


### Lesson 3 - Creating a Contour Map

The **Map | Contour Map** command creates a contour map based on a grid file.

To create a contour map of the TUTORWS.GRD file created in the previous lesson:

1. Choose the **Map | Contour Map | New Contour Map** command, or click the  button.
2. The **Open Grid** dialog is displayed. The grid file you just created (TUTORWS.GRD) should appear in the *File name* box. If the file does not appear in the *File name* box, select it from the file list.
3. Click the *Open* button to create a contour map.
4. The map is created using the default contour map properties.
5. If you want the contour map to fill the window, choose the **View | Fit to Window** command.

#### Opening the Map Properties

After creating a map, you can change the map properties. There are several ways to open an object's properties. The most common method is to double-click on the object. Refer to *Object Properties* in *Chapter 21, Creating, Selecting, and Editing Objects* for alternative methods of opening properties.

#### Changing Contour Levels

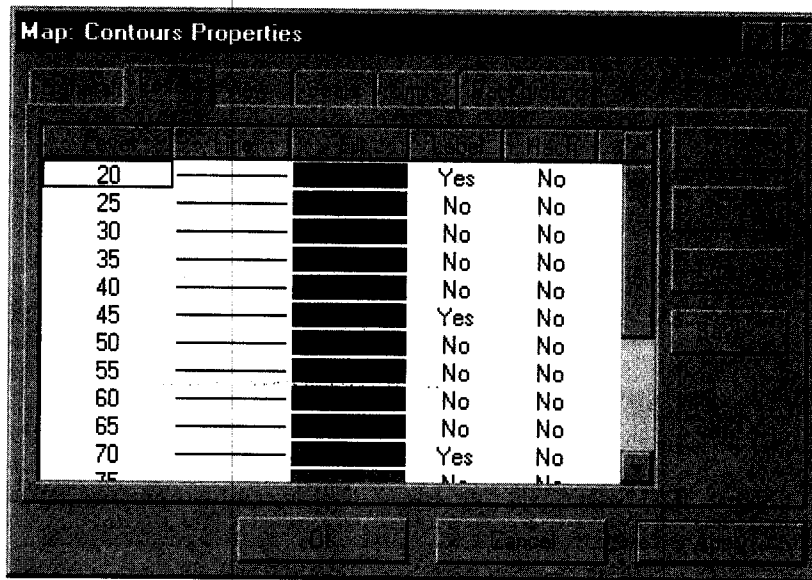
After you create a contour map, you can easily modify any of the map features. For example, you might want to change the contour levels displayed on the map.

To change the contour levels of the map you just created:

1. Place the pointer inside the limits of the contour map and double-click to open the contour map properties dialog.

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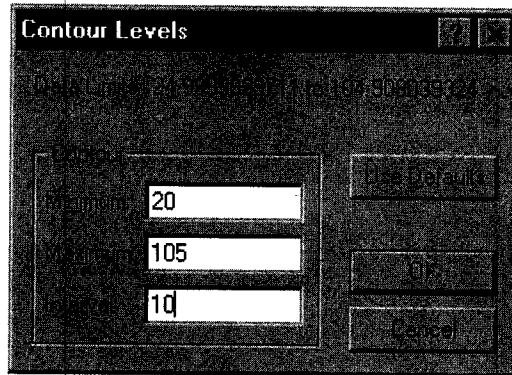
2. In the contour map properties dialog, click the **Levels** page to display the contour levels and contour line properties for the map. In this example, the contour levels begin at  $Z = 20$ . Click on the scroll bar at the right to scroll to the bottom. You can see that the maximum contour level is  $Z = 105$  for this map and that the contour interval is 5.



Click the *Levels* page to display the contour level properties.

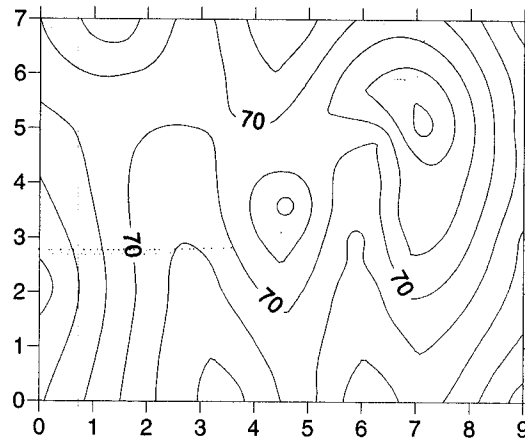
3. To change the contour range and interval, click the *Level* button and the **Contour Levels** dialog is displayed. This shows the *Minimum* and *Maximum* contour level for the map and the contour *Interval*.

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4. Double-click in the *Interval* box and type the value 10. Click the OK button and the **Levels** page is updated to reflect the change.



*Open the Contour Levels dialog by clicking on the Level button on the Levels page.*

5. Click OK in the contour map properties dialog and the map is redrawn with the new contour levels.



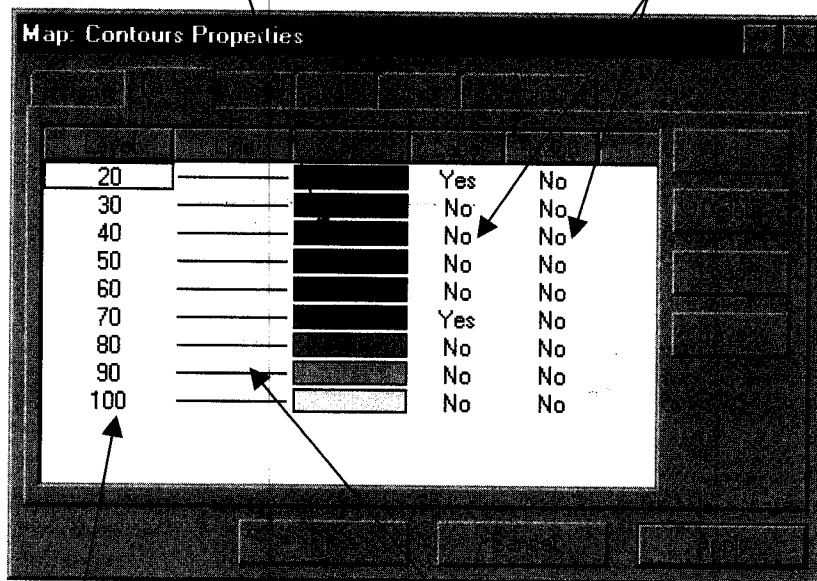
*After completing step 5, the contour map is redrawn using 10-foot contour intervals.*

### Changing Contour Line Properties

You can double-click any of the elements in the list on the **Levels** page to modify the individual element. For example, you can double-click an individual Z value in the list to change the Z value for that particular contour level. You can also double-click the line style for an individual level to modify the line properties for the selected level. This provides a way to emphasize individual contour levels on the map.

