The Tampa Bay Regional Reservoir Project

Amanda E. Rice

Tampa Bay Water is a governmental agency within the state of Florida that provides wholesale drinking water to six member governments: Hillsborough County, Pasco County, Pinellas County, New Port Richey, St. Petersburg, and Tampa. These member governments, in turn, provide drinking water to approximately 2 million people.

Tampa Bay Water was created in 1998, with assistance from the Florida Legislature and the governor, by restructuring the West Coast Regional Water Supply Authority from a cooperative association into a true public utility. The agency began supplying surface water to its member governments in 2002.

The surface-water supply system is made up of the Alafia River Pump Station; the Tampa Bypass Canal Pump Station; the Tampa Bay Regional Surface Water Treatment Plant; the 13-mile, bi-directional, 72-inch diameter South-Central Hillsborough Intertie; the 15-billion-gallon (46,000 acre-feet) Tampa Bay Regional Reservoir; and the eight-mile, bi-directional, 84-inch diameter Reservoir Transmission Main. The capital cost for the entire surface-water system is $350 million. The cost for the reservoir and the reservoir transmission main is $148 million.

The Tampa Bay Regional Reservoir Project is a necessary component of the surface-water system because the allowed withdrawals from the pump stations vary with flows in the river systems, with no withdrawals allowed during low-flow conditions. During the rainy season, surface-water withdrawals could be as high as 202 million gallons per day, or three times the 66-million-gallons-per-day capacity of the surface-water treatment plant. When withdrawals exceed the capacity of the treatment plant, the extra water will be routed south to the reservoir for reserve capacity to help meet demand during the dry season without withdrawing water from traditional sources.

A total of 11 permits were required for the reservoir project before construction could begin. In addition, the U.S. Environmental Protection Agency (EPA) prepared an environmental impact statement (EIS) because over $48 million in federal funding has been allocated to the project to date. The EIS was prepared under a third-party consultant agreement that allowed Tampa Bay Water to fund the study but let EPA retain control over its direction. The Final EIS was issued on November 9, 2001, and the record of decision was issued on January 14, 2002.

The major permit for the reservoir project is a state-issued environmental resource permit (ERP) that covers the design of the embankment as well as all environmental issues, such as wetland impacts and mitigation. No design criteria for this facility exist within the rules of the Florida Department of Environmental Protection because this is the first facility of its type in the state. The rule that would most closely fit is for earthen dams used in phosphate mining (Chapter 62-672), but that rule was deemed not applicable because phosphate industry storage embankments are temporary structures with very different seepage potentials.

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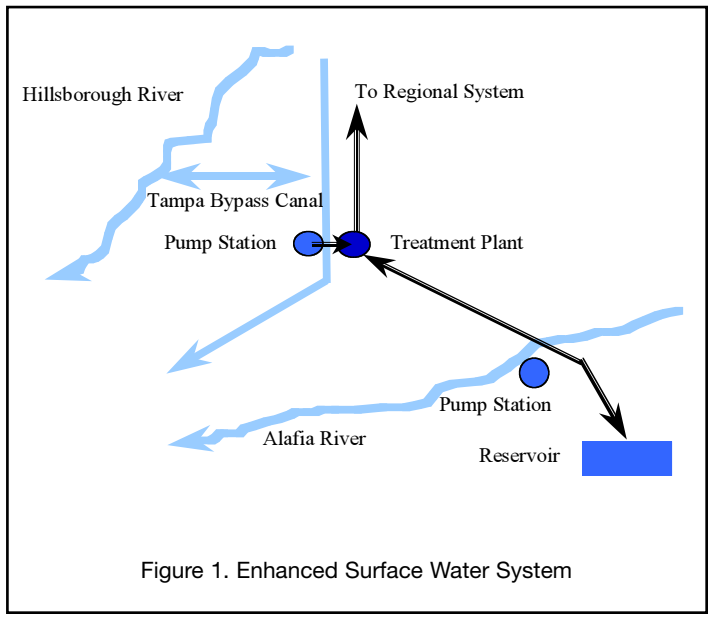

