



Introduction Tutorial

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Product

Surpac™ 6.6

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Introduction

Surpac

GEOVIA Surpac™ is the world's most popular geology and mine planning software, supporting open pit and underground operations and exploration projects in more than 110 countries. The software delivers efficiency and accuracy through ease-of-use, powerful 3D graphics, and workflow automation that can be aligned to company-specific processes and data flows.

Surpac addresses all the requirements of geologists, surveyors, and mining engineers in the resource sector and is flexible enough to be suitable for every commodity, orebody, and mining method. Its multilingual capabilities allow global companies to support a common solution across their operations.

Surpac must be installed on the local computer and your user customisable files saved locally in the share folder. Working files can be saved locally or to a network location. It is recommended that you back up both your data and user customised files regularly.


Overview

This document is designed to help new users install Surpac and start using the software. More detailed training information is available from within the software and from your local support office.

Requirements

Before proceeding with this tutorial, ensure you have the following items:

1. A copy of Surpac v6.6 for installation.
This is usually installed from a DVD, but you can also download the software from the <http://www.GEOVIAsupport.com> web site.
2. A suitable computer with a DVD drive.

	Minimum	Recommended
Windows	Microsoft Windows® 32-bit Professional, Enterprise, Ultimate	Microsoft Windows® 64-bit Professional, Enterprise, Ultimate
Memory	4GB	8GB (3.xGB max for Surpac 32-bit process)  Note: 8GB allows 3.2+ Windows without paging.
CPU	i5 2.3Ghz quad core	i7/Xeon 2.2Ghz + quad core
HDD	1 x 500GB 7200RPM SATAII	500GB 2700RPM SATA or SAS 10,000RPM (data) + SDD (for Windows and Applications)
Graphics card	Nvidia NVS 420/Q1000m	Nvidia Quadro Q2000/m or Q4000/m

3. The data set accompanying this tutorial.

Document conventions

Typographical conventions

Some text in this manual has special formatting to identify it as a particular element of information. The following list describes the different formats and their meanings:

Text Format	Meaning
<Bold Italic>	Text or data that varies with each input is shown in italic font and enclosed in angle brackets. Some examples are installation directories, dates, names and passwords. When you substitute the text for the variable, do not include the brackets. For example: <password> requires you to substitute a password in place of '<password>'.
<i>Italics</i>	A word or phrase to which the author wants to give emphasis. For example: you must select an item from the list to continue.
Bold	<p>This typeface indicates one of the following:</p> <ul style="list-style-type: none"> • A file name, path or URL. • Strongly emphasized text. For example, "It is very important to save the data [...]" • Text that a procedure has instructed you to type. • A menu option, tab, button, check box, list, option button, text box, icon, field, or area of the user interface. <p>For example: Open pit1.str into Graphics.</p>

Keyboard conventions

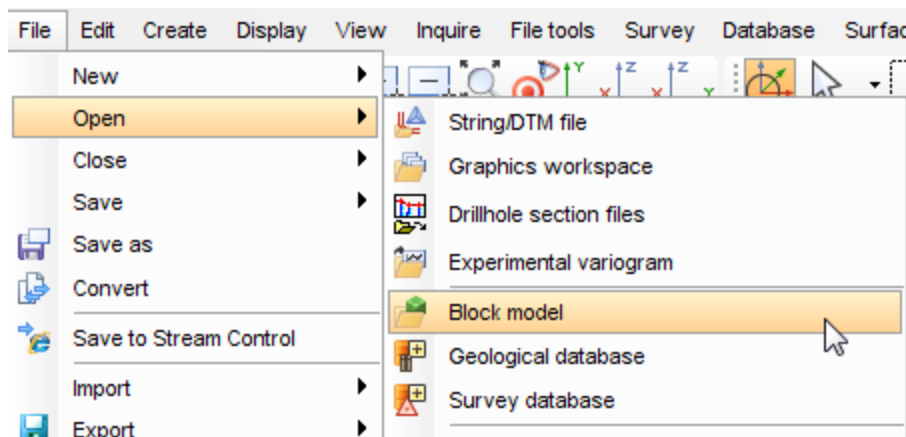
Key Combination	Meaning
<key>+<key>	Press and hold down the first key, then press the second key. For example: CTRL+Z means hold the CTRL key down, then press Z.

Menu conventions

In this documentation, the following example demonstrates the syntax used for menus and submenus:

Choose **File > Open > Block model**.

This means click the **File** menu, move the pointer over the **Open** command, and select **Block model** on the submenu.



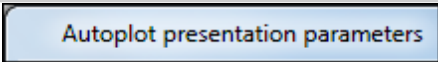

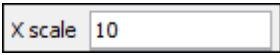


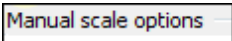

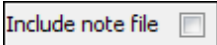

Mouse conventions

Action	Description
Click	Quickly press and release the left mouse button without moving the mouse.
Right-click	Press and release the right mouse button without moving the mouse.
Double-click	Without moving the mouse, click the left button twice rapidly.
Drag and drop <an object>	With the pointer over the object, press and hold down the left mouse button to select the object. Move the mouse until the pointer is in the position you want and then release the mouse button.
Drag	Press and hold down the left mouse button. Then move the mouse in the direction that the text specifies.
Right drag	Press and hold down the right mouse button. Then move the mouse in the direction that the text specifies.
Rotate	Use your finger to make the wheel button roll. Move it forward, that is in a clockwise direction, or backward, that is in an anticlockwise direction.

Forms

Forms contain elements that you will use to provide information to Surpac:

The screenshot shows the 'Autoplot presentation parameters' dialog box. It is divided into two main sections: 'Sheet setup' and 'Plot content'. The 'Sheet setup' section includes fields for 'Output file name' (main_graphics_layer), 'Sheet size' (A3), 'Orientation' (Landscape selected), 'Data units' (Metric selected), 'Scale method' (Manual Scale selected), and 'Auto-group Elements' (checked). The 'Manual scale options' section includes 'Minimum scale to fit data in window: 12', 'Lock X/Y scale' (unchecked), 'X scale' (10), 'Y scale' (10), and 'Lower left corner coordinate' (E and N fields). The 'Plot content' section includes 'Drawing area' (DEFAULT), 'Grid' (YXA3), 'Border' (BORD), 'Title block' (NMA3), 'Plot data contents' (Vector data, no surfaces selected), 'Raster resolution (DPI)' (100), and 'Optional content' (Note file section with 'Include note file' unchecked). A red note at the bottom right states: 'NOTE: Plan strip and batch sections unavailable. Not currently in plane mode, no section exists.' The dialog box has an 'Apply' button and a 'Cancel' button at the bottom right.

Element	Description	Example
1. Title	Title of the form.	
2. Tab	Labelled group of options used for many similar kinds of settings.	
3. Text box	Rectangular box in which you can type text. If the box already contains text, you can select that text and edit it.	
4. Combo box or Drop-down list	Closed version of a list box with an arrow next to it. Clicking the arrow opens the list.	
5. Radio button or Option button	Round button you can use to select one of a group of mutually exclusive options.	
6. Label	Text attached to any option, box, button, or to any other element of a window or form.	
7. Help	Context-sensitive help button.	
8. Check box	Square box that you select or clear to turn an option on or off.	
9. Button	Rectangular or square button that initiates an action. Buttons have text labels to indicate their purpose.	

Surpac concepts










Overview

In this chapter, you will learn about:

- Surpac data types
- function-centric versus data-centric operations

Surpac data types

Surpac uses many different file types. Each file type is represented by a unique icon in the Navigator. The following table describes the most common file types used in Surpac:


File type	Example	Description
String	 pit1.str	A string is a sequence of three-dimensional coordinates representing some physical feature.
DTM	 pit1.dtm	Digital Terrain Model (DTM) files are generated from .str files and can represent surfaces or solids. <ul style="list-style-type: none"> • A surface is a set of triangles that represent a surface such as topography or a pit design. • A solid model is a set of triangles that represents a 3D shape, such as an ore zone or an underground mine design.
Geological database	 surpac.ddb	Drillhole database (DDB) files are used to connect to relational drillhole databases. It is a text file that tells Surpac which tables and fields to read from and write to in the client database.
Survey database	 ug_mine.sdb	Survey database (SDB) files are used to connect to relational survey databases. It is a text file that tells Surpac which tables and fields to read from the database.
Block model	 block.mdl	A block model is a form of spatially-referenced database that provides a means for modelling a 3D body from point and interval data such as drillhole sample data. It provides a method for estimating volume, tonnage, and average grade of a 3D body from sparse drillhole data.
Plot files	 pit_str.dwf	Files for printing that are generated using the Plotting module. The output files are in DWF format. You can open and edit them in the Surpac plotting window or send them to a plot device such as a plotter.
Macros	 macro.tcl	Macros are custom programs, created to perform a set of repetitive tasks or functionality specific to an operation. You can easily record and edit TCL scripts in Surpac.
Plugins	 topo2.dxf	Plugins allow you to import files from other software applications directly into Surpac. If a file has this icon next to it in the Navigator, you can open the file in Surpac. For example, you can import any file that has one of the following extensions: .dxf , .dwg , .dgn , .dm , .shp , .dgd .
Styles file	 styles.ssi	Surpac styles files contain information such as drawing styles, colour settings for strings and DTMs, or default Surpac settings.

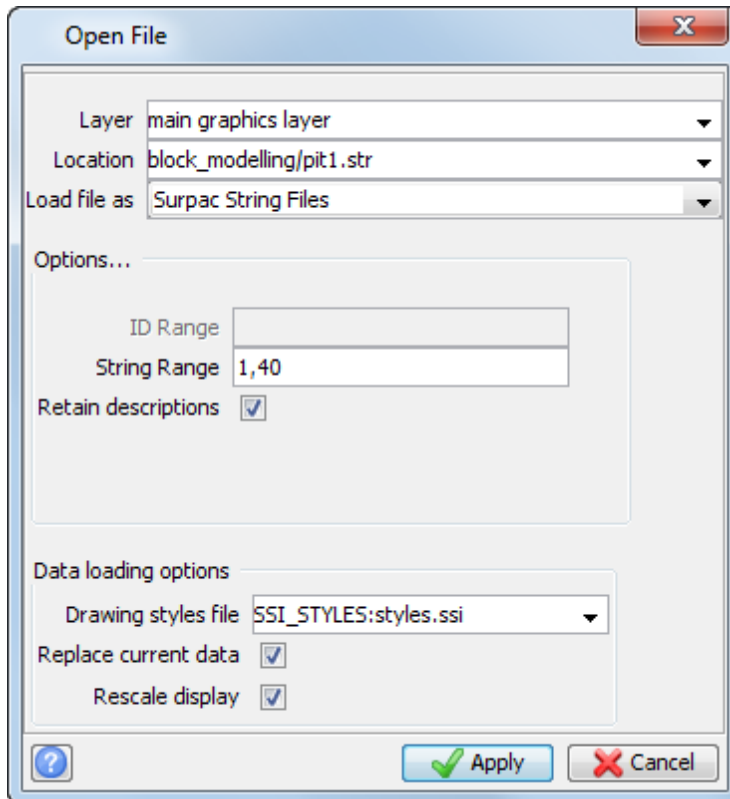
Function-centric and data-centric operations

You can perform nearly all operations in Surpac using either a function-centric or a data-centric approach. When you use a function-centric approach, you select the function, then specify the data it is going to act on. When you use a data-centric approach, you select the data, by opening it and using the selection tools in **Graphics**, and then select the function. The data-centric approach is often faster because you do not have to wait for your data to display in **Graphics** to perform the function.

Function-centric

When you run a function first, and then specify the data you want to use, you are performing a function-centric operation.

For example, when you click the icon to **Open** a file , Surpac displays a form. Then you select the file you want opened.



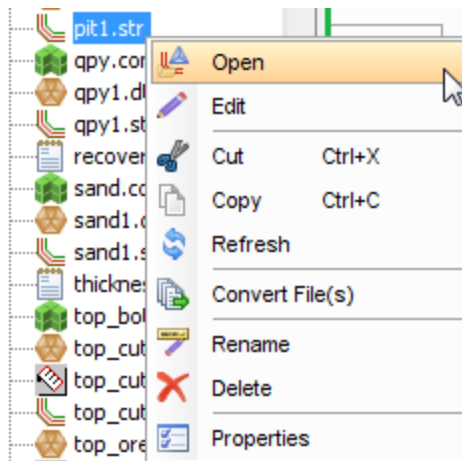
Some non-graphical operations can only be performed using the function-centric approach..

For example, to calculate volumes between two DTM surfaces, you must use the function-centric approach, selecting **Cut and Fill between DTMs** from the **Volumes** submenu, on the **Surfaces** menu.

Data-centric

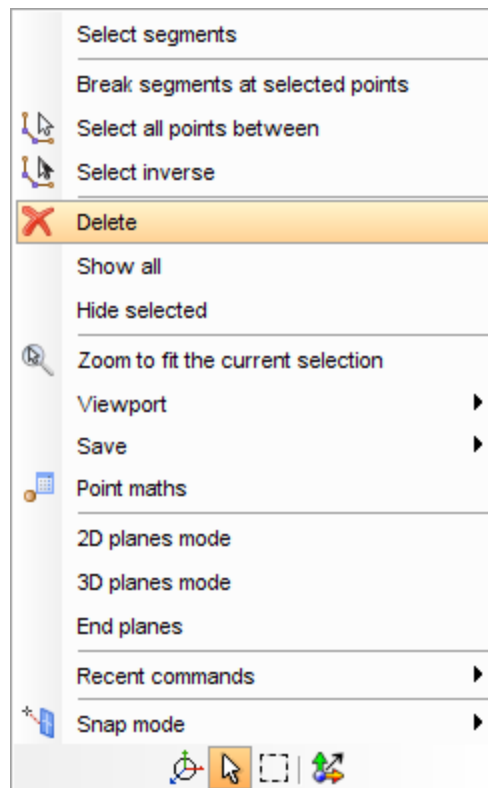
When you select data first, and then specify the function to be applied to the data, you are performing a data-centric operation.

For example, when you right-click a file, the shortcut menu is displayed. You then choose the operation to be performed, such as **Open**.



Many graphical operations are quicker and easier to perform using the data-centric approach.

For example, you can select data in a string file, and right-click to display functions that Surpac can perform on the data.




Getting started

Installing Surpac from a DVD

Task: Install Surpac


1. Insert the DVD into your computer's DVD drive.


The installation menu appears.


 **Note:** If the installation menu does not appear, use Windows Explorer to navigate to the DVD and double-click **autorun.exe**.




2. To install a 32-bit version of Surpac, click the edition you want to install. The *GEOVIA Surpac Setup Wizard* appears.
3. To install a 64-bit version of Surpac:
 - a. Click **Install 64-bit version**.
 - b. Click the edition you want to install. The *GEOVIA Surpac Setup Wizard* appears.
4. Click **Next**.
5. Choose to accept the licence agreement, and click **Next**.

 **Note:** You must accept the terms of the license agreement or the installation will not continue.
6. Click **Next** to accept the default directory, or click **Change** to select an installation directory.

 **Note:** GEOVIA recommends that you use the default locations.
7. Check that the **Sentinel Service Driver** is set to be installed on your local hard drive, and click **Next**.
8. To participate in the product development program, leave the **I would like to participate** and **Provide contact information** check boxes selected, and click **Next**.

 **Note:** GEOVIA would appreciate your participation to help us improve Surpac. This feature only collects details of the functions you use. Information about your data is *not* recorded.
9. Click **Install**.

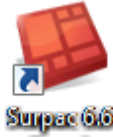
 **Note:** If Microsoft .NET Framework 4 or Direct X 9.0c are not installed on your computer, the installer for the missing component appears at the end of the Surpac installation.

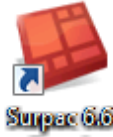
10. When Surpac is installed, click **Finish**.

Starting Surpac

Task: Start Surpac

Start Surpac, using either of these methods:



- Double-click the Surpac icon  on your desktop.
- Click **Start**, select **All Programs**, and **GEOVIA**, and **Surpac 6.6**.

Licensing Surpac

The instructions below are for installing a single user licence. In order to proceed, you will need:

- Surpac v6.6 installed, as previously described
- a USB or parallel sentinel
- a valid token number or licence file

If you do not have Surpac or a sentinel, please contact your local support office.

If you do not have a valid token number or licence file you can use the self-service licensing function when you start Surpac.

Task: License Surpac

If you already have a token number, or a licence file, complete the following steps. Otherwise, use the self-service licensing method that is described in the second procedure.

License Surpac using a token number and a sentinel

1. Ensure that your sentinel is inserted into an appropriate port on your computer.
2. Start Surpac.
If the Surpac interface is displayed, you already have a valid licence. Exit this procedure .

If you see the *Update licence* form, a valid licence does not exist. Follow the instructions within the form to request a licence from the GEOVIA Support web site, or to read the licence file.

Update licence

Licence Type none Permits unlicensed use of data viewing functions. No dongle is required.
 local A dongle must be plugged into a USB port.
 network A licence is requested from a network licence server.

Request a licence from the GEOVIA Support web site

Dongle to license: aa029292 ▼

The instructions below explain how to request a licence.

By email:
Press the By email button to create an email with the required details then press the email send button. When you receive an email reply use the Licencing->Change / Inspect licence menu item to enter the licence token.

Using the Internet:

1. Select the dongle to be licensed from the list of attached dongles and press the Using the Internet button to open up a web browser at the GEOVIA Licence Download site login page.
2. In the web browser enter your Personal Support login and password and click Enter.
3. From the next page click the Download button and save the licence file to the c:/users/public/geovia/surpac/6.6.505/share/etc/ folder.
4. After saving the licence file select local as the Licence Type and press the Apply button to activate the software.

If you need assistance or do not have a login follow the instructions on the browser login page or email loginsupport@geovia.com.

3. Select **local**, and click **Apply**.
The *Update Licence Token* form is displayed.

4. Enter the token number, and click **Validate**.

Update Licence Token

Product: Surpac Release: 6.6 Type: Beta

Build Date: Aug 8 2013 21:08:25

Dongle: ae029292

Token: d0e7d1af86e7b47f

Expires: 2014/12/31

Max Users: 2

	Module	Enabled?
1	Autoplot	<input checked="" type="checkbox"/>
2	Basic Statistics	<input checked="" type="checkbox"/>
3	Block Modelling	<input checked="" type="checkbox"/>
4	DraftSight Connector	<input checked="" type="checkbox"/>
5	Drill and Blast	<input checked="" type="checkbox"/>
6	Drill Hole Database	<input checked="" type="checkbox"/>
7	Dynamic Shells	<input checked="" type="checkbox"/>
8	Geostatistics	<input checked="" type="checkbox"/>
9	Grade Calculations	<input checked="" type="checkbox"/>
10	Graphical Sequencer	<input checked="" type="checkbox"/>
11	Hub	<input checked="" type="checkbox"/>

5. Click **Apply**.

To review licence details, or type a new token number:

- a. Choose **File > Licencing > Change/Inspect licence**.
- b. After reviewing or updating the licence details, click **Apply**.

License Surpac using the self-service licensing service and a sentinel

Note: You must have an active Internet connection to use the self-service licensing feature.

1. Ensure that your sentinel is inserted into an appropriate port on your computer.
2. Start Surpac.

The *Update licence* form is displayed.

Update licence

Licence Type none Permits unlicensed use of data viewing functions. No dongle is required.
 local A dongle must be plugged into a USB port.
 network A licence is requested from a network licence server.

Request a licence from the GEOVIA Support web site

Dongle to license: aa029292

The instructions below explain how to request a licence.

By email:
 Press the By email button to create an email with the required details then press the email send button. When you receive an email reply use the Licencing->Change / Inspect licence menu item to enter the licence token.

Using the Internet:

1. Select the dongle to be licensed from the list of attached dongles and press the Using the Internet button to open up a web browser at the GEOVIA Licence Download site login page.
2. In the web browser enter your Personal Support login and password and click Enter.
3. From the next page click the Download button and save the licence file to the c:/users/public/geovia/surpac/6.6.505/share/etc/ folder.
4. After saving the licence file select local as the Licence Type and press the Apply button to activate the software.

If you need assistance or do not have a login follow the instructions on the browser login page or email loginsupport@geovia.com.

3. Select **Request a licence from the GEOVIA Support web site**.
4. If you have multiple sentinels attached to your computer, select the sentinel you want to use for the licence.
5. Click **Using the Internet**.
The login page for GEOVIAsupport.com opens
6. Enter your GEOVIA Support user name and password.
A new page opens.
7. Click **Download**.
8. Save the **tokens.ssi** file in the Surpac SSI_ETC: directory.
9. Select **Local**, and click **Apply**.

The *Update Licence Token* form is displayed, pre-filled with the token number.

Update Licence Token

Product: Surpac Release: 6.6 Type: Beta

Build Date: Aug 8 2013 21:08:25

Dongle: ae029292

Token: d0e7d1af86e7b47f

valid

Expires: 2014/12/31

Max Users: 2

	Module	Enabled?
1	Autoplot	<input checked="" type="checkbox"/>
2	Basic Statistics	<input checked="" type="checkbox"/>
3	Block Modelling	<input checked="" type="checkbox"/>
4	DraftSight Connector	<input checked="" type="checkbox"/>
5	Drill and Blast	<input checked="" type="checkbox"/>
6	Drill Hole Database	<input checked="" type="checkbox"/>
7	Dynamic Shells	<input checked="" type="checkbox"/>
8	Geostatistics	<input checked="" type="checkbox"/>
9	Grade Calculations	<input checked="" type="checkbox"/>
10	Graphical Sequencer	<input checked="" type="checkbox"/>
11	Hub	<input checked="" type="checkbox"/>

10. Click **Apply**.

Setting the work directory

A work directory is the default directory for saving Surpac files. Files used in this tutorial are stored in the folder **<shared_files>\demo_data\tutorials\introduction**.

Where **<shared_files>** is the directory in which the Surpac shared files were installed.

In Windows Vista, Windows 7, and Windows 8, the default path is

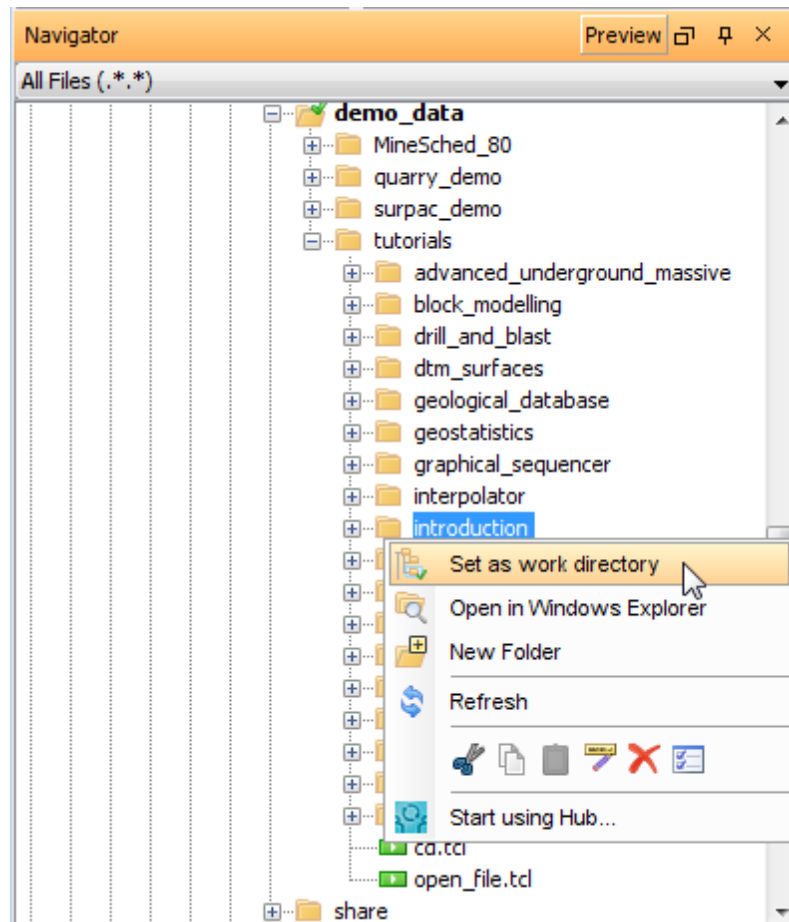
C:\Users\Public\GEOVIA\Surpac\66\demo_data\tutorials\introduction.

In Windows XP, the default path is

C:\Documents and Settings\All Users\Public\GEOVIA\Surpac\66\demo_data\tutorials\introduction.

Task: Set the work directory

1. In the Surpac Navigator, right-click the **introduction** folder.
2. Select **Set as work directory**.




The name of the work directory is displayed in the title bar of the Surpac window.

Exiting Surpac

Task: Exit Surpac

Exit Surpac, using either of these two methods:

- Choose **File > Exit**.
- Click the  button at the top right corner of the Surpac window.

Modifying the Surpac desktop icon

All of the files in this tutorial are stored in a specific directory. Each time you start Surpac, you will need to have the working directory set to that folder. The following steps describe how to create an icon that automatically sets the working directory when you start Surpac.

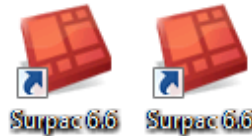
 **Tip:** You can create multiple Surpac desktop icons with different properties.

Task: Modify the Surpac icon so that the work directory is set automatically



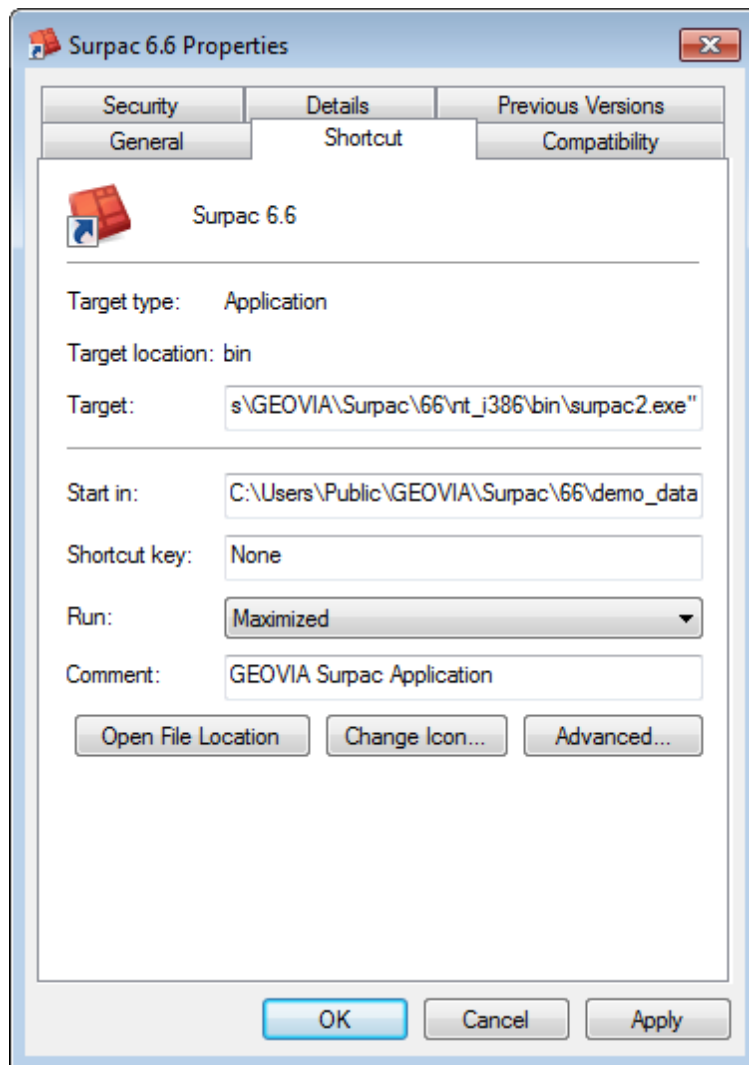
1. Move the pointer over the Surpac icon **Surpac 6.6** on your desktop.
2. Hold down the right mouse button, drag and release.
3. From the shortcut menu, select **Copy Here**.

A copy of the original icon is created:

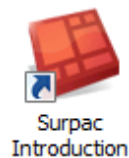


4. Right-click the new Surpac icon, and select **Properties**.
5. In the **Start in** field on the **Shortcut** tab, enter **<shared_files>\demo_data\tutorials\introduction** where **<shared_files>** is the folder where the Surpac shared files are installed.

Windows 7



6. Click **OK**.
7. Right-click the icon you have just modified, and select **Rename**.
Alternatively, you can use the **F2** key as a shortcut.
8. Type **Surpac Introduction**, and press ENTER.
The icon will appear with the new name.



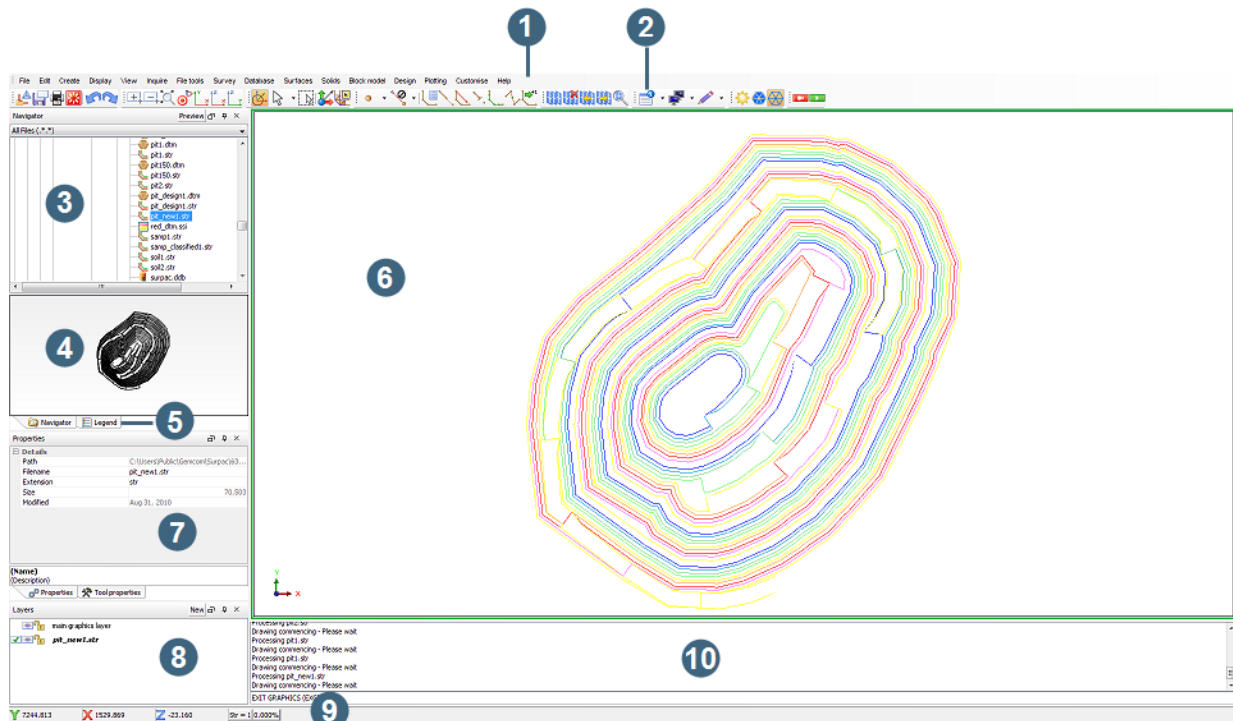
9. Double-click this icon to start Surpac.
The work directory is automatically set when Surpac starts up.

The Surpac interface

So that you can see the Surpac interface with some data files in the Navigator, ensure that you have started Surpac and set the work directory as described in the **Setup for This Tutorial** chapter.

The Surpac interface consists of 10 different areas:

1. Menus
2. Toolbars
3. Navigator
4. Preview pane
5. Legend pane
6. Graphics
7. Properties pane
8. Layers pane
9. Status bar
10. Message window

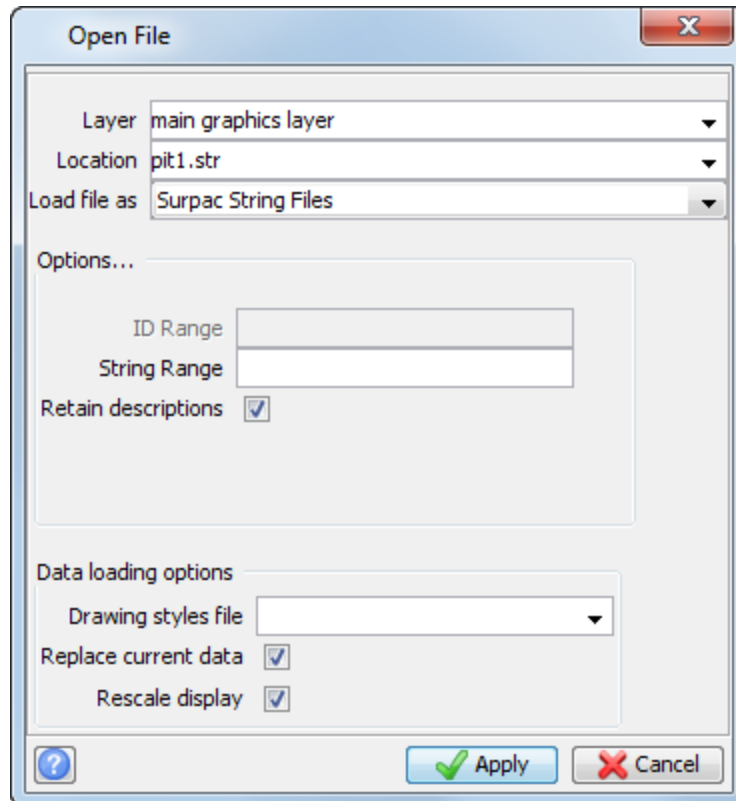


Menus

The menus organise the functions into groups according to the modules in Surpac, such as the Block Model module.

Task: Open a file using the menu

1. Choose **File > Open > String/DTM file**.
2. Enter the information as shown, and click **Apply**.




The file **pit1.str** is displayed.



Toolbars

A toolbar is a collection of icons that have related functions. By using toolbars, you can access commonly used functions directly without having to search through the menus.

Task: Use the Reset graphics button from the toolbar

1. Open **pit1.str** in **Graphics**.
2. Click **Reset graphics** .

This function removes all the data that is displayed in **Graphics**.

If data has been modified, Surpac will display a form to allow you to save the file. This is described in more detail in the chapter **Viewing and Saving Data**.

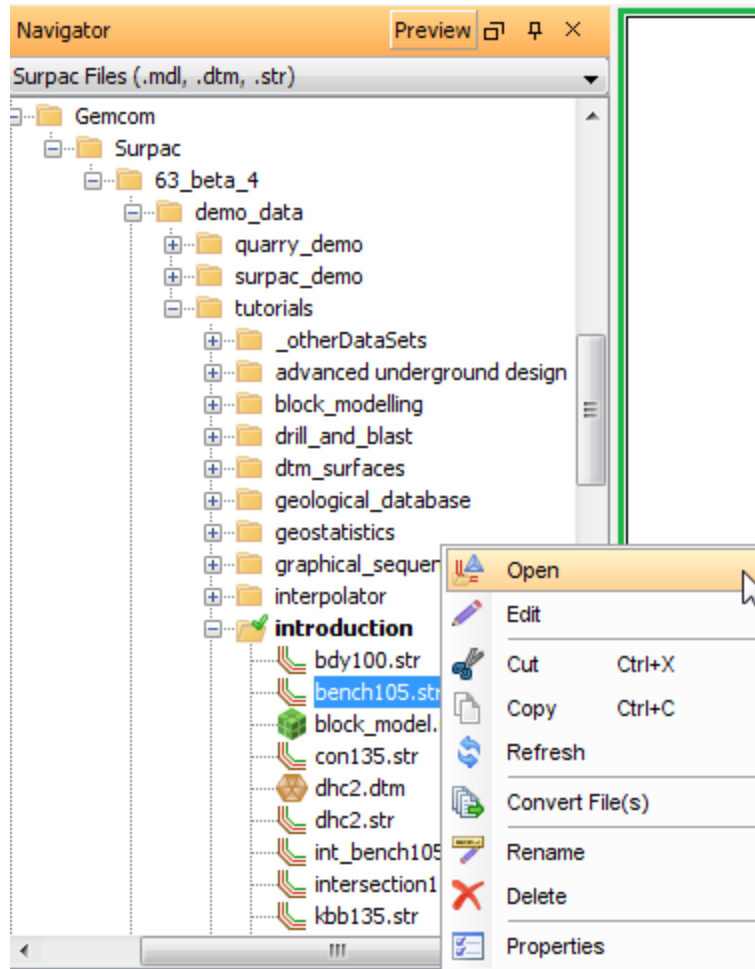
Navigator

The Navigator works like Windows Explorer. Using the Navigator, you can manage your files and directories by creating new folders, cutting, copying, pasting, and deleting files and folders.

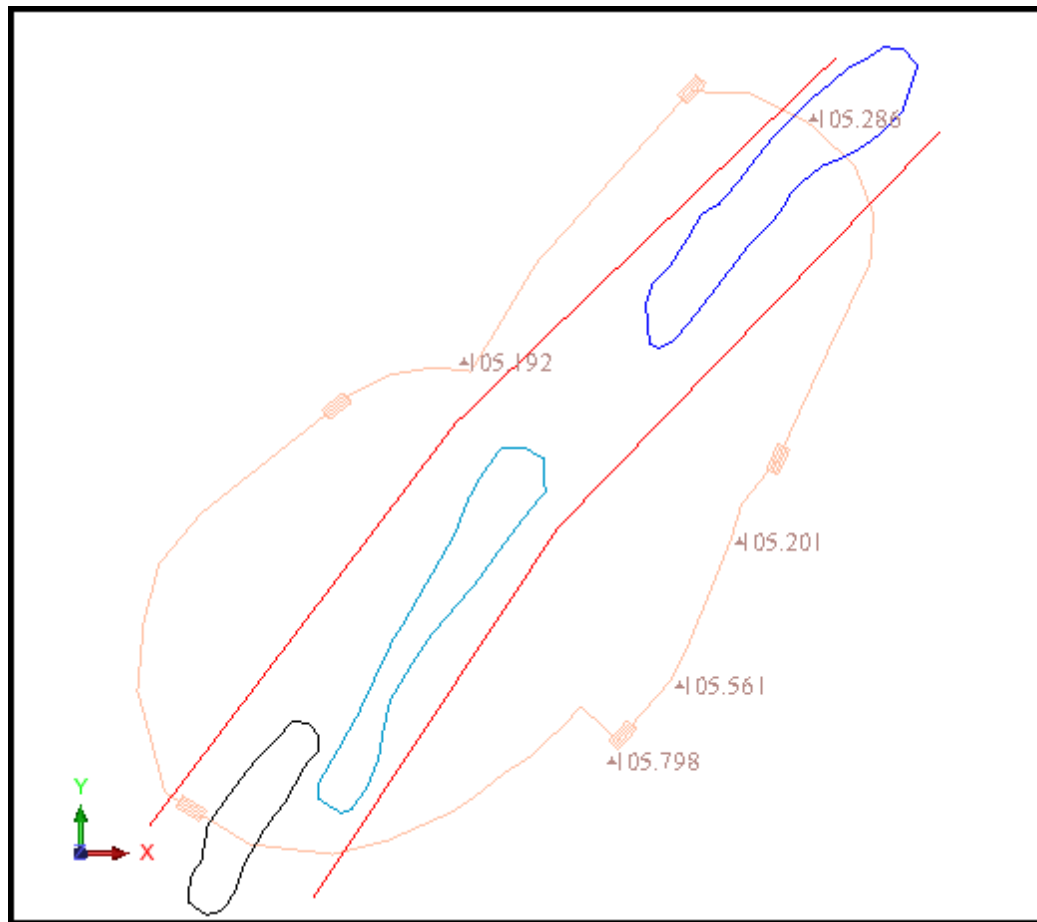
Task: Open a file from the Navigator

1. In the File Filter in the Navigator, select **Surpac Files (.mdl,.dtm,.str)**.
2. Right-click the file **bench105.str** in the Navigator.

3. From the shortcut menu, select **Open**.



bench105.str is displayed.



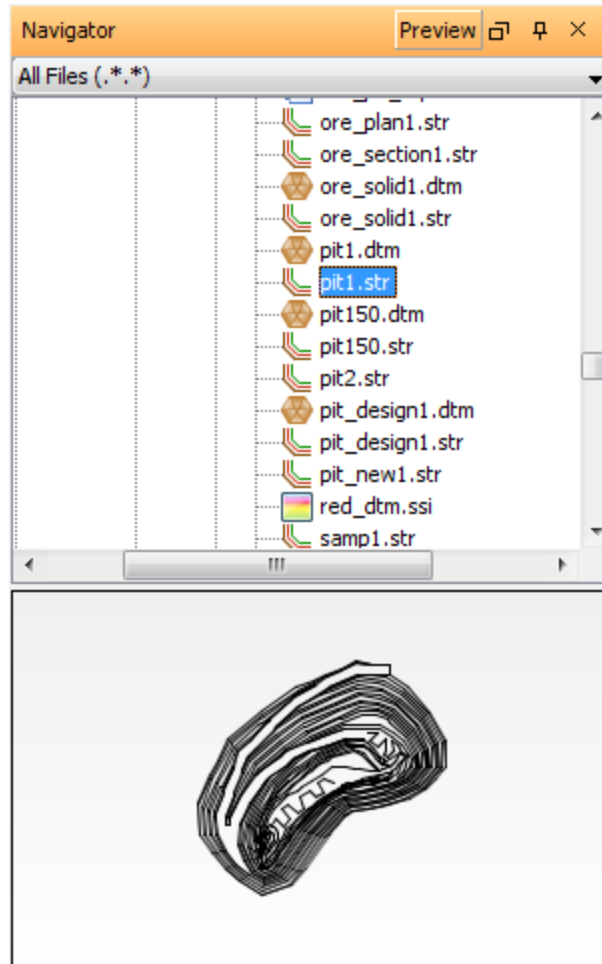
4. In the File Filter, select **All files**.

Preview pane

The **Preview** pane displays string data without the need to load it into **Graphics**.

Task: Display a string file in the Preview pane

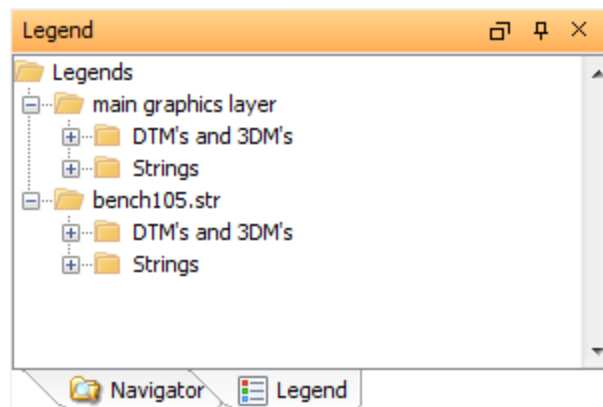
1. If the **Preview** pane is not displayed, click the **Preview** button at the top of the Navigator.
2. Click **pit1.str** in the Navigator.
3. Click and drag in the **Preview** pane to rotate the data, as shown.



4. Click the **Preview** button again to close the **Preview** pane.

Legend pane

This is the area where you can see the legends for data in **Graphics**.

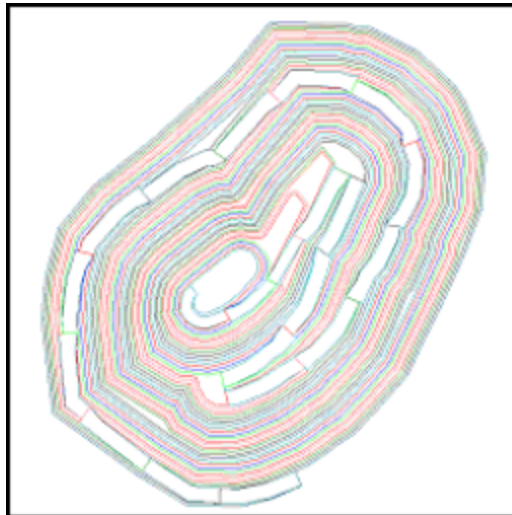


Graphics

Known as the graphics area, or simply **Graphics**, this is the area where you perform most of the work in Surpac. The graphics area is a three-dimensional work area. Any file loaded into **Graphics** has Y, X, and Z coordinates.

Task: Display and view data in Graphics

1. Click **Reset graphics** .
2. To open the file, drag **pit_design1.str** into **Graphics**.
The file **pit_design1.str** is displayed.



3. Perform the following steps:
 - a. Use the left mouse button to rotate the image.
 - b. Use the right mouse button to zoom in and out based on the centre of the image.
 - c. Use the wheel button, or both mouse buttons, to pan the image.
 - d. Use the wheel button to zoom in or out in relation to the current location of the pointer.

Properties pane

This is the area where you see:

- the properties of your file data when the Navigator is active
- information about data loaded in **Graphics** when Surpac is in select mode and you have data selected

Properties	
Information	
Layer	int_bench105.str
String	1
Segment	1
Details	
3D length	135.706
2D length	135.706
Point count	17
Closed	True
Direction	Clockwise
2D area	926.26

Layers pane

This is the area where you manage your data in layers. This is described in more detail in the chapter **Managing Data in Layers**.



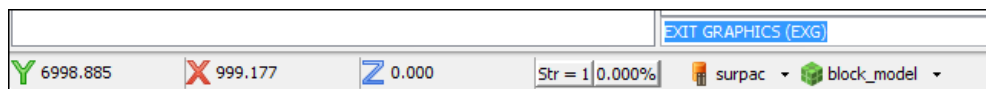
Status bar

The Status bar shows the coordinate position of the mouse pointer as well as the string number and design gradient. The Status bar also shows whether a database or block model is loaded into memory.

Task: View changes to the Status bar

1. Open **surpac.ddb** (a geological database) in **Graphics**.
2. Open **block_model.mdl** (a block model) in **Graphics**.

Two buttons have been added to the status area, indicating that a database named **surpac** and a block model named **block_model** are loaded:



3. Move the pointer within **Graphics** .
The coordinates shown in the status area are updated as you move the mouse.
4. In the Status bar, click the **surpac** button, and select **Close**.
5. Click the **block_model** button, and select **Close**.

Message window

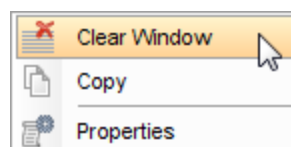
The **message window** shows the information, warnings, and error messages that Surpac produces while it is executing functions.

Tip: Sometimes the **message window** also contains information such as coordinates of selected points or properties of files in **Graphics**. You can copy this information and paste it into text files or documents.

```
Changed working directory to c:\users\public\geovia\surpac\66\demo_data\tutorials\introduction
Processing pit1.dtm
Drawing commencing - Please wait
```

Task: Clear the message window

1. Right-click in the **message window** to display a shortcut menu.
2. Select **Clear Window** .



Getting help

You can use the following resources to help you solve a problem, understand how a function works, or enter data into a form:


- field help and form help
- online help
- tutorials
- support
- software request

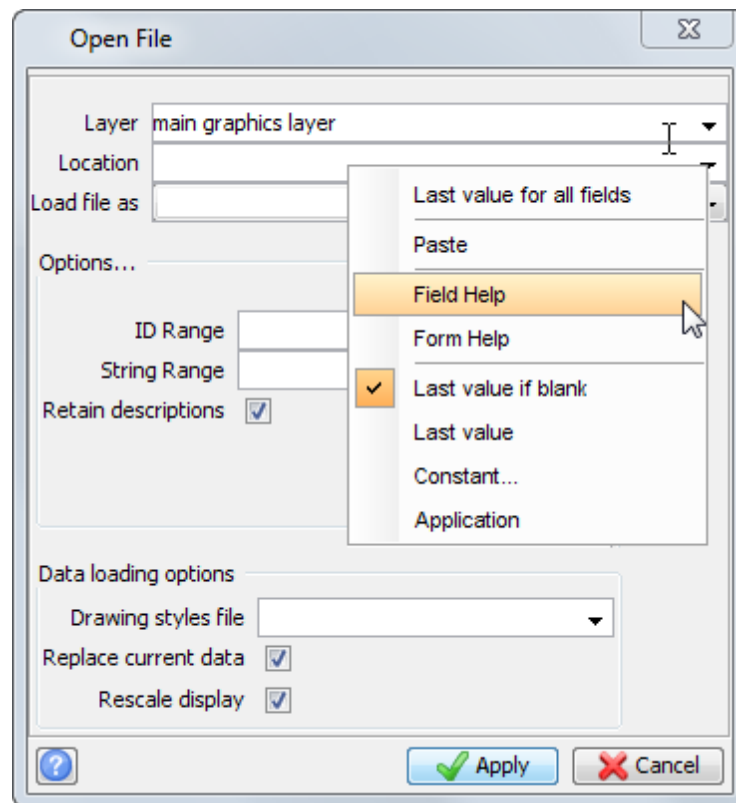
Field help and form help

When you need to enter information, Surpac will display a form. The boxes on the form where you enter information are known as fields. From within a form you can access the **Field help** and **Form help**.

- By accessing **Field help**, you can get helpful information about each field.
- By access **Form help**, you can get helpful information about the entire form.

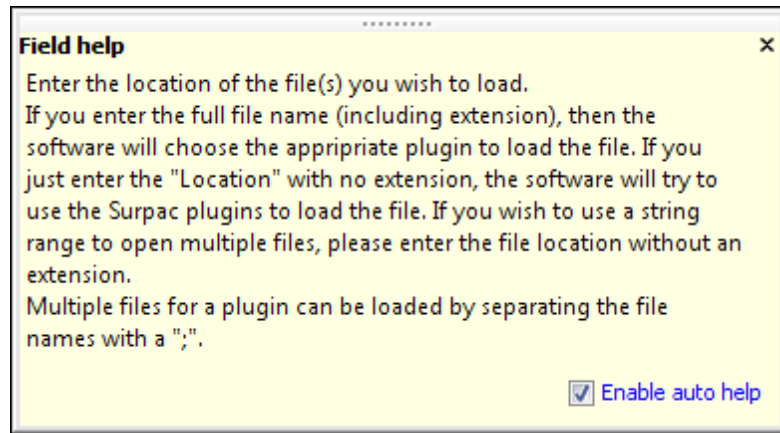
Task: Access field help and form help

1. Click **Reset graphics** .
2. Choose **File > Open > String/DTM file**.
3. Click the **Location** field, and right-click to display the shortcut menu.

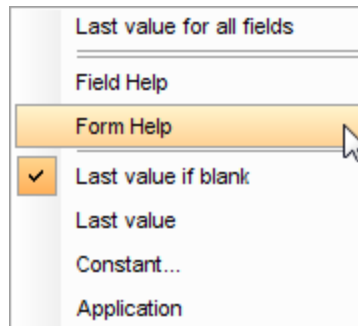


4. From the shortcut menu, select **Field Help**.

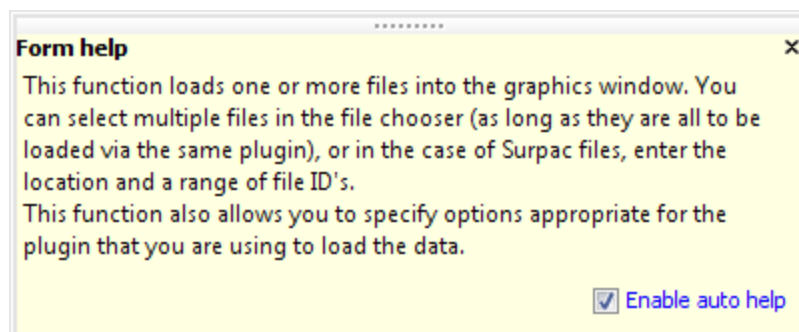
A window with help that is specific to the field you selected appears.



5. Press TAB several times.
The help text changes as you tab to different fields in the form. This happens because the **Enable auto help** check box is selected.
6. Clear the **Enable auto help** check box.
7. Press TAB several times.
The help text does not change.
8. Select the **Enable auto help** check box.
9. Click the **X** button in the upper right corner of the help window to close it.
10. Click and right-click in a field to display the shortcut menu.



11. From the menu, select **Form Help**
A window with help about the function **Open file** is displayed.




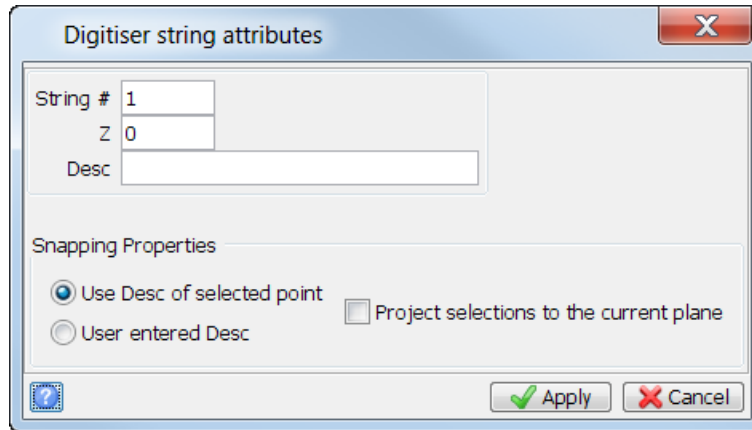
12. Close the form help, and click **Cancel** on the *Open File* form.

Online help

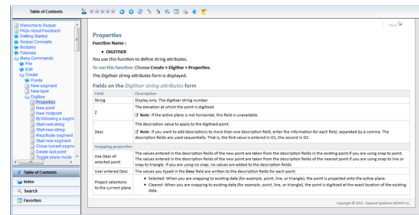
Online help contains more detailed information than field help and form help. The online help also has examples and troubleshooting information.

Task: Access online help from a form

1. Choose **Create > Digitise > Properties**.
2. Click the  button at the lower left corner of the form.



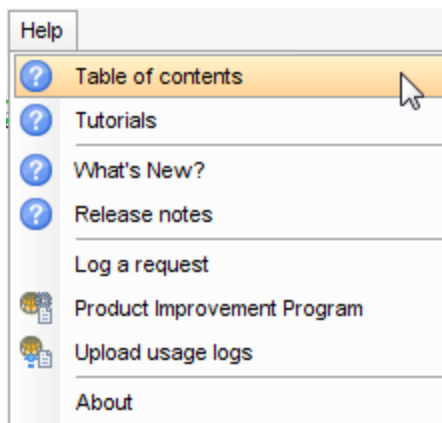
The online help for the DIGITISER function is displayed.



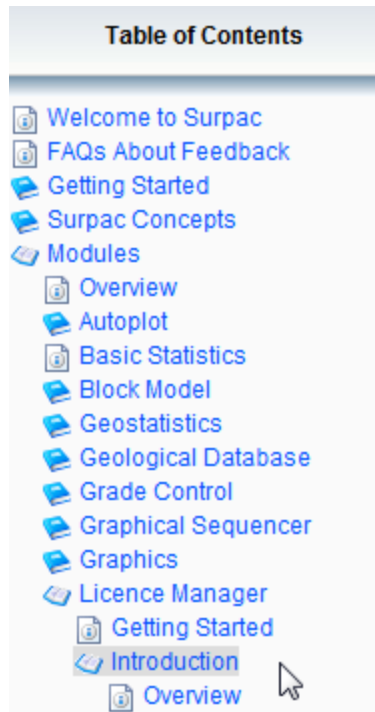
3. Close the help window.

Task: Access help from the help menu

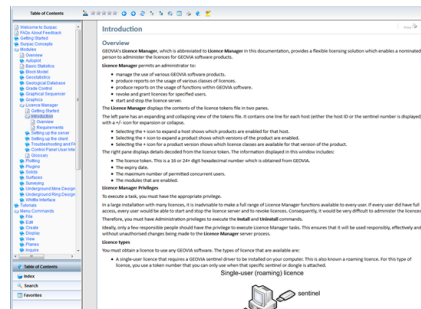
1. In Surpac, from the **Help** menu, select **Table of contents**.



2. In the lower left corner, click the **Table of Contents** tab.
3. In the table of contents, expand **Modules**, then **Licence Manager**, and click **Introduction**.



The help for the **Licence Manager** is displayed.



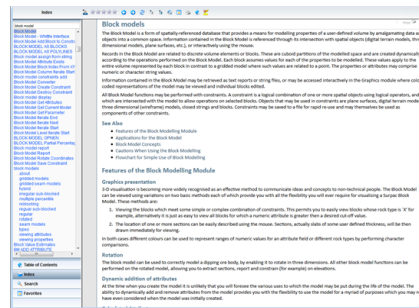
4. Close the help window.

Task: Use the index to search for information

You can use the **Index** to find the information you need.

1. In Surpac, from the **Help** menu, select **Table of contents**.
2. In the lower left corner, click the **Index** tab.
3. In the text box at the top, slowly type each letter of the word **Block Model**.
After you type each letter, the help system selects the index entry that is the closest match.
4. Press ENTER.

The help for Block Models is displayed.



5. Close the help window.

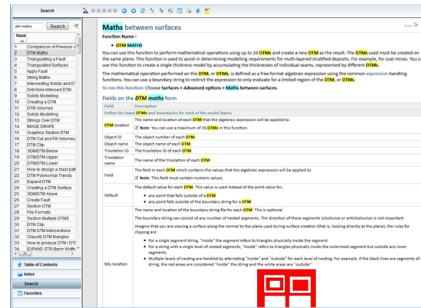
Task: Search the online help

1. In Surpac, from the **Help** menu, select **Table of contents**.
2. Click the **Search** tab.
3. Type the words **DTM Maths**, and click **Search**.

This search returns all the help topics that contain both the words “DTM” and “Maths”.

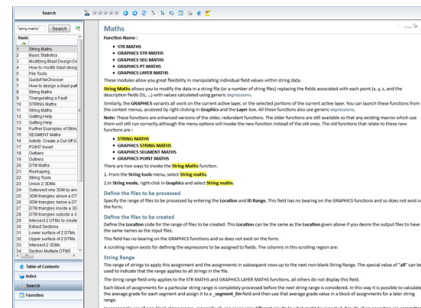
The topics that contain the most occurrences of these words are ranked higher in the list.

- Click the topic that is ranked 2 in the list, **DTM Maths**.



You can do a phrase search by enclosing your search in quotation marks.

- Type **"String Maths"**(including the quotation marks) in the **Search** box, and click **Search**. This search returns all the help topics that contain exact phrase **"String Maths"**.
- Click the topic that is ranked 1 in the list, **String Maths**.
- You can see the text **"String Maths"** is highlighted.



Tutorials

Tutorials are designed to teach you how specific functions work within a practical, task-based environment, by working through exercises using a specific dataset.

Surpac tutorials are available through the **tutorials** profile. When you install the software from the DVD, the tutorials are installed to the following folder location:

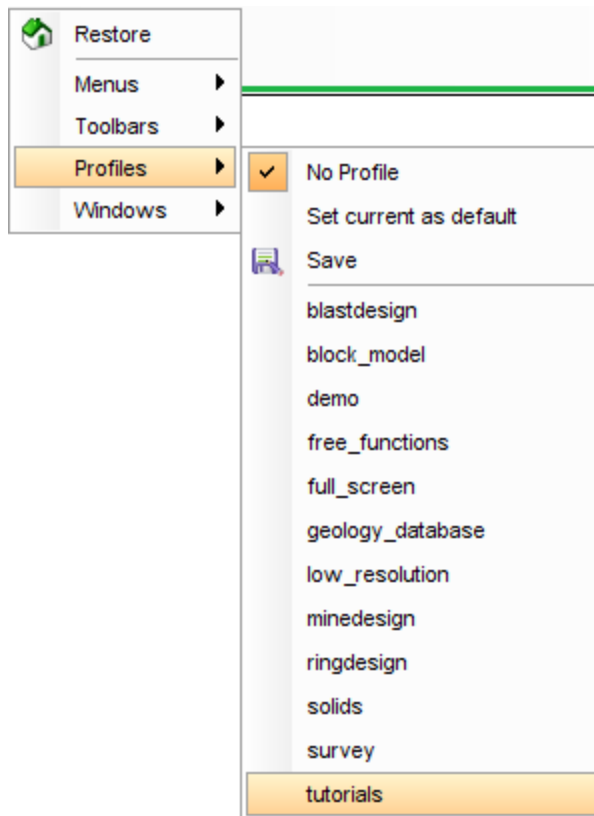
<shared_files>\demo_data\tutorials

where **<shared_files>** is the folder where the Surpac shared files are installed.

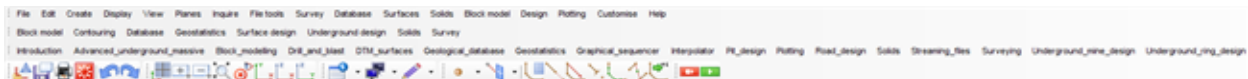
Each directory contains a tutorial in PDF format, as well as a data directory containing the files required to perform the exercises outlined in the tutorial.

Task: Access the tutorials profile

1. Right-click in the blank area to the right of the main menus.
2. From the shortcut menu, choose **Profiles > tutorials**.



A set of menus for the tutorials are displayed.




To view the tutorials or run the macros for the tutorials, you must first click the menu item to change the directory to your chosen tutorial.


You can then either view the tutorial document as a PDF or run the macros that appear in the tutorial.

Internet download

You can also download the complete set of tutorials.

1. In your web browser, type <http://www.GEOVIAsupport.com>.
2. Log in to the GEOVIA support site.
3. Click **Downloads**.
4. Under **GEOVIA Surpac**, click **Surpac Downloads**.
5. Click **Tutorials**.

 **Note:** You will need login credentials to enter the GEOVIA Support site. Contact your local support office if you do not have this information.

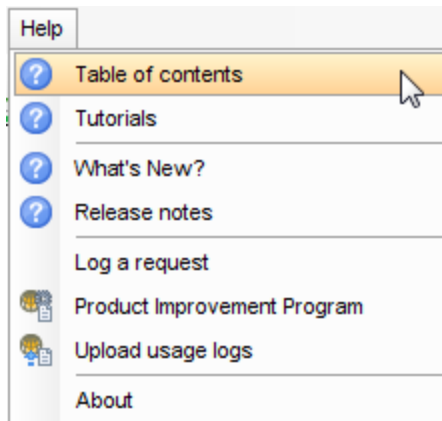
 **Tip:** The information offered on the support site may be more recent than those from the DVD installation.

Support

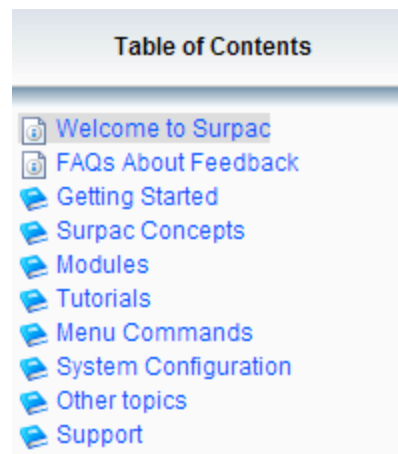
You can contact your local support office by phone or email.

Task: Find support office contact details

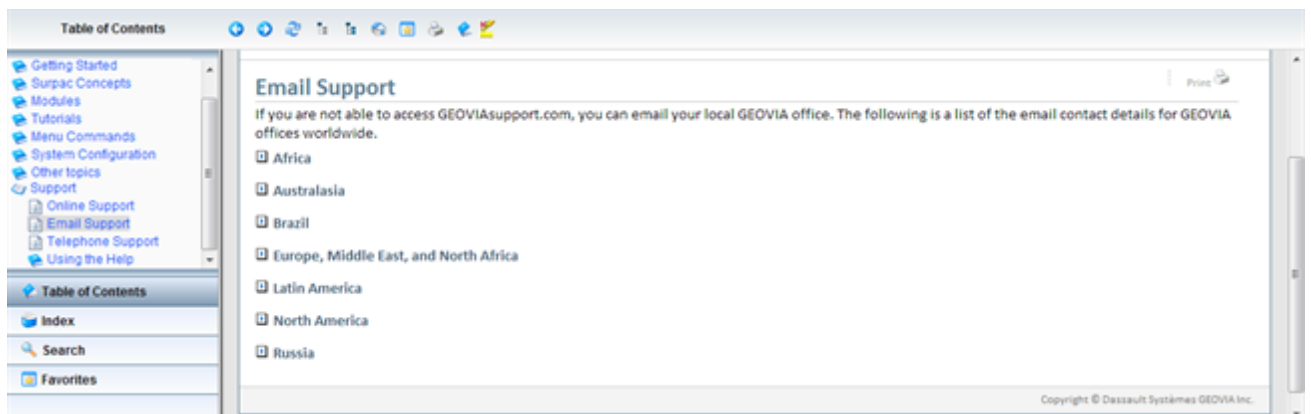
1. Choose **Help > Table of Contents**.



2. In the lower left corner, click **Table of Contents**.
The table of contents is displayed on the left side of the screen.



3. Expand the **Support** book, click **Email Support**, then click your region.



The contact details of the regional office are displayed.

<input checked="" type="checkbox"/> Africa GEOVIA.Africa.Support@3ds.com
<input checked="" type="checkbox"/> Australasia GEOVIA.AP.Support@3ds.com
<input checked="" type="checkbox"/> Brazil GEOVIA.BR.Support@3ds.com
<input checked="" type="checkbox"/> Europe, Middle East, and North Africa GEOVIA.EU.Support@3ds.com
<input checked="" type="checkbox"/> Latin America GEOVIA.LATAM.Support@3ds.com
<input checked="" type="checkbox"/> North America GEOVIA.NAM.Support@3ds.com
<input checked="" type="checkbox"/> Russia GEOVIA.RU.Support@3ds.com

Strings

A string file is the most common file format used to store information in Surpac. A string file contains coordinate information for one or more points, as well as optional descriptive information for each point. To enable you to work more efficiently with strings, it is important that you understand how Surpac organises and uses data stored within a string file.

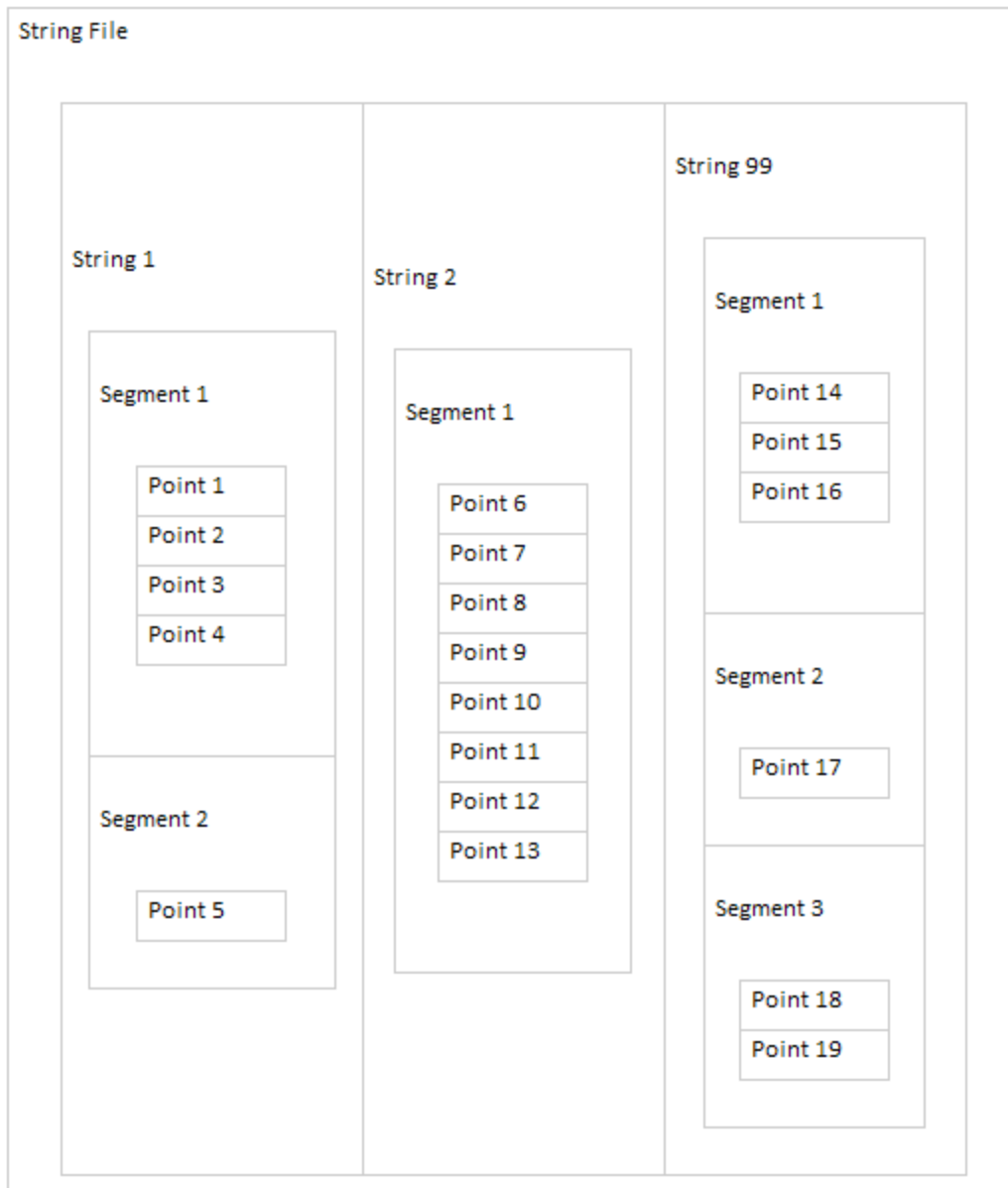
String data hierarchy

Data in a string file is classified into:

- points
- segments
- strings

All points in a string file are grouped into segments, which are further grouped into strings.

