User's Guide

Welcome to the Location File for Delaware Bay! This Location File extends up the Delaware River to the Delaware-Chesapeake Canal, a sea-level, inland waterway navigable by deep-draft vessels. Delaware Bay is bounded on the northeast by the state of New Jersey and on the southwest by the state of Delaware. In addition to the Delaware River, the bay receives the waters of numerous streams and creeks of New Jersey and Delaware. It has few natural harbors, but Delaware Breakwater, at Cape Henlopen, provides Lewes, DE with an excellent protected anchorage. Delaware Bay is the natural route followed by shipping to and from Wilmington, DE, Philadelphia, PA, Camden, NJ, and Baltimore, MD.

NOAA created Location Files for different U.S. coastal regions to help you use the General NOAA Oil Modeling Environment, GNOME. In addition, on a case-by-case basis, NOAA develops 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 (both print publications and Internet sites) to help you learn more about the location you are simulating.

As you work with the Location File for Delaware Bay, GNOME will prompt you to:

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

GNOME will guide you through choosing the model settings and entering the wind conditions. Click the Help button anytime you need help setting up the model. Check the “Finding Wind Data” Help topic 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/software/gnome/gnome.html .

Technical Documentation

Background

Delaware River ports receive the highest volume of petroleum products and crude oil on the eastern coast of the United States (Ford et al. 1992); the ports also receive one of the highest number of conventional (non-containerized) cargo ships. Ships entering the Delaware River enter either through Delaware Bay or the Chesapeake-Delaware Canal. (The Chesapeake-Delaware Canal is located near the northern-most part of Delaware on the Location File map.) The Delaware River Channel is 40 feet deep. Ships with a deeper draft anchor off Big Stone Beach and transfer cargo to smaller vessels.

Circulation in the region is driven primarily by tides. Secondary circulation patterns result from winds and mean southward flowing off-shore flow that forces some water into Delaware Bay (Pape and Garvine 1982; Wong and Moses-Hall 1998). River flow does not have a significant impact (compared with tides) on surface currents in the lower river and bay (Pape and Garvine 1982).

Current Patterns

The Delaware Bay Location File uses four current patterns to simulate tidal and subtidal circulation. The tidal current pattern is scaled to tides 0.7 nautical miles ESE of Cape Henlopen (38° 47.97’N, 75° 4.9’W, NOS tidal prediction station #4021). Offshore flow is scaled to 3 cm/s offshore at 38° 53.9’N, 74° 44.9’W. The scaling constant was extrapolated from mean flow reported in Beardsley and Boicourt (1987) and from near-real time observations from Rutger’s Institute of Marine and Coastal Studies Coastal Ocean Dynamics Application Radar (CODAR) web site.

Two wind-driven circulation patterns are used to simulate wind driven flow: one pattern from NW winds and another from SW winds. These two patterns are

combined linearly to produce a current pattern appropriate for the user-defined wind field.

All current patterns were created with the NOAA Current Analysis for Trajectory Simulation (CATS) hydrodynamic application.

References

You can get more information about Delaware Bay from these publications and web sites.

Oceanographic

Beardsley, R. C. and W. C. Boicourt, 1987. On Estuarine and Continental-Shelf Circulation in the Middle Atlantic Bight. In *Evolution of Physical Oceanography*, B. A. Warren and C. Wunsch, eds., MIT Press, Cambridge, MA, pp. 198-234.

Coastal Ocean Dynamics Applications Radar (CODAR) Real-Time Data
http://marine.rutgers.edu/mrs/codar/real-time/real_time.html
Real-time vector plots for offshore surface currents off southern New Jersey, courtesy of Rutgers Institute of Marine Coastal Studies.

Ford, R. G., D. Heinemann, M. L. Bonnell, and J. L. Casey, 1992. Computer Based Planning for Protection of Sensitive Delaware Bayshore Habitats from Oil Spill Impacts. Report prepared for the New Jersey Department of Environmental Protection Division of Science and Research.

NOAA National Weather Service (NWS) Cape May County tides
http://www.nws.noaa.gov/er/phi/tide/cape_may.htm
Tide data for the Cape May Ferry Terminal tide gage, located along the Cape May Canal near the outlet to Delaware Bay.

Pape, E. H. and R. W. Garvine, 1982. The Subtidal Circulation in Delaware Bay and Adjacent Shelf Waters. *Journal of Geophysical Research*, Vol. 87 (C10), pp. 7955-7970.

Wong, K. C. and J. E. Moses-Hall, 1998. On the Relative Importance of the Remote and Local Wind Effects to the Subtidal Variability in a Coastal Plain Estuary. *Journal of Geophysical Research*, Vol. 103 (C9), pp. 18,393-18,404.

Wind and Weather

NOAA Marine Forecast for Delaware Bay
National Centers for Environmental Prediction (NCEP) Marine Prediction Center
ftp://www.mpc.ncep.noaa.gov/pub/docs/mpc/coastal/PHLCWFPHL
Marine forecast for Delaware Bay.

NOAA National Weather Service (NWS)
http://www.nws.noaa.gov
Current weather observations, forecasts, and warnings for the entire U.S.

Interactive Weather Information Network--National Weather Service (NWS)
http://iwin.nws.noaa.gov/iwin/iwdspg1.html
Click DE on the map for Delaware weather reports and forecasts, or click NJ for New Jersey weather information.

General Information

U.S. Environmental Protection Agency (EPA) Watershed Profile
Delaware Bay
http://www.epa.gov/surf2/hucs/02040204/
Lower Delaware
http://www.epa.gov/surf2/hucs/02040202/
Environmental profile and watershed information focused on rivers, streams, lakes, and land characteristics.

Oil Spill Response

NOAA Hazardous Materials Response Division (HAZMAT)
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.