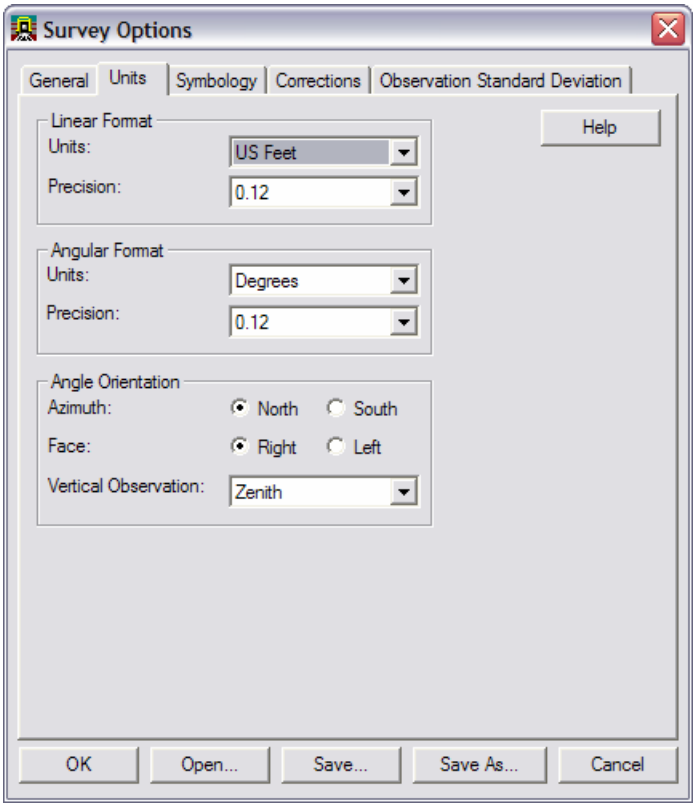
5. **<D>** the **Save** button. The **Save** dialog will close.

6. Check the box **Add/Edit Audit Trail** in the **File Options** section. All edits made will now be saved to the RBM_FieldBookEdits.log file.



Note: The Log file is a text file that can be opened and printed from Notepad.

7. **<D>** on the **Units** tab. Take a minute to review the settings and verify they are the same as the dialog below.



8. **<D>** on and review the tabs **Symbology**, **Corrections**, and **Observation Standard Deviation**.

9. From the **Survey Options** dialog **<D>** the **Save** then **OK** button.

   Note: The setup will not need to be done each time InRoads Survey is started. To demonstrate that, Exit out of the program.

10. From the **InRoads Survey** pull-down menu, select **File > Exit**. Nothing should need to be saved. If InRoads asks to save a file choose No.

11. From the **MicroStation** pull-down menu, select **File > Save Settings**. This will ensure when the file is opened in the next lab the cell library will be attached and view settings saved.

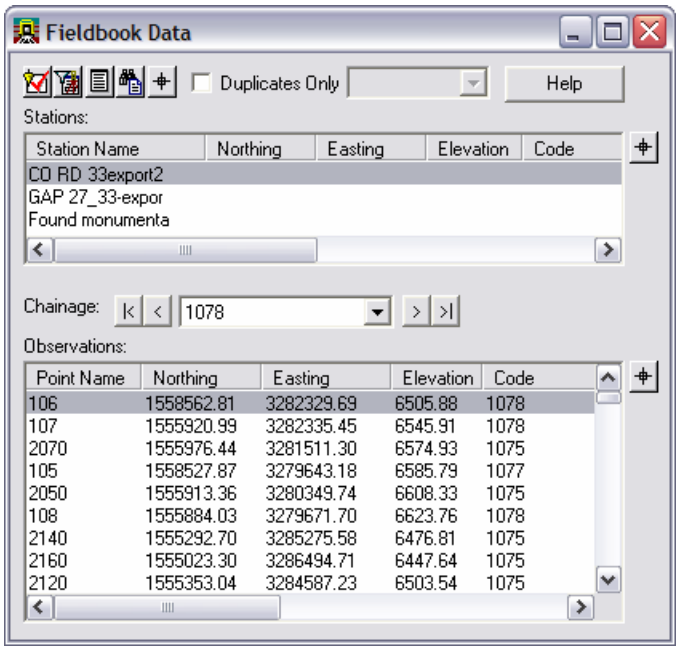
12. From the **MicroStation** pull-down menu, select **File > Exit**. By default MicroStation is always saving the design file so there is no reason to save the file. This will exit completely out of MicroStation.

Chapter 2 Working with InRoads Survey – Overview

Fieldbook Data dialog

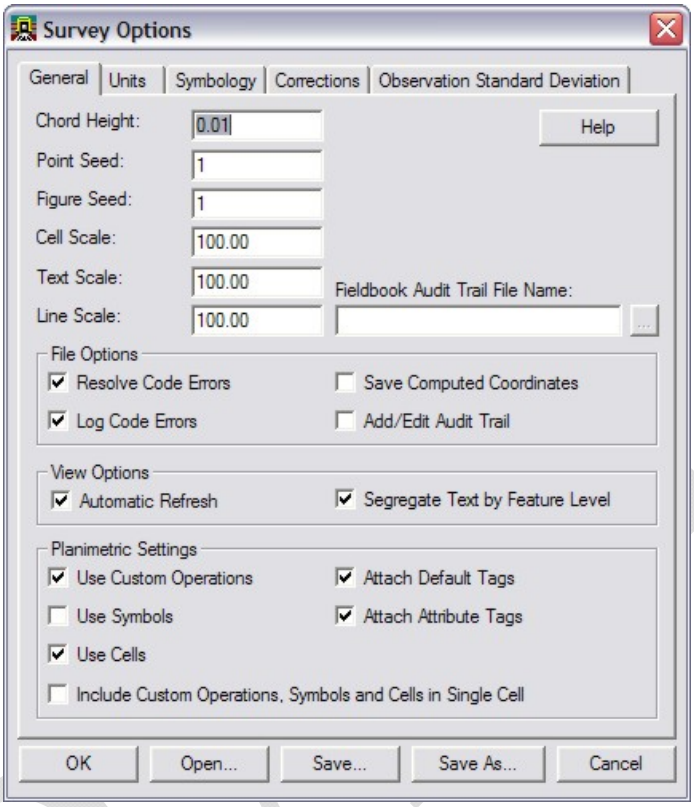
The **Fieldbook Data** dialog in InRoads Survey allows the user to manage survey data. In addition to viewing the station and observations, the dialog allows editing and adding points to the fieldbook.

- From the pull-down menu, select **Survey > Fieldbook Data…**

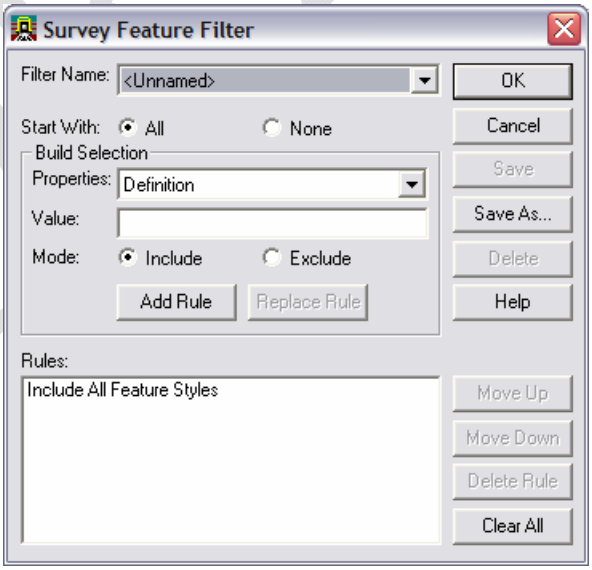


Dialog Items

- **Survey Options** - opens the **Survey Options** dialog box.



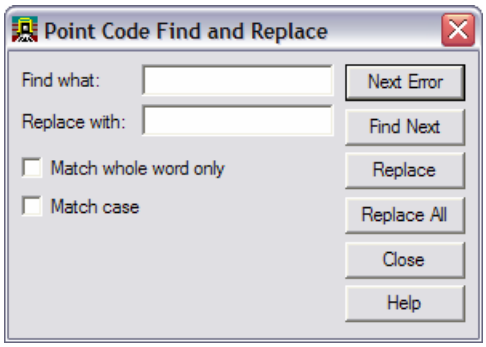
- **Survey Feature Filter** - opens the **Survey Feature Filter** dialog box.



- **Report** - opens the **Save** dialog box to generate a report.

  Note: The report is generated based on what stations/observations are selected prior to clicking the report button. To generate a report on the entire fieldbook select all the Stations in the fieldbook then click the ***Report*** button.

- **Find/Replace Codes** - opens the **Point Code Find and Replace** dialog box.



- **Select Figure** – will only locate the nearest planimetric feature or chainage. The fieldbook will highlight the start of the chainage.
- **Duplicates** – filters only duplicate points found in the Stations or Observations. To view duplicate points select it from the drop down box.

Duplicate Points General Rules:

Rule # 1

If a Point Name is duplicated in a Station Setup then the two points are averaged.

Station 764

Observation ***2000***

Observation ***2000***

Observation 2001

Observation 2002

Rule #2

If a Point Name is duplicated in two different Station Setups the points are not averaged and each point is used.

Station 764

Observation ***2000***

Observation 2001

Observation 2002

Station 766

Observation ***2000***

Observation 3001

Observation 3002

Note: For more information on how duplicate points are handled in InRoads Survey select the **Help** Help button.

Stations

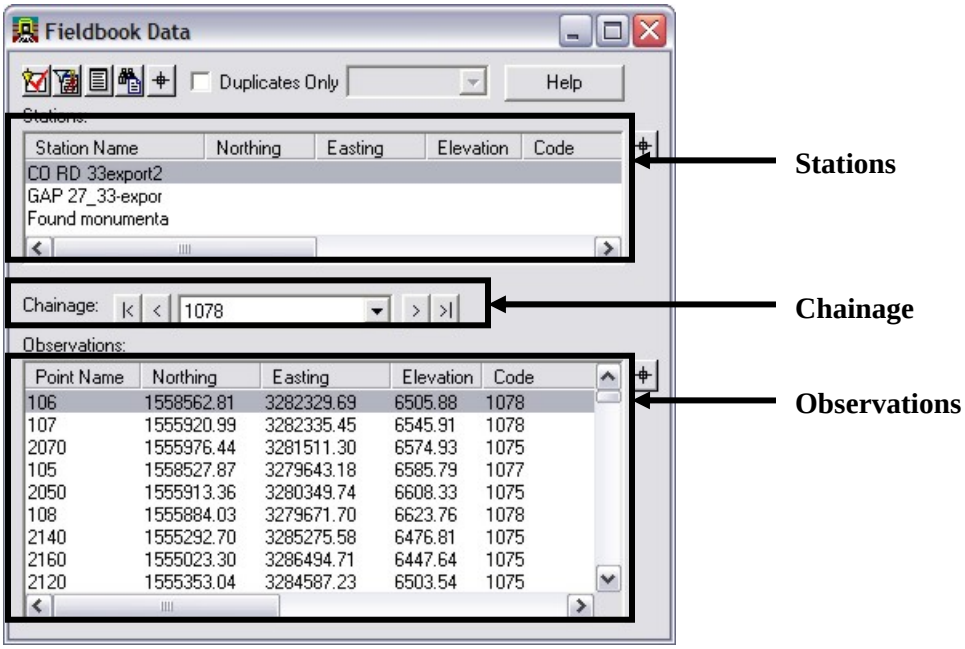
The top half of the dialog is the Stations or Instrument setup point.

Chainage

Chainage commands are a useful way to locate displayed planimetric features. Use the buttons **First**, **Previous**, **Next**, and **Last** to conveniently follow a chain.

Observations

The bottom half of the dialog is the Observations or topo shots from the corresponding instrument setup.



Lab 5 Opening Survey Data

Start by viewing a survey fieldbook that is already complete.

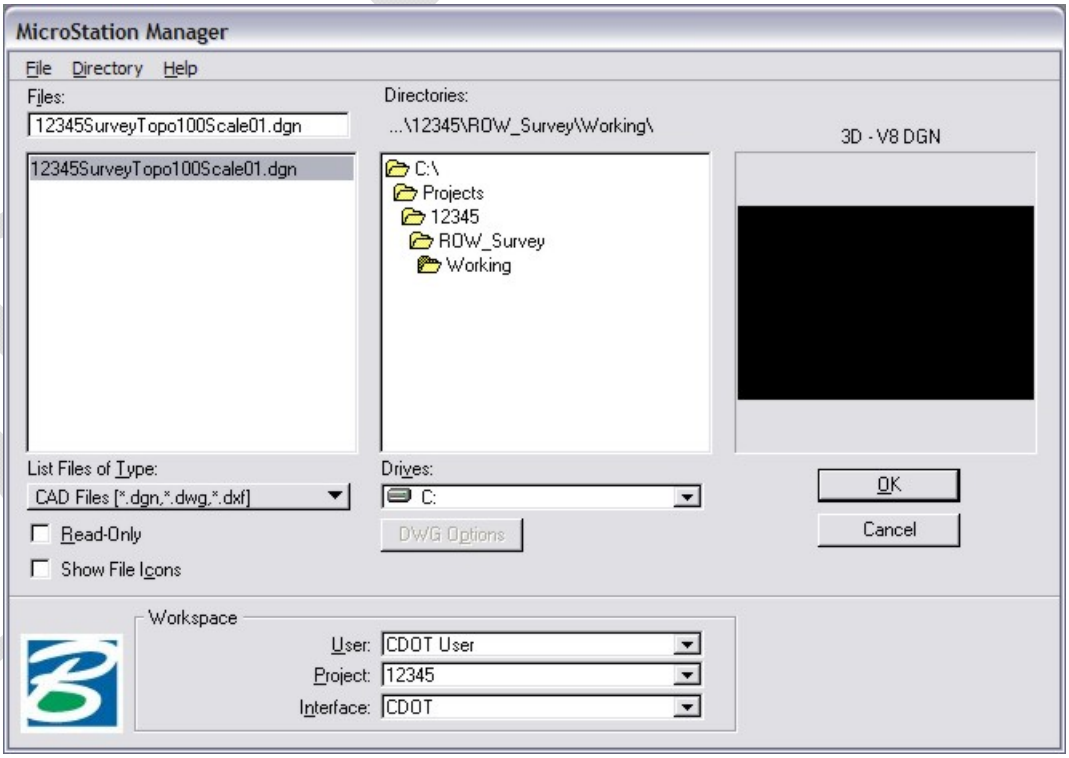
Objectives Lab 5

After completing this exercise you will know how to:

- Open a MicroStation file.
- Open an existing Survey Fieldbook.

1. Double-click on the InRoads Survey desktop button  or select **Start > All Programs > Bentley Civil Engineering > Bentley InRoads Survey**.

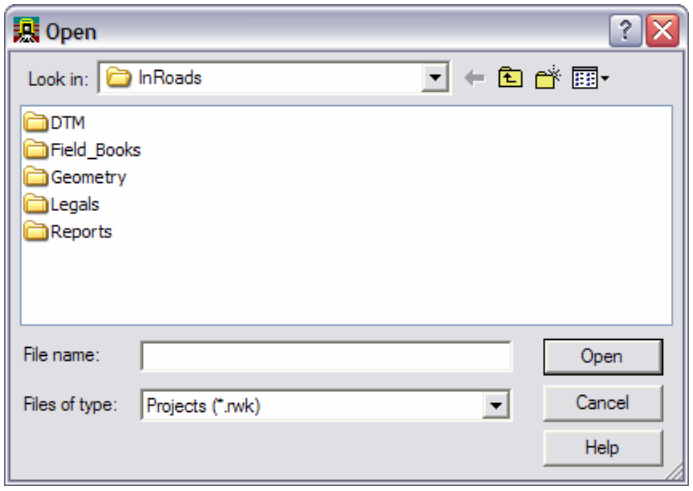
2. In the **MicroStation Manager** dialog go to the Workspace group section and change
   User: CDOT User
   Project: 12345
   Interface: CDOT



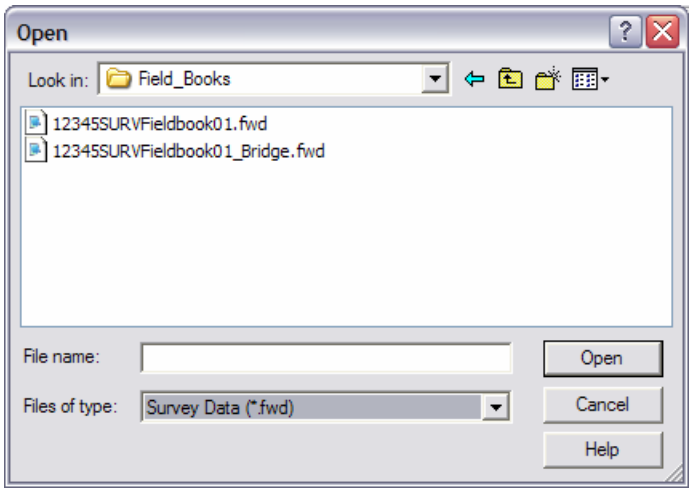
3. From the ***Working*** folder select the file ***12345SurveyTopo100Scale01.dgn***

4. **<D>** the **OK** button or double click the filename.

5. From the InRoads Survey pull-down **File > Open**. The **Open** dialog will appear.



6. From the **Open** dialog change the Files of Type to **Survey Data (*.fwd)**.



Note: Notice how the directory folder changed to **Field_Books** when the Files of type changed. This is one of the benefits of setting up the Project Defaults for each discipline.

7. Select the file **12345SURVFieldbook01.fwd**

8. **<D>** the **Open** then **Cancel** buttons.

Note: InRoads is **Memory** based, **not *Disk*** based. The file(s) in the *Workspace* pane are copies from the disk drive and reside in the computer's memory. Any changes to these data files (or creation of new data files) requires them to be saved back to the disk drive.

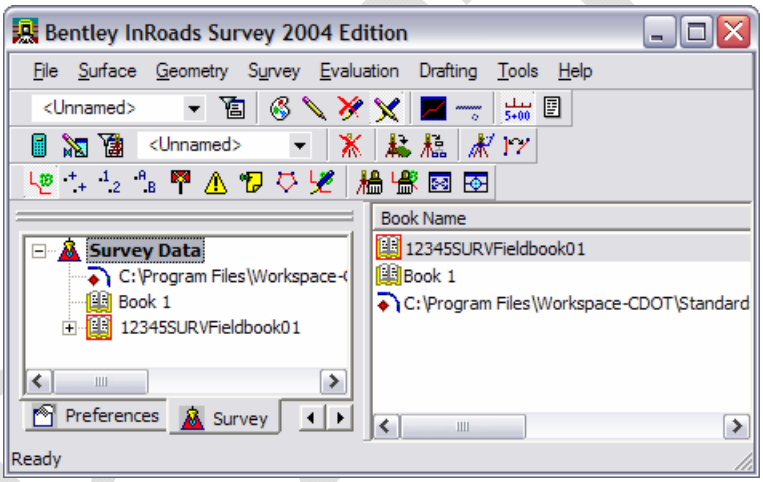
CAD vs. Fieldbook Viewing

Take a look at the InRoads Survey interface; notice the two files loaded in the Survey tab. The file with the red box around the button is the active file. Any commands that are selected will use the active file.

Objectives

After completing this exercise you will know how to:

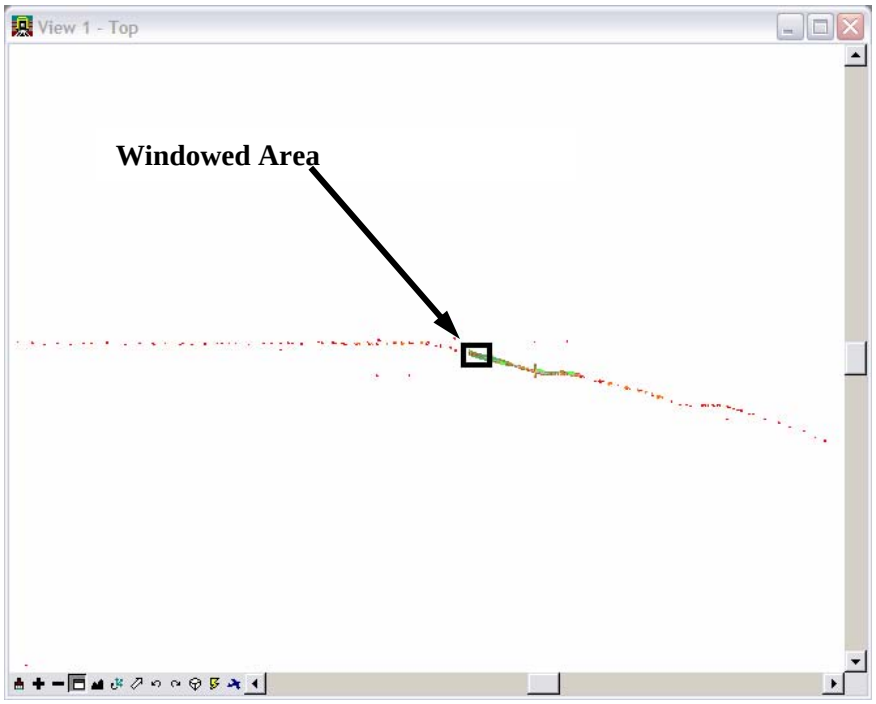
- View a fieldbook in the Survey Information Window
- View the survey data in the MicroStation view.
- Fit the Survey data in a MicroStation view.
- Use the shortcut menus in the Interface.



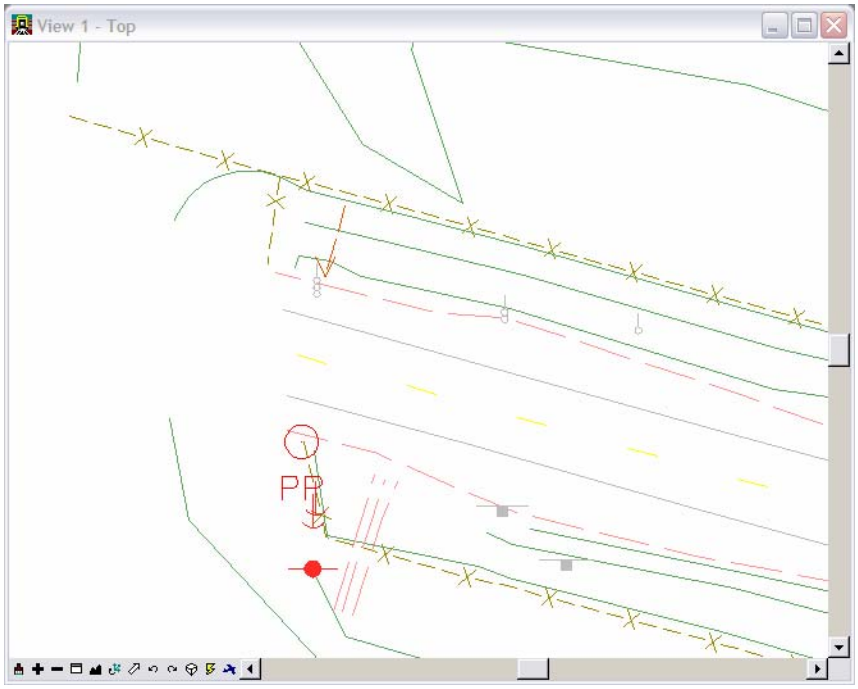
9. Use your cursor and **<D>** on the default Survey fieldbook ***Book 1***. Notice how the red box moved to ***Book 1***

10. Now use your cursor and **<D>** on ***12345SURVFieldbook01*** and make that the active book again.

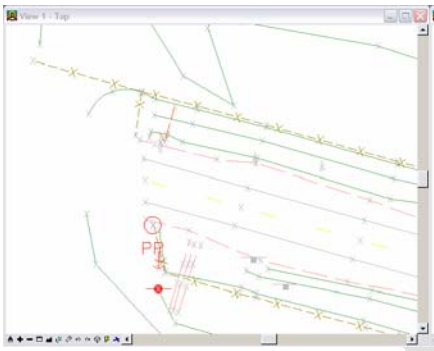
11. Fit the survey data to the view from the pull-down **Survey > Fit View**.



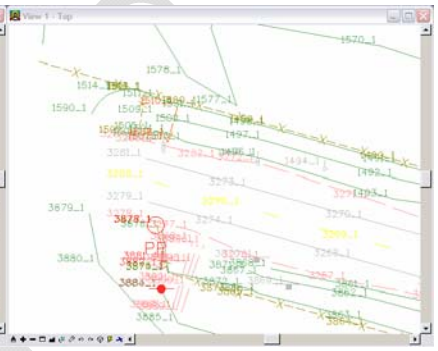
12. Use the MicroStation viewing tools to zoom to the west end of the project.



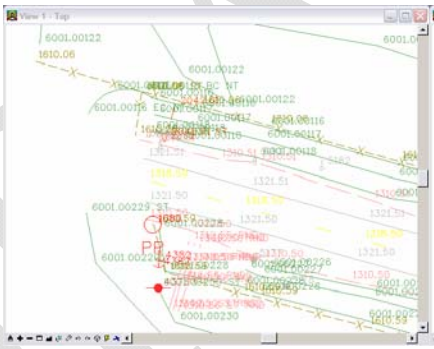
13. Investigate the viewing options of the Survey data. From the pull-down menu toggle the display on and off for
Survey > View Survey Data > Planimetrics
Survey > View Survey Data > Symbols
Survey > View Survey Data > Names
Survey > View Survey Data > Codes
Survey > View Survey Data > Elevations
Survey > View Survey Data > Errors
Survey > View Survey Data > Notes
Survey > View Survey Data > Networks.
Ignore **Write Survey Data to Graphics** for now.



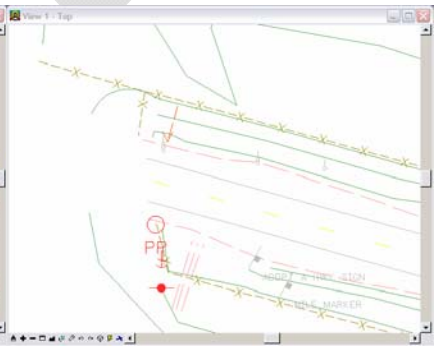
Symbols



Names



Codes



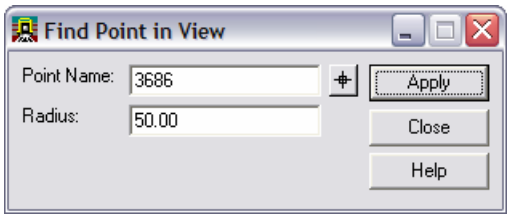
Notes

14. Also practice viewing different combinations of data using the **View Survey** toolbar. Ignore **Write Survey Data to Graphics** for now.

Note: The survey data that is viewed is dynamic. Nothing is actually in the MicroStation design file. Control of the size of the dynamic text for Point Name, Elevation, and Code etc. from the Survey Options Text Symbology tab.

15. From the pulldown menu **Survey > Find Point in View** the **Find Point in View** dialog will appear.

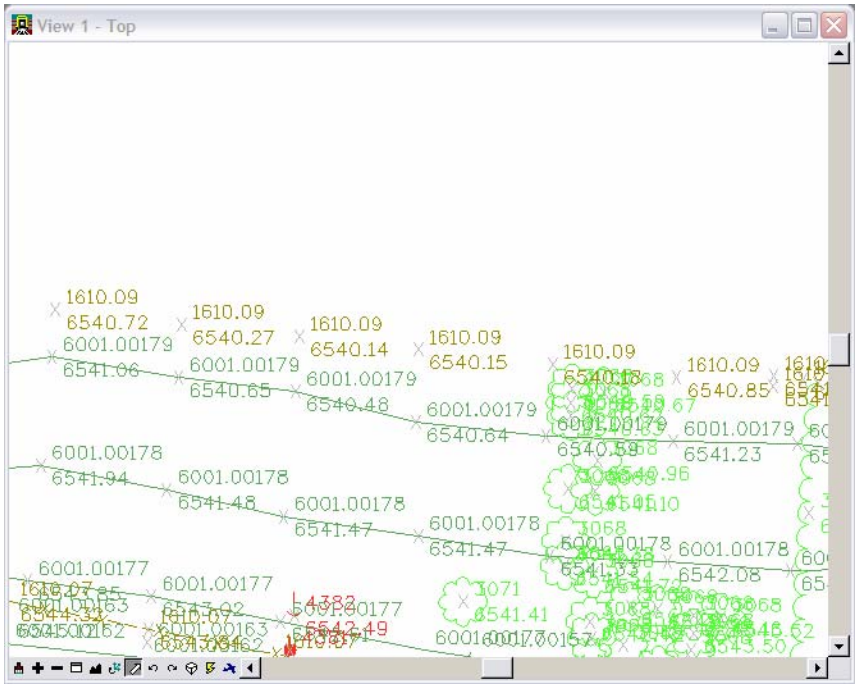
16. Type in the field Point Name: ***3686*** Radius: ***50***



17. **<D>** the **Apply** button. The MicroStation view is updated and zoomed into point number 3686.

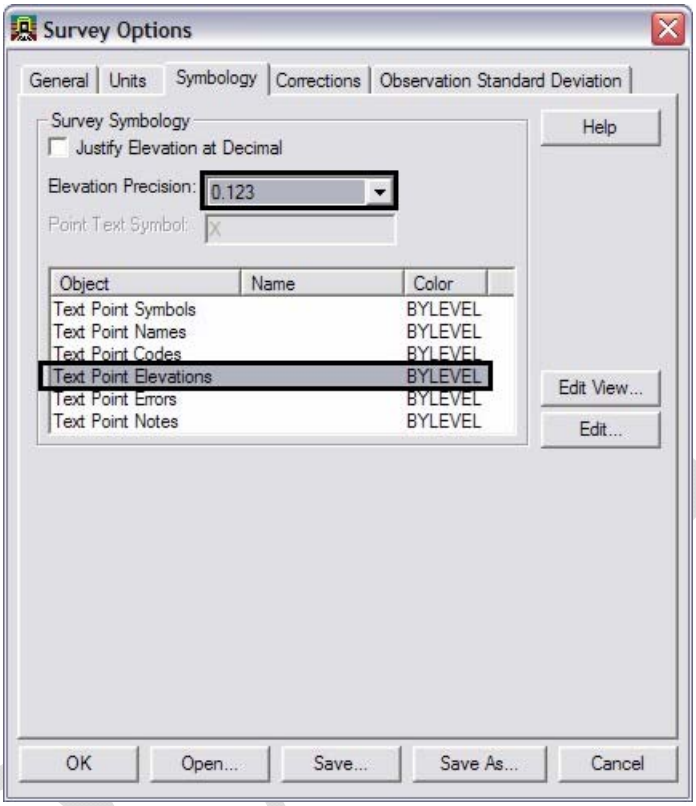
18. **<D>** the **Close** button in the **Find Point in View** dialog.

19. Toggle on **View Planimetrics**, **View Symbols, View Codes** and **View Elevations**.



20. From the pull-down menu, select **Tools > Survey Options** the **Survey Options** dialog will appear.

21. Select the **Symbology** tab.

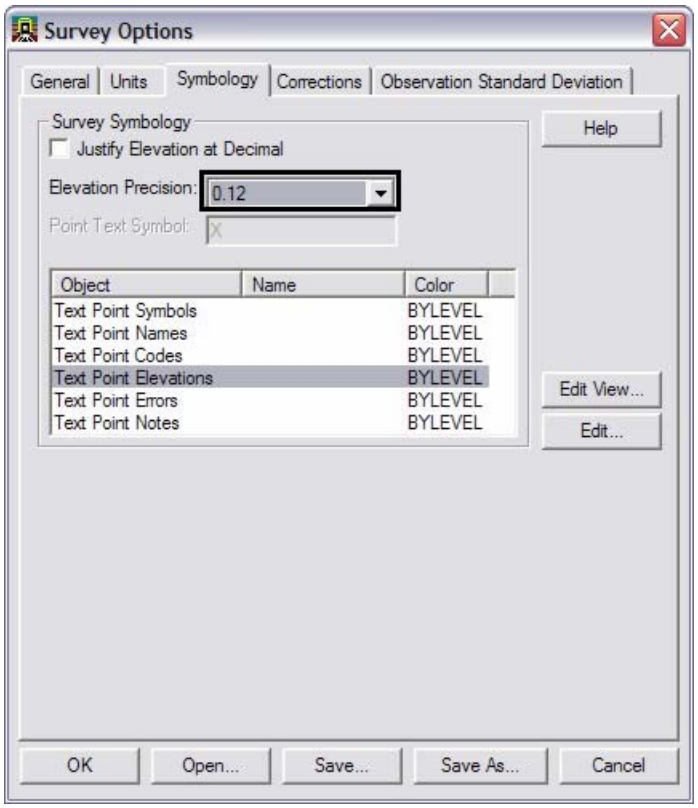


22. In the **Survey Options** dialog select the **Text Point Elevations**

23. In the Precision drop down list select **.123**. Then select the **Save** button. The elevations will update in the MicroStation view.

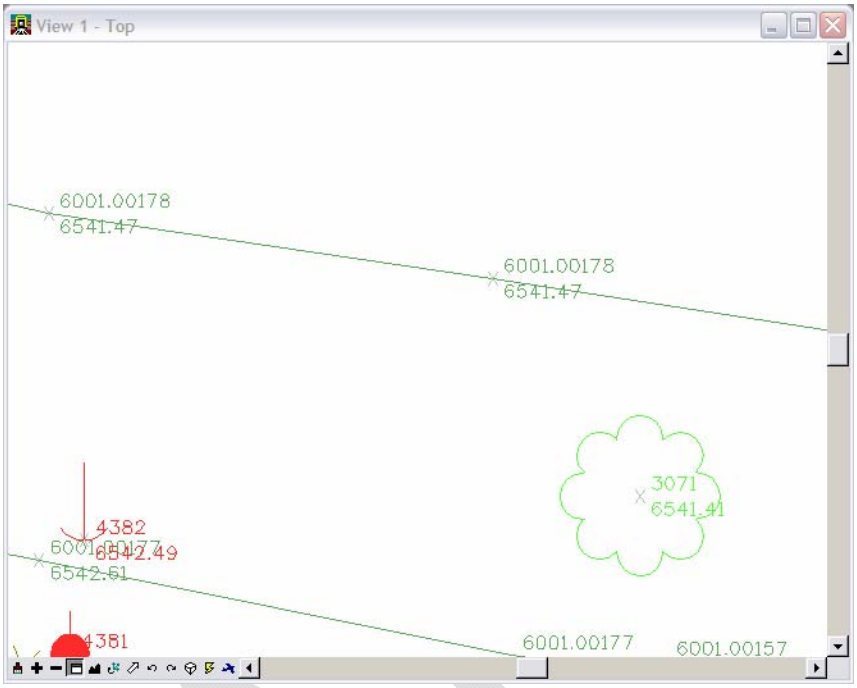
24. Review your results.

25. Set the Elevation precision back to **.12**



26. **<D>** the **Save** and **OK** buttons. The **Survey Options** dialog will close.

27. Use the MicroStation view commands  to zoom in, out, and pan the view.



Note: Notice how the text changes size and remains legible based upon the zoom ratio.

28. **<D>** MicroStation **Fit View.** In the lower left hand corner of MicroStation the status bar states **No Elements Found**.

Note: MicroStation Fit View command does not work because graphics displayed are ***dynamic*** graphics, not graphics written to the CADD file.

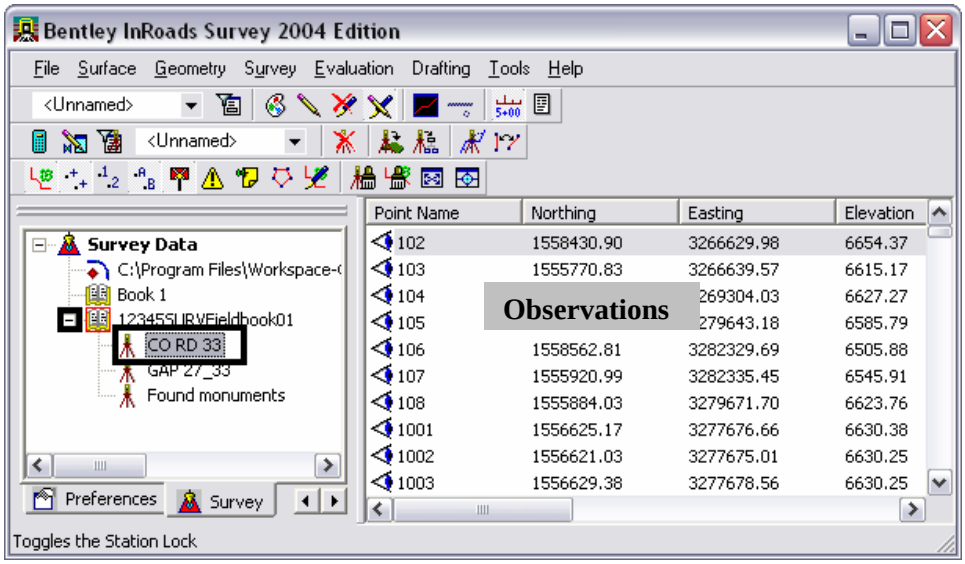
29. From the pull-down menu, select **Survey > Fit View** or use **Fit View** button  from the **View Survey** toolbar.

30. Continue to **Pan, Zoom** and **Fit** the survey data until it is comfortable.

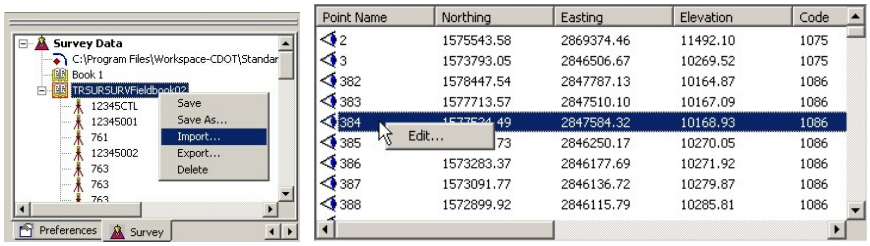
31. Continue to toggle Survey display data on and off as needed.

32. Explore the InRoads interface. **<D>** the "**+**" (**expand**) button next to the Survey data ***12345SURVFieldbook01.fwd.***

33. The workspace bar will display the Station names. Select the Station name at the top ***CO RD 33***. When the Station name is selected the Observations from that Station will display in the Information Window pane.



34. Continue to explore the ***12345SURVFieldbook01*** Survey Data. Experiment right clicking in the different areas of the interface to find different useful shortcut menus.



Lab 7 Viewing the Fieldbook Data

Open and explore some of the basic features of the electronic fieldbook. The Fieldbook will be covered in greater detail later in the manual.

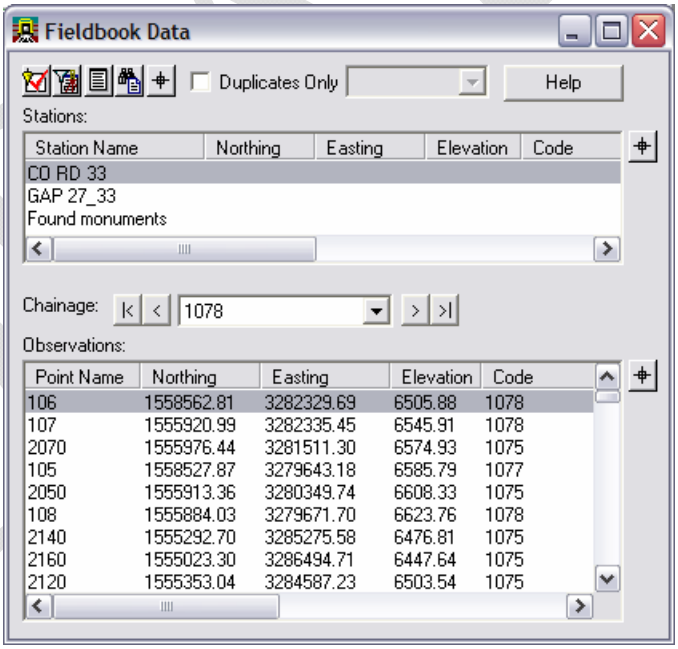
Objectives Lab 7

After completing this exercise you will know how to:

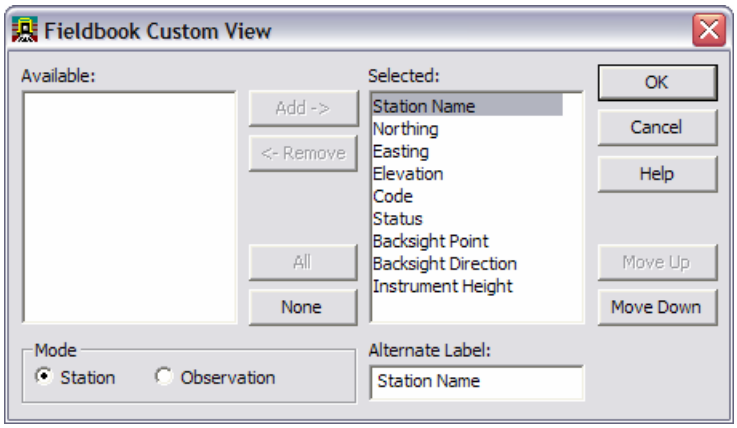
- Open the **Fieldbook** dialog.
- Find points in the **Fieldbook** dialog.
- Use the shortcut menus in the **Fieldbook** dialog.
- Use the Select Figure button.
- Use the chainage tool in the **Fieldbook** dialog.

1. **<D>** the **Fieldbook** button from the Survey toolbar. The Survey Fieldbook will appear.

2. Take a minute to review the electronic Fieldbook.



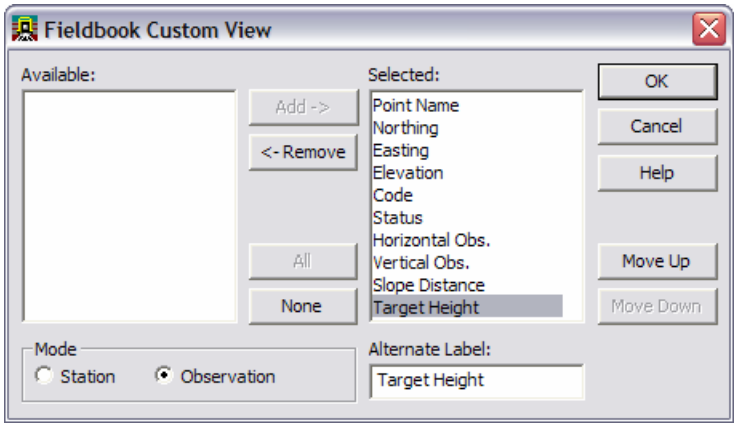
3. In the column headers of the Stations **<R>** on the Station Name. The **Fieldbook Custom View** dialog will appear.



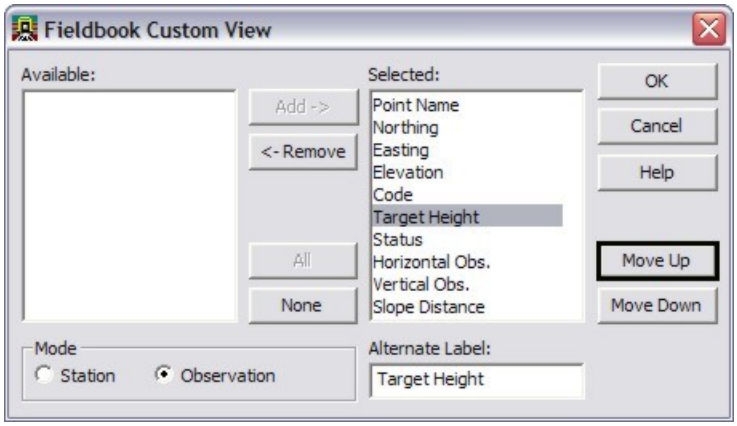
Note: This dialog allows the order of the columns to be customized in the Fieldbook.

4. In the ***Mode*** section of the dialog **<D>**on the ***Observation*** radio button.

5. Select ***Target Height*** in the ***Selected*:** section on the right side.

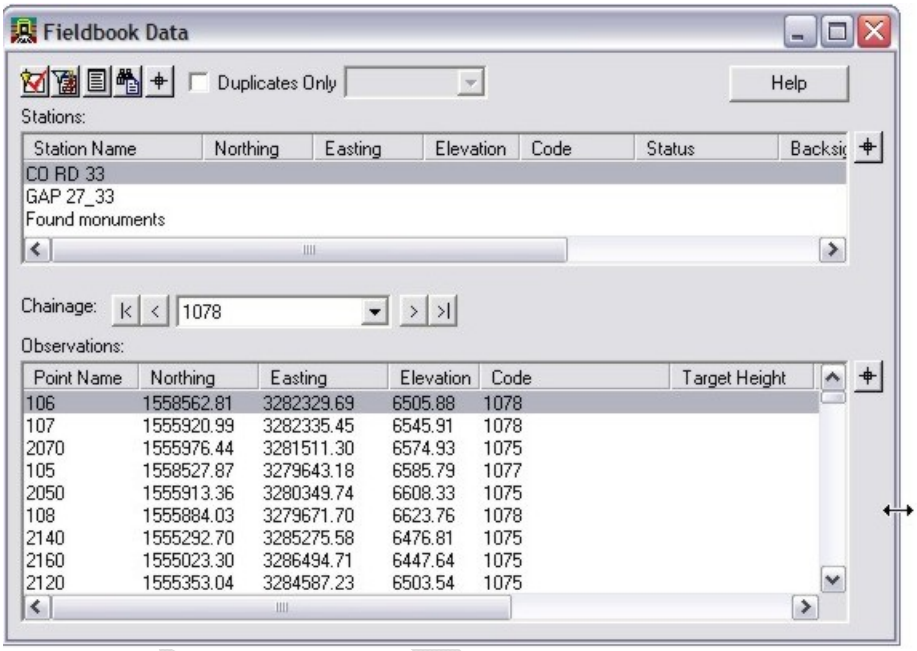


6. **<D>** the **Move Up** button until ***Target Height*** rests under the ***Code***.



7. **<D>** the **OK** button. The **Fieldbook Custom View** dialog will close.

8. **Resize** the Fieldbook so the column change for ***Target Height*** is in the view.

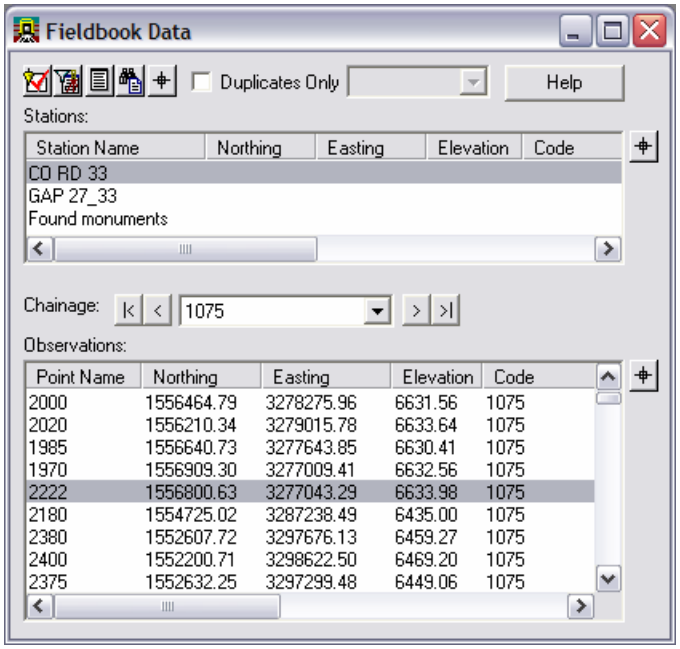


9. From the View Survey toolbar turn on only **View Planimetrics** , **View Symbols** , and **View Names** . Turn off all other View Survey Data commands.

10. **Select** Station Name ***CO RD 33*** in the top half of the **Fieldbook Data** dialog. Notice that the bottom half of the dialog updated with the observations collected from that instrument setup.

11. **Select** Point Name *2222* in the bottom half of the **Fieldbook Data** dialog.

    - Use dialog scroll bars or
    - Intelli-mouse wheel or
    - Page Up or Page Down keys or
    - Up or Down arrow keys



12. **Right click** on Point Name **2222** to access the shortcut menu. Select **Center** from the available list. Look in your MicroStation view Point Name *2222* is centered in view 1.

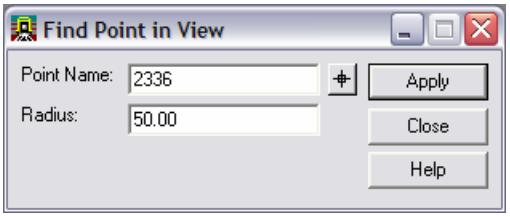
    Note: Center only centers the point to the active view zoom ratio. It may be necessary to zoom in closer and re-center from the shortcut menu.

    Added Practice

    - **Find** and **Center** Station Setup *GAP 27_33*
      Point Name *107*
    - **Find** and **Center** Station Setup *Found monuments*
      Point Name 1088_2

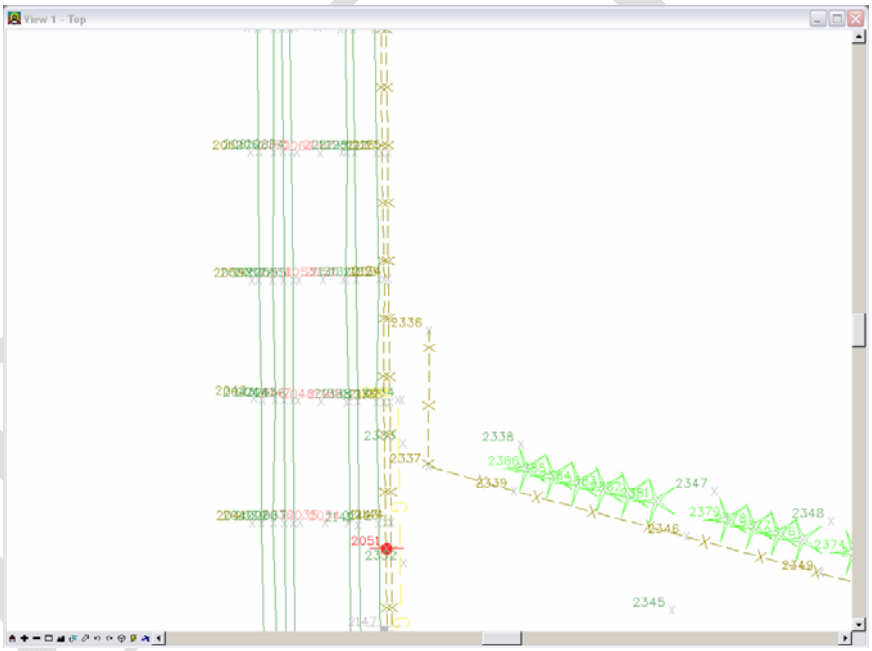
13. From the pulldown menu **Survey > Find Point in View** the **Find Point in View** dialog will appear.

14. Type n the field Point Name: ***2336*** Radius: ***50***

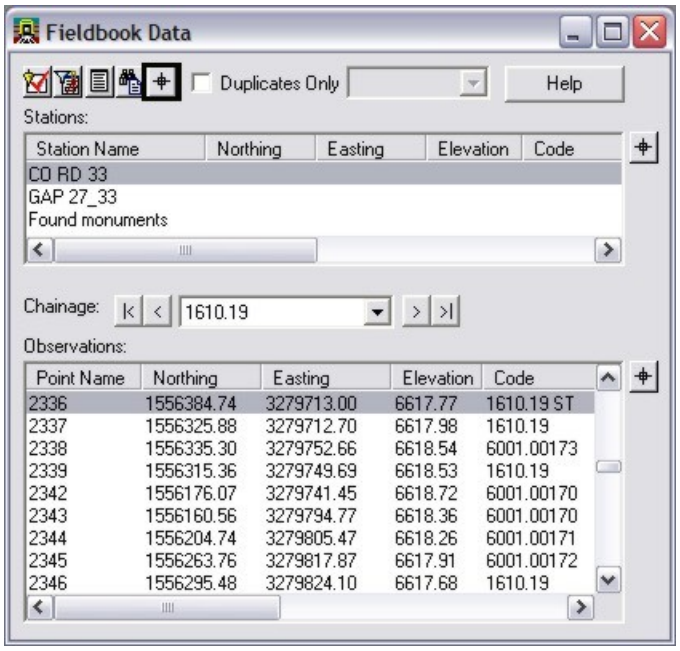


15. **<D>** the **Apply** button. The MicroStation view is updated and zoomed into point number 2336.

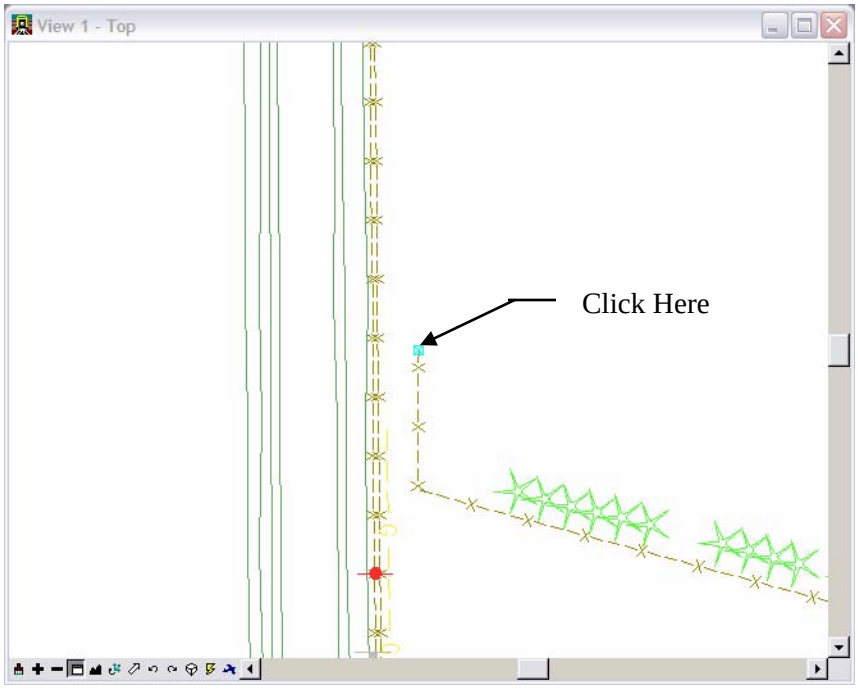
16. **<D>** the **Close** button in the **Find Point in View** dialog.



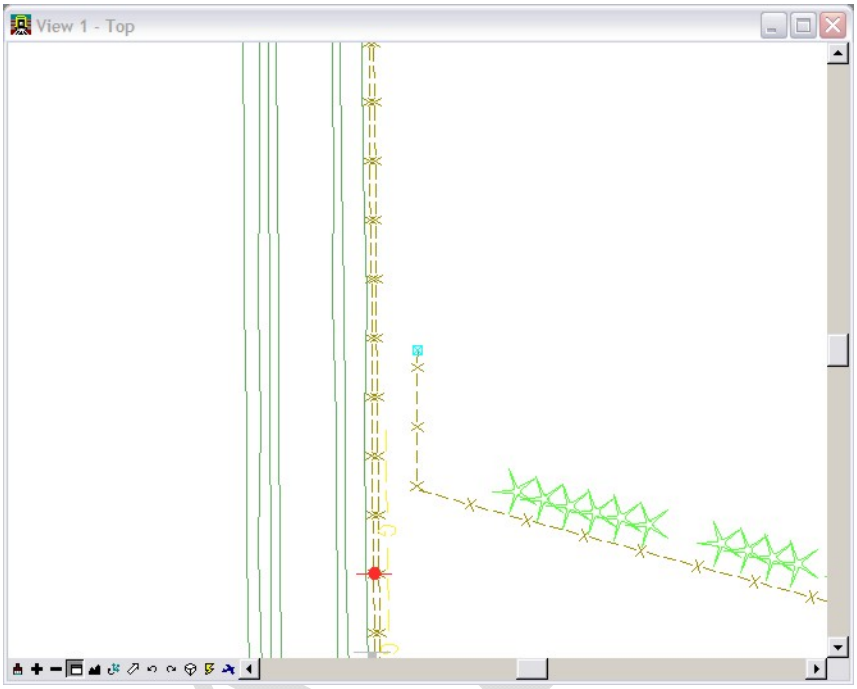
17. From the **Fieldbook Data** dialog **<D>** the **Select Figure** button. The **Fieldbook Data** dialog will contract allowing more screen space to make a selection.



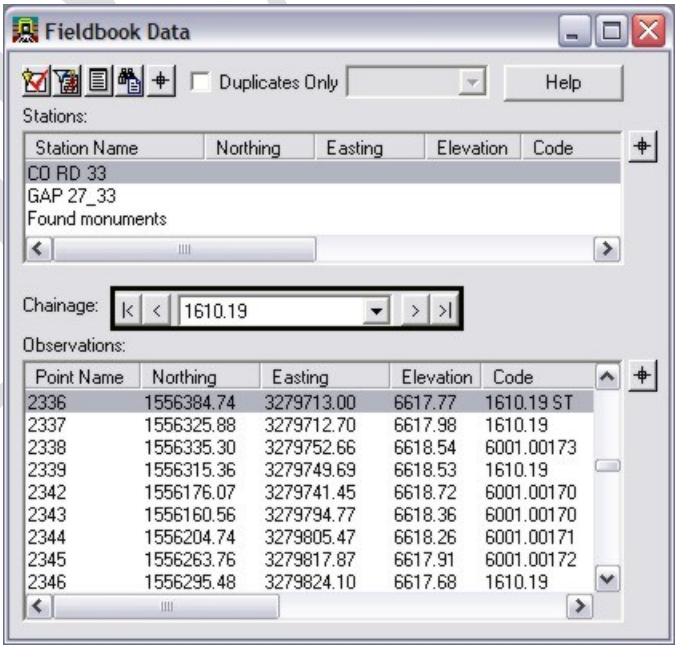
18. Select **<D>** at the start of the fence line. The **Fieldbook Data** dialog will expand with point name *2336* selected.



19. In the **Fieldbook Data** dialog **<R>** point name **2336** to access the shortcut menu and select **Highlight Observations**. Notice at the start of the line segment the **Box-X** in MicroStation View 1.

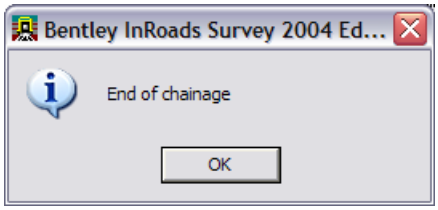


Note: In the middle of the **Fieldbook Data** dialog there is an option to follow a chainage. A chainage is a good way to follow a planimetric feature in the fieldbook and in the view.



20. Use the chainage buttons
First **Previous** **Next** and **Last** to follow the fence line chain. Notice the Highlighted Box-X that follows each point along the chain. As the point continues outside the current view the point becomes centered in the MicroStation view.

21. When the end of the chainage is reached **<D>** the **OK** button.



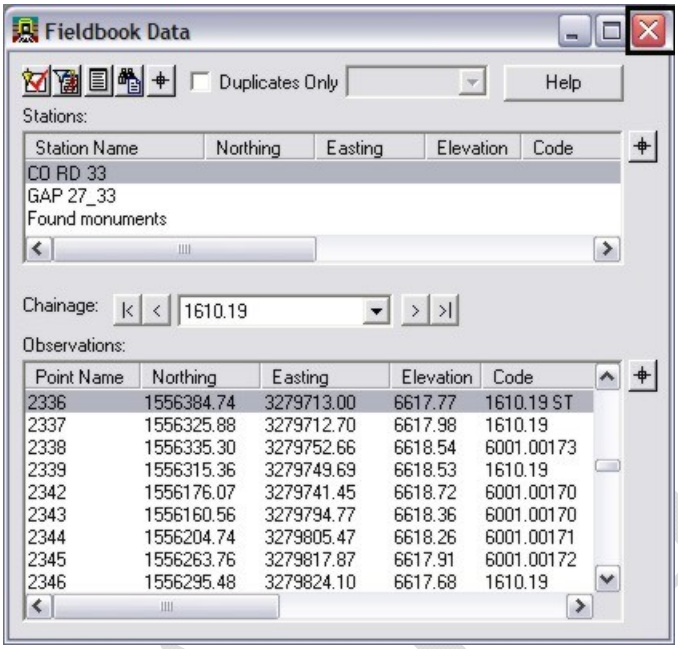
Added practice

From the west end of the project.

- Follow the chainage for a code 1310 Edge of Oil
- Follow the chainage for a code 6001 Terrain Breakline

Note: When having difficulty locating any chains try selecting the line segment instead of the start or end points.

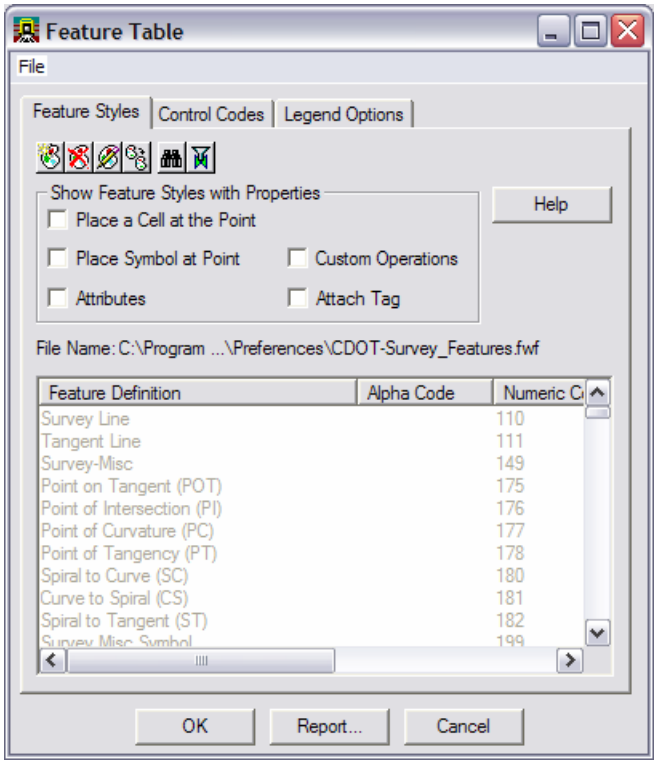
22. Close the **Fieldbook Data** dialog by clicking the **X** in the upper right hand corner of the dialog.



Chapter 3 Feature Codes and Control Codes

The Survey Feature Table (FWF) file controls how a feature is displayed in the design file, written to a DTM, or exported to Geometry.
There are two main types of graphic displays: lines and cells. Additionally, there are a few codes that place text through the use of Custom Operations. The Feature table also controls the associated symbology for the graphics such as level, color, style, and weight.

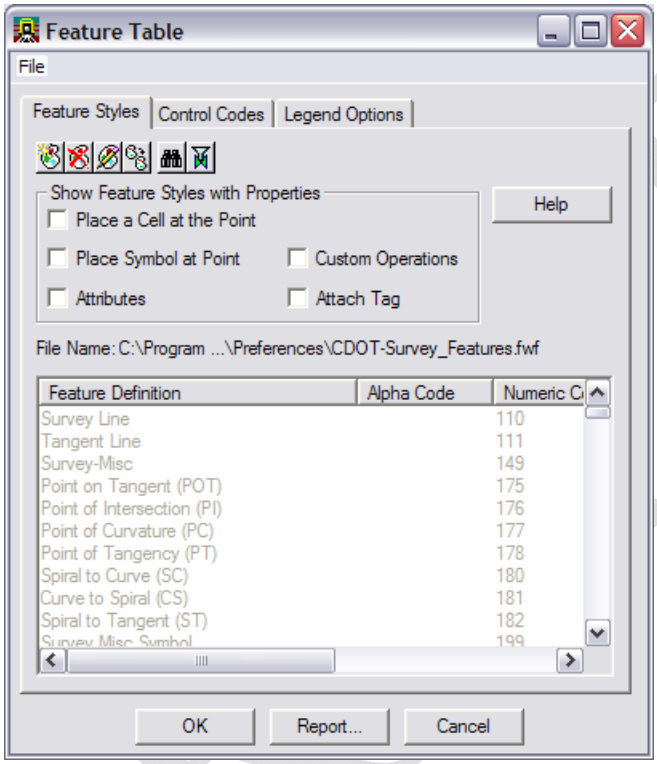
Extensive effort has been made to ensure the correct symbology is used in the Feature table. Changes to the Feature table file will be made only by the CDOT CADD Manager. Any suggested changes should be submitted to the CADD Manager.



Feature Table dialog

The Survey Feature Table controls how each surveyed feature is displayed graphically. Each feature in the Feature Table can be displayed as Lines, Cells, Text, or Symbols. The feature definitions have been standardized by CDOT and should only be modified by the CADD manager.

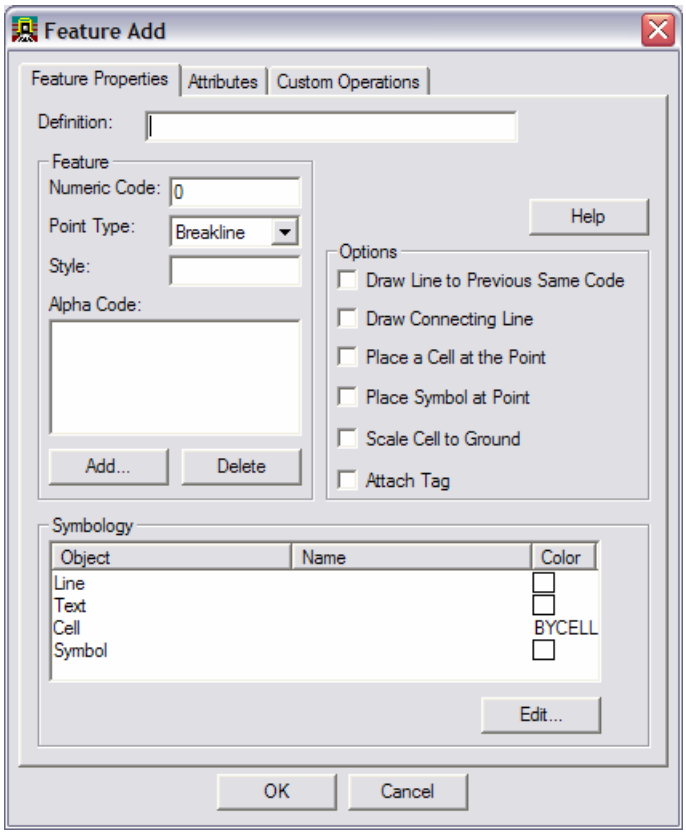
- From the pull-down menu, select **Survey > Feature Table…[Feature Styles]**



Feature Styles

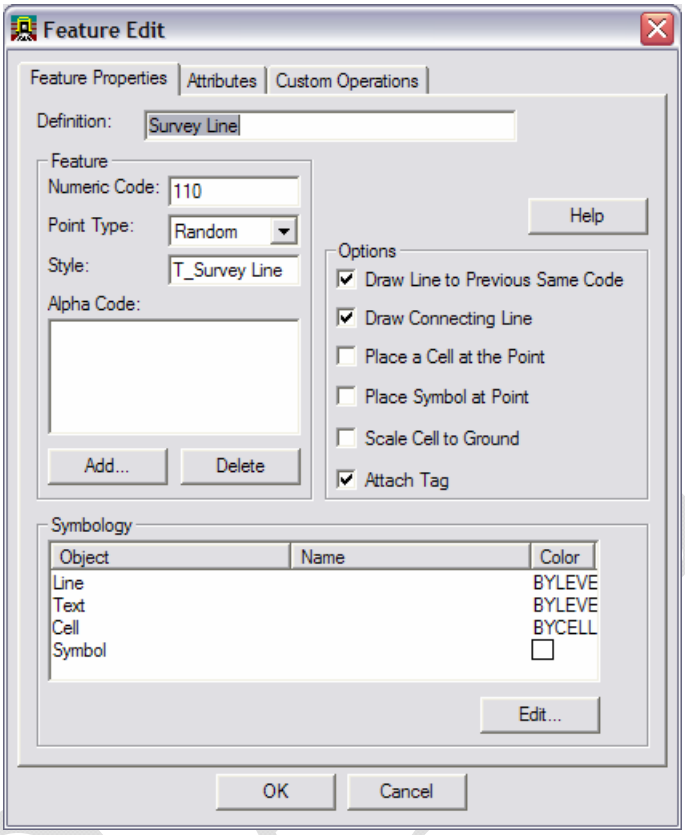
Dialog Items:

- **Add Feature** – opens the **Feature Add** dialog.

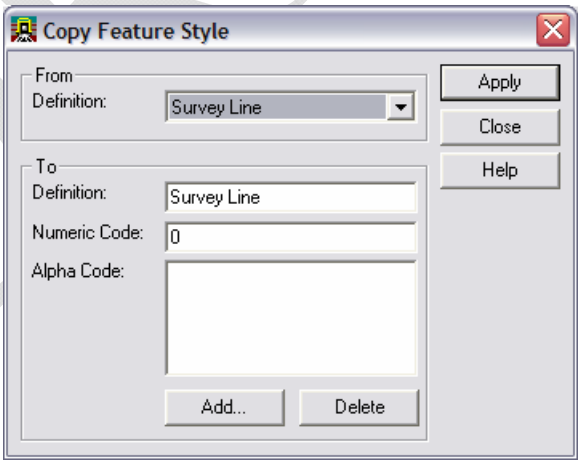


- **Delete Feature** – deletes a selected feature.

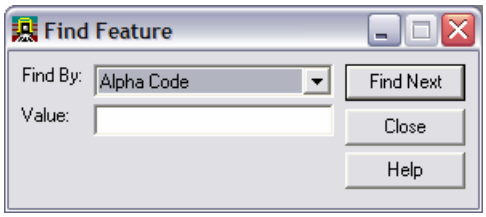
- **Edit Feature** – opens the **Feature Edit** dialog for the highlighted feature.



- **Copy Feature** – opens the **Copy Feature Style** dialog. Prior to selecting the button, select the feature to be copied



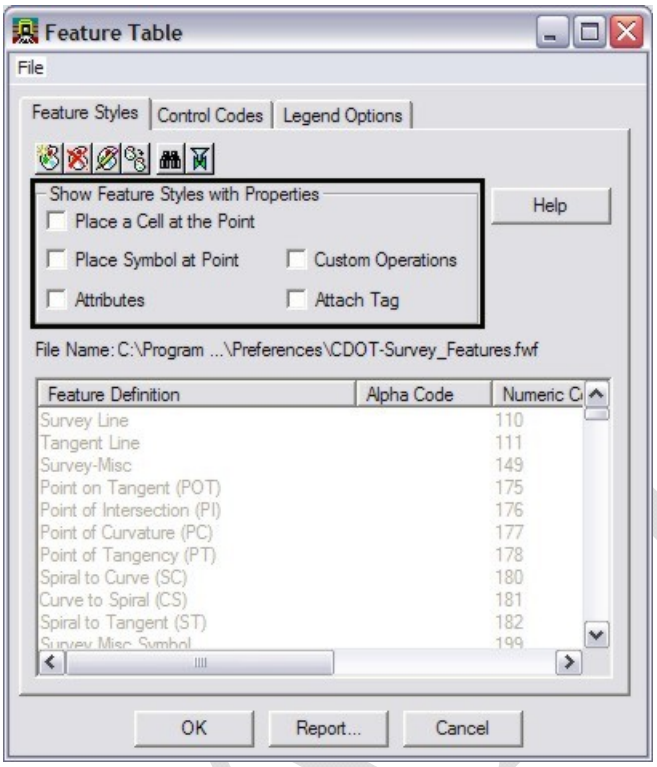
- **Find Feature** – opens the **Find Feature** dialog. **Find Feature** dialog can quickly find an exact feature based on a specific value.



  - Alpha Code
  - Feature Definition
  - Numeric Code

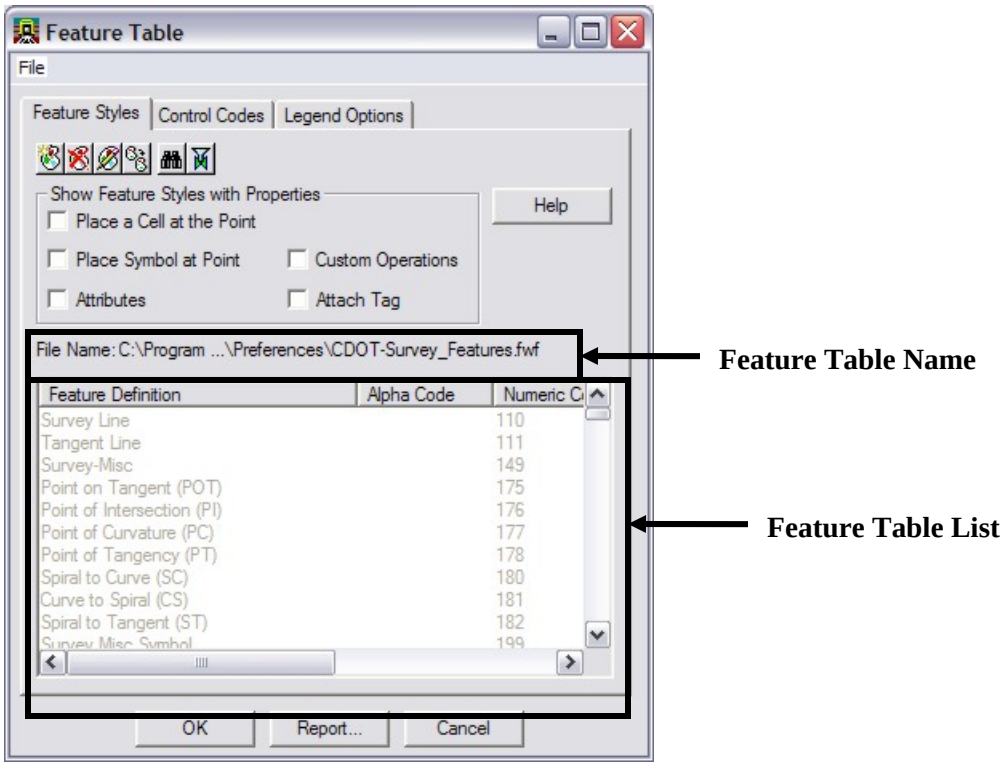
- **Show Active Codes Only** – will display only codes that are currently found in the active fieldbook.

Show Feature Styles with Properties



- **Place a Cell at the Point**
  Filters to show only the codes using cells for planimetrics.
- **Place Symbol at Point**
  Filters to show only the codes using symbols for planimetrics.
- **Attributes**
  Filters to show only the codes using attributes for data collection.
- **Custom Operations**
  Filters to show only the codes using custom operations in the feature definition.
- **Attach Tag**
  Filters to show only the codes attaching tags or non graphical data to the feature definition.

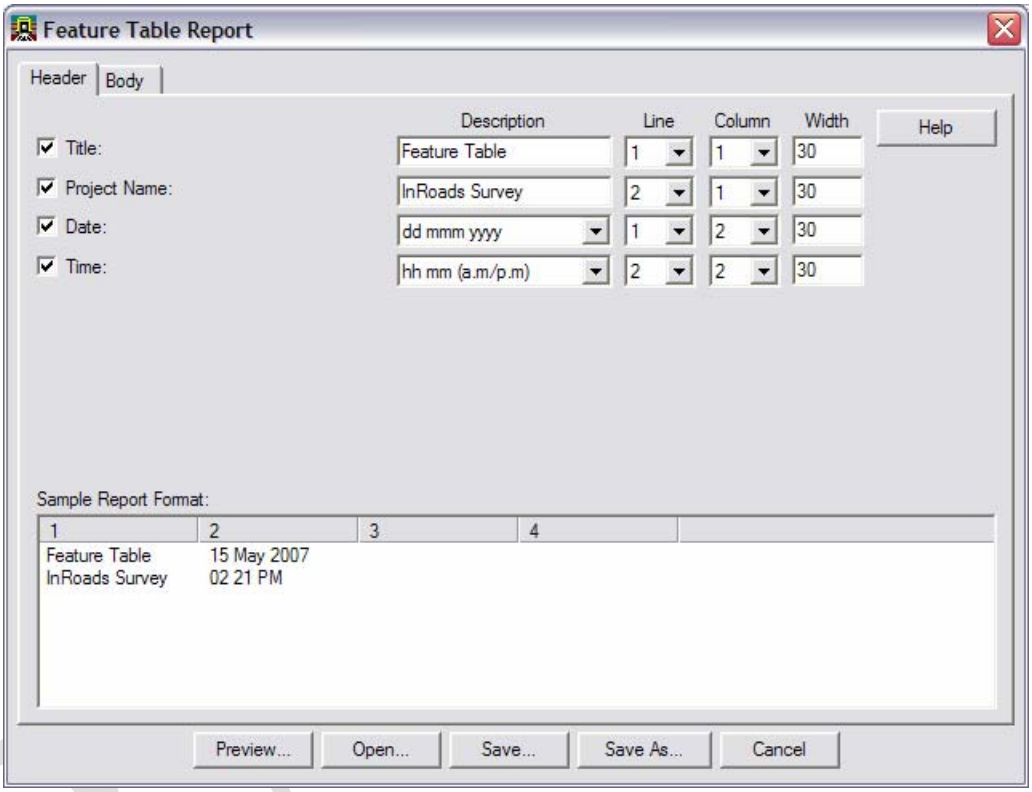
Feature Table Name and List



- Gray or dithered text represents codes not currently used in the active fieldbook.
- Black or bold text represents codes used in the active fieldbook.
- Column headers can be sorted ascending or descending by selecting the column title. Columns can also be resized using the vertical bar separating the titles.

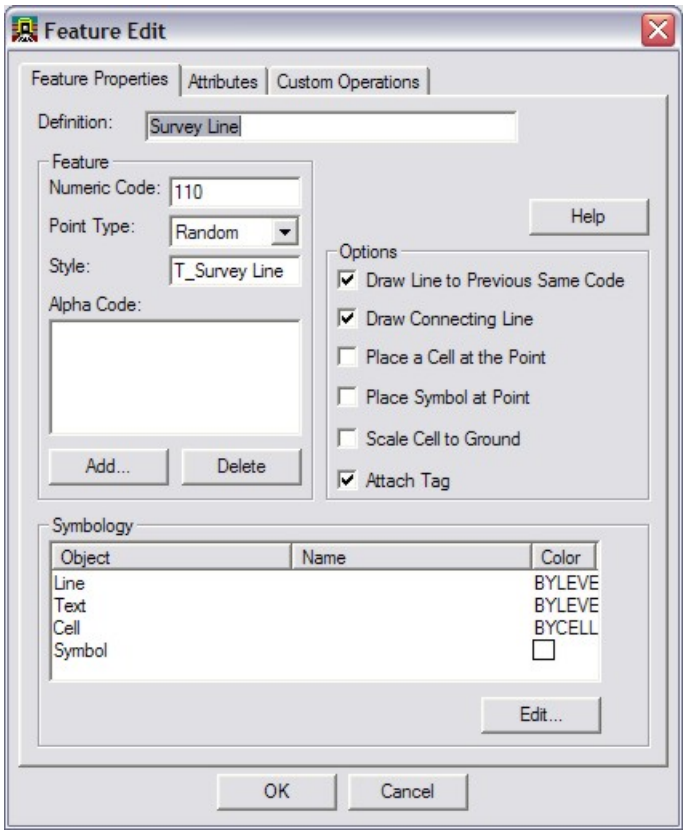
Reports

- Report... **Report** – opens the **Feature Table Report** dialog. This dialog can generate a report based on the list portion of the dialog.



Feature Edit

The **Feature Edit** dialog controls the symbology of each survey shot collected in the field. Each feature can have only one numeric code; options settings define whether a line or a cell is placed at the point. Additional information can be added using the ***Attributes*** and ***Custom Operations*** tabs.



Feature Edit Dialog Items

- ***Definition***

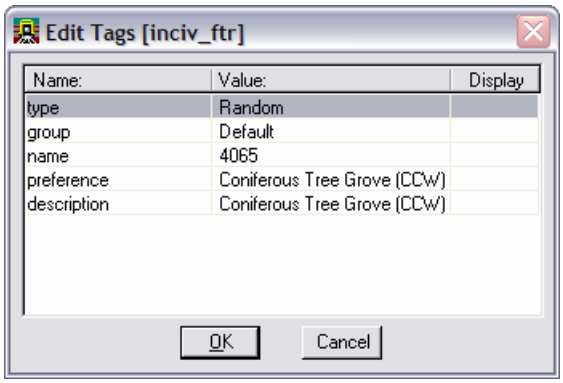
  Description of the surveyed feature, both Alpha and Numeric characters are allowed. The Survey Definition is used as the description when saved as a Surface and Geometry project.

- ***Numeric Code***

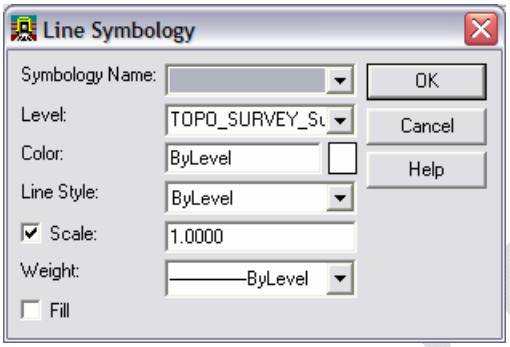
  Associates a numeric code with the Survey Feature Style. The numeric code can not be reused in the same Feature Table.

- Point Type
  - **Random**
    Regular or ***spot*** elevations. These points do not have a direct relationship with adjoining points other than a linear interpolation. For example: high or low elevations, topography shots such as trees, valves, signs, etc.
  - **Breakline**
    Breaklines are comprised of linear features where a change in grade may occur. For example: curb lines, a roadway crown, edge of pavement, ditches, ridges, toe of slope, etc.
    A breakline must contain at least 2 points and will restrict triangulation from crossing.
  - **Interior**
    Interior boundaries are comprised of a closed shape. They define obscure areas (voids) in a surface model. Triangulation does not occur inside interior boundaries thereby eliminating any contouring, surface modeling, or volume computations within said interior feature. Multiple interior boundaries can exist in a surface model.
    For Example: Bodies of water, building pads, areas not surveyed, etc.
  - **Exterior**
    By definition, an exterior boundary must be a closed shape. It defines the limits of the data InRoads can work with. Only one exterior boundary can exist in a surface model.
    For example: limits of survey data or limits of slope intercepts for a new design.
  - **DNC (Do Not Contour)**
    DNC shots will collect the X,Y, and Z position of the feature but when it comes time for InRoads to triangulate the DTM the DNC points will be left out. Think of underground utilities or a shot on the top nut of a hydrant. If these shots were part of the triangulation there would be incorrect valleys and spikes in the DTM.

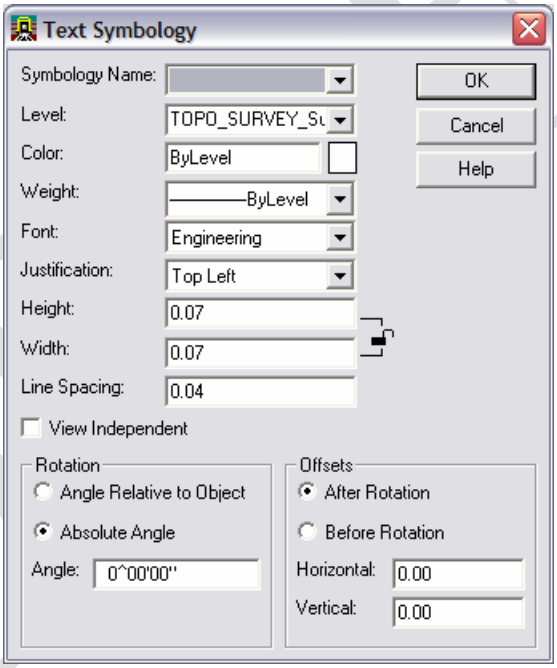
- **Style**
  When saving Survey features to a Surface or Geometry project a named Feature Style is associated during the export. This style corresponds to a Named Symbology in the Preference INI file.
- **Alpha Code**
  Alpha codes are used as an additional way to collect the survey data in the field. Alpha feature codes are not to be used as part of the CDOT collection.
- **Draw Line to Previous Same Code**
  Controls planimetric line work for the specific feature. This option is used in conjunction with the control code **ST**.
- **Draw Connecting Line**
  Controls planimetric line work for the specific feature. This option is used in conjunction with the control codes **JPT**, **JNC**, and **–** (dash).
- **Place a Cell at the Point**
  Controls the planimetric placement of cells for features. The symbology and cell name is controlled in the Symbology Section for Cell.
- **Scale Cell to Ground**
  Overrides all scale factors for cell placement to a value of 1.
- **Attach Tag**
  Attaches a MicroStation tag value to the feature when written to the design value, such as DTM type, Point name, Preference, and Description. To review attached tags use the Review Tags button from the Main toolbar in MicroStation.



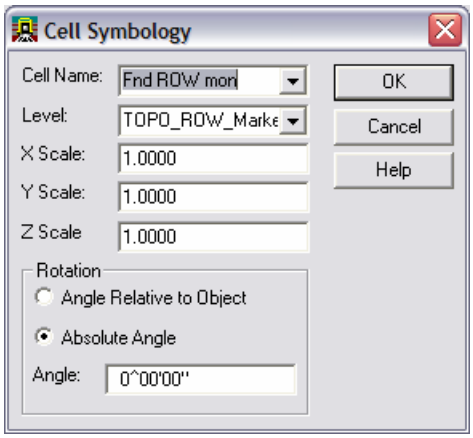
- **Symbology Line**
  Controls the Level, Color, Style, and weight of lines or arcs for each feature written to graphics. To modify the symbology highlight the symbology Line and **<D>** the **Edit** button.



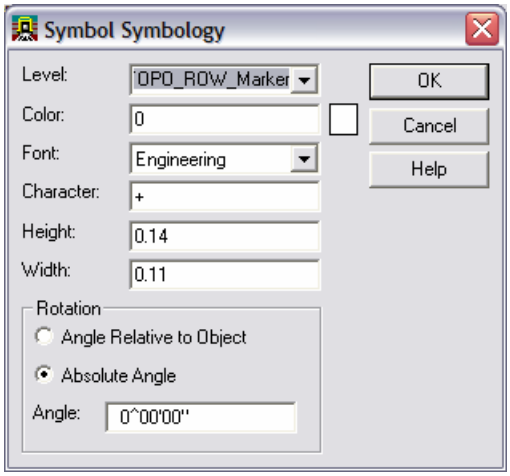
- **Symbology Text**
  Controls the symbology, text size, and font for any text displayed with custom operations. To modify the symbology highlight the symbology Text and **<D>** the **Edit** button.



- **Symbology Cell**
  Controls the cell name, size, rotation, and symbology for placement. To modify the symbology highlight the symbology Cell **<D>** the **Edit** button.

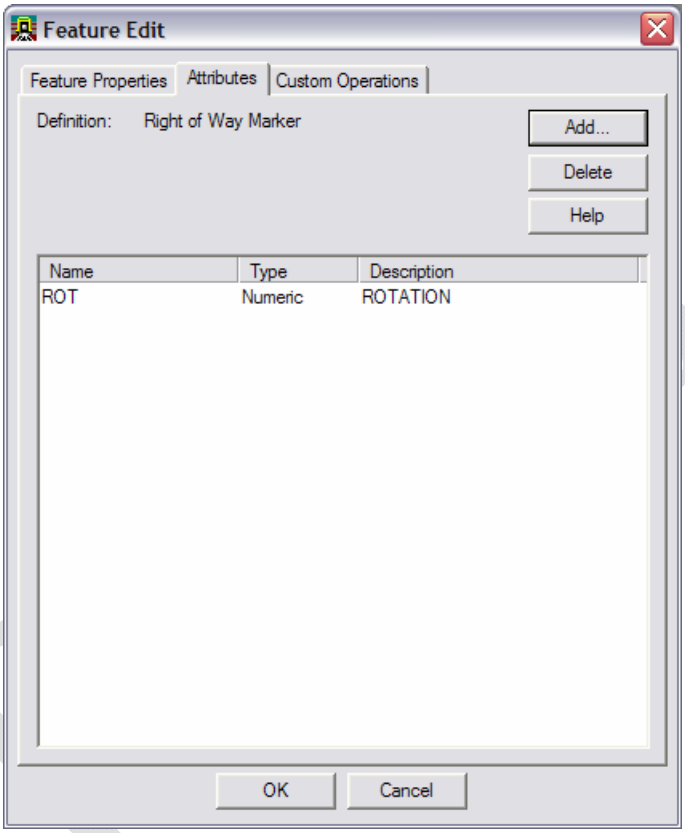


- **Symbology Symbol**
  A symbol is a custom font character, similar to a True Type Font Wingdings. Symbols can be used in addition to any cells being placed. CDOT does not currently use any Symbols. The font, size and symbology can be controlled. To modify the symbology highlight the symbology Symbol **<D>** the **Edit** button.



Attributes tab

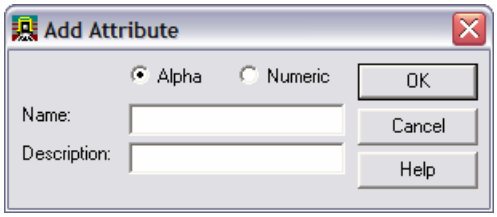
Attributes are used to help further define or control survey features in the field. Attributes can be collected in numeric or alpha data. As an example, additional information such as size, flow, and silt levels in a culvert pipe can be added to a single shot in the field. Any Attributes that do not have any field information will be viewed in the fieldbook as a status "***A***". Attributes that have a value will show up in the fieldbook with a status "***V***".



As shown above they can also help control placement of a cell by defining the rotation.

- Add

  Opens the **Add Attribute** dialog that can create Alpha and Numeric Attributes. One survey feature can have more than one Attribute. Alpha Attributes can store both alpha and numeric data such as “MH1024”. Numeric Attributes can store only numeric data such as “1024”.



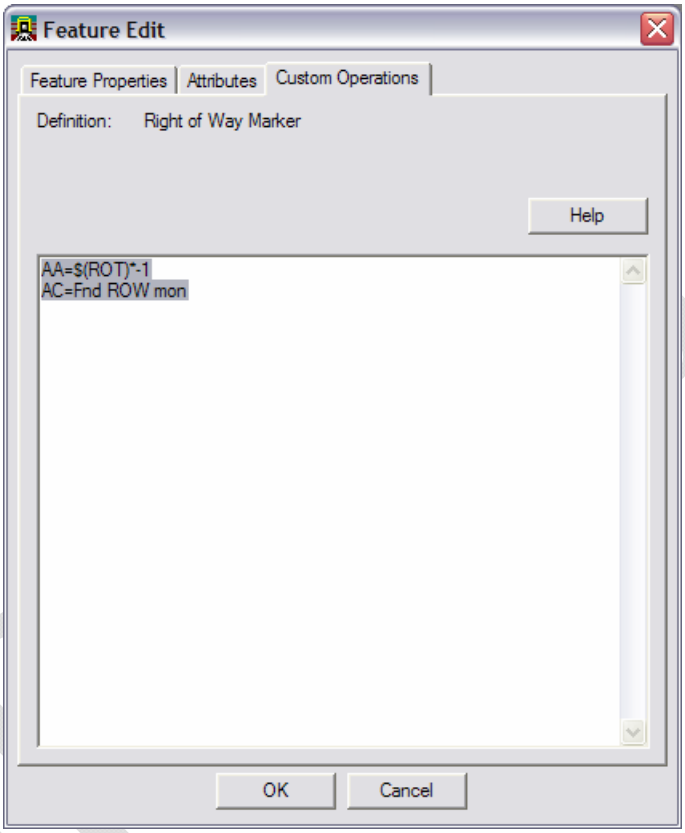
- Delete

  Deletes the selected attribute from the list.

  Note: There is no modify or edit command when working with Attributes. In order to make a change delete and recreate the attribute.

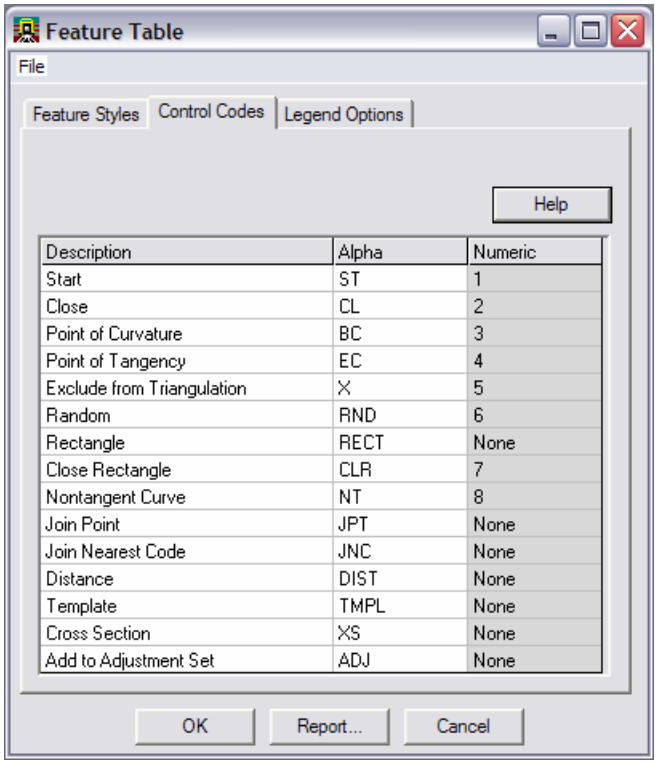
Custom Operations tab

Custom operations can be thought of as a script file or a list of commands that should be run on a certain survey feature. It can be used to control graphic types, symbology, text, placement, and run math functions. Use MicroStation and InRoads key-ins to enter commands right into the dialog. There is also the option to Copy and Paste from other sources. To view examples of custom operations **<D>** the **Help** button.

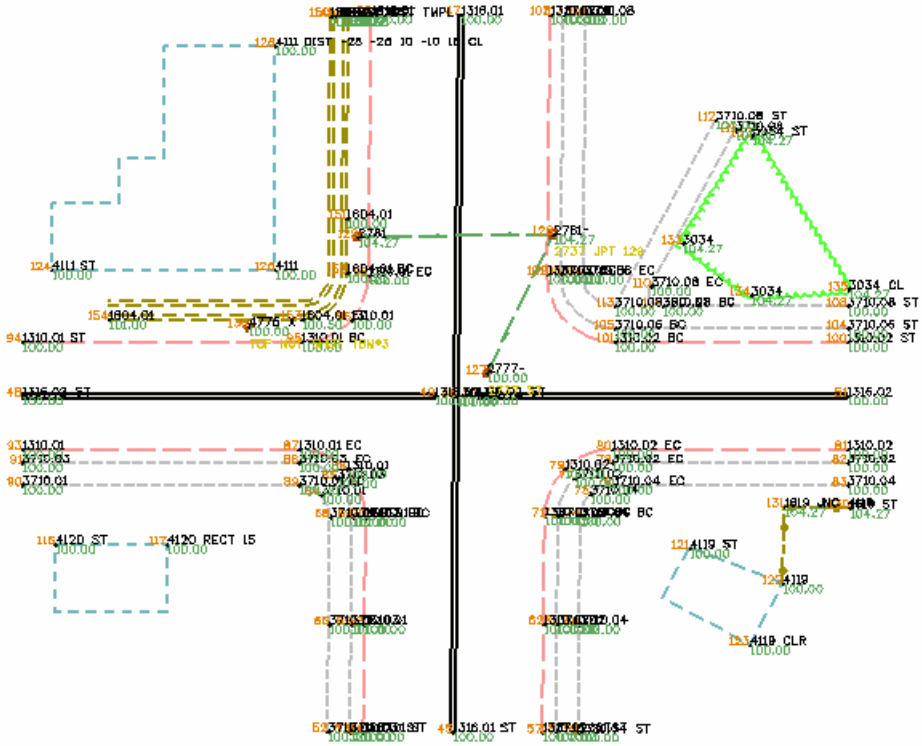


Control Codes

Control Codes tab in the **Feature Table** dialog lists the codes that work with survey planimetric lines, arcs, and shapes. There are additional control codes that work with survey shots and triangulation in a digital terrain model. Each code has an example below.



