

Independent Assessment of Extreme Rainfall Events

# Conclusions and Recommendations

Great Lakes Water Authority Board of Directors

June 22, 2022

# Introductions



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## Independent Panel Members

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- Salil Kharkar, P.E., CMRP, DC Water, Senior Technical Advisor to Chief Operating Officer
- Melanie Kueber Watkins, Ph.D., P.E. Michigan Technological University, Flooding and System Modeling
- Johanna Mathieu, Ph.D., University of Michigan, Electrical and Controls

## Conclusions

# June 25/26 Rainfall Event

- The intensity of the rainfall far exceeded the designed capacity of the wastewater system and, as a result, some level of both surface flooding and basement backup was unavoidable.
- Operational problems during the storm event likely exacerbated flooding and basement backup:
  - Electrical supply issues at Freud PS prevented all pumps from operating
  - Vacuum priming system problems at Connors Creek PS delayed pump starts
  - Voltage out-of-range at Bluehill PS prevented all storm pumps from operating
- An analysis of risk of basement backup did not show an appreciable reduction in risk should everything had worked as intended.
- Contract limit exceedances that occurred during the June 25/26, 2021 event did not significantly affect basement backup flooding.
- The above suggests that conveyance capacity in the collection system, not pumping, was the primary cause of flood risk and additional pumping capacity would not have appreciably reduced the risk of basement backups. Rather, a strategic assessment of conveyance improvements, inlet controls and in-system storage is warranted



## Conclusions

# July 16 Rainfall Event

- While smaller than the June 25/26 event, the intensity of the rainfall exceeded the designed capacity of the wastewater system in some areas and, in those areas, basement backups were reported.
- The Connors Creek PS and Freud PS operated as intended despite some power quality issues at Freud and no surface flooding was observed. Despite this, numerous basement backups were reported in Jefferson Chalmers suggesting local conveyance issues/restrictions may be present.
- Power quality issues at the Bluehill PS delayed the necessary starting of storm pumps which resulted in high water levels in the station and likely surcharge of the local upstream collection system.

