



SMS 14.0 Tutorial

Cross Sections to Surface

Converting Cross Sections to a 2D Surface



Objectives

Learn about preparing cross sections so that they can be converted to a surface.

Prerequisite Tutorials

- Overview
- Data Visualization
- Map Module

Required Components

- SMS Core

Time

- 15–25 minutes

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1 Introduction

This tutorial demonstrates using cross sections to create a 2D surface. This project uses a location along the Musselshell River in Montana. The project will begin with importing a centerline coverage, then importing cross sections. The cross sections will then be converted to a scatter set (TIN) to represent the surface of the river channel.

Before converting the cross sections to a scatter set (TIN), adjustments will need to be made both to the centerline arc and the cross sections. This helps improve the triangulation of the final scatter set so it's more representative of the channel surface.

2 Getting Started

First, start by opening a map file that contains the project centerline and sets the projection for the project.

To import the map file, do the following:

1. Open SMS.
2. If SMS is already running, select **File | New** to ensure that the program settings are restored to their default state.
3. If asked to save changes, click **Don't Save** to close the dialog and restore SMS to a default state.
4. Select **File | Open...** to bring up the *Open* dialog.
5. Browse to the SMS_Cross_Section_to_Surface\data files folder and select "cl.map".
6. Click **Open** to import the file and exit the *Open* dialog.

A centerline map coverage with a single arc should appear similar to Figure 1.

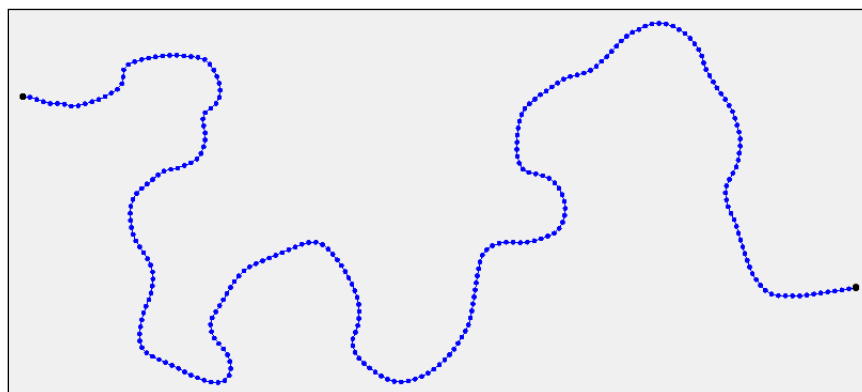


Figure 1 Initial project with centerline arc

It's recommended to save the project before continuing to the next steps. To do this:

7. Select *File* | **Save As...** to open the *Save As* dialog.
8. Navigate to the tutorial folder for this tutorial.
9. For the *File name*, enter "xs_surface.sms".
10. Click **Save** to close the *Save As* dialog and create the project.

It is recommended to save the project periodically while completing the tutorial.

3 Importing the Cross Sections

Import the cross sections by doing the following:

1. Select *File* | **Open...** to bring up the *Open* dialog.
2. Browse to the SMS_Cross_Section_to_Surface\data files folder and select "cross_sections.csv".
3. Click **Open** to exit the *Open* dialog and start the *File Import Wizard* dialog.

The *File Import Wizard* will define how the cross section database is imported into the project. In the *File Import Wizard*, set the following:

4. In *Step 1 of 2* of the *File Import Wizard*, accept the default settings and click **Next >**.
5. In *Step 2 of 2* of the *File Import Wizard*, change the *SMS data type* to be "Feature Data".

Create a 1D-Hydraulic Cross Section coverage to be used for the imported data.

6. Click **Create...** to bring up the *New Coverage* dialog.
7. In the *Coverage Type* section, select *Generic* | **1D-Hyd Cross Sections**.
8. Click **OK** to close the *New Coverage* dialog.

A new  "1D-Hyd Cross Section" coverage should appear in the Project Explorer.

