

Automated Data Sharing Helps Commerce Flow through US Ports

By Steve Snow, Esri Mapping, Statistics, and Imagery Team

The United States moves 95 percent of its imported and exported goods by ship, so keeping its ports open is critical to the economy.

The US Army Corps of Engineers (the Corps), maintains the country's waterways and wages a constant battle against the forces of nature. If a storm hits causing underwater sediment to shift and makes a port too shallow for cargo ships, the Corps must dredge that port to keep it open for shipping. To avoid getting grounded in the mud, ship captains and harbor pilots rely on the Corps for this work and for updates about port conditions.

With the 2016 Panama Canal expansion, the cargo capacity of ships traveling through this important channel nearly tripled. Along with an increase in the number

of ships, those ships had increased drafts. Draft is the distance between waterline and keel and it marks the necessary water depth for safe travel. These "New Panamax" ships have a fully loaded draft of nearly 50 feet, placing constraints on navigation that favor the nation's deepwater ports.

Recent storm-related sediment buildup (known as shoaling) in the deepwater Port of Texas City in Galveston Bay restricted shipping from the typical 45-foot draft to just 41 feet. This four-foot difference had an economic impact on the port and the industries

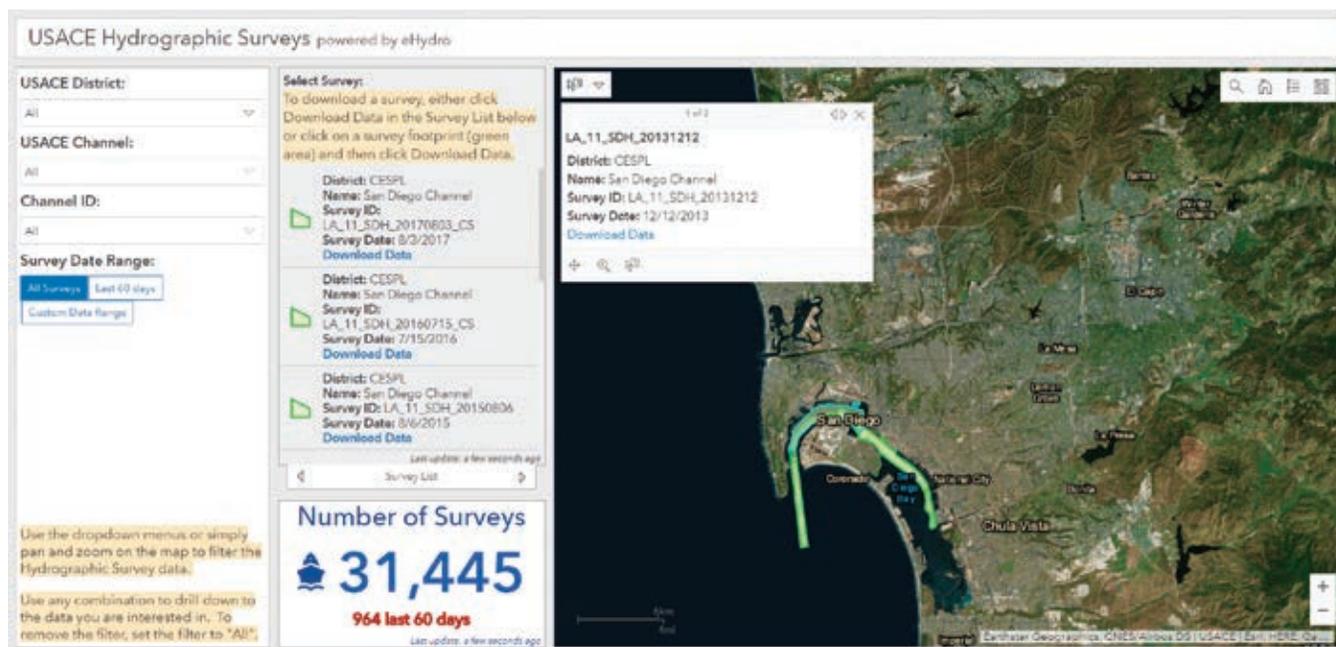
that rely on it. The lower draft meant that companies needed to use smaller ships to ferry cargo into the Gulf of Mexico for loading onto bigger ships or divert their ships to different ports.

