12d Model

Getting Started for Surveying

Version 11

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12d Model Getting Started for Surveying Manual

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Disclaimer

12d Model is supplied without any express or implied warranties whatsoever.

No warranty of fitness for a particular purpose is offered.

No liabilities in respect of engineering details and quantities produced by 12d Model are accepted.

While every effort has been taken to ensure that the advice given in this manual and the program 12d Model is correct, no warranty is expressed or implied by 12d Solutions Pty Ltd.

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Preface

Why a 'Getting Started for Surveying' Manual ?

12d Model is supplied with a comprehensive on-line Reference manual which describes the function of each menu option in detail. It is a Reference manual however and makes no attempt to describe how to use 12d for production surveying and civil engineering work.

This *Getting Started for Surveying* manual is designed to show you how to install *12d Model*, work with the on-line help system, and then as the first section of Training, help you start to learn how to use 12d to achieve typical surveying tasks. The *Getting Started for Surveying* manual uses examples where possible to clarify usage. It complements rather than replaces the on-line Reference manual. In general, information in the on-line Reference manual will not be duplicated here.

The *Getting Started for Surveying* manual is available as a printed manual and as a PDF file on the *12d Model 11 Installation DVD* and the *12d Model Training DVD*.

Training Material

The training tutorials assumes that a series of files are already on your hard disk. These tutorial files are automatically installed from the DVD during installation of the ***12d Model*** software.

Getting Started for Design

There is also a *Getting Started for Design* manual which has the first seven chapters in common with the *Getting Started for Surveying* manual (context sensitive help and basic modelling) but then diverts to cover topics from the direction of a civil designer whereas the *Getting Started for Surveying* manual continues on with surveying techniques.

The *Getting Started for Design* manual is available as a printed manual and as a PDF file on the *12d Model 11 Installation DVD* and the *12d Model Training DVD*.

Using the Practise and Small Versions of 12d Model

IMPORTANT NOTE - The Practise Version is not yet available for 12d Model 11

The Practise version of ***12d Model*** is limited to a maximum of 5,000 points. Following the procedures as stated in the Training Manual may create projects with more than 5,000 points.

Where appropriate, the text will suggest how to vary the input for each instruction so that the example feature can be completed within the limits of the ***12d Model*** *Practise* version.

The number of points used at any time in the Practise and small versions can be displayed by the option

Projects => Check base points

The easiest way to reduce the current point count is to delete any unwanted models with

Models => Delete

The installed icon on your desktop for running the practise version of 12d with these training files is labelled ***12d 11 Practise***.

Please Note: Projects created by Practise versions of ***12d Model*** cannot be accessed by Release versions of ***12d Model*** and vice-versa.

1 Installing 12d Model

The *12d Model 11 Installation DVD* can be used to install the *Release* and *Practise* versions of ***12d Model 11***.

IMPORTANT NOTE - The Practise Version is not yet available for 12d Model 11

The *Practise* version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the *Release* versions of *12d Model* and vice-versa. However the Practise version can be used free of charge by *12d Solutions* customers and registered Practise Users.

Installing the Release Version for Sites Not Running 12d Model 9 or 12d Model 10

For a **new** installation of the **Release** version of *12d Model 11*, the user is provided with

(a) one *12d Model* dongle

(b) one *12d Model 11 Installation DVD*

(c) an email with the *12d Model 11* authorization file *nodes.12d11n* attached, or a folder with the *12d Model 11* authorization file *nodes.12d11n* or *nodes.4d* in it.

Please check that you have all three items before commencing the installation.

The ***notes*** and ***video*** for a new install of the *Release* version of *12d Model 10* are on the ***12d Model 11 Installation DVD*** or can be downloaded from the 12*d* web site *www.12d.com* under the *Updates* area.

Installing the Release Version for Sites Already Running 12d Model 9 or 12d Model 10

Existing *12d Model 9* or *12d Model 10* users already have a dongle and so are only provided with

(a) one *12d Model 11 Installation DVD*

(b) an email with the *12d Model 11* authorization file *nodes.12d11n* attached, or a folder with the *12d Model 11* authorization file *nodes.12d11n* or *nodes.4d* in it.

For existing *12d Model 9 and 10* users with a **Wibu** dongle, your existing dongle can be used with *12d Model 11*. If *12d Model 11* is **already** running on your computer, please **uninstall** it before installing a new version of *12d Model 11*.

For existing *12d Model 9 and 10* users with a **Hardlock** dongle, your existing dongle can **NOT** be used with *12d Model 11*. Please contact your *12d Model 11* Reseller to obtain a new dongle.

The ***notes*** and ***video*** for a new install of the *Release* version of *12d Model 11* are on the ***12d Model 11 Installation DVD*** or can be downloaded from the 12*d* web site *www.12d.com* under the *Updates* area.

Installing the Practise Version:

IMPORTANT NOTE - The Practise Version is not yet available for 12d Model 11

To install a **Practise** version of *12d Model 11*, all that is needed is:

one *12d Model 11 Installation* DVD

or *12d Model 11 Practise* downloaded from www.12d.com

The *Practise* version must be Registered with *12D Solutions* once it is installed on a computer. A new Registration is required **for each computer** that the Practise version is run on.

The ***notes*** and ***video*** for installing the practise version of 12d Model 11 are on the *12d Model 11 Installation DVD* or can be downloaded from the 12*d* web site *www.12d.com* under the *12d Model 11 Practise* area.

2 Before You Begin the Training

2.1 Installing the Training Files

If you have installed Training from the *12d Model Installation DVD*, then the *Training* folder will have been automatically created for you but where the files reside on the disk depends on whether you installed the *Release* version or the *Practise* version of ***12d Model***.

The Training manual dialogue assumes that the working folder (i.e. shortcut) of your ***12d Model 11*** or ***12d Model 11 Practise*** icon is set to

c:\12d\11.00 for the *Release* version of ***12d Model***

and

c:\12 Model 11 Practise for the *Practise* version of ***12d Model***

The training files can be place in any sub-folder on your hard disk but for convenience in this manual, it is assumed that the training files are installed in

c:\12d\11.00\Training

All the required material is already in the ***Training*** folder.

2.2 12d Icons on your Desktop

It is recommended that you use the ***12d Model 11*** icon for the ***Release*** version or ***12d Model 11 Practise*** icon for the ***Practise*** version whilst initially working with this training manual. The reason for this is that the icon points directly to the folder that containing the ***Training*** folder.

2.3 Using the Practise Version

IMPORTANT NOTE - The Practise Version is not yet available for 12d Model 11

Remember that the ***Practise*** version of ***12d Model*** is limited to a maximum of 5,000 points.

Following the procedures as stated in the Training Manual may create projects with more than 5,000 points. Where appropriate, the text will suggest how to vary the input for each instruction so that the example feature can be completed within the limits of the ***12d Model*** *Practise* version.

2.4 Overview of 12d File and Folder Structures

Before you begin using 12d, it is useful to understand how 12d uses the file and folder structure under Windows 7.

12d recognises long filenames up to 256 characters so you are not limited to the old DOS convention of 8.3 filenames.

The 12d software and its support files are installed on your hard disk, the program itself is installed into the folder ***c:\Program Files\12d*** or ***c:\Program Files (x86)\12d***, and various subfolders below. The training data and user areas, are installed into the folder ***c:\12d\11.00*** and subfolders below.

When the software was installed, the ***12d Model 11*** program icon is setup to point to the folder c:\12d\11.00.

The tutorial is about designing a road and the training the files have been set up in a folder c:\12d\11.00\Training\11.00\Design\Getting Started Basic.

As each ***12d Model*** project you work on will have different files, it is strongly recommended that you keep each project in a separate subfolder. This can be anywhere on your hard disk or network. For convenience, you may prefer to keep them all under one major folder e.g. c:\12djobs.

In the general case for production work however, if you were about to start work on a new project by the name ‘Highway’, you would like it to be in a new folder under say 12djobs i.e. c:\12djobs\Highway. This is simply done from within ***12d Model*** where a folder of the same name as the project is automatically created with the project inside it.

Either numeric or alpha characters and spaces can be used in ***12d Model*** project names so you may prefer to use your job name as the project name. Also 12d project names are *not* case sensitive so ‘Highway’ is seen as the same name as ‘highway’.

2.5 Why Keep Projects in Separate Folders

12d can have more than one project within the one Windows folder. For example, projects under ‘Highway’ might be ‘Stage 1’ and ‘Stage 2’ or ‘Fred’ and ‘Bill’. Each project has its own data and configuration setup which controls the number of views, which models are on display etc.

However although most internal 12d project files are kept separate another projects internal files, all *input* and *output* files, *mtf* files, *chains*, *plots* and *reports* go into the folder containing the project and are not held inside the project itself. Hence to prevent projects interfering with each other, it is best to create a separate folder and create each project in its own folder.

For example, if the Highway project has two stages, create the project ***Stage 1*** in the folder ***Highway\Stage 1*** and the project ***Stage 2*** in the folder ***Highway\Stage 2***

Once inside 12d, from within any one project, it is possible to import any or all data from another project so there is some flexibility on a major job to move/copy survey or design data between stages if staging is used and then have multiple users perform parallel development. Model and tin sharing could later be used to subsequently assemble staged project data at the completion of a major job. Within any one project, model names must be unique so some planning is necessary if parallel development streams are subsequently to be reassembled. Models can be renamed at any time. Models are discussed in See Chapter 3.11 (on page 43).

Provided no 12d user is currently accessing a particular project, the project (and the folder containing it) can be copied, renamed, moved and deleted from within ***12d Model***.

WARNING - information inside the project itself ***should not*** be manipulated except from within ***12d Model*** since this may corrupt the project and data could be lost. For example, model names can only be renamed from within ***12d Model***.

If you need to manually place any files on disk for a project (e.g. survey files from a total station or CAD files to get data into ***12d Model***, it is recommended that you place them in the folder containing the project. that way all the data and the project are in the one folder.

2.6 File Backup Procedures

To ensure that you can retrieve any job or project at any time from backup procedures, it is important that a complete ‘set’ of files is taken whenever backup is created. To backup the files associated with the ‘Highway’, you would typically backup all files and sub-folders in and below

c:\12djobs\Highway

There are configuration files used that may be used in the Highway job, that are supplied by 12D Solutions and are automatically installed from the ***12d Model*** Installation DVD. These files are in

c:\Program Files\12d\12dmodel\11.00\set_ups

c:\Program Files\12d\12dmodel\11.00\library

There are other user configurable files that 12d may use and require to fully recreate all steps of a project. They are not supplied on the ***12d Model*** Installation DVD. These files are typically in

c:\12d\11.00\user

c:\12d\11.00\user_lib

These folders may contain files that have been configured specifically for your site e.g. your corporate standard mapping, template and plot parameter files, your particular Total Station survey macros and any user defined macros etc. In general, such files are not project specific, however because these files are user configurable they may be changed at any time and hence particular project specific versions of them may be needed as part of the complete file set of a project.

In the above case, the folders shown are for ***12d Model*** 11. As implied, the files in these folders will never be changed automatically by the installation process when you reinstall a later version of 12d.

The above paths are indicative only. It is possible that folders have been setup at different places for your site. For more information on exactly where all library and user folders are located, refer to the section **37.1 Folder Structure Installed by 12d Model** in the ***12d Model Reference Manual*** and ***12d Model Context Sensitive Help***, and for information on the environment variables

USER_4D

USER_LIB_4D

SET_UPS_4D

LIB_4D

that control where the various files are, see **8.6.3 env.4d** and **37.5 Environment Variables** in the ***12d Model Reference Manual*** and ***12d Model Context Sensitive Help***

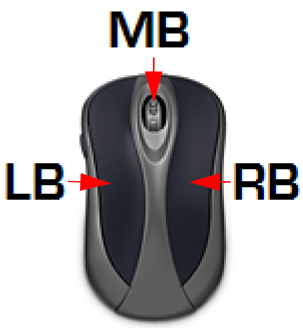
3 Basic Operations

3.1 The Mouse

12d works best with a three button mouse (preferable a wheel mouse). 12d will work with a (Microsoft) two button mouse but the lack of the middle button means that you have extra mouse clicks to perform.

All 12d Documentation uses the following notation for mouse functions.

LB = left mouse button	- used for picking screen items, menus etc.
MB = middle mouse button	- used to accept the highlighted item
RB = right mouse button	- used to pop up a list of alternatives



The left button is the 'Select' button – typically used to select graphic items or text. The middle button (or wheel) is the 'Accept' button, used to confirm a selection. The right button is the 'Menu' button. It is context sensitive and often displays a list of alternatives available at that instant.

With a two button mouse you achieve this functionality by clicking the right mouse button to pop up the 'Pick Operations' menu and then clicking LB on **Accept** or by simply pressing the <Enter> key

The term 'clicking' a button means pressing it down and releasing it again. The position of the mouse is taken at the time the button is <u>released</u>. In this tutorial manual, items that are selected by a mouse click are in **bold**.

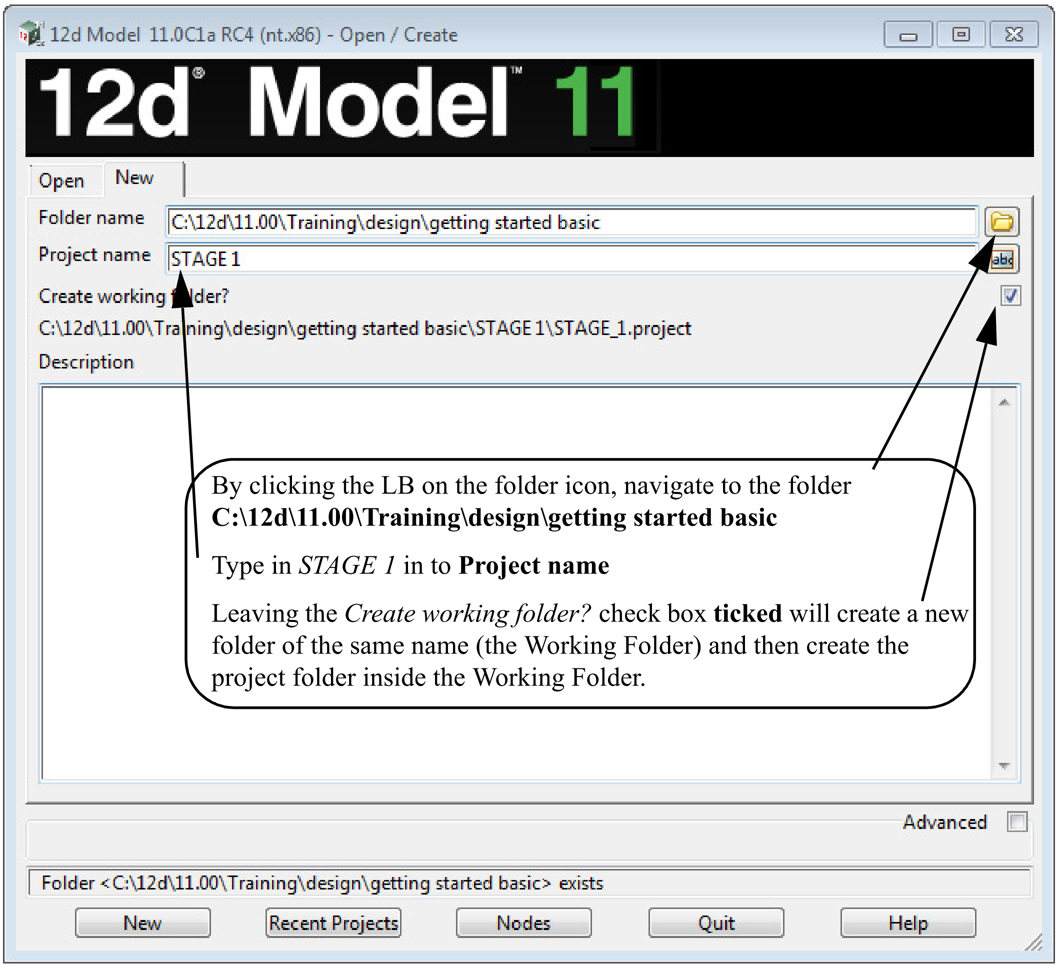
As we get more experienced, we will also introduce the term 'dragging' the mouse for some advanced 12d operations. We do this by pressing down a button and <u>whilst still holding it down</u>, moving the mouse so that the screen cursor moves. Once a definite distance has been achieved, just a millimetre or two is sufficient, release the button. 12d notes the vector you defined and can use this information to detect the direction in which you dragged the mouse.

Finally, we will use the term 'double clicking'. This is where we press the button twice in quick succession. This is often used for short-cuts.

3.2 Starting Up - The Project Selection panel

If you installed ***12d Model*** from the *12d Model Installation DVD*, then a ***12d Model 11*** icon will have been created on your desktop. The ***12d Model*** front screen will then appear.

Click LB on *New* button at the bottom of the panel to bring up the **Open/Create** panel with the **New** tab selected.



Click LB on the **folder** icon at the end of the **Folder name field** and browse to:

C:\12d\11.0\Training\design\getting started basic.

Type **STAGE 1** into the **Project name** field and **tick** on **Create working folder**.

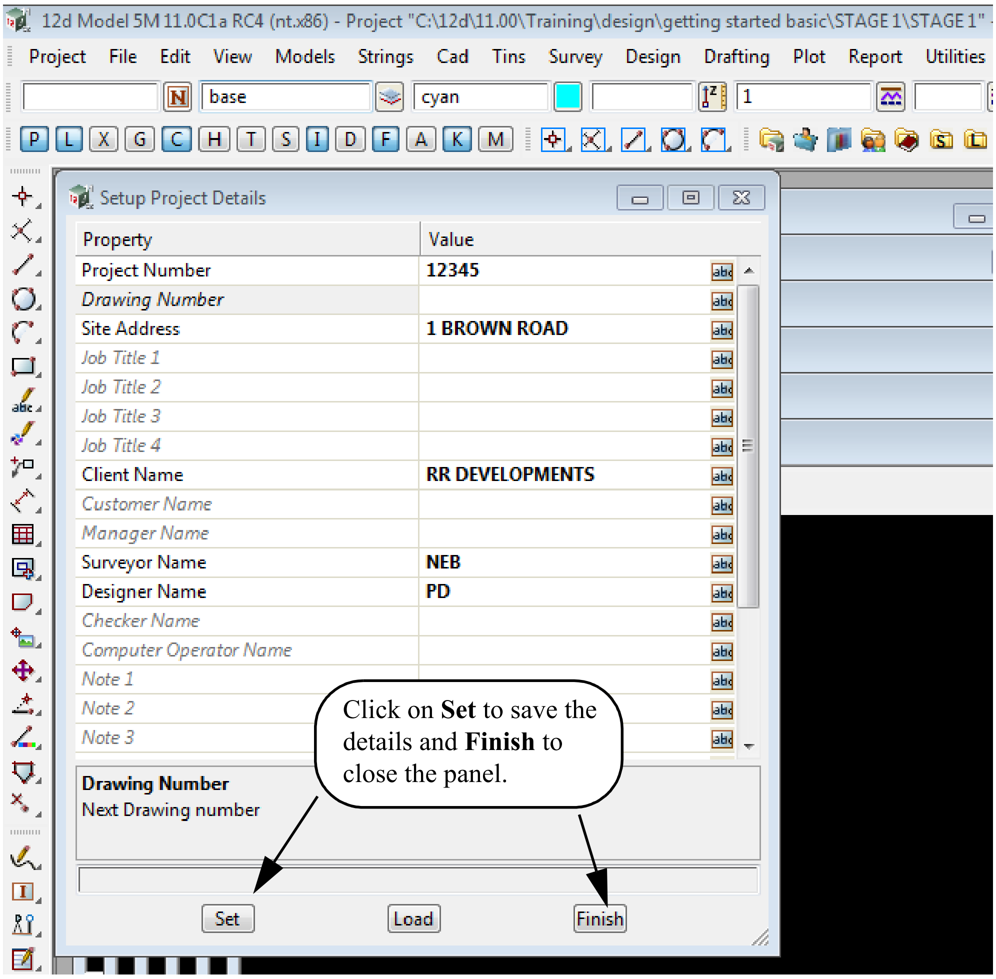
Then click LB on the ***New*** button.

Then a folder with the same name as **Project name** is created (called the Working Folder), and a new project called **Project name** is created inside the Working Folder.

Note

It is important to select names that are meaningful to your job as you may have several projects associated with a large or complex job.

Once a project is selected, the graphics screen will display, with the *Setup Project Details* panel open. Fill in the panel with the relevant required details



RULES FOR ENTERING DATA INTO PANELS

Important: The cursor must be locked into the appropriate data entry field when typing data into a 12d panel. Often this will happen automatically. If you cannot see the cursor flashing in the data field in which you want to enter data, use the mouse to position the cursor anywhere over the data field and click the LB to lock the cursor into the field before typing any data. Terminate the data entry sequence by pressing the <Enter> key.

If you make a mistake, you can always select the erroneous entry by double clicking over it with the mouse LB. The text should then appear highlighted. As you retype it, the old entry is deleted.

When filling in data in any 12d panel, it is not essential to terminate the entry of data by pressing <Enter>. You can use the <Tab> and <BackTab> keys to move from field to field. You can also use the mouse to move between fields.

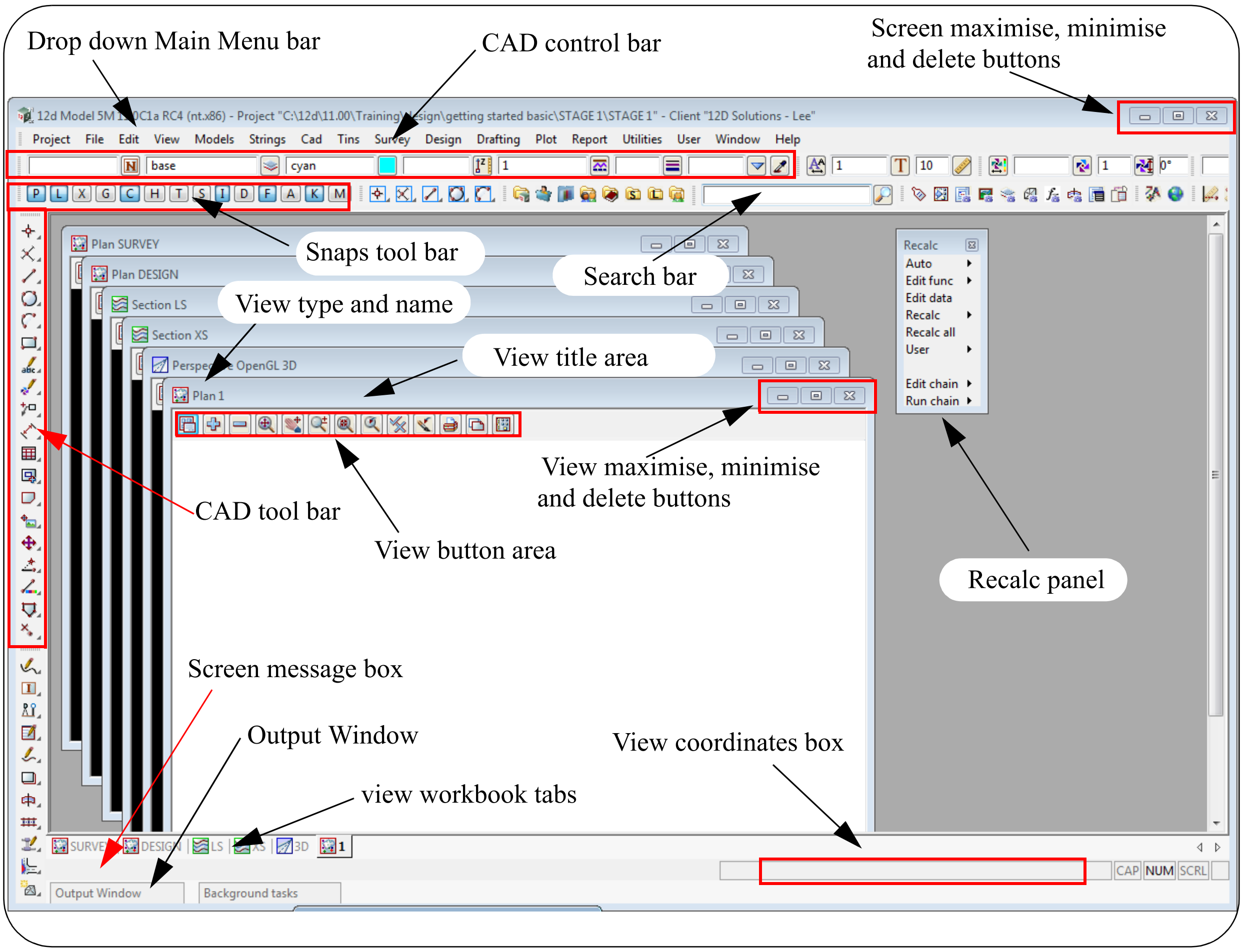
If you do press <Enter> to terminate the entry of data into a field, 12d will immediately validate the data in that field and if required, write an error message.

3.3 The Initial Screen Layout

The default background colour for a view is black because black is the best colour for reducing eye strain and for distinguishing colours displayed in a view.

To make the *Getting Started* manuals easier to print on in-house printers, many of our illustrations have a white background colour.

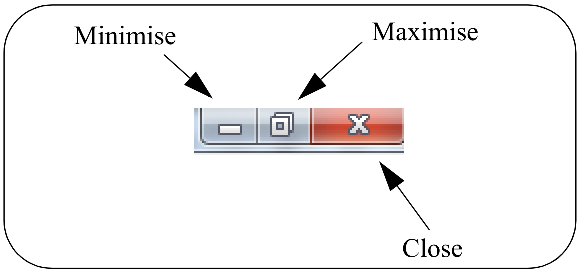
The names we use for the various parts of the screen are shown on the diagram below. Your screen may not appear exactly as shown as most components on the screen can be moved or turned off by user configuration options, or you have a different screen resoluiton.



Note that the View in the image with the white background has a title and it is **Plan 1**. This says that it is a **Plan view** with the name **1**. The View names must be unique.

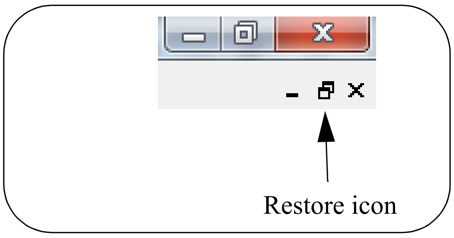
Each View can be Minimised, Maximised or Closed.

The Plan View **1** can be maximised by clicking LB on the square button in the top right hand corner of the view menu.



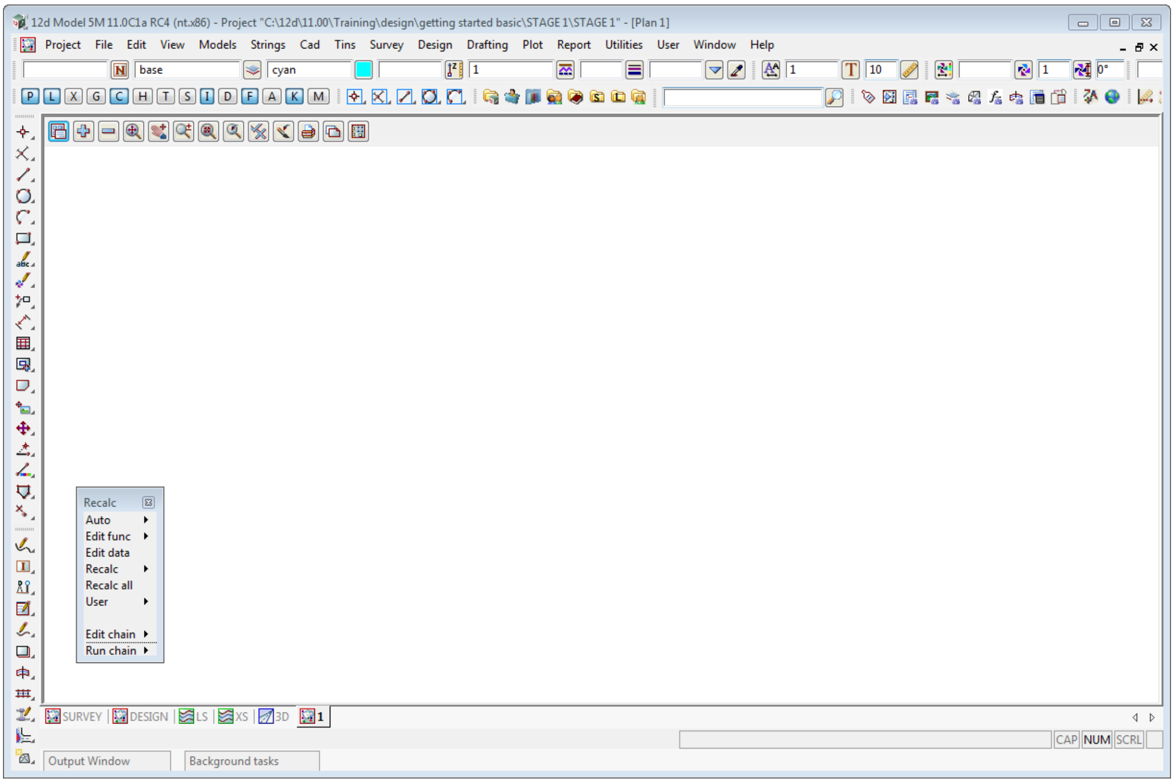
This then takes up the entire viewing area. Alternatively, you can **double click LB** on the plan view title area to maximise the view (The blue area to the left of the View Minimise button).

To reduce it back to its original size you can hit the restore icon.



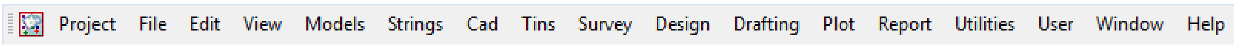
The **Recalc** panel is used to quickly rerun design calculations and will be discussed later. We will move the panel down to the bottom left of the screen by holding LB down over the menu title are Recalc and then moving the cursor to bottom left hand corner of the screen and then releasing LB wen the Recalc menu is where we want it to be.

The view should then look as shown below.

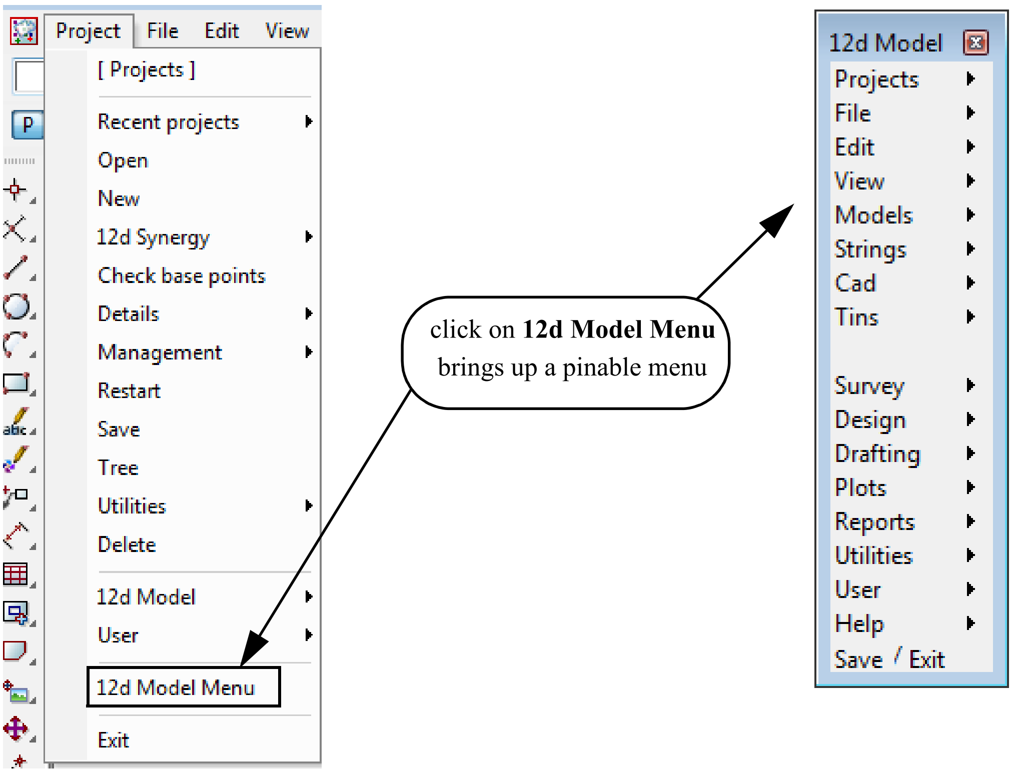


3.4 How to Find Your Way Around 12d Menus

12d options are run by a number of methods. The **Drop Down** Main Menu system from the bar running across the top of the screen is the main way we access 12d programs.



In addition to the **Drop Down** Main menu system, there is a floating ***12d Model*** menu that can be pinned. This is found at **Projects=>12d Model menu**.



12d has a unique graphical user interface (GUI) involving hundreds of menu items. These are logically grouped by function in a Walk Right and Tear Off menu system.

Walk Right menus are menus designed such that if you move the mouse cursor right on a menu item containing a right arrow, a further menu will pop up, usually on the right hand side.

Tear Off menus means that a menu can be torn off it's parent menu and relocated elsewhere on the screen for clarity of operation. In general, it is possible to have multiple copies of the same Tear Off menu on the screen at one time.

Notice that the order of items left-to-right on the Drop Down **Main Menu** bar is the same as the top-to-bottom order on the Walk Right ***12d Model*** menu. You can select menu items from either one of these sources – the end result is the same.

The Drop Down menu bar conforms to normal Microsoft standards so it can be dragged and placed at any of the four sides of your desktop. It is probably most usable left at the top of your desktop.

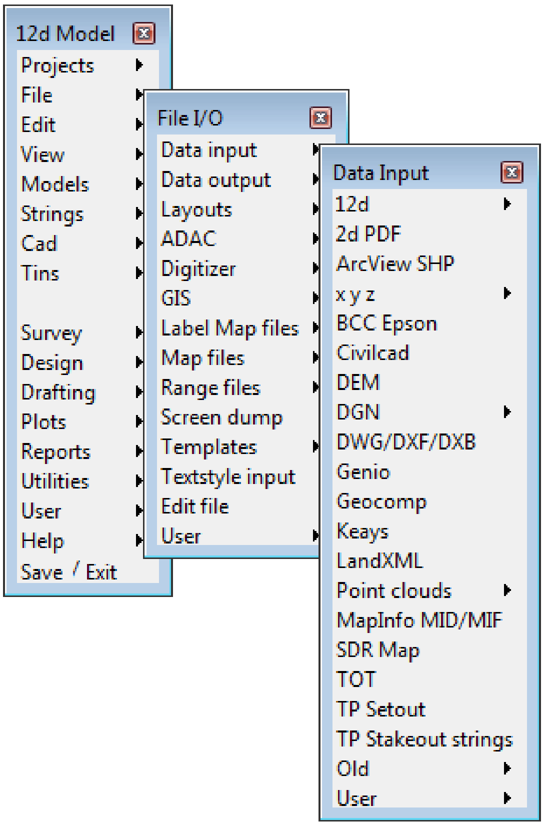
The following comments apply to ALL menus. To move any menu around on the screen, you **drag** it by **depressing** the LB in the View Title area at the top of the menu, anywhere other than over the **X** in the top right hand corner. With the button still depressed, move the mouse to the desired location and release the button to repin the menu. The same procedures also apply when moving panels and views. When doing this just make sure that LB is clicked in the general heading area and not on a **View** button.

To ease the learning and usage process, a menu description system has been adopted in this manual that describes where to look to achieve a specific function. For instance, to import an AutoCAD DXF file of point and line data into 12d, you Walk Right on the ***12d Model*** menu or from the Drop Down Main Menu bar, through two submenus and select DWG/DXF. This instruction is documented as…

File =>Data Input =>DWG/DXF/DXB

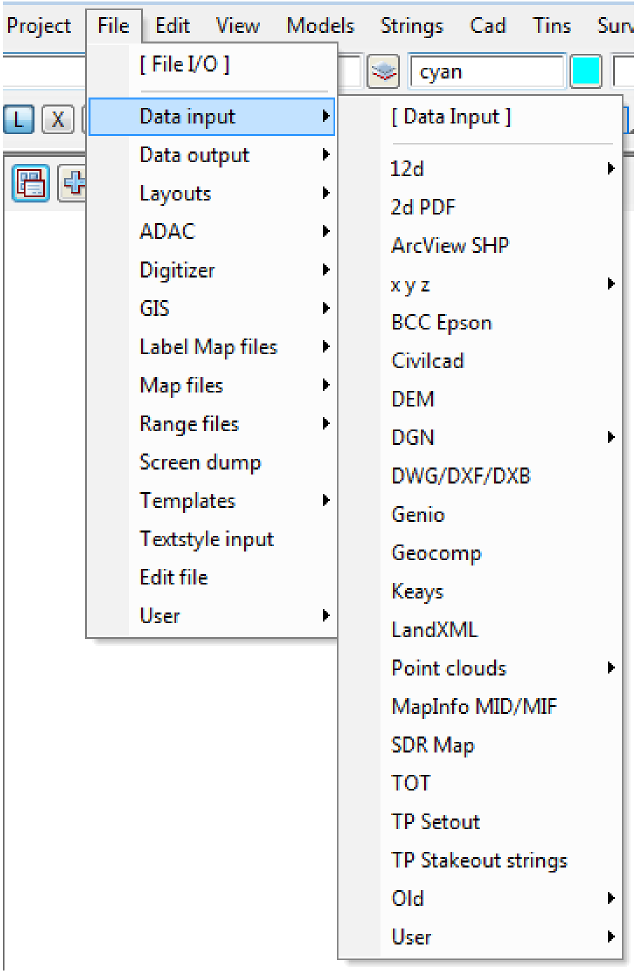
To display submenus from the Walk Right, you do not need to use the mouse buttons. Simply position the mouse cursor over the ***12d Model*** menu and once **File I/O** is highlighted, slide the mouse right over the arrow and the **File I/O** menu will pop up. Slide further right on the **Data input** menu item and the **Data Input** menu will pop up.

Your screen should appear as follows

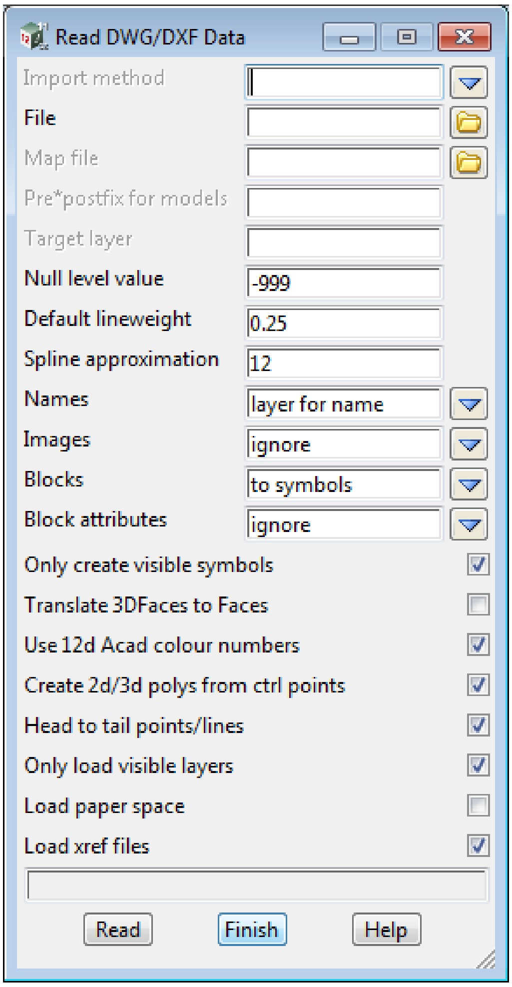


Alternatively, you can use the Drop Down menu bar to get to the same point …

To get to this same point using the pull down system, you need to click LB on **[File]** on the Drop Down menu bar and then proceed as before on the walk rights as shown below.



Regardless of which menu selection method you used, place the cursor over the words **DWG/DXF/DXB** and click the left mouse button (LB) once. The **Read DWG/DXF Data** panel will appear.



The panel is placed on the screen at the location where the mouse cursor was when LB was clicked.

Once the panel is selected, the Walk Right menu system should collapse and be removed from the screen. If you move and **repin** any of the menus however, they will not collapse automatically.

If a menu is in the way, you can move it as already described. Any menu can be **removed** by clicking LB on the **X** button in the top right hand corner.

You would normally now start entering data into the panel. At this time, we will not proceed further with this panel. Shut down the panel by clicking LB on the  in the top right hand corner or clicking LB on **Finish** at the base of the panel.

3.5 Toolbars and Controlbars

See

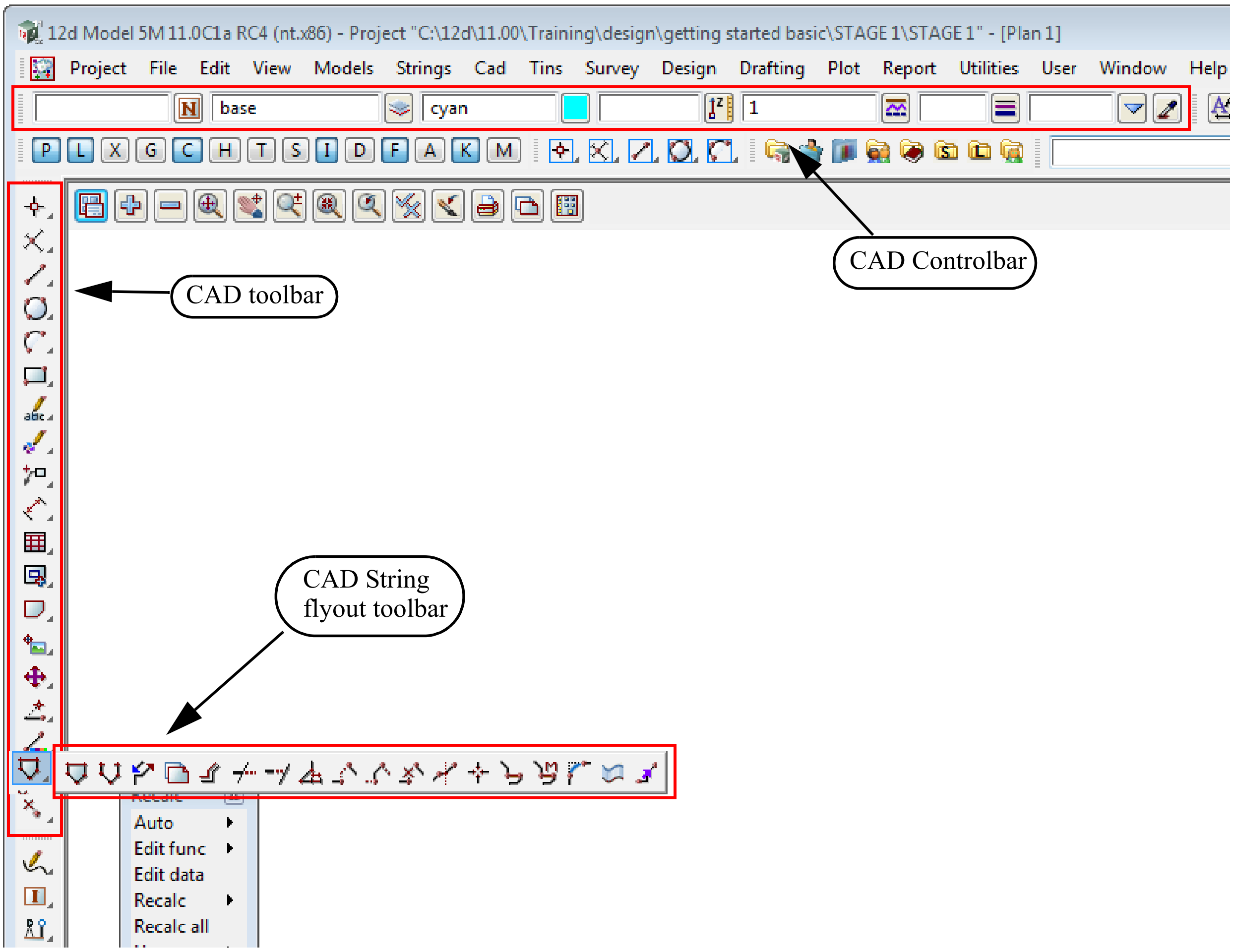
Chapter 3.5.1 CAD Toolbar and CAD Contolbar
Chapter 3.5.2 CAD Text Toolbar and Text Controlbar
Chapter 3.5.3 Symbol Controlbar
Chapter 3.5.4 Search Toolbar
Chapter 3.5.5 Snaps Toolbar

3.5.1 CAD Toolbar and CAD Contolbar

In ***12d Model*** there are CAD options which are available under both the *CAD* menu and on the *CAD Toolbar* on the left hand side of the ***12d Model*** screen.

The **CAD** options create various elements using a number of methods. These options make use of **Tool bars** and **Control bars**. Tool bars just have icons on them but Control bars have icons and also controls such as a model box on them. The method groupings are shown on the toolbars (e.g. Points, Lines etc.).

The user can select an icon on the tool bar and a **Flyout** for all options of the grouping are displayed. This can be done by selecting the appropriate group symbol by holding down the left mouse button on the icon. This shows all the different options for that grouping in a flyout panel. Whilst still holding down the left mouse button, the user can move along the flyout toolbar to the appropriate option.



The elements created from the CAD options will have attributes as defined by the **Cad Control Bar**. This control bar is placed on the top left hand side of the screen under the Main Menu control bar on the creation of a project

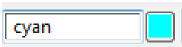
The fields and buttons used in this control bar have the following functions.

Field Description	Type	Defaults	Pop-Up
	name box	base	names.4d names

name of string. If a valid name already exists in names.4d, the **[N]** *button can be used to bring up a choice box of available names. On selection of a valid name, the rest of the values in the control bar will be filled out. e.g. colour, linetype etc.*

Field Description	Type	Defaults	Pop-Up
	model box	base	existing models

this field can be recognised by the model icon button on the right hand side of the field. The user can select an existing model by selecting the model icon. If a new model is to be used, the user simply types the model name into the field.

Field Description	Type	Defaults	Pop-Up
	colour box	red	standard 12d colours

this field can be recognised by the colour icon button on the right hand side of the field. The user can select a 12d standard colour model by selecting the colour icon, typing in a a colour name of number, or even typing in he RGB of a colour in the format ***rgb(red_integer,greeen_integer,blue_integer)****.*

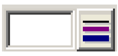
Field Description	Type	Defaults	Pop-Up
	height input		Measures menu

this field allows a height or z value to be assigned to the created elements. If a valid value exists, this value will be applied to the created element. This is regardless if the z value was specified in an XYZ box.

If no value is specified, the level will be interpolated where possible. A value of **null** *can be entered into the height field as well so that created points will be given a null height value.*

Field Description	Type	Defaults	Pop-Up
	linetype box	1	valid linestyles

this field can be recognised by the linestyle icon button on the right hand side of the field. The user can select a valid linestyle by selecting the linestyle icon

Field Description	Type	Defaults	Pop-Up
	weight box		

this field allows the user to type in a line weight for the cad item created

Field Description	Type	Defaults	Pop-Up
	tinablility box		no, yes, points

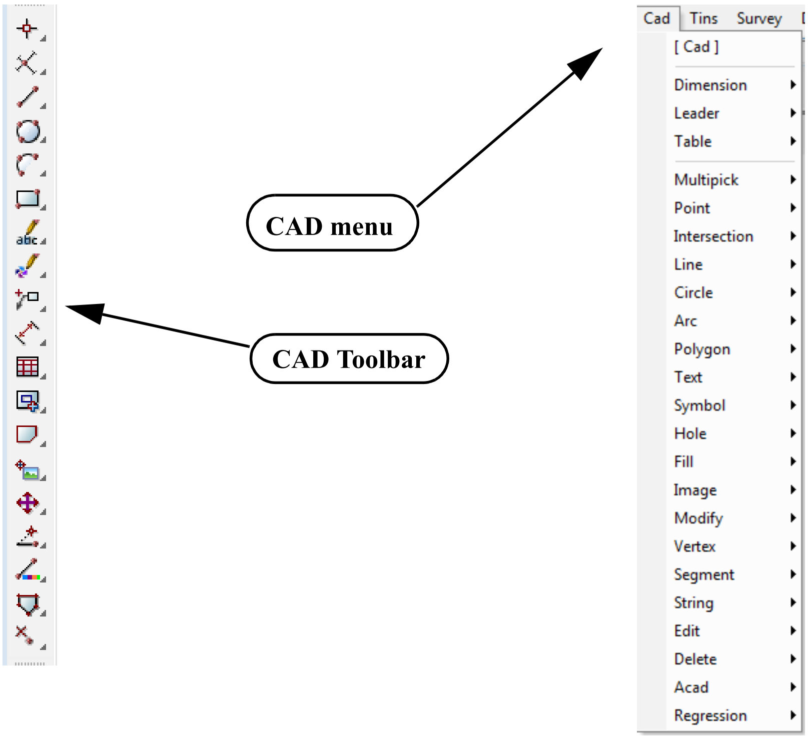
the Tinable field sets whether:

yes - the vertices and segments are tinable (used in triangulations)
no - not tinable (not used in triangulations)
points - only the vertices (points) are tinable.same as

Field Description	Type	Defaults	Pop-Up
	button		same as

the ***same as*** *(or eye dropper) allows the user to select an existing element which will be used to define all the cad control bar values.*

The **CAD** options are available from the **CAD toolbar** or from the **CAD** menu.



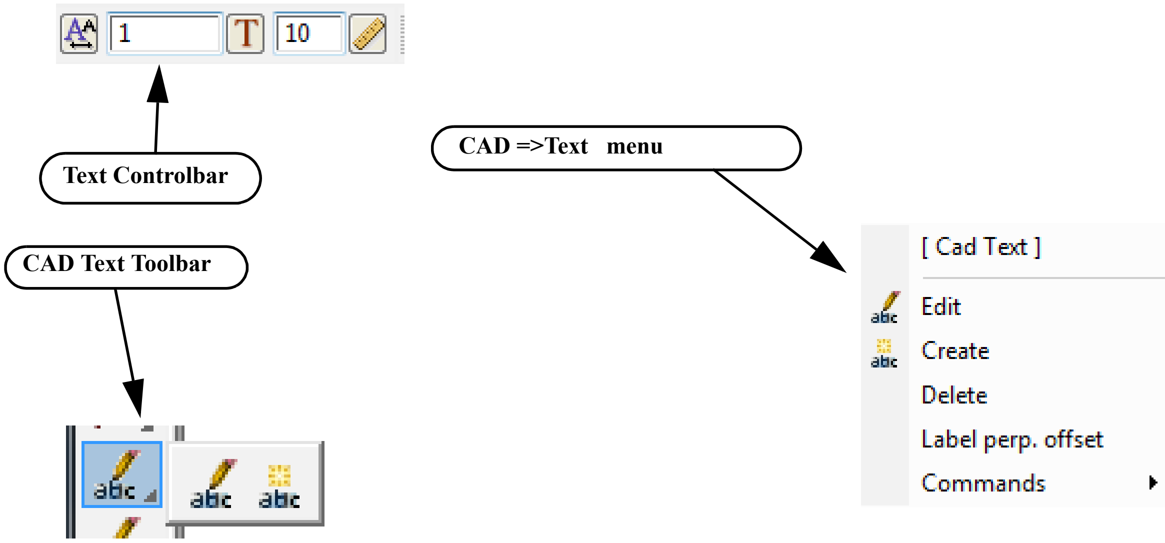
When options are chosen from the CAD Toolbar, help messages are written to the Screen Message Box at the bottom of the ***12d Model*** screen.

Although there is no panel or menu involved with the CAD toolbar options, if the F1 key is pressed whilst the cursor is over an item on a toolbar, the context sensitive help will be called.

Alternatively all the CAD options are documented under each of the walk-right menus of the *CAD* menu.

3.5.2 CAD Text Toolbar and Text Controlbar

The various **Text** options are:



Text can occur as a text string, on vertices of a 4d string, and on vertices and segments of a super string. Each type of text has

(a) a vertex (these are displayed when Vertices are toggled on in a plan view)

(b) a justification point, a rotation

(c) an offset

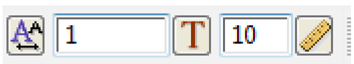
(d) a raise value.

The vertex and justification point only coincide if the offset and raise values are both zero.

All text on a 4d string must have the same height, colour, angle, offset and raise.

Each part of the text on a super string vertex segment can be independently modified depending on the settings for the super string.

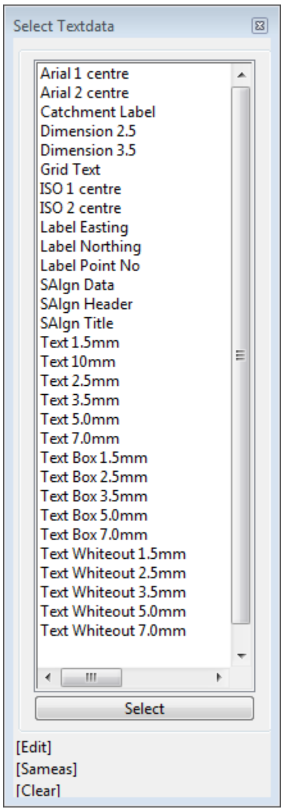
For text options, the created elements will have attributes as defined by the **Text Control Bar**. This control bar is placed at the top right of the screen under the main menu control bar on the creation of a project



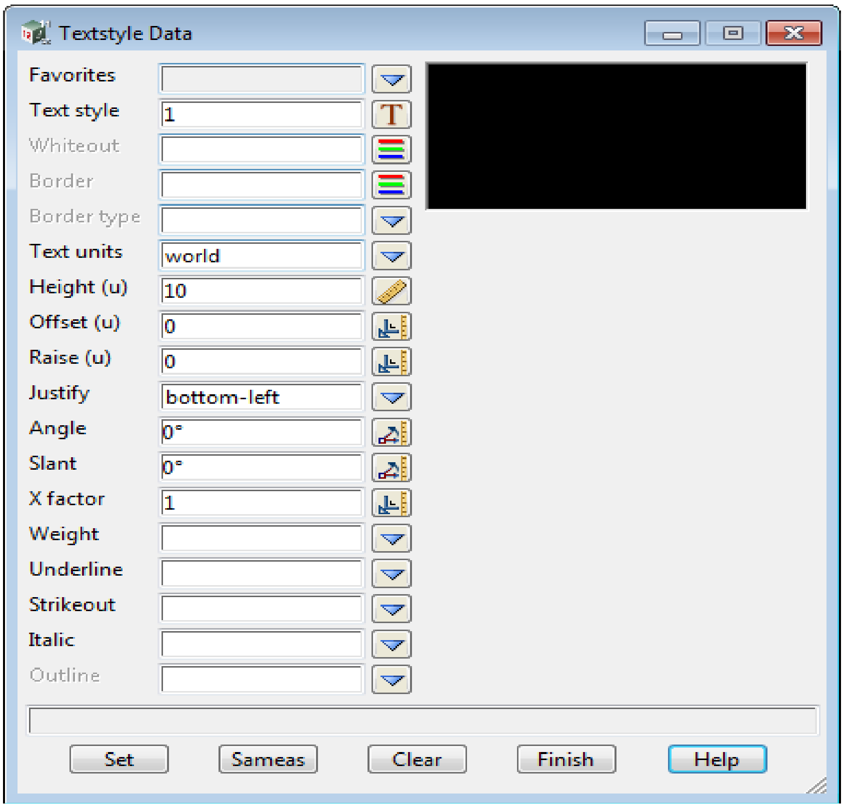
The fields and buttons used in this control bar have the following functions.

Field Description	Type	Defaults	Pop-Up
	Textstyle data box		

On pressing the button a list of available textdata with predefined names read from the ***texstyle_names.4d*** *file are displayed.*



If you require a different textsyle, the user can edit the current settings by selecting the *[Edit]* button to bring up the **Textstyle Data** panel. This allows for definition of textstyle, units, height offset raise etc.



textstyle box 1 available textstyles

the user can select an existing textstyle by selecting the textstyle icon or entering a value into the input box to the left of the button.

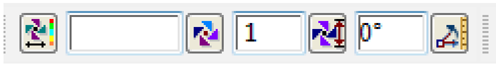
text height box 10

the user can measure a height by selecting the text height icon or entering a value into the input box to the left of the button. The value units are defaulted to world units. This can be changed in the Textstyle Data box

3.5.3 Symbol Controlbar

The ***Symbol Controlbar*** is normally at the top right of the **12d Model** screen.

Symbol Control toolbar

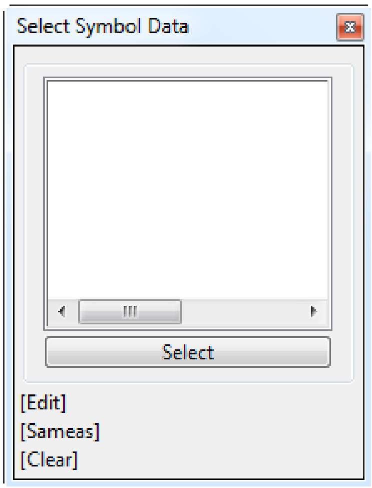


Users can define their own symbols to draw at vertices of super strings. The definition of symbols are stored in a file called symbols.4d.

The fields and buttons used in this control bar have the following functions.

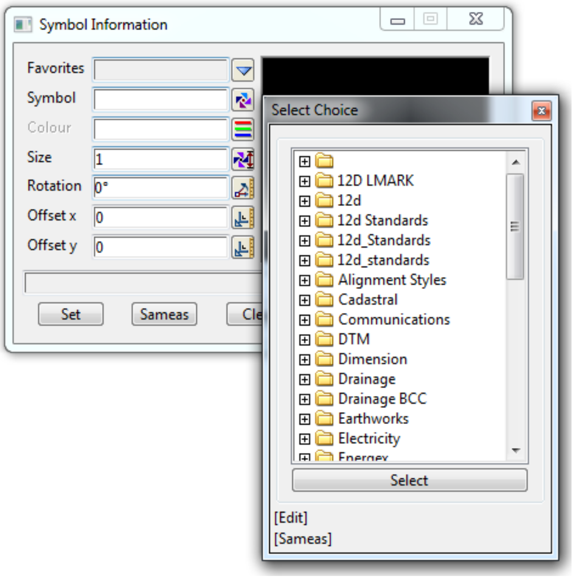
Field Description	Type	Defaults	Pop-Up
	Symbol data box		

On pressing the *Symbol data* button a panel appears



If you require a different symbol, the user can edit the current settings by selecting the [Edit] button to bring up the **Symbol Information** *panel (shown below).*

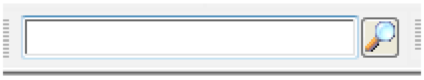
The current symbol can be selected from the Symbols list and the colour, size and rotation can be manually set



Alternatively the size and rotation (anti clockwise) can be entered manually into the boxes in the Control bar

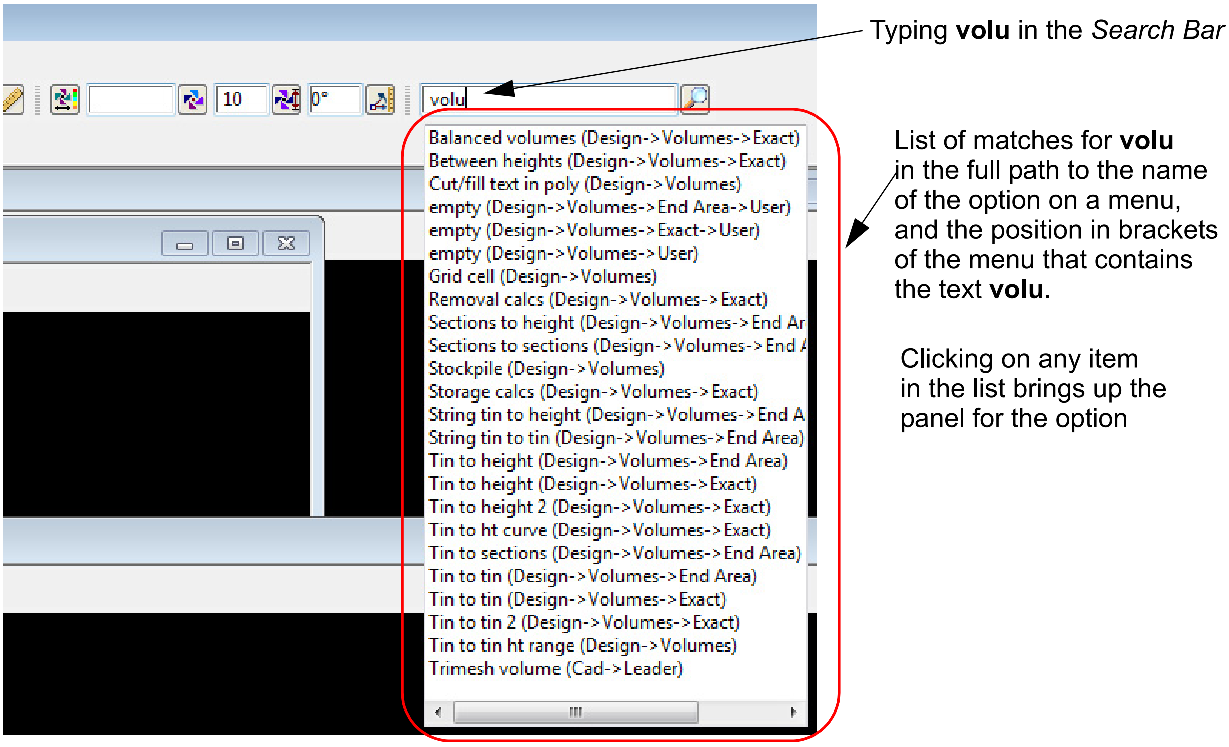
3.5.4 Search Toolbar

The ***Search bar*** is normally at the top right of the ***12d Model*** screen.



By simply typing text into the **Search Bar,** the option searches for matches of the typed text amongst the **full path names** of all the **options on the menus**, and then lists the menu items and the position of the menu that contains the menu item.

For example, typing in **volu** will bring up the list shown below.



Double clicking on an item in the list brings up the panel for that item.

Note that case is ignored when searching for matches.

3.5.5 Snaps Toolbar

The ***Snaps Toolbar*** is normally at the top right hand corner of the ***12d Model*** screen.

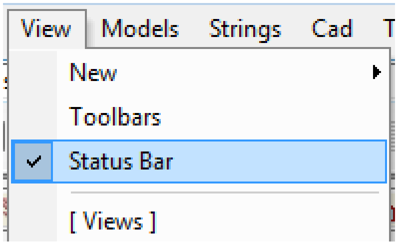
Snaps are used when picking strings - see Chapter 7.4 ’Snap Settings’.

3.6 Status Bar

The Status Bar is an optional part of your desktop. It appears at the base of your desktop. The Status Bar contains the Screen Message Box and the View Coordinates Box. It is strongly recommended that you keep it turned ON.

If desired, the Status Bar may be turned OFF at any time.

From the **View** drop down menu bar, click LB on **View**, untick the **Status Bar** checkbox. To turn it back ON, repeat the selection but this time tick the checkbox.

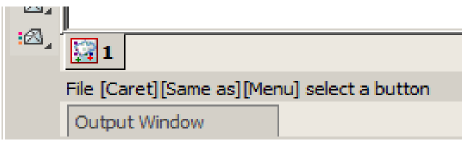


3.7 Screen Message Box

The Screen Message Box contains messages that help you interact with the 12d menus. For instance, when importing a DWG/DXF/DXB file as shown previously, you have to select a file name to read. Let us investigate the messages 12d gives us to help us with this simple operation.

If the DWG/DXF/DXB Data panel is not already showing, select it again as shown previously.

Click in the ‘File’ name entry data field. Observe that the following response appears in the Screen Message Box



You interpret this help message as follows. 12d is asking you to supply a file name. The three sets of square brackets [ ] correspond to your response via the three mouse buttons, LB, MB and RB.

The LB message ‘Caret’ indicates the position of the cursor if you want to type an answer using the keyboard.

To type an answer, you must first make sure that the cursor is locked onto the field you wish to modify. The cursor must appear as a flashing vertical bar before 12d will accept any data from the keyboard.

You can reposition the caret anywhere in the existing word by using the LB. You could then edit it by using the <Backspace> key.

Alternatively you can use the <Delete> key to delete the character to the right of the cursor or the Arrow keys to move within the word.

The <Home> and <End> keys take you to either end of the existing entry.

To delete the entire entry, double click anywhere in the text to highlight it. Then press the <Delete> key to erase the entry, or just start typing to replace it.

The MB message ‘Same As’ indicates that you can point at any existing item on your desktop. This would not normally be used for a file name.

The RB message ‘Menu’ puts up a menu. At this time, no items are available. If another filename was copied to the windows clipboard then the ‘Paste’ would be highlighted.

Or finally, you can click LB on the folder icon to locate the required file

The Screen Message Box area changes dynamically with the position of the cursor on the screen so watch it closely for helpful messages.

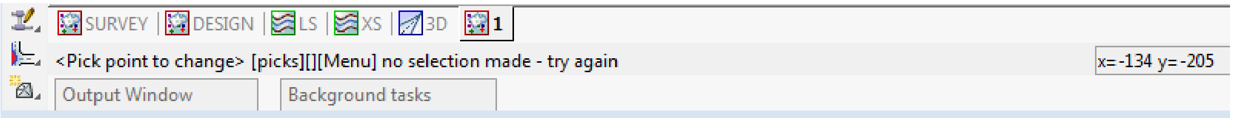
3.8 View Coordinates Box

Note the location of the View Coordinates Box at the bottom right of the desktop (the right hand side of the Status Bar).

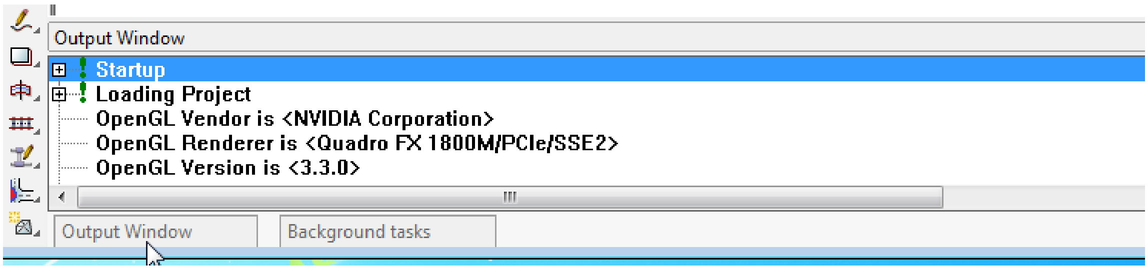
This box displays the X-Y coordinates of the cursor when in a Plan view and Chainage-Height-X coordinate-Y coordinate when in a Section view.

3.9 The Output Window

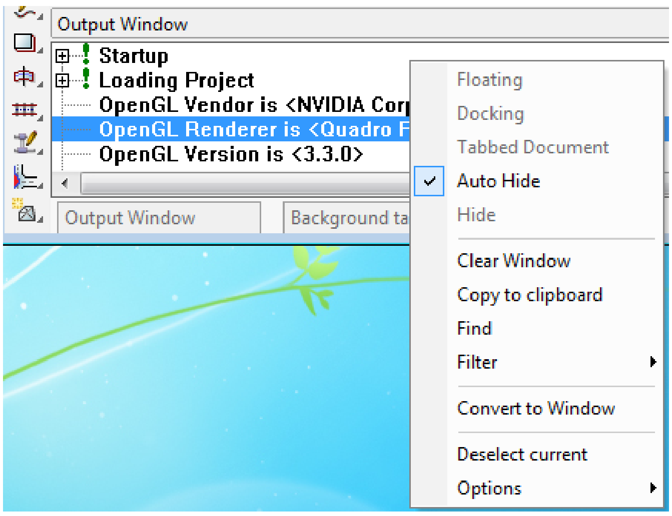
The Output Window appears as a tab at the bottom left of the screen and flashes if there are any messages that need to be reviewed.



By default the Output Window is in Auto-Hide mode and when you move your cursor over the Output Window tab, the Output Window appears.



Auto-Hide mode can be turned off by moving over the Output Window and pressing RB to bring up the **Output Window** menu. Click on *Auto-Hide* to remove the tick and Auto-Hide is no longer on.



When Auto-Hide is turned off, the Output Window stays open permanently.

The Output Window menu includes the options:

Clear - clears the Output Window,

Copy to clipboard - copy any selected text in the Output Window to the Clipboard.

Hide - removes the Output Window.

Float - makes the Output Window a floating window that can be docked on any of the sides of the ***12d Model*** screen.

Convert to window - turns the Output Window into a normal Window which then appears on your desktop. It may be moved by clicking LB in the Output Window heading area, then dragging the cursor to another part of your desktop and releasing the LB to pin it down.

When the Output Window is a normal Window or a floating window, then clicking on **x** at the top right of the window will remove the Output Window.

The Output Window can be made taller or shorter by moving the bar at the top of the Output Window.

The Output Window can be turned off by **Hide** but also unticking the Output Window on the Window Main Menu will remove the Output Window.

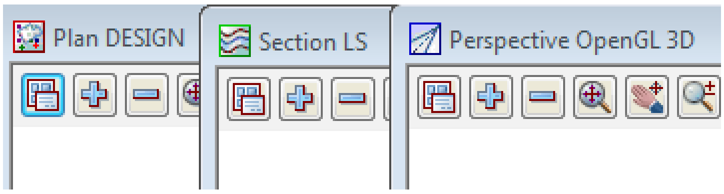
Once the Output Window is removed, the only way to turn it back on is to click on **Output Window** on the **Window** Main Menu.

3.10 Introduction to Views

There are three types available in ***12d Model*** - Plan, Section, Perspective - and some subtypes. For example Perspective and Perspective OpenGL are both Perspective Views and most Perspective operations work identically on them.

It is possible to have multiple Plan, Section and Perspective views on the desktop at one time, each showing different information. There is no limit to the number of views you may create.

Each View has a **View type icon** and a must have a **unique name** such as **SURVEY** or **2** etc. The names can be any number of characters that must be either alphanumeric of spaces although for uniqueness upper and lower alphabetic characters are considered to be the same thing. View names will automatically have any leading or trailing spaces removed.

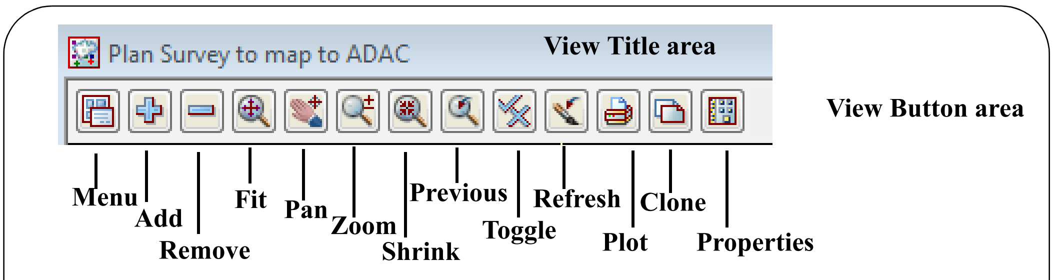


The name appears in the **View Title Area**. This is the heading at the top of each view.

Just below the name is the **View Button Area** which contains the most common **View buttons** (i.e. a subset of the complete list of view options). The View buttons appears horizontally after the view name. The **View Button Area** appears automatically with each view as the view is created and each view type has different view buttons that reflect it's characteristics.

The **View Name** defaults to a number but can be over typed with any alphanumerics. The View Name must be **unique** for the project.

For example, the View Buttons shown on a Plan view called *Survey to map to ADAC* are:



Plan View Buttons

Each view also has its own menu (the view menu) which can be brought up by clicking the LB on the view button called **Menu**.

The View menus can also be brought up in another special way:

> if you click the RB in the View Button Area or the View Title Area, you will also get the View menu to pop up. Clicking RB again in the View Button Area or the View Title Area will remove the view menu.

So by using the RB, view menus can be accessed even if the Menu item is not visible in the View Button Area.

The View menu contains options available for that particular view type. It is a superset of the buttons that appear on the horizontal View Button Area. If the View is made very small or moved off the right hand side of the desktop, the various buttons on the horizontal View Button Area will not be selectable as they will not be visible. In such case, you have to use the RB in the View Button Area to get access to the various View menu items.

Hence there are **four** menu systems in 12d, one for each view type (Plan, Section and Perspective) and an overall Main Menu.

Views may be created, resized, overlapped, moved , minimised, maximised and deleted.

When you create a new view, 12d will automatically supply it an ascending number for reference purposes e.g. **Section 2**. This automatic name can be changed to any other unique view name.

To make Menus and Panels easy to see thye will always be displayed on top of any views.

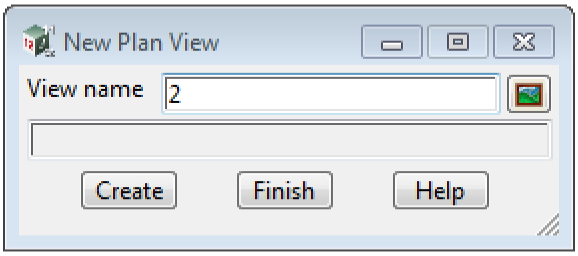
3.10.1 Basic View Operations

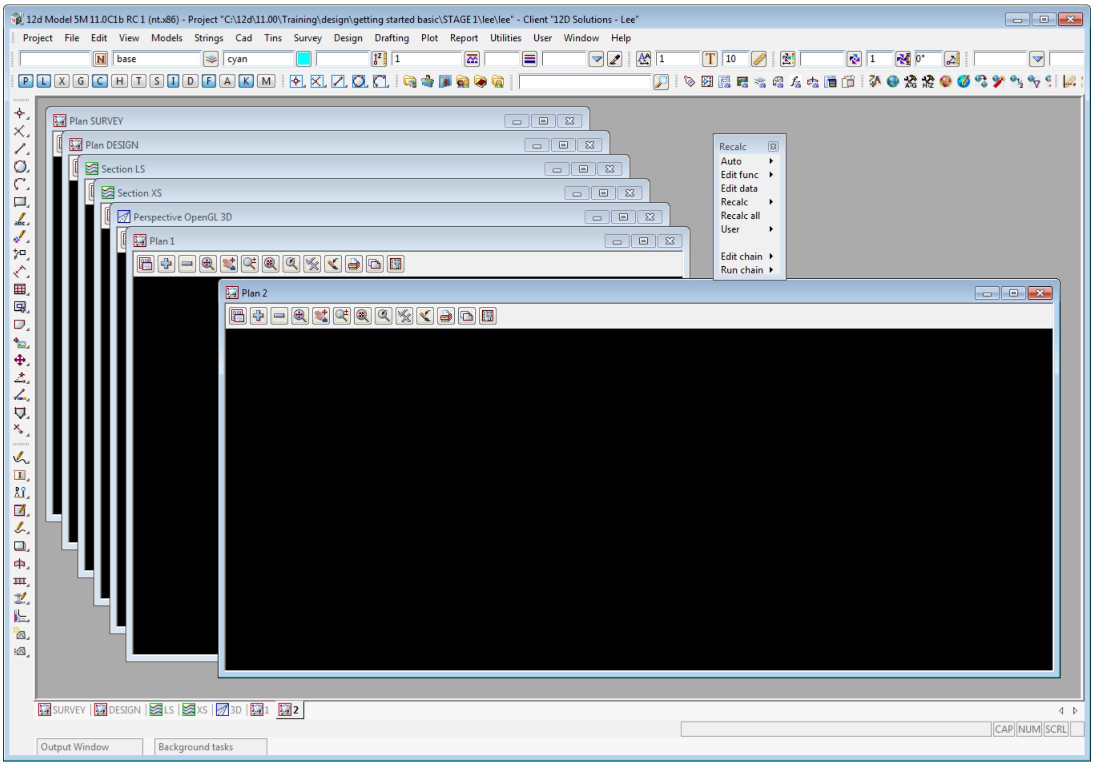
We will now practice some basic View operations

To create a new View, we can use the **Views =>New** or the **Views =>Create** option.

For example to create a new Plan view, select **Views =>New =>Plan** from the main menu to create a plan view with the next view number.

Alternatively, you can use **Views =>Create =>Plan View.** Pick **Create** with the LB after first supplying a View name or accepting the 'number' supplied by 12d as the View name.





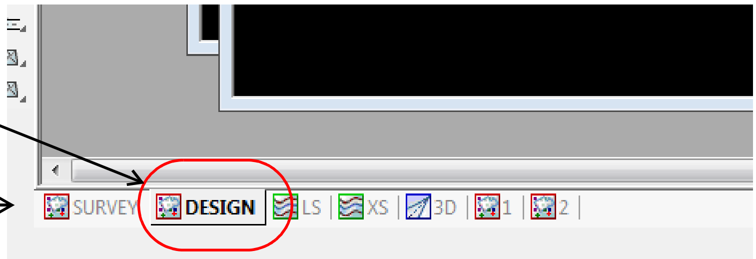
Important note: Each view name must be unique.

Once the View is on display, the following operations can be performed from the **View Button Area**.

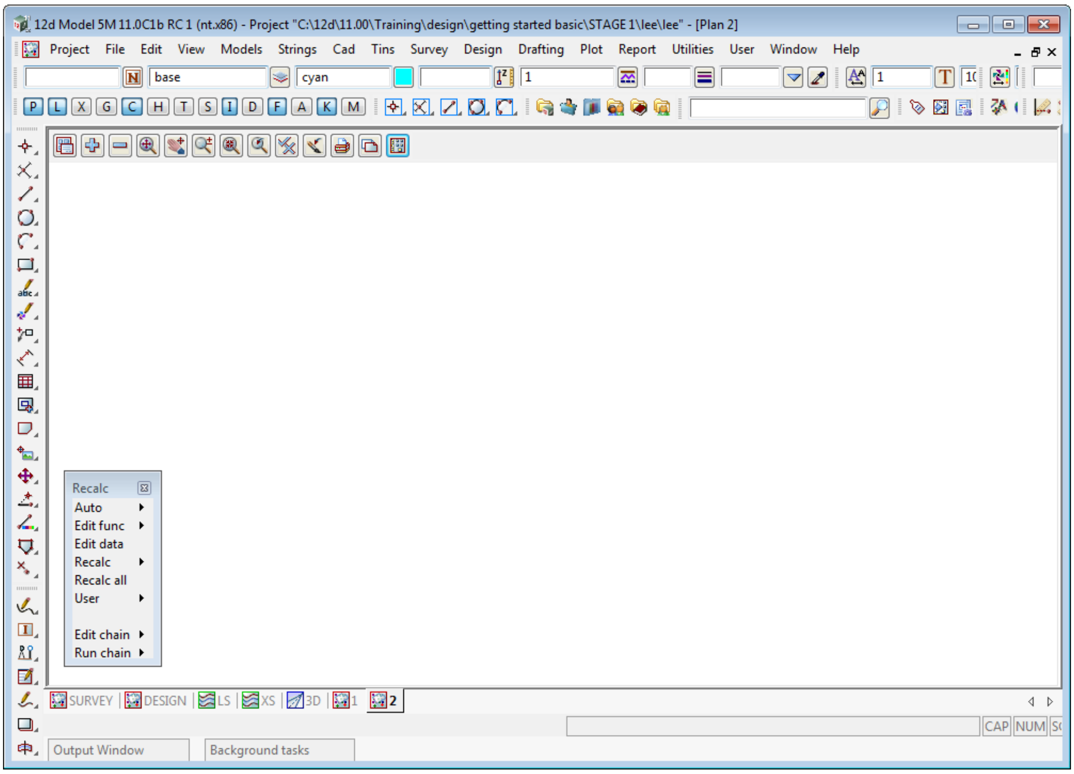
To **MOVE a View** to a new location on your desktop, **depress** the **LB** in the **View Title Area** – the area on the top of the view showing the words **Plan 2**. Whilst you still have the mouse button depressed, drag the mouse and you will see the View move. **Pin** the View again by releasing the LB.

To **RESIZE a View,** use the standard Windows features to change the size of the View. Place the cursor near any corner or midside of the existing plan view and when the drag arrows popup, depress and hold down the LB and drag the mouse to see the Window size change. Pin the new location of the corner by releasing the LB.

A **DISPLAY** a view **ON TOP** of all the other views, click on any visible part of the view except in the view drawing area (the black part of the view). Or by clicking on the View tab for that view in the View tabs area at the bottom of the view display area.

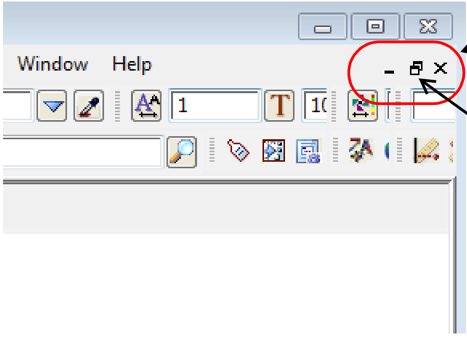


To **MAXIMISE a view**, click on the **Maximise** button on the top right corner of the view. The view will then take the entire view display area and no other view will be visible.

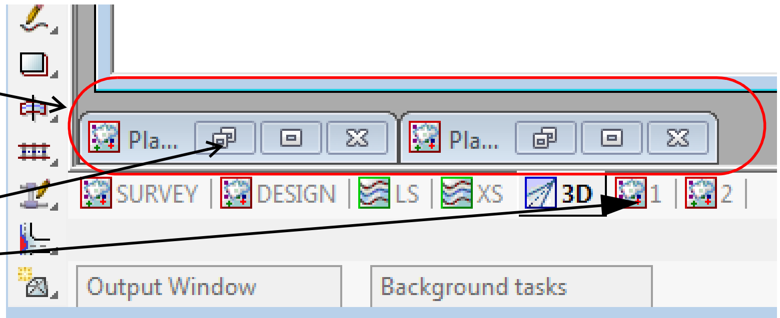


If a view is maximised then clicking on any other View tab will bring that view to the TOP and hence it will become the MAXIMISED view.

When a view is maximised, the three buttons that normally appear in the top right hand corner now appear at the right hand side of the Main Menu area. Click on the **Restore** button to **UNMAXIMISE** the view.

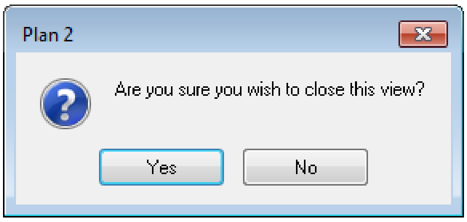


To **MINIMISE a view**, click on the **Minimise** button on the top right corner of the view. The view will be reduced to just an icon at the bottom of the View Display Area. To **RESTORE** the **minimised view**, simply click on the Restore button on the view icon or click on the View tab of the minimised view.

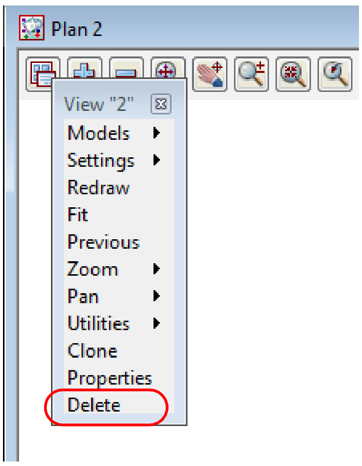


To **DELETE a View** just click LB on the **X** button in the top right hand corner of the view.

A **Yes-No Confirmation** panel will then appear and select **Yes** to delete the view.

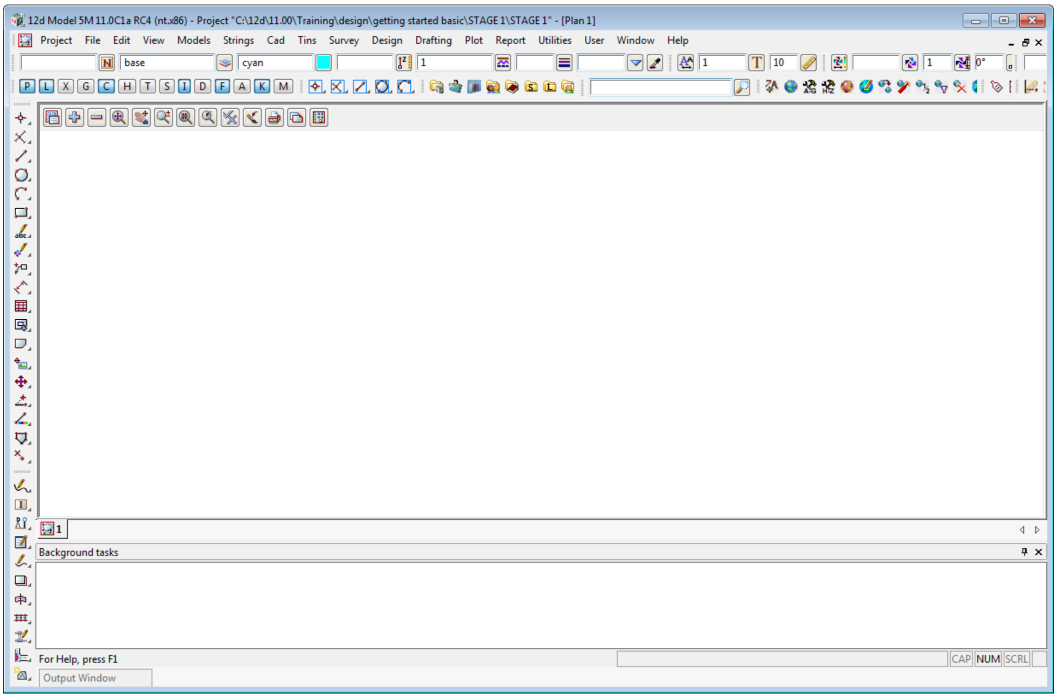


Click LB on **Yes** to confirm the action



For the purpose of the tutorial, delete all the existing views **EXCEPT** Plan View **1** and maximise it to leave just large Plan View called **1** on the desktop.

In the following chapters we will create and demonstrate the use of all the different view types, and how the various views are linked together.



3.11 Introduction to Models

Models are a 12d concept and basically a model represents a repository for data. Each point or line that is created or imported into 12d is put into a model. A model is similar to the layering concept AutoCAD, or levels in Microstation

By adding models to, or removing models from, a view, it is possible to change the amount of information that is displayed on a view. And it is possible to have different models on display in different views.

There is no limit to the number of models used in any one 12d Project.

If you want multiple copies of a certain line (i.e. string), it is possible to copy the line from one model to another. The lines can then be displayed independently. If both models were on at once, the information will appear as one line instead of two since the strings are coincident. It is possible to selectively snap to and edit either line in such a case.

At any time, individual models can be **Renamed, Duplicated, Cleaned** (removes all points and lines but the name of the model is retained) or **Deleted**.

By default, any deleted models will be stored in a **Trash Bin** as a back up. Models in the Trash Bin can be restored at a later time. An example of this will be shown later in the manual.

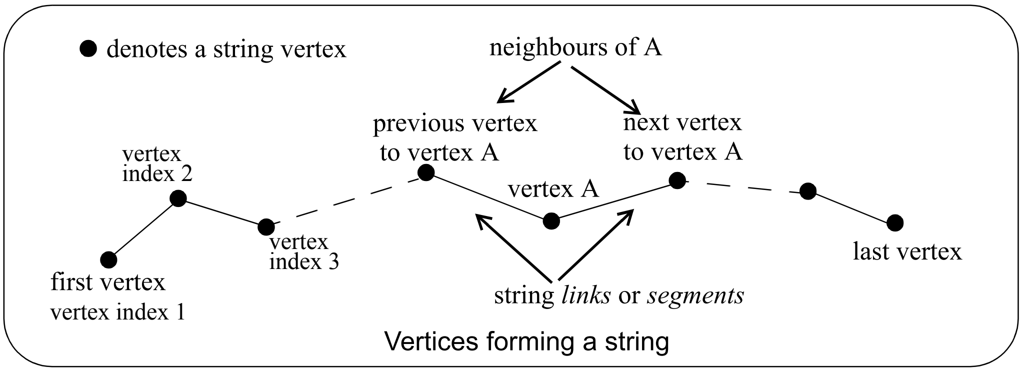
It is possible to copy models between projects (See **Models=>Utilities=>Copy Project Models**) or to Share Models from another project into you project so that you have the latest copy of the shared model. These are more advanced features of 12d that we will not look at in this manual.

3.12 Introduction to Strings

12d is very much a ‘strings’ rather than ‘points’ based system.

In it’s simplest form, a string can be just a single vertex (point), or a line between two ore more vertices.

A string may be made up of many vertices, joined by straight line segments or arc or transition segments.



Strings vary in complexity from 2d (x,y and constant z value) to multidimensional, and an alignment string that has both horizontal and vertical geometry independently defined.

In general, as well as x, y and z values, strings have properties such as string name, string type, string colour, line style, and chainage.

Strings also have a point/line property that can be set such that they appear as disconnected points or connected lines.

From a design point of view, strings are much more useful than points.

3.13 Introduction to Panels

A panel is the means of supplying all the information required for a ***12d Model*** option.

Once a panel appears on the desktop, you can use the mouse or the Tab and BackTab keys (denoted by <Tab> and <Back tab>) to position the cursor over any data field. Remember, when typing data from the keyboard, the cursor must be flashing in the data field for characters to be accepted.

When supplying data to a 12d panel, you do not need to terminate the entry of data into a field by pressing the *Enter key (<Enter>)*. For instance, you can use <Tab> and <BackTab> or the mouse to move to another field after entering data. If you do press <*Enter*> to terminate the entry of data into a field, 12d will immediately validate the data in that field and supply an error message if appropriate.

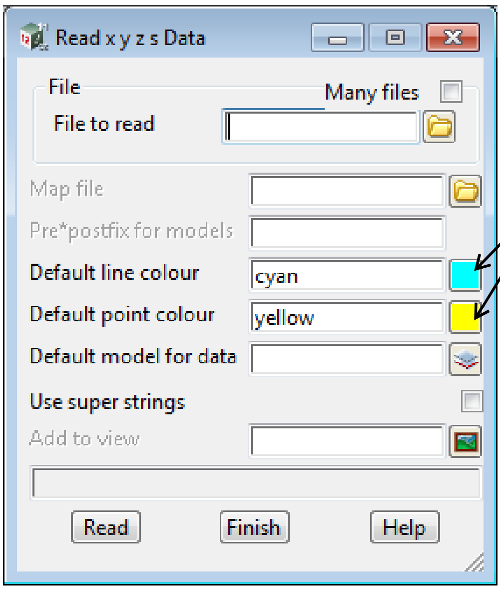
When validating supplied or previously entered data (i.e. where you do not need to change the data in a field), it is not necessary to place the cursor in the data field. Just press <*Enter*> to pass through each field in the panel in turn.

When typing data into a field, please observe that the Delete key (<Delete>) deletes a single character to the right of the cursor. The Backspace key is also active. If you need to delete multiple characters, drag the LB across the characters to highlight them (or double click over a word) and press <Delete> to delete them or start typing to replace them.

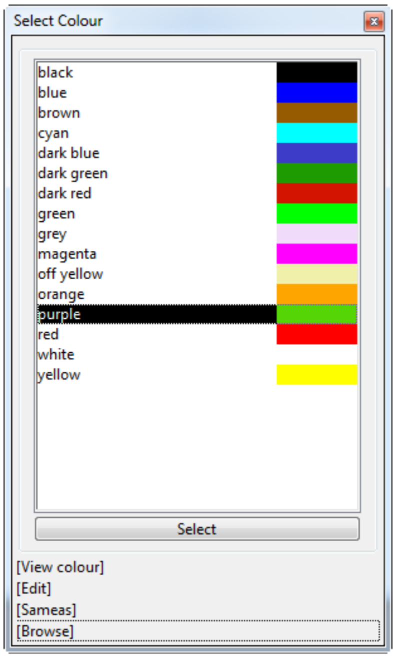
In general, 12d has been setup so that data can be selected from lists rather than typed from the keyboard. When entering data into a field, if there is a list of alternatives already known to 12d, pressing the LB on the icon at the end of the field will display the list.

To practice this, bring up the **Read xyzs Data** panel - from the Main menu, click LB on

File I/O =>Data Input =>xyz =>xyzs



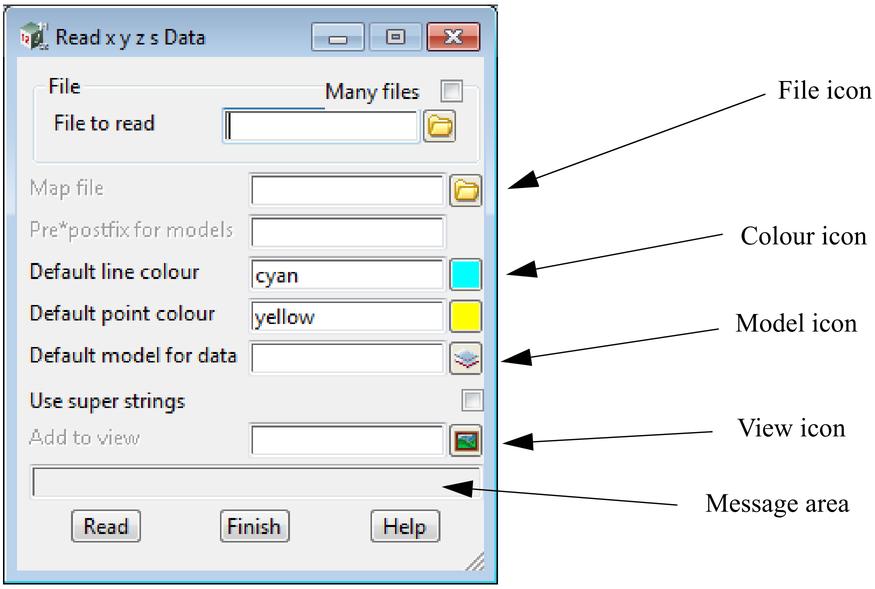
Click LB on a colour icon to bring up the list of colours



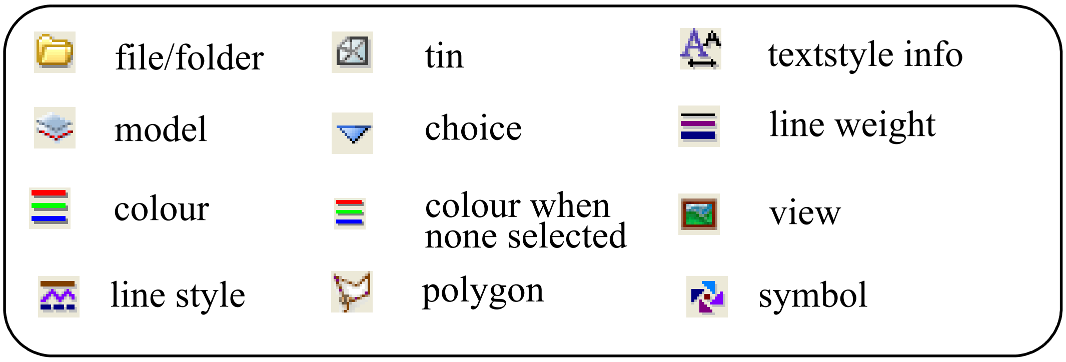
Set the **Default line colour** in the above panel to *dark green* by clicking LB on the colour icon (the icon to the right of the word *red* in the fourth data field). A list of available colours will pop up. Use the mouse to click LB on *dark green* and then process it by clicking LB on the **Select** button at the base of the panel.

Alternatives: You can double click LB on *dark green* to short-cut this sequence. You could also have used the down arrow key to work your way down through the list to highlight the word *dark green* and then pressed < Enter>.

In a manner similar to the colour panel field just discussed, most panel fields have a pop-up list of choices available and the list is activated by clicking on the icon at the right hand end of the panel field. Some times there will be a special icon such as the ***colour*** icon in the previous example or the file box icon at the end of the ***File to read*** field.



Some of the more common icons we will see are:



Note that there is a Message Area at the base of the panel (just above the **Read** button in the ***Read xyzs Data*** panel).

Each panel has its own message area to help you interact with 12d. If 12d does not appear to be working the way you think it should, you will often get helpful information in the Panel Message area. Look in the Screen Message Box as well as it may also be updated when interacting with panels.

If a panel is in the way, you can move it as stated above. Any panel can be removed (shut down) by clicking LB on the **X** button in the top right hand corner or by clicking on the **Finish** button.

If you want to keep a panel that is already filled in such that you can refer to it later, you may decide to temporarily minimise it by clicking LB on the '**-**' button. It can later be maximised again by clicking LB on the 'overlapping windows' button (where the '**-**' used to be).

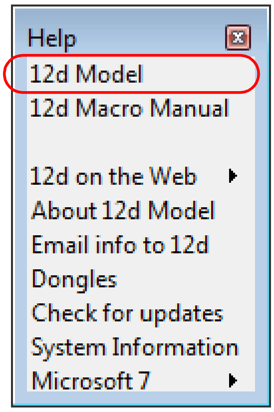
As we don't wish to proceed further with this panel click LB on **Finish** or click LB on the **X** button in the top right hand corner of the panel.

4 12d Model Help

Position of option on menu: **Help =>12d Model**

All the information in the ***12d Model* Reference** manual is also available as electronic **Help** accessed from within ***12d Model*** (also know as the ***12d Model* Context Sensitive Help**).

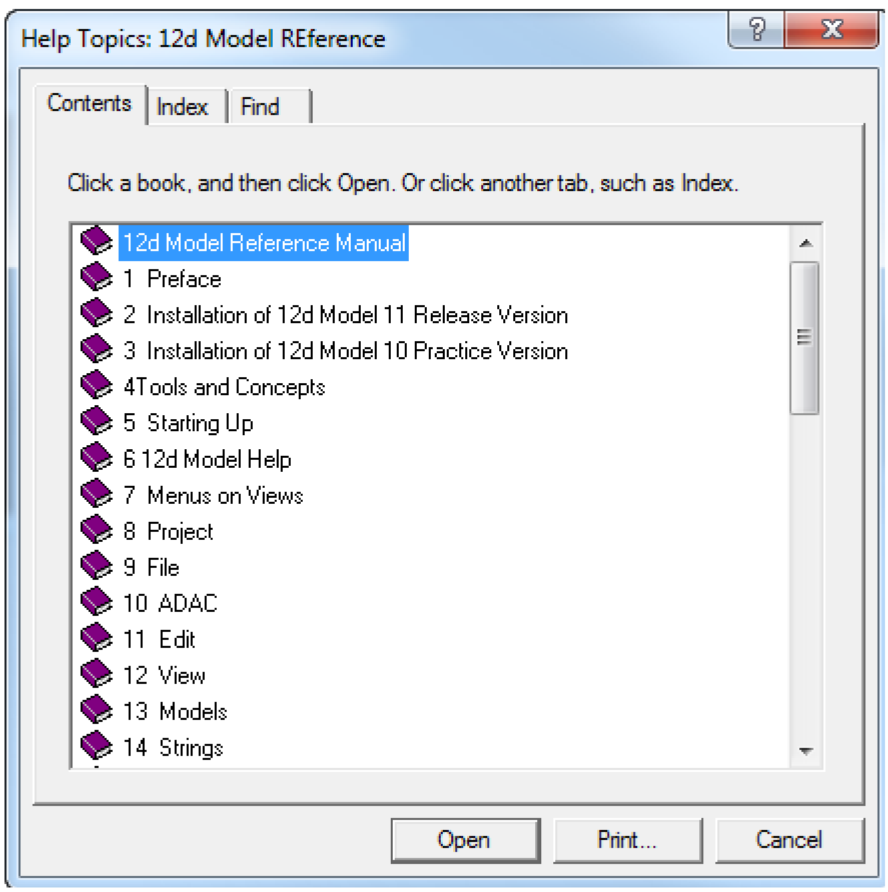
The entire ***12d Model Help*** manual can be accessed by selecting ***12d Model*** on the **Help** menu item on the main ***12d Model*** menu.



12d Model help
12d macro programming language help

links to web site www.12d.com.
12d Model modules authorized, dongle number
email details of your 12d Model to 12d Solutions
dongle testing panel
check for newer versions of 12d Model
brings up Microsoft's System Information panel
For Windows 7 links to the WinHlp32.exe

Clicking on ***12d Model*** brings up **Help Topics: 12d Model Reference**



The panel **Help Topics: 12d** is actually using Microsoft's ***WinHlp*** system and it allows you to look at the overall structure of the ***12d Model*** *Help* and access any part of it. More information on using the tabs **Contents**, **Index** and **Find** will follow in the next section.

Alternatively, individual topics for a panel or menu can be invoked by pressing the F1 key whenever the focus is on the menu or panel, or by clicking on the *Help* button on any ***12d Model*** panel (see F1 Key). This is the *context sensitive* nature of the ***12d Model*** Help.

For some options, there is also additional help files and videos. This is denoted by a * after **Help** on the **Help** button. That is **Help*** (see Extra Help).

It is also possible to have a **Help** button and **F1** key available for ***12d Model*** PLs (macro) programs written by 12d Solutions or by Users. Please see the ***12d Model*** *Programming Language* manual for more information on this feature.

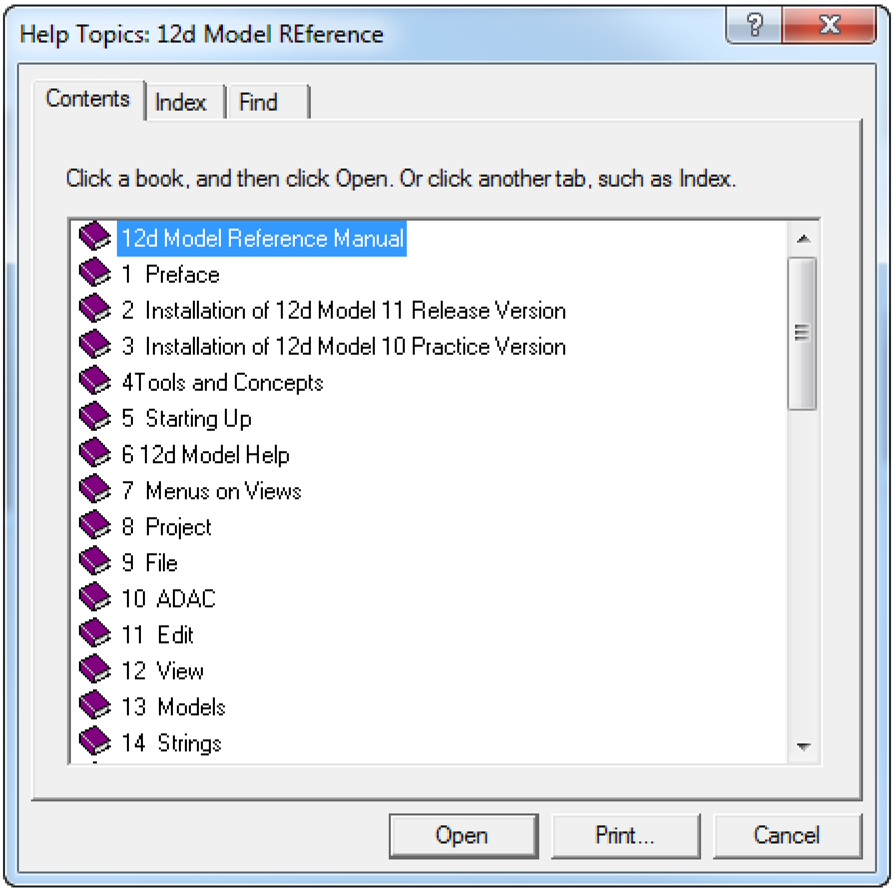
Note: The ***12d Model*** *Reference* manual is available in pdf on the ***12d Model*** installation DVD, or on the 12d web site www.12d.com.

More information on the **Help** system is given in the sections:

Contents
Index
Find
Panel Help Button
F1 Key
Navigating in Help
Extra Help

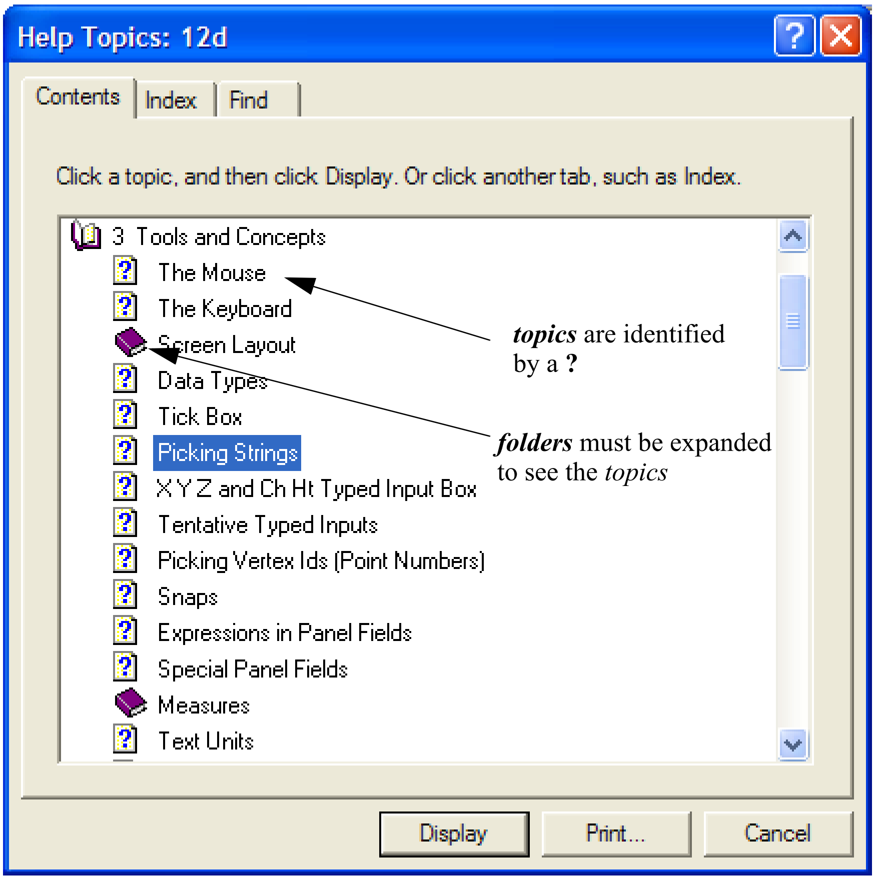
Contents

The **Contents** tab allows you to look at the overall structure of the ***12d Model*** *Help* and access any part of it.



Warning - only *topics* in the *Contents* can be viewed in *Help* so any folders in *Contents* folders must be expanded until *topics* are displayed. *Topics* can be easily identified because they have a question mark beside them indicating that *Help* is available and can be viewed.

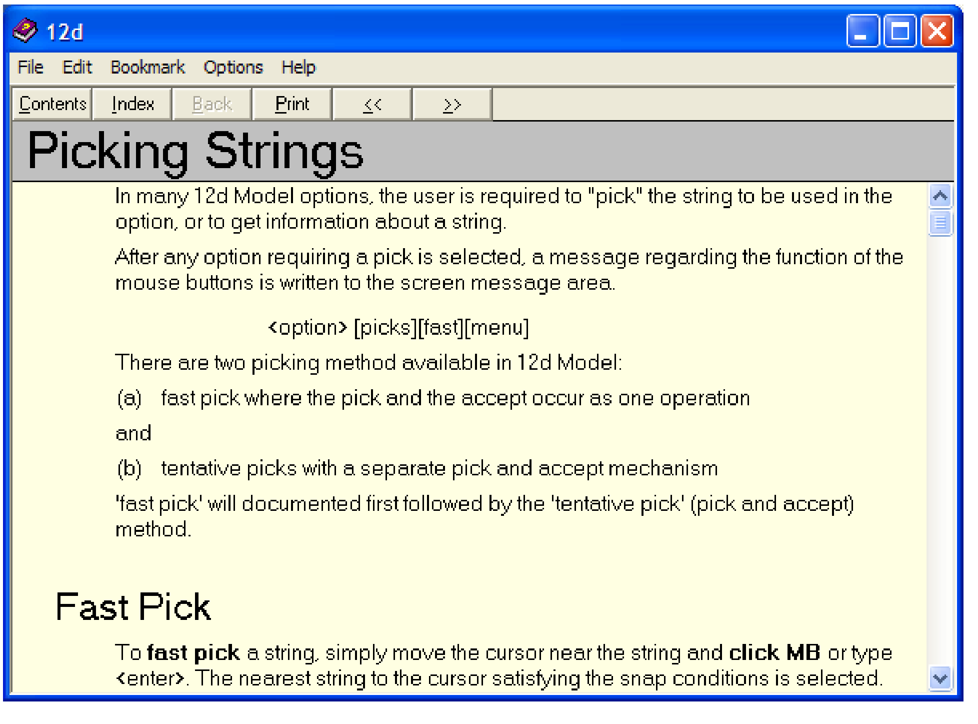
For example, double clicking on ***Tools and Concepts*** expands the next level of ***Tools and Contents***.



and topics are *The Mouse*, *The Keyboard* etc.

Double clicking on the topic ***Picking Strings*** will then display the topic.

The ***Contents*** then disappear leaving *Help* open at the selected topic.



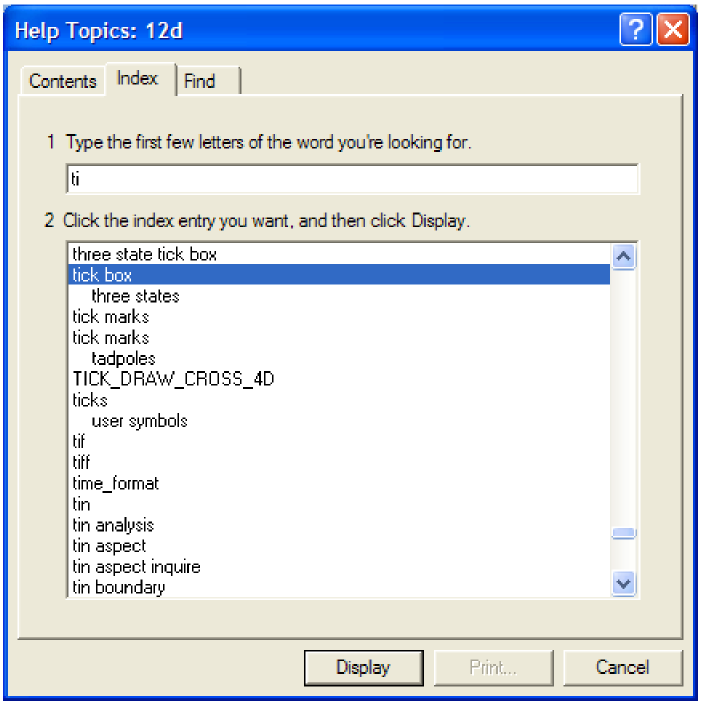
Double clicking on ***Contents*** on the top of the *Help* will bring the Contents listing back up.

Continue to Index or return to 4 12d Model Help.

Index

The *Index* tab searches through all entries in the Index of the Help.

As the first few characters of the required entry are typed in, the matching index entries are displayed.



Double clicking on the displayed entries will go to the topic in the Help containing the selected index entry. If more than one topic includes the index entry, then the list of topics is displayed.

If the index has sub-indices, they can be searched by first typing in the main index followed by a comma, then a space and the first few characters of the sub-index.

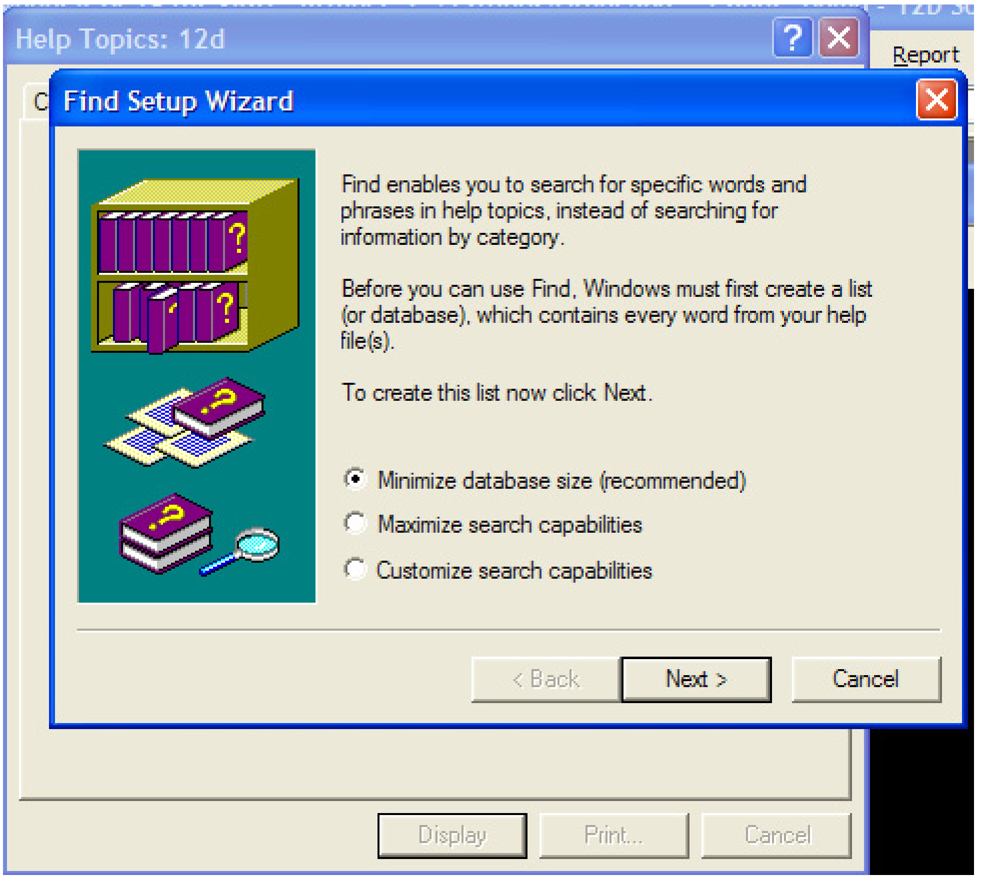
Continue to Find or return to 4 12d Model Help.

Find

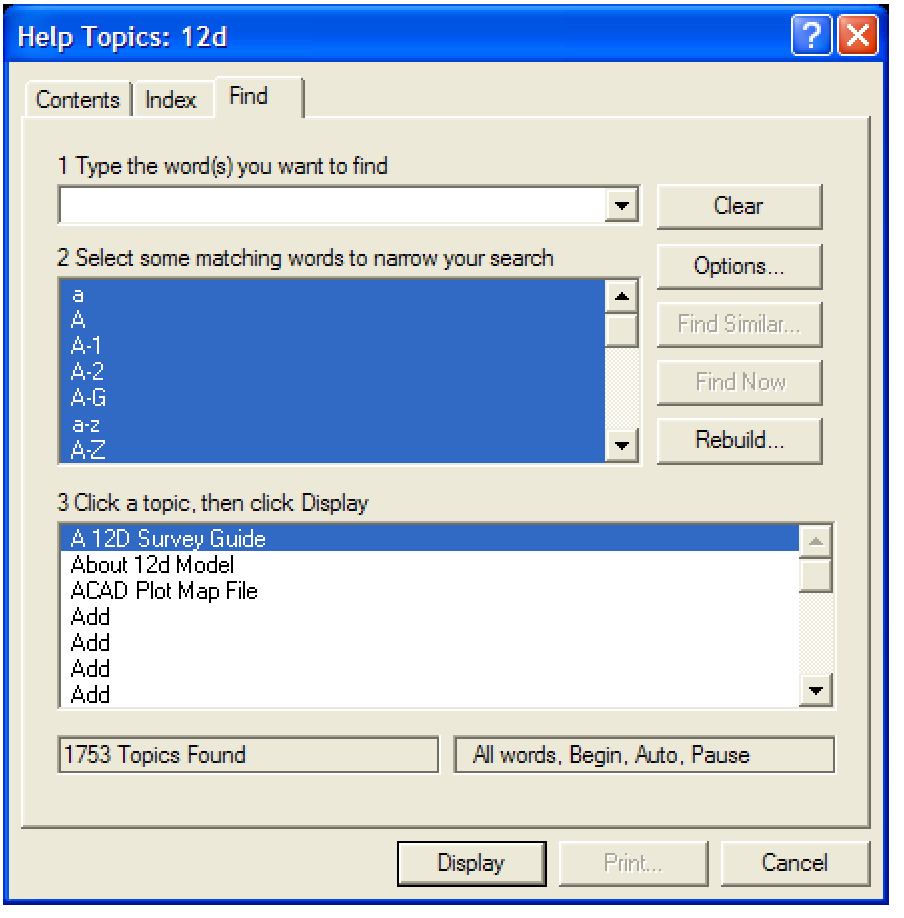
The most powerful searching method for the *Help* system is *Find*.

Simply click on the *Find* tab to search for words or phrases that may be contained in a Help topic.

If *Find* is being invoked for the first time, the ***Find Setup Wizard*** runs to create an index of every word in the Help.



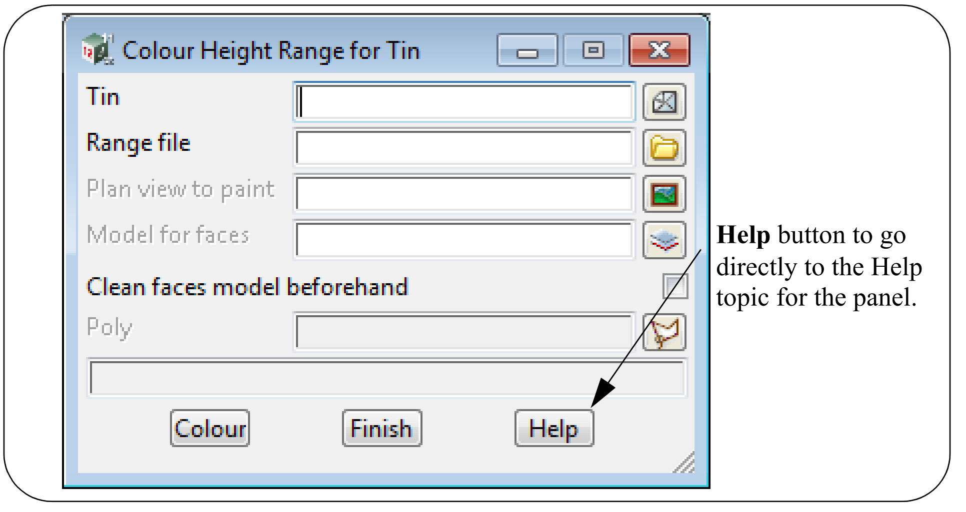
From then on, selecting the *Find* tab goes straight to the *Find* screen.



Continue to Panel Help Button or return to 4 12d Model Help.

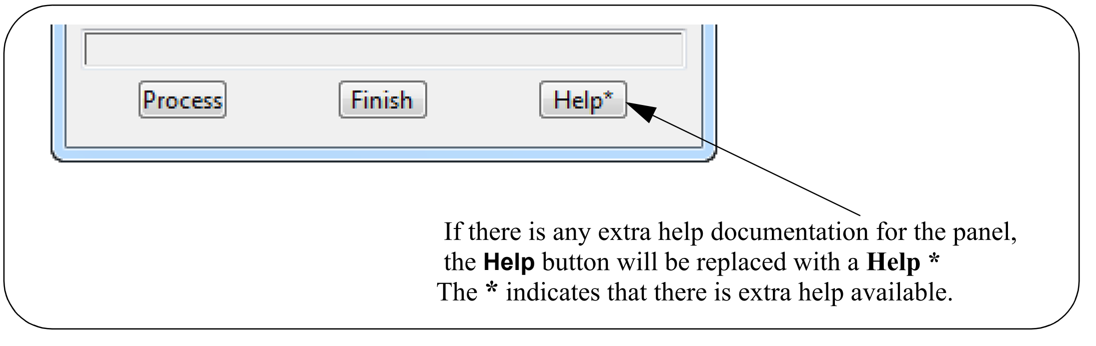
Panel Help Button

Every panel has a **Help** button which when selected goes to the *topic* describing that panel.



The default ***12d Model*** **Help** is all in one *Winhlp* file but a method for displaying additional help information exists so 12d Solutions, 12d Distributors and Users can supply additional (extra) **Help** information.

If there is extra help available for an option, then **Help*** will appear instead of **Help** on the panel button.



Information on how the extra help is set up is given in the section Extra Help.

Continue to F1 Key or return to 4 12d Model Help.

F1 Key

Another method of invoking **Help** is by using the **F1** key as follows:

> when a **menu** or **panel** is on the screen and has focus (the menu or panel title area will be highlighted), or the cursor is over an item on a **toolbar**, pressing **F1** will bring up the *help* for that menu, panel or toolbar item.

Warning - some of the items on the *Strings* menu automatically start up a string select and change the focus from the panel to a View. This means that pressing F1 will bring up the Help for the View and not the Help for the panel.

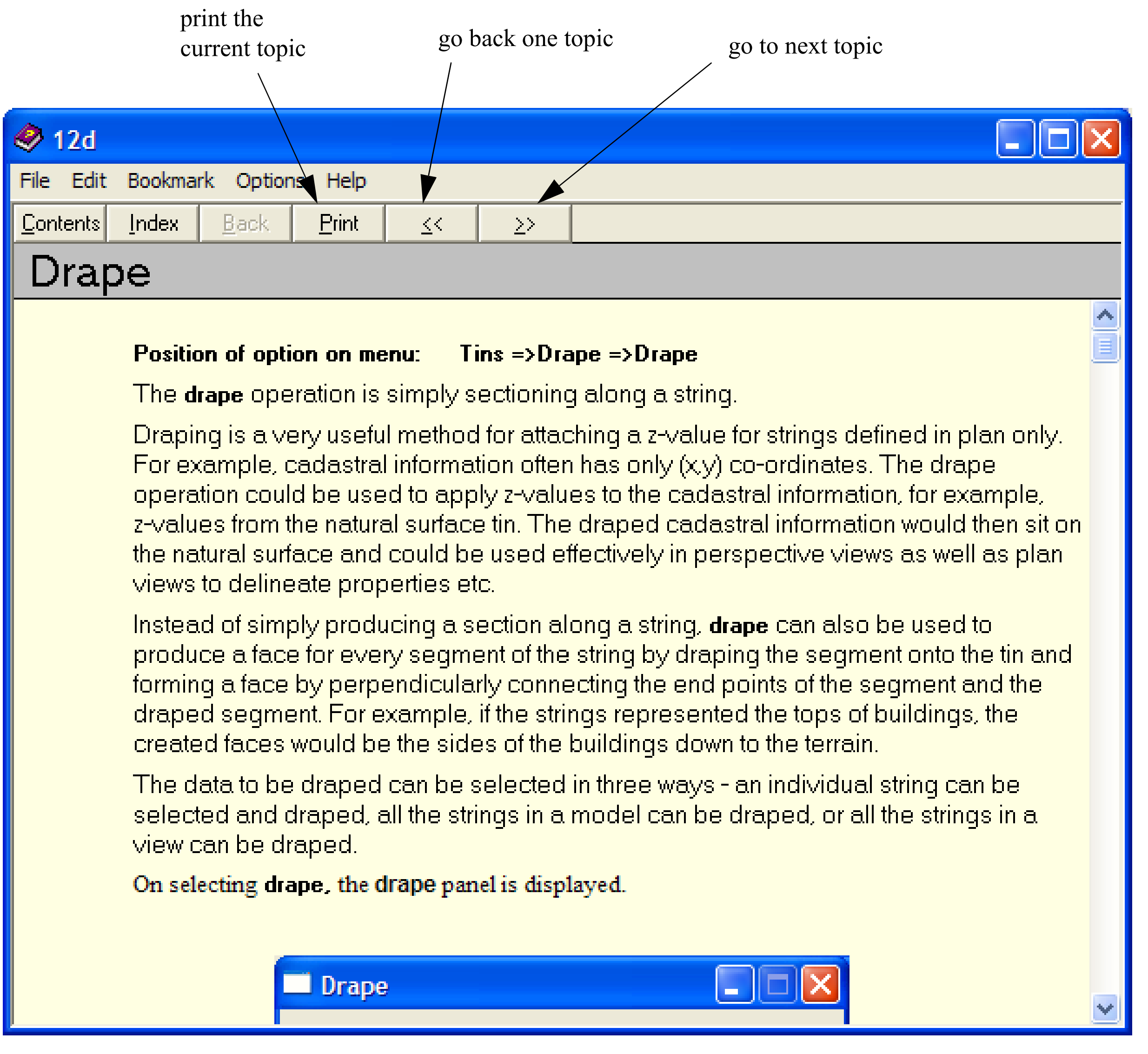
To get **Help** for such a panel, click on the panel to bring the focus back to the panel before pressing F1. The top of the panel will highlight showing that it has focus.

Continue to Navigating in Help or return to 4 12d Model Help.

Navigating in Help

Once at a *topic* in the Help, the **<<** and **>>** buttons at the top of the Help topic will go to the previous and next Help topics respectively.

Individual Help topics can be printed by clicking ***Print*** at the top of the Help page.



Because it is difficult to print large sections of Microsoft's Help system, a PDF file of the entire ***12d Model Reference*** Manual has been created and can be used to print out large sections of the manual.

The ***12d Model Reference*** Manual PDF file is on the ***12d Model*** *11 Installation DVD* in the folder ***Documentation\Reference Manual***.

Continue to Extra Help or return to 4 12d Model Help.

Extra Help

The default context sensitive ***12d Model*** **Help** is all in one help file supplied by *12d Solutions* but a method for displaying additional help information exists so 12d Solutions, 12d Distributors and Users can supply additional (extra) **Help** information. This extra information can also be supplied by ***12d Model*** PLs (macros) written by 12d Solutions or Users.

How to Set Up Extra Help

Any extra help for an inbuilt panel (that is, one not created by a macro) is placed in a folder with the same name as the dump name for the panel without the ending after the “.” (to get the dump name, see ***Dumping a Panel, Creating a Screen Layout File or Default File*** in *12d Help* or the ***12d Model*** *Reference manual)*.

For macros, created by Users or 12d Solutions, there can only be the same Help button for any panels created by the macro and the extra help for the macro is placed in a folder with the same name as the macro without the ending "4do" after the “.” **and** with any blanks or non alphanumeric characters replaced by a underscore ("_"). For example, the extra help files for the macro called "testing help (3) system.4do" go in a folder called testing_help__3__system. Note there is an underscore for the blanks and the "(" and ")" in the macro name.

The extra help files for an inbuilt panel or macro can have *any name* and can be a pdf, wmv, avi. txt etc.

For example, for the panel ***Project Tree*** brought up by selecting **Project** =>**Tree,** the extra documentation would be in a folder called ***Project_Tree.***

The folder of extra help for a panel, is then placed in any one of the three places:

(a) in the *Help* folder in the ***12d Model*** installation area: For example, for version 11

c:\Program Files\12d\12d Model\11.00\Help

c:\Program Files (x86)\12d\12d Model\11.00\Help

(b) in a folder called *Help* inside the *Set_ups* folder in the ***12d Model*** installation area. For example

c:\Program Files\12d\12d Model\11.00\Set_ups\Help

c:\Program Files (x86)\12d\12d Model\11.00\Set_ups\Help

or

(c) in a folder called *Help* inside the *User* folder in the 12d User area. For example

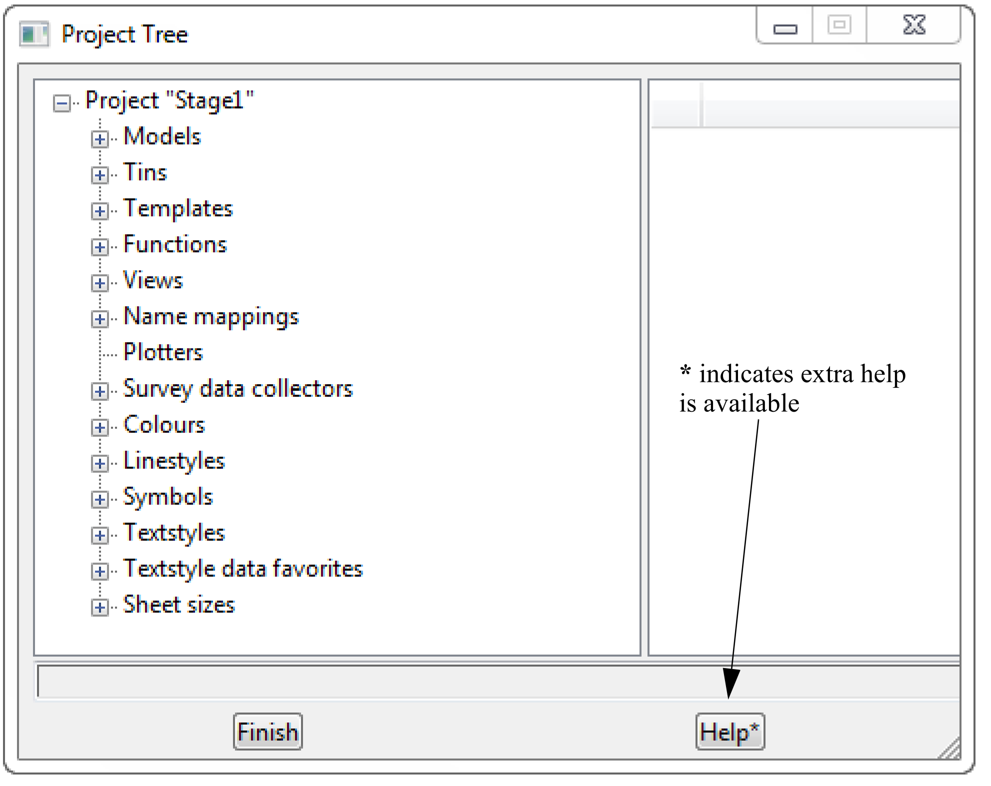
c:\12d\11.00\User\Help

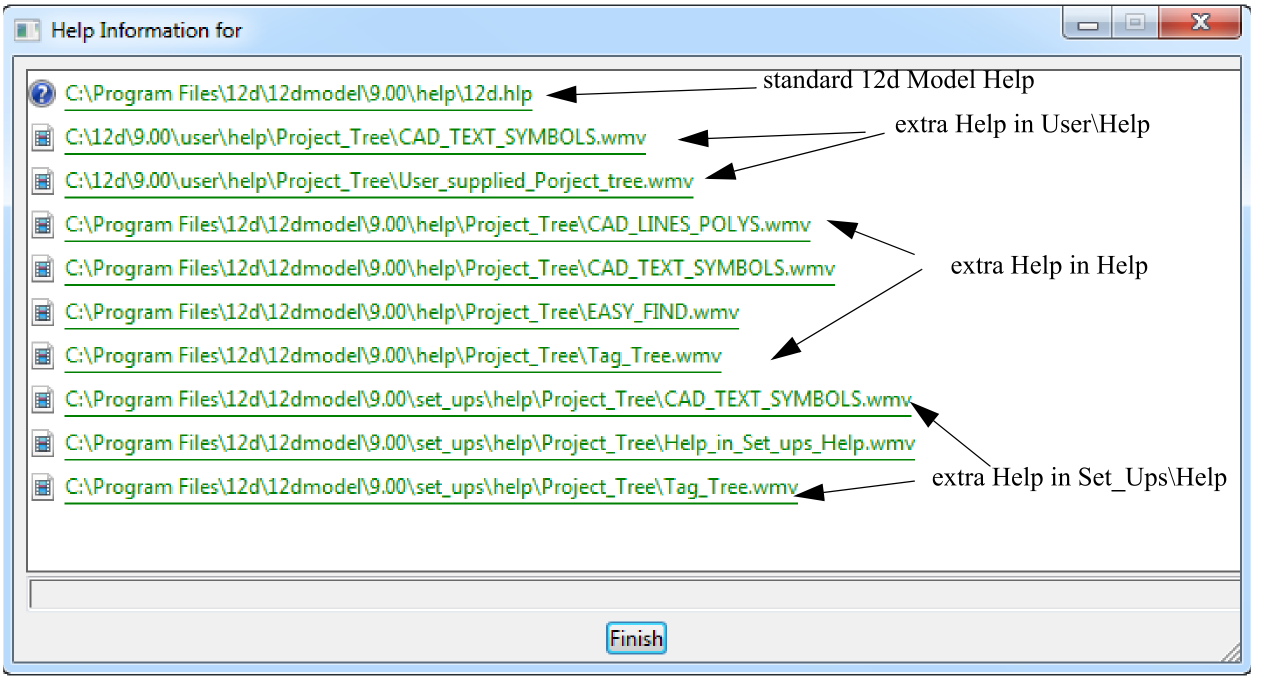
For an inbuilt panel an macro, each of these areas is searched and if any extra help is found, it is listed with the full path to each extra help file.

If there is any extra help for a inbuilt panel or macro, the **Help** button on the panel will be replaced with a **Help *** button. The ***** indicates that there is extra help available.

When you click on the **Help** * button, you will get a list of all the extra help files for that inbuilt panel or macro with the full pathname to the extra help. Clicking on the file name will bring up that extra help.

For example,



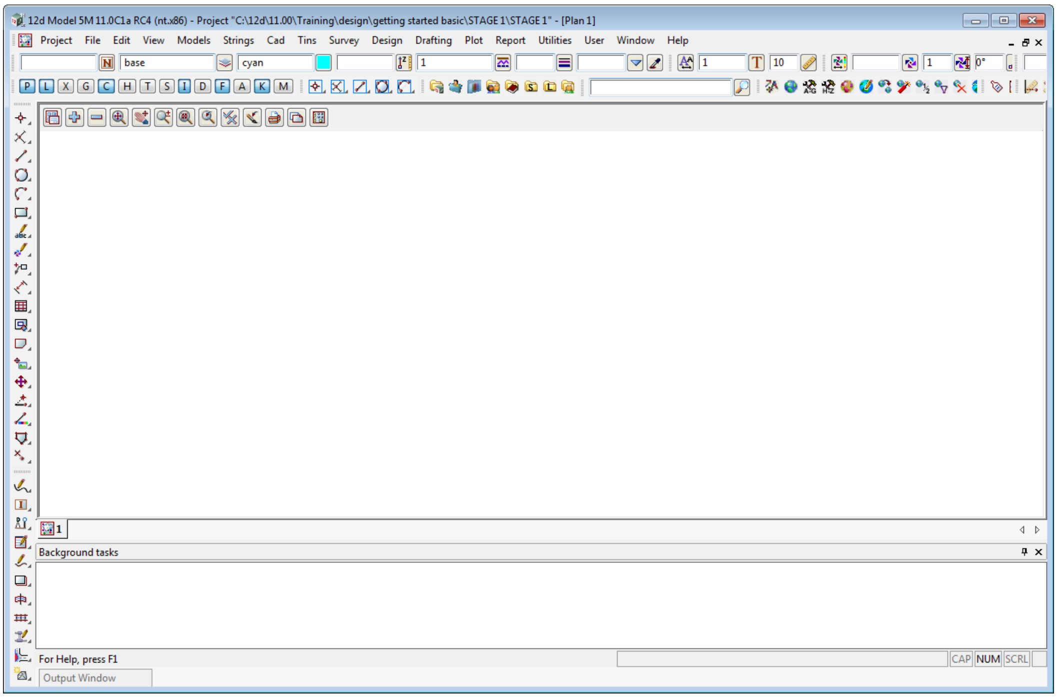


Users Own Extra Help Files

Note that users can also have their own extra help files and the files are simply placed in the correctly named folder under **User\Help**.

5 Starting the Tutorial

Before starting your tutorial, it is assumed that your overall desktop layout is as shown at the end of Chapter 3.10.1 Basic View Operations, i.e. one large Plan view on display called **1**.



5.1 Importing Point Data into 12d

The easiest way to understand the use of Models and Panels is to import some data into 12d and see by example.

Point and Line data can be imported into 12d from a variety of sources. For the purposes of the tutorial, we will use the simplest of these - a simple text file containing point number, x, y and z coordinates along with a code and string number.

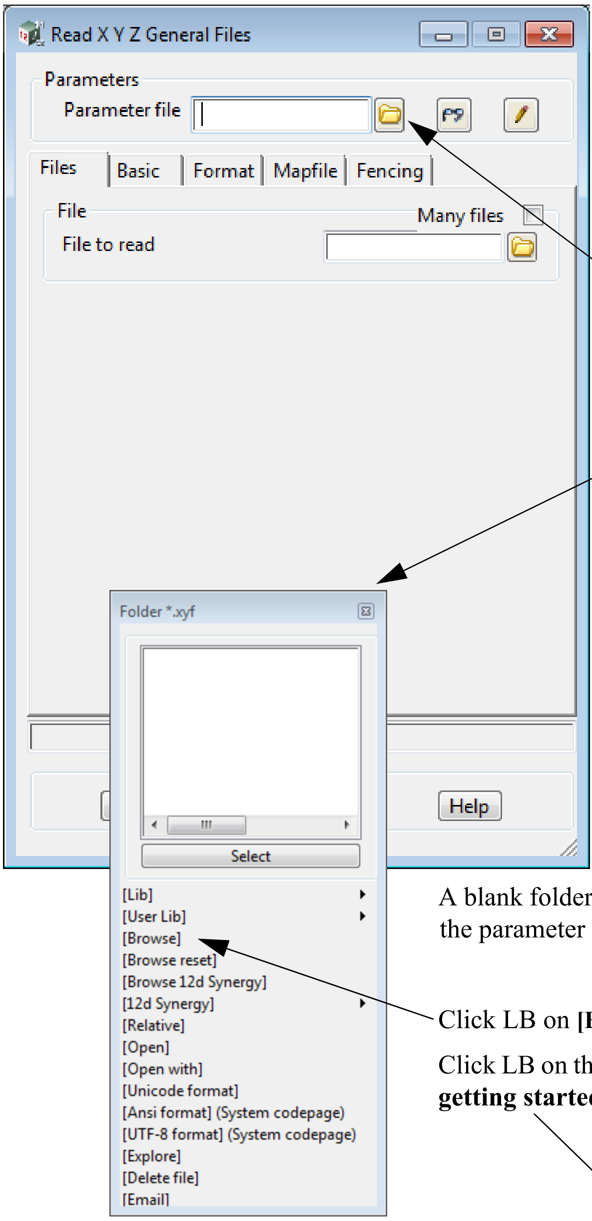
We will begin by reading in a Points file called 'DETAIL SURVEY.csv'.

This file lies in the folder **C:\12d\11.00\Training\design\getting started basic**

```
1,42518.873,36865.368,71.833,DR,1
2,42535.232,36859.942,69.805,DR,1
3,42556.394,36847.968,69.349,DR,1
4,42572.709,36848.796,67.75,DR,1
5,42592.277,36848.967,65.879,DR,1
6,42606.098,36848.526,64.818,DR,1
7,42612.6,36847.949,64.739,DR,1
8,42410.27,36954.217,72.574,DR,2
9,42419.677,36955.067,71.904,DR,2
10,42433.789,36954.863,70.552,DR,2
11,42446.673,36955.149,69.777,DR,2
12,42460.181,36955.284,68.955,DR,2
13,42474.806,36955.092,68.24,DR,2
```

The format is one point per line containing a point number, x, y and z coordinate, string name and string number all separated by commas.

To read in the file, click LB on **File =>Data Input =>x y z =>x y z general** from the Main menu.



12d gives you the ability to fill in this panel once and then save the setup to a parameter file. This allows you, on subsequent occasions, to call up the parameter file and then you only need select the data file to be read.

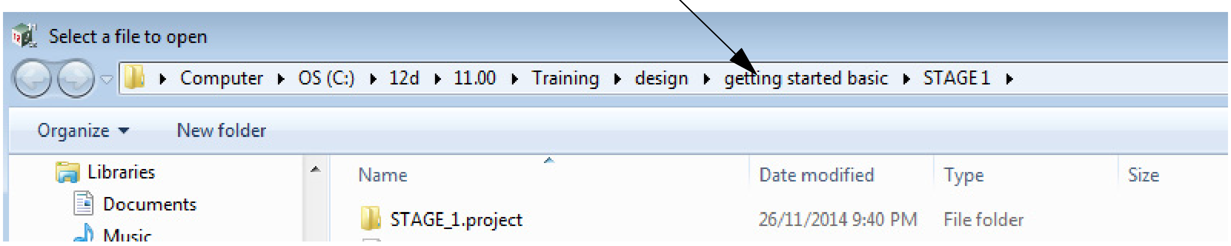
To make things easier we have already created a parameter file and stored it in **Getting Started Basic** folder.

Click on the folder icon at the end of the ***Parameter file*** field.

