



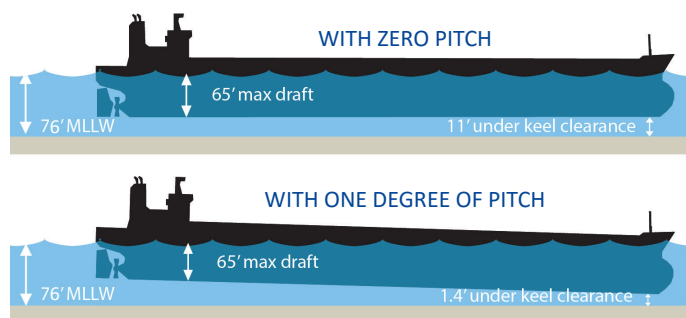
NOAA PORT OF LONG BEACH PRECISION NAVIGATION PROJECT

NOAA products and services support the Port of Long Beach precision navigation project and will soon save vessels an estimated \$10 million per year in lightering costs. Additionally, for every extra foot of draft allowed by the port, tank vessels can load \$2 million of extra product. It showcases how NOAA supports the increasingly complex decisions mariners make as they navigate ever-larger ships through U.S. ports, especially decisions related to underkeel clearance. This flagship project integrates private sector innovation and NOAA data streams for safe navigation of deep-draft ships.

Why the Port of Long Beach for precision navigation support?

The Port of Long Beach is exposed to the open ocean, and is influenced by unique wave, swell, and water-level conditions. New ultra large crude carriers that entered the port were vulnerable to potential groundings when waves arrived in long period swells.

For instance, an 1,100 foot ship that pitches one degree can have its draft increase by over ten feet. As a precaution, the port reduced the maximum allowable ship draft to 65', even though the channel is dredged to 76'.



Response to Port of Long Beach challenges

Jacobsen Pilots, who are responsible for all pilotage within the port, initially brought the issue to the attention of NOAA's Office of Coast Survey in late 2012 at a Los Angeles/Long Beach Harbor Safety Meeting.

In the years that followed, an industry working group contracted with a Dutch company that produces a web-based application called PROTIDE (PRObabilistic Tidal window DEtermination). PROTIDE maximizes the accessibility of the harbor by calculating ideal times for ships that require tidal data to safely transit. It does this by combining individual ship dimensions and stability details, actual channel layout, up-to-date environmental forecasts and a state-of-the-art ship motion analysis engine. All of these calculations require numerous, accurate, and validated real-time observations of water levels and waves, which were available by building on an existing project with the Southern California Coastal Ocean Observing System (SCCOOS).



Port of Long Beach, our nation's largest port complex and the ninth busiest port worldwide.



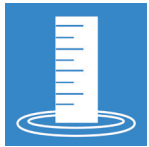
How NOAA is helping

NOAA provides high quality, operational, environmental information to support the PROTIDE software system. All NOAA data streams used by PROTIDE are publicly available, so that other users can develop similar decision systems.



Nearshore Wave Prediction System (NWPS) forecasts for wave and swell conditions - Wave models are validated with real time data from the Integrated Ocean Observing System (IOOS®) and U.S. Army Corps of Engineers (USACE) Coastal Data Information Program (CDIP) wave buoys.

National Weather Service



Water levels - Predictions and real-time values are available via PORTS® (Physical Oceanographic Real-Time System).

Center for Operational Oceanographic Products and Services



Wave buoys - Real-time values can be used by PROTIDE or the 3 hour nowcast for short term predictions. Calculations more than 3 hours in the future use the NWPS product.

Integrated Ocean Observing System



Shoreline - Data collected via lidar is used to update the nautical charts.

National Geodetic Survey



Hydrographic surveys and high resolution bathymetric inland ENC overlays (bIENC¹) - NOAA Ship *Fairweather* conducted a comprehensive survey in 2013 from which new navigation products were created. Pilots use bIENC files in their portable pilot units for increased accuracy and resolution over traditional charting products. Files are updated every few months using data from the USACE and Port of Long Beach survey department.

Office of Coast Survey

Measuring success foot-by-foot

Due to the success of this project, the U.S. Coast Guard Captain of the Port (COPT) removed the 65' draft restriction. After several successful runs with the 66' allowable draft, the port and pilots agreed to increase it to 67'.

In the future, the port and pilots will agree to increase the draft as long as they consider it safe and maintain a 10% underkeel clearance. The long term goal is to achieve 69' draft transits safely at which time lightering offshore will no longer be required, which will improve operational efficiencies, safety, and reduce environmental risk.

Further, for every extra foot of draft, tanker ships can load 40,000 more barrels of crude oil. This equates to **\$2 million** of extra product that can be loaded for every foot of increased draft.

Public/private partnerships key to success

NOAA is working with industry partners and app developers for mobile devices to deliver data in a unified, intuitive fashion with minimal intervention from the mariner.



¹Bathymetric Inland ENCs contain Depth Area features that have been produced at a higher density than traditional depth areas that are contained within the ENC.