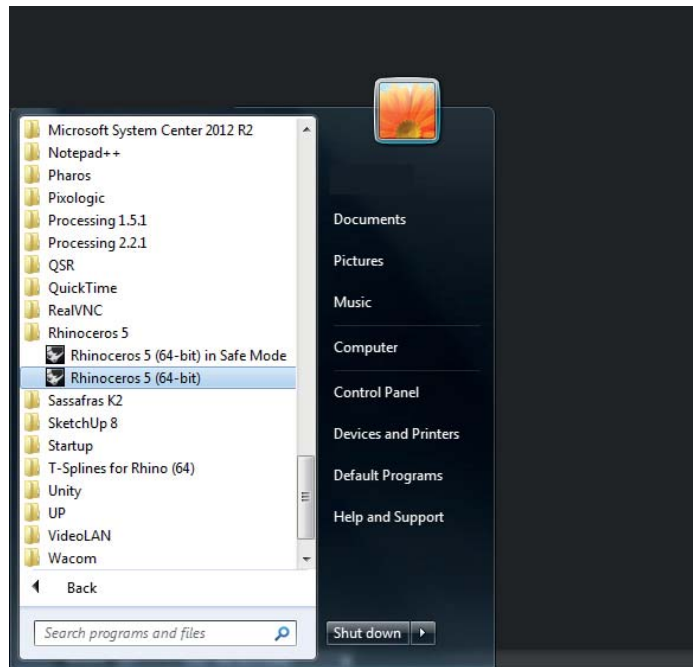


Tutorial Prerequisite

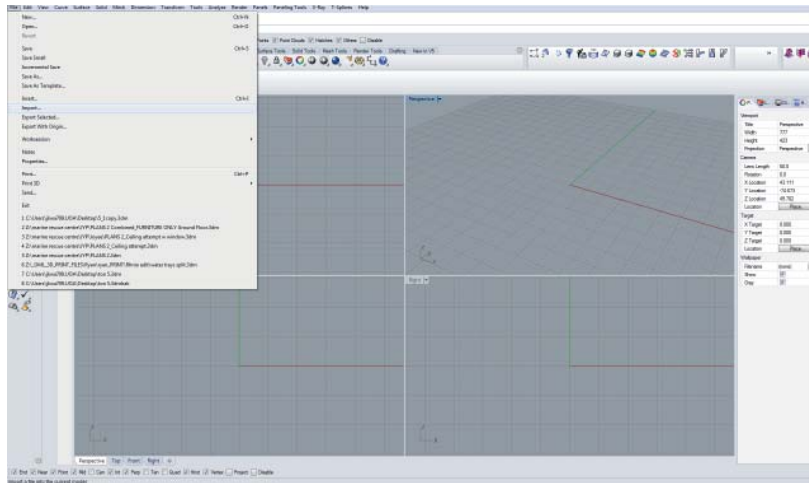
Contour lines from a GIS database in a drawing format such as .DWG or .DXF

1. Open Rhino	Pg 3
2. Import .dwg or .dxf	Pg 4
3. Position	Pg 5
4. Form Boundary	Pg 6
5. Open Grasshopper	Pg 7
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7. Extract curve endpoints	Pg 9
8. Create terrain mesh	Pg 10
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10. Set accuracy	Pg 12
11. Bake to Rhino	Pg 13
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13. Baked mesh	Pg 15
Example script	Pg 16



1. OPEN RHINO

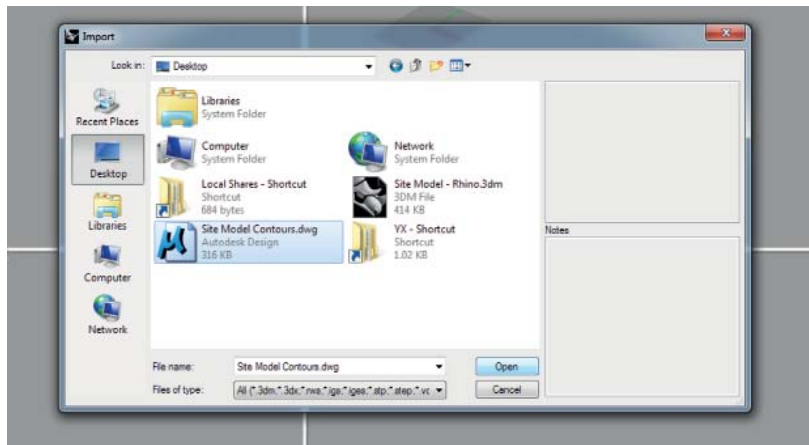
Open Rhino, under Start> All Programs> Rhinoceros 5> Rhinoceros 5.0