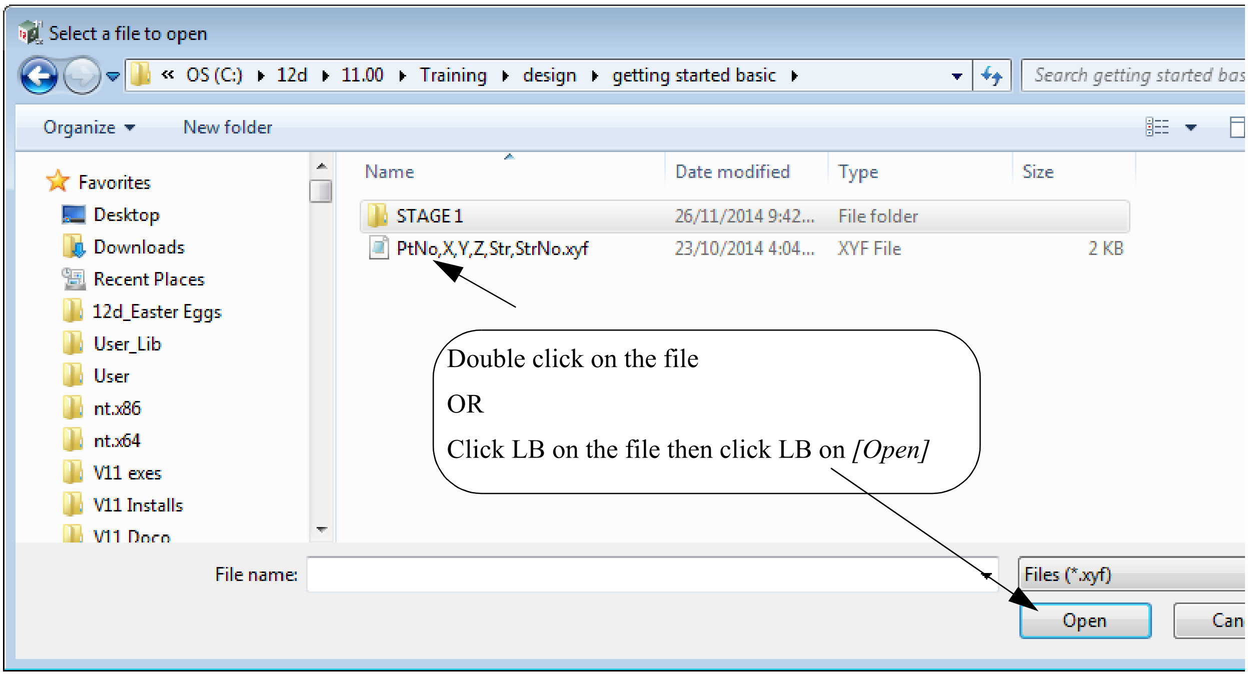
A blank folder panel will pop up, but we will browse for the parameter file

Click LB on **[Browse]**

Click LB on the *getting started basic* to move back to the **getting started basic** folder



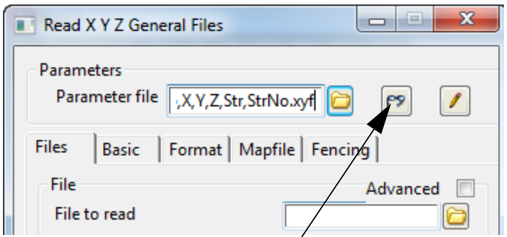
<u>**Note that if you have created the training project in a folder different to the one shown here then you will have to navigate to the required folder**</u>



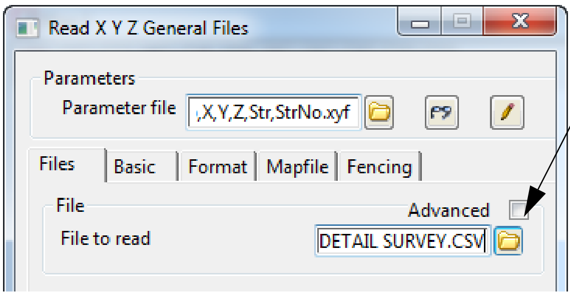
Double click on the file

OR

Click LB on the file then click LB on *[Open]*

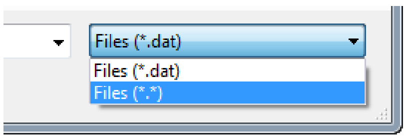


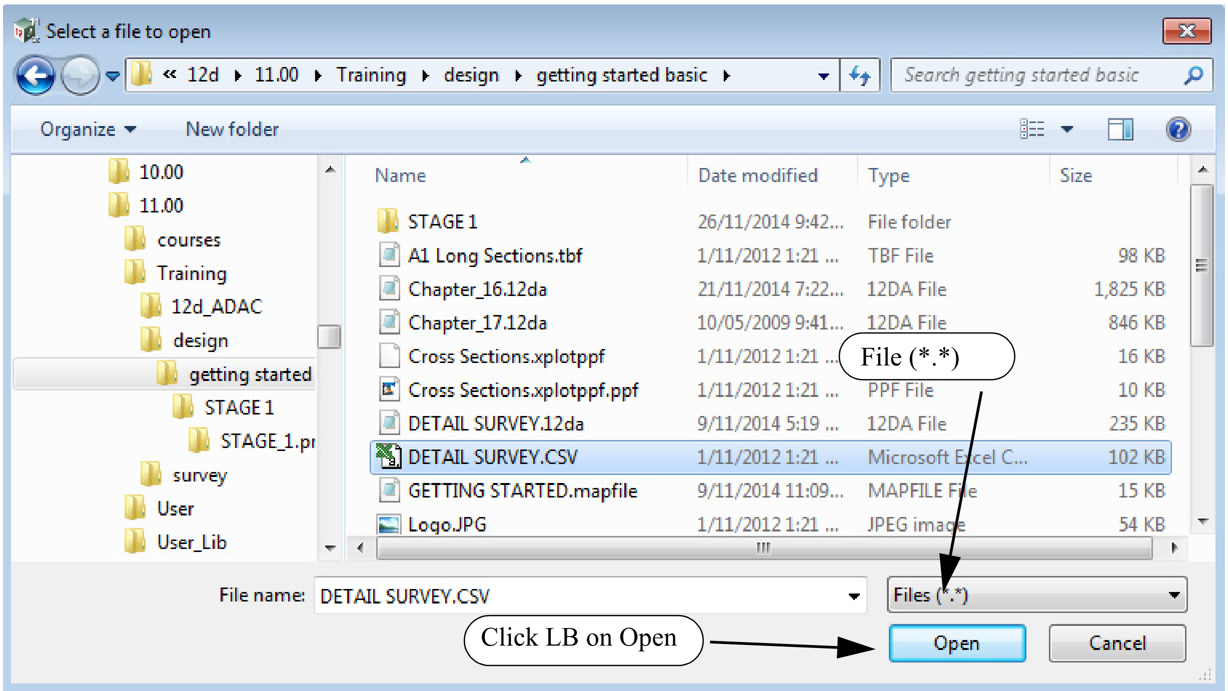
Click LB on *Read* icon to load the parameters



Using the folder icon browse to the same folder that held the parameter file (**C:\12d\11.00\Training\design\getting started basic)** and locate the file DETAIL SURVEY.csv.

You will have to change the *File type* display to *All files (*.*)*

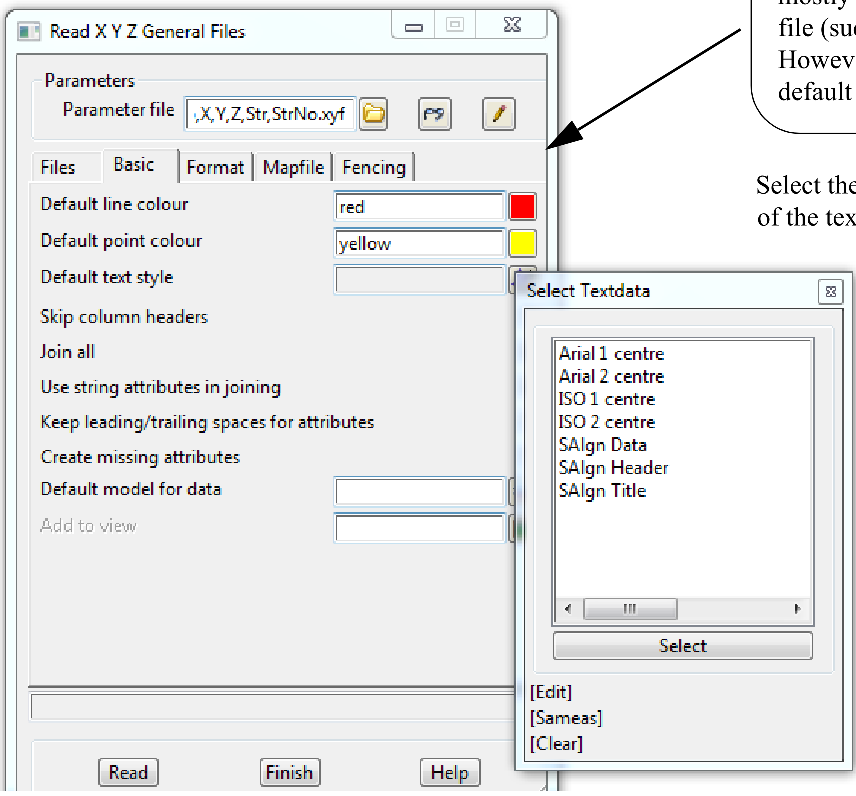




Select the **Basic** tab

You will notice that the panel is mostly filled in from the parameter file (such as red and yellow). However, you still need to set the default text field

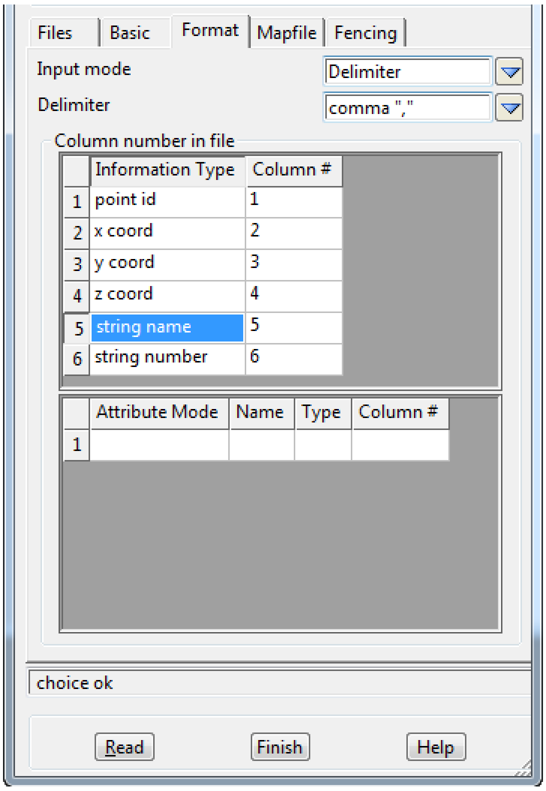
Select the choice icon then select any of the text style



Select the **Format** tab

The format for the file values are already set up by the xyf file.

No user entry is needed for this tab



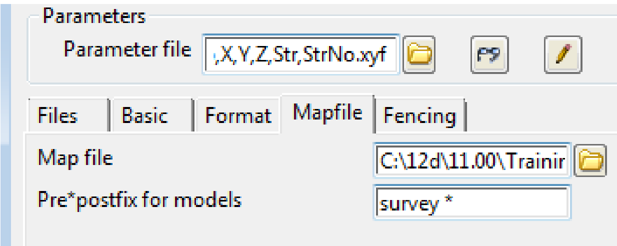
Select the **Mapfile** tab

A user defined Map File uses the code found in the data file to set the parameters for the strings including the model name, linestyle, colour and more.

The path name of the Map File GETTING STARTED.mapfile has also been set up by the xyf file.

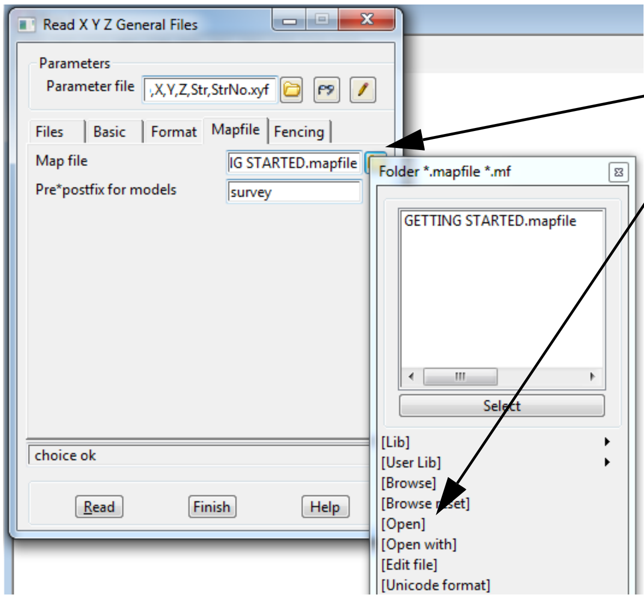
"GETTING STARTED.mapfile" already exists in **C:\12d\11.00\Training\design\getting started basic.**

A model prefix **"survey *"** (note that there is a space after the word ***survey***) is used to group the survey models together after the map file has set the model names. This will help keep the survey data separate from the design. Using lower case for the word will send the models to the bottom of the listing

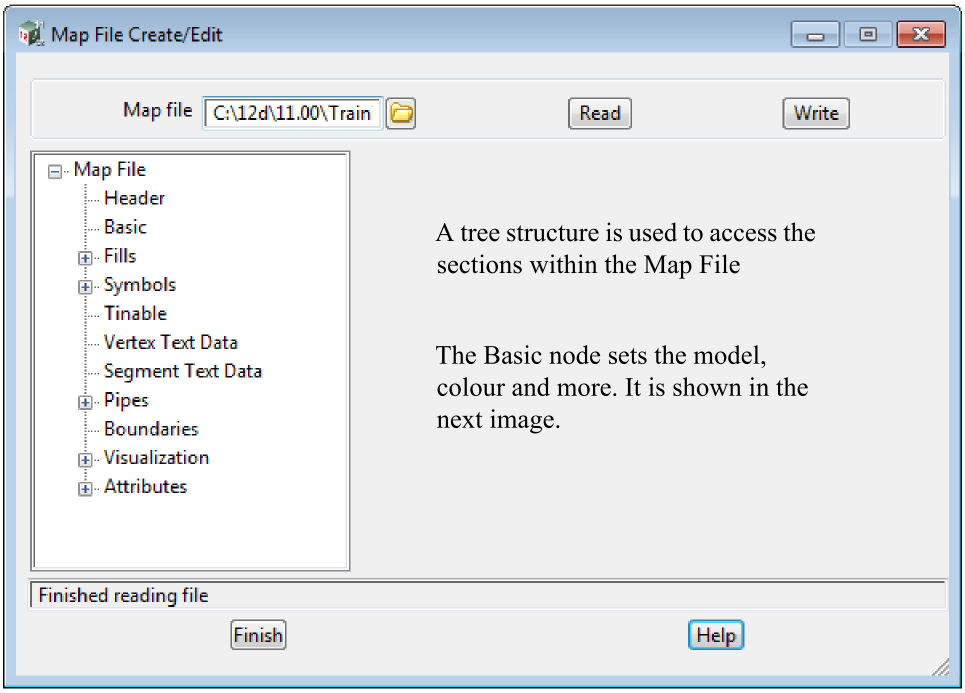


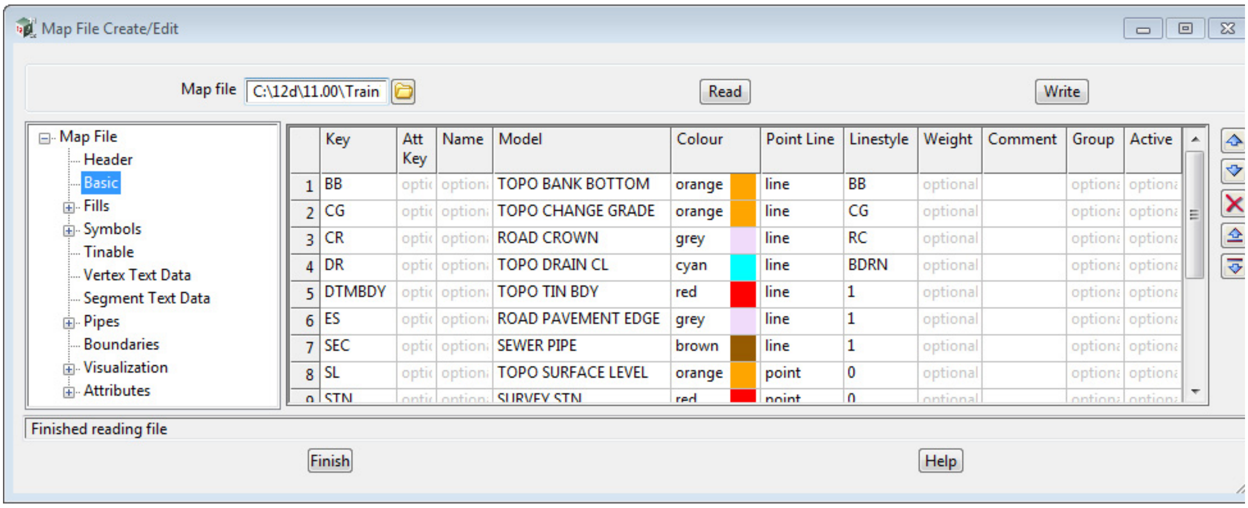
We'll have a look at the Map File so that you are aware of how it works and what the Map File is doing.

To open the map file



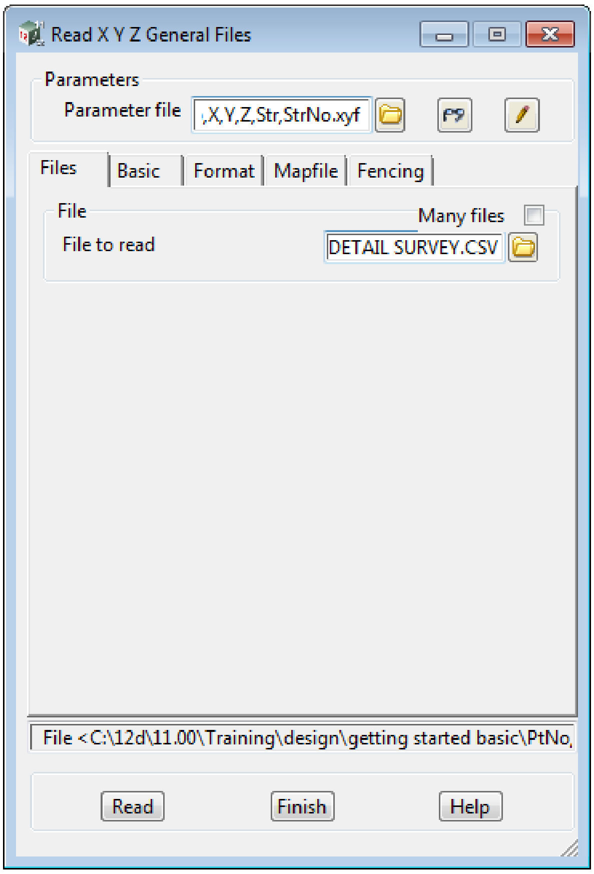
Select the folder icon then select **[Open]**





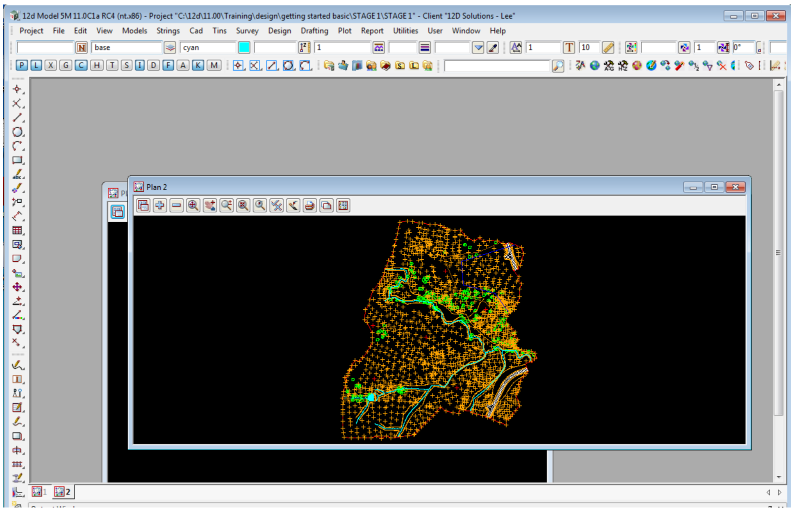
Click LB on **Finish** to exit the mapping file

Now that we've had a look at the Map file, we'll read the data in using the **Read X Y Z General** panel

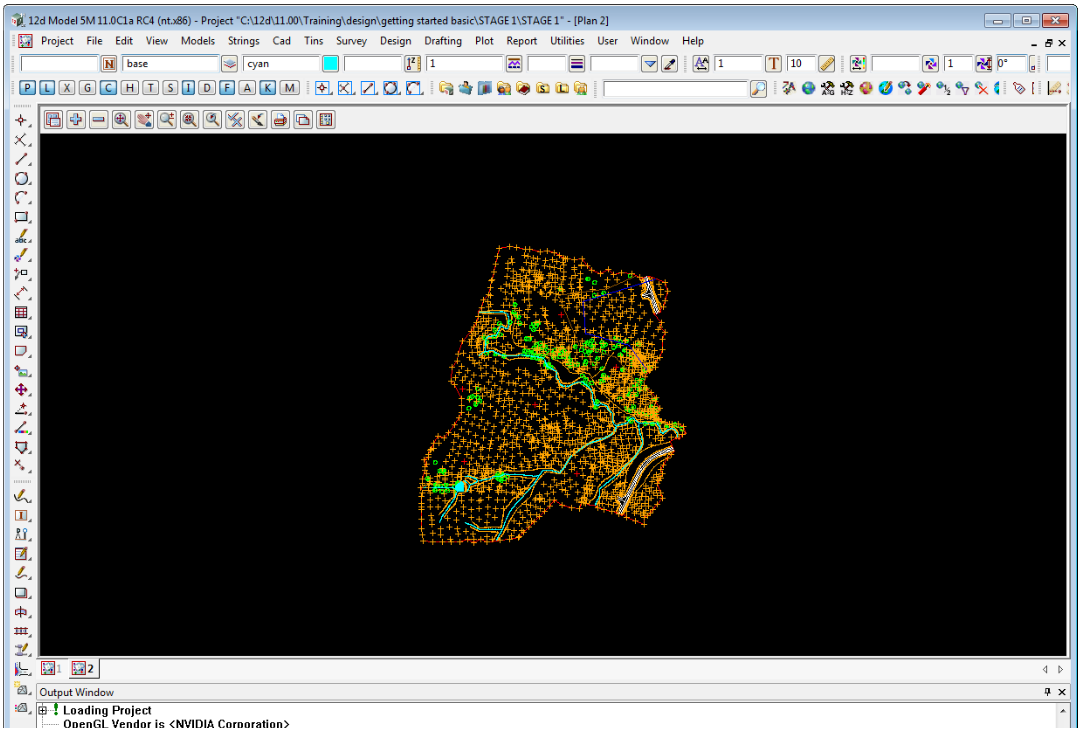


On the **Read X Y Z General** panel, click on **Read** to import the data file.

You will notice that a new Plan view called **2** view has been created and the models containing the data read in have automatically been added to the view. This is the default action when reading data in.



Maximise Plan view 2 and the screen should look like:



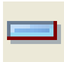
5.2 Plan View Operations

Now that we have some data, we can begin to look at some more of the Plan view features of 12d.

Menu

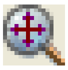
Bring up the Plan view Menu.

Adding/Removing models



In the Plan View Button Area, you will observe a '+' and '-'. This is a shorthand technique for turning models on and off.

Click on the '-' sign button with LB. A list of available models to remove from the view pops up. Pick 'survey VEG TREE' and click LB on 'Select'. You will observe the tree symbols in model 'survey VEG TREE' are removed from the view. The '+' works in a similar way to add models to the View. Practice adding and removing models from the view with the + and -. Remember, the models are not being deleted with the '-', merely removed from the current View. Turn back on the tree model **survey VEG TREE.**



Fit

After multiple pans and zooms, you sometimes wish to return to a point where all of your data appears in the view. This is equivalent to an AutoCAD Zoom-Extents. Click on Fit with LB to see all of your data.

Dynamic Pan

This facility allows you to move the centre of the view but retain the current zoom factor. Click on Pan with LB. You then press down LB on a point in the View and then drag the mouse. The data in the view will move with the mouse until LB is released.

Zoom

Select Zoom (to Zoom In) from the Plan View Button area with LB. Click LB on two diagonal points of a rectangle and then click LB once anywhere in the plan view. The information will appear enlarged based on the size of the rectangle.

MB Wheel Zoom

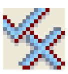
If your mouse has a wheel as part of the middle button, then it can be used to dynamically zoom in or out. Simply click LB in the plan view at the point you want to zoom about and then roll the wheel forward to zoom in and backwards to zoom out.

Shrink

This is equivalent to Zoom Out. It works just like Zoom but in reverse.

Previous

If you click LB on Previous, the view will appear as it was prior to the Zoom. 12d always keeps the details of the previous view setting available so that you can return to it quickly. Only one level of previous view settings is kept.



Toggle

There are multiple items under the Toggle Pop Up menu. At this time, we will try only one of them. Select **Grid** with the LB. A rectangular grid should appear. If you click LB on **Toggle =>Grid** again, the Grid will be removed from the display.
The appearance of the grid can be changed by clicking LB on the Menu button in the View Button Area and click LB on **Settings =>Grid.** You can change any of the settings in the panel. Try changing the grid

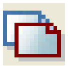
spacing from 100 to 10 in both x and y directions and click LB on **Set.** You will notice that the Grid can be turned on and off from either the panel settings or the **Toggle =>Grid** switch. Click LB on **Finish** to terminate the panel.

Refresh

All the information on the view will be redrawn. This can also be achieved by clicking MB anywhere in the *View Title Area* or anywhere in the *View Button Area* except over the '+' or '-' buttons.

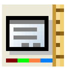
Plot

Bring up the Plan view Plot Menu. This has options to generate a quick plot of what is on the screen, plot *plot frames* and drainage plan plots



Clone

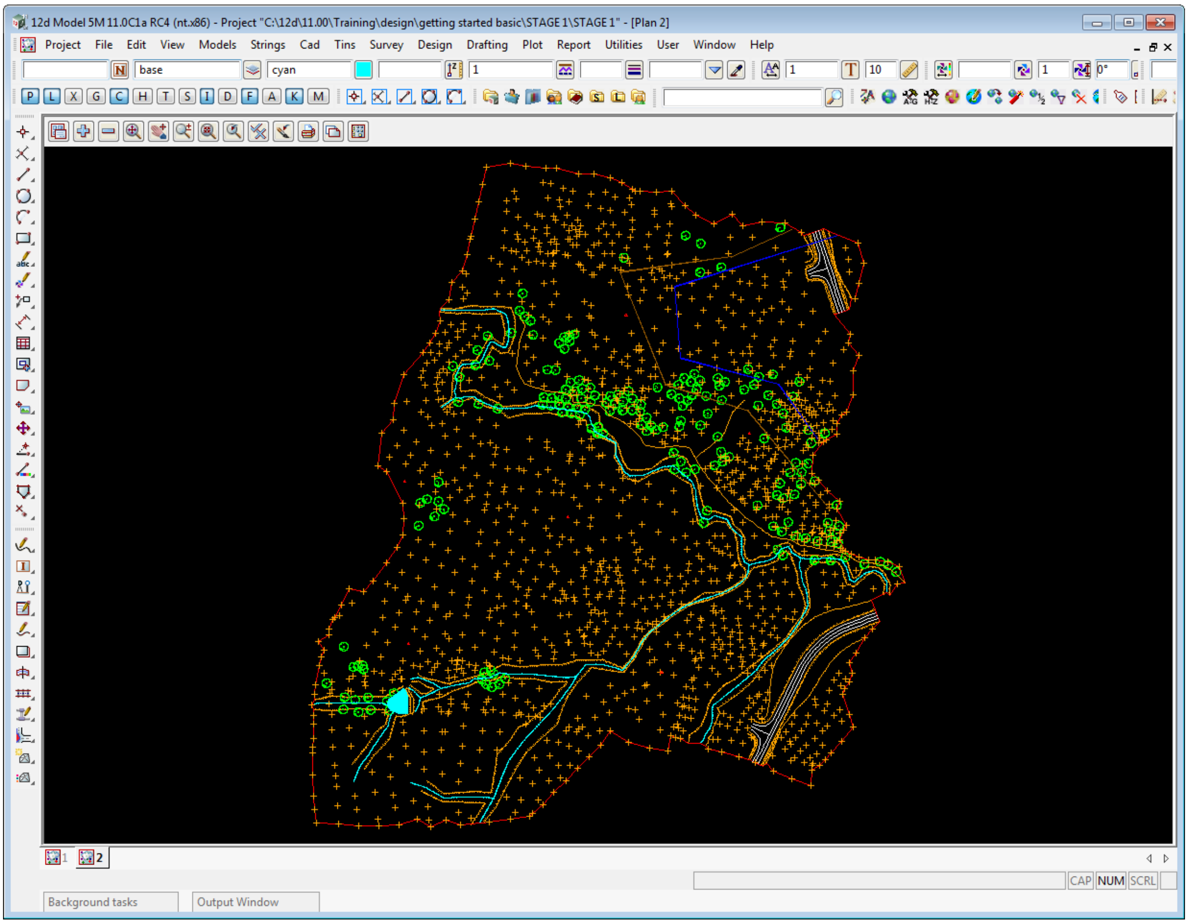
Creates a copy of the view.



Properties

Brings up the Plan View Properties panel for this view.

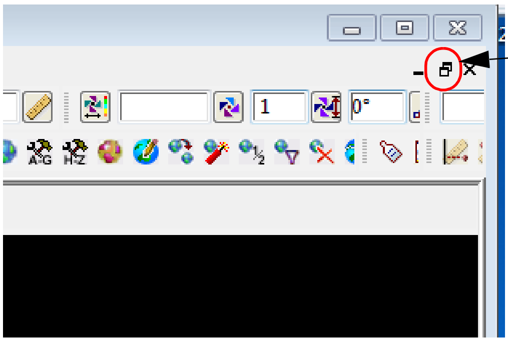
If we clicking on the Fit icon  on Plan 2, then we will get.



5.3 Birds-Eye Views and Throwing Between Views

To introduce some new concepts in 12d, we will need both of the Plan views on the screen at once.

First we'll un-maximise Plan 2 by clicking on the **Restore** icon for the current maximised View (there can only be one maximised view).

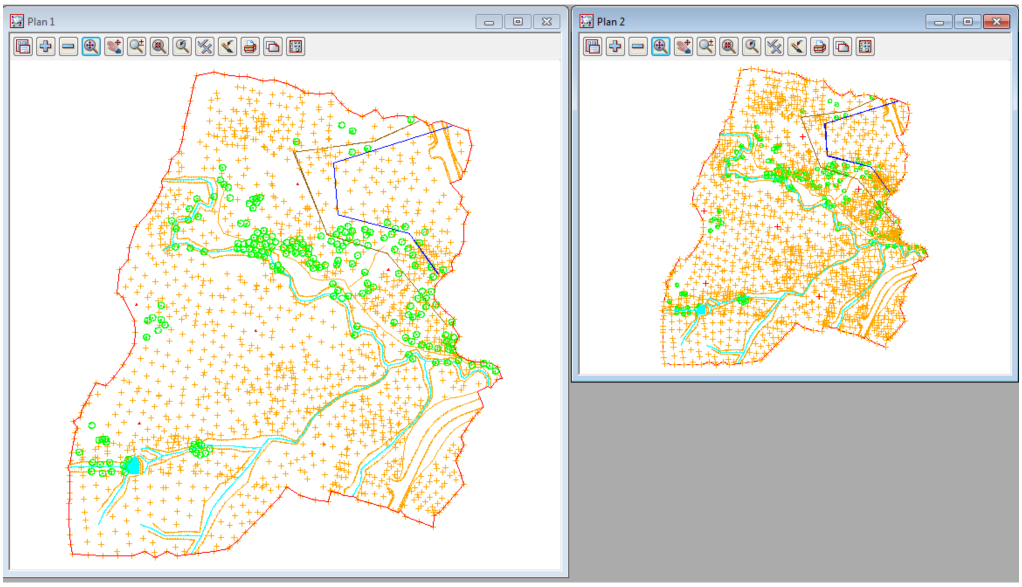


Restore the maximised view to its previous un-maximised state

Now resize and move the views around so that Plan 1 is on the left and takes up half the area and Plan 2 is on the right and only takes up around 2/3 of the area.

From the main menu, click LB on **Views=>New=>Plan** and place a small view about 50mm square in the top right hand corner of your desktop. This will create View 'Plan 2'. See Chapter 3.10.1 for full details on how to create and resize Views.

In the View Plan 1, use the + view button to turn on all of the models. Do a Fit to both views.



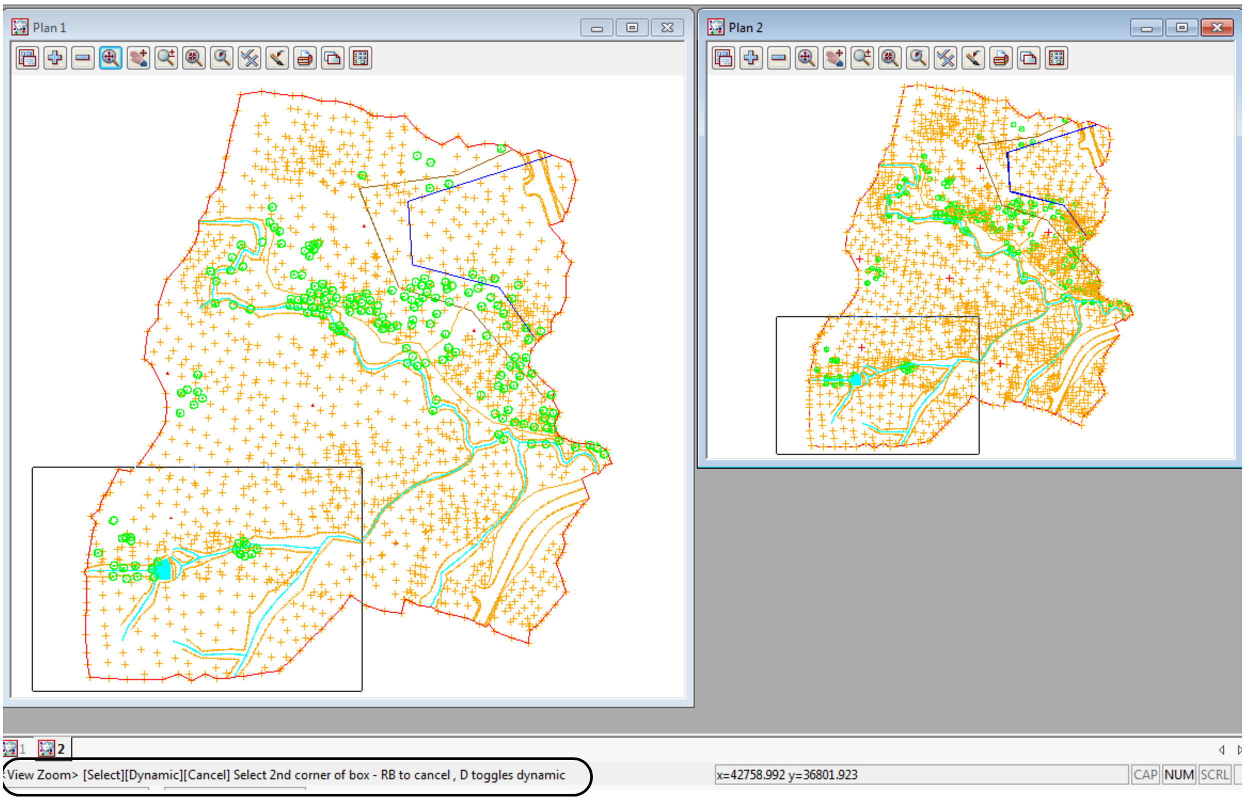
Note: the quickest method of adding all the models on one view to another view is to user the option ***View =>Models transfer***.

From the Plan 2 View Button area, click LB on **Zoom** and click a point in the lower left corner of the View Plan 2. Before selecting the second point of the Zoom rectangle, move the cursor into the other View i.e. Plan 1.

Notice that the second point of the Zoom rectangle is being taken from the second view and the view box is drawing in both views.

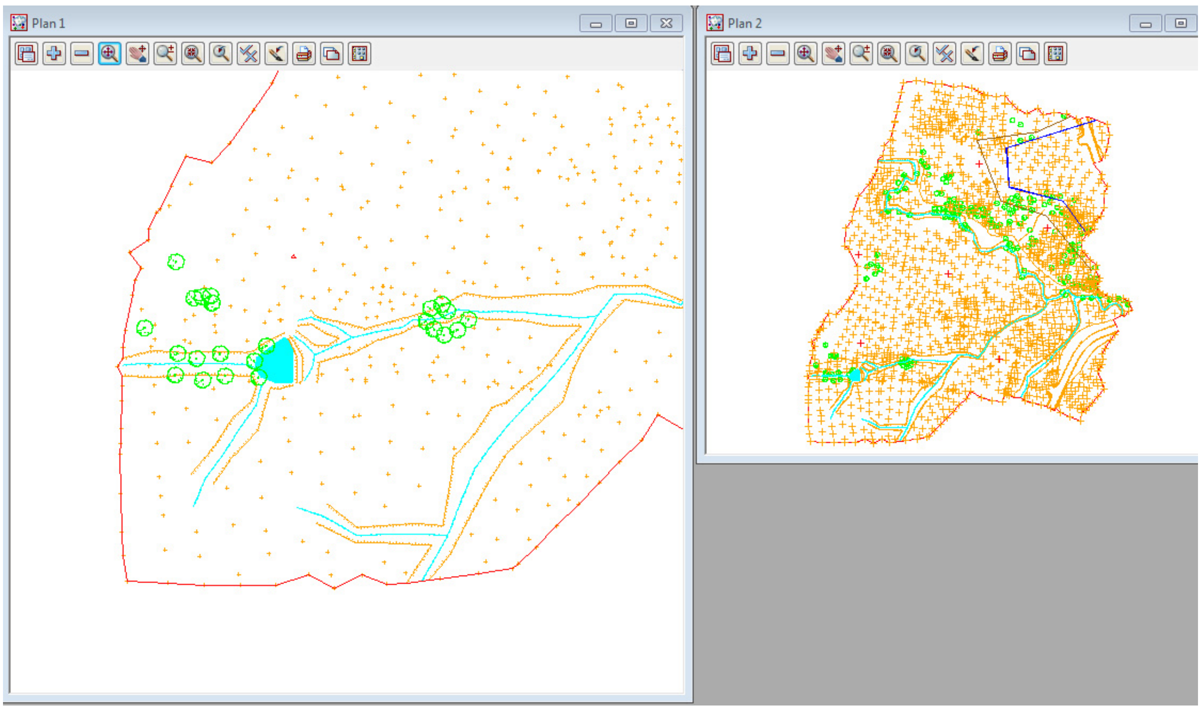
Select the second point of the Zoom rectangle in either View, and take it at the bottom left hand corner of the data.

After selecting the second point of the Zoom rectangle, you will notice the prompt **Select destination view - RB to cancel** in the Screen Message Box



12d is prompting you to select the View you want **zoomed**. That is, the view that you want to zoom rectangle to take up the entire view.

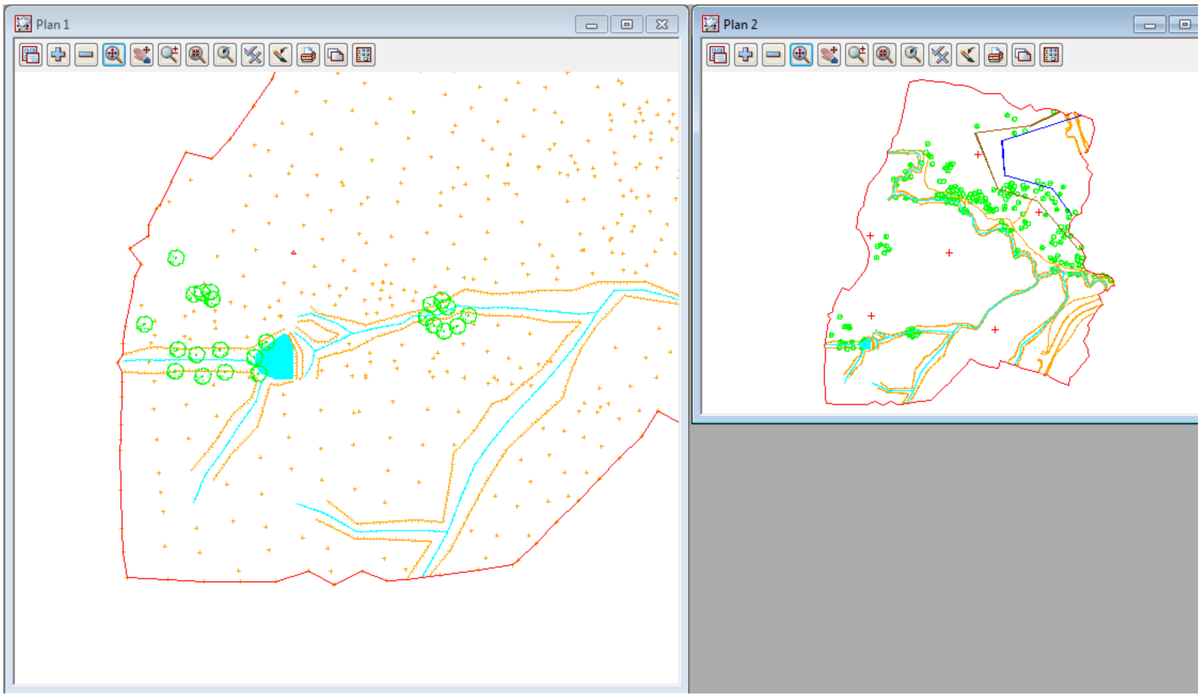
Click LB in View Plan **1**. The zooming will then take effect in View Plan **1**.



Notice that using this technique, it is possible to achieve a birds-eye effect where the smaller View displays the complete model whilst the larger **working** view is zoomed to an extent where it displays only the detail that you are currently working on. You would typically define all of your zoom rectangles in View Plan 2 but have the zoomed details updated in View Plan 1.

You can even do this with different models turned on in each view. For example, in the birds-eye view, you would typically only turn on sufficient detail to enable you to zoom on known features.

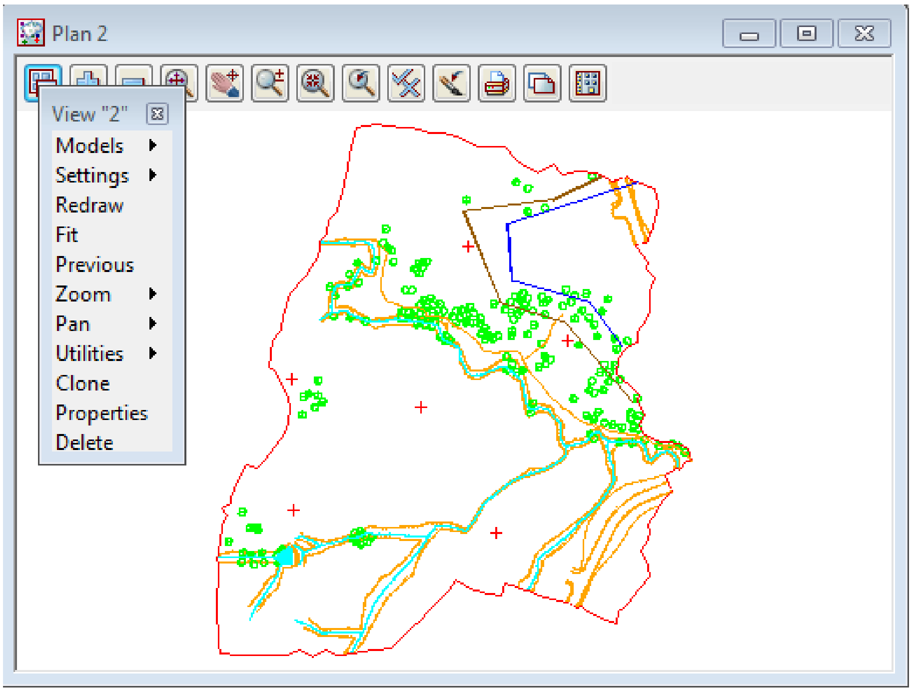
To see this, click LB over the **-** button on View Plan 2 and remove the model **Survey TOPO SURFACE LEVEL**. This will make the large scale details much easier to see on view Plan 1 and still have the full level of detail on the zoomed in view, Plan 2.



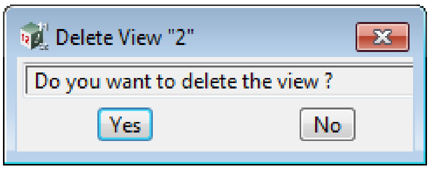
Please practice zooming and throwing between Views as it is a powerful concept in 12d.

After completing this exercise, delete View Plan 2 as it is no longer needed by using a second way to delete a View.

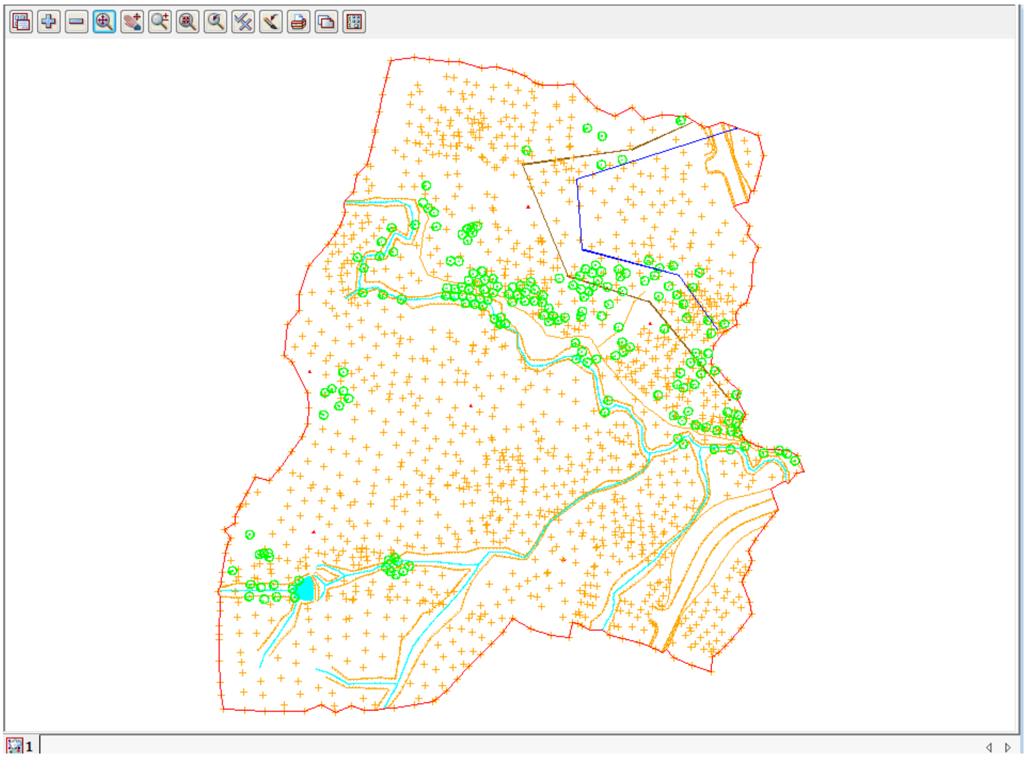
Click LB on the **Menu** button in the View Button Area of Plan 2 OR click RB anywhere in the View Button Area of Plan 2, to bring up the **View Menu** for the view.



Select **Delete** and then **Yes** to confirm the deletion.



Then maximise Plan 1 and do a **Fit**.



5.4 Rolling Middle Mouse Button to Zoom In and Out

The Zoom option was introduce so you could zoom in on a selected area.

Another method of zooming in and zooming out is to use when your mouse has a Roller Middle Button.

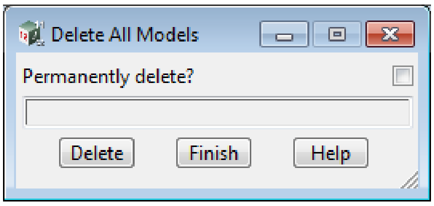
First click any button in the view to highlight the view (get focus on the view), **rolling** the middle button **forward** will **zoom in** about the position that you clicked inside the view to get focus.

Rolling the middle button **backwards** will **zoom out** about the position that you clicked inside the view to get focus.

5.5 Deleting a Model

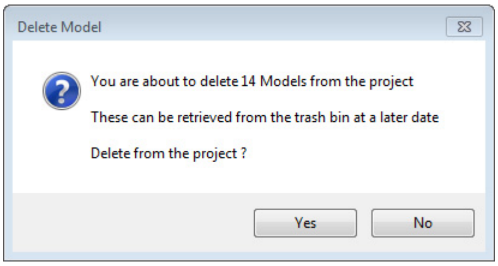
As we now wish to look at an alternative (and preferred) way of importing data into 12d, we will delete the existing models as they will be recreated in the following option.

From the Main menu, click with LB on **Models=>Delete=>Delete all models.**



Click LB on **Delete**

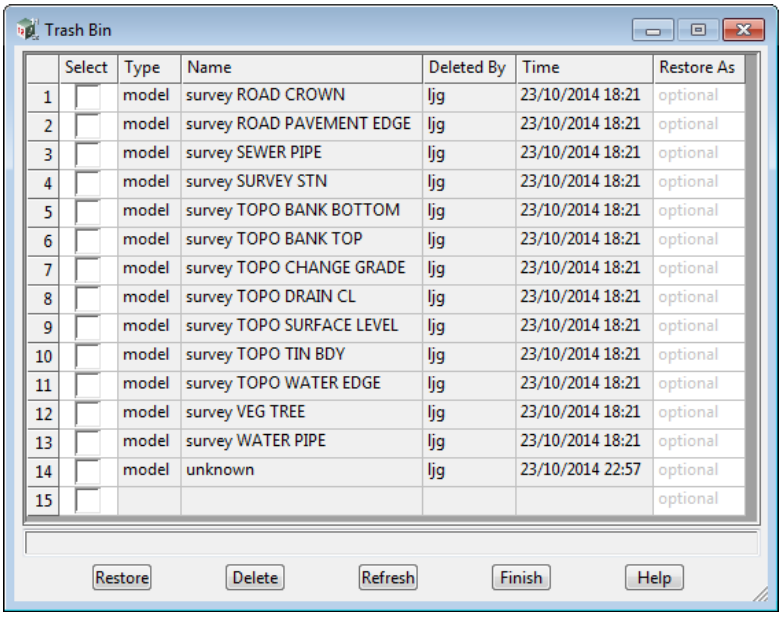
Click LB on **Yes** to confirm



When **Permanently delete?** is NOT ticked on and models are deleted, they are sent to the **Trash Bin** in case they need to be restored at a later stage.

When there are models in the Trash Bin, a Trash Bin icon appears at the bottom right of the 12d screen

To access the deleted models, double click LB on the icon or select **Project =>Management =>Trash Bin**



To **restore** models, click LB in the **Select** column next to the models that you want to restore to turn on ticks for the models, then click LB on the button **Restore.**

To **permanently delete** models in the Trash Bin, click LB in the **Select** column next to the models that you want to permanently delete to turn on ticks for the models, then click LB on the button **Delete.**

To **permanently delete all the models** in the Trash Bin (like emptying the Windows Recycle Bin), turn on ticks in all the rows in the **Select** column by clicking LB then RB over the top of the **Select** column to bring up the **Column** operations menu.

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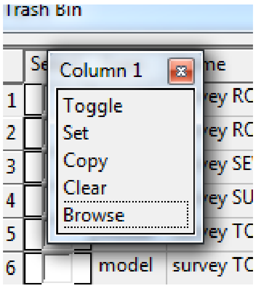
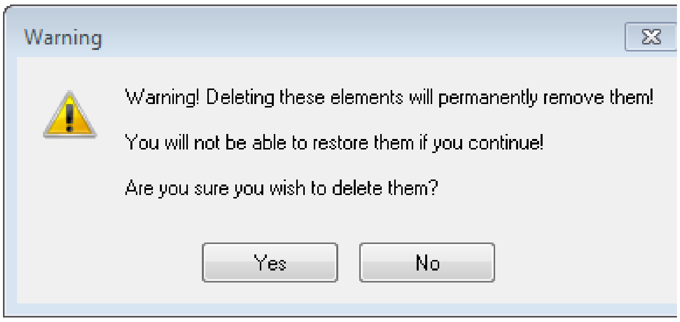


Click LB on **Set** to turn on all the ticks and then click LB on the **Delete** button.



Click LB on the **Yes** button to confirm permanently deleting all the selected models.

5.6 Redraw - Fixing up a Modified or Erroneous View

Whenever data is removed from a View e.g. turning off the display of a model, the view does not automatically get refreshed. 12d typically removes a model by overdrawing the information using the background colour, usually **black**. This operation can leave the view looking speckled and unclear.

You can force the view to refresh by clicking LB on the Refresh button , or click MB in the View Button Area anywhere other than over the '+' or '–' view buttons. The whole View will be repainted to display the corrected information.

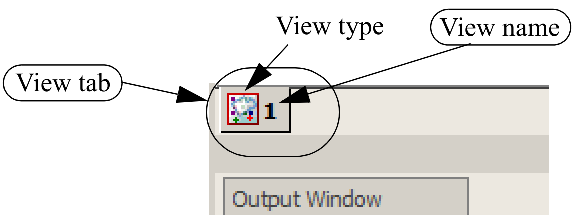
It is also possible that some of the menus may at times become corrupted. Windows is a very complex multitasking environment and the menus are stored in memory which is being updated continuously. If you ever get parts of your desktop that don't look correct, you can force your entire 12d screen area (all menus, views etc.) to be refreshed by holding the Ctrl and R keys down together (<Ctrl>+R).

Alternatively you can refresh just any one Menu by clicking MB in the Menu Title Area.

5.7 View Tabs

There is a tab for each view on a bar just above the Status Bar at the bottom of your 12d screen. If you have the Output Window in the default position (the tab at the bottom left of your desktop), the tabs bar is displayed just above the Output Window.

The ***View Tab*** has the icon for the view type and then the view name beside it.



Each tab corresponds to a 12d View.

To bring a 12d view to the top of all other views and to set the view as your active view, just click LB on the appropriate View Tab, or click LB in the view title area of the view.

Note that when a view is active, the View title highlights in blue.

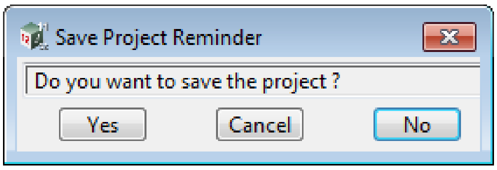
When there is more than one view tab, the order of the View tabs can be changed by holding LB down on the View tab whose order you want to modify and then moving the cursor to the left or right until you reach the position that you want the selected view tab to be in.

5.8 Saving a Project

The current changes to the Project you are working on are only stored in memory.

To make the changes permanent and update your files on disk you need to **Save** the Project. This can be done at any time by clicking LB on **Save** from the Projects Menu (**Project =>Save)**, or by holding the Ctrl and S keys down together (<Ctrl>+S).

12d will also pop up a panel reminding you **Do you want to save the project?**



Click on **Yes** with LB to force a Save to occur.

The timing at which this message appears is set from the **Defaults** panel brought up by the menu item **Project =>Management =>Defaults**. The time in minutes is set in the field **Save Interval (min)** under the **System Settings** tab.

The default is every 15 minutes. Set the time interval to zero to turn this feature off altogether.

If you ever crash out of 12d due to a power failure for instance, any changes since your last **Save** operation will be lost.

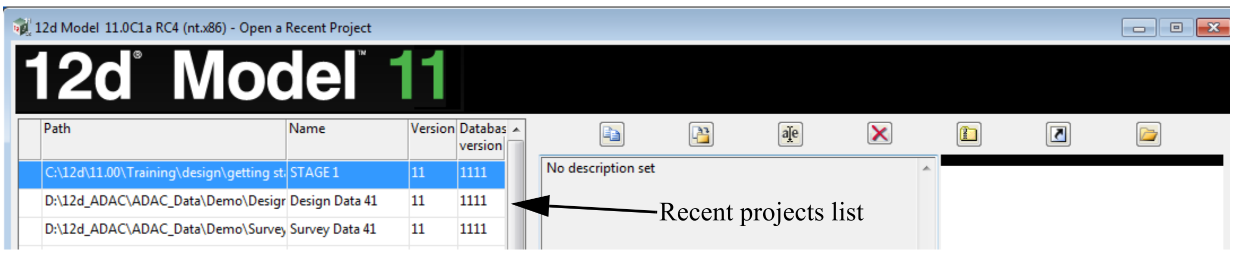
5.9 Exit

To terminate a ***12d Model***session, click LB on **Exit** on the Project menu (**Project =>Exit)**.

If you try to Exit 12d after changes have been made to your Project, 12d will remind you of the changes by prompting you for a further **Save** operation.

5.10 Starting 12d When Projects Already Exist

When ***12d Model*** is started and projects already exist and have been opened in 12d, the most recent projects will be listed on the left hand side of the ***12d Model*** Front Screen.



Double clicking on a project in the Recent Projects list will open the project.

Also when you are in ***12d Model***, the walk right menu **Project =>Recent projects** will also list the recent projects and clicking on a project in the list will exit the existing project (asking if a Save is wanted) and opens the selected project.

When you return to an existing project, the appearance of the views and toolbars on the screen will be just as you last left them.

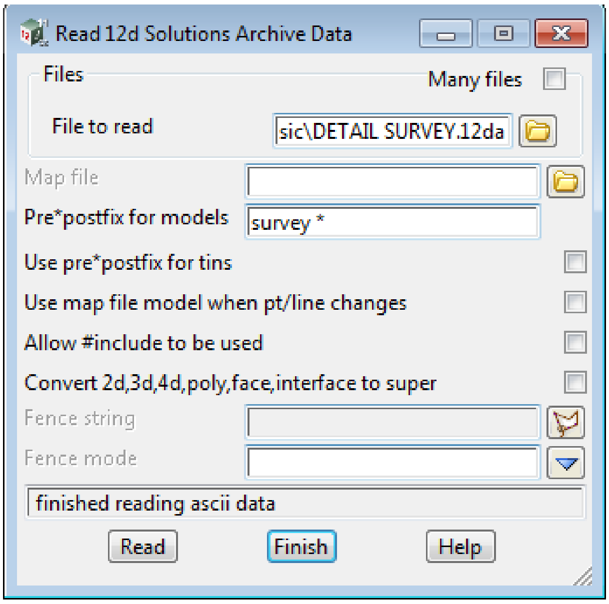
6 Basic Modelling

6.1 Alternative Data Entry

We will now repeat the process of importing data into 12d but this time we will use a 12d Archive file.

This option is the more common way of transferring data from Surveyor to Designer when both parties use 12d. The Archive format will often include all of the strings with the correct model, colour and other properties so that no mapping is required. Also a tin (triangulation) can be included in this file format so that the Designer has no need to create a new tin from the survey data. In this instance we will assume the coding is correct but the models are different so that mapping is required. Also a tin is not included.

We will import the file DETAIL SURVEY.12da. To read in the file, click LB on **File =>Data Input =>12d =>12d archive data** from the Main menu.



Click LB on the **File to read** folder icon then browse back up to the folder **C:\12d\11.00\Training\design\getting started basic**

Double click LB on the file **DETAIL SURVEY.12da** and the file name will be piped into the field **File to read**

A map file is not required.

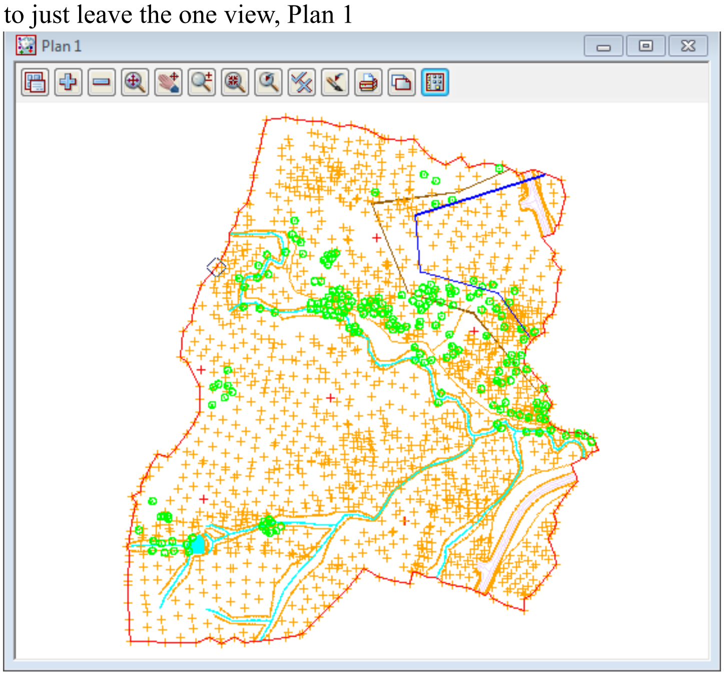
A model prefix "**survey ***" is again typed in to group the survey models away from the future design models.

Click on **Read** to read the data into 12d Model.

Again a new view Plan 2 is created with the models read in automatically added to it.

Transfer the models from View 2 to View 1 by using the option **View =>Model transfer**.

Delete Plan 2 to just leave the one view, Plan 1



Another great way to read in an existing 12da file into an existing project is to use **Drag and Drop**.

To Drag and Drop, in Windows Explorer, press LB down whilst over the file **DETAIL SURVEY.12da** and then move the cursor over the 12d screen area and then release LB.

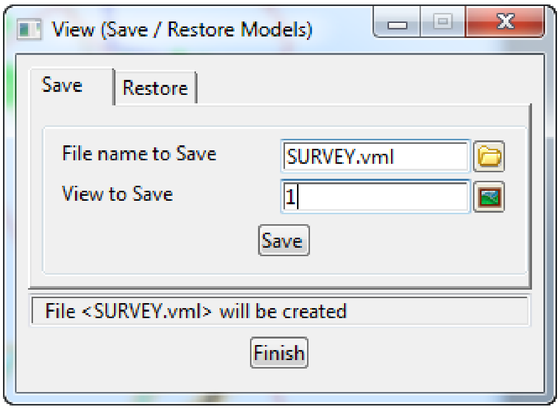
A **Read 12d Solutions Archive Data** panel with the full path name to the file **DETAIL SURVEY.12da** automatically entered into the **File to read** field.

6.2 Saving a Model Listing to a File for Future Use

The current thirteen models on the view are exactly the models that are used to create the *natural surface* tin. We will now see how to record these models in a form that can be used in the future to restore those same models to another view.

To make the list, we first click on the Plan 1 view tab to make Plan View 1 the focus. The heading in view Plan 1 should appear coloured bright blue and if there were others views, will be brought to the forefront.

From the Main menu click LB on **View =>Models Save/Restore**



Type in the file name **SURVEY**. Pressing <Enter> will add the extension **.vml**

Click LB on the view icon then select view **1**

Click LB on **Save**

Click LB on **Finish** to exit the panel

This file can be read at any future time by use of the **Restore** tab on the **View (Save/Restore Models)** panel. This will add the models in the vml file to any view.

6.3 Triangulation

We will now use this point and line information to create a 3d surface or TIN (Triangulated Irregular Network).

One of the concepts in 12d is that a TIN can be created from a single model, a single view (and all the models on that view are used) or a model list.

In general, you will use Views to create models since you can control which models are on display in a View.

It is important to understand that when creating a TIN from a View, only those strings in models added to the View will be used in creating the TIN and only then if the strings have been set to tinable.

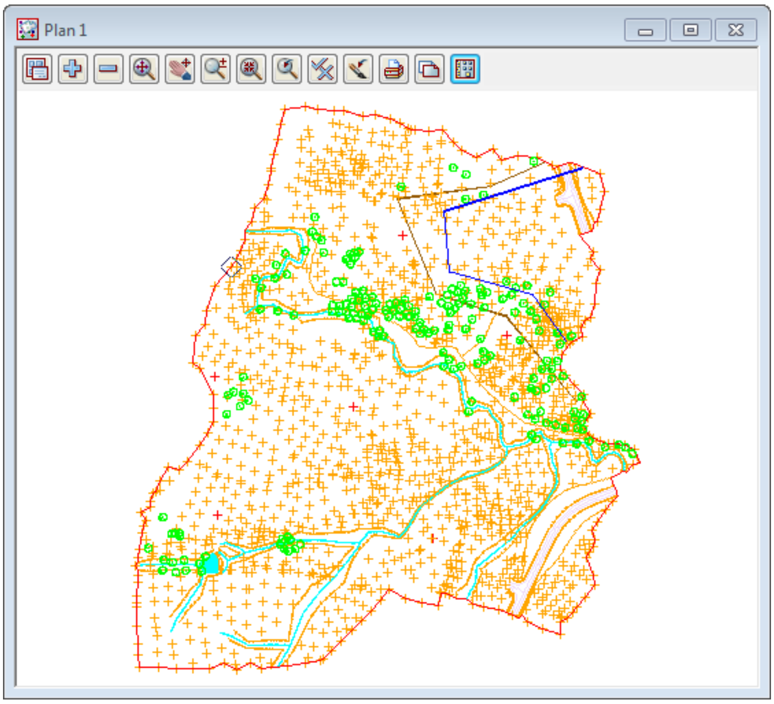
For instance, if you were forming a TIN representing the natural surface, you could only leave models that represented underground surfaces on the view used to create the TIN, **if** such data is **non tinable** (i.e. not used in a triangulation).

When using a mapping file to read in data, strings can be flagged as being **tinable** (and Breaklines) or **non tinable**. Only tinable strings are used in the triangulation.

Breaklines are used to pick up the topographical features accurately.

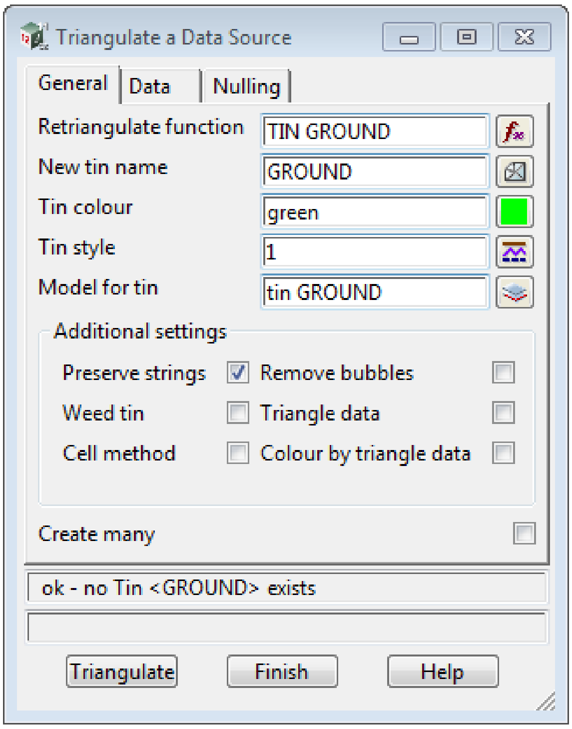
When forming triangles, 12d ensures that every straight segment in the breakline is the side of a triangle.

In this exercise we are assuming that the survey strings have already been checked for errors (See the **Getting Started for Surveying** manual on methods for checking the data).



For the purposes of the tutorial, please ensure that all models in view **Plan 1** are on display prior to creating the TIN. **Plan 1** should look as shown above.

From the Main menu, click LB on **Tins =>Create =>Triangulate data**



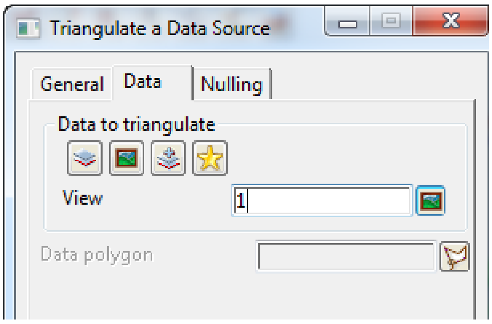
Fill in the first tab of the panel as shown.

The **Triangulation function** option is used to construct a function which, when recalculated, will run a retriangulation on the tin. Place the cursor in the data field with the LB and type in **TIN GROUND**

Each TIN requires a name. Position the cursor in the **New tin name** field and type in **GROUND**. If you press <Enter>, this name will also be used to fill in the **Model for tin** field but with the prefix "tin " (see panel). The TIN name is subsequently used to refer to this specific TIN.

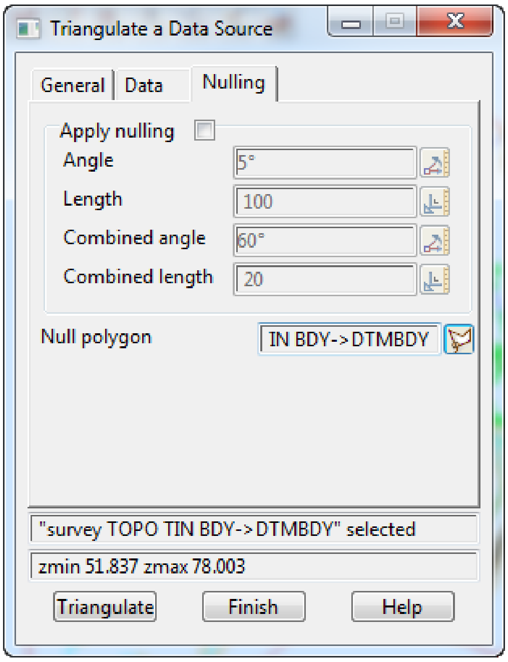
Position the cursor in the **Model for Tin** field and type in the suffix **",1"** after the name so that the model is added to the view **1**, and hence displayed, as soon as the TIN is created.

There is no problem if you don't add the ",1"because you can always add the model containing the tin to a view at any time.



Click on the **Data** tab.

As we wish to triangulate all the data in plan view **1** and leave the tinabitily to determine which data to use, click LB on the view icon. Sel **1** from the list.



Click on the **Nulling** tab.

There are two options here, you can set the parameters to null the external triangles, and/or you can use a polygon to null all triangles outside this polygon.

The **DTMBDY** string will be used as the boundary for the tin.

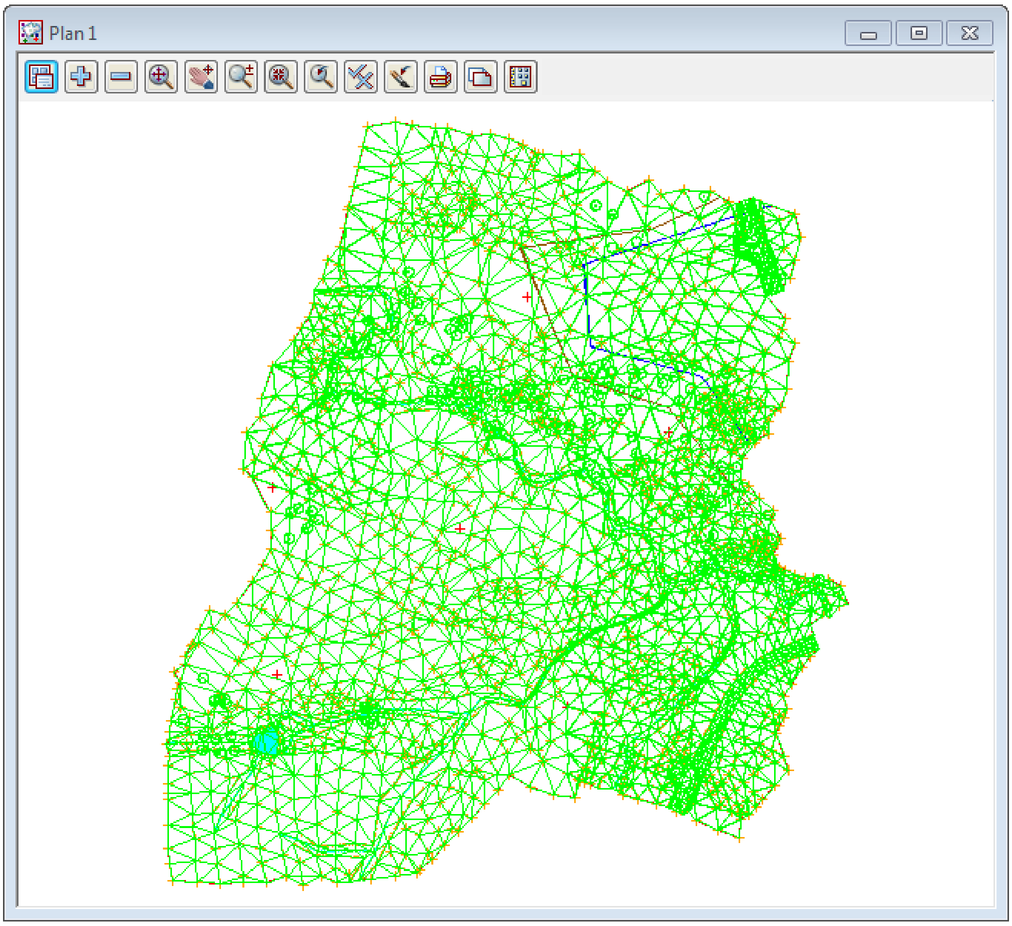
Click LB on the **Null polygon** string icon then click LB on the **DTMBDY** string followed by clicking middle button (MB) to accept the string.

(We will cover selecting strings in Chapter 7 String Picking Concepts.)

Click LB on **Triangulate** to create the TIN. There will be a short delay and then your TIN will be created and displayed as shown in the next picture.

Click LB on **Finish** to terminate the panel.

If you didn't use the ",1" after the model name in the **Model for tin**, now add the model **tin GROUND** to the view. View **1** should now look like:



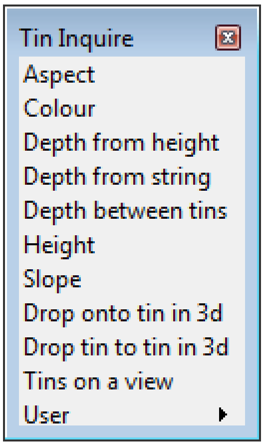
Note that the TIN is clipped at the selected **Null polygon** ensuring only the surveyed data is included.

Now that we have a TIN we can display the TIN data in a variety of ways.

Important Notes

1. Tin names must be unique in the project.
2. A tin can only be displayed on a view by adding a model that contains the tin to a view.
3. A tin can be in more than one model. Or even in no model.
4. More than one tin can be in the one model.
5. Deleting a model DOES NOT delete any tins in the model. Tins are deleted with **Tins ->Delete**

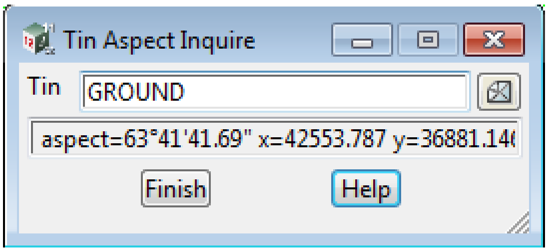
6.4 Tin inquire



From the Main menu, click LB on **Tins =>Inquire** to bring up the **Tin Inquire** panel.

Click LB in the menu title area (where it says Tin Inquire), move the menu and Pin it with the LB. This operation is necessary to stop the menu from being automatically removed after the first menu pick.

Click LB on **Aspect**, and the **Tin Aspect Inquire panel** will pop up.

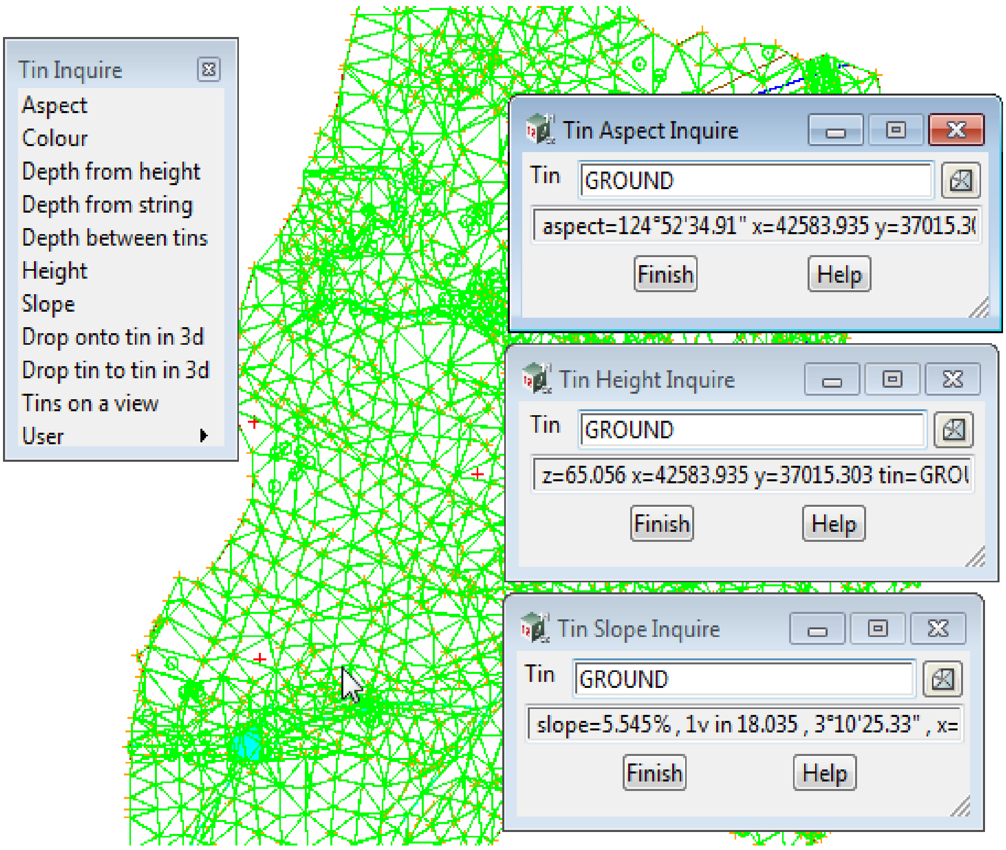


Move the cursor over the *Tin* icon button at right end of the **Tin** field and use the LB to pop up a list of Tins. Double click LB on **GROUND**. Then click LB in the menu title area (where it says Tin Aspect Inquire), move the panel to a clear area of your screen and pin it with the LB.

Do <u>not</u> Click on the Finish button in the panel.

Notice that as you move your cursor over the tin, the aspect is being displayed in the panel message area.

Repeat this procedure with both the **Height** and **Slope** menu items.



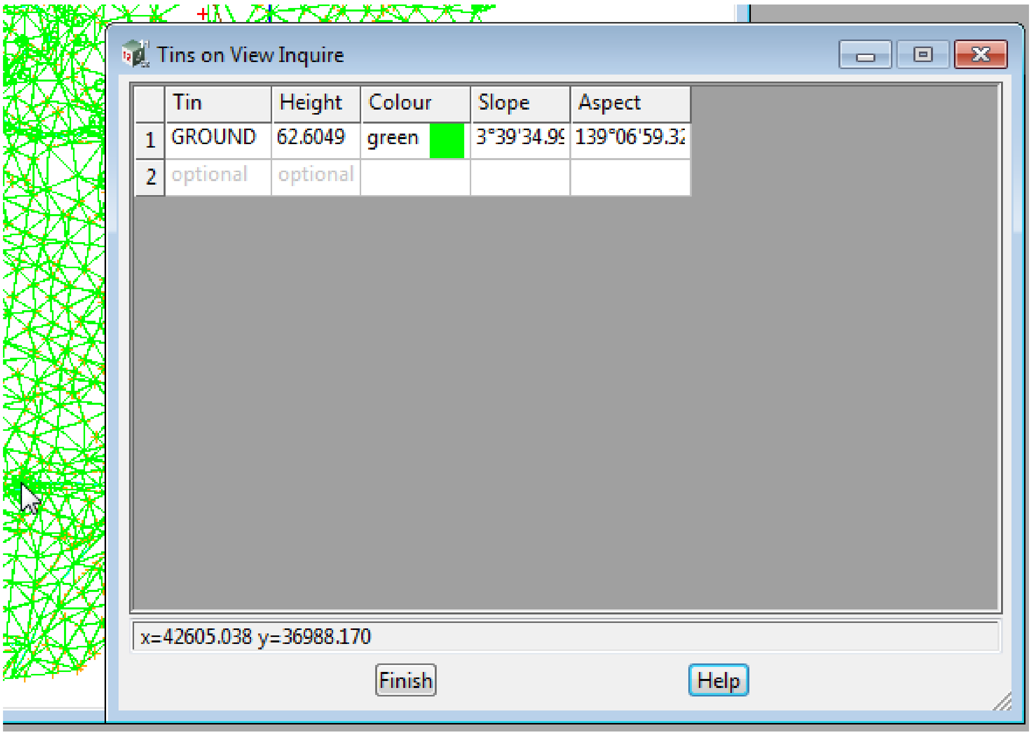
Once all three panels are on the screen, move the cursor anywhere over the TIN and observe what happens.

When the cursor is positioned over any one triangle, the three point coordinates of the triangle are being used to linearly interpolate *on the fly* to calculate the exact x,y,z coordinates of the cursor. Also the aspect and slope of the triangle is shown in the respective panels.

We'll now look at one option that combines all three, as well as **Tin colour**, and does not even need a Tin to be set.

On the Tin Inquire panel, click on **Tins on a View** (**Tins =>Inquire =>Tins on a view**) to bring up the **Tins on View Inquire** panel.

Now move the cursor around the view and any tins under the cursor will be dynamically listed in the panel and at the (x,y) position of the cursor, display the height of the tin, and the triangle colour, slope and aspect.



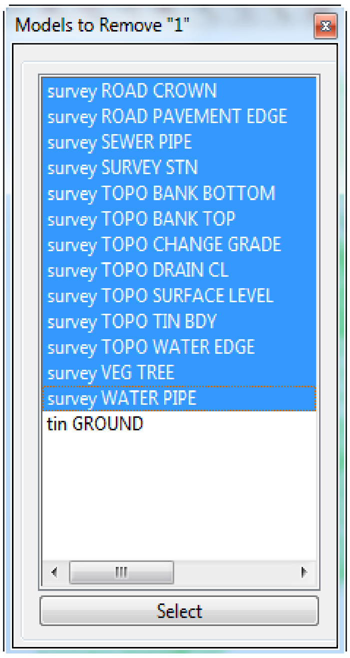
Click LB on **Finish** on all four panels to put them away.

Also click LB on **X** on the **Tin Inquire** menu to shut it down.

We will now look at the various ways information in TINs can be viewed.

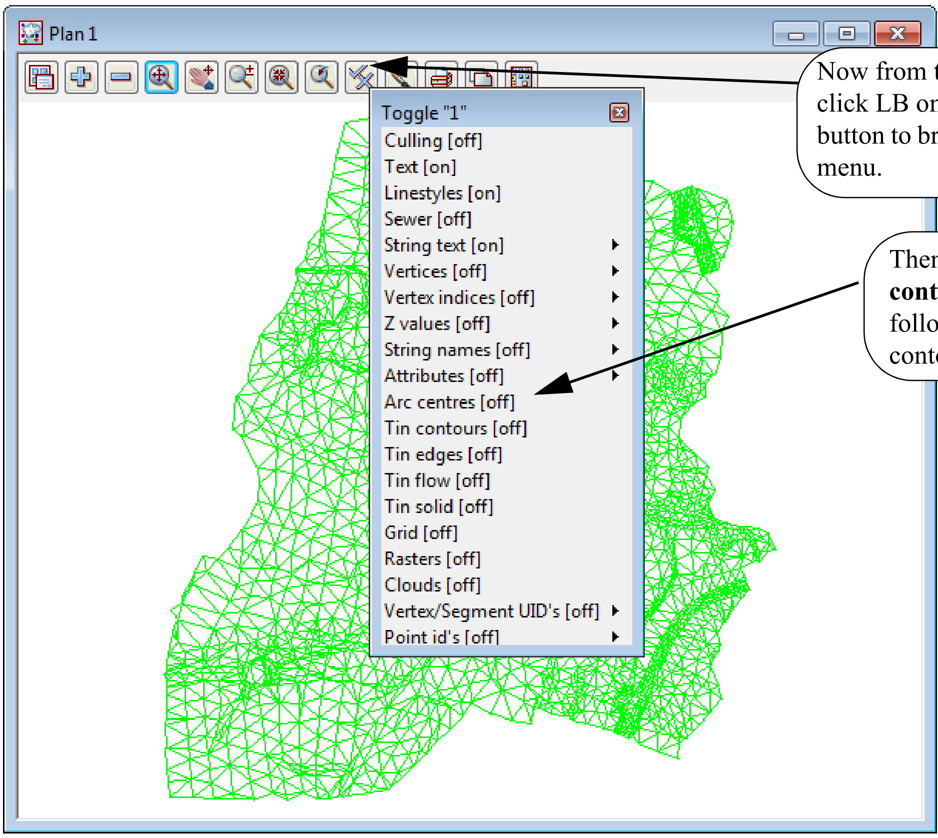
6.5 Fast Contours

We now want to remove all of the models from the View except **tin GROUND**. From the View menu (in the View Button area), click LB on the **-** sign to pop up the **Models to Remove** panel.



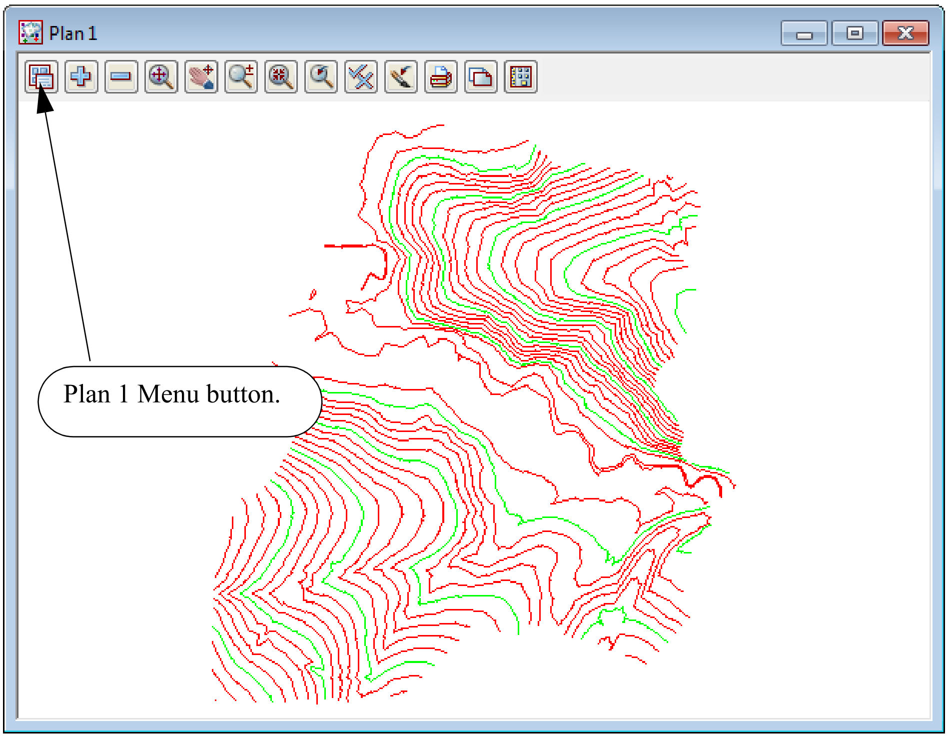
Click LB in the panel title area (over the words Models to Remove), move the panel and repin it with LB so that it doesn't collapse after each selection.

Now click the LB on the first survey model. Drag the mouse down the list to highlight all the survey models and click on **Select**. Alternatively, you could double click LB on each model in turn ***except*** **tin GROUND**. Click LB on **X** to shut down the panel.



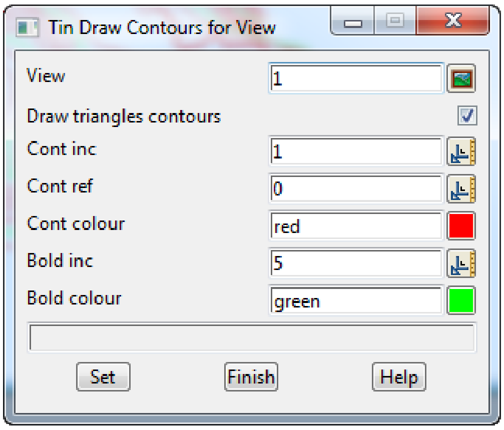
Now from the View buttons, click LB on the **Toggle** button to bring up the Toggle menu.

Then click LB on **Tin contours**. You should see the following red and green contour lines appear.



If you click **Toggle =>Tin contours** again, the View will revert to the green triangle display.

The appearance of the contours can be changed by clicking LB on the **Plan 1 Menu** button in the View Button Area. Click LB on **Settings =>Tins =>Contours** and the following panel will pop up.



You can change any of the settings in the panel including colour. Click LB on the colour icon at the right end of the contour colour field to see a popup list of available colours. Select a colour by double clicking on it with LB.

Try changing the contour increment (spacing) from 1 to 5 and the bold increment from 5 to 25. Click LB on **Set** to activate the changes**.** You will notice that the Fast contours can be turned on and off from either the **Draw triangles contours** tick box setting in the panel, or the **Toggle=>Tin Contours** switch.

At the completion of experimenting it is suggested that you put the settings back to their default values (as above) at this time.

Click LB on **Finish** to terminate the panel. Your new settings will remain in effect indefinitely until changed.

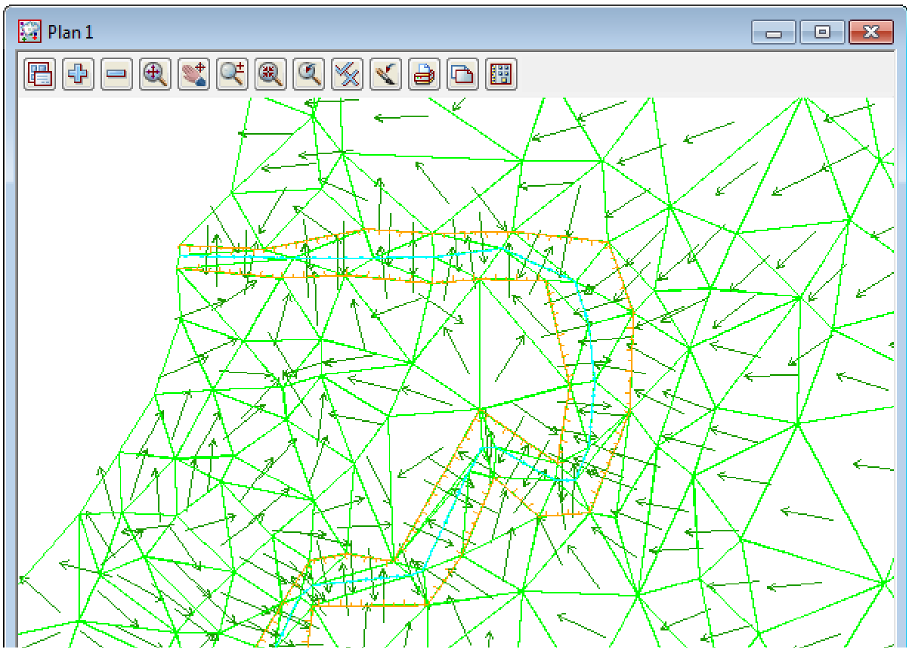
6.6 Fast Flow Arrows

It is recommended that you turn on the drainage models for this exercise. From the View menu (in the View Button area), click LB on the '+' sign button and double click LB on **survey TOPO BANK BOTTOM**, **survey TOPO BANK TOP** and survey **TOPO DRAIN CL**. Make sure that the **tin GROUND** model is also still turned on. The easiest way to confirm this is to click LB on the '**-**' sign button in the View Button Area and look at the list of the models that <u>could</u> be turned off. Click LB on the **X** button to terminate the list.

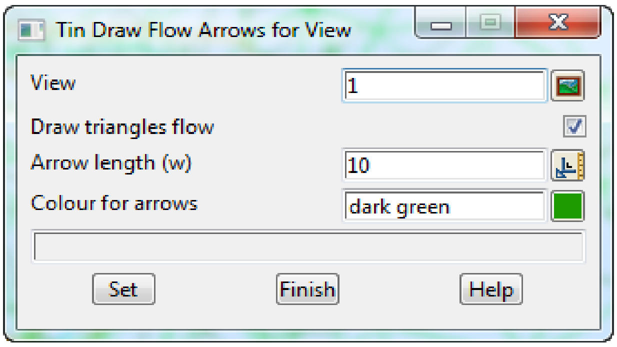
Now from the Toggle button, click LB on **Toggle =>Tin contours** to turn OFF the contours and then **Toggle =>Tin edges**. The purpose of this is to outline each triangle.

Then click LB on **Toggle =>Tin flow**. You should now see an arrow appear at the centre of each triangle representing the direction of water flow.

Try zooming in on a section of the model for a closer look. When you have finished zooming, click on **Fit** to again fill the View window.



The appearance of the flow arrows can be changed by clicking LB on the Plan 1 Menu button in the View Button Area. Click LB on **Settings =>Tins =>Flow Arrows** and the following panel will pop up.



You can change the size of the arrow heads and their colour. Click LB on the colour icon for the **Colour for arrows** field to popup a list of available colours. Select one by double clicking LB.

Try changing the arrow length from 10 to 5 world coordinates (in this case metres).

Click LB on **Set** to activate the changes**.** You will notice that the Flow arrows can be turned on and off from either the **Draw triangles flow** tick box setting in the panel or the **Toggle =>Tin Flow** switch.

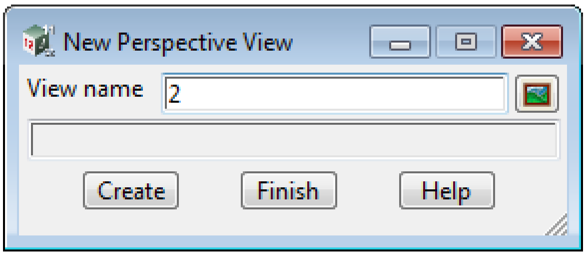
Click LB on **Finish** to terminate the panel. Your new settings will remain in effect for this view until changed.

Click both **Toggle =>Tin edges** and **Toggle =>Tin flow** again and the View will revert to the green triangle display.

6.7 Perspective View

We will now look at the perspective view facilities in 12d to examine the surface we created above.

Create a new perspective view. Click LB on **Views =>New =>Perspective** from the Main menu and a new view pops up. Alternatively by selecting **Views =>Create =>Perspective view** from the Main menu, a panel pops up.



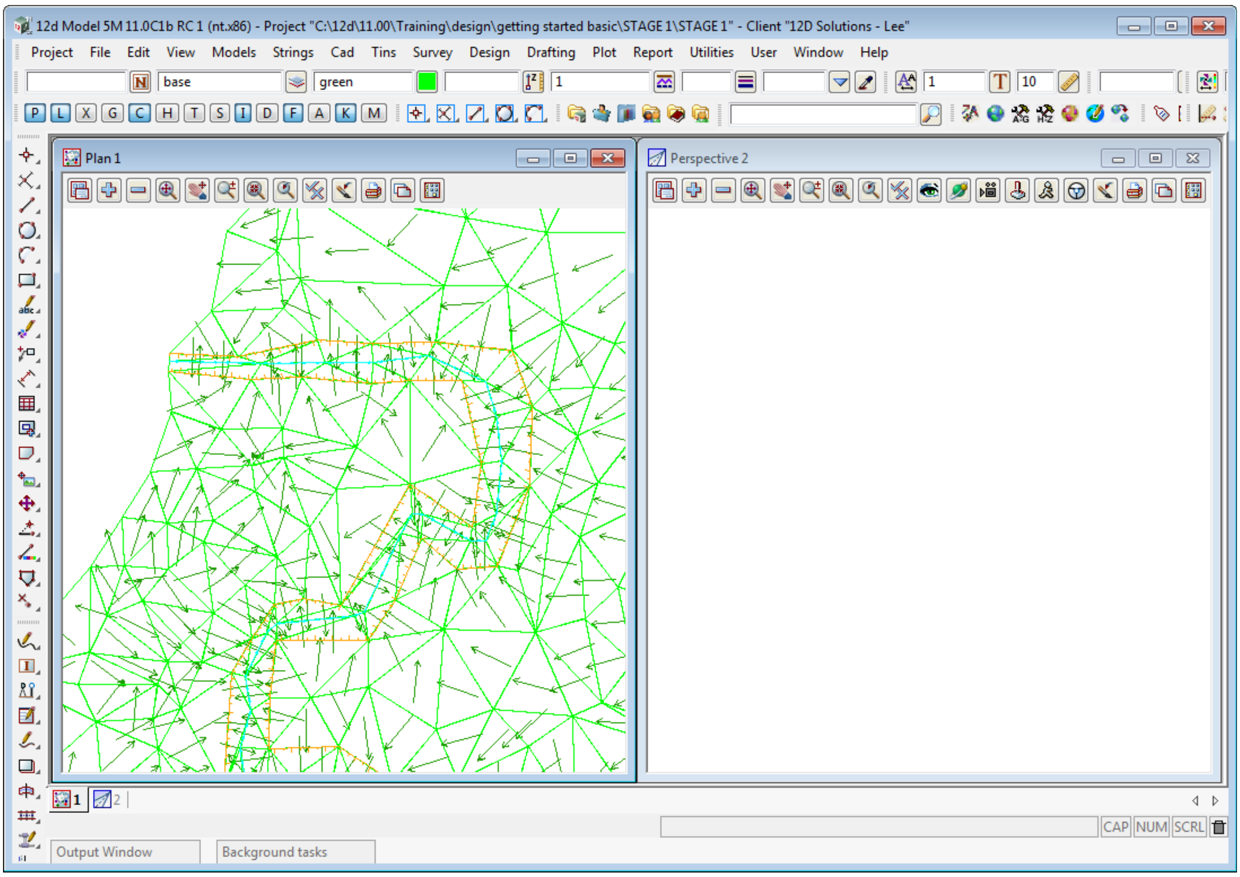
If necessary, put the cursor in the View name field, backspace over the existing entry (or use the Delete key) and type **2**.

Click LB on **Create.**

Note the new view is created immediately and is placed over the top of your existing windows. If a view is maximised then it will be unminimised when a new view is created.

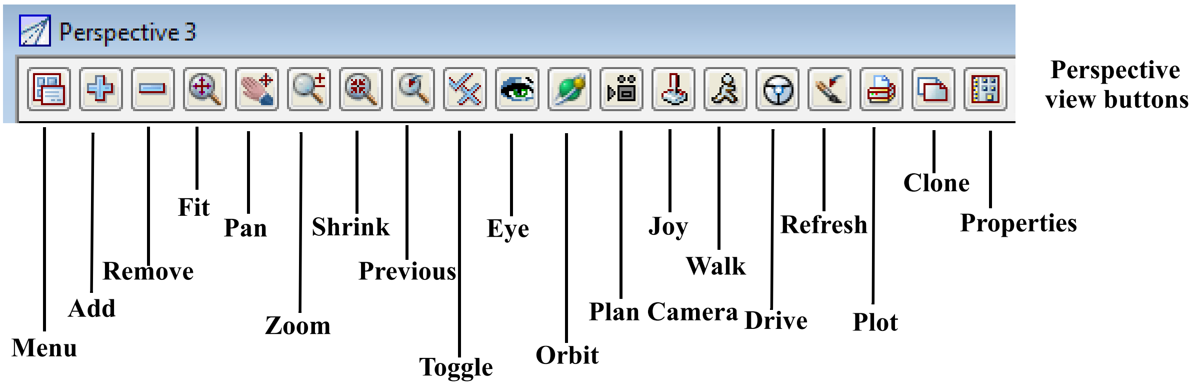
You can use the standard windows features to **Tile** the views. For example, on the Main Menu select **Window =>Tile Vertical.**

Your overall screen layout should now look something like this.



Note that the highlighted view is placed on the left by **Tile Vertical**.

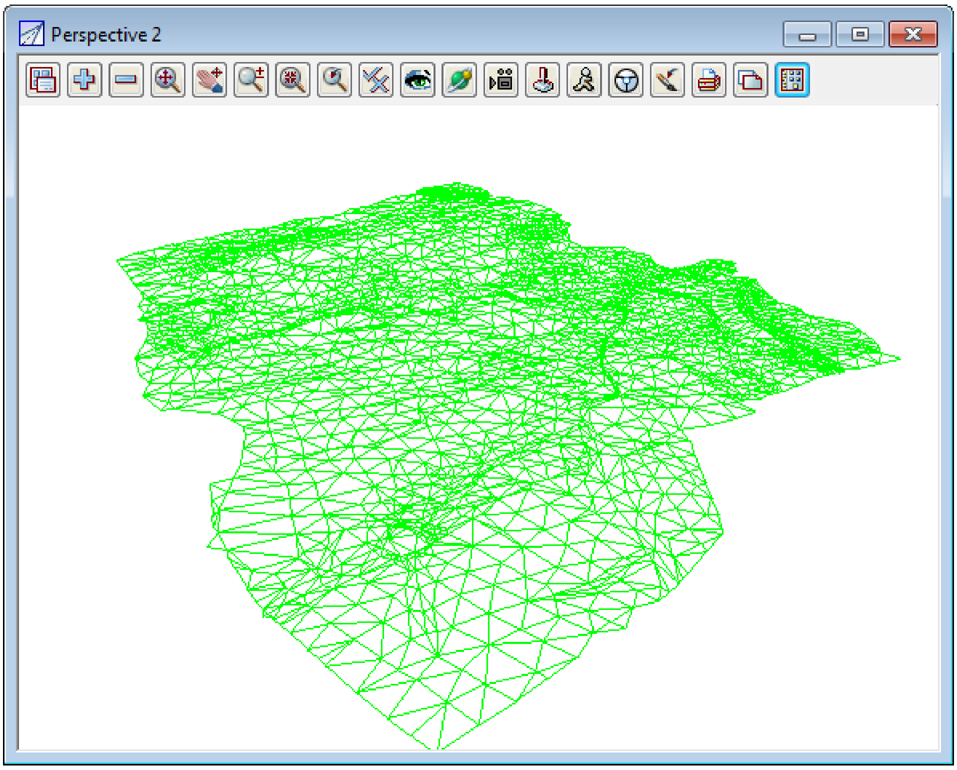
The view buttons on a Perspective view are



we now need to add the TIN to the perspective view. In the View Button Area of Perspective OpenGL 2, click LB on the '+' sign button and double click LB on **tin GROUND.** Click LB on the **Fit** icon.

Note that Zoom using the Zoom option and rolling the middle mouse button both work in a Perspective view.

So after your **Fit**, zoom in so that the tin almost fills view **2**.



6.8 Pan and Zoom in Perspective Views

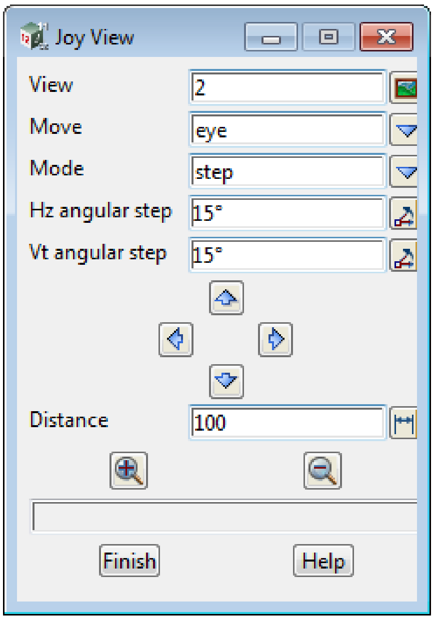
Pan and **Zoom** both work for a Perspective View.

Trying Zooming in and panning around.

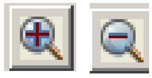
6.9 Joy Panel

The **Joy View** panel (short for Joystick) provides a quick way of orientating your eye in relation to your data when manipulating a Perspective view.

The **Joy View** panel is accessed from the View Buttons Area. Click LB on the *Joy* button in the View Button Area of Perspective 2 and the **Joy View** panel appears.

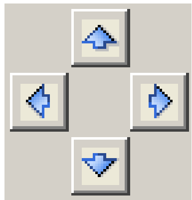


Try clicking LB on **In** and **Out** icons



and observe what is happening. You eye is moving inwards or outwards from the data.

Also try **Up, Down, Left** and **Right**. icon



If you get lost or zoom in too far, you can always start again by clicking LB on **Fit** in the View Button Area.

The angular step between each up or down step defaults to 15 degrees. You can change this if you want smaller increments by entering a new value in the Angular Step field.

Similarly, the Distance changed on each In/Out movement defaults to 100 (metres in our case as all data is in metres).

The easiest way to reset a view so that you can see all of the data is to click LB on **Fit** from the View Button Area.

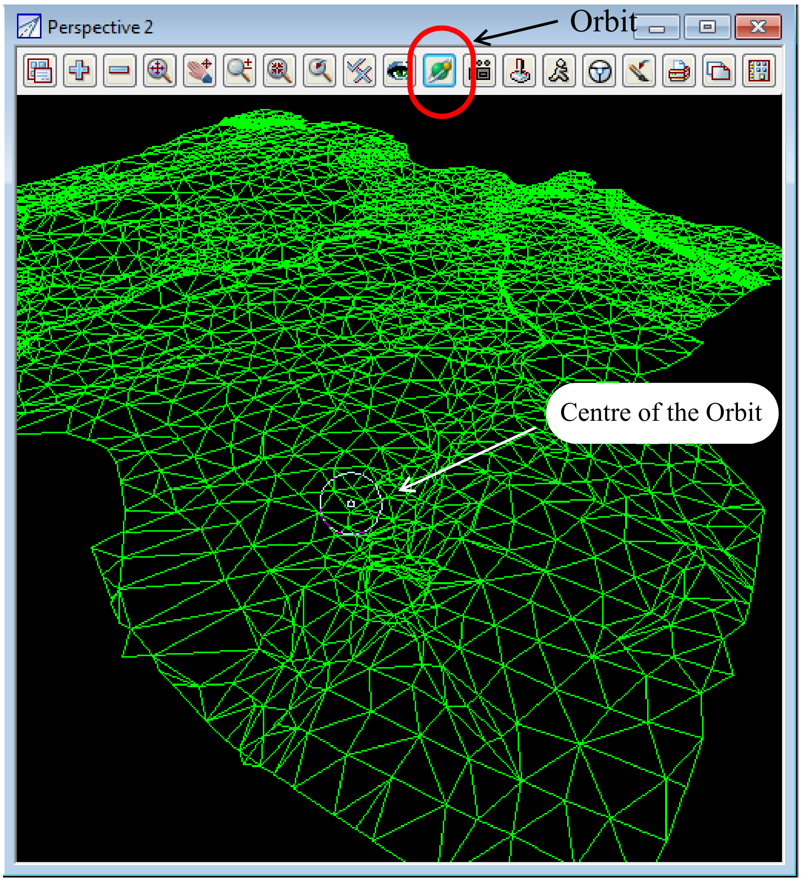
6.10 Orbit

The Orbit is another way to orient your eye in relation to your data when manipulating a Perspective view.

The **Orbit** option is accessed from the View Buttons Area. Click LB on the *Orbit* button in the View Button Area of Perspective OpenGL 2.

By holding LB down and moving your cursor around you will see the effect Orbit has.

The centre of the Orbit is displayed on view **2** as a white circle.



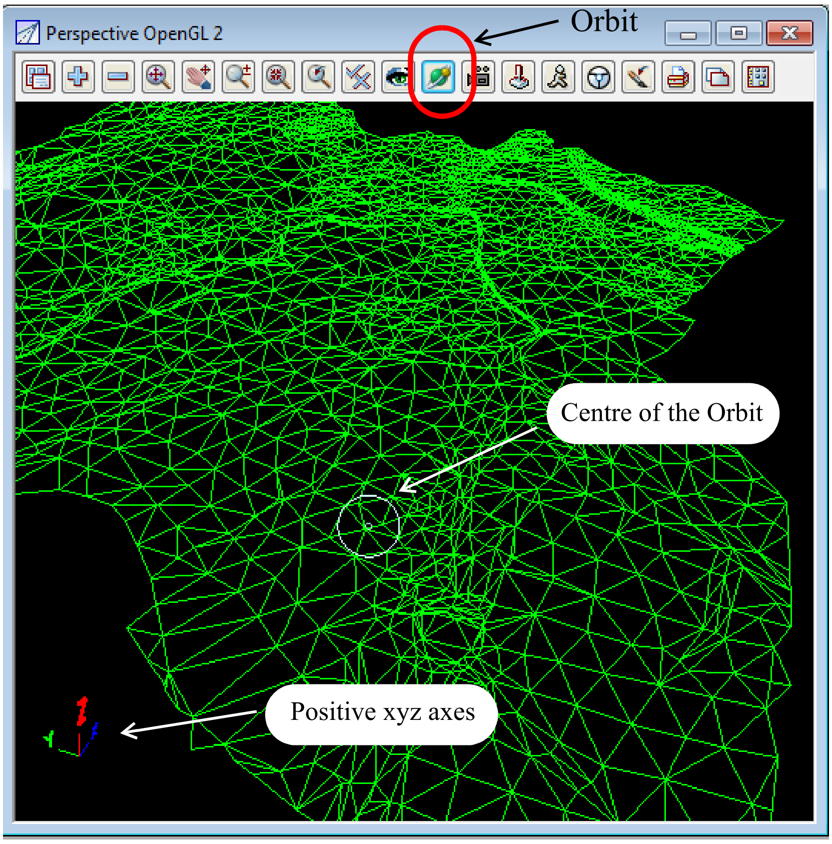
A message with the instructions for Orbit is also written to the Screen Message Area.

<Perspective Camera> [Orbit][Pan][Swivel] w,a,s,d - pan, e,t - pick eye / target, f - fit, esc - cancel

So try holding MB down and moving your cursor around and then holding RB down and moving your cursor around.

Notice there are also key commands **w**, **a**, **s**, **d** and **f**. Plus <Esc> to terminate Orbit.

If you had created a Perspective OpenGL view instead of a Perspective view, you will also see a set of coordinate axes displayed in the bottom left hand corner to indicate the positive X, Y and Z directions.



You can use either a Perspective 2 or a Perspective OpenGl 2 in the training and if there is any major difference then it will be pointed out.

6.11 Plan Camera

The **Camera** button links the Perspective view to all the unminimised Plan views (we'll refer to them as just the Plan views).

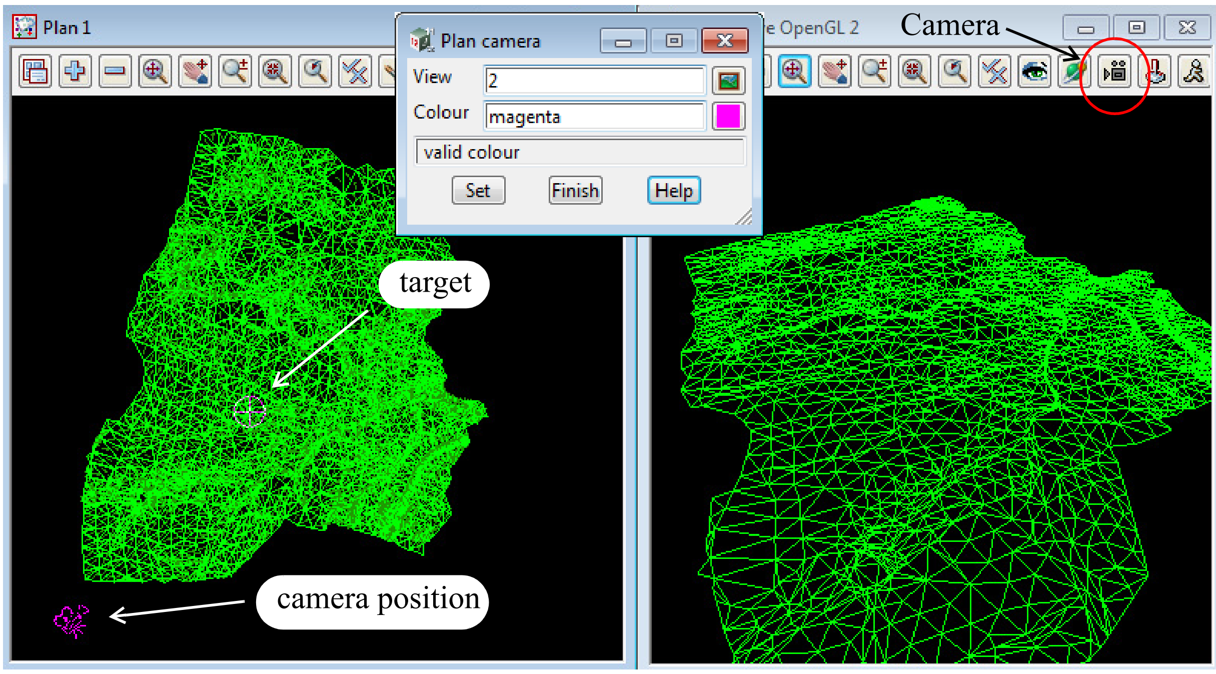
The Camera (Eye point) and Target point for the current perspective settings of the Perspective view are displayed as icons in the unminimised Plan view and moving the Camera and Target icons around in a Plan view controls the perspective settings for the linked Perspective view.

Click LB on the **Camera** button in the View Button Area of Perspective OpenGL 2 and the **Plan Camera** panel appears. This panel displays which Perspective view the Plan Camera is running for and the colour of the Camera and Target icons.

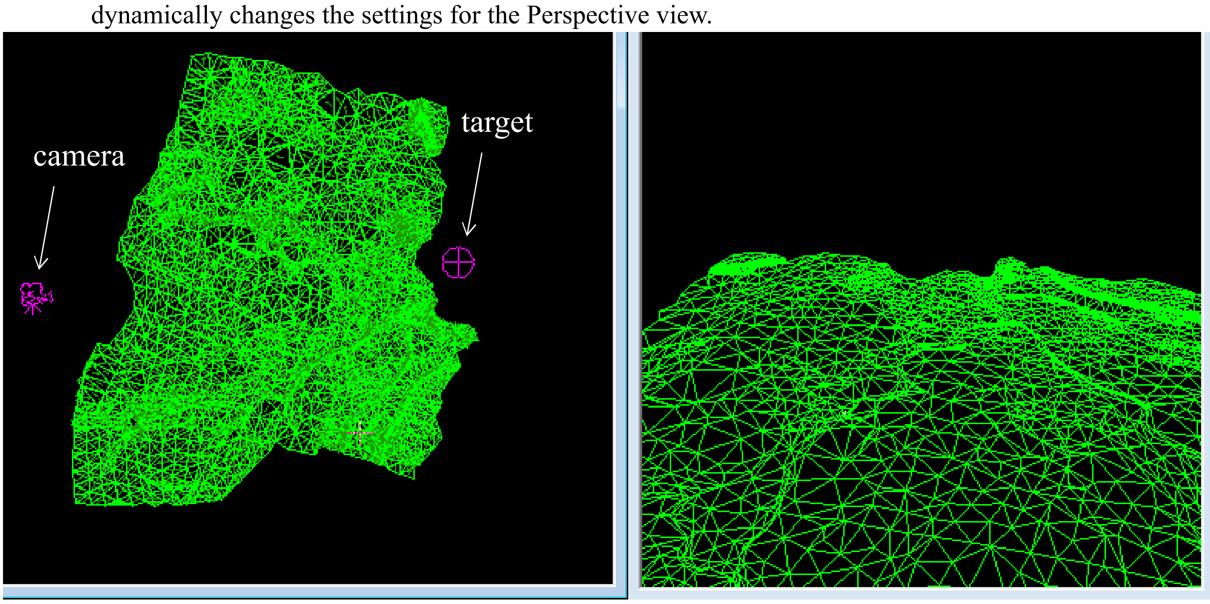
Select the colour magenta in the **Colour** field to display the camera and target, and then select **Set**.

Important note - leave the **Plan Camera** panel up because the option terminates when the panel is finished.

The camera and target that define the perspective view are now shown in all visible Plan views. You may have to zoom out to see them both.



Holding down LB on either the Camera or Target icons and moving them around in a Plan view dynamically changes the settings for the Perspective view.



Move both the camera and the target around in the view to see how the Perspective view is linked to the Plan views.

Notice that if you have the **Plan Camera** panel up with the camera and target icons showing and then perform any operation on the Perspective view to change the perspective settings, then the camera and target icons will move to reflect the new perspective settings. For example, using **Fit**, **Zoom**, **Pan** or **Orbit**.

However after the other operations are completed, you will need to select the **Set** button again on the **Plan Camera** panel to be able to select and move the **Camera** and **Target** icons around.

When the **Plan Camera** panel is finished, the Camera and target icons are removed form the Plan views.

Note

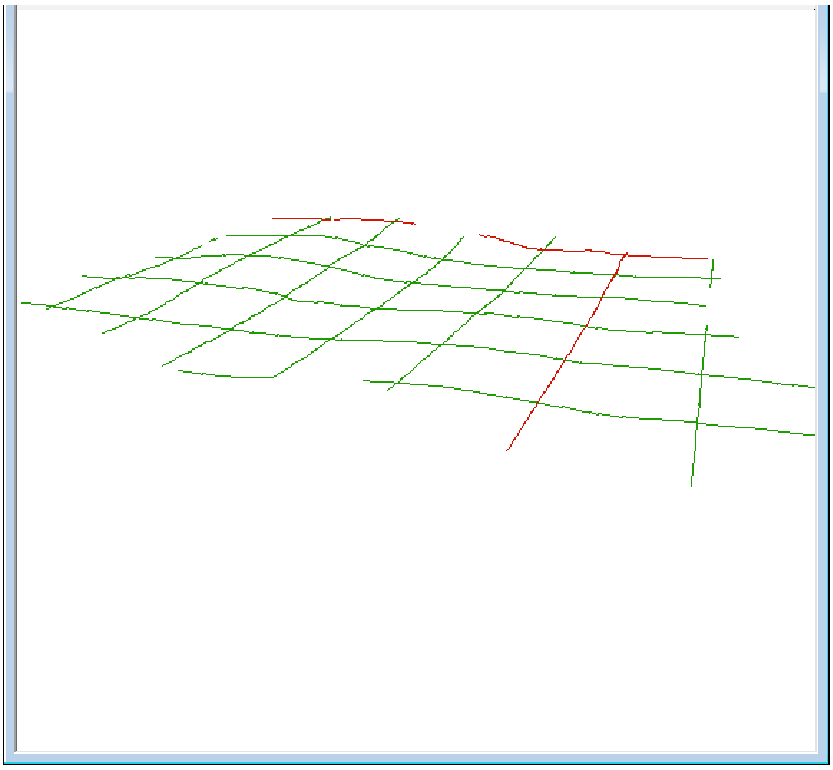
If you have more than one Perspective view then you can have a set of Camera and Target icons for each of Perspective view and each set will be displayed on all visible Plan views. To avoid confusion between the Camera-Target sets, use a different colour for each set.

Although the Camera and Target icon sets are all visible, only one of them is can be active (and hence can be moved around) at the one time. To make set active, click on the **Set** button on the **Plan Camera** panel for that Camera-Target set.

6.12 Fast Meshes in Perspective view

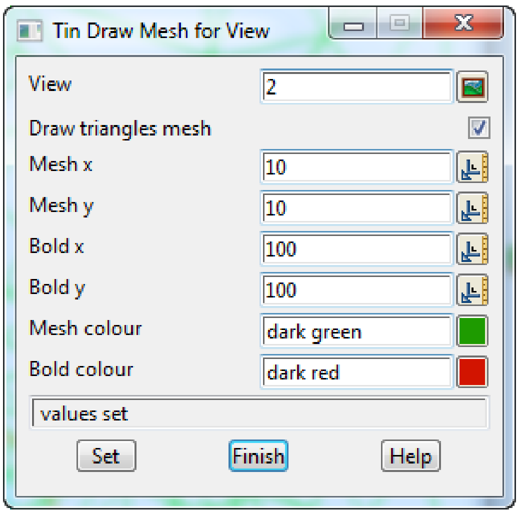
We will now see how to quickly display the TIN in mesh form.

From the Perspective View menu, click LB on **Toggle =>Tin mesh**. You should see a coarse rectangular grid of red and green mesh lines appear.



The appearance of the mesh can be improved by reducing the mesh spacing.

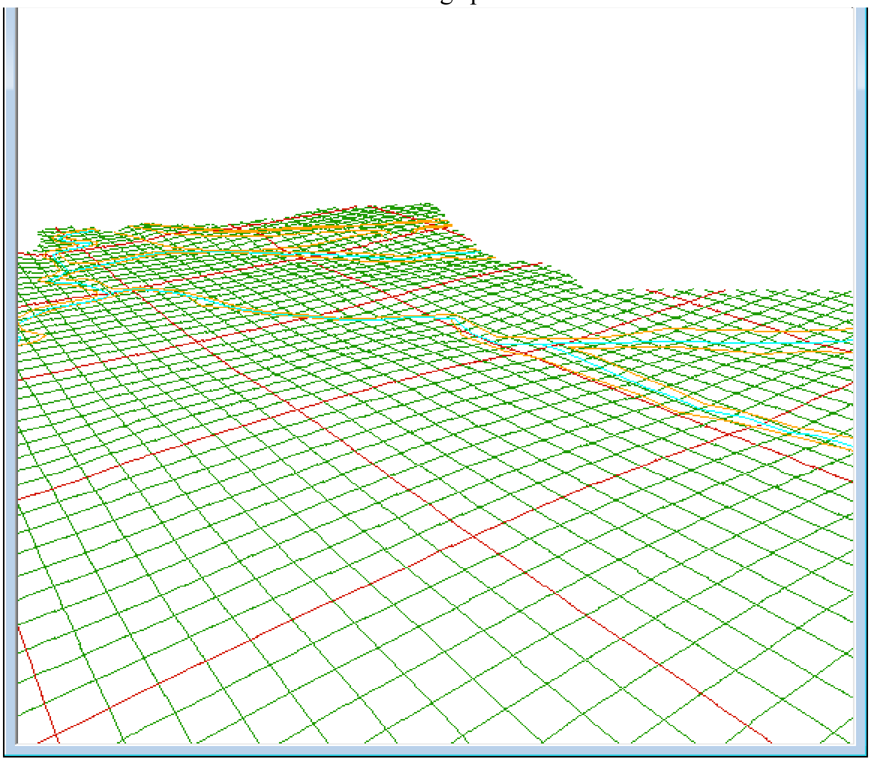
Click LB on the Menu button in the View Button Area of the Perspective OpenGL 2 view and then click LB on **Settings => Tins =>Mesh.** The following panel will pop up.



Change the settings to those shown in the panel. Change the mesh spacing from 100 to 10 in both x and y directions and bold x and y spacing from 1000 to 100. Click LB on **Set** to activate the settings.

You will notice that the Mesh can be turned ON and OFF from either the **Draw triangles mesh** tick box in the panel or from the View menu via the **Toggle =>Tin Mesh** switch.

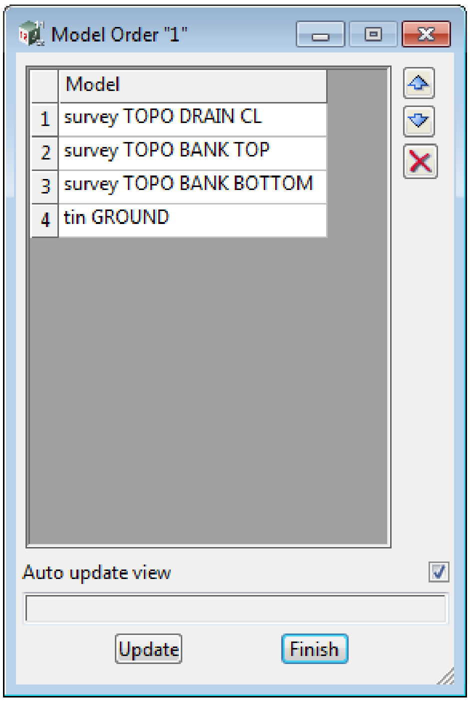
Click LB on **Finish** to terminate the Mesh settings panel.



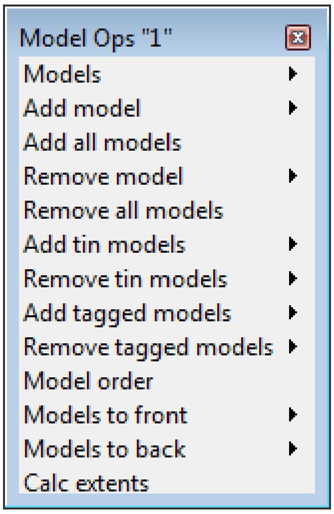
The effect of the creeks superimposed on the TIN (shown above) is created by turning on the Drainage models. Click LB on the + sign button in the View Button Area and double click LB on **survey TOPO BANK BOTTOM**, **survey TOPO BANK TOP** and **survey TOPO DRAIN CL**.

Note that 12d always displays the models in the order that they are turned on with the + and - buttons. Thus to get the effect of survey DRAIN CL (and any other models) superimposed on your TIN, you first turn all models off, then turn the TIN on first and then any other models to be superimposed last.

The drawing order on a view can also be modified by using the option from the View Menu
Models =>Model order



Note that the **Models** walk right menu has a number of useful options, too many to have as button in the View Button Area.



For example **Models =>Remove all models** is a fast way to turn all models off.

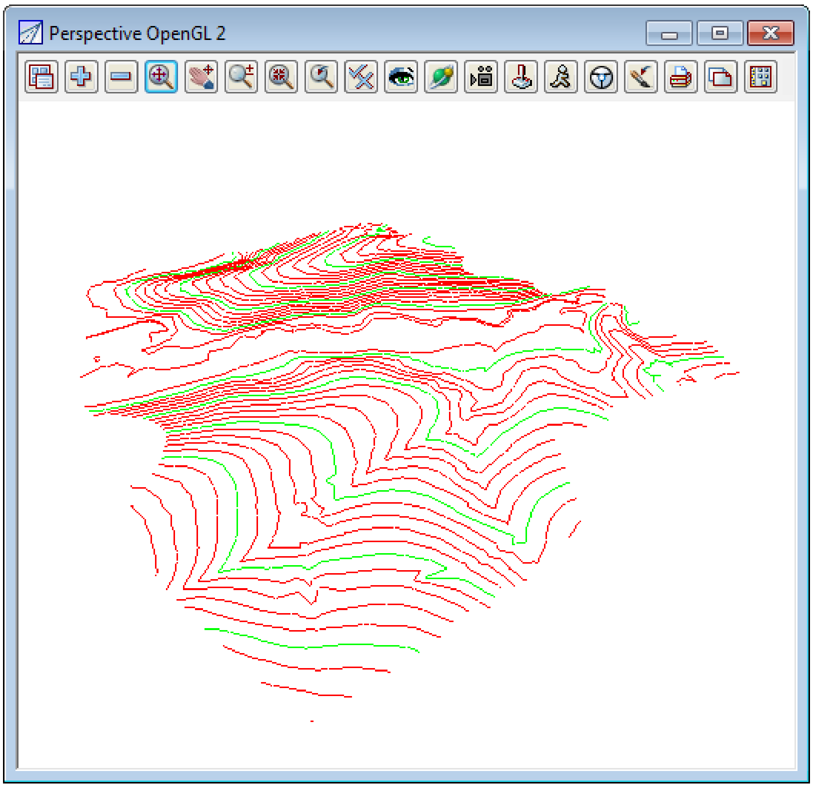
The perspective view orientation will stay as it is unless changed by further **Joy** or equivalent perspective view operations.

Toggle off the tin mesh via **Toggle =>Tin Mesh**.

6.13 Fast Contours in Perspective Views

Sometimes it is useful to display contours in perspective views.

You do this using the Toggle button like we did for the Plan view - simply click LB on **Toggle =>Tin Contours**.



The contour spacing and colours of the Perspective view can be changed just as we did before in the Plan view. This time however you would click LB on the Menu button in the View Button Area of the Perspective Open GL 2 view.

As before then click LB on **Settings =>Tins =>Contours.** See 6.5 Fast Contours on page 86. for more details.

Click **Toggle =>Tin contours** again to revert to the green triangles display.

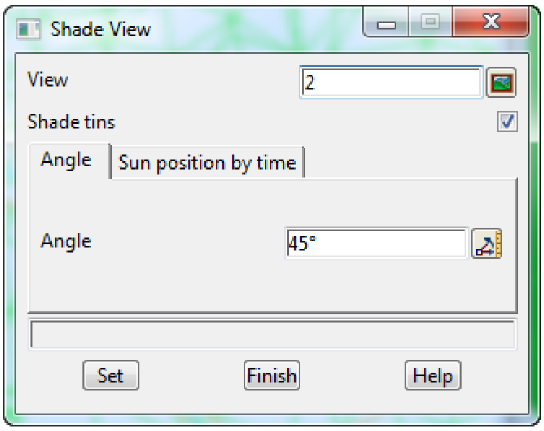
6.14 Shaded Views

It is also useful to view a perspective as a colour shaded view.

In a shaded view, the angle that each triangle makes with the sun (a point light source at infinity) is used to define a different shade of green. The angle of the Sun can be varied but 45 degrees (the default) gives the maximum contrast.

To quickly shade all the TINs on the perspective view, simply click LB on **Toggle =>Shade**.

To access the Shade View panel to modify the shade settings, click LB on the Menu button in the View Button Area of ‘Perspective OpenGL 2 and then click LB on **Settings =>Shade.**



Clicking LB in the **Shade tins** tick box will toggle on and off the shading. A tick indicates the shade is activated.

Click LB on **Set** to create the shaded view.

All TINs in the view will be shaded using the faces in order furthest to nearest the viewer. This has the effect of removing faces that are hidden from view.

Click LB on **Finish** to terminate the panel.

Now every time the view is refreshed or the view changed, the shaded view will reappear.

To get back to a green triangles rather than a shaded view, click LB on **Toggle =>Shade** to toggle the shade off.

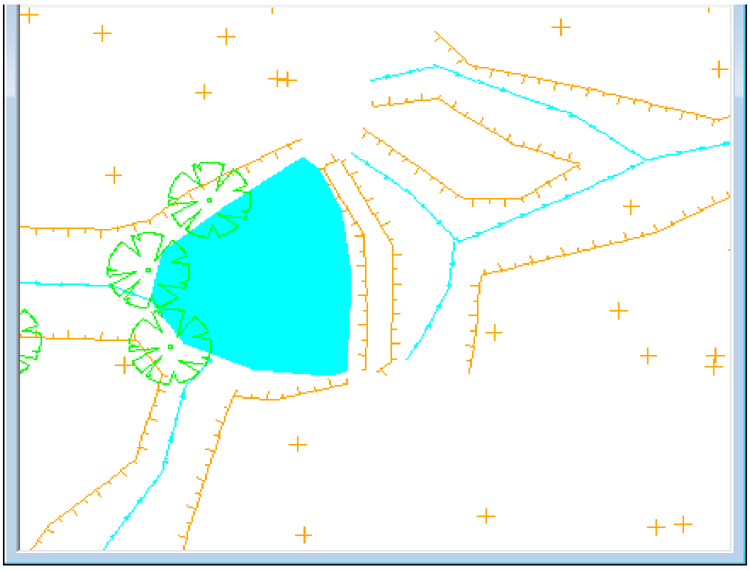
7 String Picking Concepts

We will now investigate picking concepts and how the mouse is used to interact with 12d when pointing to and selecting items on your screen. Initially, do all picking (i.e. mouse clicking) with the LB. This uses the 12d Model Tentative pick. Later we will look at Fast picking using MB (**F** snap) and Fast Accept (**A** snap).

In Plan View **1** turn on all the models **except** the triangulation (tin GROUND).

Check that **P**oint snap, **L**ine snap, **C**ursor snap and **I**nfo are on, and **F**ast snap and fast Accept) snap are both turned off.

Zoom in to the left dam. Your overall screen layout including the ‘Plan 1’ view should now look as shown below.

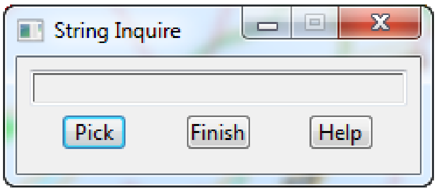


Whilst the **string picking** concepts are used throughout 12d, especially during construction of design features where we want to connect into existing geometry, we will learn about them by example through the relatively simple **String Inquire** feature.

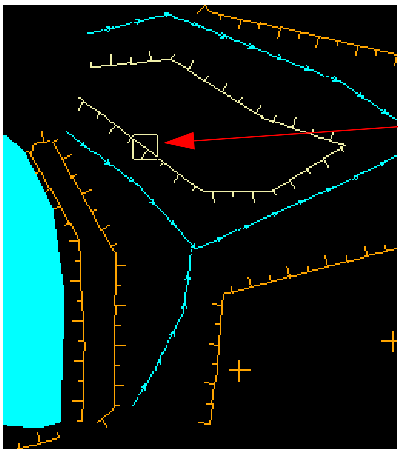
7.1 String Inquire

String Inquire is used to inquire and view the details of a typical line (i.e. string) that is already present in the View. From the Main menu, click LB on **Strings=>Inquire** to bring up the following panel.

NOTE: the *String Inquire* panel can also be brought up by pressing the F2 key. This has been defined in the standard 12d Model function key short cuts (userkeys.4d).

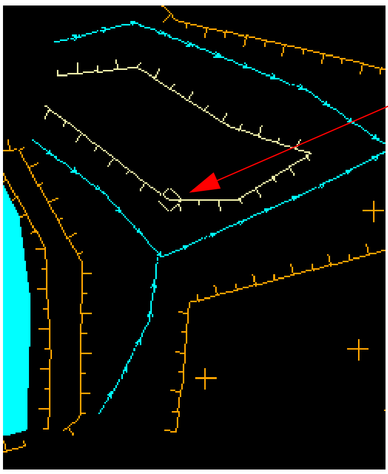


Click LB on **Pick** and then move the cursor anywhere over one of the bank strings and **click LB** (press and release LB).



If you placed the cursor over a line segment between two vertices:

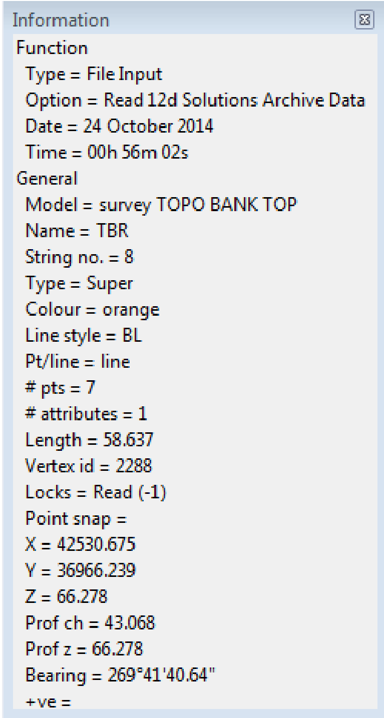
you should see the string go light yellow and a yellow square box appear at the location where you clicked LB.



If you placed the cursor over a vertex at the end of a line segments:

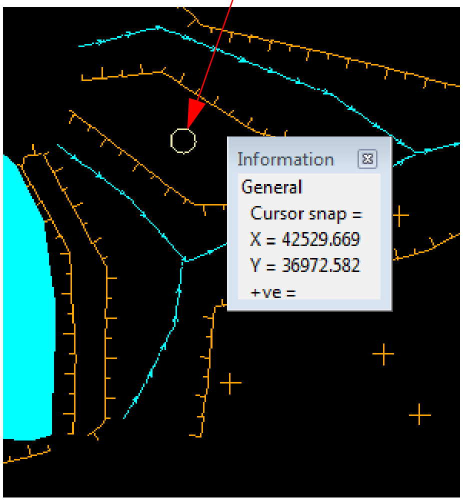
if you happened to snap to a vertex rather than a segment, you will see the string go light yellow and a yellow diamond appear at the location where you clicked LB.

In either case, an Information panel will pop up as shown at right (provided the **I**nfo snap is ON - See 7.4 Snap Settings on page 105.). It reports such information as the name of the Model which contains the selected string (survey TOPO BANK TOP), the string name (TBR), the type of string (Super), colour and linestyle. The number of points in the line are also returned along with it's length.



The x, y and z coordinates are those of the string where the pick occurred. And in this case the panel shows that the string was accessed via a **Point snap**.

If you move the cursor away from the string and pick with the LB again, you will notice that the Information panel changes, the string goes back to its original orange colour and the cursor is now replaced with a light yellow circle.



This sequence may seem strange at first. What has happened is that the first pick located a string within snapping distance of the cursor so the string **highlighted** in light yellow and the Information panel for this string popped up. The pick location showed a diamond to indicate that a **snap to the nearest vertex** had occurred. 12d is in effect asking you 'Is this the string you want?'. To reject the currently highlighted string, without moving your mouse, simply pick with LB again.

The last pick couldn't find any more strings to snap to (adjacent strings were outside snapping distance) and so no more information panels popped up. Instead, a circle showed at the pick location to indicate that a **snap to the cursor location** had occurred. That is, the only thing that 12d could find at the pick location was the cursor.

The above sequence will only happen this way if **P**oint, **L**ine and **C**ursor snaps are on. See below for more about snap settings.

Now if click LB a number of times on the same string without moving your cursor, you will end up getting the light yellow circle indicating a cursor snap.

The reason for this is that when you click LB the first time, 12d finds all the strings and pick types in the picking distance of the cursor and highlights the closest string with the closest pick type.

If you click LB again **without moving the cursor**, the **next closest string and pick type** is displayed. And if click LB again, the next closest string and pick type is displayed. This continues until there are no strings left that have not been rejected by clicking LB again.

The purpose of this behaviour is so that if there are (say) three lines on top of the other, it is possible to sequentially snap to each one in turn by looking at the Information panel details as you perform each LB mouse click. Even with the one string, the closest snap point may be a line snap, and when you click again you may get a Point snap **on the same string**.

The fact that we could only snap to one string confirms that there is only one string present at this location.

A quick method of restarting a pick sequence is **to move the mouse (i.e. cursor)** a short distance from the last pick point. The picking mechanism is then reset and all strings can then be picked again.

The next section shows how the mouse buttons can also be used to restart a pick sequence.

To terminate the String Inquire, click LB on **Finish** in the **String Inquire** panel.

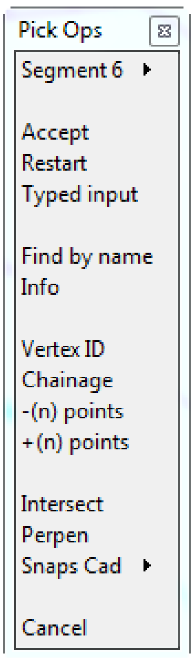
7.2 Use of Mouse Buttons and Enter Key when using Tentative Picking

The three mouse buttons and the Enter key all have a function when picking strings. Those functions are

LB - Left Button	Select the nearest string
MB - Middle button	**Accept** the current **highlighted** string. This will also terminate the current pick sequence.
RB - Right button	Bring up the **Pick Ops** menu
Enter key (<Enter>	**Accept** the current **highlighted** string. This will also terminate the current pick sequence. This is the same as MB and is very useful if you only have a two-button mouse (not advisable).

7.3 Pick Operations Menu via the Right Mouse Button

We will now focus on the use of the RB. Repeat the above picking sequence but now after getting the yellow square cursor (i.e. picking the string), click the RB and the Pick Ops menu will pop up



Click with LB on **Restart**. This resets the pick sequence to start over as if the previous pick sequence had never occurred.

If you now click on the string with LB, you will notice that the string can now be picked again with the LB. The lesson here is that if you ever get confused during a picking sequence, the picking operation can be reset and start over again by either moving the cursor a given distance or click RB to bring up the **Pick Ops** menu and select **Restart.**

The **Accept** menu item needs special mention. During a picking sequence, once you have located the string you are after, you normally terminate the sequence by clicking the MB. This accepts the current string and terminates the pick sequence.

The **Accept** menu item has the same function as clicking the MB during the pick sequence i.e. it is used to indicate to 12d that the string found is the one that you wanted. If you are using a 2-button mouse, this is another way around the lack of the middle button (using <Enter> for accepting was described in the previous section). You can accept a string by using the RB to bring up the Pick Ops menu and click LB on **Accept**. If you have a 3-button mouse, it is easier to use the MB to accept the string directly.

The **Info** menu item also has a special function. The Information panel that pops up when a string highlights is only displayed temporarily. If you move the mouse cursor a small distance, the information panel will disappear. This occurs even of you don’t click any mouse buttons. The **Info** menu item is used to pop up the Information panel (again) for the currently highlighted string.

The **Cancel** menu item is used to terminate many of the operations that are recursive. For instance when creating a string, 12d assumes that it will involve multiple line segments so it stays in create mode after each segment is placed. After the last point on the string is placed, use the RB to pop up the Pick Ops menu and click LB on **Cancel** to terminate the creation.

7.4 Snap Settings

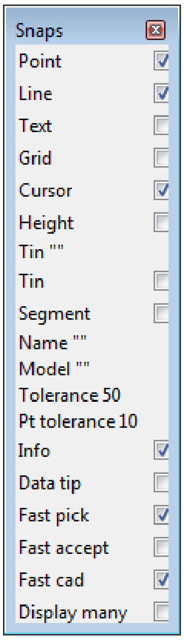
In the context of String Inquire, the snap settings are used to selectively choose from 12d data sets when inquiring on existing items. The snap settings can be toggled on and off from the snaps toolbar.

