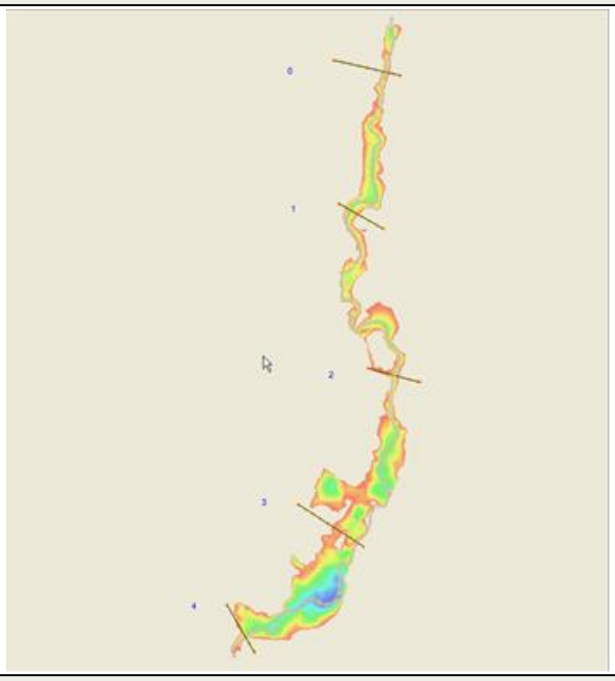
WMS 11.4 Tutorial

Managing HEC-RAS Cross Sections

Modify cross sections in a HEC-RAS model to use surveyed cross section data



Objectives

Build a basic HEC-RAS model from a conceptual schematic of cross sections, river banks, and river centerlines. Extract the cross sections from background elevation data. Then merge surveyed cross sections into extracted cross sections using the cross section database management tools in WMS. Export and run a HEC-RAS model, read the results into WMS, and delineate a floodplain using the HEC-RAS results.

Prerequisite Tutorials

- HEC-RAS Analysis

Required Components

- WMS Core
- HEC-RAS Model Intg.

Time

- 15–30 minutes

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1 Introduction

HEC-RAS is a 1-D river model that relies on cross section data along reaches to compute results. Cross sections can be extracted from a TIN in WMS, but the TIN does not always define the channel with enough resolution to get an accurate cross section through the channel. Tools in WMS make it possible to manage cross sections by editing their shape, defining properties, and merging multiple cross sections together. Surveyed channel cross section data can be merged with cross sections extracted from a TIN in order to develop cross sections that accurately depict both the channel and surrounding terrain.

2 Objectives

This exercise will show how to merge cross sections and use the data for input into a HEC-RAS model by:

- Extracting cross sections
- Merging cross sections
- Preparing the model for HEC-RAS

3 Getting Started

1. Open WMS. If WMS is already open select *File* **|** **New** then click **No** if prompted to save changes.
2. Select *File* **|** **Open** to bring up the *Open* dialog.
3. Browse to *xsecs**xsecs*\ and select “conceptual.wms”.
4. Select **Open** to close the *Open* dialog.
5. Click **OK** to close the *Error* dialog stating that a valid cross section coverage was not found.

3.1 Define Centerline and Bank Arcs

1. Select the **Map Module** .
2. **Zoom** in close enough around any section of the feature arcs to see three distinct arcs as shown in Figure 1.

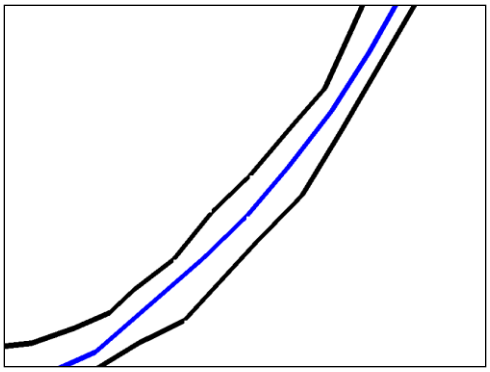

Figure 1 Centerline and bank arcs

3. Using the **Select Feature Arc** tool, double-click on the middle arc to open the *River Reach Attributes* dialog.
4. Ensure the *Arc type* is set to “Centerline”.
5. For *River Name,* enter “Jordan River”.
6. For *Reach Name,* enter “Riverton”.
7. Select **OK** to close the *River Reach Attributes* dialog.
8. Use the **Select Feature Arc** tool to select both outer arcs by pressing and holding down the *Shift* key while clicking on each of the outer arcs.
9. Select *Feature Objects* **| Attributes** to open the *River Reach Attributes* dialog.
10. Make sure the *Arc type* is set to “Bank”
11. Click **OK** to exit the *River Reach Attributes* dialog.

