SMS 13.0 Tutorial

Cartesian Grid Generation

Objectives
This tutorial gives a brief introduction to generating a Cartesian Grid in SMS.

Prerequisites
- Overview Tutorial
- Map Module Tutorial

Requirements
- Map Module
- Cartesian Grid Module
- Scatter Module

Time
- 5–10 minutes
1 Introduction

This tutorial demonstrates how to create a Cartesian grid in SMS. Some of the models that use Cartesian grids include STWAVE, CMS-Wave, and TUFLOW. This tutorial uses data from Shinnecock Inlet, Long Island, New York, in the United States.

2 Getting Started

The initial project has a scatter dataset of the area around Shinnecock Inlet on the south shore of Long Island, New York. The display and object projections have already been set.

To open the project, do the following:

1. Select File | Open... to bring up the Open dialog.
2. Browse to the data files folder for this tutorial and select “shinnecock.sms”.
3. Click Open to import the project and exit the Open dialog.

The project should appear similar to Figure 1.

![Figure 1 Initial project appearance](image-url)
3 Creating the Cartesian Grid

The next step is to create a Cartesian grid. The grid frame is created in the Map module, which contains tools for creating GIS objects such as points, arcs, and polygons. It is also used for creating a frame, which will be filled in by a Cartesian grid.

3.1 Creating the Cartesian Grid Frame

To create the grid frame:

1. Switch to the Map module.
2. Right-click “Area Property” in the Project Explorer, select Type | Generic | CGrid Generator.
3. Right-click “Area Property” and select Rename.
4. Enter “Shinnecock” and press Enter to set the new name.
5. Using the Create 2-D Grid Frame tool, click out three corners of the grid in the order shown in Figure 2 to create the grid frame.

The first two points clicked define the i-direction, which is the direction of the incoming waves, and the last two points clicked are placed on the land.

![Figure 2 Creating the Cartesian grid frame](image)

6. Using the Select Grid Frame tool, click on the selection box in the middle of the grid frame. The origin should be in the bottom right corner of the grid, as indicated by the arrows (Figure 3).
7. Resize the grid frame by dragging the corners or edges until the grid frame fits over the desired area.

Dragging a corner or side resizes the frame. Dragging the middle point moves the entire frame. Rotate the frame around the origin by dragging the circle located at the top right corner just outside the grid.

8. Double-click on the grid frame to bring up the Grid Frame Properties dialog. The origin and angle can be manually entered in this dialog. This allows for greater precision in placement of the grid.

9. In the Origin, Orientation and Dimensions section, enter “438,000.0” as the Origin X.

10. Enter “70,000.0” as the Origin Y.

11. Enter “112.0” as the Angle.

12. Enter “15,000.0” as the I size and “17,000.0” as the J size. These values can also be edited when generating the 2-D grid in section 3.2.

13. Click OK to close the Grid Frame Properties dialog.

14. Click outside the grid frame to unselect the grid.

15. Frame the project.

### 3.2 Mapping to the Grid

Now to fill the interior of the grid. While the grid is filling, the depth and current values will be interpolated from the scatter set and mapped to each cell.

To do this:

1. Right-click on “Shinnecock” and select Convert | Map → 2D Grid to bring up the Map → 2D Grid dialog.

2. Verify the values in the Origin, Orientation and Dimensions section match those given in steps 9–12 in section 3.1.

3. In both the I Cell Options and J Cell Options sections, select Cell size and enter “100.0” in the field to the right of each.
4. In the Depth Options section, select “Scatter Set” from the Source drop-down, then click Select... to bring up the Interpolation dialog.

5. In the Scatter Set To Interpolate From section, select “elevation” from the tree list.

6. Click OK to exit Interpolation dialog.

The elevation values will now be interpolated to the final Cartesian grid. Other options can be selected as needed.

7. Click OK to exit the Map → 2D Grid dialog and create the Cartesian grid.

The project should appear similar to Figure 4.

![Cartesian grid with the scatter set](image)

**Figure 4**   Cartesian grid with the scatter set

A Cartesian grid has been created from the grid frame.

### 4   Interpolating to a 2D Grid

It is easiest to interpolate elevations when creating the 2D grid. However, elevation values can be interpolated to the grid after the grid has been generated but using the scatter module interpolation commands.

1. Select the “depth” under “Shinnecock” to make it active.

2. Select Scatter | Interpolate to… to bring up the Interpolation dialog.

3. In Datasets To Interpolate From section, select “depth” from the tree list.

4. In Target objects click on “Shinnecock Grid”

5. Click OK to exit Interpolation dialog.
The "depth" dataset has now been interpolated to the Cartesian grid as "depth_interp". It is not being used as the elevation for the grid because another dataset was already being used for the elevation. To change this:

6. Select "Shinnecock Grid" to make it active.
7. Select Data | Map Elevation to bring up a Select Dataset dialog.
8. Select "depth_interp" and click Select to close the Select Dataset dialog.

The "depth_interp" dataset has now been set as the elevation for the grid.

5 Grid Display Options

To view only the grid:

1. Turn off "Scatter Data" in the Project Explorer.
2. Frame the project.
3. Select Display | Display Options… to bring up the Display Options dialog.
4. Select “Cartesian Grid” from the list on the left.
5. On the Cartesian Grid tab, click All Off and turn on Contours.
6. On the Contours tab, in the Contour method section, select “Color Fill” from the first drop-down.
7. Click OK to close the Display Options dialog.
8. Select the "depth" dataset under "Shinnecock Grid".

The project should appear similar to Figure 5.

Figure 5 Cartesian grid with contours
6 Conclusion

This concludes the “Cartesian Grid Generation” tutorial, which showed how to create a Cartesian grid using the Cartesian grid generator coverage. It also showed ways to interpret elevation to a Cartesian grid.