The key Brazilian port of Santos experienced similar storm-related restrictions. The port estimated that every day a vessel is not operating, shipowners lose between \$10,000 and \$75,000, depending on the size and type of ship. Restrictions on shipping for

↓ The US Army Corps of Engineers use the dredge New York in the Port of New Jersey Channel. Photo © Vince Elias



“We’ve been working to arrive at an enterprise data collection process for 20 years.”



↑ The Corps’ operations dashboard makes information about the number of surveys and their extents readily available.

just one day in Santos collectively cost ship-owners \$1 million, to say nothing of losses to the port and the overall economic impact on Brazil’s economy.

Dredging the Ports

Without dredging, many ports would become impassable. The Corps regularly performs this maintenance chore that keeps 400 ports and harbors along 13,000 miles of deep-draft coastal channels and 12,000 miles of shallow-draft inland and intra-coastal waterways usable.

Storm debris increases the Corps’ regular workload, adding 250 million cubic yards to the material dredged from the nation’s waterways every year. The Corps conducts regular hydrographic surveys across 22 coastal and 16 inland districts to assess channel safety and prioritize dredging needs.

“The Corps is a decentralized organization with districts managing their own programs in their own geographic areas of responsibility,” said Tony Niles, assistant

director for Civil Works Research and Development, Headquarters US Army Corps of Engineers. “This structure proves effective for project management, but it poses challenges for pulling together enterprise data.”

Recently, the Corps started using an enterprise-wide system dubbed eHydro that includes tools and workflows to catalog, organize, and share surveys. eHydro is an application and scripts that easily—and almost automatically—feed the data from each survey into a Corps-wide system.

“We’ve been working to arrive at an enterprise data collection process for 20 years,” Niles said. “We realized this goal by inserting the reporting into existing project workflows—not changing any data collection methods or tools, just changing what they do with the dredging data once the boat is in.”

Free Flow of Information

Each dredging effort is a project, so eHydro acts as a centralized system of projects. It

captures the horizontal and vertical dimensions of each dredging project as the work is completed and records surveys periodically conducted to assess current channel conditions.

Since implementing the approach, the Corps has seen marked improvements in the accuracy, consistency, timeliness, and sharing of project information. The streamlined data aggregation allows for automation of regular reports on channel availability and condition.

“Previous to eHydro, channel information was sent to a central location, but after it was there a period of time, it was stale,” said Mel Littell, engineering technician in the Portland District of the Corps where eHydro originated. “Now, when each district changes something in their channel, they just push a button, and it updates the national channel framework ensuring everybody works off the same current datasets.”

Internal data sharing was a big advancement, but the full benefit comes from

“We can get surveys turned around quicker to know about changing conditions and prioritize trouble areas.”

sharing with all stakeholders through the Corps Navigation Portal (navigation.usace.army.mil). Now information can flow to the National Oceanic and Atmospheric Administration (NOAA) to update the nation’s navigational charts.

“The Corps’ data is by far the biggest outside source of data that NOAA uses in its nautical charts,” said Clint Padgett, chief, Spatial Data Branch, the Mobile District of the Corps. “In the past, they had to go to every district and normalize data provided in more than 20 different formats. Now, they just consume our data through a web service.”

Knowing the Channels

Dredging projects are constantly in backlog given the workload plus time and budget constraints.

“If we’re going to maintain all of our 25,000 miles of channels to authorized dimensions 100 percent of the time, we’d need billions more dollars,” Padgett said. “We know that we’ll never get that level of funding, so we work to manage impacts with the budgets that we have.”

