

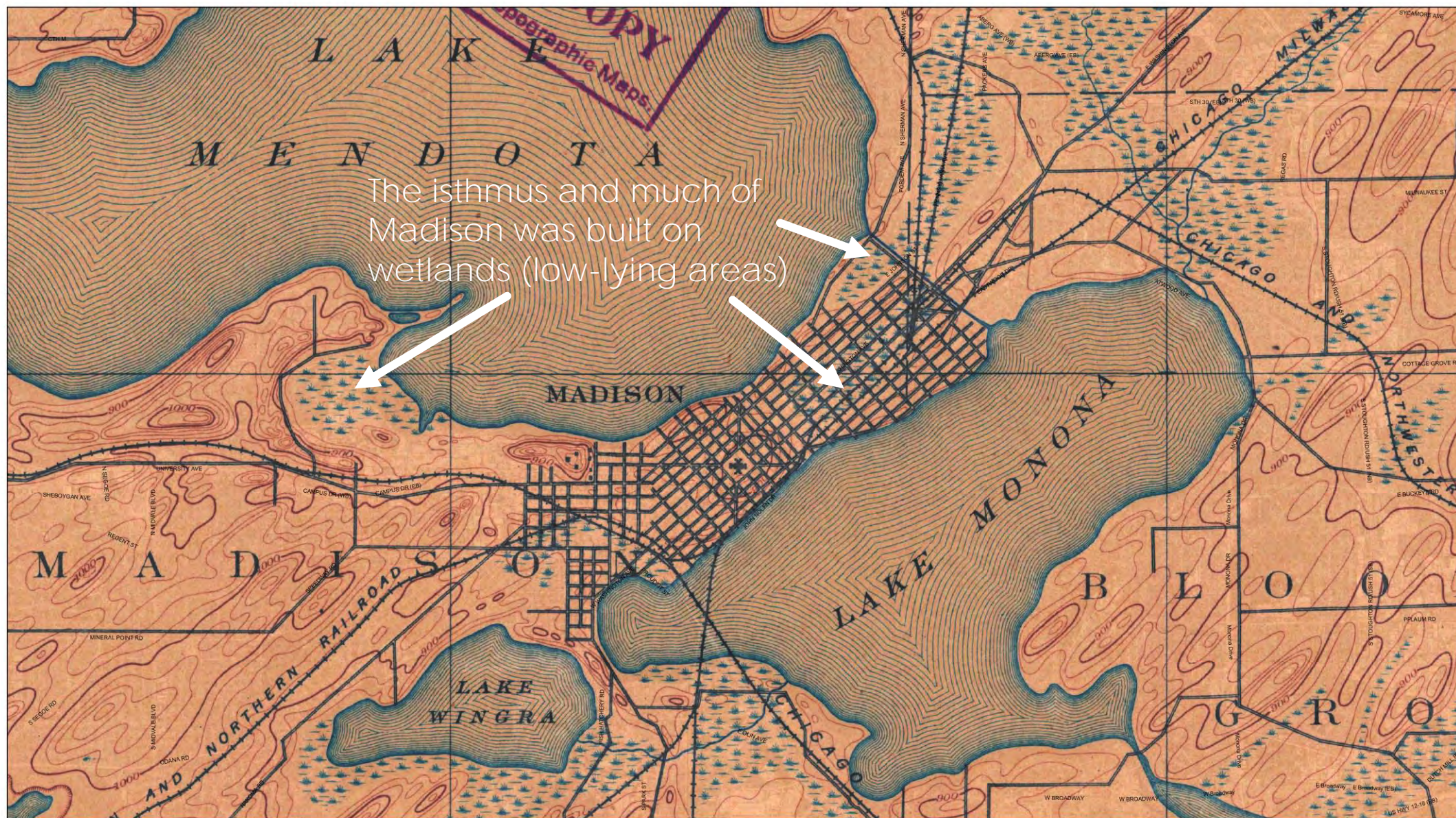


# Summer Flooding 2018 Community Impacts

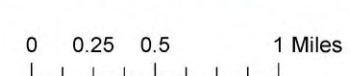
AUGUST 20<sup>TH</sup>, 2018-PRESENT

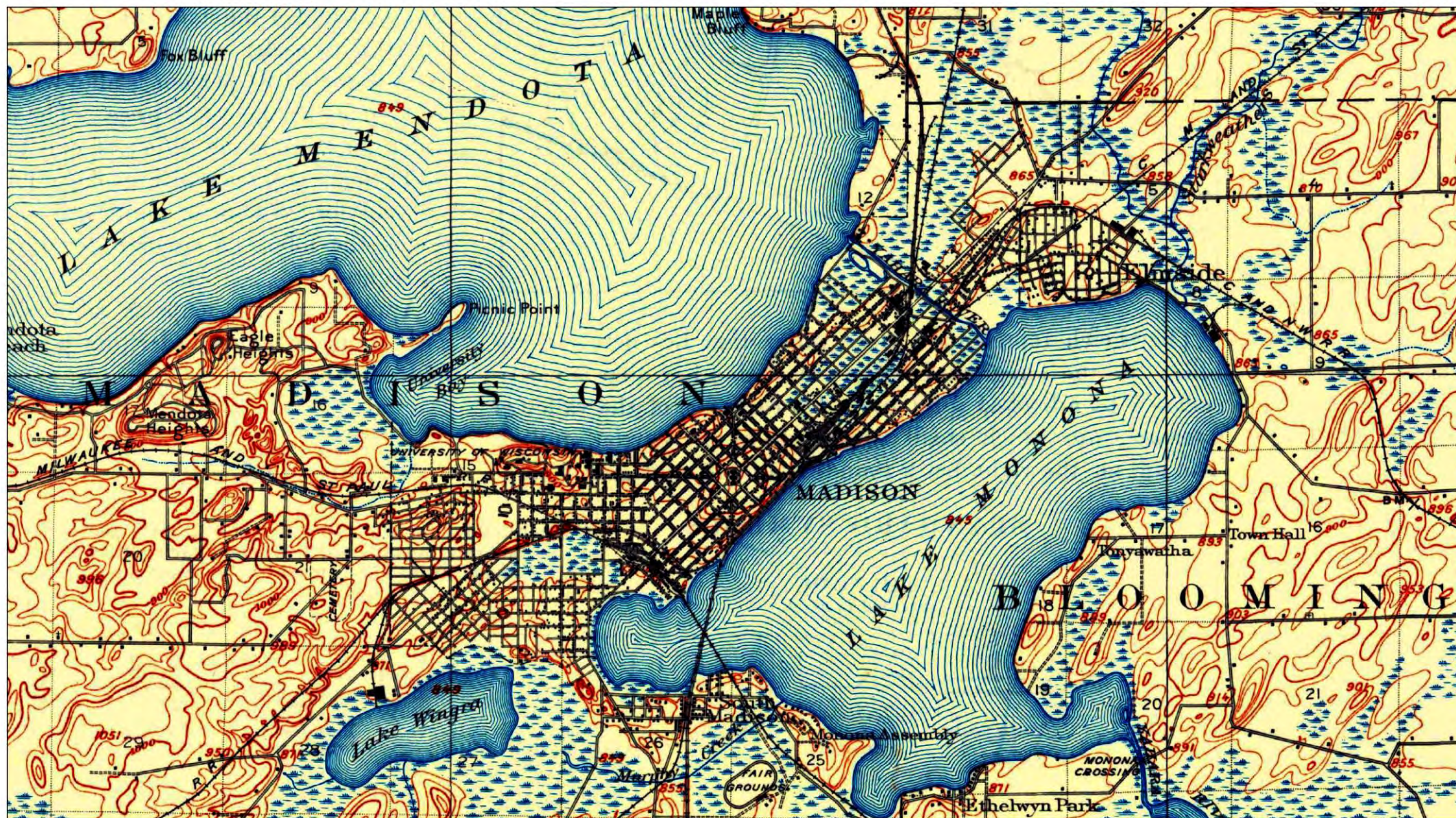
# Presentation Overview

- ▶ Review of Flash Flooding and Flooding from High Lake Levels (August 20<sup>th</sup>-Present)
- ▶ Lake Level Information
- ▶ Damages
  - ▶ How did Engineering Respond?
  - ▶ Public and Private
  - ▶ Sandbag and Protective Measures
- ▶ FEMA
- ▶ How Does the City Plan to Proceed?
  - ▶ New Policy
  - ▶ Moving Forward
    - ▶ Short-Term Actions
    - ▶ Mid-Term Actions
    - ▶ Long-Term Actions
- ▶ Next Steps
- ▶ Resources



