# User's Guide

Welcome to the Location File for Charleston Harbor!  Charleston Harbor is an estuary along the southeast coast of the United States and serves as the major port for the city of Charleston, South Carolina. The estuary is formed by the junction of the Ashley, Cooper, and Wando Rivers at 32°49'7.10"N 79°55'40.41"W. Charleston Harbor is part of the Intracoastal Waterway along the East Coast of the United States.



NOAA has created Location Files for different U.S. coastal regions to help you use the General NOAA Operational Modeling Environment, GNOME. On rare occasions, NOAA has developed international Location Files when working with specific partners.

Each Location File contains information about local oceanographic conditions that GNOME uses to model oil spills in the area covered by that Location File. Each Location

File also contains references to help you learn more about the location you are simulating.

As you work with the Location File for Charleston Harbor, GNOME will prompt you to:

1. Choose the model settings (start date and time, and run duration).
2. Input the wind conditions.

GNOME guides you through each of these choices. Each window has a button that leads you to helpful information and the general Help topic list. If you need help setting up the model, click the "Help" button. When you need to input the wind conditions in the "Choosing Wind Type" window, you can click the "Finding Wind Data" button to see a list of web sites that publish wind data for this region.

More information about GNOME and Location Files is available at http://response.restoration.noaa.gov/gnome.

# Technical Documentation

## *Background*

The currents within the modeled domain are mostly tidally driven, but there is a freshwater component to the flow. The Ashley and Wando Rivers are short and contribute limited runoff into the estuary. The Cooper River is the longest of the three rivers and contributes the significant amount of freshwater into the estuary. It extends upriver, to the north, and into Lake Moultrie. The flow from Lake Moultrie into the Cooper River is controlled by the Pinopolis Dam. The Charleston Harbor Location File is based on NOAA's tidal current predictions for various locations along the three rivers which incorporate average runoff conditions for each river.

## *Current Patterns*

The currents in the Charleston Harbor Location File are simulated with eleven current patterns. The current patterns were created with the NOAA Current Analysis for Trajectory Simulation (CATS) hydrodynamic application. There are three patterns for each of the tidal rivers – the Wando, the Cooper, and the Ashley – which are scaled to the tidal current forecast at the mouth of each river, the lower section of each river, and the upper section of each river. There is also a pattern at the harbor mouth and a simplified offshore current pattern. The picture below illustrates the model domain and the finite element domain.
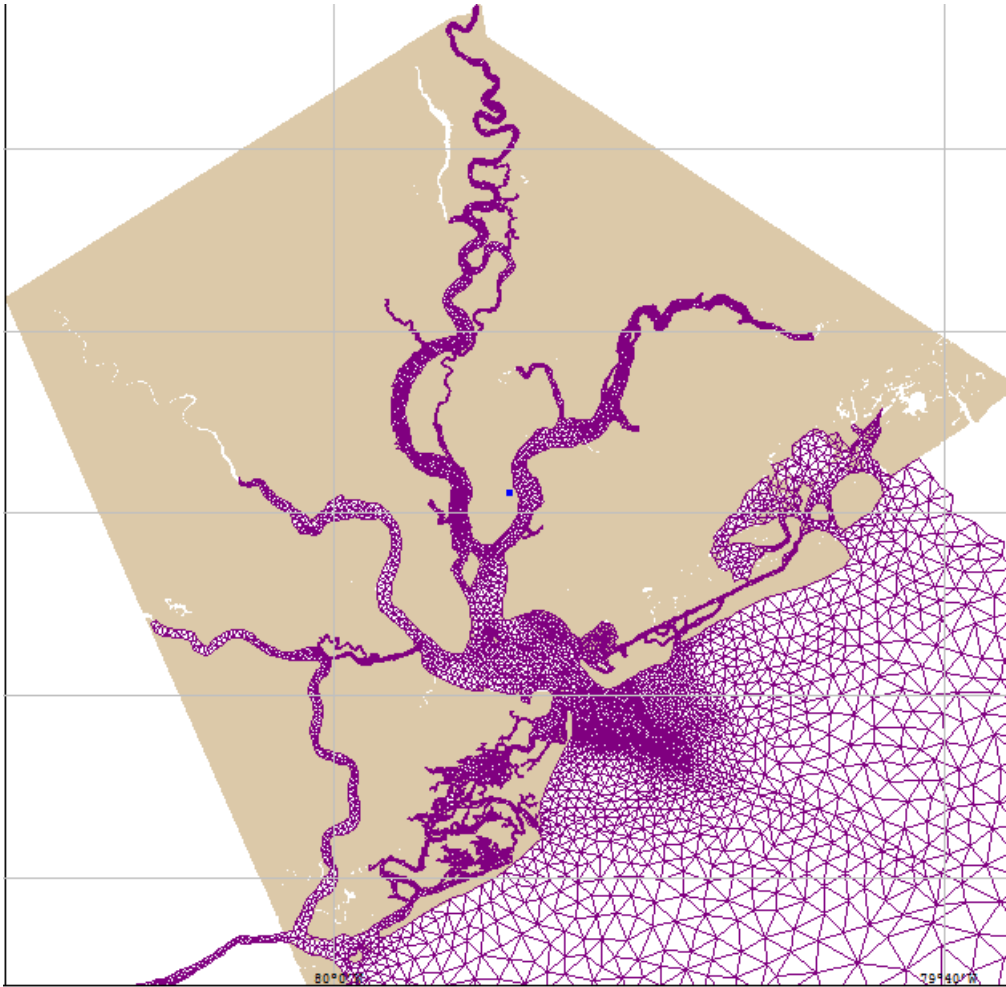
## *Charleston Harbor Location File Limitations*

