

# Precision Navigation and the demand for Coastal Intelligence



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***AAPA Harbors & Navigation Committee Meeting  
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# Precision Navigation

The ability of a vessel to safely and efficiently navigate where sea room is limited with statistical certainty.







**RIGHT NOW**

**CRUISE SHIP FINALLY DOCKS IN TAMPA AS FOG SUBSIDES**  
**MANY PASSENGERS STILL ON SHIP DUE TO HOTEL ROOM SHORTAGE**



**11:07**



Cruise  
Terminal

2

CHANNELSIDE

CANAL PORT AUTHORITY

2

JOFFREY'S

COFFEE



# The Goal of Precision Navigation

## Improve Safety

- Reduce risk of collisions/allisions
- Reduce risk of groundings/port closures
- Reduce risk of oil spills

## Improve Efficiency

- Optimize cargo loading
- Reduce lightering costs



# Ocean to Shore & Shore to Store

Ocean *to* Shore

Shore *to* Store



## Supporting Data

Weather

National Spatial Reference System

Navigational Charts

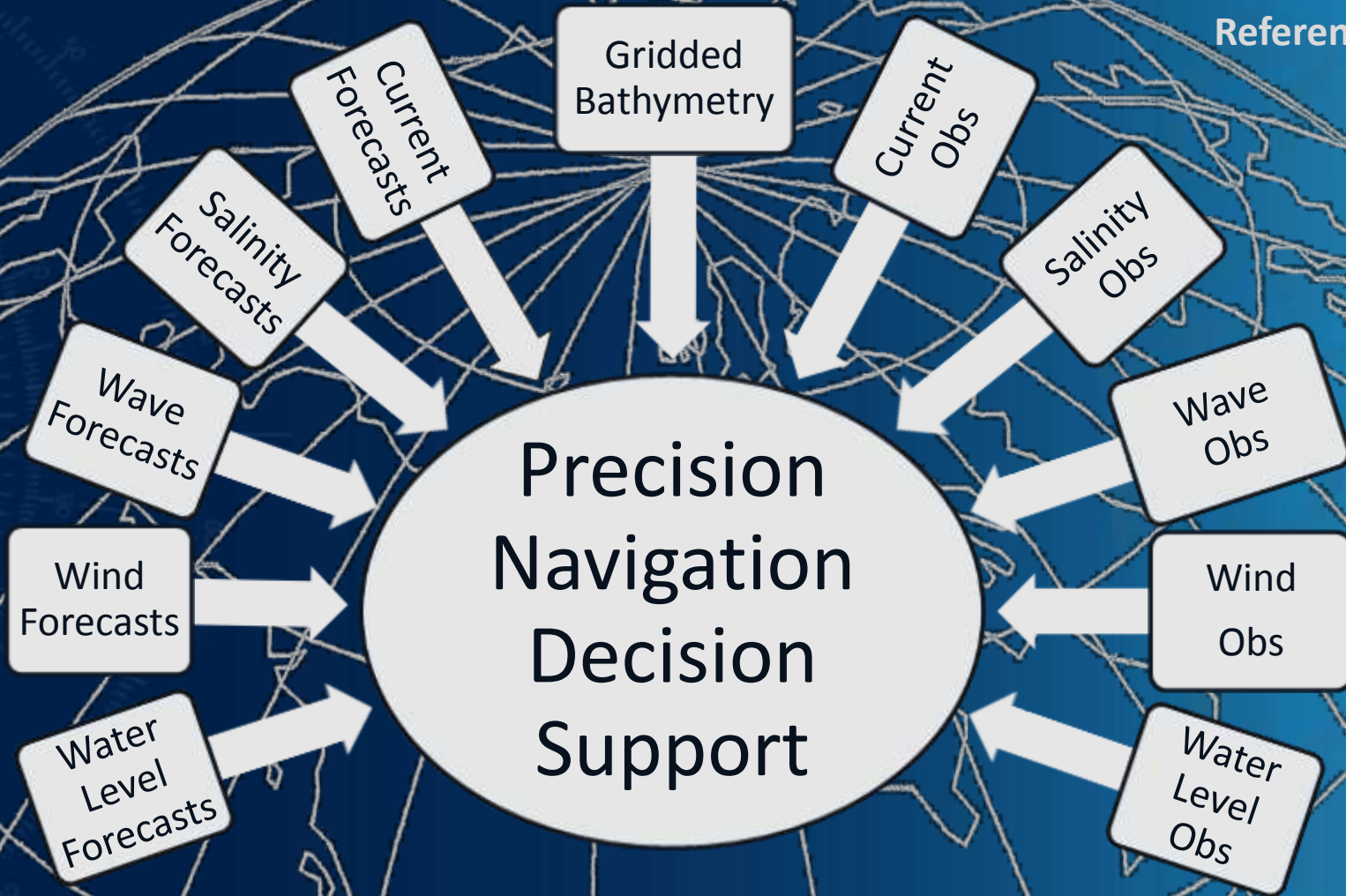
Observations and Forecasts





# Precision Navigation

National Spatial  
Reference System



# Port of LA/Long Beach Project

## Challenge

- Very large tankers enter the Port of Long Beach
- How we can reduce the risk they touch bottom?

### SHIP MOTION DUE TO OCEAN SWELLS

WITH ZERO PITCH

76' MLLW

65' max draft per COTP

11' under keel clearance

ONE DEGREE OF PITCH

76' MLLW

65' max draft per COTP

1.4' under keel clearance

*With one degree of pitch, there is a 9.6' increase in draft for a 1,100 foot taker.*