Snaps toolbar

If you are new to 12d, it is easiest to first stat using the full snaps menu until you get used to the abbreviations in the **Snaps** toolbar.

To bring up the full **Snaps** menu, click LB on **Utilities=>Snaps=>Snaps**.

On the **Snaps** menu, at any one time each snap setting is toggled either ON or OFF. If a tick appears, the snap setting is toggled ON. The settings shown are the default settings when starting 12d.



At this stage we will focus on 4 of the first 5 boxes: Point, Line, Grid and Cursor. Upon a successful snap, each snap type returns a unique appearance.

Point Snap - diamond
Snaps to the nearest point or end of line

Line Snap - square
Snaps to the nearest line

Grid Snap - circle
Snaps to the nearest grid intersection point

Cursor Snap – circle
Snaps to the mouse cursor (x,y) position. This is used when drawing freehand.

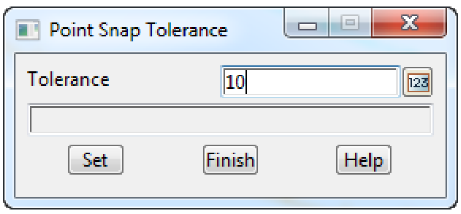
To change a snap setting, click LB anywhere from the snap name text to the snap tick box. The setting will toggle ON or OFF.

As shown above, it is possible to have multiple snap settings on simultaneously. For instance, if you want to be able to select a string on either the segments of the string, or the vertices of the string (the ends of the segments), you need both **Point** and **Line** snap ON.

You can generally leave Cursor snap ON. Most times, if all other snaps fail or are not set, you want the mouse cursor position returned. This is useful when free handing into 12d strings that are not connected to existing features e.g. the centreline of a new road. If you don't have Cursor Snap ON, you will get a **Failed Snap** error message whenever all other snap settings fail.

Near the bottom of the Snaps menu is an **Information** tick box labelled **Info**. If this box is NOT ticked, the Information panel will NOT pop up as each string is selected.

Above the **Information** tick box is the menu item **Pt tolerance 10**. This figure indicates the current point snap tolerance setting is 10. To change the snap setting, click on **Pt tolerance 10** with LB and the following panel pops up



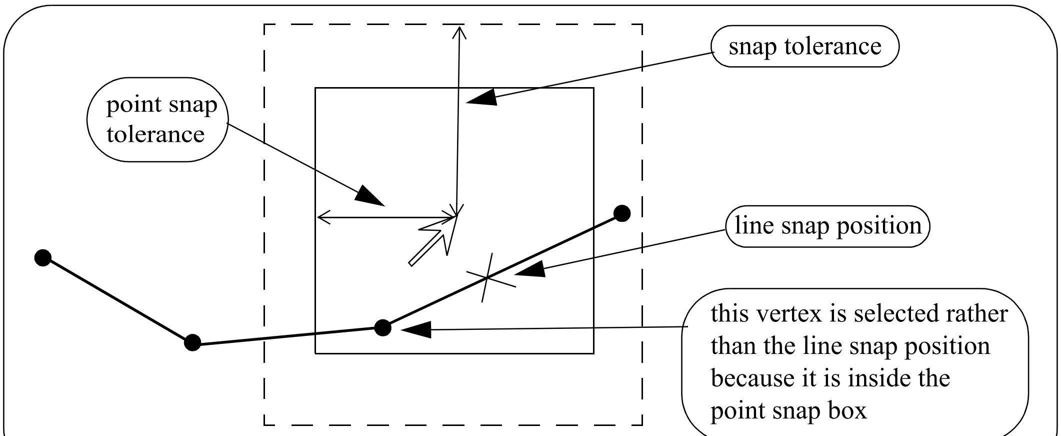
The point snap tolerance is measured in screen pixels. In 1024 resolution, a point snap tolerance of 10 represents about one hundredth of your screen width. If point snap is set, then the closest vertex within this distance of the cursor will be selected.

To change the tolerance, lock the cursor in the *Tolerance* field by highlighting (double clicking on) the existing text, press <Delete> and type a new Tolerance value. Click LB on **Set** to activate the new setting. Click on **Finish** to terminate the panel.

Similarly for the **Tolerance** menu item - click on **Tolerance** and the *Snap Tolerance* panel pops up

NOTE - When ***Point*** snap is set on, any vertex of a string within the point snap tolerance box around the cursor when LB is clicked, is considered for selection ***before any other type of snap is considered***. Centres of circles, centres of arcs and arc end points are considered to be vertices.

When ***Line*** snap is set on, the cursor only needs to be within the snap tolerance distance of any visible segment of a string when LB is clicked, and that string is considered for selection. Also arcs and circles are considered for selection.

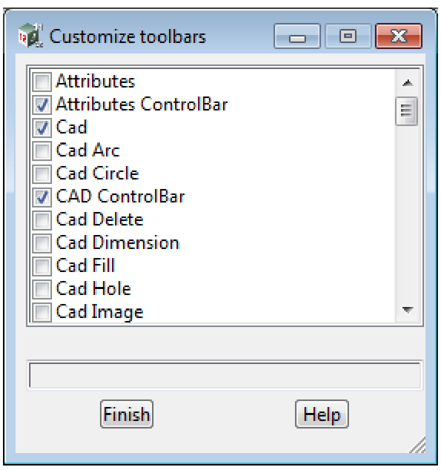


Point Snap Box and Snap Box

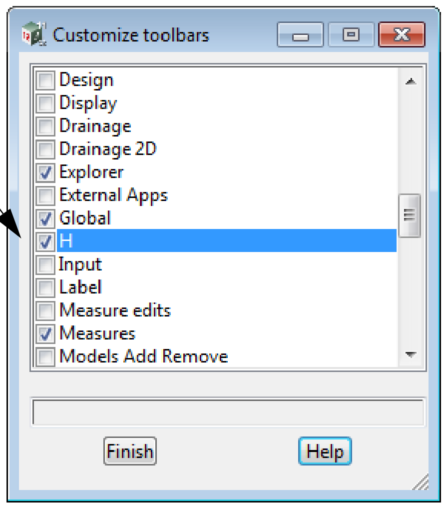
In the area between the point snap box and the snap box, vertices and line snap positions are treated equally and the closest one to the cursor is selected.

As you use 12d you need quick access the turning snaps on and off but it is not that often that you need to change the other settings. So rather than having the large **Snaps** menu on display at all times, the **Snaps toolbar** and **Snaps (Vertical)** menus are available as abbreviated forms of the full **Snaps** menu. They take up less room on your screen and hence are useful to the experienced user.

The **Snaps** toolbar is normally in the top section of the screen but if it has been deleted, it can be brought back again by clicking on **View =>Toolbars to bring up the Customize Toolbars** panel and ticking on **H** (for Horizontal snaps).



Scroll down until the H tick box is visible and turn it to a tick

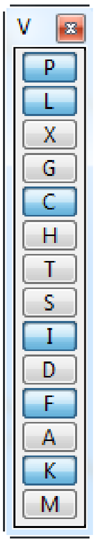


The **Snaps** toolbar will then appear on the screen

Similarly selecting **Utilities =>Snaps =>Snaps (vert)** on the Main Menu) will bring up a Vertical snaps menu. Unlike the **Snaps** toolbar, the **Snaps Vertical** menu can not be docked.

Snaps **V**ertical menu

Point
Line
Te**x**t
Grid
Cursor
Height
Tin
Segment
Info
Data tip
Fast pick
Fast **a**ccept
Fast snaps cad accept
Lists all strings within
snap tolerance



Snaps toolbar

At any one time each snap setting is toggled either ON or OFF. For the **Snaps** toolbar and the **Snaps Vertical** menu, the snap setting is OFF when the button is depressed or appears clear and ON when the button appears raised or blue.

To practice this further, do a **Fit** on your current View. Pick a feature in the view where lots of lines meet and without moving the mouse, do a series of **String Inquires** by repeated use of the LB and observe how 12d will snap to adjacent items near to the mouse cursor. Note the cursor shapes returned that indicate that sometimes you are getting a **Point snap** and sometimes a **Line snap**.

Remember points are just a special type of string.

7.5 Models and Snap Settings

Whilst it may appear obvious, it is important to remember that you can only snap to data that is currently on display. Models that are currently turned off will not participate in the selection process during snapping. If you find that you are snapping to unwanted items, consider turning off models that are irrelevant to your current operations

7.6 Fast Picking Snap (F)

If **Fast Snap** (**F)** is on, instead of clicking LB to select a string, **click MB** or press <enter>, and the nearest string to the cursor satisfying the snap conditions is selected.

Hence using **MB** alone replaces a LB followed by an MB.

Note: If you are using **F** snap then you get the first string only.

7.7 Fast Accept Snap (A)

If **Fast Accept** (**A**) snap is on, then if there is only one string that satisfies the snap conditions, then that string is automatically accepted.
However if there is more than one string then the normal snap selection is followed.

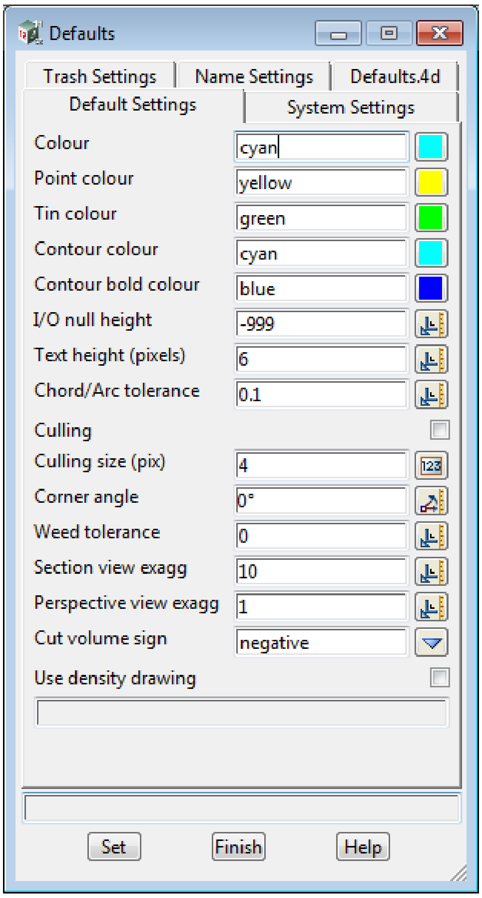
Note: **A** snap is a good compromise - if there is only one possible string then it is immediately accepted. If there is more than one possible string, then you get the choice to select which one.

7.8 Modifying the String Highlighting Colour

12d has various default parameters for the display of data including the string highlighting colour. This is the colour a string is changed to whilst it is selected.

The default highlight colour is *white* but this is not be very useful if you want to draw strings in white, or if you use a white background colour. In either case, it is important to change the highlight colour to a colour other than the white.

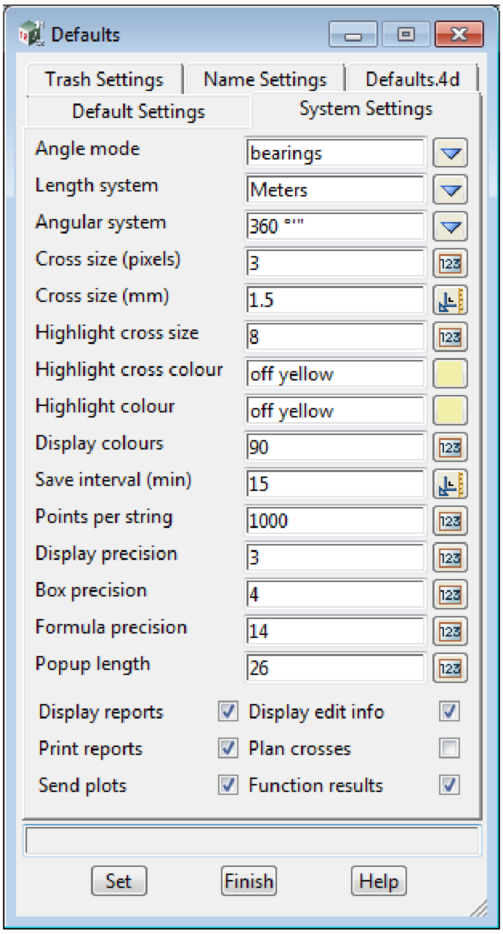
To check the highlight colour for the project, we select from the main menu **Project => Management => Defaults** and the **Defaults** panel pops up.



From this panel, the user can change various parameters for this project that 12d uses for calculations, display and data handling.

To change the **default highlight colour**, select the *Systems Settings* tab by clicking LB on the **Systems Settings** tab.

The following panel should appear:



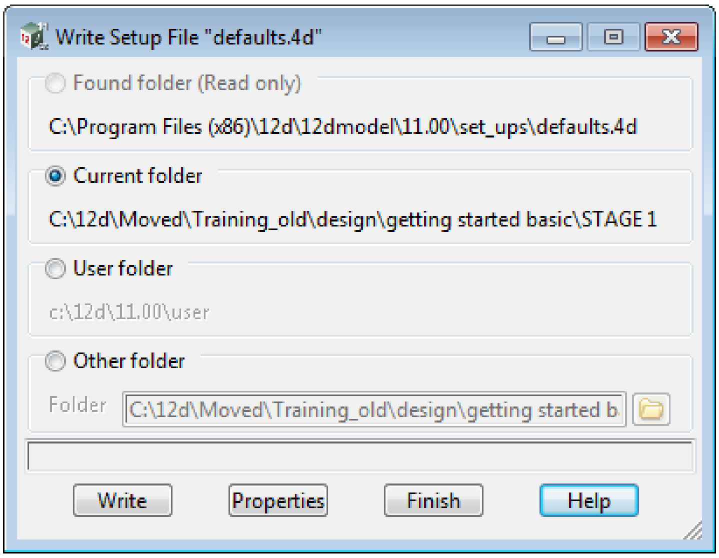
Note that the Highlight colour is set to off yellow.

To change this, LB click on the colour icon adjacent to the Highlight colour input box and select another colour such as cyan from the colour choice box. Then press **Select** on the colour choice box panel. Colours can more quickly be selected from the choice box by double clicking LB on the desired colour - the Select button is not required.

To set the current values for the defaults press the **Set** button.

NOTE: When a new project is created, the values in the **Defaults** panel are loaded from the set-ups file *defaults.4d* which 12d Model looks for on start up in the standard 12d location (for more information on the search order, see 37.8 Defaults File in 37 Setting Up & Configuring 12d in the context sensitive 12d Model Reference manual). For an existing project, all the values in the **Defaults** panel are saved with the project so if any have been changed in the project after the project was first created, then the defaults for the project will differ from those in the *defaults.4d* file.

If you wish to keep the current defaults for a project to use as the initial defaults for future new projects, you can save the file **defaults.4d** to a suitable location by clicking on the **defaults.4d** tab and then the **Write defaults** button to bring up the **Write Setup File "defaults.4d"**panel.



Specify where you wish the *defaults.4d* file to be saved and then click on **Write**.

In this example select **Current folder**. If you wanted the changes to apply to any new project you create then you would select **User folder** and it would save the changes to the *User* folder.

Click on **Finish** to close the **Write Setup File "defaults.4d"** panel, and then **Finish** on the **Defaults** panel.

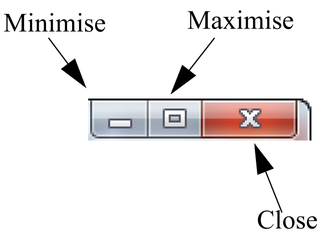
8 Creating Strings with CAD

We will now investigate creating strings using the CAD options. We will create points (one point strings), a 2 point line (single segment string) and a line string (multiple segments in the string).

First we will create a new plan view to work in.

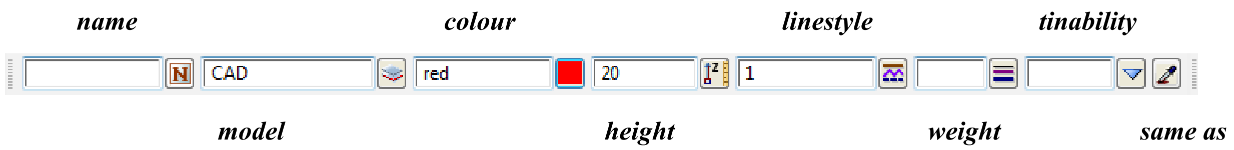
From the main menu, click LB on **Views =>New =>Plan**. This will create View **Plan 3.**

Maximise the view by clicking on the *Maximise* icon on the top right hand corner of the view or by double clicking on the plan view title area.



8.1 Creating Points

The CAD options to create points, lines etc. can be done by using the main menu system or by the use of the CAD **toolbar**, which is displayed on the left of the screen at start-up. Regardless of the method used to activate the CAD commands, the CAD **controlbar** as outlined on in 3.5 Toolbars and Controlbars on page 26.will be used to define the characteristics of the created elements. We will change the values in the **controlbar** as follows.



Click LB in the model field and type in **CAD**. Click LB on the colour icon and choose the colour ***red*** from the choice box by double clicking on *red* in the pop-up list of colours. Enter **20** into the height box and leave the linestyle type as **1**.

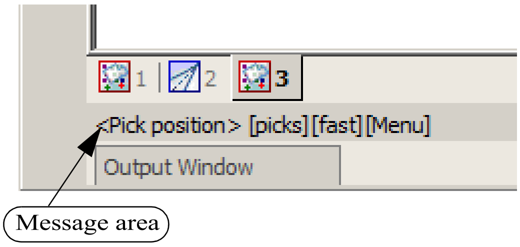
Note: We are only using red because it will show up on a white background in the images. Use whatever colour you prefer.

To create a point string (i.e. one vertex string) we will use the CAD **toolbar** flyout. Pick the points section of the toolbar by clicking LB over the CAD Point symbol and keep LB depressed.

The points **flyout** menu is displayed which has all the options in the points section of the CAD creation tools. This is displayed as a horizontal bar consisting of all the icons that make up all the options in the points section of the CAD tools. Whilst holding down LB move the cursor over each of the icons and the **tooltip** function tells what each of the options does.

To select an option, keep the LB depressed until the cursor is placed over the specific option you want and then release the LB. We will select the **Point** option which is the first icon in the **flyout**.

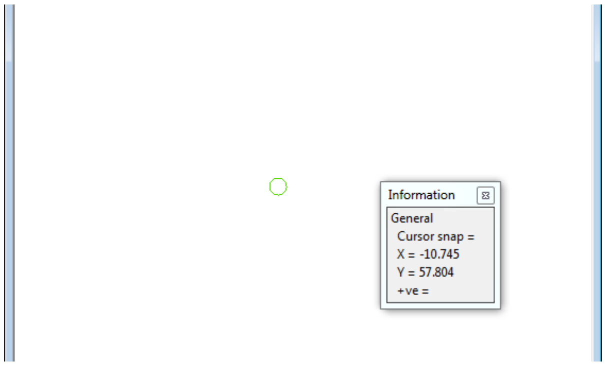
On selecting the **Point** option, or any other CAD option, the user is prompted for the relevant data in the screen message box located on the bottom left hand corner of the 12d Model application window



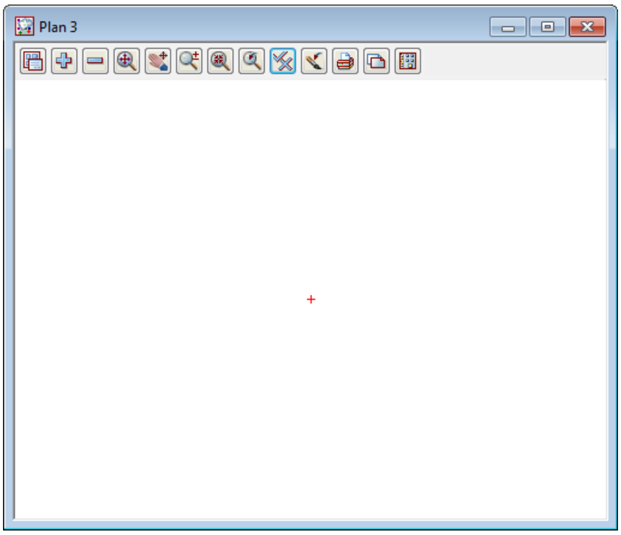
The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the point is created at the selected position. The model, colour, height etc. are defined in the **Cad Controlbar**.

The snap mode will influence the mouse selection. For example if Cursor snap is on, the user can choose a position not yet defined. If Point snap is on and the selection snaps to an existing point, the option will place another point at that location.

Ensure that the **Cursor** snap is activated in the Snaps **toolbar**. Click LB at a position roughly in the middle of the view.

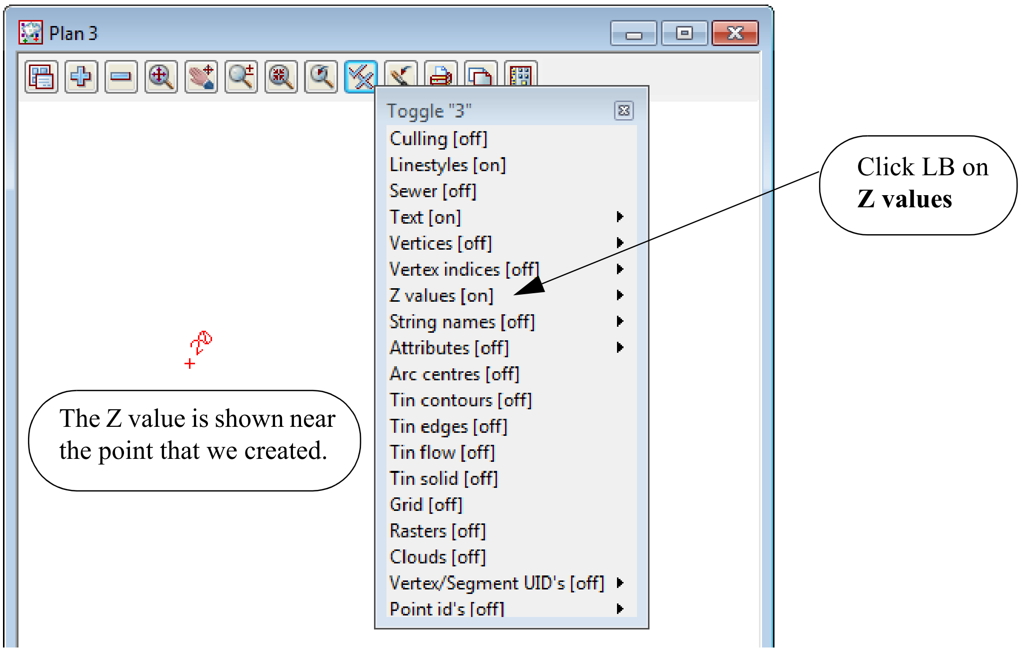


Click MB. The point is then created with the model CAD being added to the view automatically.



To see the height of the point we must toggle on the Z values. To do this click LB on the toggle button on the view menu to bring up the toggle menu. Then click LB on the **Z values [off]** position.

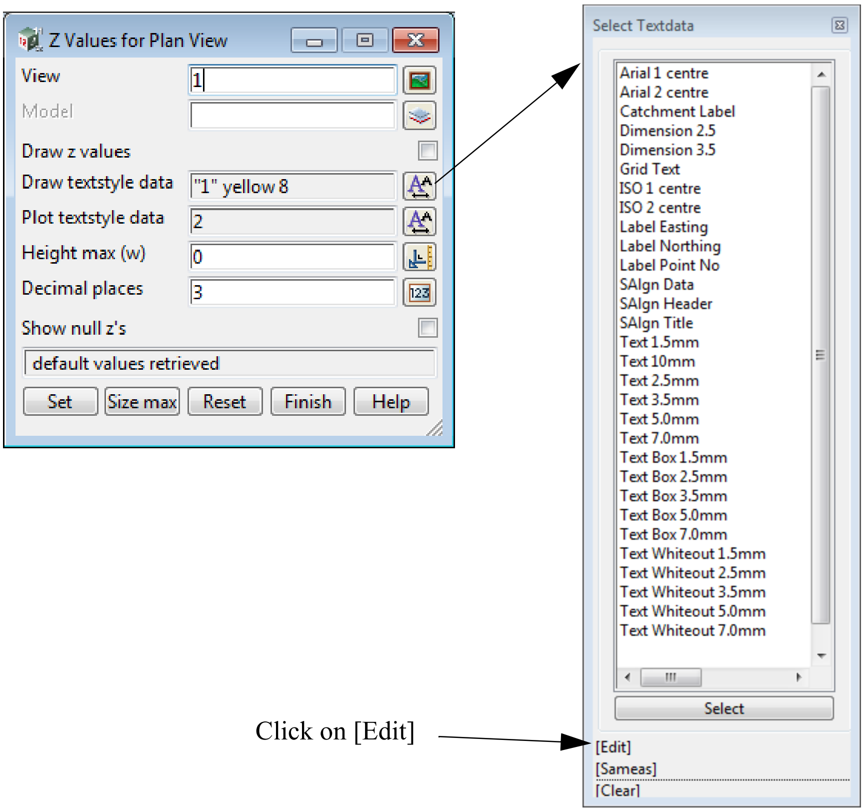
Don’t walk right on the arrow near this position - this is to specify individual models to turn the Z values on or off. By clicking LB on the Toggle menu, you turn on (or off) all Z values in that view for all models.



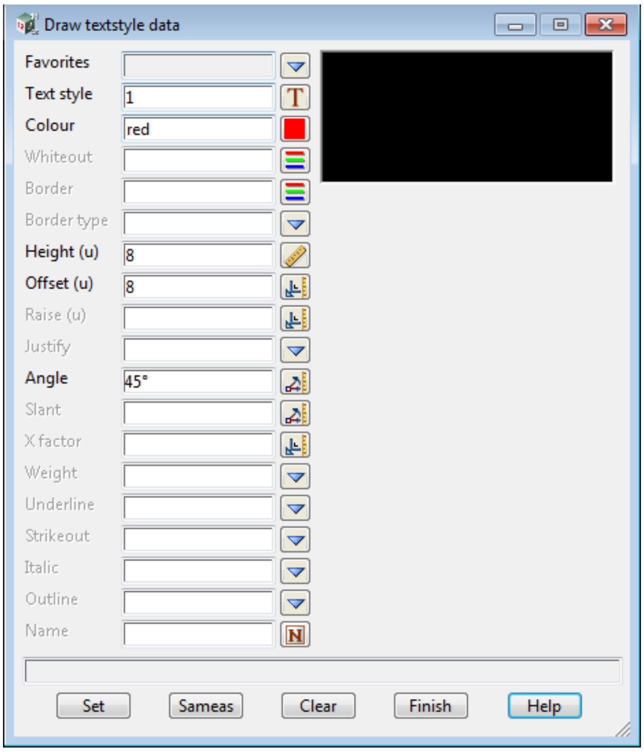
The default colour for the height text is yellow but to make it clearer on our white background, we will change the text colour to red (as depicted in the image above).

To change the colour of the height text, click LB on the menu icon from the Plan 3 View menu to bring up the Plan View menu. From that menu click LB on **Settings =>Z values =>Single** to bring up the **Z Values for Plan View** panel.

From this panel, for the **Draw textstyle data field**, select the **Textstyle Data** icon and then click on **[Edit]**.



:



Change the **Colour** field to red and then click **Set** and **Finish** to close the panel.

Finally click **Set** on the **Z Values for Plan View** panel and **Finish** to close the panel. The colour of the height text will then be red.

The change is made only for View 3 and when any other points are added to the view, they will also have their height text shown in red.

There are various ways of selecting a position when creating a point. For the first point we just selected anywhere on the view.

Specification of a position can also be done by the direct input of the xyz coordinate of the point.

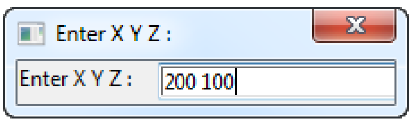
Select CAD Point again to begin creating a new point and when over the view either press the space bar or start typing the x value and the **Enter XYZ** panel will come up.

The user then enter the X, Y and Z values into the box each value separated by a space. e.g. 200 150 40. As we have already set a Z value in the CAD **controlbar,** you only have to specify a X and Y value into the box. **NOTE:** The Z value will default to the value entered into the CAD **controlbar** whether or not it is specified in the XYZ box. If no height value exists in the CAD **controlbar** or the XYZ box, then a value will be interpolated if possible, otherwise a 0 value will be assigned.

We will again create a point by using the CAD **toolbar**.

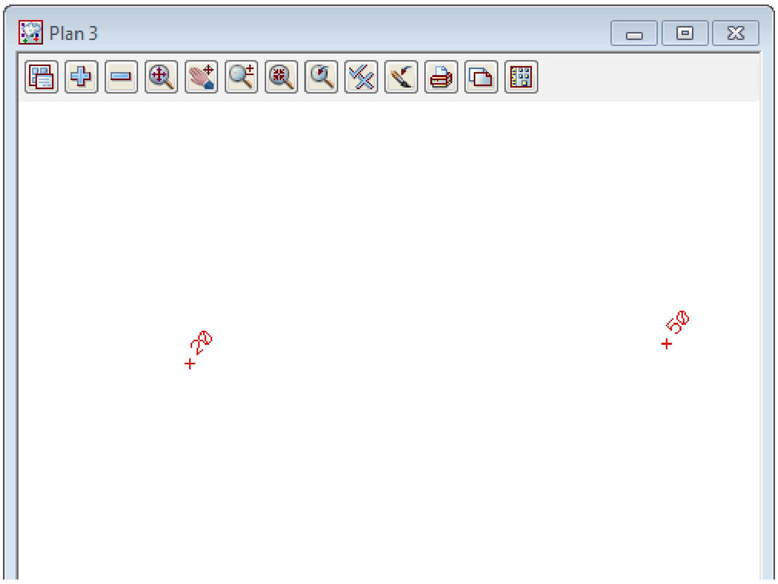
Firstly, change the Z value in the CAD **controlbar** to **50**. Then repeat the steps outlined above to choose the CAD Point option. Instead of selecting a point with the mouse we will type in the coordinate values.

To pop up the XYZ box, press the spacebar. Then type into the box, 200 100 and then press <Enter>. We did not have to specify a Z value in XYZ box as it was already defined in the CAD **controlbar**. **NOTE:** A space must be placed between the X and Y values.



A new point is created. Click LB on the **Fit** icon on the view menu  to fit the data in the view.

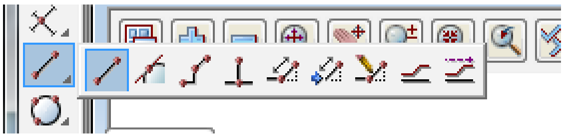
It should now look like as shown below:


Plan 3
20
50

8.2 Creating Two Point Lines

We will now create a simple one segment line. To do this we will again use the CAD **toolbar** but this time use the CAD Line flyout.

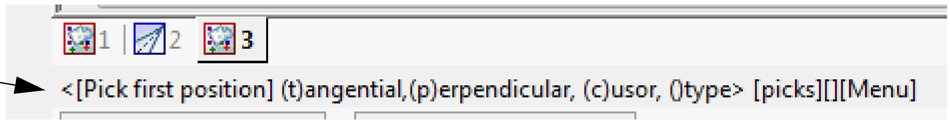
Pick the Cad Line section of the toolbar by clicking LB over the CAD Line symbol and keep LB depressed.



The Cad Line **flyout** menu is displayed which has all the options in the lines section of the CAD creation tool. Select the **2 points** option which is the first icon in the **flyout**.

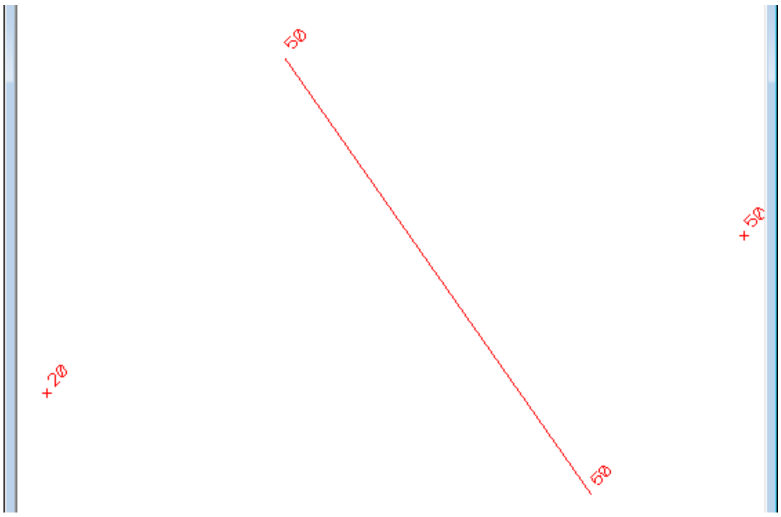
On selecting the **2 points** option, the user is prompted for the relevant data in the screen message box located on the bottom left hand corner of the 12d Model application window

Message area



We will pick a position with the mouse to define the start of the line. Pick a position with LB about halfway between the two existing points and then MB to accept. After accepting the start point, the user is told in the message area to pick the second position (the end of the line). You will also notice when you move the mouse around that a line is drawn **rubber banding** to the cursor position.

We now select a point going south east to define the end of the string with LB and MB to accept. The created string will be shown using the parameters given in the CAD **controlbar** at the time of construction.



8.3 Creating Line Strings

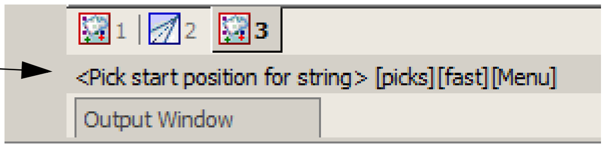
We will now create a multi-segment string.

Although we could use **Line String** option on the CAD Line flyout, this time we will use the CAD menu from the Main Menu system rather than from the CAD toolbar

From the Main Menu, click LB on **Cad =>Line =>Line string**. The **Line String** option will now be running. **NOTE:** These CAD options have no panels.

On selecting **Line String** the user is prompted for the relevant data in the screen message box located on the bottom left hand corner of the 12d Model application window

Message area

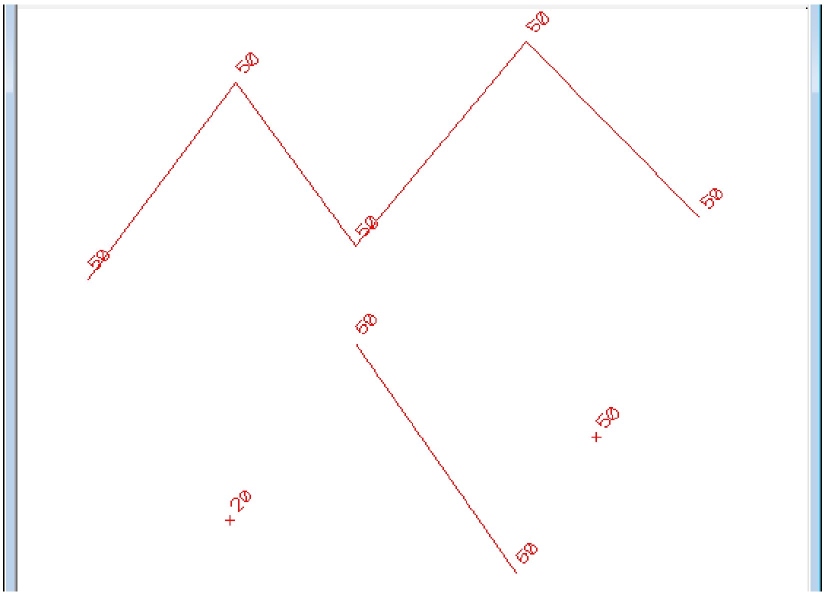


We will pick a position with the mouse to define the start of the line.

Pick a position with LB any where on the view and accept with MB. Then move the cursor to a new position and pick and accept a second point. Pick and accept a third point and so on.

To finish the string simply press <Esc> on the keyboard, or alternatively RB to bring up the **Pick Ops** menu and then select **Cancel** from it

The string will be created using the parameters given in the CAD **Controlbar** at the time of construction.



This has given a small introduction to the use of the CAD options. For a more detailed explanation of these tools see the chapter CAD in the 12d Model Reference manual.

We will now finish this section by deleting the current view. As the view is maximised, select **View =>Delete** and select view **3**. Alternatively, we could have restored the view and clicked LB on the **X** icon at the top right of the view.

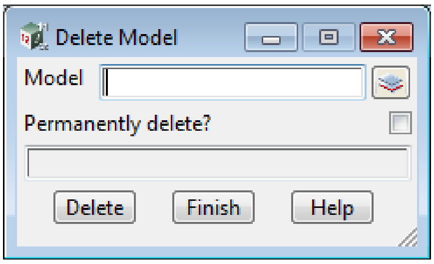
This should then leave two views, Plan 1 and Perspective 2. If either Plan 1 or Perspective 2 are left maximised, select the restore button on the top right hand side of that view to leave two views as they were at the start of this chapter.

Clear the value for the default height in the Cad Controlbar. Leaving the height there may create problems when creating strings at a later stage. Also change the default model to one of the existing survey models as we will be deleting the CAD model and don't want it being created again.

Finally, to delete the CAD model click LB on the *Delete model* option from the Main Menu **Models =>Delete =>Delete a Model**.

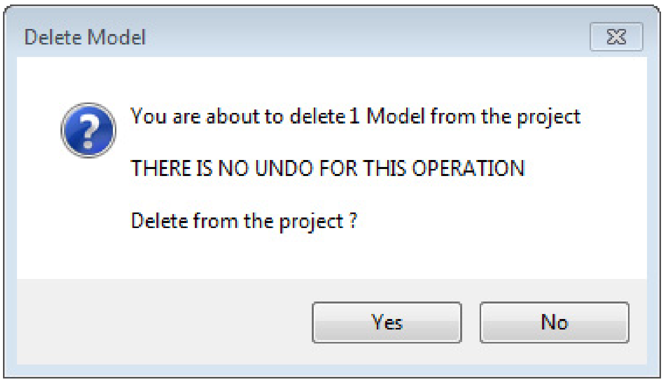
This brings up the **Delete Model** panel

.



Select the Model icon with LB and then double click LB on **CAD**.

Tick on **Permanently delete?** and then click on the **Delete** button, and answer **Yes** to the confirmation panel for Delete Model.



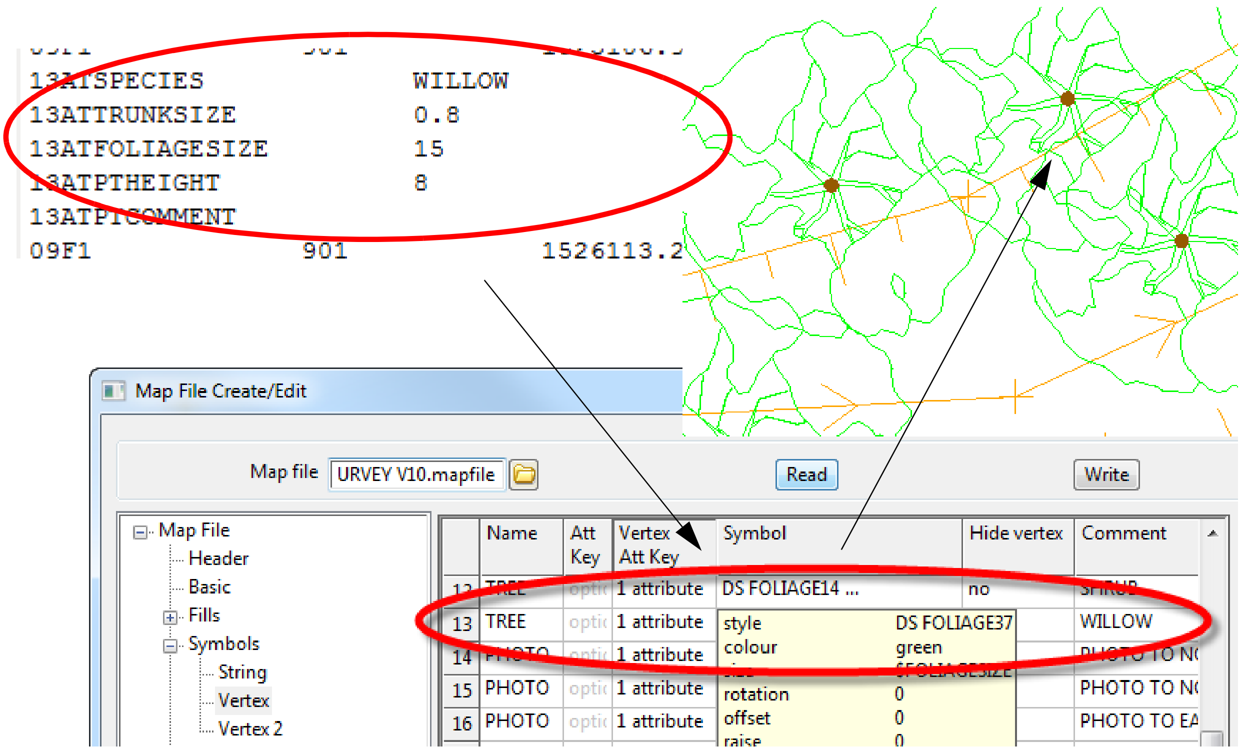
This then deletes the model from the project.

9 Survey Data Reduction

9.1 Coding

9.1.1 Feature Codes

Feature codes and attributes are used to define surveyed points in the field. The code and attribute will be used to assign properties such as model name, colour, symbol and linestyle via a mapping file.

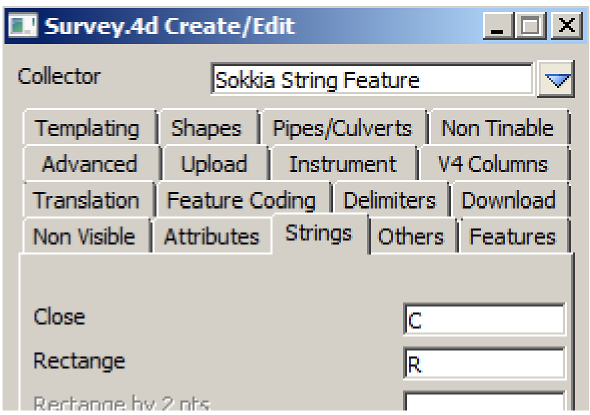


9.1.2 Field Codes

Field codes are used to enhance the effect of feature codes.

Field codes are defined for each data collector and are set up in the **Survey.4d Create/Edit** panel.

We will look at how to bring up this panel later (**see** 9.4.1 Creating/Checking/Modifying a 12d Data Collector Definition on page 132.)



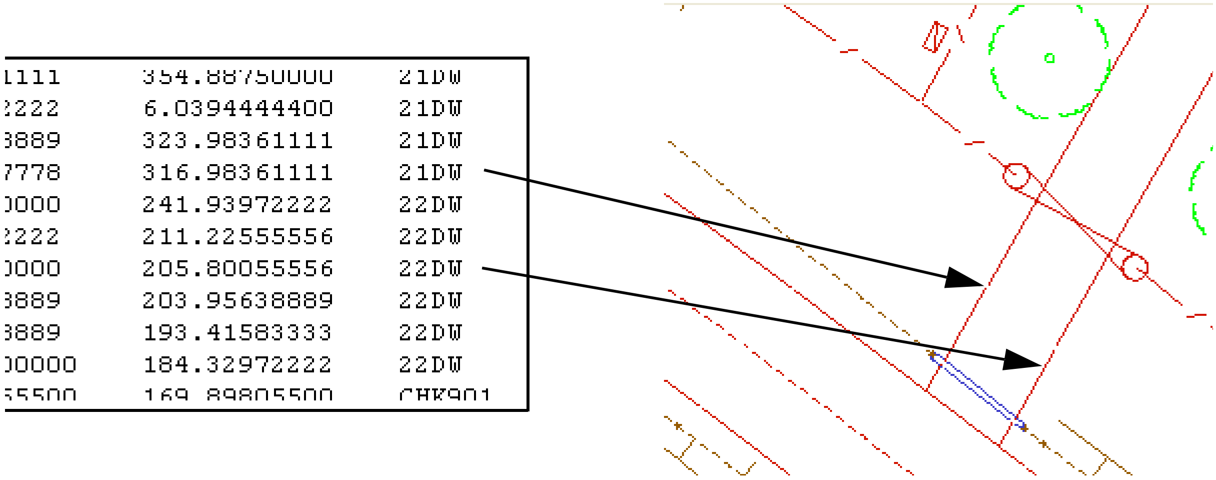
In the *Survey.4d Create/Edit* panel, Field Coding is set up under the panel tabs: **Templating, Shapes, Pipes/Culverts, Non Tinable, Feature Coding, Non Visible, Strings, Others and Features**

The Field codes are user definable and can be any letters. It is advisable to ensure that the codes used are not the same as feature codes.

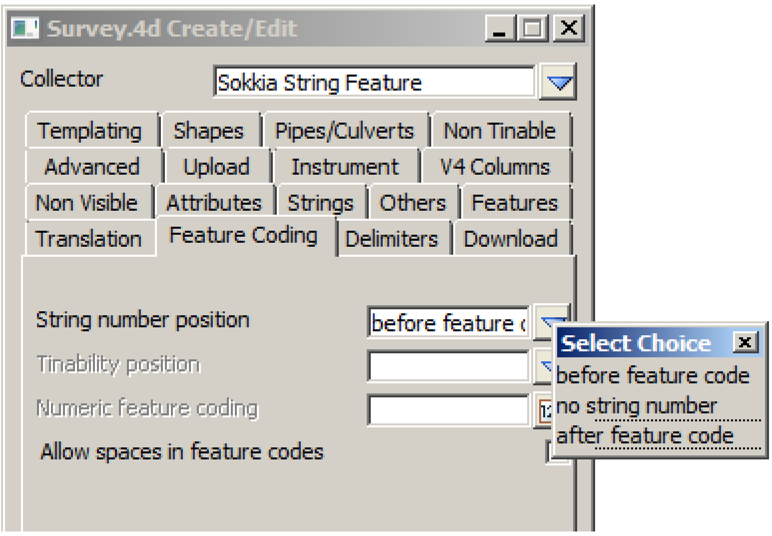
A list of Field codes can be found in the Reference manual.

9.1.3String numbers

Numbers can be used to differentiate separate strings using the same code.

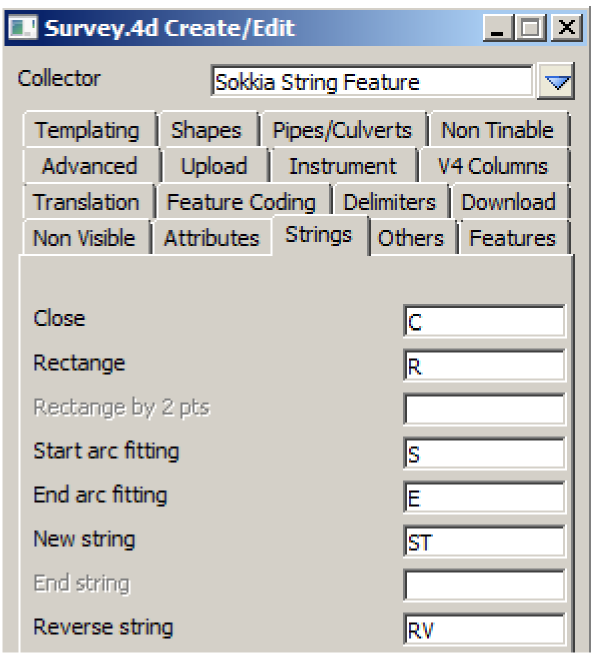


.

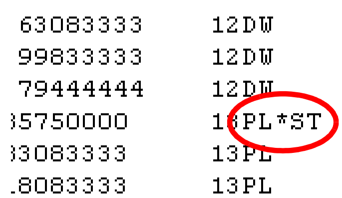


The string number position is specified under the **Survey Data Setup** menu under the **Feature Coding** tab

.



String numbers may be omitted and a **New String** command can be included after the code. This is set up under the **Strings** tab



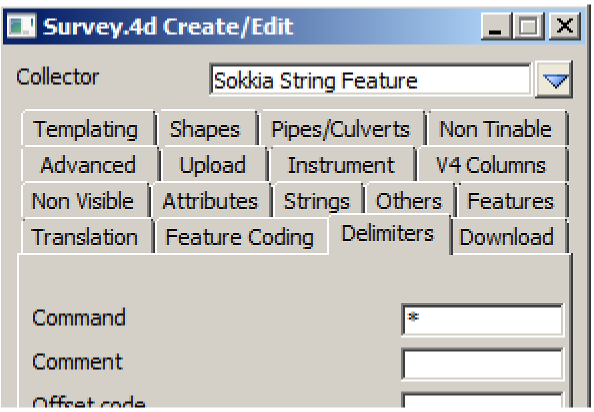
9.1.4Delimiters

There are a number of delimiters used in 12d. Two commonly used ones are the code delimiter and the comment delimiter.

```
27770     108.94333300    TR0309 WATTLE
13888     81.141111100    TR0306 GUM
02777     292.79027700    TR0608 GUM
11111     350.24777700    25FE
55555     5.8144444000    25FE*XN
00000     60.870277800    25FE
13888     74.994166700    25FE*27BU
88888     78.408333300    25FE

47222     80.721111100    25FE
```

A Comment delimiter (space) is used to separate a feature code from a text description

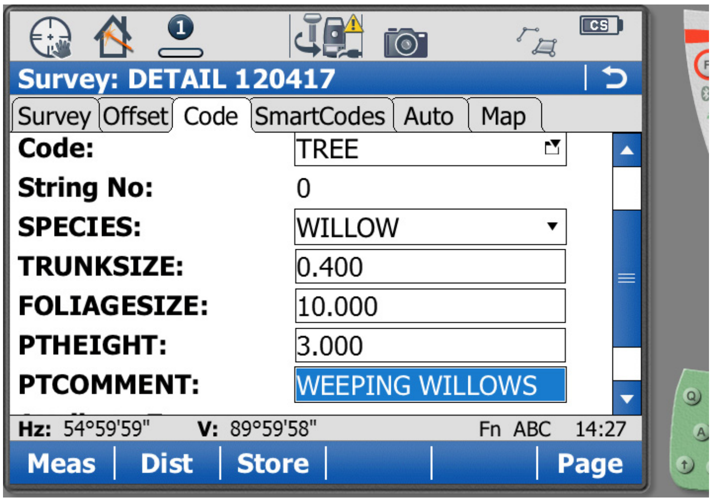
A code delimiter (*) is used to separate multiple feature codes and/or feature codes and field codes



The Delimiters can be defined under the **delimiters** tab of the **Survey Data Setup** menu

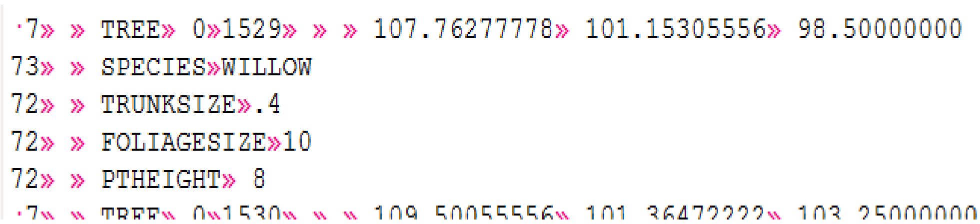
9.1.5Attributes

Attributes are used to minimise the number of codes. For example a single code TREE can use attributes to define the species, trunk diameter and foliage size



In the example Data collector screen shown above the attributes defining the species and size of a tree are entered in the field

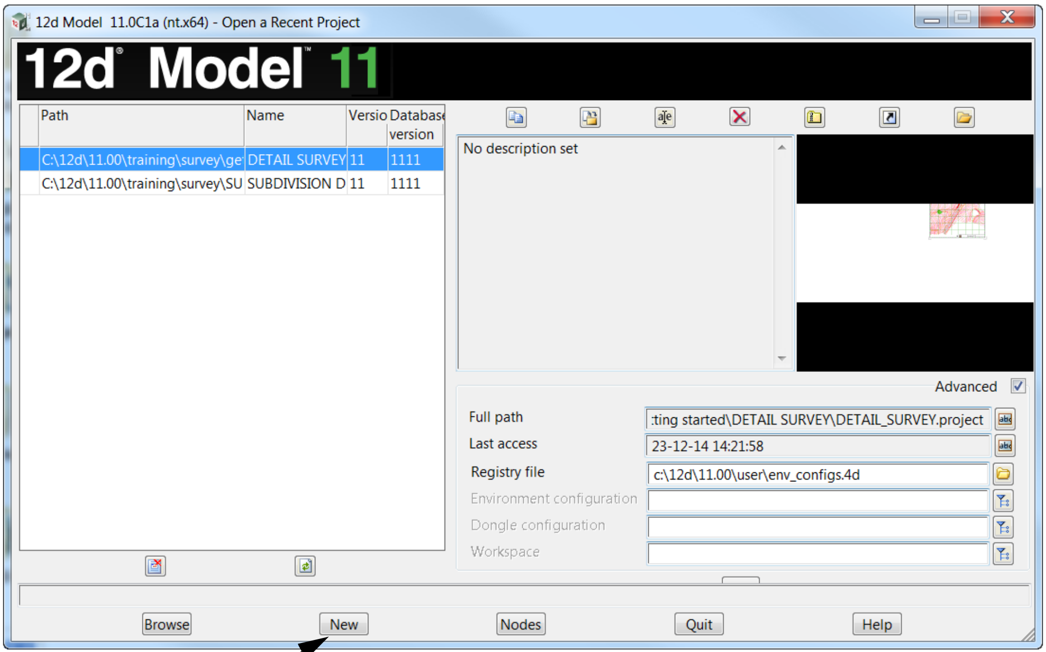
The resulting field file (shown below) is then processed to create a unique symbol



9.2 Setting up a New Project

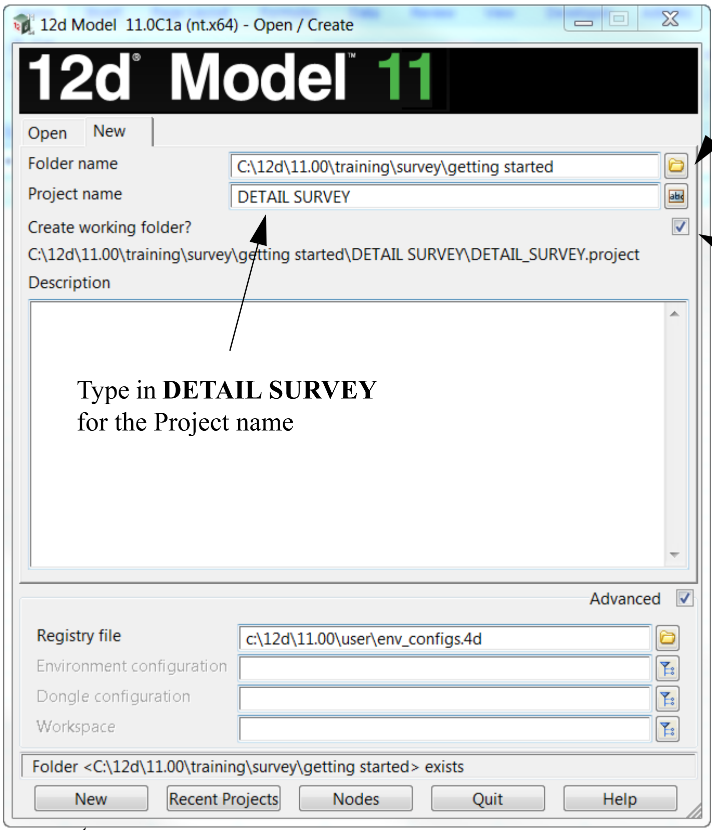
Before we can reduce the survey data, we first we need to create a project to read the survey data into. We will create a new project called 'DETAIL SURVEY' in the Survey Getting Started training area.

First, double click on the *12d Model 11* icon to bring up the **Project Selection** panel.



Select **New** button to bring up the **New project** panel.

Select the Folder icon then browse to folder **C:\12d\11.00\Training\survey\getting started**

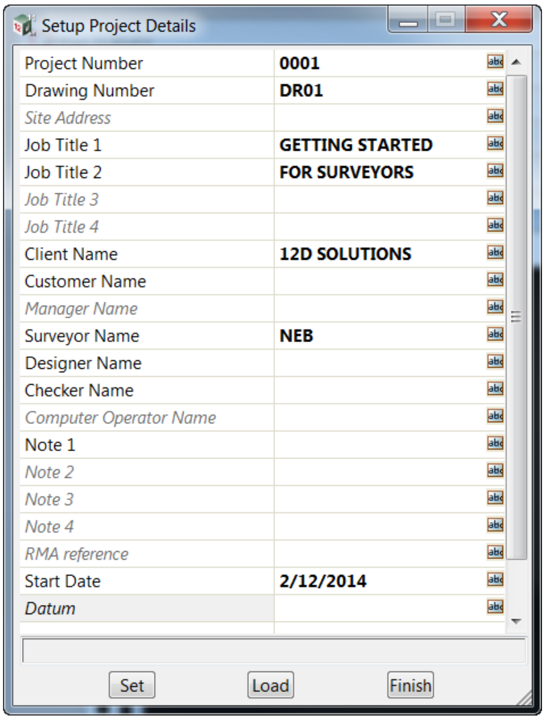


Type in **DETAIL SURVEY**
for the Project name

Ensure **Create Working Folder** is ticked

Select **New** button to open the new project

9.2.1Screen Setup

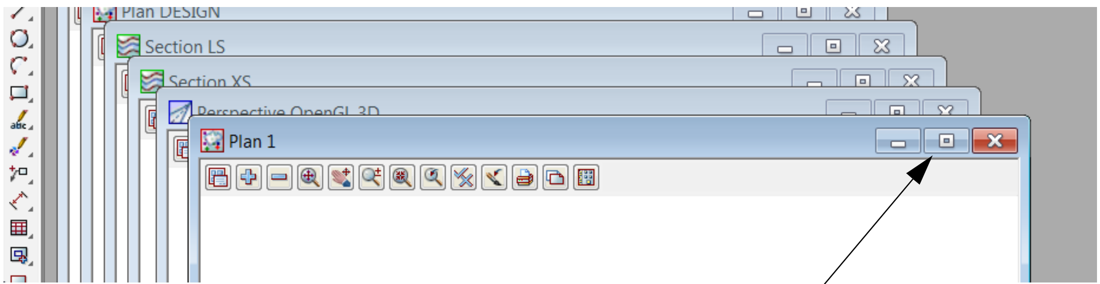


When the project starts up for the first time the **Project Details** panel appears

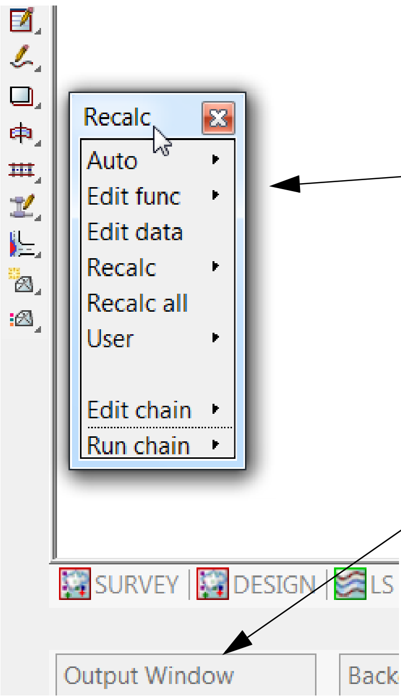
The information typed in here can be used when plotting from this project

Fill in the values as required

Select **Set** then **Finish** to save the settings and continue



Maximise the plan view **1**



Move the **Recalc** panel to the bottom left

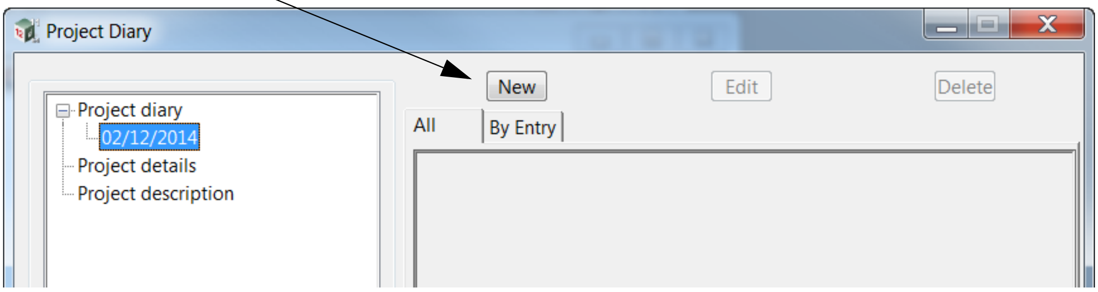
If the **Output window** tab is highlighted blue you can move the cursor over the tab to display the error message if any. Normally when creating a new project there are optional file that are not found.

9.2.2Project diary

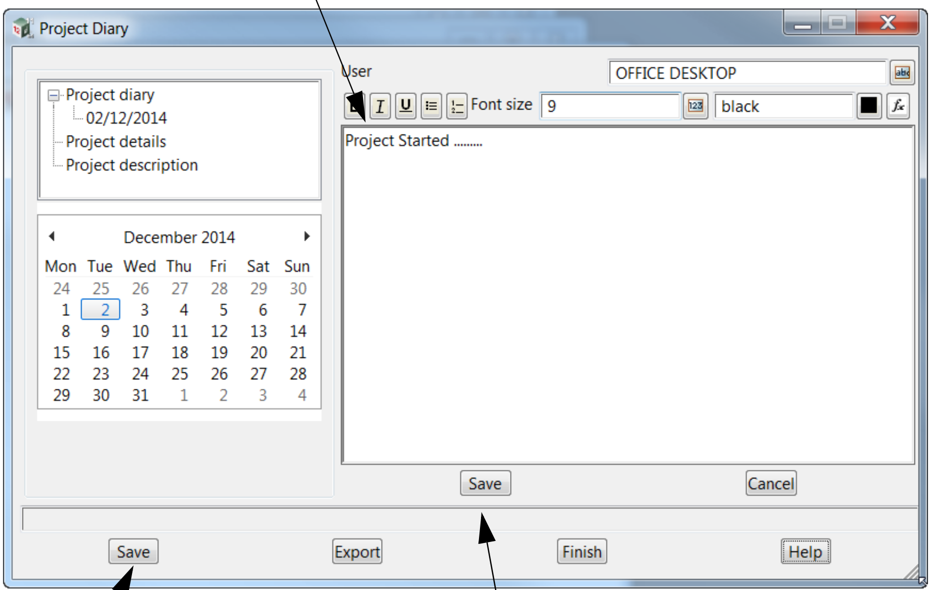
It is useful to keep a record of operations performed in the project.

Select option ***Project =>Details =>Diary***

Click on ***New***



Type the details into the panel



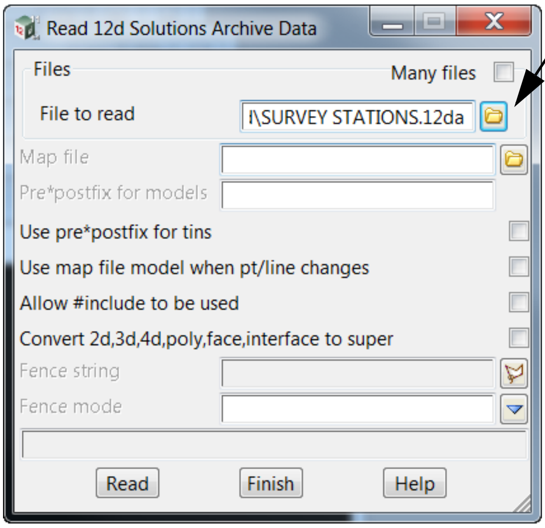
Select **Save** to save the typed input

Select **Save** and then **Finish** to exit the Diary panel

9.3 Survey Control Station Coordinate entry

Coordinates for the survey stations can be stored in the data collector file or created in the project by a number of methods. For this example we will read in an ascii file containing the Control Station coordinates.

Select the option ***File =>Data Input =>12d =>12d archive data***

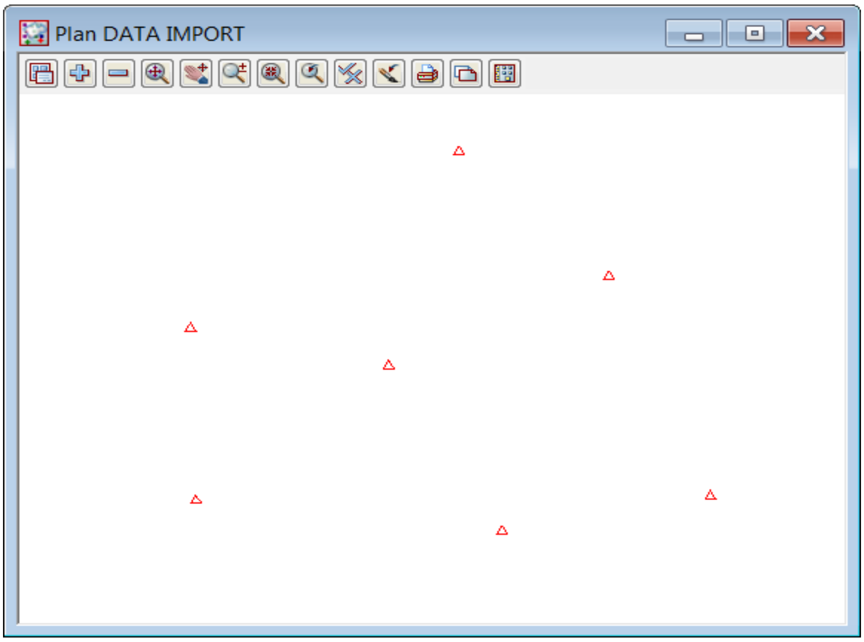


Select the **File to read** folder icon

Browse up one level to the folder **C:\12d\11.00\Training\survey\getting started**

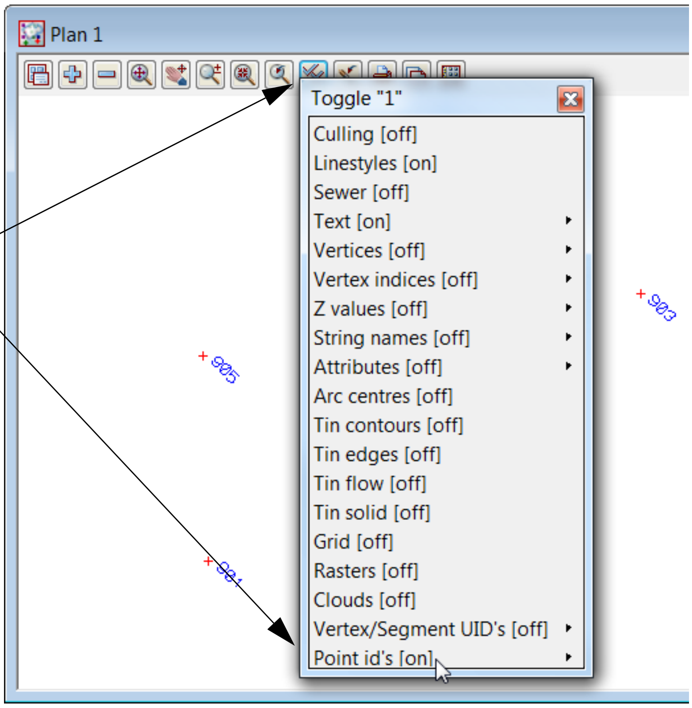
Select the file **SURVEY STATIONS.12da**

Click **Read** and the Control station points will appear on a newly created view called **DATA IMPORT**

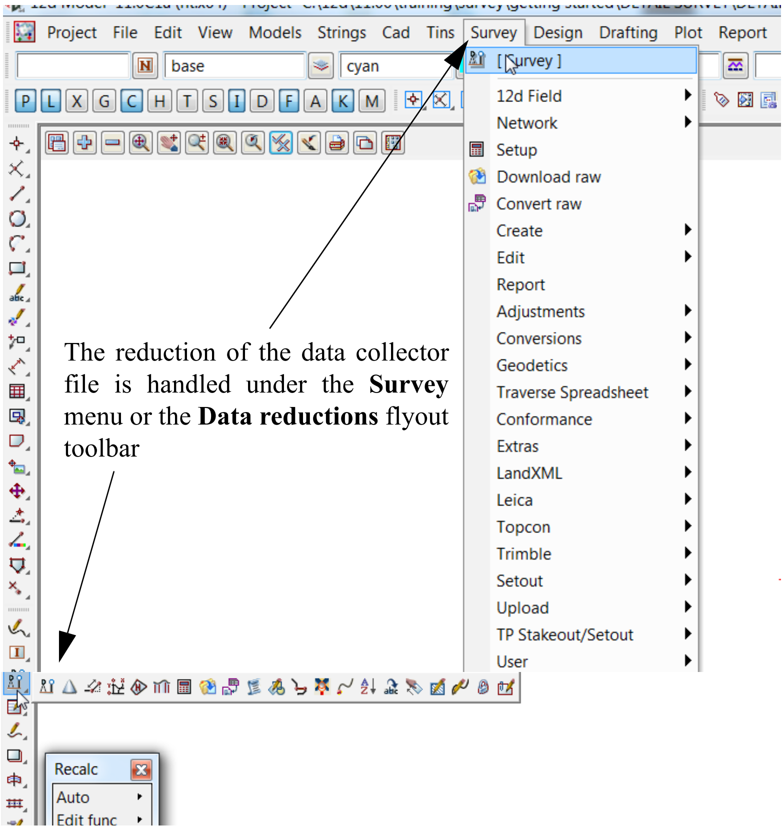


Turn on the model **SURV STATION** in plan view 1

To display point id's select the **Toggle** icon then select **Point id's**



9.4 Data collection reduction



The raw survey data is either

(a) downloaded from an instrument

or

(b) copied to the computer via a Memory storage device.

9.4.1Creating/Checking/Modifying a 12d Data Collector Definition

To allow for a variety of data collectors and coding methodologies, 12d Model allows you to save a user-specified set of data collector parameters away under a user supplied name

The data collectors defined within 12d Model include such information as:

(a) Instrument name, extension for the raw file and vertical circle information.

(b) Position of the feature code, tinability code and number of digits in the numeric code.

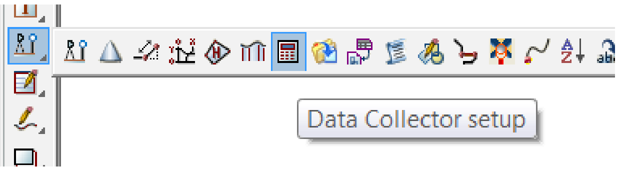
(c) Delimiters for commands, comments, offset codes, backsight and foresights, check measurements

(d) Field template codes.

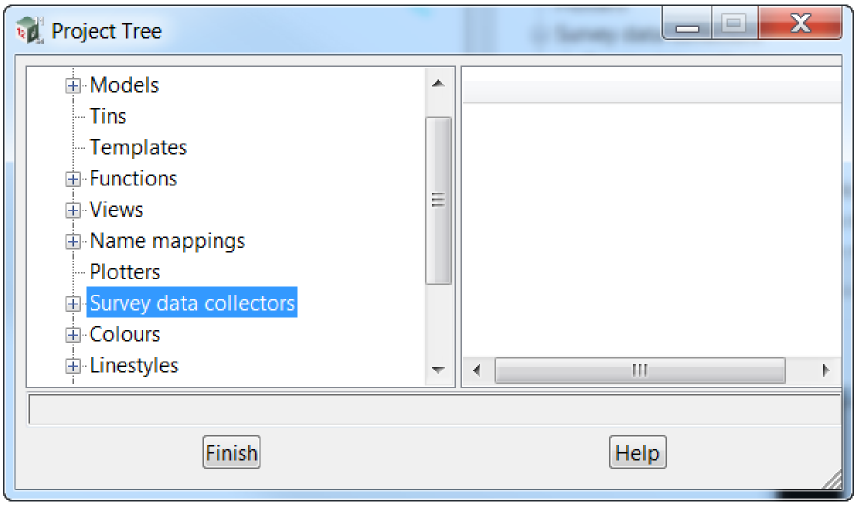
(e) Communication settings for uploading and downloading.

(f) Coding for arcs, rectangles, closing strings, pipes and culverts.

Creating new or modifying existing 12d data collectors can be done by picking the **Survey Setup Data** icon



or by using the option ***Project*** => ***Tree*** =>***Survey Data Collectors***



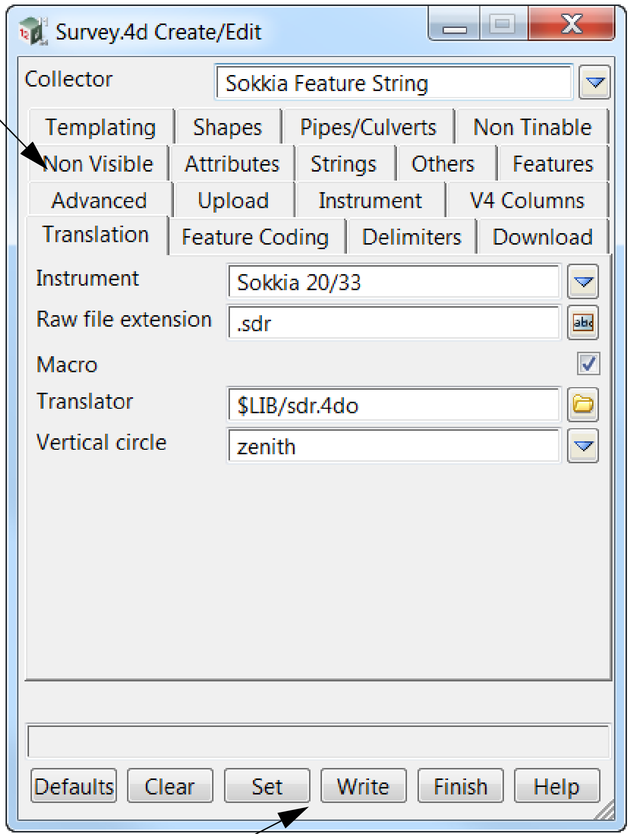
We will use the option ***Project*** => ***Tree*** for this example

Select the + beside ***Survey data collectors*** to see the list of existing data collectors.

Double click on **Create data collector** to create a new 12d data collector definition, or double click on an existing data collector in the list to examine or modify it. The **Survey.4d Create/Edit** panel will then appear.

The example below is shown when selecting the **Sokkia Feature String** data collector type

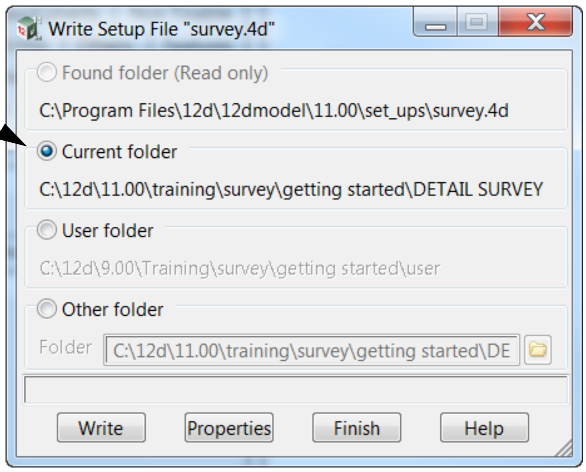
To edit any of the parameters in the **Survey.4d** file select the relevant tab and change the values.



To save the edited file select **Set** and then **Write**

Select **Current folder** to store the file ***survey.4d*** in the local working folder for use in this project only

Select **Write** then **Finish**

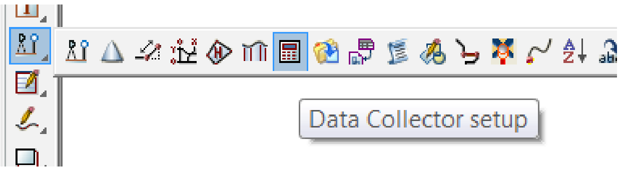


Select **Finish** back in the **Survey.4d Create /Edit** panel

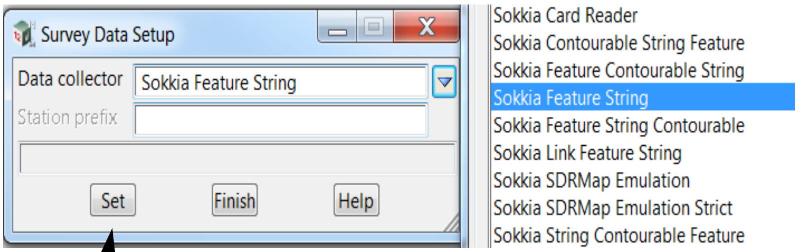
Select **Finish** back in the "**Project Tree**" panel

9.4.2Selecting the Data Recorder type

Select ***Survey=>Setup*** or **Survey Data Setup** icon



Select the **Data collector** choice icon then double click on the data collector **Sokkia Feature String**



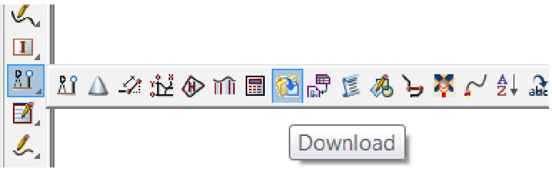
Select ***Set*** and then ***Finish***.

9.4.3Downloading a Raw Survey File from an Instrument

The raw survey file we require is already on the computer and does not have to be downloaded from a survey instrument.

NOTE - after doing a typical survey job, the raw file for the survey would still be in the data collector and would need to be downloaded using the following procedure:

Select ***Survey=>Download*** or **Survey Data Download** icon

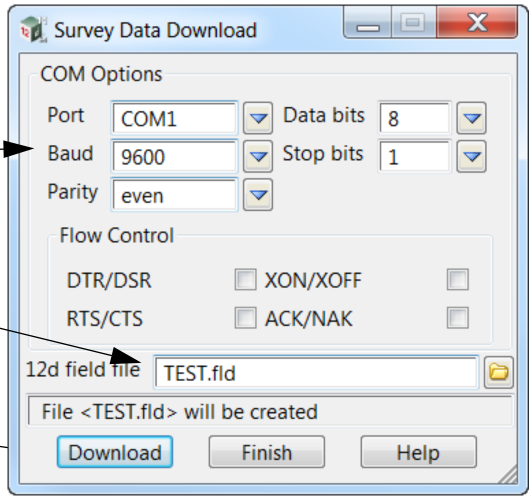


The values for the communication parameters have come from the data collector definition **Sokkia String Feature**.

If required, the communication parameters can be modified in the panel before commencing the download. For example, the ***Port*** is the port that you have the data collector connected to.

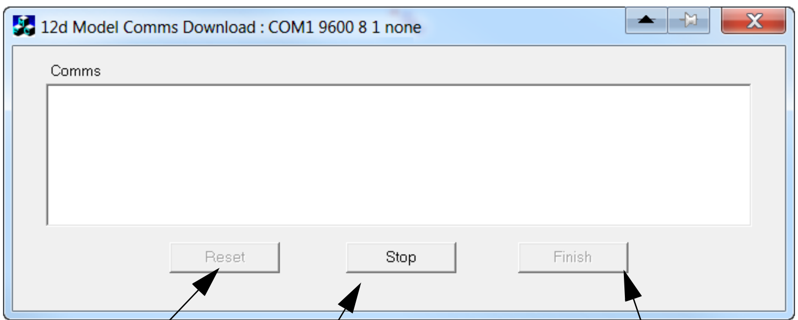
Type in a name for the created Field file.

Select **Download** to commence downloading.



NOTE - you must have a data collector attached to the nominated COM port to be able to download data

The **Comms Capture** panel is automatically placed on the screen to display messages for the download.



To stop the download press **Stop**

To restart the download press **Reset**

To finish the download select **Finish**

The raw file is downloaded and the field file is created. Both the raw file and the 12d field file are stored in the working folder. In this project the working folder is

C:\12d\11.00\Training\survey\getting started\DETAIL SURVEY

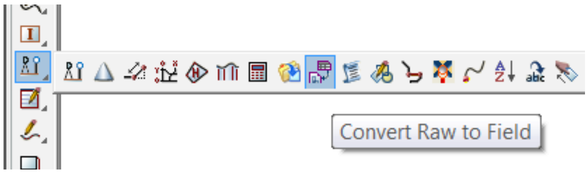
9.4.4Converting a Raw File to a 12d Field File

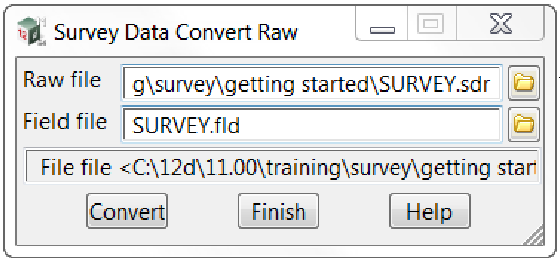
If the field data was not created when downloaded from a data collector then the raw survey data needs to be converted to a 12d Field File before reduction.

For this training example a raw survey data file **SURVEY.sdr** is already in the **getting started** folder, ready for converting.

However, in real situations, the raw survey data file may have been copied from a Memory card.

To convert a raw file, select ***Survey=>Convert Raw*** or **Survey Data Convert raw** icon





Click on the **Raw file** folder icon

Browse up a level to folder **C:\12d\11.00\Training\survey\getting started** and select the file **SURVEY.sdr**

The field file name **SURVEY.fld** will automatically be filled in or can be user defined.

To create the field file select **Convert** then **Finish**

This will convert the raw SDR file to the 12d Field File format ready for reduction.

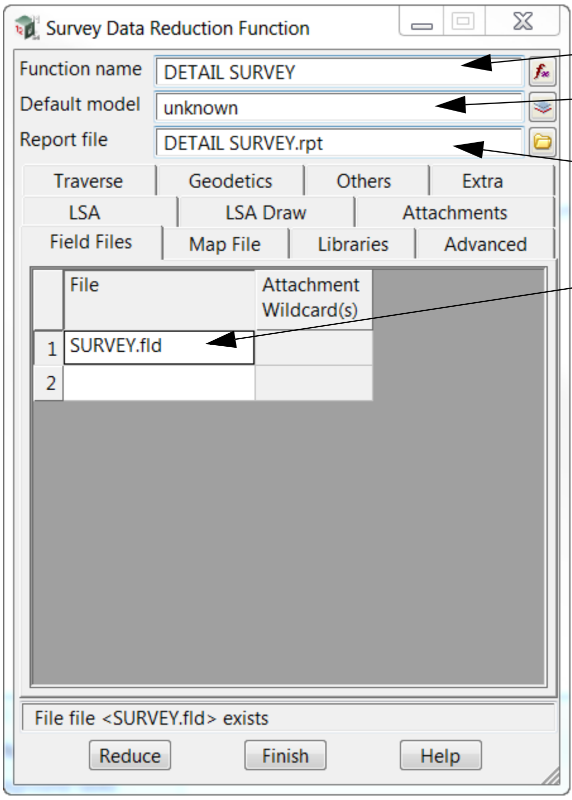
Note: The list of raw survey files are expected to have the extension "***.sdr***" as specified in the data collector definition ***Sokkia Feature String***. It is recommended that any files manually copied to the working folder have the correct extension.

9.4.5Running the Survey Data Reduction Function

The field file will now be reduced in 12d using the Survey Data Reduction function. The function will link the field file to all relevant information needed to create the features surveyed in the field.

These would include items such as the Control model, Mapping file and Geodetic datum.

Select ***Survey => Create => Reduce Field File*** or select **Reduce Field File** icon



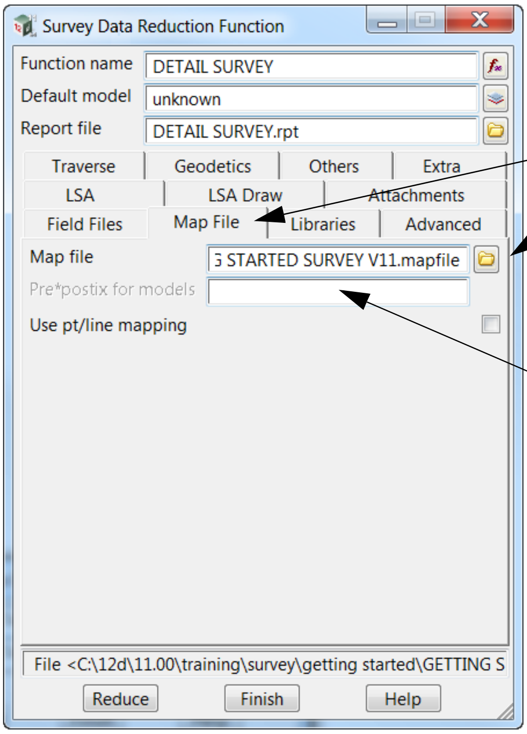
Type in the Function name **DETAIL SURVEY**

Type in **unknown** for the model name for strings that have unrecognised feature codes.

Type in report file name **DETAIL SURVEY** (when pressing [Enter] the file is given the extension**.rpt**).

Under the **Field Files** tab the newly created field file **SURVEY.fld** is displayed as the default

Map file tab

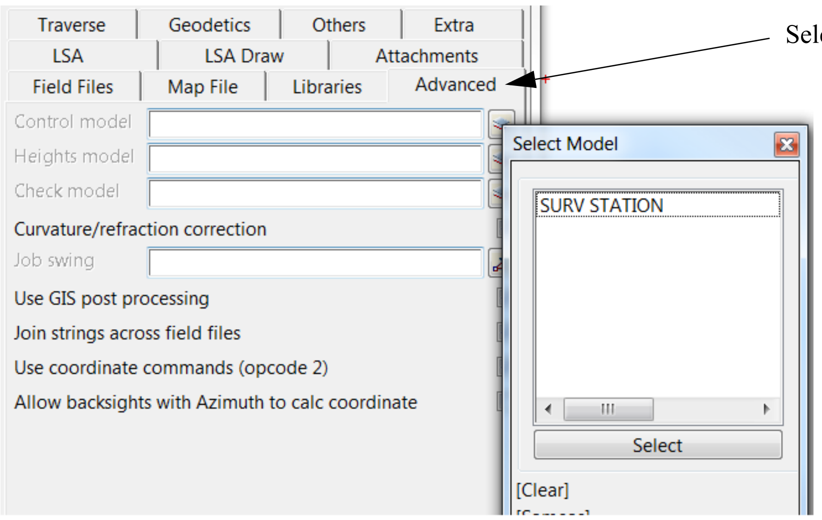


Select the **Map File** tab

Select the map file **GETTING STARTED SURVEY V11.mapfile** from the folder **C:\12d\11.00\Training\survey\getting started**. This will be used to map the survey readings to their correct model and other features.

The reduced data can be separated from other surveyed data by using a prefix which goes in front of any model name created using the mapping file.

Advanced tab



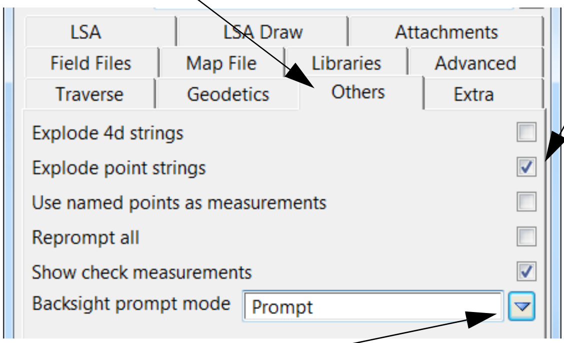
Select the **Advanced** tab

12d can either reduce the survey readings from station information within the field file or by specifying the model containing the survey station points. In this case we have read survey points existing in the project.

Select the **Control model** choice icon and then select the model name **SURV STATION**

Others tab

Select the **Others** tab



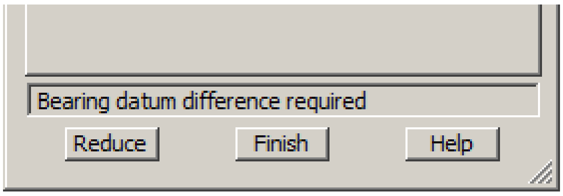
Tick **Explode point strings** check box to ensure individual survey points are kept separate from other points with the same code

Tick **Show check measurements** check box to display check measurements during the reduction

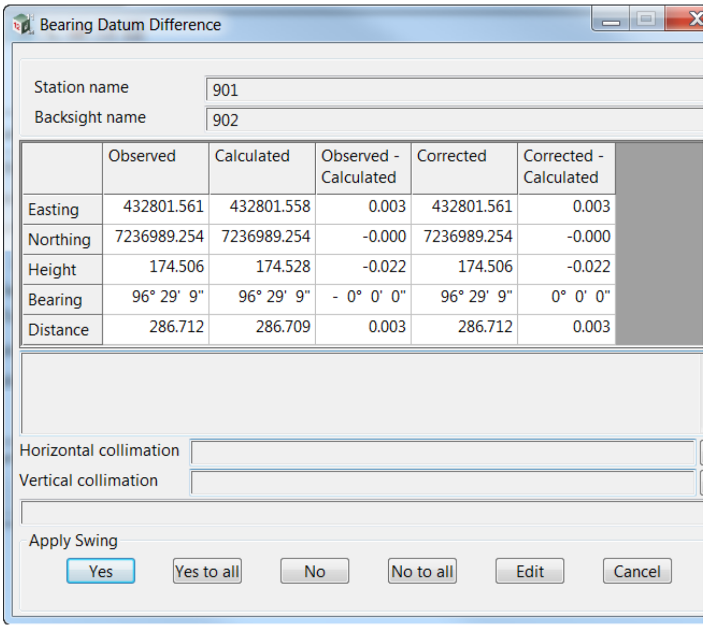
Select the **Backsight prompt mode** choice icon and select **Prompt** to pause the reductions as each backsight reading is reduced

Reduce the function

Select **Reduce** to reduce the field file



Each time a Backsight measurement appears in the reduction a **Bearing Datum Difference** panel is displayed.



The user has a number of possible responses

Yes will apply the swing to the following readings until the next bearing difference panel appears

Yes to all will apply the swing to the following readings and bypass all following panels using **yes** as the default.

This is not a good idea unless the file is being re-reduced

No will apply no swing to the following readings until the next bearing difference panel appears

No to all will apply no swing to the following readings and bypass all following panels using no as the default.

This is not a good idea unless the file is being re-reduced

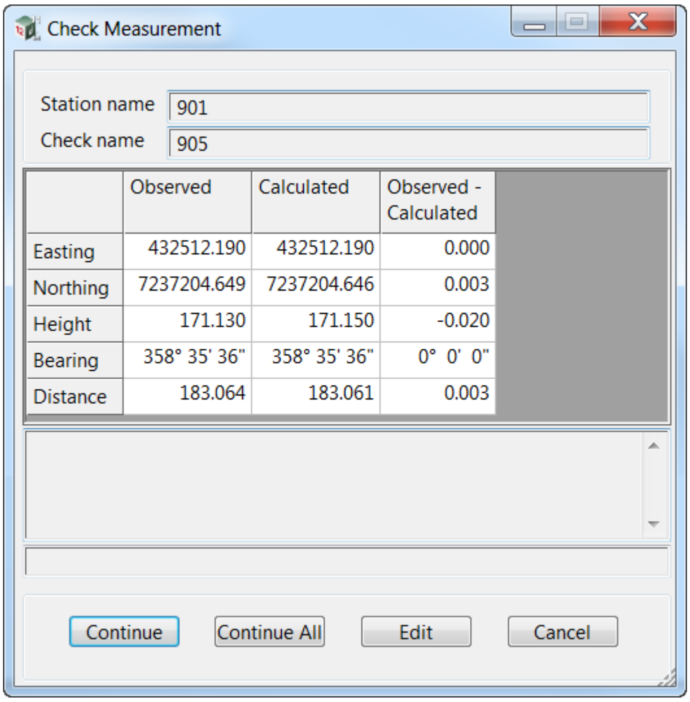
Edit is used to activate the field file editor to view the reading to the backsight point. This is useful if the wrong backsight point ID is entered. The new ID can be edited and the reduction continued

Cancel is used if there is a major problem with the reductions and the process has to be terminated in order to fix the error.

Note: By pressing Cancel the process stops at that point in the reduction and an incomplete survey may appear in the graphics

You have to rereduce the survey after pressing Cancel

For this exercise select **Yes**



If check readings are taken to known points a **Check Measurement** panel is displayed

Again the user has a number of possible responses

Continue will close the panel and the processing continues until the next check reading is encountered

Continue all will close the panel and the processing continues with all following check measurement panels not displayed

This is not a good idea unless the file is being rereduced

Edit is used to activate the field file to view the check reading to the point. This is useful if the wrong check point ID is entered. The new ID can be edited and the reduction continued

Cancel is used if there is a major problem with the reductions and the process has to be terminated in order to fix the error.

Note: By pressing Cancel the process stops at that point in the reduction and an incomplete survey may appear in the graphics

You have to rereduce the survey after pressing Cancel

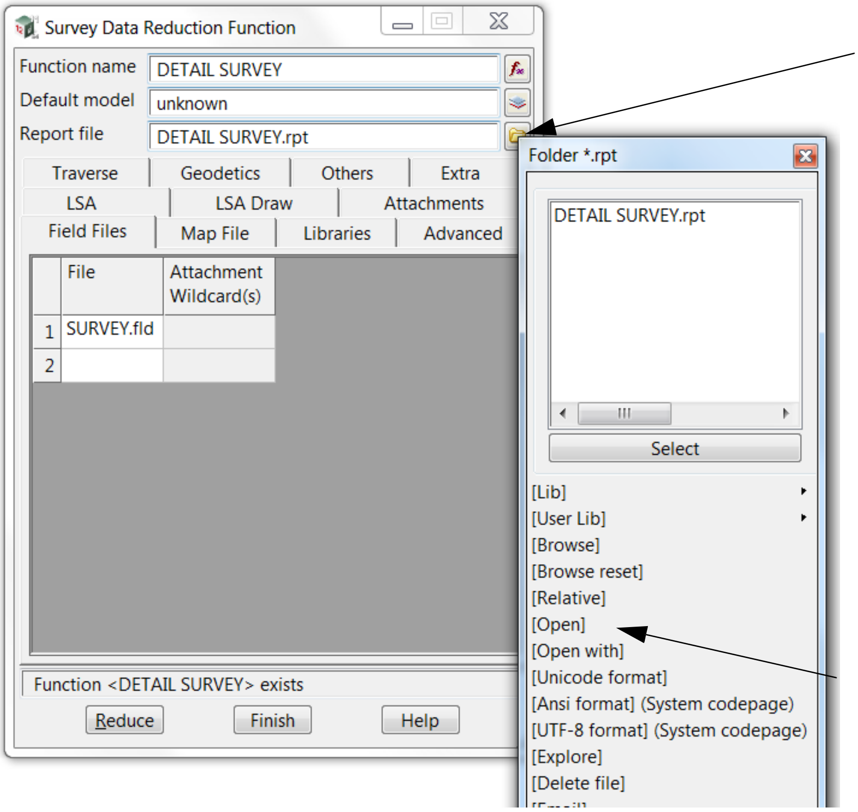
For this exercise select **Continue** each time the panel appears.

NOTE - When the survey data is being reduced, the **Bearing Datum Difference** panel and **Check Measurement** panels come up a number of times.

When the reduction is finished **don't** press Finish until the report file has been checked for errors

9.4.6Checking the Report File for Reduction Errors

We will now check the report for any errors found by the reduction process. This should be done prior to any other editing

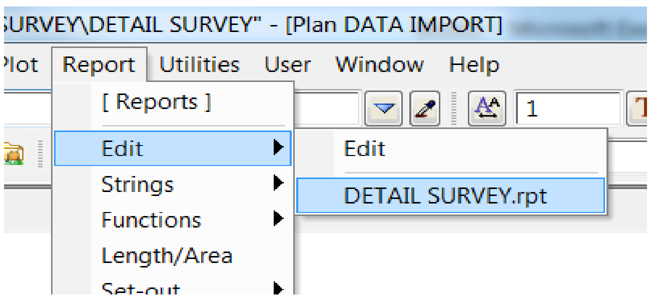


Select the **Report file** choice icon

Select **Open** to display the report file in the default text editor.

If the Survey Data Reduction Function panel has accidentally been closed the file can be loaded into the text editor by selecting option ***Reports => Edit***

Double click on **DETAIL SURVEY.rpt**.



The file **DETAIL SURVEY.rpt** will then displayed in the default text editor.

```
DETAIL SURVEY.rpt - Notepad
File  Edit  Format  View  Help
Survey Data Reduction
=====================

Reduction report for field files
  SURVEY.fld

New scale factor 1.00000000
Memo: Current view
Memo: 10000
Memo: P.C. mm Applied: 0.000
Coordinate for station "901" defined from control model "SURV STATION->STN"

Occupying Station              : 901
Coordinates                    : E 432516.684   N 7237021.640   H 207.000
Code                           : STN
Instrument Ht                  : 1.565
N Value                        : 0.000

Coordinate for Backsight "902" defined from control model "SURV STATION->STN"
         96° 29'  9"  96° 27' 37" 288.543  1.600  432801.561 7236989.254   174.506

******** Backsight to "902" Code "STN" ***********

                       OBSERVED       CALCULATED      OBSERVED -       CORRECTED
                       (SWUNG)                        CALCULATED
EASTING              432801.561      432801.558          0.003       432801.561
NORTHING            7236989.254     7236989.254         -0.000      7236989.254
HEIGHT                  174.506         174.528         -0.022          174.506
BEARING             96° 29'  9"     96° 29'  9"                     96° 29'  9"
DISTANCE                286.712         286.709          0.003          286.712

Bearing datum difference    0°  0'  0" applied to subsequent measurements

Coordinate for Check measurement "905" defined from control model "SURV STATION->ST

******** Check Measurement to "905" Code "" ***********

                       OBSERVED       CALCULATED      OBSERVED -
                                                      CALCULATED
EASTING              432512.190      432512.190          0.000
NORTHING            7237204.649     7237204.646          0.003
HEIGHT                  171.130         171.150         -0.020
BEARING            358° 35' 36"    358° 35' 36"    -  0°  0'  0"
DISTANCE                183.064         183.061          0.003

PointID    Horiz         Vert        SDist    HTar       East         North       Height
   1003 145° 28' 38"  91° 18' 17" 248.604   1.600  432657.540 7236816.868   201.308
   1004 141° 19'  7"  91° 44'  2" 240.550   1.600  432666.956 7236833.944   199.690
   1005 136° 39' 12"  92° 21' 57" 234.056   1.600  432677.206 7236851.576   197.307
   1006 131° 58' 26"  93°  5' 42" 228.997   1.600  432686.684 7236868.712   194.605
```

Scroll down through the report file checking for any problems or errors.

At the end of the file is the list of **Unknown Feature Codes**.

These are the feature codes that appeared in the field file **SURVEY.fld** but were not in the mapping file .

```
 (659 measurements)

Count  Unknown Feature Codes
----------------------------

    1  TBK

End of reduction report
```

TBK is a code found in the field file **SURVEY.fld** but not in the mapping file **GETTING STARTED SURVEY V11.mapfile**

TBK was entered in error for the code **TBL**

Quit from the text editor. After the report file has been closed, the **Survey Data Reduction Function** panel can be **Finished**

9.5 Graphically Editing the Field File Data

The detail survey can be edited graphically whilst maintaining a dynamic link to the field file and the resulting report file. This ensures that if the field file is re-reduced any changes will be maintained.

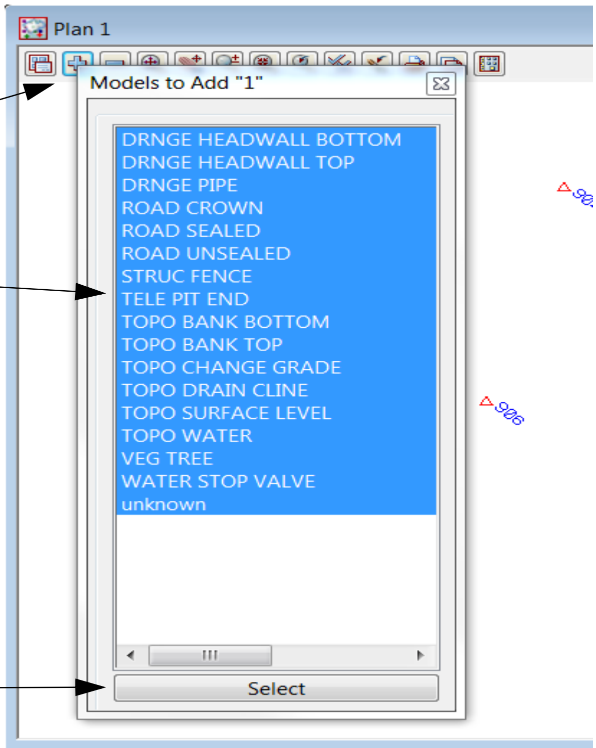
As the manuals are produced with the view background colour as white string colours may appear different to those one your screen

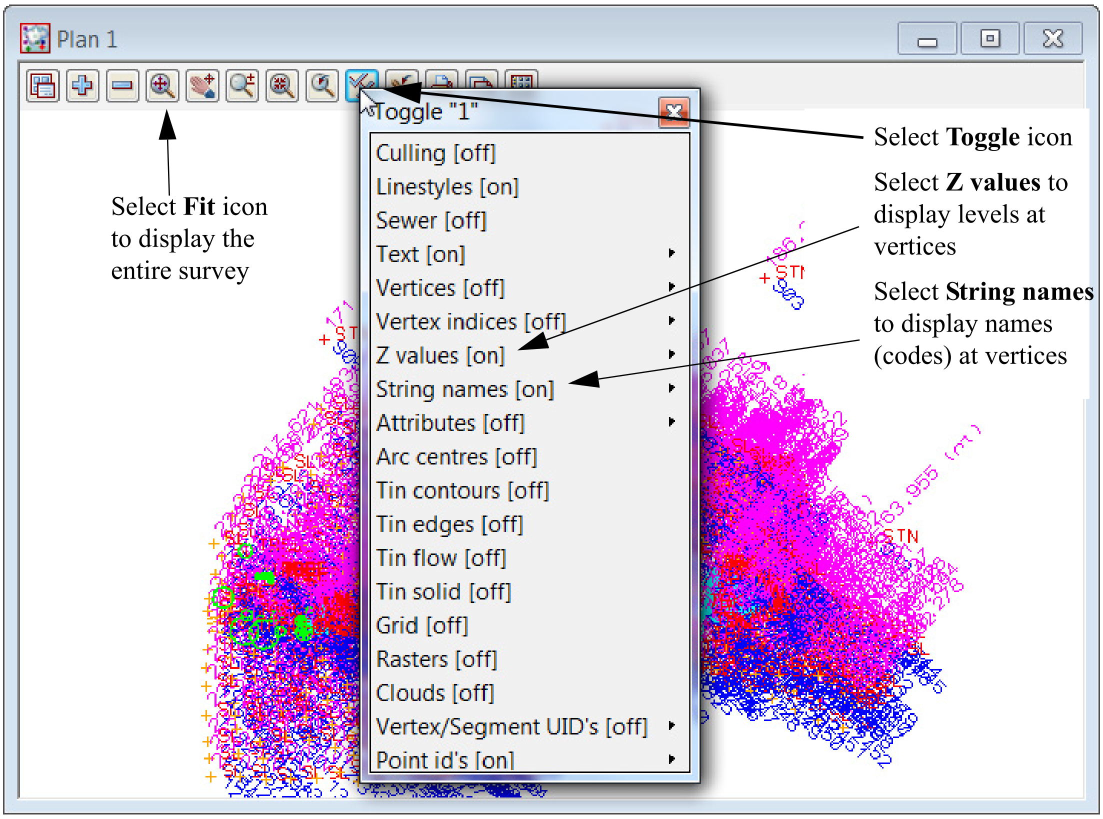
9.5.1 View the Survey Data

Turn on all models featured in the survey by selecting **Models to add** icon

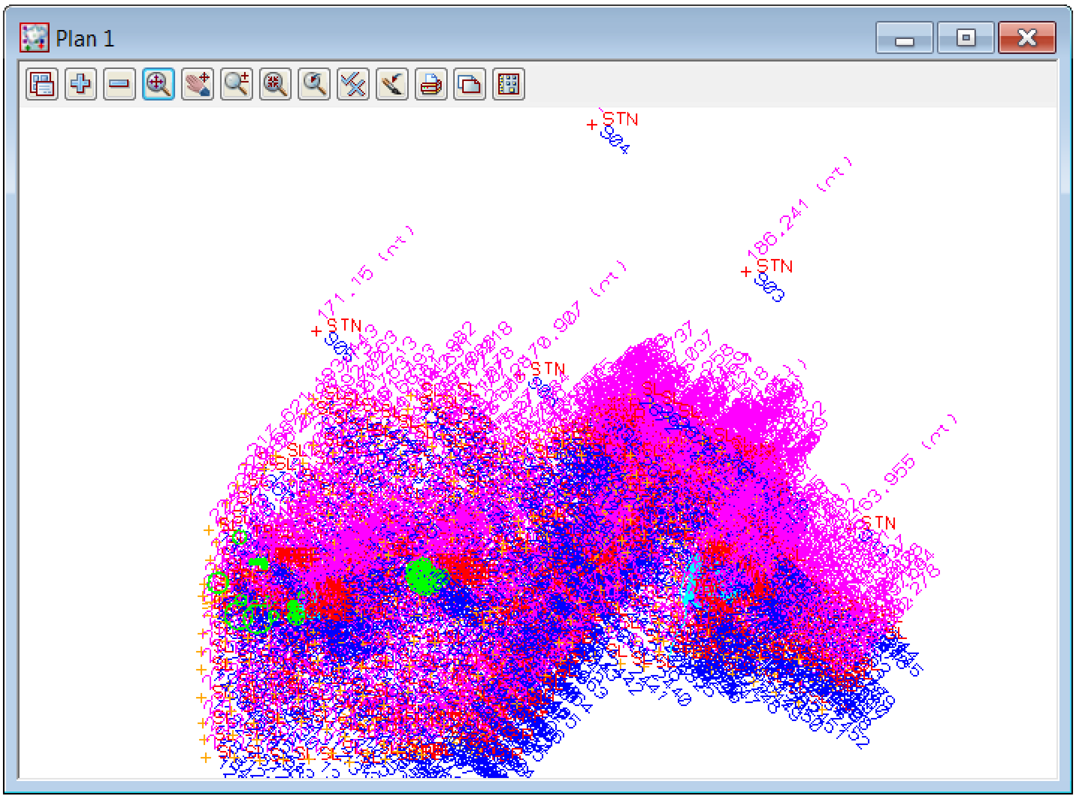
Highlight all of the models

Press **Select**





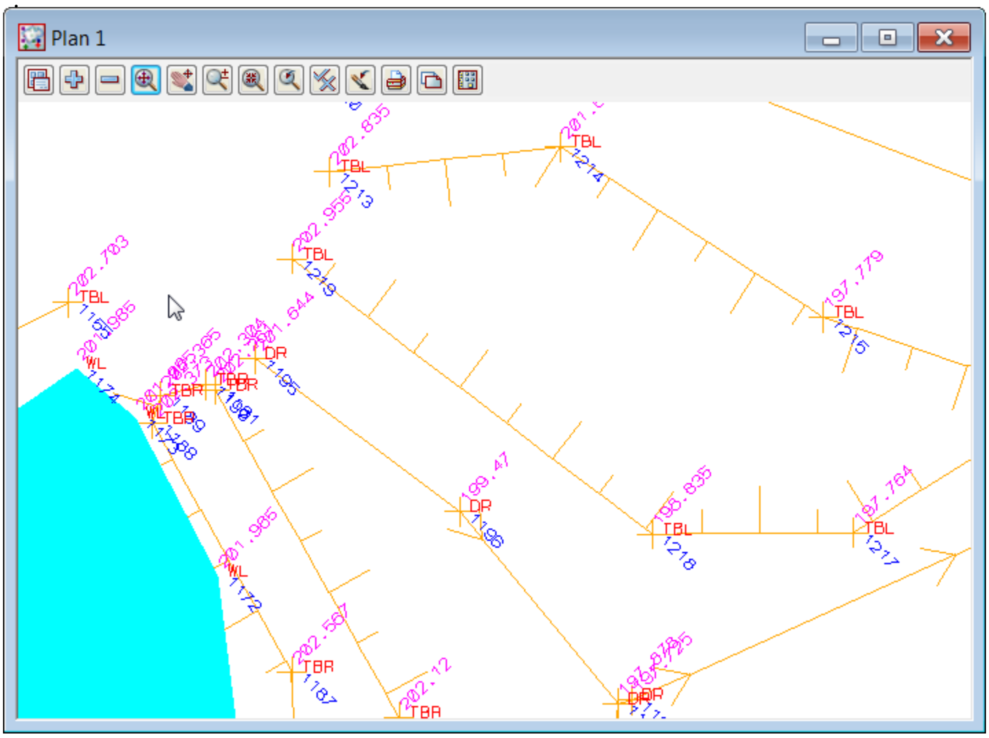
With all the text turned on, the survey is hard to read



The toggled text can be given user defined settings to allow the text to be viewed only when zoomed in to a preset scale.

9.5.2Setup your text screen settings

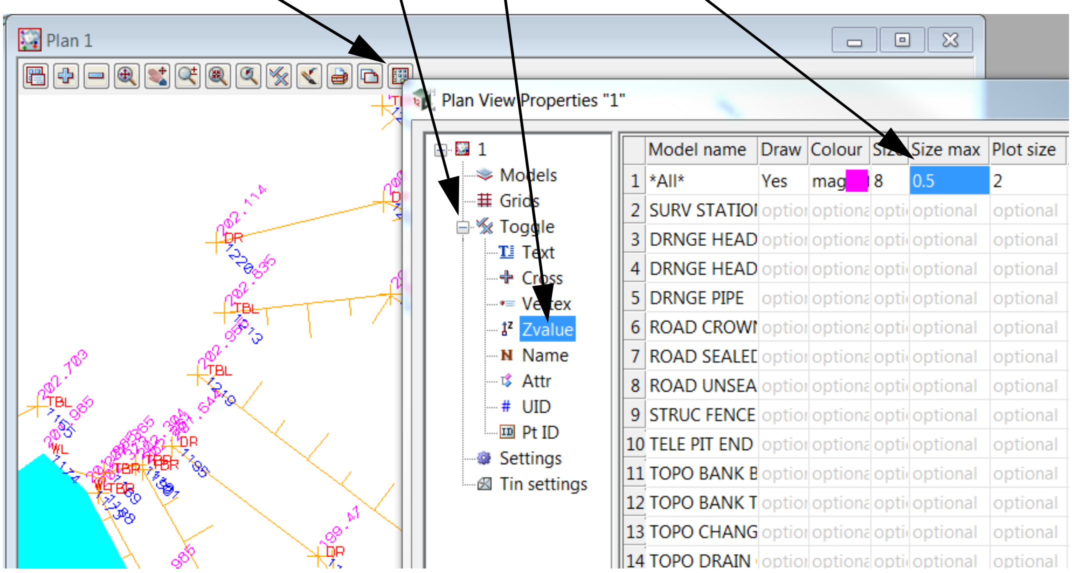
Zoom into an area with a lot of text displayed



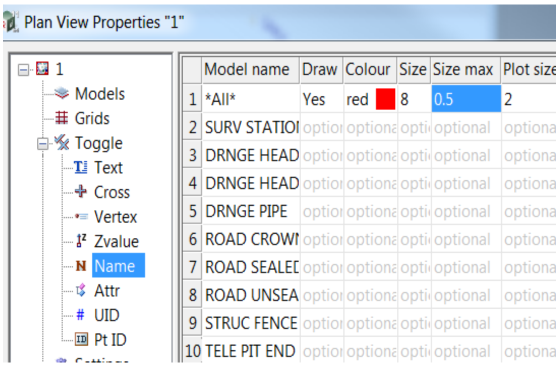
Select the **Plan View Properties** icon

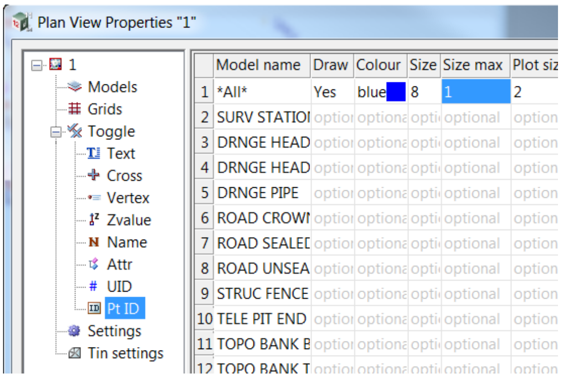
Expand the Toggle Branch

Select **Zvalue** and type in 0.5 [Enter] for the Size max



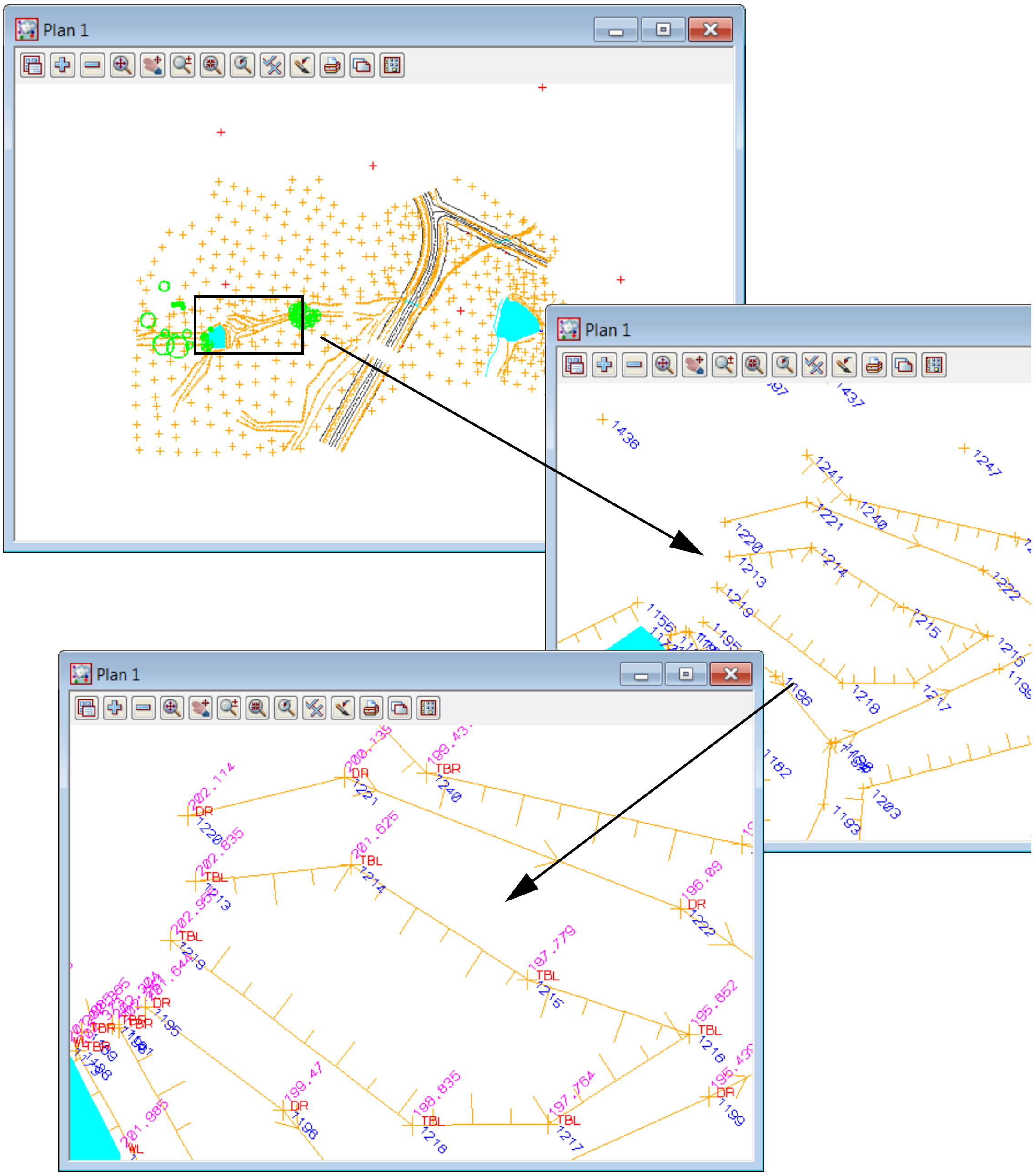
Repeat for Name and Pt ID as shown in examples below





Zoom all to see a clean view of the survey strings

As you zoom in the point id's will appear first followed by the Z values and String names



9.5.3Graphically Editing the Field File Data

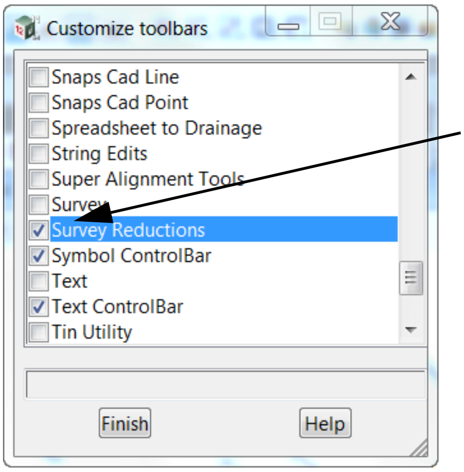
As we move along the survey, errors are detected and need to be changed in the field file if possible.

There are options that can edit both the graphics and the field file but update the field file reduction after these edit

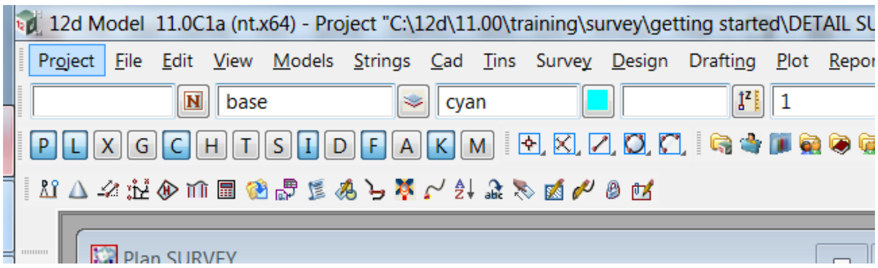
The Graphical edits are selected from the ***Survey=>Edit*** menu or the **Detail Survey reductions** flyout toolbar on the cad toolbar

The toolbar will be pinned up at the top of the main menu

Select ***View=>Toolbars***



Tick the check box for **Survey Reductions**

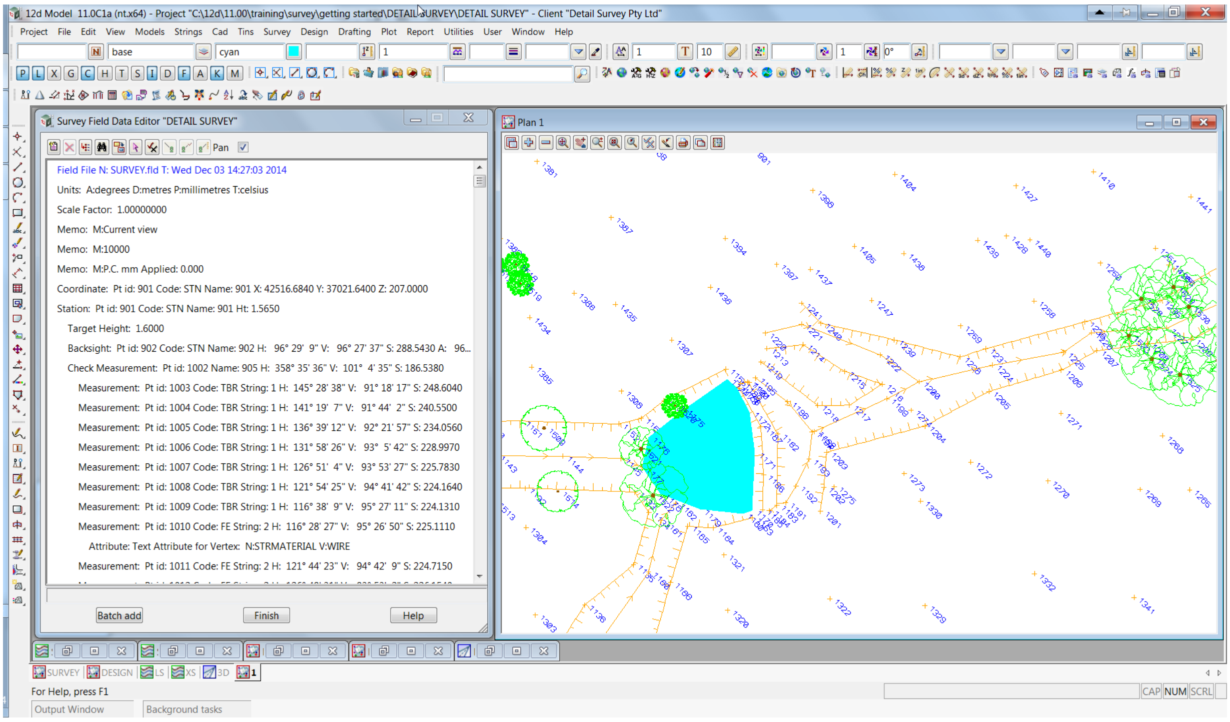


Pin the Toolbar up below to the Snaps toolbar

9.5.3.1Tiling field file editor with plan view

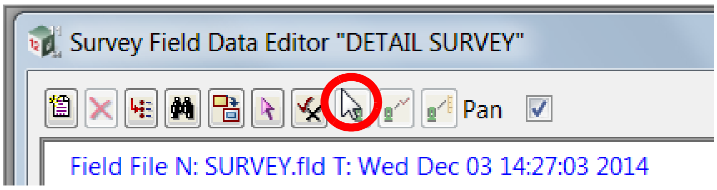
Open the field file editor using option ***Survey=>Edit=>Field data*** or select **Edit field file** icon

Place the field file editor on the left side of the screen with the plan view 1 on the right

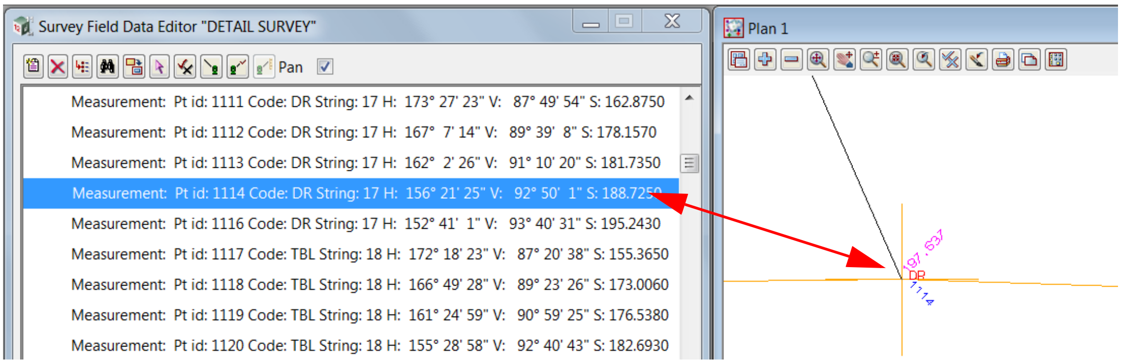


The advantage of having the field file editor active when editing the survey is the ability to reset any edits that are performed either graphically or directly into the field file editor.

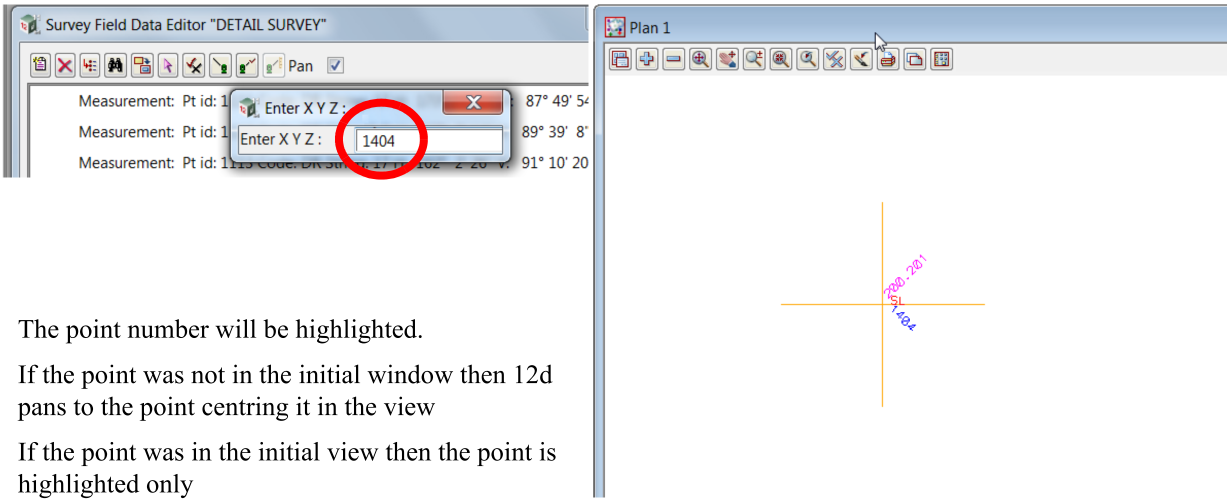
Field file editor link to graphics



The pick icon shown above can be used to select a point in the graphics and if the point is associated with the field file function being edited then the relevant measurement line will be highlighted



Alternatively once the Pick icon has been selected the point number can be typed in manually. This can be done by either typing in the point number or pressing [space] bar to activate the input panel then typing in the point number.



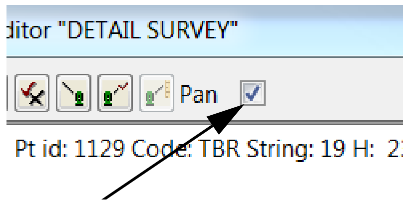
The point number will be highlighted.

If the point was not in the initial window then 12d pans to the point centring it in the view

If the point was in the initial view then the point is highlighted only

Once the point is confirmed the point is shown in the field file editor

NOTE. Always confirm the point selection as the string is locked until confirmation. An error will occur if the reduction is run with a locked string



The **Pan** check box can be ticked so that any point highlighted in the field file will be the centre of the plan view

WARNING. Field file edits are different from manual cad edits and you must not edit the survey data with cad edits while performing field file edits. The reason for this is that after each field file edit the function is rerun and the edits are remembered by the function. Manual cad edits are not linked to the function and will be lost if the function is re-reduced. Duplicate data can also result in the incorrect use of cad edits while the field file reduction is running

9.5.3.2Find and Replace

When reducing the field file the code **TBK** was listed as incorrect in the report file

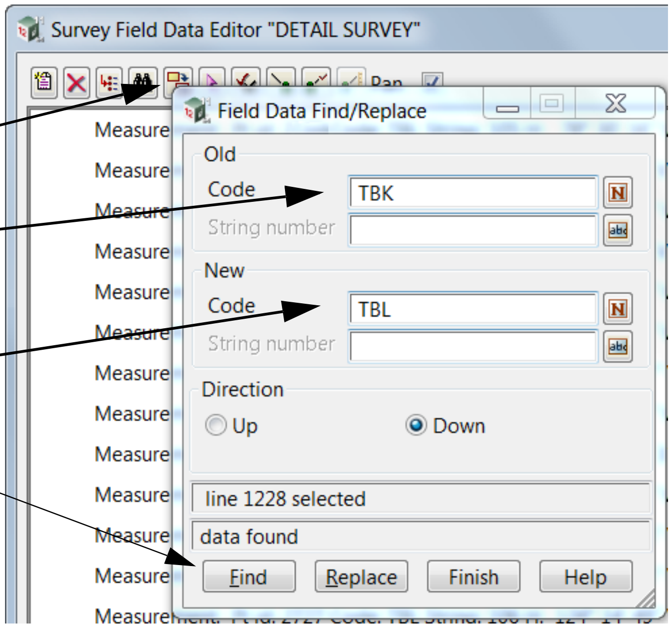
We will use the **Find / Replace** option in the field file editor to fix the error

Select **Find/Replace** icon

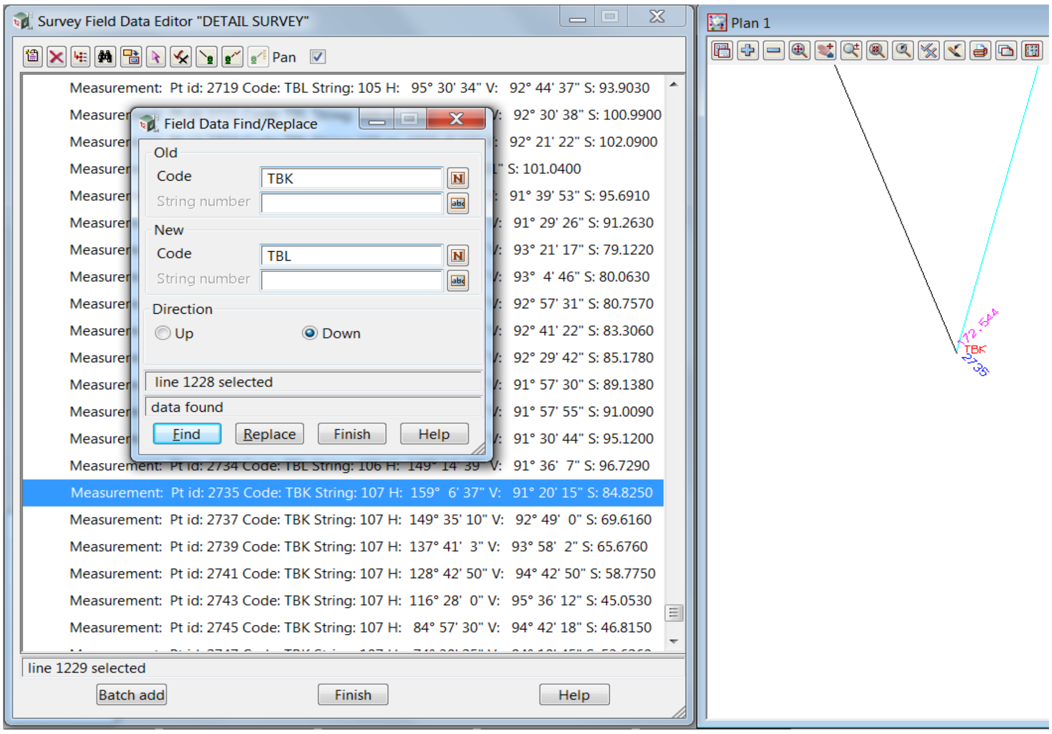
Type in the incorrect code listed in the report file

Type in the correct code TBL

Select **Find**

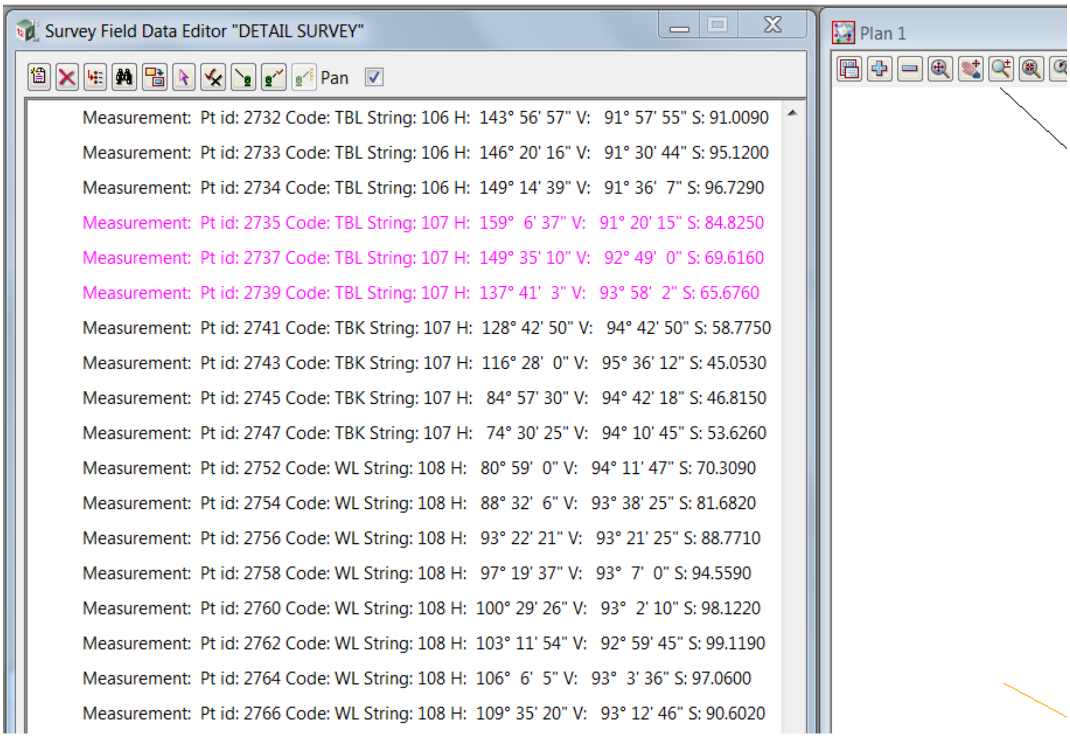


The first occurrence of the incorrect code is found and highlighted. If you have the **Pan** check box ticked the view will move to that point. To replace the code select **Replace**. Select **Replace** once again. The rest of the string will be fixed with the next option



When the code is corrected the line in the field file is coloured magenta indicating that the reading has been changed.

We will look at the audit trail options in more detail later in this chapter



9.5.3.3Changing codes

In addition to the Find/Replace option we can change a point's code by simply locating the measurement in the field file editor and editing the point. We will go through the individual point edits later. In the mean time we will use a menu option to type in a new code or by matching another point with the required code

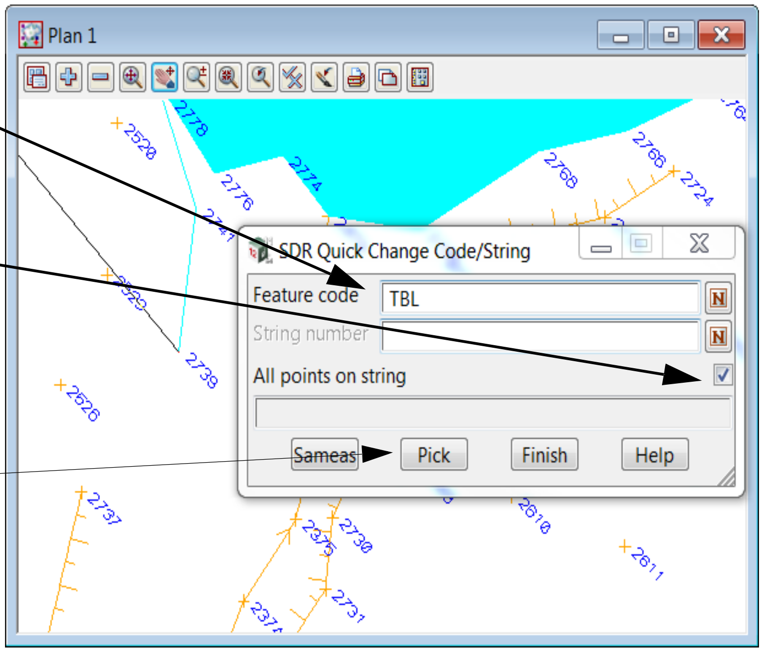
Select the option ***Survey=>Edit=>Coding=>Quick change*** or select **Quick code edit** icon

Locate point 2739 (the next point on the TBK string)

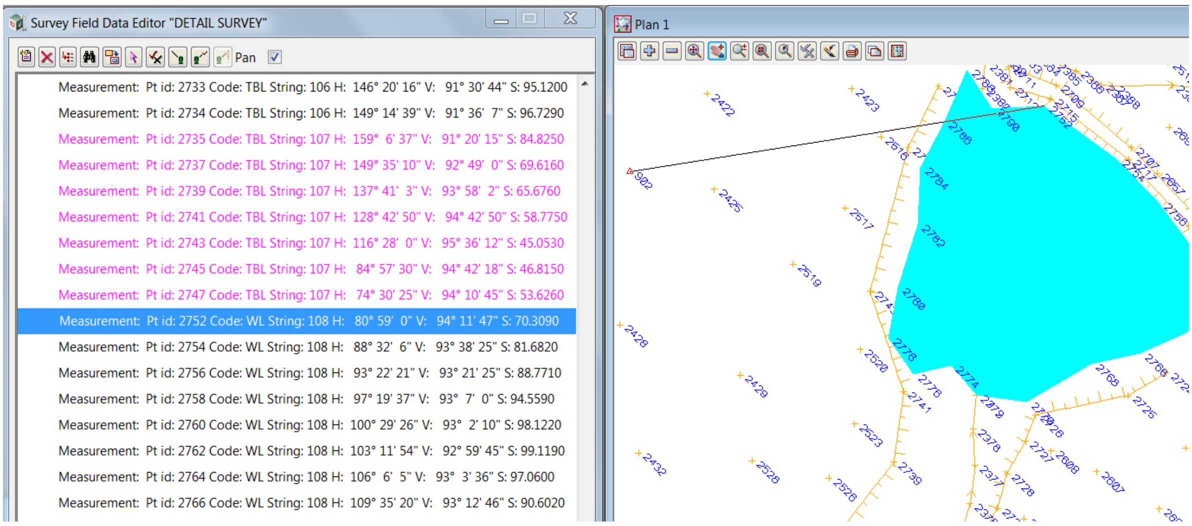
Type in correct code **TBL** or by selecting the **Sameas** button and selecting a point with the required code

Tick on **All points on string**

Select **Pick** button then select the point to change



The function is rerun and the point now displays the properties of the new code.The relevant lines in the field file will also be highlighted magenta



9.5.3.4Target heights

Another common error made during a detail survey is to incorrectly record the target height.

Instead of amending the level of the reduced point, a new target height can be entered into the field file reduction either manually or graphically

Select the option ***Survey=>Edit=>Target height=>Insert*** or select **Insert target height** icon

Locate point 1044 by using the **Pick** icon in the field file editor

Select **Pick** button then select the first point with the incorrect target

The target height is displayed at the bottom of the panel.

Type in the correct target height

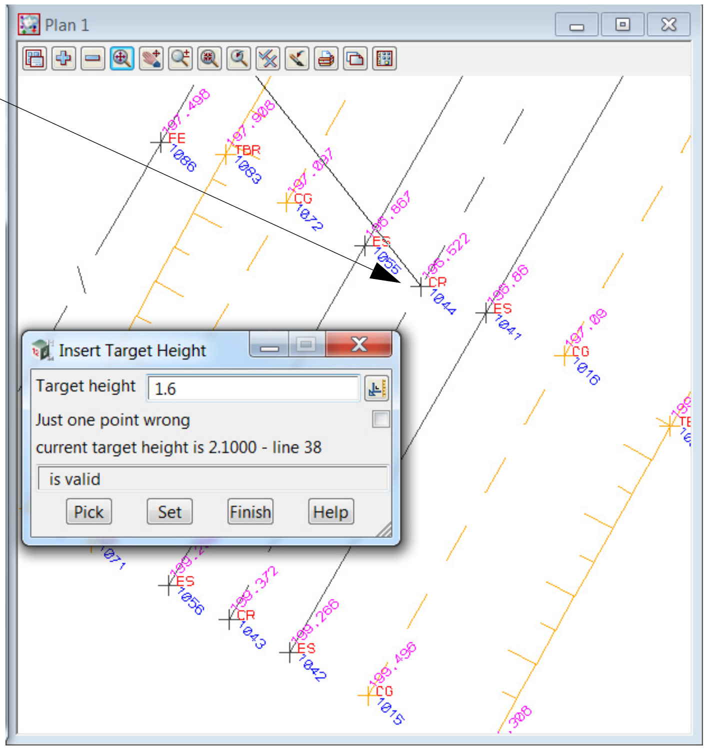
If only one point has an incorrect target height then tick the **Just one point wrong** check box prior to selecting **Set**

Otherwise select **Set**

The function is rerun and the point now has the correct height. All subsequent points will also be updated until the next height of target line occurs

In the field file a new line appears stating the target height.