9. In the *Mapping options* section, turn on *Cross section database*.

In the *File preview* section, set the columns as follows:

10. For the column with the *Header* "Pt_ID", change the *Type* to be "Name".
11. For the column with the *Header* "Pt_Type", change the *Type* to be "Pt Type". This will open the *Point Property Types* dialog.
12. For the *Thalweg* row, enter "T" for the *Keyword*.
13. Click the **New** button 4 times to add 4 new rows.
14. For the first new row, enter "Left Toe" for the *Name* and enter "LT" for the *Keyword*.
15. For the second new row, enter "Right Toe" for the *Name* and enter "RT" for the *Keyword*.
16. For the third new row, enter "Left Abutment" for the *Name* and enter "LA" for the *Keyword*.
17. For the fourth new row, enter "Right Abutment" for the *Name* and enter "RA" for the *Keyword*.

The *Point Property Types* dialog should appear similar to Figure 2.

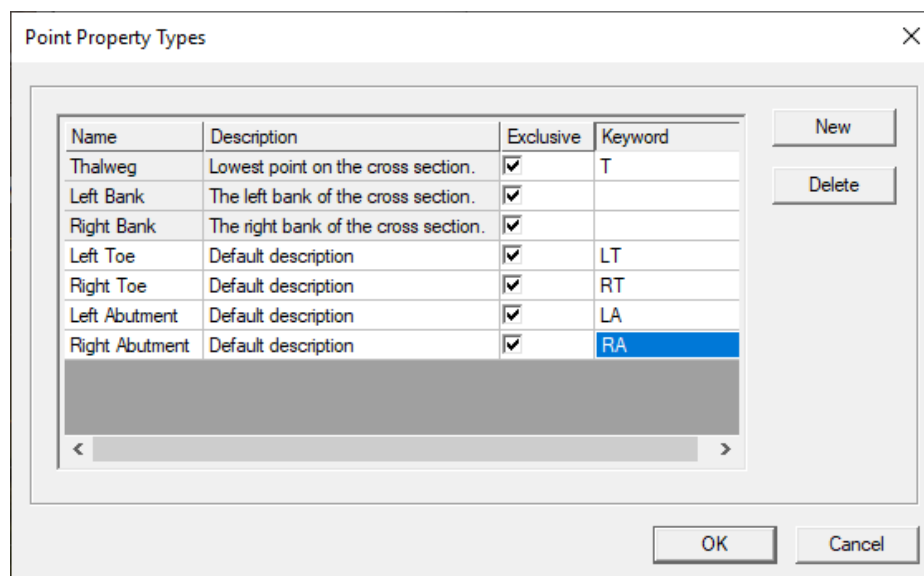


Figure 2 Point Property Type dialog

18. Click **OK** to close the *Point Property Types* dialog.
19. For the column with the *Header* "XS", change the *Type* to be "XS ID".
20. Click **Finish** to close the *File Import Wizard*.
21. Click **OK** to set a projection and open the *Projection – Project\Map Data\1D-Hyd Cross Section* dialog.
22. Accept the display projection and click **OK** to close the *Projection* dialog.

The cross sections should now be visible in the Graphics Window.

