

Cost-Effective and Minimally-Disruptive Trenchless Solution for San Jose Pipeline

The City of San Jose sanitary sewer system consists of approximately 2,000 miles of sewer mains ranging in size from 6 inches to 90 inches in diameter. To increase sewer capacity to serve the planned developments in its General Plan, San Jose hired Carollo to design the Monterey-Riverside Sewer Improvements project. This project consists of 2,000 feet of 42-inch-diameter gravity flow sanitary sewer, tunneled through Tulare Hill in south San Jose in order to eliminate the need for a 24-year-old lift station and corresponding 12-inch to 24-inch force main to carry sewage over Tulare Hill. Work included a feasibility study, a preliminary design report, final design, and construction-phase services.

Difficult Tunneling Conditions

Because construction required tunneling through Tulare Hill at depths of up to 55 feet, Carollo gave special emphasis to the tunneling portion of the project. Initial estimates for construction of an alternate alignment around Tulare hill proved to be too costly and disruptive. The team evaluated and compared trenchless construction methods, designed construction staging areas, considered construction equipment and contractor availability, evaluated geotechnical conditions, and compared pipeline material alternatives.

Selection of the tunneling method was difficult due to the diversity of geotechnical conditions, which



Varying soil conditions required the use of three different MTBM cutter heads.

ranged from saturated clays to dense gravel fills and sandstone and quartzite with rock strengths as high as 32,000 psi. Successful completion of the project required 16 exploratory borings and three different tunneling methods: microtunneling, conventional tunneling with a tunnel boring machine (TBM), and conventional mining.

Highlights

- ▼ Microtunneling of 2,000 feet of 42-inch-diameter gravity flow sanitary sewer.
- ▼ Elimination of the need for a lift station and alternative pipeline route.
- ▼ Extremely diverse geotechnical conditions.
- ▼ Variety of tunneling techniques, including microtunneling, conventional tunneling with a tunnel boring machine, and conventional mining.

State-of-the-Art Microtunneling Operation

Microtunneling operations involved using a micro-tunneling boring machine (MTBM) with a pressure-balanced cutting chamber and slurry spoil removal. The electronically-powered MTBM provided the optimum efficiency and cutting torque needed for long drives such as this one. The MTBM operator



A state-of-the-art control console, located in a portable container, allowed operators to remotely control the electronically-powered MTBM.

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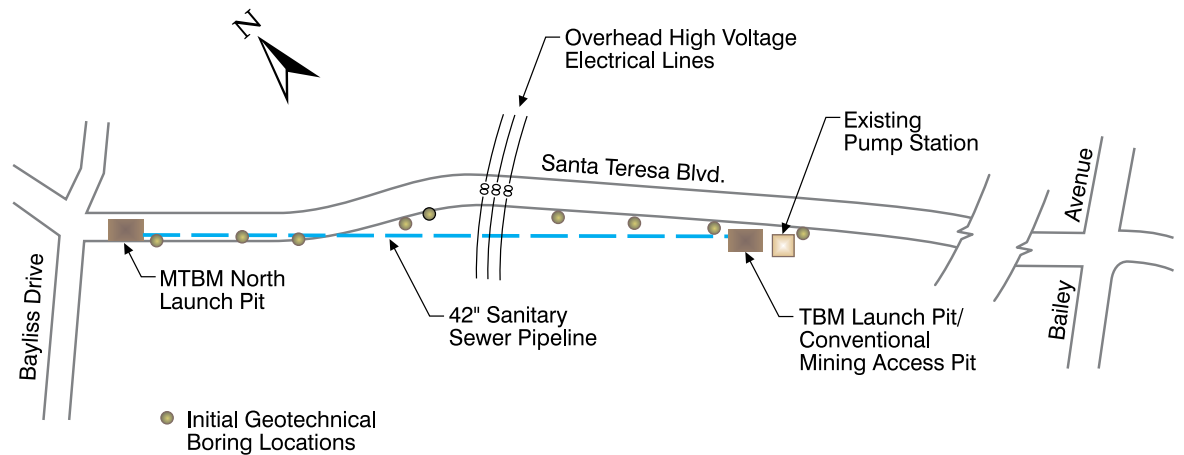


remotely controlled boring and pipe jacking sequencing from a state-of-the-art control console housed in a portable container on the site.

The final cost of the tunnel construction and pipe installation was still lower than any of the open excavation options. The project team was able to work cooperatively on this extremely challenging project and construct a trenchless solution that will best serve the future development of the area.



The MTBM used for San Jose's Monterey-Riverside Sanitary Sewer Improvements project featured a pressure-balanced cutting chamber and slurry spoil removal.



Location map and tunneling operations layout.