







How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

Konstantinos Papatheodorou, May 2015













How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

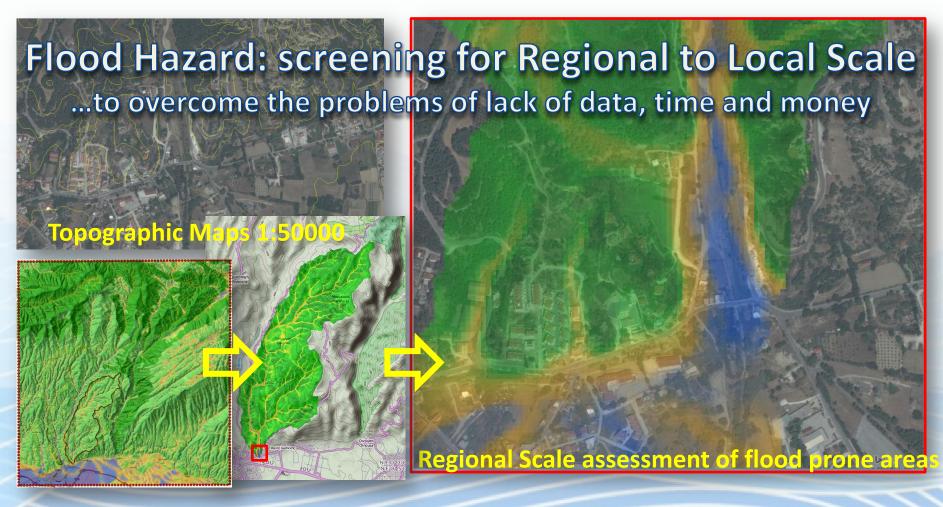
.....in less than 5 minutes !







Flood Hazard Assessment: The ...SciNetNatHaz project approach









Common borders. Common solutions. Flood Hazard... on Local scales

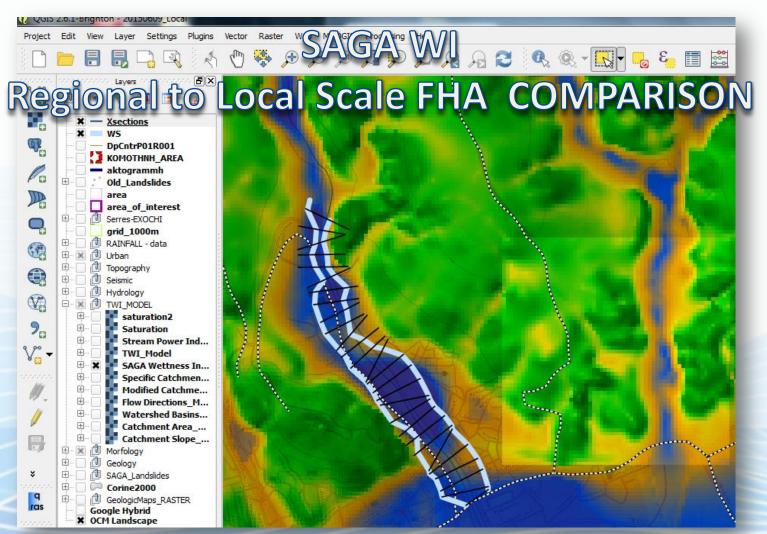


Top width of the wetted cross section.





