

Unit 2:

Introduction to ArcView and Simple display

The aim of this Unit is to introduce you to the basic components of ArcView, how they can be used to display spatial data and how you can save and print your work.

2.0 Introduction - and running ArcView

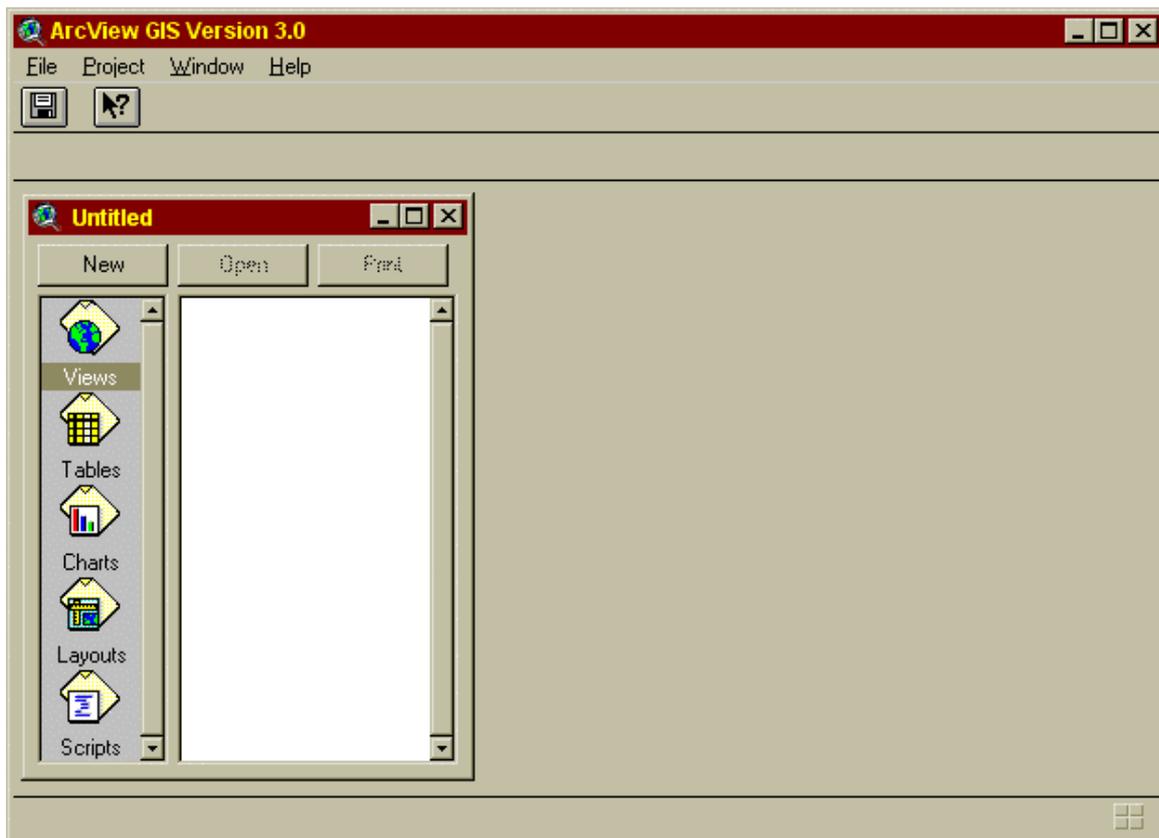
ArcView is a Geographical Information System, GIS, which runs on a wide variety of different computer systems, (often called 'platforms'). ArcView behaves in exactly the same way on each of these platforms, so it does not matter which one you are using when working with this tutorial. There are some tools in ArcView which cannot operate in certain computing environments; these have been introduced as 'Extensions' from ArcView Release 3 (1996) and will only be met in the more advanced, optional, units of this tutorial.

Throughout the tutorial, terms specific to ArcView are printed using **this** font. When you are required to carry out a specific action on the computer the instructions are given in italics *like this*. Where a specific text must be typed, for example to open a dataset, the text is printed like `this`.

The ArcView GIS looks more or less identical on the screen no matter which platform it is running on, although the way the application is started, which we need to do next, may vary.

Now start up ArcView. As institutions differ in the way their computer systems are set up you will need to consult Point 1 on the Addendum Sheet from your own institution for instructions on how to do this.

Once your screen has settled down it should look like Fig. 2.1



[Fig. 2.1](#)

ArcView is organised into a number of components which are displayed as 'windows'. At the moment your screen should show two windows, the Arcview window itself, within which all ArcView is displayed, and inside this, a smaller window currently headed Untitled which is known as the **Project** window (more of this in a moment!).

The basic ArcView window contains, from the top, a Menu bar, with named pull down menus, currently listing **File**, **Project**, **Window** and **Help**; a tool icon bar, with pictorial icons for those tools available, currently the Save, and Help icons; a display area; and, at the very bottom, a status line. When the mouse cursor is located over a tool icon descriptive text identifying the purpose of that tool is displayed in the status line.

- *Try this now by putting the cursor on the 'floppy disk' icon.*

The collection of tool icons displayed in the tool bar will vary depending upon the type of window that is currently active. Most windows provide a Help tool, which invokes the help system in a context relevant to the specific window, in addition to the Help menu.

Now look at the **Project** window. On its left-hand side this lists the 5 main components of ArcView, each of which has its own type of window; those for displaying **VIEWS** of spatial data; examining database **TABLES**; preparing statistical graphs or **CHARTS** from selected data; for setting out the **LAYOUT** of a printed page; and, for more advanced users, programming **SCRIPTS** for new ArcView applications. When you want to save your ArcView session you do so as a

project which can contain any of these components.

Each window can be maximised to the extent of the main ArcView window, between the tool bar and the status line. It can also be minimised to an icon, also within the ArcView window area.

*Click in the top right-hand corner of the **Project** window to maximise it. Now click again to return it to its original size.*

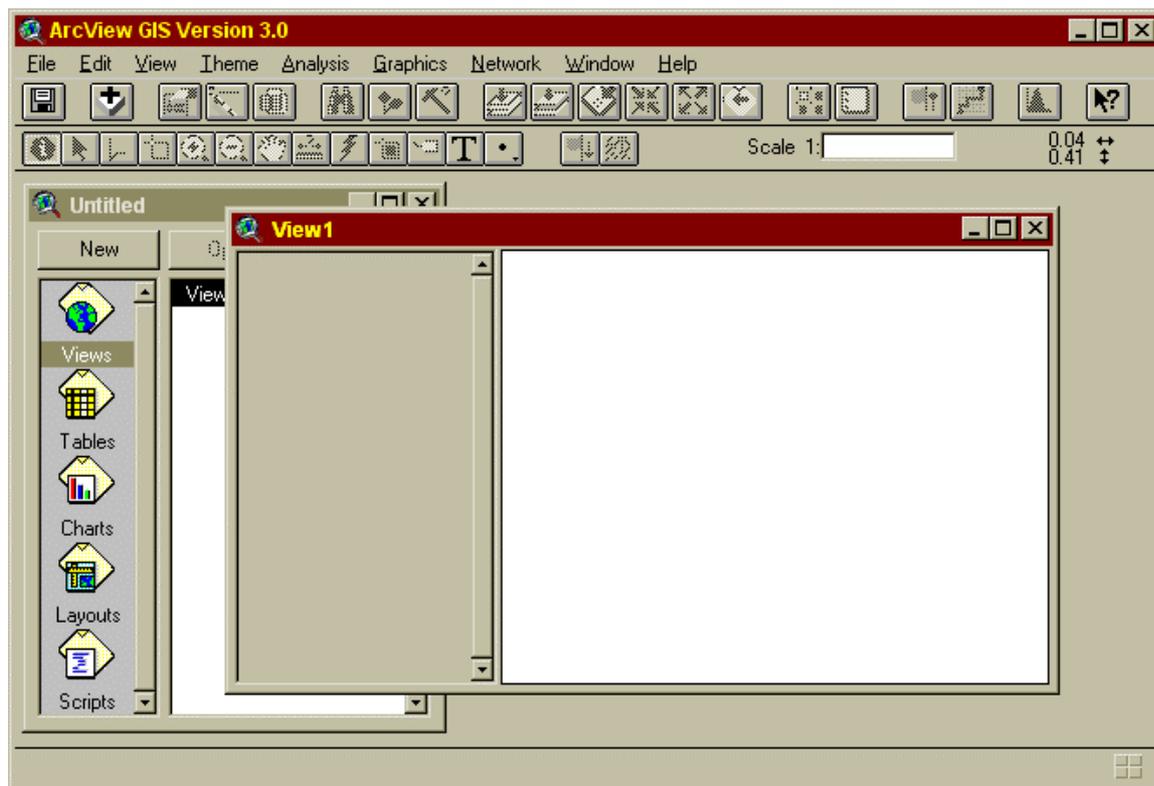
We will now concentrate on the **View** window in order to discover how to display spatial information. Cartography, commonly called mapmaking, is the technique of representing spatial data in a graphical form. The advantage of doing this is that the human brain can process visual images extremely quickly and therefore gain a rapid appreciation of relative distance and direction. In ArcView maps are displayed as a **VIEW** but with distinct advantages over a paper map. The **View** window is more like an interactive drawing board where you can specify existing information to be drawn, control the way information is represented (symbology), sketch annotations onto displayed information and even modify the information presented.

