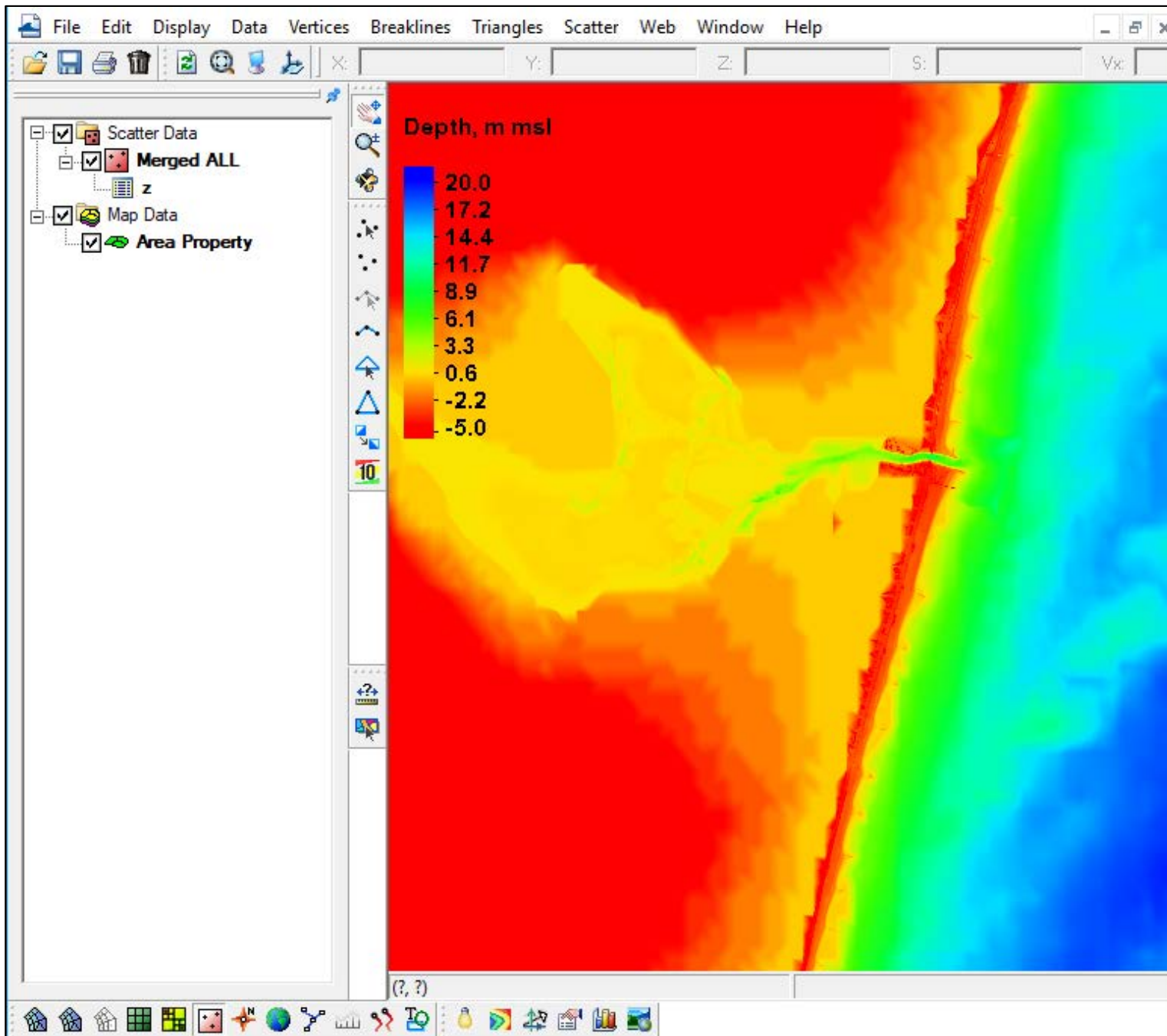
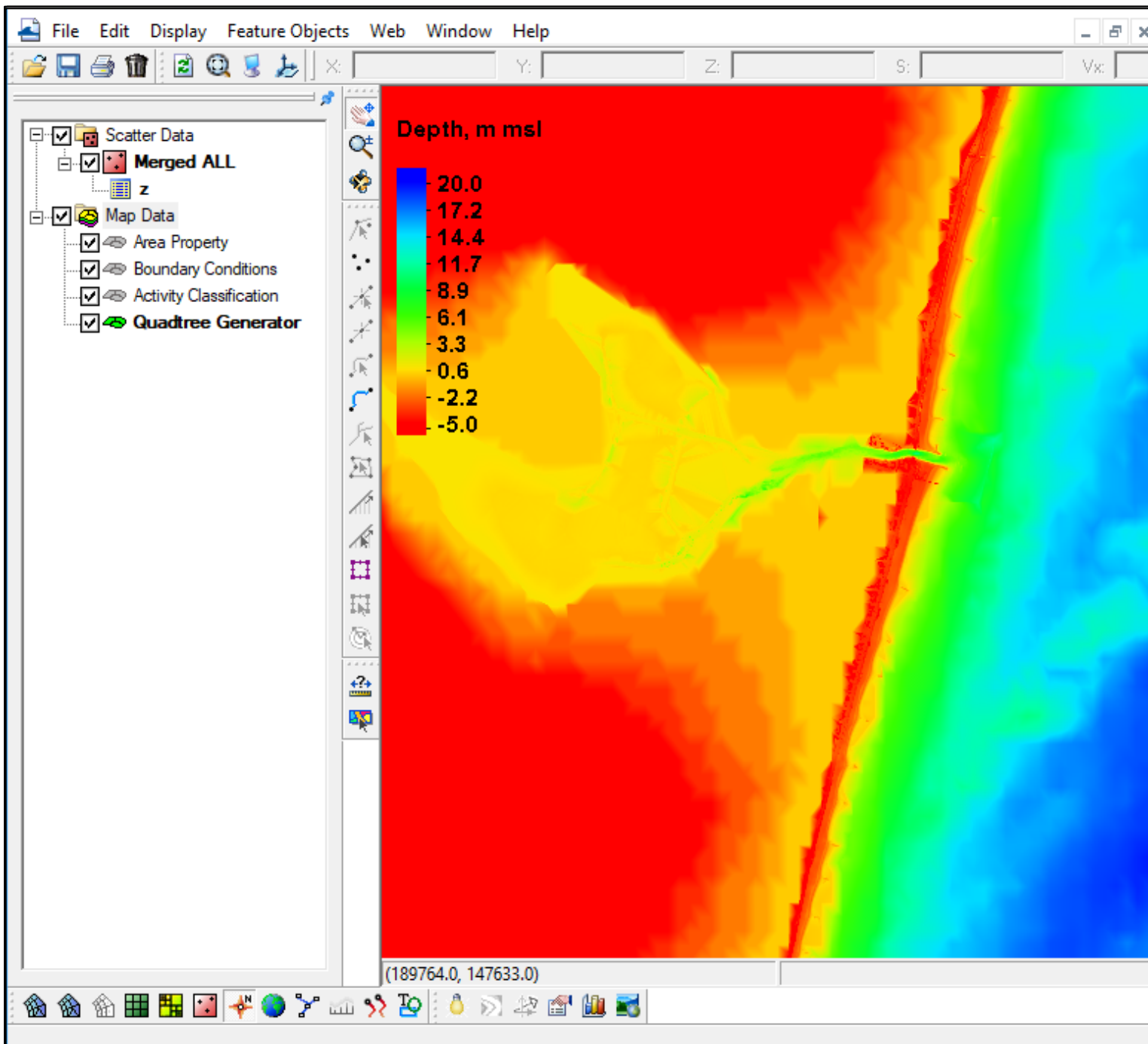


## Creating a CMS simulation

- Load Bathymetry Scatterset/SMS Project
- Develop Grid Domain
- Activity Dataset (Land/Water)
- Build Quadtree or Cartesian grid frame
- Boundary Conditions



Old survey datasets in project are not necessary once the final merged bathymetry is set. Others can be removed from project.

