How Surface Currents and Wave Information Can Assist with Oil Spill Response

Julie Thomas

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Coastal Data Information Program – Program Manager

COCMP
HF Radar Coverage
CA Prop 40/50
$21M for funding
Coastal current
Monitoring program
Southern California Coastal Ocean Observing System
Coastal Conservancy
CENCOOS

COASTAL DATA INFORMATION PROGRAM

6/2014

US Army Corps of Engineers

Mission: Monitor and predict near shore waves and shoreline change.

SCCOOS Observations

6 Harmful Algal Bloom Stations since 2005

4 Automated Shore Stations since 2005

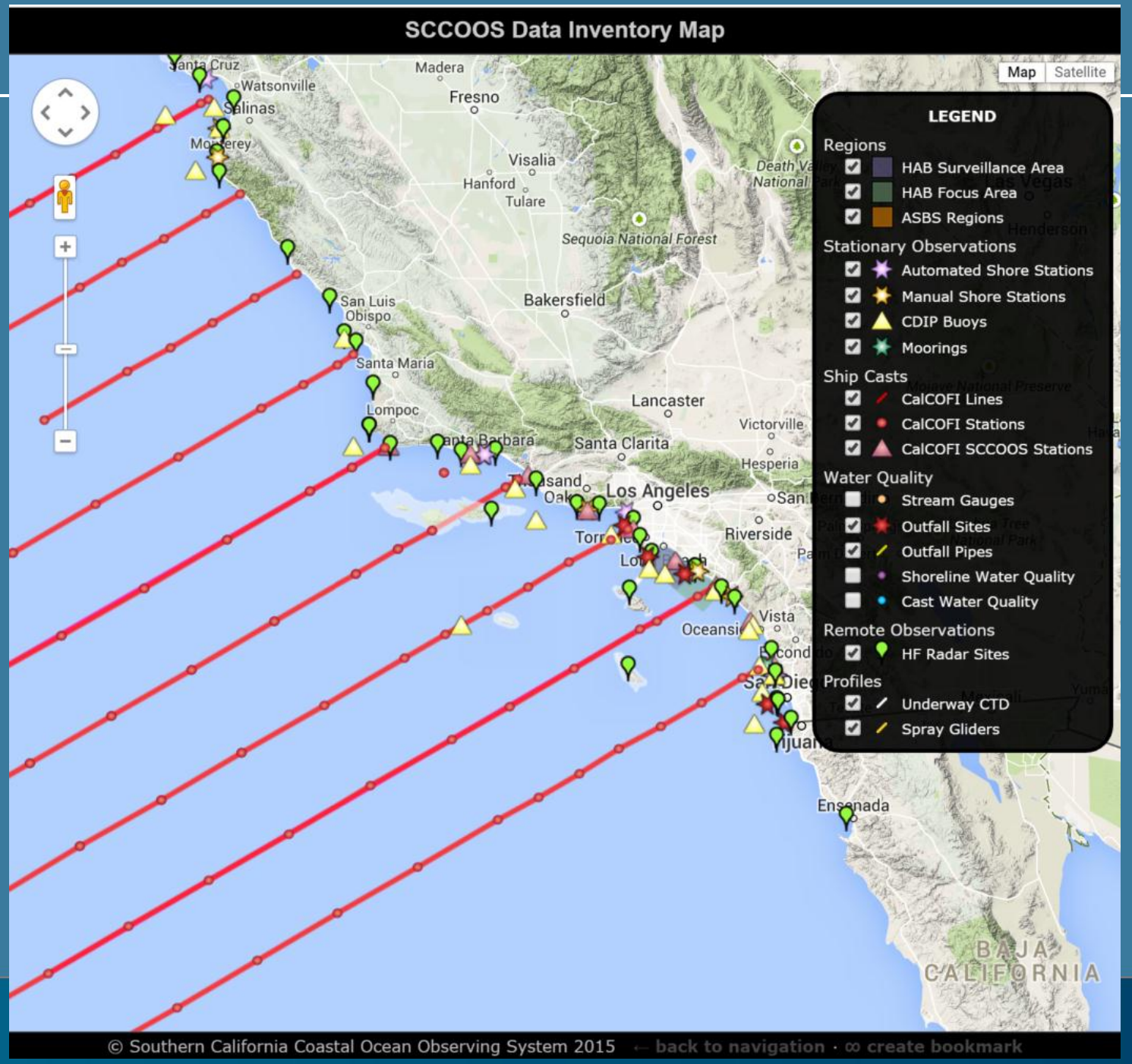
6 Manual Shore Stations since 1916

13 Wave Buoys Since 1975

9 Nearshore CalCOFI stations since 2003

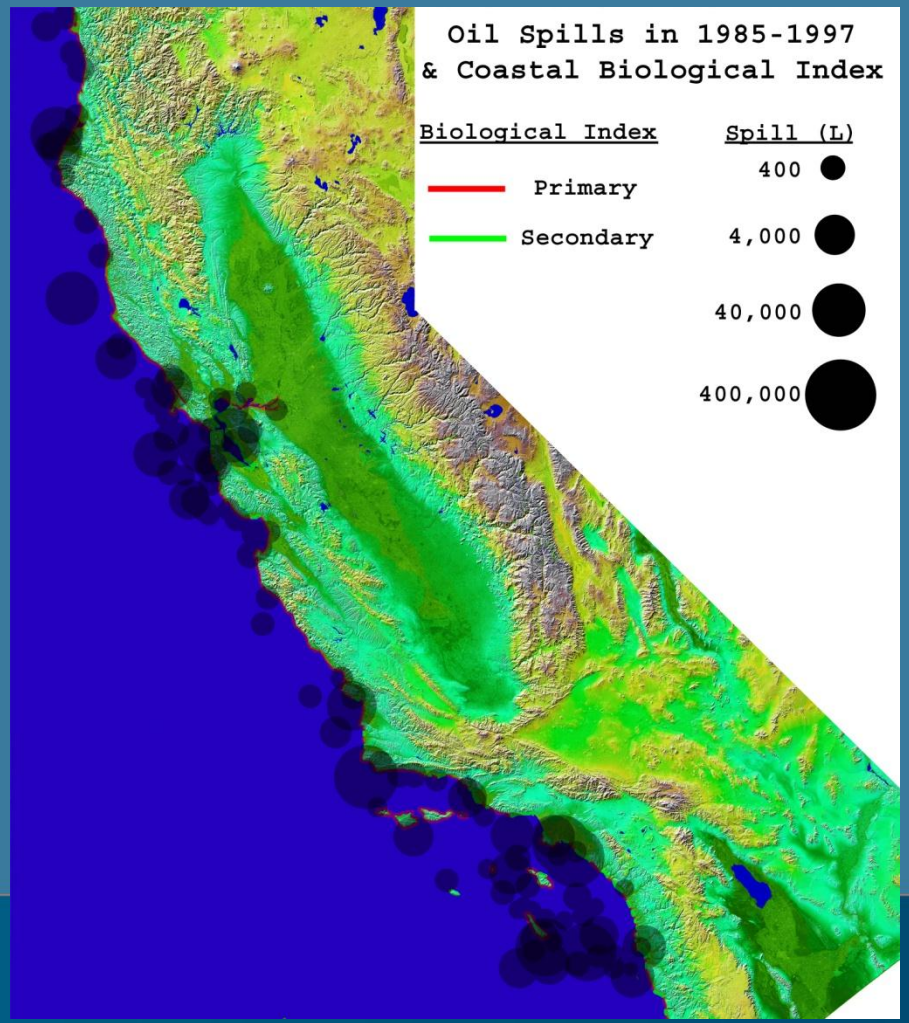
53 High Frequency Radar Stations Since 2001