The example below shows conceptually how a string file contains strings, which contain segments, which contain points.



Types of strings

There are three types of strings:

- open
- closed
- spot height

The table below explains these terms.

Surpac term	Common term	Example
Open string	Line	Drill hole trace
Closed string	Polygon	Property boundary
Spot height string	Points not associated with a line or polygon	Blast hole collar locations

Description fields

Points, strings, and segments can have one or more pieces of descriptive information associated with them. This information is stored in a description field. Description fields are named according to the order they appear. Description fields are named in the format **D<incremental number>**, such as **D1, D2, D3**.

For example, a closed segment representing an ore zone could have the gold grade, silver grade, and specific gravity stored in separate description fields. If the information is stored in that order, they could be assigned as follows:

D1: gold grade

D2: silver grade

D3: specific gravity

Data numbering


Strings, segments, and points are identified by unique numbers. You can assign string numbers to represent particular features, such as string 1 for toes in a pit, string 2 for crests, and string 99 for spot heights. Surpac automatically assigns segment numbers and point numbers.

Data ranges

You can use a range to refer to groups of data numbers, such as strings, segments, and points.

The comma (,) is used for a range that includes a start, an end, and, optionally, an increment. You use the following format to specify such a range in Surpac:

<start>,<end>,<increment>

 **Note:** When the increment is 1, you can use **<start>,<end>** without specifying the increment.

The semicolon (;) is used to identify unique values, or to separate multiple ranges.

Here are some examples:

Data values	Range	Description
1 2 3 4 5 6 7 8	1,8	from 1 to 8, at an increment of 1 (implied)
1 3 5 7	1,7,2	from 1 to 7, at an increment of 2
2000 2200 2400	2000,2400,200	from 2000 to 2400, at an increment of 200
1 6	1;6	1 and 6
2 6 9	2;6;9	2 and 6 and 9
2 3 4 5 6 9	2,6;9	from 2 to 6 at an increment of 1 (implied) and 9
25 50 60 70 80 90	25;50,90,10	25 and from 50 to 90 at an increment of 10
3 6 9 12 15 20 30	3,15,3;20;30	from 3 to 15, at an increment of 3 and 20 and 30
5 10 15 20 40 50 60	5,20,5;40,60,10	from 5 to 20, at an increment of 5 and from 40 to 60, at an increment of 10

String file names

Surpac string file names have the following components:

Component	Description	Required?
Location	Any combination of characters and numbers	Required
ID	Numbers only	Optional
Extension	Always .str	Required

Here are some examples of file names:

File name	Location	ID	Extension
pit.str	pit		.str
bench105.str	bench	105	.str
2007design.str	2007design		.str
2007design2.str	2007design	2	.str
grade_control135.str	grade_control	135	.str
dhcomp2_50.str	dhcomp2_	50	.str
level-300.str	level	-300	.str

Spaces in file names are not recommended. In some situations, Surpac might not work correctly if you are using a file that has a space in the file name.

You can use ranges to refer to the ID of filenames. For example, you can refer to the files:

geo130.str, geo140.str, geo150.str, geo160.str, geo170.str

using the following syntax:

Location: geo ID: 130,170,10

String directions


When you view closed strings in the XY plane, the points have an order that is either clockwise or anticlockwise. This direction is important when calculating areas and volumes.

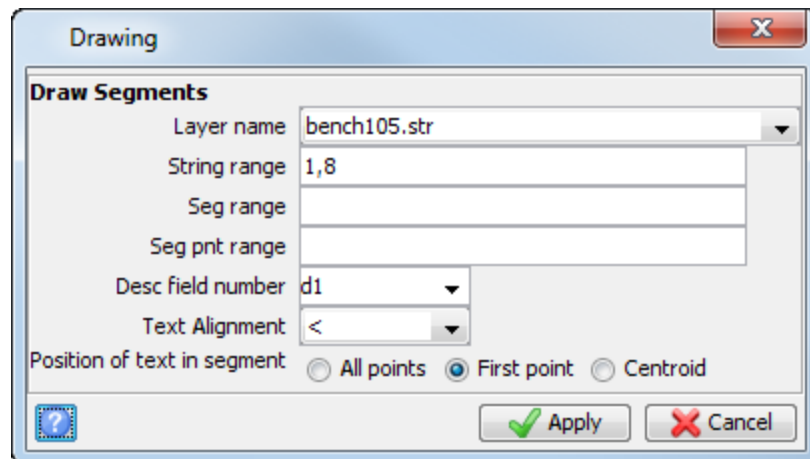
- Clockwise strings represent an area of inclusion.
- Anticlockwise strings represent an area of exclusion.

Viewing string data

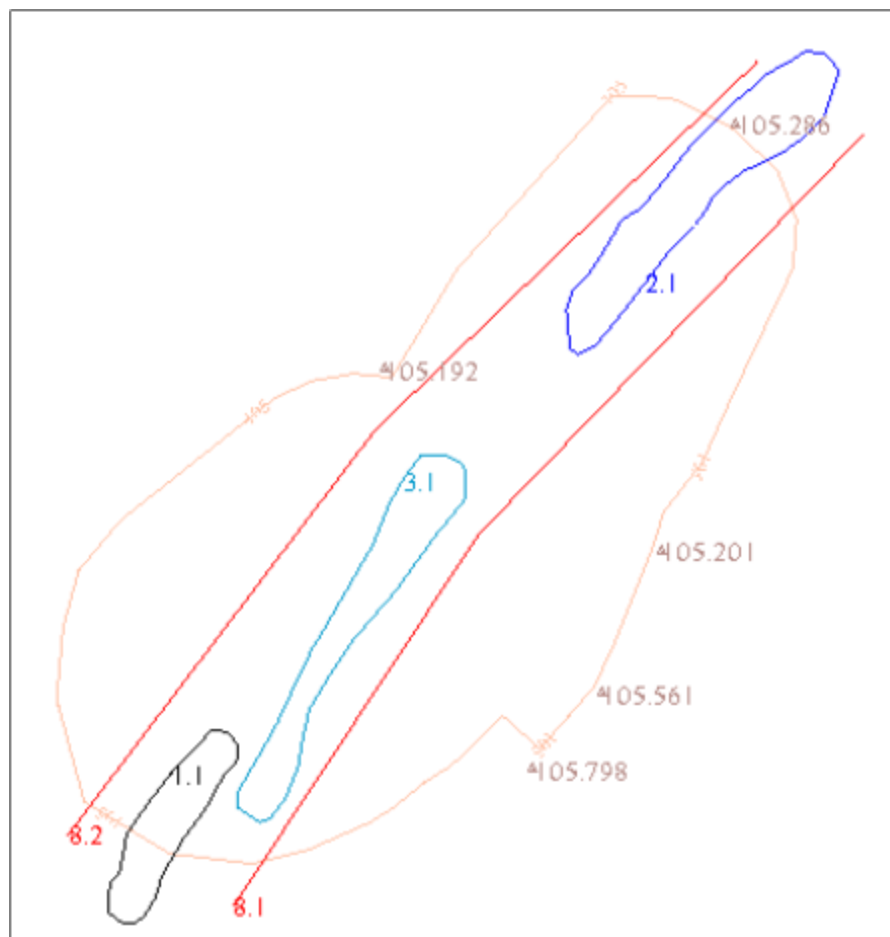
Here is an example that demonstrates the previous concepts.

Task: View string data

1. Click **Reset graphics** .
2. Open **bench105.str** in **Graphics**.
3. Choose **Display > Strings > With string and segment numbers**.
4. Enter the information as shown, and click **Apply**.



The file **bench105.str** is displayed.

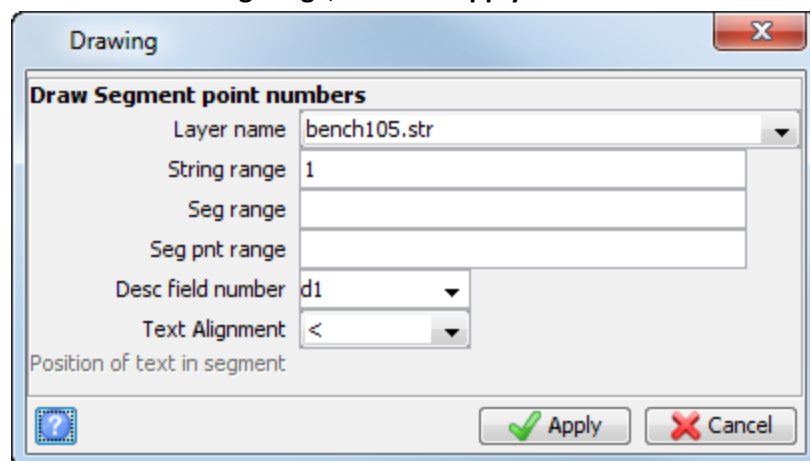


The data in this file represents a horizontal view, also known as a plan view, of a pit design, the survey stations, and the geology for one level in a pit.

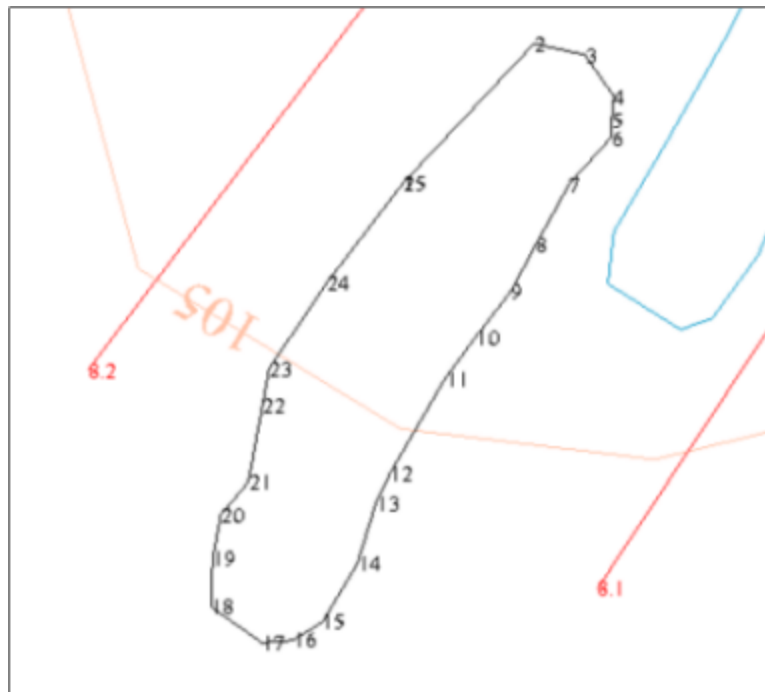
The data is organised as follows.

String number	Segment number	Data	Type	D1	D2	D3
1	1	Low grade ore	Closed	Gold (g/t)	Silver (g/t)	SG
2	1	Medium grade ore	Closed	Gold (g/t)	Silver (g/t)	SG
3	1	High grade ore	Closed	Gold (g/t)	Silver (g/t)	SG
8	1	Footwall trace	Open	footwall		
8	2	Hangingwall trace	Open	hangingwall		
30005	30005	Pit design toe	Closed			
30008	30008	Survey stations	Spot height	Station name		


5. Choose **Display > Point > Numbers**.
6. Enter a value of 1 for the **String range**, and click **Apply**.



The order of points for string 1 is clockwise in the XY plane.



7. Click **Reset graphics** .

 **Note:** To see all the steps performed in this task, run `01a_viewing_string_data.tcl`. You need to click **Apply** on any forms presented.

String file structure

Sometimes it is helpful to view the contents of a string file in a text editor.

Task: View string data in a text editor

1. From the Navigator, right-click **bench105.str**, and select **Edit**.
The file opens in your text editor.

```

bench105, ,SSI_STYLES:styles.sst
0, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000
1, 7251.877, 1605.882, 105.000, 1.23,14.23,2.7
1, 7269.668, 1622.639, 105.000, 1.23,14.23,2.7
1, 7268.251, 1629.151, 105.000, 1.23,14.23,2.7
...
...
1, 7239.170, 1596.134, 105.000, 1.23,14.23,2.7
1, 7251.877, 1605.882, 105.000, 1.23,14.23,2.7
0, 0.000, 0.000, 0.000,
2, 7445.523, 1793.471, 105.000, 2.46,24.67,2.62
2, 7437.376, 1787.157, 105.000, 2.46,24.67,2.62
2, 7429.764, 1781.293, 105.000, 2.46,24.67,2.62
...
...
2, 7458.524, 1803.336, 105.000, 2.46,24.67,2.62
2, 7445.523, 1793.471, 105.000, 2.46,24.67,2.62
0, 0.000, 0.000, 0.000,
3, 7367.273, 1697.309, 105.000, 4.75,11.97,2.65
3, 7377.687, 1704.914, 105.000, 4.75,11.97,2.65
3, 7377.747, 1714.138, 105.000, 4.75,11.97,2.65
...
...
3, 7358.097, 1692.192, 105.000, 4.75,11.97,2.65
3, 7367.273, 1697.309, 105.000, 4.75,11.97,2.65
0, 0.000, 0.000, 0.000,

```


- The first line is known as the **header record**, and contains these items: file name, date modified, purpose (which is empty in this example), styles file.
- The second line contains the **axis record**. This is a two-point line used in some sectioning functions. For many string files this is not required; when it is not required, values of zero are used for all coordinates. The Y, X, and Z values of each of the two end points of the axis are stored in the following order: Y(1), X(1), Z(1), Y(2), X(2), Z(2).
- The third line is the start of **string data**, and is stored as String number, Y, X, Z, D1, D2, D3, ... D100.
- A **null record** indicates the end of a segment.
- String 1 is closed, because the first point and the last point are the same.
- When the file was created, the following values were chosen: D1 = gold (g/t), D2 = silver (g/t), and D3 = SG. String 1 outlines an area of low grade ore with:
 - a gold value of 1.23 grams/tonne.
 - a silver value of 14.23 grams/tonne.
 - a specific gravity of 2.7.

2. Scroll down in the file to see the data as shown.

```
0, 0.000, 0.000, 0.000,
8, 7199.895, 1630.789, 105.000, footwall
8, 7346.360, 1727.625, 105.000, footwall
8, 7503.229, 1878.935, 105.000, footwall
0, 0.000, 0.000, 0.000,
8, 7227.920, 1565.439, 105.000, hangingwall
8, 7387.427, 1686.744, 105.000, hangingwall
8, 7532.455, 1837.632, 105.000, hangingwall
0, 0.000, 0.000, 0.000,
30005, 7356.295, 1801.489, 105.000,
30005, 7355.173, 1800.666, 105.000,
... ..
30005, 7356.295, 1801.489, 105.000,
0, 0.000, 0.000, 0.000,
30008, 7253.261, 1749.263, 105.798, STATION_105A
30008, 7283.412, 1776.295, 105.561, STATION_105B
30008, 7339.854, 1799.957, 105.201, STATION_105C
30008, 7411.188, 1690.666, 105.192, STATION_105D
30008, 7508.075, 1829.604, 105.286, STATION_105E
0, 0.000, 0.000, 0.000,
0, 0.000, 0.000, 0.000, END
```

- String 8 is open, since the first and last points are different.
- String 8 consists of two segments.
- String 30005 is closed, since the first and last points are the same.
- String 30008 is a spot height string with the survey station name in the D1 field.

3. Exit the text editor without saving any changes.

 **Note:** Manually editing string files is not recommended. If the format becomes corrupt, Surpac may not work correctly when using the file.

Planes

Planes definitions are "corridors" in space used for displaying data. The definitions are created by defining a flat plane (horizontal, vertical, or inclined) with a "towards" and "away" distance. The corridor width is equal to the towards distance plus the away distance. Planes definitions are simply referred to as planes. When a plane is active, data within the corridor is displayed, and data outside the corridor is hidden.

Viewing planes can be useful for a number of tasks. Geologists use planes to view vertical cross-sections of drillhole and surface topography data. Engineers use planes to view horizontal sections of a block model while creating a pit design. Surveyors use planes to create cross-sections of areas which have been mined to display the cut for a specified period.

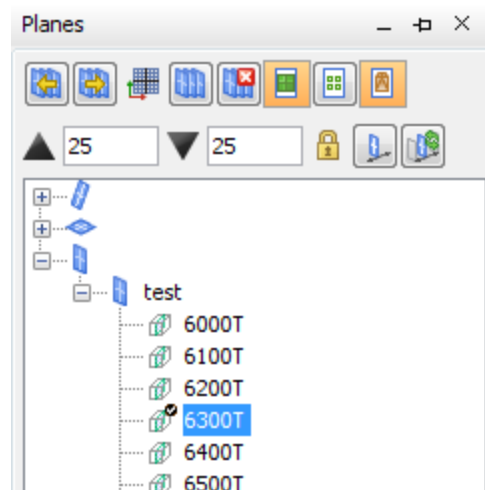
Active plane

The "active plane" is the plane on which the data is projected in **Graphics**. By default, if you have not selected a plane, the initial plane that is active when you start Surpac is a horizontal plane that has an elevation of zero with projection distances of 10000 above and below. Any data beyond the projection distances from this plane (that is, outside the corridor) is hidden.

You can find out which plane is active in **Graphics** by looking at the Status bar or the **Planes** panel. The Status bar shows you the name of the active plane.



The **Planes** panel shows a check mark next to the active plane.



Planes panel

The **Planes** panel is available on start-up at the upper right of **Graphics**. By default, the panel is collapsed. You can view the panel by clicking it, and you can unpin the panel to change its location.

Storing planes

You can create, view, and interact with a group of planes and store them temporarily or permanently to planes files in the **Plan view**, **Vertical sections**, or **Incline sections** folders. If you store planes temporarily, when you exit Surpac, the planes are removed from the planes folders. However, if you store planes permanently, the planes will be available for future sessions in Surpac.

Planes viewing modes

You can view your data in **Graphics** in two-dimensional (2D) or three-dimensional (3D) mode. The Status bar in the lower-left corner of the Surpac window shows you the current setting (2D or 3D).

2D mode

In 2D mode, all data is projected onto a single active plane; Vertical, Inclined, or Plan. The view in **Graphics** is perpendicular to this plane. When you view data in 2D mode, a grid with the same position as the active plane is displayed. If you have not set an active plane, then the view is Plan, and the elevation is zero.

2D mode locks the data to the active plane, so you can digitise onto the active plane, zoom in or out, or pan, but you cannot rotate the data.

3D mode

In 3D mode, the data is displayed in **Graphics** in three dimensions. In this mode you can zoom in and out, pan, and rotate the data.

Planes groups

Planes groups are a collection of one or more parallel planes saved to the Plan, Vertical, or Inclined folders in the **Planes** panel.

The group name is the name of the folder in which the planes are stored.

Planes projection distance

When you set up planes, you define the default thickness of the corridor. The corridor thickness is also known as the projection distance. You can modify the projection distance of a plane.

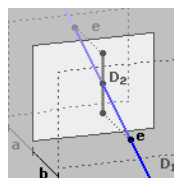
Usually, Surpac displays, selects, and reports data that is inside the projection distance of the active plane.

A plane has projection distances on each side:

- toward the view plane
- away from the view plane

The orientation of the plane determines which projection distance is towards and which is away. Together, the two projection distances determine the total thickness of the plane corridor.

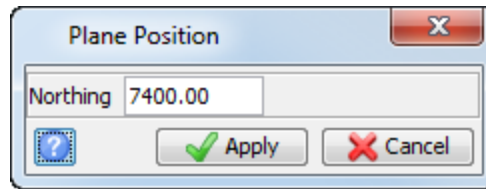
In the following example, the plane thickness is **a + b**. The projection distance away is **a**. The projection distance towards is **b**. **D1** is the drillhole trace, and **D2** is the trace orthogonally projected onto the plane. Point **e** shows where the drillhole trace exits the plane.



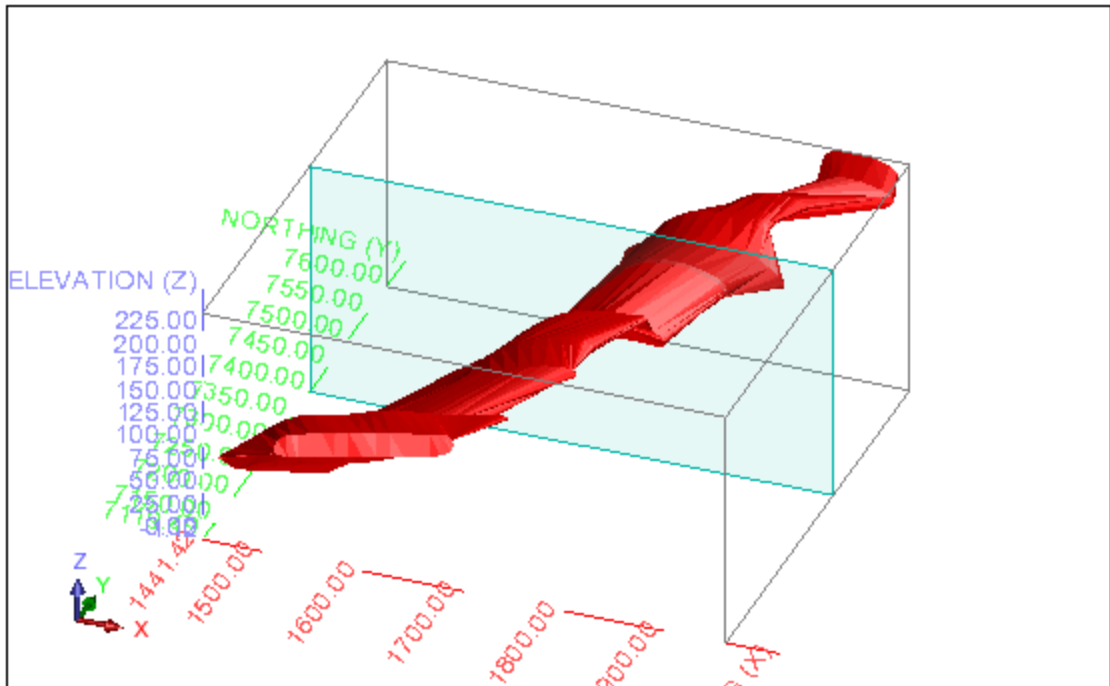
Task: Creating a temporary plane for graphical validation

1. Open **ore_solid1.dtm**.
2. Choose **Planes > Vertical > Looking north**.
3. Move the slider and click at 7400.00.
The *Plane Position* form appears.

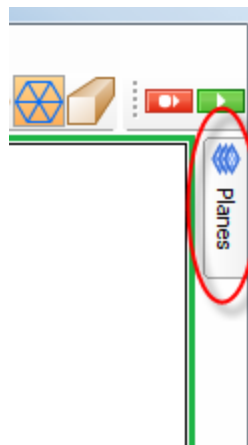
4. Enter the information as shown, and click **Apply**.



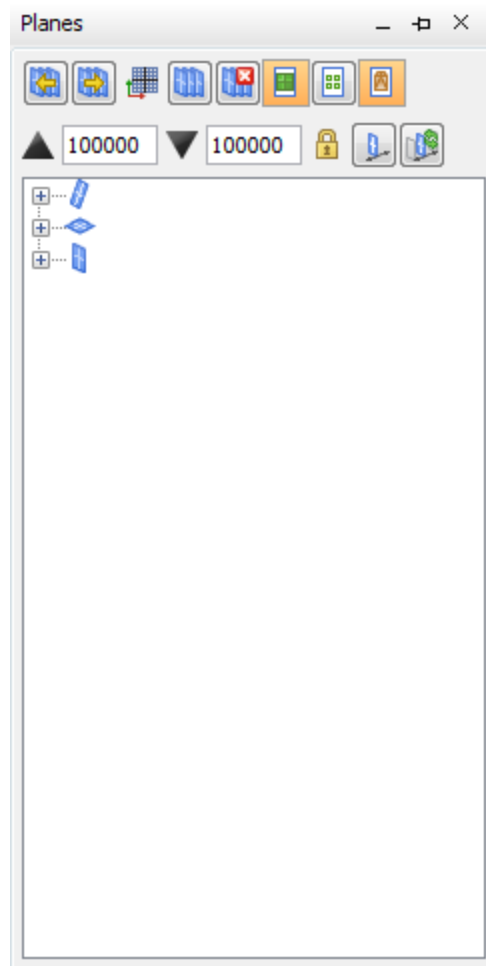
A temporary plane is created at 7400 N.



5. Click the **Planes** tab.



The **Planes** panel is displayed. Because the plane you have created is temporary it is not listed in the **Planes** panel.



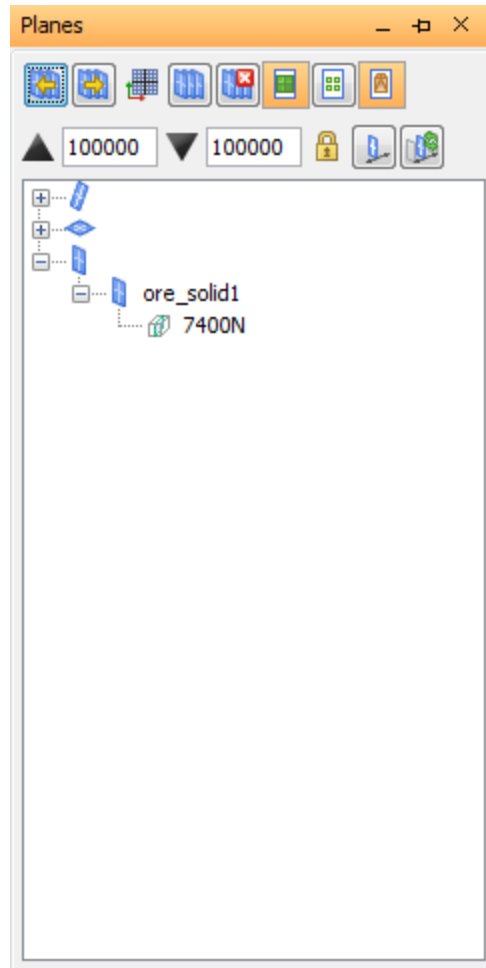
Task: Saving a plane

1. Choose **Planes > Save current plane as**.
The *New plane* form appears.
2. Enter the information as shown and click **Apply**.

The plane is saved.

3. Click the **Planes** tab.

The **Planes** panel is displayed. Because the plane you have created is saved, it is listed on the **Planes** panel.

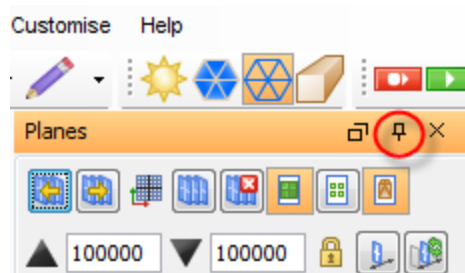


Task: Pinning the Planes panel to Surpac


1. Click the **Planes** tab.
2. Click the pin icon.



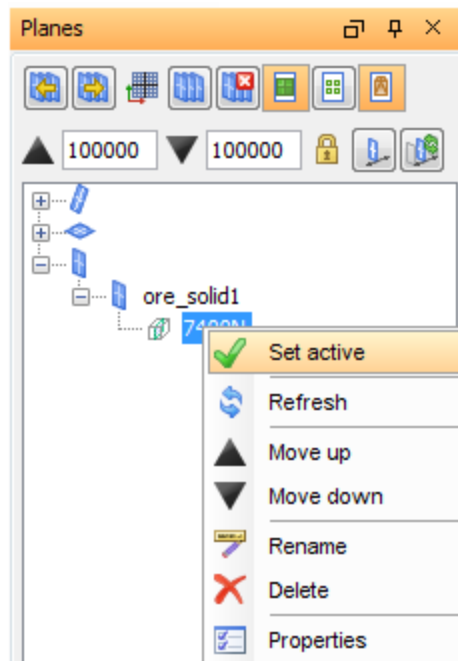
The **Planes** panel is pinned to the interface, and the pin icon is oriented down. The **Planes** panel remains to the right of **Graphics** regardless of the position of the cursor.




Task: Loading a plane from the Planes panel

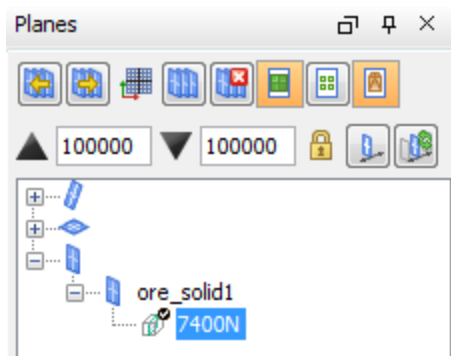
1. Click **Reset graphics** .
2. Open **ore_solid1.dtm**.

- In the **Planes** panel, right-click **7400N**, and choose **Set active**.




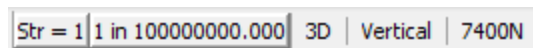
7400N is the active plane.

 **Note:** Plane 7400N has a check mark on the plane icon to show that it is the active plane.



Task: Identifying the active plane using the Status bar

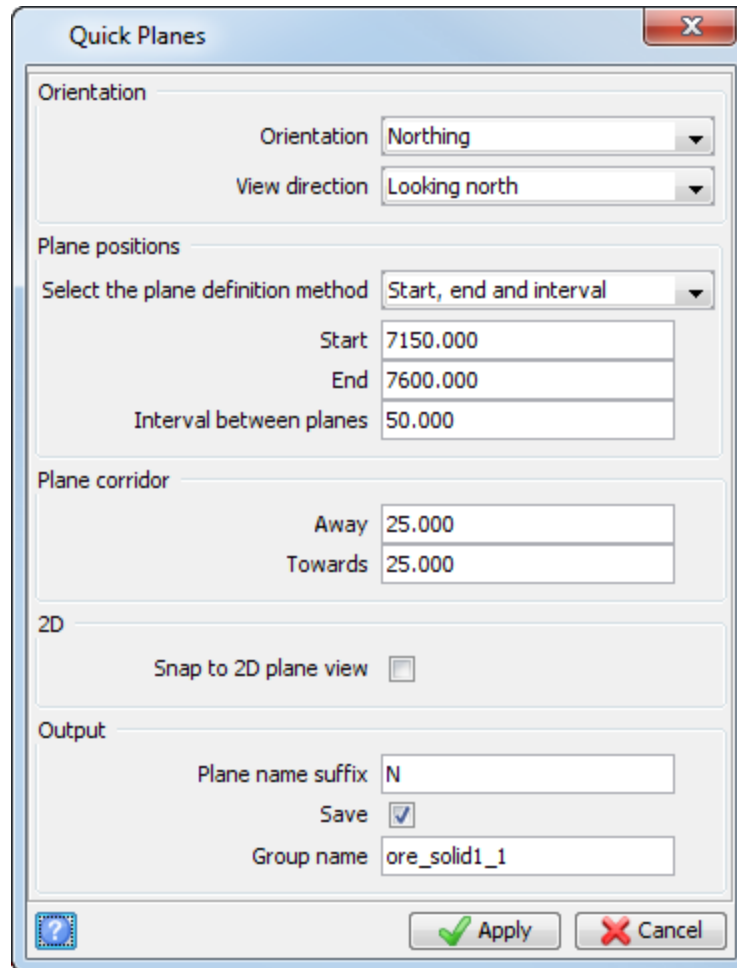
- Click **Reset graphics** .
- Look at the Status bar.
The plane is **Dynamic**.
- In the **Planes** panel, right-click **7400N**, and choose **Set active**.
7400N is now the active plane.
- Look at the Status bar.
The plane name has changed to 7400N.



Task: Creating planes using Quick planes

- Choose **Planes > Quick planes**.
The *Quick Planes* form appears.

2. Enter the information as shown, and click **Apply**.

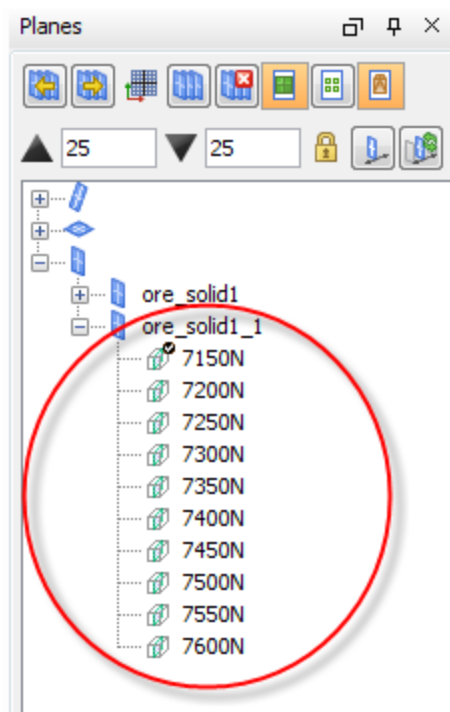


The screenshot shows the 'Quick Planes' dialog box with the following settings:

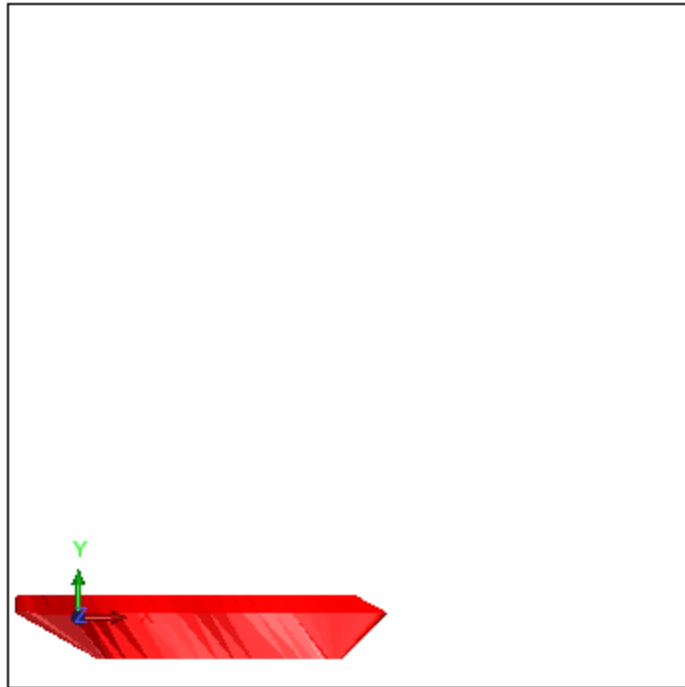
- Orientation:** Orientation: Northing, View direction: Looking north
- Plane positions:** Select the plane definition method: Start, end and interval; Start: 7150.000; End: 7600.000; Interval between planes: 50.000
- Plane corridor:** Away: 25.000; Towards: 25.000
- 2D:** Snap to 2D plane view:
- Output:** Plane name suffix: N; Save: ; Group name: ore_solid1_1

Buttons at the bottom: ? (Help), Apply (green checkmark), Cancel (red X).


The plane group is listed in the **Planes** panel.



The first plane in the sequence is displayed in **Graphics**.

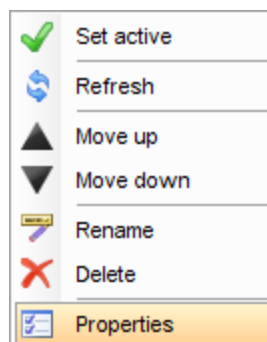


Task: Moving between planes

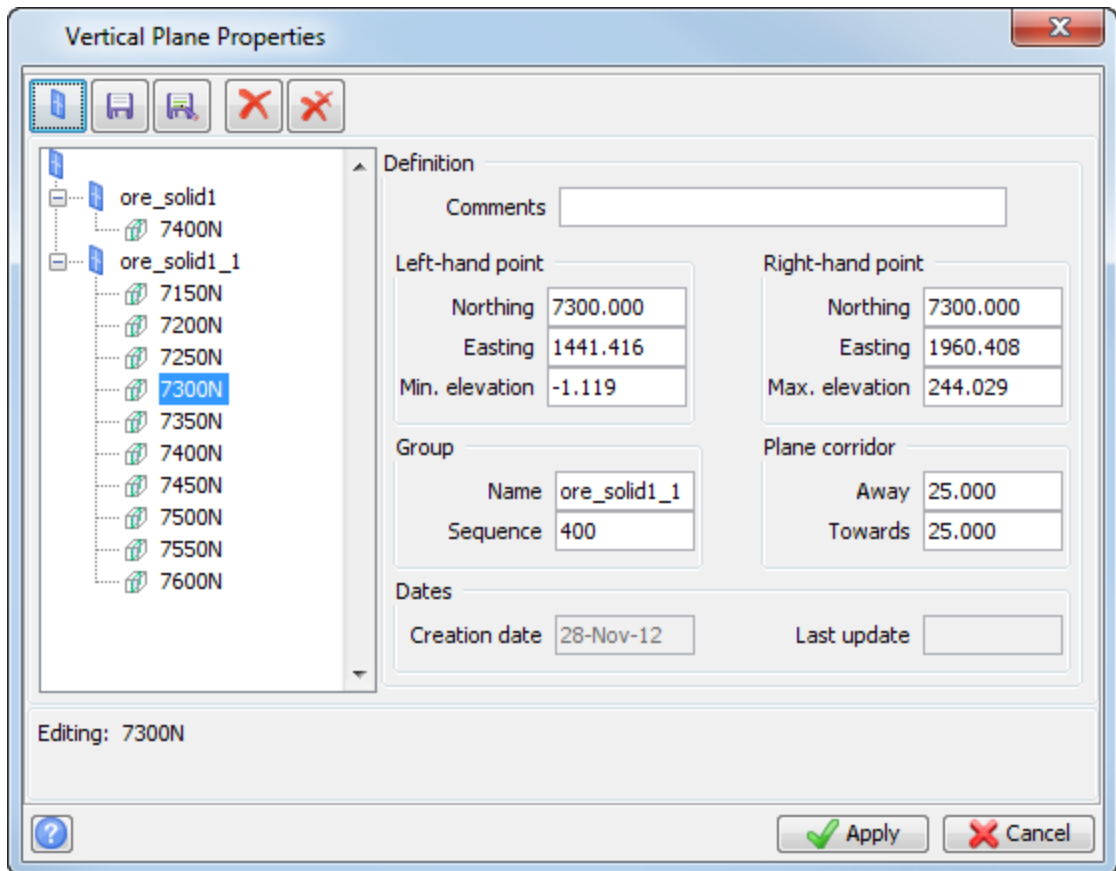
1. In the **Planes** panel, click the **Next Plane** and **Previous plane** buttons .
2. Press F11.
The previous plane is displayed.
3. Press F12.
The next plane is displayed.

Task: Viewing and changing plane properties

1. In the **Planes** panel, right-click **7300N**.
2. Choose **Properties**.

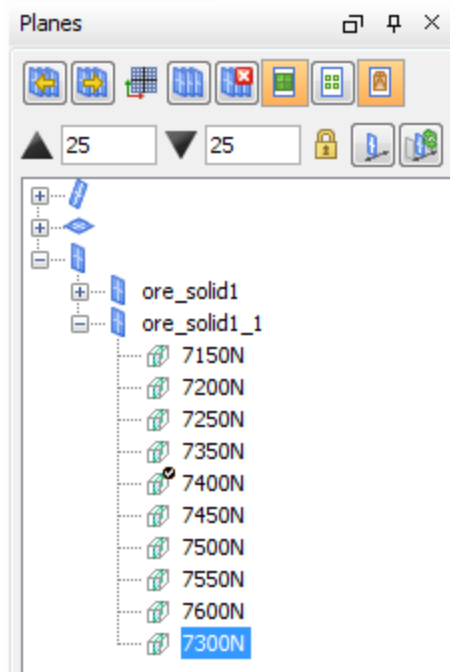


The *Vertical Plane Properties* form appears.



Notice that the sequence number for the plan is 400, and that the plane is the fourth in the group.


- Type **1100** for the **Sequence** number, and click **Apply**.
Plane 7300N is now listed last in the group.





- In the **Planes** panel, right-click **7200N**.
- Choose **Properties**.

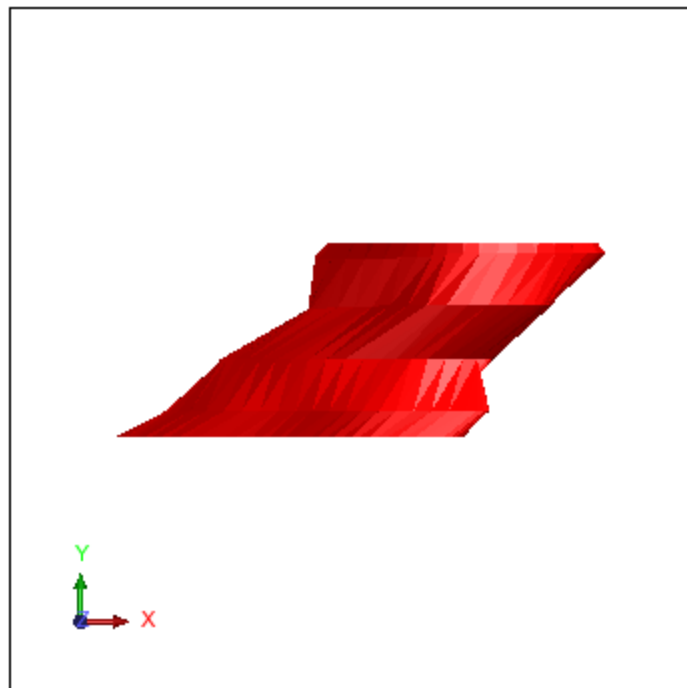
The Vertical Plane Properties form appears.


6. In the **Away** field, type **50**.
7. In the **Toward** field, type **50**.
8. Click **Apply**.
9. In the **Planes** panel, right-click **7200N** and select **Set active**.
The plane corridor is now 100 units wide.
10. Press F12.
Plane 7250N is now active. Notice that plane 7250N is still 50 units wide. The change you made was to the width of only plane 7200N.

 **Note:** To modify the properties for every plane in the group in one action, right-click on the plane group and choose **Properties**.

Task: Changing the viewing corridor using the Planes panel

1. In the **Planes** panel, right-click **7400N**, and choose **Set active**.
2. In the **Away** field  , type 50.
3. In the **Towards** field  , type 100, and click out of the field.
The view corridor is changed to display the data 50 units away from the view, and 100 units towards the view.



4. Press F12.
Plane 7450N is displayed with the default viewing corridor.
5. In the **Away** field, type 50.
6. In the **Towards** field, type 100.
7. Click **Lock plane corridor** .
8. Press F12.
Plane 7500N is displayed with a viewing corridor that contains the data 50 units away from the view, and 100 units towards the view.

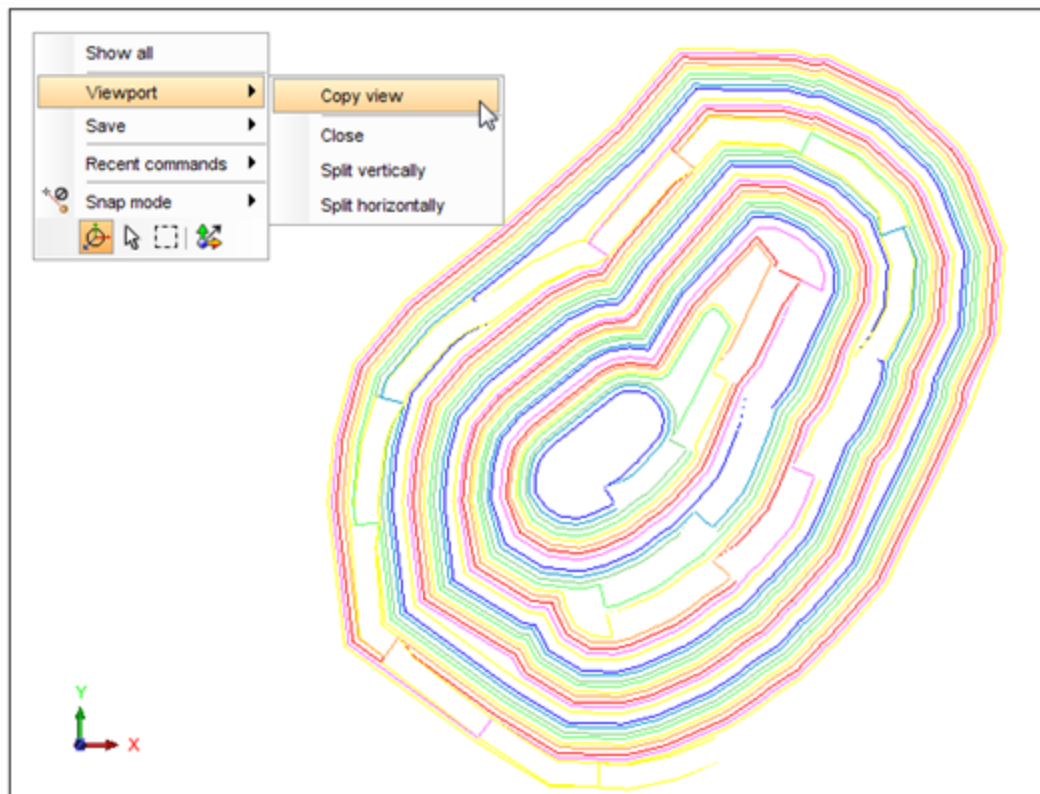
Viewing and saving data

Multiple viewports

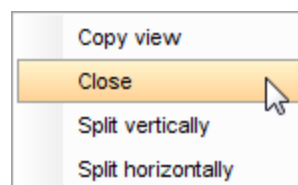
You can view data in different ways using multiple viewports.

Task: Work with multiple viewports

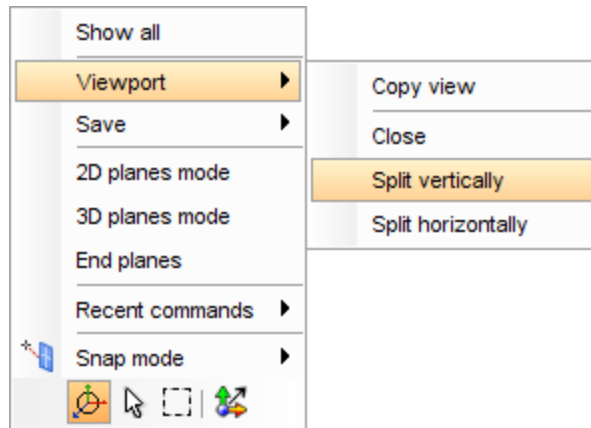
1. Click **Reset graphics** .
2. Open **pit_design1.str** in **Graphics**.
3. Right-click in **Graphics** to display the shortcut menu.



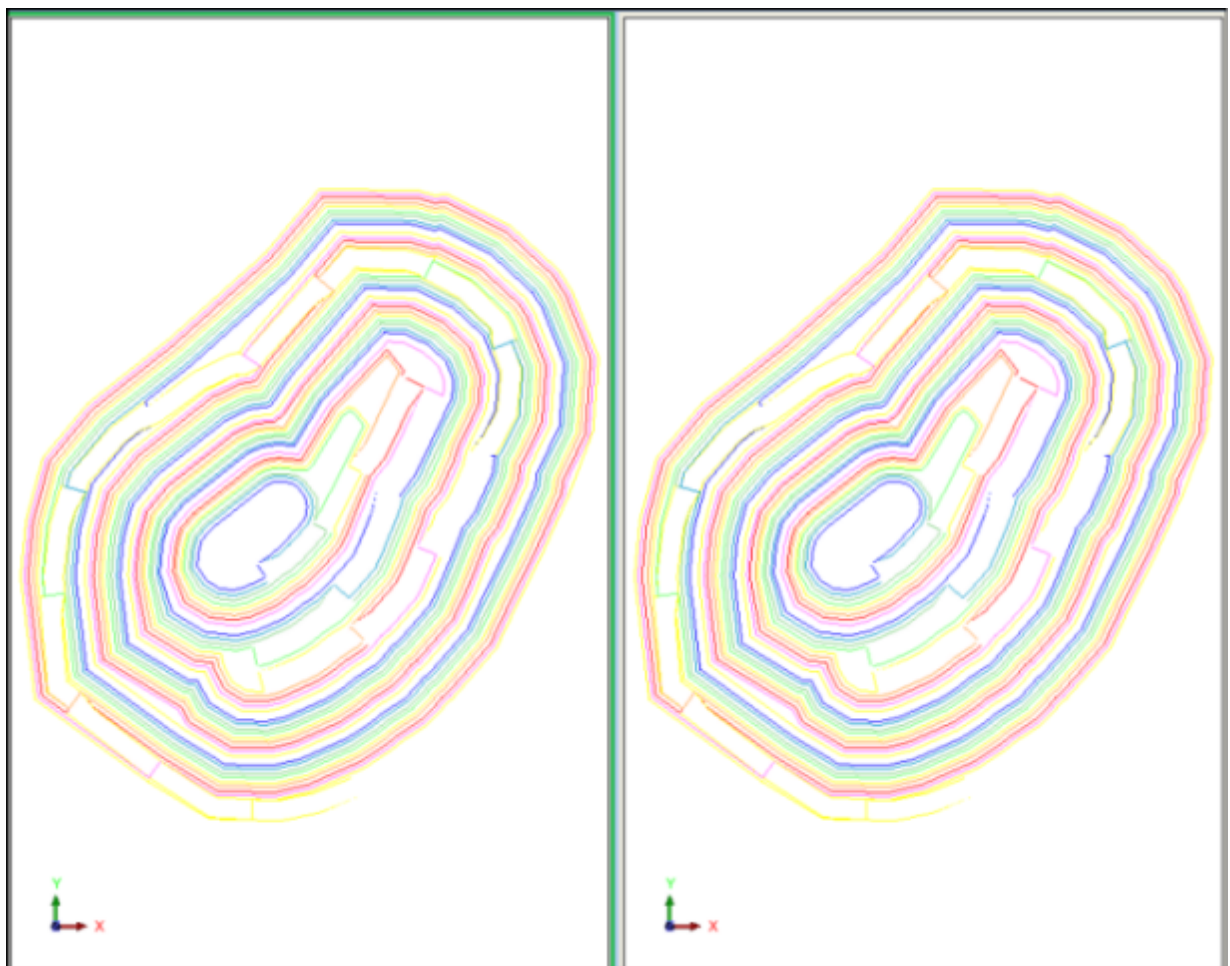
4. From the shortcut menu, select **Viewport**, and choose **Copy view**.
A maximised copy of the current view on a tab called **View 2** is displayed.
5. Right-click the **View 2** tab, and choose **Close**.



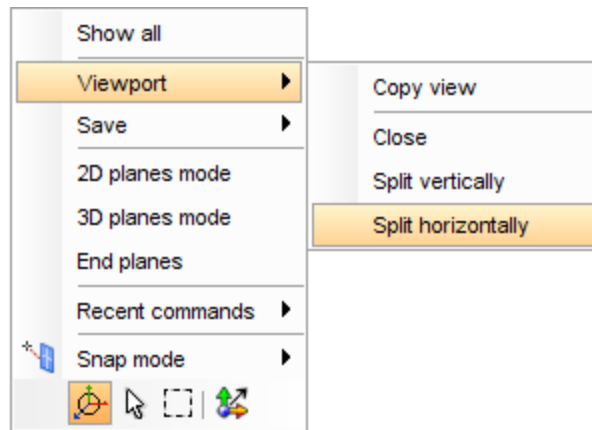
6. Right-click in **Graphics**, and choose **Viewport > Split vertically**.



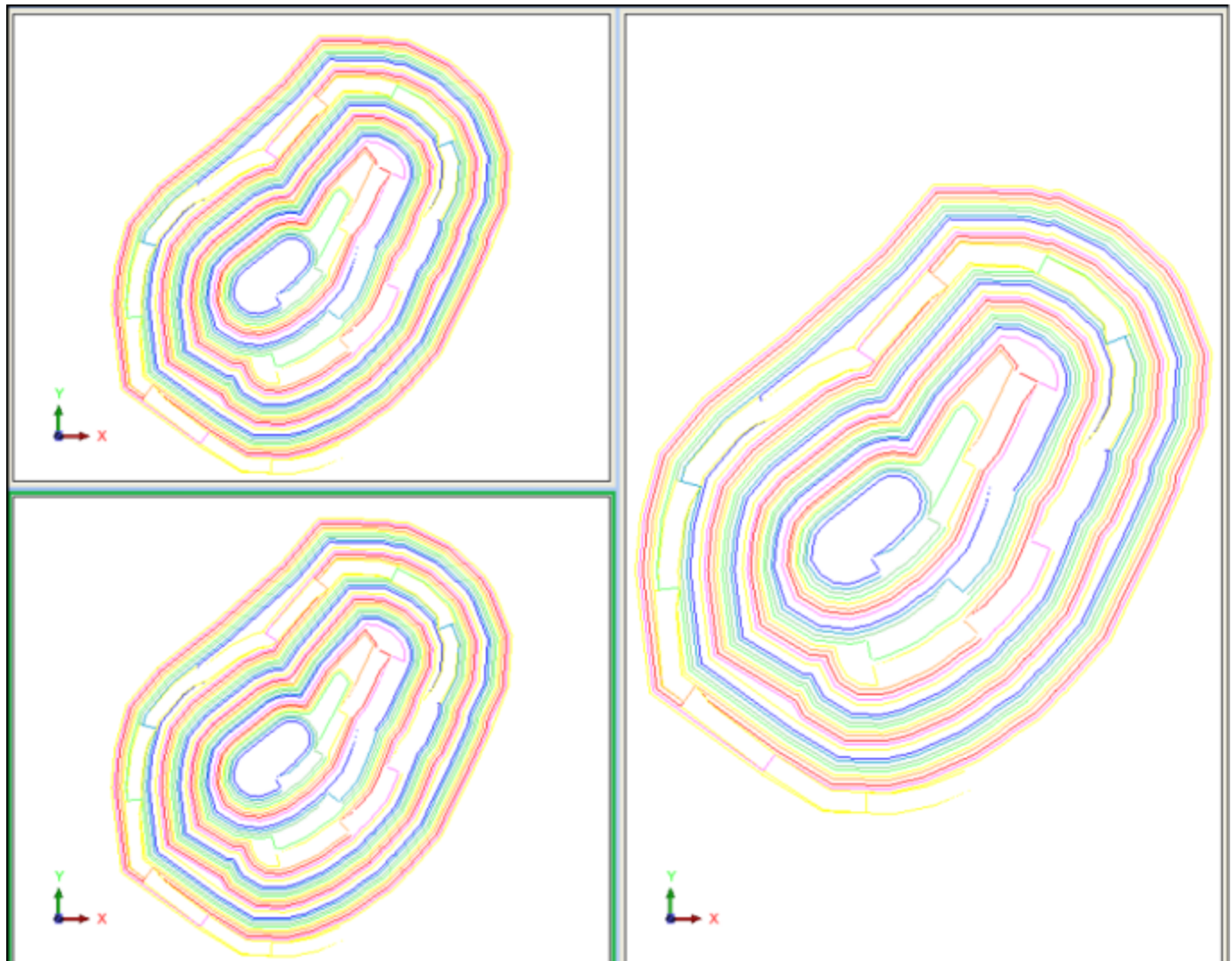
Each viewport now displays the same view of the same data.



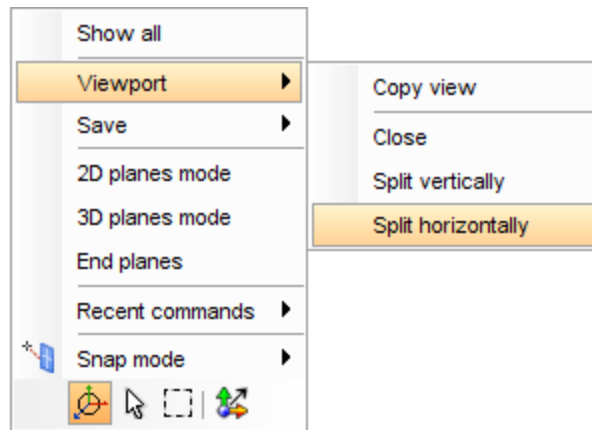
7. Right-click the left viewport, and choose **Viewport > Split horizontally**.



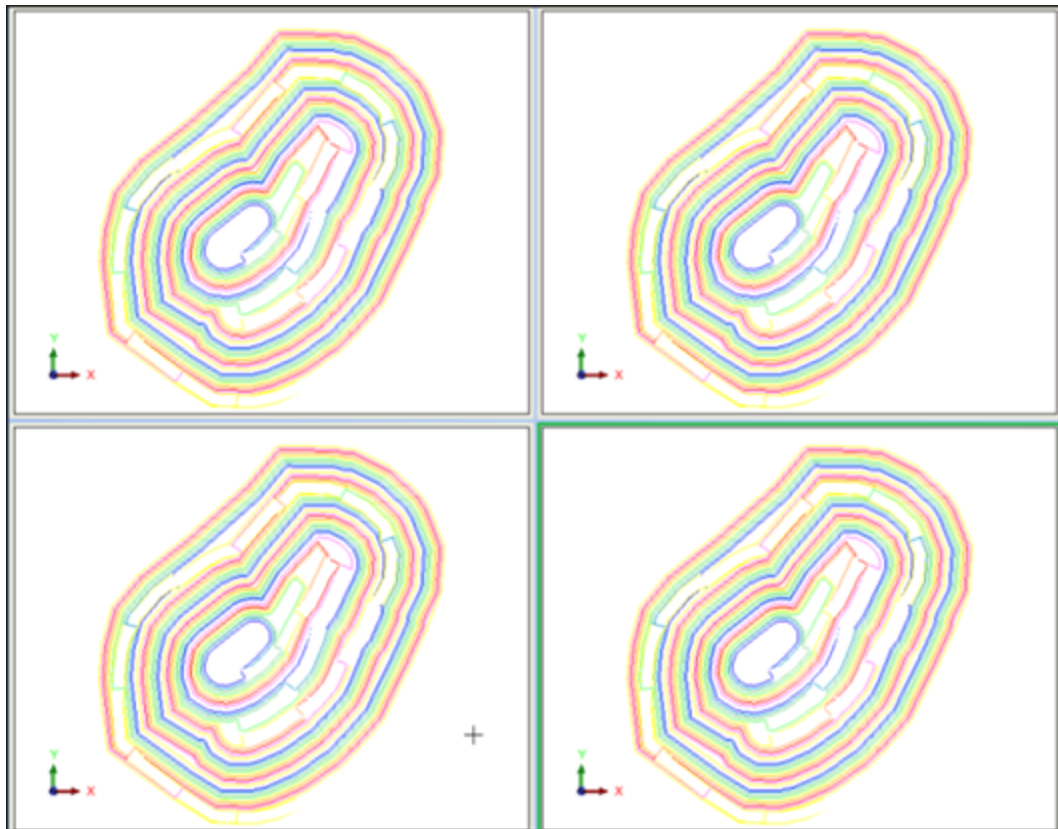
The left viewport is split horizontally as displayed.





8. Right-click the right viewport, and choose **Viewport > Split horizontally**.

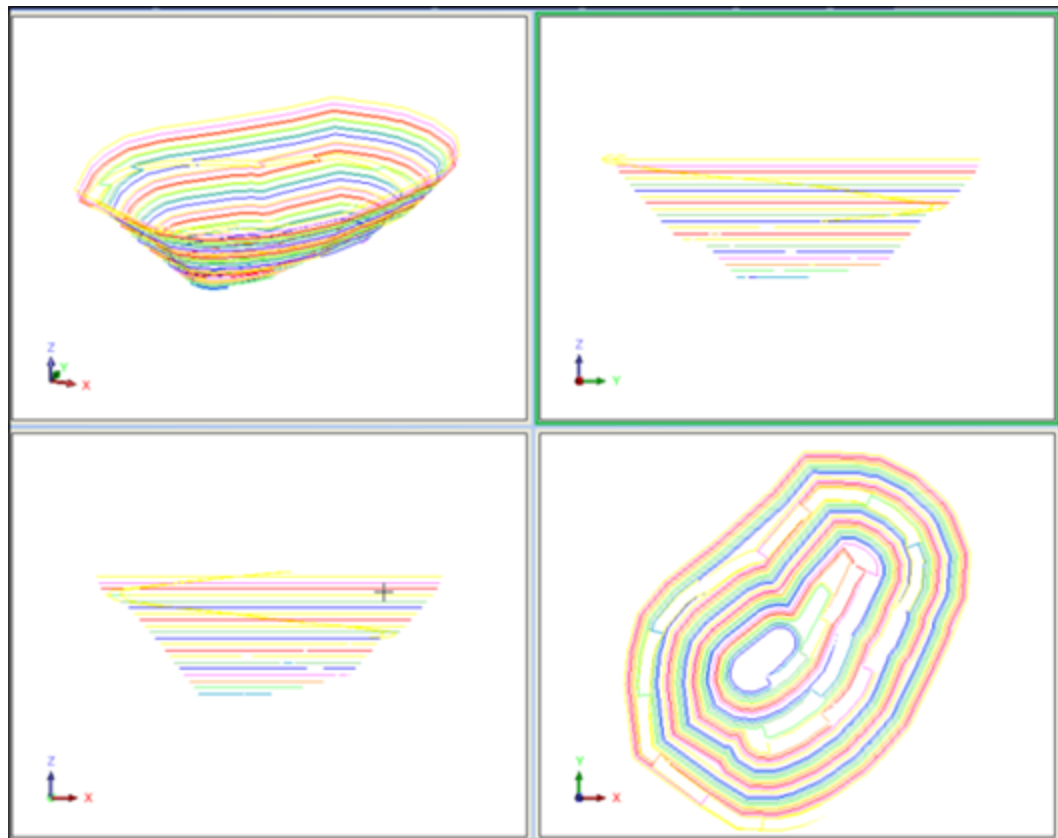


Four viewports are now displayed.



9. Click and drag in the upper left viewport to rotate the data. The data is shown in an oblique view.
10. Click in the lower left viewport.
11. Click the  icon to view the data in the XZ plane.
12. Click in the top right viewport.
13. Click the  icon to view the data in the YZ plane.

Four viewports with different views of the data are displayed.



Attributes and styles files

Styles files control how strings, digital terrain models and solid models (DTM files) are displayed. You can change them to suit your needs. With styles files, you can specify many attributes, such as line colour, marker size, and drawing method (lines, markers, attributes, values).

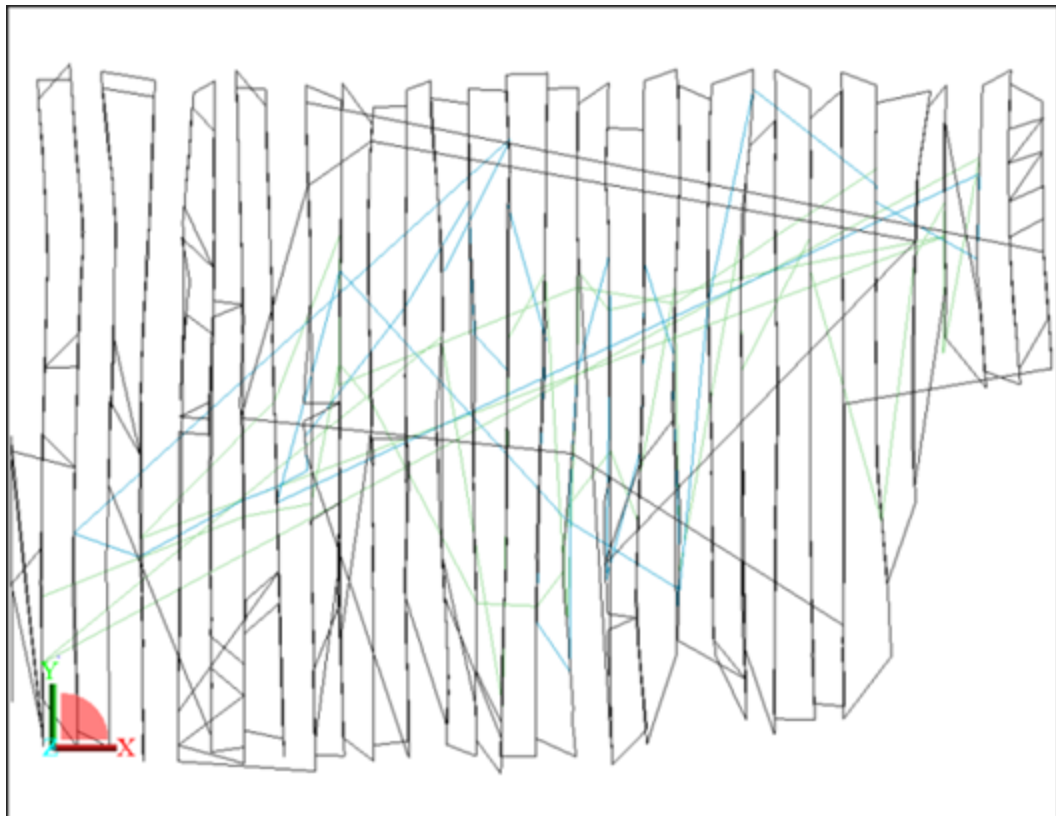
Every time you save a string file, the associated styles file is also saved so that when the string file is next opened, it will automatically use the correct styles.

Task: Change display style

The dataset in this task represents a soil sampling study that measured arsenic concentrations at various locations. In this task you will change the display style for the points to make it easier to see where the concentrations of arsenic are highest.

1. Open **samp_classified1.str** in **Graphics**.

This file contains a series of points that show the concentration of arsenic in the soil. The default style settings showing the strings as coloured lines is displayed. Representing the data in this way does not help you to see where the arsenic concentration is high or low.



The points have been classified into four levels of concentration, each represented by a separate string.

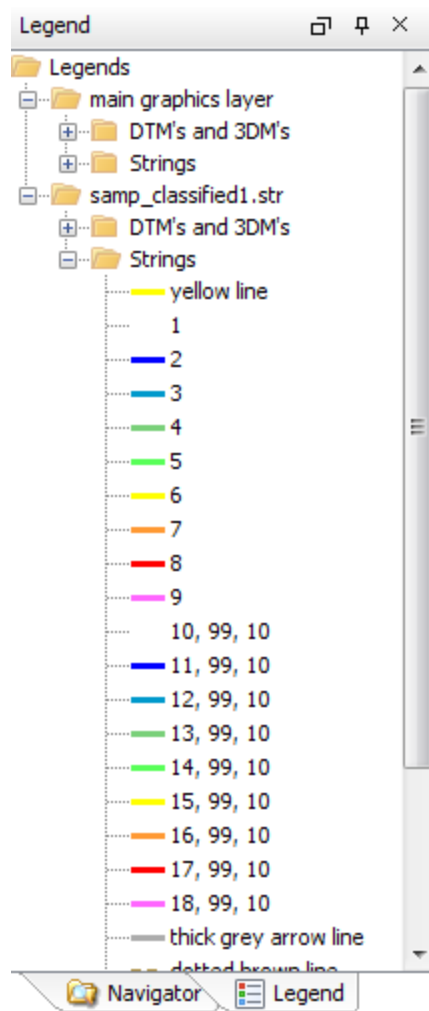
	Output String ID	MIN field Value	MAX field Value
1	1	0	100
2	2	100	300
3	3	300	500
4	4	500	9999

A point with an arsenic concentration of 350 parts per million (ppm), for example, forms part of string 3.

