

Coastal Inundation Assessment: Oil Refinery and Storage Facility

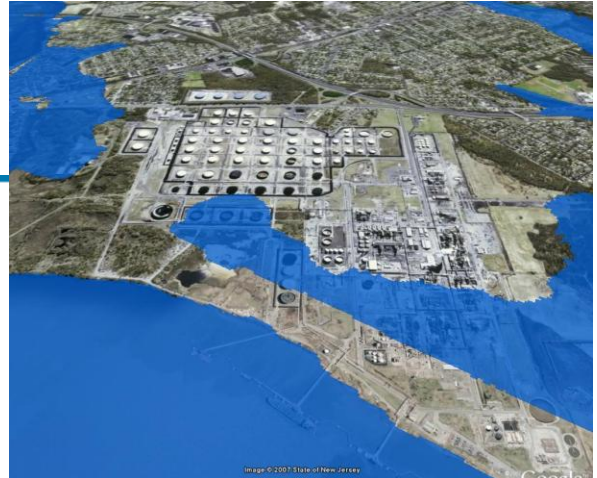


CLIENT:

Coastal oil refinery and storage facility

PROJECT ELEMENTS:

- Coastal inundation assessment
- Storm surge
- Rainfall accumulation
- GIS visualization and animation



PROBLEM. PURPOSE.

Mapping the effects of coastal storms is an important issue due to the high vulnerability and risk associated with many coastal areas. Of the 10 costliest hurricanes over the last 50 years, 8 have occurred in the last 10 years. By mapping the flood zones of a variety of simulated storms, not just the 100-year FEMA design storm, facility managers can easily visualize the risks associated with different events and learn how to reduce vulnerability.

SCIENCE. SERVICES. SOLUTIONS.

In response to the oil facility's request for an inundation analysis at three refinery sites, Applied Science Associates (ASA) modeled various storm surge and rainfall events at each site. The event magnitudes were based on both hurricane category and the 10-year and 100-year rainfall and storm surge events for the area.

ASA's Inundation Module and Rainfall Accumulation Module, both custom GIS models for ESRI's ArcView, utilized elevation data and expected flood levels/rainfall amounts to determine the flooding extents for each scenario. For elevation data, ASA's modules made use of the United States Geological Survey (USGS) National Elevation Dataset (NED) at a 10-meter resolution. Flood elevations and rainfall amounts were determined using the National Hurricane Center's SLOSH model outputs, local FEMA flood insurance studies, and NOAA precipitation frequency analyses.

The three refinery sites differed somewhat in their vulnerability to the events facing them due to both their relative locations and their elevations. The northern most site experienced significant flooding from only the most extreme of surges (Category 4 hurricane), while the other sites were susceptible to lesser surges. At all three sites the 10-year 24-hour rainfall event caused nearly as much flooding as the 100-year event because the areas vulnerable to accumulation were mostly filled from the 10-year event. The extra water from the 100-year event is expected to drain to the local waterways in most cases.

PRODUCTS. RESULTS.

- ASA's Inundation Toolbox™, a custom ArcGIS® extension
- ASA's Rainfall Accumulation Module, a custom ArcGIS® extension
- Custom Google Earth flooding overlays