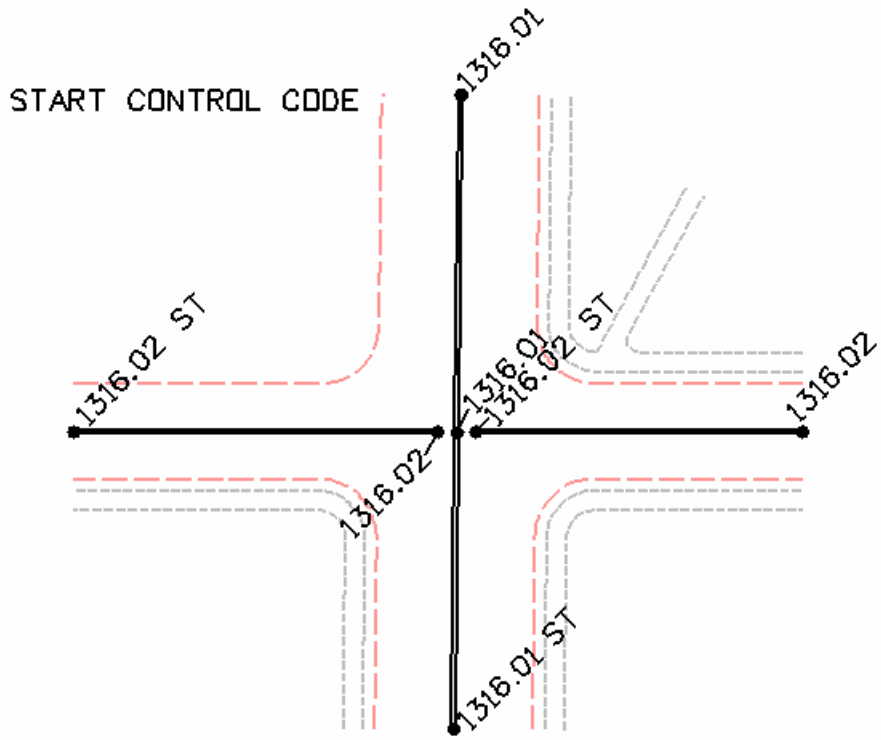
Intersection Control Code example



- Start

  Alpha ***ST*** | Numeric ***1***

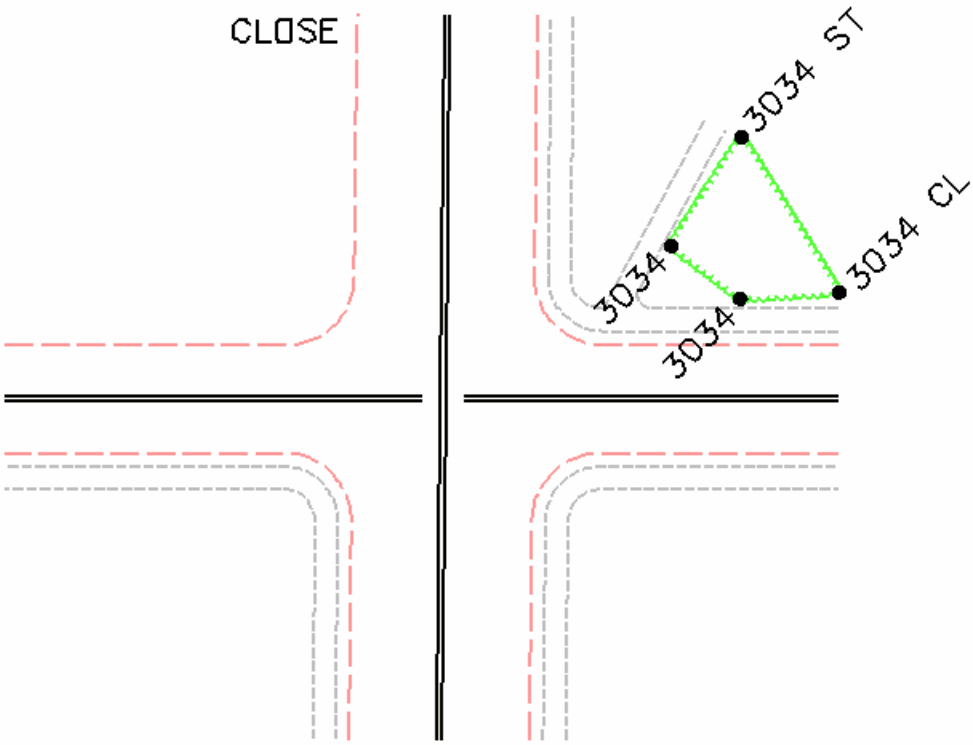
  Control Code Start begins planimetric lines; there is no code for end. To end a line, restart the figure and the previous line will discontinue. See the example below for feature code 1316.02.



- Close

  Alpha ***CL*** | Numeric ***2***

  Control Code Close will create a closed shape from the last shot to the first shot of the feature. Closed shapes in InRoads can be used as Interior or Exterior DTM point types. Closed shapes in MicroStation will become linestrings.



Note: Only a survey feature with a point type Breakline will honor the Close control code when it is pushed to a surface.

- Point of Curvature

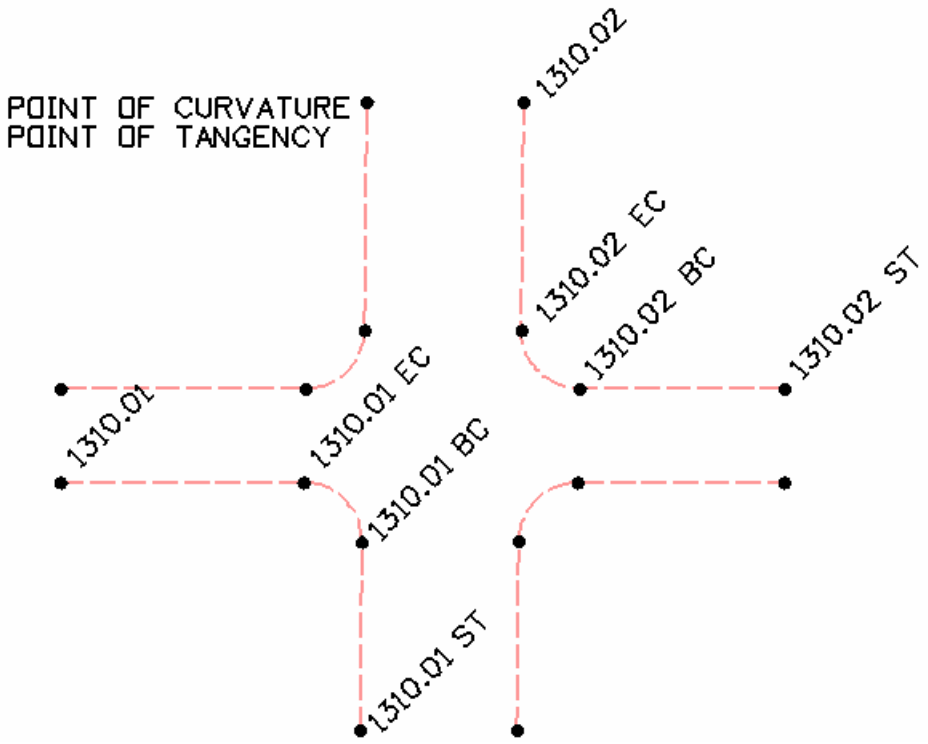
  Alpha ***BC*** | Numeric ***3***

  Control Code Point of Curvature identifies the beginning of the curve. The incoming tangent of the curve controls the degree of curve.

- Point of Tangency

  Alpha ***EC*** | Numeric ***4***

  Control code Point of Tangency identifies the end of the curve. The outgoing tangent of the curve controls the degree of curve



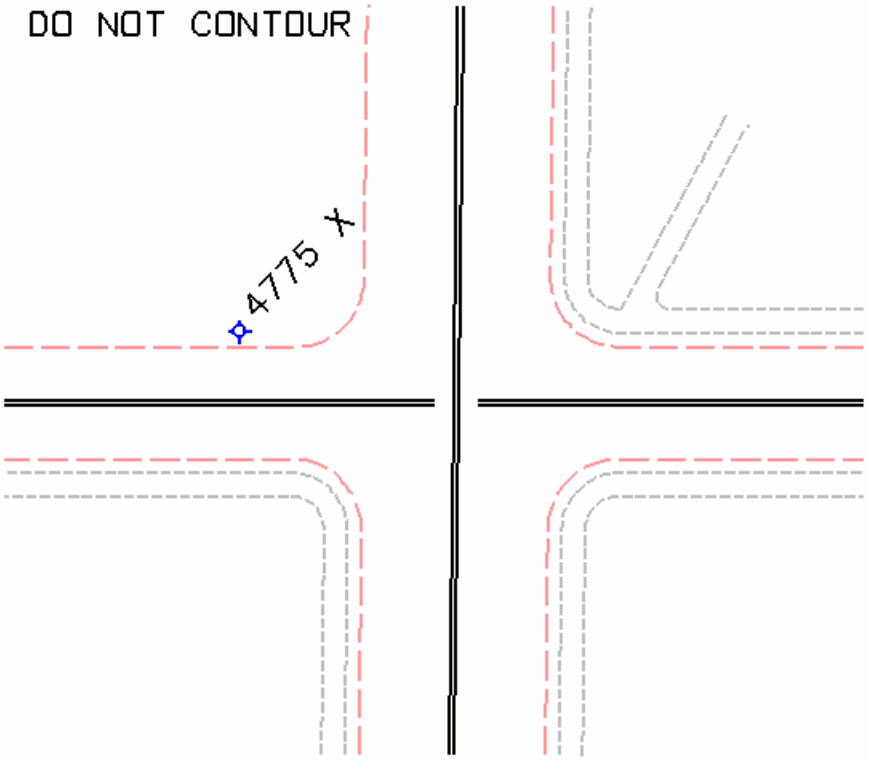
Note: If a single point on arc is taken then the tangent lines are ignored and the curve is generated by the three points PC, POC, and PT.

Note: If more than one point is taken on the arc then the tangent lines are used when calculating the PC and PT of the curve. CDOT has standardized using the control code NT non-tangent to follow all BC and EC shots. Coding with NT will not add calculated PC's and PT's to the linear features. The PC's and PT's will be observed points as in the field.

- Exclude from Triangulation

  Alpha ***X*** | Numeric ***5***

  Control code Exclude from Triangulation identifies points that will not (and should not) be used to generate surface contours. Any point not resting on the terrain should be excluded from triangulation. Points that are coded with "**X**" could include such items as fire hydrants, manhole inverts, benchmarks and control points, valve boxes, and other similar features.



- Random

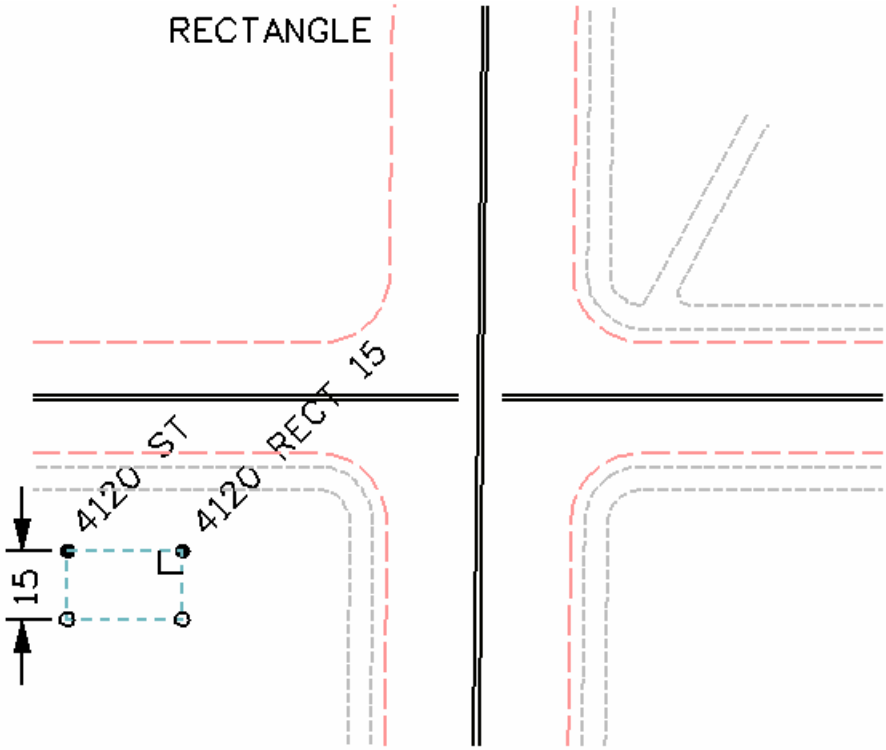
  Alpha ***RND*** | Numeric ***6***

  Control code Random overwrites DTM point types set in the Survey Feature table. For example Breaklines become Random types and Do Not Contour point types become Random points Excluded from triangulation.

- Rectangle

  Alpha ***RECT*** | Numeric ***None***

  Control code Rectangle will draw a rectangle based on two points shot in the field and a measured distance. The two points collected in the filed define the direction of the baseline and the measured distance defines the width. The previous two points collected in the filed define the direction of the baseline. To turn left of the baseline use a negative number (-15); to turn right of the baseline use a positive number (15). Each added point using the Rectangle command will be considered a derived point in Survey.

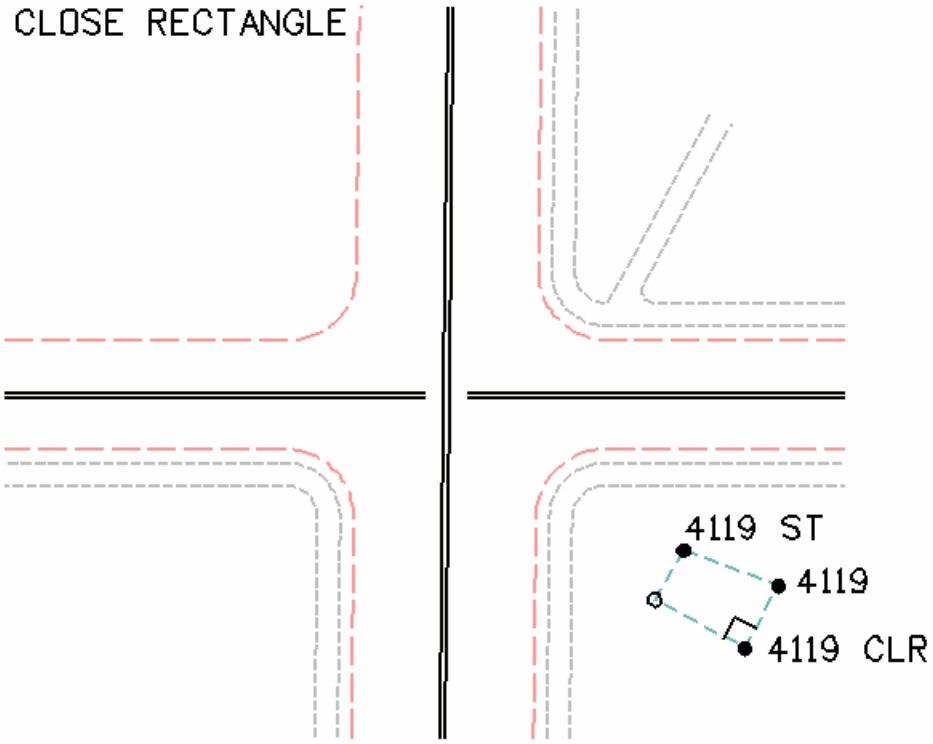


Note: Only a survey feature with a point type Breakline will honor the Rectangle control code when it is pushed to a surface.

- Close Rectangle

  Alpha ***CLR*** | Numeric ***7***

  Control code Close Rectangle will draw a trapezoid based on three points shot in the field. The last two points become the baseline and the fourth point generated will be 90 degrees to the baseline.

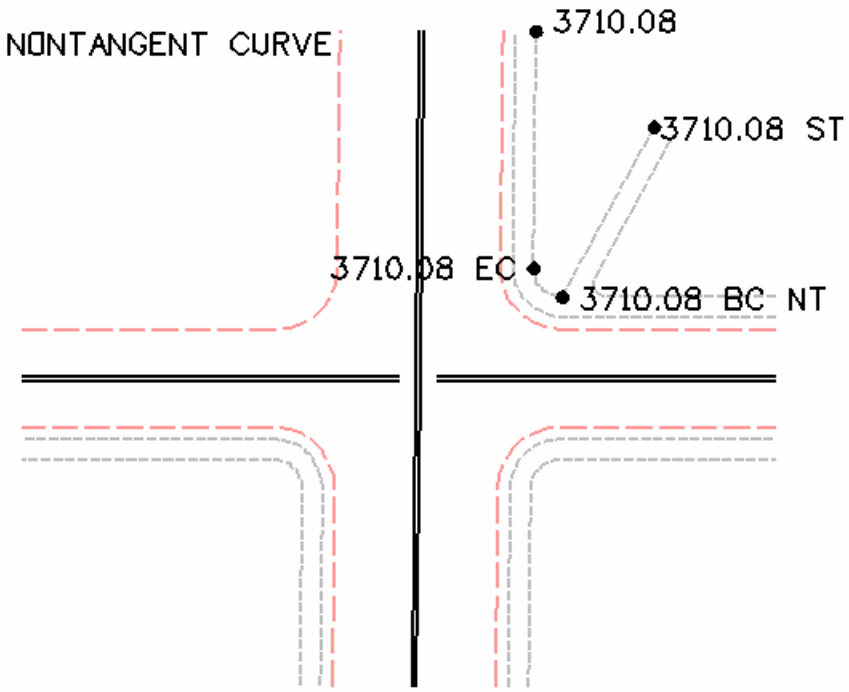


Note: Only a survey feature with a point type Breakline will honor the Close Rectangle control code when it is pushed to a surface.

- Nontangent Curve

  Alpha ***NT*** | Numeric ***8***

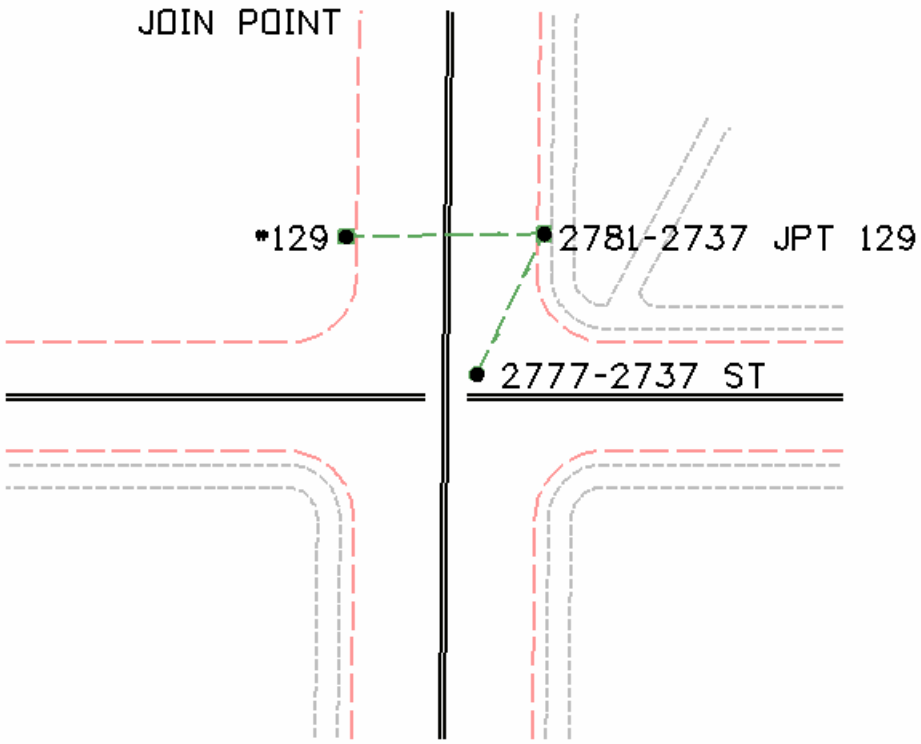
  Control code Nontangent Curve identifies a curve that will be nontangent to either the incoming or outgoing tangent lines. This control code works in conjunction with BC or EC.



- Join Point

  Alpha ***JPT*** | Numeric ***None***

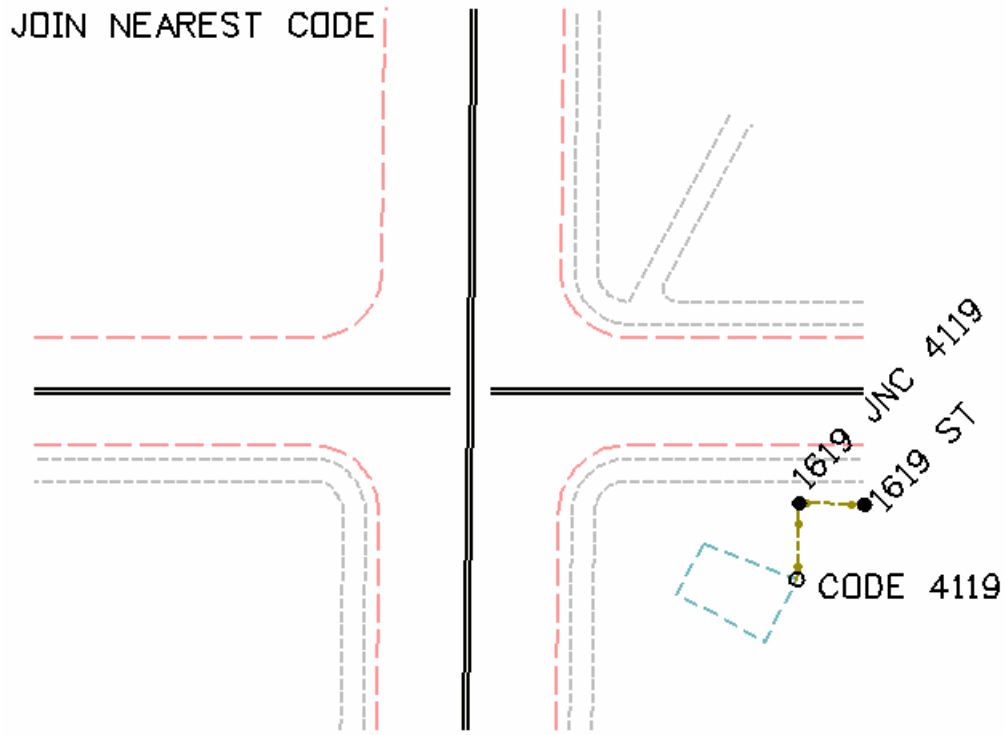
  Control code Join Point will draw a connecting line to the specified point number in the fieldbook using the current feature style.



- Join Nearest Code

  Alpha ***JNC*** | Numeric ***None***

  Control code Join Nearest Code will locate the closest code specified and draw a connecting line using the current feature style.

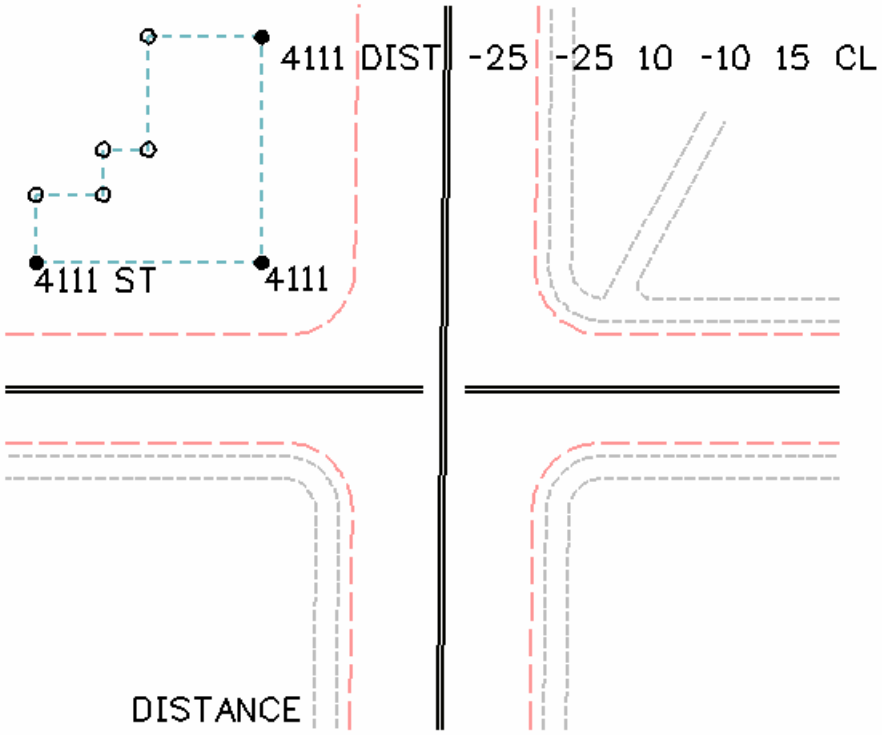


- Distance

  Alpha ***DIST*** | Numeric ***None***

  Control code Distance will continue to draw lines based on measured distances and direction. The previous two points collected in the filed will define the direction the next point will be calculated from. The angle will always be a 90 degree deflection angle, turned looking forward from the last point collected or calculated. To turn left of the baseline use a negative number (-25) to turn right of the baseline use a positive number (10). Each point using the Distance command will be considered a derived point in Survey and will also be used in calculation of DTM surfaces and ALG geometry alignments.

  Note: Attention should be paid to the elevations assigned by this method that the surface is only as good as this info is. There may be work-arounds for these instances, but if accurate info is needed, the effort should be made in the field to collect actual data.

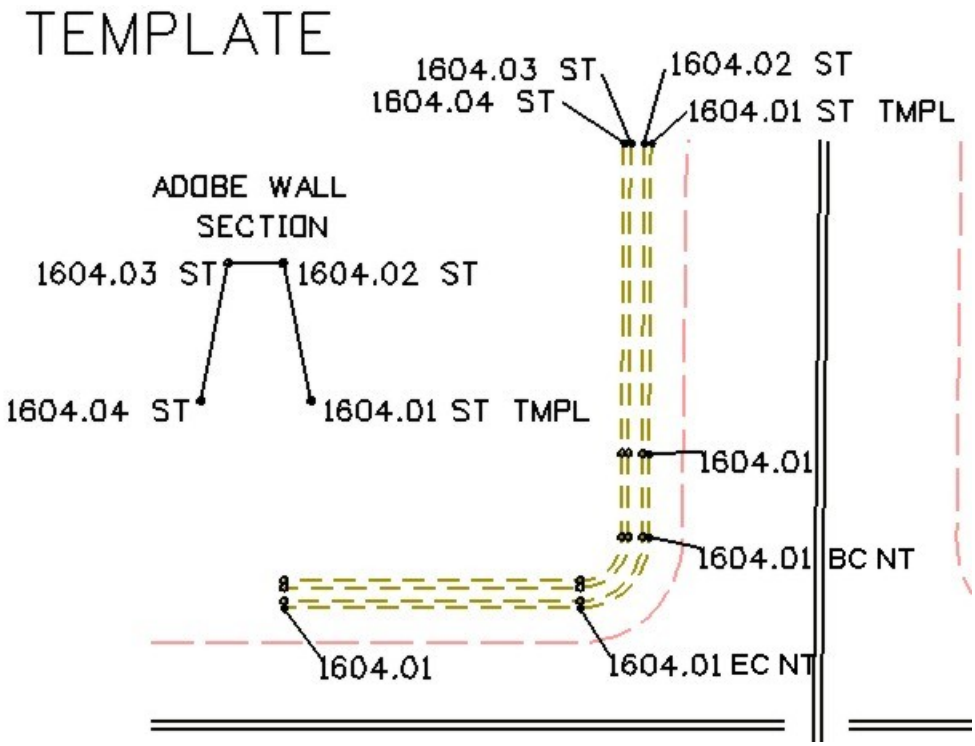


  Note: Only a survey feature with a point type Breakline will honor the Distance control code when it is pushed to a surface.

- Template

  Alpha ***TMPL*** | Numeric ***None***

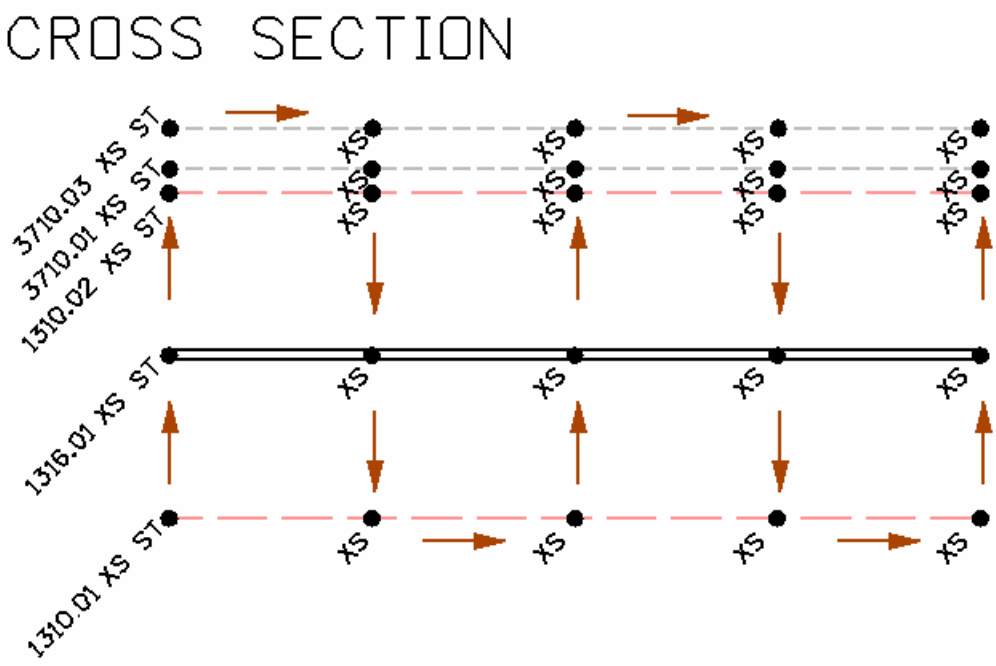
  Control code Template defines multiple survey features that are uniform in distance and elevation from a baseline. Using the template control code will lessen the number of shots needed in the field.



- Cross Section

  Alpha ***XS*** | Numeric ***None***

  Control code Cross Section allows any uniform set of corridor shots to be collected efficiently. Start by collecting the start of each new feature, and then continue to collect the shots in a crossing pattern.



Note: When the raw data is imported into the field book it will convert the code XS to the correct feature code.

- Add to Adjustment Set

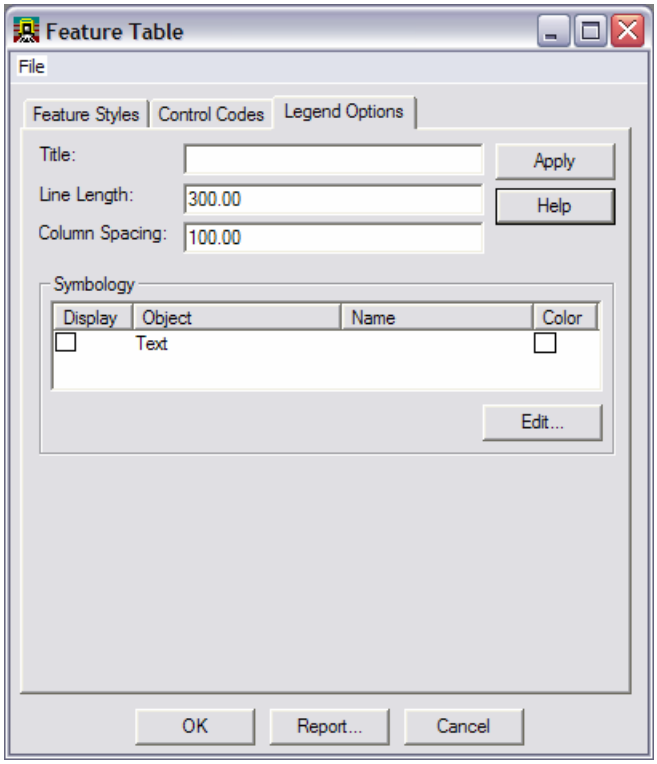
  Alpha ***ADJ*** | Numeric ***None***

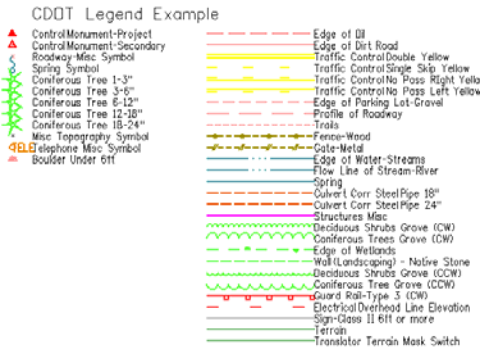
  Control code Add to Adjustment Set defines a sideshot of an unknown point to be included to the adjustment set data.

Legend Options

Legend option tab will generate a legend from the selected features in the list. It will generate two columns. The first column will represent the line, cell, text, or symbol placement and the second column will contain the corresponding description. The Legend Option is not currently part of the CDOT workflow.

- From the pull-down menu, select
  Survey > Feature Table…[Legend Options]





Lab 8 Viewing Survey Feature Table

The Survey Feature Table controls how the graphics are displayed on the screen. These settings are the CDOT standard changes should not be made to the file. However, it is a good to understand what controls the display of the survey data and how the data is interpreted.

Objectives Lab 8

After completing this exercise you will know how to:

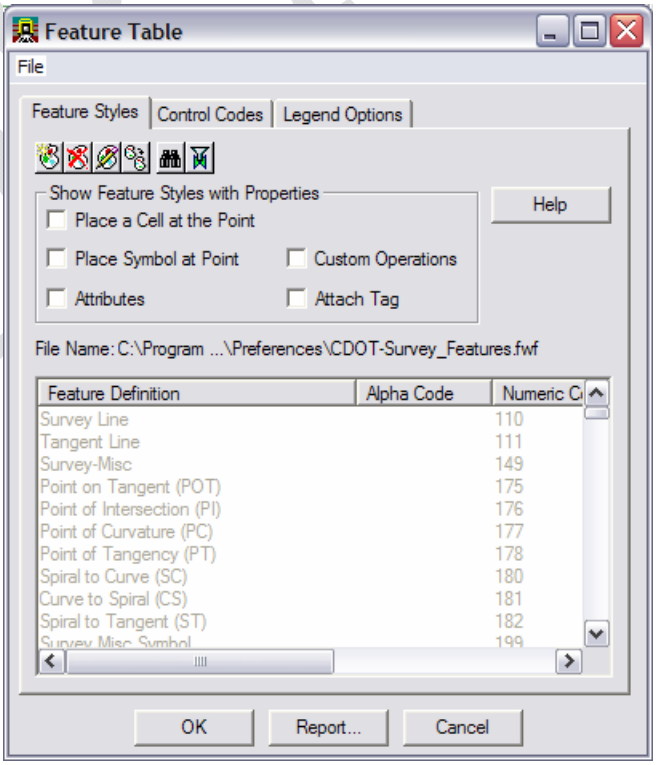
- Open the feature table dialog.
- Find feature codes quickly using the Find Feature command.
- Use the Show Active Codes Only command.
- Use the Feature Styles with Properties option to narrow a lookup.
- Review Custom Operations for a feature.
- Review Control Codes settings.

1. Launch InRoads Survey if it is not already;

    a. Open ***12345SurveyTopo100Scale01.dgn*** from the ***Working*** folder.

    b. Open **12345SURVFieldbook01.fwd** from the ***Field_Books*** folder.

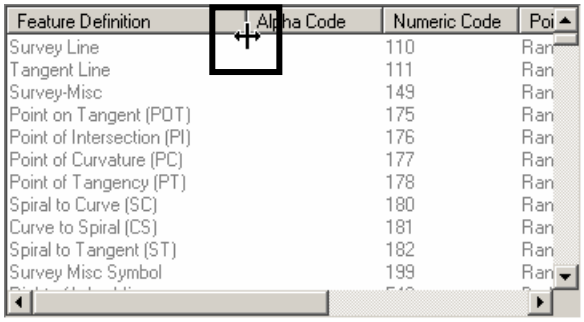
2. From the InRoads Survey pull-down menu, select **Survey > Feature Table**. The **Feature Table** dialog will appear.



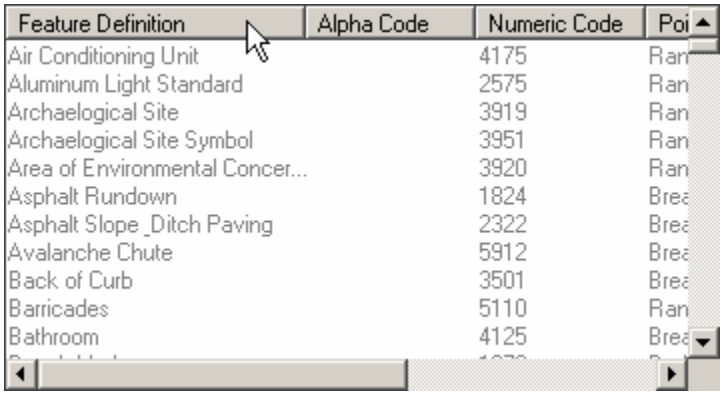
3. Take a minute to scroll through the list of survey codes. Using the scroll bars on the side or using your roller on the mouse.

    - Scroll through the list notice how some of the features are bold. The bold features represent codes that are used in the current fieldbook.

4. Move your cursor to the **Feature Table** and hold on the gray line in the gray title bar between **Feature Definition** and **Alpha Code**. Your cursor will change appearance to a vertical line and arrows, allowing each column in the Feature Table to be resized.



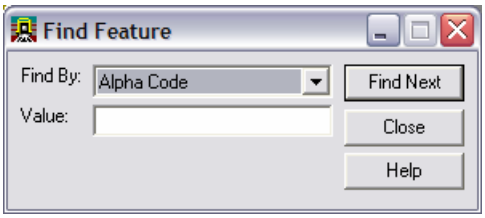
5. Move the cursor to the **Feature Table** and **Select** on the column heading **Feature Definition**. This will resort all the definitions in ascending or descending order.



Added practice

- **<D>** on the **Numeric Code** column twice to sort the codes in ascending and descending order.

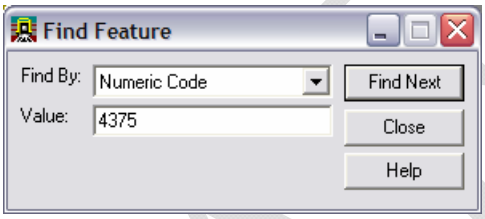
6. In the **Feature Table** dialog **<D>** the **Find Feature** button . The **Find Feature** dialog will open. This tool will quickly jump to the found code in the Feature Table.



7. Change the **Find By:** drop-down box to **Numeric Code**.

8. Key-in the known numeric code for Power Pole ***4375***

9. **<D>** the **Find Next** button. The Feature Table will highlight numeric code **4375**.

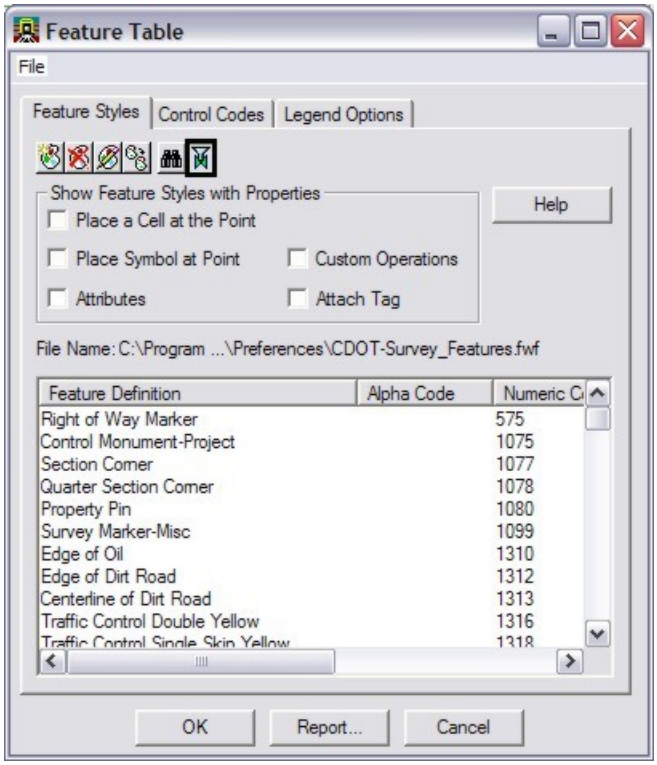


Added practice

- Find the **Numeric Code: *3011***
- Find the F**eature Definition: *Flow Line of Stream-River***

10. **<D>** the **Close** button in the **Find Feature** dialog.

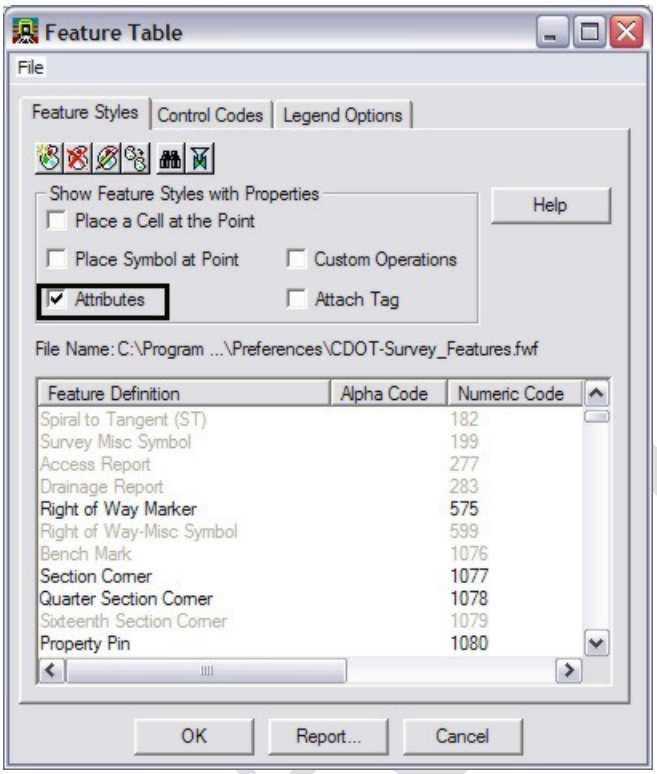
11. **<D>** the **Show Active Codes Only** button. This toggle button will filter out all of the unused feature codes to efficiently view only the active codes.



12. Review the points collected in the active fieldbook.

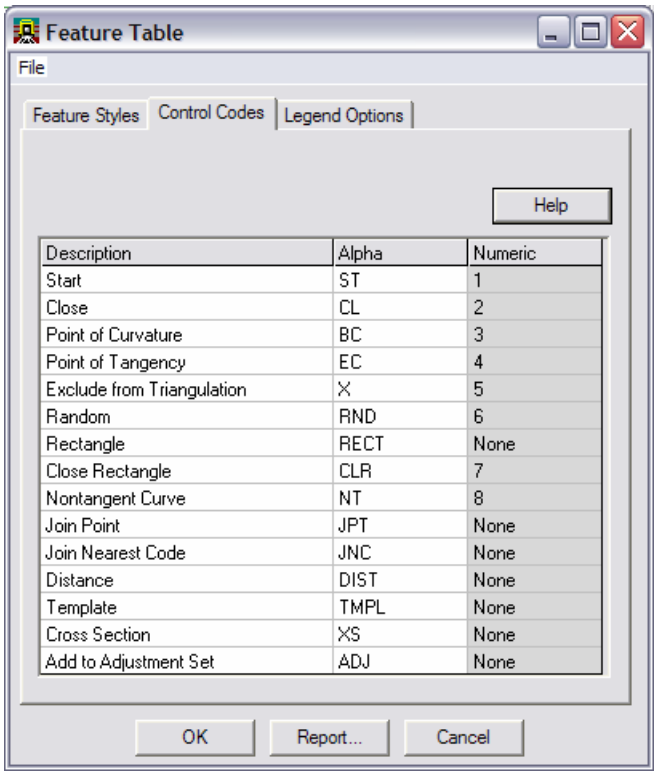
13. Toggle off the **Show Active Codes Only** to see all the available codes again.

14. In the ***Show Feature Styles with Properties*** section check on **Attributes**. Notice how the feature list filters and displays only the survey features that have an attribute defined.



15. Uncheck the Properties to see all the codes again before continuing.

16. Select the **Control Codes** tab and review. Control Codes helps in the creation of planimetrics.

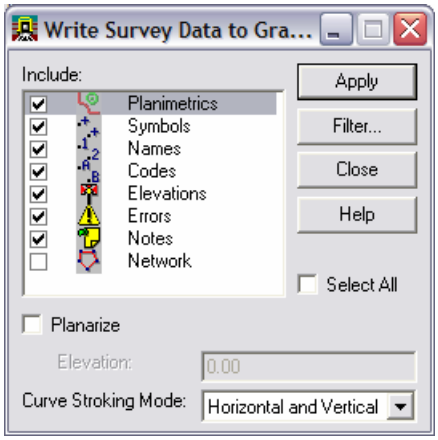


17. **<D>** the **Cancel** button. The **Feature Table** dialog will close not saving any changes.

Chapter 4 Exporting the Fieldbook – Overview

Write Survey Data to Graphics dialog

Writing Survey data to graphics creates the MicroStation design file (DGN) basemap. Once the file has been saved to a MicroStation design file there no longer is a link between the InRoads Survey fieldbook and MicroStation graphics. If there are changes that need to be made to the graphics, modify the InRoads Survey fieldbook and then re-export the graphics.



Dialog Items:

- **Planimetrics** – if checked Planimetrics such as lines, arcs, and cells will be saved to the design file
- **Symbols** – if checked a tic mark representing the location of the shot will be saved to the design file.
- **Names** – if checked the point name of the shot will be saved to the design file.
- **Codes** - if checked the point code of the shot will be saved to the design file.
- **Elevations** – if checked the point elevation of the shot will be saved to the design file.
- **Errors** – if checked any errors in the fieldbook will be saved to the design file.
- **Notes** – if checked any notes in the fieldbook will be saved to the design file.
- **Network** – if checked any traverse legs will be saved to the design file.
- Apply **Apply** – will save the checked items to the design file
- Filter... **Filter**- will allow the user to include or exclude any feature codes by a set of rules. Only the feature codes that pass through the filter will be saved to the design file.

Note: The symbology for Symbols, Points, Elevations, Notes, Errors, and Codes is controlled in the **Survey Options** dialog.

Planarize

- **Elevation** – if checked all points will place at a defined elevation.

Curve Stroking Modes

Curves generated from Survey are chorded arcs based on the Chord Height distance in the **Survey Options** dialog. MicroStation will generate a number of small line segments to represent the arc. There are three settings for generating arcs in 2D and 3D graphics.

- Horizontal and Vertical

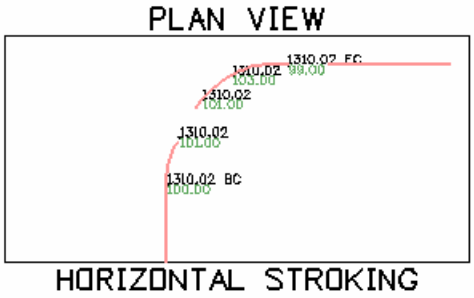
  The curve is created by multipoint splines in the x, y, and z directions. In extreme variations in elevations unwanted sag or crest of a curve may occur.

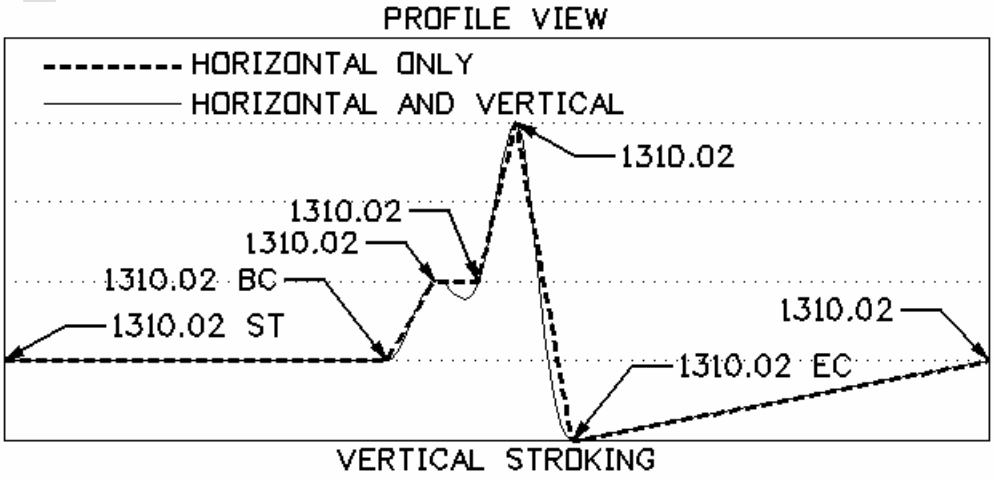
- Horizontal Only

  The curve is created by multipoint splines only in the x and y directions. The elevations or z values of the points are interpolated linearly between points.

- Do Not Stroke

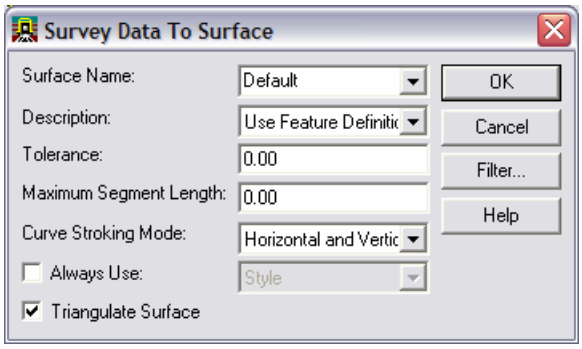
  The curve is not created. It will be represented as linear elements between points.





Survey Data to Surface dialog

Writing Survey data to surface creates the Digital Terrain Model (DTM). Each feature is triangulated based on the Point type set in the Survey Feature Style. The intelligence built in to the feature comes from the Preference Style setting in the Survey Feature Table.



Dialog Items:

- **Surface Name**

  Key-in field to create a new empty surface for export from survey. If a surface has already been created, choose it from the dropdown arrow.

- **Description**

  Each feature in the DTM will be unique. When the feature is pushed to the DTM it will use one of the following options from the Feature table for the description.

  - Use Feature Definition
  - Use Attributes
  - Use Codes

- **Tolerance**

  Tolerance will set the minimum distance between points. If there are any points closer than the minimum, the points will be dropped from the surface. If the value is set to 0 then tolerance is ignored and all points will be used in the surface.

- **Maximum Segment Length**

  Maximum Segment Length defines the point density of an element. If points were taken every 100 feet and the segment length was set to 25 feet then the result would be three additional points used in the triangulation.

Curve Stroking Mode

Curve Stroking Mode defines a curve horizontally and vertically. Curves in InRoads are defined by short line segments from the **Survey Options** dialog Chord Height.

- ***Horizontal and Vertical***
  The curve is created by multipoint splines in the x, y, and z directions. If extreme variations in elevations exist, unwanted sag or crest of a curve may occur.
- ***Horizontal Only***
  The curve is created by multipoint splines only in the x and y directions. The elevations or z values of the points are interpolated linearly between points.
- ***Do Not Stroke***
  The curve is not created. It will be represented as linear elements between points

Always Use:

Defines what each feature style name will be in the surface. CDOT has defined a Style for each survey feature that corresponds to an InRoads Feature Style. By default if it is unchecked the feature style will be assigned in the following order.

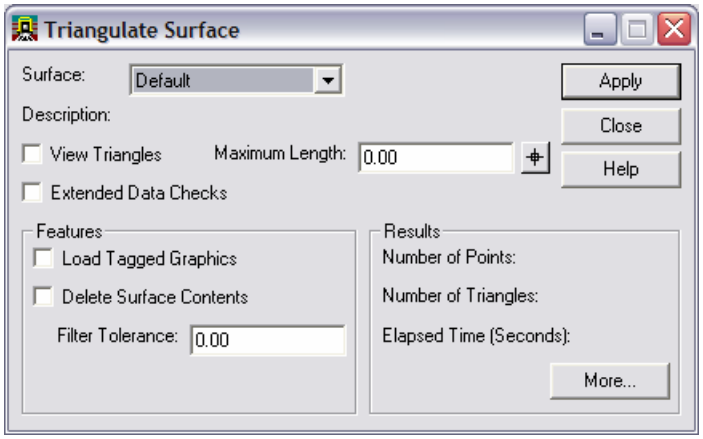
- **Style** – Preference Style name defined in the feature table.
- Alpha Code
- Numeric Code

Triangulate Surface

If checked the **Triangulate Surface** dialog will appear after the surface has been exported.

Triangulate Surface dialog

This dialog will appear when check triangulate surface in the **Survey to Surface** dialog. Exporting Survey data to Surface without triangulating it will result with the data in the surface, but the triangle network will not exist yet.



Dialog items:

- **Surface** – drop down box shows the active surface by default, other surfaces selectable
- **View Triangles** – displays the dynamic triangles in the MicroStation view as the surface is triangulated.
- **Extended Data Checks** - checks DTM integrity (during triangulation) as to crossing breaklines and miss-matched elevations
- **Maximum Length** - maximum length any one triangle segment (leg) can span during the triangulation process. If set to 0, triangle legs can extend to any length. Used to constrain triangulation to prevent unnecessary 'surface' data.
    - **Target** button – define a distance by picking two points in a MicroStation view

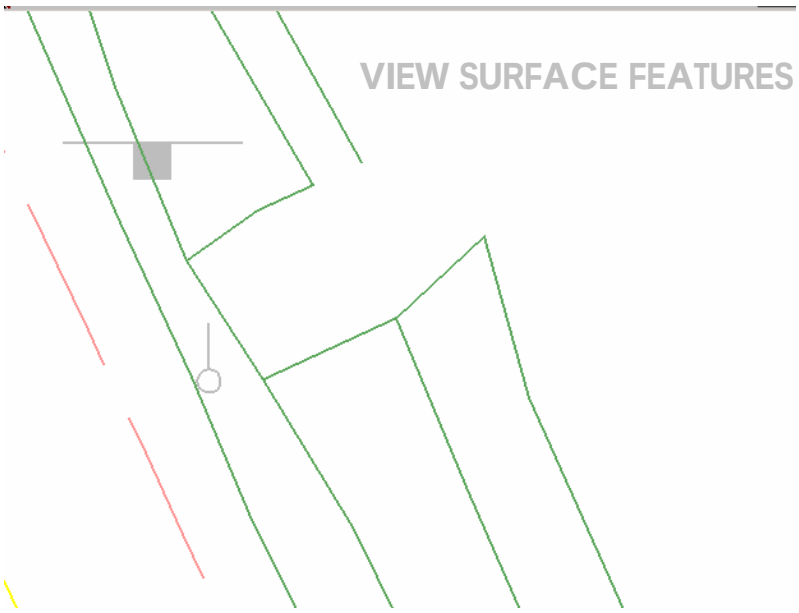
- **Load Tagged Graphics** – scans the design file for any InRoads tagged data and loads the elements into the surface.
- **Delete Surface Contents** – empties the surface prior to adding any tagged elements
- **Results** – readout of triangulation outcome
- 

More – opens the **Surface Properties** dialog

Multiple Feature coding and the DTM

- Rule #1 Multicoded linear features to be triangulated

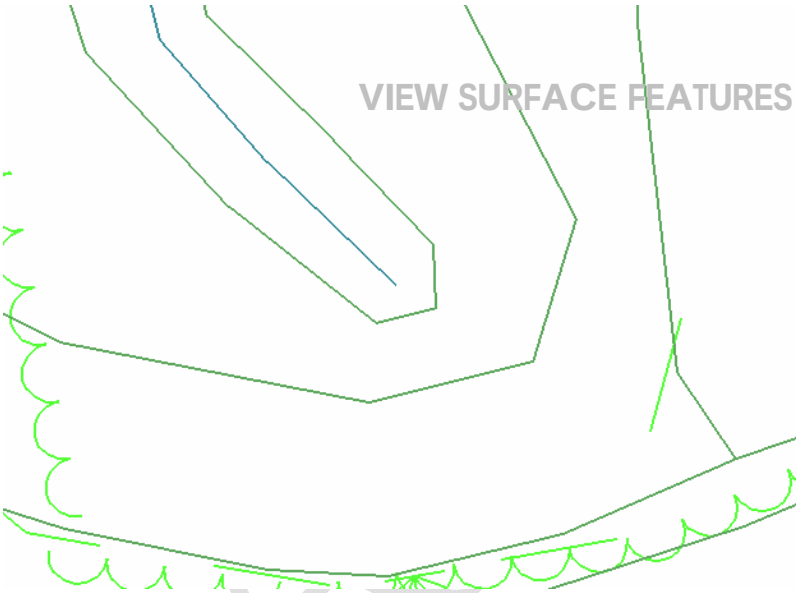
  Survey linear features that are also DTM point type breaklines will be moved to the Surface. When duplicate points are triangulated, one will be dropped and will create a shared triangulation point.



- Rule #2 Multicoded linear features with random points to be triangulated

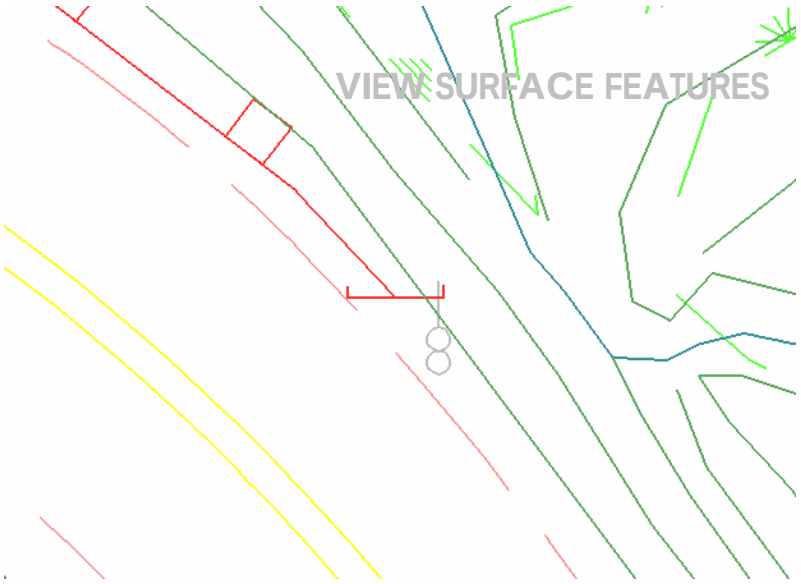
  Survey linear features and random points will be moved to the Surface. However, when duplicate points are triangulated the breakline will override and the random point will be dropped entirely from the surface.

  The only way to keep this from happening is to exclude the random point from triangulation with a control code “X”. This will allow the feature to remain part of the surface.



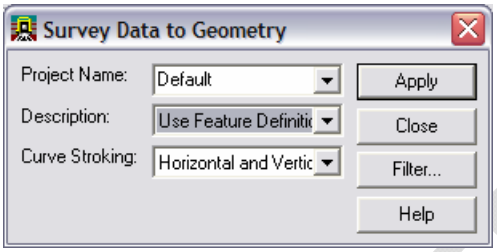
- Rule #3 Multicoded linear features excluded from triangulation with random points to be triangulated

  Survey linear features that are excluded from triangulation and random point types will be moved to the Surface. When duplicate points are triangulated the linear feature will remain and the random point will be used for triangulation.



Survey Data to Geometry dialog

Saving Survey Data to Geometry creates a Geometry Project (ALG) which can contain multiple horizontal and vertical alignments from any planimetric linear feature. Any single point such as property corners or trees will also be saved to the same Geometry Project and placed into the Cogo buffer.



Dialog Items:

- ***Project Name***

  Key-in field to create a new empty Geometry Project for export from survey. If a Geometry Project has already been created, choose it from the drop down arrow.

- ***Description***

  Each alignment in the Geometry Project will be unique. When the alignment is pushed to the Geometry Project it will use one of the following options from the Feature table for its description.

  - ***Use Feature Definition***
  - ***Use Attributes***
  - ***Use Codes***

Curve Stroking

Curve Stroking mode defines a curve horizontally and vertically. Curves in InRoads are defined by short line segments from the **Survey Options** dialog Chord Height.

- Horizontal and Vertical
  The curve is created by multipoint splines in the x, y, and z directions. In extreme variations in elevations unwanted sag or crest of a curve may occur.
- Horizontal Only
  The curve is created by multipoint splines only in the x and y directions. The elevations or z values of the points are interpolated linearly between points.
- Do Not Stroke
  The curve is not created. It will be represented as linear elements between points

Lab 9: Exporting Survey Data to Graphics *Overview*

InRoads Survey can export the fieldbook in 3 different formats. These formats are CAD graphics, Surfaces, and Alignments. Begin by exporting graphics to a MicroStation DGN file. This will create a basemap to be used and referenced by the designers.

Objectives Lab 9

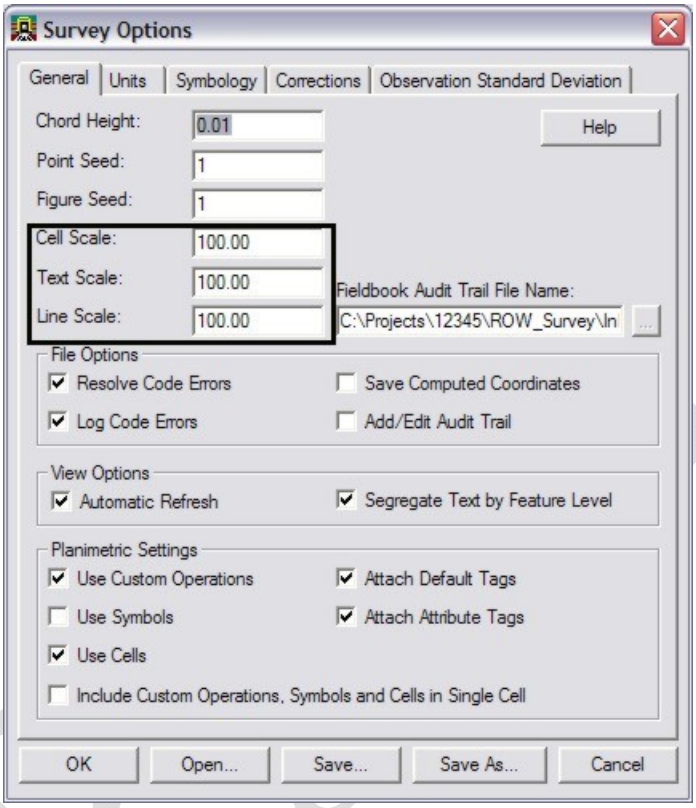
After completing this exercise you will know:

- What to modify in Survey Options prior to exporting.
- How to export a Survey Fieldbook to a design file.
- The difference between CAD and Fieldbook viewing.
- How to work with Survey levels and level filters.

1. Launch InRoads Survey if it is not already;
    a. Open ***12345SurveyTopo100Scale01.dgn*** from the ***Working*** folder.
    b. Open **12345SURVFieldbook01.fwd** from the ***Field_Books*** folder.
2. Disable the display of any dynamic graphics shown on the screen. Toggle on **View Planimetrics** button  turn off any other symbols, names, codes, etc. that may have enabled.
3. Verify the **12345SURVFieldbook01.fwd** fieldbook is active. The fieldbook that is active has the red box around the fieldbook button.
4. To modify the scale as it relates to cells, text, and linestyles go to **Tools > Survey Options > [General]**. The **Survey Options** dialog will appear.

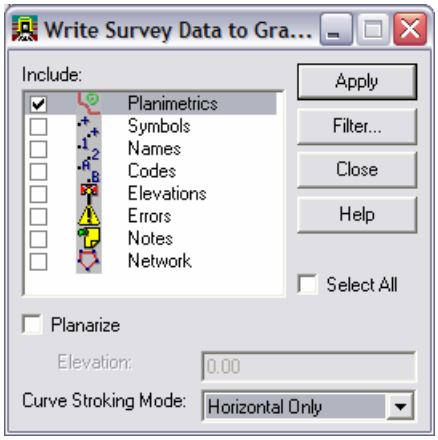
5. Set the Scales for ***Cell***, ***Text***, and ***Line*** as shown below.

   - Cell Scale:***100***
   - Text Scale:***100***
   - Line Scale:***100***



6. **<D>** the **Save** then **OK** buttons. The **Survey Options** dialog will close.

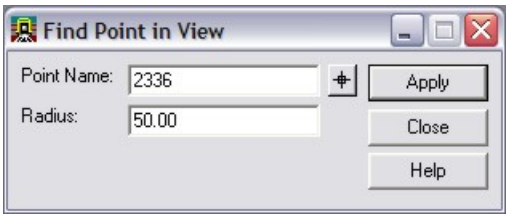
7. Once the settings are complete, to write the survey data to graphics, go to the pull-down **Survey > View Survey Data > Write Survey Data to Graphics...** the **Write Survey Data to Graphics** dialog will open.



Note: By default if having any dynamic graphics still toggled on, those same components would be toggled on in the Write **Survey Data to Graphics** dialog.

8. Set Curve Stroking: **Horizontal Only**
9. **<D>** the **Apply** button. The graphics will be created in the design file.
10. Watch the **Status Bar** as the graphics are written to the design file.
11. **<D>** the **Close** button in the **Write Survey Data to Graphics** dialog.
12. Toggle off all View Survey buttons.

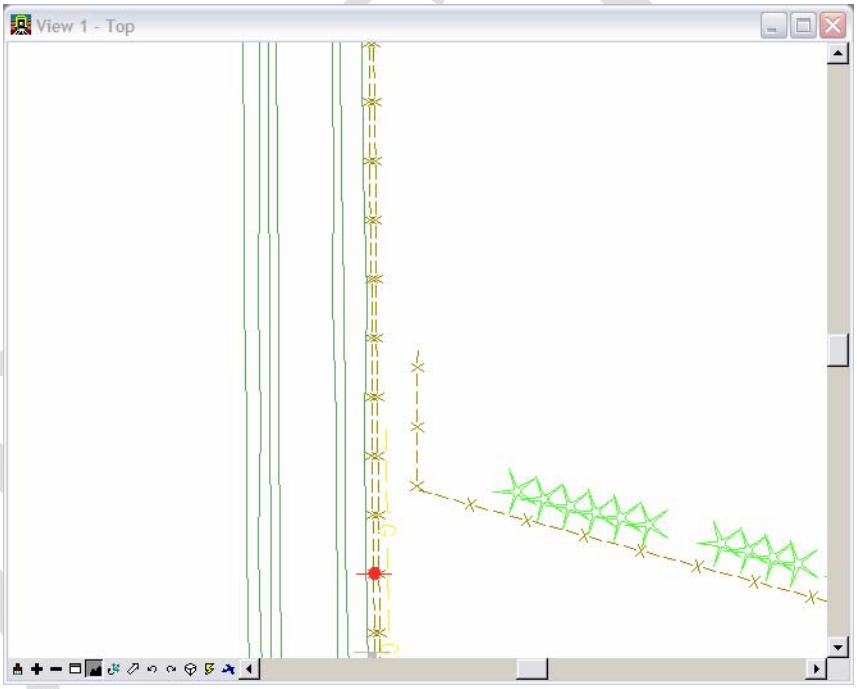
13. From the InRoads Survey pull-down **Survey > Find a Point in a View** the **Find a Point in a View** dialog will appear.



14. Key-in Point Name: ***2336***

15. Key-in Radius: ***50***

16. **<D>** the **Apply** button. The MicroStation view will center to shot number ***2336***.



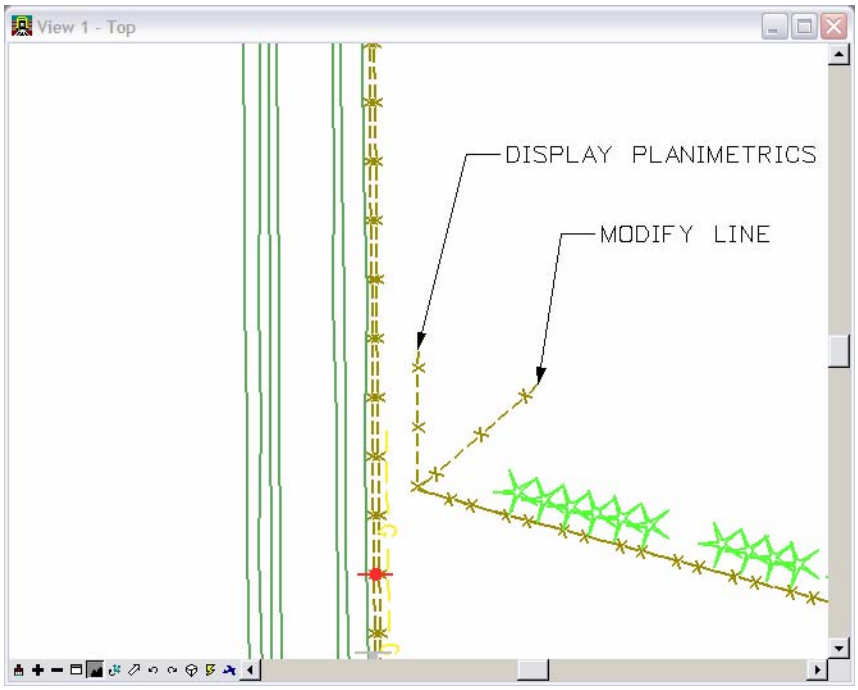
Note: The graphics displayed are MicroStation elements written to the design file. The graphics become independent from the survey data. There is no linkage from the MicroStation graphics back to the survey data. Therefore it is important to remember that if changes to the survey data are made, the survey data will need to be rewritten to the CAD file after editing.

17. To demonstrate this concept, use MicroStation tools to manipulate the displayed survey graphics.

18. Delete, move, or otherwise modify the on-screen graphics.

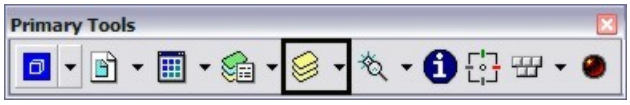
19. Review the survey fieldbook  to verify data integrity.

20. Toggle on dynamic display of **Planimetrics**  . Notice the location of the fieldbook data vs. the modified MicroStation graphics.

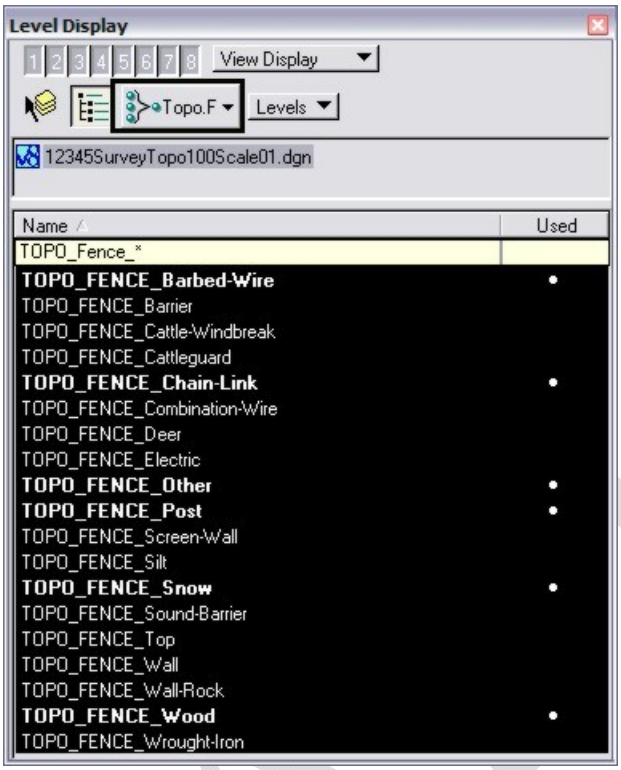


21. Toggle off dynamic display of **Planimetrics**  .

22. From the MicroStation **Primary Tools** toolbar **<D>** the **Level Display** dialog. The **Level Display** dialog will appear.

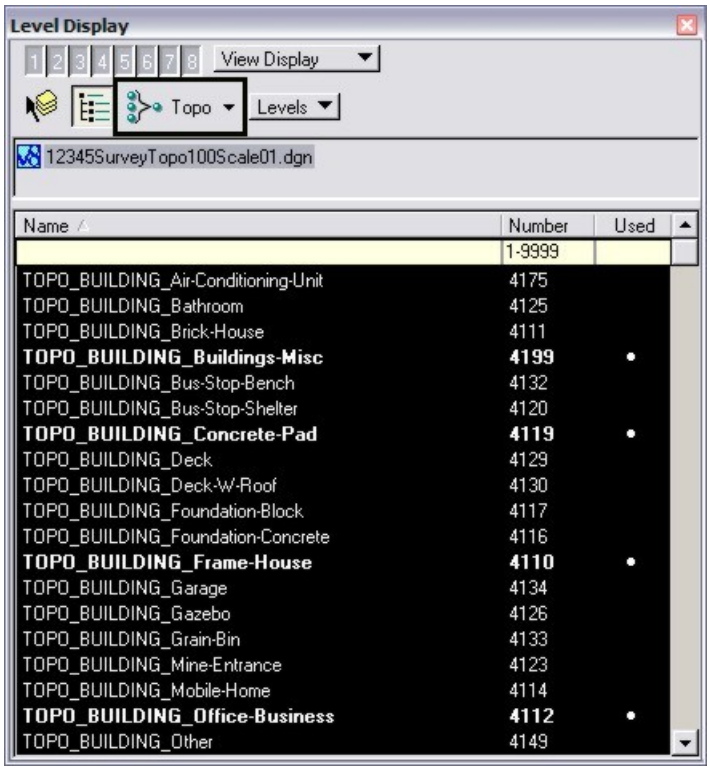


23. From the filters pull-down select the **Topo > Fence** filter.



24. Practice turning **ON** and **OFF** the fence levels in MicroStation.

25. From the filters pull-down select the **Topo** filter. This will help when viewing only the levels that pertain to the survey data.



Added practice:

- Sort the **Name**, **Number**, and **Used** columns by clicking on them.
- Right click on the level names to view the level popup options. Practice using these shortcuts.

26. Close the **Level Display** dialog.

Lab 10: Exporting Survey Data to Surface *Overview*

Exporting to a surface DTM will create a triangulation network used for displaying contours, features and spot elevations.

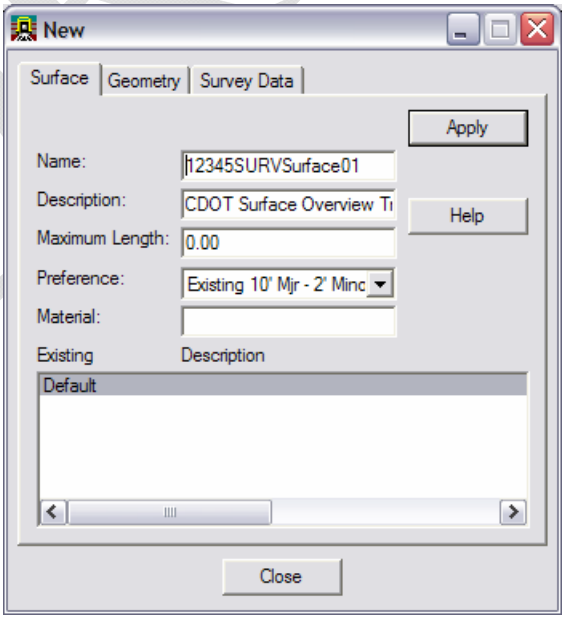
Objectives Lab 10

After completing this exercise you will know:

- How to export a Survey Fieldbook to a Surface DTM file.
- How to triangulate a surface.
- How to set surface property for display.
- How to save a Surface.

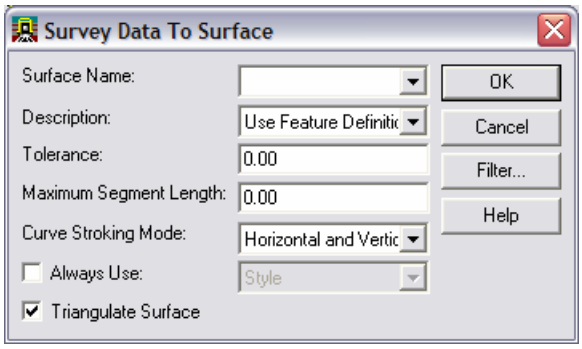
1. Verify the **12345SURVFieldbook01** fieldbook is active. The active fieldbook will have a red box around the fieldbook button.
2. From the pull-down menu, select **File > New**. The **New** dialog will appear.
3. Select the ***Surface*** tab.
4. Key in the surface Name: ***12345SURVSurface01***
5. Key in the Description: ***CDOT Surface Overview Training***

   Note: Key in any additional file information in the **Description** field of the dialog, such as **Date**, **User**, and **Design file** name. There are up to 64 characters available in the Description field.
6. Keep the **Maximum Length** set to ***0.00***
7. Set ***Preferences***: **Existing 10' Mjr – 2' Minor**

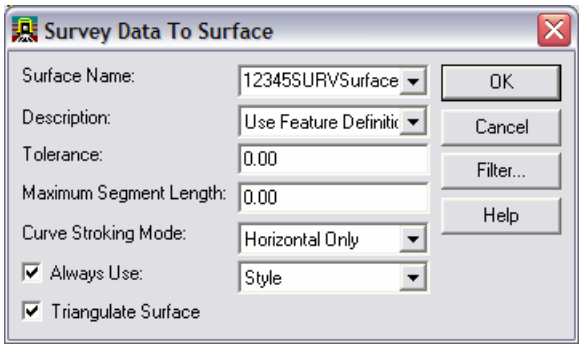


8. **<D>** the **Apply** then **Close** buttons.

9. From the pulldown menu **Survey > Survey Data to Surface**. The **Survey Data to Surface** dialog will appear.

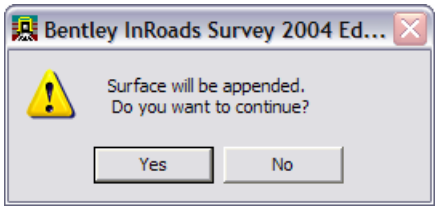


10. Pick ***12345SURVSurface01*** in the ***Surface Name*** field.
11. Set the ***Description*** to **Use Feature Definition**
12. Keep the ***Tolerance*** and ***Maximum Segment Length*** set to ***0.00***
13. Set the ***Curve Stroking Mode*** to **Horizontal Only**
14. Check ***Always Use***: **Style**
15. Check **Triangulate Surface**



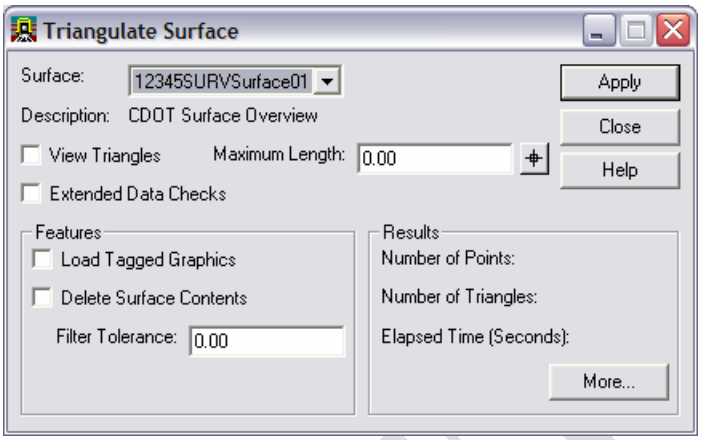
16. **<D>** the **OK** button.

    Note: An alert dialog will appear notifying that the surface will be appended. This is alright to do so because this Surface was created with no data in the Surface.



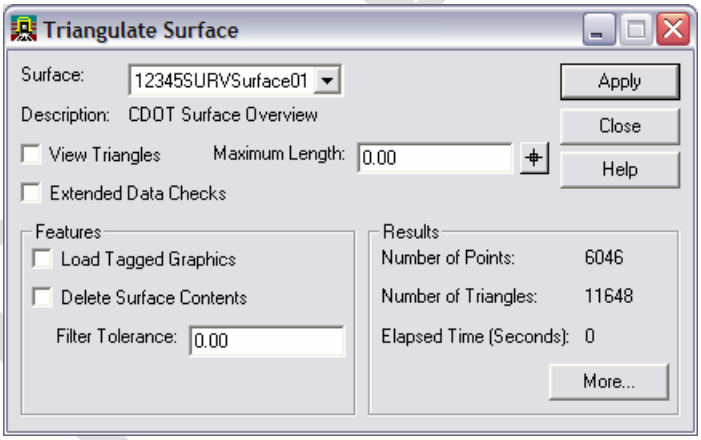
17. **<D>** the **Yes** button.

18. The **Alert** dialog will close and the **Triangulate Surface** dialog will appear.

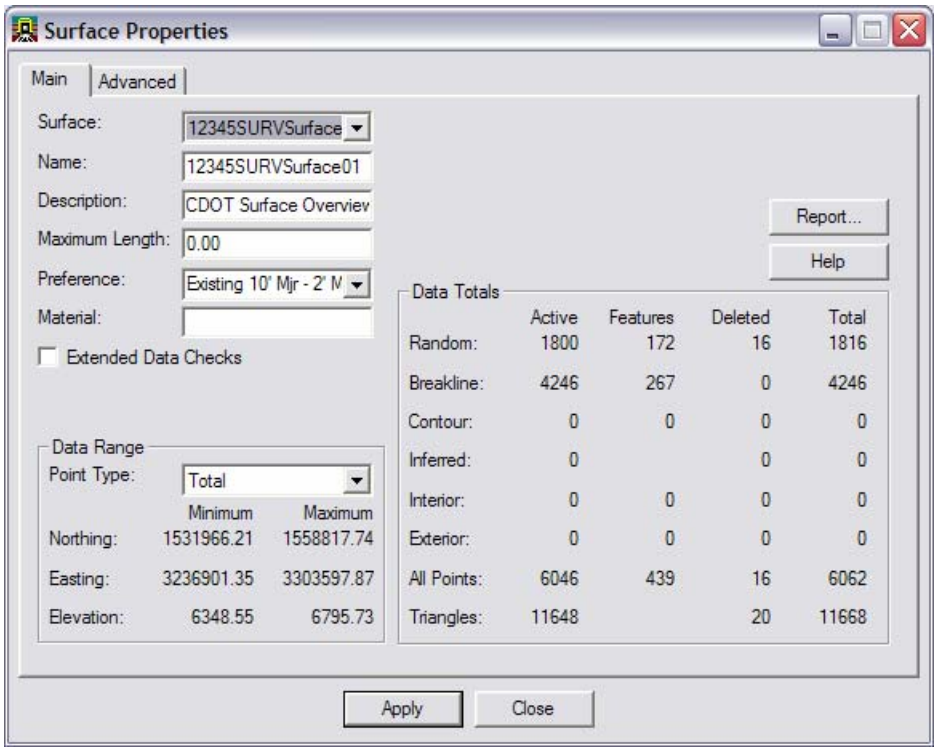


19. Leave all settings unchecked. **Maximum Length** should be set to **0.00**.

20. **<D>** the **Apply** button. The **Results** section of the dialog should look similar to the image below.



21. **<D>** the **More** button. The **Surface Properties** dialog will appear.



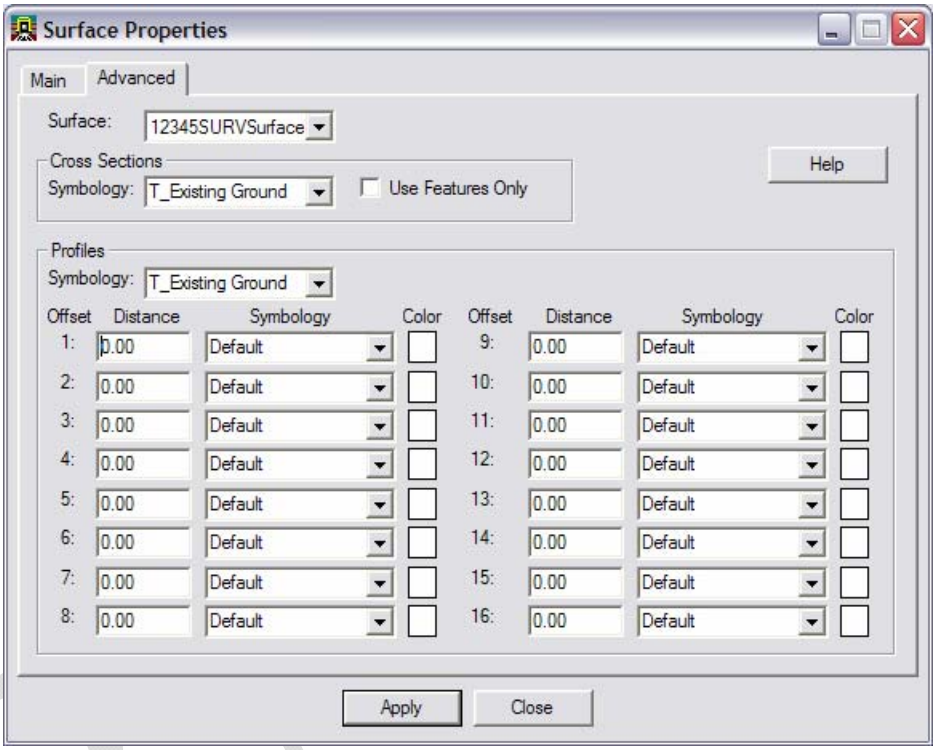
22. Verify the correct surface is being used ***12345SURVSurface01***.

23. Review the section for **Data Range**. The Easting, Northing, and Elevation values should fall within the project limits.

24. **<D>** the ***Advanced*** tab.

25. In the Cross Sections Section select
Symbology: T_Existing Ground

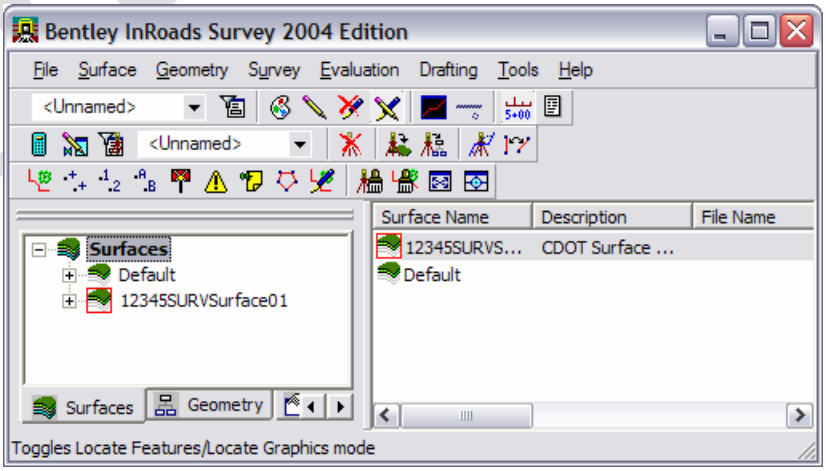
26. In the Profiles section select
Symbology: T_Existing Ground



27. **<D> Apply** then **Close** buttons in the **Surface Properties** dialog.

28. **<D>** the **Close** button in the **Triangulate Surface** dialog.

29. Use the **Workspace** pane scroll **arrows** to view the **Surfaces** tab.

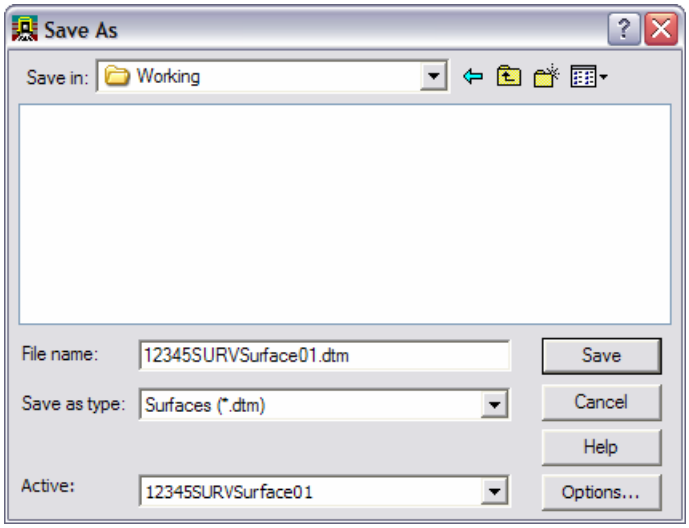


30. Verify **12345SURVSurface01** is the active surface.

Note: To change the active surface from the pull-down menu **Surface > Active Surface**; highlight the surface name and **<D>** the **Apply** button.

31. From the pull-down **File > Save > Surface**. The **Save As** dialog will appear with the **Save as type** set to **Surfaces (*.dtm)**.

32. Verify the correct project directory.
C:\Projects\12345\ROW_Survey***Working***



33. The file name should match the **Active** name at the bottom of the **Save As** dialog. If necessary, use the drop-down arrow in the **Active** field and reselect the desired name to ensure the saved file name will match the surface name.

Note: Ensuring that the saved Surface name in the project folder matches the Surface name displayed in InRoads explorer will minimize any confusion.

34. **<D>** the **Save** then **Cancel** buttons. The file will be saved to disk and the **Save As** dialog will close.

Lab 11: Exporting Survey Data to Geometry *Overview*

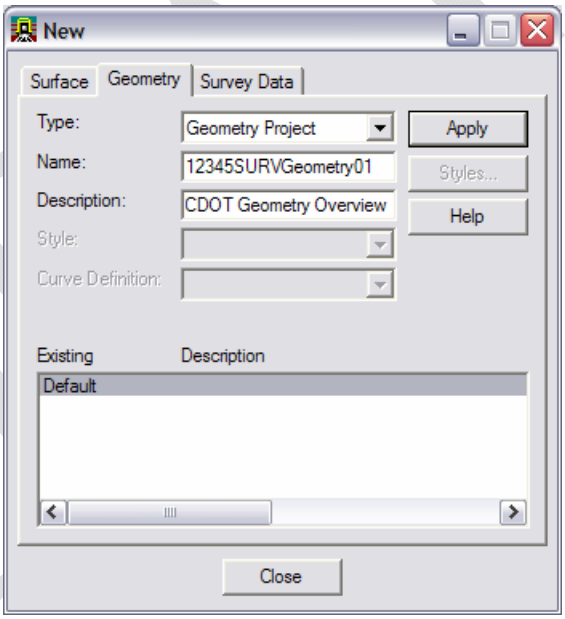
These steps show how to export the electronic fieldbook to a Geometry Project or ALG file. Exporting to an ALG file will create horizontal and vertical alignments. InRoads refers to all exported topographic strings as alignments. InRoads will also write all survey shot locations to the Cogo buffer. The alignments and Cogo points will then be available for use for Right-Of-Way or design purposes.

Objectives Lab 11

After completing this exercise you will know:

- How to export a Survey Fieldbook to a Geometry Project.
- How to view the geometry project in the InRoads interface.
- How to save a Geometry Project.

1. Verify the ***12345SURVFieldbook01*** fieldbook is active. The fieldbook that is active has the red box around the fieldbook button.
2. From the pull-down menu, select **File > New**. The **New** dialog will appear.
3. Select the ***Geometry*** tab.

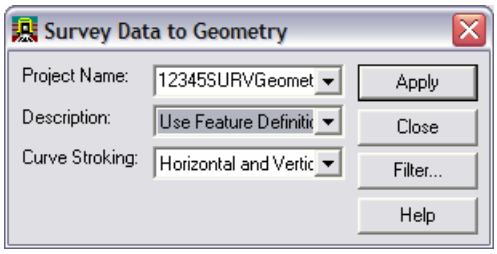


4. From the type pick list verify the ***Type*: Geometry Project**
5. Key in the geometry ***Name***: ***12345SURVGeometry01***
6. Key in the ***Description***: ***CDOT Geometry Overview Training***

Note: Key in any additional file information in the **Description** field of the dialog, such as **Date**, **User**, and **Design file** name. There are up to 79 characters available in the Description field.

7. **<D>** the **Apply** and **Close** buttons.

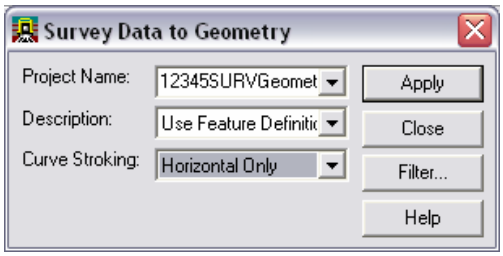
8. From the pull-down menu, select **Survey > Survey Data to Geometry**. The **Survey Data to Geometry** dialog will appear.



9. In the ***Project Name***: select from the list ***12345SURVGeometry01***

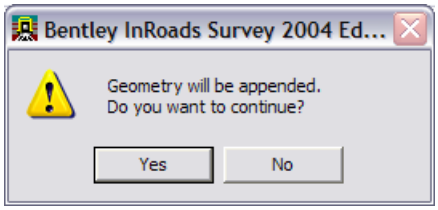
10. Set the ***Description:*** to **Use Feature Definition**

11. Set the ***Curve Stroking:*** to **Horizontal Only**



12. **<D>** the **Apply** button.

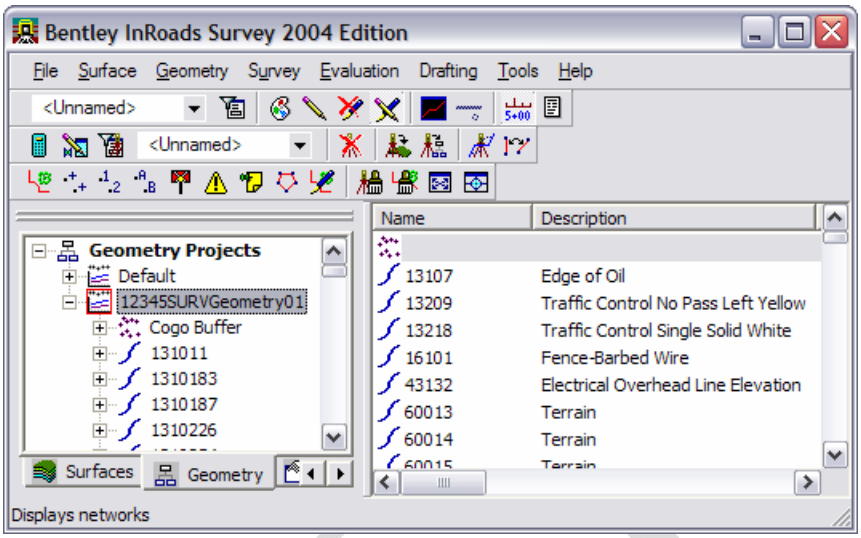
13. An alert dialog will appear notifying that the Geometry will be appended..