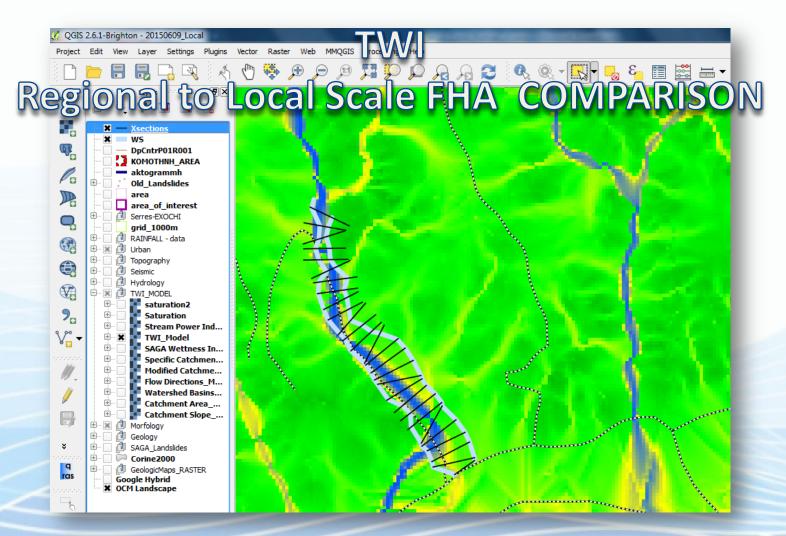


















TWI Regional to Local Scale FHA COMPARISON Lours de marte







DATA REQUIREMENTS

Compulsory

- Contour lines (DIGITIZED) every 20m (topographic map at 1:50.000 scale of the WATERSHED (REGIONAL scale assessment)
- Contour lines (digitized) every 1m the most! (around 0.50m is OK) from a topographic map of a scale 1:1000 or higher (1:500 etc) (LOCAL scale assessment)

Optional

- Elevation points
- Ancillary data (road network, etc)

Data Created in the process

DEMs, Stream line, Cross Sections (CR), CR elevation points







Other REQUIREMENTS

Compulsory

- Basic GIS concepts (types of data, Geographic and Projection systems ...)
- A minimum competency with GIS software









- LOAD the contour lines (just "open" the respective shapefile)
- RUN Menu > Grid > Spline Interpolation> Thin Plate Spline
- Insert the contour file name
- Insert the proper PIXEL size
 - for data from 1:50000 scale a pix.size of 15m is OK.
 - 1:1000, pix.size 0.5m



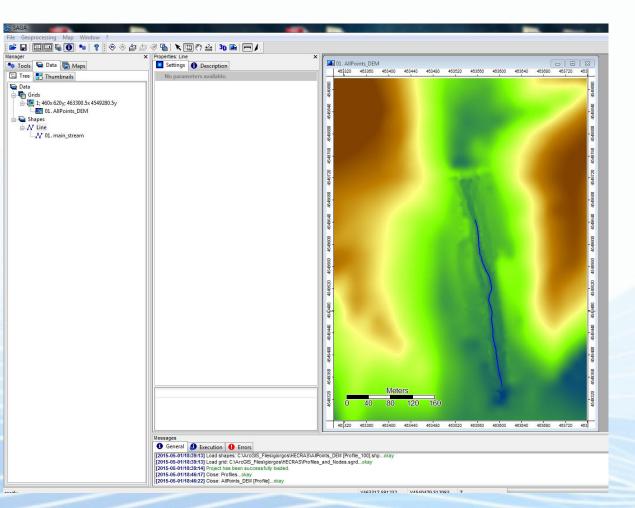
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- LOAD DEM (just "open" the geotiff)
- LOAD the stream (just "open" the shapefile)





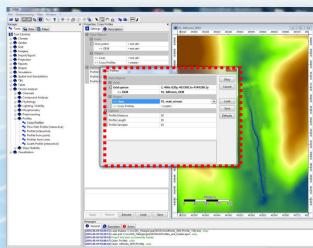






GO toTools > Terrain Analysis > Profiles and run (double click) CROSS PROFILES

CI	lick and select	Click and select	Click and select				
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Konstantinos Papatheodorou