3 Autonomous Profiling Gliders Since 2007

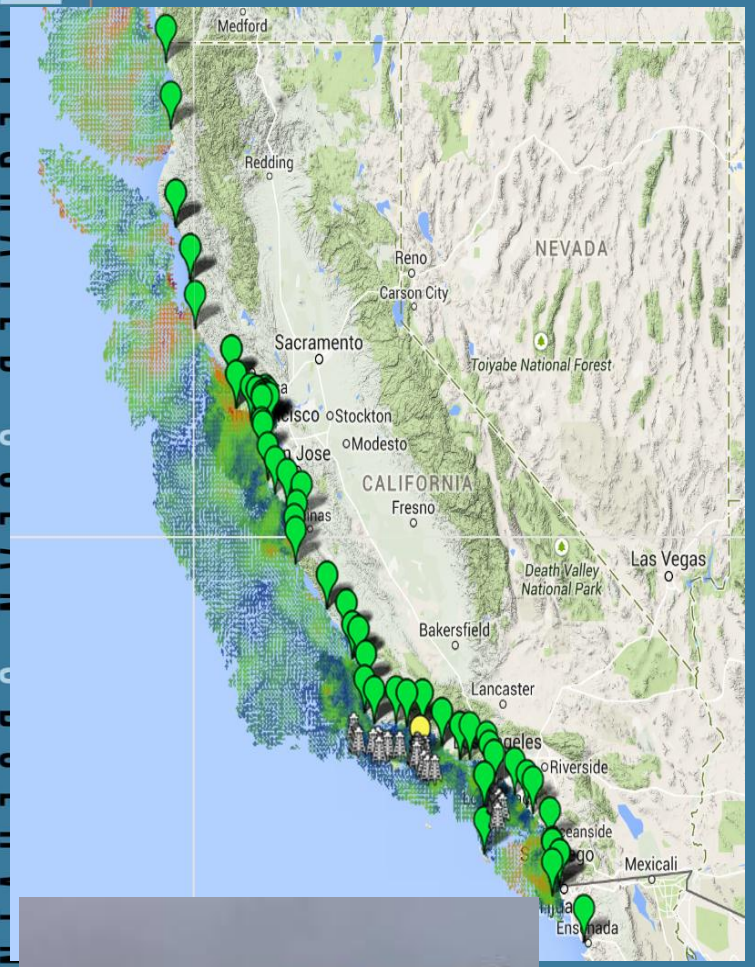


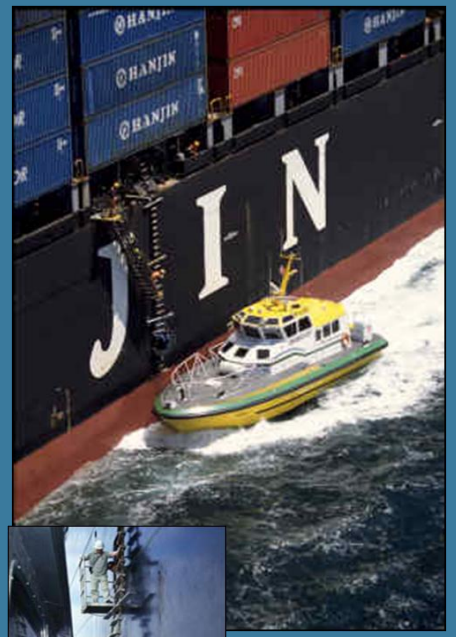
Drivers for a CA Coastal Observing System – regional needs

- population distribution
- location of permitted wastewater ocean discharges
- coastline sensitivity and areas special biological significant
- oil spill probability



Marine and Coastal Safety





High Frequency Radar (HFR) derived surface currents maps (above) provide critical support for Maritime Operations.

For instance:

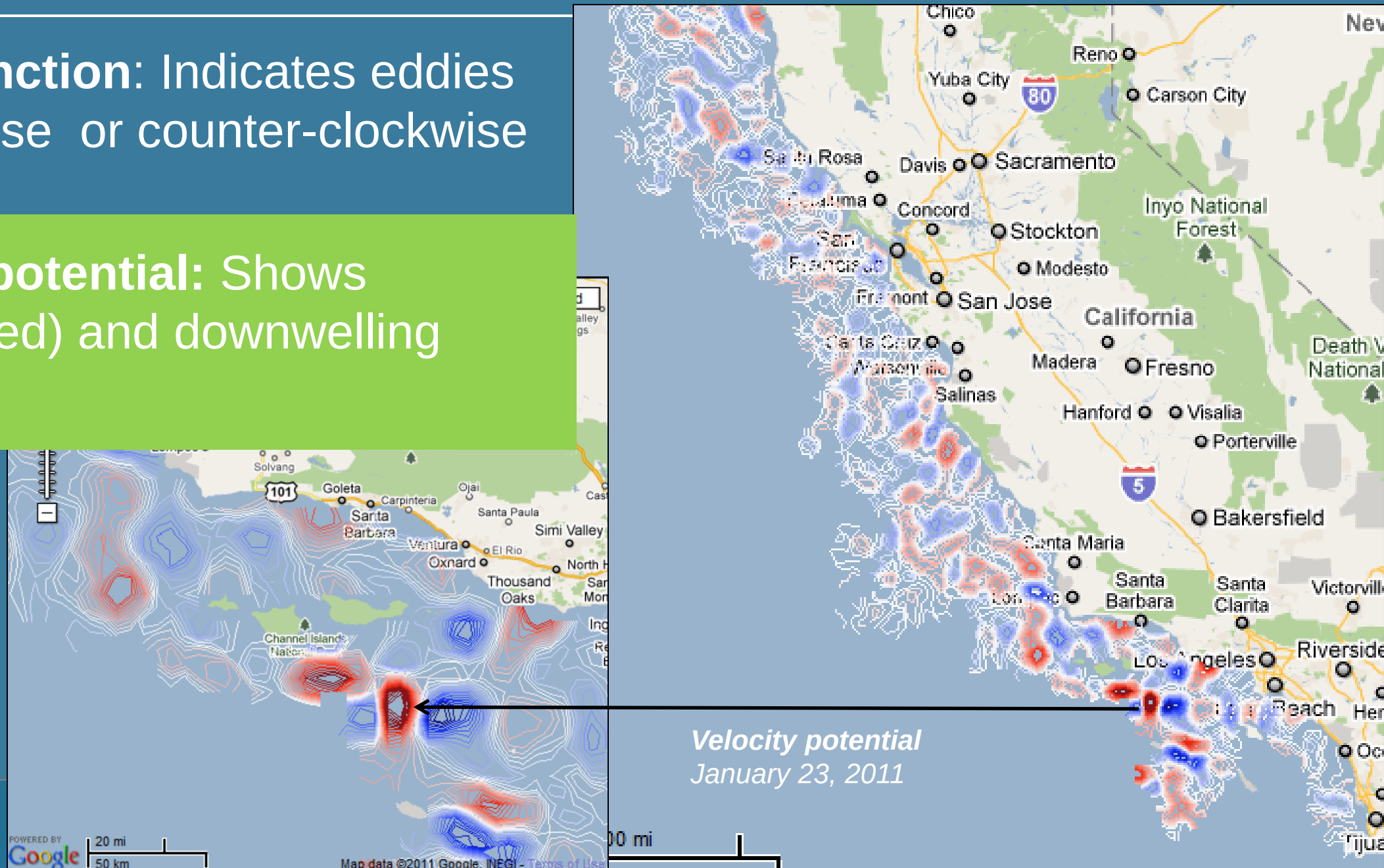
1) The Navy and Marines require updated information on sea conditions for coastal flights, and target recovery

