CSO Storage Makes a Splash in Monticello

Large-diameter SRPE pipe was installed underground to prevent overflow into nearby bodies of water.

SRPE pipe helps resort city meet long-term control plan

By Cory Carlson, Andrew Jenkins & D. Adam Downey

Views of the nearby Tippecanoe River at Bryan's Lift Station remain unobstructed due to the SRPE's underground construction.

When a combined sewer overflow (CSO) detention system was needed for the city of Monticello, Ind., innovation was the only thing overflowing.

Nestled between Lake Shafer and Lake Freeman in north-central Indiana, the city of Monticello is a popular Midwest summer vacation destination. Hugging twin lakes and home to Indiana Beach Amusement Resort, it is no wonder the city touts "life with a splash." Still, there was room for improvement of the neighboring waterways through upgrades to the city's sewage system.

For this community of approximately 5,400 year-round residents, the city owns and operates a combined sewer collection system and Class II wastewater treatment plant with a design average flow of 1.1 million gal per day (mgd) and peak capacity of 2.4 mgd. This collection system has six CSO outfalls that discharge into the Tippecanoe River and Lake Freeman.

In an effort to comply with the federal Clean Water Act, the city's long-term control plan included the reduction and elimination of CSOs. Specific to this was the Bryan's Lift Station Improvements Project, created to increase the lift station's pumping capacity to 2.5 mgd and provide approximately 500,000 gal of detention to manage wet weather events.

Bryan's Lift Station originally was constructed in the 1950s and served combined sanitary and storm sewers. During peak water events, the lift station was overwhelmed and unable to handle the full flow. Because the wastewater treatment plant was located approximately 1 mile downstream, untreated sewage backups and subsequent CSO events occurred, affecting Monticello's waterways. Overflow would specifically discharge directly into the Tippecanoe River upstream of Lake Freeman.

With approximately $1 million in grant funding from the Indiana Office of Community and Rural Affairs, the first of two project phases was able to proceed ahead of schedule.

The Storage Challenge

The site presented challenges in terms of limited space, a high water table and tight hydraulic limitations on the existing sewer systems. Further, property owners directly uphill of the site were justifiably concerned with maintaining their aesthetic views of the scenic Tippecanoe River.

Considering the site layout challenges and its visible location to the public, traditional storage structure options quickly were eliminated. Open concrete tanks would be difficult and expensive to build on site. Steel tanks were evaluated, but would have required an additional pump station to convey the incoming wet weather flows to the storage structures. A large-diameter tunnel did not appear financially or geographically practical, given the site and the city's budget.

The Storage Solution

With innovations in plastic pipe technology, creation of a steel-reinforced polyethylene (SRPE) CSO storage system was economical and possible. This solution borrowed the model of an underground, high-performance detention system by utilizing a grid of buried pipe to store combined sewage out of visible sight. For Bryan's Lift Station, Contech's DuroMaxx SRPE pipe system was engineered into a CSO detention and drainage system that met the challenges of having a small footprint, water-tight joint performance and long-term durability.

"With tight site constraints and poor subsurface conditions, the DuroMaxx pipe was ideal for maximizing capacity while minimizing the overall footprint," said Project Manager Jonathan Borgers, P.E., of Wessler Eng. "DuroMaxx pipe specifically was selected for the underground CSO storage structure based on its availability in larger diameters."

The pipe matrix includes a 96-in.-diameter manifold pipe connected directly to the new lift station wet well, above the typical submersible pump-operating water depths, to ensure that

normal dry weather flows did not back up into the storage structure. Six additional leader pipes slope down to the connected manifold pipe and have access risers at the higher ends.

The significant slope of these leader pipes facilitates system flushing after wet weather events. During wet weather flows when the submersible pumps cannot keep up with incoming flows, the wet well backs up into the manifold and leader pipes, capturing the "first flush" and eliminating CSOs from all but the most extreme conditions. After events, the pump station runs at full speed until the storage structure has drained and the wet well level falls back to normal operating depths.

The system boasts the advantages of a buried and out-of-sight tunnel, along with a low-depth profile that plays well into existing system hydraulics and high water tables. The 80-ksi steel-reinforcing ribs with pressure-rated polyethylene resin provide a strong and durable pipe, exactly what the city sought. The ability to nest the varying-diameter SRPE pipe, coupled with the material's lighter weight compared with traditional storage systems, also reduced the freight and installation costs.

The pipe matrix spans the 1-mile distance between the WWTP and the storage structure at Bryan's Lift Station.

F&K Construction Inc. of Flora, Ind., the selected contractor, installed the grid of 96-, 84- and 72-in.-diameter SRPE pipe. Because DuroMaxx SRPE is lightweight, installation was quick, which meant less expense and fewer dewatering issues.

"One thing we really like about the product is it is fast and easy to install, and doesn't need a large machine to lift the large diameter pipe," said Greg Kuns, owner of F&K Construction. "It goes together quickly, so it helped the progress of the job move along nicely."

Due to the proximity to the Tippecanoe River and Lake Freeman, joints also were a concern. Electrofusion joints were used, because each joint can be individually vacuum tested, and they provide the water-tight protection needed. Additionally, because the DuroMaxx SRPE pipe has fewer joints to assemble on site, installation is faster.

Bearing a smaller footprint than alternative systems, the SRPE pipe offered easier constructability and room for future expansion. Storage for 395,000 gal was created during the Phase I configuration. In 2014, as part of Phase II of the project, the 96-in. manifold pipe is expected to be extended west approximately 25 ft, and two more leader pipes will be added to expand the system to the full 500,000 gal of storage volume indicated in the city's long-term control plan. WWD

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