Welcome!
We will begin shortly…

Virtual Meeting Schedule	
6:30 – 6:40	Welcome
6:40 – 7:40	Presentation
7:40 – 8:00	Presentation Q & A (General)
8:00 – 8:30	Zoom Breakout Rooms
8:30	Come Back Together/Wrap-Up

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East Isthmus and Yahara River Watershed Study Public Information Meeting No. 3

City of Madison Engineering Division
July 24, 2025

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Meeting Technical Housekeeping

- This meeting will be **recorded** and posted to the project page.
- All attendees should be **muted** to keep background noise to a minimum.
- Use the **"Q and A"** button for technical issues with meeting to troubleshoot with staff to assist.
- Use the **"Q and A"** button to type questions about presentation. Questions will be answered live after the presentation.
- Inappropriate questions may be dismissed.
- Use the **"raise your hand"** button to verbally ask your question. You will be prompted to unmute when it is your turn.

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This meeting is being recorded.

It is a public record subject to disclosure.

By continuing to be in the meeting, you are consenting to being recorded and consenting to this record being released to public record requestors.

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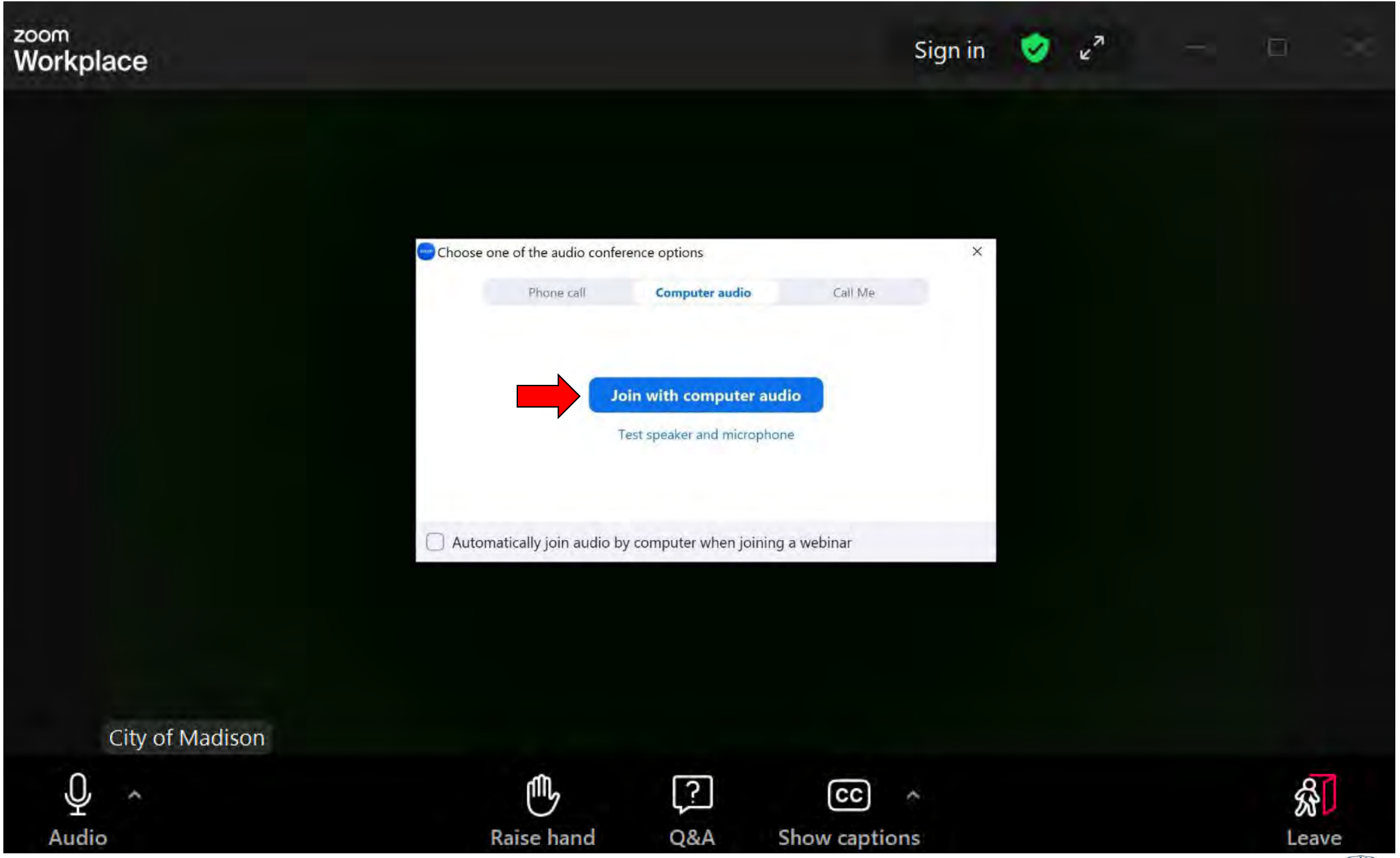
How to Participate



Make sure to join audio

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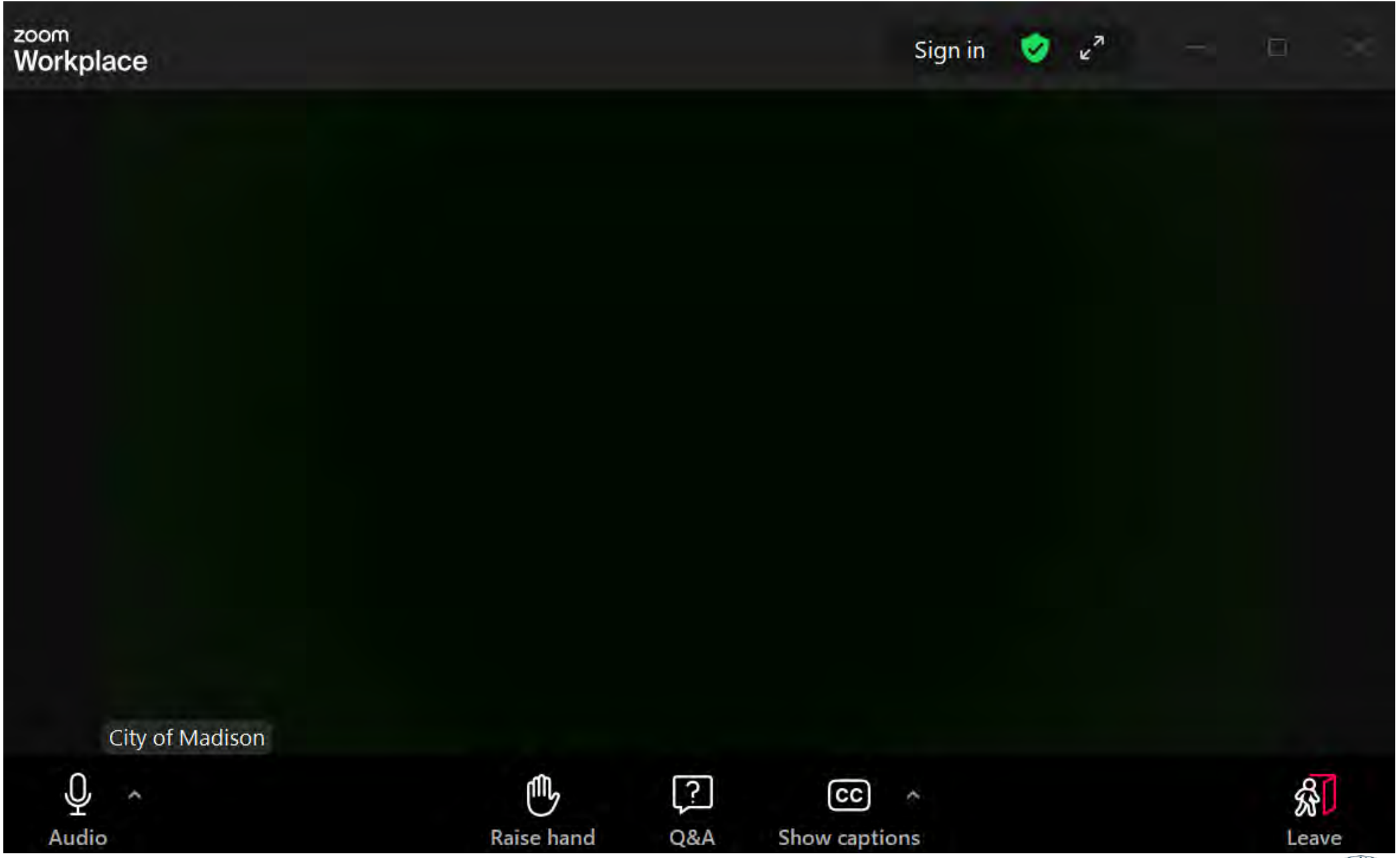
How to Participate



Raise your hand to be unmuted for comments or ask additional questions.

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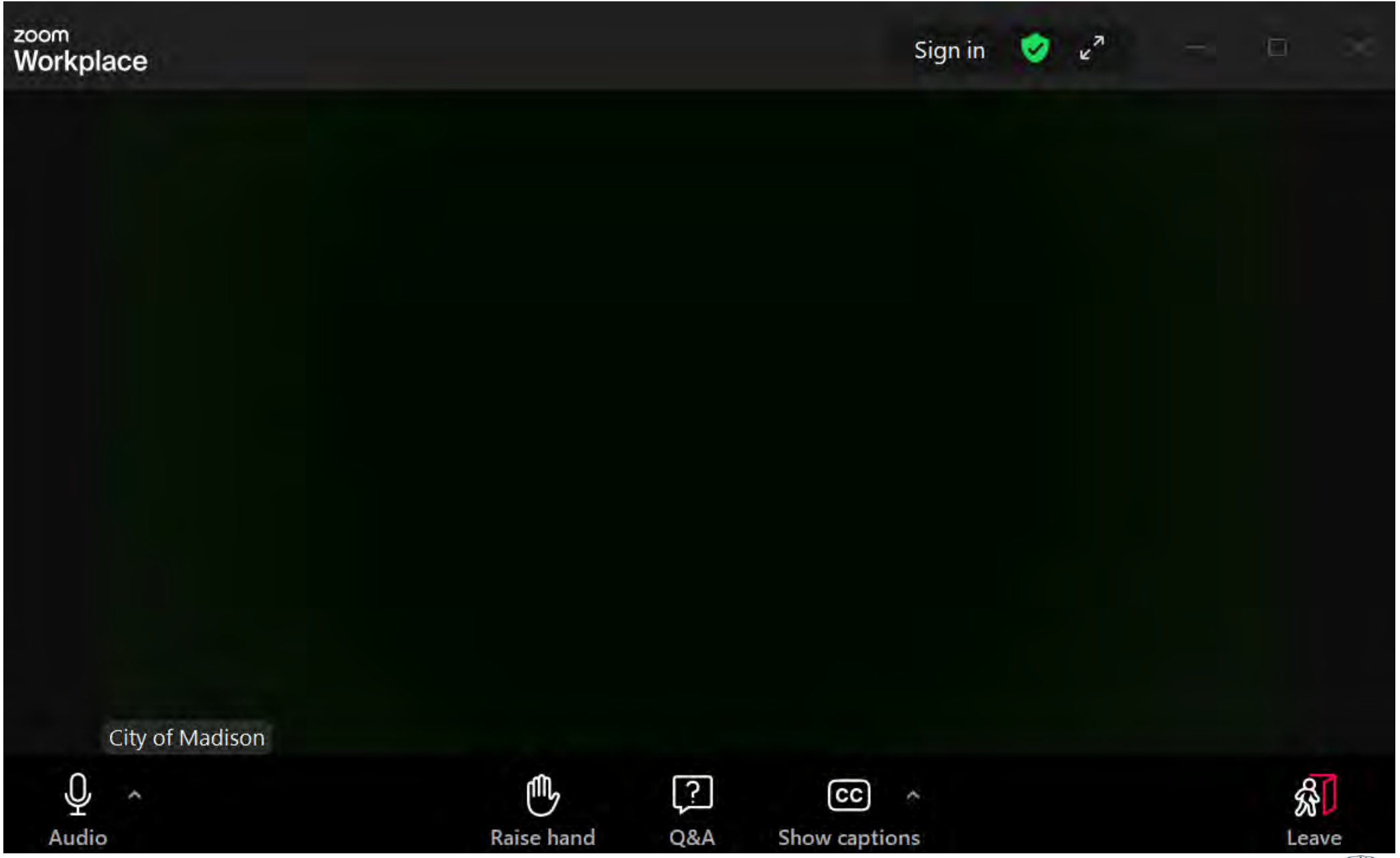
How to Participate



Use Q&A button if you have technical issues or a question for the panelists.

