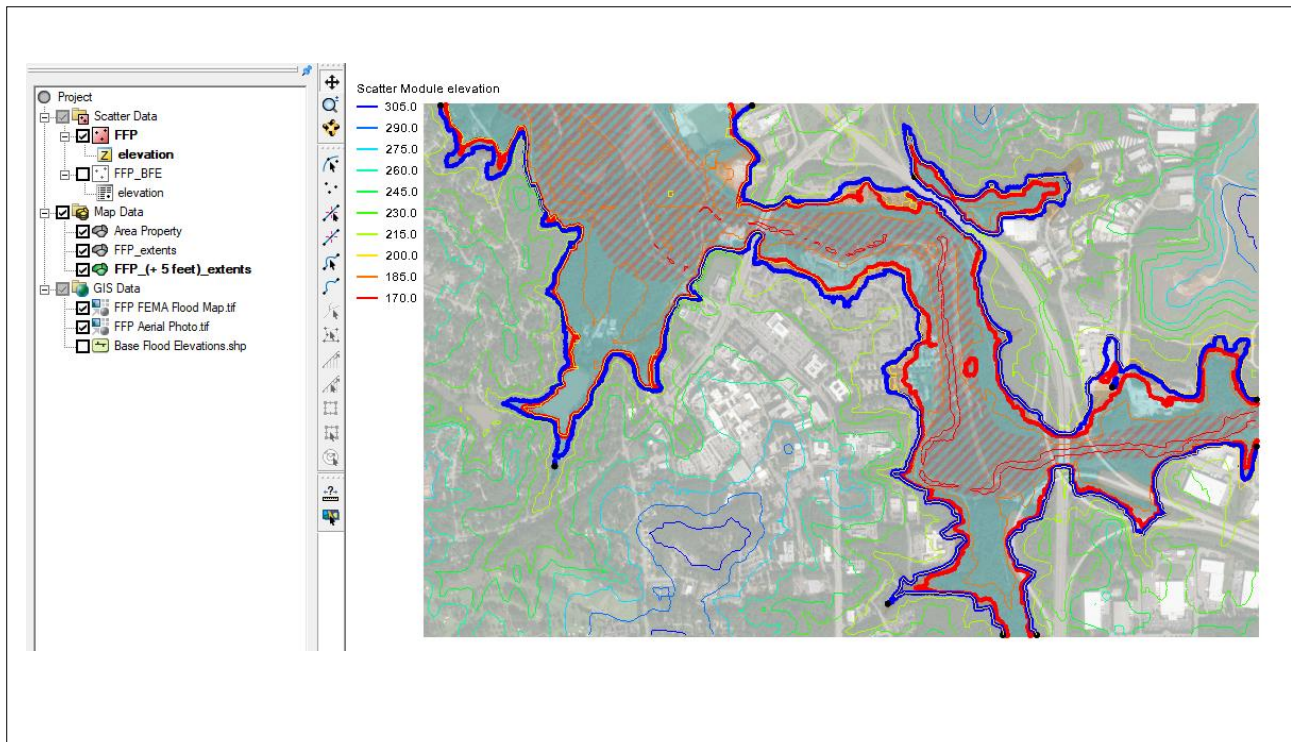*SMS 13.0 Tutorial*
Creating a Fast Floodplain Map

Objectives

This tutorial shows how to use the **Map Flood** tool to quickly generate floodplain data.

Prerequisites	Requirements	Time
• SMS Overview	• Scatter Module	• 10–15 minutes
• Map Module	• Map Module	
• Online Maps	• Internet Connection	

1   Introduction

The **Map Flood** tool in SMS utilizes ground elevations and existing flood hazard maps from the Federal Emergency Management Agency (FEMA) to quickly visualize the impacts of possible modifications in the flood level. The tool is designed to utilize data from web services including ground elevations, flood hazard base flood elevations, and flood hazard floodplain extents. FEMA data is only available for locations inside the United States and its territories. However, user supplied data for the ground elevations and base floodwater elevations can also be used when supplied as a scatter set.

To get started:

1. Launch the SMS application, if it is not currently running.

2. If SMS is running, select *File* | **New** to initialize a new instance of SMS.

2   Generating a Floodplain Using FEMA Base Flood Elevation Data

There are multiple ways to use the **Map Flood** tool depending on the data availability of each site. The first part of this tutorial will demonstrate using the SMS web services to download terrain and base flood elevation data for use in the tool.

1. Select *File* | **Map Flood** to open the *Floodplain Mapping Options* dialog.

Continue to the next section.