In this task, you will display the strings as spot heights to show the areas that have the highest concentration of arsenic.

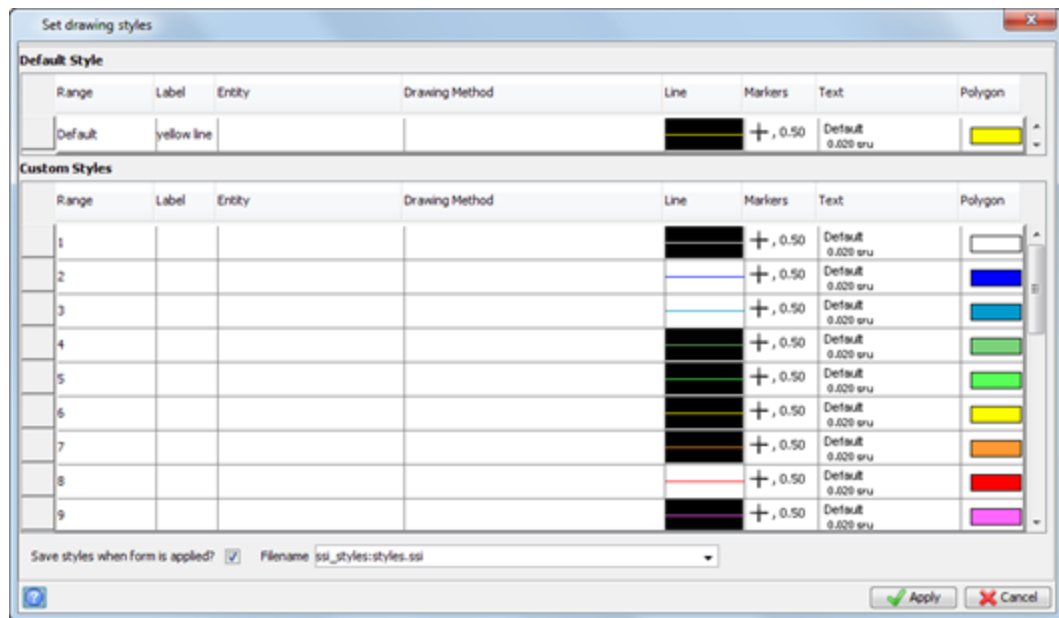
2. Click the **Legend** tab to show the **Legend** pane.
3. In the **Legend** pane, click on the "+" sign next to **Strings** under the file **samp_classified.str**.

The legend shows that string 1 is white, string 2 is blue, string 3 is blue-green, and string 4 is green.




4. In the Legend, double-click string 1.
The **Set Drawing Styles** form is displayed.

5. Enter the information as shown to select the drawing method, colour, marker type, and text properties for displaying the four spot height strings.

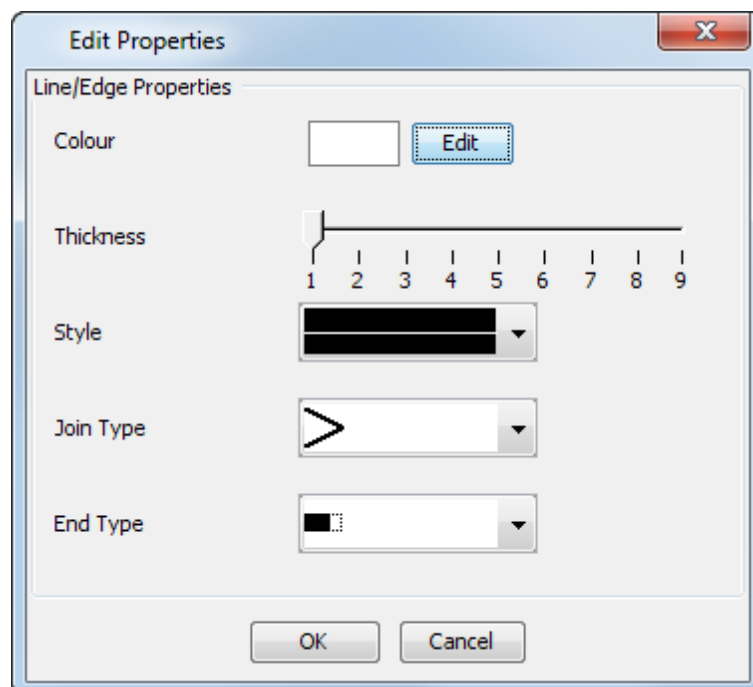



Specifically, do the following steps for each of the **Custom Styles** rows 1 to 4:

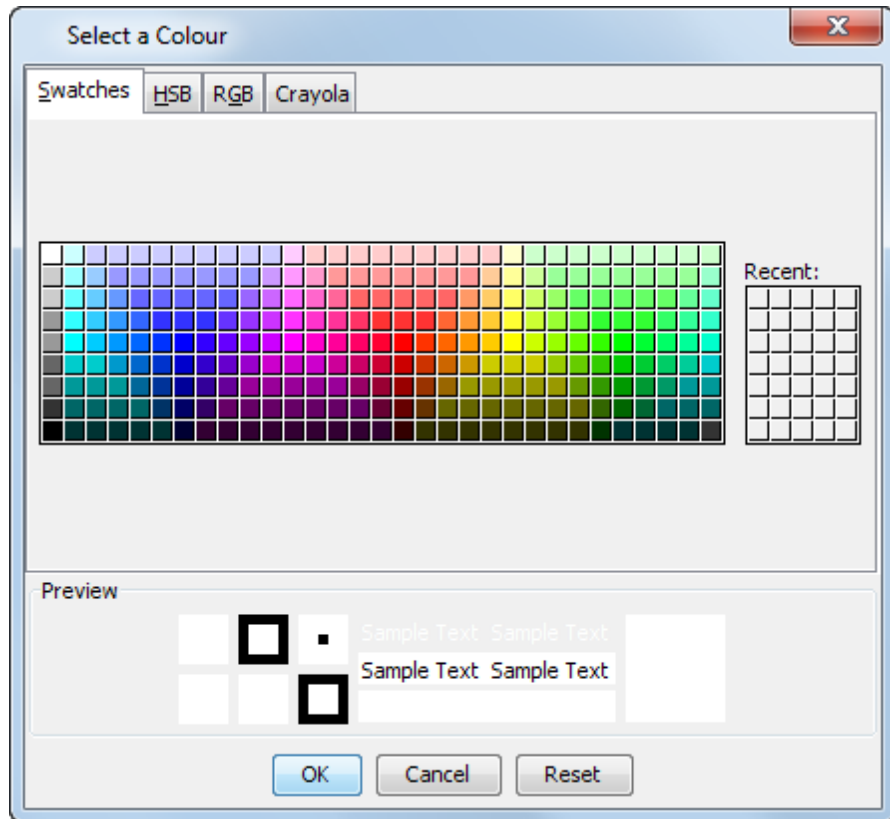
- Type **marker,d1** in the **Drawing Method** cell.
 **Note:** **marker,d1** instructs Surpac to draw a marker for each point, using the **d1** field as a label.
- Select the line colour by clicking the line in the line cell and selecting **Properties**.



- Click **Edit**.







- d. Select the colour — blue, green, orange and red for each of the four rows respectively.
-  **Note:** You can use any of the four colour tabs shown below to select the colour of the markers and the **d1** field labels.

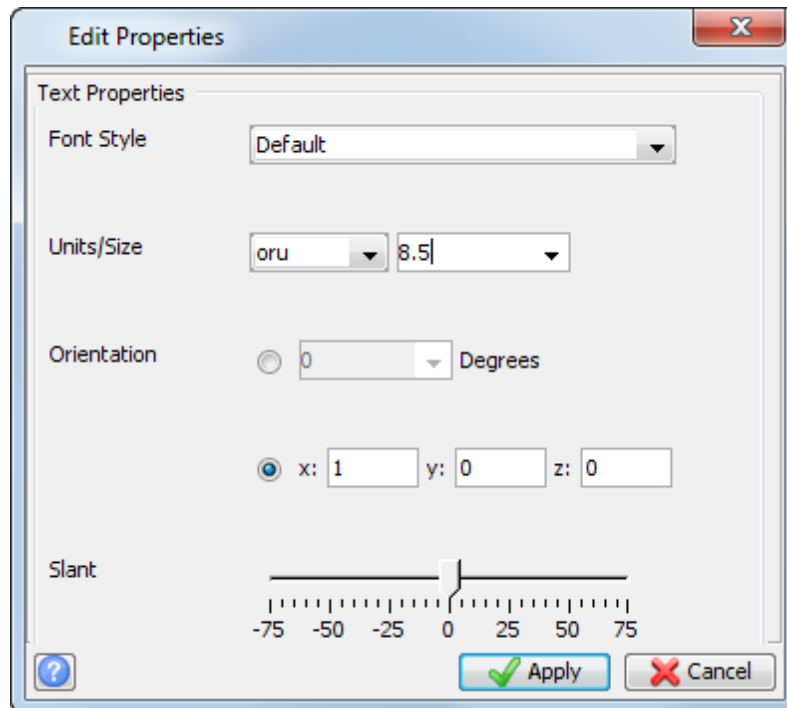


This tab...	allows you to choose a colour by ...
Swatches	clicking in a box on the display.
HSB	specifying its Hue , Saturation , and Brightness .
RGB	specifying its Red , Green , and Blue values
Crayola	selecting the name of the colour from a standard list of colour names.

- e. Click **OK** to finish the colour selection.
- f. Click the **Markers** cell, select **Properties** and then select the marker type.

For this row...	Select this marker type...
1	
2	
3	
4	

- g. Click in the **Text** cell, select **Properties**, and enter **oru** for the Units and **8.5** for the size.
- h. Click **Apply**.



With object relative units (oru), the size of the text is set to the same units as the object. In our example, the text size for range 1 is set to 8.5 oru. The text size will be equivalent to an object that is 8.5 metres high and so will appear larger when you zoom in and smaller when you zoom out.

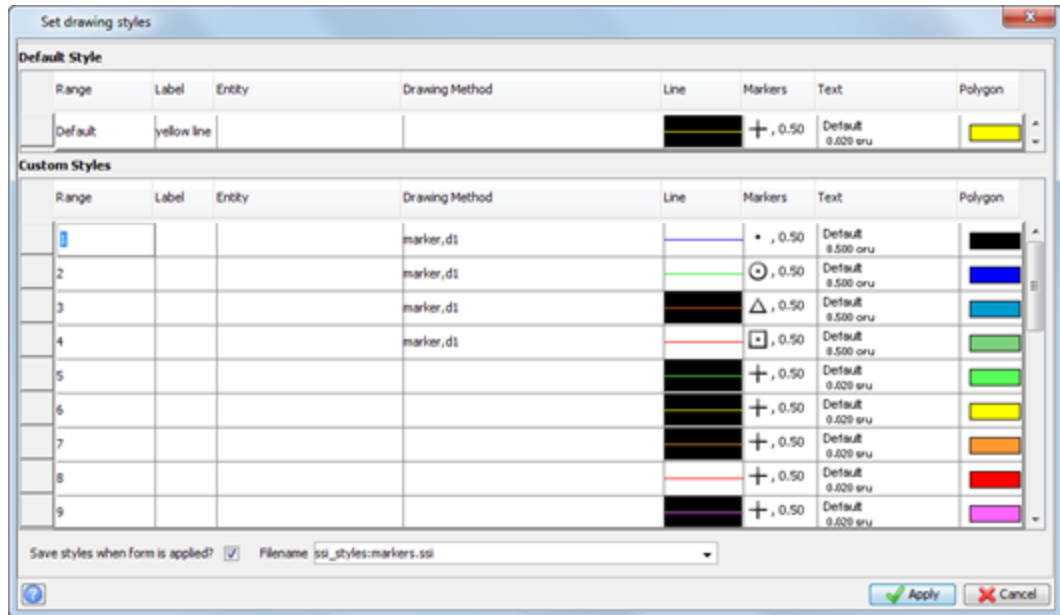
Note: For more information on choosing text sizes, see the **Online help**.

- Click the check box in the lower left part of the form, and in the **Filename** box, type **ssi_styles:marker.ssi**.

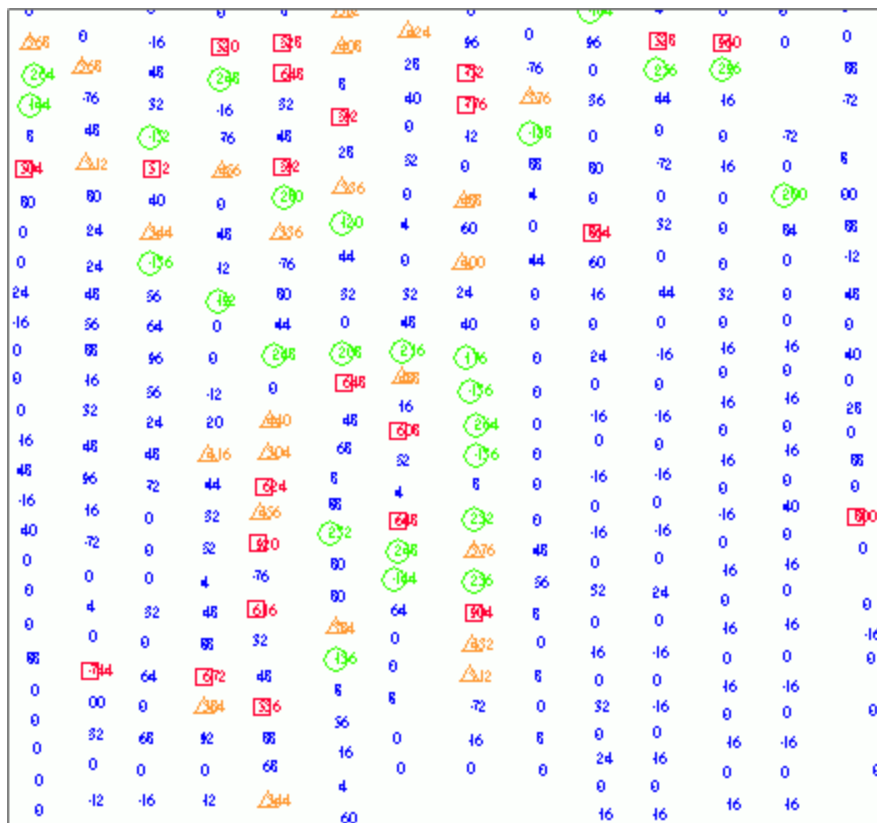
Save styles when form is applied? Filename

- Click **Apply**.
The styles are now stored in the file **marker.ssi** in the **styles** directory.

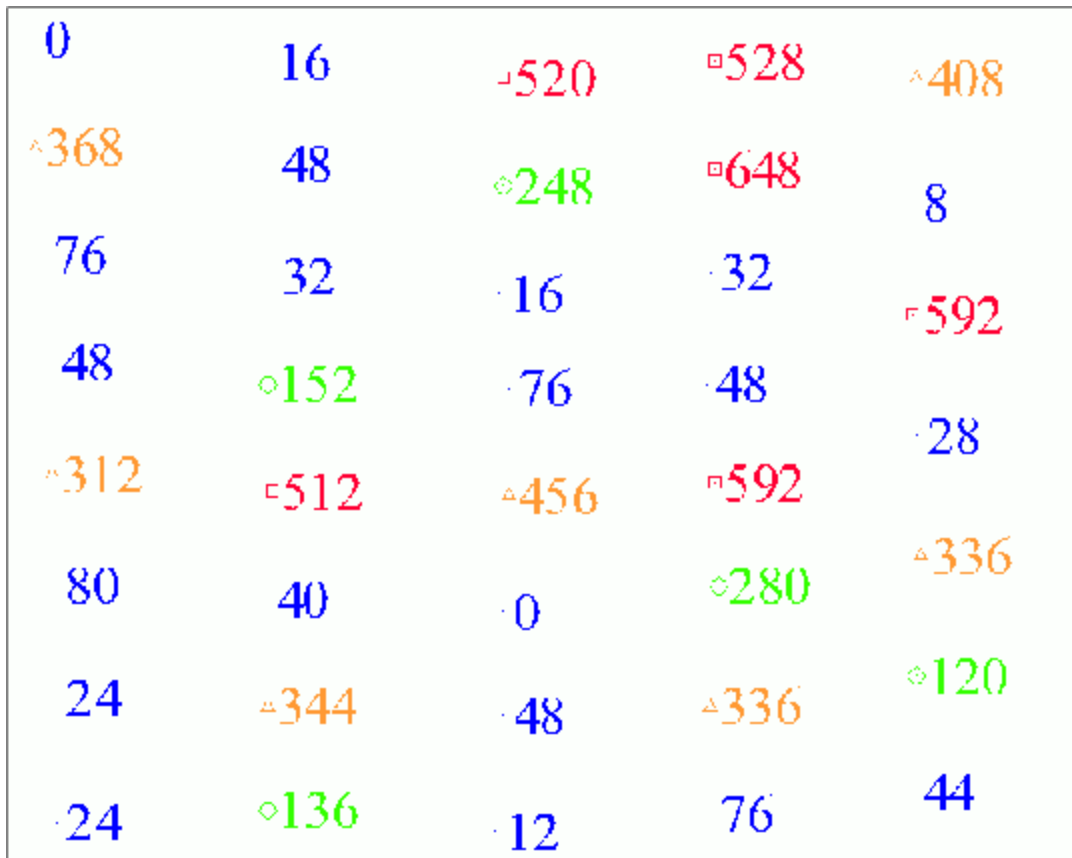
If you double click a string in the **Legend** pane, the *Set Drawing Styles* form will now look like the following.




A sample of the points is displayed below. By looking at the colours, you can quickly see the areas of lowest arsenic concentration (blue), intermediate concentration (green and orange) and highest concentration (red).



8. Zoom in and you will see numbers and symbols displayed.




9. Click the **Save** icon on the toolbar .
10. Click **Apply** in the **Save File** form.

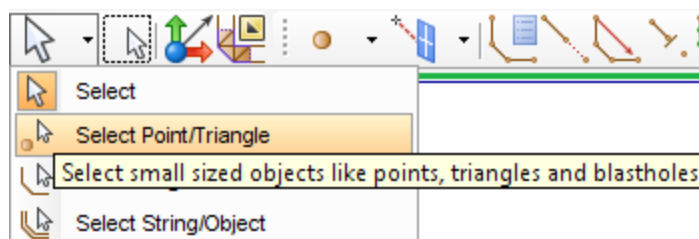
The file **samp_classified1.str** is associated with the styles file **marker.ssi**. This means that when **samp_classified1.str** is next opened, this styles file will also load. In this way it is possible to have a collection of styles files suitable for a range of display purposes.

Note: If you want to see all of the steps performed in this task, run **02a_change_display_styles.tcl**. You need to click **Apply** on any forms presented.

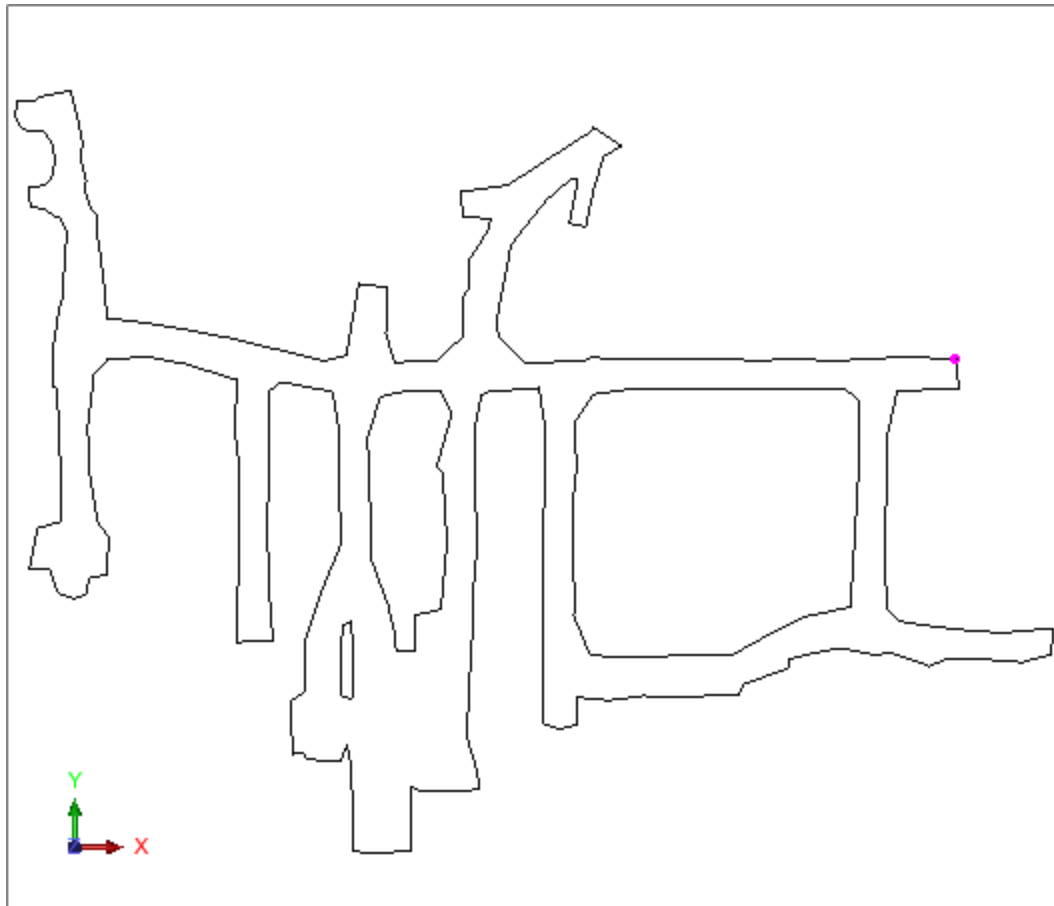
Task: View point properties

The **Point properties** function displays point attribute information including string, segment, and point numbers, y, x, z coordinates, and description fields.

1. Click the **Reset graphics** icon .
2. Open **lev1665.str** in **Graphics**.
3. Right-click in the area next to the menu titles and select **Toolbars**.
4. Select the **Tools** toolbar.
5. On the Select tool drop-down, choose **Select Point/Triangle**.



- Hold the CTRL key and click to select any four points.




- Choose **Inquire > Point properties**.

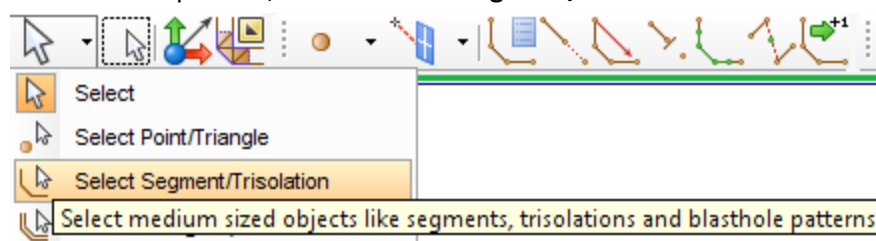
The **message window** displays the point properties for all of the selected points.

```
Layer=lev1665.str String=1 Segment=1 Point=64 Y=9023.237 X=8357.661 Z=1662.817
Desc=
Layer=lev1665.str String=1 Segment=1 Point=63 Y=9023.33 X=8360.66 Z=1662.823
Desc=
Layer=lev1665.str String=1 Segment=1 Point=62 Y=9028.43 X=8360.41 Z=1662.824
Desc=
Layer=lev1665.str String=1 Segment=1 Point=61 Y=9028.583 X=8357.286 Z=1662.818
Desc=
```

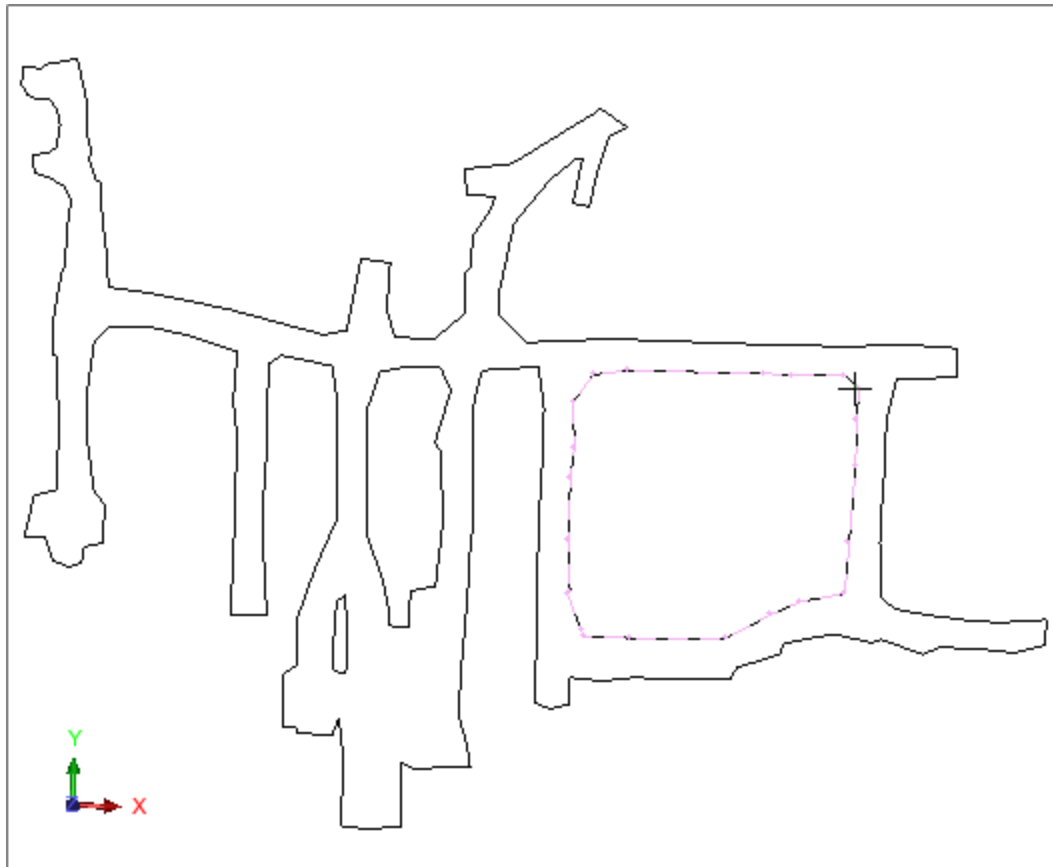
Note: If you want to see all of the steps performed in this task, run **02b_view_point_properties.tcl**. You need to click **Apply** on any forms presented.

Task: View segment properties

- Click **Reset graphics** .
- Open **lev1665.str** in **Graphics**.
- On the Select tool drop-down, choose **Select Segment/Trisolation**.



4. Select the segment as shown.




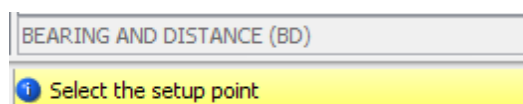
The segment properties are displayed in the **Properties** pane.

Properties	
Information	
Layer	lev1665.str
String	1
Segment	2
Details	
3D length	176.563
2D length	176.446
Point count	23
Closed	True
Direction	Anti-clockwise
2D area	-2,114.139

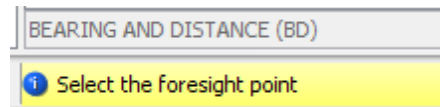
Note: If you want to see all of the steps performed in this task, run **02c_view_segment_properties.tcl**. You need to click **Apply** on any forms presented.

Task: Determine bearing and distance between two points

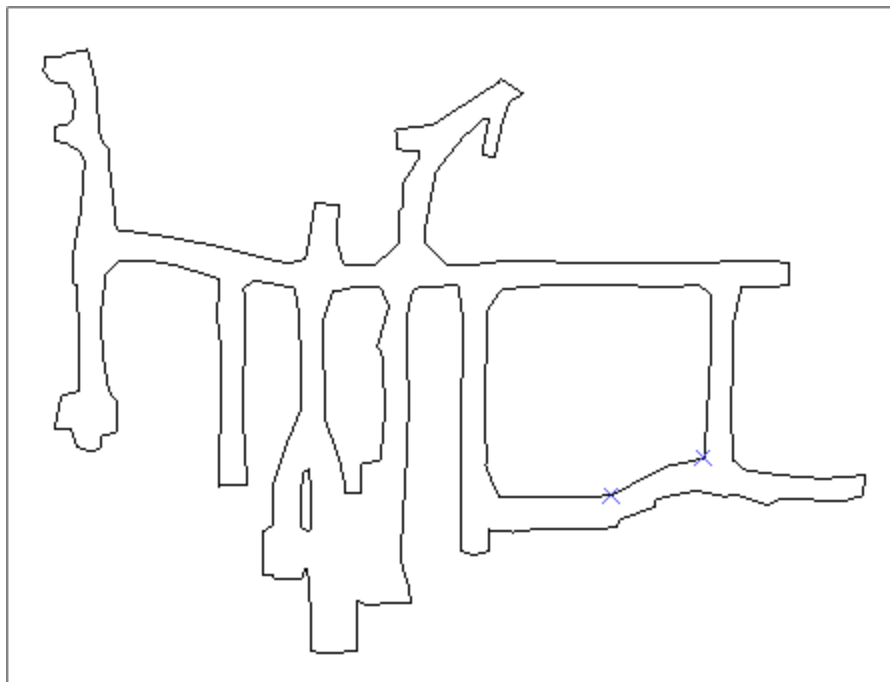
1. Click **Reset graphics** .
2. Open **lev1665.str** in **Graphics**.
3. Choose **Inquire > Bearing and distance between 2 points**.
A prompt to select the setup point is displayed.



- Click the setup point.
A prompt to select the foresight point is displayed.



- Click the foresight point.
The **message window** displays the bearing, distance and gradient between the two points in the order in which they were selected.



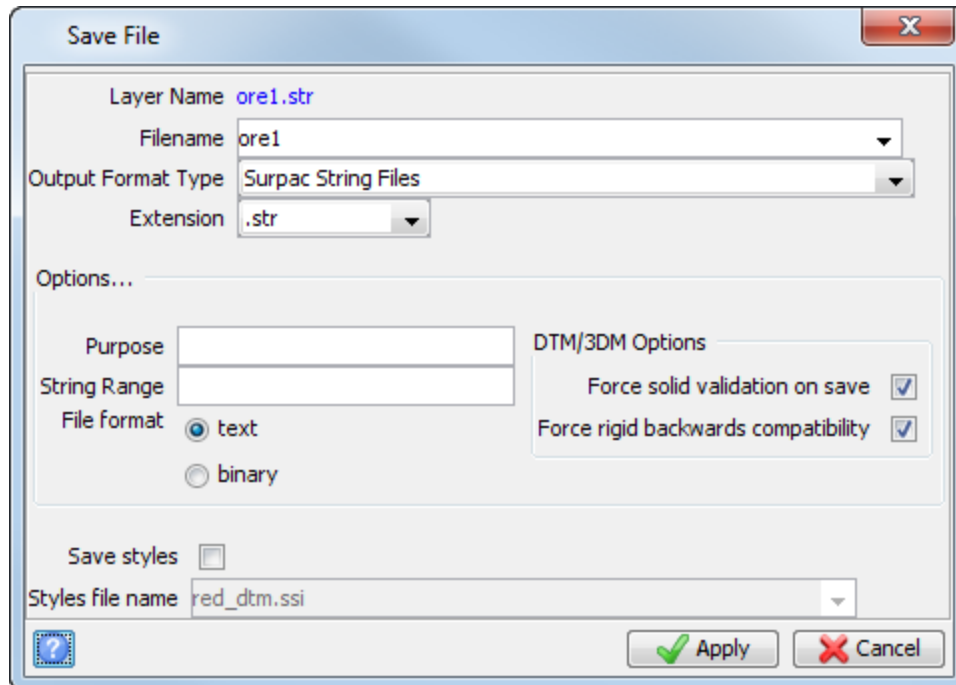
```
Processing lev1665.str
Drawing commencing - Please wait
From (Y=8960.09 X=8245.31 Z=1663.30) to (Y=9023.44 X=8204.53 Z=1660.05):
Bearing = 327.1347 DMS, Horiz Dist = 75.341
Slope dist = 75.411, Vert Dist = -3.246, Gradient: -2.467 decimal degrees = -2.2801 DMS = -4.308 % = 1 in -23.21
```

- Press ESC to exit the function.

📌 **Note:** To see all of the steps performed in this task, run **02d_bearing_and_distance.tcl**. You need to click **Apply** on any forms presented.

Saving data


You can save a file to a text or binary format.

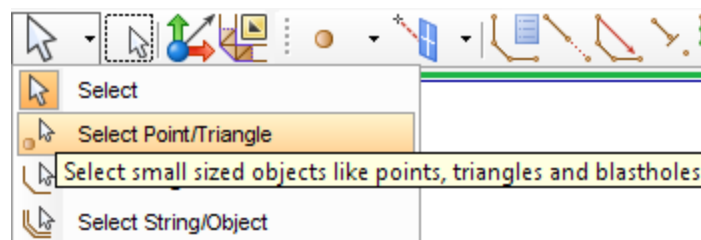


In most cases you will save strings as text files. However, if the text string files are very large (more than 5 MB), it may be worth saving them as binary files to reduce the time it takes to load the data into **Graphics**.

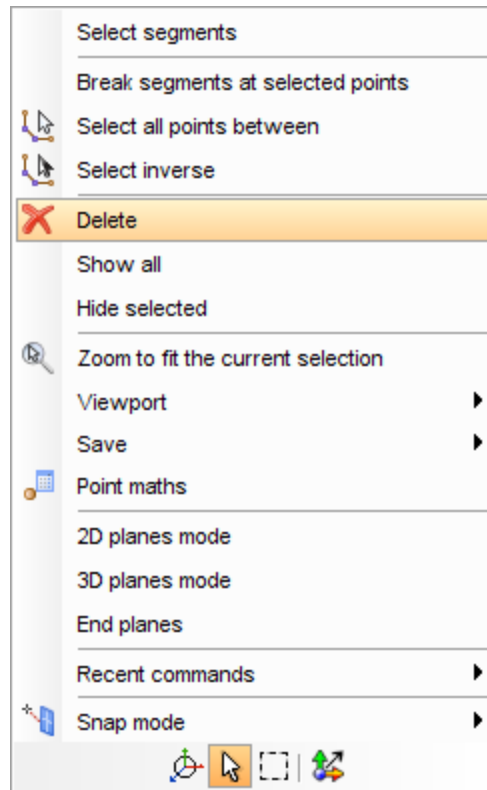
Typically, you can expect a saving of up to 15% in the size of the string file and up to 30% in the time to load the data into **Graphics**.

Task: Save a file

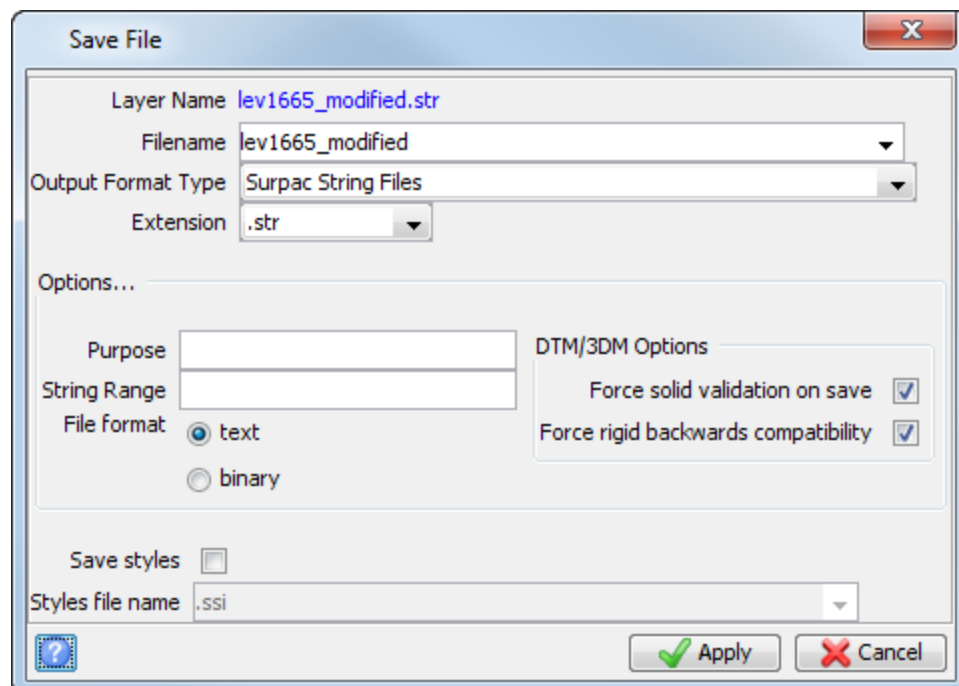
1. Click **Reset graphics** .
2. Open **lev1665.str** in **Graphics**.
3. On the Select tool drop-down, choose **Select Point/Triangle**.



4. Click on a point in **Graphics**.
5. Right-click and select **Delete** from the shortcut menu.



6. Choose **File > Save > string/DTM**.
7. Enter the information as shown, and click **Apply**.



The **Save** function saves the contents of the active layer to a file.




Tip: An alternative method to show the **Save File** form is to click the icon  in the toolbar.

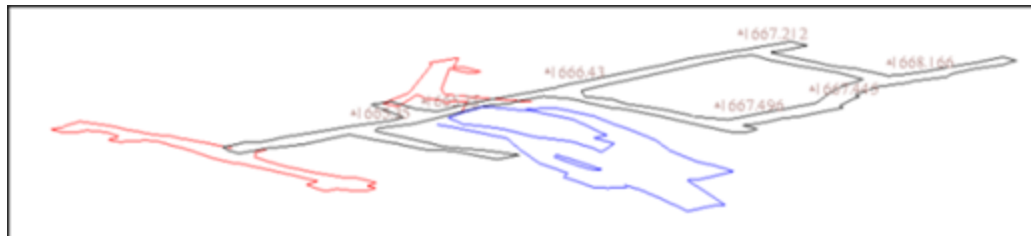
Note: To see all of the steps performed in this task, run **02e_saving_data.tcl**. You need to click **Apply** on any forms presented.

Orbit mode

Orbit mode is the default **Graphics** mode, where you can rotate data in three dimensions. When you are using the orbit tool, Surpac operates in function-centric mode.






Task: Use orbit mode to rotate data

1. Click **Reset graphics** .
2. Open **survey1665.str** in **Graphics**.
3. On the **Tools** toolbar , click the **Orbit tool** .
4. Click and drag in **Graphics** to rotate the data.
The data rotates in three dimensions.





Selection modes

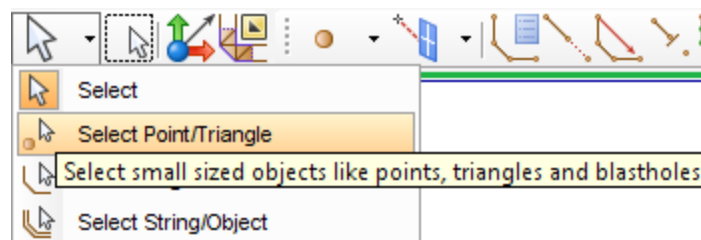
There are several ways of selecting data:

-  **Select** mode
-  **Point/Triangle** mode
-  **Segment/Trisolation** mode
-  **String/Object** mode
-  **Box** selection






When you use any of these section tools, Surpac operates in data-centric mode.

Task: Change selection modes

1. On the **Tools** toolbar , click the drop-down triangle  on the **Select tool** .
2. Click **Select Point/Triangle**.



The **Select tool** now displays the **Point/Triangle** selection mode .

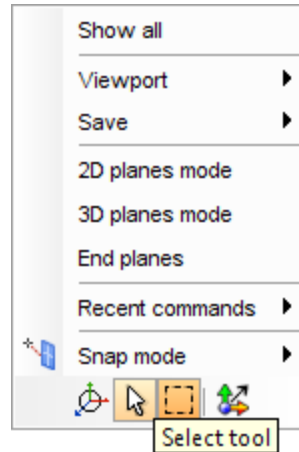
3. Click the **Select tool**  (not the drop-down triangle ).
- The icon now displays **Segment/Trisolation** selection mode .
4. Click the **Select tool**  again.
- The icon now displays **String/Object** selection mode .

5. Click the **Select tool** icon  again.
The icon now displays **Select** selection mode .

6. On the **Tools** toolbar , click the **Box** selection icon .

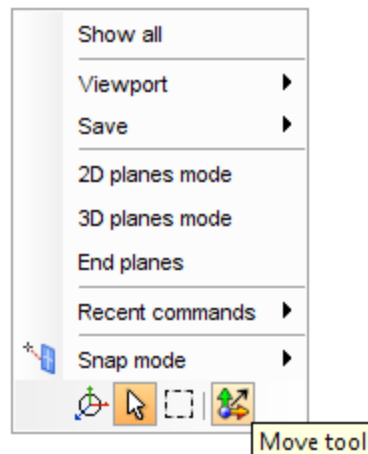
The **Tools** toolbar now displays **Box** selection mode: .

7. Right-click anywhere in **Graphics** to display a shortcut menu.
8. At the bottom of the menu, click the **Select tool**.





The **Tools** toolbar now displays **Select** selection mode .

9. Right-click anywhere in **Graphics** to display a shortcut menu.
10. At the bottom of the shortcut menu, click the **Orbit view tool**.



The **Tools** toolbar now displays **Orbit view** mode .


11. On the **Tools** toolbar, click the **Select tool** .

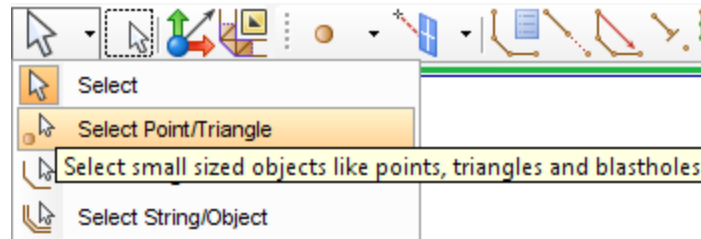
The **Tools** toolbar now displays **Select** selection mode .

12. Press the **ESC** key.

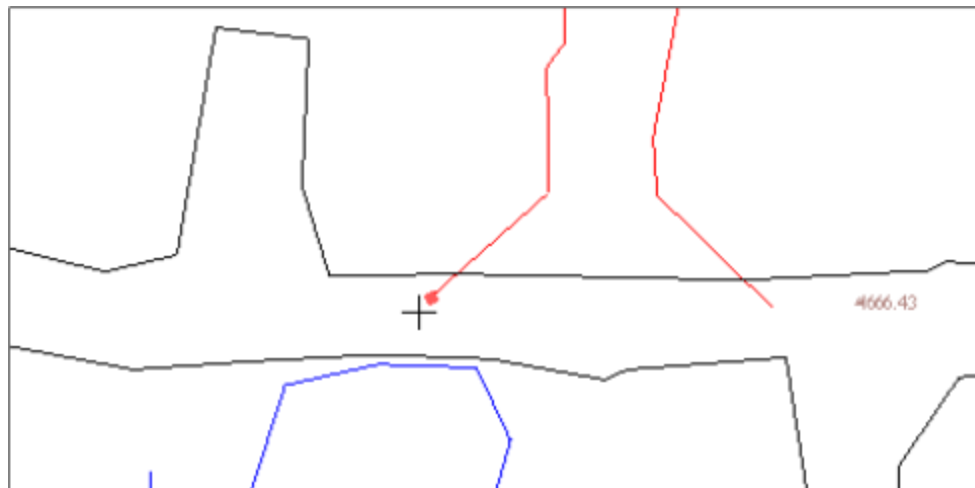
The **Tools** toolbar now displays the **Orbit view** mode .

Task: Use point/triangle mode to delete points

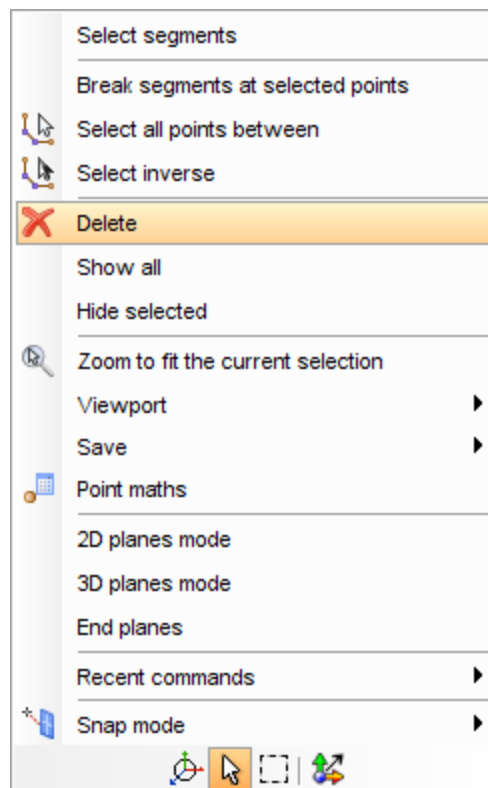
1. Click **Reset graphics** .
2. Open **survey1665.str** in **Graphics**.
3. From the **Selection** menu on the **Tools** toolbar, click **Select Point/Triangle**.



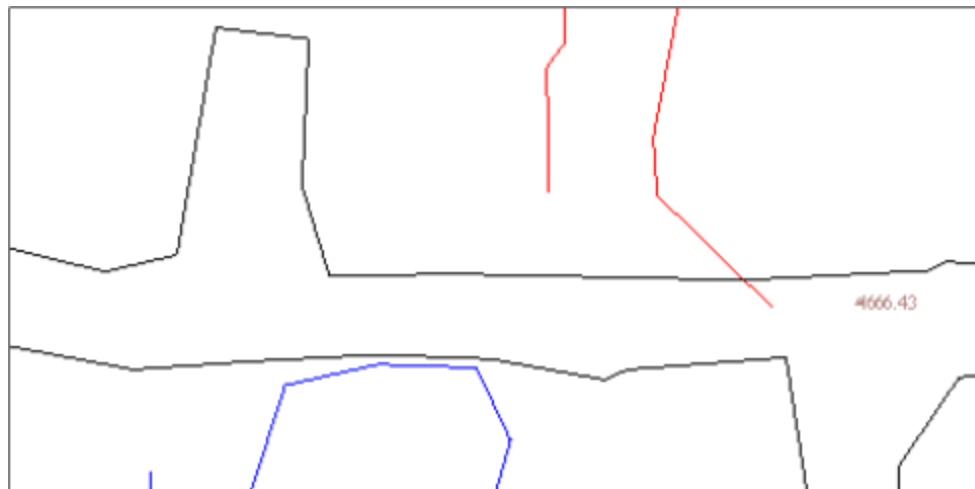
4. Click the point as shown.



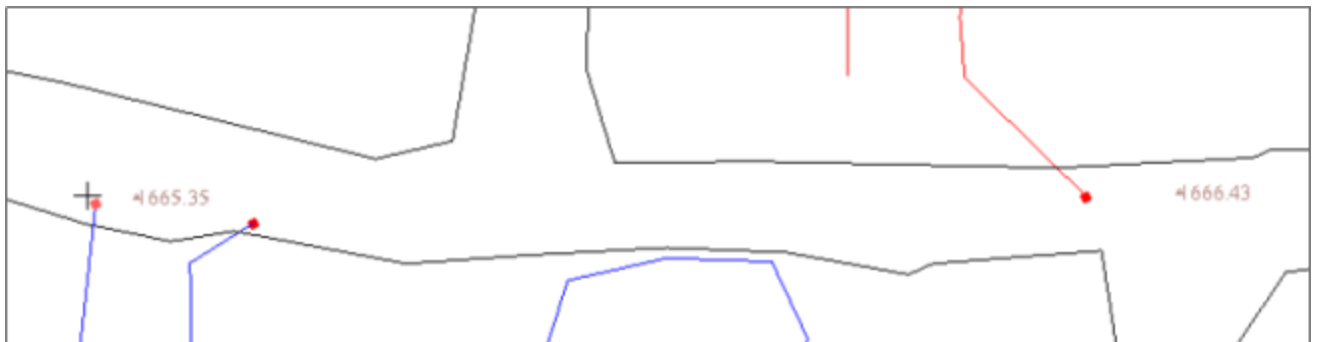
5. Right-click anywhere in **Graphics** to display a shortcut menu.
6. From the shortcut menu, select **Delete**.



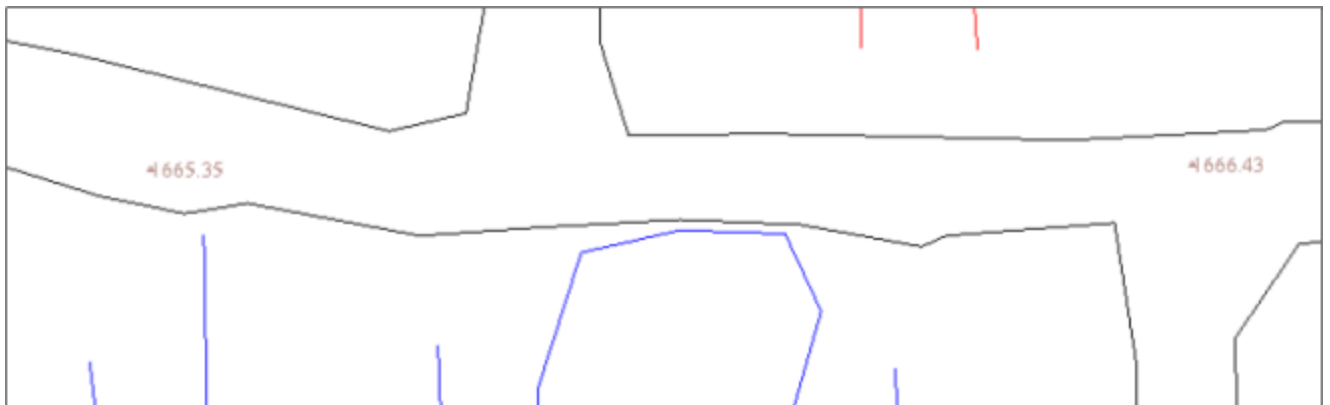
The point is deleted.



7. Hold the CTRL key, and click the points as shown.

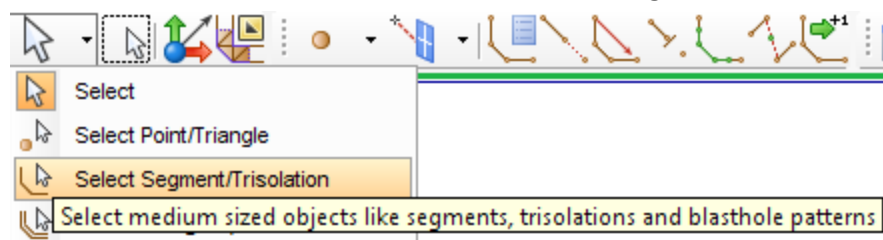


8. Press the DELETE key.
The points are deleted.

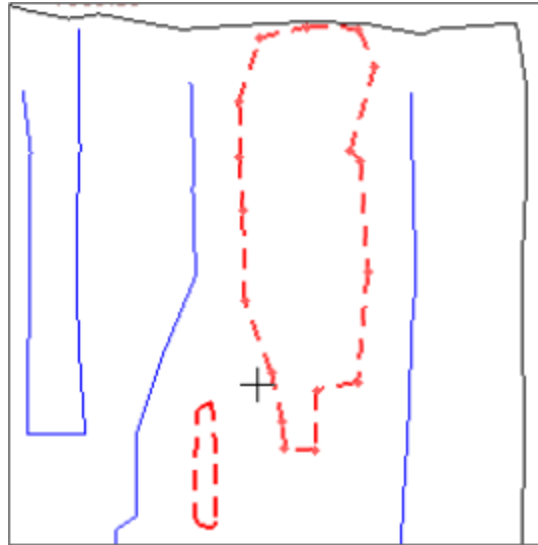


Task: Use segment/trisolation mode to reverse segments

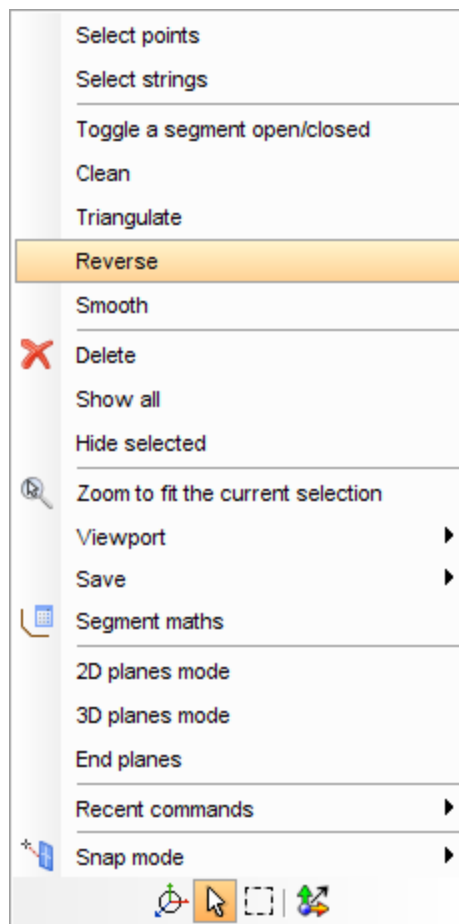
1. From the **Selection** menu on the **Tools** toolbar, click **Select Segment/Trisolation**.



2. Hold the CTRL key, and click the segments as shown.



3. Right-click anywhere in **Graphics** to display a shortcut menu.
4. From the shortcut menu, select **Reverse**.



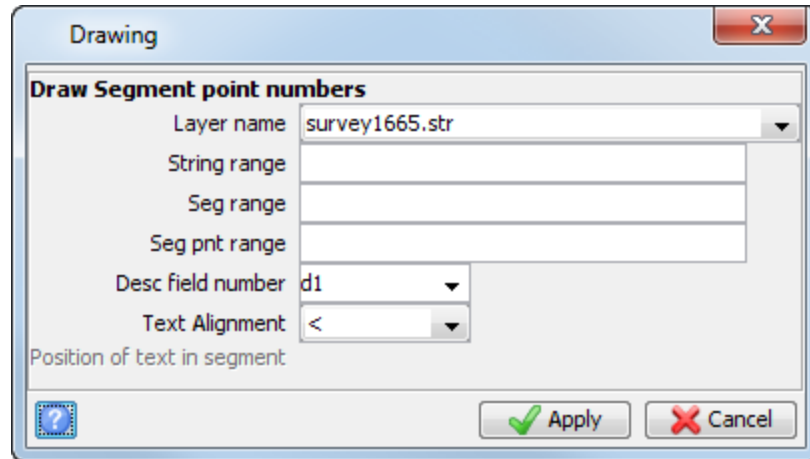
The new segment directions are displayed in the **message window**.

String 2 Segment 1 is now Anti-clockwise
String 2 Segment 3 is now Anti-clockwise

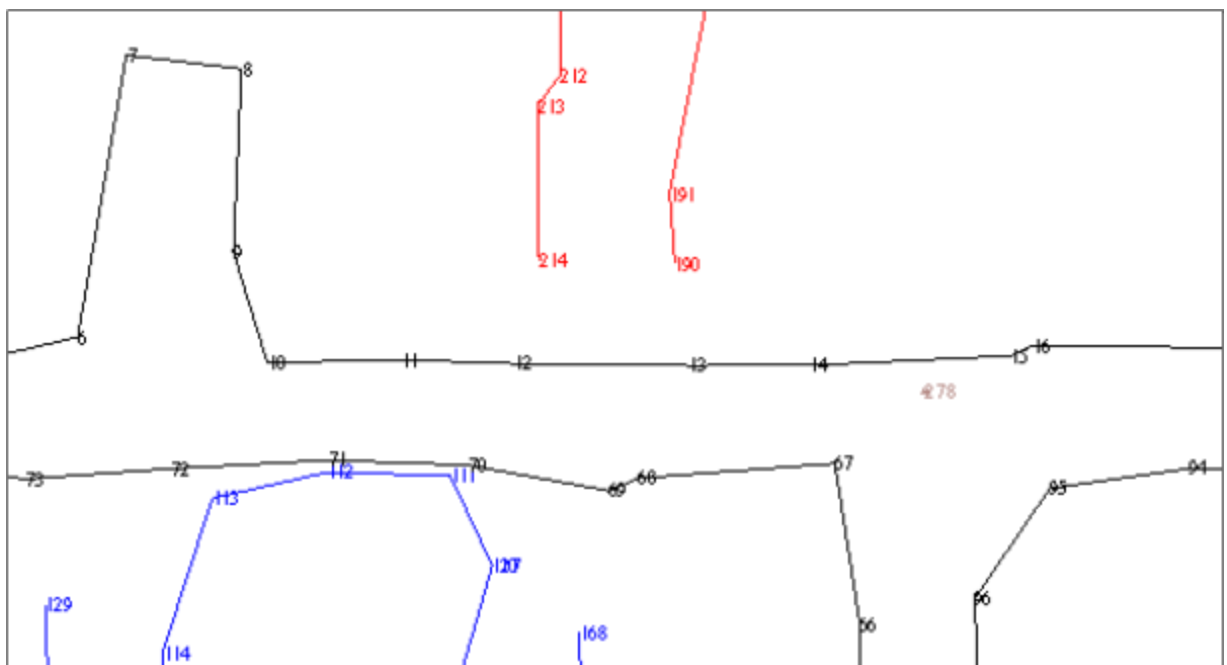
Task: Use select mode to break, join, and renumber segments

With select mode, you can select either points or segments. This mode allows you to perform many string editing tasks quickly.

1. Choose **Display > Point > Numbers**.
2. Enter the information as shown, and click **Apply**.

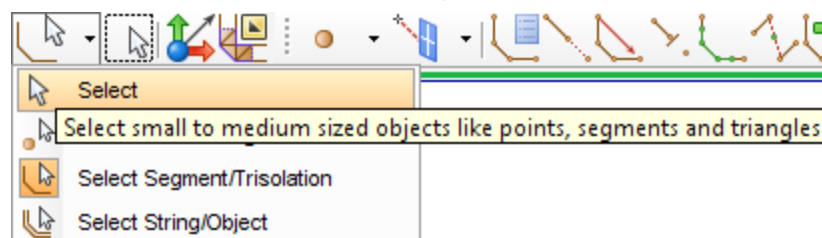


Point numbers are displayed.

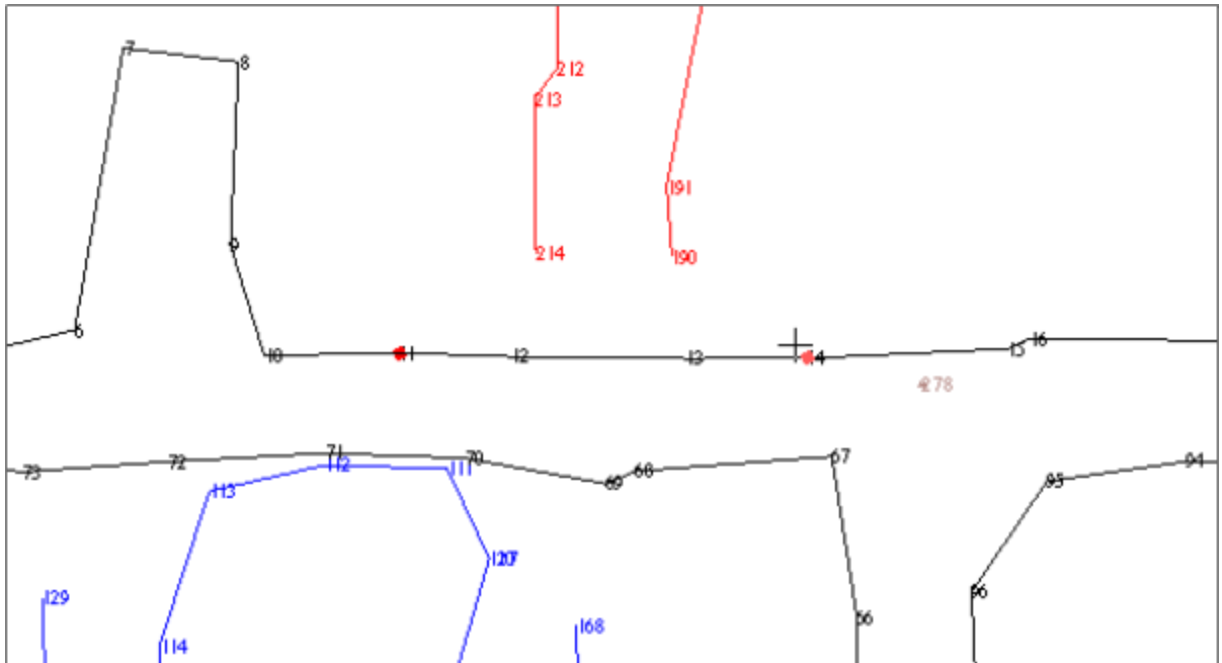


Note: It is not necessary to display point numbers. This is only done to clearly identify points that you will select in the following steps.

3. From the **Selection** menu on the **Tools** toolbar, click **Select**.

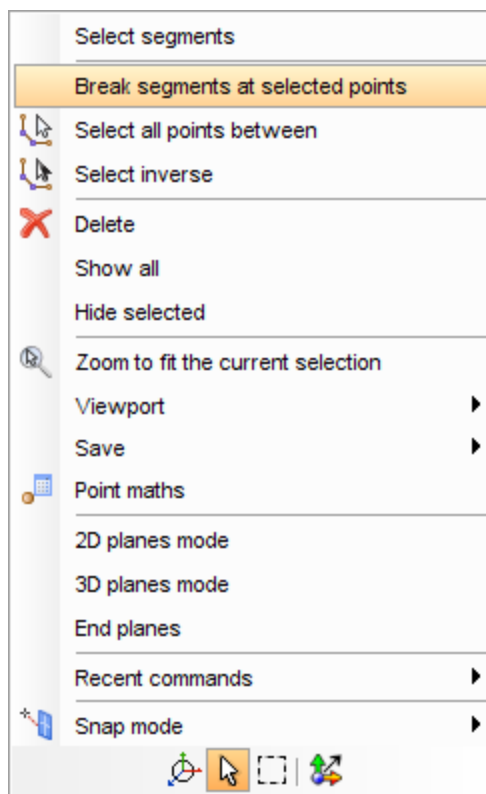


4. Hold the CTRL key, and click points 11 and 14.

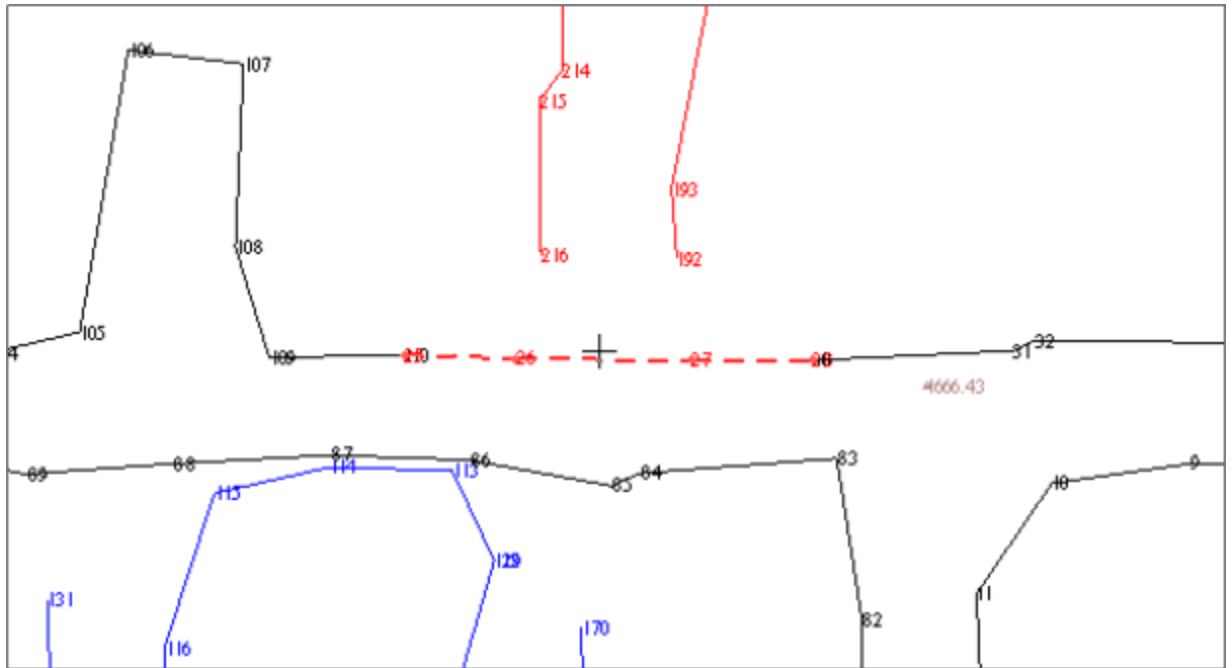


5. Right-click anywhere in **Graphics** to display a shortcut menu.

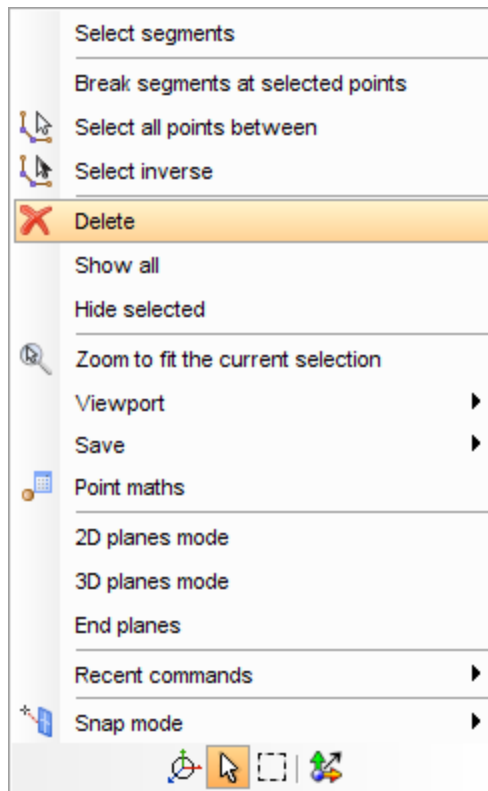
6. From the menu, select **Break segments at selected points**.



