Protecting Little Walnut Creek

A long buried problem is solved with tunneling and boring.

For more than 15 years, residents in an Austin, TX, neighborhood had complained about wastewater discharges from the Little Walnut Creek interceptor. Infiltration and inflow were the problem with the 42-in. pipeline that runs beneath a stream and has manholes rising out of the water every 100 yd. When it rained, the sanitary sewer would overflow into the creek.

During the late 1980s, the city originally proposed to replace the interceptor, but residents blocked the project over concern that the proposed open cut construction would disrupt nearby neighborhoods and cause environmental harm to the creek. Unhappy residents also blocked a redesigned project.

But all that changed when the EPA's Region 6 presented the Austin Water Utility with an Administrative Order requiring the central Texas utility to eliminate sanitary sewer overflows by December 2007 to protect its water supply. Austin is located in the Highland Lakes area of Texas and has a number of water features including Barton Creek and the Barton Springs Edwards Aquifer, a sole-source drinking water aquifer and one of the most prolific artesian aquifers in the world.

Austin faced a tight schedule and had to work quickly. The tasks included land acquisition, permitting, design, and construction of numerous projects for its five-plant, 2,316-mile collection system. The Little Walnut Creek Tunnel Interceptor Project One was the most challenging and critical. City officials wanted a product with a proven track record and a leak-free joint system. They conducted an extensive evaluation and selected a centrifugally cast, fiberglass reinforced, polymer mortar (CCFRPM) pipe from HOBAS Pipe USA (www.govengr.com/hobas). Under Austin's Clean Water Program (CWP), this third and final design was assigned to national engineering and consulting firm Brown and Caldwell (BC, www.brownandcaldwell.com), one of several engineering firms involved in the many mandated projects.

CCFRPM pipes were blocked in place to facilitate annular space grouting.

Combining engineering with community relations, BC's design used tunnel boring machine (TBM) technology to construct a new 10,000-ft, 96-in. diameter primary tunnel in one continuous run with no intermediate shafts. The $12.7-million project design called for a 60-in. fiberglass carrier pipe that was specified to increase the pipeline's useful life.

The CCFRPM pipe exceeded specifications and was selected, with 72 stiffness and flush bell-spigot couplings. To expedite the time to place each carrier pipe within the tunnel, two insertion shafts were utilized. The first pipe placed was at the midsection of the tunnel and was a special bell-by-bell CCFRPM pipe provided by HOBAS. Subsequent CCFRPM pipes were carried into the tunnel from two insertion points, one at each end. Pipes were brought in with the bell trailing and blocked in place. Blocking was straightforward and rapid due to the flush exterior of the coupling. The simple push-together assembly of the couplings sped insertion.

Installation was assigned to KM&M JV of Solon, OH. Lee DuPont, project manager, said, "I've probably got about 20 years of experience with HOBAS pipe. I've always had great experience dealing with HOBAS pipe. I have another job that I'm getting ready to start in Round Rock and I am using HOBAS pipe on that job, a little over 8,000 feet of pipe, in a tunnel."

The mining crews worked 140 ft below the surface in the Austin hill country during the hot Texas summer, pushing a TBM along the pipeline route. The choice of CCFRPM pipe increased their efficiency. Because of the pipe's high strength, it has a much thinner wall. This was of great benefit on the Little Walnut project, since it was a perfect fit to the available pipe carrier, and provided extra room for alterations in pipe alignment within the primary tunnel, which was constructed of steel ring beam and wooden lag.

"Our initial bore was right at 99 inches, that's the machine we had available. The ribs were about four inches, so the primary tunnel provided plenty of working space for the 60-inch liner. Our TBM was 31 feet long. With a trailing

On the Little Walnut Creek project, the design called for inserting 10,000 ft of 60-in. diameter pipe into the tunnel from installation shafts at each end with no intermediate shaft.

sled to accommodate the conveyor and muck (spoil-removal) cars, this totaled 90 to 100 feet. We were placing the primary support right behind the cutting head. We encountered all solid rock the whole way; the conditions were pretty consistent," said DuPont.