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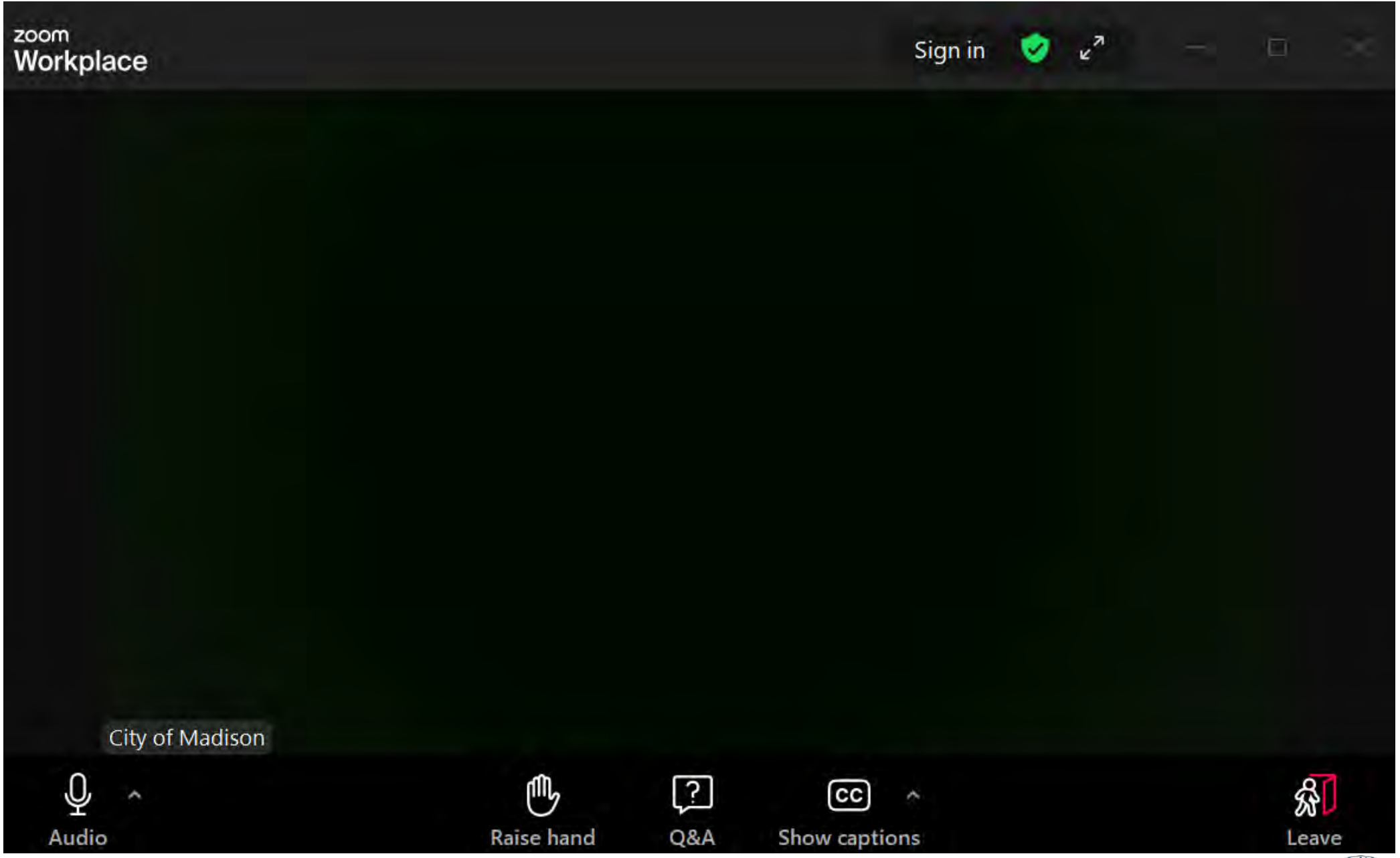
How to Participate



Use **Q&A button for all other questions.**
We will answer after the presentation.

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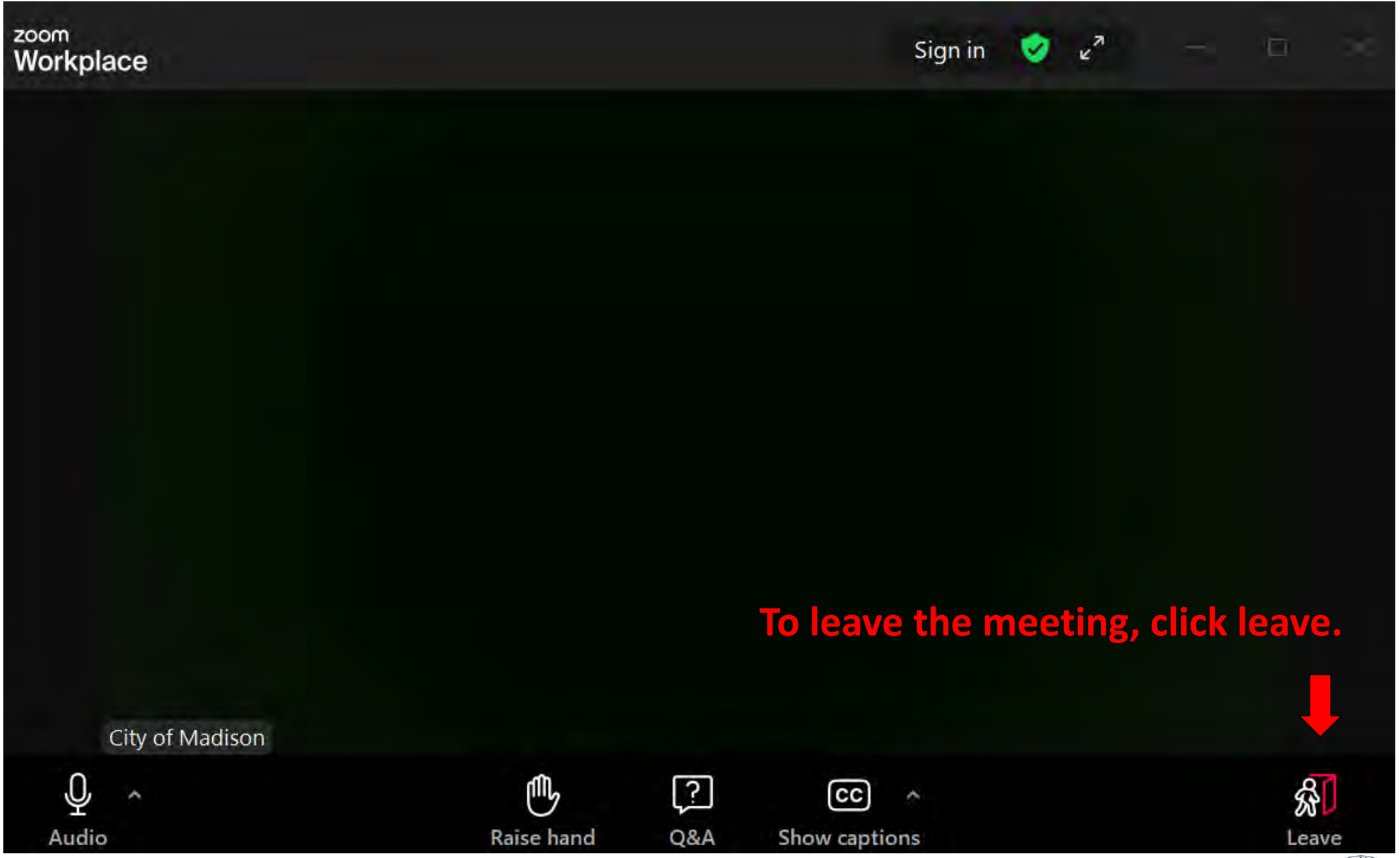
How to Participate



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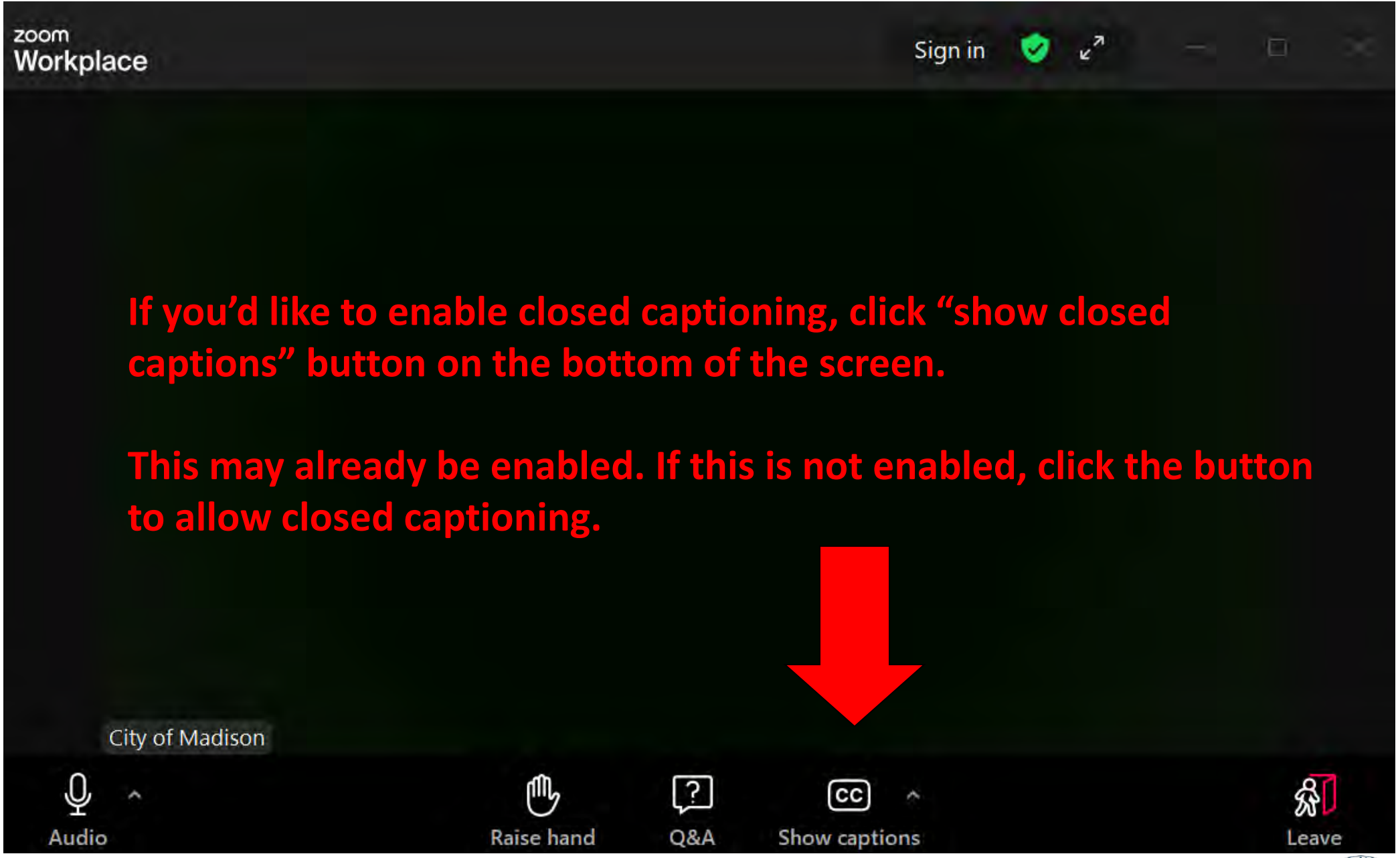
How to Participate



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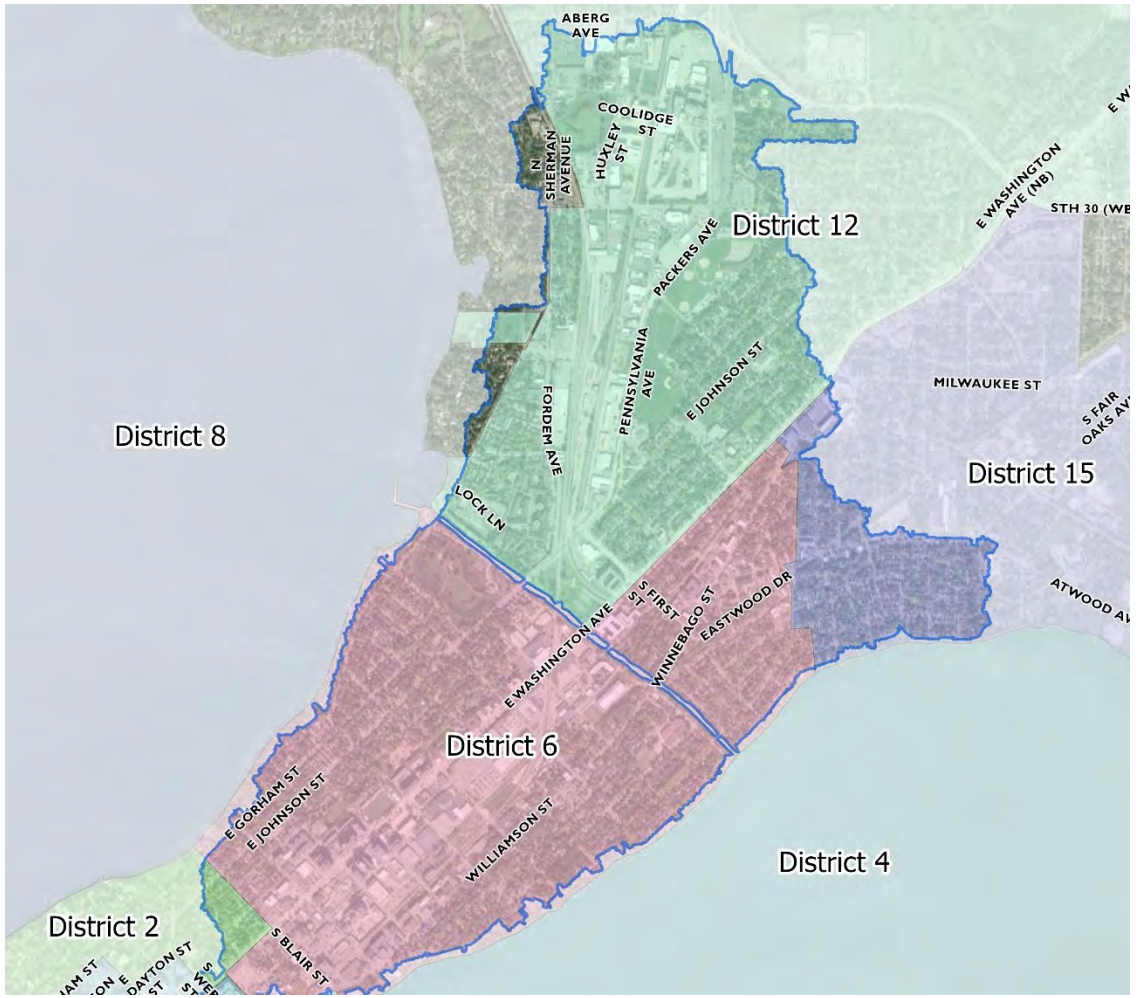
Project Contact Introductions