2.1   Parameters Using FEMA Base Flood Elevations

In the *Floodplain Mapping Options* dialog it is possible to define how the floodplain extents will be generated from the source data.

The ground and water surface elevations can be set to use an existing dataset in the project; however, since a local dataset is not available, the tool will retrieve this data from online sources.

1. In the *Ground Elevations* section, ensure that the default option *Use Worldwide Elevation Data* is selected.

2. In the *Water Surface Elevations* section, ensure that the default option *Use FEMA Base Flood Elevations* is selected.

Selecting the *Use FEMA Base Flood Elevations* option will cause the water surface elevations to be downloaded from FEMA as base flood elevations. It is important to note that FEMA base flood elevations are not available for every reach. The FEMA National Flood Hazard Layer viewer can be used to search for a site and see what data is available.

Additional options include specifying a flood level offset from the base flood. A background image and FEMA flood map can also be downloaded during the process.

3. Set the *Offset from Base Flood* to "5" (ft) and leave the other options at their defaults (the *Prefix* option is used to identify the datasets and coverages that are created from this tool).

4. Click **OK** to close the *Floodplain Mapping Options* dialog.

Continue to the next section.

2.2   Locating the Project Area

The *Virtual Earth Map Locator* appears when local datasets are not being used. This dialog allows the selection of the area of interest for the project.

Use this dialog to define the extents of the area. Complete the following:

1. In the *Place to search for* field, enter "Holston Lane, Raleigh, NC".

2. Click **Jump to Search Location**.

3. Click on the zoom out button ⊟ three (3) times to zoom out to similar extents as shown in Figure 1.

The map area should refresh to show a satellite view of the Holston Lane area in Raleigh, North Carolina. The bounding extents of this map window will determine the bounding extents for the data that will be downloaded from the SMS web services.

For more information on using the *Virtual Earth Map Locator* window, see the "Online Maps" tutorial.

4. Select "Imagery" from the drop-down in the top right corner of the map.

5. Click **OK** to use this location and close the *Virtual Earth Map Locator*.

6. Click **OK** on the message that appears stating that the feature requires a global projection. The *Display Projection* dialog will appear.

7. Accept the specification of *UTM Zone 17* for the projection and click **OK** to close the *Display Projections* dialog and run the floodplain delineation.

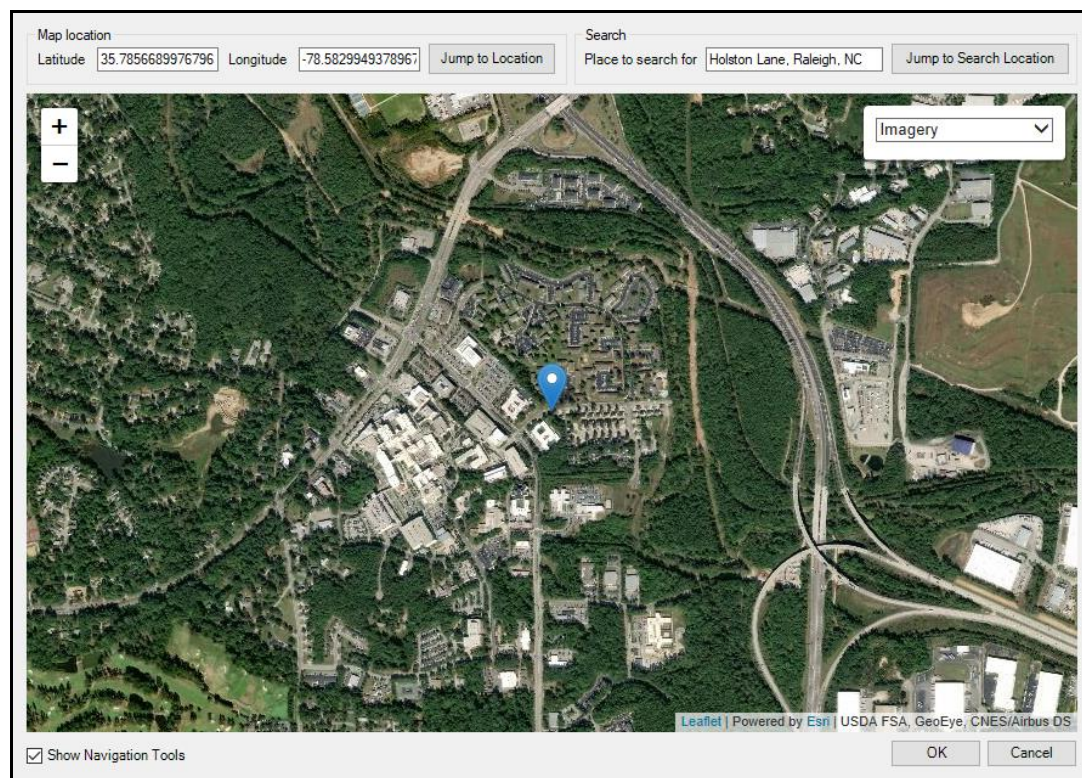It may take a few moments for the **Map Flood** tool to finish.