# The ProTide Under Keel Clearance Report

PROTIDE advice 15 Tanker 006 (Inbound)  
<https://protide.eu>

Time zone: Coordinated universal time  
 Created: 2014-08-27 09:33:00

## Tanker 006

Advice 15 (Inbound)

### Request

Request ID	11
SHIP	Tanker 006 (5 / T006)
Ship dimensions l / w / dwt	285 m 49 m 250000 tons
Draft l / m / a	20.46 m 20.46 m 20.46 m
Berth	Harbor entrance (23.16 m / Inbound)
Requested time of departure	2014-08-22 00:00
Water displacement	234294 tons
GM	7.78 m
GG'	0.4 m
Roll period	13.71 s
Estimation method used	Yes
Submitted by	Take Roes (2014-08-27 09:29)

### Calculation

Settings	Long Beach 0.017% probability
Vertical motion calculation method	Amarcon - 2d spectrum
Earliest route start time	-
Speed regime	Average
Use manual predictions	No
Use channel bottom elevations	No
Calculated by	Take Roes (2014-08-27 09:29)

### Advice

Location	Wm	Open	Reference	Close
Outside breakwater	9.65	2014-08-22 00:00	2014-08-22 00:15	2014-08-22 04:52
Breakwater entrance	4.06	2014-08-22 00:30	2014-08-22 00:45	2014-08-22 05:22
Breakwater entrance	3.85	2014-08-22 00:31	2014-08-22 00:46	2014-08-22 05:23
Inside breakwater	1.17	2014-08-22 00:50	2014-08-22 01:05	2014-08-22 05:43
Harbor entrance	0	2014-08-22 01:01	2014-08-22 01:16	2014-08-22 05:53

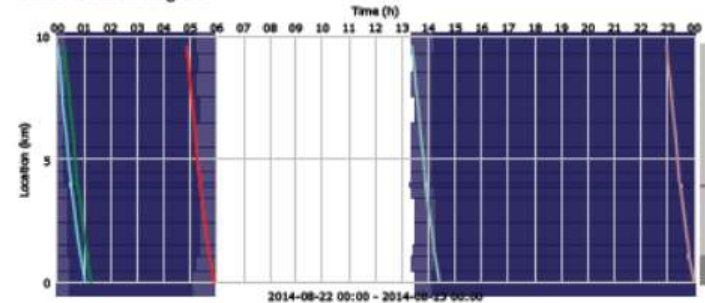
### Statistics

Maximum bottom touch probability (upper bound of reliability)	7.7E-05
Mean under keel clearance	4.15 m
Mean under keel clearance with squat reduction	3.97 m
Wait time	00:15
Down time	31.51%

