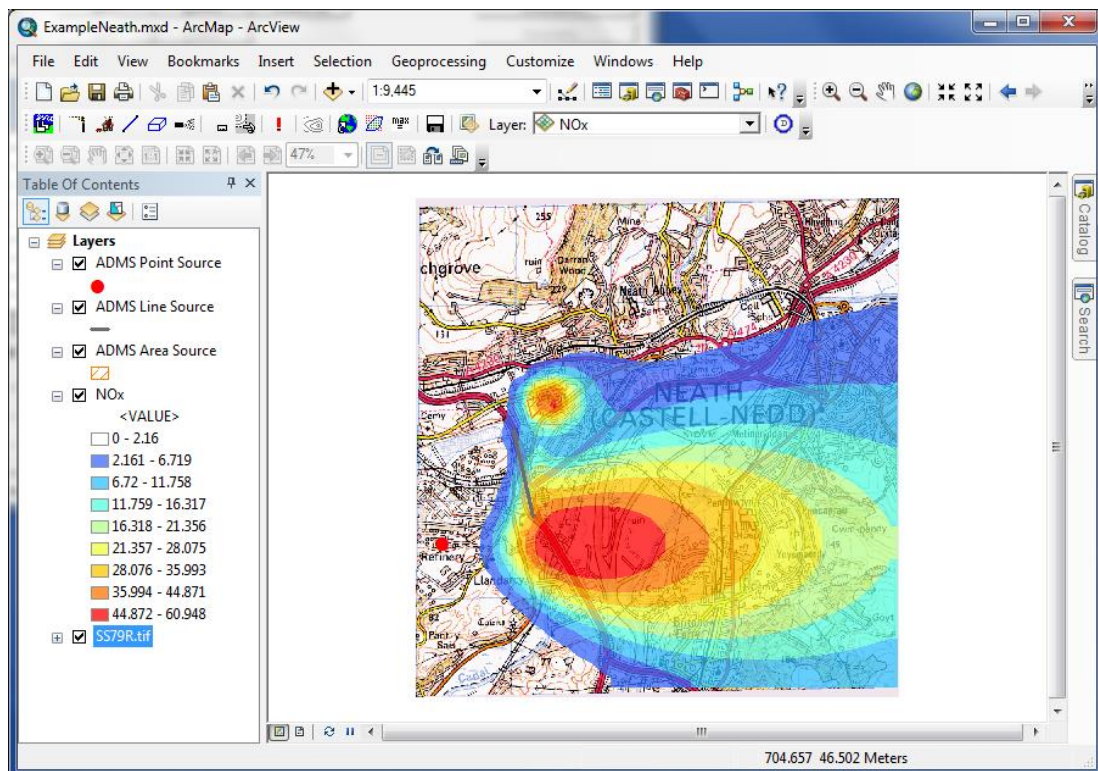




# ADMS 6

*ArcGIS Link*



*User Guide*

**CERC**

# ADMS 6 ArcGIS Link

## User Guide

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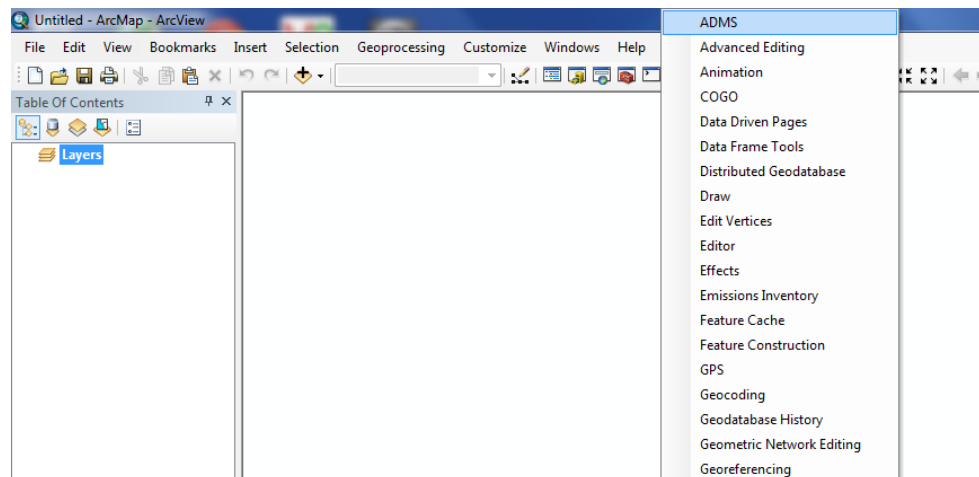
# SECTION 1 Getting Started

In order to use the ADMS 6 ArcGIS Extension you will need a copy of ADMS 6, ArcGIS<sup>1</sup> and Spatial Analyst. If you have not already done so, you should install them following the instructions provided with each product. Ensure the Spatial Analyst extension is switched on in ArcMap by launching ArcMap, selecting **Customize, Extensions...** and ticking Spatial Analyst.

To install the ADMS ArcGIS Link, log on as administrator, locate your ADMS application directory, e.g. *C:\Program Files (x86)\CERC\ADMS 6*, open the folder *Support\ArcGIS* and double click on *Setup.exe*. This will take you through the install wizard and install the links.

To view the ADMS ArcGIS extension you should:

- Step 1** Launch ArcMap by double-clicking on the ArcMap icon.
- Step 2** Then right click anywhere on the tool bar for a list of the available tools. See **Figure 1.1**.



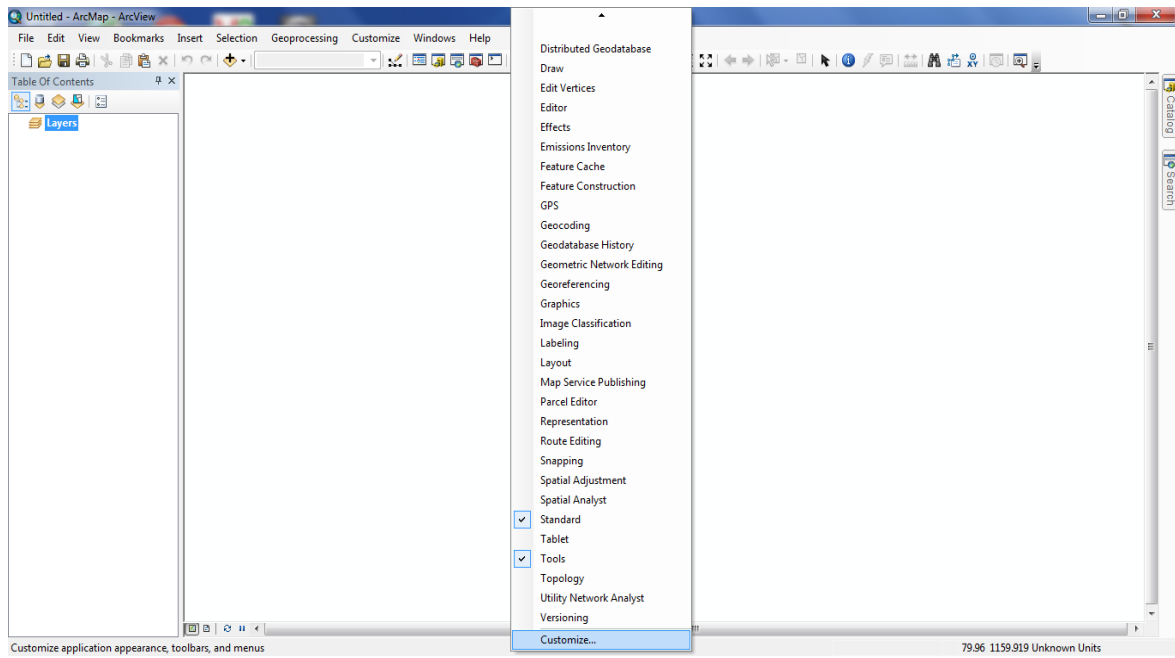
**Figure 1.1** – List of ArcMap toolbars.

- Step 3** Click the **ADMS** tool and the toolbar will be added to the view.

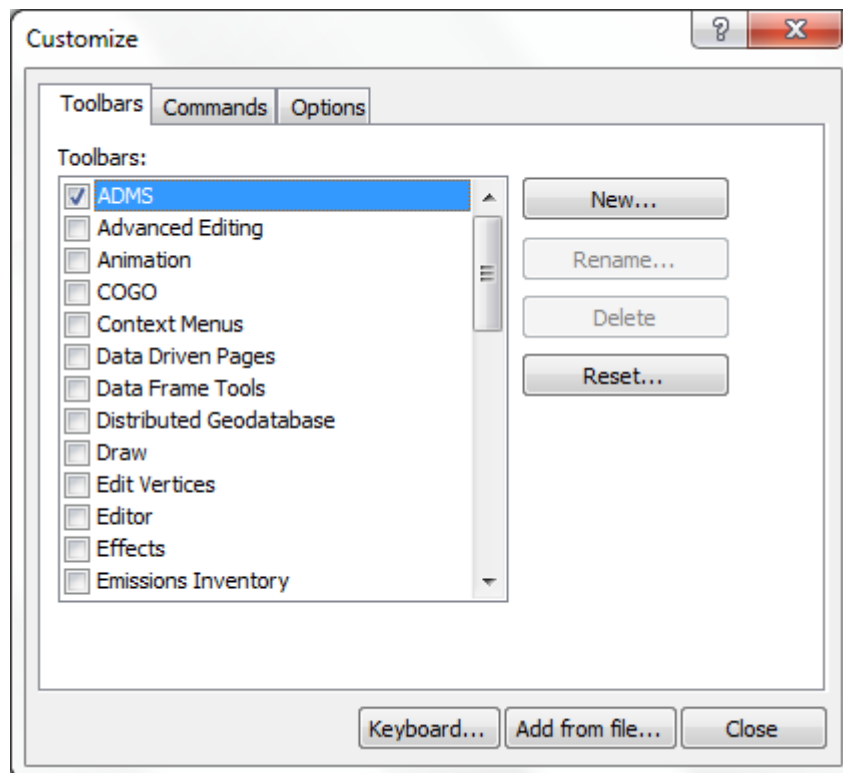
If ADMS is not in the list then select **Customize...** at the bottom of the list, as shown in **Figure 1.2**. Then select the **Add from file...** button. This will launch a browser dialogue; locate the file *ADMS\_URBAN\_ArcGISLink.dll*, which should be in your ADMS-ArcGIS application directory *C:\Program Files (x86)\CERC\ADMS-ArcGIS\ADMS*. You will be shown a message, click **OK** to this, then tick the **ADMS** toolbar as shown in **Figure 1.3**. Finally click **Close** and the toolbar will be added to ArcMap.

You are now ready to use ADMS 6 with ArcGIS.

<sup>1</sup> Check [cerc.co.uk](http://cerc.co.uk) for the full list of supported ArcGIS versions.



