Ed Hogan, PE
Dave Nitz, PE

GLWA Board of Directors Meeting

November 18, 2021

June and July 2021 Post Event Analysis - Recommendations

Agenda

1) Review of the Investigation and Findings
2) Recommendations
    1) Short Term
    2) Medium Term
    3) Long Term
3) Local Systems and Private Property
4) Key Takeaways and Most Impactful Actions
5) Questions

Preliminary, subject to further investigation and analysis

Review of the Investigation & Findings

Wade Trim's Investigative Work

Focus: Entire GLWA Collection System

- Conducted a regional system-wide storm response investigation and event reconstruction
- Interviewed operations, maintenance and supervisory personnel
- Collected, reviewed, analyzed, and trended literally millions of data points
- Modeled, analyzed, and compared the as-operated and as-designed regional system responses

Brown and Caldwell's Investigative Work

Focus: Power and Pumping for East Side Collection System

Conners Creek, Freud, Fairview and Bluehill Pump Stations

- Conducted Pump Station Power Vulnerability Assessments
- Post Event Data Acquisition/Analyses
- Electrical Testing Coordination
- Power Load Analyses

Conducted Pump Station Operations Assessments

- Rain Event Operations Data Analyses
- GLWA Staff Interviews and Field Investigations
- Sewer Condition Assessments
- Wet Weather Event Observations and Troubleshooting

Preliminary, subject to further investigation and analysis

Review of the Investigation & Findings

Wade Trim's Primary Finding

The ***intensity and magnitude of rainfall*** that occurred on June 25-26, 2021 significantly exceeded the design level for the collection and treatment system and ***was the primary cause of water-in-basements***.

Brown and Caldwell's Primary Finding

Power supply reliability and quality are significant on-going vulnerabilities to the operations of Freud Pump Station and Bluehill Pump Station and the ***timing of PLD/DTE power supply conversion was a critical factor*** in the number of pumps available at Freud PS during the June event and at Bluehill PS in the July event.

Preliminary, subject to further investigation and analysis

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3) Local Systems and Private Property
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Preliminary, subject to further investigation and analysis

Recommendations

Short Term (2022)

a) Complete Conversion of Power Supply for Freud & Bluehill Pump Stations

b) Update In-System Storage Devices and Level Sensor Programs

c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements

d) Increase Staffing and Update Standard Operating Procedures

e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements

b) Evaluate Power and Pumping Requirements and Redundancy System-Wide

c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer

d) Continue to Improve System Management Through Staffing and Training

e) Add Grant Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

Preliminary, subject to further investigation and analysis

Short Term - Conversion of Power Supply

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

a) GLWA should work with PLD and DTE to accelerate, to the extent possible, the conversion of the Freud and Bluehill Pump Stations' power supply from PLD to DTE. This will greatly improve both power supply reliability and power quality, which have hindered the ability to pump as intended.

Preliminary, subject to further investigation and analysis

Short Term - Update ISD & LS Programs

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

b) GLWA should evaluate its programs related to the In-System Storage Devices and Level Sensors to ensure that the programs includes the following:
   - Additional devices and instruments to improve system operations.
   - Increased staffing to address the maintenance and calibration for the additional devices and instruments.
   - After event operational reviews
   - Operability in extreme events.

Preliminary, subject to further investigation and analysis

Short Term - Member Partner Discussions

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

c) GLWA should conduct Member Partner discussions:

- Fox Creek Enclosure -- with Wayne County and GLWA's east side Member Partners that are tributary to the Fox Creek Enclosure aimed at brainstorming solutions regarding the capacity limitations in the Fox Creek Enclosure.
- Local Systems -- with Member Partners aimed at brainstorming and information sharing regarding local system improvements and modifications related to prevention of water in basements.

Preliminary, subject to further investigation and analysis

Short Term - Staffing & SOPs

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

d) GLWA should improve its system management through:

- Increased number of operations and maintenance Team Members.
- Development of Standard Operating Procedures (SOPs) for extreme wet weather events and circumstances.
- Implementation of a more robust training program that includes system-wide operations and emergency response.
- Augmentation of after-event analyses to include more events, more analytical tools, and more diverse operations and maintenance team member participation.
- Improve emergency and regular communication regarding system operations.

Preliminary, subject to further investigation and analysis

Short Term - Initiate Flood Relief Study

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

e) GLWA should study the effects of exceedingly intense and/or large rain events (climate change) on its wastewater system. Specifically, GLWA should evaluate the ***costs and benefits*** of the following:

- Flood relief projects that would mitigate impacts of large rainfall events.
- Actions necessary to mitigate detrimental impact on the system due to rising river levels.

GLWA should seek grant funding for this type of study and/or the projects that are recommended as a result of it.

Preliminary, subject to further investigation and analysis

Medium Term - Evaluate Pump Stations

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

a) GLWA should evaluate its other pump stations to determine if flood mitigation measures could be implemented, including emergency overflow options, additional instrumentation and/or new emergency operational protocols.

Preliminary, subject to further investigation and analysis

Medium Term - Evaluate Power & Pumping

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) **Evaluate Power and Pumping Requirements and Redundancy System Wide**
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

b) GLWA should perform a comprehensive review of external power supply, internal power capabilities and flexibility, and firm capacities and operational targets, for all the following system-wide critical operational elements:

- Pump Stations
- CSO Treatment Facilities
- In-System Storage Devices
- Valve Remote Sites

Preliminary, subject to further investigation and analysis

Medium Term - Reduce Sediment Deposition

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

c) GLWA should evaluate the possibility of making structural or other engineering modifications to minimize the accumulation of sediment deposition in the Conner Creek triple barrel that is downstream of the forebay.