*Make sure the **Views** icon in the **Project** window is selected, as shown in Fig.2.1. Click on the other **Project** window icons in turn to see how selection is indicated before returning to **Views**.*

The right-hand part of the **Project** window will list the different Views (or Tables etc.) currently available in the project. As this space is empty and the Open button is unavailable there are no views at present and we shall have to create one. ArcView does allow you to have several views open at once, but we shall work with a single **View** window for the time being.

*With **Views** selected, click on the **New** button in the **Project** window.*

Your screen should now look like Fig. 2.2



[Fig. 2.2](#)

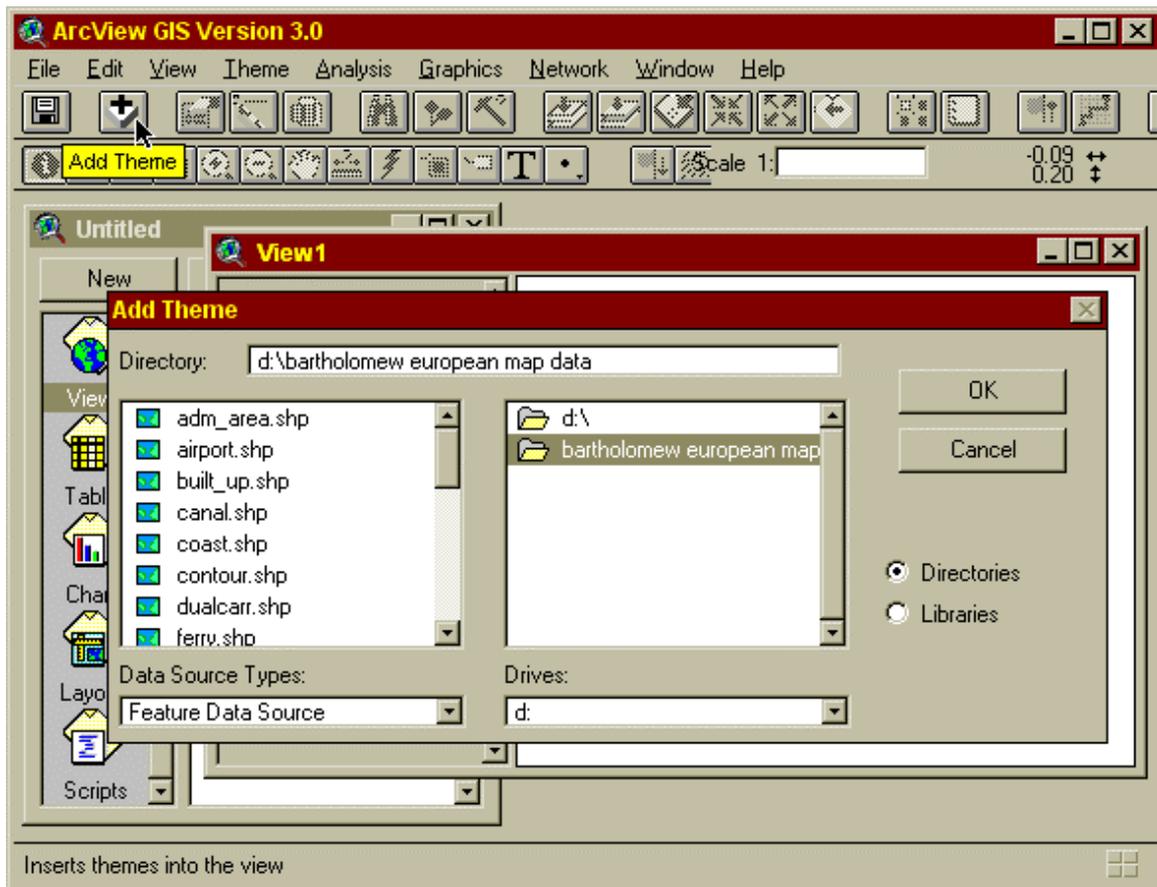
Notice that as well as opening a **View** this has also changed the Menu Bar and icon bar to those necessary for a **View**. You will see that the **View** window is split into two portions - on the left is a scrollable region in which legends will be displayed, and on the right is the drawing area, on which the various pictorial elements will be displayed.

In ArcView terminology, a **View** comprises one or more **Themes**. Each theme is simply a distinct set of information - such as roads or rivers or county boundaries etc., rather like the different layers that can be used to build up a map as shown in Fig.1.2 of Unit 1. In addition, each **Theme** has its own legend, which is a list of the symbology used.

We now need to add a theme to the view.

*Click the **Add Theme** icon. Alternatively, you can click **View** on the Menu Bar and then **Add Theme** from the drop-down menu displayed.*

You should now see the **Add Theme** dialogue box as shown in Fig. 2.3, showing any files in your disk area which ArcView recognises as holding spatial information. These will be listed in the left hand part of the window, although the files and directories listed will, of course, be those available from your institution.