Figure 1. Enhanced Surface Water System

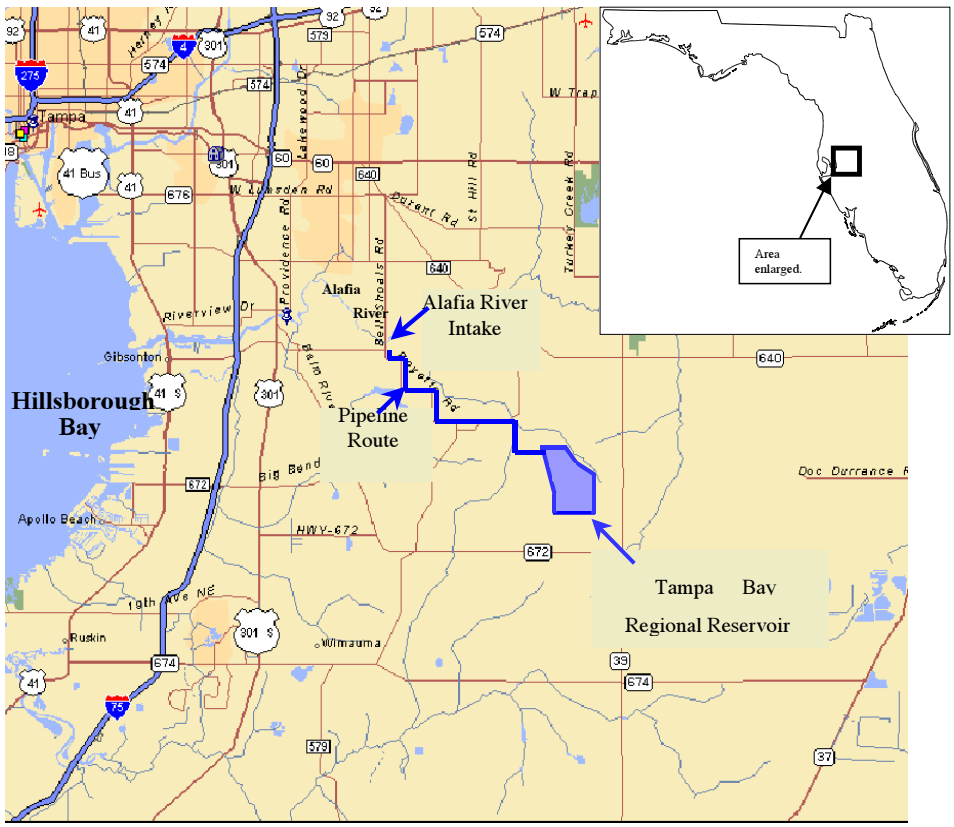

Figure 2. Location of Tampa Bay Regional Reservoir

Florida DEP, Chapt. 62-672	Corps of Engineers EM 1110-2-1902	Soil Conservation Service, TR-60	State of Georgia DNR, Chapt. 391-3-8	Adopted Factor of Safety
END OF CONSTUCTION, Both upstream and downstream slopes				
No requirement	1.3 general case	1.3 strong found.	1.3 no restrictions	1.3
RAPIND DRAWDOWN, Upstream slopes				
No requirement	1.0 from max. pool	1.2 emerg. spillway	1.3 no elevation def.	1.3
PARTIAL POOL, Upstream slope				
No requirement	1.5	No requirement	No requirement	1.5
STEADY SEEPAGE, Downstream slope				
1.75 base of fill 1.5 within fill	1.5 from max. pool 1.4 from sur. pool	1.5 from spillway	1.5	1.75 1.5
EARTHQUAKE				
No requirement	1.0	1.1	1.1	NA

Table 1. Comparison of Factors of Safety for Stability Analyses

Type of Exploration	No. of Explorations	Total Footage	No. of Samples		No. of In-Situ Tests
			Soil	Rock	
Rotary-Wash Boring	189	14,896 (5,827)*	2,905	1,218	--
CPTU Sounding	139	4,063	--	--	--
Dilatometer Sounding	18	474	--	--	438
Auger Boring	60	900	180	--	--
Soil Probe	49	--	--	--	--
Hand Auger	23	--	21	--	--
Trench	4	1,450	58	--	--
Borehole Hydraulic Conductivity	4	--	--	--	17
Piezometers	124	--	--	--	--
Aquifer Pump Tests	8	--	--	--	--

