Bypass Averts Christmas Crisis

A sinkhole interrupted critical sewer flows and cut off access to a subdivision of 23 homes, where all residents were evacuated on Christmas Eve day, 2016.

Repair of the damaged 11-ft-dia sewer interceptor involved over a mile of 48-in. and 54-in. piping and eight large vertical turbine trash pumps.

On Christmas Eve in 2016, a sinkhole brought a sudden crisis to the Detroit suburb of Fraser, Mich. The opening, measuring some 300 ft long and 60 ft wide, developed on a major road when an 11-ft-dia sewer interceptor collapsed. The interceptor, which was installed 60 ft below grade, carried sewage for more than 500,000 people, 40,000-plus businesses and a military base.

"The sinkhole not only interrupted critical sewer flows but also cut off access to a subdivision of 23 homes, all of which had to be evacuated on Christmas Eve day," says Gino Mersino, president of Mersino Dewatering.

With snow and rain falling, 13 million gallons of raw sewage was diverted into the Clinton River, which flows into the Great Lakes, as construction crews raced to install an intermediate bypass for the interceptor. Ongoing heavy rains kept SCADA operators and emergency crews spending many sleepless nights diverting sewage from one interceptor to another—and taking the county's storage capacity right to its max.

The initial emergency and intermediate pumps and piping became the foundation for a long-term bypass solution, a system of seven 250 HP pumps, one 500 HP pump and 1.25 miles of piping. All eight pumps were designed and installed to fit within an area less than 100 sq ft in order to meet the very limited access areas available along the interceptor's path.

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>
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PHOTOS: COURTESY OF MERSINO

A Thousand Gallons per Second

All eight of the pumps, running at full capacity, were capable of sending 150 cu ft of sewage per second downstream of the collapsed portion of the interceptor, where it continued on to the wastewater treatment facility in Detroit. "That's 1,000 gallons per second," Mersino says. "This bypass pumping system is unique because of the depth of the sewer, the flow rates required for bypassing and the construction limitations."

Construction of the long-term bypass was completed last April, though small tweaks to the system were made since then to ensure optimal performance. The bypass diverts the sewage around the collapsed sewer interceptor and starts by lifting the sewage up from 60 ft underground, crosses three major roads and snakes around the sinkhole repair shaft, then freefalls 60 ft back into the interceptor pipe downstream.

Resolving Ragging

The emergency repair project overcame a number of critical obstacles. One of the biggest challenges was contending with the amount of "ragging" experienced at the pumping system. Ragging occurs when items like disposable wipes, paper towels and other non-biodegradable items are introduced into the sewer system. Such items tend to twist together, forming long, rope-like slugs of waste that wrap around the strainer basket or the impeller of a pump, impeding flow and potentially damaging the system.

With the cutting-edge controls systems installed to manage the long-term bypass, Mersino was able to collect data in real time to monitor the performance of each pump and communicate that information to the county SCADA system for 24/7 observation from remote locations. This observation allowed operators to witness how and when ragging effected a pump. To combat the ragging, Mersino installed screens to catch the ragging materials—screens that must be manually cleaned as often as every hour during a rain. "The larger 500 HP vertical turbine pump, with a 24-in. column pipe, was installed ahead of the second of the two temporary screens, with a suction intake facing upstream to collect suspended rag-like solids before they were delivered to the seven pumps in the temporary pump station," Mersino says. The 24-in. pump is fitted with a set of chopper blades fabricated specifically to counteract the ragging concern. These blades played a major role in the successful operation of the long-term bypass and ensured the project's completion on time and without the need to perform further emergency discharges into the Clinton River. ◆

The critical nature of the project required personnel on site 24/7 from Christmas Eve until mid-October when substantial completion of the repairs was achieved.

Featuring 1.25 miles of pipes, eight massive pumps, and high-tech communication and telemetry software, construction crews maintained normal interceptor flow, preventing raw sewage from being discharged into the Great Lakes.

Mersino diligently constructed eight vertical turbine pumps suspended into the 60-ft-deep, 11-ft-dia interceptor pipe.

PHOTOS: COURTESY OF MERSINO


RAYMOND