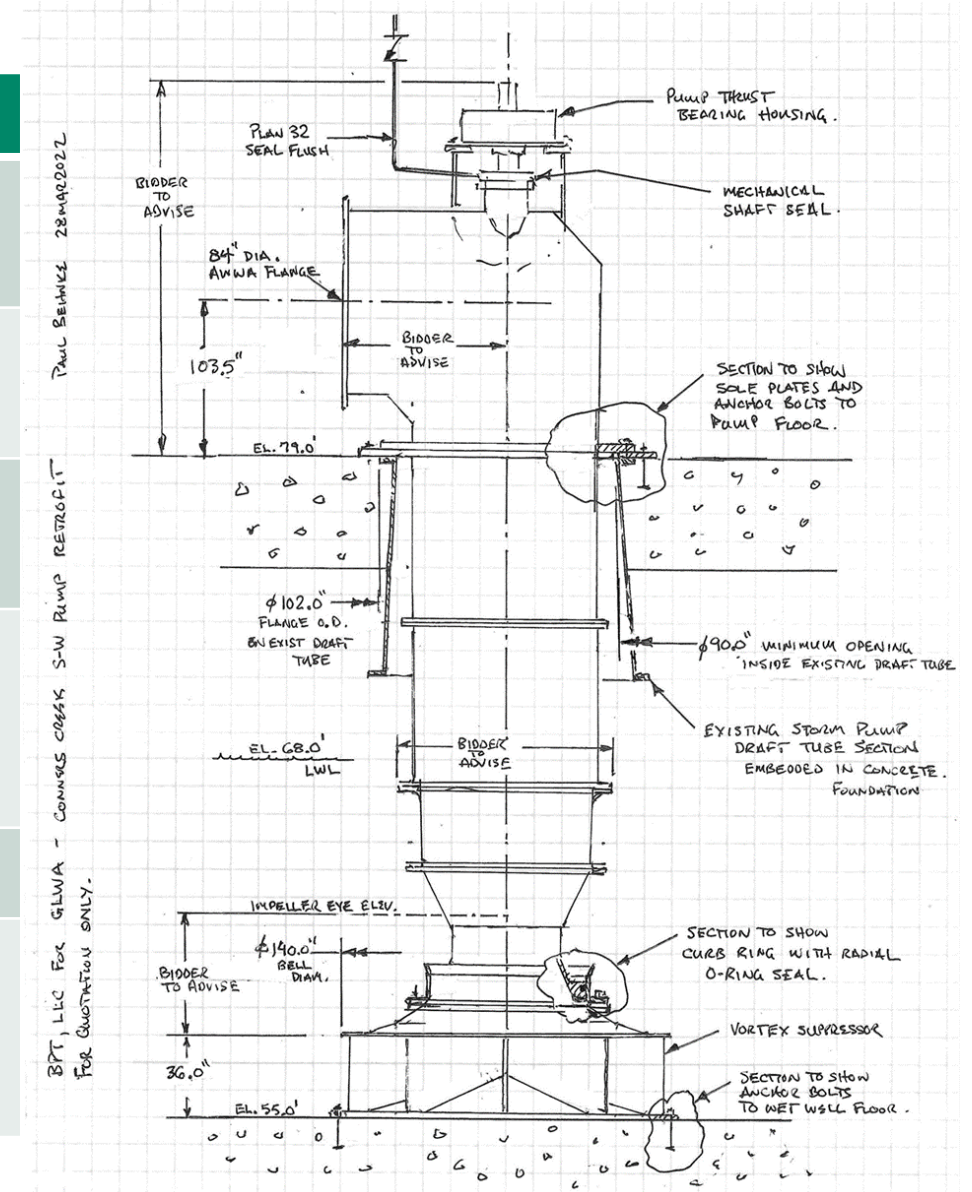


Short Term (approximately 12 to 18 months)	
<b>General (4.1.1)</b>	Take measures to reduce basement backups. Maintain a level of service of at least 14 of 16 storm pumps at Connors Creek and Freud PS and at least 3 of 4 storm pumps at Bluehill PS. Be ready for extreme storms at all times not just when predicted.
<b>PS (4.1.2)</b>	Conduct tests on vacuum priming system and pump starting at Connors Creek PS to improve system reliability and to provide operator training opportunities. Develop, improve and document operational measures. Regularly use Connors Creek PS in wet weather and maintain the vacuum priming systems after a large storm events to improve system readiness and enhance operator training.
<b>Electrical Systems (4.1.3)</b>	Transfer power sources to DTE. Provide capability for emergency generators to be connected to any section of the switchgear to enable generators to power any group of pumps. Develop protocols to operate generators at no-load prior to expected events to enable the pumps to be quickly switched to generator power if there is an outage.
<b>Mechanical Systems (4.1.4)</b>	Make improvements to seal water and vacuum priming systems. Keep the Connors Creek storage gates and relief gates at the CSO Basins in good working order.





Medium Term (approximately 2 to 5 years)		
General (4.2.1)	Define level of service objectives with respect to flooding and water quality and implications of water quality requirements. Investigate how those objectives have been achieved previously.	
PS (4.2.2)	Implement modifications to the “Freud Pump Station Improvements – DRAFT” report prepared by Arcadis/Brown and Caldwell for GLWA project number CS-120 in August 2020	
Electrical Systems (4.2.3)	Provide for a policy for redundant PS power sources and perform studies to understand existing and potential power source redundancy.	
Mechanical Systems (4.2.4)	Implement intake flow conditioning devices at Connors Creek PS and Freud PS wet wells based on testing and recommendations from the February 2018 Clemson Engineering Hydraulics, Inc. study. Also, replace two storm pumps with vertically suspended pumps at Connors Creek PS. Expand and improve the Connors Creek PS seal water system.	\$16M for IFC devices \$19.5M for VS3i pumps
Operational Measures (4.2.5)	Operate and inspect IFC devices. Regularly clean the Connors Creek Storm wet well and IFC devices.	
Additional Investigation/Studies (4.2.6)	Review existing studies with consideration of flooding and water quality objectives. Conduct additional studies to understand flooding and water quality level of service and optimize system operations using “real-time” data. Consider different operating procedures for extreme storms that maximizes conveyance but may increase CSOs.	