2) The Coast Guard upload surface current to their and search and rescue operations (SAROPS) maps

3) California's Office of Oil Spill Prevention & Response uses surface currents in live and training exercises

Surface Current Time Series Shows Upwelling and Downwelling

- **Stream function**: Indicates eddies with clockwise or counter-clockwise rotations
- **Velocity potential:** Shows upwelling (red) and downwelling (blue)
-



Velocity potential
January 23, 2011

Water Quality – The U.S./Mexico Border Region

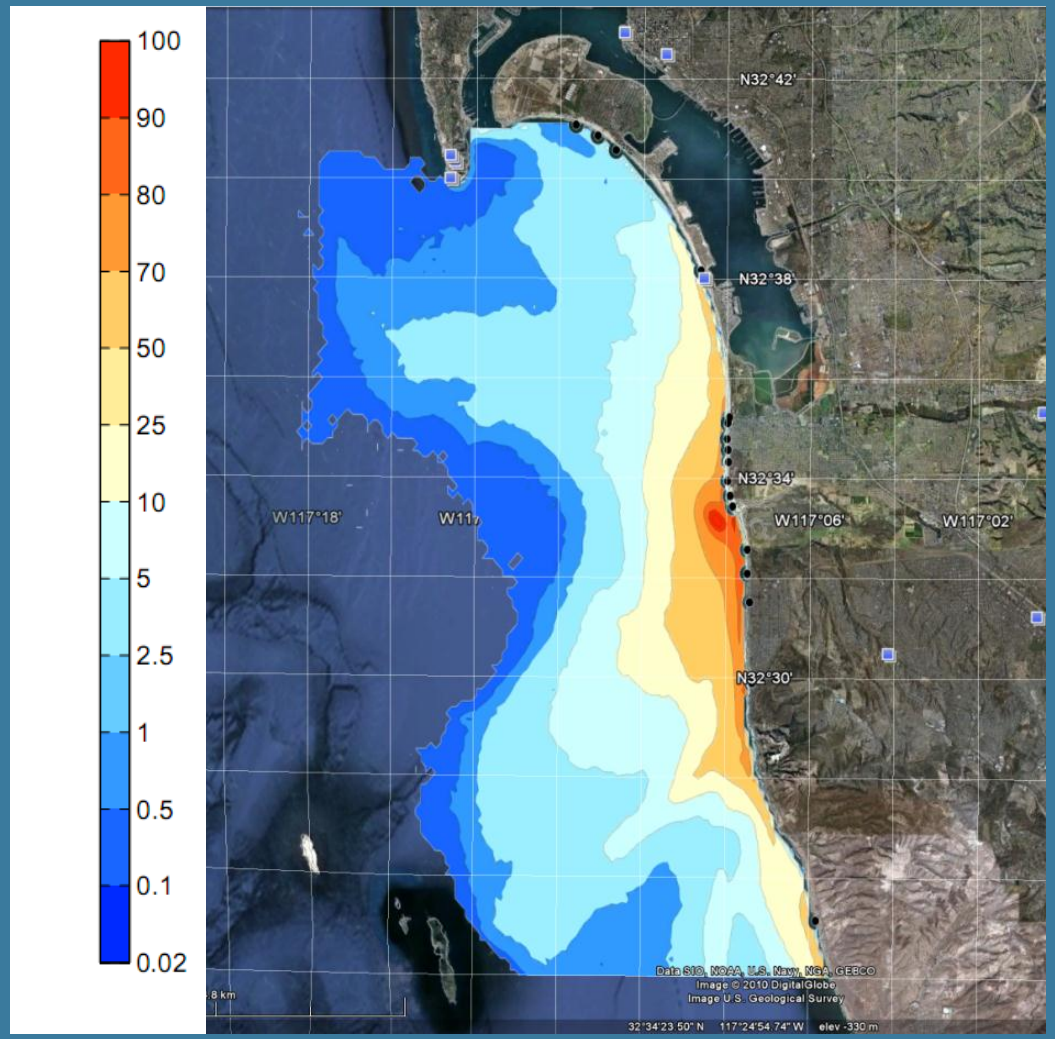
More than 2 Million people visit these beaches each year

CA Marine Protected Areas

Tijuana River National Estuarine Research Reserve

This exposure map shows the area of influence from the Tijuana River freshwater plume following rain events.

