

BEAR CREEK DAM REMEDIATION HODGES, ALABAMA		YEAR COMPLETED	
		PROFESSIONAL SERVICES May 2007 – June 2009	CONSTRUCTION June 2009
PROJECT OWNER'S INFORMATION			
PROJECT OWNER Tennessee Valley Authority	POINT OF CONTACT NAME John Duncan	POINT OF CONTACT TELEPHONE NUMBER (423) 751-4838	

RIZZO Associates (RIZZO's) approach was selected by the Tennessee Valley Authority (TVA) for the design and construction of a backup Roller Compacted Concrete (RCC) dam, addressing both ongoing seepage issues and PMF capacity. The TVA constructed the Bear Creek Dam in 1969 to provide flood control, recreation, water supply, and economic development benefits. The structure consists of an earth dam, a concrete overflow spillway, an intake tower, lined tunnel, and an outlet structure. The dam is approximately 1,200 ft. long at the crest and is 68 ft. high at the maximum section. Seepage through the karst foundation was observed at the downstream toe of the dam after first filling the reservoir in 1969, and has been a continuing issue throughout the life of the Project. TVA selected RIZZO to provide improved seepage performance, increased seismic stability, and PMF capacity for the Embankment Dam as part of the National Environmental Policy Act process.



DESIGN ENGINEERING: RIZZO personnel performed a comprehensive subsurface investigation and subsequently developed all design details, drawings, and specifications for the composite seepage barrier and RCC berm from initial through final design.

REMEDICATION, INSTRUMENTATION, AND EMBANKMENT MONITORING: The remediation consisted of a RCC Reinforcing Structure (RCC Berm) located near the toe of the existing embankment dam, including a composite grout curtain-cutoff wall seepage barrier through the karst rock foundation. RIZZO's Scope included the installation and maintenance of instrumentation system components and daily monitoring of the existing embankment during construction, and seismic evaluation. Monitoring of the existing embankment during excavation of the toe to competent bedrock was a critical component of the Project.

RIZZO installed a series of inclinometers and piezometers and used existing instrumentation to monitor the response of the existing embankment, underlying alluvial layers, and foundation rock for excavation and dewatering activities. Numerous stability analyses were completed to represent various headwater and tailwater elevations at different stages of excavation in order to identify critical conditions and appropriate alert levels. Historical piezometer and headwater data have been analyzed and correlated by RIZZO in order to identify the response of the embankment to changes in headwater elevation.



RIZZO also provided daily monitoring and assessment of embankment stability and has provided weekly Monitoring and Instrumentation Reports to the client during the life of the Project. Rapid headwater rises, of up to 24 feet within a two-day period, have tested the monitoring program during the excavation process. RIZZO provided 24-hour monitoring and daily reporting during increased headwater conditions. In addition to existing embankment monitoring, RIZZO instrumented the spillway and outlet structures with tiltmeters and monitored these devices twice daily to assess the response of these structures to adjacent excavations. Survey control points were used to monitor soldier pile walls.



CONSTRUCTION ENGINEERING & OBSERVATION: During construction, RIZZO performed construction oversight of all foundation preparation and treatment phases and RCC production and placement. Successful rehabilitation of the karst foundation at Bear Creek Dam was achieved by performing a progressive series of treatments to fully treat the complicated geology. To effectively tailor the individual aspects of the foundation rehabilitation, it was critical to continuously update the understanding of the site geologic setting as more data was procured in successive treatments. To that end, real time data collection and processing, in conjunction with daily reporting of relevant conditions and maintenance of an evolving concept of the site specific karst system in CAD

models were employed. RIZZO prepared bid documents, and construction cost estimates, and construction observation services. During the construction of the RCC Berm and the cutoff wall, RIZZO provided onsite construction observation services.

GROUTING PROGRAM: The 1,300 foot long double line grout curtain was installed using real time computer monitoring of all pressure, flow, and grout volume data and balanced, stable mix designs. Drill rigs used for the borings were equipped with drilling parameter recorders which greatly aided in the evaluation and mapping of clay fill and cavernous karst features on the daily updated subsurface profiles.

At locations identified by the grouting program as having significant clay infill in karst features, or where foundation rock was found to be highly fissile, concrete cutoff wall panels were installed to provide robust, long term seepage protection. Four of these panels were installed across significant karst features discovered in the foundation prep and grouting stages of the Project to depths up to 32 feet below the foundation surface.



Post construction piezometric levels and field inspections from the site indicate that the composite seepage barrier and RCC berm have effectively eliminated flows through the foundation of Bear Creek Dam, even at elevated reservoir levels.