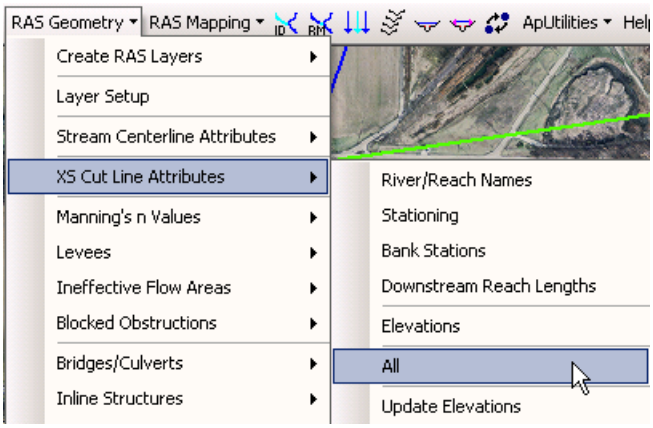
Creating bathymetric mesh using field surveyed channel elevation data.

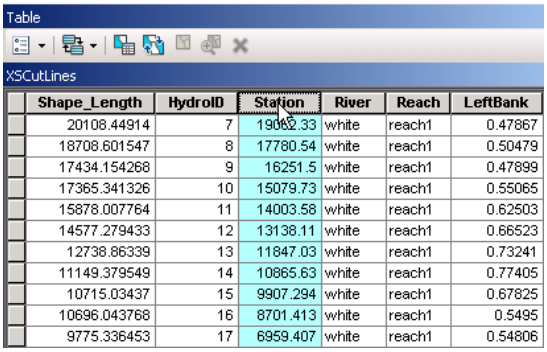
Additional information is available in the GeoRAS manunal and in the tutorial document below. The tutorial document b describes how to download the tool. The tutorial also describes how to run the tool but steps below describes in more detail how to run the tool and shows some modified use of the tool. (http://web.ics.purdue.edu/~vmerwade/research/bathymetry_tutorial.pdf).

1. Filter the field data if needed with Haversine (or something similar) program to about 50 - 100 points per xsection. Project the field data to match the rest of base GIS data (i.e. State Plane West/East).
2. Start the GeoRAS geometry process to create center line, bank lines, flowpath lines and xscutlines as you would do normally. Be sure to follow streamflow direction (i.e. upstream to downstream, left to right bank…).

Run all the "RAS Geometry" steps (as normal) prior to and including the highlighted step below.



Make sure “Station” column is populated in XScutlines table.

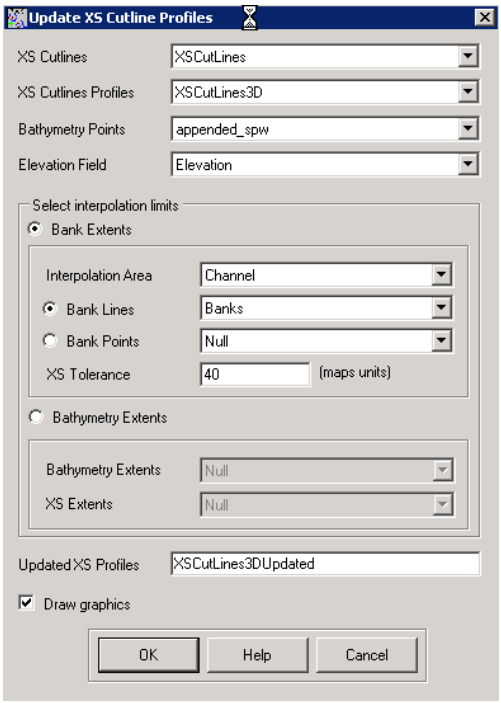


Table

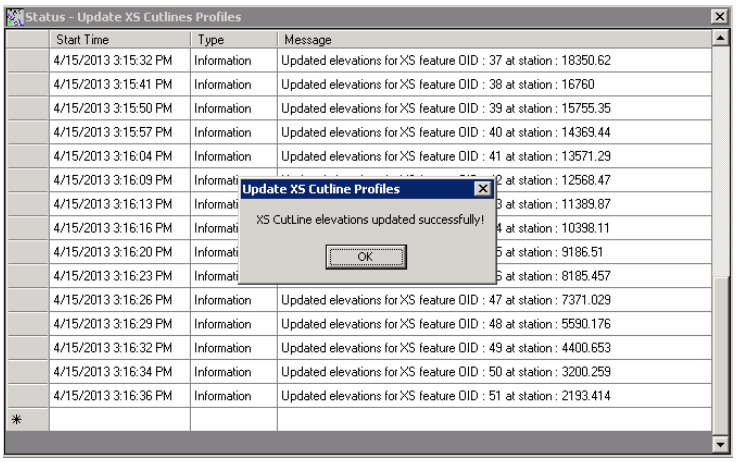
XSCutLines

Shape_Length	HydroID	Station	River	Reach	LeftBank
20108.44914	7	19062.33	white	reach1	0.47867
18708.601547	8	17780.54	white	reach1	0.50479
17434.154268	9	16251.5	white	reach1	0.47899
17365.341326	10	15079.73	white	reach1	0.55065
15878.007764	11	14003.58	white	reach1	0.62503
14577.279433	12	13138.11	white	reach1	0.66523
12738.86339	13	11847.03	white	reach1	0.73241
11149.379549	14	10865.63	white	reach1	0.77405
10715.03437	15	9907.294	white	reach1	0.67825
10696.043768	16	8701.413	white	reach1	0.5495
9775.336453	17	6959.407	white	reach1	0.54806

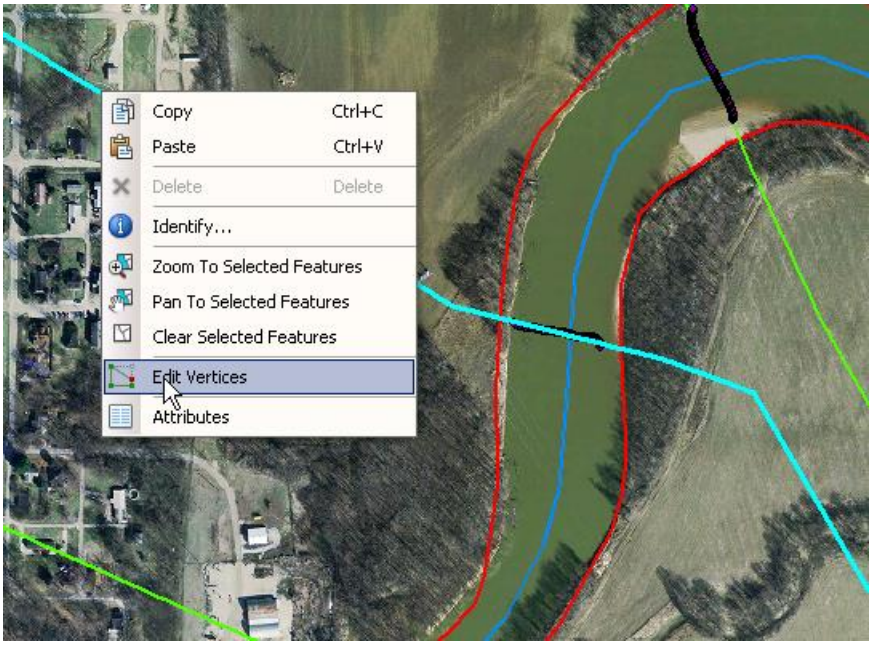
3. Update Xscutline3D layer with field surveyed channel elevation data by using “Update Elevations” tool in GeoRAS (see the second image in previous page). More details of the tool can be found in GeoRAS manual.