**Figure 1.2** – List of ArcMap toolbars.

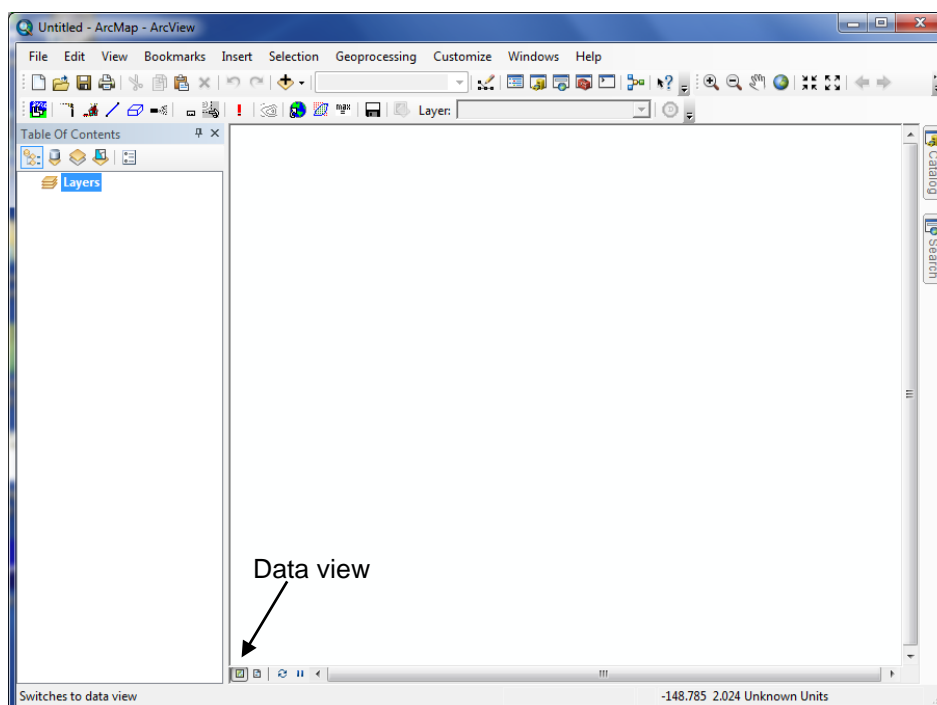


**Figure 1.3** – The ArcMap toolbar **Customize** screen.

## SECTION 2 An introduction to ArcMap projects

This section provides only a brief introduction to using ArcMap, so before using the ADMS 6 ArcGIS tools, it is recommended that the user completes the ArcMap tutorial supplied with the software in order to become accustomed to ArcMap terminology.

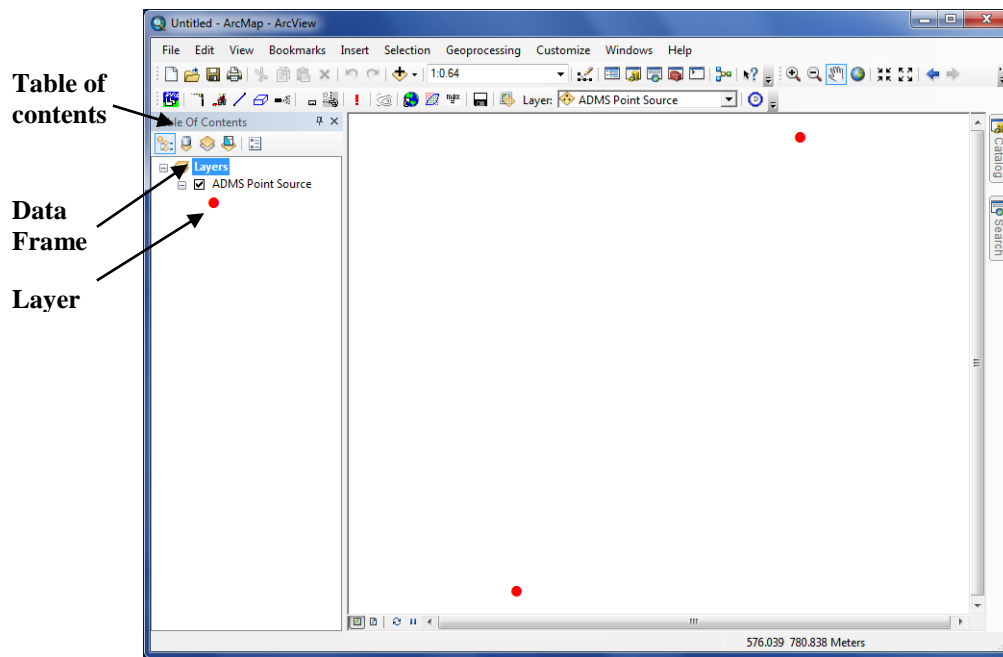
ArcMap has two modes of working: data view and layout view. The latter is used for producing layouts for reports and is described in Section 5. In order to use the full capabilities of the ADMS link, the user must be working in data view, which is the default view when ArcMap opens. If you are not in the data view, you can switch to it by selecting the data view button shown at the bottom of the screen, as shown in **Figure 2.1**.




**Figure 2.1** – The data view in the ArcMap Project screen.

ArcMap work is saved in ArcMap **Documents** (.mxd files). **Figure 2.1** shows a **Document Window** within the ArcMap interface, which at present is untitled. To give the project a title click on **File, Save As...** and choose a directory and title for the project.

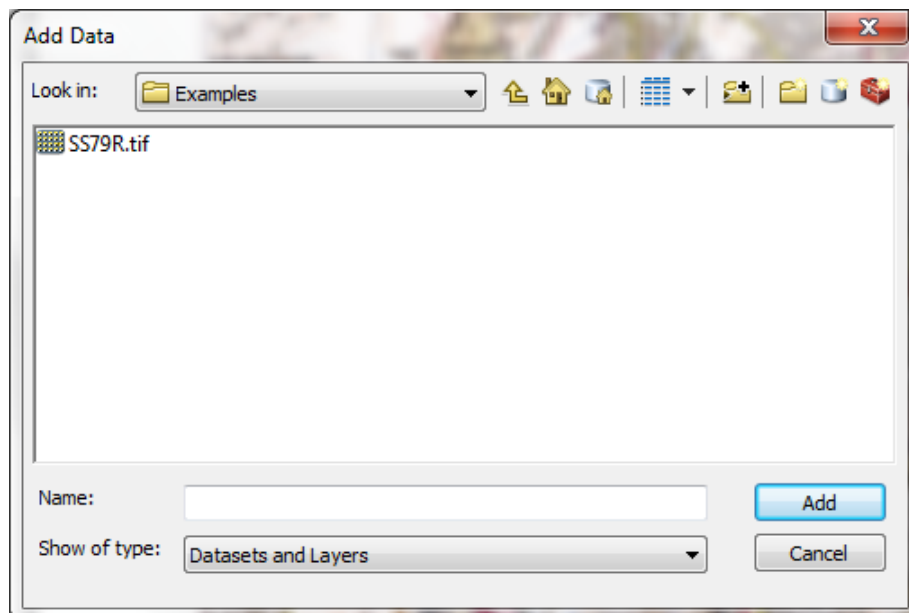
Map data is entered into **Layers**. These layers are stored in **Data Frames** which can be seen in the **Table Of Contents**, as shown in **Figure 2.2** (currently your ArcMap document will not contain any layers).



**Figure 2.2** – The table of contents in the ArcMap data view screen.

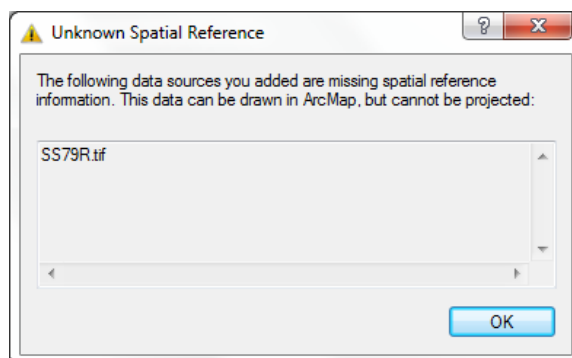
To load an OS map as a layer click on the **File** menu and, via the **Add Data** submenu, select the **Add Data...** button  or select the **Add Data** button from the toolbar. **Figure 2.3** shows the **Add Data** dialogue that is launched.

Locate the data you want to add as a new layer and select the **Add** button.



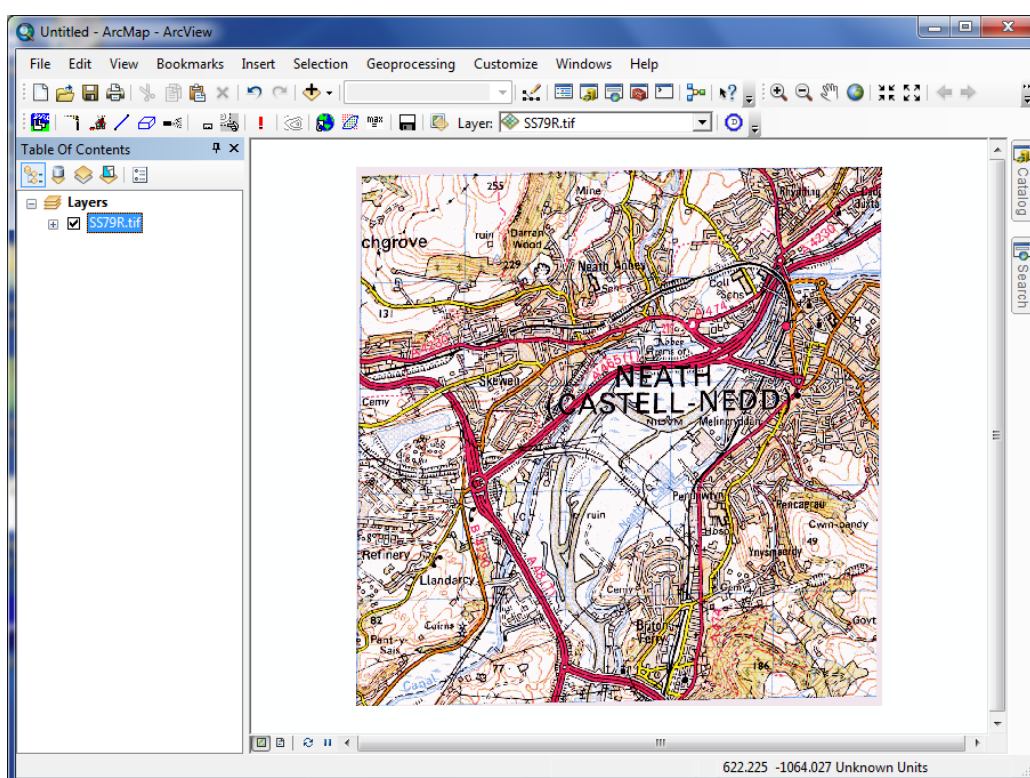
**Figure 2.3** – The **Add Data** screen.

You may see the message shown in **Figure 2.4** if the spatial reference has not been set, in this case just click **OK**.



**Figure 2.4** – Error message if a Spatial Reference has not been set for the map.

The title of the layer is added to the data frame. Click on the tick box next to the layer title to switch the view of the layer off and on as shown in **Figure 2.5**.



**Figure 2.5** – An example of an OS data tile loaded into ArcMap.

In ArcMap, if you have no associated *.tfw* file with your *.tif* file, then the map data may not be positioned at the correct coordinates on your map. Data tends to be supplied in decimal degrees so that it can be easily transformed into other coordinate systems. To position the tile with the correct National Grid coordinates, it is necessary to initially set the coordinate system: refer to Section 6 for further details on how to do this.

You are now ready to position sources on the map and set up an ADMS run.



## SECTION 3 Setting up an ADMS run using ArcMap














### 3.1 Overview




Once your map image is registered, you are ready to position sources on the map and set up an ADMS run.

The ADMS ArcGIS extension is controlled from buttons on the ADMS toolbar. The toolbar is shown in **Figure 3.1**, and the buttons are described in **Table 3.1**.