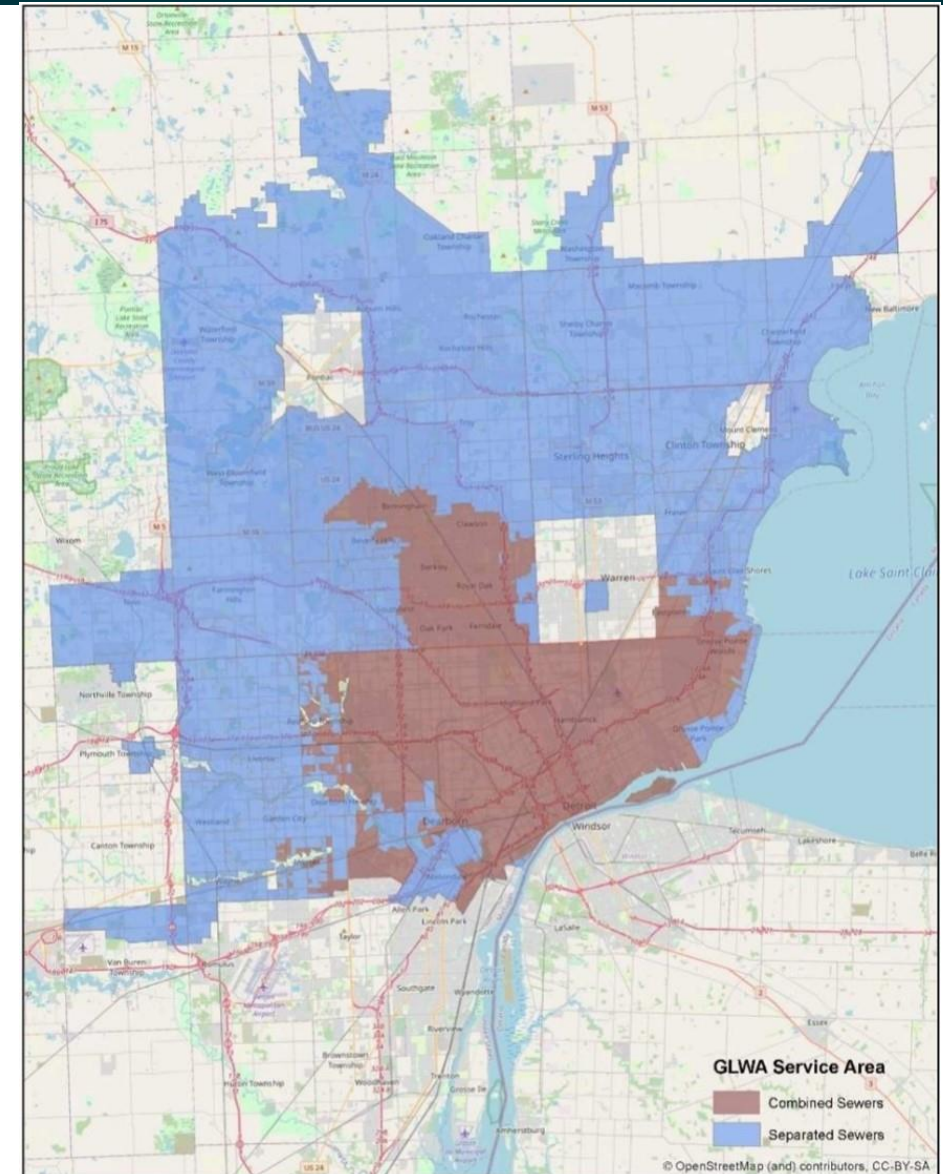


# Recommendations

## Long Term Recommendations (> 5 years)

Investigate and Develop Policies to Maximize Level of Service (LOS)