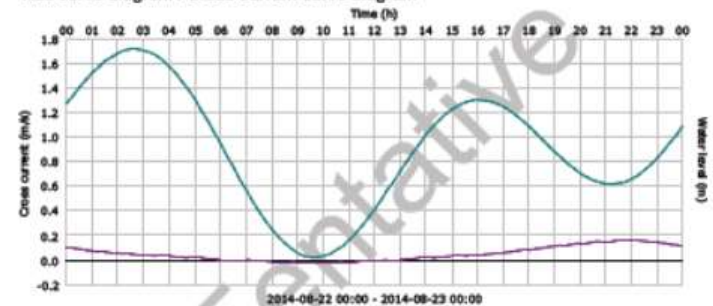
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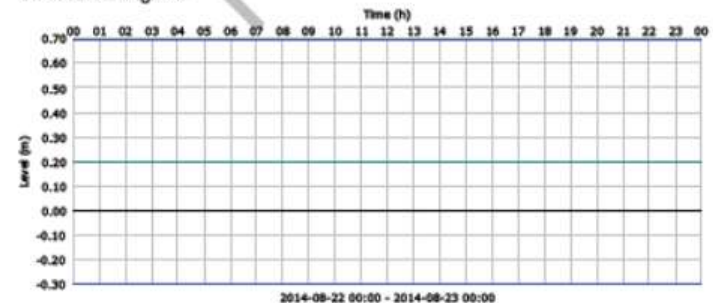
### Time / location diagram



