Dynamic Cable Completes Record-Setting Potomac Crossing

by Paul J. Miller

A new fiber optics cable across the Potomac River near Washington, D.C., now provides one more communications link to our nation's capital, thanks to the directional drilling expertise of Texas-based Dynamic Cable Construction. What was expected to be a record length directional crossing had been carefully planned in minute detailto achieve its objectives.

First slated for December '96, the crossing was beset by numerous delays. Finally, nine months later, Dynamic Cable was able to launch the horizontal drilling project. The five-week project was completed with the cable installation on September 22.

The new fiber optic link was being installed for Jones Communications of Alexandria, Va., a subsidiary of Colorado-based Jones Intercable Inc., a provider of cable television, telephone and high-speed data transmission services in the Washington, D.C. metro area.

Overview of drill spread on the Maryland launch site from which Dynamic Cable installed 3,750 ft of the 6,600 ft. crossing.

Jones contracted with Commlink Constructors Inc. of Concord, N.C., to install a cable under the Potomac River. Keith Price, president of Commlink, recommended the use of directional drilling to Tom Gorman, senior director of engineering for Jones Communications. This was the first occasion for Jones to use the HDD river crossing method.

Price contacted Dynamic Cable Construction Co. Inc. of Ben Wheeler, Texas, to consider the drilling subcontract for the crossing project. Dynamic frequently works with underwater cable lays and has experience with both directionally drilled and underwater jetted installations.

By coincidence, Dynamic Cable had a new drill rig on order from Contractors Manufacturers Services, Inc. Macedonia, Ohio. Originally specified as a 180,000-lb rig, it was designed so that it could be upgraded. Since it was still being manufactured, Dynamic had it upgraded right away. When delivered, the drill had 436,000 lbs of push/pull force and 57,000 ft-lbs of rotational torque.

Project Logistics

Dynamic Cable planned carefully for the drill rig-up scheduled for August 25. The aim was to complete a single crossing of approximately 6,600 if of drill-and-leave 5-in. pipe from Maryland to the Alexandria, Va. side. The drilling site was set up on a bluff on the Maryland side of the Potomac, about 500 ft from the river's edge. Soil borings taken on both sides were carefully studied. TruTracker navigational grids were set up in the normal manner from the drill site to the river and also across all but a 1,400-ft wide shipping channel. Divers set grids into the shallow river bed to assure navigational accuracy.

Navigational services were provided by Centerline Directional Guidance Systems Inc. of Houston. Pat Woodward, president of Centerline, directed the steering services. Parchem Inc., Laurel, Miss., supplied mud engineering and the bentonite and drilling fluids under the direction of Tim Tynes, vice president of Parchem. Underwater services were furnished by Precon Marine Inc. of Chesapeake, Va.

Dynamic Cable's Bob Edwards was the general superintendent while Rob Richardson was the drilling superintendent for the Potomac project. Mickey Redwine, president of Dynamic Cable, was also on site for the duration. Commlink's Tom Price was the project manager.

Almost immediately after spud-in, Dynamic found the alignment was moving in and out of gravel. Redwine reported that soil samples had shown no gravel on the Maryland launch side and only some trace gravel on the Virginia side. They encountered just the opposite. "What that tells you is that you could do a core sample in one spot and move over 10 ft and get something totally different," said Redwine. "That's the case, no matter where you're at." Loss of mud circulation due to the gravel plagued the project from the beginning.

Since the project was a drill-and-leave crossing, Dynamic could not use the spiders typically inserted in the pilot drill stem to hold the downhole navigation wireline in place. Instead, they inserted a 3/4-in. PVC pipe downhole inside the drill pipe, which had to be made up with each pipe breakout.

A jetting assembly had been used at the outset of drilling but after hitting gravel and some hard clays, Dynamic Cable replaced it with a bent sub and a rollercone bit. After another 1,000 ft of drilling, Dynamic found they couldn't push anymore. They had to trip out again and added a downhole motor. "We just went through sandstone briefly, but we kept the motor on for the duration of the first bore due to the gravel encountered," said Redwine.