*Double-click on a fill sample to change the fill properties for a level.*

*Double-click on Yes or No to control the display of contour labels and hachures for a level.*



*Double-click on the level value to enter a new Z value for a level.*

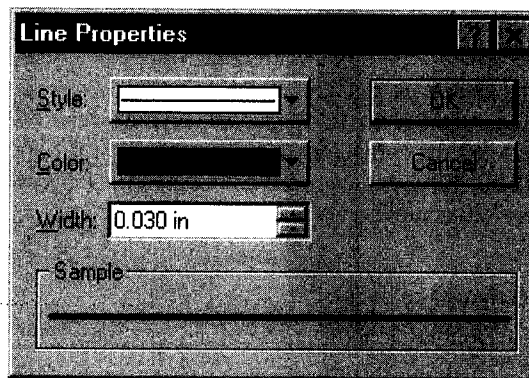
*Double-click on a line to change line properties for a level.*

*You can double-click on individual elements on the **Levels** page to set specific parameters for the selected level.*

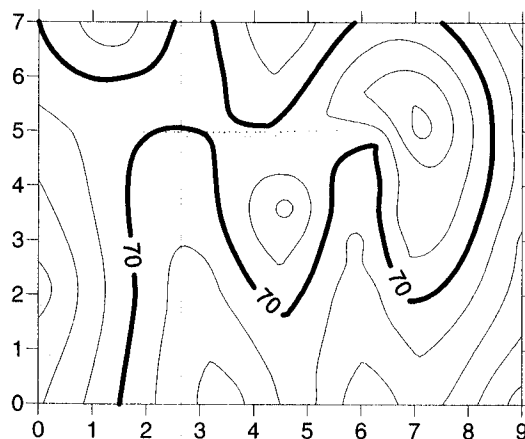
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To change contour line properties:

1. Double-click the contour map to open the map properties.
2. On the **Levels** page, double-click the line sample for the contour level at  $Z = 70$  to open the **Line Properties** dialog.
3. You can select the line color, style, or width for the selected line in the **Line Properties** dialog. In the **Width** box, click the up arrow, and change the width value to 0.030 in. (A width of 0.000 in is equivalent to one pixel width.)
4. Click **OK** in the **Line Properties** dialog and the **Levels** page is updated to reflect the change.
5. Click **OK** in the map properties dialog and the map is redrawn. The contour line at  $Z = 70$  is drawn with a thicker line.



*You can use the **Line Properties** dialog to set the properties of the selected line.*



*The contour line at  $Z = 70$  appears bolder than the other contour lines on this map after changing the line properties.*

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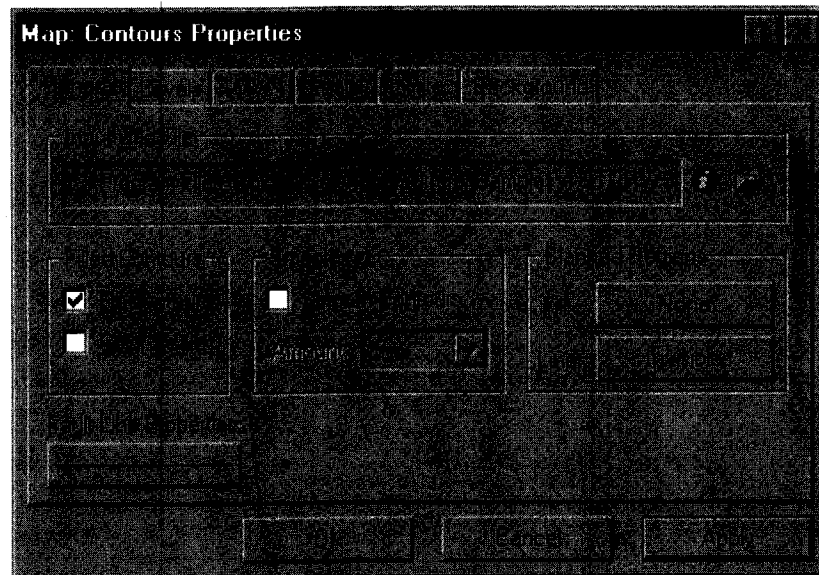
### Adding Color Fill between Contour Lines

Color fill can be assigned to individual levels in the same way as line properties. Alternatively, you can assign colors based on a gradational spectrum between two colors.

The **Levels** page in the contour map properties dialog shows a correspondence between a level (under the *Level* button) and a color (under the *Fill* button). The colors are used to fill in the space between the corresponding level and the next higher level. For example, if the contour levels are 20, 30, 40, ..., etc., then the color corresponding to level 20 is used to fill in the space between the level 20 contour and the level 30 contour.

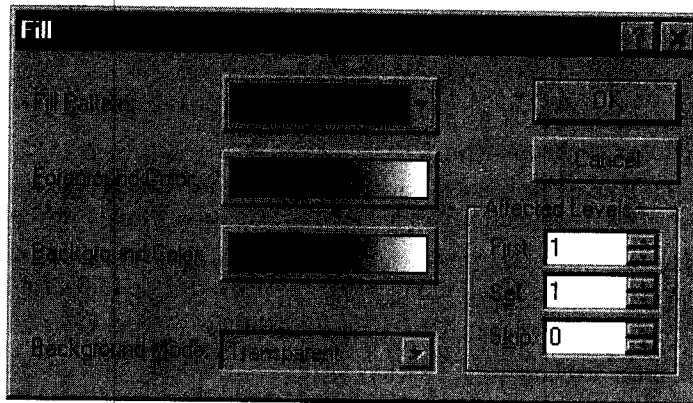
To change color fill:

1. Double-click the contour map and to open the contour map properties dialog.
2. Click the *Fill Contours* check box on the **General** page.



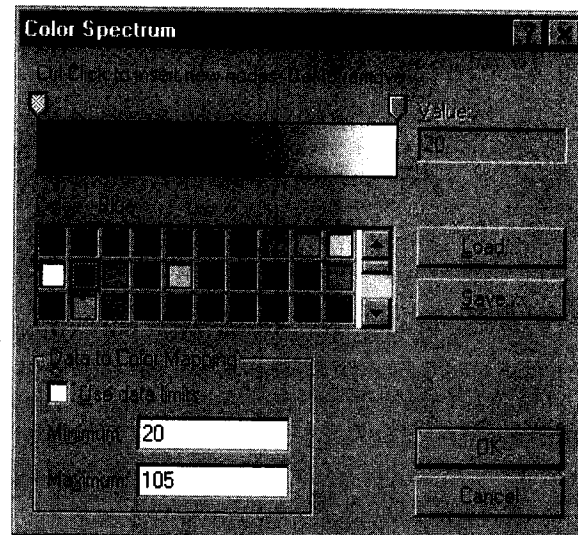
*Make sure the Fill Contours box is checked on the General page to add fill between the contour lines.*

- On the **Levels** page, click the *Fill* button to open the **Fill** dialog.