### Tide curve diagram / Cross current curve diagram

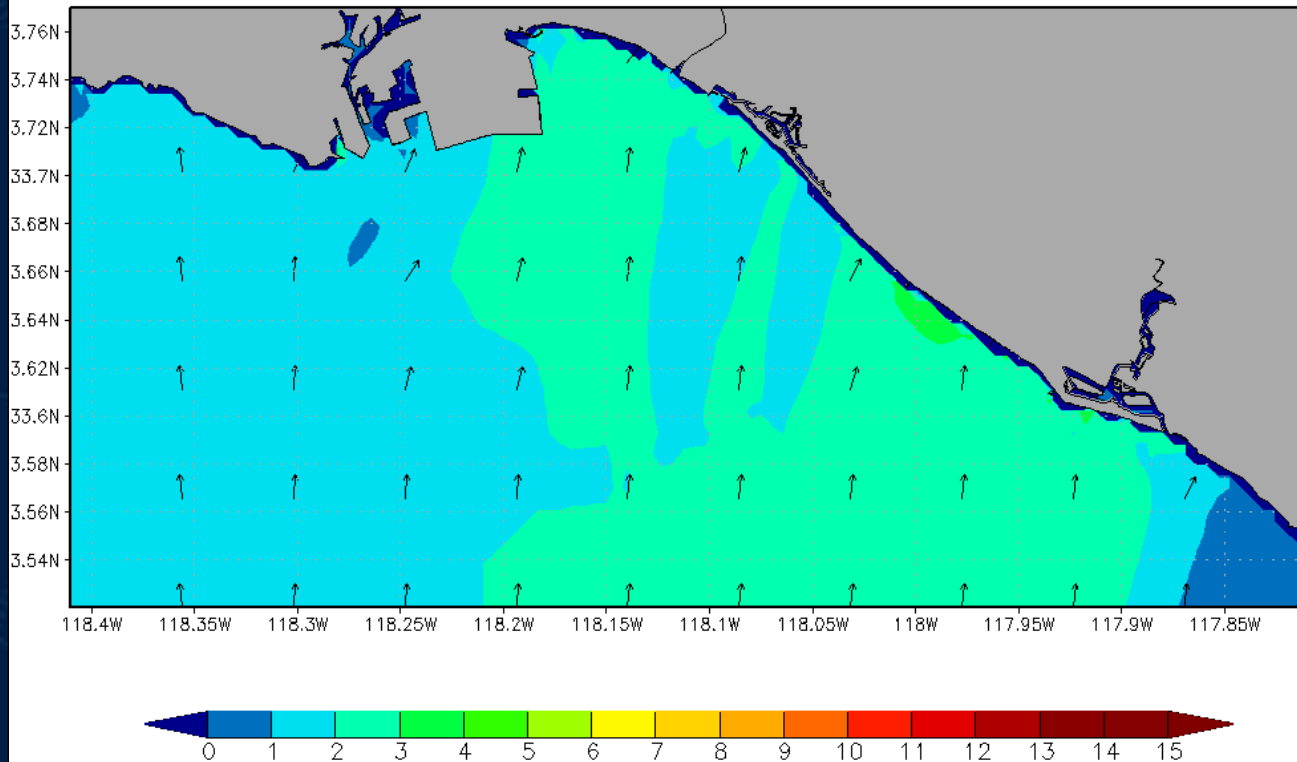


### Swell curve diagram



# Nearshore Wave Prediction System

NWPS Significant Wave Height (ft) and Peak Wave Direction  
Hour 3 (09Z04MAR2015)



