

Calculating Volumes Tutorials

For this tutorial, we'll be using a sample stockpile drawing and calculating its volume using five distinct techniques.

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We begin in the DTM-Contour module by drawing a perimeter polyline using the outermost points of the stockpile. The perimeter polyline limits the volume calculation to the area within the polyline. Always use the perimeter polyline as the inclusion polyline for routines that prompt for an inclusion polyline. In this example, the perimeter polyline consists of points 2000 - 2028. To pick these points you can set your osnap to node using the Aperture-Object Snap under the Inq-Set pulldown menu. Then run the Draw 3D Poly Perimeter found in the Site menu. After you draw your perimeter polyline, simply return your osnap to none.

The volume calculations are created using the difference between a base and a final surface model. In this example, the Base surface is modeled by the perimeter polyline, whereas the Final surface is modeled by the perimeter polyline and the points.

Draw 3D Poly Perimeter

Ignore Z values of pick points (.XY filter)

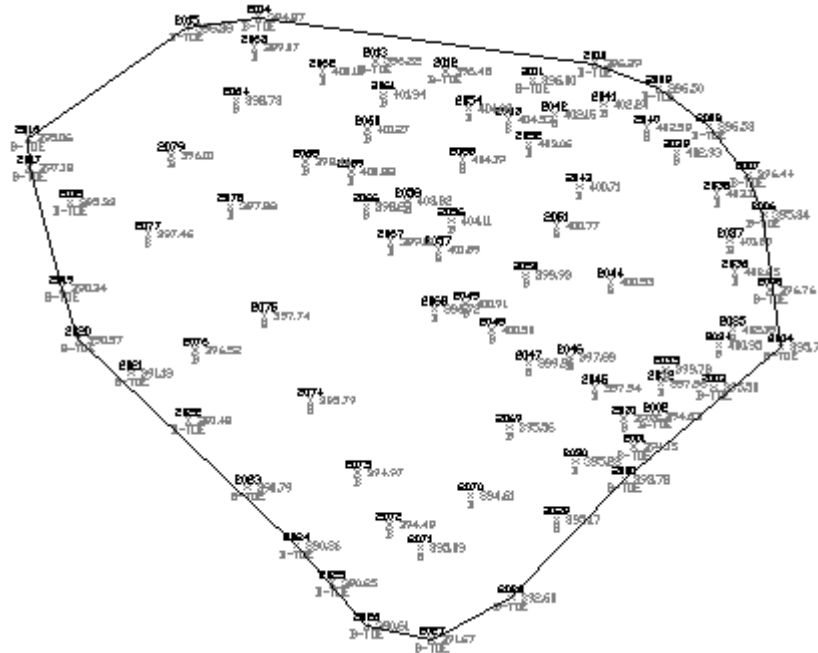
(Yes/<No>)? Press Enter

Use surface model from file (Yes/<No>)? Press Enter

Undo/Pick point or point numbers>: Pick the points

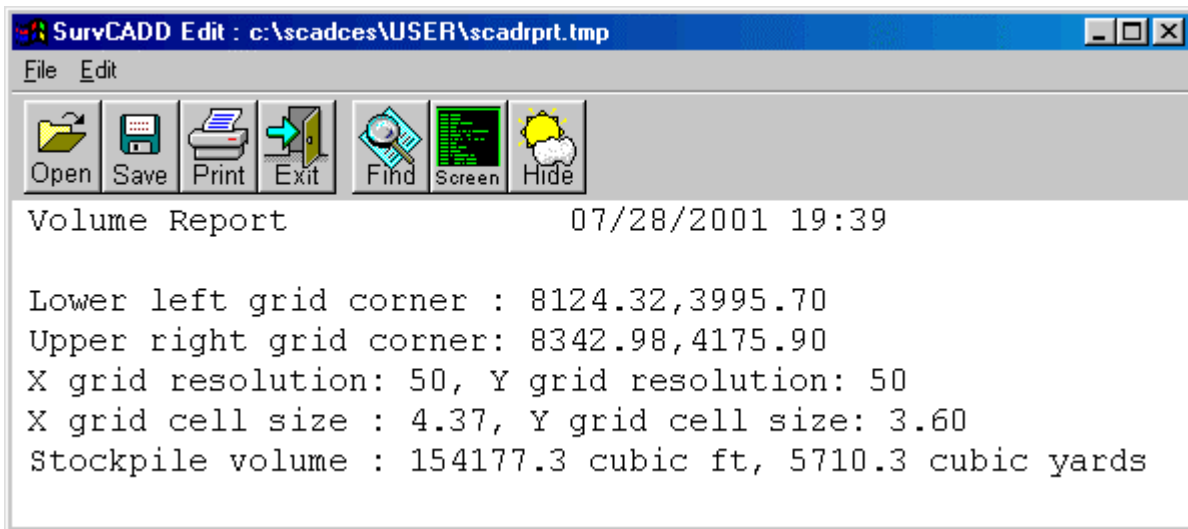
that create the perimeter polyline

Calculate Stockpile Volumes (Site menu - DTM-Contour Module)



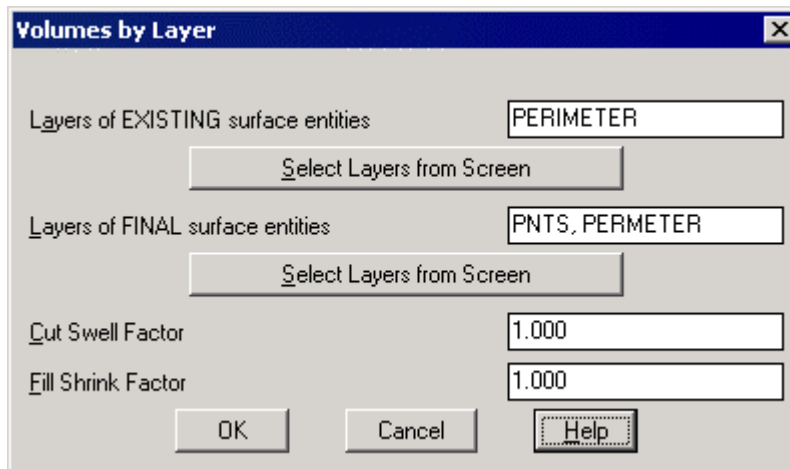