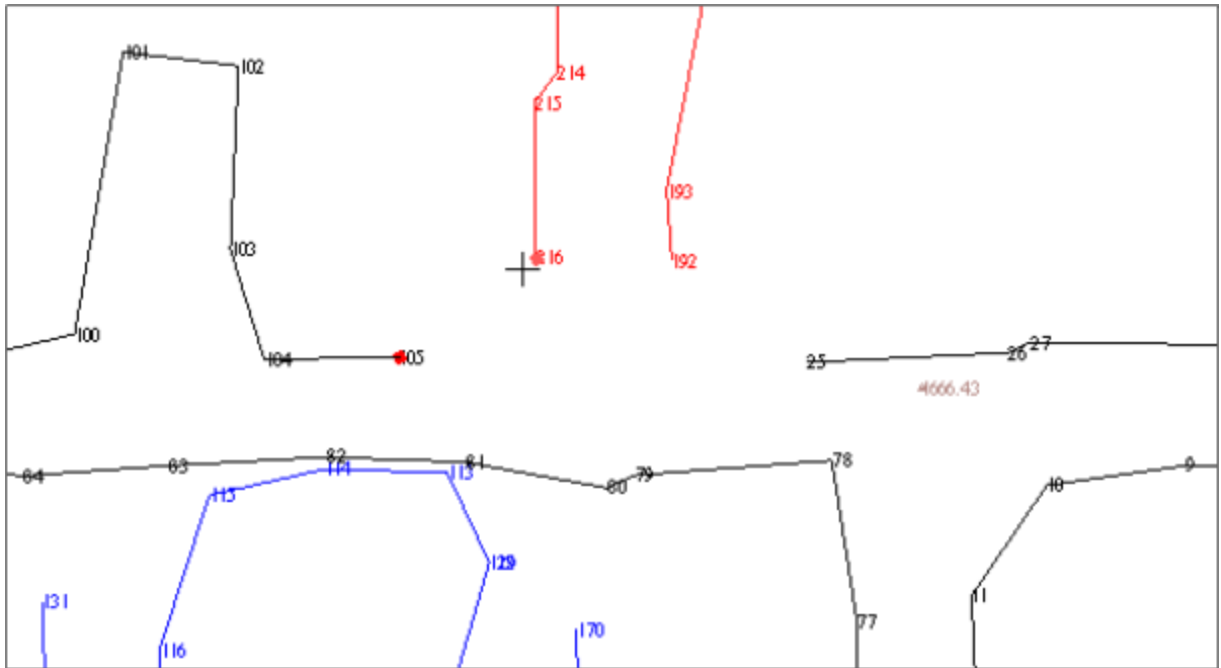
7. Click at a location between the two points on the segment to be deleted, as shown.



8. Right-click anywhere in **Graphics** and select **Delete** from the shortcut menu.

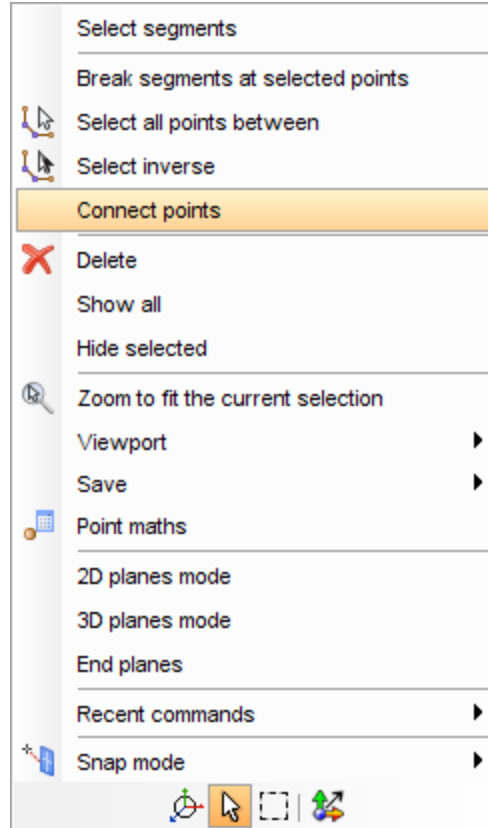


9. Hold the CTRL key, and select two points to be joined (105 and 216).

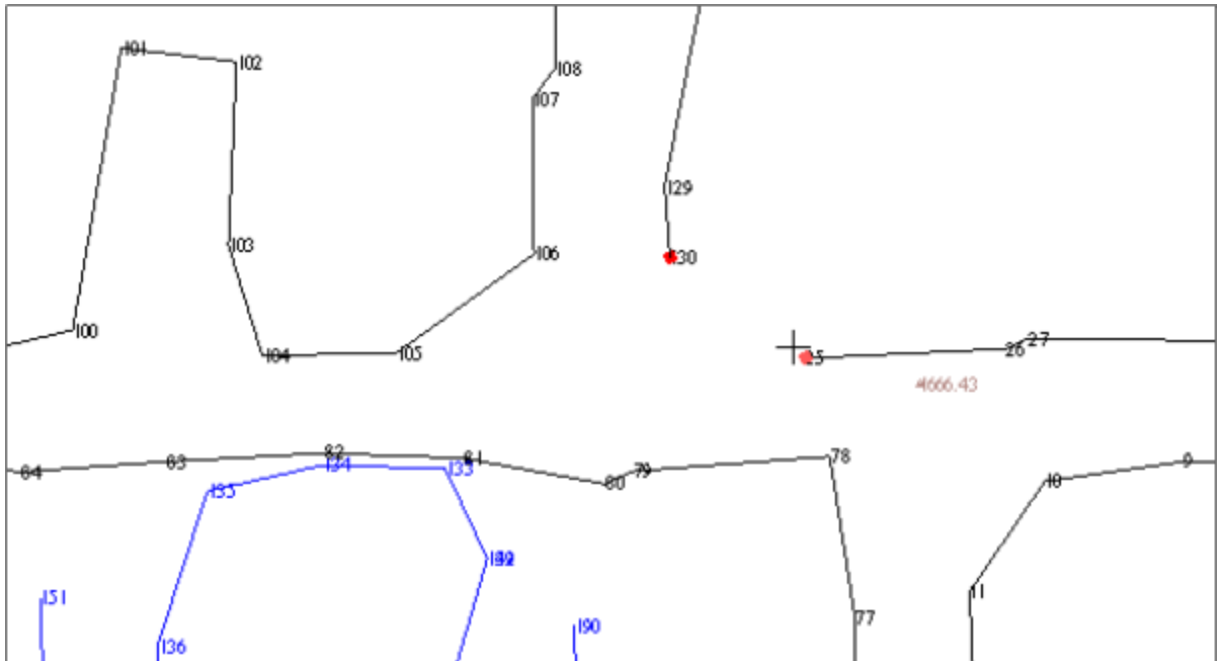


Note: If two segments of different string numbers are connected, the string number of the first point selected is used for the result. In the preceding example, if point 105 is selected first, then the resulting string number will be 1. If point 216 was selected first, the resulting string number will be 8.

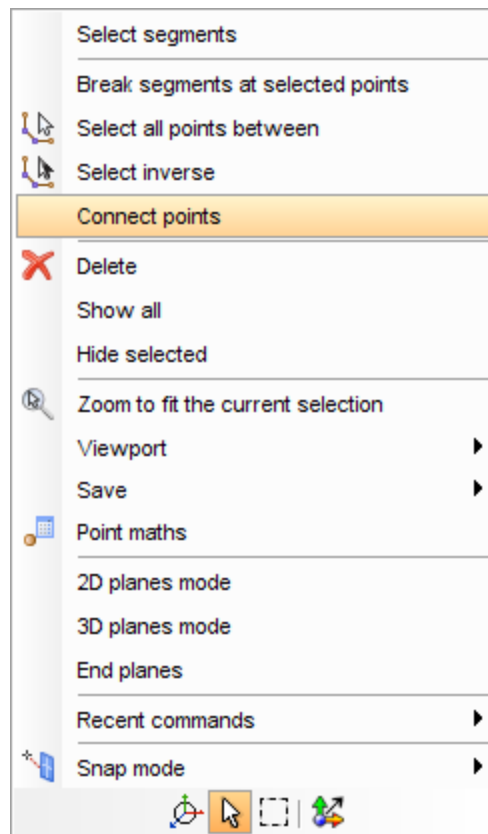
10. Right-click anywhere in **Graphics** and select **Connect points** from the shortcut menu.



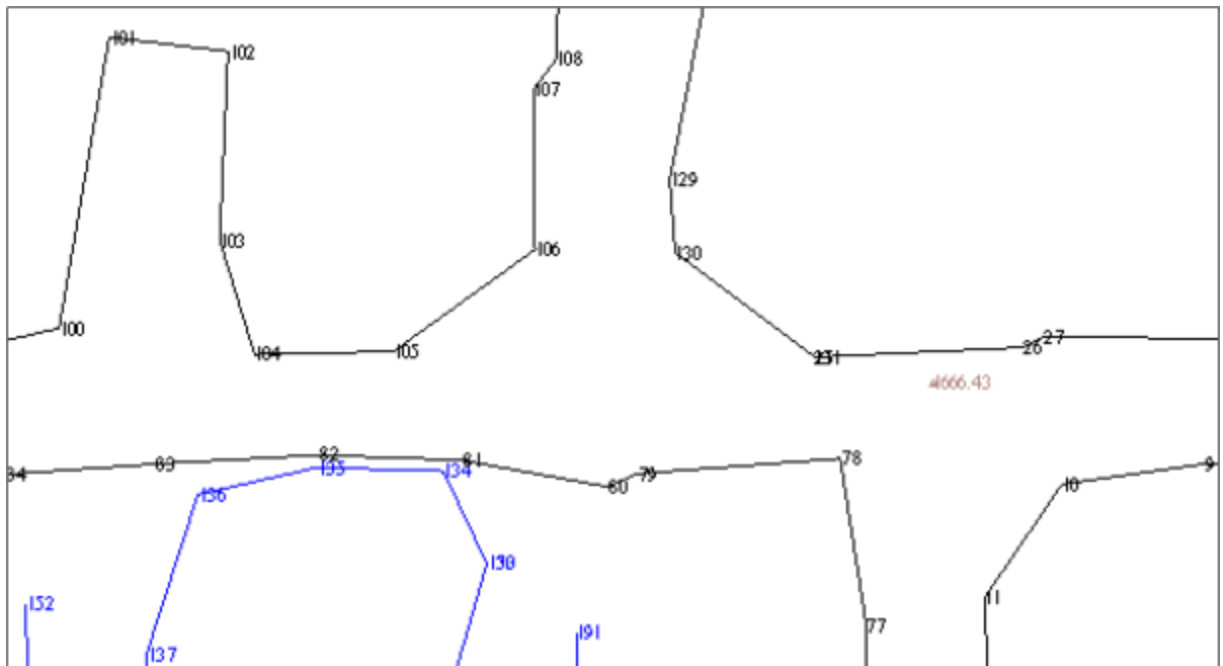
11. Hold the CTRL key, and select two points to be joined (130 and 25).



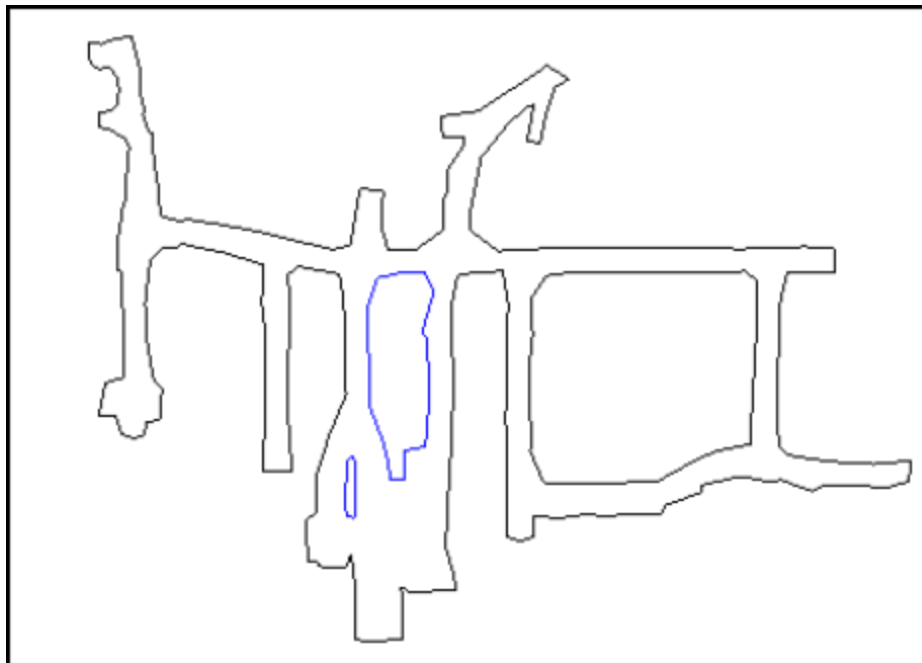
12. Right-click anywhere in **Graphics** and select **Connect points** from the menu.



The points are joined.

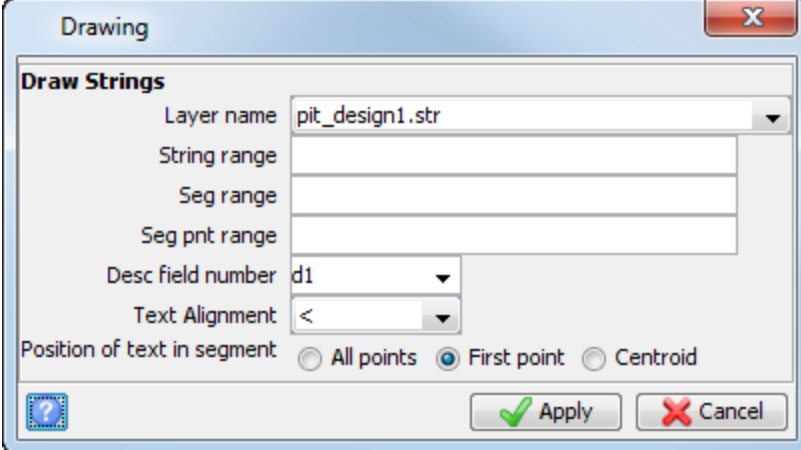


13. Repeat steps 4 to 12 for other locations, until you get the final result is as displayed below.

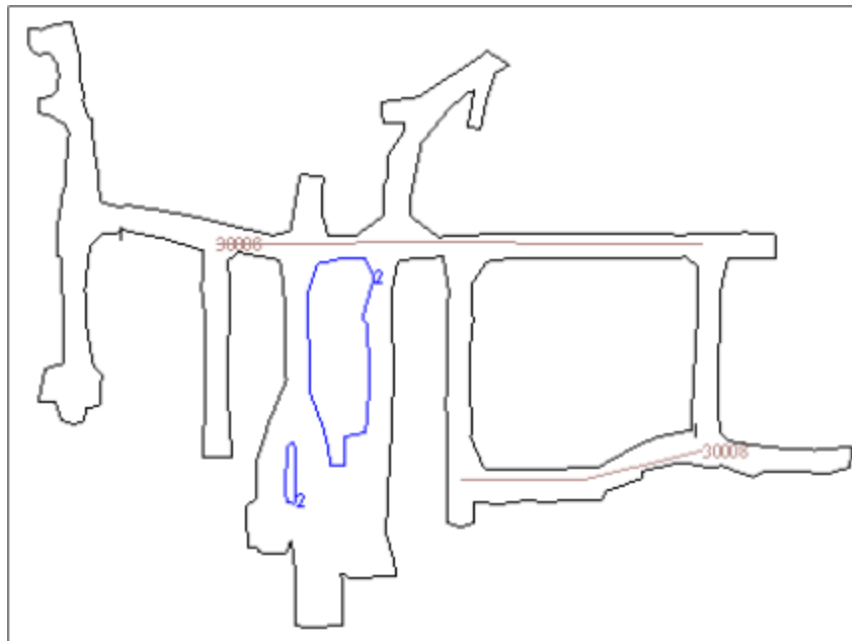


14. Choose **Display > Strings > With string numbers**.

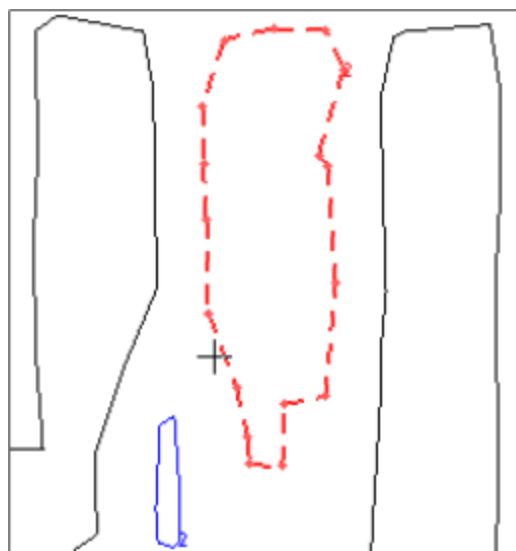
15. Enter the information as shown, and click **Apply**.



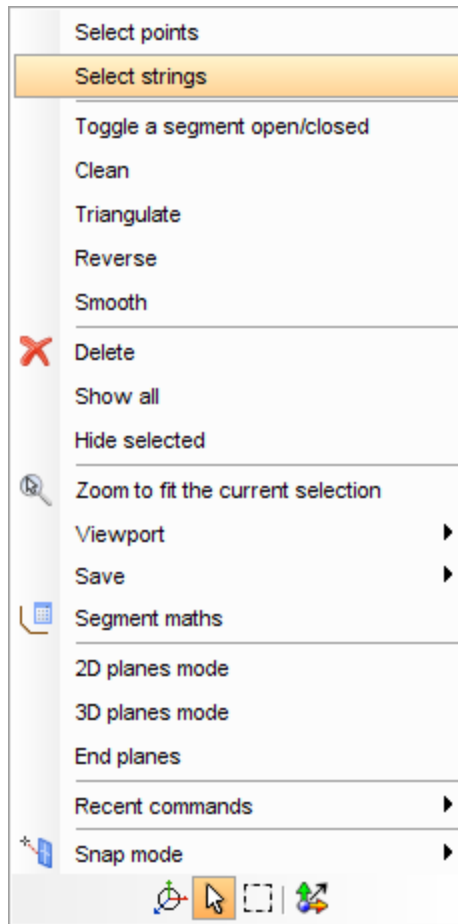
Next, you use the select tool to select and renumber all segments of string 2 to string 1.



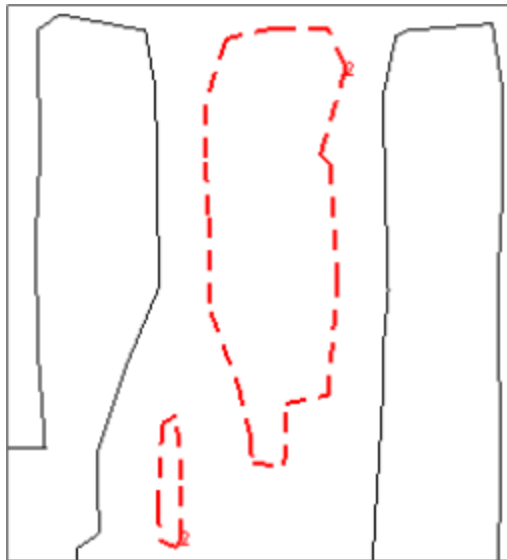
16. Click at a location between two points on the segment that you will renumber.



17. Right-click anywhere in **Graphics** and choose **Select strings** from the shortcut menu.

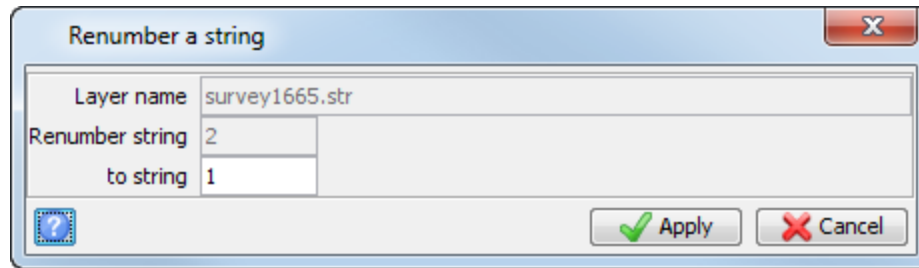


Both segments of string 2 are selected.



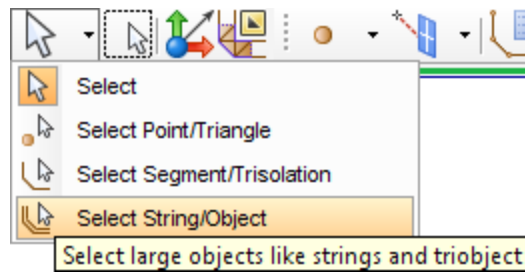
18. Choose **Edit > String > Renumber**.

19. Enter the information as shown, and click **Apply**.

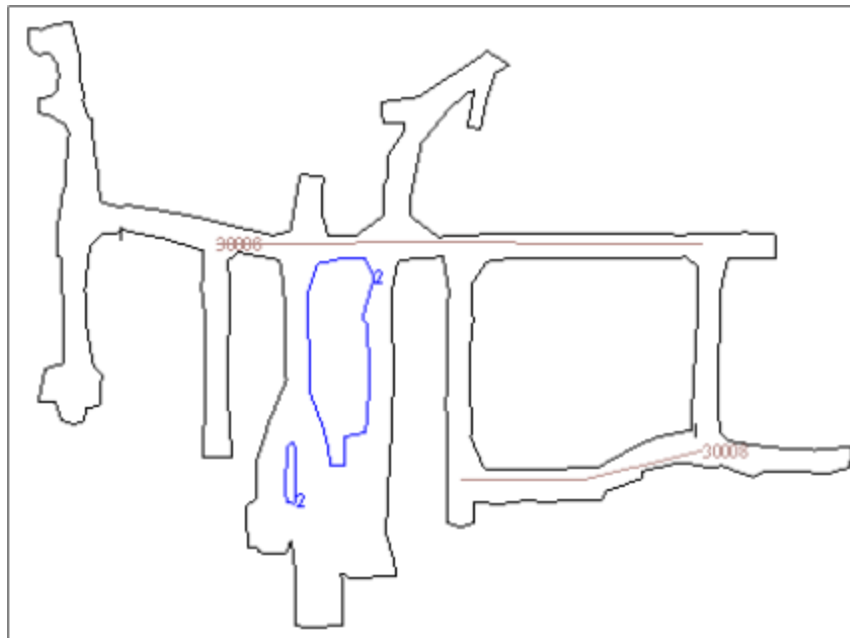


Task: Use string/object mode to delete and clean strings

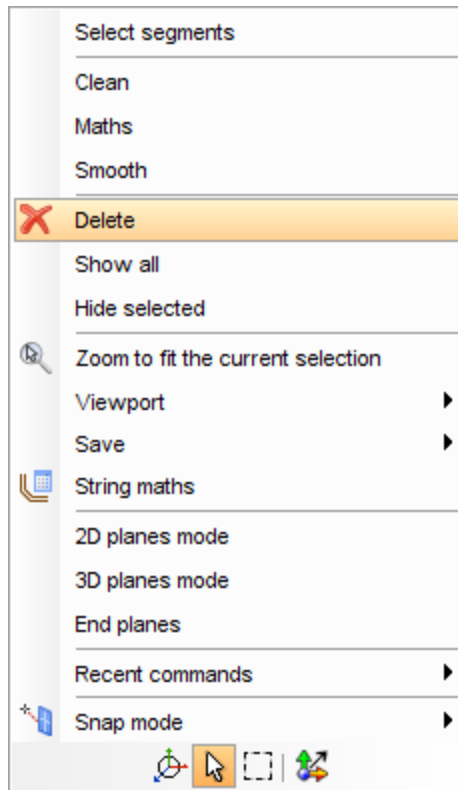
1. From the **Selection** menu on the **Tools** toolbar, click **Select String/Object**



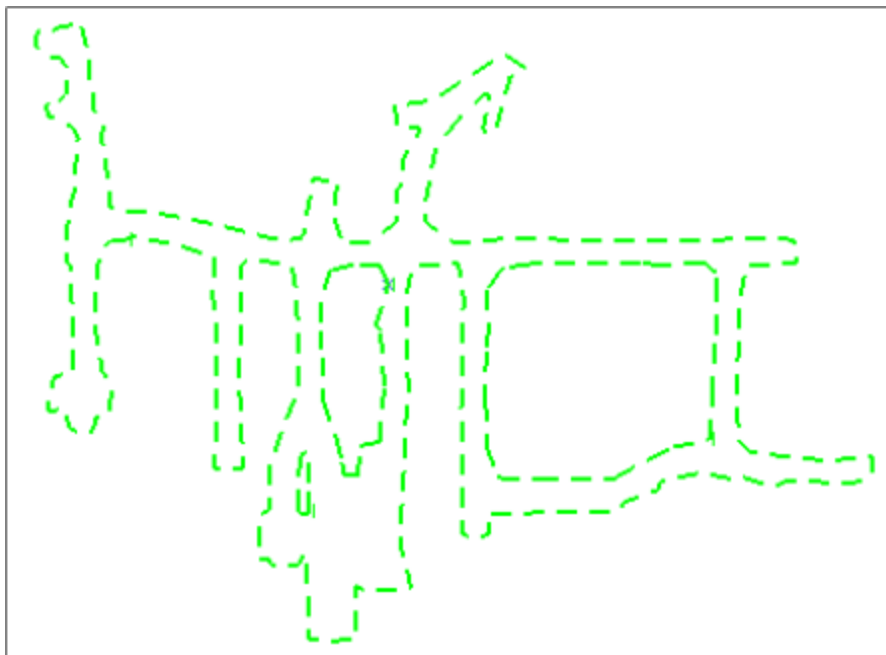
2. Click string 30008 as shown.



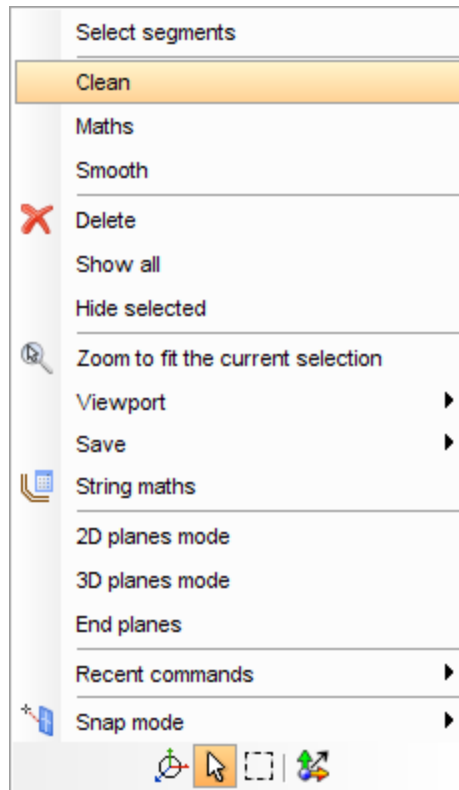
3. Right-click anywhere in **Graphics** and select **Delete** from the shortcut menu.



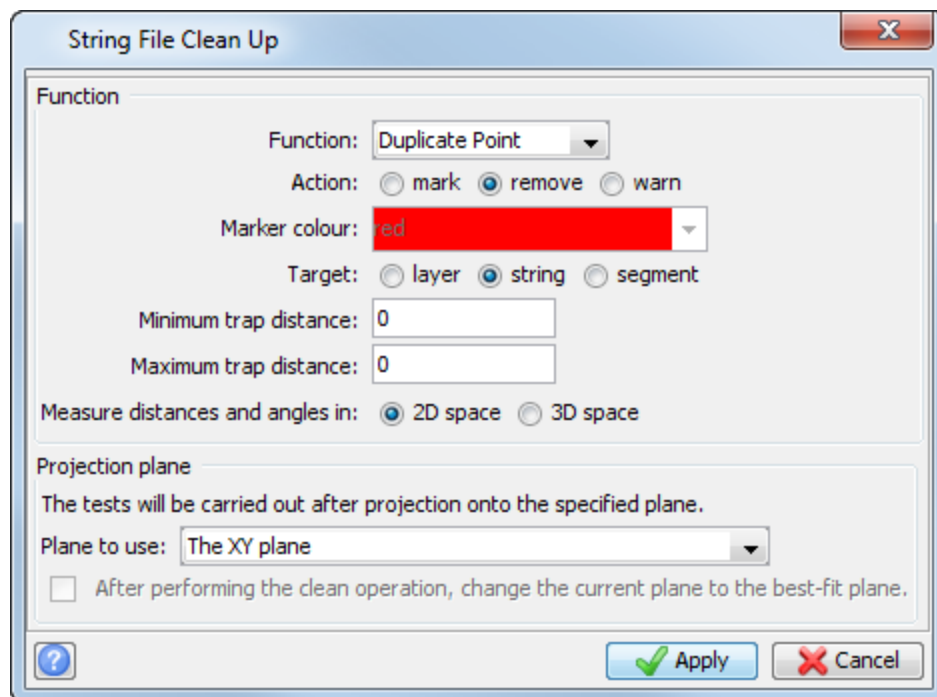
4. Click string 1, as shown.



5. Right-click anywhere in **Graphics** and select **Clean** from the shortcut menu.

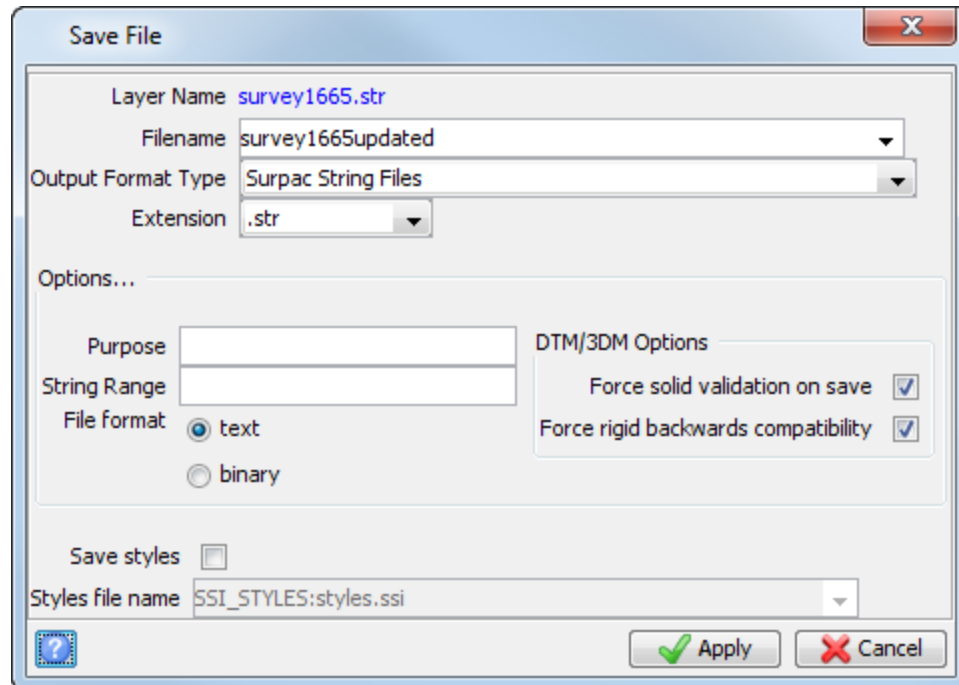


6. Enter the information as shown, and click **Apply**.



7. Choose **File > Save as**.

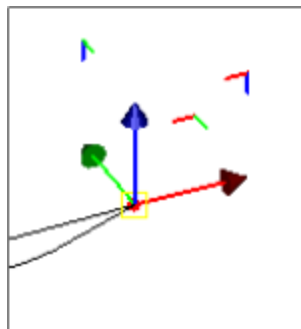
8. Enter the information as shown, and click **Apply**.



The Move tool

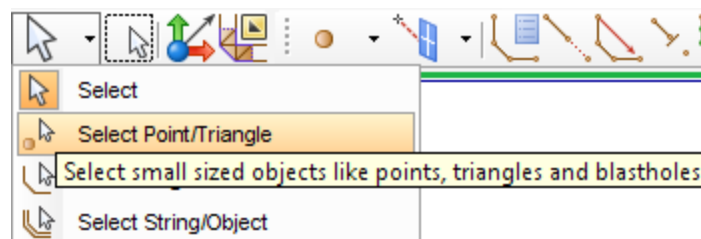
After you select data, you can use the **Move Tool** to move it:

- constrained along an axis
- constrained in a plane
- unconstrained

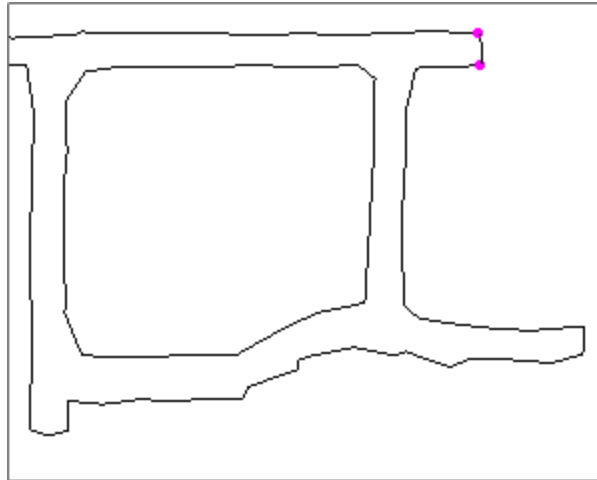


Task: Move data along an axis

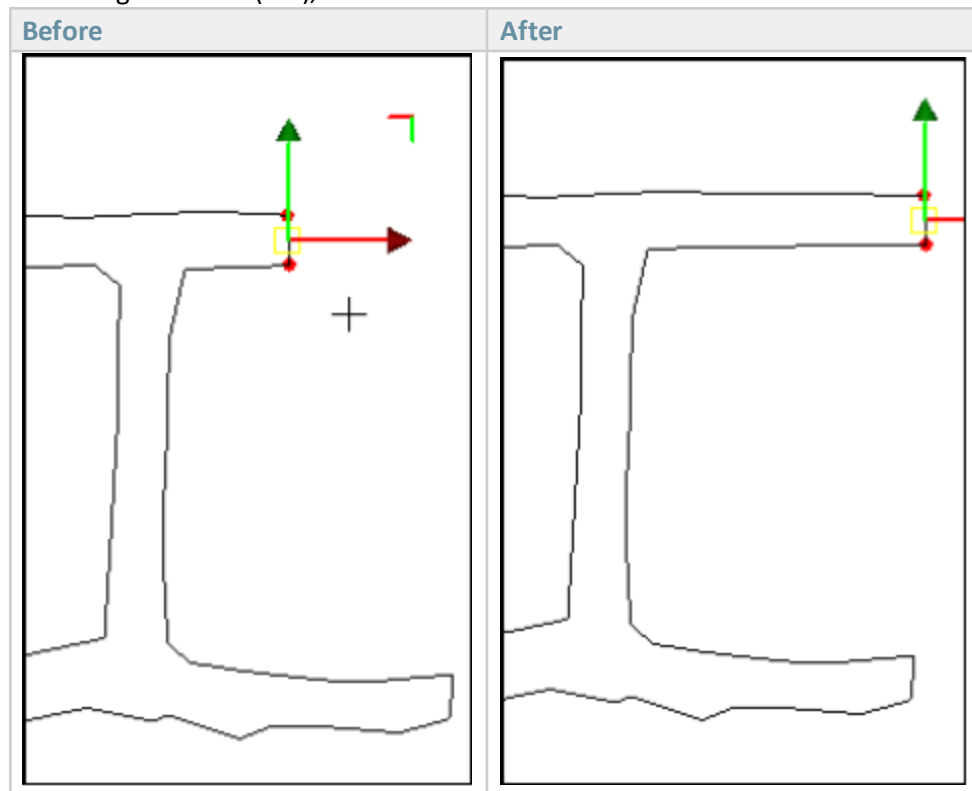
1. Click **Reset graphics** .
2. Open **lev1665.str** in **Graphics**.
3. From the **Selection** menu on the **Tools** toolbar, click **Select Point/Triangle**.



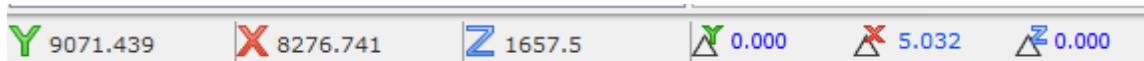
4. Hold the CTRL key, and click the two points as shown.




5. From the **Tools** toolbar, click the **Move Tool**.
6. Click and drag the X axis (red), as shown:

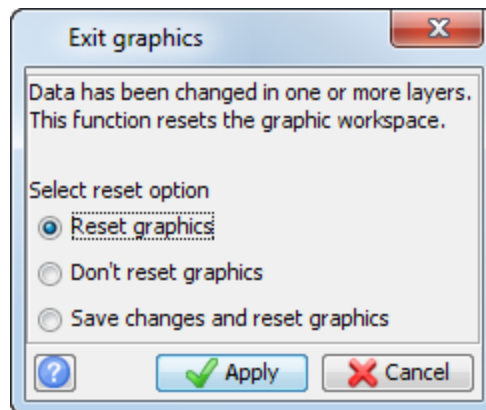


The Status bar displays coordinate values as well as the movement.

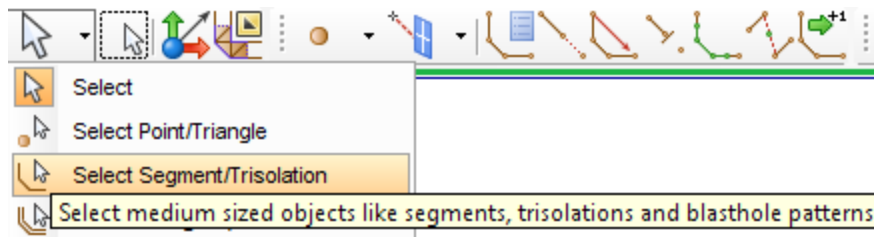


Task: Move data in a plane

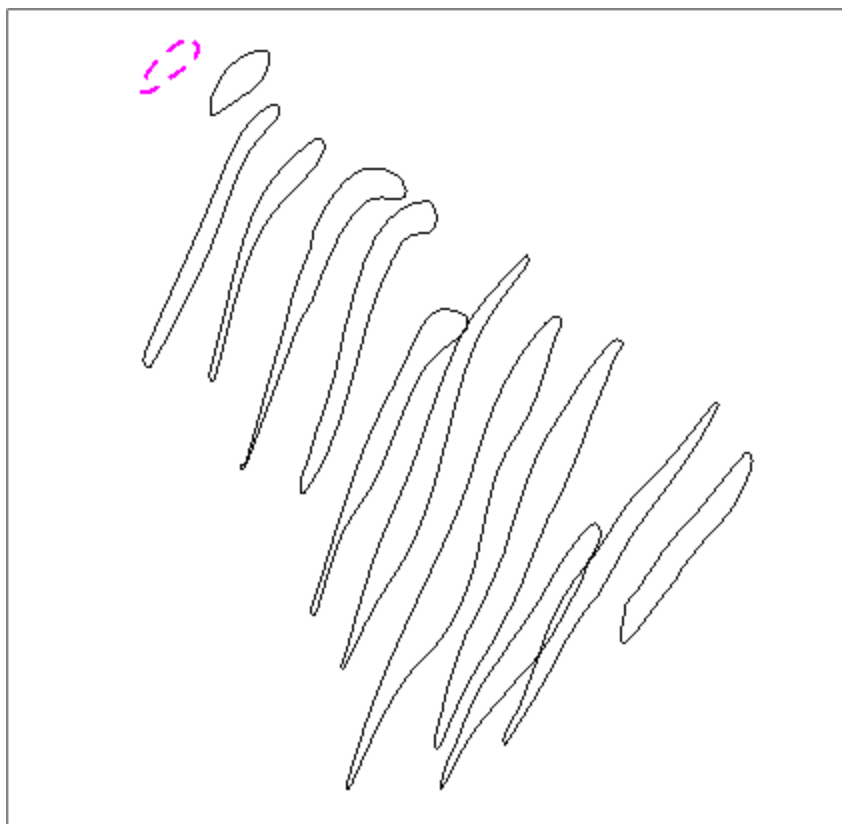
1. Click **Reset graphics** .
2. Enter the information as shown, and click **Apply**.





3. Open **ore1.str** in **Graphics**.
4. Rotate the data as shown in the image in step 6 below.
5. From the **Selection** menu on the **Tools** toolbar, click **Select Segment/Trisolation**.



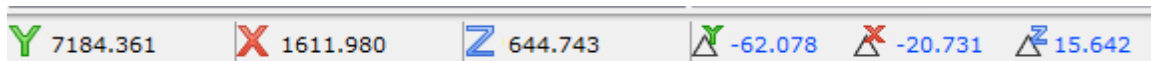
6. Click the segment as shown.




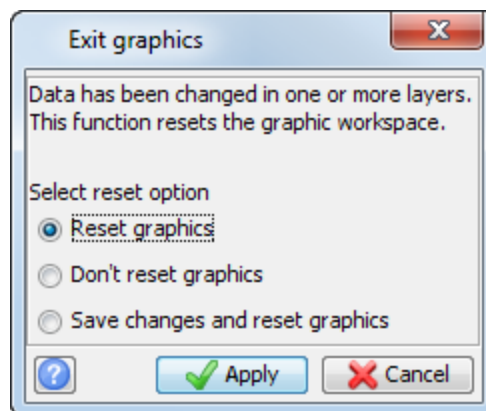
7. On the **Tools** toolbar,  click the **Move Tool** icon .
8. Click and drag the red and blue corner to constrain the movement to the XZ plane.



Only the X and Z values in the Status bar change as you move the segment.



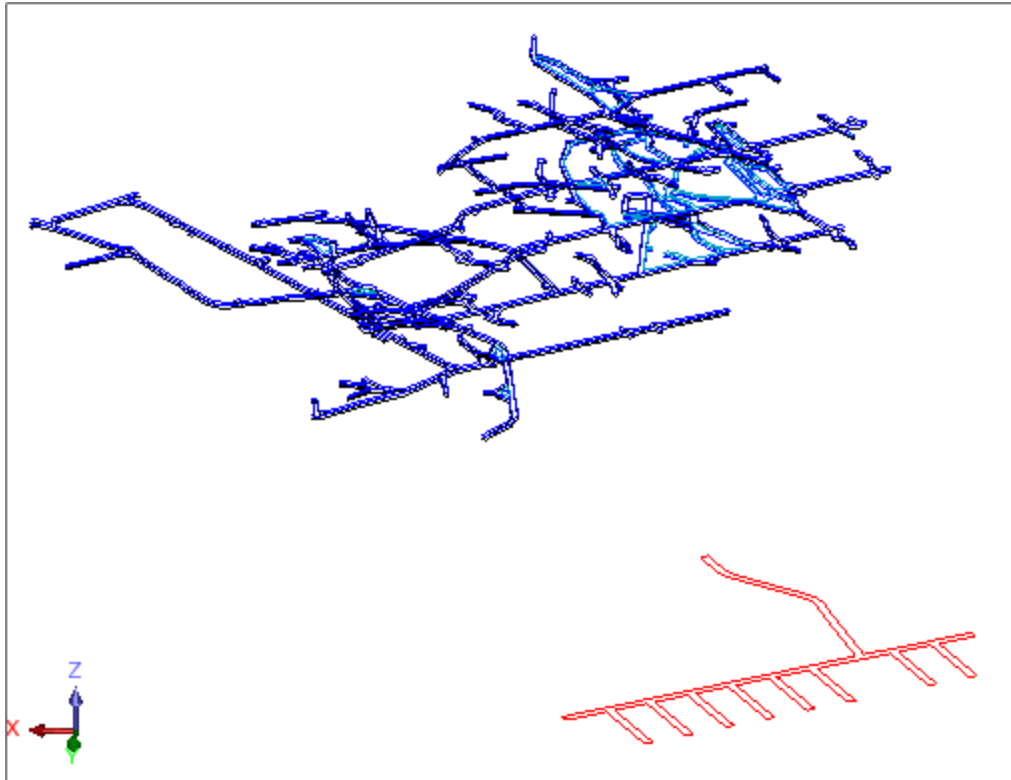
9. Click **Reset graphics** .
10. Enter the information as shown, and click **Apply**.



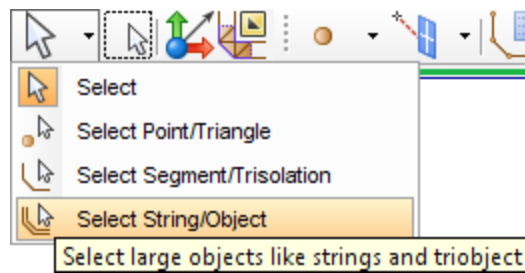
Task: Move data in three dimensions

1. Click **Reset graphics** .
2. Open **und1.str** in **Graphics**.
3. Open **und_layout.str** in **Graphics**.

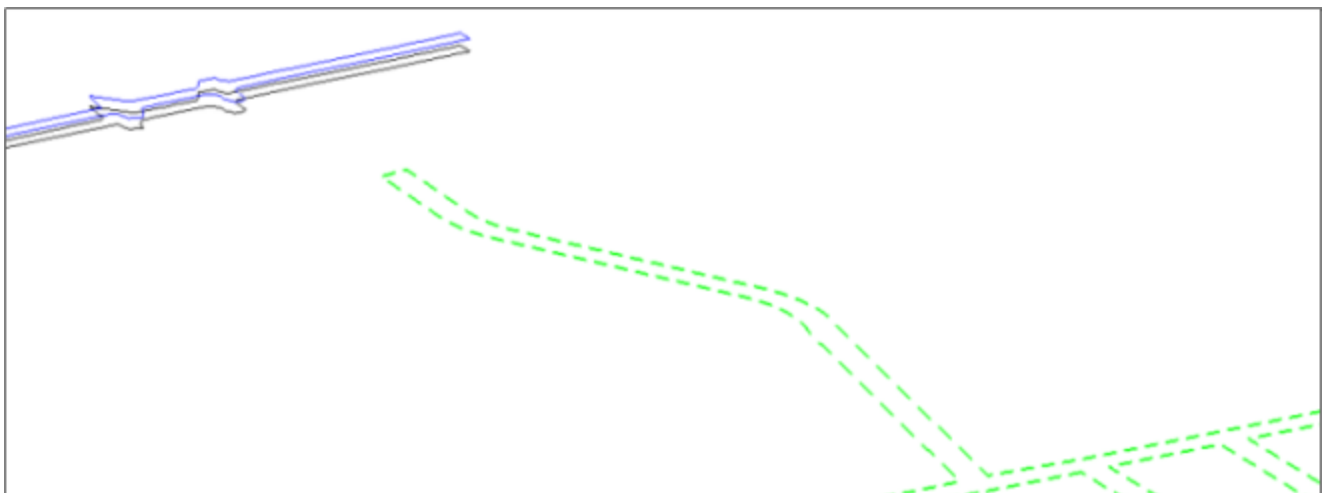
4. Click and drag in **Graphics** to rotate the data as shown.



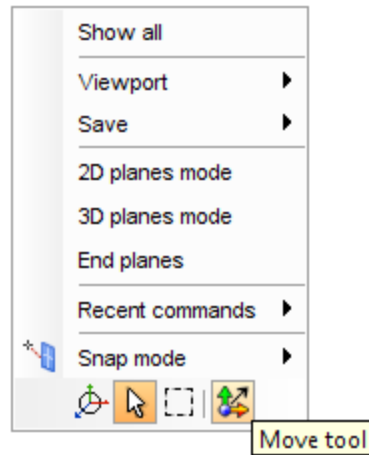
5. From the **Selection** menu on the **Tools** toolbar, click **Select String/Object**.



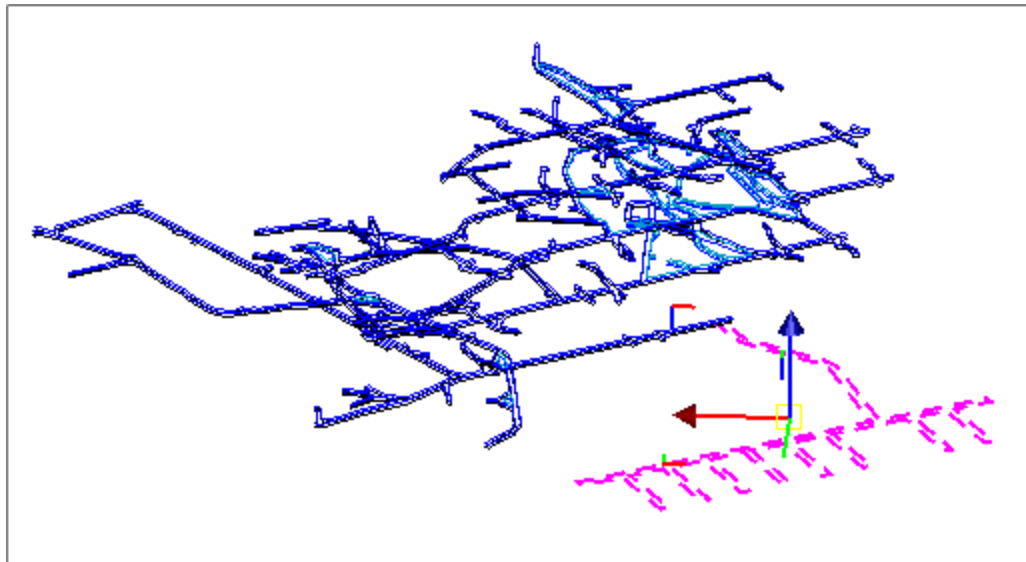
6. Click the string in **und_layout.str**.



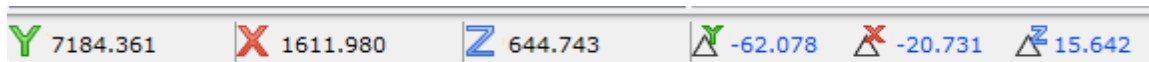
7. Right-click and select the **Move Tool** from the shortcut menu.



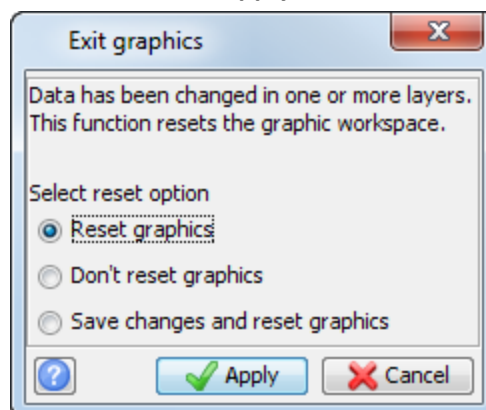
8. Click inside the yellow square at the intersection of the three axes and move the string as shown.



All three coordinates in the Status bar change as you move the string.



9. Click **Reset graphics** .
10. Enter the information as shown, and click **Apply**.




Creating data

Create a simple pit design

You will design a pit base around an ore zone at an elevation of 150, and then extend it up to an elevation of 250 with a pit wall angle of 45 degrees.

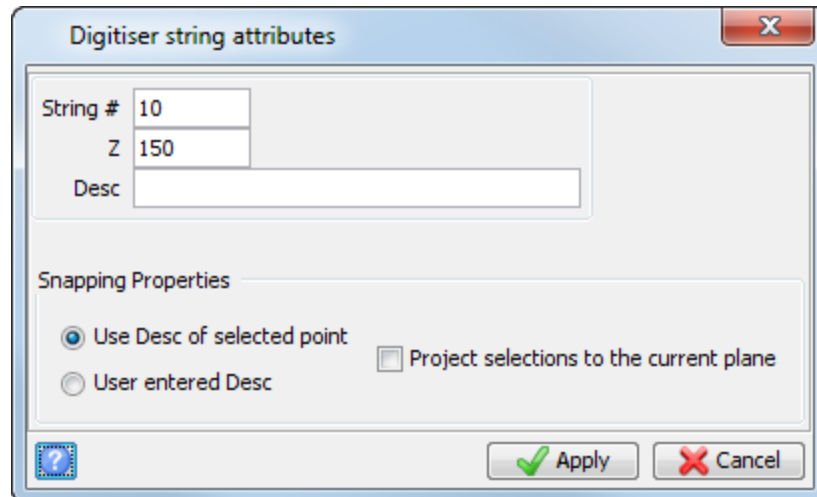
Task: Create a simple pit design

1. Click **Reset graphics** .
2. Open **ore150.str** in **Graphics**.
You can see a horizontal slice of ore zones at an elevation of 150.



3. Choose **Create > Digitise > Properties**.

4. Enter the information as shown, and click **Apply**.



Digitiser string attributes

String # 10
Z 150
Desc

Snapping Properties

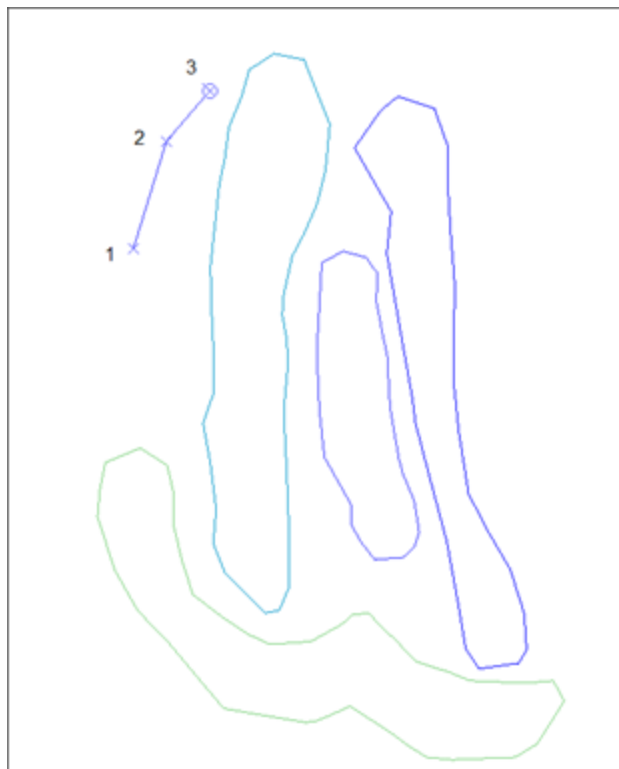
Use Desc of selected point Project selections to the current plane
 User entered Desc

Apply Cancel

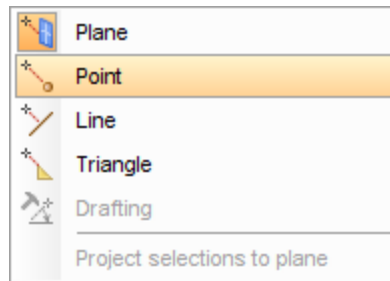
5. Choose **Create > Digitise > New point**.
6. Click in **Graphics** to create points 1, 2, and 3 as shown.

 **Notes:**

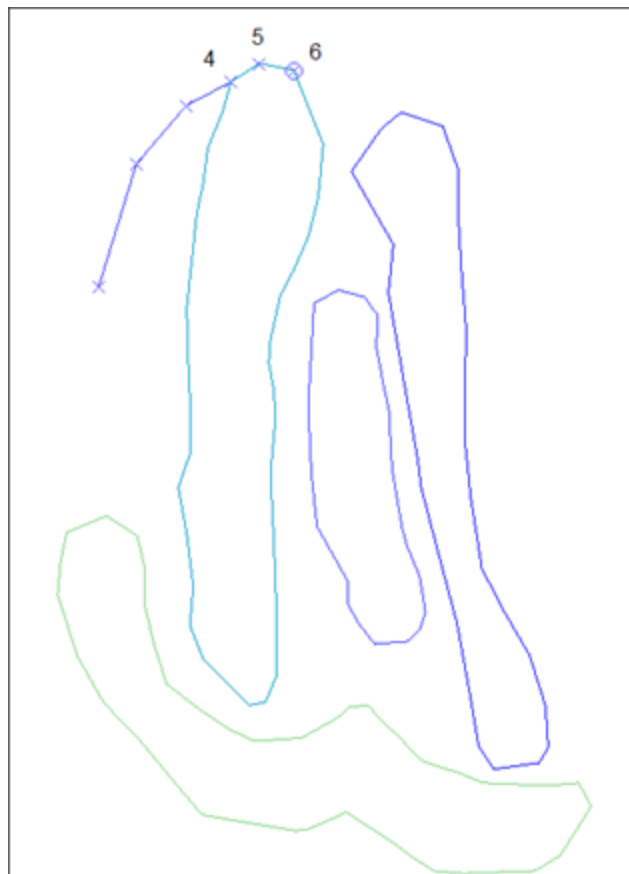
- Do **not** press **ESC**. You have not finished creating the string.
- Numbers 1, 2, and 3 are not displayed in **Graphics**. They are shown on the images so you know the order in which to create the points.



7. Right-click in **Graphics** and select **Point**.

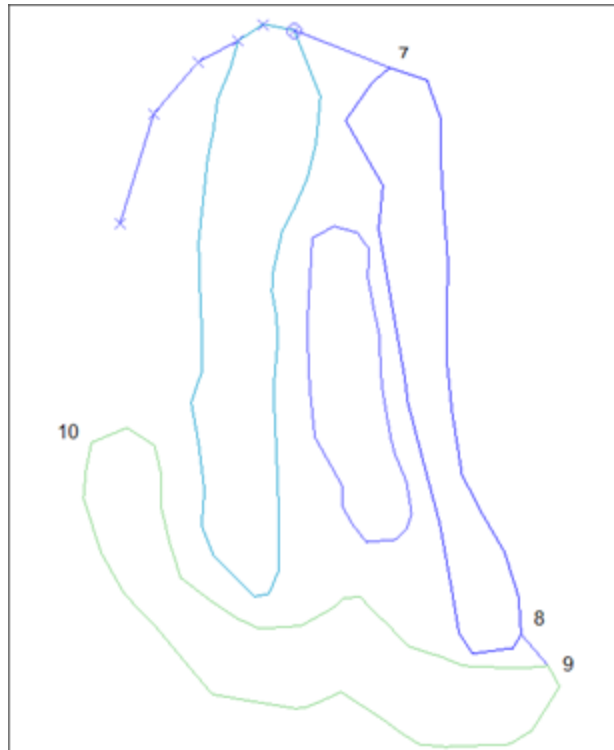


8. Click three points at the northern end of the segment as shown, to create points 4, 5, and 6.




9. Choose **Create > Digitise > By following a segment**.
10. Click and hold down the left mouse button at point 7, then drag to point 8 and release.

- Click and hold down the left mouse button at point 9, then drag to point 10 and release.

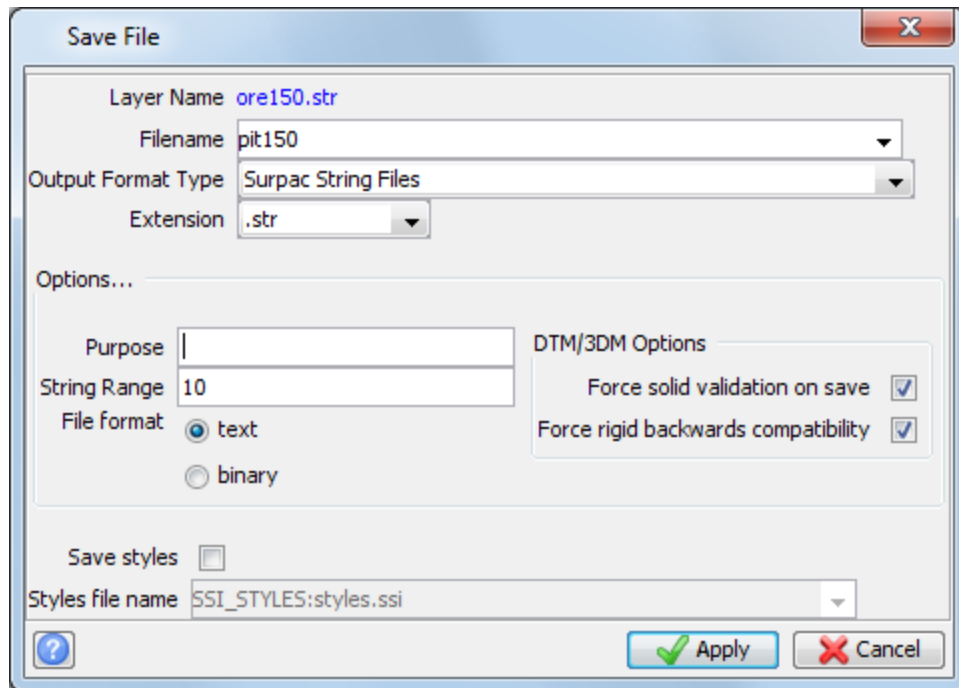



- Choose **Create > Digitise > Close current segment**.
The closed segment is displayed.

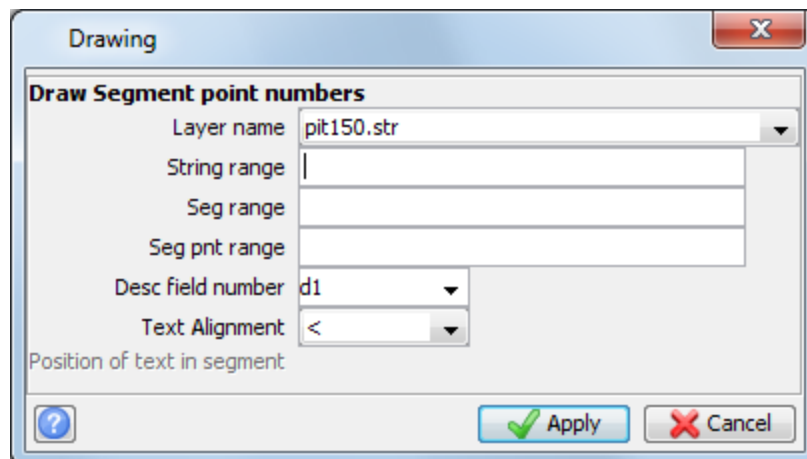


 **Note:** When you create closed segments in the XY plane (plan view), you will usually create them in a clockwise direction. Clockwise segments are regarded as an area of inclusion, and give expected results when you intersect them with other clockwise segments.

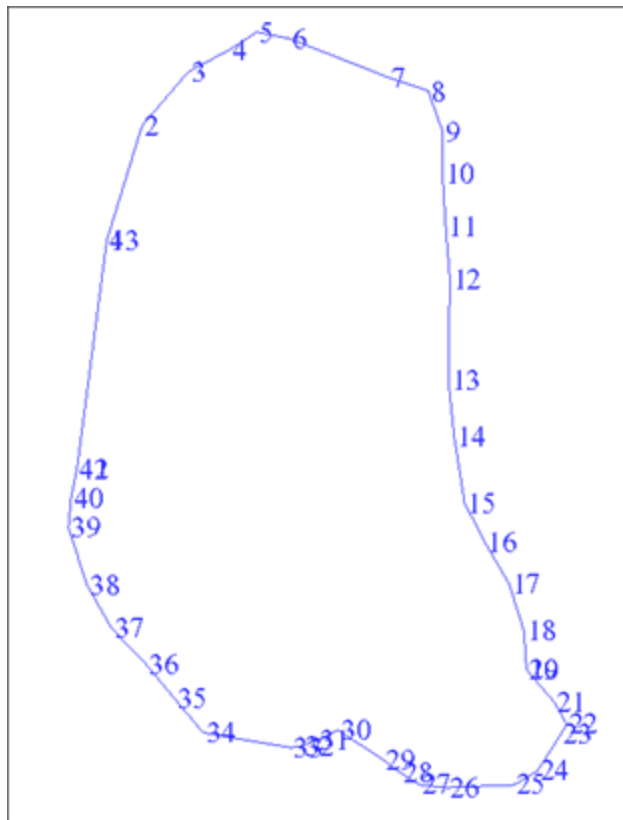
13. Choose **File > Save > string/DTM**.
14. Enter the information as shown, and then click **Apply**.



15. Click **Reset graphics** .
16. Open **pit150.str** in **Graphics**.
17. Choose **Display > Point > Numbers**.
18. Enter the information as shown, and click **Apply**.

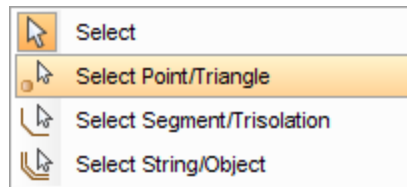


The numbered points on the segment are displayed.

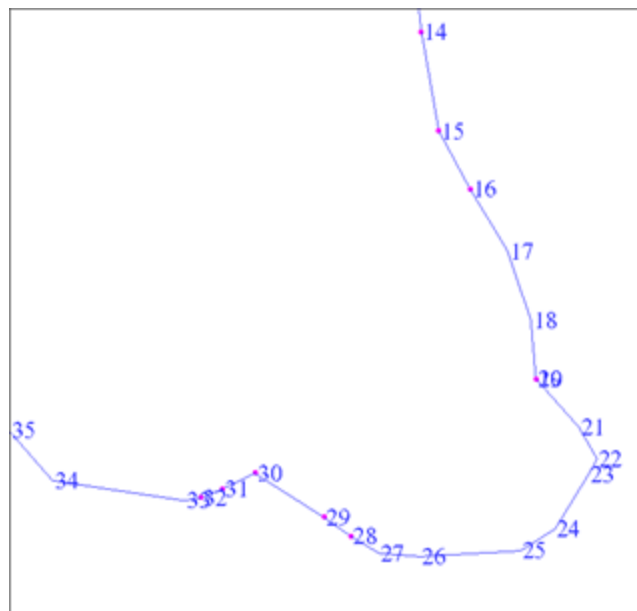


Next, you will delete some points to make the outline more convex.

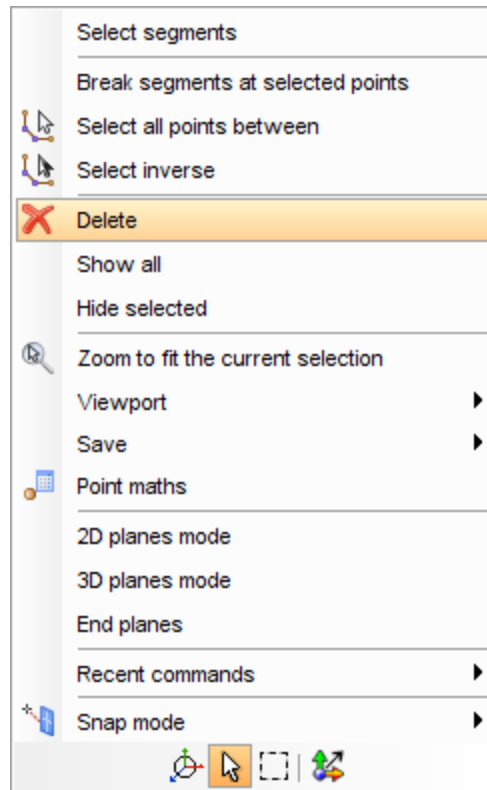
19. Set the selection mode to **Select Point/Triangle**.



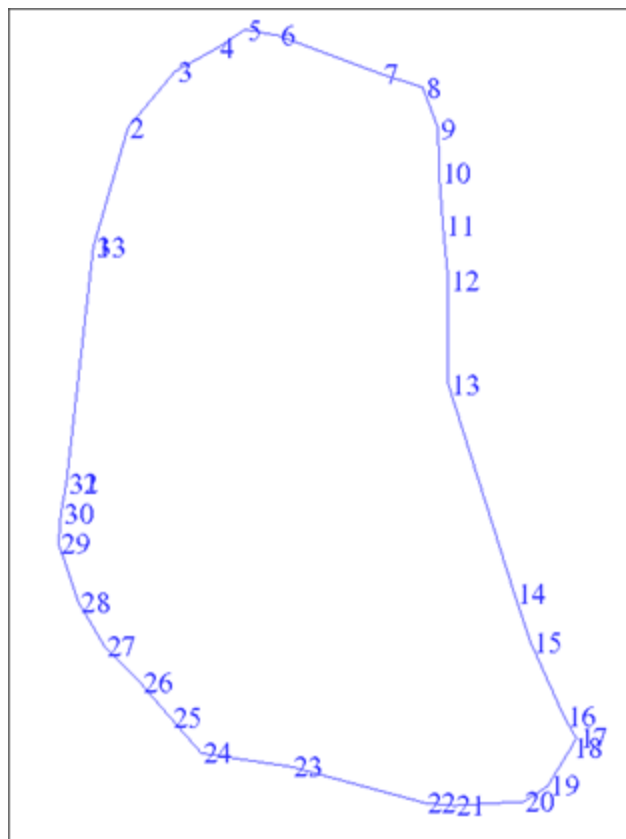
20. Hold the **CTRL** key and click several points as shown.