**Figure 3.1** – The ADMS toolbar.


Button	Button Name	Action
	Show ADMS	Activates the ADMS interface
	Add Point Source	Adds a new ADMS point source where you click
	Add Area Source	Adds a new ADMS area source where you click (double-click to end the area source)
	Add Line Source	Adds a new ADMS line source where you click (double-click to end the line source)
	Add Volume Source	Adds a new ADMS volume source where you click (double-click to end the volume source)
	Add Jet Source	Adds a new ADMS jet source where you click
	Add Receptor	Adds a new ADMS receptor point for generating output concentrations
	Define Contour Area	Defines an ADMS output grid over the rectangle drawn
	Refresh All Data	Updates the ArcMap display with all the sources in the current ADMS <i>apl</i> file
	Generate Contours	Creates a contour layer of concentrations based on ADMS output and adds it to the View
	Import ADMS Output	Imports an ADMS output file into ArcMap
	Clip Point To Boundary	Clips a point layer according to the boundaries in a polygon layer
	Report Max Values	Displays the maximum concentration values in a point layer

Button	Button Name	Action
	<b>Save Shapefile with Aliases</b>	Saves a Shapefile and associated layer file in the same location, for the selected layer. This ensures any column aliases are saved with the data.
	<b>Adjust Transparency</b>	Adjusts the transparency of the selected layer
	<b>Save Current Symbology as Default</b>	Saves the current symbology properties of the sources as the default

**Table 3.1** – Brief description of toolbar buttons in the ArcMap extension for ADMS.

## 3.2 Displaying existing sources and receptors



ArcMap will display the locations of any sources and specified receptor points that are included in the ADMS input file (.apl). A separate layer will be added for each source type. Point, jet, line, area and volume sources are displayed, along with specified receptor points. Buildings are not displayed and cannot be created or edited using the ADMS-ArcGIS link.

If you have an existing ADMS input file, then click on the **Refresh** button  to display all the sources in the file, and any specified receptor points.

If you wish to add new sources, follow the appropriate instructions in sections 3.3 to 3.9.

## 3.3 Creating point sources

Follow the steps below to create a point source from within ArcMap.

- Step 1** Click the **Add Point Source** button. 
- Step 2** Click on the map window at the location where you want to position your point source.
- Step 3** A new point source is created and displayed in the ADMS **Source** screen. The source coordinates will have been filled in automatically, but you will need to enter the other parameters for the source. Refer to the ADMS User Guide for further details.
- Step 4** To add another point source, return to ArcMap by clicking on the ArcMap window title bar, and repeat steps 2 and 3.
- Step 5** The location of the point source(s) should automatically be added to the map. If for any reason they are not, click the refresh button. 

### 3.4 Creating area sources

Follow the steps below to create an area source from within ArcMap.

**Step 1** Click the **Add Area Source** button. 

**Step 2** Click on the map at the position of one of the vertices. Then, moving around the source clockwise or anticlockwise, click at the position of the remaining vertices, double-clicking at the final vertex. An area source can have between three and fifty vertices.


---

*Hold down the right mouse button and move the cursor around the map to pan while drawing.*

---

**Step 3** A new area source is created and displayed in the ADMS **Source** screen. The source geometry will have been filled in automatically, but you will need to enter the other parameters for the source. Refer to the ADMS User Guide for further details.

**Step 4** To add another area source, return to ArcMap by clicking on the ArcMap window title bar, and repeat steps 2 and 3.

**Step 5** The location of the area source(s) should automatically be added to the map. If for any reason they are not, click the refresh button. 

### 3.5 Creating line sources

Follow the steps below to create a line source from within ArcMap.

**Step 1** Click the **Add Line Source** button. 

**Step 2** Click on the map at the position for one end of the source. Then, double click the mouse button to position the other end. A line source must be a simple line and can only have two vertices.


---

*Hold down the right mouse button and move the cursor around the map to pan while drawing.*

---



**Step 3** A new line source is created and displayed in the ADMS **Source** screen. The source geometry will have been filled in automatically, but you will need to enter the other parameters for the source. Refer to the ADMS User Guide for further details.

**Step 4** To add another line source, return to ArcMap by clicking on the ArcMap window title bar, and repeat steps 2 and 3.

**Step 5** The location of the line source(s) should automatically be added to the map. If for any reason they are not, click the refresh button .



## 3.6 Creating volume sources

Follow the steps below to create a volume source from within ArcMap.

- Step 1** Click the **Add Volume Source** button. 
- Step 2** Click on the map at the position of one of the vertices. Then, moving around the source clockwise or anticlockwise, click at the position of the remaining vertices, double-clicking at the final vertex. A volume source can have between three and fifty vertices.
- 
- Hold down the right mouse button and move the cursor around the map to pan while drawing.*
- 
- Step 3** A new volume source is created and displayed in the ADMS **Source** screen. The source co-ordinates will have been filled in automatically, but you will need to enter the other parameters for the source. Refer to the ADMS User Guide for further details.
- Step 4** To add another volume source, return to ArcMap by clicking on the ArcMap window title bar, and repeat steps 2 and 3.
- Step 5** The location of the new source(s) should automatically be added to the map. If for any reason they are not, click the refresh button .

## 3.7 Creating jet sources

Follow the steps below to create a jet source from within ArcMap.

- Step 1** Click the **Add Jet Source** button. 
- Step 2** Click on the map window at the location where you want to position your jet source.
- Step 3** A new jet source is created and displayed in the ADMS **Source** screen. The source co-ordinates will have been filled in automatically, but you will need to enter the other parameters for the source. Refer to the ADMS User Guide for further details.
- Step 4** To add another jet source, return to ArcMap by clicking on the ArcMap window title bar, and repeat steps 2 and 3.
- Step 5** The location of the jet source(s) should automatically be added to the map. If for any reason they are not, click the refresh button. .

## 3.8 Defining an output grid



Follow the instructions below to define an output grid from within ArcMap.

- Step 1** Click the **Define Contour Area** button. 

- Step 2** Click on the map at one of the corners of the output grid area and, while holding down the mouse button, drag the mouse to the opposite corner of the area. A rectangle will appear on the map while you drag the mouse. When the rectangle reaches the size you require, release the mouse button.
- Step 3** You are then asked “**Do you wish to use this area for the ADMS output grid?**” If the correct area has been selected then click **Yes**. Otherwise, click **No** and select a new output grid. Click **Yes** when you have selected a suitable area.
- Step 4** The ADMS **Grids** screen will appear with the new output grid coordinates. You may modify the grid coordinates and number of points by hand if you wish.

### 3.9 Adding receptors

Follow the steps below to define receptors (also known as “specified points”) using ArcMap.

- Step 1** Click the **Add Receptor** button. 
- Step 2** Click on the map at the position for the new receptor point.
- Step 3** The ADMS **Grids** screen appears, showing your new specified point with the coordinates of the point at which you clicked. You should provide a name for the point.
- Step 4** To add another receptor, return to ArcMap by clicking on the ArcMap window title bar, and repeat steps 2 and 3.
- Step 5** The location of the receptor source(s) should automatically be added to the map. If for any reason they are not, click the refresh button. 

### 3.10 Completing the input file

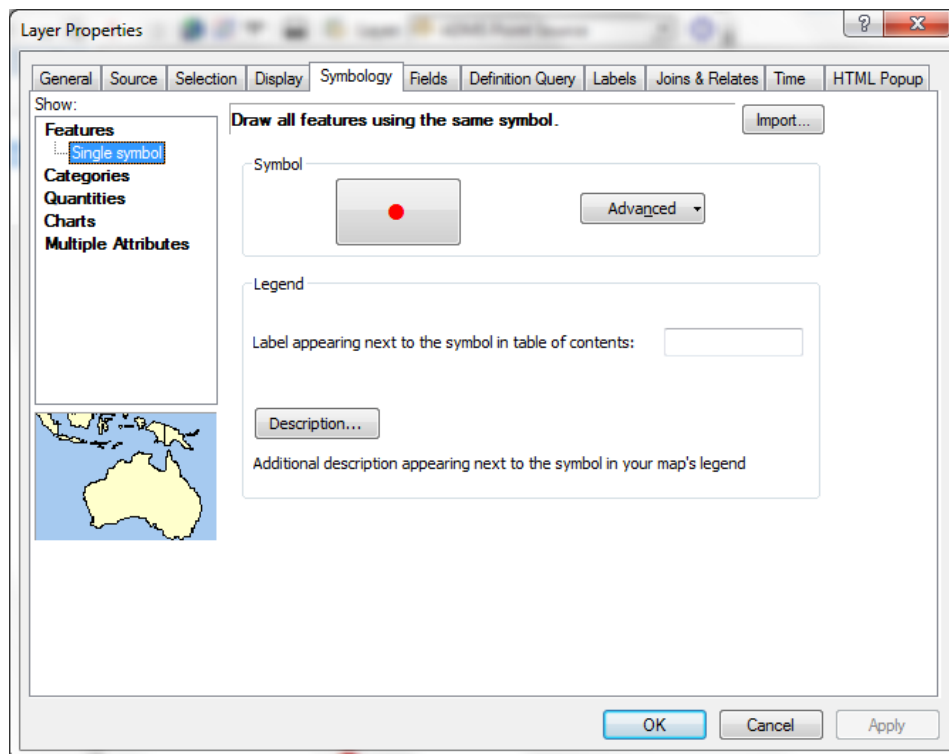
Complete the remainder of the ADMS model set-up (met. data, pollutant data, emission rates etc.) in the ADMS interface. Refer to the ADMS User Guide for further details.

Save and run the ADMS model as normal.

You are now ready to display your ADMS results in ArcMap.


### 3.11 Changing the symbology

The appearance of the ADMS layers can be changed, either by right clicking on the layer and selecting the **Properties...** option, or by double clicking on the layer. This opens the **Layer Properties** screen. Select the **Symbology** tab as shown in **Figure 3.2**.



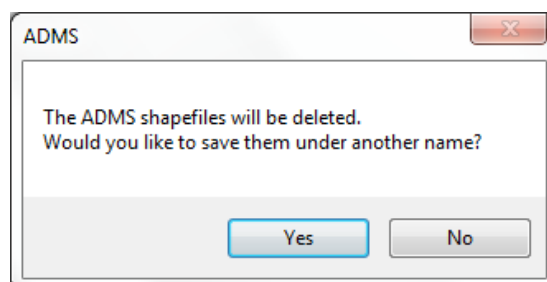
**Figure 3.2** – The **Symbology** tab of the **Layer Properties** screen.

You can change the colour and style by clicking the box in the **Symbol** frame and choosing a new colour. Once you are happy with the appearance click **OK** to return to the map, or click **Cancel** to discard any changes and return to the map.

To save your chosen colours and styles as the defaults, click the **Save Current Symbology as Default** button . From now on the ADMS layers will appear in the new colours and styles in all your ArcGIS projects.

## 3.12 Saving your project

If ArcMap contains any ADMS layers when you close the project you will be asked whether you want to save the ADMS shapefiles under a different name so that they are not deleted, as shown in **Figure 3.3**.



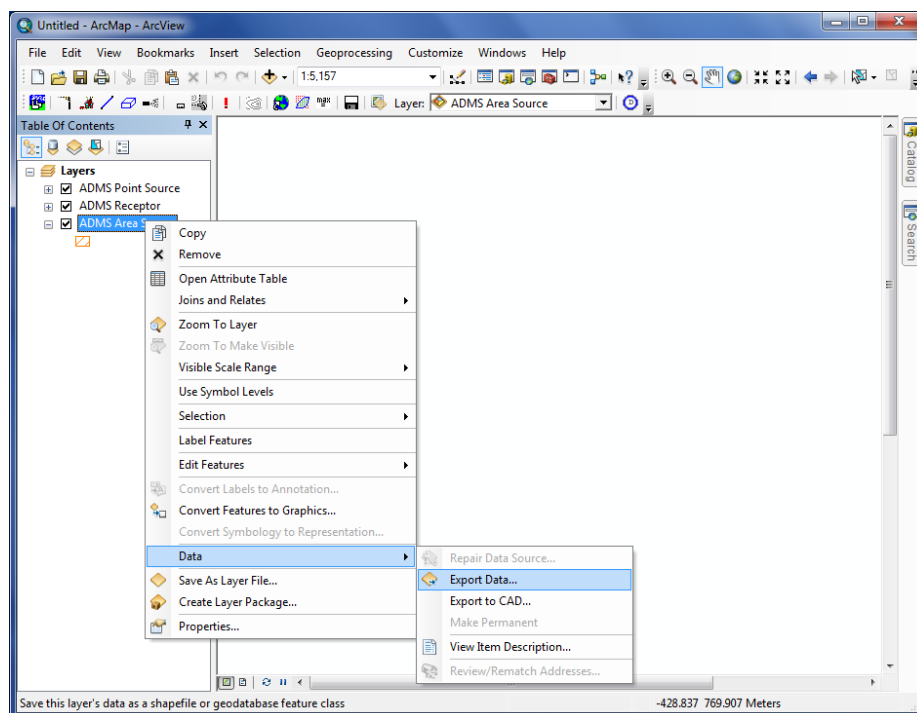
**Figure 3.3** – Closing project warning message.