This command is a very straightforward way of calculating the volumes for a stockpile. First the program prompts whether to ignore zero elevations (which neatly voids all extraneous lines and frames, etc., which are defaulted to a zero elevation). Then you select all the stockpile objects and the program automatically calculates the base and final surfaces and the volume. The base surface is modeled by the 3D polyline in the PERIMETER layer. This polyline is also automatically used as the inclusion perimeter. The final surface is modeled using all the selected objects. A Volume Report is then generated showing the volume in both cubic feet and cubic yards.

Material density lbs/ft³ (Enter for none): **press enter**
Ignore zero elevations (<Yes>/No)? **press enter**
Select stockpile entities and perimeter.
Select objects: **select all the stockpile objects**
Select objects: **press enter**



Volumes by Layers (DTM menu - DTM-Contour Module)

The Volumes by Layers command prompts the user to window the surface area (the stockpile) and creates grid models for the base and final surface from this selection and then calculates the volumes. The Volumes by Layer dialog box prompts the user for the Existing and Final layers. In this example we've set the Existing layer to [perimeter] and the Final layers to [perimeter] and [pnts]. By using these settings, the Existing surface will be modeled by the polyline in the [perimeter] layer, and the Final surface will be modeled by both the same [perimeter] polyline and all the points in the [pnts] layer.