Figure 1   Holston Lane, Raleigh, North Carolina

2.3   Viewing the Results

Running the **Map Flood** tool with the above specified settings completes several processes.

The tool will download the following data:

- Elevation data for the area (stored as a scatter set)

- Base flood elevation lines for the area (loaded as a shapefile, stored and utilized as a scatter set)

- Flood insurance map which is placed as an image in the GIS module

- Aerial Imagery map which is placed as an image in the GIS module

The tool will create the following data:

- Flood extent arcs for both the baseline and offset floodwater elevations. These arcs are stored in separate map coverages.
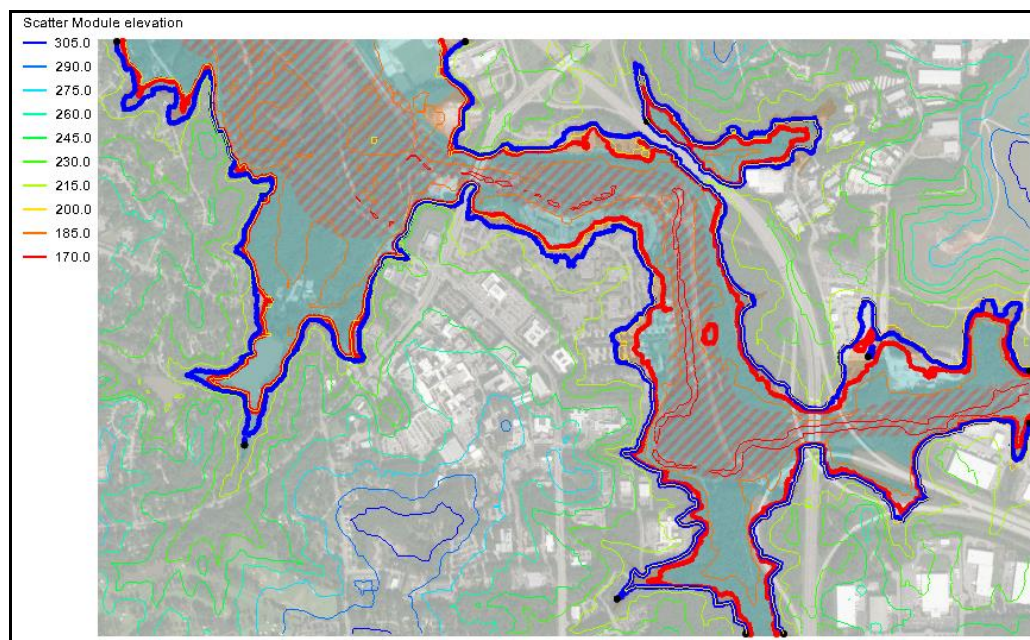
Figure 2   The fast floodplain map for Holston Lane, Raleigh, North Carolina

The results will appear in the Project Explorer and in the display window.

1. In the Project Explorer, switch back and forth between the "⬡ FFP_extents" and "⬡ FFP_(+ 5 Feet)_extents" coverages to see the difference between the base floodplain and the offset floodplain.

The FEMA base flood elevation cross section lines that were downloaded can be viewed by checking the box next to the "⊡ FFP Base Flood Elevations.shp" shapefile in the Project Explorer.

3   Re-Issuing the Map Flood Tool

Once the **Map Flood** tool has been used, ground elevation and water surface elevation scatter sets will have been created. These scatter sets will be set as the default options to be used.

To demonstrate this:

1. Select *File | **Map Flood*** to open *Floodplain Mapping Options* dialog.

The options in the dialog have changed. The ground and water surface elevations have already been set to the *Use Local 2D Scatter* option. Furthermore, the data provided from the last use of the **Map Flood** tool has been selected. The ground elevation will use the "⬚ FFP" scatter set elevations and the water surface elevations will use the "⬚ FFP_BFEl" scatter set elevation. These options could be changed if needed.