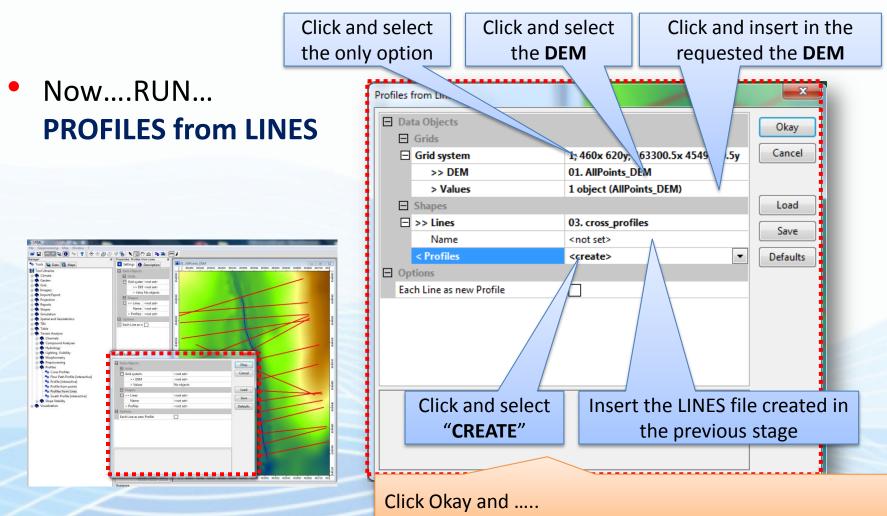
• RUN and

Cross sections
 file appears
 under the Data
 click tab







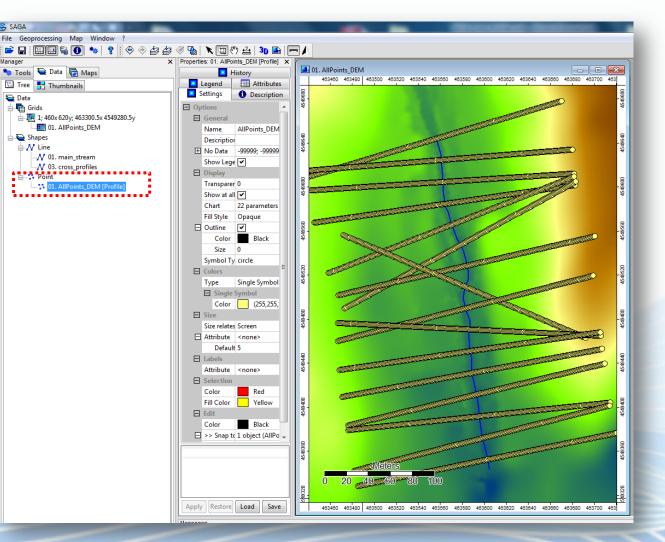








- RUN and
- Cross sections POINTS file appears under the Data click tab
- Now, for every cross section, there are points spaced 1.4m from each other
- Right Click on the point data file and select...ATTRIBUT ES "Save as"....





AlPoints_DEM (Profile).shp Αρχεία Επεξεργασία Μορ LINE_ID ID

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Common borders. Common solutions.

 Right Click on the point data file and select ATTRIBUTES ... "Save as" and Save as TEXT.

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• This file can be imported into EXCEL for the next few steps before being imported into HEC-RAS for applying the Hydraulic Model