City of Madison 1892



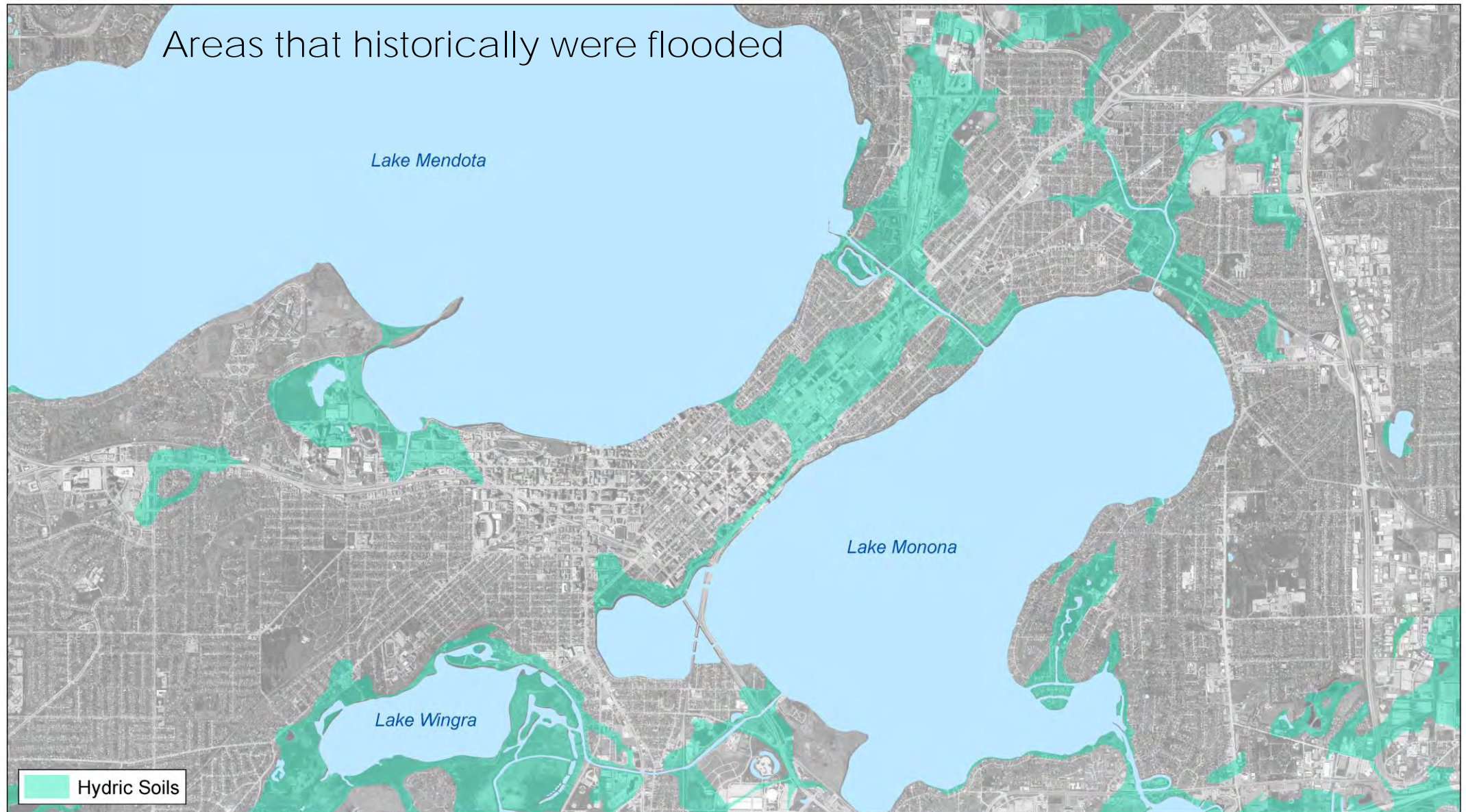


City of Madison 1906

0 0.25 0.5 1 Miles



Areas that historically were flooded



## City of Madison - Current Hydric Soils

Hydric soil: formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

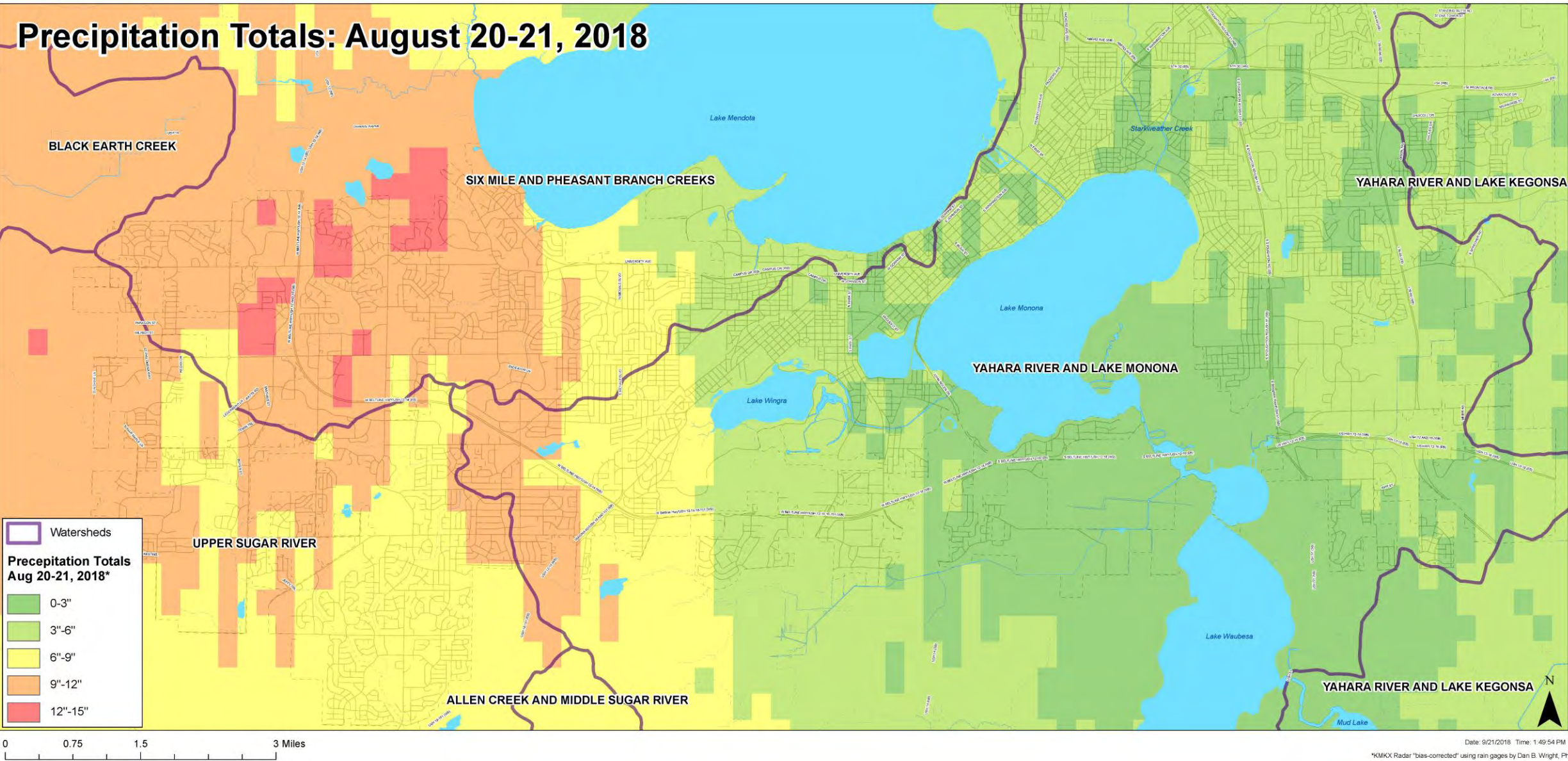
0 0.25 0.5 1 Miles





**City of Madison - Current Hydric Soils + Low Lying Areas**

# 2 events: Flash Flooding + Flooding from High Lake Levels



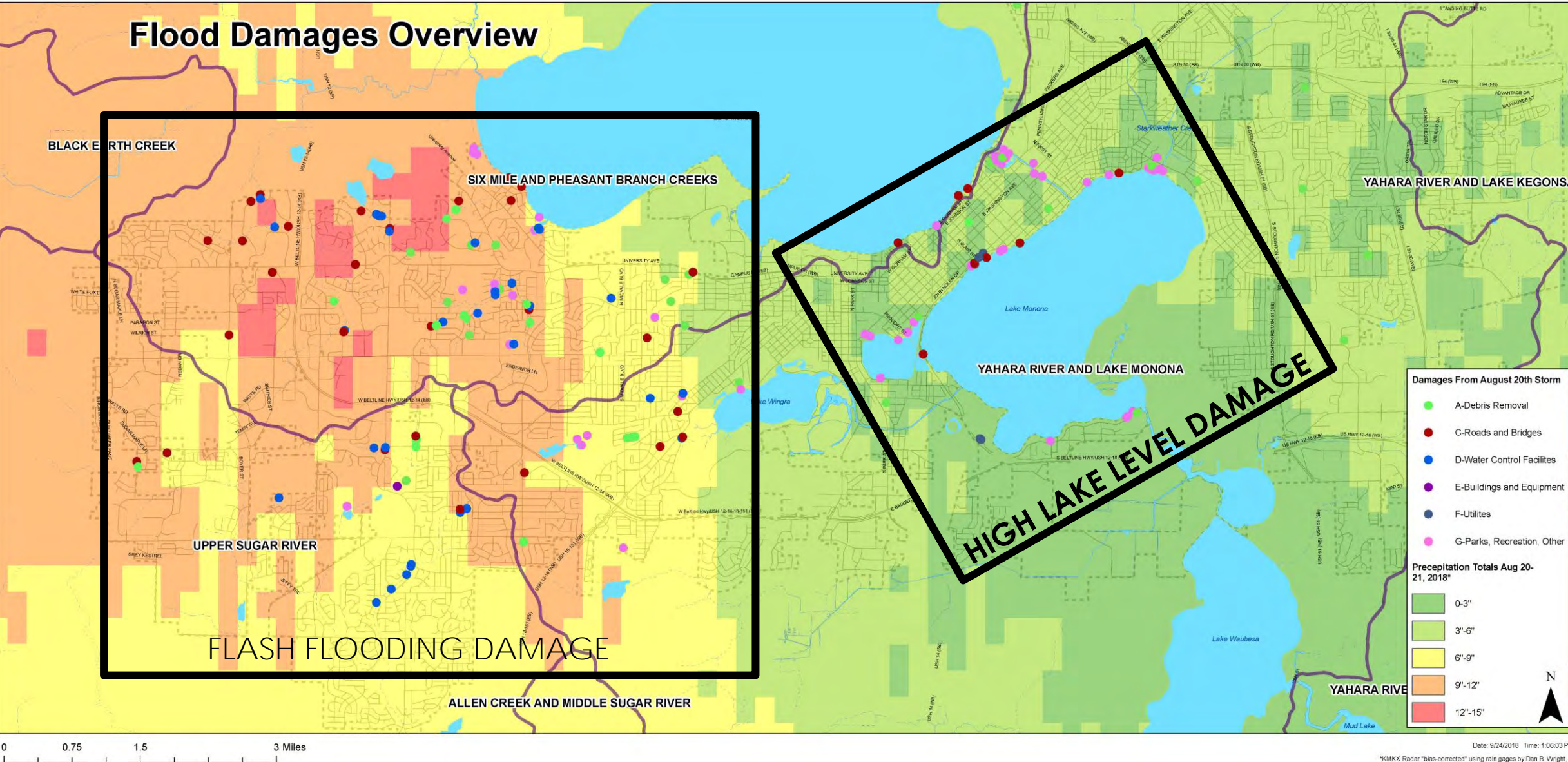
# City Response

- ▶ Quick Response to flash flooding
  - ▶ Emergency Operations Center opened
  - ▶ Damages surveyed
  - ▶ Emergency repairs
  - ▶ Begin understanding quantity of rain
    - Lake level issues
- ▶ Begin preparing for high lake level flooding