Water Quality Applications – Tijuana Plume Tracker



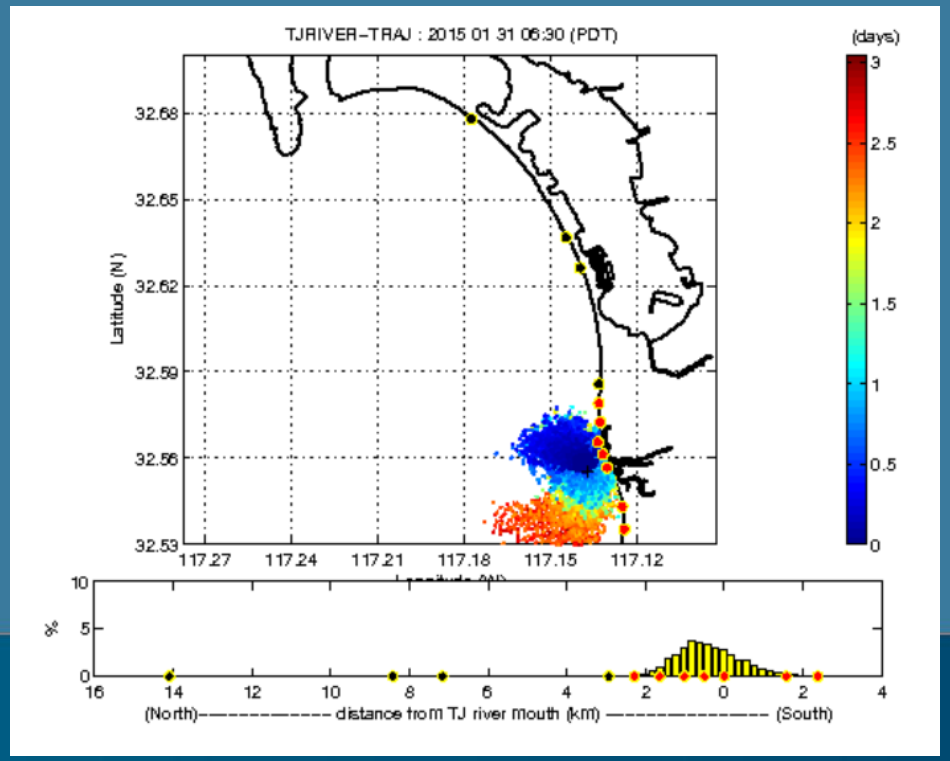
Stormwater Plume Tracking

Tijuana River Flow Rate

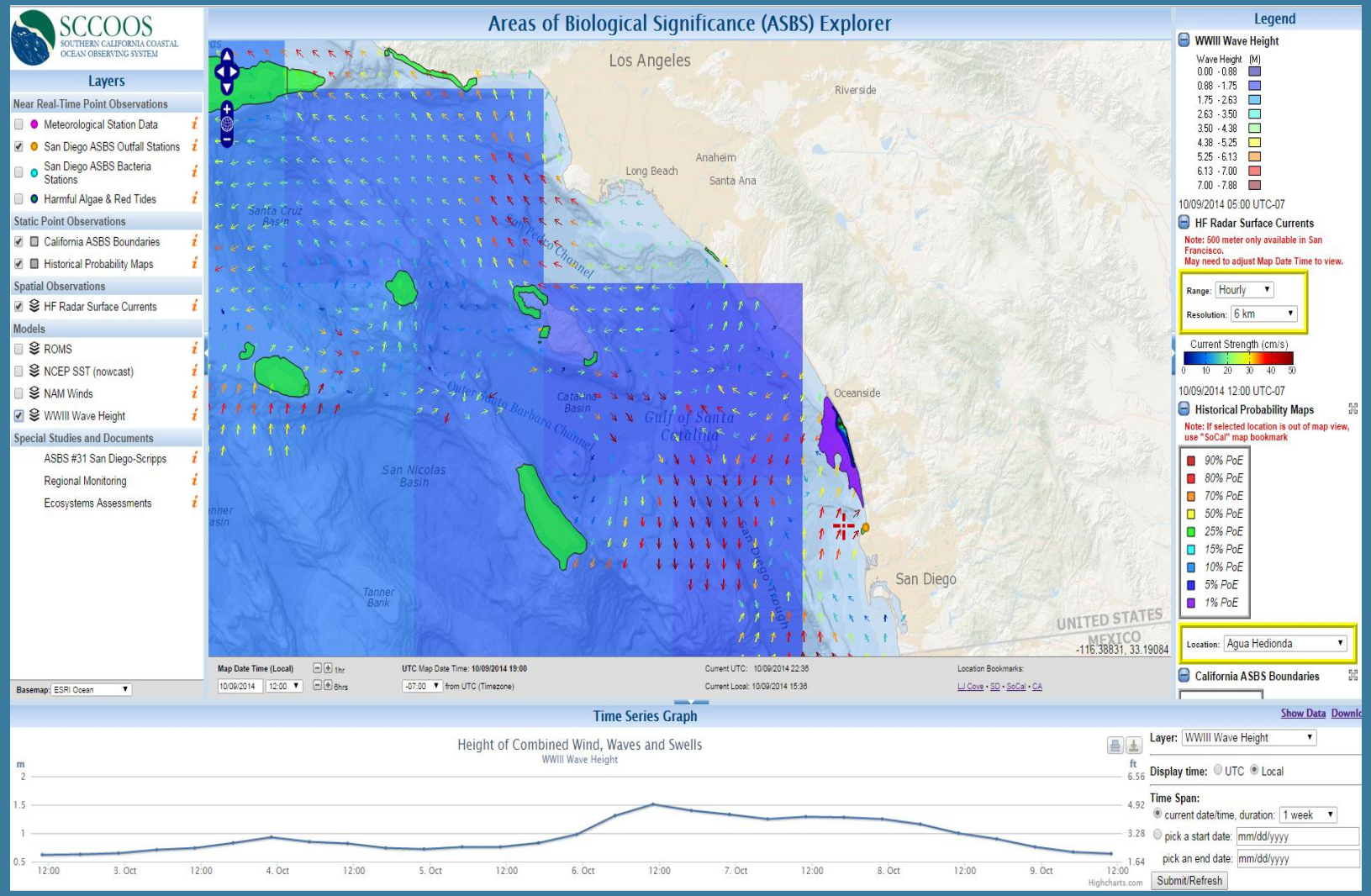
Latest Observations	24hr Maximum	24hr Minimum
0.00 MGD	0.00 MGD	0.00 MGD
0.00 cm/s	0.00 cm/s	0.00 cm/s
2015-02-05 20:00:00 UTC	2015-02-05 20:00:00 UTC	2015-02-05 20:00:00 UTC

MGD = Millions of gallons per day. cm/s = Cubic meters per second.

Values in red indicate the data is greater than 24 hours old. Otherwise values are displayed in black.



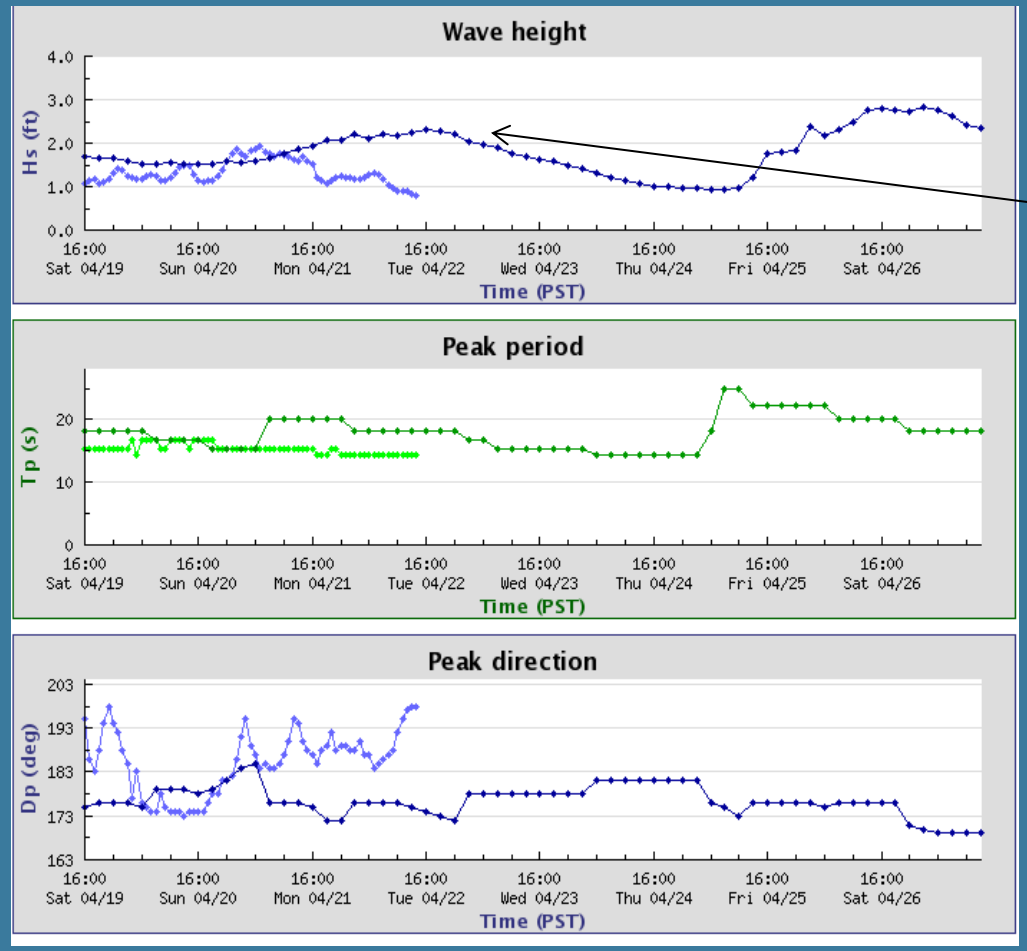
Operational Product – ASBS Data Portal



Coastal managers can be faced with million dollar decisions.

This online tool allows them to interpret data through information management.