- Project Manager: Jojo O'Brien, City of Madison, Stormwater Engineer
- Tetra Tech – Consultant Engineers
  - Dan Christian, Project Manager
  - Jenna Troppman, Project Engineer
- Other City Staff:
  - Hannah Mohelnitzky, Public Information Officer
  - Janet Schmidt, Stormwater Section Manager
  - Greg Fries, Deputy City Engineer – Sanitary, Storm and Landfill
  - Ryan Stenjem, Stormwater Engineer
  - Phil Gaebler, Water Resource Engineer

Project Contact Introductions

Alder Information

- District 2 – Alder Will Ochowicz
- District 6 – Alder Davy Mayer
- District 12 – Alder Julia Matthews
- District 15 – Alder Dina Nina Martinez-Rutherford



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Evening Overview

- Welcome (Hannah Mohelnitzky, City of Madison)
- Presentation (Dan Christian, Tetra Tech)
- Q&A (facilitated by Hannah Mohelnitzky, City of Madison)
  - Submit questions through Zoom “Q and A”
  - Questions answered at the end of the Presentation
- Wrap Up (Hannah Mohelnitzky, City of Madison)
- Breakout Groups (Tetra Tech and City of Madison staff)
  - An option to join breakout groups will appear on your screen

Presentation Outline

1. Watershed Study Background
2. Flood mitigation targets
3. Inundation mapping
4. Proposed solutions development process
5. Proposed solutions
   a. Standalone projects
   b. Local storm sewer
6. Dredging Analysis
7. Implementation and cost
8. Why aren't all flood targets met?
9. Green Infrastructure Analysis and information for residents
10. Next steps

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Watershed Study Limitations

- Utilizing computer models for analysis (computer models have inherent limitations, require assumptions, and are for one specific set of circumstances)
- Retrofitting infrastructure takes a lot of time and money
- Not all problems can be solved
- Repairs are not always easy, popular, or inexpensive
- Best engineering solution may not be the one chosen
- Property owners will need to create solutions too
- Solutions will need broad community cooperation
- Groundwater problems not easily addressed by infrastructure

Definitions of commonly used terms

- **Stormwater**: rainwater produced from a rain event
- **Stormwater runoff**: the portion of the rainwater that does not soak into the ground
- **CFS:** cubic feet per second, used as a measurement of how quickly water is moving
- **Green Infrastructure (GI):** is smaller infrastructure that filters and absorbs stormwater where it falls
- **Storage:** area to store stormwater temporarily, and slowly release it to mitigate flooding
- **Conveyance (pipes):** moving water through more quickly with bigger pipes to mitigate flooding
- **Model**: computer software that is used to evaluate the stormwater conveyance system
- **Local Sewer Projects**: storm sewer that is reconstructed with another already-scheduled project – typically street reconstruction
- **Stand-alone Projects**: Flood mitigation projects that will be constructed on their own – not tied to another already-scheduled project
- **Dredging:** the removal of sediments and debris from the bottom of lakes, rivers, harbors, and other water bodies

Study Location

A watershed is an area of land that drains to a single location.

This is the East Isthmus and Yahara River Watershed in the City of Madison.

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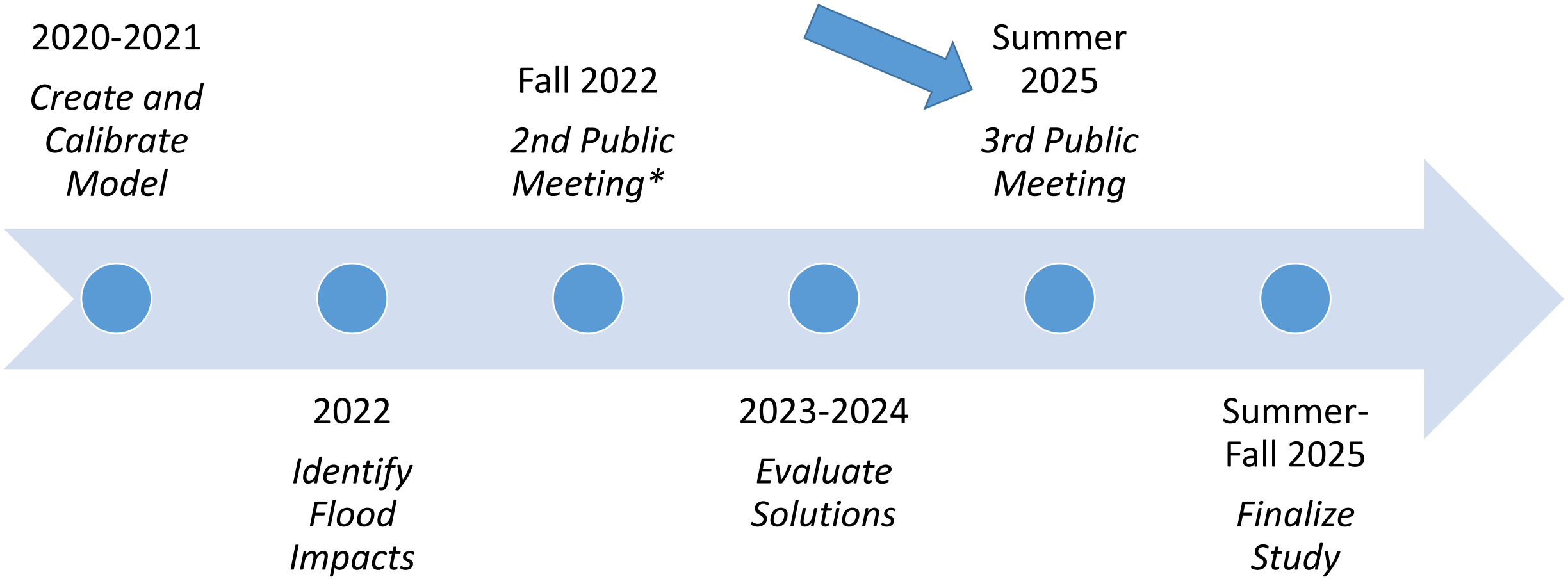
Schedule



*Presentations from PIM1 and PIM 2 can be found on the Watershed Study project page: www.cityofmadison.com/IsthmusYaharaWatershed

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1% Annual Chance Event

- The “100-Year” Storm
- 1/100 or 1% Annual Chance Event
  - 6.7 inches of rain in 24 hours
  - Does NOT mean that a storm will only occur once in 100 years.
  - During a 30-year mortgage, there’s a 26% chance of experiencing a 100-year (1% chance) event.

% Annual Chance	Chance of occurring in 1 Year	Return Period or Average Recurrence Interval
100%	1 in 1	1-year
50%	1 in 2	2-year
10%	1 in 10	10-year
4%	1 in 25	25-year
1%	1 in 100	100-year
0.10%	1 in 1000	1000-year

Flood Mitigation Targets

10% Chance Event

- No surcharging of storm sewer onto roadway (storm sewer pipes are sized to carry storm)

4% Chance Event

- 0.2’ at Centerline of Road (roads passable for emergency vehicles)

1% Chance Event

- No structure (home/building) flooding
- No greenway crossing overflow (stormwater does not come out of greenway and flow over the road)

0.2% Chance Event

- Safe conveyance of overflow

Flood Mapping Disclaimer

The flood map exists to help you quickly get information about general flood risks. The maps do not identify all areas that may flood or predict future flooding.

Do not use these maps to make official flood risk determinations for insurance, lending, or other purposes. These are not official FEMA federal Flood Insurance Rate Map or the state or local equivalent.

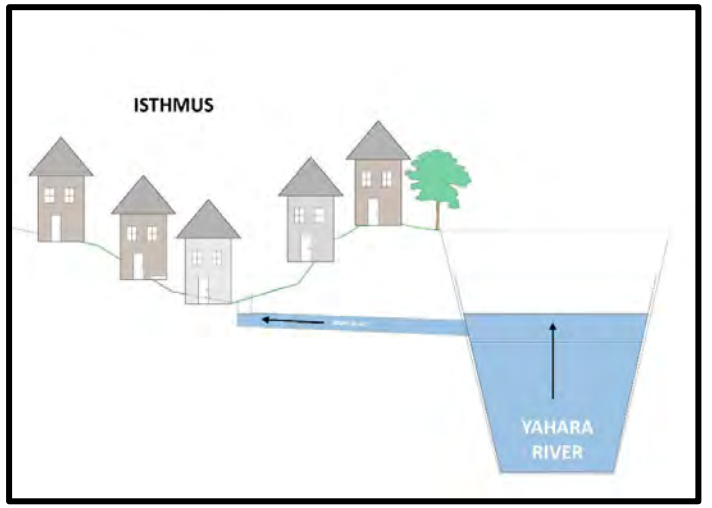
The City of Madison assumes no liability for any errors, omissions, or inaccuracies. The City also assumes no liability for any decisions or actions a user might take based on these maps.

Lake and River Levels Matter for Flooding on the Isthmus

- The Yahara River flows between Lake Mendota and Lake Monona through downtown Madison.
  - Many storm sewers drain to the Yahara River
- When lake levels are high, stormwater has nowhere to go — drains can back up, and flooding worsens.
- Even light rain can cause problems if the lakes are already full.
- River and lake levels affect how fast water can drain from streets, homes, and businesses.

Regulatory Lake Levels

	Lake Mendota Water Level (ft)	Lake Monona Water Level (ft)
Ordinary High-Water Mark	850.50	845.62
Target Maximum	849.90	845.00
Target Summer Minimum	849.40	844.50
Target Winter Minimum	848.00	842.00



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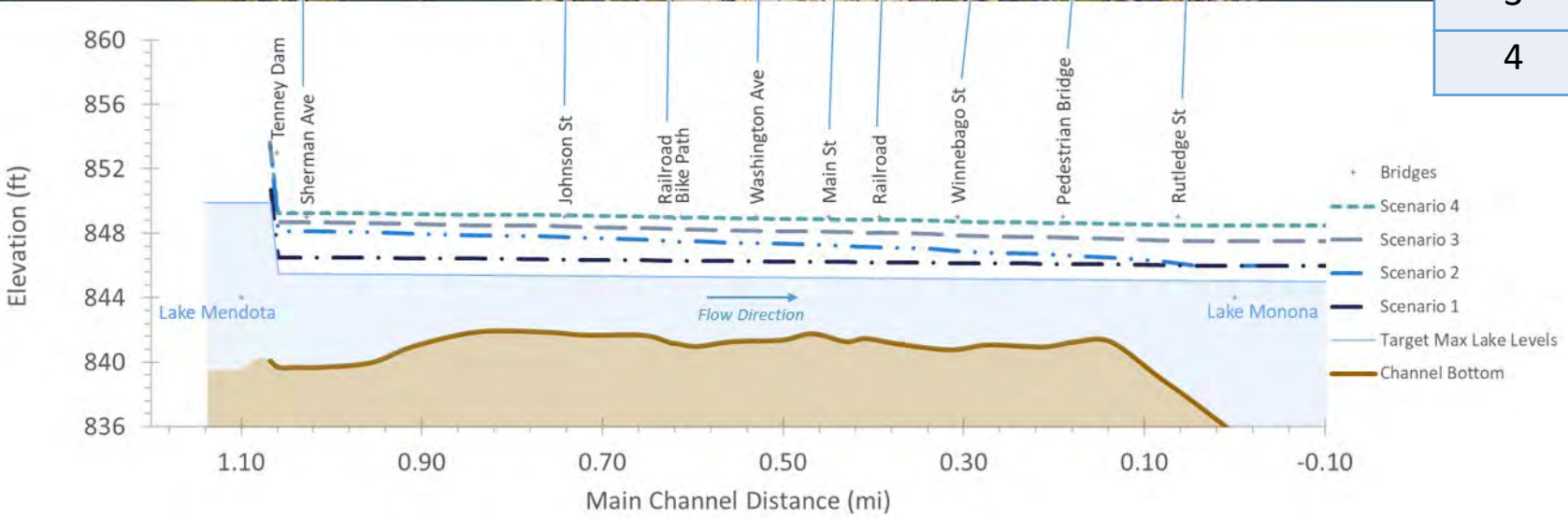
Variety of Lake Levels Considered in Study



Scenario	Yahara River Discharge (cfs)	Lake Monona Elevation (ft)
1	250	846.0
2	700	846.0
3	700	847.5
4	700	848.5

Less likely to occur, more conservative

For reference, Lake Monona is currently at 845.3, and Yahara River Discharge is 150 cfs on 7/23/24 (below Scenario 1)