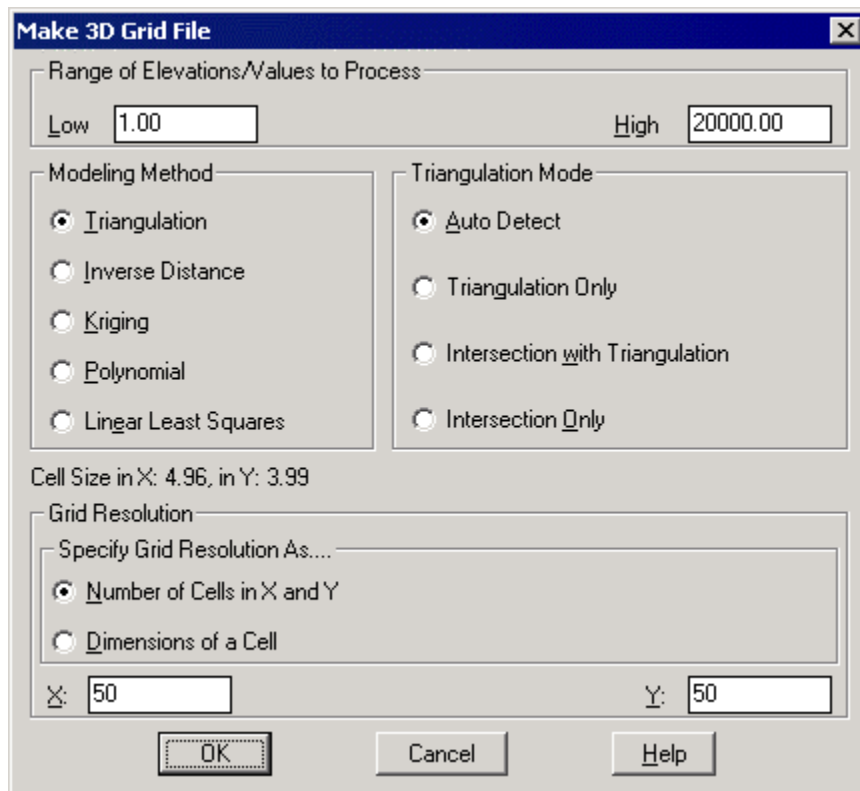
Pick Lower Left limit of surface area:
Pick lower left corner to window the stockpile
Pick Upper Right limit of surface area:
Pick upper right corner to complete window of stockpile
Select surface entities on corresponding layers.
Select objects: Window the stockpile
Select objects: Press Enter
Select the Inclusion perimeter polylines or ENTER for none:
Select the perimeter polyline
Select objects: Press Enter
Select the Exclusion perimeter polylines or ENTER for none:
Press Enter

Two Surface Volumes (DTM menu - DTM-Contour Module)

Two Surface Volumes is a powerful routine that allows the user to produce a wider range of output with the addition of a Volume Report Options dialog box available at the end of this command (an example is shown below). Before running Two Surface Volumes the user must create the two grid files by using the Make 3D Grid File located under the DTM pull-down menu. The first grid file should be the base (Fig. 1). You will want to pick its grid position from the screen since this creates the layout area for the *.grd file that you create (i.e. base.grd).

Use position from another file or pick grid position (<Pick>/File)? Pick
Pick Lower Left grid corner: Pick lower left corner to window stockpile
Pick Upper Right grid corner: Pick upper right corner to form window
Make Grid File Dialog Shown to left. Click OK.
Select the points, line and polylines to grid from.
Select objects: pick the base perimeter
Select objects: Press Enter

The Make Grid File dialog box then appears and the user may fill it out accordingly.



You will then be prompted to select the objects for the base file, which is simply the perimeter polyline. The user then needs to create a second, or final, grid file which, in this example, we've called pile.grd (Fig. 2). This file will consist of the perimeter polyline and all of the stockpile points. In creating this grid file it is important to remember to select 'File' when prompted 'Use position from another file or pick grid position?'. This allows you to then select your base file grid position so that your final grid file perfectly overlaps the base grid file (Fig. 3). This method will then prompt you for low elevation and high elevation where the defaults are generally sufficient. You will then be prompted

to select the objects for this final grid file so you will need to select the perimeter polyline and all the stockpile points, as explained earlier.

Use position . . . pick grid position (<Pick>/File)? File

Range of Elevations to Process.

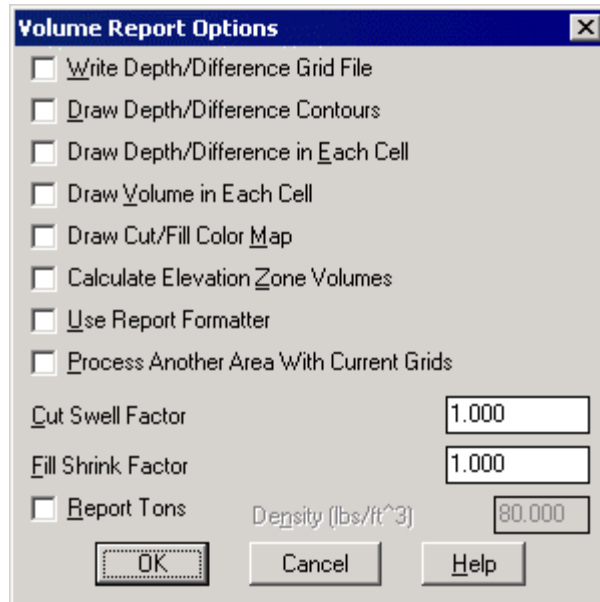
Low Elevation <1.0>: Press Enter

High Elevation <20000.0>: Press Enter

Select the points, lines, and polylines to grid from.

