

# HARNESSING DATA FOR SMARTER WASTEWATER MANAGEMENT: GLWA'S INTERCEPTOR HYDRAULIC VIEWER

BY IMAD SALIM AND DAVID MCCORD

The Great Lakes Water Authority (GLWA) manages one of the most complex and extensive wastewater collection and treatment systems in the world. Spanning approximately 950 square miles across Macomb, Oakland and Wayne counties in Michigan, the system is the backbone of water quality protection in the Detroit metropolitan area and beyond. Its infrastructure is vast: a water resources recovery facility (WRRF) with a firm treatment capacity of 1,700 million gallons per day (MGD), four large interceptors, major trunk sewers, nine sewage pump stations, 13 inflatable dams and nine combined sewer treatment facilities. Together, these assets serve 79 communities and protect both the Detroit and Rouge rivers from untreated discharges.

## GLWA by the Numbers

- 950 square miles: Service area
- 1,700 MGD: WRRF firm treatment capacity
- 18: Member Partner communities served
- 9: Sewage pump stations
- 13: Inflatable dams
- 9: Combined sewer treatment facilities
- 62: Combined sewer outfalls to the Detroit and Rouge Rivers

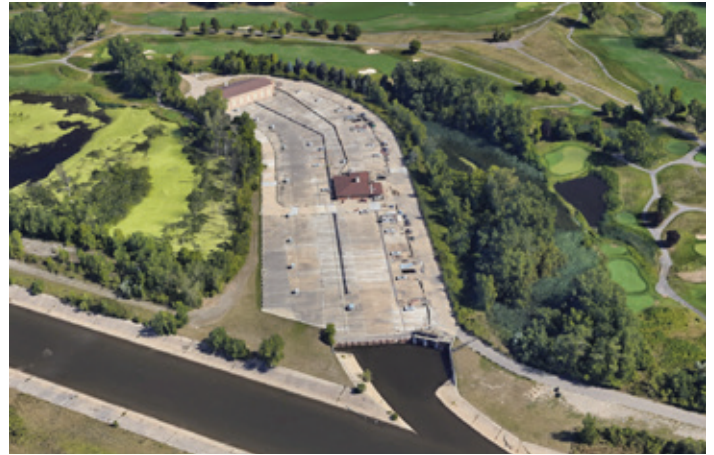
What makes GLWA's system particularly challenging to manage is not only its size, but also the highly variable flows driven by wet weather. The collection system includes 62 combined sewer outfalls (CSOs) to the Detroit and Rouge rivers. During rainfall events, volumes can surge dramatically, forcing operators to make rapid decisions to balance public health, environmental protection and infrastructure capacity. Doing this efficiently requires not just physical infrastructure, but a powerful information backbone.

## The Role of SCADA in Modern Wastewater Management

To meet this challenge, GLWA operates a robust Supervisory Control and Data Acquisition (SCADA) system. This network gathers data from hundreds of sensors spread across the region: sewer level monitors, wet well gauges, river level sensors, flow meters, valve and gate position indicators, pump status monitors, and inclinometers for backwater gates. Rainfall is tracked through a network of gauges and enhanced with gauge-adjusted radar rainfall estimates to better capture spatial variability in storms.



Conner Sewage Pump Station. Courtesy of GLWA



Hubbell Southfield Combined Sewer Treatment Facility. Courtesy of GLWA



City of Detroit Combined Sewer System and Outfalls. Courtesy of GLWA

All these data streams feed continuously into GLWA's Ovation database. By design, the system provides operators with a real-time picture of how water is moving through the collection system, how much capacity remains in interceptors, and whether critical assets such as pumps, inflatable dams or diversion gates are operating properly. Yet, as valuable as raw data is, information overload can be a real barrier. The challenge is not just collecting numbers but making them meaningful for real-time decision-making.

## From Data to Insight: The Hydraulic Viewer

Recognizing this, GLWA developed an innovative Hydraulic Viewer tailored specifically for the Detroit River Interceptor (DRI) and the Oakwood Interceptor (OI), two of the most important conveyance systems feeding the WRRF. The Hydraulic Viewer integrates data from multiple SCADA elements and presents them in a dynamic, visual interface.

At a glance, operators can see:

- Water levels in interceptors and trunk sewers
- River stages for the Detroit and Rouge rivers
- Pump station wet well elevations and flows
- Rainfall intensity and distribution
- Backwater gate positions and outfall activation status

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This holistic view allows staff to quickly assess how upstream and downstream conditions interact. For example, a rise in river levels can back up the collection system, affecting the ability to store or convey wet weather flows. Similarly, the status of WRRF pump stations directly influences the performance of tributary sewers and CSO facilities. By displaying all this information together, the Hydraulic Viewer makes system performance transparent not only to operations staff, but also to engineers and regulatory partners.

### Intelligent Outfall Monitoring

One of the most powerful features of the Hydraulic Viewer is its ability to analyze whether a combined sewer outfall is actively discharging. It does this by comparing real-time chamber levels against diversion weir crest elevations, river levels and gate statuses. Every time step (whether one minute, five minutes, or more) is checked, providing operators with a precise timeline of outfall activity.