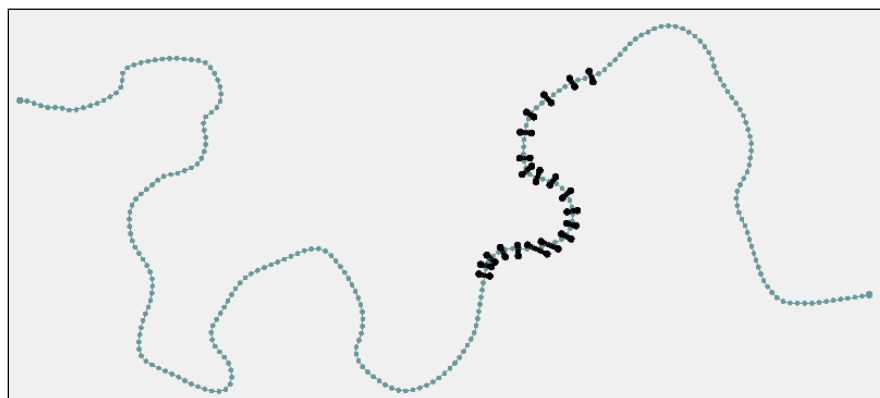


Figure 3 Cross sections after being imported

4 Viewing Cross Sections

Now that the cross section database has been imported into SMS, the features and attributes within the cross section database can be viewed. In reviewing the cross section, it is important to note the spacing of the cross section stations. If the cross

sections are spaced too far apart, or there are too few cross sections, the resulting channel surface could fail to follow the actual channel or could have gaps.

To review the cross sections, do the following:

1. Select “ 1D-Hyd Cross Section” to make it active.
2. Using the **Select Feature Arc**  tool, double-click on any one of the cross sections to bring up the *Cross Section Attributes* dialog.

A profile of the cross section will be displayed (Figure 4).

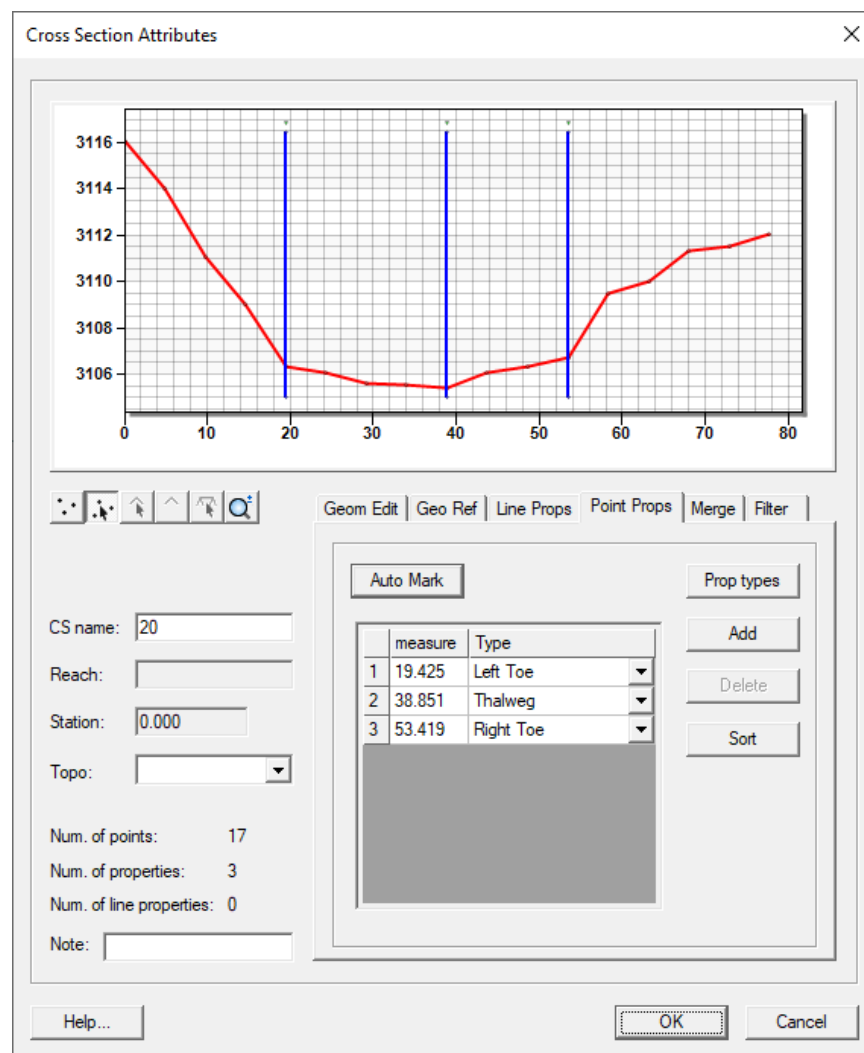


Figure 4 Assign Cross Section Profile dialog

In reviewing the station values, note that the values are between 52 and 201. In order to generate a more accurate surface, additional cross sections are needed.

