Increase Sewer Capacity

Denver and Aurora are the principal cities of the Denver Metropolitan Area in Colorado. Aurora, with a growing population of over 300,000 residents, is home to a vibrant business environment. It includes major industries such as aerospace, military, renewable energy, high-tech, biotechnology and health care, distribution and manufacturing.

The majority of the wastewater generated in Aurora is conveyed through the Tollgate Creek Interceptor to the Metro Wastewater Reclamation District’s Robert W. Hite Wastewater Treatment Facility. The interceptor begins in the southern portion of the city and runs north along the banks of the Tollgate Creek to the treatment plant.

Design Considerations

Installed in the 1980s, the Tollgate Creek Interceptor consists of reinforced concrete pipe and varies in diameter from 30 to 42 inches. Based on future planning, the City of Aurora identified the need for additional capacity in the Tollgate system. Another consideration was the poor condition of the existing interceptor. Pipe samples from the existing Tollgate Interceptor line indicated significant deterioration.

In order to handle future flows, the city embarked on a multi-year capital

Continued on page 2
improvement program to design and construct a new interceptor parallel to the existing Tollgate Creek Interceptor. The new system was designed to divert all sanitary flows into the new interceptor, which would allow the existing interceptor to be inspected and rehabilitated before both would be required to be in service. “The city requested that the new interceptor be designed to transport all flow for ten years after completion of construction,” stated Swirvine Nyirenda, P.E., senior project manager for Aurora Water.

The project was divided into two separate projects, Tollgate Creek Interceptor North and Tollgate Creek Interceptor South. Tollgate Creek Interceptor South was completed in January 2011 and was installed by direct bury and trenchless methods.

**Product Confidence**

Construction on Tollgate Creek Interceptor North began in December 2010 and was installed by BT Construction, Inc. of Henderson, Colorado. Ten thousand feet of 42-inch centrifugally cast, fiberglass reinforced, polymer mortar (CCFRPM) pipe was supplied by HOBAS Pipe USA. Pipe materials allowed on the project were FRP, HDPE and polymer concrete. BT Construction bid the project using CCFRPM. “We were comfortable with the product as we had used HOBAS before and had a good relationship with the company,” explained Brenden Tippets, project manager, BT Construction.

Trenchless methods were used for 4,500 feet of the project because of its urban location. The project area included creek and road crossings, transportation projects and existing utilities. Five thousand, five hundred feet was direct buried in the open areas that allowed access. The pipe was designed and manufactured with a stiffness class of 46 and 72 psi.
“Since the alignment of the pipeline followed Tollgate Creek and had major road crossings, it was decided early in the design process to incorporate trenchless installation methods. The thought was that trenchless installations would minimize the risk to public safety, private property and the environment. In the end, microtunneling with a TBM combined with the appropriate ground modifications where necessary and direct bury were all considered as acceptable pipe installation methods. Each of these was coupled with allowable pipeline materials,” stated Swirvine. Because of the close proximity to Tollgate Creek, microtunneling was less likely to cause embankment failures.

Deep Installation

There were many challenges associated with this project. It was a deep pipeline and very wet, with a high table of groundwater. “We were working in small easements and in areas less than 20 feet wide laying pipe in wet conditions and at depths greater than 20 feet. Soil conditions varied on every tunnel segment, which created a lot of thinking on our feet to adjust to the new condition,” explained Tippets. In addition, many utility conflicts had to be resolved over months of planning. “We addressed these challenges by being able to adjust on the fly with our diversity in construction and different installation methods.”

The pipe was installed within runs between manholes, with 21 manholes located along the interceptor. “The installation method depended on soil conditions between manholes,” explained Tippets. The drives averaged between 500 and 700 feet. Some portions of the interceptor exceeded 35 feet in depth.