Long Term (more than 5 years)	
General (4.3.1)	Consider implementing comprehensive policies and practices that address the frequency and extent of flood losses.
PS (4.3.2)	Make additional PS modifications at the Connors Creek PS based on performance of medium-term recommendations, including replacing the remaining six storm pumps and constructing access and screening improvements in lieu of building a new pumping station.
Regional Coordination	
General (4.4)	Foster regional coordination. Various recommendations generally intended to reduce future flood damages and requiring regional coordination to implement.



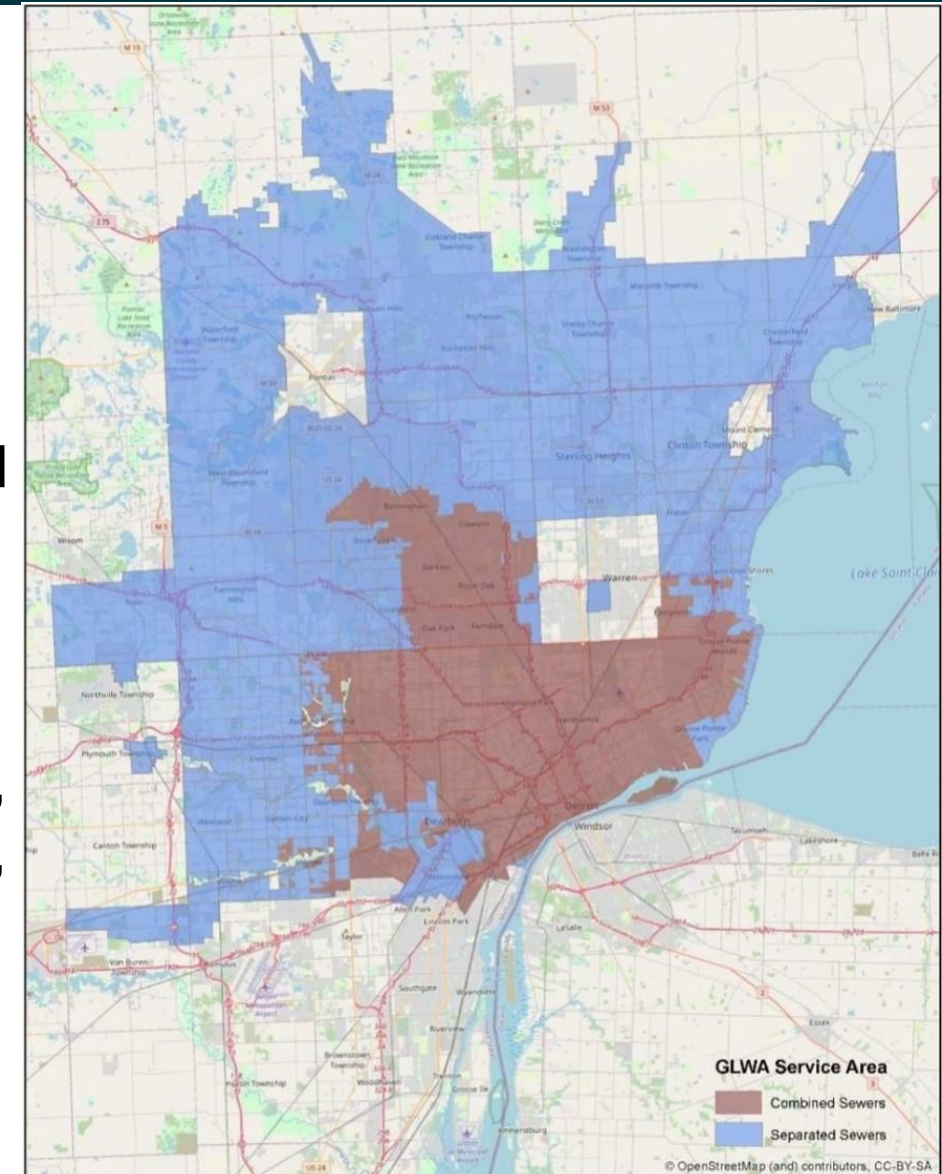


# Long Term Recommendations (> 5 years)

Investigate and Develop  
Policies to Maximize Level of  
Service (LOS)