AllPoints_DEM	[Profile].shp.txt	t - Σημειωματάριο						×			
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1	0 9.	.395110	.616797	463449.965230	4549611.8719	4 Ag. Georgios 1		463462.12413	4549615.5141	85.656509399	
i	1 10	0.439011	10.673734	463450.965230	4549612.1715	5 Ag. Georgios 1					A. in QGIS RUN the following SAGA GIS modules: 1. Cross Profiles (Using a DEM and the stream reach as the axis
i		1.482912	11.745027	463451.965230	4549612.4710	6 Ag. Georgios 1 7 Ag. Georgios 1		463464.12413		85.405944824 85.255401611	"Cross_prof.shp" will be created and imported into the layers (data frame)
i		2.526813	12.815680	463452.965230	4549612.7706			463465.12413 463466.12413			Note: clear the "Cross_prof.shp" file from profiles that intersect each other
i		3.570714	13.871586	463453.965230	4549613.0701	9 Ag. Georgios 1		463467.12413			3. Profiles from Lines (Using the SAME DEM and the "Cross_prof.shp" as the "lines" file
						10 Ag. Georgios 1					"Each New LINE as a NEW file" Select NO
1		4.614615	14.940154	463454.965230	4549613.3697	11 Ag. Georgios 1		463469.12413	4549617.611	84.777389526	It saves a new shapefile as a POINT shapefile WITH coordinates (i.e. rofile_points.shp) 4. Import the "Profile points.shp" into Excel (or copy from the attribute table within QGIS and paste into excel)
1		5.658516	16.007521	463455.965230	4549613.6692	12 Ag Georgios 1		463470.12413		84.64894104	5. COPY from Profile points.shp and PASTE all columns.
1		6.702417	17.073602	463456.965230	4549613.9688	13 Ag. Georgios 1			4549618.2101	84.600311279	6. ERASE the columns "ID", "DIST" and "DIST SURF"; leave only the columns "Line ID", "X", "Y" and "Z"
1		7.746318	18.126782	463457.965230	4549614.2683	14 Ag. Georgios 1		463472.12413	4549618.5096	84.477111816	7. Insert TWO columns on the left: Column A will be named as RIVER_NAME and Column B as RIVER_REACH
1	9 16	8.790220	19.190207	463458.965230	4549614.5679	15 Ag. Georgios 1	0	463473.12413	4549618.8092	84.355293274	
2	0 1	9.834121	20.252188	463459.965230	4549614.8674	16 Ag. Georgios 1	0	463474.12413	4549619.1087	84.313400269	8. ADD the name of the river (column A) in ALL lines;
2	1 20	0.878022	21.302831	463460.965230	4549615,1670	17 Ag. Georgios 1	0	463475.12413	4549619.4083	84.19329071	 ADD the RIVER_REACH name (=i.e. "2" or anything else); RENAME column "Line ID" as "RIVER STATION" (column "Line ID" of the "Profile points.shp" shapefile).
2		1.921923	22.362029	463461.965230	4549615,4665	18 Ag. Georgios 1	0	463476.12413	4549619.7078	84.07258606	Now the file has six columns: River name (A), River Reach (B), River Station (C), X (D), Y (E) and Z (F)
2		2.965824	23.419932	463462.965230	4549615.7661	19 Ag. Georgios 1		463477.12413		84.029472351	Save the file in excel format so that you can re-use it.
2		4.009725	24.468049	463463.965230	4549616.0656	20 Ag. Georgios 1			4549620.3069		
								463479.12413	4549620.6065	83.776519775	11. SAVE the file in .CSV format. Please note than in some cases, EXCEL uses the semi-colon (;) character instead of the
2		5.053626	25.523639	463464.965230	4549616.3652			463480.12413	4549620.906	83.638145447	comma (,). In such a case, open the CSV file with Notepad, press ctrl-H (replace function) and REPLACE ";" with "," (not use the quotes)
2		6.097527	26.578339	463465.965230	4549616.6647	23 Ag. Georgios 1				83.567764282	not use the quotes)
2		7.141428	27.632273	463466.965230	4549616.9643			463482.12413		83.416793823	SAVE the CSV file and it is ready for importing into HEC-RAS
2		8.185329	28.678268	463467.965230	4549617.2638			463483.12413 463484.12413		83.262825012 83.190818787	
2	9 2	9.229230	29.730891	463468.965230	4549617.5634	27 Ag Georgios 1	0	463485.12413	4549622.1042		B. Import.csv to HEC-RAS
3	0 30	0.273132	30.783049	463469.965230	4549617.8629	28 Ag. Georgios 1	0				Open HEC-RAS New Project
3	1 3	1.317033	31.828238	463470.965230	4549618.1625	29 Ag. Georgios 1	0	463487.12413		82.821868896	New Project New Geometry Data
3		2.360934	32,879620	463471.965230	4549618.4620						Import Geometry Data / CSV
3		3.404835	33.930766	463472.965230	4549618.7616	31 Ag. Georgios 1		463489.12413	4549623.6019	82.527488708	
5	5 5	5.154055	33.550700	.55472.565250	.545010.7010	32 Ag. Georgios 1	0	463490.12413	4549623.9015	82.384246826	Set/Pick the correct Columns
						33 Ag. Georgios 1	0	463491.12413	4549624.201	82.343406677	Pick the UNIT system (SI or Metric) andfinish / import data.
						34 Ag. Georgios 1		463492.12413	4549624.5006	82.209220886	
						35 Ag. Georgios 1				82.079406738	
						36 Ag. Georgios 1		463494.12413	4549625.0997	82.058876038	
						37 Ag. Georgios 1		463495.12413		81.940498352	
						38 Ag. Georgios 1				81.828010559	
	-					39 Ag. Georgios 1			4549625.9983		
						40 Ag Georgios 1	0	46-4498 17413	4549626 2979	81 779 78 654	actacticas Darathaederou Illau