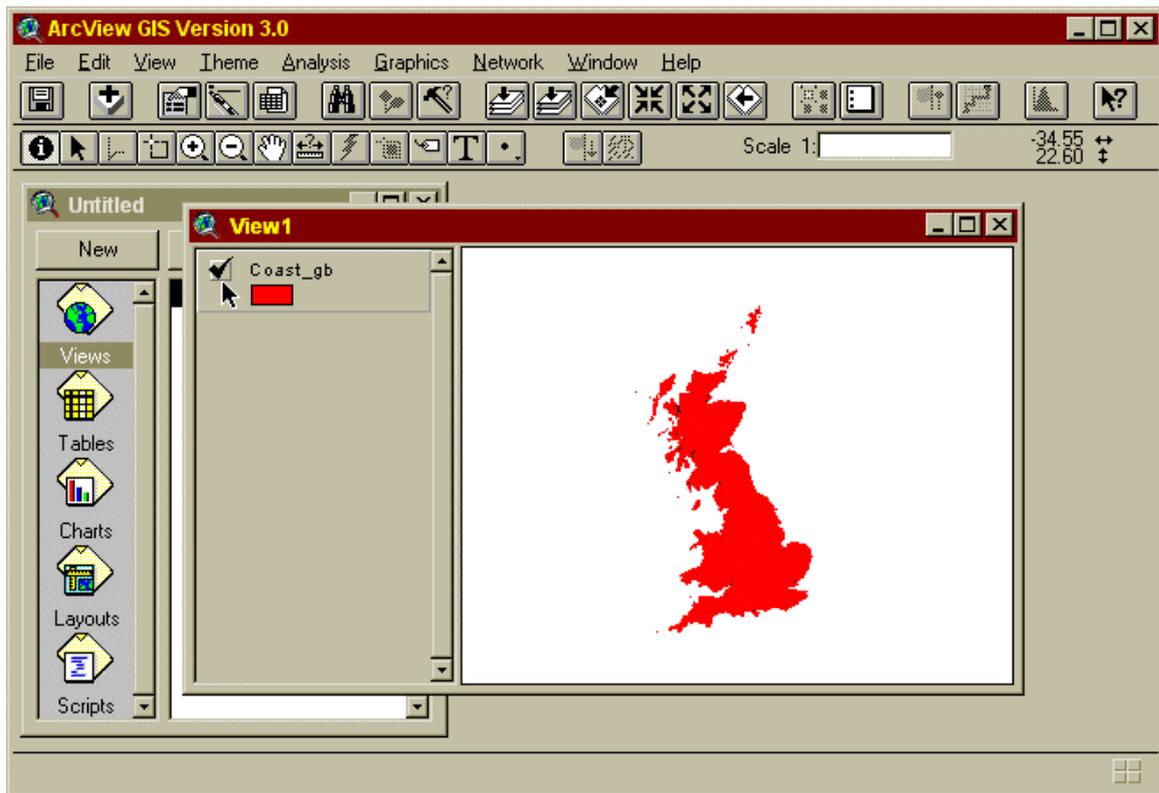
[Fig. 2.3](#)

Navigate to the file called `districts.shp` by following the instructions in point 2 on the Addendum Sheet and then click OK.

Note how the name of the theme with its symbol appears in the **View Legend** area, together with a little selection box just to the left of the name.

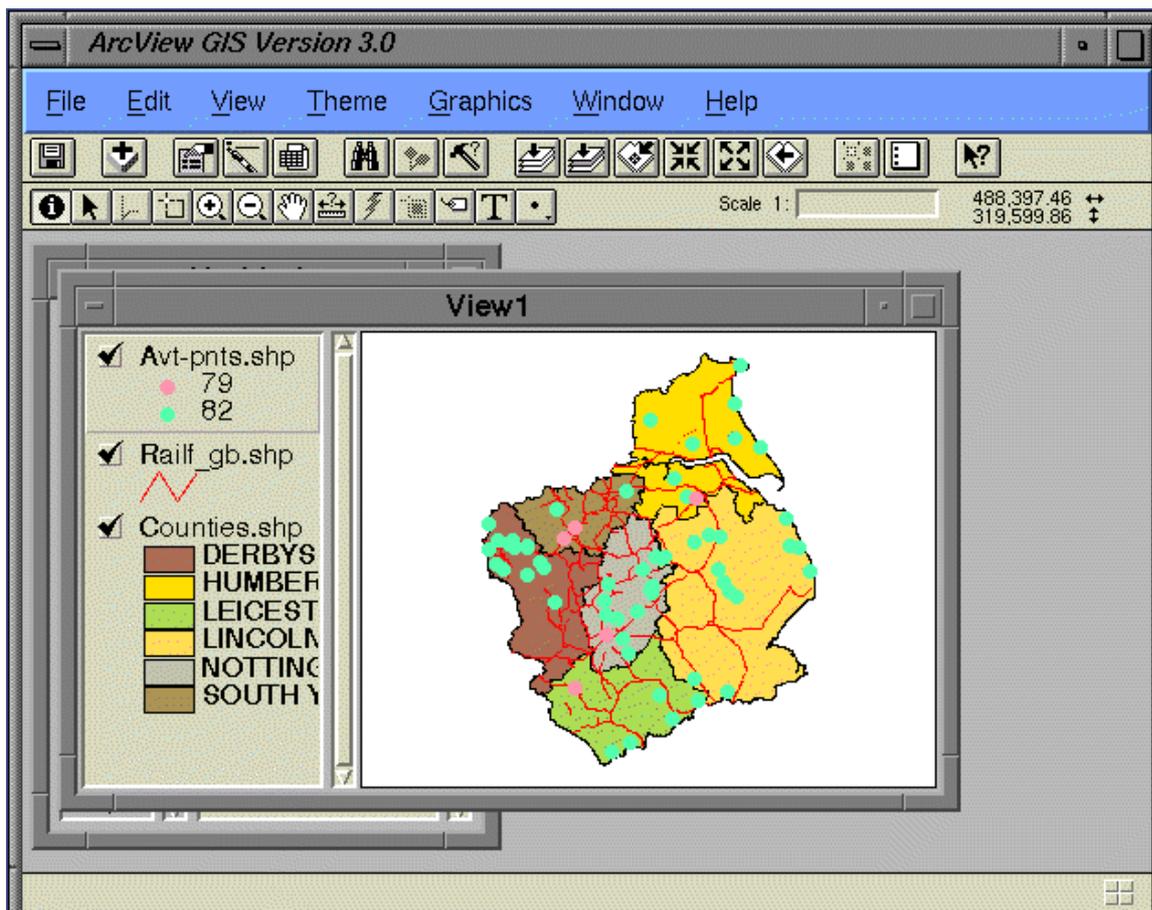
Click in this selection box.

You should now see a tick in the selection box and the theme will be drawn using the symbol displayed under the theme name, as shown in Fig. 2.4.



[Fig. 2.4](#)

You are now looking at a map showing some of the districts of the Eastern Midlands of England. The ways in which such features are represented vary depending partly upon the way the information is collected and partly on what is being represented. At this stage features will be represented as one of three types:- points, polylines, or polygons (see Fig. 2.5).



[Fig. 2.5](#)

Point representation is used for individual, and discrete, items such as lamp posts, location markers (e.g. Whitby Abbey - a named church on the map in Fig. 1.2), mountain summits, etc. When these are displayed, some symbol or other will be used to mark the point and, perhaps, to distinguish it according to what it represents.

Polyline representation is used for linear features that will be drawn as a line - like a road or a railway. It is called 'polyline' because, although if it is a straight line, it will be defined simply by two sets of coordinates (one at either end), a line representing a natural feature is rarely straight and will often need many sets of coordinates, one for each time it changes direction.

Polygon representation (which in reality is very similar to a polyline that has been closed in on itself to enclose an area and is defined by co-ordinates for each time it changes direction) is used to represent areal information - for example the boundaries of a local authority, as in the districts displayed on your screen at present, a census enumeration district, or the outline of a lake.

If you now look back at the map in Unit 1 (Fig. 1.2) you will see that the principle of points, polylines and polygons can also be applied to the way in which features are drawn on a paper map.

We can now add another theme to the view.

Click the **Add Theme** icon and navigate to the file called `railf_gb.shp` by following the instructions in point 2 on the Addendum Sheet, click **OK** and then click on the small selection box in the **Legend** column to display the data.

This new theme you have just added uses polylines to display its data. Each **Theme** in ArcView can only use one type of representation, in this case polylines.

Notice also that this new theme has been added at the top of the **Legend** column - and is now drawn last of all, on top of the earlier data.

Click on the `railf_gb.shp` theme name in the **Theme Legend** window (avoiding the selection box) and, with the mouse button depressed, drag the railway theme name to be below the `districts` theme name.

The screen will now be re-drawn, starting with the theme at the bottom of the list. If a theme higher up the list totally obscures an earlier one, that's life! It does illustrate, however, that even at a simple display stage it is necessary to think about the order in which things are being displayed.

Now return the railway data to the top of the **Theme Legend** list and click in the selection box to stop displaying it for the time being. Click on the `districts.shp` name in the **Legend** window to make sure it is selected.