REAL TIME WAVE MESSAGING TO COMMERICIAL PARTNERS



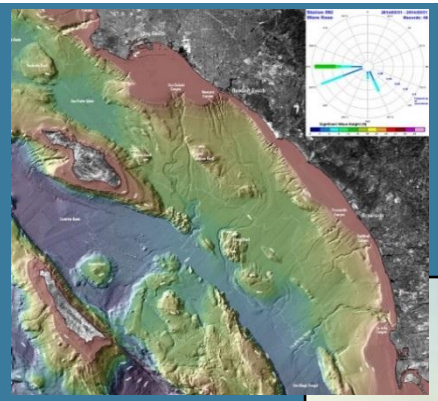
Model is over predicting by >1 ft Significant Wave height.

San Pedro Buoy observation vs WW3 Model Predictions
April 2014

CASE STUDY: Long Beach – Under Keel Clearance Project

Location:

Port of Long Beach shipping channel



Partnerships:

Jacobsen Pilot Servic, Inc.
The Marine Exchange of Southern California
National Oceanic and Atmospheric Administration (NOAA)
NOAA's National Weather Service (NWS)
National Center for Environmental Prediction (NCEP)
Office of Coast Survey (OCS)
Oil Spill Prevention and Response (OSPR)
Operational Oceanographic Products and Services (CO-OPS)
Port of Long Beach (POLB)
PROTIDE
Tesoro
U.S Integrated Ocean Observing System (IOOS)

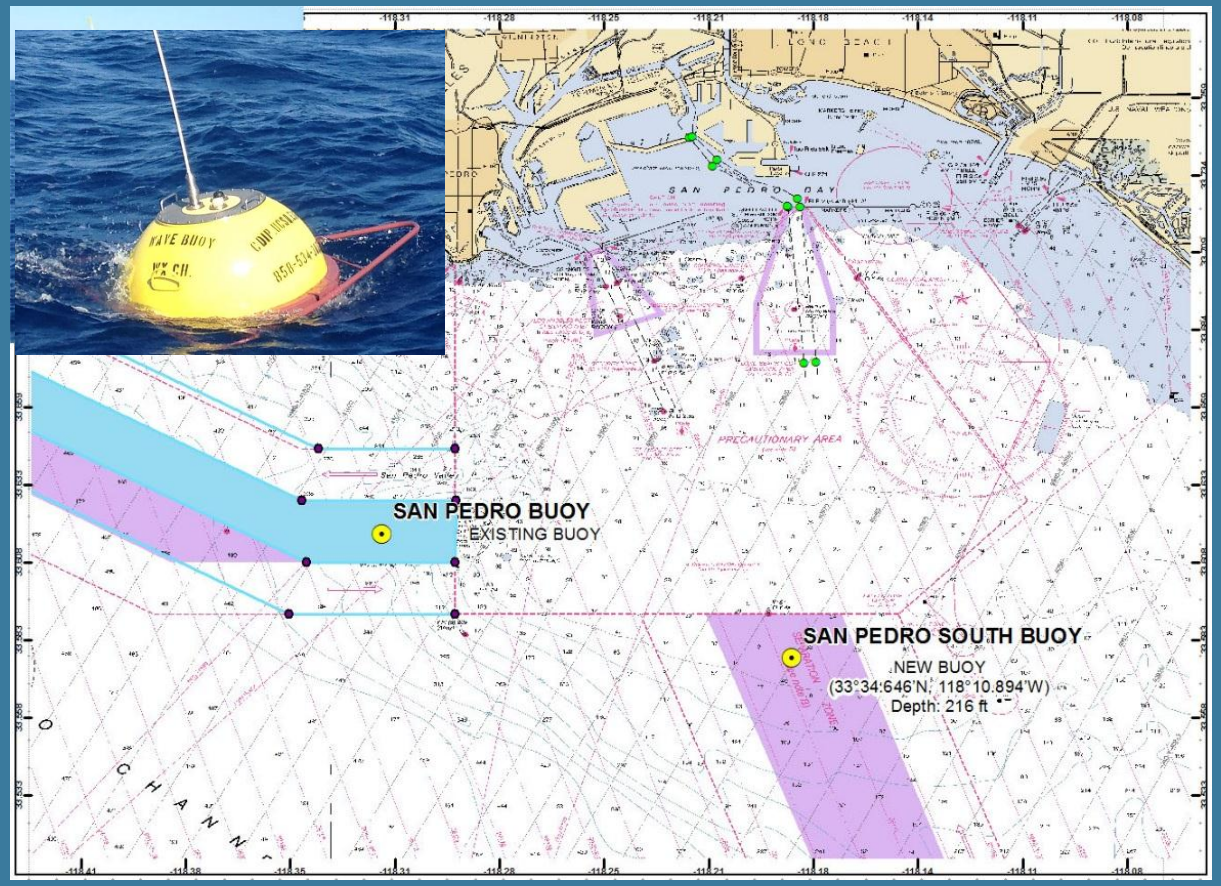
Economics:

The Port of Long Beach and Los Angeles are the busiest ports U.S, CDIP helps ensure safety of marine operations contributing to our national and global economy.

VLCC – 1200 ft length

June 2014 - San Pedro Wave Buoy measured 21ft peak, at 13-14 sec. An ATC Oil Tanker rolled 10 degrees at the Long Beach Breakwater entrance. The vessel had a 55 ft draft, 160 ft wide. The roll increased the draft to 64 feet. (Channel currently dredged to 69ft)

Marine Planning



Contributing factors:

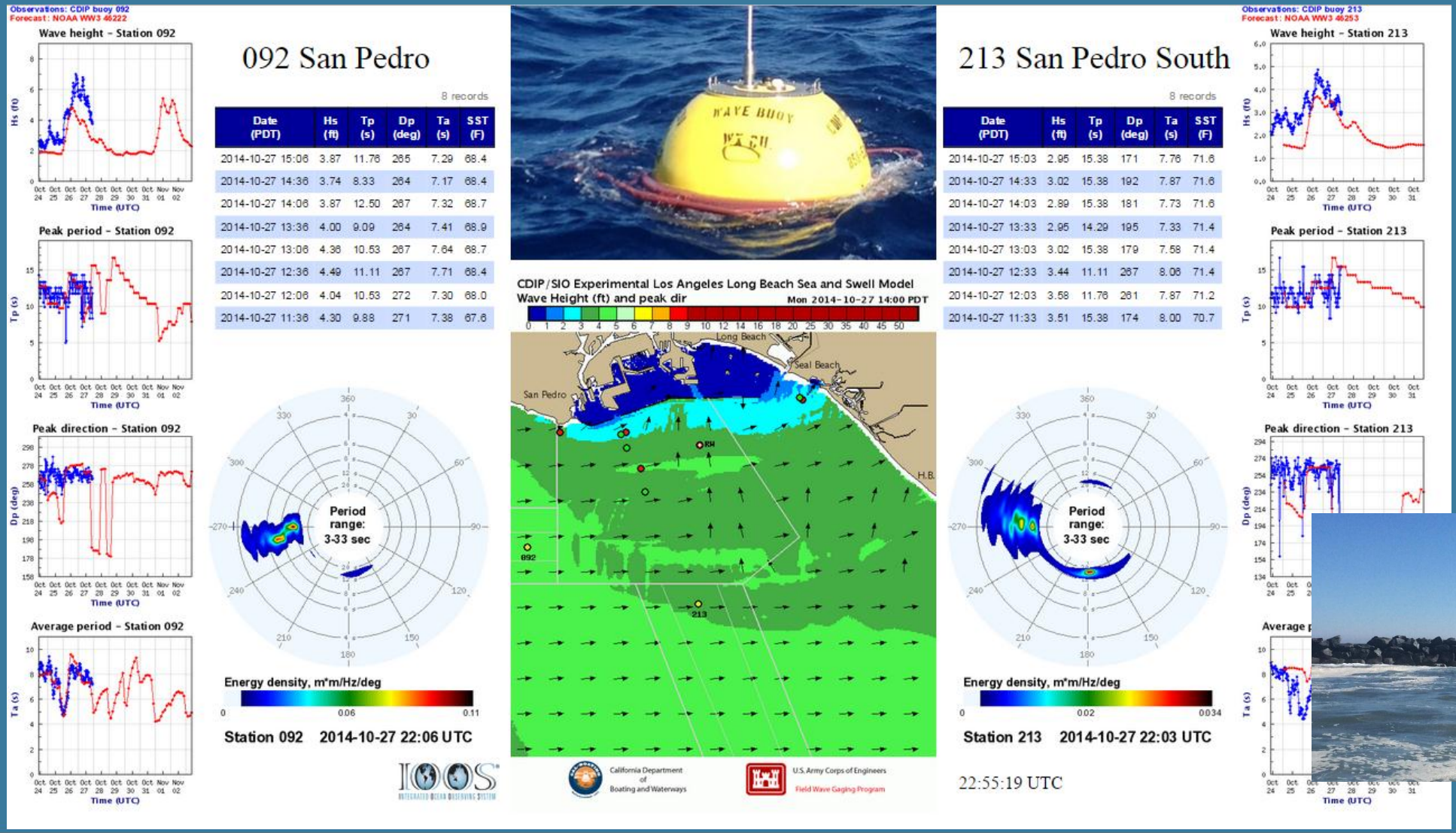
- Shipping lanes
- Ship Traffic
- Bathymetry
- Swell model verification
- Swell direction
- Fishing