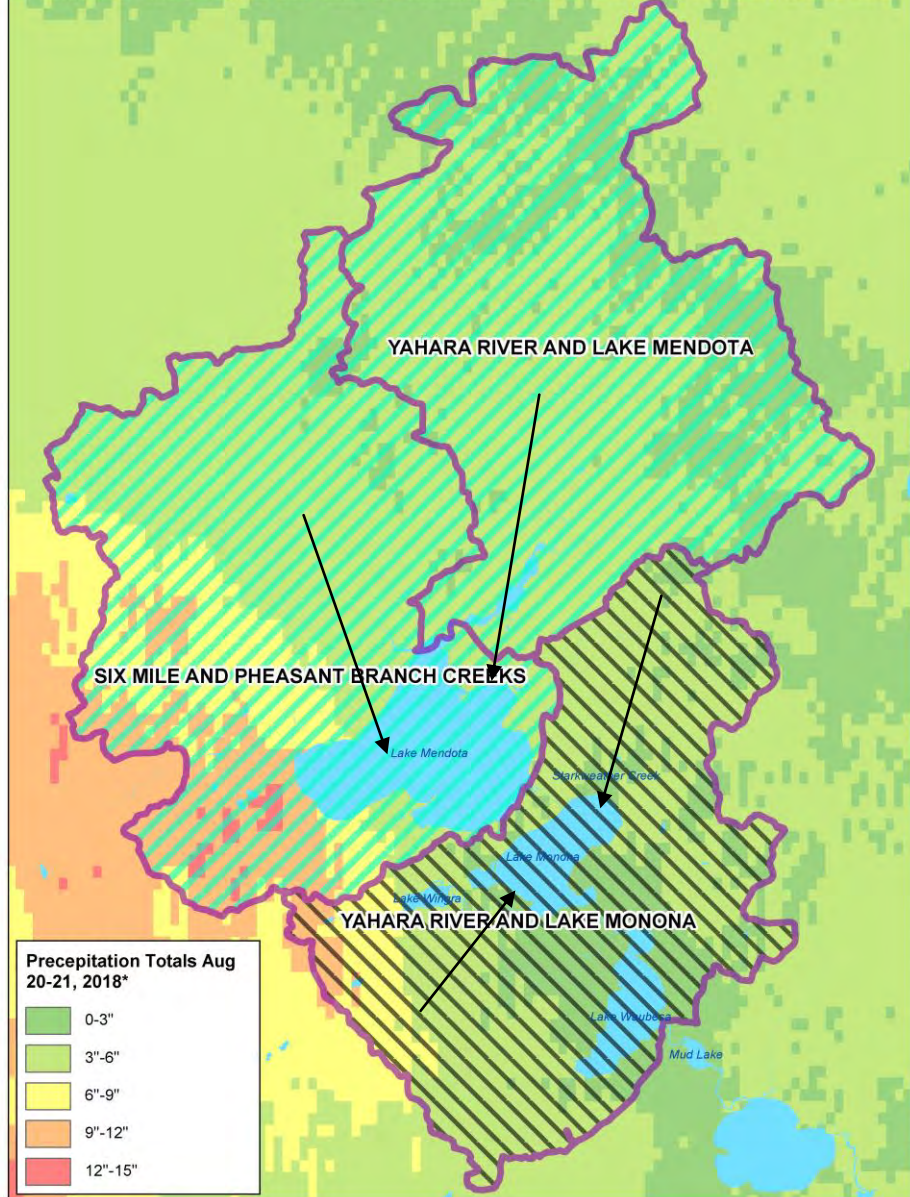


Deming Way Damage

# Damages from 2 Events: Flash Flooding + Flooding from High Lake Levels

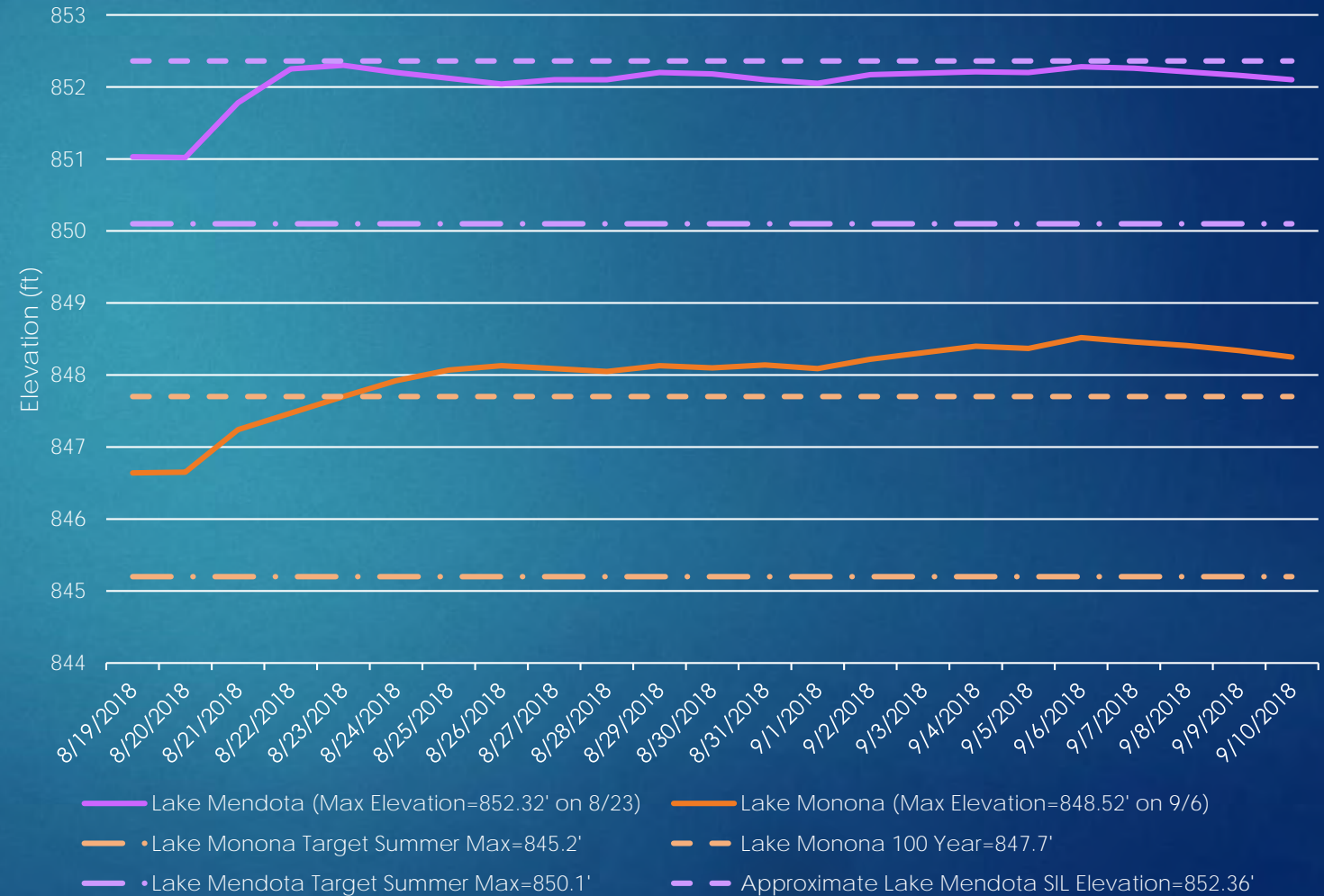


## Lake Mendota and Lake Monona Watersheds

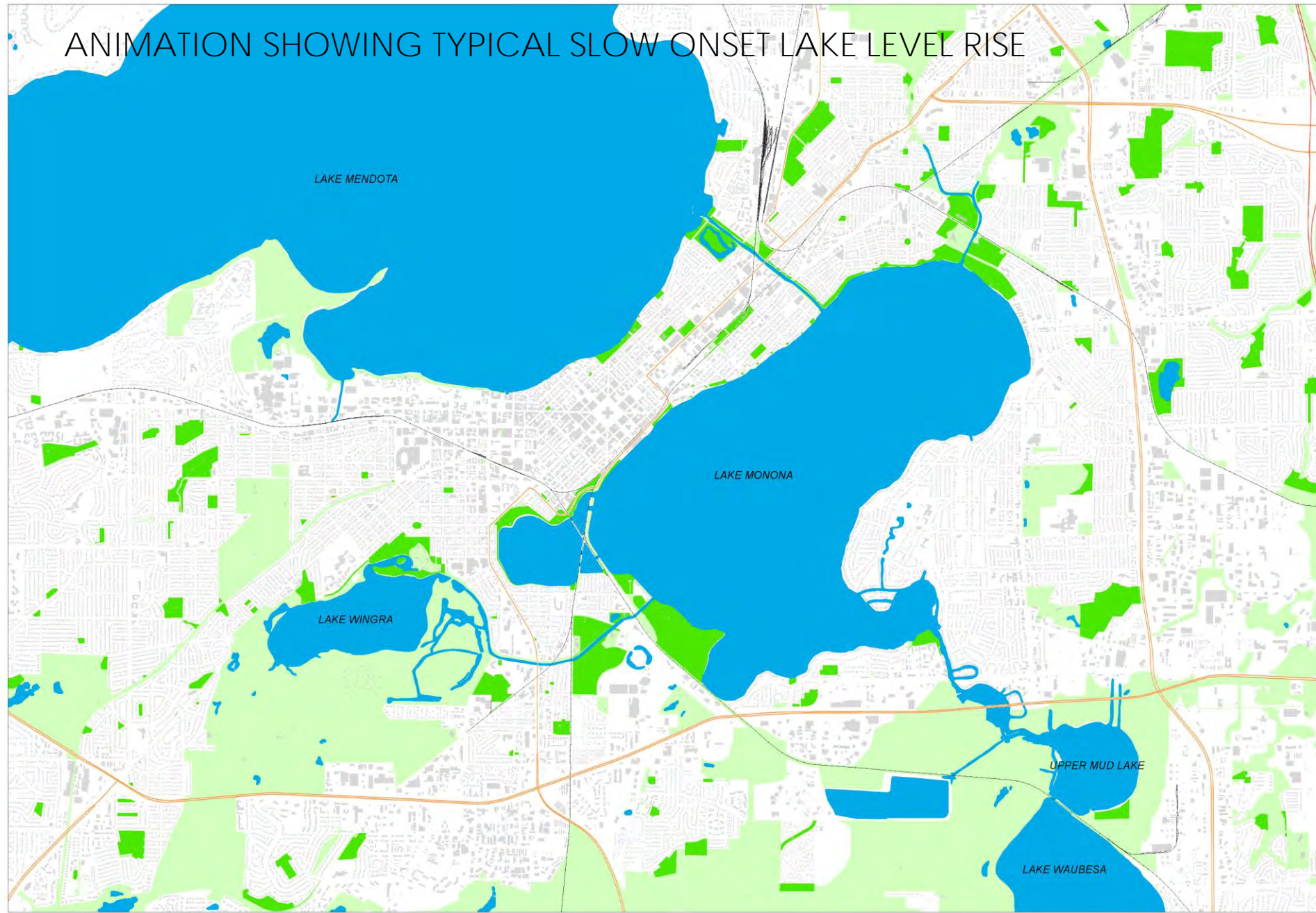


# 2<sup>nd</sup> Event: High Lake Level Flooding

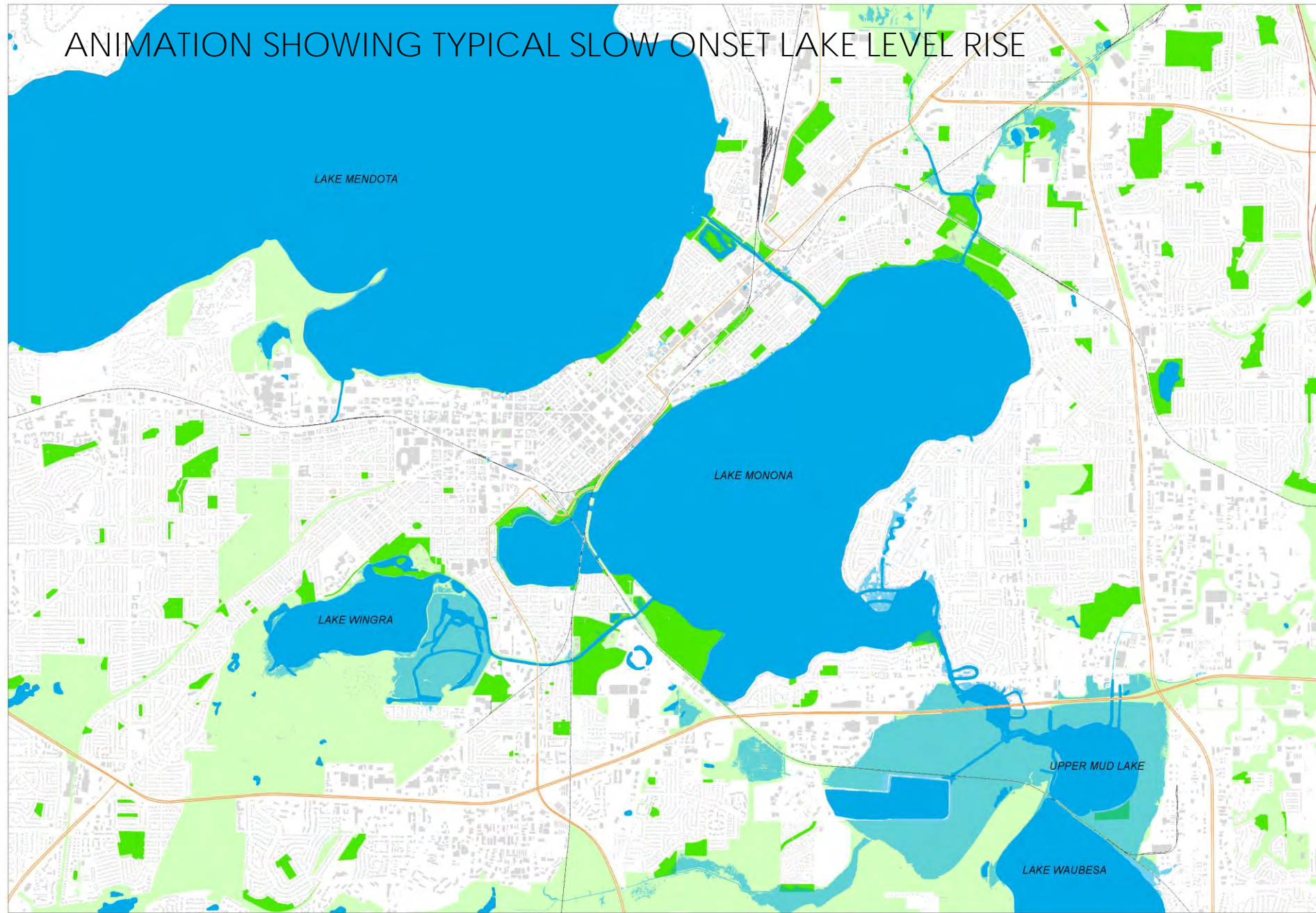
Lake Levels 8/19/18 to 9/10/18



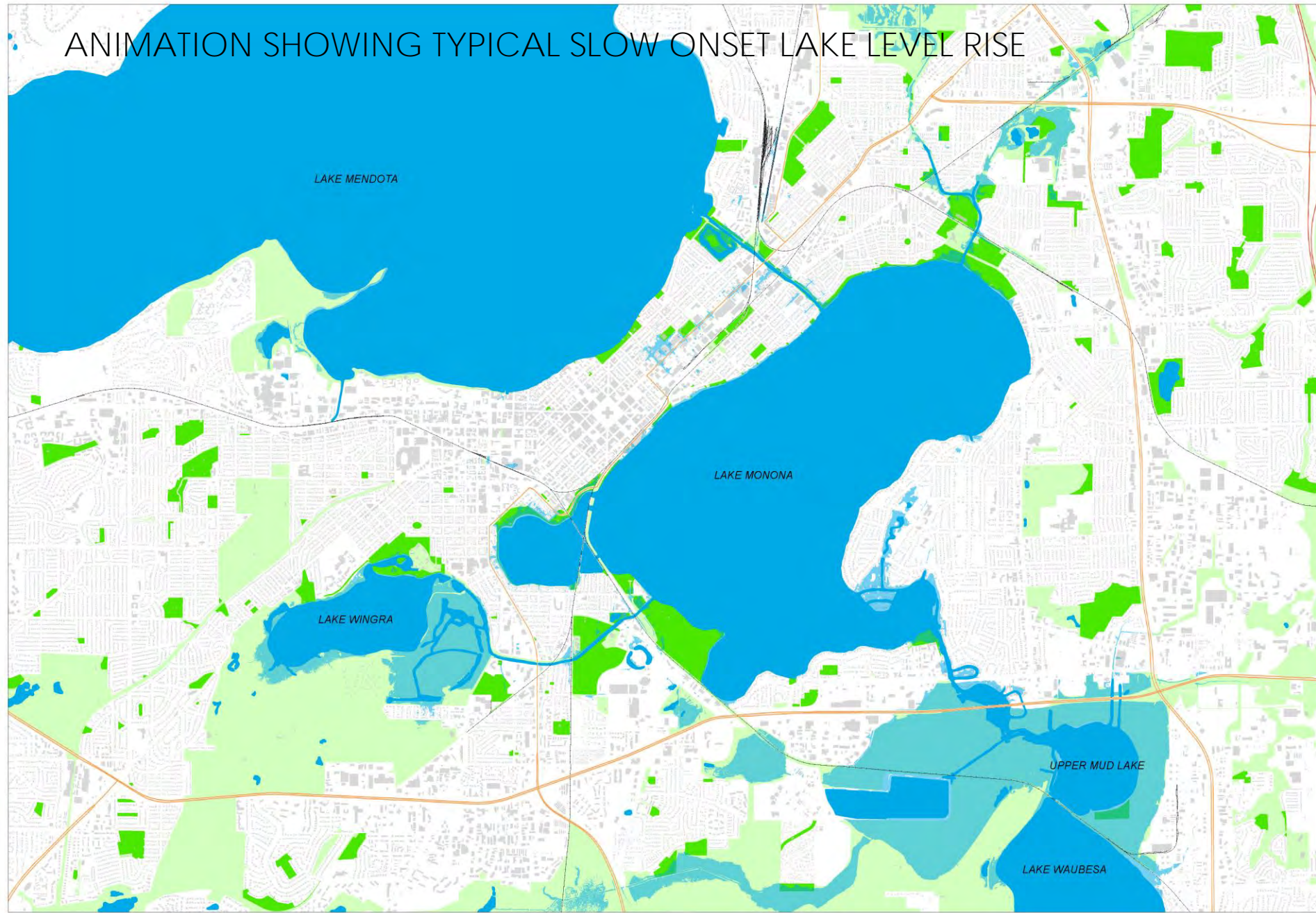
# ANIMATION SHOWING TYPICAL SLOW ONSET LAKE LEVEL RISE



# ANIMATION SHOWING TYPICAL SLOW ONSET LAKE LEVEL RISE

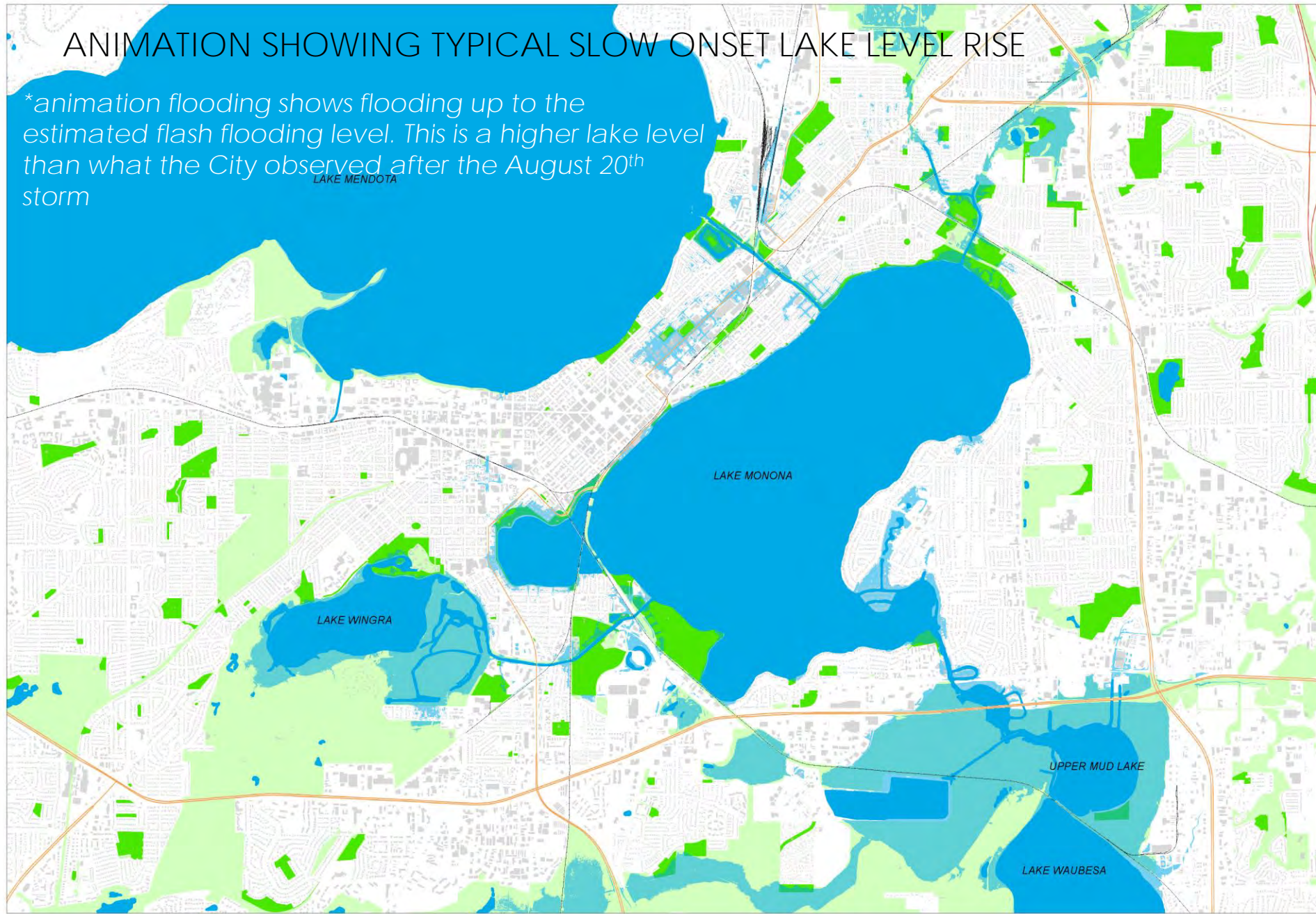