21. Right-click in **Graphics** to display a shortcut menu, and select **Delete**.



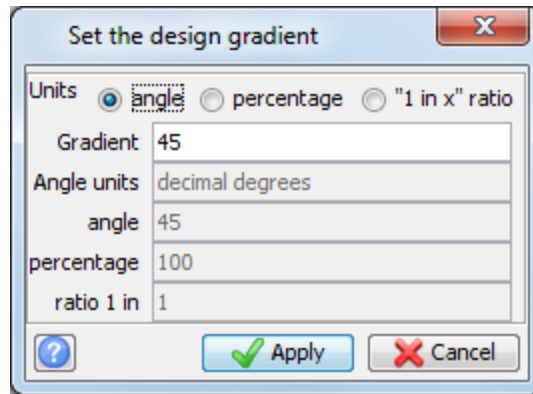
The renumbered segment is displayed.



Next, you will set the slope wall angle to 45 degrees.

22. Choose **Design > Pit design > Set slope gradient**.

23. Enter the information as shown, and click **Apply**.



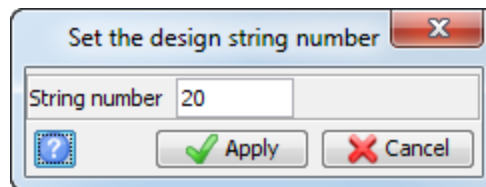
The **Design grade** button `45.000 angle` displays the current design gradient.

Next, you will set the string number for the top of the pit.

Note: This step is optional.

24. From the Status bar at the bottom of the Surpac window, click the **Design string** button `Str = 1`.

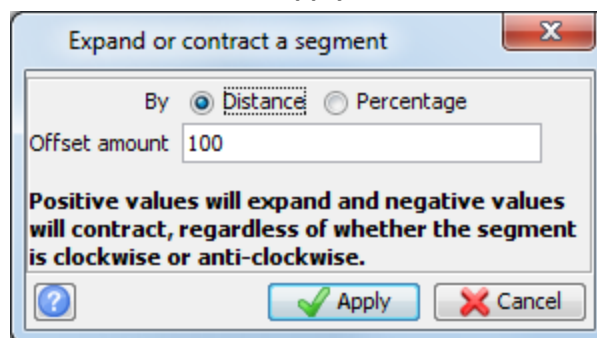
25. Enter the information as shown, and click **Apply**.



The **Design string** button displays the current design string number `Str = 20`.

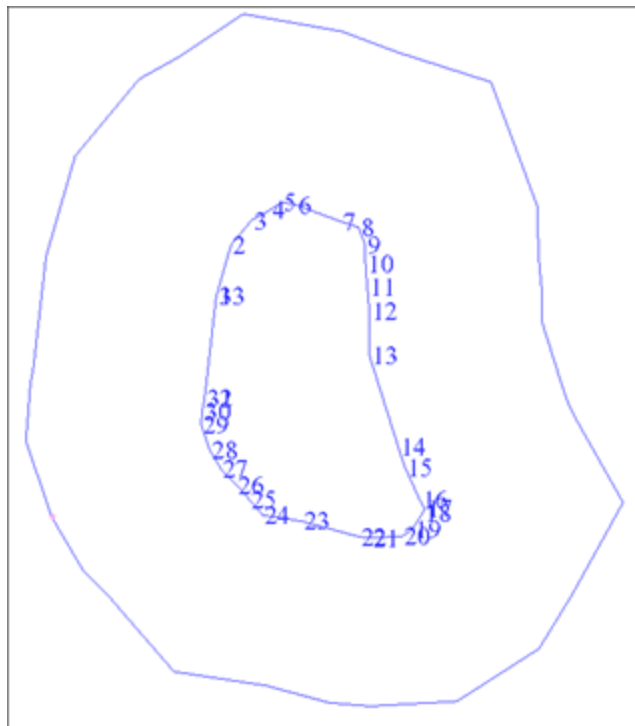
Next, you will expand the segment horizontally by a distance of 100. At an angle of 45 degrees, this will create a pit crest 100 meters above the base, at an elevation of 250.

26. Choose **Edit > Segment > Expand/Contract**.
27. Click anywhere in **Graphics** to select the segment for expanding.
28. Enter the information as shown, and click **Apply**.



29. Press **ESC** to finish expanding.

The segments representing the top and bottom of the pit are displayed.

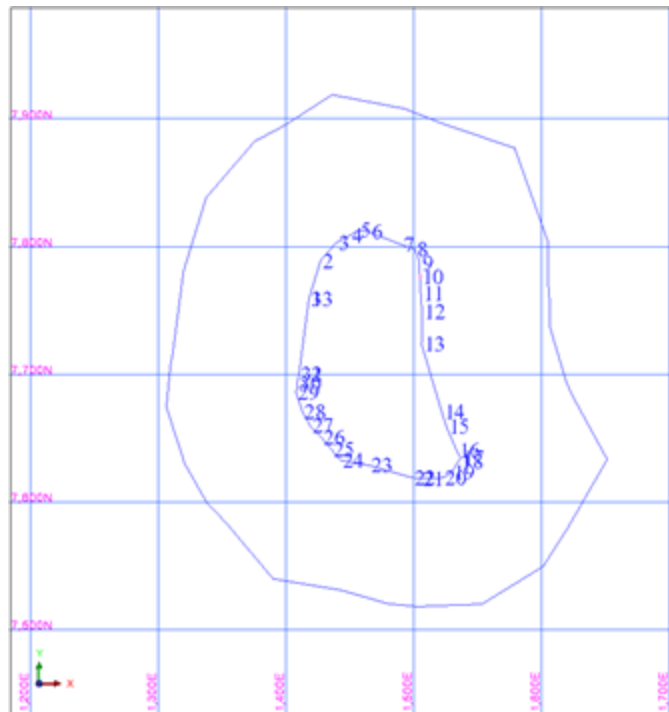


30. Hold down the right mouse button and drag down or to the left to zoom out.

31. Click the **Plan View** button .

32. Choose **Display > Dynamic 2D Grid**.

The pit strings and the Dynamic 2D grid are displayed.

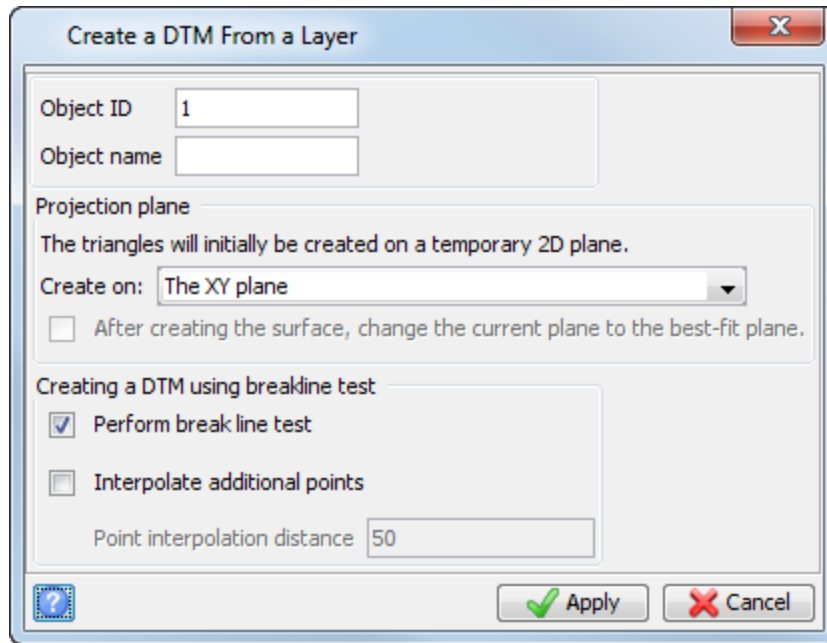


This procedure can be useful for determining the limits of a block model.

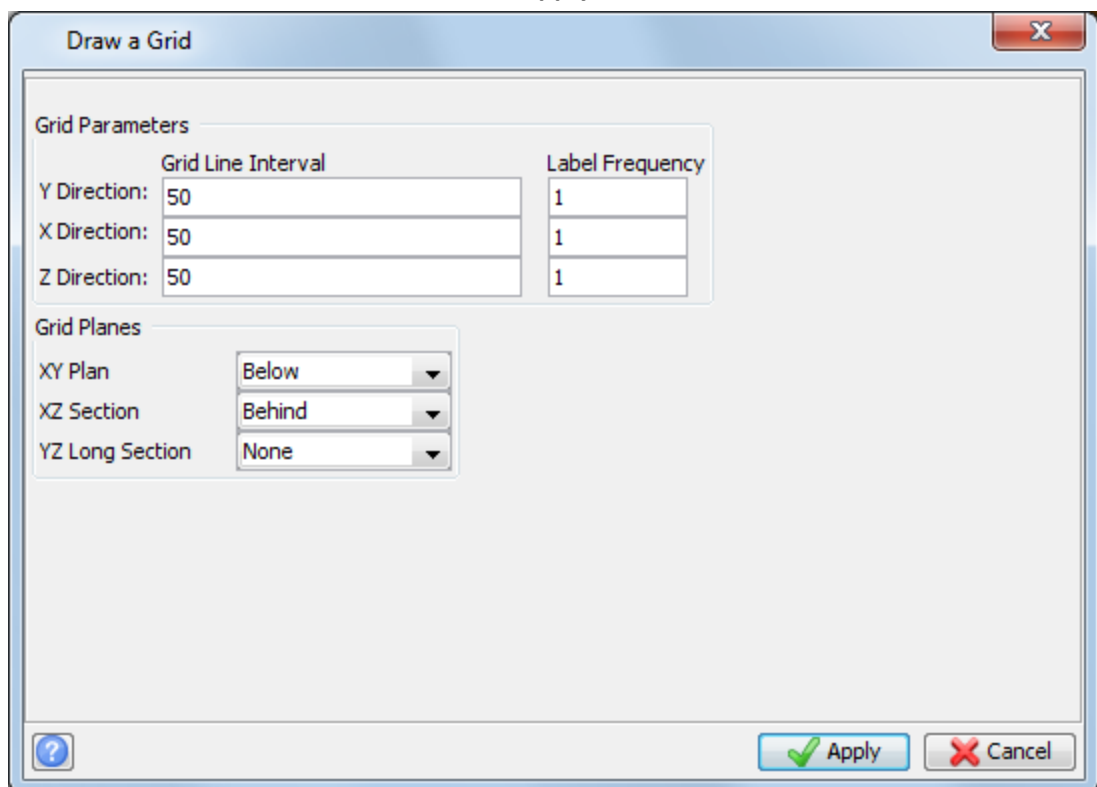
Next, you will create a DTM from this data.

33. Choose **Surfaces > Create DTM from Layer**.

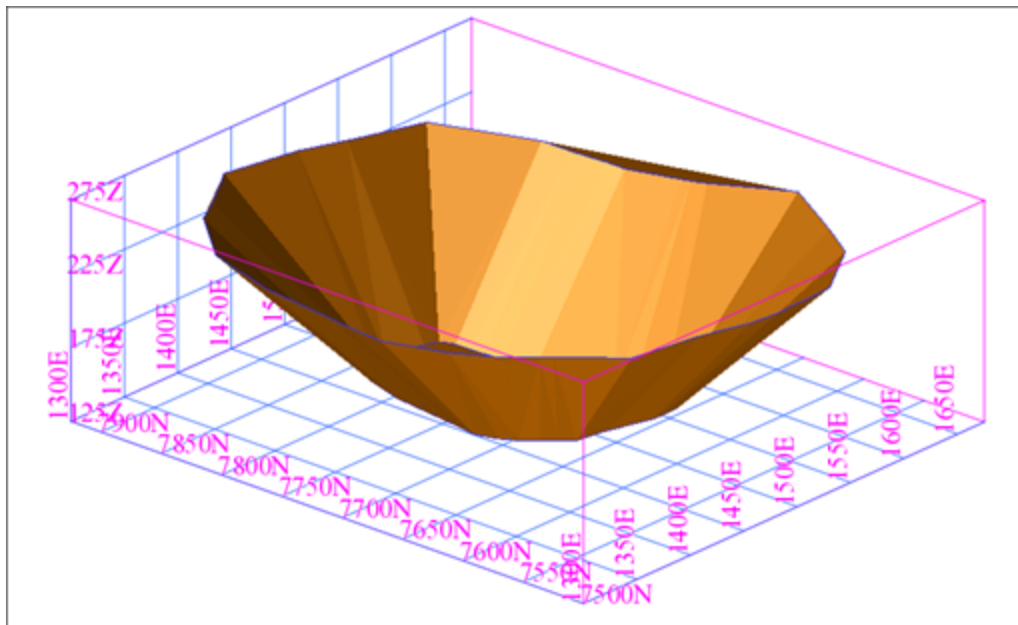
34. Enter the information as shown, and click **Apply**.



35. Choose **Display > Hide grid**.
 36. Choose **Display > 3D Grid**.
 37. Enter the information as shown, and click **Apply**.

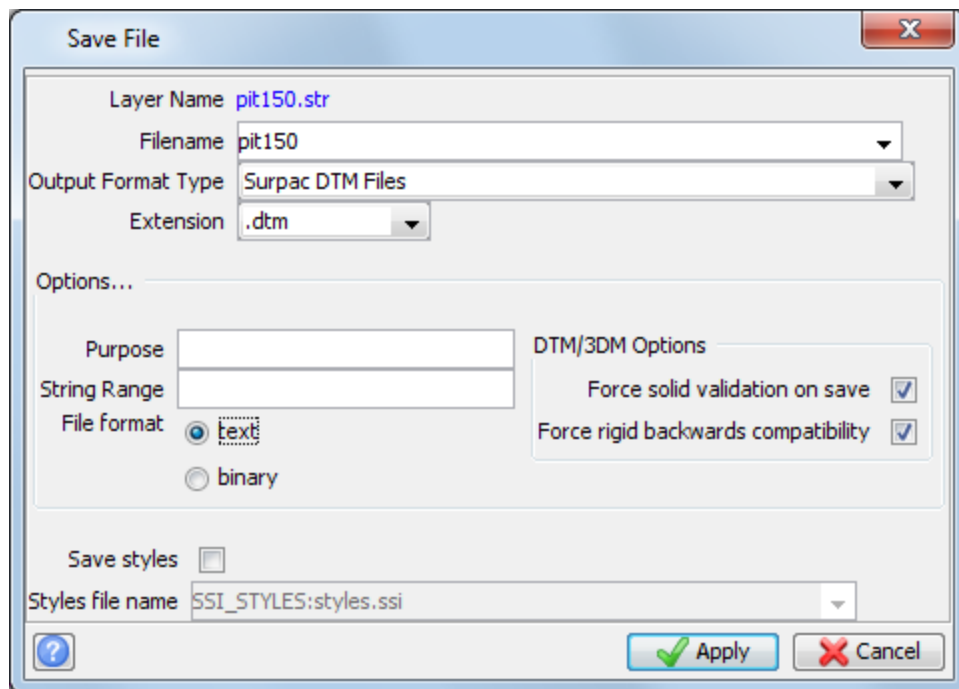


38. To rotate the data, choose **Planes > 2D planes mode**, then click and drag in **Graphics**. The pit and 3D grid are displayed.

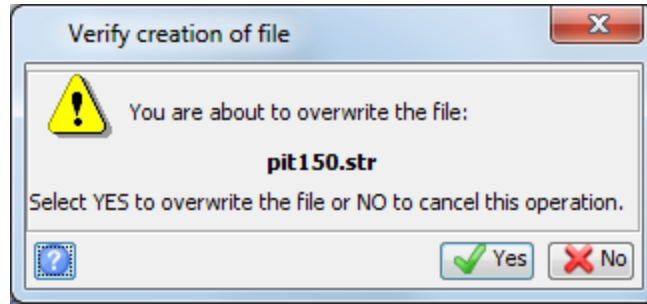


Next, you will save the DTM file.

39. Choose **File > Save > string/DTM**.
40. Enter the information as shown, and click **Apply**.



41. In the verification form, click **Yes**.

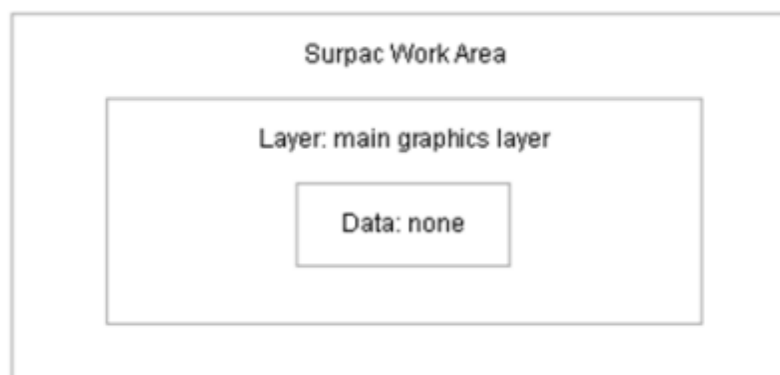


Managing data in layers

Many computer-aided design (CAD) packages use the term “layer” to define a set of information contained within one file. In this way, a Surpac string number is the same as a CAD package “layer”. However, in Surpac, a layer is an area in memory that contains data displayed in **Graphics**. Layers can contain strings from one or more string files. With this in mind, you can append data from different files into one layer, and create a new file. All layers are contained within the Surpac Work Area (SWA).

Layers and the Surpac work area

When Surpac starts, it creates an area in memory called the Surpac Work Area (SWA). All data that is displayed in **Graphics** is stored within one or more layers, which are located within the SWA. Before you have displayed any data in **Graphics**, the SWA contains one layer, called the “main graphics layer”.




All layers in the SWA are displayed in the **Layers** pane, at the lower left corner of the Surpac window:



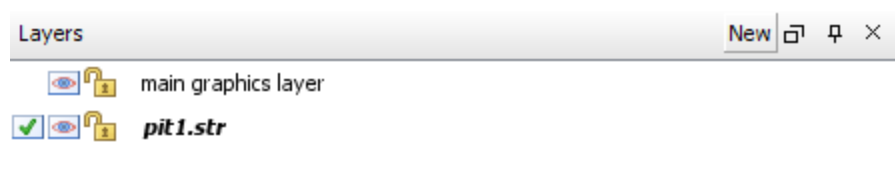
Creating layers




When you open a file by dragging it from the Navigator into **Graphics**, you create a new layer with the same name as the file. You can also create a new layer using the **New** button on the **Layer** pane.

Task: Create layers

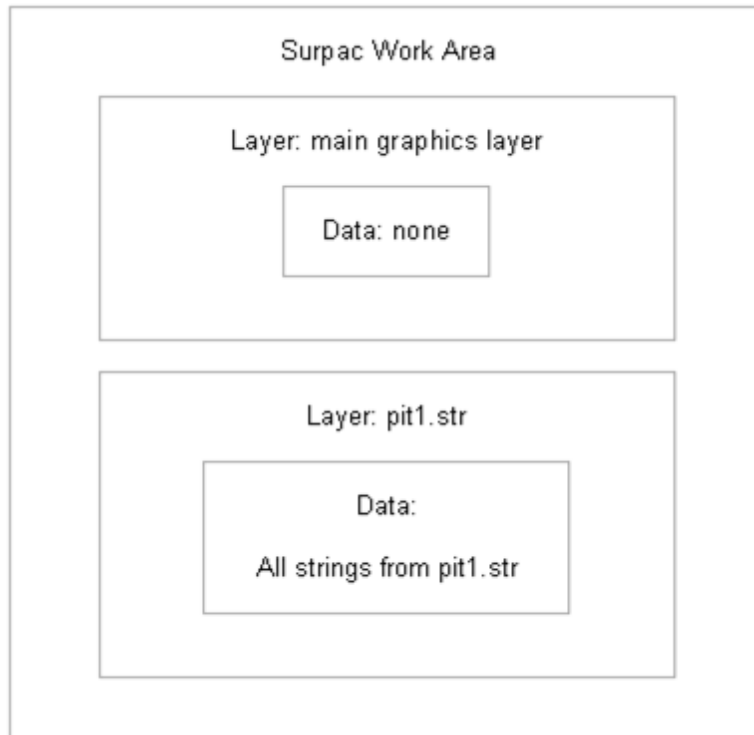
1. Click **Reset graphics** .
2. Open **pit1.str** in **Graphics**.

The **Layers** pane now shows two layers, the **main graphics layer** and a new layer called **pit1.str** that becomes the active layer.



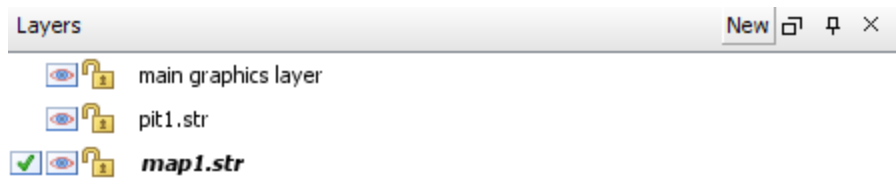
This symbol...	indicates that the layer is...
	active
	visible
	selectable

The SWA now contains:



3. Open **map1.str** in **Graphics**.

The **Layers** pane now shows three layers, and **map1.str** is the active layer.

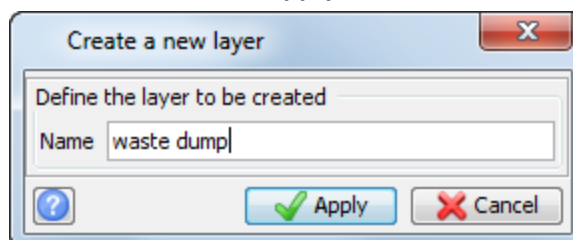


The SWA now contains:

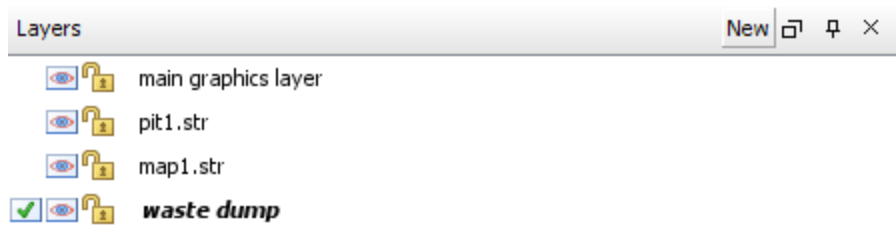


Next, you create a circular area, which is the boundary of a waste dump, and save the data to a separate file. As part of this process, you will create a new layer where the data is stored.

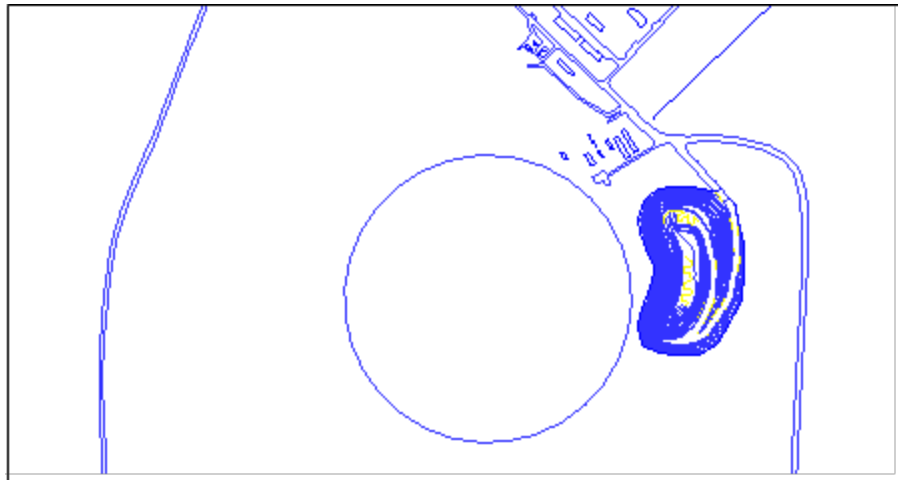
4. On the **Layers** pane, click **New**.
5. Enter the information as shown, and click **Apply**.



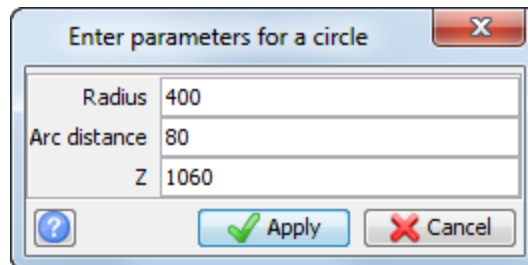
The new layer is now the active layer.



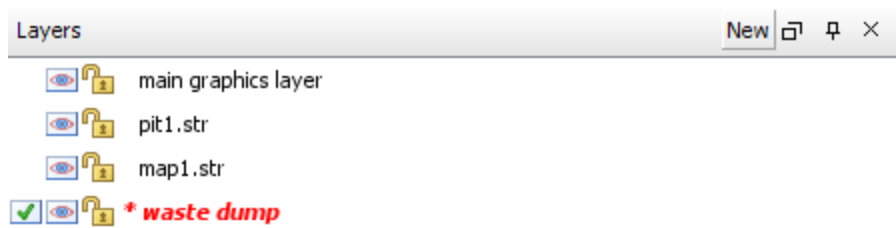
6. Choose **Create > Circle by drag**.
7. Click the centre of the circle, drag to the location shown, and then release the mouse button.



8. Enter the information as shown, and click **Apply**

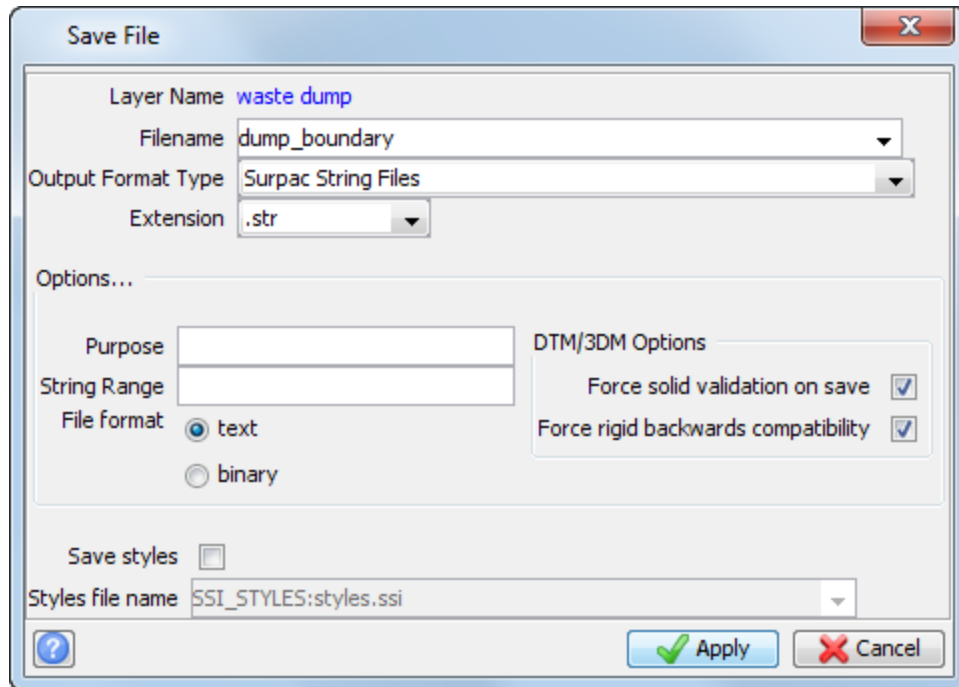


9. Press **ESC** to finish using the function. The **waste dump** layer is now displayed in red, and it is preceded by an asterisk (*). This occurs when you have changed data in a layer, but you have not saved it to that layer.

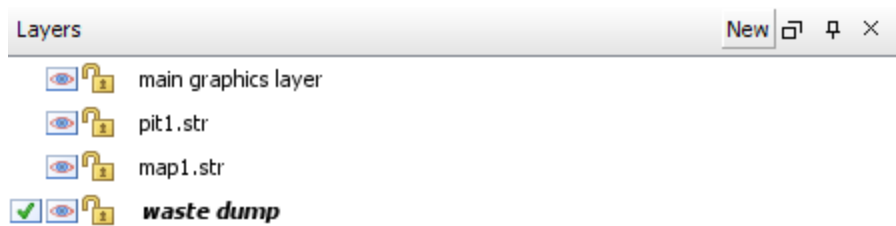


10. Choose **File > Save > string/DTM**.

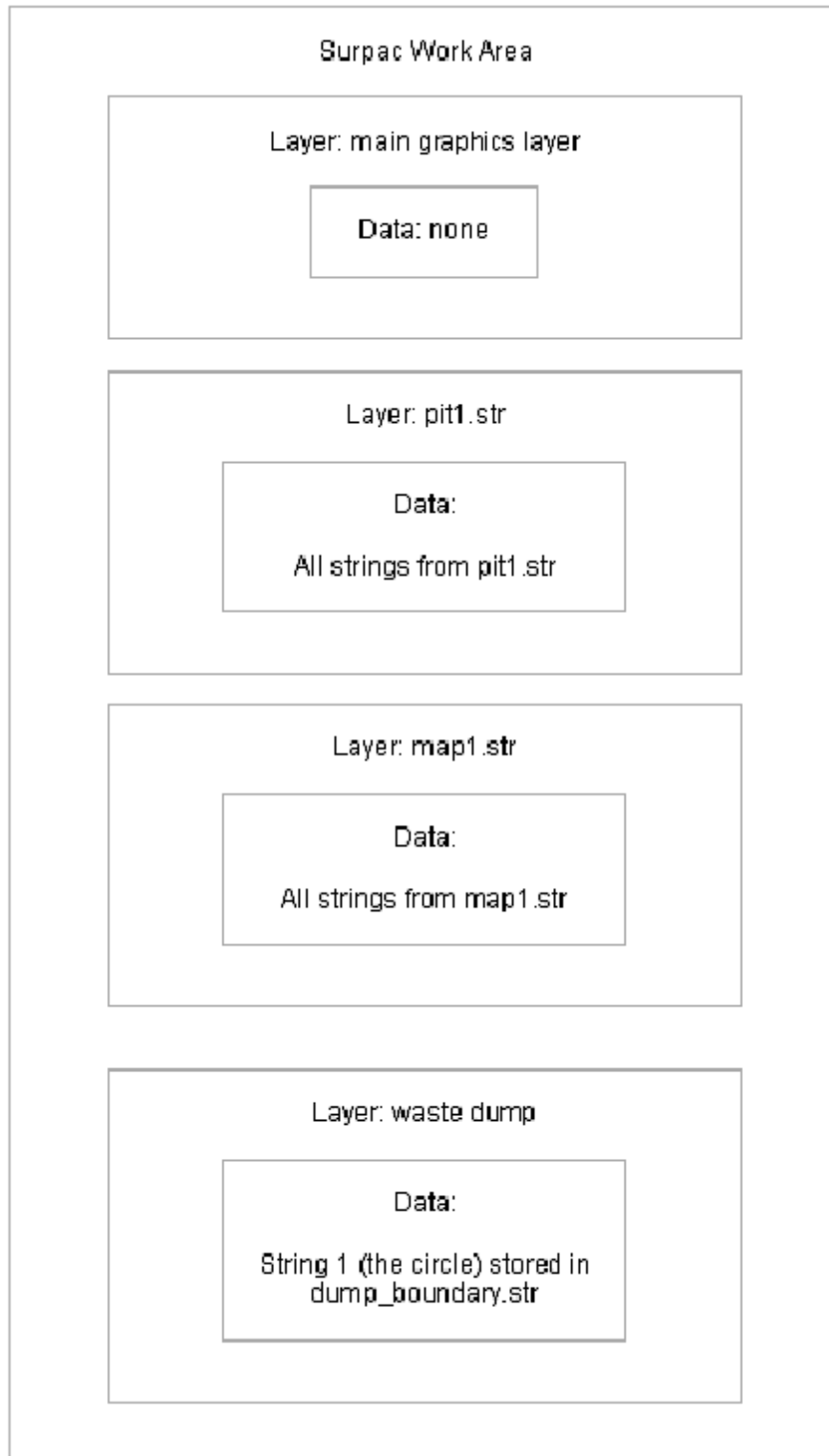
11. Enter the information as shown, and click **Apply**.



The **waste dump** layer is now displayed in black.



The SWA now contains:




Appending data to a layer

You can append data to a layer by holding the CTRL key when dragging a file into **Graphics**. You can also use an option on the *Open File* form to append data to a layer.

You can combine data from different files by appending them into one layer, and then saving the file.

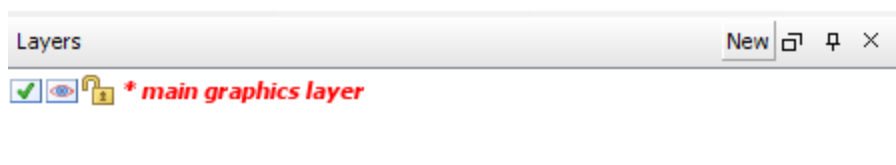
Task: Append data to a layer with the Navigator

1. Click **Reset graphics** .
2. Hold the CTRL key, then drag **pit1.str** into **Graphics**.
✎ **Note:** When you hold the CTRL key and drag a file into **Graphics**, the cursor is

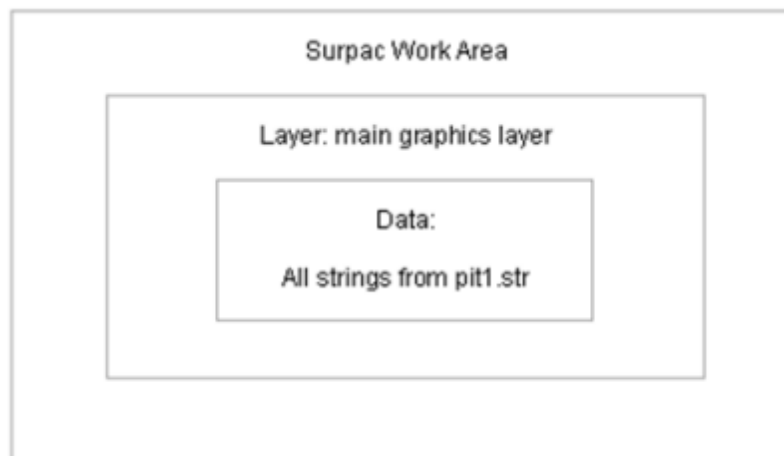


displayed with a plus sign (+)

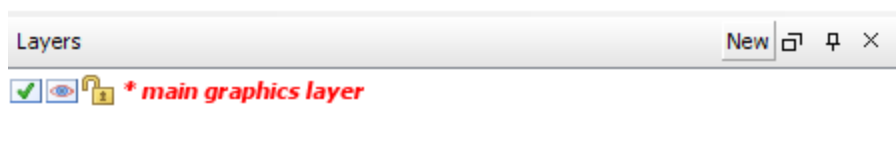
After releasing the mouse button, the **Layers** pane still only shows one layer, the **main graphics layer**.



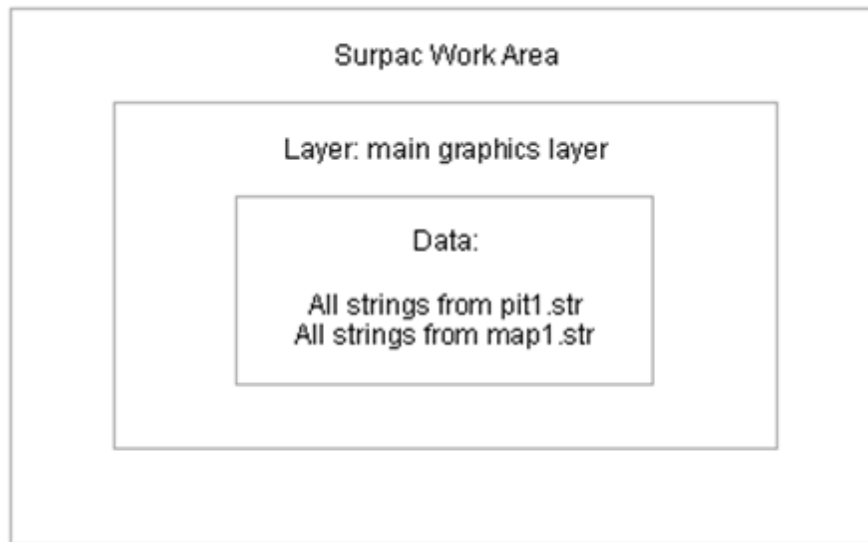
The SWA now contains:



3. Hold the CTRL key, and then drag **map1.str** into **Graphics**.
 The **Layers** pane still only shows one layer, the **main graphics layer**.

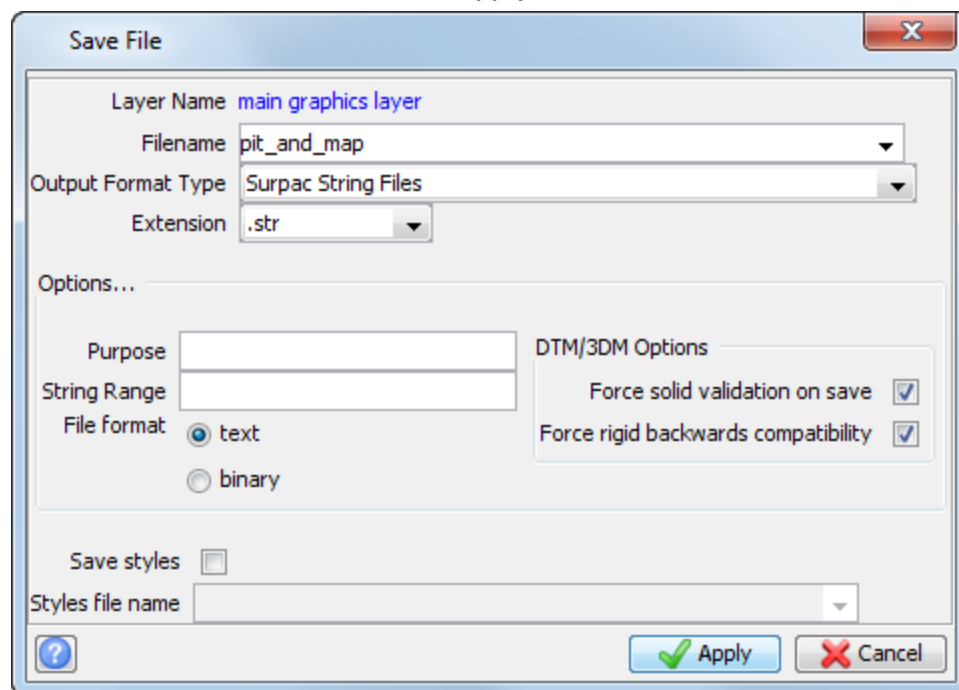


The SWA now contains:




Next, you save the data from both files to a new file.

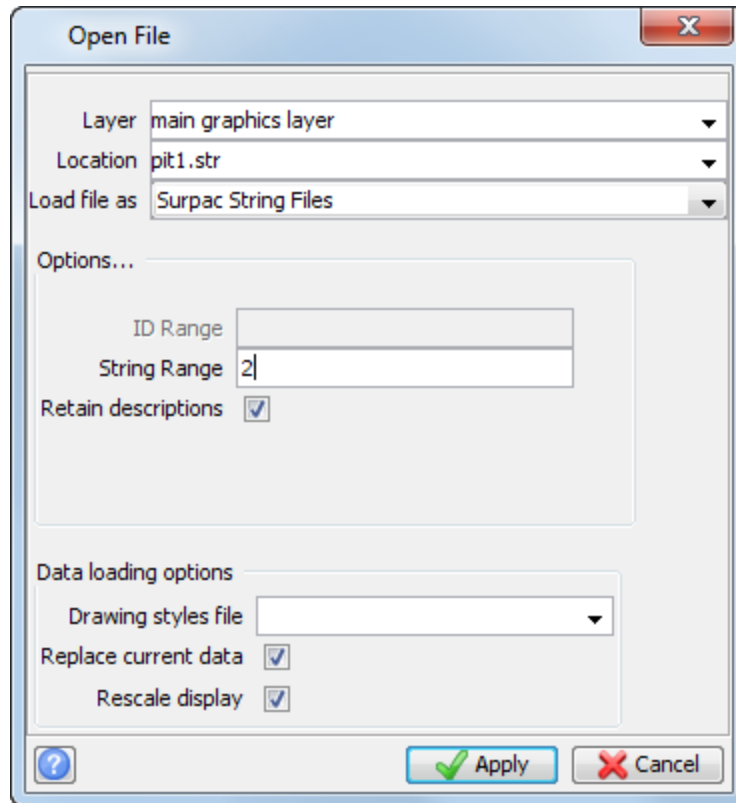
4. Choose **File > Save > String/DTM file**.
5. Enter the information as shown, and click **Apply**.



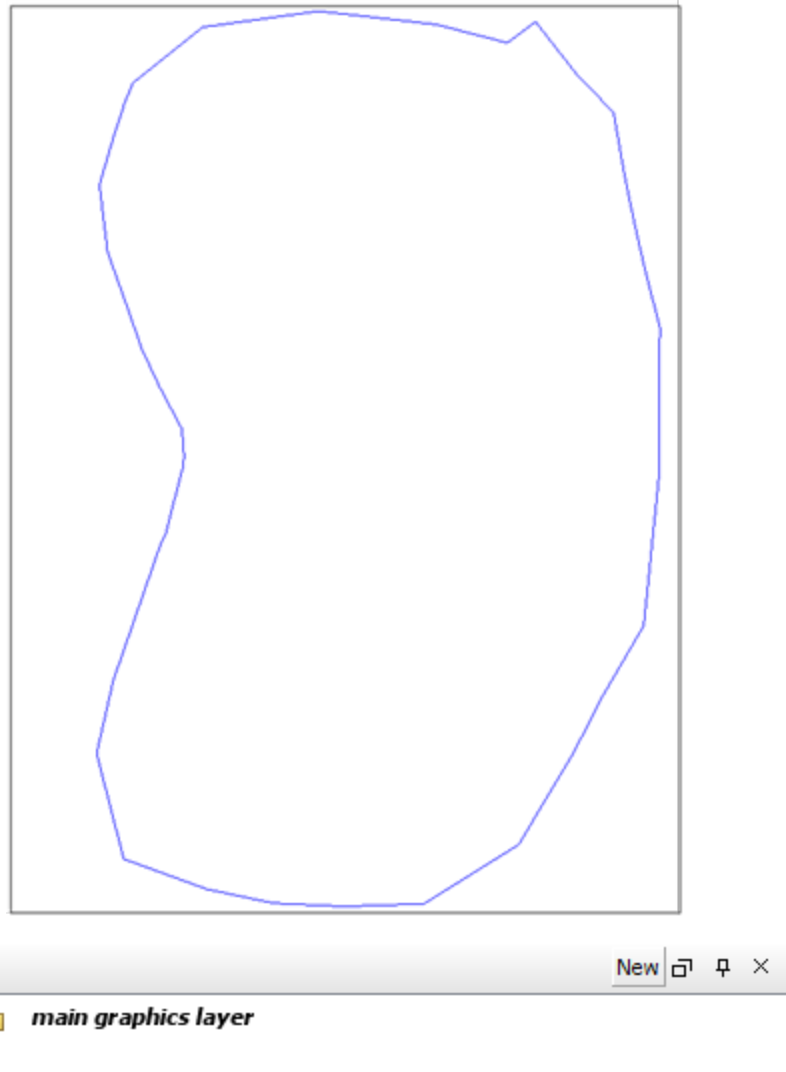
The file **map_and_pit.str** contains all data from **pit1.str** and all data from **map1.str**.

Task: Append data to a layer with the open file command

1. Click **Reset graphics** .
2. Choose **File > Open > String/DTM file**.
3. Enter the information as shown, and click **Apply**.

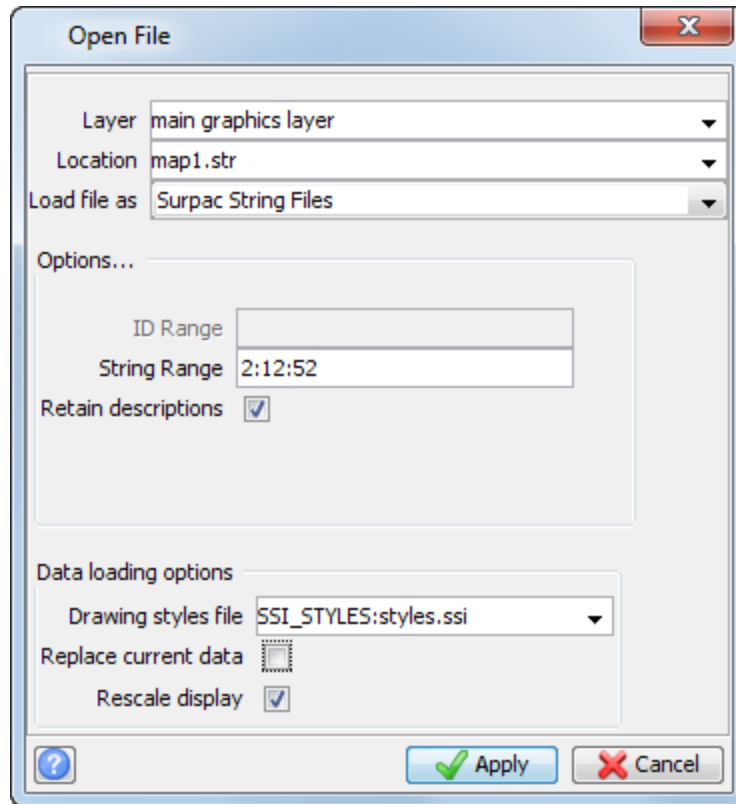


Setting **String Range** to 2, means that only string 2 from **pit1.str** is opened in the **main graphics layer**.

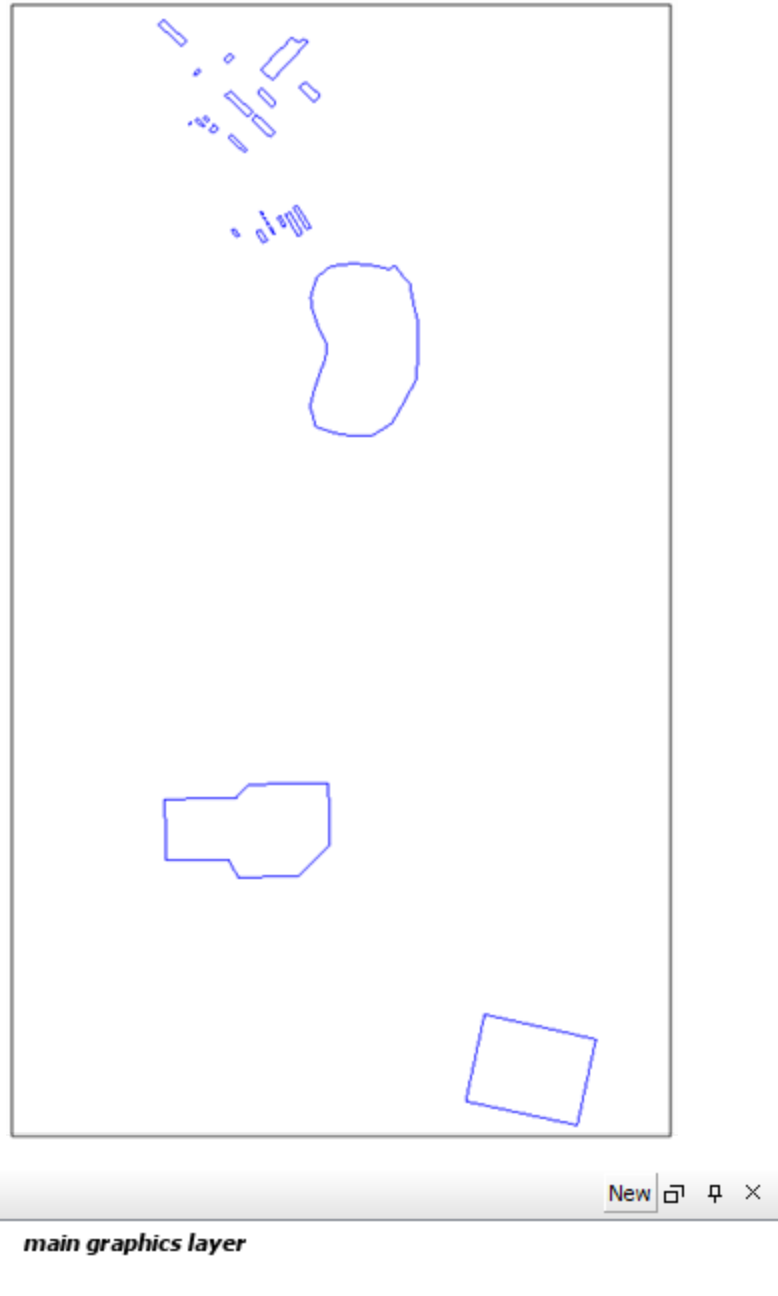


4. Choose **File > Open > String/DTM file**.

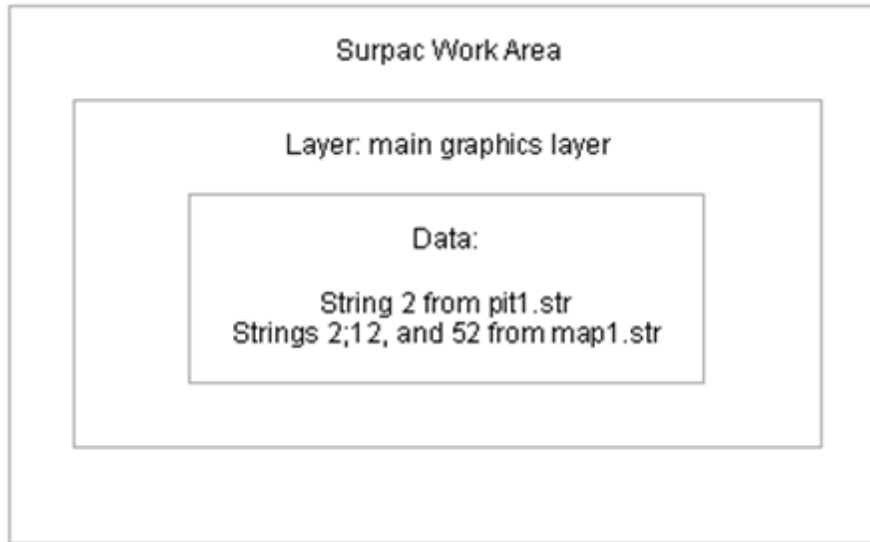
5. Enter the information as shown, and click **Apply**.



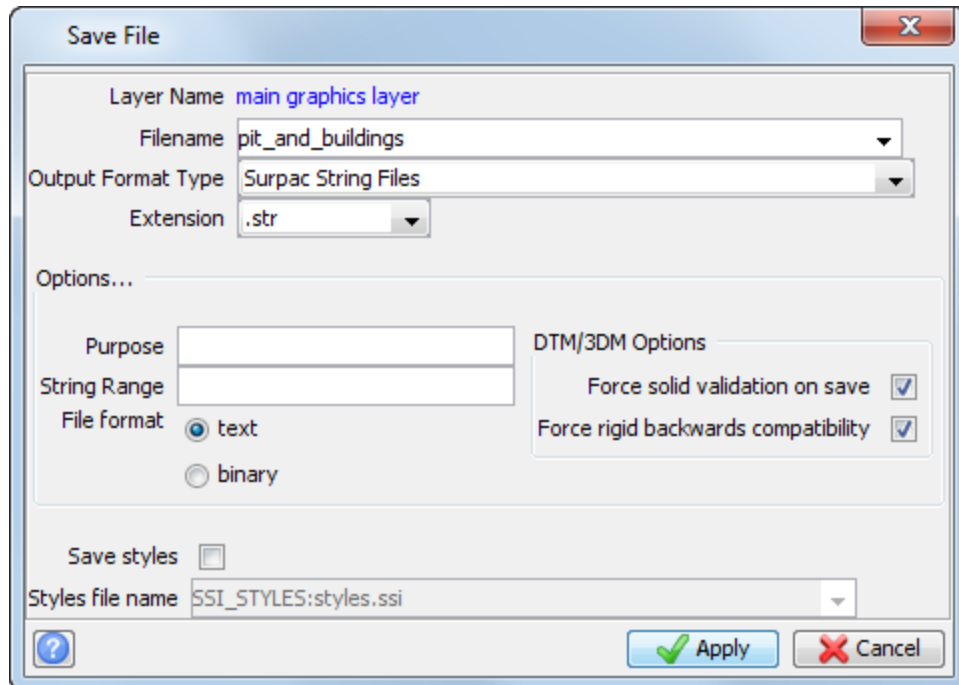
Setting String Range to 2;12;52 means that only those three strings are opened. Also, because the **Replace current data** check box was cleared, the data is appended to the **main graphics layer**.



The SWA now contains:



6. Choose **File > Save > string/DTM file**.
7. Enter the information as shown, and click **Apply**.



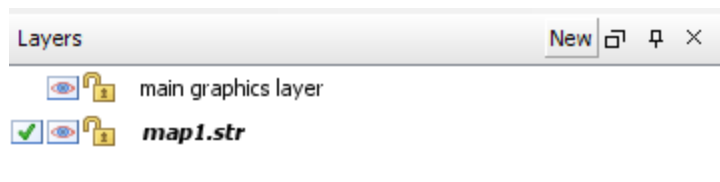
The file **pit_and_buildings.str** now contains string 2 from **pit1.str** and strings 2, 12, and 52 from **map1.str**.

Replacing data in a layer

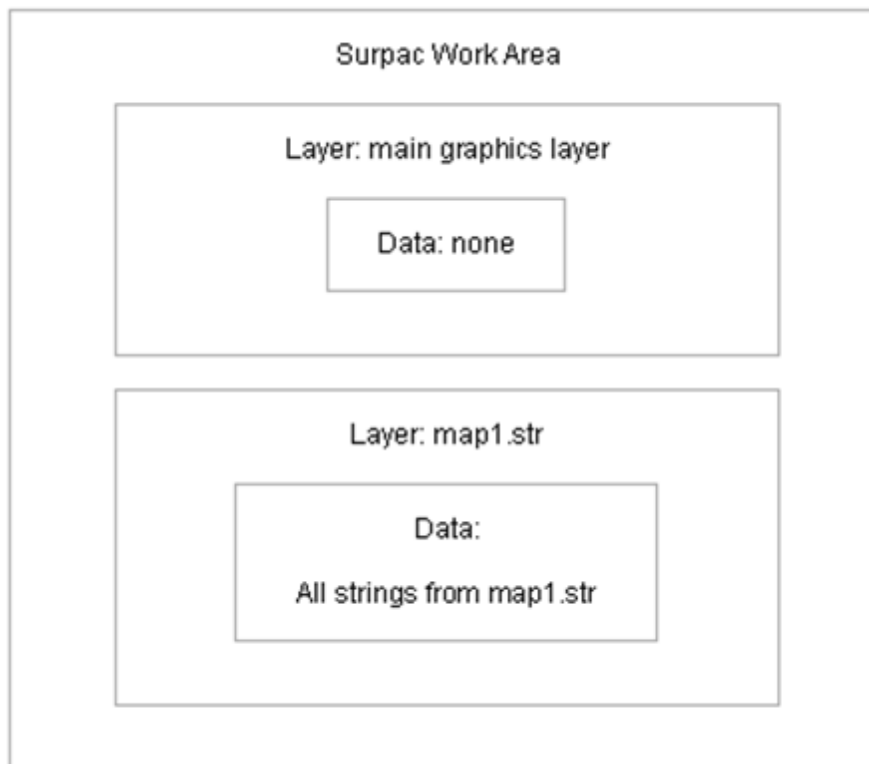
You can replace data in a layer by holding the SHIFT key when dragging a file into **Graphics**. You can also use an option on the *Open File* form to replace data in a layer.

Task: Replace data in a layer with the Navigator

1. Click the **Reset graphics** icon .
2. Open **map1.str** in **Graphics**.
The **Layers** pane shows the two layers:



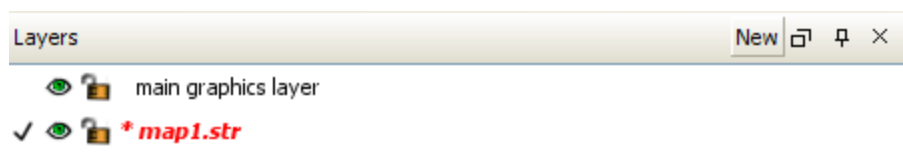
The SWA now contains:



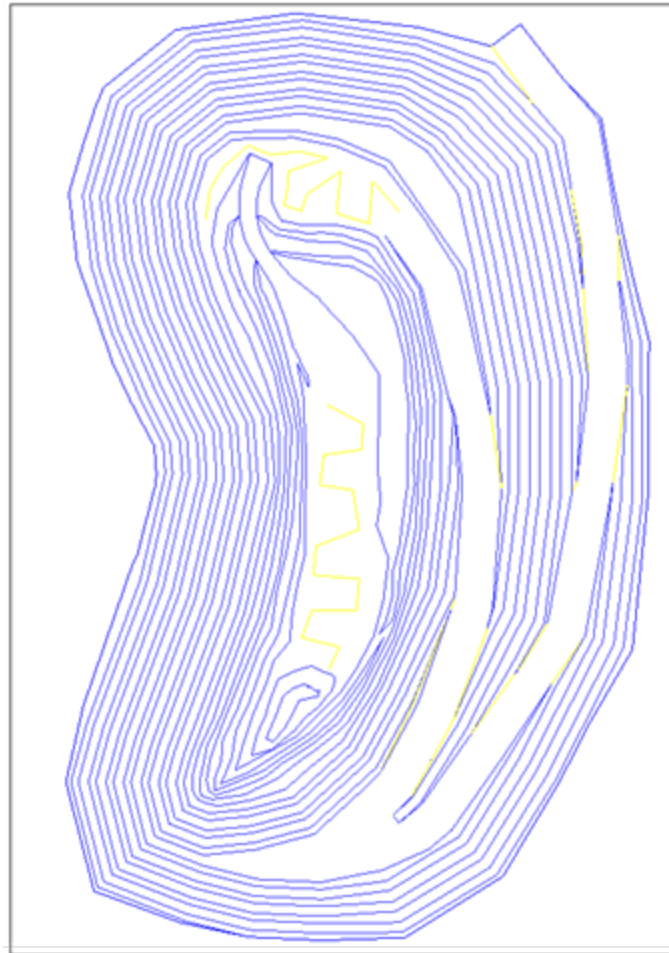
3. Click **pit1.str** so that it is highlighted in the Navigator.
4. Hold the SHIFT key, and then drag **pit1.str** into **Graphics**.
When you hold the SHIFT key and drag a file into **Graphics**, the cursor is displayed with an



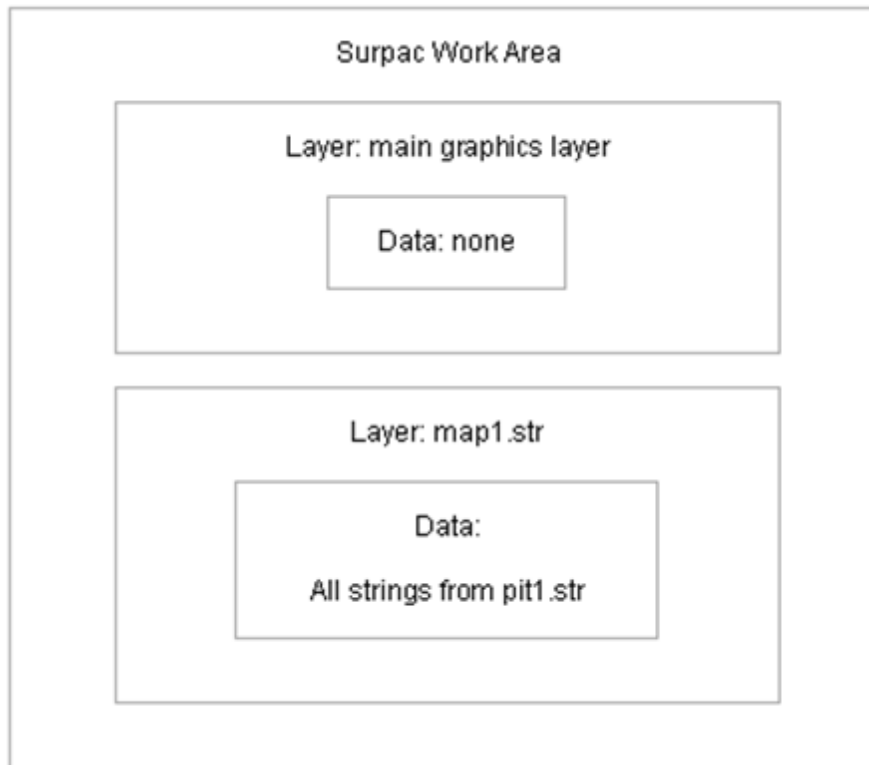
The **Layers** pane still shows both layers:




However, the contents of the **map1.str** layer has been replaced by the data in **pit1.str**:

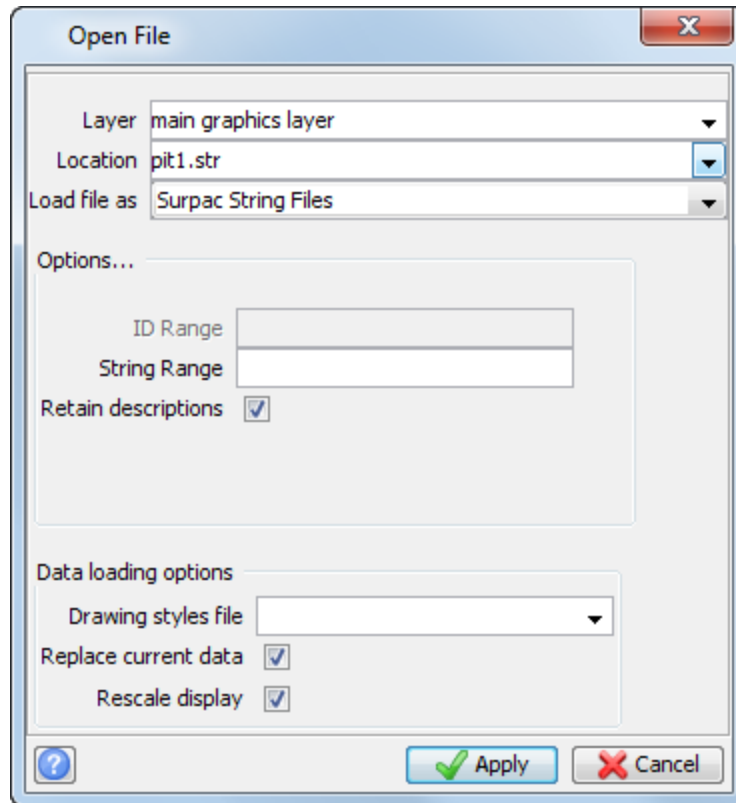


The SWA now contains:

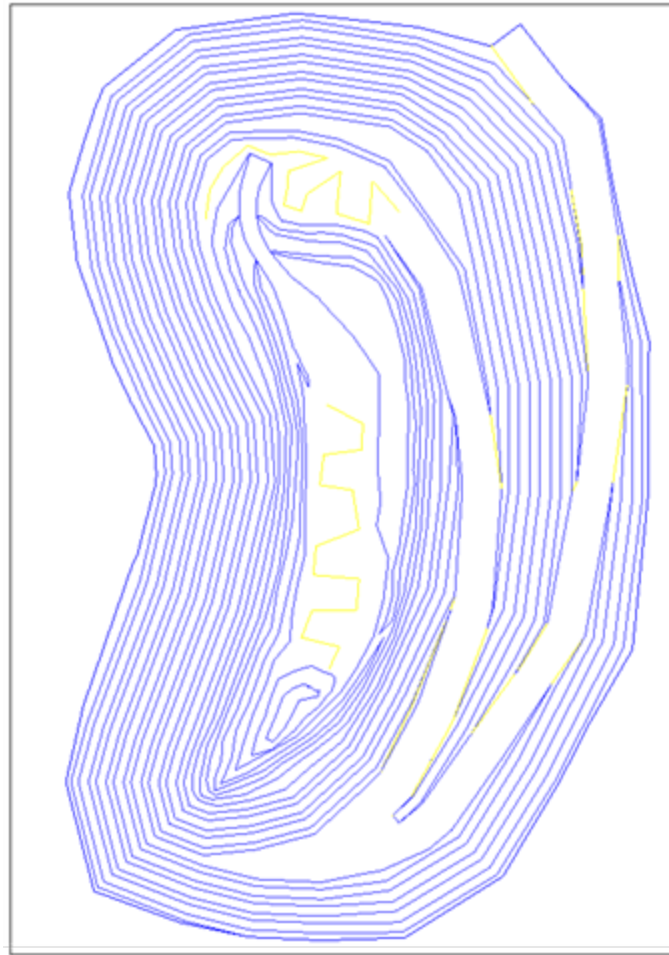


Task: Replace data in a layer using the open file command

1. Click **Reset graphics** .
2. Choose **File > Open > String/DTM**.
3. Enter the information as shown, and click **Apply**.

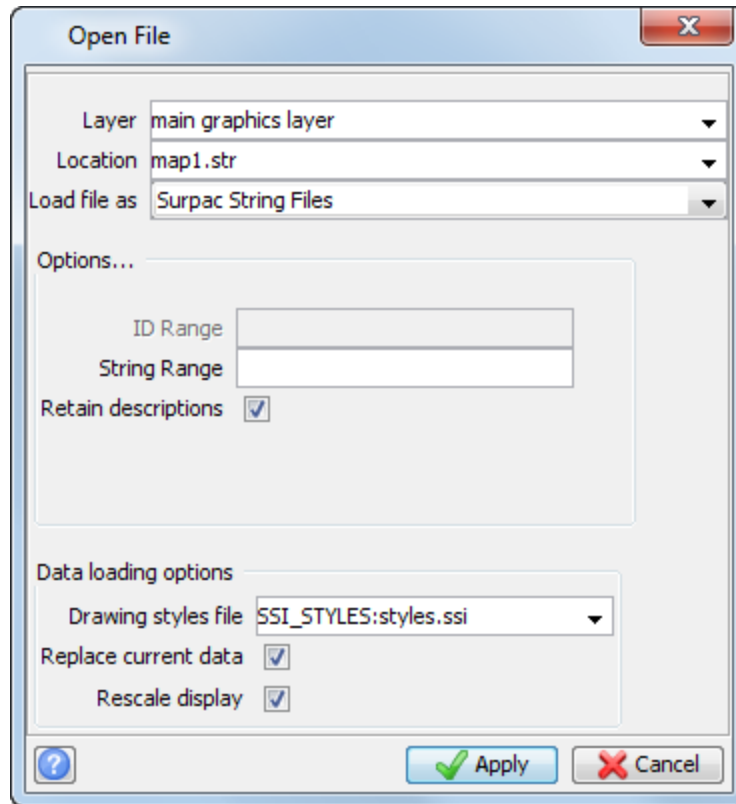


All the data in **pit1.str** is displayed in the **main graphics layer**.

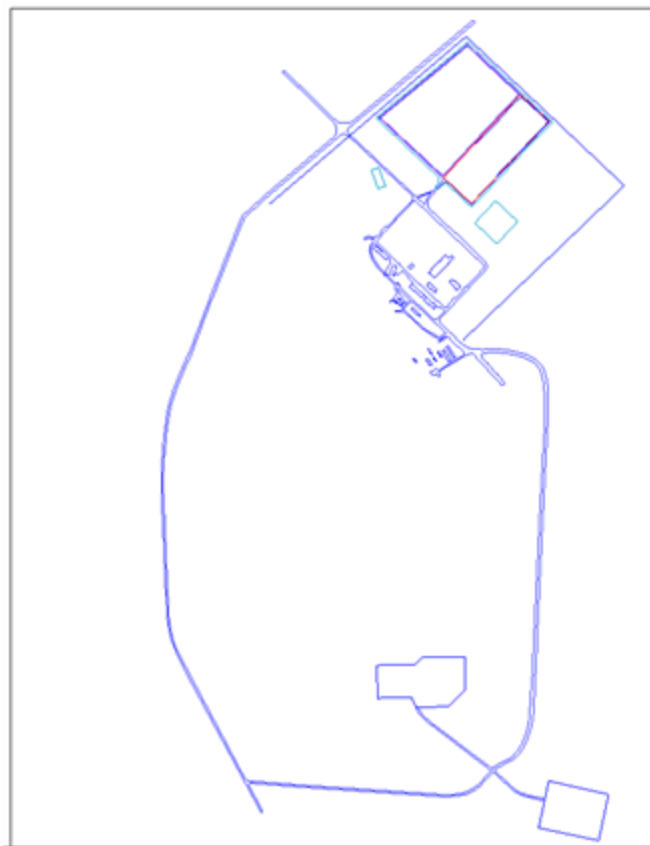


4. Choose **File > Open > String/DTM**.

5. Enter the information as shown, and click **Apply**.



All data in the **main graphics layer** is replaced by the data in **map1.str**.

