Oasis montaj Advanced Mapping

As more information becomes available in digital format, Earth science specialists are recognizing that it is essential to work with a variety of data from different sources. This approach not only spreads resources as far as possible but it also enables professionals to pool their knowledge and interpret results more effectively and make more informed decisions.

This How-To Guide investigates the integration of geochemical data in to an environment that has focused on a single type of data (i.e. geophysical).

This tutorial assumes you have a Geosoft project open with both geophysical and geochemical databases available.

Creating Custom Base Maps

Many users have the need to create custom base maps based on corporate standards or client requirements. Custom base maps can be prepared using the commands available in the MAPPLOT GX.

A MAPPLOT template file (mappplot.con) is available in the "C:\Program Files (x86)\Geosoft\Oasis montaj\etc" folder. You can use this file as a template to create your own custom MAPPLOT control file.

Using MAPPLOT to create a Custom Base Map

You can create a MAPPLOT custom base map from either a control file or a custom pdf.

To Create a Custom Base Map from a MAPPLOT Control File

1. On the *Map Tools* menu, select *Base map*, then select *MAPPLOT Control File* and then select **From Control File**. The *MAPPLOT control file and load on current map* dialog appears.
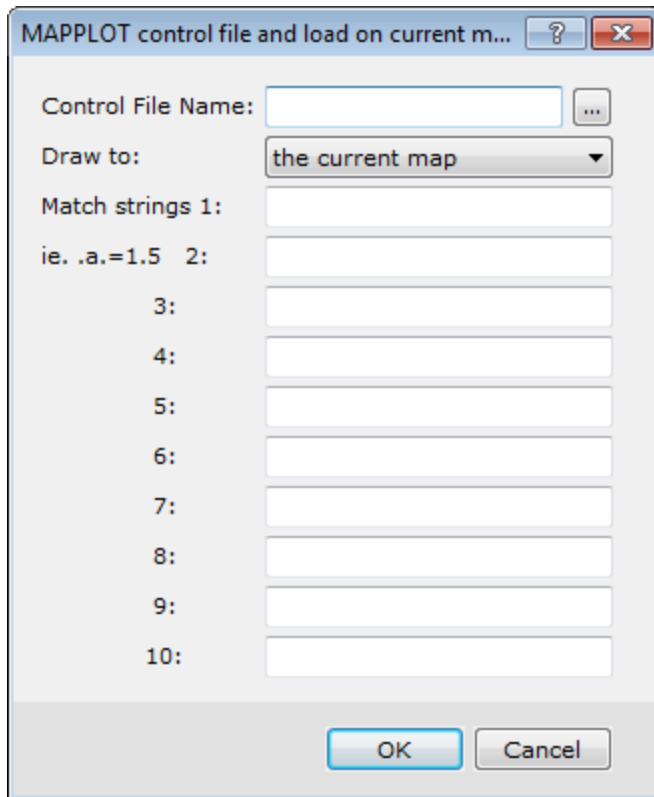
2. Browse to and select the *Control File Name*.
3. From the *Draw to* dropdown list select *a new map* or *the current map*.
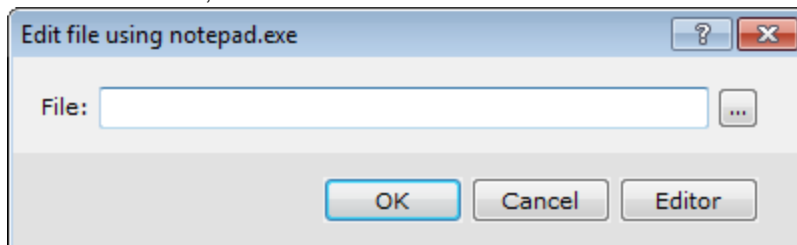4. Specify the *Match strings* if required.

⚠️   *For more information on match strings, click the **Help** button.*

5. Click **OK**. If you specified a new map above, the *New map* dialog appears.
6. Specify the *New map name* and click **OK**.
   The map with the base map based on the MAPPLOT control file is displayed.

To View and Edit a Control File

1. On the *Edit* menu, select **Edit a file**.

2. Use the *Browse* button to locate the control *File*.

Example

A example control file is shown below. This file accesses several text files for legend information: **survey.leg** and **mag.leg**. It also places three images on the map: a Geosoft format grid file, a TIF file, (**Oasis montaj** logo); and a JPG file.

The four letter commands (for example, SURR) are all described in the help for the MAPPLOT GX.

```
MDFF map04.mdf

DATT s1=kt100
DATT s2=kt200
DATT s3=kt500

DATT t1=kt100
DATT t2=kt200
DATT t3=kt300

MGRP Surround,0,0
SURR s3,0.15,s1
DATT s1

MGRP Coordinates,0,1
ANOY ,,,,,2000,0.15,,-1,-1,,,-0.15,,1
ANOX ,,,,,2000,0.15,,-1,,,,-0.15,,1

DATT refgrid=kt150
GRID 2

PROJ map.PRJ
DATT llgrid=kt050
GRID -3,0.05,0.0230
ALAT ,,0.5,,,-1
ALON ,,0.5

DATT s1
RECT 12
MGRP Scale_Bar,0,0
SCAL 1,6,2,,ft,,,,1
SCAL 1,6,3,,mt

MGRP North_Arrow,0,0
```

```
NARR 9,-6,-4,0.0,4,s2,80.3,23.4

MGRP Index_Map,0,0
RECT 3,-10,7,-2.65,15
TEXT 3,-9.8,7.2,-1,"Index Map - Topography"
s1,,,,,TI
RECT 3,-8,10,-6,13
s3
TEXT 3,-8.2,9.7,-1,"Survey Area"
s1,,,,,TI

MGRP Color_Bar,0,0
CBAR 6,-14,-8,1.2,0.6,s1
mag.agg,,,,-1
"Magnetics"
"[nT]"

DATT s1
MGRP Legends,0,0
TXTB 3,-6,20,0,,mag.leg
s1
TXTB 3,-10,30,-1,,survey.leg
 s1

MGRP Titles,0,0
TITL 3,0,0,12

b,"Total Field Magnetics",0,t3,.3
b,"Northern Province",0,t2,.3
b,"Canada",0,t2,.3
c,"Data collected by ",0,t1,.25
c,"Helicopter Magnetics System",0,t1,.25
c,"flown by",0,t1,.25
c,"Surveys 'R Us",0,t1,.25
```

```
d,"Gold Mapping Corp.",0,t2,.3,,,15
MGRP Mag,0,1
AGGR 0
AGG_mag
mag.grd,colour.tbl,3
MGRP Logo,0,0
AGGR 2,-5,1,18,6,1
AGG_logo
omontaj.tif(IMG;t=tif)
MGRP IndexMap,0,0
AGGR 3,-10,7,36,15,1
AGG_indexmap
indexmap.jpg(IMG;t=jpg)
```

Gridding Random Data

The random gridding method (RANGRID GX) fits a minimum curvature surface to the data points. An example is shown below.

Grid Random Data Using Minimum Curvature

If the data is relatively smooth between sample points or survey lines, minimum curvature gridding should be used. If the data is variable between sample locations, or is known to be statistical in nature (such as geochemical data), is poorly sampled or clustered, use the kriging method.

RANGRID first estimates grid values at the nodes of a coarse grid (usually 8 times the final grid cell size). This estimate is based upon the inverse distance average of the actual data within a specified search radius. If there is no data within that radius, the average of all data points in the grid is used. An iterative method is then employed to adjust the grid to fit the actual data points nearest the coarse grid nodes.