14. **<D>** the **Yes** button.

15. **<D>** the **Close** button in the **Survey Data to Geometry** dialog.

16. Use the **Workspace** pane scroll **arrows** to view the **Geometry** tab.

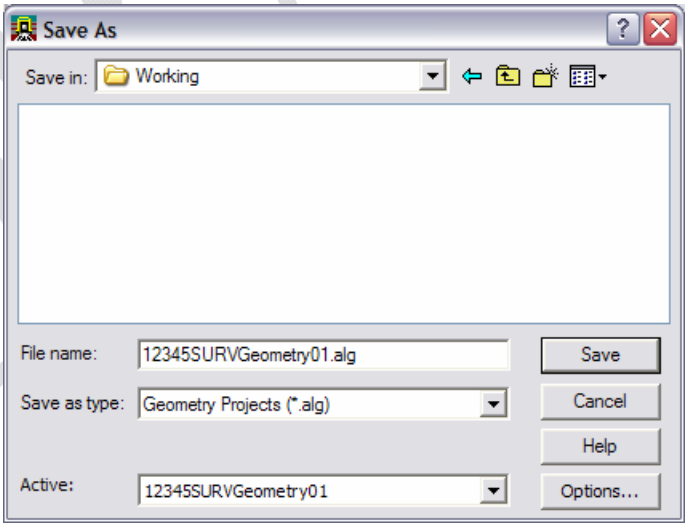


17. Verify ***12345SURVGeometry01*** is the active Geometry Project.

    Note: To change the active Geometry from the pull-down menu **Geometry > Active Geometry** then highlighting the desired geometry project name and **<D>** the **Apply** button.

18. From the pull-down **File > Save > Geometry Project**. The **Save As** dialog will appear with the Save as type set to **Geometry (*.alg)**.

19. Verify the correct project directory.
    C:\Projects\12345\ROW_Survey***Working***



20. The file name should match the **Active** name at the bottom of the **Save As** dialog. If necessary, use the drop-down arrow in the **Active** field and reselect the desired name to ensure the saved file name will match the surface name.

Note: Ensuring that the saved Geometry name in the project folder matches the Geometry name displayed in InRoads explorer will minimize any confusion.

21. **<D>** the **Save** and then the **Cancel** button. The file will be saved to disk and the **Save As** dialog will close.
22. Exit InRoads **File > Exit**
23. From the MicroStation pull-down select, **File > Save Settings**
24. Exist MicroStation **File > Exit**

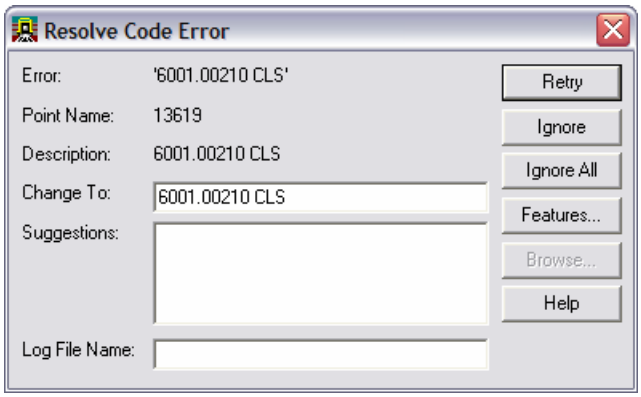
The existing fieldbook has been exported and created 3 specific files from the Survey data. The **MicroStation Design file** (***DGN***), an **InRoads Surface** (***DTM***), and **InRoads Geometry Project** (***ALG***).

In the next section a fieldbook will be created from scratch and then look at the entire process in more detail. This was merely an overview to help getting familiar with the product and to begin to be familiar with the overall workflow. The next sections will work as reinforcement of the workflow process.

Section 2 - Workflow

Chapter 5 Importing Data

Resolving Code Error dialog



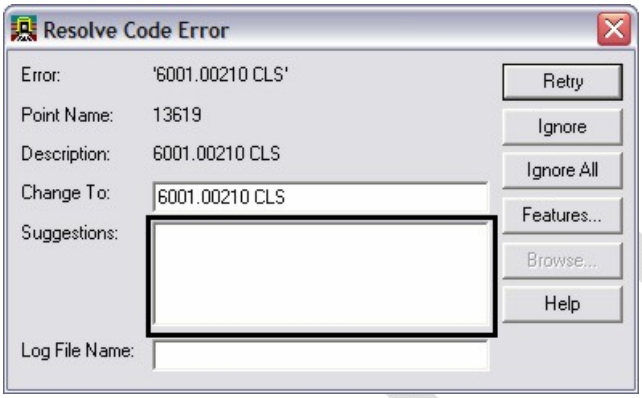
Dialog Items:

- **Change To** – field used to type the new correct feature code
- **Suggestions** – pick list of codes that nearly matches. Only available when using Alpha feature codes.
- **Log File Name** – specifies a text file name and directory that can save out the code errors that are found.
- Retry **Retry** – rechecks the ***Change To*** field to make sure the updated code is correct.
- Ignore **Ignore** – the current code that has an error will be ignored during import.
- Ignore All **Ignore All** – all codes that have errors will be ignored and will be added to the fieldbook.
- Features... **Features** – opens the **Feature Table** dialog.
- Browse... **Browse** – opens the **Save As** dialog. The Browse button only becomes active when the Log File Name field is selected.

Resolving Code Errors options

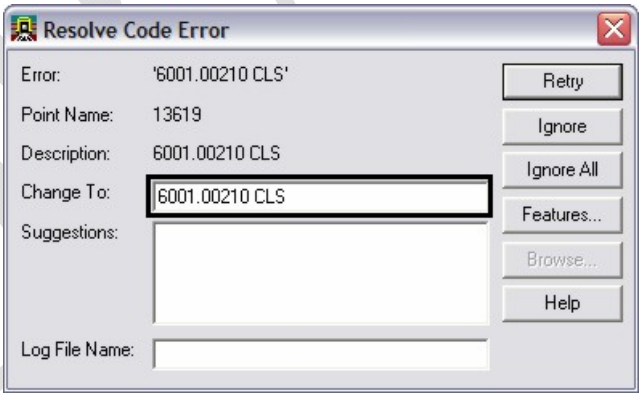
Suggestions

- Choose one of the Suggestions: to change the code.
- **<D>** the **Retry** button. The code will be corrected and processed. The dialog will then move on to the next code error. Continue correcting code errors until complete.



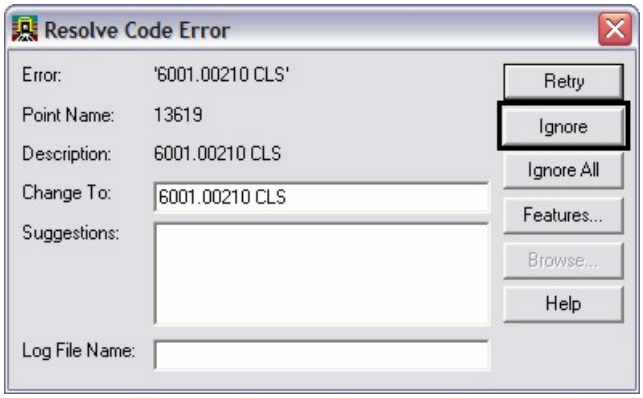
Manually Correct

- Key in the correct code in the ***Change To***: field.
- **<D>** the **Retry** button. The code will be corrected and processed. The dialog will then move on to the next code error. Continue correcting code errors until complete.



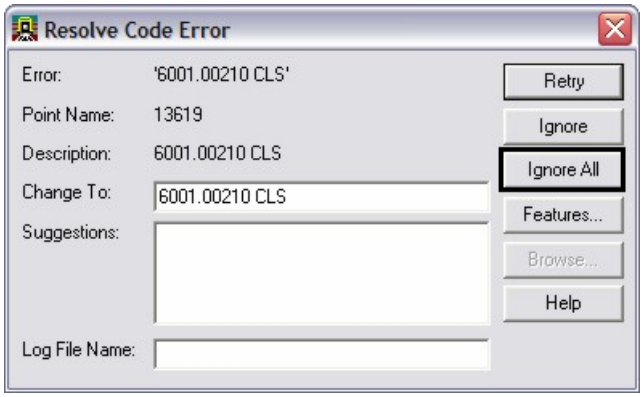
Ignore

- When unsure of the correct code **<D>** the **Ignore** button.
- The code will be ignored. The dialog will then move on to the next code error. Continue ignoring code errors until complete.
- The **Results** dialog will appear showing what codes still have errors. This report can be saved as a text file to the project directory or dismissed.

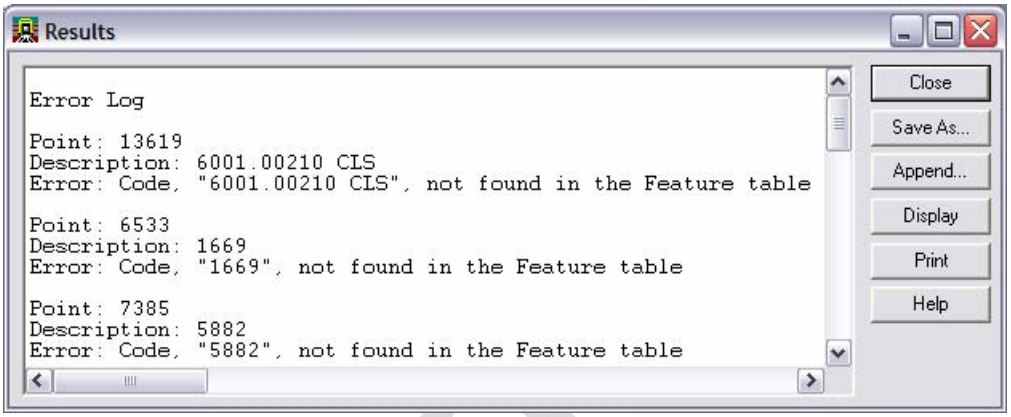


Ignore All

- When unsure of all the correct codes **<D>** the **Ignore All** button.
- All codes will be ignored. The **Resolve Code Error** dialog will then close.
- The **Results** dialog will appear showing what codes still have errors. This report can be saved as a text file to the project directory or dismissed.



Saving Error Results



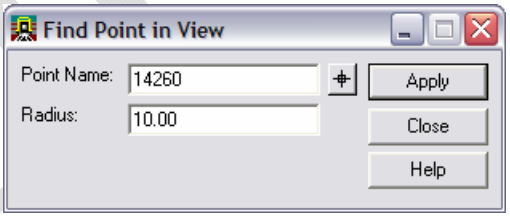
Dialog items:

- Save As... **Save As** – opens the **Save As** dialog. This will create a text file that can be opened in Notepad.
- Append... **Append** – opens the **Append** dialog allowing the user to add additional errors to the end of an existing file.
- Display **Display** – will write the text to graphics. The text will be displayed using the active text style.
- Print **Print** – opens the **Print Setup** dialog. The file will be printed and will not save the file to disk.

Finding Points in a MicroStation View

Find point in View command will locate a specified point in the active fieldbook and center the point in the active MicroStation view.

- From the pull-down menu, select **Survey > Find Point in View…**



Dialog items:

- **Point Name** – key-in field to enter point numbers.
- **Radius** – view ratio around the specified point.
- **Target button** – select point from the MicroStation view
- Apply **Apply** – executes the locate and centers the point to the view

Lab1: Managing Survey Files

In Section 1 of the training a fieldbook, design file, surface model, and geometry project were created. Consider that work to be out of date and those files will need to be managed in the Working directory.

1. Open Windows Explorer and path to the directory ***C:\Projects\12345\ROW_Survey\Working***

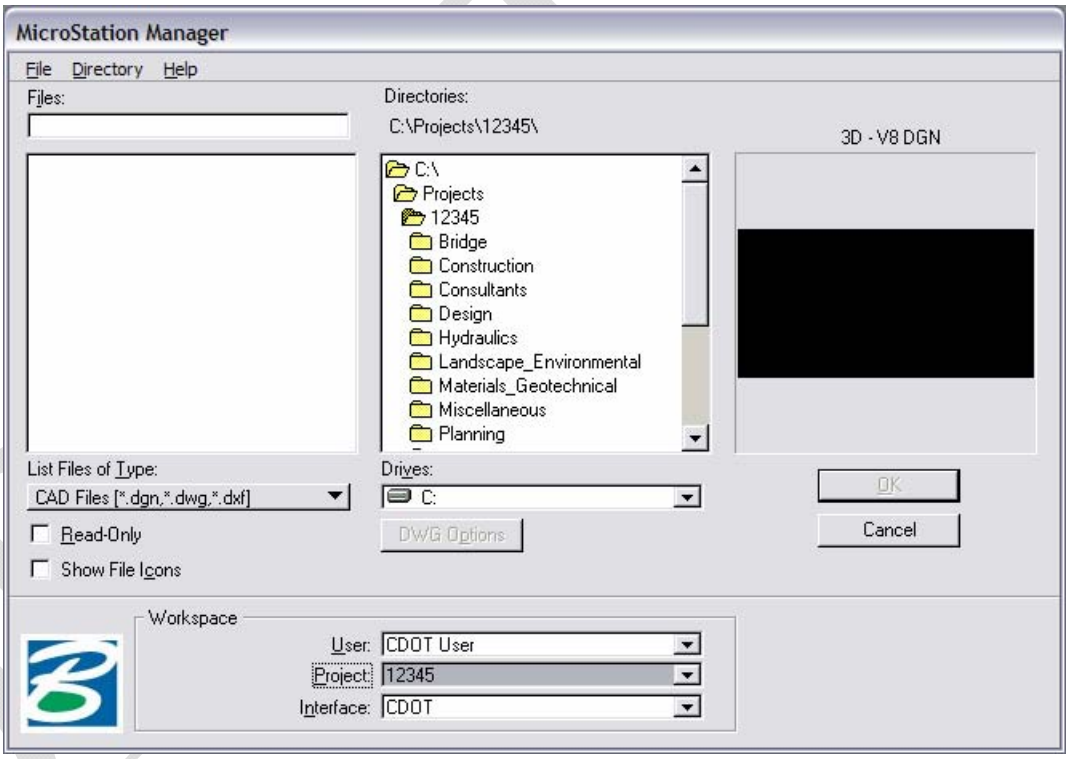
2. Rename the working file with your initials and date YYYY-MM-DD for example ***RBM***12345SurveyTopo100Scale01***_2007-05-04***.dgn

   Note: Eventually when the design file has been finalized it will be moved to the ROW_Survey\Drawings\Reference_Files\ directory for use by the rest of the project team.

Lab 2: Importing Control Files

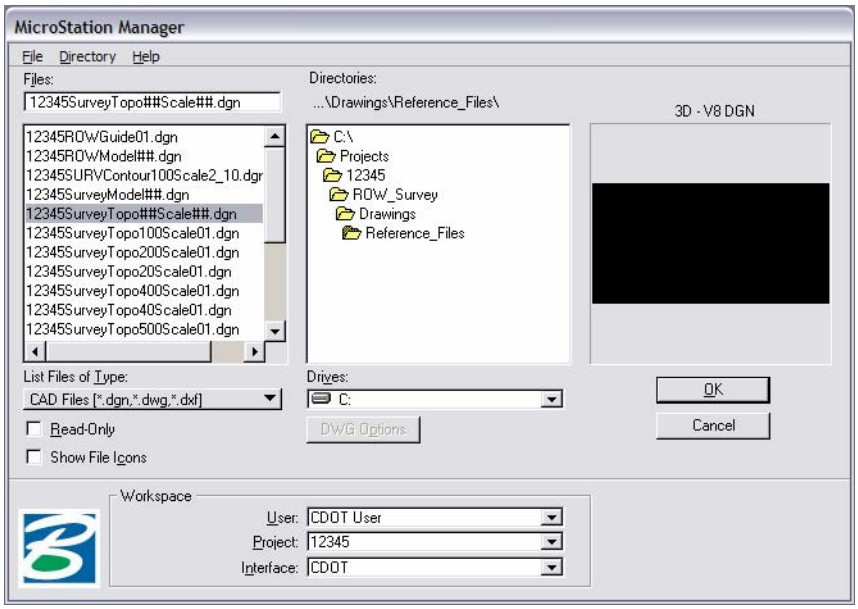
1. Double-click on the InRoads Survey desktop button  or select **Start > All Programs > Bentley Civil Engineering > Bentley InRoads Survey**.

2. In the **MicroStation Manager** dialog go to the Workspace group section and change
   User: **CDOT User**
   Project: **12345**
   Interface: CDOT



3. In the **MicroStation Manager** dialog path to the directory: ***C:\Projects\12345\ROW_Survey\Drawings\Reference_Files***

4. Select the file **12345SurveyTopo##Scale##.dgn** from the **MicroStation Manager** dialog.

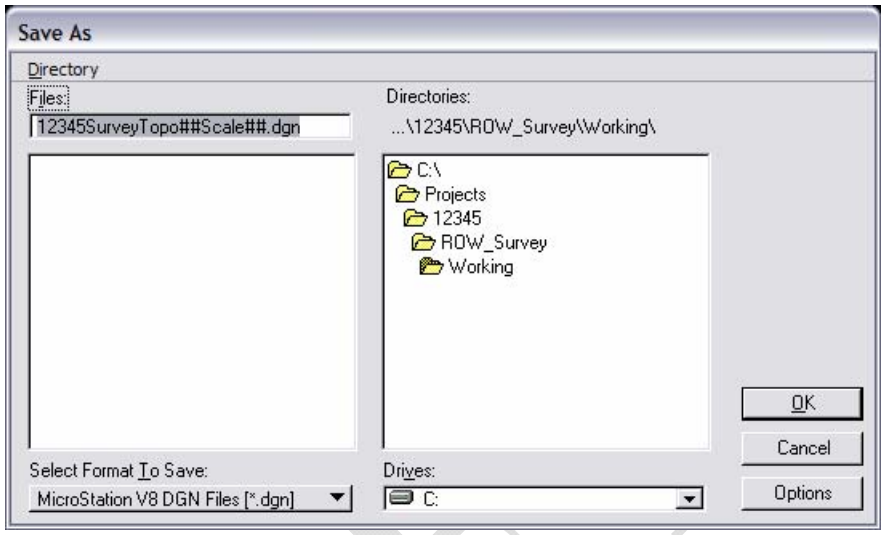


Note: The purpose of the files with "##" symbols are for creating new files with the correct naming convention.

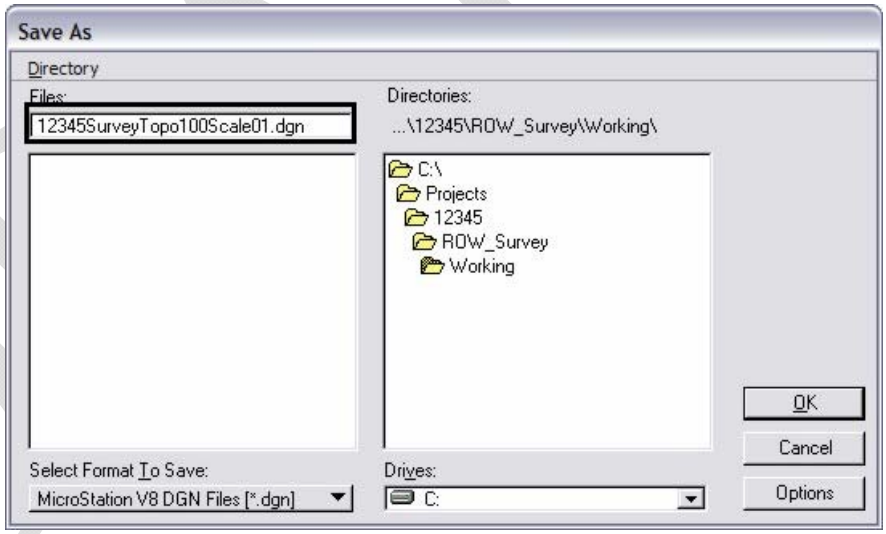
5. **<D> OK** the **MicroStation Manager** dialog will close and open the file.

6. From the MicroStation pull-down menu File **> Save As** the **Save As** dialog will appear.

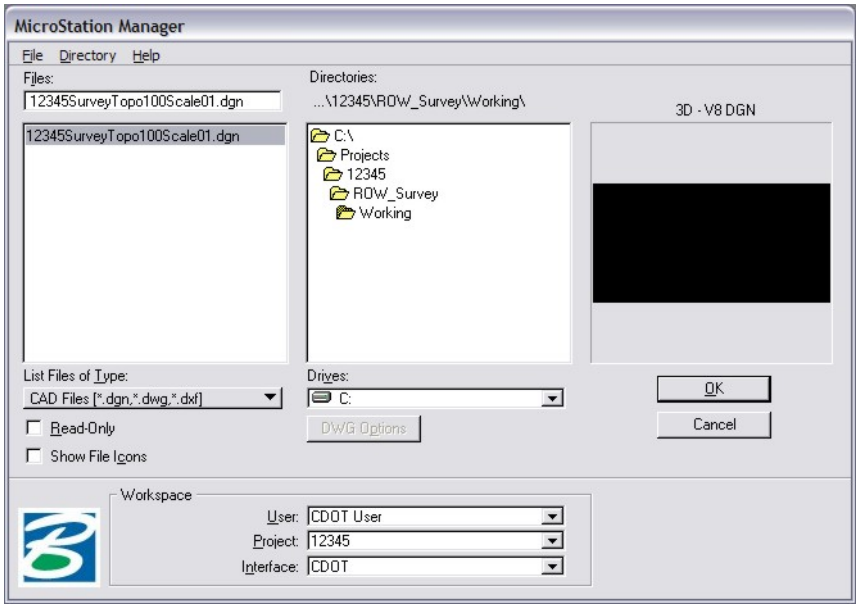
7. Path to the folder C:\Projects\12345\ROW_Survey***Working***



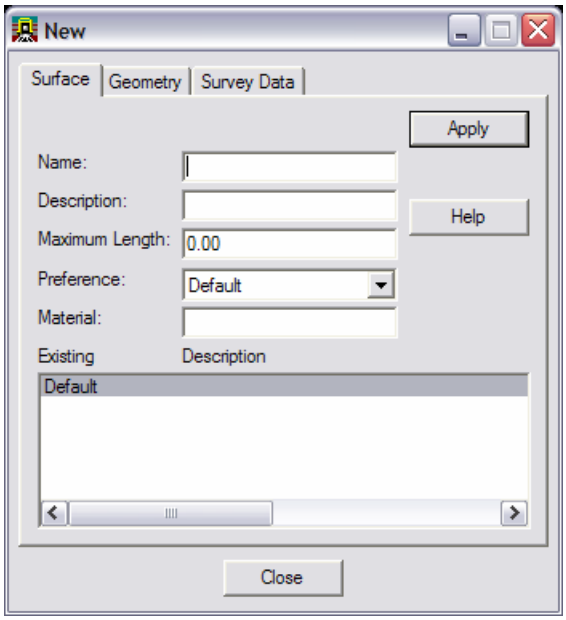
8. Replace the ## symbols with ***100*** scale and ***01*** model.
Type in ***Files: 12345SurveyTopo100Scale01.dgn***



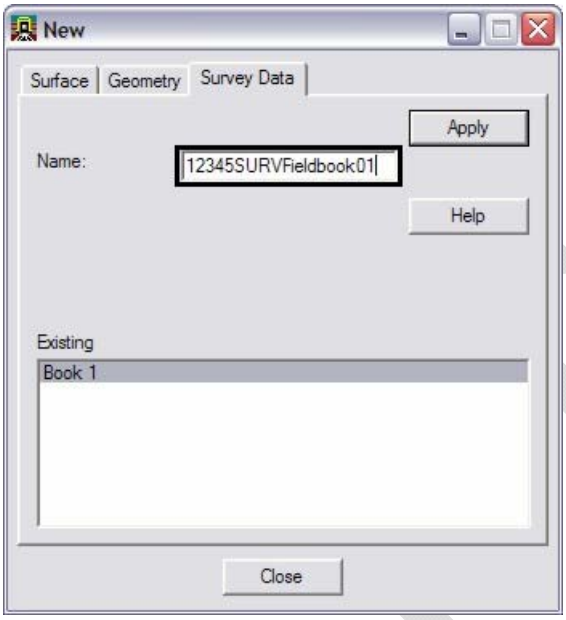
9. **<D>** the **OK** button the **Save As** dialog will close and MicroStation will open the file ***12345SurveyTopo100Scale01.dgn***



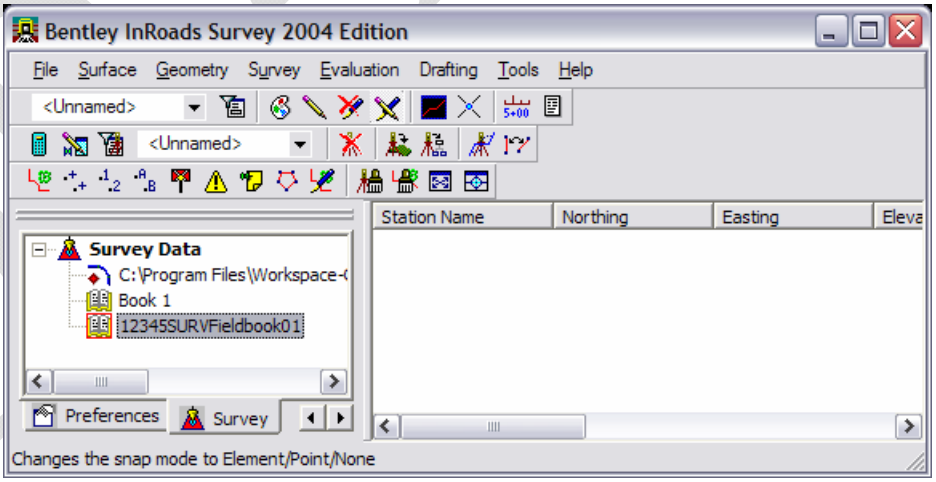
10. Once MicroStation and InRoads opens. From the InRoads pull-down menu, select **File > New**. The **New** dialog will appear.



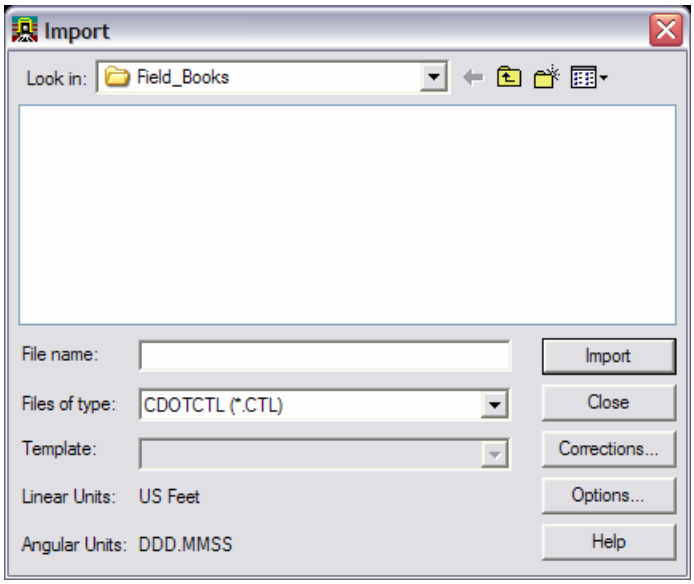
11. Select the **Survey Data** tab.
12. Key in the Name: ***12345SURVFieldbook01***



13. **<D>** the **Apply** button. The new fieldbook will appear below.
14. **<D>** the **Close** button.
15. From the **Workspace** bar the ***12345SURVFieldbook01*** will be active.



16. From the pull-down menu, select **File > Import > Survey Data**. The **Import** dialog will open.



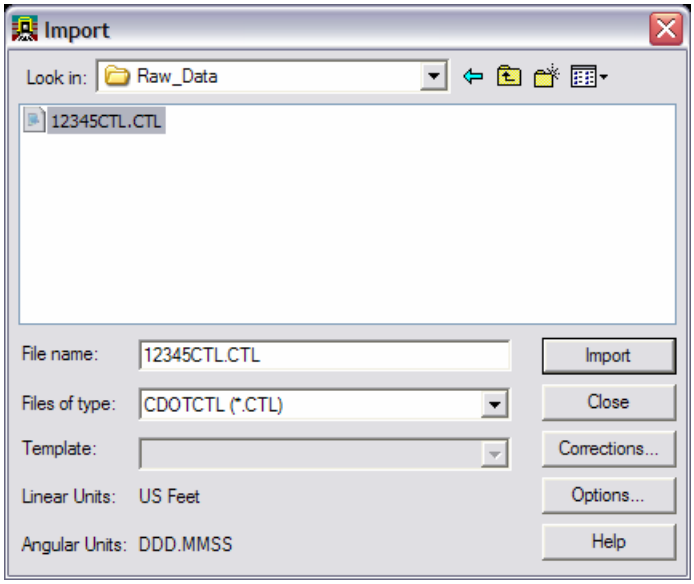
17. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey***Raw_Data***

18. Verify the Files of type: **CDOTCTL (*.CTL)**

    - Importing the CTL file first is only needed if the field books being imported are conventional files. GPS (positional) files do not require the CTL file.

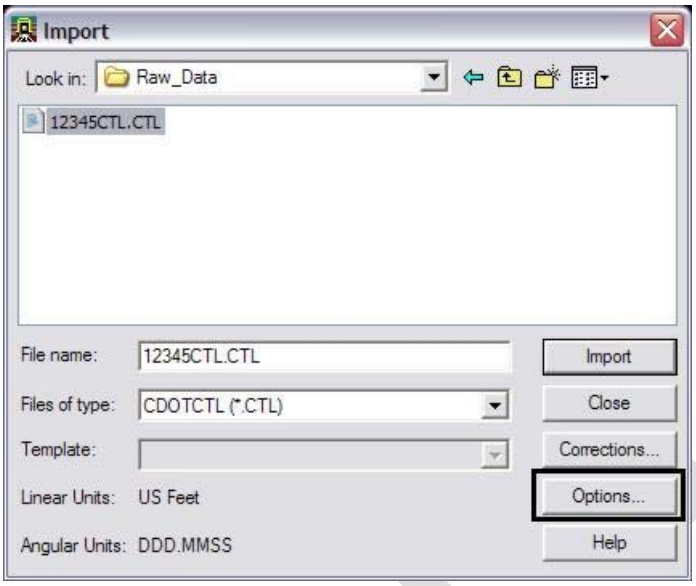
    Note: The **Files of type:** drop-down box works as a filter. Allowing to the files that have the particular file extensions to be viewed. This allows InRoads Survey to utilize a specific import wizard for each file type.

19. Select the project control file **12345CTL.CTL** to be imported.



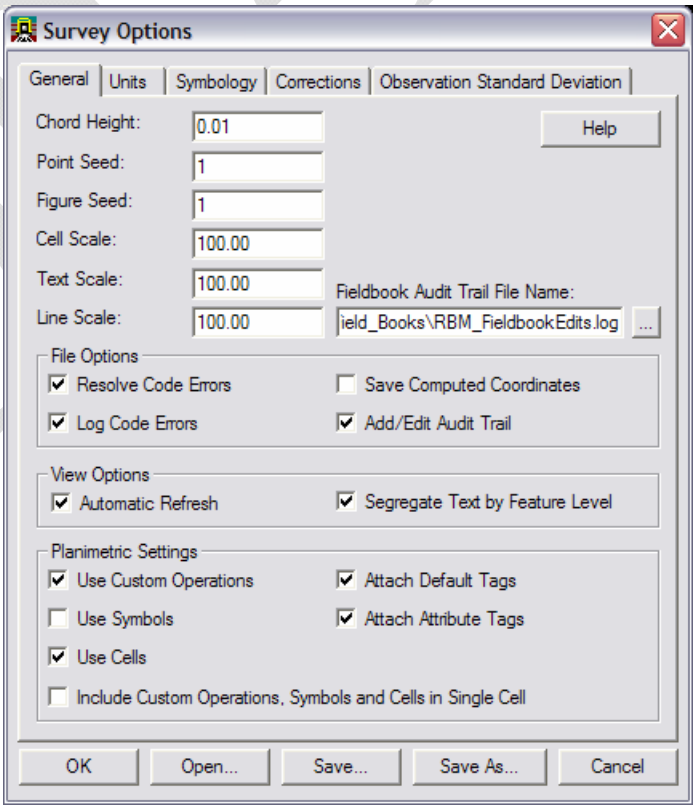
20. **<D>** the **Options** button.

    - This is the same dialog that can be opened from **Tools > Survey Options**



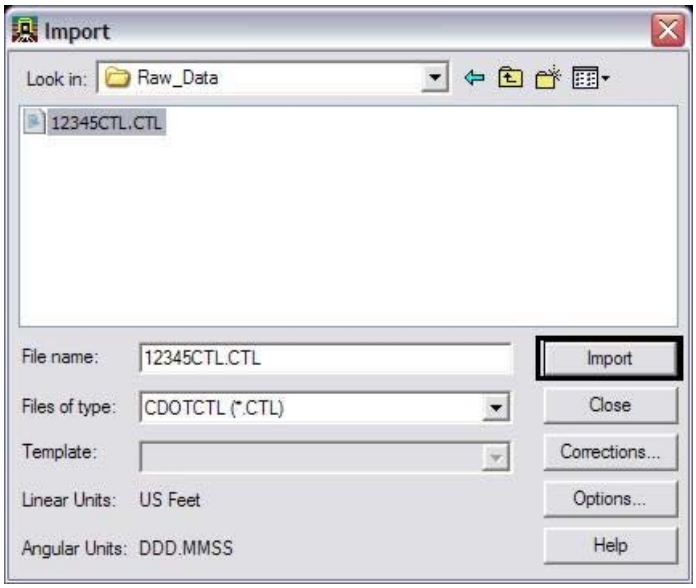
21. Verify the **Cell**, **Text**, and **Line** Scales are all set to ***100***

22. Verify **Fieldbook Audit Trail File Name** is still set from Section 1. (C:\Projects\12345\ROW_Survey\InRoads\ **Field_Books**\"UserInitials"_FieldBookEdits)



23. **<D>** the **Save** then **OK** buttons. The **Survey Options** dialog will close.

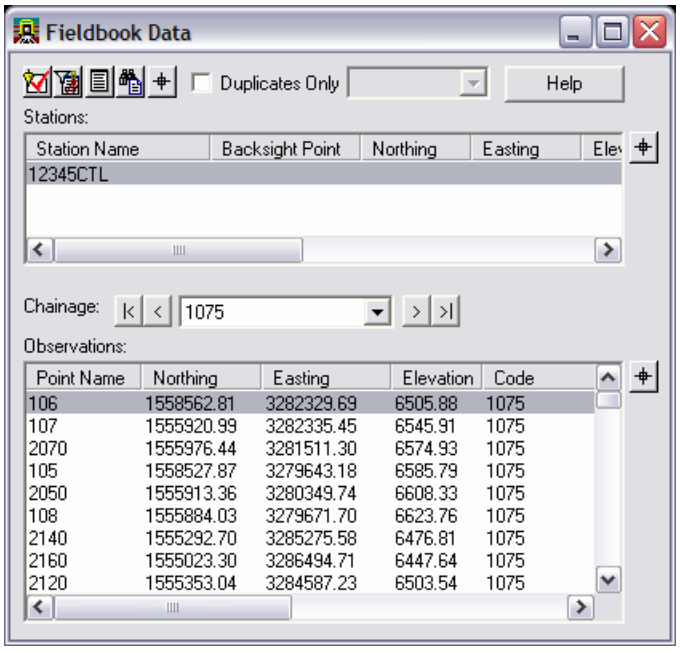
24. **<D>** the **Import** button. The **Import** dialog will remain open allowing additional files to be imported.



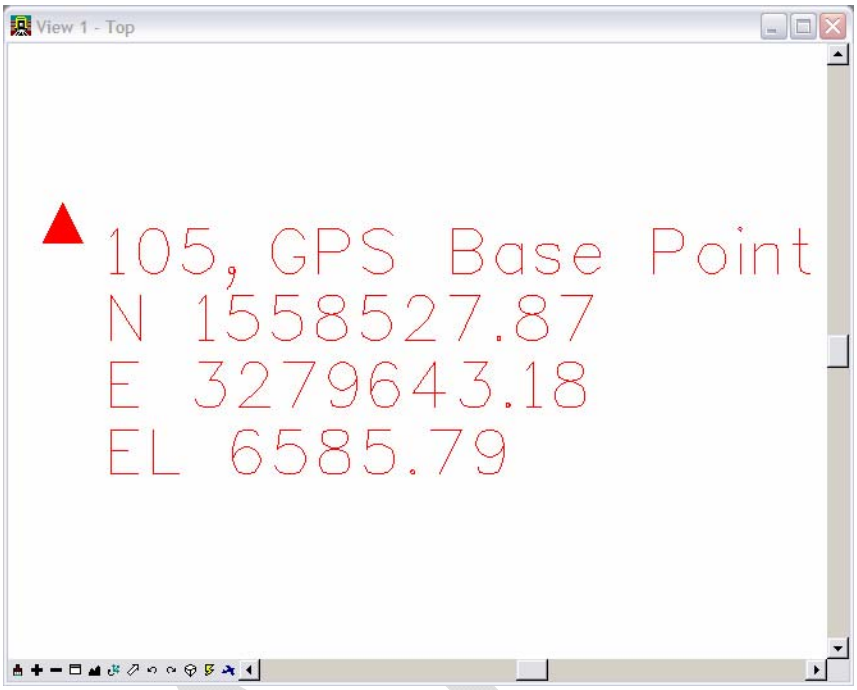
25. **<D>** the **Close** button.

    Note: Upon closing, InRoads Survey executes the import routine.

26. From the pull-down menu, select **Survey > Fieldbook Data…**. Take a minute to review the imported Survey control data that is now contained in the electronic Fieldbook.



27. While the **Fieldbook Data** dialog is open, also look at the MicroStation view and displayed graphics.



28. Practice changing the display graphics using the **View Survey Data** toolbar.

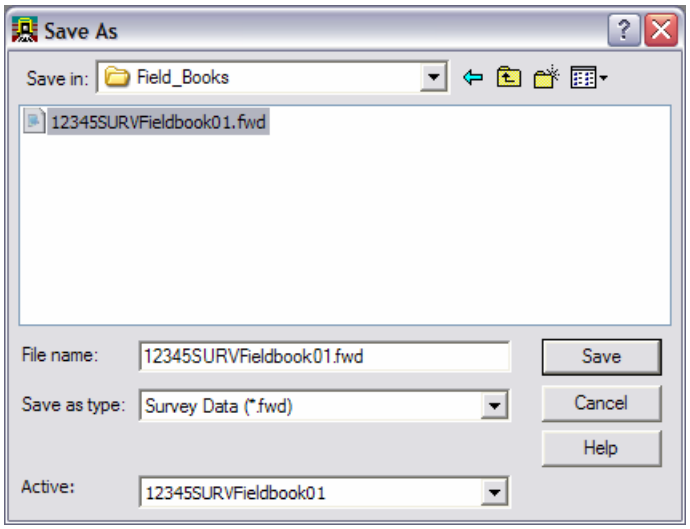
29. Continue to practice **zooming** and **panning** using the MicroStation view border buttons.

30. Close the **Fieldbook Data** dialog.

31. **Fit View** from the View Survey Data toolbar.

It is up to the user to determine when to save the data in InRoads Survey. Until now the fieldbook is being stored in memory. If something was to cause InRoads to close, your data would be lost.

32. **File > Save > Survey Data** the **Save As** dialog will open.



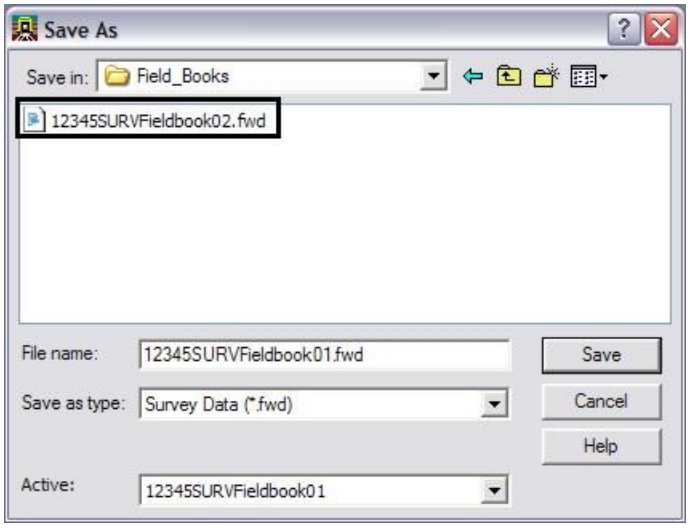
33. Verify the directory location:
    C:\Projects\12345\ROW_Survey\InRoads**Field_Books**

Prior to saving this new fieldbook steps are needed to ensure correct file management of multiple fieldbooks.

34. In the **Save As** dialog select the file ***12345SURVFieldbook01*** so it highlights.

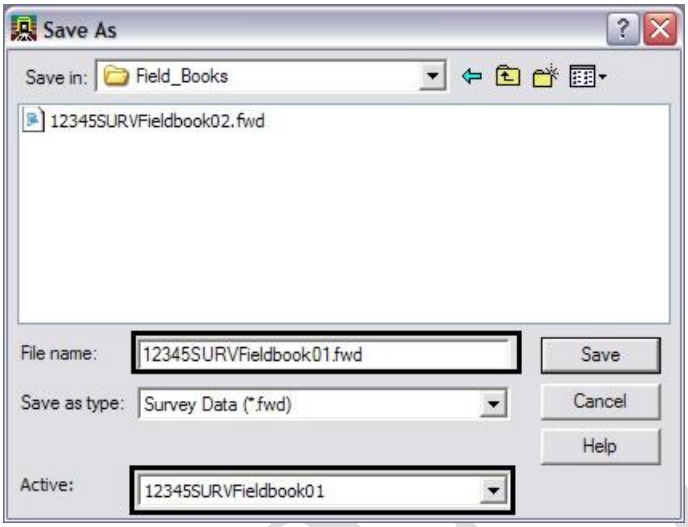
35. **<R>** the filename and select **Rename** from the popup menu.

36. Change the file name to **12345SURVFieldbook02**

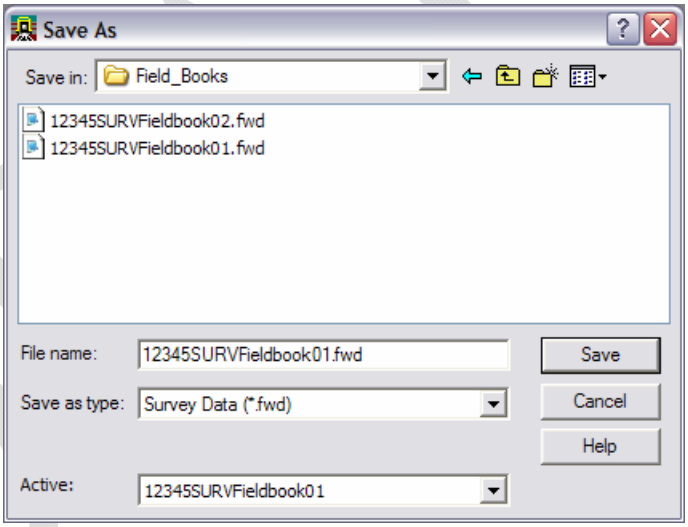


37. Choose the **Active: 12345SURVFieldbook01** at the bottom of the dialog.

38. Verify the File Name: ***12345SURVFieldbook01.fwd***



39. **<D>** the **Save** button. The file will be saved to disk and will show in the dialog.

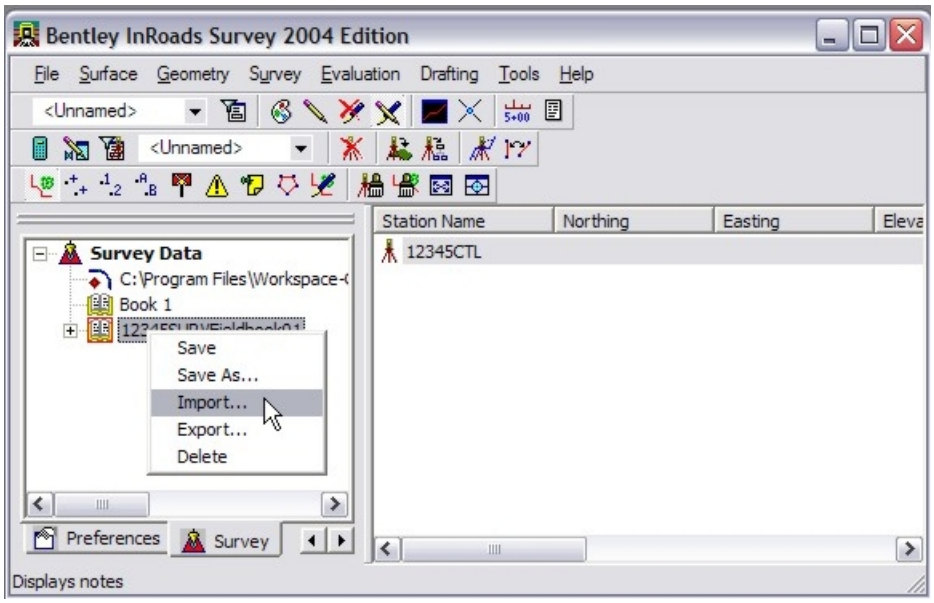


40. **<D>** the **Cancel** button. The **Save As** dialog will close.

Lab 3: Importing Data collector files

Importing SDR files

1. From the Workspace bar select and highlight **12345SURVFieldbook01** and **<R>** to view the shortcut menu.

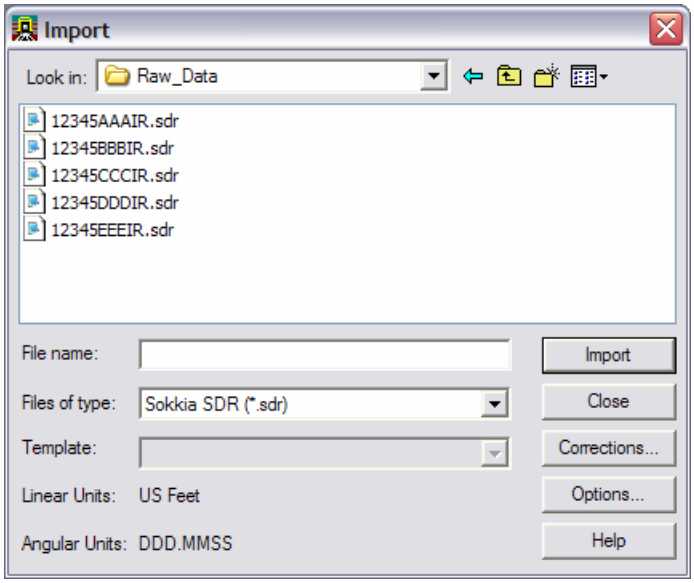


2. **<D> Import…** The **Import** dialog will appear.

   - This is a same as using the pull-down menu **File > Import > Survey Data**.

3. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey**Raw_Data**

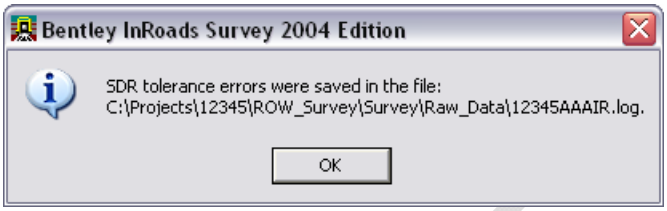
4. Change the drop-down arrow Files of type: **Sokkia SDR (*.sdr)**



5. **Select** the file **12345AAAIR.sdr** from the filtered list of files.

6. **<D>** the **Import** button. The **Import** dialog will remain open allowing additional files to be imported.

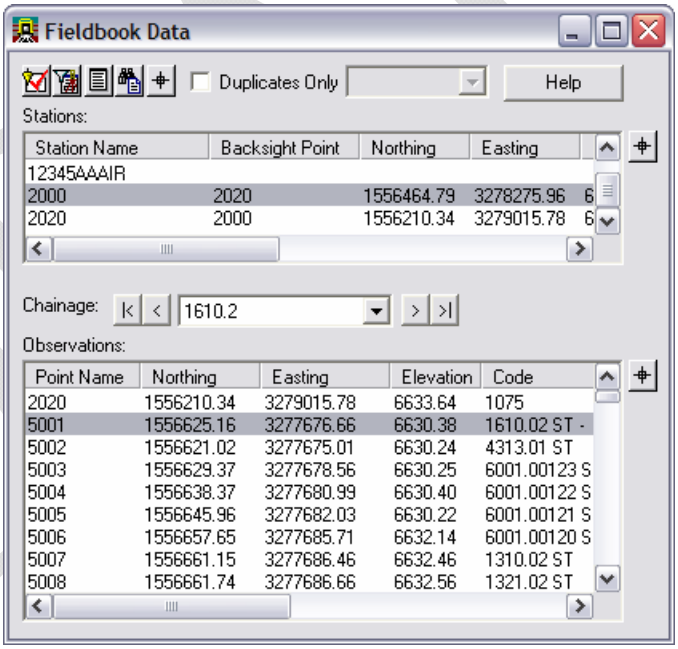
7. **<D>** the **OK** button in the SDR Tolerance error dialog.



8. **<D>** the **Close** button.

9. **Select** the **Fieldbook** button from the Survey toolbar. The Survey Fieldbook will appear.

10. Take a minute to review the observations from Station Name ***2000*** that was imported into the electronic Fieldbook.



11. Close the **Fieldbook** dialog **<D>** the **X** in the upper right hand corner of the dialog.

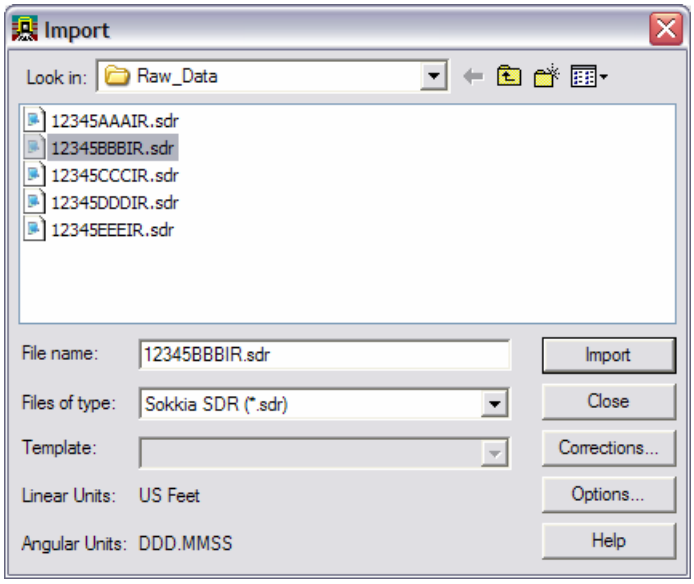
Resolving Code errors

From the **Tools > Survey Options** dialog the choice was made to resolve any code errors when the data is imported. There are a couple of ways to handle code errors.

12. From the pull-down menu, select **File > Import > Survey Data**. The **Import** dialog will open.

13. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey**Raw_Data**

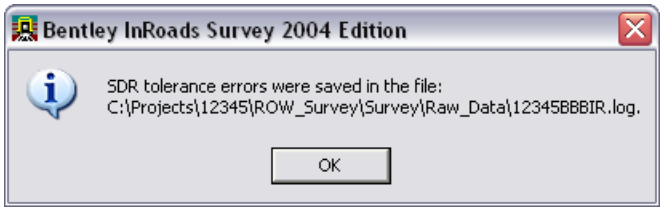
14. Verify the drop-down arrow Files of type: **Sokkia SDR (*.sdr)**



15. **Select** the file **12345BBBIR.sdr** from the filtered list of files.

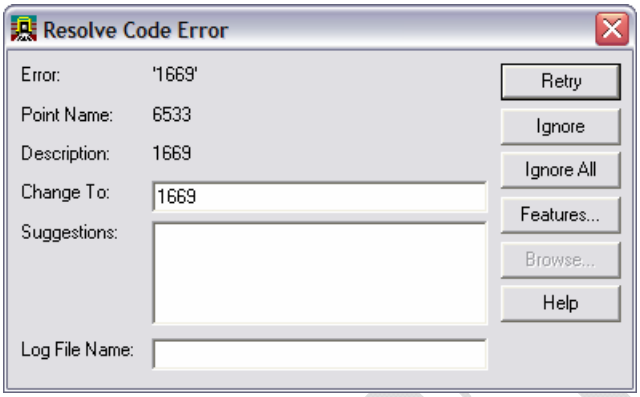
16. **<D>** the **Import** button. Only one file can be selected at a time. The **Import** dialog will remain open allowing for additional files to be imported.

17. **<D>** the **OK** button in the SDR Tolerance dialog box.



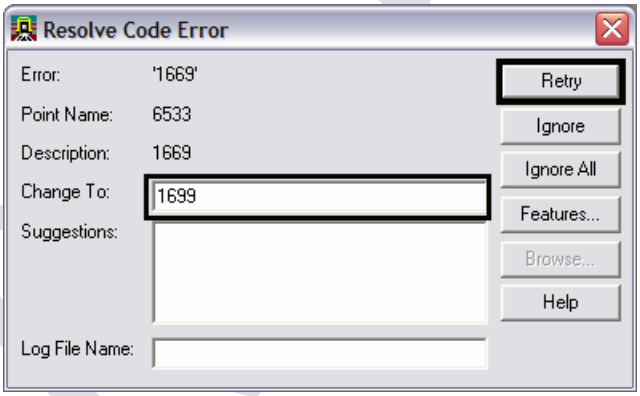
18. **<D>** the **Close** button. The imported SDR files will be processed.

    Note: There are code errors with these files; the **Resolve Code Errors** dialog will appear.



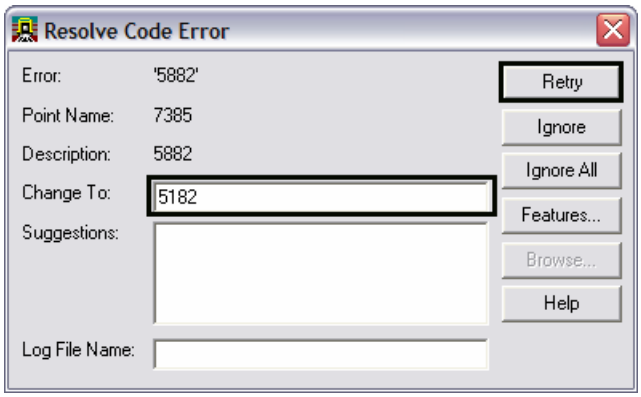
19. Key-in Change To: ***1699***

20. **<D>** the **Retry** button. The code will be processed and the next error will appear.

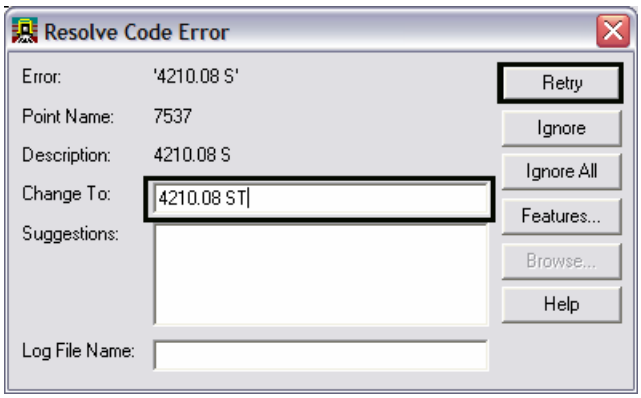


Continue this process for the next three code errors.

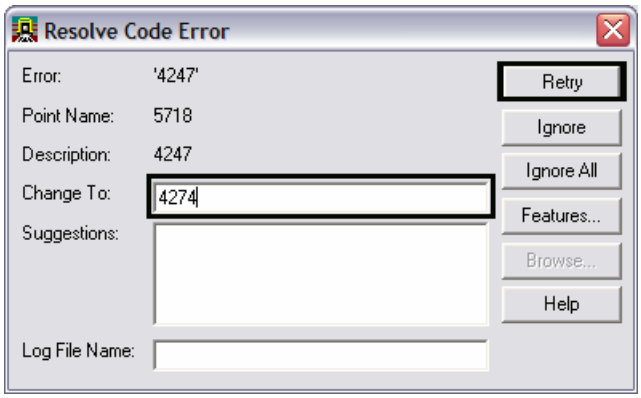
21. Key-in Change To: ***5182*** **<D>** the **Retry** button.



22. Key-in Change To: ***4210.08 ST*** **<D>** the **Retry** button.



23. Key-in Change To: ***4274*** **<D>** the **Retry** button. The **Resolve Code Error** dialog will close and Survey will process the data.

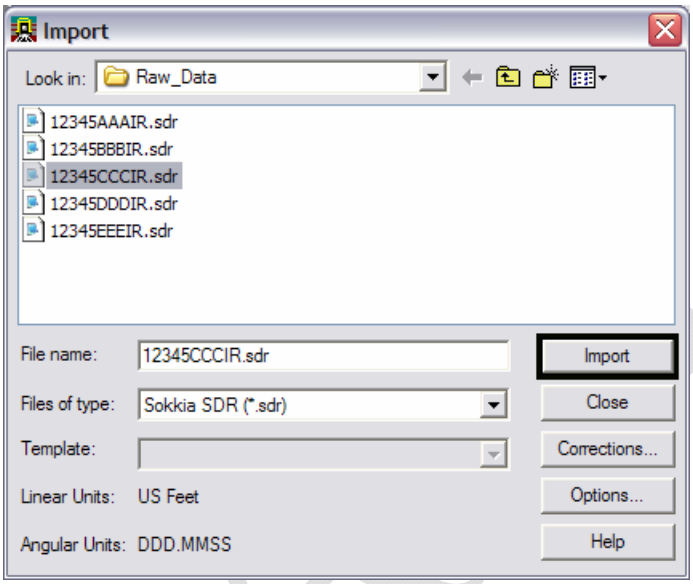


24. From the pull-down menu, select **File > Import > Survey Data**. The **Import** dialog will open.

25. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey**Raw_Data**

26. Verify the drop-down arrow Files of type: **Sokkia SDR (*.sdr)**

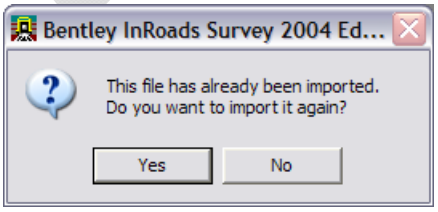
27. **Select** the file **1234500CCCIR.sdr** from the filtered list of files.



28. **<D>** the **Import** button. The **Import** dialog will remain open allowing for additional files to be imported.

29. Continue to import the remaining SDR files ***1234500DDDIR- 123450EEEIR***

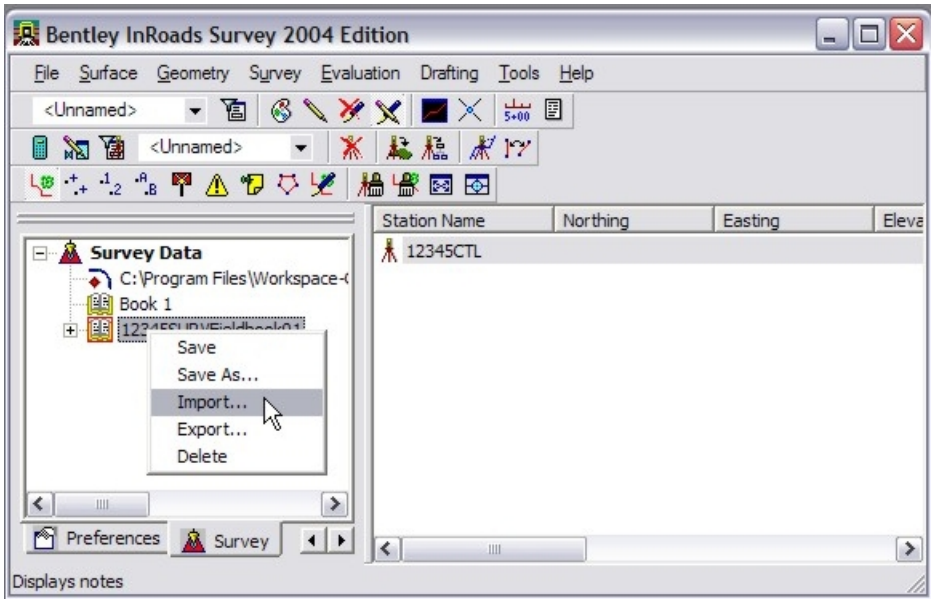
    - If a previously imported SDR file was selected the following dialog will appear.



      <D> the **No** button and go back and select a different file.

Importing Trimble DC file

30. From the Workspace bar select and highlight ***12345SURVFieldbook01*** and **<R>** to view the shortcut menu.

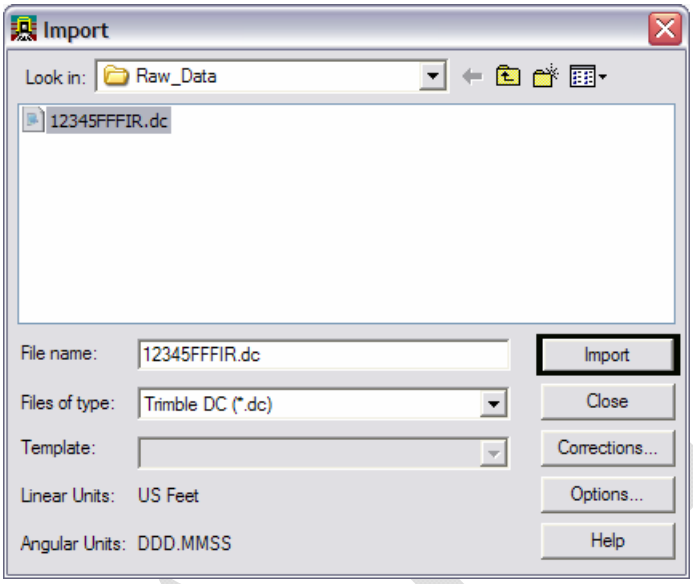


31. **<D> Import...** The **Import** dialog will appear.

    - This is a same as using the pull-down menu **File > Import > Survey Data**.

32. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey**Raw_Data**

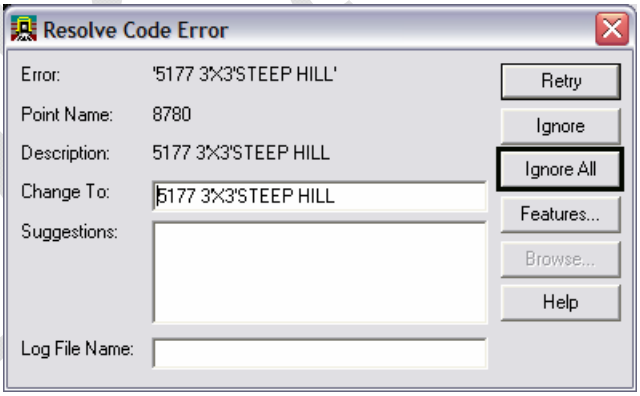
33. Change the drop-down arrow Files of type: **Trimble DC (*.dc)**



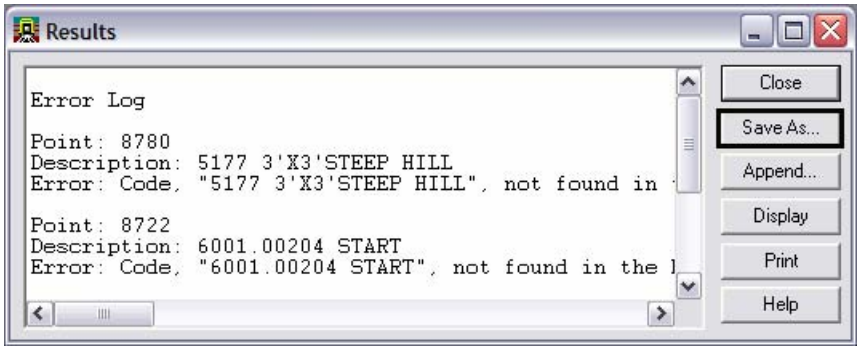
34. **Select** the file **12345FFFIR.dc** from the filtered list of files.

35. **<D>** the **Import** button. The **Import** dialog will remain open allowing for additional files to be imported.

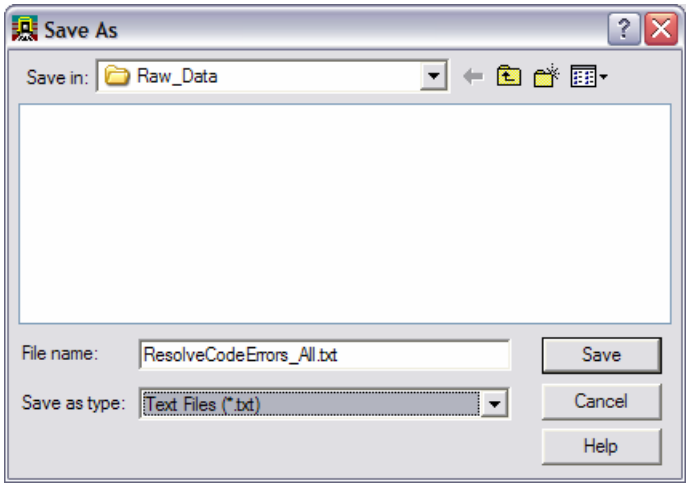
36. **<D>** the **Close** button. If errors are present in the input files, the **Resolve Code Errors** dialog will appear.



37. **<D>** the **Ignore All** button. The **Resolve Code Error** dialog will close and Survey will process the data. The code errors will be corrected later in the manual.

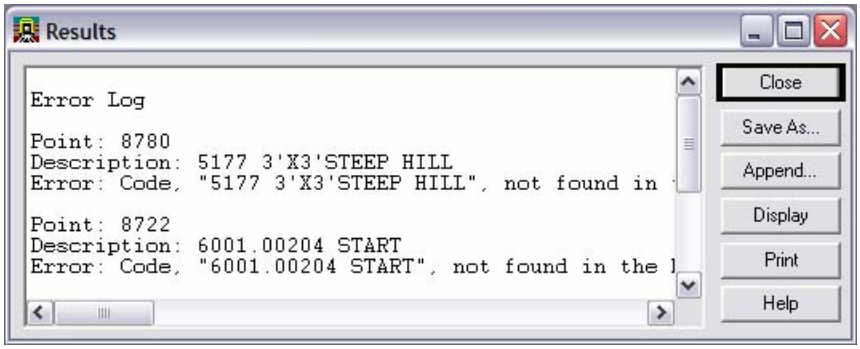


38. The **Results** dialog will appear **<D>** the **Save As** button. The **Save As** dialog will open.



39. Key-in the **File name:** *ResolveCodeErrors_All.txt*

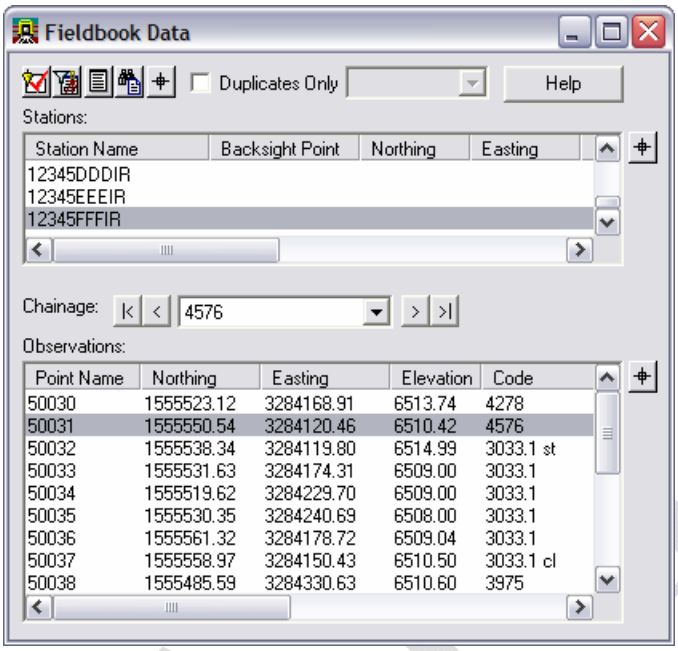
40. **<D>** the **Save** button. The **Save As** dialog will close.



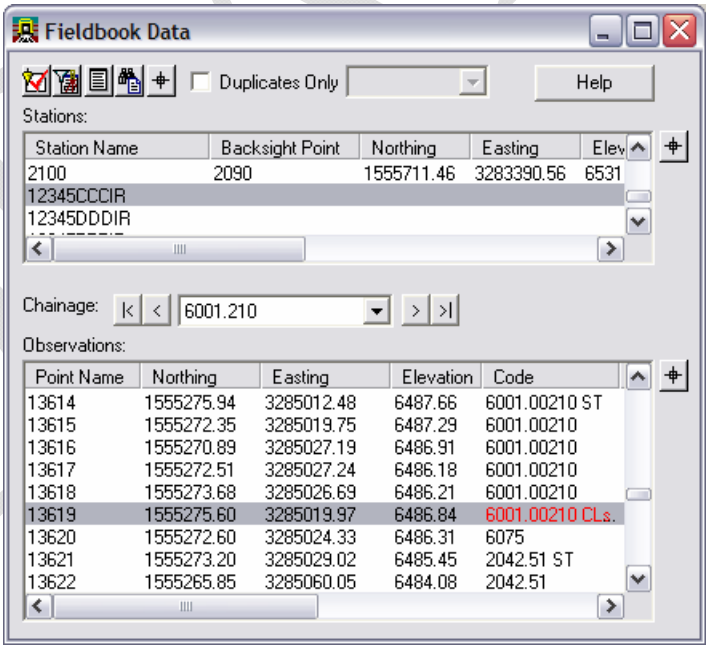
41. **<D>** the **Close** button in the **Results** dialog.

42. **Select** the **Fieldbook** button from the Survey toolbar. The Survey Fieldbook will appear.

43. Take a minute to review the observations from Station Name ***12345FFFIR*** that was imported into the electronic Fieldbook.



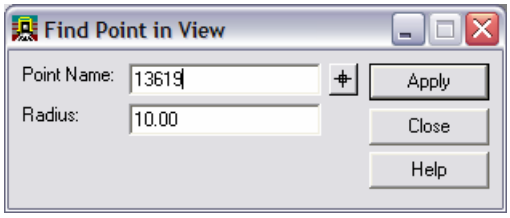
44. Locate Station Name: ***12345CCCIR*** Point Name: ***13619***. Notice the code is red, representing an error.

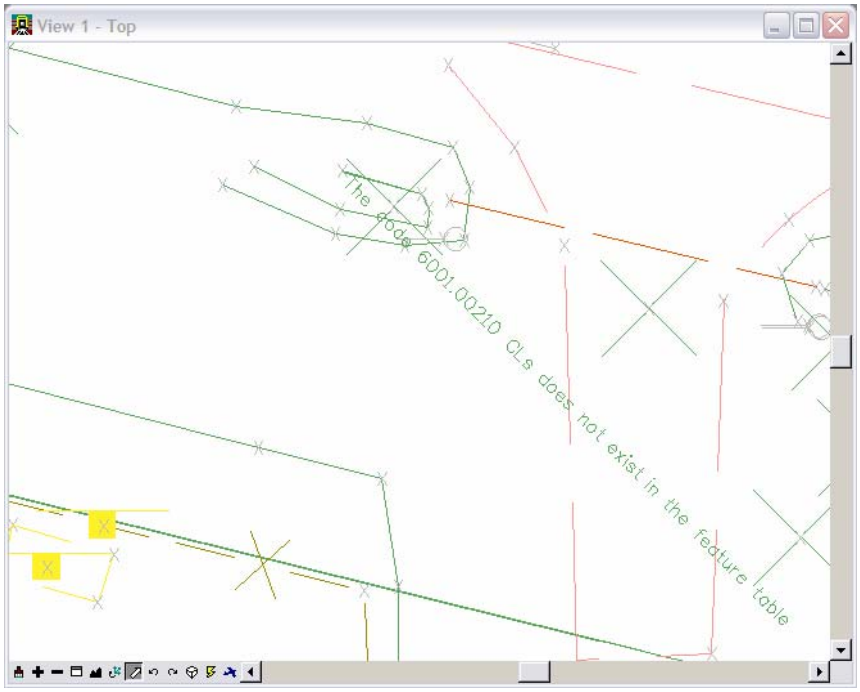


Note: While the **Fieldbook Data** dialog is open, look at the MicroStation view and displayed graphics.

45. Locate the same point in View 1 using one of the following methods.

    - **<R>** Point Name to view the Fieldbook shortcut list and select **Center**
      or
    - From the pull-down menu, select **Survey > Find Point in View**



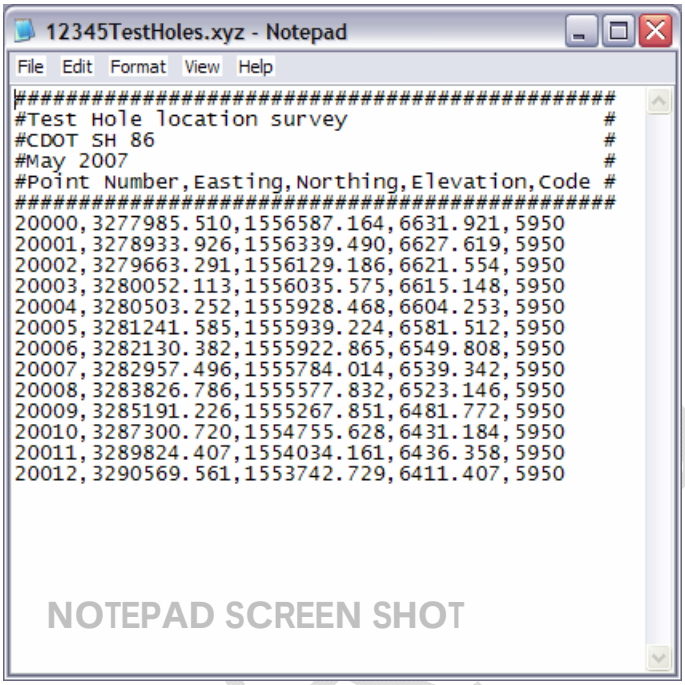


Note: The code errors will be corrected in the fieldbook later in the lab.

46. Close the **Fieldbook** dialog and any other dialogs.

Lab 4: Importing ASCII files

In the following steps an ASCII file will be imported. To import ASCII files the Text Import Wizard (TIW) will be used. This format created for importing text can be saved and recalled for future use.

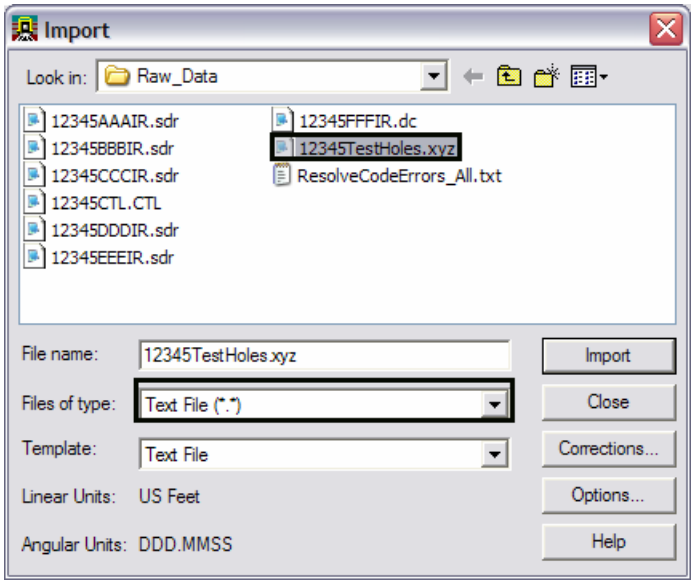


1. From the pull-down menu, select **File > Import > Survey Data**. The **Import** dialog will open.

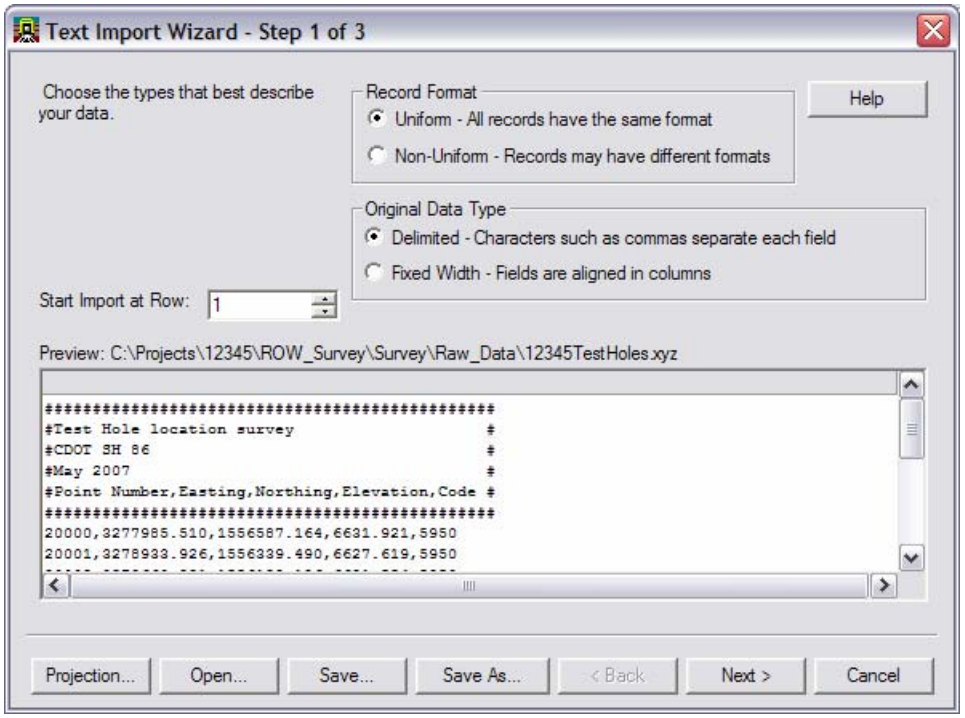
2. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey**Raw_Data**

3. Change the drop-down arrow **Files of type: Text File (*.*)** All the files in the directory will be shown.

4. Select the file ***12345TestHoles.xyz***



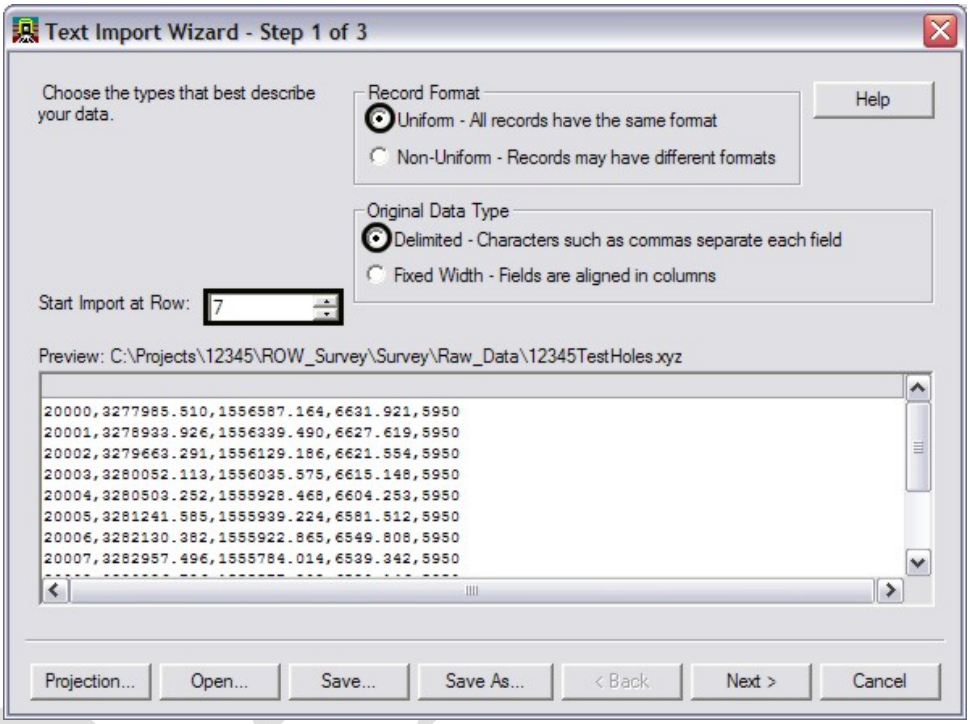
5. **<D>** the **Import** button. The **Text Import Wizard** dialog will appear.



6. Change the entry field ***Start Import at Row: 7*** and ***Tab*** out of the field. This will ignore the header information in the file.

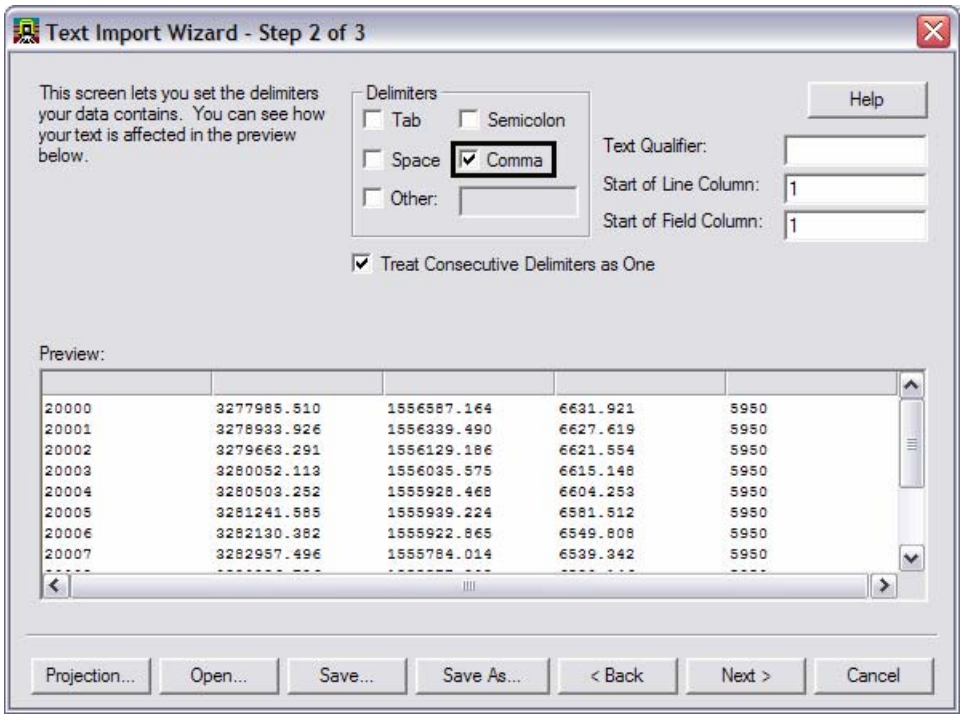
7. Verify the **Record Format** radio button is set to **Uniform**.

8. Verify the **Original Data Type** radio button is set to **Delimited**.

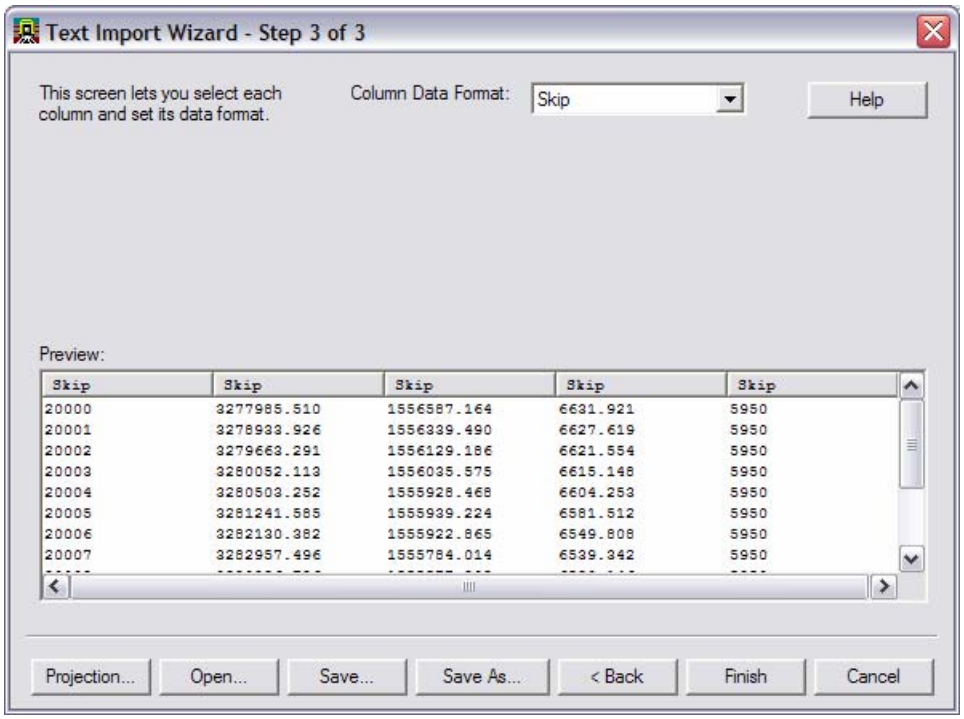


9. **<D>** the **Next >** button. The **Step 2 of 3** dialog will appear.

10. In the **Delimiters** section of the dialog check on the **Comma** delimiter field as this defines what separates our columns of data. Verify the rest of the dialog is set as shown below.

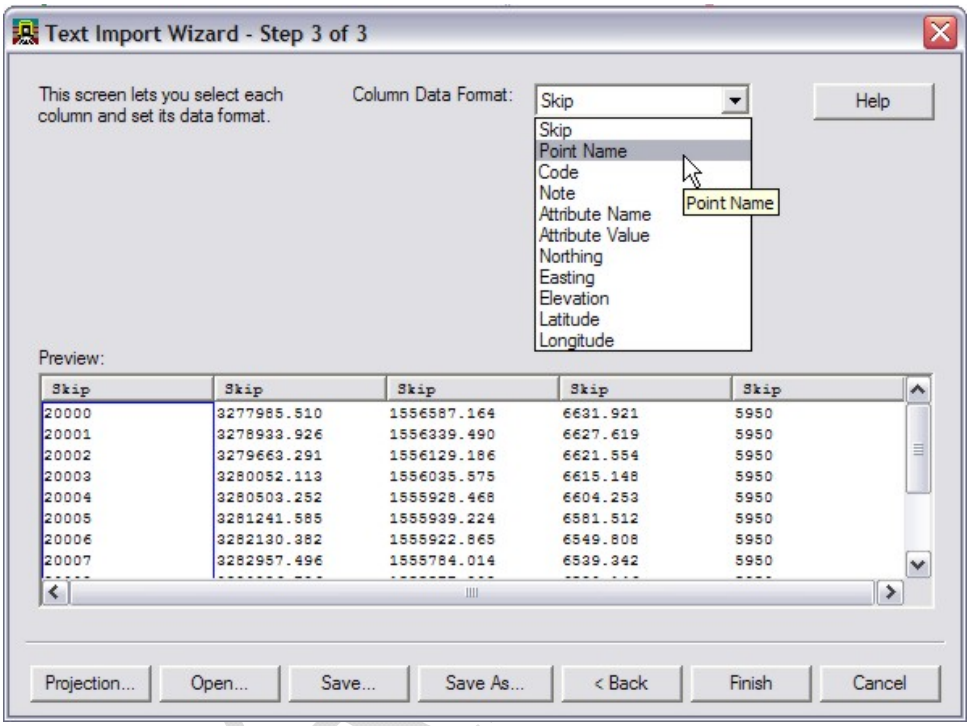


11. **<D>** the **Next >** button. The final **Step 3 of 3** dialog will appear.



12. Select the header of the first column labeled **Skip**. The column will highlight as shown below.

13. From the **Column Data Format** drop-down box select **Point Name**

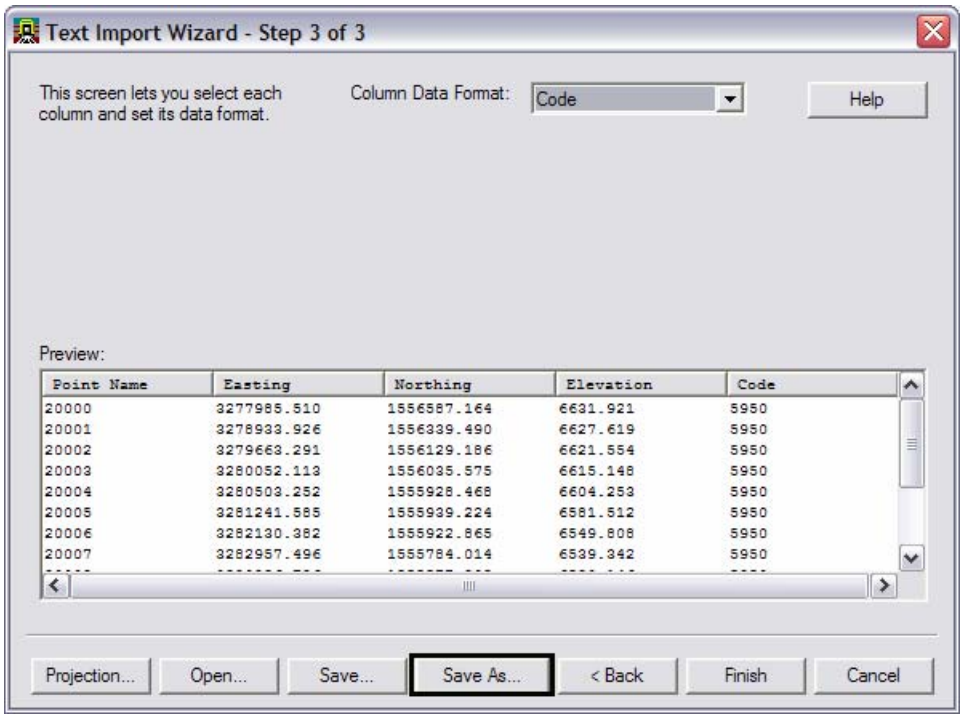


14. Select the second **Skip** column header then select **Easting** from the **Column Data Format** drop-down box.

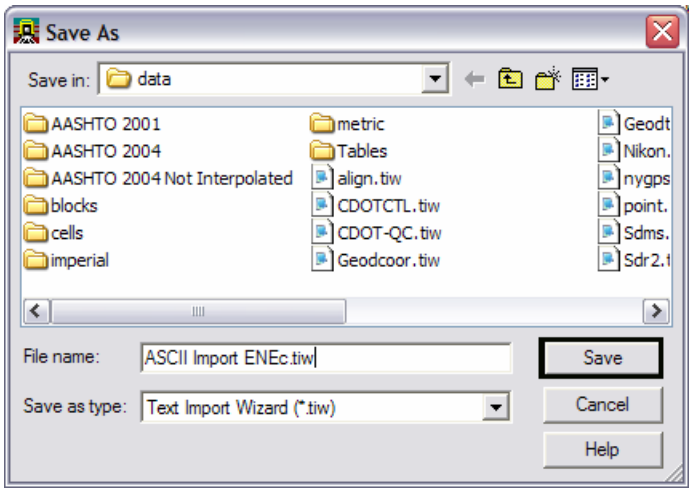
15. Select the third **Skip** column header then select **Northing** from the **Column Data Format** drop-down box.

16. Select the fourth **Skip** column header then select **Elevation** from the **Column Data Format** drop-down box.

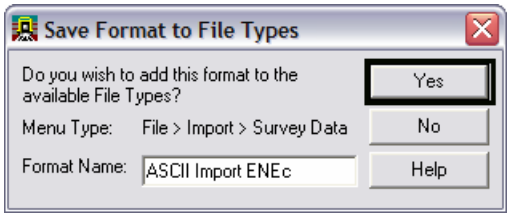
17. Select the fifth **Skip** column header then select **Code** from the **Column Data Format** drop-down box.



18. **<D>** the **Save As** button. The **Save As** dialog will appear.
19. Key in File name: ***ASCII Import ENEc***



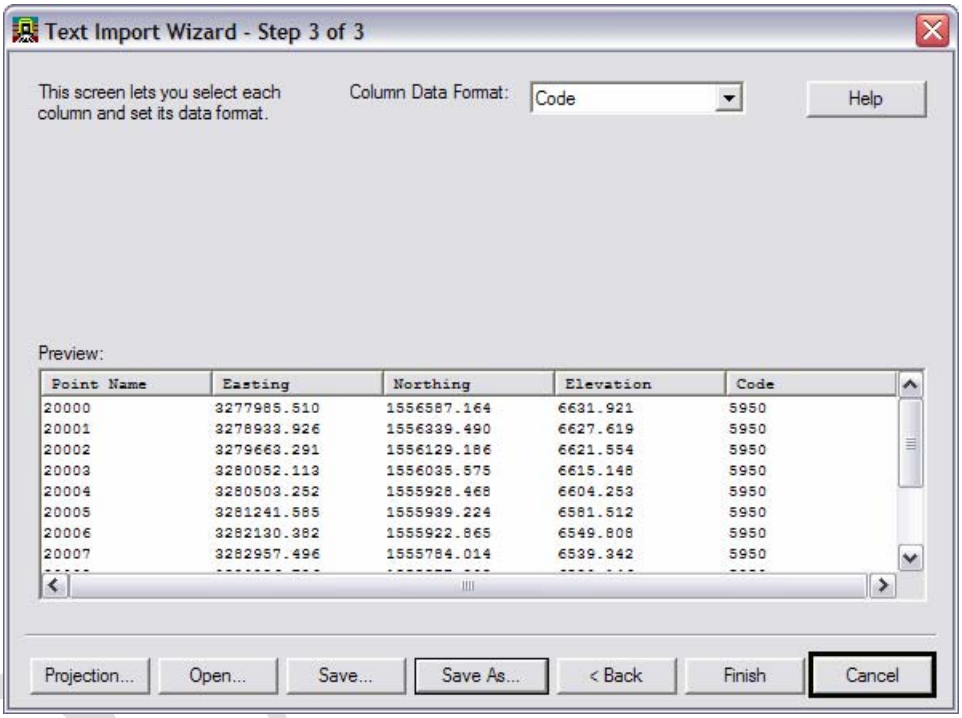
20. **<D>** the **Save** button. The **Save As** dialog will close.
21. The **Save Format to File Types** dialog will appear. Verify **Format Name: *ASCII Import ENEc***



22. **<D>** the **Yes** button. The **Save Format to File Types** dialog will close and the **Step 3 of 3** dialog will reappear.

    Note: The Text Import Wizard has been created for future use.