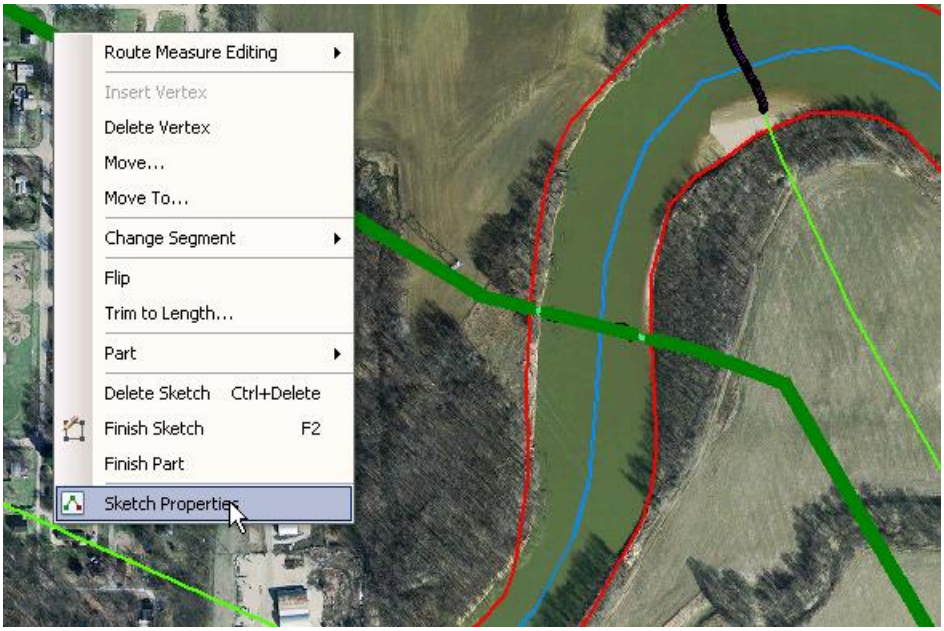
- When it’s done, you should see a message similar to one below and graphics to indicate how the buffer and the points used in updating elevation.



- If you would like to check to see if the field data have been applied, you can check in editor mode. Select one of the “XSCutLines3DUpdated” lines; right click on the highlighted line and select “Edit Vertices”;



- Right click on one of the vertices and select “Sketch Properties”.



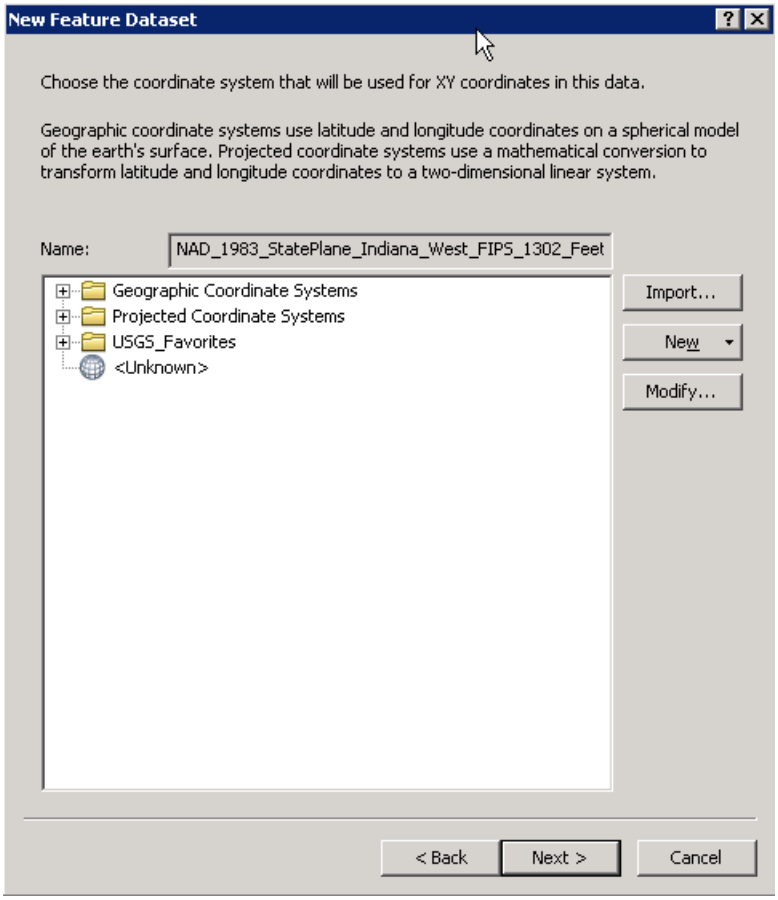
- Box select vertices around the channel width and you should see a table similar to one below and see that the channel elevations have been applied. Make sure you stop editing before next steps.

