

# SINGLE 4,100-FOOT HDD INSTALLATION OF 16-INCH FUSIBLE PVC® SANITARY FORCE MAIN

## Spring Lake Pump Station force main replacement - Contract 3, Grand Haven MI

By: John Kosiur, Underground Solutions

The Grand Haven-Spring Lake Sewer Authority (GHLSA) and the Ottawa County Road Commission located in Western Michigan developed a five-phase project in early 2017 which included upgrades and improvements to sewer lift stations in Spring Lake, Ferrysburg and Grand Haven, along with headworks upgrades at the treatment plant. Phase 3 of the project involved the installation of an approximately 4,000-foot force main underneath the Grand River, which replaced the existing 12-inch ductile iron force main that was installed there in the 1970s. The GHLSA knew the existing force main was approaching the end of its useful life expectancy and it was time to upgrade to a new force main that would accommodate the recent and future increased flow capacity for the service area.

Prein&Newhof (P&N), an engineering firm located in Grand Rapids were hired to analyze the existing system and force main. Multiple pipe alignments were reviewed and trenchless methods were compared with barge supported open cut or direct bury methods. The direct bury method would require additional permitting and clearance. Additionally, both riverbanks were filled with popular recreational parks, and the river was also a home to an endangered mussel species. Another concern was disturbance to the surrounding neighborhoods. The north end of the pipeline was located in a residential area while the south end was on a truck route for the city. Construction noise and vibration level had to be kept to the minimum to minimize impact to the residents. Because direct bury installation would have caused extended environmental and economic disturbance to the surrounding area a trenchless method was selected for the project.

It was determined that a 16-inch pipe size would handle current and future capacity demands and that horizontal directional drilling the new pipeline under the Grand River was the most suitable and cost-effective method of installation. Matt Hulst, an engineer for P&N designed the HDD bore alignment, layout and installation.

### The design considered two pipe material options:

1. A 16-inch DR14 Fusible PVC® pipe
2. A 22-inch DR7.3 high-density polyethylene (HDPE) pipe



Replacement force main alignment

Due to the difference in material properties between PVC and HDPE, the thicker wall of the HDPE pipe required increasing the pipe size to maintain the flow area and pressure capacity the system required.

The project phase was released for a public bid in November 2018 and Gabe's Construction of Sheboygan, Wisconsin was awarded the contract. Gabe's chose the 16-inch Fusible PVC® pipe option as its material of choice, mainly because the smaller, 16-inch pipe size represented major time and construction cost savings compared to installing the larger 22-inch HDPE pipe section and the commensurately larger final ream size required for that pipe section.

Construction started in March 2019 with a tight deadline for completion. Using an American Auger DD330 directional drilling rig, a pilot bore was used to set the alignment, and took about two weeks to complete. The depth of the pilot hole ran about 110 feet beneath the bottom of the river, 20 feet deeper than the design profile. This allowed the USACE 60 feet minimum depth of cover at the edge of the water to be met, while keeping the exit angle lower. In general, ground conditions were favorable for a 4,000-foot HDD, even though there was one difficult area of geology



Pipe was staged in 720-foot sections



Fusible PVC® pipe entry pit during installation

## To minimize impact to the surrounding area, a trenchless method was selected for the project

that they worked through. After the pilot drill, the borehole was increased in size to 26-inches using a single pre-ream pass, which also took about two weeks to complete. A final swab pass cleaned out the finished borehole and it was ready for the pipe installation.

As the drilling and reaming passes were being completed, Underground Solutions performed the thermal butt-fusion services to assemble the Fusible PVC® pipe. Underground Solutions worked side by side with Gabe's to maintain the



The Fusible PVC® pipe supported on rollers along the alignment

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*Successful completion of the crossing*

schedule. Due to the project site and pipe layout constraints, the 16-inch Fusible PVC® pipe was staged in 720-foot sections and five intermediate fusion joints would be performed during the pipe installation in the borehole.

From start to finish, the installation process took about 11 hours. Water ballasting of the pipe (filling the pipe with water to counteract the buoyant forces of the pipe in the borehole) was utilized after the third intermediate fusion joint. Ballasting was not required per specification, but strongly suggested by pipe manufacturer based on pullback calculations. This process reduced drag generated by frictional force between the pipe and the borehole wall and lowered pullback forces from 104,000 pounds to 64,000 pounds, compared to a safe allowable pull force for the 16-inch DR 14 Fusible PVC® pipe of 176,600 lbs. A total of 18,000 gallons of water was used for the ballasting.

After the installation was complete, a pressure test was performed and the pipe passed all inspection requirements. Standard mechanical-joint fittings and PVC restrainer glands were

used to make the final connections on either side of the HDD installation.

The new force main was completed on April 13, 2019 and became operational on June 6, 2019. This highly visible project required coordination of several municipalities and property owners to provide the necessary space for the contractor to complete their operations and provide the system owners with accurate estimates for budgeting. Early communication with those involved and bringing in contractors to review the operations were essential to keeping everyone informed of the schedule and potential impacts from construction. A successful crossing was completed with the efforts of all parties and a new, appropriately sized force main is now in place to serve the residents.

Fusible PVC® has been used to complete many long, deep and high-risk HDD crossings for satisfied clients across the United States. This project, which provided a fully restrained, gasketless, leak-free piping product that will serve the Grand Haven-Spring Lake Sewer Authority for years to come, is another example of the benefit of Fusible PVC® pipe to the water and wastewater community. †

**ABOUT THE AUTHOR:**



*John Kosiur is Vice President of Sales, Eastern Region for Underground Solutions and is based out of Macomb, Michigan. John has 25 years of experience in underground construction and the municipal water industry. His construction background includes proficiency in both directional drilling and pipe bursting. He has worked in municipal waterworks sales for the last 7 years, most recently covering the southeastern Michigan market.*



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