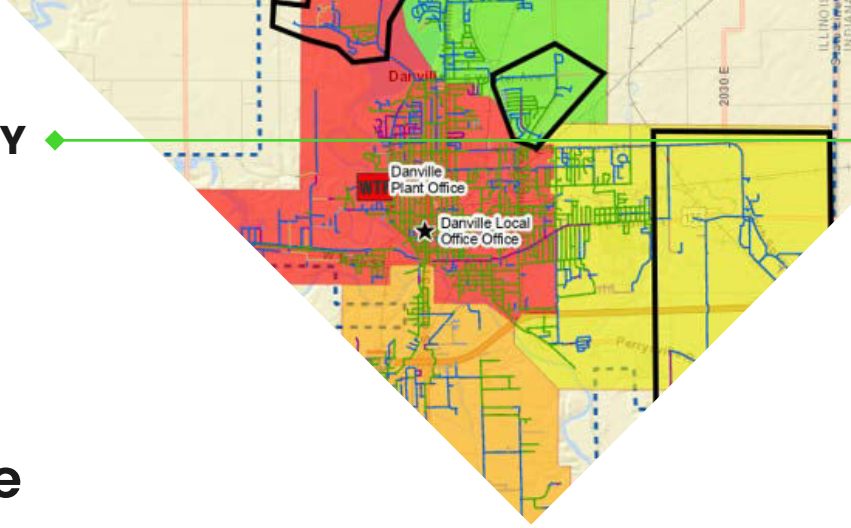
Bentley
Advancing Infrastructure

CASE STUDY



AQUA Relies on Hydraulic Modeling to Assist During Illinois Emergency Outage

Leveraging OpenFlows™ Water Accelerated the Recovery Schedule and Reduced Impacted Customers by 90%

THE DANVILLE DEEP FREEZE

AQUA, the owner and operator of over 1,700 public water and wastewater systems across their eight-state platform, provides drinking water to approximately 3 million people and wastewater service to about 250,000. Their Illinois branch serves a total of 280,000 people spanning 14 counties, with about 20,000 connections alone in the city of Danville. In January 2024, the city experienced a deep freeze that impacted the treatment plant and, subsequently, the water service throughout the distribution system that produces an average of 6 million gallons of water a day. Rain caused increased water flows and turbidity at Lake Vermillion, Danville's water source, which was immediately followed by extreme cold temperatures. The combination of conditions severely strained AQUA's treatment facility and damaged equipment, requiring them to operate at a lower production level.

Committed to providing safe and reliable services and minimizing the number of customers impacted by the emergency, AQUA implemented digitalization efforts to facilitate effective communication with regulatory officials and the community and propose a timely recovery plan. The project included performing hydraulic modeling to provide reasonable estimates for when normal water service was going to be resumed so that families and businesses could plan accordingly. "The objective of the project was to implement real-time modeling using the previously calibrated hydraulic model and 'semi-live' system data through the supervisory control and data acquisition (SCADA) system," said Elizabeth Loughnane, senior hydraulic modeling and planning engineer at AQUA.

A NEED FOR OPERATIONAL INSIGHT AND COMMUNICATION

With AQUA's hydraulic modeling and planning group in their corporate engineering department located in Pennsylvania, more than 600 miles from the emergency event, going digital was key to support the local Danville operations team. The corporate team needed to have the same operational insight as the local team on site to effectively issue water boil advisories and to develop and communicate a timely recovery plan for reinstated service. "Communications were a pinch point that needed to be addressed [...] It was integral to get a communication plan together between local operations, my corporate team, and the outward community," Loughnane said.

To ensure that accurate network information was timely communicated, it was vital to have a digital model for real-time evaluation and insight into the water system to identify damaged equipment and compromised areas. One of the biggest challenges that AQUA faced was communicating system operations over the course of the event. They wanted to develop procedures to remotely and regularly transfer operational data between the corporate engineering team and local operations staff. AQUA realized that they needed a hydraulic modeling solution to generate a digital representation of the system. "This was crucial to get insights to parts of the system where there is no data logging and save the [local] operations team from needing to continually survey the system," Loughnane said.

LEVERAGING OPENFLOWS WATER FOR HYDRAULIC MODELING

AQUA selected OpenFlows Water to perform hydraulic modeling and generate a virtual replica of the entire system. Working in an open, real-time modeling environment streamlined information sharing between the dispersed engineering and operations teams to accurately identify the impacted areas, make data-driven decisions, and forecast

PROJECT SUMMARY

ORGANIZATION
AQUA

SOLUTION
Water and Wastewater

LOCATION
Danville, Illinois, United States

PROJECT OBJECTIVES
- To implement hydraulic modeling for real-time operational insight.
- To minimize customer impact during emergency outage and accelerate creation of a recovery plan.