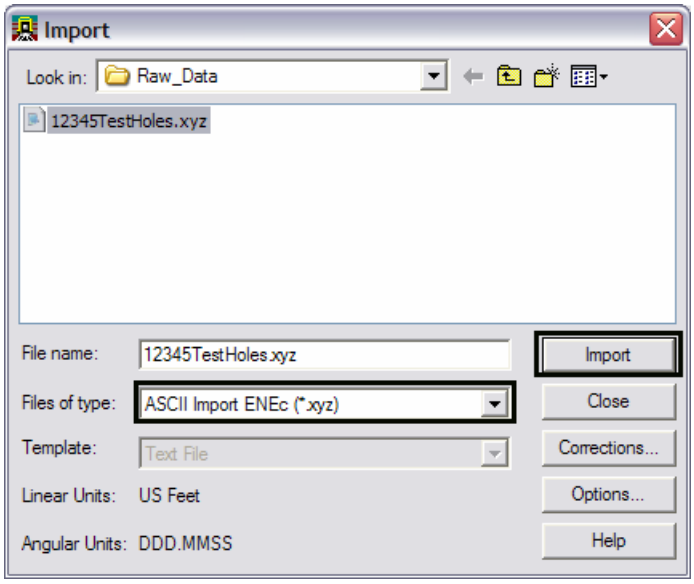
23. In the **Step 3 of 3** dialog **<D>** the **Cancel** button. The **Step 3 of 3** dialog will close and the **Import** dialog will reappear.



24. In the **Import** dialog change the
    Files of type: **ASCII Import ENEc (*.xyz)**

    Note: The extension for the filter (*.xyz) came from the original file extensions that was imported.

25. Select the file *12345TestHoles.xyz*



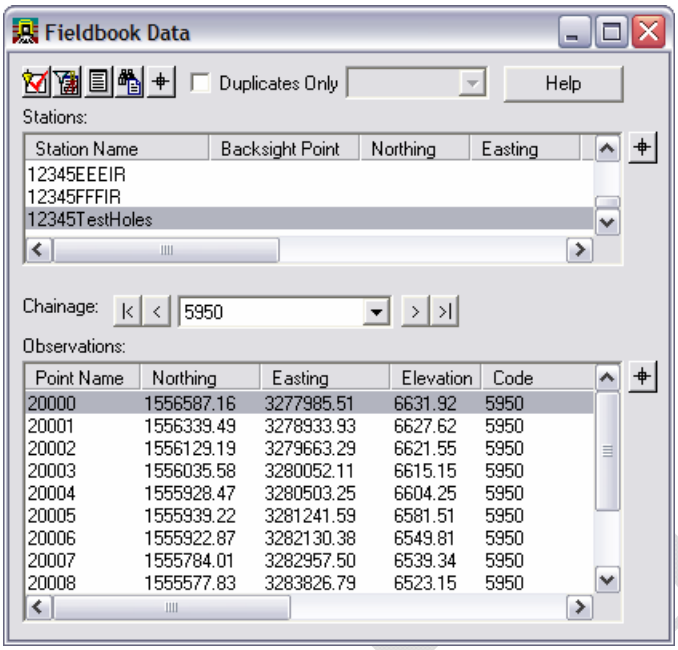
26. **<D>** the **Import** then **Close** buttons.

27. **<D>** **Ignore All** in the **Resolve Code Error** dialog and then close the dialog.

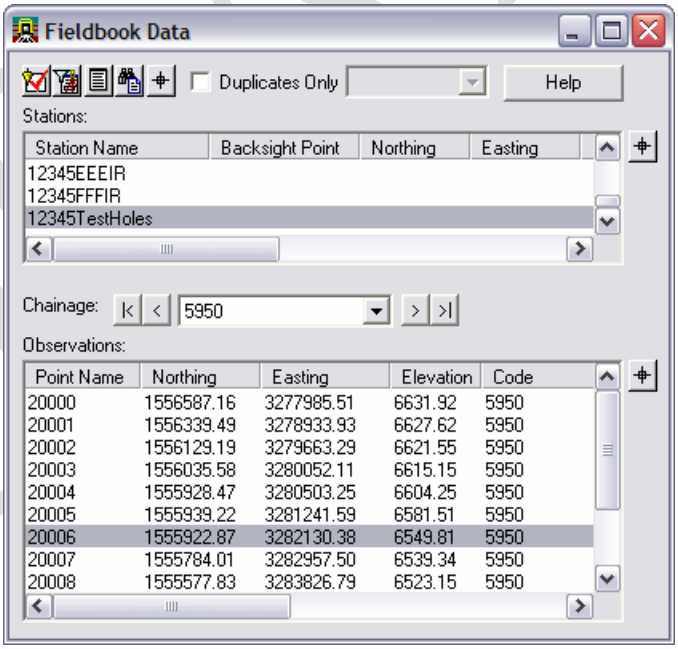
    Note: The **Resolve Code Error** dialog continues to open because the entire file is processed each time a file is imported.

28. **<D>** the **Close** button in the **Results** dialog.

29. Review the data that was imported **Survey > Fieldbook Data…**



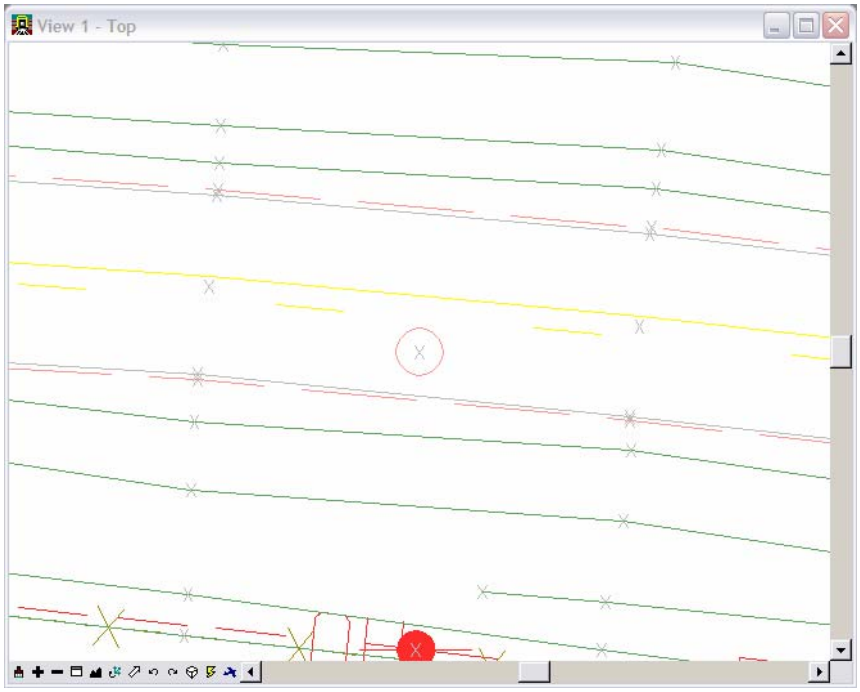
30. **Locate** the file that was imported into the **Fieldbook Data** dialog. As files are imported to the fieldbook they will always append to the active fieldbook.



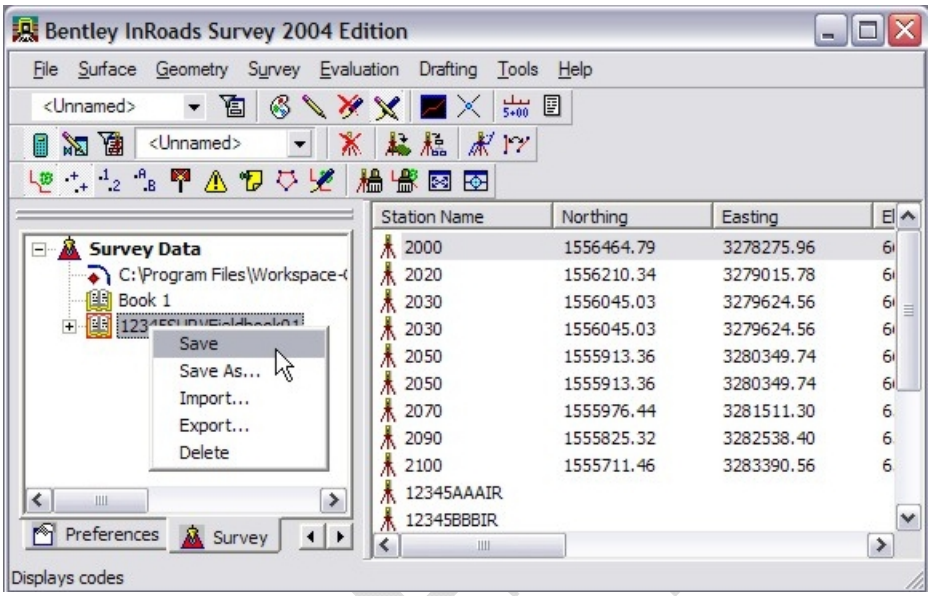
31. Select **Point Name *20006*** in the fieldbook.

32. **<R> Center** Point Name 20006 to the MicroStation view.

    Note: The center command from the shortcut menu works with the current zoom ratio and will not zoom into the point.



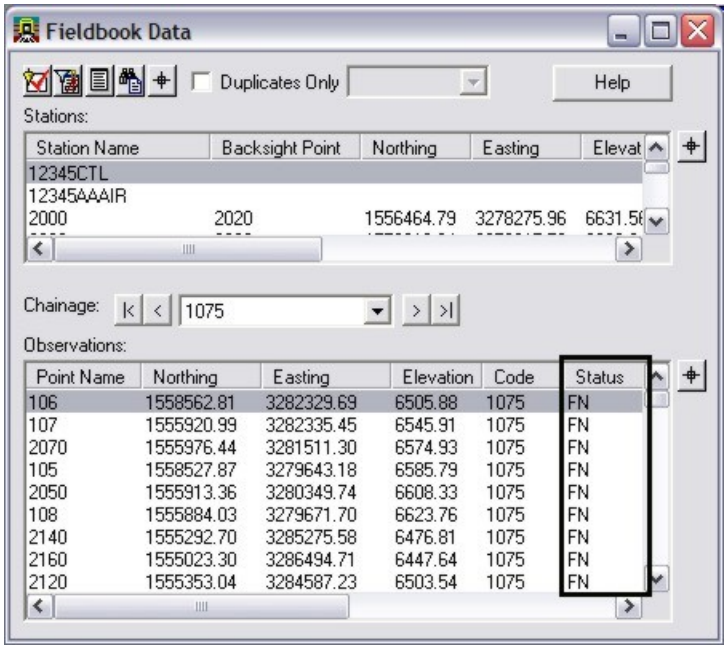
33. Save the Survey fieldbook. From the Workspace Bar **<R>** on **12345SURVFieldbook01** select **Save** from the shortcut menu.



- The Status Bar will show that it was saved.

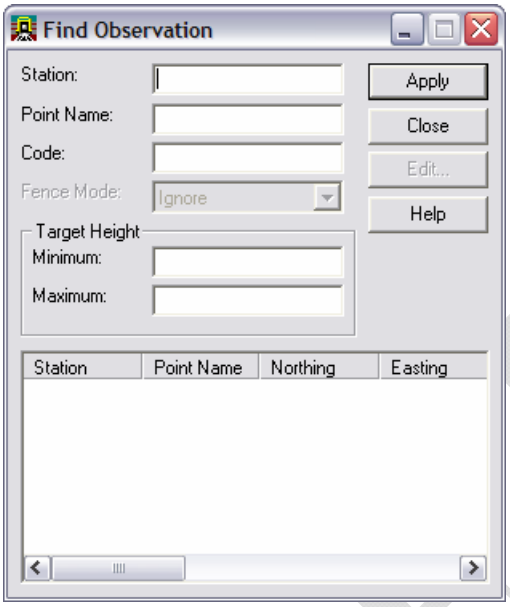
Chapter 6 Fieldbook Edits

Fieldbook Data dialog



- Status Codes
  - **N** – The point has a Note
  - **E** – The point has been Edited
  - **F** – The point is Fixed or has been keyed in
  - **A** – The point has an Attribute associated to the Survey Feature
  - **V**- The point has a Value for an associated Attribute
  - **I** – The point has been Inserted into the fieldbook
  - **C** – The point has been adjusted

Find Observation dialog

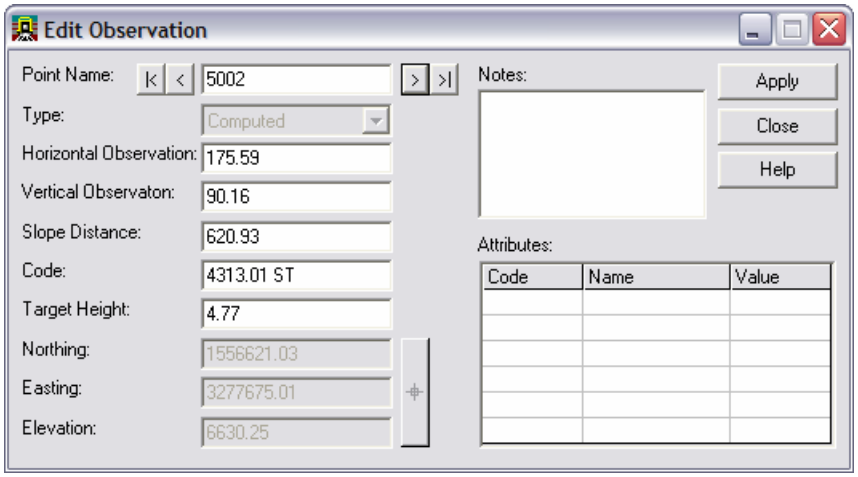


Dialog items:

- ***Station*** – key-in field used to locate Station point numbers in the active fieldbook.
- ***Point Name*** - key-in field used to locate Observation point numbers in the active fieldbook.
- ***Code*** - key-in field used to locate Alpha or Numeric codes in the active fieldbook.
- ***Fence Mode*** – used to constrain a lookup area. If a fence is placed in the design file then the item will be activated so a fence mode could be selected.
- ***Target Height*** – locates survey shots based on a target height range
  - ***Minimum***
  - ***Maximum***
- ***List*** – points found based on the selection criteria.
  - Use the Shift and Ctrl keys to select multiple points in the list.
- **Apply** – locates the points in the active fieldbook and places them in the list section.
- **Edit** – opens the **Edit Observation** dialog for the selected point numbers.

Edit Observation dialog

When editing points in the electronic fieldbook the original raw imported data is not edited. The **Edit Observation** dialog allows the fields that are not grayed out to be edited. After the point has been edited the point will show an "E" in the Status column of the fieldbook. Edits will also be tracked in the Audit Trail file.

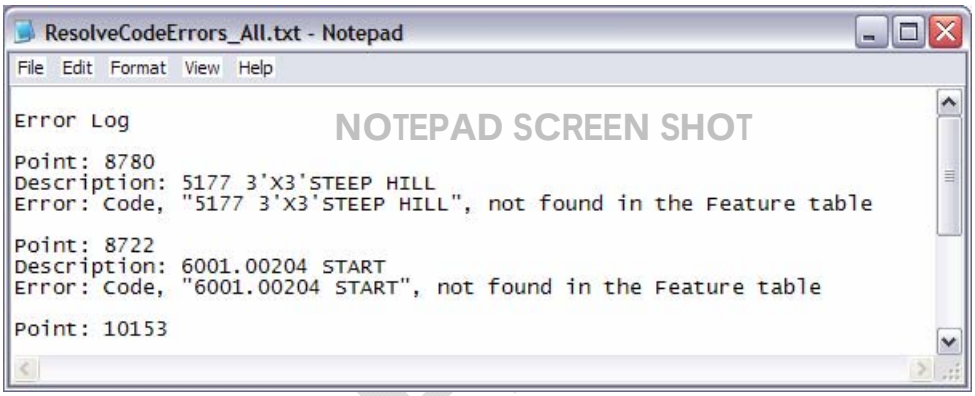


Dialog items:

- ***Point Name*** – assigned point value in the fieldbook.
  - Use the arrows to easily cycle through the points.
- ***Type*** – definition of the point in the fieldbook
  - ***Computed*** – point is defined from measured distances and angles.
  - ***Fixed*** – point is defined from keyed in values for Northing Easting, and Elevation.
  - ***Geometry*** – point is defined from the Cogo buffer point name.
- ***Horizontal Observation*** – measured value
- ***Vertical Observation*** – measured value
- ***Slope Distance*** - measured value
- ***Code*** – feature and control codes
- ***Target Height*** - measured value
- ***Notes*** – any notes added to the shots in the field
- ***Attributes*** – any additional information collected for the point

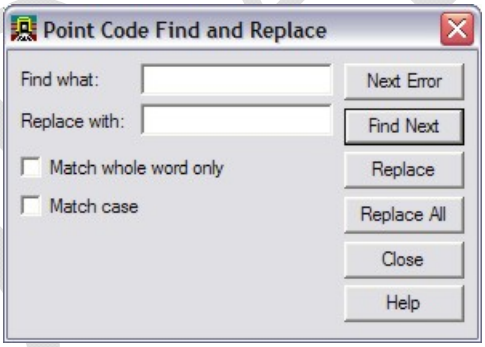
Lab 5: Correcting Fieldbook Code Errors

Code errors are codes that are not found in the Survey Feature table including feature and control codes. From the document that was generated from Resolve Code Errors ***ResolveCodeErrors_All.txt*** those errors will begin to be corrected.

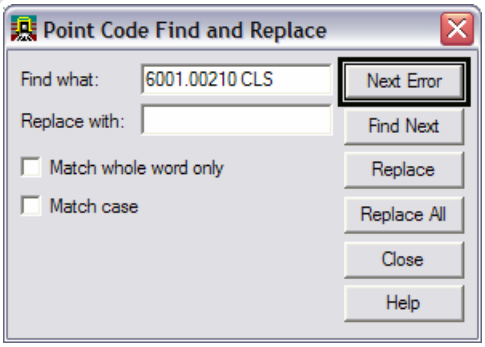


1. **<D>** the Fieldbook button from the Survey toolbar. The Survey Fieldbook will appear.

2. From the **Fieldbook** dialog select the **Find / Replace Codes** button. The **Point Code Find a Replace** dialog will appear.

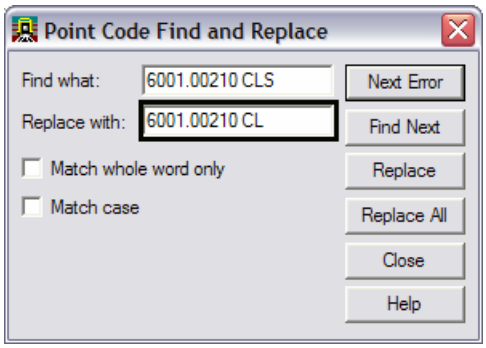


3. Select the **Next Error** button. The command will look in the current fieldbook and return the first code error it finds.



This error has an incorrect Control Code for Close.

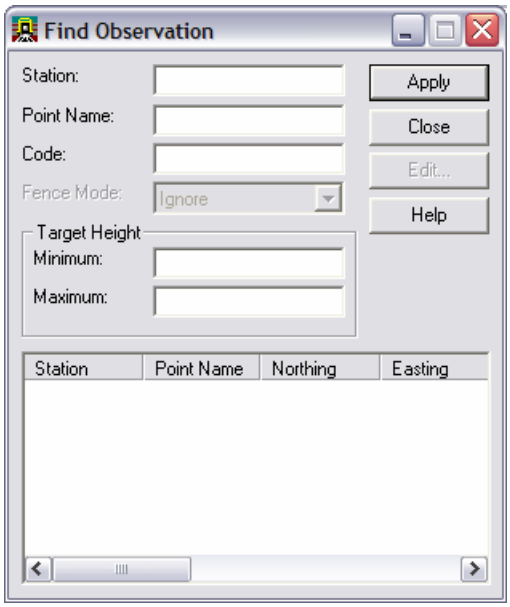
4. Type the correction in the field ***Replace with: 6001.00210 CL***



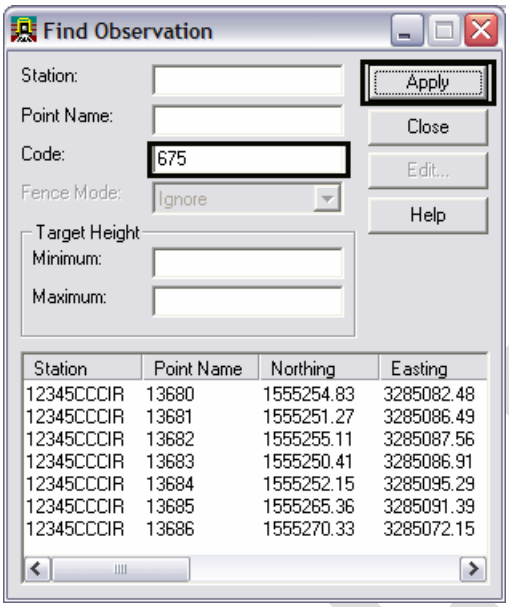
5. **<D>** the **Replace** button. The code in the fieldbook will be updated. The dialog will automatically locate the next code error 675.

6. **<D>** the **Close** button in the **Point Code Find and Replace** dialog.

7. In the Fieldbook Data dialog **<R>** any Point Name in the observation section of the dialog. From the shortcut menu Select ***Find***. The **Find Observation** dialog will appear.

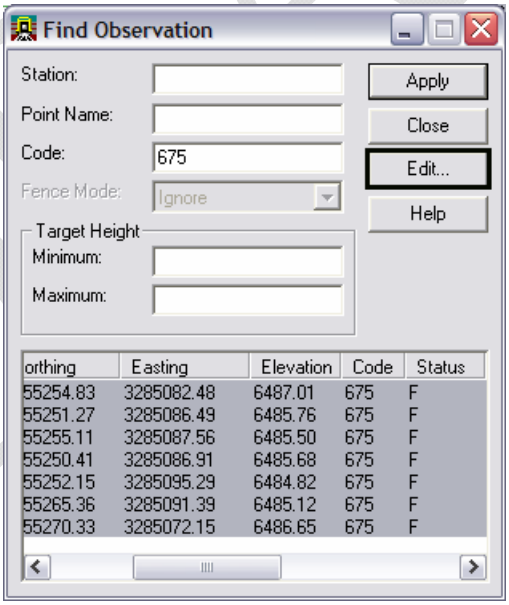


8. Key-in the ***Code: 675*** then select the **Apply** button.



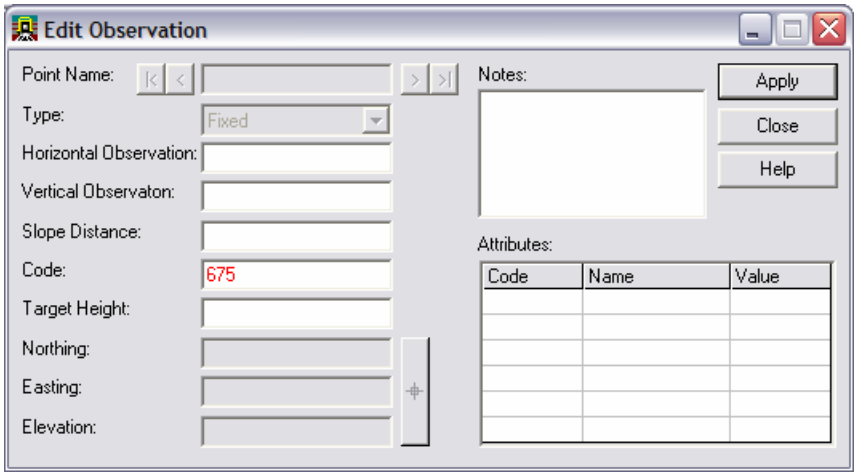
The Code 675 was missed typed into the data collector the correct code for these shots should be 6075. Using the **Find Observation** dialog, multiple codes can be found and edited together.

9. Select the first point in the list then hold down the Shift key select the last point in the list.



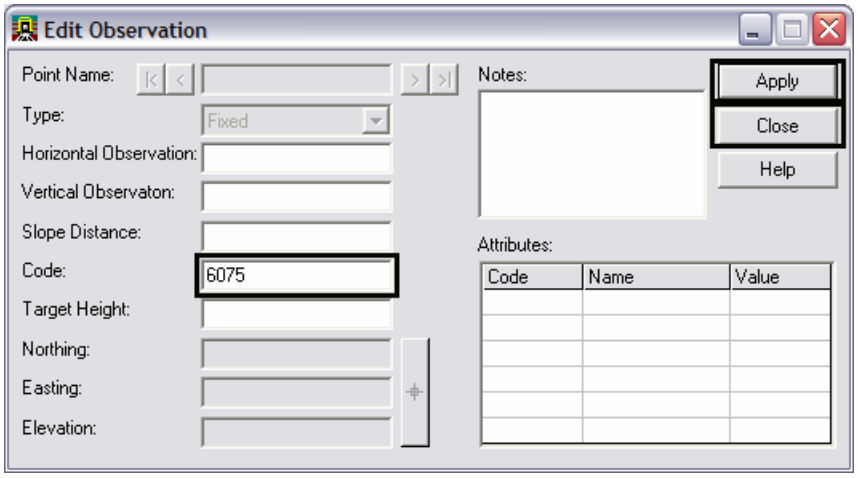
Note: Use the Shift and Ctrl keys on the keyboard to select and deselect multiple points in the Find Observation list.

10. **<D>** the **Edit...** button. The **Edit Observation** dialog will appear.



The Code error 675 is highlighted red indicating the error.

11. Type the correct ***Code: 6075*** Tab key out the code field the code text will change to black indicating an acceptable code was entered.

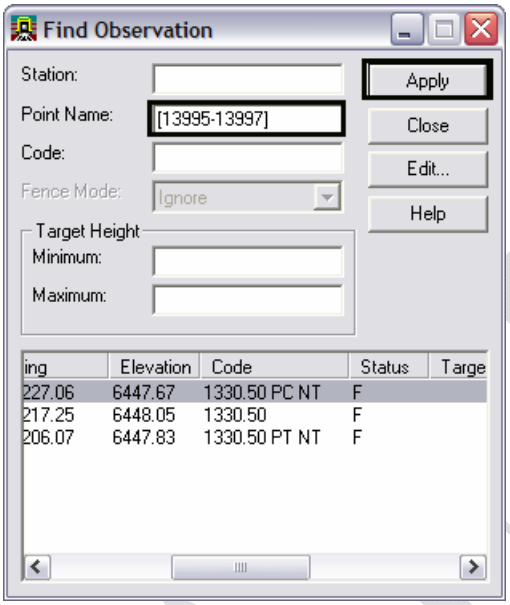


12. **<D>** the **Apply** then **Close** buttons to accept the change for all the selected points.

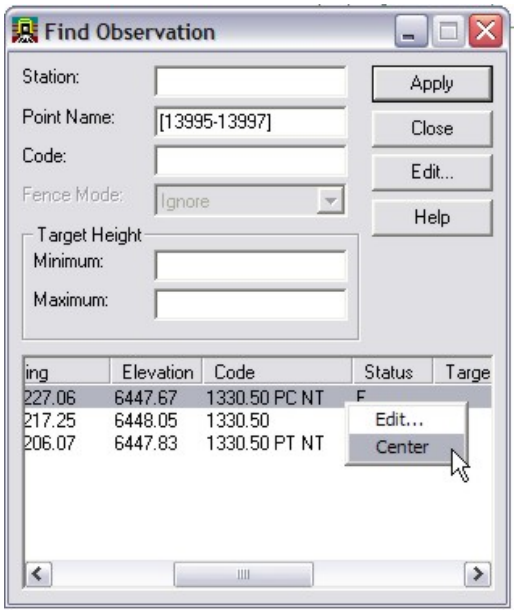
13. Open the **Find Observation** dialog. **<R>** on a point name Observations in the **Fieldbook Data** dialog and select **Find** from the popup menu.

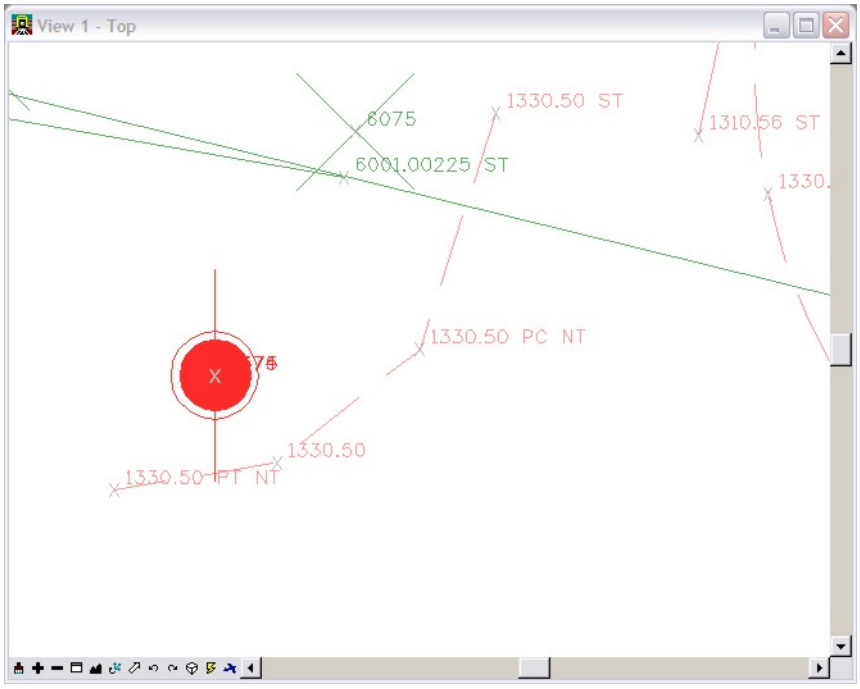
14. Key-in the ***Point Name: [13995-13997]***

15. **<D>** the **Apply** button. The point names in that range will appear in the list.

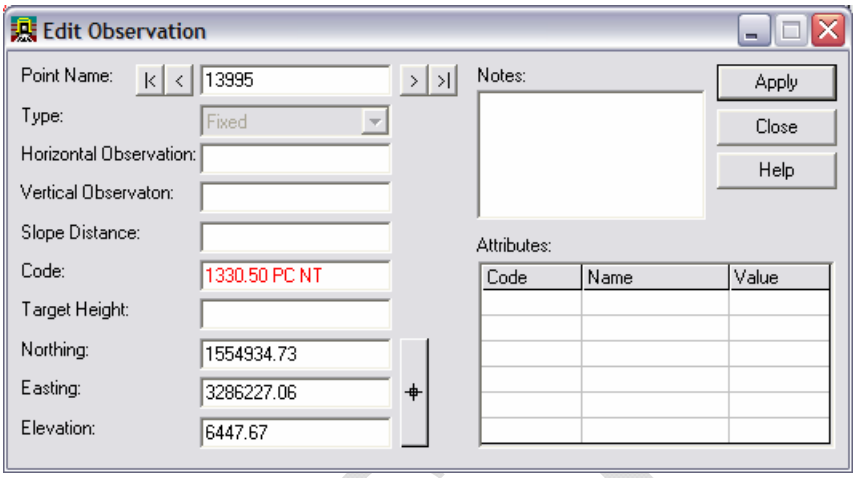


16. Select the point name ***13995*** and **<R>** from the popup menu select **Center**. The point 13995 will center to the MicroStation View 1.

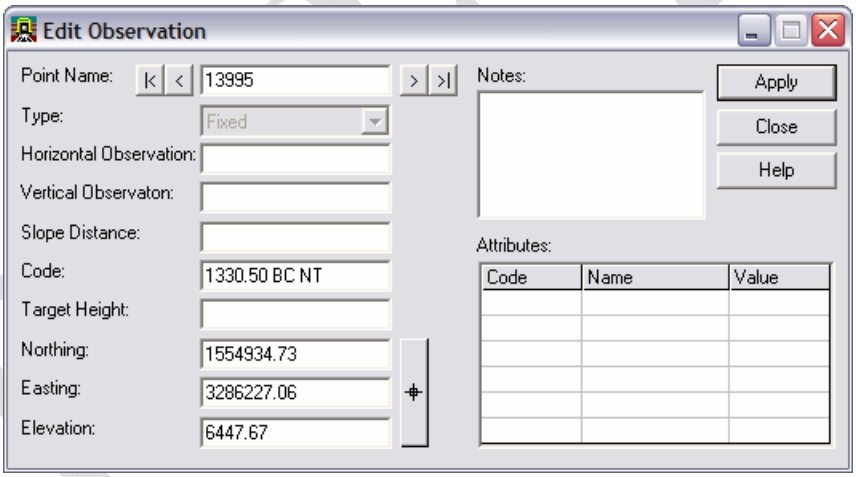




17. From the **Find Observation** dialog select the **Edit** button. The **Edit Observation** dialog will appear.

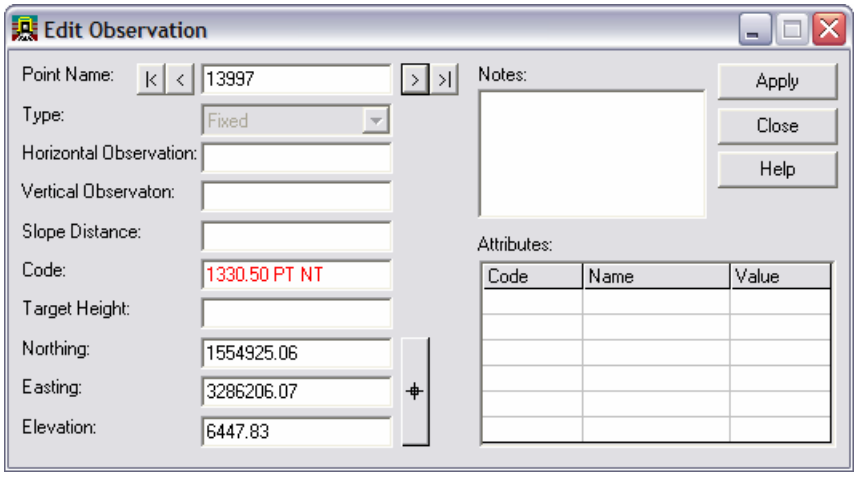


18. Type in the ***Code: 1330.50 BC NT***

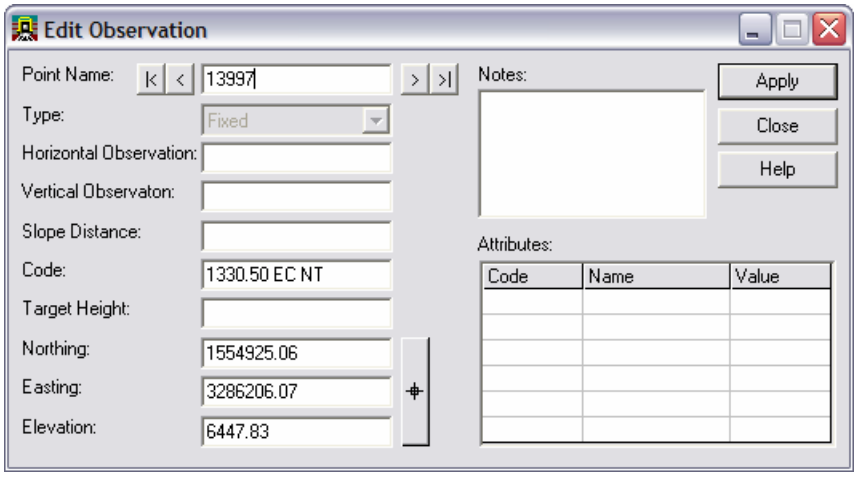


19. **<D>** the **Apply** button.

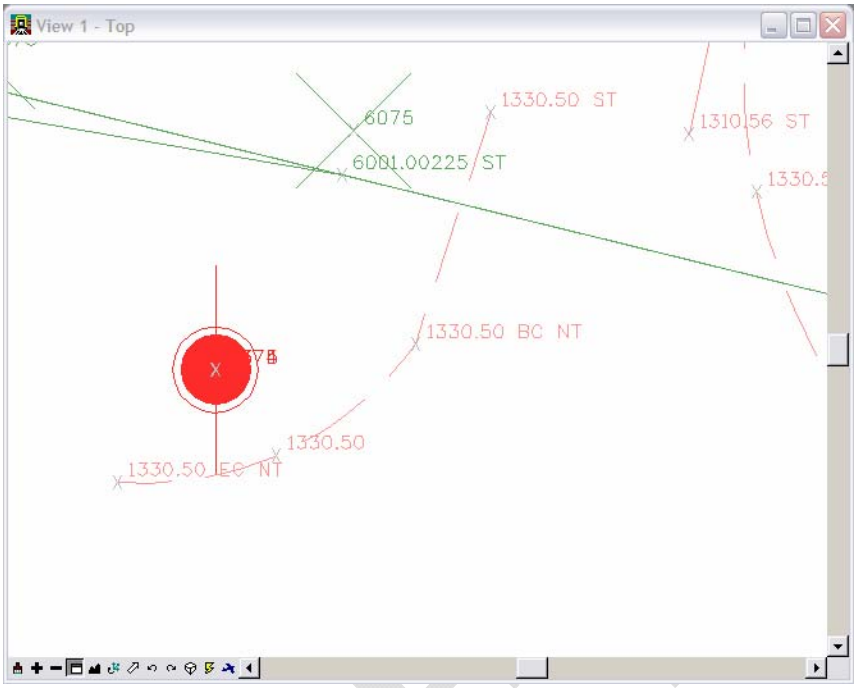
20. **<D>** the **Next**  button at the top of the dialog, stop at point ***13997***.



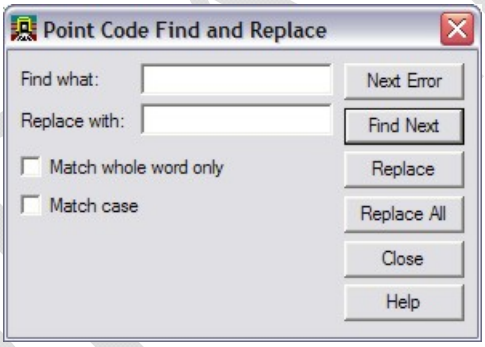
21. Type in the ***Code: 1330.50 EC NT***



22. **<D>** the **Apply** the **Close** buttons. Review your results in MicroStation View 1.

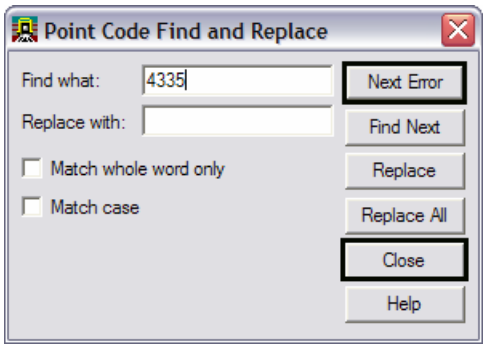


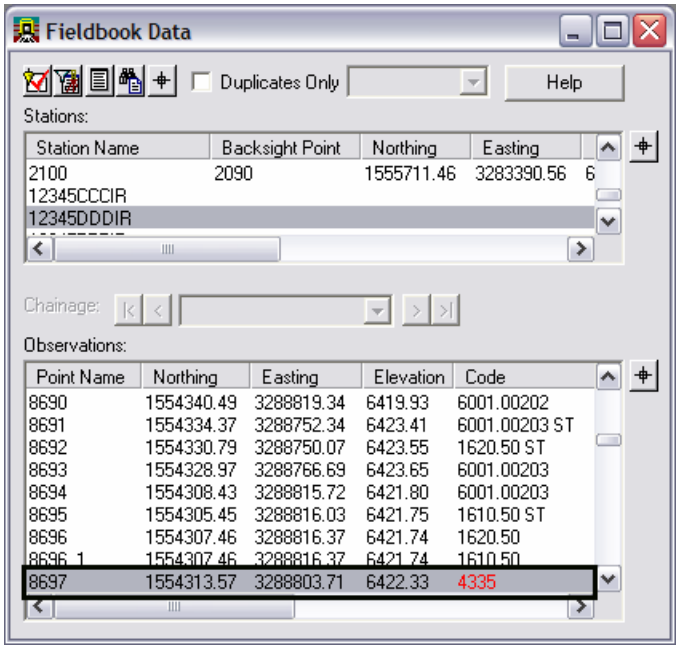
23. From the **Fieldbook** dialog select the **Find / Replace Codes** button. The **Point Code Find a Replace** dialog will appear.



24. **<D>** the **Next Error** button. The command will look in the current fieldbook and return the first code error it finds.

25. **<D>** the **Close** button. The incorrect point will be located in the **Fieldbook Data** dialog.

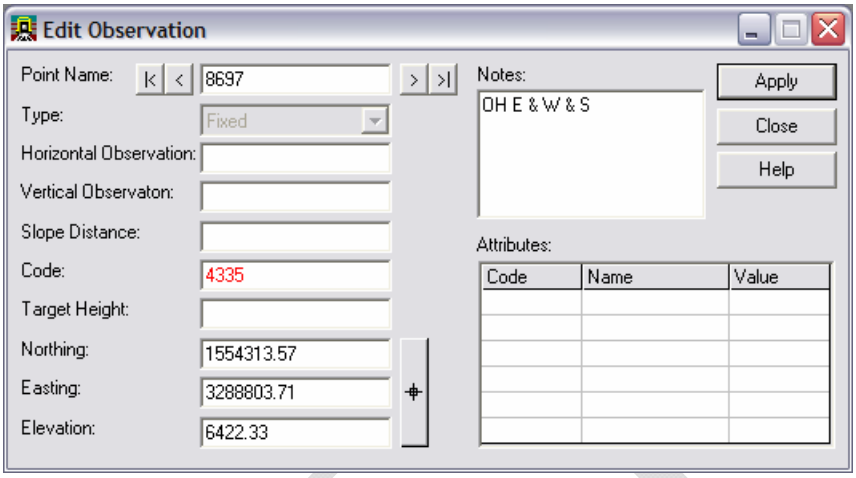




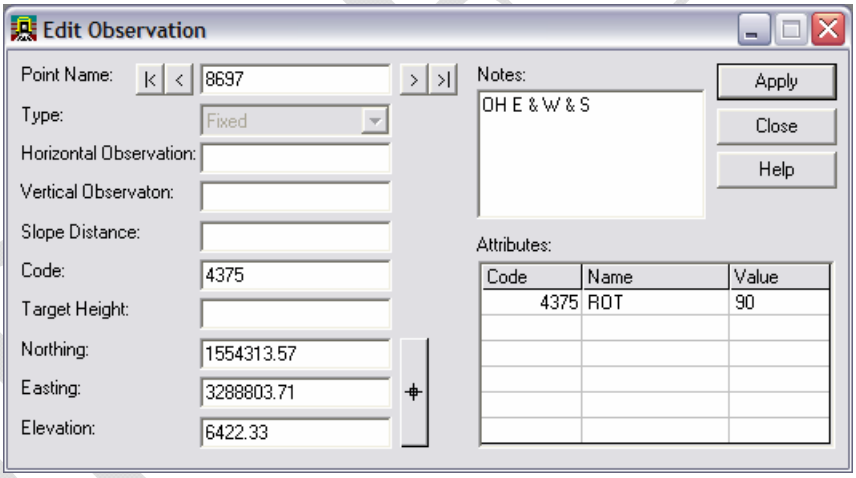
This error has an incorrect Feature Code for a Power Pole.

26. In the **Fieldbook Data** dialog **<R>** on the point name ***8697*** from the popup menu select **Center**. The point name will be centered to the MicroStation View 1.

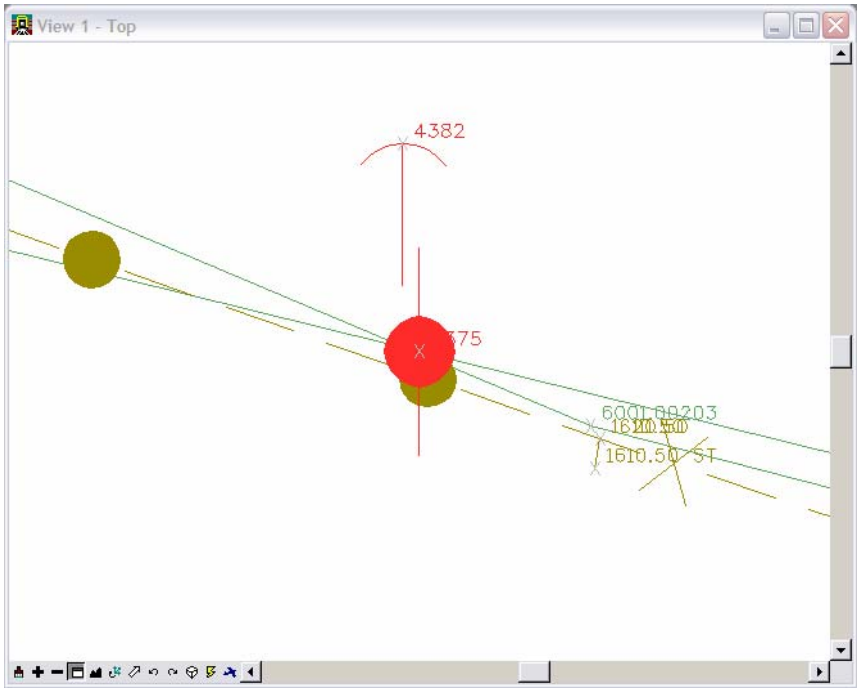
27. Again in the **Fieldbook Data** dialog **<R>** on the point name ***8697*** from the popup menu select **Edit.** The **Edit Observation** dialog will appear for point 8697.



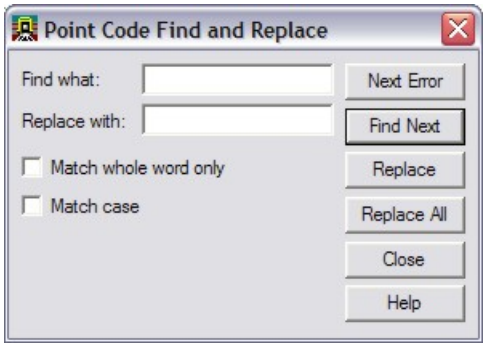
28. Type in the ***Code: 4375***



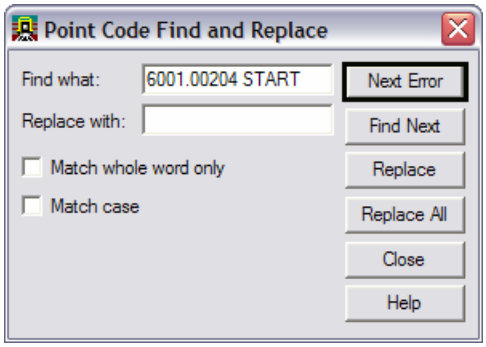
29. **<D>** the **Apply** then **Close** buttons. In the MicroStation View 1 the point has been updated and a power pole cell is at the location.



30. From the **Fieldbook** dialog select the **Find / Replace Codes** button. The **Point Code Find a Replace** dialog will appear.

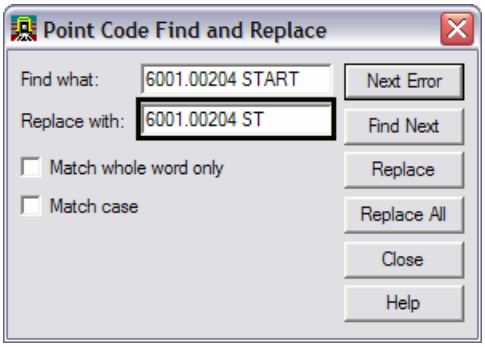


31. Select the **Next Error** button. The command will look in the current fieldbook and return the first code error it finds.



This error has an incorrect Control Code for Start.

32. Type the correction in the field ***Replace with: 6001.00210 ST***



33. **<D>** the **Replace** button. The code in the fieldbook will be updated. The dialog will automatically locate the next code error ***5177 3'X3'STEEP HILL***

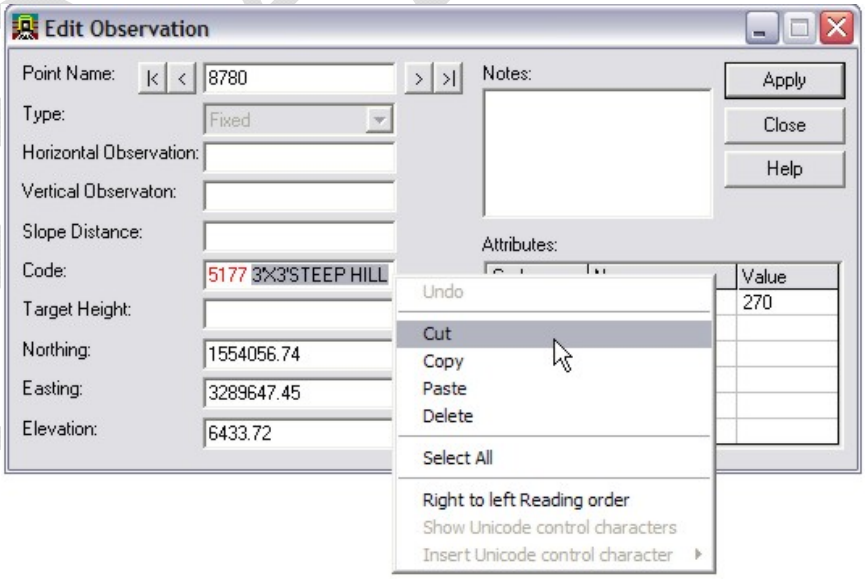
34. **<D>** the **Close** button in the **Point Code Find and Replace** dialog. The point name 8780 will be selected in the **Fieldbook Data** dialog.

35. **<R>** the point name ***8780*** and from the popup menu select **Edit**. The **Edit Observation** dialog will appear.

This error is because of the note being entered into the code field. The note will be cut and then pasted into the Notes field, where it belongs.

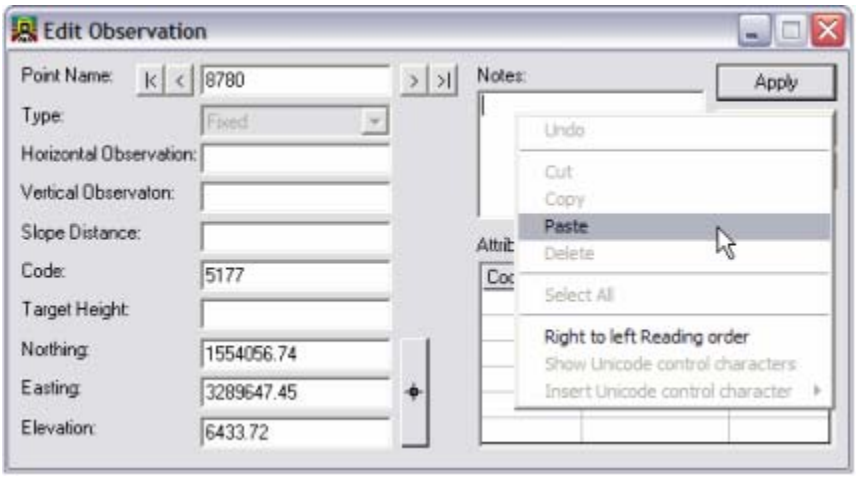
36. In the Code field highlight the additional text in the code line "***3'X3'STEEP HILL***"

37. **<R>** on the highlighted note and select **Cut** from the popup menu.

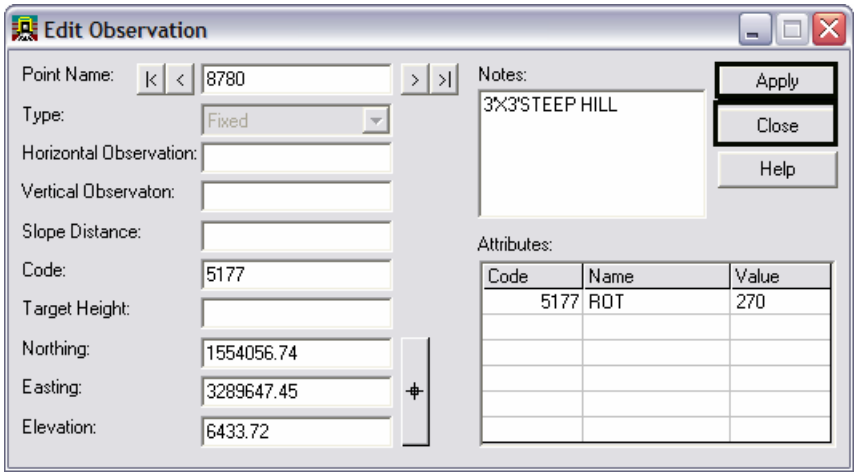


38. **<D>** in the ***Notes*** field so the field has focus.

39. **<R>** in the ***Notes*** field and select **Paste** from the popup menu.

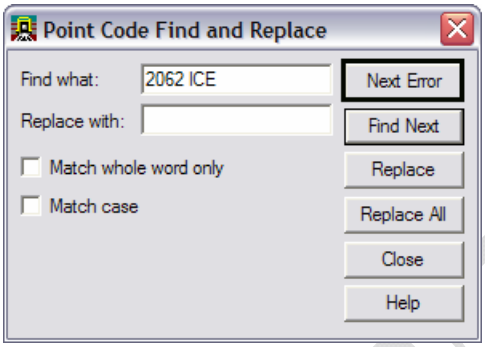


40. In the **Edit Observation** dialog **<D>** the **Apply** then **Close** buttons.



41. From the **Fieldbook** dialog select the **Find / Replace Codes** button. The **Point Code Find a Replace** dialog will appear.

42. Select the **Next Error** button. The command will look in the current fieldbook and return the last coding error in this fieldbook.



43. **<D>** the **Close** button in the **Point Code Find and Replace** dialog. The point name 10153 will be selected in the **Fieldbook Data** dialog.

44. **<D> <D>** the point name ***10153***. The **Edit Observation** dialog will appear.

Again this error is because of the note being entered into the code field. The note will be cut and then pasted into the Notes field, where it belongs.

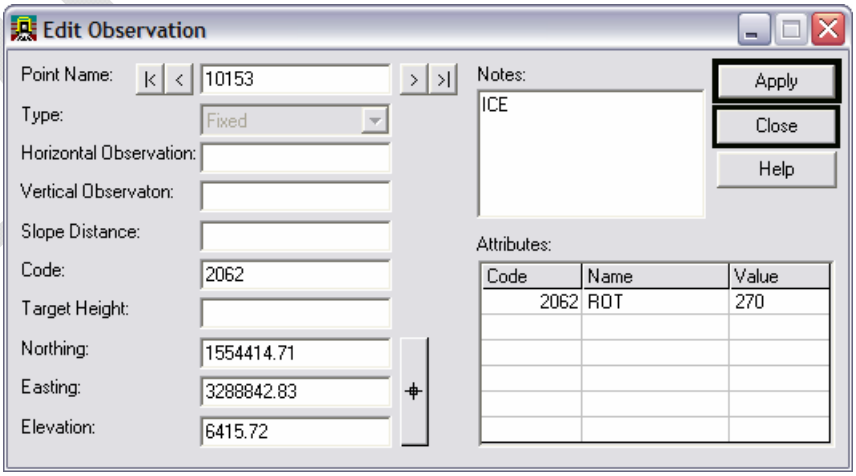
45. In the Code field highlight the additional text in the code line "***ICE***"

46. **<R>** on the highlighted note and select **Cut** from the popup menu.

47. **<D>** in the ***Notes*** field so the field has focus.

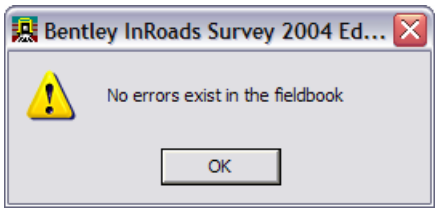
48. **<R>** in the ***Notes*** field and select **Paste** from the popup menu.

49. In the **Edit Observation** dialog **<D>** the **Apply** then **Close** buttons.



This should have taken care of our code errors in the fieldbook.

50. Verify this by opening the ***Point Code Find and Replace*** dialog and selecting **Next Error**. An alert dialog will appear stating that no errors exist in the fieldbook.



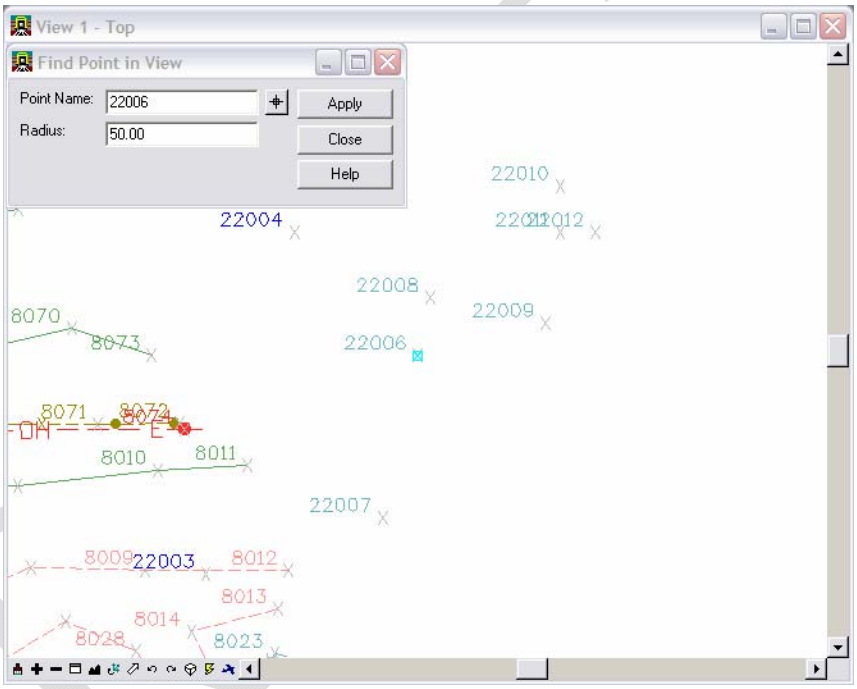
51. Save the Survey fieldbook. From the Workspace Bar **<R>** on **12345SURVFieldbook01** select ***Save*** from the shortcut menu.

Lab 6: Correcting Fieldbook Control Code Errors

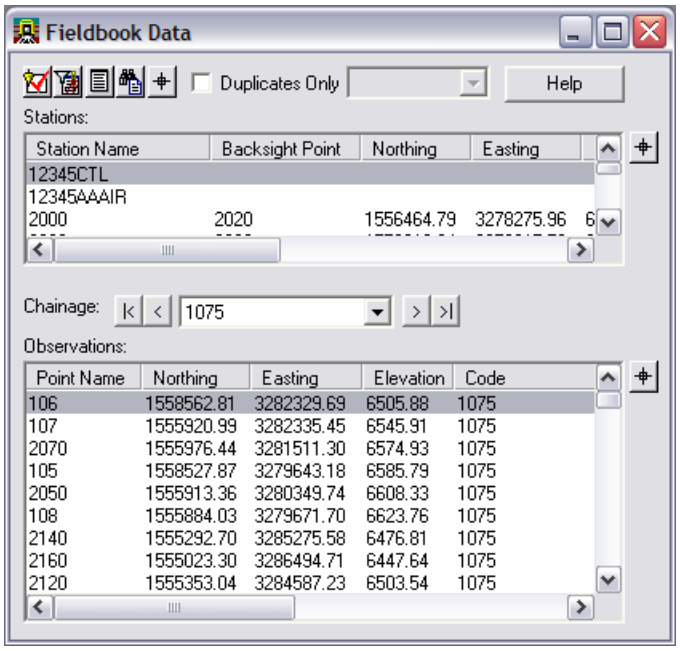
Control codes are the drawing tools for InRoads Survey. When collecting data in the field think of the range pole as a large pencil and using control codes allows you to draw the lines. Even though CDOT has standardized on Numeric feature codes, InRoads Survey does allows the use of Alpha control codes.

1. From the pulldown menu **Survey > Find Point in View** The **Find Point in View** dialog will appear.

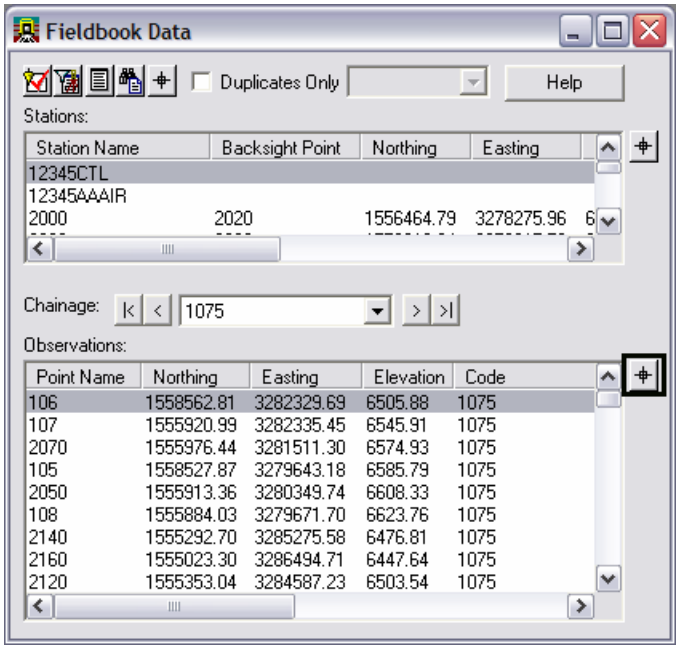
2. Key-in the ***Point Name: 22006***
   Radius: 50



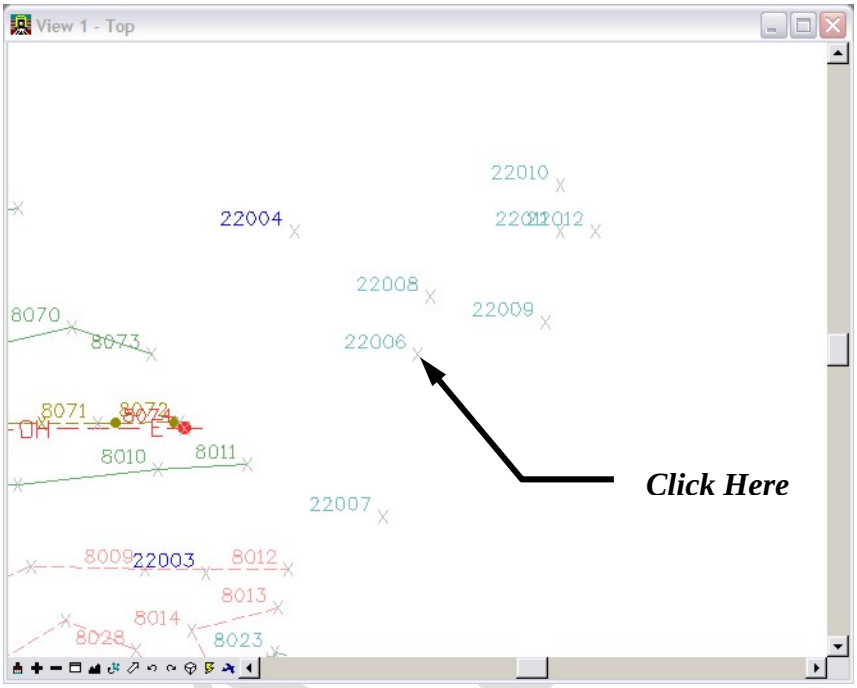
3. Open the **Fieldbook Data** dialog **Survey > Fieldbook Data**

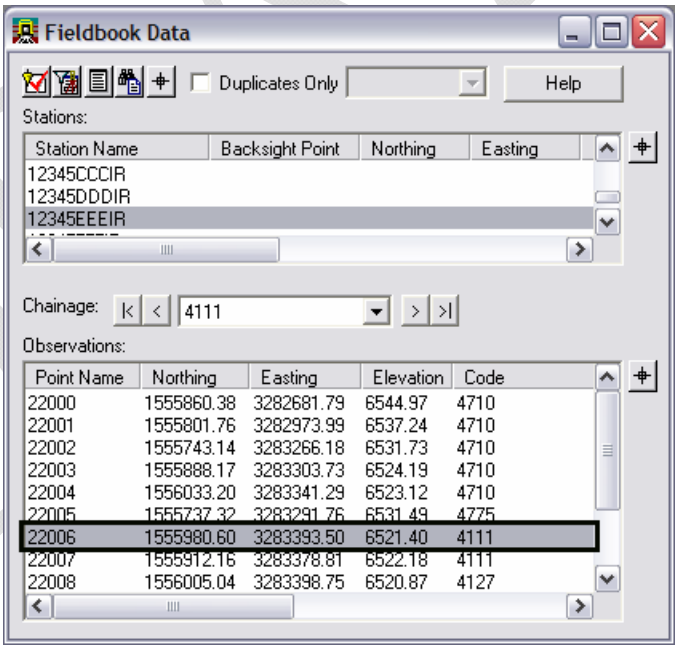


4. From the **Fieldbook Data** dialog **<D>** the ***Select Observation***  target button. The **Fieldbook Data** dialog will minimize allowing more of the view to be displayed.



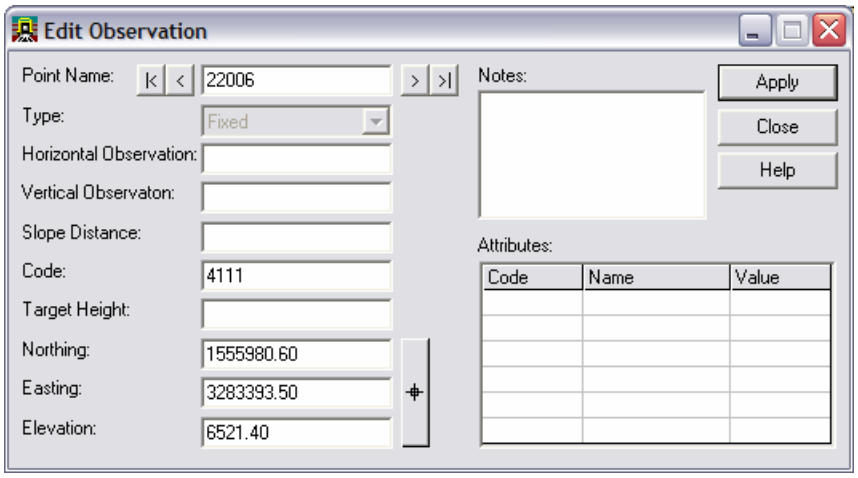
5. **<D>** point ***22006*** in the MicroStation View 1. The **Fieldbook Data** dialog will restore to the screen and the point name ***22006*** will be highlighted in dialog.





6. **<D> <D>** the point name ***22006***. The **Edit Observation** dialog for point 22006 will appear.

The brick house point code is missing the control code ST to start the line work. Also the distance control code DIST will be utilized to complete the planimetrics of the house.



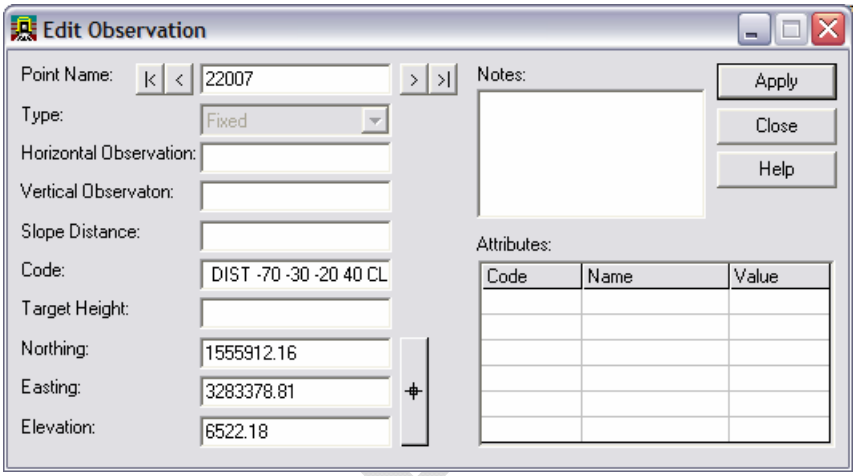
7. Type in the ***Code: 4111 ST***

8. **<D>** the **Apply** button. The line work for the house will start.

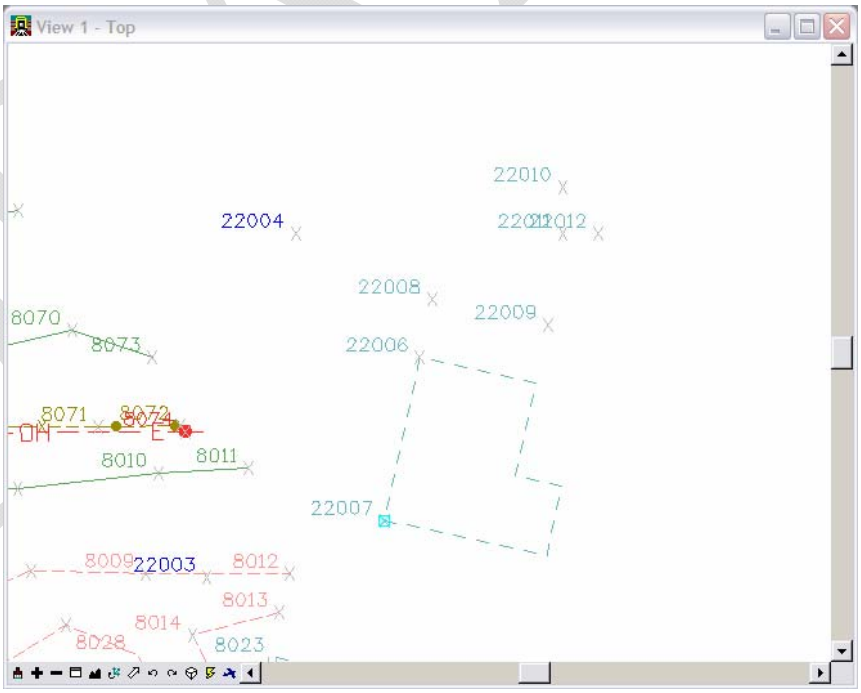
9. **<D>** the **Next** button in the **Edit Observation** dialog stop at point name ***22007***.

10. Type in the ***Code: 4111 DIST -70 -30 -20 40 CL***

11. **<D>** the **Apply** button.



Note: A ***positive number*** will place the line to the ***right*** of the two base line points. A ***negative number*** will place the line to the ***left side*** of the two base line points.

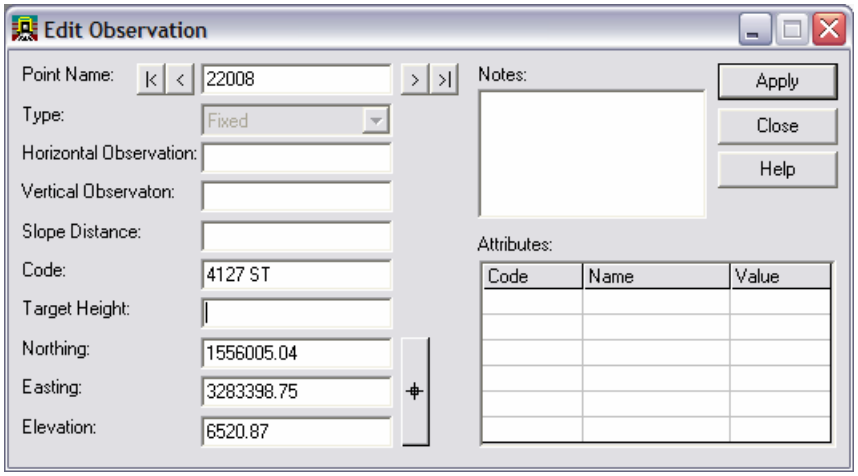


12. Locate point name ***22008*** in the **Fieldbook Data** dialog

13. **<D> <D>** the point name ***22008***. The **Edit Observation** dialog will appear.

The next edits will be to create the deck on the back of the house using two shots and a measured distance with the rectangle RECT control code.

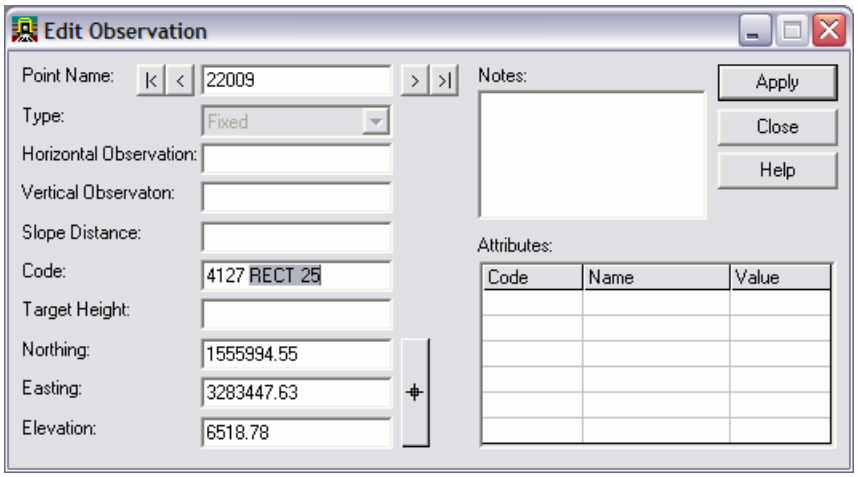
14. Type in the ***Code: 4127 ST***



15. **<D>** the **Apply** button. The line work for the deck will start.

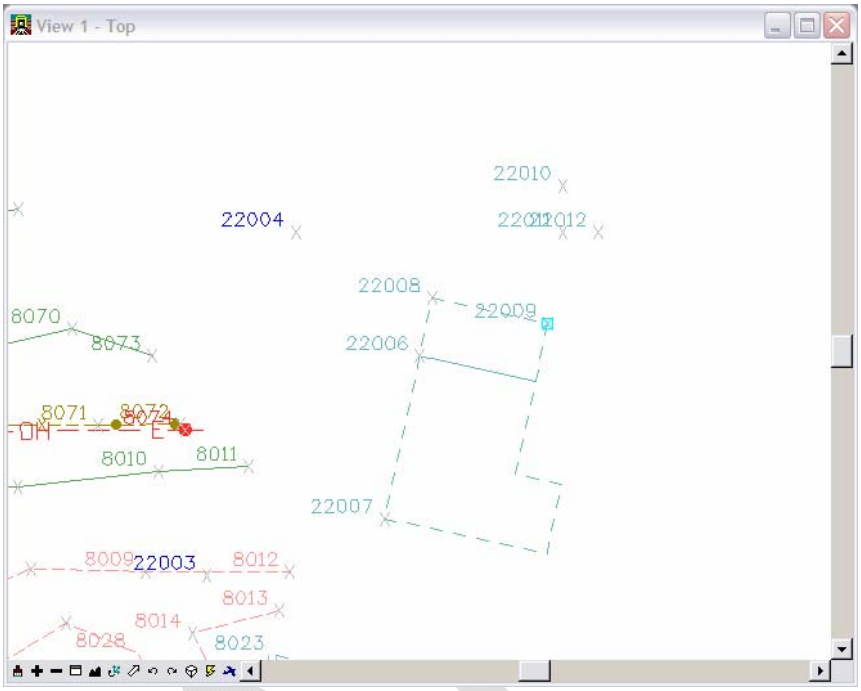
16. **<D>** the **Next** button in the **Edit Observation** dialog stop at point name ***22009***.

17. Type in the ***Code: 4127 RECT 25***



Note: A ***positive number*** will place the rectangle on the ***right side*** of the two base line points. A ***negative number*** will place the rectangle on the ***left side*** of the two base line points.

18. **<D>** the **Apply** button the rectangle control code will have finished creating the line work.

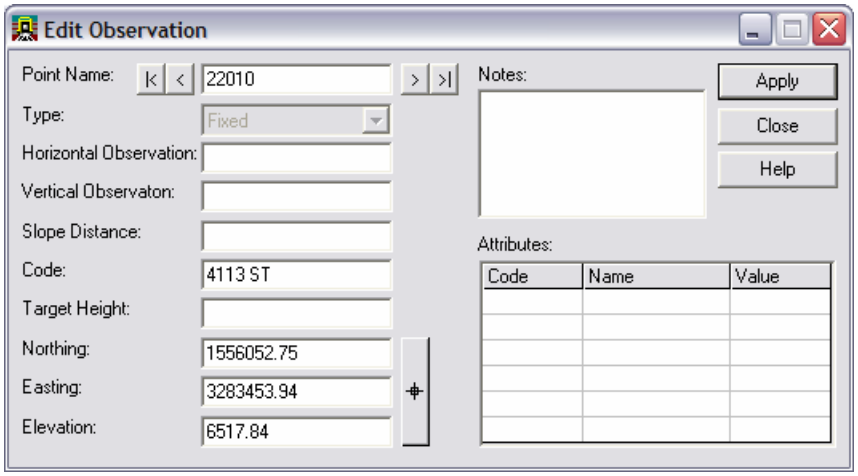


19. Locate point name ***22010*** in the **Fieldbook Data** dialog.

20. **<D> <D>** the point name ***22010***. The **Edit Observation** dialog will appear.

The next edits will be to create the shed using three shots with the close rectangle CLR control code.

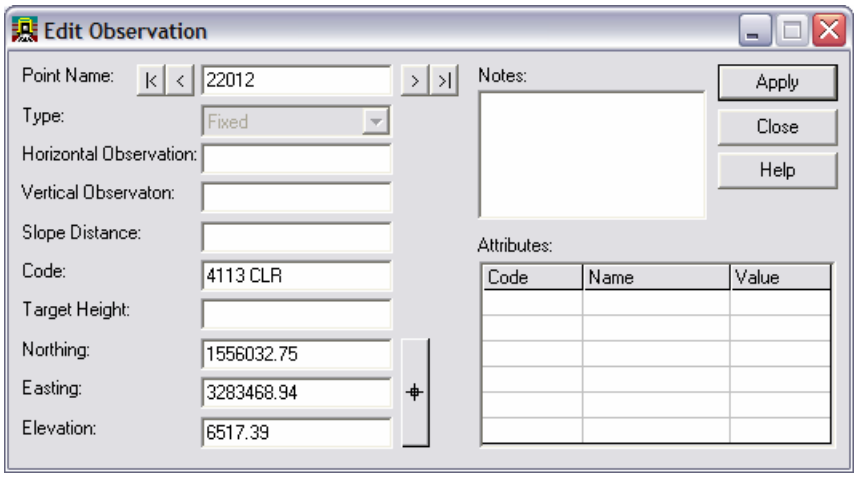
21. Type in the ***Code: 4113 ST***



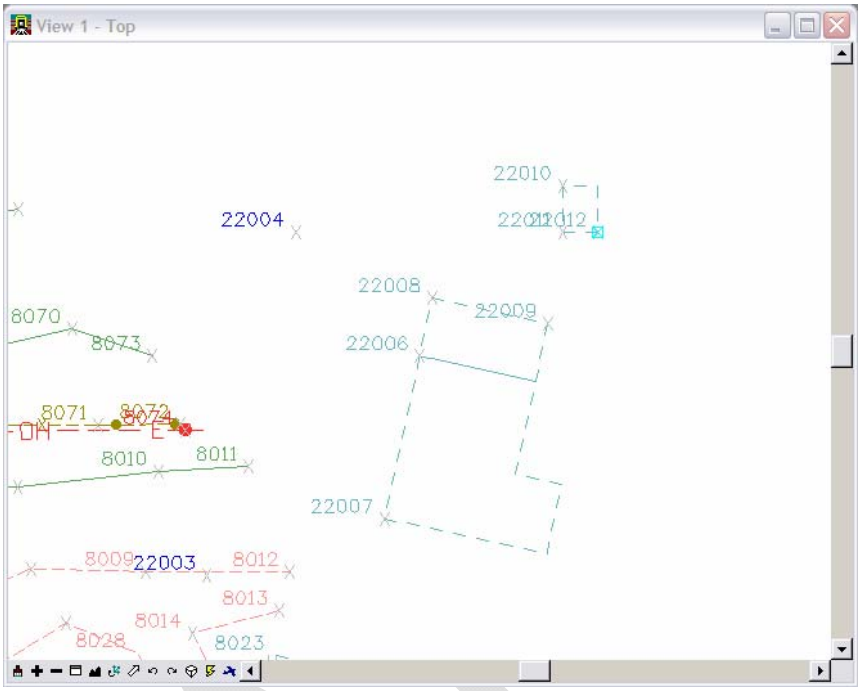
22. **<D>** the **Apply** button. The line work for the deck will start.

23. **<D>** the **Next** button in the **Edit Observation** dialog stop at point name ***22012***

24. Type in the ***Code: 4113 CLR***

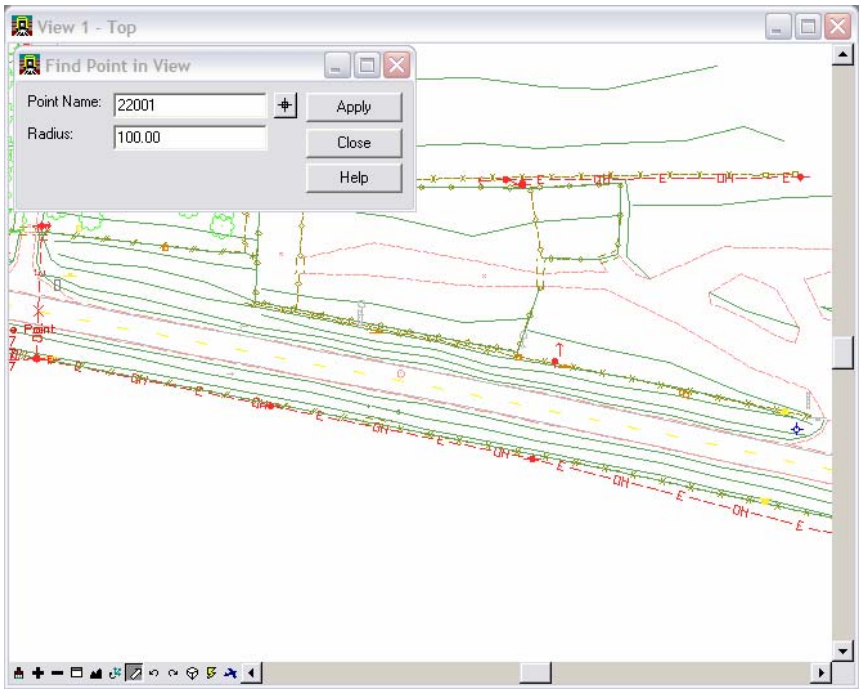


25. **<D>** the **Apply** button the close rectangle control code will have finished creating the line work.



26. From the pulldown menu **Survey > Find Point in View** The **Find Point in View** dialog will appear.

27. Key-in the ***Point Name: 22000***
Radius: 100

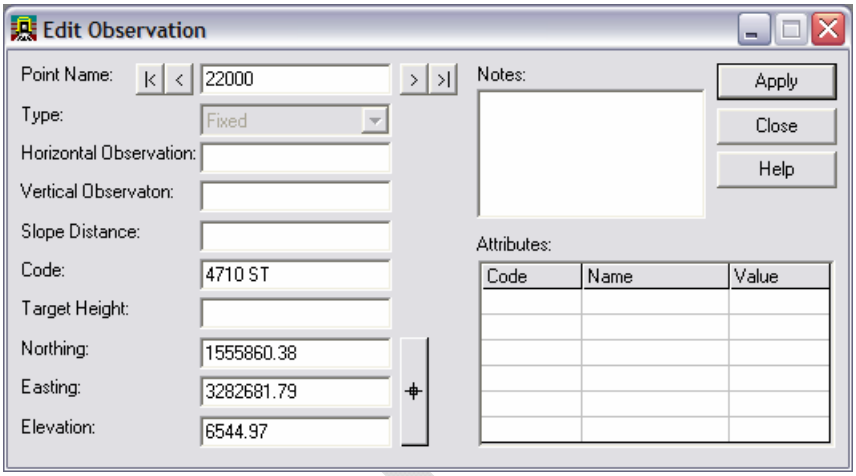


28. Locate point name ***22000*** in the **Fieldbook Data** dialog.

29. **<D> <D>** the point name ***22000***. The **Edit Observation** dialog will appear.

The next edits will be to create the waterline along the edge of the roadway and then connect the waterline to the fire hydrant at the driveway entrance.

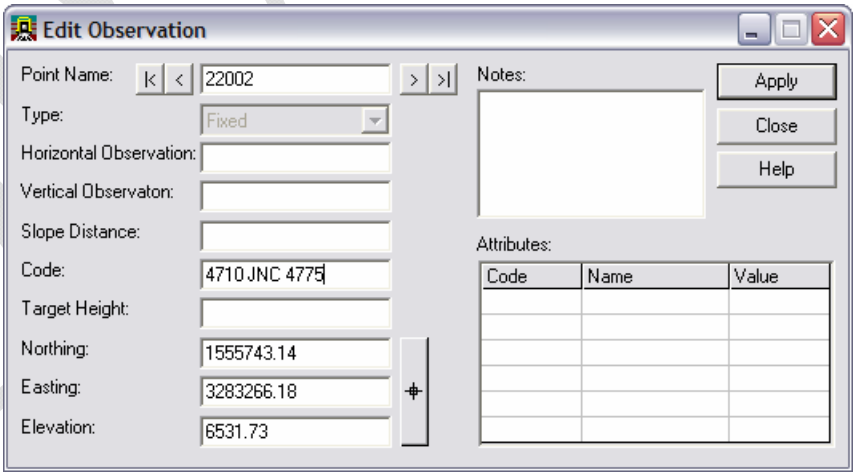
30. Type in the ***Code: 4710 ST***



31. **<D>** the **Apply** button. The line work for the deck will have started.

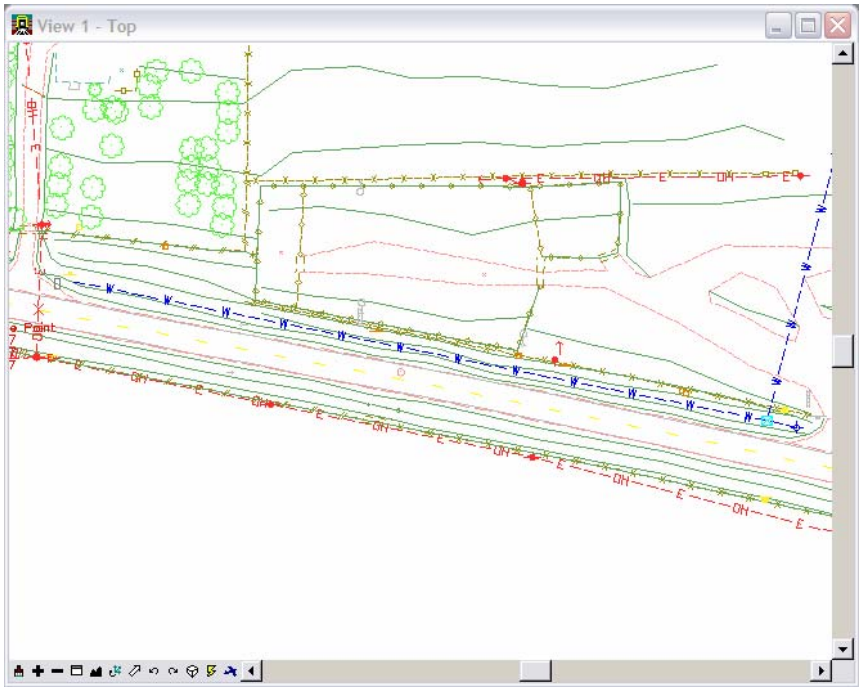
32. **<D>** the **Next** button in the **Edit Observation** dialog stop at point name ***22002***

33. Type in the ***Code: 4710 JNC 4775***



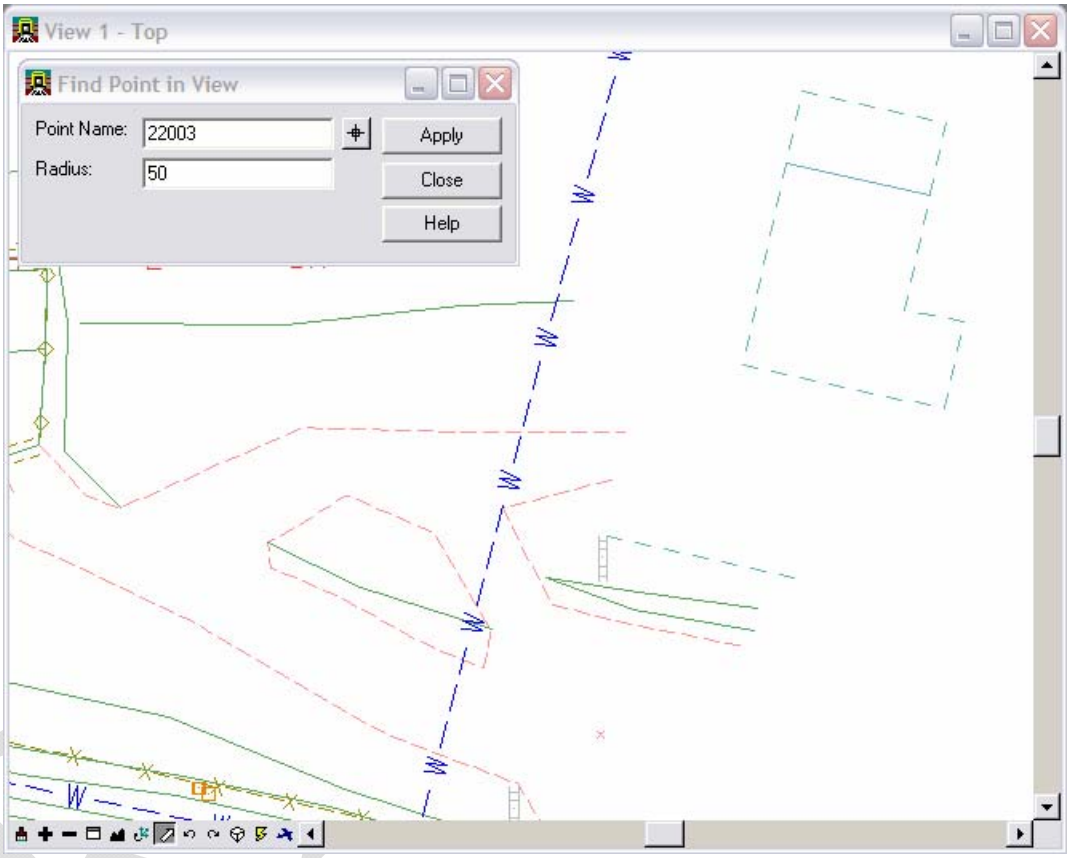
Note: The Join Nearest Code JNC will locate the nearest fire hydrant 4775 feature code and connect a line to that code.

34. **<D>** the **Apply** button the close rectangle control code will have finished creating the line work.

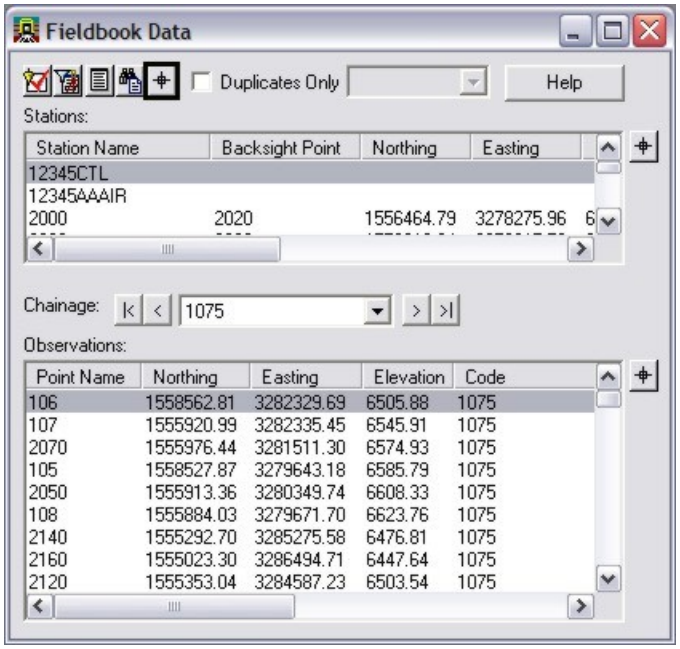


35. From the pulldown menu **Survey > Find Point in View** The **Find Point in View** dialog will appear.

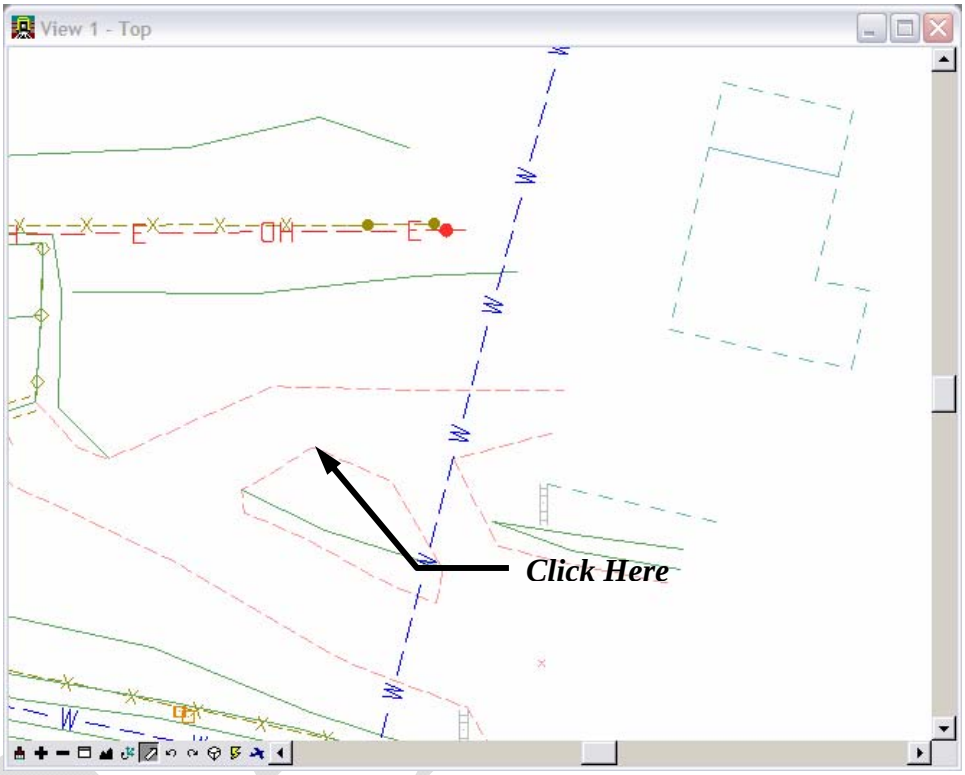
36. Key-in the ***Point Name: 22003***
Radius: 50

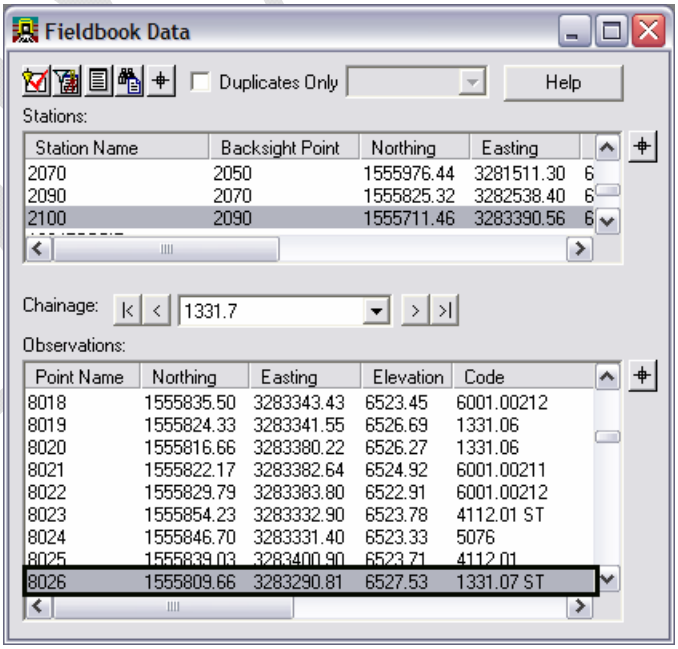


37. From the **Fieldbook Data** dialog **<D>** the ***Select Figure*** target button. The **Fieldbook Data** dialog will minimize allowing more of the view to be displayed.