The trenchless sections were designed as a two-pass system with the HOBAS carrier pipe installed in 54-inch steel casing. The steel pipe was jacked in behind a TBM and then the carrier pipe was installed in the tunnel. In the next step, the annular space between the liner and carrier pipe was grouted. Corrosion resistance was important since the line was gravity flow and had to be resistant to acid attack. Because the pipe was joined in the tunnel, it was manufactured with FWC couplings attached to one end. The FWC coupling is a structural filament-wound sleeve overwrapped and mechanically locked to an internal full-face elastomeric membrane.
The Greater Lawrence Sanitary District (GLSD) serves the Massachusetts member communities of Lawrence, Methuen, Andover, North Andover, Dracut as well as Salem, N.H. The GLSD was established by Chapter 750 of the Massachusetts Acts of 1968 for the purpose of building, maintaining and operating a system of sewage collection and disposal. The establishment occurred after a series of investigations called for the cleaning up the Merrimack River, which had been plagued by pollution, not only from sanitary sewage but industrial contributors dating back to the late 1800’s.

GLSD’s most recent challenge was to determine the best course of action to repair or replace an existing prestressed concrete cylinder pipe (PCCP) force main, which was installed in the mid 1970’s. The PCCP was manufactured with reinforcing wire, which was brittle leading to pipe failures. Studies included condition assessment and structural evaluation of the PCCP and acoustic monitoring for real-time recording of wire breaks.

GLSD learned in 2002 that pipe supplied in 1974 was similar to pipelines experiencing a high rate of catastrophic failures throughout the United States. The district began an assessment program to determine the structural condition of the line. This evaluation found one pipe section was in a state of imminent failure and required emergency repairs to advert a catastrophic failure that would have significant financial and environmental implications.

GLSD ultimately chose to replace the existing pipeline as part of their combined sewer overflow (CSO) control and its implementation into the future. Their design considerations for the new line were long range while they were mindful of the short term effects of construction. They wanted to meet the increase in wet weather flows of 167 million gallons per day, select a replacement line that would last for many years, and to reduce the disruption during construction by limiting bypass pumping and minimizing the effect of construction on Riverview Street.

GLSD ultimately evaluated two scenarios. The first was to slipline the existing force main with a 54-inch diameter pipe and install an adjacent 54-inch diameter line. Although this option provided the district with 95 percent redundancy of flow and operational flexibility, it also had drawbacks. The capital, operational and maintenance costs were greater by 15 percent and the construction...
duration would be lengthened. The second option was to install a new 72-inch line capable of handling all of the flows. This is the option that offered the best results.

The district evaluated several materials for the project including PCCP, steel, ductile iron, high density polyethylene and fiberglass. GLSD evaluated the materials based on several criteria including availability, resistance to scour and corrosion, suitability for trenchless installation as well as fabrication time and cost. After a thorough evaluation, they decided that only HOBAS Pipe USA would be allowed as a material supplier on this critical project. The project specifications stated, “In accordance with Massachusetts General Laws, Chapter 30, Para 39M(b), the Owner, in the public interest, has stated in writing in the public records that the centrifugally-cast fiberglass reinforced polymer mortar pipe (CCFRPM) specified herein as sewer force main, as manufactured by HOBAS Pipe USA (HOBAS), Houston, Texas, will be solely allowed under this Contract.”

The General Laws of the State of Massachusetts referred to above, reads as follows: “Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest”

HOBAS supplied 2,300 linear feet of CCFRPM to the project, which ranged in depth from three to 18 feet and included a rail crossing at 17 feet of cover under a Massachusetts Bay Transit Authority (MBTA) line. In addition to the depth and traffic crossings, the project had other challenges including its location in a residential area, the proximity to other utilities, and the need to maintain the pump station and force main without bypass pumping. HOBAS also custom manufactured a dozen one- and two-miter elbows that simply connected to the mainline with the standard couplings.

The specifications also required pressure testing of each pipe joint (low pressure air) and a system hydrostatic test before the line could be placed in service. “We successfully passed the hydrostatic test of the 72-inch force main. The line held 95 psi for one hour. The force main actually held the pressure over the course of last night,” stated Jason Babidge, assistant project manager, Methuen Construction Company, Inc.
26 Year Old Force Main Still Performing Well

In February of 2013, the City of Houston solicited bids for the Hendrick Force Main Crossing project, which included the demolition of an existing force main, and construction of a new force main crossing under Buffalo Bayou. The force main includes over 1,200 feet of pipe. Installation by directional drilling was used for 700 feet of 42-inch HDPE under the bayou, and 400 feet of 36-inch HOBAS pipe was installed in the areas where open cut was an option.