Edit Sketch Properties

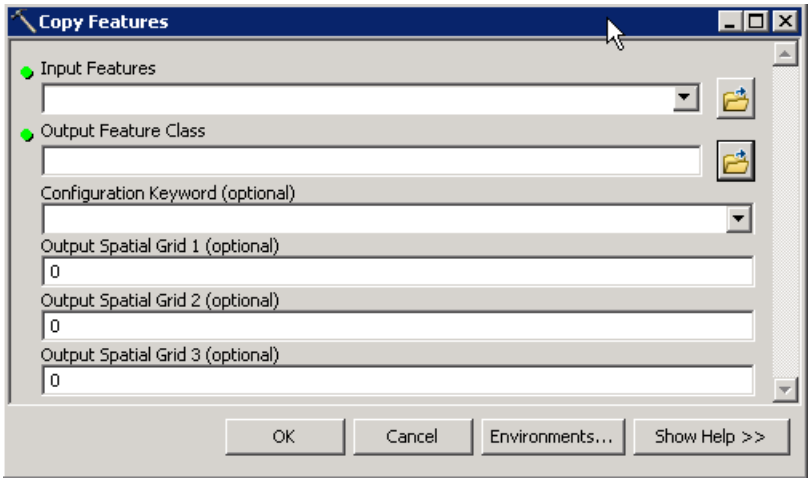
Finish Sketch

#	X	Y	Z
824	29081...	12906...	453.722
825	29081...	12906...	453.662
826	29081...	12906...	453.662
827	29081...	12906...	453.662
828	29081...	12905...	453.662
829	29081...	12905...	453.491
830	29081...	12905...	453.337
831	29081...	12905...	453.334
832	29081...	12905...	453.135
833	29081...	12905...	452.814
834	29081...	12905...	452.493
835	29081...	12905...	452.436
836	29080...	12905...	432.670
837	29080...	12905...	430.870
838	29080...	12905...	430.570
839	29080...	12905...	430.470
840	29080...	12905...	430.070
841	29080...	12905...	429.870
842	29080...	12905...	429.970
843	29080...	12905...	429.970
844	29080...	12905...	429.870
845	29080...	12905...	430.370
846	29080...	12905...	430.370
847	29080...	12905...	430.870
848	29080...	12905...	431.070
849	29080...	12905...	431.070
850	29080...	12905...	431.470

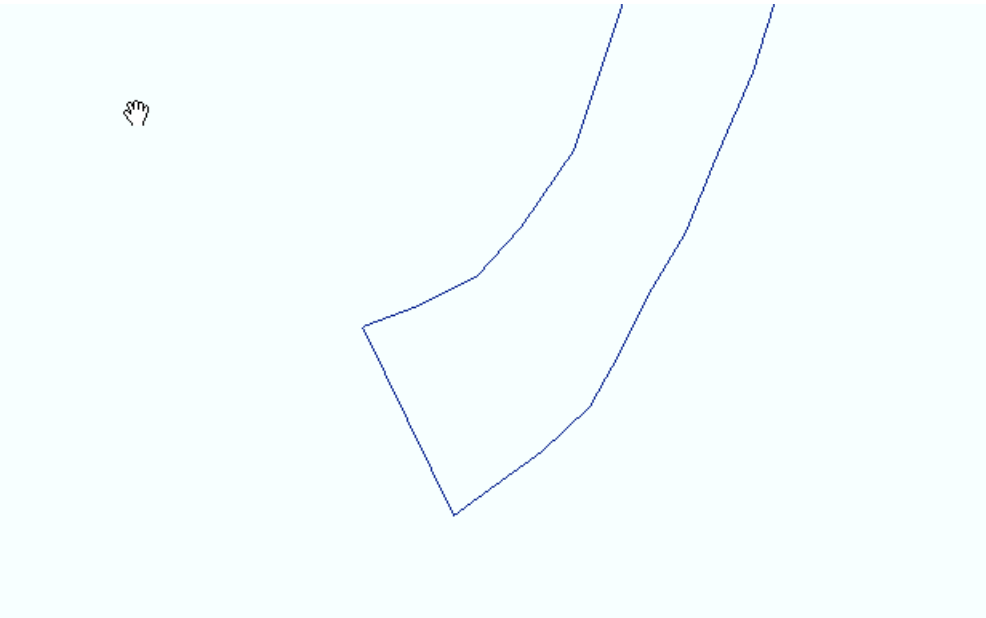
4. Before you start using the bathymetry mesh tool, in a new folder/workspace, you will need to create new personal geo-database and then create new feature dataset using DEM layer as a reference for coordinate system (As you copy/create new set of layers, add these layers to a new ArcMap session for bathymetry mesh tool process).



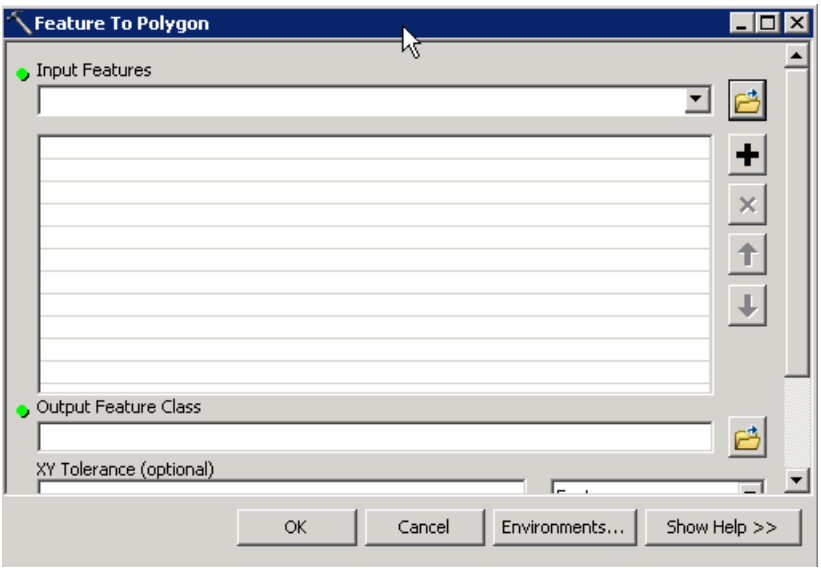
5. Copy “River” and “Banks” (as “Banks_line”) layers from GeoRAS database to Mesh database by using “Copy Features” toolbox.



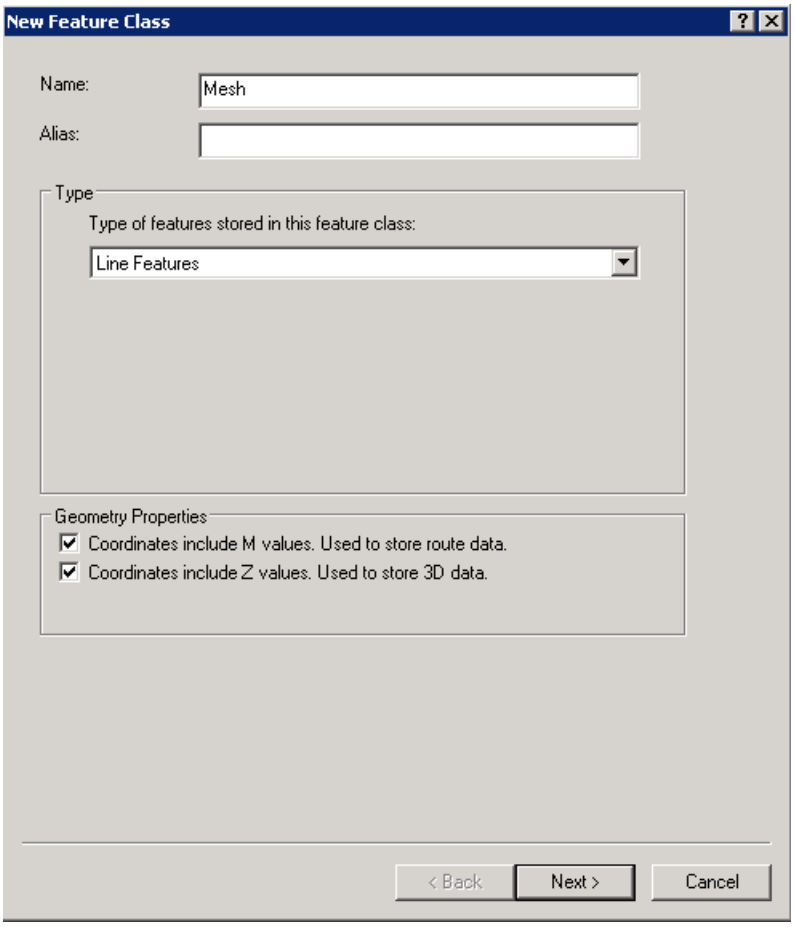
6. Banks line needs to be converted to polygon for mesh tool to work. Edit “Banks_line” by connecting the lines at both upstream and downstream ends.