38. **<D>** the figure shown in the MicroStation View 1. The **Fieldbook Data** dialog will restore to the screen and the point name ***8026*** will be highlighted in dialog.

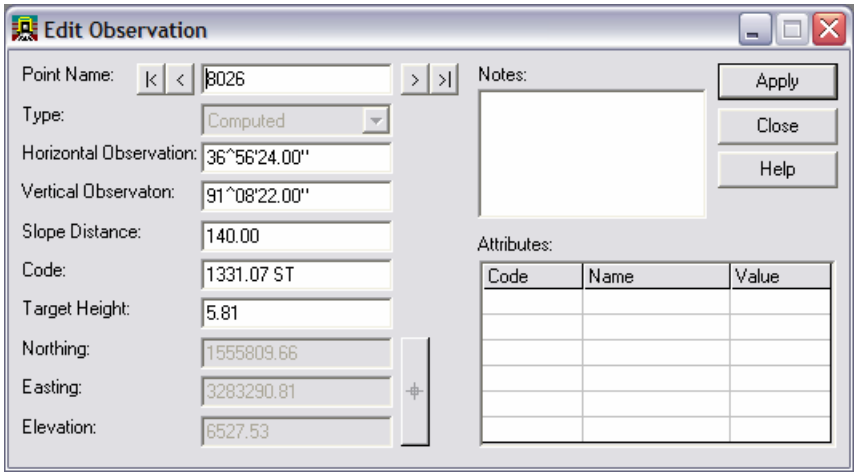




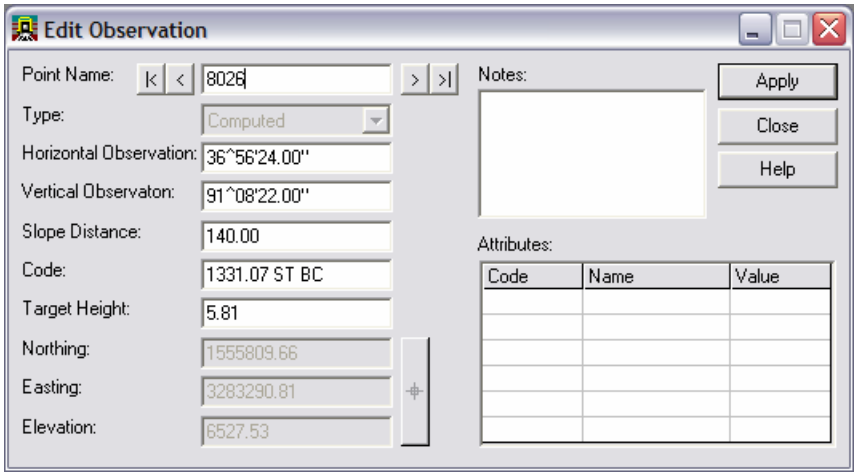
Note: The point highlighted is the start of the figure you selected.

39. **<D> <D>** the point name ***8026***. The **Edit Observation** dialog for point 8206 will appear.

The figure shown in plan view has sharp edges and should be smoothed for a better looking basemap.

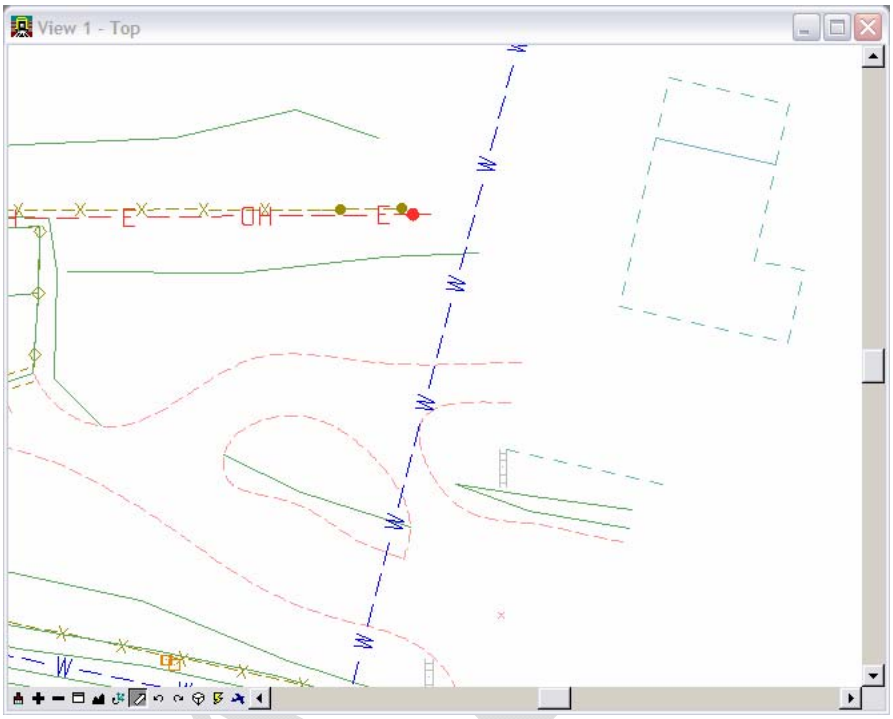


40. Type in the ***Code: 1331.07 ST BC***



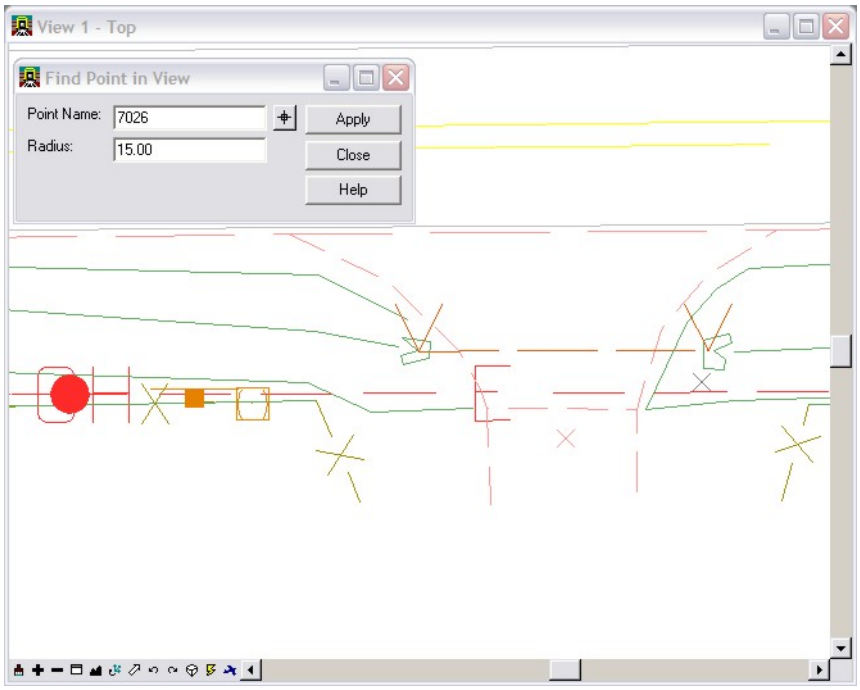
41. **<D>** the **Apply** button. The line work for the figure will be smoother.

42. Continue to edit the rest of the Dirt Driveway figures in the area with the Begin Curve BC control code.



43. From the pulldown menu **Survey > Find Point in View** The **Find Point in View** dialog will appear.

44. Key-in the ***Point Name: 7026***
Radius: 15

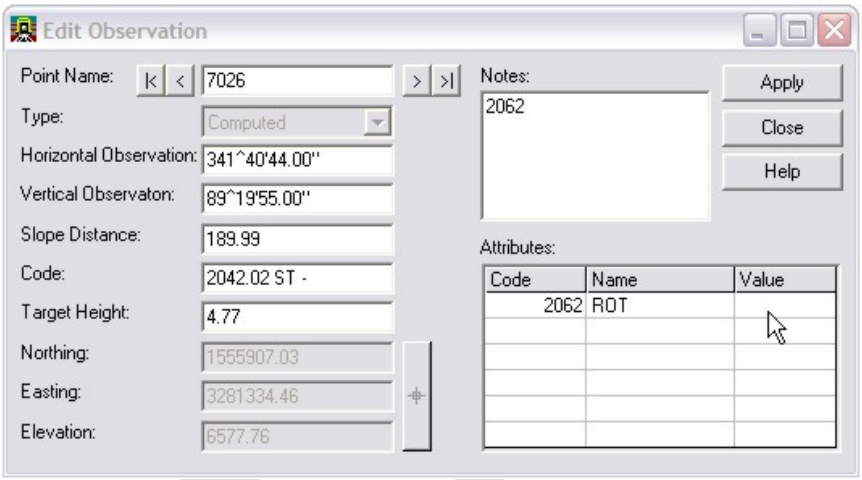


45. Locate point name ***7026*** in the **Fieldbook Data** dialog.

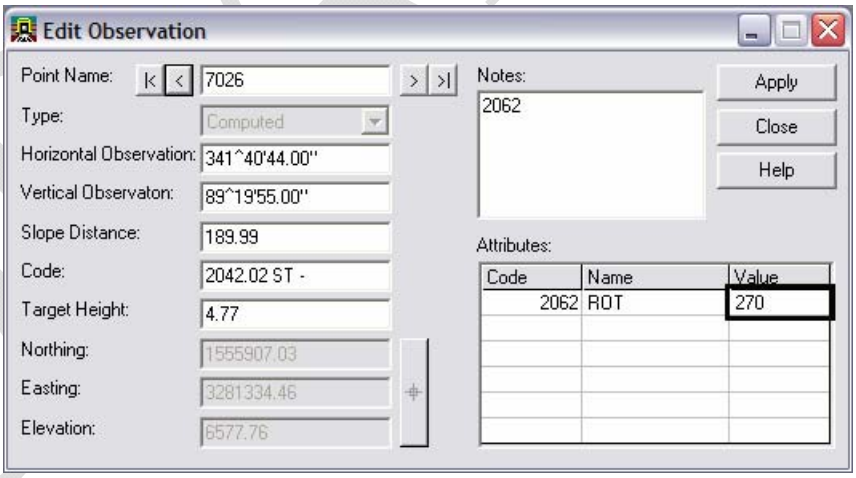
46. **<D> <D>** the point name ***7026***. The **Edit Observation** dialog will appear.

The next edits will be to rotate the culvert end sections into the direction of the pipe.

47. Move your mouse to the ***Attributes*** section of the dialog and <**D**> the Value for Code 2062. The Value field will open allowing keyboard input.



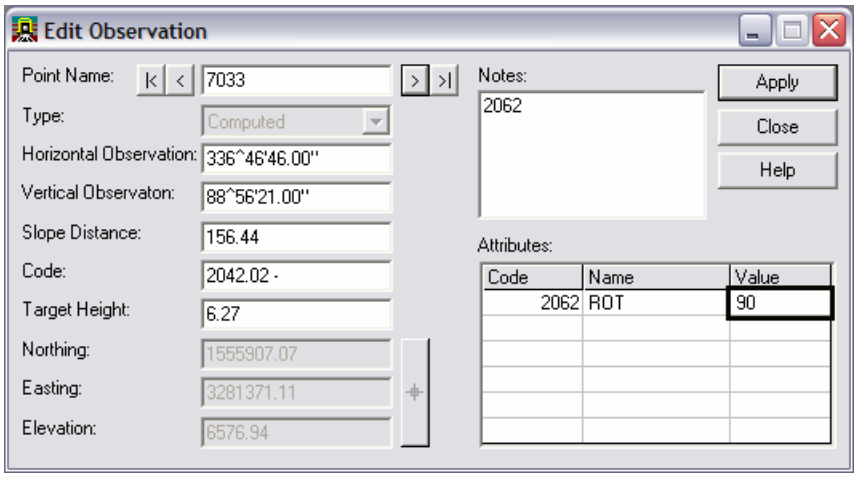
48. Type in the ***Value: 270***



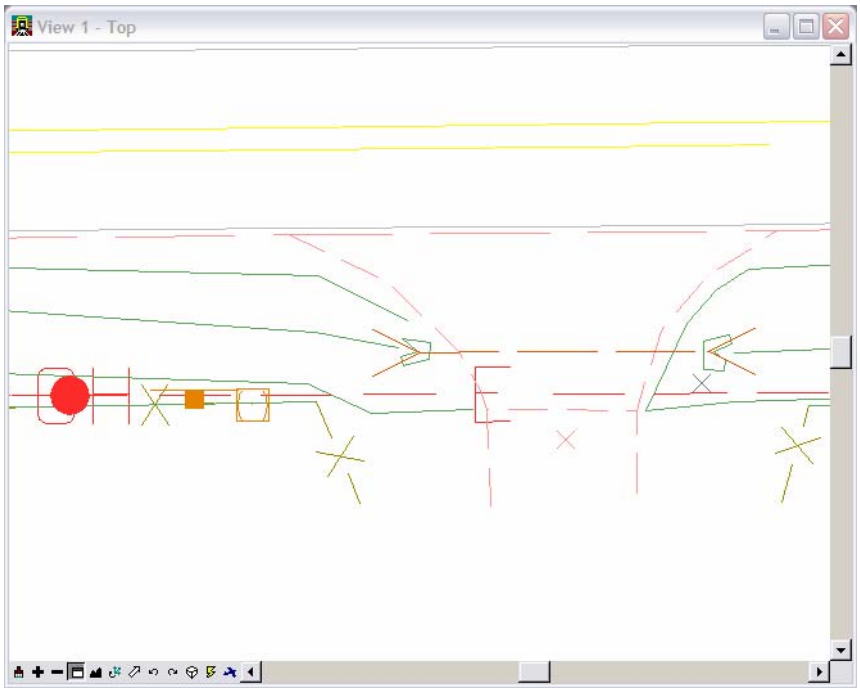
49. **<D>** the **Apply** button. The end section cell will have rotated into the direction of the pipe.

50. **<D>** the **Next**  button in the **Edit Observation** dialog stop at point name ***7033***

51. Type in the ***Value: 90***

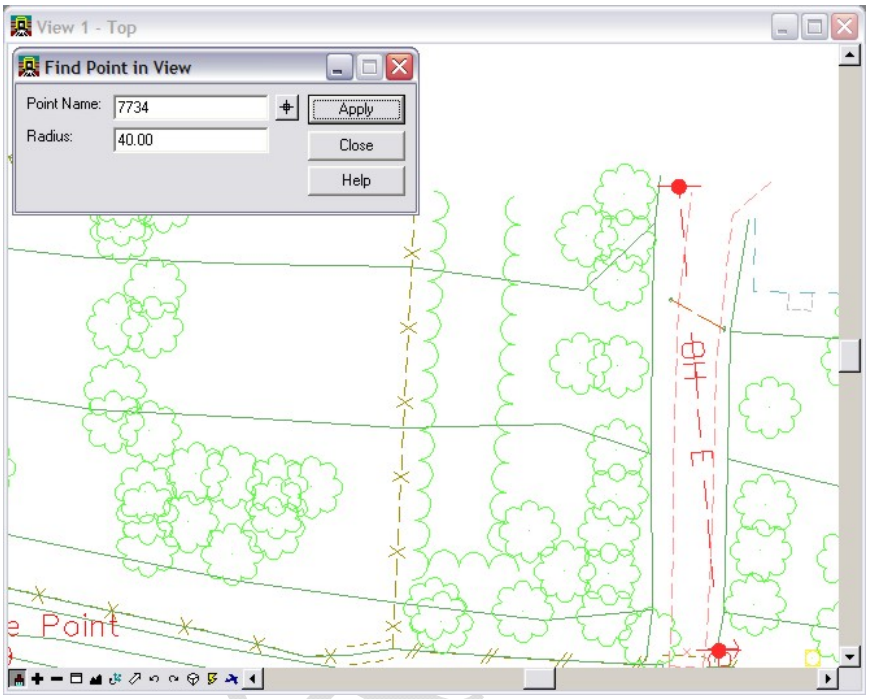


52. **<D>** the **Apply** then **Close** buttons. The end section cell will have rotated into the direction of the pipe.



53. From the pulldown menu **Survey > Find Point in View** The **Find Point in View** dialog will appear.

54. Key-in the ***Point Name: 7734***
Radius: 40

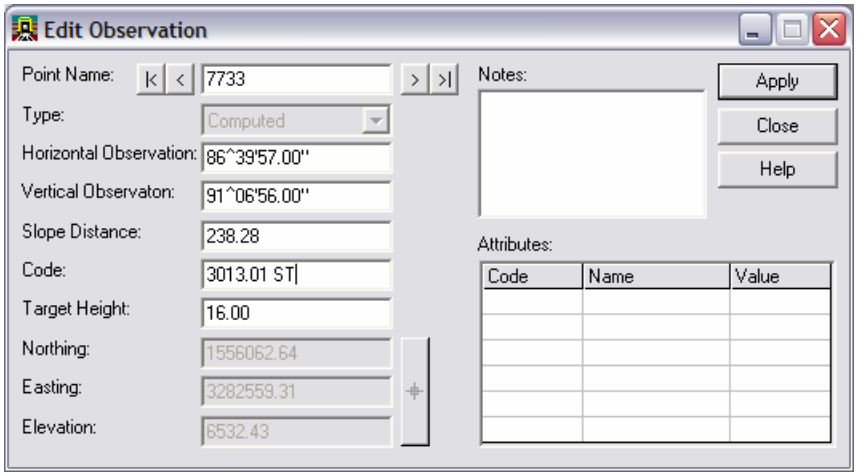


55. Locate point name ***7733*** in the **Fieldbook Data** dialog.

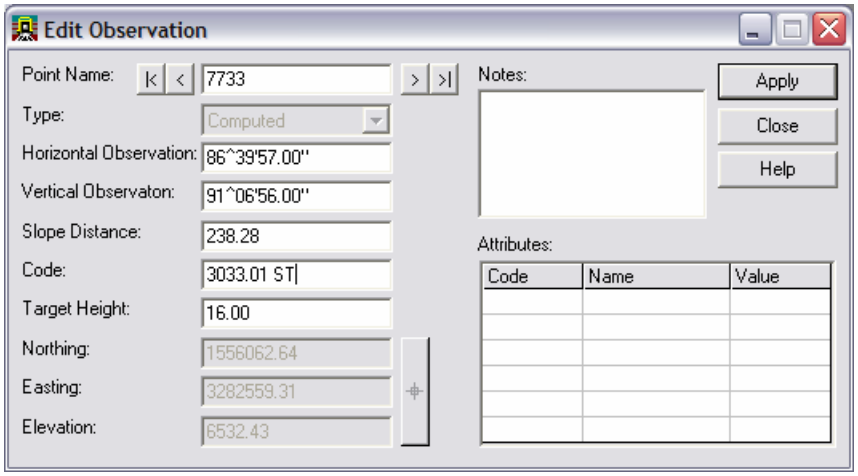
56. **<D> <D>** the point name ***7733***. The **Edit Observation** dialog will appear.

The next edits will be to change the feature code to be 3033 counter clockwise CCW so the planimetrics will be correct.

57. Move your mouse to the ***Codes*** section of the dialog.



58. Type in the ***Code: 3033.01 ST***

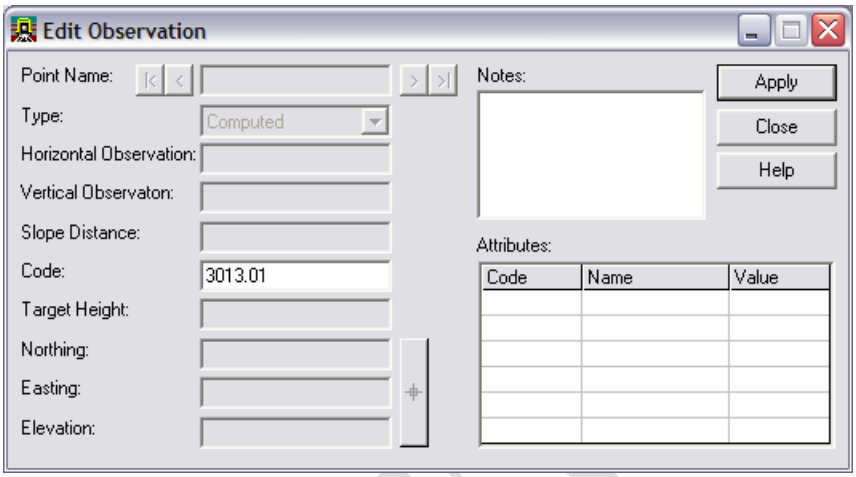


59. **<D>** the **Apply** then **Close** buttons. The change in direction for the feature code will correct the planimetric display.

    Note: Notice that at this point the entire display of the line has disappeared. To correct the remaining shots that make up this figure will also need to be changed to a feature code 3033.

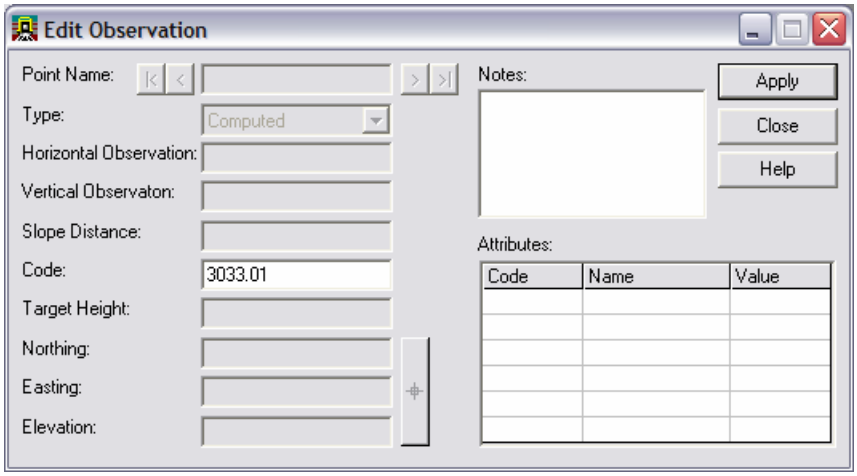
60. In the **Fieldbook Data** dialog **<D>** the point name ***7734***, then holding down the **Shift** key **<D>** the point name ***7738***. A selection set of points 7734-7738 have been highlighted in the fieldbook.

61. **<R>** the select point list from the popup menu select **Edit.**

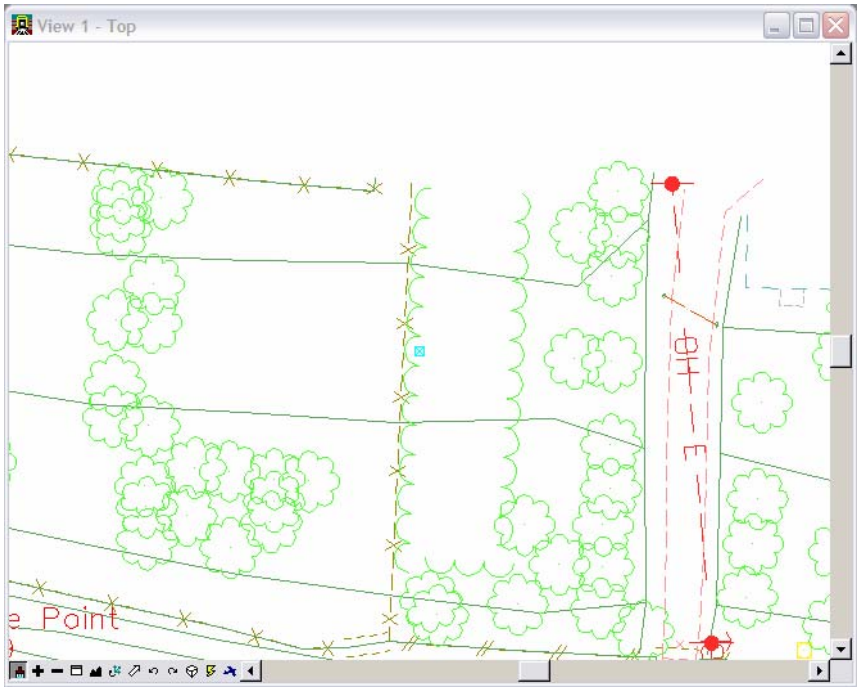


Note: Notice that the only fields that can be edited are the ones that are the same.

62. Type in the ***Code: 3033.01***



63. **<D>** the **Apply** then **Close** buttons. The planimetrics will display the correct direction.



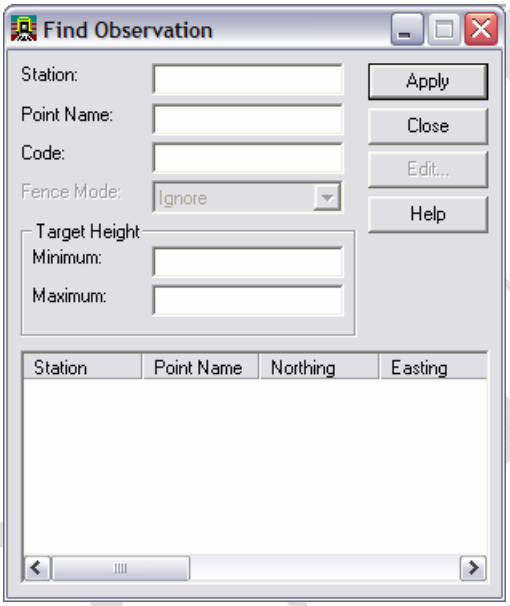
64. Save the Survey fieldbook. From the Workspace Bar **<R>** on ***12345SURVFieldbook01*** select ***Save*** from the shortcut menu.

Lab 7: Correcting Elevation Errors

There are five shots that were collected with incorrect rod heights. The shots can be located and edited as a group.

1. **<D>** the Fieldbook button from the Survey toolbar. The Survey Fieldbook will appear.

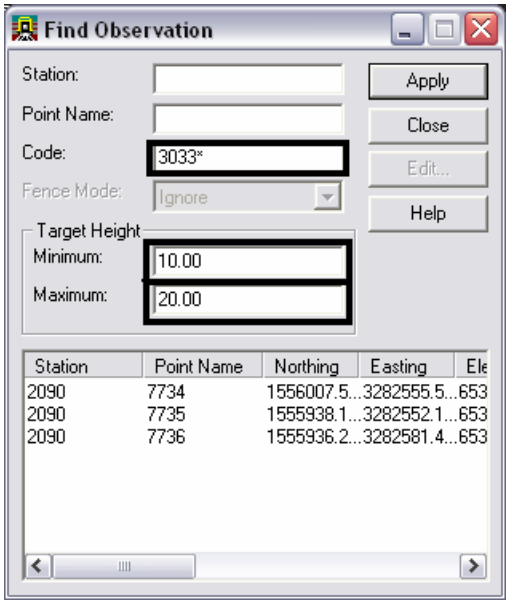
2. In the **Fieldbook Data** dialog **<R>** any Point Name in the observation section of the dialog. From the shortcut menu Select ***Find***. The **Find Observation** dialog will appear.



3. Key-in the ***Code: 3033****

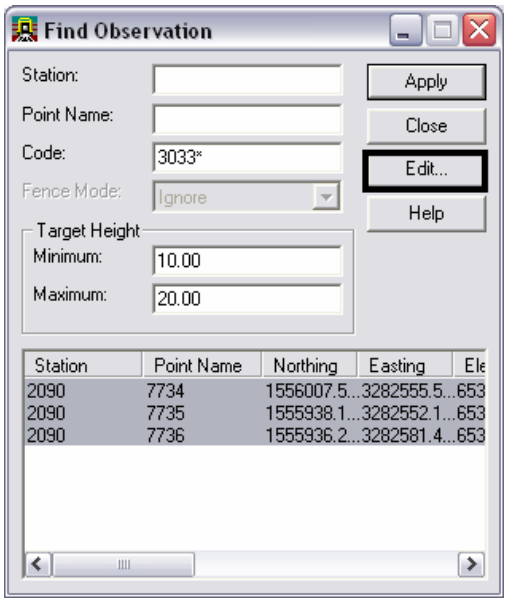
4. Target Height
   Minimum: 10
   Maximum: 20

5. **<D>** the **Apply** button.



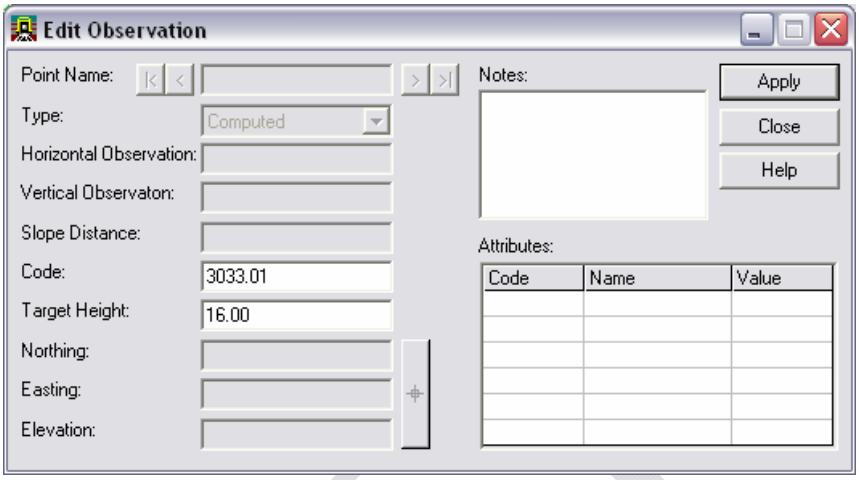
The shots for code 3033 were taken with the incorrect rod height. Using the **Find Observation** dialog multiple codes can be found and edited together.

6. Select the first point in the list then hold down the Shift key select the last point in the list.



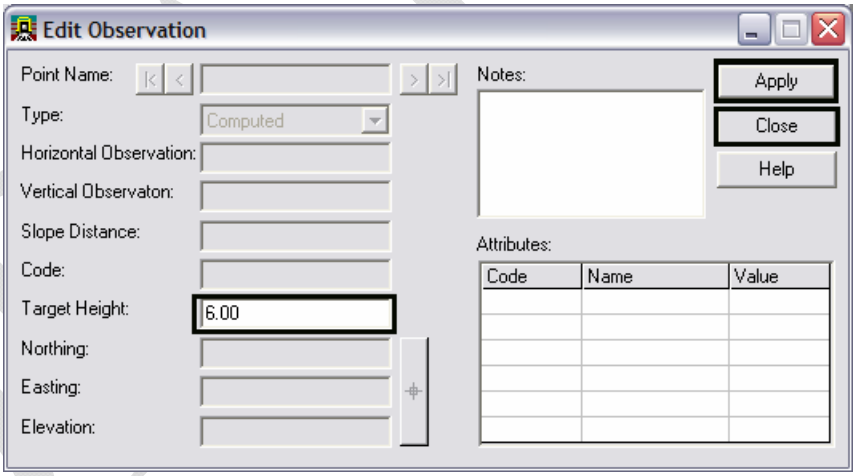
Note: Use the Shift and Ctrl keys on the keyboard to select and deselect multiple points in the Find Observation list.

7. **<D>** the **Edit…** button. The **Edit Observation** dialog will appear.



The target height is incorrect at 16.00.

8. Type the correct ***Target Height: 6.00*** Tab key out the code field the code text will change to black indicating an acceptable code was entered.



9. **<D>** the **Apply** then **Close** buttons to accept the change for all the selected points.

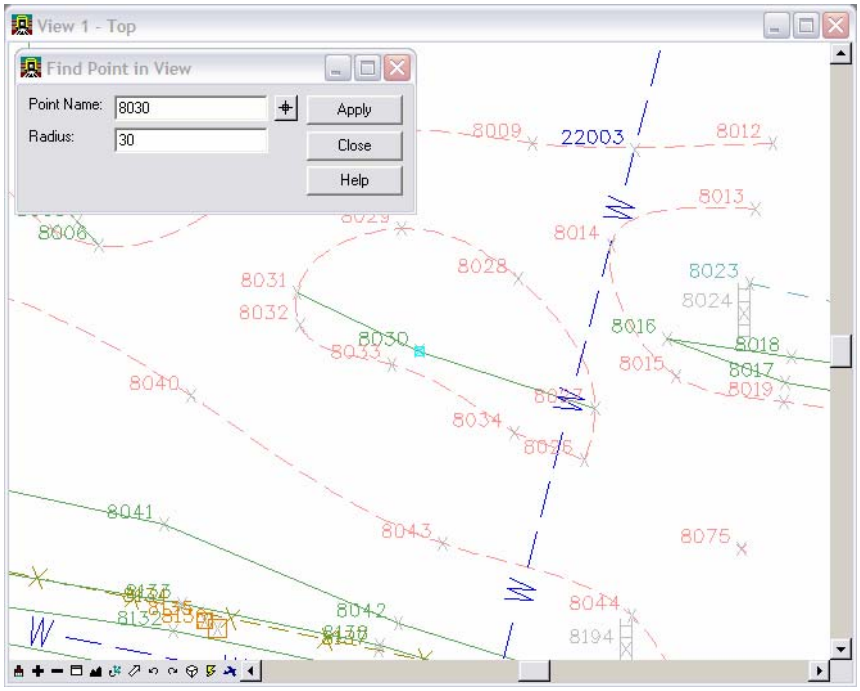
10. Save the Survey fieldbook. From the Workspace Bar **<R>** on ***12345SURVFieldbook01*** select ***Save*** from the shortcut menu.

Lab 8: Adding points to the fieldbook

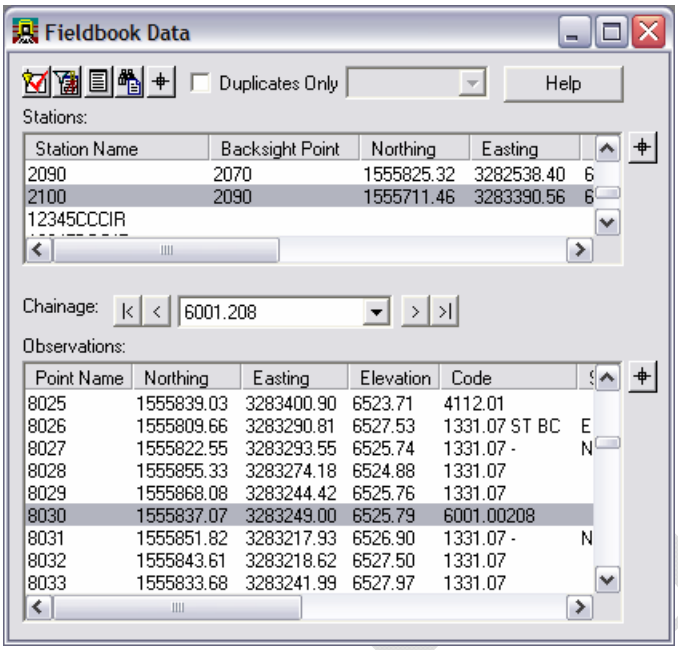
The ability to add points to the fieldbook is simple to accomplish. Points can be added based on computed, fixed, or from geometry locations.

In this example a tree will be added to the fieldbook.

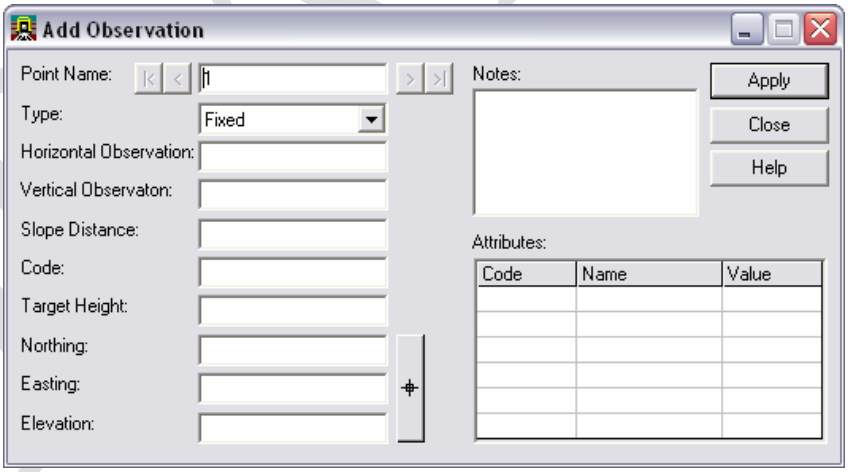
1. In the MicroStation view ***Find Point Name: 8030 Radius: 30***



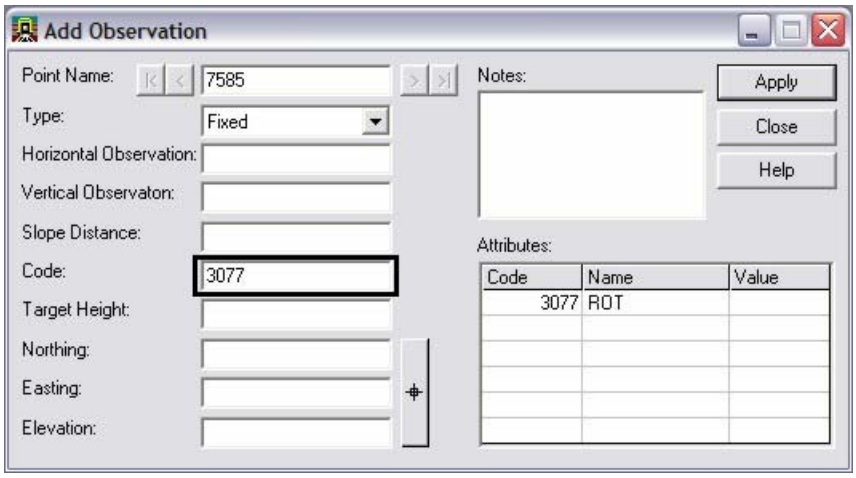
2. In the InRoads Survey Fieldbook Locate point ***8030***



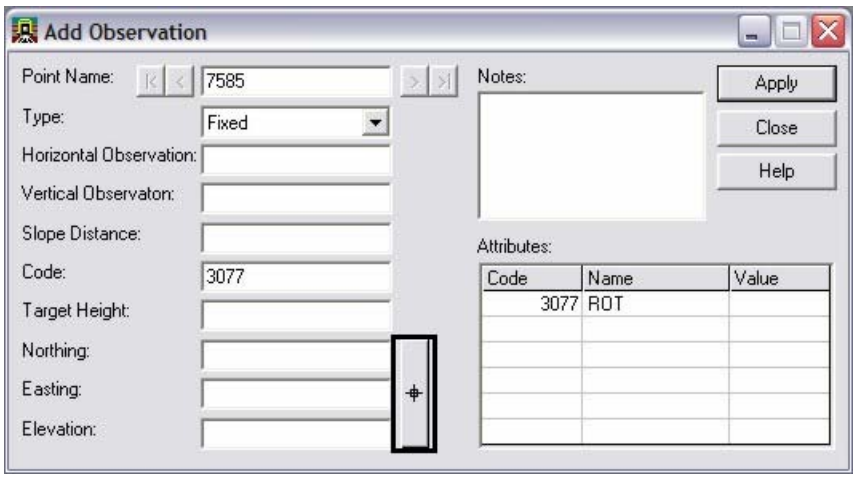
3. **<R>** the point name ***8030*** and select ***Add After*** from the shortcut menu. The **Add Observation** dialog will appear for point ***1.***



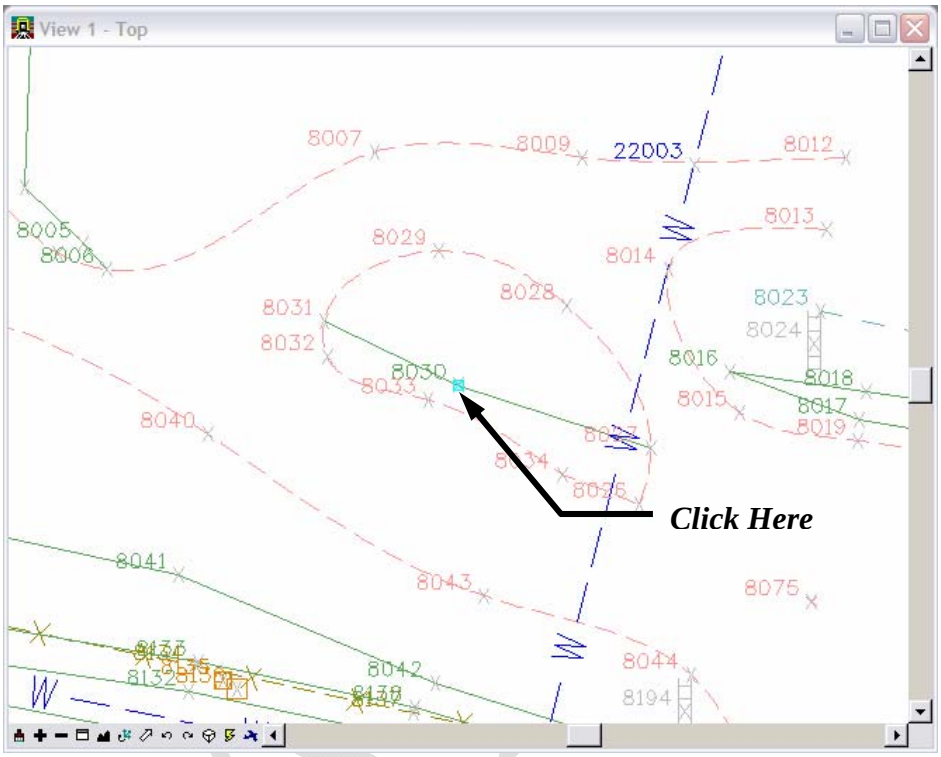
4. Type in the ***Code: 3077***



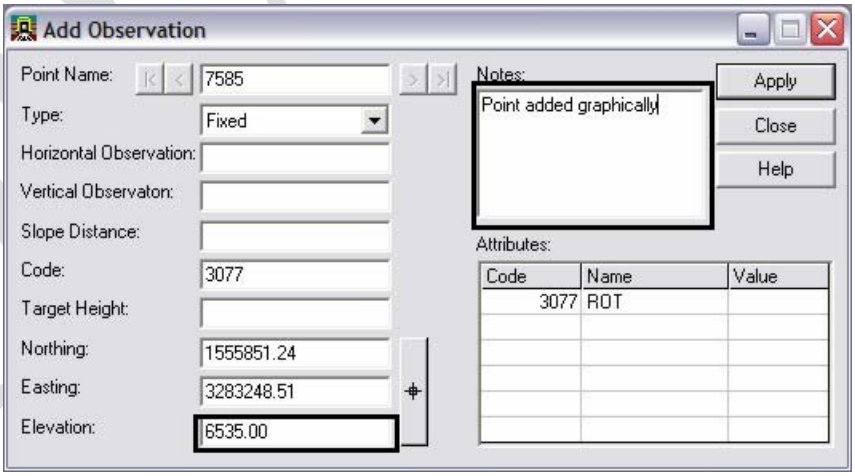
5. **<D>** the **Target** button for the Northing Easting and Elevation. The **Add Observation** dialog will minimize.



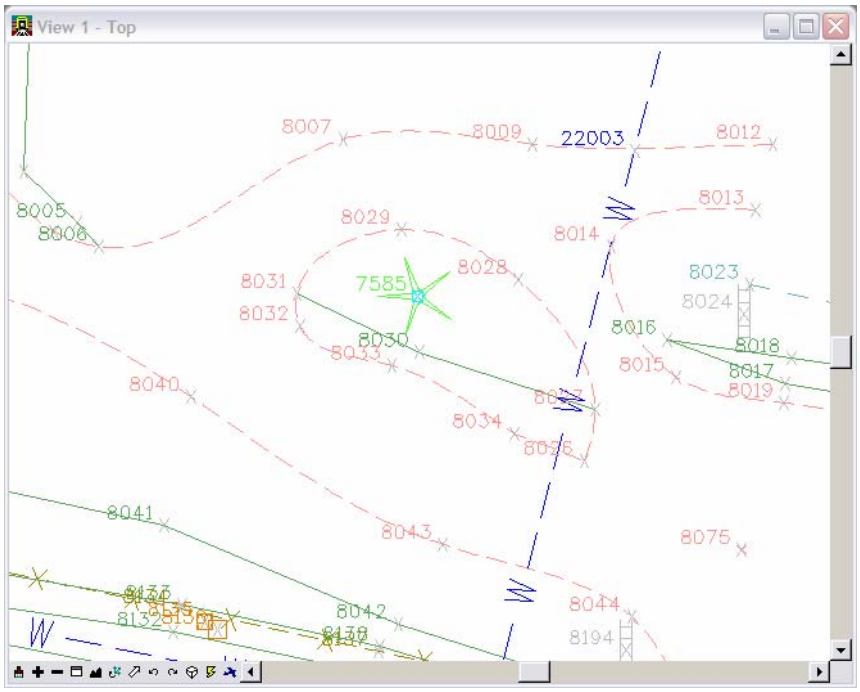
6. **<D>** a point in the MicroStation view in the approximate area shown in the screen capture. The **Add Observation** dialog will reappear.



7. Type in the ***Elevation: 6535.00***
Notes: Point added graphically



8. **<D>** the **Apply** then **Close** buttons. The tree will dynamically display in the MicroStation view.

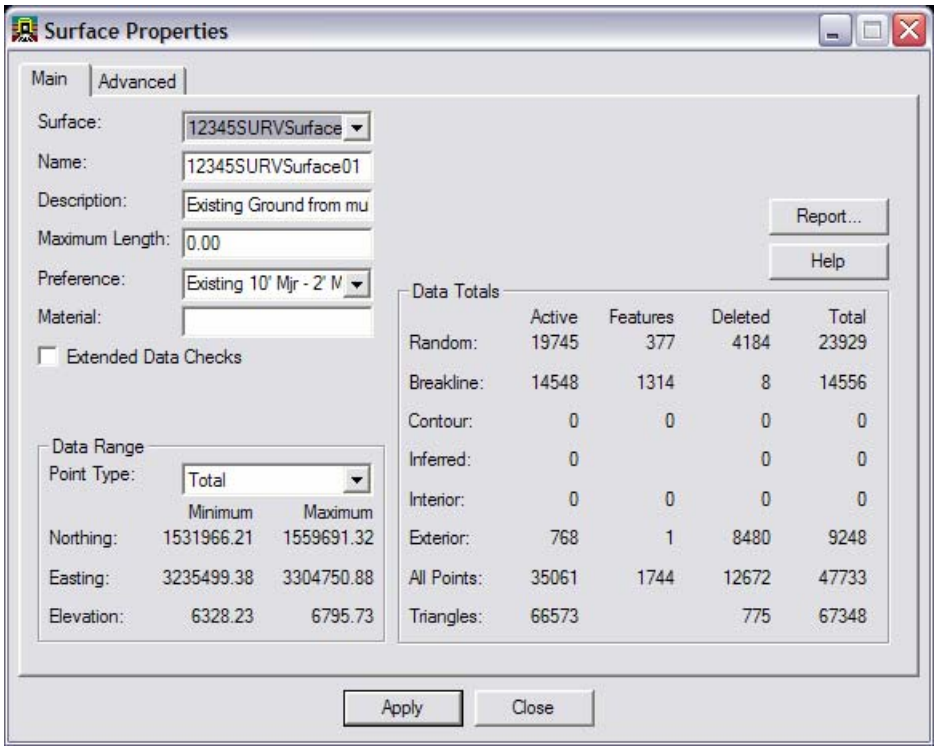


9. Save the Survey fieldbook. From the Workspace Bar **<R>** on ***12345SURVFieldbook01*** select ***Save*** from the shortcut menu.

Chapter 7 DTM Evaluation

As part of the deliverables the survey department will be given to design will be the Surface DTM file. The DTM file is to be an exact copy of what exists in the fieldbook. What that means is any edits to the DTM to correct crossing breaklines or busted elevations is fixed in the Survey fieldbook.

Surface Properties dialog



Dialog Items

- ***Surface*** - drop-down shows the active surface by default, other surfaces are selectable
- ***Name*** – the name of the DTM as InRoads has it stored in memory (not necessarily the file name on disk). The surface can be renamed here by typing in a new name.
- ***Description*** – user defined description
- ***Maximum Length*** – maximum length any one triangle segment (leg) can span during the triangulation process. If set to 0, triangle legs can extend to any length. Used to constrain triangulation to prevent unnecessary 'surface' data.
- ***Preference*** – predetermined display settings – bypasses the **View Contour** dialog box if the Style lock is enabled.
- ***Material*** – optional surface identifier, used in material (cut/fill) tables to define varying slopes based on material composition
- ***Extended Data Checks*** – checks DTM integrity (during triangulation) for crossing breaklines and miss-matched elevations

- Report... ***Report*** – generates a separate window summarizing surface properties. The generated report can be printed, written to the CAD file, or stored as an ASCII file
- ***Advanced*** tab – graphic display attributes related to profiles & cross sections for the surface

Data File Naming & Saving

- As noted above, a user can rename a surface in the **Surface Properties** dialog. A critical point to remember is that InRoads is a memory based program. The name given the file on disk can differ from the name used in memory. While they do not have to be the same, it is highly recommended that they share a common name.
- Assigning a different name to a surface in the **Surface Properties** dialog box or by using **Surface > Rename Surface** simply redefines the surface name as it resides in memory, not on disk.
- Renaming a surface in both memory and on disk is a two step process. Use one of the methods described in the preceding paragraph to rename the surface in memory and then use the **File > Save As** command, using the new name, to save it to disk.

Lab 9: Exporting Survey Data to Surface for Evaluation

Exporting to a DTM surface will create a triangulation network used for displaying contours, features and spot elevations.

1. Verify the **12345SURVFieldbook01** fieldbook is active as this is the survey data to be exported to a DTM. You can tell which fieldbook is active by the red box around the fieldbook button.

2. Write Survey Data to Graphics if they are not already. The planimetrics will make viewing in the MicroStation model easier.

3. From the pull-down menu, select **File > New**. The **New** dialog will appear.

4. Select the ***Surface*** tab.

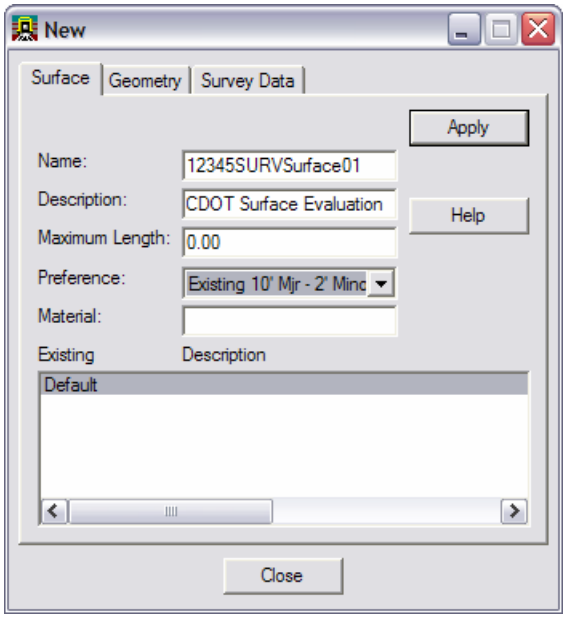
5. Key in the surface Name: ***12345SURVSurface01***

6. Key in the Description: ***CDOT Surface Evaluation***

   Note: Key in any additional file information in the **Description** field of the dialog, such as **Date**, **User**, and **Design file** name. You have up to 34 characters even though you may not see all the characters in the Description field.

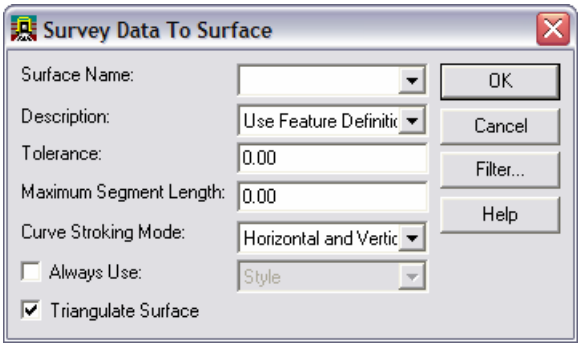
7. Keep the **Maximum Length** set to ***0***

8. Set pick list to the Preference: **Existing 10' Mjr – 2' Minor**

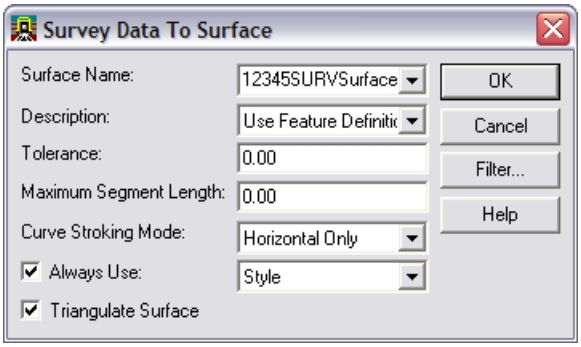


9. **<D>** the **Apply** then **Close** buttons.

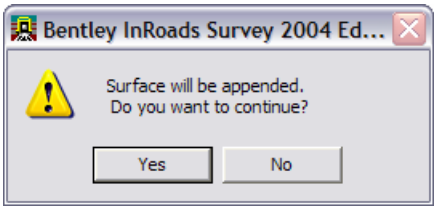
10. From the pulldown menu **Survey > Survey Data to Surface**. The **Survey Data to Surface** dialog will appear.



11. Pick from the list in the ***Surface Name 12345SURVSurface01*** in the Surface Name field.
12. Set the ***Description*** to **Use Feature Definition**
13. Keep the ***Tolerance*** and ***Maximum Segment Length*** set to ***0.00***
14. Set the ***Curve Stroking Mode*** to **Horizontal Only**
15. Check ***Always Use***: **Style**
16. Check ***Triangulate Surface***

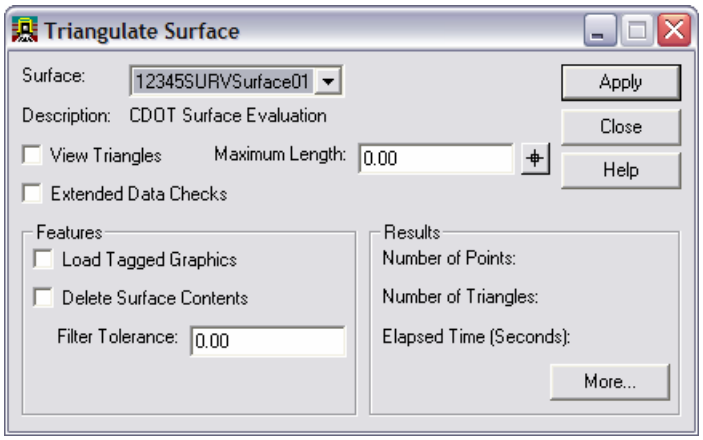


17. **<D>** the **OK** button.
18. An alert dialog will appear informing you will be appending a surface. This is alright to do so because this Surface was created with no data in the Surface.



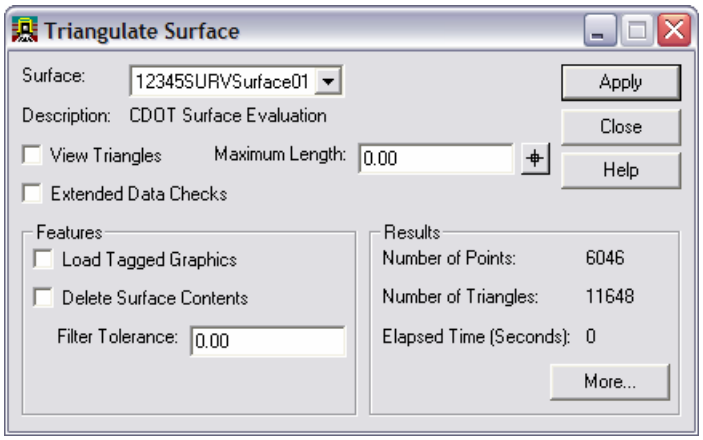
19. **<D>** the **Yes** button.

20. The **Alert** dialog will close and the **Triangulate Surface** dialog will appear.

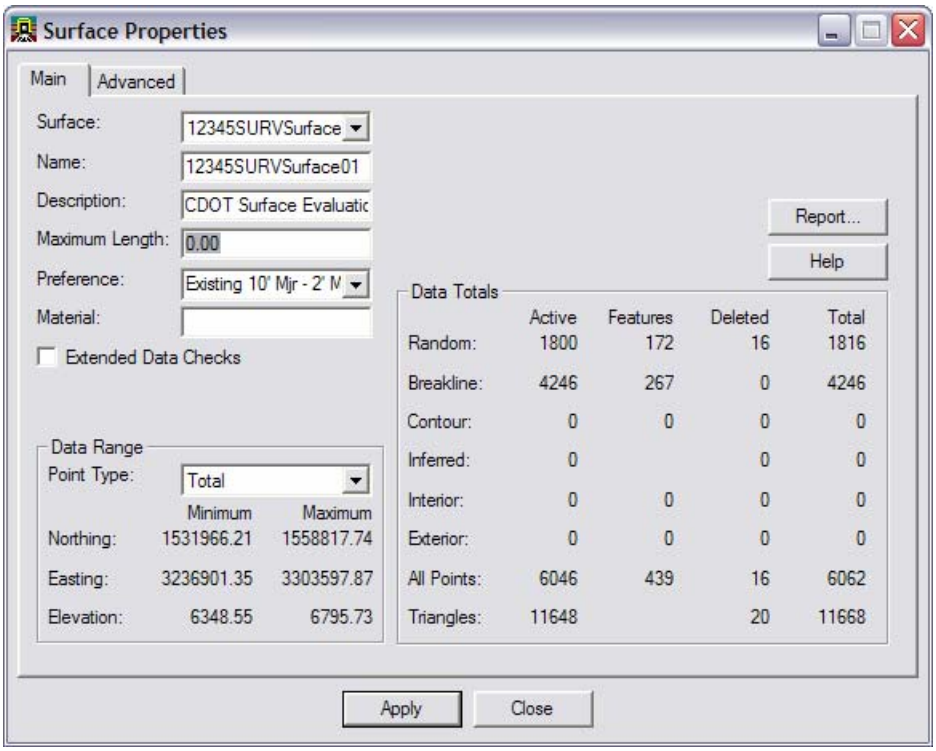


21. Leave all settings unchecked. **Maximum Length** should be set to **0.00**.

22. **<D>** the **Apply** button. The **Results** section of the dialog should look similar to the image below. (Numbers may not match exactly)



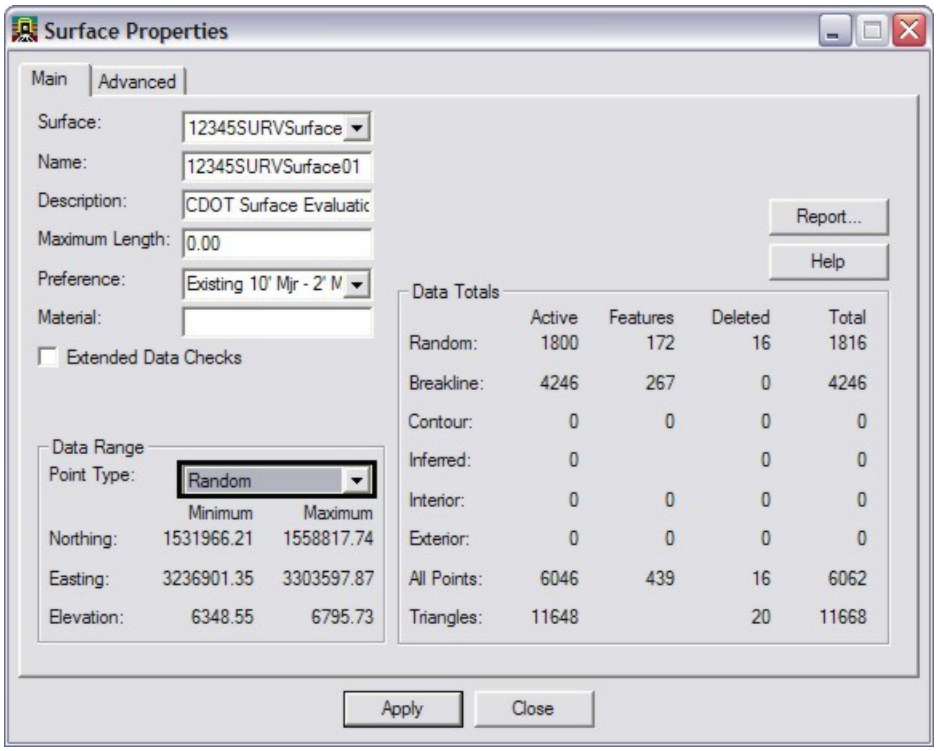
23. **<D>** the **More** button. The **Surface Properties** dialog will appear.



24. Verify you are working with the correct surface ***12345SURVSurface01***.

25. Review the section for **Data Range**. The Northing, Easting, and Elevation values should fall within the project limits.

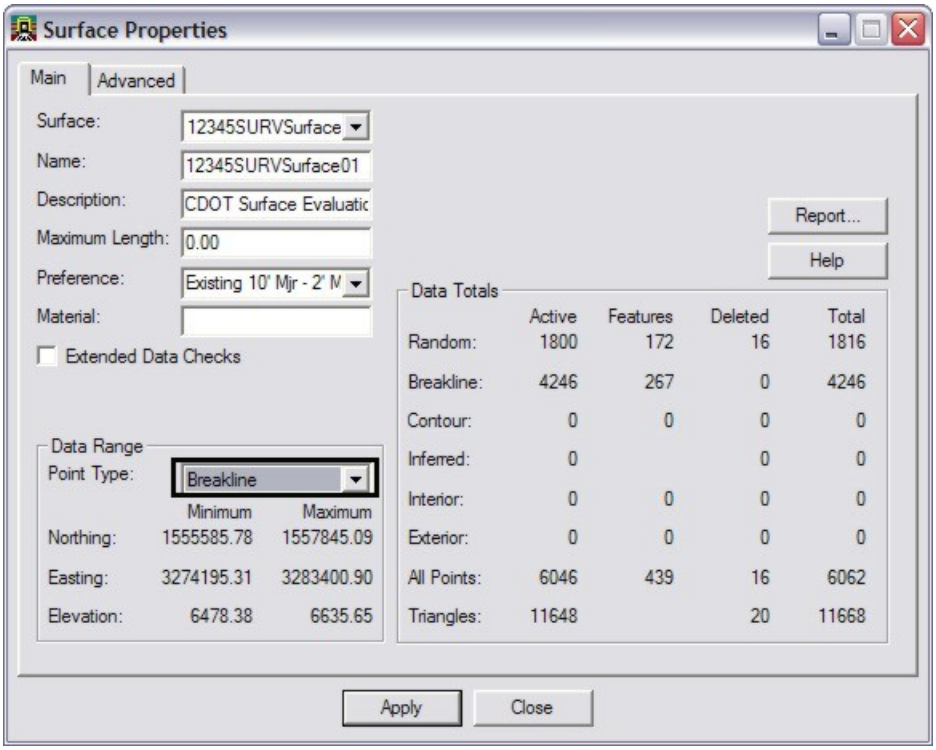
26. In the **Data Range** section, change the drop down selection to **Random**.



27. Review the **Random** point range.

Note: As part of your evaluation of the surface you are looking for a large error in the data such as a zero elevation, or truncated coordinates.

28. In the **Data Range** section, change the drop down selection to **Breakline**.

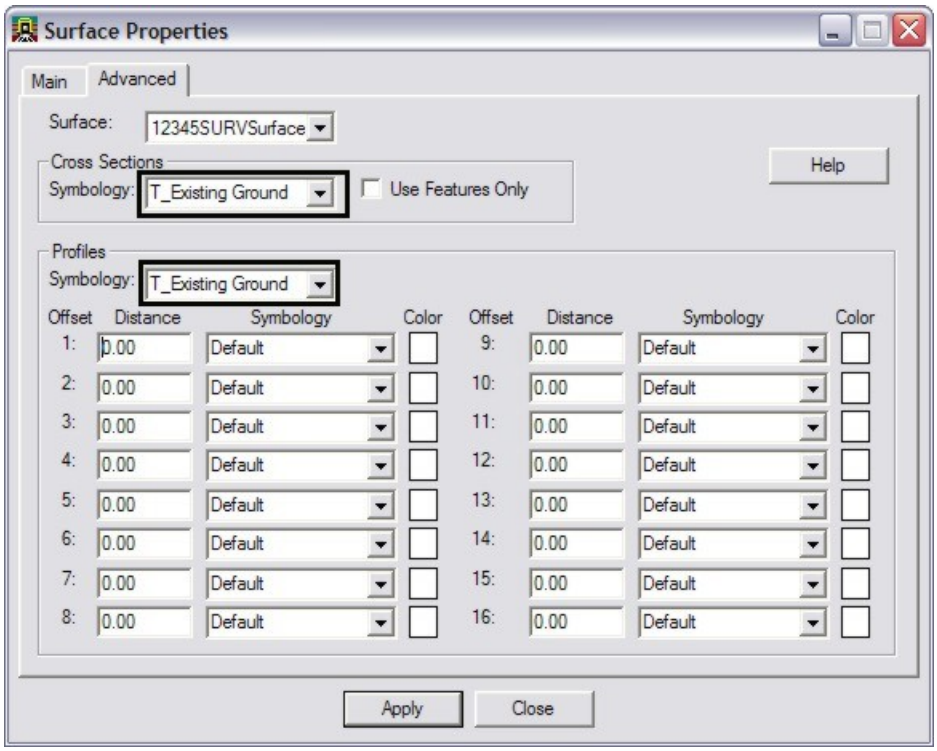


29. Review the **Breakline** point range.

Note: Having the flexibility to review our data by type can help when trying to track down errors in the DTM.

30. On the Advanced tab choose
    Cross Sections - Symbology: T_Existing Ground

31. On the Advanced tab choose
    Profiles - Symbology: T_Existing Ground



32. **<D> Apply** then **Close** in the **Surface Properties** dialog.

33. **<D>** the **Close** button in the **Triangulate Surface** dialog.

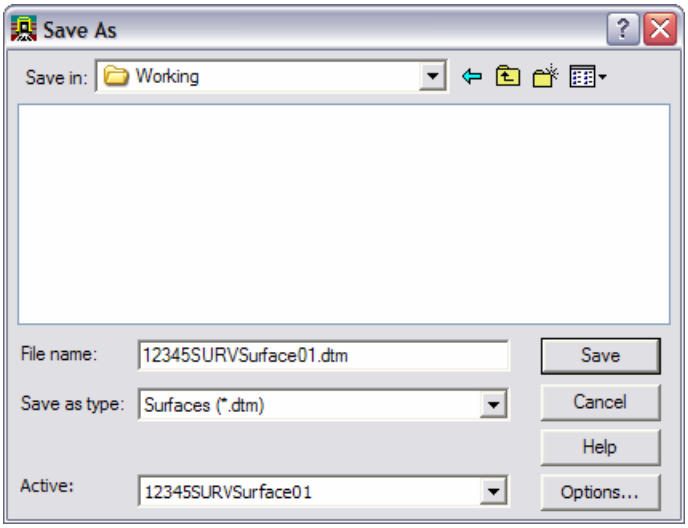
34. Use the **Workspace** pane scroll **arrows** to view the **Surfaces** tab.

35. Verify **12345SURVSurface01** is the active surface.

    Note: You can change the active surface from the pull-down menu **Surface > Active Surface**; highlight the surface name and **<D>** the **Apply** button.

36. From the pull-down **File > Save > Surface**. The **Save As** dialog will appear with the **Save as type** set to **Surfaces (*.dtm)**.

37. Verify you are in the correct project directory. C:\Projects\12345\ROW_Survey***Working***



38. The file name should match the **Active** name at the bottom of the **Save As** dialog. If necessary, use the drop-down arrow in the **Active** field and reselect the desired name to ensure the saved file name will match the surface name.

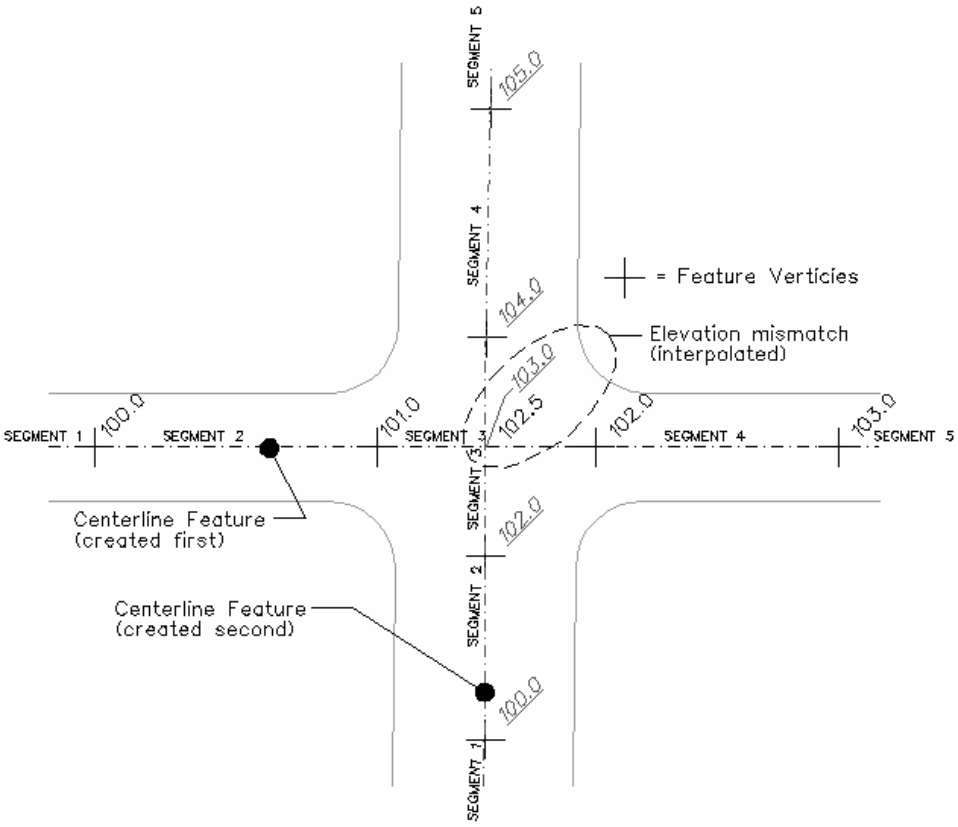
    Note: Ensuring that the saved Surface name in the project folder matches the Surface name displayed in InRoads explorer will minimize any confusion.

39. **<D>** the **Save** then **Cancel** button. The file will be saved to disk and the **Save As** dialog will close.

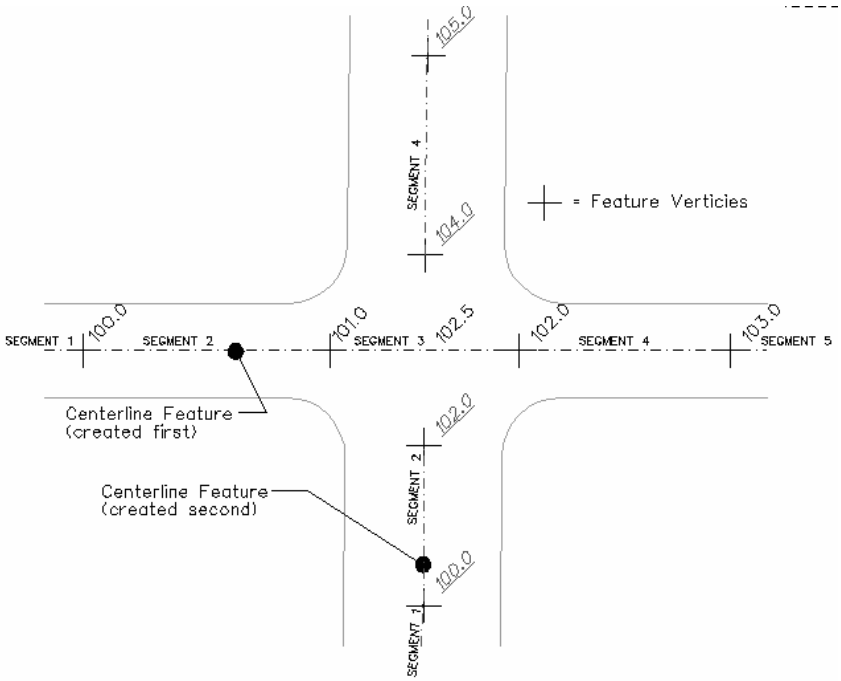
Crossing Segments

Errors encountered during the triangulation process may be an indication of features that either cross, or cross and have elevations that are not identical at the location of intersection. Experiencing this is possible with surveying items without defined limits, such as edge of gravel parking lot vs. edge of abutting gravel drive.

The following images will illustrate this situation. The first image represents features created along the crown of the crossing roadways as surveyed (or designed). An observation was not taken at the centerline-centerline intersection. Therefore, InRoads will interpolate an elevation at this location during the triangulation process resulting in a mismatched elevation situation.

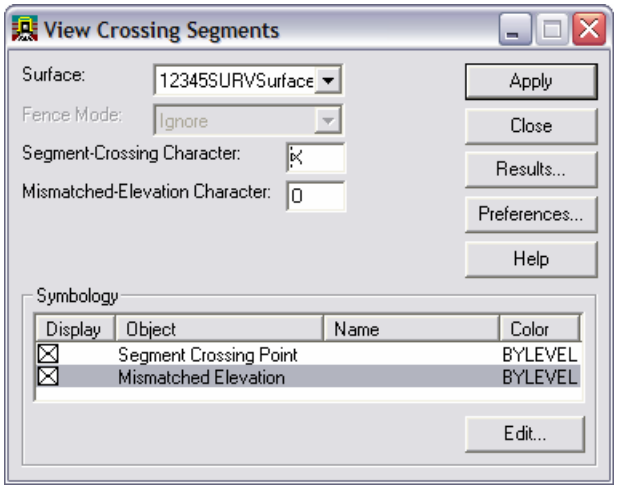


This second image shows the result of instructing InRoads to correct this DTM error automatically. This is accomplished during triangulation by toggling on ***Extended Data Checks*** in the **Surface > Triangulate Surface** dialog. Note that the crossing segment in the second feature is eliminated.



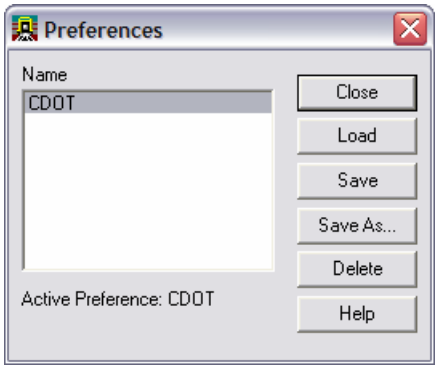
Lab 10: Correcting Crossing Segments

1. From the pull-down menu select,
   Surface > View Surface > Crossing Segments.
   The **View Crossing Segments** dialog will appear.



2. Verify from the **Surface** drop down **12345SURVSurface01** is selected.

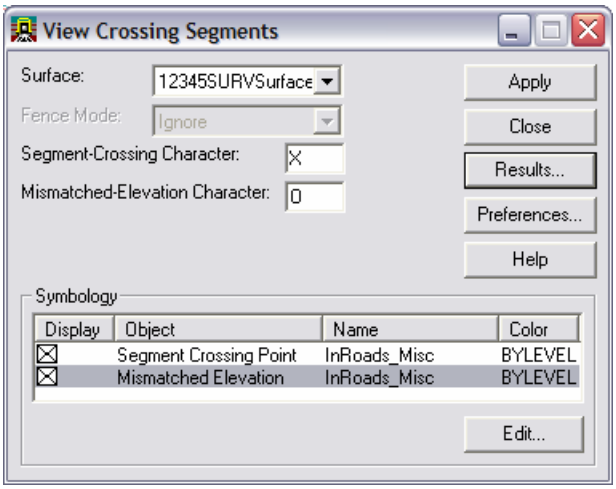
3. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



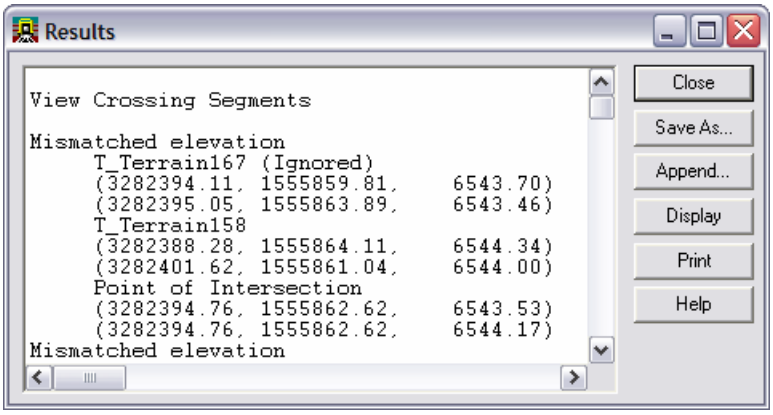
4. **Select** the ***CDOT*** preference

5. **<D>** the **Load** then **Close** buttons.

6. **<D>** the **Apply** button from the **View Crossing Segments** dialog.



7. **<D>** the **Results** button. The **Results** report will appear locating all mismatched and crossing segments.



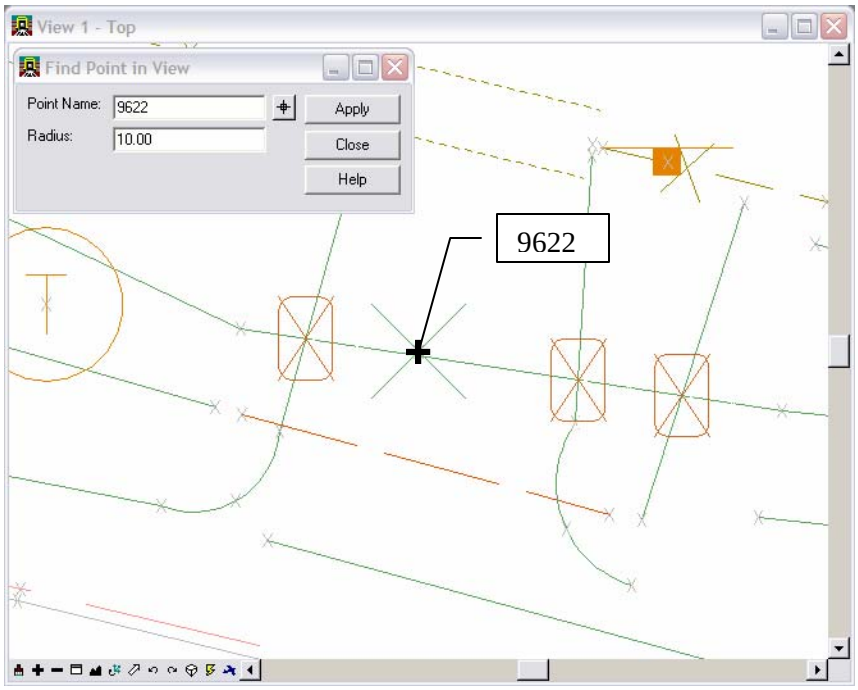
Note: This report can be saved to the dgn file or text file if needed.

8. Review the results.

9. **<D>** the **Close** button on the **Results** dialog.

10. From the pull-down menu, select **Survey > Find Point in View**

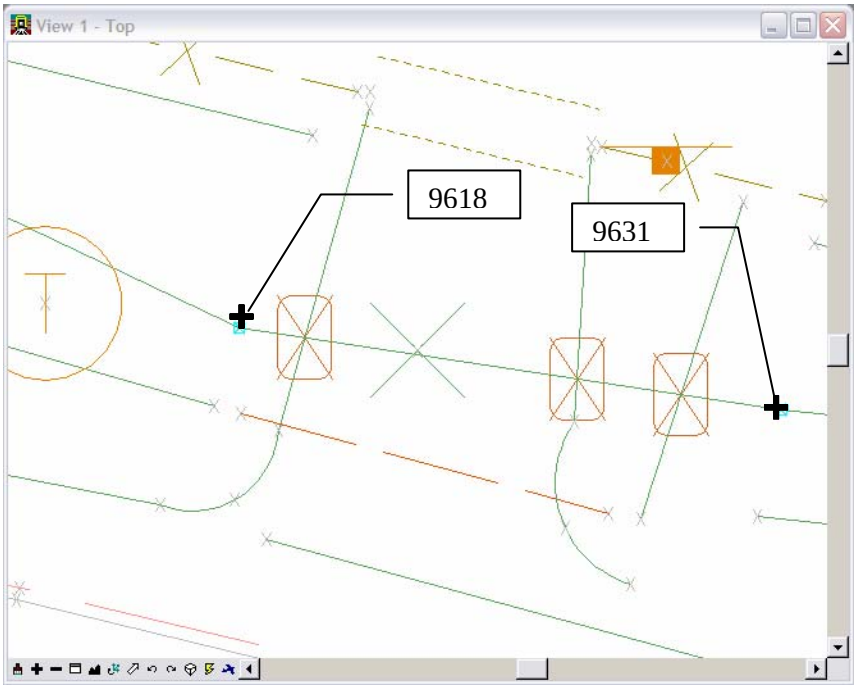
11. Find **Point Name:** ***9622*** Radius: ***10***



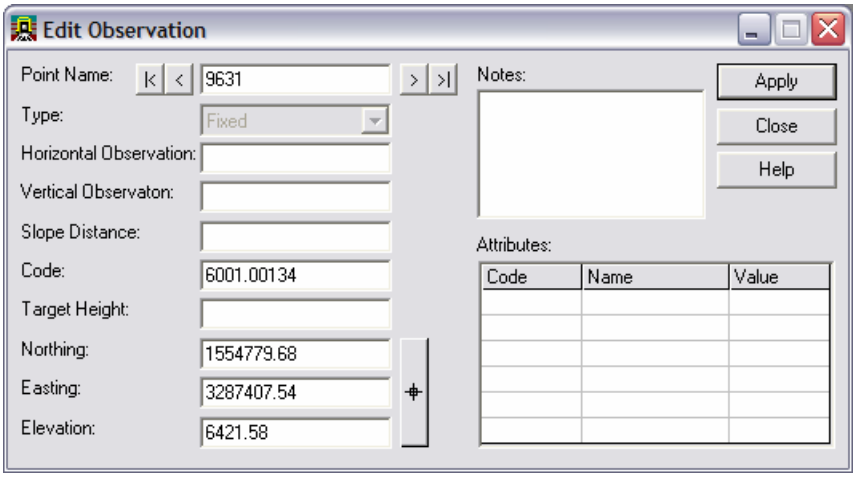
Note: Thr terrain breakline running left to right is crossing multiple other terrain breaklines. In this particular situation a solution would be to break the terrain line using a Start control code.

12. **<D>** the **Fieldbook** button from the Survey toolbar. The survey **Fieldbook Data** dialog will appear.

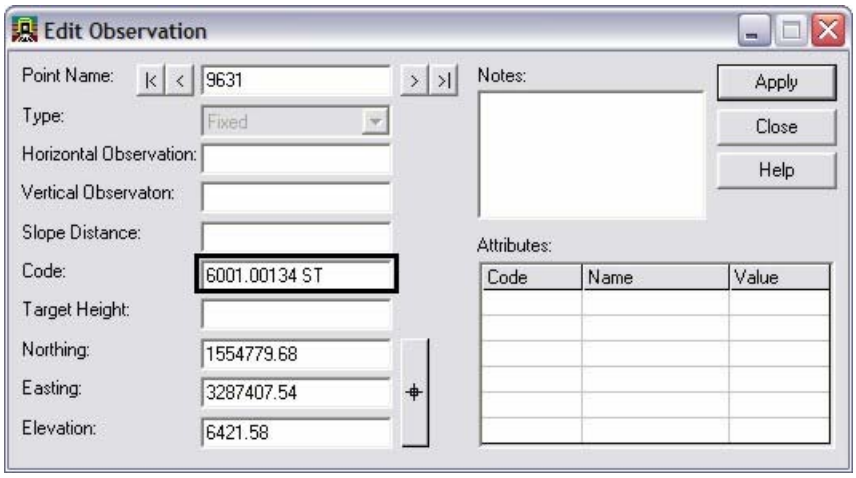
13. Locate point name **9631** in the fieldbook using the **Select Observation** button from the **Fieldbook Data** dialog.



14. **<R>** the point name **9631** and select **Edit** from the shortcut menu or double click the point name. The **Edit Observation** dialog will appear for point 9631

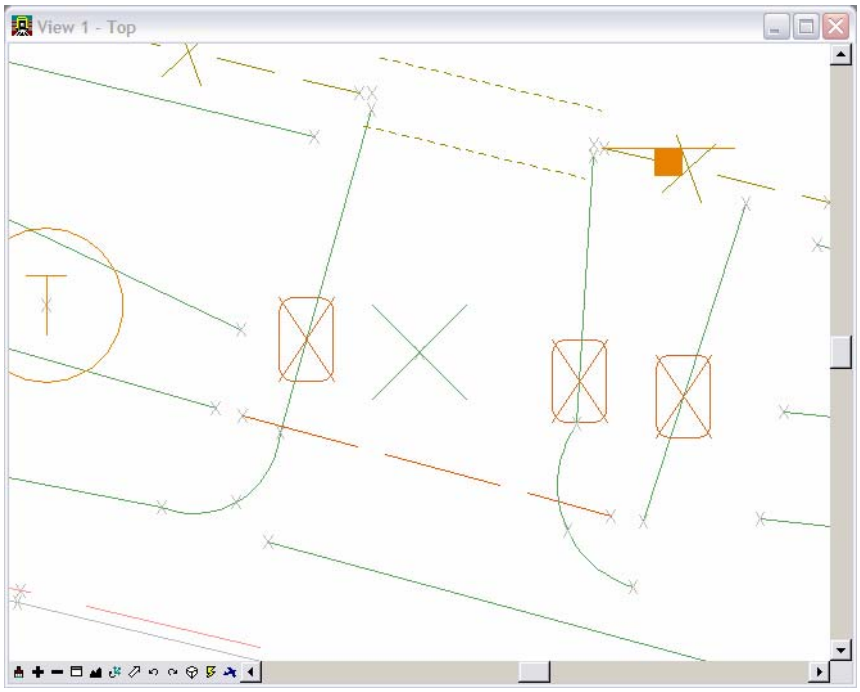


15. Type in the ***Code: 6001.00134 ST***



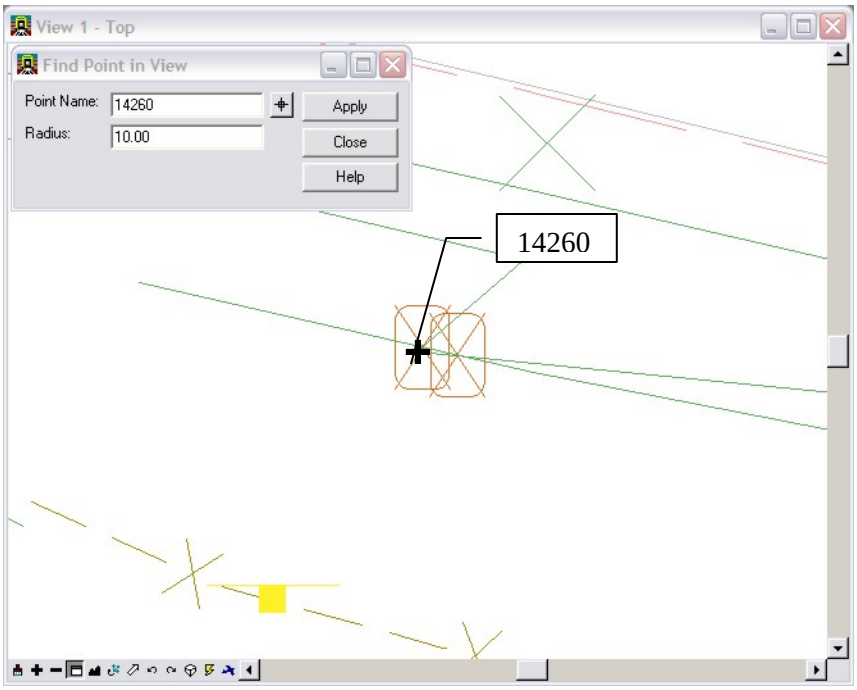
16. **<D>** the **Apply** then **Close** buttons.

17. Review your results dynamically from the fieldbook. The terrain breakline was restarted so the breaklines are no longer crossing.



18. From the pull-down menu, select **Survey > Find Point in View**

19. Find **Point Name:** ***14260*** Radius: ***10***

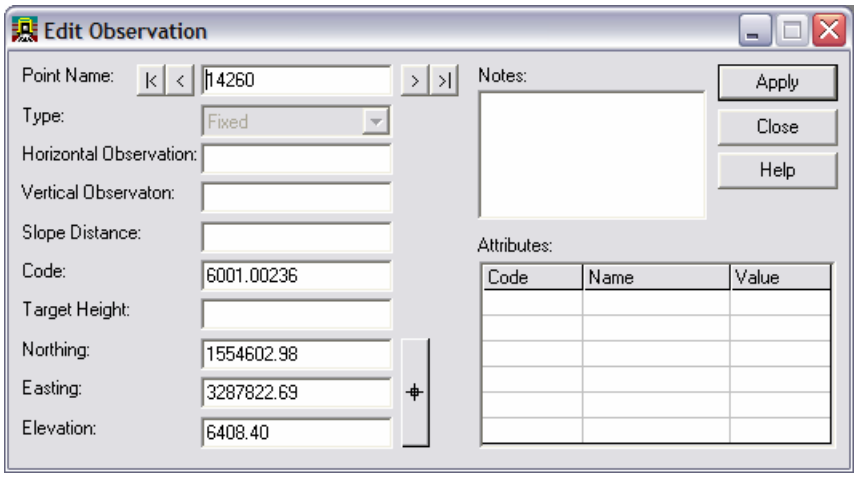


Note: The terrain breakline is overlapping slightly where the line zig-zags. In this particular situation a solution would be to edit the XY location of the point.14

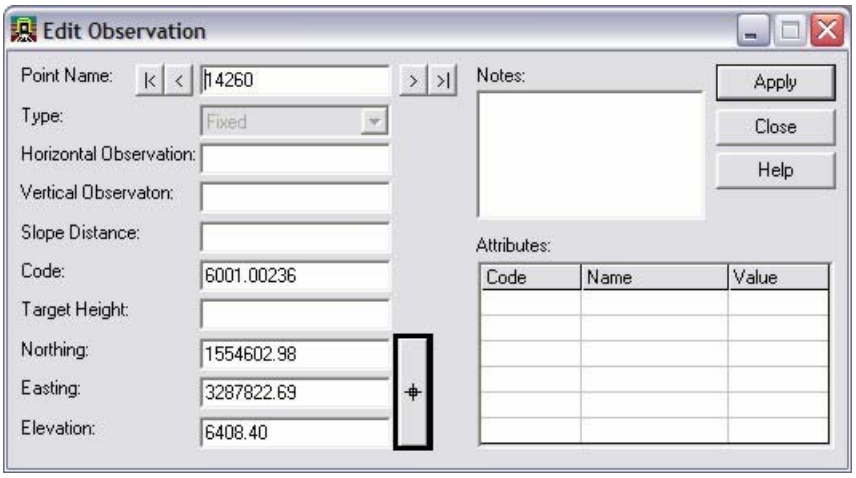
20. **<D>** the **Fieldbook** button from the Survey toolbar. The survey **Fieldbook Data** dialog will appear.

21. Locate point name 1**4260** in the fieldbook using the **Select Observation** button from the **Fieldbook Data** dialog.

22. **<R>** the point name **14260** and select **Edit** from the shortcut menu or double click the point name. The **Edit Observation** dialog will appear for point 14260



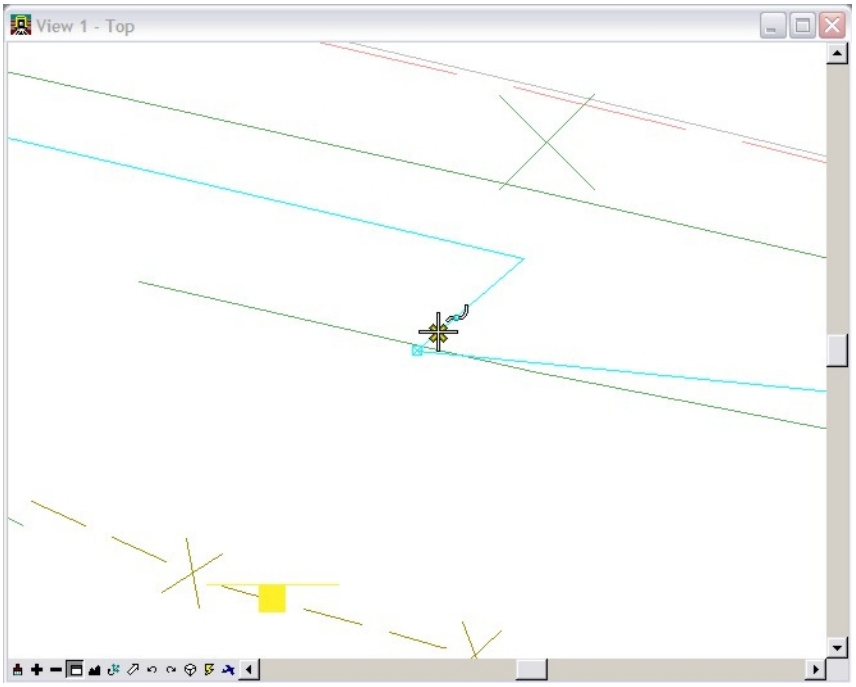
23. **<D>** the **Target** button. The **Edit Observation** dialog will minimize allowing to select a point in the MicroStation view.



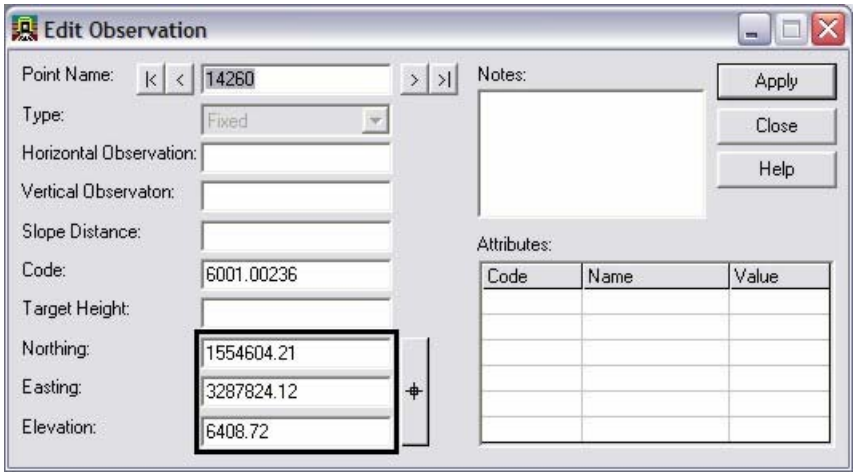
24. Using MicroStation snaps set the temporary snap to **Nearest**.