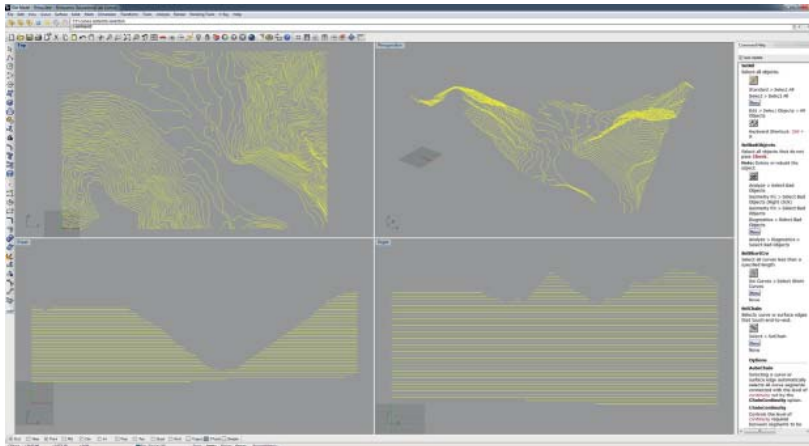


2. IMPORT .DWG or .DXF

Import contour file under **[File] > [Import]**

Navigate to the folder you saved the contour lines in and **[Open]**



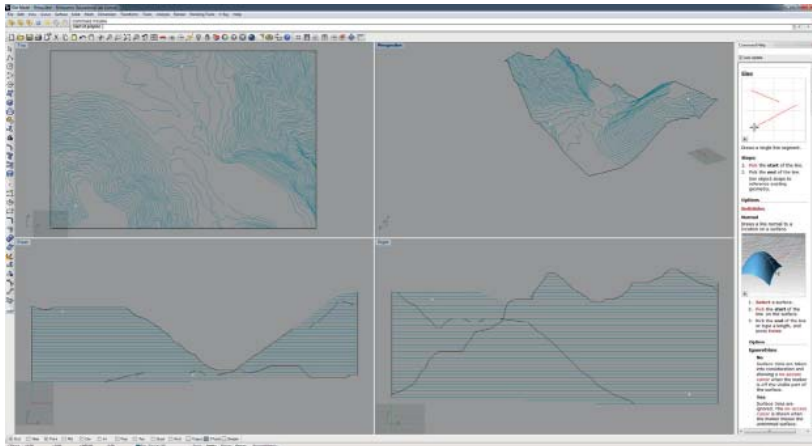


3. POSITION

Your contours will be imported as polylines.
Make sure that:

The contours are located around the centre of the workspace.

If not, type in “[Move]” to move the contours to the centre.
The centre is marked with a dark grey grid.
(This is to prevent display/meshing inaccuracy)



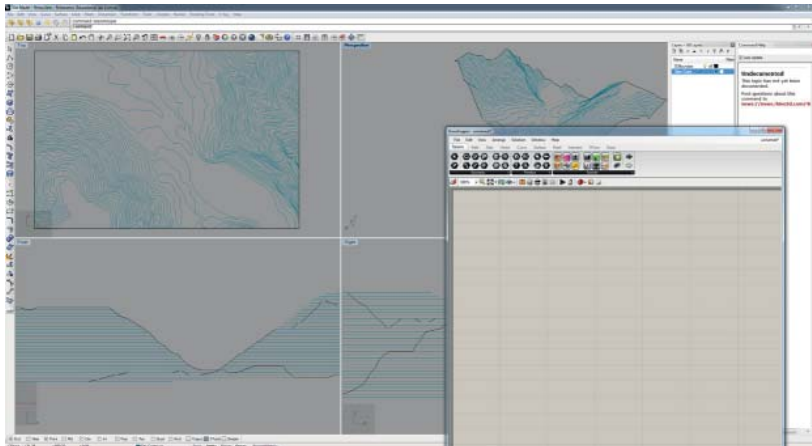
4. FORM BOUNDARY

If not already done, trim the contour to your site boundary.