PROJECT PLAYBOOK
OpenFlows Water

FAST FACTS

- The Danville deep freeze in January 2024 impacted water service to city residents.
- AQUA relied on hydraulic modeling to assist with communications and the recovery plan during the emergency outage.
- They used OpenFlows Water to create a digital replica of the entire system, providing real-time insight into network operations.

ROI

- Hydraulic modeling enabled AQUA to reduce customers under boil water advisories by 90%.

> "The approach to use Bentley software during this outage was the most efficient way to identify the impacted areas and forecast the recovery."
>
> *– Elizabeth Loughnane, Senior Hydraulic Modeling and Planning Engineer, AQUA*

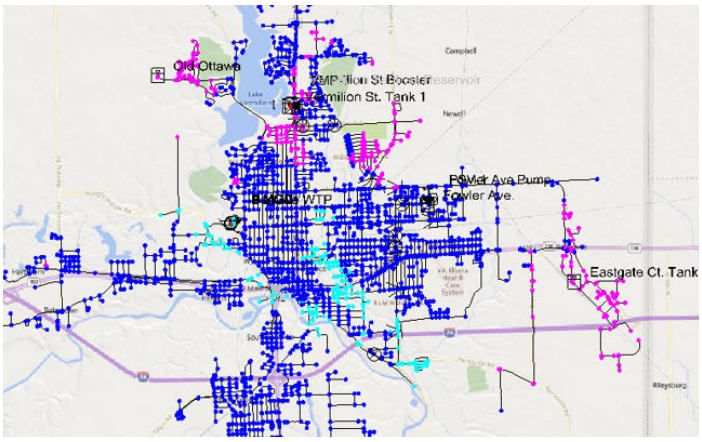
a recovery plan. The digital representation served a dual purpose. "First, it allowed us to denote areas of the system that dropped under the required 20 pounds per square inch; and secondly, the hydraulic model was key in creating the recovery plan," Loughnane said.

Based on the hydraulic model, AQUA had real-time, accurate insight into network performance to strategically communicate and provide support to the community, local authorities, and regulators. "We [were able to] check in on a regular frequency three times a day to discuss operational changes and run the model for forecasted results," Loughnane said. Bentley's OpenFlows application was crucial during the emergency outage to notify customers of the extent of damage and where the necessary steps could be taken to ensure their water was clean and safe to use. The model facilitated collaboration with the Illinois Department of Environmental Protection to develop and execute a timely and effective recovery plan, supporting a structured timeline and process for returning to normal operations.

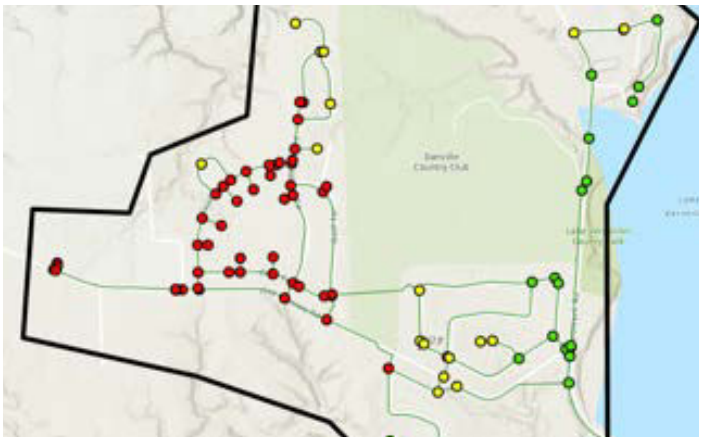
DIGITALIZATION OPTIMIZES EMERGENCY RESPONSE AND SUPPORTS RESILIENCY

Developing a hydraulic model using OpenFlows was the most efficient way to identify the impacted areas and forecast the recovery, optimizing AQUA's emergency response. The model delineated the boil water advisory areas at the click of a button rather than requiring field staff to conduct pressure surveys on the system. "It allowed us to create smaller boil water advisory areas and bring the number of affected customers down from 20,000 to only 2,076," Loughnane said. Utilizing the hydraulic model, AQUA was also able to determine how long it would take to get the tanks back to their normal operating levels. They used that information to communicate a timeline to regulators and the public, positively impacting those relationships and advancing the recovery schedule. "We estimate the model approach accelerated the recovery schedule by a few days and reduced downtime, consequently," Loughnane said.

The project has become an example of what emergency response can look like for AQUA's other 1,700 systems, mitigating the costs of traditional response efforts. Moreover, hydraulic modeling can be used to detect asset conditions and ensure the network can handle an asset failure. While AQUA has always reaped benefits through hydraulic modeling, these typically have been related to capital planning, growth, and building business. This project proved that hydraulic modeling provides vital operational and asset insights to specifically address emergencies and asset health. "One of the biggest takeaways from this project is the consideration of resiliency in the system," Loughnane said.



AQUA used OpenFlows Water to create a digital replica of the entire system, providing real-time insight into network operations.



AQUA relied on hydraulic modeling to assist with communications and the recovery plan during the emergency outage.