

FAST THINKING SAVES HIGGINSVILLE'S CITY LAKE

It started as a trickle and could have led to catastrophe, if not for the keen eye of a fisherman who spotted the spillway breach on City Lake just east of Higginsville one early August morning. By then, water was flowing freely through a four-foot gap under the old concrete structure between the upper and lower reservoirs.

"The way it was flowing, our concern was that we were going to lose a 40-acre lake in a matter of hours," says Jim Urfer, superintendent water and wastewater for Higginsville. "We couldn't see the extent of damage, but it was as if you pulled the plug on a bathtub and could see the vortex, water sucking down and going under the spillway and coming up into the lower lake."

Lee Barker, the city administrator, agreed: "The whole structure could have failed, because when water starts cutting underneath, the longer you wait, the more material it cuts out and then you won't have a spillway at all."

Urfer was concerned that this amount of water draining into the lower lake would cause major water quality issues, with silt also decreasing the capacity of the City's drinking water supply – even making water levels in the upper lake so low that fish could not survive.

The City knew it had to act immediately – first contacting Shafer, Kline and Warren (SKW) who in turn reached out to the Dam and Reservoir Safety Department at Missouri Department of Natural



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Resources (MDNR). There was no immediate danger of breach, stated MDNR experts, yet they recommended filling the hole with riprap as a temporary measure to slow the water down. With that accomplished, they turned to the consulting engineers for recommendations for a more permanent repair.

Located 50 miles east of Kansas City along I-70 and U.S. Highway 13, Higginsville is home to more than 4,800 Missourians in the heart of Lafayette County. The City was founded in 1869 by Harvey Higgins, and today maintains its strong farm heritage while continuing to attract a wide range of businesses in this growing economic region.

City Lake is made up of two reservoirs. The original, smaller reservoir was built in the early 1900s, the spillway connected only to a creek. The newer, larger reservoir – in place since 1951 – covers 154 acres and serves as the primary source of drinking water for the City, as well as providing recreational opportunities for fishing, duck hunting and boating. Higginsville also relies on a connection to the Missouri River: an eight-mile line that feeds the small upper reservoir, vital in times of drought when the City pumps 1.8 million gallons a day; water then overflows the spillway to keep the lower reservoir full under dry conditions.

At approximately 100 feet wide, the old spillway is composed of a reinforced concrete slab with a cutoff wall at the top and bottom. Water had eroded away concrete on the upper cutoff wall; previously, the City had completed some patchwork repairs to address minor leakage. Now, however,

water was moving underneath the slab and the lower toe wall before entering the larger basin.

Once the spillway had been stabilized, Higginsville City Council approved SKW to lead the design-build effort for a permanent repair. This allowed the firm's structural engineers to quickly prepare a design and arrive at a plan of action.

"There were no real blueprints for this spillway, so we didn't know exactly what we were going to encounter," recalls Steve Schultz, PE, of SKW's Columbia office. "We realized that the toe wall for the structure would not be sufficient enough to support a new spillway slab, so we adjusted our plans to include a new toe with the spillway."

Next, SKW solicited multiple bids from contractors, gained further approval on a maximum price and then hired the most qualified low bidder. Schultz estimated this fast-track approach decreased overall project time by as much as 75 percent versus a traditional approach.

To facilitate repairs, the City used several siphon drains stretched over the top of the dam to reduce water levels by two to three feet in the upper lake. Then the contractor was able to place equipment on the spillway's front side in order to build a new lower toe wall. SKW specified a special, early high-strength concrete used for bridge decks, as well as locally-sourced clay material to fill the voids and recompact underneath. In all, repairs were completed and tested in a matter of weeks, right before the 2013 rainy season began.

Urfer of Higginsville acknowledged that the design-build approach was the right choice for this emergency repair: "We didn't have time to go in and completely reengineer, then submit plans. When you've got something that needs to be done rapidly, design-build is the way to go because you can speed the whole process up."

Today, six months later, everything's back to normal in Higginsville and on the water at City Lake - just as it should be. □

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