# ANIMATION SHOWING TYPICAL SLOW ONSET LAKE LEVEL RISE



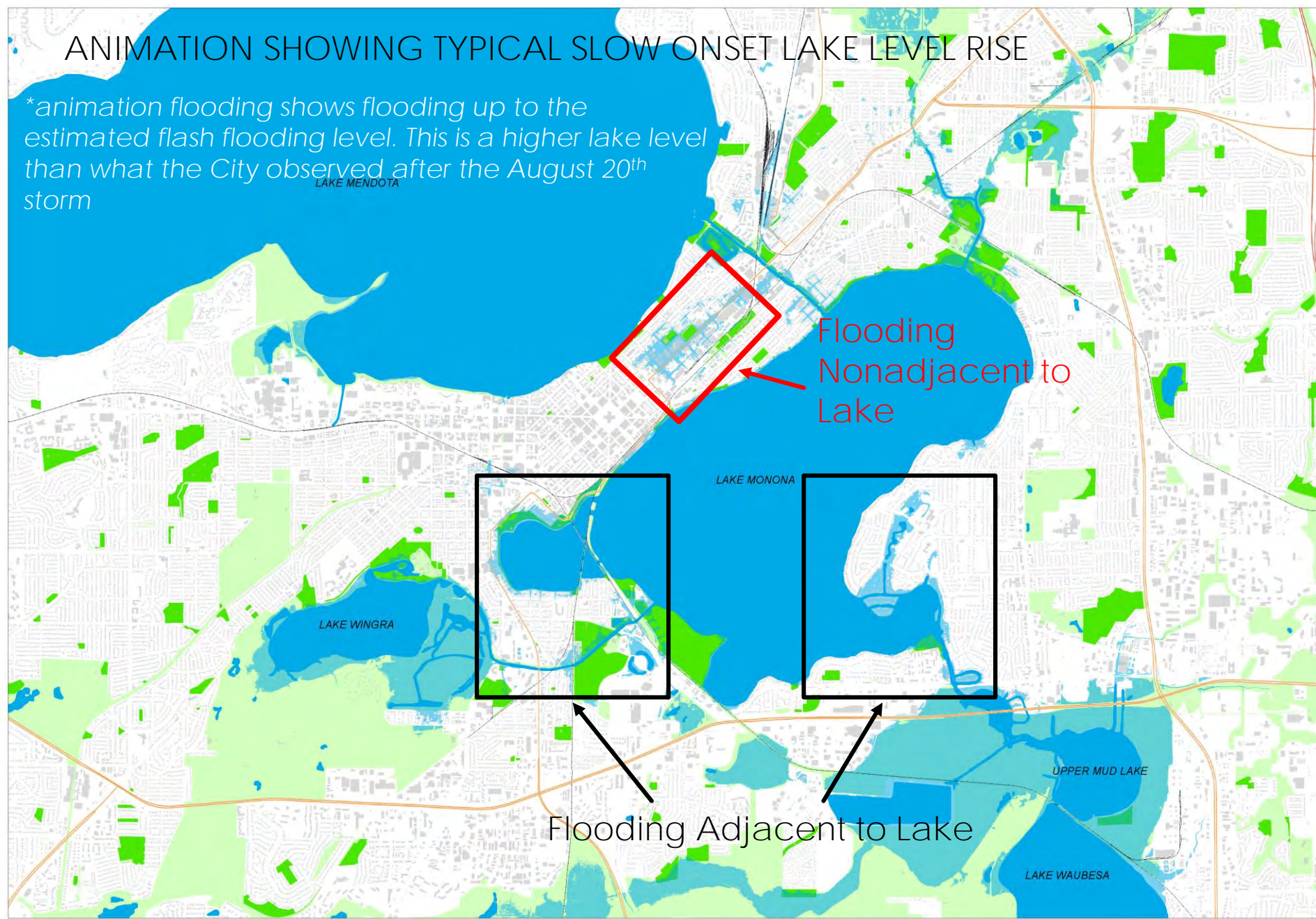
## ANIMATION SHOWING TYPICAL SLOW ONSET LAKE LEVEL RISE

\*animation flooding shows flooding up to the estimated flash flooding level. This is a higher lake level than what the City observed after the August 20<sup>th</sup> storm

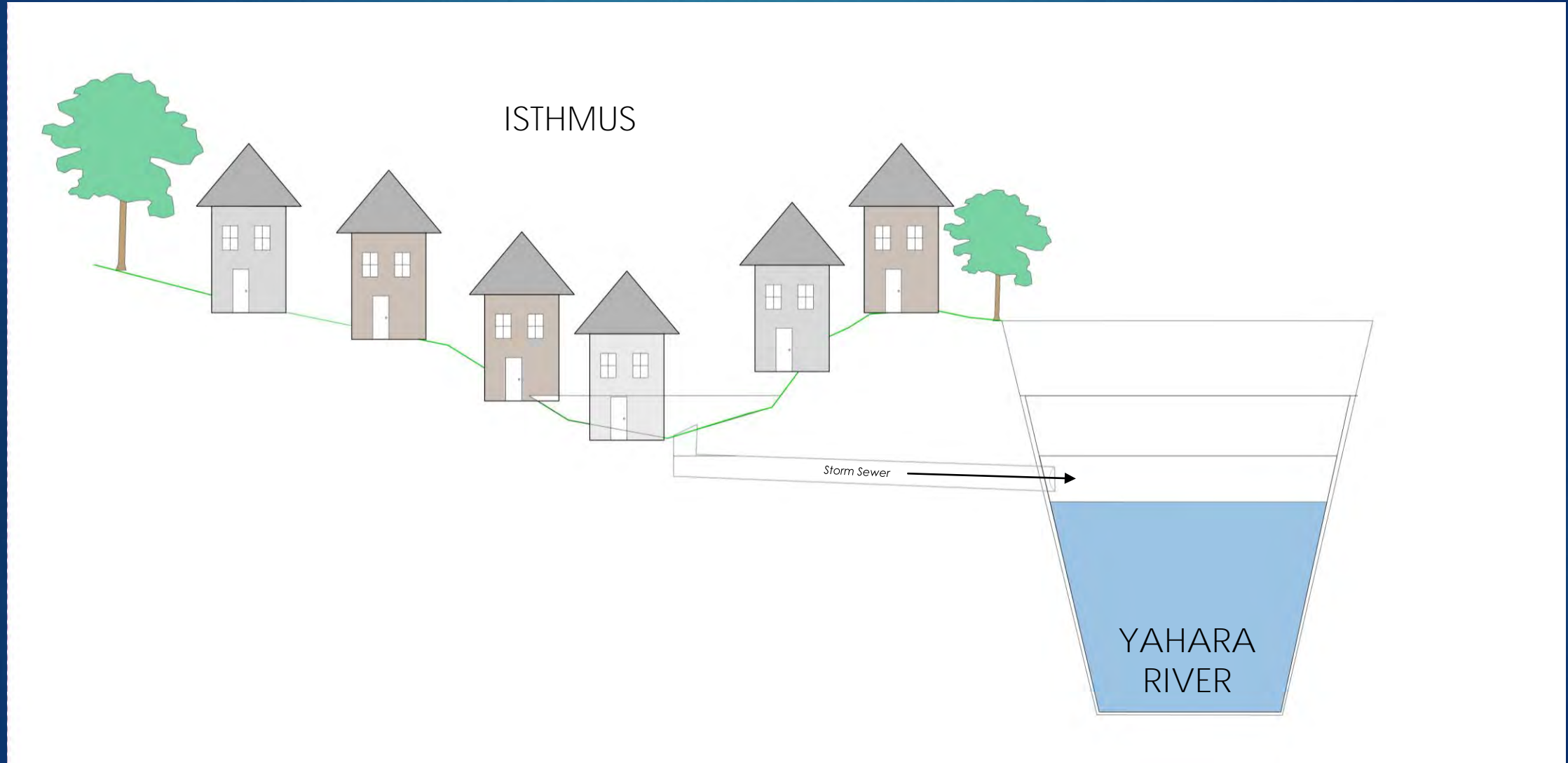


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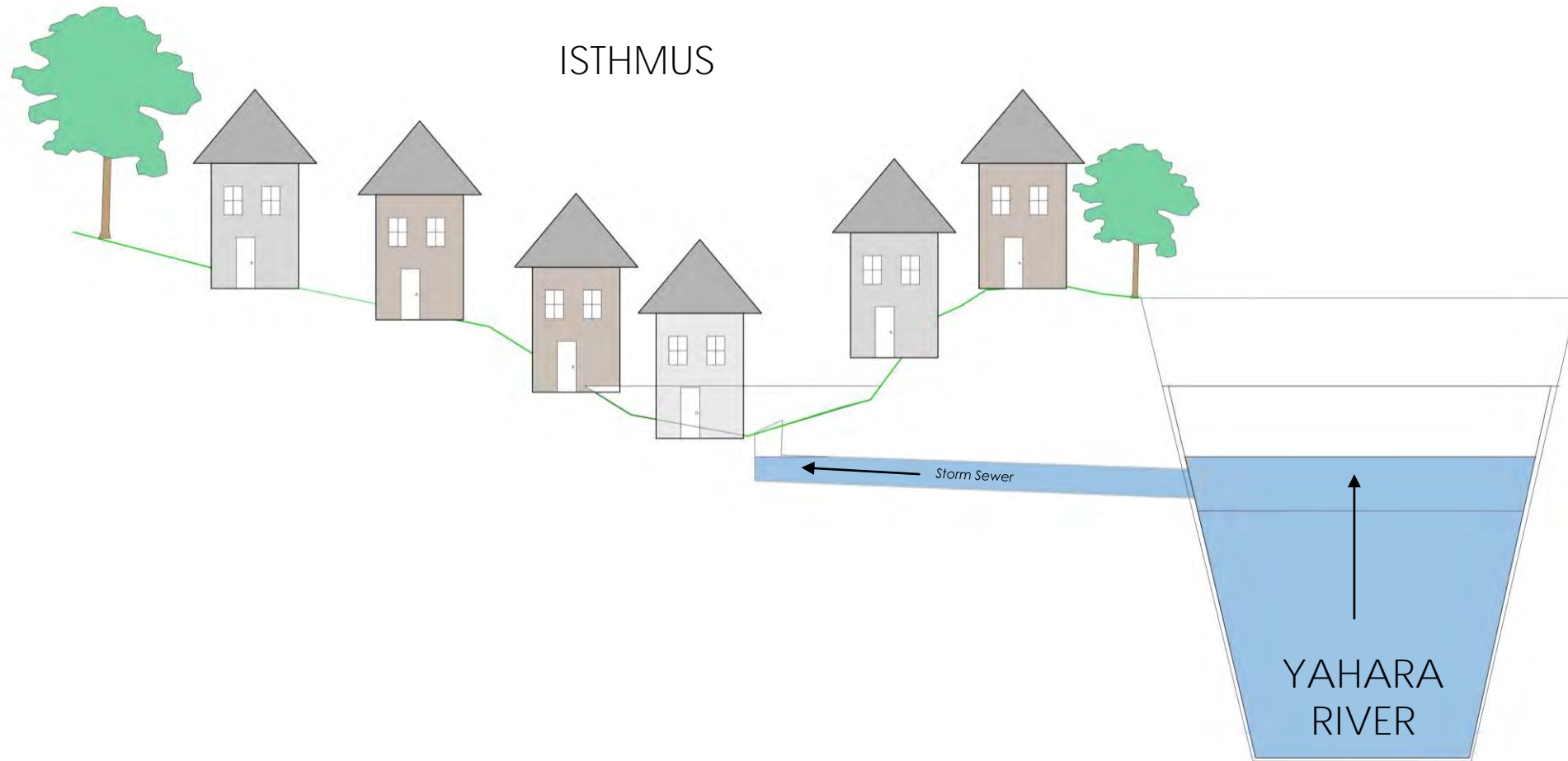
\*animation flooding shows flooding up to the estimated flash flooding level. This is a higher lake level than what the City observed after the August 20<sup>th</sup> storm