*You can use the **Fill** dialog to set the contour level foreground and background fill.*

- Click the *Foreground Color* button to open the **Color Spectrum** dialog. This dialog allows you to select colors to assign to specific Z values. Click on the left anchor point button above the spectrum, click on blue in the color palette, and then click OK. The *Foreground Color* button is now displayed as a gradation from blue to white in the **Fill** dialog.
- Click OK and the fill colors on the **Levels** page are updated to reflect the change.
- Click OK and the contour map is redrawn with color fill between the contours.



*To change the color spectrum, click the left anchor button and then click blue in the color palette.*


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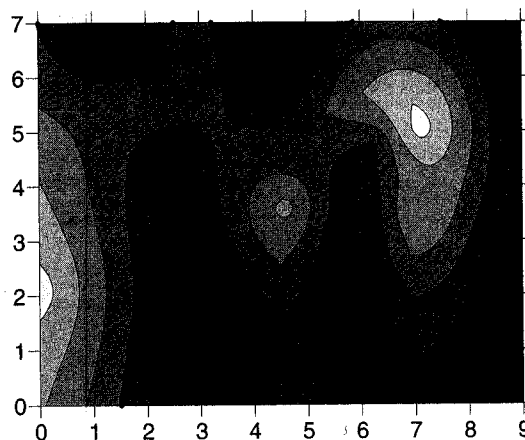
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### Add, Delete, and Move Contour Labels

Contour label locations can be changed on an individual basis. Labels can be added, deleted, or moved.

To add, delete, and move contour labels:

1. Right-click on the contour map and choose the **Edit Contour Labels** option. You can also edit labels of a selected contour map using the **Map | Contour Map | Edit Labels** command. The pointer changes to a black arrowhead  to indicate that you are in edit mode.
2. To delete a label, click on the label and press the DELETE key on the keyboard. For example, click on a 70 label and then click the DELETE key on your keyboard.
3. To add a label, press and hold the CTRL key on the keyboard and click on the location on the contour line where you want the new label located. Add a 60 contour label to the lower left portion of the map.
4. To move a contour label, click on the label, hold down the left mouse button, and drag the label. Move the 70 contour label on the right portion of the map to the north.
5. To exit the **Edit Contour Labels** mode, press the ESC key.



*Contour labels can be moved, added, or deleted.*

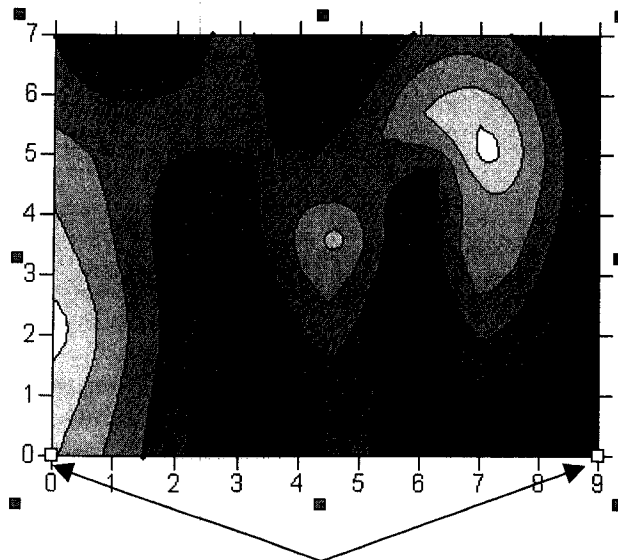


### Modifying an Axis

Every contour map is created with four axes: the bottom, right, top, and left axes. You can control the display of each axis independently of the other axes on the map. In this example, we will change the contour spacing and add an axis label.

To modify an axis:

1. Move the pointer over one of the axis tick labels on the bottom X axis and left-click the mouse. In the status bar at the bottom of the plot window, the words "Map: Bottom Axis" are displayed. This indicates that you have selected the bottom axis of the contour map. Additionally, hollow handles appear at each end of the axis, and solid green handles appear surrounding the entire map. This indicates that the axis is a "sub-object" of the entire map.



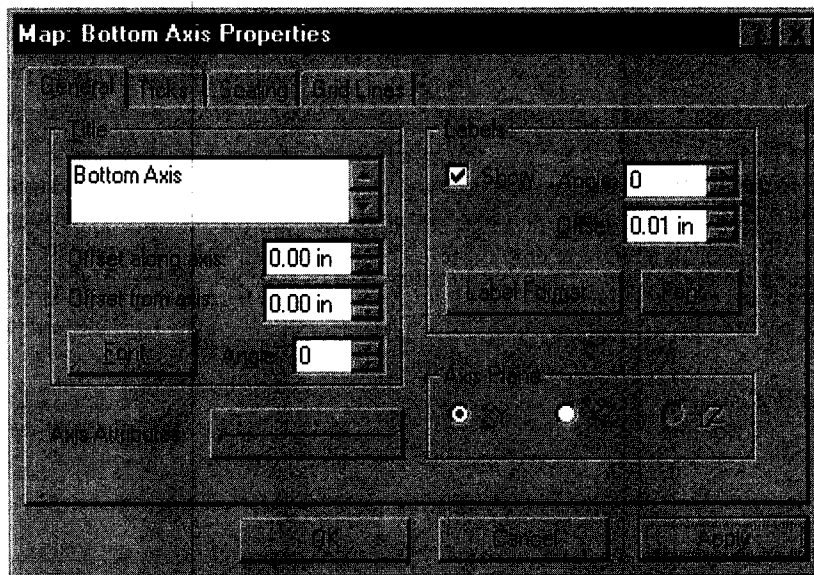
hollow handles

*Eight solid green handles appear around the selected map, and hollow handles appear at the ends of the selected sub-object. In this case, the bottom axis is the sub-object.*

Double-click on the bottom axis to display the bottom axis properties dialog.

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3. In the *Title* box on the **General** page, type "Bottom Axis" (without quotes) and then click the *Apply* button. This places a title on the selected axis.

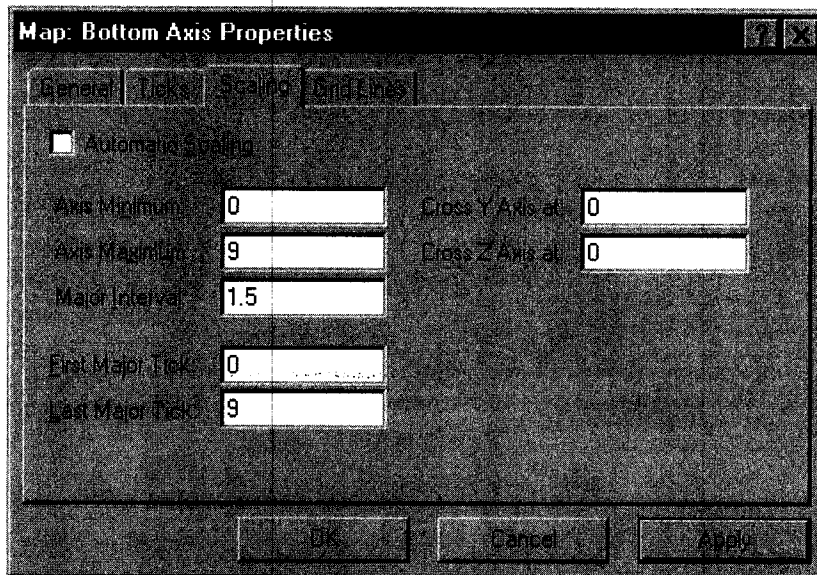


*If you would like to edit other axes, just click on the axis. You do not need to close the dialog before changing your selection.*

4. If you cannot see the axis title, select **View | Zoom | Selected**. Notice that you do not have to close the properties dialog to select menu commands, toolbar buttons, or objects in the plot window.