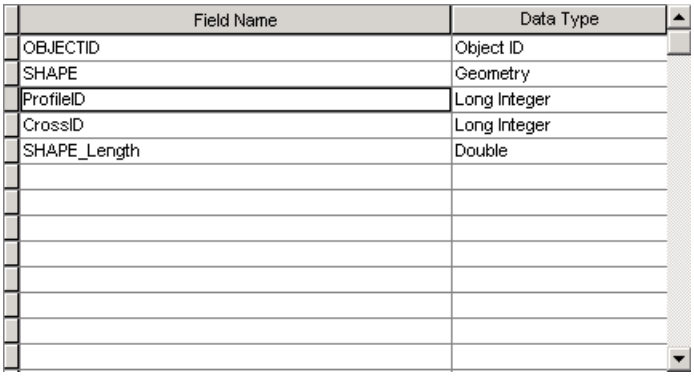


- Convert “Banks_line” to “Banks_poly” by using “Feature to polygon” toolbox.



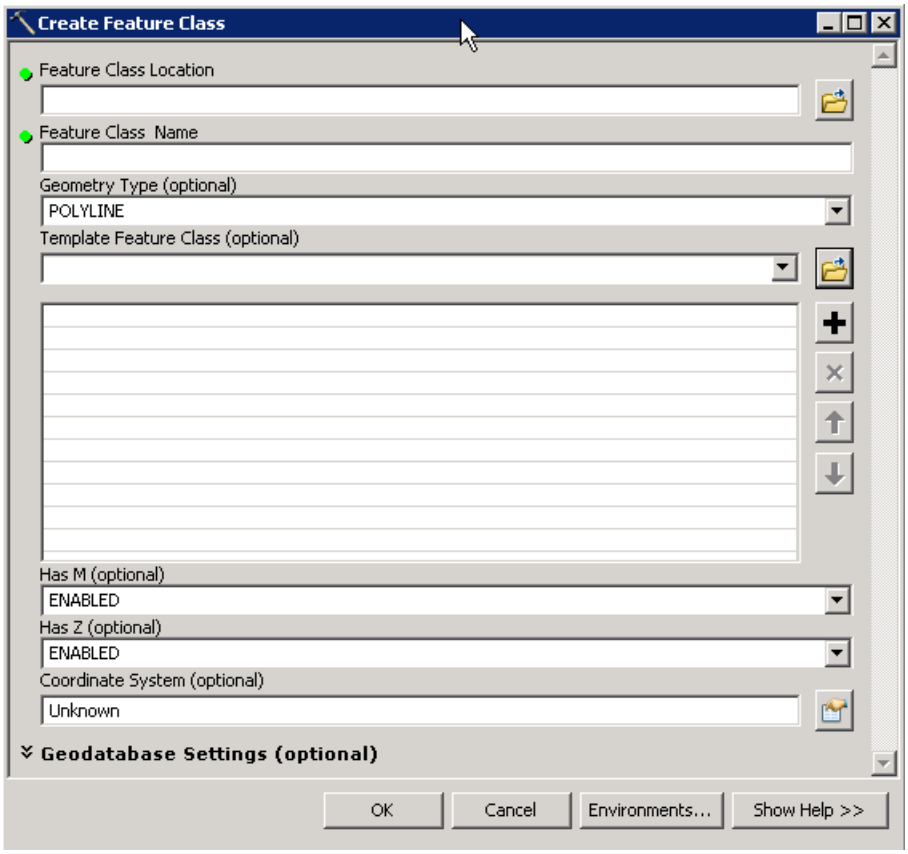
7. Create empty/new “Mesh” layer in the new geo-database in ArcCatalog; be sure to check mark M and Z values. And add fields called “ProfileID” and “CrossID” as shown below.