1. Draw an outline (using "Polyline" or "Rectangle" tool)
2. Use the outline to trim the contours (type "[Trim]")

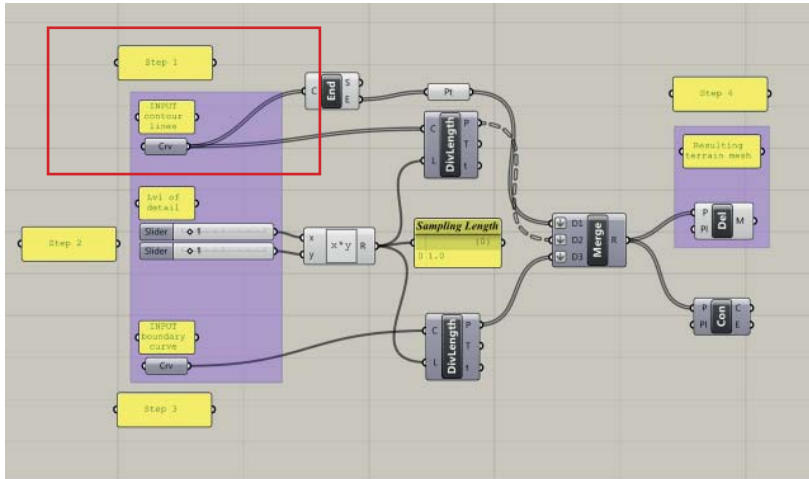
Not required, but it is useful to draw a 3D boundary following the contours, or else your terrain model may be cut off at the corners.

1. Draw with a polyline and have "OSnap" on, snapping to the Ends of the contours
(Turn on "OSnap" at the bottom of the display port, and ensure "End" is ticked)



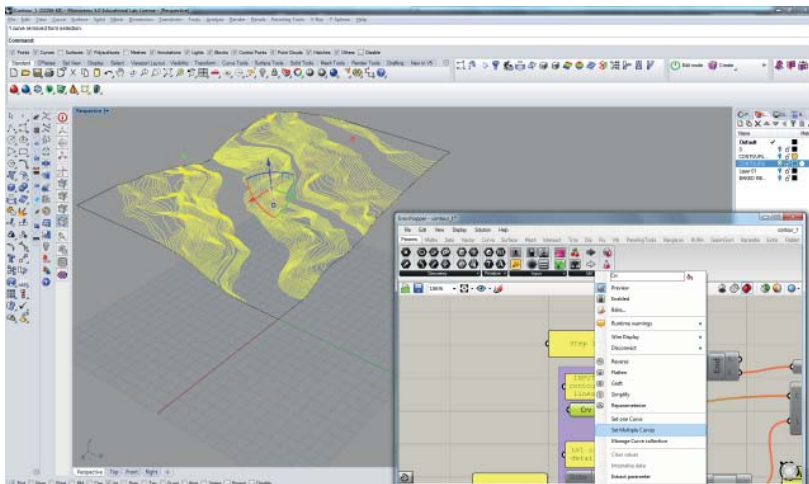
5. OPEN GRASSHOPPER

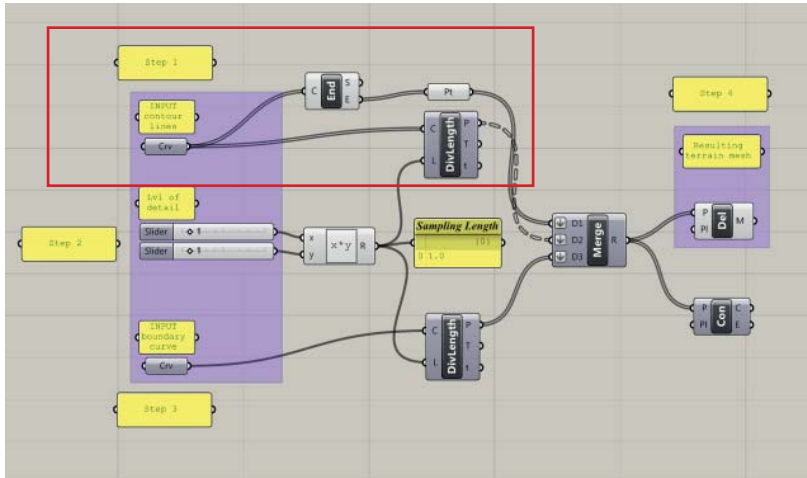
To open Grasshopper type "[grasshopper]"



