

# Predicting Hyper-Local Impacts of Sea Level Rise

**US Harbors and Divirod Make Affordable, Relatively Maintenance-Free, Tide Stations Available to Coastal Communities.**

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The United States has over 95,000 miles of coastline. It includes a wide variety of ecosystems—from major metropolises to untouched wild areas—and encompasses radically different geographic, oceanographic, and weather conditions. Understanding local trends and predicting the hyper-local impacts of sea level rise across such an immense and variable shoreline is a significant challenge.

US Harbors provides tidal data, monthly tide charts, and coastal and marine weather forecasts on over 1,400 harbors in the U.S. It is designed to cover specific coastal conditions, and to help the millions of people who live and work on our coasts (and in the Great Lakes) plan their time on and near the water. We are receiving increasing numbers of calls and emails from users who are surprised by unpredicted tidal flooding in their neighborhoods, and from others asking how their small communities can better understand and plan for the hyper-local changes they are observing in sea level rise and the corresponding coastal erosion.

We are lucky that NOAA, the National Oceanic and Atmospheric Administration, has been measuring and predicting tides since the early 1800's. While early measurement techniques were rudimentary, today's highly engineered tide stations are sensitive enough to measure a wide variety of conditions beyond basic water levels. Impressively, NOAA has nearly 170 years of continuous data on water levels for the Presidio in San Francisco, CA. However, they currently maintain only 200 real-time observational tide (or water level) stations and rely on algorithms to derive tidal predictions for all other locations. While these algorithms are sophisticated and incorporate both historical water-level data and local hydrographs (the 3D mapping of the ocean floor and coastline used for nautical charts), they do not always reflect hyper-local conditions and shorelines as they evolve due to sea level rise and changing weather conditions.

After a year of research on helping small communities with their quest for accurate and dynamic local water level data, our team at US Harbors learned a few important things:

- 1. Tide stations are complicated.** They require sensors, power sources, a communication system to transmit the data they collect, a data storage solution/backend to contain the data, and a way for humans to access that data.
- 2. Tide stations are expensive.** For local communities with tight municipal budgets, building and maintaining even a simple tide station is out of the question. Tidal stations require significant investment both in infrastructure and in the technical expertise required to install AND maintain the system.
- 3. NOAA is limited in budget and human resources.** Due to their large number of other obligations and responsibilities, it is unlikely that NOAA will be able to launch and maintain the number of hyper-local, real-time stations needed by the numerous communities thriving on our 95,000 miles of shoreline.

With rapidly changing coastal weather, rising sea levels, and increasing shoreline erosion, it is urgent that local communities have access to accurate water-level data for their specific



location. To meet that need, US Harbors has joined forces with the data services company Divirod, to make highly affordable coastal monitoring and forecast services available to coastal communities around the country. Their proprietary space-edge technology is not intrusive, requires minimal maintenance, and has been extensively correlated with NOAA sources.

The stations are designed for simple installation and consist of a small box and antenna mounted on a pole or dock piling. For versatility, they can be powered by either standard electricity or solar power. Data is collected from the stations via satellites and aggregated by Divirod, who then shares that data with the community through a dashboard and alert system. The system allows the community to view, analyze, and monitor changes in sea level in their exact location, all with minimal investment and maintenance requirements.

Access to real-time, hyper-local water-level data can help everyone on the coast: individuals, businesses, municipalities, and state governments can use this data to understand local and regional water-level trends as they evolve. Most importantly, this type of hyper-local data can help all of us who live on the coast effectively plan for the impacts of storms and sea level rise, thereby making our coastal communities more resilient in the future.

#### More Information at:

- > [www.usharbors.com/tidal-network](http://www.usharbors.com/tidal-network)
- > [www.divirod.com](http://www.divirod.com)

#### About the Technology

Divirod's technology consists of two core components: An IoT device that acts as a passive radar data logger and cloud-based advanced analytics. The passive radar utilizes GNSS (GPS and other) satellite constellations as signal source to collect high-precision data about water and water content around the sensor location. This information is broadcast using LTE wireless network to the cloud, where the raw data is processed using proprietary algorithms in real-time. This processing provides hyperlocal information about water levels, tidal changes, snow/ice, soil moisture, and precipitation for each sensor location. Aggregating this inter-comparable information from a network of sensor locations, over extended periods of time, enables a wide range of actionable insights from improved situational awareness and disaster response to long-term water risk and resiliency planning for businesses and communities.