CASE STUDY
PIPE JACKING | ROCK TUNNEL BORING

Project Name:
Highway SR-51 Trenchless Crossing

Prime/Sub Contractors:
Horizontal Boring LLC

Location:
Phoenix, AZ

Owner:
City of Phoenix

Ground Conditions:
Breccia & Phyllite/Schist Rock Formations

Akkerman Equipment:
Pipe Jacking System, WM720-II TBM, 5200 Pump, 1548 Haul System, 2325BE Lube System, TBM Rock DCH

Pipe:
86-in. OD x 1-in Wall Steel Casing

Total Length/Longest:
330-lf.

PROJECT OVERVIEW

Since no ground water was present and two large clasts up to 3-ft diameter and UCS 35,000-psi were expected, they anticipated this trenchless crossing to be performed by either slurry microtunneling or hand-mining. Due to increased capabilities, Horizontal Boring LLC selected an Akkerman WM720-II Pipe Jacking System with a Rock DCH to tackle the alignment. The system greatly reduced daily operating costs over slurry microtunneling while significantly increasing productivity over hand-mine operations.

THE CHALLENGES

- Extremely Hard Rock Conditions: The alignment passed through breccia and phyllite/schist formations, with anticipated clasts up to 3 feet in diameter and compressive strengths up to 35,000 psi, presenting serious excavation challenges.
- Initial Consideration of Costly Methods: Early plans called for slurry microtunneling or hand-mining, both of which would be either cost-intensive or slow.
- Tight Alignment Under a Major Highway: The trenchless crossing had to be completed with high accuracy under an active section of Highway SR-51, demanding precision and minimal surface impact.
- Large-Diameter Steel Casing: Installing 86-inch OD casing through solid rock required robust equipment capable of high thrust and torque.

THE SOLUTION

- High-Performance TBM Selection: Horizontal Boring LLC opted for the Akkerman WM720-II TBM paired with a Rock Disc Cutterhead (DCH), offering the cutting force needed for high-strength rock.
- Optimized Pipe Jacking System: The use of Akkerman's Pipe Jacking System enabled the precise installation of 86-inch OD steel casing while delivering the necessary jacking force.
- Integrated Support Systems: The 5200 Pump Unit, 1548 Haul System, and 2325BE Lube System worked together to ensure efficient spoil removal, machine cooling, and continuous operation.
- Increased Efficiency and Lower Costs: This solution offered a significant reduction in daily operating costs compared to slurry microtunneling, while delivering higher productivity than hand-mining alternatives.

OUTCOME

- 330 feet of 86-inch casing was successfully installed through hard rock with no deviation.
- The TBM system reduced costs and increased efficiency compared to slurry or hand-mining methods.
- The project was completed with zero surface disruption to Highway SR-51 traffic.
- Proof of Capability: This project demonstrated the WM720-II's ability to handle large-diameter, hard-rock tunneling efficiently and accurately.

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