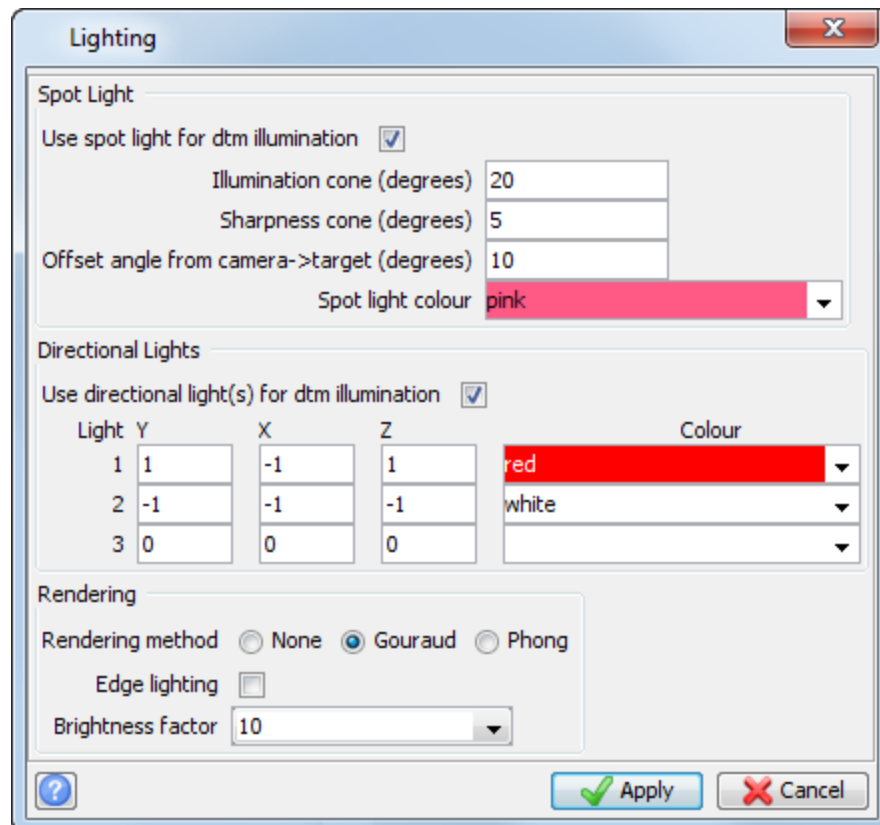


Saving workspace settings

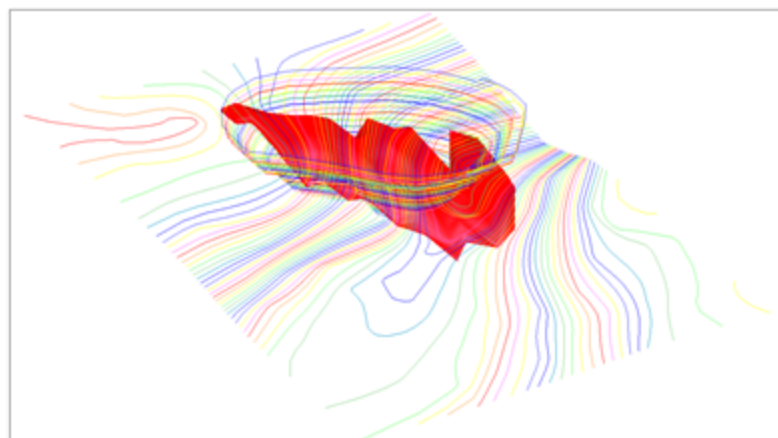
You can save all the data, layers, and settings in a Surpac Work Area (SWA) file. You can restore all of the information saved opening the SWA file.

Task: Save a workspace

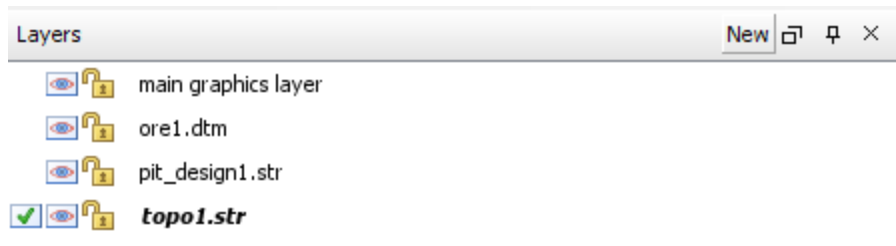
1. Click **Reset graphics** .
2. Open **ore1.dtm** in **Graphics**.
3. Choose **View > Surface view options > Lighting options**.
4. Enter the information as shown, and click **Apply**.



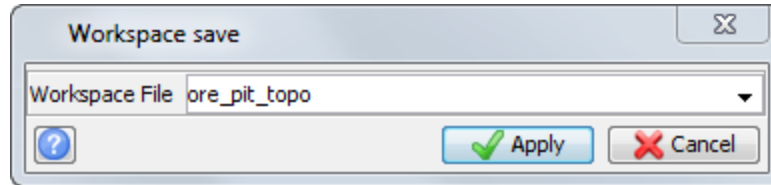
5. Open **pit_design1.str** in **Graphics**.
6. Open **topo1.str** in **Graphics**.
7. Click in **Graphics** and drag to rotate into the position shown below.



Four layers exist in the **Layers** pane.




8. Choose **File > Save > Graphics workspace**.
9. Enter the information as shown, and click **Apply**.



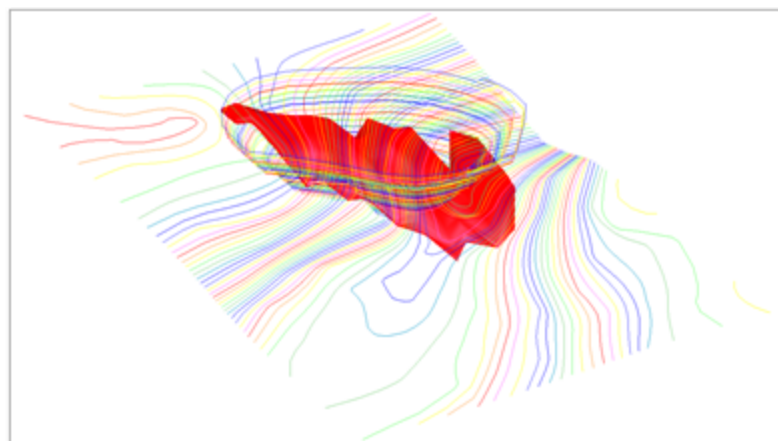
The file **ore_pit_topo.swa** is created.


Note: The terms “Graphics workspace” and “SWA” both refer to the Surpac Work Area. When you save a workspace, you create a file with a **.swa** extension.

10. Click **Reset graphics** . All the layers are deleted except the default **main graphics layer**.

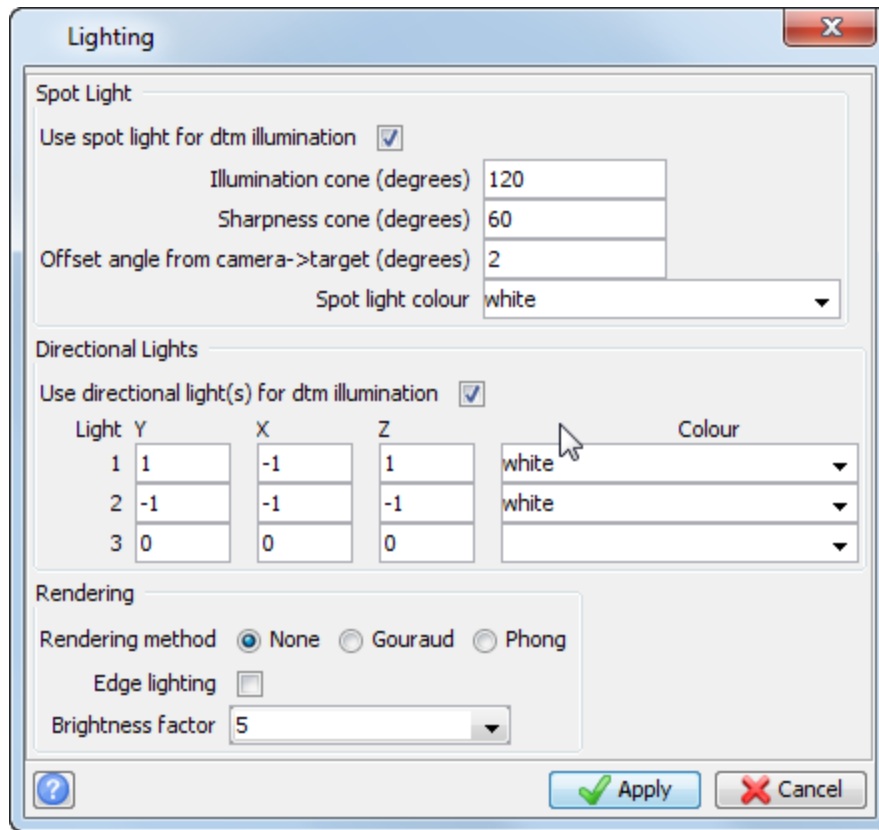


11. Open **ore_pit_topo.swa** in **Graphics**. You have restored the layers in the **Layers** pane, as well as the lighting settings and the view direction.

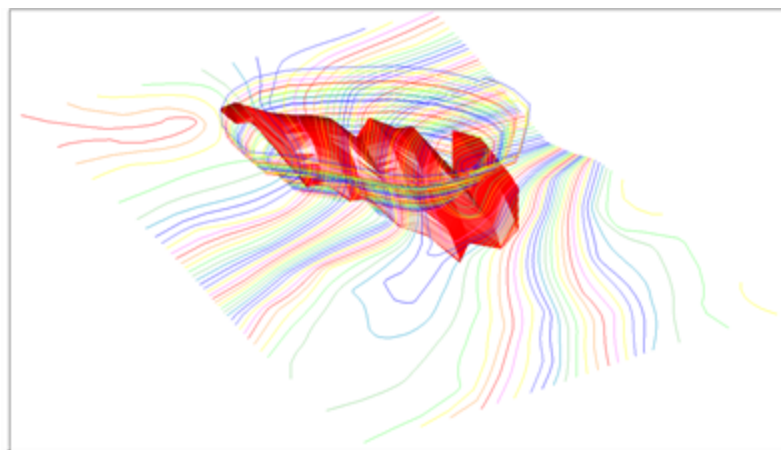


 **Note:** SWA files are text files that store information about other files. If you want to open a SWA file on another computer, you need to make sure that the files that are referenced by the SWA file are available on the alternate computer, using the same folder structure.

12. Choose **View > Surface view options > Lighting options**.
13. Enter the following information, and click **Apply**.



The lighting is reset to its original state.



Triangulated surfaces

Surpac supports two types of triangulated surfaces:

- digital terrain model surfaces (DTMs): A DTM surface is a set of triangles which represent a surface, such as topography or a pit design.
- three-dimensional solid models (3DMs): A solid model is a set of triangles which represents a three-dimensional shape, such as an ore zone or an underground mine design.

Naming conventions

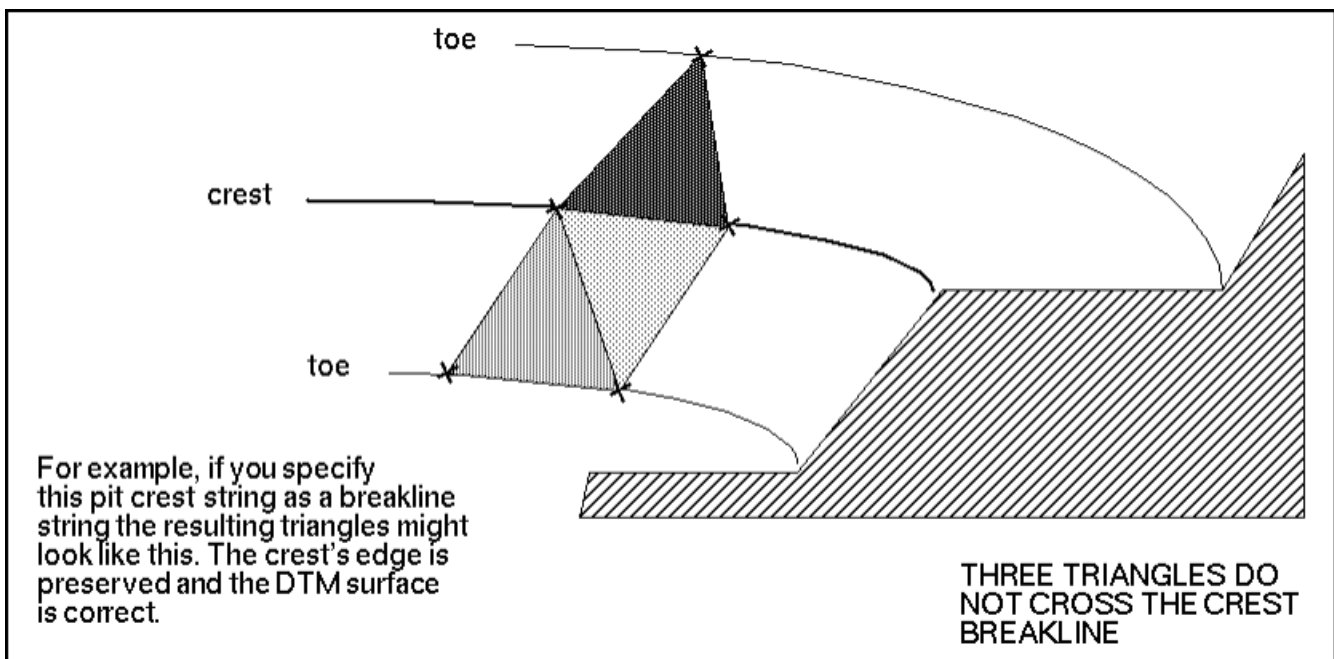
The objects you create in Surpac are numbered by a system similar to that of string and string segment numbers. The hierarchy of triangles, trisolations, and objects of a **.dtm** file is analogous to the points, segments, and strings of a string file.

String	=>	Object
Segment	=>	Trisolation
Point	=>	Triangle

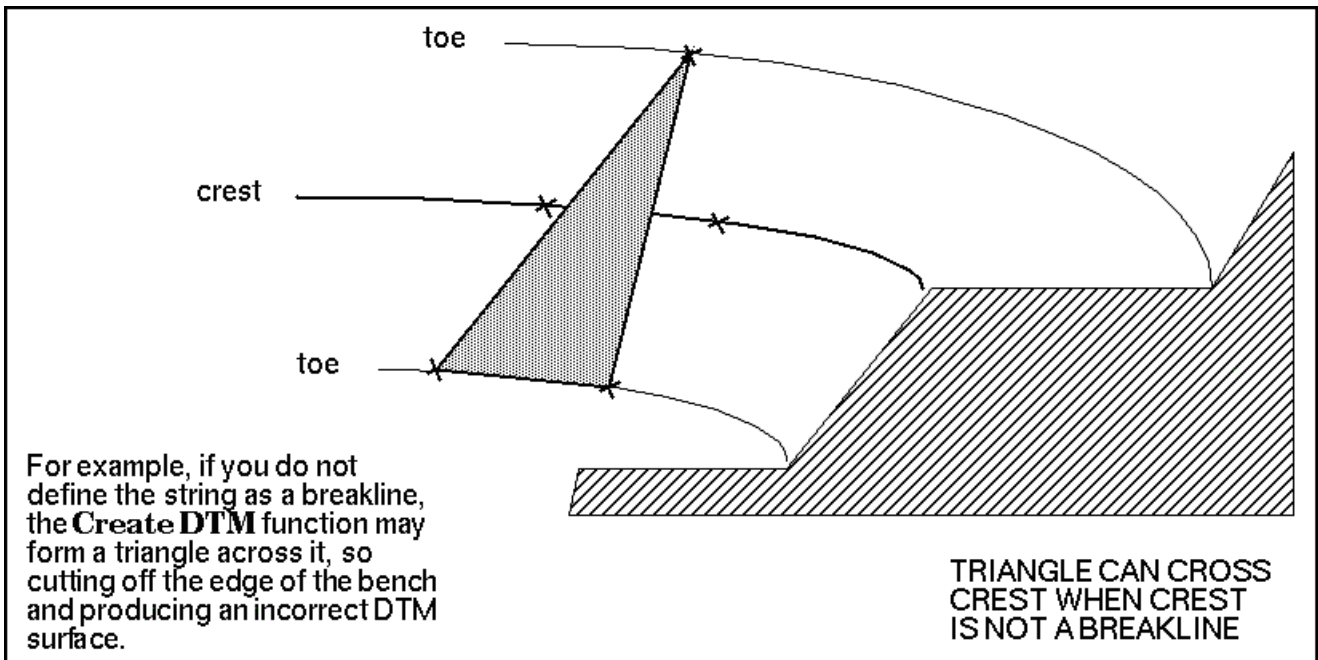
When you define an object, you explicitly assign it both an object number and a trisolation number. Surpac refers to the object by the object and trisolation number that you assigned. The object number must be an integer within the range of 1 to 32000. The trisolation number must be a positive integer.

Breaklines and spot heights

Breakline strings are those which represent linear physical features that you can see in the real world e.g. crest of a pit, a fault in a geological model, a contour in a pit.



Spot height strings contain points which represent non-linear or point features, such as hill peaks, surface low points, gridded points, borehole collars etc. The lines connecting the points in the spot height string in graphics do not infer a physical line.




DTM conventions

- DTMs cannot model overhangs or vertical surfaces.
- When creating a DTM, strings identified as spot heights are interpreted differently to strings identified as breaklines.

This chapter describes how to use strings to act as break lines. A breakline string is a string that represents physical features you can see in the real world, such as a crest of a pit, a fault in a geological model, or a contour in a pit. Spot height strings contain random points that, when connected by a string line, do not represent any physical feature. For example, randomly surveyed points or borehole collars.

Viewing a DTM surface

Task: View a DTM in Graphics

1. Click **Reset graphics** .
2. Open **waste_dump.dtm** in **Graphics**.

The waste dump is displayed.



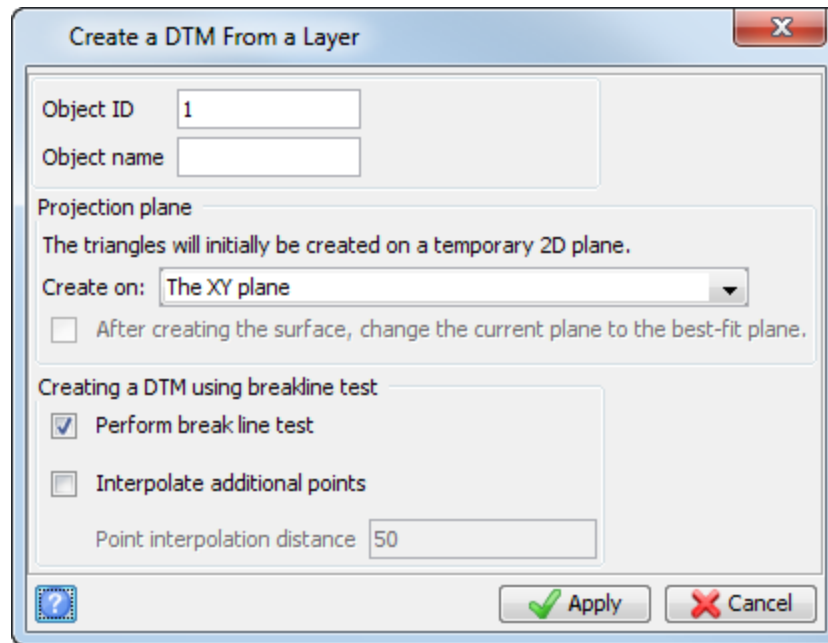
3. Click and drag the mouse to rotate the data and view it from different angles.

Creating a DTM surface

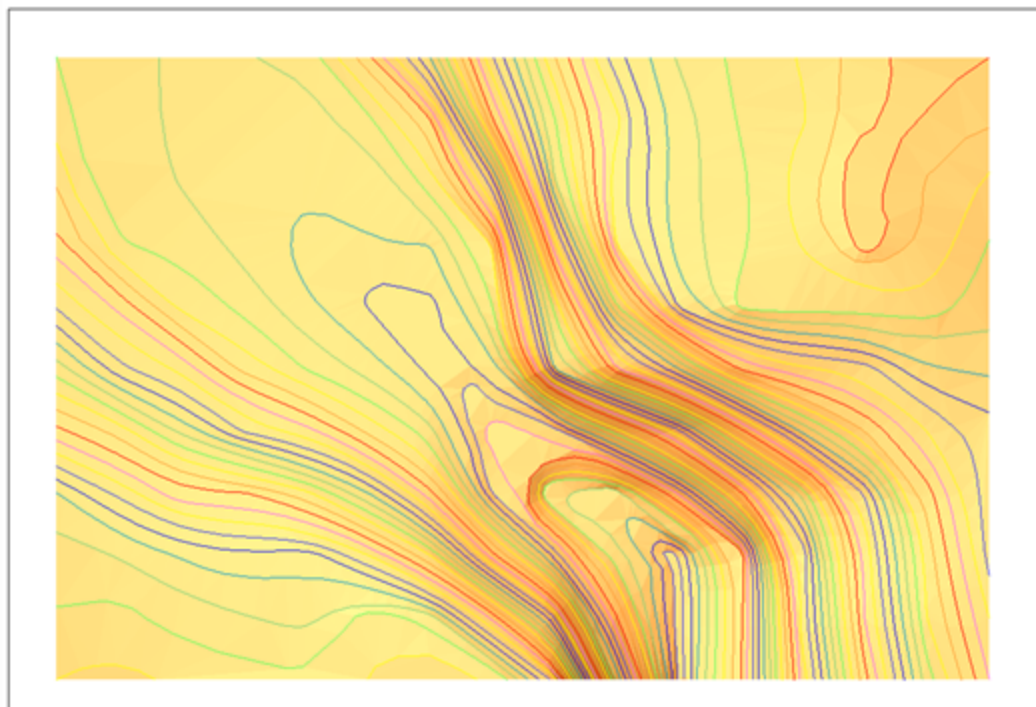
It is important to understand how a string file relates to a DTM. In order for a DTM file to remain valid, the string file from which it was created must remain unchanged from the time when you created the DTM. Therefore, if you modify the string data, you must also recreate the DTM.

Task: Create a DTM — graphics-based method

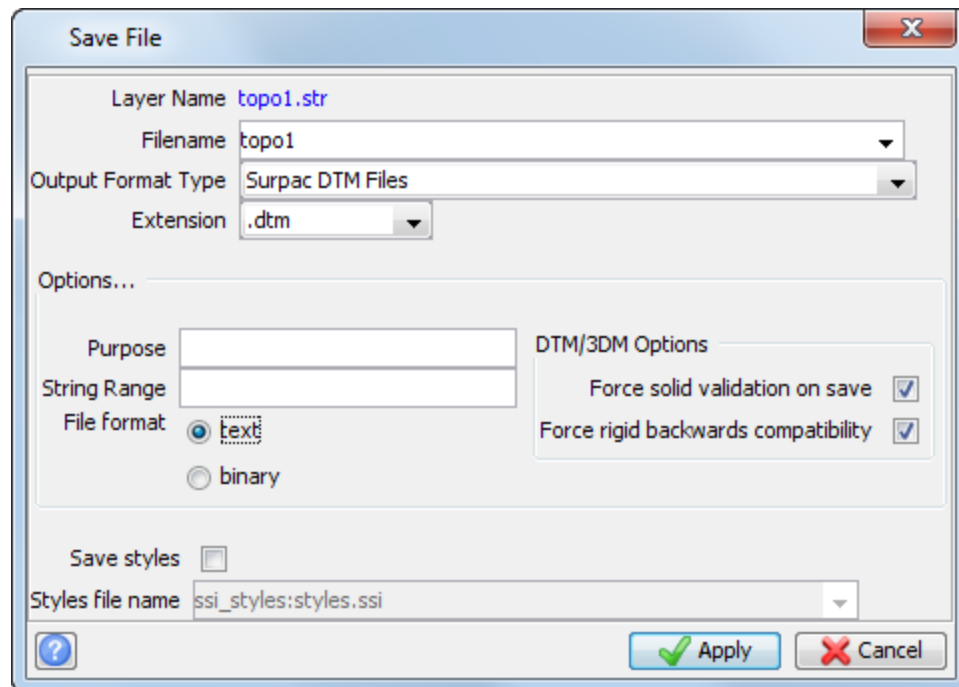
1. Click **Reset graphics** .
2. Open **topo1.str** in **Graphics**.
3. Choose **Surface > Create DTM from layer**.
4. Enter the information as shown, and click **Apply**.



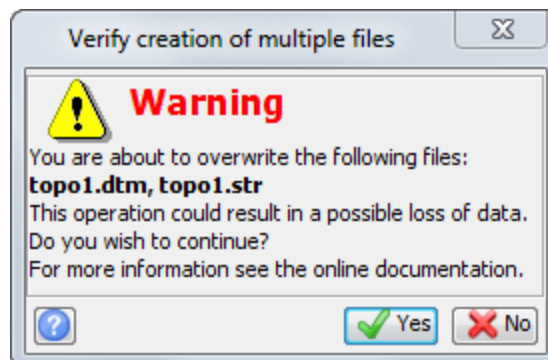
The string file contours and the DTM of the topography are displayed.




5. Choose **File > Save > string/DTM file**.
6. Enter the information as shown, and click **Apply**.



7. Click **Yes** to overwrite the files.



 **Note:** To see all of the steps performed in this task, run **03a_create_dtm_graphics.tcl**. You need to click **Apply** on any forms presented.

Task: Create a DTM — file-based method

You will now create a DTM from the string file **pit_design1.str** using the file-based DTM creation option. This task demonstrates the impact of using strings as breaklines.

1. Click **Reset graphics** .
2. Choose **Surfaces > DTM File functions > Create DTM from string file**.

3. Enter the information as shown, and click **Apply**.

Create a DTM from a string file

Define the string file

Location: pit_design1

Object ID: 1

Object name:

Projection plane

The triangles will initially be created on a temporary 2D plane.

Create on: The XY plane

After creating the surface, change the current plane to the best-fit plane.

Define other parameters

Common point check distance: 0.0050

Strings to act as break lines

Any spot height strings

Spot height string range:

Perform break line test

Interpolate additional points

Point interpolation distance: 50

Define the boundary string to clip the DTM

Would you like to clip the DTM to a boundary after creation?

Location: pit_design1

String: 40

Retain triangles inside boundary

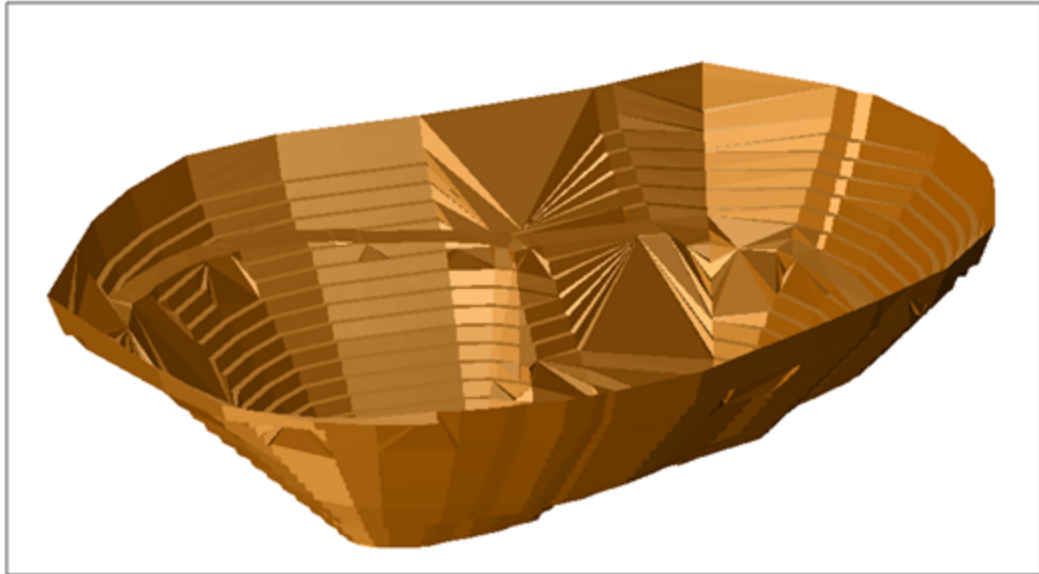
Retain triangles outside boundary

Apply Cancel


Note: This time the **Strings to act as break lines** check box is **not** selected.

Progress is reported in the **message window**. When the DTM is created, a log file opens in the default text editor. The log file is a report containing information about the DTM.

4. Open **pit_design1.dtm** in **Graphics**.



Several triangles in the DTM do not reflect the desired results. Next, you repeat the procedure, but using the **Strings to act as breaklines** option.

5. Click **Reset graphics** .
6. Choose **Surfaces > DTM File functions > Create DTM from string file**.
This time ensure that the **Strings to act as break lines** check box is selected.

7. Enter the information as shown, and click **Apply**.

Create a DTM from a string file

Define the string file

Location: pit_design1

Object ID: 1

Object name:

Projection plane

The triangles will initially be created on a temporary 2D plane.

Create on: The XY plane

After creating the surface, change the current plane to the best-fit plane.

Define other parameters

Common point check distance: 0.0050

Strings to act as break lines

Any spot height strings

Spot height string range:

Perform break line test

Interpolate additional points

Point interpolation distance: 50

Define the boundary string to clip the DTM

Would you like to clip the DTM to a boundary after creation?

Location: pit_design1

String: 40

Retain triangles inside boundary

Retain triangles outside boundary

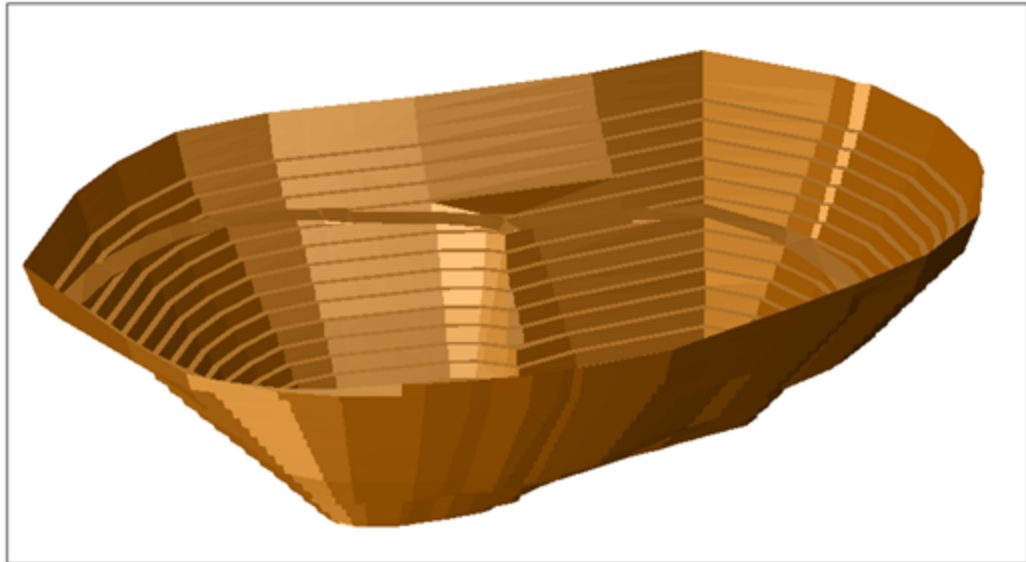
Apply Cancel


Note: This time the **Strings to act as break lines** check box is selected.

Progress is reported in the **message window**. When the DTM is created, a log file opens in the default text editor. The log file is a report containing information about the DTM.

8. Close the log file window.
The DTM file is saved automatically as **pit_design1.dtm**.
9. Open **pit_design1.dtm** in **Graphics**.

The pit is displayed.



 **Note:** To see all of the steps performed in this task, run `03b_create_dtm_file_based.tcl`. You need to click **Apply** on any forms presented.

Creating a boundary string between two DTM surfaces

You will now create a boundary string at the location where a pit intersects the topography.


A boundary string file is used for:


- delineating cut and fill material for calculating volumes
- finding the intersection of a fault plane with a surface
- finding where a pit design breaks the natural surface

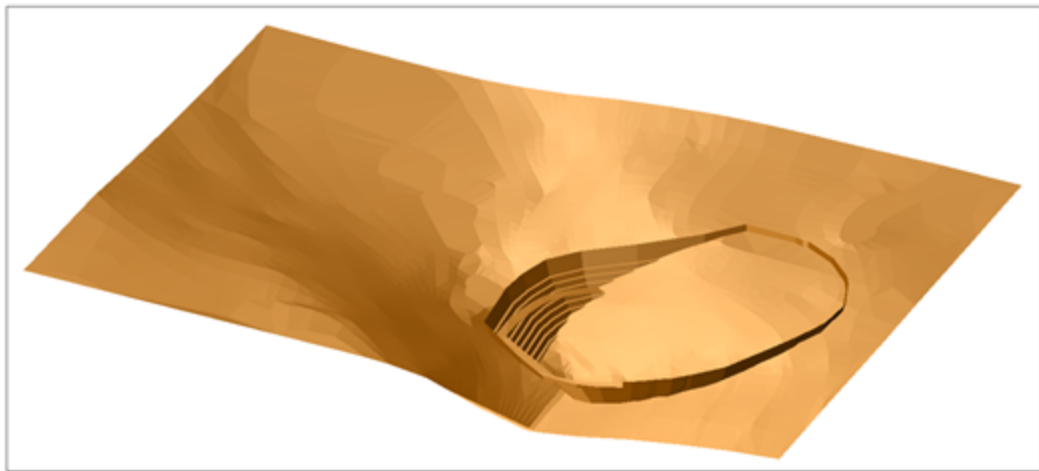
There are two methods of creating the boundary string in Surpac:

- file-based method: In this method, you do not need to display the DTMs. Surpac automatically saves the boundary string to the nominated file.
- graphics-based method: In this method, you must display the DTMs in **Graphics**. Surpac does not automatically save the boundary string. The boundary string is displayed in its own **Graphics** layer. If you use the graphics-based method you must save the boundary string to a file after it is generated.

Task: Create a boundary string – file-based method

 **Note:** To help you understand the purpose, and result, of this task, you will open the DTMs in **Graphics**. However, for the file-based method to work, you do not need to open any files in **Graphics**.

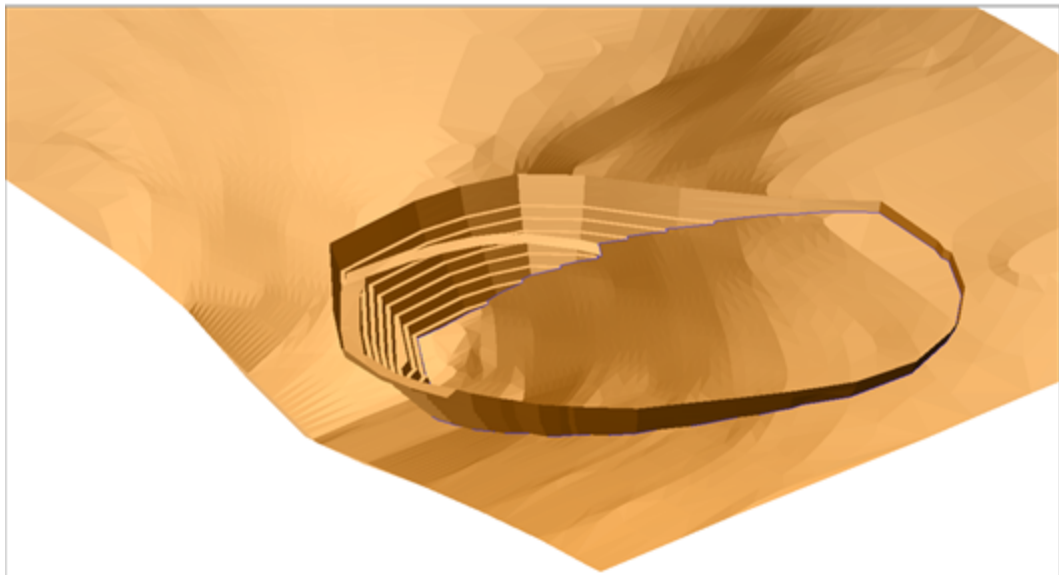
1. Click **Reset graphics** .
2. Open **pit_design1.dtm** and **topo1.dtm** in **Graphics**.
The pit extends past the natural topography. To determine the volume of the pit, you need to define the boundary where the topography cuts the pit design. You do this by creating a boundary string of the intersection between both DTMs.



3. Choose **Surfaces > DTM File functions > Line of intersection between two DTMs**.

4. Enter the information as shown, and click **Apply**.

5. Open **intersection1.str** in **Graphics**.
The boundary string is displayed.

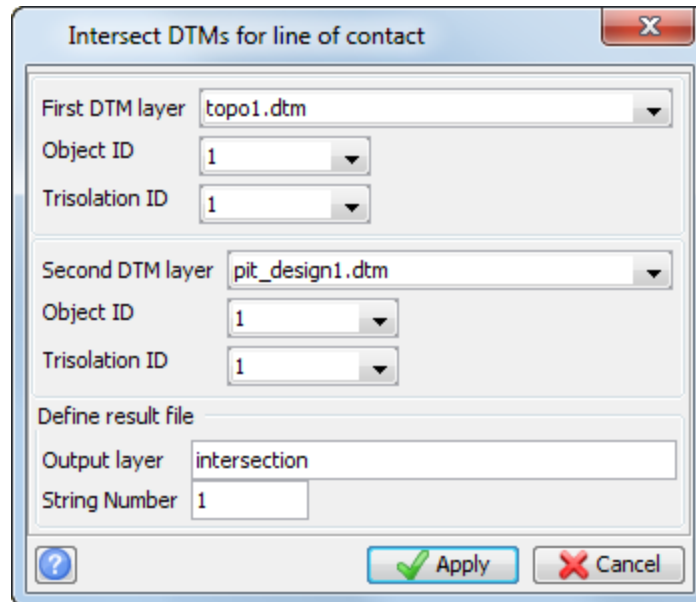


Task: Create a boundary string – graphics-based method

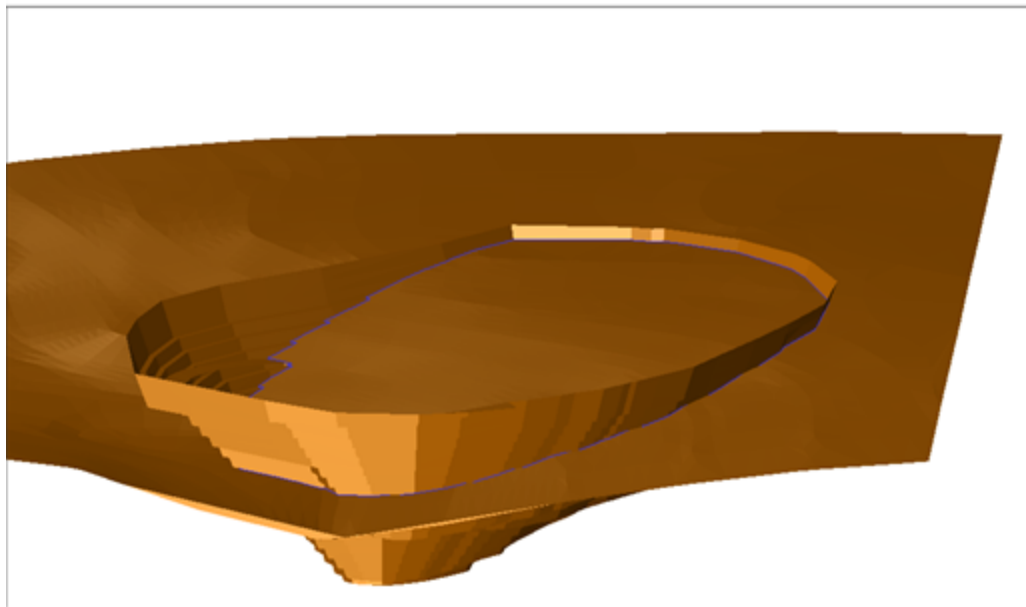
Note: When using the graphics-based method you must open the DTMs in **Graphics**. This is because the function uses graphics layers to determine inputs and outputs.

1. Click **Reset graphics** .
2. Open **topo1.dtm** and **pit_design1.dtm** in **Graphics**.
3. Choose **Surfaces > Clip or intersect DTMs > Line of intersection between DTMs**.

4. Enter the information as shown, and click **Apply**.



The output is the same result as the file-based function, but it does not automatically save the new string file. To save the line of intersection, use **File > Save > string/DTM**.



Calculating cut and fill volume using DTM surfaces

Task: Calculate cut and fill volumes between two DTMs

One of the most common uses of DTMs is to calculate volumes. You can use DTM VOLUMES to compute the volume between two DTM surfaces, contained within a boundary string.

1. Click **Reset graphics** .
2. Choose **Surfaces > Volumes > Cut and fill between DTMs**.

- Enter the information as shown, and click **Apply**.

DTM cut and fill volumes

Define the first DTM

Location:

Object ID:

Trisolation ID:

Define the second DTM

Location:

Object ID:

Trisolation ID:

Define the volume boundary string

Location:

Boundary string:

Define the file for the cut and fill boundary

Location:

ID number:

Fill string:

Cut string:

Boundary string:

Define reporting options

Decimals:

Density:

Report format:

Detailed report

Report by elevation

Range:

- Open **cfill_volume.not**.
The report opens in the default text editor.

```

DTM CUT AND FILL VOLUME REPORT                                MAR 31, 2012

#first dtm: pit_design1.dtm
#second dtm: topo1.dtm
#upper dtm object id: 1
#upper dtm trisolation id: 1
#lower dtm object id: 1
#lower dtm trisolation id: 1

Boundary file: intersection1.str
Boundary string: 1
Number of segments: 1
Density: 1.000
Elevation range: 40,260,10

DTM Extents
-----
#dtm      X minimum X maximum Y minimum Y maximum Z minimum Z maximum
pit_design1.dtm  1424.116 1995.046 7036.983 7659.763 45.561 255.561
topo1.dtm        600.000 2100.000 4999.891 8000.000 158.000 258.000

volumes
-----
cut vol  cut Area  #111 vol  #111 Area  Nett vol  Nett Tonnage  Common Area
0.00    0.00  12808357.65  182470.75  12808357.65  12808357.65  0.00

Total volumes by elevation
-----
#from  To cut vol  Avg. cut Area  #111 vol  Avg. #111 Area  Nett vol  Nett Tonnage  Common Area  Cum cut vol  Cum #111 vol  Cum Nett vol  Cum Nett Tonnage
40.0  50.0  0.00  0.00  21064.37  21064.43  21064.37  21064.37  0.00  0.00  21064.37  21064.37  21064.37
50.0  60.0  0.00  0.00  72143.14  72143.14  72143.14  72143.14  0.00  0.00  93207.41  93207.41  93207.41
60.0  70.0  0.00  0.00  124036.02  124036.02  124036.02  124036.02  0.00  0.00  217243.43  217243.43  217243.43
70.0  80.0  0.00  0.00  198816.10  198816.10  198816.10  198816.10  0.00  0.00  416057.53  416057.53  416057.53
80.0  90.0  0.00  0.00  292340.87  292340.87  292340.87  292340.87  0.00  0.00  708398.39  708398.39  708398.39
90.0  100.0  0.00  0.00  391116.16  391116.16  391116.16  391116.16  0.00  0.00  1099514.56  1099514.56  1099514.56
100.0  110.0  0.00  0.00  490217.08  490217.08  490217.08  490217.08  0.00  0.00  1589731.64  1589731.64  1589731.64
110.0  120.0  0.00  0.00  599929.57  599929.57  599929.57  599929.57  0.00  0.00  2189661.20  2189661.20  2189661.20
120.0  130.0  0.00  0.00  718478.07  718478.07  718478.07  718478.07  0.00  0.00  2908139.27  2908139.27  2908139.27
130.0  140.0  0.00  0.00  838382.13  838382.13  838382.13  838382.13  0.00  0.00  3746521.40  3746521.40  3746521.40
140.0  150.0  0.00  0.00  961199.73  961199.73  961199.73  961199.73  0.00  0.00  4707721.14  4707721.14  4707721.14
150.0  160.0  0.00  0.00  1088409.06  1088409.06  1088409.06  1088409.06  0.00  0.00  5796130.19  5796130.19  5796130.19
160.0  170.0  0.00  0.00  1107059.36  1107059.36  1107059.36  1107059.36  0.00  0.00  6903189.55  6903189.55  6903189.55
170.0  180.0  0.00  0.00  1067876.82  1067876.82  1067876.82  1067876.82  0.00  0.00  7971101.37  7971101.37  7971101.37
180.0  190.0  0.00  0.00  1046541.30  1046541.30  1046541.30  1046541.30  0.00  0.00  9017642.67  9017642.67  9017642.67
190.0  200.0  0.00  0.00  999034.06  999034.06  999034.06  999034.06  0.00  0.00  10016676.73  10016676.73  10016676.73
200.0  210.0  0.00  0.00  900822.46  900822.46  900822.46  900822.46  0.00  0.00  10917501.19  10917501.19  10917501.19
210.0  220.0  0.00  0.00  784834.69  784834.69  784834.69  784834.69  0.00  0.00  11702335.88  11702335.88  11702335.88
220.0  230.0  0.00  0.00  639893.80  639893.80  639893.80  639893.80  0.00  0.00  12342229.68  12342229.68  12342229.68
230.0  240.0  0.00  0.00  383681.50  383681.50  383681.50  383681.50  0.00  0.00  12725911.18  12725911.18  12725911.18
240.0  250.0  0.00  0.00  7691.81  7691.81  7691.81  7691.81  0.00  0.00  12802828.29  12802828.29  12802828.29
250.0  260.0  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  12803428.29  12803428.29  12803428.29
total  0.00  0.00  12,805,628.30  12,805,628.30  12,805,628.30  12,805,628.30  0.00  0.00  12,805,628.30  12,805,628.30  12,805,628.30
    
```

Viewing a solid model

A 3DM, or solid, is a closed shape that represents a closed structure.

Task: View a solid model


1. Open **solid_model.dtm** in **Graphics**.
The solid is displayed.



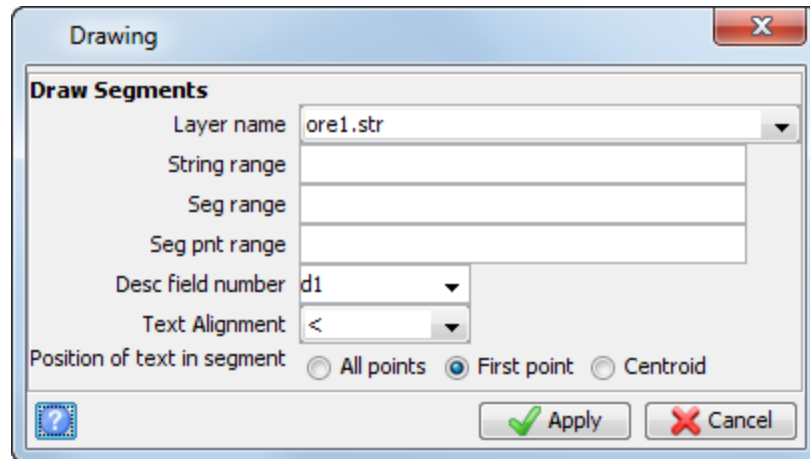
2. Click and drag your mouse to rotate the solid and view the ore body from different angles.

Creating and validating a solid model

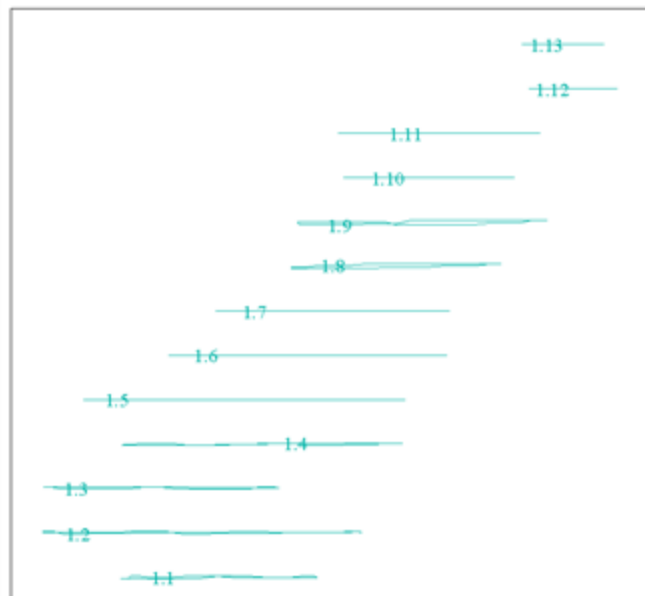
Task: Create and validate a solid model


1. Click **Reset graphics** .
2. Open **ore1.str** in **Graphics**.
3. Choose **Display > Strings > With string and segment numbers**.


4. Enter the information as shown, and click **Apply**.



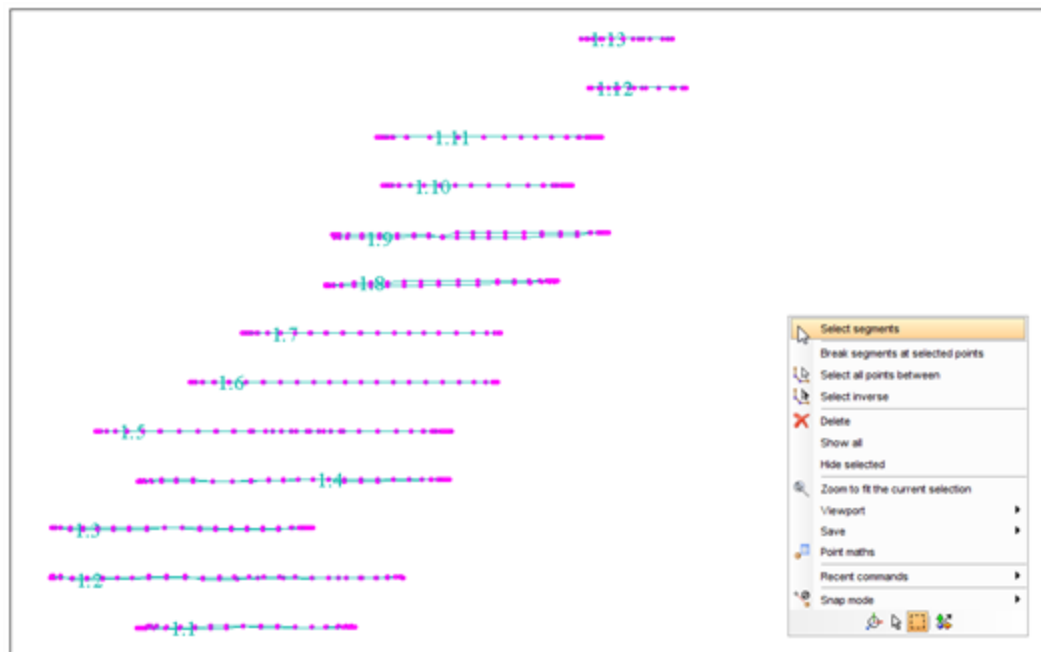
The segments are displayed.



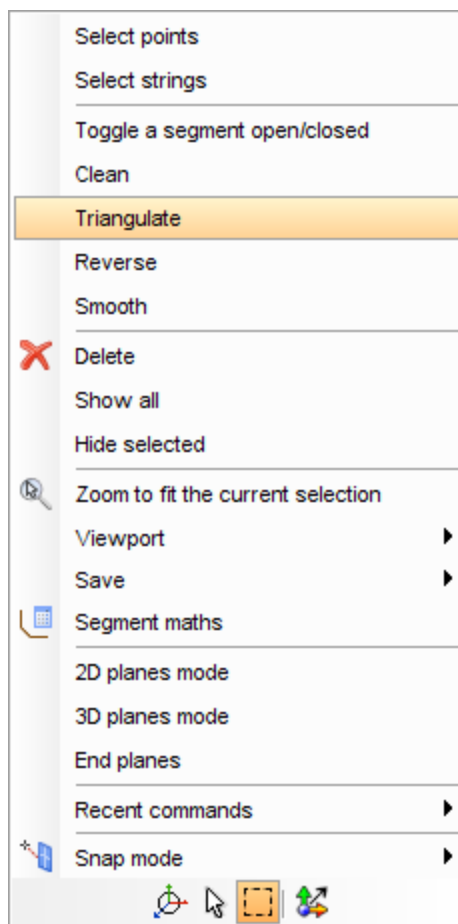
 **Note:** Triangulation uses segment numbers. This means that segment 1 will triangulate to segment 2, segment 2 will triangulate to segment 3, and so on.

5. Choose **View > Zoom > Out**.
6. On the **Tools** toolbar, click **Box Select Points**  .
7. Click and drag to create a box around all of the segments.

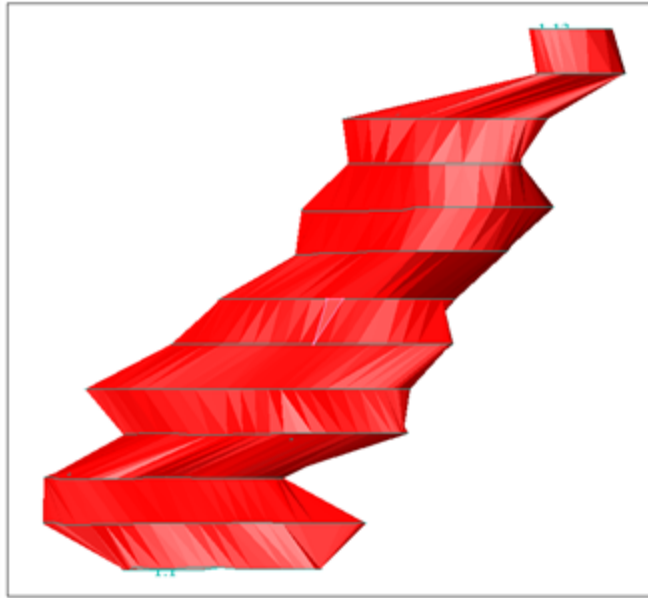
8. Right-click in **Graphics**, and select **Select segments**.



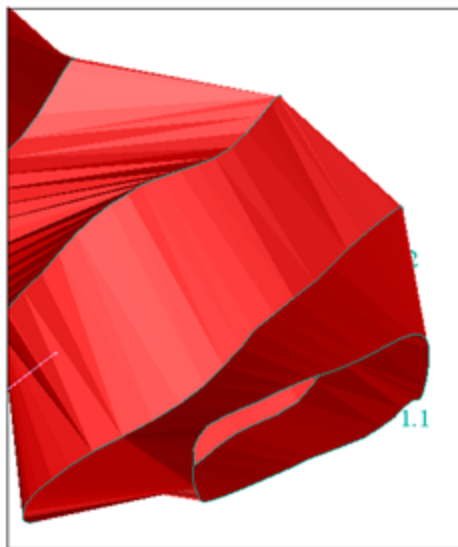
9. Right-click in **Graphics**, and select **Triangulate**.



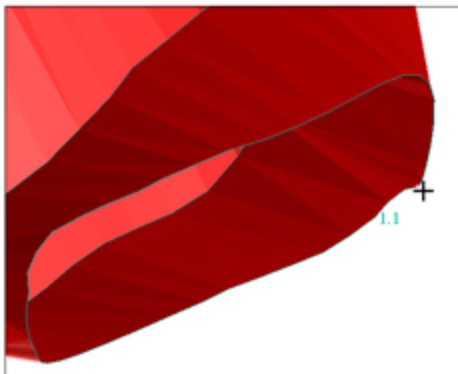
The 3DM orebody is displayed.



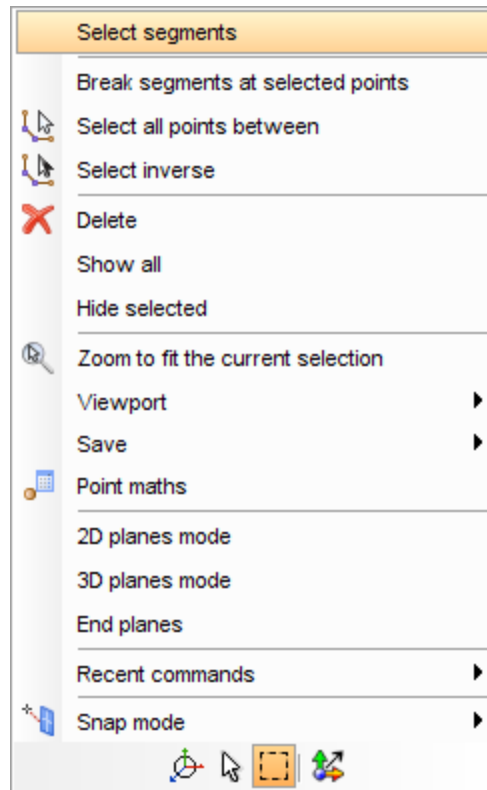
10. Hold the ALT key, then click and drag in **Graphics** to rotate the data to the view shown below.
The solid is not closed.



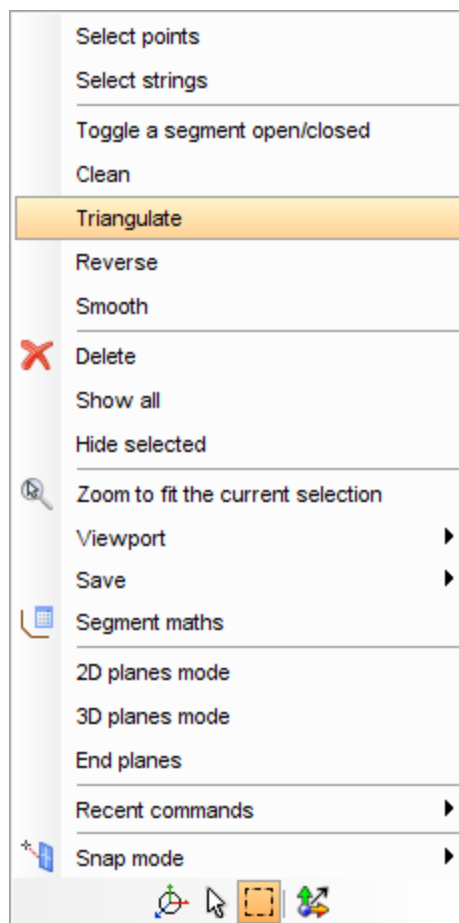
11. Move your pointer near the end segment, and click to select one point.



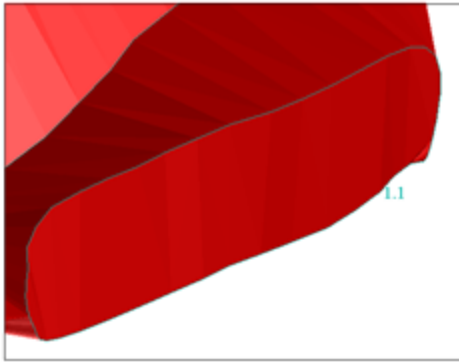
12. Right-click in **Graphics**, and select **Select segments**.



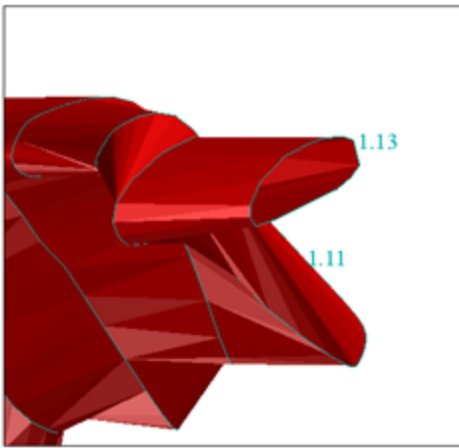
13. Right-click in **Graphics**, and select **Triangulate**.



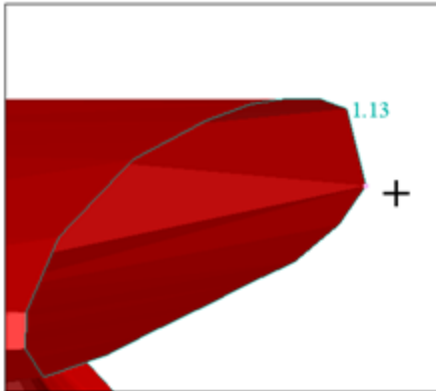
The solid is now closed at the end segment.



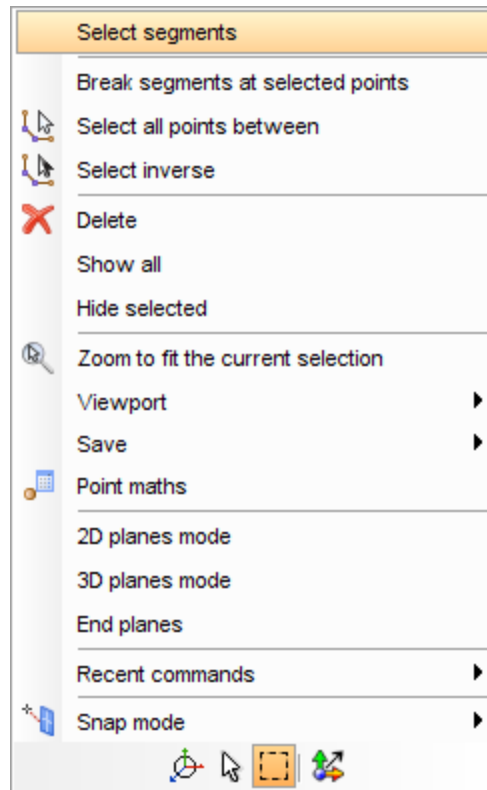
14. Hold the ALT key, then click and drag in **Graphics** to rotate the data to expose the other end of the object.



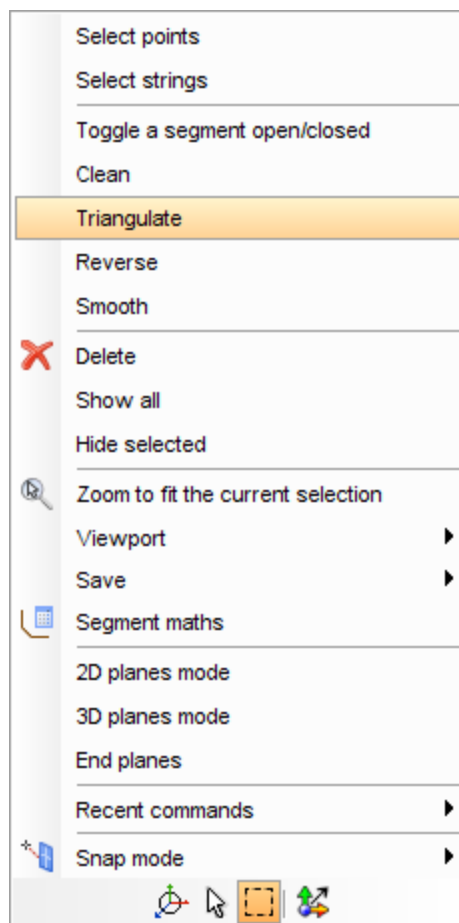
15. Move the pointer near the end segment, and click to select one point.



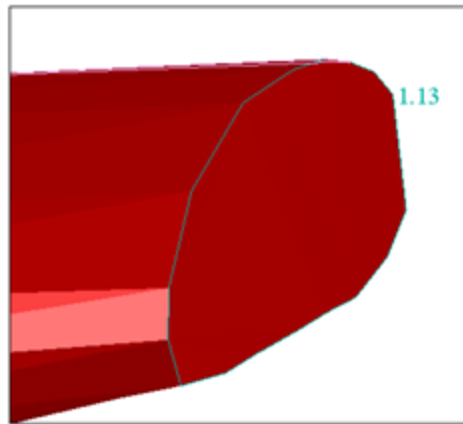
16. Right-click in **Graphics**, and select **Select Segment**.



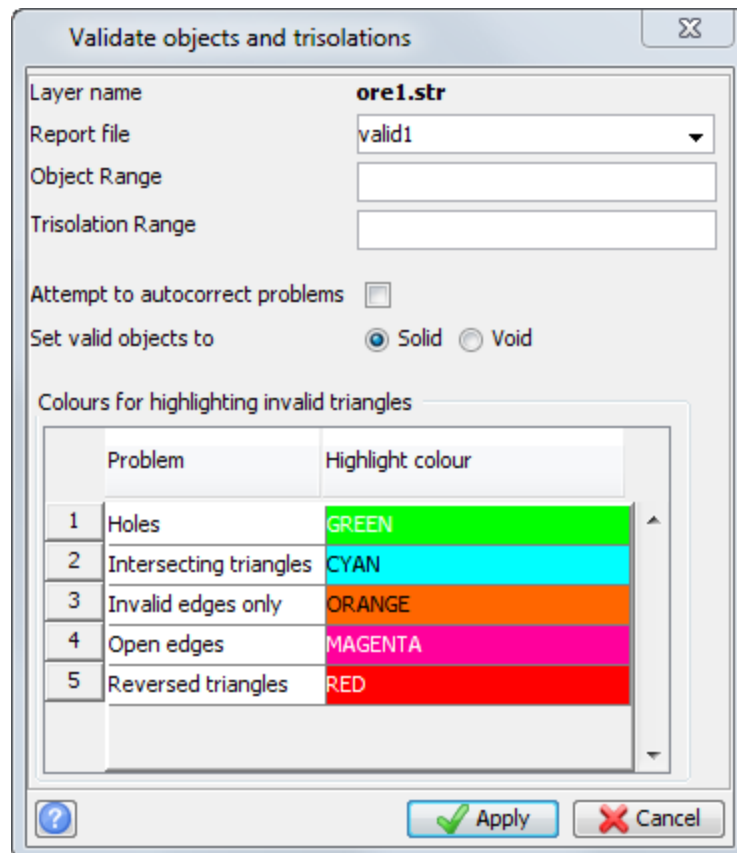
17. Right-click in **Graphics** and select **Triangulate**.



The solid is now closed at the end segment.



18. To validate the solid, choose **Solids > Validation > Validate object/trisolation**.
19. Enter the information as shown, and click **Apply**.



The validation status is written to the **message window**.

```
Validating Object 1, Trisolation 1:
Trisolation is closed.
Trisolation successfully validated
```

The results are also written to the **valid1.not** file.