If you click **No**, the project will close and none of the ADMS shapefiles will be saved. If you click **Yes** then you will be returned to your project where you can save the files.

ADMS shapefiles are deleted each time ArcMap is closed because they contain the data that is currently loaded in the ADMS user interface. These files are therefore always changing and do not remain fixed for a given project. If you wish to view sources from a particular *apl* you must either have it loaded in the interface, or save the sources to a shapefile so they can be viewed without using the ADMS link. This can be useful when creating layouts for a report.

If you want to save the shapefiles, right click on an ADMS layer, select **Data**, then click **Export Data...** as shown in **Figure 3.4**. The **Export Data** dialogue will appear. Select the location where you wish to save the shapefile, give it an appropriate name and click **OK**. You will be shown a message asking if you want to display the exported file as a layer in your map, click **Yes**. You will have to repeat this for all the layers. You can now remove the ADMS layers from the project and save it. When you close the project you will no longer see any warnings.

Remember that the saved files will contain a ‘snapshot’ of the data currently loaded in the ADMS user interface, if you change the *apl* you may want to resave the shapefiles.




**Figure 3.4** – The Layer options menu.

## SECTION 4 Displaying ADMS results in ArcMap

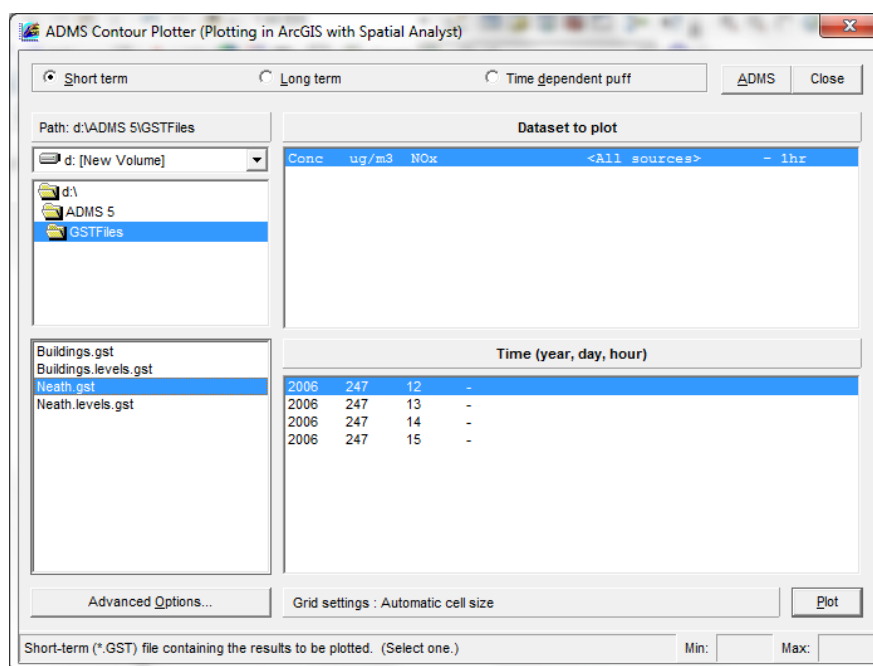
### 4.1 Producing contour plots from ADMS results

Once you have completed your ADMS input file (.apl) and run the model, you can display the results by creating contour plots in ArcMap. Please note that you must have used gridded output to create a contour plot. On the **Grids** screen the **Receptor type** option must be either **Gridded** or **Both**.

Follow the steps below to produce a contour plot.

**Step 1** In the ArcMap interface, press the Generate Contours button. 

**Step 2** The **ADMS Contour Plotter** screen will appear, as shown in **Figure 4.1**.



**Figure 4.1** – The **ADMS Contour Plotter** screen.

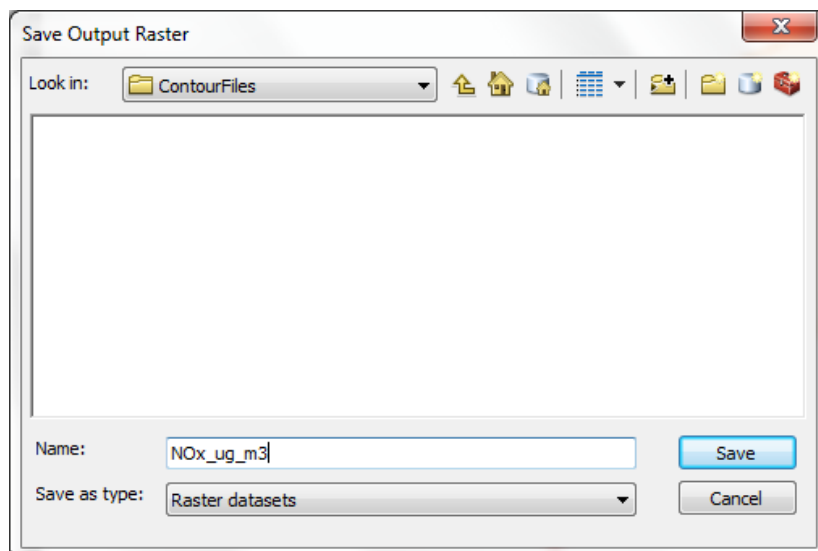
**Step 3** Select the output file you wish to contour and click on **Plot**.

*Check that you have the correct pathname and that you have selected short term, long term or time-dependent results as required.*

**Step 4** The **Save Output Raster** dialogue box then appears as shown in **Figure 4.2**. Select the location in which to save the file, edit the filename if required and then click **Save**. This will save the concentration contours in an output

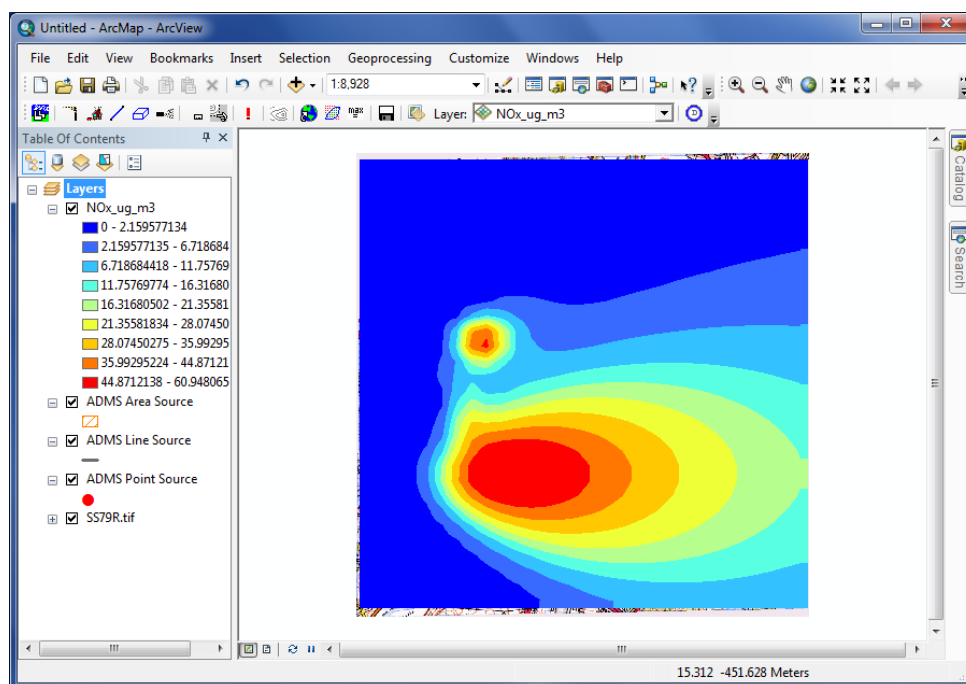


raster file, which can be saved as part of the ArcMap document file (\*.mxd).



**Figure 4.2** – Save Output Raster dialogue.

**Step 5** The contours will then be added to the view, overlaying the map, as shown in **Figure 4.3**. Section 4.2 describes how to make the concentration contours transparent so that you can see the underlying map information.



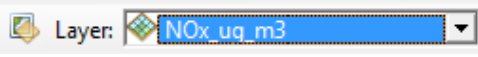
**Figure 4.3** – Example concentration contours plotted using Spatial Analyst.

## 4.2 Generating Transparent Filled Contours and Iso-Concentration Contours

Use the following instructions to increase the transparency of the contour layers so that the background map and ADMS sources and receptors are visible beneath them.

**Step 1** Double click on the concentration layer to view the **Layer Properties** screen, or right click on the layer and select the **Properties...** button. (**Figure 4.4** shows the **Layer Properties** screen for the NOx\_ug\_m3 layer of **Figure 4.3**)

**Step 2** Select the **Symbology** tab. Double click on the dark blue colour for the lowest range, then select the **No Color** option and click **OK**. You are now able to see a lot more of the map where the values were either zero or very low.

**Step 3** Select the concentration layer in the **Effects Layer** menu  then select the **Adjust Transparency** button. Adjust the slider until the transparency is about 25%. This makes the contour layer more transparent so that you can see the data underneath, as shown in **Figure 4.5**.