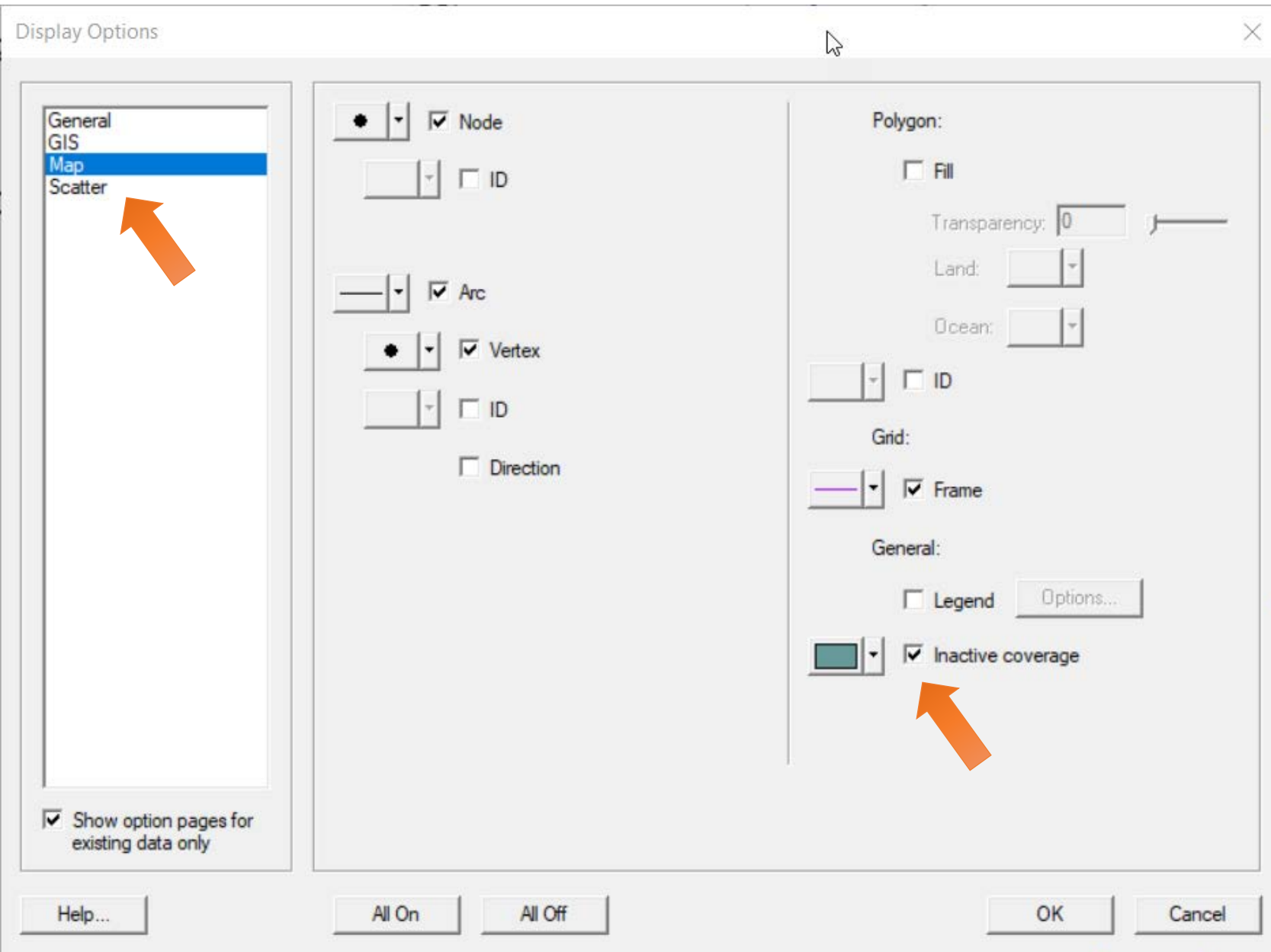


## Add New Coverages for CMS

- Models | CMS-Flow | Boundary Conditions
- Generic | Activity Classification

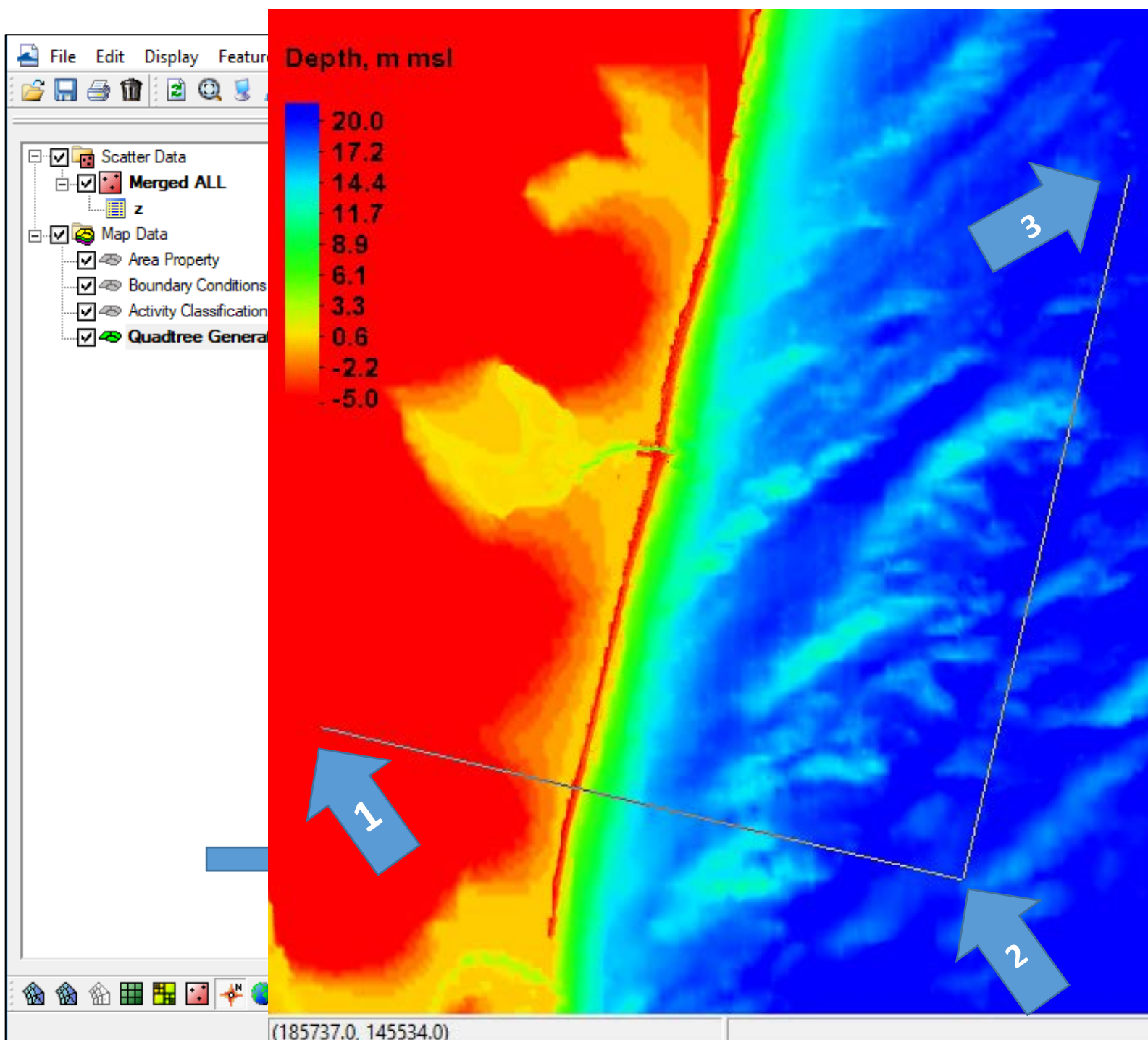
Add the Quadtree generator coverage:

- Generic | Quadtree Generator



Since there are several coverages that will be used from the Map Module, we will want to see some of the information from other coverages while we work on some others.

- To enable this, choose Display | Display Options
- Click Map from the options on the left, then place a check in the box named “Inactive coverage” from the options on the right.

