



FALL 2012

Portugues Dam is a 220-foot high, roller-compacted-concrete (RCC) dam under construction northwest of Ponce, Puerto Rico. It is the final piece of the Portugues and Bucana flood risk management project which was authorized to reduce impact of flooding in Ponce from the Portugues and Bucana Rivers.

Construction began in 2008, and is expected to be complete in 2013. When complete, the dam will be the first single-centered, RCC thick-arch dam constructed by the U.S. Army Corps of Engineers. The total cost of the project is \$375 million.

THE CHALLENGE

Puerto Rico's topography varies from the low plains of the southern coast, to steep mountain slopes that rise up 600 above the Portugues River. The mountainous terrain features heavy growth of trees and brush. During the normal dry season, the Portugues River is shallow, and looks like a quiet stream. However, during the wet season, the steep mountain slopes can cause runoff from heavy rain to fill the stream quickly, resulting in flooding to many surrounding areas. For decades, the people of Ponce have endured much human suffering and massive property damage.

THE FLOOD RISK

- Channels & levees overtopped with flood > 25 yrs
- 40,000 people subject to 1.5-meter high velocity flooding
- 1,833 acres of urban areas impacted
- 13,200 residential structures
- City hospitals, schools, courts, police, fire departments.
- 5 million square feet of commercial area
- Range of potential damages – \$200-\$500 million

THE HISTORY

Since the 1970s, when technical experts began investigations to find the best location for the dam, this project has brought the Corps and its partner, the Department of Natural and Environmental Resources (DNER) of Puerto Rico, together as one team to meet its many design and geological challenges.

In the 1980s, technical experts decided the area's many unique challenges would call for the creation of the Corps' first three-centered double curvature thin arch dam. Final design and approval followed. In the 1990s excavation, foundation test grouting and foundation curtain grouting took place with excavation for the left and right abutments, removing 350,000 cubic yards of material.

It was during the height of the testing program, which involved grout migration, mapping and extensive lab testing, a new grouting procedure called "duration grouting" was developed. This new procedure forms the basis for the foundation or grout curtain for the original design.

However, when the Portugues Thin Arch Dam was advertised for construction in September 2000, only one proposal was received, which was significantly above the government's cost estimate.



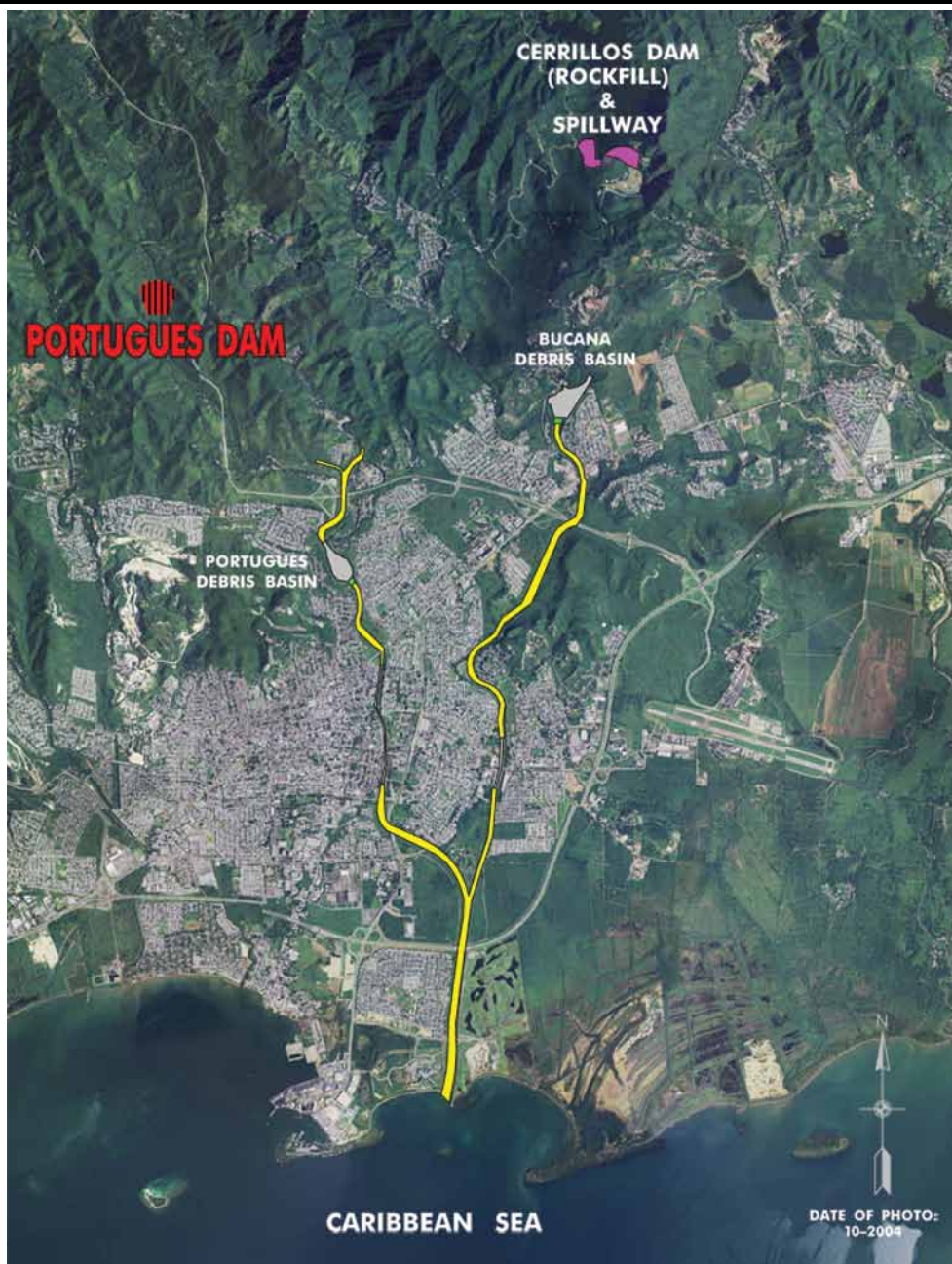
A NEW APPROACH

To reduce costs, a five-year program was started. This program included investigation of alternative designs, field explorations, test programs, finalizing the designs and preparing contract plans and specifications. The Corps of Engineers Computer Aided Structural Engineering Task Group, composed of experts from the Corps and the Bureau of Reclamation, developed arch dam software tools and design criteria. Studies showed that costs could be reduced by redesigning the structure from a double-curvature thin arch dam to a single-centered RCC thick arch dam.

Incorporating RCC design also resulted in an overall design change of the left side of the dam, placing it upstream to avoid the foundation resting on weathered rock. Construction began in 2008. Concrete installation began in 2010, and workers finished the concrete work earlier this spring. Finishing work on the dam continues, along with construction of a valve house and access road.

AN EDUCATION TOOL

With the amount of new dam construction decreasing across the nation, the Corps is entering an era of dam repair and remediation. To further train engineers, the Corps has used Portugues Dam as part of its "Dam Safety University" program. This program is intended to deepen the knowledge of dam safety practices within the Corps as many dam safety engineers are nearing retirement age.



FOR MORE INFORMATION



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