This analysis is critical for compliance with Michigan Department of Environment, Great Lakes, and Energy (EGLE) regulations. CSO discharges are strictly monitored, and accurate reporting is essential. But beyond compliance, knowing exactly when and where discharges occur helps GLWA optimize use of its nine CSO treatment facilities.

For example, if interceptor capacity is exhausted during a storm, flows must be diverted to treatment basins. The Hydraulic Viewer helps operators identify these moments in real time and coordinate with WRRF operations. After the event, when interceptor capacity is restored, the Hydraulic Viewer also supports decisions about when to initiate dewatering of stored flows back into the system. This coordinated approach ensures maximum use of treatment assets, reducing untreated discharges to the rivers.

### Real-Time and Post-Event Applications

The Hydraulic Viewer is designed for both real-time operations and retrospective analysis. During active rainfall events, operators can watch conditions evolve minute by minute. This situational awareness is invaluable during fast-moving storms, where timely decisions can mean the difference between protecting or overwhelming parts of the system.

Equally important, the tool can pull historical data from Ovation (data historian) for any specified period. Engineers and operators can replay past events, studying how the system responded and identifying opportunities for improvement. Was a particular interceptor underutilized? Did pump stations respond as expected? Could coordination between facilities be improved? By answering these questions, the Hydraulic Viewer becomes not only a real-time operational tool but also a driver of long-term system optimization.

### Accessibility and Future Development

One key design choice was to build the Hydraulic Viewer within the Microsoft Excel environment. While this may sound surprising for such a sophisticated application, the decision was intentional. Excel is already widely used across GLWA teams, making the Hydraulic Viewer accessible without specialized training or expensive proprietary software. The familiar platform also simplifies future enhancements. As operational needs evolve, new data sources, analytical routines or visualization features can be integrated into the existing framework.

This accessibility ensures that the Hydraulic Viewer is not siloed within a single department. Operations staff, engineers and planners can all use the same tool, fostering collaboration and a shared understanding of system performance.

### A Model for the Future

The scale of GLWA's wastewater system is matched only by the complexity of managing it. Few utilities worldwide deal with the same combination of massive infrastructure, variable wet weather flows and stringent environmental regulations. By leveraging SCADA data through the Hydraulic Viewer, GLWA is pioneering a model of data-driven wastewater management that other agencies can learn from.

As climate change brings more intense and unpredictable storms, the importance of real-time information and real-time operational decision-making will only grow. Tools like the Hydraulic Viewer not only help utilities respond in the moment, but also provide the insight needed to plan investments, adapt operations and safeguard water quality for future generations.

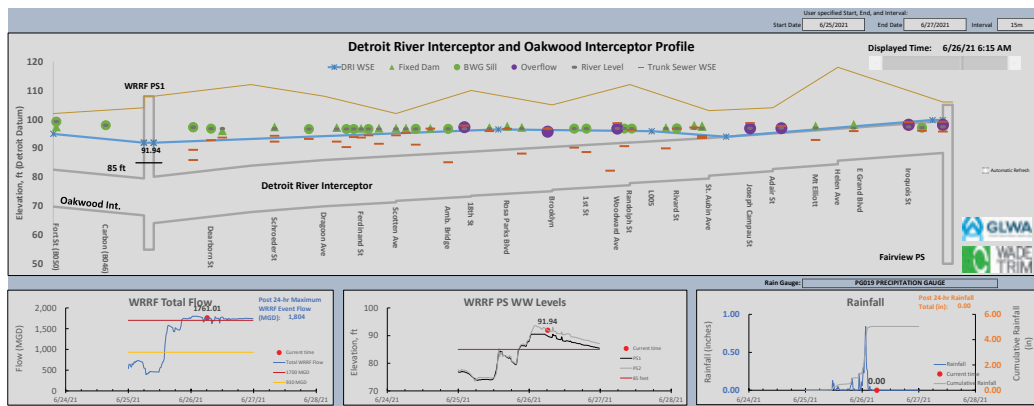
### Conclusion

The GLWA's collection and treatment system is one of the largest in the world, and managing it requires more than pipes and pumps; it requires intelligence. The Hydraulic Viewer transforms raw SCADA data into actionable information, enabling operators to protect public health and the environment, comply with regulations, and make the best use of existing infrastructure.

By combining real-time situational awareness with powerful post-event analysis, and by making the tool accessible across teams, GLWA has created a system that is both practical and forward-looking. In doing so, it is setting a standard for how large utilities can harness data to manage water responsibly in the 21st century.

**Looking Ahead: Vision for Expanding the Hydraulic Viewer**

1. Integration with predictive rainfall modeling.
2. Use of machine learning for real-time decision support.
3. Potential to scale across the full collection system beyond the DRI and OI.
4. Leverage the Hydraulic Viewer as part of the Regional Operating Plan (ROP) and post event dewatering of Member Partner RTBs, Equalization Basins, and storage facilities.



By transforming raw SCADA data into actionable information, the Hydraulic Viewer gives GLWA the insight to protect public health and the environment in real time. Courtesy of GLWA

*Imad Salim, PhD, PE, is a senior project manager with Wade Trim Associates who may be reached at ISalim@wadetrim.com. David McCord is the director of Conveyance - Wastewater with the Great Lakes Water Authority who may be reached at david.mccord@glwater.org.*