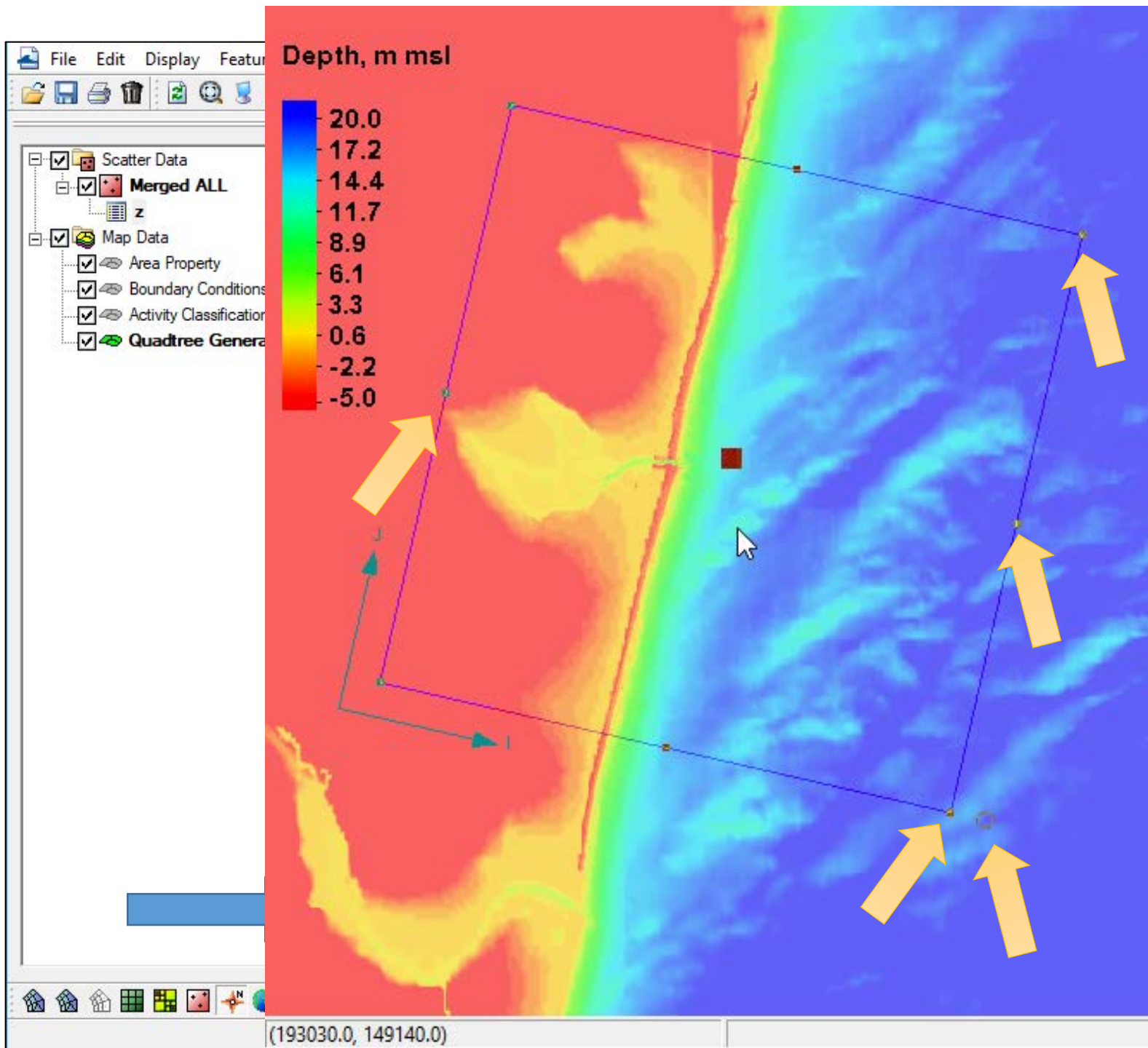


- Select Quadtree Generator Coverage
- Select Create Grid Frame tool

- Define domain of CMS grid by clicking three points (order or extreme accuracy is not necessary)

- Grid Frame is built but may be partially hidden from view by filled display contours.
- Making contours semi-transparent can help.





- Click Select Grid Frame tool

- Click frame selector
- You can now resize with corner or edge center points
- You can rotate around IJ Axis with handle

- Make sure to SAVE frequently as you go along.

Grid Frame Properties

Origin, Orientation and Dimensions

Origin X: 186200.000000 Angle: 347.000000 I size: 7630.000000 m

Origin Y: 145780.000000 J size: 11100.000000 m

I Cell Options

☒ Define cell sizes

☒ Cell size: 10.000000 m

☐ Number of cells: 763

☐ Use refine points

Maximum cell size: 10.000000 m

Maximum bias: 1.100000

☒ Use inner growth

J Cell Options

☒ Define cell sizes

☒ Cell size: 10.000000 m

☐ Number of cells: 1110

☐ Use refine points

Maximum cell size: 10.000000 m

Maximum bias: 1.100000

☒ Use inner growth

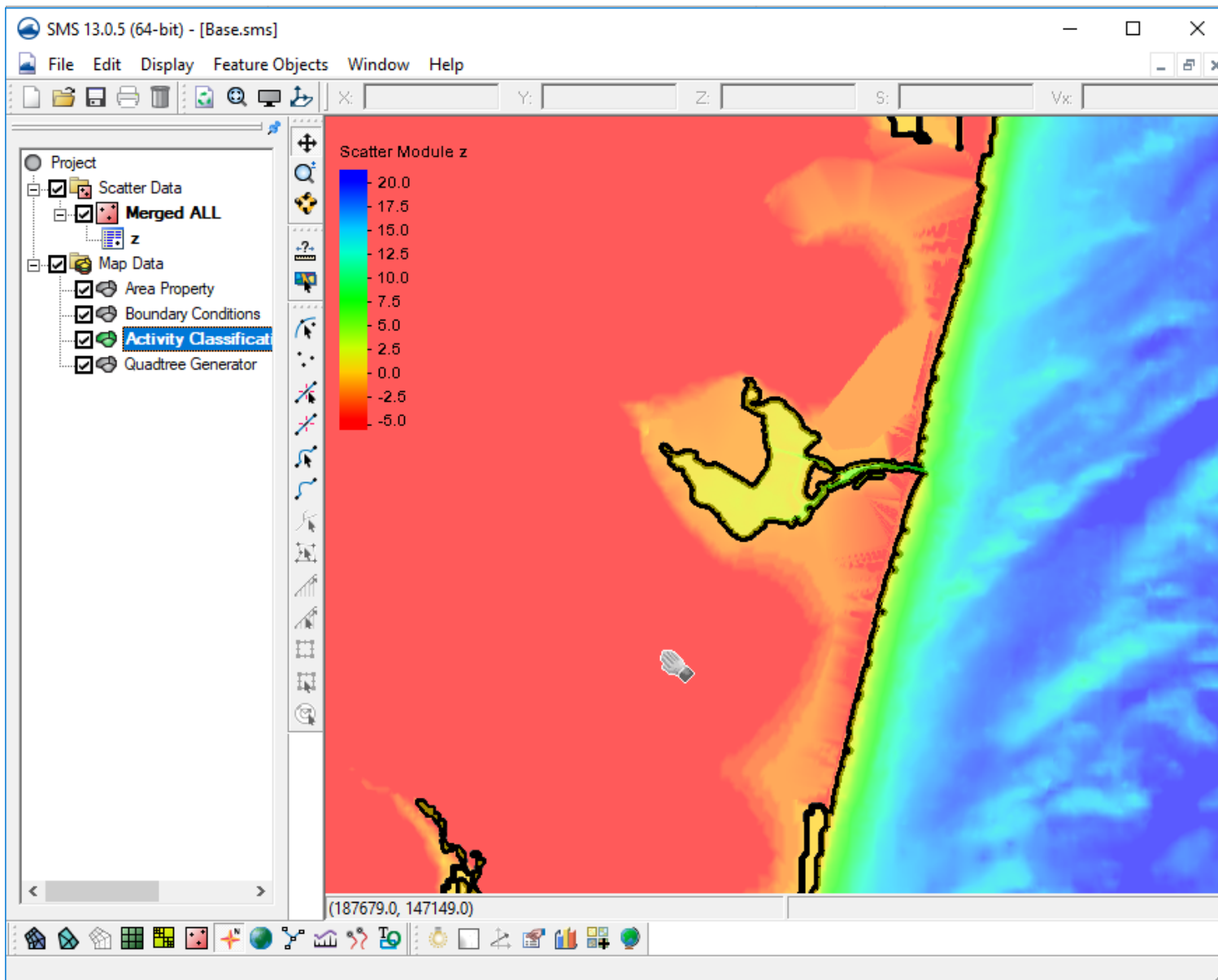
Help... OK Cancel

- Double Clicking the Grid Frame selector will bring up a property dialog.
- After experimenting with the handles and rotating, enter the values as shown in the top section only.

- This defines the exact origin, I and J extents and rotation angle to our desired area.

- We will come back later to add resolution for telescoping/quadtree grids.

Next, we define the Land/Water interface with the Activity Classification coverage.