This means a constant weighing of trade-offs for the Corps. If one channel is authorized at a 35-foot depth and it’s only 32 feet, the Corps has to balance the \$5 million additional cost to get the channel to that depth against other projects. In some cases, it’s more beneficial to dredge a deepwater port from 40 feet to 45 feet to accommodate today’s larger ships.

Now, the Corps has a means for evidence-based decisions to clearly compare present channel conditions and prioritize dredging funds against the impacts to commercial shipping. “We can get surveys turned around quicker to know about changing conditions and prioritize trouble areas,” Littell said.

The Corps works in close coordination with cargo pilots who move large vessels. This group has become a big consumer of Corps data even though the Corps doesn’t produce navigation charts on coastal deep-draft

harbors. Pilots count on the Corps to know the latest channel conditions.

“The Columbia River Pilots Association depends heavily on this information,” Littell said. “We meet once a month with the pilots to address their concerns. We go over every single chart and look at where material is building up and where we should do more maintenance.”

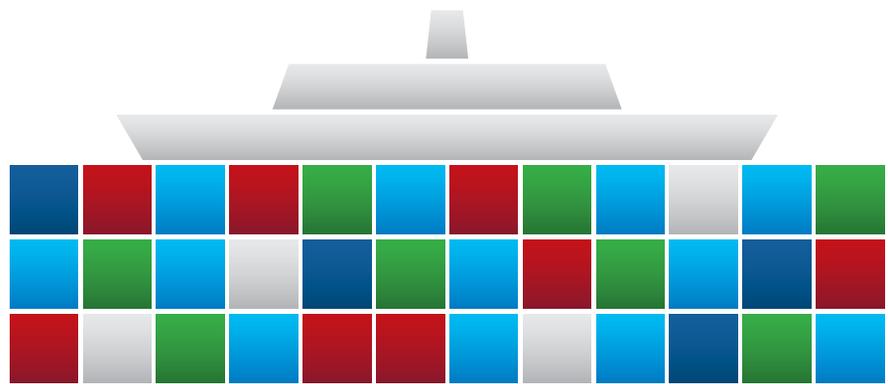
Over the next 20 years, the volume of cargo traveling by container ships is projected to increase by 65 percent, according to the global management consulting firm McKinsey & Company. With demand at ports and waterways rising steadily, the Corps’ streamlined data sharing efforts have an increasing impact on the flow of commerce.

Visit the Corps’ operations dashboard to

see the number of surveys and their extents. To learn more about navigational charting, visit [ArcGIS for Maritime: Charting online](http://ArcGISforMaritime.com).

About the Author

Steve Snow is an industry specialist for mapping, statistics, and imagery at Esri with more than 18 years of experience working in GIS, mapping, charting, and remote sensing. He focuses on applying remote sensing capabilities to solve user mapping challenges. Prior to joining Esri, Snow was a commissioned engineer officer in the US Army. He was also a corps officer with NOAA, whose work was focused on remote sensing, surveying, and charting for the US National Geodetic Survey Remote Sensing Division and NOAA’s Office of Marine and Aviation Operations.



The Value of an Added Foot of Draft

In 2017, the Port of Los Angeles/Long Beach increased the draft of the port from 65 feet to 66 feet. Each additional foot of draft means that larger ships can enter it and each of those ships can carry more goods. Each foot of depth translates into considerably more cargo and value.

The National Ocean Service, a division of NOAA, puts this added capacity into perspective. With a foot more draft, a cargo ship can carry

- 684 more tractors, worth more than \$45 million.
- 378,624 more laptop computers, worth more than \$262 million.
- 9,274,800 more bushels of wheat, worth more than \$720,000.
- 61,728 more 55-inch televisions, worth approximately \$26 million.

The added capacity means fewer individual trips with less fuel consumed, which translates into dollars saved and greenhouse gas emissions reduced.