After an acceptable fit is achieved, the coarse cell size is divided by 2. The same process is then repeated using the coarse grid as the starting surface. This is iteratively repeated until the minimum curvature surface is fit at the final grid cell size.
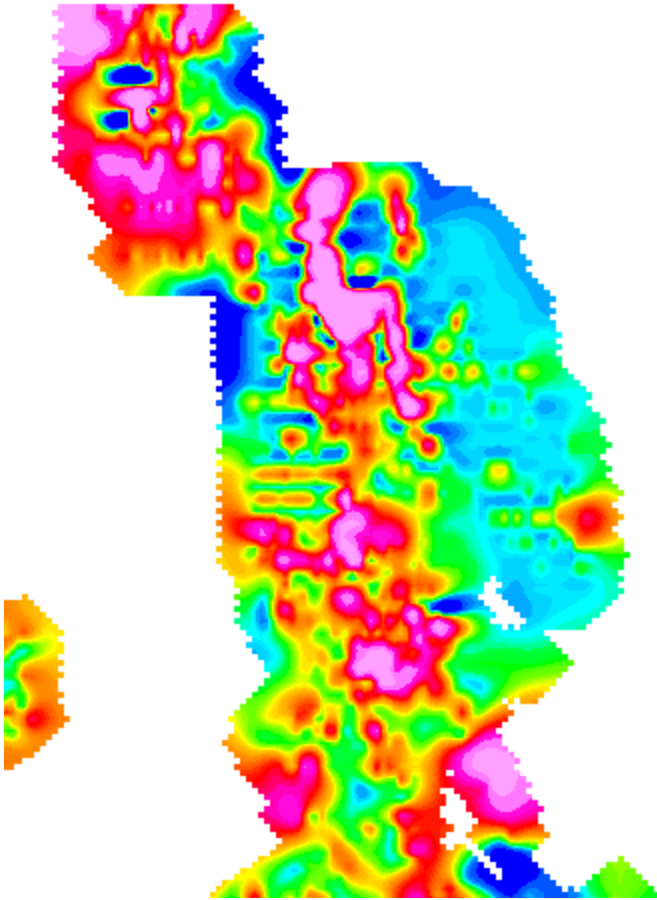
💡 *For details on minimum curvature gridding, please refer to the Application Help files.*

To Perform Minimum Curvature Gridding

1. Select the database.
2. On the *Grid and Image* menu, select *Gridding* and then select **Minimum Curvature**.
   The *Minimum Curvature Gridding* dialog appears.

3. Select the *Channel to grid* from the dropdown list.
4. Specify the *Name of new grid file*
5. Specify a *Grid cell size*.

> ⚠️ For more information on the Advanced gridding parameters, click the **Help** button.

6. Click **OK**. The system processes the data and creates the output grid file.

Gridding Geochemical Data

There are six potential methods to use for gridding data:

1. **Bi-directional**
   Suitable for highly sampled data surveyed along regular lines. Can work well with potential field geophysical data.
2. **Minimum Curvature**
   Suitable for randomly oriented data with a relatively large number of samples. Can work well with geochemical data from comprehensive regional and local surveys.
3. **Kriging**
   Suitable for clustered data in which clusters are characterized by a relatively large number of samples and may be widely spaced. Can work well with geochemical data from stream sediment surveys and similarly sampled data.
4. **Tinning**
   Suitable for randomly oriented data with a relatively large number of samples, or clustered data in which clusters are characterized by a relatively large number of samples and may be widely spaced. Can work well with geochemical data.
5. **Inverse Distance Weighting Gridding**
   Suitable for randomly oriented data with a relatively large number of samples. Works well with interpolating geochemical data, creating a grid from point data using an Inverse Distance Weighting algorithm.
6. **Direct Gridding**
   Suitable for over-sampled datasets, such as, LiDAR; provides a quick gridded view of the datasets without using any interpolation.

Based on these very general criteria, Minimum curvature, Tinning, Inverse Distance Weighting and Kriging are all optimal methods for statistical data such as that from geochemical surveys, based on your data. Since geochemical data are statistical in nature and have a high range from sample to sample, it may also be appropriate to reduce the range of data through standard processing (i.e. application of a logarithmic transform).

In this brief tutorial, we provide an overview of Kriging and describe how to select an initial model (variogram, or more strictly, a semi-variogram) for creating a grid. Selecting a variogram model is the key to obtaining high-quality results – the actual gridding process is relatively routine. We also provide summaries of how to apply Kriging in Oasis montaj and create a map of your final results.

> 💡 *This tutorial assumes you have a database with clustered data suitable for Kriging.*

Kriging – Quick Overview

This statistical gridding method uses the method of Kriging to determine a value at each grid node based on the located data you provide. A significant by-product of Kriging is the ability to estimate the error of the data at each grid node.

In Kriging, the approach is to first calculate a variogram of the data, which shows the correlation of the data as a function of distance. Simply speaking, the further apart the data points become, the less correlation we expect between points. A variogram shows this phenomena for a given dataset, and based on the variogram, you are able to select a model that best defines the variance of the data. There are five types of variograms you can generate in the system, including:

- Power
- Sphere
- Gaussian
- Exponential
- User-defined

The technique of Kriging uses the model you select to estimate the data values at the nodes of the grid. In geochemical applications, the sphere and gaussian model are typically most effective. The spherical model is mathematically simpler and we typically recommend this model as your starting point. Advanced users may want to experiment with gaussian and user-defined variogram models.

Geosoft supports ordinary Kriging as well as universal Kriging. Universal Kriging differs from ordinary Kriging in that it enables the data to contain a regional trend. For a more in-depth understanding of geostatistical analysis and Kriging, refer to *Mining Geostatistics* written by A.G. Journel and C.J. Huijbregts, 1978.

Variograms

The semi-variogram (referred to as a variogram for convenience in Geosoft) shows the correlation (semivariance) of the data as a function of the distance away from the sampling point. The further apart the data points become the less correlation we expect between points.

The normal procedure for creating a variogram is to:

1. Create a variogram file (*.var) of the channel you wish to display
2. Select a variogram model
3. Plot the variogram
4. Repeat this process for other models