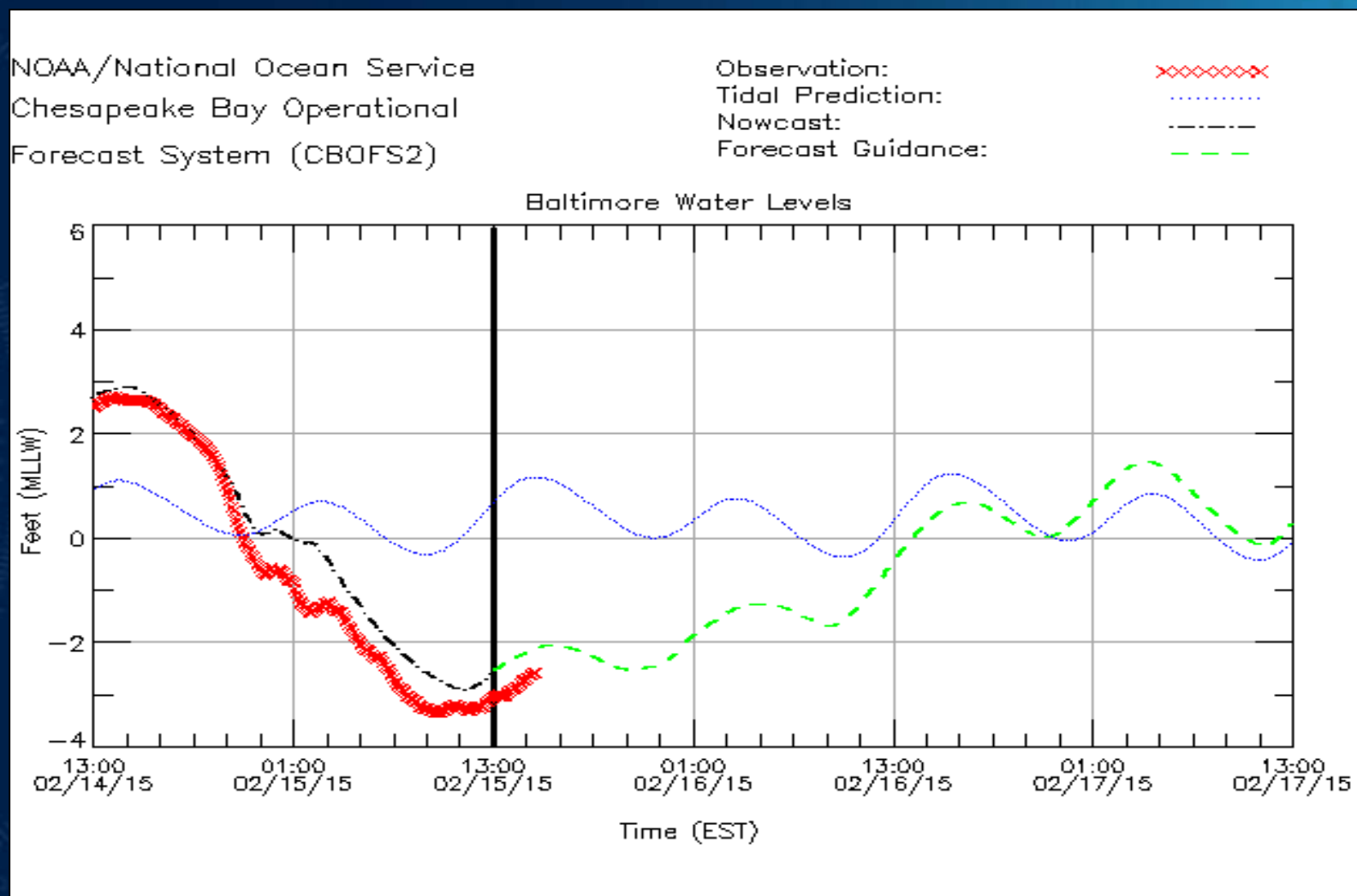
\*\*EXPERIMENTAL\*\*