As Dynamic passed the midpoint of the crossing, the bore hole started tightening up from friction and drag caused by the gravels. Redwine recounted the scenario: "As we got to 3,750 ft, the hole was getting really tight and we were about to stick it. So we made the decision to exit the bore into the river bottom. We were pretty fortunate as to where it exited because it was a sand flat with water depths ranging from 2 to 4 ft" Dynamic prepared to move to the opposite shore for a second shot.

Second Shot

The move to the Alexandria side meant an equipment change. The drill site was a small park flanked by pricey condominiums, and the turf required use of a lighter, rubber-tired drill rig. A noise restriction also called for a smaller mud system and related support equipment.

Dynamic moved in an Ardco Model 4000 drill rig with 40,000 lbs of push/pull force and 5,000 ft-lbs of torque to tackle the balance of the crossing. To reduce noise levels sound baffles were placed around the drilling site.

The second shot begins on the Alexandria side of the Potomac crossing. The midi-sized drill rig completed the more than 2,200-ft bore.

Silty clay soils on the Virginia side provided substantially improved drilling conditions. However, Dynamic again lost circulation on the first drill stem going in, Redwine reported.

The dredged shipping channel with a depth of 30 to 35 ft lies approximately 650 ft from the shore. Dynamic was able to maintain a cover of 25 ft below the channel bottom. After the channel, the bore was allowed to rise for the remainder of the much shallower normal river. The smaller drill rig drilled some 2,251 ft before it punched out. Redwine considers that a very successful bore and probably a record for this rig capacity.

The exit point of the second drill still left a 600-ft margin to reach the end of the first bore. Dynamic sent a barge out to the exit and had it tie onto the drilling assembly. "As we pushed, the barge dragged it in a straight line toward the end of the first bore," Redwine recounted. "We pushed another 500 ft. When the two bores approached, they were perfectly lined up."

Innerduct

At that point the work shifted from drilling to insertion of innerduct. Arnco Corp. of Elyria, Ohio, was prepared to place the triple ducts and fiber optic cable.

Arnco set up the duct reels on a barge along with a duct pushing machine. A barge-mounted crane raised the two underwater casing ends so they could be accessed from the barge.

Arnco used its waved rib duct and a lubricant compatible with both steel and polyethylene for installation in the 3.75-in. ID drill casing. Originally, Jones had planned to only install two 1.25-in. ducts, but Arnco proposed use of three 1-in. conduits instead. The custom lubricant and the duct pusher ensured a successful installation of the innerduct.

Under the direction of Tom Baldwin, Northeast regional manager for Arnco, technicians pushed the duct bundle one direction while Dynamic pulled from the corresponding end. When the first length was in, Arnco cut the duct, turned the reels around and repeated the process in the opposite direction. The ducts were then fusion coupled.

Dynamic Cable president Mickey Redwine (left) confers with Pat Woodard of Centerline Directional Guidance Systems, the navigationalservices contractor.

As the assembled innerduct and drill pipe were slowly lowered into the river, the slack was pulled back from the Virginia shore literally a few inches at a time. When the completed line lay stretched out on the river bottom, a piece of 10-in. steel casing with the side cut out of it was laid over the exposed line between the pipe ends. Precon Marine then jetted the full 600 ft of pipe into the river bottom to the required depth.

As the final stage, Arnco blew the two lengths of 192-count fiber optic cable the full length of 6,600 ft under the river. Arnco used a hydraulic/air assisted method of placing the two fiber cables. With a run-rate of approximately 180 ft per min., the operation required only 40 mins. per duct to install the fiber optic cable. The third duct was sealed off under air pressure to preserve it for Jones' future use.

Arnco's Baldwin noted two achievements in this installation: "There were significant design accomplishments to install these innerducts damage-free at these record lengths. It also got the owner a third pathway under the Potomac at no additional charge."

Redwine added, "The spare duct is probably going to pay for their bore."