Create a Variogram File

In this procedure, we will use the default model (linear) to simply generate a variogram of our data that we can then use to select the optimal variogram model and parameters.
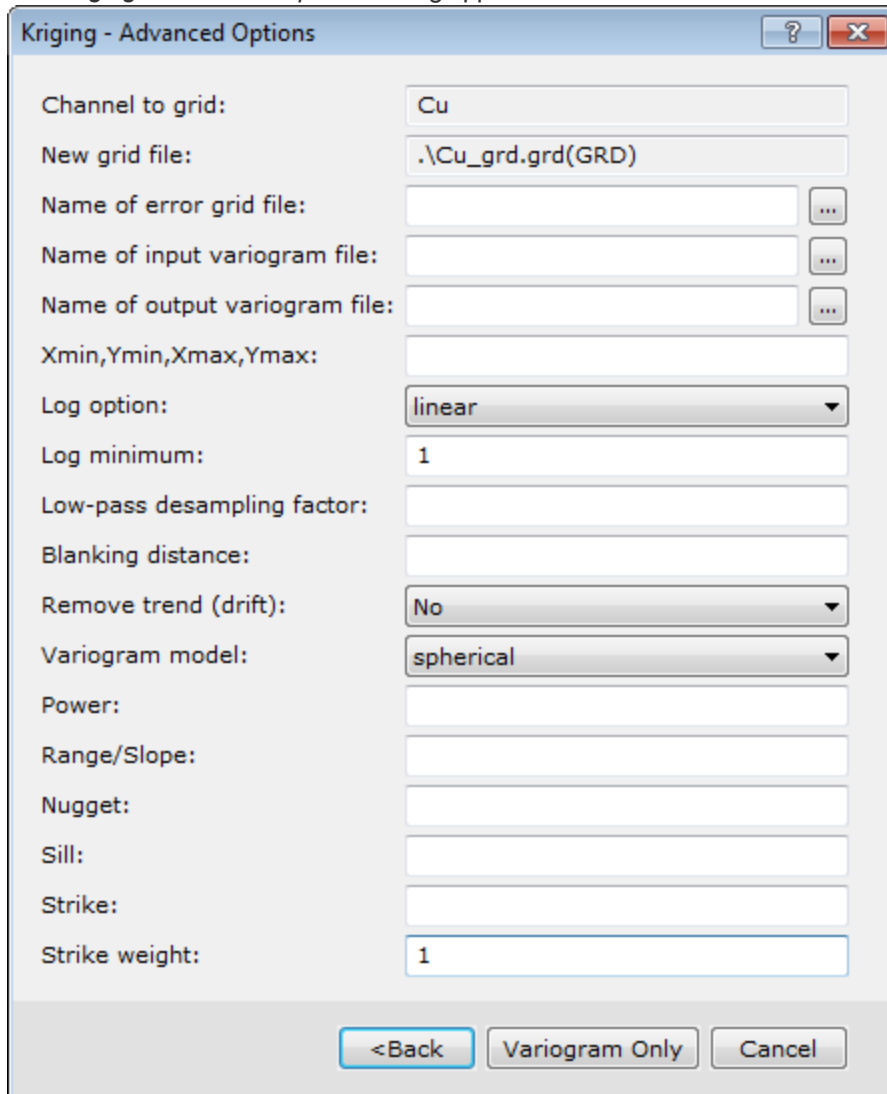
1. On the *Grid and Image* menu, select *Gridding* and then select **Kriging**.
   The *Kriging* dialog appears..
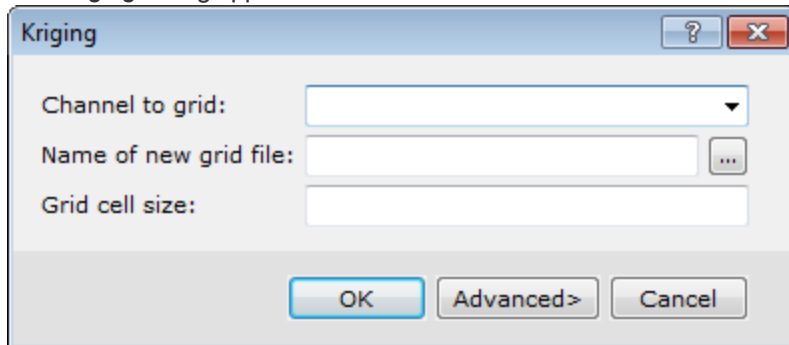
2. Select the *Channel to grid* from the dropdown list.

3. Specify the *New grid file name*.
4. Click **Advanced**.
   The *Kriging - Advanced Options* dialog appears.

5. Specify the *output variogram file* name.
6. Leave the rest of the settings as default.
7. Click **Variogram Only**. The system creates a variogram and displays it in a map in the current project.

Example

In the example below, we used the default model (linear) to simply generate a variogram of our data that we can then use to select the optimal variogram model and parameters.
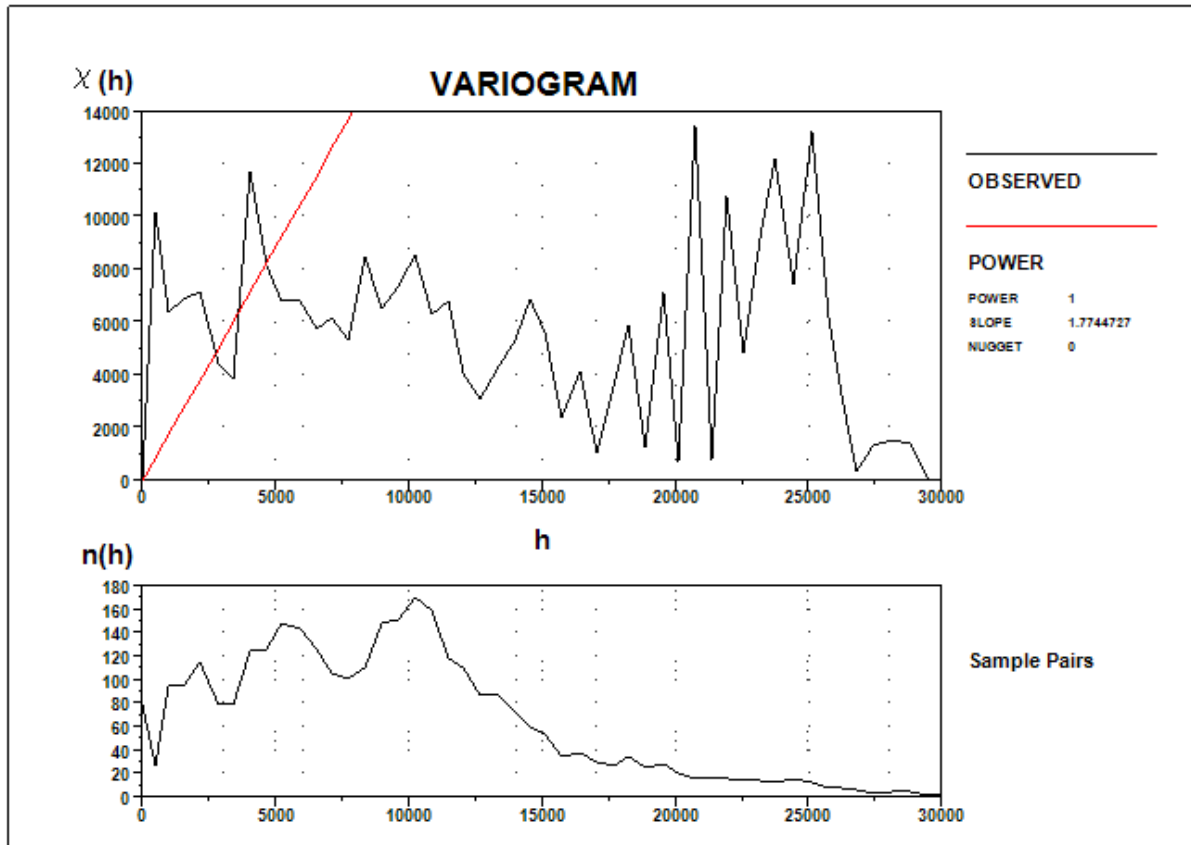
We see a variogram based on the data with a linear model superimposed. The variogram shows the anticipated increase in variability as distance increases. At the right end, it may appear to decrease but this is usually the result of too few pairs for the statistics to be valid. Normally the variogram reaches a point (sill value) at which the semivariance plateaus. The corresponding *h* value is called the range value – beyond this distance there is no similarity in samples.

We also see a plot of sample pairs. This latter plot shows how many sets of samples occur within specified distances of each other – this curve may help you to refine your variogram in the selection of the data points used to visualize your model curve. Here, most of the data occurs within 10 000 m and data beyond this point should not be given as high an emphasis when building your variogram.

Variogram Models and Parameters

Selecting a model and parameters is the toughest part of your kriging decision and requires considerable experience. Typically, you would use kriging to grid data within clusters accurately and then truncate the model between clusters so that clusters do not affect the gridding of neighbouring clusters. In this application, data integrity is maintained both within and between clusters and you can examine the error grid to verify that this effect is maintained.

💡 *For more information on advanced kriging options, click the **Help** button on the dialog box.*

Variogram Parameters

In general, you must specify a geochemical data channel, output variogram file, log option, log minimum and variogram model. In addition, depending on the model you are using, you may have to set additional parameters as follows:

Variogram Model Type	Parameters Defined
Power	Specify a power value to use.
Spherical, Gaussian and Exponential	Specify the Range/Slope, Nugget and Sill.
User-defined	Specify an input grid containing your custom variogram model and select the User-defined Variogram model.

❱ **Power** - This is the power for the power model. The default is 1, and the nugget and slope will be fit to the data by default if not specified.
❱ **Nugget (starting value)** - The nugget is the average error in each data point, and is indicated by the intersection of the variogram model with the h=0 axis. The default is 0 indicating that there are no repeated samples.
❱ **Sill** - This is the value corresponding to the point at which the variogram becomes uncorrelated and reaches its plateau point (or goes flat).
❱ **Range/Slope** - The range is the distance at which the variogram model reaches the sill value. Beyond the range, the data is uncorrelated.