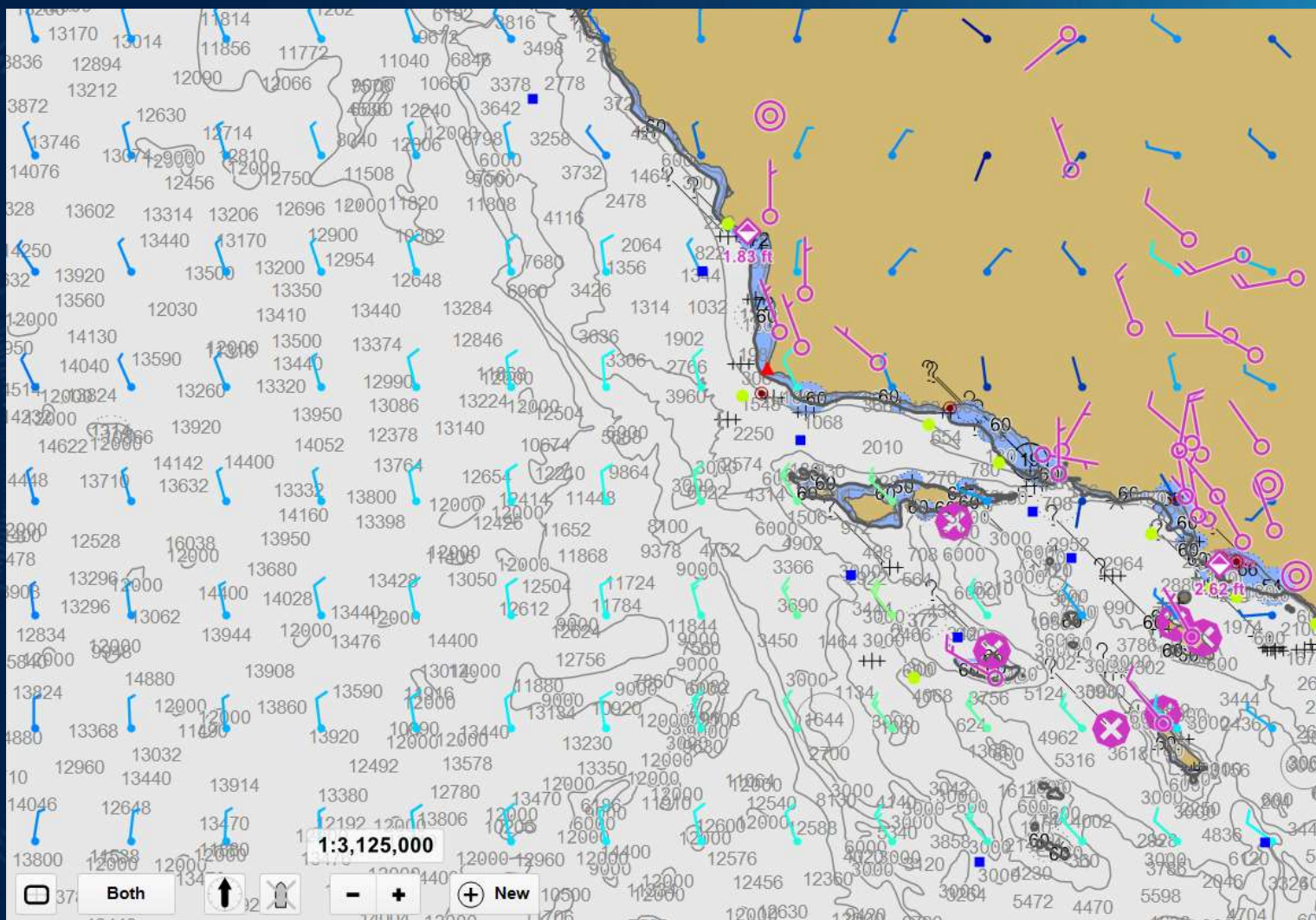
# Coastal Data Information Program Wave Buoy