6. INPUT CONTOUR CURVES

Input the contour curves by selecting all contours in Rhino, then right-click "[Curve]" component > **Set Multiple Curves**

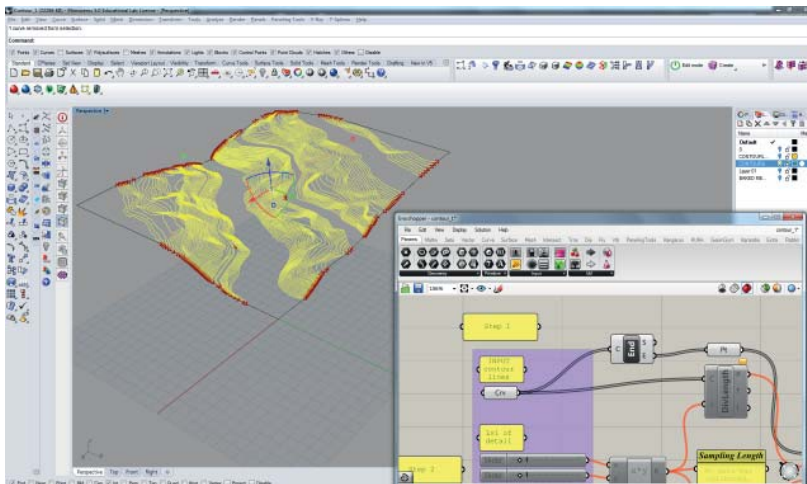


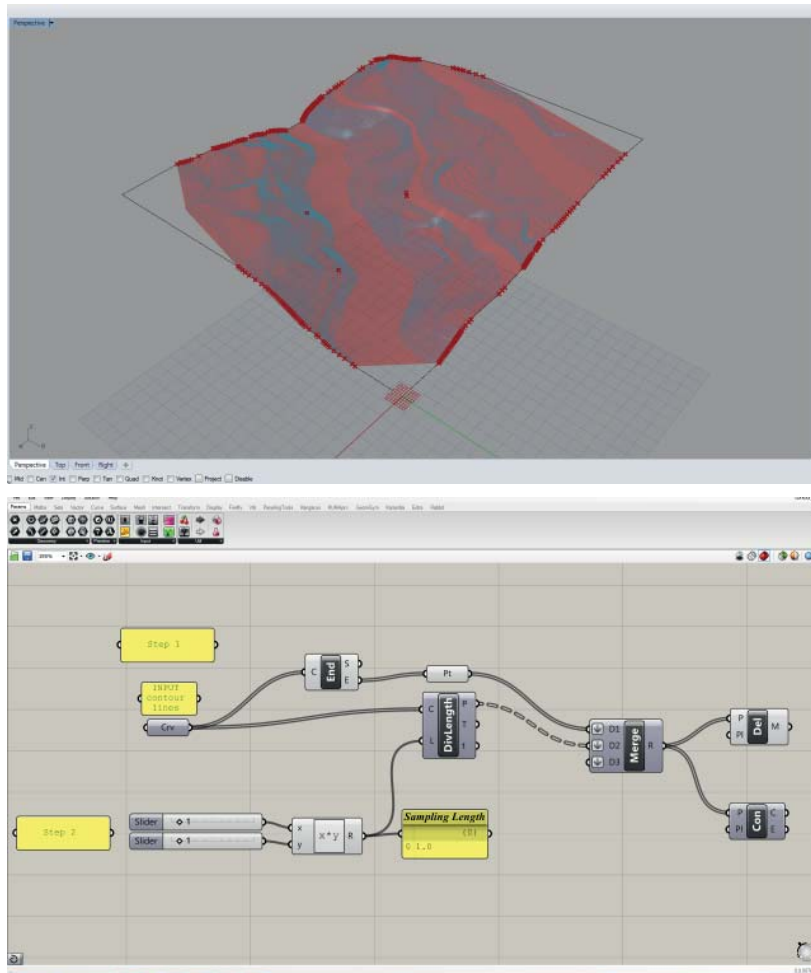


7. EXTRACT CURVE END POINT

To extract contour curve endpoints:

1. Plug curves into "[End Points]" component
2. Plug "end" into "[Points]" component



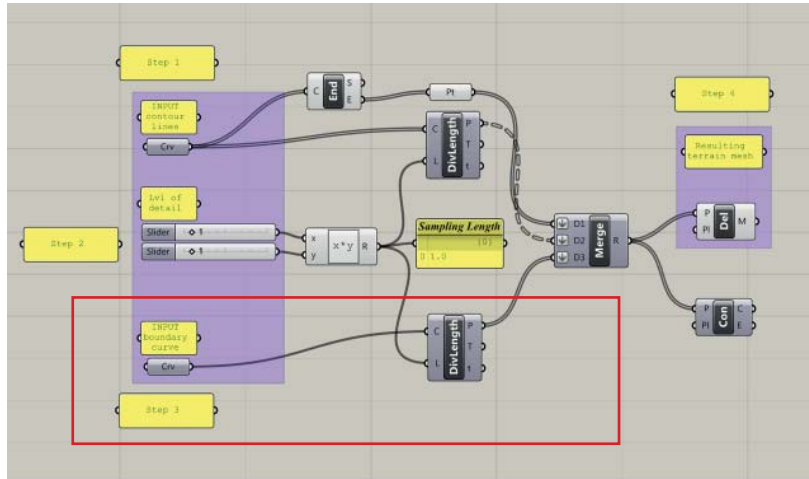


8. CREATE TERRAIN MESH

1. Connect points to “[Merge]” component
2. Connect Result to “[Delaunay Mesh]” component

The terrain will be displayed as a mesh (in red) once the contour lines are set.

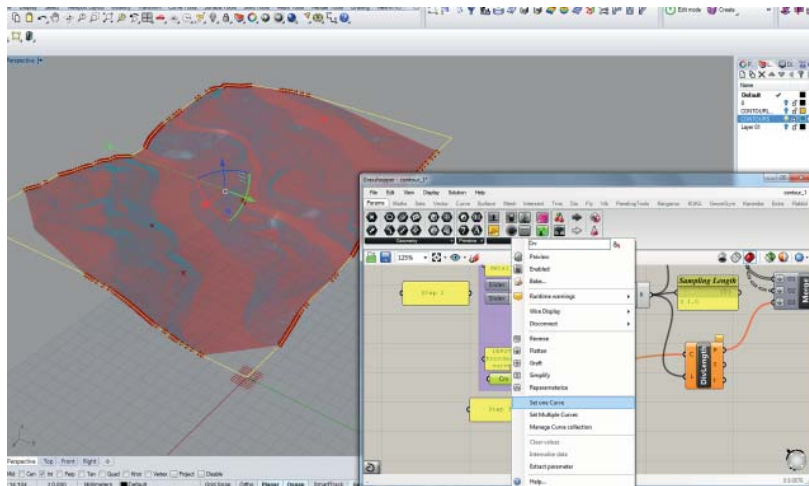
Note that the corners are missing. If this is not an issue skip to step 13. Otherwise make sure you have a 3D boundary following the contour ends.