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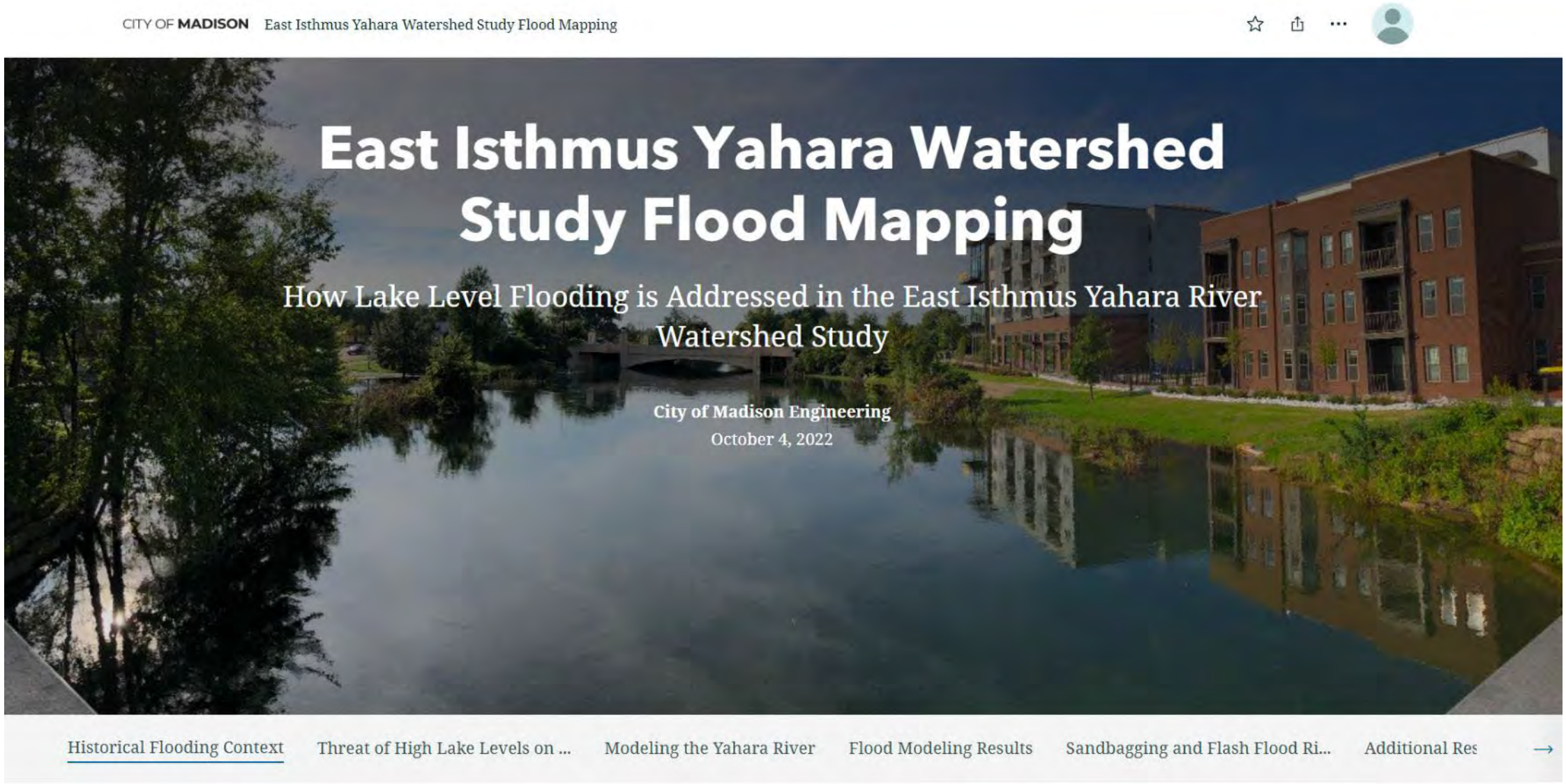

To view storymap on your own device visit: **https://arcg.is/1jaPLa**

Or you can find a link to the Story Map on the project webpage: www.cityofmadison.com/IsthmusYaharaWatershed

**You cannot view the story map in Internet Explorer*

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Closed Depressions

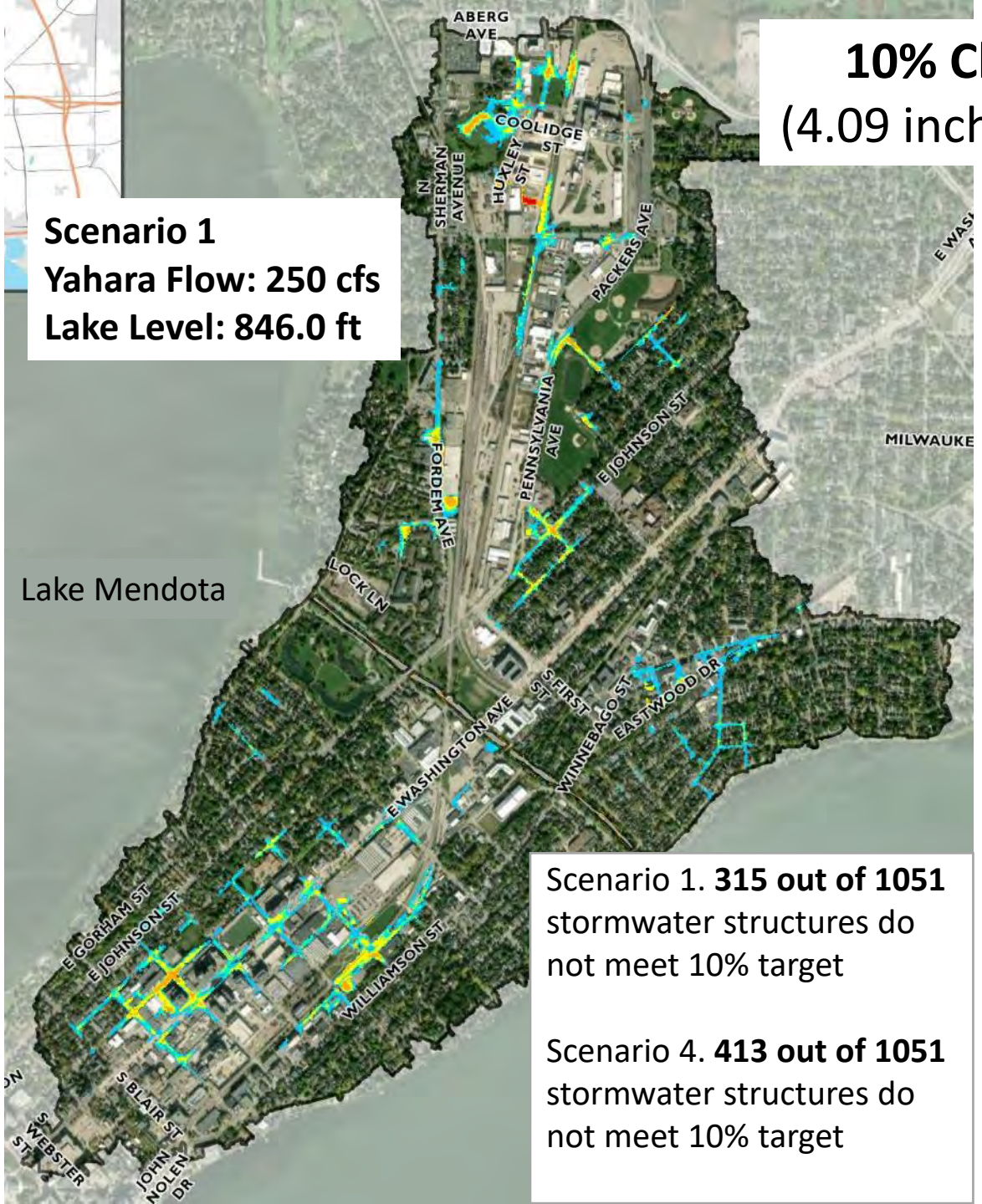
<u>Definition:</u>

A low area of land with no (natural) outlet that accumulates or receives runoff. The only way for water to leave is through a pipe.

Existing Conditions Inundation Mapping

10% Chance Event
(4.09 inches in 24 hours)

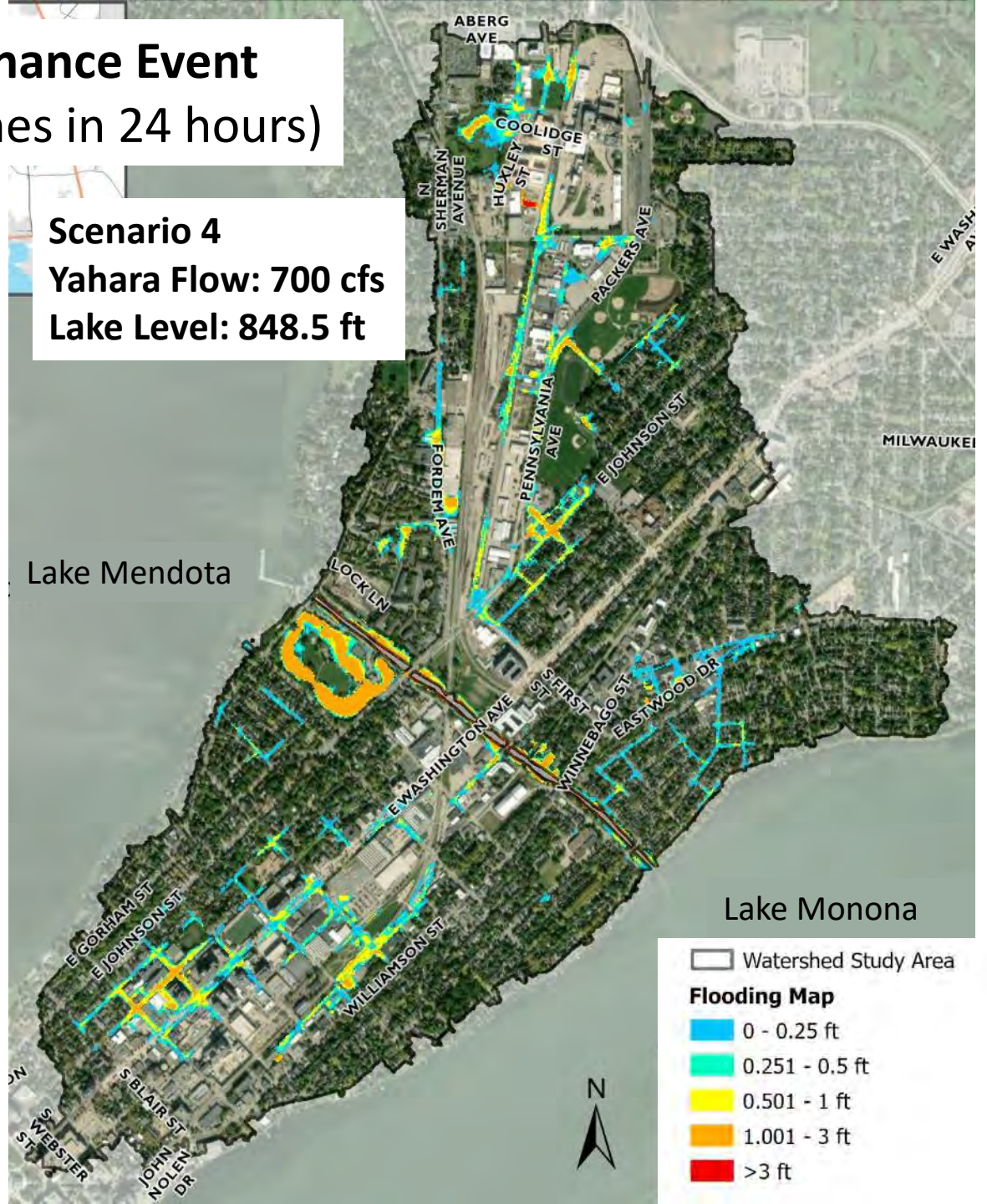
Scenario 1
Yahara Flow: 250 cfs
Lake Level: 846.0 ft



Scenario 1. **315 out of 1051** stormwater structures do not meet 10% target

Scenario 4. **413 out of 1051** stormwater structures do not meet 10% target

Scenario 4
Yahara Flow: 700 cfs
Lake Level: 848.5 ft



Existing Conditions Inundation Mapping

1% Chance Event
(6.66 inches in 24 hours)

Scenario 1
Yahara Flow: 250 cfs
Lake Level: 846.0 ft

Scenario 4
Yahara Flow: 700 cfs
Lake Level: 848.5 ft

Lake Mendota

Lake Monona

Scenario 1. **100 out of 7,421** buildings do not meet 1% target

Scenario 4. **135 out of 7,421** buildings do not meet 1% target

Watershed Study Area

Flooding Map

- 0 - 0.25 ft
- 0.251 - 0.5 ft
- 0.501 - 1 ft
- 1.001 - 3 ft
- >3 ft

N

Proposed Solutions Process

- Iterative process
  - Brainstormed solutions for Scenario 1
    - Green Infrastructure (GI)
    - Storage
    - Conveyance (pipes)
  - Consultant analyzed ideas and provided results
  - Some solutions not found to be viable for various reasons
  - Several meetings to develop the “suite of solutions”
    - Ran solutions in model to see impact on Scenario 4

- Met with City Agencies for feedback & revised solutions as needed
  - Impacts to Agency’s infrastructure/property
  - Additional solutions
  - Places for cooperation/win-win solution

- Meeting with you tonight

What is Green Infrastructure (GI)

- GI is smaller infrastructure that **filters and absorbs stormwater where it falls**.
- GI uses plant or soil systems, permeable pavement or other permeable surfaces to **store, infiltrate, or evapotranspirate stormwater** and **reduce flows** to sewer systems or to surface waters.
- The City encourages GI use through the stormwater ordinance, the rain garden program, and a GI Pilot Study.