The Location File is designed to show the user how floating pollutants such as oil would move under "normal" flow conditions. It should not be used under extreme high runoff or low runoff conditions for the rivers. It should not be used under storm surge or tsunami conditions. The Location File should not be used to predict transport of pollutants along the outer coast. The model domain was extended past the entrance to the harbor to give the user an idea of how far offshore an ebb cycle can carry pollutants into the Atlantic Ocean. It was not meant to predict movement along the outer coast.

Note that the user is not allowed to start spills everywhere in the domain. This is done because we don't want the pollutant to move quickly outside of the modeling domain and because the modeled currents have high uncertainty along the fringes of the model domain. Remember, the current pattern is calibrated to tidal analysis done along the main channels of the Cooper, Wando, and Ashley Rivers and along the main shipping channel of the lower estuary.

## *References*

You can get more information about the Charleston Harbor area from these publications and web sites:

### General Information

U.S. Army Corps of Engineers: Charleston District
     http://www.sac.usace.army.mil/
The Corps is an important partner in Congressionally-authorized water resource projects (related to navigation, flood control, beach erosion, and other activities) designed to help protect the economy and the environment of U.S. coastal areas

NOAA: Tides and Currents
     http://tidesandcurrents.noaa.gov/ports/index.html?port=ch
Meteorological and water level information for Charleston Harbor.

U.S. Army Corps of Engineers: Charleston District
     http://www.sac.usace.army.mil/Missions/Navigation
Links to channel information, hydrographic maps, weather information, flood risk and hurricane information.

BookletChartTM: Charleston Harbor, NOAA Chart 11524
     http://ocsdata.ncd.noaa.gov/BookletChart/11524_BookletChart.pdf
A reduced-scale NOAA nautical chart for small boaters.

Wikipedia: Charleston Harbor
     http://en.wikipedia.org/wiki/Charleston_Harbor

### Oceanography

Cantrell, Wade. 2013. Total Maximum Daily Load Revision: Charleston Harbor, Cooper, Ashley, and Wando Rivers. Technical Document Number: 0506-13, Bureau of Water, Columbia, SC: South Carolina Department of Health & Environmental Control.

Kjerfve, Björn. 1989. "Physical Processes in Charleston Harbor." Charleston Harbor: Issues, Resources, Status, and Management. Washington, DC: NOAA Estuary-of-the-Month Seminar Series 16. pp. 12.

Lu, Silong, and Steven R. Davie. 2005. "Charleston Harbor System 3-Dimensional Modeling, Charleston, SC." Proceedings of the Ninth International Conference on Estuarine and Coastal Modeling. Charleston, SC: American Society of Civil Engineers. pp. 19.

Rodriguez, Hugo N., and Jamie Miller. 2007. "Water Quality Modeling System for Charleston Harbor, South Carolina." Ports 2007. San Diego, CA: American Society of Civil Engineers. pp. 11.

Tetra Tech, Jordan, Jones & Goulding. 2008. 3-D Modeling Report for the Charleston Harbor System. Charleston, SC: Berkeley-Charleston-Dorchester Council of Governments.

## Wind and Weather

National Weather Service, Charleston, SC
   http://www.weather.gov/chs/
Current weather conditions and forecasts for locations throughout South Carolina.

National Weather Service, Charleston, SC, Marine Weather
   http://www.weather.gov/chs/marine
Text and graphical marine forecasts for Charleston.

Weather Underground, Charleston, SC
   www.wunderground.com/US/SC/Charleston.html
Current conditions and 10-day forecast for Charleston, SC.

National Data Buoy Center
   http://www.ndbc.noaa.gov/data/Forecasts/FZUS52.KCHS.html
Wind and wave forecast for coastal South Carolina.

South Carolina Information from Interactive Weather Information Network (IWIN)
   http://www.weather.gov/view/states.php?state=sc&map=on
Current, site-specific weather observations for South Carolina locations.

Interactive Weather Information Network (IWIN), Forecasts from South Carolina (text only version)
   http://www.weather.gov/view/states.php?state=sc
State and zone forecasts and weather data for South Carolina.

## Oil Spill Response

NOAA Office of Response and Restoration, Emergency Response Division (ERD)
   http://response.restoration.noaa.gov
Tools and information for emergency responders and planners, and others concerned about the effects of oil and hazardous chemicals in our waters and along our coasts.