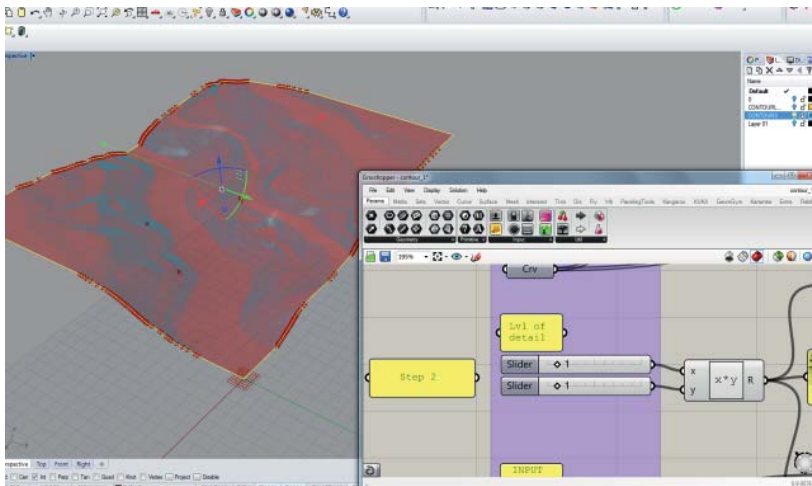
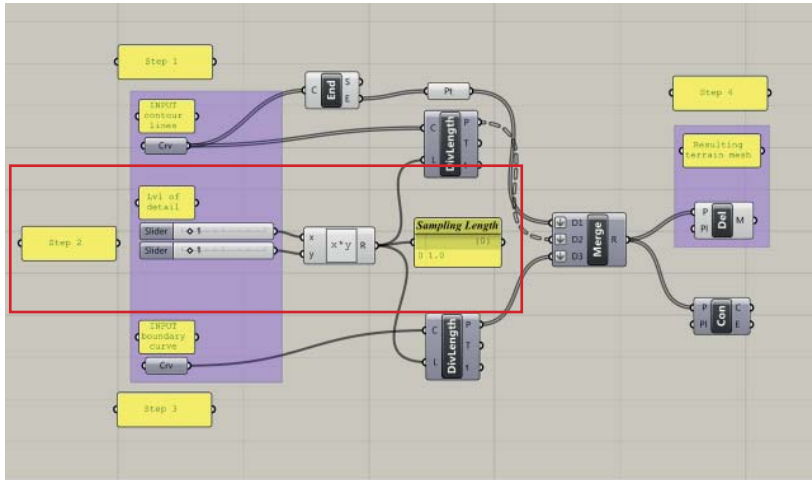


9. REFERENCE CONTOUR BOUNDARY

To fill in the corners of the mesh reference the contour boundary lines:

Select boundary curve, then right click on "[Curve]" component, then "Set One Curve".





10. SET ACCURACY

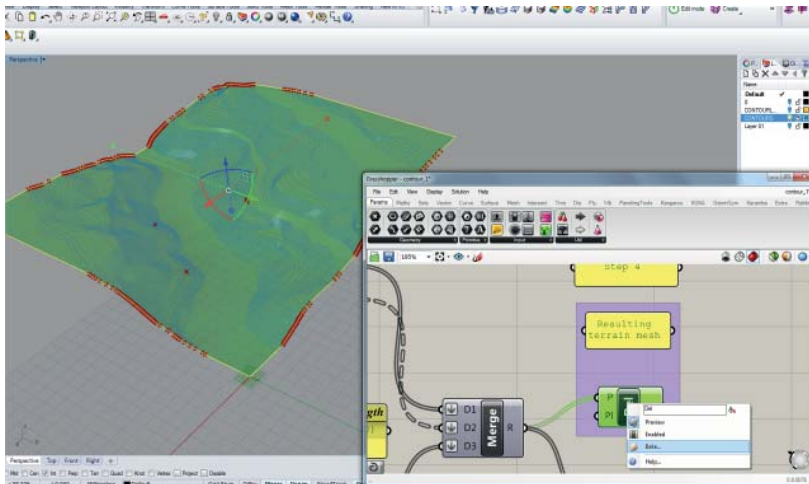
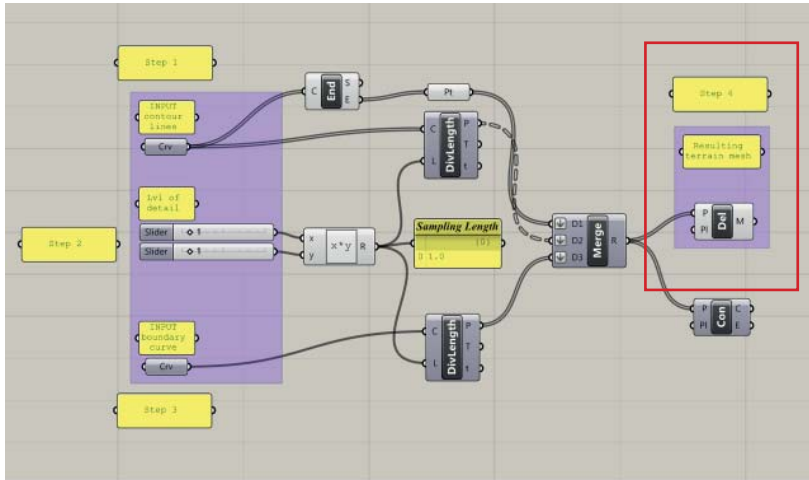
Control the level of detail by editing “Length” in “[Divide Length]” Component.