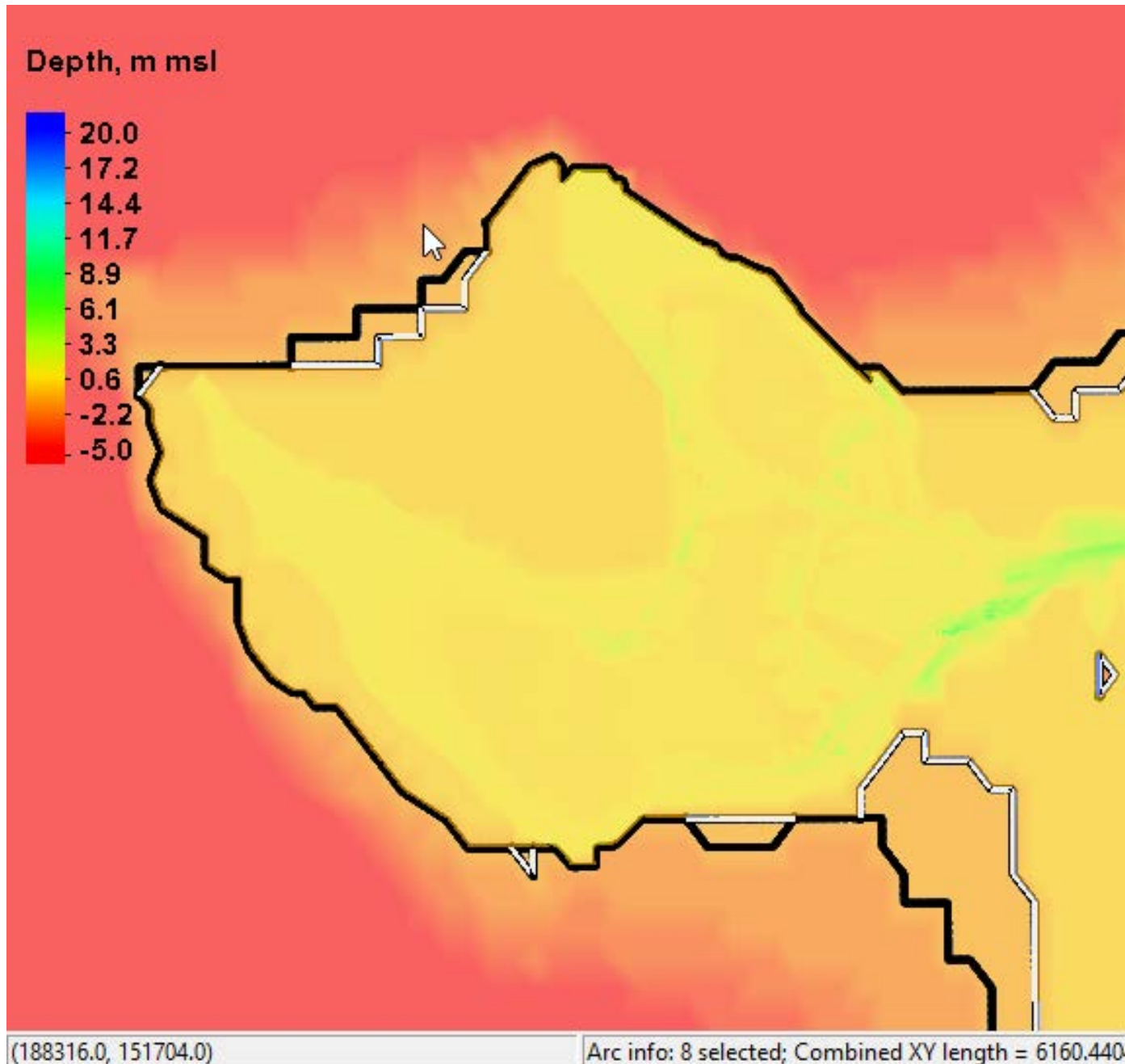
- Click the *Activity Classification* coverage in the Data Tree


- Right Click your final bathymetry dataset in the scatter module.
- Choose “Convert | Scatter Contours → Map”

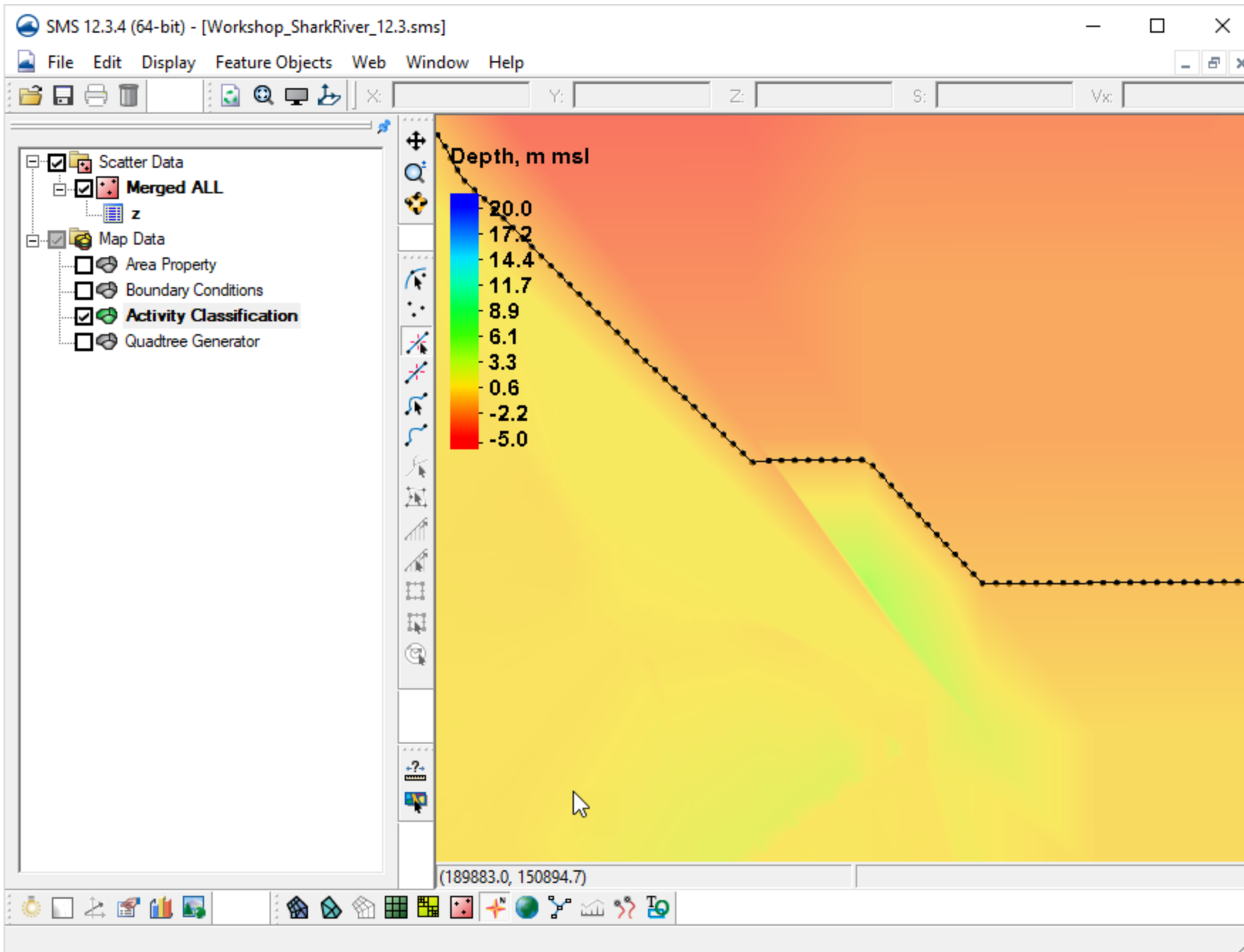
- Destination coverage should be “Activity Classification”, if not select that coverage.
- Elevation = 0 m, Spacing = 10 m


- Note: Using 0.0 is just an example. Realistically, you would consider the tidal range and other factors when determining the land/water interface.





- Usually after the previous steps, you will need to clean up excess feature arcs.
  - Click the Feature Arc selection tool. 
  - Click the first arc you wish to remove, then click subsequent arcs while holding the Shift key down to multi-select and delete.
  - Continue for your entire domain area.
- 
- To pan your screen while selecting, hold the F2 key down and drag with your mouse, then release and keep selecting.



- If you want to remove some sharp angles or other points from the boundary arc, select feature vertices with the tool. 
- Once selected, hit the delete key to simplify the feature arc.

# Additional way to bring in a shoreline from a Coastline database

The screenshot shows the NGS Home web application interface. A file explorer window titled "Shoreline" is open, displaying the contents of a folder named "Shoreline" within the path "Data4TB (F:) > !CMS\_Basics\_Webinar\_050619 > Day2". The file explorer shows a list of files with columns for Name, Date modified, Type, and Size. The file "CUSPLine.shp" is highlighted with a red box, indicating it is the target for loading into the application.

Name	Date modified	Type	Size
CUSP_metadata.html	11/15/2018 11:30 ...	Chrome HTML Do...	68 KB
CUSPLine.dbf	11/15/2018 11:30 ...	DBF File	283 KB
CUSPLine.prj	11/15/2018 11:30 ...	PRJ File	1 KB
<b>CUSPLine.shp</b>	11/15/2018 11:30 ...	SHP File	21 KB
CUSPLine.shx	11/15/2018 11:30 ...	SHX File	1 KB

The ArcGIS shape file can be directly loaded into SMS for part of the coastline arcs.