25. Hold down the **Ctrl** and **Shift** keys. This will enable AccuSnap when using an InRoads command.

26. Move the cursor to a point along the linestring making sure the lines are not overlapping.

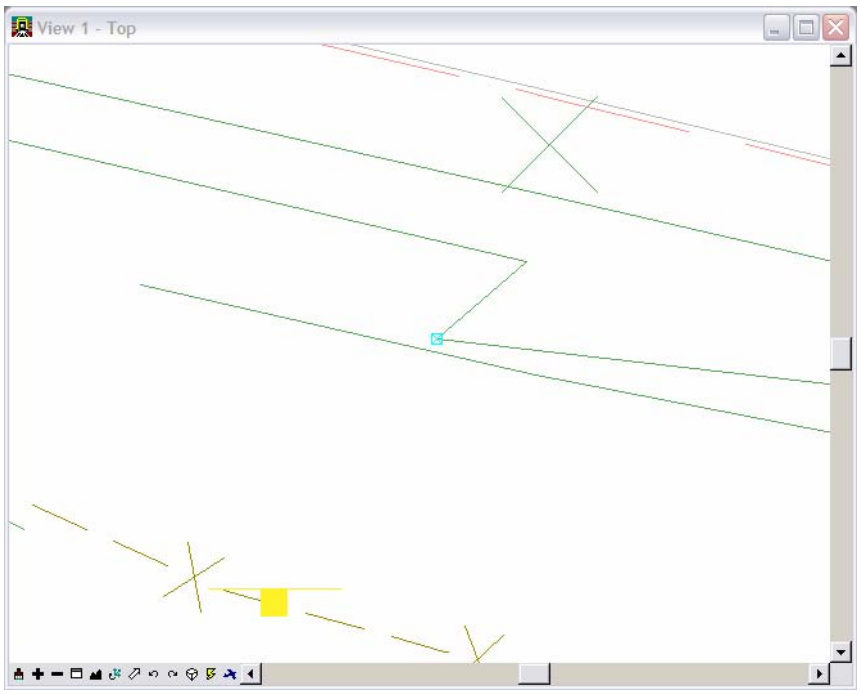


27. **<D>** a point in the MicroStation view to accept the point. The **Edit Observation** dialog will reappear. The new XYZ locations will be updated.



28. **<D>** the **Apply** then **Close** buttons.

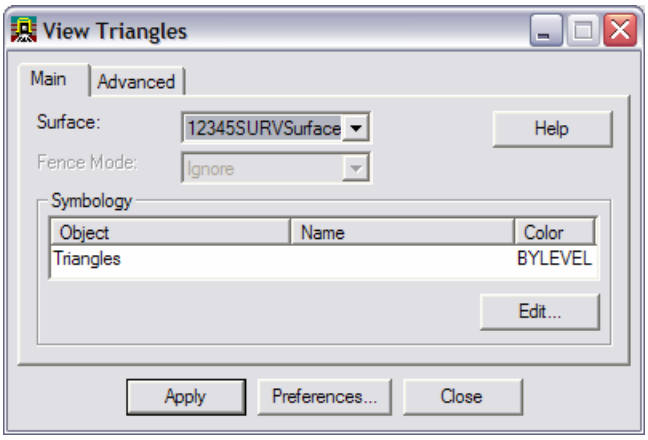
29. Review your results dynamically from the fieldbook. The terrain breakline was restarted so the breaklines are no longer crossing.



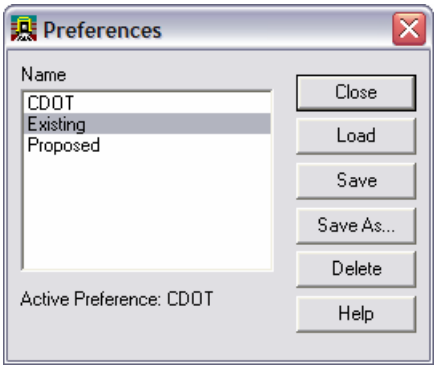
Surface Triangles

Lab 11 Evaluate Surface Triangles

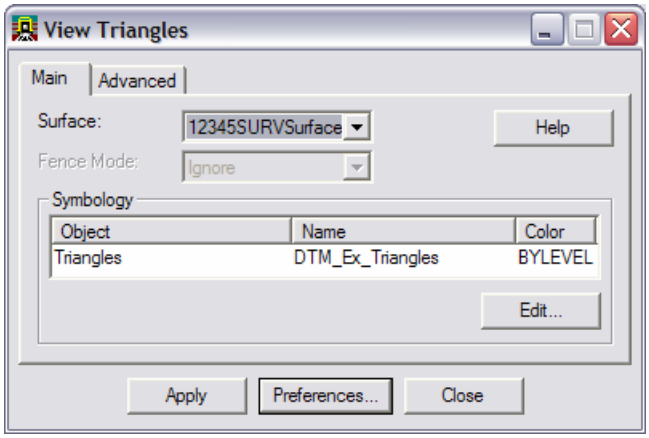
1. From the InRoads pull-down select, **Surface > View Surface > Triangles**. The **View Triangles** dialog will appear.



2. Verify **12345SURVSurface01** is the active surface.
3. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



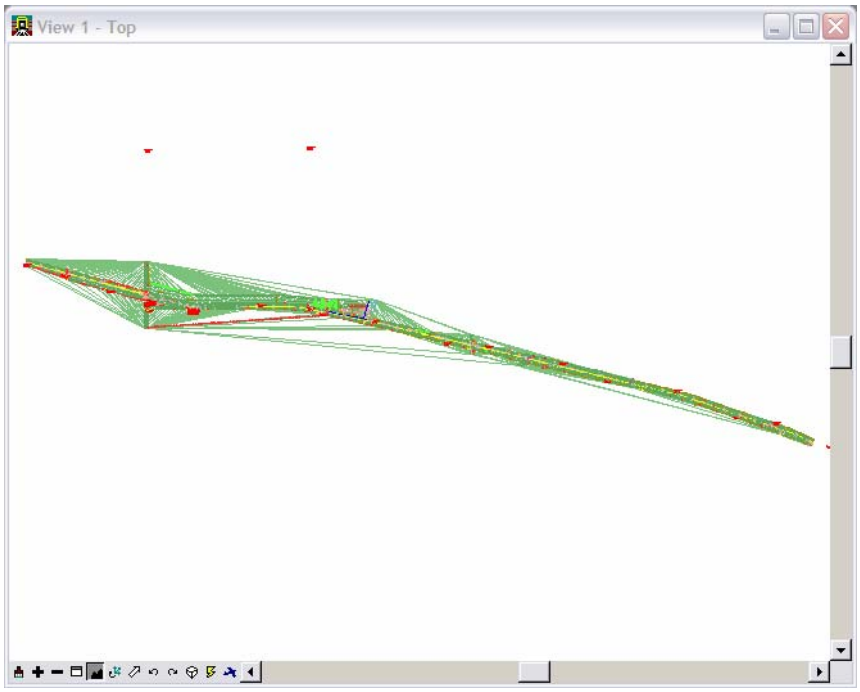
4. Select the ***Existing*** preference.
5. **<D>** the **Load** then **Close** buttons.



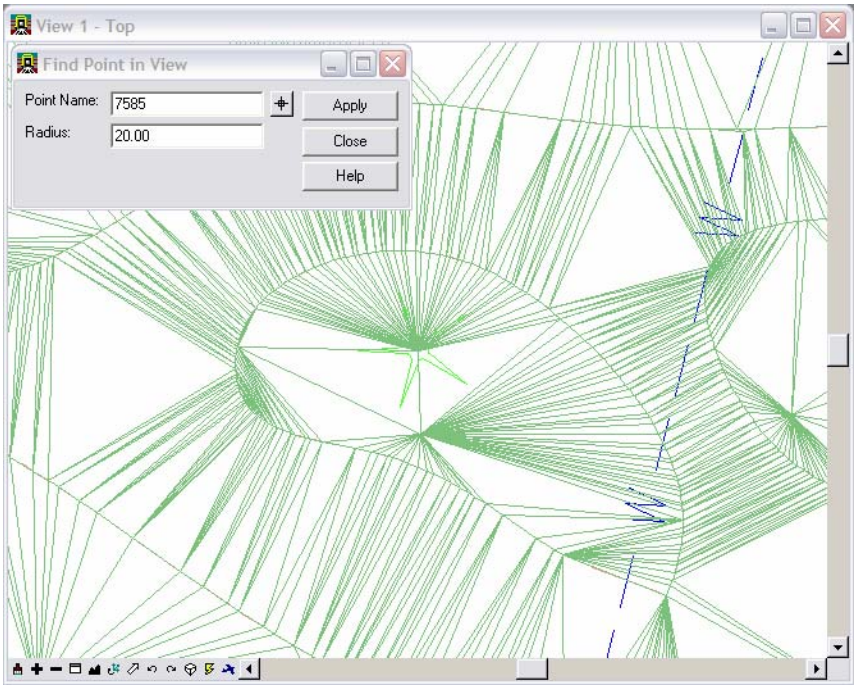
6. **<D>** the **Apply** button. The **View Triangles** dialog will minimize as the triangles are generated. The dialog will reappear when it is finished.

7. **<D>** the **Close** button in the **View Triangles** dialog.

8. Using **MicroStation** viewing commands **Fit Active** to review your results.

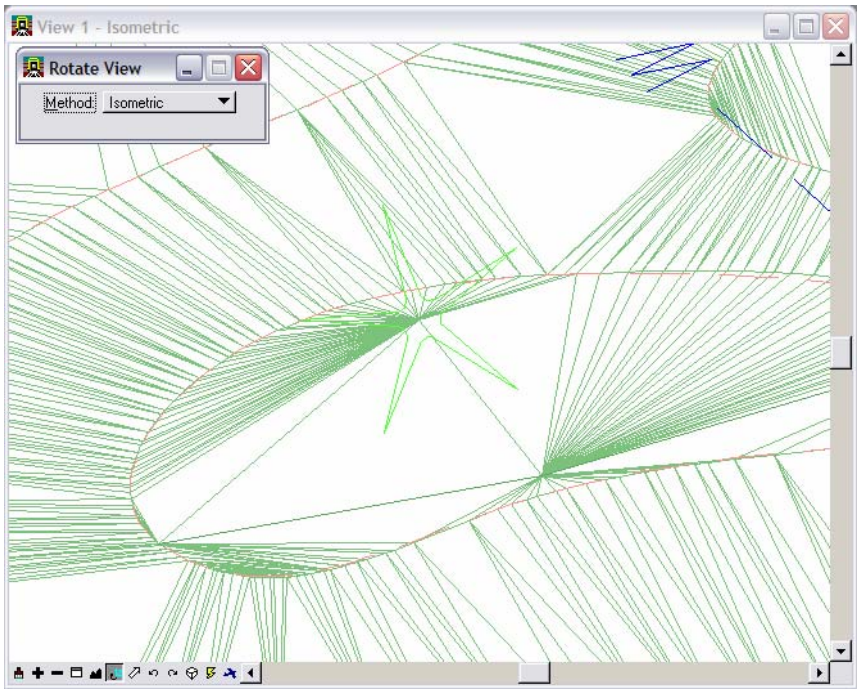


9. From the pull-down menu, select **Survey > Find Point in View**
10. Find **Point Name:** ***7585*** Radius: ***20***

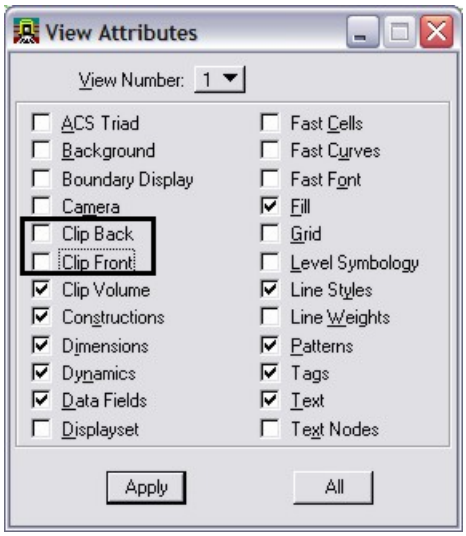


11. Using **MicroStation** viewing commands **Rotate View** to review your results.

12. From the tool settings dialog select **Method: Isometric**



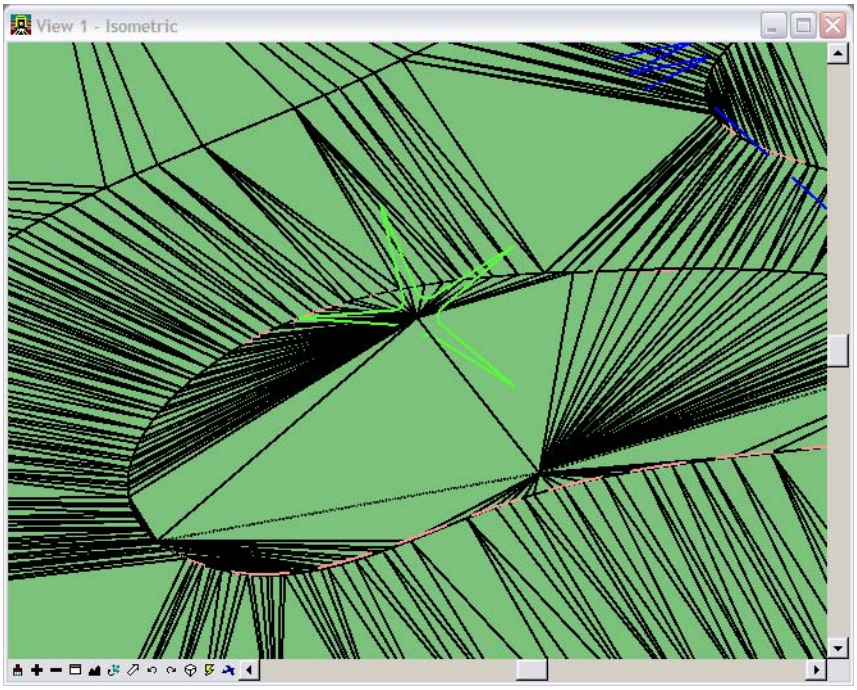
13. If you can not see all the triangles in the view. Go to the MicroStation pulldown **Settings > View Attributes** and check off ***Clip Back*** and ***Clip Front*** then **Apply** and exit the dialog.



14. From the MicroStation pull down menu select, **Utilities > Render > Filled Hidden Line**.

15. Place a **<D>** in **View 1**

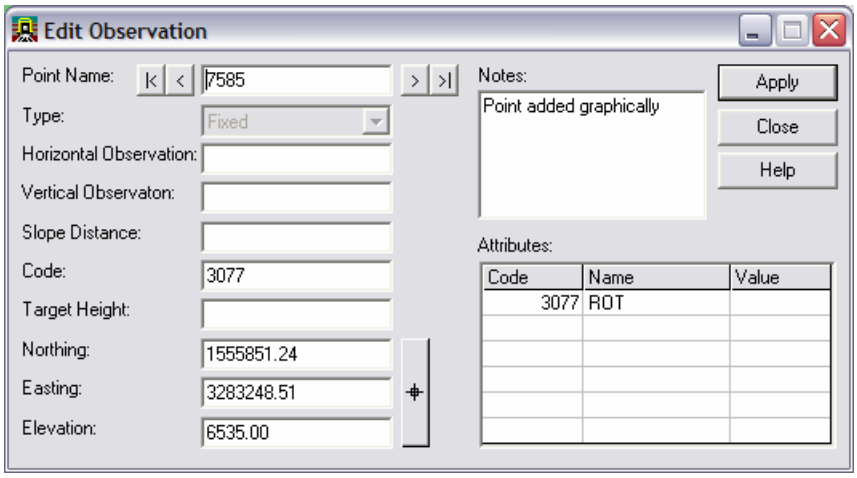
16. Review your results.



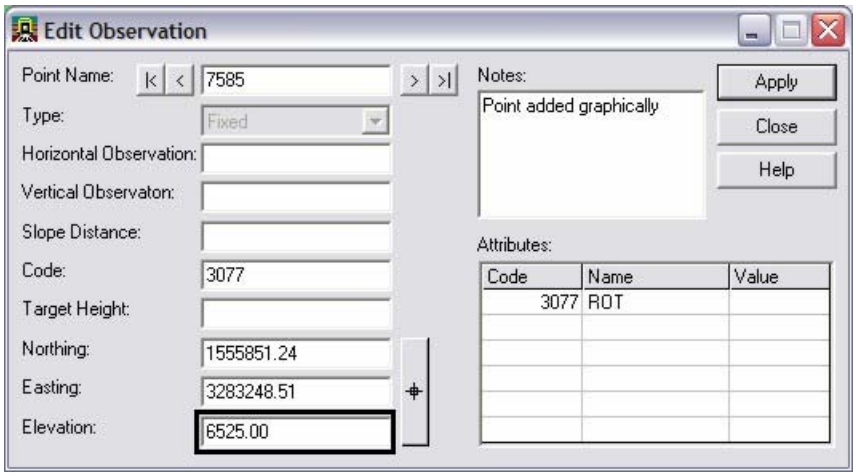
Note: The tree feature code 5077 that was added to the fieldbook had the elevation transposed. The elevation error will be corrected back in the fieldbook.

17. Locate point name **7585** in the fieldbook using the **Select Observation** button from the **Fieldbook Data** dialog.

18. **<R>** the point name **7585** and select **Edit** from the shortcut menu or double click the point name. The **Edit Observation** dialog will appear for point 7585.



19. Key-in the ***Elevation: 6525.00***



20. **<D>** the **Apply** then **Close** buttons.

21. From the View Survey toolbar toggle **ON View Planimetrics**

22. Review your results.

    Note: The fieldbook data is now correct when the fieldbook is re-exported the Survey data to Surface the surface data will be corrected also.

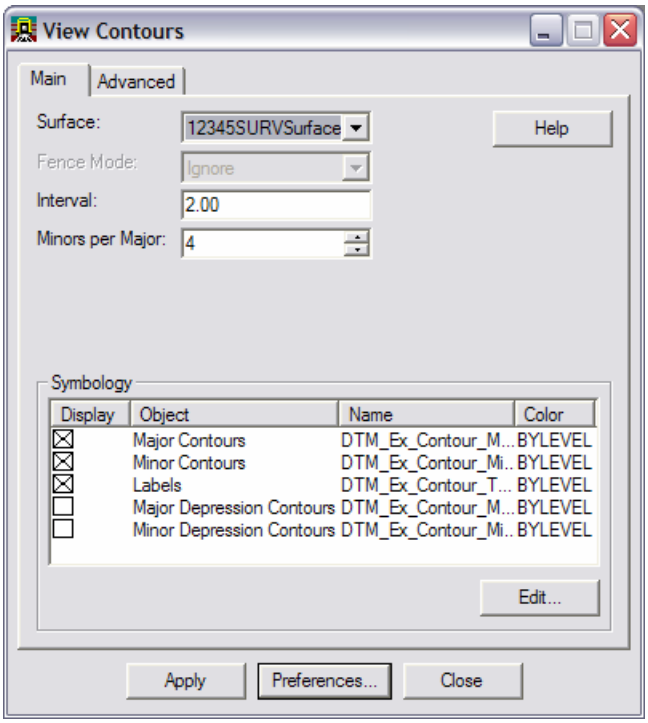
23. From the View Survey toolbar toggle **OFF View Planimetrics**

24. In the MicroStation view border **Rotate** view to **Top**

Surface Contours

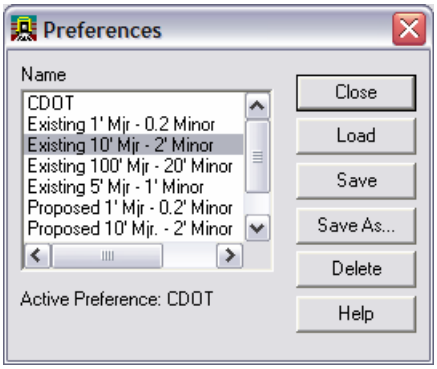
Lab 12: Evaluate Surface Contours

1. From the InRoads pull-down select, **Surface > View Surface > Contours**. The **View Contours** dialog will appear.



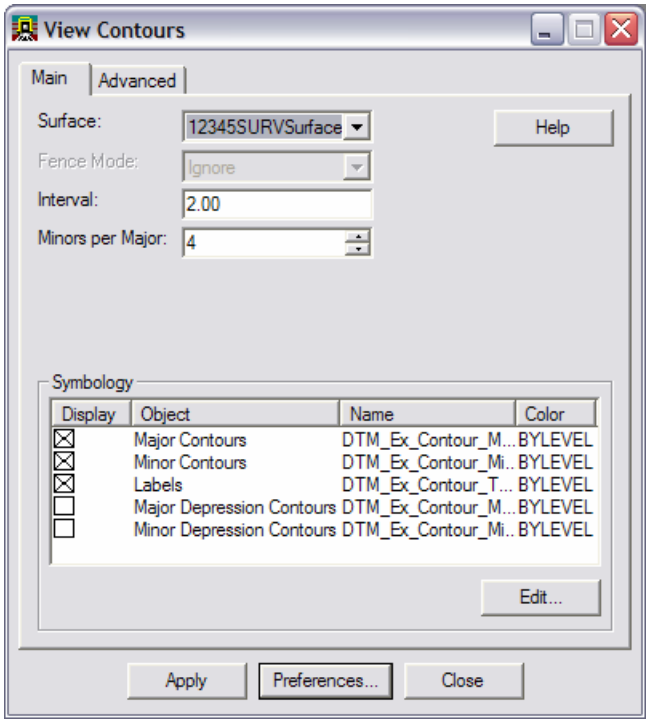
2. Verify **12345SURVSurface01** is the active surface.

3. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



4. Select the ***Existing 10' Mjr – 2'Minor*** preference.

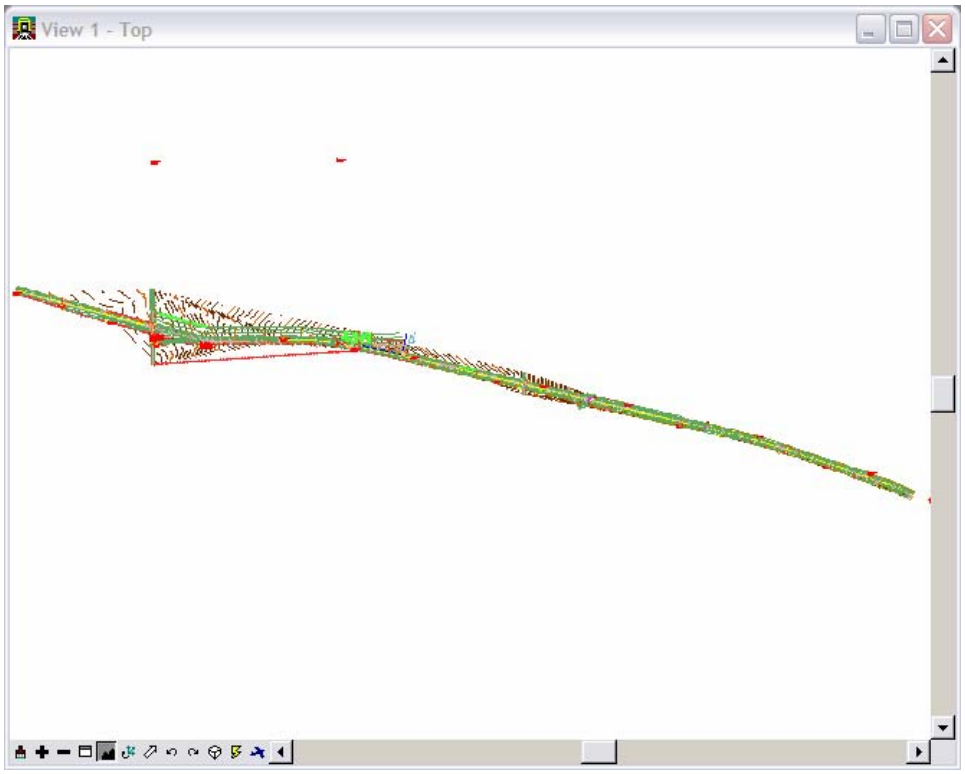
5. **<D>** the **Load** then **Close** buttons.



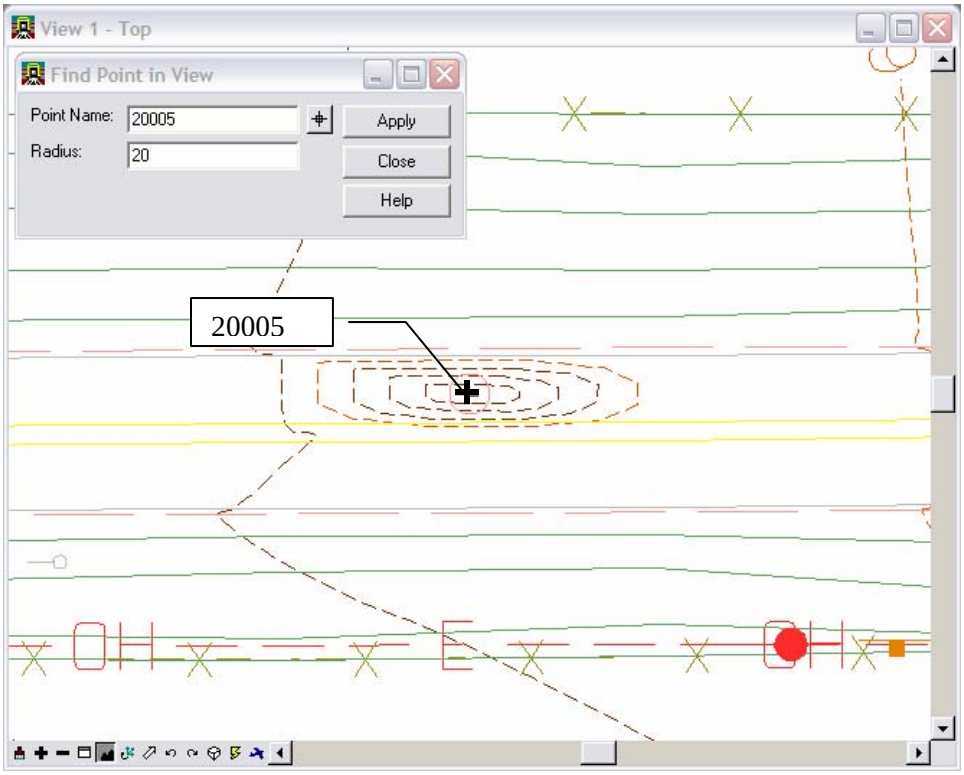
6. **<D>** the **Apply** button. The **View Contours** dialog will minimize as the triangles are generated. The dialog will reappear when it is finished.

7. **<D>** the **Close** button in the **View Contours** dialog.

8. Using **MicroStation** viewing commands **Fit Active** to review your results.



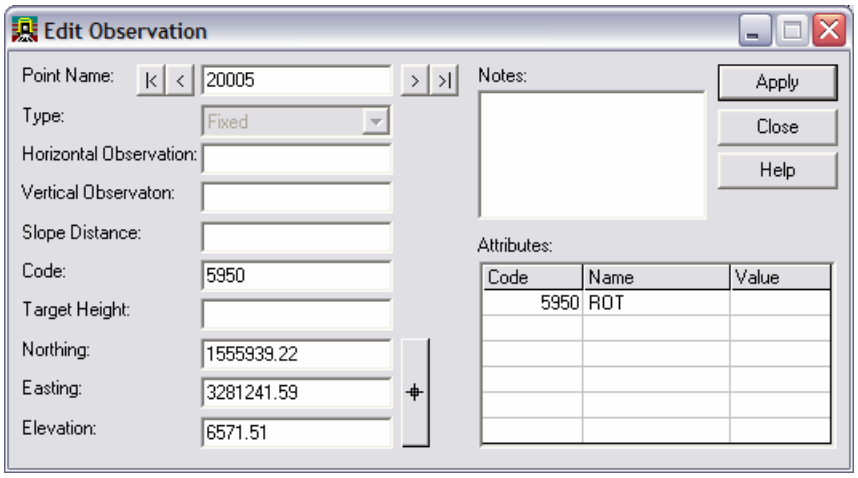
9. From the pull-down menu, select **Survey > Find Point in View**
10. Find ***Point Name: 20005 Radius: 20***



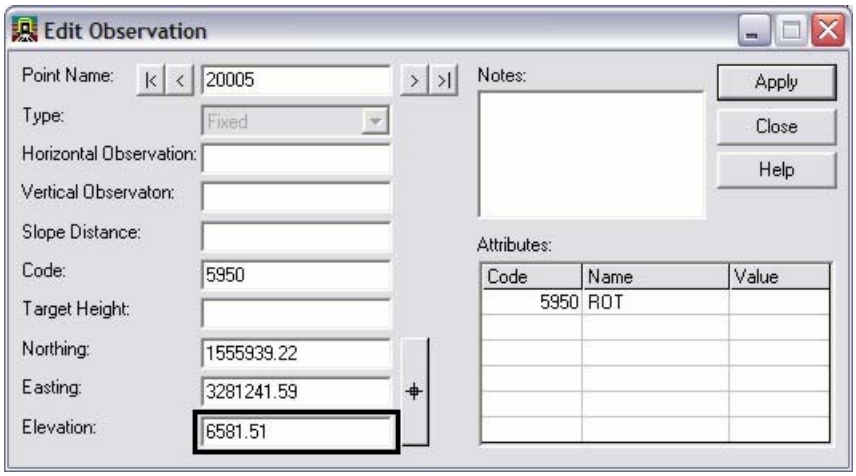
Note: There is a problem with a random point in the roadway. The test hole location that were imported with the import wizard has a busted elevation.

11. Locate point name **20005** in the fieldbook using the **Select Observation** button from the **Fieldbook Data** dialog.

12. **<R>** the point name **20005** and select **Edit** from the shortcut menu or double click the point name. The **Edit Observation** dialog will appear for point 20005.

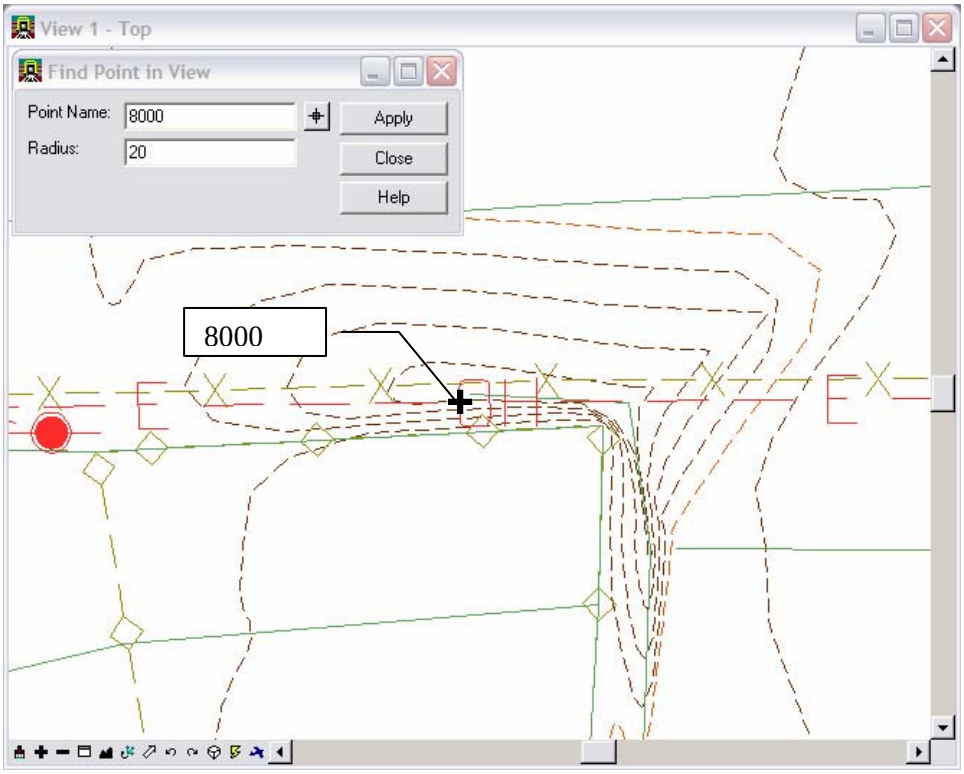


13. Key-in the ***Elevation: 6581.51***



14. **<D>** the **Apply** then **Close** buttons. The elevation will be corrected for the final DTM export.

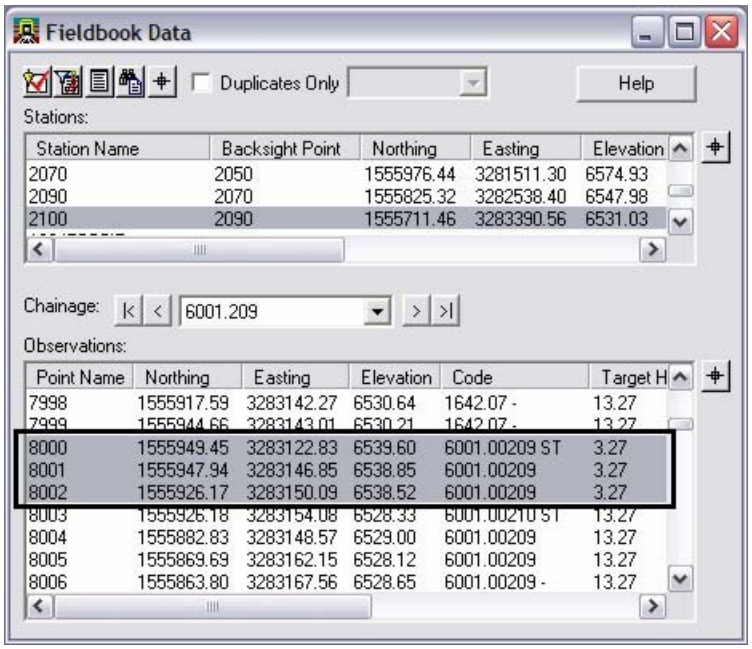
15. From the pull-down menu, select **Survey > Find Point in View**
16. Find ***Point Name: 8000 Radius: 20***



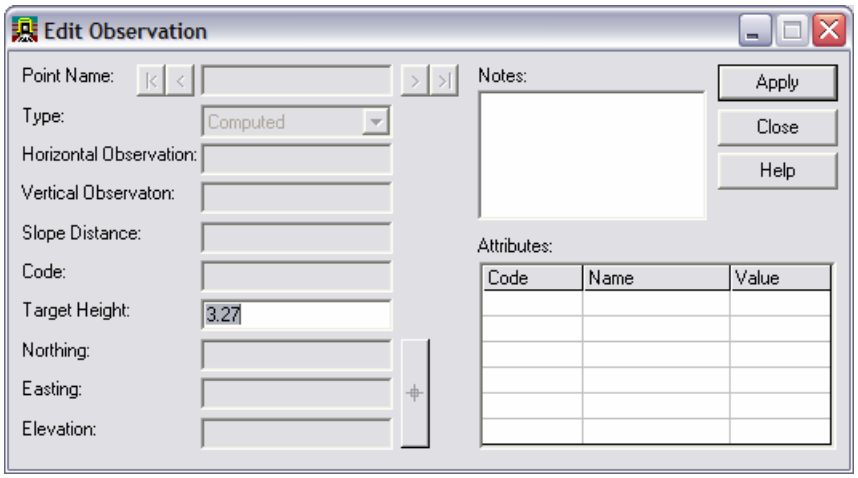
Note: There is a problem with the breakline. The breakline has a bust in the rod height.

17. Locate point name ***8000*** in the fieldbook using the **Select Observation** button from the **Fieldbook Data** dialog.

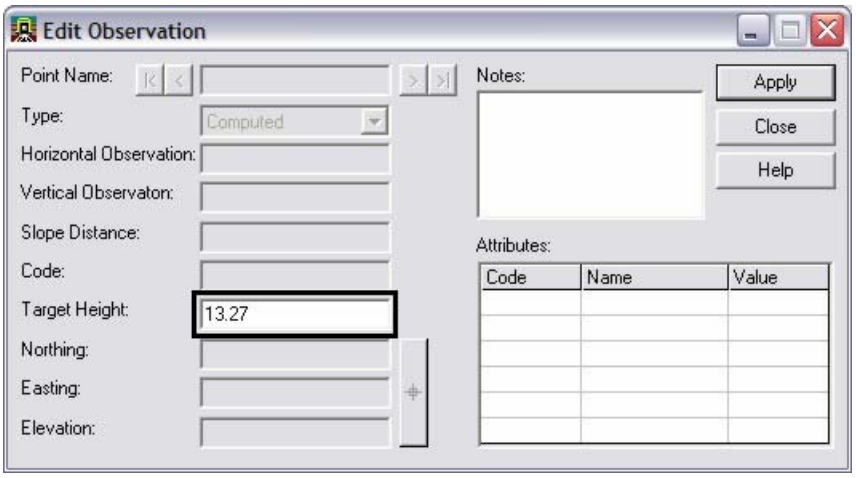
18. **<D>** the point name ***8000*** then hold down the **Shift** key and select point name ***8002***.



19. **<R>** the selected list and select **Edit** from the shortcut menu. The **Edit Observation** dialog will appear.



20. Key-in the ***Target Height: 13.27***



21. **<D>** the **Apply** then **Close** buttons. The elevation will be corrected for the final DTM export.

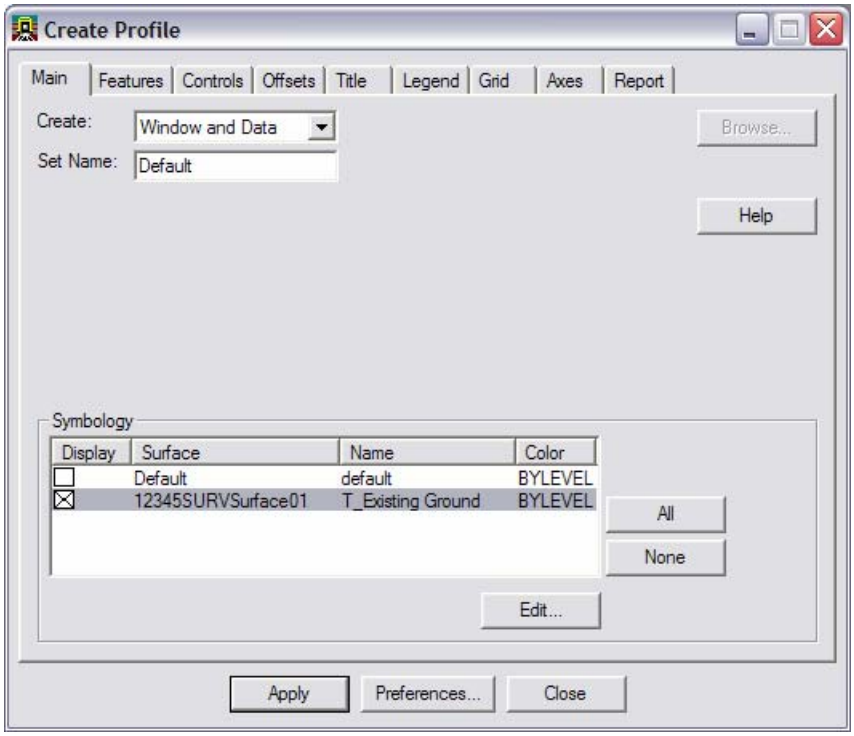
22. Save the Survey fieldbook. From the Workspace Bar **<R>** on ***12345SURVFieldbook01*** select ***Save*** from the shortcut menu.

Profiles

Another method to evaluate a DTM is by extracting profiles across the surface. These 2D line drawings give the user the ability to extract vertical views from any triangulated DTM at any location or vertical distortion.

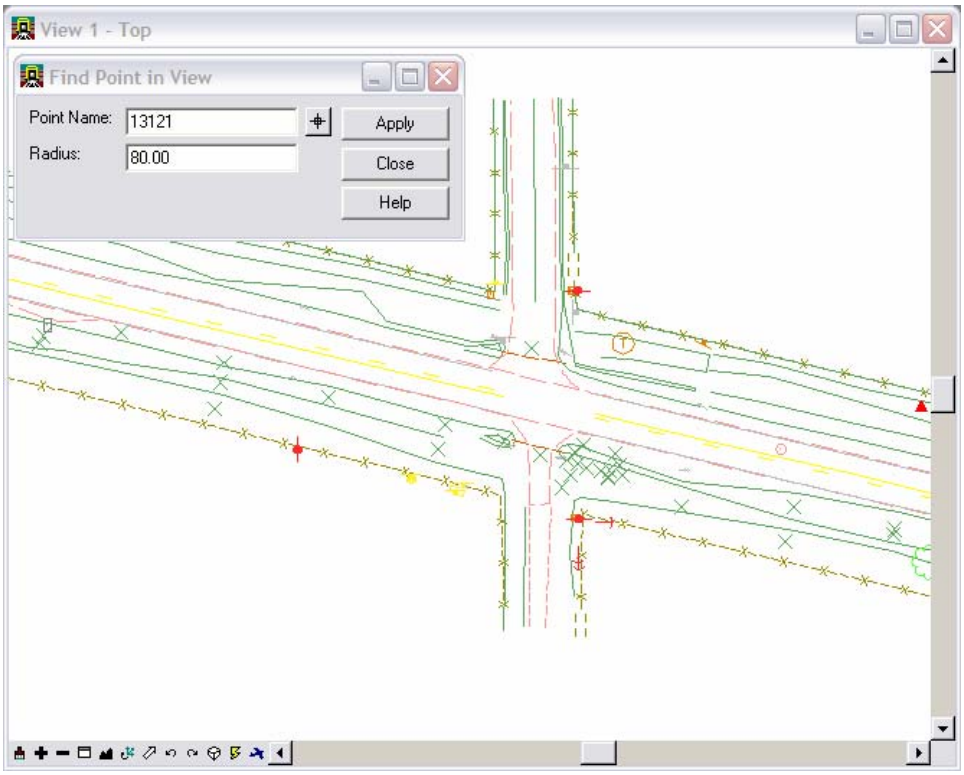
The profile command in InRoads Survey is limited to creating profiles by interactively selecting the needed location in the MicroStation view.

The profile command in InRoads is more robust allowing the user to define the profile location by interactively selecting points (Multipoint), by Alignment, Graphics, or by locations defined in an ASCII file.



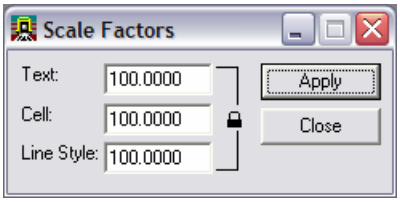
Multipoint Profile as Section check

1. From the pull-down menu, select **Survey > Find Point in View**
2. Find ***Point Name: 13121 Radius: 80***



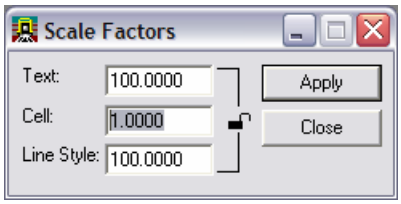
Note: Using the Multipoint Profile command will be used to evaluate key areas such as this culvert crossings.

3. Using MicroStation Level Display, **Turn OFF** all Terrain levels as shown above.
4. From the pull down menu select, **Tools > Global Scale Factors...** The **Scale Factors** dialog will appear.



- If Global Scale Factors is not an option go to the InRoads pulldown menu and select:
  Tools > Application Add-Ins > Global Scale Factors Add-In

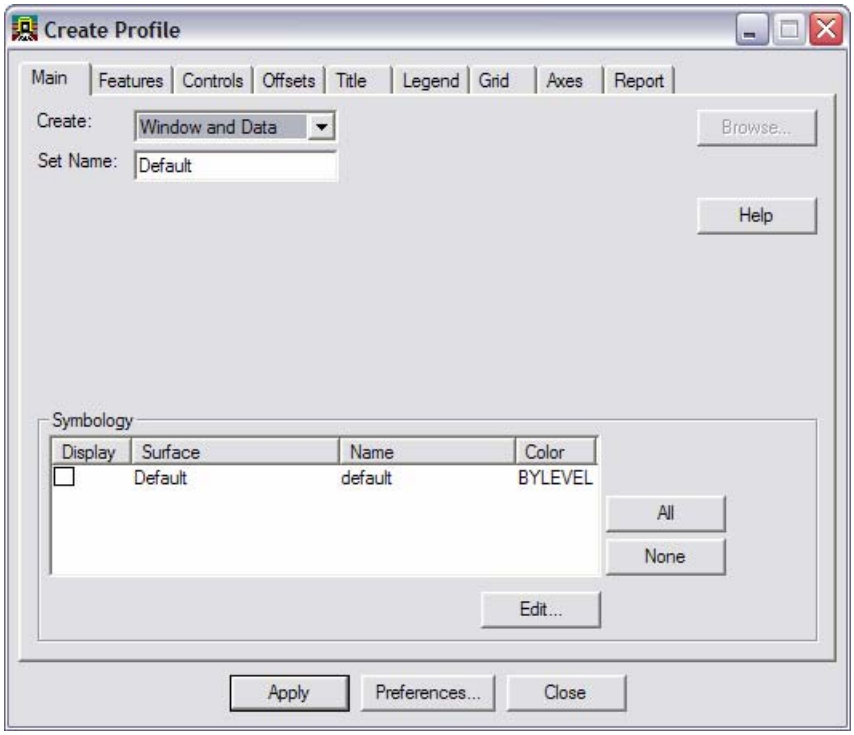
5. **<D>** the **Lock** button. The button display will change showing as unlocked.



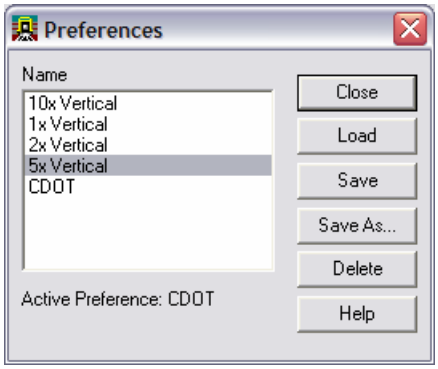
6. Key-in scale **Cell: *1***

7. **<D>** the **Apply** then **Close** buttons.

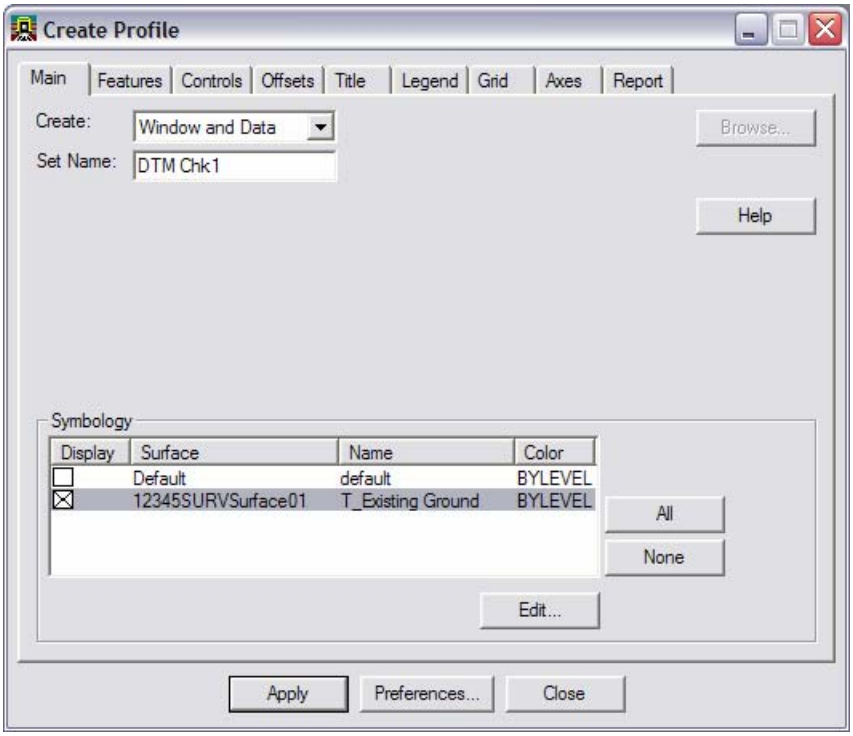
8. From the pull down menu select, **Evaluation > Profile > Create Profile**. The **Create Profile** dialog will appear.



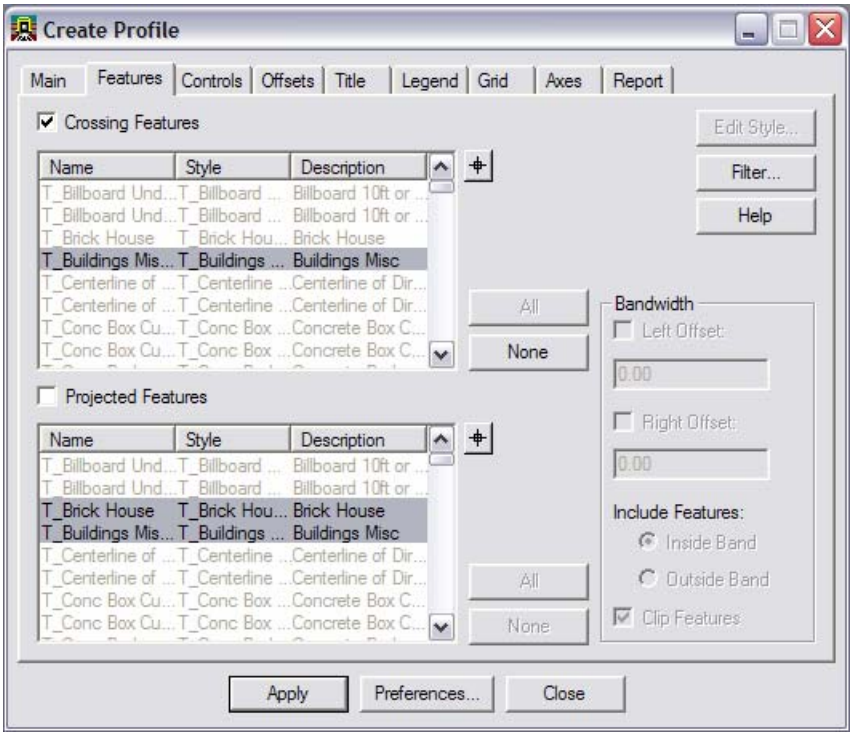
9. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



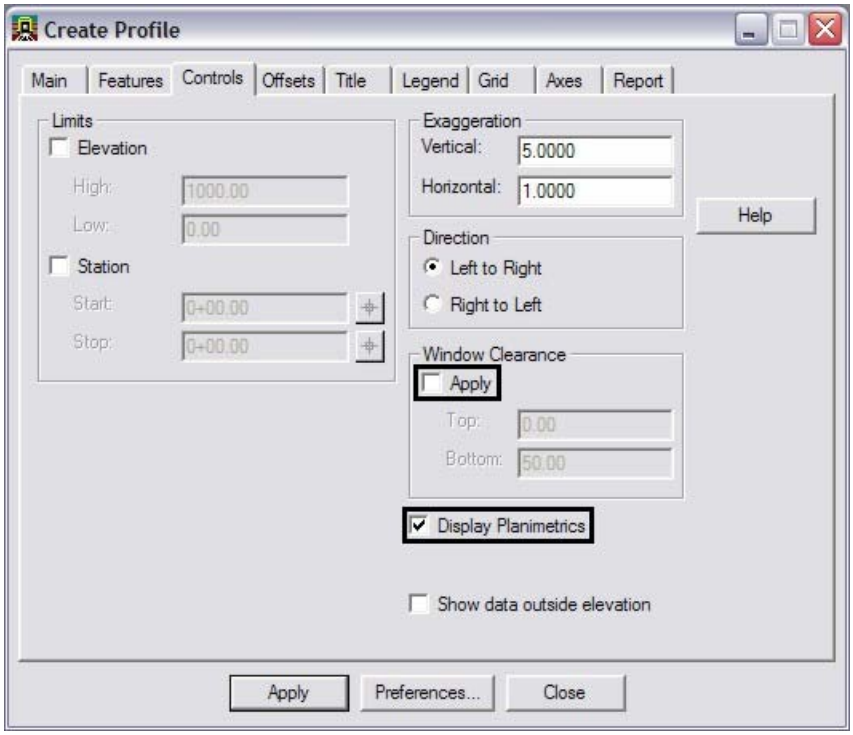
10. Select the preference name ***5x Vertical***
11. **<D>** the **Load** then **Close** buttons.
12. On the **[Main]** tab key-in ***Set Name: DTM Chk1***
13. Verify ***12345SURVSurface01***is checked in the **Symbology** section.



14. **<D>** the **[Features]** tab.



15. **Check** the Crossing Features box.
16. **<D>** the **[Controls]** tab.
17. **Check Off** the ***Window Clearance Apply*** box.
18. **Check ON** the ***Display Planimetrics*** box.

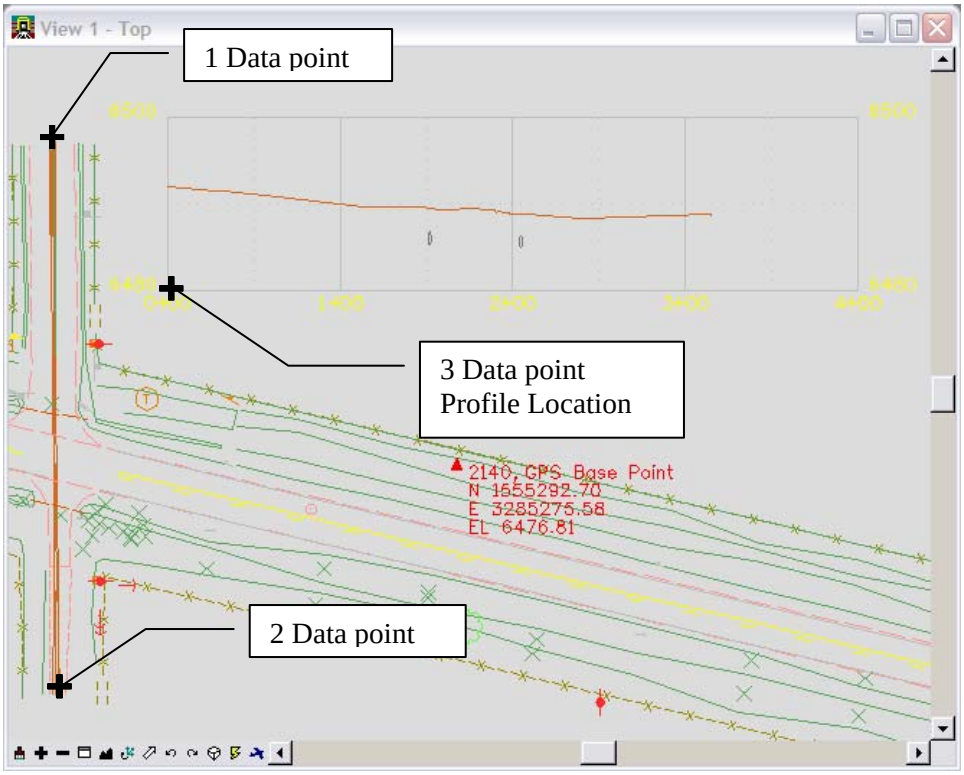


19. **<D>** the **Apply** button. The dialog will minimize allowing you to select points in the MicroStation view.

20. **<D>** a point in the MicroStation view at the north end of the and center of the road..

    - There is no need to hold down on the Left mouse button.

21. Move the cursor, a line will begin to generate



22. **<D>** a second point perpendicular across the roadway crossing the culvert, as shown above.

23. **<R>** to quit defining profile extraction vertices.

24. **<D>** a location in the MicroStation view to draw the profile. The **Create Profile** dialog will reappear and the Profile is generated in the view.

25. Review your results.
26. Continue to Create Profiles at key locations.
    - Culvert Crossings
    - Driveway Entrances
    - Centerlines

    When finished:
27. Using **MicroStation Delete** button. Delete all DTM Check profiles.
28. Save the Survey fieldbook. From the Workspace Bar **<R>** on *12345SURVFieldbook01* select ***Save*** from the shortcut menu.

Chapter 8 Exporting the Fieldbook

Final Export and save

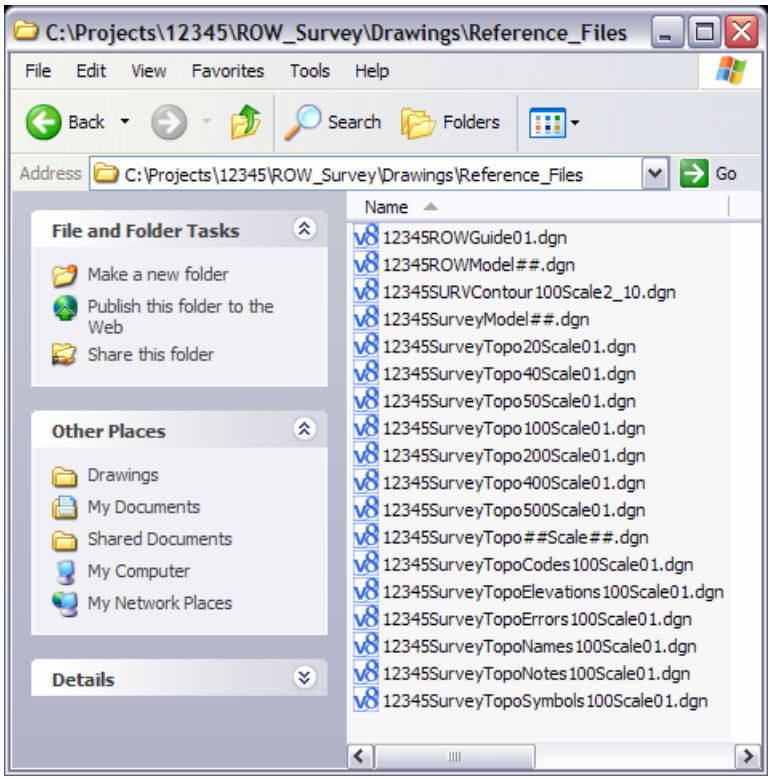
The fieldbook has been corrected until there are no more visible errors. Now the fieldbook will be exported to a DGN, DTM, and ALG files.

Lab 13: Exporting Survey Data to Graphics

Managing Drawings in the Reference Files folder

The files in the Reference Files folder are for other disciplines to reference. Other disciplines are to reference in the 01 model file. There are already 01 files in the Reference Files folder that are out of date. The new Survey Fieldbook that is exported will become the new 01 file.

1. Open Windows Explorer
2. Navigate to the folder ***C:\Projects\12345\ROW_Survey\Drawings\Reference_Files***



3. Rename each file *12345SurveyTopo** with a *01* counter and rename it to ***02***.

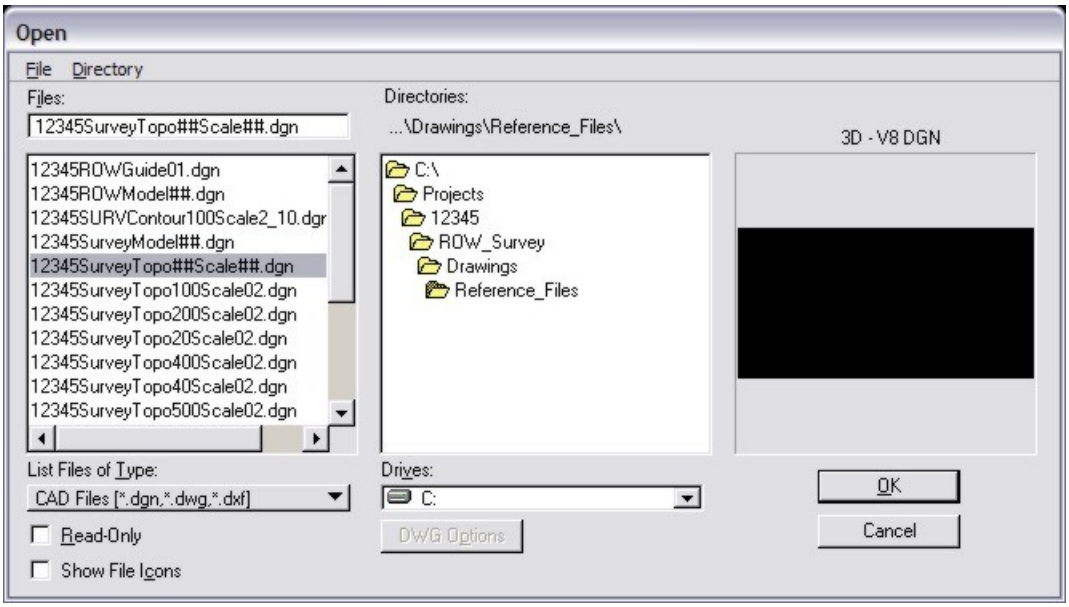
Note: The next steps will create these model files with an updated InRoads Survey fieldbook.

Creating new 01 model files

4. From the MicroStation pulldown menu select **File > Open** the Open dialog will appear.

5. In the MicroStation Manager dialog path to the directory: ***C:\Projects\12345\ROW_Survey\Drawings\Reference_Files***

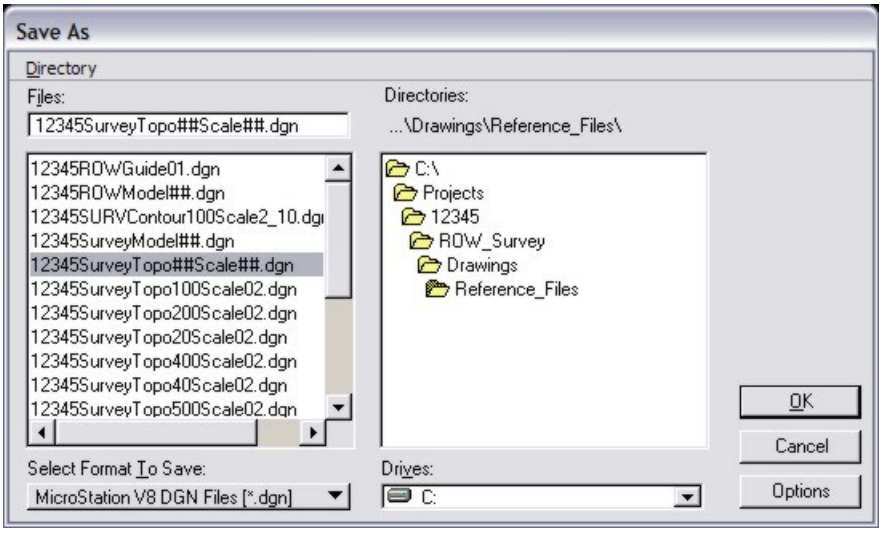
6. Select the file **12345SurveyTopo##Scale##.dgn** from the **Open** dialog.



Note: The purpose of the files with "##" symbols are for creating new files with the correct naming convention.

7. **<D> OK** the **MicroStation Manager** dialog will close and open the file.

8. From the MicroStation pulldown menu **File > Save As** the **Save As** dialog will appear.



9. Replace the ## symbols with 100 scale and 01 model.
   Type in ***Files: 12345SurveyTopo100Scale01.dgn***

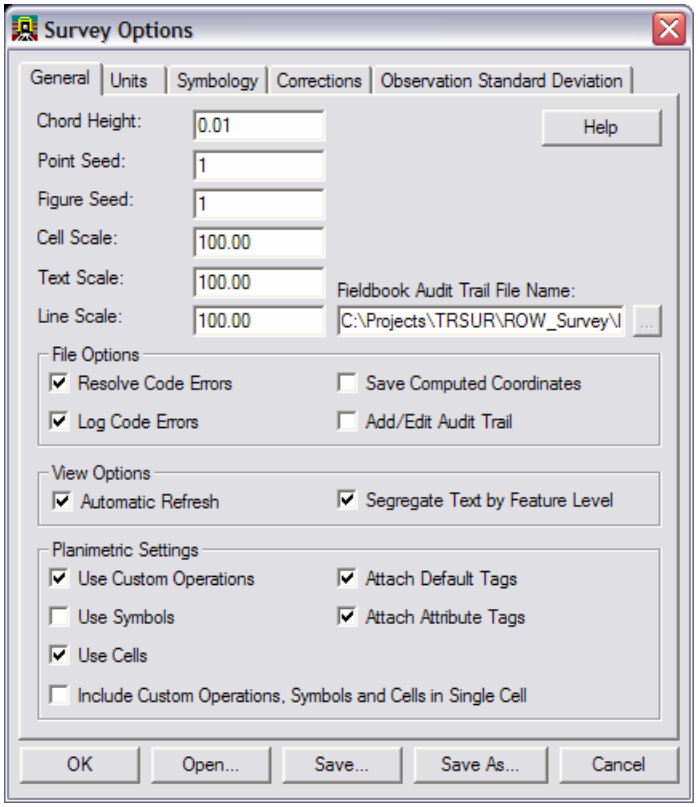
10. **<D>** the **OK** button the **Save As** dialog will close and MicroStation will open the file ***12345SurveyTopo100Scale01.dgn***

11. Verify the **12345SURVFieldbook01** fieldbook is active. You can tell which fieldbook is active by the red box around the fieldbook button.

12. To modify the scale as it relates to cells, text, and linestyles go to **Tools > Survey Options > [General]**. The **Survey Options** dialog will appear.

13. Set the Scales for **Cell**, **Text**, and **Line** as shown below.

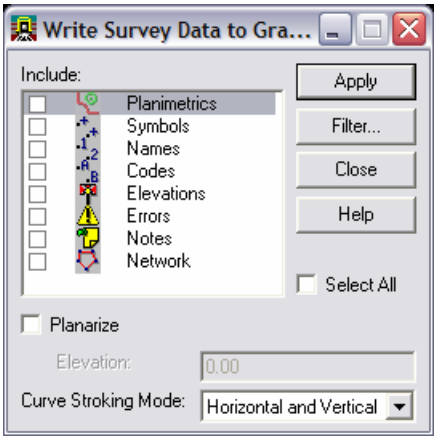
    - Cell Scale: ***100***
    - Text Scale: ***100***
    - Line Scale: ***100***



Note: Segregate Text by Feature Level, should be checked on, this will save the symbols, point names, codes, notes, errors, and elevations to the same level as the survey feature.

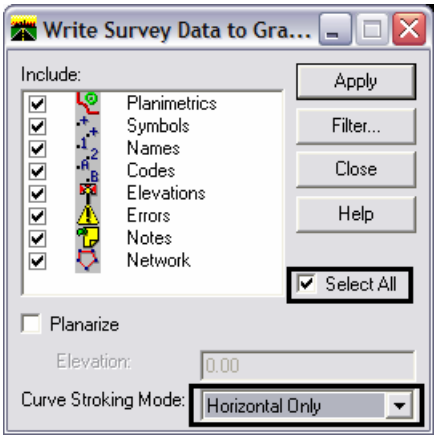
14. **<D> Save** then **OK** the **Survey Options** dialog will close.

15. Once the settings are complete, to write the survey data to graphics, go to the pull-down select,
Survey > View Survey Data > Write Survey Data to Graphics... the **Write Survey Data to Graphics** dialog will open.



Note: By default if you had dynamic graphics still toggled on, those same components would be toggled on in the **Write Survey Data to Graphics** dialog.

16. Check only the **Planimetrics** box.



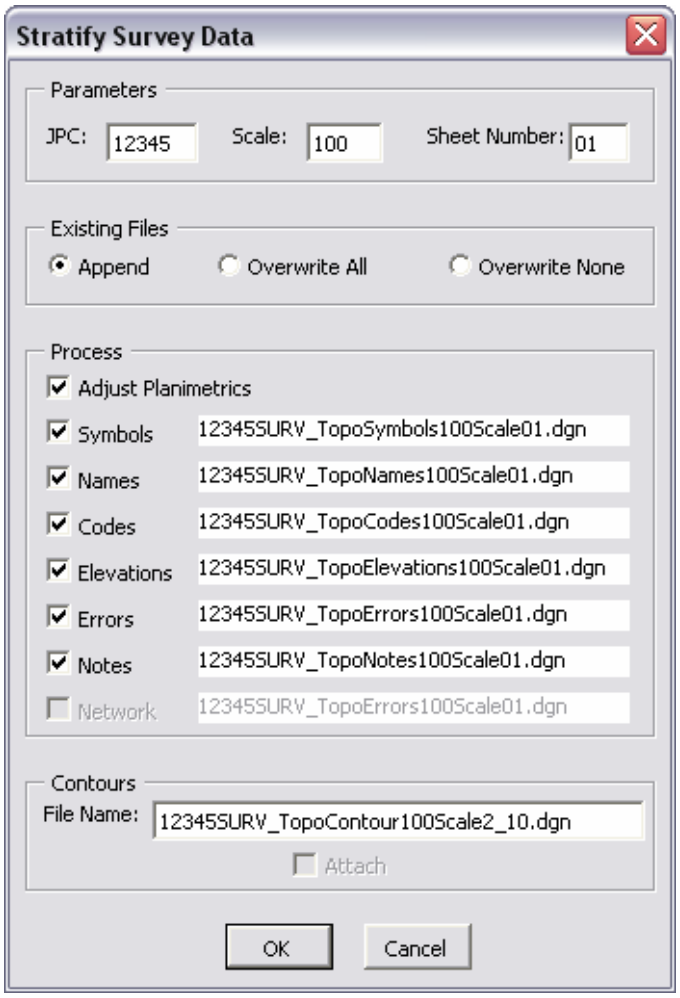
17. Set Curve Stroking: **Horizontal Only**

18. **<D>** the **Apply** button. The graphics will be created in the design file.

19. **<D>** the **Close** button. The Survey fieldbook planimetrics has been written to graphics.

20. Verify all **View Survey Data** buttons are toggled display off.

21. From the MicroStation view border **Fit** the design file.
22. Review your results.
23. From the CDOT Menu pull-down select **Add On's > Stratify Survey**. The **Stratify Survey** dialog will appear.



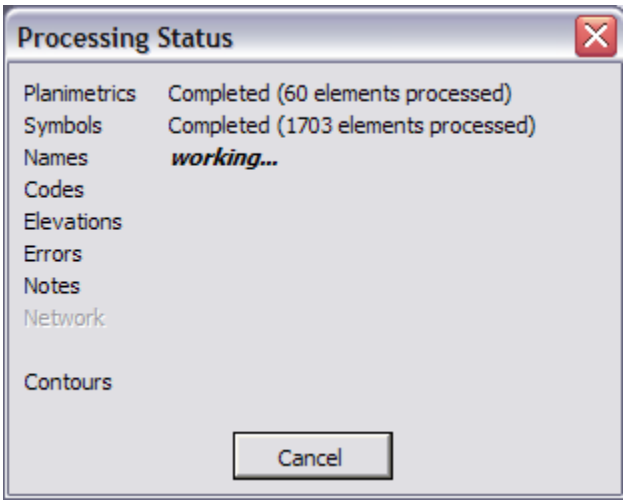
Notes:

- Under Existing Files, the Append option will add or merge the new data into an existing file. A new file will be created if the file does not already exist.
- Under Existing Files, the Overwrite All option will create a new file, deleting any previously existing file.
- Under Existing Files, the Overwrite None option will disable the processing option for a file if the file already exists.
- The Process option Adjust Planimetrics will resize the planimetrics text (if necessary) and convert the grouped text strings to view independent cells in order to allow for viewing this text in any 3D view.

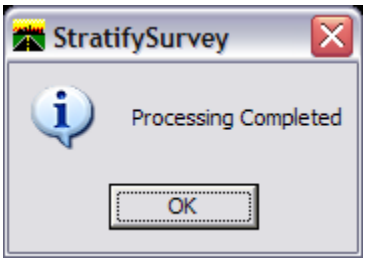
24. Verify the **JPC**, **Scale**, and **Sheet Number** entries are correct. Altering any of those values will automatically alter the output file names. If the **Attach** check box in the Contours section is grayed out, the contour file does not exist. You may edit the name specified in the **File Name** field to enter the name of an existing contour file.

25. **<D> OK** button to start the process.

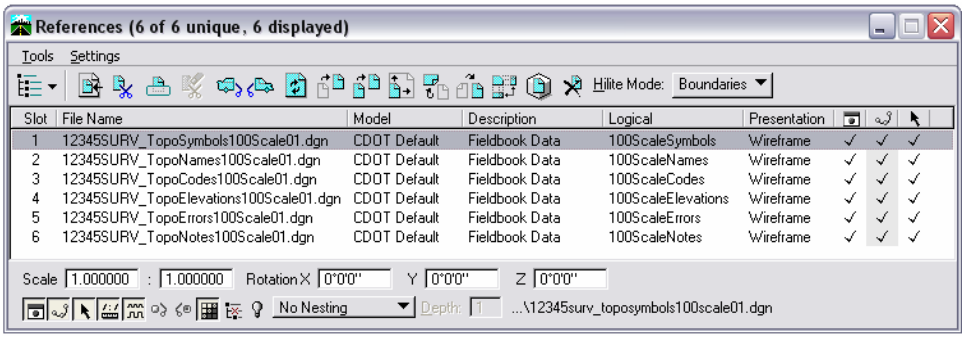
26. As the data is being moved to the appropriate reference file a **Processing Status** dialog provides an update on the progress. You may **<D> Cancel** at any time to stop the processing, if necessary.



27. When completed, a ***Processing Completed*** message is displayed. **<D> OK** to exit the program.



28. The fieldbook data has now been stratified into separate reference files. The planimetrics will be in the master design file with all of the symbols, names, codes, etc., attached as reference files. To view these attachments select **File > Reference** from the MicroStation pull-down menu.

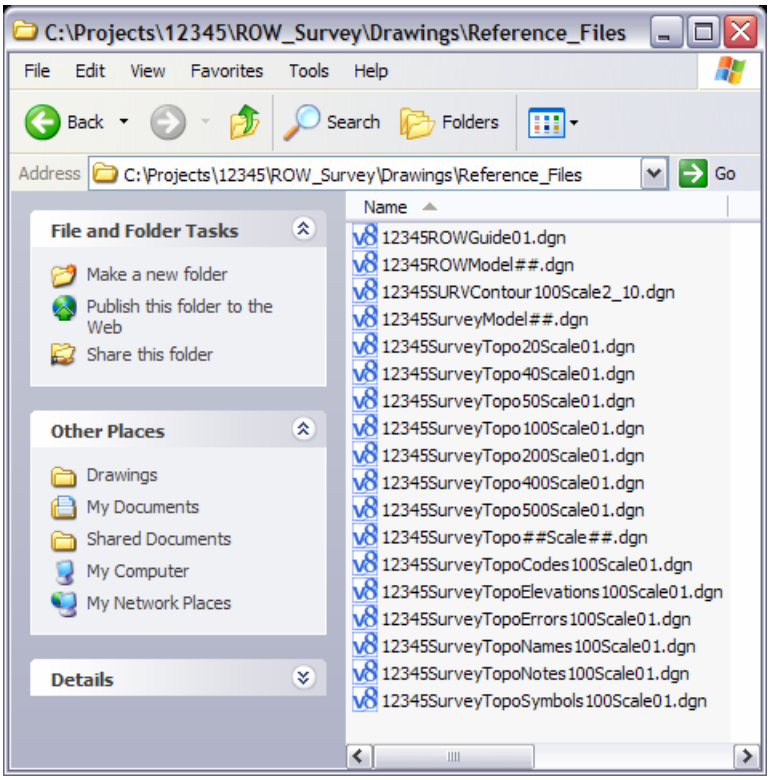


Lab 14: Exporting Survey Data to Surface

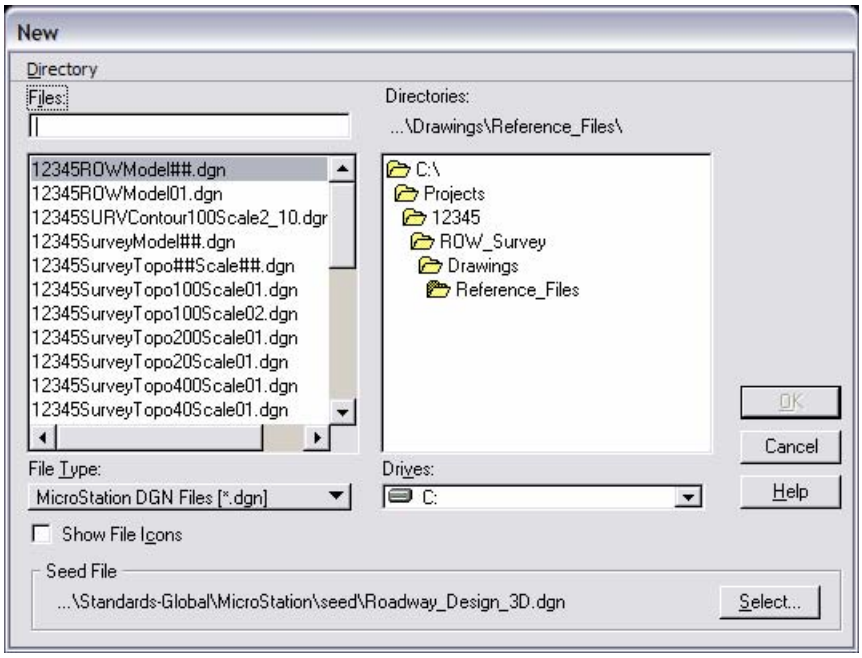
Managing Drawings in the Reference Files folder

The files in the Reference Files folder are for other disciplines to reference. Other disciplines are to reference in the contour model file. There is already a contour file in the Reference Files folder that is out of date. The new Survey Fieldbook that is exported will become the new contour file.

1. Open Windows Explorer
2. Navigate to the folder ***C:\Projects\12345\ROW_Survey\Drawings\Reference_Files***

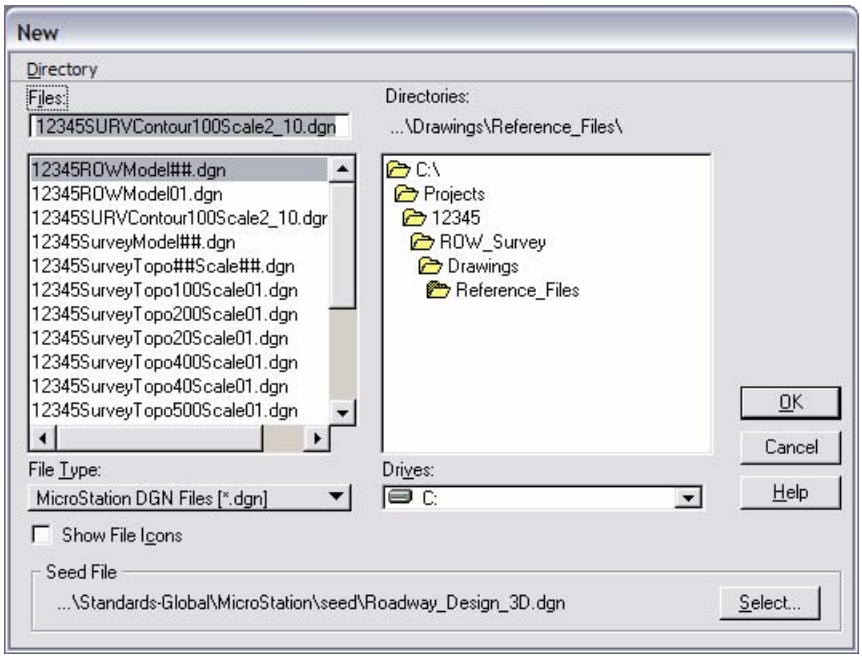


3. Rename the file *12345SURVContour100Scale2_10.dgn* with a counter ***02***.
4. From the **MicroStation** pulldown menu select **File > New** from the pull-down menu. The **New** dialog will appear.
5. Navigate to the file folder **Reference_Files** by double clicking the directory folders.
6. At the bottom of the dialog box verify that the seed file is set to **Roadway_Design_3D.dgn**.



7. Key in the file to be created:
   12345SURVContour100Scale2_10.dgn

8. **<D>** the **OK** button in the **New** dialog. The **New** dialog will close and the file ***12345SurveyTopoCodes100Scale01.dgn*** will open.



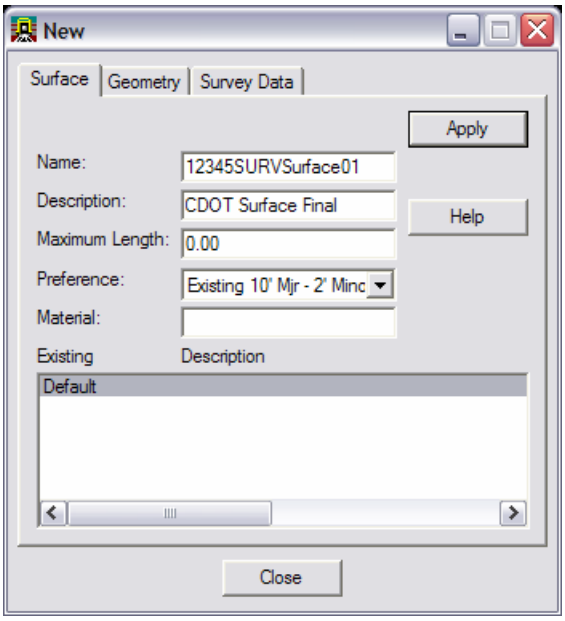
9. Verify the **12345SURVFieldbook01** fieldbook is active. You can tell which fieldbook is active by the red box around the fieldbook button.

Survey Data to Surface

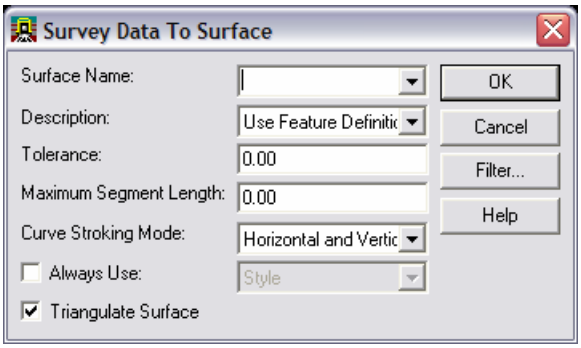
10. From the InRoads pull-down menu, select **File > New**. The **New** dialog will appear.
11. Select the ***Surface*** tab.
12. Key in the surface ***Name: 12345SURVSurface01***
13. Key in the ***Description: CDOT Surface Final***

    Note: Key in any additional file information in the **Description** field of the dialog, such as **Date**, **User**, and **Design file** name. You have up to 34 characters even though you may not see all the characters in the Description field.

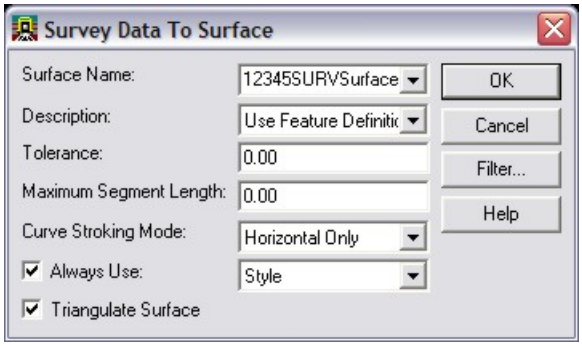
14. Keep the **Maximum Length** set to ***0***
15. Set pick list to the Preference: **Existing 10' Mjr – 2' Minor**



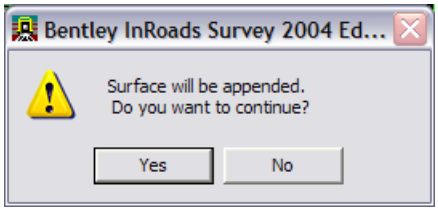
16. **<D>** the **Apply** then **Close** buttons.
17. From the pulldown menu **Survey > Survey Data to Surface**. The **Survey Data to Surface** dialog will appear.



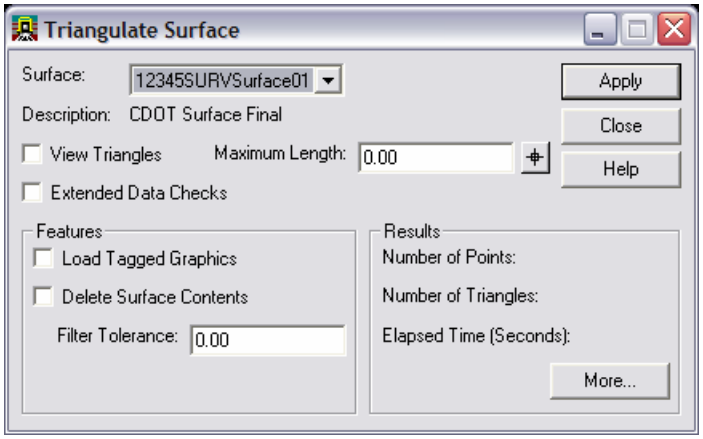
18. Pick from the list in the surface name ***12345SURVSurface01*** in the Surface Name field.
19. Set the Description to **Use Feature Definition**
20. Keep the Tolerance and Maximum Segment Length set to ***0.00***
21. Set the Curve Stroking Mode to **Horizontal Only**
22. Check Always Use: **Style**
23. Check **Triangulate Surface**



24. **<D>** the **OK** button.
25. An alert dialog will appear informing you will be appending a surface. This is alright to do so because this Surface was created with no data in the Surface.

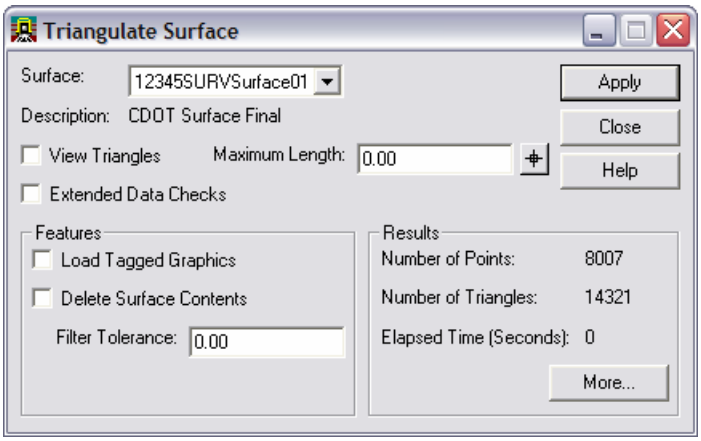


26. **<D>** the **Yes** button.
27. The **Alert** dialog will close and the **Triangulate Surface** dialog will appear.

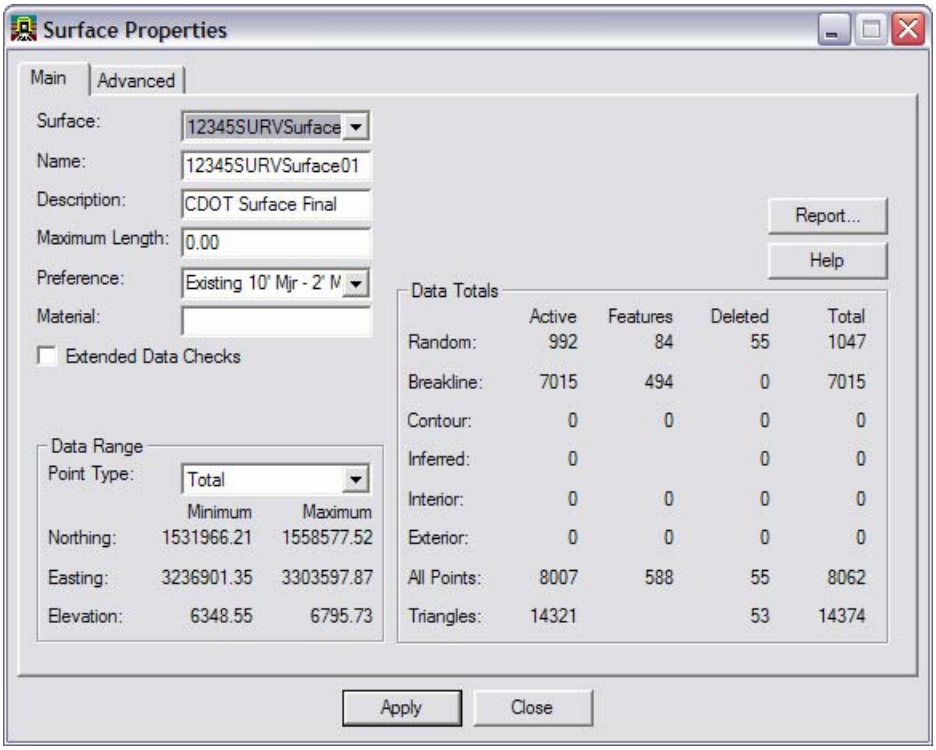


28. Leave all settings unchecked. **Maximum Length** should be set to **0.00**.

29. **<D>** the **Apply** button. The **Results** section of the dialog should look similar to the image below.



30. **<D>** the **More** button. The **Surface Properties** dialog will appear.

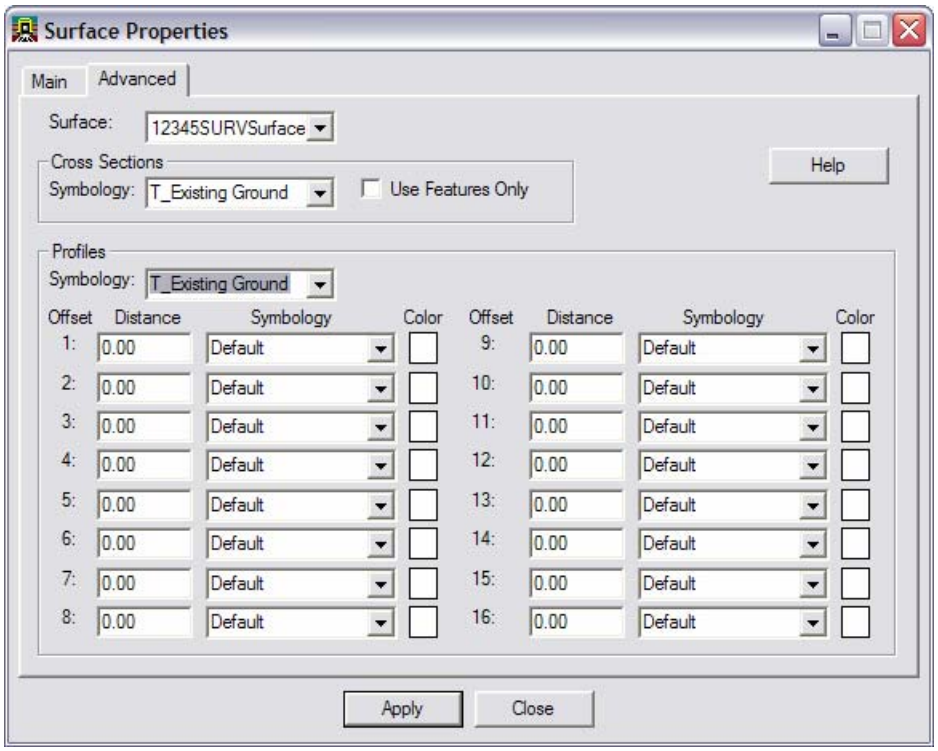


31. Verify you are working with the correct surface ***12345SURVSurface01***.

32. Review the section for **Data Range**. The Northing, Easting, and Elevation values should fall within the project limits.

33. On the Advanced tab choose
    Cross Sections - Symbology: T_Existing Ground

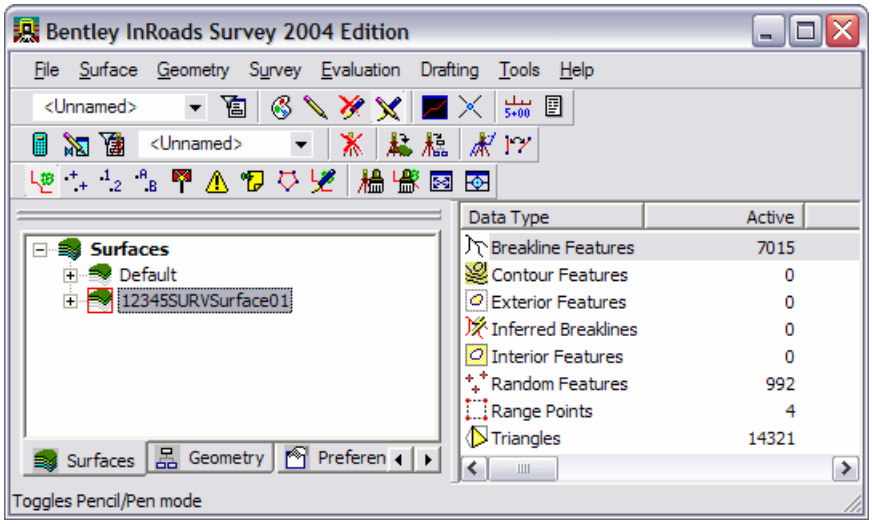
34. On the Advanced tab choose
    Profiles - Symbology: T_Existing Ground



35. **<D> Apply** then **Close** in the **Surface Properties** dialog.

36. **<D>** the **Close** button in the **Triangulate** Surface dialog.

37. Use the **Workspace** pane scroll **arrows** to view the **Surfaces** tab.

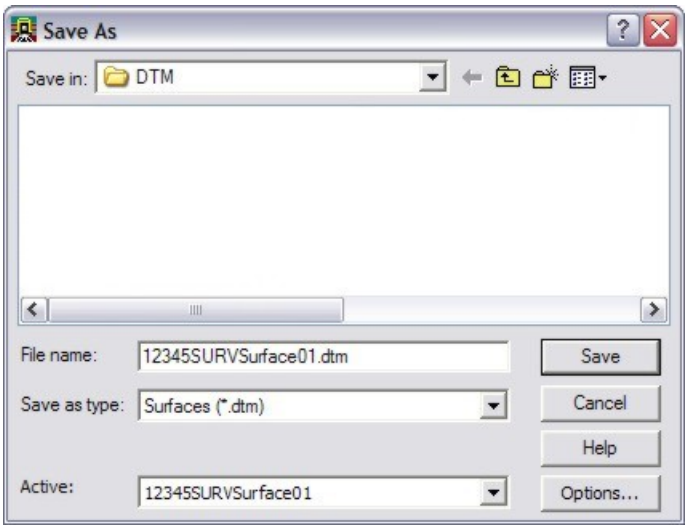


38. Verify **12345SURVSurface01** is the active surface.

Note: You can change the active surface from the pull-down menu **Surface > Active Surface**; highlight the surface name and **<D>** the **Apply** button.

39. From the pull-down **File > Save > Surface**. The **Save As** dialog will appear with the **Save as type** set to **Surfaces (*.dtm)**.

40. Verify you are in the correct project directory. C:\Projects\12345\ROW_Survey\InRoads***DTM***



41. The file name should match the **Active** name at the bottom of the **Save As** dialog. If necessary, use the drop-down arrow in the **Active** field and reselect the desired name to ensure the saved file name will match the surface name.

    Note: Ensuring that the saved Surface name in the project folder matches the Surface name displayed in InRoads explorer will minimize any confusion.

42. **<D>** the **Save** then **Cancel** button. The file will be saved to disk and the **Save As** dialog will close.