The line will be highlighted blue



Measurement: Pt id: 1043 Code: CR String: 7 H: 147° 2' 9" V: 91° 43' 34" S: 235.6150

Target Height: 1.6000

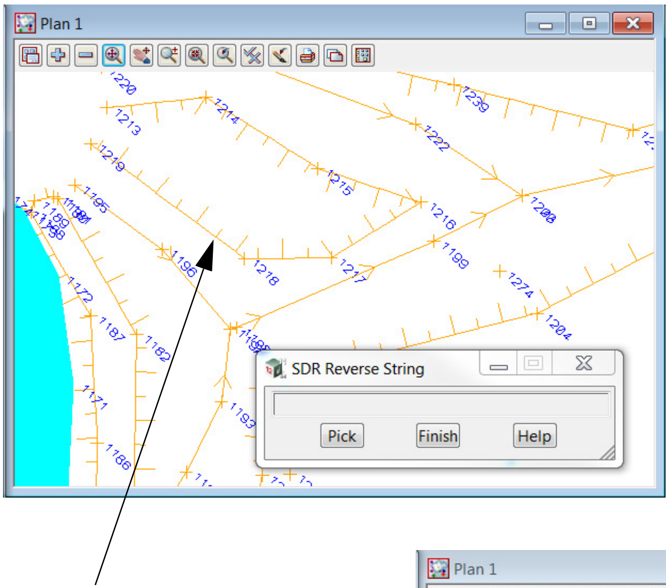
Measurement: Pt id: 1044 Code: CR String: 7 H: 142° 39' 41" V: 92° 30' 28" S: 227.3330

Measurement: Pt id: 1045 Code: CR String: 7 H: 137° 45' 13" V: 93° 18' 10" S: 220.2340

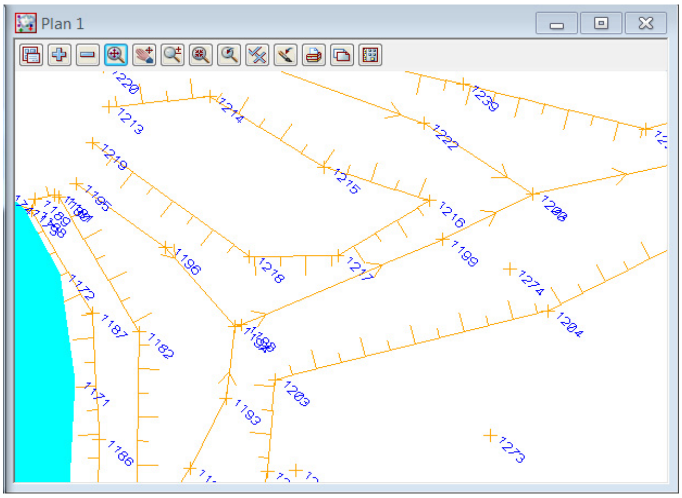
9.5.3.5Reversing strings

If a string is surveyed in the wrong direction it can be reversed using the following option.

Select the option ***Survey=>Edit=>Stringing=>Reverse***



Pick the string to reverse



The function is rerun and the string is reversed.

A Reverse string command will be inserted at the measurement line and this will be highlighted in blue

Measurement: Pt id: 1214 Code: TBL String: 30 H: 165° 33' 21" V: 97° 0' 14'

Reverse String:

Measurement: Pt id: 1215 Code: TBL String: 30 H: 157° 28' 23" V: 100° 2' 5'

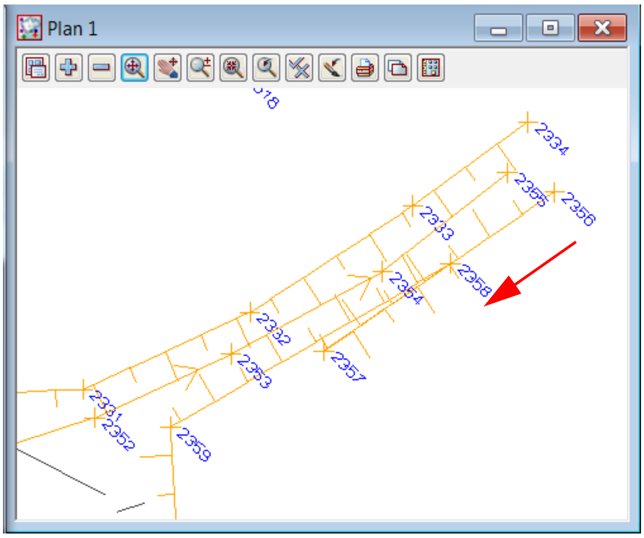
Measurement: Pt id: 1216 Code: TBL String: 30 H: 150° 56' 53" V: 100° 50' 1·

9.5.3.6Re-order string

If a string has been surveyed incorrectly the string can be re-ordered using a number of options including **Order by points**

Zoom in to point 2357

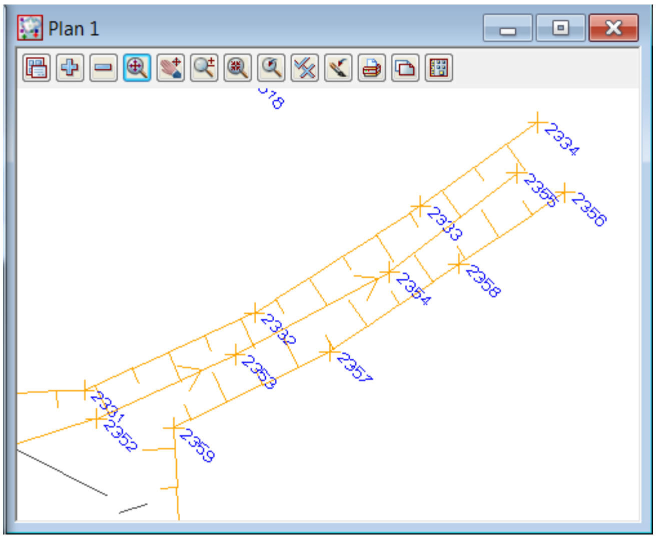
In the example here the point 2357 has been surveyed in the wrong order. Rather than stopping the string to take a single reading at point 2358 we simply string to point 2358 and then 2359 and so on.



To re-order the string by points use the option ***Survey=>Edit=>Order=>by points***

or **Order by points** icon

Select point 2356. Then pick point 2358. At this point the string order is correct when reprocessed.



If the string order is done incorrectly the original order can be reinstated using the option

Survey=>Edit=>Order=>Remove

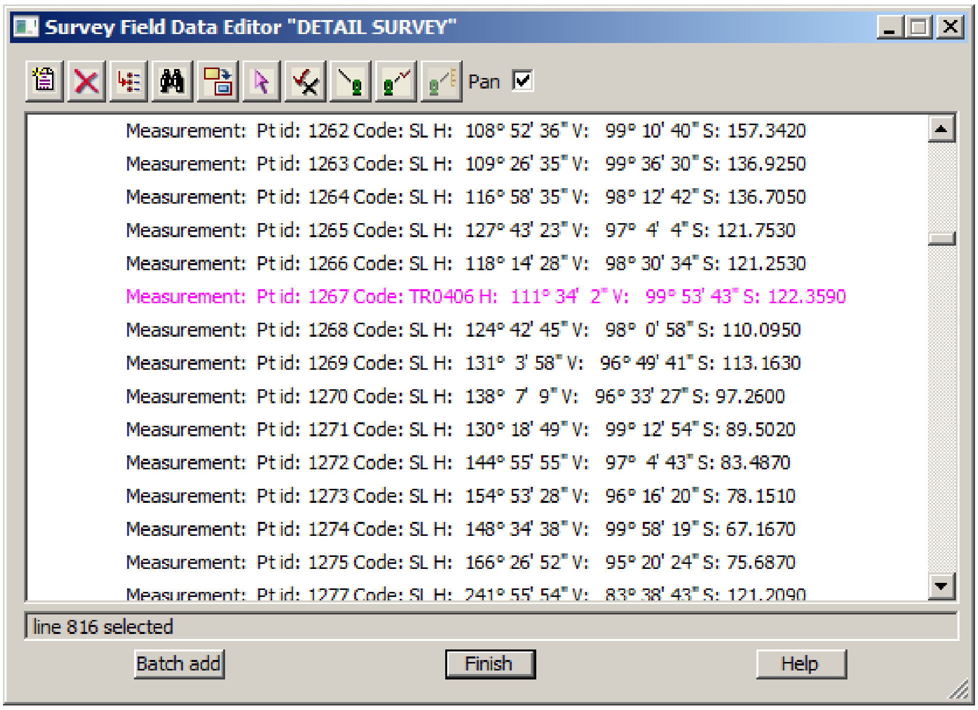
or **Remove order** icon

Pick on the string to restore the order and retry the ordering

9.6 Direct Editing of the Field File

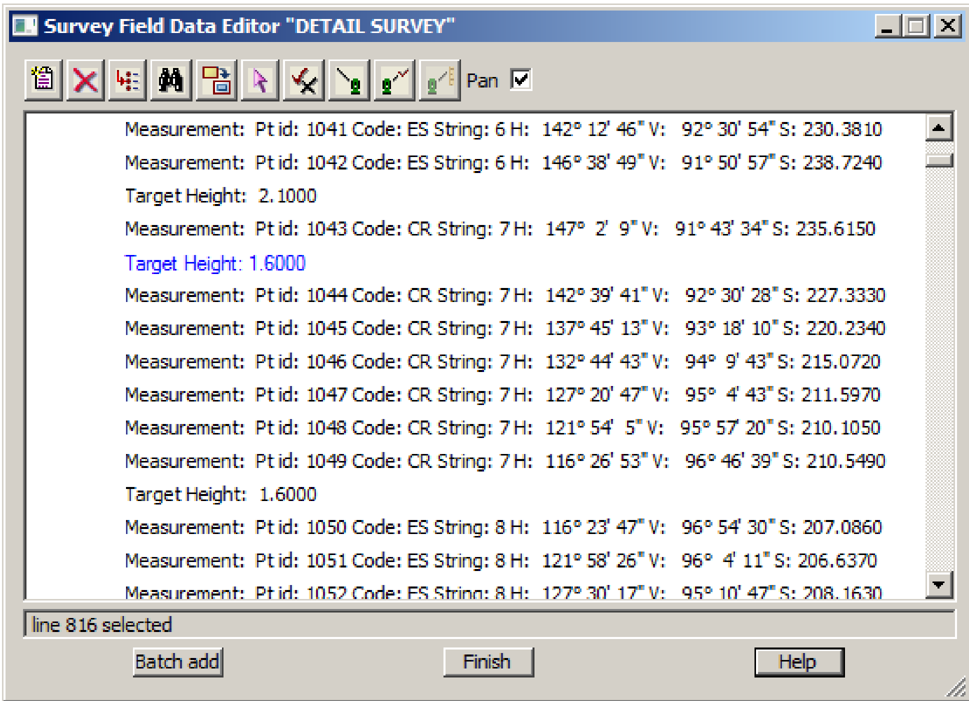
Although the previous options were graphical, each change has been recorded in the field file reduction.

Data in the field file that has been changed in any way is coloured magenta.



Data which has been entered directly into the field file or added via a command such as the *Target Height* option is coloured blue

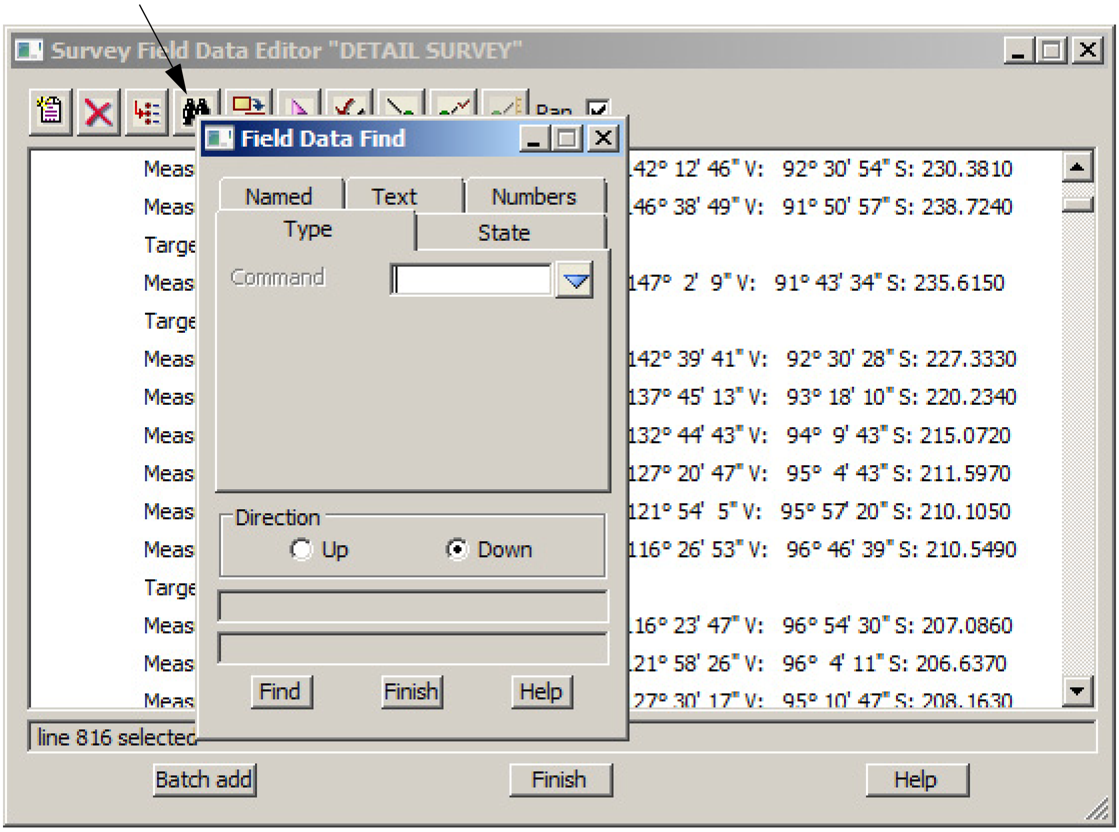
This colour coding gives an audit trail of any field file editing



9.6.1To Find data in the Field File

The find option gives the user a number of methods to find data in the field file

Select the *Find* icon



NOTE: You have to clear the current Find values before commencing a new search.

Named

A search can be performed on data in the field file using filters **Code, String number, Named point, Point number or attribute.**

To search for point number 2375

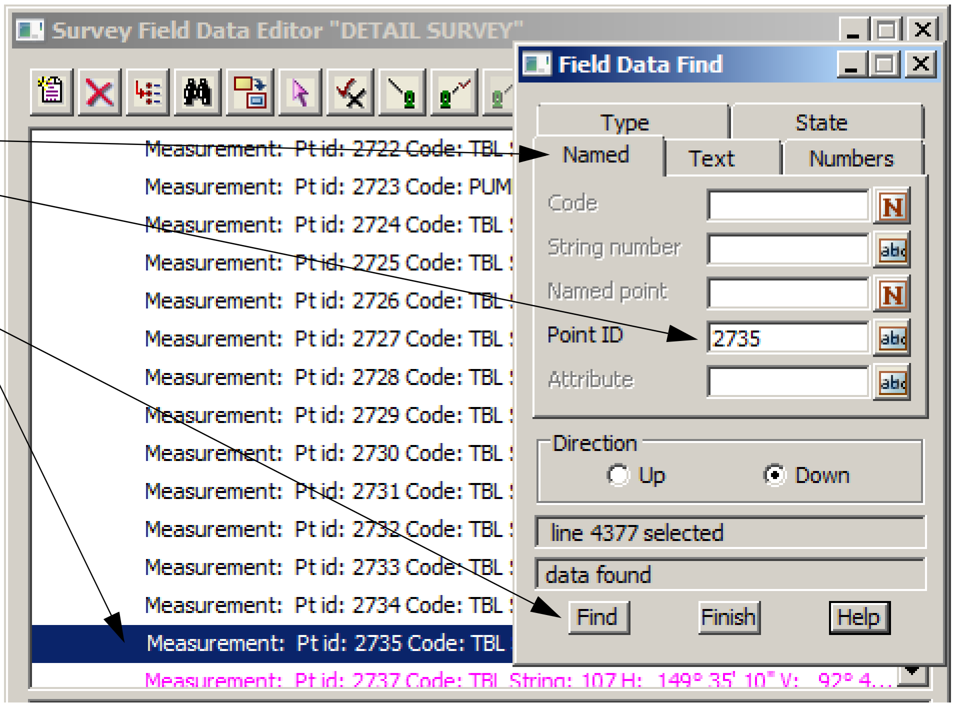
Select **Named** tab

Type in point number **2735**

Select **Find**

The line in highlighted

This example is generally not used as the user can locate a point by simply clicking on the **Find by Pick** icon at the top of the panel and typing in the point number



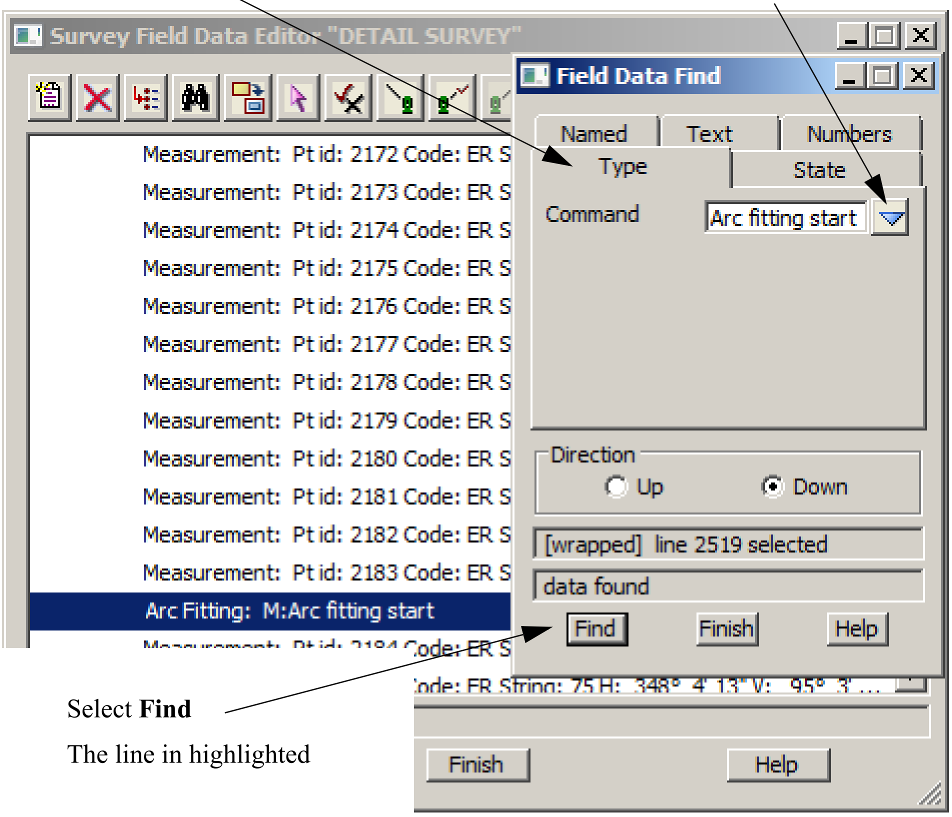
Type

A search can be performed on data in the field file given a particular command type.

To search for an *Arc Fitting Start* command

Select **Type** icon

Select Command choice **Arc fitting start**



Select **Find**

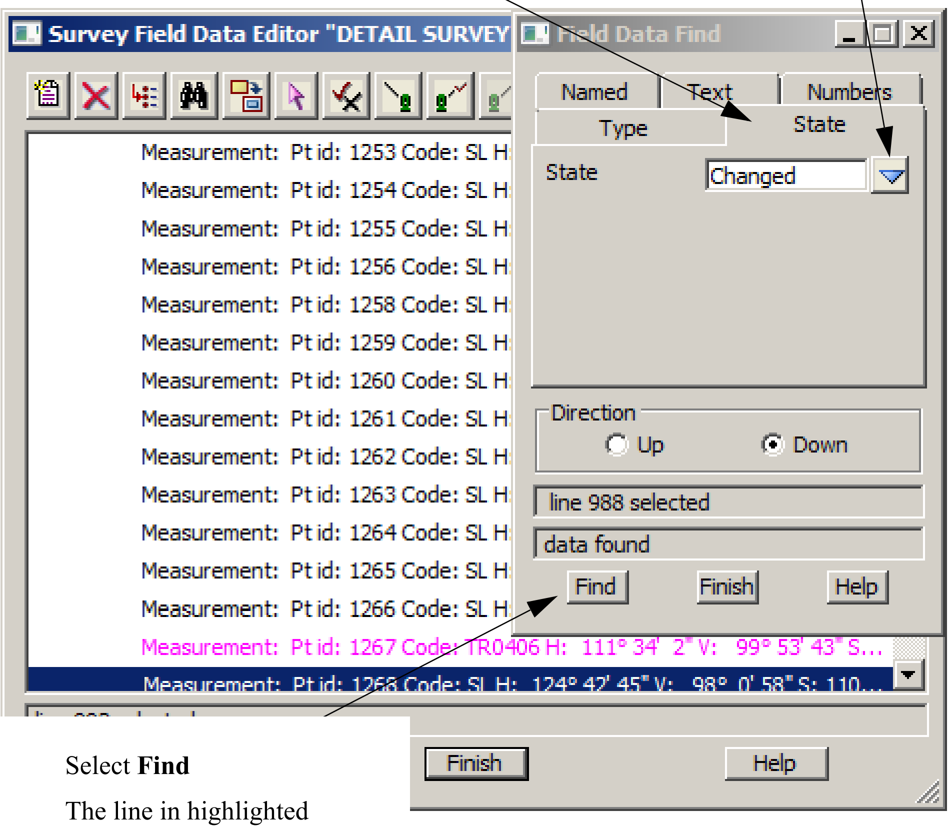
The line in highlighted

State

A search can be performed on data in the field file given a change of state including **added, changed, deleted or field**. To search for a **changed** state

Select **State** tab

Select Command choice **Changed**

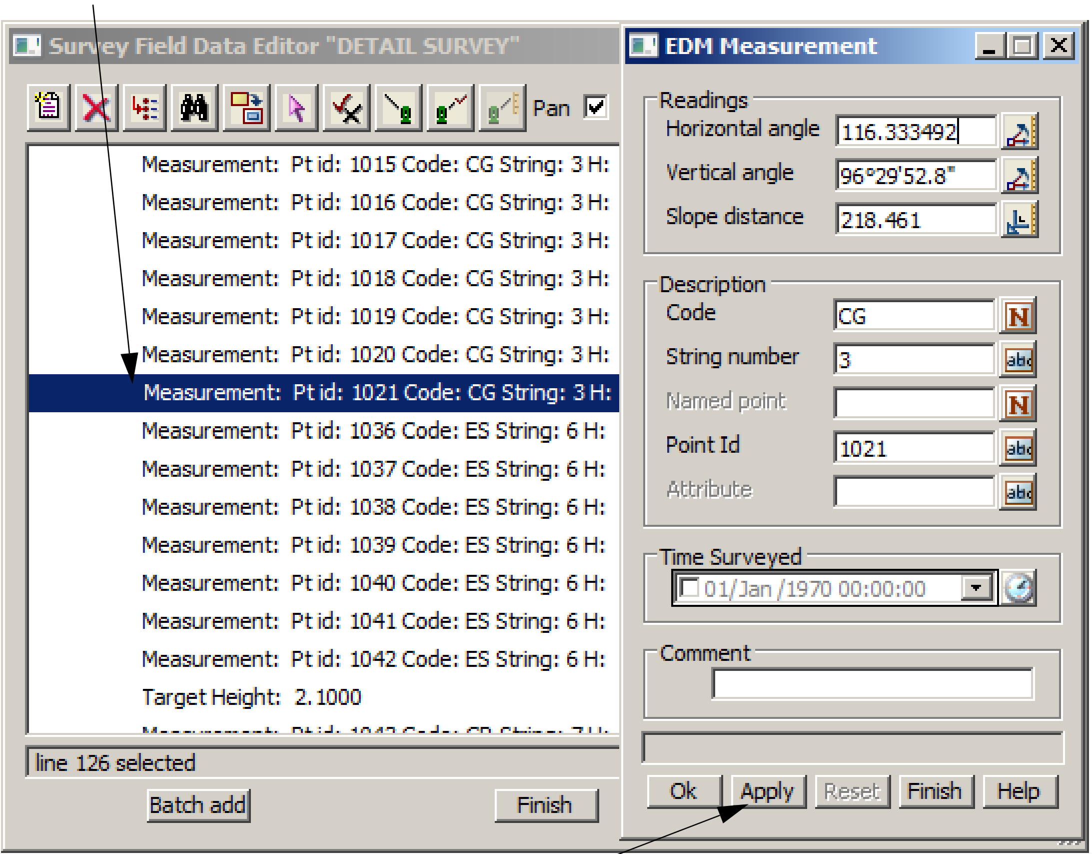


Select **Find**

The line in highlighted

9.6.1.1 To Edit a Field File Line

Double click on the line in the Field File to edit.



A panel appears with editable fields

Any data can be changed

To set the changes press **Apply**. The field file reduction will rerun updating the graphics and the field file line will appear in a magenta colour.

Select **Finish** to save the change or select **Reset** to cancel the change and then **Finish**.

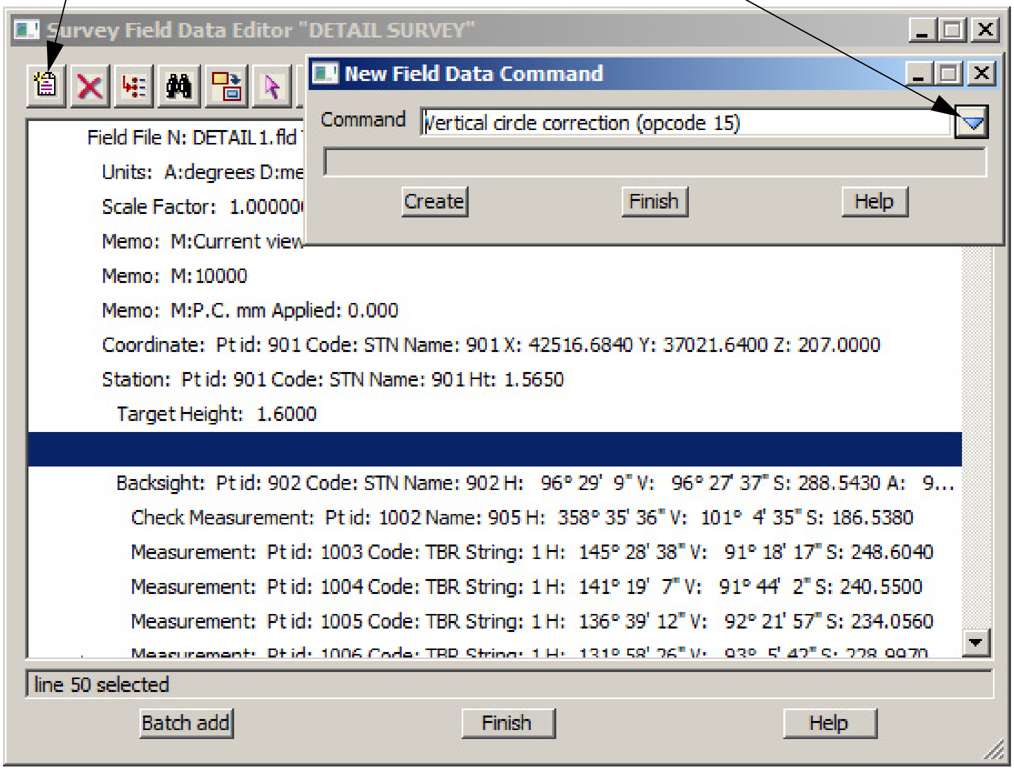
9.6.1.2 To Insert a command

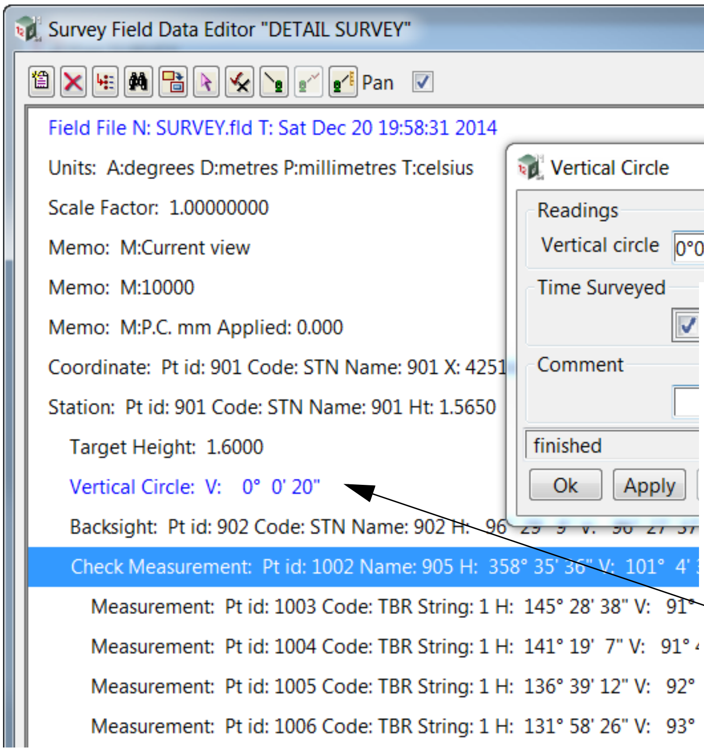
A command can be placed in the field file. Often any graphical field file edit can be substituted with an Insert command.

To insert a **Vertical circle correction** put the cursor on line where entry is to be made

Press **Insert** icon

Select the Command choice and select the Command **Vertical circle correction**. Select **Create**





Type in the correction as **0.0020** as the decimal point is the degree marker and the minutes and seconds are typed together. Make sure you type in the trailing zeroes.

The correction is applied to all subsequent readings

Select **Apply** to insert the command

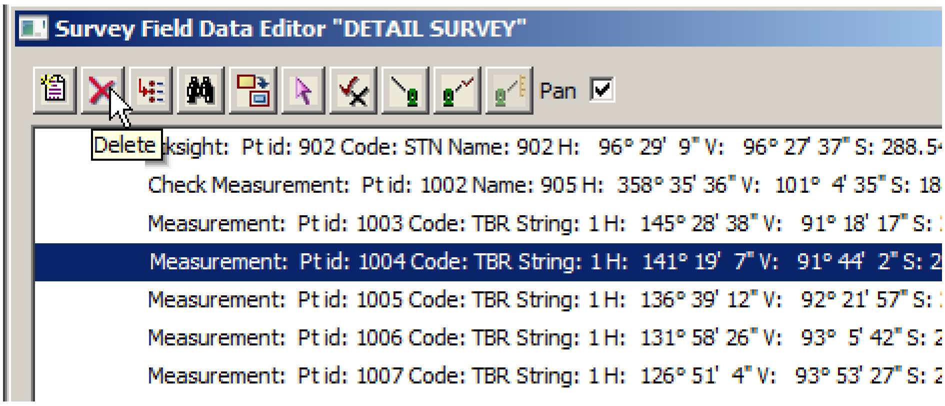
The command is inserted in to the field file editor and is highlighted blue

Select **Reset** then **Finish** to undo the command

9.6.1.3Deleting a Line

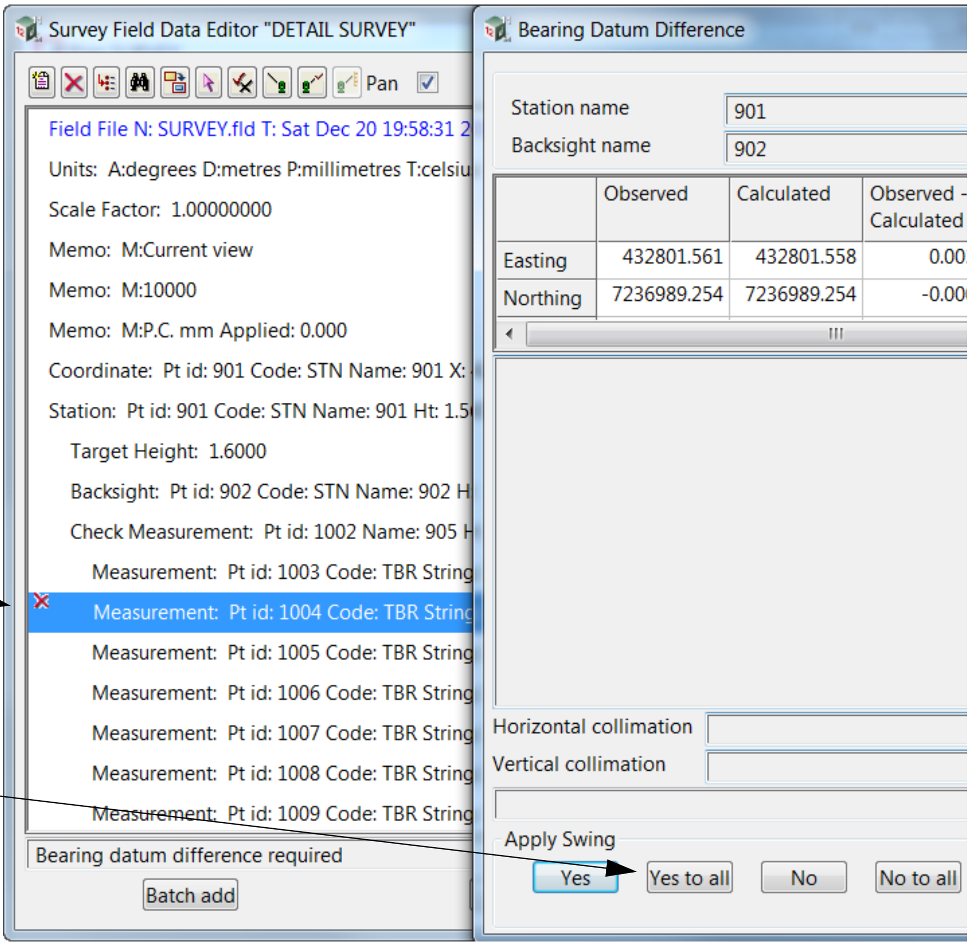
To delete a line in the field file put the cursor on the line to be deleted

Select the **Delete** icon



When a line of data is deleted a red cross is placed at the start of the line.

When the function is rerun, Backsight and Check measurement prompts will redisplay. Select **Yes to all** and **Continue all** to accept the default settings on the panels



To **undelete** a line simply highlight the deleted line and select **Delete** again

We can now finish editing the field file. Click on **[Finish]** to exit the editor

9.7 Printing the Report File

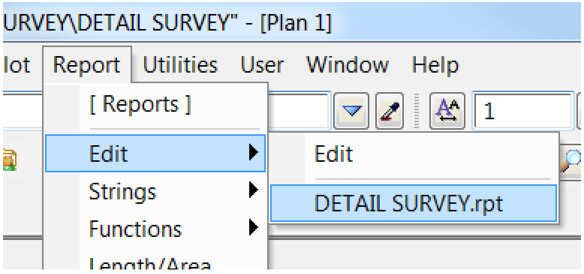
When the field file edits are complete print the Report file

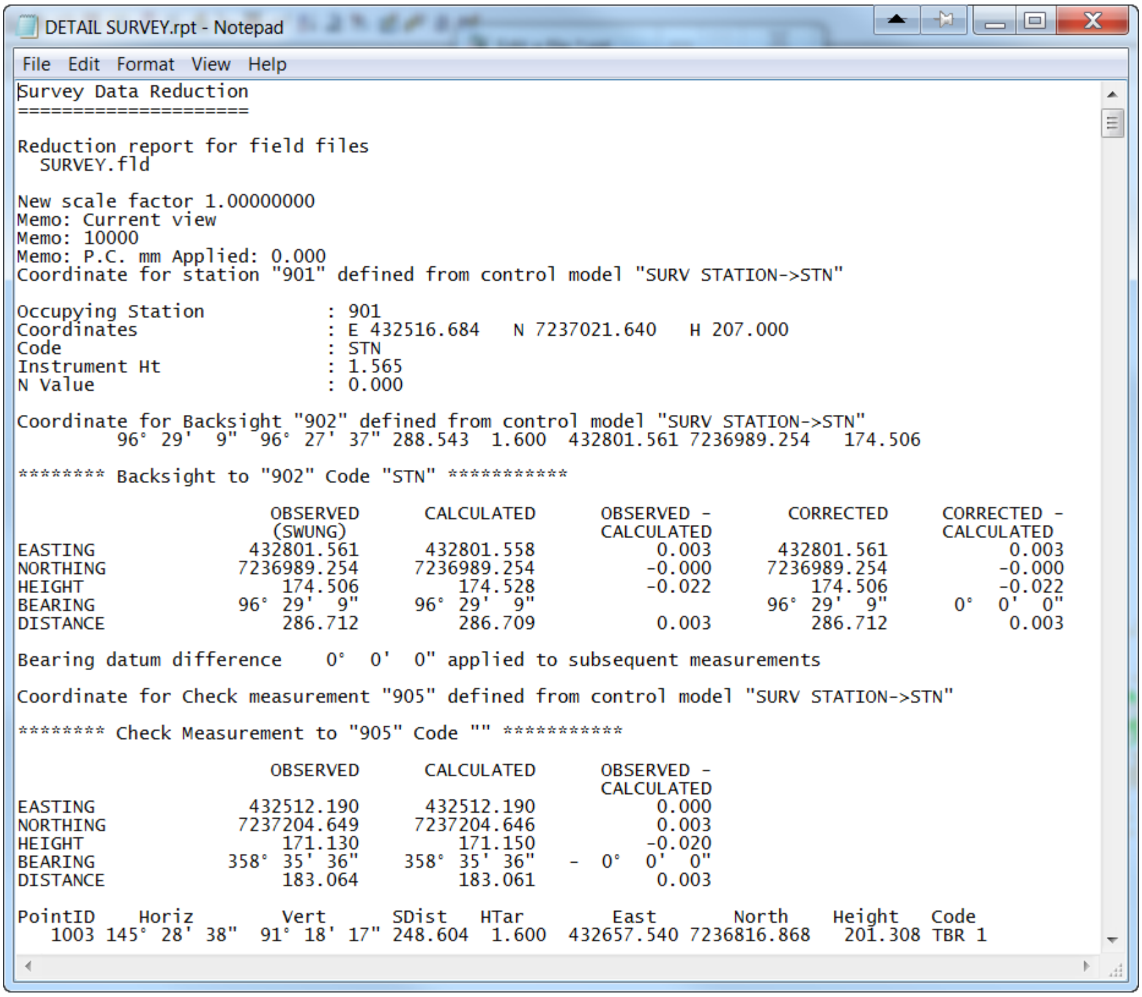
.

Select ***Report => Edit***

or **Print Report** icon

and select the relevant file






```
Survey Data Reduction
=====================

Reduction report for field files
  SURVEY.fld

New scale factor 1.00000000
Memo: Current view
Memo: 10000
Memo: P.C. mm Applied: 0.000
Coordinate for station "901" defined from control model "SURV STATION->STN"

Occupying Station             : 901
Coordinates                   : E 432516.684   N 7237021.640   H 207.000
Code                          : STN
Instrument Ht                 : 1.565
N Value                       : 0.000

Coordinate for Backsight "902" defined from control model "SURV STATION->STN"
         96° 29'  9"  96° 27' 37" 288.543  1.600  432801.561 7236989.254   174.506

******** Backsight to "902" Code "STN" ***********

                       OBSERVED       CALCULATED      OBSERVED -        CORRECTED     CORRECTED -
                        (SWUNG)                       CALCULATED                      CALCULATED
EASTING              432801.561      432801.558          0.003        432801.561          0.003
NORTHING            7236989.254     7236989.254         -0.000       7236989.254         -0.000
HEIGHT                  174.506         174.528         -0.022           174.506         -0.022
BEARING              96° 29'  9"     96° 29'  9"                     96° 29'  9"      0°  0'  0"
DISTANCE                286.712         286.709          0.003           286.712          0.003

Bearing datum difference    0°   0'   0" applied to subsequent measurements

Coordinate for Check measurement "905" defined from control model "SURV STATION->STN"

******** Check Measurement to "905" Code "" ***********

                       OBSERVED       CALCULATED      OBSERVED -
                                                      CALCULATED
EASTING              432512.190      432512.190          0.000
NORTHING            7237204.649     7237204.646          0.003
HEIGHT                  171.130         171.150         -0.020
BEARING             358° 35' 36"    358° 35' 36"   -  0°  0'  0"
DISTANCE                183.064         183.061          0.003

PointID    Horiz         Vert      SDist   HTar       East       North     Height   Code
   1003 145° 28' 38"   91° 18' 17" 248.604  1.600  432657.540 7236816.868   201.308  TBR 1
```

The report file is displayed in your default text editor and can be printed to keep a record of the survey reductions

9.7.1 Locking the Data Reduction Function

After all field file edits have been made it is important to ensure that the data reduction function can not be rerun.

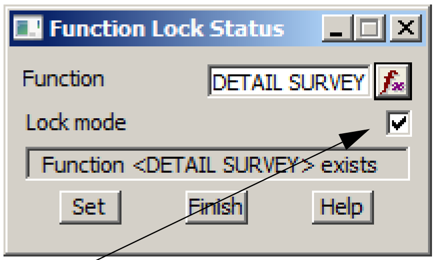
This is because if any non-field file operations are performed on the reduced data and then the reduction is rerun, the non-field file operations may be lost

Once the function has been locked it can't be rerun by mistake resulting in data integrity problems

To lock the Data reduction function

Select **Utilities=>Functions=>Lock**

or **Lock Function** icon

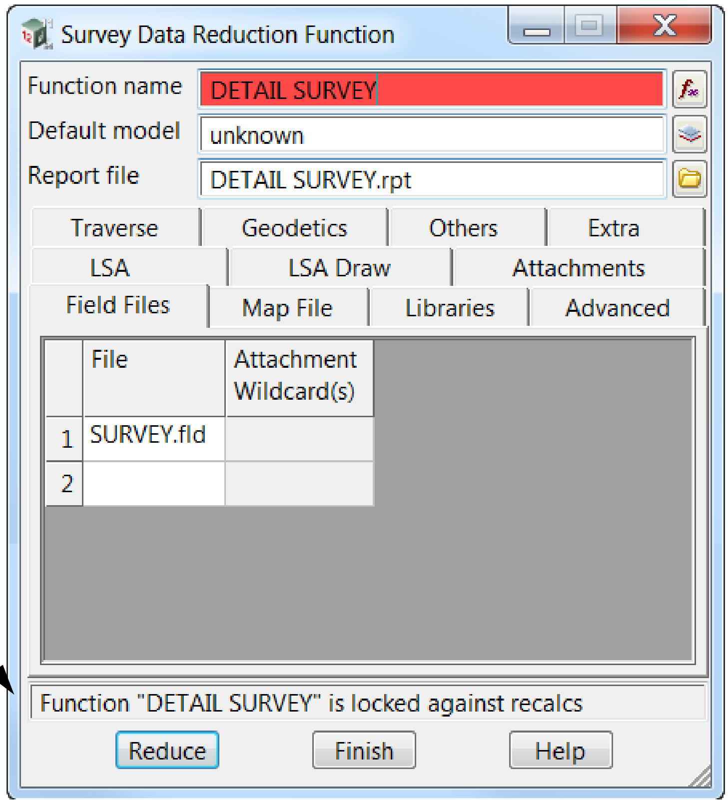


Select the **Lock Function** choice icon and select the function name **DETAIL SURVEY**

Tick the **Lock mode** check box

Select **Set** and **Finish**

If the function is rerun, the following error message occurs



9.8 Graphical Edits

We now edit the survey graphically to perform tasks either not available in the field file editor or in some case easier to do graphically.

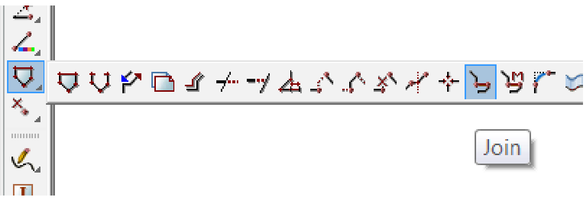
Most of the options used in the following examples are duplicated under the ***Strings=>Cad*** menu

9.8.1 Joining strings

9.8.1.1 Join

Select *Strings=>Strings Edit=>Join*

or **Join** icon



Points can be joined in a number of ways. The first type of join will result in two strings of the same type being combined into one string. If the two strings are different, then the resulting string uses the properties of the first string selected

Zoom in to point number 1232

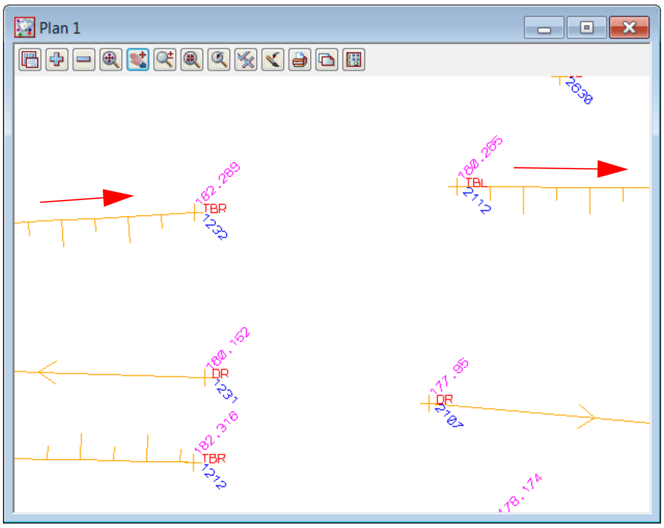
This string will be joined to the string starting at point 2112

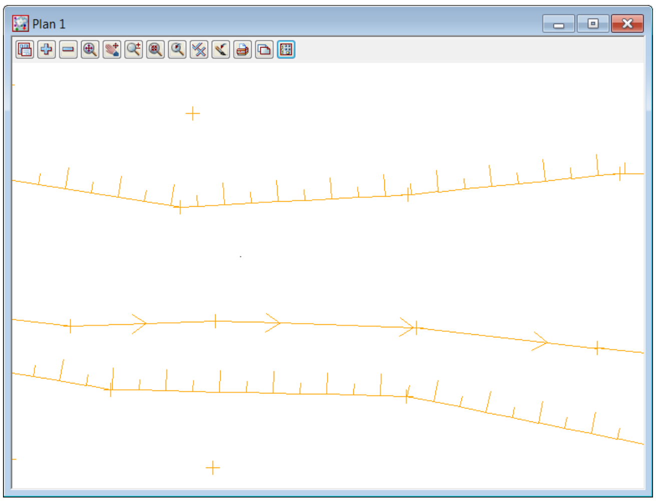
Hold down the left button and drag a short distance along the left string with direction ***towards*** point number 1232. Release the left button then select middle button to accept

Select the right string in the same way with direction ***away*** from point 2112 and accept

The strings are joined to make one string. In this case the string will require reversing which is explained later

Repeat for all of the other gaps in the survey where the two strings have the same properties and you are joining the ends (<u>not joining from an end to a corner of a string)</u>

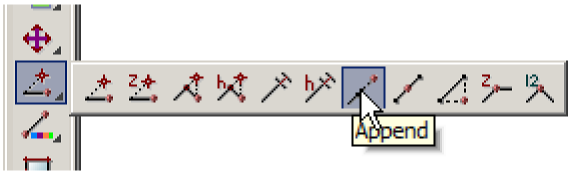




9.8.1.2Append

Select *Strings=>Points Edit=>Append*

or **Append** icon



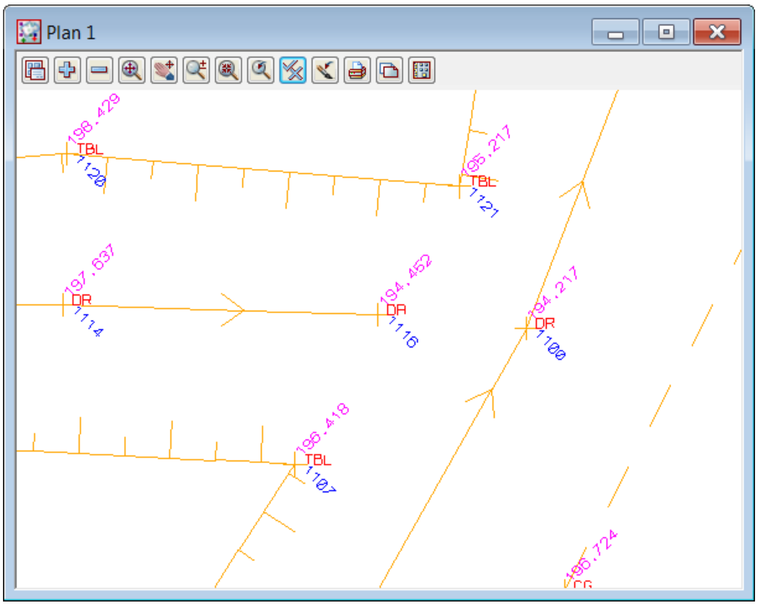
This option is used to append the end of a string on to another point on a string

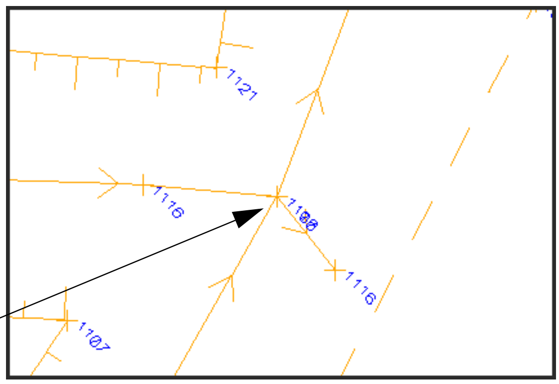
Zoom in to point number 1100

Select point 1116 and accept

Select point 1100 and accept

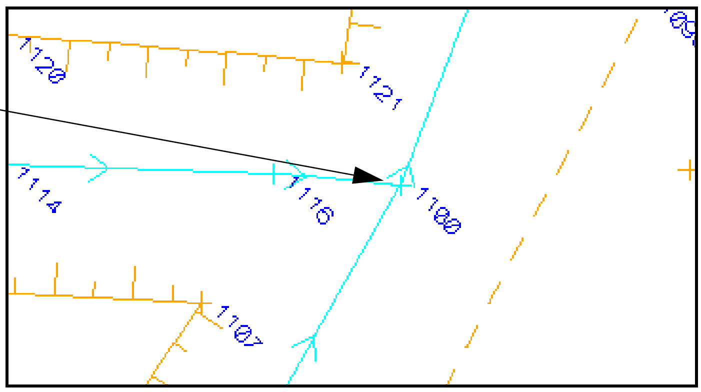
Press [Escape] to finish picking





The first strings is appended to point 1100

If the point id's are turned on the appended string will duplicate the last point id.

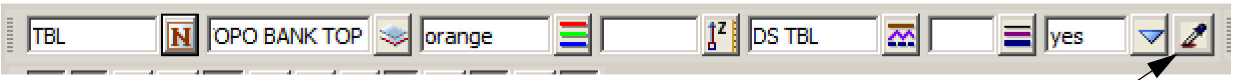


If you use the cad option no point id will appear on the appended point

9.8.1.3Cad Create Line

A line string taking its default properties from the **Cad Controlbar** can be created. This will create a single line string independent of the two points selected.

Firstly select the properties for the new string by manually changing options in the **Cad Controlbar**



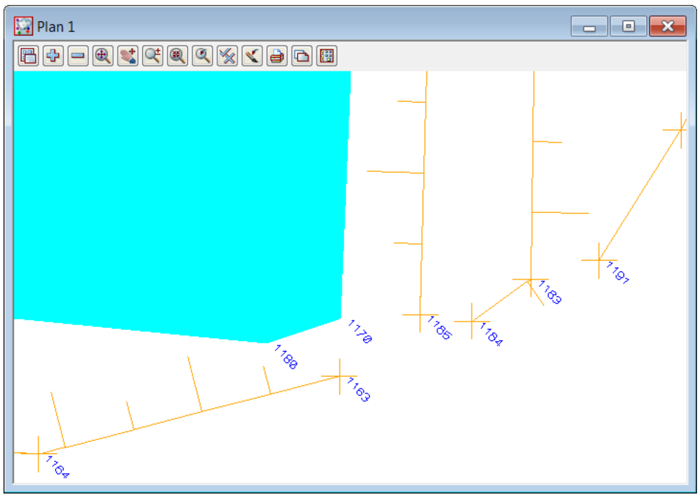
When editing a survey you should be using the **Name** icon to select the relevant code. Once the code is selected the rest of the cad control bar is filled in. The file names.4d is used to set up this process. It is very similar to a mapping file used to read in the survey initially

The other method of presetting the cad control car is to use the **Sameas** icon to pick a point on the string with the properties required.

For our exercise we will use the **Sameas** button and select a **TBL** string

Zoom in to point 1185

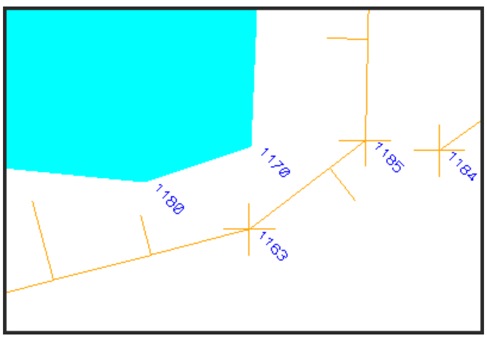
Select option ***Cad=>Lines=>2 points*** or select **2 points** icon



Select point1185 and accept

Select point 1163 and accept

A new string is created between the two points



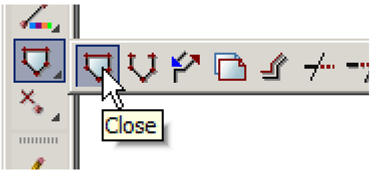
9.8.1.4Close

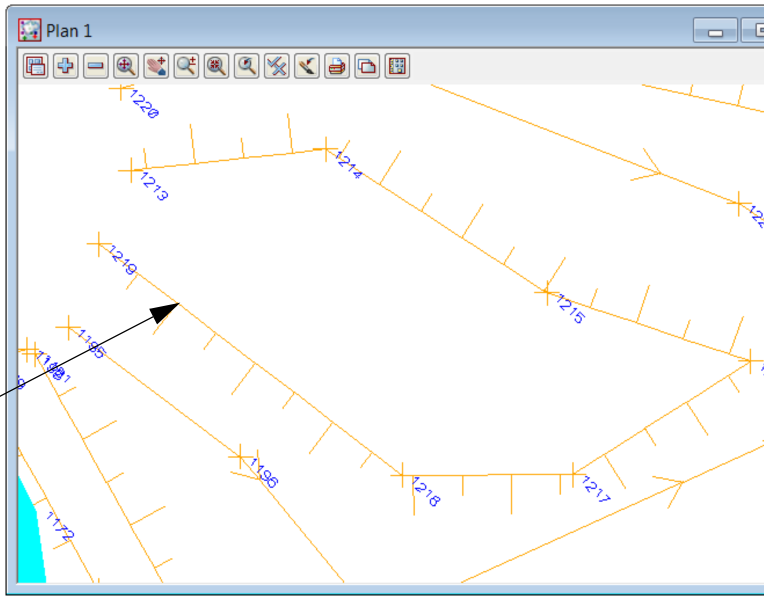
If a gap appears between the end and the start point of a string then we join these points together (or close the string) to form a polygon. This option is also available in the field file editor. It should be noted that as many field file edits as possible should be used instead of manual edits as there is no audit trail in manual edits

Zoom in to point 1213

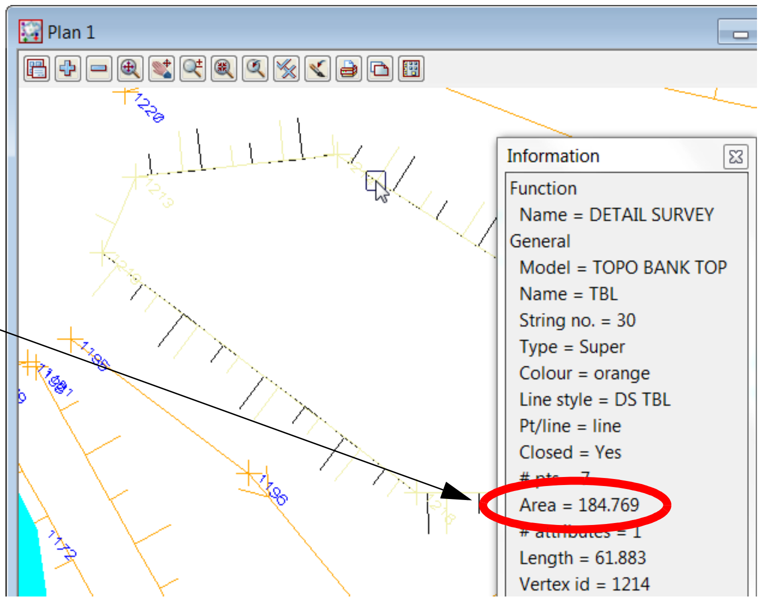
To close the string select option ***Strings=>Strings Edit=>Close***

or the **Close** icon





Select anywhere along the string and accept.

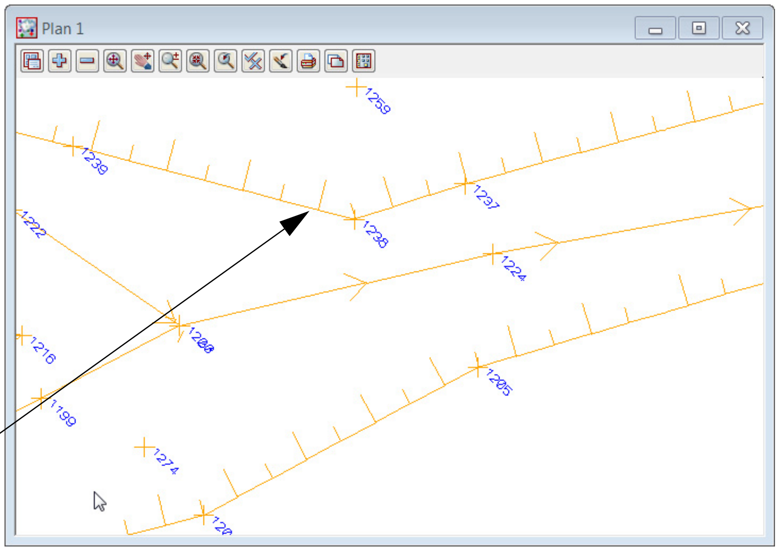


When inquiring on a closed string, the area is displayed in the information panel

9.8.2Reverse String

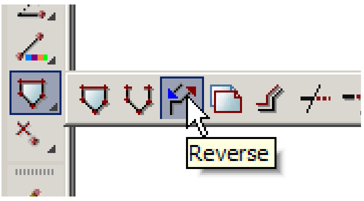
If strings are created with the linestyle shown on the wrong side then the string can be reversed.

Zoom in to point 1238

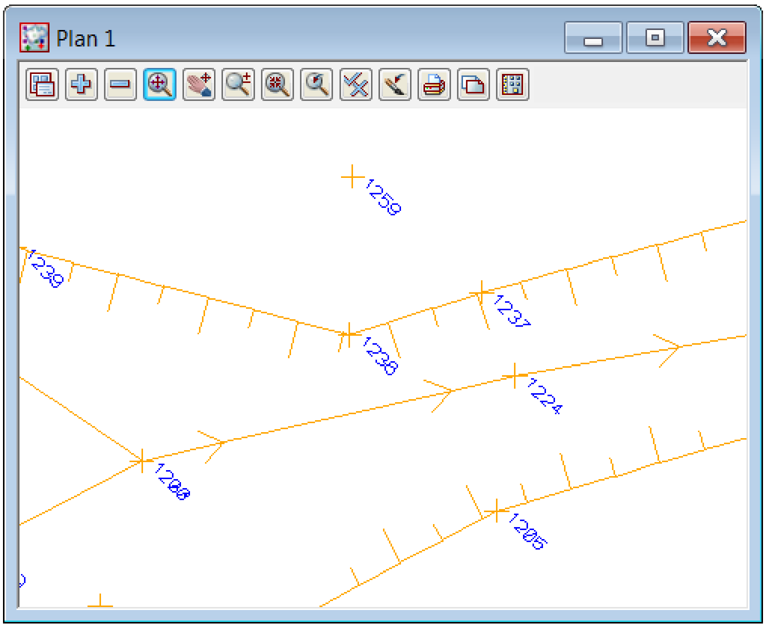


Select option ***Strings=>String Edit=>Reverse***

or **Reverse** icon



Select the string and accept



The string direction is reversed

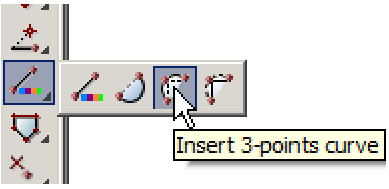
9.8.3Add arc to curve

An arc can be placed in to a string by selecting the middle point of a 3 point curve.

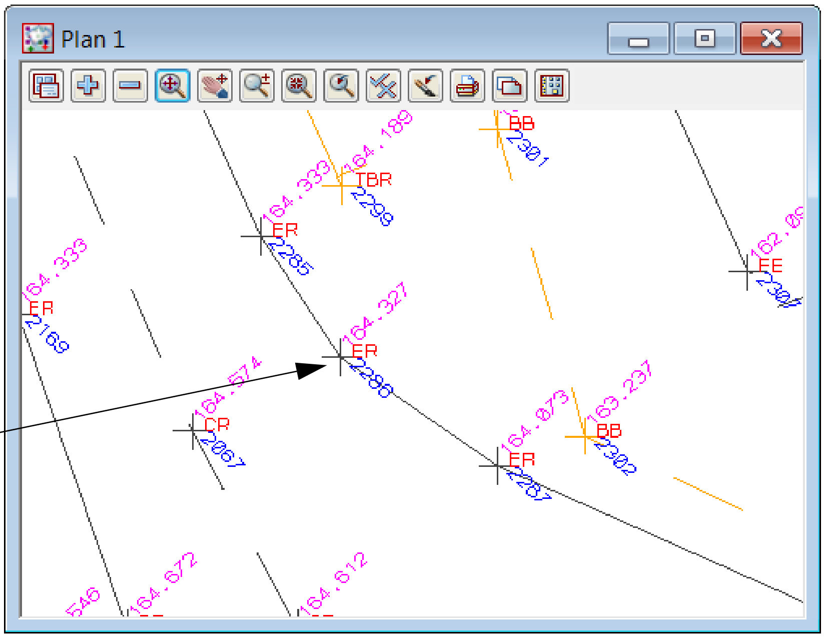
Zoom in to point number 2286

Select option ***Strings=>Points Edit=>Add 3 Pt curve***

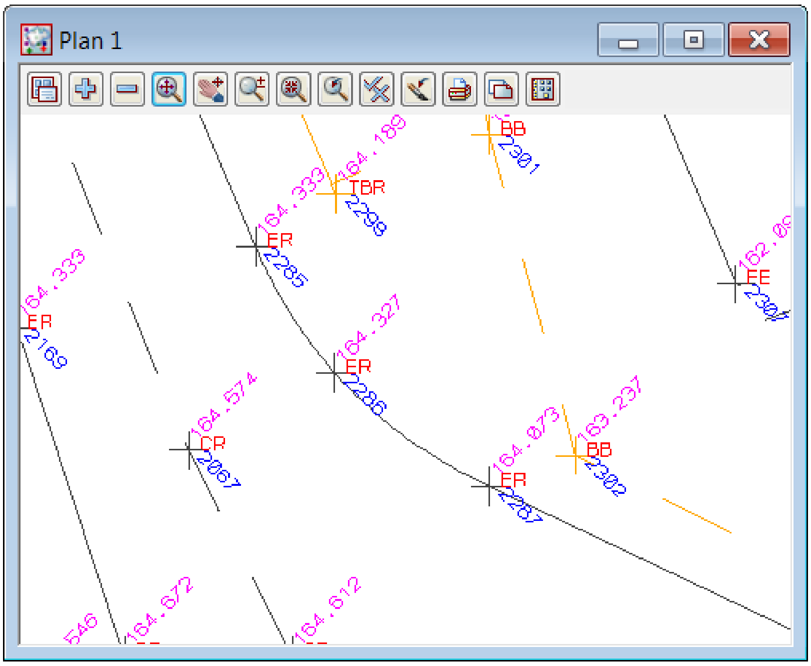
or **Insert 3-points Curve** icon



Select point 2286 and accept



A curve is created



9.9 Triangulation

The survey is almost ready to form a triangulation from the tinable data that is displayed in the view.

Ensure that all models are turned on in view 1.

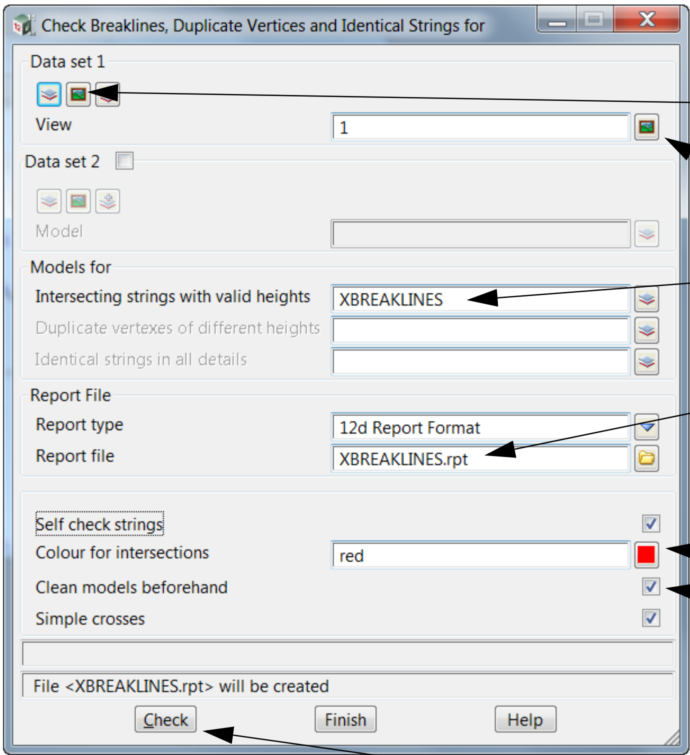
9.9.1 Check for Crossing Breaklines

Prior to forming the triangulation we need to check for any overlapping breaklines.

If not corrected these will cause errors in the triangulation.

Coloured diamond shapes can be created around the errors along with a report file

Select option ***Tins=>Check Breaklines***



We want to check all data in View 1 so select **View** icon

Select view number **1**

Type in model name **XBREAKLINES** to create strings around the errors

The report file name **XBREAKLINES** is typed in. Press [Enter] after entering the text and the extension **.rpt** is added

Select the colour **red** for the strings

Tick check box to **Clean models beforehand**

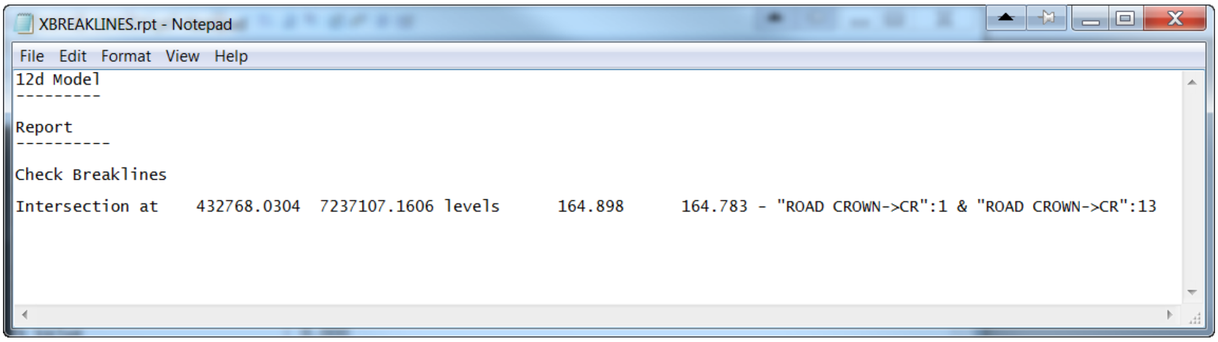
NOTE - report files are not available in the12d Model Practise Version

Select **Check**

The report is generated and displayed in the default text editor

At the bottom of the report the intersections are listed giving the model names, coordinates and codes of the intersection strings

Exit the text editor



Drag the **Check breakline** panel over to the bottom edge of the screen as we will rerun the option later

Turn on the model **XBREAKLINES**

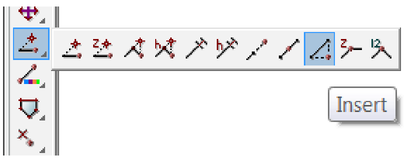
Zoom in to the red diamond at point 2275

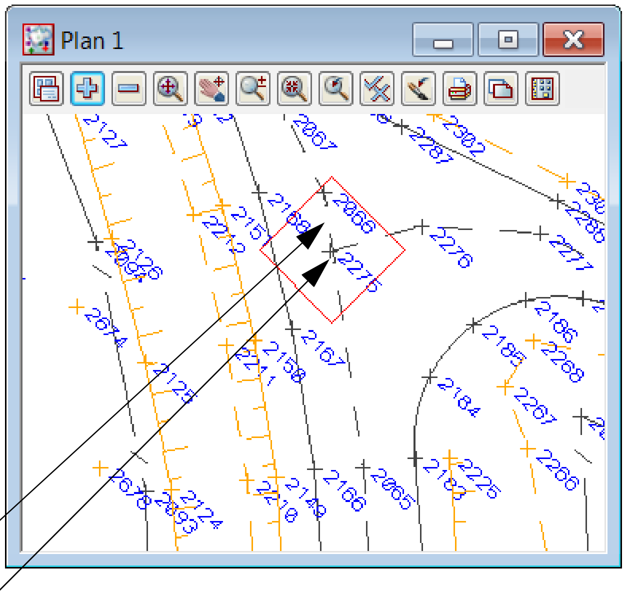
A red diamond appears centred at the intersection of the two strings

To correct we will insert point 2275 into segment from point 2065 to point 2066

Select option ***Strings=>Points edit=>Insert***

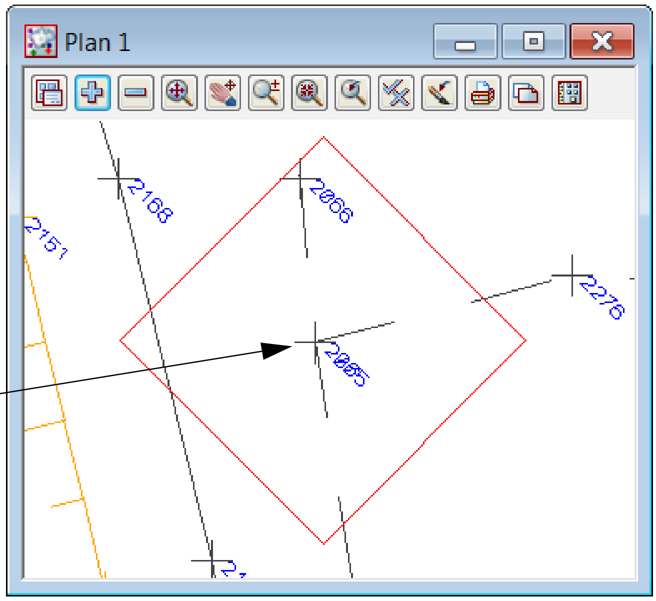
or **Insert** icon





Pick and accept the string between point 2065 and 2066

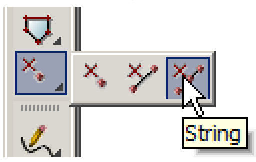
Pick and accept point 2275



The string now has a vertex at point 2275

Lastly delete the diamond string surrounding the crossing breakline. We delete the diamond string as it has levels at the vertices and if the ***Check Breakline*** option is rerun without the **Clean models** option ticked, more crossing breaklines would result

Select ***Strings=>Delete*** or **String** icon



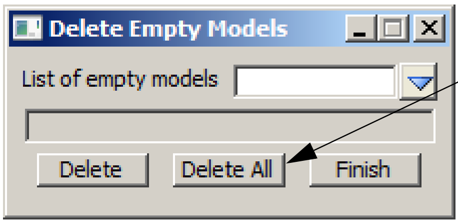
Pick the diamond and accept

As the **Crossing Breakline** panel is still active rerun the option to confirm all crossing breakline have been fixed

9.9.2Delete empty models

When triangulating a view of data it is important to delete any empty models.These are models containing no strings. If the tin was to include these models and the models were deleted at a later stage the tin function would not work. The user would have to edit the triangulation and remove the models from the list

Select option ***Models=>Delete=>Delete empty models***



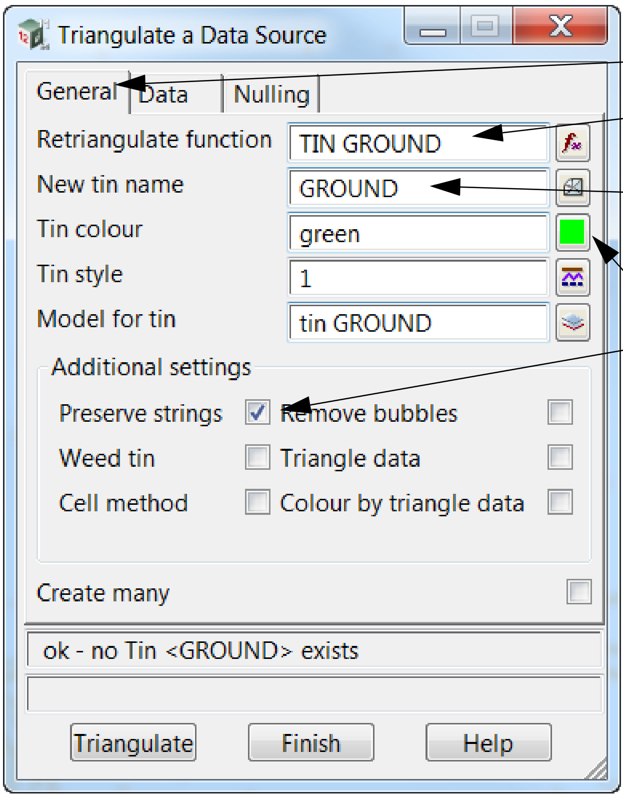
Select **Delete All**

This will delete the model **XBREAKLINES** and **unknown** which was created during the field file reduction

9.9.3Triangulate data

All tinable data in View 1 will now be triangulated. In this example we will triangulate a view of data. Turn off the model name **Trash model** if it exists. This model may have been created as a result of certain string edits. The edit panels may have given the user the option to send the affected string to the ***Trash model***

Select option ***Tins=>Create=>Triangulate data***



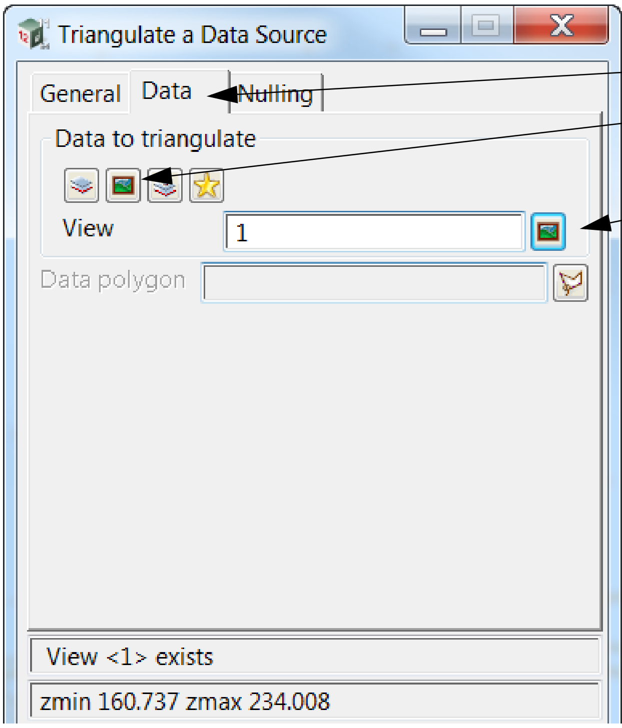
Select the **General** tab

Type in the function name **TIN GROUND**

Type in **GROUND** as the tin name. Press [Enter] and the **Model for tin** will use the same name prefixed with the word **tin**

Select a tin colour **green**

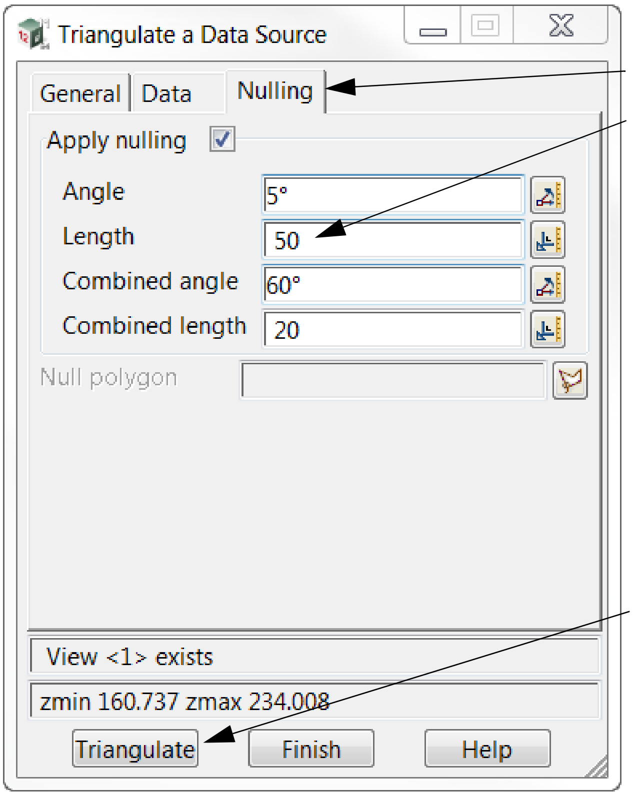
Tick the check box to **Preserve strings**. This will ensure that the triangles run along the edge of the breaklines



Select the **Data** tab

Select the view icon

Select view 1



Select the **Nulling** tab

Type in a length of 50. This will delete any triangle with a side longer than 50

The angle and combined length / angles are explained by pressing **Help**

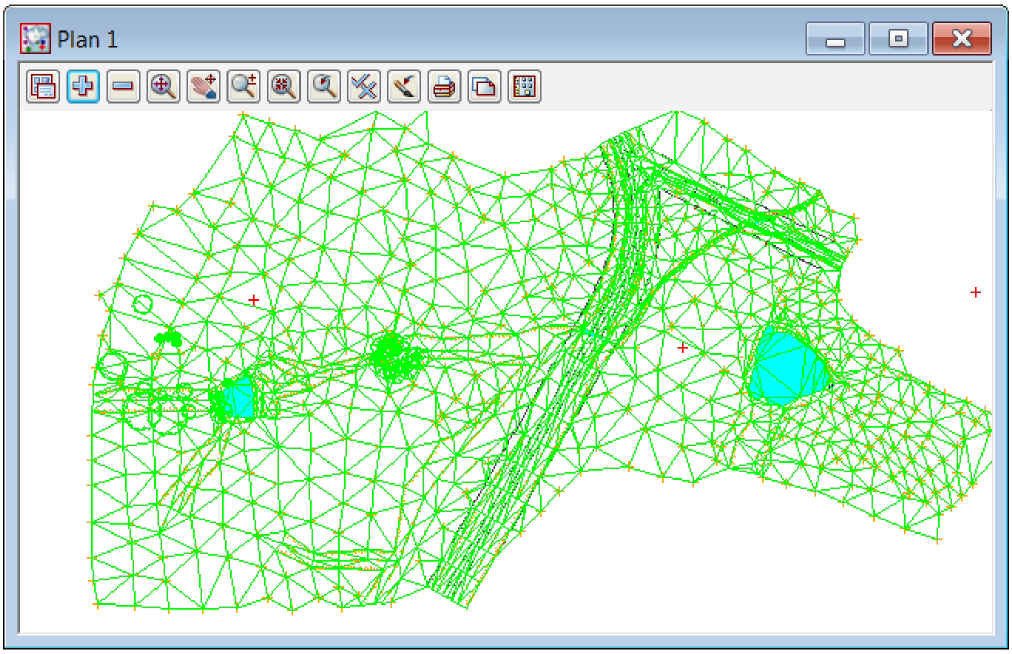
We are going to manually create a boundary at a later stage so there is no **Null polygon**

Select **Triangulate**

The panel changes to a **Retriangulate Tin** panel.

We will use this panel again later to select the tin boundary so it can be moved over to the edge of the screen

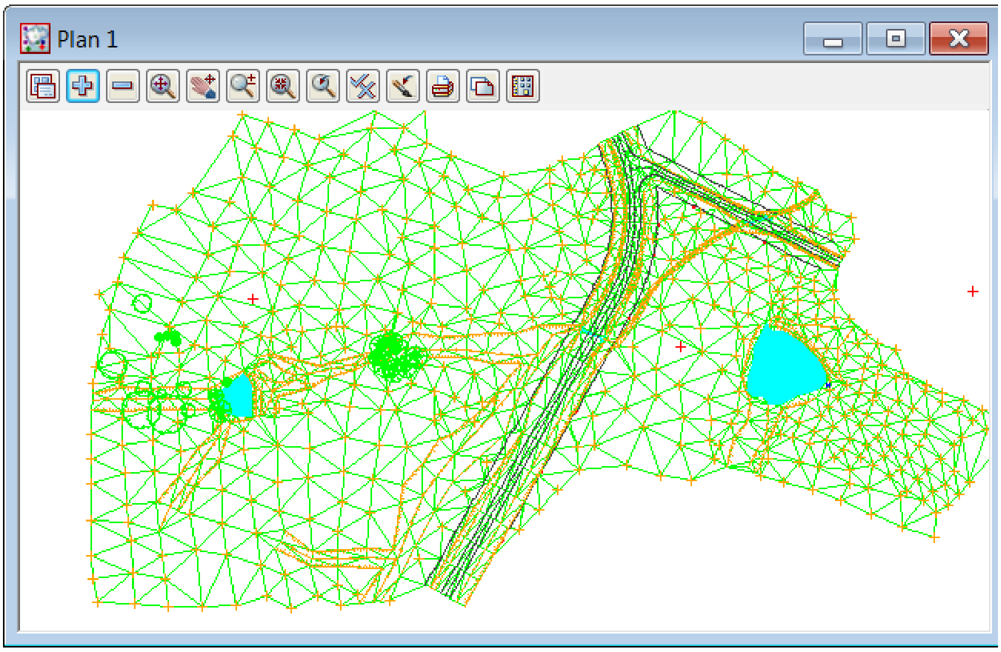
Turn on the model **tin GROUND**



The triangulation is shown with preliminary nulling around the edge

9.9.4Nulling Triangles

When deleting triangles it is important to be able to see the survey strings. As the tin was the last model turned on the green triangle lines cover the survey strings. We can put the green tin strings to the back by selecting ***View =>Send tins/rasters to back***



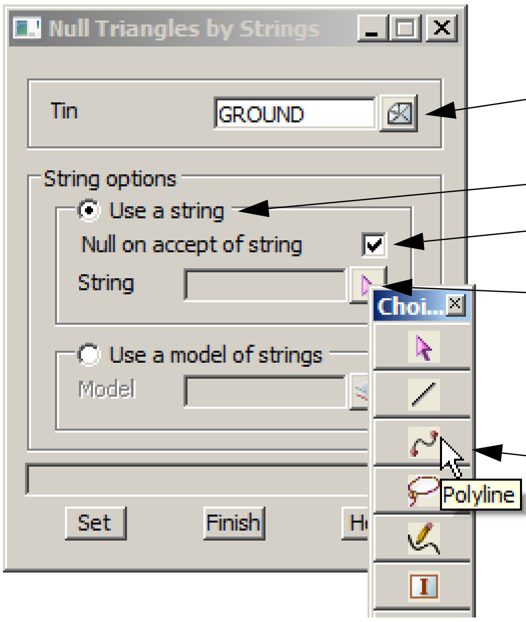
The triangles around the edge of the data have been partially nulled by the Triangulation function but we need to trim the triangles even further to be able to create a boundary around the edge of the survey.

There are a number of ways to null triangles including ***By points and by strings***

9.9.4.1Null by strings

Triangles can be deleted by dragging a line, polyline or lasso through the ones that are incorrect.

Select option ***Tins=>Null=>By strings***



Select the **Tin** icon

Select tin **existing**

Select **Use a string**

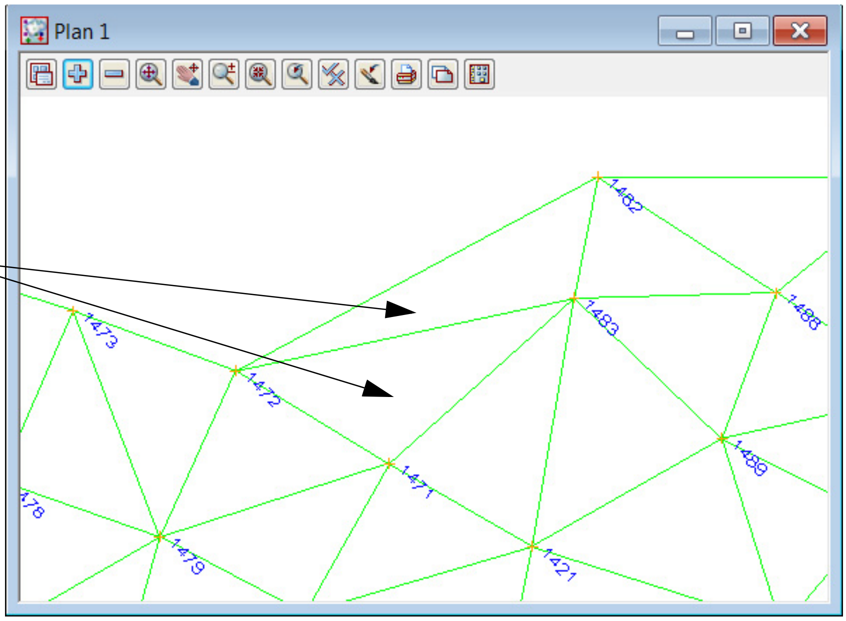
Tick **Null on accept of string**

Right click on the **String** choice icon

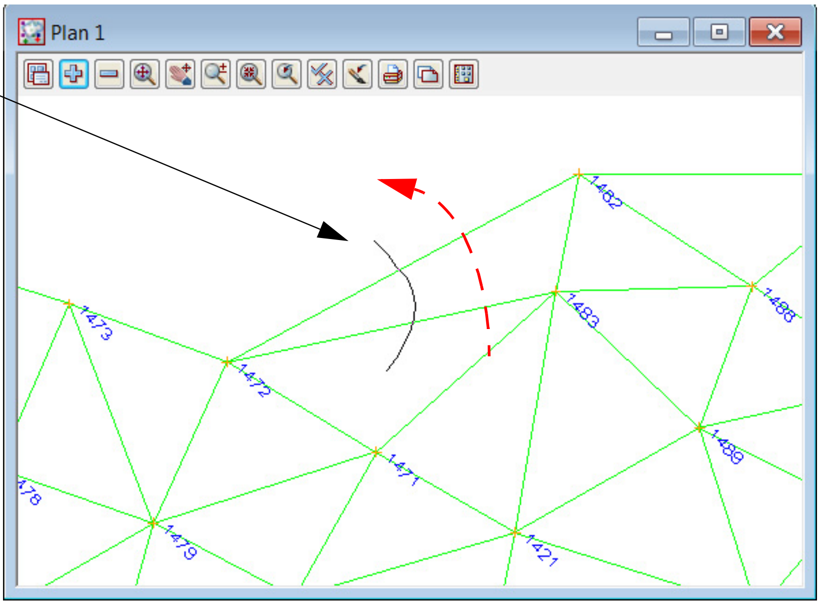
Select **Polyline** icon

Zoom in to point 1482

These two triangles need to be nulled

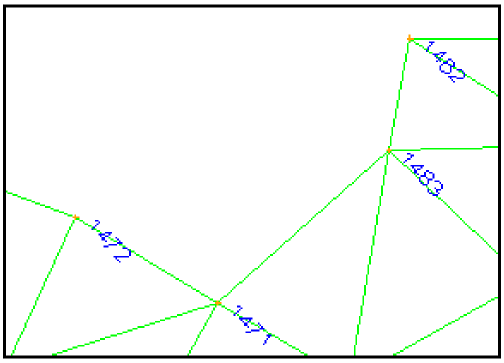


Holding down the left button, drag a polyline through the triangles as shown. Release the left button then press middle button to confirm the delete



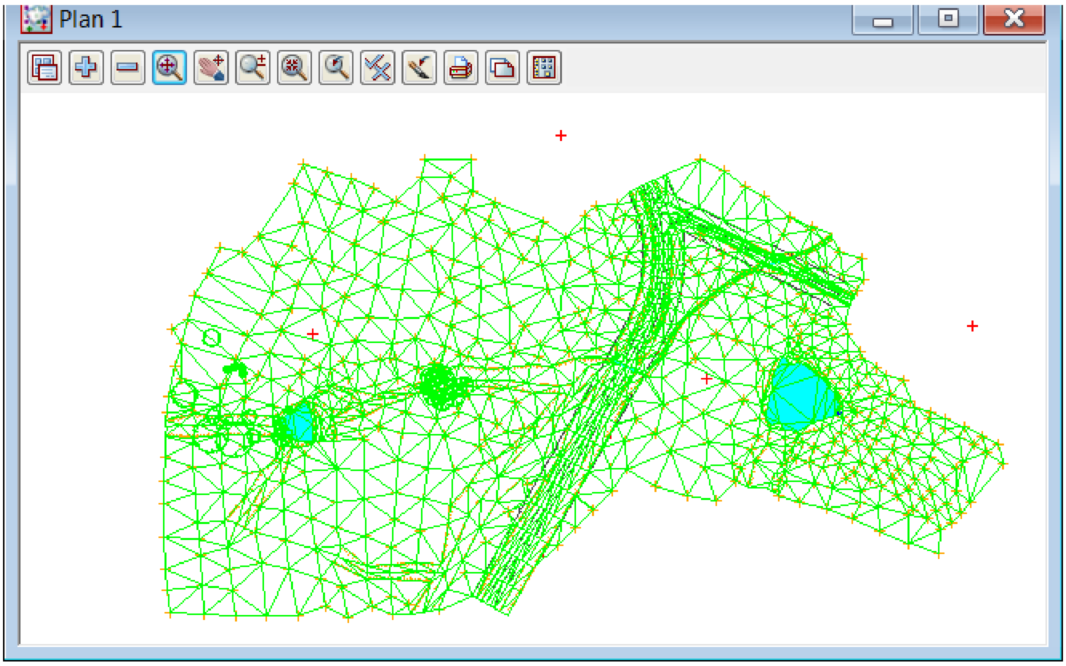
The triangles will be deleted

Pan around the edge of the survey deleting triangles in this manner



Pay particular attention to the triangles where the creek beds meet the boundary. The triangles often cross from one top of bank to the other.

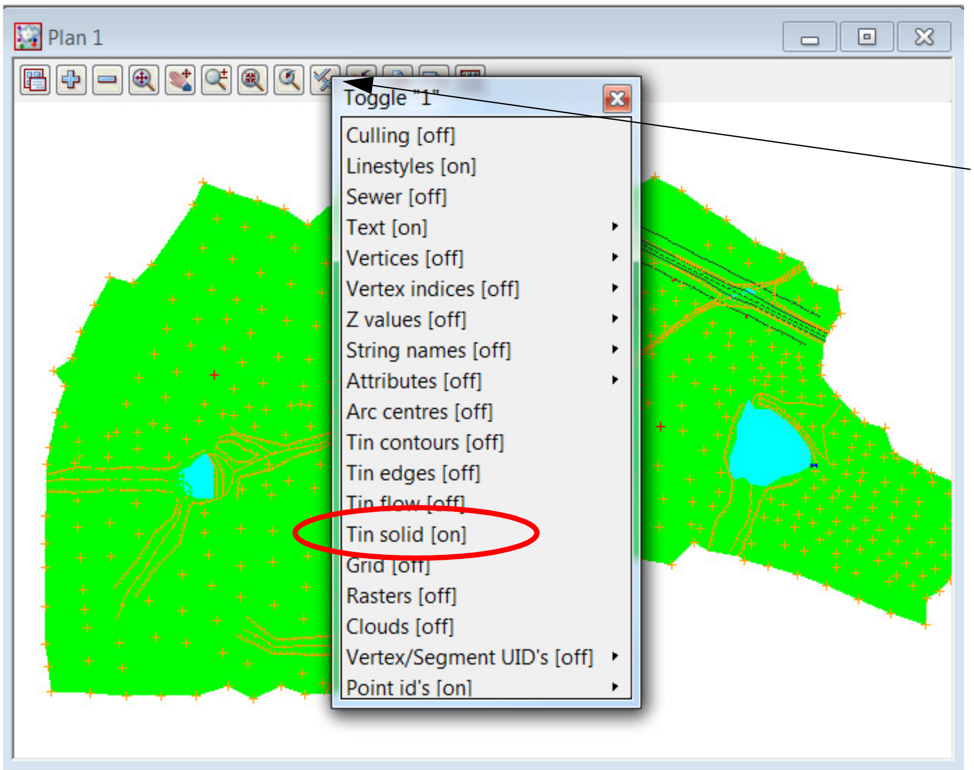
The final trimmed triangles should look like the example below



9.9.4.2Tin Solid

To ensure there have been no errors while deleting the triangles, the surface can be coloured with a solid fill. This enables any errors to be easily seen

Zoom to the extents of the survey data

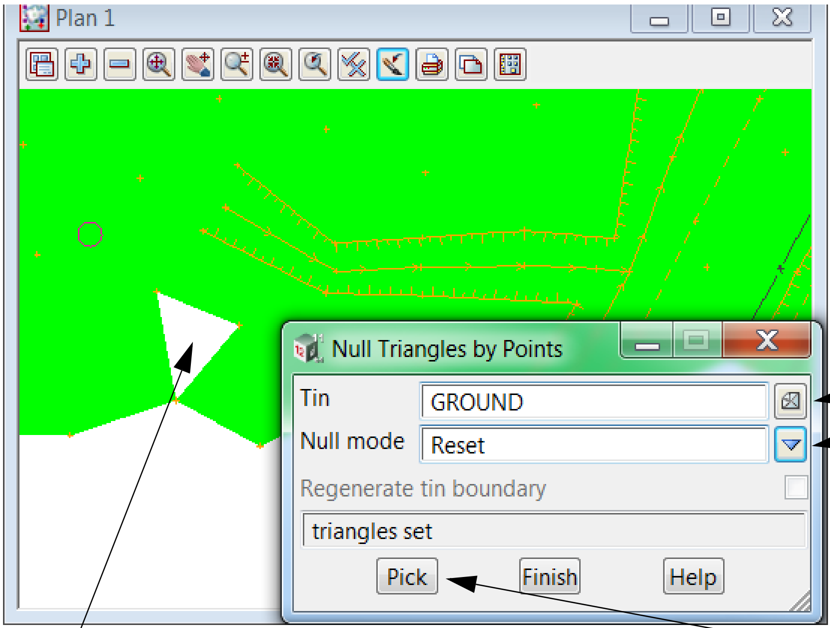


Select **Toggle** icon

Select **Tin Solid**

9.9.4.3Reset triangles

To “Undo” a wrongly deleted triangle select the option ***Tins=>Null=>By Points***

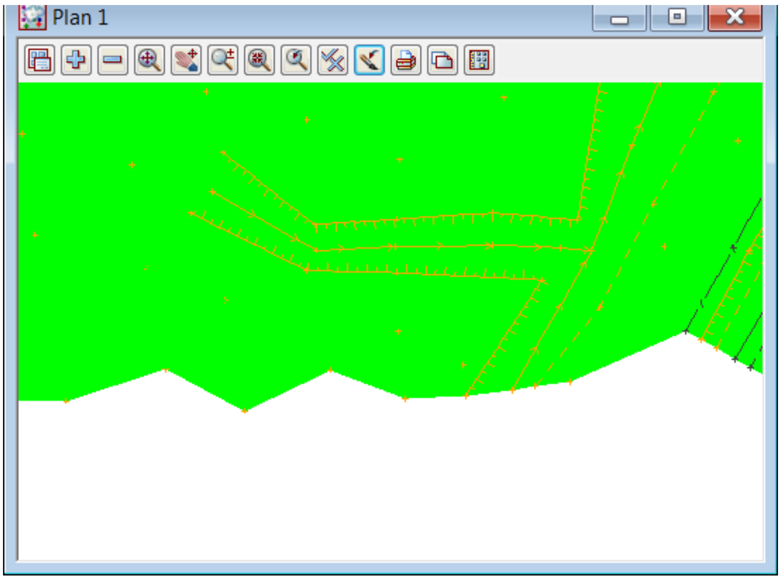


Select tin **ground**

Change the **Null** mode to **Reset**

Select **Pick**

Select and accept the centre of the triangle to reinstate



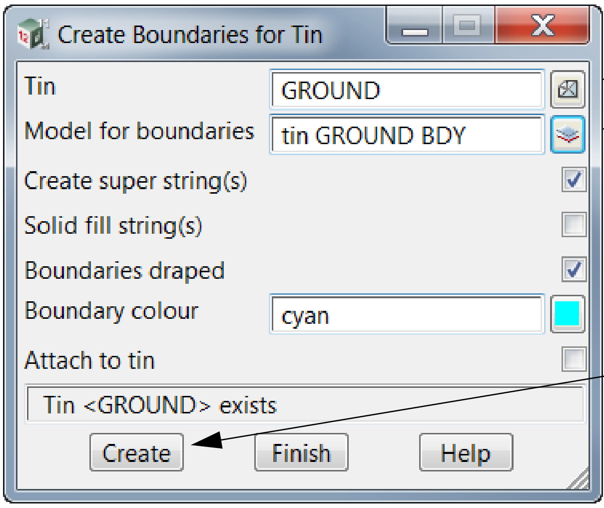
The triangle will be restored as seen by the solid fill

9.9.5Tin Boundary

Once the triangles have been trimmed around the edge of the survey a string can be created along the extent of the triangulation. This is then used to nominate a Null polygon for the triangulation.

Toggle off **Tin Solid**

Select the option ***Tins =>Boundary =>Boundary***



Select the tin **ground**

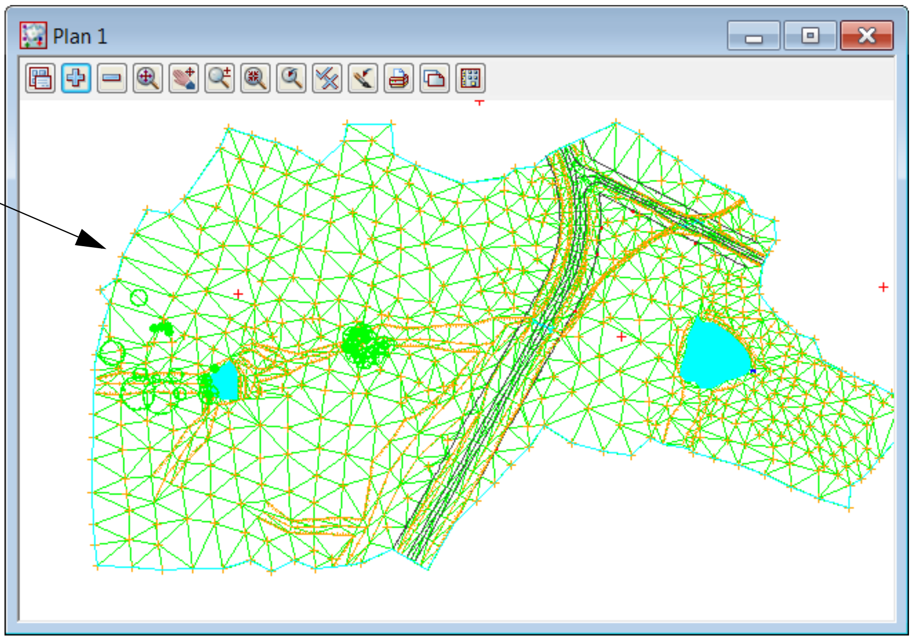
Select tin model **tin ground** then add **BDY** to the model name

Leave check boxes ticked

Select **Create**

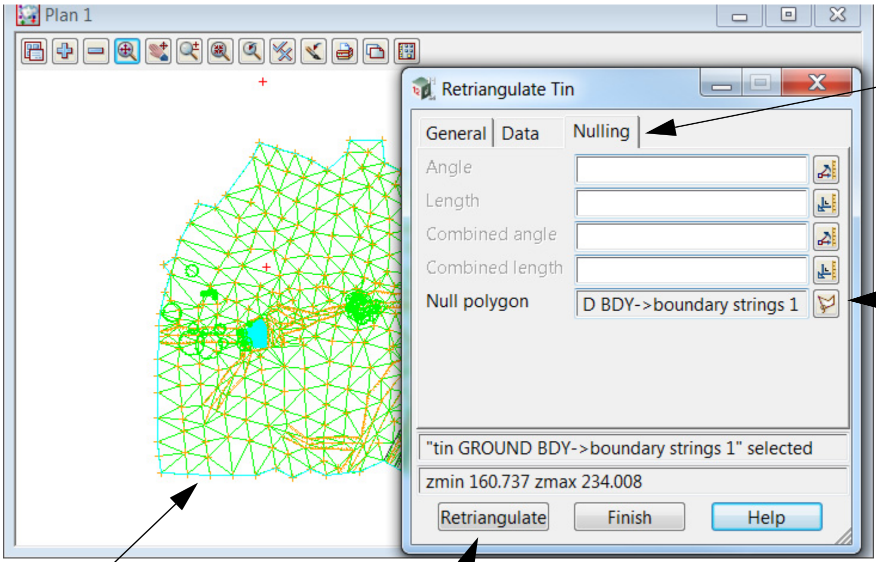
Turn on the model **tin GROUND BDY**

A cyan string is created around the extent of the triangulation



Now we need to include the boundary string in the triangulation

Return to the **Retriangulate Tin** panel



Select the **Nulling** tab

Clear out the previous nulling values

Select **Null Polygon** pick icon

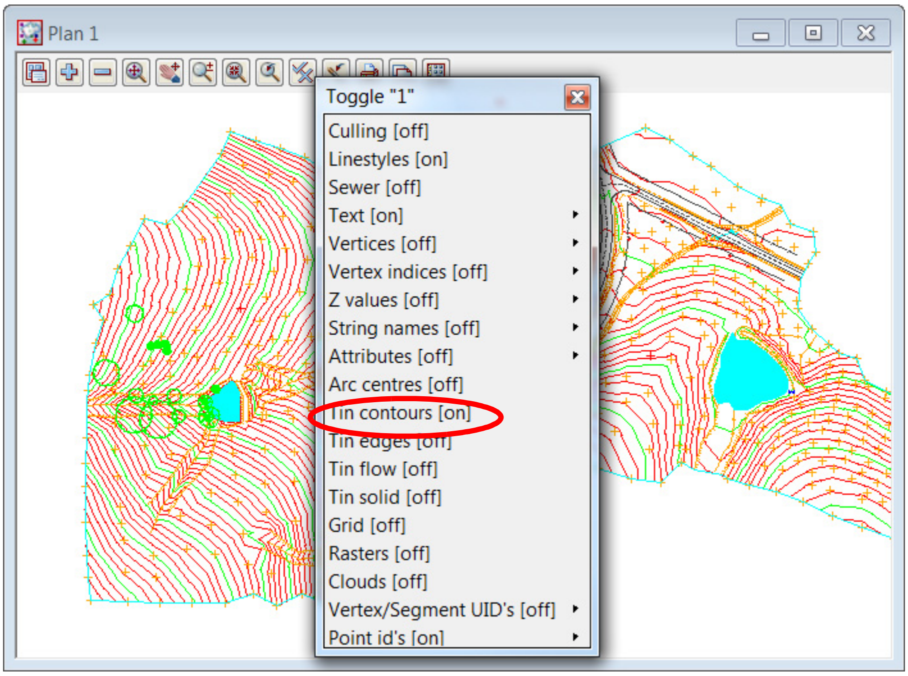
Pick and accept the boundary string

Select **Retriangulate** then **Finish**

9.9.6Viewing fast contours

We will now turn on the fast contours to analyse the triangulation.

Select ***Toggle=>Tin Contours***

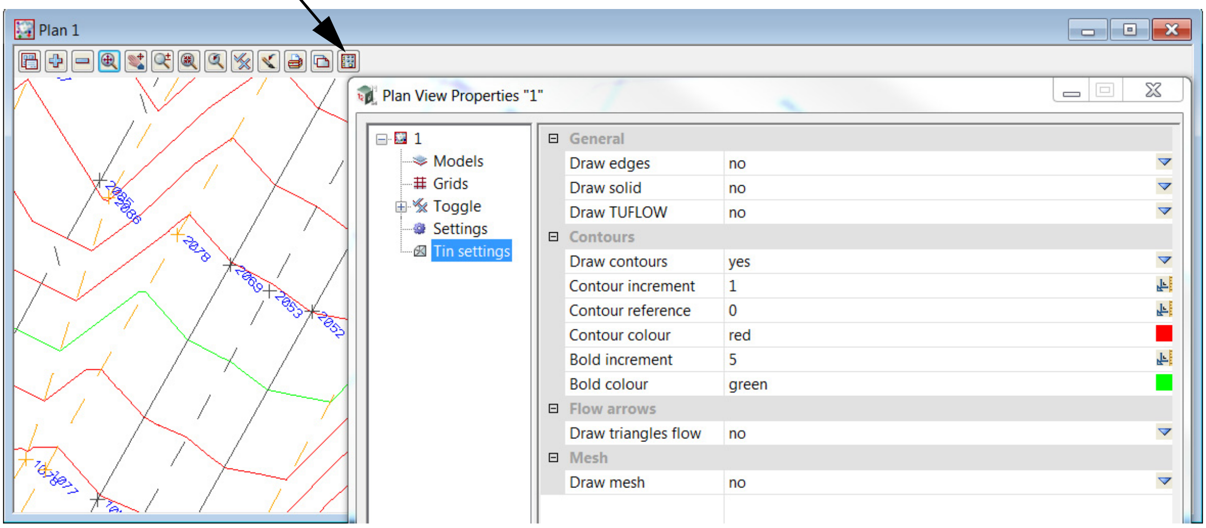


The contours should be checked for any errors

The contour increment can be changed for the view.

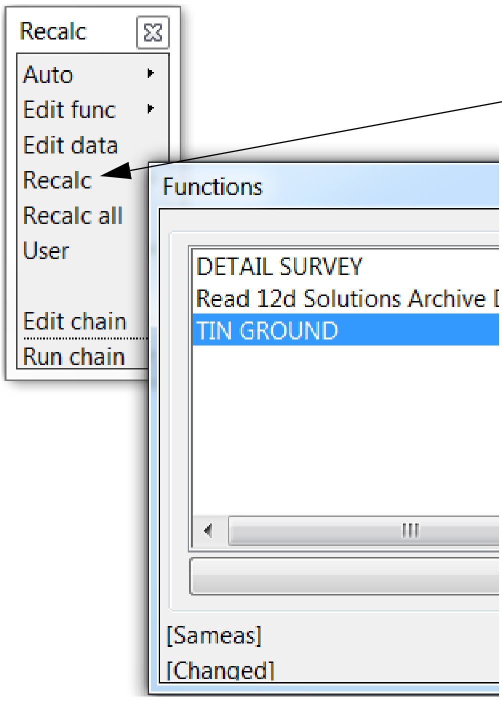
Select the **Plan View Properties** icon

Select **Tin settings**. All features for the contours can be changed



To update the triangulation select ***Tins=>Edit=>Retriangulate=>GROUND***

Or by using the new recalc the function using the recalc panel

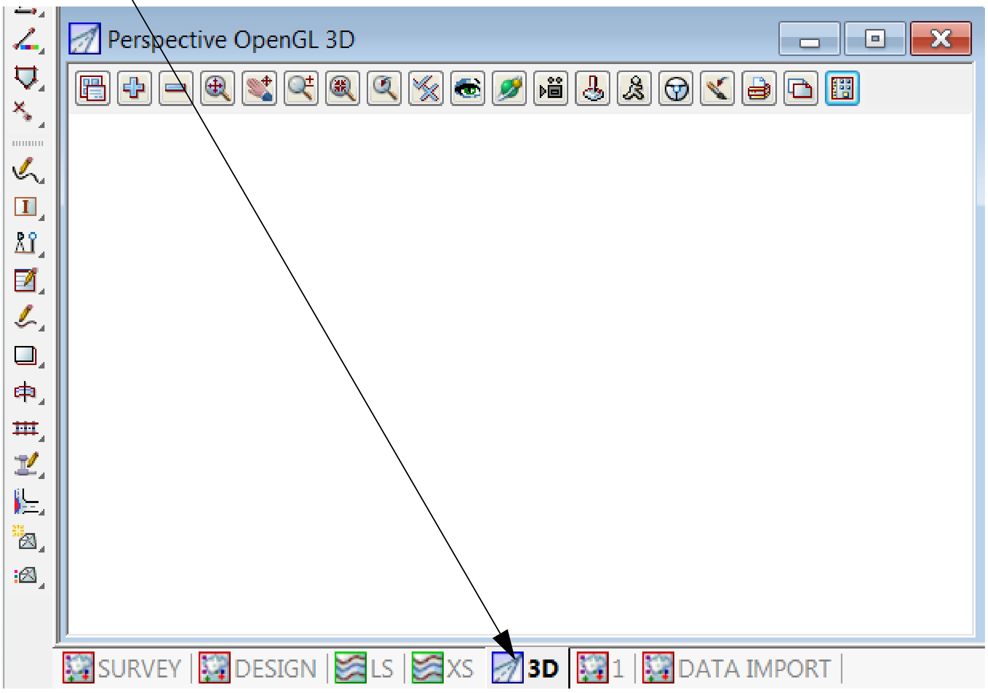


Walk right on **Recalc** then double click on **TIN GROUND**

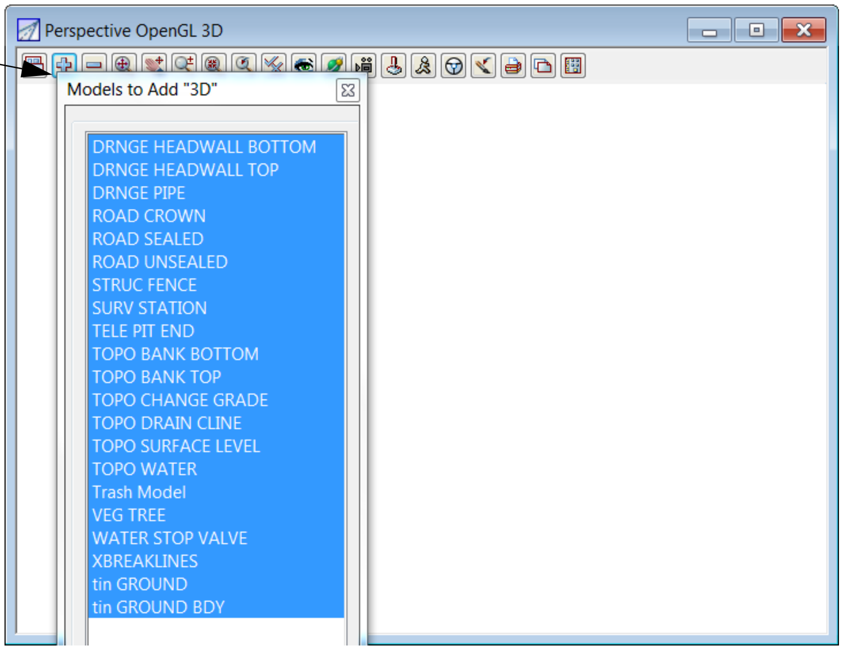
9.9.7Perspective Views

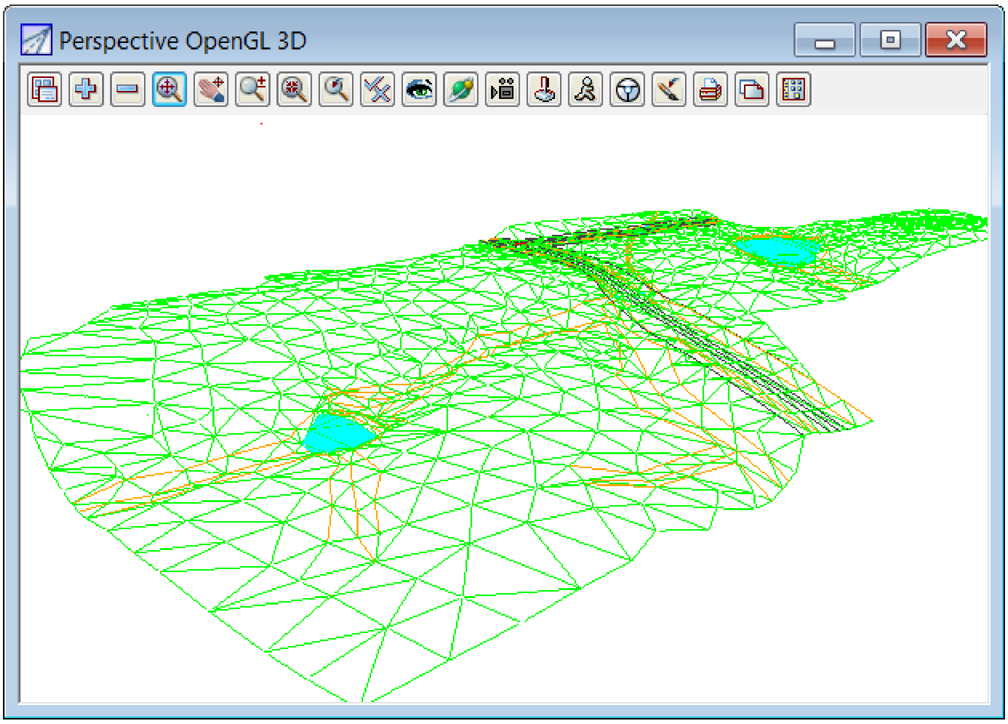
To help analyse the triangulation a perspective view can be used. The surface can be shaded and viewed from any angle

Select View **3d**



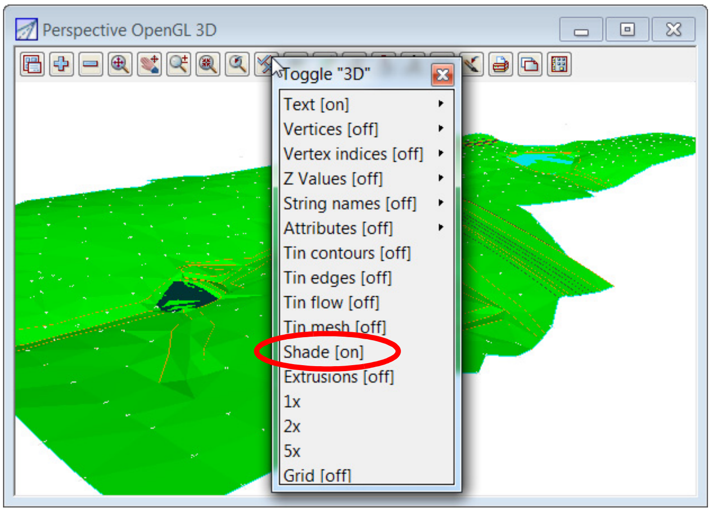
Turn on all the models to be viewed



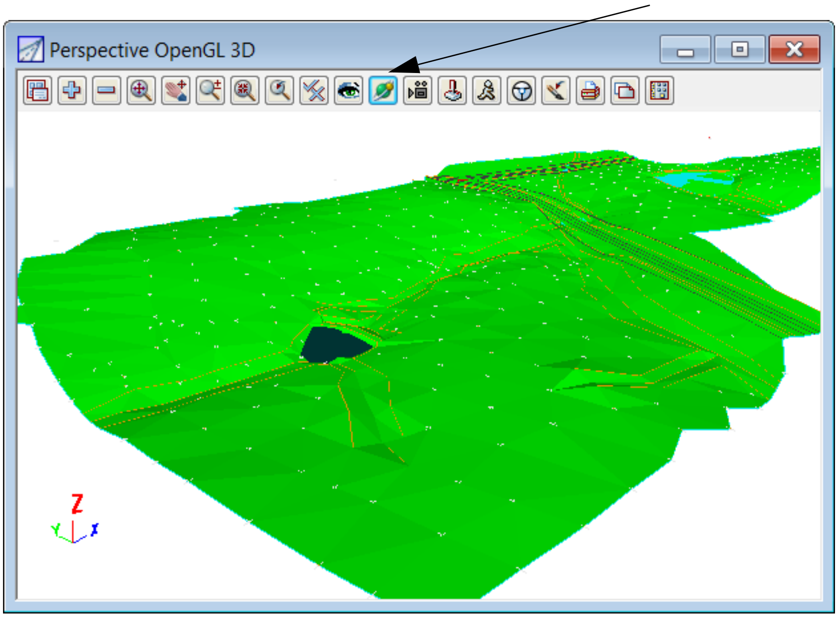


Shade the triangulation

Select ***Toggle=>Shade***



To move around the view select the ***Orbit*** icon



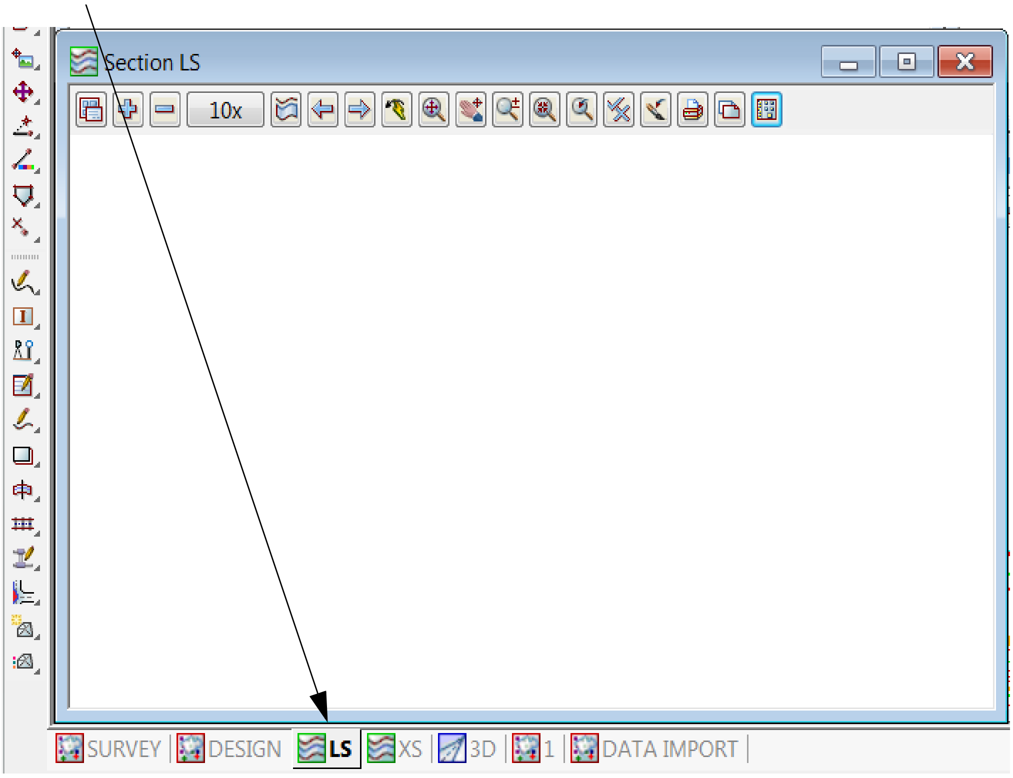
Hold the left button down while moving the mouse to move around the view

Close the perspective view

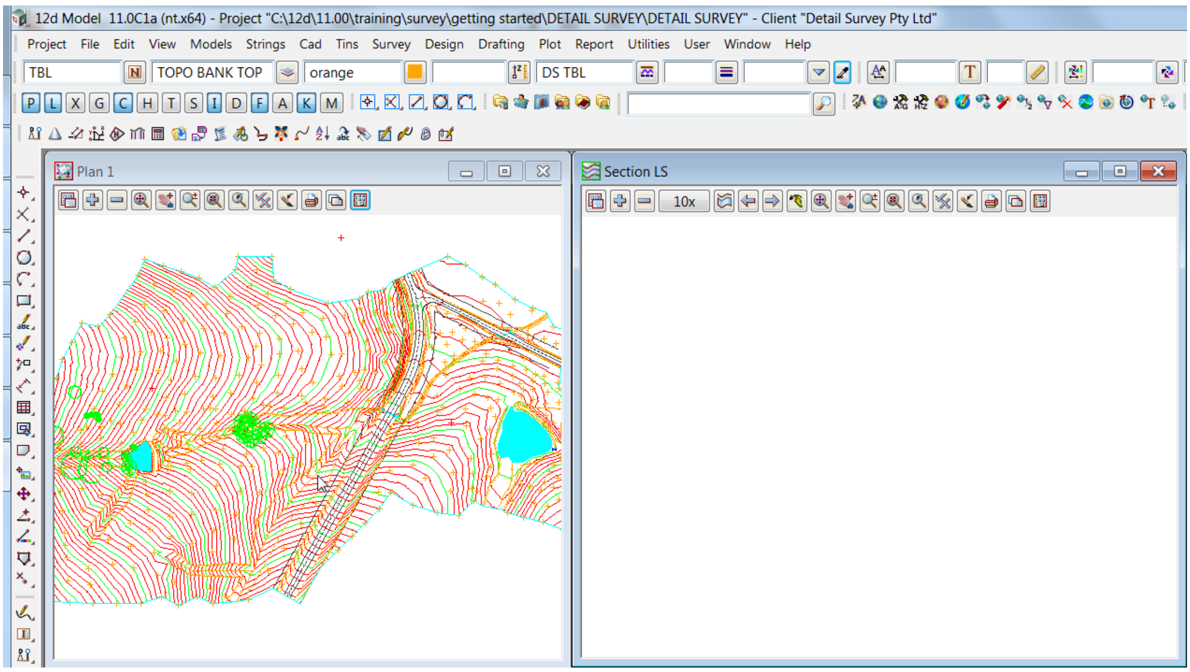
9.9.8Section views

A section view will be used to view profiles along existing strings or to create dynamic sections through the survey

Select Section view **LS**



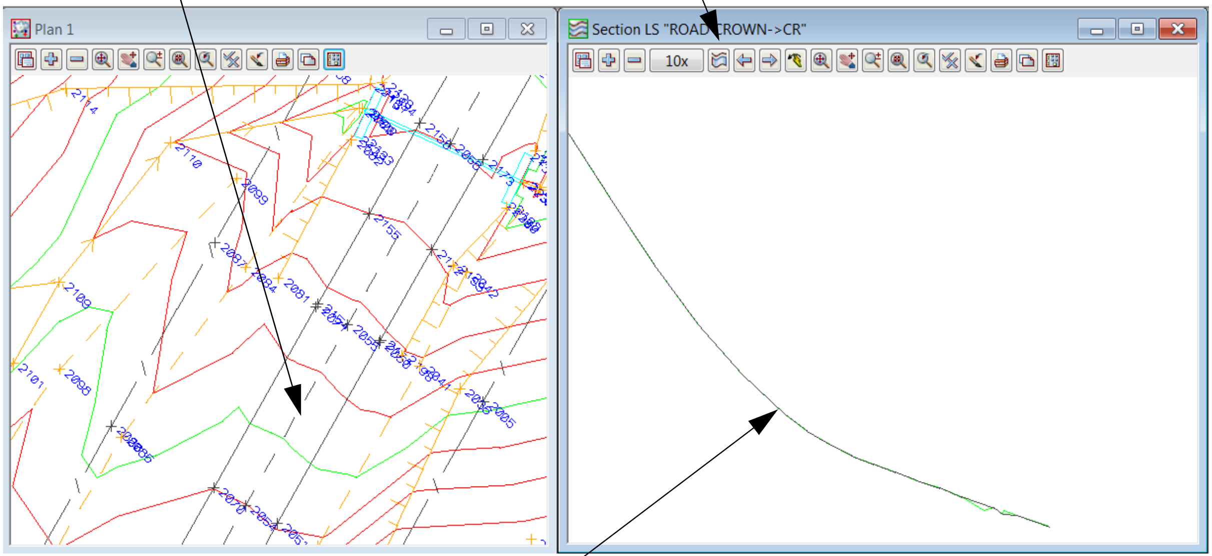
Place the section view beside the plan view 1 as shown below



In the section view turn on model **tin GROUND**

Select ***Profile*** icon

Select and accept the crown of the road string



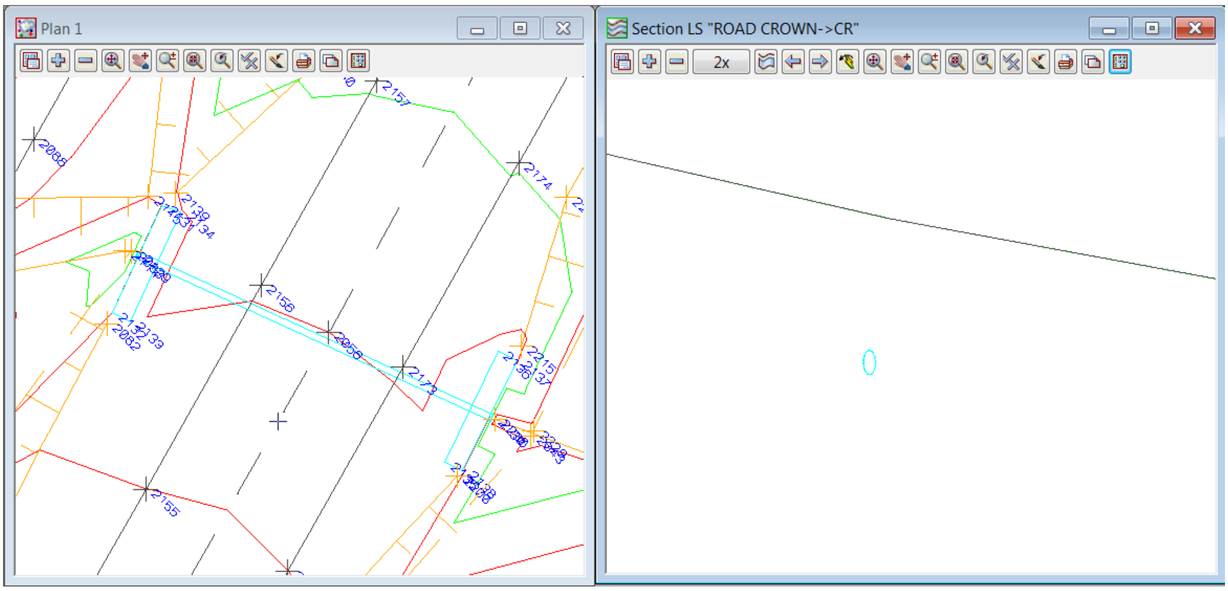
The profile of the string is displayed

Now turn on the model **DRNGE PIPE** in the section view

Zoom in to point 2056 where the drainage pipe crosses the road

Select the **Vertical exaggeration** icon and set the vertical exaggeration to **2**

Zoom into the part of the section view to see the pipe under the ground



Close the section view

9.10 Plotting

9.10.1Create New Plan View

We will firstly create a new plan view on which the data will be set up for plotting.

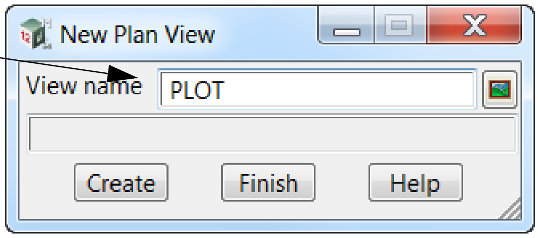
Select option ***View=>Create=>Plan View***

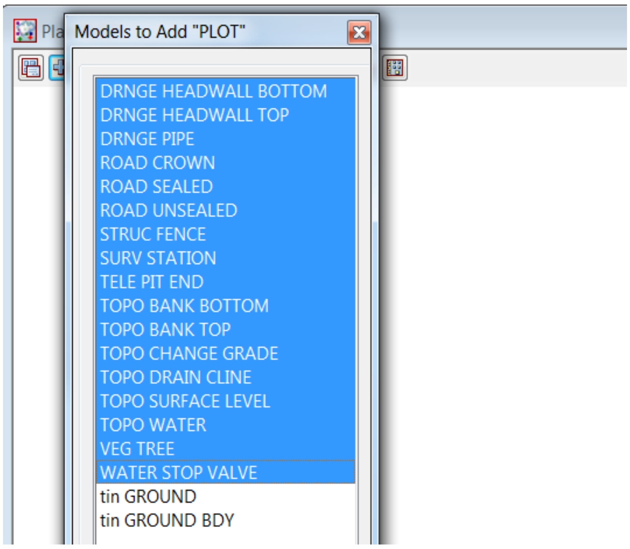
Type in the name **Plot**

Select **Create**

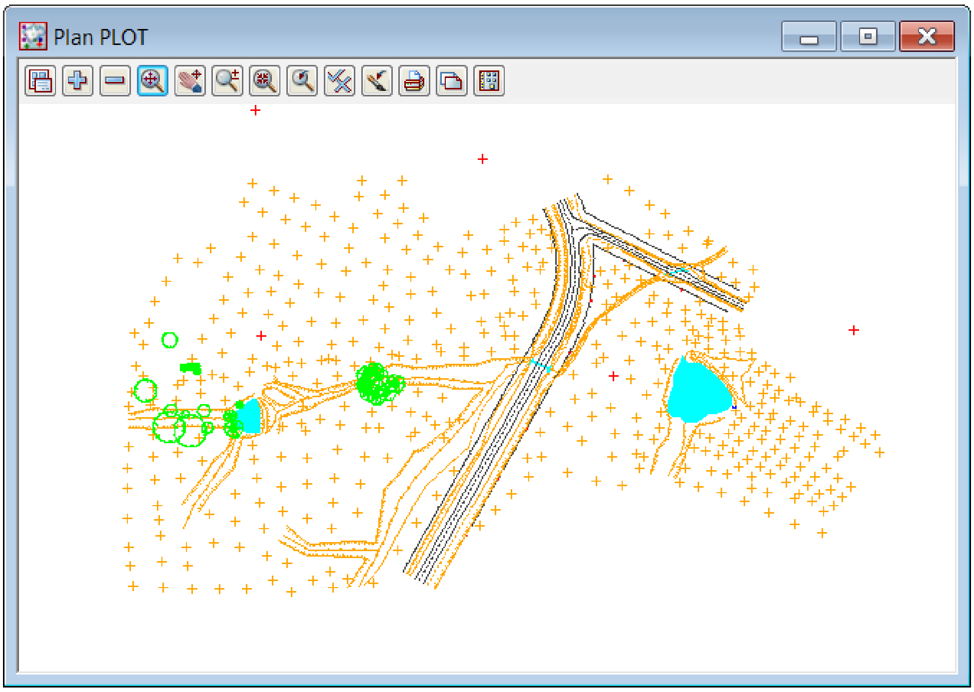
Maximise the view

Turn on all models to be plotted. We will not turn on the tin models as we will be creating separate contours to plot





Zoom to the extents of the survey data



9.10.2Feature labelling

The points in the survey can be labelled according to their names (codes). Labelling can be text such as **heights, codes and point numbers**

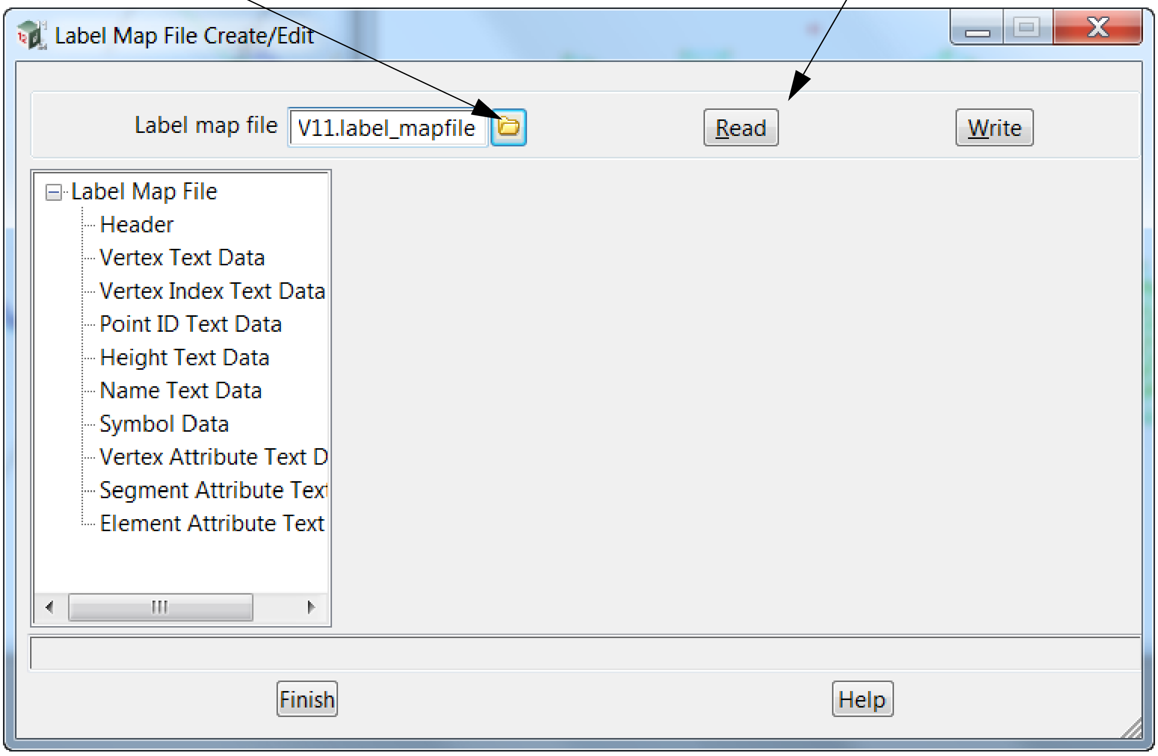
Firstly we will look at the label map file

Select option ***File =>Label Map Files =>Create/Edit***

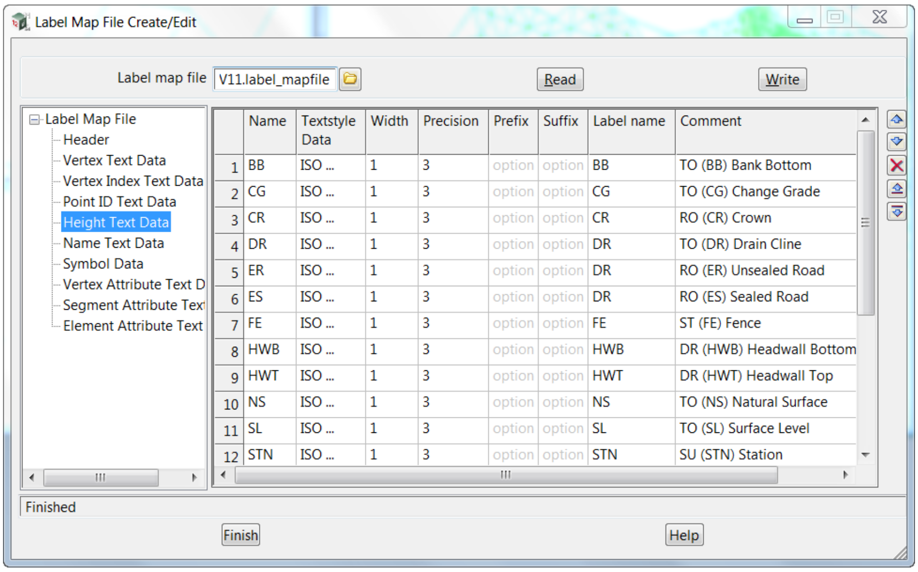
Select the Label map file folder icon

Select the file **DETAIL SURVEY v10.label_mapfile** from the **Getting Started** folder

Select **Read**



Select the **Height Text Data** branch

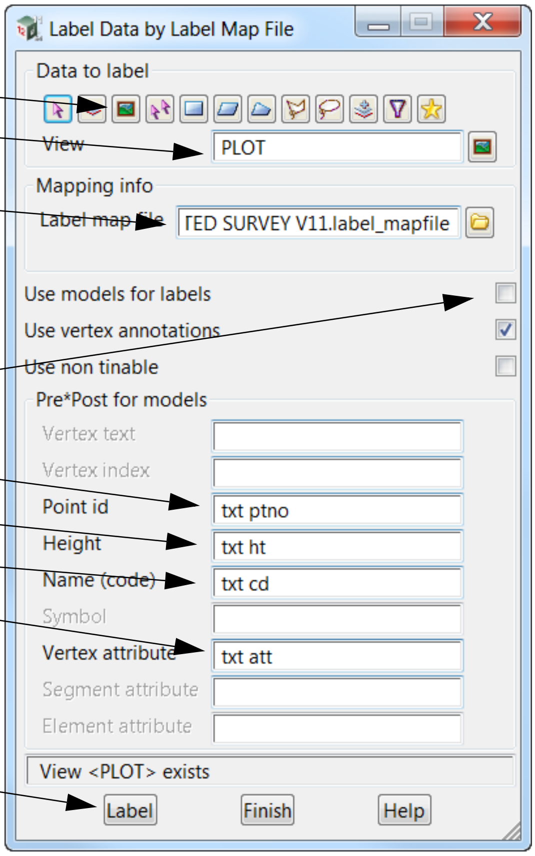


For each code the feature can have user defined text parameters including **text style data, width, precision (number of decimal places) and prefix or suffix text.**

The other lines can be filled in in a similar manner

Select **Finish** to exit the editor

To label the data select ***File =>Label Map Files =>Apply***



Select the **View** icon

Select the View **Plot**

Select the Label map file

DETAIL SURVEY v11.label_mapfile from the **Getting Started** folder

If the **Use models for labels** check box is clear then the user is prompted for a model prefix so that each label is placed in a separate model

Clear the check box

Type in **txt ptno** as prefix for height models

Type in **txt ht** as prefix for height models

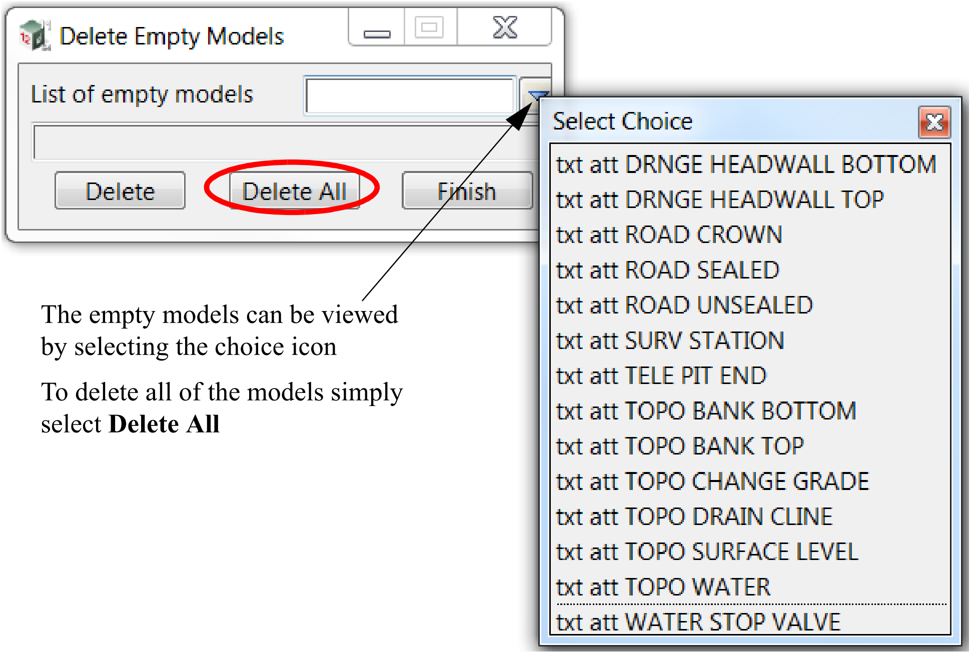
Type in **txt cd** as prefix for code models

Type in **txt att** for both the Vertex attributes

Note that a space was placed after the prefixes above

Select **Label**

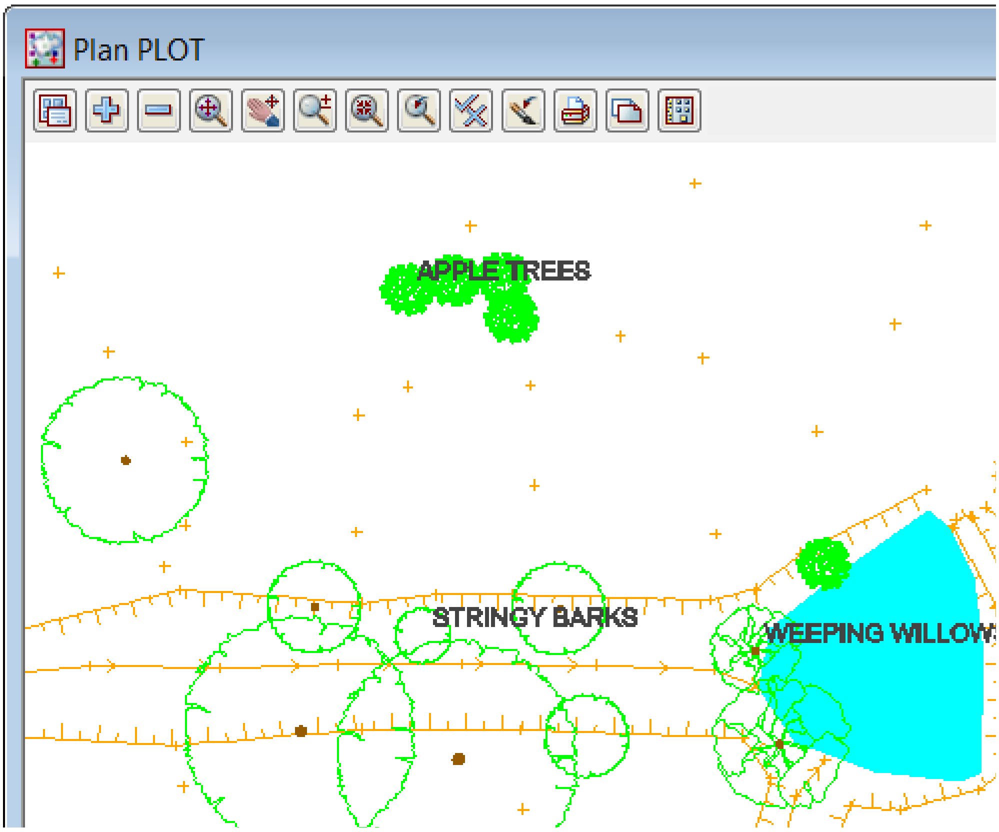
Prior to turning on the label models we need to delete any empty models (models with no data) created with this option. This is done by selecting option ***Models=>Delete=>Delete Empty Models***



The empty models can be viewed by selecting the choice icon

To delete all of the models simply select **Delete All**

Turn on the models **txt att DRNGE PIPE** and **txt att VEG TREE**

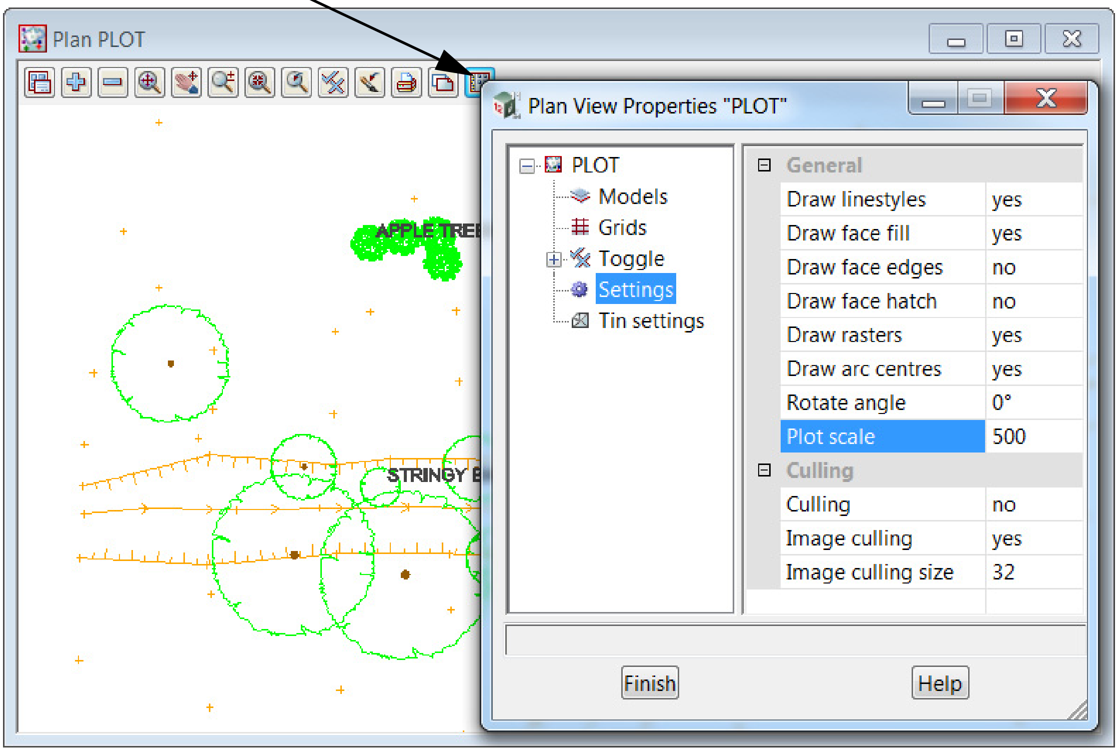


9.10.3Setting the correct plot scale for the view

The plot is to be done at a scale of 1:500 so to view the paper unit text in the correct scale we need to set the view plot scale

Select the **Plan View Properties** icon

Select **Settings**. Type in the new plot scale **500**

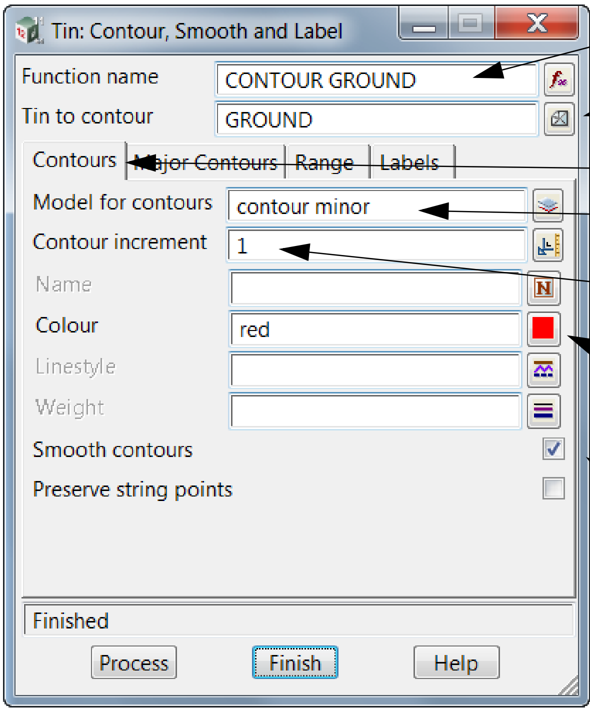


9.10.4Creating Contours

The contour lines displayed in plan view 1 are "fast contours".