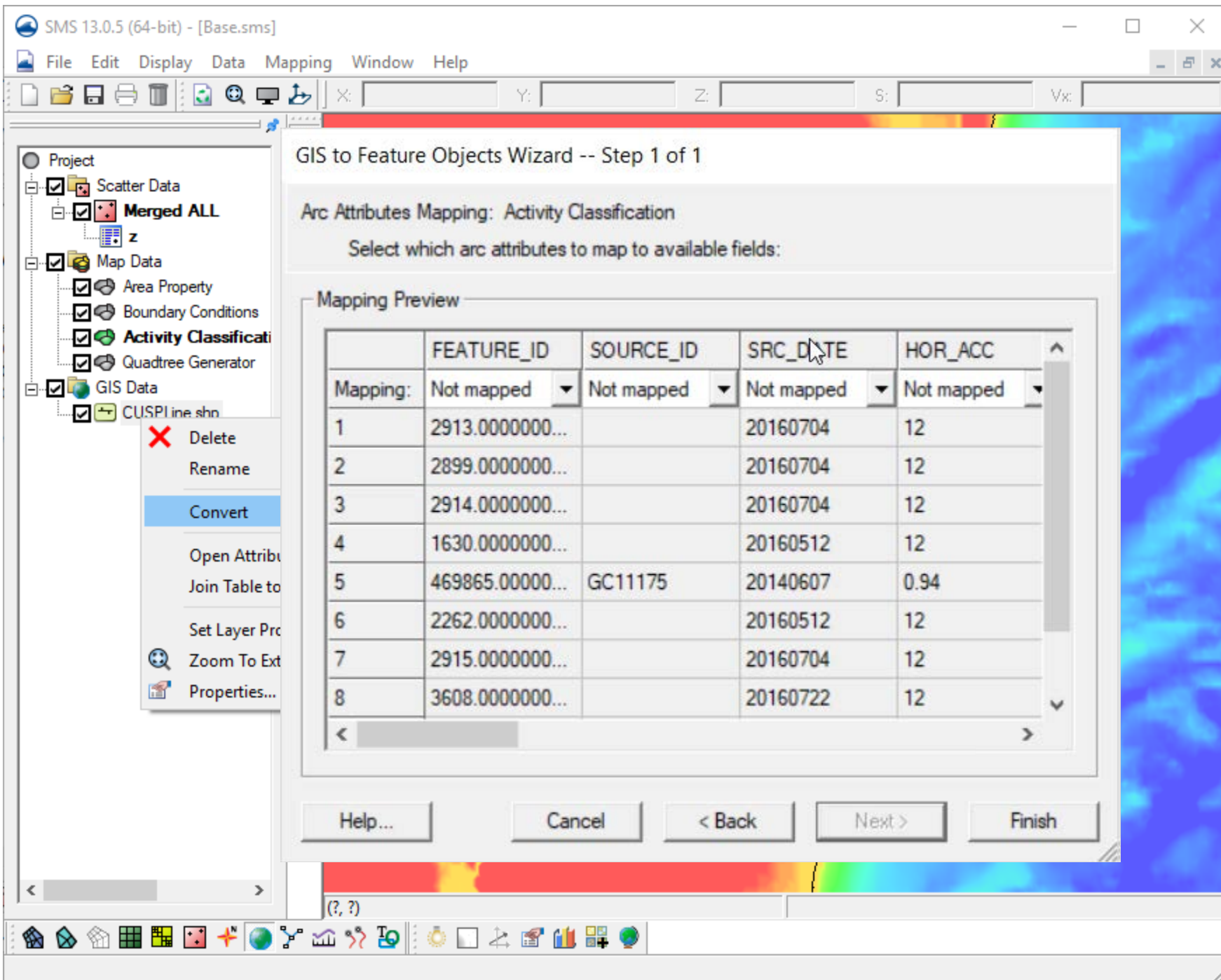
NGS Home | About NGS | Data & Imagery | Tools | Surveys | Science & Education | Search

Google Scale = 1 : 108K DD -73.98452, 40.15180

Imagery ©2018 TerraMetrics | Terms of Use | Report a map error

Website Owner: National Geodetic Survey / Last modified by NGS NSDE Team 11/15/2018 11:08:08

NOS Home | NGS Employees | Privacy Policy | Disclaimer | USA.gov | Ready.gov | Site Map | Contact Webmaster

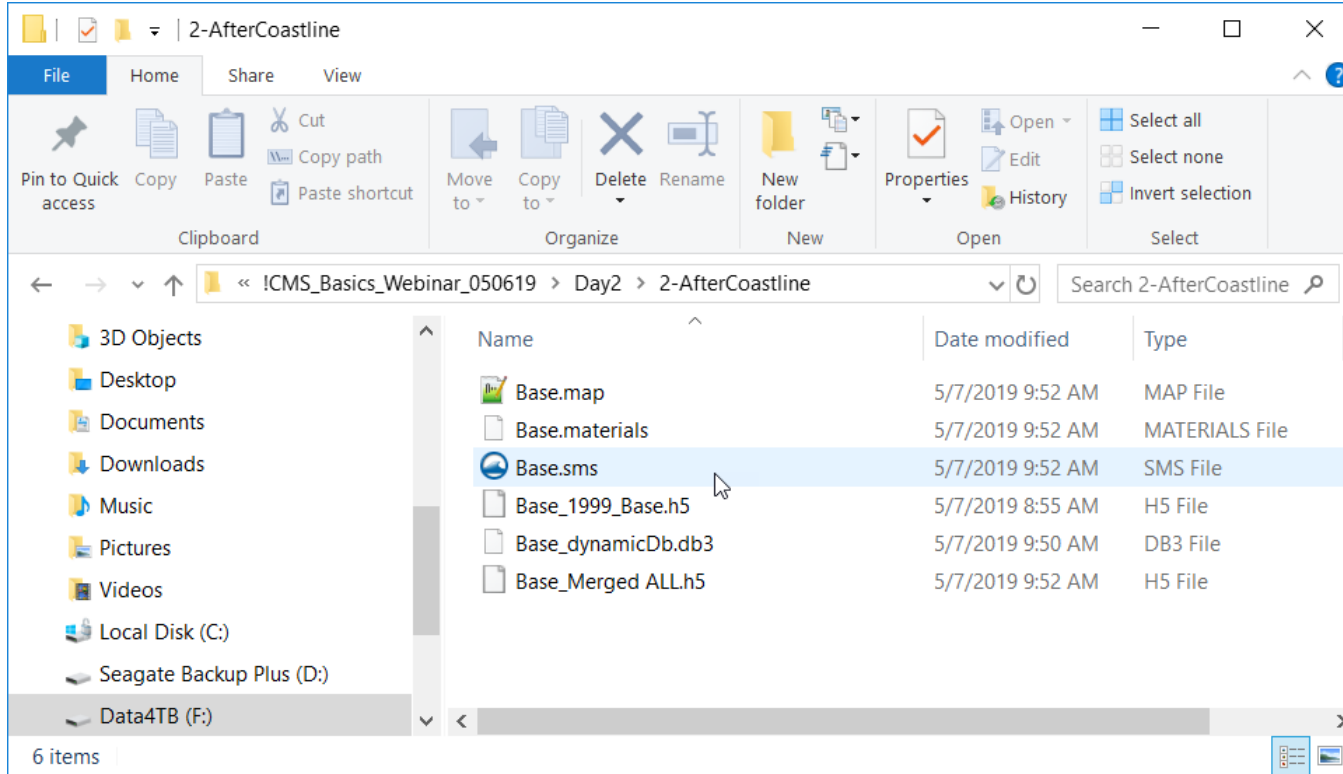


If you have an elevation dataset in the shape file to match with the coastline, it can be selected.

We will just click Finish

This is only part of the shoreline. We must add the remainder in other ways such as manual input or the method previously discussed.

# Load new project from “AfterCoastline” directory



- Combine a variation of the previously covered steps to define your coastline for the land/water (computational/noncomputational) activity classification coverage.
- To start from the same stage and setup, load an existing project to get you to this stage.