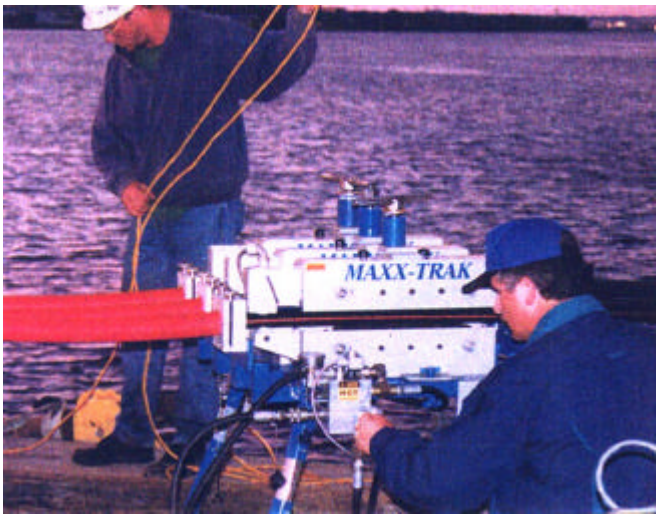
When asked in retrospect what he might have done differently, Redwine said a launch from the Virginia side would have likely helped them. "The soils there were much better. With the channel so near the shore, we could have gotten under it a lot quicker. Then we could have `shallowed up the bore' for the remainder of the crossing and perhaps stayed out of the gravel. That perhaps would have given us a better shot at doing the crossing in a single bore." Permitting problems kept Dynamic off the Virginia side as the principal drill site.

Despite the diversion into two shots across the river, the length still may be a record river crossing, said Redwine. "If there's ever been a river crossing made by any method longer than this, I haven't heard of it." And the bore with the Ardco 4000 drill rig certainly exceeded expectations.

Commlink's Keith Price expressed satisfaction with the crossing project. "With all the problems we had, we made it within schedule and at minimal cost." He said the City of Alexandria was very happy with the manner in which the drilling contractors worked in the park area. "When the unexpected occurred, there was no panic. Everybody was a professional," said Price. "We thank God for the success of the project."

Dynamic Cable is accustomed to extraordinary drilling projects. Prior to the Potomac crossing, its longest crossing had been just over 5,000 ft. Redwine said, "We like to specialize in tougher bores that no one else wants. There's less competition and we enjoy the challenge!"

Doubtless Dynamic will challenge other records in the future.



Arnco's A1 Crandall, product manager for placement equipment, adjusts the barge-mounted duct pusher for the insertion of the triple innerduct.

Paul Miller is editor of Trenchless Technology.

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Mr. Mickey Redwine, President
Dynamic Cable Construction, Inc.
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December 18, 1998

Dear Mickey.

Jones Communications of Maryland has had an ambitious plan to construct a major fiber network in the Washington, DC metropolitan area. When we were faced with the task of connecting Alexandria, Virginia with Prince Georges County, Maryland, we had quite an obstacle in the way; the Potomac River. With the help of Dynamic Cable, our goal was realized.

I wanted to take the time to thank you for the tremendous effort put forth by you and your team. A 6800' directional bore is obviously no small undertaking. Frankly, I wasn't so sure we weren't biting off more than we could chew. When Dynamic arrived, it was obvious we were in good hands. The skill and professionalism displayed made me (and the company) confident that the job would get done. From setup to breakdown, your team truly made an almost impossible job seem easy. Even when the river bed wouldn't cooperate, there was never a doubt about attaining success.

More importantly, and not to be overlooked, was the personal attention (OK, hand holding) you gave me and my staff throughout the project. You and your team were available to meet and give updates at a moments notice throughout the project. You brought in the right team and the right equipment to get a difficult job done. I am forever grateful.

You can be certain that if ever I need to get a major directional boring job done, you'll be the first to get the call. If you ever need a reference, please feel free to use me.

Very Truly Yours,

Thomas J. Gorman
Senior Director of Engineering
Jones Communications