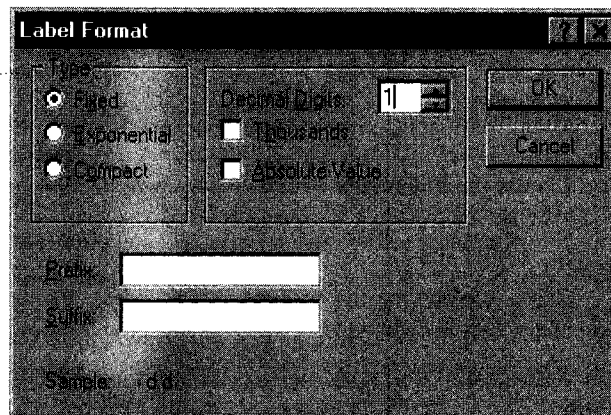
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- Click on the **Scaling** page to display the axis scaling options. In the *Major Interval* box, type the value 1.5 and then click the *Apply* button. This changes the spacing between major ticks along the selected axis.



Enter 1.5 for the Major Interval to space the ticks 1.5 units apart.

- Click on the **General** page and then click the *Label Format* button to open the **Label Format** dialog.
- In the **Label Format** dialog, select the *Fixed* option in the *Type* group. Click on the down arrow on the *Decimal Digits* box and change the value to 1. This indicates that only one digit follows the decimal point for the axis tick labels.
- Click OK in the **Label Format** dialog to return to the axis properties dialog.

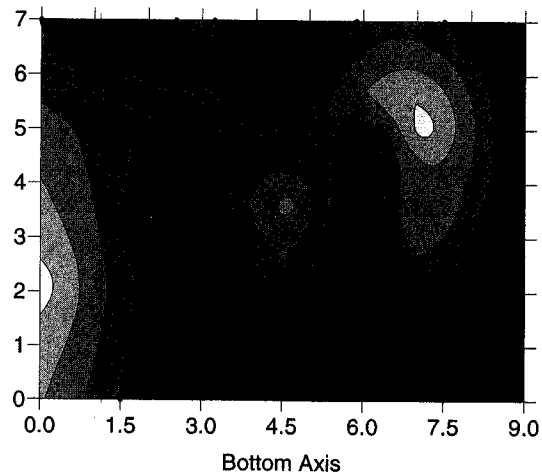


Set the label format to Fixed with one Decimal Digit in the *Label Format* dialog.

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- Click OK in the axis properties dialog and the map is redrawn. The axis tick spacing and labels are changed, and the axis title is placed below the map.




*You can use the axis properties dialog to change the tick mark and axis title properties.*

### Saving a Map

When you have completed the map or drawing in the plot window, you can save the map to a **Surfer** file [.SRF] containing all the information necessary to reproduce the map. When you save a map, all the scaling, formatting, and parameters for the map are preserved in the file.

To save a map:

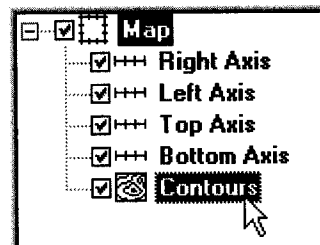
- Choose the **File | Save** command, or click the  button. The **Save As** dialog is displayed because the map has not been previously saved.
- In the *File name* box, type TUTORWS.
- Click *Save* and the file is saved to the current directory with an [.SRF] extension. The saved map remains open and the title bar changes reflecting the changed name.

### Exporting 3D Contours

When you have completed a contour map in the plot window, you can export the contour lines with associated Z values to an AutoCAD DXF file.

To export contour lines:

1. Select the map by clicking on the map in the plot window or by clicking on the word "Contours" in the **Object Manager**.
2. Choose **Map | Contour Map | Export Contours**.
3. In the **Save As** dialog, type TUTORWS into the *File name* box.
4. Click *Save* and the file is exported to the current directory. This creates a file titled TUTORWS.DXF that can be opened in any program with an AutoCAD DXF import option.





*You can select the map by clicking on it in the **Object Manager** (above) or by clicking on the map in the plot window. If you do not see the **Object Manager**, click **View | Object Manager** to open it.*

### Lesson 4 - Creating a Wireframe

Wireframes are three-dimensional representations of a grid file. Wireframes are block diagrams generated by drawing lines representing the grid X and Y lines (the grid columns and rows). At each intersection of a column and row (i.e. at each grid node), the height of the surface is proportional to the grid Z value at that point. The number of columns and rows in the grid file determines the number of X and Y lines drawn on the wireframe.

#### Creating a New Wireframe

To create a new wireframe:

1. Select the **File | New** command, or click the  button.
2. Select *Plot Document*, in the **New** dialog and click **OK**. A new empty plot window is displayed.
3. Select the **Map | Wireframe** command or click the  button.
4. Choose the grid file TUTORWS.GRD from the list of files in the **Open Grid** dialog, click *Open*, and the map is created. (TUTORWS.GRD, created in *Lesson 2 - Creating a Grid File*, is located in **Surfer's** SAMPLES folder.)


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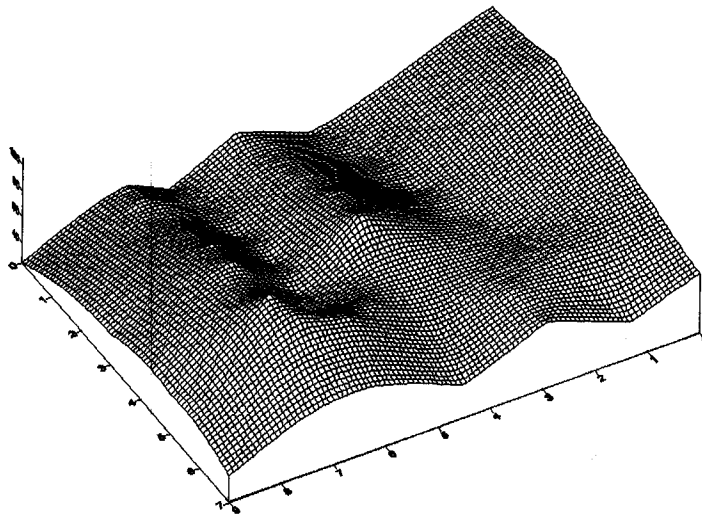
### Changing the Orientation of a Wireframe

Although this example uses a wireframe to illustrate rotation and tilt, you can perform this operation on most map types in **Surfer**.