The other options in the dialog have all been turned off and the *Offset from Base Flood* option is set at the same value used in the last run.

2. Change the *Offset from Base Flood* to be "10".

3. Click **OK** to close the *Floodplain Mapping Options* dialog.

The **Map Flood** tool will run. The *Virtual Earth Map Locator* did not appear this time because local ground elevations and base flood elevation data was used.

Notice the tool used local data and did not download new elevation data or maps. It did create a new coverage with the offset flood extents.

4. In the Project Explorer, switch back and forth between the "🌐 FFP_extents", "🌐 FFP_(+ 5 Feet)_extents", and "🌐 FFP_(+ 10 Feet)_extents" coverages to see the difference between the base floodplain and the offset floodplains.

Now to save the project before continuing.

5. Select *File |* **Save New Project** to open the *Save* dialog.

6. Browse to the desired location and specify a *File name* of "Raleigh_FFP.sms".

7. Select **Save** to save the project.

4   Generating a Floodplain Using FEMA Floodplain Boundaries

There are multiple ways to use the **Map Flood** tool depending on the data availability of each site. The next part of this tutorial will demonstrate using the SMS web services to download terrain and FEMA floodplain extents data for use in the tool. This option can be used when base flood elevation data is not available or when the available base flood elevation data is limited to a small amount of data for the chosen site.

SMS uses the floodplain extents to extract elevation values from the ground dataset. These values are then used as a set of approximate base flood elevation values to be used for the floodplain delineation.

1. Select *File |* **New** to initialize a new instance of SMS.

2. Select **Don't Save** when asked if you would like to save any changes to the project.

3. Select *File |* **Map Flood** to open the *Floodplain Mapping Options* dialog.

Continue to the next section.

4.1   Parameters Using FEMA Floodplain Boundaries

As in the previous site, the tool will be set up to retrieve ground elevation data from online sources. The site that will be used in the steps below, however, does not have any FEMA base flood elevation data available for download. For water surface elevations the *Use FEMA Floodplain Boundary* option will be used to create approximate base flood elevation data as previously described.

1. In the *Ground Elevations* section, ensure that the default option *Use Worldwide Elevation Data* is selected.

2. In the *Water Surface Elevations* section, select the *Use FEMA Floodplain Boundary* option.

3. Set the *Offset from Base Flood* to "8" (ft)

4. Enter "FFP_LA" for the *Prefix* as and leave the other options at their defaults.

5. Click **OK** to close the *Floodplain Mapping Options* dialog.

The Virtual *Earth Map Locator* window will appear. Continue to the next section.

4.2   Locating the Project Area

The *Virtual Earth Map Locator* can once again be used to specify the bounding extents of the site for which data will be downloaded.

When using the *Use FEMA Floodplain Boundary* option it is important that the full extents for the floodplain surrounding a floodway of interest be visible in the project area to get valid results.

1. In the *Place to search for* field, enter "Cheniere, LA" and click **Jump to Search Location.**

2. Select "Imagery" from the drop-down in the top right corner of the map.

3. Use the default map extents and click **OK** to close the *Virtual Earth Map Locator*.

4. Click **OK** on the message that appears stating that the feature requires a global projection. The *Display Projections* dialog will appear.

5. Accept *UTM Zone 15* for the projection and click **OK** to close the *Display Projection* dialog and run the floodplain delineation.
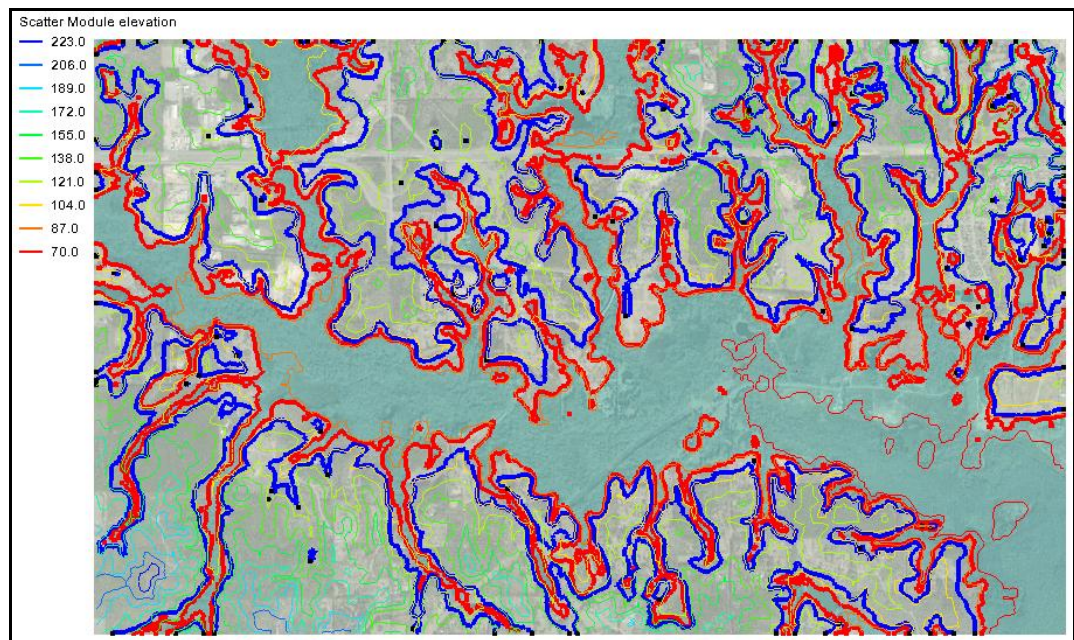