Solid validation report									
Layer:ore1.str									
Object	Trisolation	valid	Open/closed	Connected	Duplicate (removed)	Invalid Edges	Intersecting	Reversed	
1	1	valid	Closed	Connected	0	0	0	0	0
Totals					0	0	0	0	0
Solid validation report						1/1			


20. Choose **File > Save > string/DTM file**.
21. Enter the information as shown, and click **Apply**.

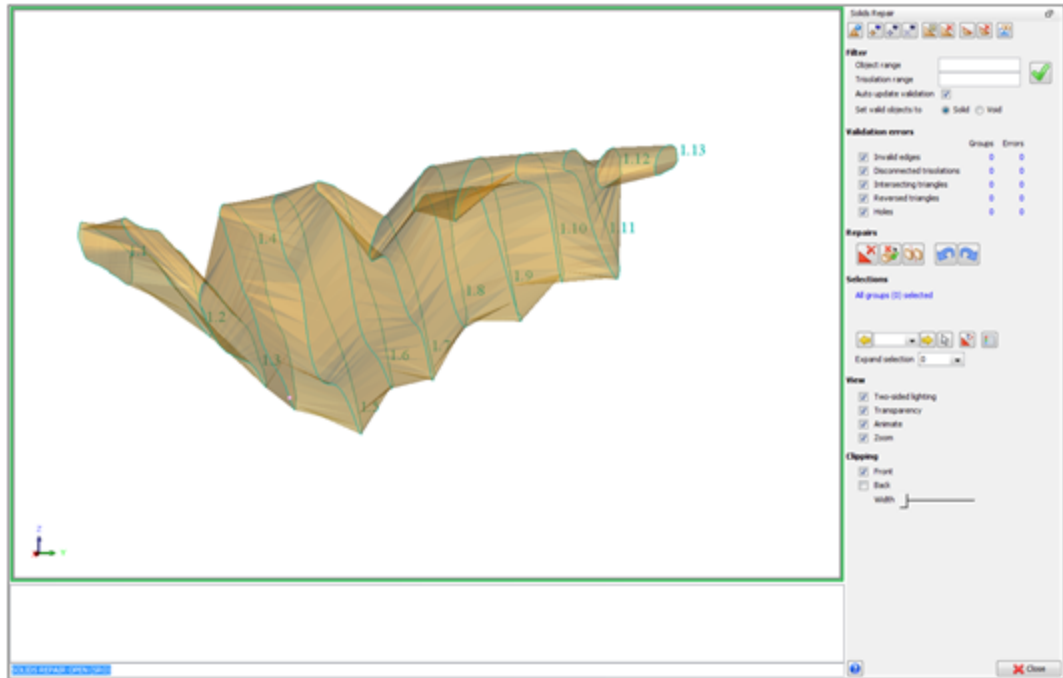
The 'Save File' dialog box contains the following fields and options:


- Layer Name: ore1.str
- Filename: ore1
- Output Format Type: Surpac DTM Files
- Extension: .dtm
- Options...
 - Purpose: (empty text box)
 - String Range: (empty text box)
 - File format:
 - text
 - binary
 - DTM/3DM Options:
 - Force solid validation on save
 - Force rigid backwards compatibility
- Save styles
- Styles file name: red_dtm.ssi

Buttons: ? (help), Apply (green checkmark), Cancel (red X).

Note: To see all of the steps performed in this task, run **04a_create_and_validate_solid.tcl**. You need to click **Apply** on any forms presented.


 **Tip:** You can also validate your solid using the solids repair functions (**Solids > Validation > Solids repair**).

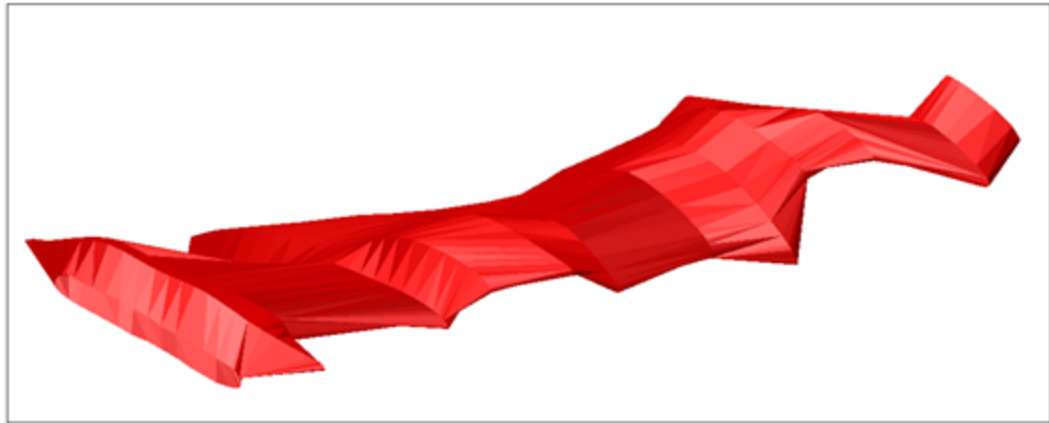


The **Solids Repair** panel is displayed. The green check mark  at the top of the panel means that the solid is valid.

Calculating a volume using a solid model

Task: Calculate a volume for a solid model

1. Click **Reset graphics** .
2. Open **ore_solid1.dtm** in **Graphics**.
The solid is displayed.



3. Choose **View > Data view options > Long section view**.
4. Choose **Display > 2D Grid**.
5. Enter the information as shown, and click **Apply**.

X

Grid Parameters

	Grid Line Interval	Label Frequency
Y Direction:	<input type="text" value="50.000"/>	<input type="text" value="1"/>
X Direction:	<input type="text" value="50.000"/>	<input type="text" value="1"/>
Z Direction:	<input type="text"/>	<input type="text" value="1"/>

Grid Extents

Y Direction:	Minimum: -100	Maximum: 350	View ▼
X Direction:	Minimum: 7050	Maximum: 7700	View ▼


Grid Position

In Front
 Midpoint
 Behind
 Position

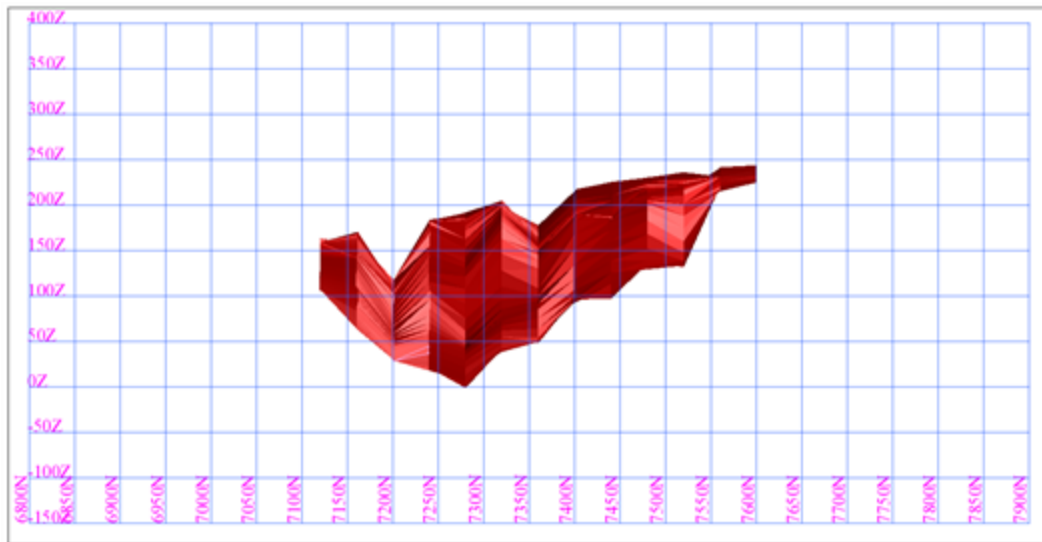
Enter the value:

Appearance

Replace current grid: <input checked="" type="checkbox"/>	Line colour: ▼
Append to file: ▼	Text colour: ▼



6. Choose **View > Zoom > Out**.



7. Choose **Solids > Solids tools > Report volume of solids**.

8. Enter the information as shown below, and then click **Apply**.

Object report X

Layer name

Define the report file to create

Location ▼

ID number

Report Format ▼

Decimals

Check overlaps

Report by Total Interval Elevation Range

Elevation range

Elevation interval

The report is displayed.

```


SOLID MODELLING OBJECT REPORT
Layer Name: ore_solid1.dtm
Elevation range: 0,250,50

Object: 1
Trisolation: 1
Validated = true
Status = solid

Trisolation Extents
X Minimum: 1441.416 X Maximum: 1960.408
Y Minimum: 7119.489 Y Maximum: 7600.000
Z Minimum: -1.119 Z Maximum: 244.029

warning: The elevation range does not encompass the Z extents.

Volumes By Elevation
From To Volume Avg. Horizontal Area Surface Area Cumulative volume Cumulative Surface Area
-----
0.0 50.0 91992 1840 19506 91992 19506
50.0 100.0 617931 12359 54395 709923 73901
100.0 150.0 847105 16942 78592 1557028 152493
150.0 200.0 632212 12644 77722 2189240 230215
200.0 250.0 337987 6760 45769 2527227 275984
Total 2,527,227 275,984
    
```

 **Note:** To see all of the steps performed in this task, run **04b_solid_volume.tcl**. You need to click **Apply** on any forms presented.

File tools

The File tools menu contains several different functions that you can use to filter, classify, transform, split, combine, intersect, and perform mathematical operations on string files.

For the tasks within this section, the data is displayed in **Graphics** to help you understand how the functions work. However, you do not have to view the data to run any of the File tools functions.


String maths

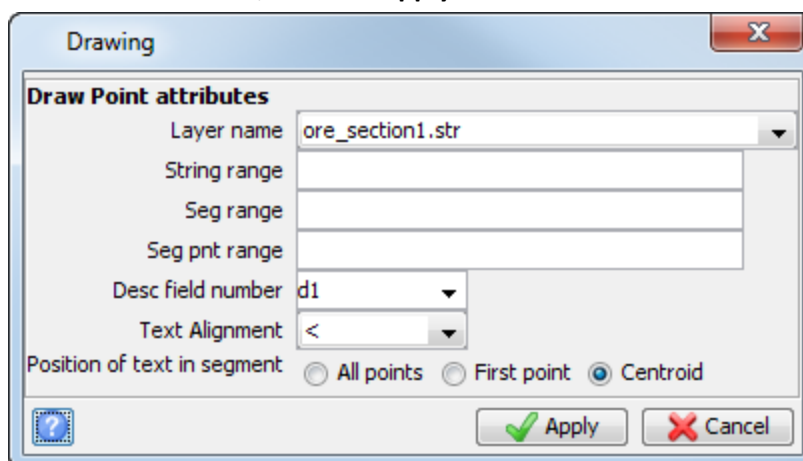
You can use String Maths to perform mathematical operations on string files, such as:

- convert section coordinates to real-world coordinates.
- add a constant value to a coordinate (such as the northing) of all strings.
- apply a topcut to sample values.

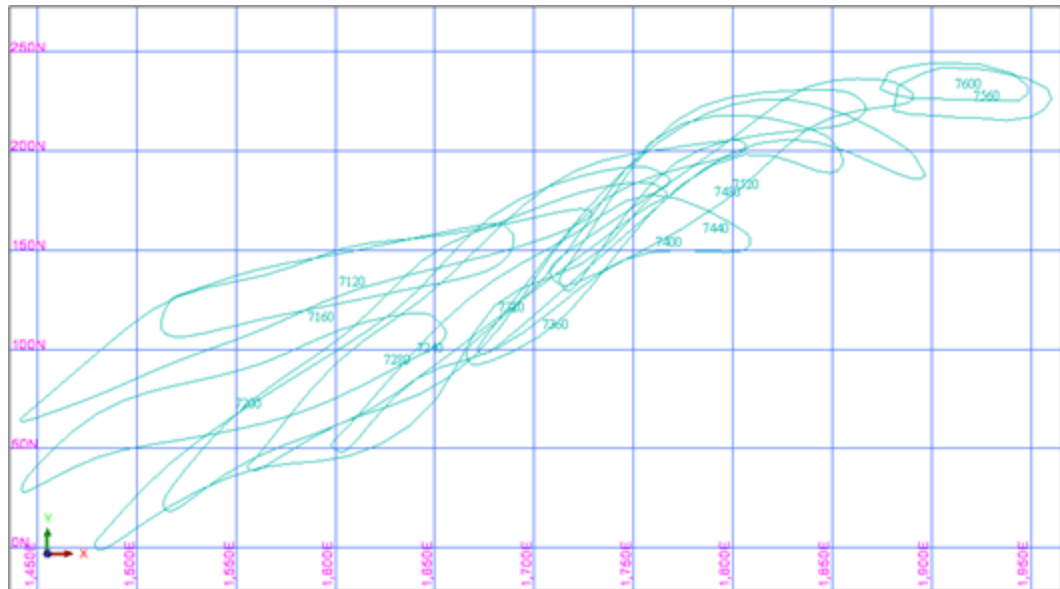
Task: Convert section coordinates to real-world coordinates

You will use String Maths to convert a string file in which the Y field represents the real-world Z value, and the Z field represents the real-world Y value. This is a common approach used when data on a cross section has been digitised from a tablet.

1. Click **Reset graphics** .
2. Open **ore_section1.str** in **Graphics**.
3. Choose **Display > Dynamic 2D grid**.
4. Choose **Display > Point > Attributes**.
5. Enter the information as shown, and click **Apply**.



The strings in **ore_sections1.str** are sectional interpretations of ore zones that have been digitised from a digitising tablet. The Y field of **ore_sections1.str** represents the real-world elevation, or Z value. The Z field of all points on each segment of **ore_sections1.str** represents the real-world northing, or Y value. The X field is the real-world easting.



Next, use String maths to convert this data to real-world coordinates by swapping the Y and Z values.

6. Choose **File tools > String maths**.
7. Enter the information as shown, and click **Apply**.

String maths X

Define the files to be processed

Location: ore_section

ID range: 1

Define the files to be created

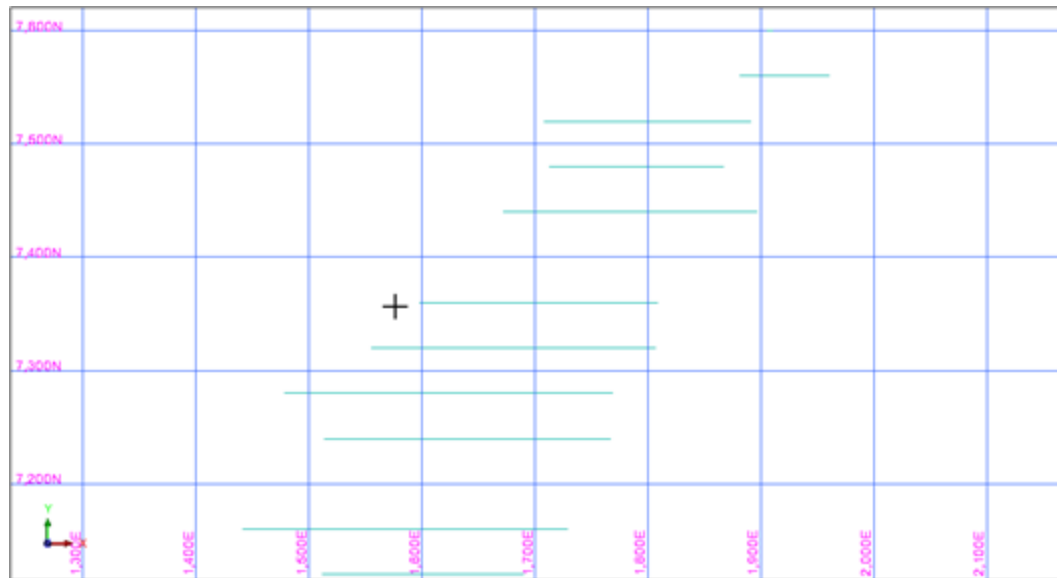
Location: ore_plan


String range	Constraint	Field	=	Expression
1		y	=	z
2		z	=	y
3			=	
4			=	

8. Click **Reset graphics** .
9. Open **ore_plan1.str** in **Graphics**.

10. Choose **Display > Dynamic 2D grid**.


The strings in **ore_plan1.str** represent the real-world coordinates.



 **Note:** To see all of the steps performed in this task, run **05a_string_maths1.tcl**. You need to click **Apply** on any forms presented.

Task: Adjust coordinates

You will use String Maths to adjust the easting, or X value of all data in a string file. You would adjust the coordinates when there are two coordinate systems that are used for a string file or when you need to correct an error made in the coordinate values when the data was created.

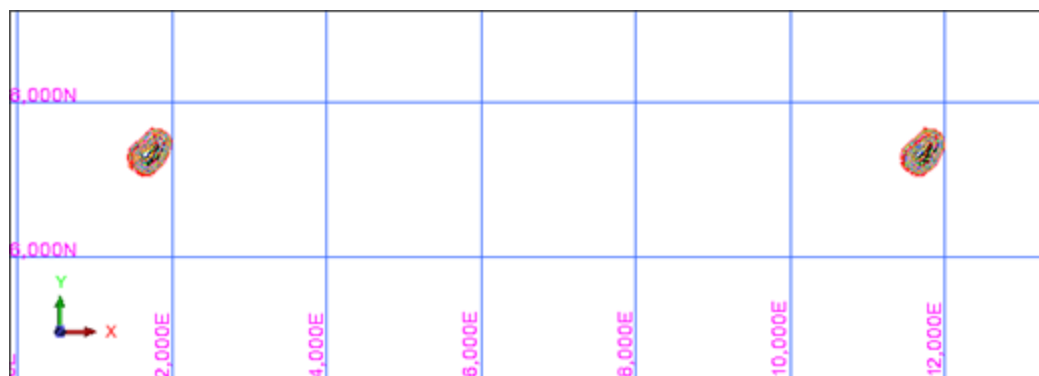
1. Click **Reset graphics** .
2. Open **pit_design1.str** in **Graphics**.
3. Choose **File tools > String maths**.
4. Enter the information as shown, and click **Apply**.

String range	Constraint	Field	=	Expression
1		x	=	x+10000
2			=	
3			=	
4			=	

5. Open **pit_new1.str** in **Graphics**.
6. Choose **View > Zoom > All**.

- Choose **Display > Dynamic 2D grid**.

The easting of **pit_new1.str** is 10,000 meters greater than **pit_design1.str**.



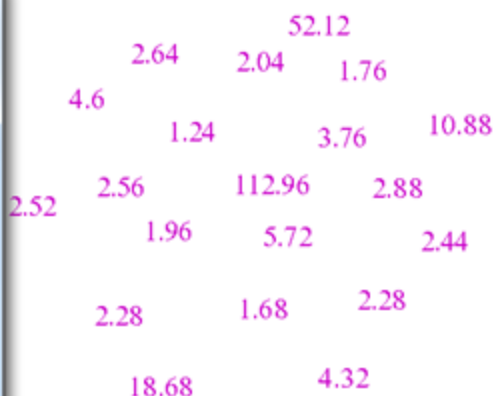
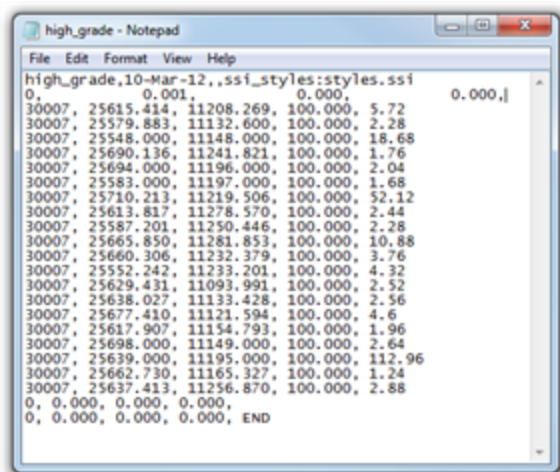
Note: To see all of the steps performed in this task, run **05b_string_maths2.tcl**. You need to click **Apply** on any forms presented.

Task: Topcut high grade samples

You will use String Maths to set values in a string file that are above a maximum value equal to a given value. You would want to do this if you have sample data that you want to use for a resource estimation in which you do not want to allow extreme data values to have too much influence on the estimation.

- Click **Reset graphics** .
- Open **high_grade.str** in **Graphics**.
- From the Navigator, right click **high_grade.str**, and select **Edit**.

The file opens in a text editor. The sample values in the D1 field are displayed in **Graphics**.



Most of the data values are between 1 and 10, but there are a few values above 10. You will now use String Maths to "topcut", or convert values that are above 10 to the value of 10.

- Choose **File tools > String maths**.

- Enter the information as shown, and click **Apply**.

String maths

Define the files to be processed

Location: high_grade

ID range:

Define the files to be created

Location: top_cut

	String range	Constraint	Field	=	Expression
1			d2	=	if(d1>10,10,d1)
2				=	
3				=	

Apply Cancel

- Click **Reset graphics**.
- Open **top_cut.str** in **Graphics**.
- Choose **Display > Point > Markers**.
- Enter the information as shown, and click **Apply**.

Drawing

Draw Markers

Layer name: top_cut.str

String range:

Seg range:

Seg pnt range:

Desc field number: d1

Text Alignment: <

Position of text in segment: All points First point Centroid

Apply Cancel

- Choose **Display > Point > Attributes**.
- Enter the information as shown, and click **Apply**.

Drawing

Draw Point attributes

Layer name: top_cut.str

String range:

Seg range:

Seg pnt range:

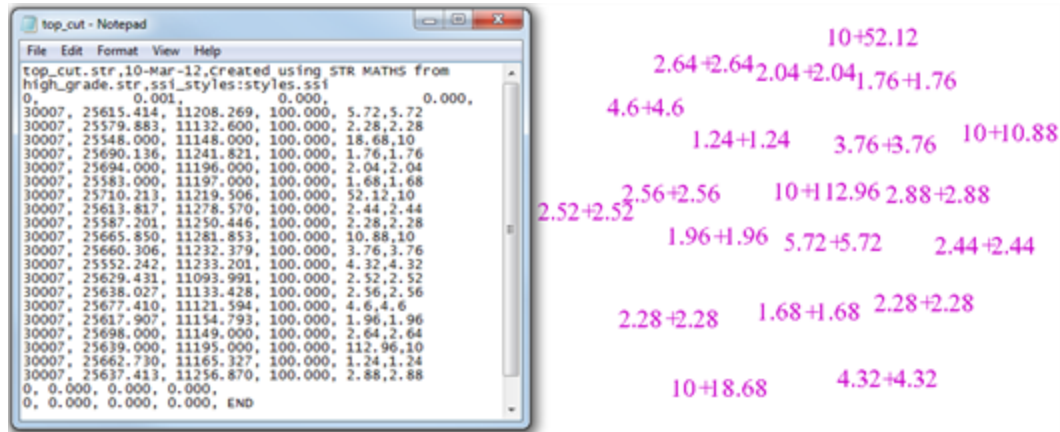
Desc field number: d2

Text Alignment: >

Position of text in segment: All points First point Centroid

Apply Cancel

- In the Navigator, right click **top_cut.str**, and select **Edit**.
The file opens in a text editor. The values in the D2 field represent the "topcut" values, and are displayed to the left of the point in **Graphics**.



Notice that where the D1 value is less than 10, the D2 value is equal to the D1 value. Where the D1 value is greater than 10, the D2 value has been topcut to 10.

Note: To see all of the steps performed in this task, run **05c_string_maths3.tcl**. You need to click **Apply** on any forms presented.

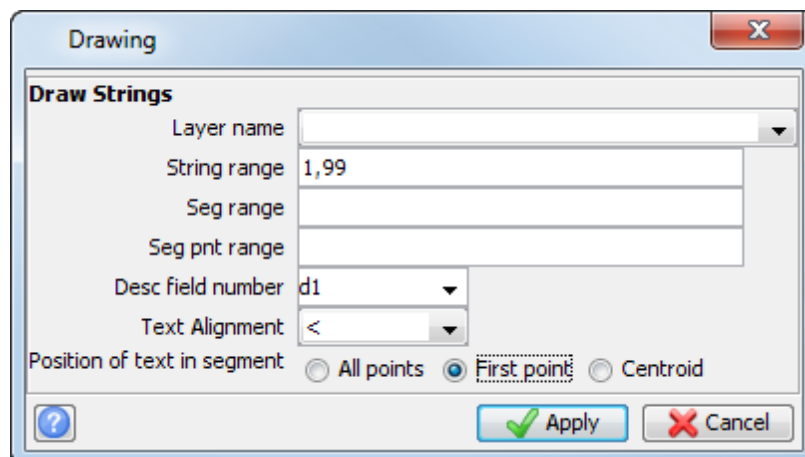
Clip data by a boundary

You can use **Apply boundary string** to remove data inside or outside a closed, clockwise boundary string.

Task: Apply a boundary string to a soil sampling file

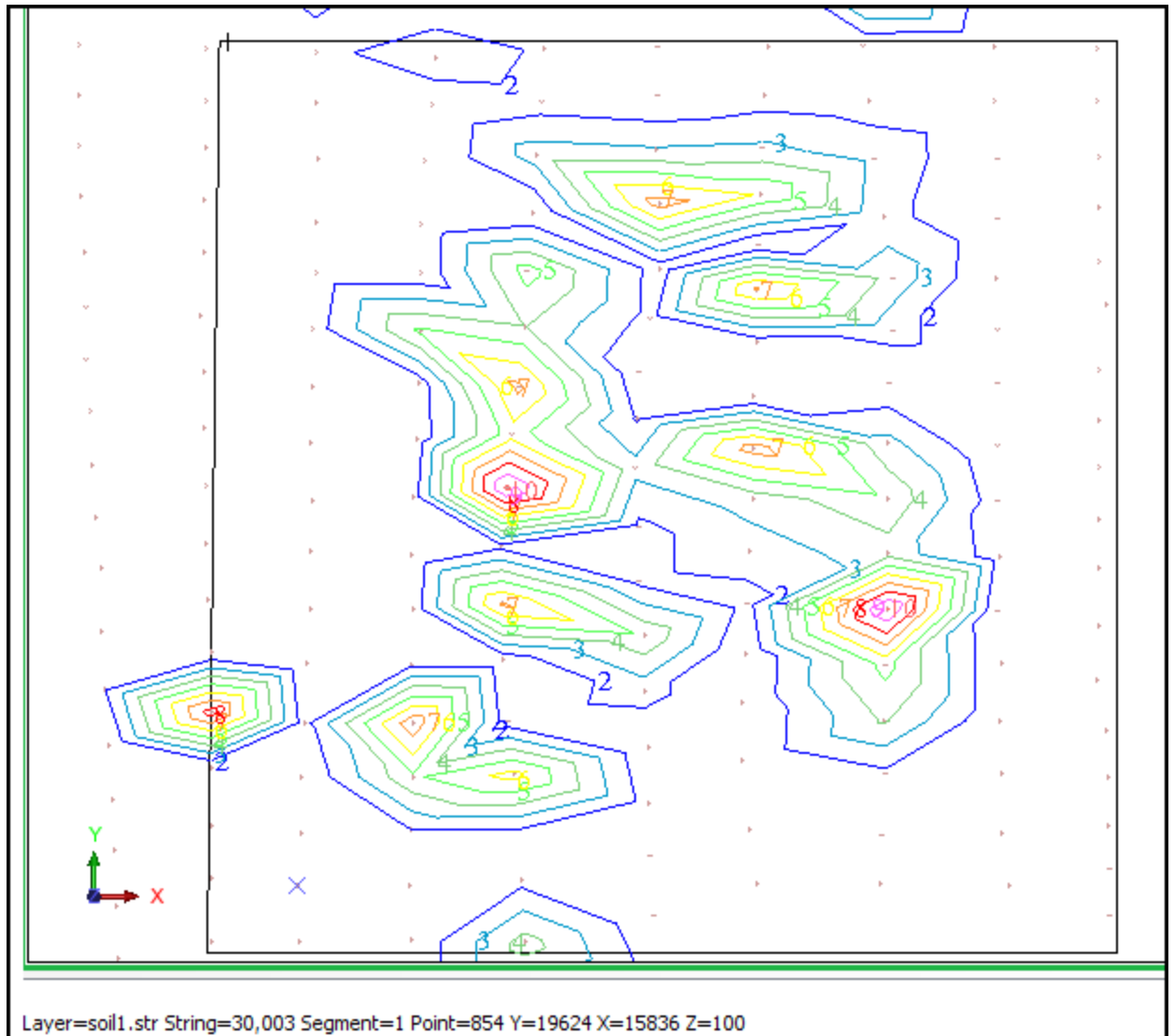
You will use **Apply boundary string** to remove data outside a boundary string.

- Click **Reset graphics** .
- Open **soil1.str** in **Graphics**.
- Open **bdy100.str** in **Graphics**.
- Choose **Display > Strings > With string numbers**.
- Enter the information as shown, and click **Apply**.



- Choose **Inquire > Point Properties**.
- Select one of the markers (a spot height string).

Strings 1 to 99 are labelled and displayed in **Graphics**. The spot height string number 30003 is displayed in the **message window**.



You will clip the data in **soil1.str** by string 1 in **bdy100.str**. String 30003 in **soil1.str** is the only spot height string.

8. Choose **File tools > Apply boundary string**.

9. Enter the information as shown, and click **Apply**.

Extract strings inside/outside a boundary

Define the boundary string

Location: bdy
ID number: 100
Boundary String number: 1

Define the existing string files


Location: soil
ID range: 1
Any spot height strings:
Range: 30003

Define the files to be created

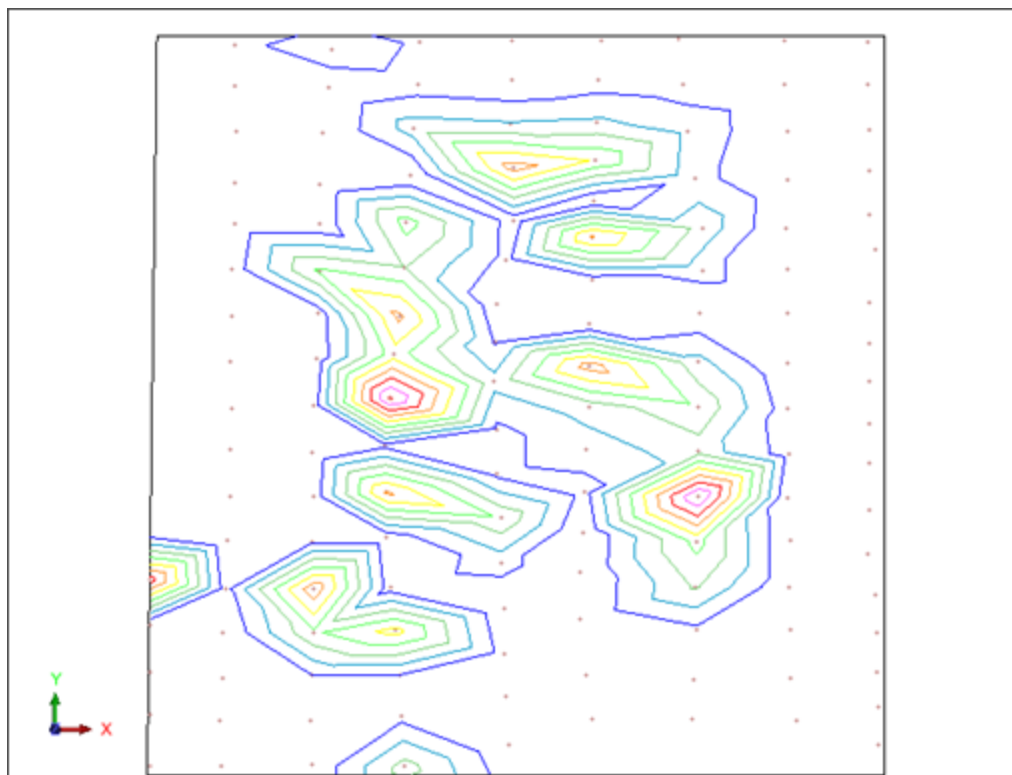
Location: soil
ID range: 2
Retain string numbers:
Retain descriptions:
Select data: Inside Outside

Apply Cancel

Note: When you apply a boundary string to spot heights, only those points that lie inside or on the boundary are saved. For strings that are not defined as spot height strings, new points are created where the boundary string intersects the line.

10. Click **Reset graphics** .
11. Open **soil2.str** in **Graphics**.
12. Open **bdy100.str** in **Graphics**.

Data in **soil2.str** is contained within the boundary.



Note: To see all of the steps performed in this task, run **05d_apply_boundary.tcl**. You need to click **Apply** on any forms presented.

Classify strings

You can use Classify strings to assign a string number based on the value of the Y, X, Z, or description field. You can also display the data with different colours or line thicknesses.

Task: Colour points by sample values

You will use **Classify strings by numbers** to display sample values of points in different colours.

1. Open **samp1.str** in **Graphics**.
2. Choose **Display > Point > Attributes**.
3. Enter the information as shown, and click **Apply**.

Drawing

Draw Point attributes

Layer name: samp1.str

String range: []

Seg range: []

Seg pnt range: []

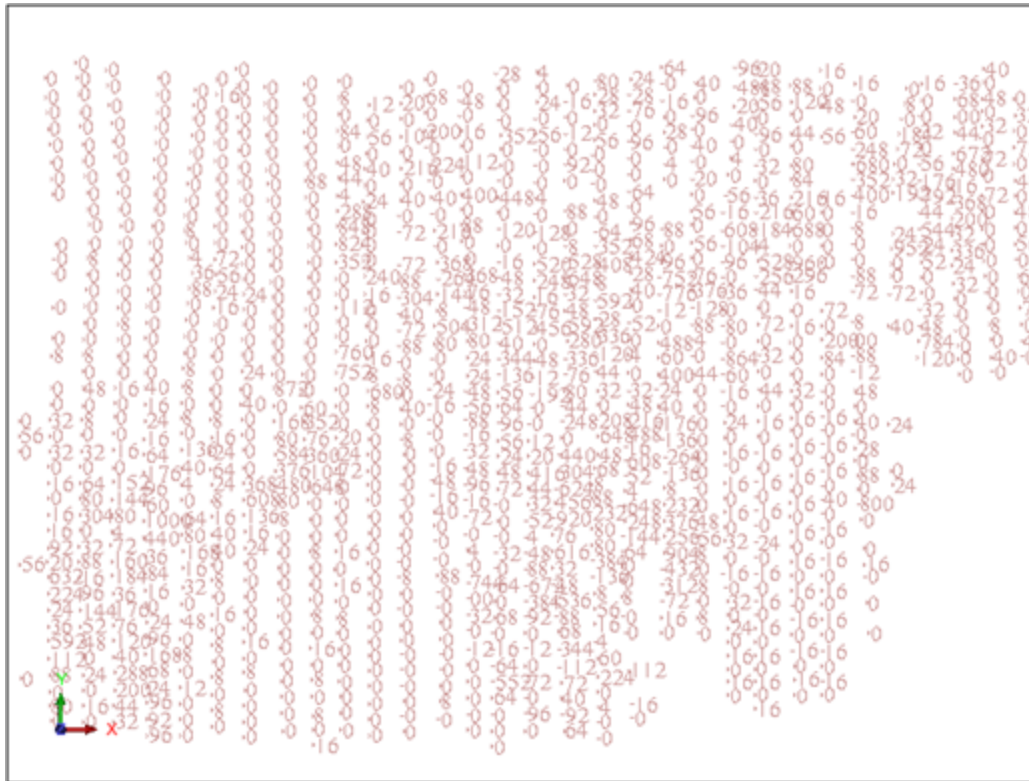
Desc field number: d1

Text Alignment: <

Position of text in segment: All points First point Centroid

[?] [Apply] [Cancel]

The D1 value for each point is displayed.



4. Choose **File tools > Classify strings by numbers**.
5. Enter the information as shown, and click **Apply**.

Classify strings by a numeric field

Define the input files

Location

ID Range

Define the output files

Location

Use descriptions

Number of classification passes

CLASSIFICATION PASS 1

Input method table range

Input string range

Classifying field

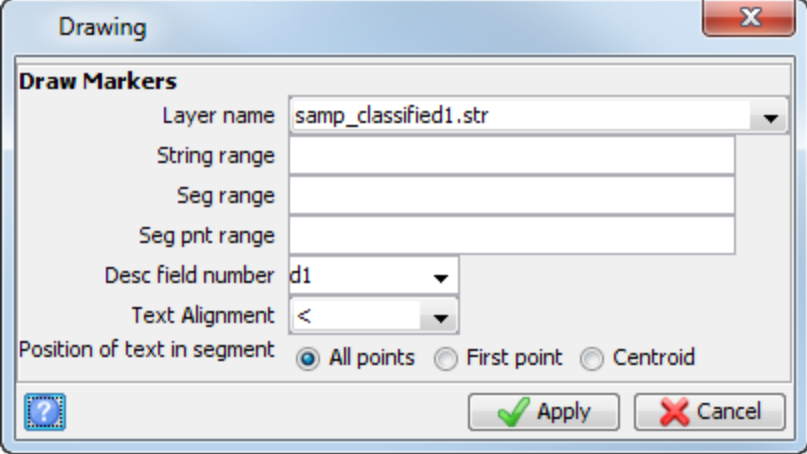
Classify by segment point

	Output String ID	MIN field Value	MAX field Value
1	1	0	100
2	2	100	300
3	3	300	500
4	4	500	9999

?
✔ Apply
✘ Cancel

Note: Press TAB to create a new row in the classification table.

6. Click **Reset graphics** .
7. Open **samp_classified1.str** in **Graphics**.
8. Choose **Display > Hide everything**.
9. Choose **Display > Point > Markers**.
10. Enter the information as shown, and click **Apply**.



Drawing

Draw Markers

Layer name: samp_classified1.str

String range:

Seg range:

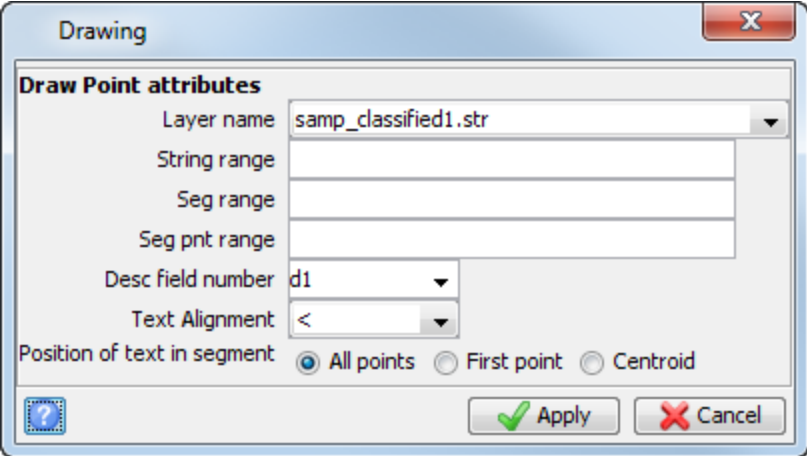
Seg pnt range:

Desc field number: d1

Text Alignment: <

Position of text in segment: All points First point Centroid

11. Choose **Display > Point > Attributes**.
12. Enter the information as shown, and click **Apply**.



Drawing

Draw Point attributes

Layer name: samp_classified1.str

String range:

Seg range:

Seg pnt range:

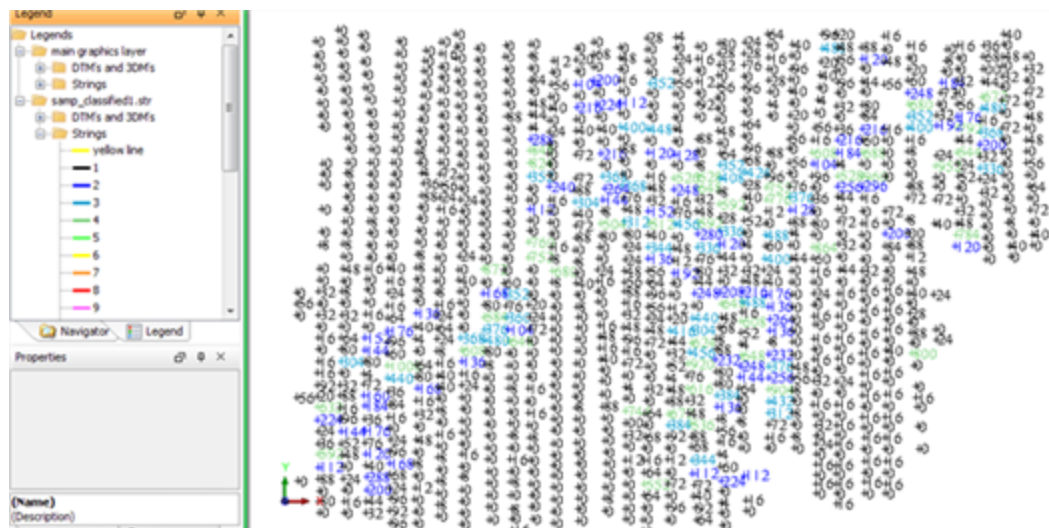
Desc field number: d1


Text Alignment: <

Position of text in segment: All points First point Centroid

13. Select the **Legend** tab, and expand the **Strings** legend for **samp_classified1.str** as shown below.

The points have been classified and are displayed according to the colour of each string.




 **Note:** To see all of the steps performed in this task, run **05e_classify_strings.tcl**. You need to click **Apply** on any forms presented.

2D transformations

You can use 2D transformations to transform data from one coordinate system to another. Before you run this function, you must know what the coordinates of two points are in each of the two systems. You can also add or subtract a constant value to the Z coordinates between the two systems.

Task: Transform data to a different coordinate system

You will transform **pit1.str** into the same coordinate system as **pit2.str** using 2D transformation. You will be provided with the coordinate values of the two points in each of the two systems, as well as a Z correction.

1. Click **Reset graphics** .
2. Open **pit1.str** in **Graphics**.
3. Choose **Inquire > Report layer extents** to show the coordinate extents in the **message window**.

```
Processing pit1.str
Drawing commencing - Please wait
Ymin = 6668.83, Ymax = 7140.678, Xmin = 2290.649, Xmax = 2587.695
Zmin = 944.371, Zmax = 1062.01
```

4. Open **pit2.str** in **Graphics**.
5. Choose **Inquire > Report layer extents** to show the coordinate extents in the **message window**.

```
Processing pit2.str
Drawing commencing - Please wait
Ymin = 19391.76, Ymax = 20199.93, Xmin = 9338.89, Xmax = 9795.08
Zmin = 180, Zmax = 270
```

- Click **Zoom to data extents** .



- Choose **File tools > Transformations > 2D transformation of string file**.
- Enter the information as shown, and click **Apply**.

Transform coordinates of strings (2D)

Define files to transform

Location: pit
ID range: 1

Define files to create

Location: transformed_pit

Any Z correction:
Transform AB axis:

Correction factor: -750.000000
Addition Multiplication

Define transformation parameters

Old points		New points	
Y1	7132.000000	Y1	18819.413000
X1	2347.000000	X1	8882.917000
Y2	6750.000000	Y2	18510.579000
X2	2291.000000	X2	8650.891000

Apply Cancel

Note:

- Old points** are the coordinates of the two points in the existing coordinate system. **New points** are the coordinates of the same two points in the coordinates system to which you are transforming the data.
- The Z coordinates of the new system are 750 meters below the Z value of the existing system.

The transformation parameters are displayed.


Verify transformation parameters

Scale	1.000518128
Rotation	28.3439
Shift Y	11687.413
Shift X	6535.917

Accept these adjustments


Apply Cancel

Note:

- If the grids are plane metric grids, the scale should be very close to 1.0. In this example, there is an error of 0.5 mm in per meter.
 - The rotation is displayed in DDD.MMSS format.
 - **Shift Y** is the difference between Y1 (old) and Y1 (new) as entered on the first form.
 - **Shift X** is the difference in easting between X1 (old) and X1 (new).
9. Select the **Accept these adjustments** check box, and click **Apply**.
 10. Open **transformed_pit1.str** in **Graphics**.
 11. Click **Zoom to data extents**  .



At the top of the screen you can see both pits in the same coordinate system. Notice **transformed_pit1.str** has been shifted north and east, and it has also been rotated.

 **Note:** To see all of the steps performed in this task, run **05f_2d_transform.tcl**. You need to click **Apply** on any forms presented.


Polygon intersection

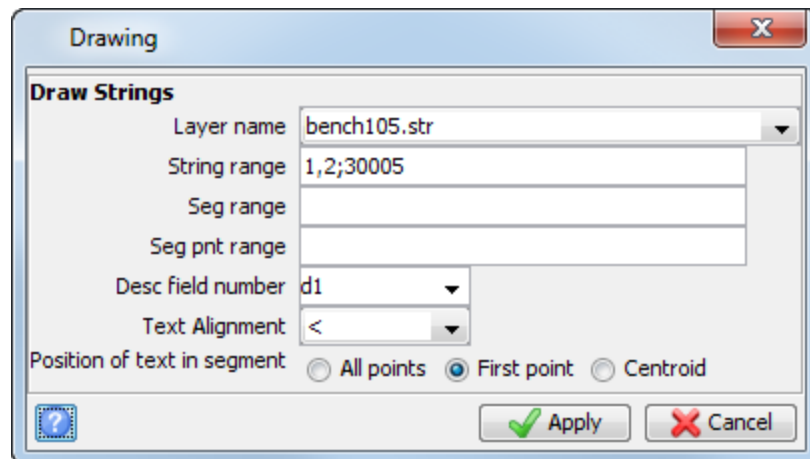
You can use **Intersect polygons** to perform an intersection, outersection, or union of two or more closed segments.

Operation	Example of Usage
Intersection	Determining the area which is common to two closed strings. By intersecting two closed strings you produce a string which has one or more segments which represent the area common to the two strings.
Outersection	Determining the material which might remain after an excavation is completed, for example the excavation of an open pit.
Union	Joining two strings together to represent the total area of both strings, for example to represent the shape which will remain after two intersecting pits are excavated.

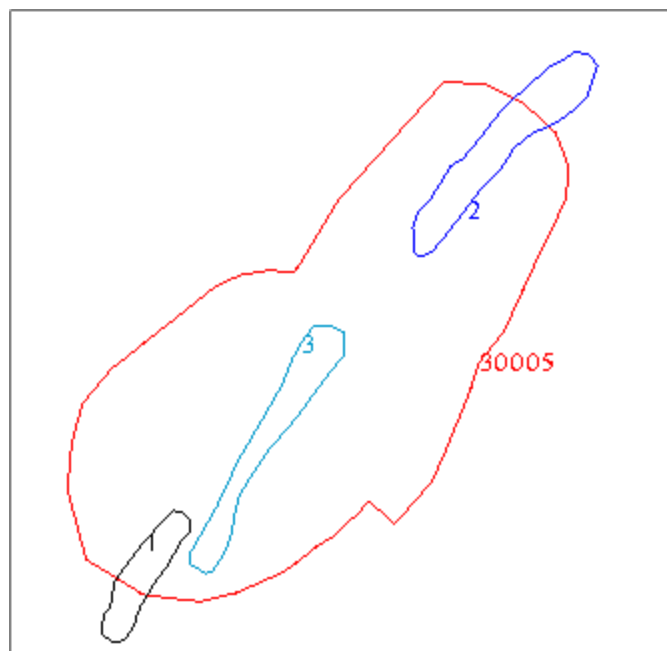
Task: Calculate the area of an ore zone within a pit

You will intersect closed, clockwise ore zone strings at a midbench elevation (105) with a closed, clockwise midbench contour of a pit design at the same elevation. Afterward, you will display the clipped strings and the area of each segment.

1. Click **Reset graphics** .
2. Open **bench105.str** in **Graphics**.
3. Choose **Display > Hide everything**.
4. Choose **Display > Strings > With string numbers**.
5. Enter the information as shown, and click **Apply**.



Strings 1, 2, 3, and 30005 are displayed.



6. Choose **File Tools > Intersect polygons**.

7. Enter the information as shown, and click **Apply**.

Polygon intersection

Define the intersecting or outersecting polygons

Location: BENCH

ID range: 105

String range: 30005

Define the intersected or outersected polygons

Location: BENCH

String range: 1;2;3

Retain descriptions

Define output string files

Location: INT_BENCH

Polygon operation: Intersection, Outersection, Union

Define the report file for results

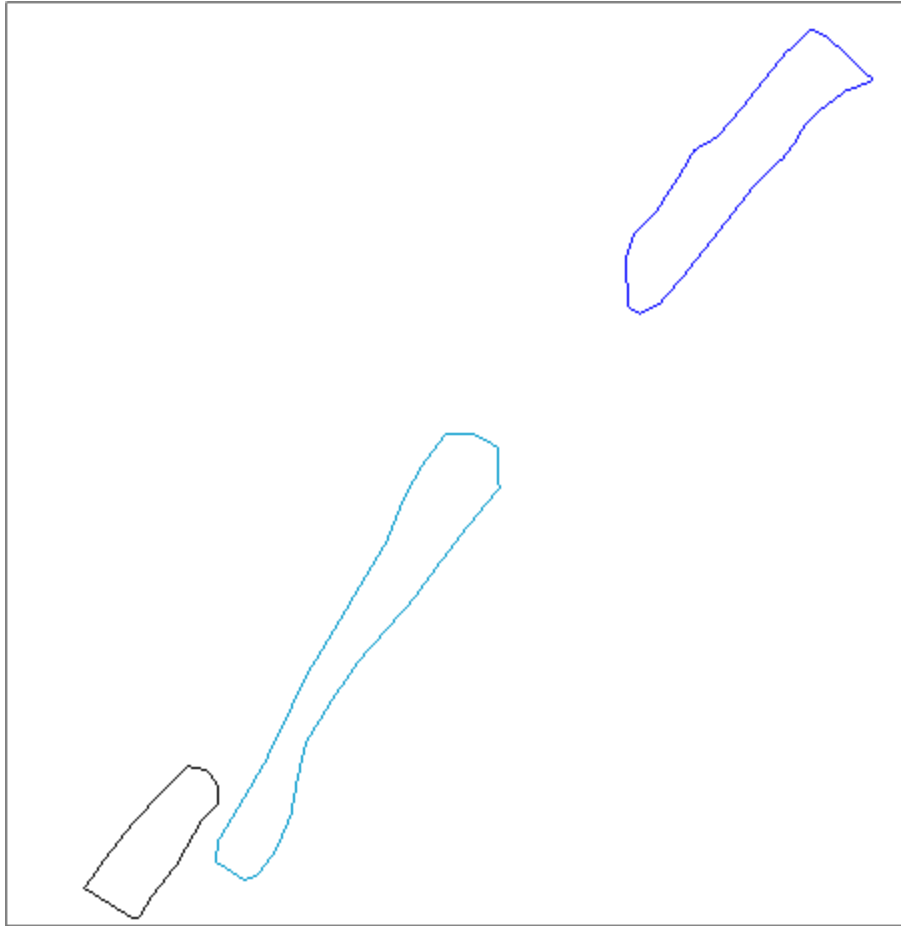
Report file name: b105_int

Format: .not - Surpac Note File

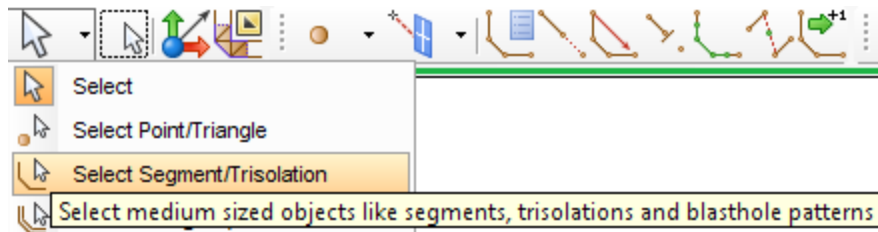
Note: Strings 1,2, and 3 will be intersected by string 30005.

8. Click **Reset graphics**

9. Open **int_bench105.str** in **Graphics**.
The clipped strings are displayed.



10. From the **Selection** menu on the **Tools** toolbar, click **Select Segment/Trisolation**.




11. Select each segment.
The area of the segment is shown in the bottom row of the **Properties** pane.

Properties	
Information	
Layer	int_bench105.str
String	1
Segment	1
Details	
3D length	135.706
2D length	135.706
Point count	17
Closed	True
Direction	Clockwise
2D area	926.26

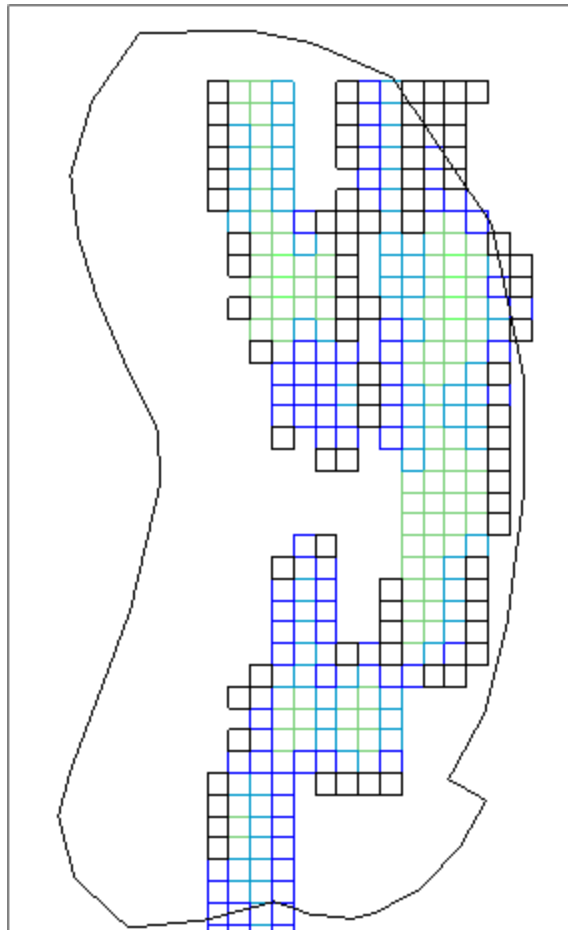
🔗 **Note:** To see all of the steps performed in this task, run `05g_intersect_polygons.tcl`. You need to click **Apply** on any forms presented.

Task: Clip ore blocks inside a pit

You will intersect closed, clockwise block model strings at a midbench elevation (135) with a closed, clockwise midbench contour of a pit design at the same elevation. Afterward, you will display the clipped strings.

1. Clear **Reset graphics** .
2. Open `kbb135.str` in **Graphics**.
3. Open `con135.str` in **Graphics**.

The two files are displayed in **Graphics**. Some of the ore blocks are outside the pit boundary.



🔗 **Note:** The file `kbb135.str` contains strings 1,2,3,4, and 5. The file `con135.str` contains strings 1. All strings are at the same elevation.

4. Choose **File tools > Intersect polygons**.

5. Enter the information as shown, and click **Apply**.

Polygon intersection

Define the intersecting or outersecting polygons

Location: CON
ID range: 135
String range: 1

Define the intersected or outersected polygons

Location: KBB
String range: 1,5
 Retain descriptions


Define output string files

Location: KBI
Polygon operation: Intersection
 Outersection
 Union

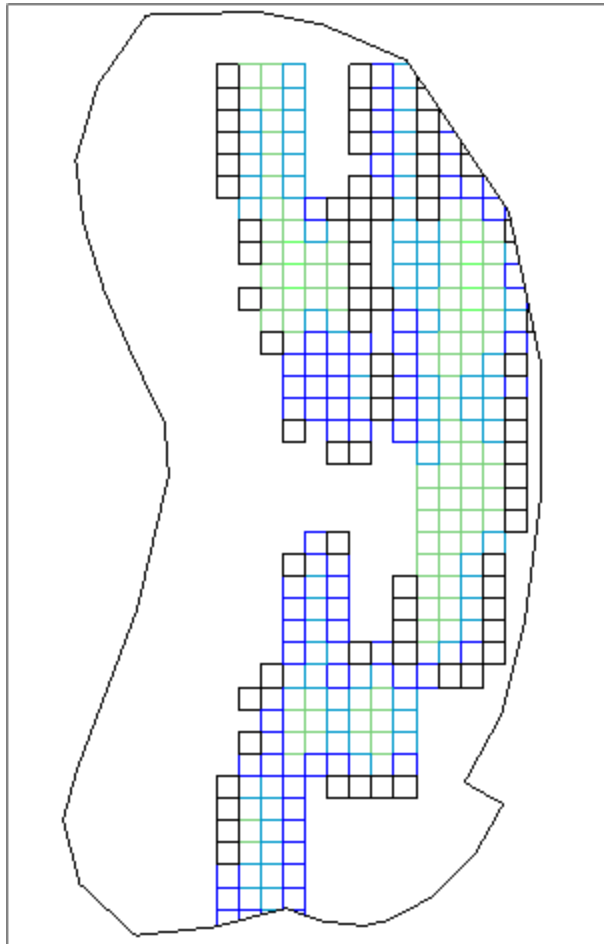
Define the report file for results


Report file name: intersection_report
Format: .not - Surpac Note File

Apply Cancel

6. Click **Reset graphics** .
7. Open **kbi135.str** in **Graphics**.
8. Open **con135.str** in **Graphics**.

The blocks inside the boundary are displayed.



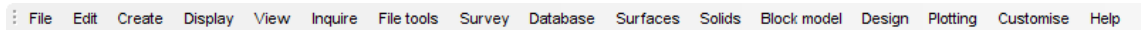
 **Note:** To see all of the steps performed in this task, run `05h_clip_ore_blocks.tcl`. You need to click **Apply** on any forms presented.

Advanced interface operations

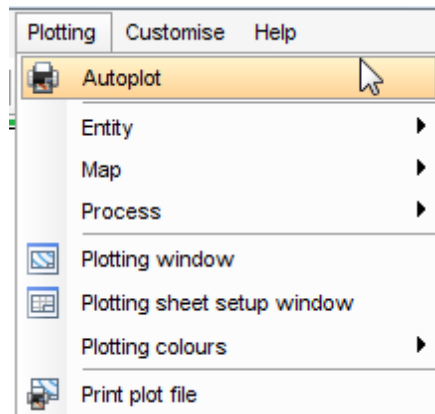
Menu bars, menus, and commands

If you do not understand the meaning of the terms menu bar, menu, and command, you could easily become confused when you try to create a customised menu bar.

The following image shows the **Main** menu bar.



Each menu contains commands (or menu items). The commands are located on the menu or on a submenu. For example, the **Plotting** menu contains the **Autoplot**, **Plotting window**, **Plotting sheet setup window**, and **Print plot file** commands, and it also contains the **Entity**, **Map**, **Process**, and **Plotting colours** submenus. Each submenu contains more commands.



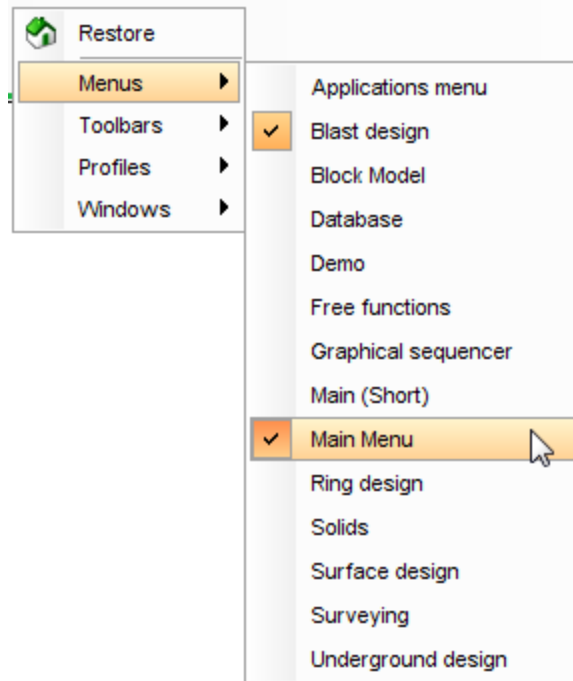
Displaying and customising menu bars

You can activate most Surpac functions using the menu system.

A black triangle ▶ on the right side of a menu item indicates that you can select it to display a submenu.

To see the list of menu bars and toolbars you can view, right-click in empty space on the menu bar or in the toolbar region.

The following image indicates that the **Blast design** and the **Main Menu** menu bars are displayed.

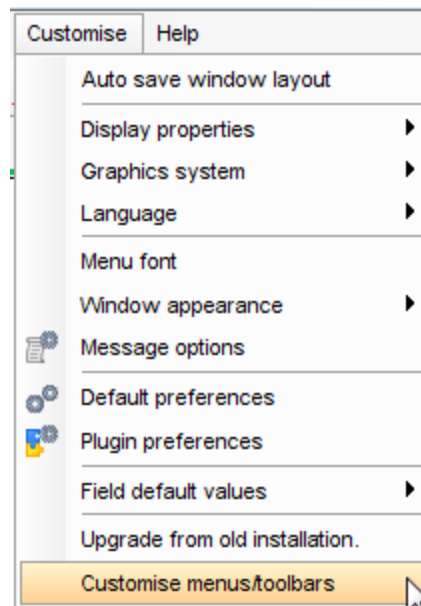


Click a menu bar to switch between displaying and hiding it.

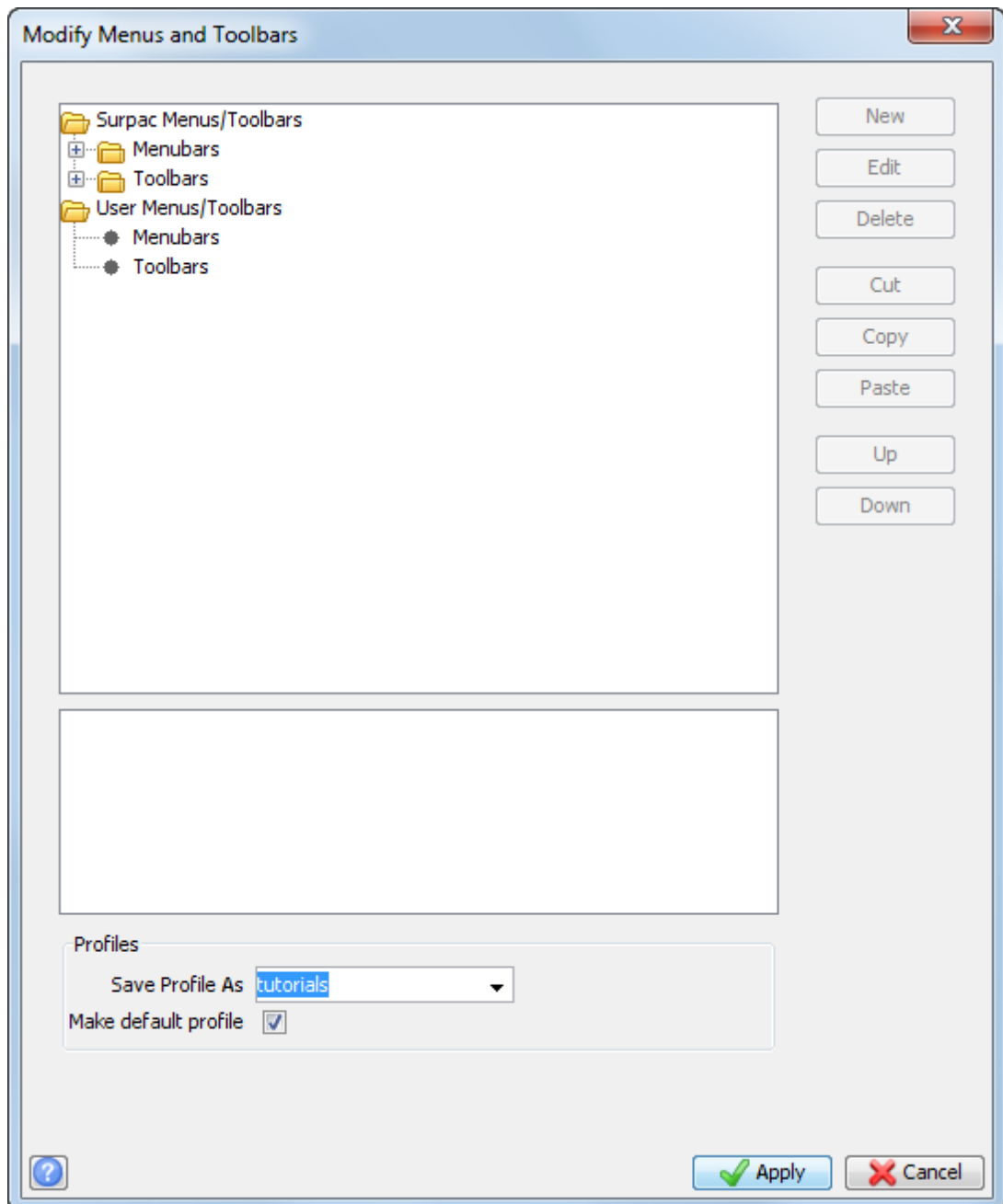
You can also create your own customised menu bars or toolbars to group together the functions that you use frequently, or to group together all the functions that you need to use to do a specific task.

Task: Create a customised menu bar

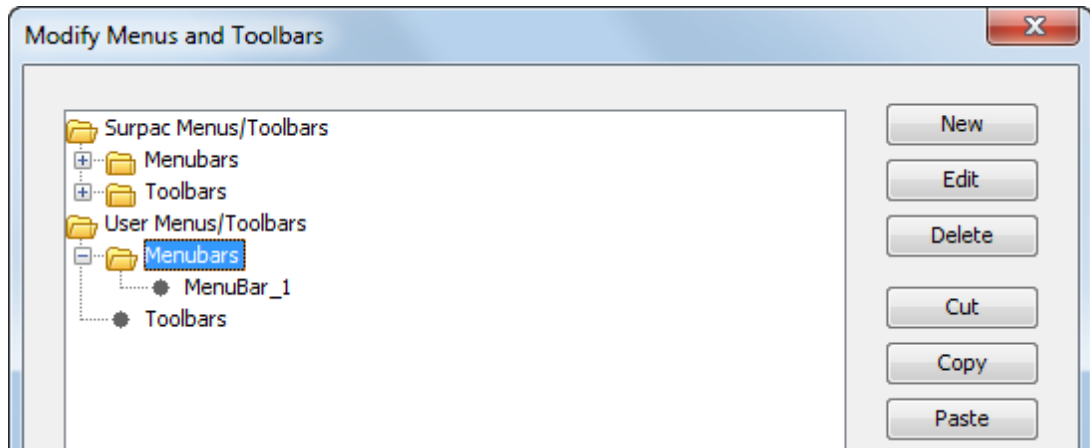
1. Choose **Customise > Customise menus/toolbars**.



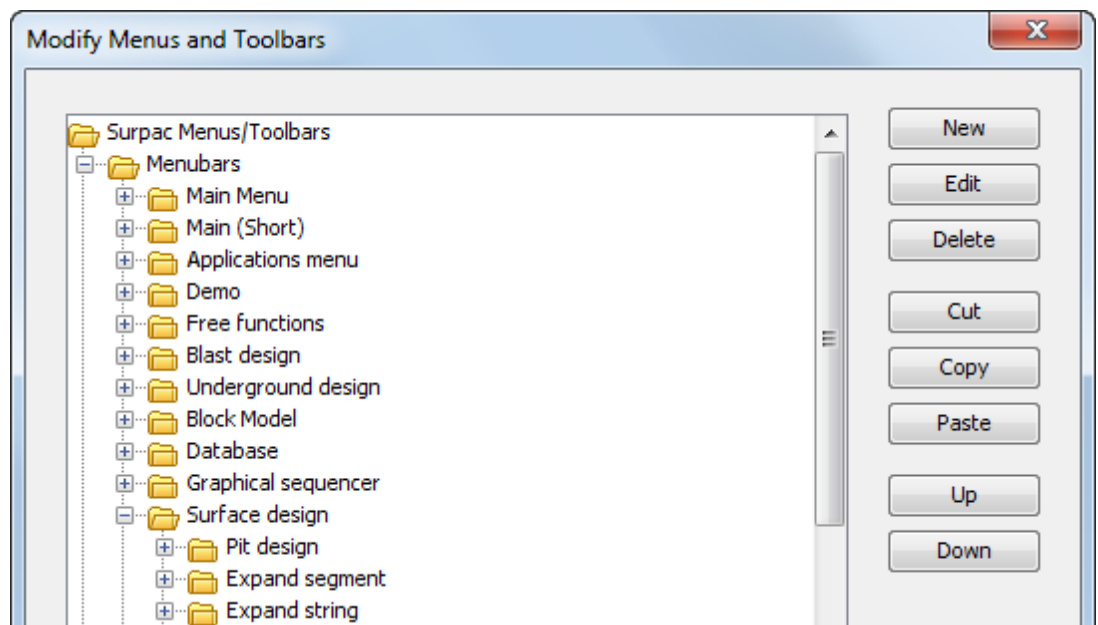
The *Modify Menus and Toolbars* form is displayed.