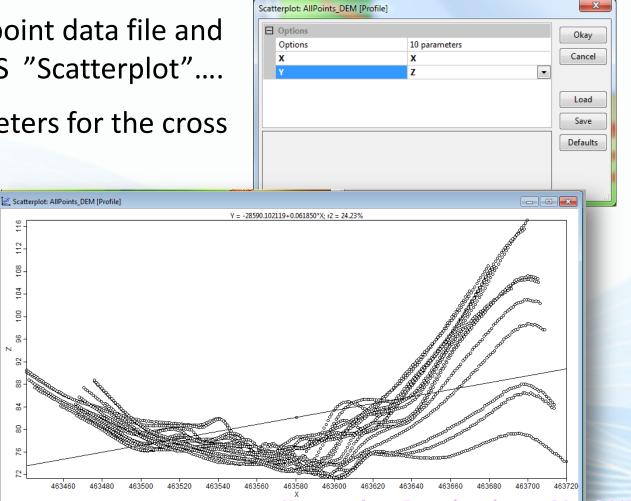


- Right Click on the point data file and select...ATTRIBUTES "Scatterplot"....
- Provide the parameters for the cross sections... X & Z

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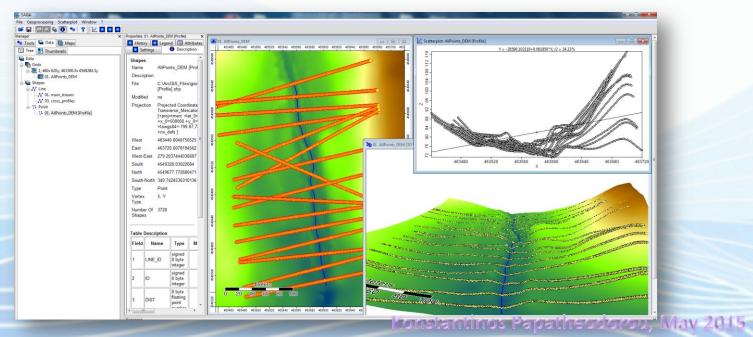
...and you get...this!