Preliminary, subject to further investigation and analysis

Medium Term - Continue Staffing & SOPs

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

d) GLWA should continue to improve its system management through:

- Increased number of operations and maintenance Team Members.
- Development of SOPs for extreme wet weather events and circumstances.
- Implementation of a more robust training program that includes system-wide operations and emergency response.
- Augmentation of after-event analyses to include more events, more analytical tools, and more diverse operations and maintenance team member participation.
- Improve emergency and regular communication regarding system operations.

Preliminary, subject to further investigation and analysis

Medium Term - Add Flood Projects to CIP

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

e) GLWA should study the effects of exceedingly intense and/or large rain events (climate change) on its wastewater system. Specifically, GLWA should evaluate the ***costs and benefits*** of the following:

- Flood relief projects that would mitigate impacts of large rainfall events
- Actions necessary to mitigate detrimental impact on the system due to rising river levels.

If funding is available, add projects to the GLWA Capital Improvement Plan

Preliminary, subject to further investigation and analysis

Long Term - Complete Pump Station Upgrades

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations
b) Update In-System Storage Devices and Level Sensor Programs
c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements
d) Increase Staffing and Update Standard Operating Procedures
e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

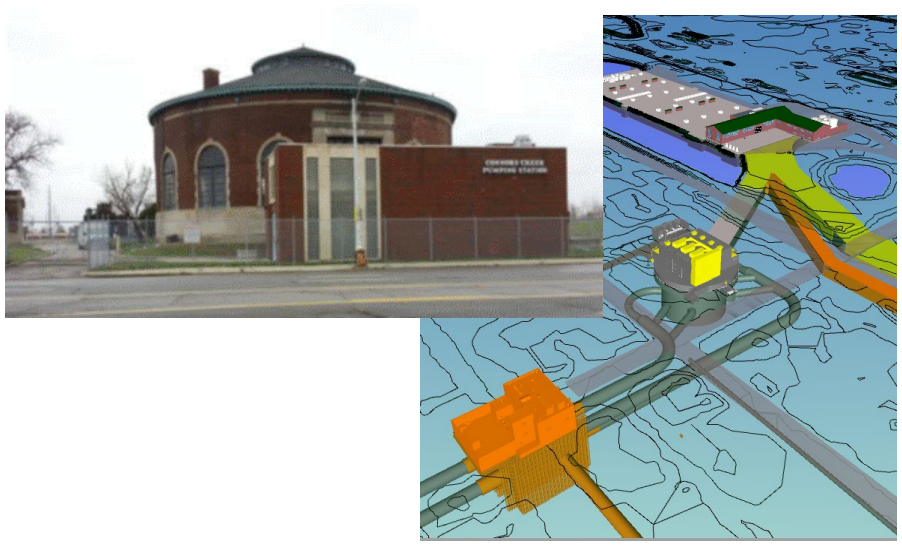
Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements
b) Evaluate Power and Pumping Requirements and Redundancy System Wide
c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer
d) Continue to Improve System Management Through Staffing and Training
e) Add Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

a) To the extent possible, GLWA should accelerate the completion of the Conners Creek and Freud Pump Stations improvements with a focus on:
   - Improving operational flexibility, including providing the ability to start storm pumps earlier and better manage in-system storage capacity.
   - Improving maintainability, including providing the ability to test storm pumps during dry weather.
   - Improving power resilience by providing robust power -supply, -distribution, and -standby systems to handle emergency scenarios .
   - Providing emergency flood relief discharge capabilities.
   - Consider providing additional emergency flood control pumping capacity and dewatering capabilities.



Preliminary, subject to further investigation and analysis

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1) Review of the Findings
2) Recommendations
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Local Systems and Private Property

It is important to note that the regional system works in conjunction with the local systems and the private property sewer assets. The pipes are all connected and if one element of the system is not functioning or not prepared for extreme weather, flooding can and will occur.

Local Systems

Many local systems may have experienced similar exacerbating circumstances as GLWA. Additionally, local systems are prone to sewer misalignments, obstructed lateral sewers, inflow and infiltration, and competition for capacity in the local and regional systems.

Private Property

On private property the sewer leads (from the home to the local sewer) are prone to misalignments, obstructions due to root intrusion, clogged drains within the house, and downspouts which connect the roof drainage directly to the sewer lead, which may cause the pipes to become overwhelmed and back up into basements.

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Key Takeaways and Most Impactful Actions

Short Term (2022)

a) Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations

b) Update In-System Storage Devices and Level Sensor Programs

c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements

d) Increase Staffing and Update Standard Operating Procedures

e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements

b) Evaluate Power and Pumping Requirements and Redundancy System Wide

c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer

d) Continue to Improve System Management Through Staffing and Training

e) Add Grant Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) Complete the Freud and Conners Creek Pump Station Improvements

Preliminary, subject to further investigation and analysis

Key Takeaways and Most Impactful Actions

Short Term (2022)

a) **Complete Conversion of Power Supply for the Freud & Bluehill Pump Stations**

b) Update In-System Storage Devices and Level Sensor Programs

c) Conduct Member Partner Discussions of Fox Creek Enclosure & Local System Improvements

d) **Increase Staffing and Update Standard Operating Procedures**

e) Initiate Study of Measures for Flood Relief and High River Levels and Seek Grant Funding

Medium Term (2023-2025)

a) Evaluate Other Pump Stations for Flood Mitigation Improvements

b) **Evaluate Power and Pumping Requirements and Redundancy System Wide**

c) Evaluate Measures to Reduce Sediment Deposition in Conner Sewer

d) **Continue to Improve System Management Through Staffing and Training**

e) Add Grant Funded Flood Mitigation and High River Level Projects to the CIP

Long Term (Post 2025)

a) **Complete the Freud and Conners Creek Pump Station Improvements**

Preliminary, subject to further investigation and analysis

Thank you,

Questions?