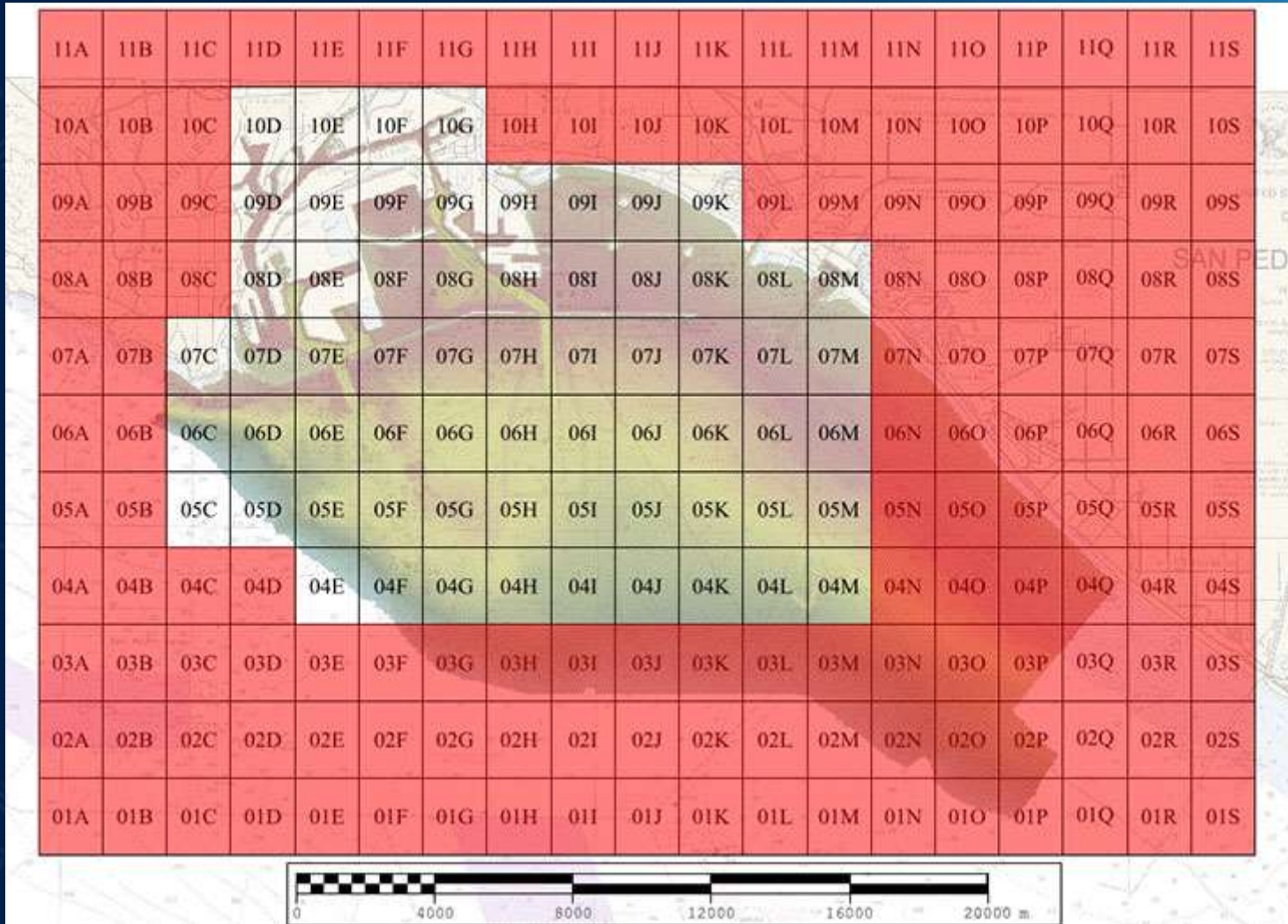
# The Importance of Forecast Water Levels