A rain garden on private property treats and infiltrates stormwater on-site and provides wildlife habitat

Permeable Pavement installed with pilot project

Terrace Rain Garden

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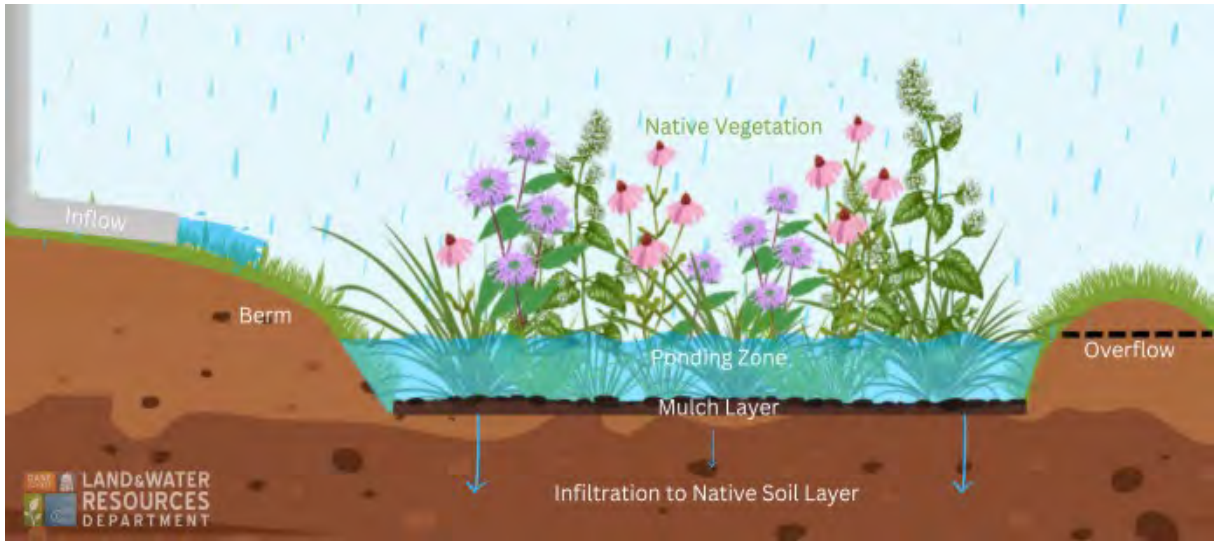
How Green Infrastructure (GI) Works

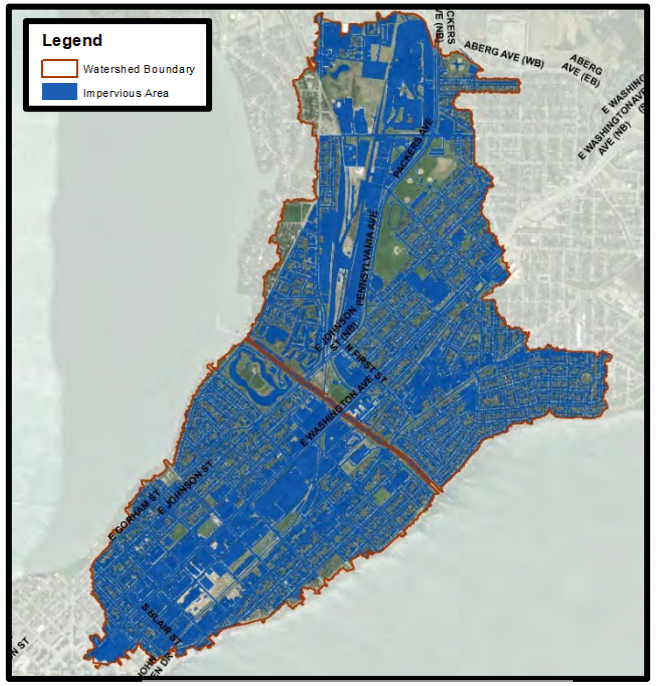


- GI is like a cup. It is typically designed to capture small storms (1-year storms or ~1") that occur the most frequently to infiltrate that small amount of stormwater
  - The most effective way to clean stormwater that enters our waterways is collecting water from regularly occurring storms that flush pollutants and debris into our waterways each time it rains
- When more water is directed to the GI than it can handle, it overflows, much like adding water to a full cup, and pours downstream

Watershed Study Solutions – Green Infrastructure

High-level analysis to see if GI could solve 1% chance flooding:

- During a 1% chance storm event, there is ~ **4.8 million cubic feet** of water ponding on the isthmus
  - That's equivalent to water **100 feet deep (10 stories) on a football field**
  - If we want to utilize GI to hold the ponded water, ~105 square feet of green infrastructure space is needed for every 1,000 square feet of contributing impervious surface.
- To use GI to meet 1% chance flooding target, **~187 acres of land is needed**, which is **~30% of the pervious area*** in the watershed.
  - Would mean 30% of single-family yards, terraces, Parks, etc.
  - The capital costs would be ~$500 million plus annual operation and maintenance needs.
  - **assumes average soil infiltration and low ground water so you can pond water in GI 12" deep – not the case thru a large portion of the isthmus*
- Following this analysis, we focused on conveyance (pipes) and storage solutions
  - We will talk about analysis to use GI for smaller storms later in presentation



Impervious Area
979 acres
60% of watershed

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Watershed Study Solutions

Next assessed storage options, which are limited on isthmus:

- Looked at adding underground storage to parks near flooded areas (Reynolds Park, Demetral Park)
- Results showed higher costs, and lesser benefits than the pipe improvements, and had negative short-term impacts to park recreation
    - Ex: 25’ deep underground storage needed at Reynolds Park (and would need to be pumped out)

→ Pipe improvements were most effective way to meet flood mitigation targets

Proposed Solutions

~56,500 feet of local storm sewer improvements

<u>Standalone Projects (large box culverts)</u>

- Commercial Ave
- Pennsylvania Ave
- E Johnson St
- Wilson St (Few St to Brearly St)
- Capital City Trail (Brearly St to Livingston St)
- Paterson Relief
- Blount St

Photo of a box culvert (square stormwater pipe)

Local Storm Sewer Improvements

- Storm sewer upgrades will happen during future street reconstruction projects
- Recently rebuilt streets likely won't see upgrades for many years.

All Storm Sewer Improvements

- Local storm sewer improvements (previous slide) +

Standalone Projects

1. Capital City Trail (Brearly St to Livingston St)
2. Wilson St (Few St to Brearly St)
3. Pennsylvania Ave
4. Commercial Ave
5. E Johnson St
6. Paterson Relief
7. Blount St

All Storm Sewer Improvements

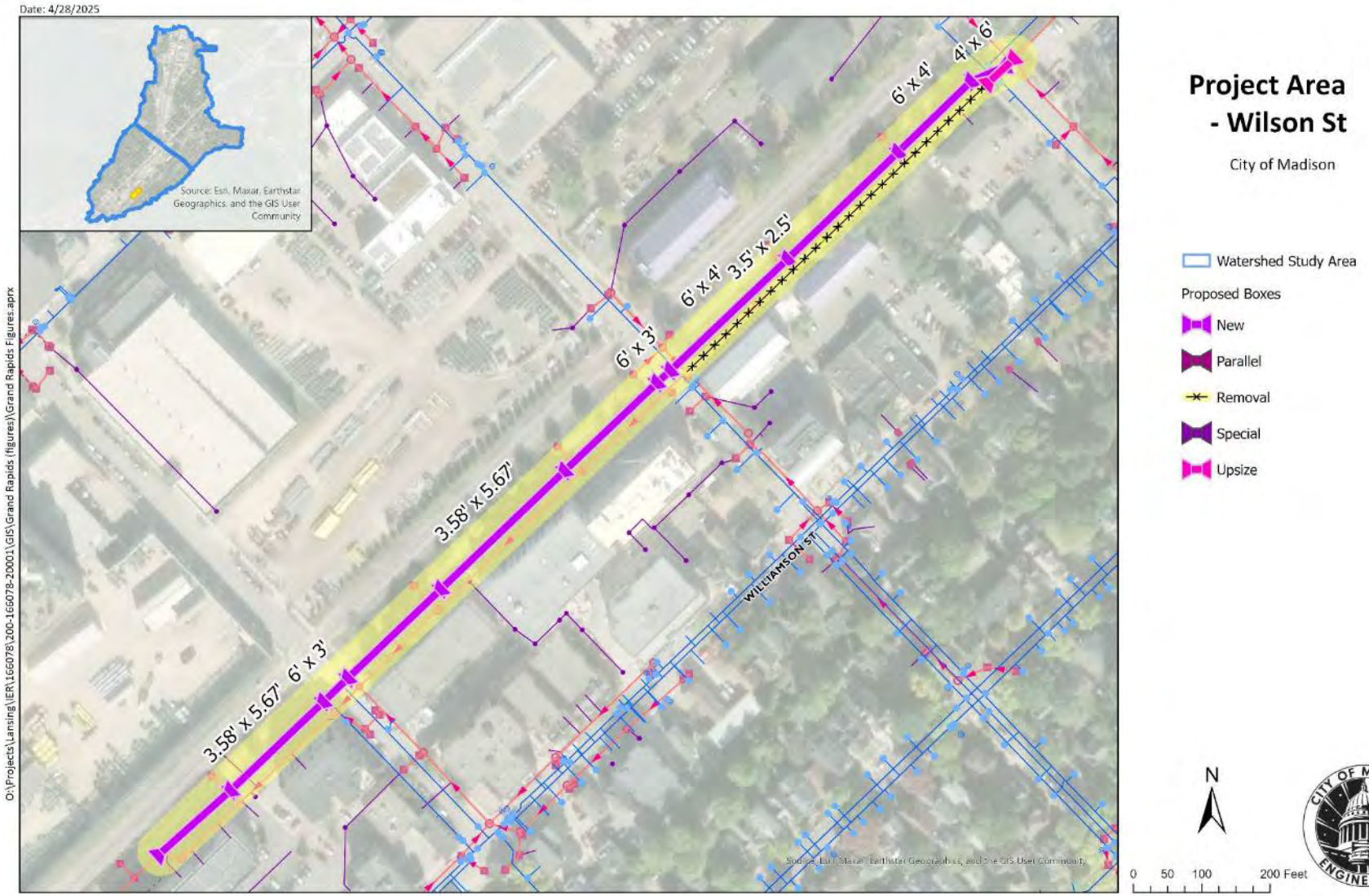
Spaghetti of utilities under major street corridors make fitting very large box culverts challenging, and often impossible in some locations.

Photo: installing a sanitary sewer with Wilson St project.

EX: we know the existing box culvert under East Wash is as big as we could fit with other competing utilities, so the consultant did not propose upsizing that pipe

1. Capital City Trail (Brearly St to past Livingston St)

- Replace failing pipes and increase conveyance along trail.
- Construction in 2025-26
- Cost $2.4M (bid price)

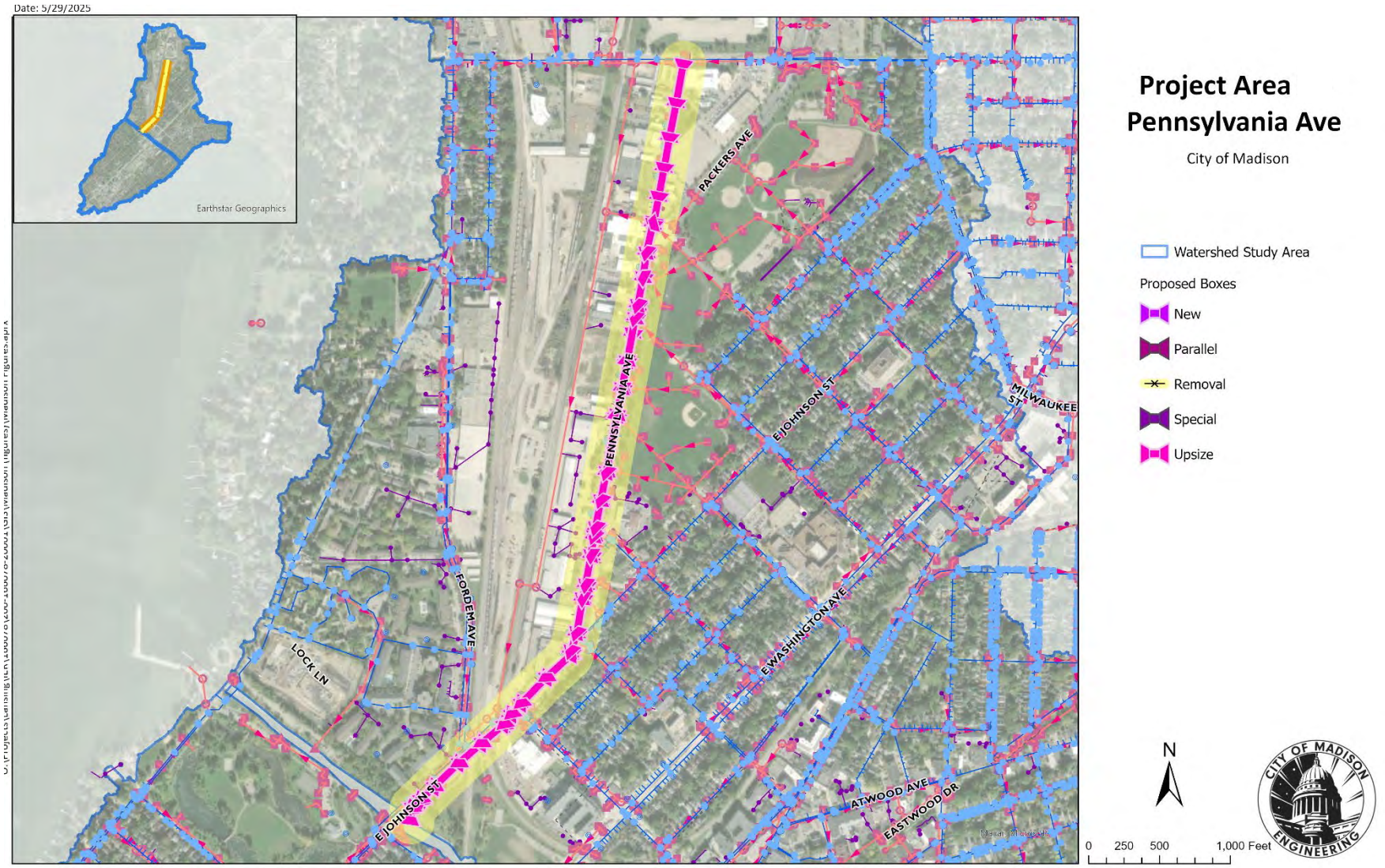


2. Wilson Street (Few St to Brearly St)

- Replace older pipes and increase conveyance along Capitol City Trail and on Wilson St.
- Est. Cost $1.5M