Exterior Boundary

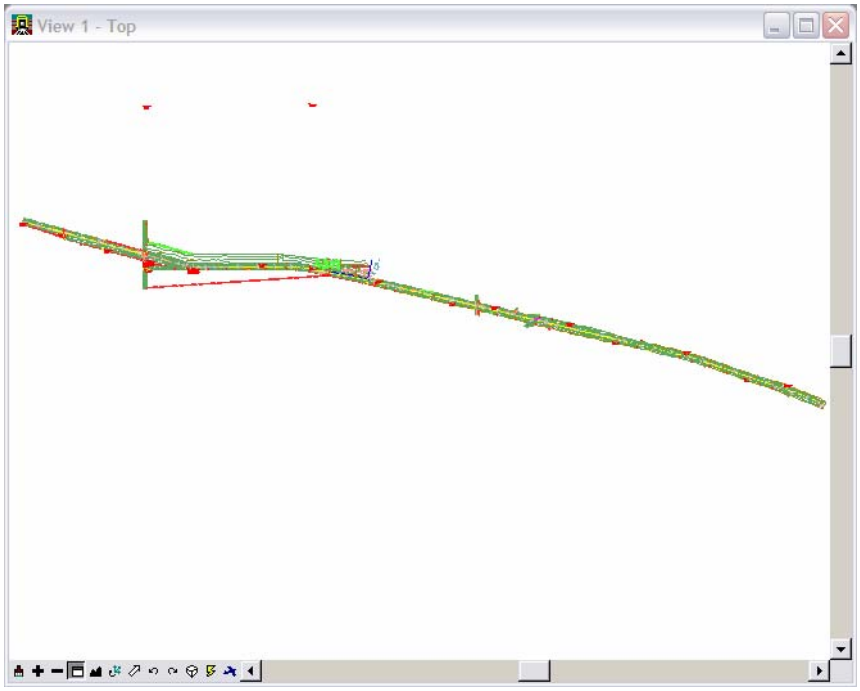
Errant triangles can be eliminated by controlling the maximum triangle length. However this can cause problems in areas of the DTM where data density varies. A more refined method is to add an exterior boundary that constrains the triangles to fall within the limit of the exterior boundary.

This process will involve several steps, they are:

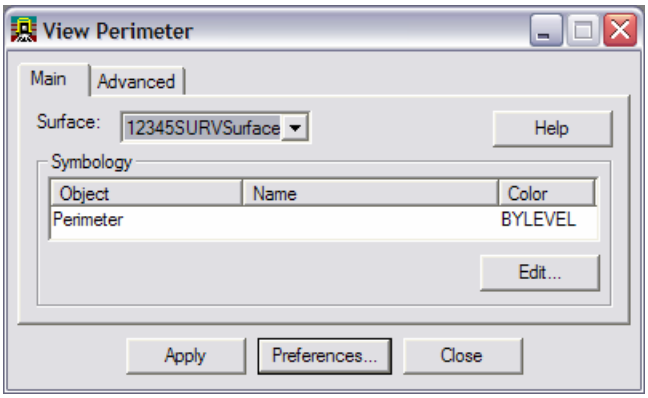
- Delete unwanted triangles from the model
- Display the perimeter of the model (active triangle limits)
- Import the displayed perimeter into the DTM as an exterior feature.
- Verify the results

43. Using MicroStation **Delete**. Delete all triangles from the DGN file.

44. Using MicroStation **Window Area** button center the graphics to **View 1 Top** rotation.



45. From the pull down menu select, **Surface > View Surface Perimeter**. The **View Perimeter** dialog will appear.



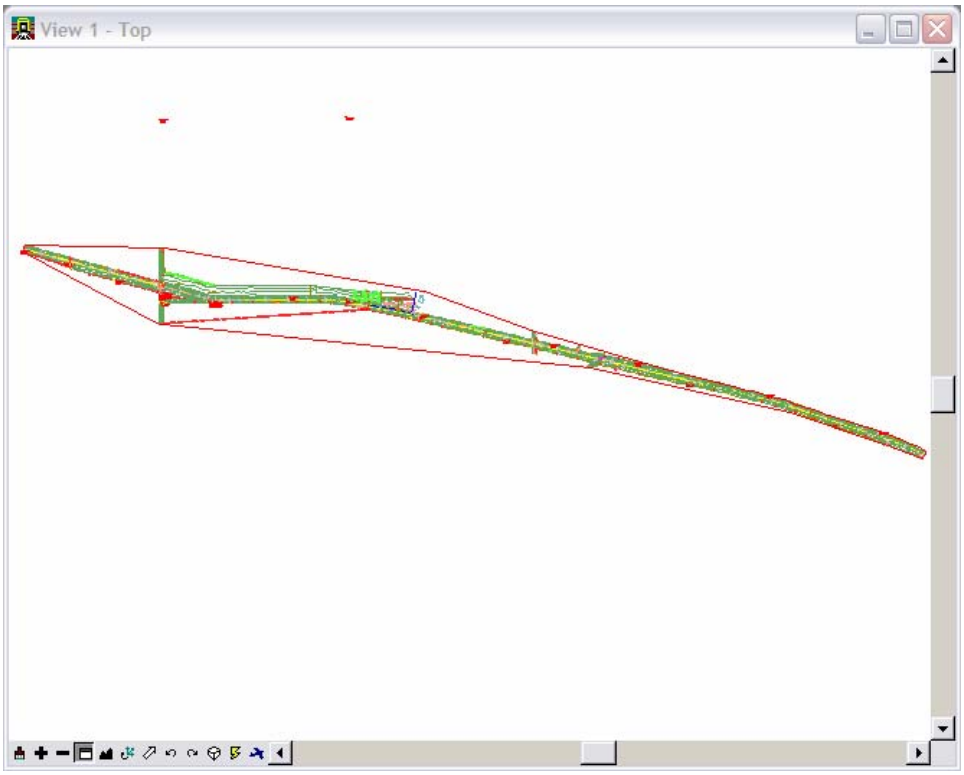
46. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.

47. Select ***CDOT*** from the **Preferences** dialog

48. **<D>** the **Load** then **Close** buttons in the **Preferences** dialog.

49. **<D>** the **Apply** button in the **View Perimeter** dialog.

50. Review your results.



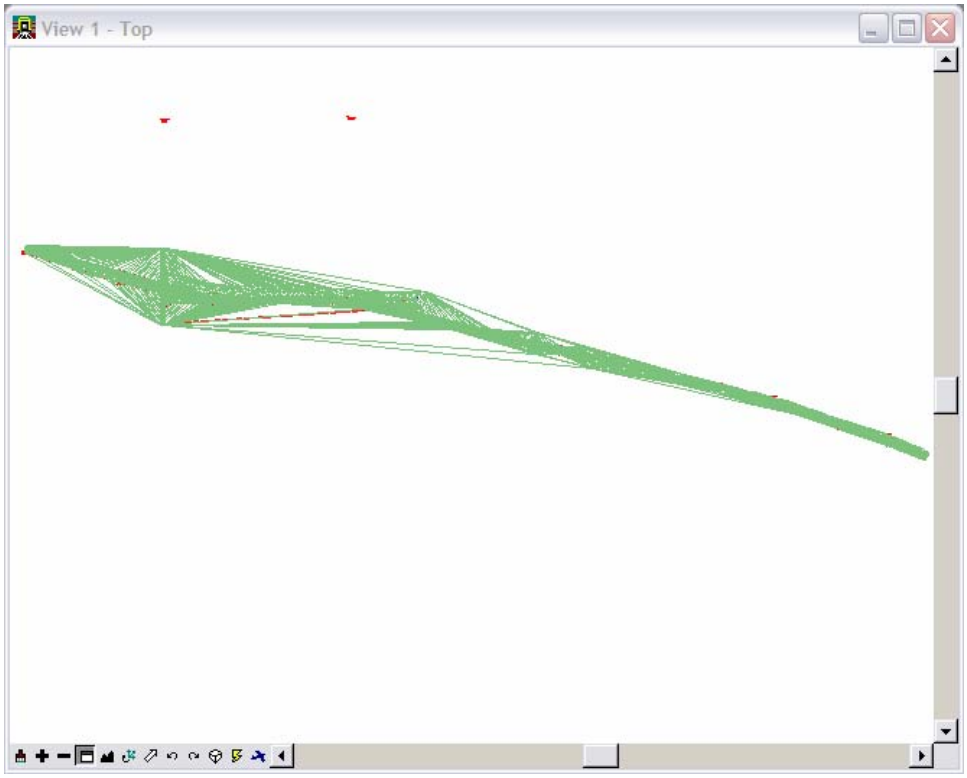
Note: The perimeter will be used as a reference line as triangles are deleted.

51. Verify **Write Lock**  is toggled **OFF**.

OFF

52. Redisplay the triangles **Surface > View Surface > Triangles.** The **View Triangles** dialog will appear.

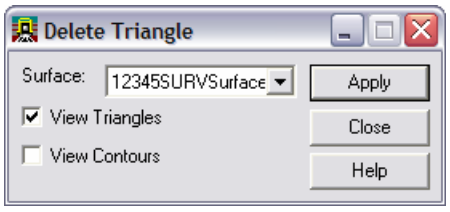
53. **<D>** the **Apply** button in the **View Triangles** dialog.



Note: Make a mental note of the display where triangles need to be removed.

54. Use the **MicroStation** view border button to **Refresh** the view. The temporary triangles will disappear.

55. From the InRoads pull down menu select, **Surface > Edit Surface > Delete Triangles**. The **Delete Triangle** dialog will appear.

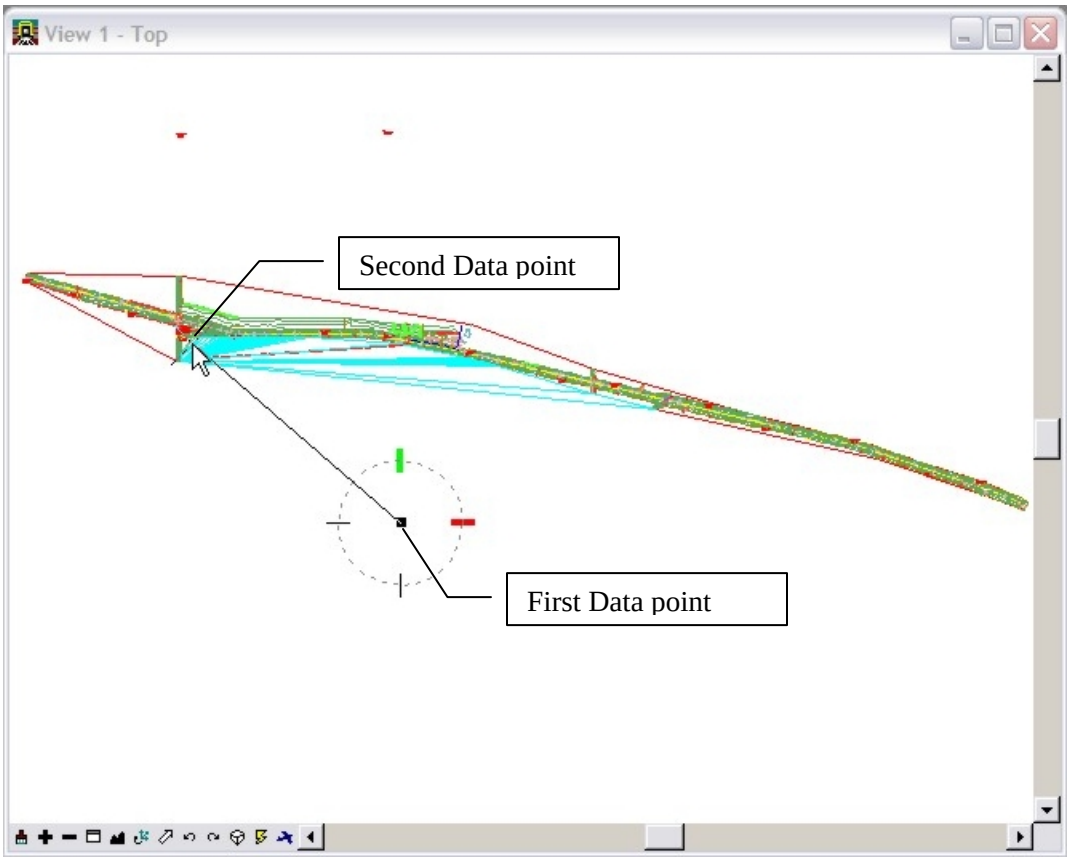


56. **Check** on View Triangles

57. **<D>** the **Apply** button. The **Delete Triangle** dialog will minimize allowing you to select a point in the view.

58. **<D>** a point in the MicroStation view off to the side of the surface limits.

- There is no need to hold down on the Left mouse button.



59. Move the cursor, a line will begin to generate
60. Sweep the cursor over the surface model to dynamically highlight surface triangles

    Note: The line highlights triangles as they are crossed. Highlighted triangles will be removed from the surface model once a data point <D> is given to establish the endpoint of the line (selection).

61. **<D>** a second point to define the line at the point shown above.
62. **<D>** a point in the view to accept and delete the triangles.
63. Continue drawing lines to remove undesirable triangles from other areas of the surface.
64. **<R>** when you have completed deleting triangles from this zoom ratio. The **Delete Triangle** dialog will reappear.

    Note: You can write triangles to the display as MicroStation graphics at any time. **Do not** re-triangulate the surface before defining an exterior boundary as deleted triangles will be re-established.

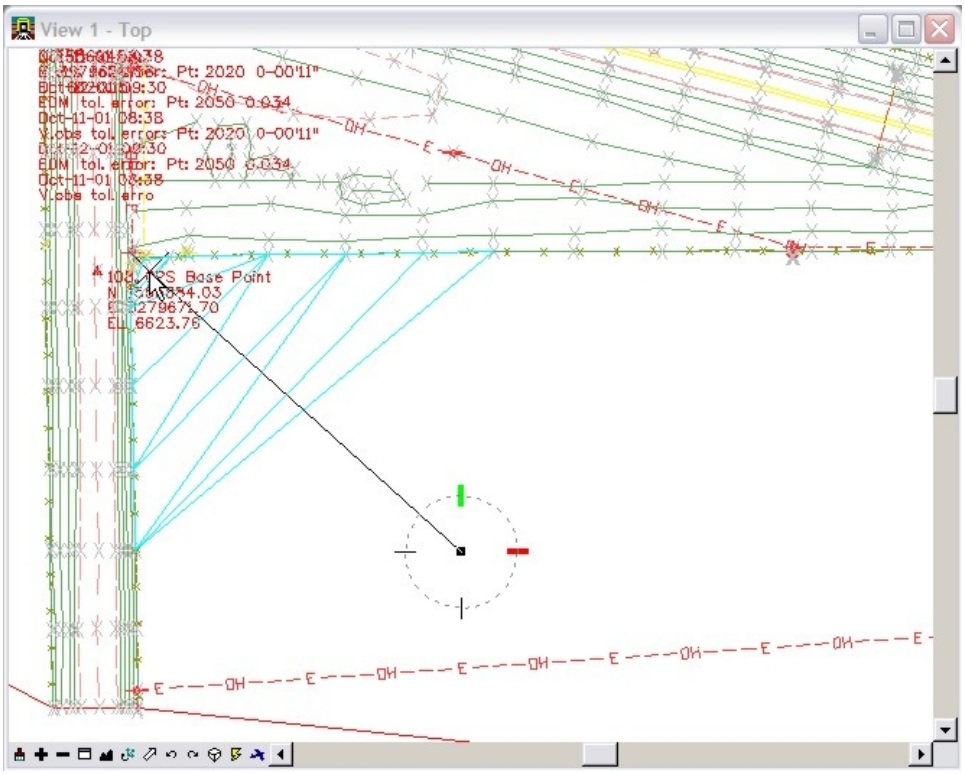
    Note: If the triangles are redisplayed, keep in mind, displayed triangles are a reflection of what InRoads has in memory at a specific point in time. If triangles are deleted (from memory) the

MicroStation graphics displayed will not reflect this change until the triangles written to graphics are redisplayed (refreshed).

65. Use **MicroStation** to view border button to **Window** into an area of the survey.

66. From the View Survey toolbar toggle display **ON** for **Symbols**

    - If your symbols are not displaying make sure the level is turned on.



Note: Triangles should only span between known (collected) points. The above graphic shows a group of triangles that should be eliminated.

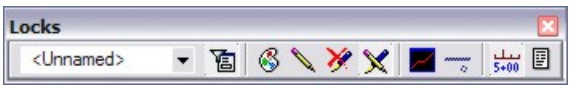
67. Continue to **Pan** along the file and **Deleting triangles**. Don't be concerned that the model may not be perfect for this training.

When you have finished:

68. **<D>** the **Close** button in the **Delete Triangle** dialog.

69. From the View Survey toolbar toggle display **OFF** for **Symbols**

70. Verify **Write Lock** is toggled **ON**.

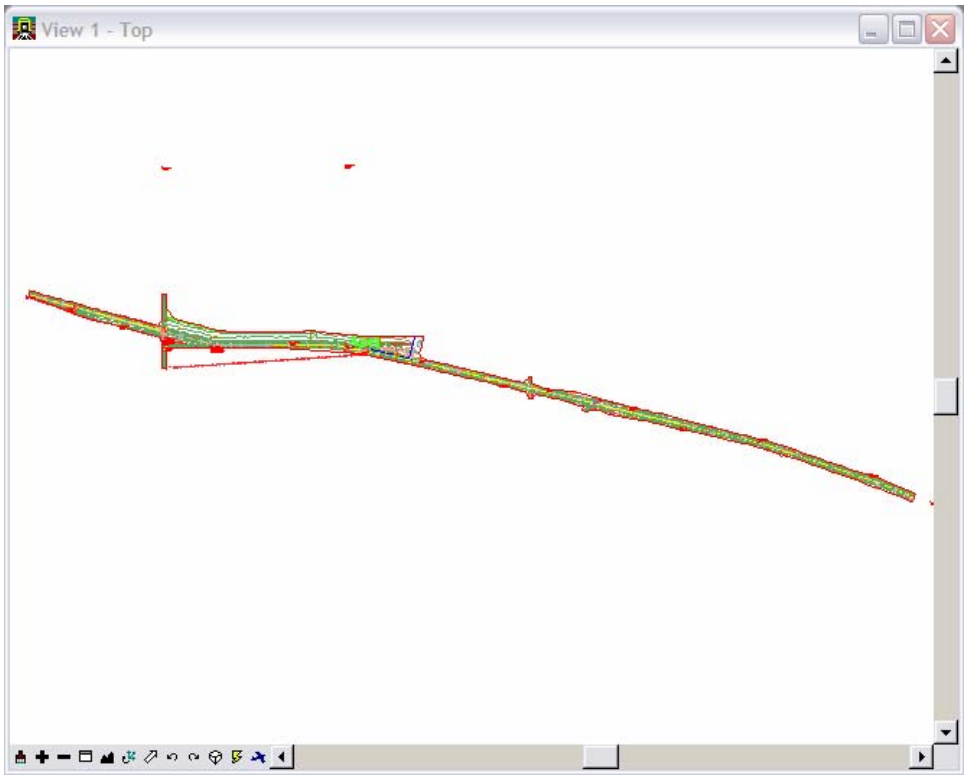


ON

71. Redisplay the perimeter **Surface > View Surface > Perimeter.** The **View Perimeter** dialog will appear.

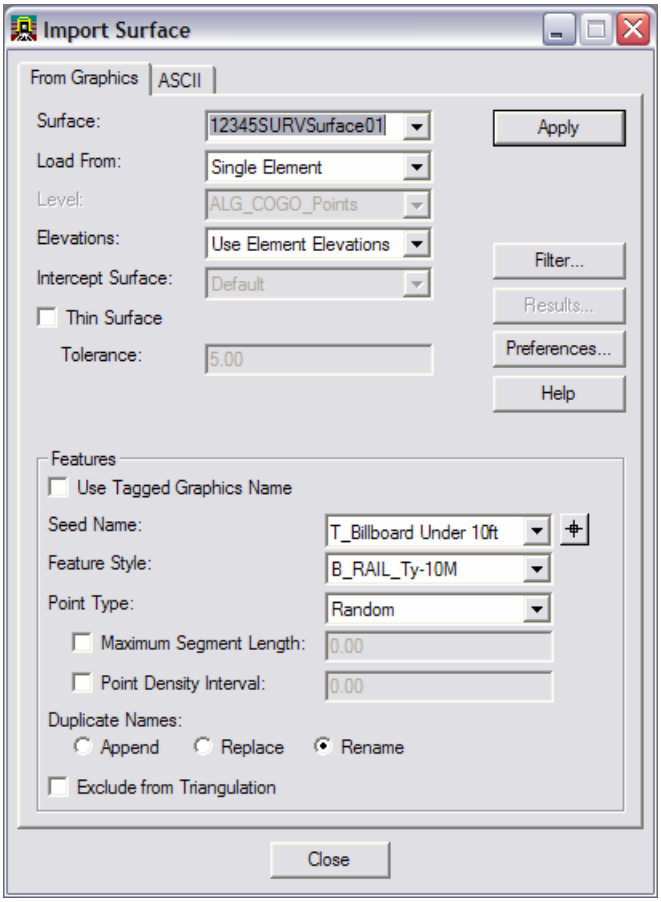
72. **<D>** the **Apply** button in the **View Perimeter** dialog.

73. Review your results.



Note: This closed shape represents the edge of the surface (triangles) spatially correct (location and elevation). Importing this shape into the DTM will act as an exterior boundary to constrain the triangulation process.

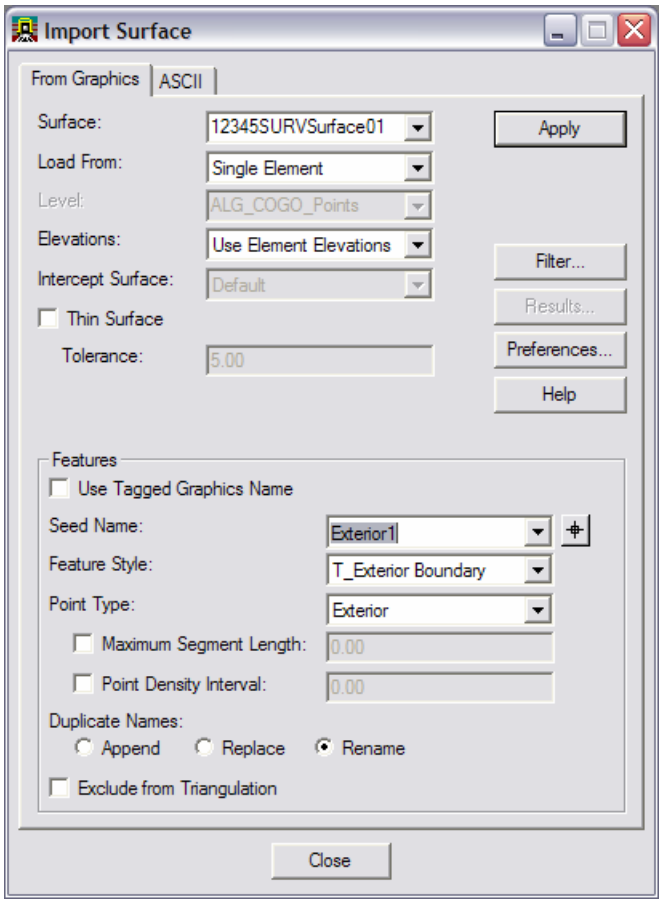
74. From the InRoads pull down menu select, **File > Import > Surface.** The **Import Surface** dialog will appear.



75. **<D>** the **[From Graphics]** tab.

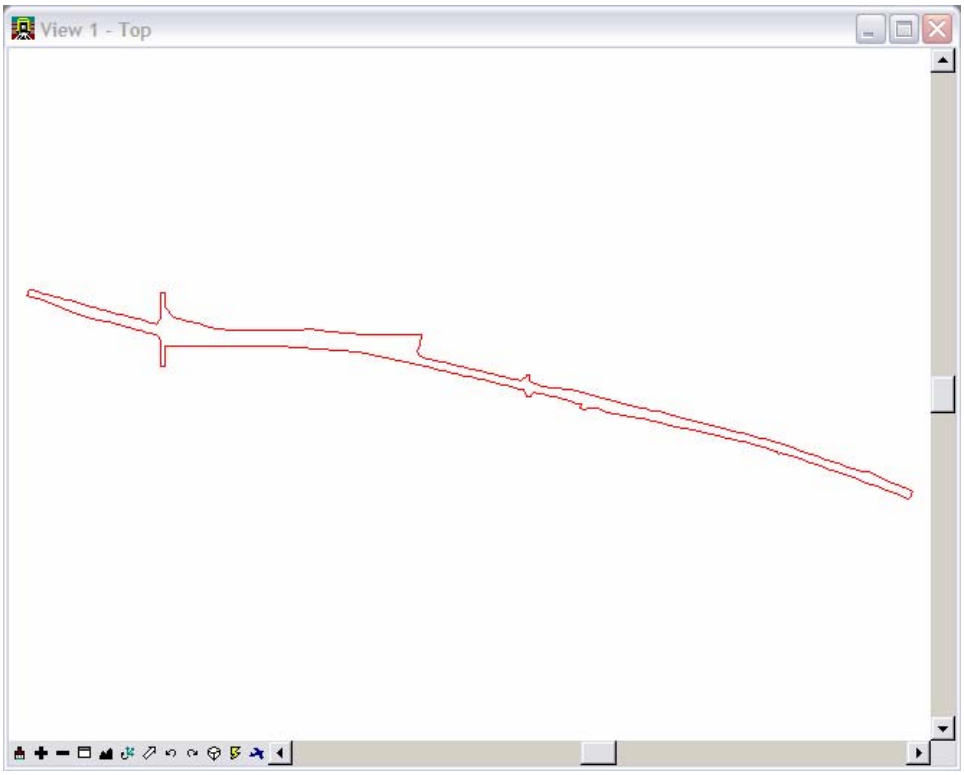
76. Set the following dialog items:

    - **Surface: 12345SURVSurface01**
    - **Load From: Single Element**
    - **Elevations: Use Element Elevations**
    - Key-in **Seed Name: *Exterior1***
    - **Feature Style: T_Exterior Boundary**
    - **Point Type: Exterior**



77. **<D>** the **Apply** button. The **Import Surface** dialog will minimize allowing you to select the perimeter element.

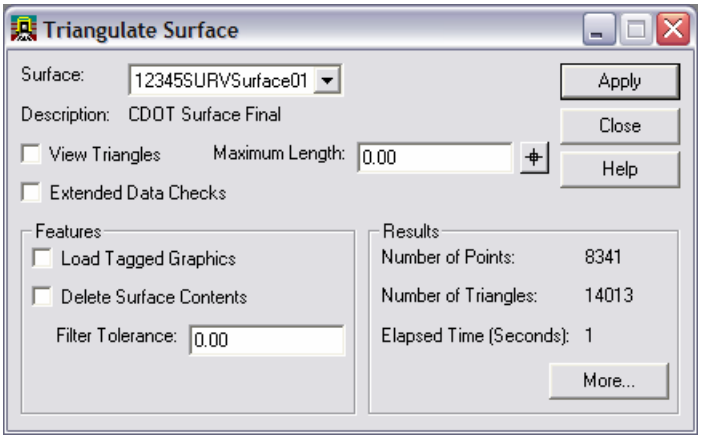
78. **<D>** on the surface Perimeter graphics displayed in MicroStation View 1.



79. **<D>** again to accept this element. The **Import** Surface dialog will reappear.

80. **<D>** the **Close** button in the **Import** Surface dialog.

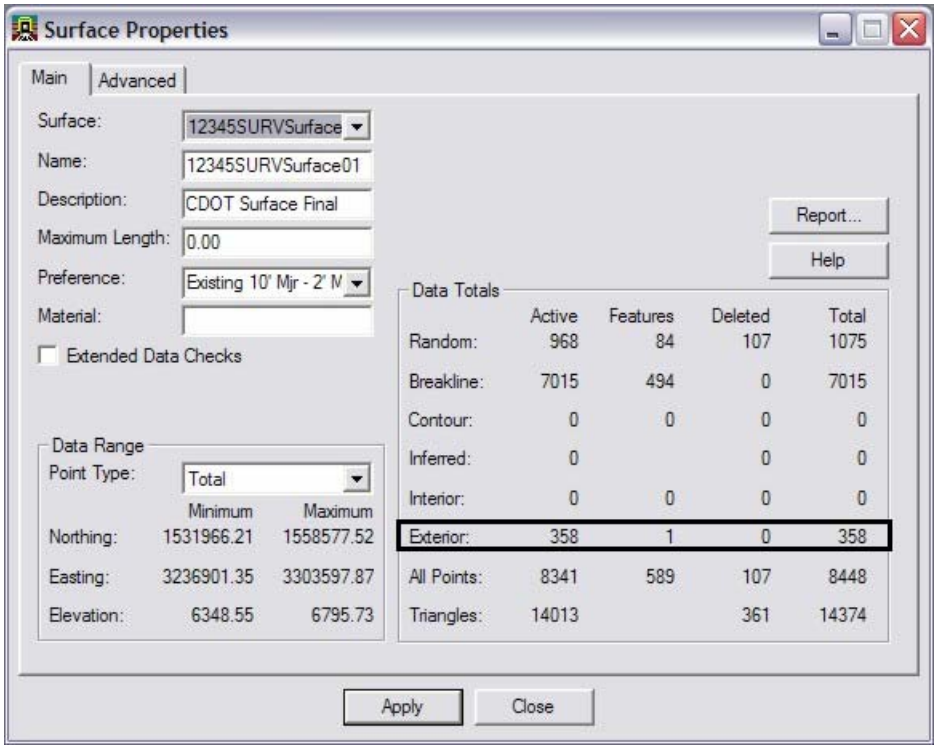
81. From the pull down menu select, **Surface > Triangulate Surface.** The **Triangulate Surface** dialog will appear.



82. **<D>** the **Apply** button in the **Triangulate** Surface dialog.

83. **<D>** the **More** button on the **Triangulate Surface** dialog. The **Surface Properties** dialog will appear.

84. Review your results.



Note: The surface now has Exterior point data, your numbers will not match exactly.

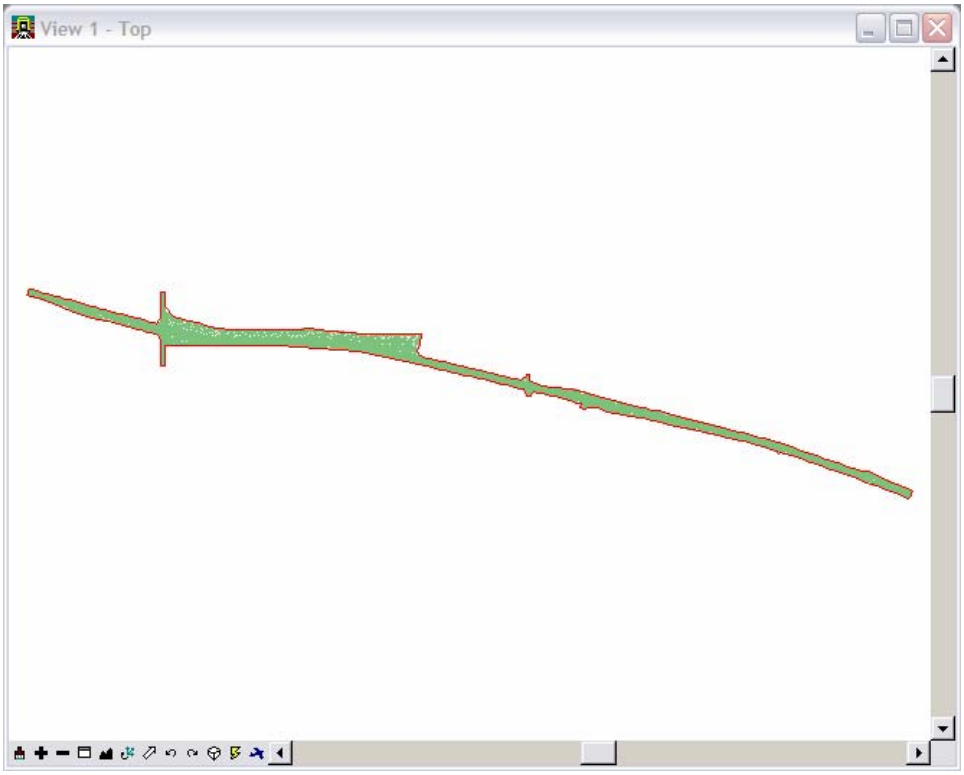
85. **<D>** the **Close** button in the **Surface Properties** dialog.

86. **<D>** the **Close** button in the **Triangulate** Surface dialog.

87. Redisplay the triangles **Surface > View Surface > Triangles.** The **View Triangles** dialog will appear.

88. **<D>** the **Apply** button in the **View Triangles** dialog.

89. Review your results.

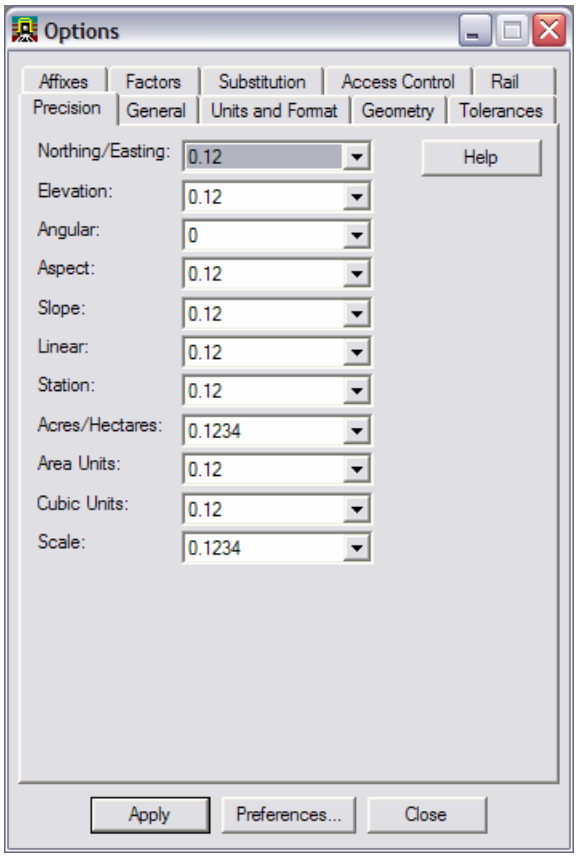


90. Save the Surface DTM file **<R>** right click on **12345SURVSurface01** select **Save** from the shortcut menu.

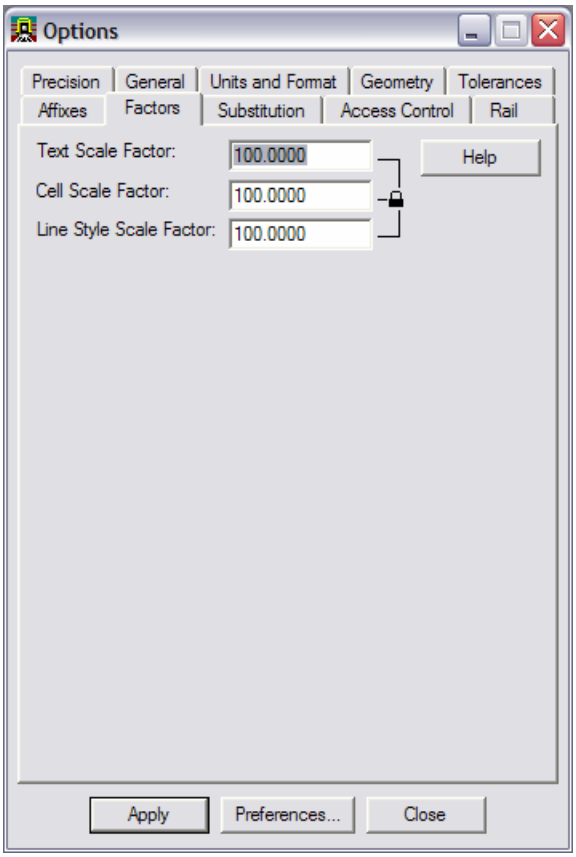
Contour Files

Contour information will be saved to separate files for ease of referencing and level control. Each scale and contour interval will have a unique name.

91. From the pull-down menu select, **Tools > Options**. The InRoads **Options** dialog will appear.



92. **<D>** the **Factors** tab.

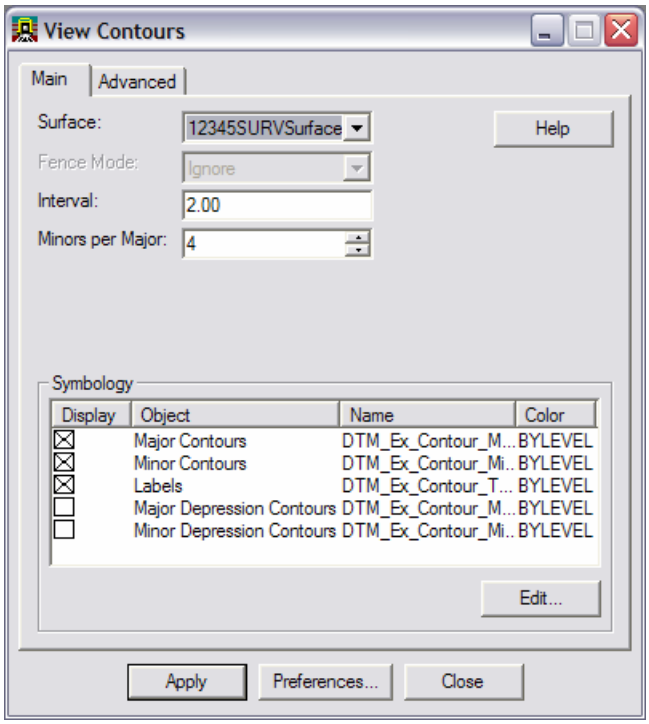


Note: The values shown here will be applied to all commands that display text, cells, or line styles.

93. Verify the **Text**, **Cell** and **Line Style** Scale Factors to ***100***

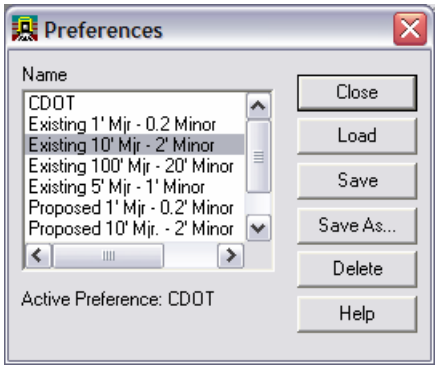
94. **<D>** the **Apply** then **Close** buttons.

95. From the pull-down menu select,
Surface > View Surface > Contours. The **View Contours** dialog will appear.



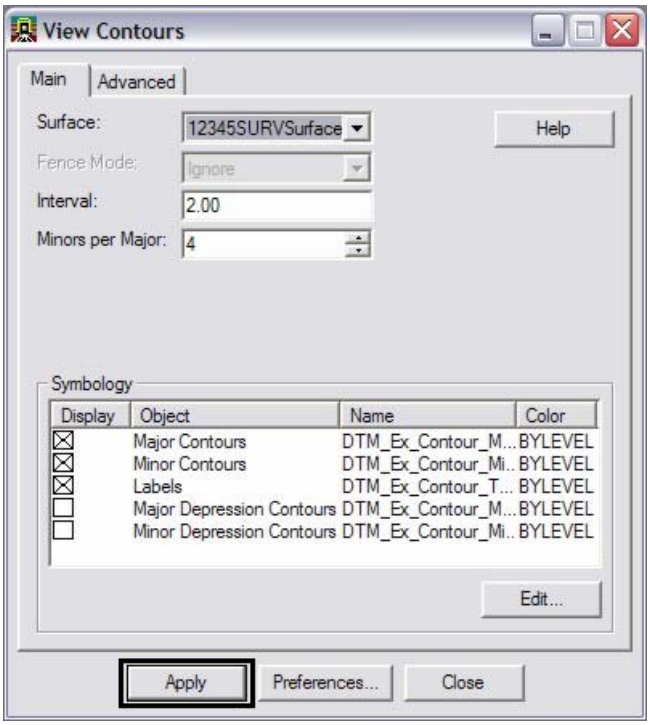
96. Verify the active Surface: ***12345SURVSurface01***

97. **<D>** the **Preferences** button.



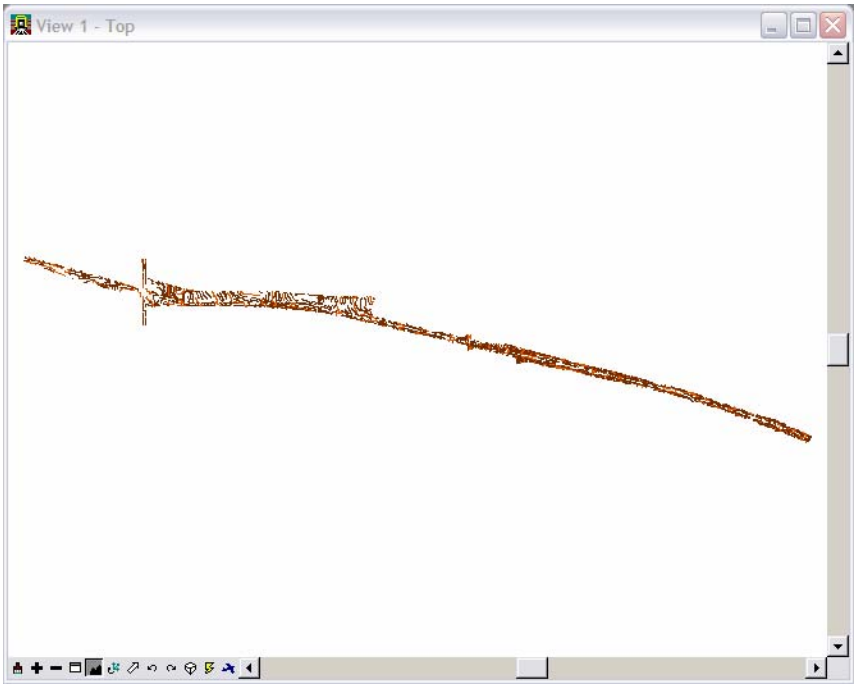
98. Select the preference ***Existing 10' Mjr – 2' Minor***

99. **<D>** the **Load** then **Close** buttons.



100. **<D>** the **Apply** button. The **View Contours** dialog will temporarily minimize as the surface is processed and the contours are generated the dialog will reappear when the contours have been generated.

101. Review your results.

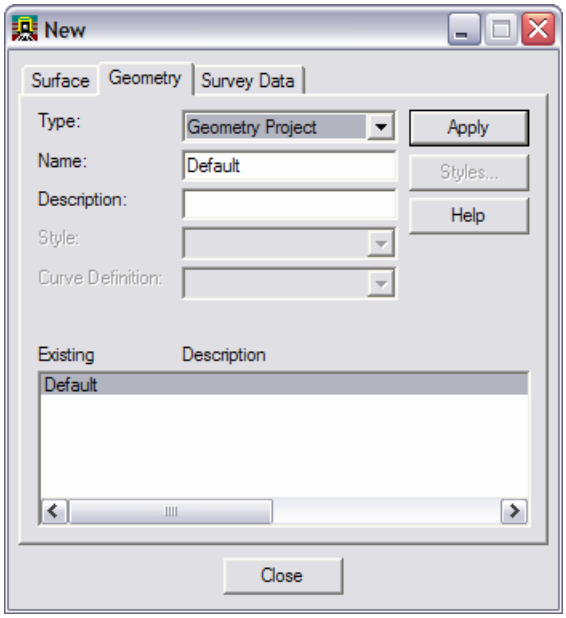


Lab 15 Exporting Survey Data to Geometry - FINAL

1. Verify the **12345SURVFieldbook01** fieldbook you want to export is active. You can tell which fieldbook is active by the red box around the fieldbook button.

2. From the pull-down menu, select **File > New**. The **New** dialog will appear.

3. Select the **Geometry** tab.



4. From the type pick list verify the **Type: Geometry Project**

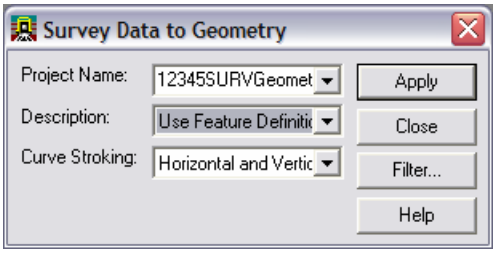
5. Key in the geometry Name: ***12345SURVGeometry01***

6. Key in the Description: ***CDOT Geometry Final***

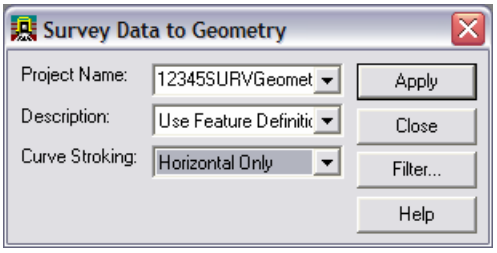
   Note: Key in any additional file information in the **Description** field of the dialog, such as **Date**, **User**, and **Design file** name. You have up to 34 characters even though you may not see all the characters in the Description field.

7. **<D>** the **Apply** and **Close** buttons.

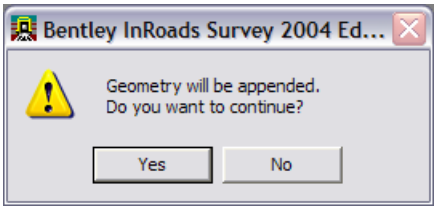
8. From the pull-down menu, select **Survey > Survey Data to Geometry**. The **Survey Data to Geometry** dialog will appear.



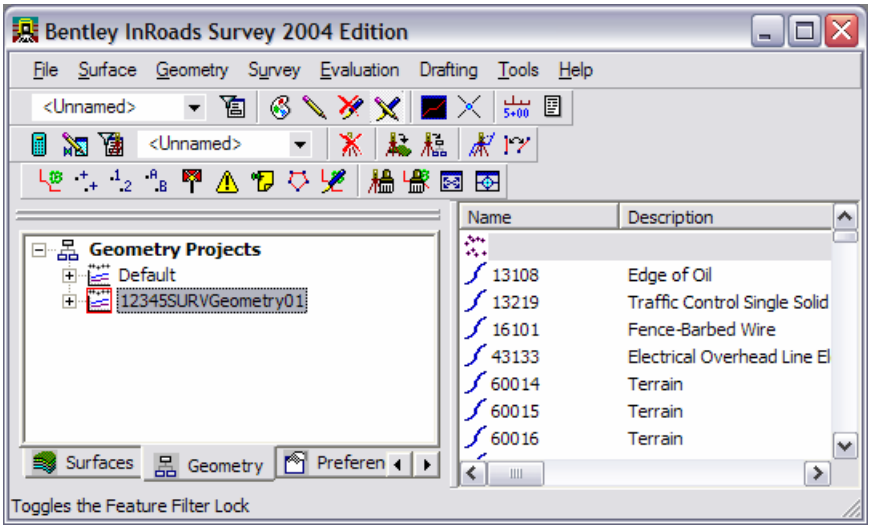
9. In the Project Name: select from the list ***12345SURVGeometry01***
10. Set the Description to **Use Feature Definition**
11. Set the Curve Stroking to **Horizontal Only**



12. **<D>** the **Apply** button.
13. An alert dialog will appear informing you will be appending a Geometry.



14. **<D>** the **Yes** button.
15. **<D>** the **Close** button in the **Survey Data to Geometry** dialog.
16. Use the **Workspace** pane scroll **arrows** to view the **Geometry** tab.

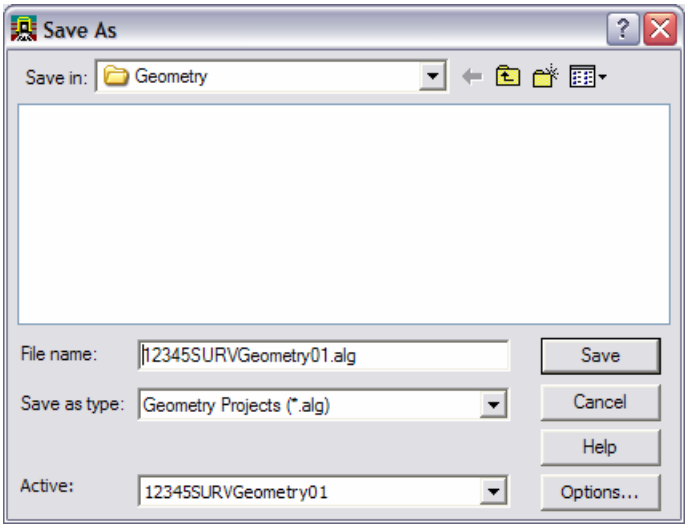


17. Verify ***12345SURVGeometry01*** is the active Geometry Project.

    Note: You can change the active Geometry from the pull-down menu **Geometry > Active Geometry** then highlighting the desired geometry project name and **<D>** the **Apply** button.

18. From the pull-down **File > Save > Geometry Project**. The **Save As** dialog will appear with the Save as type set to **Geometry (*.alg)**.

19. Verify you are in the correct project directory. C:\Projects\12345\ROW_Survey\InRoads**Geometry**



20. The file name should match the **Active** name at the bottom of the **Save As** dialog. If necessary, use the drop-down arrow in the **Active** field and reselect the desired name to ensure the saved file name will match the surface name.

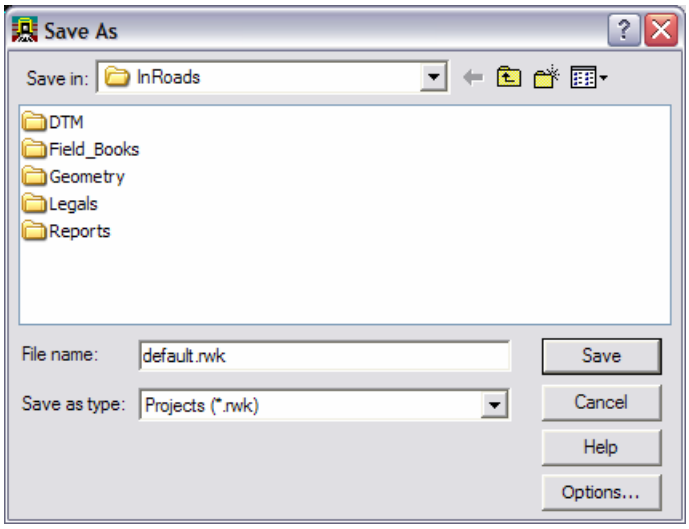
    Note: Ensuring that the saved Geometry name in the project folder matches the Geometry name displayed in InRoads explorer will minimize any confusion.

21. **<D>** the **Save** and then the **Cancel** button. The file will be saved to disk and the **Save As** dialog will close.

Lab 16 Saving an InRoads Project file RWK

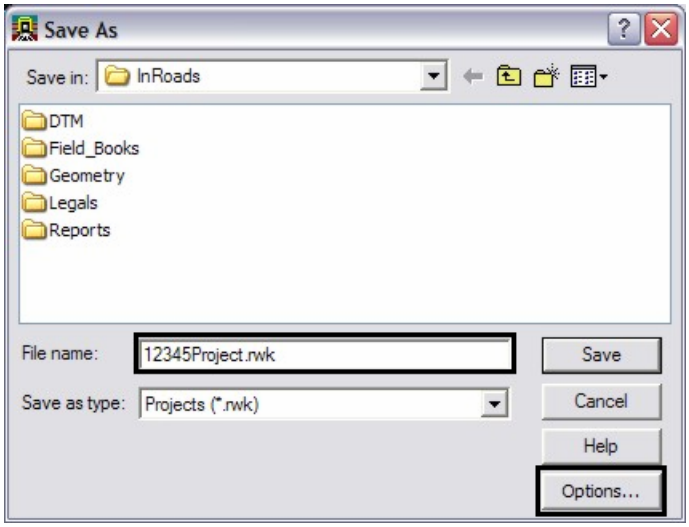
Project file stores the location of multiple InRoads files. RWK files allow the user to open just one RWK which could load a survey, surface, and geometry project. The RWK can be opened and edited in Notepad incase there are changes in the directory structure.

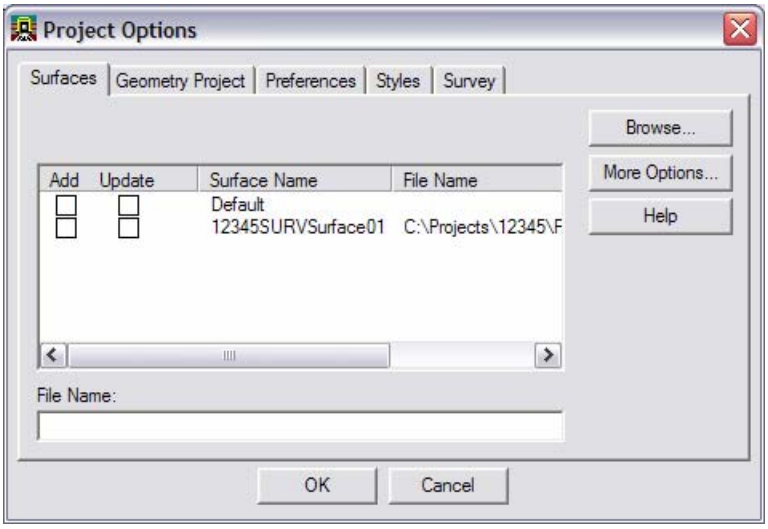
1. From the pull-down menu, select **File > Save > Project**. The **Save As** dialog will appear.



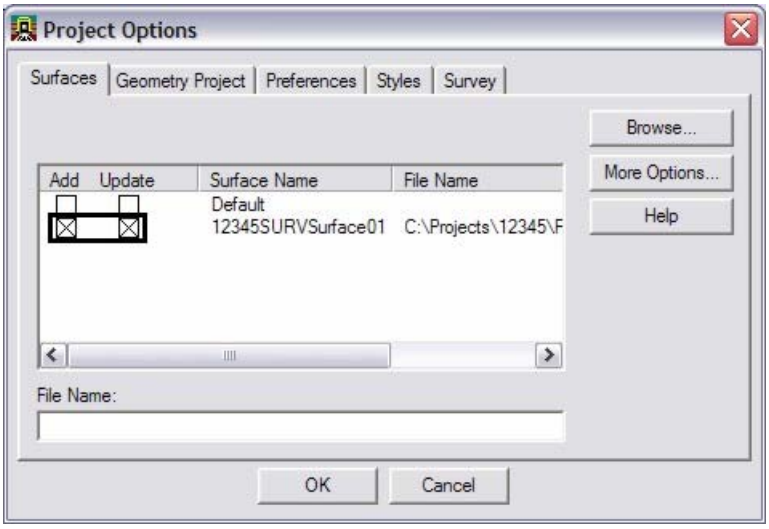
2. Key-in the File name: ***12345Project.rwk***

3. **<D>** the **Options...** button. The **Project Options** dialog will appear.

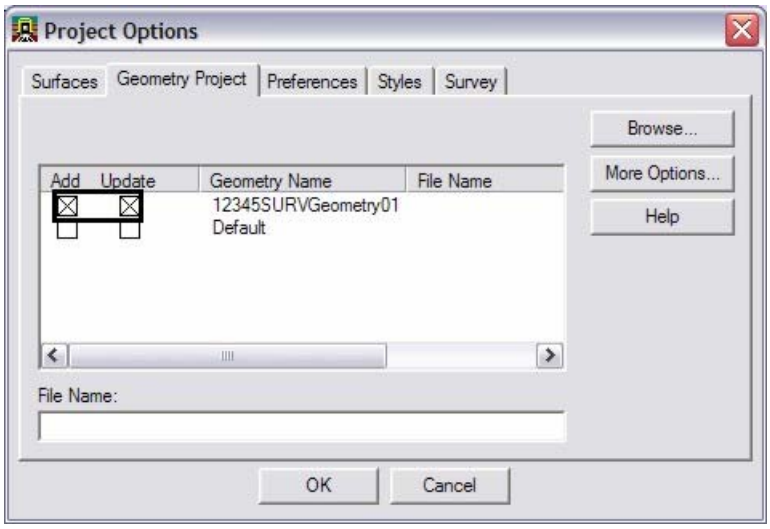




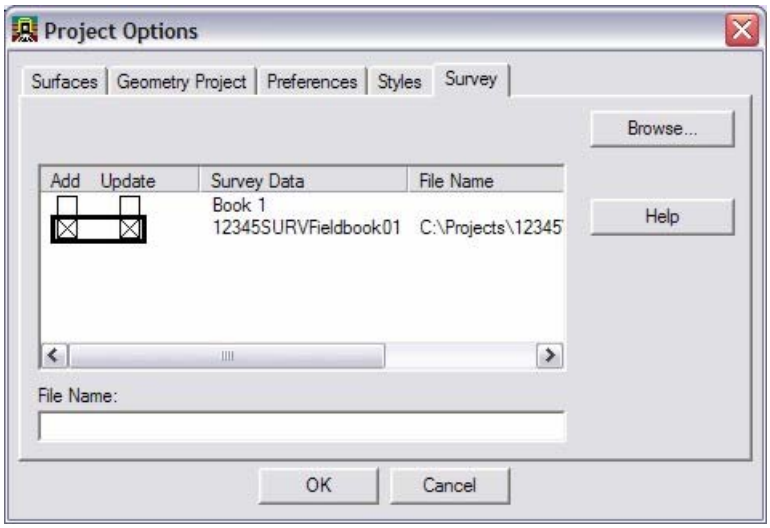
4. From the **Surfaces** tab check the **Add** and **Update** boxes for Surface Name **12345SURVSurface01**.



5. From the **Geometry Project** tab check the **Add** and **Update** boxes for Geometry Name **12345SURVGeometry01**.

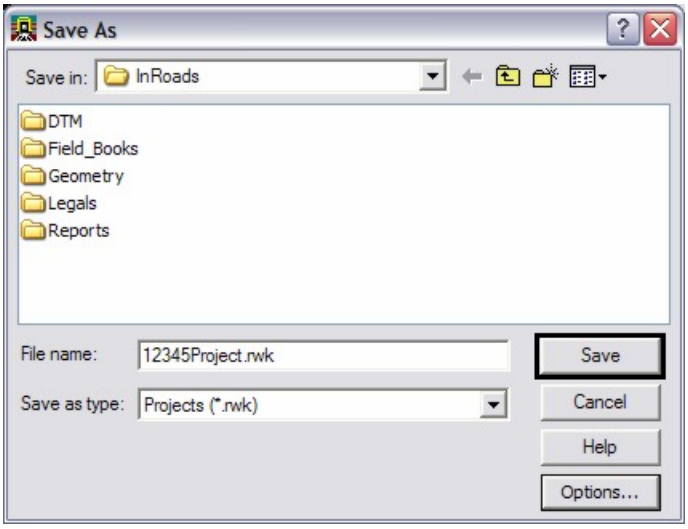


6. From the **Survey** tab check only the **Add** box for Survey Name **12345SURVFieldbook01**.



Note: By only selecting the Add check box for the Survey tab the file will act as read only when opened and saved with the RWK file in the future.

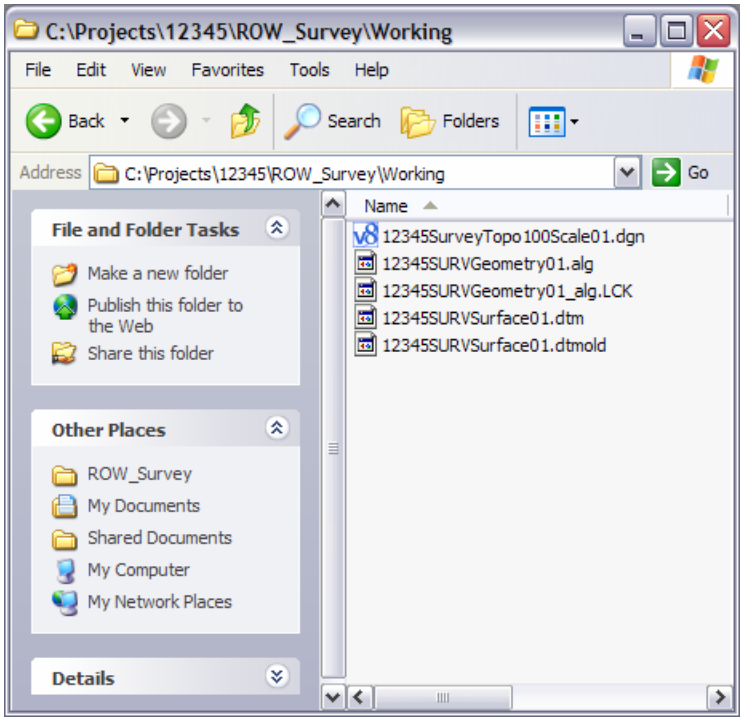
7. **<D>** the **OK** button. The **Project Options** dialog will close.



8. **<D>** the **Save** then **Cancel** buttons. The **Save As** dialog will close.

Lab 17 Directory Clean up

1. Open Windows Explorer **Windows + E**
2. Navigate to the folder C:\Projects\12345\ROW_Survey**Working**
3. Delete any old or duplicated files for the Working directory.

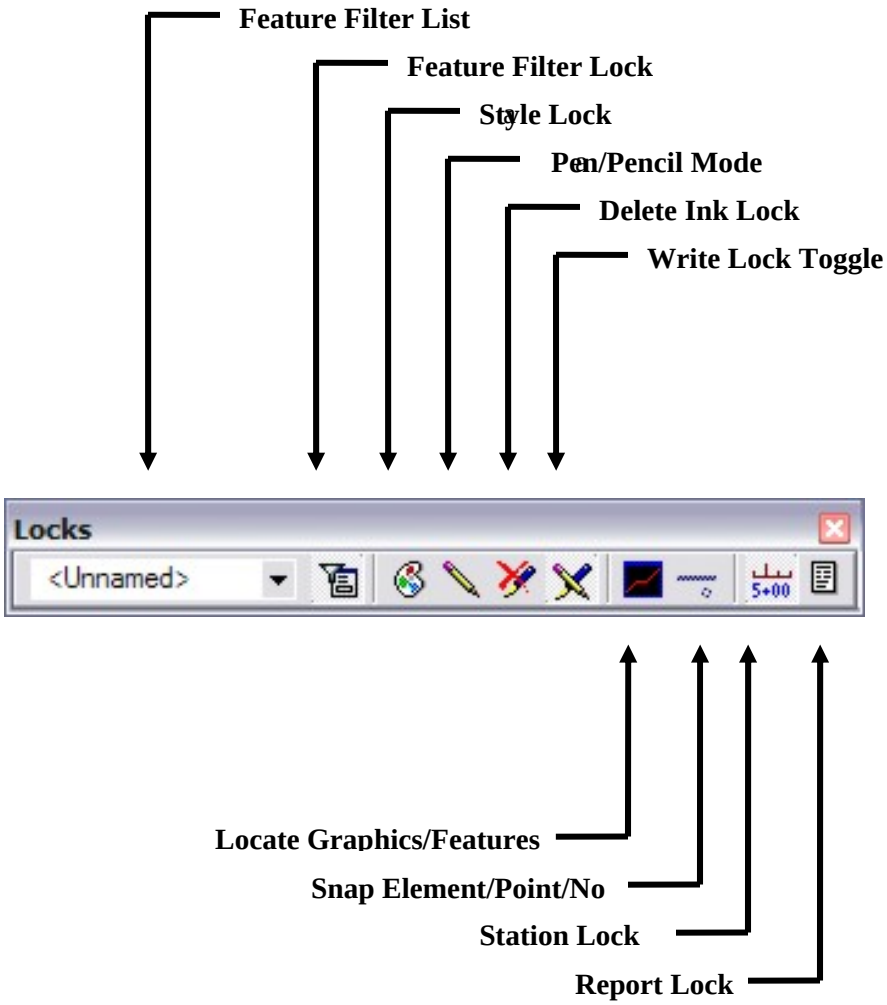


Additional Exercises

Surfaces

Locks

Locks Toolbar



1. Open a new working MicroStation model file.

2. Open an InRoads Surface.

3. Verify **Write Lock**  is toggled **ON**. The Write Lock is on if the two mode buttons to the left of the Write Lock button are colorized. **Write** lock **ON** – ***Display and Write mode*** – graphics show on screen ***and*** are written to the CAD file.

ON

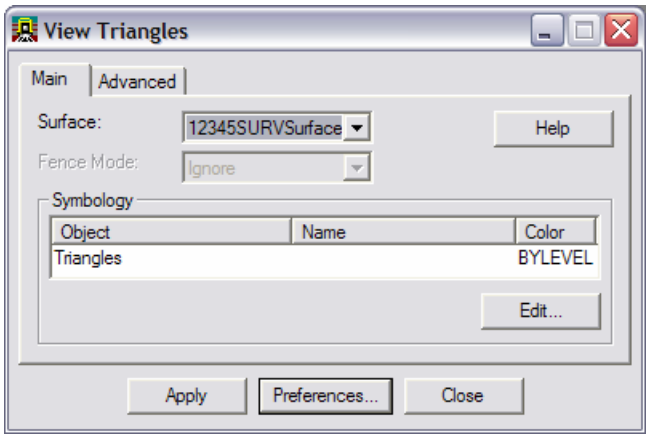
   - **Write** lock **OFF** – ***Display Only mode*** – Note the two mode buttons to the left of the Write Lock button are dithered. Graphics show on screen but are not written to the CAD file. With Write lock off, graphics are written to the CAD display only. Any commands that require the view to refresh will eliminate the graphics.

OFF

4. Verify both the **Feature Filter Lock**  and **Style Lock**  are toggled **OFF**. The Locks are toggled OFF when the button appears darker.

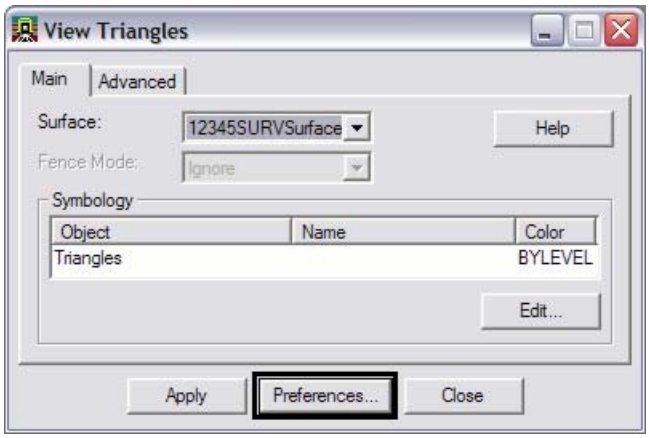
OFF

5. From the InRoads pull down menu select, **Surface > View Surface > Triangles.** The **View Triangles** dialog will appear.

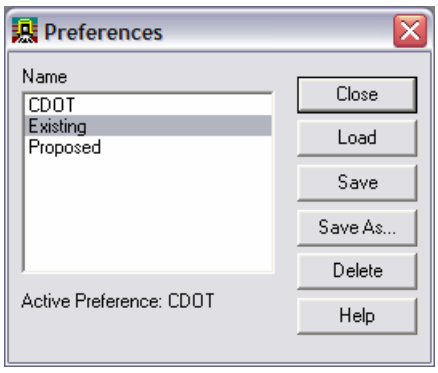


6. **<D>** the **Apply** button. The **View Triangles** dialog will minimize as the triangles are generated. The dialog will reappear when it is finished.

   Note: The triangles displayed are not using the correct element attributes for color and level. Using the Pencil mode will erase the current displayed triangles and redisplay the correct element attributes for existing triangles.

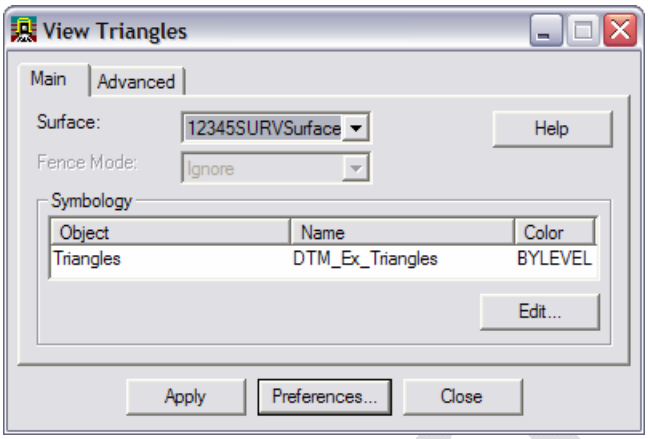


7. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



8. Select the ***Existing*** preference.

9. **<D>** the **Load** then **Close** buttons.



10. **<D>** the **Apply** button.

Note: Notice how the old triangles are "erased" and the new triangles are redrawn using the loaded existing preference.

Advanced Locks

These are only generalized steps to guide you. Ask your instructor if you have any questions.

11. Using MicroStation **Delete**. Delete all triangles from the DGN file.
12. Toggle the Write lock from **Pencil**  mode to **Pen**  mode.

13. Display the triangles using **Preference Existing**.
14. Redisplay the triangles using **Preference Proposed**.

    Note: You should end up with two sets of triangles. Pen mode can be used for other display operations such as perimeter and contours.

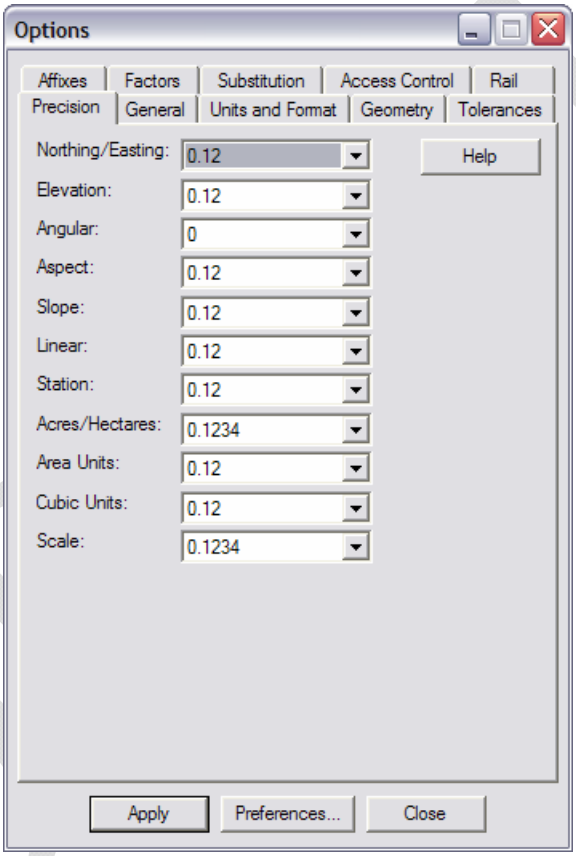
When you have finished:

15. Using MicroStation **Delete** button. Delete all triangles from the DGN file.
16. From the MicroStation pull down menu select,
    File > Compress > Design
17. Verify your Locks toolbar is set back to **Pencil**  mode.

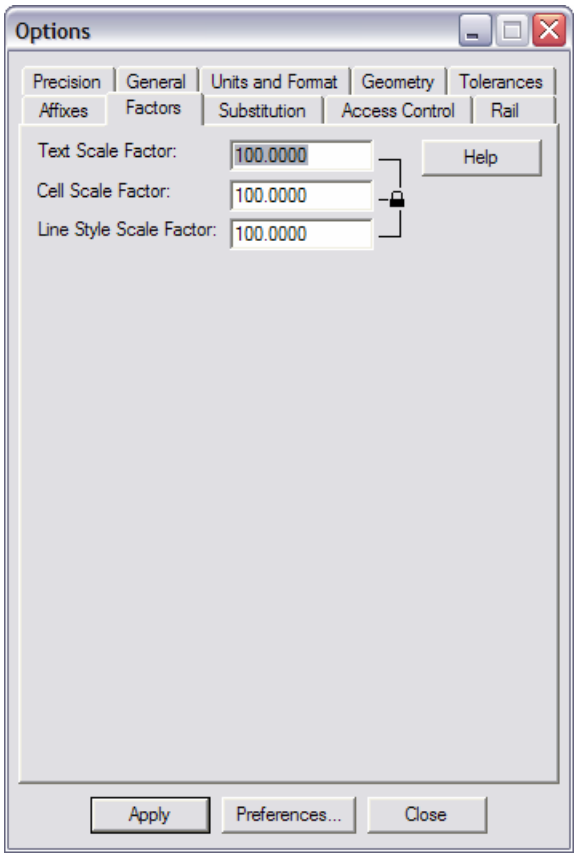
Global Scale Factor

InRoads annotation (text, cells, and linestyles) is controlled with configurable scale settings. In the case of contour labeling, text size is driven by 2 factors. The text size specified in the **View Contours** dialog box and the active settings (multiplier) defined through the use of a Global Scale Factor.

1. Open a new working MicroStation model file.
2. Open an InRoads Surface.
3. From the pull-down menu select, **Tools > Options**. The InRoads **Options** dialog will appear.

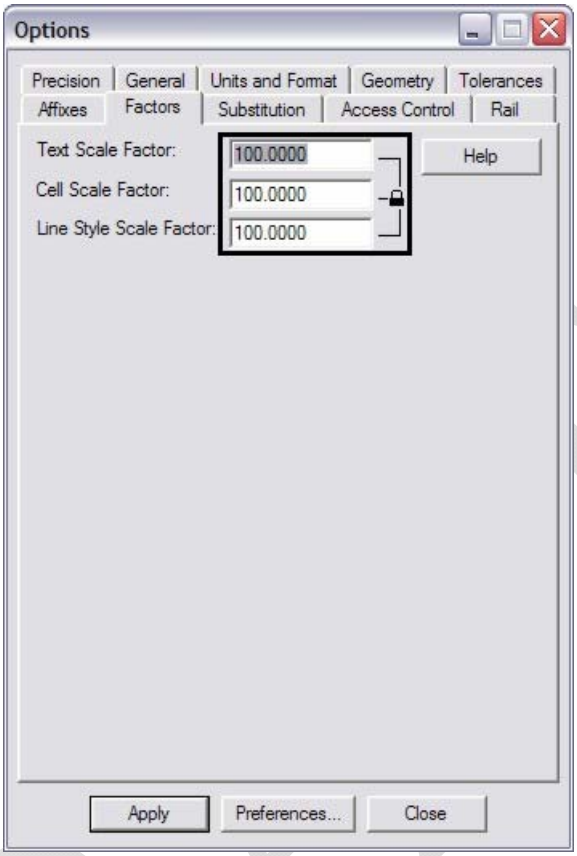


4. **<D>** the **Factors** tab.



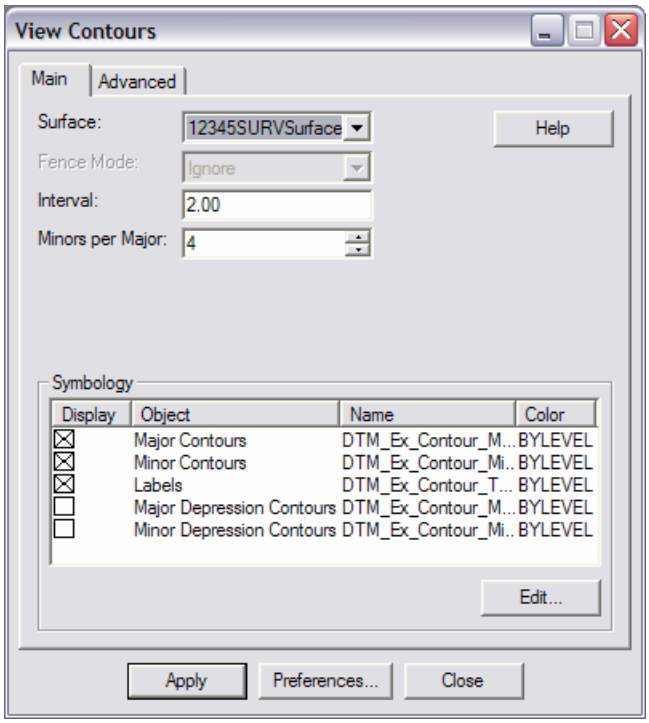
Note: The values shown here will be applied to all commands that display text, cells, or line styles.

5. Set the **Text**, **Cell** and **Line Style** Scale Factors to ***100***



6. **<D>** the **Apply** then **Close** buttons.

7. From the pull-down menu select, **Surface > View Surface > Contours**. The **View Contours** dialog will appear.

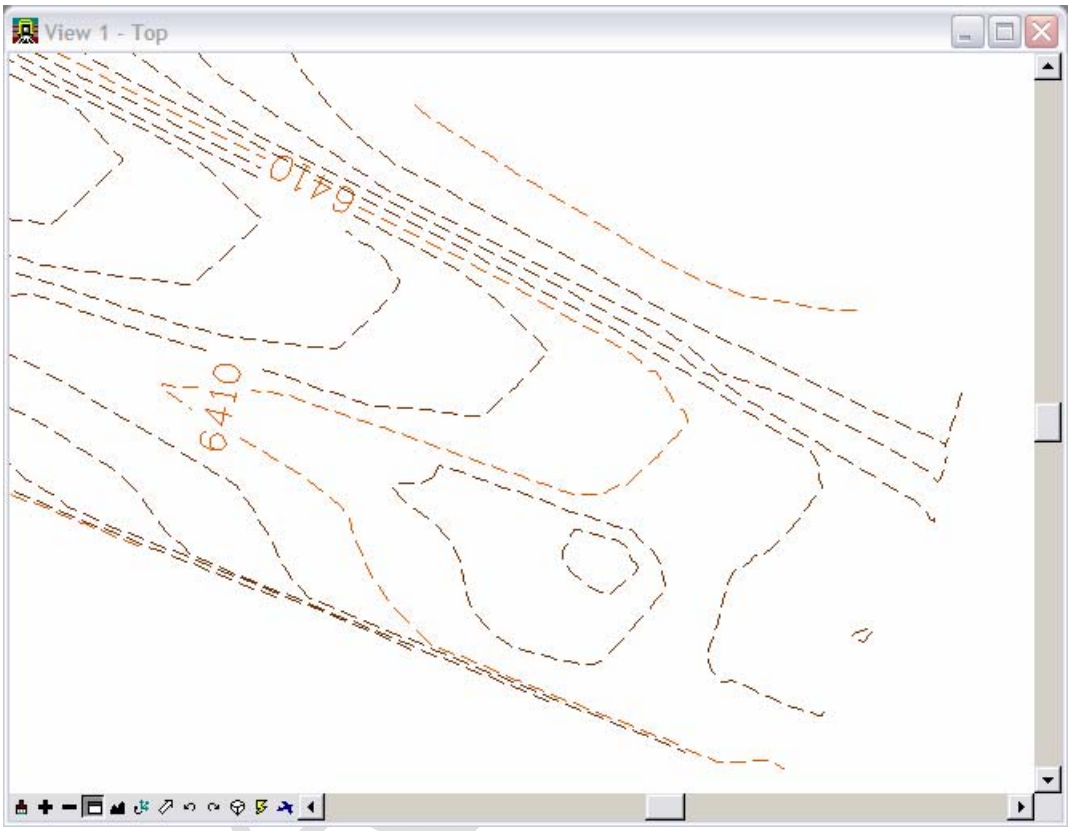


8. Verify the active Surface: ***12345SURVSurface01***

9. Load the ***CDOT*** Preference

10. **<D>** the **Apply** button. The **View Contours** dialog will temporarily minimize as the surface is processed and the contours are generated the dialog will reappear when the contours have been generated.

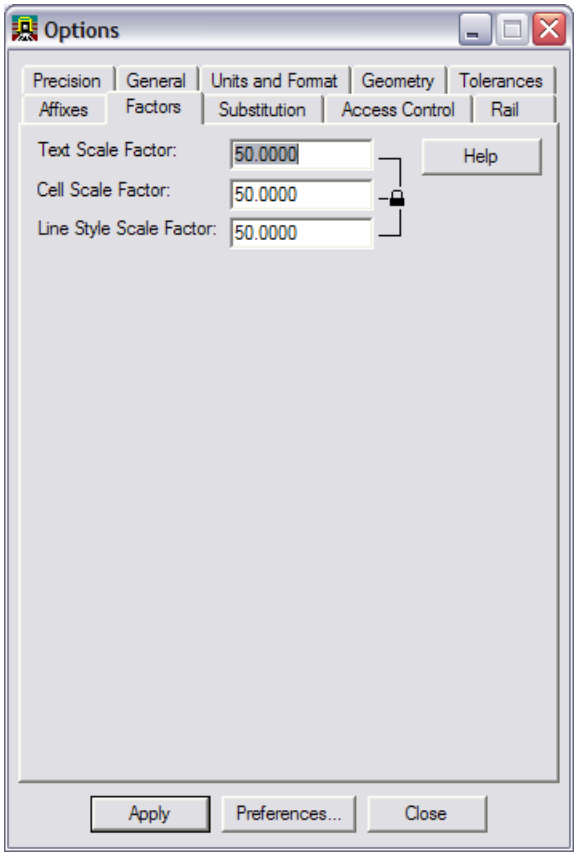
11. Review your results.



12. From the pull-down menu select, **Tools > Options**. The InRoads **Options** dialog will appear.

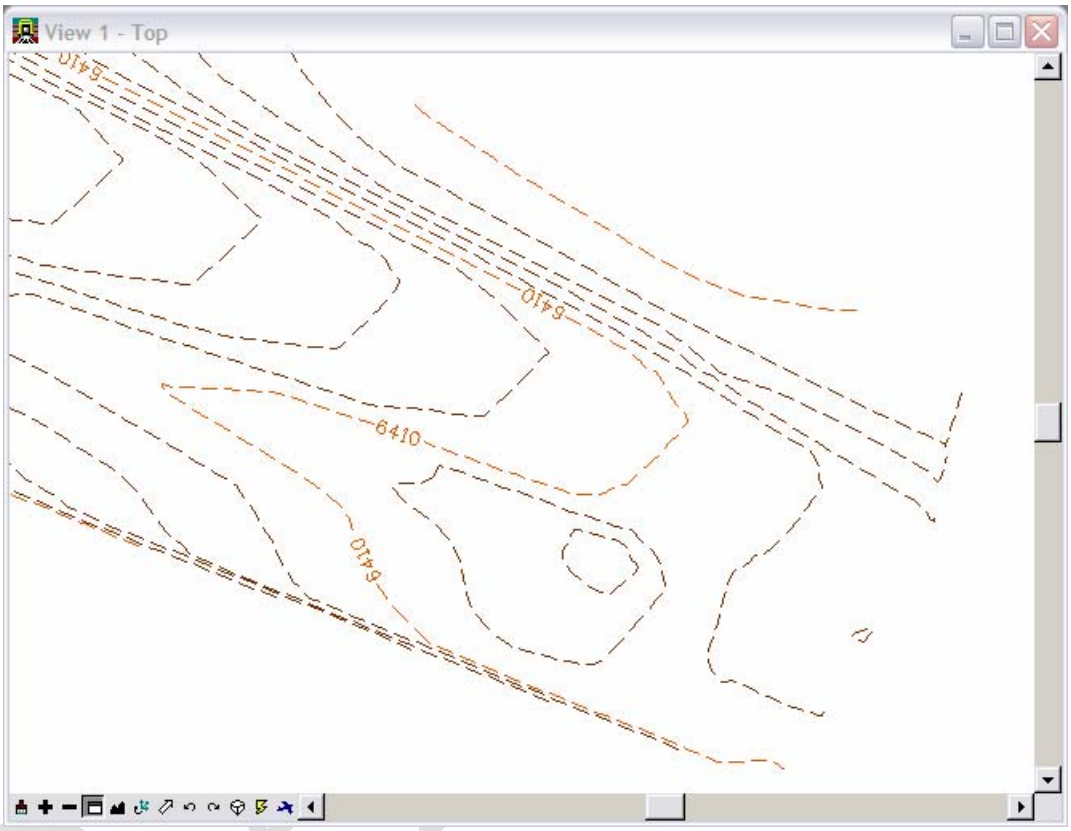
13. **<D>** the **Factors** tab.

14. Set the **Text**, **Cell** and **Line Style** Scale Factors to ***50***



15. **<D>** the **Apply** then **Close** buttons.

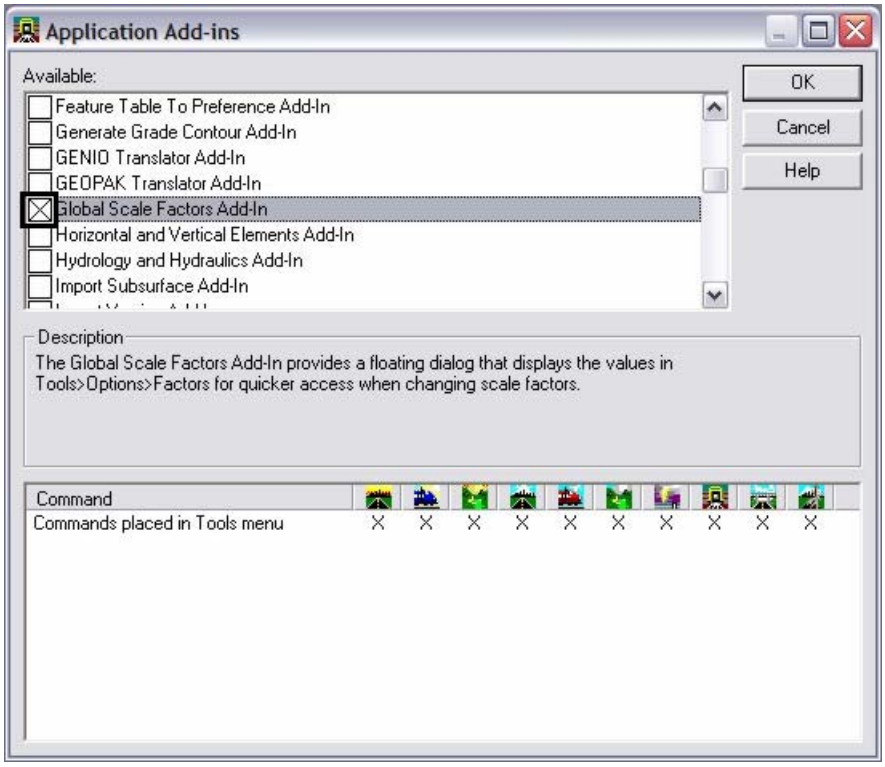
16. **<D>** the **Apply** button in the **View Contours** dialog. Notice the change in the annotation size.



Note: The **Global Scale Factor** dialog is frequently used. It can be added to the interface for easy access.

17. From the pull down menu select, **Tools > Application Add-Ins**, the **Applications Add-ins** dialog will appear.

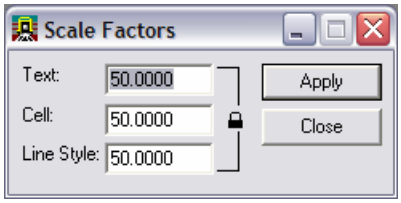
18. **Check** on Global Scale Factor Add-In.



Note: The Description section of the dialog will give details where to find the added command in the pull down menus.

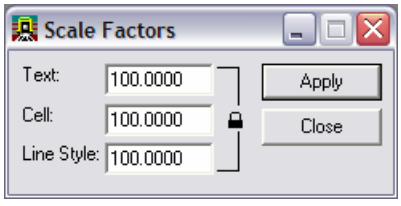
19. **<D>** the **OK** button. The **Application Add-ins** dialog will close.

20. From the pull down menu select, **Tools > Global Scale Factors...** The **Global Scale Factors** dialog will appear.



Note: The **Scale Factors** dialog can remain open saving space and time.

21. Key-in the ***Text***, ***Cell***, and ***Line Style*** **Scale Factors** dialog to ***100***

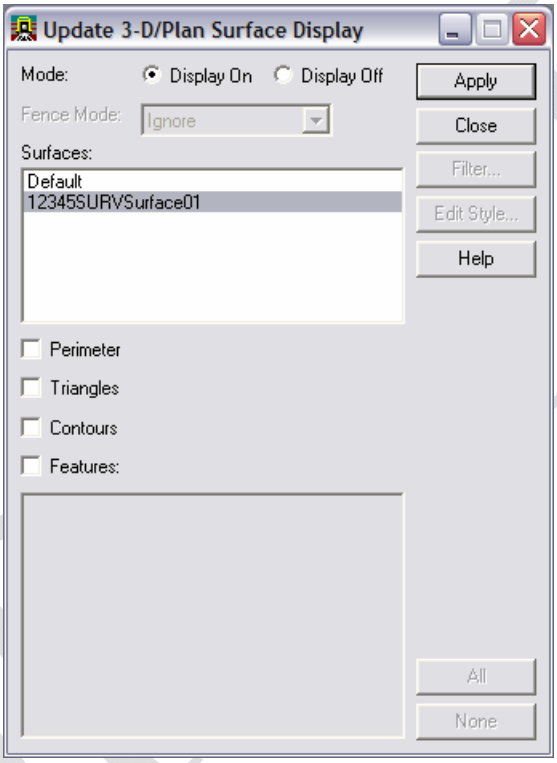


22. **<D>** the **Apply** button.

View Surface Display Constrained

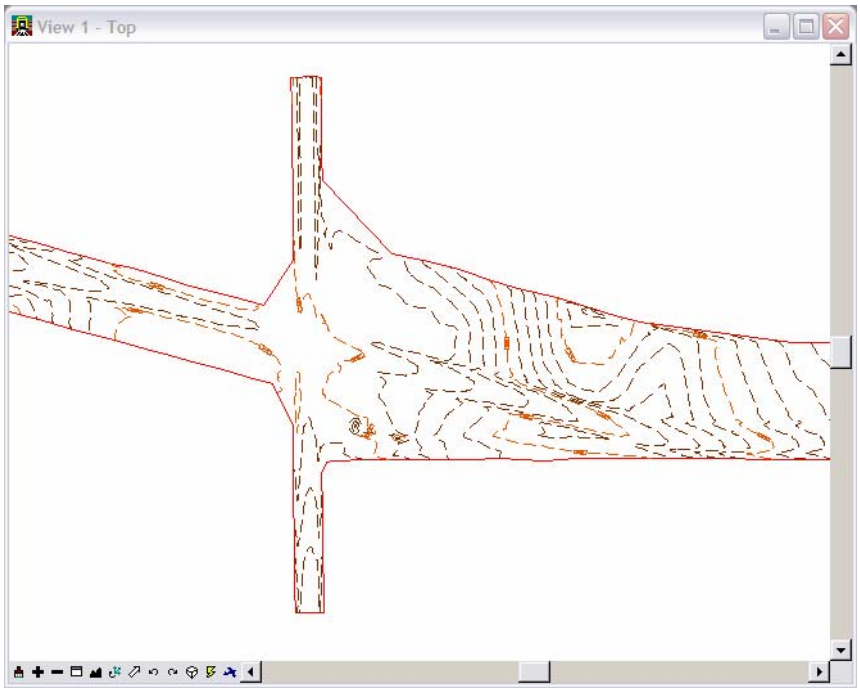
Most surface display commands have the option to display within the limits of a fence place in a MicroStation model.

1. Open a new working MicroStation model file.
2. Open an InRoads Surface.
3. From the InRoads pull down menu select, **Surface > Update 3-D/Plan Surface Display**. The **Update 3-D/Plan Surface Display** dialog will appear.

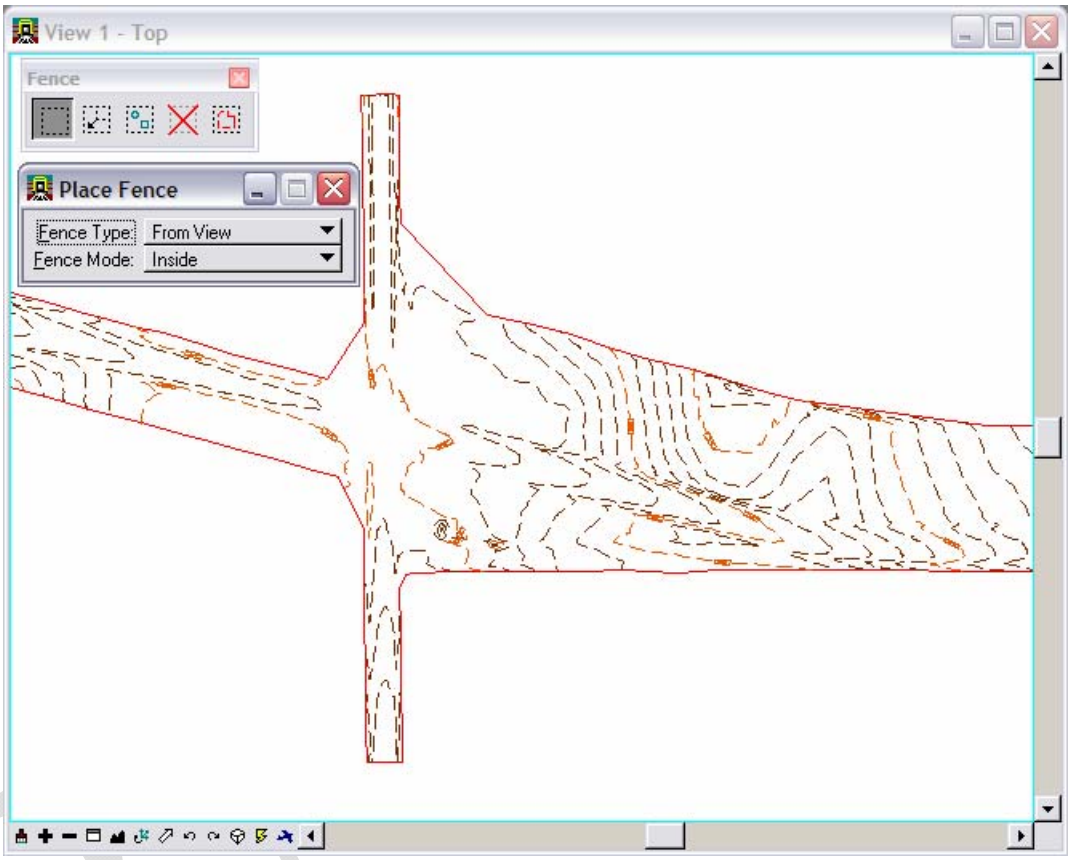


4. Select the **Mode: Display On** radio button.
5. Verify **12345SURVSurface01** is the active surface.
6. **Check** Perimeter box
7. **Check** Contours box.
8. **<D>** the **Apply** buttons. The Contours and Perimeter graphics will be displayed to the design file.

9. Using MicroStation view commands window into a portion of the surface.

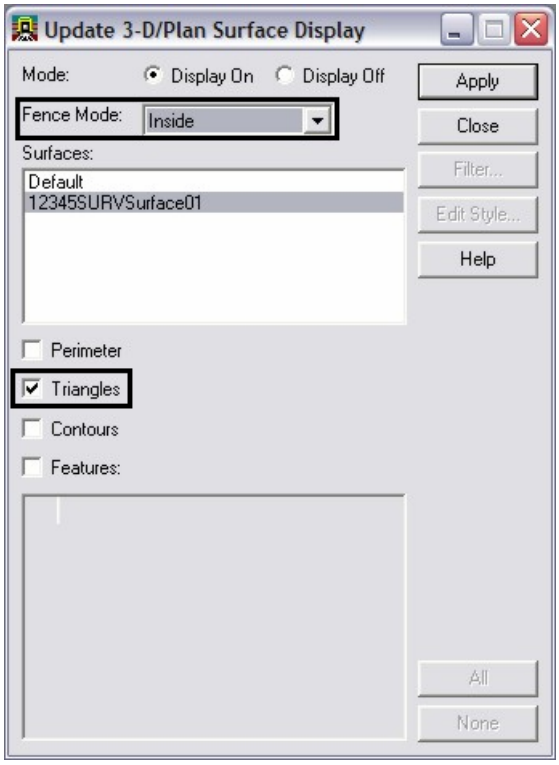


10. From the MicroStation Main toolbar **<D>** the **Place Fence** button.
11. From the Tool Settings dialog select **Fence Type:** ***From View***



12. **<D>** a point in **View 1**. The Fence will appear around the edge of the view border.