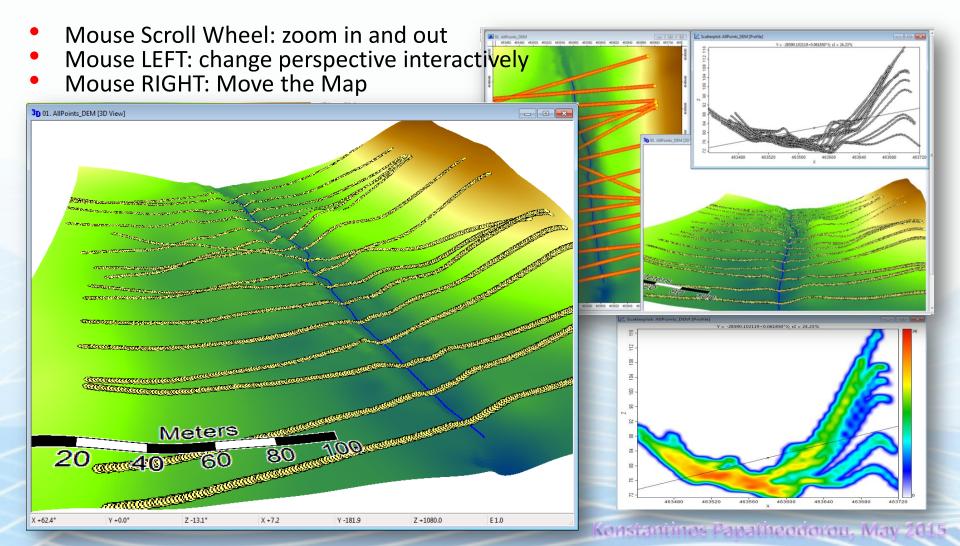
- Double Click on the DEM file on the DATA tab, and display the respective map
- Click on the map and select from the TOP MENU > Map > Show 3D View
- Input the parameters (DEM etc)
- Okay and PLAY!

















Steps to create Cross Sections for HEC-RAS



- Either open the contours and make a DEM within SAGA or open a DEM created with other software
- Open the Stream shapefile
- Run Tools > Terrain Analysis > Profiles > CROSS PROFILES
- RUN... **PROFILES from LINES** (same menu)
- Right Click on the point data file and select ATTRIBUTES ... "Save as" and Save as TEXT

.... import the file into EXCEL for making a few changes

Konstantinos Papatheodorou, May 2015



The





Common borders. Common solutions.



How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis ...IN LESS THAN 5' !







(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

- In QGIS load/create the DEM of the area and the stream line
- RUN the following SAGA GIS modules:
 - 1. Cross Profiles (Using a DEM and the stream reach as the axis. A shapefile (named by you) will be created and imported into the layers (data frame).
 - 2. Profiles from Lines (Using the SAME DEM and the "Cross_prof.shp" as the "lines" file. "Each New LINE as a NEW file" Select NO (It saves a new shapefile as a POINT shapefile WITH coordinates (i.e. profile_points.shp))
 - **3.** Copy from the attribute table within QGIS the list of numbers (all columns) and paste it PASTE into Excel

...some work is needed in Excel which is common for both the SAGA and the QGIS based procedure









- ERASE the columns "ID", "DIST" and "DIST_SURF"; leave only the columns "Line_ID", "X", "Y" and "Z"
- Insert TWO columns on the left: Column A will be named as RIVER_NAME and Column B as RIVER_REACH
- 6. ADD the name of the river (column A) in ALL lines; (e.g. Agios_Georgios)
- 7. ADD the RIVER_REACH name (=i.e. "2" or anything else);
- 8. RENAME column "Line_ID" header as "RIVER_STATION" (column "Line_ID" of the "Profile_points.shp" shapefile).
- Now the file has six columns: River_name (A), River_Reach (B), River_Station (C), X (D), Y (E) and Z (F)
- Save the file in excel format so that you can re-use it.