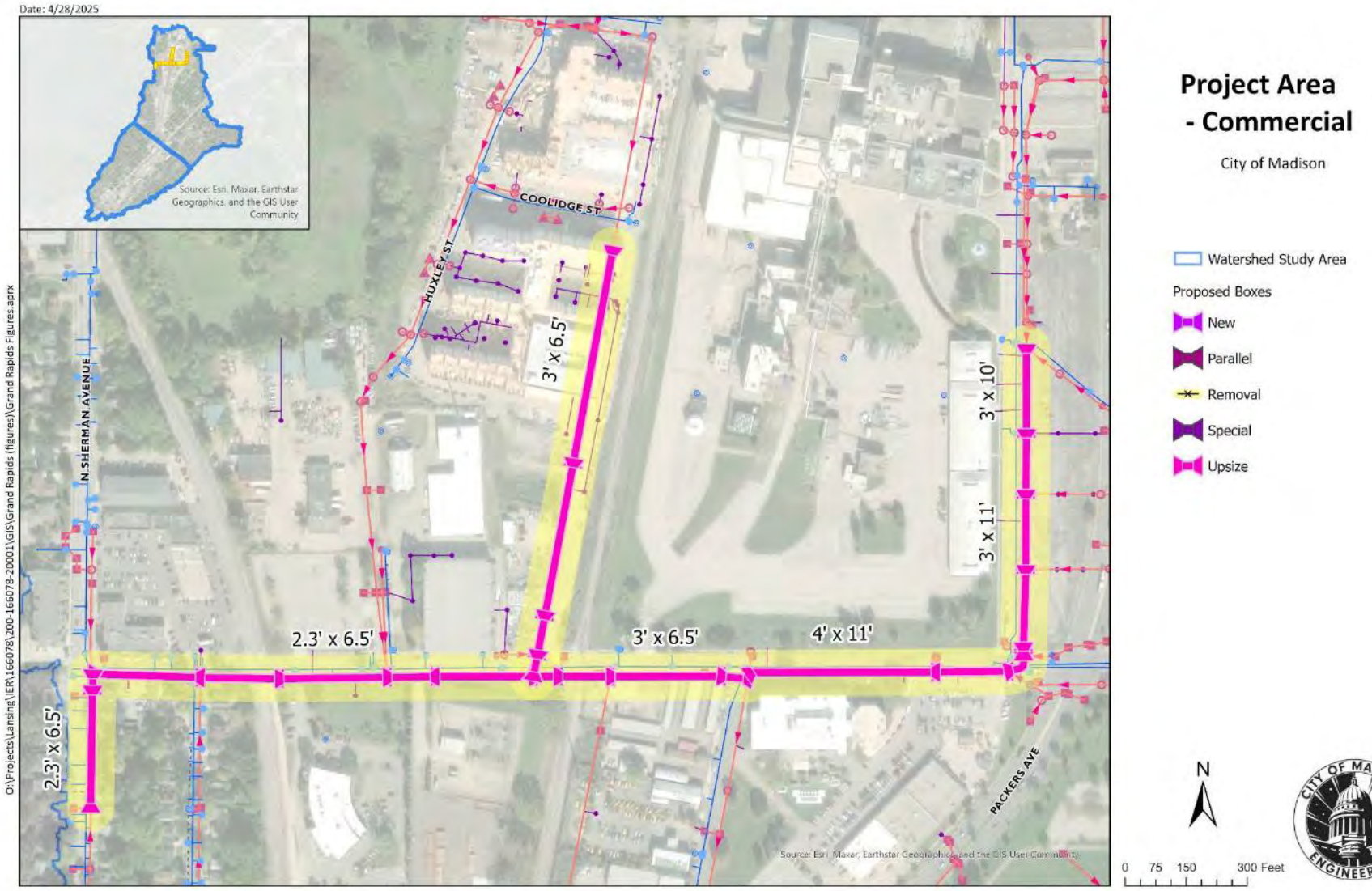
3. Pennsylvania Avenue (Commercial Ave to Yahara River)

- Increase conveyance along Pennsylvania Ave to Yahara River.
- Dual 5’ by 12’ box culverts.
- Relieves flooding on Johnson and Third St.
- Est. Cost $33.2M



4. Commercial Avenue (Sherman Ave to Oscar Ave)

- Increase conveyance to reduce upstream flooding
- Est. Cost $8.2M



5. East Johnson St (Few St to Yahara River)

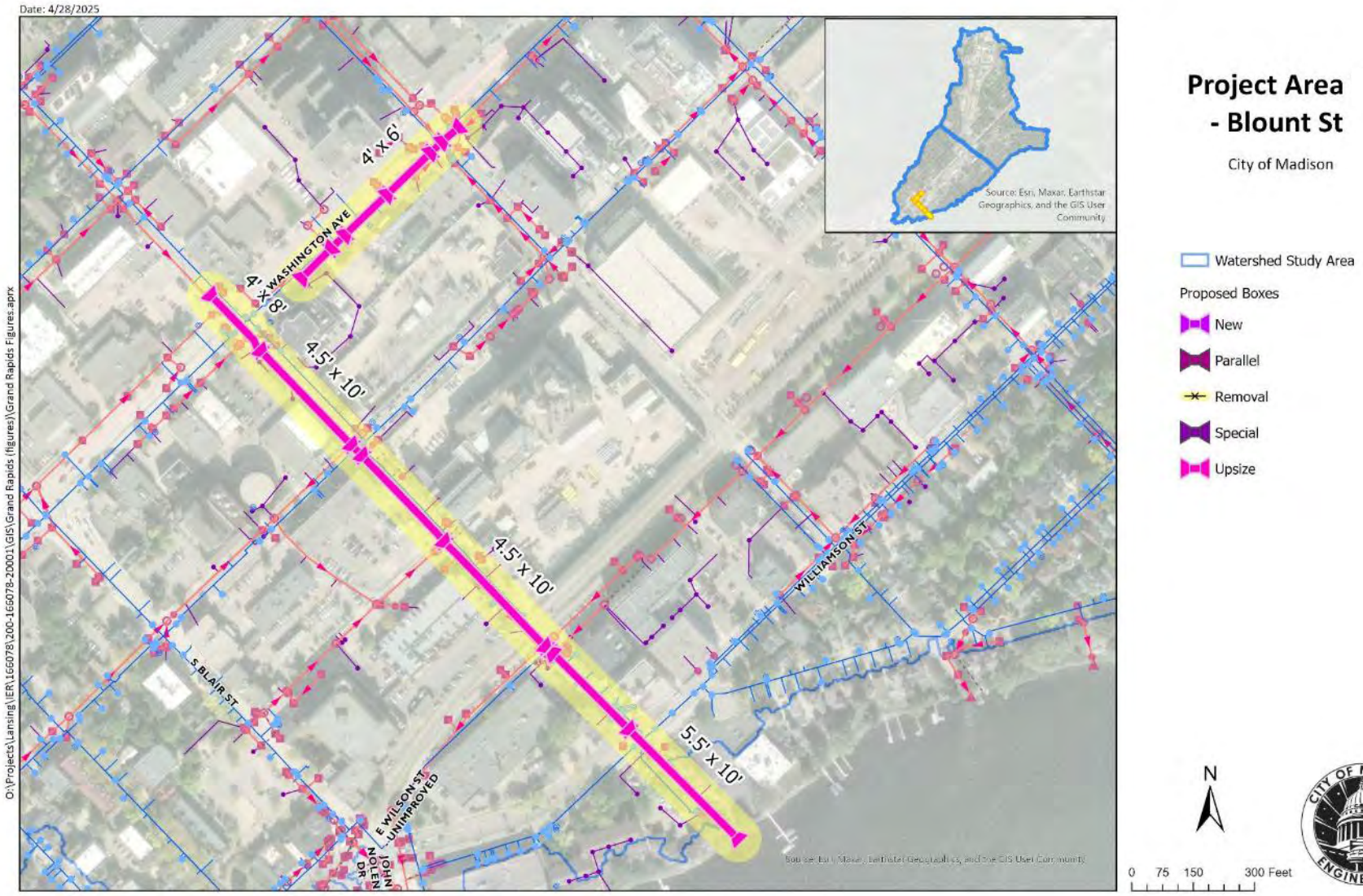
- Reduce flooding in upstream neighborhood adjacent to Tenney Park.
- Est. Cost $ 3.9M

6. Paterson Relief Pipe (E Washington Ave to Lake Monona)

- Primary relief pipe for flooding on E Washington
  - Relieves flooding at Mifflin and Livingston as well
- 9’ diameter pipe - depths require tunneling
- Est. Cost $8.8 M

7. Blount Street (E Washington Ave to Lake Monona)

- Increase conveyance to Lake Monona to help drain low areas.
- Est. Cost $6M



Recommended Implementation Order and Cost

Project	Estimated Total Cost	Note
1. Capital City Trail	$2.4 M	*Bid to be constructed in 2025-2026 due to failing pipe.*
2. Wilson St (Few to Brearly)	$1.5 M	*Can be constructed after Project 1.*
3. Pennsylvania Ave	$33.3 M	*Downstream of Project 4 and should be constructed first.*
4. Commercial Ave	$8.2 M	*Project 3 is downstream and should be constructed first.*
5. East Johnston St	$3.9 M	
6. Paterson Relief	$8.8 M	
7. Blount St	$6.0 M	
Standalone Projects Subtotal	**$64.1 M**	

Existing Conditions Inundation Mapping

10% Chance Event
(4.09 inches in 24 hours)

Scenario 1
Yahara Flow: 250 cfs
Lake Level: 846.0 ft

Scenario 4
Yahara Flow: 700 cfs
Lake Level: 848.5 ft

Lake Mendota

Lake Monona

Scenario 1. **315 out of 1051** stormwater structures do not meet 10% target

Scenario 4. **413 out of 1051** stormwater structures do not meet 10% target

Watershed Study Area

Flooding Map

- 0 - 0.25 ft
- 0.251 - 0.5 ft
- 0.501 - 1 ft
- 1.001 - 3 ft
- >3 ft

N

Proposed Conditions Inundation Mapping

10% Chance Event
(4.09 inches in 24 hours)

Scenario 1
Yahara Flow: 250 cfs
Lake Level: 846.0 ft

Scenario 4
Yahara Flow: 700 cfs
Lake Level: 848.5 ft

Lake Mendota

Lake Monona

Scenario 1. **290 additional stormwater structures** will meet 10% target

Scenario 4. **384 additional stormwater structures** will meet 10% target

Watershed Study Area

Flooding Map

- 0 - 0.25 ft
- 0.251 - 0.5 ft
- 0.501 - 1 ft
- 1.001 - 3 ft
- >3 ft

N

Existing Conditions Inundation Mapping

1% Chance Event
(6.66 inches in 24 hours)

Scenario 1
Yahara Flow: 250 cfs
Lake Level: 846.0 ft

Scenario 4
Yahara Flow: 700 cfs
Lake Level: 848.5 ft

Lake Mendota

Lake Mendota

Lake Monona

Scenario 1. **100 out of 7,421** buildings do not meet 1% target

Scenario 4. **135 out of 7,421** buildings do not meet 1% target

Watershed Study Area

Flooding Map

- 0 - 0.25 ft
- 0.251 - 0.5 ft
- 0.501 - 1 ft
- 1.001 - 3 ft
- >3 ft

N

Proposed Conditions Inundation Mapping

1% Chance Event
(6.66 inches in 24 hours)

Scenario 1
Yahara Flow: 250 cfs
Lake Level: 846.0 ft

Scenario 4
Yahara Flow: 700 cfs
Lake Level: 848.5 ft

Lake Mendota

Lake Monona

Scenario 1. **96 additional buildings** will meet 1% target

Scenario 4. **104 additional buildings** will meet 1% target

Watershed Study Area

Flooding Map

- 0 - 0.25 ft
- 0.251 - 0.5 ft
- 0.501 - 1 ft
- 1.001 - 3 ft
- >3 ft

N

Flood Mitigation Targets Progress With Proposed Solutions

10% Chance Event

- Target: No surcharging of storm sewer onto roadway (storm sewer pipes are sized to carry storm)
- With proposed solutions: 92% more stormwater access structures meeting target

4% Chance Event

- Target: 0.2’ at Centerline of Road (roads passable for emergency vehicles)
- With proposed solutions: 95% more roads passable

1% Chance Event

- Target: No structure (home/building) flooding
- With proposed solutions: 96% fewer structures flooding

Dredging and Lake Levels Updates

Dane County is leading a dredging effort from Lake Monona to Stoughton

- Phases 1 and 2 are complete. Phases 3 and 4 are in different phases of planning and construction
- Impact: 2024 data shows nearly double the flow through the Yahara River out of Waubesa in comparison to 2008 and 2018, from both dredging and aquatic plant removal.
- Learn more at:
  - Nov 2024 Dane Co Lakes & Watershed Commission Meeting Recording: https://dane.granicus.com/player/clip/4321?view_id=1&redirect=true
  - Project webpage: https://lwrd.danecounty.gov/CurrentProjects/Detail/Yahara-River-Sediment-Removal-Project
  - Lake level management contact: John Reimer, reimer.john@danecounty.gov

Map from The Cap Times article What Dane County is learning from its Yahara River Dredging project - Created by Brandon Raygo