3. Click **Cancel** to close the *Cross Section Attributes* dialog.

5 Redistributing the Centerline Vertices

Based on the station values and the radius of the cross section curvature, the centerline vertices need to be redistributed so that additional cross sections can be generated.

To do this:

1. Select “ Centerline” to make it active.
2. Using the **Select Feature Arc**  tool, select the centerline arc.
3. Right-click and select **Redistribute Vertices...** to open the *Redistribute Vertices* dialog.
4. Set the *Average Spacing* to “25”.
5. Turn on *Use cubic spline*.
6. Click **OK** to close the *Redistribute Vertices* dialog.

The vertices have now been redistributed to more closely match the distribution of the cross sections.

6 Interpolating the Cross Sections

The cross sections can now be interpolated to create additional cross sections thus creating a better surface. To do this:

1. Select “ 1D-Hyd Cross Section” to make it active.
2. Using the **Select Feature Arc**  tool, right-click in the Graphics Window, and select **Select All**.
3. Right-click again and select **Interpolate Cross Sections....** A warning dialog will appear.
4. At the dialog warning that all stations will be recomputed, click **Yes**. Then, the *Interpolate Cross Sections* dialog will appear.
5. Enter “50” for the *Target spacing*.
6. Click **OK** to close the *Interpolate Cross Sections* dialog and open the *Excluded Features* dialog.
7. Do not exclude any features. Click **OK** to close the *Excluded Features* dialog.
8. A message will appear stating the number of cross sections that were created. Click **OK** to close this message.

7 Converting Cross Sections to 2D Scatter Points

The elevations that were read in the cross sections are also assigned to the feature vertices along the arc. In the absence of any other elevation data these can be used for the creation of the 2D model domain. The elevations along each of the cross sections can be converted to a 2D scatter set (TIN).

To do this:

1. Right-click on “ 1D-Hyd Cross Section” and select **Convert | Map → 2D Scatter** to bring up the *Map → Scatter* dialog.
2. In the *Create Scatter Point Set Source* section, select *Cross-section database*.
3. Enter “Channel” as the *New scatter point set name*.
4. Click **OK** to close the *Map → Scatter* dialog and open the *Excluded Features* dialog.
5. Do not exclude any features. Click **OK** to close the *Excluded Features* dialog.

A new “ Channel” entry should appear under “ Scatter Data” in the Project Explorer.

9. Turn off “ Centerline” and “ 1D-Hyd Cross Section” in the Project Explorer.

The scatter set is a triangulated, irregular network (TIN) of elevation points. The triangles can be viewed and contours can be generated to help visualize how the elevations are represented with the scatter set.

10. Right-click on “ Scatter Data” and select **Display Options...** to bring up the *Display Options* dialog.
11. Select “Scatter” from the list on the left.
12. On the *Scatter* tab, turn on *Triangles* and click **OK** to close the *Display Options* dialog.
13. **Zoom**  and **Pan**  to observe the triangulation of the scatter data.

Note that the triangulation simply connects the cross sections. The centerline, bank arcs, or other cross section features are not incorporated into the triangulation.

14. **Frame**  the project.

The project should appear similar to Figure 5.