Several icons in the **View** window enable you to zoom in or zoom out from a **View**. For the time being we will introduce you to just two, the **Zoom In** tool (Insert + icon) and the **Zoom Out** tool (insert - icon).

Click the **Zoom In** tool on the tool bar and then move the cursor on to the **View** display area (notice what happens to the cursor).

Choose a particular district on the map, move the cursor to a point just above and to the left of the district and then, with the left mouse button depressed, drag out a rectangle which surrounds the district.

The area within the rectangle should now be redrawn to occupy all of the **View**. Now try using the **Zoom Out** tool to reverse this situation! If things don't work out quite as you had hoped then do the following:-

Go to the Menu Bar and click on **View** and then **Full Extent** or see if you can find the appropriate button on the tool bar and click on it.

To the right of the **Zoom In** and **Zoom Out** tools on the tool bar is the **Pan** tool.

Click on the **Pan** tool and then within the display area and with the left mouse button depressed move the **View** around.

Practice using the **Zoom** and **Pan** tools for a short while, remembering that if you get lost you can always go back to **Full Extent**.

So far the **View** shows the outlines of some local authority districts but tells us nothing else. We

shall now investigate what other information is available.

*Click on the binoculars **Find** icon, type Mansfield in the resulting dialogue box and then click OK.*

You should now see the district of Mansfield selected in a different colour from the rest of the districts. To do this ArcView has searched the relevant part of the theme database for a particular string of text, i.e. Mansfield. If there had been no match, an information window with the 'No Match' message would have been displayed. You do not need to know the details of the database to use this tool; ArcView will simply indicate whether or not it can find the particular string of text you have asked it to search for.

However, it is important to learn more about the relationship between a theme and its database.

*Click on the **Table** icon.*

A new window is now displayed showing a table. The table shows part of the database associated with this particular theme, in particular what is known as the descriptive attributes of the theme (other data associated with the theme e.g. the data necessary to draw the polygons is not shown). You will see that this **attribute** table consists of columns, which contain **fields** (categories of data e.g. name, area, perimeter etc.), and rows which contain **records**.

The table is probably too large to fit on your screen, even when maximised, so you can use the horizontal scroll bars, if necessary, to examine all the fields of a record. At the left end of the table is a **shape** field containing the word 'polygon', indicating the category of feature drawn in the view. To the right of this are other fields recording things like unit name, area and perimeter. In other tables different types of data may be recorded e.g. **polyline** features may have their length recorded; information on things like population statistics, construction materials, date and contractor for the last maintenance event could be included - indeed any information that may be relevant!

Each feature in the theme, in this case districts, has its own record.

Find the Unit-name field (you will probably have to scroll to the right) and then scroll down until you have found Mansfield.

Notice that in this case the record for Mansfield, selected when you used the **Find** button, has been emphasised with a yellow background. Note also that the other records displayed in the table, around the selected record, may not be those for records of geographically adjacent objects.

*Now return to the **View** window by clicking the mouse pointer anywhere within its frame.*

You can work the other way around, starting with the items displayed upon the screen. To do this it is necessary to select a feature in the display and then to examine the record for the selected object.

*Click on the **Information** icon, then click it on any location within the **View**.*

An **Identify Results** window will be opened displaying the details of the object at the location

pointed to.

*Click on another feature in the **View**.*

Another line will be added to the **Identify Results** display. The detail shown in this window, on the right hand side, is that for the selected record.

Click on the previous item in the scroll area to the left.

This provides a way of easily comparing information relating to the different locations.

*Now close the **Identify Results** window by double clicking on the **Bar** tool in the top left hand corner of the window frame.*

You can also measure distances across, or between, objects in the display.

*Click on the **Measure** tool icon. Now locate the '+' part of the pointer icon at your chosen starting position, click the left mouse button and move the mouse pointer across the **View**.*

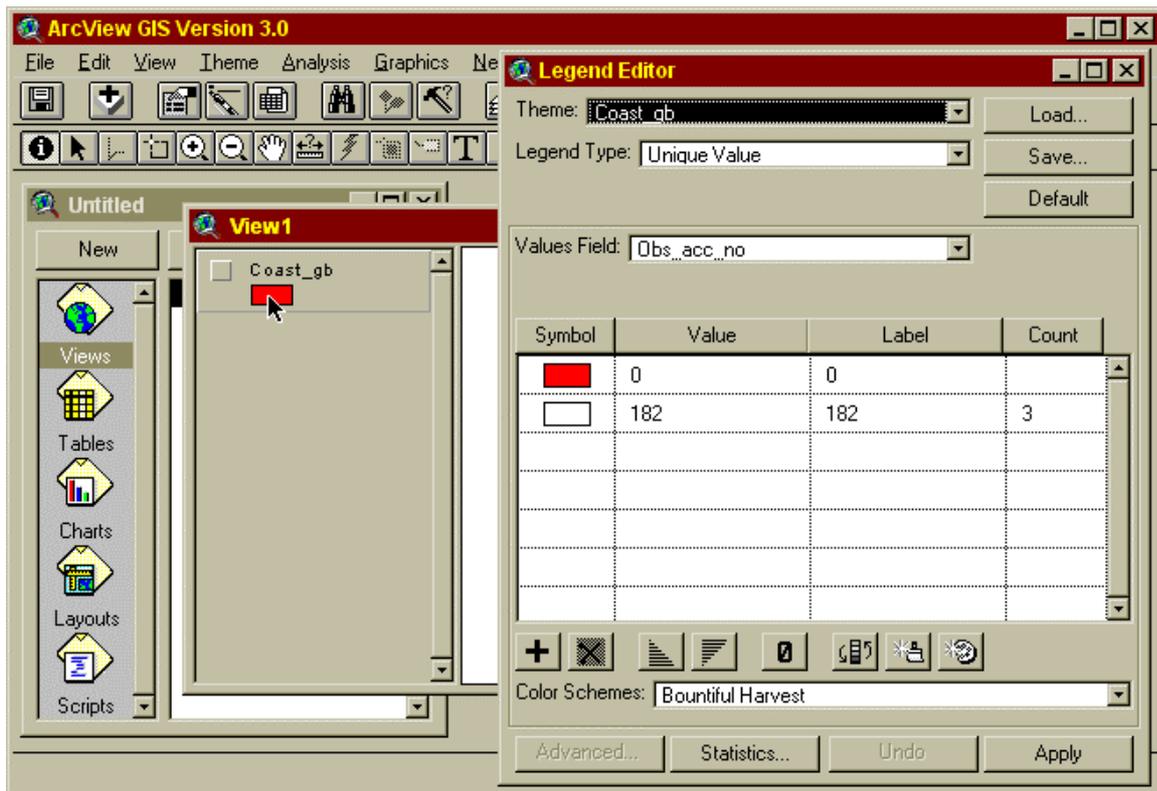
In the bottom right of the ArcView window, in the Status bar area, you will see displayed **Segment Length** and **Length**. These will change, as you move the pointer, until you click the mouse button again. After you have clicked the button once you can continue to move the pointer - the **Segment Length** will have restarted from zero at the location at which you clicked the mouse button but the **Length** value will continue to accumulate. This facility is useful, for example, for measuring distances between locations, following the route of a road (or roads) or a river, although there are also other ways of performing route finding which you will meet in a later unit.

Terminate your length measurement by double clicking the mouse button.

All objects within this theme, other than that selected with the **Find** tool, are currently displayed using the same symbol; this is a little confusing.

*Place the cursor over the symbol, in the **View Legend**, and double click on it.*

ArcView will now display the **Legend Editor** window, shown in Fig. 2.6



[Fig. 2.6](#)

In the **Legend Editor** window the name of the selected theme is displayed, along with the current **Legend Type**, which at the moment says Single Symbol.