To change rotation and tilt:

1. Click on the map once to select it.
2. Click the **Map | Trackball** command or click the  button.
3. Click the left mouse button and hold it while moving the mouse to the left and right. This changes the rotation of the wireframe. The rotation is listed in the status bar.
4. Click the left mouse button and hold it while moving the mouse up and down. This changes the tilt of the map. The tilt is listed in the status bar.
5. Once you have rotated and tilted the map, click the ESC key on your keyboard to end trackball mode.

Changing the rotation, tilt, field of view, and projection can also be accomplished by double clicking the wireframe and using the options on the **View** page.



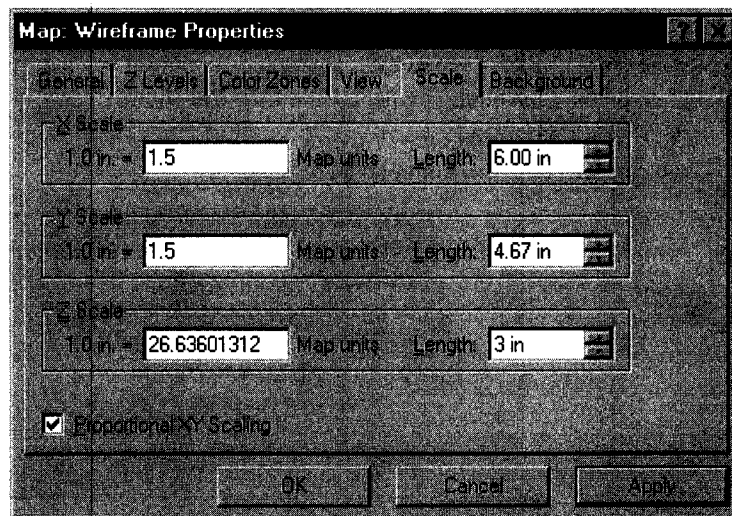
*This is the wireframe at a new rotation and tilt.*

### Changing the Scaling of a Wireframe

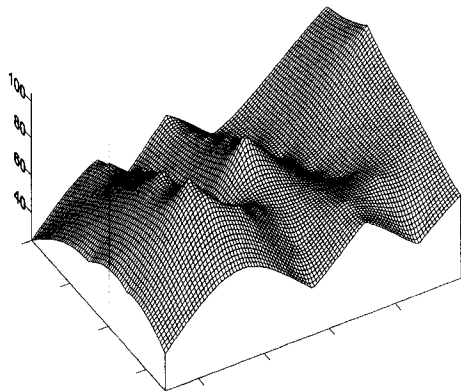
You can change the scaling of wireframes and surfaces in three dimensions. In this example, the Z scaling is changed, and the wireframe becomes somewhat exaggerated in the Z dimension.

To change the Z scaling:

1. Double-click the wireframe to open the map properties.
2. Click the **Scale** page. You can set scaling by entering the number of map units per inch or by entering the length for the map in page coordinates.
3. In the *Length* box of the *Z Scale* group, change the value to 3 by scrolling to 3 or by highlighting the existing value and typing 3. The *Map units* value changes to reflect the change you made.
4. Click OK and the wireframe is redrawn exaggerated in the Z dimension.



*On the Scale page, you can change the Z scaling on wireframes and surfaces.*



*The Z scale on the wireframe is changed Z dimension is exaggerated.*

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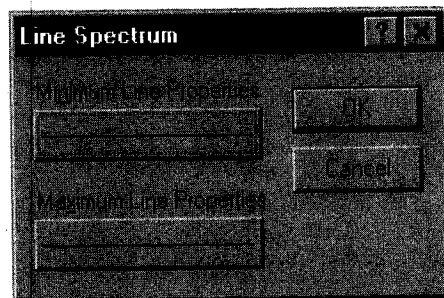
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### Adding Color Zones to a Wireframe

You can change the line colors of any wireframe by applying color zones. In this example, we will change color zones gradationally and individually.

To add a color zone to a wireframe:

1. Double-click on the wireframe, to display the wireframe properties dialog.
2. Click on the **Color Zones** page.
3. Click on the *Line* button to display the **Line Spectrum** dialog.
4. Click on the *Minimum Line Properties* button to open the **Line Properties** dialog. From here, you can select the line color, style, or thickness.




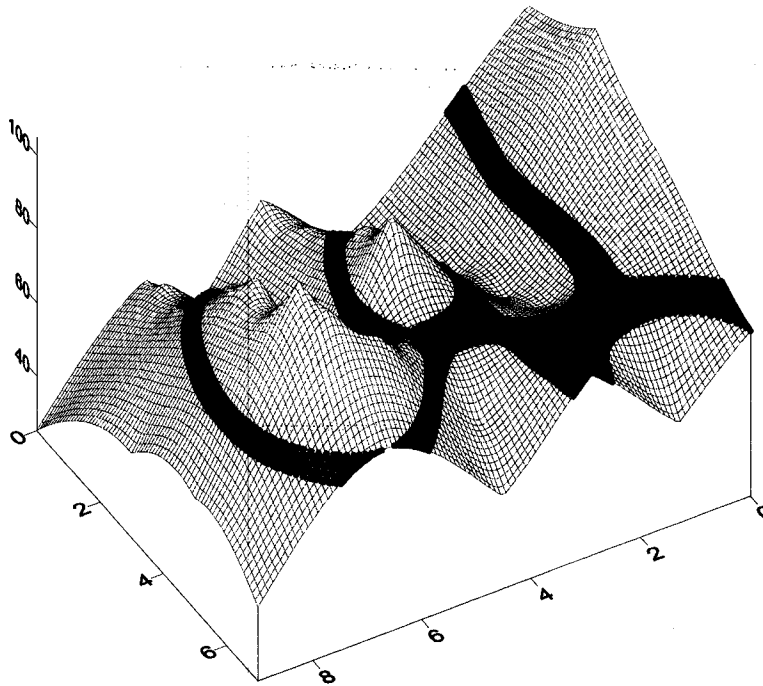
*Click the Line button on the Color Zones page to open the Line Spectrum dialog.*

5. Click on the *Color* button and select blue.
6. Click OK to return to the **Line Spectrum** dialog.
7. Click on the *Maximum Line Properties* button and change the line color to red using the steps above.
8. Click OK in the **Line Spectrum** dialog to return to the **Color Zones** page.
9. In the wireframe properties dialog, check the *Apply Zones to Lines of Constant X* and *Y* boxes by clicking in them.
10. Click *Apply* and the wireframe is displayed with gradational colors varying by the Z variable. (Leave the dialog open.)