The new force main transitioned to an existing line that included 36-inch diameter pipe which is beyond the open cut portion of the project. To make the connection to the new 42-inch diameter section, HOBAS supplied a flanged connection which mated with the HDPE flanged connection.

Reytec Construction Resources, Inc of Houston, Texas, a general contractor founded in 1996, was awarded the project. The 36-inch pipe supplied by HOBAS Pipe USA had a unique situation since it connected to the existing 36-inch diameter line that was a HOBAS installation completed in 1988. What made the project unique was not the HOBAS to HOBAS connection, but rather the age of the existing pipe. The original 36-inch diameter HOBAS line that Reytec was now connecting to was part of the Magnolia Street Force Main.

This force main was the very first force main sewer installation using HOBAS pipe manufactured in the USA. The Magnolia Street Force Main was a 7,000 foot line constructed to redistribute sewerage flows as part of the East Side WWTP Relief Program.

Versatile Fitting Manufacture

The original line, constructed 26-years ago, includes over 20 elbows to follow the zig zag route through an existing residential neighborhood. “Until we dug it up, we didn’t exactly know what we were dealing with as far as the alignment and condition of the original line. We appreciated the responsiveness of HOBAS to deliver the necessary custom pieces. We added several mitered fittings to the order to assist us with making the connection between the existing pipe and the new line,” said Tomas Garza, site supervisor, Reytec Construction Resources, Inc. “The pipe material is rugged and user friendly and the couplings provide leak free connections.”
Corrosion Concerns

The design engineer for the original Magnolia Street Force Main was concerned about both internal and external corrosion of the line and also needed a high strength pipe with leak-free joints to withstand the 125 psi design pressure. Because of these requirements, only HOBAS PN 150 SN 46 (minimum 150 psi pressure rating and 46 psi stiffness rating) and cement lined class 52 Ductile Iron with polybags were specified.

Quick Delivery

HOBAS pipes were chosen for the Magnolia Street Force Main project by BRH Garver of Houston due to their competitive price and quick delivery. At the time of the installation, the superintendent for BRH Garver said, “The HOBAS pipe is a rugged product and is easy to lay.” A quarter of a century later, the current installation contactor, Raytec, uncovered this pipe to take a look.

“When we uncovered the original HOBAS pipe that had been buried and in service for over 25 years, it looked like it could have been buried yesterday, it was still in perfect condition,” said Garza.

Year of construction 1988
Total length of pipe 7,000 feet
Diameter 36-inch
Stiffness class 46 psi
Pressure Class 150 psi
Installation method Direct Bury
Application Sanitary Sewer
Client City of Houston
Installer BRH Garver
Advantages Quick delivery, easy installation
HOBAS Pipe USA is continuing the expansion of its field service group and now includes seven technicians located across the country. They have nearly 75 years of combined HOBAS experience. This is one of a variety of ways Hobas provides support for their customers.

Randy Whiddon, HOBAS field service manager, explained, “My department provides clients, contractors, and the HOBAS sales staff with a knowledgeable, useful and reliable resource in preventing, solving, and correcting problems, which may occur in the field. And they serve as a liaison between the field and the in-house technical staff.”

Installation of centrifugally cast, fiberglass reinforced, polymer mortar (CCFRPM) pipe is quick and easy with predictable, reliable pipe performance using many installation methods. Push-together joints are simple and fast to assemble and the lightweight pipes are safe and easy to handle.

HOBAS field service technicians are available upon request to assist before, during and after the installation. The Field Service Department will establish ongoing communications with the installers of HOBAS pipe to discuss their particular project at any stage of the work. They will also observe and provide recommendations related to construction practices. This includes transporting, handling, storing and installation of HOBAS pipe.