*Click on the scroll button (at the right hand end of the **Legend** type box) and then click on the **Unique Value** menu item.*

The **Legend Editor** window will now change to display a table, several new buttons and three new boxes with drop-down menus.

*Click on the scroll button at the right-hand end of the **Values Field** box to bring up a menu showing all the available attribute fields in the theme's database. Select Unit-name.*

The table below, with columns headed **Symbol**, **Value**, **Label**, **Count** will now display a different colour for each different value of the **Name** field.

*Click the **Apply** button.*

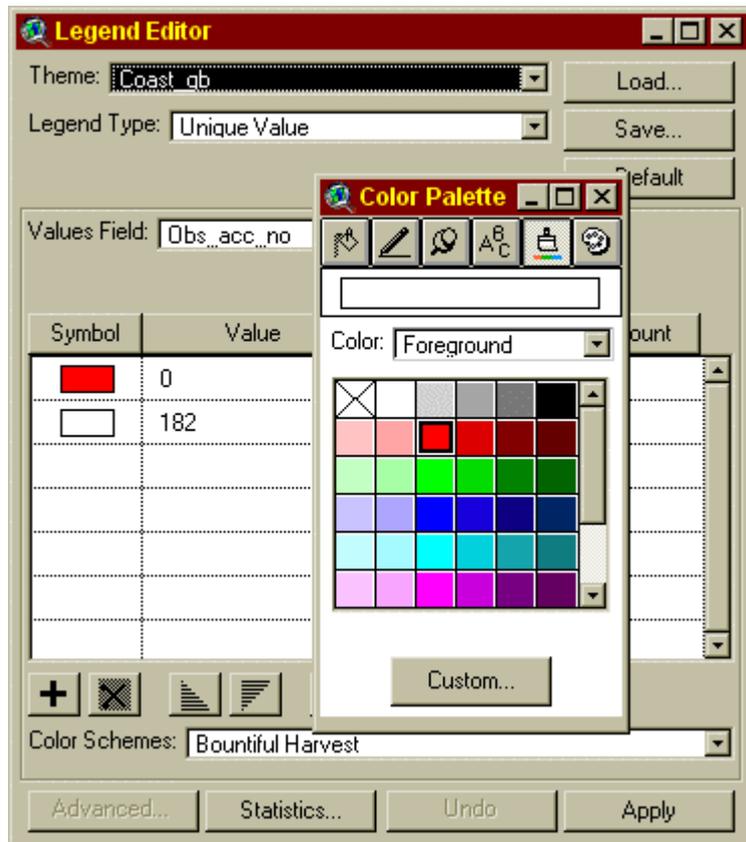
The **View** screen will now be re-drawn using different colours for the various areas displayed; that originally selected will remain highlighted. You may now decide that you want to change one of the colours used.

*Double click the colour you want to change in the **Symbol** column.*

This will display ArcView's **Symbol** window. The title at the top of this window will depend upon which of the 6 buttons just below is depressed (see Fig. 2.7). You will need to make sure

that the **Colour Palette** (indicated by a paintbrush) is displayed.

*Click on the **Colour Palette** button (if necessary) and then click on the colour of your choice. If the **Colour Palette** window is obscuring the **Legend Editor** window you can move it by placing the cursor in the title bar at the top, keeping the left mouse button depressed and then dragging the window to one side. You can, of course, move the other windows around in the same way.*



[Fig 2.7](#)

You should now see that the colour you wanted to change has been changed. Apply this change to the **View** as you did for the change in **Classification Field** above.

*Now close both the **Symbol** window and the **Legend Editor** window by, in each case, double clicking the **Bar** tool at the top left corner of the window.*

2.1 Saving your work

At some stage you will need to save your work in order to have it available to work on at a later session. You may remember from earlier in this Unit that ArcView saves work as **Projects**.

*Make sure that the **Project** window is active and then click the **Save Project** icon. Alternatively, click **File** on the Menu bar and then **Save As**.*

A **Menu** window will be offered with a possible name. You may choose the name offered, or type to the File Name box a name of your own choosing. This name should not exceed eight

characters in length. You do not need to specify the file type (.apr); ArcView will add this file extension automatically for you. You will also need to consider where your file is to be saved and it is probably a good idea to do this before you do any renaming.

Consult Point 3 on the Addendum Sheet from your own institution and then select the appropriate drive and directory.

*Now select a name for your project, confirm by clicking on the OK button and then close the **Project**.*

Before going on to the next section try the following self-assessment exercise on the material covered so far.

SAQ 2.1. *Start a **New Project and New View**. Add the theme `distrcts.shp` and display. Find the district of Great Grimsby and then maximise it in the window. What is its area? Repeat this process for Derby and find out its perimeter.*

2.2 Printing

For this part of the Unit we need to return to the project you saved earlier.

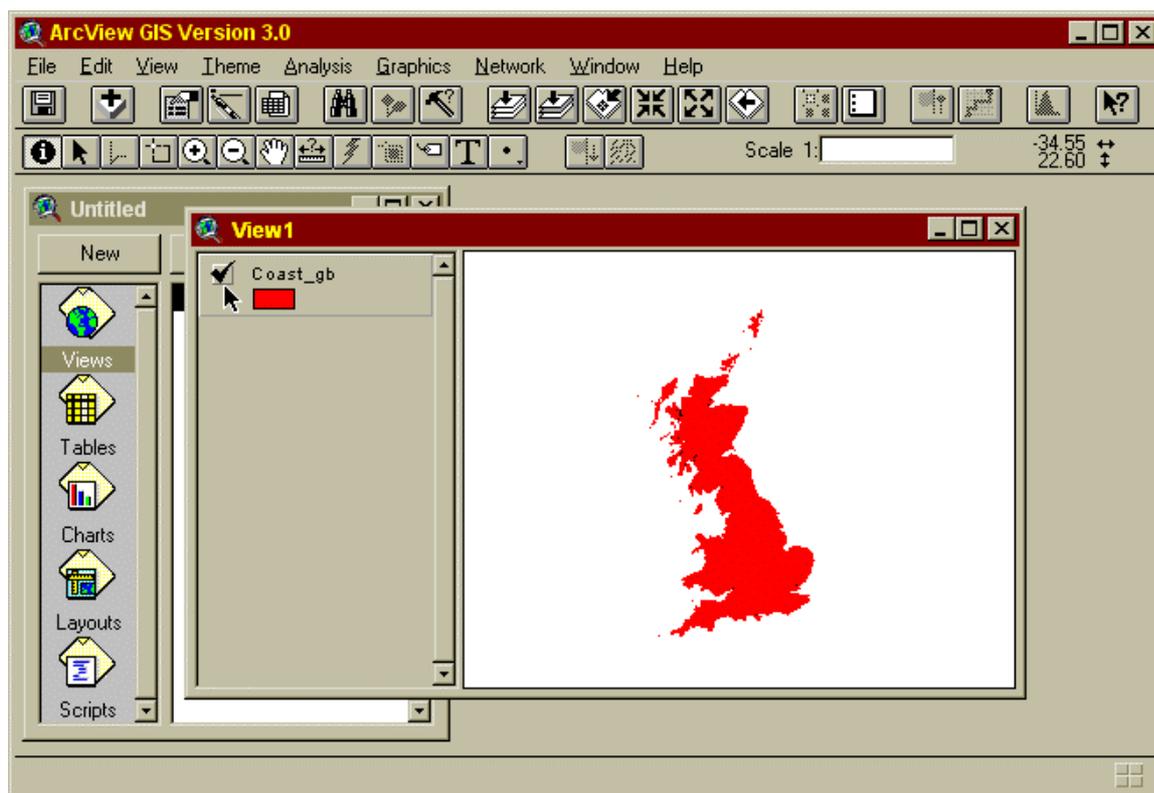
*In the main ArcView window click **File** on the Menu bar and then **Open Project**. Navigate to where your project has been saved, select it and then click OK.*

It is possible to print the **View**, say, that you are working on just as it is on the screen by clicking on the Menu bar and then **Print**. However, you have to choose between the View's display or its table of contents (i.e. legend) and a map without the latter is not a lot of use. The component of ArcView known as **Layout** enables you to put together a presentation suitable for printing which can include views, legends, tables, charts etc. However, before starting this it is necessary to ensure that ArcView knows about the sort of units and the coordinate system, that the data is using. Up to now these have simply been a stream of numbers.