# Isthmus Sewer Animation Example

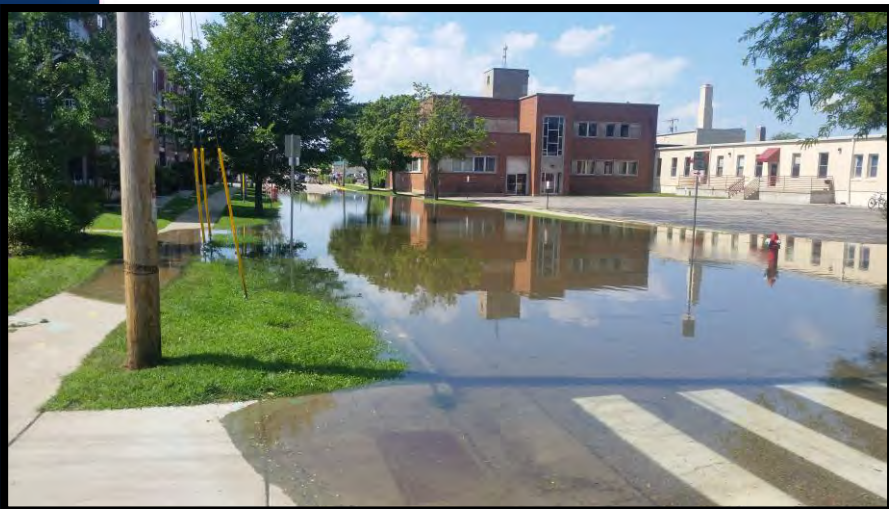
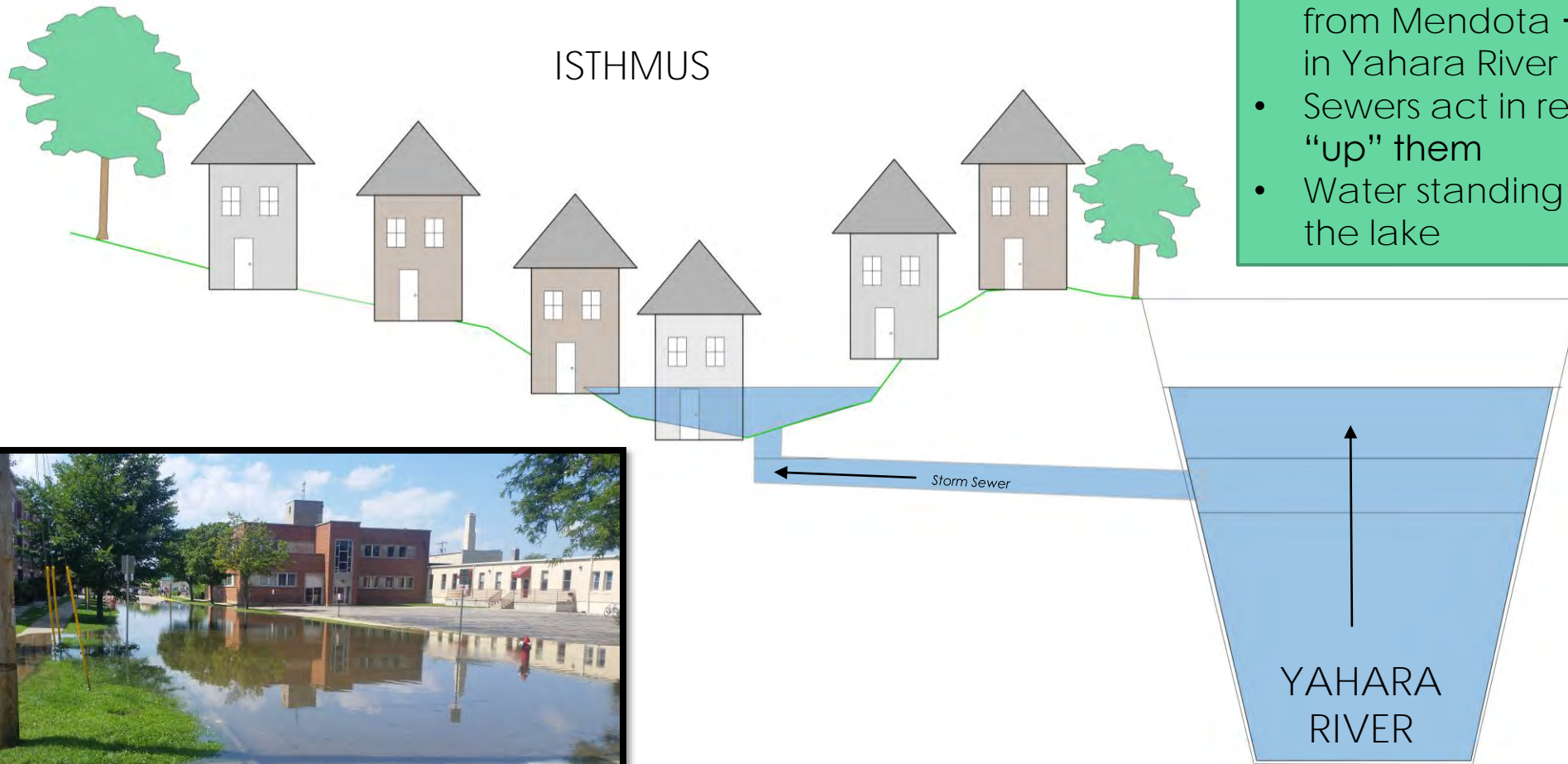


# Isthmus Sewer Animation Example

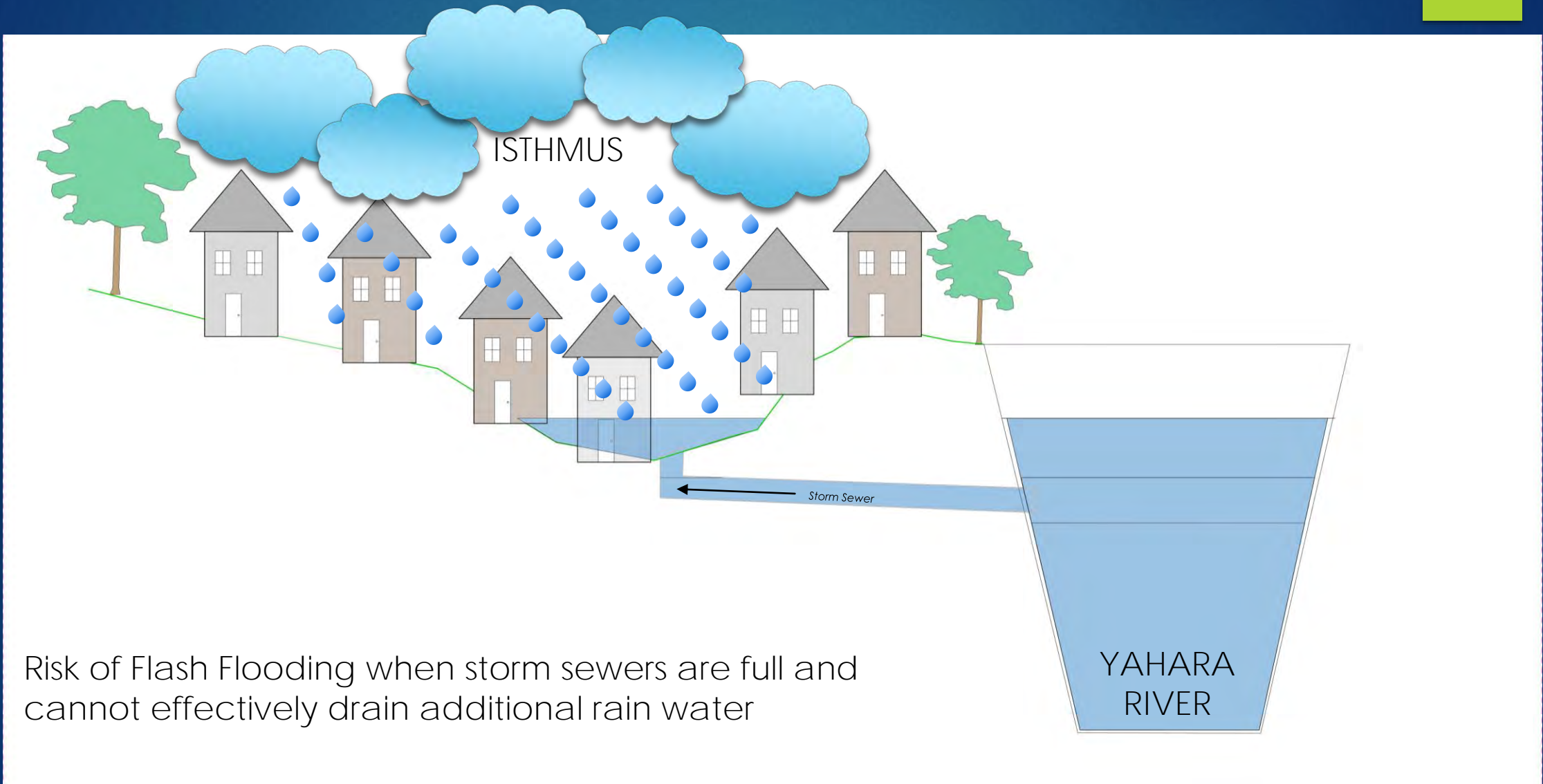


# Isthmus Sewer Animation Example

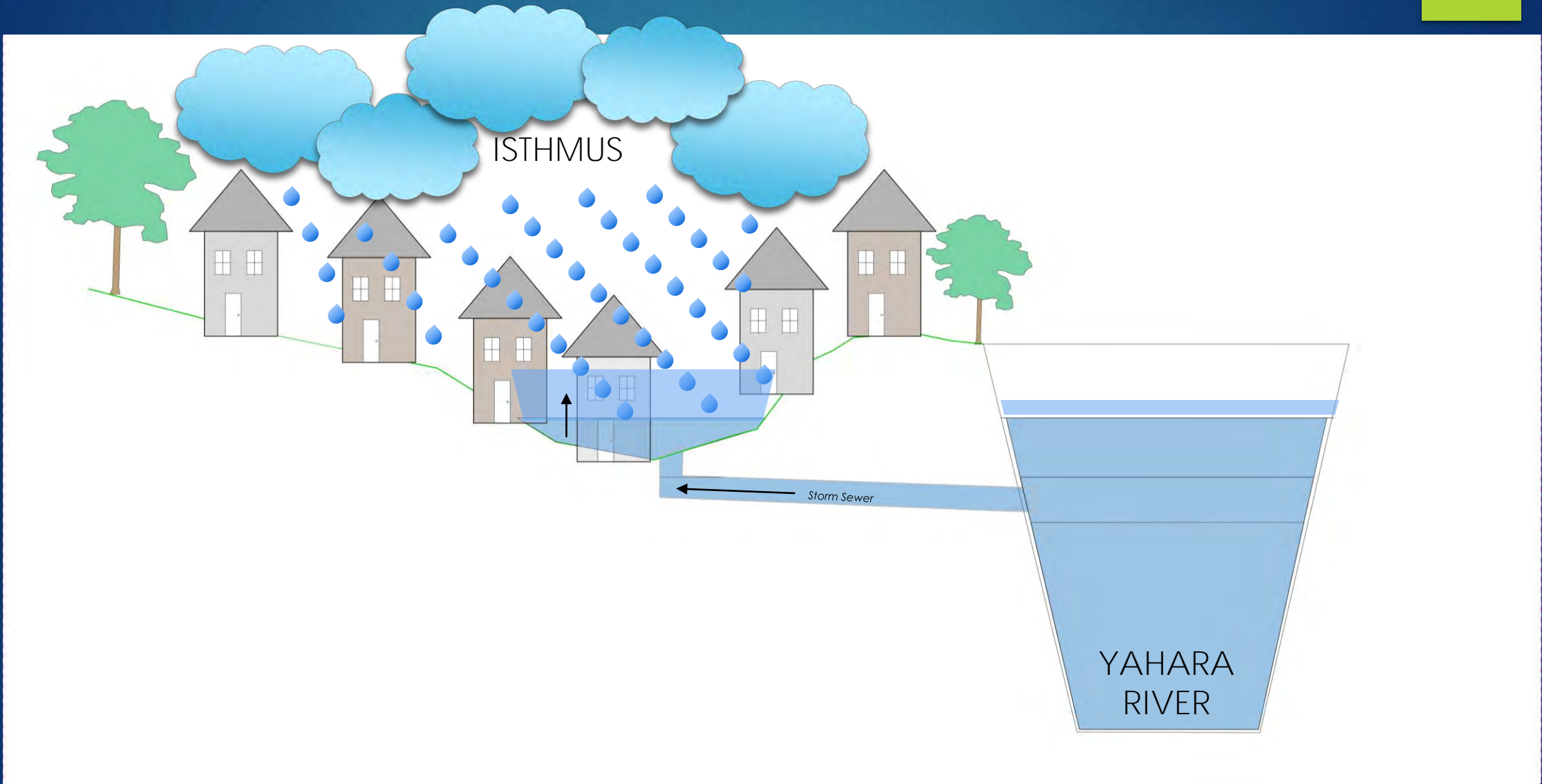
- Storm sewers drain Isthmus during rain events
- Large amounts of water released from Mendota → higher water levels in Yahara River
- Sewers act in reverse, water travels “up” them
- Water standing in isthmus is part of the lake