Port of Long Beach, Buoy Deployment

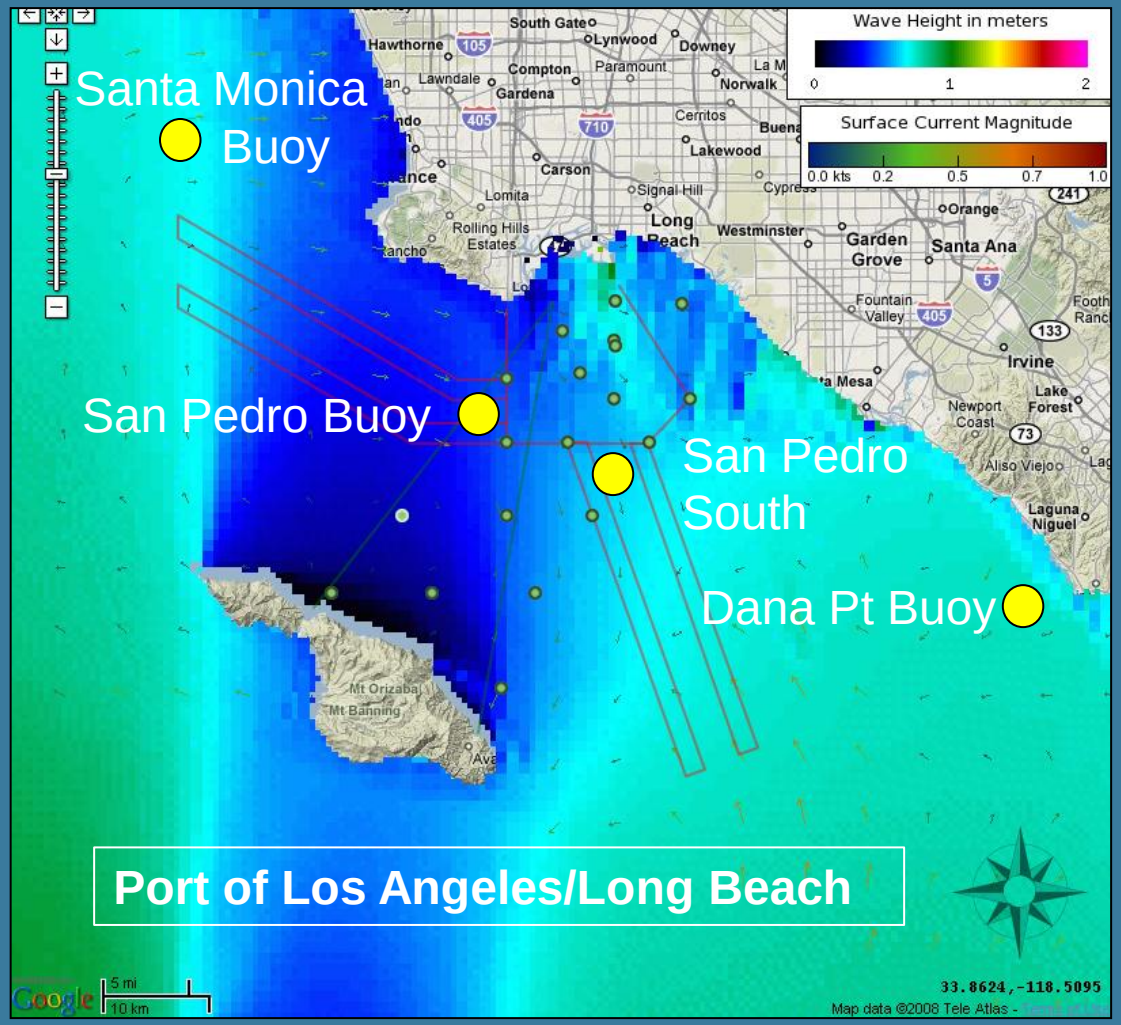
October 15, 2014

INTEGRATED OCEAN OBSERVING SYSTEM
IOOS

Data Products



Wave and Surface Current Operational Products



This customized site is used for maritime traffic for either near real-time decisions as to their immediate transit, or for planning purposes through available forecast information.

1. ***Wave data*** from California Data and Information Program (CDIP).

2. SCCOOS provides ***HF radar surface currents, wind, meteorological data, sea surface temperature, and tide data***.

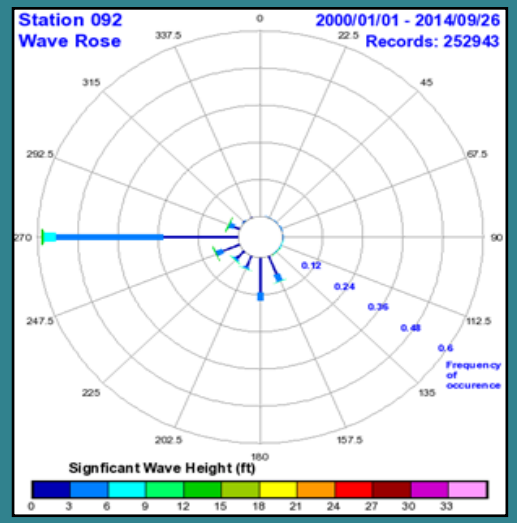
3. The ***HF radar technology*** is supported by the State of California through its Coastal Ocean Currents Monitoring Program.