To do this we must use the **View Properties** control window.

*Click on **View**, on the Menu bar and then click on the **Properties** item in the menu list.*

A **View Properties** window will be displayed, as shown in Fig. 2.8. Some of the options here are simply descriptive, like the **Name** and **Creation Date** fields, and are provided to enable you to better organise your work. Around the middle of the window are two fields, **Map Units** and **Distance Units** (greyed out). Both are currently set to the value **unknown**.



[Fig. 2.8](#)

*Click on the scroll button to the right of the **Map Units** box and select **Meters**, from near the bottom of the menu.*

The **Distance Units** will remain set to 'unknown' but will no longer be greyed out. You may now choose a distance measurement system (e.g. kilometers) from the menu offered when you click on the scroll button. After leaving this window, if you use the **Measure** tool again, the values reported will be in the units you have just selected. We need to set these units so that we can include a scale bar on the printed version of the display - without which a reader would be left with a pretty picture (perhaps!) but very little in terms of reference for size and distance.

*Click OK to confirm the settings and to return to the main **View** window.*

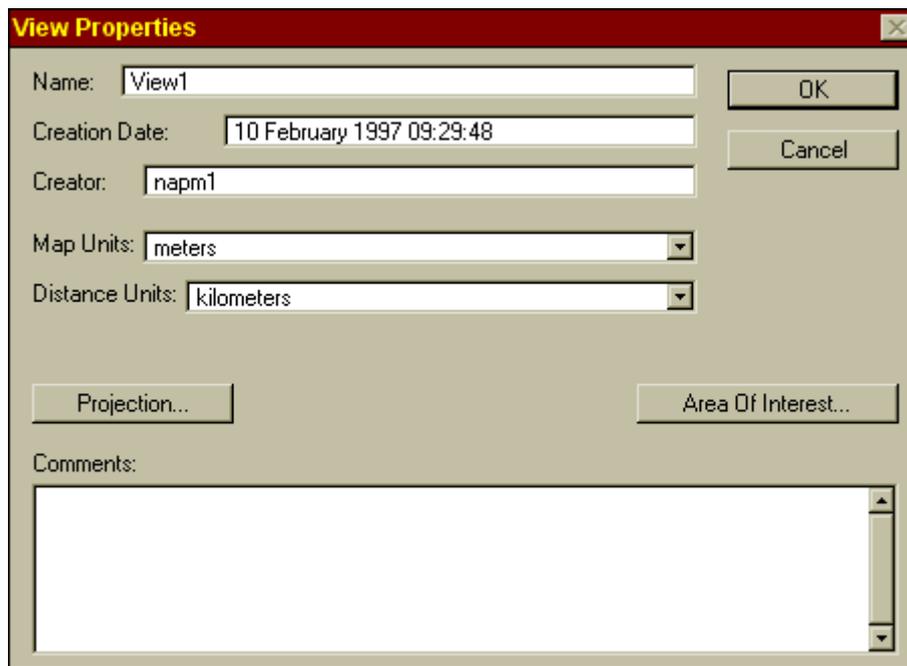
2.3 Simple Presentation

The ArcView **Layout** facility provides the tools required for the generation of the printed page, or 'pages' which will later be incorporated into other documents, such as, for example, Word or WordPerfect reports or dissertations. **Layout** supports the gathering together of **View** displays, the positioning of these displays on the page, the provision of scale bars, titles, frames, etc., such as are necessary for the neat presentation of your work. The components that this unit will teach you about represent the bare minimum that will result in a comprehensible illustration. In a later unit you will learn about more advanced techniques of presentation and page layout; for the moment we will keep things simple!

*Double click on the **Layouts** icon in the **Project** window.*

An empty page 'canvas' window will now be displayed. It will probably be a good idea at this point to 'maximise' this window, to the largest extent the ArcView window will contain, as you did with the **Project** window earlier in this Unit.

A convenient way of thinking about the **Layout** window is in terms of an artist's canvas, or a large, but empty, sheet of paper. On this the various elements that will make up the final page are placed or moved around to obtain a better 'fit' or a more pleasing visual appearance. It is here that different **Views** may be combined - perhaps a general view of the whole of the United Kingdom in one view and a detailed view of a very much smaller part in another. Once these are placed on the page, lines may be drawn to link them as for an 'exploded' view, and further explanatory text, figure numbers, or titles, etc., may then be added for completeness. See Fig 2.9.



[Fig. 2.9](#)

Now select **Layout**, from the Menu bar at the top of the ArcView window frame, and click on **Page Setup**.

This will open the page specification menu, from which the page size, orientation, margins, etc., are controlled as shown in Fig 2.10. S/He is a wise user who sets up the page configuration first thing, before defining any of the elements that it is desired to place on the page!

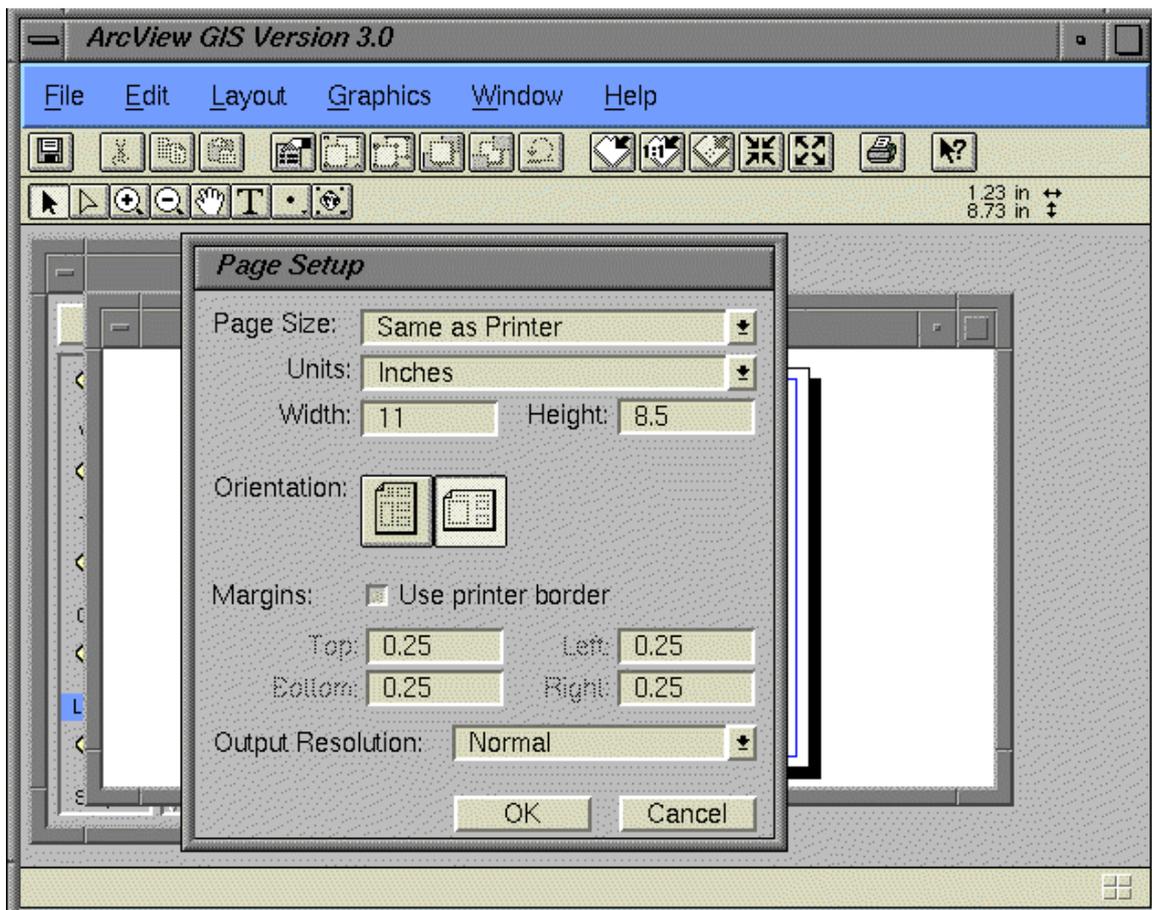


Fig. 2.10

Click the scroll button at the right hand side of the Page Size box and scroll down until you reach A4 which you should now select by clicking on it.

