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Panama Canal Expansion Prompts Study of Dredging and Excavation Impacts

By Mark Fitzgerald

The construction of the Panama Canal—widely regarded as one of the largest and most difficult engineering projects ever undertaken—resulted in the excavation of nearly 270 million cubic yards of earth. Completed by the U.S. in 1914 at a cost of more than $375 million, the canal traverses the Isthmus of Panama in Central America and connects the Atlantic and Pacific Oceans—effectively cutting in half the time and distance it would otherwise take for ships to travel between the eastern and western seaboards. The Society designated this achievement an International Historic Civil Engineering Landmark in 1984, one of the Seven Wonders of the Modern World in 1996, and a Millennium Monument in 1999. "The canal remains a testament to the combined skills of structural, geotechnical, hydraulic, and sanitary engineers," ASCE recognizes on its history and heritage website.

Flowing from Colon in the Caribbean to Panama City in the Pacific, the canal has been a key link in world trade, and over the years the number and size of the ships passing through it have grown. According to the Panama Canal Authority (ACP), more than 250 million tons of cargo passes through the canal on some 14,000 ships each year. The ACP, which assumed control of the canal in 1999, has been coping with much more vessel traffic than the canal was designed to accommodate. Today a ship waits an average of 16 hours before it begins to move through the canal—a process that utilizes a system of locks to elevate vessels by draining millions of gallons of fresh water from Gatún Lake. The locks, which are approximately 33.5 m wide, are not big enough for the passage of most modern container ships, cruise ships, and tankers.

Through a national referendum in October 2006, Panamanian voters approved a $5.25 billion expansion project aimed at creating a third set of locks to accommodate larger ships while doubling the canal's capacity. The project, which is expected to take approximately eight years, will involve extensive excavation of access channels to the new set of locks and widening and deepening existing navigational conduits. It will also entail increasing the elevation of Gatun Lake's maximum operating level.

In March the ACP authorized a study focused on assessing the potential environmental impacts of the project, particularly the dredging and excavation activities necessary to expand the canal. "No construction can start until these studies are complete and reviewed by an environmental agency," explains Jorge L Quijano, P.E., ACP's engineering and programs management director. Slated to be completed in nine months, the study will involve analyzing baseline information and extensive data obtained by the ACP as well as a wide variety of geological and ecological factors, including the rainforests in Panama, which are one of the most biologically diverse areas in the world. The rainforests serve as a sanctuary for numerous species of plants and animals and also reduce erosion and sedimentation of the canal.

"We've been dredging the canal since the French came over more than a hundred years ago," adds Quijano, who has applied his expertise in locks engineering to the operations and maintenance of the canal for over 30 years. "We've also been doing dry excavation for quite some time, so we already have sites that we use to deposit the material we dig up. We think we have identified enough sites to cover this project. But dredging and dry excavation of the canal is a continuous activity. It's not just because of the expansion; it's something that you need to do as the ships get larger and sink deeper. They need more draft, so you have to make space for that."

Rather than construct new lakes, submerge jungles, and relocate existing communities, the ACP plans to enlarge Gatún Lake, the main water storage source, while using adjacent basins in the new locks to recycle water. "We're going to go a little deeper and a little wider," says Quijano, who prior to the referendum in October served as the canal's director of maritime operations. "It's the same area we've always used; it's all part of the existing canal where vessels travel every day. The state and the canal own the area, so we won't have to move anybody or buy them out because we already have the land where we are going to be working."

It currently takes ships between 8–12 hours to traverse the canal, which is approximately 80 km long. "The expansion of the canal won't really affect the transit time for ships," points out Quijano. "The length of the canal won't change and vessels will have to move at roughly the same speed regardless of how wide or deep things are. But what will change is the waiting time. The amount of time ships have to wait before going through the canal will probably be cut in half."

On August 15, 2014 the Panama Canal will have been open to maritime traffic for 100 years. By that time the ACP expects the expansion project will be completed. "At this point of time, we see that date as a feasible target," adds Quijano, who is coordinating the bidding process for contracts. "Of course we'll know more once the tenders are out. But so far the schedule that we have planned for, in terms of bringing in a program manager and the subsequent construction launch, falls within the contingencies we have established in regard to time."