Perspectives for Success in Bypass Pumping

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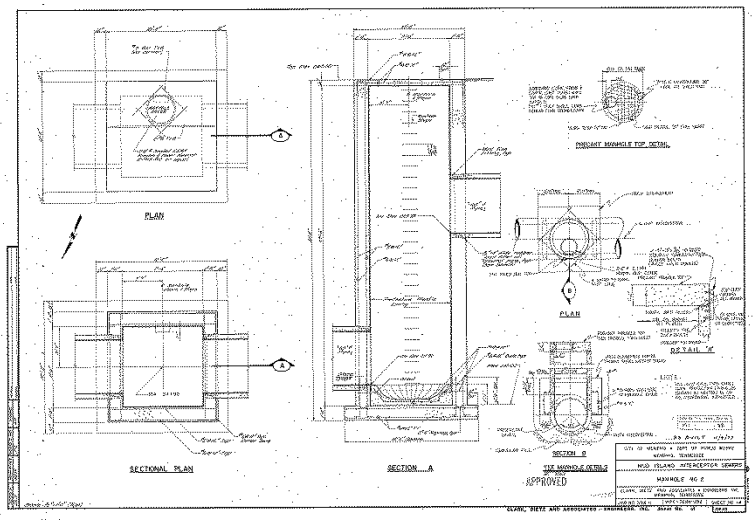
The City of Memphis, Tennessee, like all major cities across the U.S., is faced with aging infrastructure that requires constant attention and proactive initiatives for upgrades and rehabilitation. In September 2012, the United States Environmental Protection Agency and the Tennessee Department of Environment and Conservation issued a Consent Decree to the City requiring the implementation of an "investigation and rehabilitation program" with the objective to eliminate sanitary sewer overflows (SSOs). To address the Consent Decree requirements, the City implemented the Sewer Assessment and Rehab Program (SARP10) to proactively work through the critical projects in and around the greater Memphis area. Black & Veatch was chosen as the Program Manager and Overland Contracting, Inc. (Overland) was chosen as the Construction Manager. Black & Veatch, Overland and the City identified the Mud Island Interceptor and Manhole Rehab project as a priority on the list. This job required the rehabilitation of a 35-year-old monolithic reinforced 60-inch diameter concrete sanitary sewer pipe– that served as a critical trunk line for the City's sewer network. The entire 3,500-linear foot length of the 60-inch diameter pipe needed to be upgraded along with 24- and 36-inch diameter laterals. A bypass pumping operation would have to be put in place in order to access all three lines during the rehabilitation project.

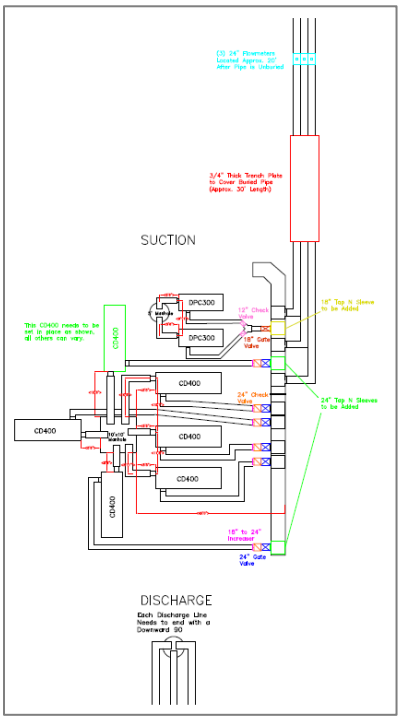
Insituform Technologies, LLC (Insituform), a subsidiary of Aegion Corporation, with its cured-in place pipe (CIPP) solution, was chosen for the SARP10 Mud Island project. Insituform was contracted by, and worked closely with, Overland to build the project. Insituform needed a bypass pumping partner to handle all aspects of the bypass – from upfront design and ground preparation, to installation and 24-hour pump watch duty once the bypass was up and running. Insituform chose to contract the bypass pumping activities of the project to Xylem due to their bypass pumping expertise and the unique solution that they proposed. This unique solution resulted in significant cost savings for the City.

Outside-the-box thinking

The 60-inch sanitary sewer line to be rehabilitated ran off of a 30-foot deep drop structure. Insituform initially expected that the bypass would need to start upstream from the drop structure, tap into the upstream line and bypass it along with the entire length of 60-inch pipe. This was estimated to be a very costly part of the bypass. The unique design had the bypass starting from within the 30-foot deep 60-

inch drop structure – with the suction point directly in the structure – eliminating the need for the costly upstream tap. This unique solution helped save the City over $100,000.





Bypass pumping at its best

In order to handle the 47.5 million gallons per day of flow, six Godwin diesel-driven critically silenced CD400M pumps, and four diesel-driven critically silenced DPC300 pumps were used. Five of the CD400M pumps were set up to draw suction from the 30-foot deep drop structure, and the sixth CD400M pump was a redundant back-up should any of the other pumps fail. A 60-inch sewer plug was installed at the drop structure exit with a ½ inch steel plate above the plug to help keep it secure. The CD400M pumps utilized five 18-inch high-density polyethylene (HDPE) suction pipes that entered through a hole cut in the concrete at the top. They were set into the drop structure and were cut with a 40° chamfer on the ends, so they could support their own weight yet still have open pipe exposed for suction. The discharge was into a 48-inch manifold with check valves and gate valves for directional flow only. The manifold then discharged into three lines of 24-inch HDPE pipe that ran approximately 3,500 linear feet along a greenway to the discharge structure at the Wolf River siphon. Two of the DPC300 pumps were used on the 24-inch lateral line and were connected to the manifold. The two other DPC300 pumps were connected to the 36-inch lateral and had discharge lines of 24-inch HDPE pipe that ran directly to the discharge point.

The manifold with discharge pipes, which would travel to the discharge point, 3,500 feet away.

The bypass system utilized Field Smart Technology (FST) to monitor pump engine operating parameters such as hours, speed, engine temperature, and fuel consumption, as well as pump parameters such as suction and discharge pressure. The data was communicated via cellular and satellite networks back to the City of Memphis and Xylem personnel, to ensure optimum pump performance. MJK flow meters were also installed to monitor flow rates to assess system efficiency and capabilities.

In addition to providing turnkey site excavation, construction and bypass setup, 24/7 system monitoring and pump watch duty was provided while the bypass was online. The bypass took three weeks Xylem to install and it ran for four weeks while Insituform installed the 60-inch CIPP solution. When the Insituform team rehabilitated the 400 linear feet of 24-inch diameter CIPP, the bypass pumps were again fired up.

The bank of diesel-driven critically silenced CD400M pumps, in place for the Mud Island bypass.