The fast contours are not editable features and don't have labels

To create contours select ***Tins=>Contour=>Contour, Smooth and Label***



Type in function name **CONTOUR GROUND**

Select **Tin to contour** choice icon then select tin **ground**

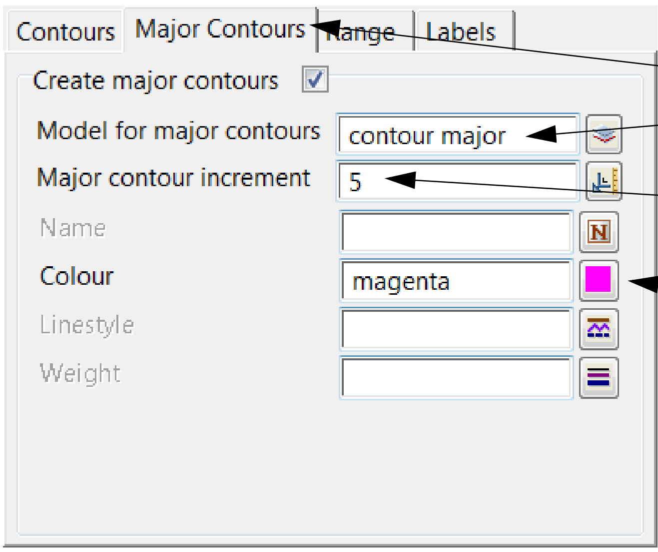
Select the **Contours** tab

Type in **contour minor** for Model name

Type in contour interval **1**

Select colour **red**

Tick the **Smooth contours** box

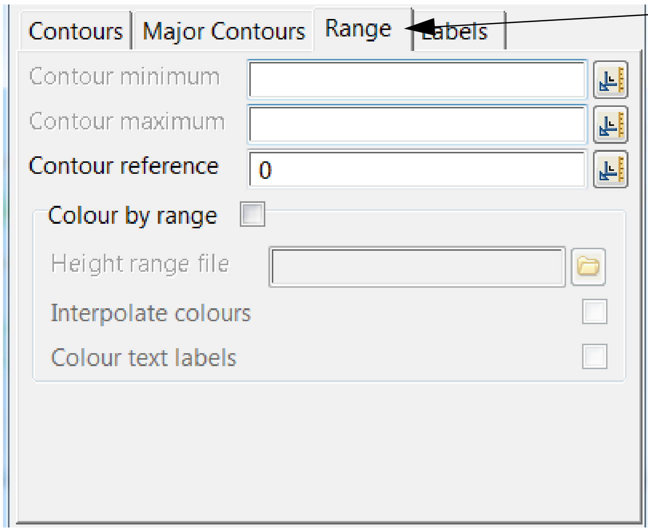


Select the **Major Contours** tab

Type in **contour major** for Model name

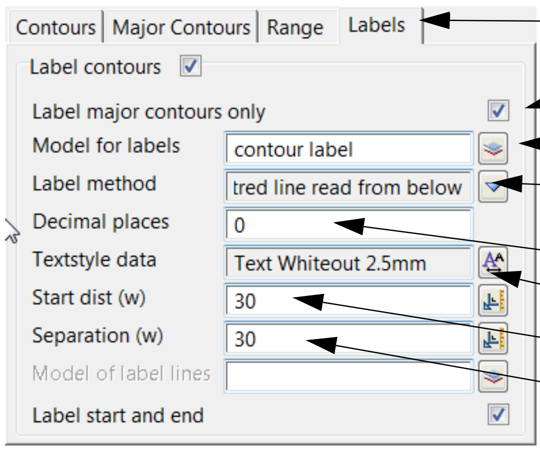
Type in contour interval **5**

Select colour **magenta**



Select the **Range** tab

Leave this panel unaltered



Select the **Labels** tab

Tick check box to **Label major contours only**

Type in label model **contour label**

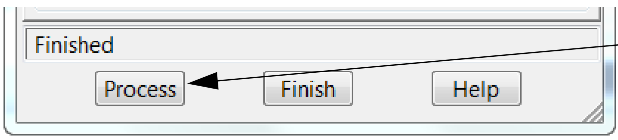
Select label method **Centre line read from below**

Type in **0** for number of decimal places

Select textstyle **Text Whiteout 2.5mm**

Type in start distance of **30**

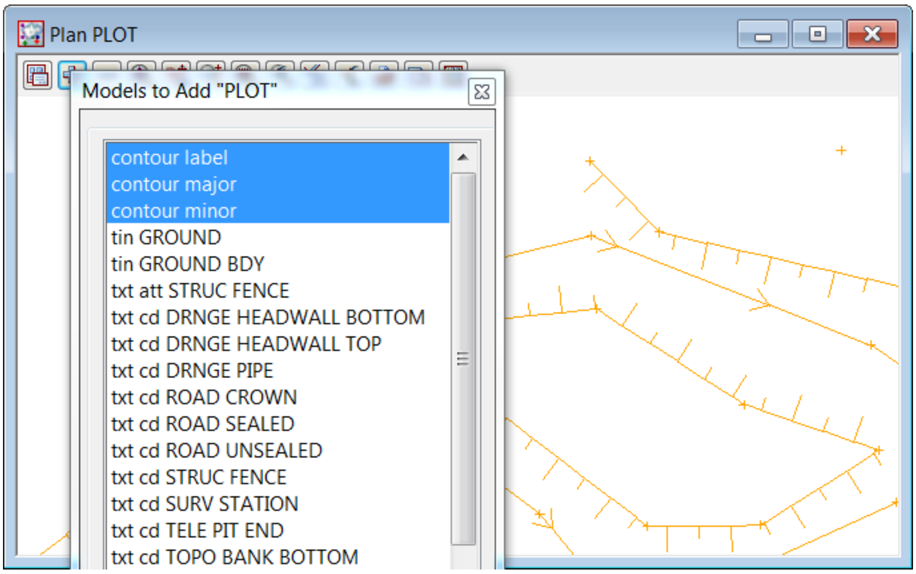
Type in separation of **30**



Select **Process**

Don't press Finish until you have verified the contour labelling

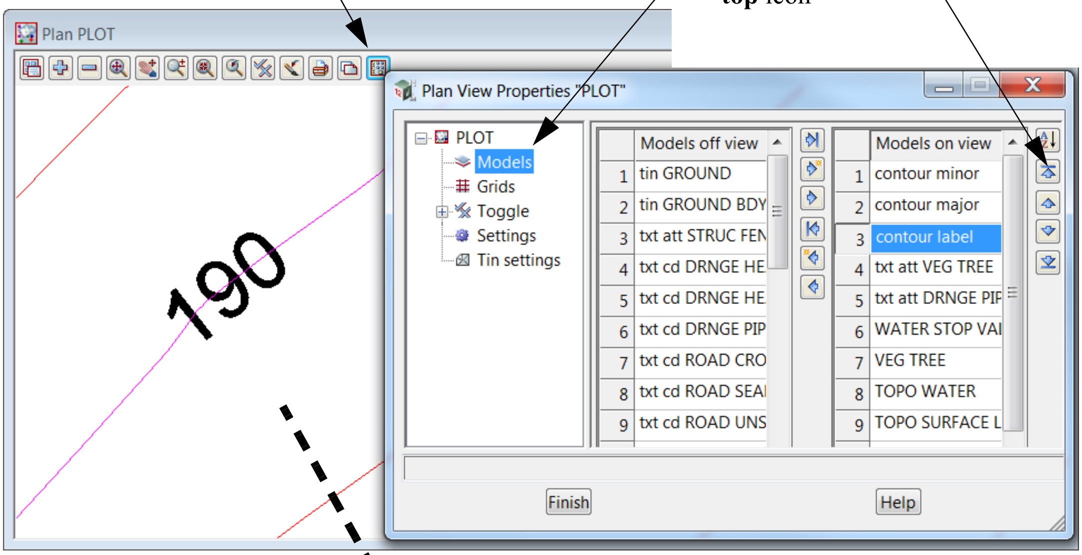
Turn on the newly created models **contour label, contour minor and contour major**

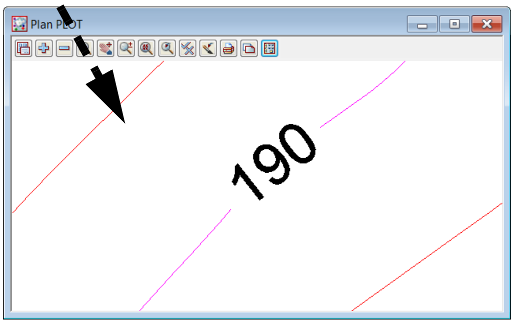


The major contour appear to be crossing the labels. This is because the model contour label was turned on prior to the other contour labels. This can be rectified by moving the contour label model to the top of the model list

Select the **Plan View Properties** icon

Select **Models**. Highlight model **contour label** and select **Move to top** icon





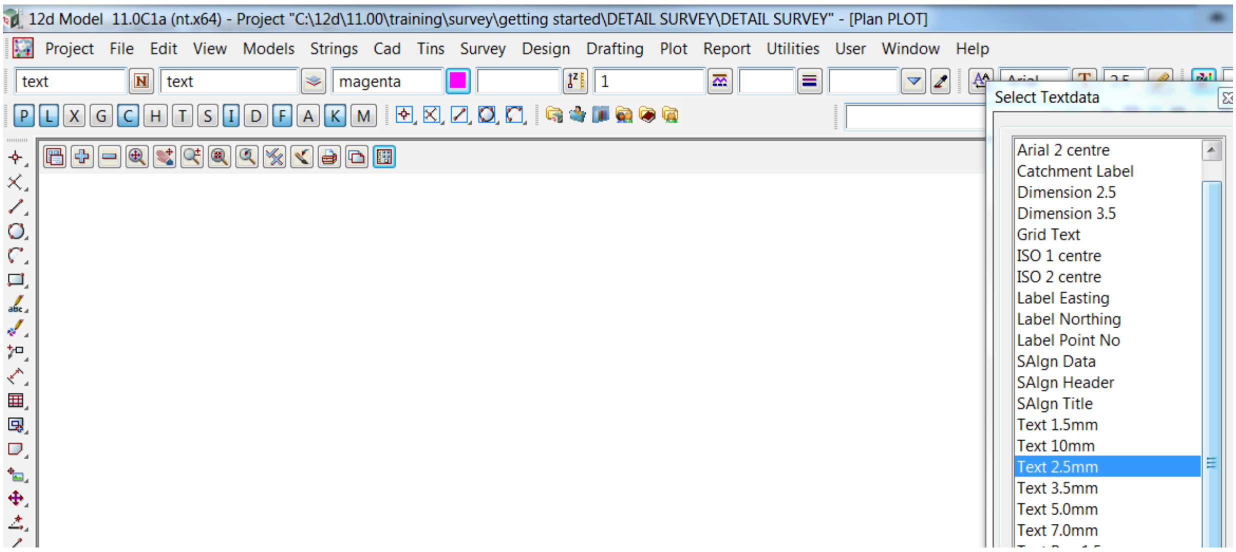
9.10.5 Text Editing

In this section we will add new text and edit existing text

9.10.5.1Adding text

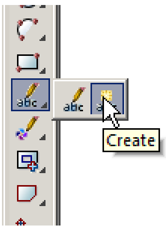
Text can be added to the view to describe features.

Firstly we need to set the default text properties including the model, colour and font.



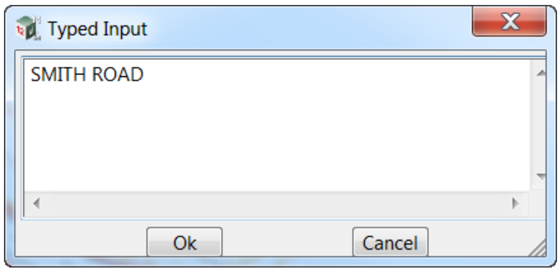
Type in name and model name **text**, select colour **magenta** and select Text Data favourite **Text 2.5mm**

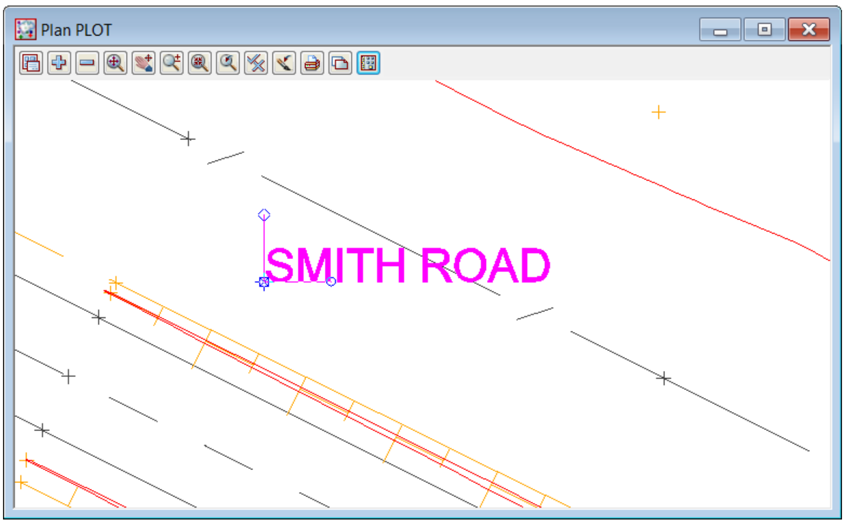
From the **Cad Text** toolbar select **Create** icon



Select and accept the insertion point of the text

Type in **SMITH ROAD** into the Text box





The text appears on the screen with three nodes at the start of the text. These are used to move, rotate and scale the text

Press **[Escape]** to finish the text placement

9.10.5.2Editing text

We will now look at editing the text using the nodes

Select the **Edit** icon

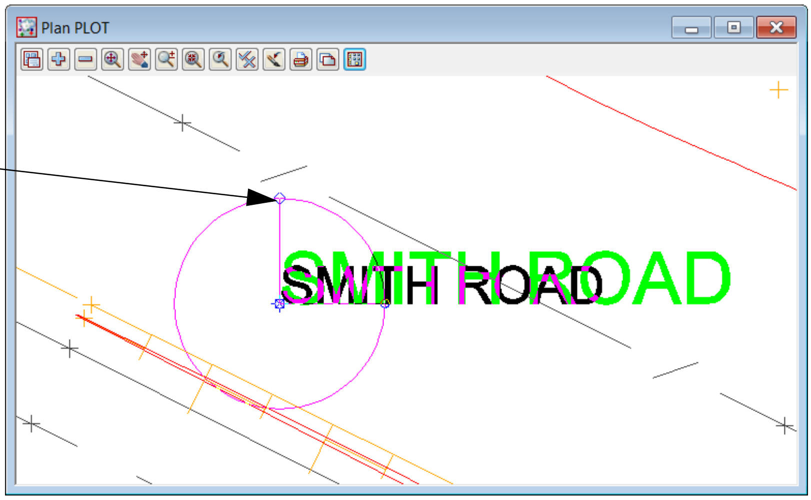
Select the piece of text to edit at the insertion point at the bottom left.

Scaling text

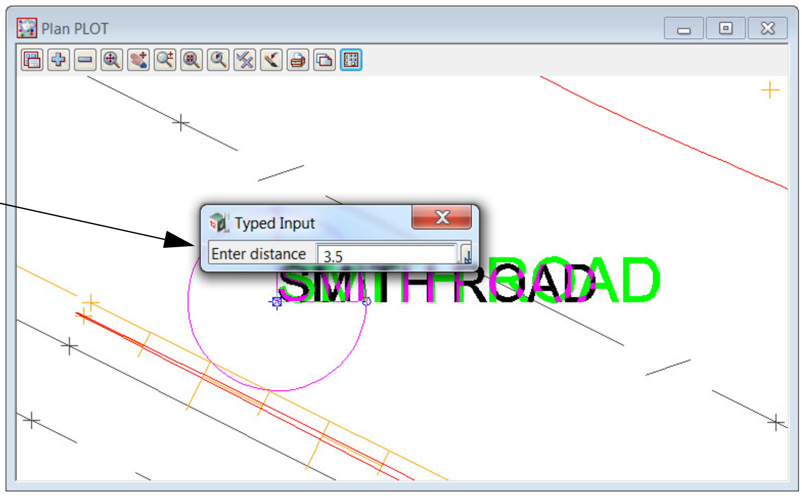
.

Pick the top left node

As you move the cursor the text is resized. Accept with middle button



Alternatively to type in a text size simply type in the value and press [Enter]

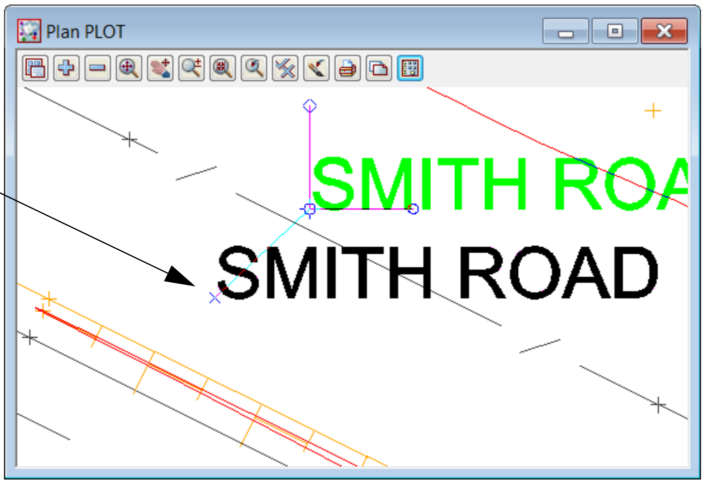


Moving text

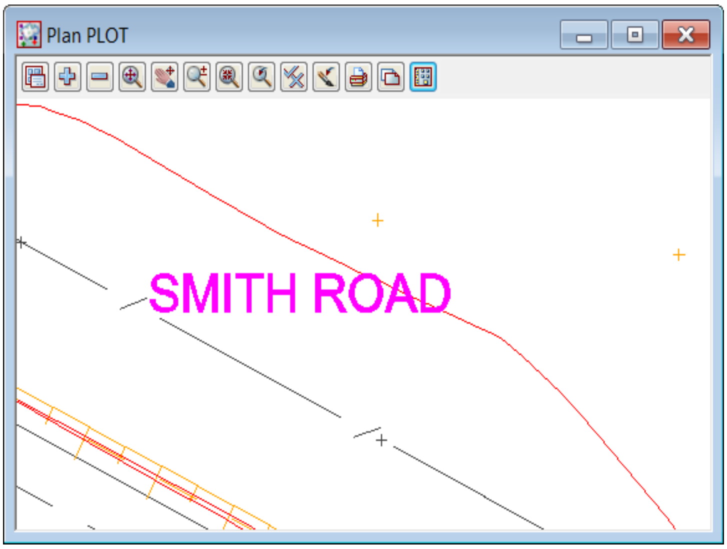
.

Pick the bottom left node.

As you move the cursor the text moves.



Pick and accept the new position

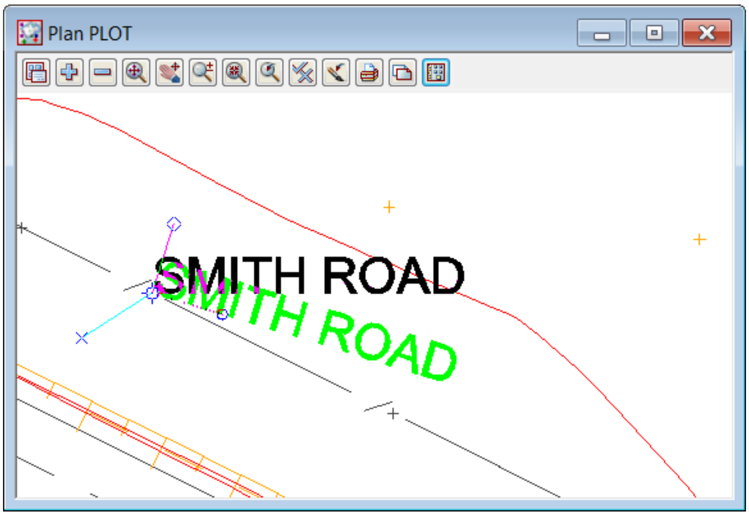


Rotating text

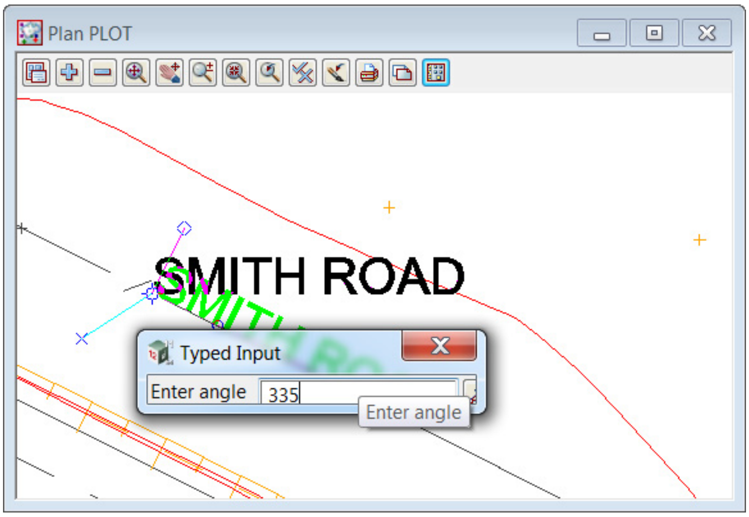
.

Pick the bottom right node

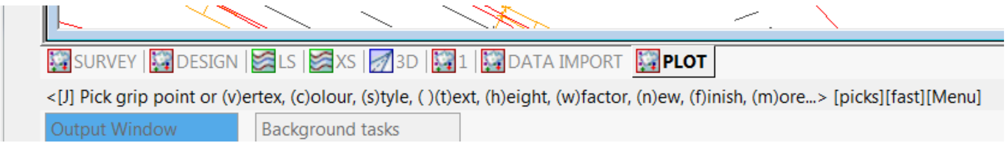
As you move the cursor the text rotates.



To rotate to a set angle simply type in the value and press [Enter]

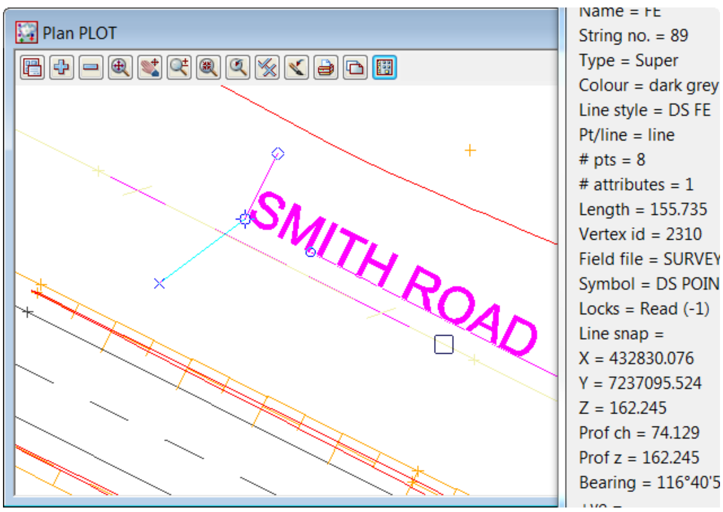


Additional keystrokes displayed at the bottom of the screen can be used to rotate tangential or perpendicular to a selected string



In the example here the key **T** was pressed and the fence string was picked to align the text to the fence line

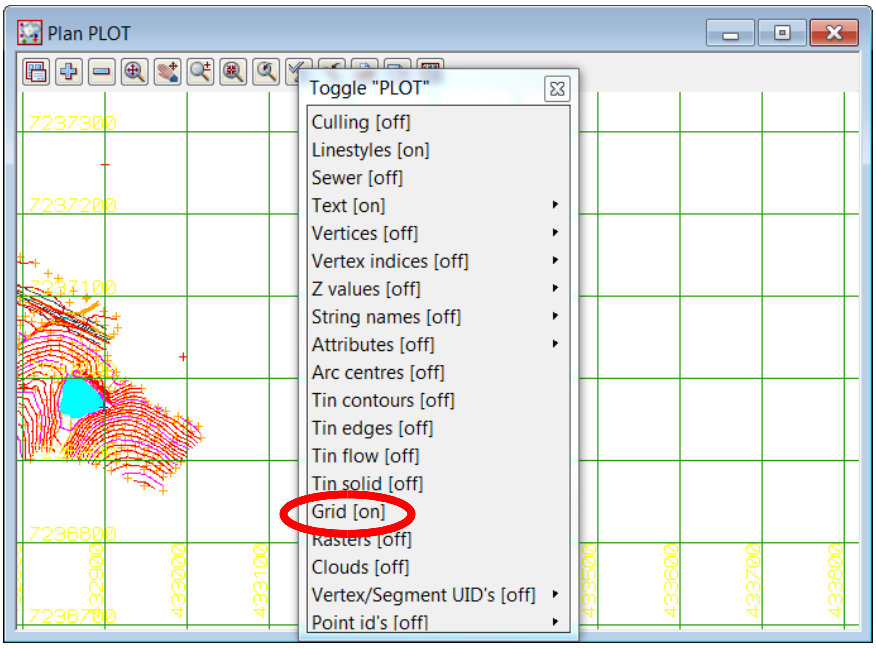
Accept with middle button to confirm rotation.



9.10.6Grid display

A grid can be displayed and plotted with user defined attributes such as grid type, spacing, text placement and prefix / postfix additions to values

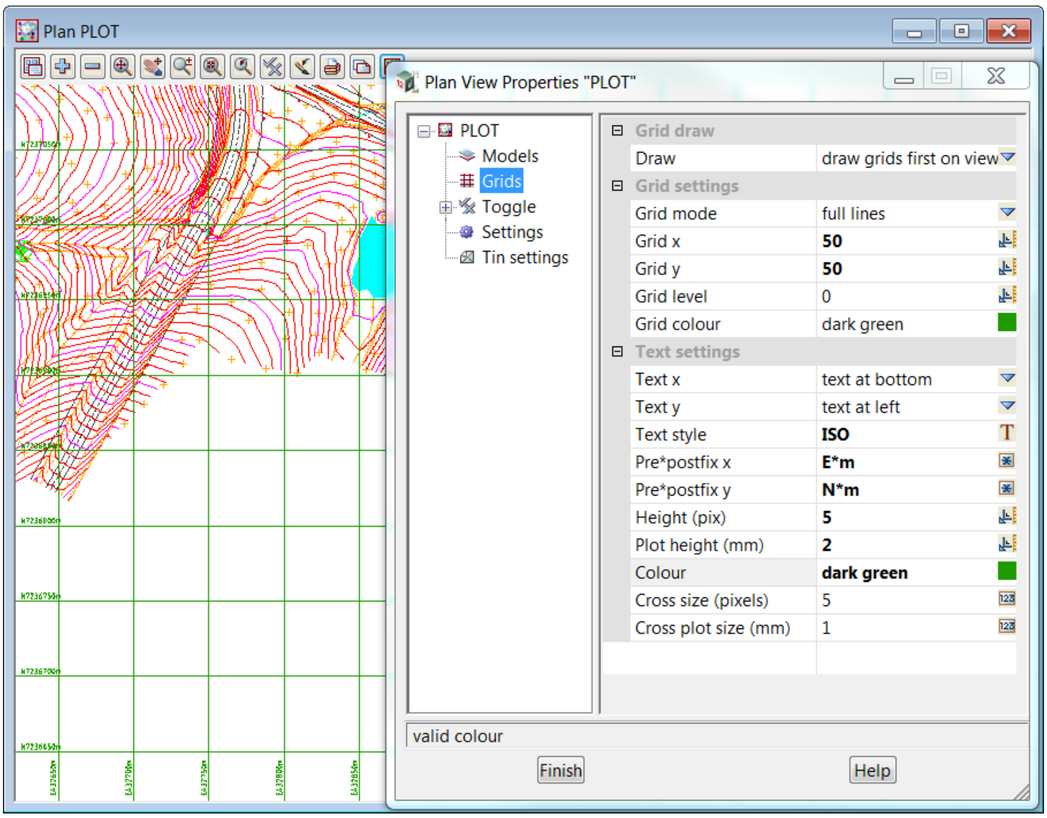
Firstly toggle on the grid



To configure the grid settings

Select the **Plan View Properties** icon

Select **Grids**. Type in the new grid settings as shown below

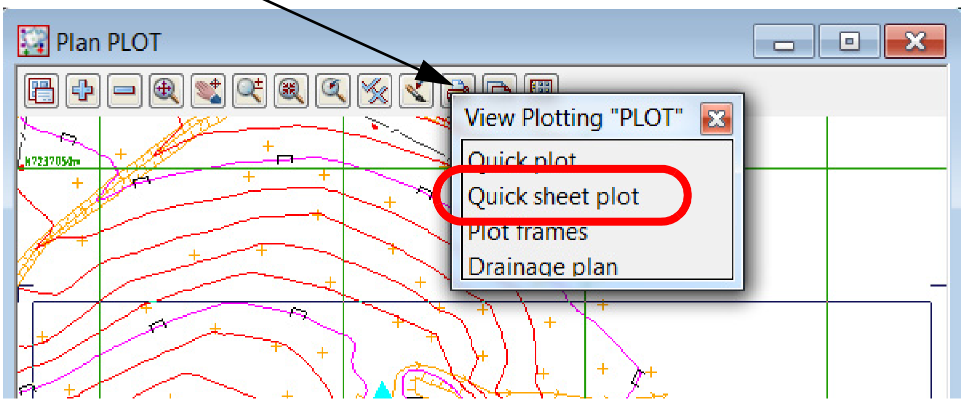


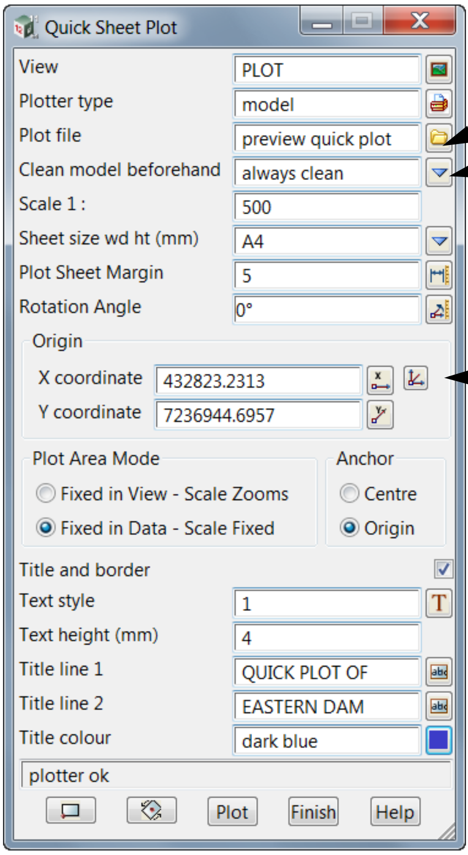
9.10.7Quick sheet plot

A section of the survey can be easily plotted without the need to set up a plot frame.

Zoom in to the eastern dam

Select **Print** icon then select **Quick sheet plot**





Fill in the panel as shown. Make sure that the plotter type is **model** so that we can preview the plot.

Type in **preview quick plot** for the model name

Select **always clean** as clean model mode

Select the **Origin** icon and select a point in the graphics for the lower left corner of the plot sheet

There are two types of plotting methods. The first is ***Fixed in View***

Using this option the view can be zoomed in or out and the plot frame size stays linked to the view edge

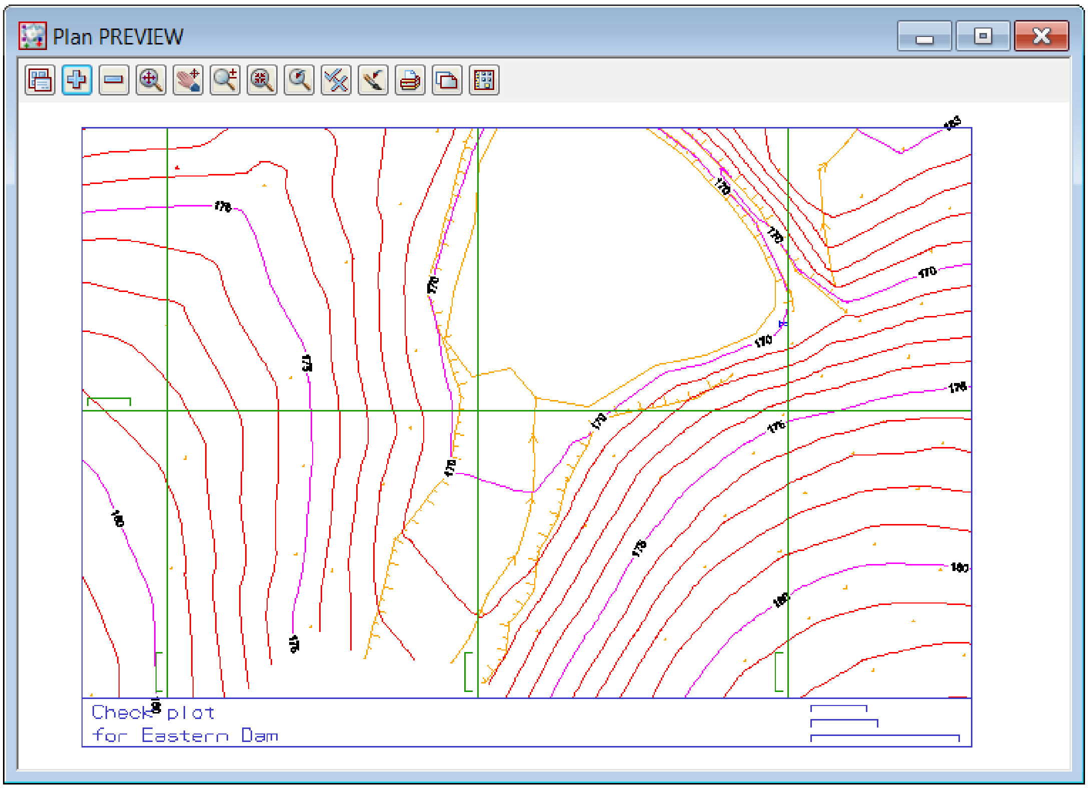
Fixed in Data uses the parameters in the panel such as Scale and origin coordinates

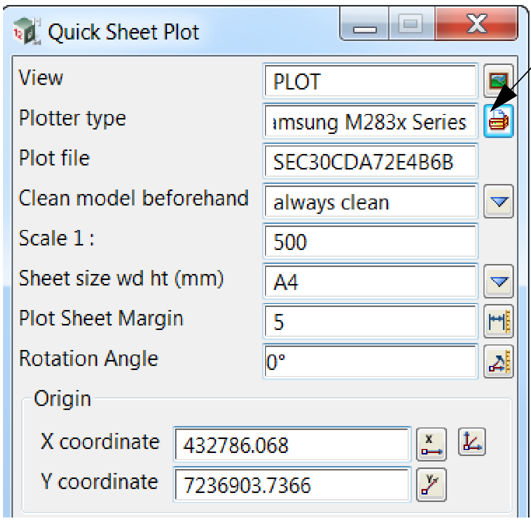
We are using ***Fixed in Data*** for the following plot

Fill in the rest of the panel as shown

Click on **Plot**

Create a new view called **PREVIEW** and turn on the model of the plot





Once the plot model has been checked the plotter type can be changed for output to a printer

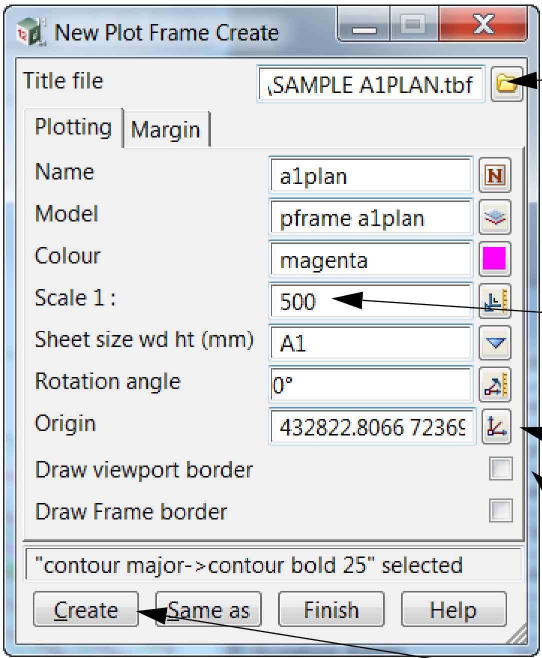
Once the printer has been configured select Plot to send the plot to the printer

9.10.8 Plotting Using Plot Frame

9.10.8.1Create Plot Frame

User defined plot frames can be placed over the survey. These frames show both the sheet size and plot area borders.

Select option ***Plot=>Plot frames=>Create***.



Select title file **SAMPLE A1PLAN.tbf** from the **Getting Started** folder

The panel is filled with data read from the title block file

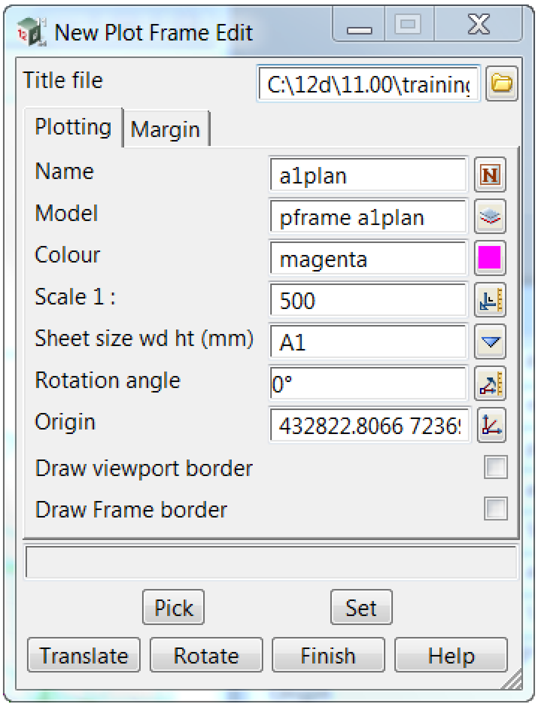
Type in the proposed plot scale

Select the **Origin** selection icon then select and accept a point at the lower left of the survey

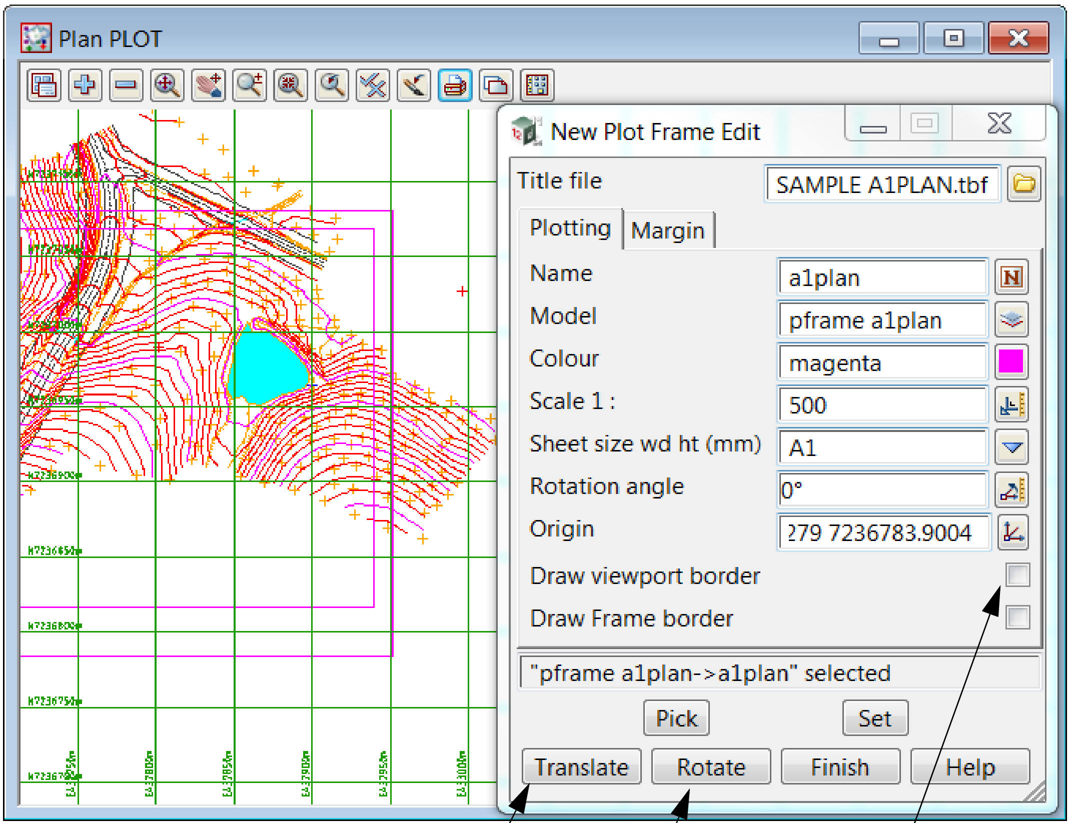
Untick the **Draw viewport border** check box

Select **Create**

The panel is converted to an **Edit** panel



Turn on the model **pframe a1plan**



To move the plot frame over the survey select **Translate** and move the plot frame manually to the required position. Select and accept that position

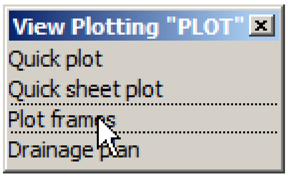
To rotate the plot frame type in a rotation angle or select **Rotate** and use the cursor to change the rotation. Select and accept the position.

Untick the **Draw viewport border** check box then select **Set** then **Finish**

9.10.8.2Create Plot Using Plot frame PPF Editor

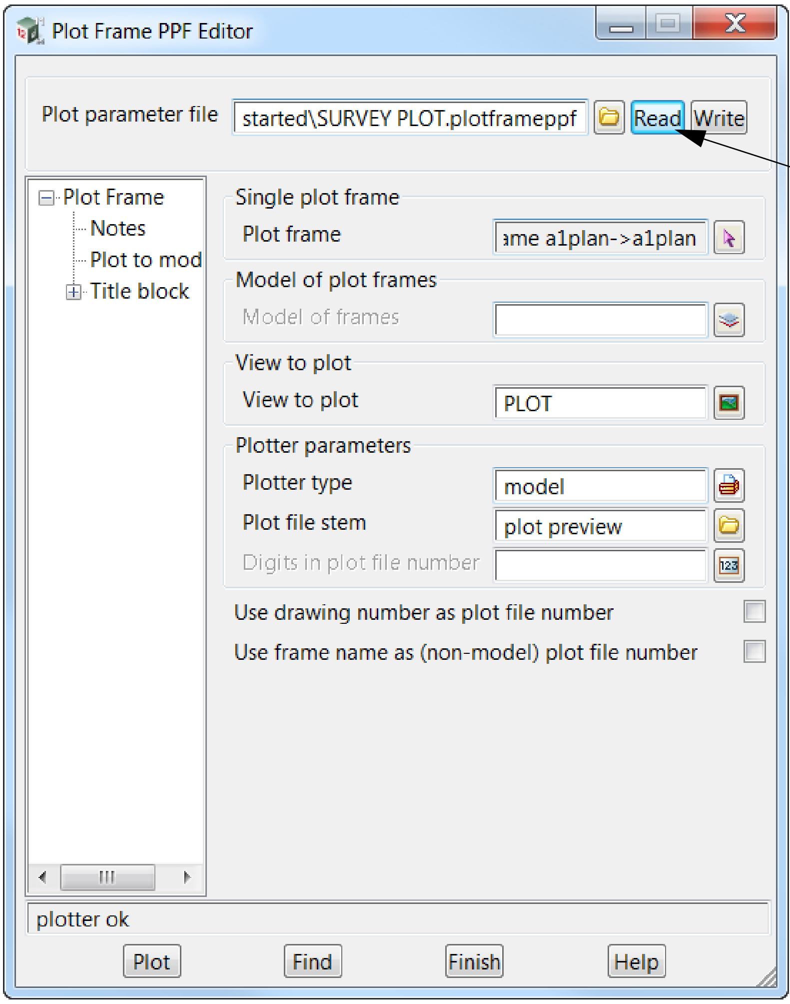
Select option ***Plot=>Plot frames=>Plot*** or select the plan view plotting icon

Select the option **Plot frames**



This brings up the **Plot frame PPF Editor** panel

Read in the sample plot parameter file from the **Getting Started** folder called **SURVEY PLOT.plotframeppf**



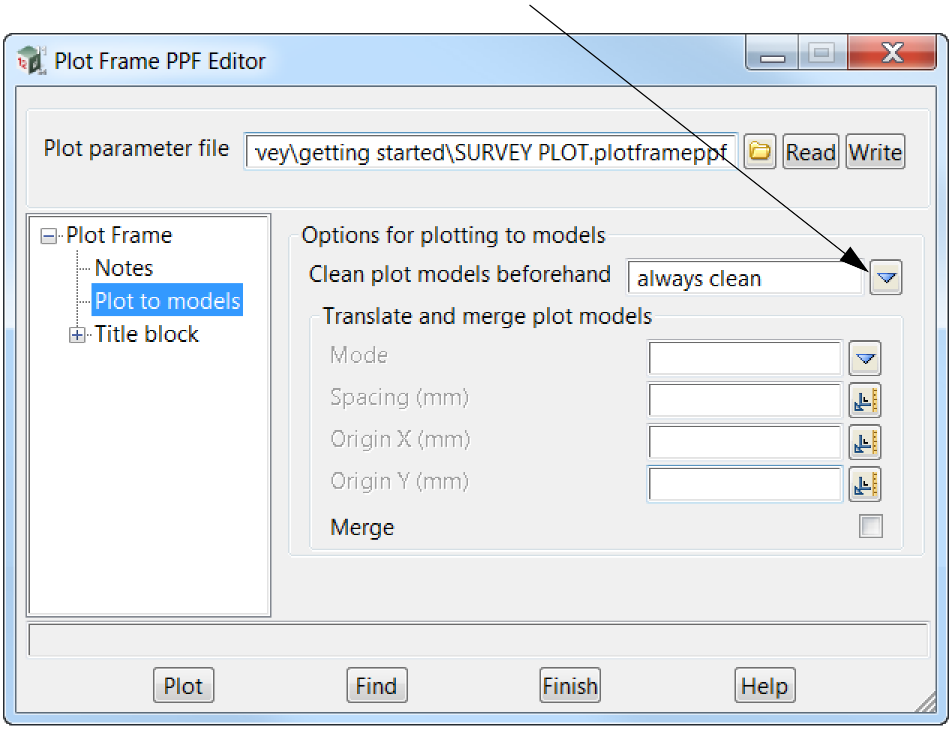
Select **Read**

The Plot Frame screen is filled in from the parameter file

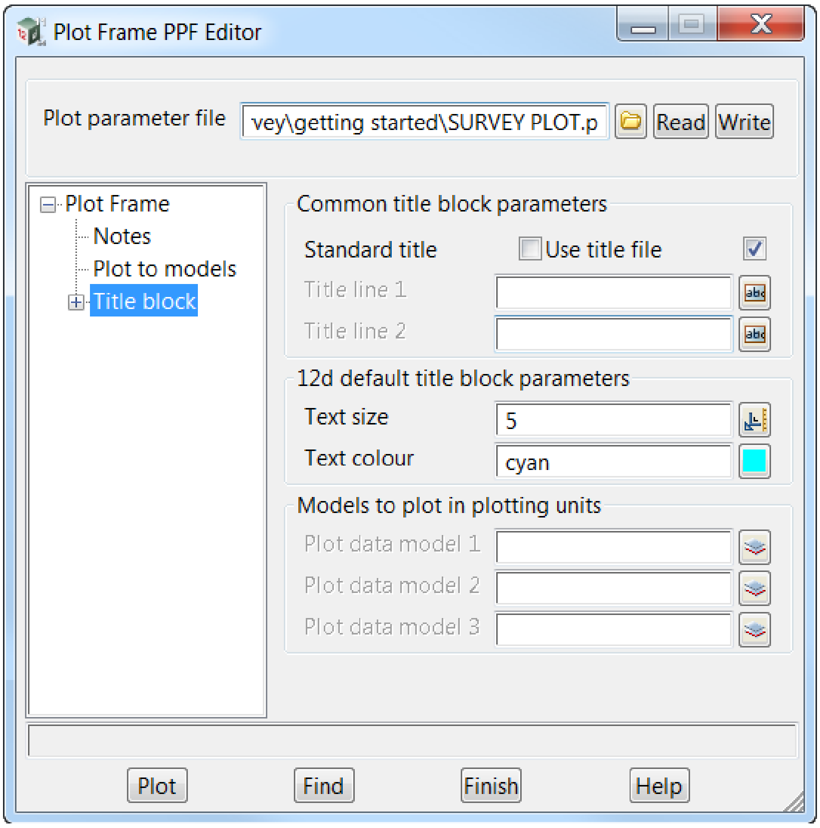
The plot will be sent to a model called **plot preview**

Select **Plot to models**

Ensure the **Clean plot models beforehand** is set to **always clean**



Select **Title block**



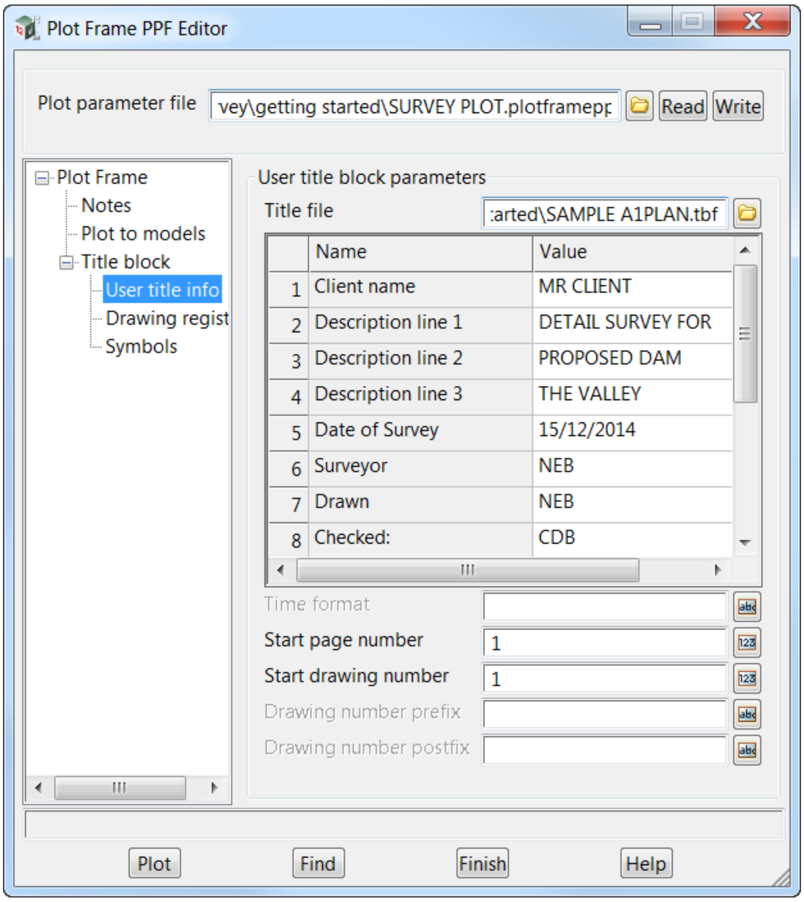
We are using a title file so the **Use title file** check box is ticked

Select the [+] symbol to expand the next option

Select **User title info** to specify title file and title block text

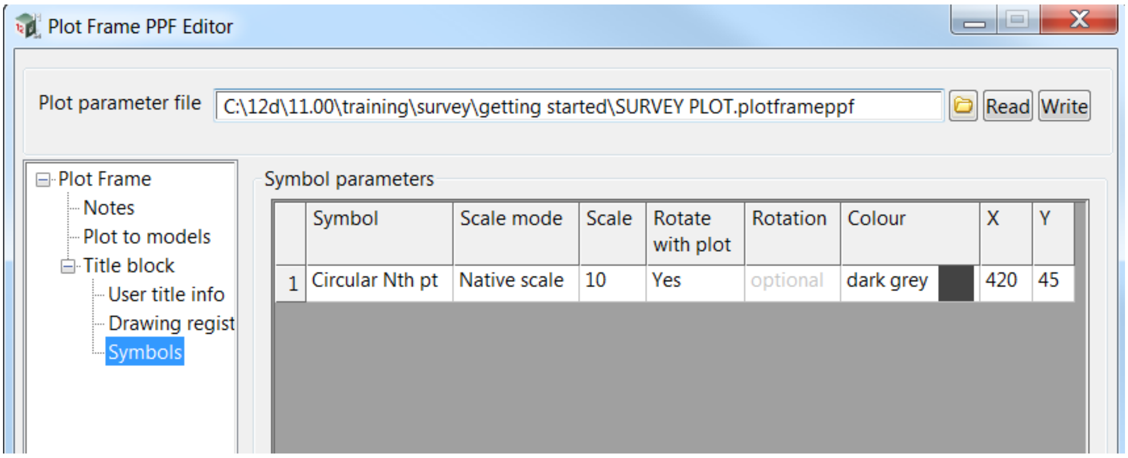
The prompted values for the title file **SAMPLE A1PLAN** data are filled in.

To change any of the data simply type over the top of the existing value

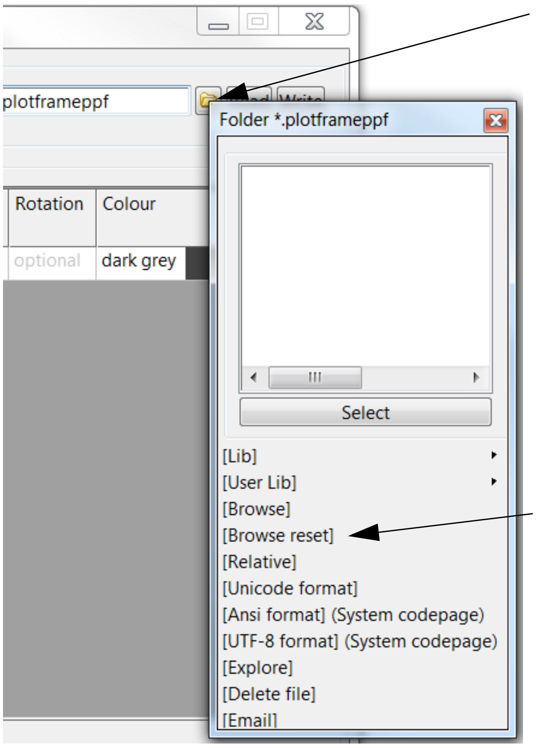


Select **Symbols**

A rotating North point symbol called **Circular Nth pt** has been selected to sit just left of the title file logo. This symbol will automatically rotate with the plot frame



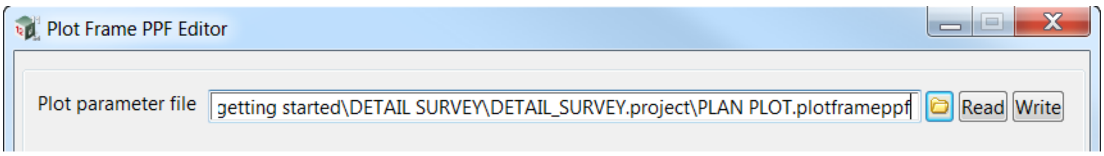
Prior to creating the plot we need to create a new Plot parameter file that sits locally in the project. We don't **<u>ever</u>** update the one we have read in as it may be a template for other users



Select the **Plot parameter file** icon

Select **Browse Reset** to change the folder to the current project folder

Type in a new plot parameter file name **PLAN PLOT** and then select **Write**



Once the parameter file is created select **Plot** to create the plot preview model

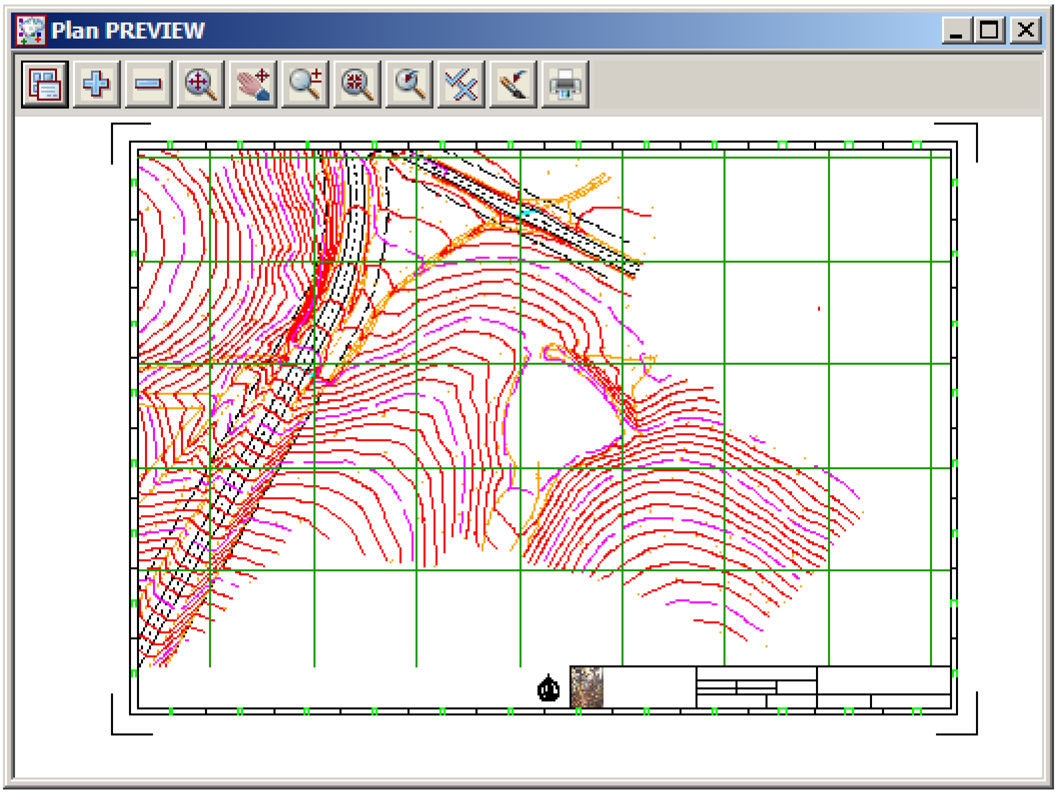
9.10.8.3Display and check the plot

Move the panel to the bottom of the screen

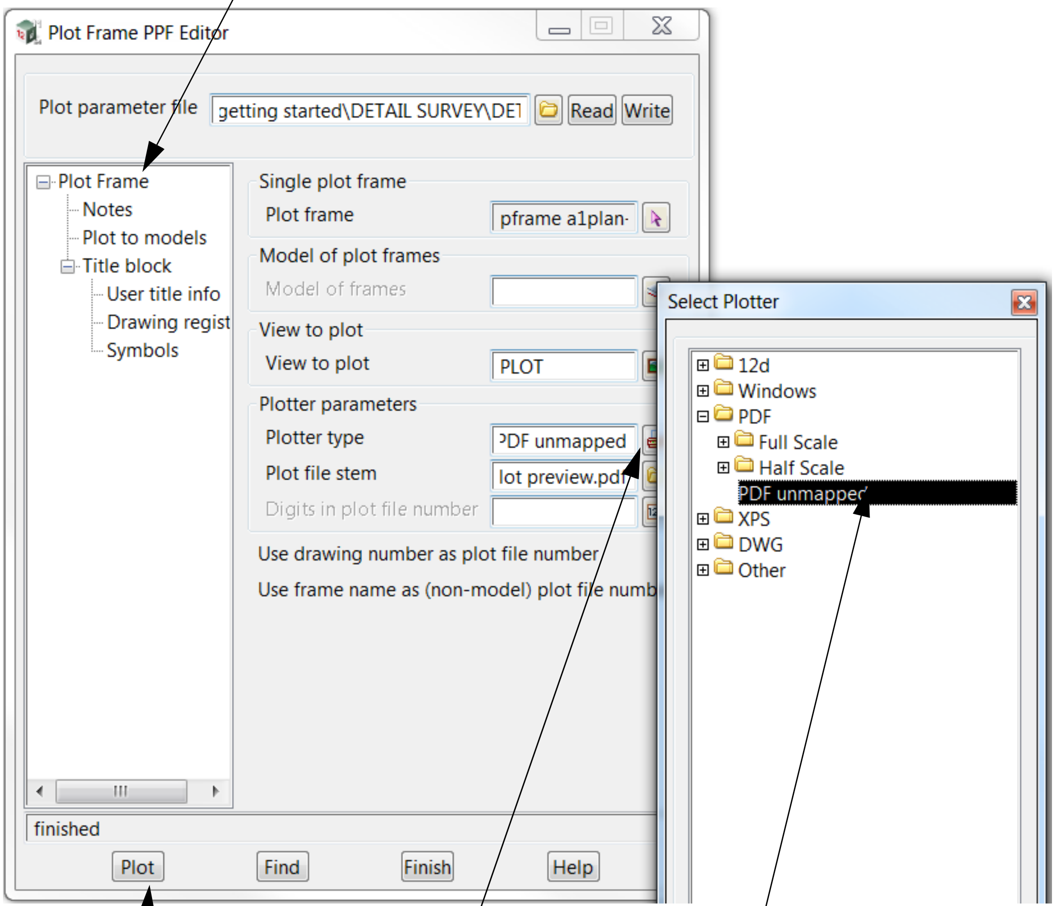
The plot has been created in the model called **plot preview1**

In the view **PREVIEW** turn off all models and then turn on model **plot preview1**

The preview can be checked for errors prior to plotting to the plotter.



Once the preview model has been checked, bring up the **Plot Frame PPF Editor** panel and select **Plot Frame**



Select the **Plotter type** icon

Select the required plot device

Select **Plot** to send the plot to the selected device

10 Volumes

In this chapter we will look at various types of volume calculations including:

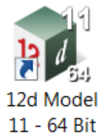
10.1 Stockpile volume

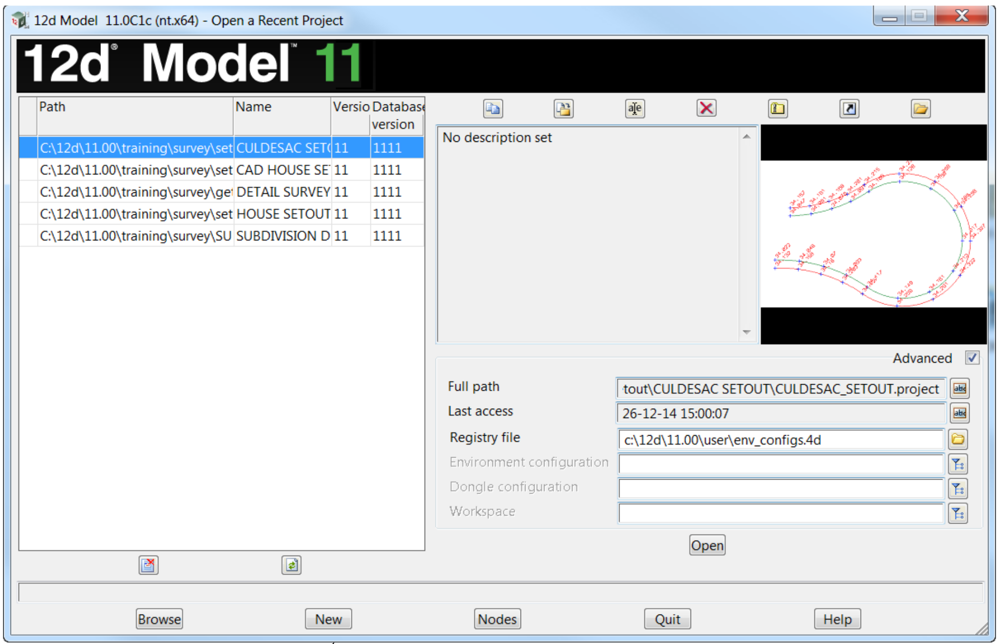
This topic deals with calculating the volume of a stockpile given data for both the existing surface prior to the stockpiles creation and the surface of the stockpile

A volume will be calculated between the triangulations (tin) of the two surfaces

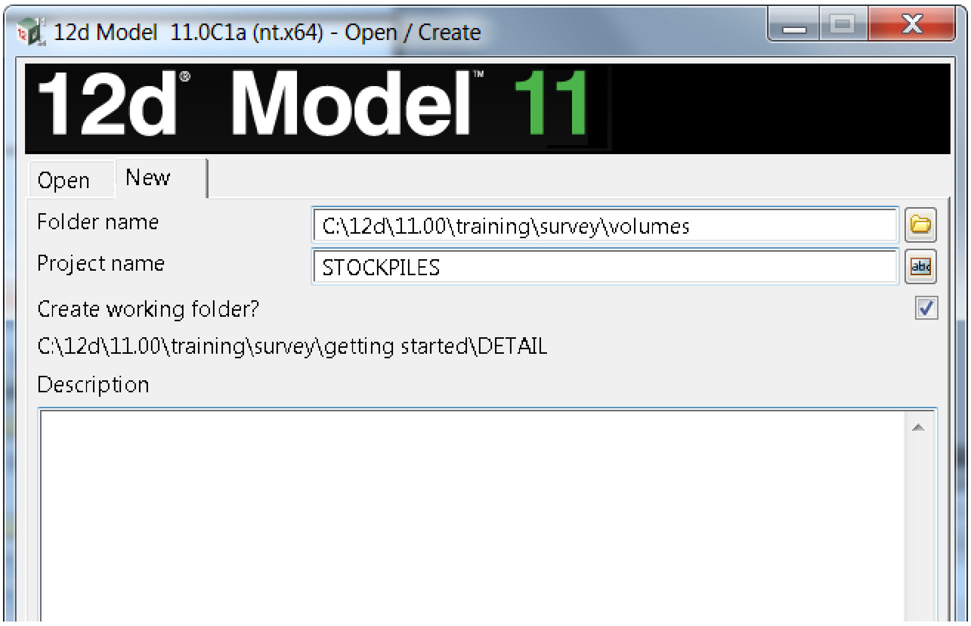
To begin create a new project called **STOCKPILE** in the Survey training area

First, double click on the *12d Model 11* icon to bring up the **Project Selection** panel.





Select **New** button to bring up the **New project** panel.

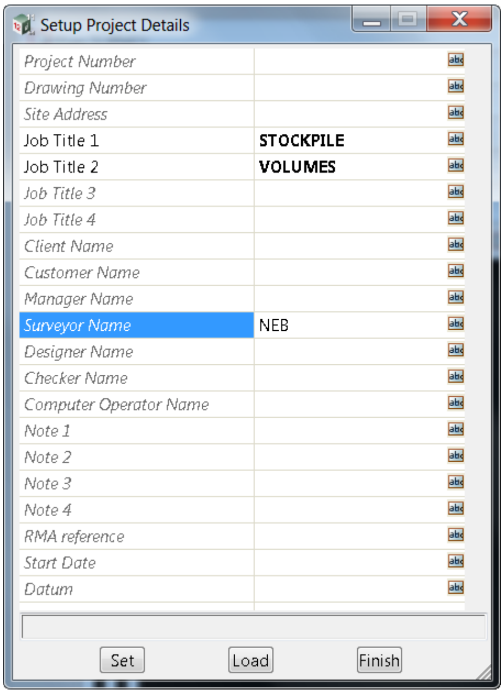


Create a project under the folder **C:\12d\11.00\Training\survey\volumes** called **STOCKPILE**

With the ***Create working folder*** check box ticked a working folder with the same name as the project will be also created

Select **[Create]** to create and open the project

Screen Setup



When the project starts up for the first time the **Project Details** panel appears

The information typed in here can be used when plotting from this project

Fill in the various prompts if necessary

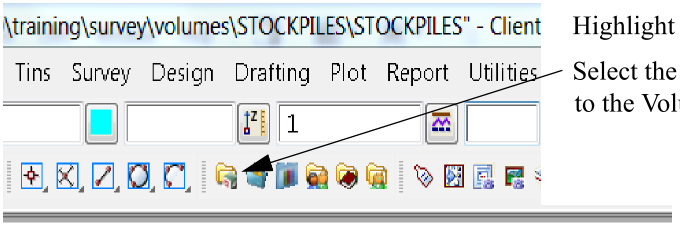
Select **Set** then **Finish** to save the settings and continue

10.1.1Existing surface

We will read in the data for the existing surface. The data is in the form of a 12d archive file

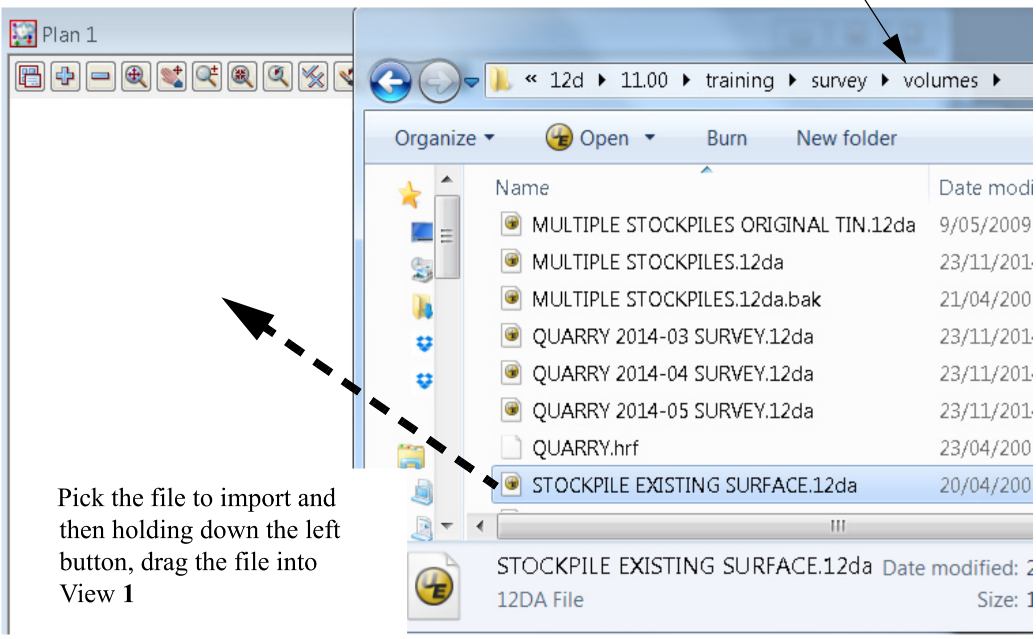
10.1.1.1Read in data

We will use a new feature in 12d model which allows us to drag and drop the 12d archive file straight into the graphics

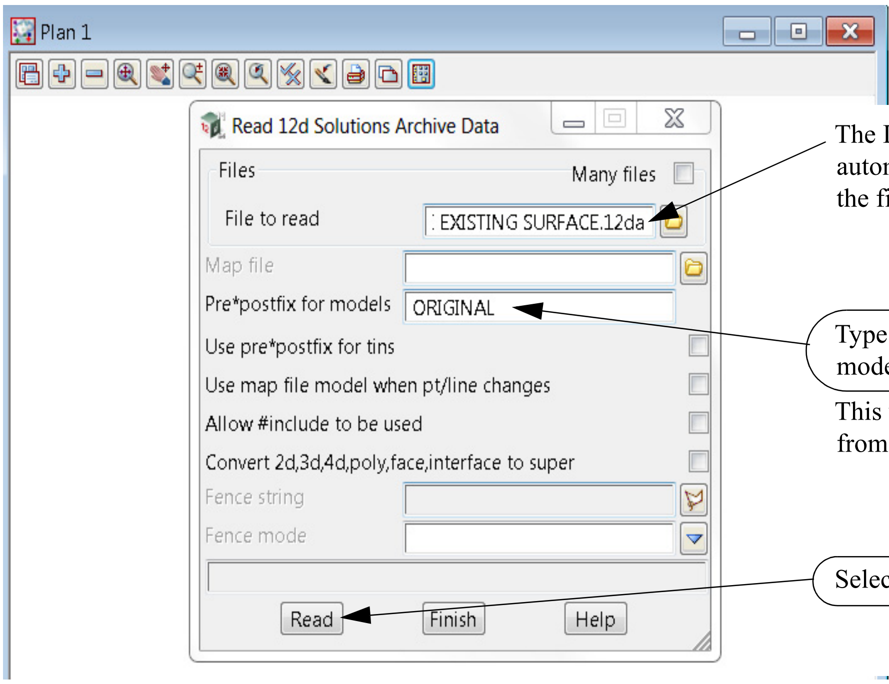


Highlight plan view **1**

Select the **Explore working folder** icon and move up to the Volumes folder



Pick the file to import and then holding down the left button, drag the file into View **1**



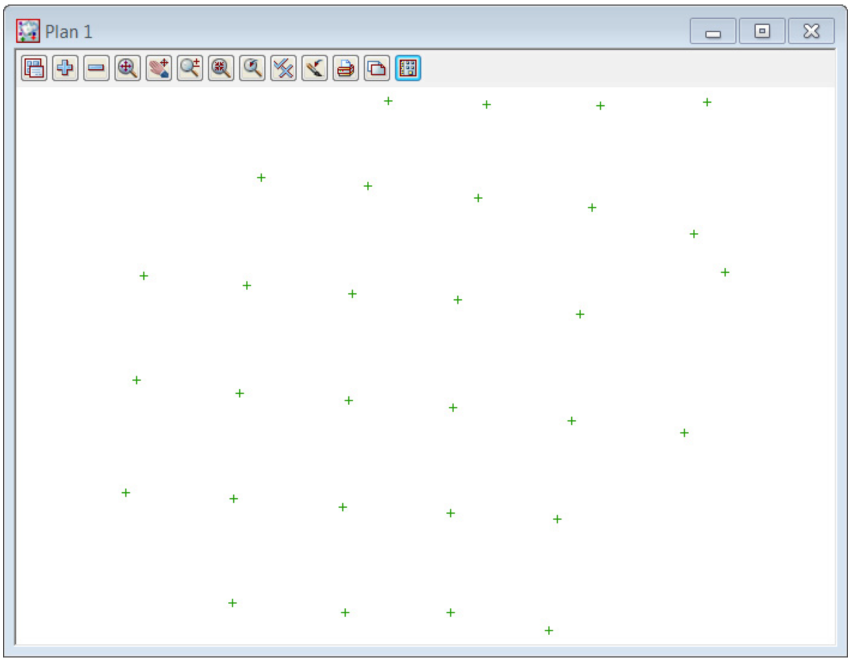
The Import panel will automatically appear with the file name prefilled.

Type in **ORIGINAL** for model prefix

This will help separate data from multiple surveys

Select **Read**

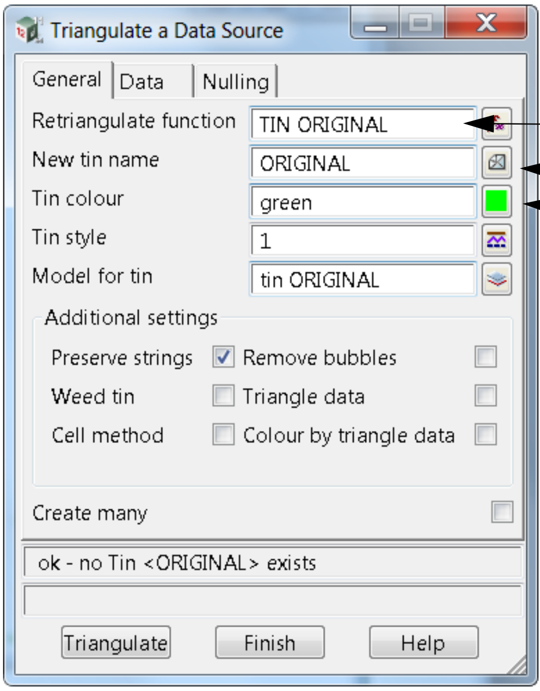
The survey points in model **ORIGINAL TOPO SURFACE LEVEL** appear



10.1.1.2Triangulate the existing surface

We now form a tin using the points from the original surface.

Select ***Tins=>Create=>Triangulate data***



Type in the function name **TIN ORIGINAL**

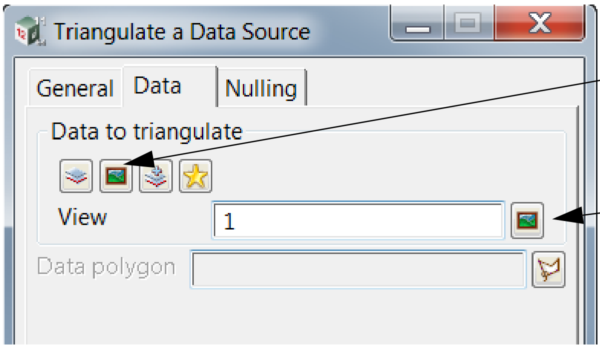
Type in the tin name **ORIGINAL [Enter]**

Select colour **green** for tin

When selecting **[Enter]** key after entering tin name the model name is automatically created with **tin** as the prefix

The only check box needed to be ticked is **Preserve strings** which will ensure breaklines are inserted at the time of triangulation

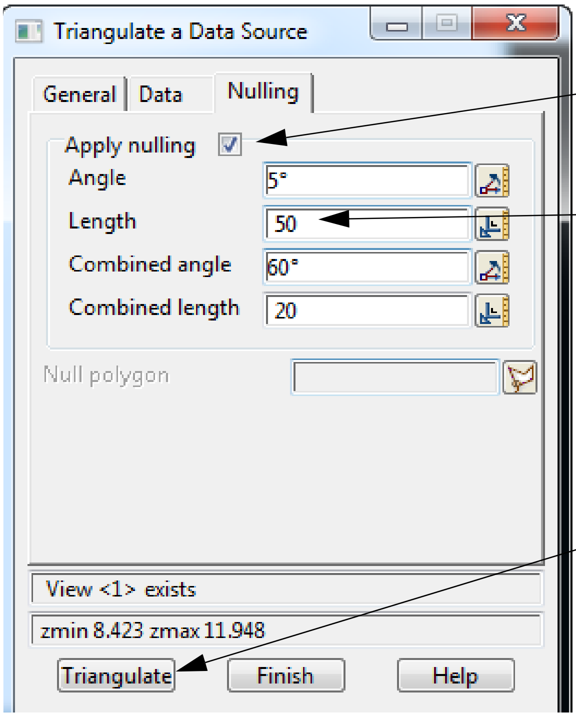
Select the **Data** tab



Select the view icon

Select view **1**

Select the **Nulling** tab



Tick on **Apply nulling**

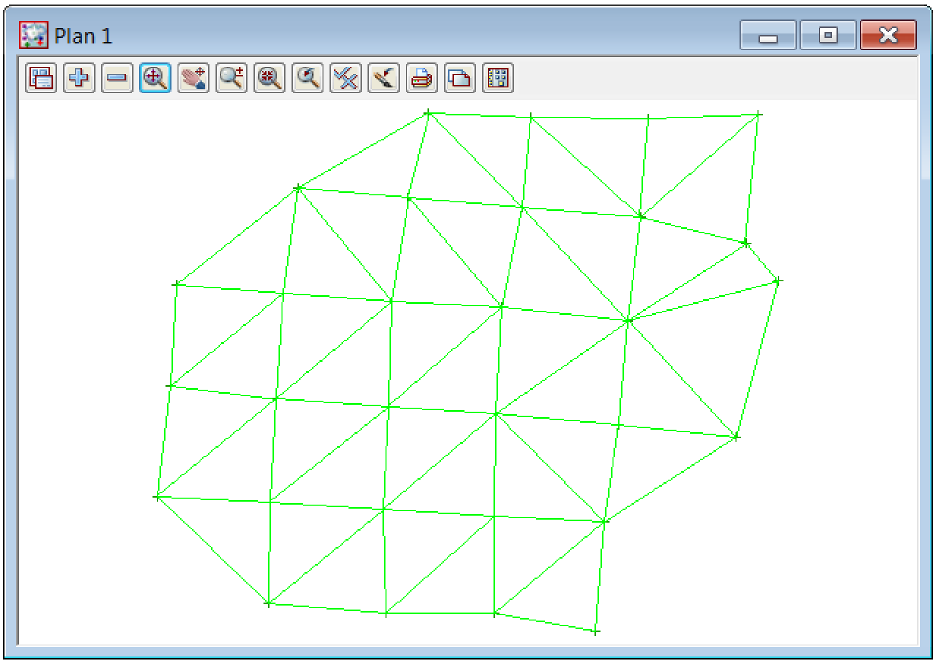
Change the length to **50**

Select **Triangulate**

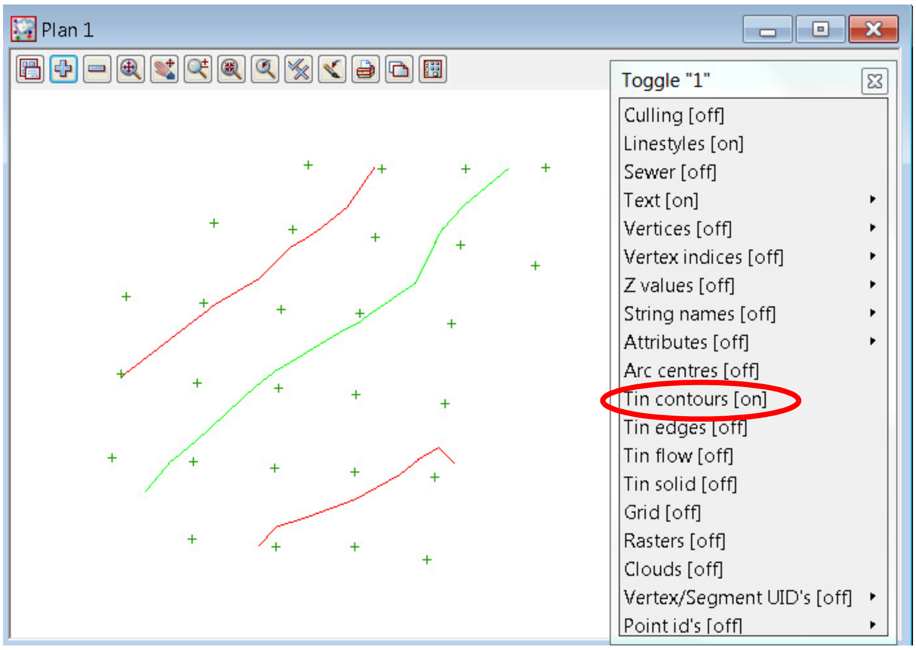
The panel changes to **Retriangulate tin**.

Select **Finish**

Turn on the model **tin ORIGINAL** to view the triangulation



Toggle on the contours

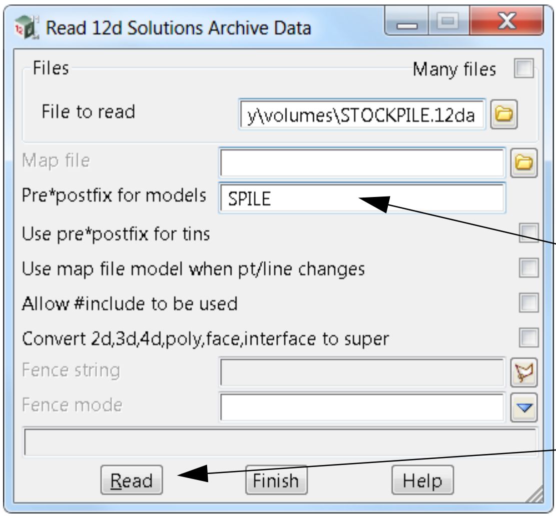


10.1.2Stockpile surface

We will now read in the data for the stockpile surface. The data is again in the form of a 12d archive file and this file includes the tin of the stockpile surface

10.1.2.1Read in data

Read in the **STOCKPILE.12da** file from the folder **C:\12d\11.00\Training\survey\volumes** by dragging and dropping from the **Explore working folder** icon as shown previously

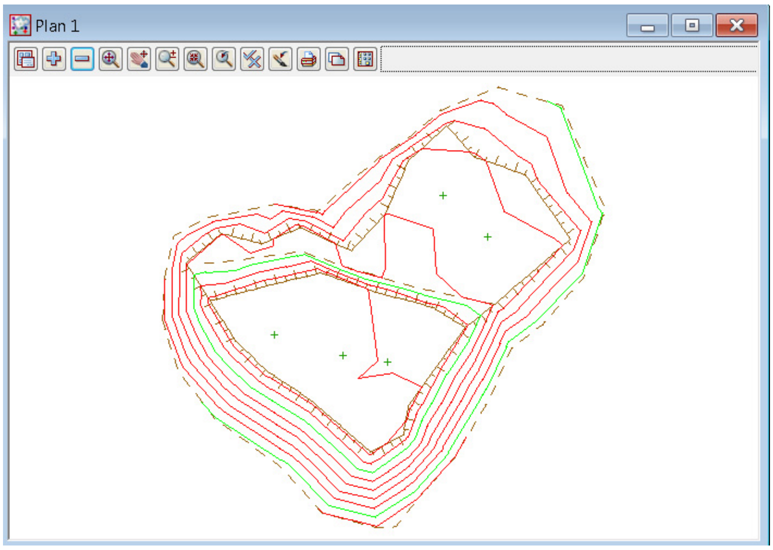


Type in **SPILE** for model prefix

Select **Read**

The survey points of the stockpile will appear along with the tin.

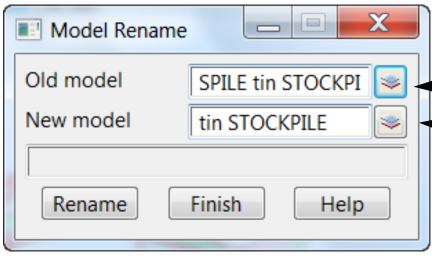
The contours are displayed



The only issue with importing tins inside ascii files is that if the you tried to retriangulate the tin it will not work as the model names have changed due to the prefixing. Also the tin function name is not held in the 12d archive file. So remember not to try to retriangulate the data.

Also the tin model shouldn't really have a prefix as it is preferable to keep them all in the same area in the model list.

We can rename the tin model using the option ***Models=>Rename***



Select the model **SPILE tin STOCKPILE**

Rename to **tin STOCKPILE**

10.1.3 Check stockpile tin lies within existing tin

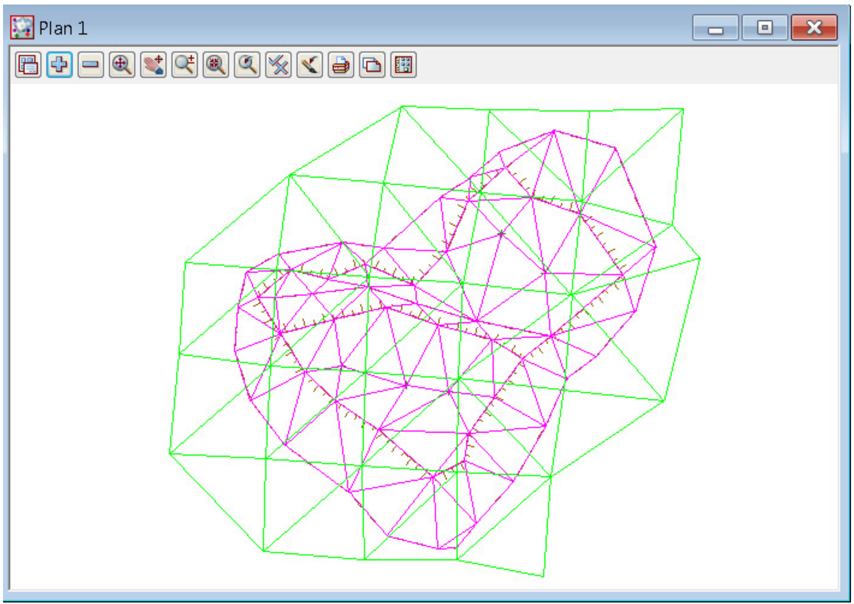
We will now turn on both triangle models to check that the stockpile tin sits inside the tin created from the existing surface points.

If this is not the case then the volume calculation will only cover the area where the two tins coincide.

Turn on model **tin ORIGINAL**

Toggle off the contours.

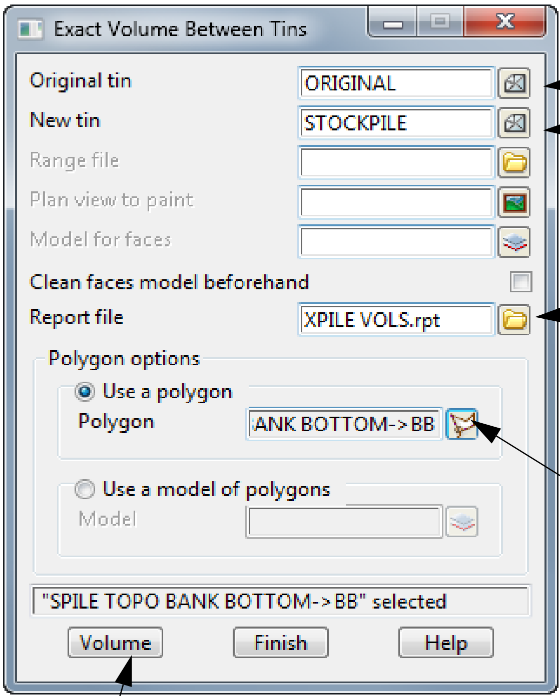
Ensure the outline of the stockpile triangulation lies completely inside the original surface triangulation



10.1.4Calculate volumes by exact method

The volume between the two tins can now be calculated and written to a report file

Select ***Design=>Volumes=>Exact=>Tin to tin***



Select **ORIGINAL** for original tin model

Select **STOCKPILE** for new tin model

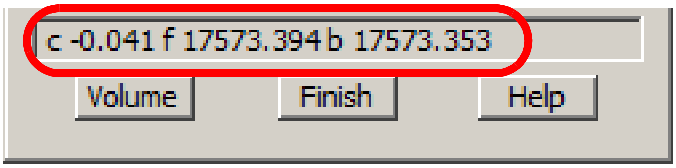
Type in **XPILE VOLS** for report file name

NOTE - report files are not available in the 12d Model Practise Version

Select **Polygon** choice icon and then pick and accept the string around the edge of the stockpile

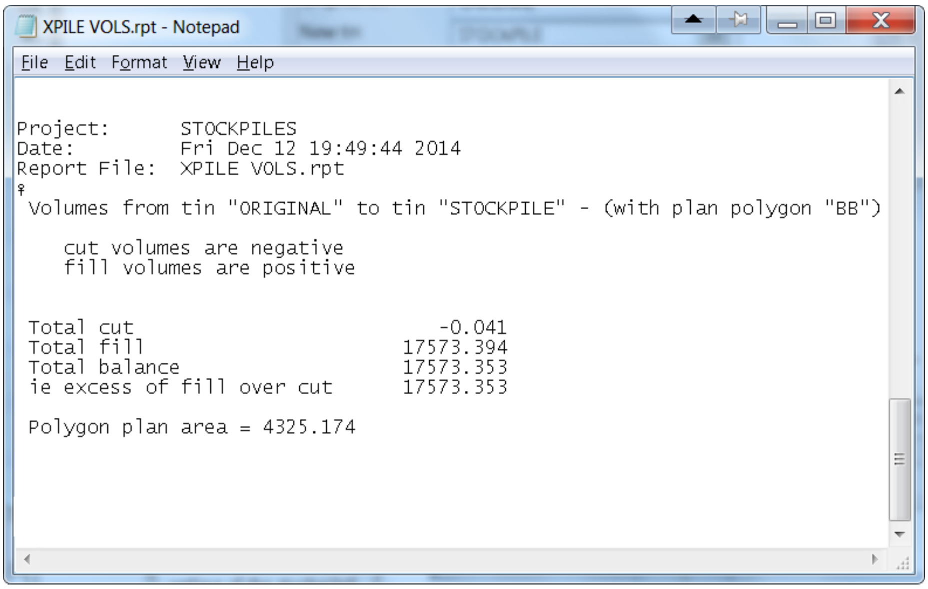
Select **Volume** to calculate the volume between the two surfaces

The volumes of cut and fill are displayed the bottom of the panel



The report is activated in the default text editor (*Notepad* is the default)

The two surfaces used are listed in the report header



The volume of cut is listed along with the fill volume and the balance (Fill - Cut)

The polygon plan area is the horizontal area of the outline of the stockpile

Exit the text editor and select **Finish** on the Volume panel

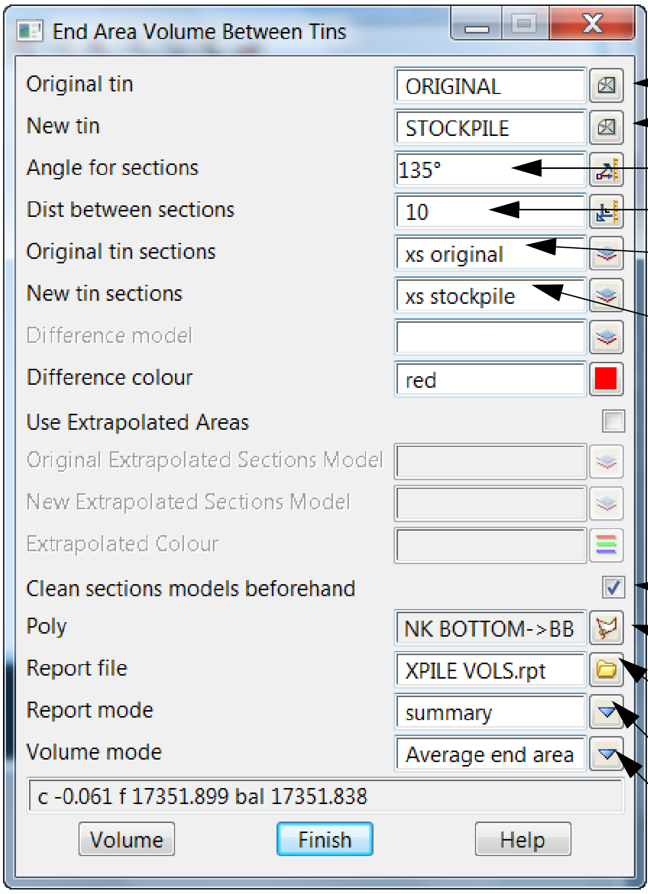
10.1.5Calculate volumes by End area

Another type of volume calculation is the end area method. Volumes are calculated between cross sections generated through the stockpile. An alignment is not necessary to produce the sections.

Strings will be created at each cross section for viewing in the section view

It important to note that the smaller the separation of the sections the more accurate the volume

Select option ***Design=>Volumes=>End area=>Tin to tin***



Select **ORIGINAL** for original tin name

Select **STOCKPILE** for new tin name

Type in the angle **135** for the cross sections

Typed in **10** for the distance between sections

Type in **xs original** as existing section model name

Type in **xs stockpile** as stockpile section model name

Tick check box to clean section models

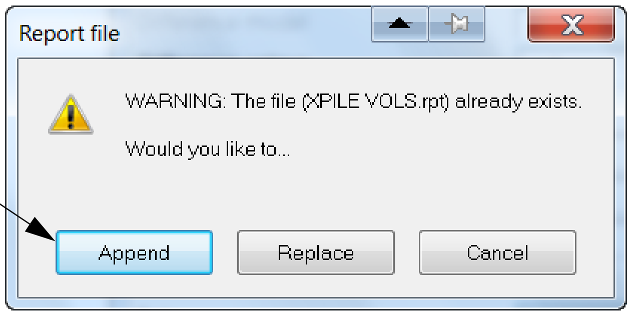
Select the **Poly** icon. Select the **String pick** icon then pick and accept the string around the edge of the stockpile

Select **Report mode** icon then pick **XPILE VOLS.rpt**

Select **Summary**

Select **Volume mode** choice icon then select **Average end area**

Select **Volume**



Select **Append** to append the volume results to the end of the previous report

NOTE - report files are not available in the 12d Model Practise Version

As per the previous option the report is displayed

XPILE VOLS.rpt - Notepad

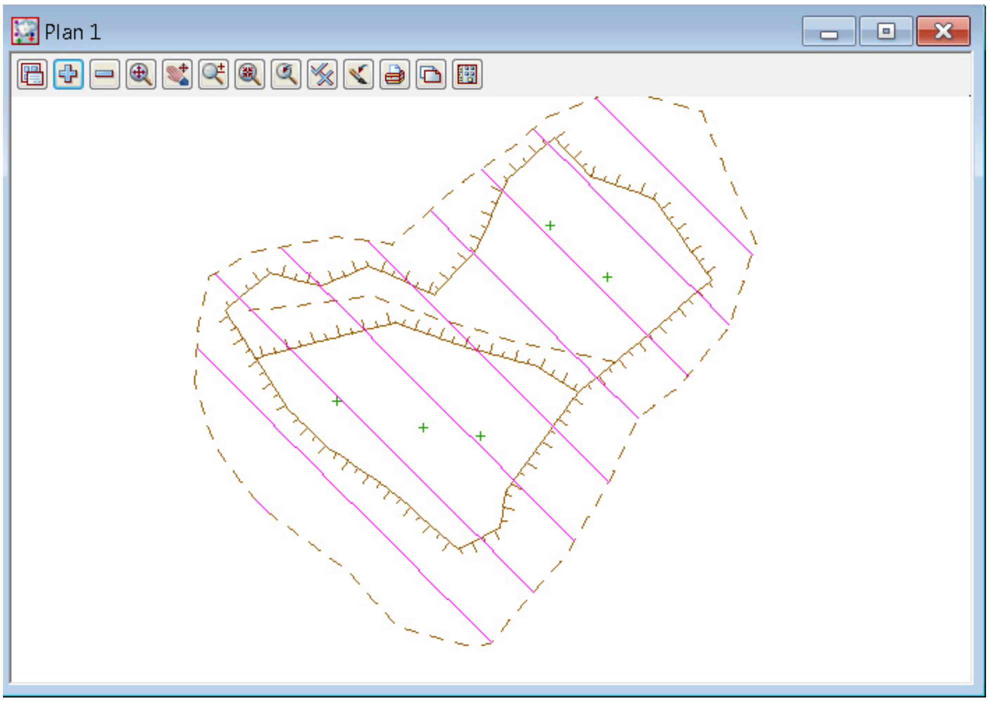
File Edit Format View Help

```
Project:      STOCKPILE
Report File:  XPILE VOLS.rpt
♀
 Volumes from tin "ORIGINAL" to tin "STOCKPILE" - (with plan polygon "BB")

    cut volumes are negative
    fill volumes are positive


 Total cut                              -0.041
 Total fill                          17573.394
 Total balance                       17573.353
 ie excess of fill over cut          17573.353

 Polygon plan area = 4325.174


12d Model
========
Project:      STOCKPILE
Report File:  XPILE VOLS.rpt



 ----------------------------- BEGIN TIN-TIN VOLUME REPORT --------------------------

  surface to surface volume report - (with plan polygon "SPILE TOPO BANK BOTTOM->BB")

    original tin ORIGINAL
    new tin      STOCKPILE
    separation   10.000
    angle        135°00'00"
    method       Average end area
    extrapolated no

    cut volumes and areas are negative
    fill volumes and areas are positive



 total plan area                      4325.174

 total cut                              -0.061
 total fill                          17351.899
 balance                             17351.838
 ie excess of fill over cut          17351.838

 ----------------------------- END TIN-TIN VOLUME REPORT ----------------------------
```

The original report is amended with the volume by end area placed at the end of the report

The distance between the sections is displayed along with the direction of the section strings

Turn on the cross section model **xs stockpile** and turn off the tins

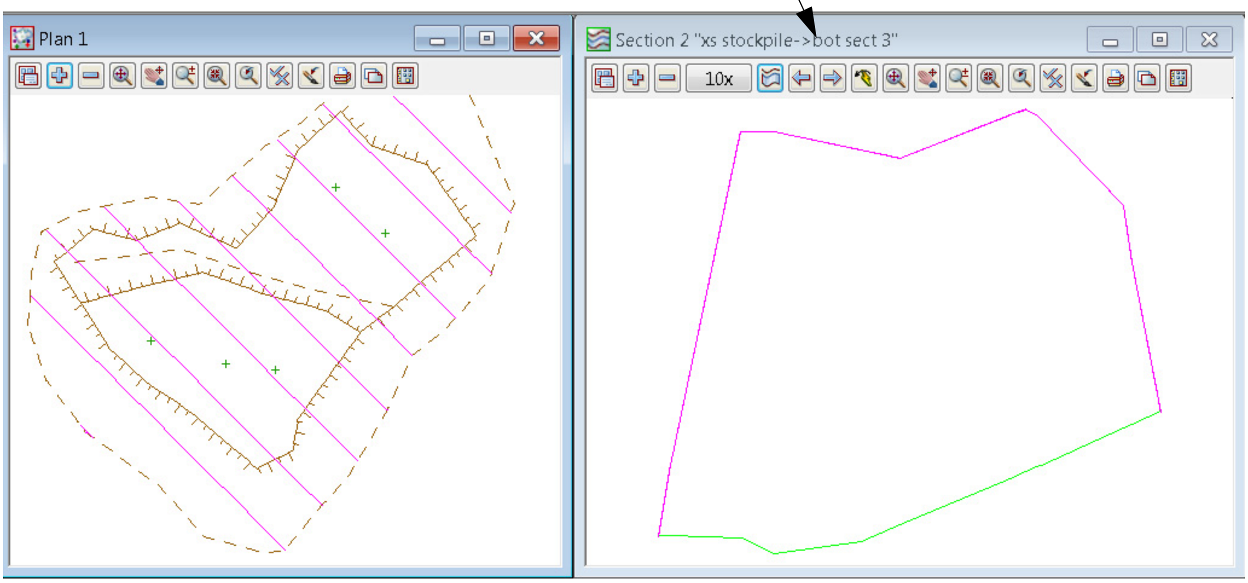


10.1.5.1View stockpile sections

The cross sections can be viewed in a section view **XS**

Place section view **XS** to the right of plan view **1**

Turn on the two tin models in the section view
To view the cross sections select the profile icon then select one of the section strings in View **1**
To move along the sections use the **Prev** and **Next** icons



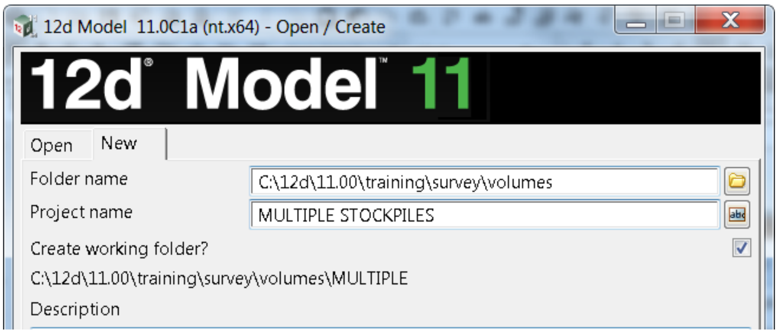
10.2 Multiple stockpiles

In this example multiple stockpile volumes can be calculated with one option automatically creating all necessary tins of the bases and tops of the stockpiles.

A Volume report will be created for each stockpile and volume text will be placed over each pile

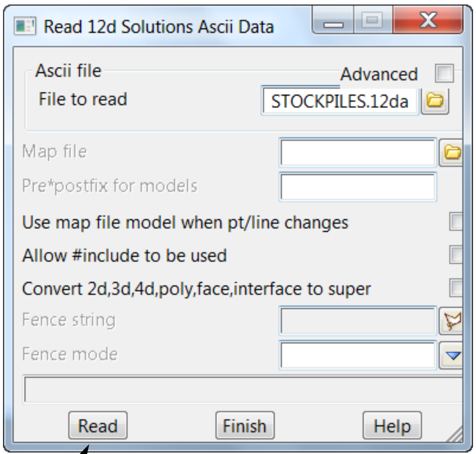
Create a new project as shown previously called **MULTIPLE STOCKPILES** in the folder

C:\12d\11.00\Training\Survey\Volumes

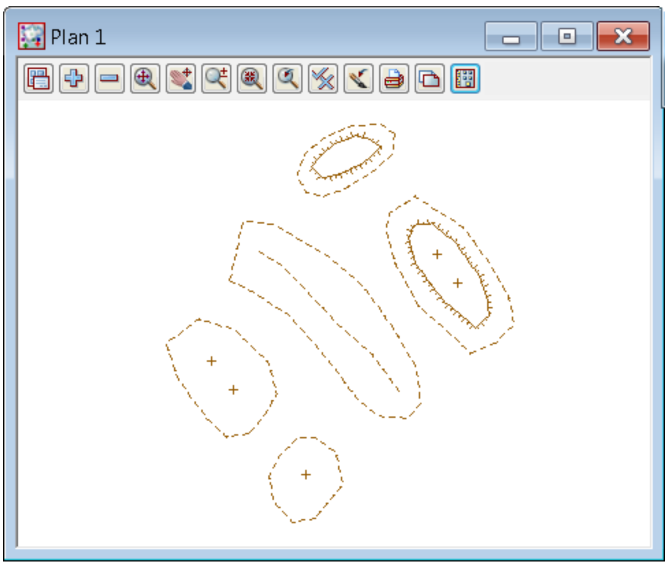


10.2.1 Read in Stockpile surface data

Read in the 12d archive file **C:\12d\11.00\Training\survey\volumes\MULTIPLE STOCKPILES.12da** file by dragging and dropping using the **Explore working folder** icon as shown previously



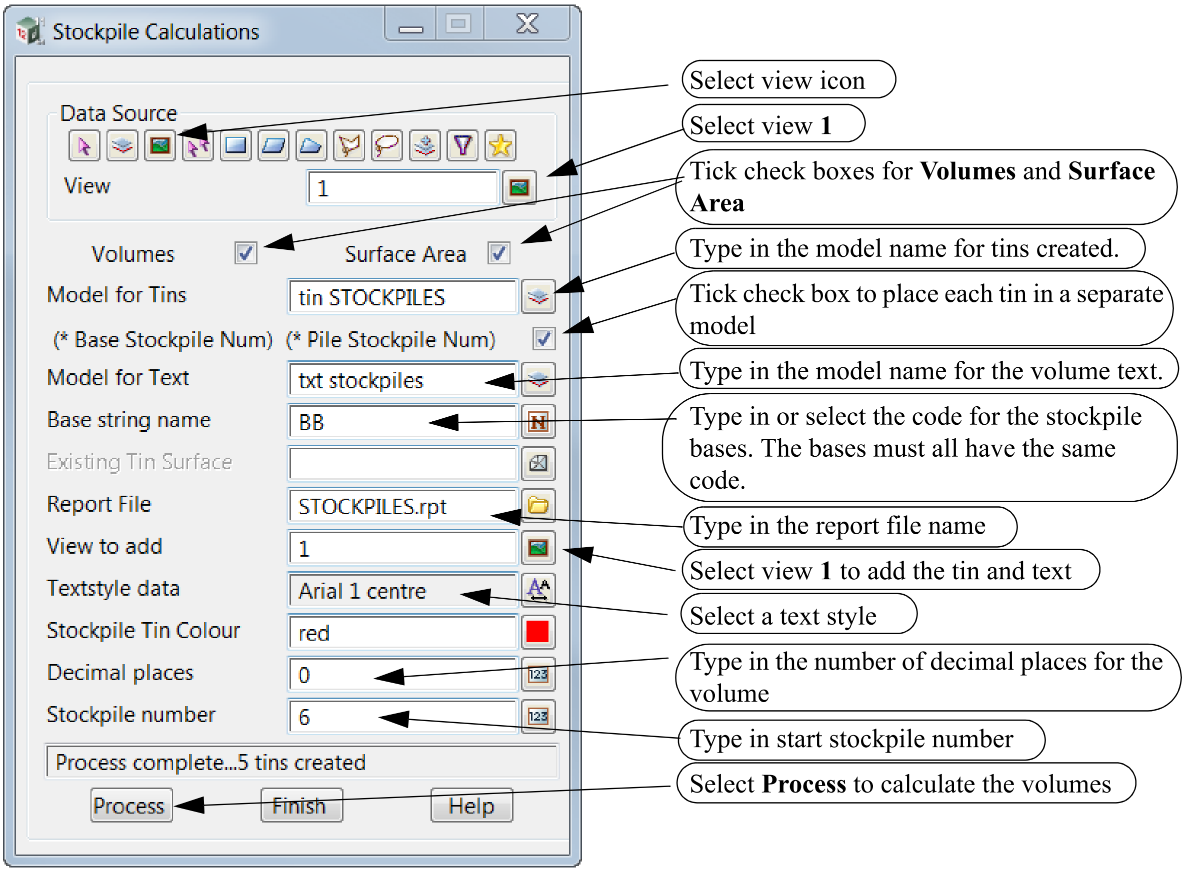
Select **Read** then **Finish**

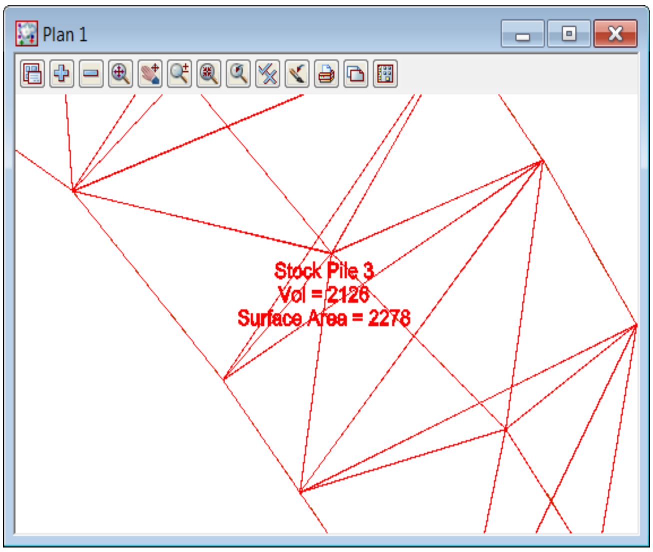


10.2.2Run Stockpile option

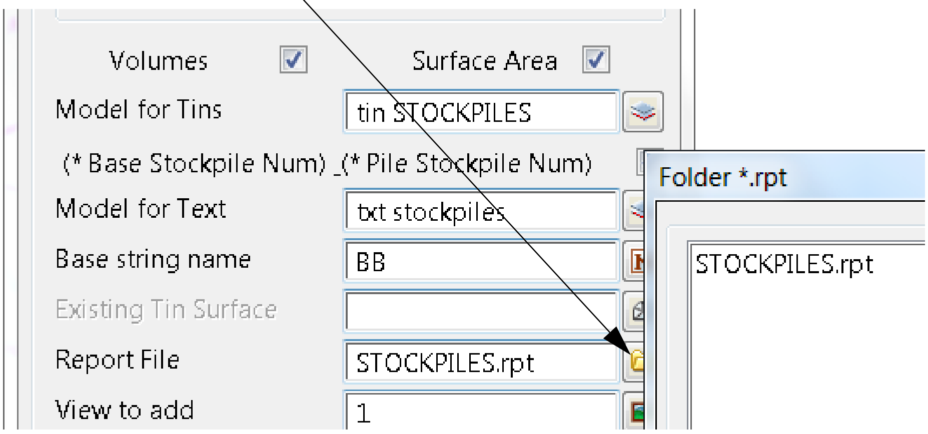
For this program to work, the strings around the bases of the stockpiles MUST share a unique code. This code should not be used within the stockpile as it is used to determine the extent of each pile.

Select option ***Design=>Volumes=>Stockpile***

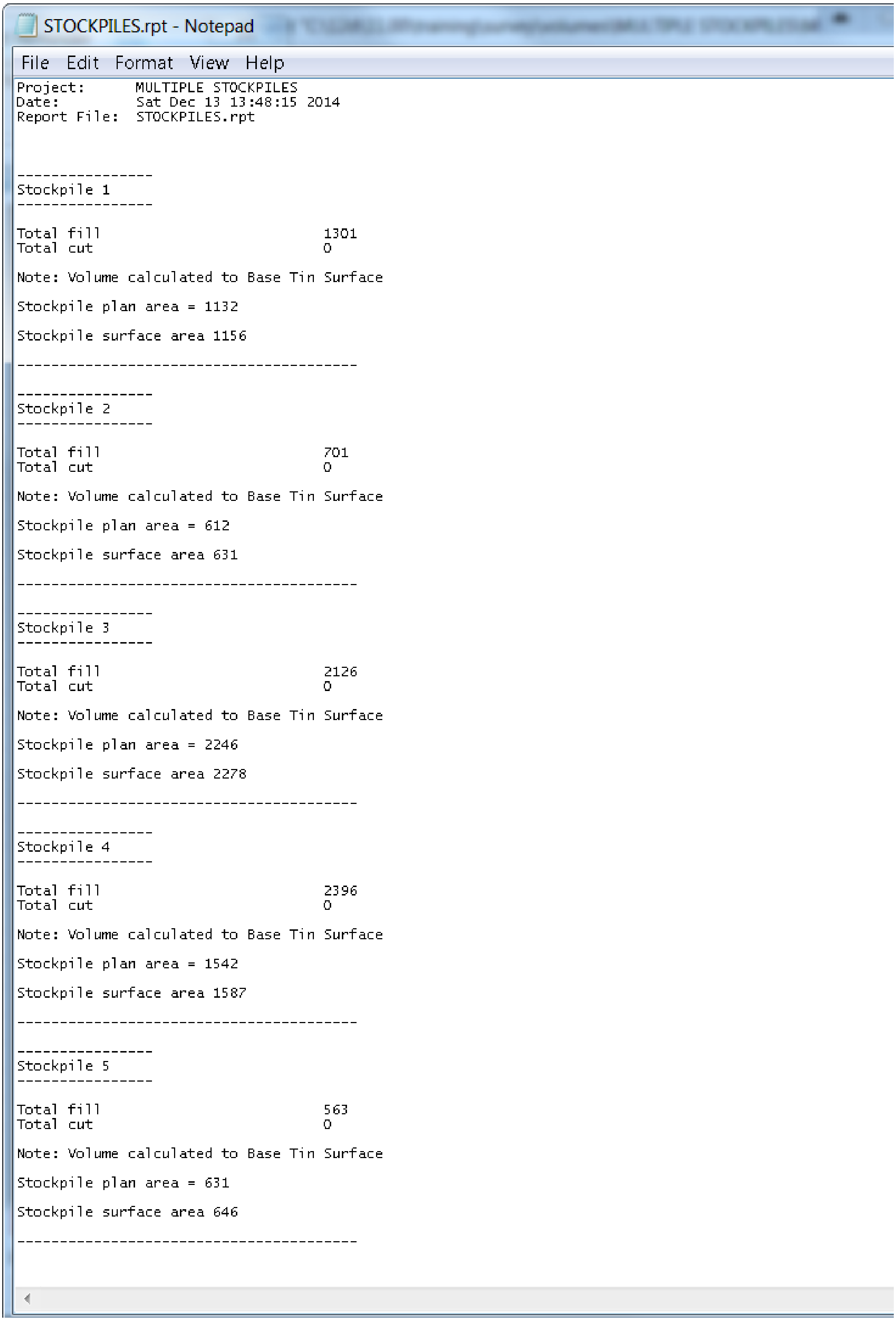




To read the volume report select the report file icon then select **Open**



NOTE - report files are not available in the 12d Model Practise Version



STOCKPILES.rpt - Notepad

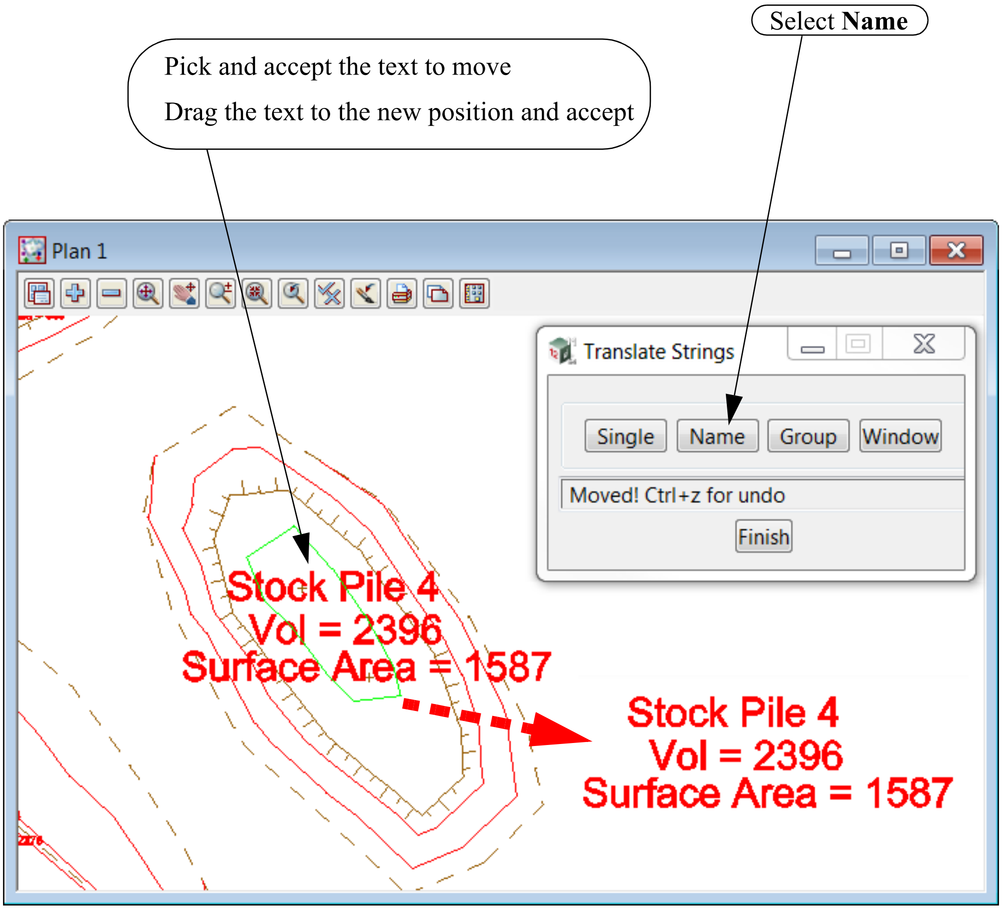
File Edit Format View Help

```
Project:      MULTIPLE STOCKPILES
Date:         Sat Dec 13 13:48:15 2014
Report File:  STOCKPILES.rpt



----------------
Stockpile 1
----------------

Total fill                      1301
Total cut                       0

Note: Volume calculated to Base Tin Surface

Stockpile plan area = 1132

Stockpile surface area 1156

----------------------------------------

----------------
Stockpile 2
----------------

Total fill                      701
Total cut                       0

Note: Volume calculated to Base Tin Surface

Stockpile plan area = 612

Stockpile surface area 631

----------------------------------------

----------------
Stockpile 3
----------------

Total fill                      2126
Total cut                       0

Note: Volume calculated to Base Tin Surface

Stockpile plan area = 2246

Stockpile surface area 2278

----------------------------------------

----------------
Stockpile 4
----------------

Total fill                      2396
Total cut                       0

Note: Volume calculated to Base Tin Surface

Stockpile plan area = 1542

Stockpile surface area 1587

----------------------------------------

----------------
Stockpile 5
----------------

Total fill                      563
Total cut                       0

Note: Volume calculated to Base Tin Surface

Stockpile plan area = 631

Stockpile surface area 646

----------------------------------------
```

After the final stockpile volume has been reported select **Finish** on the volumes report panel

Turn off all of the Stockpile base models and then toggle on the contours

To move the volume text outside each stockpile select option ***Drafting=>Multi string translate***



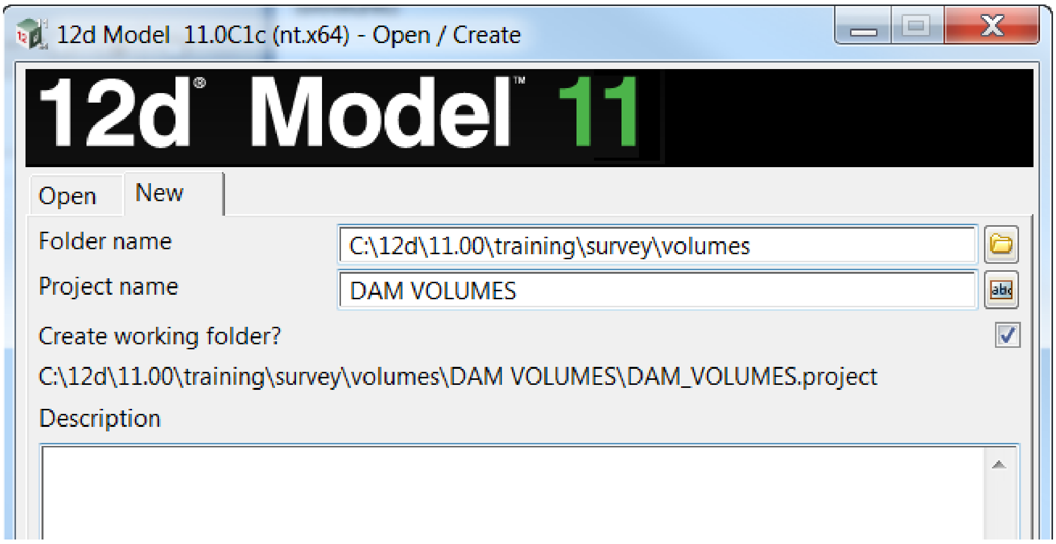
Reselect **Name** before moving each block of text

10.3 Dam Capacity

In this example the storage capacity of a dam will be calculated

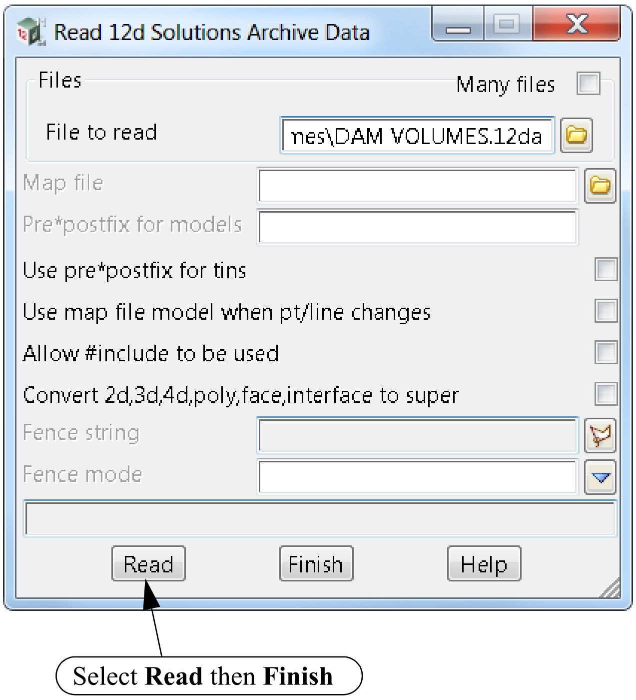
Create a new project as shown previously called **DAM VOLUMES** in the folder

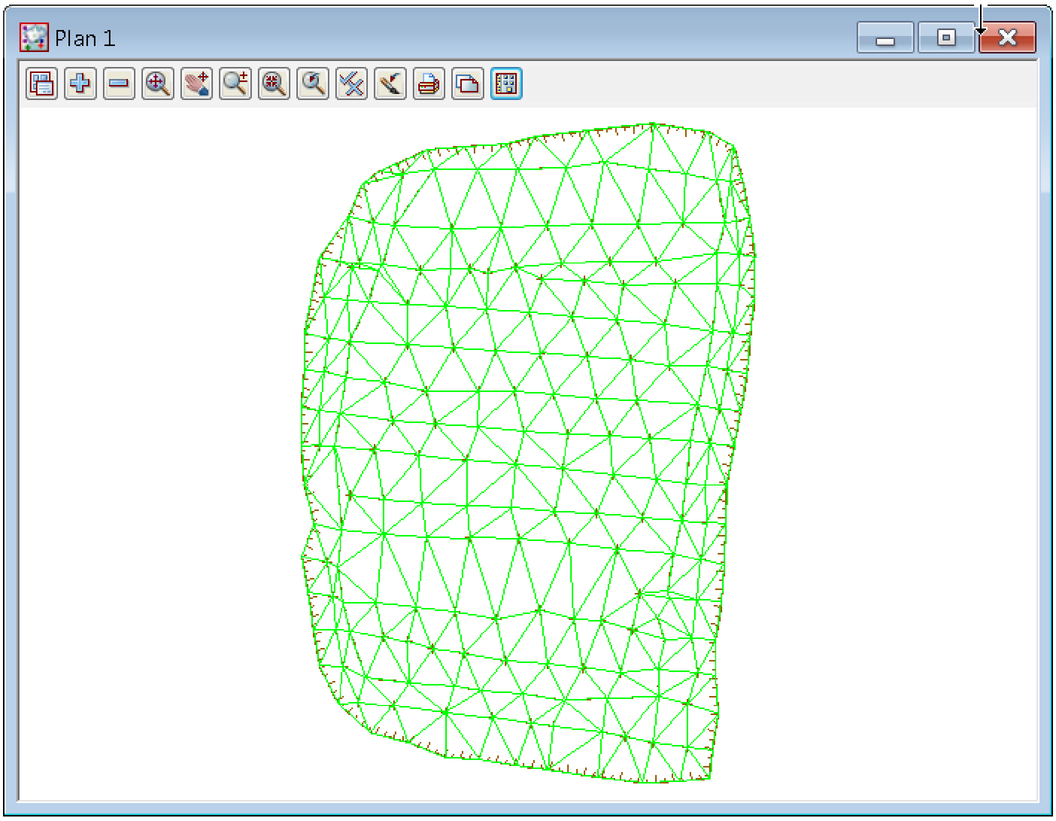
C:\12d\11.00\Training\Survey\Volumes



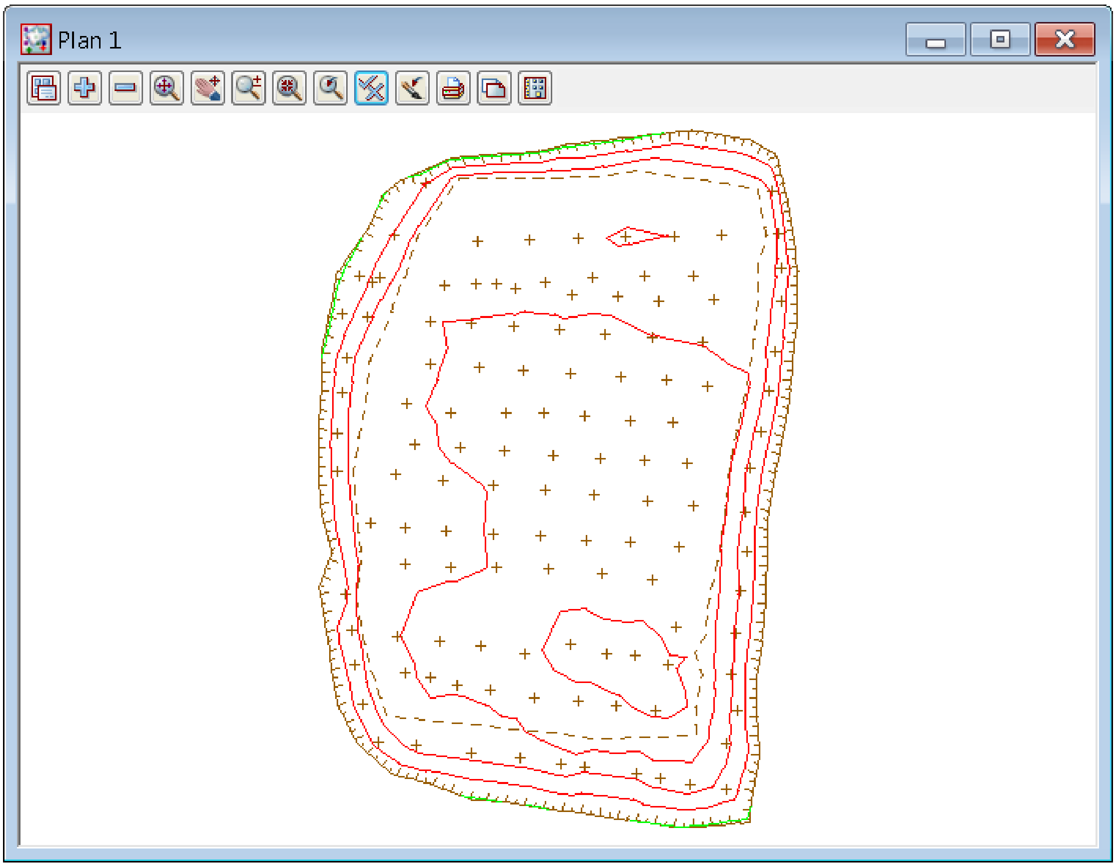
10.3.1 Read in Dam surface data

Read in the 12d archive file **C:\12d\11.00\Training\survey\volumes\DAM VOLUMES.12da** file by dragging and dropping using **Explore working folder** icon as shown previously





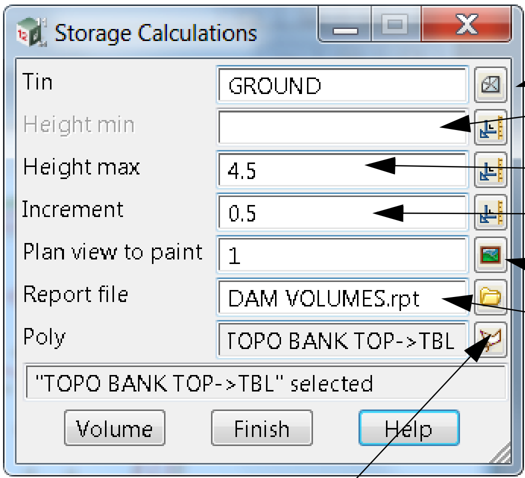
Toggle on the contours



10.3.2Calculate volumes by Storage Calcs method

The volume from the dam bottom surface up to a height can now be calculated

Select ***Design=>Volumes=>Exact=>Storage Calcs***



Select **GROUND** for tin

Leave the minimum height unaltered. This will calculate the volume from the lowest point of the tin

Type in **4.5** as the maximum height

Type in **0.5** for the height increment. The volume will be broken into 0.5 metre slices

Select view **1** to shade the extent of the volume area

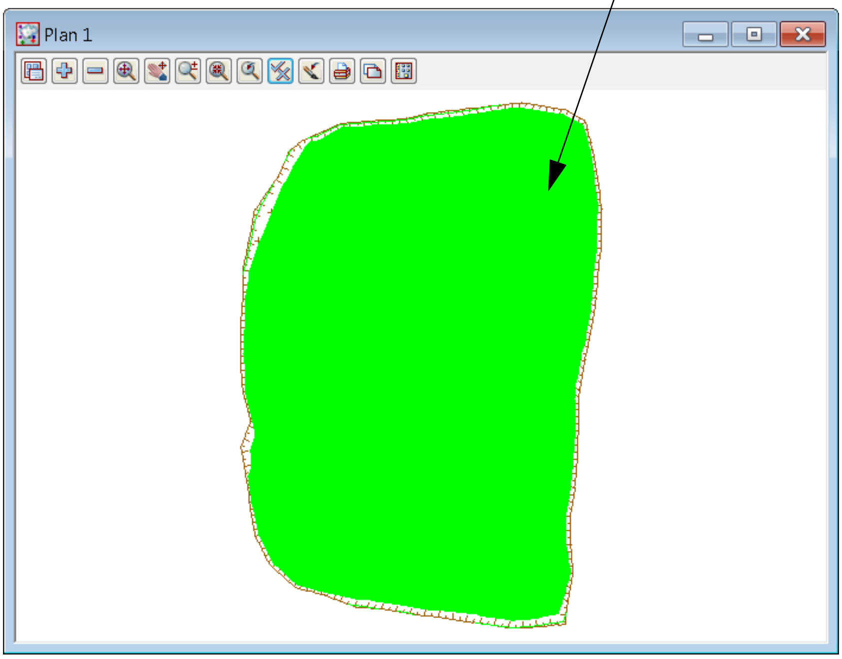
Type in the report file **DAM VOLUMES**.