4 Extracting Cross Sections

It is very easy to extract cross section geometry from a TIN in WMS. This is done by creating arcs that represent the plan view of the cross sections on a 1D-Hyd Cross Section coverage. For this tutorial, cross section arcs will be imported into the project.

1. Select *File* **| Open** to access the *Open* dialog.
2. Navigate to *xsecs**xsecs*\ and select “xsections.map”.
3. Click **Open** to exit the *Open* dialog.

The cross section arcs are approximately as wide as the floodplain might be. They end where there is a sharp break in slope and the terrain gets relatively steep. Wider cross section arcs are generally not necessary for a HEC-RAS analysis.

4. Make sure the “1D-Hyd Cross Section” coverage is active in the Project Explorer.
5. In the *Model* drop-down list at the top of the screen, select “River Tools”.
6. Select *River Tools* **| Extract Cross Section…** to open the *Extract Cross Sections* dialog.
7. Select **OK** to exit the *Extract Cross Section* dialog.
8. When prompted to extract cross sections from the DEM or the TIN, select the **TIN** option.

5 Merging Cross Sections

Any two cross sections can easily be merged in WMS. This can be done by creating a new cross section database that stores surveyed channel cross section data and merging it with the cross sections that were extracted from the TIN. Merging cross sections will create more accurate cross section geometry data. Cross sections are merged by aligning both cross sections using reference points such as the thalweg or bank locations and then inserting points from one cross section into the other.

5.1 Open Channel Cross Section Data

1. Select *File* **| Edit File** to bring up the *Open* dialog.
2. Select “channel.txt” and click **Open** to close the *Open* dialog and open the *View Data File* dialog.

If *Never ask this again* has previously been selected the file will open automatically in the selected program and the next steps may be skipped.

3. For *Open With,* choose a text editor or spreadsheet.
4. Click **OK** to open it in the selected program.

This will close the *View Data File* dialog and open the selected editor application with the surveyed cross-section data.

5. Minimize “channel.txt” for later use.

5.2 Define Channel Cross Sections in the Database

1. In WMS, select *River Tools* **| Manage Cross Sections...** to open the *Manage Cross Sections* dialog.
2. Click **New Database** to create a new database titled “CSDB (2)”.
3. In the *Cross Section* area, click the **New** button to add a cross section to the database.
4. Select the **Edit** button to open the *Cross Section Attributes* dialog.
5. Click the **Add** button.
6. In the *Add Points* dialog, enter “7” to add seven points to the cross section.
7. Select **OK** to exit the *Add Points* dialog.
8. Make sure *XY* is turned off.
9. Return to “channel.text”.
10. Copy the cross section data for “Channel Section 1” from “channel.txt” (opened in the selected text editor).
11. In the *Geom Edit* tab of the *Cross Section Attributes* dialog, select the top, left cell, and paste the data in as shown in Figure 2.

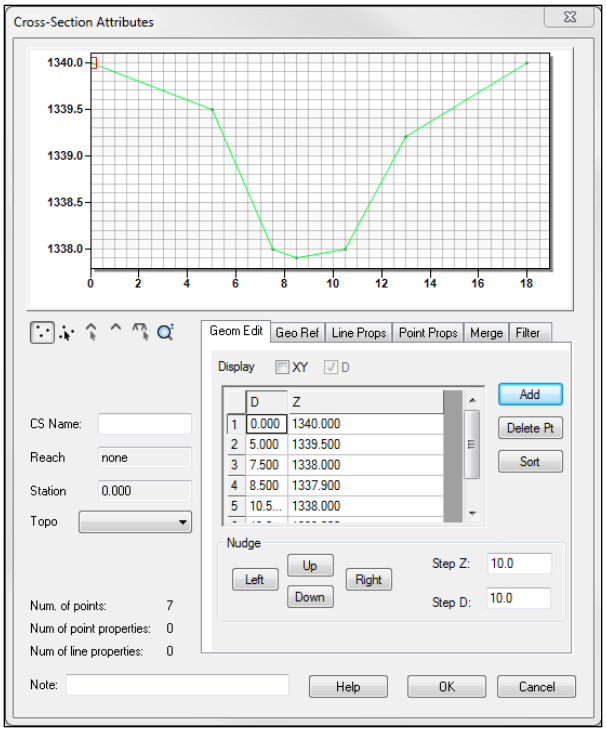

Figure 2 Adding cross section geometry data to the database

12. Select the *Point Props* tab.
13. Click the **Auto Mark** button to automatically define thalweg and right/left bank points.