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3	Ag. Georgios	1	0	463461.12413	4549615.2146	85.828056335	(How to) Crea	te and transfer cross-Se	ection Data fron	n QGIS to Hec-RAS		
4	Ag. Georgios	1	0	463462.12413	4549615.5141	85.656509399						
5	Ag. Georgios	1	0	463463.12413	4549615.8137	85.492279053		I the following SAGA GI				
6	Ag. Georgios	1	0	463464.12413	4549616.1132	85.405944824	1. Cross Profile	es (Using a DEM and the				
7	Ag. Georgios	1	0	463465.12413	4549616.4128	85.255401611		"Cross_prof.shp" will				
8	Ag. Georgios	1	0	463466.12413	4549616.7123	85.110321045		he "Cross_prof.shp" file n Lines (Using the SAME				
9	Ag. Georgios	1	0	463467.12413	4549617.0119	85.044166565	5. Promestron	"Each New LINE as a N			ne imes me	
10	Ag. Georgios	1	0	463468.12413	4549617.3114	84.908943176					nates (i.e. rofile points.	shn)
11	Ag. Georgios	1	0	463469.12413	4549617.611	84.777389526	4. Import the '				ble within QGIS and pas	
12	Ag. Georgios	1	0	463470.12413	4549617.9105	84.64894104		Profile points.shp and P				,
13	Ag. Georgios	1	0	463471.12413	4549618.2101	84.600311279	6. ERASE the c	olumns "ID", "DIST" and	l "DIST_SURF"; l	leave only the colum	ns "Line_ID", "X", "Y" an	d "Z"
14	Ag. Georgios	1	0	463472.12413	4549618.5096	84.477111816	7. Insert TWO	columns on the left: Co	lumn A will be n	named as RIVER_NAM	VIE and Column B as RIVE	R_REACH
15	Ag. Georgios	1	0	463473.12413	4549618.8092	84.355293274						
16	Ag. Georgios	1	0	463474.12413	4549619.1087	84.313400269		me of the river (column				
17	Ag. Georgios	1	0	463475.12413	4549619.4083	84.19329071		/ER_REACH name (=i.e.			the line file second she	11 - L E(-)
18	Ag. Georgios	1	0	463476.12413	4549619.7078	84.07258606	10. RENAMED				the "Profile_points.shp h (B), River_Station (C),	
19	Ag. Georgios	1	0	463477.12413	4549620.0074	84.029472351	ľ	Save the file in excel f			in (b), river_station (c),	x (D), i (E) and 2 (F)
20	Ag. Georgios	1	0	463478.12413	4549620.3069	83.90524292		Save the memory occur	office so that y	ou canne usen.		
21	Ag. Georgios		0	463479.12413	4549620.6065	83.776519775	11. SAVE the f	le in .CSV format. Pleas	e note than in s	ome cases, EXCEL us	es the semi-colon (;) cha	racter instead of the
22	Ag. Georgios		0	463480.12413	4549620.906	83.638145447					eplace function) and REF	
23	Ag. Georgios		0	463481.12413	4549621.2056	83.567764282	not use the qu					
24	Ag. Georgios		0	463482.12413	4549621.5051	83.416793823						
25	Ag. Georgios		0	463483.12413	4549621.8047	83.262825012	SAVE the CSV	file and it is ready for im	nporting into HE	C-RAS		
26	Ag. Georgios		0	463484.12413	4549622.1042	83.190818787						
27	Ag. Georgios		0	463485.12413	4549622.4038	83.037239075	B. Import .csv Open HEC-RA					
28	Ag. Georgios		0	463486.12413	4549622.7033	82.883911133	New Project	2				
29	Ag. Georgios		0	463487.12413	4549623.0029	82.821868896	New Geometr	v Data				
30	Ag. Georgios		0	463488.12413	4549623.3024	82.673568726	Import Geom	•				
31	Ag. Georgios		0	463489.12413	4549623.6019	82.527488708		,,				
	Ag. Georgios		0	463490.12413	4549623.9015	82.384246826	Set/Pick the co	orrect Columns				
32			0	463491.12413	4549624.201	82.343406677	Pick the UNIT:	system (SI or Metric) an	dfinish / impo	ort data.		
32 33	Ag. Georgios											







(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

- 11. SAVE the file in .CSV format.
- Please note than in some cases, EXCEL uses the semi-colon (;) character instead of the comma (,). In such a case, open the CSV file with Notepad, press ctrl-H (replace function) and REPLACE ";" with "," (do not use the quotes)
- The CSV file and it is ready for importing into HEC-RAS







(How to) Create and transfer cross-Section Data from QGIS to Hec-RAS

- A. in QGIS RUN the following SAGA GIS modules
- **B. Import .csv to HEC-RAS**
- Open HEC-RAS
- 1. Menu FILE > New Project (create a project)
- 2. Menu EDIT > Geometric data
- 3. Menu Geometric data > New Geometry Data
- 4. Menu Import Geometry Data / Import CSV
- 5. Set/Pick the correct Columns
- 6. Pick the UNIT system (SI or Metric) and ...finish to import data.