NOTE - report files are not available in the 12d Model Practise Version

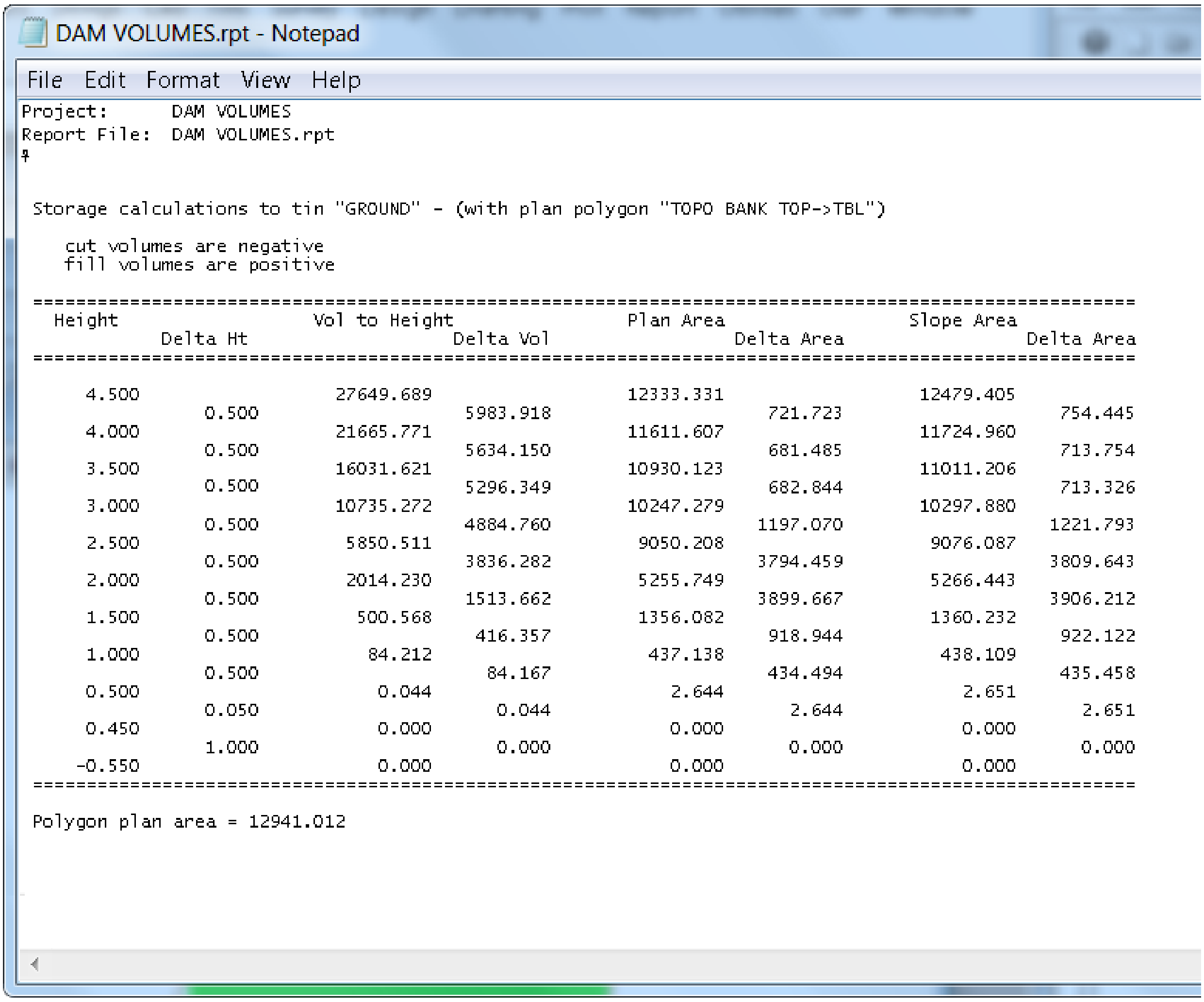
Select the **Poly** icon then pick and accept the string around the edge of the top of the dam wall

Select **Volume**

The extent of the tin up to the maximum height value is coloured



The report file is opened in the default text editor and the volumes are listed in the specified slices



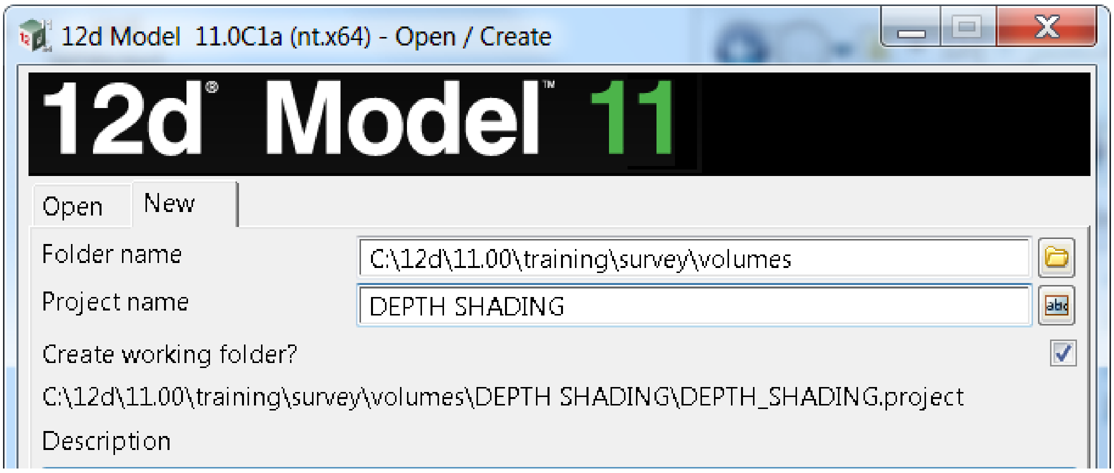
```
DAM VOLUMES.rpt - Notepad
File  Edit  Format  View  Help
Project:      DAM VOLUMES
Report File:  DAM VOLUMES.rpt

 Storage calculations to tin "GROUND" - (with plan polygon "TOPO BANK TOP->TBL")

    cut volumes are negative
    fill volumes are positive

 ====================================================================================================
   Height                Vol to Height               Plan Area                 Slope Area
            Delta Ht                 Delta Vol                 Delta Area                Delta Area
 ====================================================================================================

      4.500               27649.689                12333.331                12479.405
                 0.500                5983.918                  721.723                  754.445
      4.000               21665.771                11611.607                11724.960
                 0.500                5634.150                  681.485                  713.754
      3.500               16031.621                10930.123                11011.206
                 0.500                5296.349                  682.844                  713.326
      3.000               10735.272                10247.279                10297.880
                 0.500                4884.760                 1197.070                 1221.793
      2.500                5850.511                 9050.208                 9076.087
                 0.500                3836.282                 3794.459                 3809.643
      2.000                2014.230                 5255.749                 5266.443
                 0.500                1513.662                 3899.667                 3906.212
      1.500                 500.568                 1356.082                 1360.232
                 0.500                 416.357                  918.944                  922.122
      1.000                  84.212                  437.138                  438.109
                 0.500                  84.167                  434.494                  435.458
      0.500                   0.044                    2.644                    2.651
                 0.050                   0.044                    2.644                    2.651
      0.450                   0.000                    0.000                    0.000
                 1.000                   0.000                    0.000                    0.000
     -0.550                   0.000                    0.000                    0.000
 ====================================================================================================

 Polygon plan area = 12941.012
```

10.4 Surface Comparison

This topic deals with not only calculating the volume between two surfaces but also comparing the surfaces by depth shading

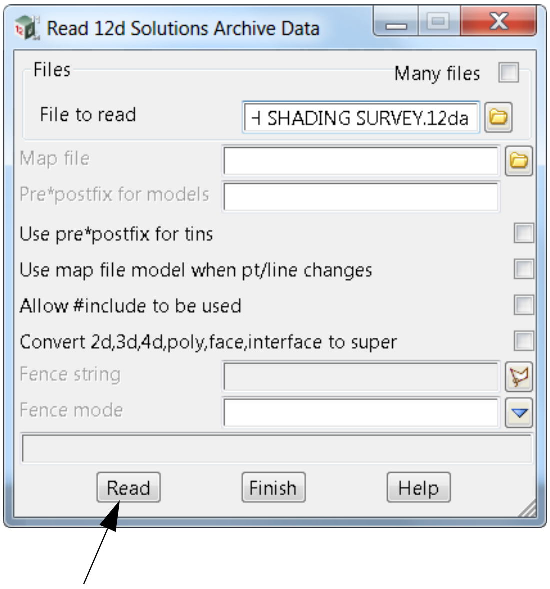
Create a new project as shown previously called **DEPTH SHADING** in the folder

C:\12d\11.00\Training\Survey\Volumes

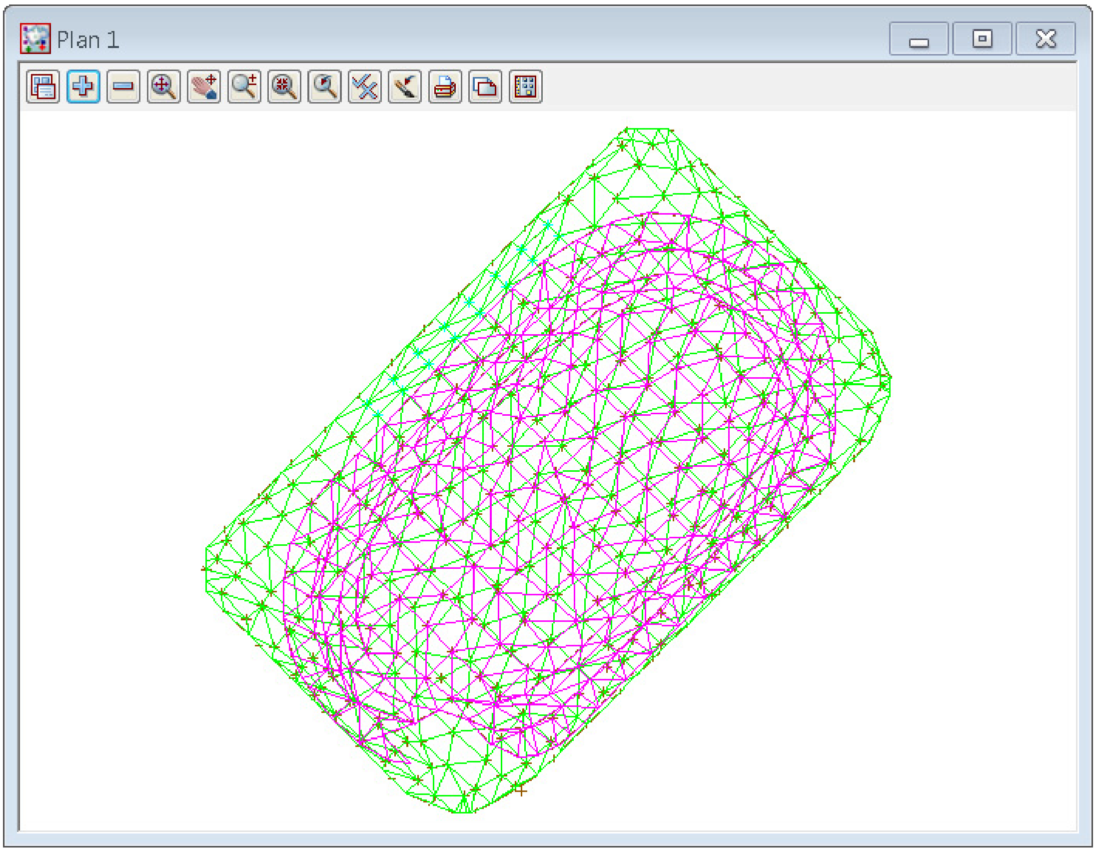


10.4.1 Read in Surfaces

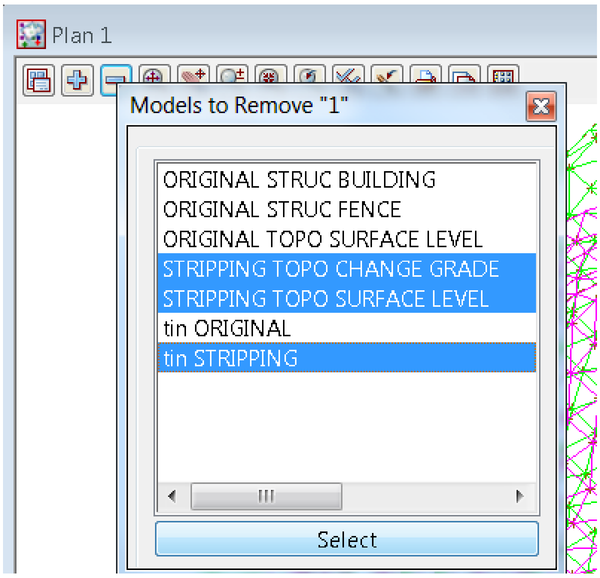
Read in the 12d archive file **C:\12d\11.00\Training\survey\volumes\DEPTH SHADING SURVEY.12da** file by dragging and dropping using the **Explore working folder** icon as shown previously



Select **Read** then **Finish**



Turn off the Stripping survey models



10.4.1.1Check original data

Toggle on the contours.

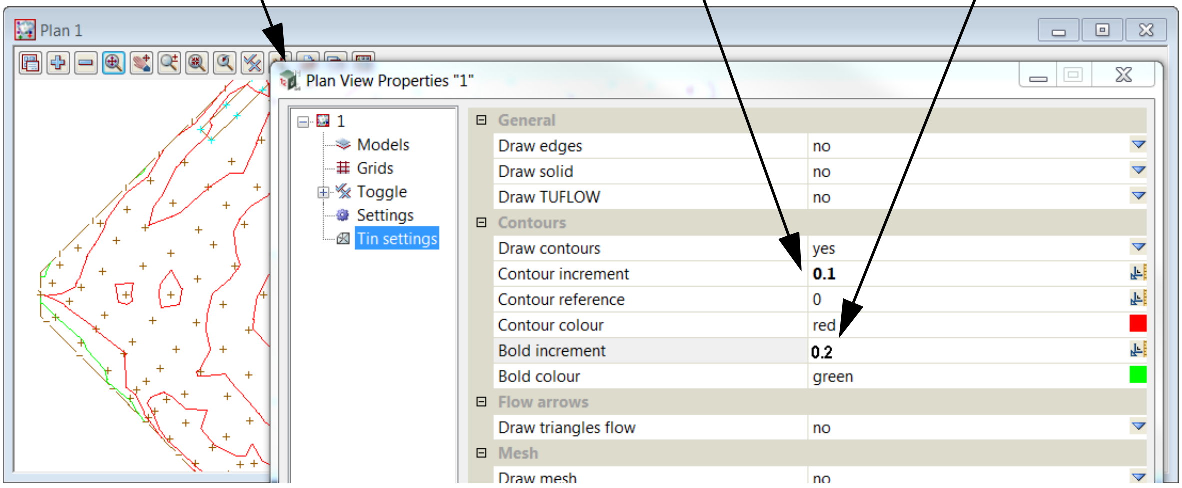
The contours are not visible as the surface is very flat. We need to change the contour interval to a smaller increment

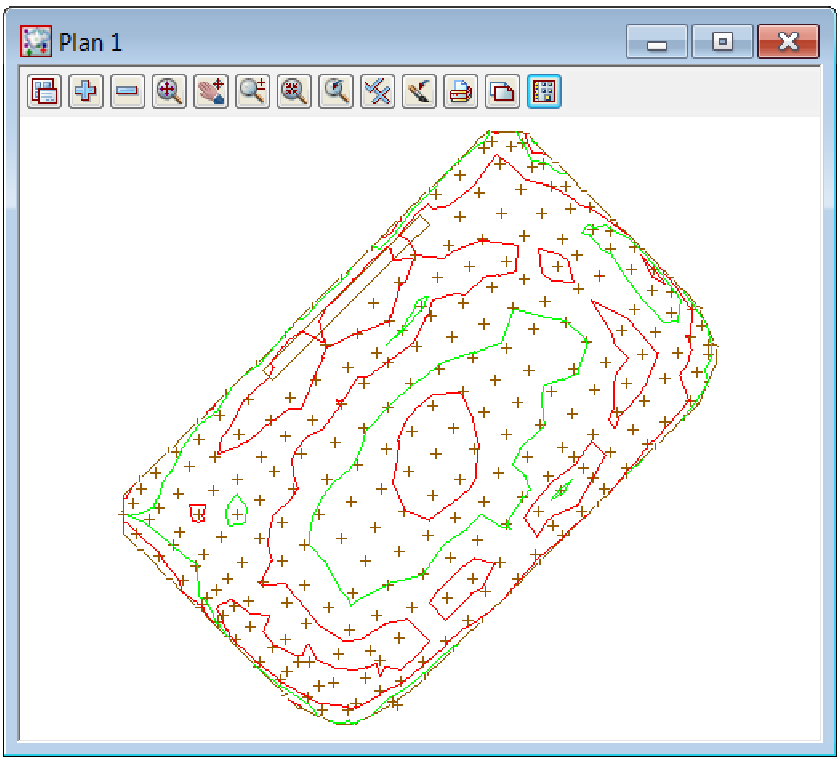
Change the contour interval to 0.1

Select the **Plan View Properties** icon

Select **Tin settings**. Change the Contour increment to 0.1 and the Bold

Contour to 0.2

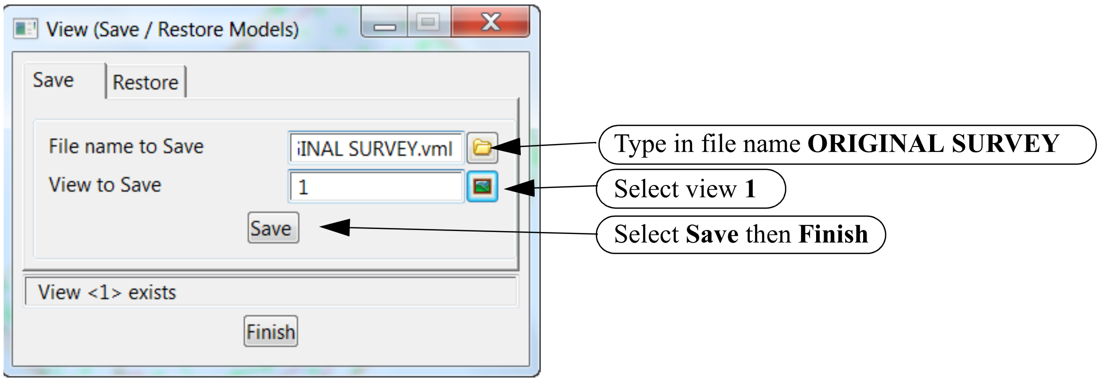




10.4.1.2Save model list

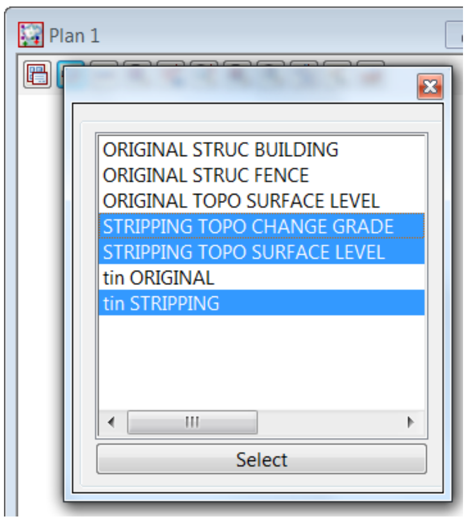
The original models can be saved away to a model listing file

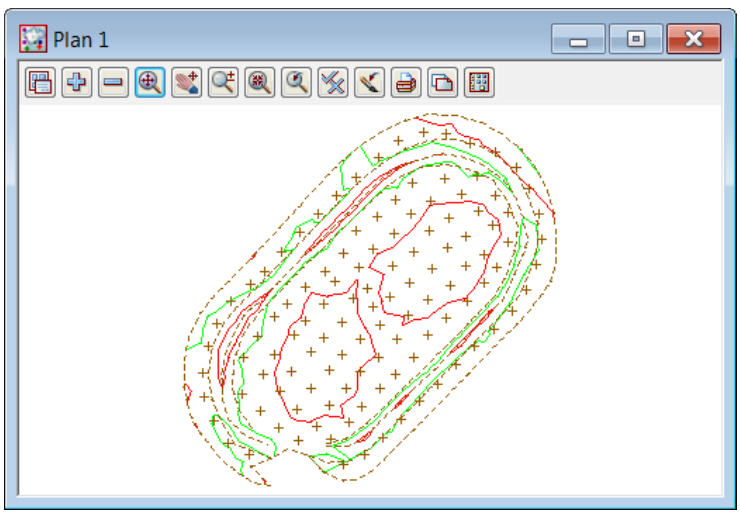
Select ***View=>Models Save/Restore***



10.4.1.3Check stripped survey data

Turn off all models then turn on the Stripping model and tin

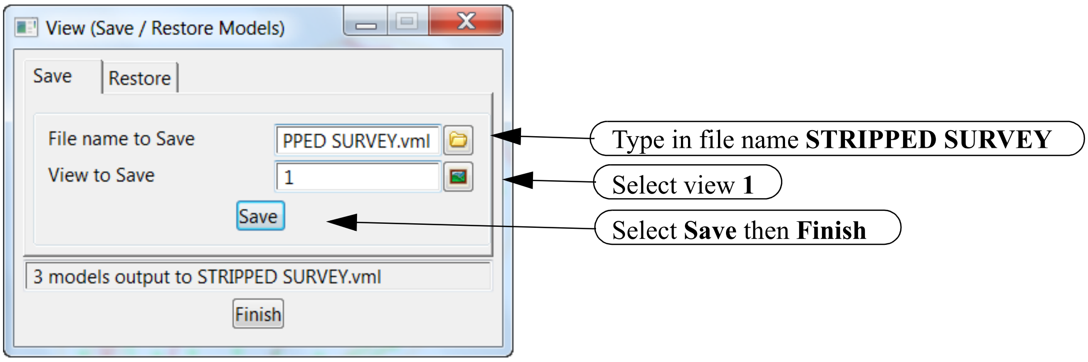




10.4.1.4Save model list

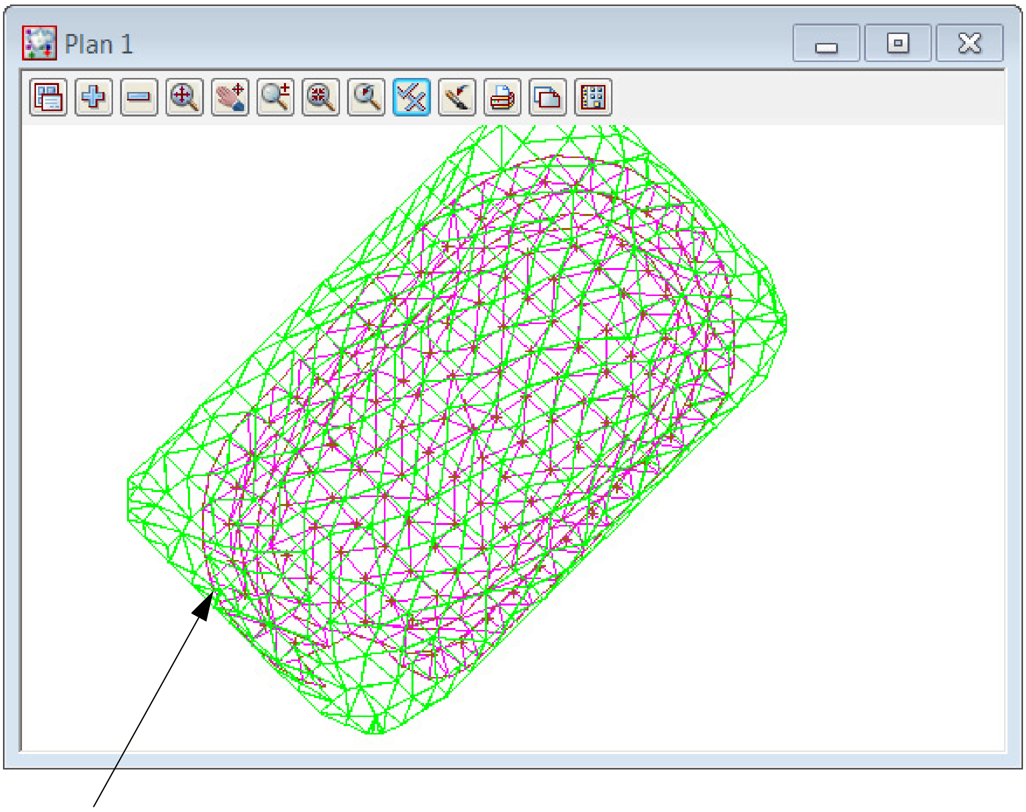
The stripping models can be saved away to a model listing file

Select ***View=>Models Save/Restore***



10.4.2Check Stripped tin lies within existing tin

We will now turn on both triangle models to check that the Stripped tin sits inside the tin created from the existing surface points. If this is not the case then the volume calculation will only cover the area where the two tins coincide.

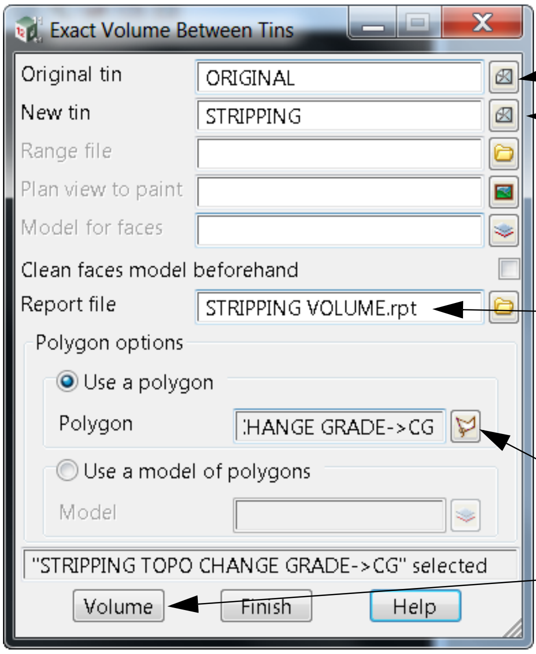


Ensure the outline of the stripping tin lies completely inside the original surface tin

10.4.3Calculate volumes by exact method

The volume between the two tins can now be calculated and written to a report file

Select ***Design=>Volumes=>Exact=>Tin to tin***



Select **ORIGINAL** for original tin model

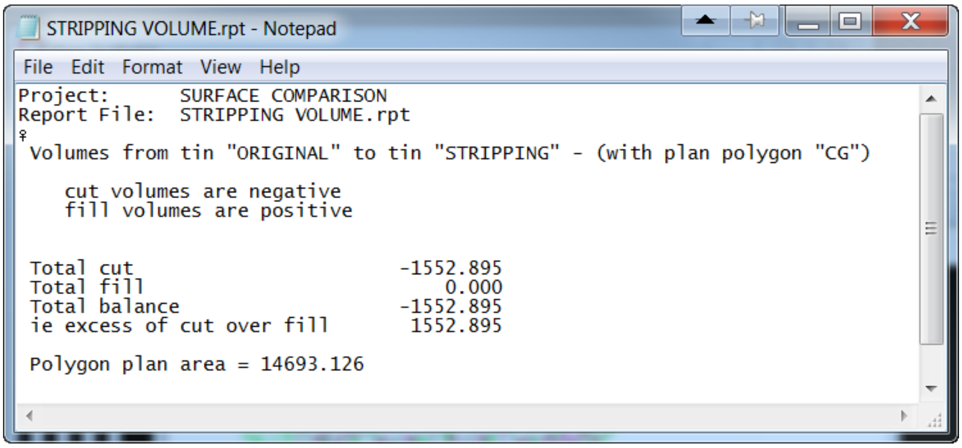
Select **STRIPPING** for new tin model

Type in **STRIPPING VOLUME** for report file name

NOTE - report files are not available in the 12d Model Practise Version

Select **Polygon** icon Pick and accept the string around the edge of the stripping survey

Select Volume

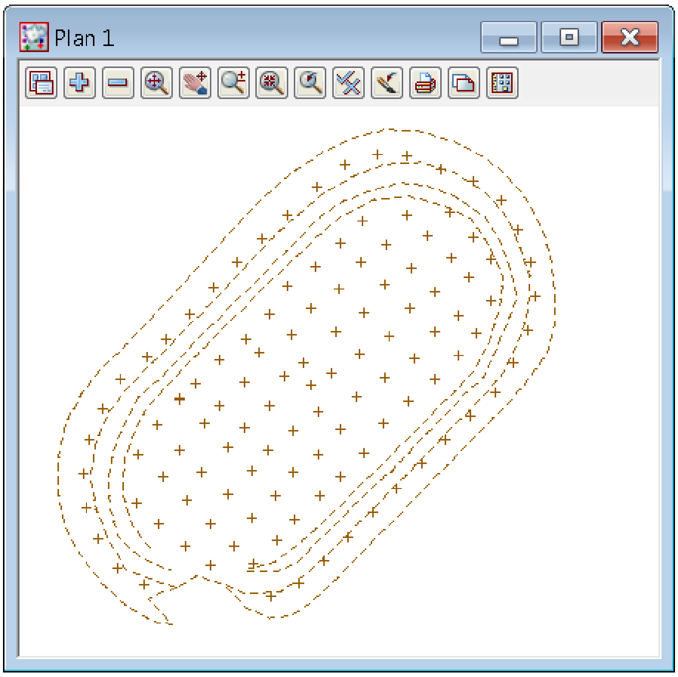



```
Project:      SURFACE COMPARISON
Report File:  STRIPPING VOLUME.rpt

 Volumes from tin "ORIGINAL" to tin "STRIPPING" - (with plan polygon "CG")

    cut volumes are negative
    fill volumes are positive


 Total cut                        -1552.895
 Total fill                           0.000
 Total balance                    -1552.895
 ie excess of cut over fill        1552.895

 Polygon plan area = 14693.126
```

10.4.4Create depth shading

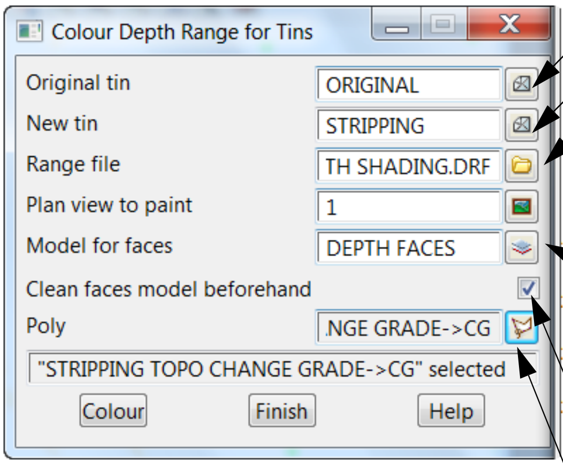
The two surfaces can be compared by colouring the height differences

Turn off the tin models



Select option ***Tins=>Colour=>Tins depths colours***

Move the panel to the side of the survey



Select **ORIGINAL** for original tin

Select **STRIPPING** for new tin

Select Range file icon then browse to the folder **C:\12d\11.00\Training\survey\volumes** then select the file **DEPTH SHADING.drf**

Select view **1** to paint

Type in model **DEPTH FACES** for the colouring model.

DO NOT ENTER A MODEL NAME IF USING PRACTICE VERSION AS A LARGE NUMBER OF STRINGS ARE CREATED

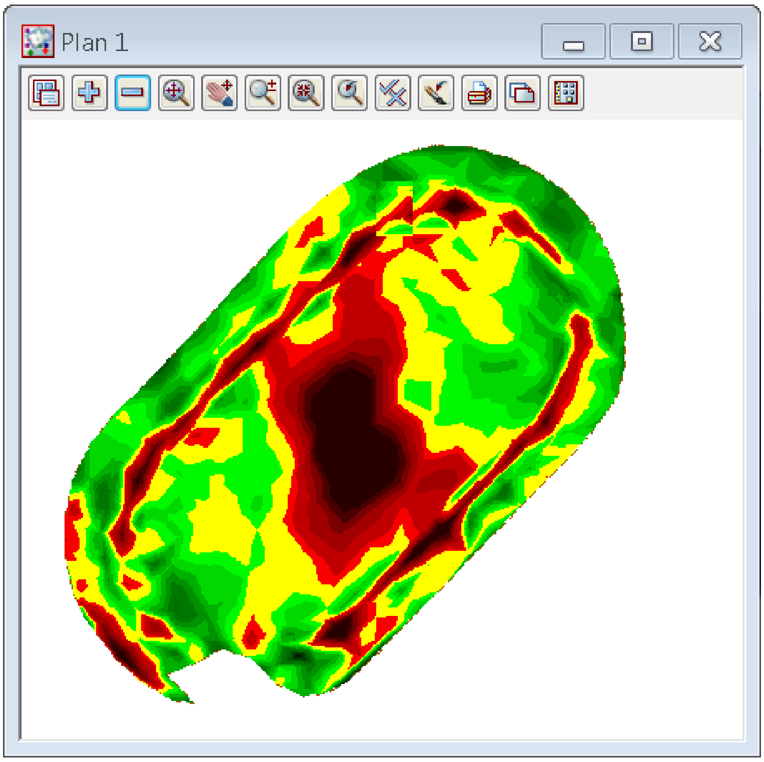
Tick check box to clean faces model beforehand

Select Poly choice icon and then pick and accept the edge of the stripped surface

Select **Colour**

A preview of the colouring appears temporarily.

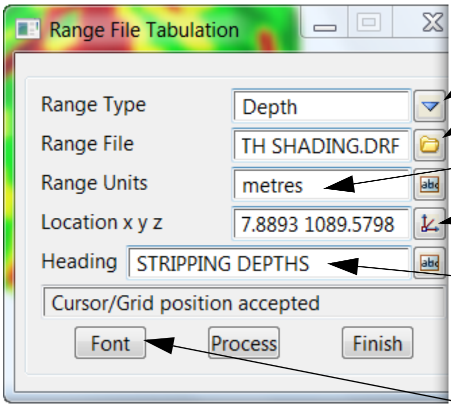
Turn on the model **DEPTH FACES**



10.4.5Create tabulation of range file

A table will be created to tabulate the depth colours

Select ***Drafting=>Text and tables=>Tabulate range file***



Select **Range Type** icon and select **Depth**

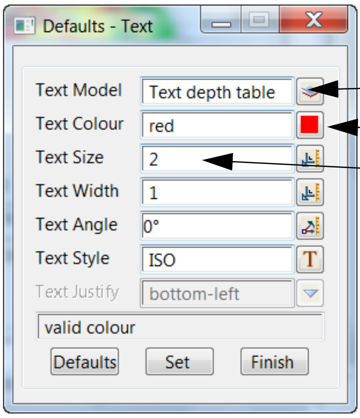
Select file **DEPTH SHADING.drf** from the folder **C:\12d\11.00\Training\survey\volumes**

Type in **metres** for the range units

Select Position icon. Pick and accept a point for the upper left corner of the propose table

Type in **STRIPPING DEPTHS**

Select **Font**



Type in model name for table **txt depth table**

Select the colour for the table

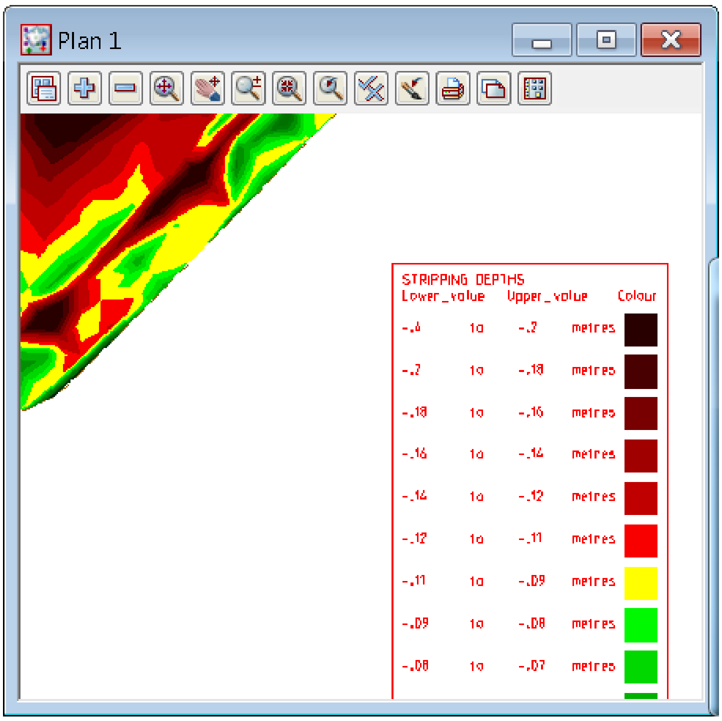
Type in an appropriate size for the text.

Note that the text size is in world units

Select **Set** then **Finish** to return to the previous panel

Select **Process**

Turn on the model **txt depth table**

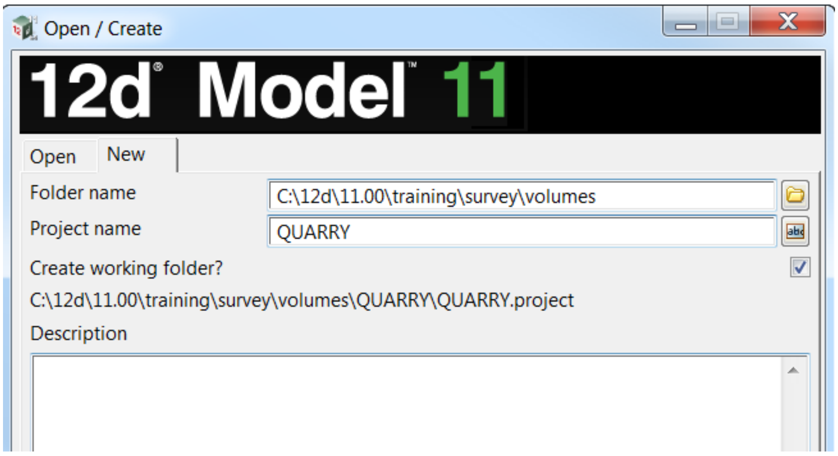


10.5 Progressive volumes

In this topic we will look at the use of super tins to combine surfaces after each survey of an excavation.

Create a new project as shown previously called **QUARRY** in the folder

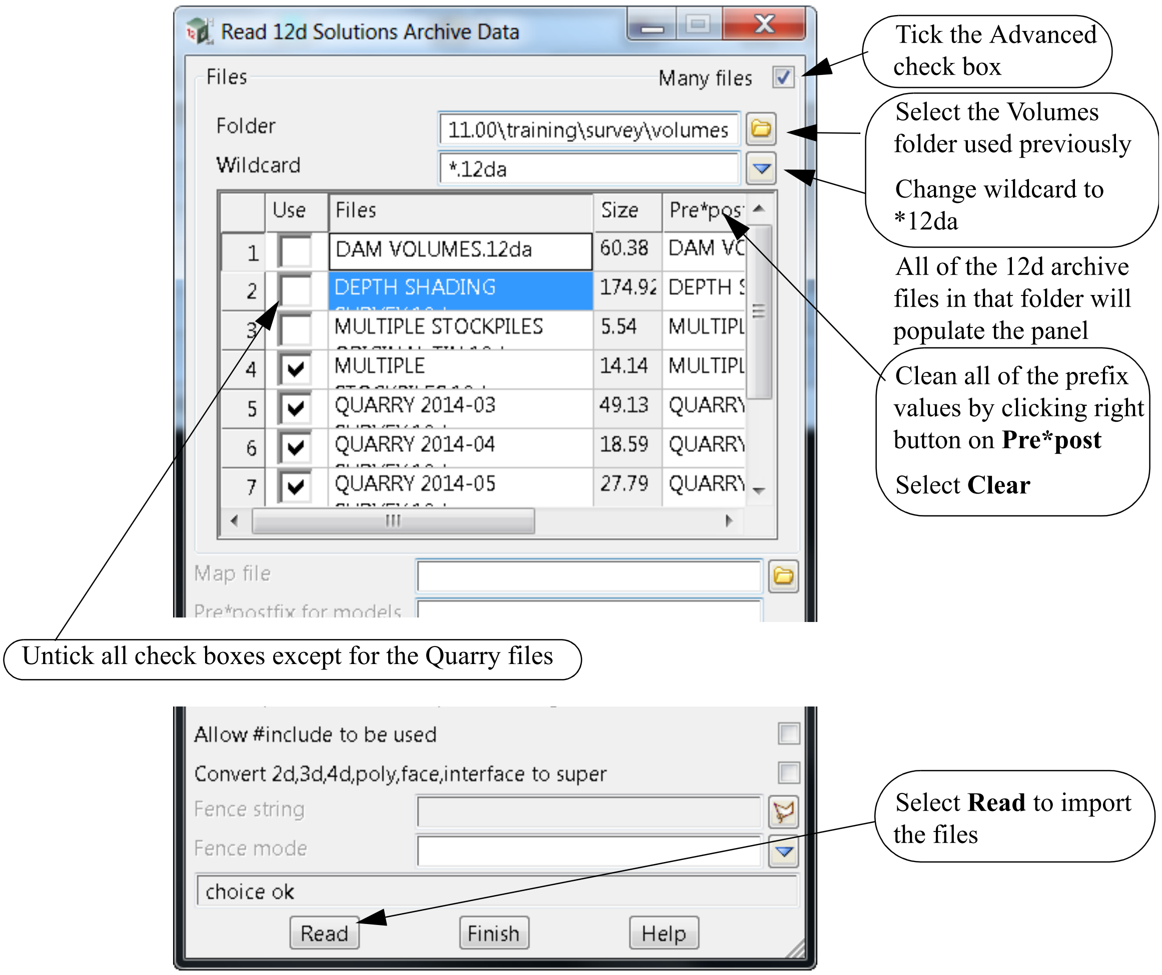
C:\12d\11.00\Training\Survey\Volumes

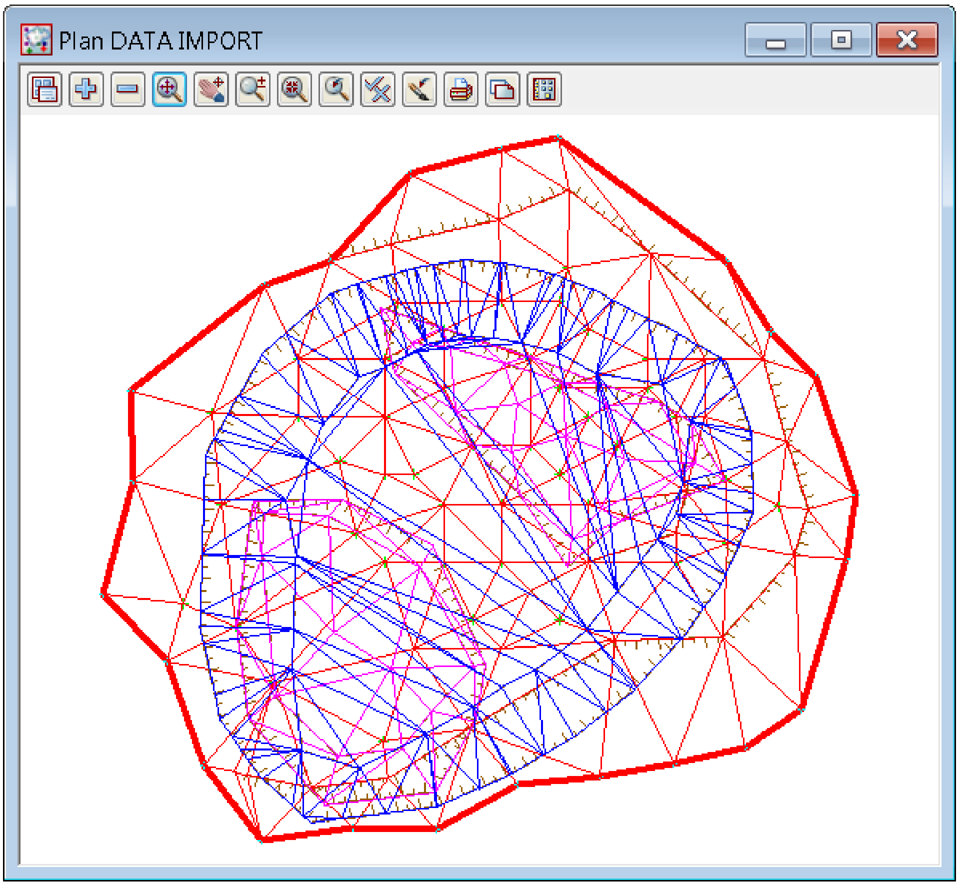


10.5.1 Read in multiple surveys

We will read in the data for the three surveys of a quarry as the excavation develops. The data has been given in the form of 3 12d archive files. This time we will read the files in together in one option

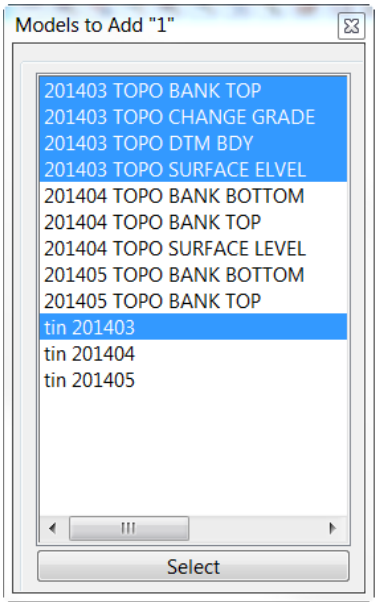
Select option ***File =>Data Input=>12d=>12d archive data***

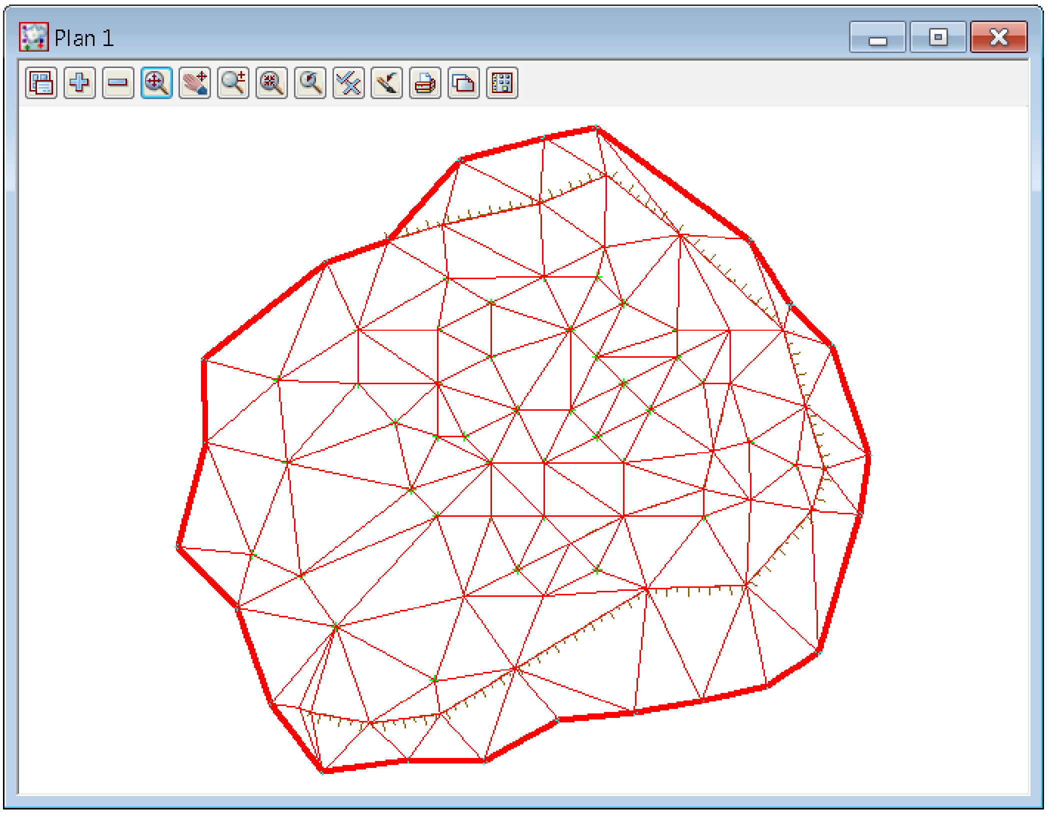



Plan DATA IMPORT

10.5.1.1View March survey

In Plan view **1** turn on 201403 models and toggle on the contours

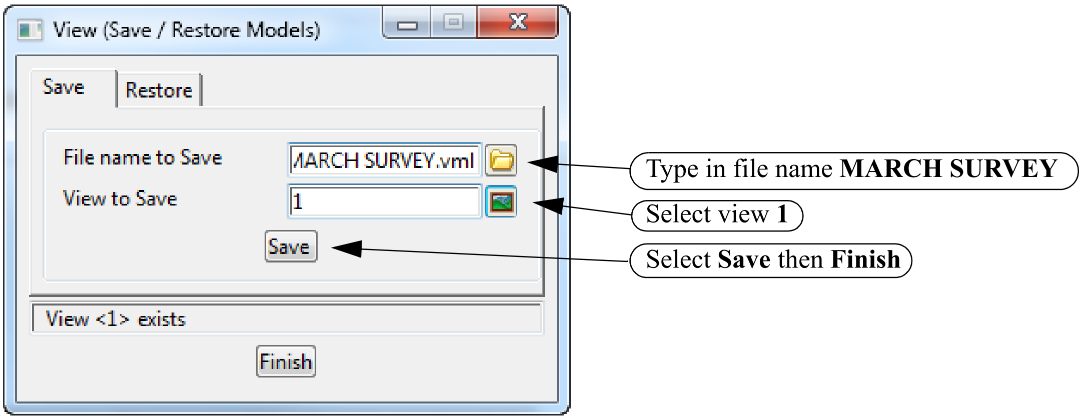




10.5.1.2Save the March model list

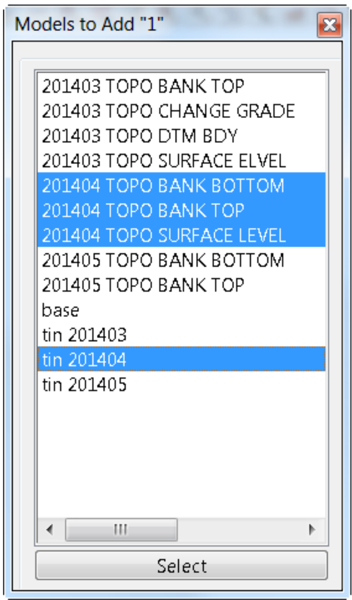
The march survey models can be saved away to a model listing file

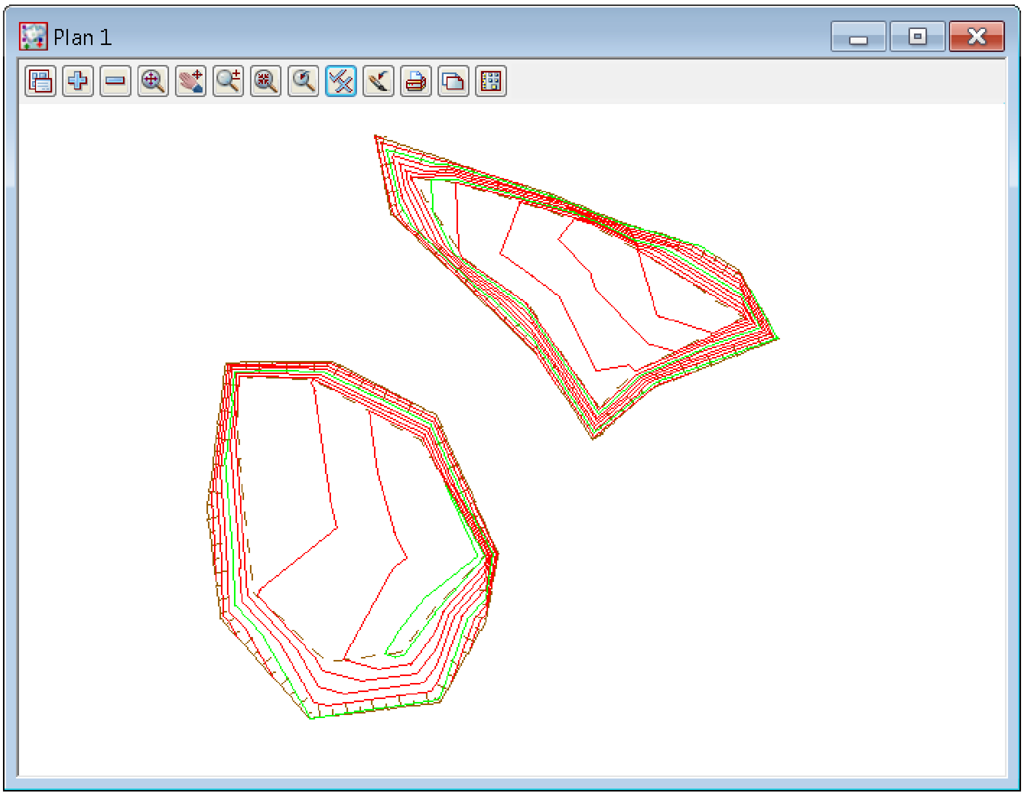
Select ***View=>Models Save/Restore***



10.5.1.3View April survey

Turn off all models and then turn on 201404 models

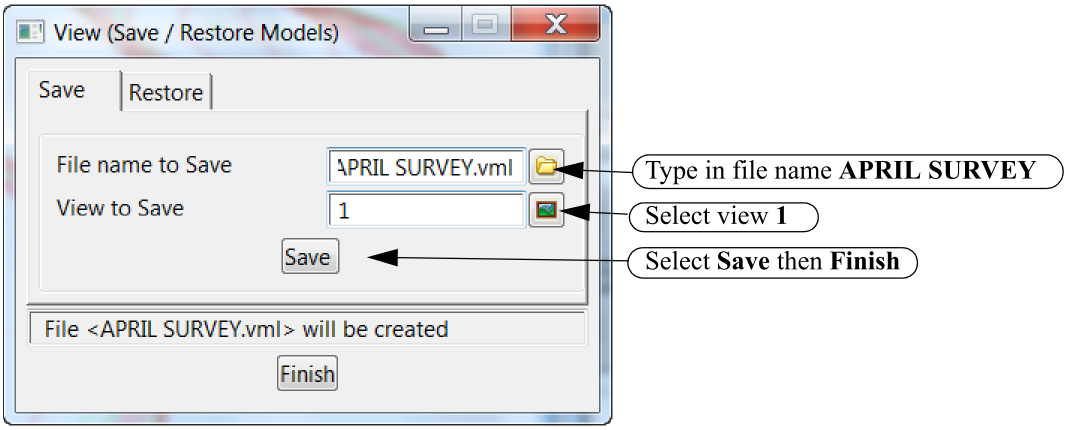




10.5.1.4Save the April model list

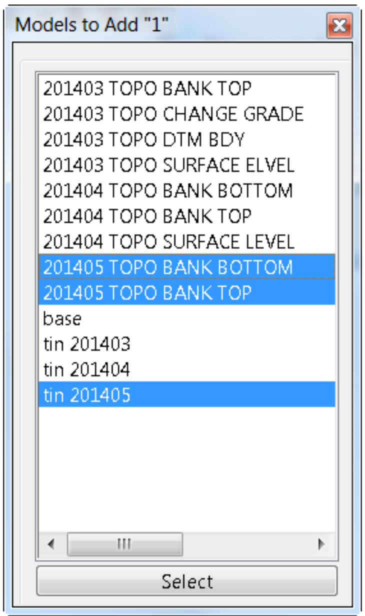
The April survey models can be saved away to a model listing file

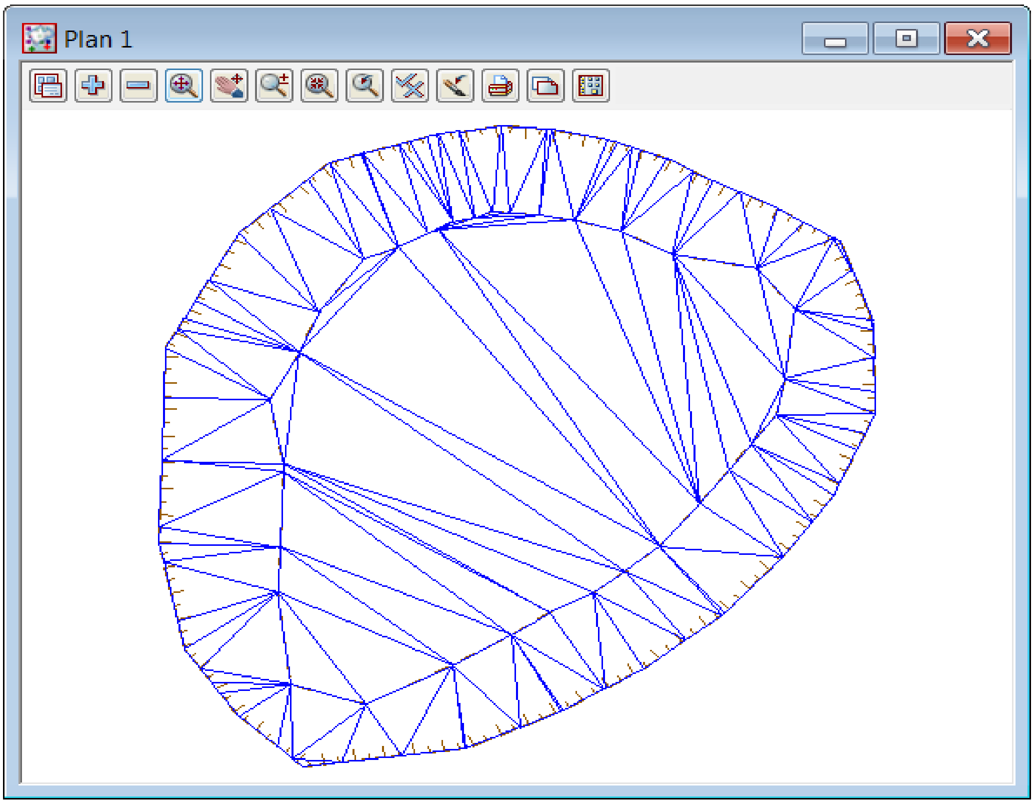
Select ***View=>Models Save/Restore***



10.5.1.5View May survey

Turn off all models then add the 201405 models

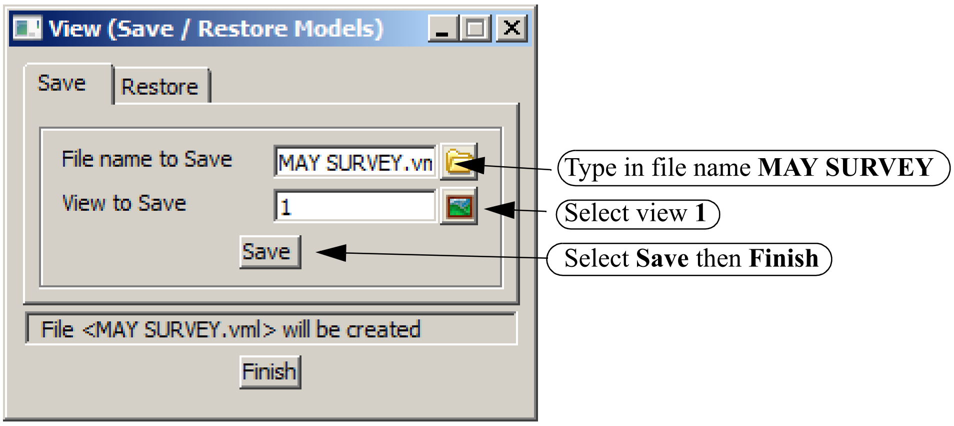




10.5.1.6Save the May model list

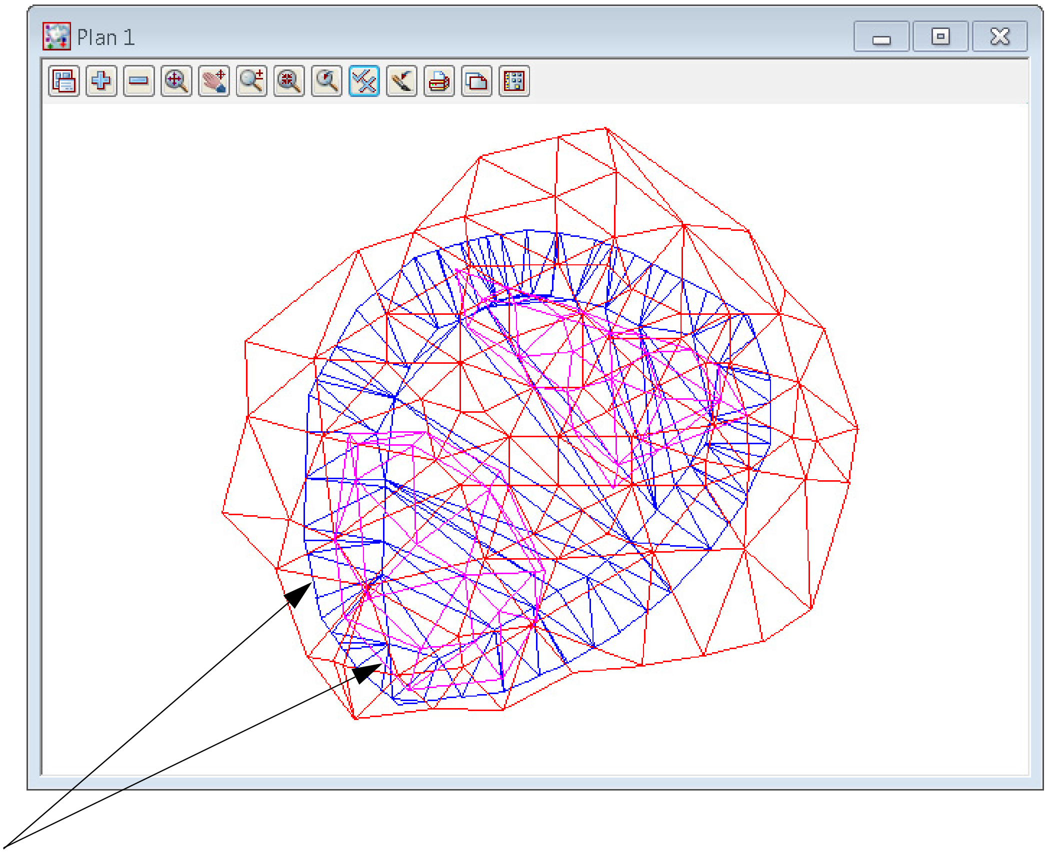
The May survey models can be saved away to a model listing file

Select ***View=>Models Save/Restore***



10.5.2Check April and May tin lies within March tin

Turn off all models then turn on all of the tins



Ensure the outline of the April and May triangulations lies completely inside the March triangulation

10.5.2.1Shade tins

Shading the tins can help with the checking of the overlapping

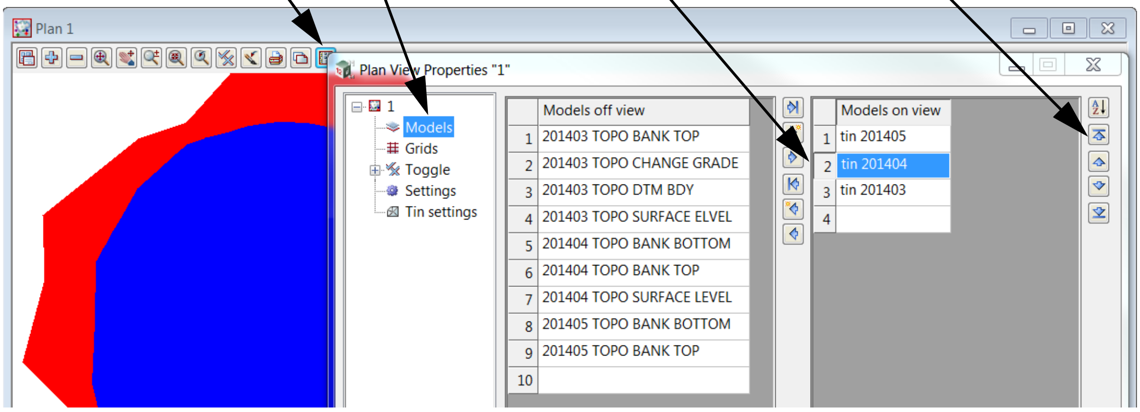
Toggle on **Tin solid**

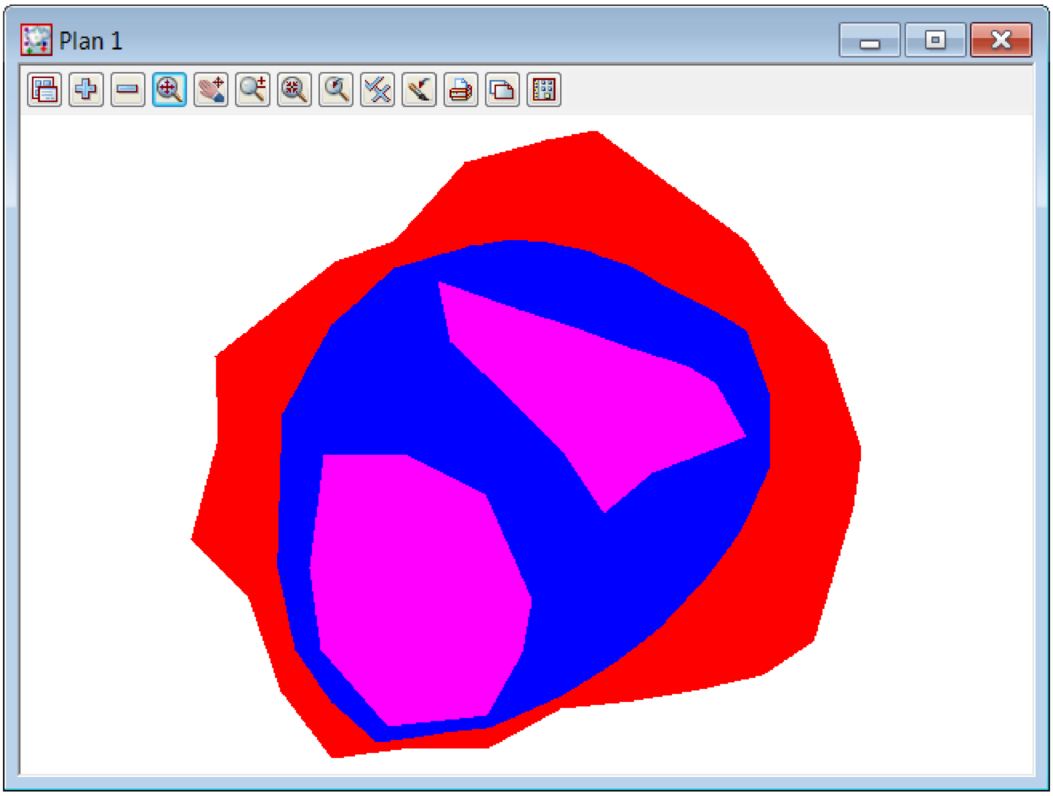
As the April tin is smaller in area than the May tin it is hidden by the May tin colouring. To make the April tin visible we can move the April tin model to the top of the model list

Select the **Plan View Properties** icon

Select **Models**.

Select model **tin 201404** and then select **Move to top** icon





Toggle off the **Tin solid**

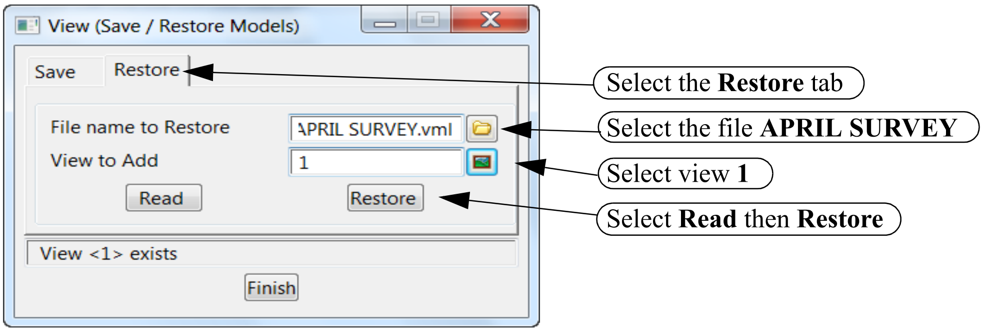
10.5.3Calculate volumes from March to April survey

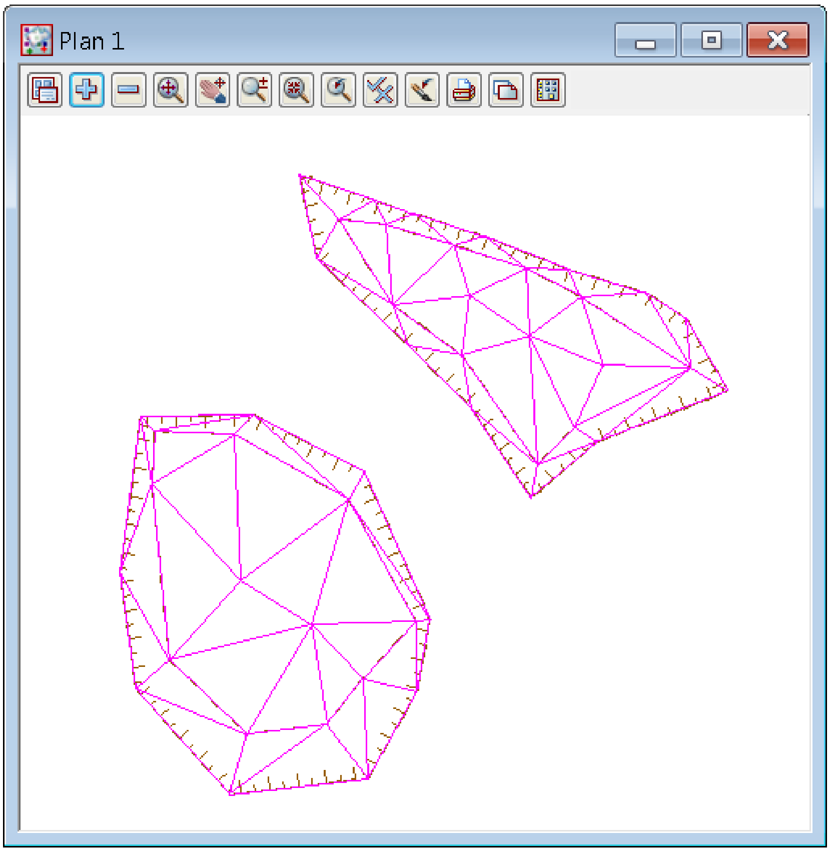
We will now calculate the volumes between the March and April survey

Firstly turn off all models then read back in the April survey. We will do this by reading in the model list previously created

10.5.3.1Restore the April model list

Select ***View=>Models Save/Restore***

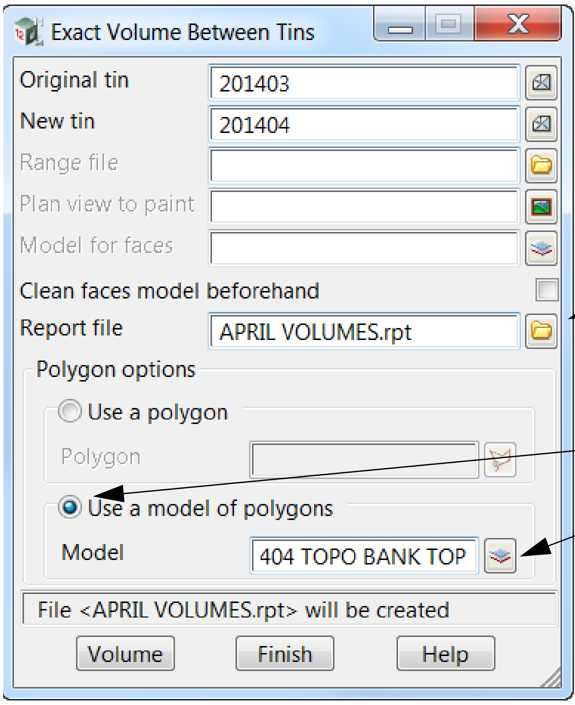




10.5.3.2Calculate EXACT TIN TO TIN volumes

The volume between the two tins can now be calculated and written to a report file. We will calculate using the Exact tin to tin exact method.

Select ***Design=>Volumes=>Exact=>Tin to tin***



Select **201403** for original tin model

Select **201404** for new tin model

Type in **APRIL VOLUMES** for report file name

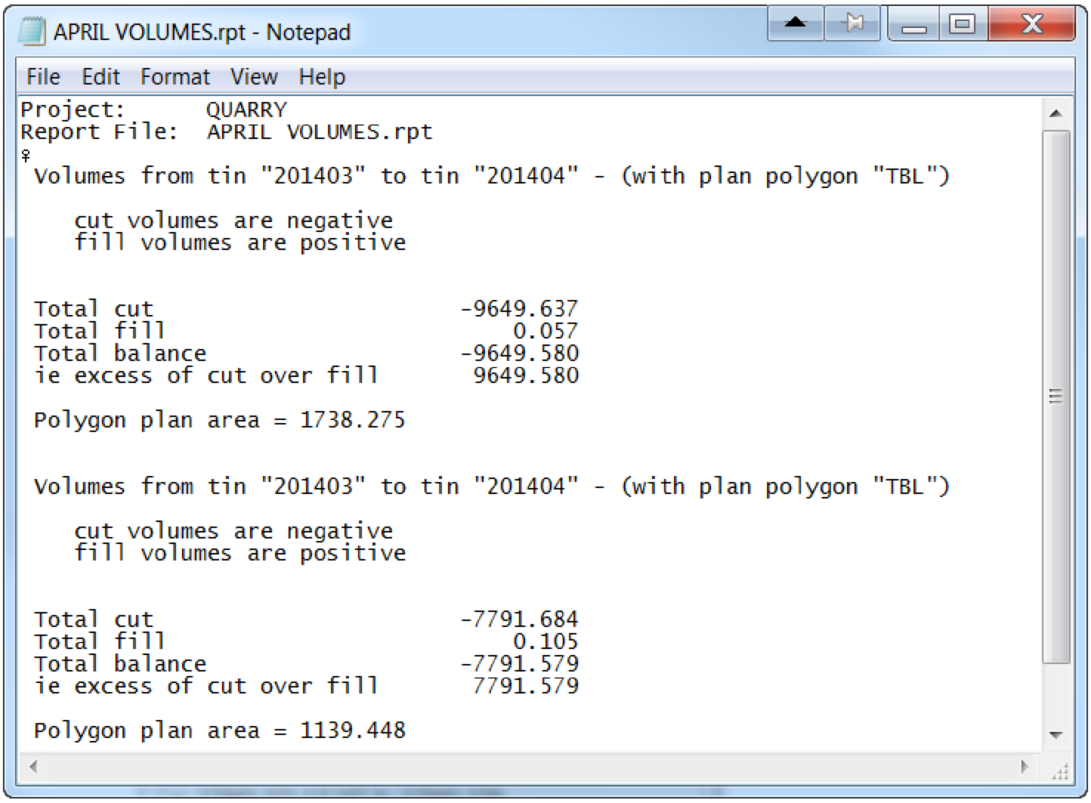
NOTE - report files are not available in the 12d Model Practise Version

Select **Use a model of polygons**

Select model **201404 TOPO BANK TOP** for the edge of the excavations

Select **Volume** to calculate the volume between the two surfaces

The volume report is opened in the default text editor with separate volumes for each pit



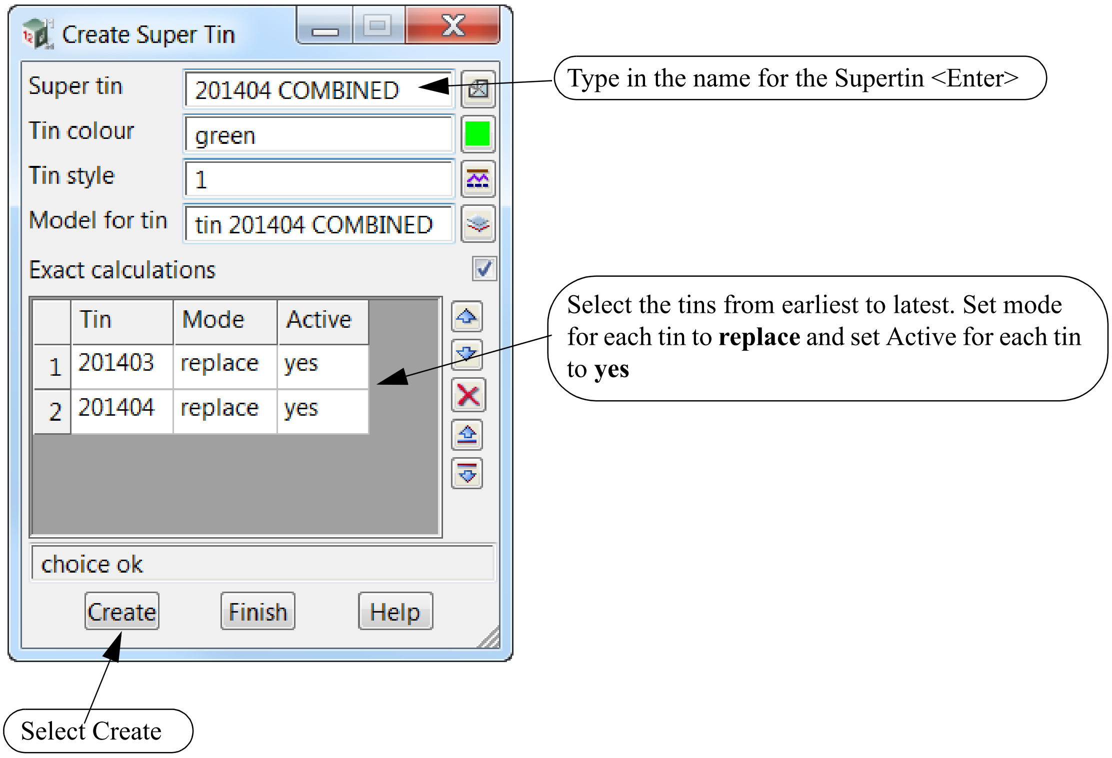
```
Project:      QUARRY
Report File:  APRIL VOLUMES.rpt

 Volumes from tin "201403" to tin "201404" - (with plan polygon "TBL")

    cut volumes are negative
    fill volumes are positive


 Total cut                        -9649.637
 Total fill                           0.057
 Total balance                    -9649.580
 ie excess of cut over fill        9649.580

 Polygon plan area = 1738.275


 Volumes from tin "201403" to tin "201404" - (with plan polygon "TBL")

    cut volumes are negative
    fill volumes are positive


 Total cut                        -7791.684
 Total fill                           0.105
 Total balance                    -7791.579
 ie excess of cut over fill        7791.579

 Polygon plan area = 1139.448
```

10.5.4Combine the March and April surfaces

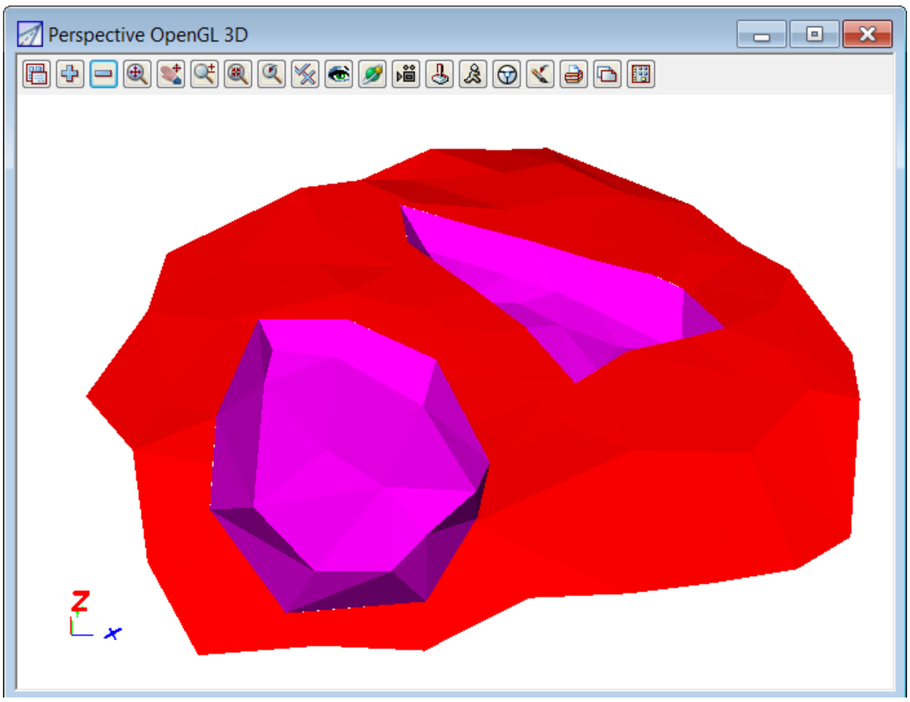
We need to combine the March and April tins in order to calculate the volumes for the May survey. This is done by creating a super tin which dynamically combines multiple tins into one

10.5.4.1Create super tin of March and April surveys

Select option ***Tins =>Create =>Supertin***



Check the supertin in the Perspective view **3D** with shade toggled on



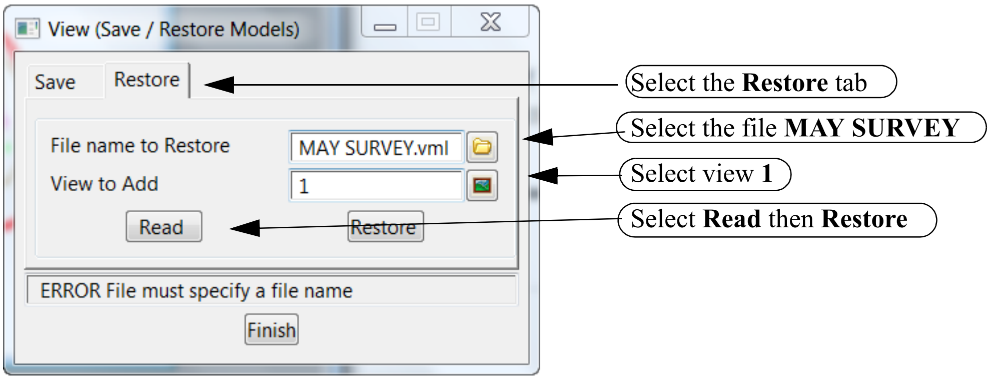
10.5.5Calculate volumes from April to May survey

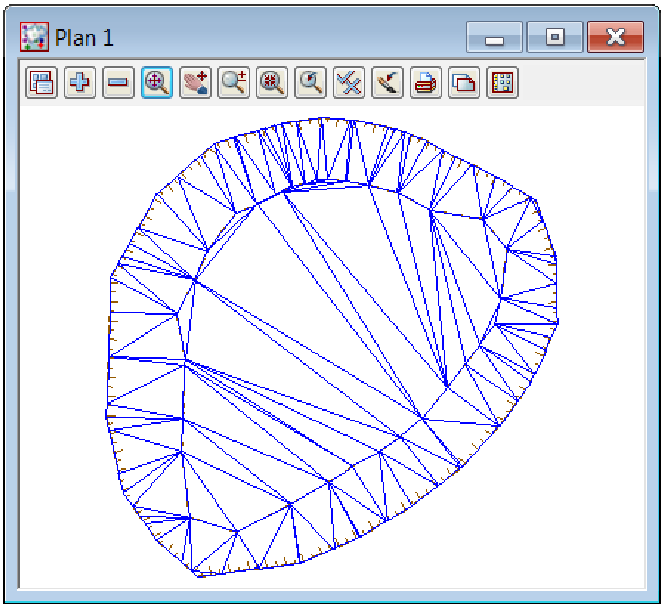
We will now calculate the volumes between the combined April supertin **201404 COMBINED** to the May survey tin **201405**

Firstly turn off all models then read back in the May survey. We will do this by reading in the model list previously created

10.5.5.1Restore the May model list

Select ***View=>Models Save/Restore***

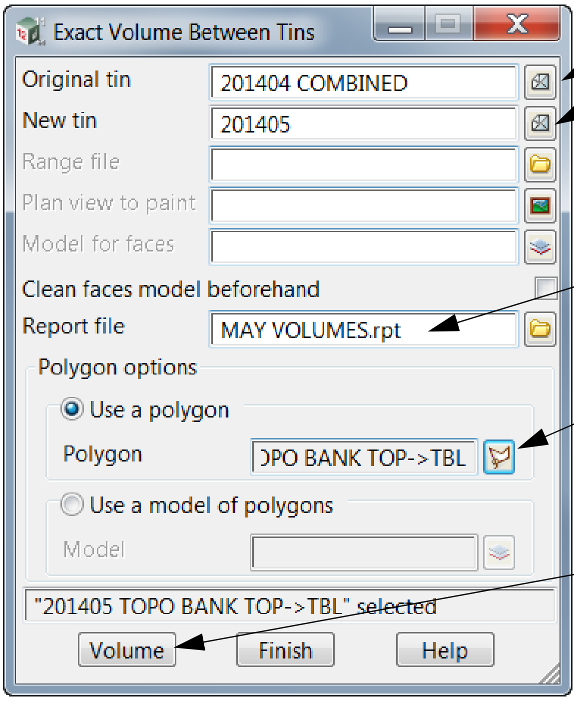




10.5.5.2Calculate EXACT TIN TO TIN volumes

The volume will now be calculated from the combined April survey to the May survey

Select ***Design=>Volumes=>Exact=>Tin to tin***



Select **201504 COMBINED** for original tin model

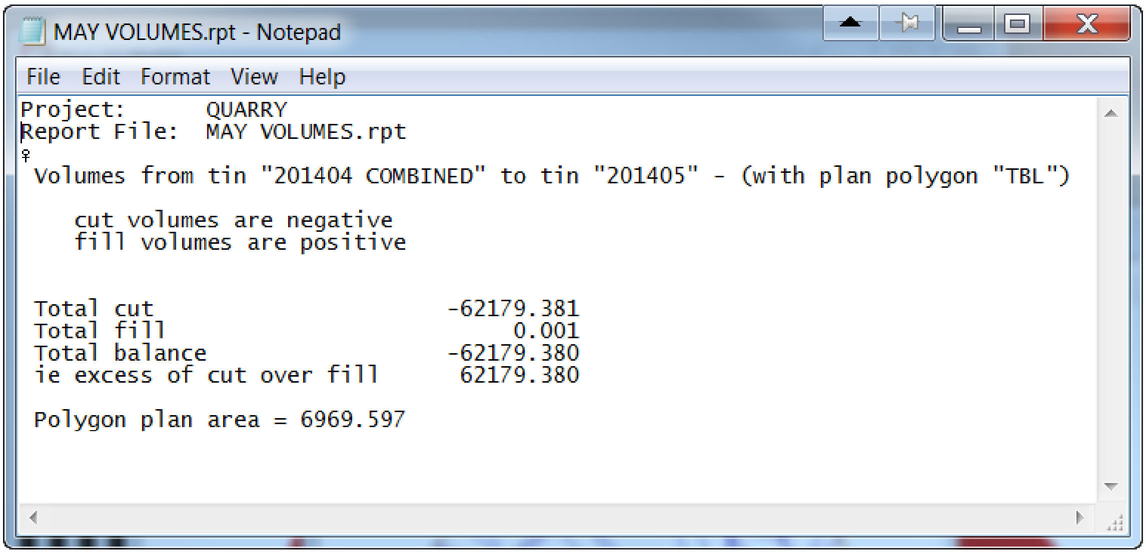
Select **201505** for new tin model

Type in **MAY VOLUMES** for report file name

NOTE - report files are not available in the 12d Model Practise Version

Select **Use a polygon** and then pick the top of bank string

Select **Volume** to calculate the volume between the two surfaces




```
Project:      QUARRY
Report File:  MAY VOLUMES.rpt

 Volumes from tin "201404 COMBINED" to tin "201405" - (with plan polygon "TBL")

    cut volumes are negative
    fill volumes are positive


 Total cut                      -62179.381
 Total fill                          0.001
 Total balance                  -62179.380
 ie excess of cut over fill      62179.380

 Polygon plan area = 6969.597
```

11 Setout

In this chapter we will look at various types of setout calculations from features constructed in the graphics to imported strings and tins. Setout files are created for each topic.

The types of setout include:

Building creation and setout. See 11.1 Building setout on page 257.

Imported building from cad file. See 11.2 Cad House Setout on page 279.

Setout for evenly graded string. See 11.3 Setout for evenly graded string on page 286.

Creating 3d setout for imported 2d cad strings. See 11.4 Setout for polyline culdesac string on page 292.

Triangulation setout. See 11.5 Triangulation setout on page 300.

Road setout from imported strings. See 11.6 Road Setout on page 302.

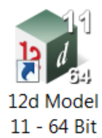
QA Reporting of point, string and tin setout. See 11.7 Setout reports on page 304.

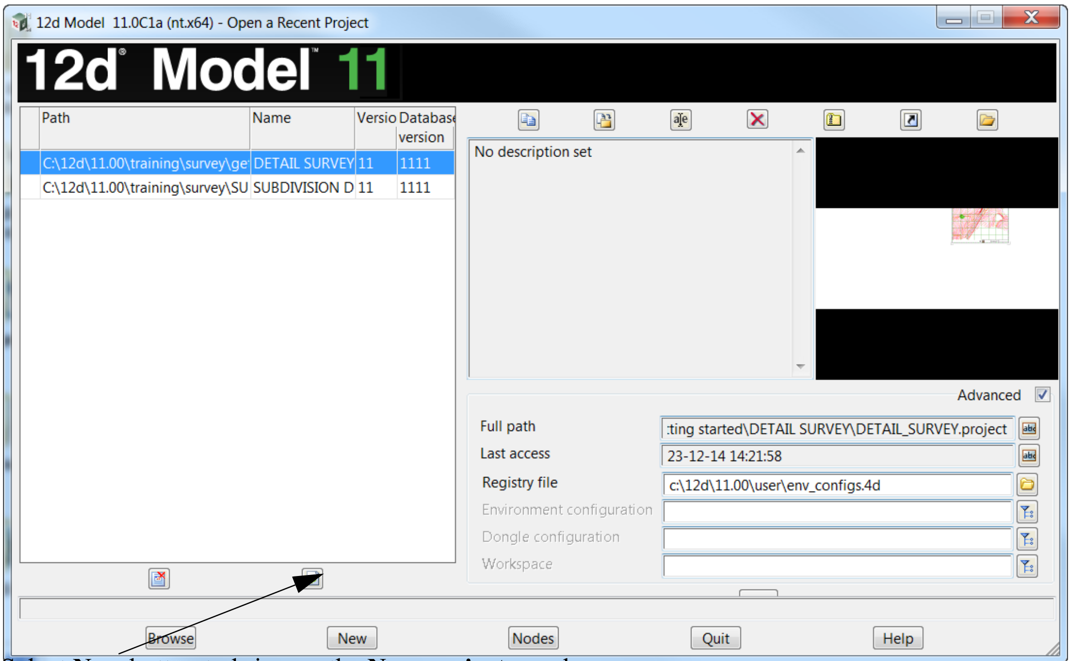
11.1 Building setout

In this topic we will create a lot outline and position a building on the lot for setout.

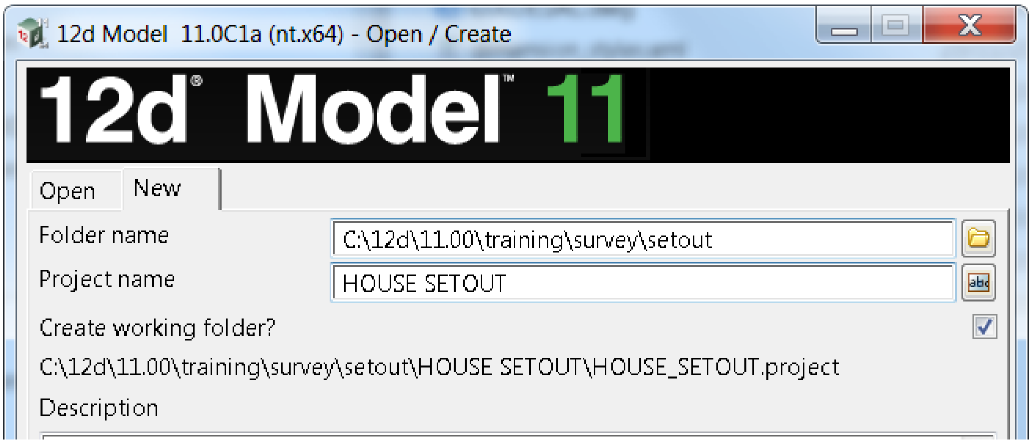
To begin create a new project called **HOUSE SETOUT** in the Survey training area

First, double click on the *12d Model 11* icon to bring up the **Project Selection** panel.





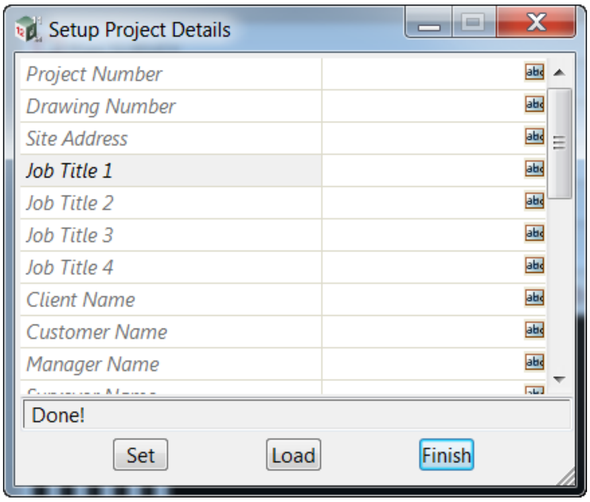
Select **New** button to bring up the **New project** panel.



Create a project under the folder **C:\12d\11.00\Training\survey\setout** called **HOUSE SETOUT**

With the ***Create working folder*** check box ticked a working folder with the same name as the project will be also created

Select **[Create]** to create and open the project



When the project starts up for the first time the **Project Details** panel appears

The information typed in here can be used when plotting from this project

Fill in the various prompts if necessary

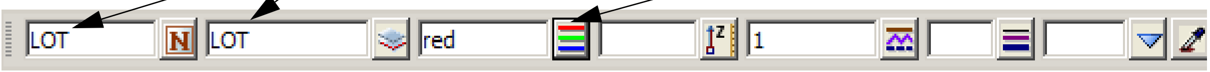
Select **Set** then **Finish** to save the settings and continue

11.1.1Create the lot outline

We will use plan view **1** for the house setout.

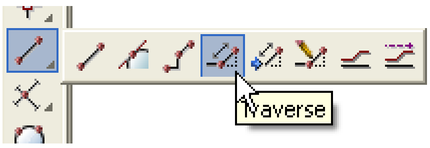
The lot outline will be created in a model called **LOT**

Type in the name and model name **LOT** in the **CAD controlbar.** Select the colour **Red**

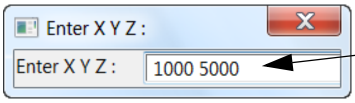


Select option ***Cad =>Line =>Traverse***

or **Traverse** icon

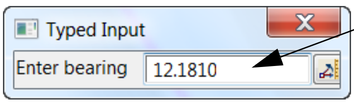


Press the **Space** bar to activate the **coordinate entry** panel



Type in the coordinates **1000 5000 [Enter]**

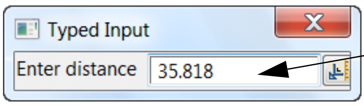
Press the **Space** bar to activate the **bearing input** panel



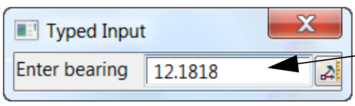
Type in the bearing **12.1810 [Enter]**

NOTE - This is the dms method for entering the bearing 12°18’10".

Press the **Space** bar to activate the **distance input** panel

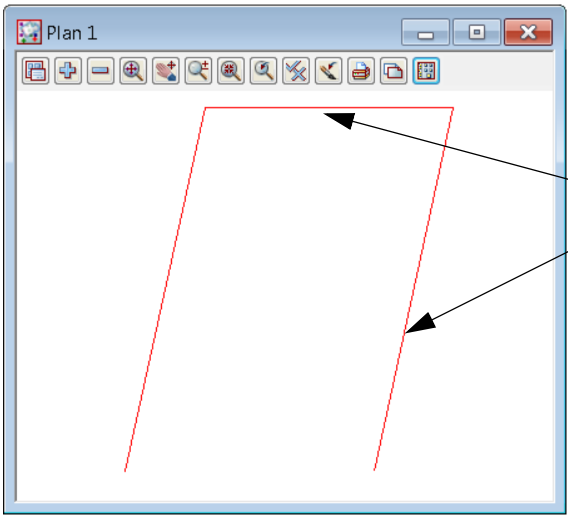


Type in the distance **35.818 [Enter]**



When pressing the space key for the next bearing input the previous bearing is shown highlighted in the panel. Type over the previous bearing to input the new bearing**.**

Other options to amend the previous bearing will be discussed when entering the house outline



Repeat the entry of bearing and distance using the following dimensions

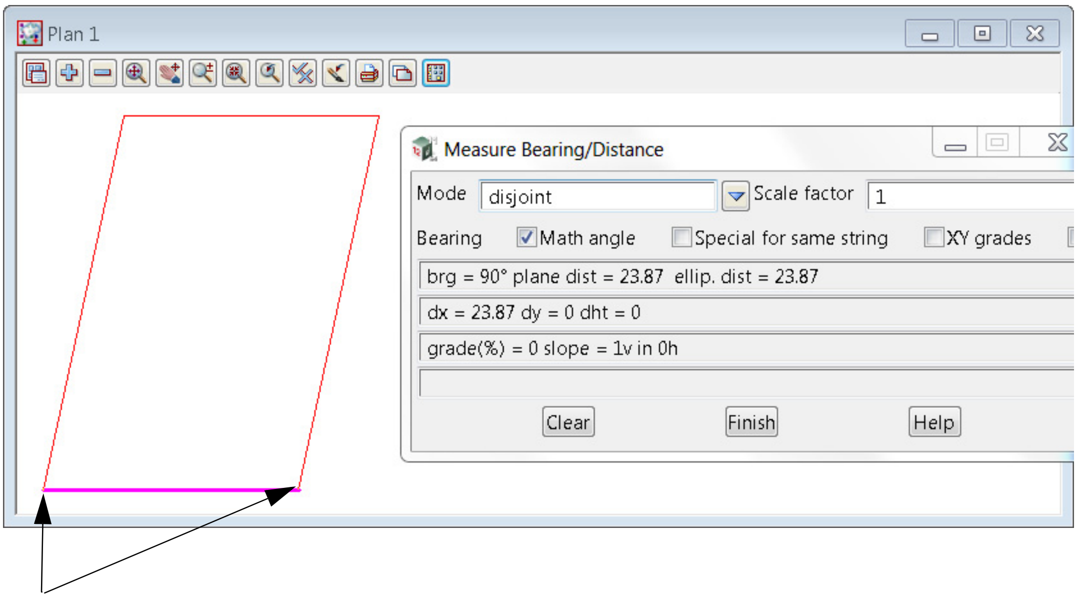
90°00’00"   23.870

192°18’10"   35.818

192°18’10" is entered as 192.1810. Remember to input the trailing zeroes.

After typing this line press [Esc] to exit option

Check the misclose of the last line by selecting option ***Utilities=>Measure=>Bearing/Distance*** or **Measure Bearing/Distance** icon



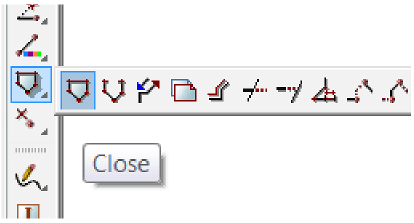
Select and accept the start and end points of the lot traverse

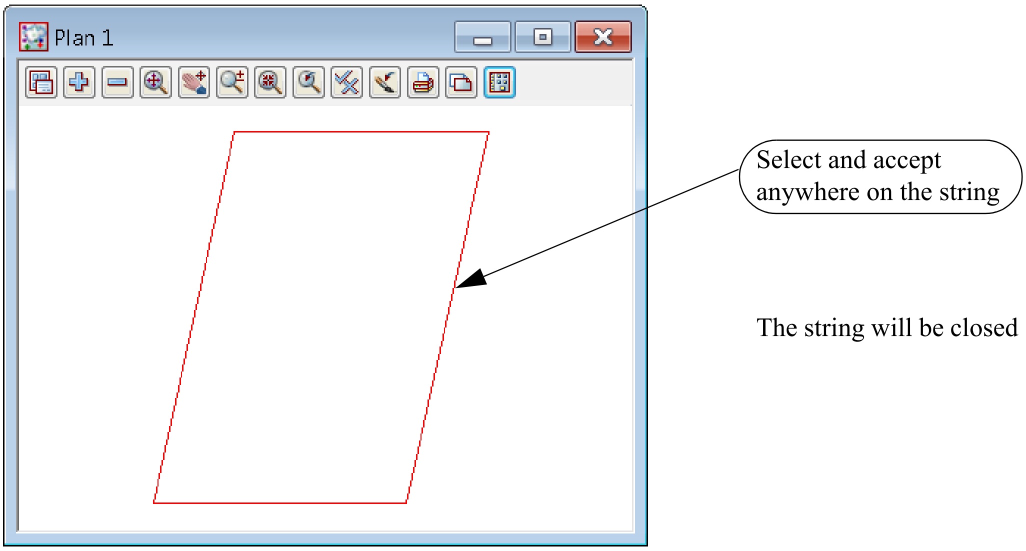
The bearing and distance between the two points is displayed

Exit the panel

If the bearing and distance between the points are correct, close the string by using option
Cad =>String =>Close

or select **Close** icon



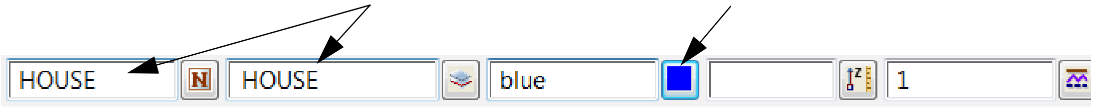


From this point on we will be using the cad icons only. The menu options are available under the ***Cad*** menu

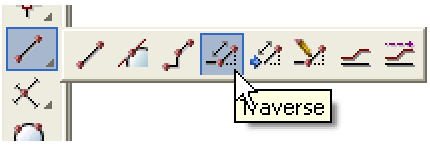
11.1.2Create building outline

In this option we will create the outline of the building using the previous traverse routine and explore some other traverse editing features

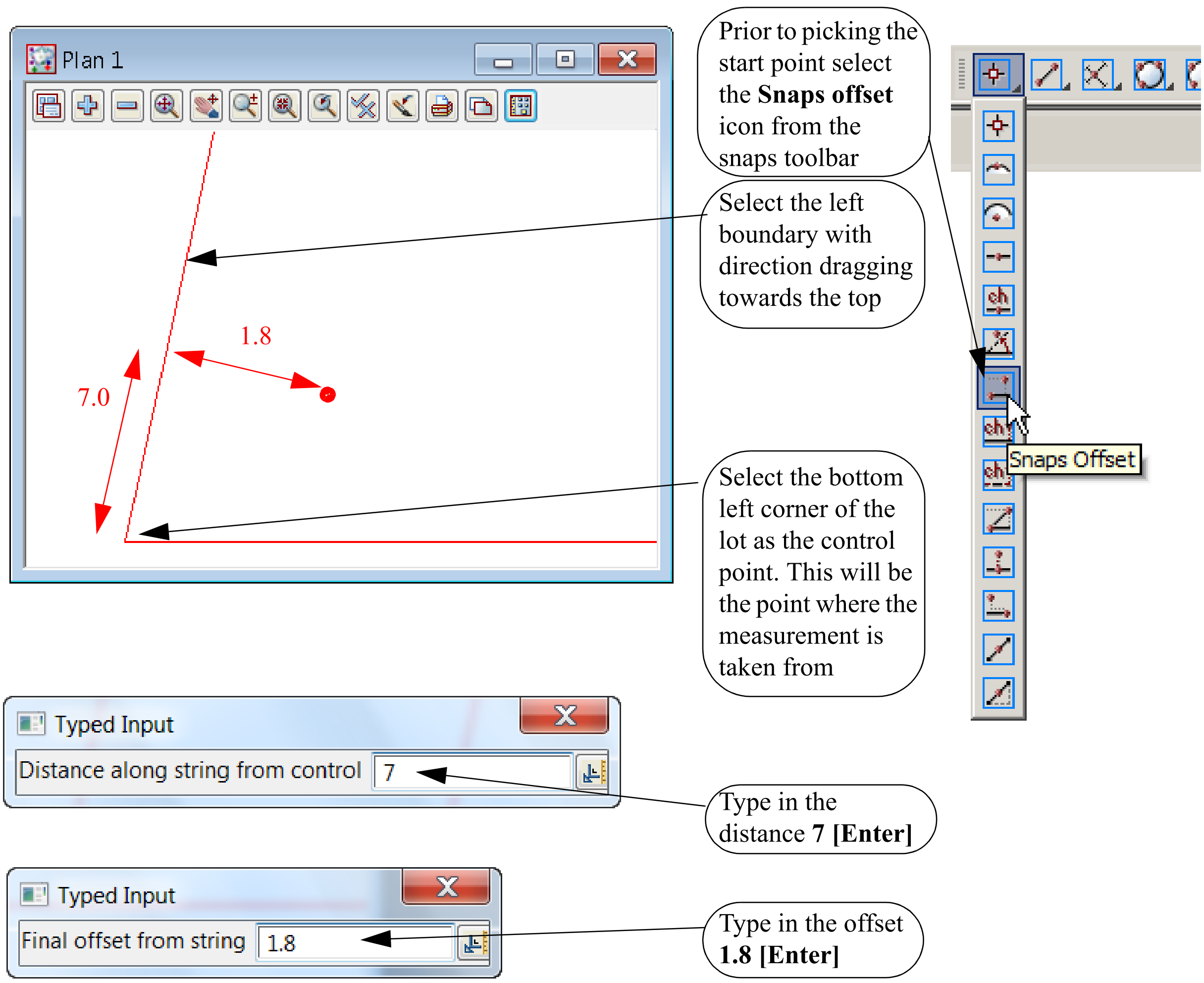
Type in the name and model name as **HOUSE** in the **CAD controlbar.** Select the colour **blue**

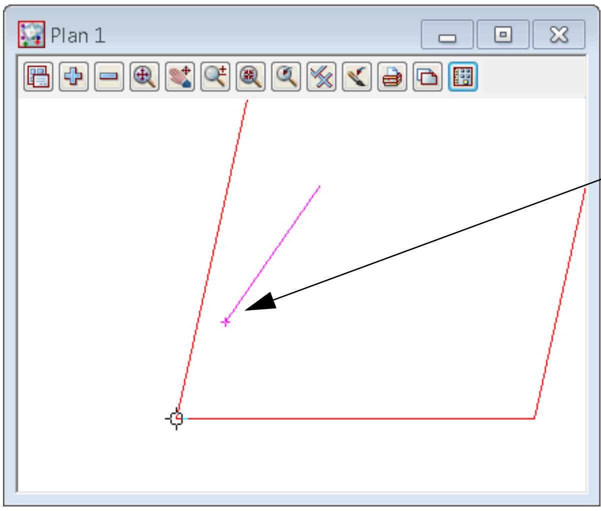


Select option **Traverse** icon



We are going to start the house corner 7.0 metres up from the lower left corner of the lot and offset 1.8 metres in from the side boundary

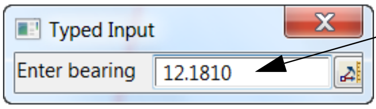




The point is created in a model called **constructions snap data** and is automatically turned off.

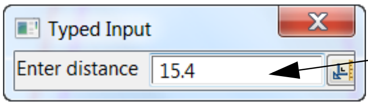
The end of the string now locks to the cursor position

Press the **Space** bar to activate the **bearing input** panel



Type in the bearing **12.1810 [Enter]**

Press the **Space** bar to activate the **distance input** panel

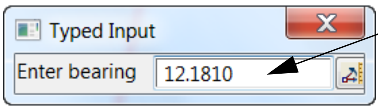


Type in the distance **15.40 [Enter]**

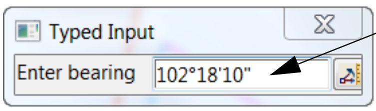
We will now look at some options to speed up the traversing process.

For the next bearing we are going to traverse at right angle to the previous bearing

Press the **Space** bar to activate the **bearing input** panel

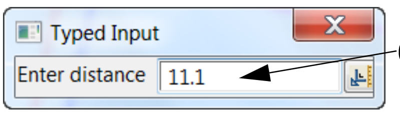


The previous bearing appears. Press **[Page Up]** to add 90 degrees to the bearing (We could have pressed [Page Down] to subtract 90 degrees.



Press [Enter] to confirm the bearing

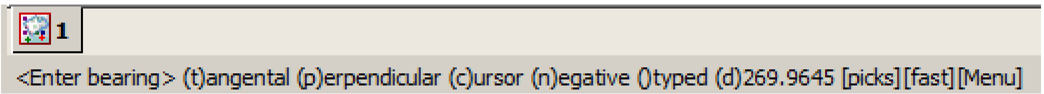
Press the **Space** bar to activate the **distance input** panel



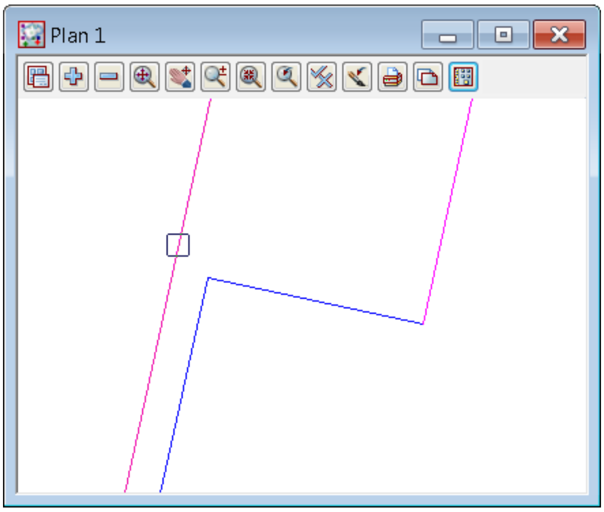
Type in the distance **11.1 [Enter]**

For the next bearing we will traverse tangential to the left boundary line

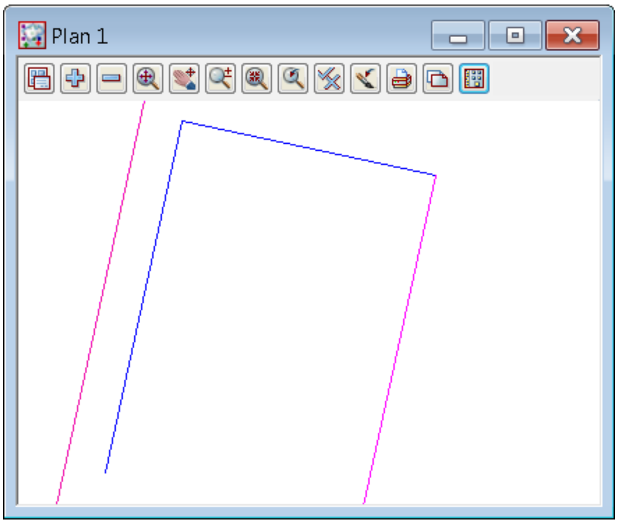
At the bottom of the screen there are a number of options that can be activated by selecting the letter following the option



To traverse tangential select **[T] from the keyboard** then pick the left boundary line



The proposed direction is highlighted. This may be in the opposite direction to that required so simply select **[N]** to reverse the direction line if necessary.



Press middle button or select [Enter] to confirm the direction

Sometimes an error occurs when entering the traverse so the traverse has to be stopped and restarted.

Press **[Escape]** to exit the traverse or click right button then select Cancel from panel

Select option **Traverse Append** icon

Pick and accept the end of the house string

The traverse can continue

The remaining lines are:

Bearing **192.1810** (or tangential to left boundary) Distance **3.0**

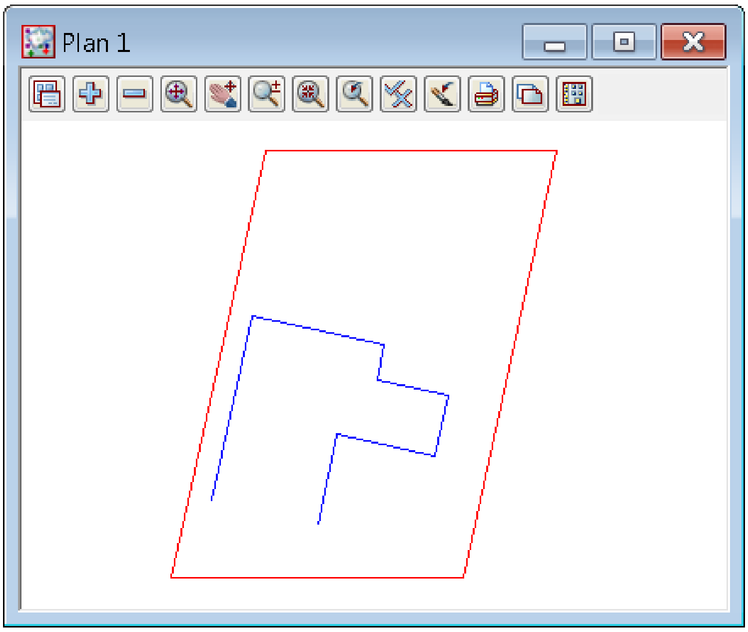
Bearing **102.1810** (or [Page Down] after last bearing) Distance **6.0**

Bearing **192.1810** (or [Page Up] after last bearing) Distance **5.0**

Bearing **282.1810** (or [Page Up] after last bearing) Distance **8.2**

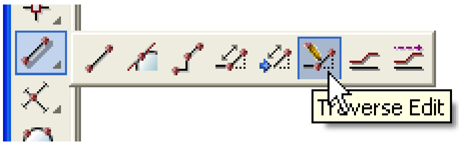
Bearing **192.1810** (or [Page Down] after last bearing) Distance **7.6**

Press [Escape]

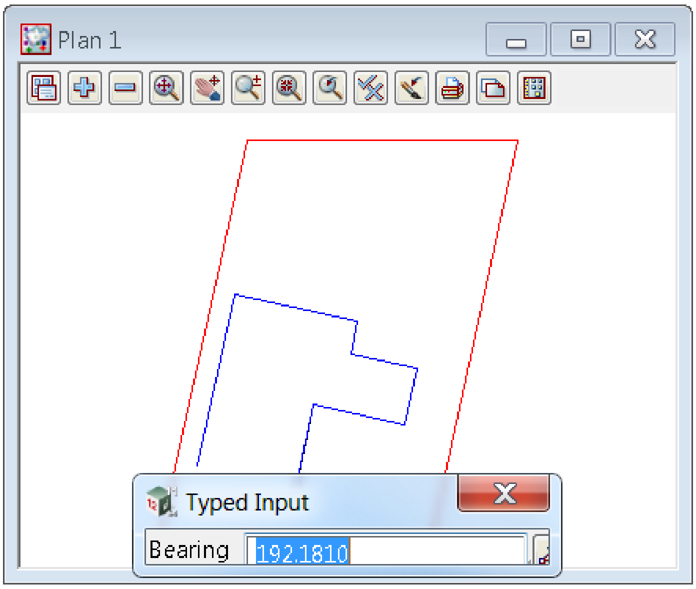


The last line has an incorrect distance and this can be edited using the following

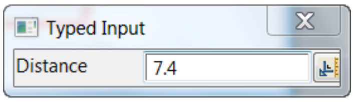
Select option **Traverse Edit** icon



Pick and accept the last traverse line

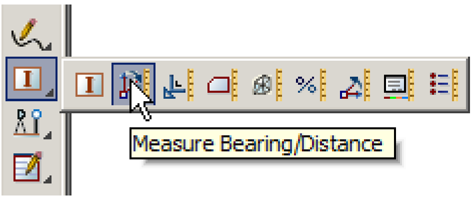


The bearing is displayed. As the error is in the distance press **[Enter]** to accept the bearing



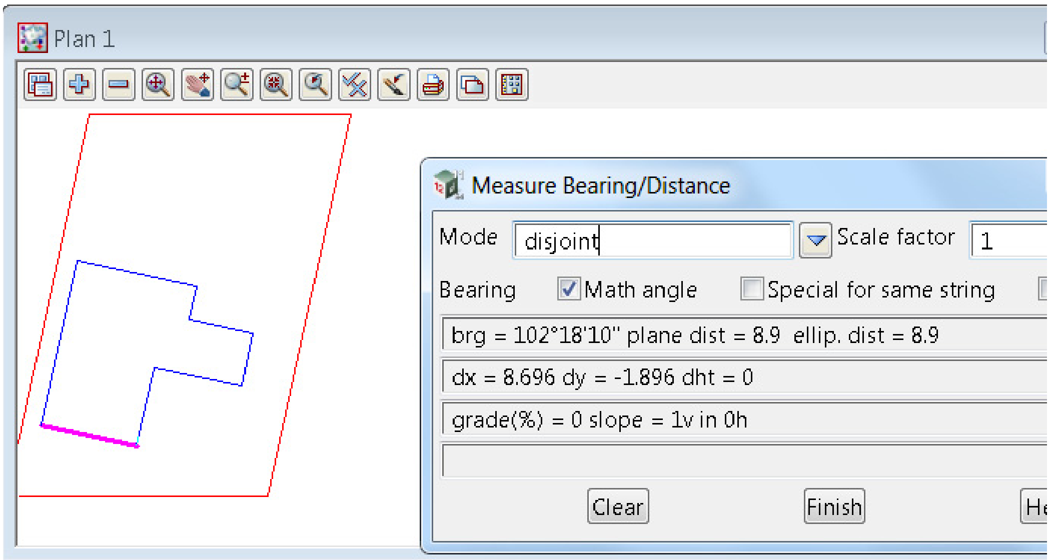
Type in **7.4 [Enter]** for the corrected distance

We can now check the misclose of the house by selecting **Measure Bearing/Distance** icon

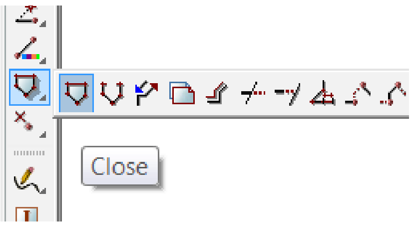


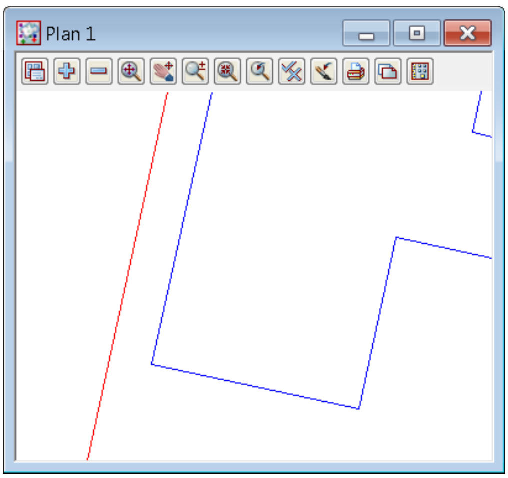
Select and accept the start and end points of the house traverse

The bearing and distance are displayed



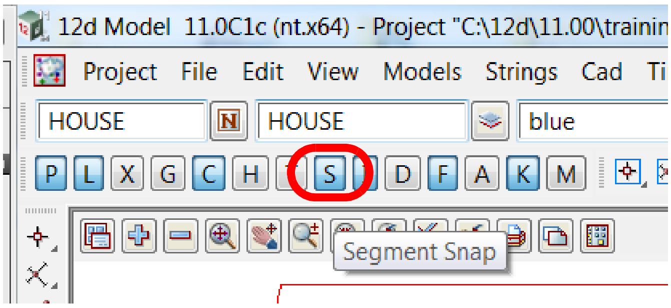
If correct, close the string by using the **Close** icon as shown previously on the lot string





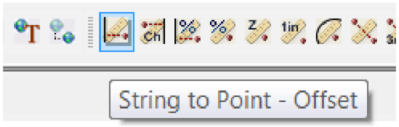
We can now check offsets from the building corners to the boundaries.

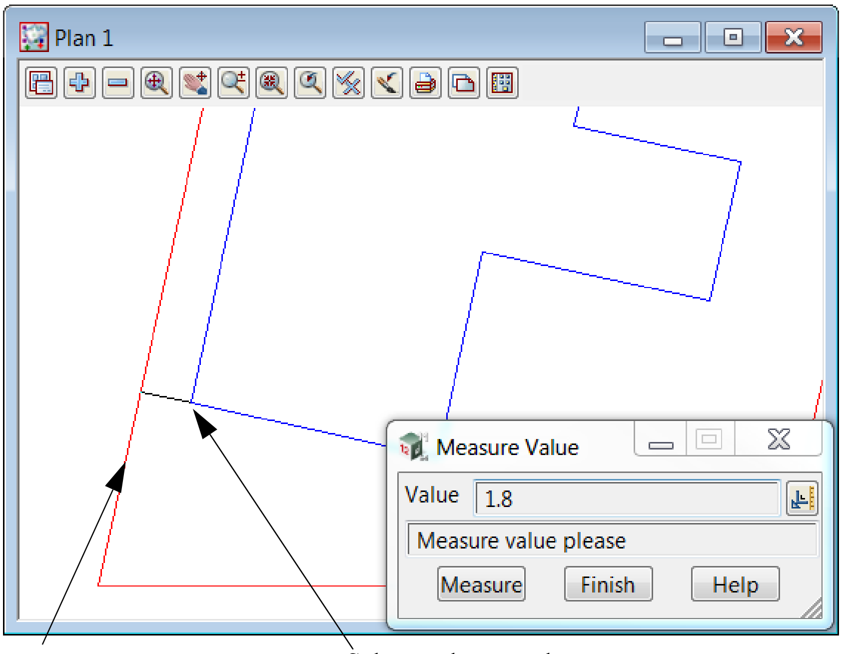
To ensure the offsets are from the selected segment only, we turn on the segment snap



Zoom in to the left side of the building

Select the **String to Point - Offset** icon





Select and accept the left boundary line

Select and accept the front left corner of the house

The offset distance is displayed

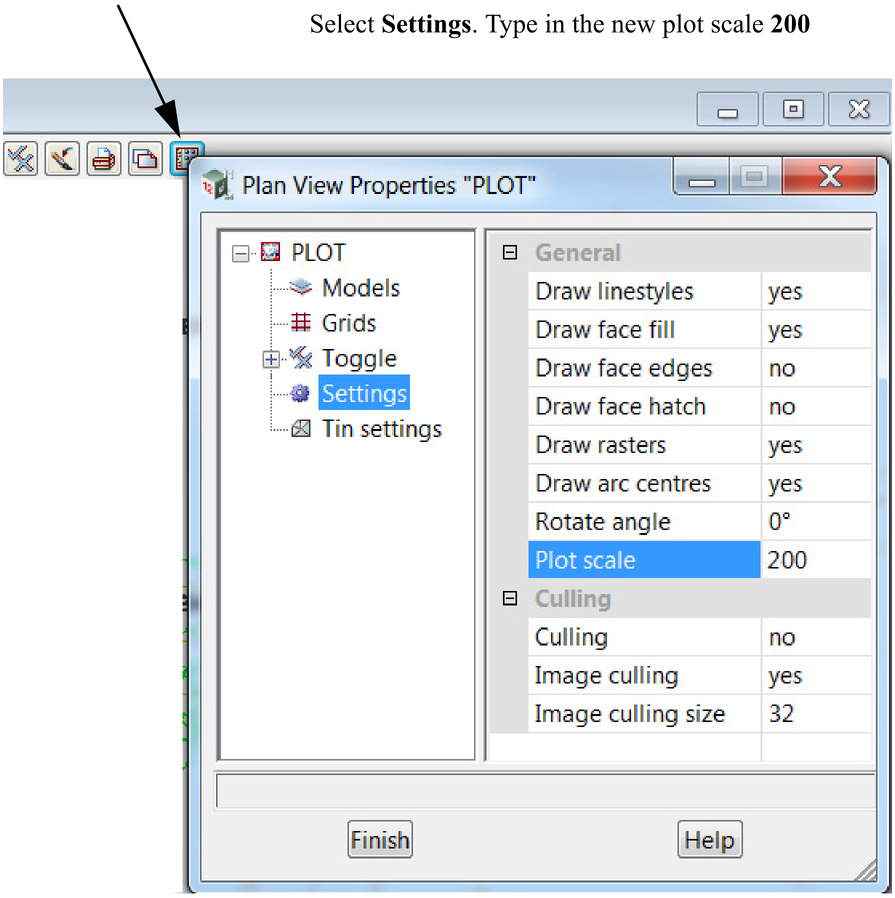
Repeat for the other house corners

11.1.3Dimension text scaling

Prior to adding text we will set up the view scale to **1:200**

Select the **Plan View Properties** icon

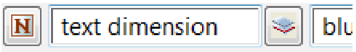
Select **Settings**. Type in the new plot scale **200**



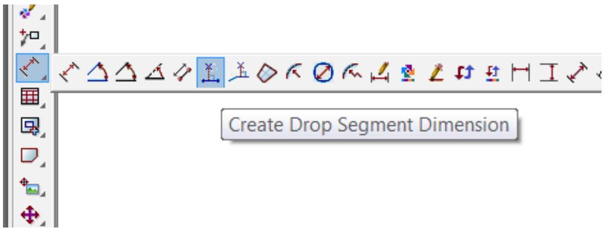
11.1.4Create dimensioned offset lines from house corners to boundaries

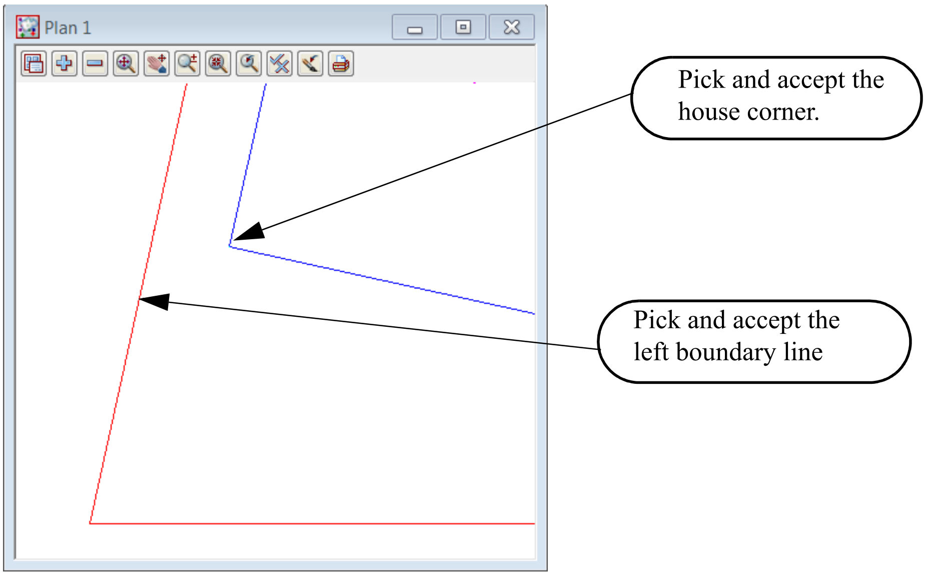
In this topic we will use an option to dimension the offsets

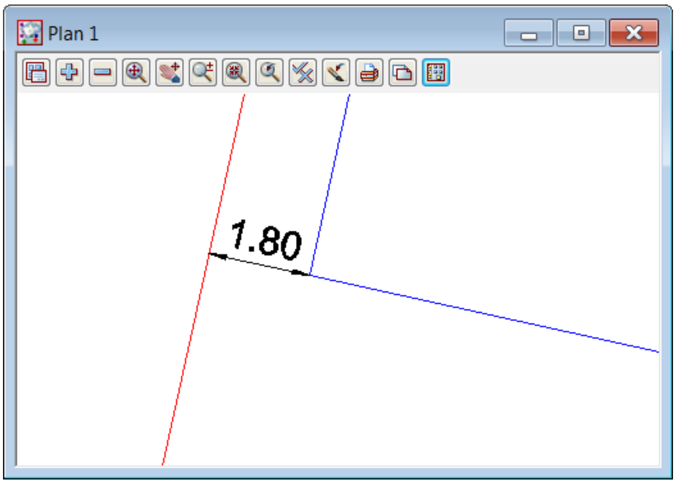
Change the model name to **text dimension**



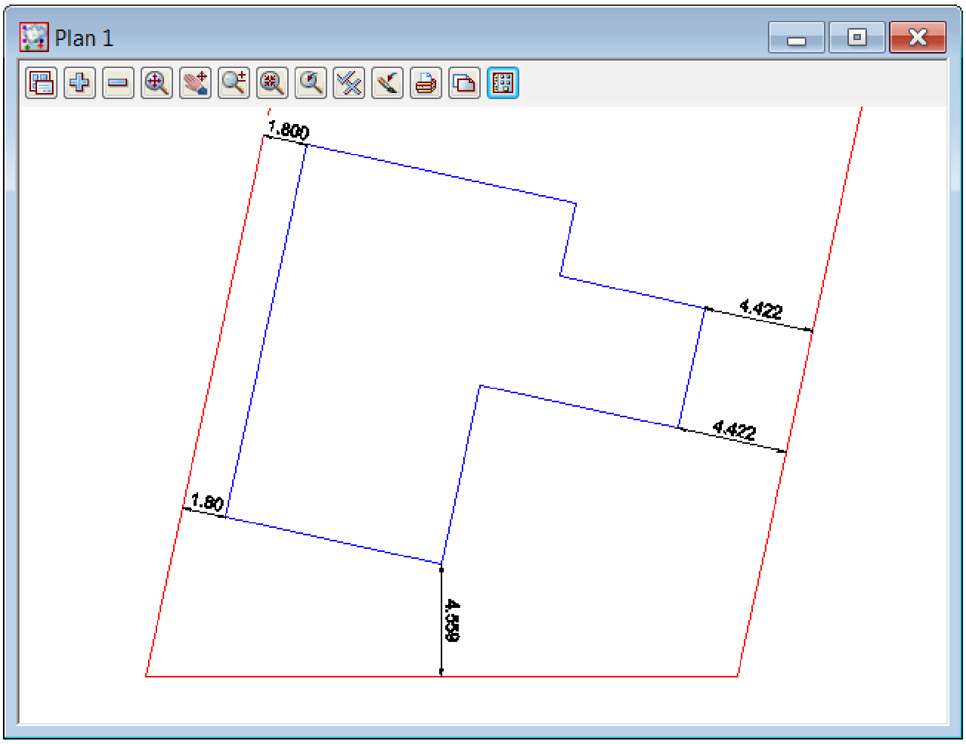
To create the dimensions select **Create Drop Segment Dimension** icon







Repeat for the other corners



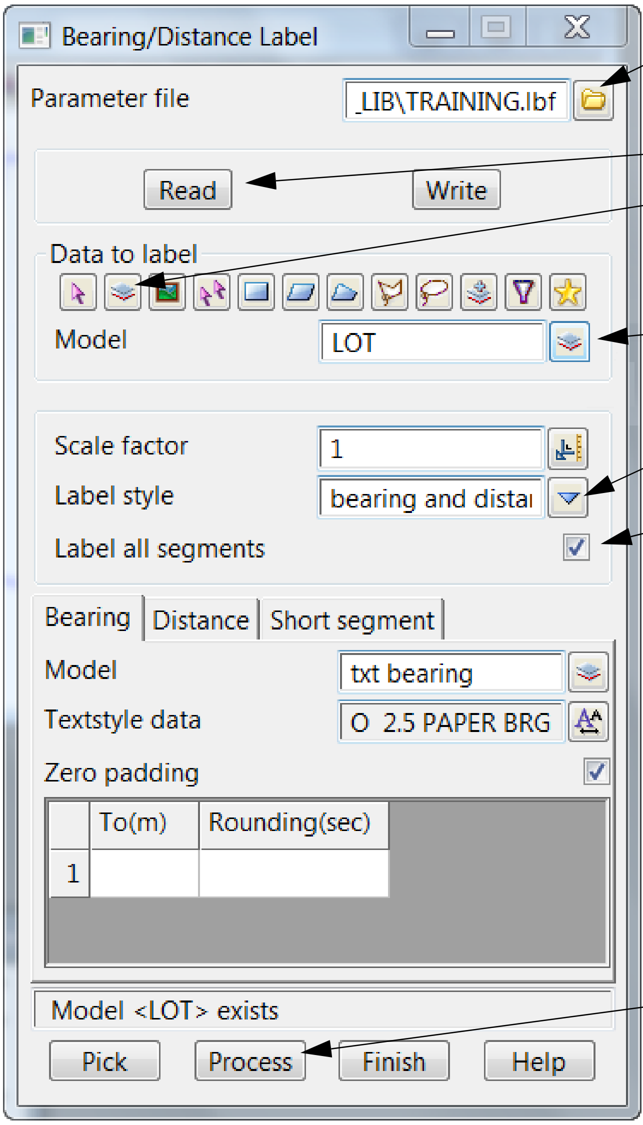
11.1.5Create dimensions for lot and building lines

We will add bearing and distances to the lot edges and distances only to the building edges.