Plug sliders into “[Expression]” component and edit expression: right-click, “edit expression” > type $x*y$

Some models may be too large, and have too much detail to work with. (Too many polygon faces to render etc.)

For small sites the sampling length should be around 1 to 10 meters.

For large sites the sampling length should be around 10 to 100 meters.

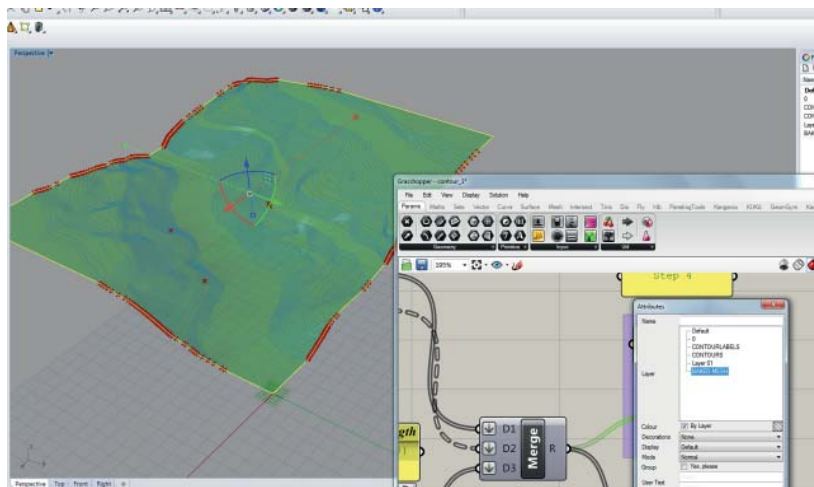


11. BAKE TO RHINO

Your terrain mesh only exists as information in grasshopper.

To get it in to Rhino (to render, model with etc) you must bake it:

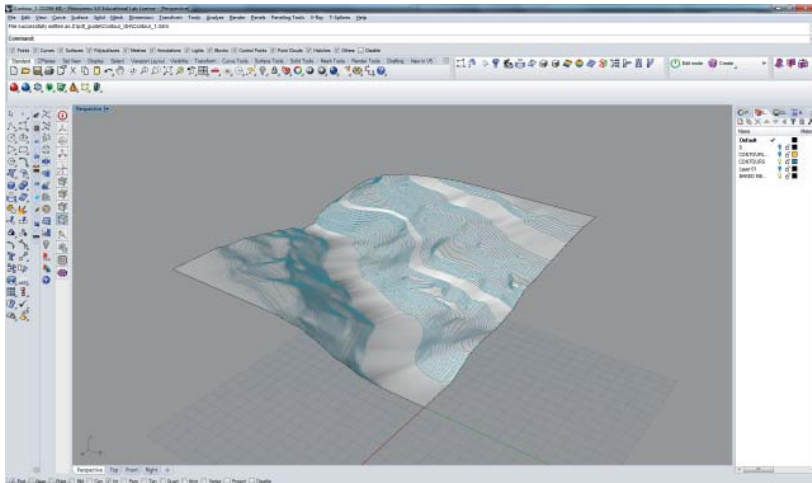
Right click on "[Delaunay Mesh]" component, click "Bake".



12. CHOOSE LAYER

Select which layer to bake the terrain mesh to:

This can be an existing layer in Rhino, or you can create a new layer.



13. BAKED MESH

You have now completed a terrain mesh model.