Figure 3   The fast floodplain map for Vardie Parsons Park,Cheniere, Louisiana

The results can be viewed in a similar manner as was demonstrated for the previous site. The display of the "🖼 FFP_LA Flood Hazard Zones.shp" shapefile that were used to generate the approximate base flood elevation points can also be displayed.

4.   Select *File |* **Save New Project** to open the *Save* dialog.

5.   Browse to the desired location (this should be a different directory than the previous project) and specify a *File name* of "Cheniere_FFP.sms".

6.   Select **Save** to save the project.

5   Generating a Floodplain Using Local Data

If neither of the two FEMA data options are available for a particular location, then a local 2D scatter for the water surface elevations can be used for the delineation. This scatter data could come from the results of a hydraulic model or possibly from a set of field water surface elevation measurements.

The example below uses a segment of the Gila River in New Mexico where no FEMA data is available. It demonstrates using results from a 2D model to delineate a floodplain. The scatter set of water surface elevations was created by directly converting the 2D mesh to 2D scatter.

1.   Select *File |* **New** to initialize a new instance of SMS.

2.   Select **Don't Save** when asked if you would like to save any changes to the project.

3.   Open the project file "GilaRiverNM.sms" included in the *Input* folder for this tutorial.

This loads the project including a scatter set for ground elevations, a scatter set for water surface elevations, and a background map.

4.   Select *File |* **Map Flood** to open the *Floodplain Mapping Options* dialog.

Continue to the next section.

5.1   Parameters Using Local Scatter Data

The tool will be set up using the local scatter sets for ground and water surface elevations.

1.   In the *Ground Elevation* section, select the *Use Local 2D Scatter* option.

2.   In the *Ground Elevation* section, click on the **Select** button to open the *Interpolation Source and Options* dialog.

3.   For *Source Geometry* select "Project\Scatter Data\Ground Elevation".

4.   For *Source Dataset* select "Project\Scatter Data\Ground Elevation\Elevation".

5.   Leave the remaining settings and click **OK** to close the *Interpolation Source and Options* dialog.

6. In the *Water Surface Elevations* section, select the *Use Local 2D Scatter* option.

7. In the *Water Surface Elevations* section, click the **Select** button to open the *Interpolation Source and Options* dialog.

8. For *Source Geometry* select "Project\Scatter Data\100-YR WSE from 2D Mesh".

9. For *Source Dataset* select "Project\Scatter Data\100-YR WSE from 2D Mesh \Water_Elev_ft".

10. For *Timestep* select "0 02:06:00".

11. Leave the remaining settings and click **OK** to close the *Interpolation Source and Options* dialog.

12. Set the *Offset from Base Flood* to "5" (ft).

13. Uncheck the box next to *Download FEMA Flood Map* and leave the other options at their defaults.

14. Click **OK** to close the *Floodplain Mapping Options* dialog and run the delineations.

The tool will now have generated floodplain delineation arcs in map coverages for a baseline floodplain and the offset floodplain. The results can be viewed in a similar manner as was demonstrated for the previous sites by alternating the selection of the map coverages.

6   Conclusion

This concludes "Creating a Fast Floodplain Map" tutorial. Continue to experiment with **Map Flood** tool, explore other tutorials, or exit SMS. To learn more about the **Map Flood** tool or troubleshoot potential issues, see the article: https://www.xmswiki.com/wiki/SMS:Map_Flood