General Recommendations Include:

1. Evaluate moving to 100-year design storm standard.
2. Local governments evaluate purchase of flood-prone properties provided State/Federal funds available.
3. Local government public outreach campaign on flood risk and purchasing flood insurance.
4. Engage all relevant stakeholders and use triple-bottom-line approach to decision-making.
5. Consult with others, such as Tulsa, Houston, Denver, Washington, D.C., St. Louis, New York City, Chicago, Toronto.

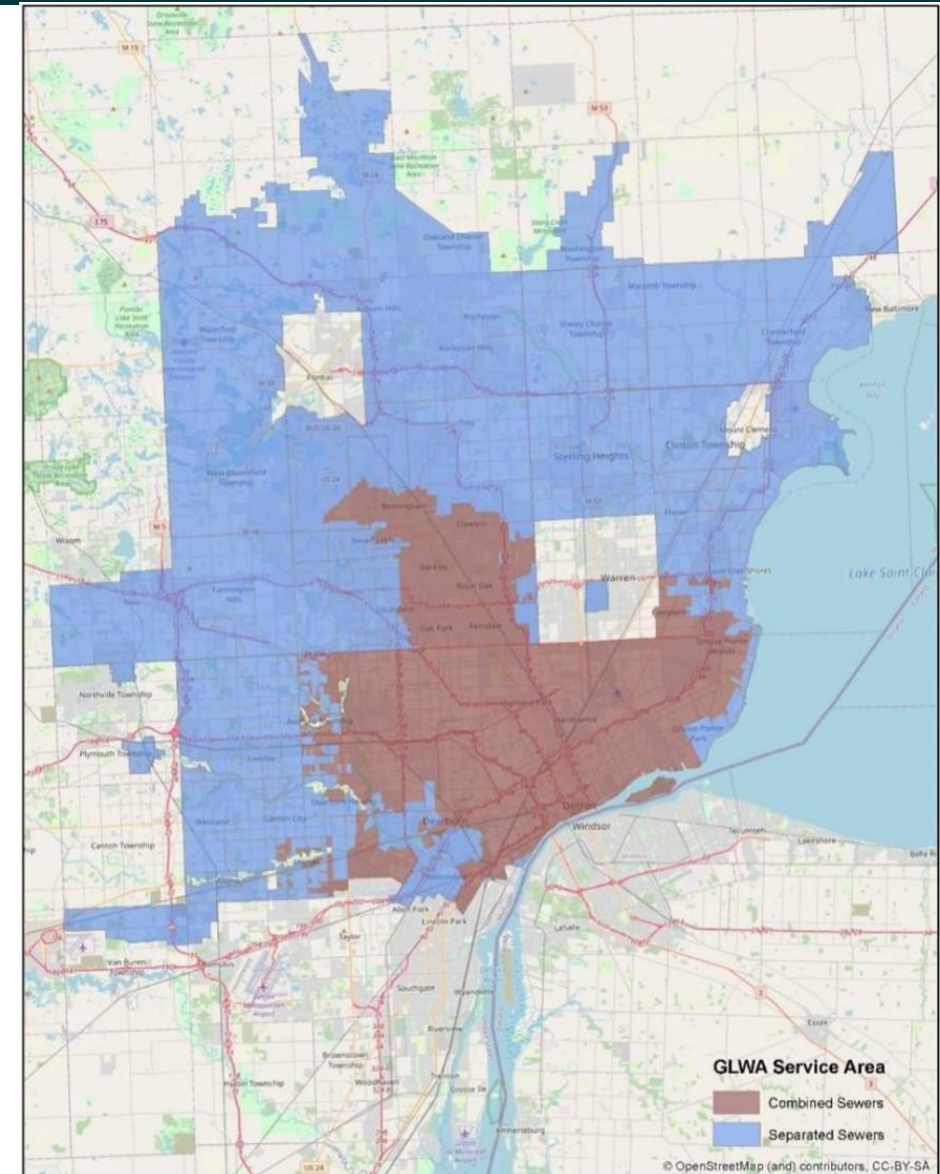


# Long Term Recommendations (> 5 years)

Investigate and Develop Policies to Maximize Level of Service (LOS)

Regional Coordination Recommendations Include:

1. Develop system-wide understanding of upstream/downstream interactions.
2. Leverage FEMA NFIP program to move toward 100-year level of flood protection.
3. Local governments update flood maps.