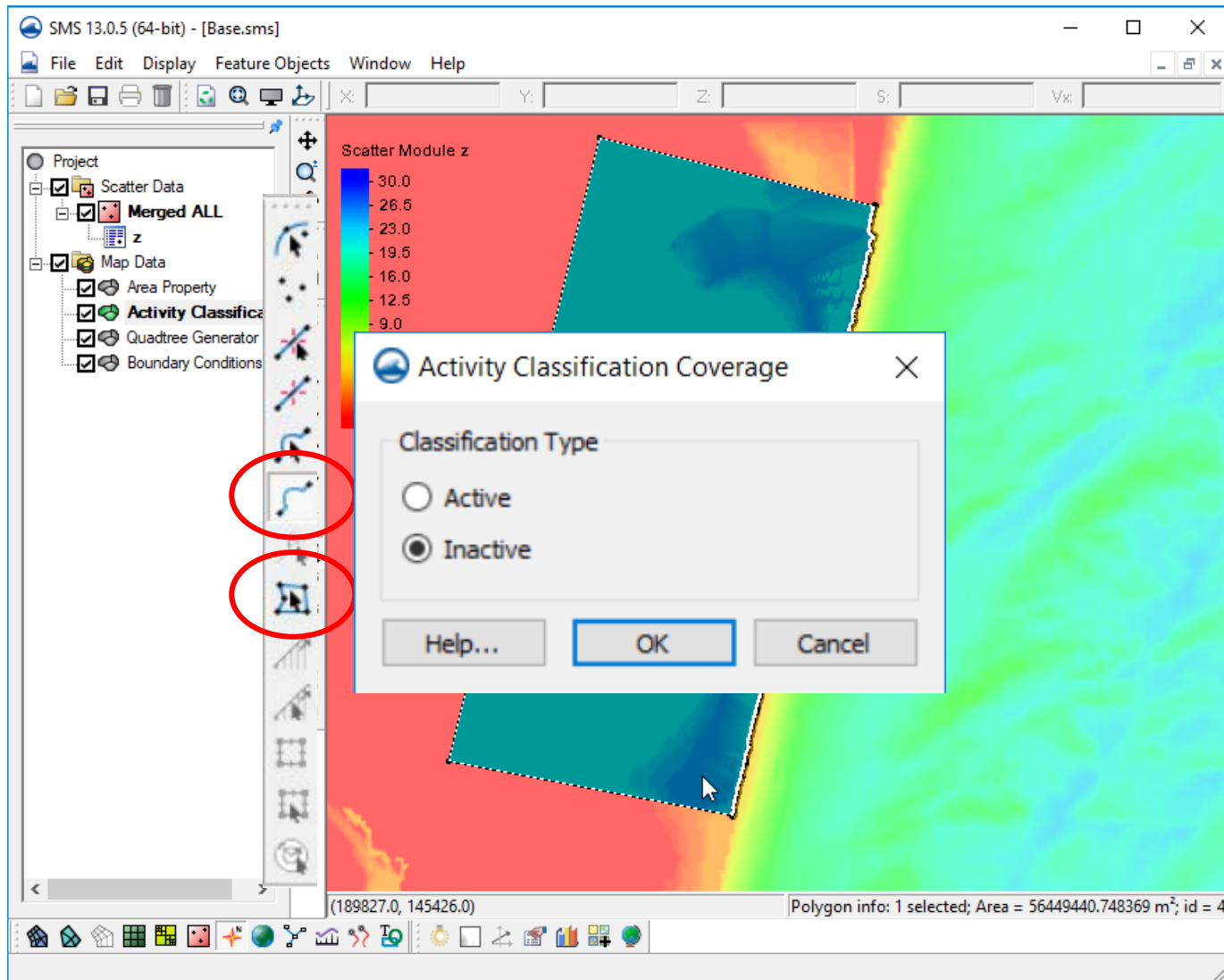


Create a polygon with coastlines to define the “land” (non-computational) area.

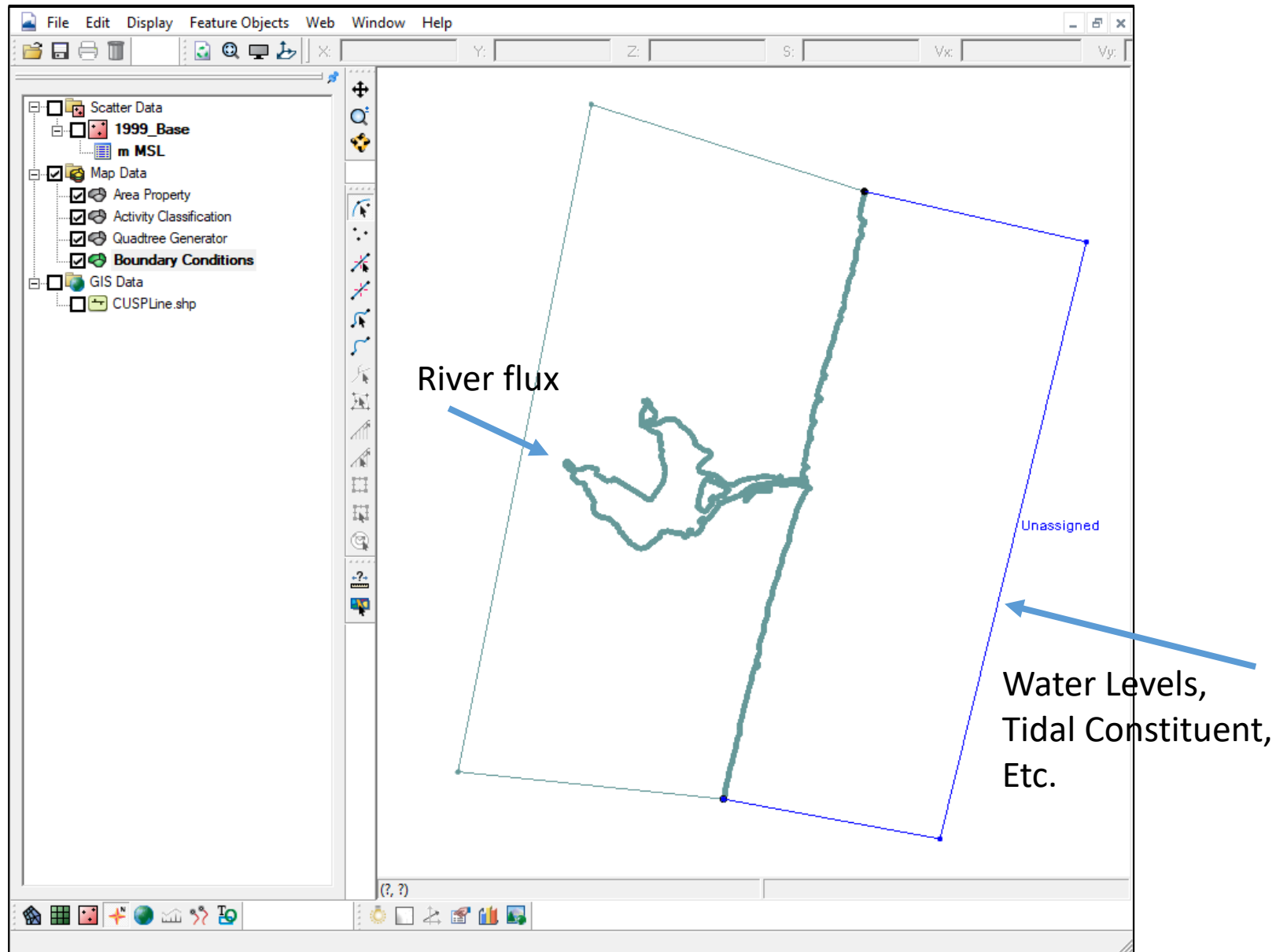
- With the *Activity Classification* coverage selected and active.

- Choose the Create arc tool and enclose the polygon using the existing end points of the coastline arc.

- Choose “Feature Objects | Build Polygons”
- Click the Select Polygon tool and click the land polygon.
- Right-click, then choose “Attributes” and make sure Inactive is specified for a Land area.



Next, we define the boundary conditions (forcing).