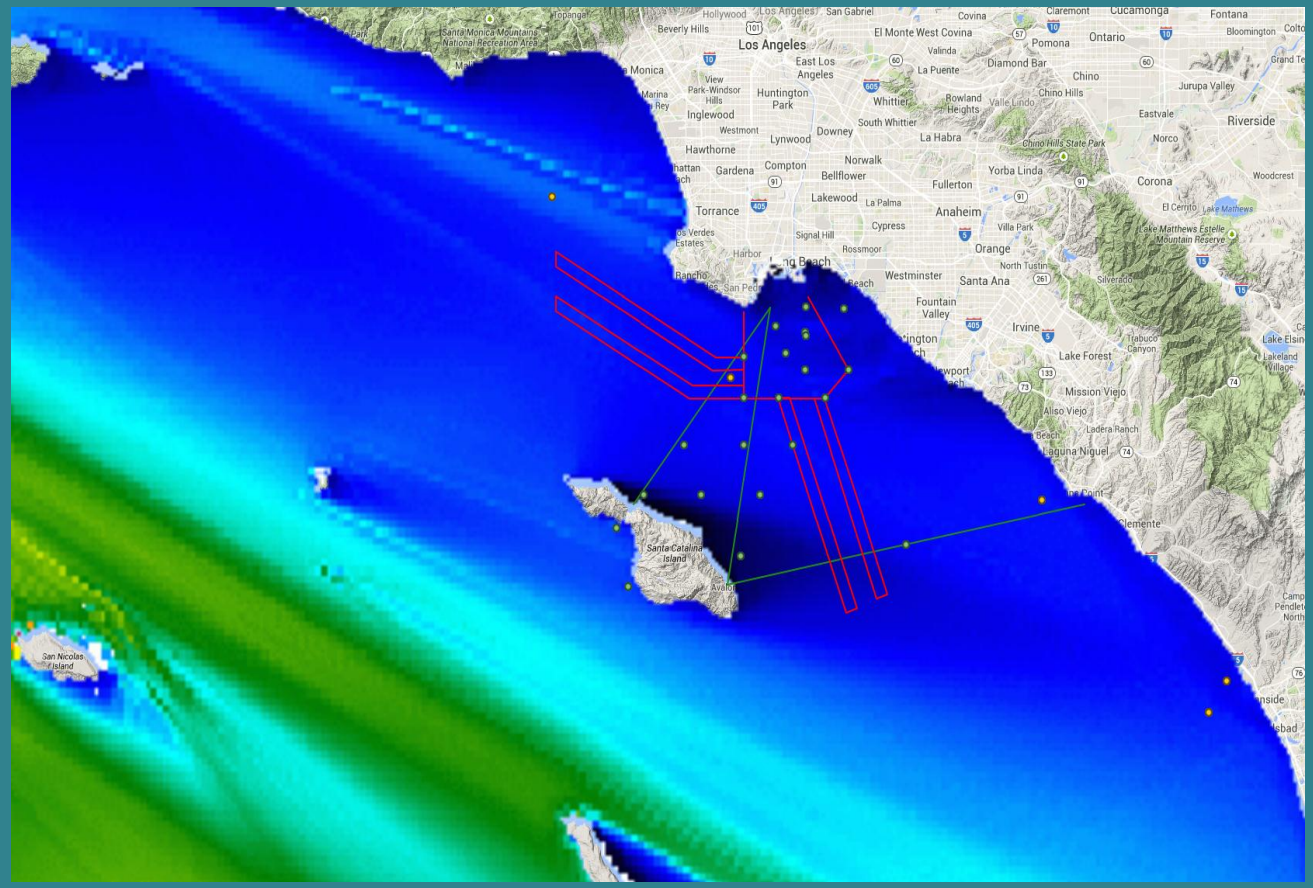
4. NOAA provides ***nautical charts, and shipping/ferry routes***.

Vessel Lightering offshore Southern California

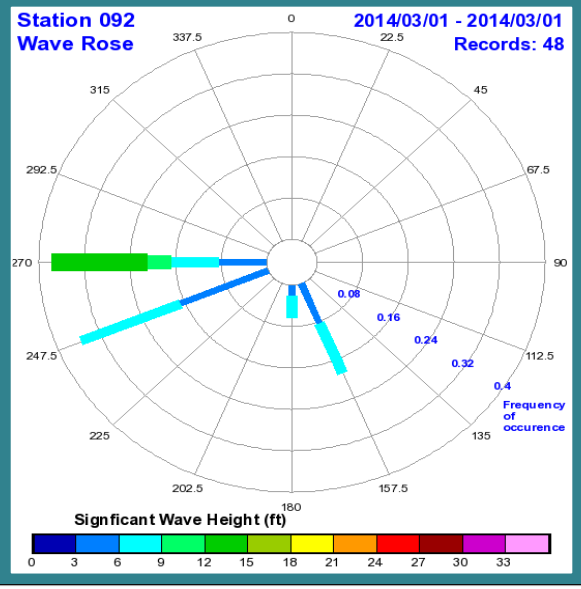
”The side-by-side mooring arrangement used in a typical lightering operation is only practical in low-to-moderate seas under reasonably good weather conditions. If the weather turns severe and waves reach a certain height, the operations must be suspended and the vessels separated.” (*Marine Board: Oil Spill Risks from Tank Vessel Lightering, 1998*)

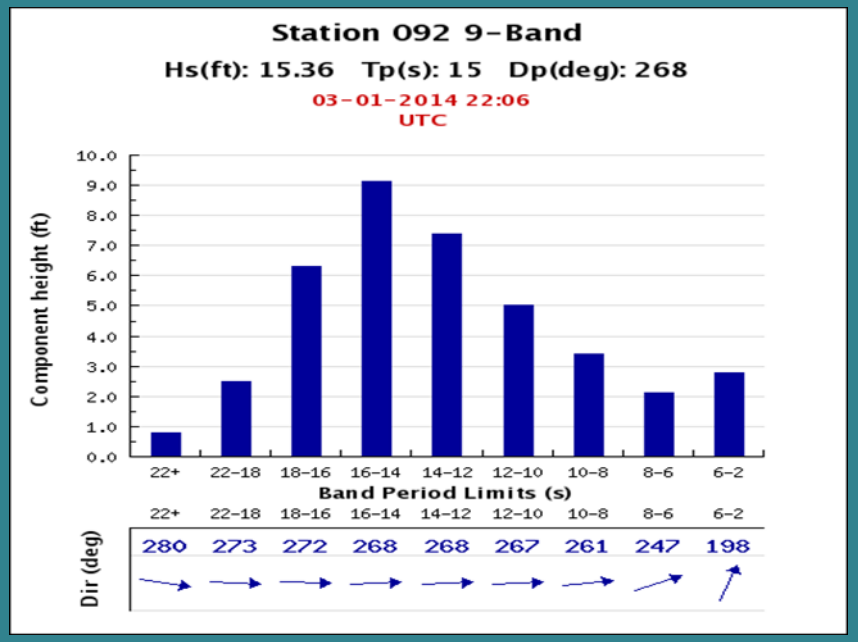
Full Directional Spectrum exposure for San Pedro buoy (2000-present)