4. Coordinated (GLWA and local communities) and on-going public outreach program.
5. GLWA and regional partners develop flood data collection program.
6. Leverage available federal funding programs.
7. Identify regional stormwater and flood plain management leader and GLWA role.
8. Develop regional approach to Federal, state, and local legal and regulatory requirements.

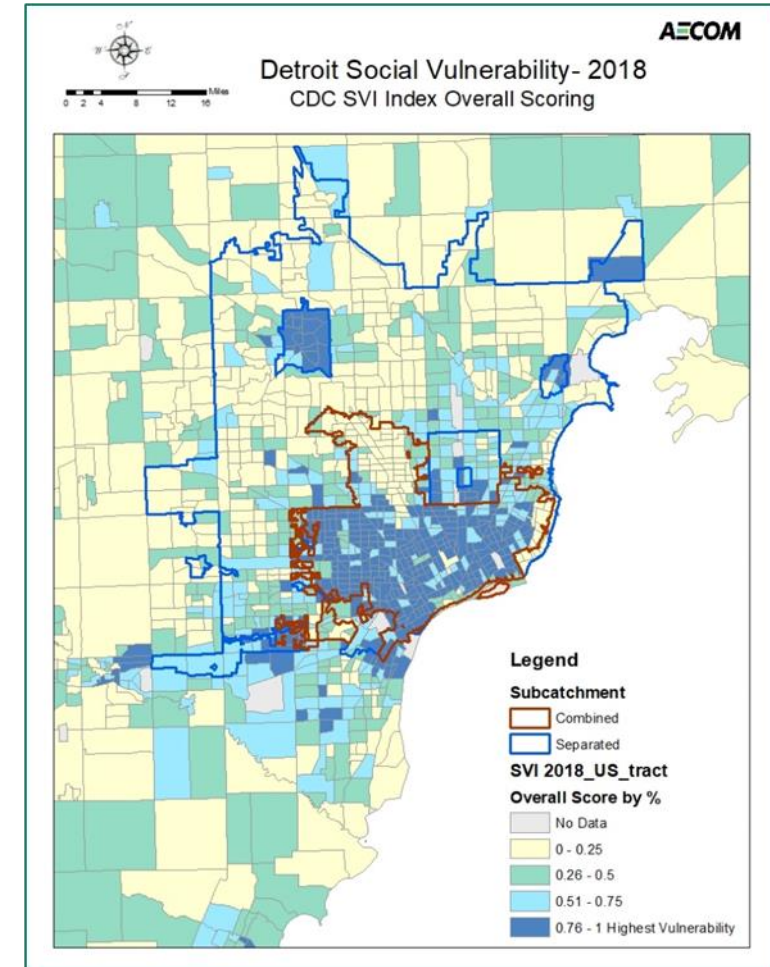




# Recommendations

## Funding Sources

- To efficiently implement and effectively fund the actions recommended, GLWA should develop an Implementation Plan that includes recommended projects and actions:
  - Matched to specific federal funding opportunities
  - Compliant with and supporting Justice 40 Directive
  - Prioritized and scheduled based on operational requirements, Justice 40 directive, and funding availability.





# Questions & Answers

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