To Define a Variogram Model

1. After displaying the starting linear model, evaluate the data and verify which Variogram model is appropriate.
2. On the *Grid and Image* menu, select *Gridding* and then select **Kriging**.
   The *Kriging* dialog appears.
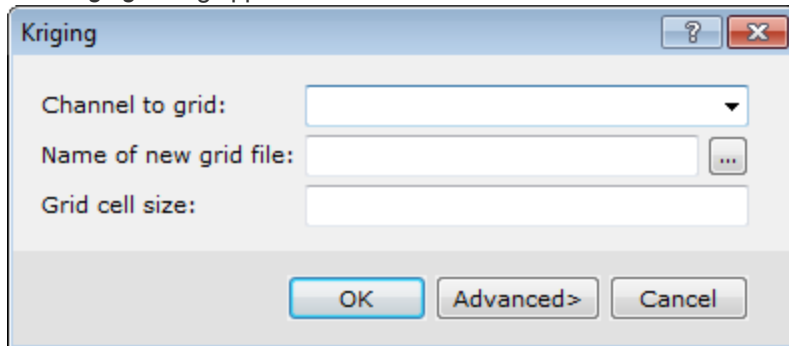
3. Select the *Channel to grid* from the dropdown list.
4. Specify the *New grid file name*.
5. Click **Advanced**. The *Kriging - Advanced Options* dialog appears.

6. Enter the *output variogram file* name.
7. Enter the *error grid file* name, if desired.
8. Specify the other kriging options to suit your data. In particular, you will want to confirm the *Variogram model*, *Log option* and *Log minimum*.
9. You should then verify *Power*, *Range/Slope*, *Nugget*, and *Sill* are correctly entered for your variogram model type.
10. Click **Variogram Only**. The variogram is plotted and displayed in your current project.

To Grid the Data

You are now ready to grid the data using the model created above.

1. On the *Grid and Image* menu, select *Gridding* and then select **Kriging**.
   The *Kriging* dialog appears
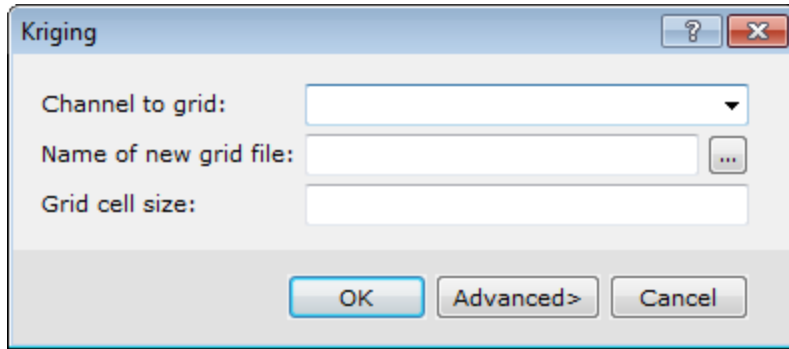
2. Select the *Channel to grid*.
3. Specify the *Name of new grid file* .
4. Click **Advanced>** to display the *Kriging – Advanced Options* dialog.
5. Specify the information as required from above.
6. Click **Back** to return to the *Kriging* dialog.
7. Click **OK** to grid the data and display it in a map window in your current project.

Plotting Krigrid Data

The basic steps to display your Krigrid grid are as follows. An example is shown below.

1. Create a new map
2. Display the grid
3. Display the variogram (using the *Grid/Gridding/Plot Variogram* menu option)
4. Display sample locations
5. Draw the Base map
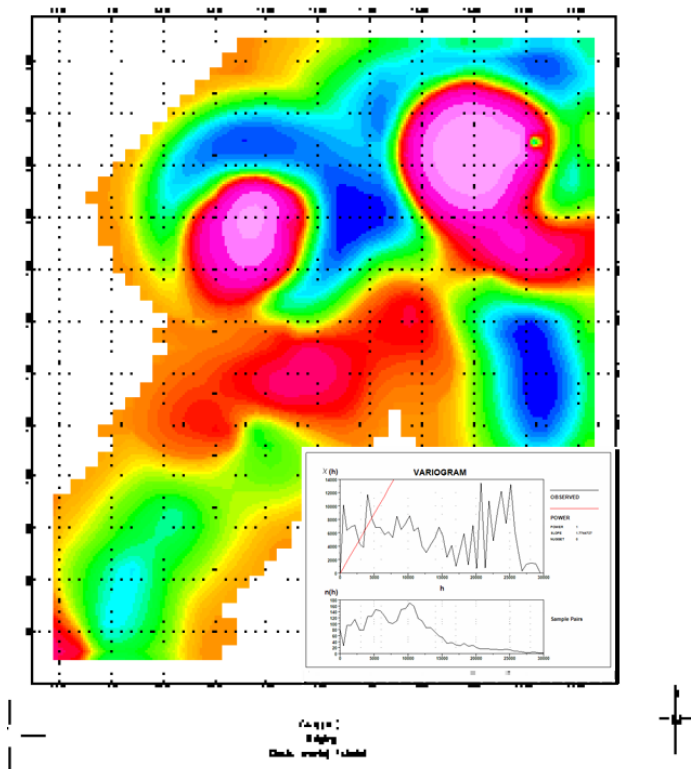
Symbols, Colour Bars and Legends

Oasis montaj provides the ability to create a variety of symbol type plots of spatially located Earth Science data. This functionality is ideally suited to the presentation of data sets that are not line-oriented, such as geochemical survey results.

Plot Symbols, Colour Bars, and Legends

The types of symbol plots available in the system include:

Location Plot...
Zone Coloured...
Colour Legend Bar...
Horizontal Colour Legend Bar...
Grid Histogram...
Colour Range Symbols...
Proportional Size...
Colour Range and Proportional Size...
Colour Range Symbol Legend...
Proportional Symbol Legend...
Strike-Dip Symbols...
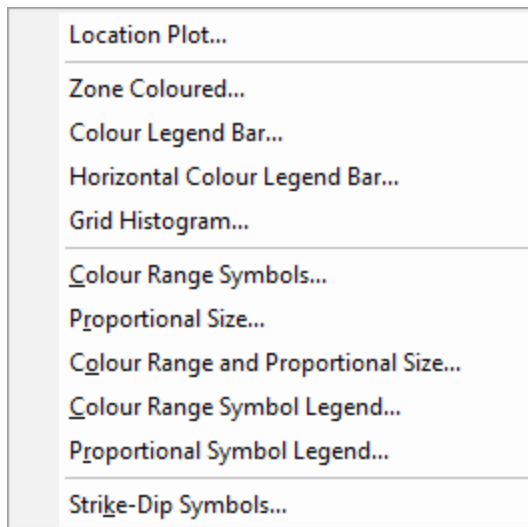
An effective method for geochemical data is to plot coloured symbols on a map. Oasis montaj enables you to create fixed size coloured symbols or symbols that are sized in proportion to the data values. Colours can be based on a variety of colour files, including zone (*.ZON) , aggregate (*.AGG) , table (*.TBL) or image transform (*.ITR) . Symbols can have different fill and edge colours. The fill and edge colours are independent, so they can be set to different values for different channels.