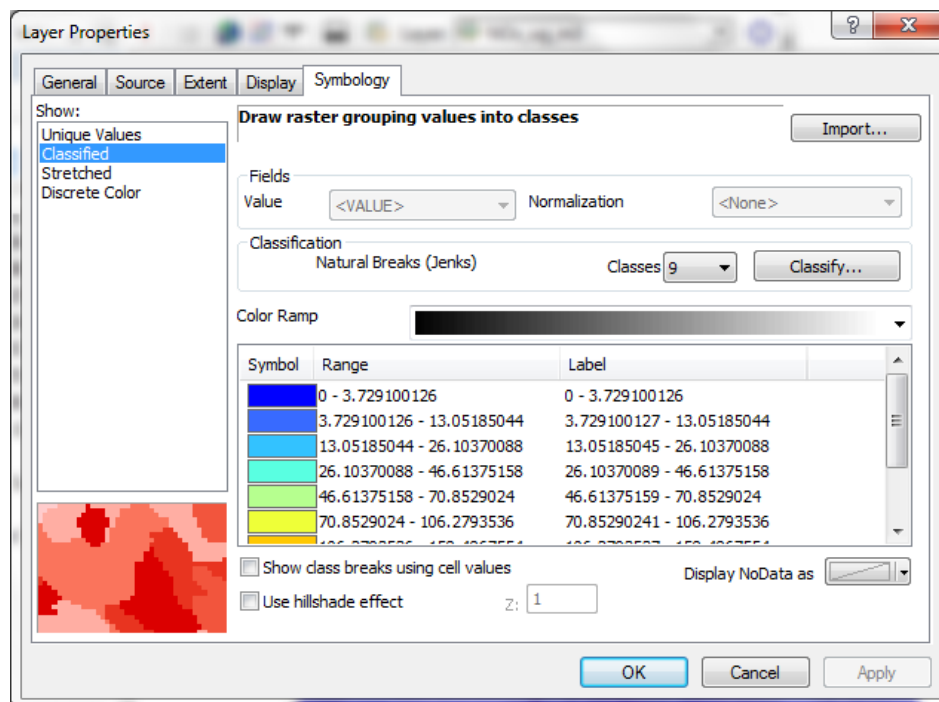
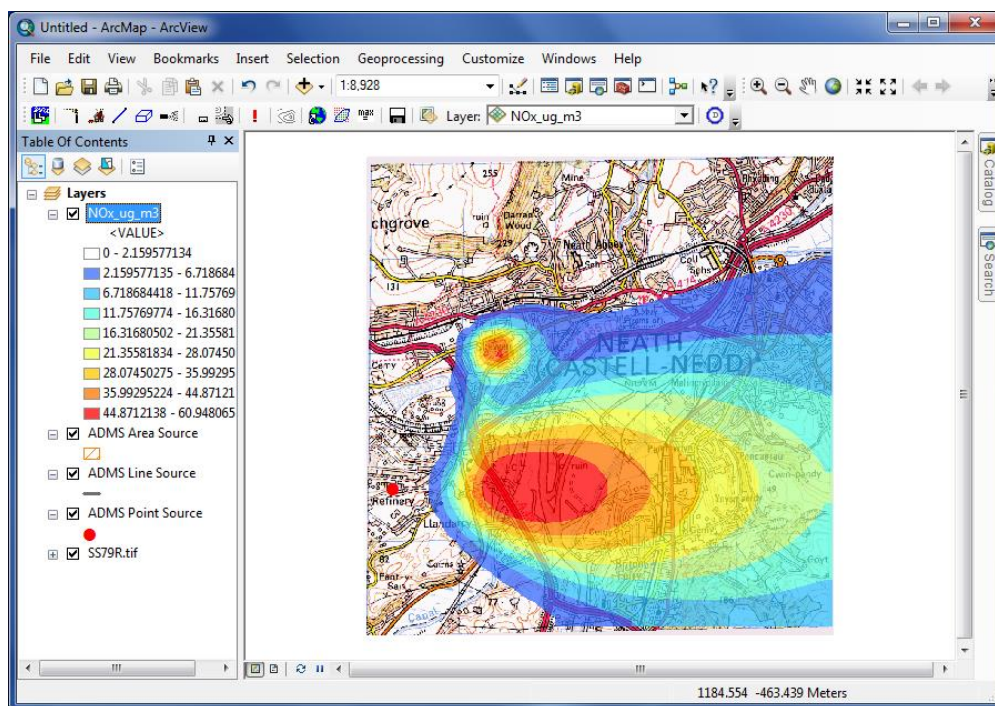

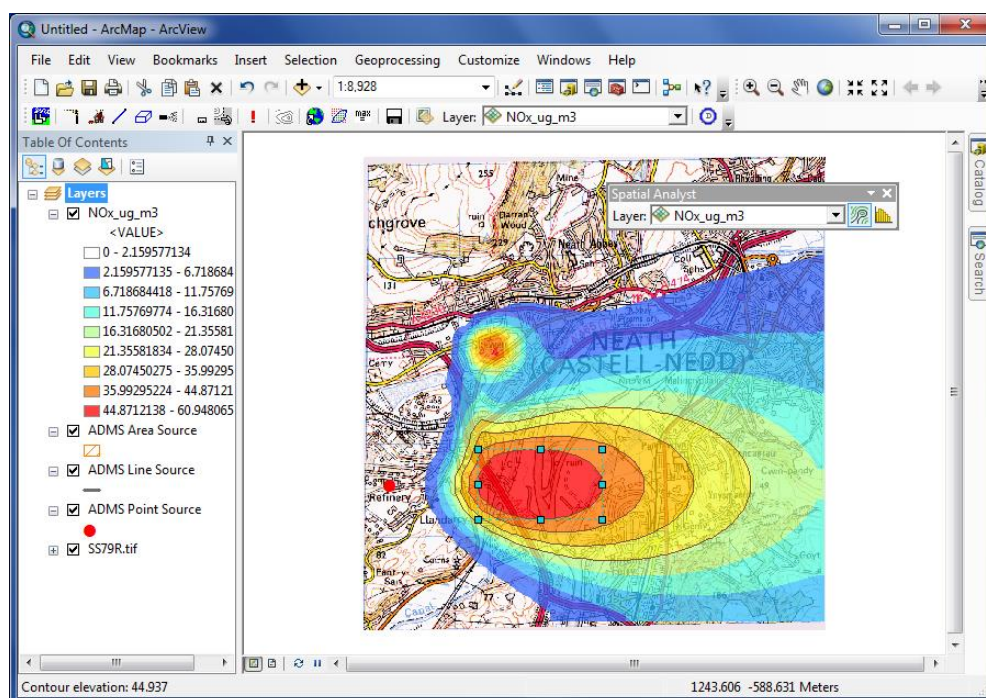


Figure 4.4 – The **Symbology** tab of the Layer Properties screen.



**Figure 4.5** – The map with overlaid shaded contours.

It is also possible to view iso-concentration contour lines (e.g. to show the contour for a specific concentration), as shown in **Figure 4.6**. To do so, ensure the Spatial Analyst toolbar is open by right clicking on the main toolbar and selecting Spatial Analyst. Make sure the selected layer in the Spatial Analyst toolbar is the appropriate concentration layer, e.g. *NOx\_ug\_m3*. Click on the create contour tool , then click anywhere on the grid and a contour will be produced that matches the concentration at that location.



**Figure 4.6** – The map with shaded contours and iso-concentrations.

### 4.3 Spatial Analyst settings used by the ADMS link

The ADMS link uses ESRI Spatial Analyst to interpolate the concentration data. It is recommended that the user allow this to be done automatically. The concentration data is interpolated using the gridding method known as inverse distance weighting.

However, the details of the interpolation process can be selected manually if the user wishes. For full details refer to the ESRI Spatial Analyst help.

### 4.4 Reclassify the Concentration Layer

You might want to reclassify the concentration layer grid so that you can compare different files on the same scale. This can be done by double clicking on the concentration layer to view the **Layer Properties** screen, or by right clicking on the layer and selecting the **Properties...** button, as shown in **Figure 4.4**.


Under the Layer Properties window you can select the **Classify...** button and change the number of breaks, limits and colours.

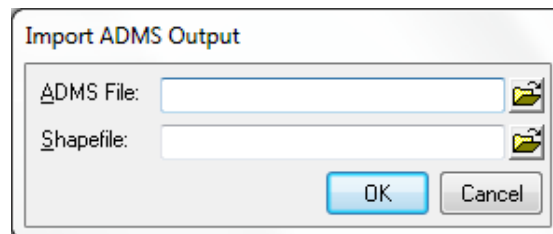
## SECTION 5 Displaying Maximum Concentration Values

The ADMS Link provides the facility to calculate the maximum concentration values in an ADMS output file outside, or inside, a site boundary. Typically you would run the following three options in order: import an ADMS output file, following the instructions in Section 5.1; delete points from the imported ADMS output file, following the instructions in Section 5.2; and finally display the maximum concentration values of the remaining points, following the instructions in Section 5.3.


### 5.1 Importing ADMS Output Files

ADMS output files (*.glt*, *.gst*, *.gtd*, *.plt*, *.pst*, *.ptd*) need to be converted into point shapefiles, in order to be viewed or used within ArcMap. The attributes of the points in the shapefile are provided by the ADMS output values and coordinates for that point.

- Step 1** Click the **Import ADMS Output** button  to display the **Import ADMS Output** screen, as shown in **Figure 5.1**.



**Figure 5.1** – The **Import ADMS Output** screen.

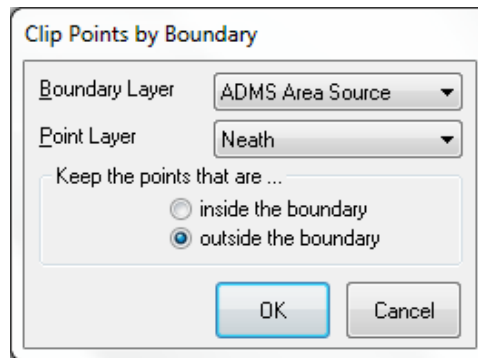
- Step 2** Use the top browse button  to locate the ADMS output file to import.
- Step 3** Use the second browse button to define the output shapefile's location and filename, or accept the default.
- Step 4** Click **OK**

### 5.2 Clip Points by Boundary

The **Clip Point by Boundary** button deletes points from a point shapefile. The points are compared against a set of polygons in a boundary shapefile and excluded depending on whether you wish to keep points inside or outside the boundary. ADMS area or volume source layers can be used as boundary shapefiles.

- Step 1** Ensure the point and boundary shapefiles are open in ArcMap.

- Step 2** Click on the **Clip Point by Boundary** button  to display the **Clip Points by Boundary** screen, as shown in **Figure 5.2**.




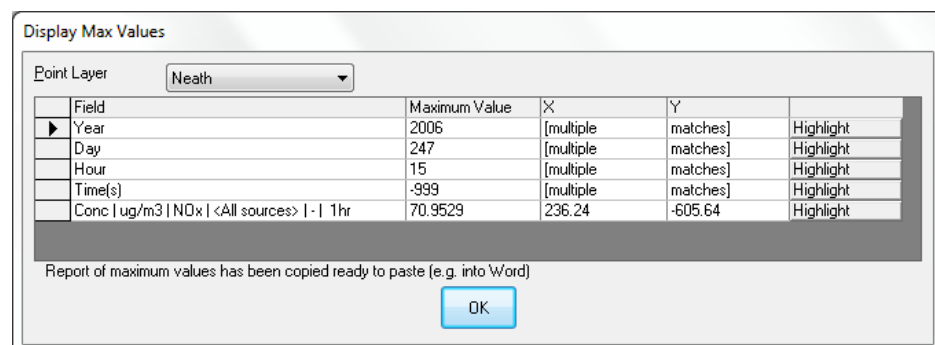
**Figure 5.2** – The **Clip Points by Boundary** screen.

- Step 3** Select the layer containing the constraining polygons from the **Boundary Layer** dropdown.
- Step 4** Select the layer containing the point data from the **Point Layer** dropdown.
- Step 5** Choose whether to keep only the points **inside the boundary**, or only the points **outside the boundary**.
- Step 6** Click **OK**

### 5.3 Display Maximum Concentration Values

The maximum value for each category (e.g. short-term NO<sub>x</sub> concentration) within a point shapefile and the coordinates of the points at which these maximum values occur can be displayed. To do so, follow the instructions below:

- Step 1** Click the **Report Max Values** button  to display the **Display Max Values** screen, as shown in **Figure 5.3**.
- Step 2** Select the point layer in the dropdown to display a list containing the maximum values for each attribute recorded in the shapefile.
- Step 3** The information in the list is also automatically copied, ready to paste into another program, e.g. Microsoft Word.



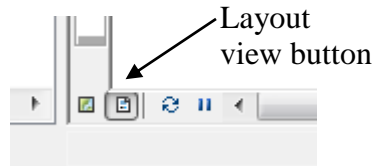
**Figure 5.3** – The **Display Max Values** screen.

- Step 4** Click a row's **Highlight** button to highlight that row's maximum value point(s) on the map.
- Step 5** Click **OK** to close the dialogue.