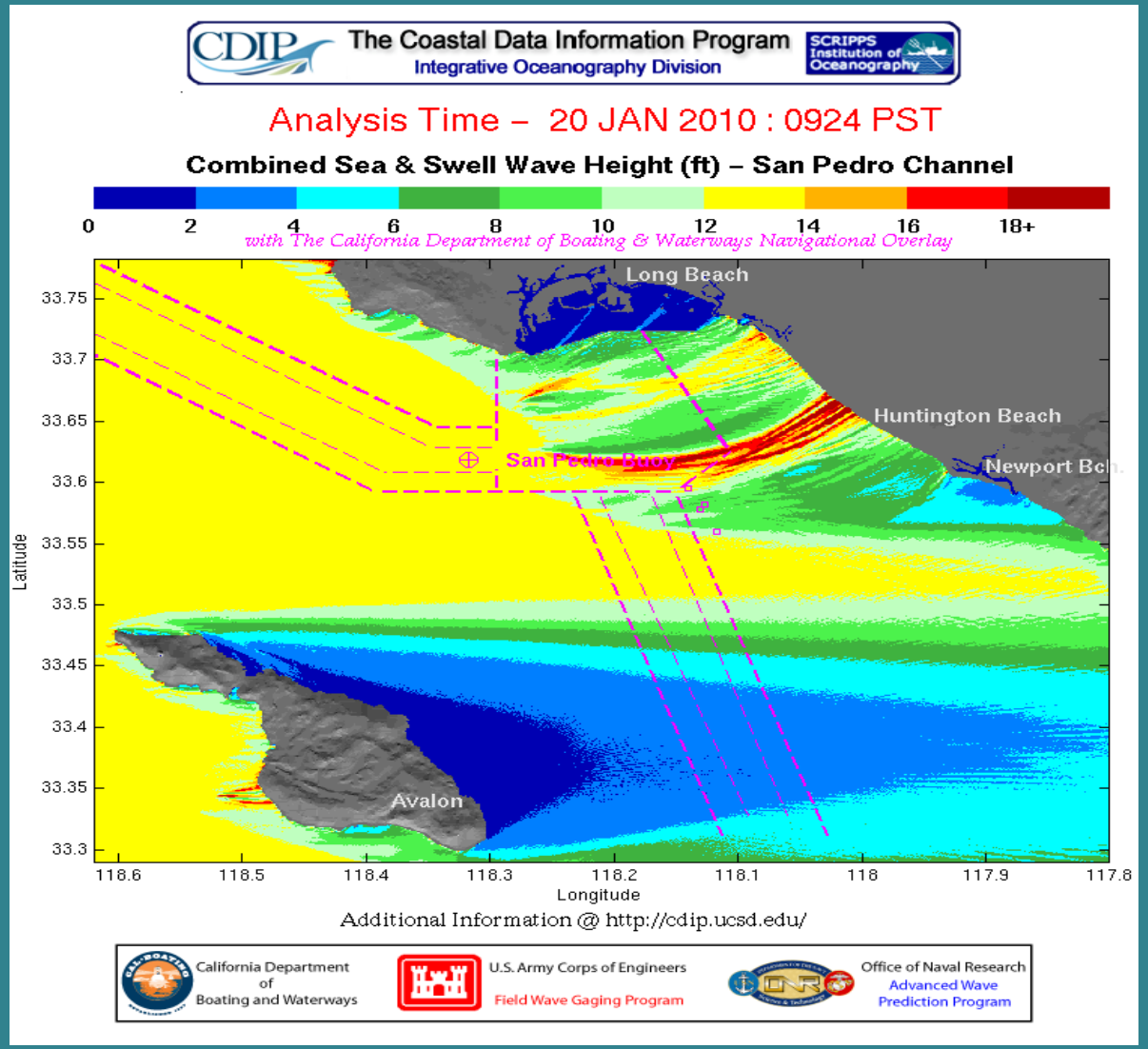




Wave Models and Exposure West Swell

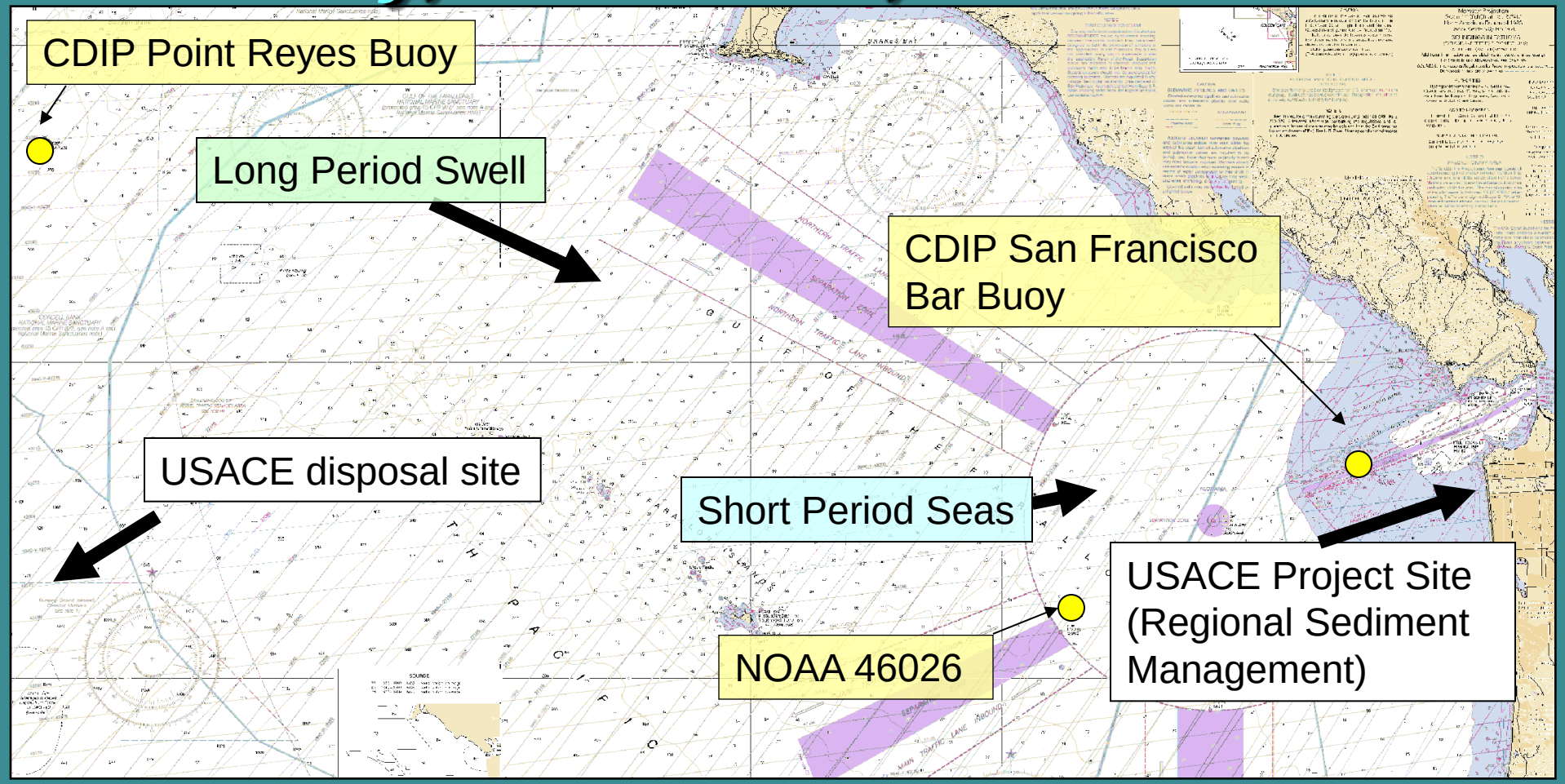






San Francisco

Safety, Economics, Environment



THANK YOU!

sccoos.org

cdip.ucsd.edu