2014

NORTH AMERICAN MICROTUNNELING

ALSO INSIDE

ACHIEVEMENT AWARD

Coluccio's Rene Inosanto, MWH's Greg Raines and Contractor Ward and Burke Earn Honors

TAPPING THE UTE RESERVOIR

Nada Pacific Completes Raw Water Intake in New Mexico (pictured)

A NEW ERA IN MICROTUNNELING

INDUSTRY'S GROWTH REFLECTED IN ASCE'S "STANDARD DESIGN AND CONSTRUCTION GUIDELINES FOR MICROTUNNELING"

A SUPPLEMENT TO:

Trenchless TECHNOLOGY

TBM TUNNEL BUSINESS MAGAZINE

INDUSTRY REVIEW

THE LAUNCH SEAL WAS DESIGNED TO WITHSTAND THE ESTIMATED GROUNDWATER PRESSURE AND CONSISTED OF MULTIPLE RUBBER SEALS AND HEAVY-DUTY SLIDE PLATES. THE SEAL IS SHOWN IN THE SHAFT WITH THE AKKERMAN MT460 JACKING FRAME.

FEATURE STORY

TAPPING THE UTE RESERVOIR: A MICROTUNNEL RAW WATER INTAKE IN LOGAN, NEW MEXICO

BY LAURA ANDERSON

At the end of April 2014, a 236-lf., 60-in. microtunneled raw water intake was completed when the microtunnel boring machine (MTBM) drilled through a concrete headwall and tremmie block before emerging into the Ute Reservoir.

Groundwater supplies for residents of Curry, Roosevelt and Quay counties in New Mexico have been dwindling in the past decade, a result of depleted supplies from local aquifers and an increase in well taps by a growing population. It became evident that current sources could not accommodate even sustained usage from the existing population in a few decades. To address these issues, the Eastern New Mexico Rural Water System (ENMRWS) was formed in 2010.

The ENMRWS was charged with finding a solution to provide a sustainable potable water source for many years to come. ENMRWS reviewed several options and chose the design of a lakeside intake structure from the Ute Reservoir as the best solution. Capitalizing on this water source is suspected to yield an annual delivery of 16,450 acre feet per year.

The Ute Reservoir was created in 1959 by damming the Canadian River in Logan, New Mexico. Today, the reservoir serves as a tourist's destination and is flanked mostly by seasonal properties.

Major design elements for the first phase of the project include an intake structure, intake tunnel and pump forebay shaft. Future phases of the project will add pump stations, water storage tanks, 87.5 miles of 30- to 54-in. diameter transmission lines, 94.8 miles of 8- to 36-in. lateral pipelines, and communication systems. The entire project costs are $550 million and are projected for completion by 2033. The Ute Reservoir Intake Screens, Tunnel and Pump Forebay Shaft phase of the project cost $14 million.

Nada Pacific Corp. of Caruthers, California, was subcontracted for the microtunnel portion of the project. All other facets of construction were performed by ASI Constructors Inc. of Pueblo West, Colorado. Occam Engineering is the project program manager and CH2M Hill of Albuquerque, New Mexico, is project engineer. Engineering & Construction Innovations Inc., of

Oakdale, Minnesota, a sister company to ASI, provided expertise for the specialized drill-and-blast operations. ASI Marine Services, another sister company to ASI, provided professional services, personnel and equipment for the underwater construction.

ASI mobilized to the project site in late 2012. Crews began with excavation to lower and level the ground to the shaft's top grade. The bedrock along the reservoir comprises highly saturated and fractured sandstone with an unconfined compressive strength of 10,000 psi. The 80-ft deep by 50-ft diameter forebay shaft, intended for future use as a pump station, was blasted and hollowed out in stages. After each blast, ASI lowered excavation equipment into the shaft with a 160-ton crane, spoils were transferred into a muck box and removed from the shaft via crane. Curtain grouting prevented water inflow during this process and the walls were supported with shotcrete and grouted rock anchors.

A specially designed compression ring slip form was used to mold the 18-in. thick, 4,000-psi cast-in-place walls that were installed in 11-ft increments. Next, ASI moved to drill-and-blast construction for the intake bench. A long-reach excavator, situated on a barge in the reservoir, excavated material 50 ft below the water elevation to create the intake bench. Permanent rock fall mesh was attached to the vertical rock above the intake bench by divers using 9-ft rock anchors to prevent loose rubble from falling on the equipment or intake bench. Nearly 80% of the rock fall mesh was attached underwater by the diving team.

