



New Pipe Laid Out on Cradles

ROUTE 5 WATER MAIN IMPROVEMENTS – BELLOWS FALLS, VT

Asbestos Cement Pipe Bursting

By: Christina Haskins P.E., Dufresne Group

pipe. The 10-inch transmission main was the primary pipeline providing potable water from the Main Pressure Zone to the North End Pressure Zone of the distribution system. Not only was the existing AC pipe creating deficiencies in the water system, a failure would result in a significant impact to commercial and industrial water service in the North End Zone, as well as vehicular traffic on a primary road.

Alternatives were evaluated for the replacement of the existing AC water main, including open trench construction with various alignment alternatives, pipe lining, and pipe bursting. The project constraints included working within the State right-of-way along a heavily traveled trucking route, conflicts with other utilities and shallow ledge along a significant length of the project area.

Coordination with the Vermont Agency of Transportation (VTrans) started early in the design phase. VTrans required that the new water main be installed outside of the travel lanes of the road. This limited the new pipe location to the road shoulders. Further complicating a new pipeline in this area was the shallow ledge located just outside the southbound shoulder and an environmentally sensitive wetland located along the northbound shoulder. Additionally, a sewer force main was already present within the northbound shoulder. Based on these constraints, varying from the existing alignment in the southbound shoulder was not possible. However, a major fiber optic duct bank was also located in the southbound shoulder directly over the existing water main. Significantly limited right-of-way, existing utilities, and roadway shoulder constraints limited options for a new water main.

Dufresne Group focused on rehabilitation or replacement options that would utilize the existing pipeline alignment. The pipe lining alternative was eliminated as it would not allow for an increase in the pipe diameter and therefore would not resolve the hydraulic deficiencies. Open trench construction would have a longer construction duration than trenchless methods, which would significantly increase the impact to traffic along Route 5. The fiber optic conduit bank located over the existing 10-inch

In 2012, Dufresne Group prepared a Water System Evaluation Report for the Village of Bellows Falls, Vermont that identified deficiencies within the existing water distribution system. A 6,600 foot section of 10-inch asbestos cement (AC) water main along Route 5 in the Town of Rockingham, Vermont was identified as a high priority for replacement. In early 2014, Dufresne Group assisted Bellows Falls in obtaining \$8.2 million in funding at a -3 percent interest rate from the Drinking Water State Revolving Fund to replace approximately 20,000 linear feet of water main throughout the Bellows Falls water system under 5 separate construction contracts. Once the funding was in place, the final design phase for the Route 5 Water Main Improvements project began, which included the 6,600 feet of 10-inch AC water main.

This project was one of the highest priority projects for the Bellows Falls water system due to concerns over the structural integrity of the AC pipe, inadequate fire flows in the North End Pressure Zone, and high headloss along sections of the AC

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... PIPE BURSTING OF AC PIPE HAD NEVER BEEN PERFORMED IN THE STATE OF VERMONT, OR IN ANY STATE IN NEW ENGLAND.

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main would have to be supported or relocated entirely for open trench construction. The longer construction duration, increased traffic control, and fiber optic handling would also significantly increase the cost of this alternative. Pipe bursting was considered as a proven method of replacing an existing pipe with a new pipe of the same or larger diameter in the exact location of the existing pipeline. Additionally, the use of 12-inch DR 14 Fusible C-900® PVC pipe (FPVCP) provided sufficient inside diameter to resolve the hydraulic deficiencies caused by the existing AC water main in the North End Pressure Zone.

To pipe burst a water main, pits are first dug at a ‘machine’ or ‘pulling’ location and at a ‘pipe insertion’ location, usually between 300 and 700 feet apart. Threaded or linked rods are fed through the host pipe from pulling side until they exit on the pipe insertion side. Tooling that can both split and burst the host pipe is attached to a lead rod, then an expander is added to expand the split and fragment existing pipe to create a void. The expander head is connected to the pull head and pipe – in this case 12-inch FPVCP. Finally, the machine engages and pulls back the rods, tooling and product pipe through the entire length. This method typically reduces excavation by approximately 85 percent.