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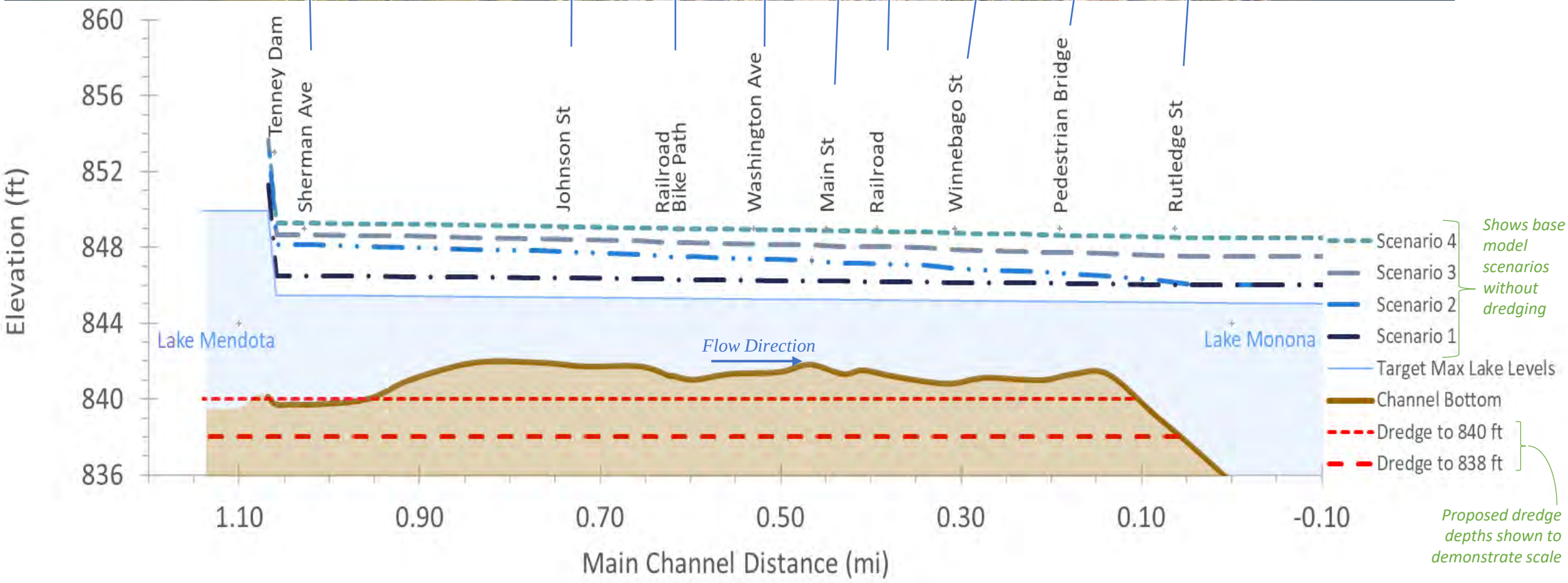
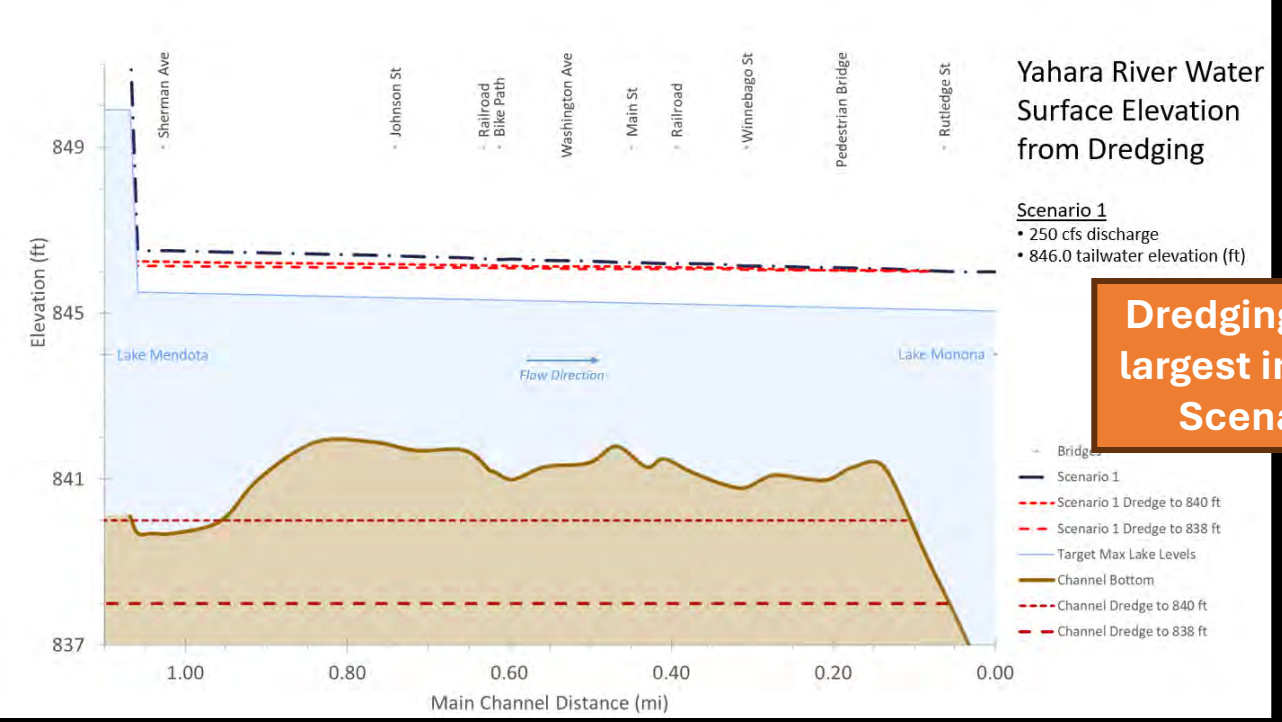
Dredging on Yahara River thru Isthmus- Analysis

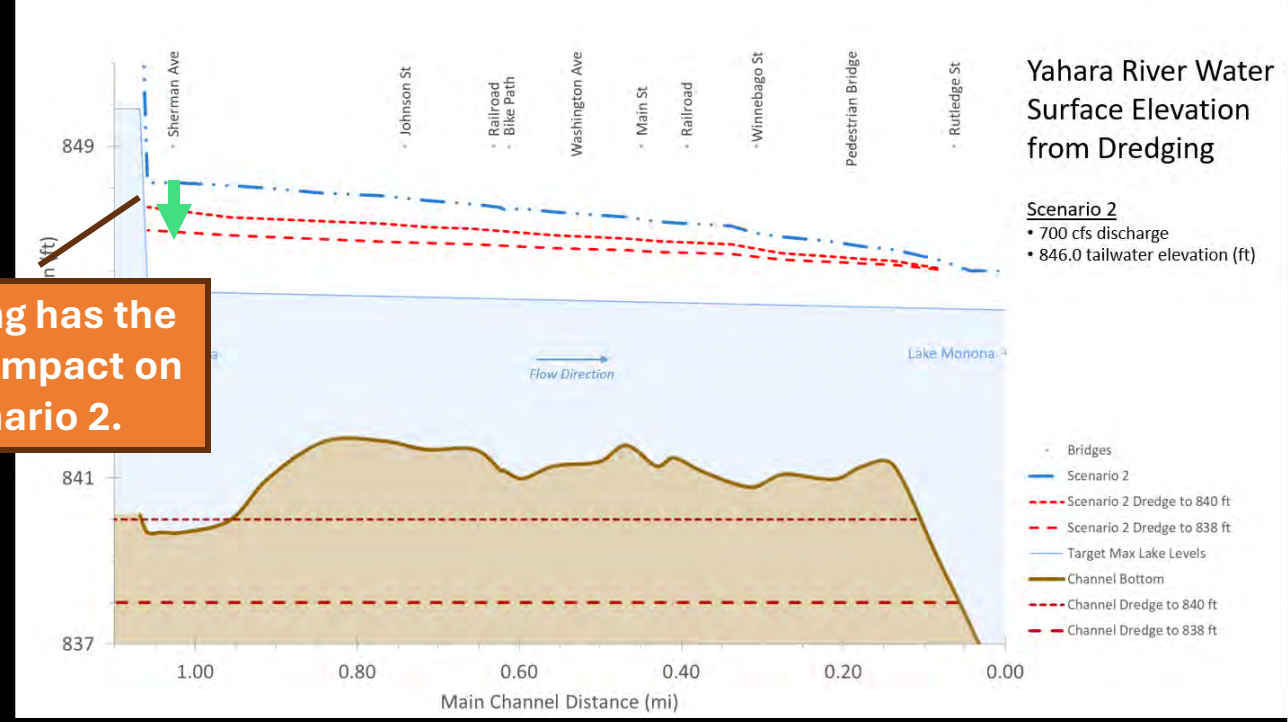
- Modeled impact of dredging from Lake Mendota to Lake Monona to assess benefits from a flash flooding perspective with the watershed study.
- Looked at the impact of dredging the river to 840’ (average cut of 1.5’ of bed material, totaling ~8,700 CY)
- Looked at the impact of dredging the river to 838’ (average cut of 3.5’ of bed material, totaling ~20,000 CY)
- Ran both dredging depths on all 4 lake level/river scenarios in our flood models to see the impact the dredging has on flash flooding around isthmus

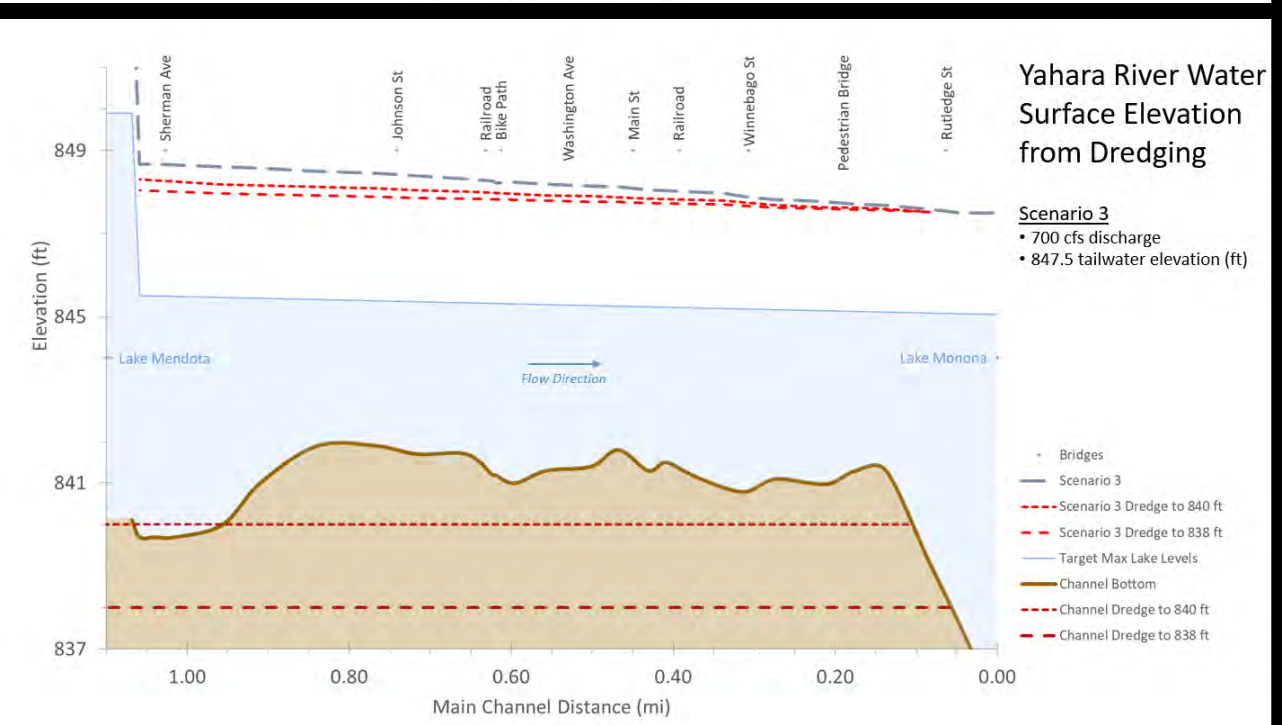
Scenario	Yahara River Discharge (cfs)	Lake Monona Elevation (ft)
1	250	846.0
2	700	846.0
3	700	847.5
4	700	848.5

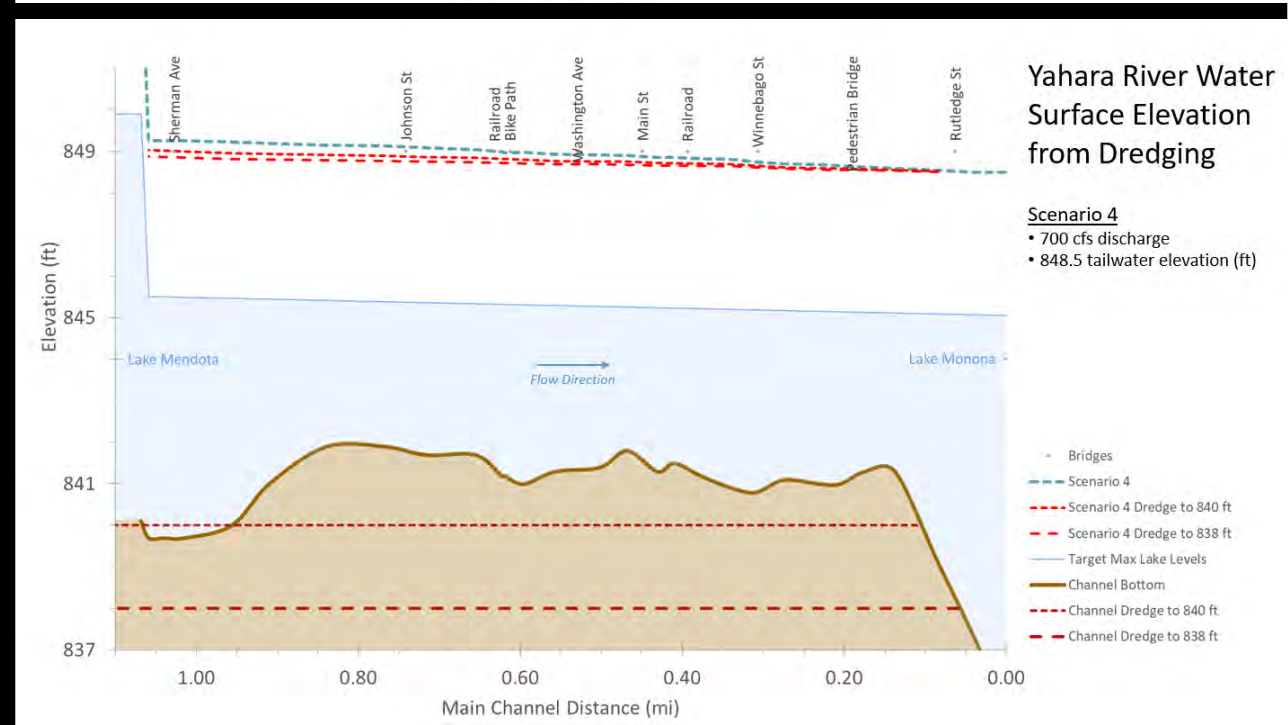

Mendota
Monona
N


860
856
852
848
844
840
836
Elevation (ft)
Tenney Dam
Sherman Ave
Johnson St
Railroad Bike Path
Washington Ave
Main St
Railroad
Winnebago St
Pedestrian Bridge
Rutledge St
Lake Mendota
Lake Monona
Flow Direction
1.10
0.90
0.70
0.50
0.30
0.10
-0.10
Main Channel Distance (mi)
Scenario 4
Scenario 3
Scenario 2
Scenario 1
Target Max Lake Levels
Channel Bottom
Dredge to 840 ft
Dredge to 838 ft
Shows base model scenarios without dredging
Proposed dredge depths shown to demonstrate scale