To change the properties of an individual Z value:

1. On the **Color Zones** page, double-click the line sample for the contour level at  $Z = 70$ .
2. You can select the line color, style, or width for the selected line in the **Line Properties** dialog. In the *Width* box, click the up arrow and change the width value to 0.030 in.
3. Click OK in the **Line Properties** dialog and the **Color Zones** page is updated to reflect the change.
4. Click OK in the wireframe properties dialog and the map is redrawn. The color zone at  $Z = 70$  is drawn with a thicker line, and is emphasized on the map. (If you need to zoom in on the map, click the  button and then click on the map. Click the ESC key on the keyboard after you are finished zooming in.)



*Double-click on the 70 level line sample to emphasize the  $Z = 70$  contour level.*

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### Lesson 5 - Posting Data Points and Working with Overlays

Post maps are created by placing symbols representing data points on a map. Posting data points on a map can be useful in determining the distribution of data points, as well as placing data or text information at specific points on the map. Data files contain the XY coordinates used to position the points on the map. Data files can also contain the labels associated with each point.

#### Creating Post Maps

When a new post map is created, it is independent of any other map in the current plot window. When the two maps are displayed, notice that two sets of axes are also displayed, one set for each map. When you use the **Map | Overlay Maps** command, the two maps are combined into a single composite map with one set of axes.

To create a post map:

1. Choose **File | Open** to display the **Open** dialog. Choose TUTORIAL.SRF in the SAMPLES directory and then click the *Open* button. TUTORIAL.SRF opens and contains a contour map.
2. Select the **Map | Post Map | New Post Map** command or click the  button.
3. Choose TUTORWS.DAT from the list of files in the **Open** dialog. (TUTORWS.DAT is located in **Surfer's** SAMPLES folder.)
4. Click *Open* and the post map is created using the default properties.

The contour map and post map are two separate maps on the page. If you look closely at the X axis, you will notice the two sets of axis tick labels for the two maps. Also, there are two map frames and axes sets listed in the **Object Manager**. We will line up the maps with the **Overlay** command after changing the post map properties.

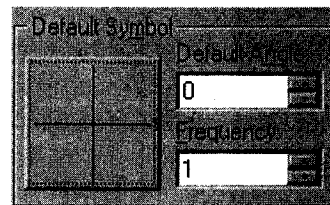
#### Changing the Post Map Properties

To change the post map properties:

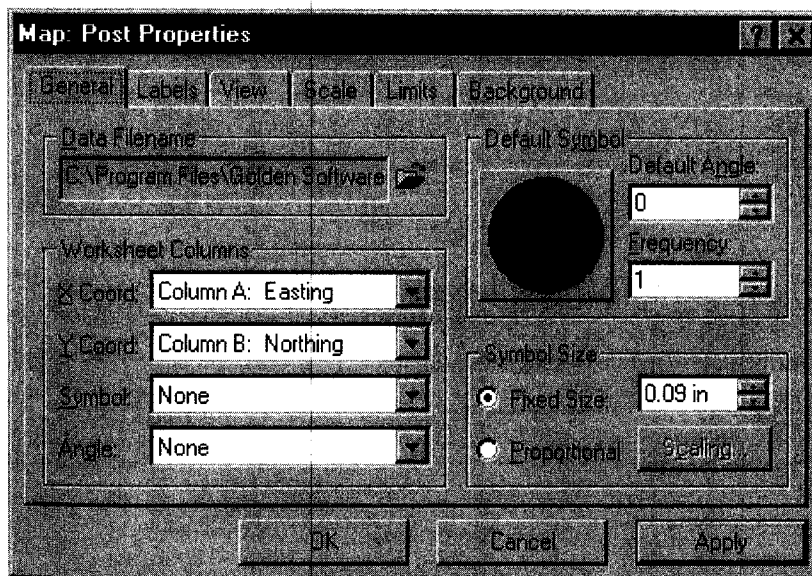
1. Open the **Object Manager** if it is not already open. The **Object Manager** is open if there is a check mark displayed next to the words **Object Manager** in the **View** menu. If there is no check mark, click on the command once.
2. Right click on the word "Post" in the **Object Manager**.
3. Select **Properties** from the context menu.

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4. In the post map properties dialog **General** page, click the symbol button to open the **Symbol Properties** dialog.
5. Choose the filled circle symbol from the palette and click OK. The selected symbol appears in the symbol button.
6. Click the *Apply* button and the symbol appears at the posted data points on the map.
7. In the *Fixed Size* box (*Symbol Size* group), specify a size of 0.09 in.
8. Click OK and the post map is drawn with the new symbol size.



*The symbol button is located in the Default Symbol group on the General page.*

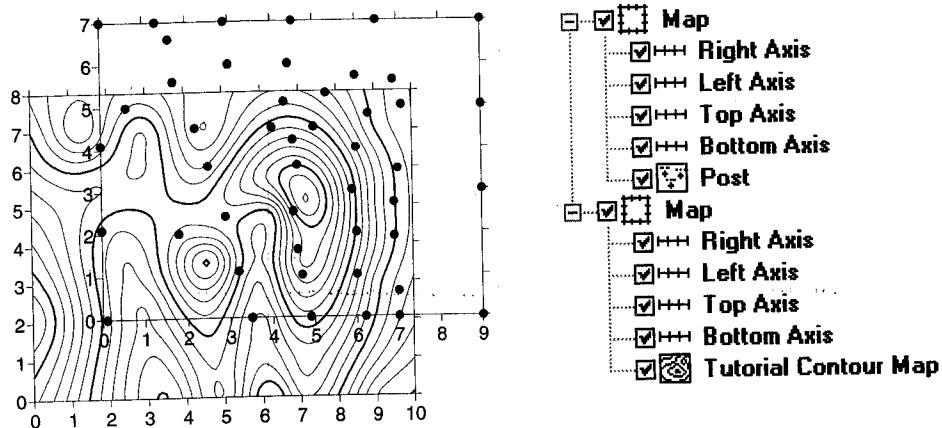


*You can change the symbol size to 0.09 inches on the General page.*

### Overlaying Maps

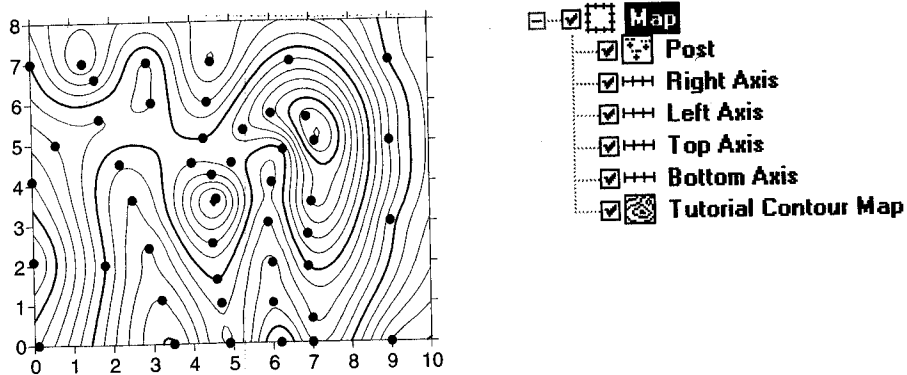
To overlay maps:

1. To see the two separate maps, place the mouse pointer in the center of the maps and click. Press and hold the left mouse button and move the pointer slightly in any direction. Release the button and the two maps are offset.