You will notice that **Units** are now set to **Centimeters** and the page width and height have values set. If the width is greater than the height then you have the **Orientation** set to **Landscape** mode and need to change it to **Portrait** mode (long edge vertical) which will swap over the values for width and height.

*Make sure that the **Portrait** mode **Orientation** button is depressed by clicking on it.*

By default, ArcView sets a page margin of a fraction over one half a centimeter. This margin will permit printing to the extremes of the printable area for most printers but will not provide an adequate binding margin for inclusion in a dissertation, report, etc.

Choose appropriate values - perhaps 2.0 for the left margin and 1.0 for the top, bottom and right margins by highlighting in turn the numbers already there and then typing in your own.

There is no need to alter the setting of the Output Resolution box.

Now confirm these settings by clicking on the OK button.

Before attempting to locate any items on this page there is one further setup action that must be performed. The **Layout** tool provides an alignment grid, which is not printed, but which makes it easier to locate, and align, the various components of the page. The default unit size of this grid is almost certainly too coarse and you will need to change it.

*Return to the **Layout** menu and select **Properties**.*

It is the value settings for the horizontal and vertical grid spacing that you need to alter.

*Set both to 0.1 (one millimeter) for the purposes of this exercise and then confirm using the **OK** button.*

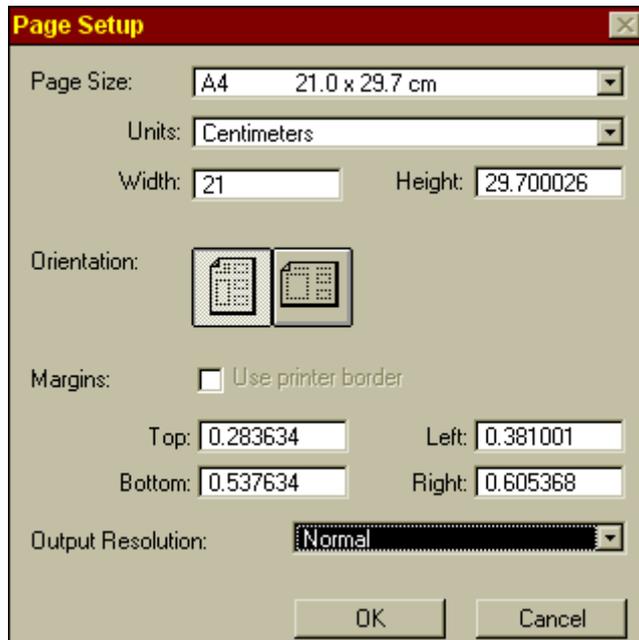
Now, having set up the various control parameters for the page, it is time to place something on it.

*Click on the **Zoom to Page** icon in the **Icon Bar** when your blank page will now be centred in the window.*

The two right hand icons in the second row of tool icons offer a further menu of tool icons when clicked on. These provide the tools for drawing directly on the page (left icon) and for placing **View Frame** items on the page (right icon). See Fig. 2.11.

*Select the **View Frame** icon and then position the '+' pointer icon at the place on your page at which you want the top left hand corner of your map view. Whilst holding the mouse button down, draw out a box with the tool to occupy that area of the page in which you want the map to appear. Release the mouse button at the bottom right hand corner of this area.*

A **View Frame** menu window will now appear as shown in Fig. 2.11



[Fig. 2.11](#)

Select the **View1** entry from the list of Views presented to you and confirm by clicking the **OK** button.

The **View** window display, which you created earlier, will now be drawn on your page. The display may not occupy the whole of the area you initially selected. This is because the ratio of width and height (the **Aspect Ratio**) of the original display is preserved so as to avoid distortion.

If you are not quite happy with the size of the display you can modify it.

Click on the **Selection** arrow icon and then click on one of the corner boxes marked on the screen and drag it to the desired size.

The **Aspect Ratio** of the original will still be preserved, no matter how you try to drag the frame. You may also want to reposition the display - perhaps to better centre it on the page.

Click on the **Select** arrow tool and then on the centre of the display object, such that the corner location spots are displayed. Now hold the mouse button down, drag the whole unit around the page to the position you desire. When you release the mouse button the display will be relocated to the new position.

No map is much use without reference indications of scale and direction. These elements are conventionally provided by means of a scale bar, to indicate relative distance, and a **North Arrow**, to indicate orientation. There are tool icons to enable the generation of these elements in the same vertical list of tool icons as the **View Frame** tool you have just used.

Select the **View Frame** tool icon. A dropdown menu of icons will appear. Keeping the mouse button down select the **North Arrow** icon (usually 4th from the bottom) and then release the mouse button. Position the '+' cursor in a suitable place on the page and draw out a box.

This box will determine the size of the **North Arrow** symbol that will be located at this point. A **Symbol Menu** window will be displayed showing a variety of conventional **North Arrow** symbols.

Click on the one you like best and then confirm by clicking the **OK** button.

Your selected symbol will now be drawn on the page, oriented in accordance with the orientation of the **View Frame** coordinates.

You may now decide that one of your existing page elements (view or north arrow) is not how you would like it. Later on we will learn how to modify page elements after their initial definition but for the moment, if one does not work out the way that is desired, it may be deleted. Try this now.