In preparation for the MTBM's emergence into the reservoir, a tremmie concrete block was poured and anchored to the surrounding bedrock so the MTBM would have a stable location to exit the highly fractured sandstone. The perimeter of the construction area in the reservoir was outfitted with a marine safety barrier to prevent contamination.

The MTBM was launched from the forebay shaft. The launch seal was designed to withstand the estimated groundwater pressure and consisted of multiple rubber seals and heavy-duty slide plates. Prior to launch, the seal and headwall were pressure tested to 30 psi using the MTBM and slurry system. A closure piece was welded from the seal to the pipe to ensure a watertight seal and that the water pressure from the reservoir would not push the pipe back into the launch shaft after the jacking frame and pipe clamp were removed.

Sixty-in. OD Permalok pipe in 20-ft lengths with T7 joints and Powercrete J coating on the exterior was specified for the intake tunnel. The coating protects the exterior of the pipe from the abrasive sandstone during the pipe jacking process and prevents corrosion after the microtunneling is completed.

Nada used its Akkerman SL60 MTBM,

THE AKKERMAN MTBM WAS LAUNCHED FROM AN 80-FT DEEP BY 50-FT DIAMETER FOREBAY SHAFT, INTENDED FOR FUTURE USE AS A PUMP STATION.

NADA PACIFIC RECENTLY COMPLETED A 60-IN. DIAMETER, 236-LF MICROTUNNEL INTO UTE RESERVOIR IN NEW MEXICO.

MT460 jacking frame, control container and bentonite pump with a Derrick Flo Line Primer slurry separation plant for microtunneling operations. The MTBM was outfitted with a bulkhead to seal off the sensitive internal components of the MTBM from water damage when retrieved from the reservoir. The MTBM cutterhead was equipped with disc cutters, drag teeth, and picks to meet the 15,000-psi rock cutter baseline.

Nada mobilized on site on March 11, 2014. After a few minor delays, crews launched the MTBM on April 7, 2014, and had to contend with constant wind, sometimes as strong as 70 mph, during their six weeks onsite. They experienced an average production rate of 34 lf per 11-hour shift, and reported a peak installation rate of 52 lf in one shift.

Prior to launch, crews welded a bulkhead in the first pipe behind the MTBM. After retrieval of the MTBM, the bulkhead served as a watertight seal between the reservoir and the jacking shaft to allow for simultaneous work on both ends of the project. After the MTBM drilled through the headwall, the 5-ft space between the back end of the MTBM and the bulkhead was closed and pressure tested before the MTBM was removed from the pipe string. The bulkhead would later be removed by ASI when the complete intake system was ready for operation.

The MTBM was recovered at 50-ft depths by drivers who connected it to a sling, then hoisted it to the surface via crane. Nada completed its portion of the project on April 29, 2014.

ASI planned to remain onsite through November 2014. Doug Laub, general superintendent for ASI, reported that they are currently "completing construction on the concrete deck designed to receive a pump station building in a future contract." Laub furthered that, "they formed and placed the intake footing 50 ft below reservoir elevation, and erected the column support structure that will hold the high and low level intake valves and support the elevated access platform, approximately 15 ft above water elevation." The intake screens are hydro-burst actuated to keep them clean for raw water filtration before it goes into the forebay shaft. It was expected that the complete system will be in full operation in late 2014.

Laub commented on the complexities of this project noting that, "the sizeable quantity of underwater work, amount of concrete installed underwater, and technical factors made this project remarkable. The unique construction variables required careful staging and extraordinary safety considerations – factors not typically considered on a job site." Laub stated that all the crews had to be careful to maximize their time. He added, "project regulations disallowed night shift and weekend work, so each step in the timeline was constantly assessed and reassessed during the crew's daily meetings."

Laub was pleased with ASI's partnership with Nada and attributed the success of the microtunnel intake to "expertise, collaborative planning and communication."

LAURA ANDERSON IS DIRECTOR OF MARKETING FOR AKKERMAN, A PIPE JACKING AND TUNNELING EQUIPMENT MANUFACTURER HEADQUARTERED IN BROWNSDALE, MINNESOTA.

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