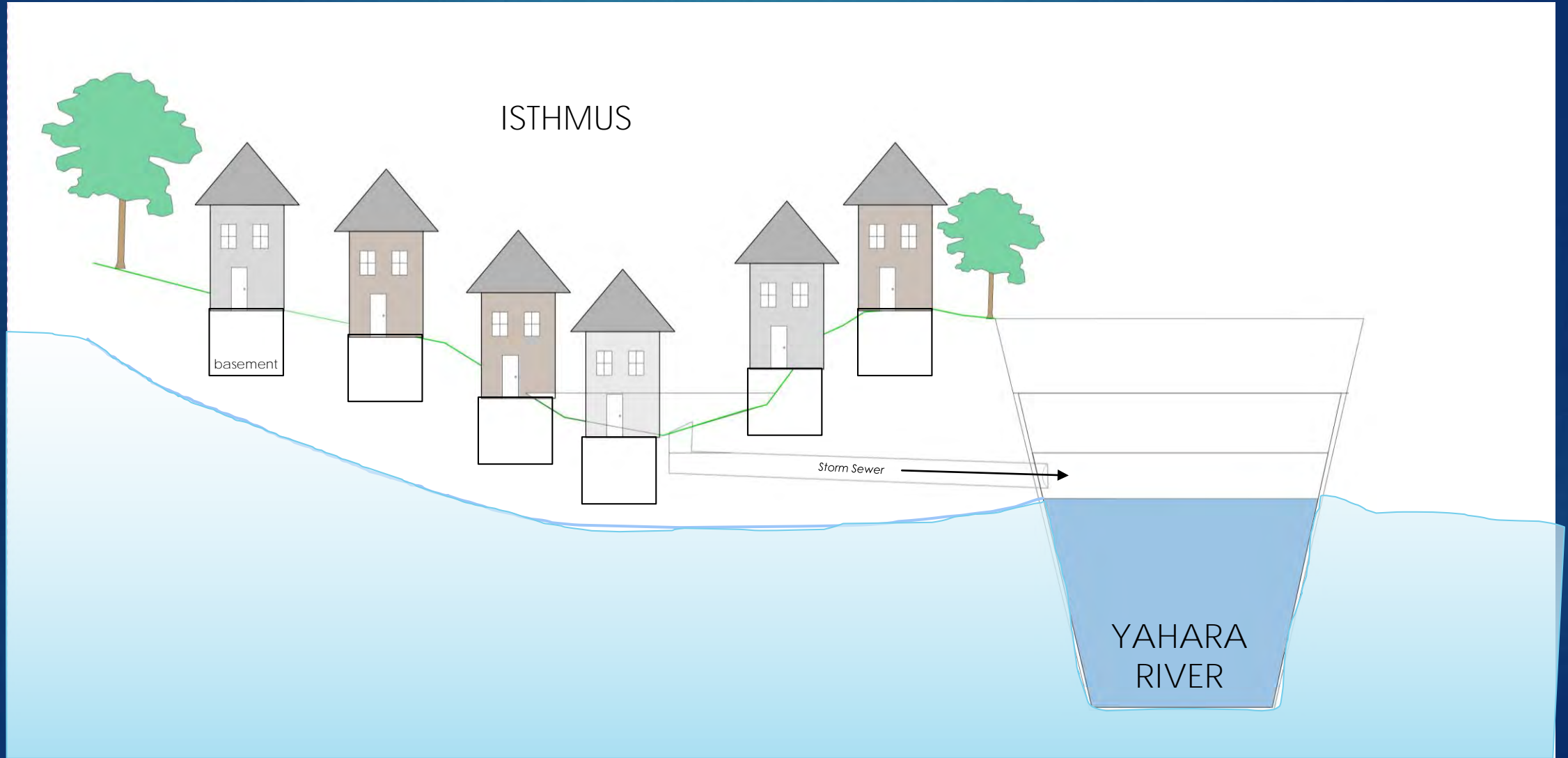
# Isthmus Sewer Animation Example-Flash Flooding



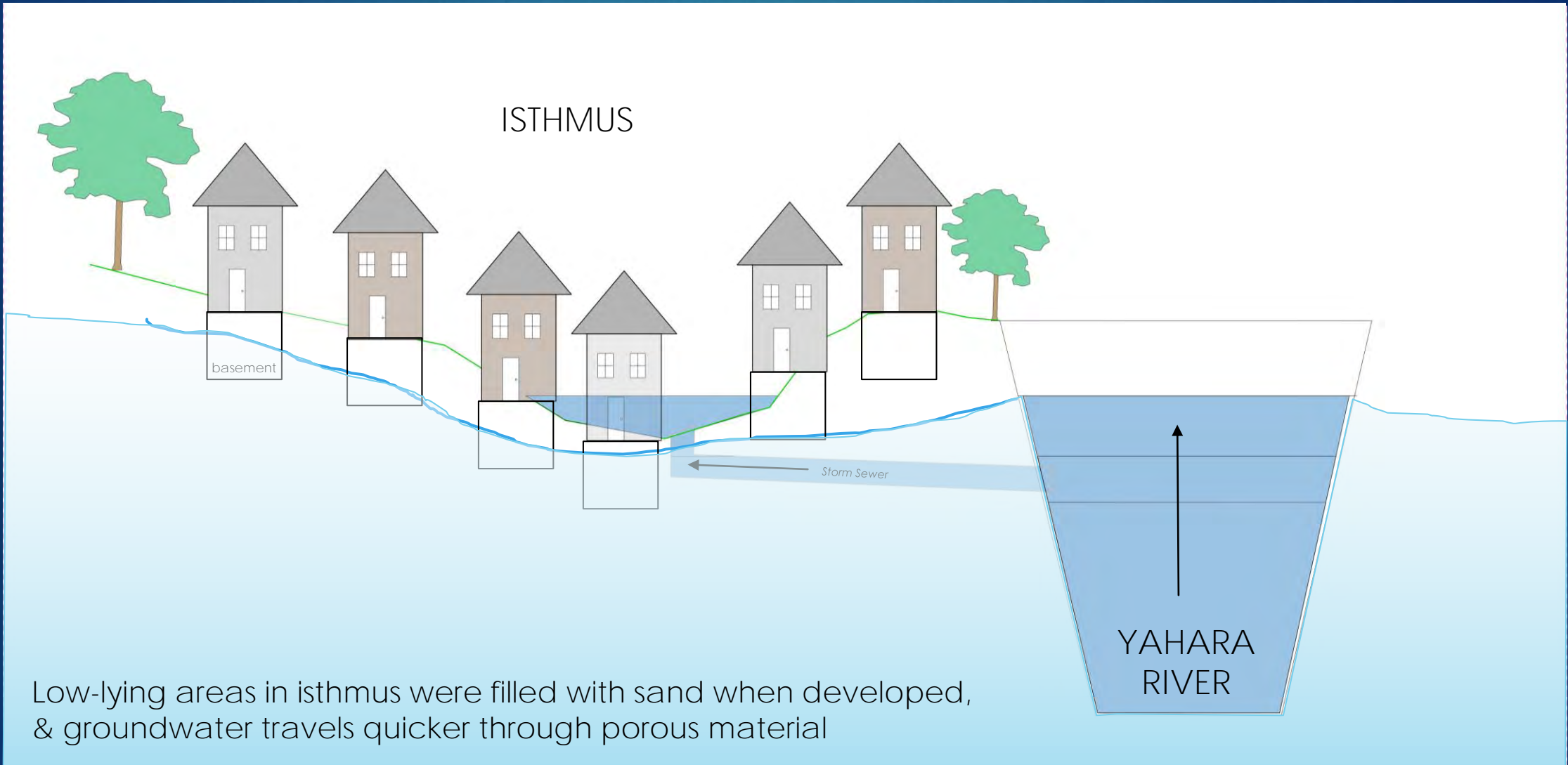
# Isthmus Sewer Animation Example-Flash Flooding



# Isthmus Sewer Animation Example-Ground Water

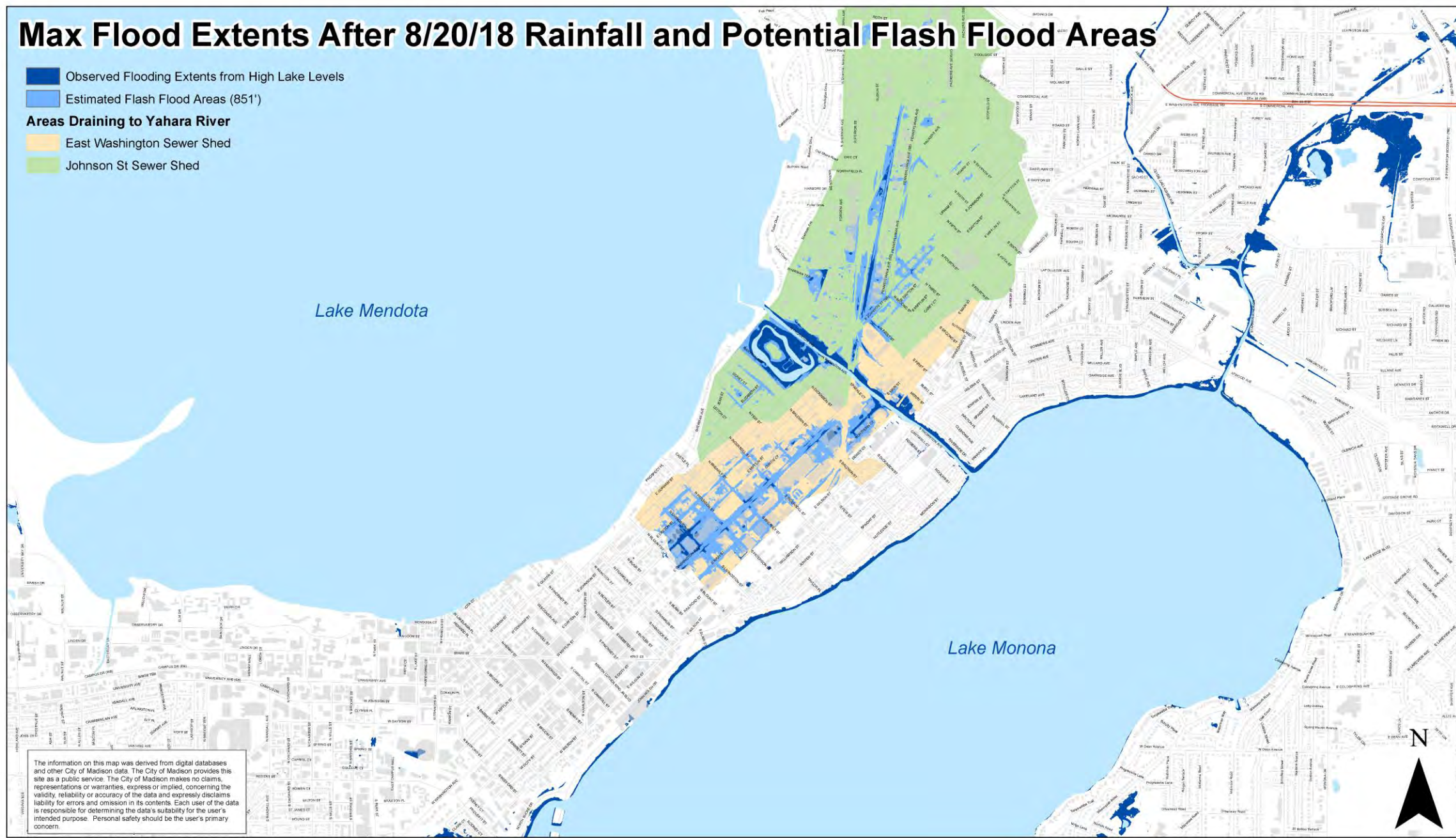


# Isthmus Sewer Animation Example-Ground Water



# Max Flood Extents After 8/20/18 Rainfall and Potential Flash Flood Areas

- Observed Flooding Extents from High Lake Levels
- Estimated Flash Flood Areas (851')
- Areas Draining to Yahara River
  - East Washington Sewer Shed
  - Johnson St Sewer Shed

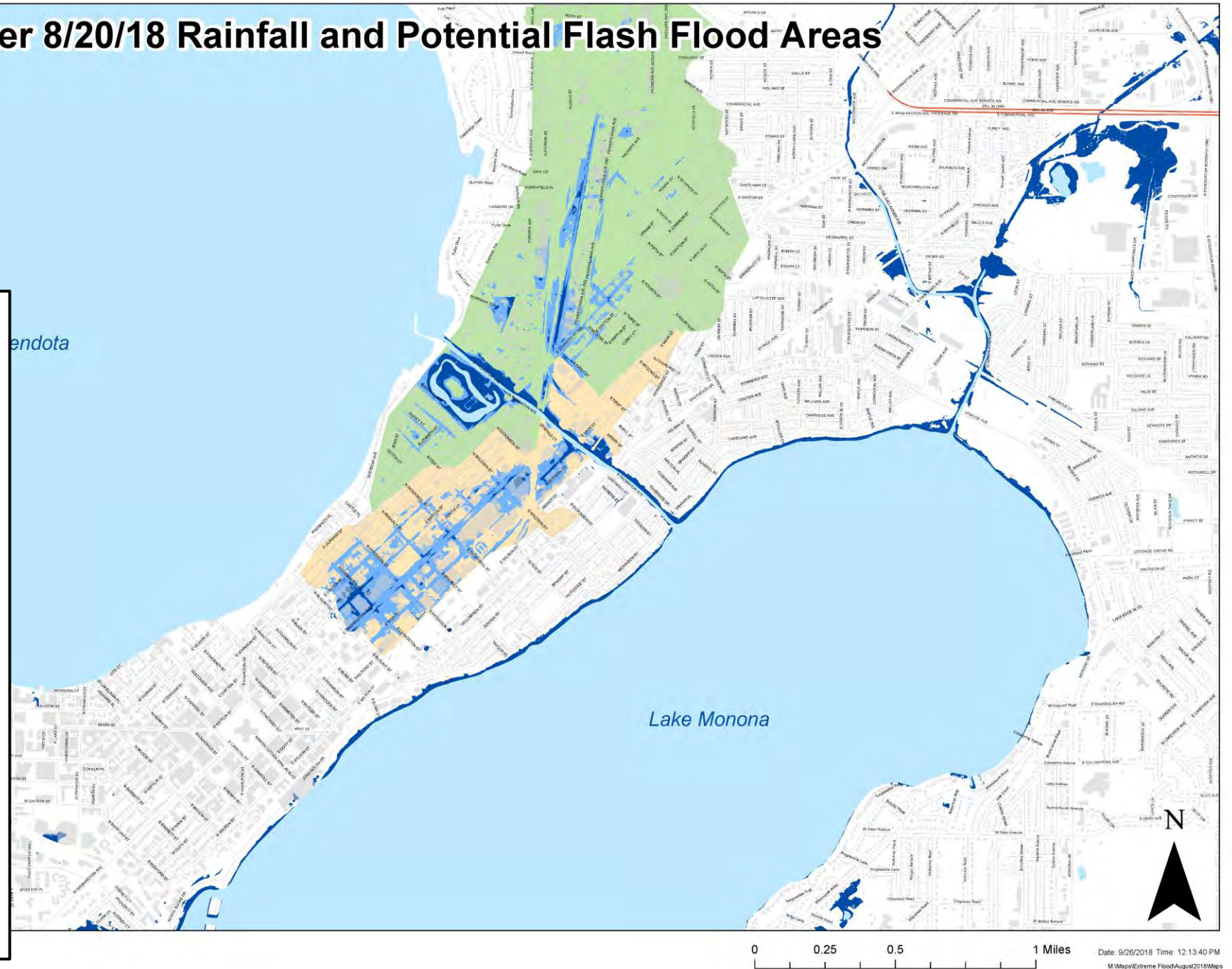
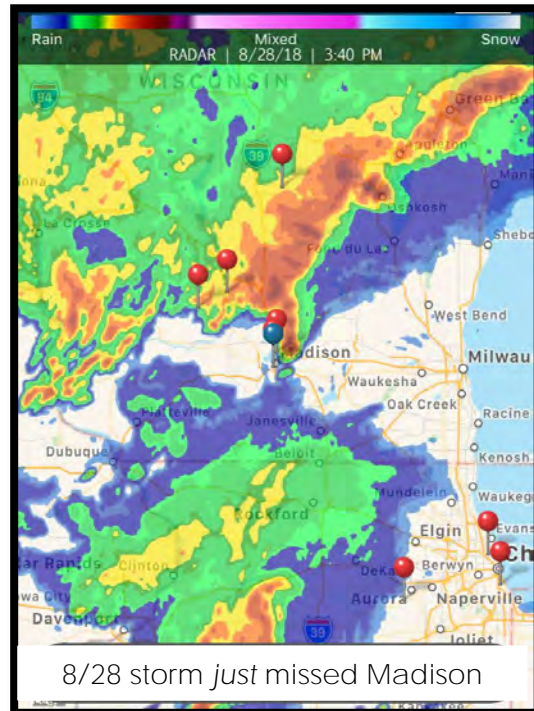