A Step-by-Step Tutorial (click to read)







Got it! Create in QGIS Cross Sections and import them into HEC-RAS in less than 5' C QGIS 2.6.1-Brighton - 20150113_Local HEC-RAS 4.1.0 Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help File Edit Run View Options GIS Tools Help -] Q 4 🕅 🏶 户 月 🛱 🗭 D A A 2 🔍 🧟 - 🛄 - 😓 5 🖬 🗮 🖦 - 🖵 😘 🛎 II + 6 Tal. C.\...VAG_ANARGYR0I-GPS_METRHSEIS\HECRAS\test1.pr Project 49 3 3 - 10 Plan: Layers C:VarcGIS_FilesVAG_ANARGYR0I-GPS_METRHSEISVHECRASVest1.g02 5 X Geometry Vo 0 * 7 3 3 5 Steady Flow Unsteady Flow Profiles Description : 🚊 🛄 US Customary Units CrossProfiles Q, Cocal_Scale Profile_points_4_HECRAS . . . Profiles from lines === stream V Geometric Data - test2 Po Polygon centroids Points_AgAN File Edit Options Tools GIS Tools Help GDAL/OGR [32 geoalgorith • Profiles Tools River Reach Area Conn. Station RS 2A 1 ... Plot WS e GeoServer/PostGIS tools [... Cross_Profile Description Editors 12.99 GRASS commands [158 geo. Cross Profiles 222 0 Models [5 geoalgorithms] Junct. Watershed Basins . OGIS geoalogrithms [68 ge Analytical Hillshading SAGA [243 geoalgorithms] Section Point_GRID_AgAN_025_FIL... Geostatistics Grid - Analysis Point GRID AgAN 025 Point_GRID_AgAN Grid - Calculus Grid - Filter Grid - Gridding W? Brdg/Culv Regional Scale Grid - Spline Grid - Tools 90 Cross Section Data - test2 Exit Edit Options Plot Help Grid - Visualization V-Imagery - Classificat Imagery - RGA River. Belitsa ٠ Apply Data + Plot Options Rep Prev XS Plots Clear Prev Imagery - Segmer Imagery - Tools • I T Reach: Ag_Anargyroi ▼ River Sta: 1 test1 Plan: 11 Kriging Recreations Shapes - Grid Description In: Row Del Row Ground Bank Sta Shapes - Lines Shapes - Points Shapes - Polygons ROB Elevation 372.676 Station Shapes - Tools Shapes - Transect 440 3.281 371.878 Channel ROB Simulation - Fire Spreading 3 6.562 371.086 Simulation - Hydrology Table - Calculus 420-2 4 9.843 370.298 5 13.123 369.512 Table - Tools Terrain Analysis - Channels Terrain Analysis - Hydrology Left Bank Right Bank 6 16.404 368.728 19 980.971 400 7 19.685 367.967 Terrain Analysis - Lighting Terrain Analysis - Morphom Terrain Analysis - Profiles 8 22.966 367.18 w [2] 2 9 26.247 366.39 Contraction Expansion 380 Cross profiles 10 29.528 365 597 0.3 20 Profile from points 11 32,808 364.801 8 Profiles from lines 12 36.089 13 39.37 364.001 360 Vigra 363.197 Scripts [14 geoalgorithms] TauDEM (hydrologic analysi 14 42.651 362.39 15 45.932 361.579 340 X Tools for LIDAR data [42 g. 16 49.213 17 52.493 360.766 1 359.952 18 55.774 19 59.055 359.136 320 xy 358.321 20 62.336 21 65.617 357.506 356.688 300 200 400 600 800 1000 Station (ft 59.62, 394.02

Konstantinos Papatheodorou, May 2015

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anced interface









How to create Cross Sections ready for importing into HEC-RAS for Hydraulic Analysis

Konstantinos Papatheodorou, May 2015