MEMBER'S JOBS: IOWA TRENCHLESS

Lower Connor Creek Interceptor

by Robert Baylor, NUCA Communication Director

Member's JOBS

This project won the NUCA 2021 Top Jobs category for Trenchless Technology.

Iowa Trenchless's Lower Connor Creek Interceptor project involved installing more than 12,500 linear feet (LF) of 36-in. gravity sewer pipe, and more than 5,000 LF of 16-in. force main for Wyandotte County, Kansas, and Kansas City, Kansas. For 2,600 LF of the project, trenchless construction methods were required.

The 2020 contract was awarded to Rodriguez Mechanical Contractors of Kansas City, with the trenchless work being a collaboration between NUCA members Midwest Mole and Iowa Trenchless. Before the work began, open-communication and teamwork between the municipal owners, engineer, prime and subcontractors was essential in identifying the need for additional geotechnical exploration. Once the results of that exploration were obtained, it was used to better define the right trenchless methods for each section.

Due to the nature and location of the dirt-rock interface, each trenchless section had a possibility of encountering a mixed-ground (soil and rock) condition. Because the project stakeholders undertook several rounds of additional subsurface exploration along both project alignments, a better plan forward was developed. The open-communication and the additional geotechnical work proved to be key to the success of each trenchless phase.

Bedrock conditions in the project areas was found to be higher than expected, which conflicted with the soft ground tunnel method originally chosen by engineers. Had this subsurface condition gone undetected and the tunnel started with a soft ground tunnel boring machine (TBM), it would have been potentially disastrous to the project. It could have resulted in the abandonment of the TBM and unfinished tunnel,

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or emergency excavation in the roadway right-of-way approaching 50-ft. deep. Additional permitting requirements, a significant disruption to the public, along with additional costs would have followed. This supplemental subsurface exploration saved the owners and contractors a substantial amount of expense and additional work.

A unique mix of three trenchless methods were used to cross a local highway and a Class 1 railroad track:

- Tunnel A: 640 LF of soft ground tunnel boring machine pipe jacking with steel casing
- Tunnel B: 1,300 LF of rock tunneling with ribs and board
- 640 LF of other multiple pilot-tube guided auger bores with steel casing.

Tunnel A:
Tunnel A consisted of 640 LF of 59.5-in. steel casing in soft ground. The additional geotechnical subsurface investigation discovered a bedrock knoll between the tunnel's start and ending points. This new information allowed a re-evaluation of the original route, which led to the tunnel's realignment and lengthening (from 570 LF to 640 LF). This extra length was required by Kansas DOT interstate requirements and to avoid the subsurface rock knoll.

This crossing design was completed with an Akkerman 480 TBM with a closed-face cutterhead. Iowa Trenchless used 59.5-in. OD Permalok steel casing as the initial tunnel liner and pushed with a 1200-ton hydraulic jacking frame. The selection of interlocking steel casing pipe helped achieve production rates as high as 60-feet per shift, with an average of 35-feet per shift. Lubrication of the tunnel was also a contributing factor in the successful installation, with no intermediate jacking stations needed.

Tunnel B:
Tunnel B was designed to be installed in 1,300 feet of interbedded limestone and shale bedrock, but little was known about the quality and characteristics of the rock. Communication and the additional geotechnical work identified hard, consistent, quality limestone strata across the route. This led to the decision to use a custom-built 66-in. TBM heavily modified to achieve optimized penetration rates in the solid rock. Midwest Mole used steel ring beam and wood lagging as the tunnel liner, with sets being built behind the ATM and expanded to match the 67.25-in. cutterhead head diameter.

The decision to select this segmented tunnel lining approach was found to be the key to success, as it significantly reduced the jacking required for the 1,300 foot crossing.

Tunnels A and B each housed the final product of 36-in. HOBAS Pipe CCFRMP used as the sanitary interceptor sewer for the municipality owners. The final product pipe was threaded, blocked, and grouted in place with low-density cellular concrete placed in multiple lifts.

Guided Auger Boring of Stell Casing:
Other trenchless methods used for the project included 24-in. and 30-in. steel casings installed using an Akkerman 240A guided boring machine (GBM) and Michael Byrne and Barbco auger boring machines (ABM).

What made this project unique was the panoply of work being performed within a single contract: A strong stakeholder team, communication resulting in recognizing the need of additional geotechnical work, and the physical requirement of soft ground tunneling, hard rock tunneling, and guided auger boring.

Successful communication and strong collaboration by Rodriguez Mechanical, Iowa Trenchless, Midwest Mole, George Butler Associates (professional engineering services), Unified Government of Wynadotte County Public Works Department, and Kansas City, Kansas, overcame the many challenges of this project and made it a success.

Lessons Learned

Iowa Trenchless was able to perform the work within the proposed schedule. The lessons learned by the project team were:

- Strong communication between the project's stakeholders, starting before the first phases of any in-ground construction
- Additional geotechnical exploration discovered several rock formations that changed the original plans and cost estimates before any construction began. ■

IOWA TRENCHLESS

NUCA member Iowa Trenchless is a full-service boring and tunneling company located in Panora, Iowa. Founded in 2002, the company offers services nationwide that include auger boring, rock boring, pilot tube boring, microtunneling, pipe ramming, pipe jacking, pipe bursting, railroad crossing, and bone bit design. Iowa Trenchless takes pride in using the newest technology and equipment to get the job done right the first time. Their website is **www.iowatrenchless.com.**