STOPPING STORM WATER IN ITS TRACKS

Brick-and-mortar CSO replaced with larger polypropylene pipe line

By Steven C. Cooper

At a certain point in a sewer system's life, it becomes necessary to either scrap it and build a new one, or replace parts of it, to ensure that it gives optimal performance. The city of Moberly, Mo., made a few notable updates and replacements to its sewer and wastewater system in the past few decades.

Moberly's CSO Project

To prevent storm water from infiltrating into its sewer system, Moberly decided to replace the crumbling 80-year-old brick and mortar tunnel that was serving as a combined storm water and sanitary pipeline. Partially financed with funds from the American Recovery and Reinvestment Act of 2009 and part of Governor Nixon's Transform Missouri Initiative, the project—designed by Jacobs Engineering Group Inc. of St. Louis, Mo.; supplied by Water and Sewer Supply of Columbia, Mo.; and installed by Emery Sapp & Sons Inc. of Columbia, Mo.—cost $1.2 million. Serving nearly 14,000 residents, the city's new system will remain a combined sewer, but because of the type of pipe used, seeping groundwater will be prevented from entering the system, which lowers the city's treatment cost per gallon of effluent.

The Reed Street combined sewer overflow (CSO) replacement project used more than 3,000 ft of new pipe to

A pipe system that was more than 100 years old was replaced with 60-in. polypropylene pipe.

connect to the Taylor Street CSO as a way to reduce inflow and infiltration by replacing the old brick sewer with a larger diameter pipe, as well as eliminate a bottleneck under Morley Street.

"The combined sewer collects wastewater and storm water runoff from the downtown area of Moberly," said Mike McCarty, P.E., of Jacobs Engineering. "In designing the new pipeline, we tried to match or exceed what the capacity of the brick arch was, which yielded the combination of pipe sizes—60-in. RCP [reinforced concrete pipe] and 54-in. PVC," McCarty said.

After the project was awarded to Sapp, the city was asked to consider polypropylene pipe. After consideration of constructability, cost and hydraulic issues, the decision was made to eliminate RCP and PVC and construct the project with polypropylene.

The process was started in 2009 and the installation was completed in early 2010. The installation was headed by J. Keith Phipps, director of utilities for the city of Moberly. "We had a brick pipe system that was about 54 in. tall at the peak," Phipps said. "There were places in this tunnel that were basically falling apart. Some portions of it dated to the 1880s."

The pipe system was replaced with 60-in. SaniTite HP pipe from Advanced Drainage Systems Inc. (ADS). There also was a bottleneck running underneath Business 63 where the system reduced down to two smaller pipes, so the city eliminated that as well and made it all 60 in. By doing this, the city not only eliminated the inflow infiltration sources, but the larger pipe also provided more storage capacity in that trunk sewer so that it would not cause as many backups during a storm.

"The whole project was about replacing the old brick arch sewer that was constructed probably 80 years ago," McCarty said. "Our CCTV inspection inside the arch showed there were some areas where the brick was falling out. Also, the narrow manholes limited accessibility to do maintenance work safely."

The combined sewer carries sanitary waste from homes and commercial areas as well as the storm water runoff collected from street inlets, curbs and gutters. It is the only trunk line to the treatment plant.

The new line also rectified another situation that was problematic, especially during times of high rain and flooding.

"One segment had an aerial creek crossing, which caused trash to build up around the aboveground crossing and limited the flow from the storm water runoff," McCarty said. "We came up with a new alignment to eliminate that aerial creek crossing and replace this section of the brick arch combined sewer."

Moberly's Replacement Project

The Moberly Wastewater Treatment Facility (WWTF) replaced two trickling filter plants in 1997. The construction of the new facility was financed by SRF funds through a $0.012 sales tax passed by the voters of Moberly. Facilities include a dual cell SBR, two aerobic digesters, sludge storage basin and a post-equalization basin that equalizes effluent flow and increases dissolved oxygen prior to discharge to an unclassified stream. Plans are being developed for an ultraviolet disinfection process.

Because Moberly is a combined sewer community, additional storage and primary treatment exist at three points in the sewer collection system. Two lagoons at the sites of the two old plants were converted to storm water holding basins for peak flow storage during rain events. These lagoons provide storage of storm water for small rain events and are permitted as overflows if the rainwater exceeds the storage capacity.

Once the rain events are over, water then is pumped back into the sewer systems and treated at the WWTF, which has a capacity of 7 million gal per day (mgd) for storm flow, 5 mgd at peak flow and 2.5 mgd at the average design flow.

