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COVER STORY

RISING TO THE CHALLENGE: REPLACING THE NORTH FORK SIPHON

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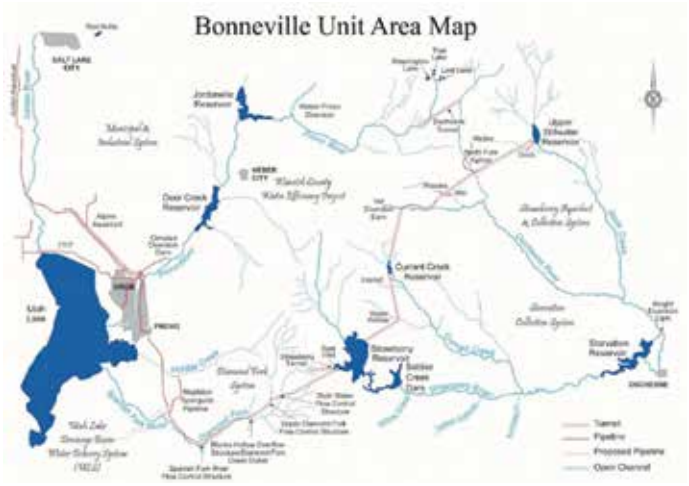
Every equipment supplier looks forward to invitations from customers to "come hang out." "Oh, and bring your tools," might elicit a little bit of concern about whether this apparently social invitation is actually a well-disguised cover for work, sort of like when your buddy says, "Come over for beer and pizza," and then slips into the conversation that he might need you to help him move a 300-pound dresser. "Bring one of the lightest, most efficient tools you have because we literally will be hanging out on 70-degree inclines in northeastern Utah not too far from a place called Starvation State Park trying to install anchors so a giant crane won't fall," might make that equipment supplier re-think his initial excitement. Or it might make him rise to the challenge.

The Central Utah Project (CUP) is the largest water resources development program ever initiated by the state of Utah. The program is being administered and executed by the Utah Bureau of Reclamation and will optimize use of the state's allotted share of water from the Colorado River by expanding and improving the existing water distribution system. The Project concentrates much of its efforts along the Wasatch Front, where a large percentage of recent population growth and development has occurred in recent years. Included in the improvements will be better water quality and increased flood control, in addition to greater water supply.

The North Fork Siphon is a critical part of the existing water supply system. The Siphon is in northeastern Utah, approximately 40 miles northwest of Duchesne, Utah, in Duchesne County. This 72-inch diameter, prestressed concrete cylinder pipe (PCCP) siphon is a component of the Strawberry Aqueduct and Collection System (SACS) that was constructed in the mid 1980's. Central Utah Water provides untreated water from the SACS to various water associations, conservancy districts, irrigation companies and local residents.



The project vicinity is characterized by rugged terrain with steep slopes bordered by streams and rivers. Most of the local geology was produced by tectonic activity and corresponding uplifts, interspersed with erosion by and deposition from glacial meltwaters during the Triassic period. The scenery is beautiful but unforgiving, dramatic but hostile.

After multiple visual, sounding and electromagnetic (EM) inspections performed by Central Utah Water, the Utah Bureau of Reclamation and three outside consultants, it was determined that the North Fork Siphon was near the end of its remaining useful life and would require complete replacement. Over 30 years ago, when the siphon was designed, PCCP was considered a cost-effective solution especially-suited for high-pressure piping situations. Time has revealed that this type of pipe has an increasing incidence of failure. One report states that since 1955 there have been nearly 600 independent failures or loss of service resulting from PCCP failures in North America. Therefore, a construction manager/general contractor (CM/GC) project delivery method was employed that teamed Central Utah Water (owners) with AECOM (design engineer) and Whitaker Construction (contractor) to accomplish the replacement. Project construction of the replacement welded steel pipeline (WSP), located parallel to the existing PCCP siphon began in May 2018 and, due to weather conditions that have prevented winter construction activities in the North Fork Canyon, should reach substantial completion by November 2020.

The project has included, among other activities: construction of the replacement WSP along slopes with a maximum 70 percent incline; replacement of the siphon crossing underneath the North Fork of the Duchesne River; abandonment of the existing siphon; installation of 14 anchor blocks (11 rock anchor sets, one micropile set and two unanchored); demolition and replacement of a blow-off structure, tunnel inlet portal, river crossing bridge and manway access vault; installation of two active cathodic protection systems; replacement of electrical and fiber lines; and creation of a tunnel portal access road.

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Installation of the valley portion of the siphon is being done via conventional method, while the slope portions have been installed using a cableway crane imported from Austria (subcontractor LCS Cable Cranes).