# Integrated Environmental Information and the Chart



# NOAA's commitment

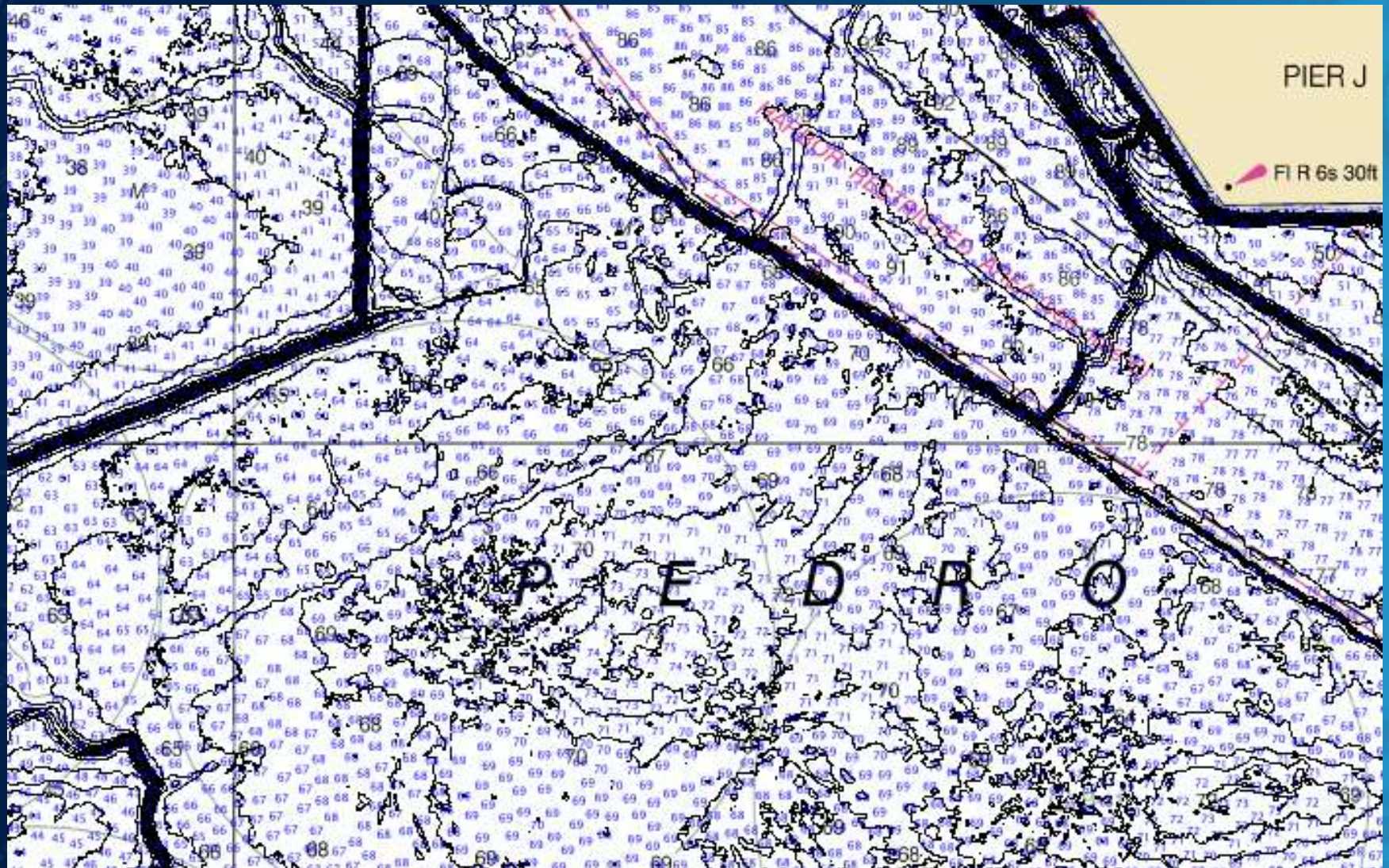


[http://www.nauticalcharts.noaa.gov/mcd/enc\\_overlays.html](http://www.nauticalcharts.noaa.gov/mcd/enc_overlays.html)





# Prototype Products



# Precision Navigation Tool Demo

NOAA/OCS Port of LA/Long Beach Precision Navigation Tool Demo

The screenshot displays the NOAA Precision Navigation Tool interface. The main map shows the Port of LA/Long Beach area, including Long Beach, Marina Shallow, and San Gabriel River. The map is overlaid with a red and yellow bathymetric chart. A green line indicates a planned route through the port. The interface includes a top navigation bar with 'Home Info' and 'Contact Us' links. A right-hand sidebar contains a 'Layer Menu' and 'Legend' section, with a 'Menu' dropdown showing various navigation parameters: 'LA/Long Beach (9410660) Water Level: 3.002 feet from MLLW', 'Vessel Specifications' (Draft: 72 feet), 'Bathymetry Selector' (One Meter), 'ECSS Parameters' (Day, Whiteback), and 'Layers' (Under Keel Clearance, Waypoints, NOAA Electronic Navigational Charts, Information about the chart display, Natural and man-made features, port features, Dredges, currents, etc., Seabed, obstructions, pipelines, Traffic routes, Special areas, Buoys, beacons, lights, fog signals, radar, Services and small craft facilities). A 'Time Control' bar at the bottom shows the current time as 7/27 9:16 am (EDT) and a timeline from 9:30 am to 7:00 am. A 'Viewer Settings' button is located in the bottom right corner.

Precision Navigation Tool Demo  
\*\* EXPERIMENTAL \*\*  
Precision Navigation Tool Demo

Layer Menu Legend

Menu

- LA/Long Beach (9410660) Water Level:  
Water Level: 3.002 feet from MLLW  
Valid Time: 7/27/2015 9:16 AM EDT
- Vessel Specifications  
Vessel Draft: 72 feet
- Bathymetry Selector  
View Ramp: One Meter
- ECSS Parameters  
Color Scheme: DAY\_WHITEBACK
- Layers
  - Under Keel Clearance
  - Waypoints
  - NOAA Electronic Navigational Charts
    - Information about the chart display
    - Natural and man-made features, port features
    - Dredges, currents, etc.
    - Seabed, obstructions, pipelines
    - Traffic routes
    - Special areas
    - Buoys, beacons, lights, fog signals, radar
    - Services and small craft facilities

Display Time: Mon, Jul 27, 2015 9:16 am (EDT)

Time Control

Viewer Settings

NOAA | NCEM | OCS | ICGA | User Support  
Web site: www.noaa.gov | Contact Us | Privacy Policy



**THANK YOU!**