The text type for the dimensions will be read in from a stored parameter file

11.1.5.1Lot dimensions

Select option ***Drafting=>Bearing/Distance labelling (2)***



Select **Parameter file** icon

Select file **TRAINING.lbf** from the **Setout** folder

Select **Read**

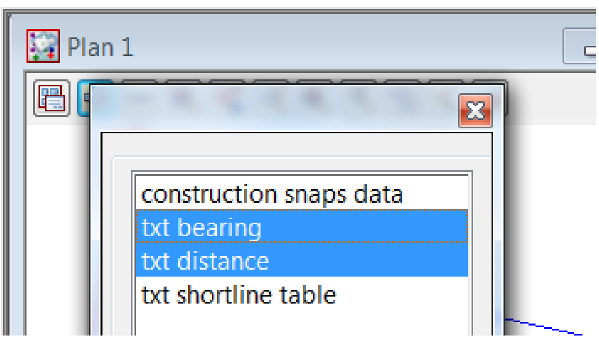
Select the **Model** icon

Select model **LOT**

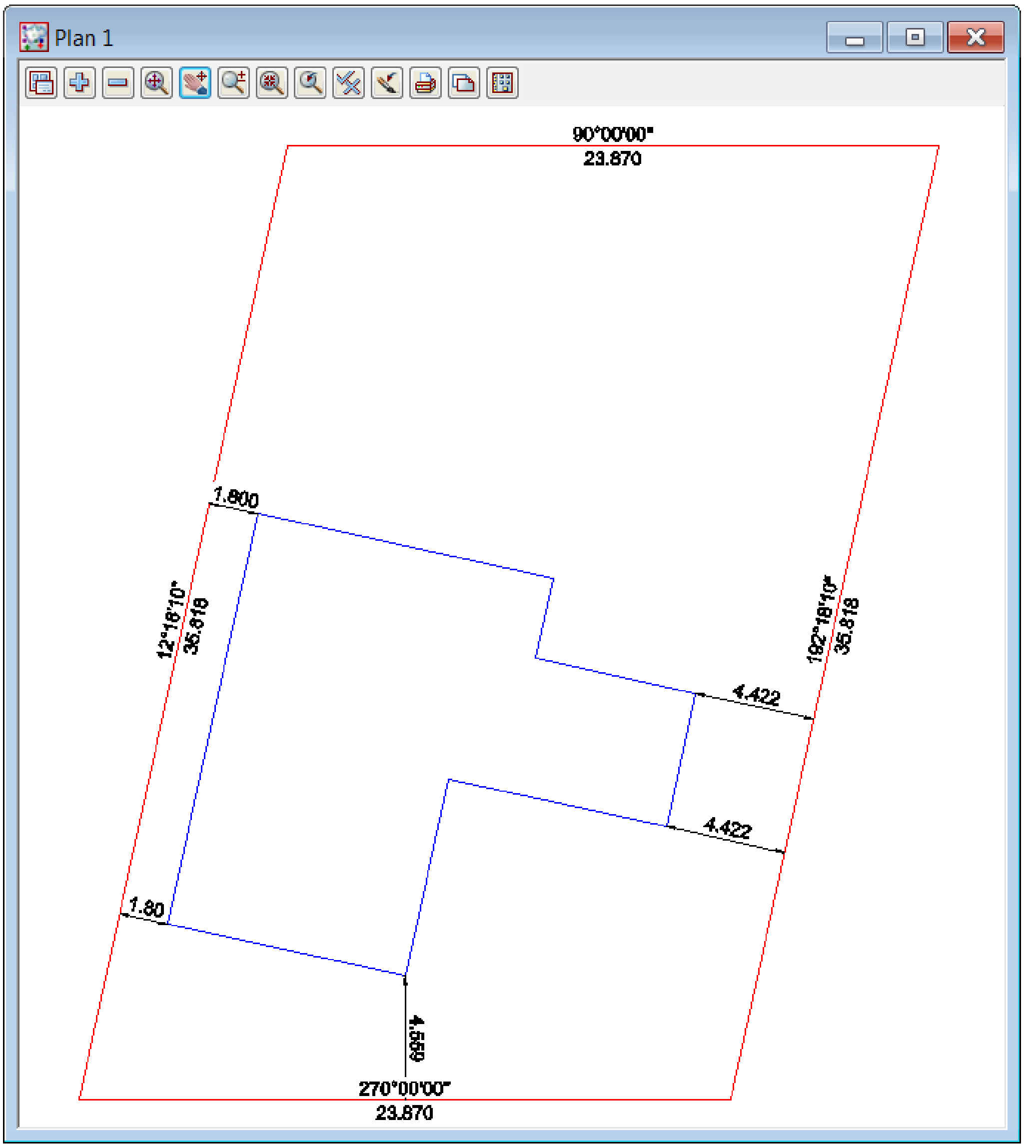
Change Label style to **bearing and distance**

Tick check box to label all segments

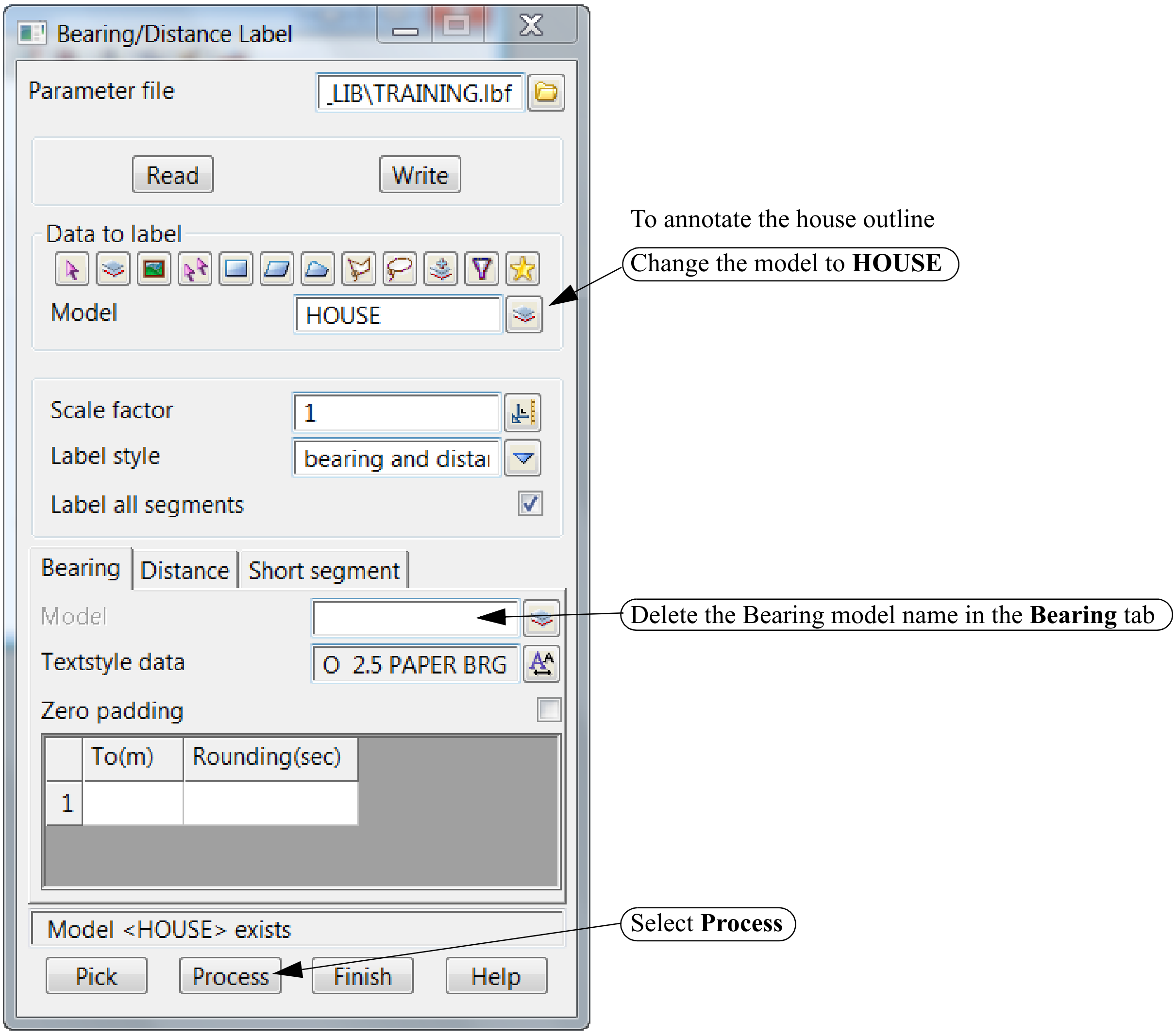
Select **Process**

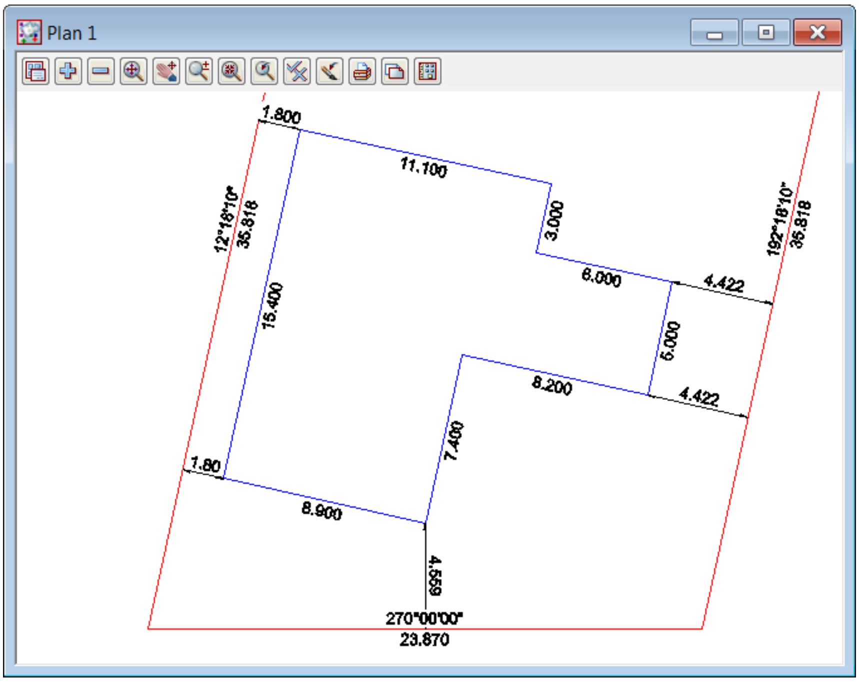


Turn on the bearing and distance models


Plan 1
90°00'00"
23.870
1.800
12°18'10"
35.818
192°18'10"
35.818
4.422
4.422
1.80
4.559
270°00'00"
23.870

11.1.5.2House dimensions



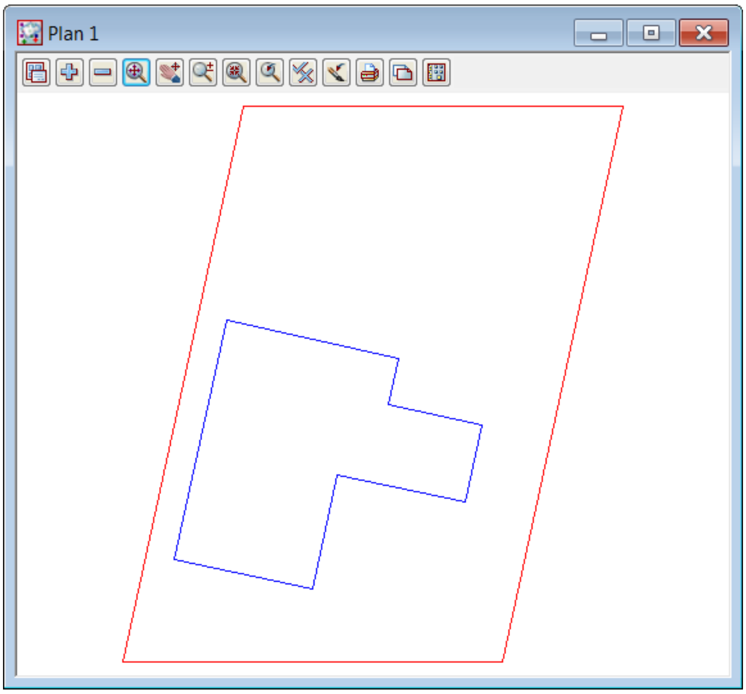


11.1.6Setout points

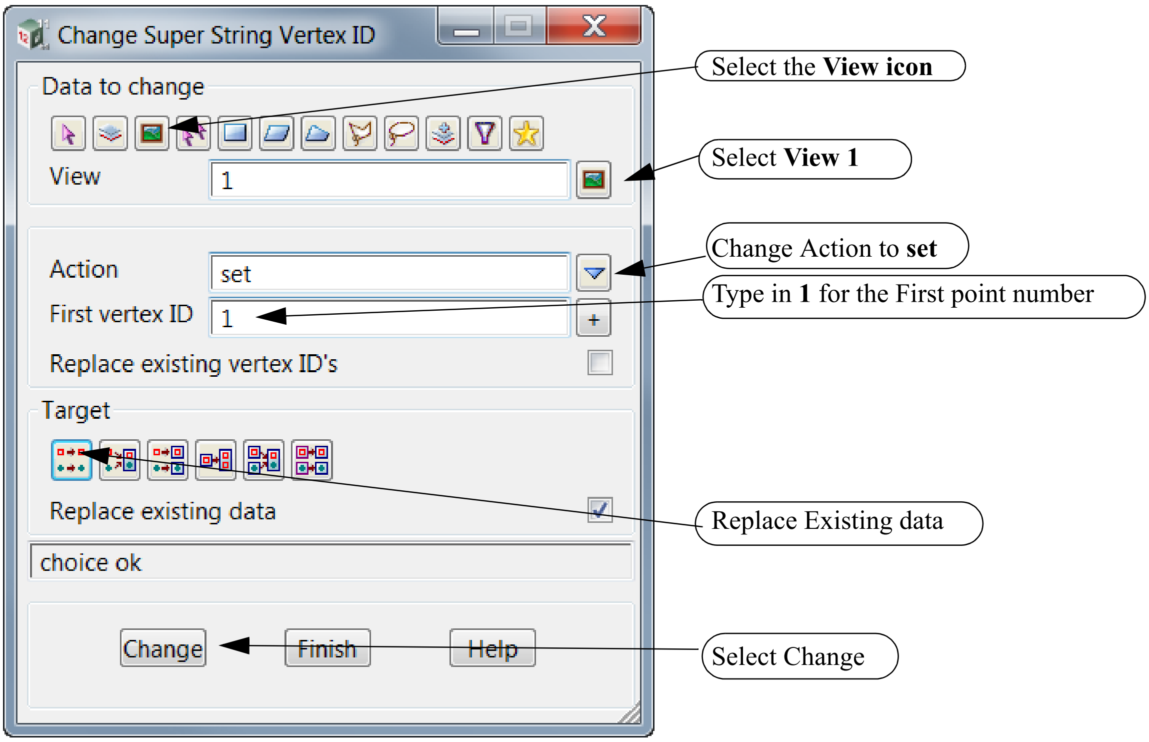
Up until now the strings created around the lot boundary and building do not have point numbers

We will now generate point numbers for the vertices for the building and lot boundaries

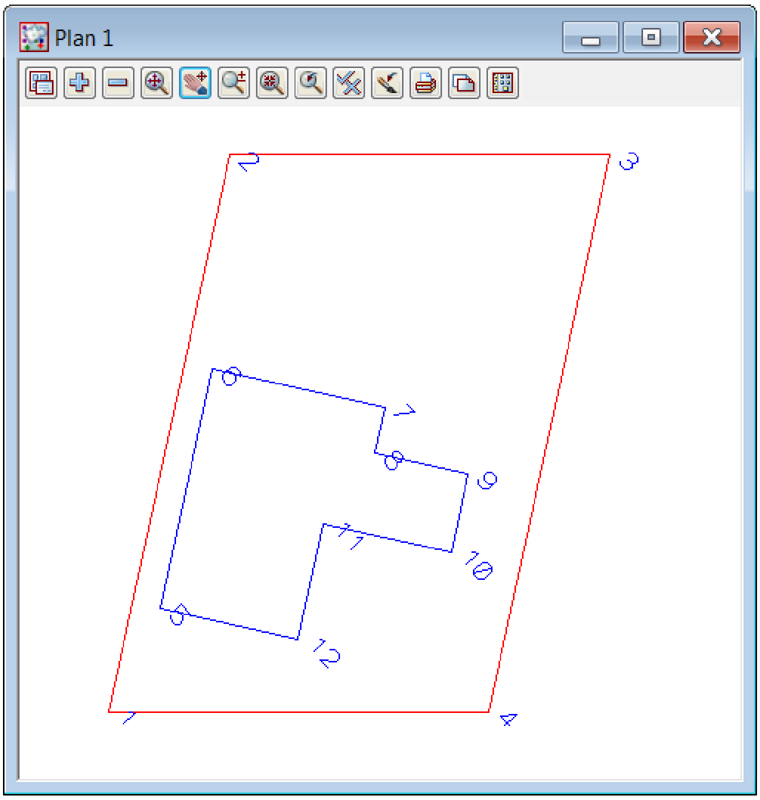
Turn off all models except for **HOUSE** and **LOT**



Select option ***Utilities =>Super strings =>Vertex i***d



Toggle on the Point ids

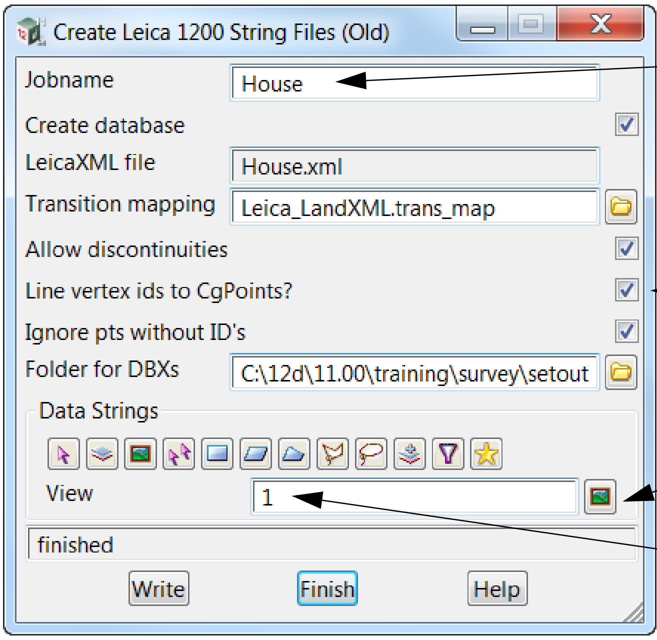


11.1.7Create upload file

The upload file of the points and strings can be used on a variety of surveying instruments

In the example below we will create an upload file for the Leica instruments

Select option ***Survey=>Leica=>1200=>Strings(V4)***



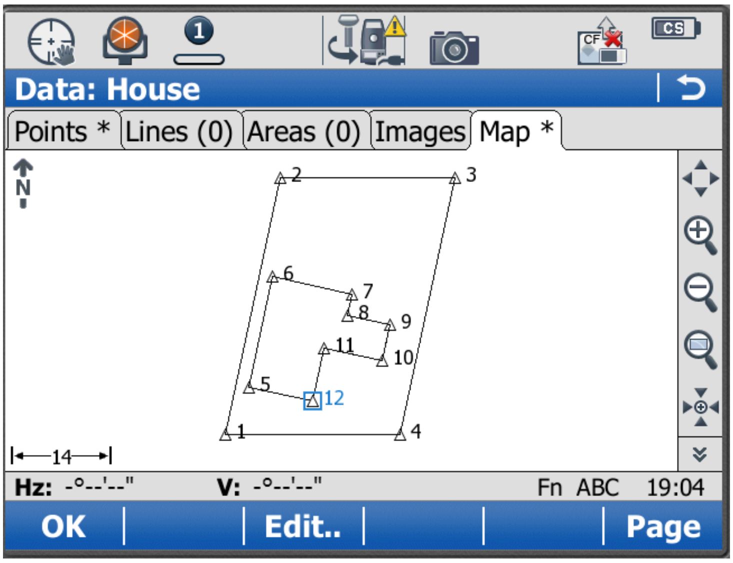
Type in File name

Tick check box to use 12d point ids

Select the **View** icon

Select view **1**

Select **Write** to create the files

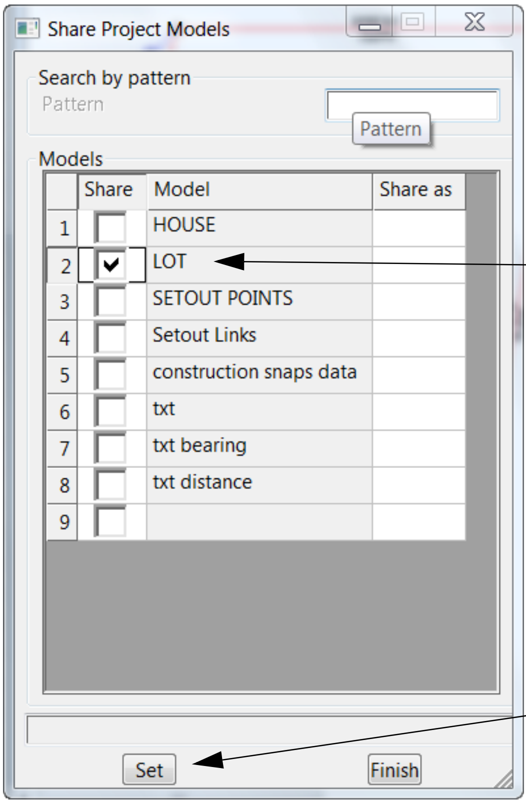


Once copied to the instrument the lot and house are able to be set out

11.1.8Sharing the Lot model for other projects

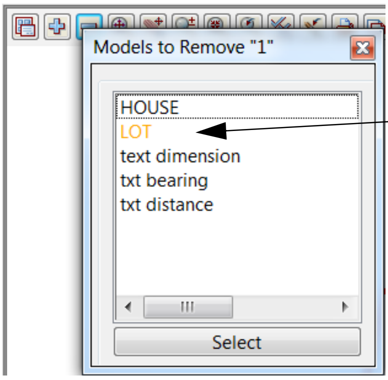
In the next exercise we will be sharing the **LOT** boundaries from this project

To share the boundary model select ***Models =>Sharing =>Share***



Tick the **Share** check box for model **LOT**

Select **Set** then **Finish**

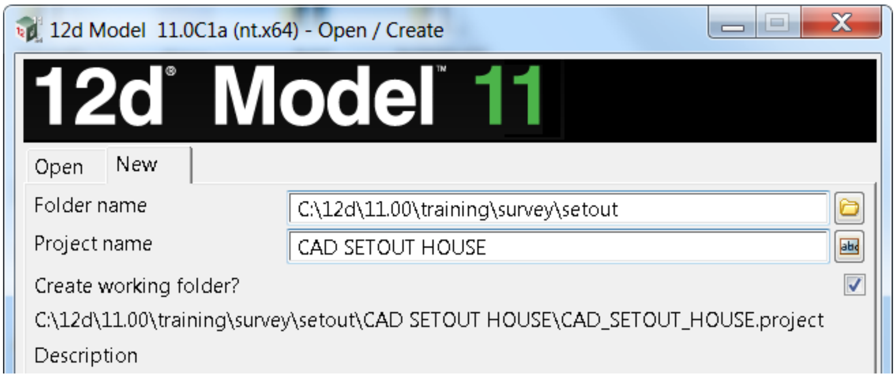


In the model listing the shared model is highlighted in a different colour

11.2 Cad House Setout

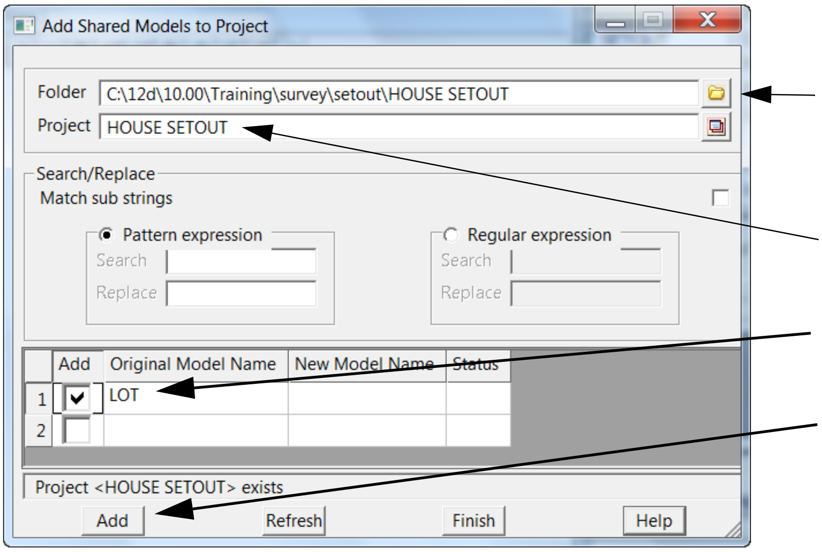
Create a new project as shown previously called **CAD HOUSE SETOUT** in the folder

C:\12djobs\11.00\Training\Survey\Setout



11.2.1 Share the lot outline from the previous project

Select option ***Models=>Sharing=>Add***



Browse to the folder **C:\12d\11.00\Training\survey\setout\HOUSE SETOUT**

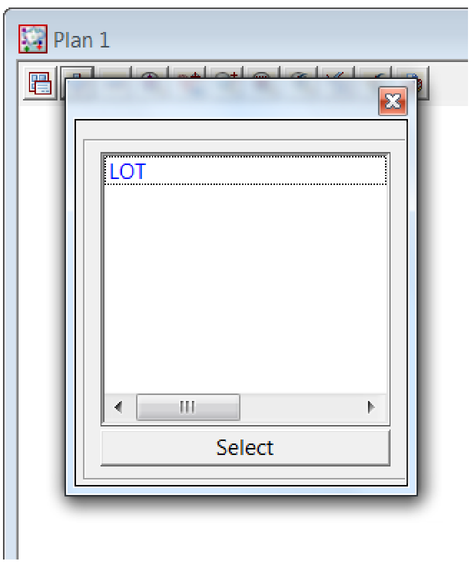
Select **HOUSE SETOUT**

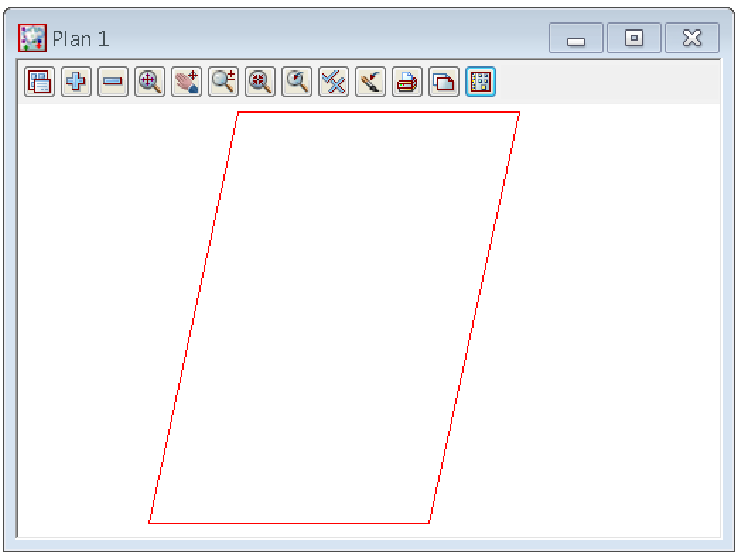
Tick next to model **LOT**

Select **Add** to share the **LOT** model

The model is referenced to the project

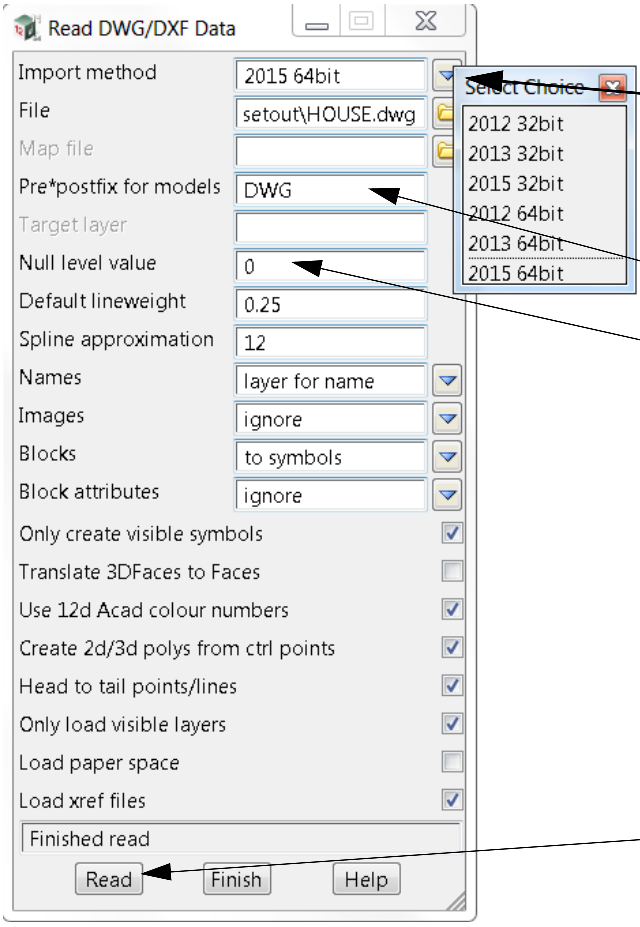
Turn on the model **LOT** and note that shared model has a blue model name





11.2.2Read in the CAD file

Read in the file **C:\12d\11.00\Training\survey\setout\HOUSE.DWG** file by dragging and dropping using the **Explore Working Folder** icon as shown previously



Select the relevant format for the your import method

Type in **DWG**<space> as the prefix for the loaded models

Type in **0** to ensure any 2d data is nulled

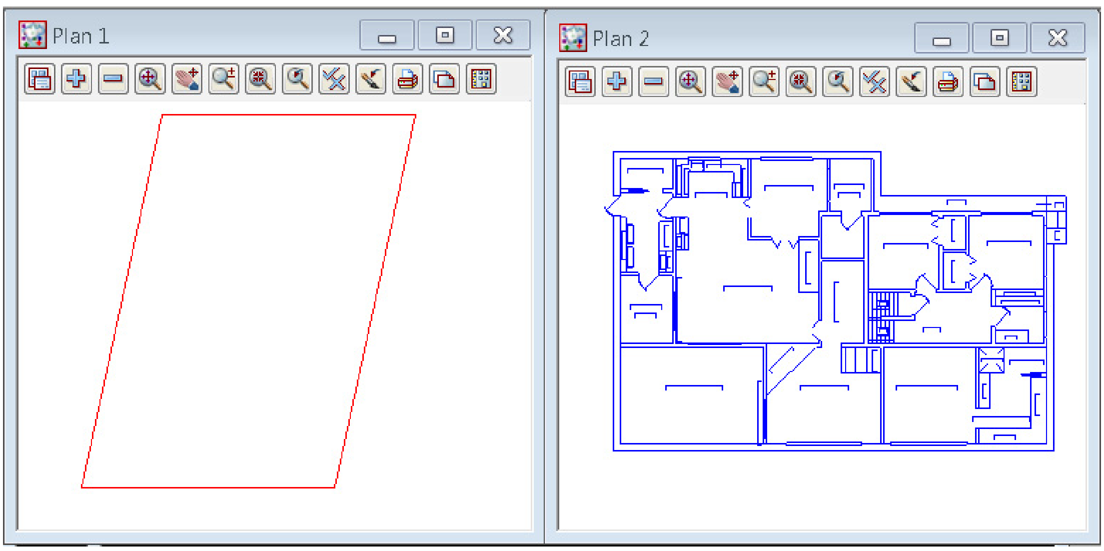
The rest of the panel can remain unchanged

Select **Read** then **Finish**

The house outline has been created in plan millimetres and will result in the house being scaled by 1000 if opened in the same view as the lot.

We will therefore rename view **SURVEY** to view **2** using option ***View =>Rename***

In view 1 turn on the model BDY only and in view 2 turn on all of the other models. Tile the two views

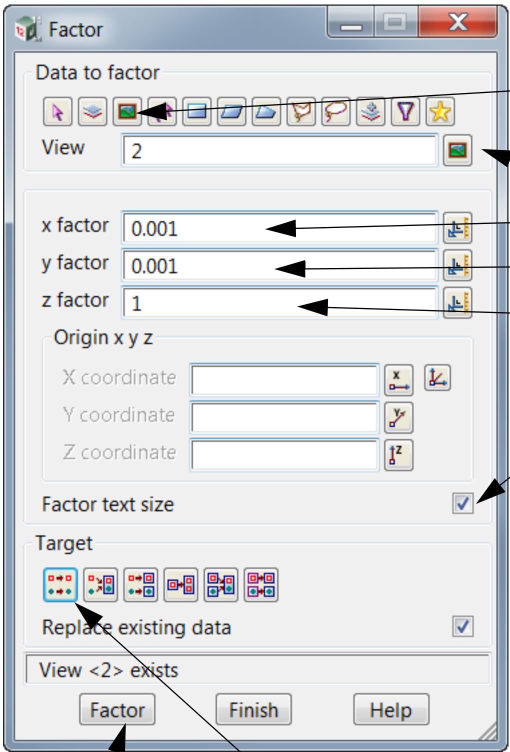


11.2.3 Scale the house models

The imported building has its base units in millimetres rather than metres so we will firstly scale the building from millimetres to metres

Select option ***Utilities=>A-G=>Factor***

or select the **Global Factor** icon



Select **View** icon

Select view **2**

Type in an **x factor** of **0.001**

Type in a **y factor** of **0.001**

Leave the **z factor** as **1**

The Origin centre point is not necessary as the house will be shifted to the correct position in a later option

Tick check box to **Factor text size**

Select **Move to original model** icon

Select **Factor** then **Finish**

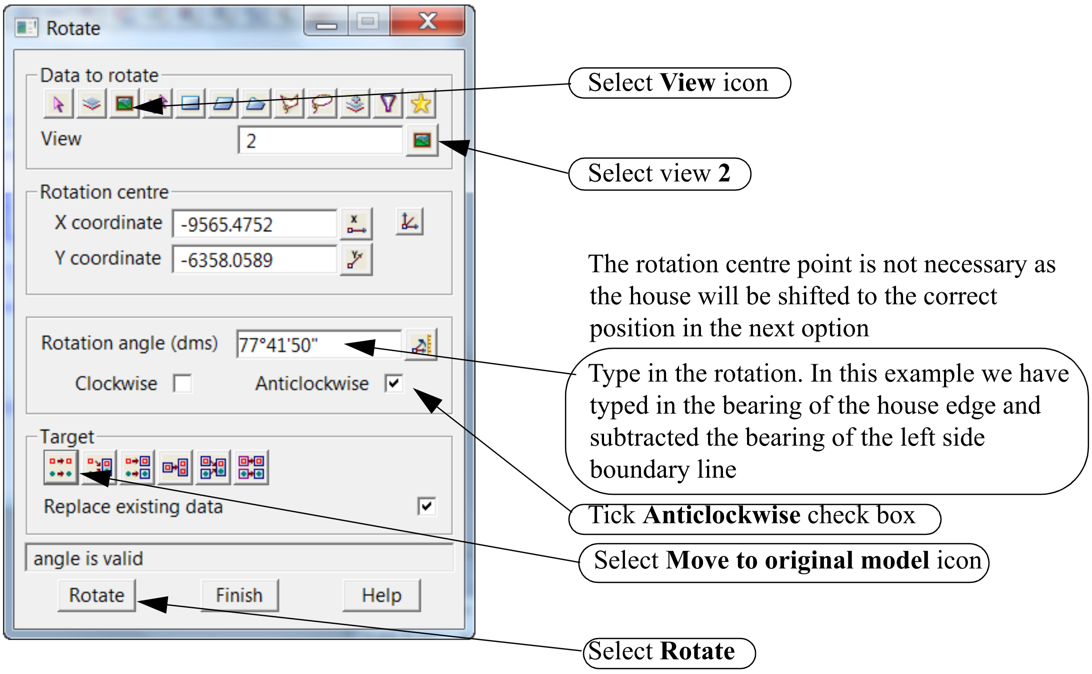
Zoom all of the house models

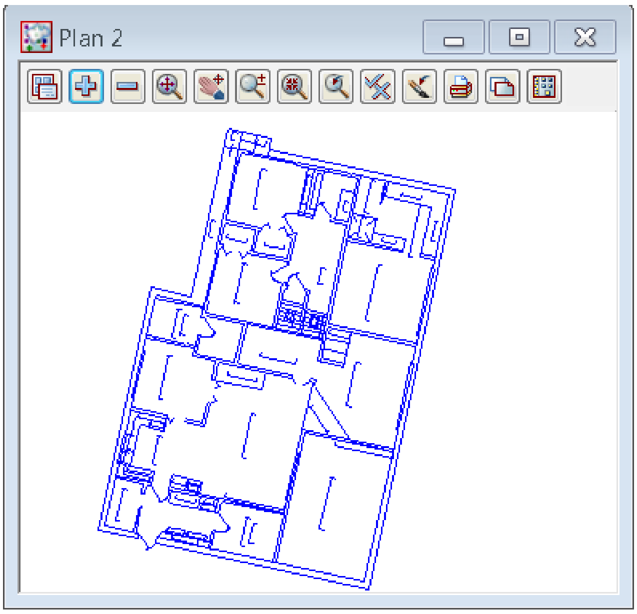
11.2.4 Rotate the building

We will now rotate the house.

Select the option ***Utilities=>H-Z=>Rotate***

or select the **Global Rotate** icon



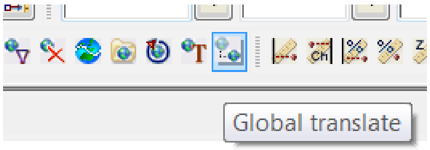


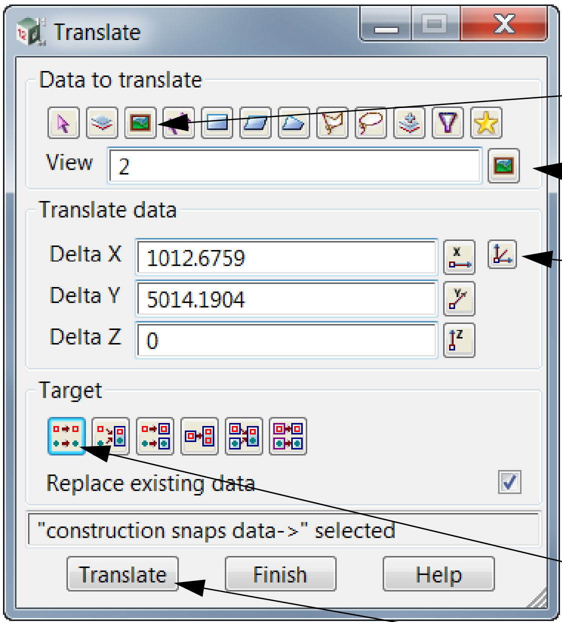
11.2.5Translate the house

We will now position the house into the lot and place the corner at a predefined position

Select the option ***Utilities=>H-Z=>Translate***

or **Global Translate** icon





Select **View** icon

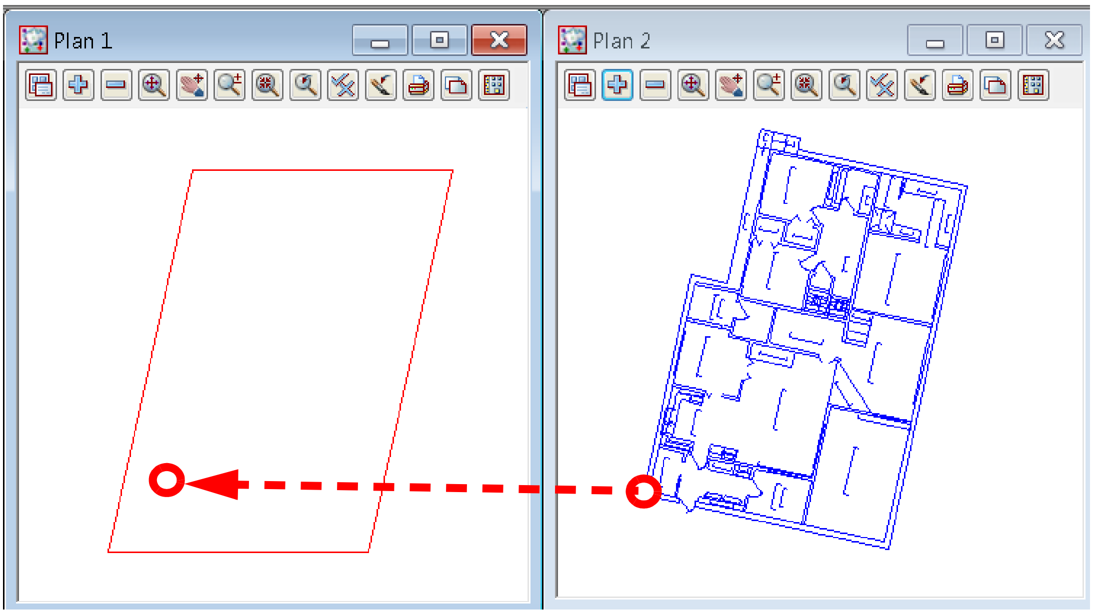
Select view **2**

Select the Position icon

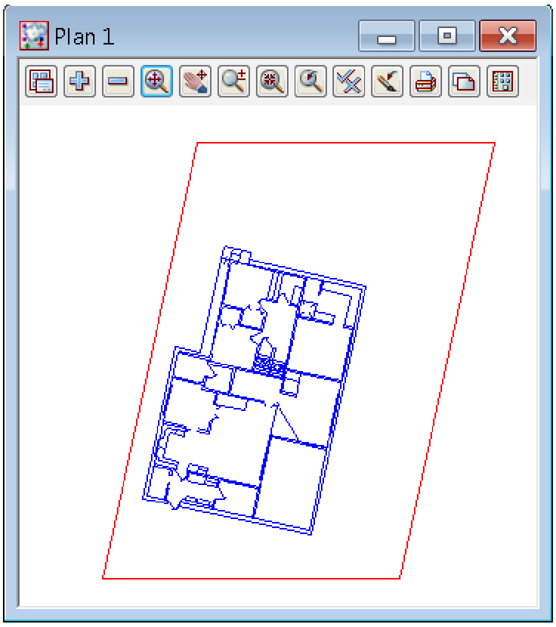
Select and accept the lower left corner of the house in plan view 2. In plan view 1 pick a point 7 metres up from the bottom left corner and in 1.8 metres in from the left boundary. This is explained in the previous setout option

Select **Move to original model** icon

Select **Translate**



In plan view 1 turn on the house models



11.2.6Create outline of house for setout

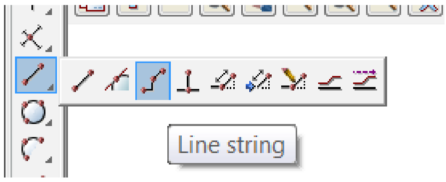
We will now create a string around the outside edge of the cad house. This is done in a model called **HOUSE**

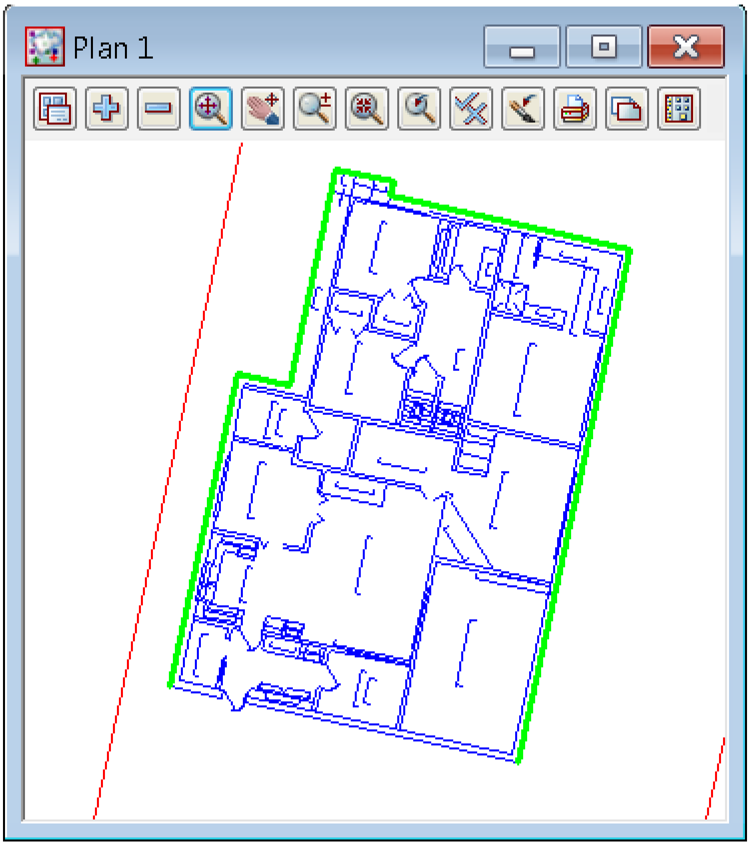
Type in the name and model name **HOUSE** in the **CAD controlbar.** Select the colour **Green** and linestyle **1**

A weight of **3** will help identify the string from the underlying string

Select option ***Cad =>Line =>Line string***

or **Line String** icon



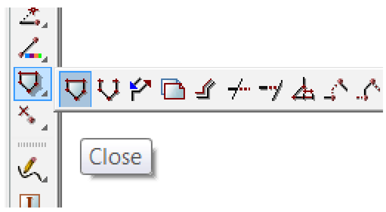


Pick and accept the corner points of the cad house

Don’t create the string back onto the start point. Press **[Escape]** to exit the string option

To close the string select ***Strings=>Strings edit=>Close***

or **Close** icon



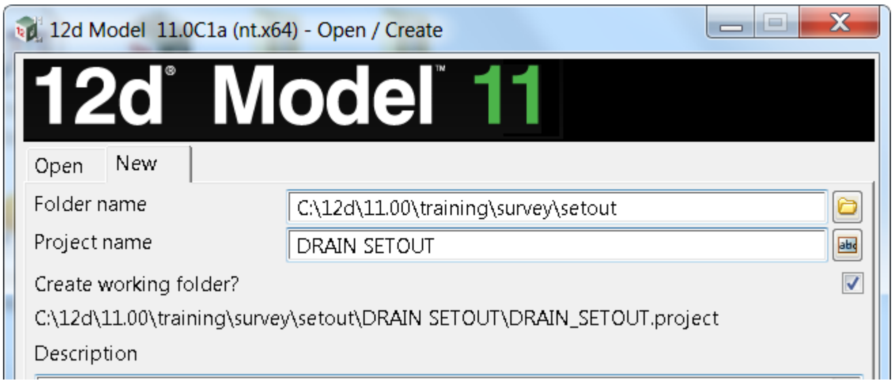
The dimensioning and setout numbers can be created as per the previous chapter

11.3 Setout for evenly graded string

In this exercise we will manually import a polyline from cad, regrade the string and create an alignment upload file for setout.

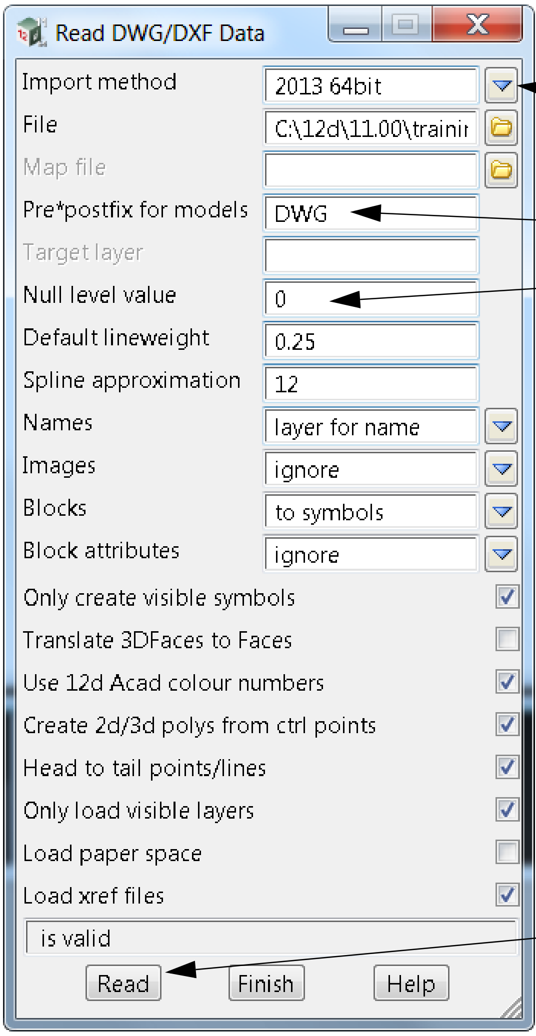
Create a new project as shown previously called **DRAIN SETOUT** in the folder

C:\12d\11.00\Training\survey\setout



11.3.1Read in the polyline from cad

Read in the file **C:\12d\11.00\Training\survey\setout\DRAIN.DWG** file by dragging and dropping using the **Explore Working Folder** icon as shown previously



Select the relevant import method

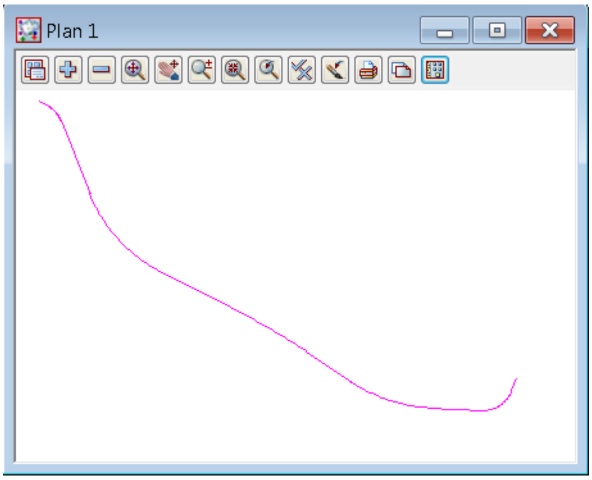
Type in **DWG**<space> as the prefix for the loaded models

Type in **0** to ensure any 2d data is nulled

The rest of the panel can remain unchanged

Select **Read** then **Finish**

Turn on the model **DWG DRAIN**



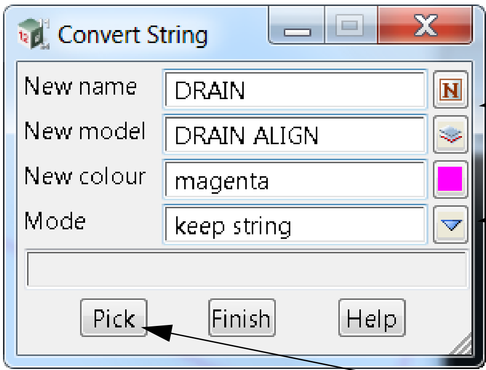
11.3.2 Convert the polyline to a super alignment string

The imported polyline has no height but the string is to be evenly graded from level 20.0 to level 25.0

We will convert the polyline to an super alignment to grade the string.

11.3.2.1 Convert to Superalignment

Select ***Strings=>Convert***

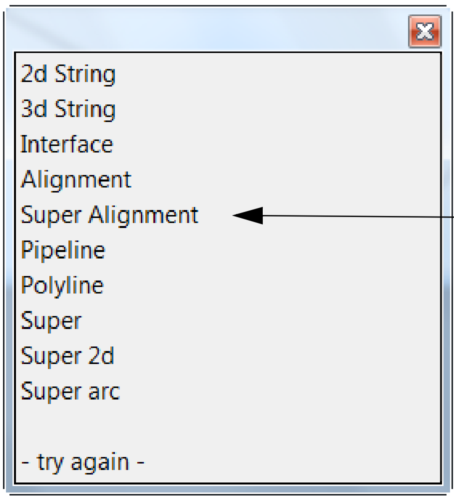


Type in a new name and model name for the alignment

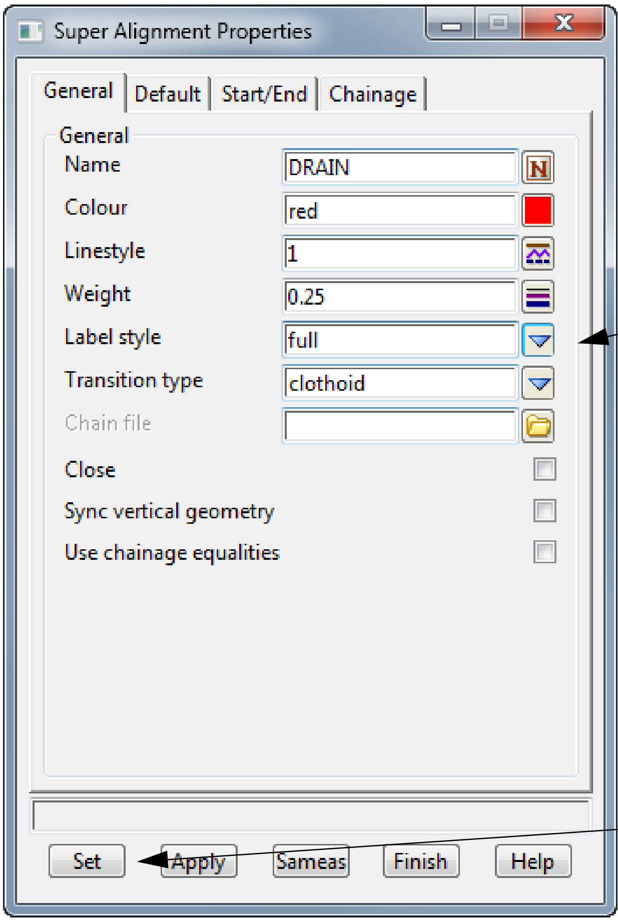
Change Mode to keep string so that the original string is not deleted during the conversion

Select **Pick**

Pick and accept the drain string

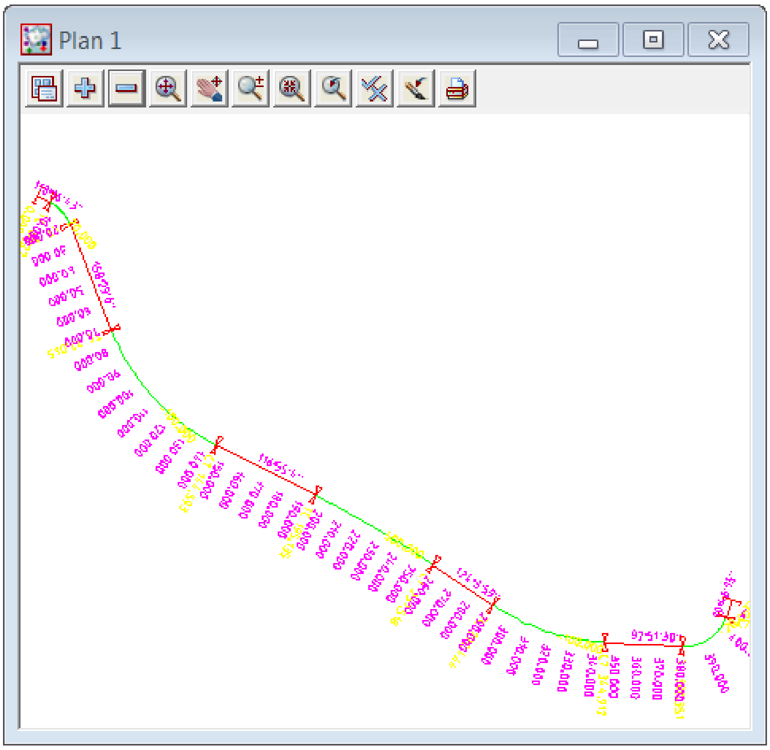


Select Super alignment



Select **full** for the label style

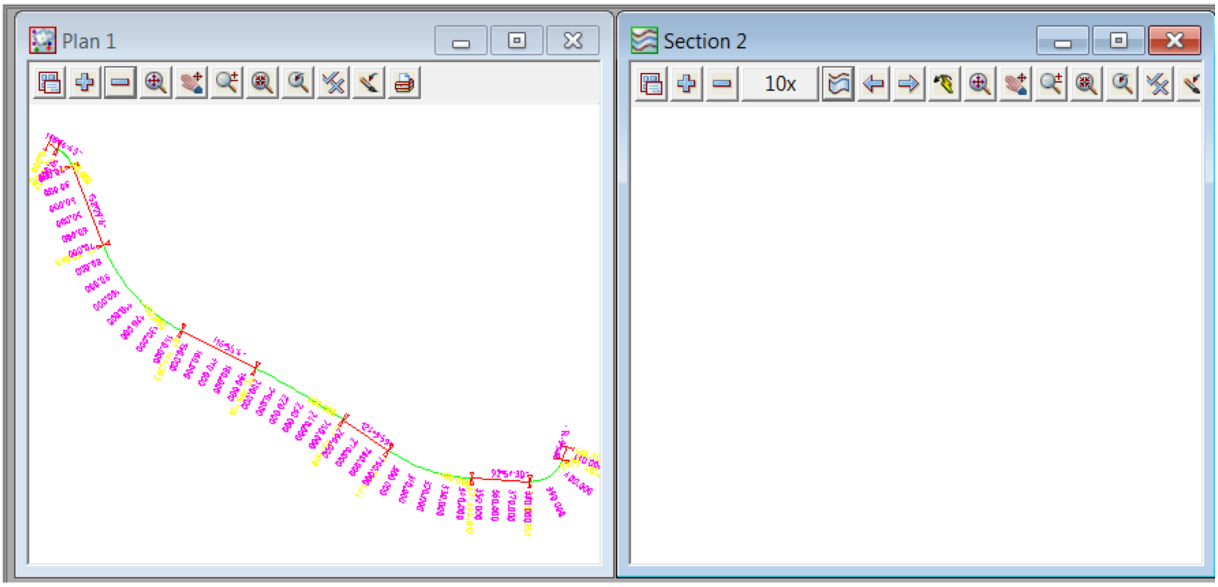
Select **Set** then **Finish**



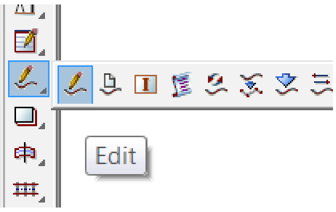
11.3.3 Create heights for each end of the alignment

We will use the Section view **LS** to profile the drain string

Select the profile icon then pick and accept the alignment string in the plan view

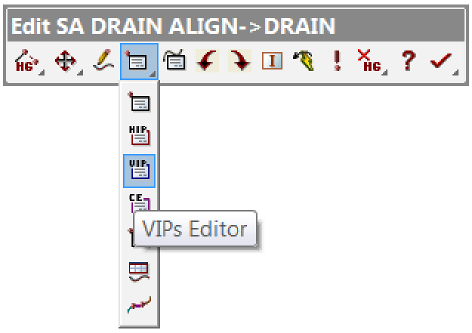


To edit the alignment string select the **Edit** icon

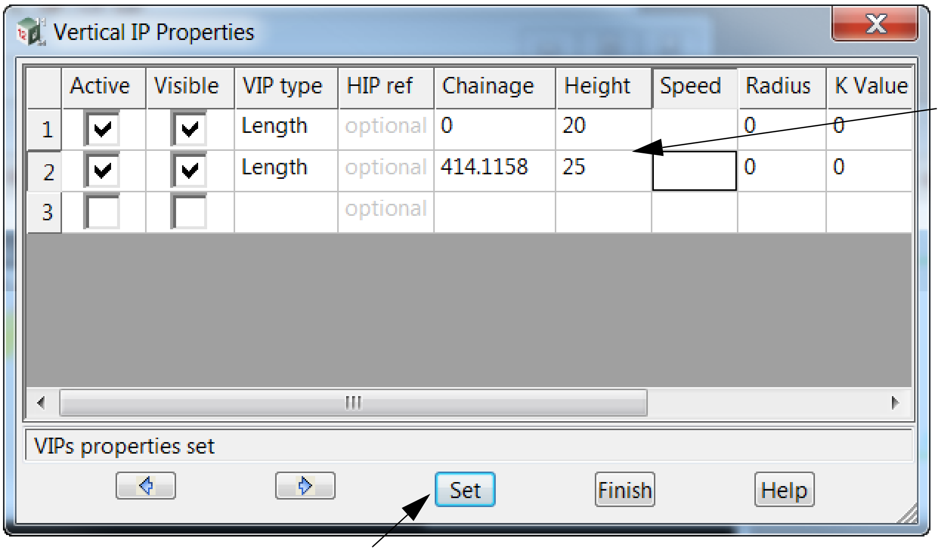


Pick and accept the alignment string

The alignment editor appears

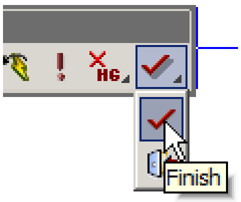


To add vertical IP points hold the left button down over the **Part Editors** icon then select **VIPs Editor**



Type in **20** for the height of Chainage **0** and **25** for the height of chainage **414.1158**

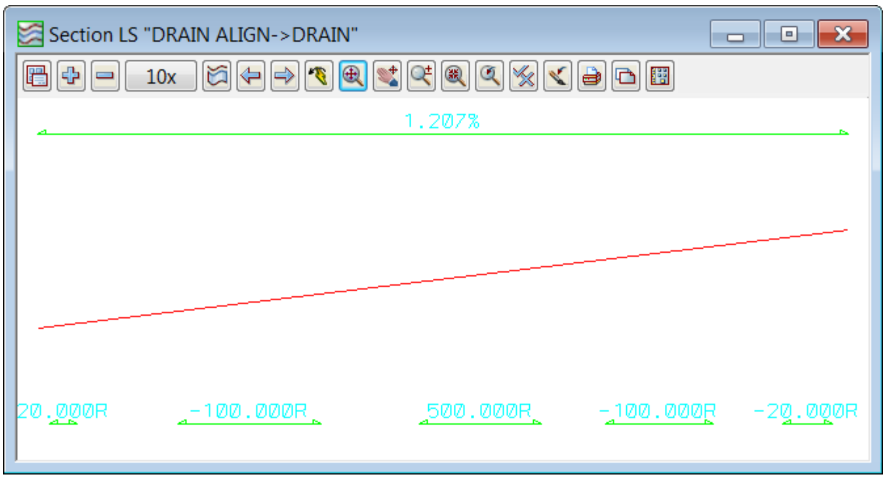
Press **Set** to exit the option



To exit the alignment editor hold the left button down over the **Finish** icon then select **Finish**

Select **Yes** to confirm finishing

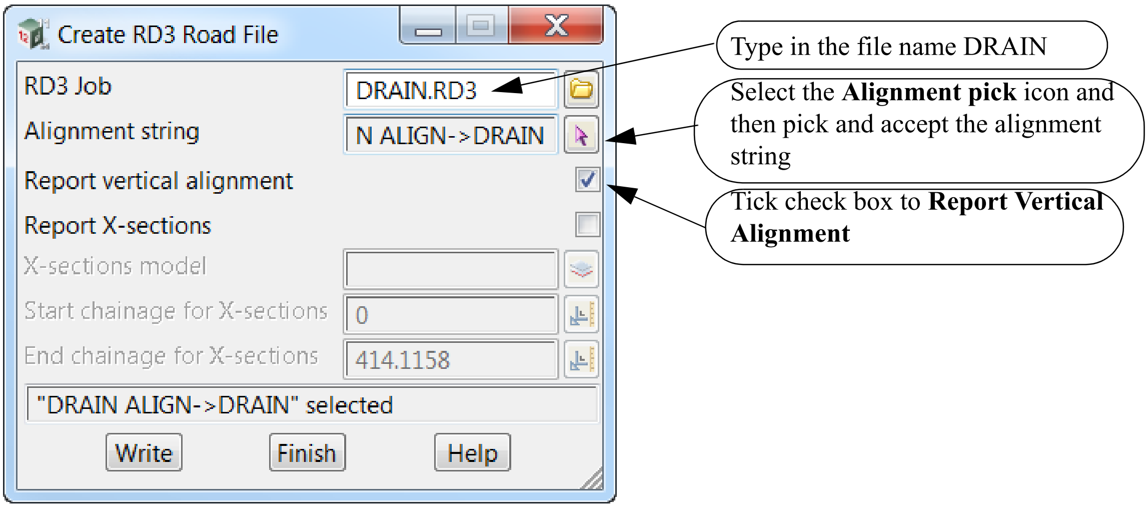
Toggle on the Grades in the Section View



11.3.4Create Upload file

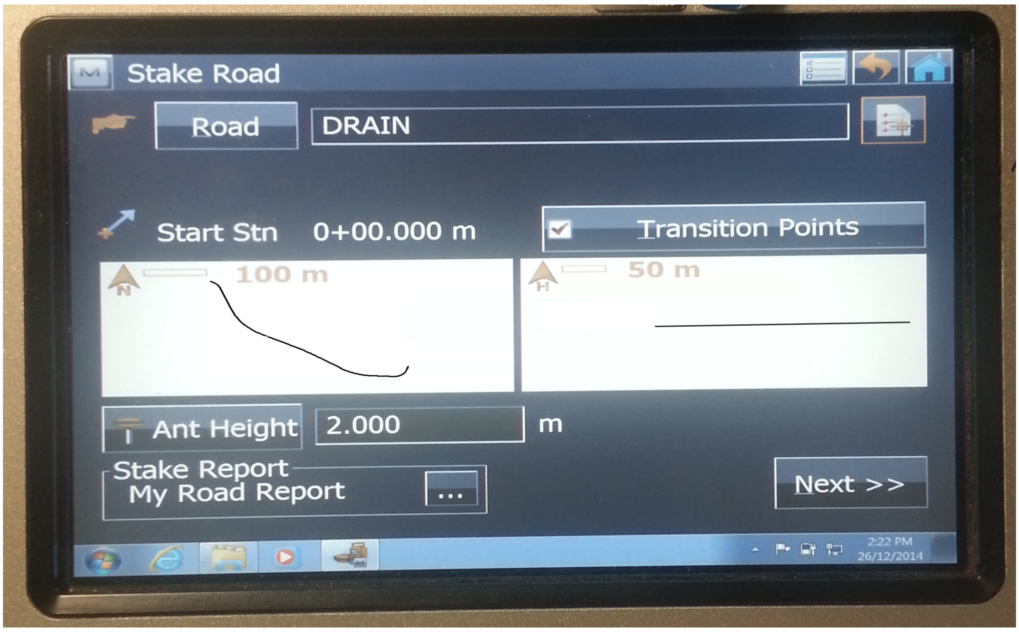
The alignment string can now be converted to an upload file for a number of survey instruments. We will create a Topcon upload file as an example

Select the option ***Survey =>Topcon =>Write RD3 file***



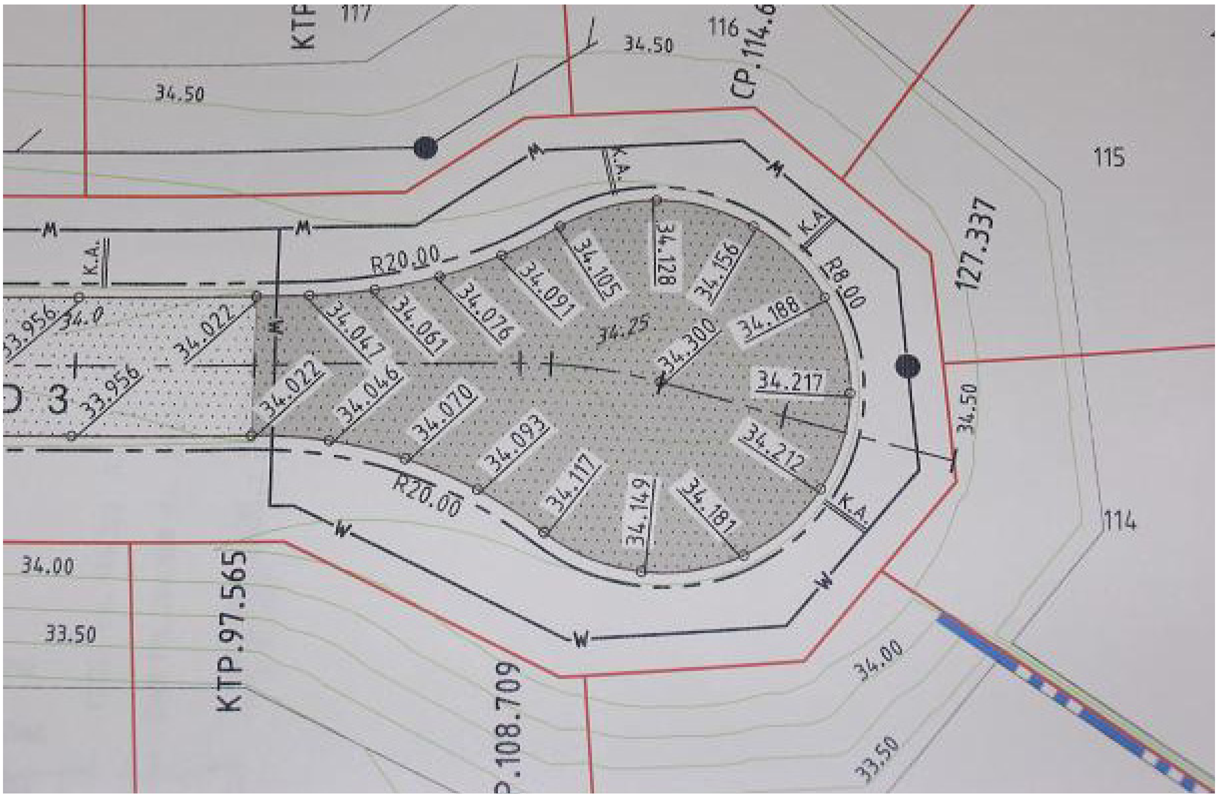
Select **Write** to create the upload file

Once copied to the instrument the alignment string can be setout



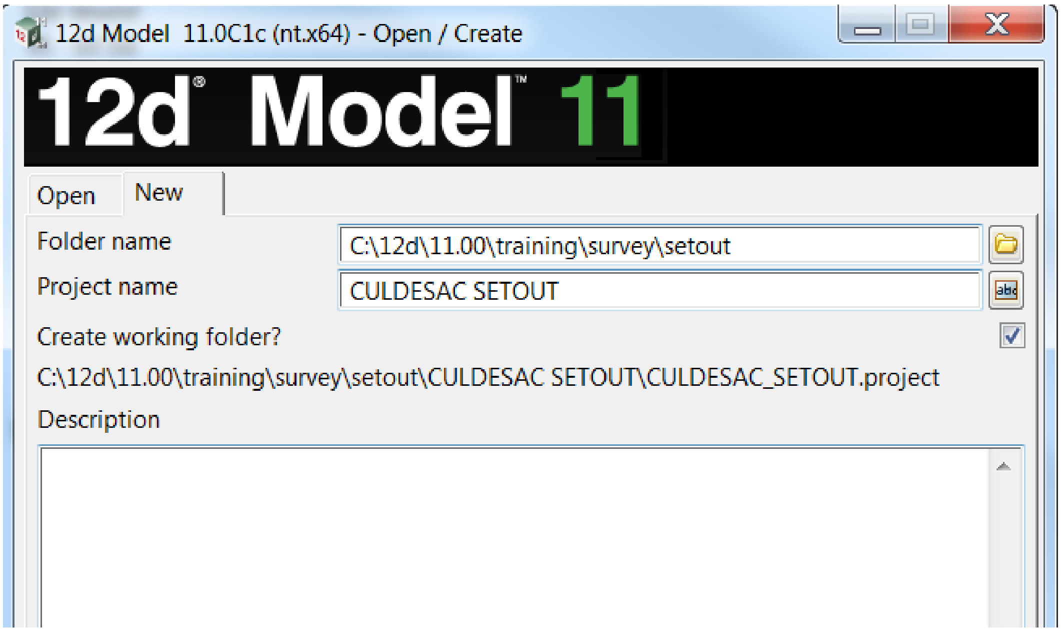
11.4 Setout for polyline culdesac string

In this exercise we will import a 2d lip of kerb polyline from cad and create heights from a provided layout drawing



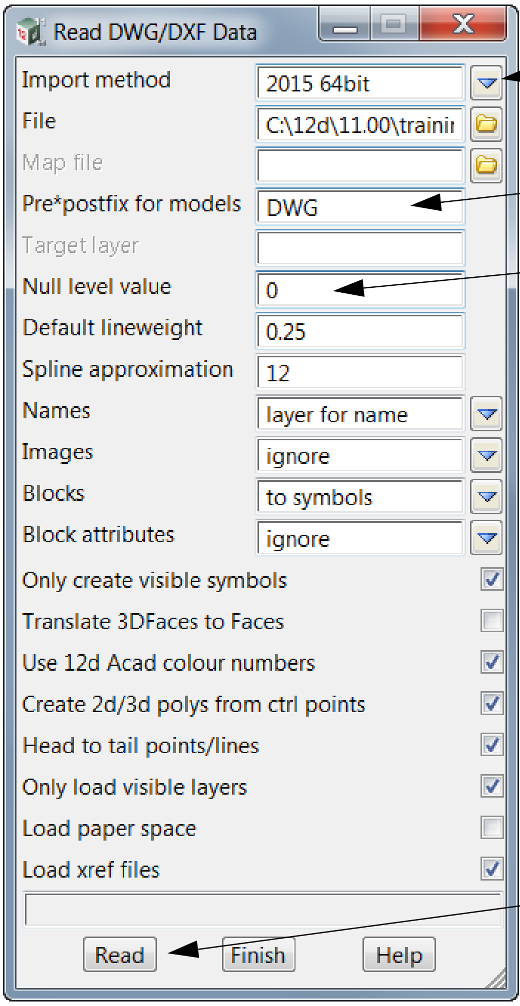
Create a new project as shown previously called **CULDESAC SETOUT** in the folder

C:\12d\10.00\Training\survey\setout



11.4.1Read in the polyline from cad

Read in the file **C:\12d\11.00\Training\survey\setout\CULDESAC.DWG** file by dragging and dropping using the **Explore Working Folder** icon as shown previous



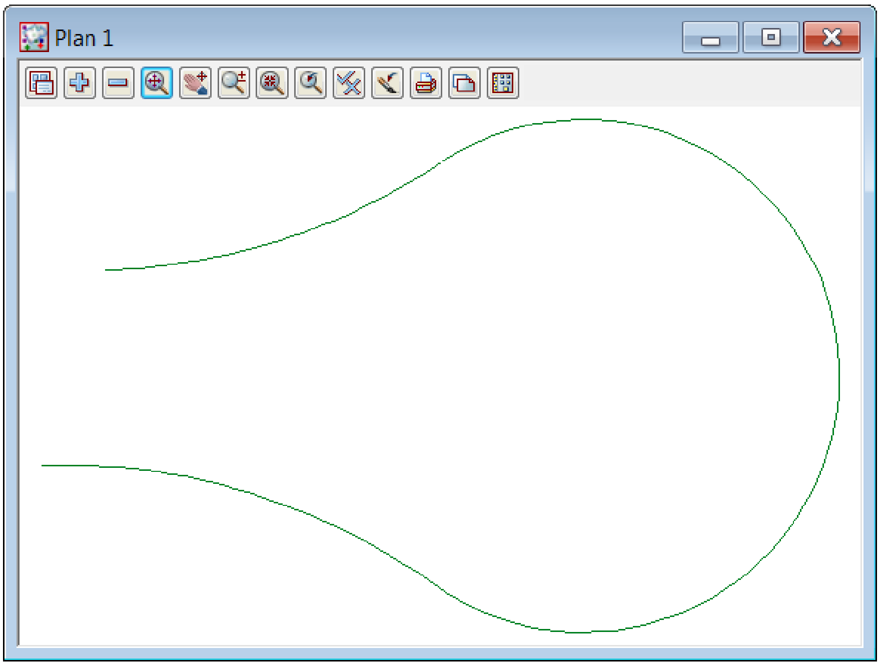
Select the relevant Import Method

Type in **DWG**<space> as the prefix for the loaded models

Type in **0** to ensure any 2d data is nulled

The rest of the panel can remain unchanged

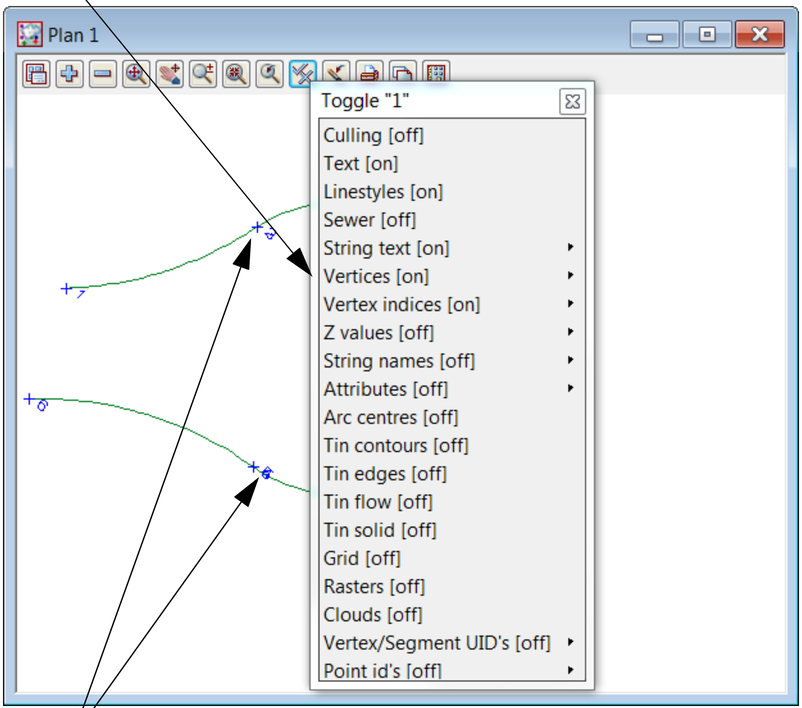
Select **Read** then **Finish**



11.4.2Filter the string

We will filter the imported string to ensure there are no duplicate vertices at the tangent points

Toggle on the vertices and Vertex indices

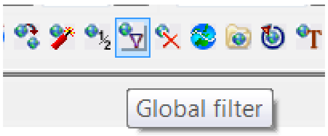


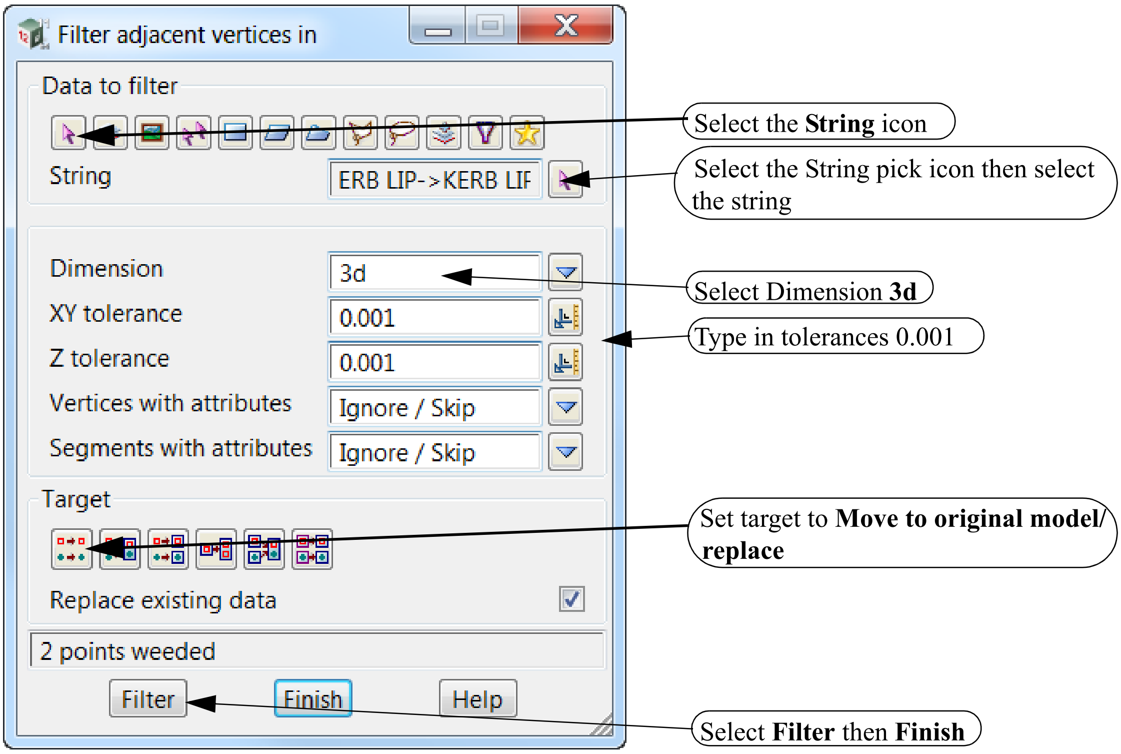
Occasionally duplicate vertices will occur. These are highlighted by the overlapping Vertex numbers

We can filter (remove) vertices on a strings which will prevent problems when paralleling strings at a later stage

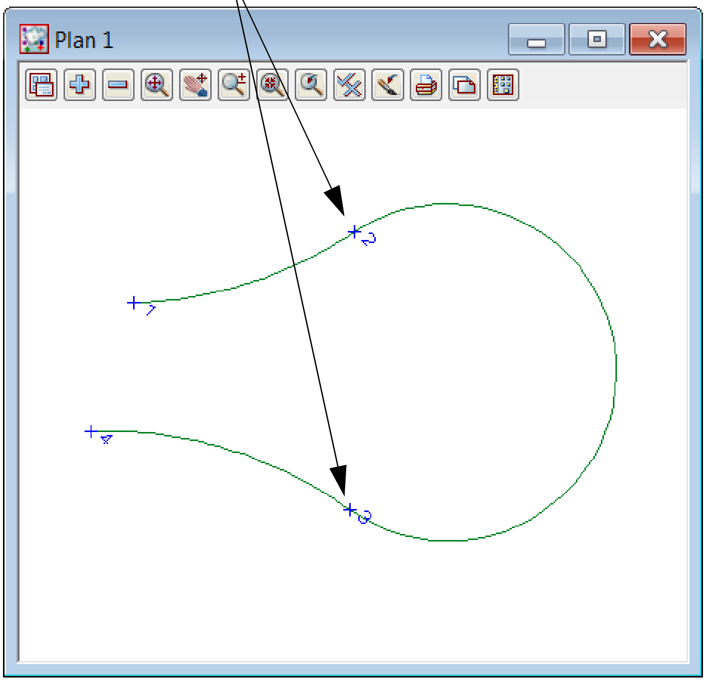
Select option ***Utilities =>A=G =>Filter =>Vertex filter***

or **Global Filter** icon





The duplicate vertices are removed.

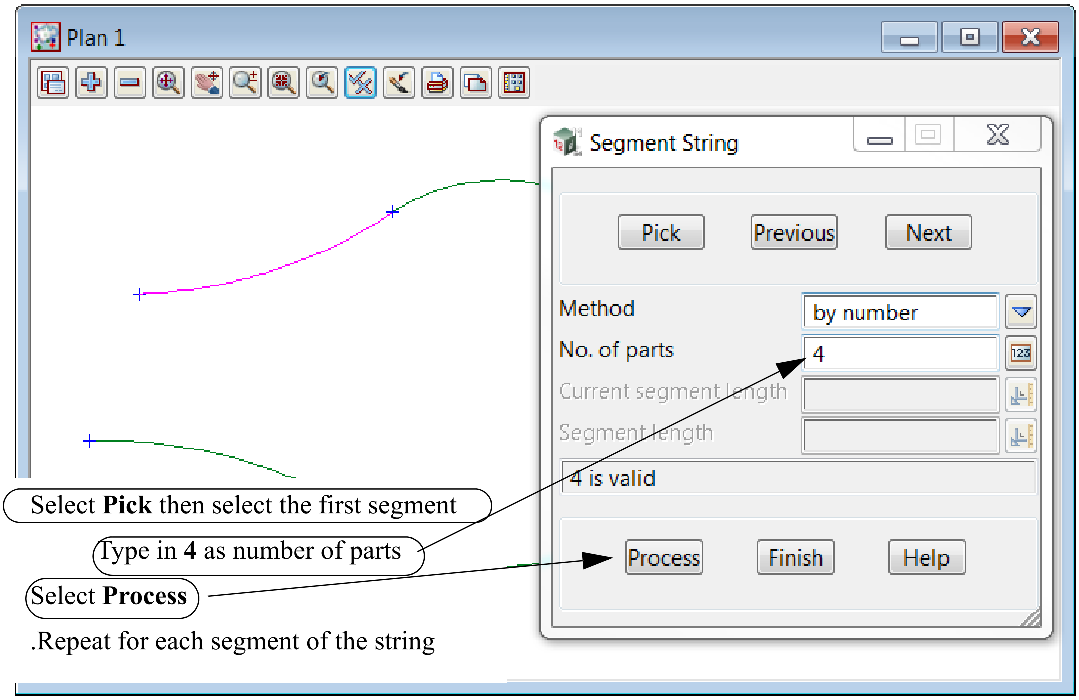


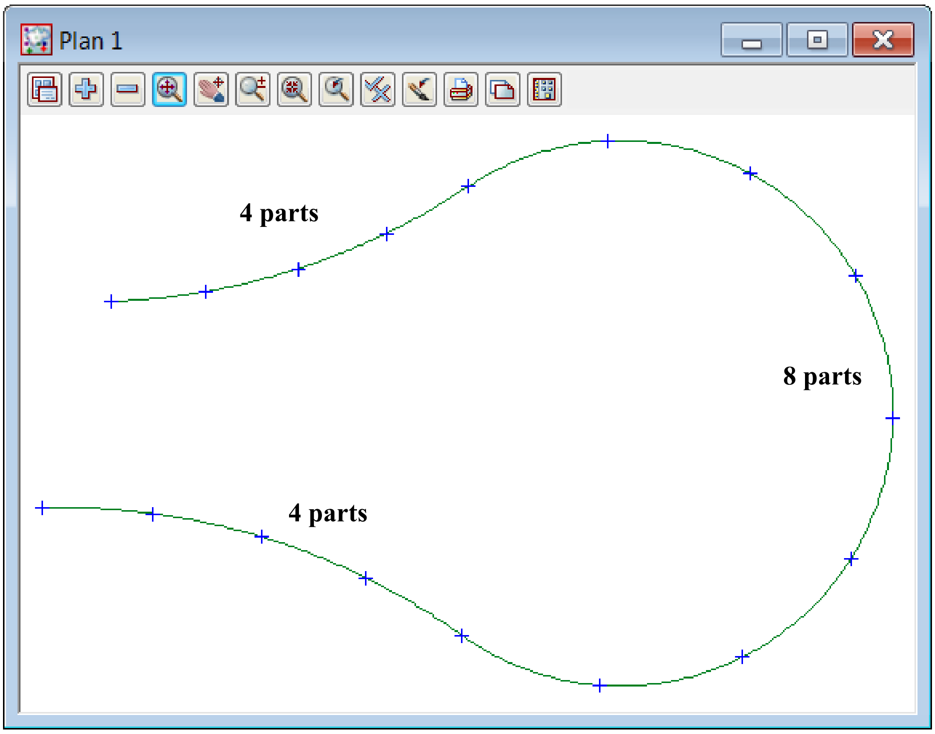
11.4.3Segment the string

We now segment the string into the equal parts shown in the diagram at the start of this topic.

Firstly toggle off the vertex indices.

Select option ***Strings=>Strings edit=>Segment strings***



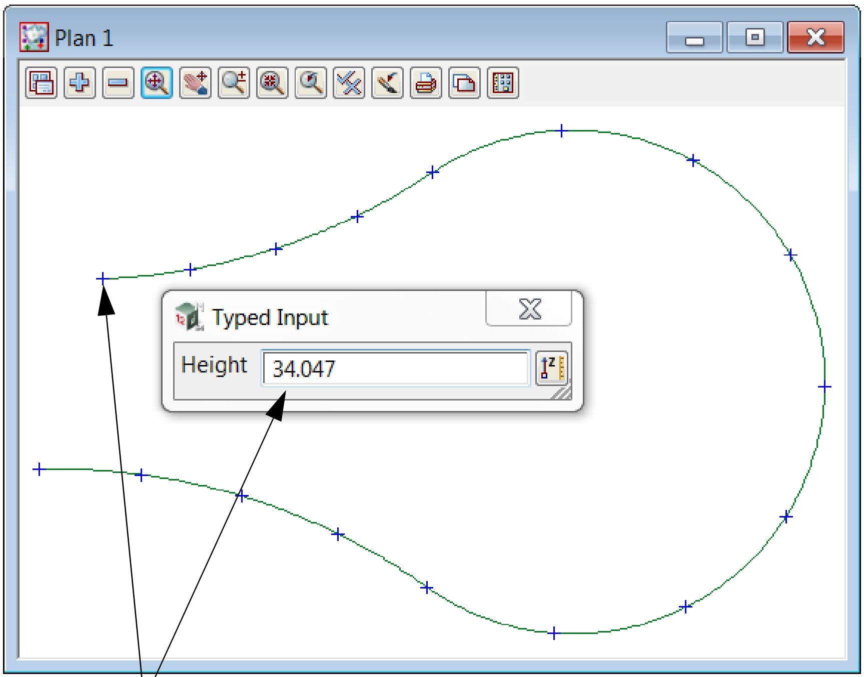


11.4.4Add heights to string

Heights will be added from the diagram

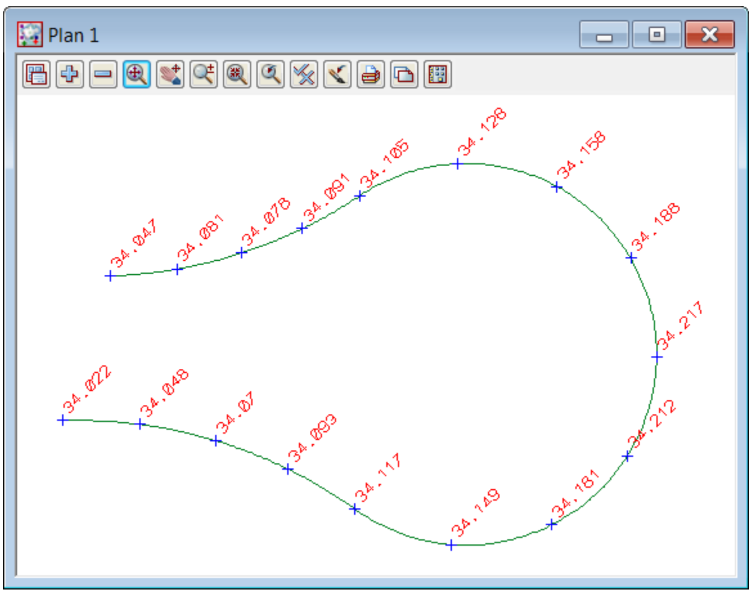
Toggle on the Z values (No levels appear yet)

To edit the string select **Point height** icon



Pick and accept the first point and then type in height [Enter]

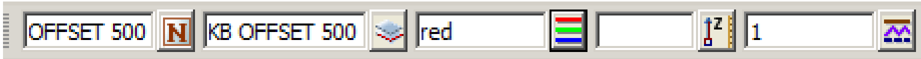
Repeat for all of the points



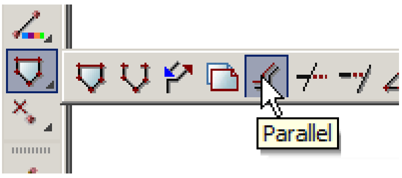
11.4.5Parallel the lip string for setout

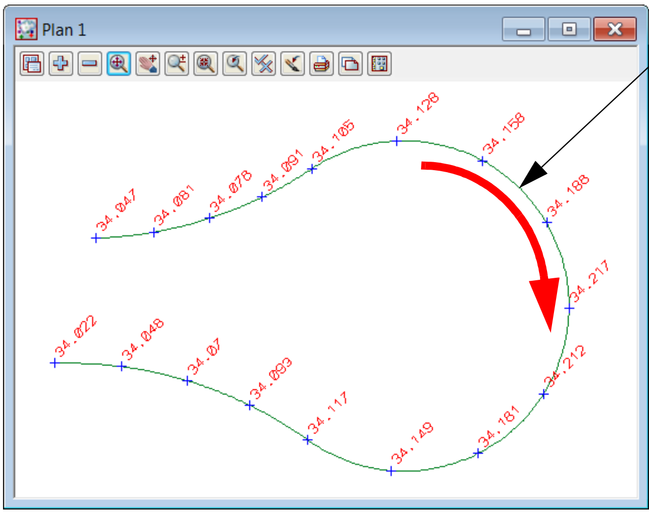
The lip will be paralleled to create setout points. The heights will be raised 0.11 to relate to the kerb level and the offset will be 0.5 behind the back of kerb

Add a new name and model **KB OFFSET 500** to the cad control bar



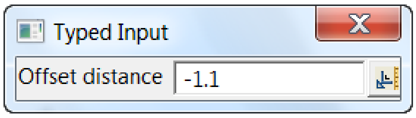
Select **String Parallel** icon



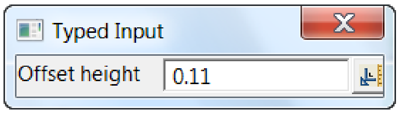


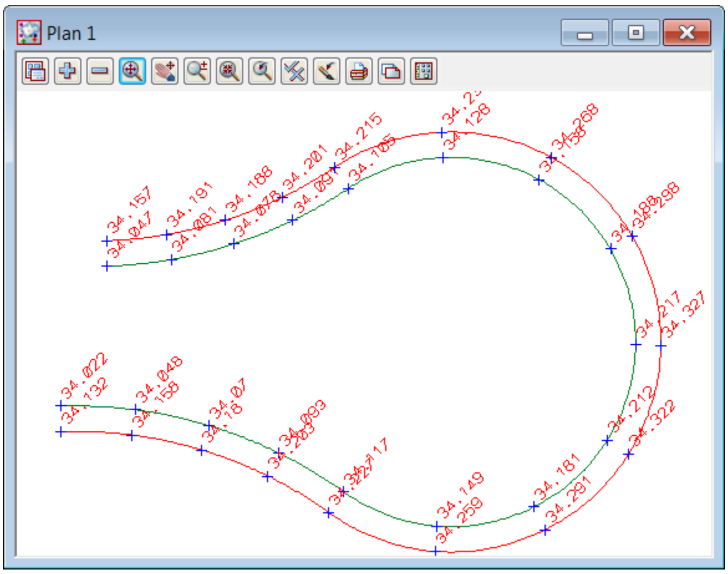
Select and accept with direction the kerb in a clockwise direction

Type in offset **-1.1 [Enter]**



Type in offset height **0.11 [Enter]**





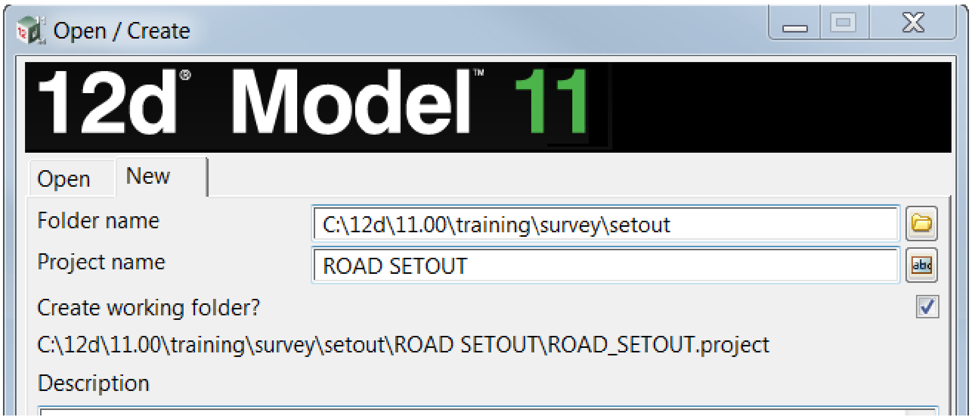
The creation of the point numbers for upload is discussed in the previous chapters

11.5 Triangulation setout

In this topic we will use a triangulation of a surface to create an upload file to be used in a data collector

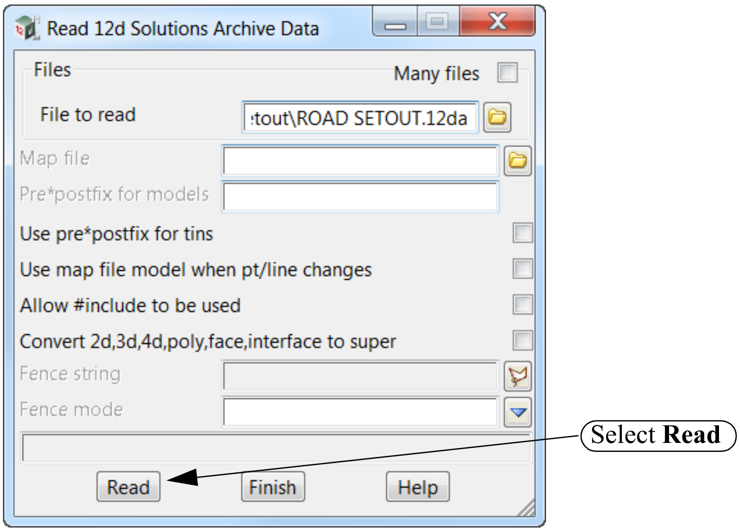
Create a new project as shown previously called **ROAD SETOUT** in the folder

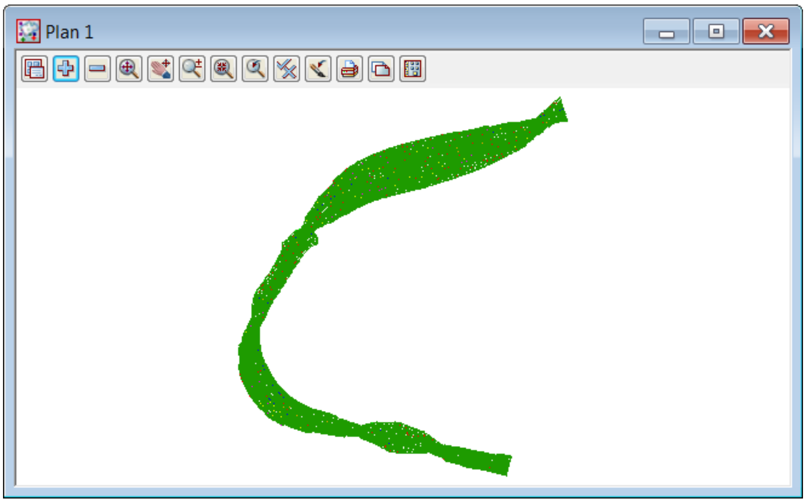
C:\12d\11.00\Training\survey\setout



11.5.1 Import 12da file

Read in the file **C:\12d\11.00\Training\survey\setout\ROAD SETOUT.12da** file by dragging and dropping using the **Explore Working Folder** icon as shown previous

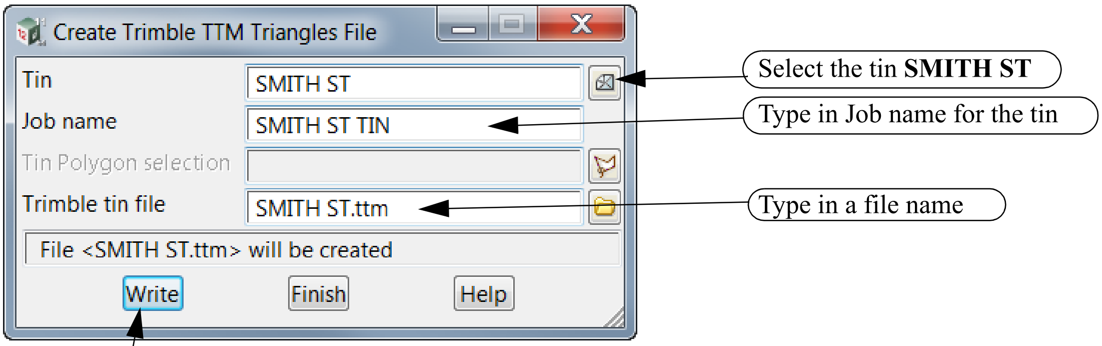




11.5.2Create upload file of the triangles

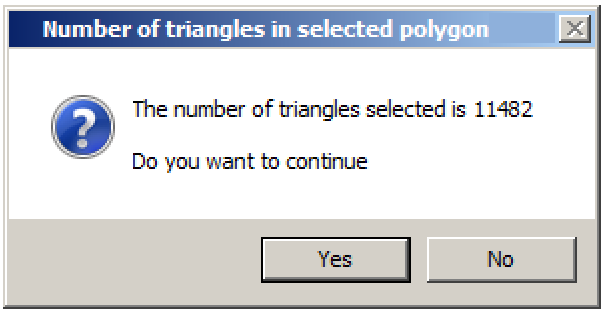
The triangles can be written to an upload file. We will create a Trimble TTM triangle file

Select option ***Survey =>Trimble =>Write TTM file***



Select **Write** to create the file

The number of triangles selected are displayed



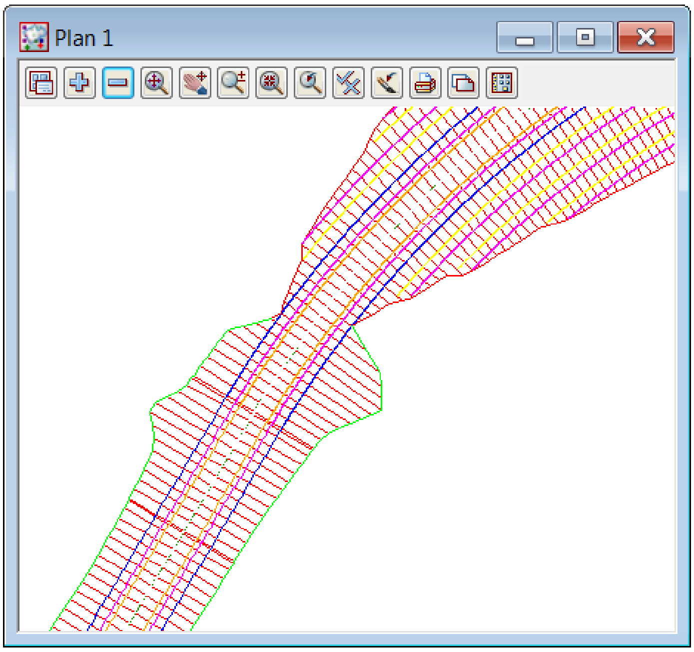
Select **Yes** to continue

The file is created

11.6 Road Setout

In this topic we will create an upload file of the horizontal and vertical alignment along with the strings or cross sections. We will use the previous project otherwise create a new project and read in the ascii file described in the previous chapter

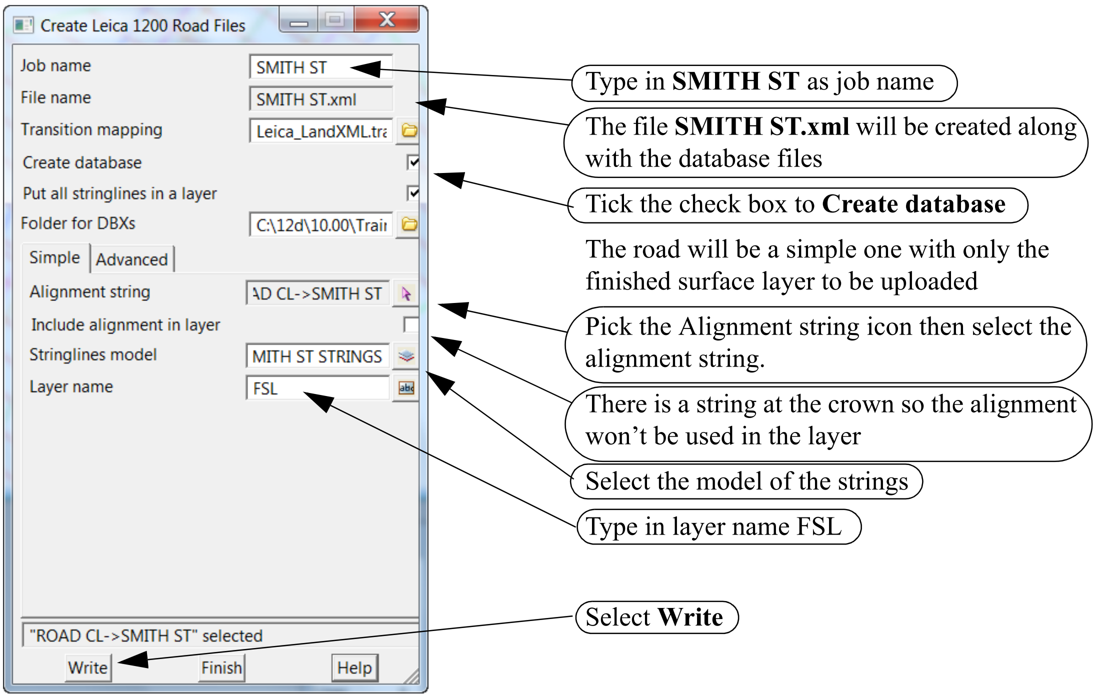
Turn off the model **tin SMITH ST** and then turn on models **SMITH ST SECTIONS** and **SMITH STRINGS** on the road models

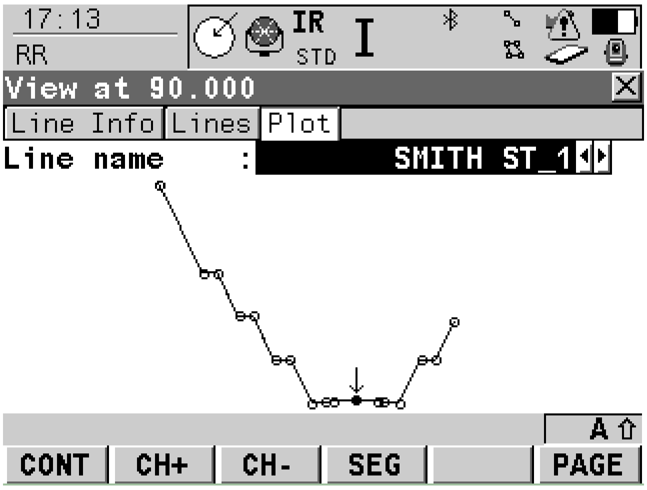


11.6.1 Create upload file of road alignment for Leica 1200

The Leica 1200 Road Runner program can accept the alignment and strings for a road setout

Select option ***Survey=>Leica=>1200=>Roads***





On board the Leica the strings are cut at the required chainage and a section can be viewed

11.7 Setout reports

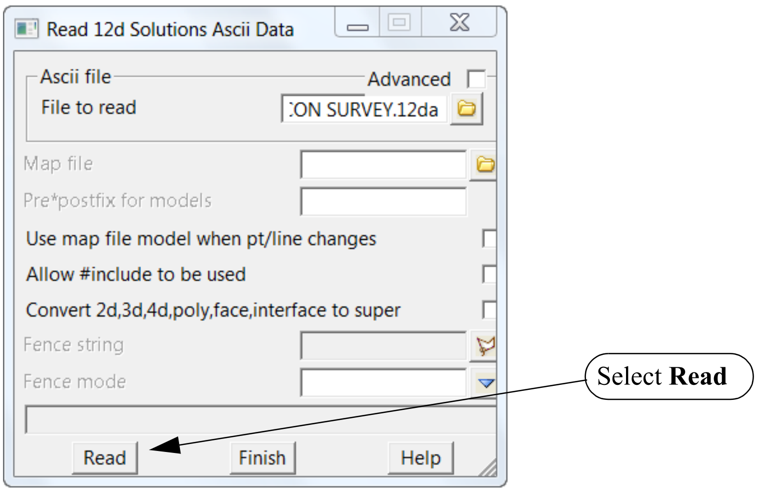
The final position of the Setout points can be checked against the design in a number of ways

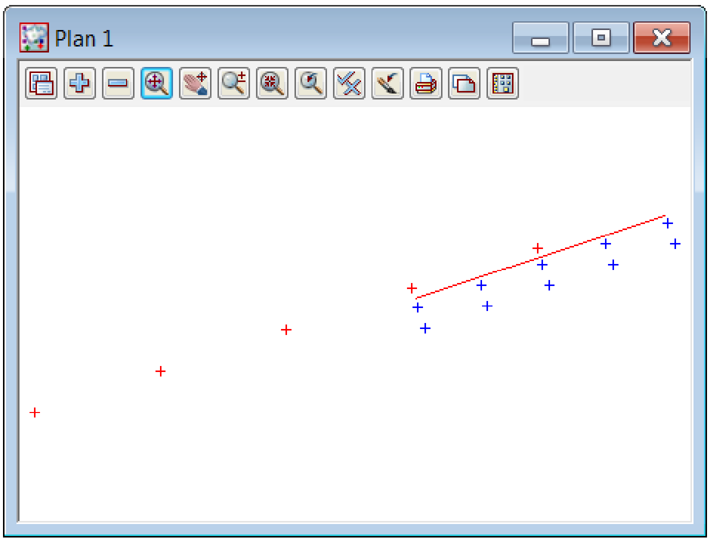
We will look at three ways

11.7.1Read in Ascon survey

We will read in an ascii file of the ascon survey. The file also contains some design positions of light poles

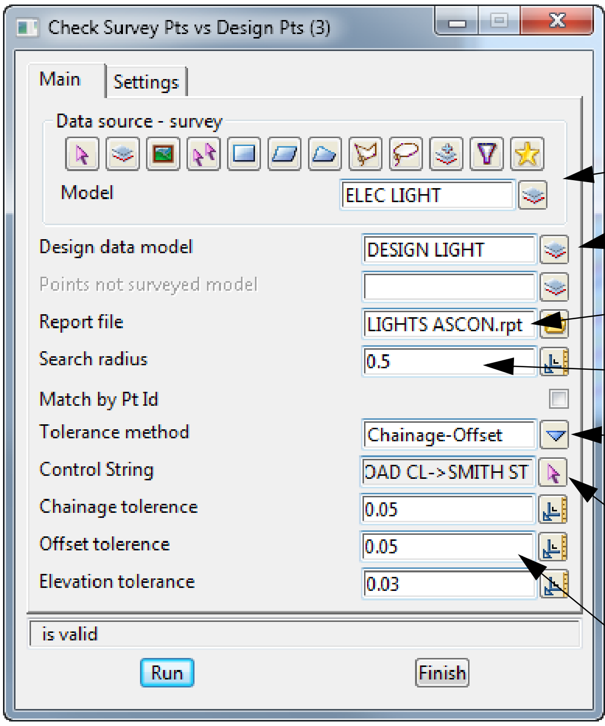
Read in the file **C:\12d\11.00\Training\survey\setout\ROAD ASCON SURVEY.12da** file by dragging and dropping using the **Explore Working Folder** icon as shown previous





11.7.2Calculate the differences between the design and as constructed data

Select option ***Report=>QA Reports=>Check survey points vs design points***



Select the model **ELEC LIGHT** for the survey model

Select the model **DESIGN LIGHT** for the design data

Type in report name **LIGHTS ASCON**

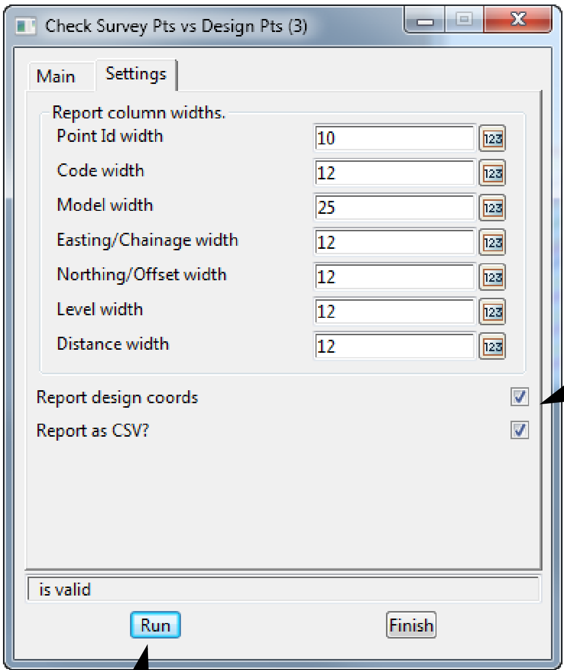
Type in distance from the design point to look for a corresponding as-constructed point

Select **Chainage-Offset** as the tolerance method

Select the **Chainage String** button then select the alignment string to report the chainages and offsets from

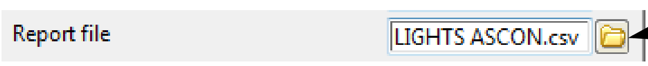
Type in the tolerances in chainage, offset and elevation

Select the **Settings** tab



Tick both boxes to Report design coords and report as csv file

Select **Run**



Return to the Main tab and open the report file

Survey Tolerance Check between survey data and design model <DESIGN LIGHT>

Parameters

```
     Search radius: 0.500
  Tolerance Method: Chainage-Offset
 Chainage tolerance: 0.050
   Offset tolerance: 0.050
Elevation tolerance: 0.030
```

Results

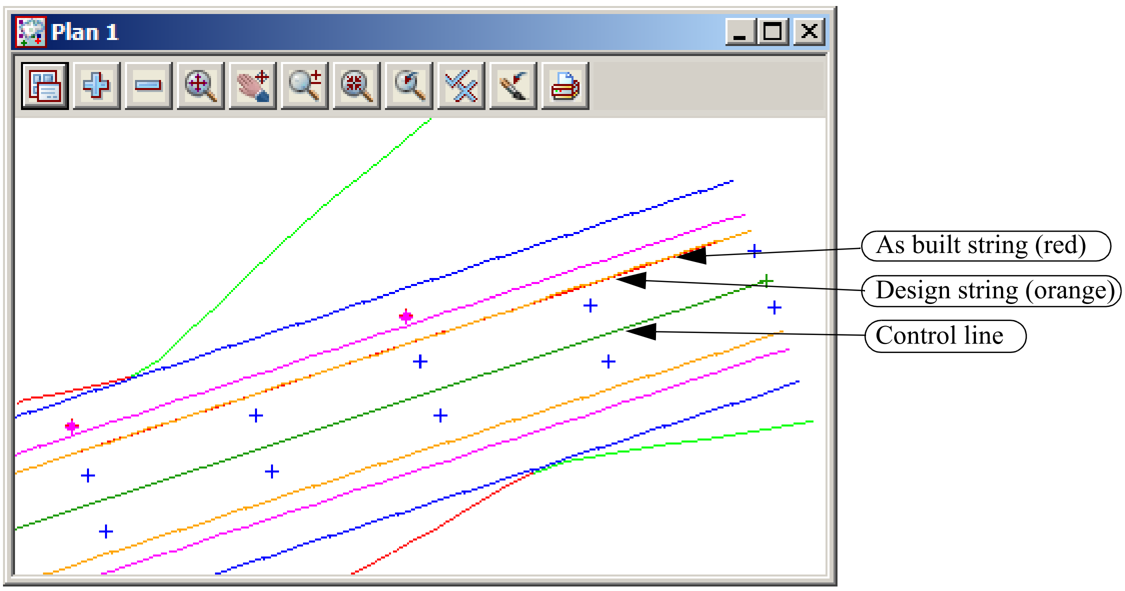
Point ID	Code	Model	Chainage	Offset	Elevation	Distance
254	LP	ELEC LIGHT	19.989	4.479	205.823	
	LP	DESIGN LIGHT	20.000	4.500	205.802	
			0.011	0.021	-0.021	0.024
255	LP	ELEC LIGHT	40.016	4.498	203.226	
	LP	DESIGN LIGHT	40.000	4.500	203.234	
			-0.016	0.002	0.008	0.016
256	LP	ELEC LIGHT	60.009	4.521	200.675	
	LP	DESIGN LIGHT	60.000	4.500	200.666	
			-0.009	-0.021	-0.009	0.023
257	LP	ELEC LIGHT	79.927	4.610	198.060	
	LP	DESIGN LIGHT	80.000	4.500	198.098	
			0.073	-0.110	0.038	0.132*
258	LP	ELEC LIGHT	100.008	4.519	195.518	
	LP	DESIGN LIGHT	100.000	4.500	195.530	
			-0.008	-0.019	0.012	0.020

Summary

Range:						
High:			0.073	0.021	0.038	
Low:			-0.016	-0.110	-0.021	
Count:			5	5	5	
Mean:			0.010	-0.025	0.006	
StdDev:			0.032	0.045	0.020	

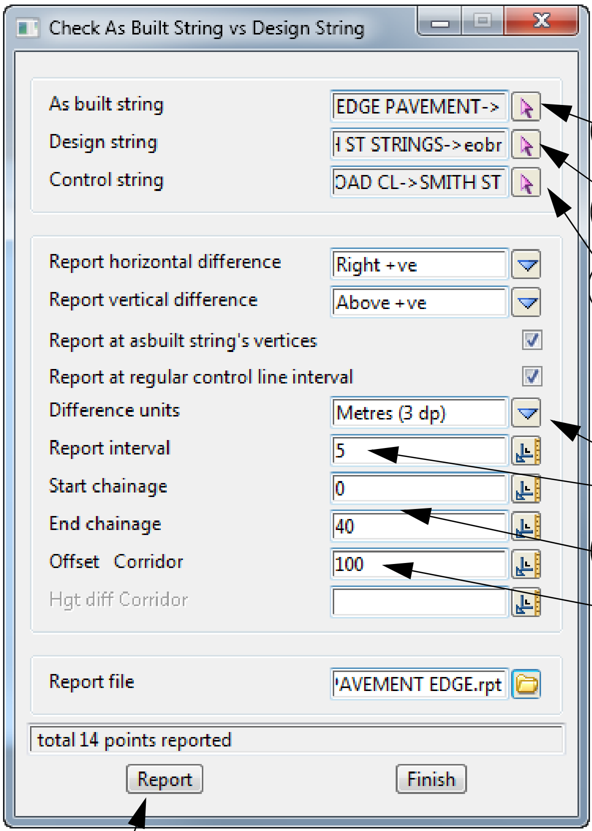
11.7.3Check asbuilt strings against design strings

Turn on the design models strings **SMITH ST STRINGS**



11.7.3.1 Calculate the difference between the ascon string and the design string

Select option ***Report=>QA Reports=>Check asbuilt string vs design string***



Select **As built string** button then pick and accept the red ascon string

Select **Design string** button then pick and accept the design orange string

Select **Control string** button then pick and accept the alignment string

Leave the reporting differences as shown

Tick all of the check boxes

Set the difference units to **Metres (3dp)**

Type in **5** for the report interval

The start chainage is kept as **0** but the end chainage is changed to **40**

Type in **100** (mm) for the range to check

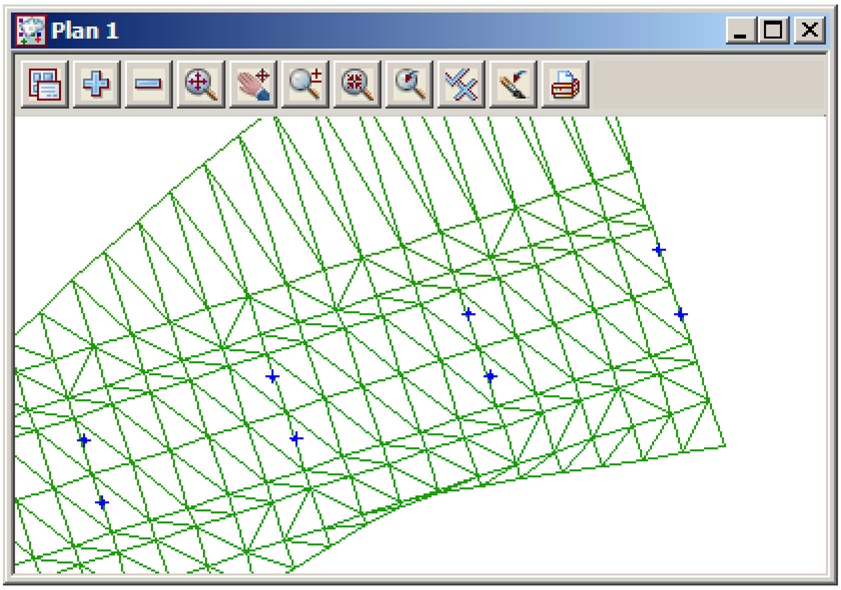
Type in report name **PAVEMENT EDGE ASCON**

Select **Report**

Open the report file

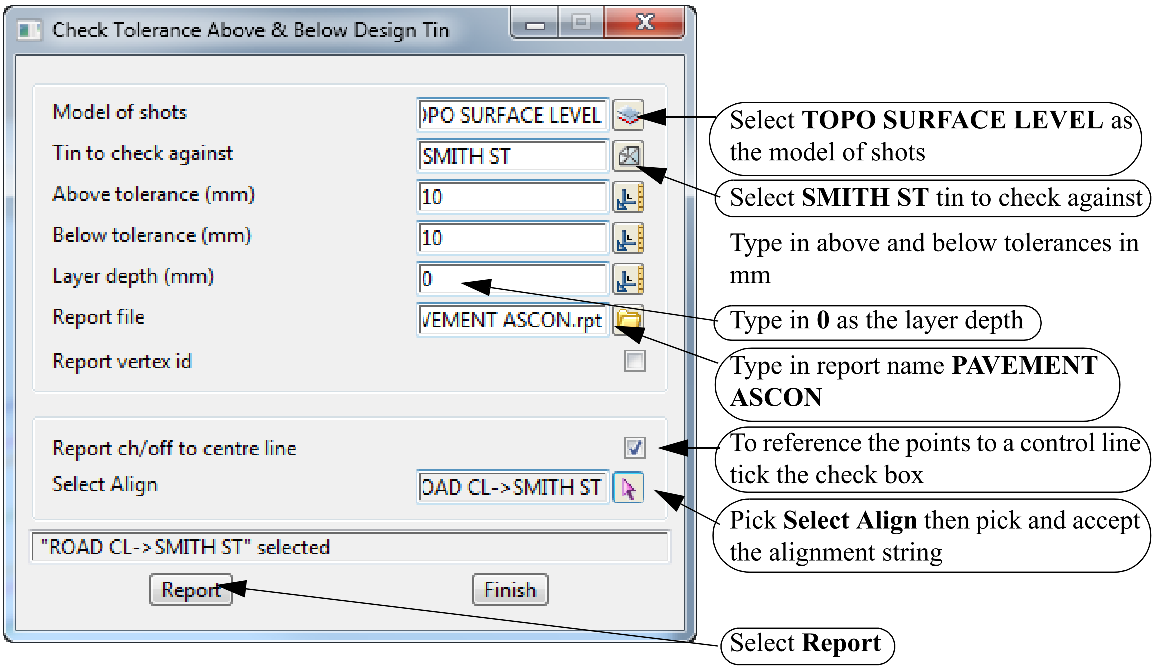
```
Macro                    Asbuilt_vs_design_h_z_dif_01
Report file name:        PAVEMENT EDGE ASCON.rpt

Check design string using as built string
    Design string       "SMITH ST STRINGS->eobr"       compared to
    As built string     "ROAD EDGE PAVEMENT->"

Control string           "ROAD CL->SMITH ST"

Date: Fri Dec 26 13:46:10 2014

Vertical difference is Asbuilt minus Design.
That is, vert diff is positive if Asbuilt is above the Design

At As Built String Vertices:
---------------------------------------------------------------------------------------------
Relative To CentreLine      Asbuilt Coordinates        Asbuilt   Design     Horz-Diff Vert-Diff
 Chainage      Offset      Easting      Northing      Level     Level        (mm)      (mm)
---------------------------------------------------------------------------------------------
      0.010       3.010    42987.051    37447.856    208.901   208.909          10        -8
      9.995       2.997    42977.569    37444.726    207.629   207.627          -3         2
     20.003       2.998    42968.061    37441.602    206.348   206.342          -2         6
     30.037       2.985    42958.533    37438.455    205.049   205.053         -15        -4
     39.990       3.011    42949.070    37435.372    203.770   203.776          11        -6

At Intervals:
---------------------------------------------------------------------------------------------
Relative To CentreLine      Asbuilt Coordinates        Asbuilt   Design     Horz-Diff Vert-Diff
 Chainage      Offset      Easting      Northing      Level     Level        (mm)      (mm)
---------------------------------------------------------------------------------------------
      0.000    No drop
      5.000       3.004    42982.312    37446.292    208.265   208.268           4        -3
     10.000       2.997    42977.564    37444.725    207.628   207.626          -3         2
     15.000       2.998    42972.814    37443.164    206.988   206.984          -2         4
     20.000       2.998    42968.064    37441.603    206.348   206.342          -2         6
     25.000       2.991    42963.316    37440.035    205.701   205.700          -9         1
     30.000       2.985    42958.568    37438.467    205.054   205.058         -15        -4
     35.000       2.998    42953.814    37436.918    204.411   204.416          -2        -5
     40.000    No drop
```

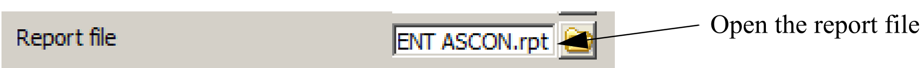
11.7.4Check as constructed points against the design tin



11.7.4.1Calculate the difference between the ascon points and the design tin

Select option ***Report=>QA Reports=>Check points vs tin***



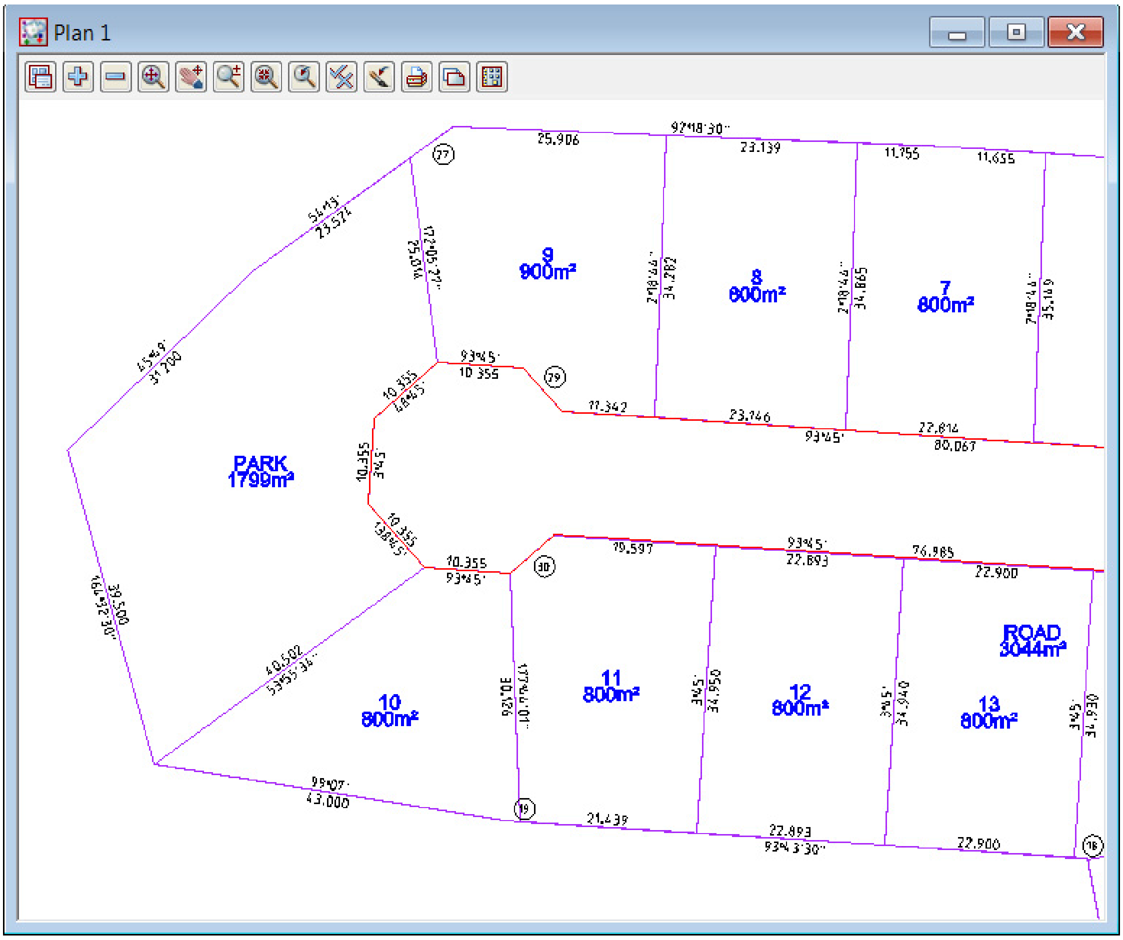


```
Macro:                    Points_vs_tin_z_dif_panel
Report file name:         PAVEMENT ASCON.rpt

Check of Model           "TOPO SURFACE LEVEL"       compared to
       Tin               "SMITH ST"
Centre Line              "SMITH ST"

Above tolerance (mm):    10.0
Below tolerance (mm):    10.0
Layer depth (mm)    :    0.0
Date:                    Fri Dec 26 13:58:13 2014
```

Relative To CentreLine Chainage	Offset	As Built Coordinates Easting	Northing	Point Level	Design Level	Vert_Diff (mm)	Outside of Tolerance	Name/notes
0.0788	1.8531	42987.3465	37446.7358	208.9393	208.9343	5.0		A
9.9057	1.8026	42978.0267	37443.6191	207.6791	207.6741	5.0		B
20.1088	1.8402	42968.3222	37440.4686	206.3579	206.3629	-5.0		C
29.8502	1.7899	42959.0837	37437.3788	205.1047	205.1137	-9.0		D
39.9858	1.5833	42949.5195	37434.0173	203.8390	203.8185	20.5	10.5 above	
39.9568	-1.7432	42950.5858	37430.8663	203.8094	203.8174	-8.0		
29.9570	-1.4609	42959.9974	37434.2572	205.1168	205.1098	7.0		E
19.9605	-1.4179	42969.4805	37437.4197	206.3966	206.3946	2.0		F
9.8829	-1.4837	42979.0747	37440.5042	207.6766	207.6866	-10.0		G
0.0234	-1.5315	42988.4560	37443.5377	208.9440	208.9510	-7.0		H

12 Subdivision Design

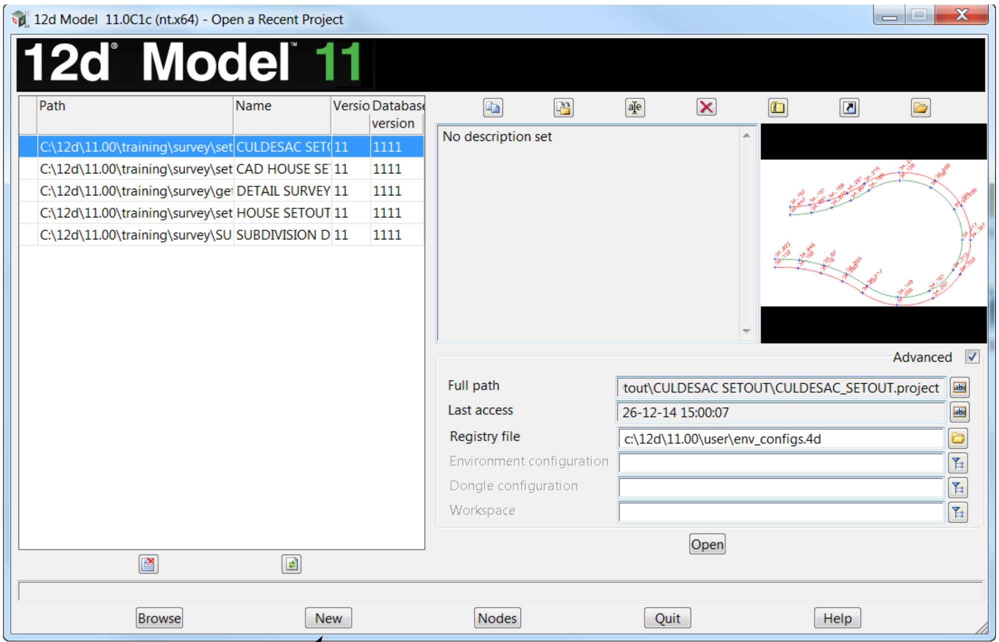
In this exercise we will create a subdivision using a defined outline and explore the various options involved in creating and reporting lot layouts



12.1 Setting up a New Project

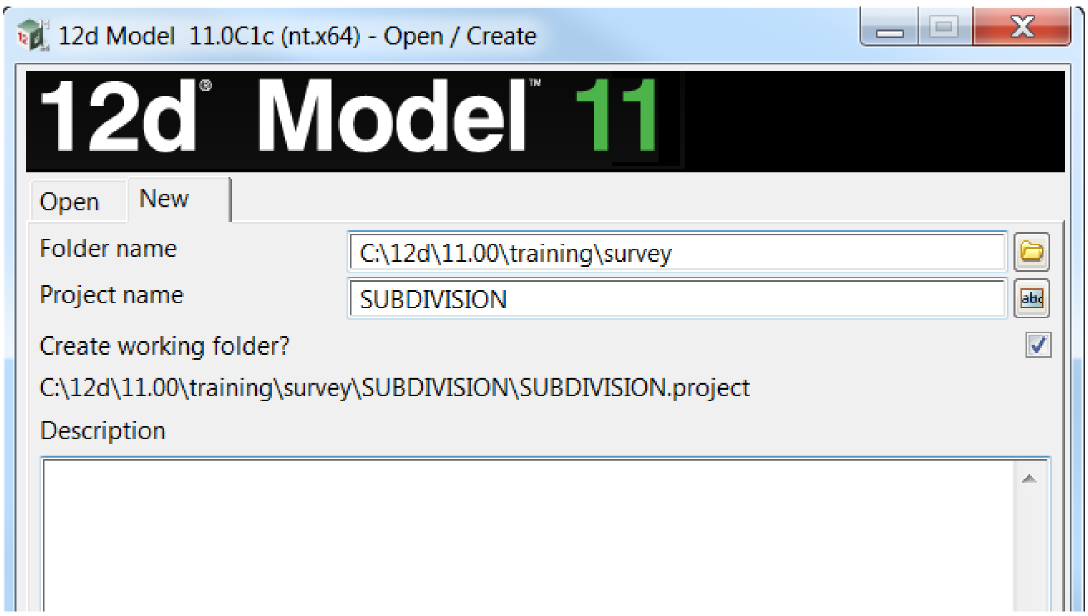
To begin create a new project called **SUBDIVISION** in the Survey training area

First, double click on the *12d Model 11* icon to bring up the **Project Selection** panel.



Select **New** button to bring up the **New project** panel.

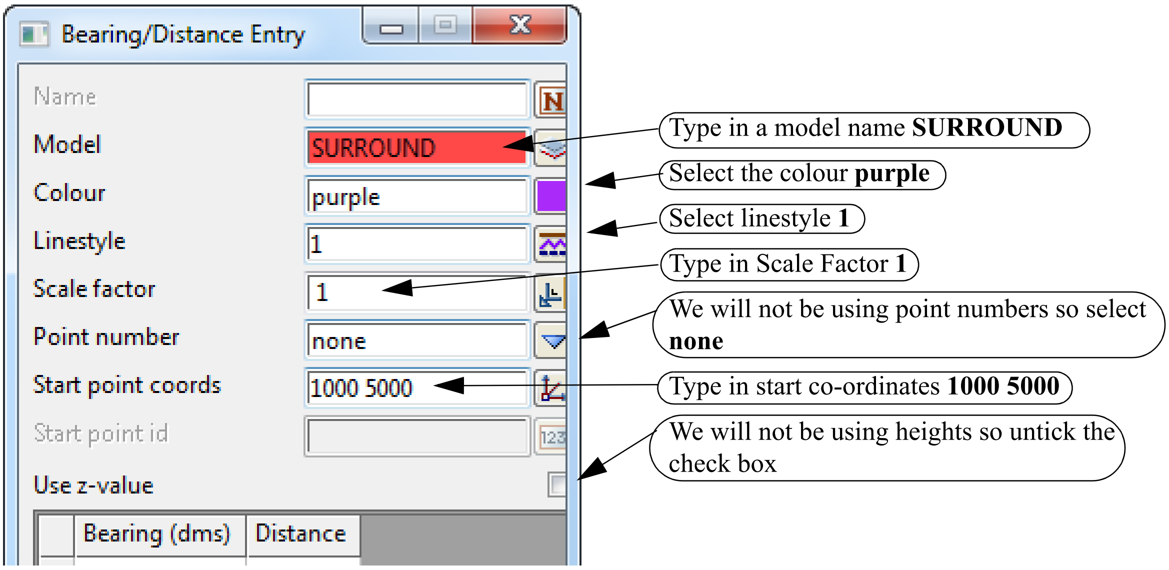
Create a project under the folder **C:\12d\10.00\Training\survey** called **SUBDIVISION**



12.2 Create the surrounding boundary

We will firstly create the string around the edge of the subdivision

Select option ***Survey=>Extras=>Bearing/Distance Entry***



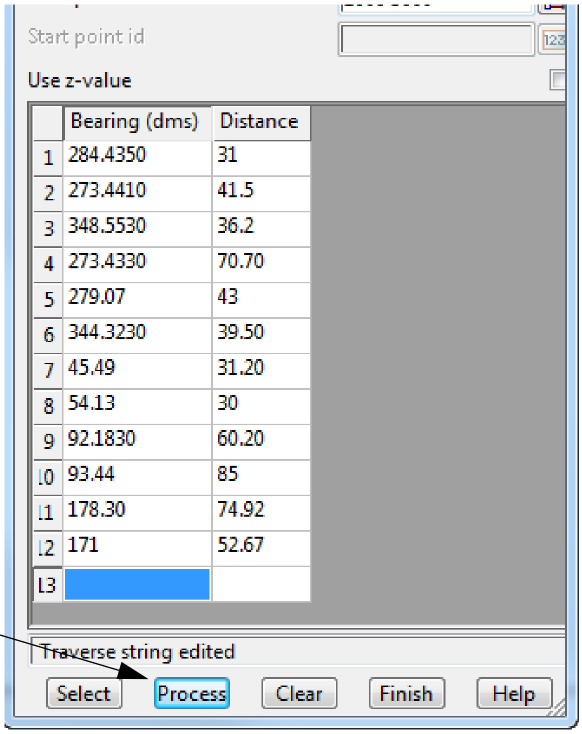
We are now able to type in the bearing and distances around the edge of the boundary

Type in the bearing and distance of the string around the surround boundary

Select the **Enter** or **Tab** key to move between cells.

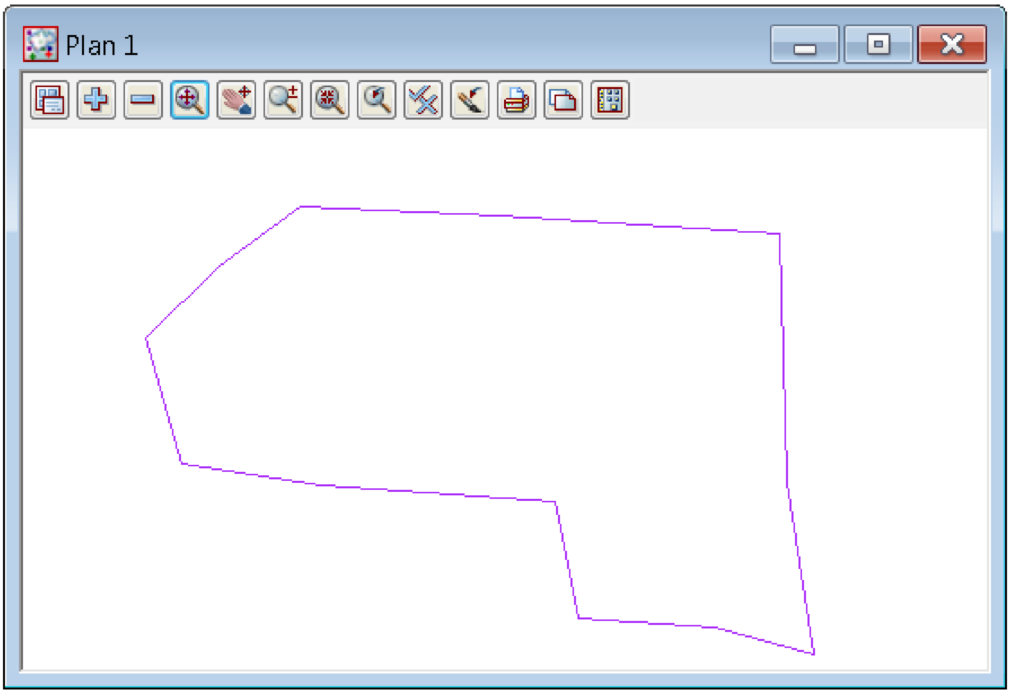
After typing in the distance press **Enter** to create the next line

Use the bearing and distances as shown in the example on the right



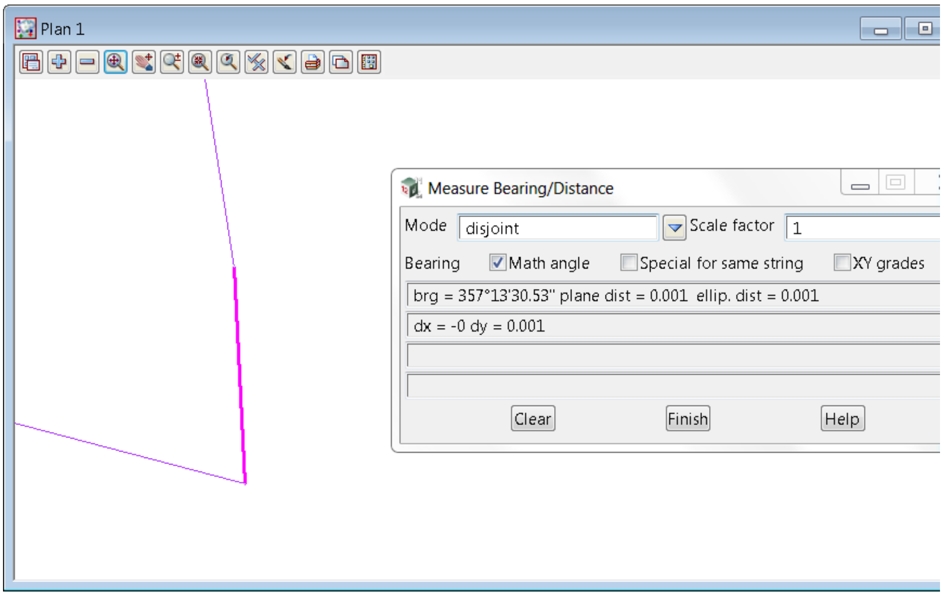
When all lines have been entered select **Process** then **Finish**

In plan view **1** Turn on the model **SURROUND** and zoom all



To check the distance between the start and end point select ***Utility=>Measure=>Bearing/Distance*** or **Measure Bearing/Distance** icon

Zoom in to the start point then select and accept the start and end point

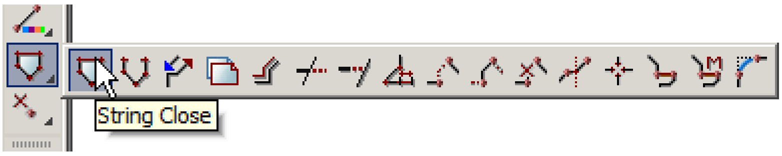


If an error is found the relevant line can be corrected in the **Bearing/Distance Entry** panel and re-processed

Select **Finish** to exit the panel

The string now needs to be closed to form a polygon

Select the option ***Cad =>String =>Close*** or **String Close** icon

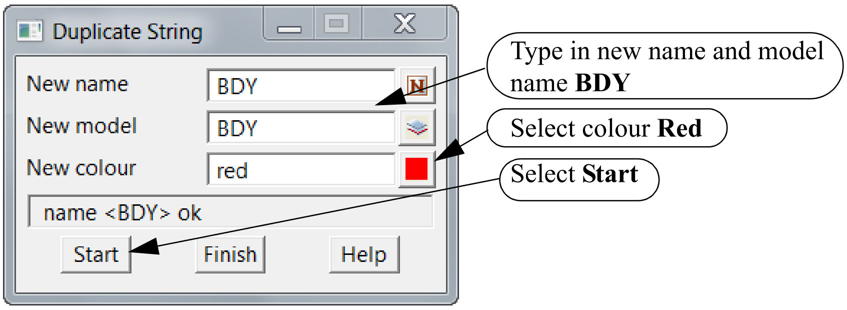


Select and accept the surround string

12.3 Duplicate the surround

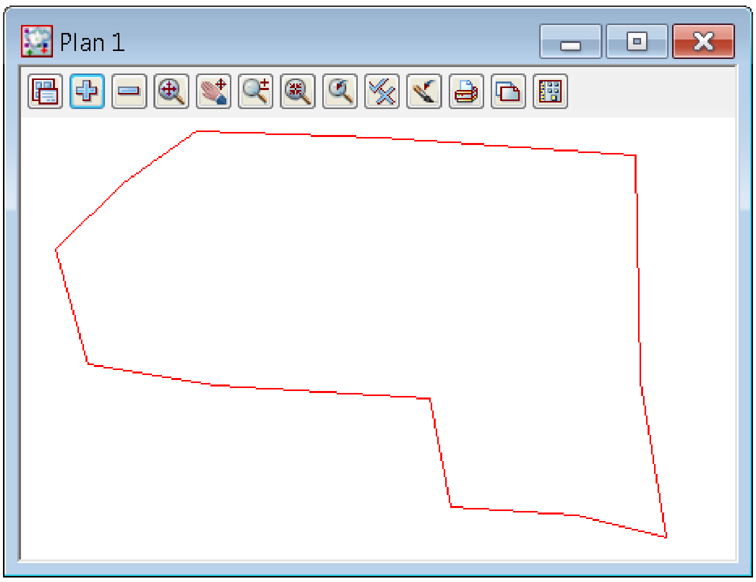
The surround string is to be duplicated in a new model called **BDY**. This new model will be used in the subsequent lot calculations

Select ***Strings=>Strings Edit=>Duplicate***



Select and accept anywhere on the **SURROUND** string

Now turn off the model **SURROUND** and turn on model **BDY**

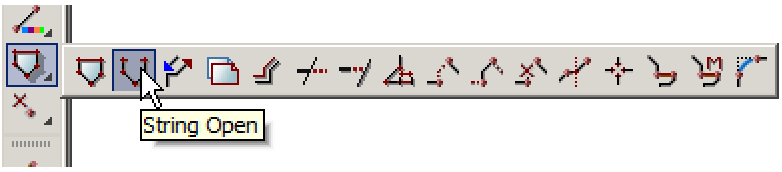


12.4 Open the Boundary string

To help with future calculations using the boundary string we open the string at this point.