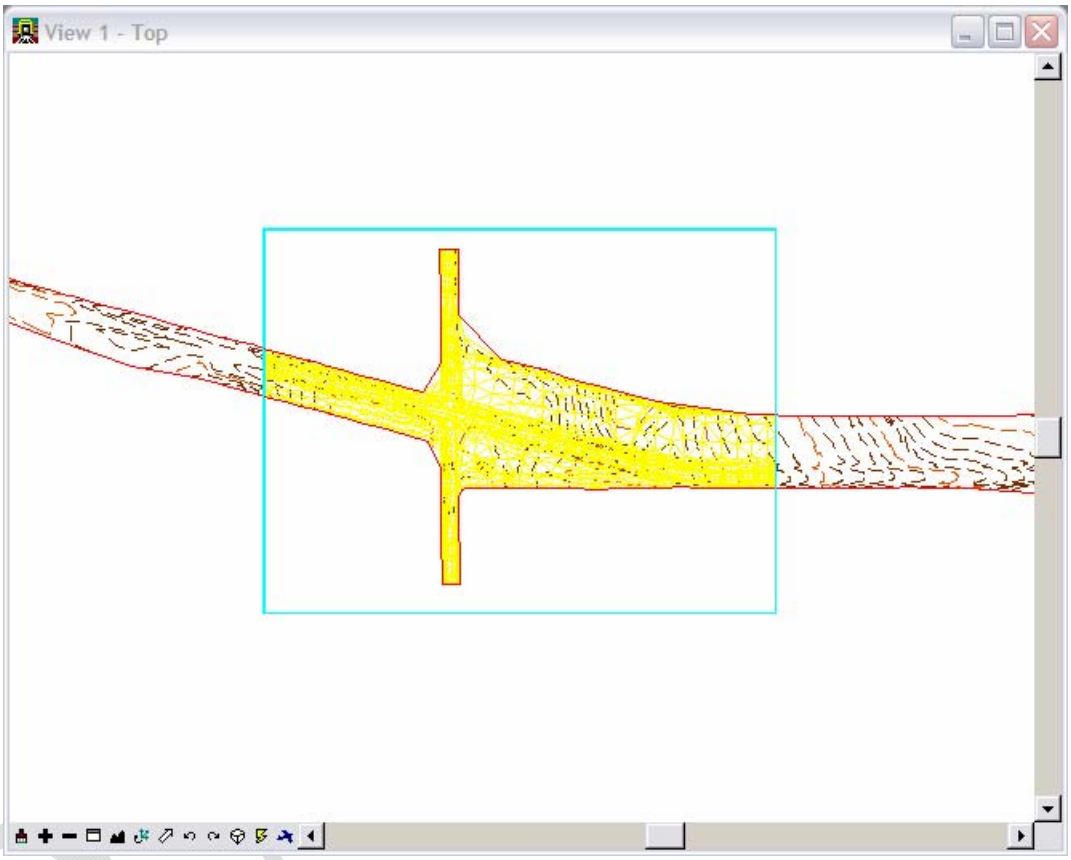
13. From the InRoads pull down menu select, **Surface > Update 3-D/Plan Surface Display**. The **Update 3-D/Plan Surface Display** dialog will appear.



Note: Notice this time **Fence Mode** became active and the mode is set to **Inside**.

14. **<D>** the **Apply** button. The triangles will display inside the fence.

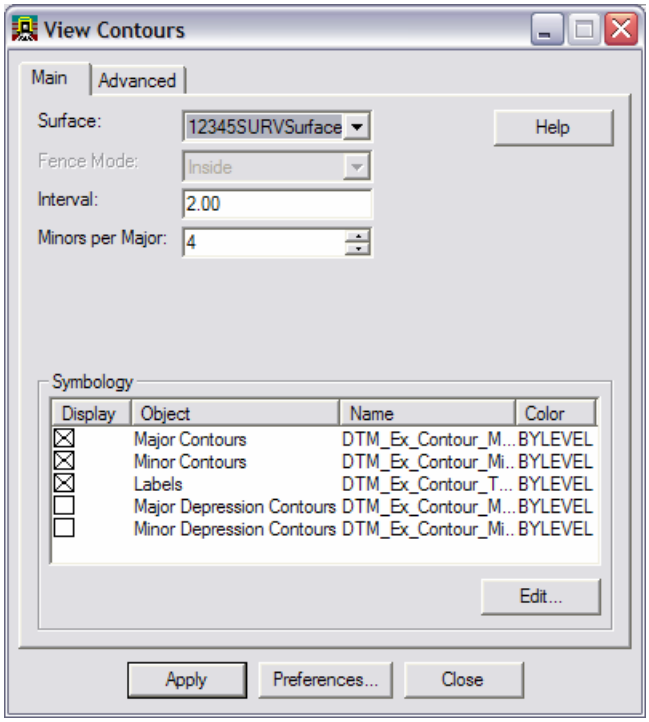
15. Using MicroStation view commands zoom out from the triangles and review your result



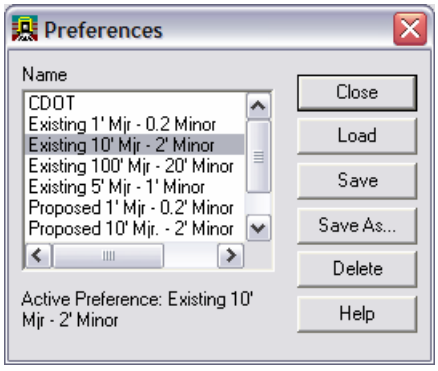
16. **<D>** the **Close** button in the **Update 3-D/Plan Surface Display** dialog.

View Contour Settings

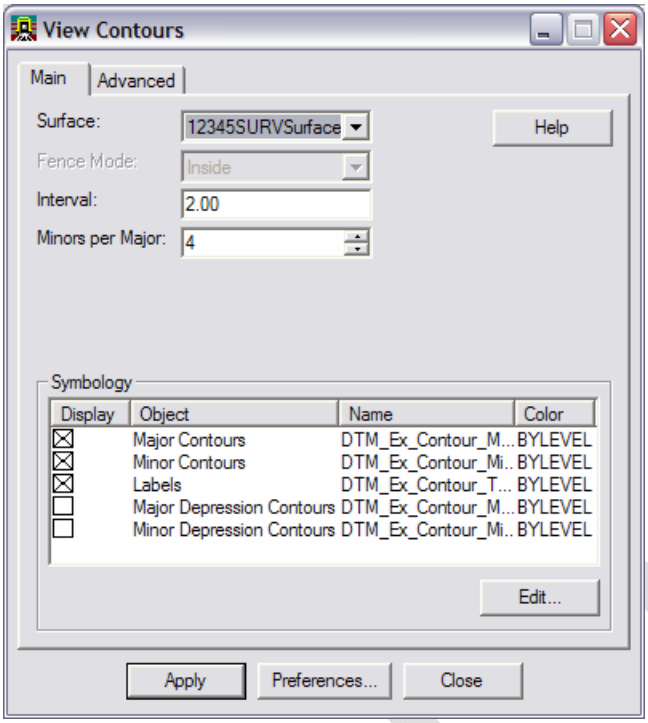
1. Open a new working MicroStation model file.
2. Open an InRoads Surface.
3. Using MicroStation **Delete** button. Delete all Contours in the drawing.
4. From the pull-down **Surface > View Surface > Contours**. The **View Contours** dialog will appear.
5. Verify the active Surface: ***12345SURVSurface01***



6. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



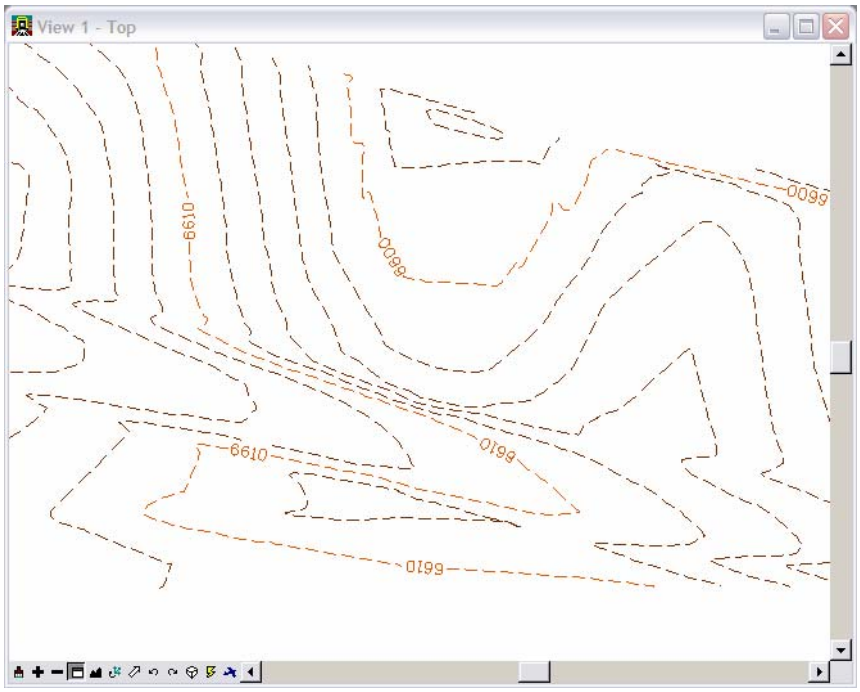
7. Select the Preference ***Existing 10'Mjr – 2' Minor***
8. **<D>** the **Load** then **Close** buttons



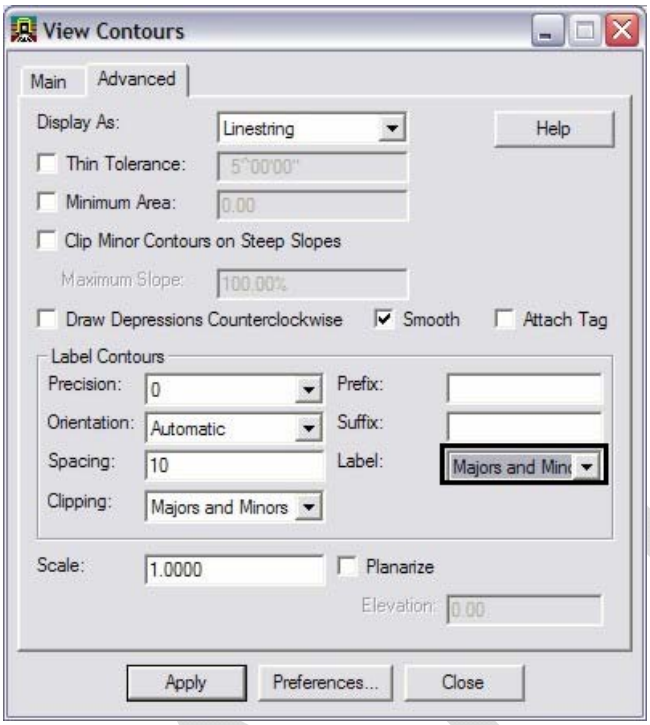
Note: Notice the change in the **Interval** and **Minors per Major** settings.

9. **<D>** the **Apply** button.

10. Review your results.



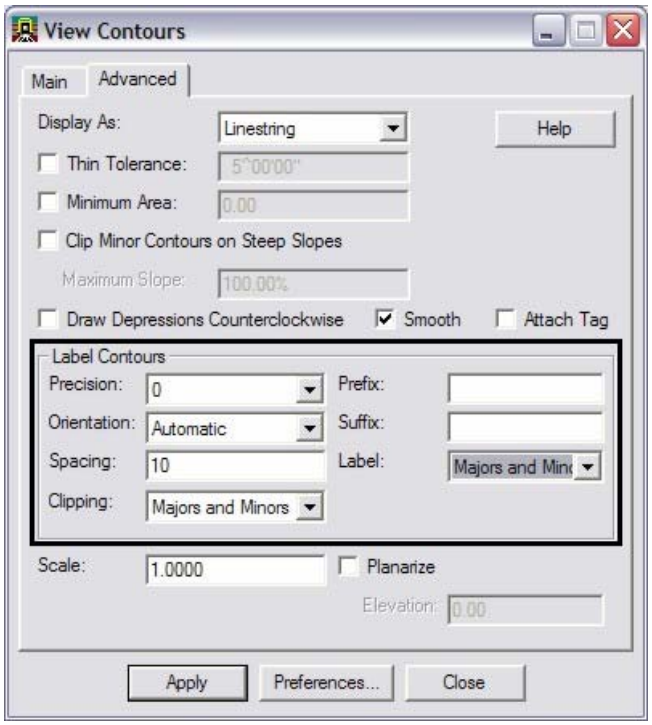
11. **<D>** the **Advanced** tab in the **View Contours** dialog.



12. Select the drop down field **Label: Majors and Minors** in the Label Contours section.

13. **<D>** the **Apply** button. Review your results.

14. Continue to display contours using different settings in the **Label Contours** section.



Note: Ask your instructor if you have a question on any of these settings.

When you have finished:

15. Load the Preference ***Existing 10'Mjr – 2' Minor***

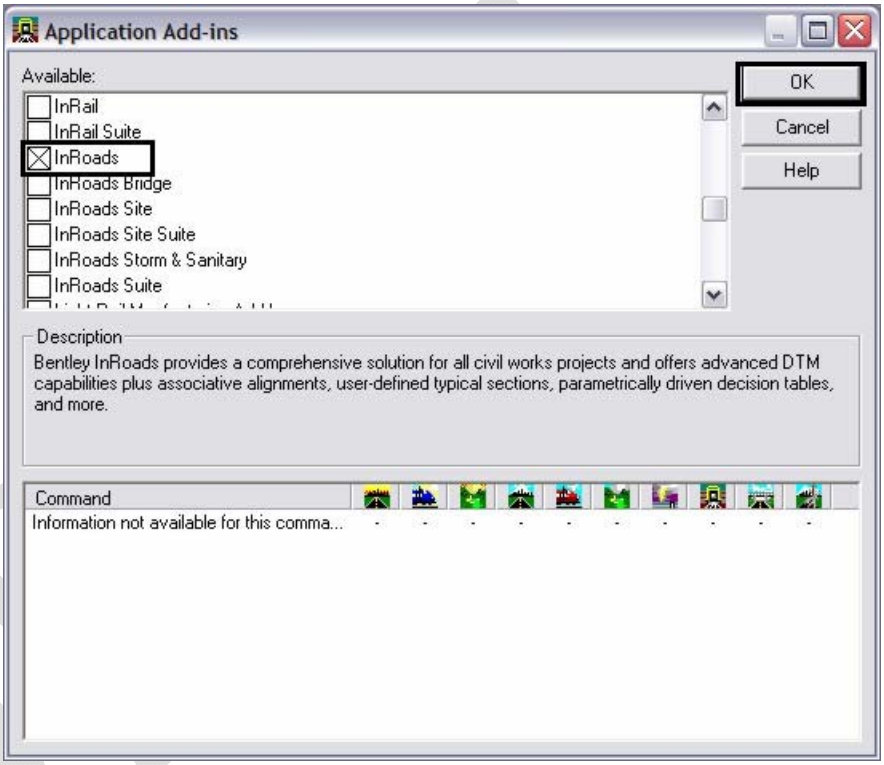
16. Redisplay the contours.

Profiles from existing alignments

1. Open a new working MicroStation model file.
2. Open an InRoads Surface.
3. Open an InRoads Geometry Project.

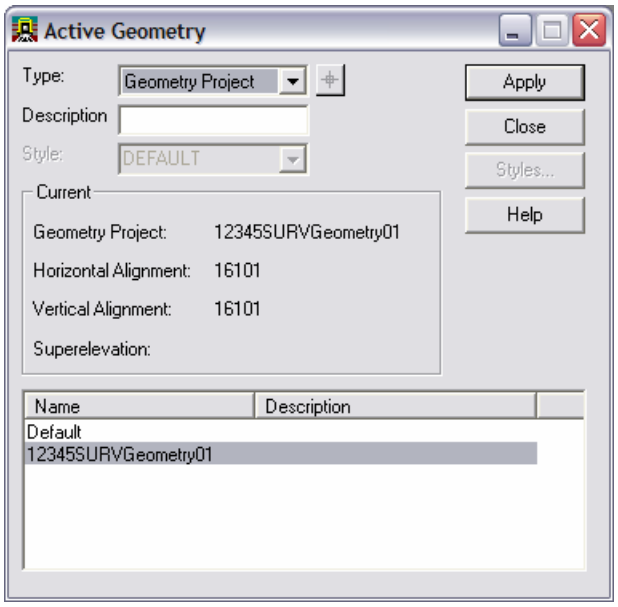
InRoads Survey only allows for multipoint profiles. To create profiles from an existing alignment InRoads needs to be added.

4. From the InRoads pull down menu select **Tools > Application Add-ins**. The **Application Add-ins** dialog will appear.



5. Select the ***InRoads*** application and select the **OK** button. InRoads application will be added to the interface.

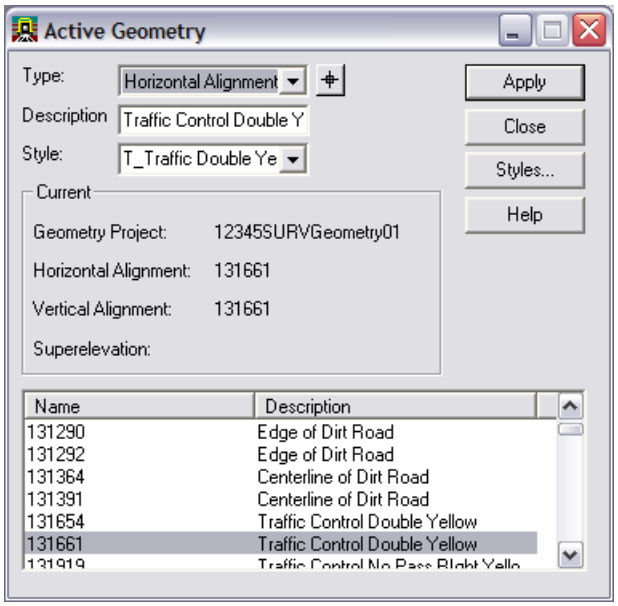
6. From the InRoads pulldown menu select **Geometry > Active Geometry**. The **Active Geometry** dialog will appear.



7. Select the ***Type: Horizontal Alignment***

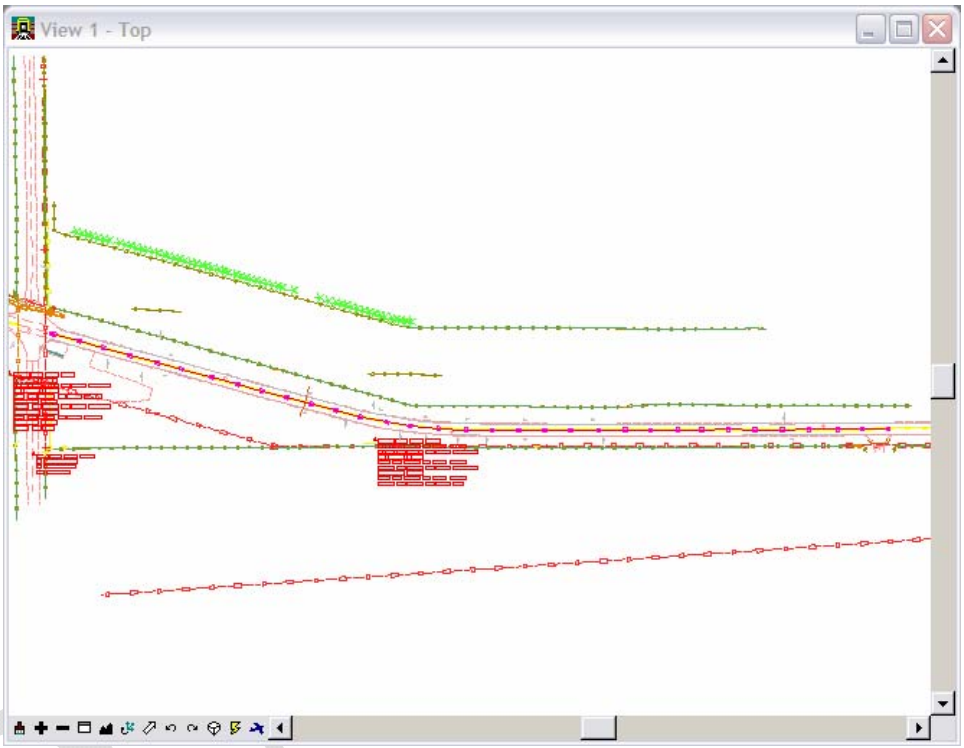
8. **<D>** the **Target**  button. The **Active Geometry** dialog will minimize allowing you to select the centerline in the MicroStation view.

9. **<D>** the centerline of the road. The centerline of road will highlight and the **Active Geometry** dialog will reappear.



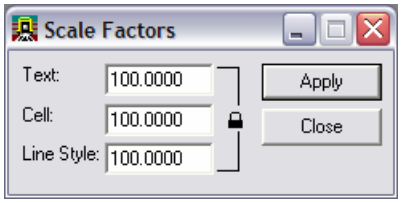
10. **<D>** the **Apply** then **Close** buttons. The Horizontal Alignment name will be active.

11. From the pull down menu select, **Geometry > Fit Alignment**
12. **<R>** in the MicroStation View
13. From the pull down menu select,
    Geometry > View Geometry > Active Horizontal



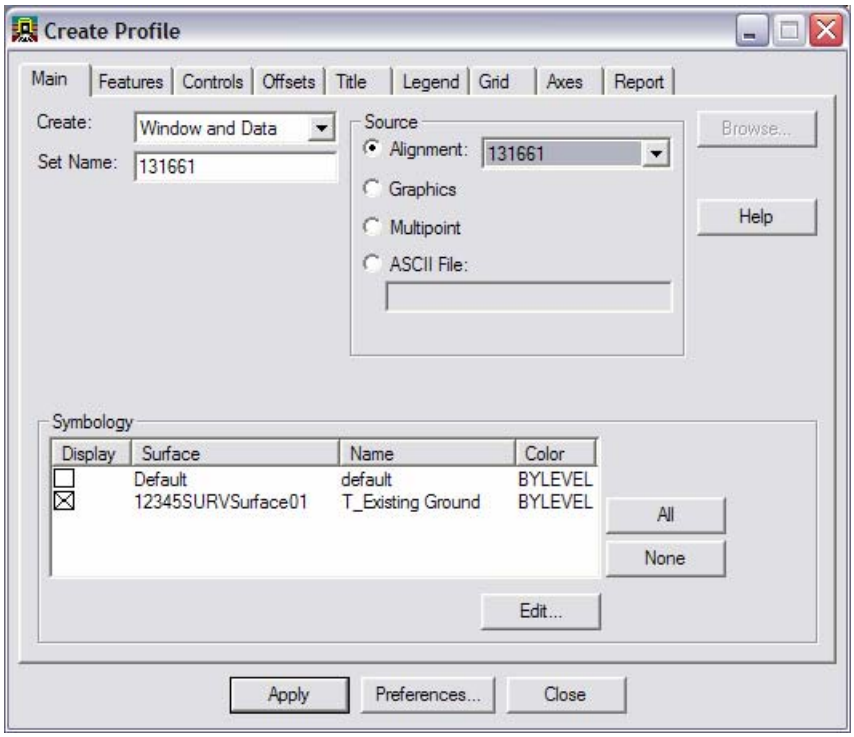
Note: The above graphic is where the profile will be extracted.

14. From the pull down menu select, **Tools > Global Scale Factors...** The **Scale Factors** dialog will appear.

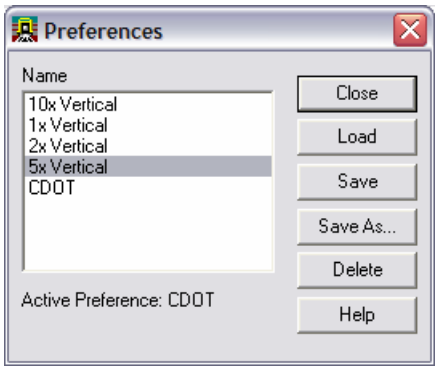


15. **<D>** the **Apply** then **Close** buttons.

16. From the InRoads pulldown menu select **Evaluation > Profile > Create Profile**. The **Create Profile** dialog will appear.

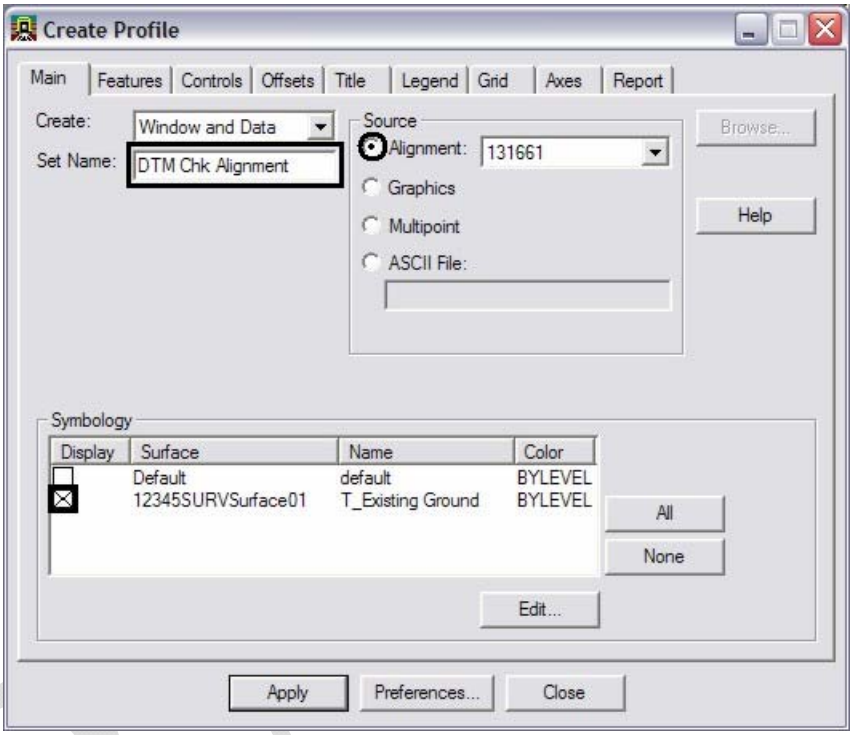


17. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.



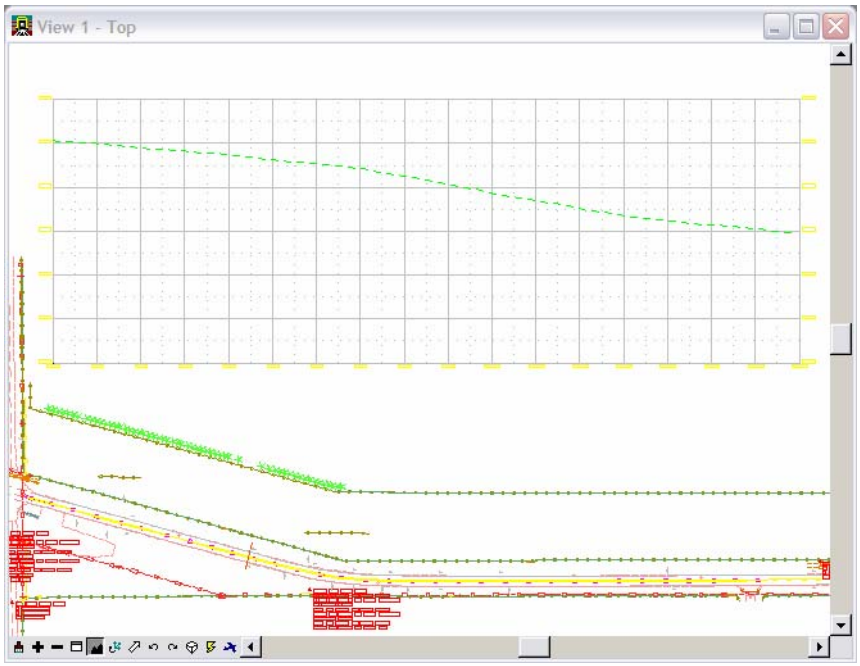
18. Select the preference name ***5x Vertical***

19. **<D>** the **Load** then **Close** buttons.
20. On the **[Main]** tab key-in Set Name: ***DTM Chk Alignment***
21. Set the Radio button to **Alignment**
22. Verify ***12345SURVSurface01*** is checked in the **Symbology** section.



23. **<D>** the **Apply** button. The dialog will minimize allowing you to select the location of the profile in the MicroStation view.
24. **<D>** a location in the MicroStation view to draw the profile. The **Create Profile** dialog will reappear and the Profile is generated.

25. Review your results.



26. Continue to generate profiles along the remainder of the centerline.

    When finished:

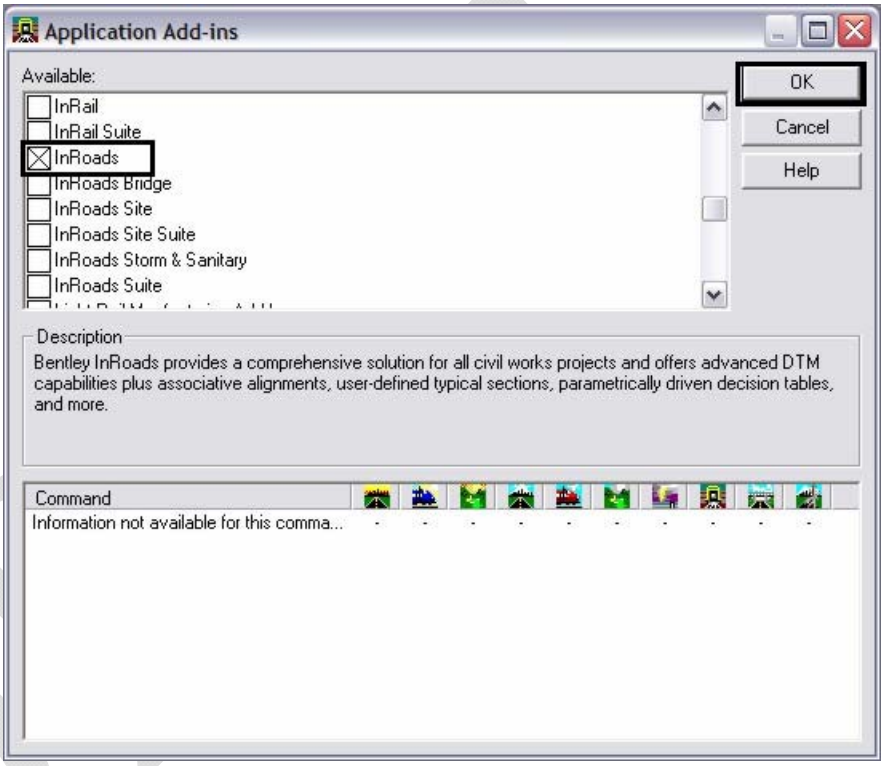
27. Using **MicroStation Delete** button. Delete all DTM Check profiles.

Cross Sections

1. Open a new working MicroStation model file.
2. Open an InRoads Surface.
3. Open an InRoads Geometry Project.

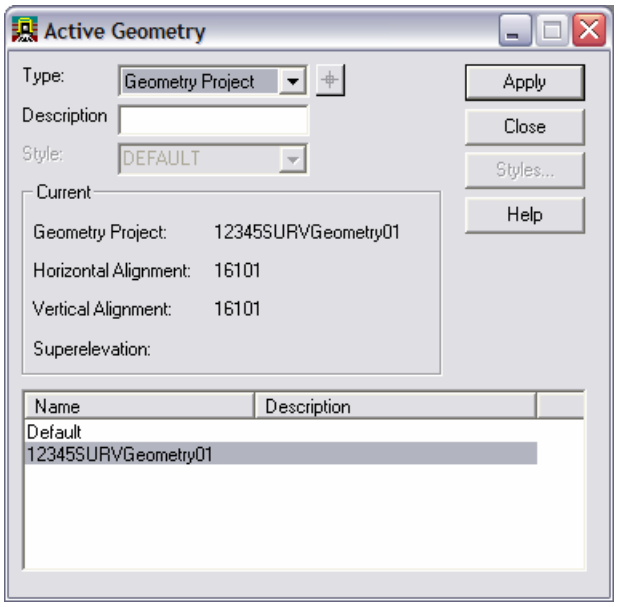
InRoads Survey does not display cross sections. To create cross sections from an existing alignment InRoads needs to be added.

4. From the InRoads pull down menu select **Tools > Application Add-ins**. The **Application Add-ins** dialog will appear.



5. Select the ***InRoads*** application and select the **OK** button. InRoads application will be added to the interface.

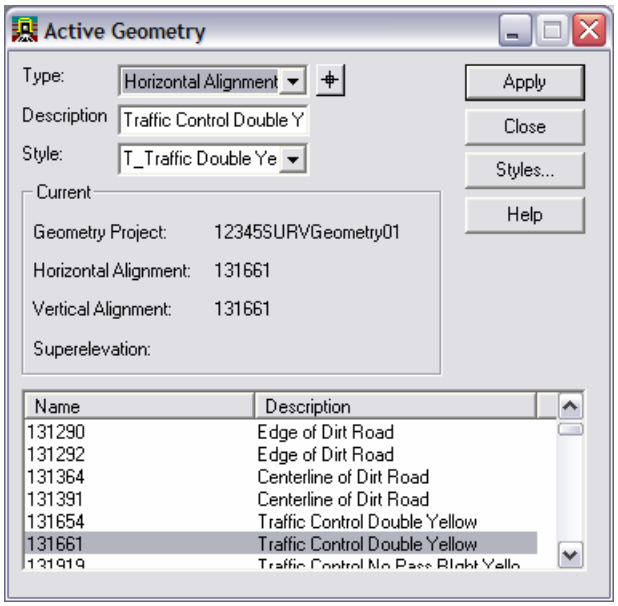
6. From the InRoads pulldown menu select **Geometry > Active Geometry**. The **Active Geometry** dialog will appear.



7. Select the ***Type: Horizontal Alignment***

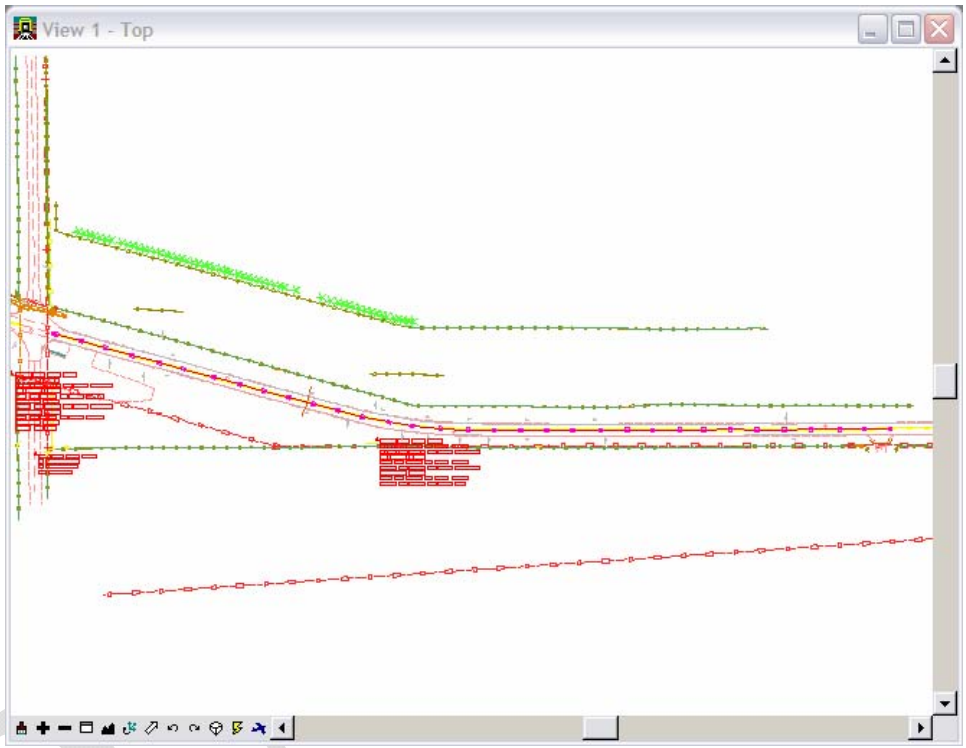
8. **<D>** the **Target**  button. The **Active Geometry** dialog will minimize allowing you to select the centerline in the MicroStation view.

9. **<D>** the centerline of the road. The centerline of road will highlight and the **Active Geometry** dialog will reappear.



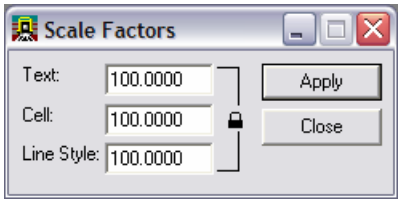
10. **<D>** the **Apply** then **Close** buttons. The Horizontal Alignment name will be active.

11. From the pull down menu select, **Geometry > Fit Alignment**
12. **<R>** in the MicroStation View
13. From the pull down menu select,
    Geometry > View Geometry > Active Horizontal

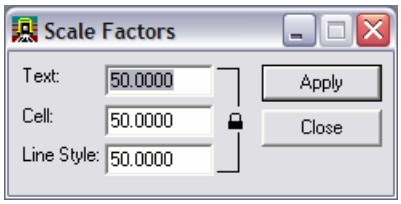


Note: The above graphic is where the profile will be extracted.

14. From the pull down menu select, **Tools > Global Scale Factors...** The **Scale Factors** dialog will appear.

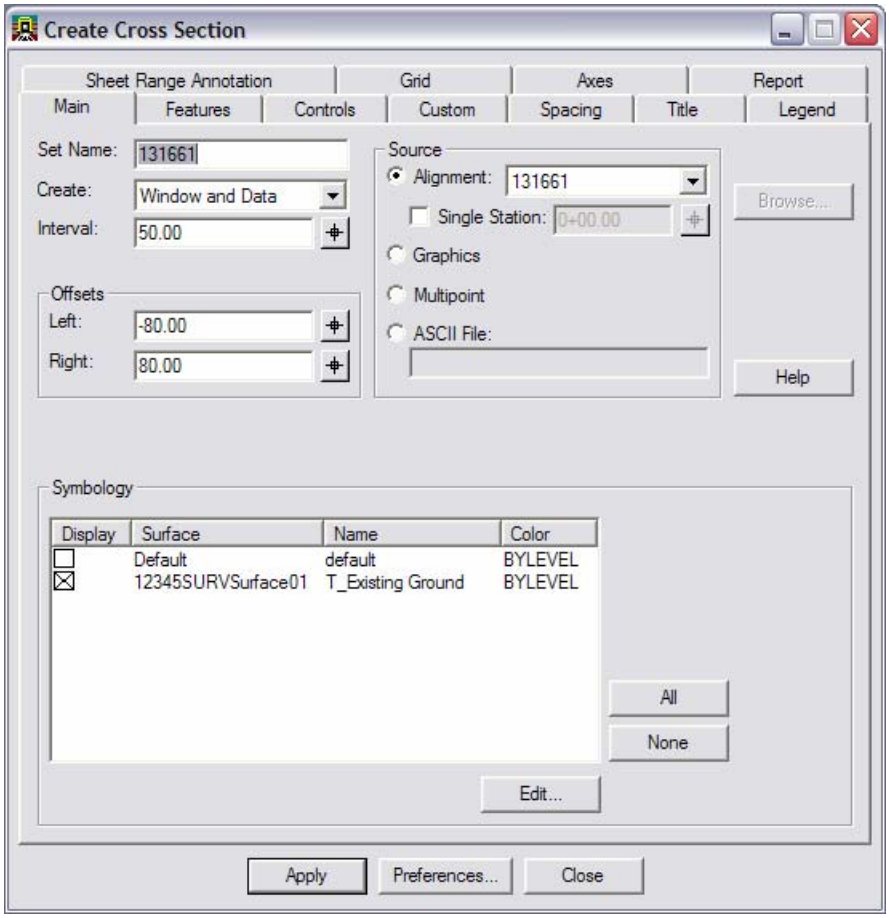


15. Change the scales to ***50***.

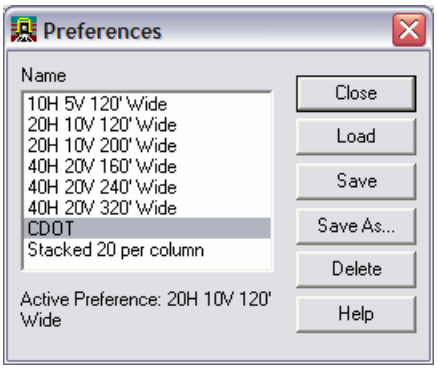


16. **<D>** the **Apply** then **Close** buttons.

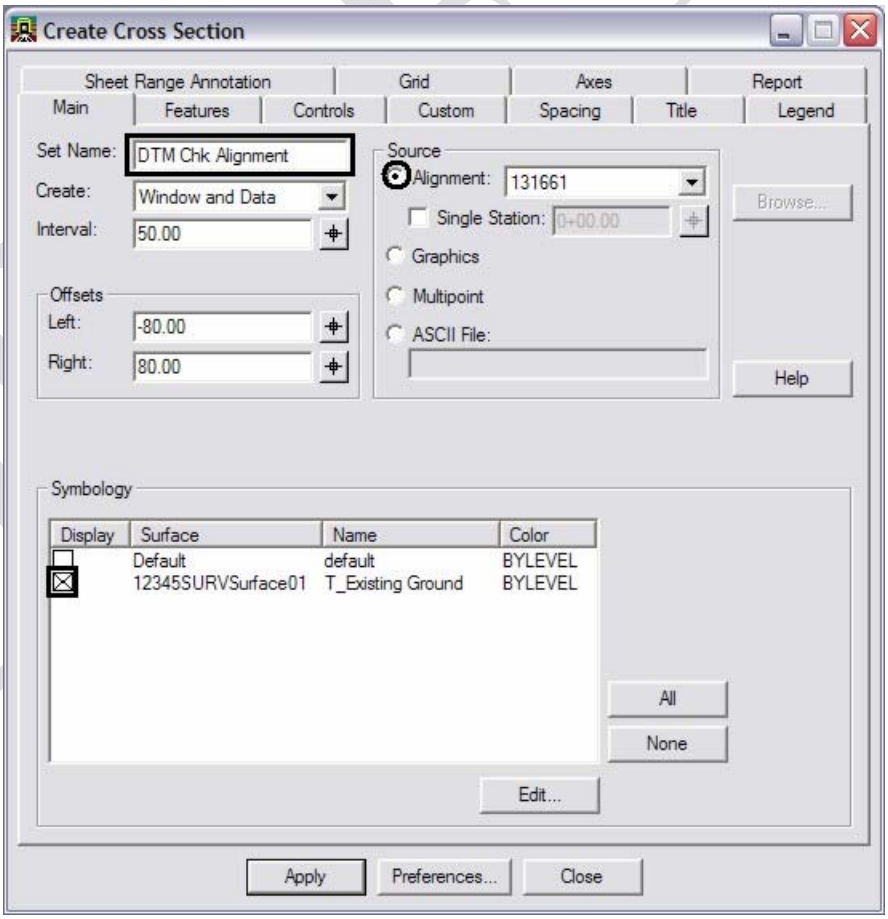
17. From the pull down menu select **Evaluation > Cross Section > Create Cross Section...**. The **Create Cross Section** dialog will appear.



18. **<D>** the **Preferences...** button. The **Preferences** dialog will appear.

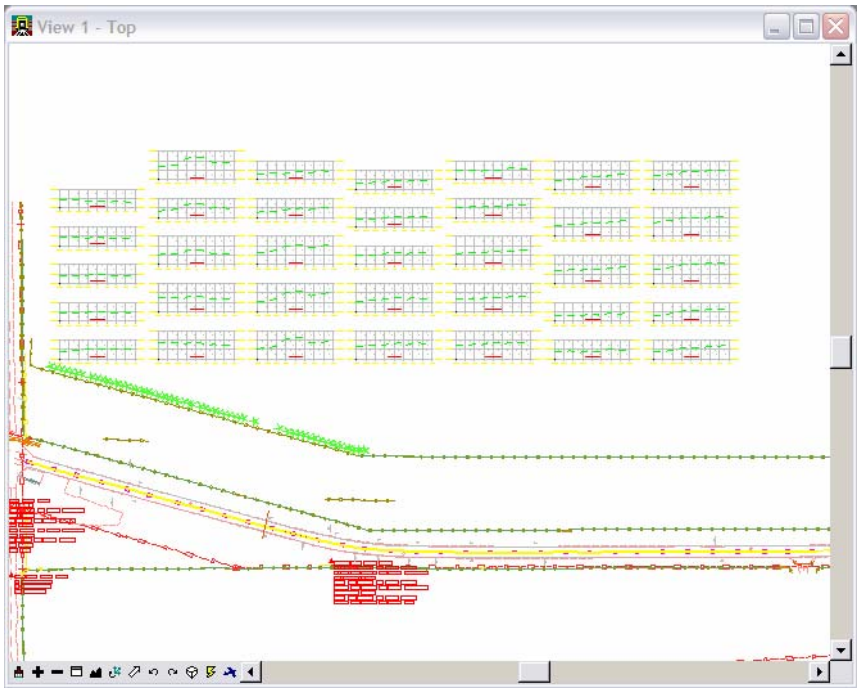


19. Select the preference name ***CDOT***
20. **<D>** the **Load** then **Close** buttons.
21. On the **[Main]** tab key-in Set Name: ***DTM Chk Alignment***
22. Set the Radio button to **Alignment**
23. Verify ***12345SURVSurface01*** is checked in the **Symbology** section.



24. **<D>** the **Apply** button. The dialog will minimize allowing you to select the location of the profile in the MicroStation view.
25. **<D>** a location in the MicroStation view to draw the profile. The **Create Profile** dialog will reappear and the Profile is generated.

26. Review your results.



Survey

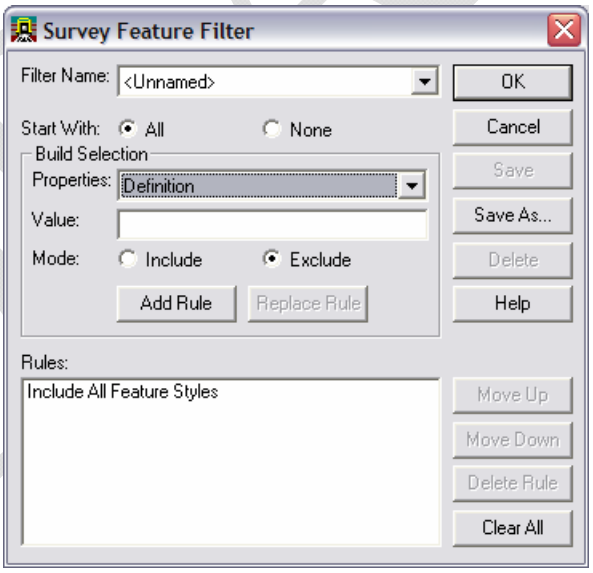
Survey Feature Filters

The geometry project ***12345SURVGeometry01*** contains horizontal and vertical alignments for every linear item that was surveyed. Additionally the Cogo buffer contains points for every survey shot collected. While this may be desirable information, often it is desirable to work with a subset of the survey information such as pavement centerlines, control lines, or other specific entities. Working with a subset of the information increases efficiency by working with a smaller data set and freeing-up additional computer memory for other operations. This can be accomplished by using Survey Feature Filters when exporting survey data (Fieldbook) to a geometry project.

The goal is to have a geometry project that contains only the information important to establishing the centerline of the existing road. The use of feature filters will assist in sorting the data for:

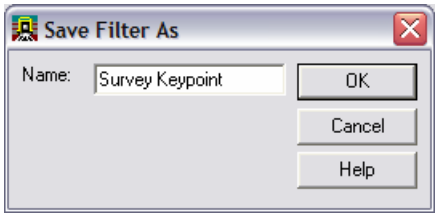
- Control points
- Pavement centerlines

1. Open a new working MicroStation model file.
2. Open an InRoads Survey Fieldbook.
3. From the pull down menu select **Survey > Survey Feature Filter**. The **Survey Feature Filter** dialog will appear.

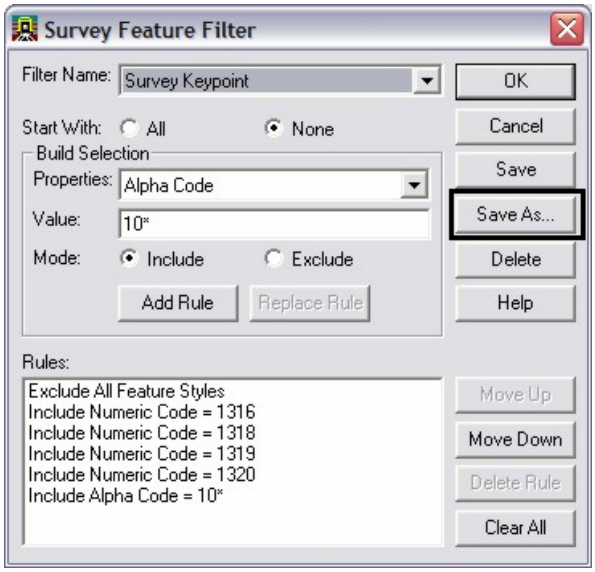


4. Toggle the radio button **Start With: None**
5. Select Properties: **Numeric Code**
6. Toggle the radio button **Mode: Include**
7. Key-in the **Value:** ***1316***
8. **<D>** the **Add Rule** button. The rule will be added to the Rules List.

9. Add additional numeric rules for:
   - ***1318***
   - ***1319***
   - ***1320***
10. Select Properties: **Alpha Code**
11. Toggle the radio button **Mode: Include**
12. Key-in the **Value: *10****
13. **<D>** the **Add Rule** button. The rule will be added to the Rules List.
14. **<D>** the **Save As** button. The **Save Filter As** dialog will appear.
15. Key-in the Name: ***Survey Keypoints***



16. **<D>** the **OK** button in the **Save Filter As** dialog.



17. **<D>** the **OK** button. The **Survey Feature Filter** dialog will close.

Note: The Survey Feature Filter just built is for filtering information contained in a Survey Fieldbook and gets saved in the Survey Feature Table (fwf) file vs. in the InRoads Civil.ini file as Feature Filters do. Therefore, it gets applied within the Fieldbook and not in the InRoads Feature Filter interface. However the Filter Lock needs to be turned on in the InRoads Locks toolbar for it to be active.

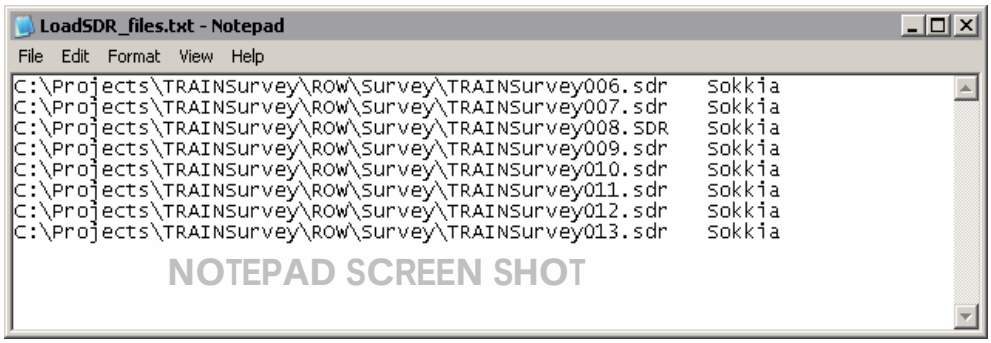
18. On the Locks toolbar, toggle **ON** the **Feature Filter Lock**

Note: Notice that 2 things happen, the **Fieldbook Data** dialog will update to display only the data that passes the filter. Also the MicroStation display will only display survey data that passes the filter.

Importing multiple files

To speed up the process of importing multiple files you can create a Group file. This.is a simple text file that points to the file location and import wizard to use. When it is available these are the steps for using Group Files on import.

- From the pull-down menu, select **File > Import > Survey Data**. The **Import** dialog will open.
- Change the drop-down arrow Files of type: **Group of Files (*.*)**
- **Select** the file **LoadSDR_files.txt** from the unfiltered list of files.
  - The Group of files option is a handy way to load multiple files at one time. The file is a simple ASCII text file that shows the file location and import type. Below is a screen shot of the file opened in Notepad. This file would need to be created prior to using it on a different project.

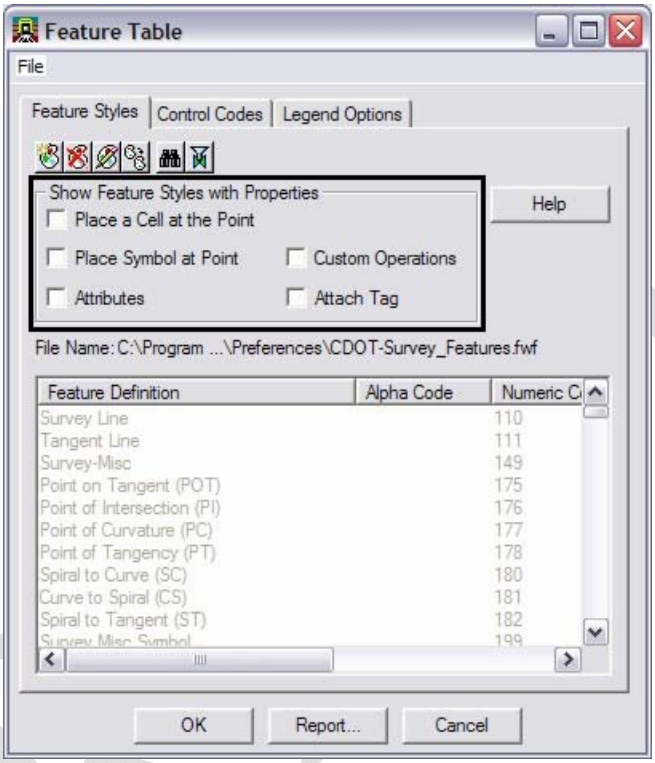


- In the **Import** dialog **<D>** the **Import** button.
- **<D>** the **Close** button. All the files listed in the text file will be imported.

Generating Feature Table Reports

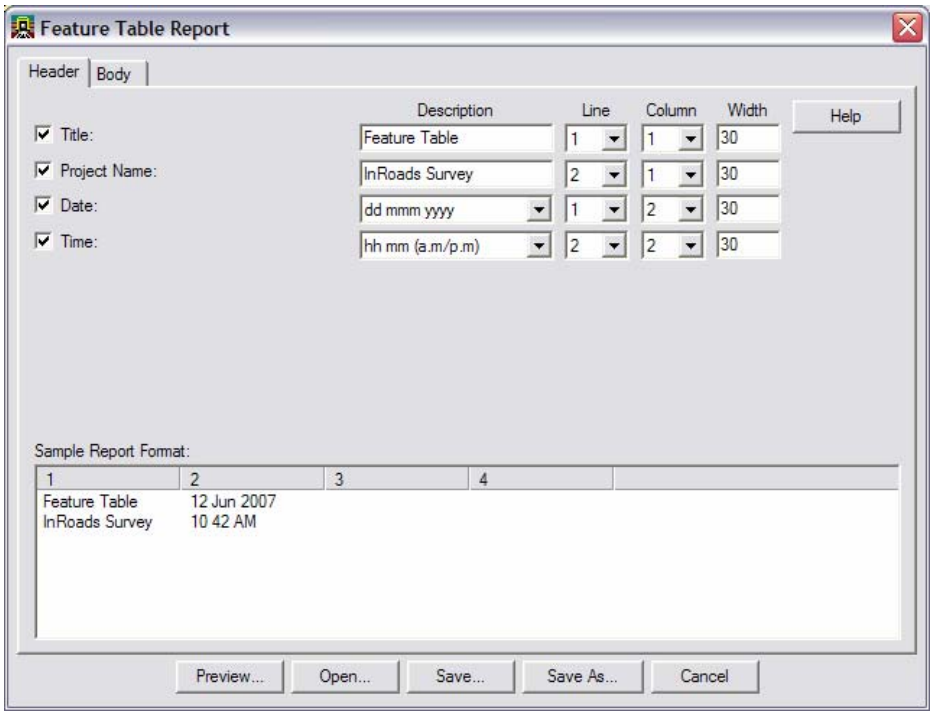
1. **<D>** the **Feature Table** button from the **Survey** toolbar. The Survey Feature Table will appear.

2. **Toggle off** and **uncheck** any Survey Feature list filters from the **Feature Table** dialog as shown below.

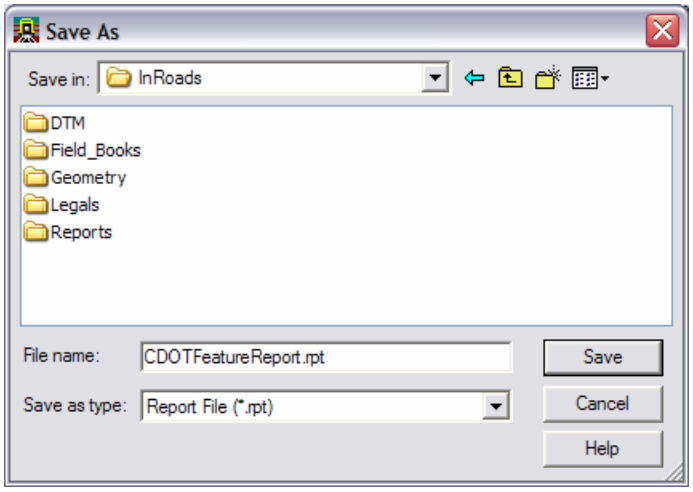


3. **<D>** the **Report** button. The **Feature Table Report** dialog will appear.

4. Explore the tabs **Header** and **Body** tabs.



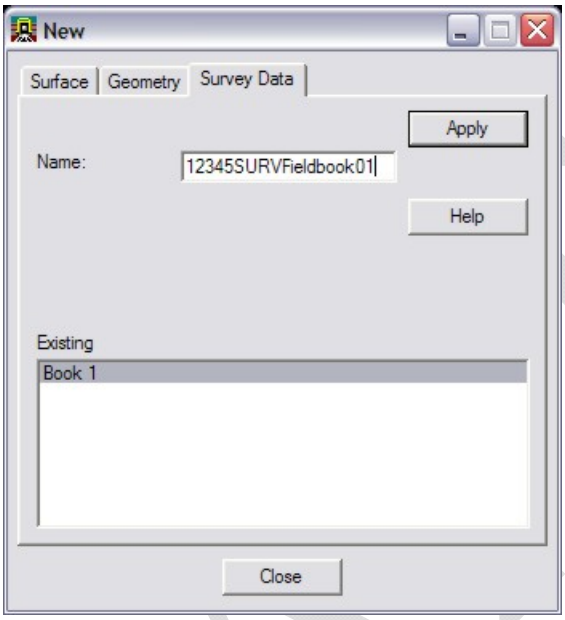
5. **<D>** the **Save As** button. The **Save As** dialog will appear.



6. Type the ***File name: CDOTFeatureReport.rpt***
7. **<D>** the **Save** then **Cancel** buttons.
8. Use Notepad to review the report.

Metric Survey Data to Imperial Survey Data

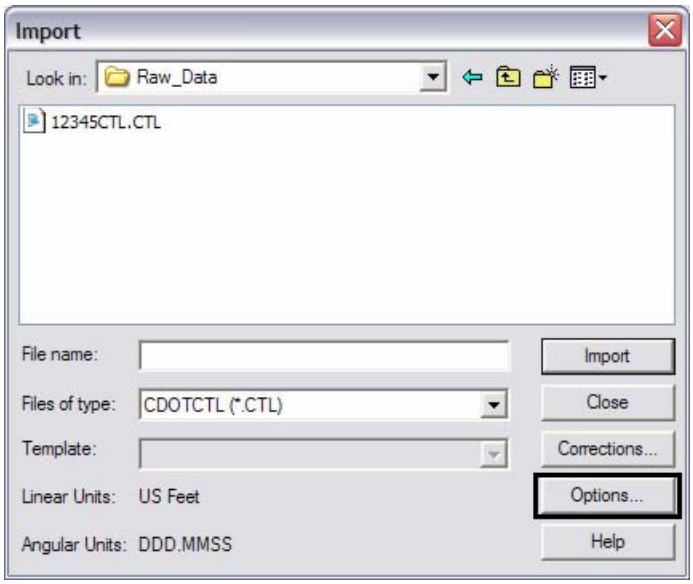
1. Open a new working MicroStation model file.
2. Once MicroStation and InRoads opens. From the InRoads pull-down menu, select **File > New**. The **New** dialog will appear.



3. Select the **Survey Data** tab.
4. Key in the Name: **12345SURVFieldbook01**
5. Select the **Apply** button. The new fieldbook will appear below.
6. **<D>** the **Close** button.

7. From the **Workspace** bar the **12345SURVFieldbook01** should be active.

8. From the pull-down menu, select **File > Import > Survey Data**. The **Import** dialog will open.



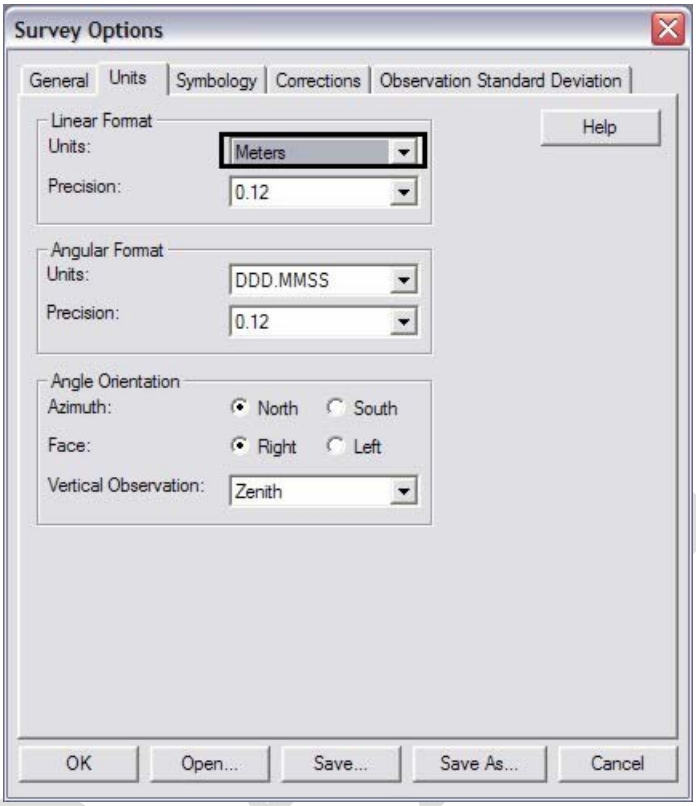
9. Change the **Look in:** folder to C:\Projects\12345\ROW_Survey\Survey**Raw_Data**

10. Verify the Files of type: **Sokkia SDR (*.sdr)**

11. **<D>** the **Options** button.

12. Verify the **Cell**, **Text**, and **Line** Scales are all set to ***100***

13. Select the **Units** tab.
14. Change the Linear Format Units: **Meters**

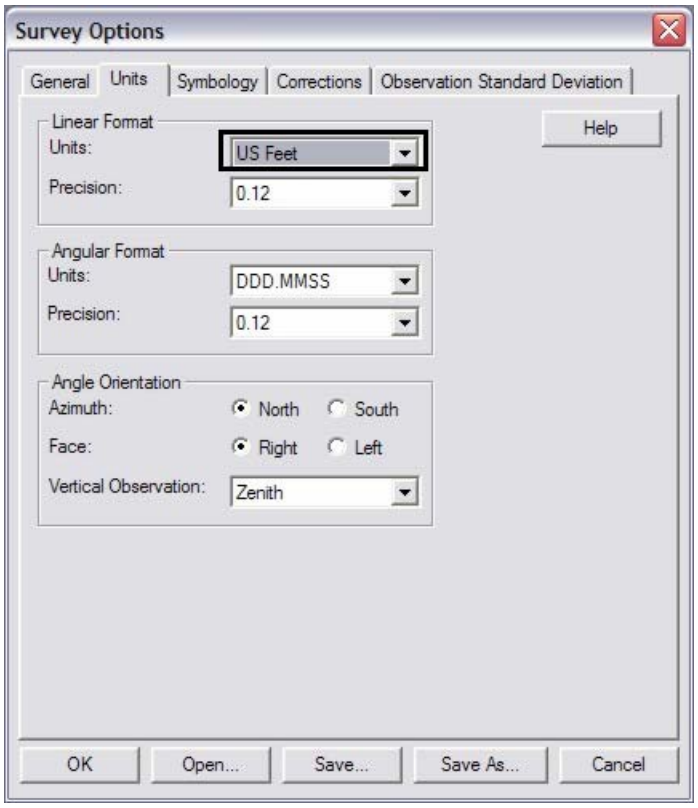


15. **<D>** the **Save** then **OK** buttons. The **Survey Options** dialog will close.
16. In the **Import** dialog select the data collector file you will be importing.
17. **<D>** the **Import** the **Close** buttons.
18. From the pull-down menu, select **Survey > Fieldbook Data**. Take a minute to review the imported Survey control data that is now contained in the electronic Fieldbook.

19. From the pull-down menu, select **Tools > Survey Options** the **Survey Options** dialog will appear.

20. Select the **Units** tab.

21. Change the Linear Format Units: **US Feet**



22. **<D>** the **Save** then **OK** buttons. The **Survey Options** dialog will close.

23. From the pull-down menu, select **Survey > Fieldbook Data**. Take a minute to review the transformed Survey data that is now contained in the electronic Fieldbook.

    Note: The file has now been converted to US Feet Units.

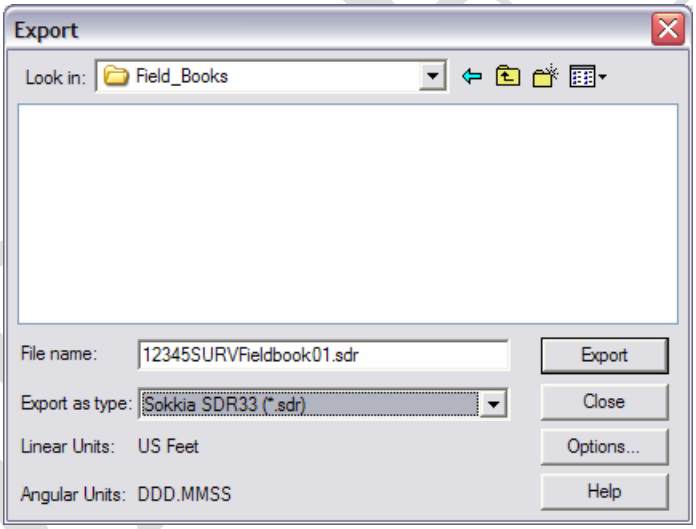
24. From the pull-down menu, select **File > Save > Survey Data** the **Save As** dialog will appear.

25. **<D>** the **Save** and **Cancel** buttons. The **Save As** dialog will close.

Exporting Survey Data to Sokkia SDR file

Exporting the fieldbook out to a SDR format would be required if you wanted to use the points and stake them out in the field.

1. Verify the **12345SURVFieldbook01** fieldbook you want to export is active. You can tell which fieldbook is active by the red box around the fieldbook button.
2. From the pull-down menu, select **File > Export > Survey Data**. The **Export** dialog will appear.
3. Change the directory to: C:\Projects\12345\ROW_Survey\InRoads**Field_Books**
4. Select the down arrow for **Export as type:** review the available file formats available.
5. Select from the list Export as type: ***Sokkia SDR33 (*.sdr)***
6. Key-in the new file name ***12345SURVFieldbook01.sdr***

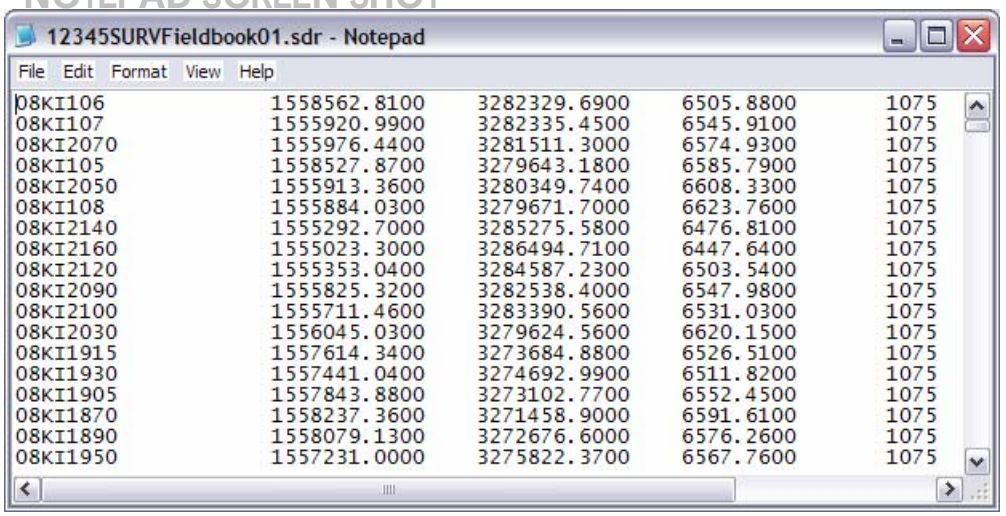


7. **<D>** the **Export** button. The **Export** dialog will close.

8. Open Windows explorer **Windows + E**

9. Open and review the file in Notepad.
   C:\Projects\12345\ROW_Survey\InRoads\Field_Books\
   12345SURVFieldbook01.sdr

NOTEPAD SCREEN SHOT



Note: This file is ready to be uploaded into the data collector. If you need to import this file back into InRoads Survey for any reason you will need to add survey header information into file.

Exporting Survey Data using Text Export Wizard

Exporting the fieldbook out to another format would be required if you wanted to use the points and stake them out in the field.

1. Verify the **12345SURVFieldbook01** fieldbook you want to export is active. You can tell which fieldbook is active by the red box around the fieldbook button.

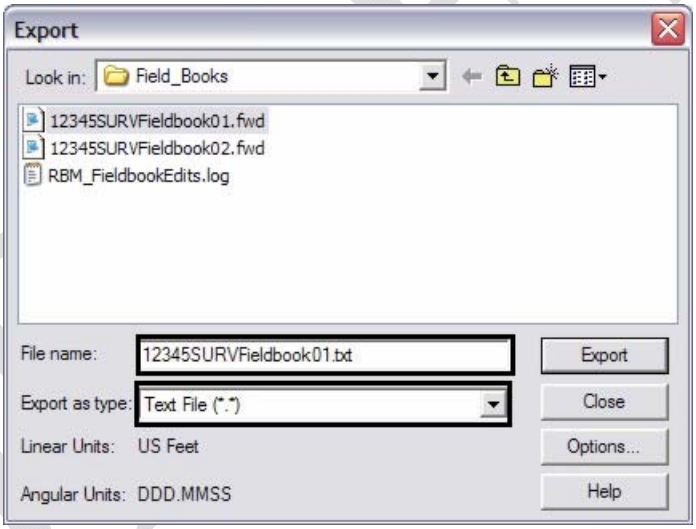
2. From the pull-down menu, select **File > Export > Survey Data**. The **Export** dialog will appear.

3. Change the directory to: C:\Projects\12345\ROW_Survey\InRoads**Field_Books**

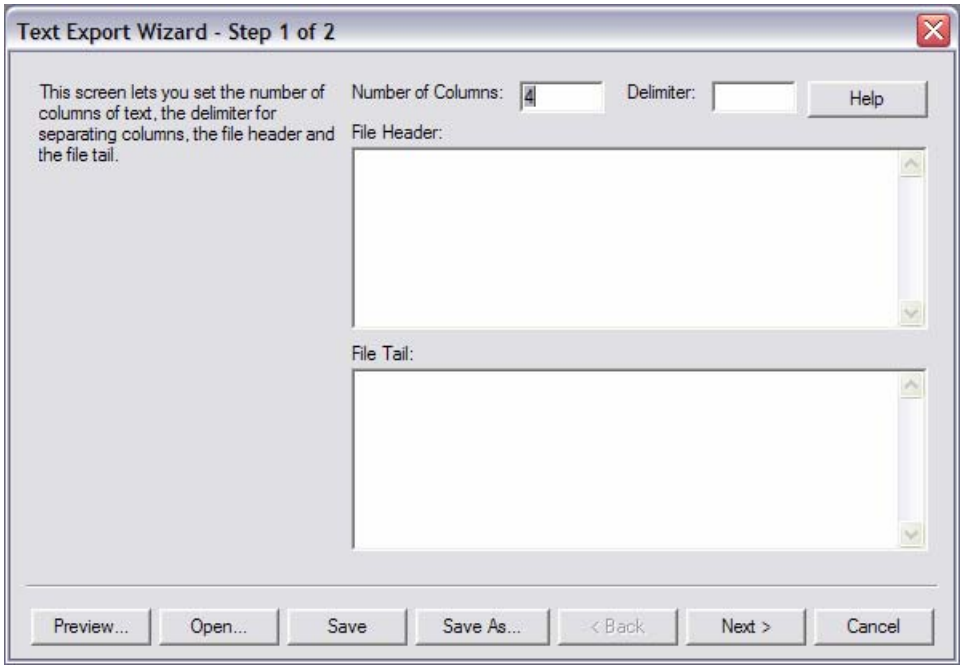
4. Select the down arrow for **Export as type:** review the available file formats available.

5. Select from the list Export as type: ***Text File (*.*)***

6. Key-in the new file name ***12345SURVFieldbook01.txt***



7. **<D>** the **Export** button. The **Export** dialog will close and the **Text Export Wizard** dialog will appear.

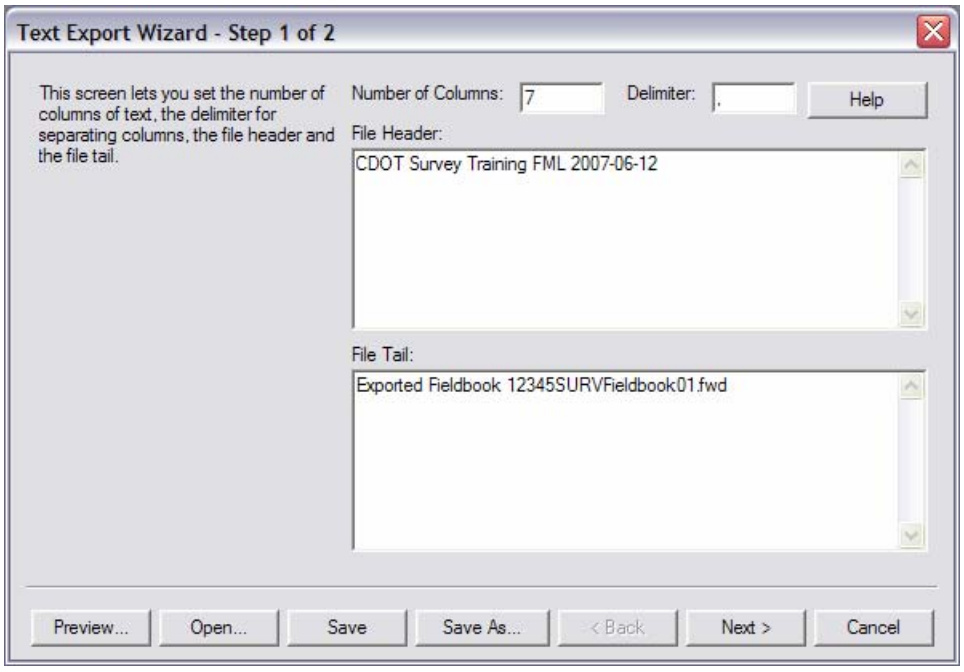


8. Key-in Number of Columns: ***7***

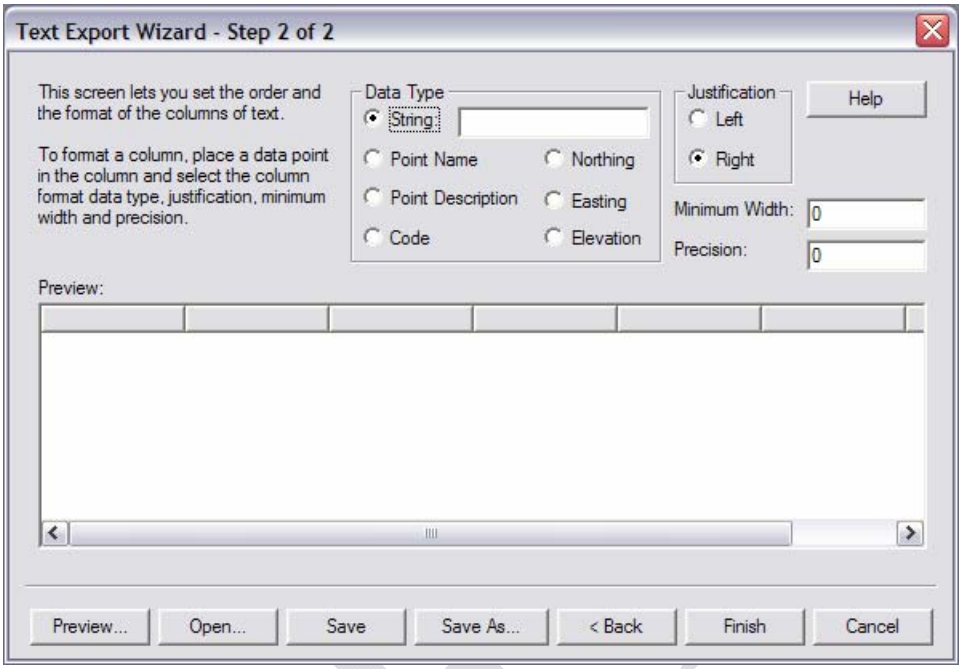
9. Key-in Delimiter: **,**

10. Key-in File Header: ***CDOT Survey Training "Initials" "Date"***

11. Key-in File Tail: ***Exported Fieldbook 12345SURVFieldbook01.fwd***



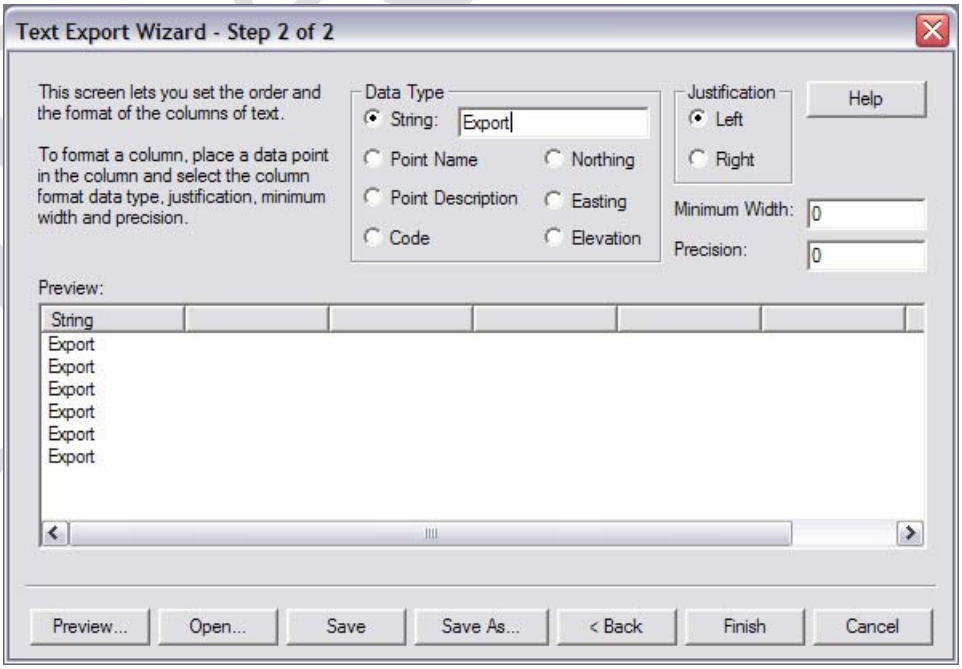
12. **<D>** the **Next >** button. The final **Step 2 of 2** dialog will appear.



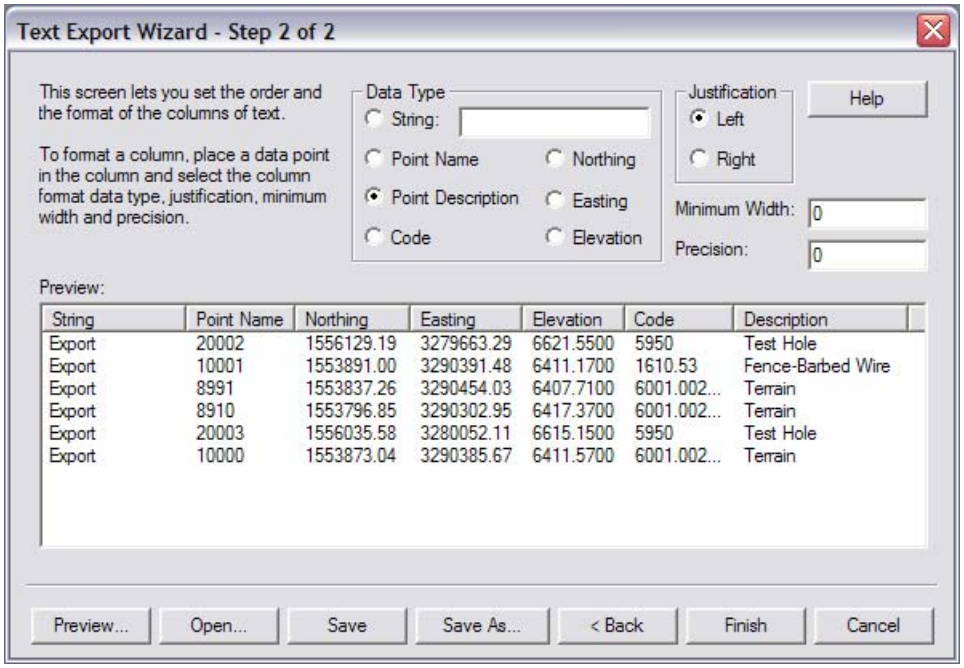
13. Select the header of the first column. The column will highlight as shown below.

14. From the **Data Type** radio button select **String: Export**

15. Justification **Left**

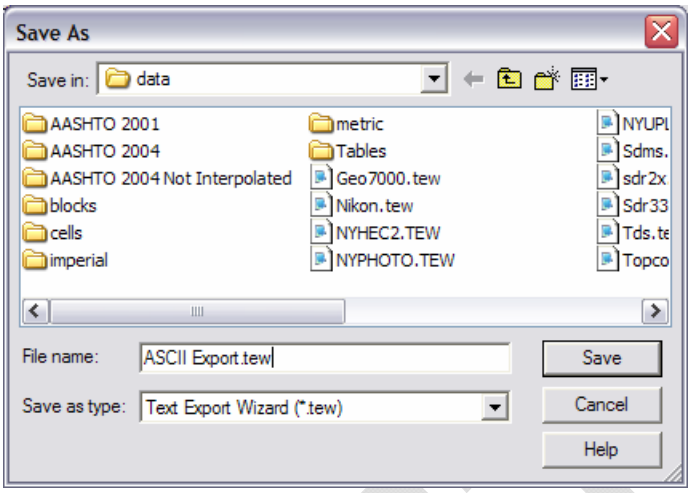


16. Select the second column header then select **Point Name** from the **Data Type** radio button.
    - **Justification:** ***Left***
17. Select the third column header then select **Northing** from the **Data Type** radio button.
    - **Justification:** ***Left***
    - **Precision:** ***2***
18. Select the fourth column header then select **Easting** from the **Data Type** radio button.
    - **Justification:** ***Left***
    - **Precision:** ***2***
19. Select the fifth column header then select **Elevation** from the **Data Type** radio button.
    - **Justification:** ***Left***
    - **Precision:** ***4***
20. Select the sixth column header then select **Code** from the **Data Type** radio button.
    - **Justification:** ***Left***
21. Select the seventh column header then select **Point Description** from the **Data Type** radio button.
    - **Justification:** ***Left***



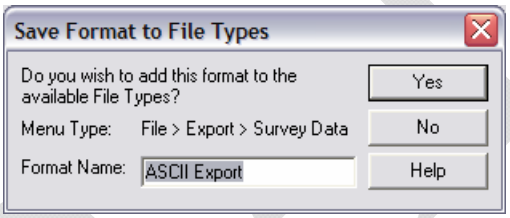
22. **<D>** the **Save As** button. The **Save As** dialog will appear.

23. Key in File name: ***ASCII Export.tew***



24. **<D>** the **Save** button. The **Save As** dialog will close.

25. The **Save Format to File Types** dialog will appear. Verify **Format Name: *ASCII Export***



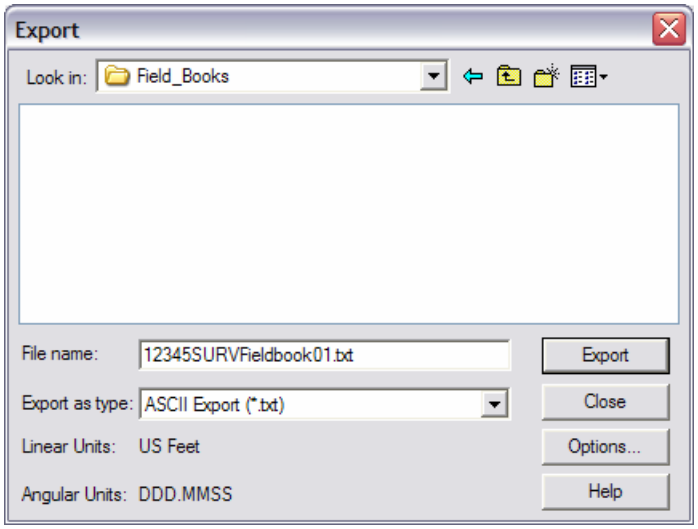
26. **<D>** the **Yes** button. The **Save Format to File Types** dialog will close and the **Step 2 of 2** dialog will reappear.

27. In the **Step 2 of 2** dialog **<D>** the **Cancel** button. The **Step 2 of 2** dialog will close.

28. From the pull down menu select, **File > Export > Survey Data**

29. In the **Export** dialog change the
    Export as type: **ASCII Export (*.txt)**

30. Path to the directory:
    C:\Projects\12345\ROW_Survey\InRoads**Field_Books**

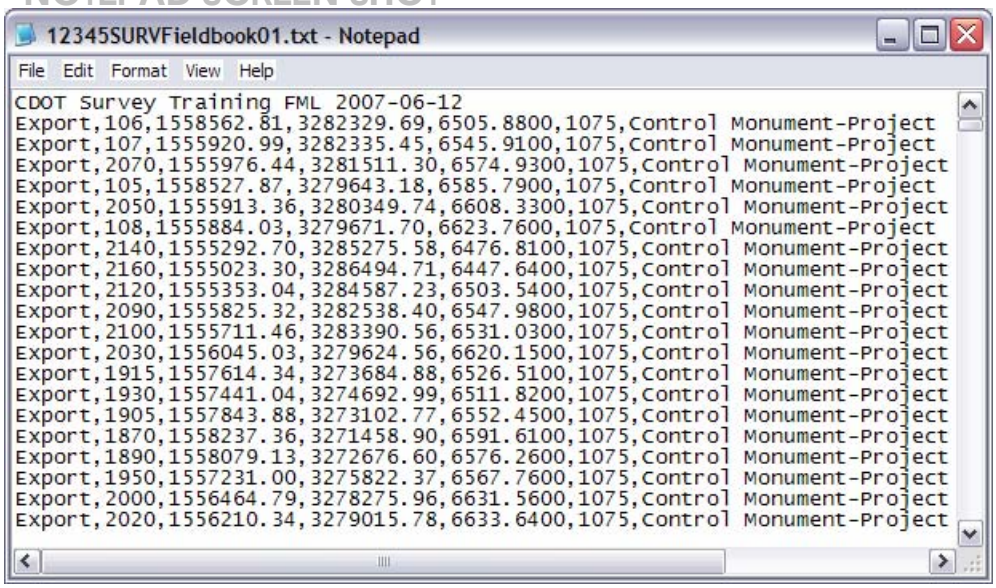


31. **<D>** the **Export** button. The **Export** dialog will close.

32. Open Windows explorer **Windows + E**

33. Open and review the file created in **Notepad**.
    C:\Projects\12345\ROW_Survey\InRoads\Field_Books\
    12345SURVFieldbook01.txt

NOTEPAD SCREEN SHOT



Exporting DC File from TGO

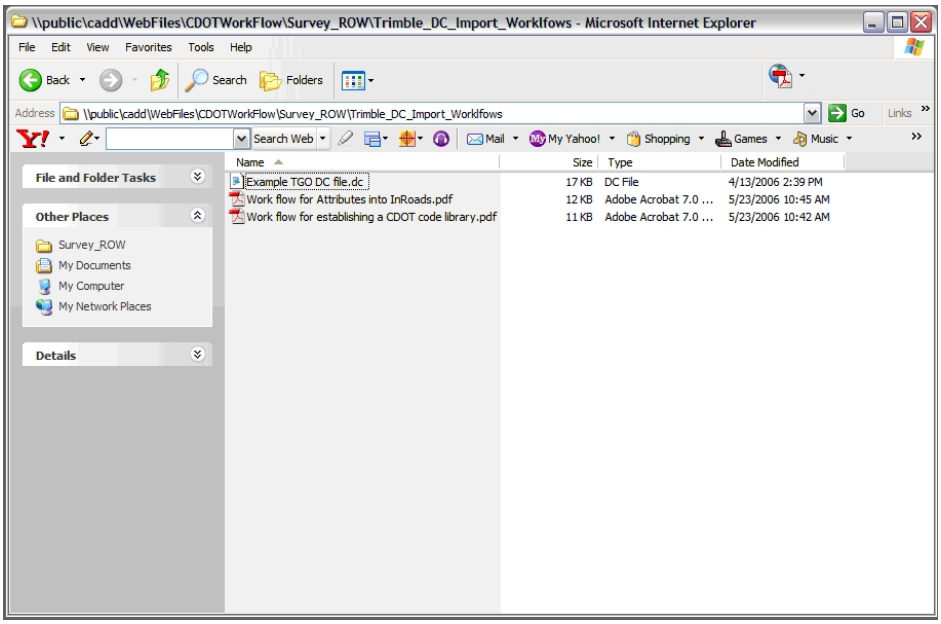
The workflows for exporting a DC file that will include the notes and attributes can be found on the CDOT CADD Library web page

The three files are:

Example TGO DC file.dc

Work flow for Attributes into InRoads.pdf

Work flow for establishing a CDOT code library.pdf



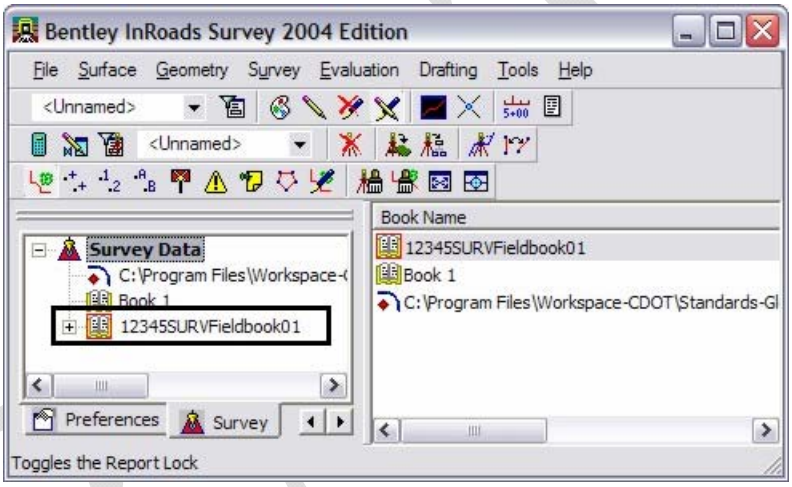
Merging InRoads Survey Fieldbook files

When a project is using more then one fieldbook for a particular job it is possible to merge those fieldbook files together.

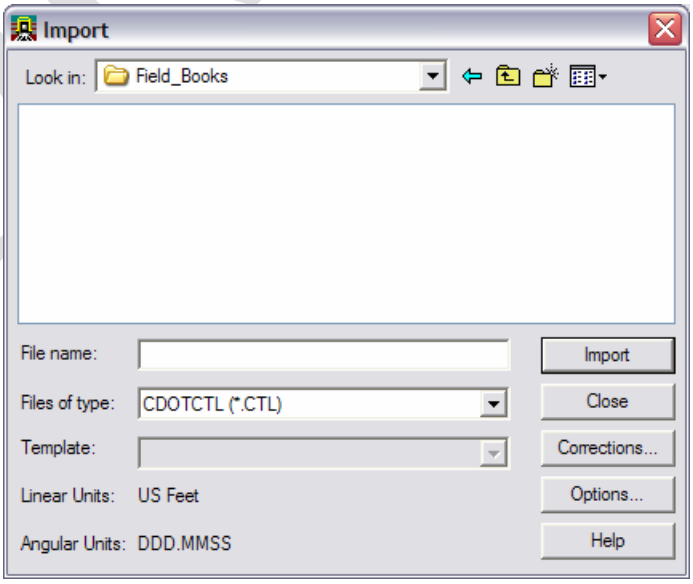
Items to address prior to merging fieldbooks:

- There can not be duplicate point names between the fieldbooks.
- If you are using figure strings make sure they are not going to conflict with the figure strings in the other fieldbook

1. Open a new working MicroStation model file.
2. Open an InRoads Survey Fieldbook.

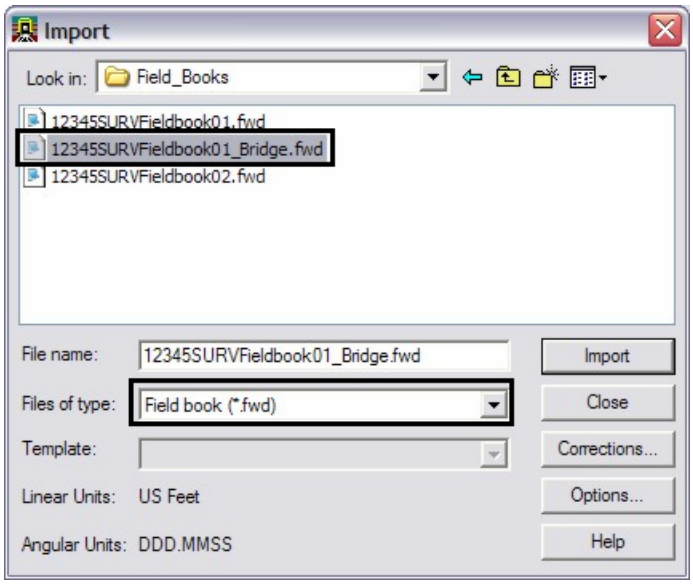


3. From the InRoads pulldown menu select **File > Import > Survey Data** The Import dialog will appear.



4. Select the **Files of type: Field book (*.fwd)**

5. Select the fieldbook name you want to import.



6. **<D>** the **Import** then **Close** buttons. The fieldbook files are now merged.

Index