2. To create a new menu bar, in **User Menus/Toolbars**, click **Menubars**, and click **New**.



3. To rename the menu bar:
 - a. Click **MenuBar_1**.
 - b. Click **Edit**.
 - c. Type **pit_design** and press ENTER.
4. Select the menus to place in the menu bar:
 - a. In **Surpac Menus/Toolbars**, expand **Menubars**, and then expand the **Surface design** menu bar.

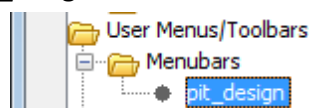


- b. Hold the CTRL key, and select the **Pit Design**, **Expand segment**, and **Expand string** folders.

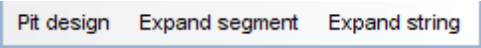


- c. Click **Copy**.

5. Select the new **pit_design** menu bar.



6. Click **Paste**.
7. In the **Save Profile As** box, type **pit_design**.
8. Click **Apply**.
 - ✍ **Note:** The new **pit_design** menu bar “floats” above the Surpac window.
9. Drag the **pit_design** menu bar to a location where there is some space at the top of the Surpac window.



Pit design Expand segment Expand string

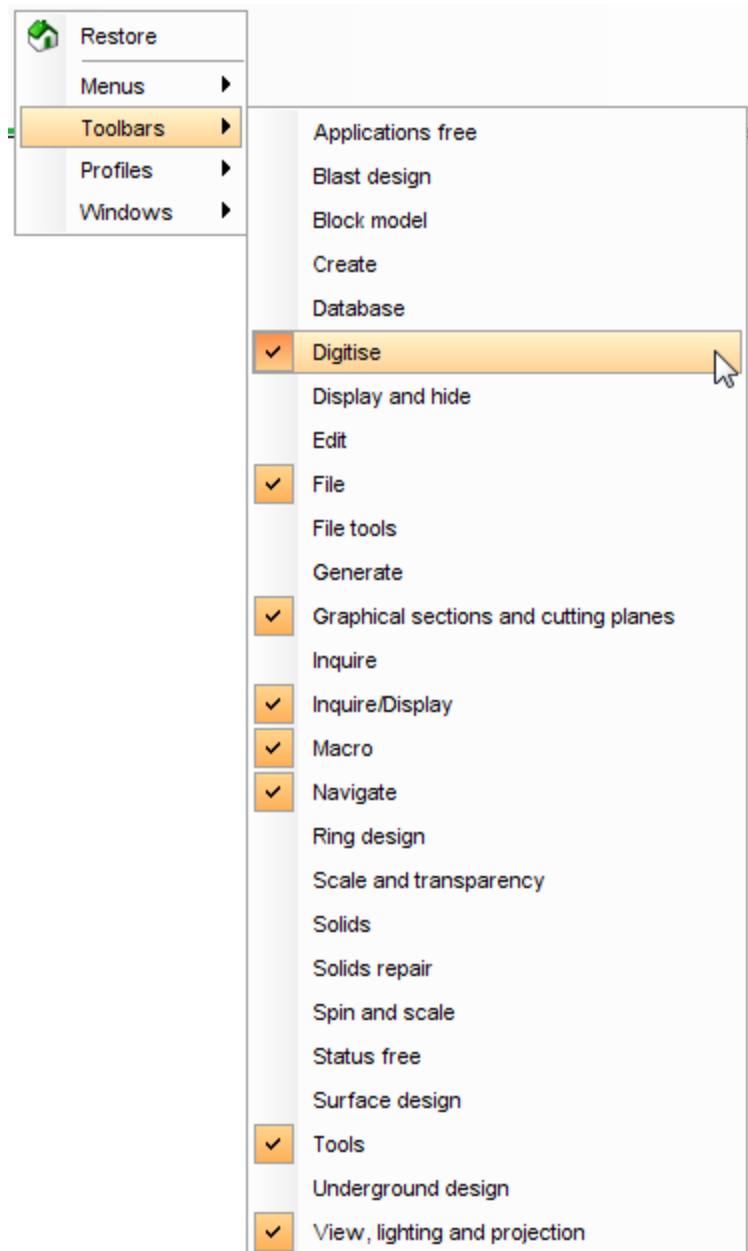
Customising toolbars and buttons

Task: Display toolbars and create a customised toolbar

You might find that you only are using only a small number of the digitising functions, for example, **Start new string**, **Start new segment**, **Digitise New Point at Mouse Location**, **New midpoint**, and **Close current segment**.

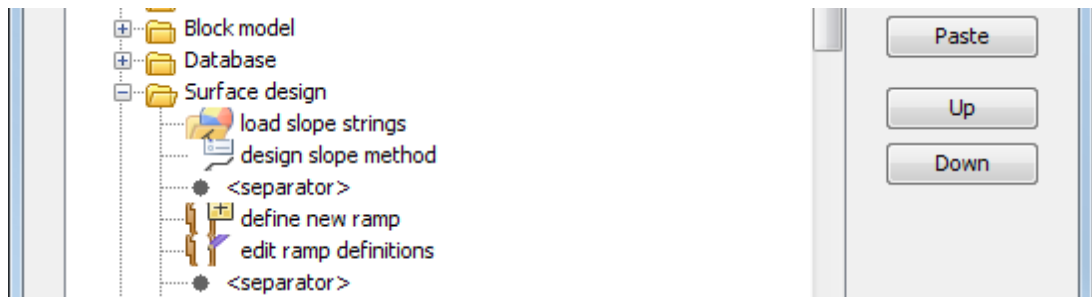
You could create a toolbar that has only the functions that you need by taking a copy of the **Digitise** toolbar, removing the functions you don't use and adding the **New midpoint** function.

1. Right-click in the empty space in the menu bar or toolbar region.
2. Select **Toolbars** to see which toolbars are currently displayed.

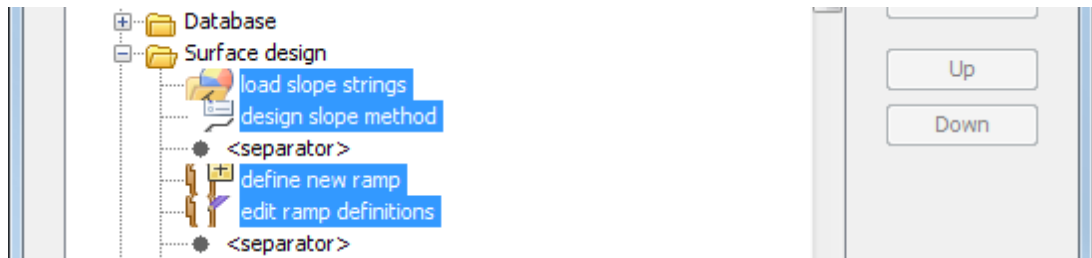


3. Choose **Customise > Customise menus/toolbars**.
4. In **User Menus/Toolbars**, click **Toolbars**, and click **New**.
This creates a new menu, called **Toolbar1**.
5. Click **Toolbar1** and click **Edit**.
6. Type **pit_design** and press ENTER.

- In **Surpac Menus/Toolbars**, expand **Menubars**, and then expand the **Surface design** toolbar.



- Hold the CTRL key, and select several of the surface design commands as shown.

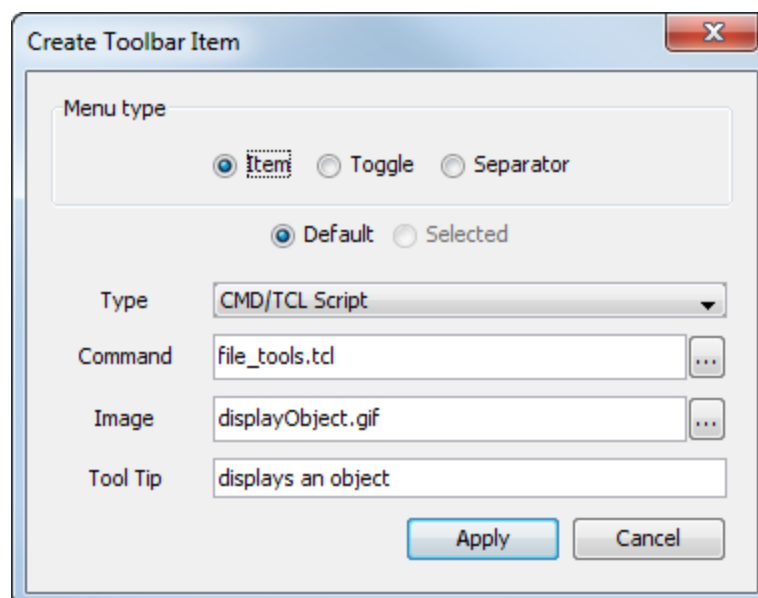


- Click **Copy**.
- Select the new **pit_design** toolbar, and click **Paste**.




Task: Creating a custom button to put on a toolbar

- Choose **Customise > Customise menus/toolbars**.
- In the **Modify Menus and Toolbars** form, select the **pit_design** toolbar and click **New**.
- Enter the information as shown, and click **Apply**.
This creates a new button on the Pit design toolbar.

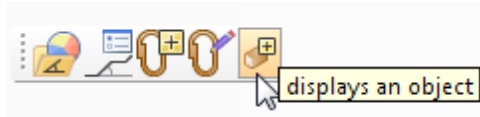


Note: To fill in the **Command** box, you have to click the **Ellipsis** button and navigate to a TCL file. Similarly, to fill in the **Image** box, you must click the **Ellipsis** button and navigate to an icon file in the **icons** folder.

 **Note:** If you have installed Surpac in the default directory, the full path to the TCL command scripts folder is:

C:/Users/Public/GEOVIA/Surpac/66/share/resource/scripts/toolbars/

4. Click **Apply**.
5. Right-click in an empty area near the toolbars.
6. From the **Toolbars** menu, select **pit_design**.
7. Drag the **pit_design** toolbar to a location where you can clearly see it.



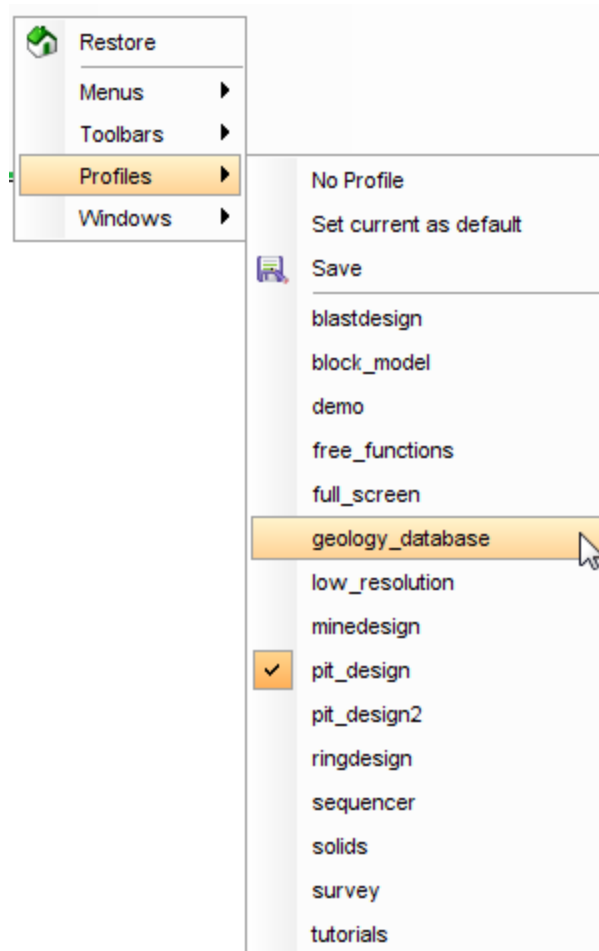
8. To see the tool tip description for an icon on a toolbar, hover the cursor over the icon.

Using and creating profiles

A profile is a set of menus and toolbars grouped together into modules. The profiles are available by right-clicking in the empty space and selecting from the available profiles.

Task: Select the geology_database profile

1. Right-click in the empty space at the top of the Surpac interface.
2. Select **Profiles > geology_database**.



The menus and toolbars in the **geology_database** profile are displayed.



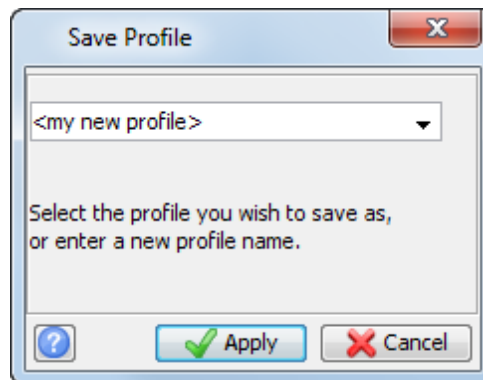
The interface now contains a new set of menus and toolbars that cover the functionality for processing data from a geological database.

Profiles allow you easy access to all of your customisations.

Task: Saving your customisations to a profile

If you are an experienced Surpac user, you might want to create your own profile to get faster access to the toolbars, menus, and commands that you need for your work.

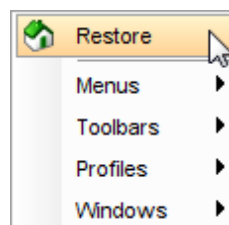
1. Make sure that Surpac is displaying the menu bars and toolbars that you use frequently, and that the menu bars and toolbars that you do not need are hidden.
2. Right-click in the empty space at the top of the Surpac window.
3. From the **Profiles** menu, click **Save**.
4. Enter the information as shown, and click **Apply**.



When you open Surpac again, you can choose the profile you just saved to reload your customised settings for menus, toolbars and buttons and automatically configure your workspace.

Task: Restoring the default profile

1. Right-click the empty space beside the toolbars at the top of the Surpac window.
2. Click **Restore**.



3. Click **Apply** to restore to the default profile.

Using the Function Chooser

A quick way for you to run a function is to use the Function Chooser. You can type an “alias” into the Function Chooser to run a function. An alias is an abbreviation of the function name.

Task: Run two functions from the Function Chooser

1. Open **pit_design1.str** in **Graphics**.
2. Type **CS** (for Clear Screen) directly into the function chooser.

CS


3. Press ENTER.
Running the **Clear Screen** function makes the graphics viewport empty but, unlike the **Reset graphics** function, it leaves the data in the layer.
4. Type the alias **PS** (for Plot Strings) into the Function Chooser.
5. Enter the information as shown, and click **Apply**.

The screenshot shows a dialog box titled "Drawing" with a close button (X) in the top right corner. The main section is titled "Draw Strings". It contains several input fields and controls:

- Layer name:** A dropdown menu showing "pit_design1.str".
- String range:** An empty text input field.
- Seg range:** An empty text input field.
- Seg pnt range:** An empty text input field.
- Desc field number:** A dropdown menu showing "d1".
- Text Alignment:** A dropdown menu showing "<".
- Position of text in segment:** Three radio buttons: "All points", "First point" (which is selected), and "Centroid".

At the bottom of the dialog, there is a help icon (question mark in a square), an "Apply" button with a green checkmark, and a "Cancel" button with a red X.

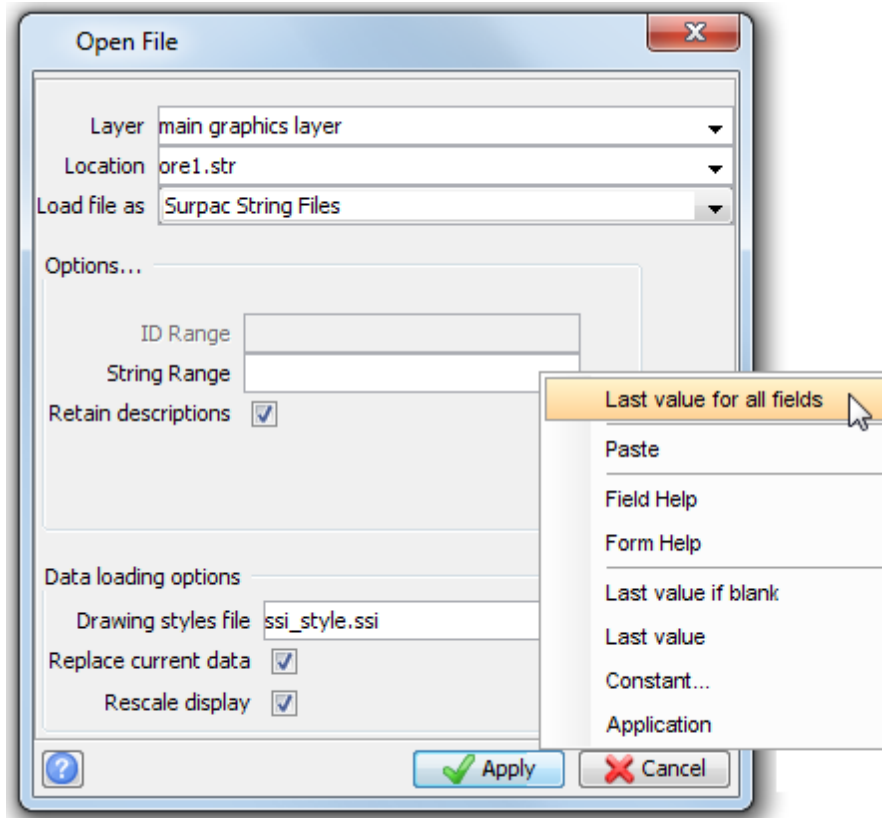
pit_design1.str is displayed in **Graphics**.

 **Note:** You can find a complete list of aliases in the files **SSI_ETC:short.ssi** and **SSI_ETC:Surpac.mst**.

Working with forms

You control how a function works by entering parameters into a form. The terms **form** and **dialog box** mean the same thing.

The **Open File** form and its components is a typical form.



By clicking once to highlight a field on a form, and then right-clicking, you see options to help you fill in the form.

Last value if blank

Selecting this command causes the field to keep the last value you entered when the application does not supply a value. For example, if you select **Last value if blank** for the **Layer** field of the *Open File* form, the text in the **Layer** field does not change, but if you select **Last value if blank** for the **Location** field, the last file name used is shown.

Last value

Selecting this item causes the field to keep the last value regardless of the value that Surpac inserts. For example, if you select **Last value** in the **Layer** field of the *Open File* form, the **Layer** field displays the name of the layer that you used on the last occasion you used this form.

Constant...

Selecting this item allows you to enter a value to use for this field every time you use the form.

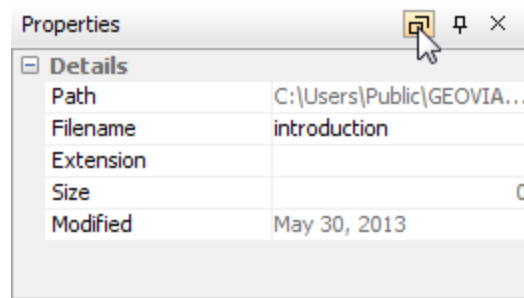
Application

Selecting this item causes the field to display the value supplied by Surpac. This is how Surpac worked in previous versions.

Configuring windows and panes in the interface

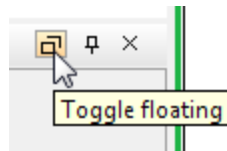
You can modify panes in the interface using the three buttons on the top right side of the pane:

- toggle floating
- toggle auto-hide
- close



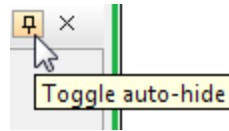
Toggle floating

The **Toggle floating** button allows you to “dock” or “undock” the pane. When the pane is docked, it is fixed to an area of the Surpac window. When the pane is undocked, it floats so you can move it to any part of the Surpac window. You can also dock the pane by moving it to one of the edges of the screen, or to an existing pane. To restore the pane to its original position, click again on the **Toggle floating** button or right-click on the top part of the pane and click **Floating**.

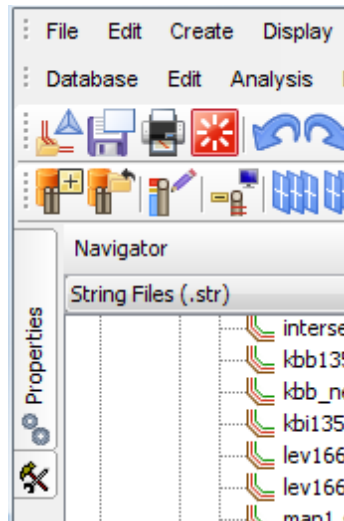


Toggle auto-hide

The **Toggle auto-hide** button enables you to hide the pane so that you have more workspace for other panes.



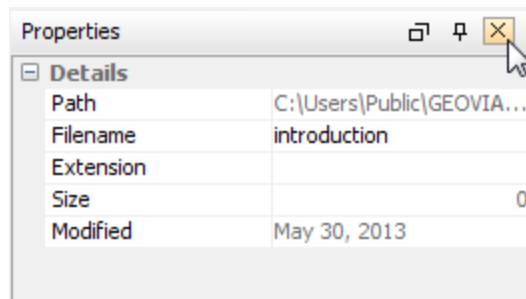
When you click **Toggle auto-hide**, the pane is minimised and attached to the side of the Surpac window. The following image shows the **Properties** pane attached to the side of the Surpac window.



To show the pane when it is minimised, move the cursor over the minimised pane. To restore the pane to its original position, click **Toggle auto-hide** again.

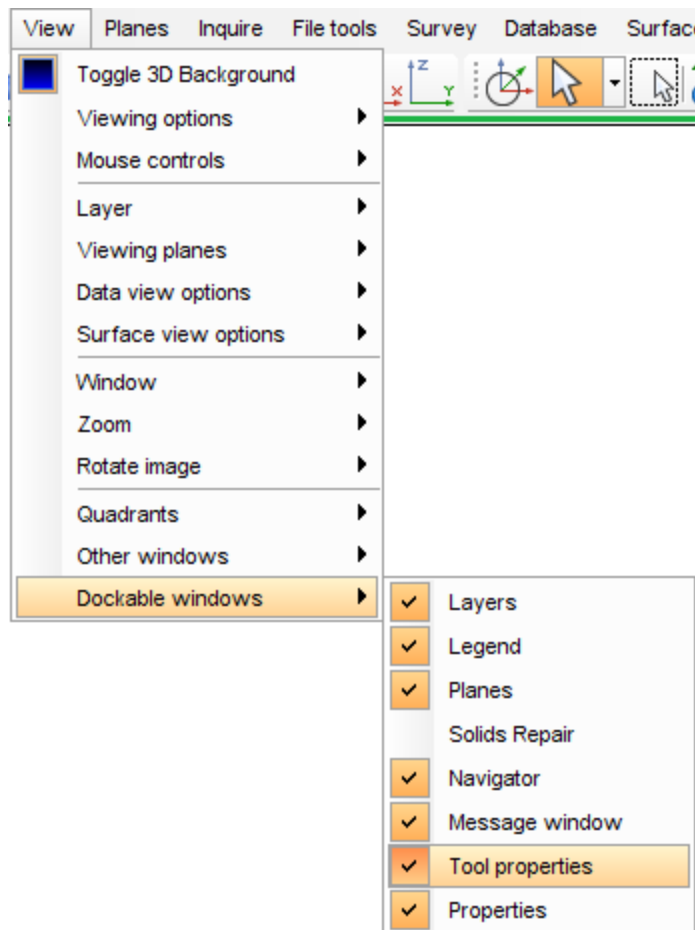
Close

To close a pane, click the **X** button in the top right corner.

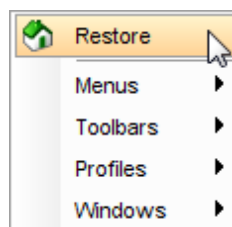


To restore a pane that you have closed, select **View > Dockable windows**, and click the pane that you want to restore.

In the example below, the **Tool properties** pane was closed, so it is not selected as a dockable window. By clicking on **Tool properties**, you can restore the pane to its original position.



To restore the whole interface to its default state, right-click an empty area in the toolbar region, and click **Restore**.




More Surpac functions


Drillhole database

You can display drillhole data, stored in a database, in any orientation such as plan or section view.

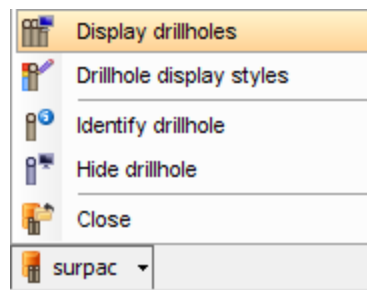
Task: Open a database, display drill hole data, and create sections

1. Click **Reset graphics** .
2. Open **surpac.ddb** in **Graphics**.
When a database is open, the name of the database is displayed on the Status bar at the bottom of the Surpac window.

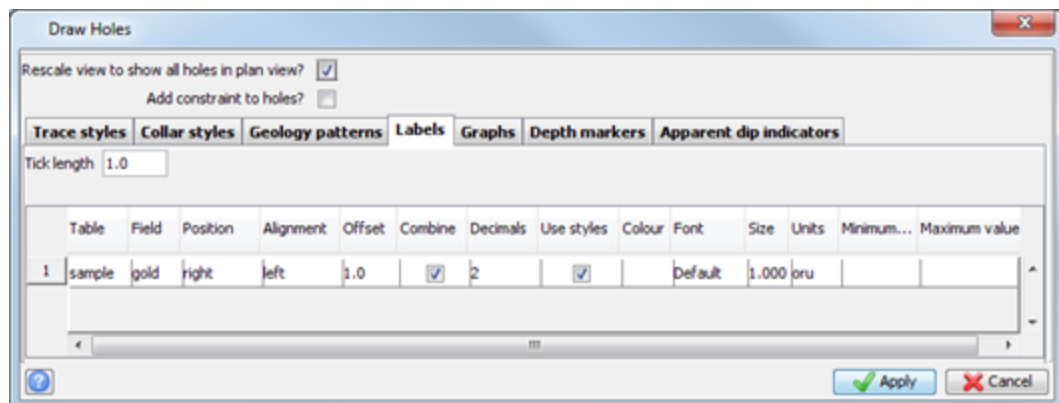


 **Note:** **surpac.ddb** connects to the MS Access database **surpac.mdb**.

3. Click the **surpac** database icon on the Status bar and select **Display drillholes**.

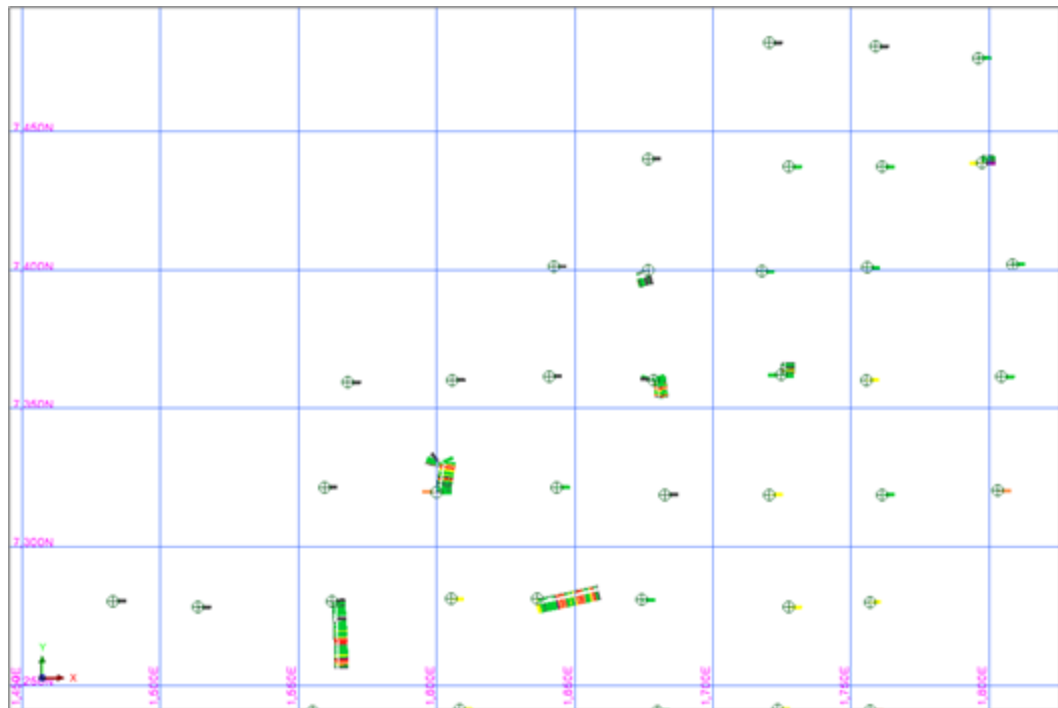



4. Enter the information as shown, and click **Apply**.



5. Choose **Display > Dynamic 2D grid**.

6. Choose **View > Zoom > In**, or use the scroll wheel on your mouse to zoom in.



 **Note:** The drill holes and gold values are displayed.

7. Choose **Database > Sections > Define**.
8. Enter the information as shown, and click **Apply**.

Define slicing planes width

Zoom to section plane to show all drillholes?

Show section planes?

Interactive Method?

Section Method **Off Section Holes**

Section definition method Northing

Distance forward of plane 20




Distance backward of plane 20

Section by Interval Range

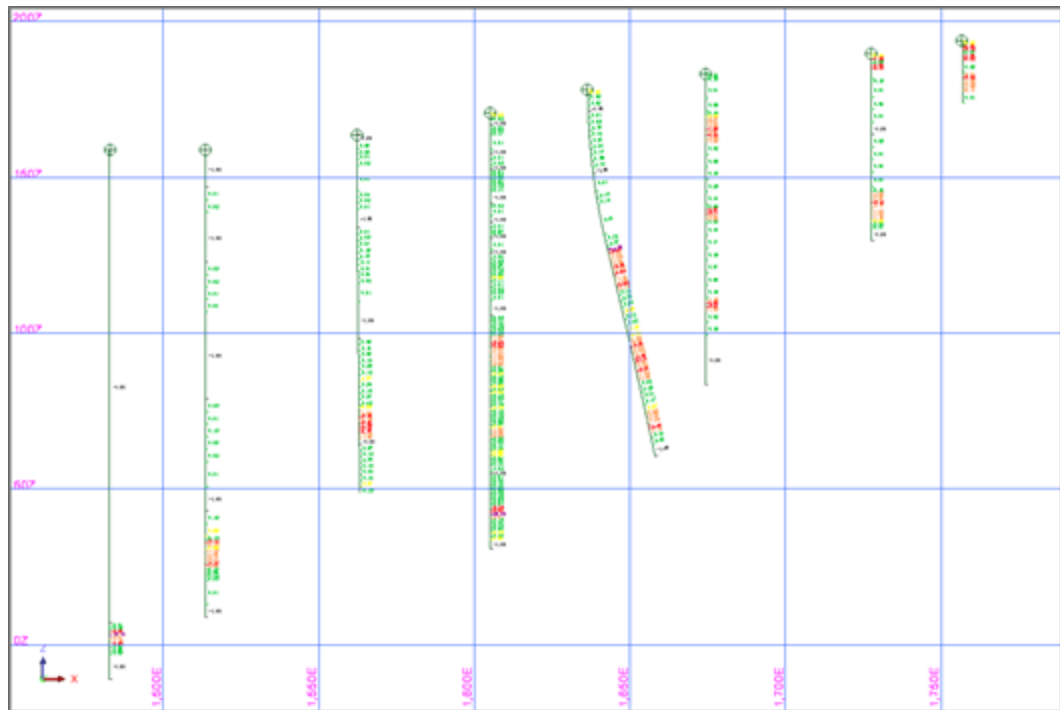
Step distance 40

Northing 7280

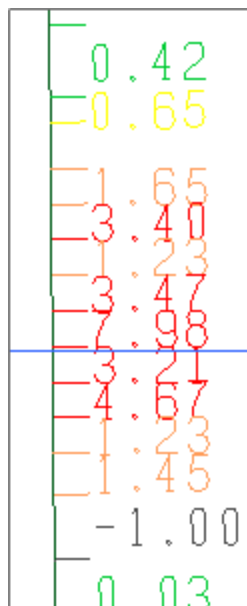
Confirm section details

The drillholes on section 7280 North are displayed.



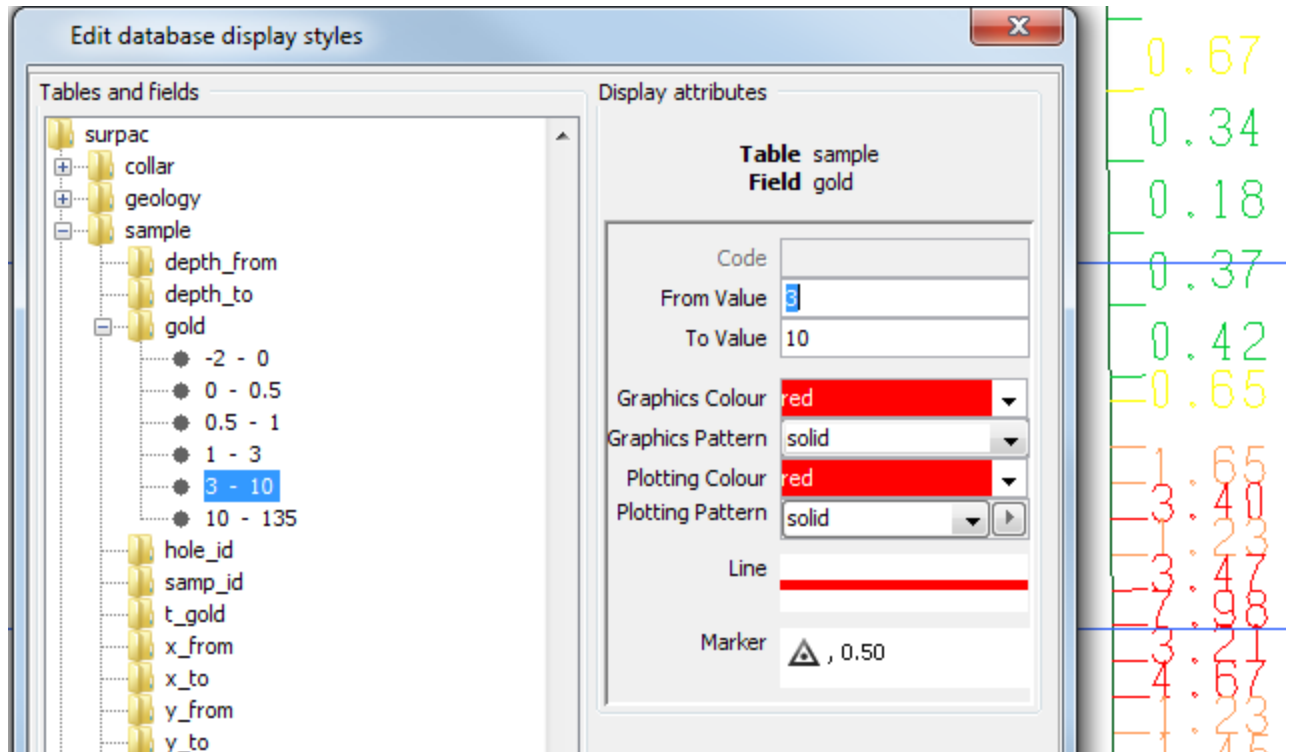
9. Use the scroll wheel on your mouse to zoom in to a drillhole as shown below.



Different sample values are displayed using different colours. These colours are controlled by a styles table in the database.

10. Click the **surpac** database icon at the bottom of the screen, and then click **Drillhole display styles**.

11. Expand the sample tree and the gold field to see the display attributes for gold.




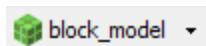
Note: To see all of the steps performed in this task, run `06a_display_drillholes_and_create_sections.tcl`. You need to click **Apply** on any forms presented.

Block models

A block model contains three dimensional spatial data. For example, specific gravity, rock type, and estimated sample values.

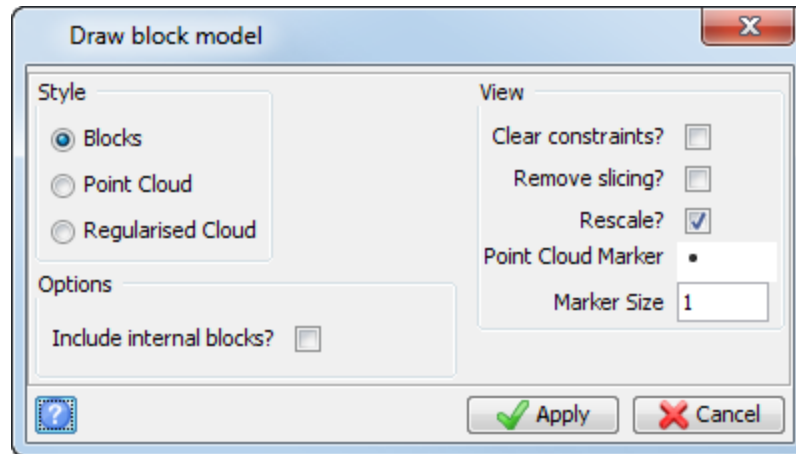
Task: Display, constrain, and report a block model

1. Click **Reset graphics** .
2. Open `block_model.mdl` in **Graphics**.
When a block model is open, the name of the block model is displayed on the Status bar at the bottom of the Surpac window.

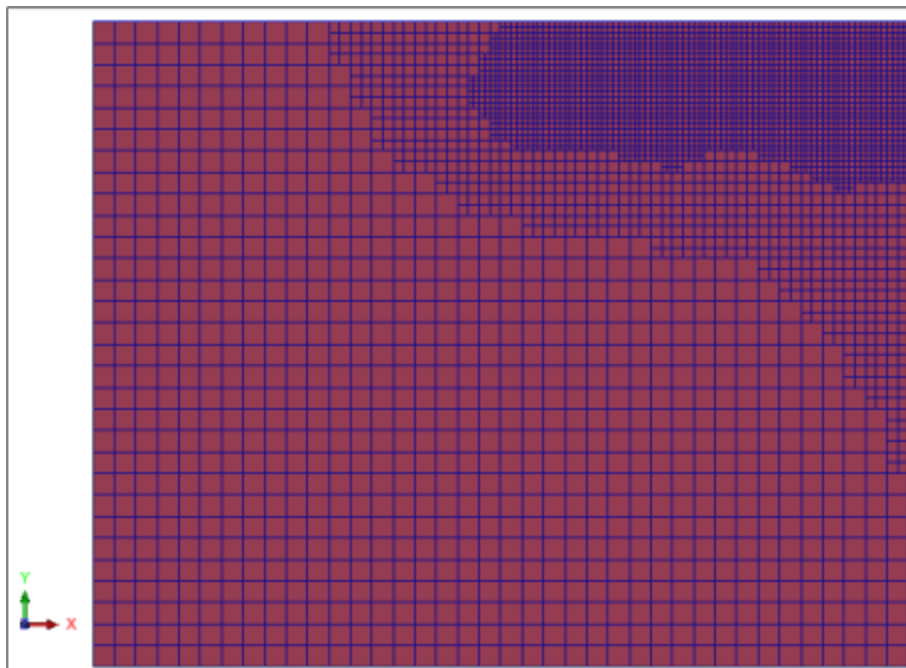


3. Click the `block_model` icon, and select **Display**.

4. Enter the information as shown, and click **Apply**.



The block model displayed in **Graphics**.

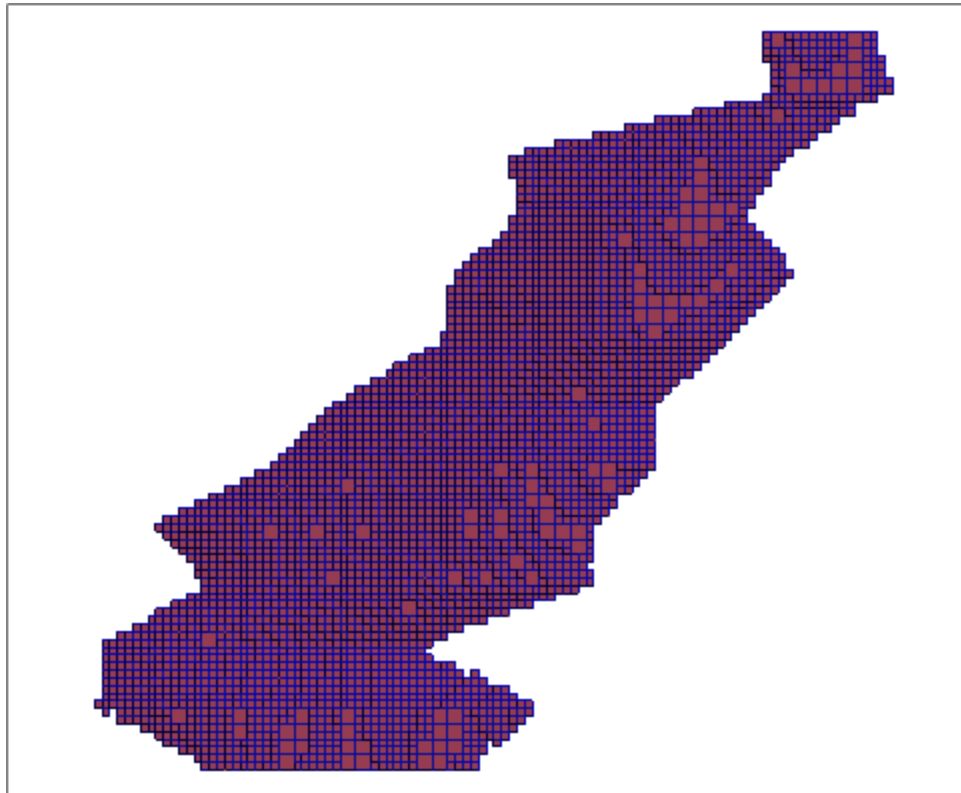


Next, you will display only those blocks which have a gold value greater than zero, using a "constraint". A constraint can be thought of as a filter which selects blocks that meet a set of conditions.

5. Click the **block_model** icon, and select **New constraint**.

6. In **Constraint type**, select **BLOCK** and fill in the three input boxes below so that the constraint is “gold > 0”.

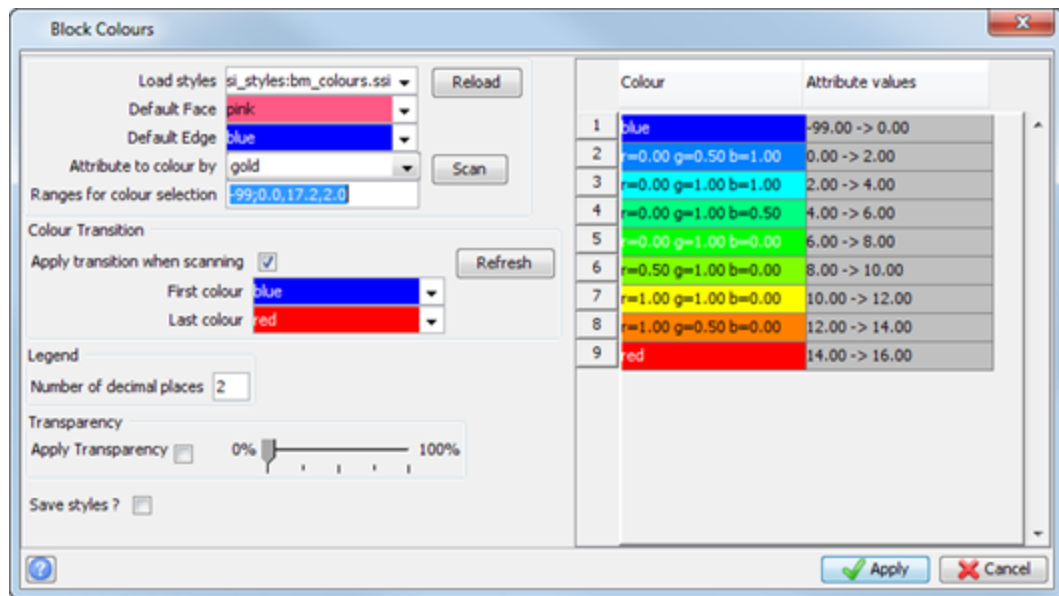
7. Click **Add** to add the constraint, and then click **Apply**.
The blocks that have a gold value greater than zero are displayed.



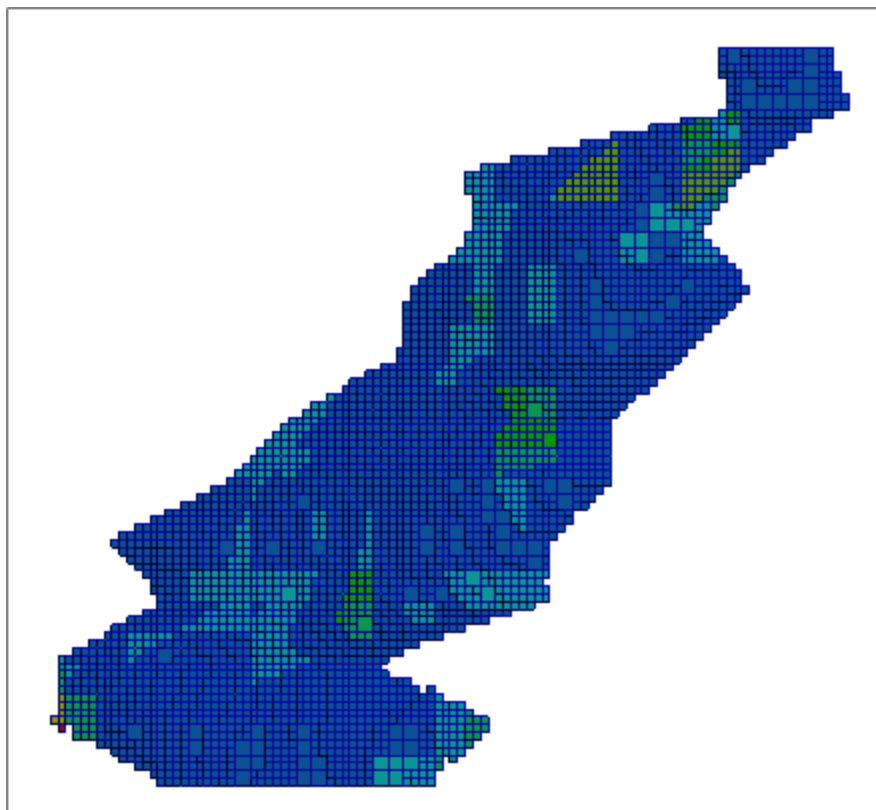
Next, you will colour the blocks by gold values.

8. Click the **block_model** icon, and select **Colour by attribute**.
9. Select **gold** for the **Attribute to colour by**.
10. Select the **Apply transition when scanning** check box.

- Click **Scan**.
A default set of colours are displayed.

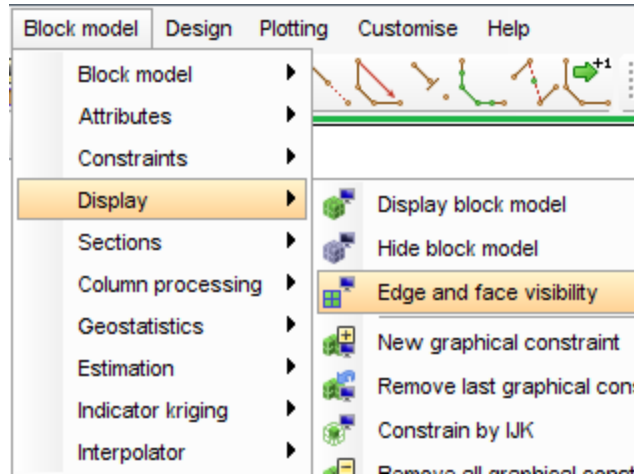


- Click **Apply**.
The blocks are coloured by gold values.

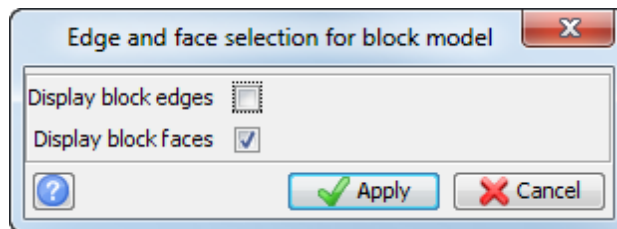


Note: You might need to click and drag the model to see the colours.

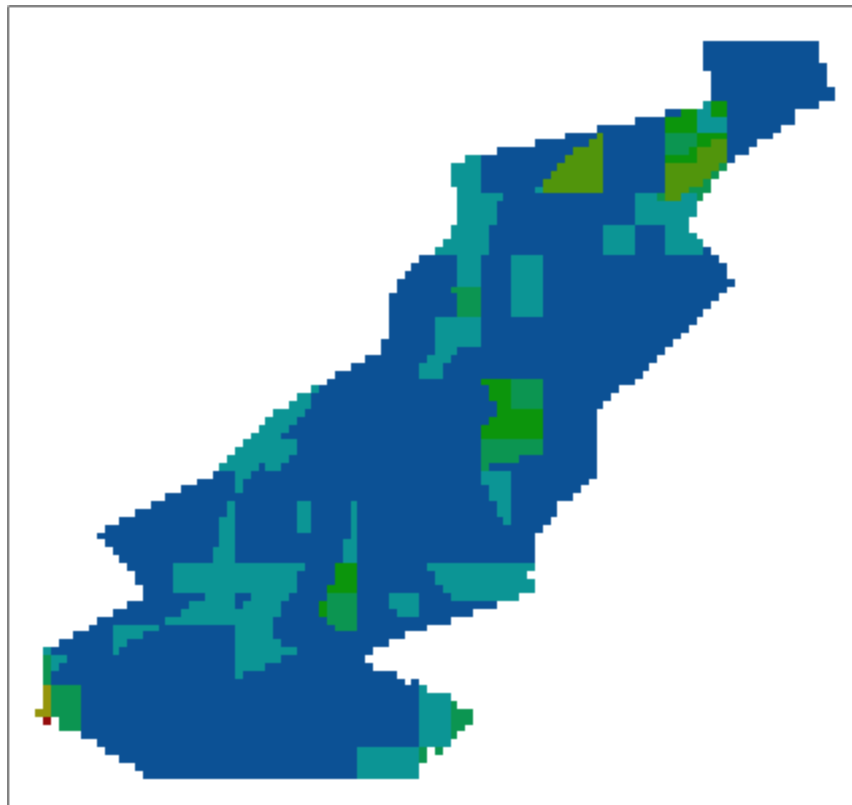
13. Choose **Block Model > Display > Edge and face visibility**.



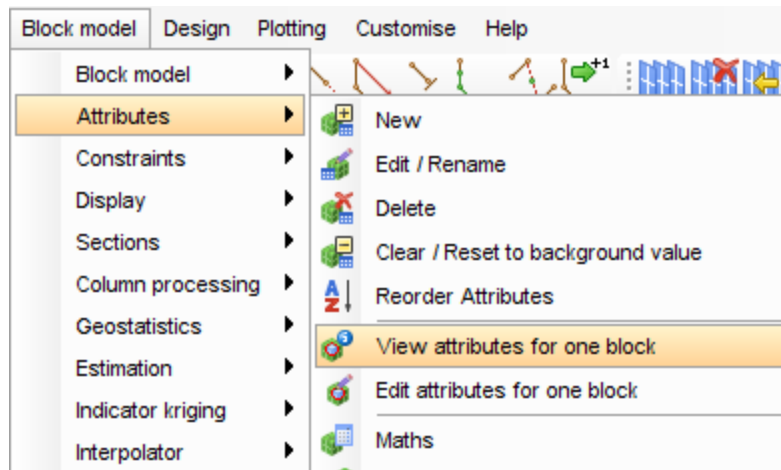
14. Clear the **Display block edges** check box, and click **Apply**.



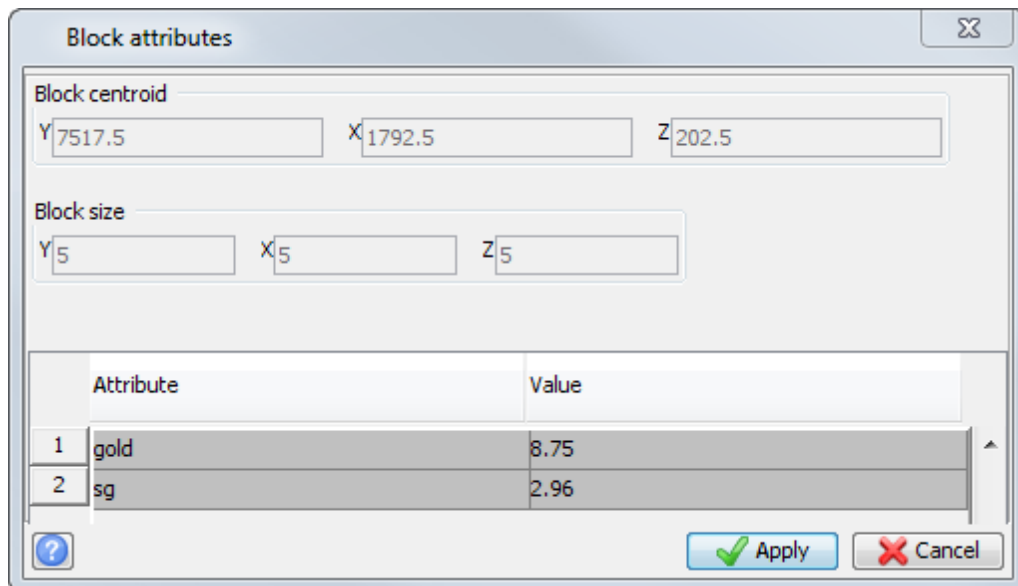
Only the block faces are displayed.



15. Choose **Block Model > Attributes > View attributes for one block**.

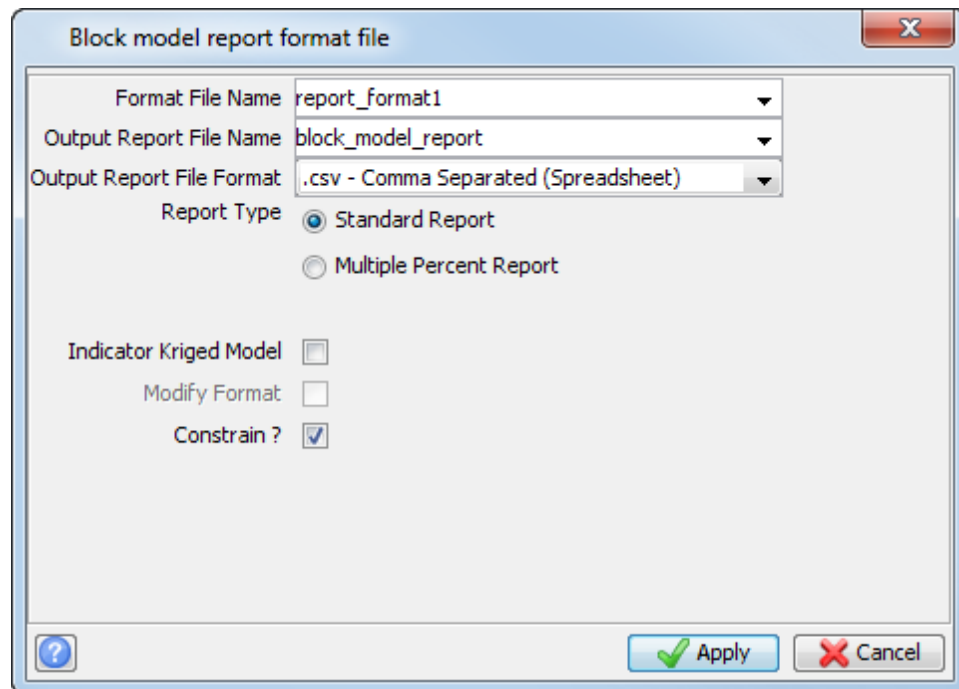


16. Click any block.
The selected block is highlighted, and the attribute values for the block are displayed.

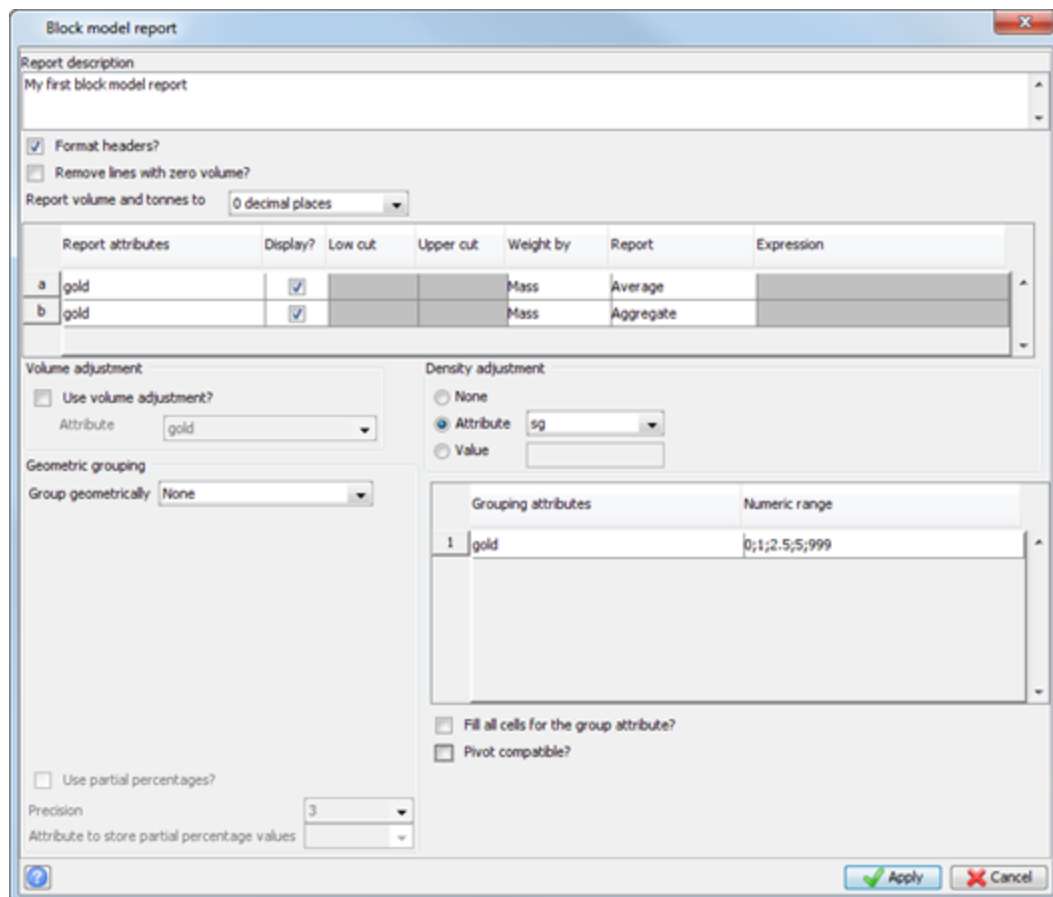



17. Click **Cancel**.
Next, you create a report of the volume, tonnes, and average gold grade.
18. Choose **Block model > Block model > Report**.

19. Enter the information as shown, and click **Apply**.



20. Enter the information as shown, and click **Apply**.



 **Note:** To add a new report attribute row, right-click below the row and select **Add**.

Report attributes	Display?	Low cut	Upper cut	Weight by	Report	Expression
a gold	<input checked="" type="checkbox"/>			Mass	Average	
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Add Set default number of rows </div>						

21. Enter the information as shown, and click **Apply**.

Enter constraints ✖

Constraint name:

Constraint type:

Add

Clear

Start Again

Constraint values

a	Block Constraint: gold > 0
b	
c	
d	
e	
f	
g	
h	
i	
j	
k	
l	


Keep blocks partially in the constraint:

Constraint combination:

Save constraint to:

The report contains volume, tonnes, average gold (grams per tonne) and aggregate gold (total grams of contained metal) for each grade range.

Block model report				
My first block model report				
Constraints used				
a. > BLOCK gold 0				
Keep blocks partially in the constraint : False				
Gold	Volume	Tonnes	Gold	Gold
0.0 -> 1.0	1177375	3446795	0.4	1367051
1.0 -> 2.5	1057750	3054470	1.62	4955674
2.5 -> 5.0	218375	646390	3.16	2044325
5.0 -> 999.0	76375	226070	6.79	1536046
Grand Total	2529875	7373725	1.34	9903096

 **Note:** To see all of the steps performed in this task, run **06b_block_model.tcl**. You need to click **Apply** on any forms presented.



Plotting with autoplot

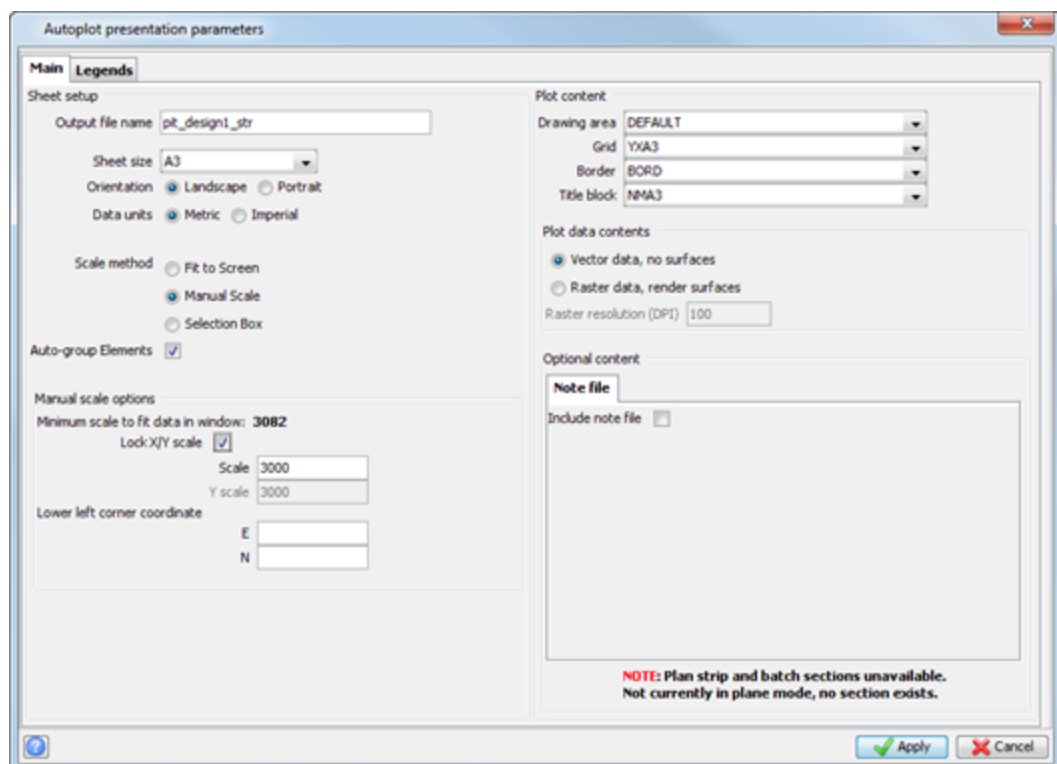
There are two ways to create plots in Surpac:

- to create simple plots from data displayed in graphics, use **Autoplot**
- to create complex plots from files on disk:
 - use the **Plotting > Entity** submenu to create or modify entity definitions
 - use the **Plotting > Map** submenu to create or modify map definitions
 - use the **Plotting > Process** submenu to create the final plot

This section describes **Autoplot** only. The Plotting Tutorial describes how to create complex plots.

Task: Produce a plot of a pit using autoplot

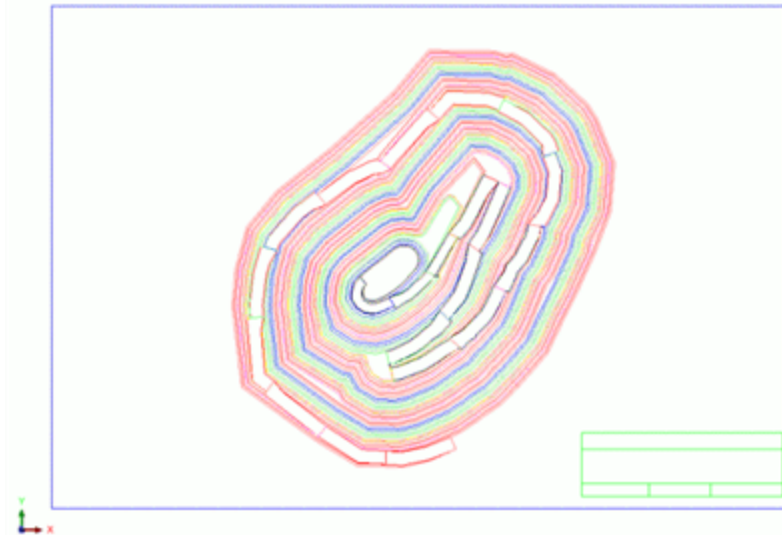
1. Click **Reset graphics** .
2. Open **pit_design1.str** in **Graphics**.
3. Choose **Plotting > Autoplot**.
4. Enter the information as shown, and click **Apply**.
 **Note:** Make sure you select the **Lock X/Y scale** check box.



5. Enter the information as shown, and click **Apply**.



- Use the scroll wheel to zoom out, then click and drag with the left mouse button in **Graphics** to move the plot outline.



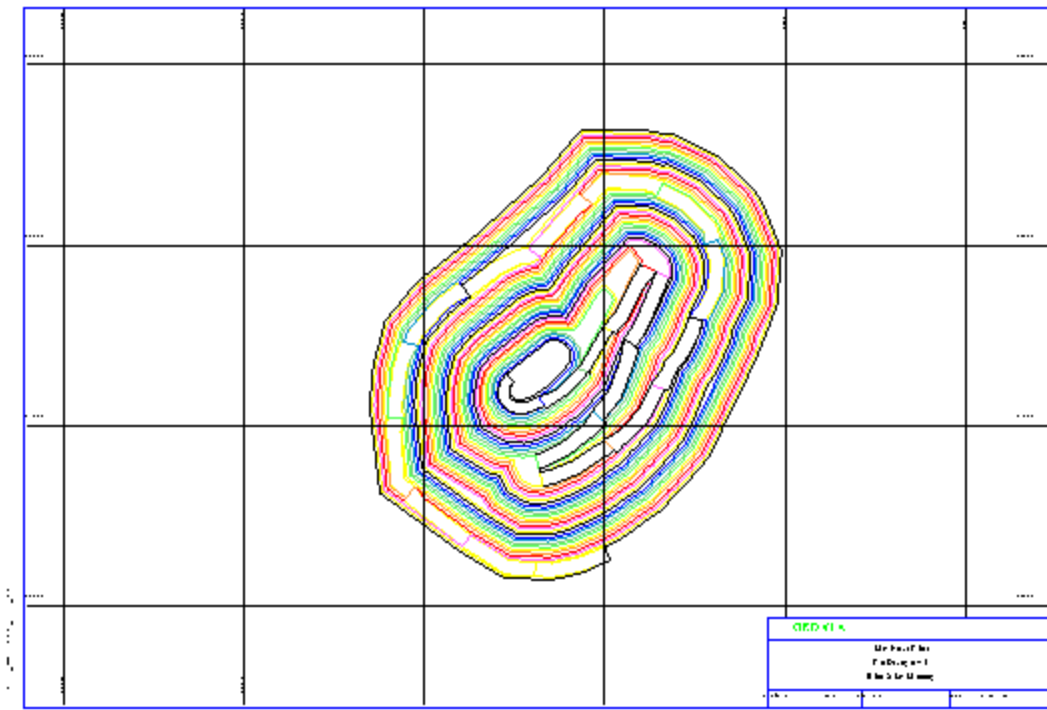
- When the plot border is positioned where you want it, Press **F2**.
- Enter the information as shown, and click **Apply**.

Grid line spacing and grid style

Y Grid Lines	X Grid Lines
Interval: 250	Interval: 250
Type:	Type:
<input checked="" type="radio"/> full lines	<input checked="" type="radio"/> full lines
<input type="radio"/> border ticks	<input type="radio"/> border ticks
<input type="radio"/> grid crosses	<input type="radio"/> grid crosses

Apply Cancel

The plot is displayed in the plot preview window.



Note: To see all of the steps performed in this task, run **06c_plotting_with_autoplot.tcl**. You need to click **Apply** on any forms presented.

References

For further information on this topic and related articles, log onto Gemcom's Knowledge Base at www.gemcomsupport.com