## SECTION 6 Making a hard copy

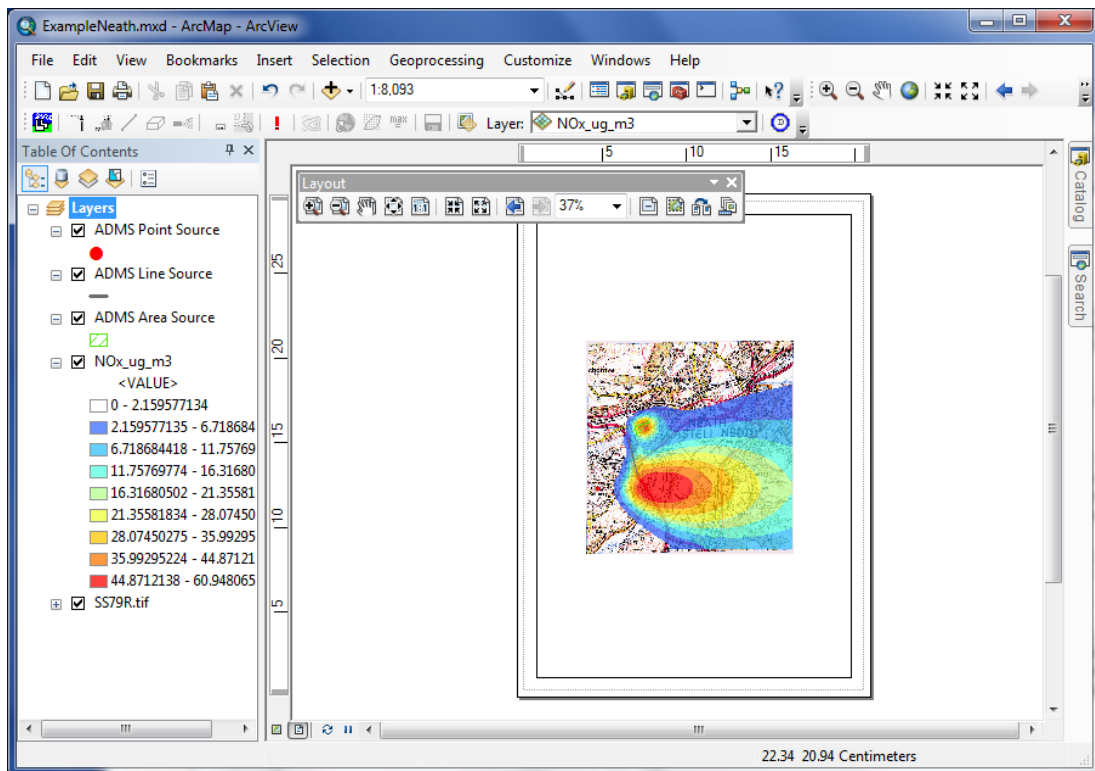
There is a facility to create layouts of your project for reports in ArcMap. It is straightforward to create a default layout which can then be edited. To make a layout of the current view, click on the **View** menu, then **Layout View**, or select the **Layout View** button at the bottom of the map, as shown in **Figure 6.1**.



**Figure 6.1** – The **Layout View** button

The screen will change to the layout view with the current map framed and the Layout toolbar launched, as shown in **Figure 6.2**. Instructions for creating a layout can be found in Section 6.1. Once you are happy with your layout, it can be printed (refer to Section 6.2 for further details) or saved as an image file (refer to Section 6.3 for further details). The printout and image file will appear exactly as seen in the layout view.


*ADMS buttons will appear grey when working in layout view, as the user must be in data view to use the full capabilities of the ADMS link described in sections 3 and 4.*



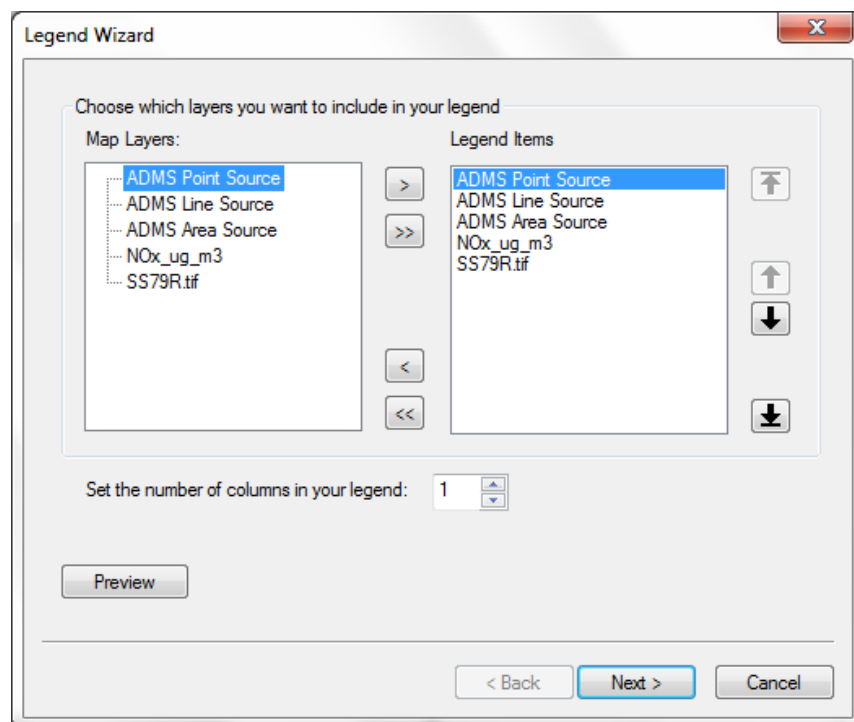
**Figure 6.2** – The layout view.



## 6.1 Creating a layout

If you have any default layouts defined you can select them by clicking the **Change Layout** button  on the layout toolbar and following the wizard. Refer to section 6.4 for further details. If you don't have existing default layers then you can create your own. This section provides an example.

Change the page layout by selecting the **File** menu, clicking **Page and Print Setup...** and selecting the **Orientation: Landscape** before clicking **OK**. Drag the edges of the frame so that they fit on the page. Select the **Insert** menu and click **Legend....** Select the layers that you want in the legend, as shown in **Figure 6.3**, then complete all the sections of the **Legend Wizard** before clicking **Finish**. Drag the legend into a suitable position and resize if necessary.



**Figure 6.3** – The Legend Wizard screen.

You can change the number of decimal places or significant figures in your legend, if any layers are showing too many, or too few. Double click on the layer to open the **Layer Properties** screen. Select the **Symbology** tab and click on the **Label** heading, before selecting **Format Labels...**; the **Number Format** screen opens, as shown in **Figure 6.4**. Select the **Numeric** category, then change the **Rounding** type and number of digits to the option you wish to display. Click **OK** to keep any changes then click **OK** on the **Layer Properties** screen to close it and apply the changes to your legend.

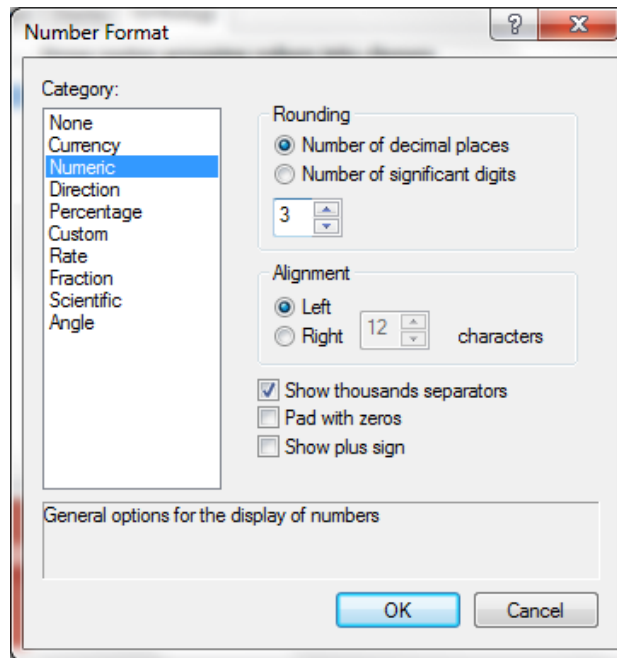


Figure 6.4 – The Number Format screen.

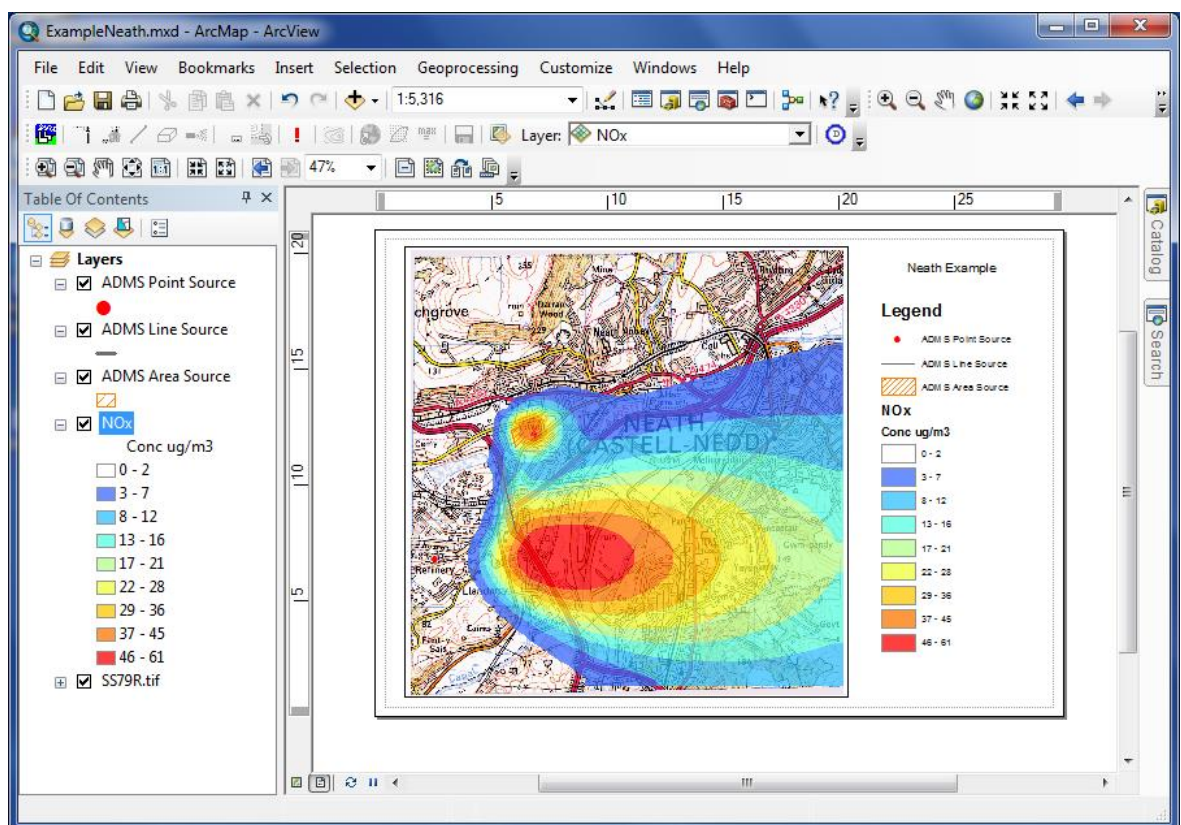


Figure 6.5 – The layout view with Legend added.

To add a title, select the **Insert** menu and click **Title**. Then type your title and press **Return**. To edit the properties of the title, double click it. To change the font properties of the title, click the **Change Symbol...** button, then choose the font, text size, style and colour. To change the background colour of the title, click **Edit Symbol...** from the **Symbol Selector** screen. Then click the **Advanced Text** tab, before

ticking the **Text Background** box and selecting the **Properties...** button beneath it. Finally, select the **Symbol...** button and change the fill to the colour you wish the title background to have. Click **OK** until you return to the layout view. An example report layout can be seen in **Figure 6.5**.



## 6.2 Printing a layout

To make a hard copy, click the **Print** button  or select the **File** menu, then click **Print....** Select a colour printer set on a high resolution for best results.

## 6.3 Saving a layout for a report

The layout image may also be exported in various image file formats, such as EMF, for use in other applications, such as Microsoft Word. This is generally the recommended option as it results in documents with low memory-usage that print quickly in high quality. To export the layout image, select the **File** menu then click **Export Map....** Choose the image file type, properties and export location then click **Save** to export the image.