To Plot Location Plot Symbols
The most basic type of symbol plotting in Oasis montaj is to draw location plot symbols on a map for all data points in the database. An example is shown below.
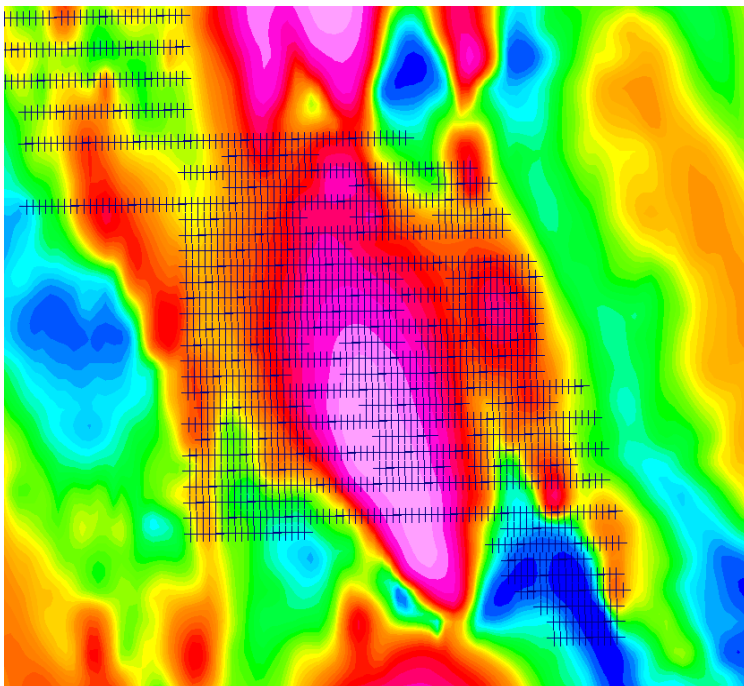
1. Verify the map is selected (highlighted).
2. On the *Map Tools* menu, select *Symbols* and then select **Location Plot**.
   The *Symbol plot* dialog appears.
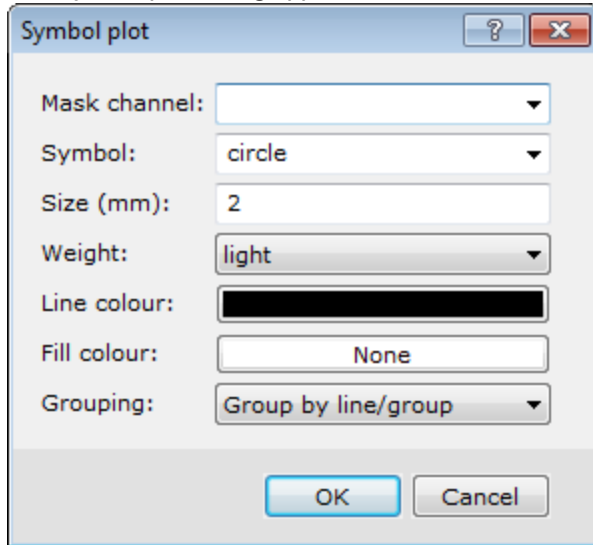
3. Select a *Mask channel* from the drop-down list. If the use of the mask channel is enabled, and set to this channel, only those data values whose corresponding mask channel value is not a dummy will be plotted or exported.
4. Specify the *Symbol* type.
5. Define symbol parameters: *Size*, *Weight*, *Line* and *Fill colour*.
6. Select the *Grouping*: *Group by line/group* or *Individual symbols*.
7. Click **OK**. The system plots and displays the symbols on your map.

To Post Data Values on a Map

Assay data values can be posted next to sample locations on your map. By defining different Posting locations, it is possible to post the values of numerous elements for each sample location (for example, Au, As, Cu, and Pb). Repeat the steps below for each value to post. An example is shown below.
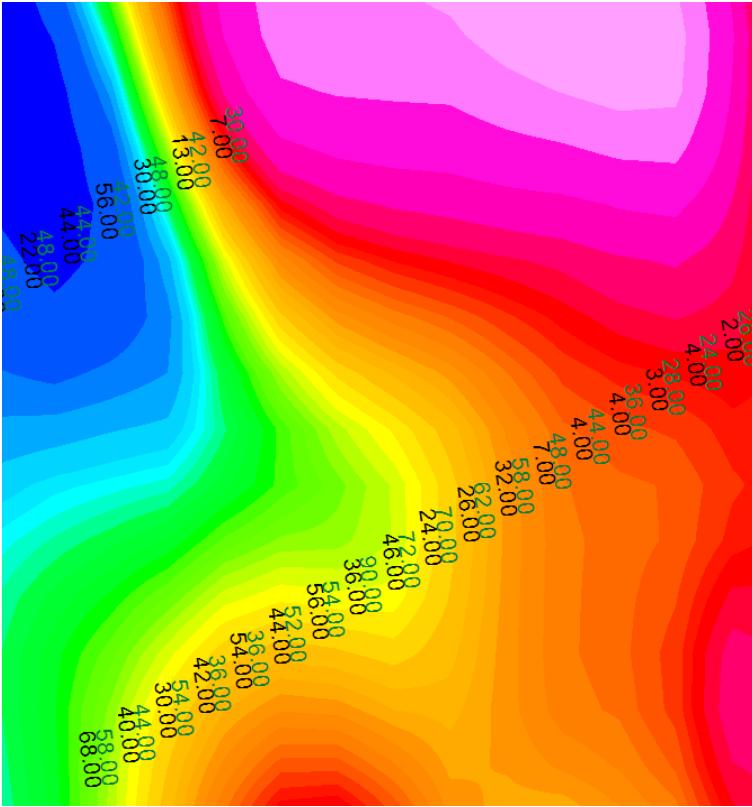
1. On the *Map Tools* menu, select **Posting**.
   The *Post data values on a map* dialog appears.

Post data values on a map		
Post channel:		▾
Posting size (mm):	1.8	
Posting color:	⬛	
Decimal places:		
Post angle (deg CCW):	0.0	
Angle relative to:	Line direction	▾
Posting location:	Above centered	▾
Horizontal offset (mm):	0	
Vertical offset (mm):	0	
Plot Dummy values?:	No	▾
Base to remove:	0.0	
Detection limit:		
Alternate +/-:	No	▾
Reference channel:		▾
Reference increment:	1	

OK   Cancel

2. Select the *Posting channel* from the drop-down list.
3. Define the posting parameters.

💡 *For more information on the dialog selections, click the **Help** button on the dialog.*