The design engineer was charged with making the upgrade a reality. The project called for replacing the existing 72-inch steel pipe with about 4,500 feet of a new larger 84-inch steel pipe. While the old pipe would be abandoned, about 2,400 feet of 84-inch pipe would need to be positioned and welded into place on two different slopes that would range from 36 degrees to 72 degrees. This is where the challenge begins. How do you get the pipe up the steep slopes and into position to be welded together? The plan called for the use of the Austrian cable crane with the capacity of lifting 44,000 lbs. to position the pipe into place and be welded.

Whitaker Construction Co., from Brigham, Utah, was tasked with setting up the cable crane to be used to position the 84-inch steel pipe to complete this part of the three-year project. Whitaker called upon ADSC Contractor Member Jones Drilling and Shoring in Salt Lake City, Utah. Jones has a wealth of expertise from over the past 70 years in the installation of micropiles, soil nails and tie-back anchors. The topographic conditions, paired with difficult limited access terrain, warranted experience and the correct equipment to make this part of the project successful. Jones was needed to install anchors for the installation of the crane blocks for the cable crane.

Every anchor block location involved more difficult access than the last. Jones knew that the tool to install these anchors would need to be lightweight, versatile, and engineered to meet the demands that required hard-to-reach positions. The obvious drill choice was the HEM760 excavator attachment, manufactured by ADSC Associate Member TEI Rock Drills. The HEM760 was engineered in Montrose, Colorado, by TEI's in-house engineers and is specifically designed to get into limited access spots and provide the power required to install the variety of anchors that this job demanded. The HEM760 has two roll gears that allow for 360-degree movement on both the vertical and horizontal axis. The TE760 hydraulic percussion head features Automatic Stroke control or ASA. This feature

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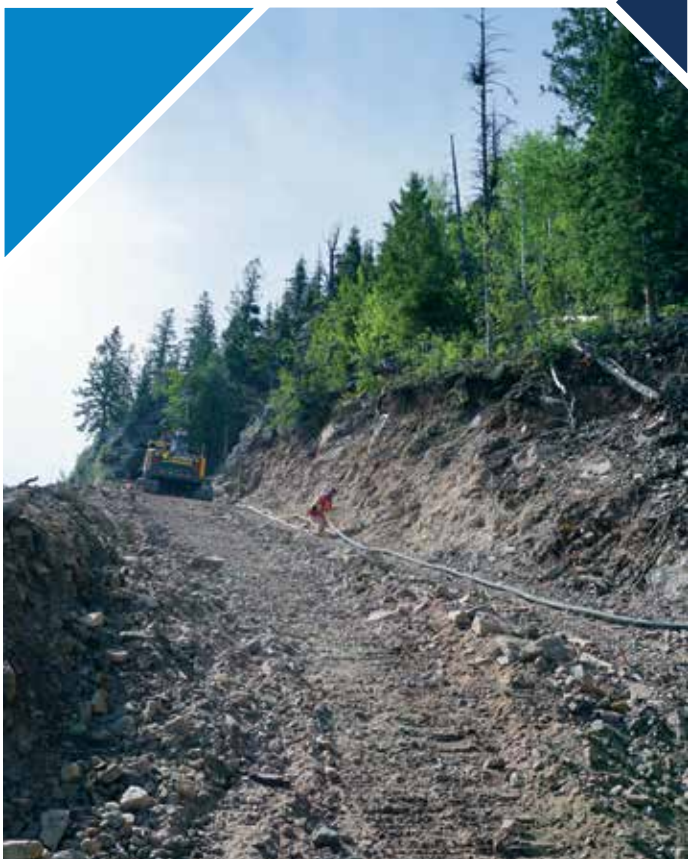
brings the hammer into an idle when the drill string is not fully engaged, and it hangs free when the operator is in a limited access drilling application. The attachment allowed for maximum performance and operation in the tightest, most extreme conditions.

The challenging terrain, geologic conditions, and structural specifications necessitated a variety of anchor installation methods, and the TEI HEM760 attachment was able to do them all. Some of the anchors required being installed inverted on the rocky, steep slopes; this job was not for the faint of heart. Six holes were drilled this way for the main cable way – six instances of danger above and beyond even the very dangerous base level of risk for the job overall. These holes were drilled 2 1/4-inch diameter and to depths of 40 feet in mostly solid rock.

Four micropiles and two tieback anchors were drilled to 25 feet deep with #10 bar for the haul ropes, and 6 holes were drilled to 25 feet deep for the guide wires. In the case of this project, the number of holes drilled in no way reflects the difficulty and risk in executing the job. Having the right equipment, experience and support from TEI distributor and Western Equipment Solutions made it possible to complete the job successfully while still protecting worker safety. Look for completion of the project in November of 2020.



SOURCES: U.S. Department of the Interior, Central Utah Project Completion Act Office, Central Utah Water Conservancy District, Utah Reclamation Mitigation and Conservation Commission