## 6.4 Using Saved Projects as a Template

Report layouts in any saved ArcGIS projects can be imported to the current project as a template. To do this, click the **Change Layout** button  on the Layout toolbar. Click the open file button  and browse for the project document (.mxd file) you wish to use as a template. Click **Finish** on the wizard and the custom layout will be applied.

# SECTION 7 Georeferencing images

When using raster image map data in ArcGIS, the coordinates and scale of the map must be specified before it can be used as a basis for entering source locations. In other words, the map image must be *georeferenced*. There are several ways to position a map image in ArcGIS. Two of these methods are discussed: using a pre-prepared \*.*tfw* World file, and using the georeferencing toolbar.


## 7.1 Set map coordinates using a \*.*tfw* World file

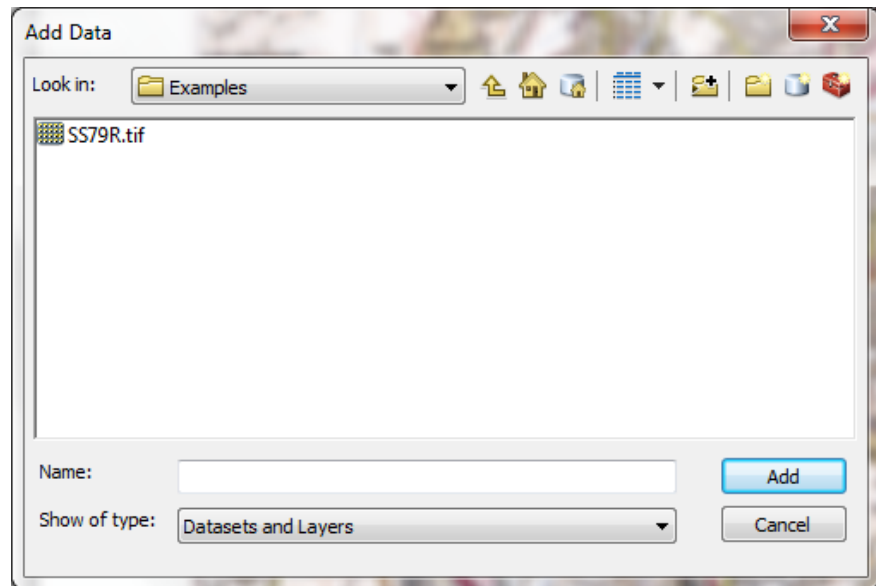
Images are stored as raster data, where each cell in the image has a row and column number. Shapefiles are stored in real-world coordinates. In order to display images correctly it is necessary to establish an image-to-world transformation that converts the image coordinates to real-world coordinates. This transformation information is typically stored with the image.

Some image formats, such as ERDAS, IMAGINE, BSQ, BIL, BIP, GeoTIFF, and grids, store the georeferencing information in the header of the image file. ArcGIS uses this information if it is present. However, other image formats store this information in a separate ASCII file. This file is generally referred to as the world file, since it contains the real-world transformation information used by the image. World files can be created with any editor.

*tfw* world files for every OS map tile are available to download from the OS website ([www.ordnancesurvey.co.uk](http://www.ordnancesurvey.co.uk)). To do this, visit the website, select the appropriate product (e.g. 1:50000 Colour Raster) and click on the link to 'Georeferencing'. Click on the link to download a WinZip file containing all \*.*tfw* files for the selected product.

Follow these steps to load and geo-reference your map image:


- Step 1** Ensure that your map image file and associated \*.*tfw* file are located in the same directory, with the same file name.
- Step 2** Click on the **File** menu and, from the **Add Data** submenu, select the **Add Data...** button  or click the **Add Data** button on the toolbar. **Figure 7.1** shows the **Add Data** dialogue that is launched.
- Step 3** Locate the data you want to add as a new layer and select the **Add** button.



**Figure 7.1** – The **Add Data** dialogue screen.

**Step 4** The image should appear in view in the correct location.

## 7.2 Set map coordinates using the georeferencing toolbar

Coordinate systems can be set in ArcCatalog, which is opened by pressing the  button on the main toolbar. ArcCatalog helps you organise and manage all your GIS information (maps, globes, datasets, models, metadata, services, and so on). It includes tools for processing data and enables you to check that data will be added with the correct format.

Once the ArcCatalog screen is open, as shown in **Figure 7.2**, locate the map image file you wish to use in the Catalog Tree. An example map tile can be located in the Data folder of the program install directory called *SS79R.tif*. Then either double click the file name in the catalog tree, or right click the file name and select the **Properties...** button. You will now see the **Raster Dataset Properties** window (Figure 7.3).

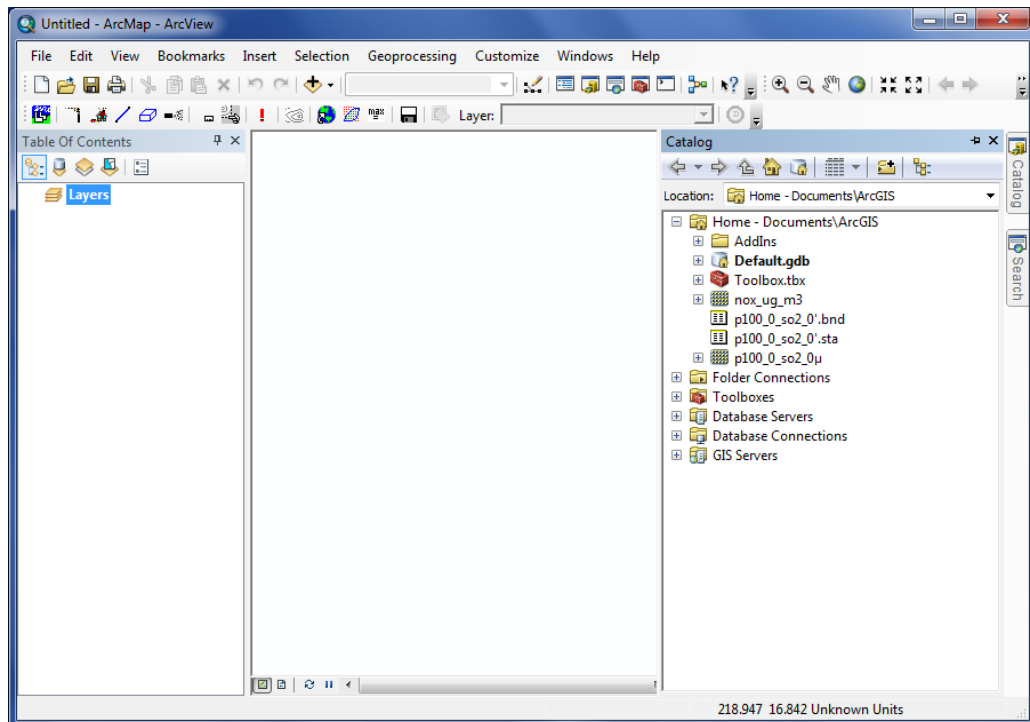


Figure 7.2 – ArcCatalog screen.

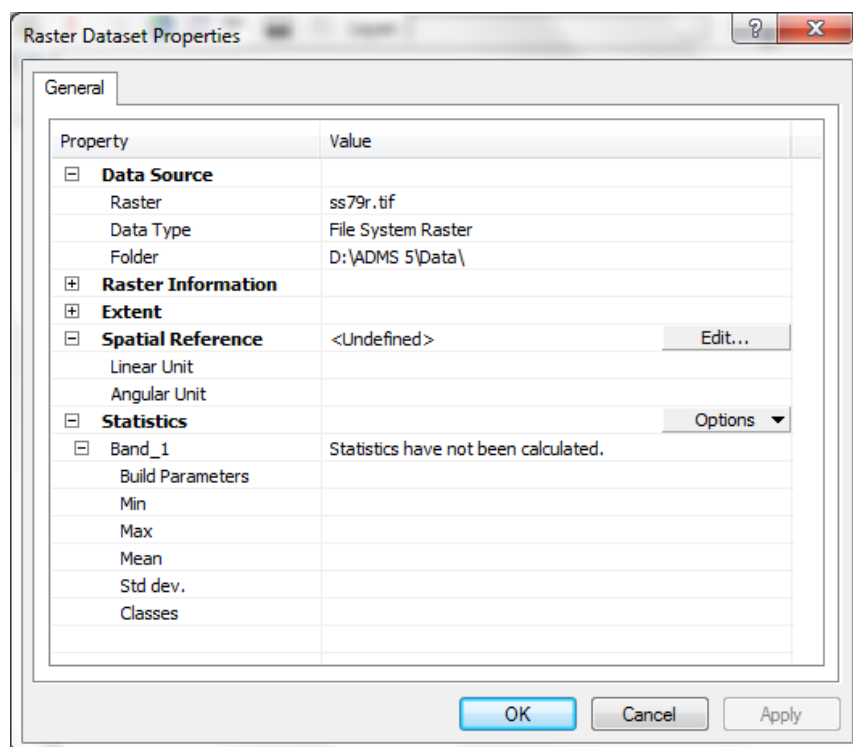
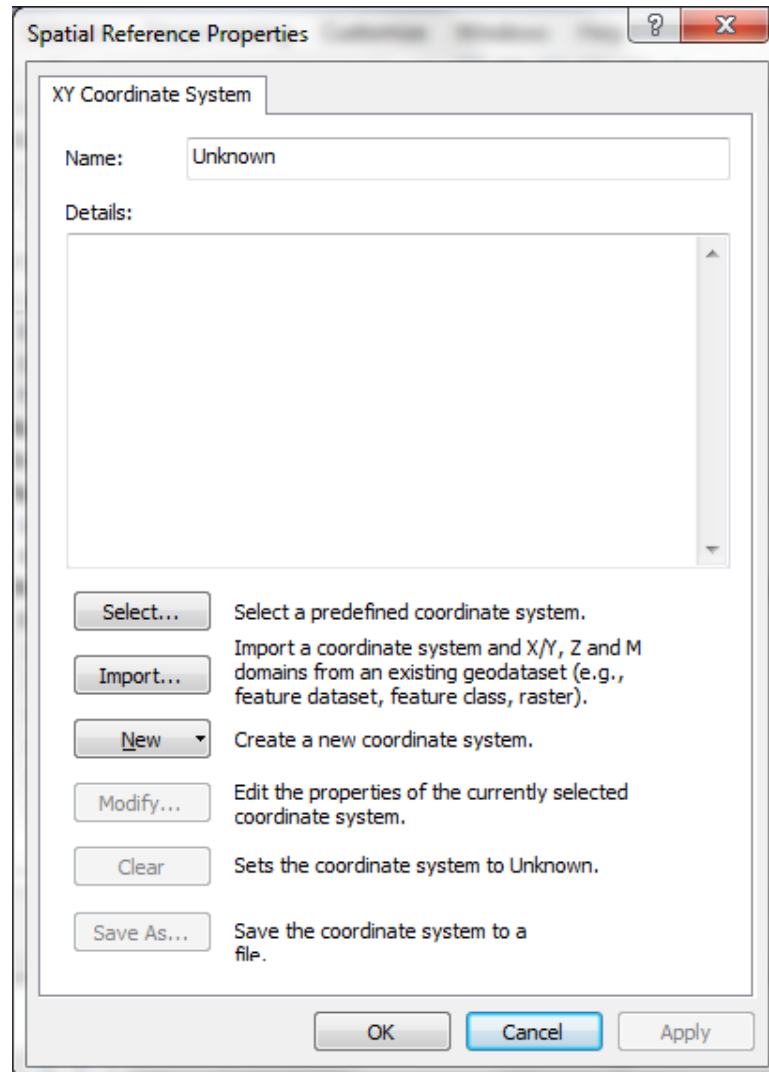


Figure 7.3 – Raster Dataset Properties screen.