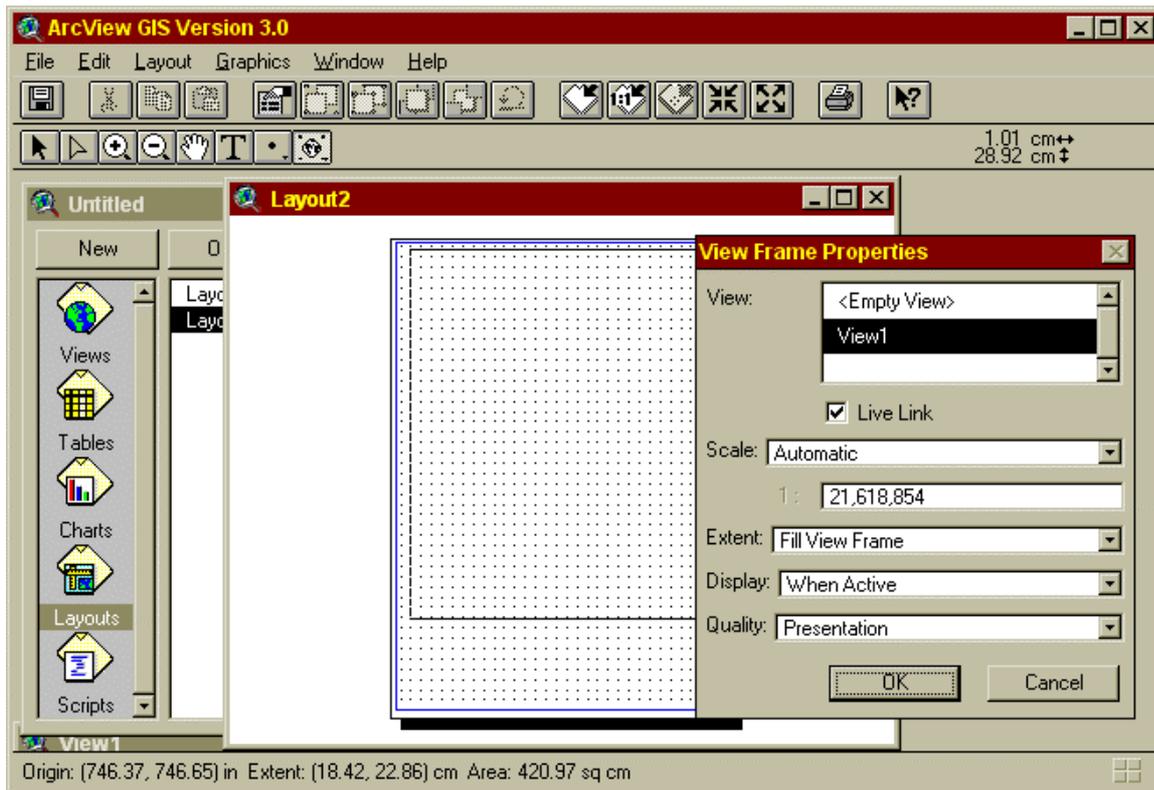
Delete an element by using the **Select** arrow tool to produce the corner markers of the element and then hitting the 'delete' key on the keyboard.

The selected element will be removed from the layout canvas. You will now need to repeat what you have done earlier to replace the element on your Layout. After this you will need to add a Scale bar to your Layout.

Return to the dropdown palette of frame tools and find the **Scale** bar icon. Select it as for the

North Arrow icon above. Find an appropriate place to drag out a horizontal and narrow box - preferably just below your View display. Start to the left of your display and allow plenty of width.

The text for the Scale bar units will be displayed to the right of the Scale bar itself. A **Menu** window will be displayed for you to select the parameters for your Scale bar as shown in Fig 2.12.



[Fig. 2.12](#)

Firstly, select in the **View Frame** menu list the entry `ViewFrame1: View1`. [Note: if you omitted to set the map and distance units in the **View Parameters** menu, as discussed earlier, this may not be an option; you will have to **Cancel**, return to the **View** window, and perform that step, before continuing from here.] Select from the list of Scale bar styles by clicking on the scroll button on the right of the Style box and repeating this for the Units box.

The values for the Scale bar **Interval**, the number of Intervals (right hand part of the scale bar) and the Left Divisions (the number of parts the Interval to the left of the zero marker will be divided into) are calculated according to the style of scale bar selected and the size of the box that was drawn out for the scale bar to occupy. You may well wish to change these 'automatic' values but note that:

If you set the Interval value too high the number of Intervals may drop to zero. In this case, reduce the value you have chosen for Interval.

If you make the value for Interval too small, you may end up with an unreadable mess when

ArcView attempts to annotate the scale bar with distance values - you may need to experiment here before you get the balance right.

Click OK to confirm these settings, or to examine the results of your selections.

A **Legend**, to explain the symbols used, is another necessary component. **Layout** can 'copy' the **Legend** window, from the **View Frame** window, and display it on the page. The symbol explanations are those defined automatically or specified using the **View Legend Editor** tool.

*Return to the dropdown palette of frame tools, select the **View Legend** tool and draw out a box in a convenient part of the page.*

If you have a lot of symbols, you may need a long area for the box. A menu window, **Legend Frame Properties** will be displayed when you release the mouse button after dragging out the legend area box.

*In the **View Frame** menu part of the window select ViewFrame1: View1 and then confirm by clicking the OK button.*

A copy of the **View Legend** will now be added to your page display.

The principle components are now in place. All that is really needed to finish things off is to give the page a title and to place a neat line box around the page. Note that the box in the **Layout** display, within which you have been placing your page elements, will not itself be drawn: it is merely a guide to indicate the area of the page on which you may work, within the limits set by the page margins.

*Click the **T Text** icon and position the **Text Cursor** icon at the point on the page at which you wish to place your title.*

A **Text Properties** menu will be displayed as shown in Fig. 2.13. You will need to type the text you desire into the scrollable region. If you want to start a new line press Return. You may choose to use left, central or right justification of text; if you placed your text cursor at the central point about which you wish to title your map you may wish now to select centred, the middle icon button for **Horizontal Alignment**.

Confirm your selection by clicking the OK button.

Now finish things off by drawing a box around your work.

*Click and drag down the dropdown palette of drawing tools, immediately to the left of the frame tools button. Select the **Box** tool by clicking it and then positioning the '+' pointer to the top left corner of your page and, keeping the mouse button depressed, draw out the box to the bottom right, enclosing all your map elements. Release the mouse button.*

If you are able to print a hard copy of your **Layout** you can do so now. Alternatively you may wish to export it in a form suitable for inclusion in another document.

*Click on the **Printer** tool, in the upper row of tool icons or from the **File** menu select **Print**.*

The **Print** window will now be displayed as shown in Fig 2.14. (check this with AV3). If you

have more than one **Layout** window, the Print box will permit you to scroll through the layouts in order to choose which to submit for printing. The 'Printer:' box allows you to select a printer, from those available to you on your system, or you may wish to type the name of a file into the 'To File:' box, in which case a file of printing information will be generated rather than a print job. The output format is specified by checking one of the items listed under 'Print Format'. 'PostScript Enhanced' generates 'Level 2' PostScript, suitable for PostScript Level 2 printers only, whilst 'PostScript Basic' generates 'Level 1' code, suitable for all PostScript printers. ArcView 3 also has a 'Print to File' button, in addition to the file name box; both must be activated in order to print to a file.

*Consult Point 4 on your Addendum sheet for details of the printer(s) available in your institution and set the options in the **Print** window accordingly. Click **OK** if you can go ahead and print or print to a specified file. Otherwise if you cannot proceed any further click **Cancel**.*

If you are able to print, ArcView will now use your system printing tools to submit the page to the printer you have chosen, or will write the printer commands into the specified file for you to 'include' in Word, WordPerfect, etc.

Incidentally, if you were to return to the **View** window and modify the content of the display, those modifications will automatically be reflected in the content of the **Layout** display.

This concludes Unit 2. The original **Project** you were working with and saved has now been modified by the inclusion of a **Layout**. If you want to save this modified project do the following:

*Double click the **Bar** tool (-) in the top left corner of the project window and when asked if you want to save the changes, click **OK**.*

SAQ 2.2. *Re-open the project you have been working with and start a **New View**. Add the themes called `counties.shp` and `railf-gb.shp` and then display them so that you can see them both in the view. Set the map and distance units for the **View**.*

- a) *Select the county of South Yorkshire and then find out its perimeter from the attribute table.*
- b) *A railway line runs from just south of the centre of Lincolnshire to its east coast. Use the measuring tool to find out its length in kilometers.*

If you now need to exit from ArcView:-

*Click on the **File** menu, on the left hand end of the list of menus in the Menu bar, and select **Exit**.*

Suggestions for further reading:

Chapter One of *Principles of Geographical Information Systems for Land Resources Assessment*, P. A. Burrough, 1986, Oxford University Press.

Geographic Information Systems: an overview, Duane F. Marble, 1990, in *Introductory readings in Geographic Information Systems*, Donna J. Peuquet and Duane F. Marble (eds), Taylor and Francis.

Maps and Diagrams, F. J. Monkhouse & H. R. Wilkinson, 1963, Methuen & Co. (This book

concentrates on *paper* based techniques; despite this the principles of communicating spatial information remain well presented.)