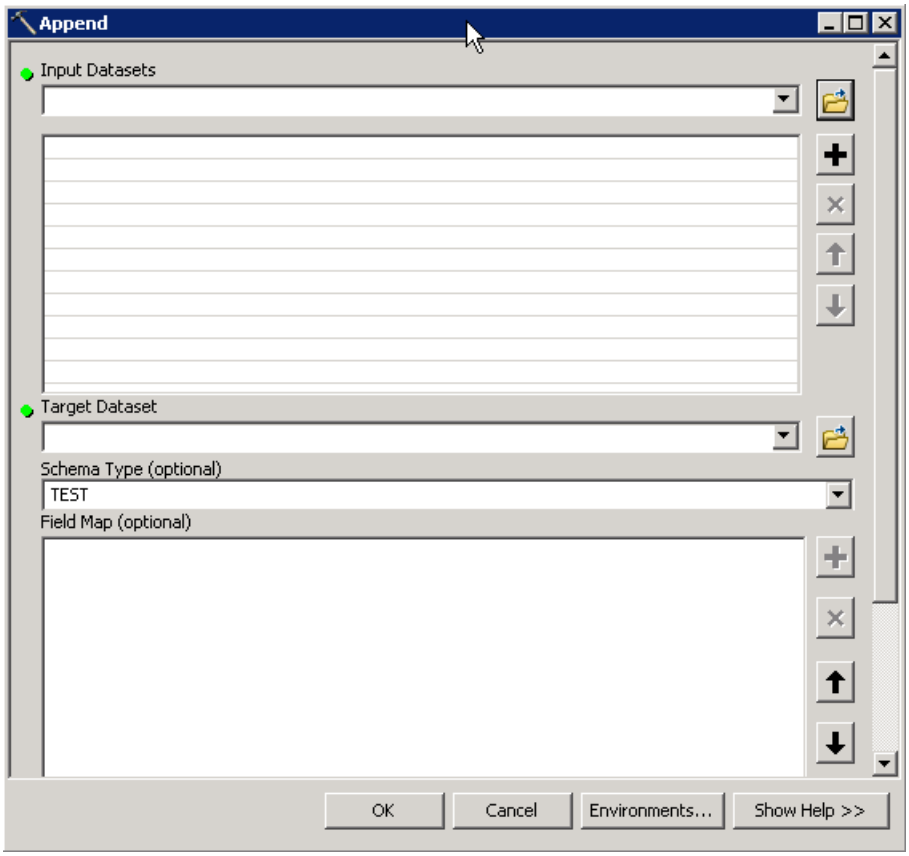




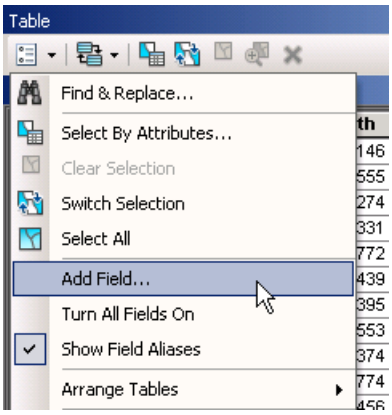
Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
ProfileID	Long Integer
CrossID	Long Integer
SHAPE_Length	Double

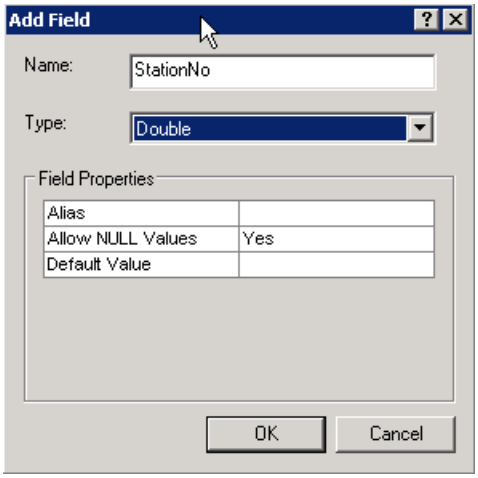
8. To copy “Xscutline3DUpdated” layer and copy all of its attribute table, first use “Create Feature Class” toolbox create empty “Xsection3D” layer (with m and z values enabled) using “Xscutline3DUpdated” layer as a template; then append the “Xscutline3DUpdated” to “Xsection3D”.


Create Feature Class
Feature Class Location
Feature Class Name
Geometry Type (optional)
POLYLINE
Template Feature Class (optional)
Has M (optional)
ENABLED
Has Z (optional)
ENABLED
Coordinate System (optional)
Unknown
Geodatabase Settings (optional)
OK
Cancel
Environments...
Show Help >>

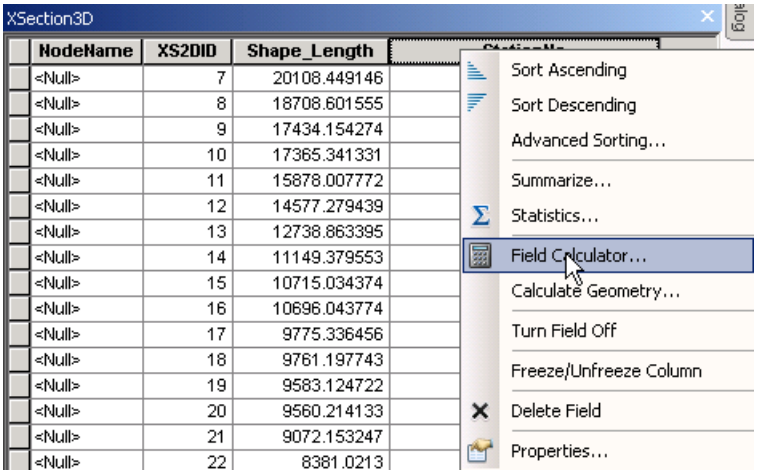

Append
Input Datasets
Target Dataset
Schema Type (optional)
TEST
Field Map (optional)
OK
Cancel
Environments...
Show Help >>

9. In order for mesh tool to work, you will need to add a field called “StationNo” in attribute table of “Xsection3D” layer and copy the values from “Station” (aka ProfileM) column.