The two maps are offset to show that the contour map and post map are separate maps. They also appear as two separate maps in the Object Manager as shown on the right.

2. Click **Edit | Select All** to select both maps.
3. Choose the **Map | Overlay Maps** command to combine the two maps into a single composite map.



The contour and post maps are combined into a single composite map after using **Overlay Maps**. Notice that the **Object Manager** displays one "Map" containing a post map, four axes, and the contour map.

### Selecting an Overlay and Assigning an Object ID

After creating a composite map, you can still modify the individual overlays in the map.

#### Selecting Maps

An individual overlay can be selected in the composite map by clicking on the overlay in the plot window or clicking on the overlay in the **Object Manager**.

The easiest way to select an overlay in a composite map is to click on the overlay name in the **Object Manager**. However, you can also select the overlay in the plot window with the mouse. Whenever two or more objects occupy the same position in the plot window, use the CTRL key and the left mouse button to select the desired object. The CTRL key allows you to cycle through the selection of overlapping objects. For example, if you want to select a text block behind a rectangle, hold down the CTRL key and click until the text is selected. You can use the status bar to help you to determine which object is selected.

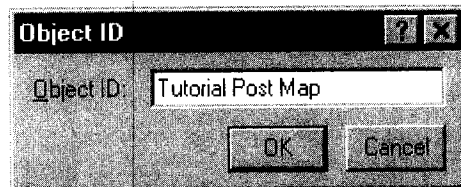
#### Renaming the Post Map

To select an overlay and assign an ID:

1. Make sure the **Object Manager** is open. If the **Object Manager** is not open, click **View | Object Manager**.
2. Click the overlay name in the **Object Manager**. In this case, click the word "Post." The status bar should now report "Map: Post."
3. Choose **Edit | Object ID**.
4. In the **Object ID** dialog, type the name "Tutorial Post Map" and click OK. The status bar, **Object Manager**, and properties dialog title reflect the name change.



*Click the word Post in the Object Manager to select the post map.*



*You can change the name of the selected object using **Edit | Object ID**.*

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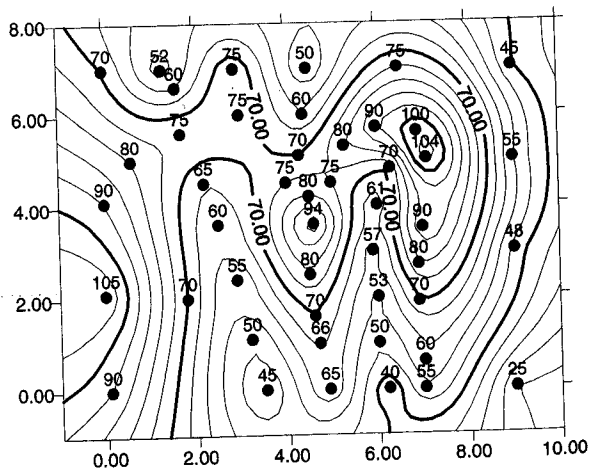
If you double-click on Tutorial Post Map in the **Object Manager**, notice that the properties dialog title changes to **Map: Tutorial Post Map Properties**. When you rename an object in **Surfer 8**, the object's properties dialog reflects the name change making it easier for you to keep track of the object you are editing. For example, if you have eight post maps in the plot window, it is beneficial to change the post map names to something meaningful to save time when trying to edit them. This is especially important because the properties dialog can stay open when changing selections.

### Adding Labels to the Post Map

You can add labels to the data points on post maps. The post map can be selected by a few different methods, though only the **Object Manager** method is discussed here.

To add labels:

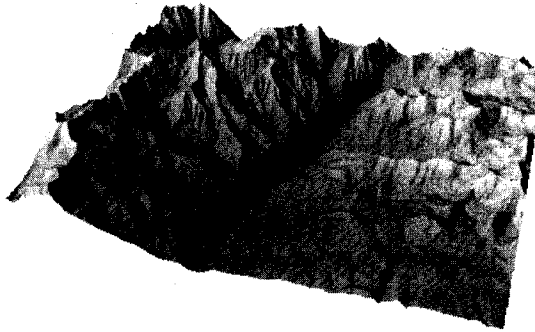
1. Right-click on "Tutorial Post Map" in the **Object Manager** and choose **Properties**.
2. Click on the **Labels** page. In the *Worksheet Column for Labels* group, click the drop-down arrow and a list of columns in TUTORWS.DAT is displayed.
3. Select *Column C: Elevation* from the list.
4. Click the *Format* button to open the **Label Format** dialog.
5. Change the *Type* to *Fixed* and the *Decimal Digits* value to zero.
6. Click OK to return to the post map properties dialog.
7. Click OK and the overlay is redrawn with labels on each of the data points.



You can add labels to post maps through the post map properties dialog.

## Lesson 6 - Introducing Surfaces

Surfaces are new to **Surfer 8**. They are similar to wireframes, except that surfaces are three-dimensional shaded renderings of a grid file. Surfaces provide an impressive visual interpretation of data. Surfaces can be overlaid with other surfaces, so that the surfaces will intersect with each other. Surfaces can also have overlays of other map types, excluding wireframes.





*This is a surface of the Telluride, Colorado USGS SDTS file.*

You can control the color, lighting, overlay blending, and wire mesh grid of a surface.

### Creating a Surface

To create a surface:

1. Select the **File | New** command, or click the  button.
2. Select *Plot Document*, in the **New** dialog and click OK. A new empty plot window is displayed.
3. Select the **Map | Surface** command or click the  button.
4. Choose the grid file TUTORWS.GRD from the list of files in the **Open Grid** dialog, click *Open*, and the surface is created using the default settings. (TUTORWS.GRD, created in *Lesson 2 - Creating a Grid File*, is located in **Surfer's** SAMPLES folder.)

### Adding an Overlay


You can overlay base, contour, post, image, shaded relief, and vector maps on surfaces. All overlays, except other surfaces, are converted into a type of bitmap known as a texture map. This texture map is then applied to the surface by stretching it and shrinking it as necessary. When these maps are overlaid, you have a choice on how to treat the texture map. You can use the colors from overlays only, from the surface only, or blend colors from the overlays and surface. For example, you could create a color filled contour map, overlay the contour map and surface, and then use the colors from the contour map only.