Select objects: Pick perimeter polyline and all points on and inside

Now that you have your base grid file and a final grid file you will want to calculate the volume between these two files by using the Two Surface Volumes command. When you run this command, the inclusion perimeter is once again the perimeter polyline.



A Volume Report is then produced, followed by the Volume Report Options menu, which allows the user to calculate output for these additional options.

Select the Inclusion perimeter polylines or ENTER for none.

Select objects: Select the perimeter polyline

Select objects: Press Enter

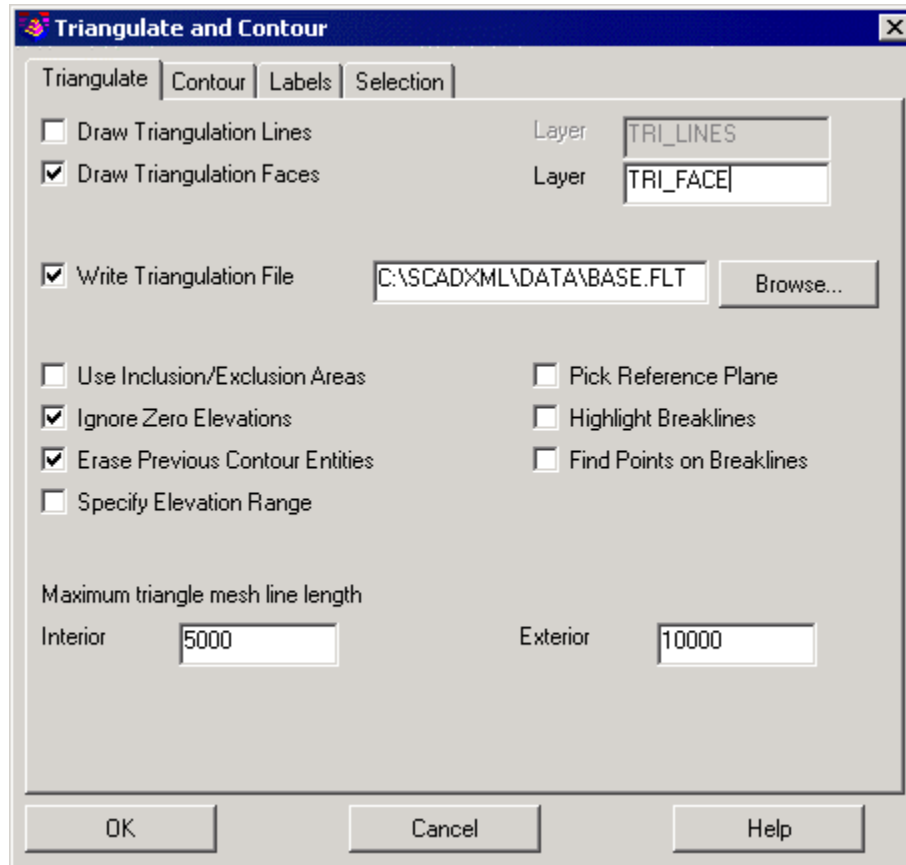
Select the Exclusion perimeter polyline or ENTER for none.

Select objects: Press Enter

Select your base and final grid files to process

Volumes by Triangulation (DTM menu - DTM-Contour Module)

To use Volumes By Triangulation you must create two triangulation (.FLT) files. As in the other volume calculations you create a base file and a final file, where again, in this example, we will name these base.flt and pile.flt. To create these files, go to Triangulate & Contour under the Contour pull-down menu.



The dialog box will appear as shown above, where you will want to turn OFF the Draw Contours option on the Contour tab and turn ON the Write Triangulation File option on the Triangulate tab. Enter the name of the Triangulation File, or press the Browse button to select the file name. After selecting OK, you will then pick the perimeter polyline to create the base file.