These reference points will be used to align cross sections for merging.

14. Click **OK** to close the *Cross Section Attributes* dialog.
15. Click **OK** to close the *Manage Cross Sections* dialog.
16. Close the text file “channel.txt” in the selected text editor.
17. Select **No** if asked to save changes.

5.3 Align Channel Cross Sections with Extracted Cross Sections

1. Use the **Select Feature Arc** tool to select the cross section arc at the top of the screen labeled “0”.
2. Select *Feature Objects* **| Attributes…** to open the *River Cross Section Attributes* dialog.
3. Click **Assign Cross Section** to open the *Assign Cross Section Profile* dialog.
4. Click the **Edit** button to open the *Cross Section Attributes* dialog.
5. Select the *Line Props* tab to view the material properties (roughness values) that will be applied to each cross section. These can be edited if necessary.
6. Select the *Merge* tab.
7. Click the **Load/Insert CS** button to open the *Assign Cross Section* dialog.
8. In the *Cross Section* table, select the cross section and click **OK** to close the *Assign Cross Section* dialog.

The surveyed cross-section points now appear to the upper left corner of the cross-section profile plot.

9. In the *Cross Section Attributes* dialog, under *Alignment,* choose “Left End” to align the left end (specified as a point property) of the channel cross section with the left end of the extracted cross section.
10. Enter a value for *Step Z* (try “5”) and use the **Down** button to move the channel cross section vertically.
11. Reduce the *Step Z* value to “1” and use the **Up** button to position the cross section.
12. Keep reducing the *Step Z* value and using the **Up** and **Down** buttons until the cross sections are aligned correctly.
13. Enter a value for *Step D* and use the **Left** and **Right** buttons if needed to move the channel cross section horizontally.
14. From the *Merge* drop-down, select “Insert All”.
15. Click **Apply** to insert the channel cross section and permanently change the extracted cross section data.
16. Select **OK** to close the *Cross Section Attributes* dialog.
17. Select **OK** to close the *Assign Cross Section Profile* dialog.
18. Select **OK** to close the *River Cross Section Attributes* dialog.

Cross sections can be merged using the *Alignment* tools shown in Figure 3. Align cross sections is done using reference points (point properties) that are defined on both cross sections such as left end, left bank, thalweg, right bank, and right end. Entering a value for the *Offset* and the cross section will offset that distance from the alignment point. Specifying a distance for *Step Z* and using the **Up** and **Down** buttons will move the inserted cross section vertically. Doing the same for *Step D* using the **Left** and **Right** buttons will move the cross section horizontally. The horizontal and vertical scales on the plots are useful for determining the distances to enter. (Remember that the scales are not equal and so the vertical distances are magnified). After merging cross sections, the model can now be prepared for use in HEC-RAS.

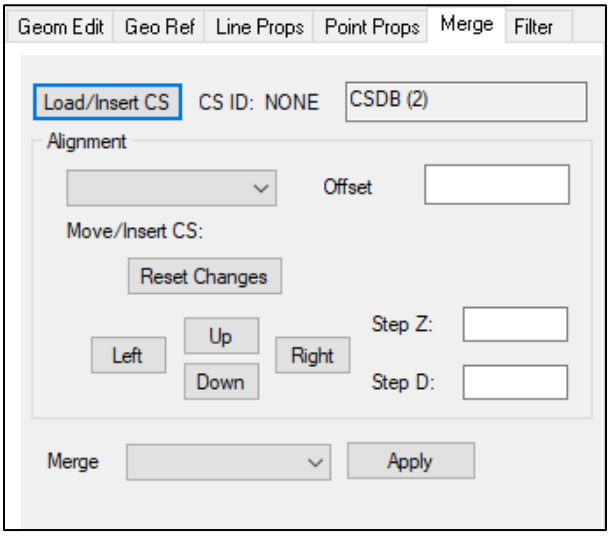

Figure 3 Alignment tools

6 Conclusion

This exercise demonstrated how to merge cross sections using the *Manage Cross Sections* dialog. In particular, it showed how to:

- Extract cross sections
- Merge cross sections