4. Click **OK**. The map is redrawn with the values posted.

To Plot Proportional Sized Symbols

You can use the *Proportional size symbols* dialog to place proportionally scaled symbols on your map. An example is shown below.
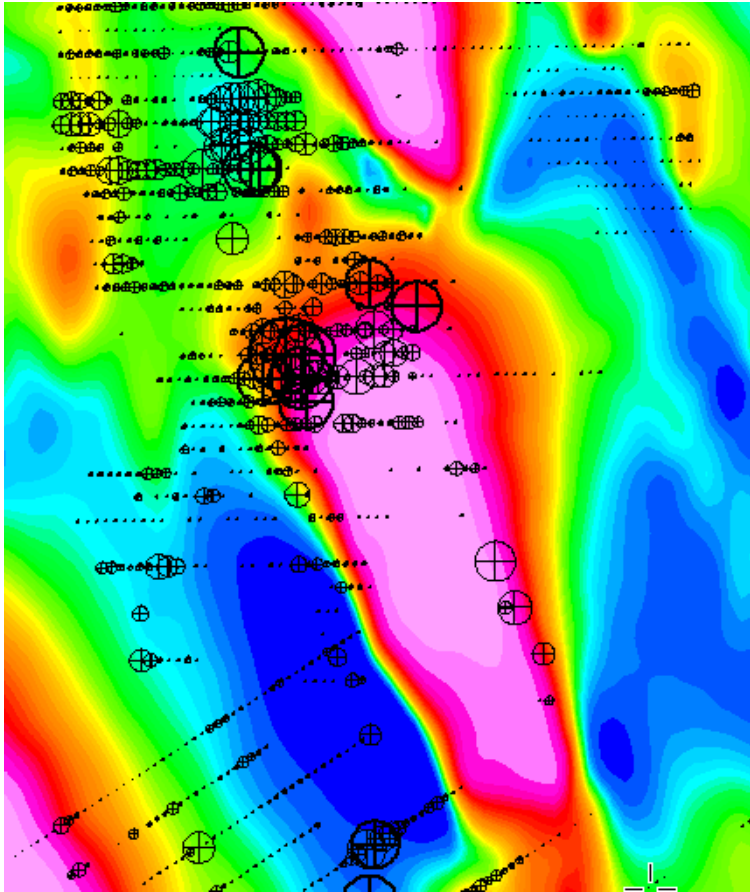
⚠️ *If you specify a base value, the value is subtracted from the data before calculating the symbol sizes. Any negative values that are left after subtracting the base are not plotted.*
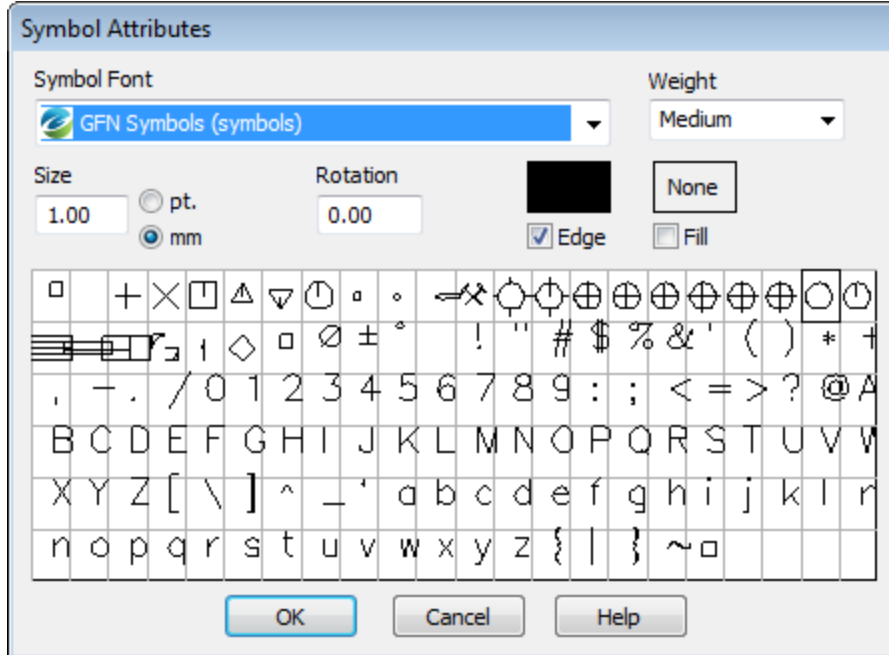
1. On the *Map Tools* menu, select *Symbols* and then select **Proportional Size**.
The *Proportional size symbols* dialog appears..
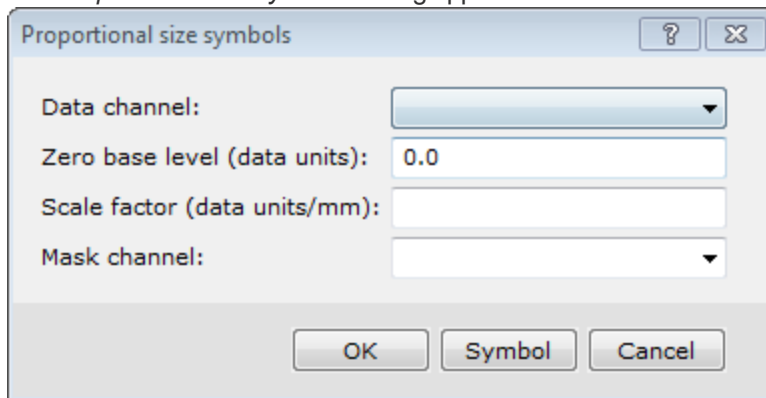
2. Select the *Data channel* from the dropdown list.

3. Define the symbol parameters. The symbol *Scale factor* value indicates how many data units are represented by a 1mm wide symbol. For example, if you specify that the scale is 1000 then a symbol, which has a data value of 20000, is plotted 20 mm wide.
4. Click **Symbol**.
   The *Symbol Attributes* dialog appears.

5. Define the symbol attributes.
6. When you are satisfied with your symbol attributes, click **OK**. The *Proportional size symbols* dialog reappears.
7. Click **OK** to display the symbols on your map.

To Plot Zone Coloured Symbols

Use the *Colored symbols* dialog to place coloured symbols on your map. Symbols can be fixed size, or sized in proportion to data values. An example is shown below.
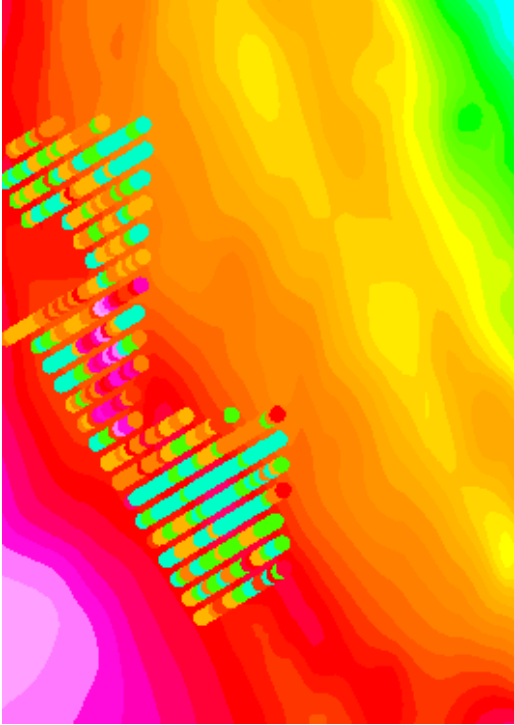
1. On the *Map Tools* menu, select *Symbols* and then select **Zone Coloured**.
   The *Coloured symbols* dialog appears.
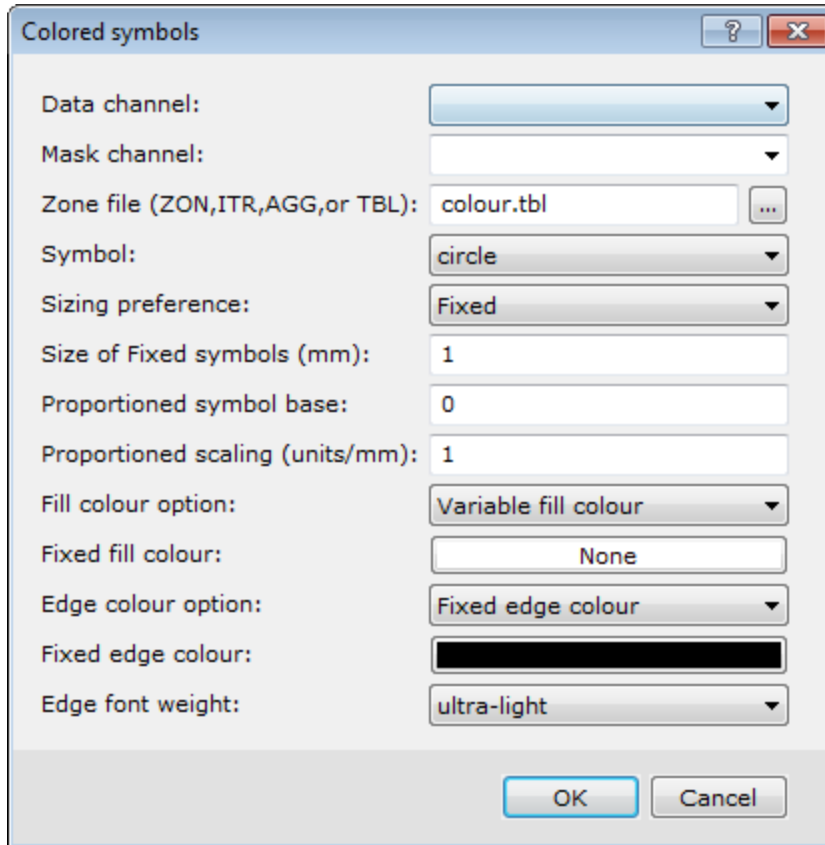
2. Select the *Data channel* from the drop-down list.
3. Specify the rest of the plotting parameters as desired.
4. Click **OK**.
   The *Colour Symbol Tool* dialog appears.
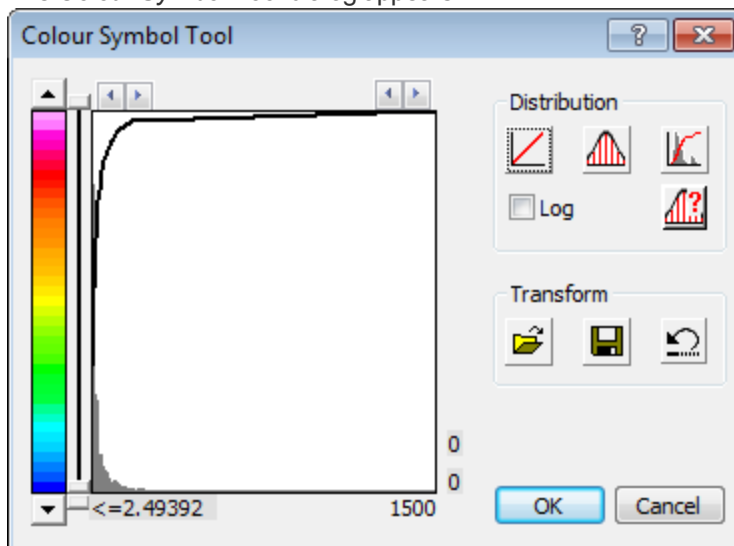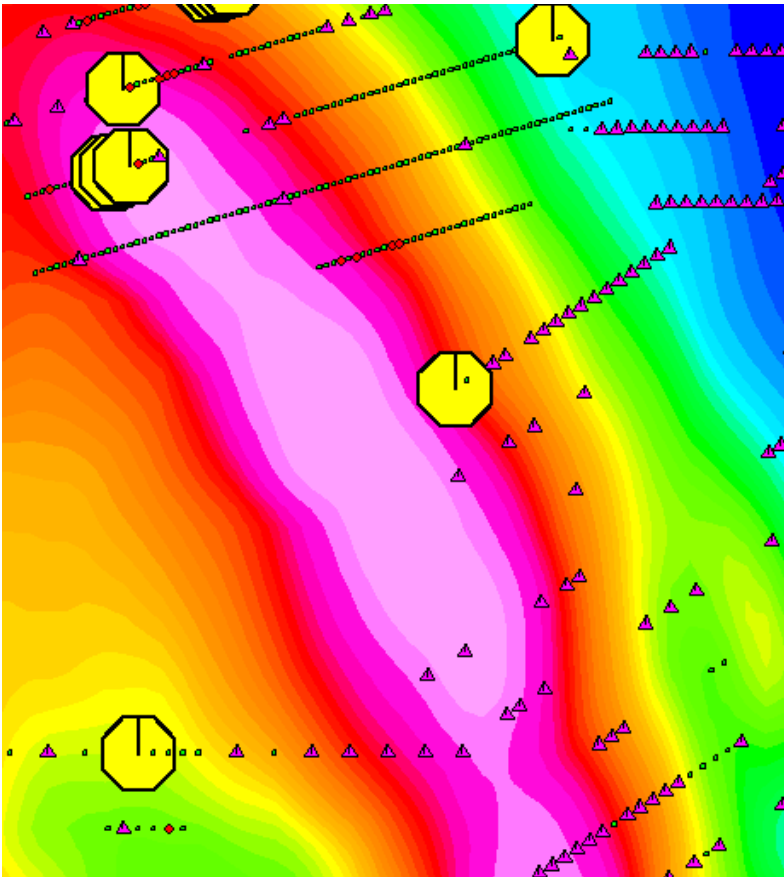
5. Define the Symbol parameters.