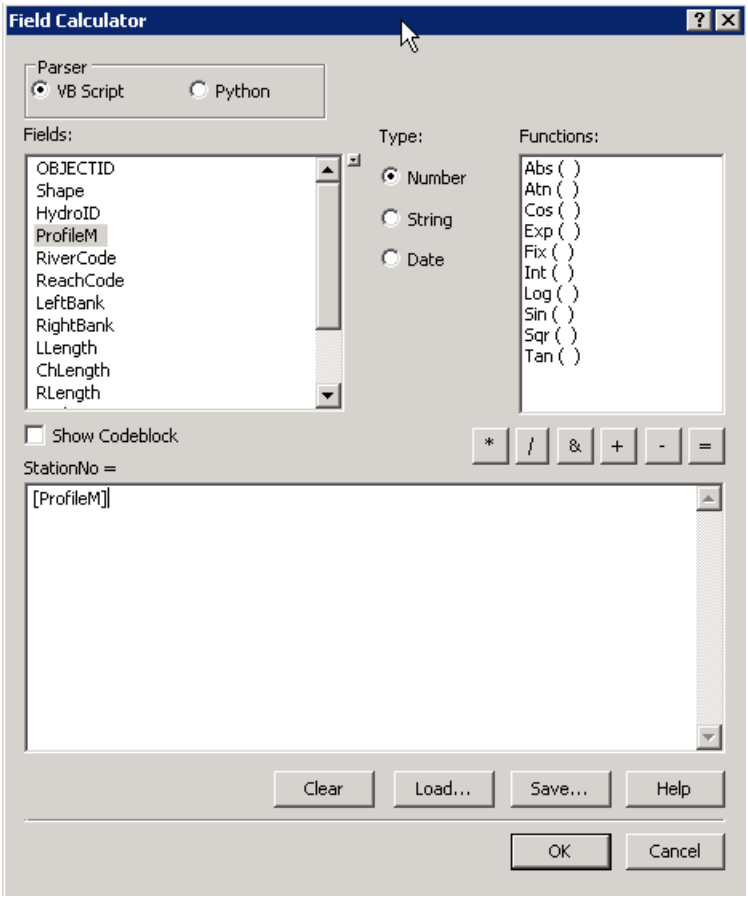




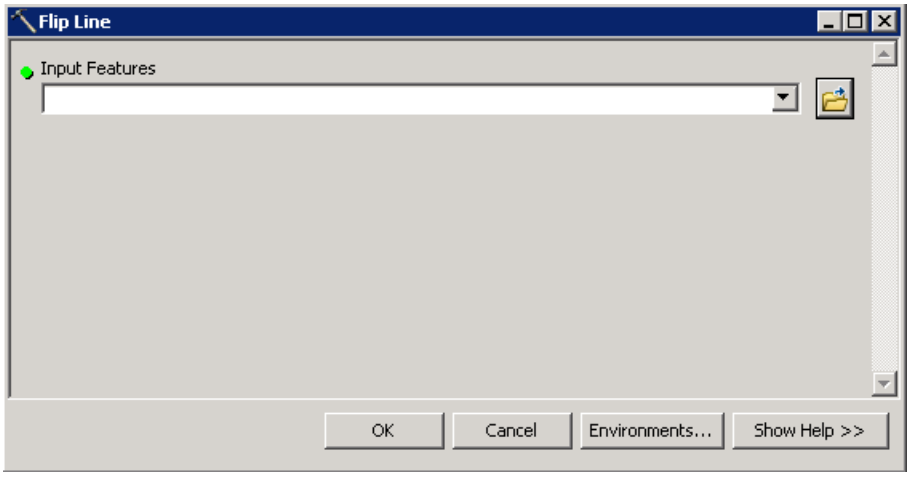
- Then right click on the “StationNo” column and select “Field Calculater”.



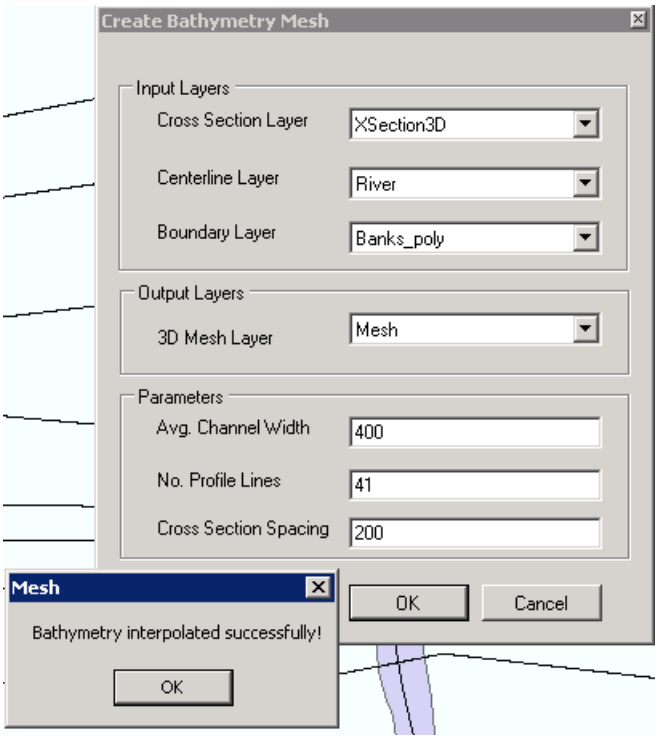
- In “Field Calculator”, double click “ProfileM” (aka Station) and OK to copy station values to “StationNo” column.

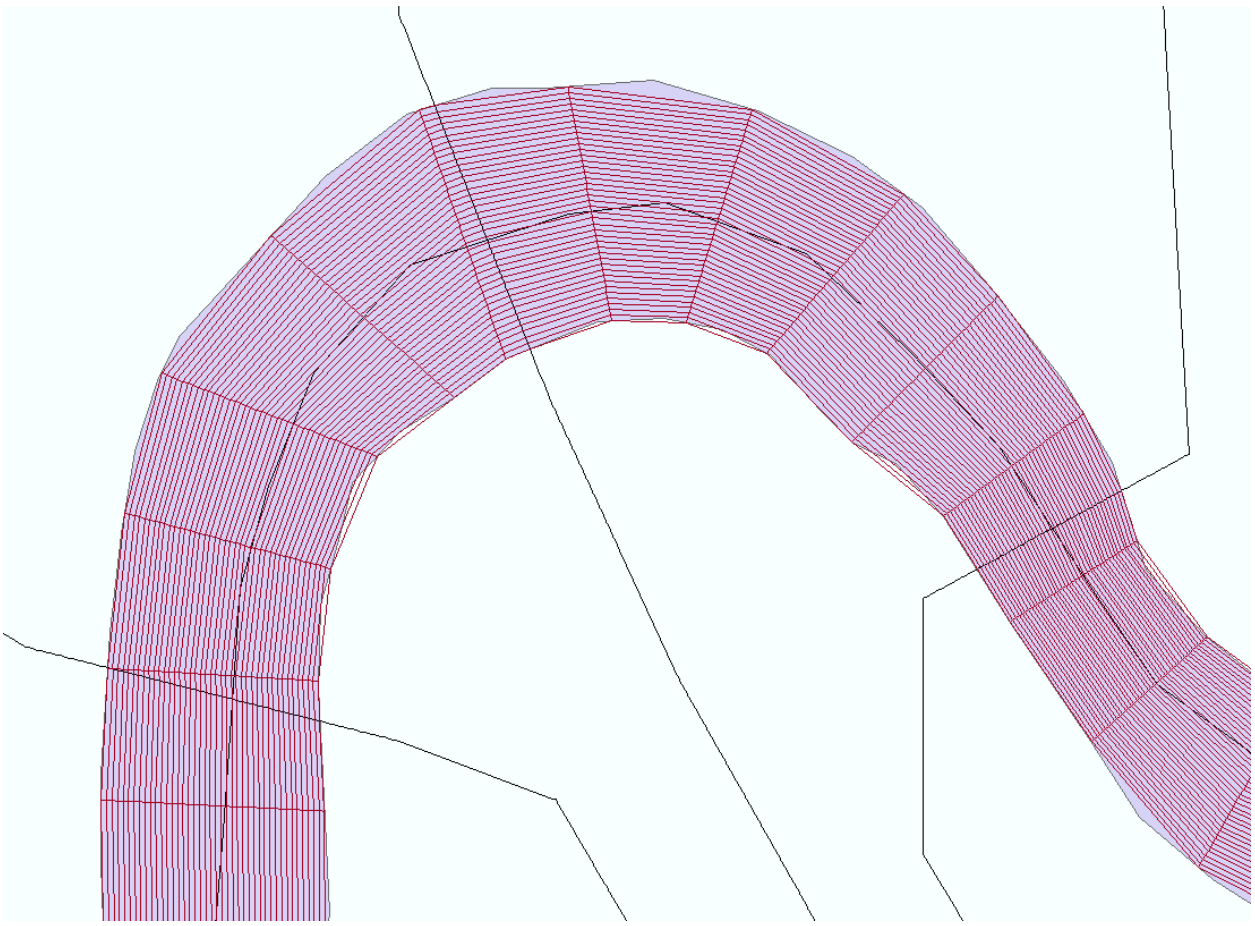


10. In order to run mesh tool properly, you will need to flip directions of the “River” and “Xsection3D” lines before running the mesh tool by using “Flip Line” toolbox.