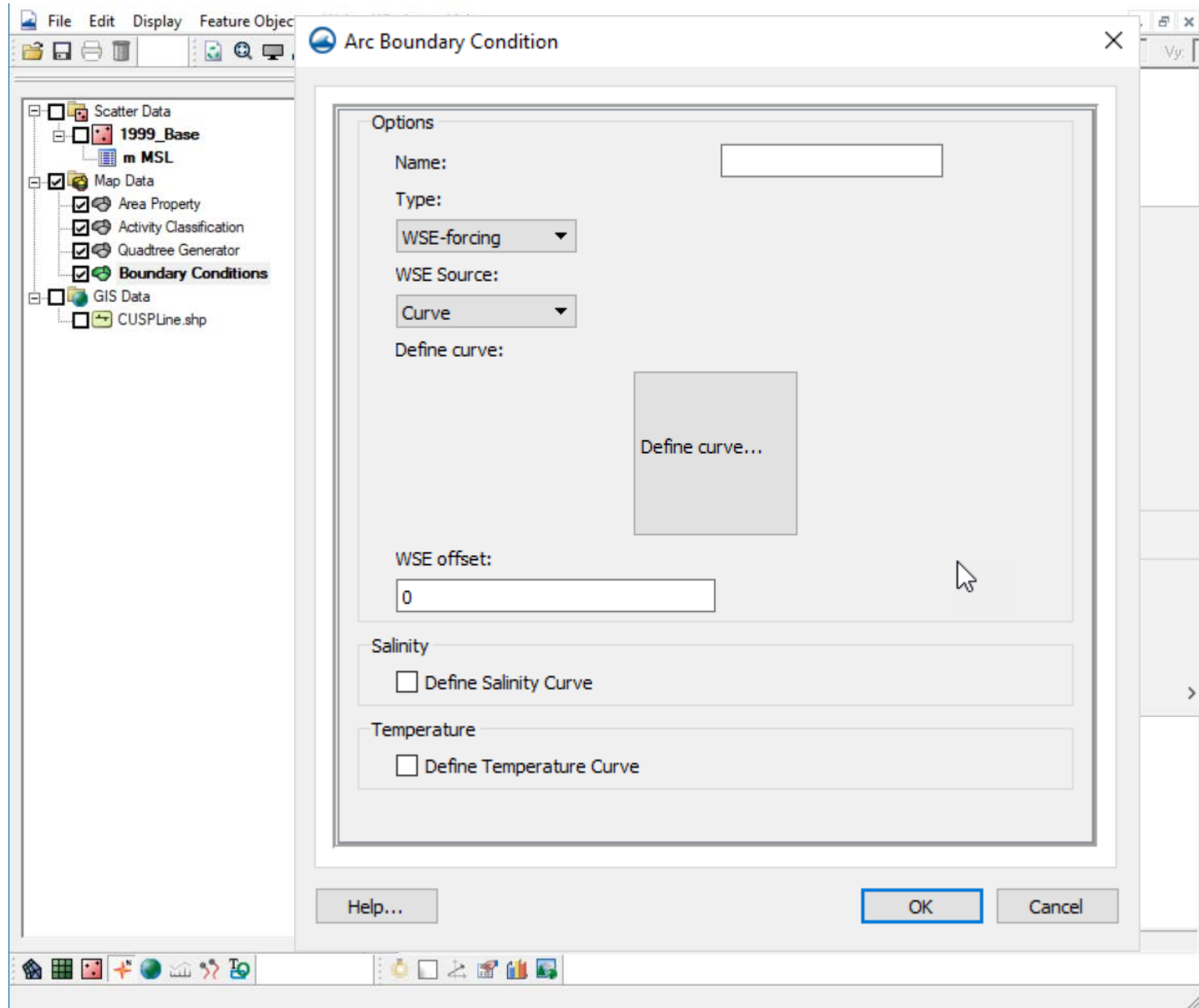


- Boundary forcing comes in from the edges by way of Feature Arcs of specific types.

- Select the *Boundary Condition* coverage, then the Create Feature Arc tool.
- Click in the approximate location for the type of forcing and create an arc for the boundary condition.



# Water Surface Elevation Boundary Condition

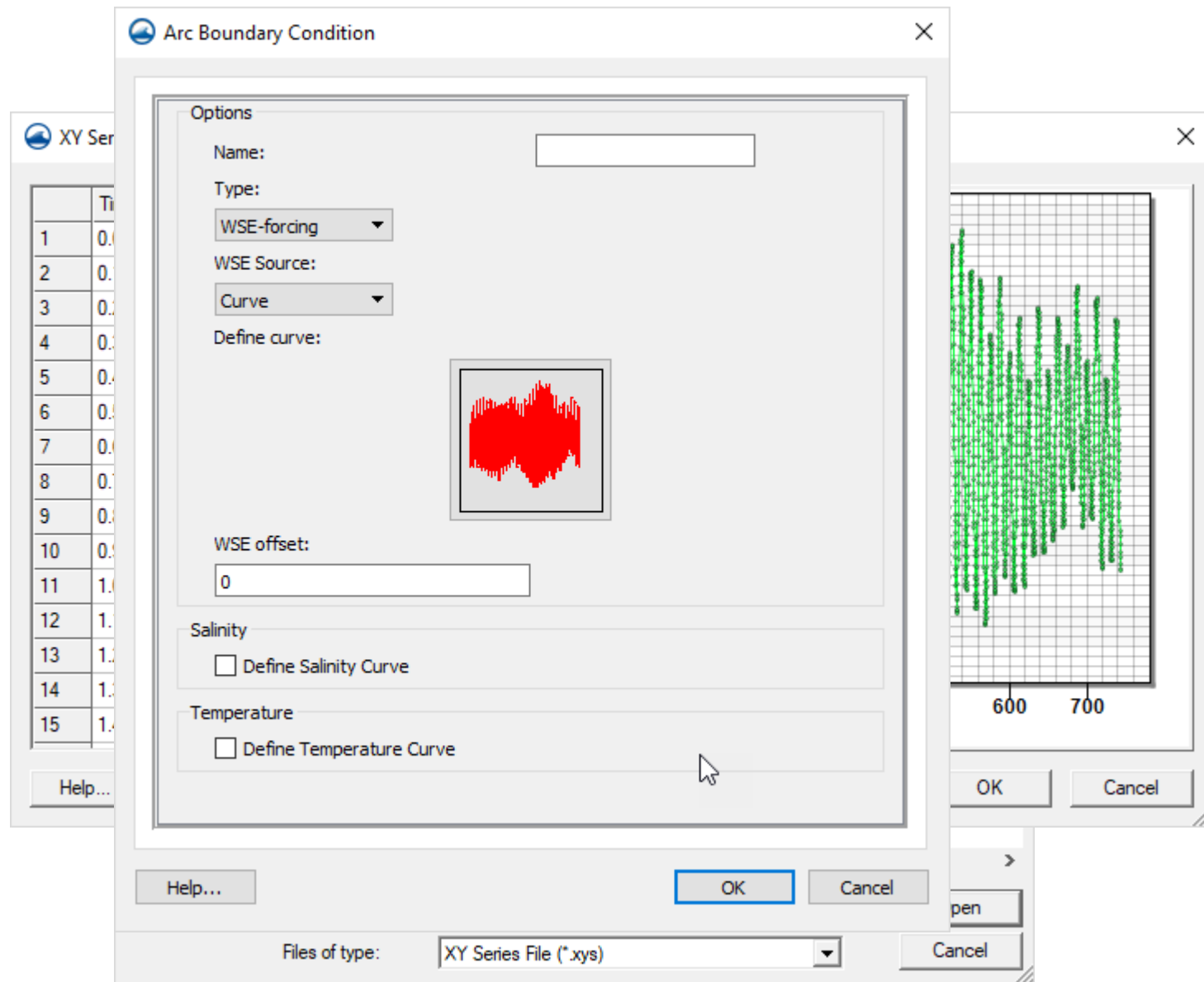


- Select the Select Feature Arc tool.
- Click, right click on the arc created.



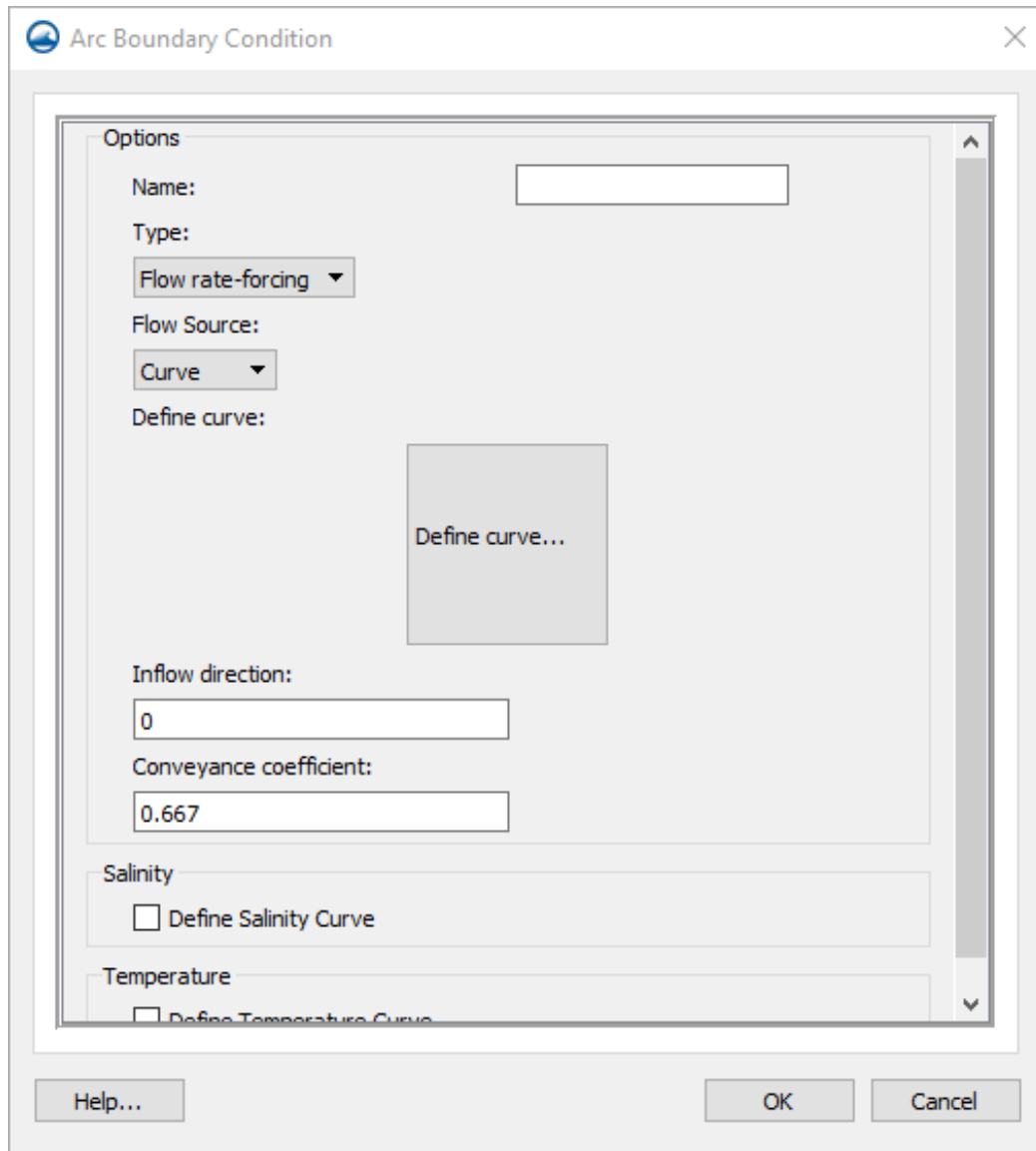
- Choose *Assign Boundary Conditions* and select the appropriate boundary type. Choose the type “WSE-forcing” and for the source, choose “Curve”.

