

# Pipeline Replacement at Depth

By: David Gill, Logan Clay Products LLC

The City of Santa Rosa, CA needed to replace an 1,800 foot section of their North Trunk Sewer Main in a heavily traveled area of the city near the courts, administrative offices, and the environmentally sensitive Paulin Creek Reserve. Emergency access to the area needed to be maintained at all times. A dramatic topography meant that some of the homes were 40 feet below the road surface.

A complete study of possible alignments at various depths, the use of lift stations and the geotechnical conditions was conducted. While the use of a lift station was explored, the risk of a failure in this area and the ongoing maintenance costs were undesirable. In the project areas that required installation at greater depths, trenchless installation with a small footprint and reliable on-target drives was effectively the best solution. The Pilot Tube Method (PTM) of guided boring does all those things well.

Alex Culick, the Project Manager from GHD described the solutions recommended: "We investigated a number of options for the specific challenges faced on this project. There was a section of the project where open-cut installation was the right solution. But in the areas that required installation at depth, given the geotechnical conditions, grades as flat as .0015, and a narrow available workspace, we identified the Pilot Tube Method as the appropriate trenchless installation. We used this combination approach to give the City the best value."

Using the PTM would mean they could avoid using a lift station and prevent its associated ongoing costs by installing the new line 45 feet below the road surface. To avoid even more extreme depths, the slope was kept to a minimum. The area with a slope of only .0015 meant maintaining the flow rate needed would require upsizing some of the existing lines.



*NO-DIG Pipe in one-meter lengths is specifically designed to enable smaller shafts in tight construction zones*


"Even with the minimal footprint of a PTM project, maintaining traffic flow and emergency access to all of the residences was a challenge," according to Steven

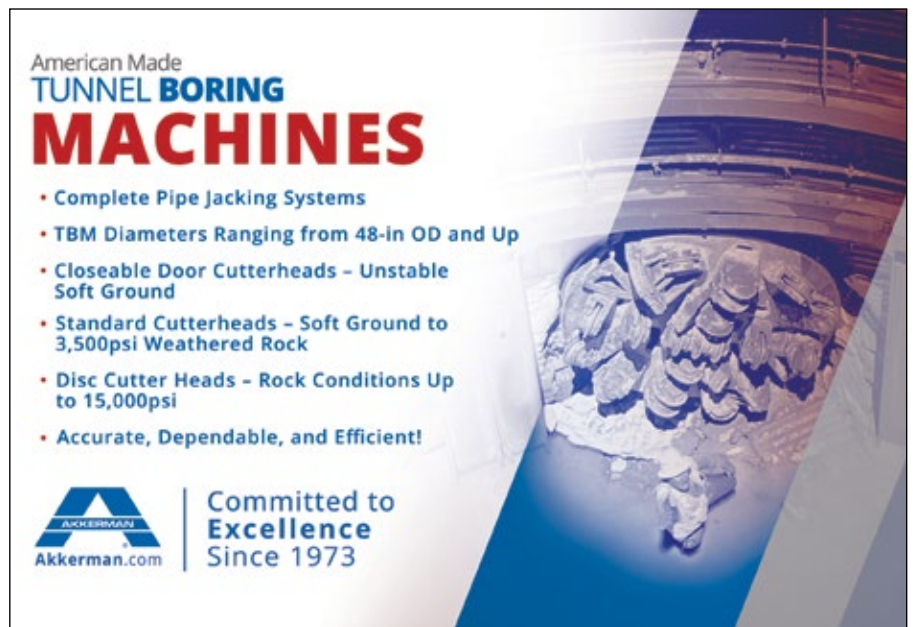
Gallyer of Pacific Boring, the trenchless contractor on this project.

Remote-controlled traffic signals were placed at each residential driveway to

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“ Some of the homes were 40 feet below the road surface. ”

facilitate traffic management in case of an emergency. The crew from Pacific Boring worked an overnight shift to minimize disruptions in an especially challenging area.

A total of six shafts were constructed at an average depth of 30 feet with the deepest being 45 feet. The jacking shafts were 12 feet in diameter and the reception shafts were 8 feet in diameter. They were designed to allow for the installation of 1-meter lengths of 8-, 15-, or 18-inch NO-DIG vitrified clay jacking pipe (VCP-J). The 1-meter pipe length is preferred for especially tight working conditions.

The Akkerman Guided Boring Machine (GBM) 4800 system used for this project includes a digital theodolite with an integrated camera mounted independent of the jacking frame, a battery-powered LED illuminated target housed in the slant-faced steering head and a computer monitor screen. This guidance system gave the operator a “real-time” view of the location and steering head orientation of the pilot tubes. This “real-time” view, together with the ability to continuously make adjustments during the entire pilot tube drive, results in pinpoint accuracy. In a



Shaft diameters of 12 feet or less and depths of up to 40 feet made this installation possible

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A mature area of the central city made limiting the size of the job site footprint critical

*Emergency access to the area needed to be maintained at all times.*

three-step installation process, driving the pilot tube to the next shaft is step one.

In the second step, a reaming head matching the Outside Diameter (O.D.) of the carrier pipe is fastened to the last pilot tube. Thrust (auger) casings advance the pilot tubes and reaming head. The spoils (displaced ground around the pilot tubes) are transported by the auger to the jacking shaft for removal. During this process, the pilot tubes and reaming head are advanced to the reception shaft for disassembly and removal.

Step three is installation of the pipe. Taking advantage of the average compressive strength of VCP-J (18,000 psi) means that no casing is needed in the final installation. The pipe itself can resist the high jacking forces generated as the pipe is thrust through the ground replacing the temporary casings and augers, and eliminating the need for an external casing pipe.

This project also included a new alignment for the water distribution lines. Once the PTM process was complete, the water lines were installed, all equipment was removed, and the shafts were converted to manholes. After the new line was placed in service, the pre-existing lines were filled with Cell-Crete® and abandoned in place in accordance with the City’s standards. Filling the lines and abandoning them in place also helped to preserve the environmentally sensitive area.

“An active community outreach program by the City, keeping the area residents and commuters informed as to progress, the expected timeline, and results were

unique and helped to keep everyone engaged,” said Culick. “When the job was completed, the City held a ribbon-cutting event to commemorate the new sewer and improvements. The City Manager, a representative from the Board of Public Utilities, and community members were all in attendance, at this unusual celebration of a project completion. In addition, when they went out of their way to say thank you to me and the contractor, it was unique.”

**ABOUT THE AUTHOR:**



*David Gill has more than 30 years of experience in the sewer pipe industry. He has been involved with countless open-cut, pilot tube, and pipe bursting projects. David speaks annually at the Colorado Tunneling Short Course and regularly presents educational information to municipalities and consulting firms.*

**About GHD**

GHD is one of the world’s leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation.

**Company overview**

Privately owned by our people, GHD provides engineering, environmental, and construction services to private and public sector clients across five continents and the Pacific region. Focused on creating lasting community benefit, our connected global network of 10,000 people delivers projects with high standards of safety, quality, and ethics.

Committed to sustainable development, GHD improves the physical, natural, and social environments of the many communities in which we operate.

**North America**

GHD has over 120 offices employing nearly 5,000 people in North America serving clients in all five of our global markets.



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