



2019 Project of the Year Rehabilitation Runner-up: Colzman Tunnel Rehabilitation Project



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The Colzman Tunnel is a 7,614-ft long, gravity sewer tunnel handlined in 1977. The tunnel is part of the Southgate Water & Sanitation Districts in Colorado.

Flow from the District's entire wastewater collection system converged at grade then was conveyed through the mushroom shaped tunnel at a maximum depth of 90 ft.

Considering the age of the tunnel, the highly corrosive wastewater environment, known deficiencies, and lack of redundancy, the District became concerned with the reliability of the tunnel. In 2015, a multi-sensor robotic inspection was performed by the District. This condition assessment revealed that the tunnel needed rehabilitation or replacement (or a combination of both).

Based on the complicated nature of the work, the high risks, and the wide variety of potential solutions, the District elected to execute the work using a progressive design-build approach. The District engaged Burns & McDonnell as its Owner's Representative and selected the Garney Construction/Dewberry Engineering team as its design-build partner.

Different trenchless rehabilitation options were considered by the design-build team including: cured-in-place pipe, cementitious and geopolymer sprays, rehabilitation with epoxies and poly-hybrid products, and rehabilitation with plastic and composite liners. Sliplining the tunnel (FPVC, Fiberglass, or HDPE) with either a single or multiple carrier pipes was also an option. Mining a second tunnel was also evaluated.

Evaluations determined that sliplining with HDPE allowed the installation of a fully structural, completely inert, and continuous pipe within the tunnel, saving the District from having to bore a new tunnel. Sliplining also facilitated installation in live sewer flows. After sliplining was complete, the annulus between in the tunnel was filled with grout.

Garney Construction partnered with two primary subcontractors to execute the tunnel lining. Global Underground Corp. (Global) was engaged to provide the HDPE fusion, joint fusion recording, and sliplining pull-in using HDD equipment. Cematrix Cellular Concrete Solutions (Cematrix) was selected as Garney's grout contractor.

Reconstruction of the tunnel began in October 2018 and was complete in May 2019. Major construction challenges and interesting project requirements included the following:

- Anchoring the HDD equipment
- Angled concrete anchor pad
- Threading the heavy steel drill stem through the tunnel
- Providing a custom manufactured pull head
- Sliplining using a cartridge style approach
- Installation uphill, against the flow



In Memoriam: Steve McCandless The project team would like to recognize Steve McCandless of Garney Construction, who passed away shortly after completion of the tunnel lining. His colleagues saw Steve as incredible person in every way and an inspiration to many.

- Low density cellular concrete (LDCC) design and use;
- Additional grout ports were drilled using an air hammer;
- A barometric loop to flood the pipeline during grouting; and
- Grout placement verification by use of specially built cameras

While longer and deeper tunnels have been restored, the Colman Tunnel presented unique challenges. The opportunity for bypass pumping was highly restrictive so a majority of the construction was performed in live flows. The irregular size and shape of the tunnel presented investigative, design, and construction challenges that all had to be met without error. Long pipe lengths, heavy pipe, poor soils, and complicated geometry at both portals required iterative design and coordination between all parties.

The project team worked together to identify solutions, opportunities, and manage risk and budget to find a solution that would bring a value-added solution to the District. The total construction value for this work was completed at less than half the cost of some of the initial engineering solution estimates. Using a slip-lining solution allowed successful rehabilitation of the sewer tunnel in live flow, without the need for expensive bypass pumping. Utilizing the Contractors' estimating team early in the project allowed the District to plan for expensive project financing while having high-cost certainty.

Use of the progressive design-build execution model allowed the Owner, Owner's Advisor, Designer, and Contractor to work together in an environment where all parties were engaged, valued, respected, and had the opportunity to present creative solutions. The open-book progressive contract terms allowed the District and the Design-Builder to build trust and to operate in a truly collaborative and transparent way.