Select the points and barrier lines to Triangulate.

Select objects: Select the perimeter polyline

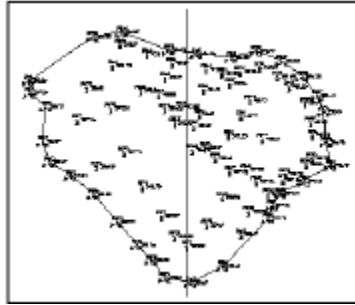
Repeat the Triangulate & Contour command for the final triangulation file, except you will select all the objects to create pile.flt.

Select the points and barrier lines to Triangulate.

Select objects: Select the perimeter polyline and inclusive points

The Volumes By Triangulation command will calculate the volume of the stockpile using the difference between these two triangulation files. Simply run this command, selecting the perimeter polyline for the inclusion perimeter, the base triangulation file (base.flt) for the EXISTING Surface Tmesh File”, and the final triangulation file (pile.flt) for the “FINAL Surface Tmesh File”.

Calculate Sections Volume (Section menu - Section-Profile module)



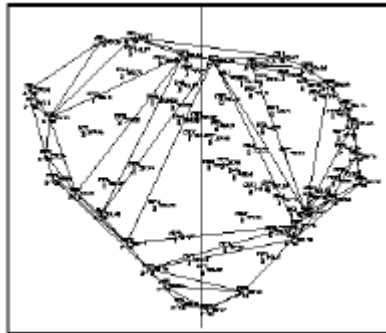
To use the command Calculate Sections Volume you will need to create two section files (*.sct), a cross-section file (*.mxs), and two triangulation files (*.flt). To create your cross-section file, draw a polyline through the middle of the stockpile (as shown at right from top to bottom) for your 'centerline'. Then run MXS File By Polyline in the Section-Profiles module to create a new *.mxs file. In this example it's called 'xsection.mxs' and contains left and right offsets of 200. Then pick the 'centerline' polyline to create the offsets.

Polyline should have been drawn in direction of increasing stations.
Select Polyline or 3DPoly that represents CenterLine: Pick centerline
Additional Odd Station (Enter to end): Press Enter

Now run the Triangulate & Contour command in the DTM menu, turning on only the Draw Triangulation Lines box and picking the perimeter polyline.

Select the points and barrier lines to Triangulate.
Select objects: Pick the perimeter polyline

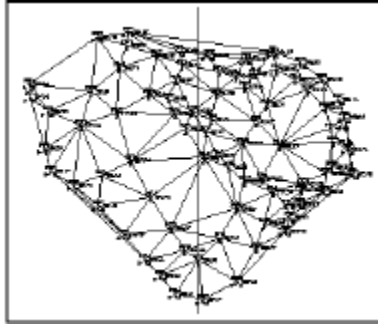
This will draw a set of triangulation lines using only the perimeter points. Returning to the Section-Profiles module, run the Sections from Surface Entities command and select the perimeter polyline and the newly created triangulation lines. This creates the base file (base.sct).



Select Lines, PLines, and/or 3DFaces that define the surface.
Select objects: Pick the perimeter polyline and newly create triangulation lines

Now simply freeze the triangulation lines layer (usually TMESH) using the Freeze Layer command under the Display pull-down menu. This will allow you to create a second section file (*.sct) using separate triangulation lines. Returning to the DTM module, again run Triangulate & Contour under the Contour pull-down menu, with the exception of renaming the triangulation layer to TMESH2 or another appropriately unique title. This will allow the user to create a second triangulation file where the triangulation lines

are located on entirely separate layers allowing for greater flexibility. Select all the points on and inside the perimeter polyline to create the second triangulation grid.



Select the points and barrier lines to Triangulate.

Select objects: Pick the perimeter polyline and stockpile points

Run Sections from Surface Entities, creating the final section file (pile.sct) using all the objects on and inside of the perimeter polyline. This conveniently excludes the base triangulation lines in the frozen 'TMESH' layer.

Select Lines, PLines, and/or 3DFaces that define the surface.

Select objects: Window select the perimeter polyline and inclusive objects

Now you can run the Calculate Sections Volumes command under the Sections pull-down menu to calculate your volumes. As in the previous examples, choose the base file (base.sct) for the Existing Ground and the final file (pile.sct) for the Final Ground.