The information on this map was derived from digital databases and other City of Madison data. The City of Madison provides this site as a public service. The City of Madison makes no claims, representations or warranties, express or implied, concerning the validity, reliability or accuracy of the data and expressly disclaims liability for errors and omission in its contents. Each user of the data is responsible for determining the data's suitability for the user's intended purpose. Personal safety should be the user's primary concern.

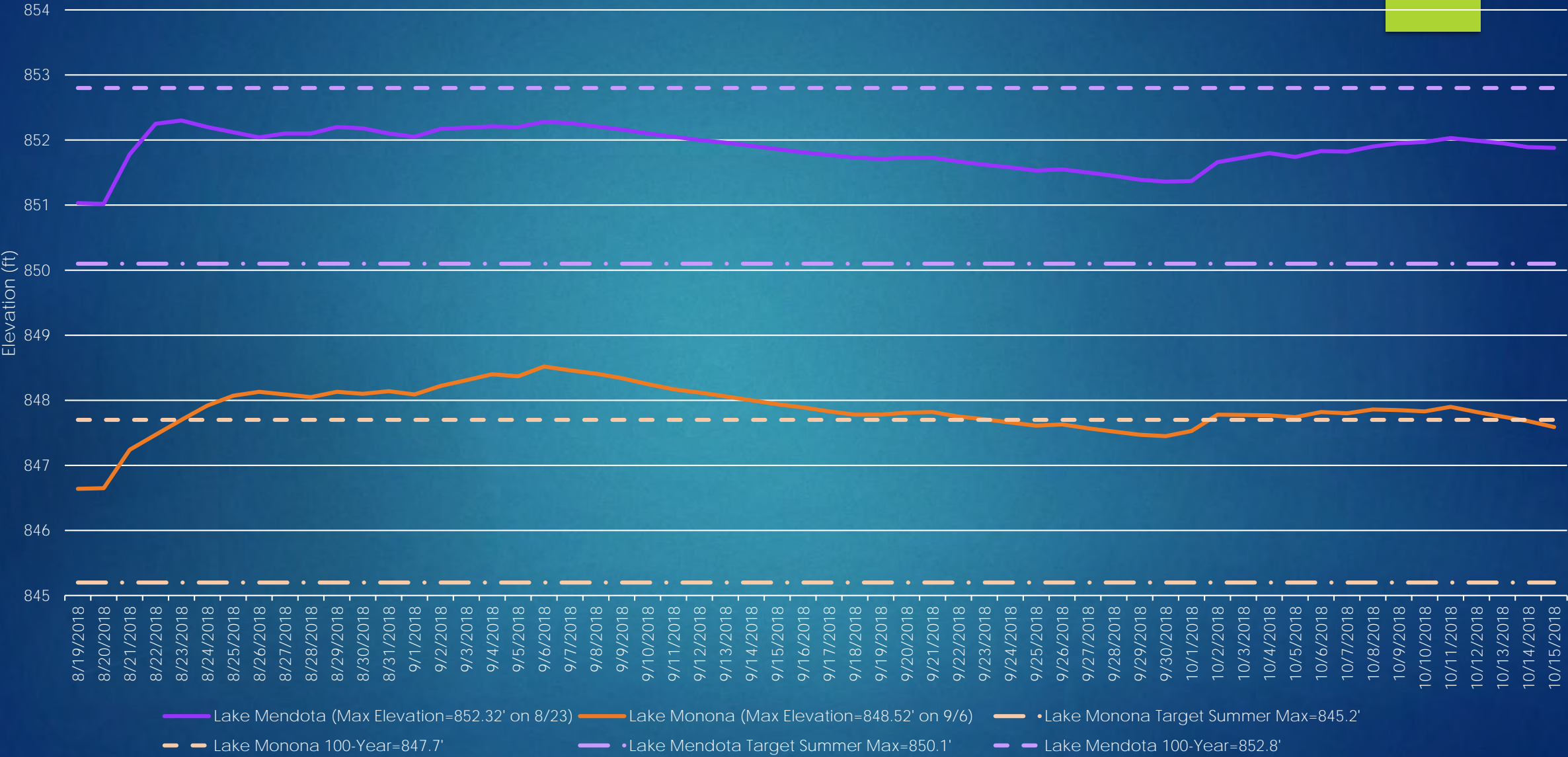
# Max Flood Extents After 8/20/18 Rainfall and Potential Flash Flood Areas

- Observed Flooding Extents from High Lake Levels
- Estimated Flash Flood Areas (851')
- Areas Draining to Yahara River**
  - East Washington Sewer Shed
  - Johnson St Sewer Shed

City was proactive and prepared for potential flash flooding

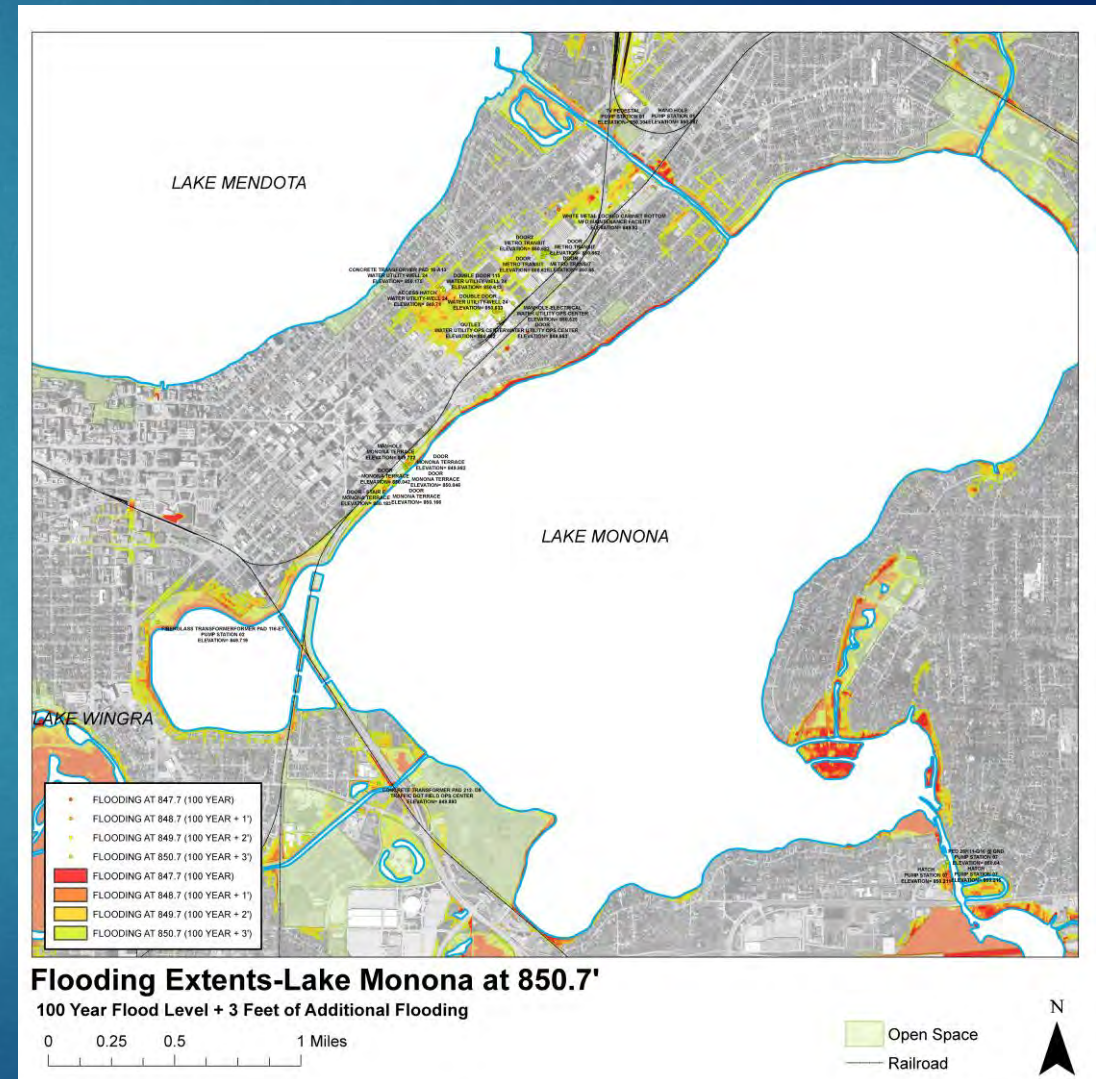


# Lake Levels 8/19/18 to 10/15/18



# City amid-Preparations for High Lake Level Flooding

- ▶ Emergency Management Exercise (11/17)
- ▶ Utility Plan-identifying vulnerabilities and creating contingency plans
  - ▶ Installed generators above max flood stage at pump stations
- ▶ Sanitary System Study-impact of extreme I&I
- ▶ Fire Dept AASPIRE Intern – developed public information
- ▶ Critical Elevations Survey
  - ▶ 33 + locations (Water Utility, Monona Terrace, Metro Transit, MMSD Schools, Pump Stations)
- ▶ Debris Management Plan



# High Lake Levels: August 20<sup>th</sup> -Present

- ▶ What can we control?
  - ▶ City of Madison
    - ▶ Protect critical infrastructure
      - ▶ Sand bagging, rubber “sealing” manhole covers
    - ▶ Effective public messaging + coordinating volunteer efforts
  - ▶ Dane County
    - ▶ Weed cutting to increase flow out of lower lakes
- ▶ What can't we control?
  - ▶ Monona outlet or downstream lake levels
  - ▶ Quantity of water coming into the system
    - ▶ Either stored in Mendota, or passed onto downstream lakes
- ▶ Protection of Tenney Locks
  - ▶ Lake Mendota operated in a manner to prevent dam failure
  - ▶ Water released in a controlled manner that allowed people to adjust to an additional 1"-3" in Lake Monona per day



# Damages – How did Engineering respond?

- ▶ Engineering staff received over 250 calls and emails.
- ▶ Staff continues to get calls and emails
- ▶ Field reviews were completed of all greenways and shorelines immediately following the event.
- ▶ Crews were on 24/7 to respond to emergencies.
- ▶ Leveraged approximately 2,000 volunteer hours for sandbagging efforts.
- ▶ National Guard assisted with sandbagging efforts for 3 days.

# Damages

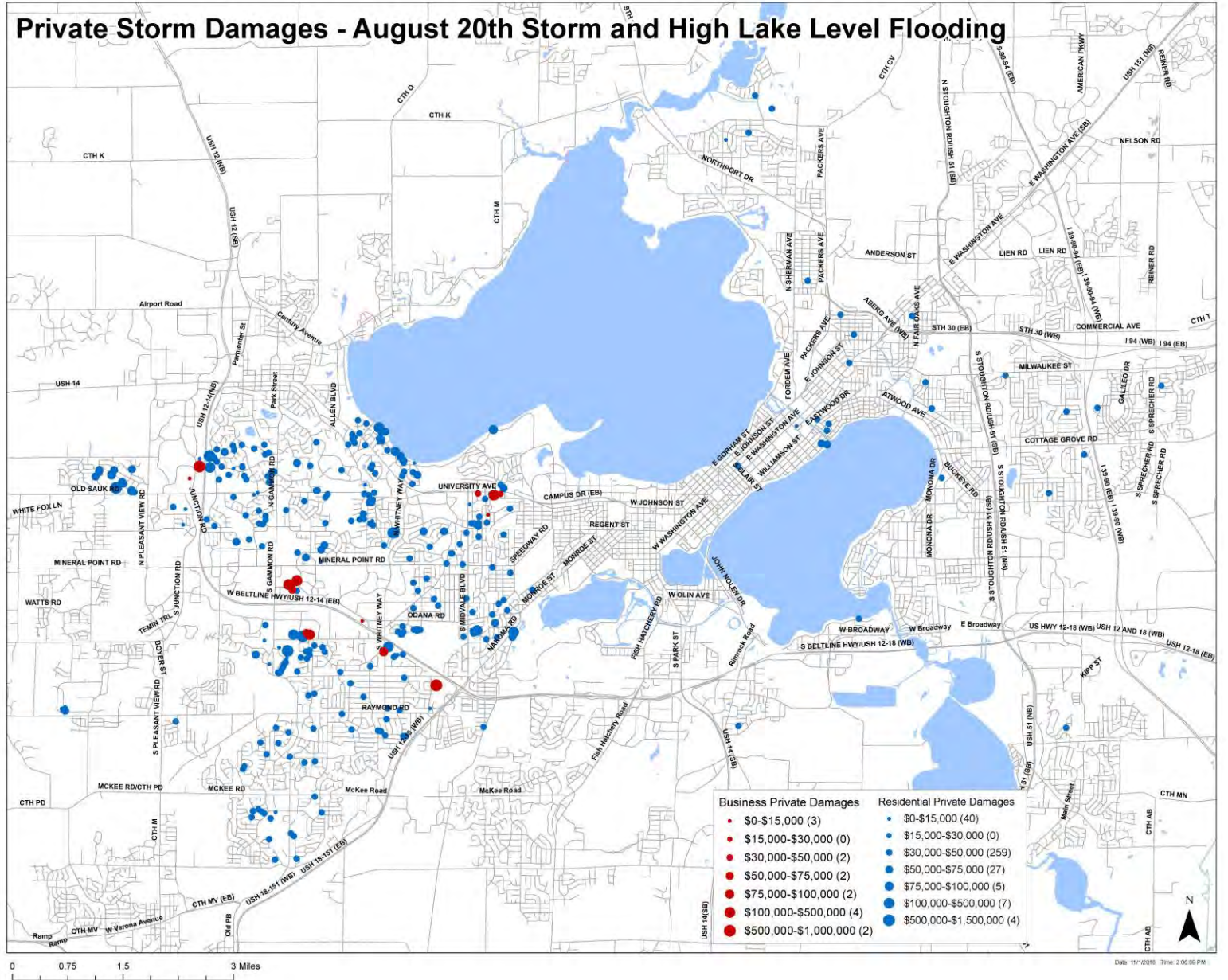
336 Residential - \$15.1M  
11 Businesses - \$2.4M

Total reported private  
damages were \$17.5M+

Public damages \$3.94M

There are many  
more that didn't  
report!