If no coordinate system has been set for this map tile, the **Spatial Reference** will be **<Undefined>**. To set a coordinate system, select the **Edit...** button next to the **Spatial Reference** heading to open the **Spatial Reference Properties** window (Figure 7.4). From here, the coordinate system for your map tile can be set to a predefined coordinate system by clicking **Select...**, an imported coordinate system by clicking

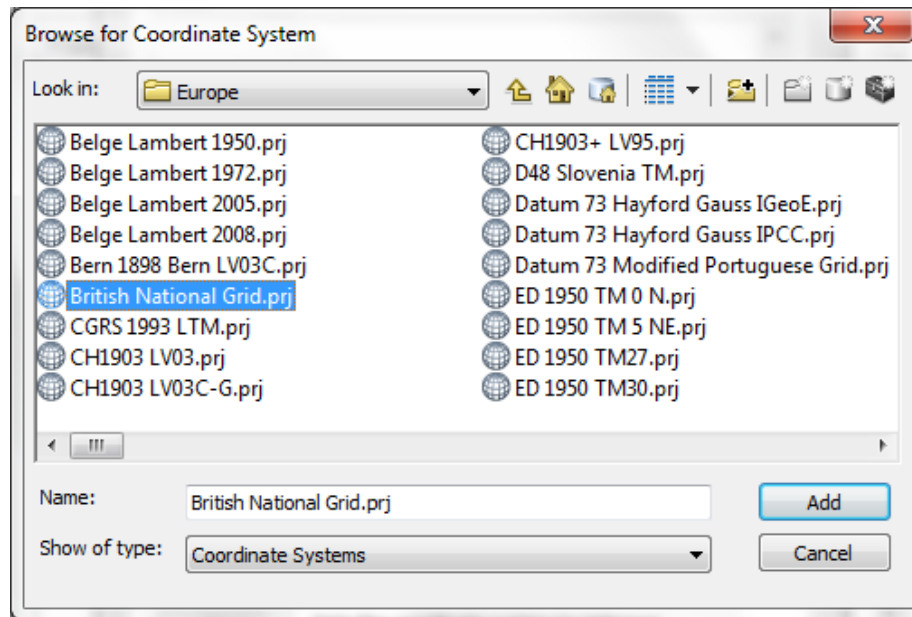
**Import...**, or a new user-defined coordinate system by selecting **New...**. Once the coordinate system has been selected, click OK to add it to the **Raster Dataset Properties** page. Click **OK** to close the page.

For example, to set the coordinate system for the map file *SS79R.tif*, click on the **Select...** button to select a predefined coordinate system. Select *Projected Coordinate Systems*, then *National Grids*, *Europe*, *British National Grid.prj*, and then click the **Add** button, as shown in **Figure 7.5**. This will return you to the **Spatial Reference Properties** screen shown in **Figure 7.4**.



**Figure 7.4 – The Spatial Reference Properties screen.**

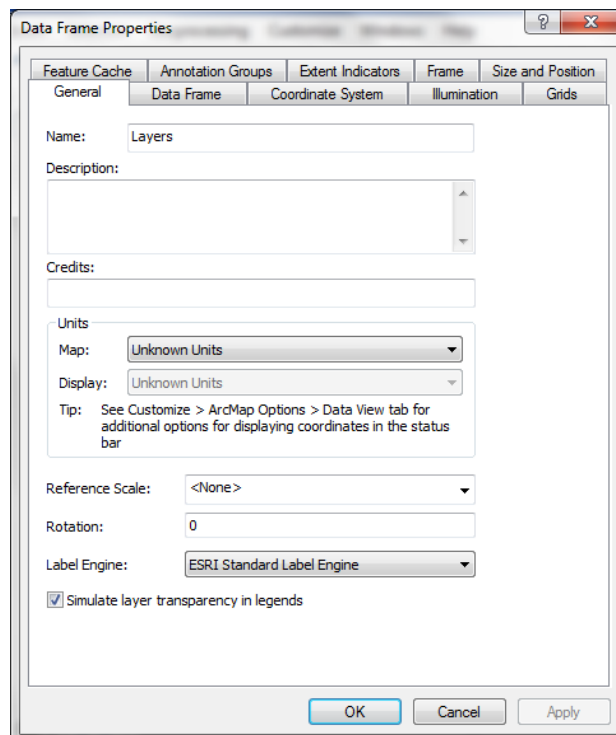




**Figure 7.5** – Selecting a coordinate system in the **Browse for Coordinate System** screen.

To add the map to the data view, drag and drop the map file name from the **Catalog** tree to the **Table Of Contents**.

Once the map has been added, you may need to set the correct distance units in the display. To do this, right click on the **Layers** Data Frame and select **Properties...** or select the **View** menu and click **Data Frame Properties...** This opens the data frame properties screen, shown in **Figure 7.6**. Select the **General** tab and change the **Map Units** and **Display Units** appropriately, e.g. **Meters** for *SS79R.tif*, then select **OK**.




**Figure 7.6** – The **Data Frame Properties** screen.

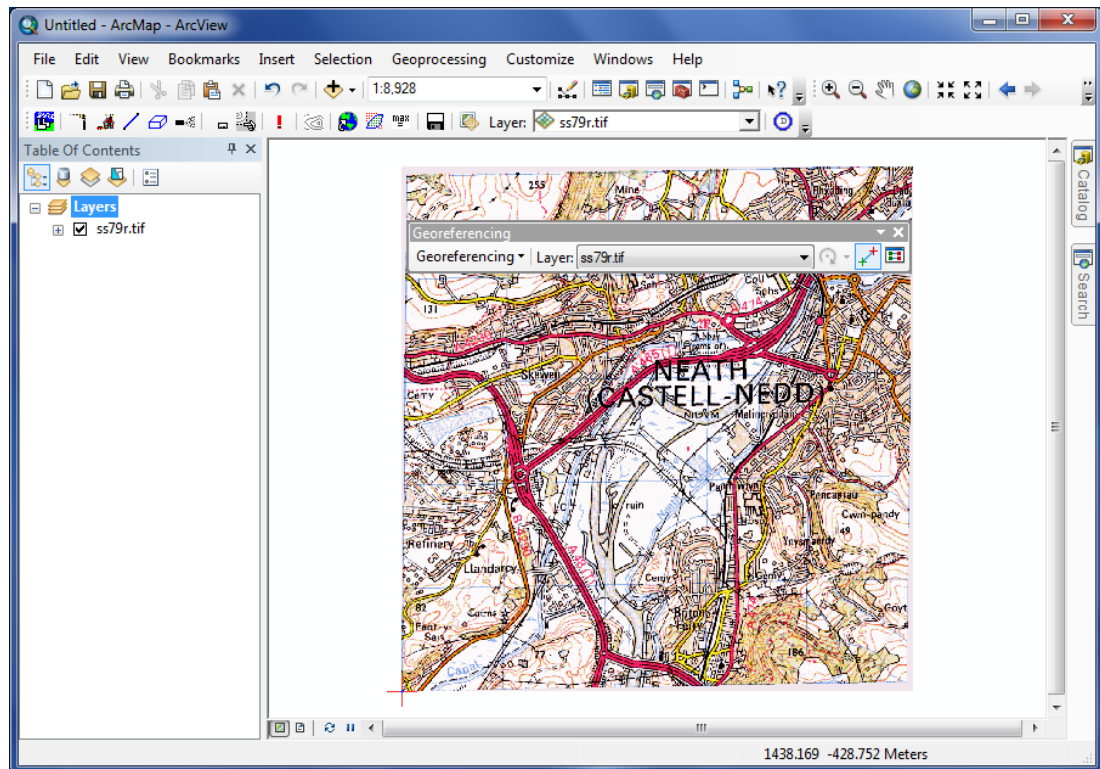


Once the units have been set, you will need to georeference your map tile so that the correct coordinates and scale are set. If you know the correct map coordinates of two reference points on your map tile, then this can be done using the **Georeferencing** toolbar. To open this toolbar, right click anywhere on the main toolbar then select **Georeferencing** from the menu. The Georeferencing toolbar will appear, as shown in **Figure 7.7**.




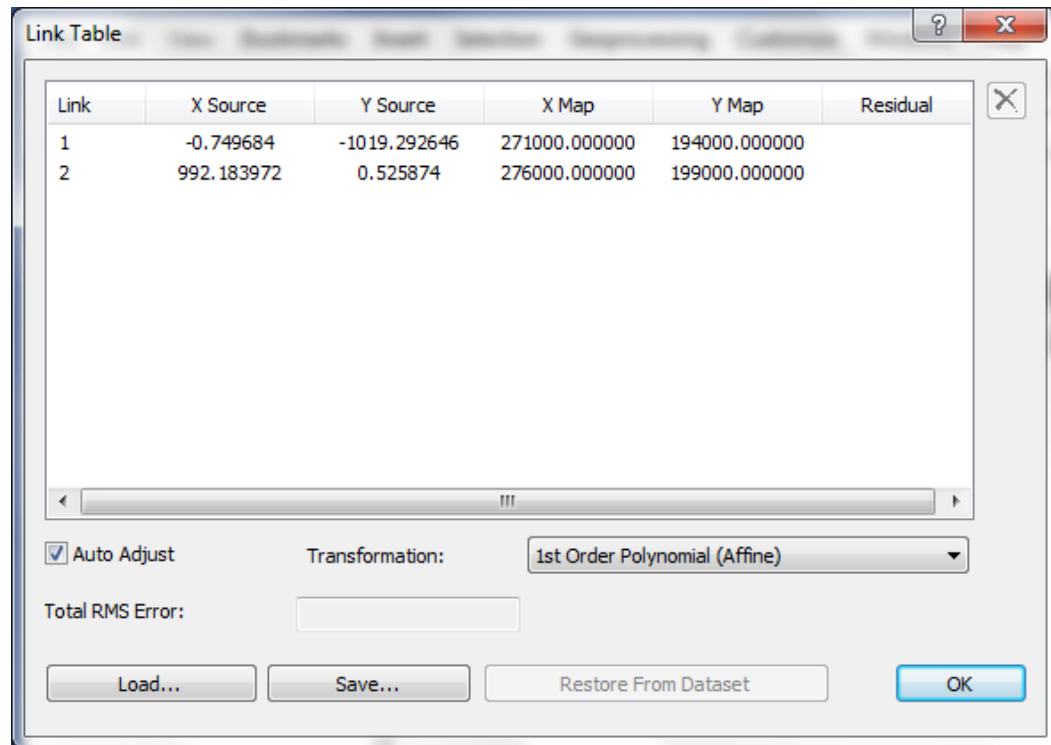
**Figure 7.7** – The **Georeferencing** toolbar.

To set the reference points, select the **Add Control Points** button . Click the first reference point on your image, e.g. the bottom left corner of the map for *SS79R.tif*, before clicking any other point on the screen. This will highlight the control point by a red cross, as shown in **Figure 7.8**. Repeat this procedure for the second reference point, e.g. the top right corner for *SS79R.tif*.



**Figure 7.8** – Selecting georeference points in the ArcMap data view screen.

Now click the **View Link Table** button  to view the selected coordinates and their links, as shown in **Figure 7.9**. Enter the correct map coordinates for your reference points in the **X Map** and **Y Map** boxes. For example, the map coordinates for *SS79R.tif* are: (271000,194000) for the bottom left corner, and (276000,199000) for the top right corner. This tells ArcMap to move the point defined by the X and Y source coordinates to the X and Y map coordinates. Click **OK** to set the reference points.



**Figure 7.9 – The Link Table screen.**

The image will now have been set to the correct position. Right click on the map layer and select **Zoom To Layer** to centre the data view on the map. If you move the mouse around over the image and look at the coordinates in the bottom right corner of the screen you will see that they are now shown in the correct coordinates. Select the **Georeferencing** drop down menu and select **Update Georeferencing**. This removes the red crosses that were created. If you look in the same folder as the image file you will see that a *.tfw* file has been created to retain the information about the projection.