Select option ***Strings=>Cad=>Change Strings=>Open***

or **Cad string open** icon

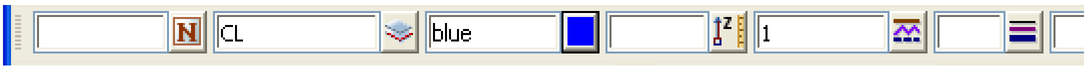


then pick and accept the boundary string

12.5 Create Road Centreline

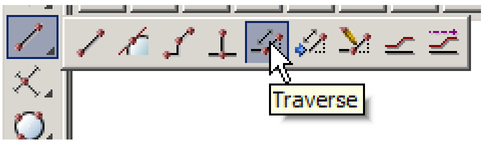
The centreline of the road reserve will now be created

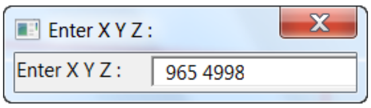
Type a new model name **CL** in the cad control bar and change the colour to **blue**



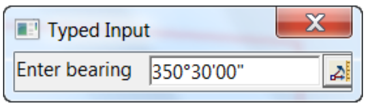
Select the option **Strings=>Cad=>Lines=>Traverse create**

or **Traverse** icon

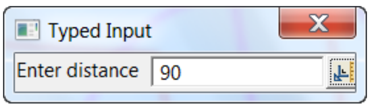




Press the space bar then type in **965 (space) 4998 [Enter]**



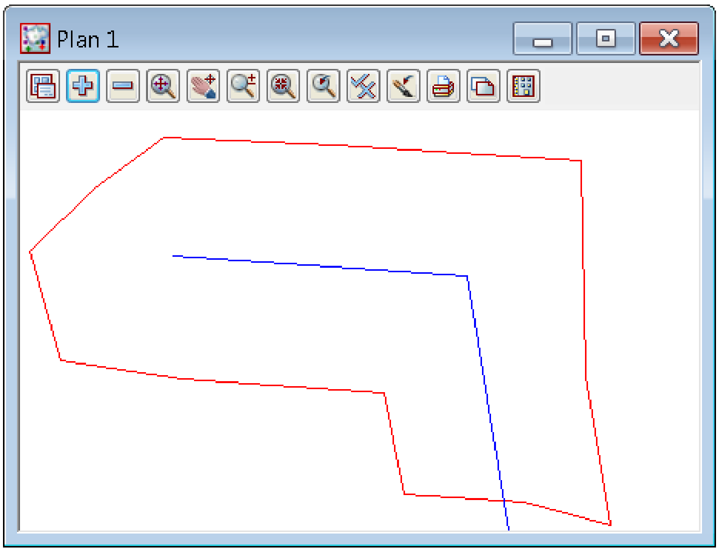
Press the space bar then type in **350.3000 [Enter]**



Press the space bar then type in distance **90 [Enter]**

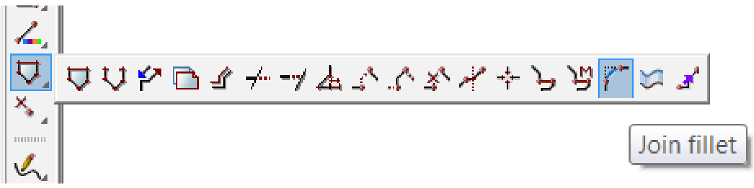
Type in the next bearing as **273.45 [Enter]** and the distance as **103 [Enter]**

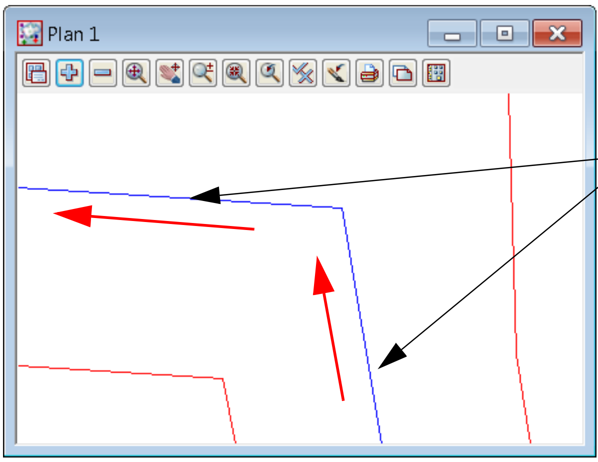
Press **[Esc]** key to exit the traverse entry



To insert a curve into the centreline string select option ***Cad =>String =>Join fillet***

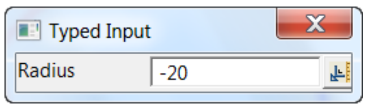
or select the **Join fillet** icon

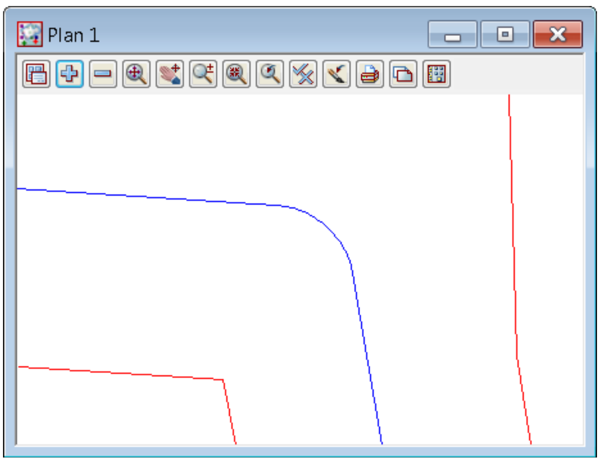




Select up the first straight with direction and accept. Pick along the second straight with direction and accept

Type in the radius **-20 [Enter]**





The curve is inserted

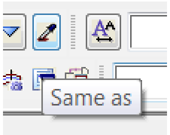
12.6 Create Road boundaries

12.6.1 Parallel centreline string

The road boundaries will be created parallel to the road centreline

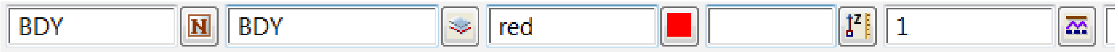
Set the name and model to **BDY** by matching an existing BDY **string**

Select the ***Same as*** icon

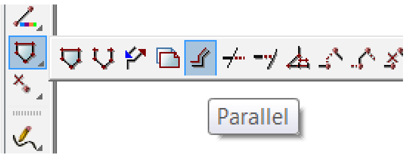


Pick and accept one of the boundary strings

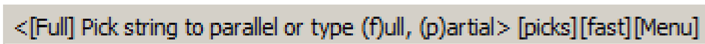
The cad control bar will self populate



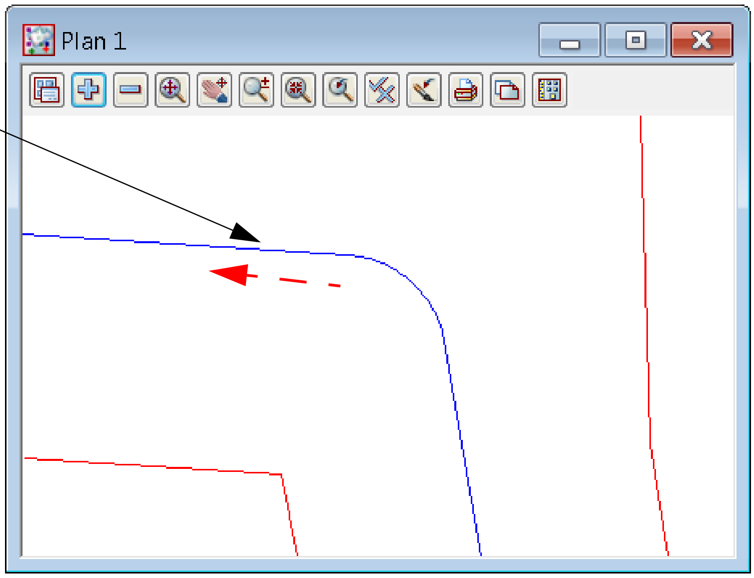
Select the **String parallel** icon

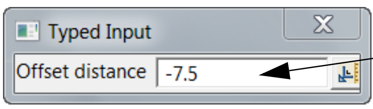


The default parallel type is full (f) parallel

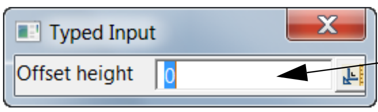


Select the string with direction and accept





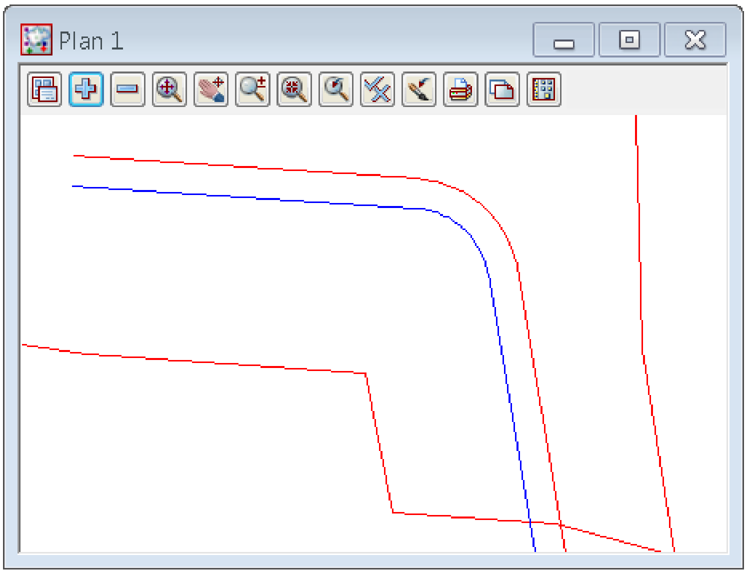
Type in the offset for the left as **-7.5 [Enter]**



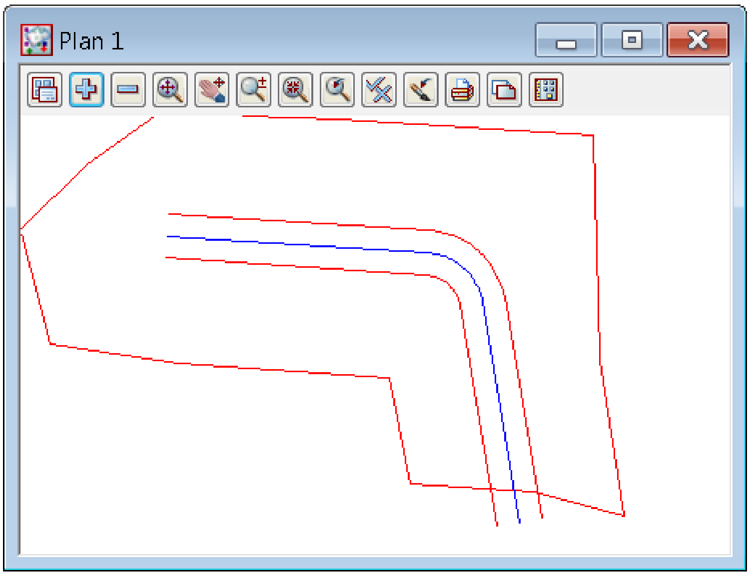
Type in the offset for the height as **0 [Enter]**

The centreline string is paralleled

Repeat this for the other side of the road using offset **7.5**

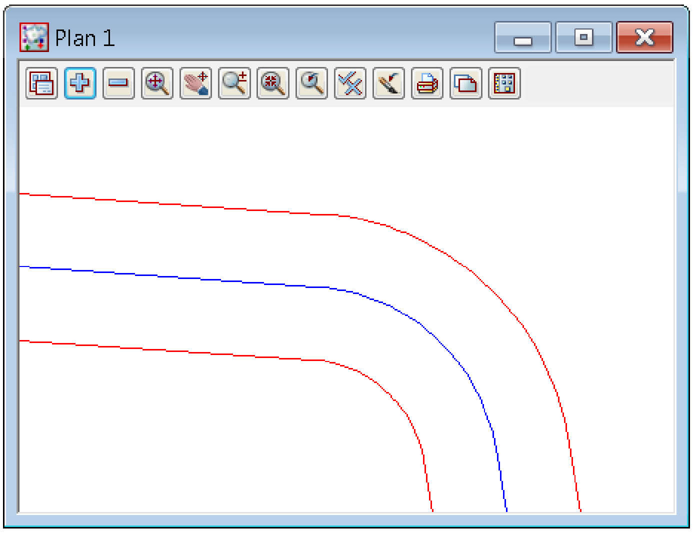


Both sides are paralleled

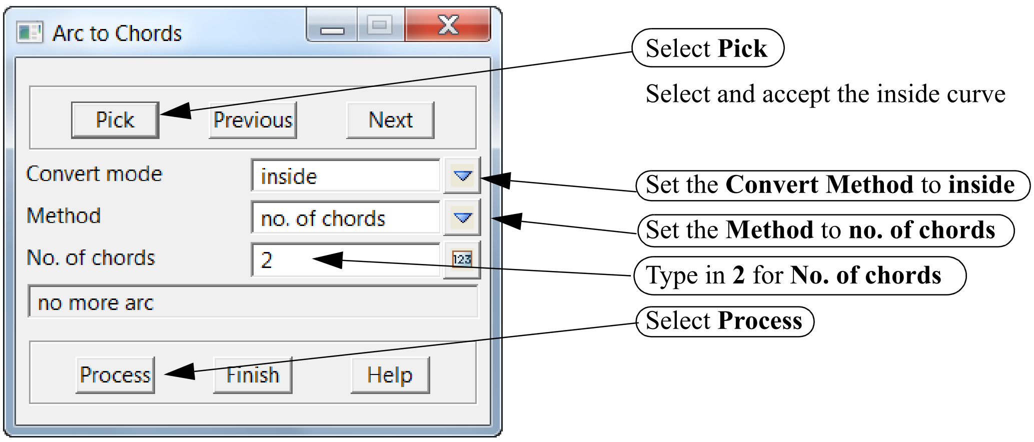


12.6.2Convert arcs to chords

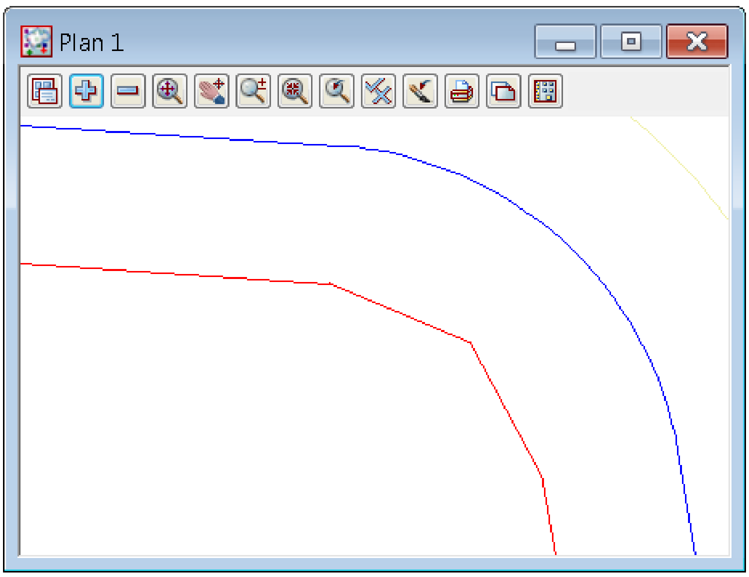
The arcs along the road boundary are to be converted to chords. These are created on the outside of the right hand curve and inside the left hand curve



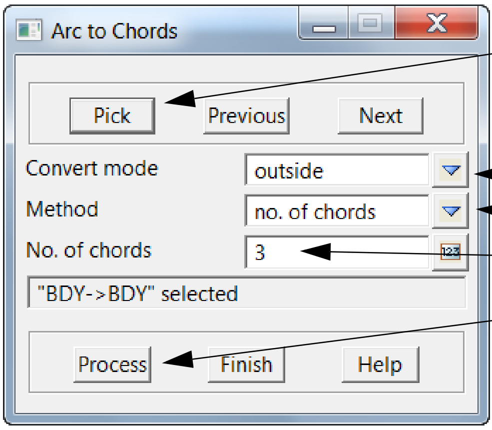
Select the option ***Strings=>Strings Edit=>Arc to chords***



The arc is converted to two chords



Repeat the process for the outside arc **creating three chords on the outside**



Select **Pick**

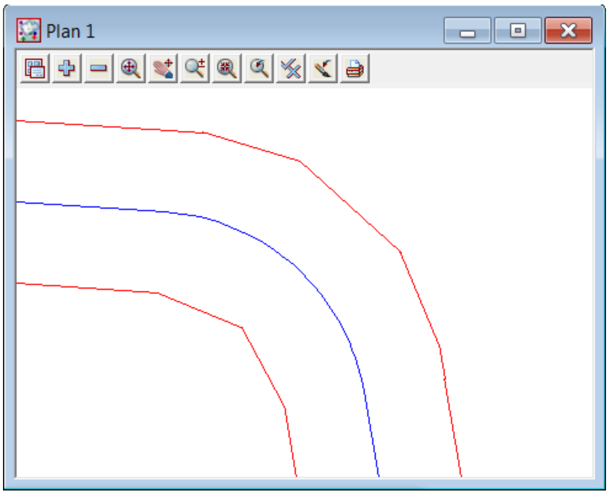
Select and accept the outside curve

Set the **Convert Method** to **outside**

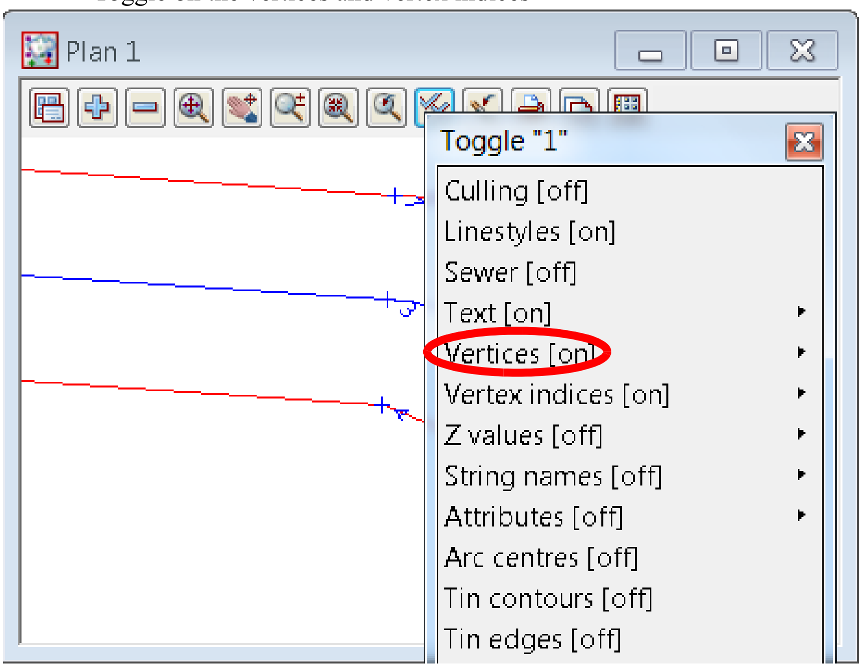
Set the **Method** to **no. of chords**

Type in **3** for **No. of chords**

Select **Process**



Toggle on the vertices and vertex indices

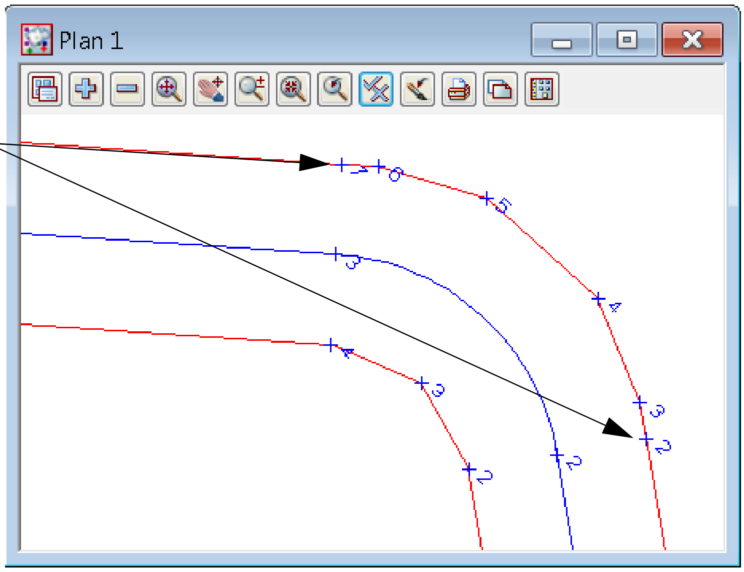


Two vertices are now redundant

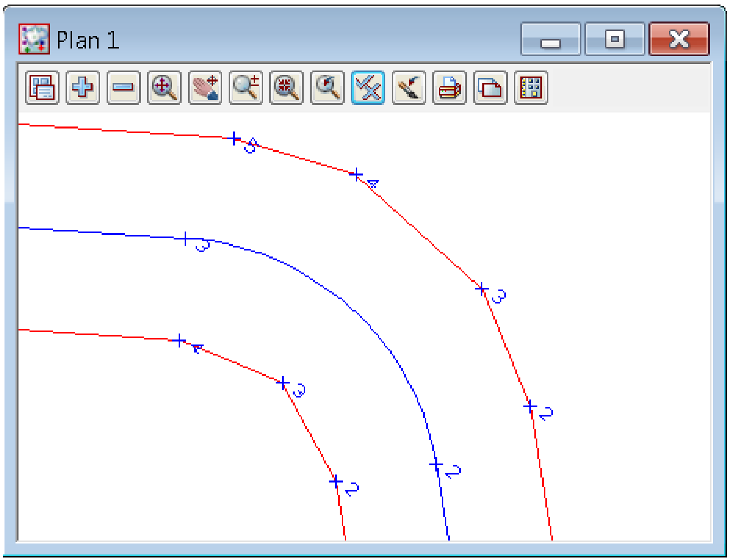
To delete these points select
Cad =>Delete =>Vertex

or **Vertex** delete icon

Select and accept the two points



The points are now deleted



12.6.3 Splay the road intersection boundaries

The road intersection boundaries have to be splayed using 3 chord truncations.

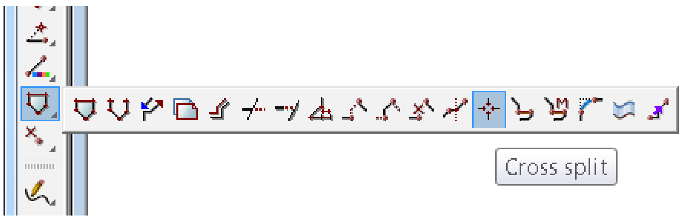
Zoom in to the road intersection

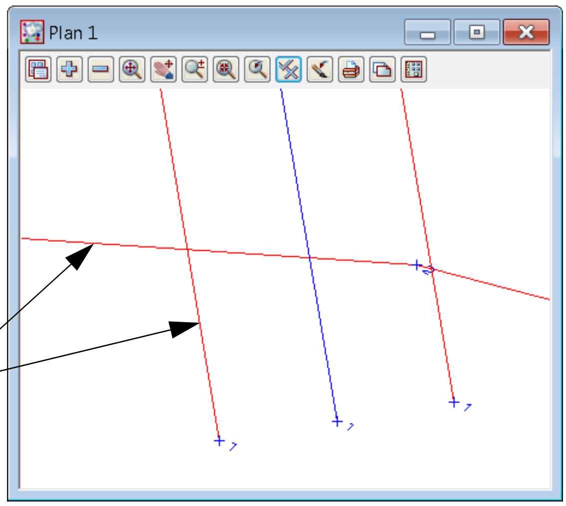
12.6.3.1Trim and delete boundary lines

We will use an option to split the strings at the intersection points

Select option ***Cad =>String =>Cross Split***

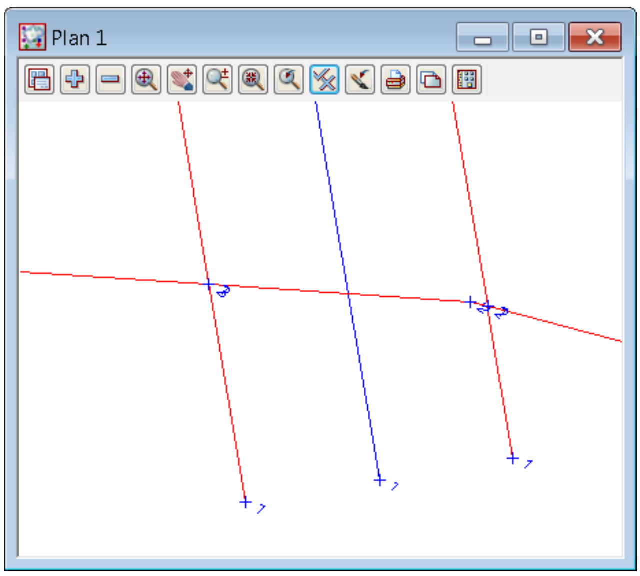
or **Cross Split** icon





Select and accept the two intersecting lines

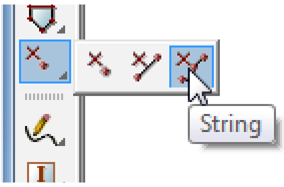
Repeat for the other side of the road

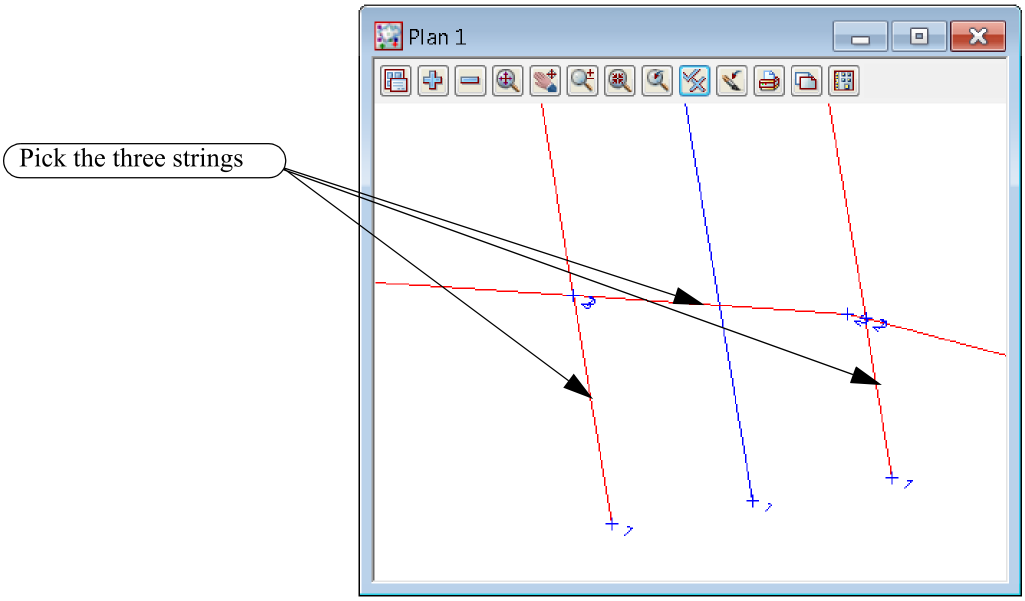


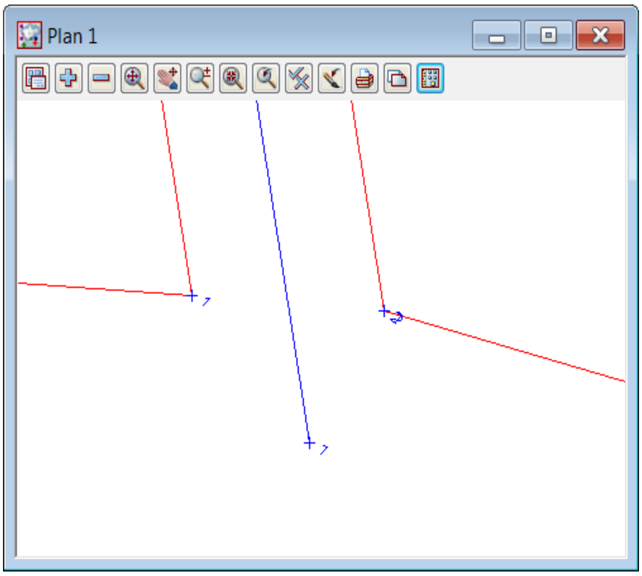
The strings are split at the intersections

We will now delete the redundant strings

Select option ***Cad =>Delete =>String*** or **String Delete** icon





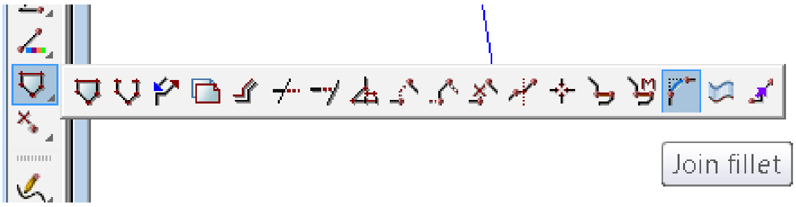


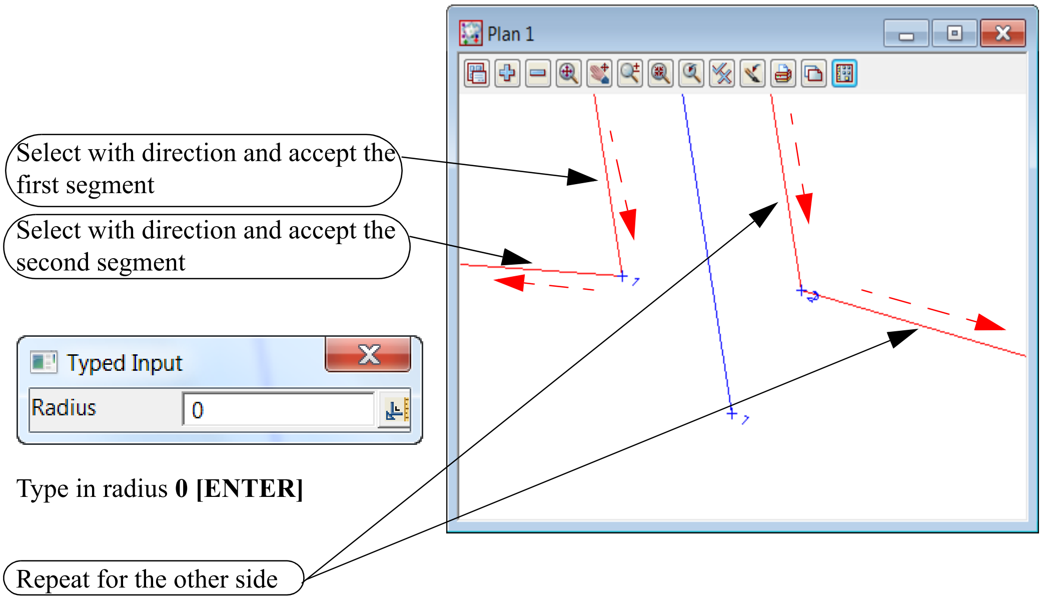
12.6.3.2Fillet corners

Before splaying the corners the segments have to be joined to create one string. Filleting the strings with a zero radius will join the strings and remove any duplicate points

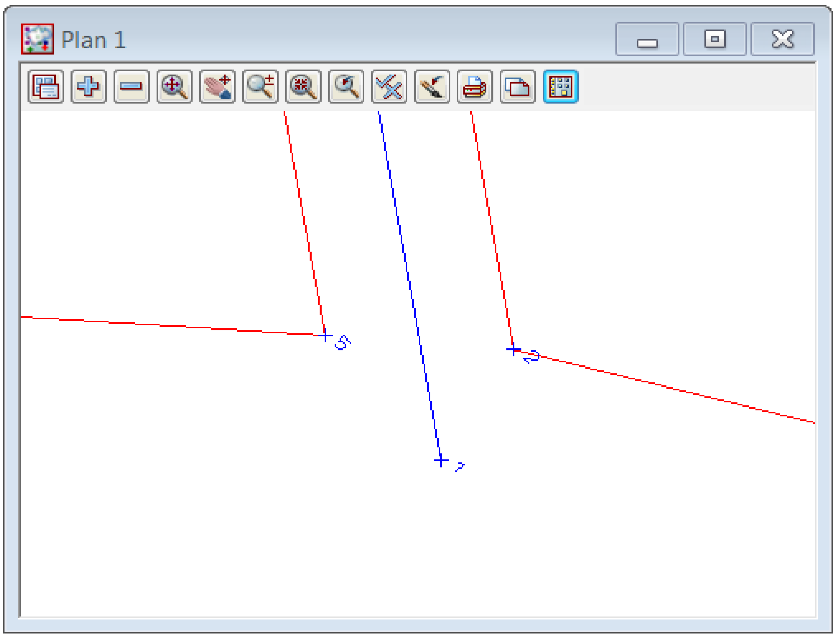
Select option ***Cad =>String =>Join fillet***

or select the **Join fillet** icon



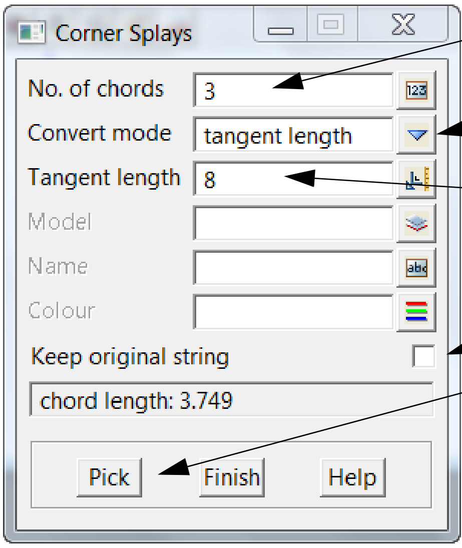


Type in radius **0 [ENTER]**



12.6.3.3Create corner splays

Select the option ***Strings=>String Edit=>Corner Splays***



Type in **3** for the number of chords

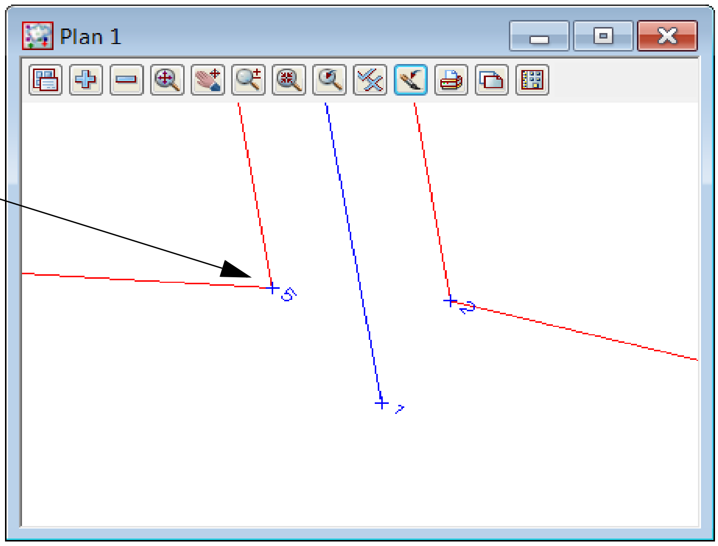
From the **Convert mode** choice list select **tangent length**

Type in a tangent length of **8**

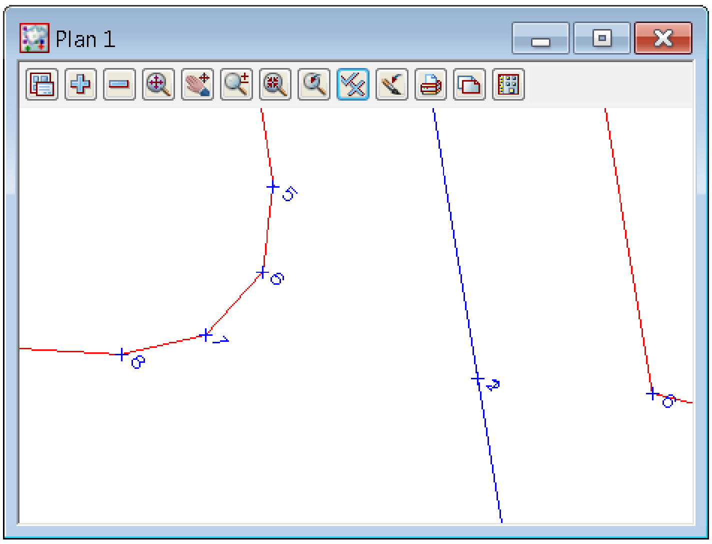
Untick the **Keep original string** check box

Select **Pick**

Select and accept the left side intersection point

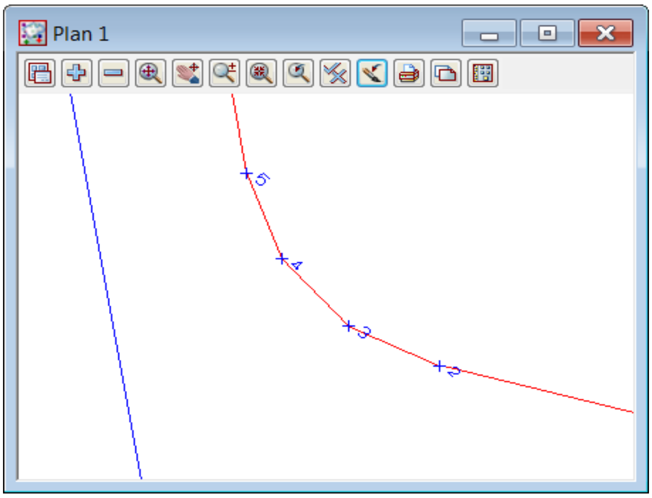


The truncations are created



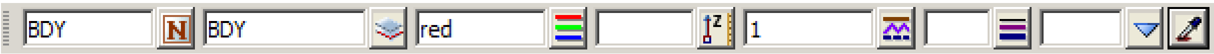
Repeat for the other side of the road

Select **Finish**



12.6.4Create Cul de sac head

We will now create a cul de sac head manually. Before continuing ensure the current model is **BDY** and set the default colour in the **Cad Control bar** to **red**



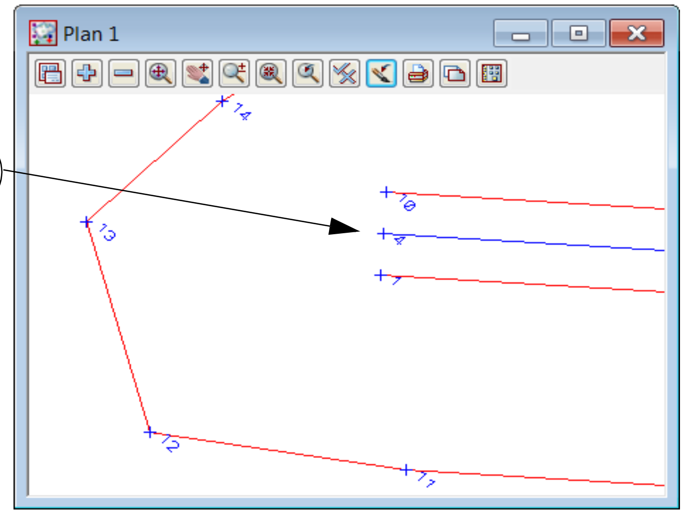
12.6.4.1Create Circle

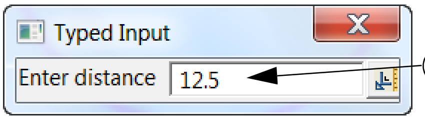
Zoom in to the end of the subdivision road

Select option ***Cad =>Circle =>Centre and Radius***

or **Centre and Radius** icon

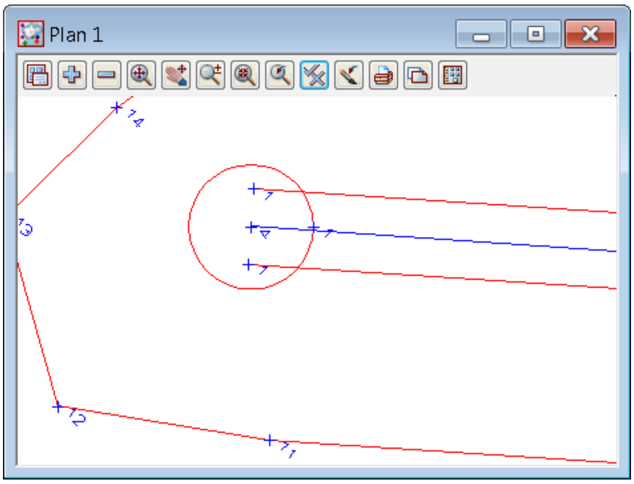
Select and accept the point at the end of the road





Press the space bar and type in the radius of **12.5 [Enter]**

The circle is created

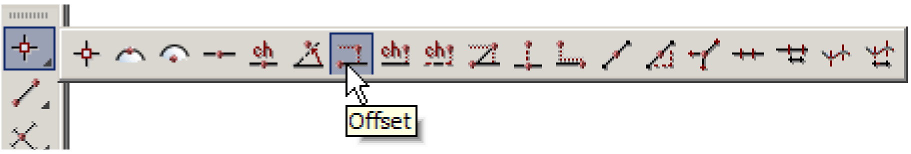


12.6.4.2Create boundary lines around cul de sac head

Prior to creating the trapezoid around the circle we need to create an offset point for the orientation of the trapezoid

Select option ***Cad =>Points =>Offset***

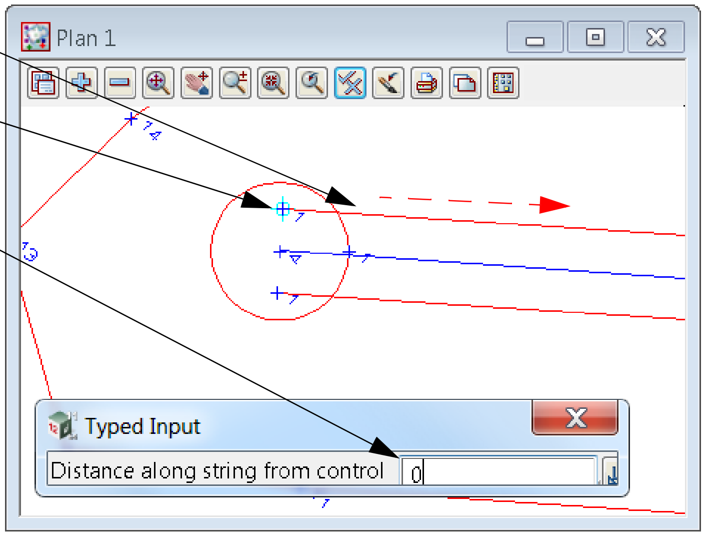
or **Offset** icon



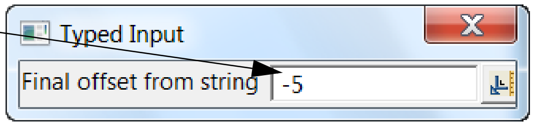
Select top edge of the road boundary string with direction

Select and accept the end point of the string

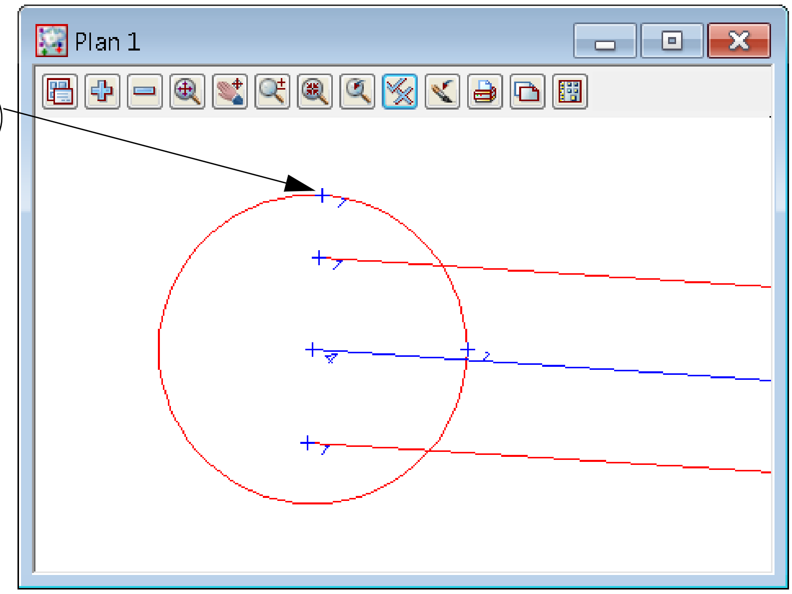
Type in the distance **0 [Enter]**



Type in the offset **-5 [Enter]**



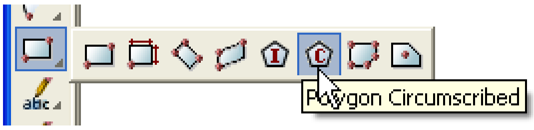
The offset point is created at the edge of the circle



We now create an 8 sided trapezoid about the circle

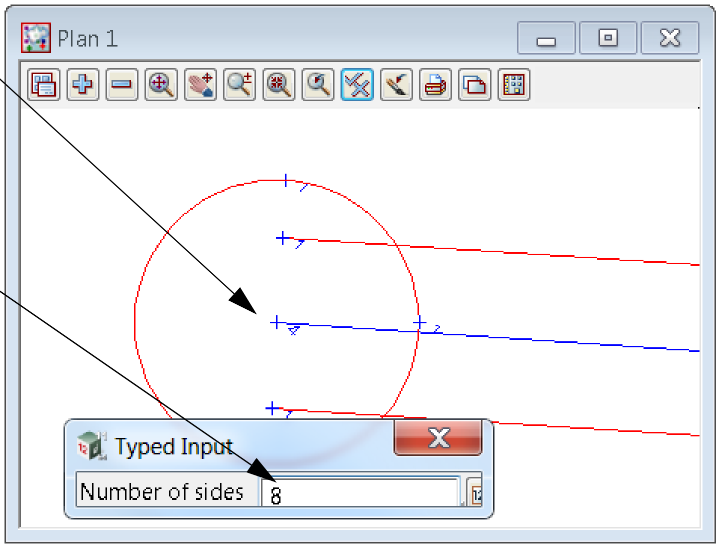
Select option ***Cad =>Polygons =>Polygon Circumscribed***

or **Polygon Circumscribed** icon

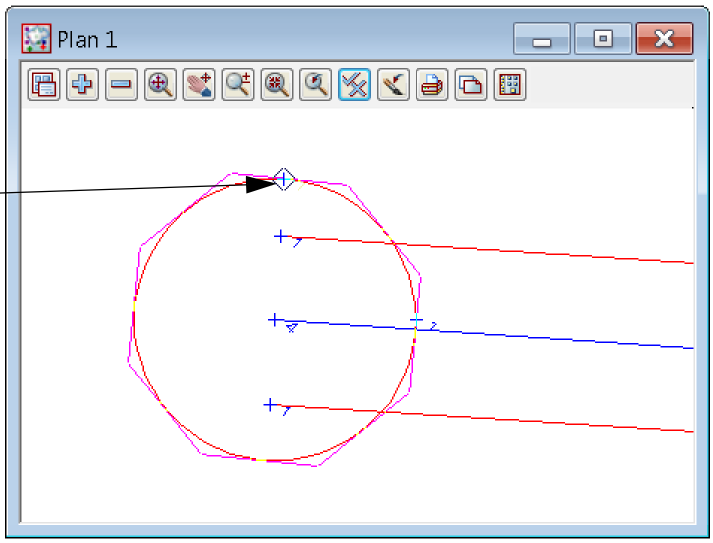


Select and accept the point at the centre of the circle

Type in the number of sides as **8 [Enter]**



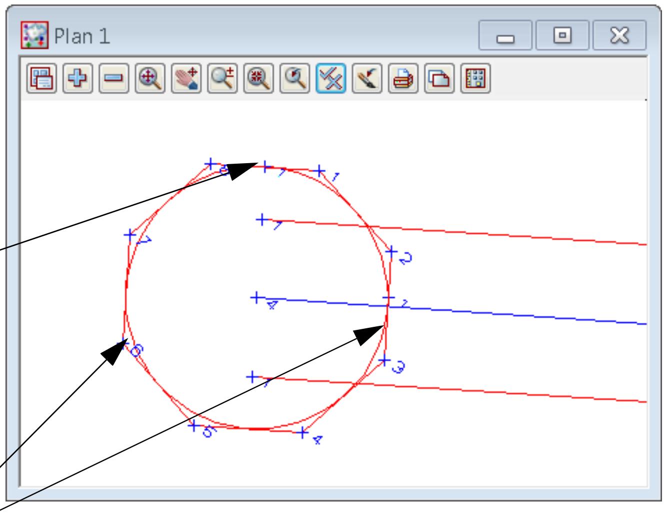
Select and accept the offset point to position the shape

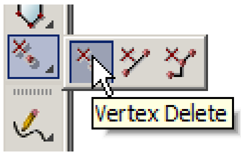


The trapezoid is created around the outside of the circle

Delete the offset point used to create the trapezoid

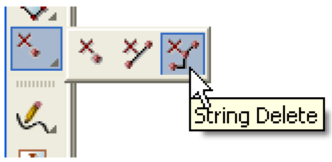
Select **Vertex delete** icon

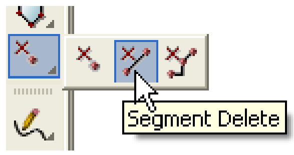


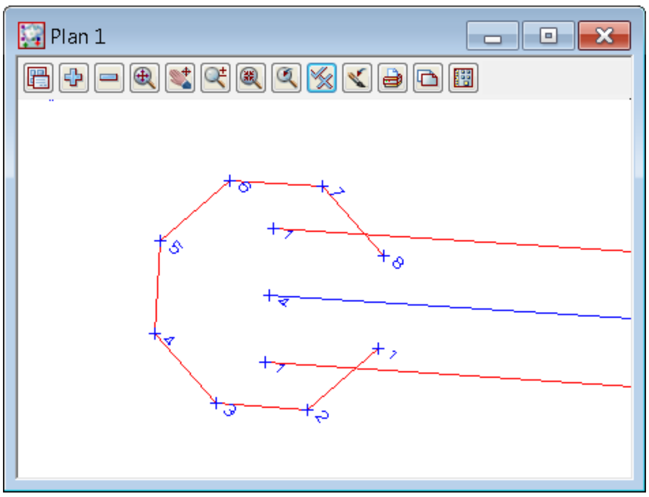


Delete the circle and right segment of the trapezoid using delete options ***Cad =>Delete Strings*** and ***Cad =>Delete =>Segments***

or **String Delete** icon and **Segment Delete** icon



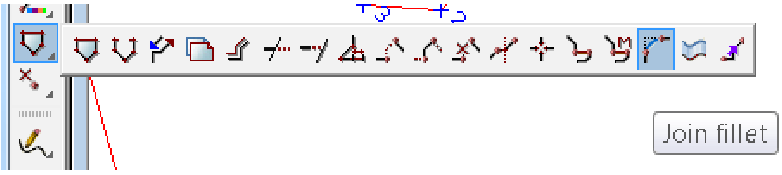




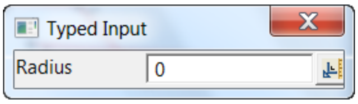
Fillet the trapezoid to the road boundary strings

Select option ***Cad =>Change strings =Join fillet***

or **Join Fillet** icon

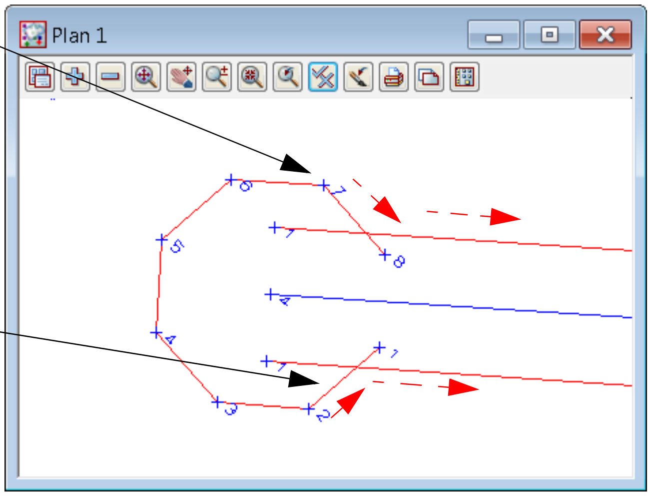


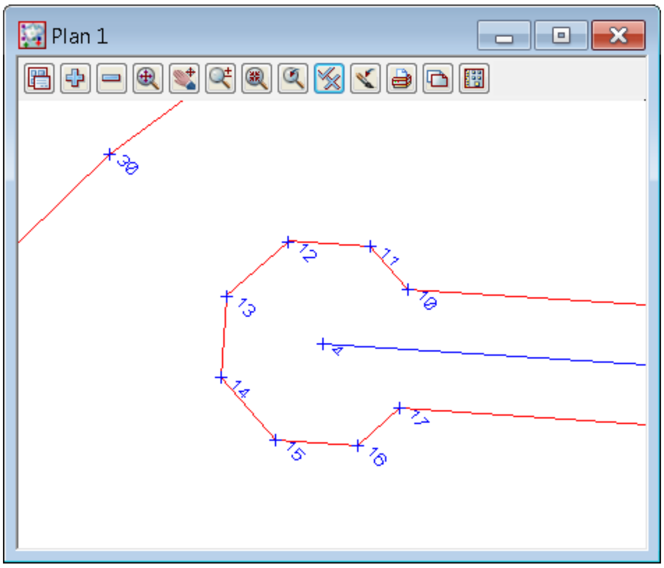
Pick and accept the two strings with direction



Type in the radius **0 [Enter]**

Repeat for the lower edge





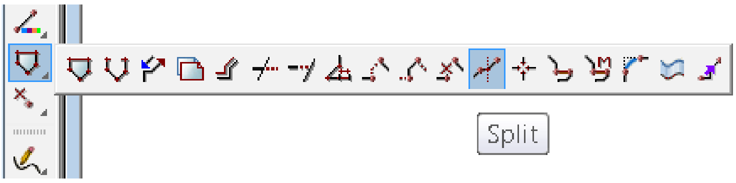
12.7 Create lots

12.7.1 Split string at starting edge

Before we start creating lots the front and rear boundaries should be separated. This is achieved by splitting the string either end of the start and end edges of the lots

Select ***Cad =>Change Strings =>Split***

or **Split** icon



Zoom in to bottom right of the subdivision

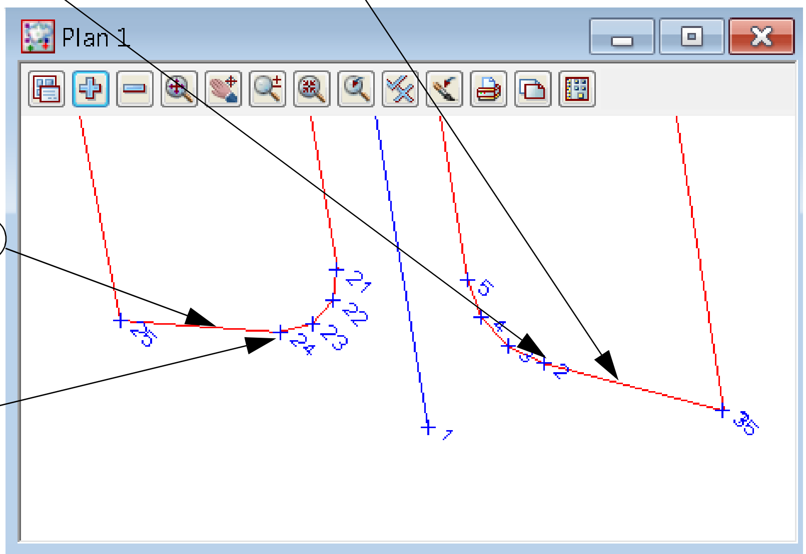
We will split the string at vertex2

Select and accept string from 1 to 2

Select vertex 2

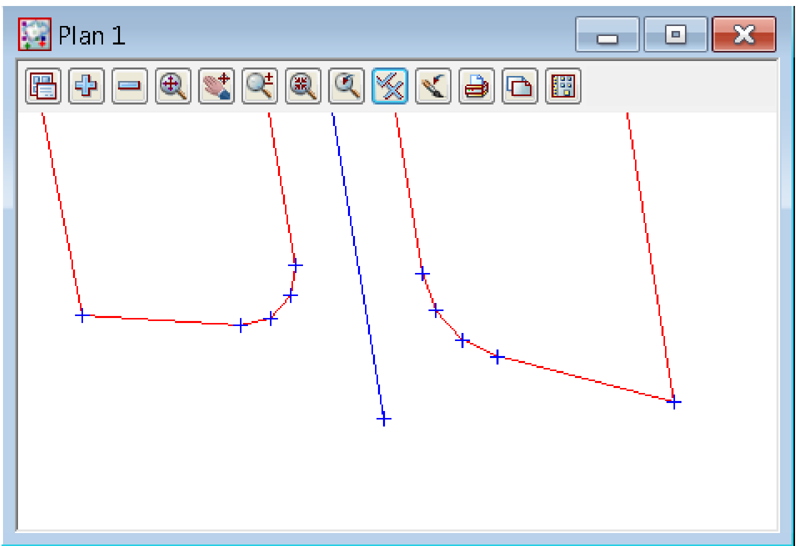
Select and accept string 24 to 25

Select and accept vertex 24



Select **Finish** on panel

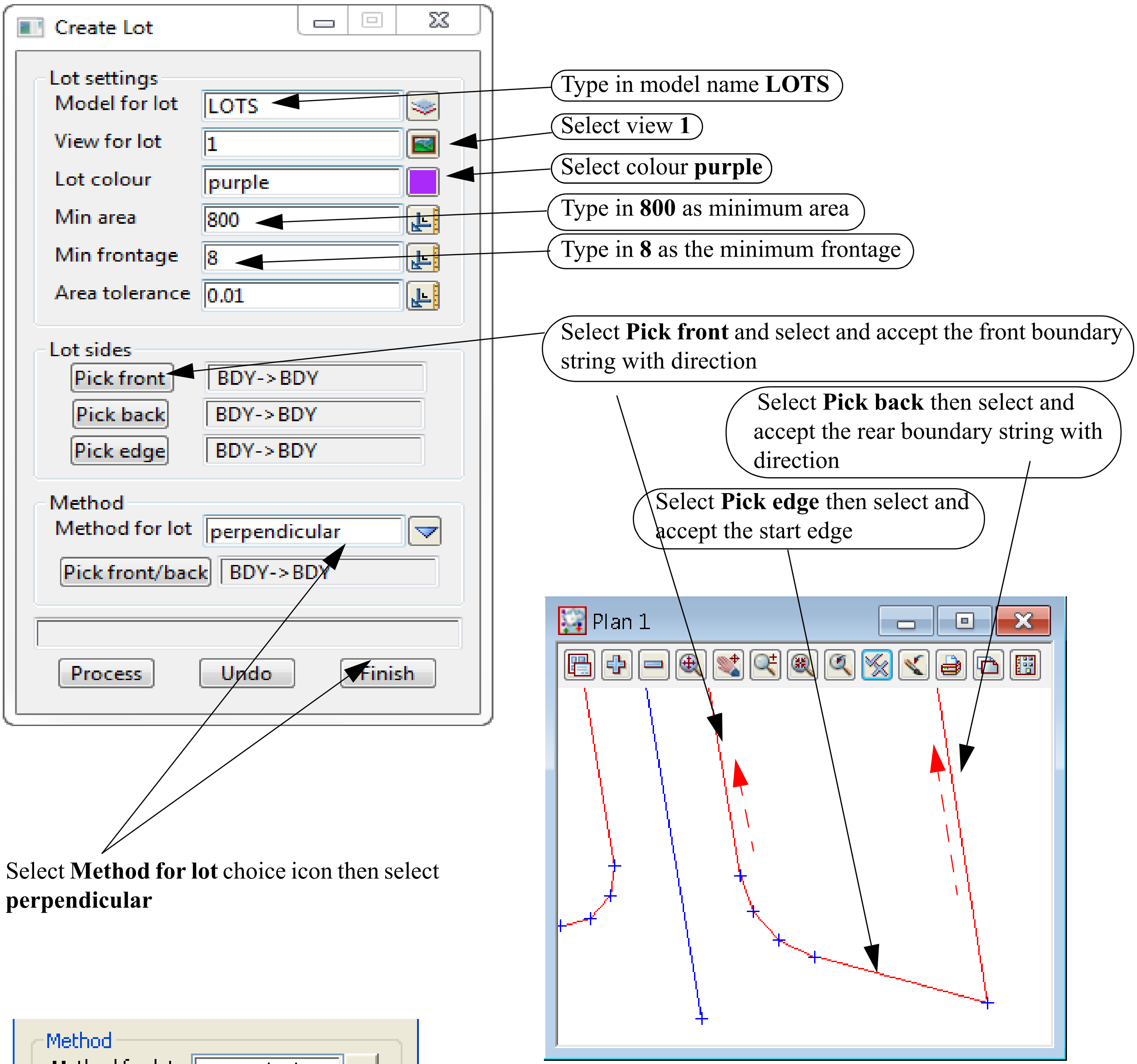
Toggle off the vertex numbers

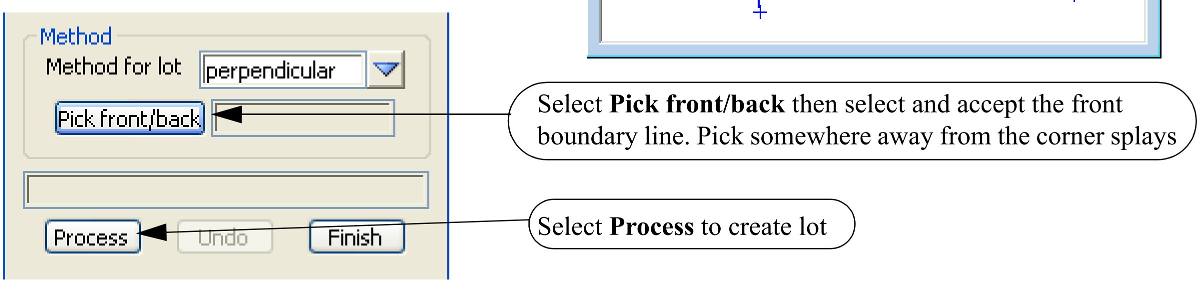


12.7.2Create lots by different methods

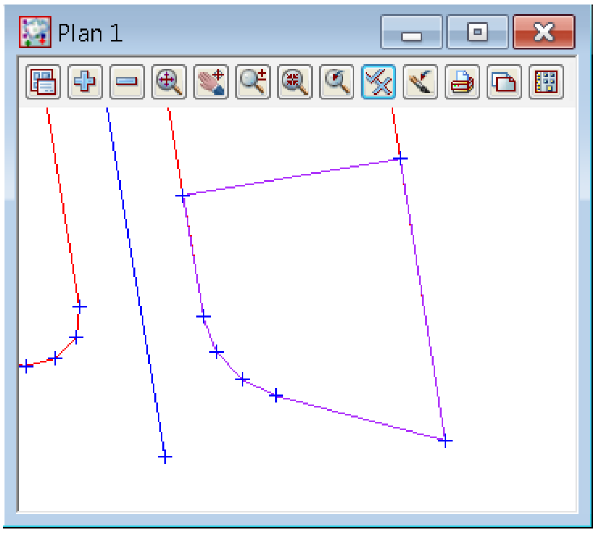
The first three lots will be created by specifying a minimum area for the new lots

Select option ***Design=>Estate/Lots=>Create lots=>Create lots***

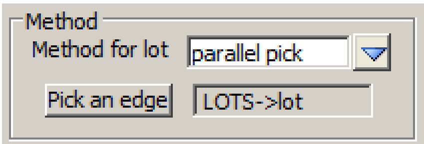




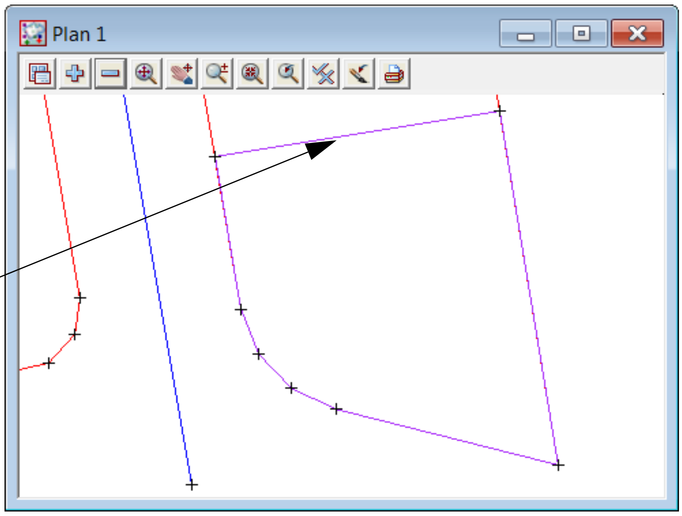
The first lot is created with the new edge perpendicular to the road frontage



Now change the **Method for lot** to **parallel pick**

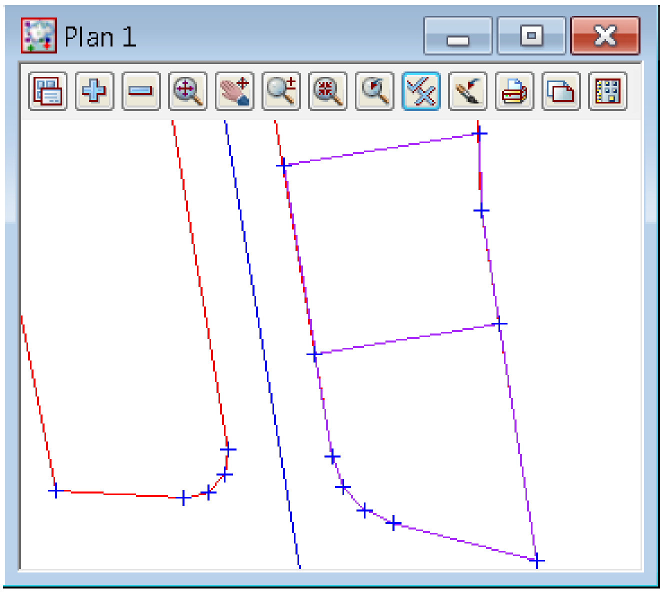


Select **Pick an edge** and select the previously created lot edge



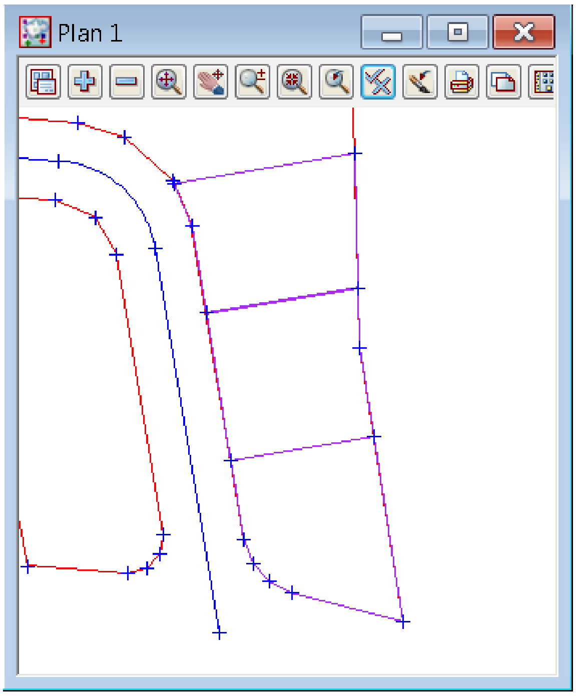
Select **Process** again

A second lot is created



Select **Process** again

The third lot is created

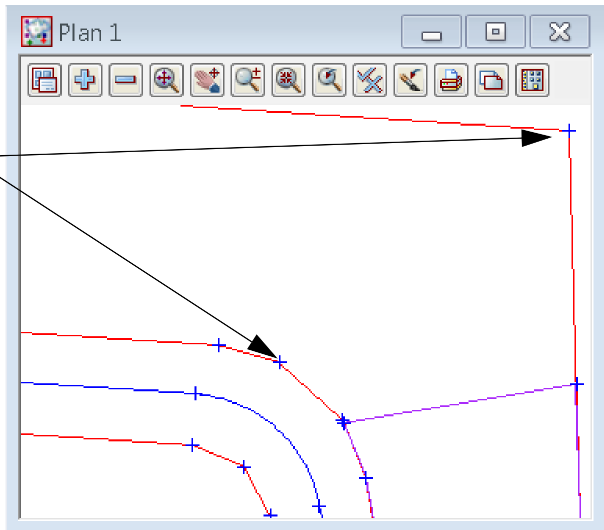


The next lot to be created will not have a minimum area but will have a new edge bound by two existing vertices on the front and rear boundaries. We will use a new option to create this lot.

Minimise the **Create Lot** panel

Pan up to the top right of the subdivision

The new boundary edge will be created from the shown vertices



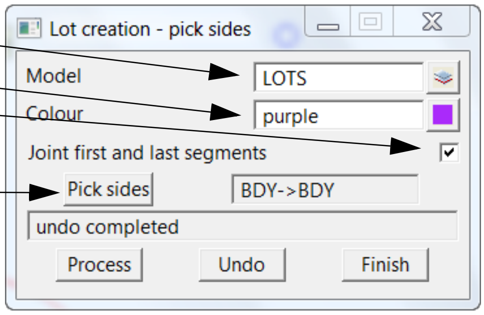
Select option ***Design=>Estate/Lots=>Create lots=>Create lots by picking segments***

Select model **LOTS**

Select colour **purple**

Tick the check box to **Join first and last segment**

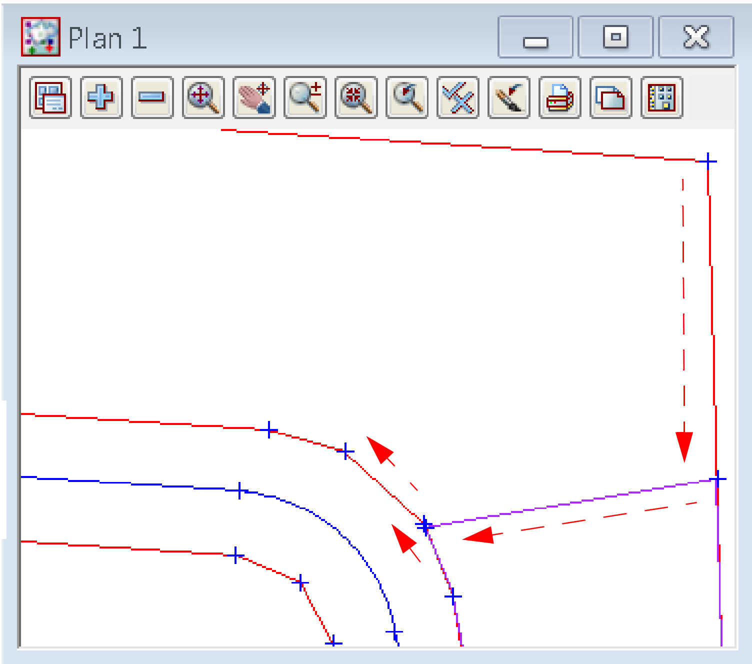
Select **Pick sides**

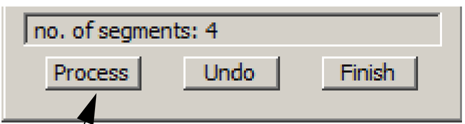


Pick the segments with direction clockwise from top right vertex

Take care to zoom into the small segment at the front

The **no. of segments: 4** is shown

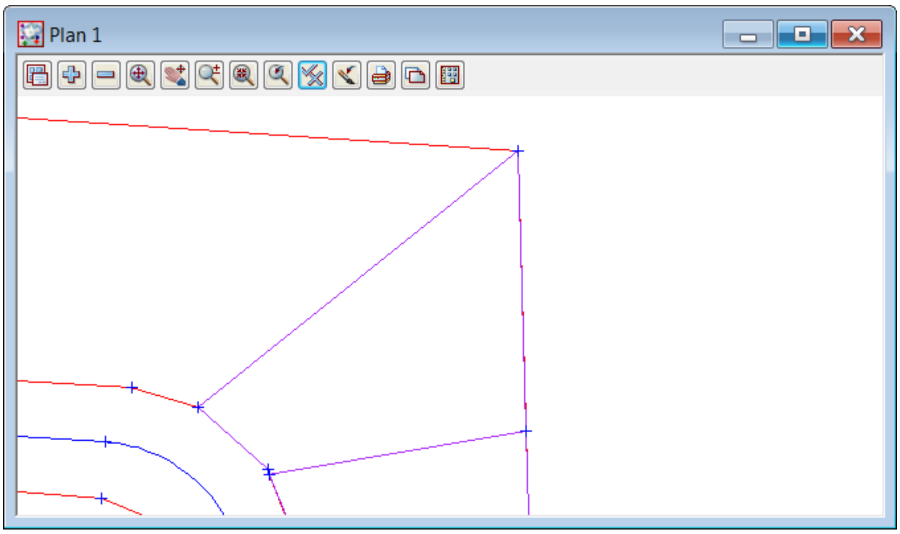




Select **Process** to create lot

Select **Finish** to exit

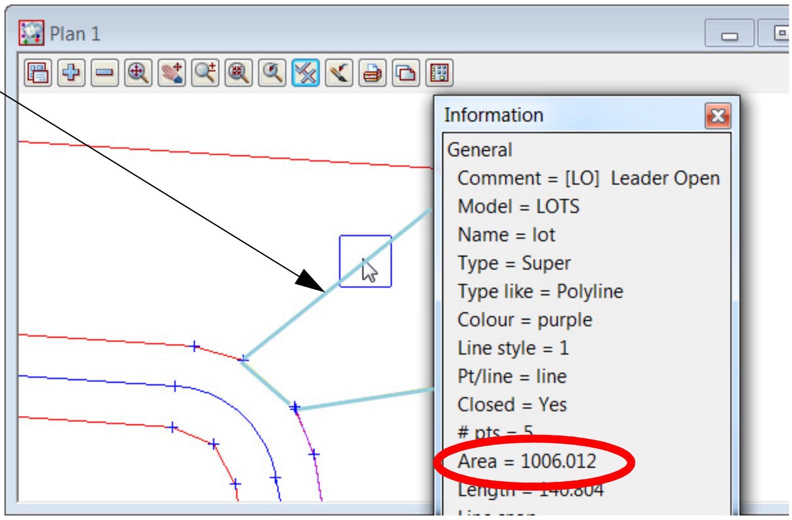
The new lot is created



To display the area select ***Strings=>Inquire***

or **String Inquire** icon

Select anywhere on the lot edge but do not confirm

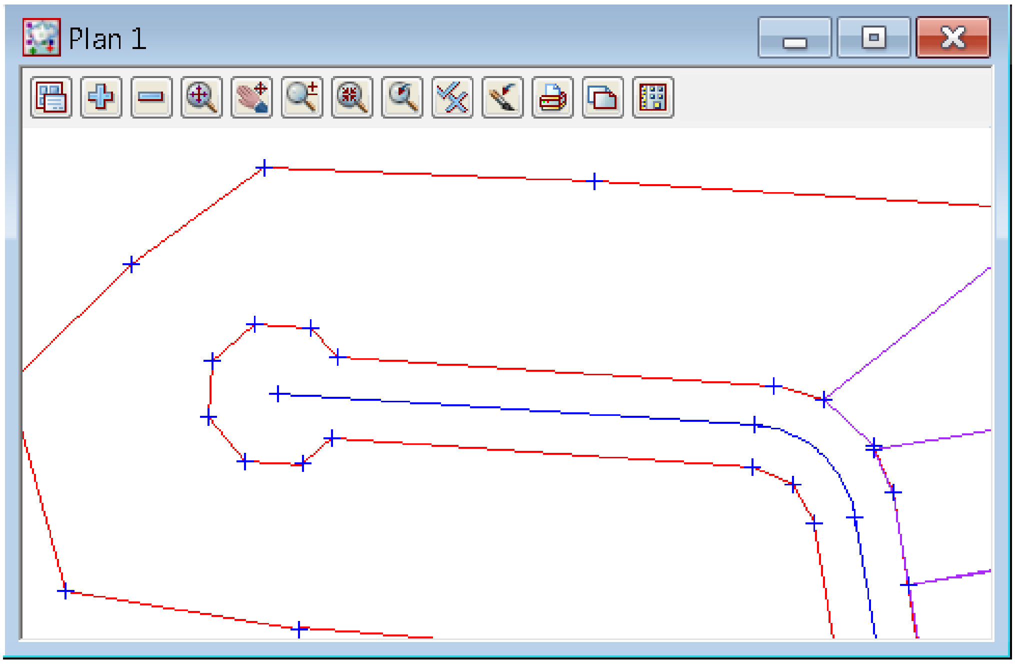


If the lot polygon is highlighted the area is displayed in the **Information panel**

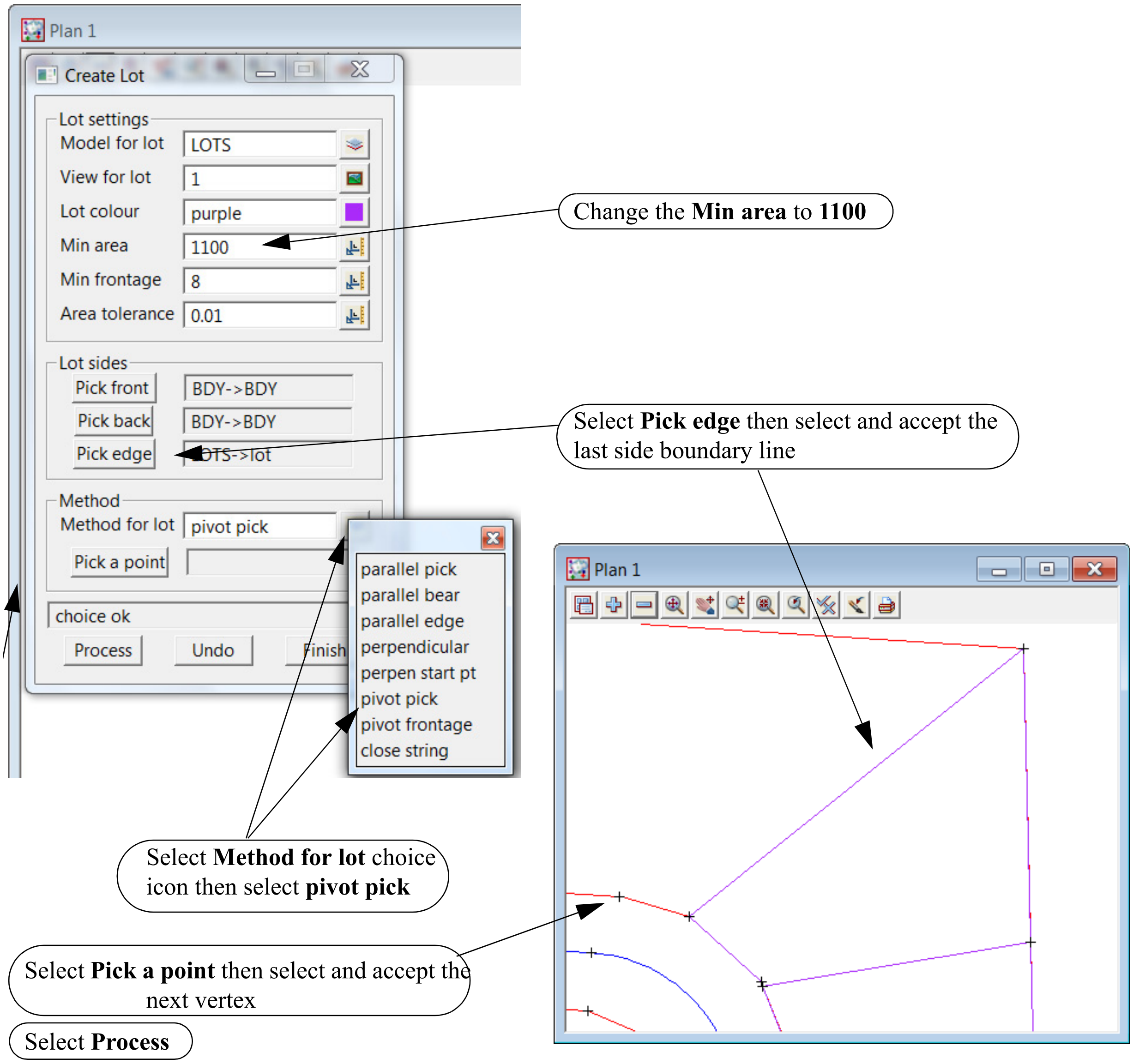
Press **Escape** key to exit the Inquire option

The next lots will be created using the minimum area panel again

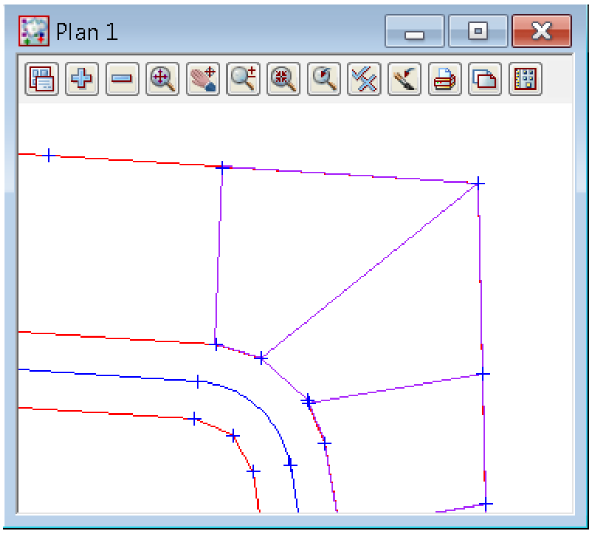
Pan left from the last created lot



Restore the **Create Lot** panel



The new lot is created with the new edge pivoted about the selected vertex

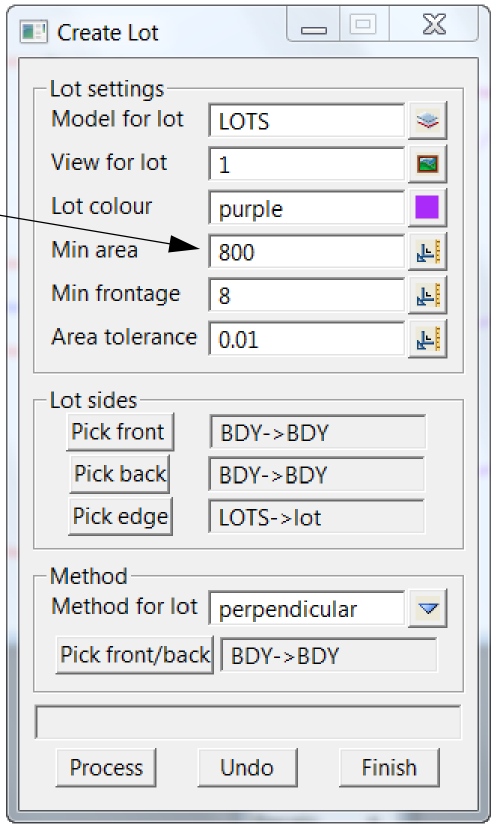


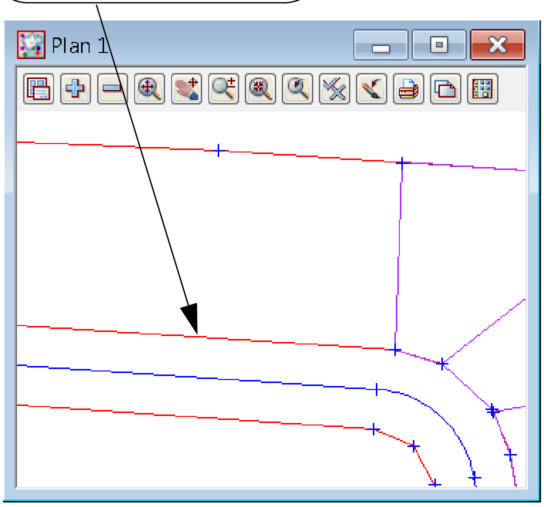
Now change the minimum area back to **800**

Set the **Method for lot** to **perpendicular**

Select **Pick front/back**

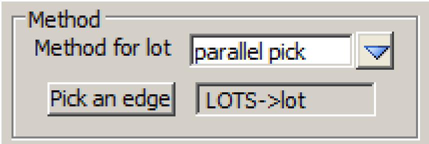
Select and accept the front boundary line





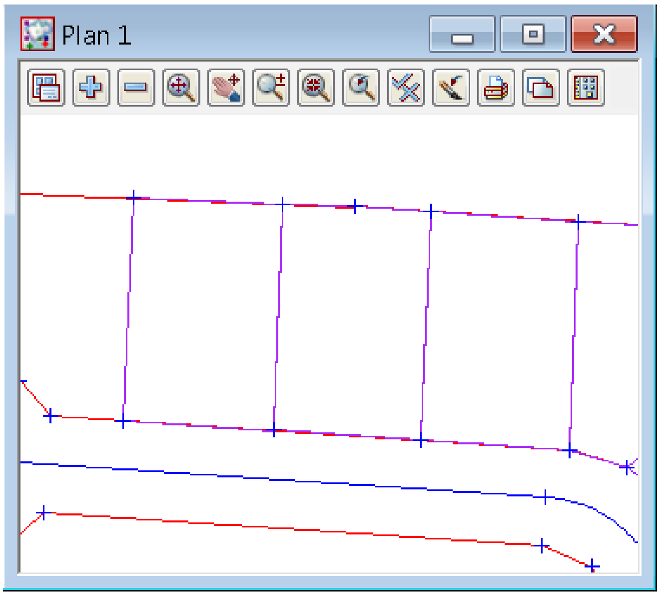
Select **Process** to create the lot

Now change the **Method for lot** to **parallel pick**

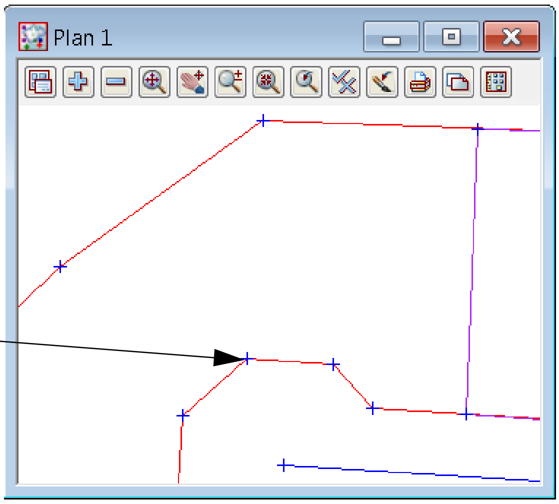


Select **Pick an edge** and select the previously created lot edge

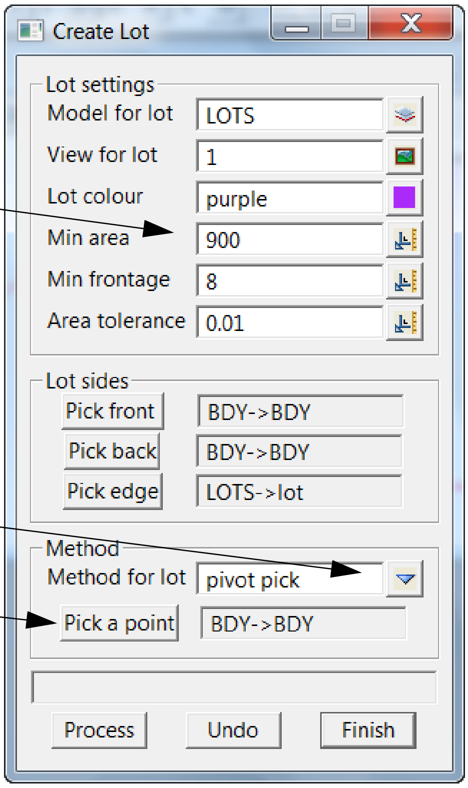
Select **Process** again twice



Zoom in to the end of the cul de sac



The next lot will be created with area of **900** and the new boundary edge to pivot from this vertex



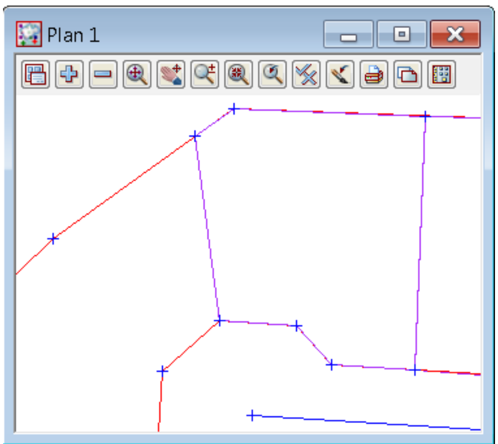
Change the minimum area to **900**

Set the **Method for lot** to **pivot pick**

Select **Pick a point**

Select and accept the pivot point

Select **Process** then **Finish**



A new lot is created

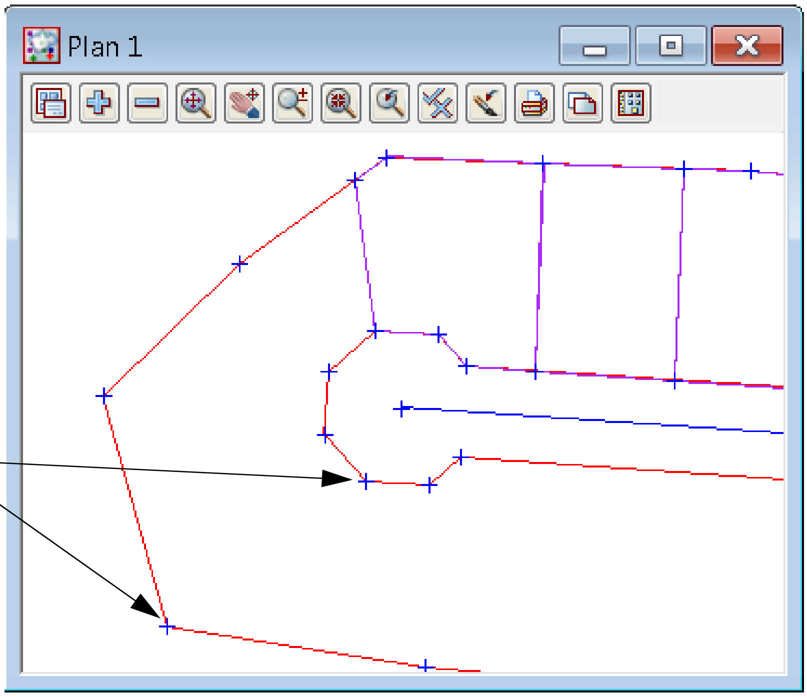
Pan around to the bottom of the cul de sac

The next lot will be a park lot.

We will use the option to create lot by selecting the sides.

The final edge will lie between these vertices

Minimise the **Create Lot** panel again



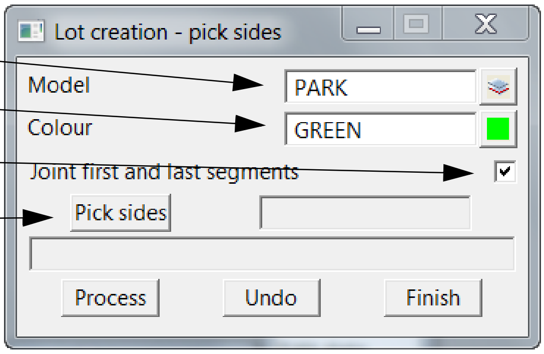
Select option ***Design=>Estate/Lots=>Create lots=>Create lots by picking segments***

Type in model **PARK**

Select colour **green**

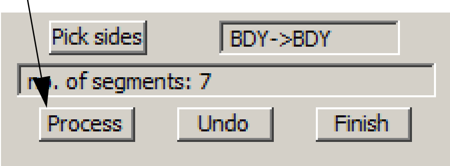
Tick the check box to **Join first and last segment**

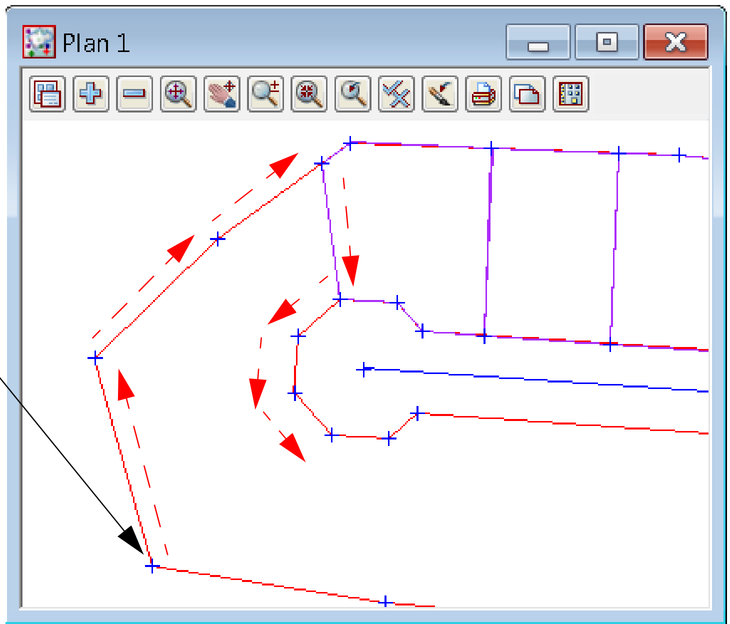
Select **Pick sides**



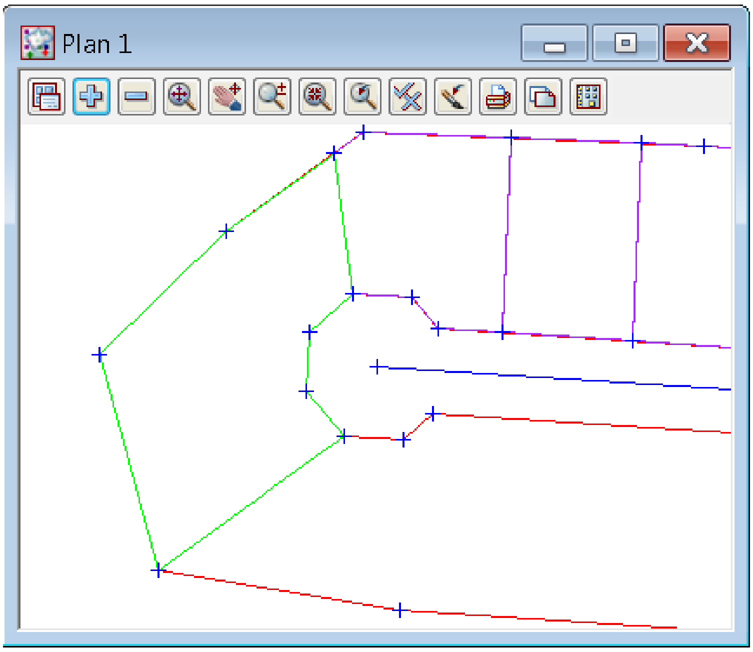
Select and accept the sides with direction in a clockwise direction from this vertex

After accepting last line select **Process** then **Finish**



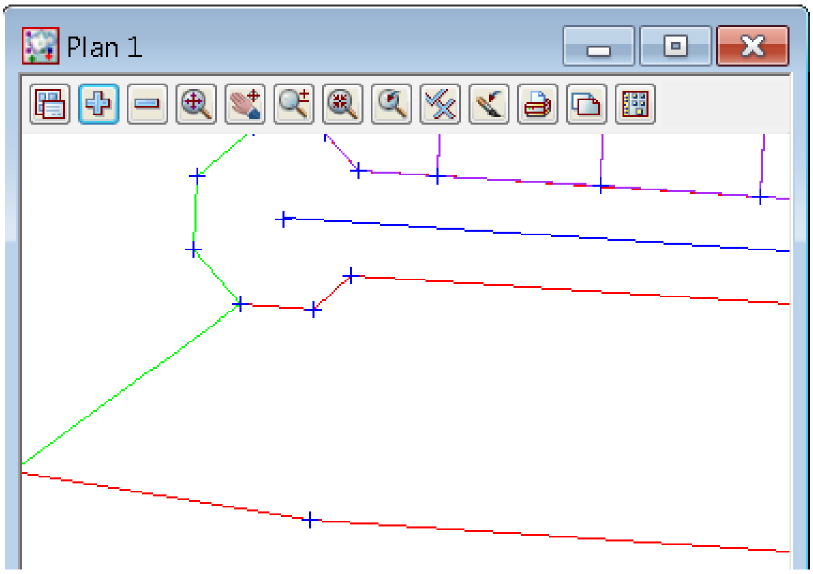


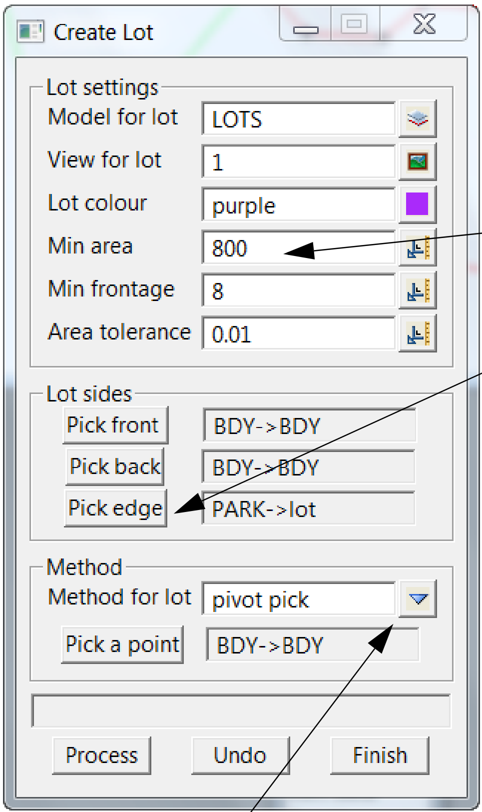
Turn on the model **PARK**



For the next six lots we will use the previous **Create lots** option

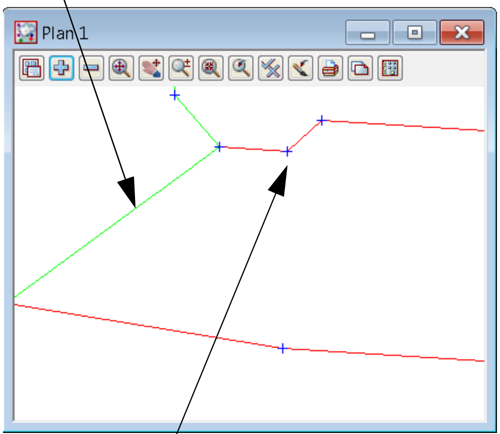
Pan along the right as per the example below





Type in **800** as minimum area

Select **Pick edge** then select and accept the side boundary line



Select **Method for lot** icon then select **pivot pick**

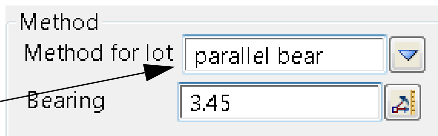
Select and accept point at next vertex

Select **Process**

The new lot is created

For the next three lots we will generate the side boundaries at a bearing of 3°45' which is perpendicular to the front boundary.

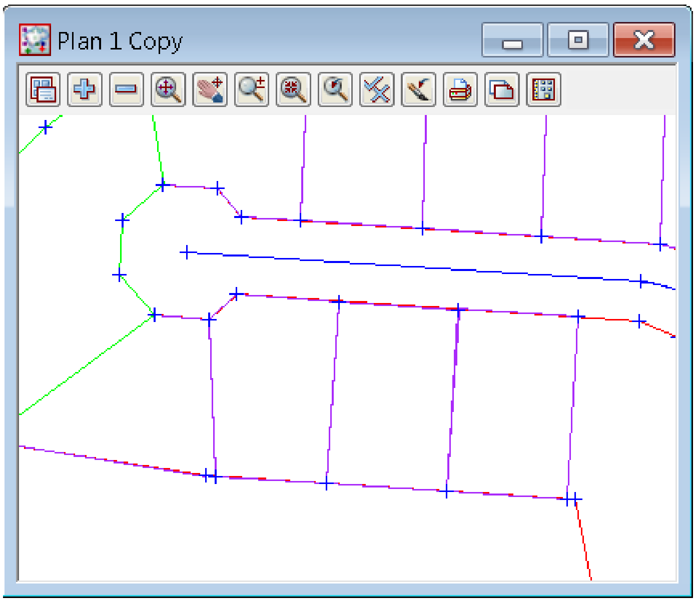
Change the **Method for lot** to **Parallel bear**



Type in bearing 3.45 (3°45')

Select **Process three times**

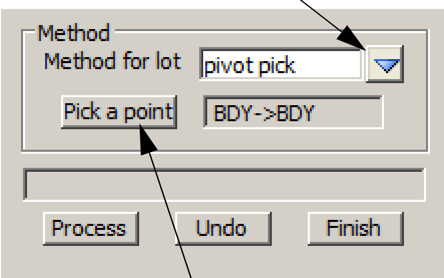
The three new lots are created with the new side at bearing 3°45’

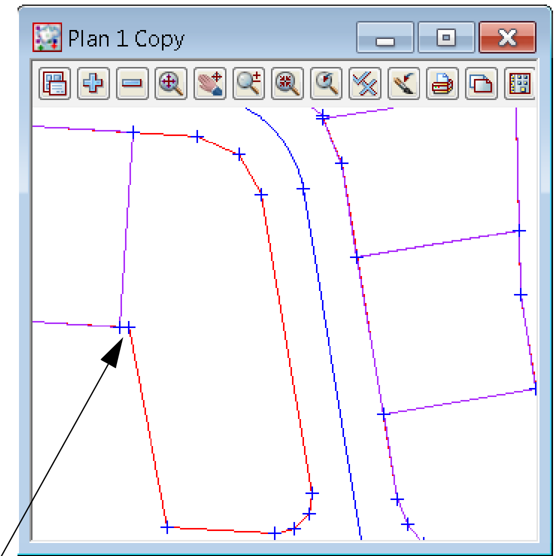


Pan down to the last section of the subdivision

The next lot will have its new edge pivot from a rear vertex

Change **Method for lot** to **pivot pick**



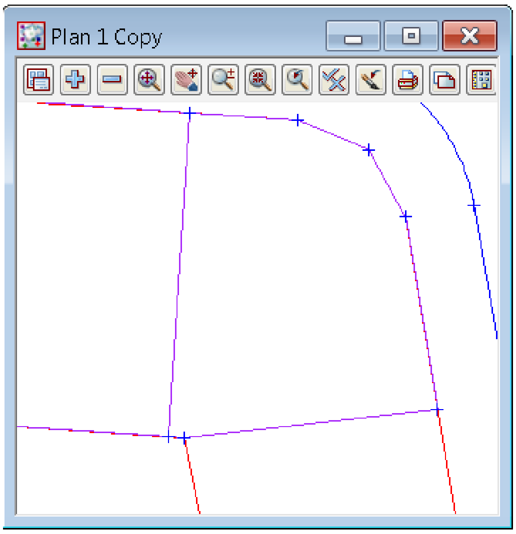


Select **Pick a point** then select and accept the next vertex on the rear boundary

Select **Process** to create new lot

The new lot is created

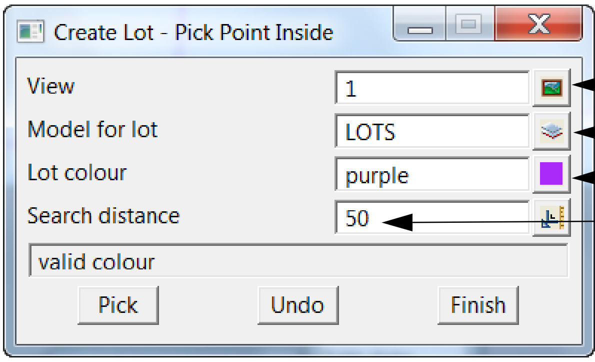
Select **Finish** on **Create Lot** panel



To create the last lot we will use an option to form a lot polygon from picking the centre of a series of strings. A search distance is entered to find all strings within the search distance radius

Pan down to the last lot

Select ***Design=>Estate/lots=>Create lots=>Create lots by picking point inside***



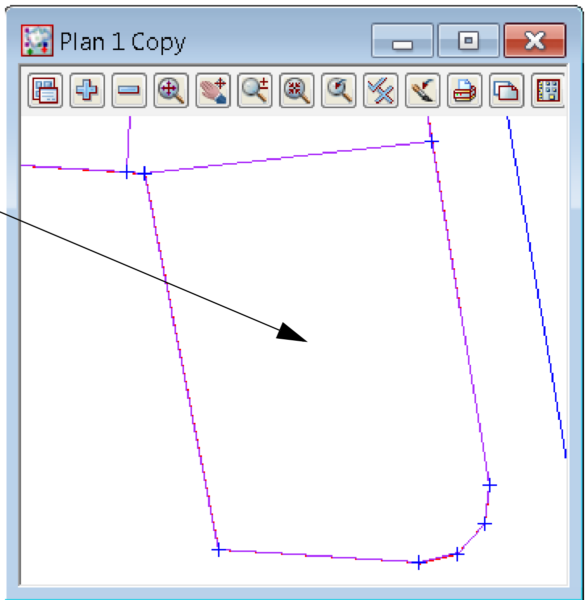
Select view **1**

Select model name **LOTS**

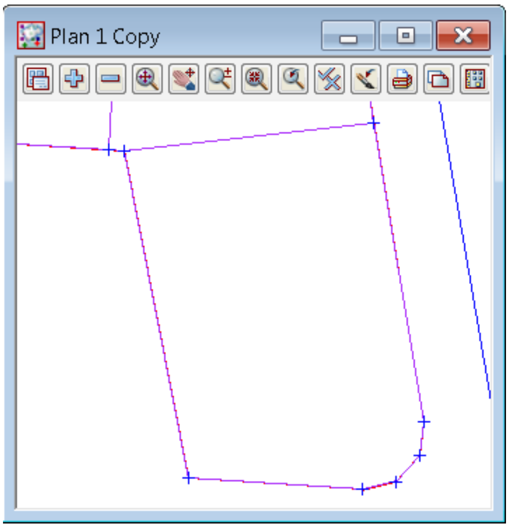
Select colour **purple**

Type in search distance **50**

Select **Pick** and select and accept a point inside the area to create the lot. Ensure the position you pick can see to each vertex of the lot



The new lot is created



This completes the house lots

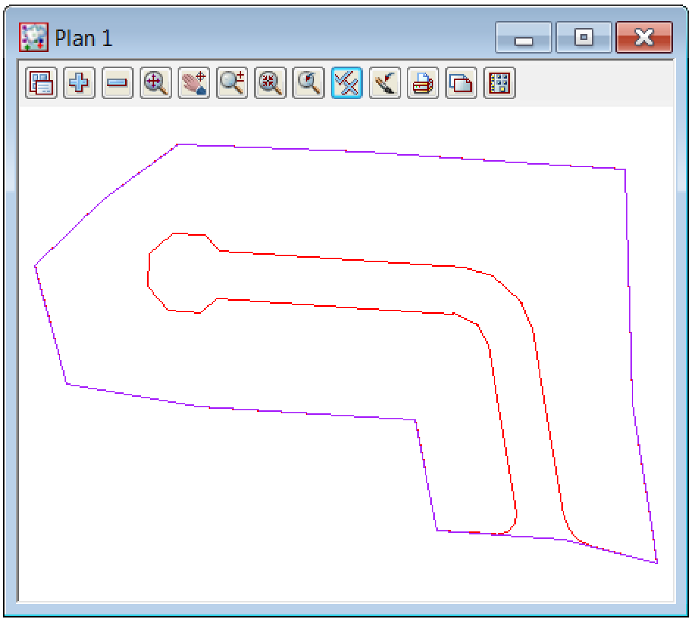
We will now create a lot for the road.

Zoom the whole of the subdivision

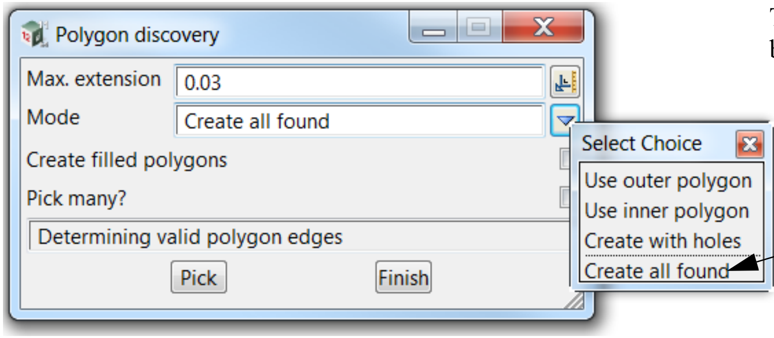
Turn off models **LOTS** and **PARK** and **CL**

Turn on the model **SURROUND**

Turn off the vertices



Set the cad control parameters as shown below



To create a polygon bound by the boundaries and the surround edge select ***Design =>Estate/lots =>Create lots =>Create lots- polygon discovery***

Select the Mode icon

Select **Create all found**

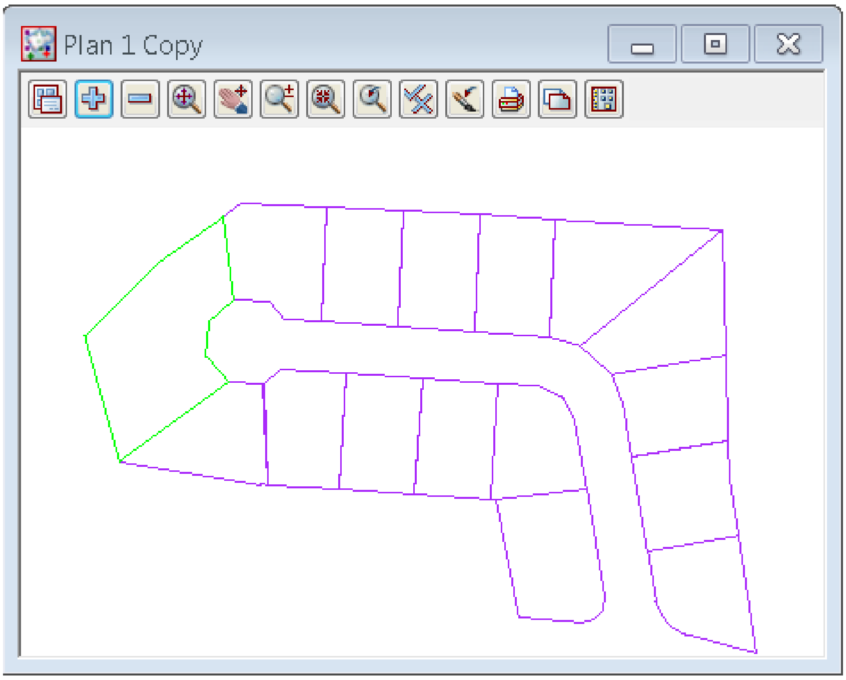
Select **Pick** then pick inside the road area to create the road boundary

12.8 Lot numbering

The lots can now be numbered according to the type of lot.

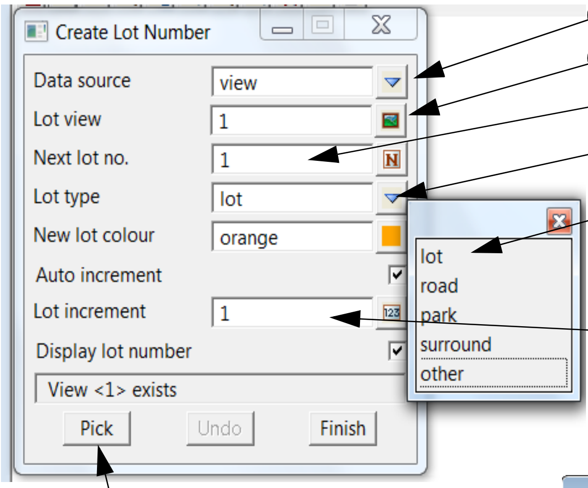
Lots, parks and roads will be numbered separately

Zoom all of the subdivision and ensure that only models **LOTS, PARK** and **ROAD** are turned on



12.8.1 Create lot numbers

Select option ***Design=>Estate/Lots=>Number Lots=>Create lot numbers***



Select the **Data source** icon then select **view**

Select view **1**

Type in **1** for **Next lot no.**

Select **Lot type** choice icon

Select **lot**

Select colour **orange**

Tick **Auto increment** check box

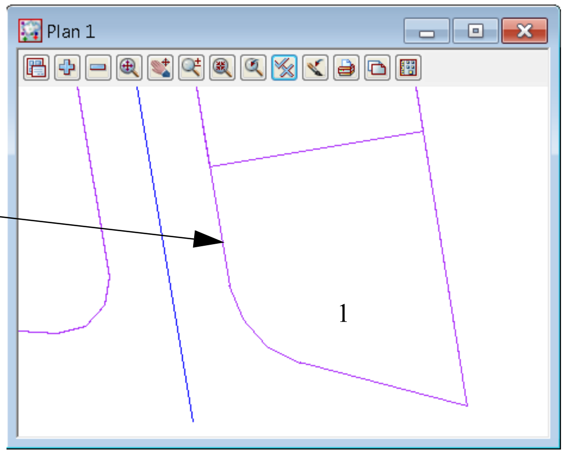
Type in **1** as **Lot increment**

Tick **Display lot number** check box

Select **Pick**

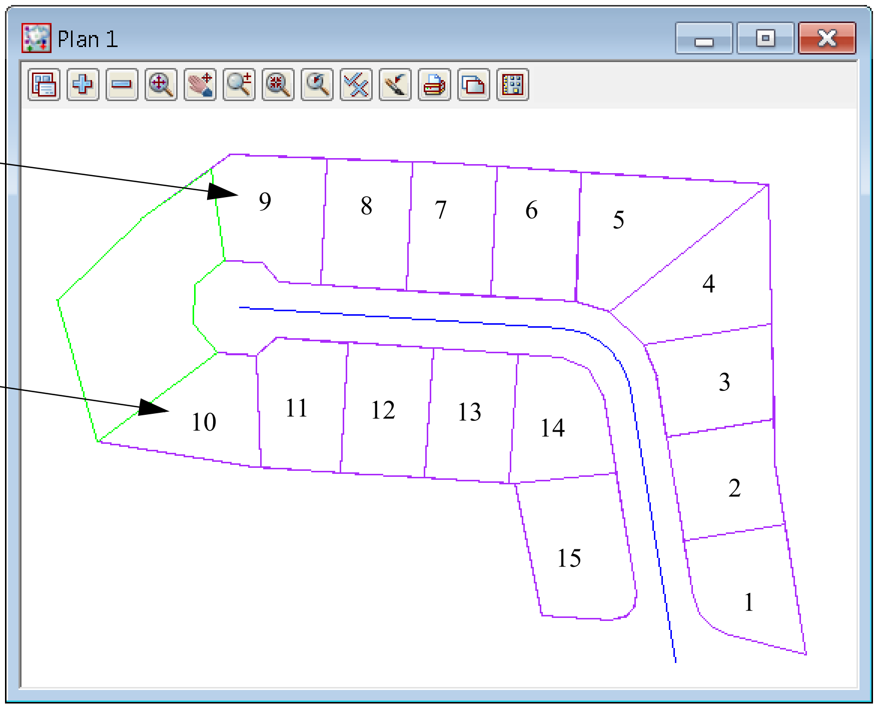
Select and accept a segment of the first lot

Point number 1 should appear in the middle of the lot

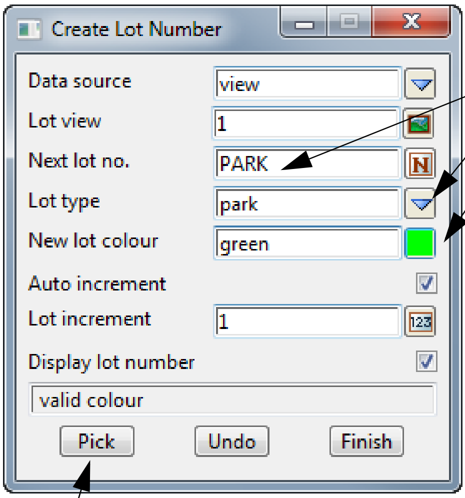


Repeat numbering lots until reaching the park

Continue numbering the lots from the other side of the park



To create the description for the park change the following settings



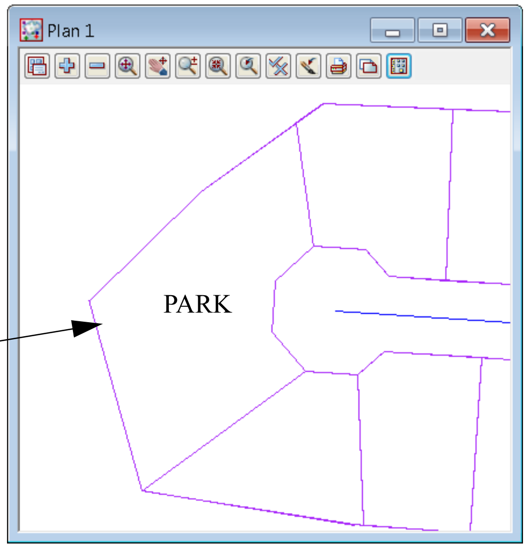
Type in **PARK** as Next lot number

Select **Lot type** choice icon and select **park**

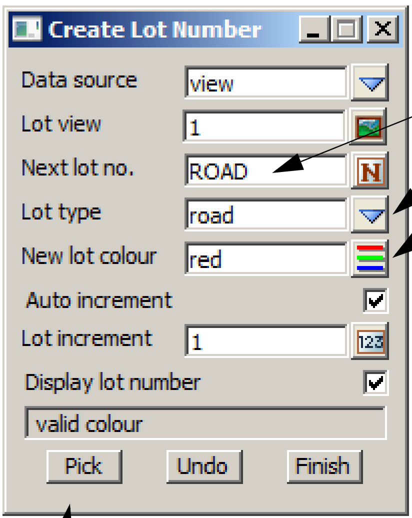
Change the colour to **green**

Select **Pick**

Pick and accept the park string



To number the road change the following settings



Type in **ROAD** as Next lot number

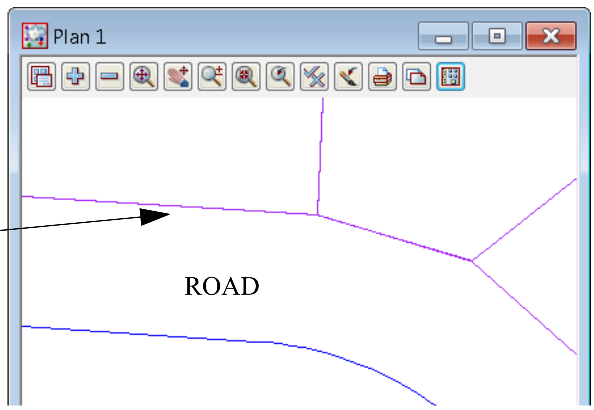
Select **Lot type** choice icon and select **road**

Change the colour to **red**

Select **Pick**

Pick and accept the road string

Select **Finish** to exit the panel. The temporary numbers will disappear



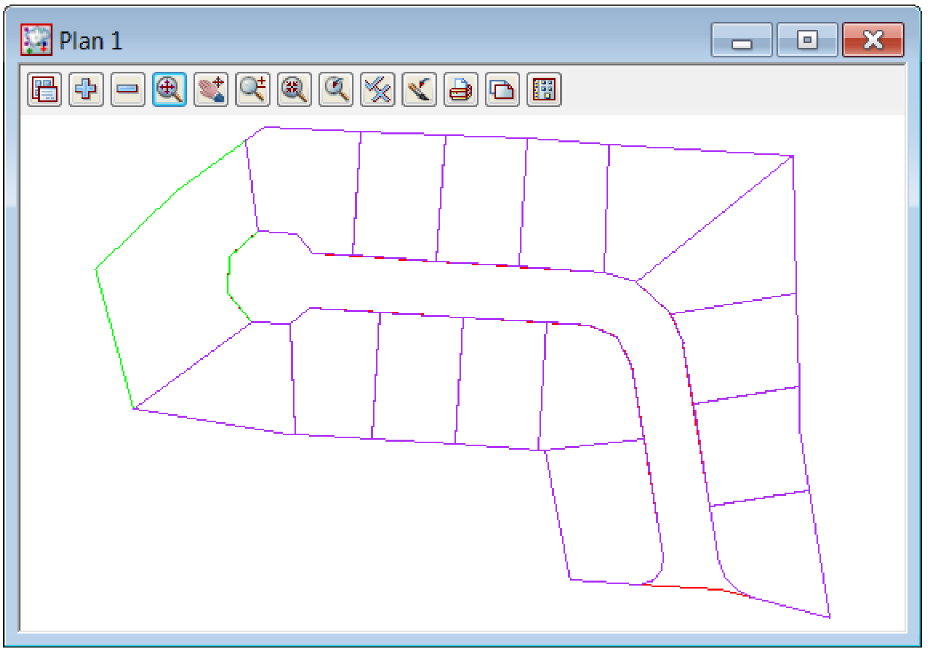
12.9 Lot labelling

The lot annotation can now be created. Features such as bearings, distances, lot numbers and areas are created for each lot

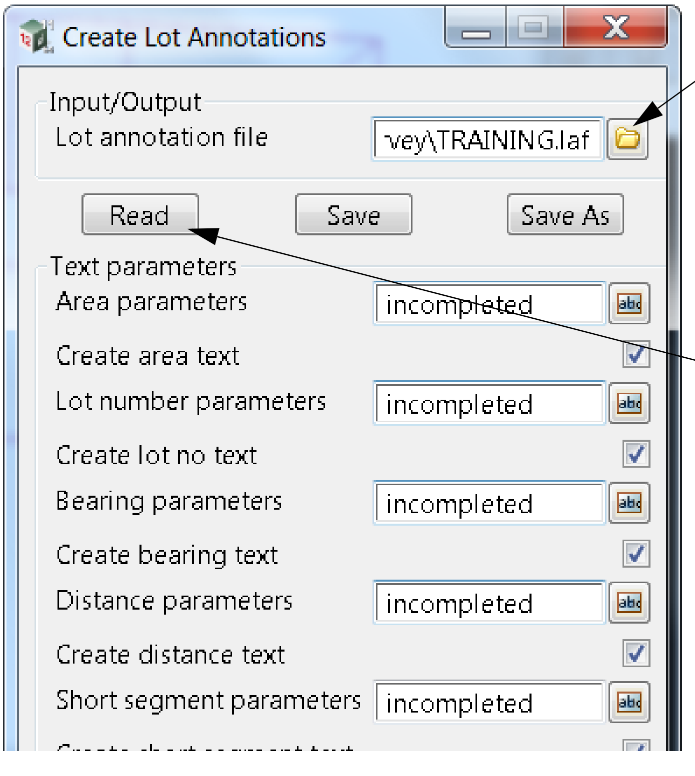
The annotation settings can be stored in a Lot annotation file which is loaded prior to creating the annotation

Ensure that the models **LOTS, PARK** and **ROAD** are the only models active

Zoom all of the subdivision



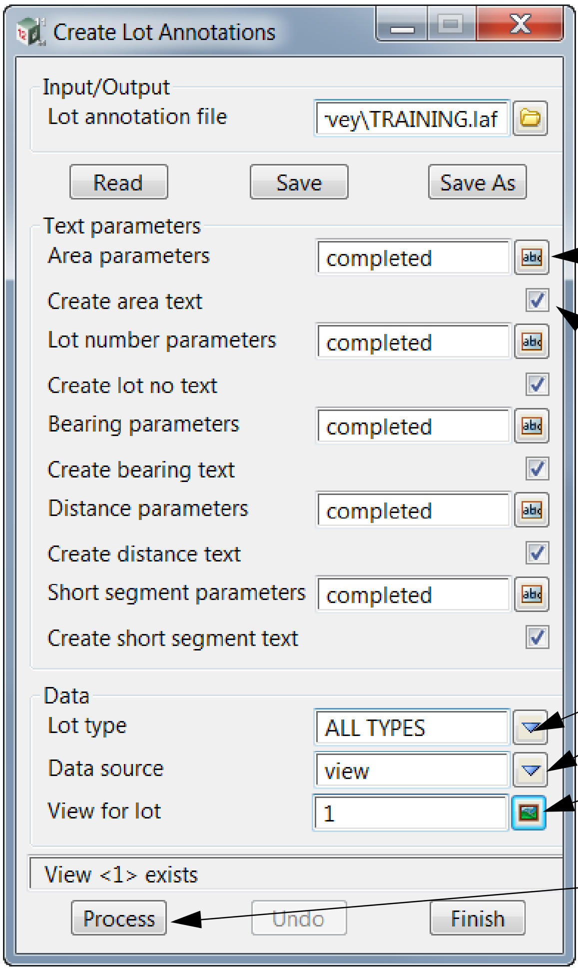
Select option ***Design=>Estate/Lots=>Label Lots=>Lot labelling***



Select the **Lot annotation file** choice icon

Select the file **TRAINING.laf** from the **Survey** folder

Select **Read**



Each type of annotation can be edited by selecting the edit icon

To create the different text types tick the relevant check boxes

A short line table can be created which will tabulate any line where the distance of the line is less than a user defined value

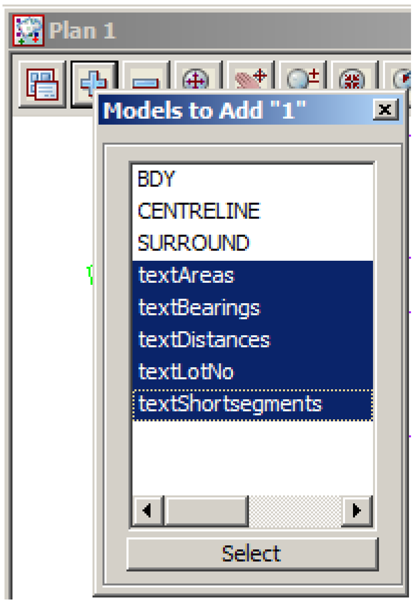
Select **Lot type** choice icon and select **ALL TYPES**

Select **Data source** icon and select **view**

Select view **1**

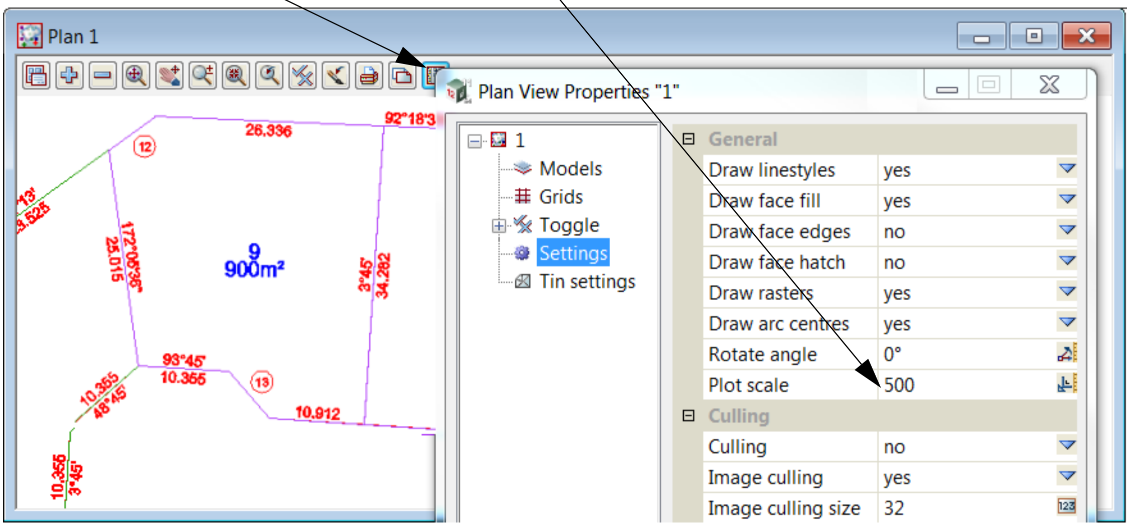
Select **Process**

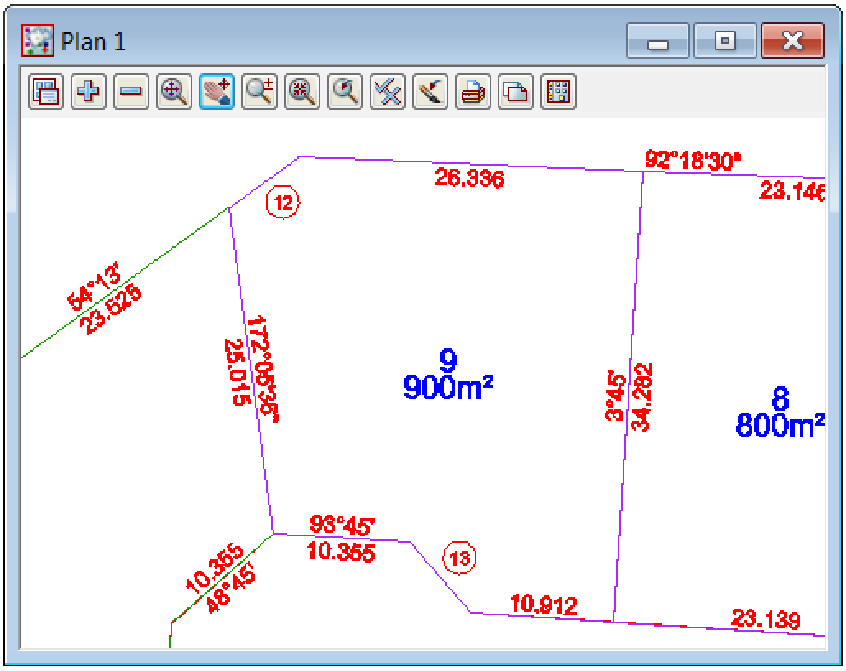
Turn on the annotation models



Select the **Plan View Properties** icon

Select **Settings**. Type in the new plot scale **500**



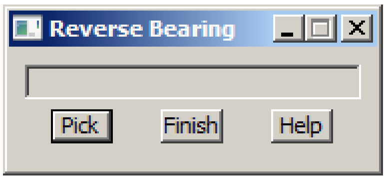


12.9.1Edit the annotation

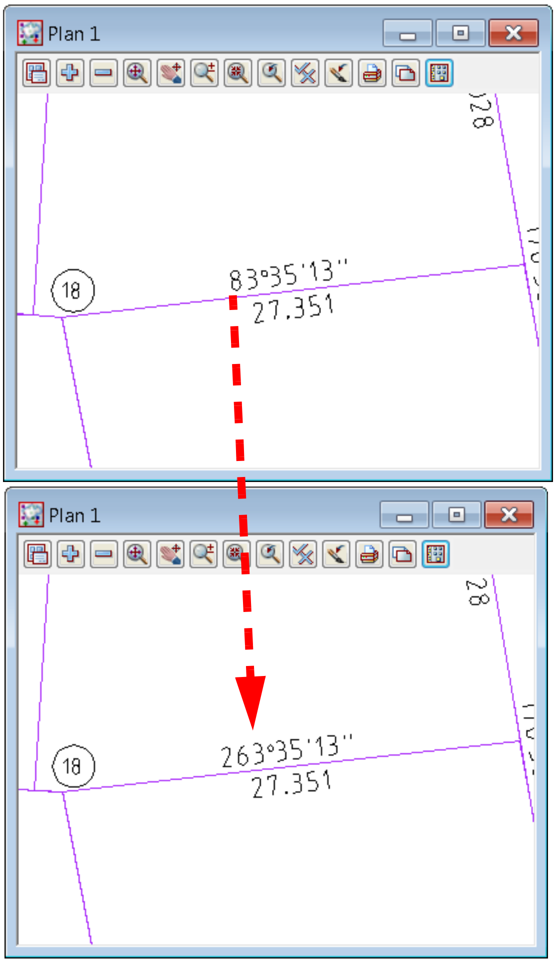
The annotation text can now be edited by using options on the text flyout toolbar

12.9.1.1Reverse Bearing

To reverse the direction of a bearing label select option ***Design=>Estate/Lots=>Lot Utilities=>Reverse Bearing***

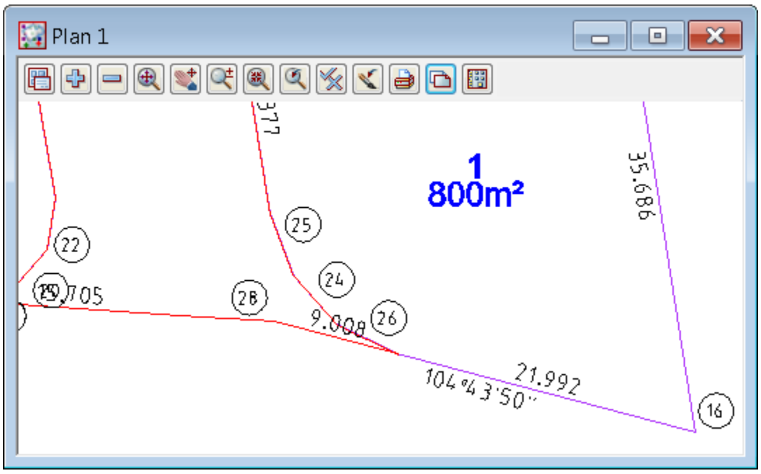


Select and accept the bearing to be reversed. You may need to turn on the vertices to see the insertion point of the text or you can turn on the text snap [X] from the snaps toolbar to click anywhere in the text



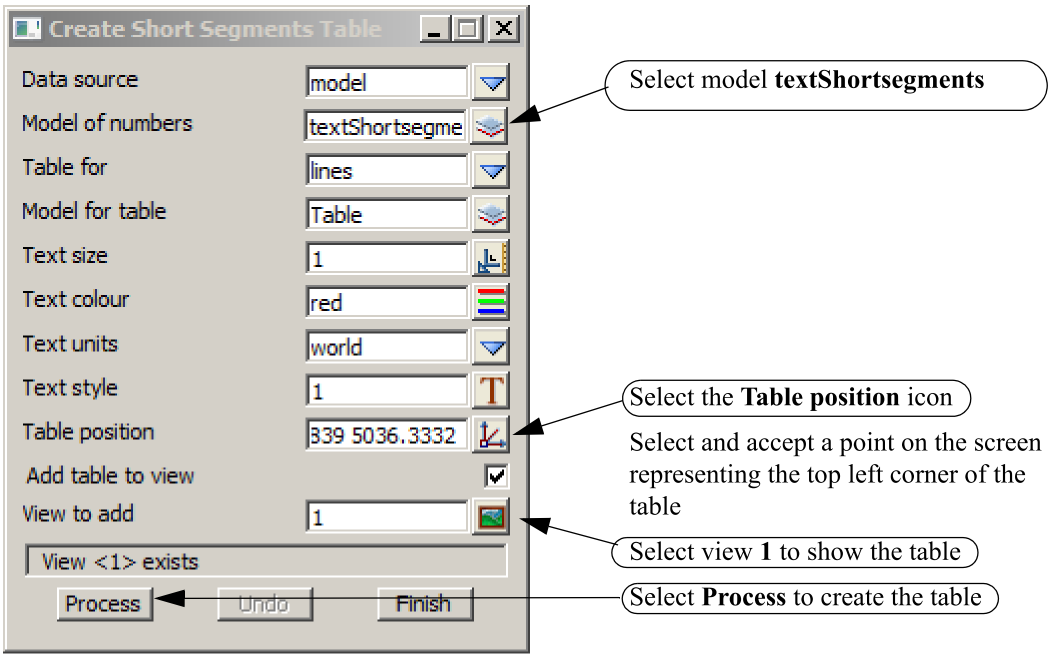
12.9.2Create Short Line table

The short lines have been identified with a circled number

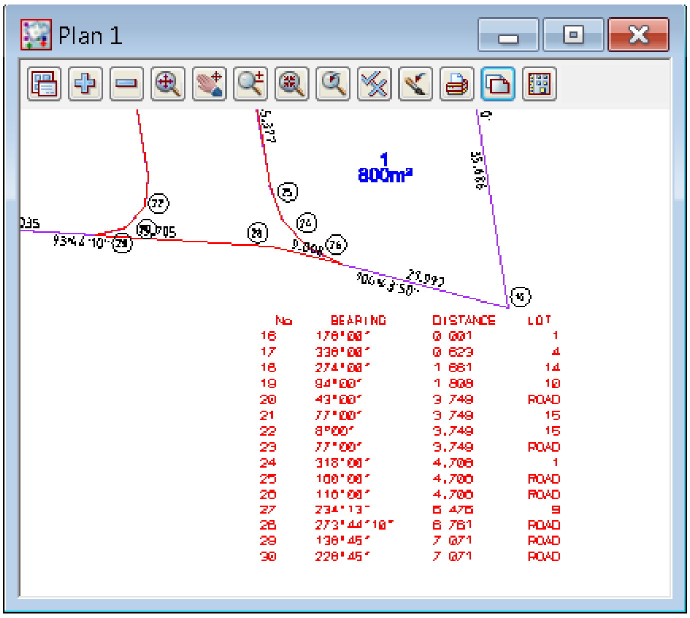


We now need to create the short line table

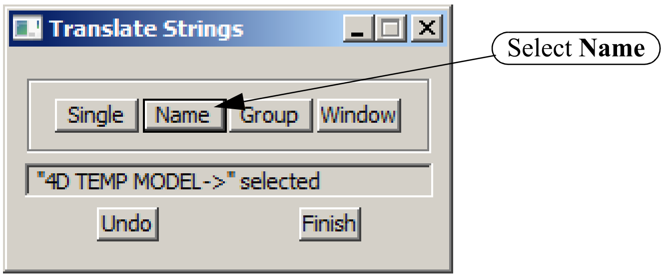
Select option ***Design=>Estate/Lots=>Lot Utilities=>Short line/arc table***



The bearing and distances of the short lines are displayed along with the relevant lot number



To move the table select option ***Drafting=>Multi strings translate***



Select and accept a piece of text in the table

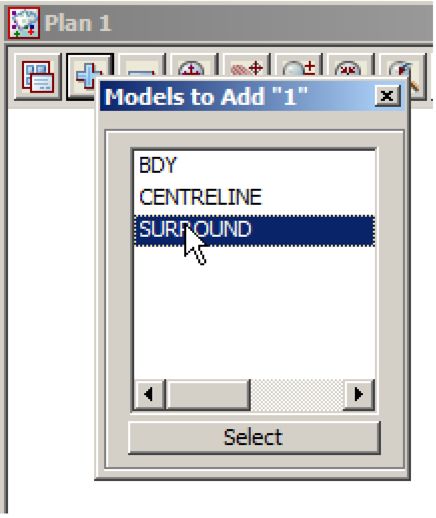
Move the table to a new location and accept the position

Select **Finish** to exit the option

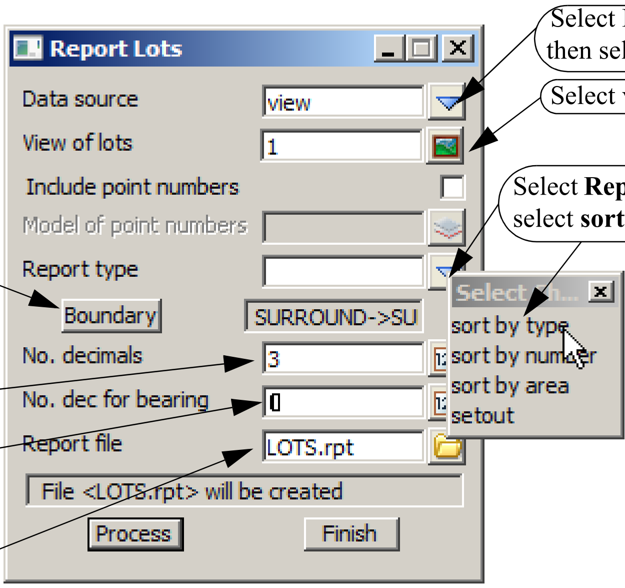
12.10 Lot Reporting

We will now generate a report on the subdivision

Turn on the **SURROUND** model to use as the Boundary



Select option ***Design=>Estate/Lots=>Report Lots***



Select **Data source** icon then select **view**

Select view **1**

Select **Report type** icon then select **sort by type**

Select **Boundary** then select and accept part of the **SURROUND** string

Type in **3** for number of decimal places

Type in **0** for number of decimals for the seconds in the bearing

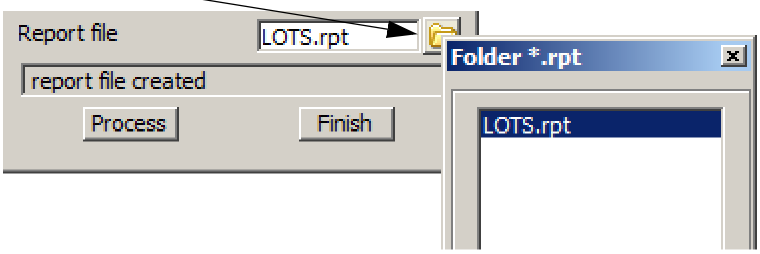
Type in report file name **LOTS**

Select **Process**

Select **Report file** folder icon

Select **LOTS.rpt**

Select **Open**



The first section of the report deals with the lots

The number, area and dimensions are displayed along with the vertex co-ordinates

```
REPORT OF LOTS SORTED BY TYPE
-----------------------------


LOT TYPE: LOT
-----------------------------------


Lot Number: 1       Area: 800.007

 Ln          Bearing     Distance    ArcLength       Radius      Eastings    Northings
---|---------------|------------|------------|------------|------------|------------
  1|171°00'0"      |      35.687|            |            |     994.417|    5035.248
  2|284°43'50"     |      21.993|            |            |    1000.000|    5000.000
  3|295°41'32"     |       4.706|            |            |     978.730|    5005.592
  4|317°36'55"     |       4.706|            |            |     974.490|    5007.632
  5|339°32'18"     |       4.706|            |            |     971.318|    5011.108
  6|350°30'0"      |      15.377|            |            |     969.673|    5015.517
  7| 80°30'0"      |      27.662|            |            |     967.135|    5030.683

Lot Number: 2       Area: 800.008

 Ln          Bearing     Distance    ArcLength       Radius      Eastings    Northings
---|---------------|------------|------------|------------|------------|------------
  1|170°30'0"      |      28.478|            |            |     962.435|    5058.770
  2| 80°30'0"      |      27.662|            |            |     967.135|    5030.683
  3|351°00'0"      |      16.984|            |            |     994.417|    5035.248
  4|358°30'0"      |      11.608|            |            |     991.761|    5052.023
  5|260°30'0"      |      29.425|            |            |     991.457|    5063.627

Lot Number: 3       Area: 800.001

 Ln          Bearing     Distance    ArcLength       Radius      Eastings    Northings
---|---------------|------------|------------|------------|------------|------------
  1|157°42'30"     |       8.704|            |            |     956.347|    5083.477
  2|170°30'0"      |      16.885|            |            |     959.648|    5075.423
  3| 80°30'0"      |      29.425|            |            |     962.435|    5058.770
  4|358°30'0"      |      25.622|            |            |     991.457|    5063.627
  5|260°30'0"      |      34.918|            |            |     990.786|    5089.240
```

After the last lot is displayed, the number of lots along with the total area, average area and percentage of the boundary (SURROUND) are listed

```
        Number of lots:      15
            Total area:    12820.958
          Average area:      854.731
Percentage of Boundary:       72.581%
```

The park is listed

```
LOT TYPE: PARK
-----------------------------------


Lot Number: PARK       Area: 1798.825

 Ln          Bearing      Distance    ArcLength       Radius      Eastings     Northings
---|---------------|------------|------------|------------|------------|------------
  1|344°32'30"     |      39.500|            |            |     808.646|    5057.519
  2| 45°49'0"      |      31.200|            |            |     798.118|    5095.590
  3| 54°13'0"      |      23.525|            |            |     820.492|    5117.335
  4|172°05'36"     |      25.015|            |            |     839.576|    5131.091
  5|228°45'0"      |      10.355|            |            |     843.017|    5106.314
  6|183°45'0"      |      10.355|            |            |     835.232|    5099.486
  7|138°45'0"      |      10.355|            |            |     834.554|    5089.153
  8|233°55'34"     |      40.502|            |            |     841.382|    5081.368

        Number of lots:        1
            Total area:     1798.825
          Average area:     1798.825
Percentage of Boundary:       10.183%
```

The road is listed

```
LOT TYPE: ROAD
-----------------------------------


Lot Number: ROAD       Area: 3044.466

 Ln          Bearing      Distance    ArcLength       Radius      Eastings     Northings
---|---------------|------------|------------|------------|------------|------------
  1|228°45'0"      |       7.071|            |            |     857.032|    5085.353
  2|273°45'0"      |      10.355|            |            |     851.715|    5080.690
  3|318°45'0"      |      10.355|            |            |     841.382|    5081.368
  4|  3°45'0"      |      10.355|            |            |     834.554|    5089.153
  5| 48°45'0"      |      10.355|            |            |     835.232|    5099.486
  6| 93°45'0"      |      10.355|            |            |     843.017|    5106.314
  7|138°45'0"      |       7.071|            |            |     853.350|    5105.637
  8| 93°45'0"      |      80.067|            |            |     858.013|    5100.321
  9|106°32'30"     |       9.326|            |            |     937.909|    5095.084
 10|132°07'30"     |      12.487|            |            |     946.849|    5092.429
 11|157°42'30"     |       9.326|            |            |     956.110|    5084.053
 12|170°30'0"      |      60.740|            |            |     959.648|    5075.423
 13|159°32'18"     |       4.706|            |            |     969.673|    5015.517
 14|137°36'55"     |       4.706|            |            |     971.318|    5011.108
 15|115°41'32"     |       4.706|            |            |     974.490|    5007.632
 16|284°43'50"     |       9.008|            |            |     978.730|    5005.592
 17|273°44'10"     |      22.465|            |            |     970.019|    5007.882
 18| 76°31'48"     |       3.749|            |            |     947.601|    5009.346
 19| 42°07'5"      |       3.749|            |            |     951.247|    5010.220
 20|  7°42'22"     |       3.749|            |            |     953.761|    5013.000
 21|350°30'0"      |      53.932|            |            |     954.264|    5016.715
 22|331°18'45"     |       8.217|            |            |     945.363|    5069.907
 23|292°56'15"     |       8.217|            |            |     941.418|    5077.115
 24|273°45'0"      |      76.985|            |            |     933.852|    5080.318

        Number of lots:        1
            Total area:     3044.466
          Average area:     3044.466
Percentage of Boundary:       17.235%
```

At the end of the report the total number of lots are listed along with the area

Any errors in the lot creations should yield a percentage difference to the boundary

```
REPORT OF LOT TYPES SUMMARY
---------------------------

    Total number of lots:      17
        Grand total area:    17664.248

  Percentage of Boundary:      100.000%
---------------------------
                Boundary:    17664.248
              Difference:       -0.000
Percentage of Difference:       -0.000%

END OF REPORT
-------------
```

Exit the report file