## Private Storm Damages - August 20th Storm and High Lake Level Flooding



# Damages - Roadways



Deming Way, Regent Street, Baker Ave

# Damages – Drainage ways and Parks



Glenwood  
Children's Park



Public Easement in  
Wexford Village

# Damages – Odana Golf Course and West Town Ponds



# Damages – Flooding and Clean Up



Attic Angel Greenway at Junction Rd;  
John Nolen Drive Bike Path Flooding

# Damages – Private Damage



Commerce Dr near  
Menards West



Gettle Ave near  
Bordner Park



# Damages – Private Damage



GHC Sauk Trails  
Clinic



# Damages – Isthmus Flooding

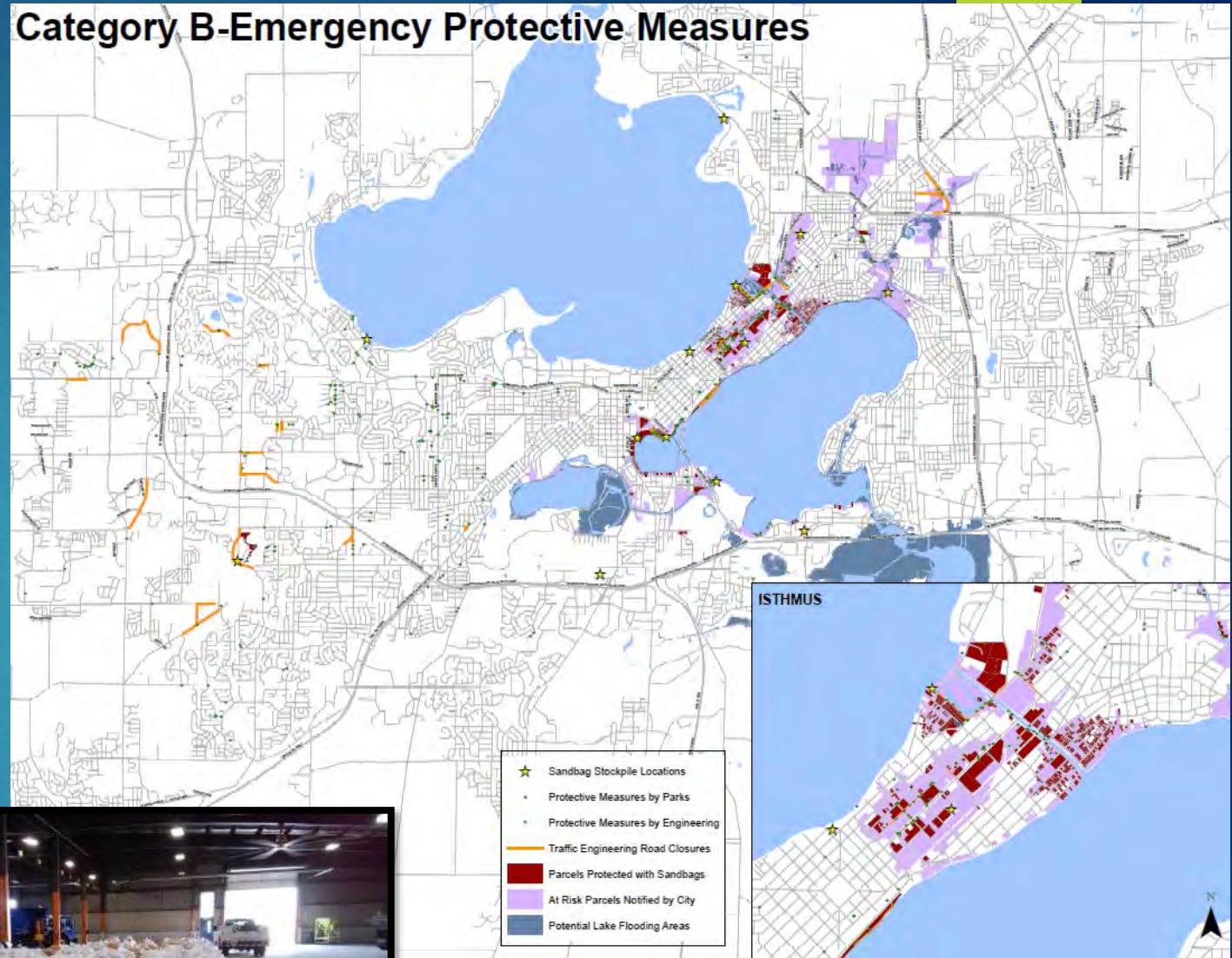


# SANDBAGS

- 225,000 Sandbags Provided
- City Staff worked 13 days, 24/7 on protective measures
- National Guard Deployed
- Estimated cost to date \$907,000 +



## Category B-Emergency Protective Measures



# SANDBAGS – Removal Plan

- ▶ Do not place full sandbags into your refuse or recycling bins.
- ▶ Do not place sandbags under leaf piles or inside leaf bags for yard waste crews.
- ▶ Sandbag Disposal
  - ▶ Store sandbags for future use. If your property was at risk of flooding during this event, it is very possible you will be at risk again. Be ready for the next flood event!
  - ▶ Cut open sandbags and spread the sand on your property. You can then throw the empty bags in the refuse.
  - ▶ Return sandbags to a [sandbag site](#).
  - ▶ Request curbside collection. Curbside collection will continue through Sunday, Nov. 25, 2018. Properties outside the [immediate flood zone](#) will need to request pickup.


# FEMA

- ▶ FEMA disaster declaration was made
  - ▶ Further documentation required for reimbursement of claims made by City
  - ▶ FEMA grant opportunities for mitigation efforts
- ▶ THERE IS STILL A LOT MORE TO DO!
- ▶ If you wish to contact FEMA for reimbursement, please visit: <https://www.disasterassistance.gov/>

# How does the City plan to proceed??

## ► FLOOD PLAN AND POLICY

- To ensure we proceed uniformly and predictably Engineering has DRAFTED/REVISED two policies for response to flooding concerns.



There are two (2) typical types of problems that Engineering responds to:

- ▶ Public problems – where stormwater runoff from the street or greenway leaves public land and enters private property causing damage.
- ▶ Private problem – stormwater runoff draining from one private property to another without ever entering public land causes damage to a downstream private property.

Public problems are the focus for this discussion. There are two main types to focus on:

- ▶ Flash flood problems
- ▶ High lake level flooding in Isthmus and surrounding areas

Flash flooding can be the result of varying public design standards over the years combined with limited private design standards.

## HISTORIC DESIGN STANDARDS

Storm design and the standards used for that design have changed over the years. A brief history of design follows: pre-1960, only very large pipes were sized using rigorous engineering methods while smaller pipes were sized using rules of thumb and often only shown in the plan view on plan sets and final design was completed by construction staff.

From the 1970's to early 1980's most pipes were designed using what is now considered basic hydrologic and hydraulic engineering techniques however NO DETENTION or water quality was considered.

Pipe sizing criteria from approximately the 1970's to the current time has been pipes leading to a culvert road crossing are sized to convey the 10-year design storm.

Culverts at channel or greenway crossings have been designed for the 10-year design storm up to about 2011 when that design standard was increased to the 25-year design event.

Standards for the sizing of pipes/inlets serving enclosed depressions did not exist until the mid-2000's when a standard of the 25-year storm event was set. In 2016 that standard was raised to the 100-year design storm.

1983 marked the first year that stormwater detention (rate control) was required by the City of Madison and design standards were such that the 10-year storm event was the design storm to be controlled. Smaller events passed through detention basins largely un-detained and storms exceeding the 10-year event overflowed the basins but the location of that overflow was not "rigorously" designed.

1993 – 2001 detention standards were revised to include water quality standards and overflow was more rigorously reviewed to assure that the overflow took place on public property but it was not "routed" or modeled to determine approximate elevations of the water. 2004 marked the first year that stormwater control of any type was required at a state level. Infiltration standards were also brought on line at that time.

2009, marked the requirement in City code for new development to meet 100-year detention standards citywide.

As a result of varying design standards over the years, available solutions to drainage problems can be limited and expensive especially in the case of retrofits to the existing infrastructure.

# MOVING FORWARD

## ▶ Short-Term Goals

- ▶ Data collection from different agencies and public
- ▶ Emergency response for safety issues (street closures, barricades, etc)
- ▶ Emergency Repairs - still in progress
- ▶ Identify and Prioritize non-critical issues

# MOVING FORWARD

- ▶ Mid-Term Goals
- ▶ Outreach
  - ▶ Public Informational Meetings, Waterways newsletter, website updates
- ▶ Kick off of Watershed and Flooding analysis
- ▶ Emergency Preparedness Plan (continued work)
- ▶ Reporting System Creation for City Agencies
- ▶ Self-reporting for Residents and owners

# MOVING FORWARD

- ▶ Long-Term Goals
- ▶ Complete Watershed and Flood studies to identify deficiencies
- ▶ Prioritize Solutions such as:
  - ▶ Improvement to pipe or inlet capacity
  - ▶ System overflow modifications (safe overflow)
  - ▶ Increase storage or detention upstream
  - ▶ Solution on private property to solve issue (low impact) such as landscape modifications
  - ▶ Solution on private property to solve issue (high impact) such as structural changes to building, flood walls
- ▶ Plan and budget for improvements
  - ▶ Seek grant and funding opportunities
- ▶ Continue Watershed and Flood studies for other areas in City
- ▶ Work with Development community to make more resilient projects
- ▶ Lake Level Technical Group

# MOVING FORWARD

- ▶ Important to recognize that not all improvements can or will be designed to protect properties to the 100-year storm event. This is especially true in areas that are being retrofitted or that are limited by existing older private infrastructure
- ▶ Not all solutions will be easy – people impacted by the solutions or repairs may not be the same as those benefitted with the repairs
- ▶ We can not fix one problem without understanding the impacts! We need to look at the system in its entirety so we are not causing unintended problems
- ▶ REPAIRS TO THE SYSTEM REQUIRE TIME AND MONEY; NOT ALL ISSUES WILL BE FIXED IMMEDIATELY

# NEXT STEPS:

- ▶ BPW acceptance of public and private drainage policies
- ▶ Kick off of Watershed and flooding analysis in priority locations
  - ▶ Public Informational meetings on specific watersheds
  - ▶ Public engagement and continued data collection
  - ▶ Website creation for watershed and flood studies and project updates
- ▶ Acquisition of properties to be used for stormwater management and flood mitigation
- ▶ Public Works construction for flood repairs and mitigation projects

# RESOURCES

- ▶ City of Madison Website  
[www.cityofmadison.com/flooding](http://www.cityofmadison.com/flooding)
- ▶ Flooding And Self-reporting at  
[www.cityofmadison.com/reportflooding](http://www.cityofmadison.com/reportflooding)
- ▶ Engineering Waterways Newsletter
- ▶ Flood Prevention Flyer and website  
[www.cityofmadison.com/floodprotection](http://www.cityofmadison.com/floodprotection)

# RESOURCES

## ► FEMA

► The last day to register for FEMA assistance is December 17, 2018.

## ► How to Apply

► There are three ways to apply for assistance:

### 1. By Phone

Call FEMA at 1-800-621-3362.

TTY available at 1-800-462-7585.

### 2. Register Online at <https://www.disasterassistance.gov/>

Enter your city and state or your ZIP code. Click “Apply Online” and complete the application process.

### 3. Visit the Disaster Recovery Center

2413 Parmenter Street  
Middleton, WI 53562

Hours: 9:00 am – 6:00 pm, Monday – Saturday

THANK YOU!

# [end slide]Map Disclaimer

- ▶ Flood mapping data from City 2016 LiDAR data
- ▶ Rain accumulation data from KMKX Radar that was “bias corrected” using rain gauges by UW Professor, Dan Wright
- ▶ The information on the maps was derived from digital databases and other City of Madison data. The City of Madison provides this site as a public service. The City of Madison makes no claims, representations or warranties, express or implied, concerning the validity, reliability or accuracy of the data and expressly disclaims liability for errors and omission in its contents. Each user of the data is responsible for determining the data’s suitability for the user’s intended purpose. Personal safety should be the user’s primary concern.