   💡 *For more information on the Colour Symbol Tool, click the **Help** button on the dialog.*

6. Click **OK**. The system plots the zone coloured symbols on the map.

To Plot Colour Range Symbols

The Colour Range Symbols are the most flexible of the entire symbol tools collection. The dialog allows for different ranges of data to be plotted using different symbols, colours and sizes. An example is shown below.
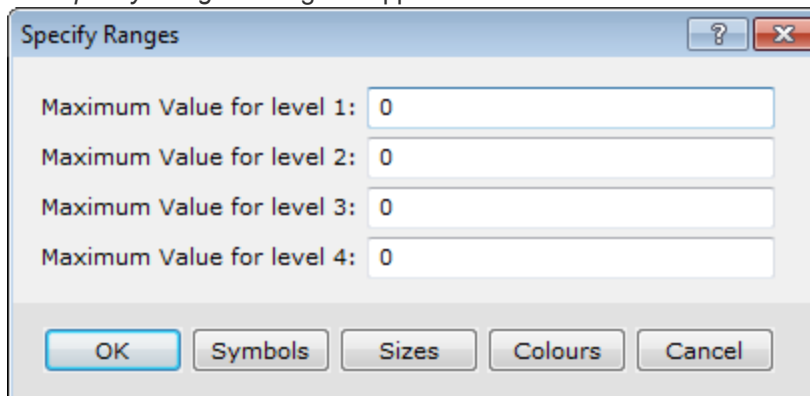

1. On the *Map Tools* menu, select *Symbols* and then select **Colour Range Symbols**.
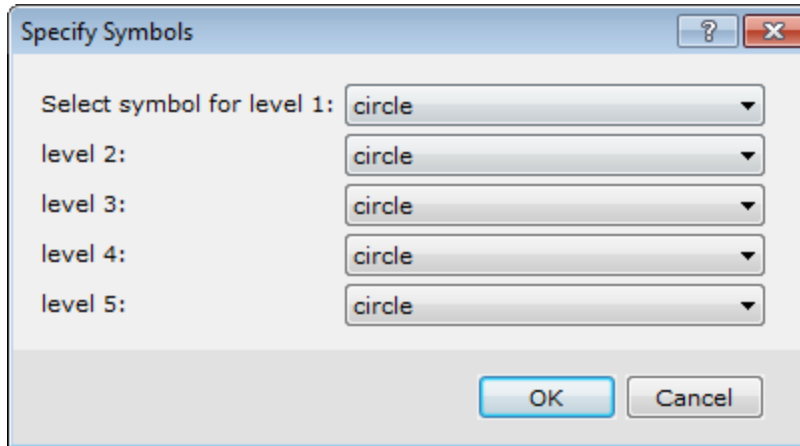   The *Classified symbol plot* dialog box appears.
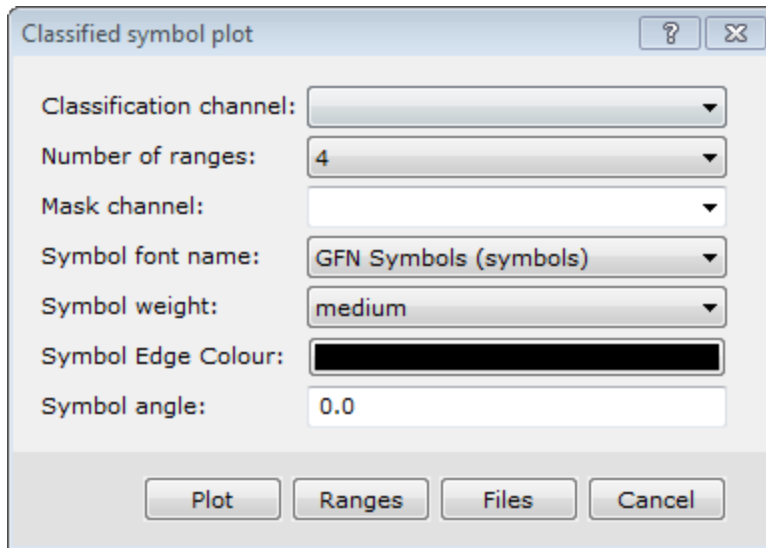
2. Specify *Classification channel* from the dropdown list.
3. Define the symbol parameters as desired.
4. Click **Ranges**.
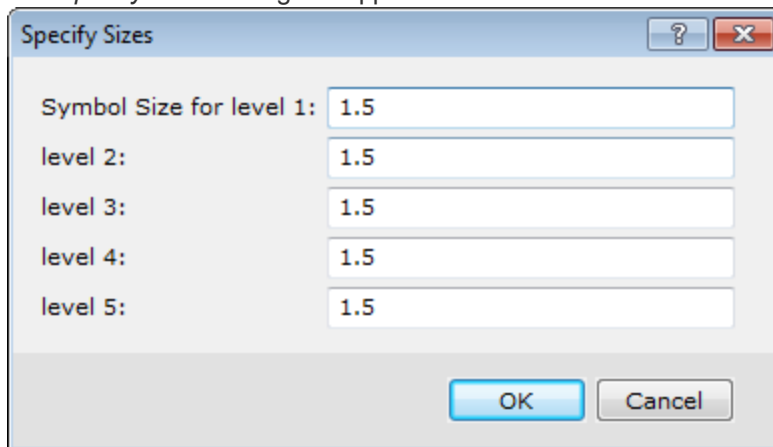   The *Specify Ranges* dialog box appears.