Some of the tunnel was located within right-of-way of existing streets. Crispin Ruiz, who handles public information for the Austin CWP, said, "The public appreciated the fact that it was a tunnel and didn't disrupt the neighborhood. The residents were also concerned about any disruption to the sensitive environment around Little Walnut Creek. So, from the neighborhood's perspective, it's been a very successful project just because it didn't disrupt their day-to-day lives."

Shoal Creek Tunnel Project

Another Austin CWP installation was part of the overall plan. The Shoal Creek Tunnel Project reached its first objective with the finishing of the Mainline Tunnel excavation. The tunnel lining is a 66-in. CCFRPM pipe, with 72 stiffness and FWC couplings. It was used to replace the 54-in. reinforced concrete pipe wastewater line that was exposed within the banks of Shoal Creek. The creek was vulnerable to flooding and the existing line had a potential breech, so the project was included in the Austin CWP and installed by W. L. Hailey of Nashville, TN.

The 3,200-linear ft run was completed after the crew negotiated two tight radius curves of 400 ft and 600 ft that made up about half of the drive. They also had to reconfigure the cutter head in place, with 500 ft remaining in the drive because of a change in geology from 500-psi clay to 10,000-psi limestone.

The Crosstown Shaft was excavated at the same time the 66-in. CCFRPM pipe was being installed. The main part of the job was completed when the mainline tunnel was connected to the Crosstown Shaft, which carried flow to the existing Crosstown Tunnel. Other elements of the project included junction boxes, directionally drilled lateral connections, several short open-cut runs, and the rehabilitation of several existing lines and manholes.

The liner pipe installation was rapid, even through radius curves, due to the lightweight pipe and the push together FWC couplings.

One other project of interest was dubbed the Barton Creek Lift Station Relief Tunnel, which was awarded to Dibco Underground of Ontario, Canada. It began when the contractor set up the work area in Zilker Park, just north of Barton Springs Road. The project was planned to avoid disrupting activities in the park and on nearby Toomey Road.

It provides a 33-in. diameter HOBAS CCFRPM pipe installed in two sections of a tunnel. A shallow tunnel in Zilker Park is about 1,700 ft long, and the 33-in. pipe extends into the existing interceptor with the annular space filled with grout.

A drop shaft joins this shallow tunnel to a deeper tunnel that extends for 1,600 ft under Barton Creek to the shaft site off Toomey Road. The main shaft at Toomey is about 70 ft deep, and has a temporary lift station built within the shaft to lift the wastewater to the adjacent South Austin Outfall. The temporary lift station will be underground, and will be operated until mid-2010 when it will be taken offline by a deeper tunnel system.

Stan Evans, project manager, Austin CWP, said, "HOBAS was chosen for these projects for a multitude of reasons. The most important one is that the Austin Water Utility established a policy long ago to have all new pipe that they install, at least large diameter pipe, to be a fiberglass type pipe so that they wouldn't have to deal with the constant problem of corrosion. And another factor is the tightness of the joint that the HOBAS pipe provides."

The pipes specified on this project were 72-psi pipe stiffness. The higher stiffness provides greater safety factors against external buckling due to long-term hydrostatic head and also during the grouting operation. Evans said, "We usually go for stiffer pipes. The stiffness requirement was the decision of the designer, which determines what the contractor provides and installs.

"There are a couple of other things I like about HOBAS large diameter pipe. It is lighter weight, and it is less subject to damage from handling in the field. And it comes in nice long joints so when you're doing a straight section you can make a lot of headway without having to stop to put more joints together.

"We are also concerned about the design life. We cite what HOBAS tells us, it could last 100 years. That's really a good thing because the cost to install the infrastructure of these larger wastewater lines is horrific. It's just crazy to put something in the ground knowing that natural forces are going to eat away at it, and you have to come back in 50 years or even sooner." GE