## Chapter 2 - Tutorial

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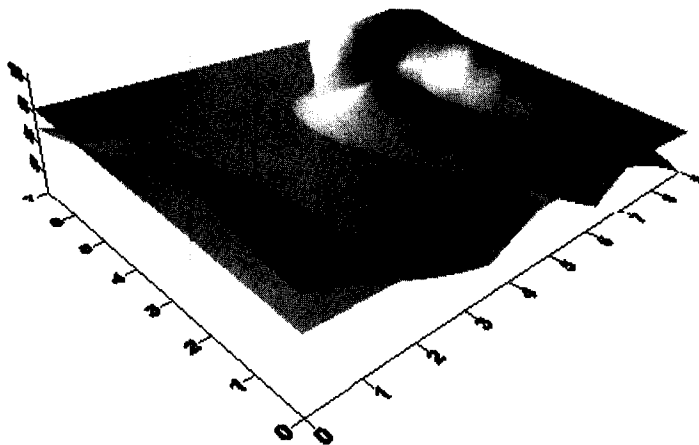
When multiple surfaces of differing elevations are overlaid, the surfaces can intersect and overlap each other. If the surfaces are adjacent to each other in the X or Y direction, the surfaces are drawn side-by-side after using **Map | Overlay Maps**. In this example, we will overlay a plane with the surface you just created.

First, create the surface plane:

1. Select the **Map | Surface** command or click the  button.
2. In the **Open Grid** dialog, open Surfer's SAMPLES folder and select TUTORPL.GRD.
3. Click *Open*, and the surface is created using the default settings.
4. Right click on the upper 3D Surface in the **Object Manager**, choose **Object ID** and add the text TUTORPL.GRD to the end of the 3D Surface label to make it easier to distinguish the two surfaces in the **Object Manager** list.

Next, overlay the surfaces:

1. Click **Edit | Select All** to select both surfaces.
2. Click **Map | Overlay Maps** to overlay the surfaces.



*You can overlay two or more surfaces. Depending on each surface's XYZ ranges, the surfaces may overlap or intersect each other.*



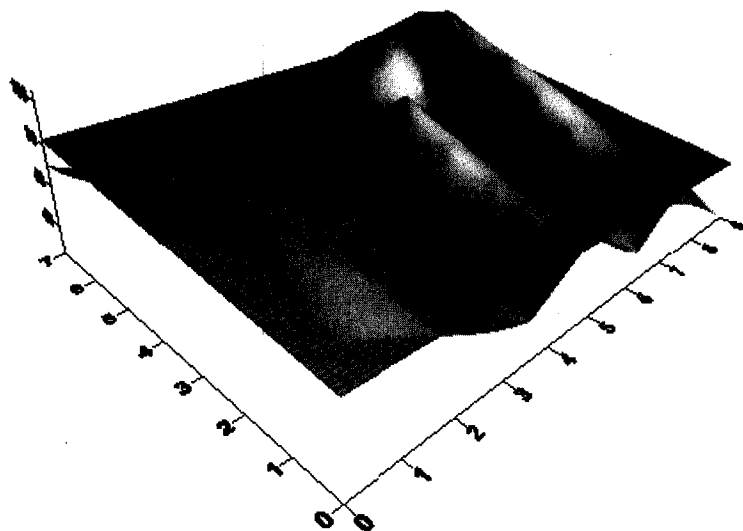
### Adding a Mesh

Mesh lines can be applied to surfaces.

To add a mesh:

1. Double-click on the surface to open the surface properties.
2. Click the **Mesh** page.
3. Check the *X* and *Y* boxes.
4. Change the *Frequency* to 5 for the *X* and *Y* lines.
5. Click the **OK** or *Apply* button to add a mesh to the selected surface.

Notice that the mesh is applied to the selected surface within the composite map, not to both surfaces. With all map types, you can only change the map-specific properties of one map at a time. Properties that apply to all overlays in the composite map include **View**, **Scale**, **Limits**, and **Background**.



*The mesh is applied to the selected overlay in the composite map.*



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### Changing Colors

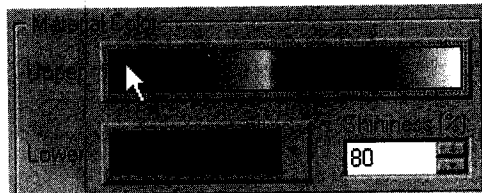
Changing color schemes on surfaces is similar to changing colors on other map types such as image maps or contour maps. The **Color Spectrum** dialog is used to load previously defined color schemes, and it is also used to create your own color schemes. The **Color Spectrum** dialog is discussed in greater detail in *Chapter 16, Adding Color to Maps*.

Before experimenting with color, let's create a new surface map in a new plot window:

1. Click **File | New** or click the  button.
2. In the **New** dialog, select *Plot Document* and then click **OK**.
3. Select the **Map | Surface** command or click the  button.
4. In the **Open Grid** dialog, open **Surfer's** **SAMPLES** folder and select any grid file [.GRD]. **HELENS2.GRD** is a good choice for experimenting with color.
5. Click *Open*, and the surface is created using the default settings.

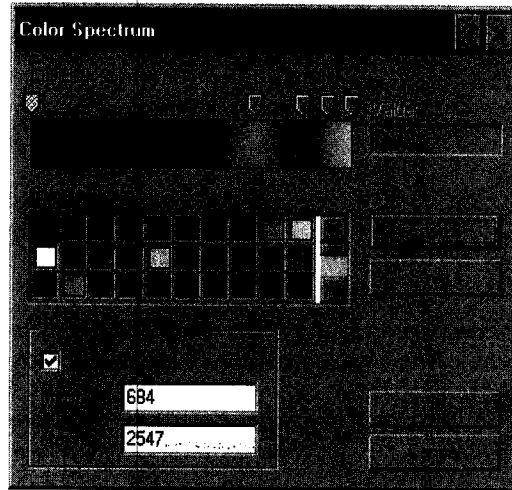
To change the surface material color:

1. Double-click on the surface to open the surface properties.
2. There is a *Material Color* group on the **General** page. Click the *Upper* button.




Click the *Upper* button in the *Material Color* group to change the surface material color.

3. Click the *Load* button in the **Color Spectrum** dialog.



*Click the Load button to use a different color spectrum file [.CLR] for the surface material color.*

4. The color schemes are stored in color spectrum files containing a [.CLR] extension. By default, **Surfer** opens in the **SAMPLES** folder, which contains many predefined color spectrums. (Browse to the **SAMPLES** folder if it is not open.) Click on one of the [.CLR] files to select it and then click the *Open* button.
5. Notice that the colors and anchor node  positions have changed in the **Color Spectrum** dialog. Click **OK** in the **Color Spectrum** dialog to return to the surface map properties dialog.
6. Click the *Apply* button in the surface map properties dialog to see your color changes. Drag the surface map properties off to the side if you cannot see the map.

You can continue to experiment with the colors by clicking the *Upper* button and loading other color spectrum files.

### Need More Information?

If you find you still have questions after you have completed the tutorial, you should consider reviewing the material in the rest of the User's Guide or accessing **Surfer's** extensive online help. Usually, the answers to your questions are found in these locations. However, if you find you still have questions, do not hesitate to contact Golden Software's technical support. We are happy to answer your questions before they become problems.