5. Specify the extent of each range by entering the maximum value for each range.
6. Click **Symbols**.
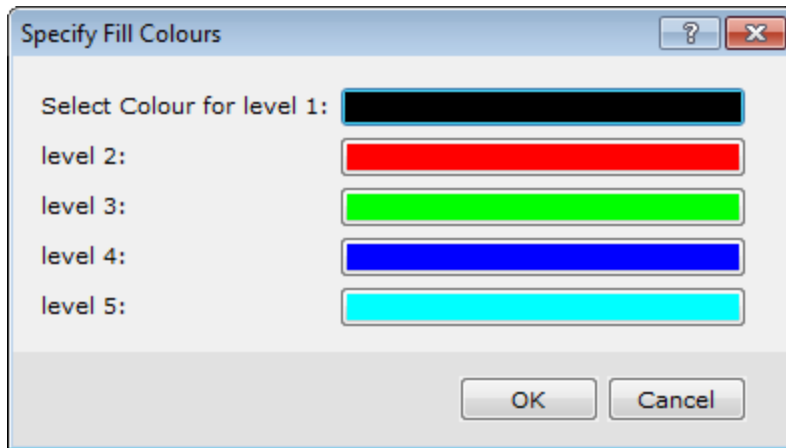   The *Specify Symbols* dialog box appears.

7. Specify the desired symbol shape for each range. In this example, circles were chosen for all of the ranges.
8. Click **OK** to return to the *Specify Ranges* dialog box.
9. Click **Sizes**.
   The *Specify Sizes* dialog box appears.

10. Specify the *Symbol Size* for each level.
11. Click **OK** to return to the *Specify Ranges* dialog box.
12. Click **Colours**.
    The *Specify Fill Colours* dialog appears.

13. Choose the colours for the 5 levels.
14. Click **OK** to return to the *Specify Ranges* dialog box.
15. Click **OK** to return to the *Classified symbol plot* dialog box.
16. Click **Plot**. The classified symbols are plotted for all 5 ranges on the map.

To Plot a Colour-Range Symbol Legend

When you use classified symbols, you will most likely create a legend showing the symbol colours and size ranges used on the map. An example creating a legend for gold (Au) is shown below.
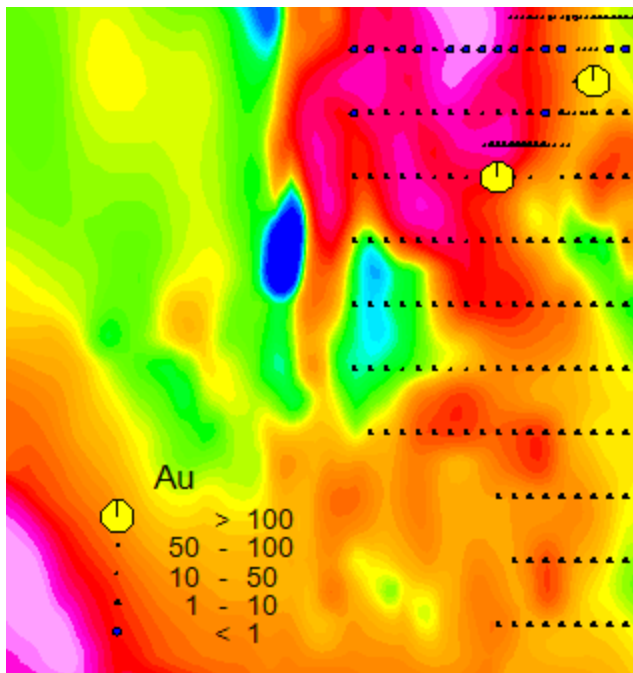

⚠️ *This option is also used for plotting legends for the zoned colour symbols where a (*.ITR) file must be specified. A (*.ITR) file is created when the zoned colour symbols are plotted. The default name is the channel-name.itr, e.g. Au.itr.*
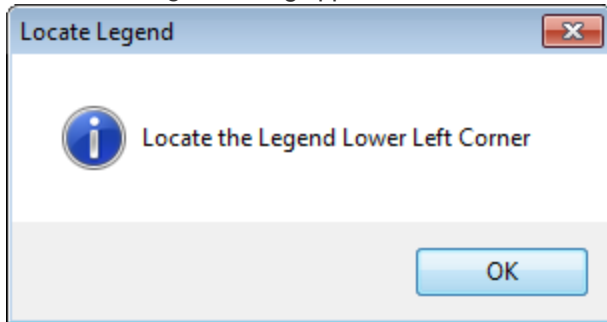
💡 *Legends can be created for several symbol types. Please refer to the Application Help files for details on creating other legends.*

1. On the *Map Tools* menu, select *Symbols* and then select **Colour Range Symbol Legend**.
   The *Classified Symbol Legend* dialog appears.
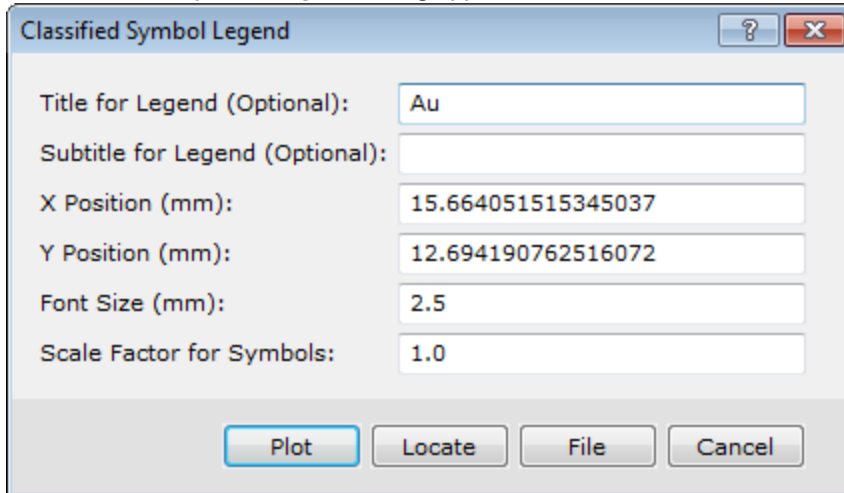
2. Specify the Legend title and Subtitle, if desired.
3. Click **Locate**.
   The *Locate Legend* dialog appears.

4. Click **OK**. Your mouse will turn into a cross-hair. Left-click where you want the lower left corner of the legend to be located.
5. The system redisplays the *Classified Symbol Legend* dialog box with the *X and Y Position* fields completed.
6. Click **Plot**. The system plots the legend on the map.

⚠️ *When you select this option, the system automatically records the colour, symbol and size settings you specified when creating the range classified symbols. This makes generating a legend easy.*

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