# Water Surface Elevation Boundary Condition



- Click the “Define curve...” box.
- Enter values for time and elevation. This can be by hand, cut/paste from spreadsheet, or importing a file.
- Let’s import a file with the data.
- Click “Import” and find the file named “WSE\_forcing.xys” which is in the CMS\_Grid\_Creation directory.
- Click “Open”. Click “Ok” to finish.
- A Name is optional.
- The WSE offset is optional.

# River Flux Boundary Condition



The screenshot shows the 'Arc Boundary Condition' dialog box. It has a title bar with a blue icon and the text 'Arc Boundary Condition'. The main area is titled 'Options' and contains several fields and buttons. At the top is a 'Name:' text box. Below it is a 'Type:' dropdown menu set to 'Flow rate-forcing'. Underneath is a 'Flow Source:' dropdown menu set to 'Curve'. Below that is a 'Define curve:' section with a large grey button labeled 'Define curve...'. Further down is an 'Inflow direction:' text box containing the value '0'. Below that is a 'Conveyance coefficient:' text box containing the value '0.667'. At the bottom, there are two sections: 'Salinity' with a checkbox labeled 'Define Salinity Curve' (which is unchecked), and 'Temperature' with a checkbox labeled 'Define Temperature Curve' (which is also unchecked). At the very bottom of the dialog are three buttons: 'Help...', 'OK', and 'Cancel'.

- For River flux, choose the type “Flow rate-forcing”
- Choose either a “Constant” or “Curve.”
- Note: Flux values differ from previous versions of SMS/CMS. All flux values are Total Flux per arc, and not per cell in the arc.
- The curve is set up the same way as WSE elevation boundary condition.

- A Name is optional.
- Inflow direction should be approximate in degrees clockwise from North. (This will be optional in a future update.)
- The Conveyance coefficient can be modified from the default.



# Tidal/Harmonic Boundary Condition

**Options**

Name:

Type: WSE-forcing

WSE Source: Tidal Constituent

Inflow direction:

Constituents:

	Constituent	Amplitude (m)	Phase (deg)
1	M2	<input type="text" value="0"/>	<input type="text" value="0"/>
2	S2	<input type="text" value="0"/>	<input type="text" value="0"/>
3	N2	<input type="text" value="0"/>	<input type="text" value="0"/>
4	K1	<input type="text" value="0"/>	<input type="text" value="0"/>
5	O1	<input type="text" value="0"/>	<input type="text" value="0"/>

☐ Copy/Paste Mode Import... Export... Insert Above Insert Below Delete

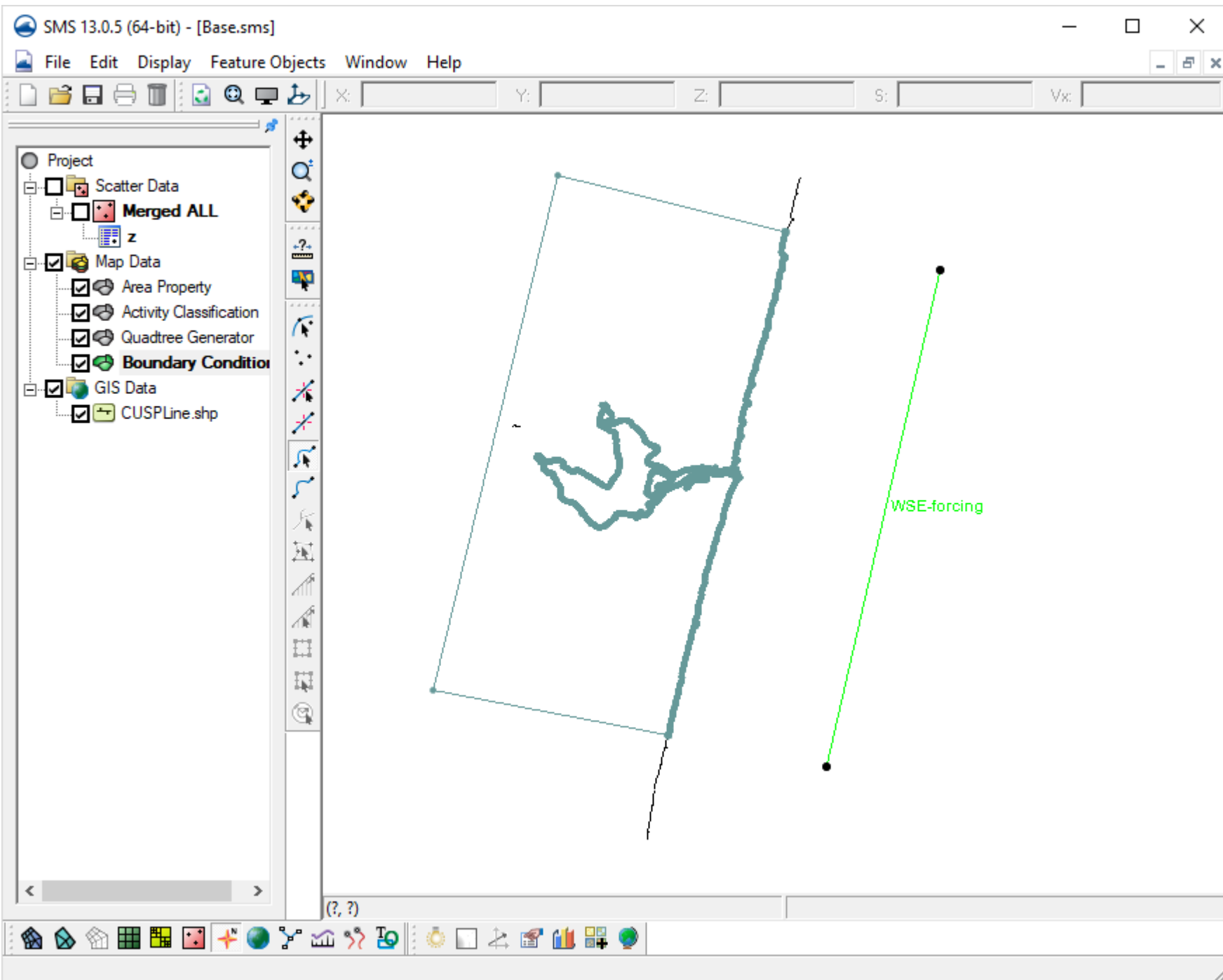
WSE offset:

☐ Salinity

Help... OK Cancel

- For Tidal Constituent or Harmonic forcing, select the type “WSE-forcing” and the source as needed. Add rows as needed to represent the constituents desired.
- Harmonic has no temporal connection to the start date/time, Tidal does.

- A Name is optional.
- Inflow direction should be approximate in degrees clockwise from North. (This will be removed in a future update.)
- The WSE Offset is optional.



- Nothing has to be exact right now.
- All of this will show up better once the Quadtree grid has been constructed.

- Be sure and save your project. This project has been saved in the “AfterBoundary” Folder as “Base.sms” for use in future steps.