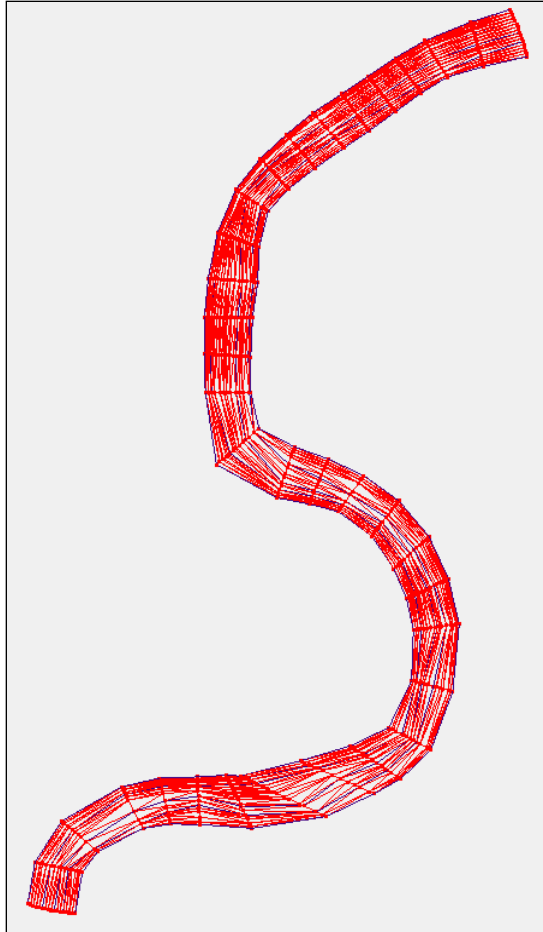


Figure 5 *Triangulation visible*

15. Click **Display Options**  to open the *Display Options* dialog.
16. Select “Scatter” from the list on the left.
17. On the *Scatter* tab, turn off *Triangles* and turn on *Contours*.
18. On the *Contours* tab, in the *Contour method* section, select “Color Fill” from the first drop-down.
19. Click **OK** to close the *Display Options* dialog.

The project should appear similar to Figure 6.

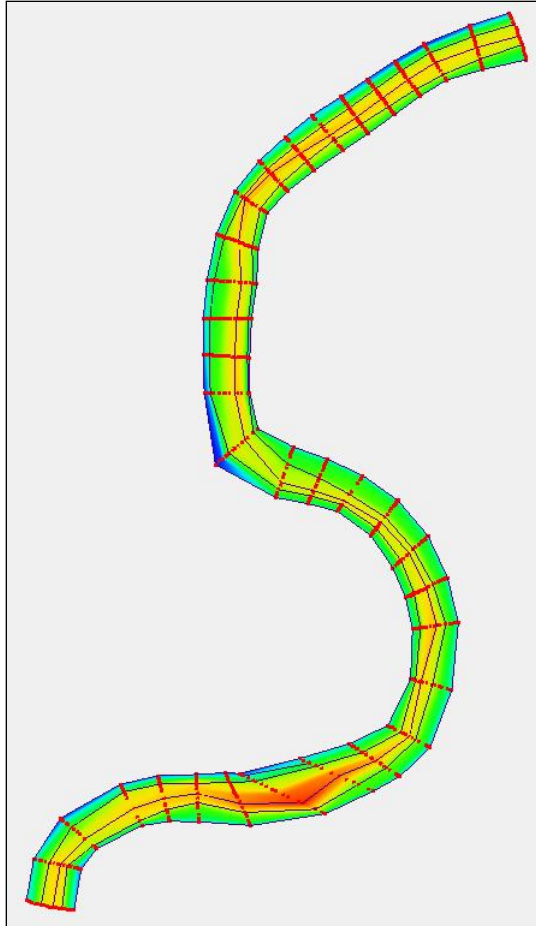


Figure 6 Scatter set with contours visible

By adding additional cross sections, the final surface is more representative of the channel.

8 Conclusion

This concludes the “Cross Sections to Surface” tutorial. Topics covered in this tutorial included:

- Importing cross sections
- Redistributing the centerline vertices to improve the curvature
- Interpolating cross sections to generate additional cross sections for the surface
- Converting cross sections to scatter points

If desired, continue to experiment with the SMS interface or quit the program.