Dufresne Group contacted Ted Berry Company to discuss the viability of pipe bursting for this project. Ted Berry Company provided information on pipe bursting and guidance specifically related to the Route 5 Water Main Improvements project. It was immediately clear that this project was an excellent candidate for pipe bursting. However, pipe bursting of AC pipe had never been performed in the State of Vermont, or in any state in New England. In May 2014, a meeting with officials from the



Pipe Insertion Pit

Vermont Department of Health, Drinking Water & Groundwater Protection Division, Solid Waste Division and Facilities Engineering Division was arranged to discuss the possibility of a demonstration project. At this meeting, Dufresne Group, Ted Berry Company and AM Trenchless presented a summary of the project constraints, pipe bursting technology and information on how pipe bursting can be performed in accordance with the State and Federal asbestos regulations. Dufresne Group, Ted Berry Company and AM Trenchless worked with the Department of Health throughout 2014 and 2015 to obtain approval to proceed with this project. In 2016, the Department of Health allowed the

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Cutter Tooling and Expander Head Entering Host AC Pipe



Cutter Tooling and Expander Head Assembled

project to proceed with specific terms and conditions, which were incorporated into the bid documents.

Construction of the project began in the fall of 2016. Ted Berry Company was hired as a sub-contractor by the general contractor, Zaluzny Excavating Corporation. Ted Berry Company conducted the pipe bursting and fusing of the FPVCP. Zaluzny was responsible for pit excavation and areas of open trench construction for interconnections, hydrant installations and water service connections. Winter weather stopped all construction on November 16, 2016 and the project was resumed on April 24, 2017 and completed on June 16, 2017. Hydrostatic pressure tests were completed at 200 PSI and all passed. The pipe was disinfected and all sections of pipe passed the bacteria testing.

The contract time allowed was 120 days due to an area of ledge removal and open trench construction where a new alignment was required to achieve the required separation from the sewer main, as well as a short water main extension onto an adjacent road. The pipe bursting activities, including excavating pits, placing equipment, paying out rods and bursting, took approximately 13 construction days total. A total of 4,700 linear feet of pipe was installed using static pipe bursting methods. The open trench construction activities for water main installation took approximately 17 construction days for a total of 1,900 linear feet. Based on observations during construction, the pipe bursting method installed an average of 360 feet of pipe per day and the open trench construction method installed an average of 110 feet of pipe per day on this project.

The Vermont Department of Health required a licensed

asbestos abatement contractor to be present on site during bursting activities to ensure that the bursting activities were being performed in compliance with the Vermont Regulations for Asbestos Control. Additionally, a Negative Exposure Assessment was required. Upon completion of the project, the Department of Health required that the location of the buried AC pipe debris be memorialized for compliance with National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations.

This is the first AC pipe bursting project to be approved in the State of Vermont and the executed project was an absolute success. It allowed for replacement and upsizing of the existing transmission main in the same alignment, minimized the amount of excavation, pavement replacement and traffic control required, greatly reduced disturbance of the co-located fiber optic conduit bank and shortened the overall construction duration.

Dufresne Group and the Village of Bellows Falls were extremely pleased with the outcome of the project. This project truly showcased the time and cost savings provided by pipe bursting. The project would have required at least another 6 calendar weeks to complete as an open trench construction project, which would have significantly increased the cost and impact to traffic. When compared to a similarly sized open trench construction project that was bid in the same month and constructed by the same general contractor, the overall project cost savings realized with pipe bursting on this project were approximately 26 percent. The cost savings realized during this project, combined with cost savings from other projects under the same funding award, allowed the Village to replace an additional 6,000 linear feet of



Bursting Machine Setup in Pulling Pit

water main for a total of 26,000 feet of water main replacement constructed under 8 separate construction contracts, as well as a source water intake improvement project. †

References:

Ambler, Edward Alan, and Timberlake, Matt (2017). “Approval of Alternate Work Procedure Covering Asbestos Cement Pipe Bursting by the Vermont Department of Health” Proc., No-Dig, Washington, DC, April, 2017 Paper MM-T4-04 (link to paper)

ABOUT THE AUTHOR:



Christina Haskins, P.E. is a project manager at Dufresne Group in Manchester, Vermont. Christina has worked at Dufresne Group for 10 years and specializes in municipal water, wastewater and stormwater engineering throughout Vermont. Christina earned a B.S. from Rensselaer Polytechnic Institute and an M.Eng. from Norwich University.



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