Table 2. Geotechnical Investigation Program Components

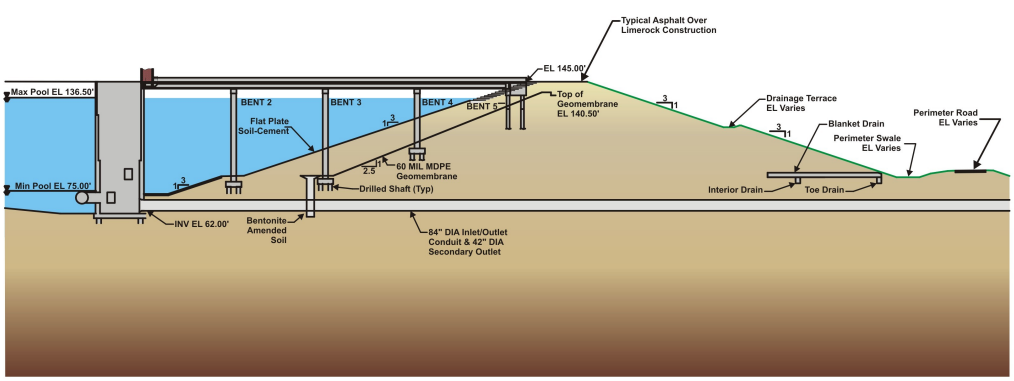

Figure 3. Embankment Cross Section

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The project team proposed design criteria from the state of Georgia, the U.S. Army Corps of Engineers, and the Soil Conservation Service. The proposed criteria were accepted and governed the design. **Table 1** compares these criteria.

Regulatory concerns during the permitting stage included potential karst conditions and the ability of the facility to retain stored water. The project team developed an original geotechnical investigative program to determine suitability of the subsurface for the embankment foundation and borrow material, and to define the sinkhole potential within the reservoir footprint. This investigation, conducted in 1999 and 2000, became part of the ERP application, and included 14,000 man-hours of study, three miles of subsurface core investigation, 30 linear miles of ground penetrating radar, and 18 linear miles of seismic work. **Table 2** lists the total quantity of explorations performed at the site.

The reservoir will be a rim dike earthen structure with an embankment length of five miles. The embankment height will vary from 30 to 65 feet, with an average embankment height of 55 feet and an average water depth of 45 feet. Some portion of the reservoir storage will be provided below the existing land surface as a result of excavation of materials required for the embankment. The facility footprint will cover 1,100 acres on a 5,229-acre site. The prominent embankment design details are:

- The flexible, textured geomembrane liner within the embankment that will reduce water losses, lower the phreatic surface in the embankment, and increase upstream and downstream slope stability.
- A soil-cement course on the upstream slope that will protect the embankment from erosion effects.
- A soil-bentonite mix cut-off wall that will reduce water losses from the reservoir, lower the phreatic surface in the embankment, and reduce groundwater seepage into the reservoir excavation during construction.
- A horizontal blanket and toe drain that will control the phreatic surface in the downsteam portion of the embankment and will provide a means to collect and

discharge embankment seepage. The blanket drain material is tailing sand from a local phosphate mine. The tailing sand is a clean, uniform-size material that is economical due to its close proximity to the construction site.

Construction of the Tampa Bay Regional Reservoir will impact approximately 173 acres of wetlands and other surface waters. **Table 3** lists the acreages for the various types of wetland mitigation that will be constructed as part of the project.

The reservoir has been under construction since July 2002. The construction phase was expected to take 25 months, so the facility was scheduled to begin filling in August 2004. The construction schedule for the project has been impacted by the heavy rains of December 2002 and June 2003. Over 19 inches of rain were recorded at the site during each of those months. The new scheduled filling date is November 2004, but the contractor has been steadily regaining time through the current dry season. To date, the contractor has moved and placed approximately 9 million of the total 11 million cubic yards of embankment material. Based on average climatic conditions, once complete, the filling phase is expected to take about one year.

Type	Acreage
CREATION	
Forested Creation	62.81
Herbaceous Creation	150.82
Wetland Scrub Creation	7.60
Open Water Creation	16.32
Open Water in Marsh	2.90
Subtotal	**240.45**
ENHANCEMENT	
Forested Enhancement	85.18
Herbaceous Enhancement	110.70
Open Water in Marsh	14.77
Subtotal	**210.65**
Total Mitigation	451.10
Upland Buffers	597.14
Grand Total	**1,048.24**

Table 3. Reservoir Project Mitigation Requirements