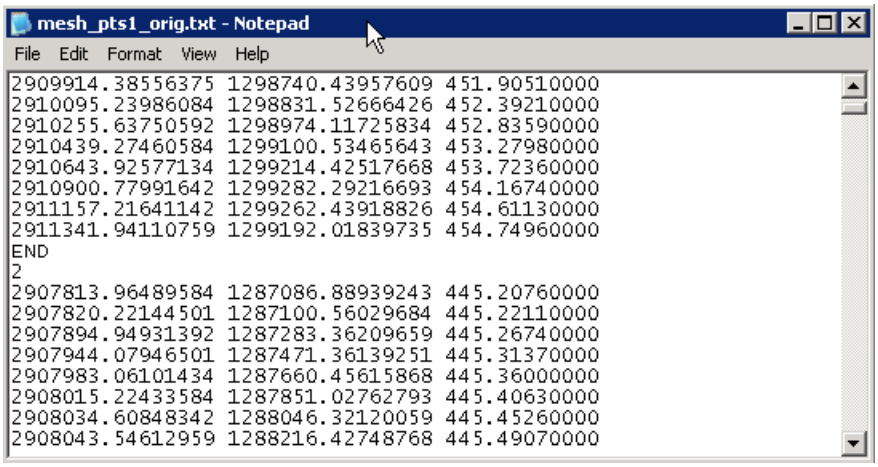


11. You are now ready run mesh tool. Input appropriate parameters for the tool. More details are available in the tutorial here (http://web.ics.purdue.edu/~vmerwade/research/bathymetry_tutorial.pdf).

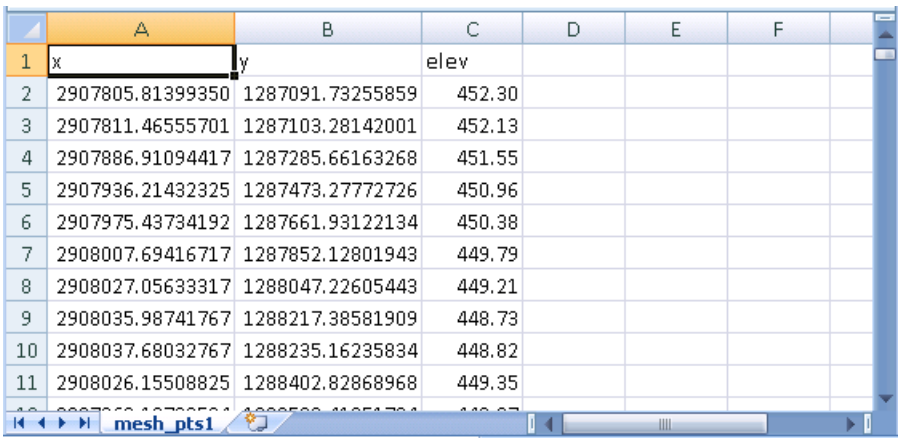




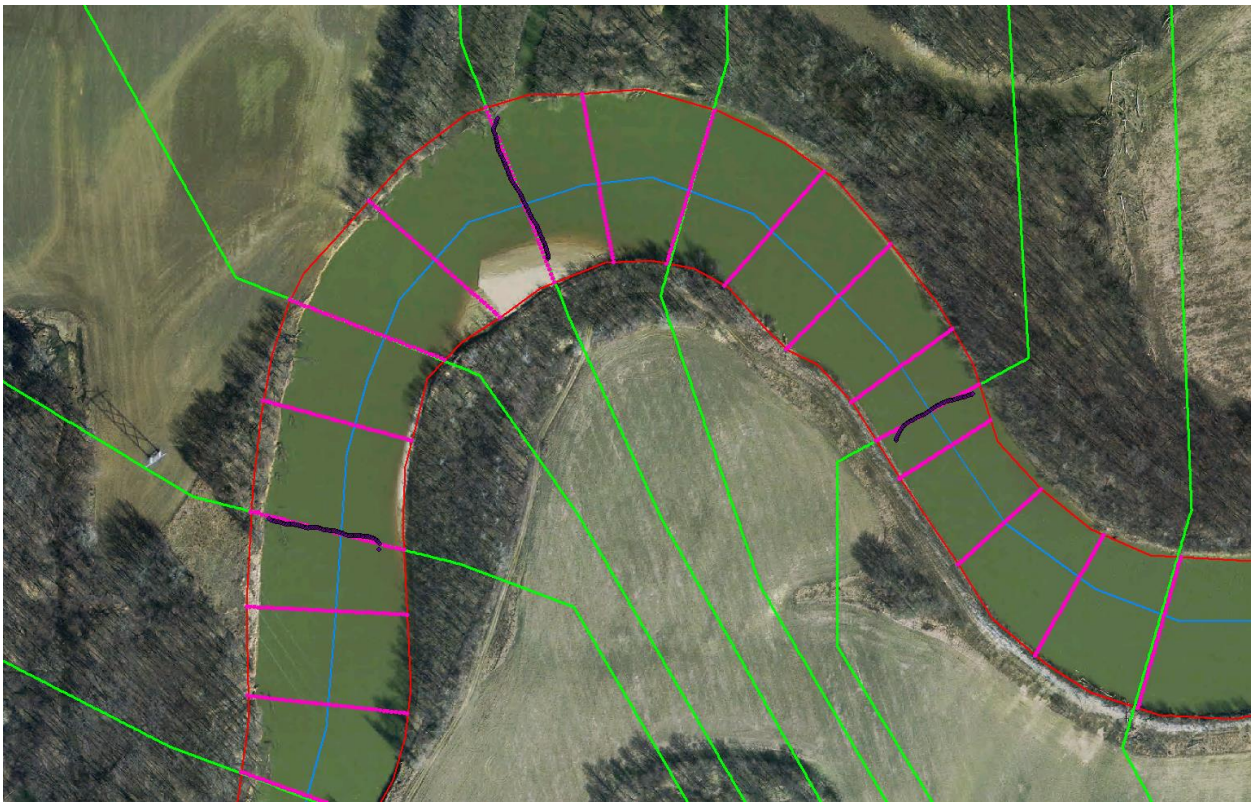
12. Elevation data points (x, y, z) from the mesh can be extracted by using “Feature Class Z to ASCII” toolbox (if any of you know of better toolbox, please let me know).