There also is a swirl concentrator at another combined sewer system outfall, with additional storage for small rain events. Each CSO is monitored daily, and rain event overflows are monitored for biochemical oxygen demand, total suspended solids and ammonia.

Sludge digestion occurs in two aerobic digesters and then is transferred to a sludge holding basin prior to being land-applied by a self-reacting sludge gun that sprays the biosolids on a city-owned 180-acre farm adjacent to the WWTF. SWS

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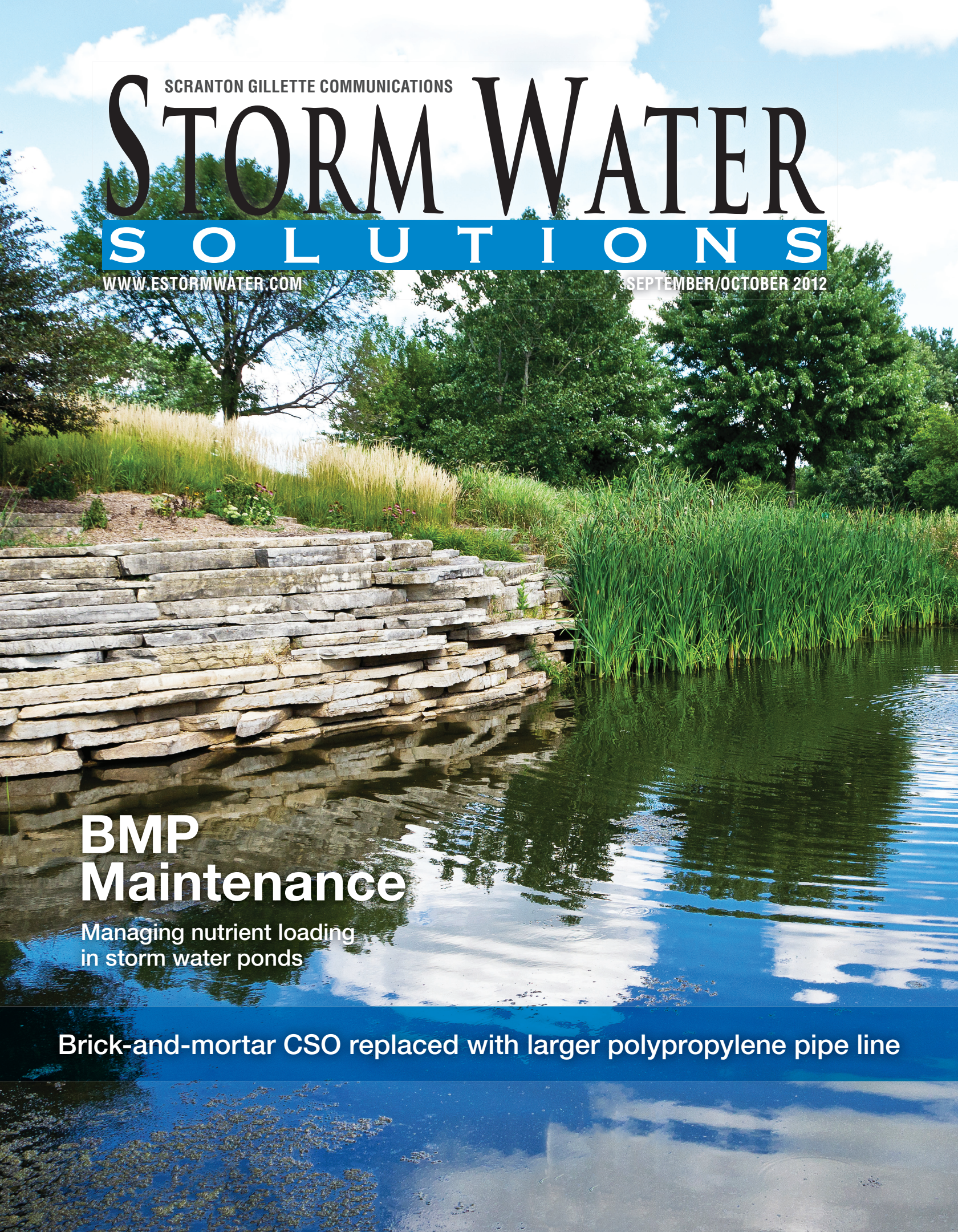

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