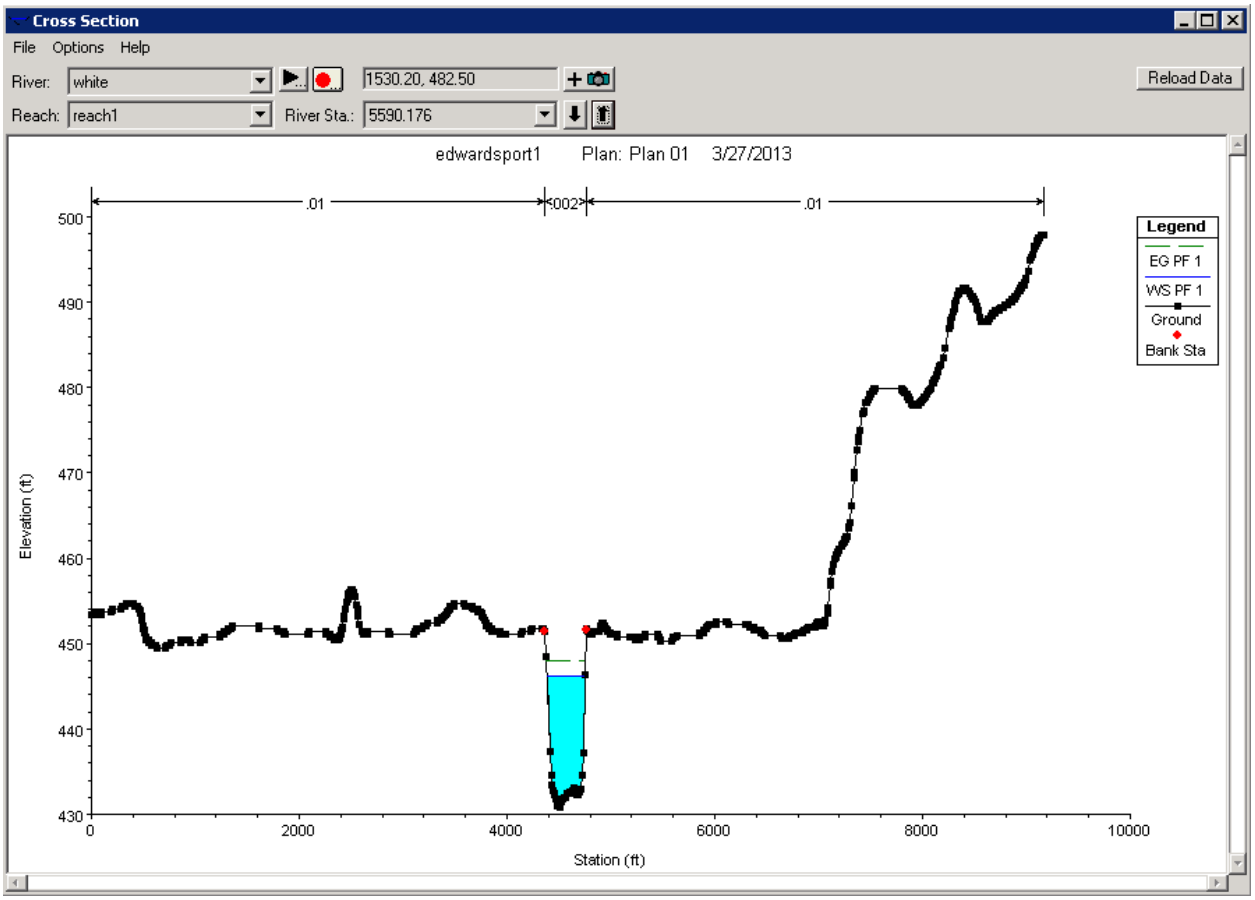
13. You will need to edit/delete the file to have xyz fields with NO additional row like shown above. Open the edited txt file in excel and add xyz column headings.



14. Create a point layer from the mesh points. Then add the point layer back in the GeoRAS ArcMap session (you may need to edit/delete some of the points depending on how close they are to each other). Add additional XScutlines for interpolated cross sections as needed in between the existing XScutlines. Re-run the GeoRAS geometry process as before, then “Update Elevations” using the mesh point layer to incorporate field surveyed and interpolated channel elevation data.

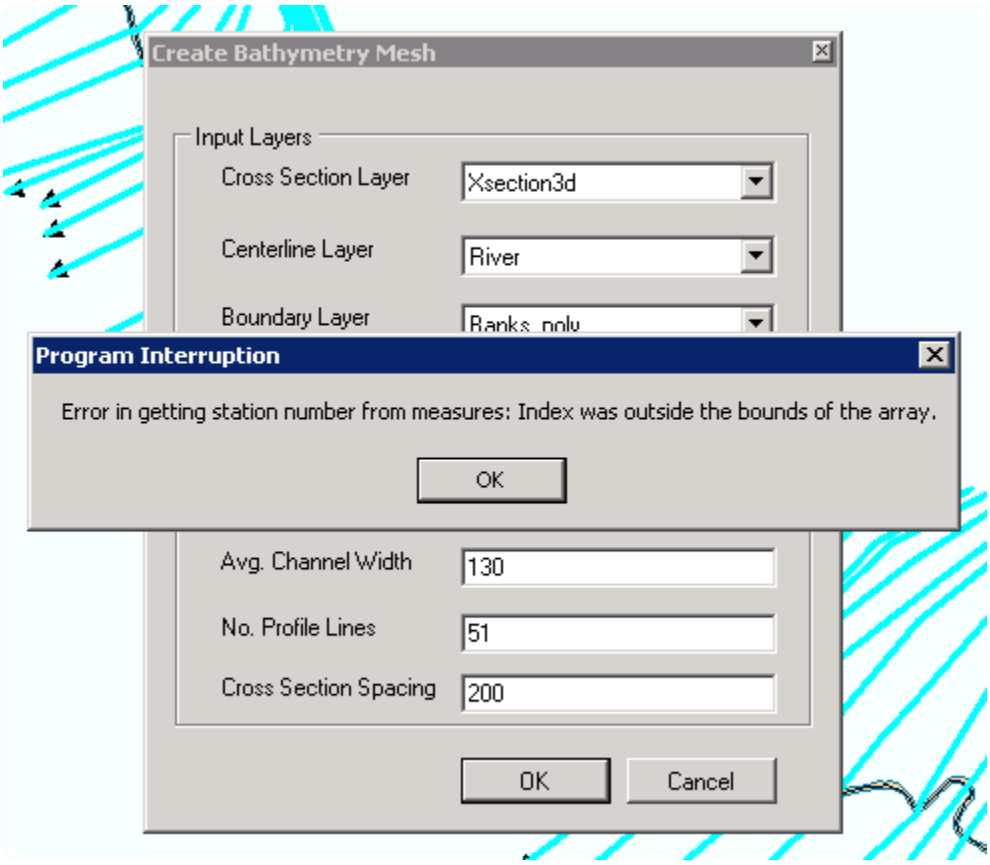


15. Export the GeoRAS geometry to RAS import file and review the cross section to verify that the field surveyed and interpolated channel bottom data have been applied reasonably.



Trouble Shooting

If you see an error message like this one below, click OK each one by one and at the end, you should get a message saying that tool ran successfully.



Contact Information

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