Yahara River Water Surface Elevation from Dredging
Scenario 1
• 250 cfs discharge
• 846.0 tailwater elevation (ft)
Sherman Ave
Johnson St
Railroad Bike Path
Washington Ave
Main St
Railroad
Winnebago St
Pedestrian Bridge
Rutledge St
Lake Mendota
Lake Monona
Flow Direction
Elevation (ft)
849
845
841
837
1.00
0.80
0.60
0.40
0.20
0.00
Main Channel Distance (mi)
Bridges
Scenario 1
Scenario 1 Dredge to 840 ft
Scenario 1 Dredge to 838 ft
Target Max Lake Levels
Channel Bottom
Channel Dredge to 840 ft
Channel Dredge to 838 ft


Yahara River Water Surface Elevation from Dredging
Scenario 2
• 700 cfs discharge
• 846.0 tailwater elevation (ft)
Dredging has the largest impact on Scenario 2.
Sherman Ave
Johnson St
Railroad Bike Path
Washington Ave
Main St
Railroad
Winnebago St
Pedestrian Bridge
Rutledge St
Lake Monona
Flow Direction
849
841
837
1.00
0.80
0.60
0.40
0.20
0.00
Main Channel Distance (mi)
Bridges
Scenario 2
Scenario 2 Dredge to 840 ft
Scenario 2 Dredge to 838 ft
Target Max Lake Levels
Channel Bottom
Channel Dredge to 840 ft
Channel Dredge to 838 ft


Yahara River Water Surface Elevation from Dredging
Scenario 3
• 700 cfs discharge
• 847.5 tailwater elevation (ft)
Sherman Ave
Johnson St
Railroad Bike Path
Washington Ave
Main St
Railroad
Winnebago St
Pedestrian Bridge
Rutledge St
Lake Mendota
Lake Monona
Flow Direction
Elevation (ft)
849
845
841
837
1.00
0.80
0.60
0.40
0.20
0.00
Main Channel Distance (mi)
Bridges
Scenario 3
Scenario 3 Dredge to 840 ft
Scenario 3 Dredge to 838 ft
Target Max Lake Levels
Channel Bottom
Channel Dredge to 840 ft
Channel Dredge to 838 ft


Yahara River Water Surface Elevation from Dredging
Scenario 4
• 700 cfs discharge
• 848.5 tailwater elevation (ft)
Sherman Ave
Johnson St
Railroad Bike Path
Washington Ave
Main St
Railroad
Winnebago St
Pedestrian Bridge
Rutledge St
Lake Mendota
Lake Monona
Flow Direction
Elevation (ft)
849
845
841
837
1.00
0.80
0.60
0.40
0.20
0.00
Main Channel Distance (mi)
Bridges
Scenario 4
Scenario 4 Dredge to 840 ft
Scenario 4 Dredge to 838 ft
Target Max Lake Levels
Channel Bottom
Channel Dredge to 840 ft
Channel Dredge to 838 ft

Dredging on Yahara Thru Isthmus - Findings

- **Dredging to 838' has the largest impact on Scenario 2.** This is because Monona's level is low enough that not all storm sewers are completely backwatered, and dredging helps move high flows through the Yahara with a lower profile. This improves storm sewer capacity on the north side of the isthmus.
  - **Eliminates flooding on E Washington Ave in small storms**
    - **Small storms means** 100% annual chance (or 1-year) and most of the 50% annual chance (2-year) storms
  - Does *not* significantly reduce flooding in small storms at:
    - Johnson/Third
    - Wilson near McPike Park
    - Mifflin and Livingston (but does reduce flooding more than at other 2 locations)
  - **Reduces flooding at centerline** of E Washington Ave **in 20% annual chance (5-year) storm**
  - **Little impact 10% chance (10-year) storm and larger**
- There's **less flood reduction** in **Scenarios 1, 3 and 4**

→ All these benefits can be achieved with proposed pipe improvements, while <u>also</u> reaching flood mitigation targets for larger storms

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Dredging - Challenges

- The entire shoreline of the Yahara River in this section is a **Historic Landmark Parkway**, on the **National Register of Historic Places**
- **Low bridge clearances** will limit equipment access via the water – will likely need multiple equipment launches, heavily disturbing more portions of the parkway
- **Material dewatering and disposal** will be a huge undertaking, and very expensive
  - Dewatering nearby would be very challenging and have major impacts to adjacent residents and parkway users
  - Pumping the material is not an easy answer (no logical location to pump material to that isn't heavily used, and pumping is expensive)
- Some unknowns could **significantly increase the cost**
  - **Contamination** – if landfilled, tipping fees will be cost prohibitive
  - Extensive **relocation of utilities** located under the river will be necessary, and City will likely need to pay for that work

A ballpark estimate for dredging cost: **~$10M** (cost could be **significantly** higher)

Dredging - Prioritization

From a flash flooding perspective, the benefits of dredging do not make it viable at this time.

Dredging has the biggest impact on very small storms on E Washington Ave flash flooding during Scenario 2.

We can achieve these benefits, and a higher flood resiliency in larger storms as well, with the other proposed projects.

Mechanical Dredging Example

Photo: Dane Co Land and Water Resources – Yahara River Sediment Removal – Update #8

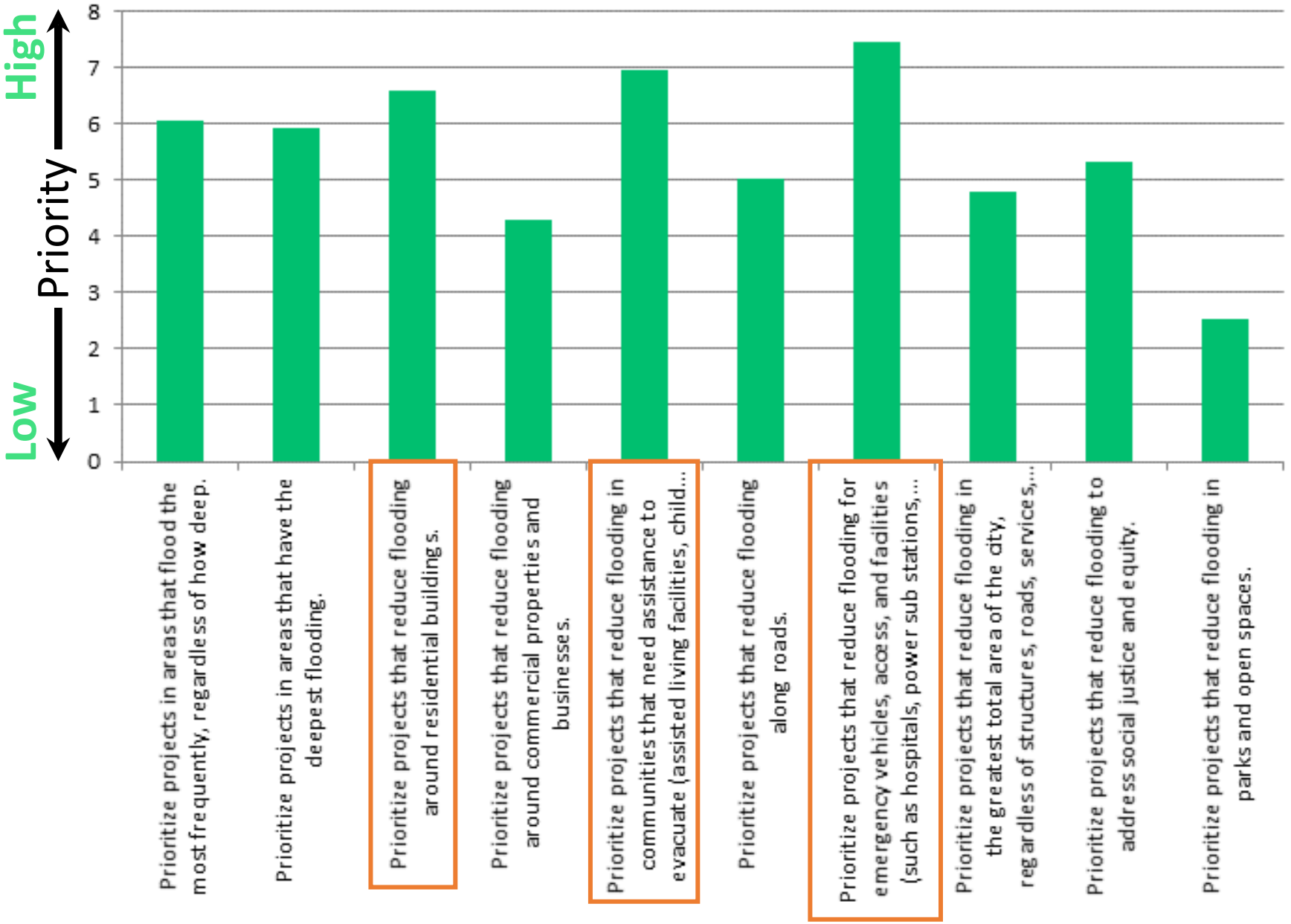
Budgeting Considerations

- Not all projects are yet identified
  - Currently 75 stand-alone projects in 11 study areas (22 watersheds will be studied)
  - $290M (2025 dollars) + $64.1 M for isthmus projects
- Stormwater Utilities fees fund projects
  - Frequent double digit rate increases – not sustainable
  - Currently funding only allows for 1-2 medium/large projects completed each year
- Additional funding mechanisms
  - Grants, appropriations, earmark funds
- Most projects take 1 ½ - 2 years to design & permit before construction

Citywide Prioritization Tool

- City created prioritization tool to make budgeting decisions
  - Will include all flood mitigation solutions in the City (22 watersheds)
  - Revisited annually as more studies are completed and solutions are added
- Solutions prioritized based on:
  - Flood reduction abilities
  - Vulnerability
    - Income
    - Evacuation
  - Ability to improve emergency service access
  - Cost
  - Water quality benefits
- Surveys completed to provide input on how solutions are prioritized

Prioritization Survey Results



Effort to collect resident input citywide on what type projects should be prioritized (2021-2024).

Results were used to develop scoring system for prioritization tool, along with other factors previously shown

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Why Aren't All Targets Met for the Watershed?

- When lake levels are high, stormwater has nowhere to go — drains can back up, and flooding worsens
- Space constraints
- Conflict with other major utilities (drinking water wells, large gas mains and electrical ducts, private utilities etc)
  - High density of utilities on isthmus, especially under major corridors
- Property ownership
- Cost impacts

What is Green Infrastructure (GI)

- GI is smaller infrastructure that **filters and absorbs stormwater where it falls**.
- GI uses plant or soil systems, permeable pavement or other permeable surfaces to **store, infiltrate, or evapotranspirate stormwater** and **reduce flows** to sewer systems or to surface waters.
- The City encourages GI use through the stormwater ordinance, the rain garden program, and a GI Pilot Study.

A rain garden on private property treats and infiltrates stormwater on-site and provides wildlife habitat

Terrace Rain Garden

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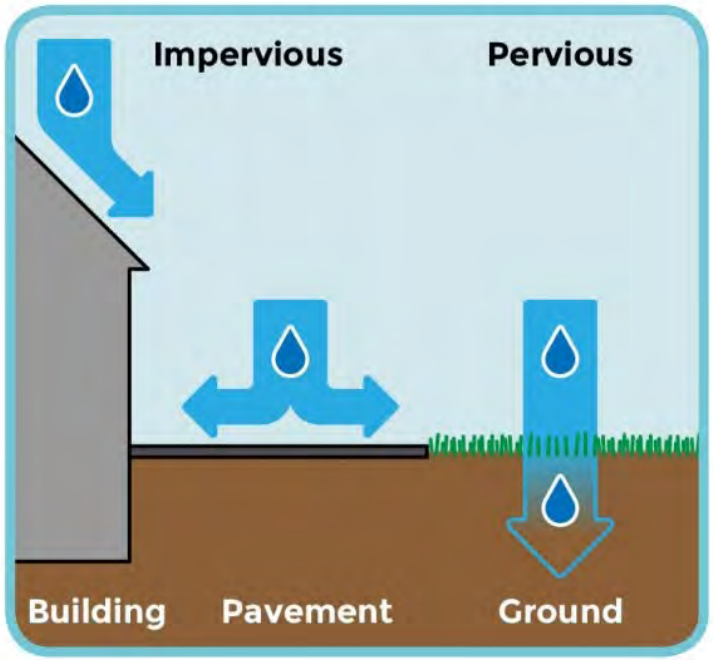
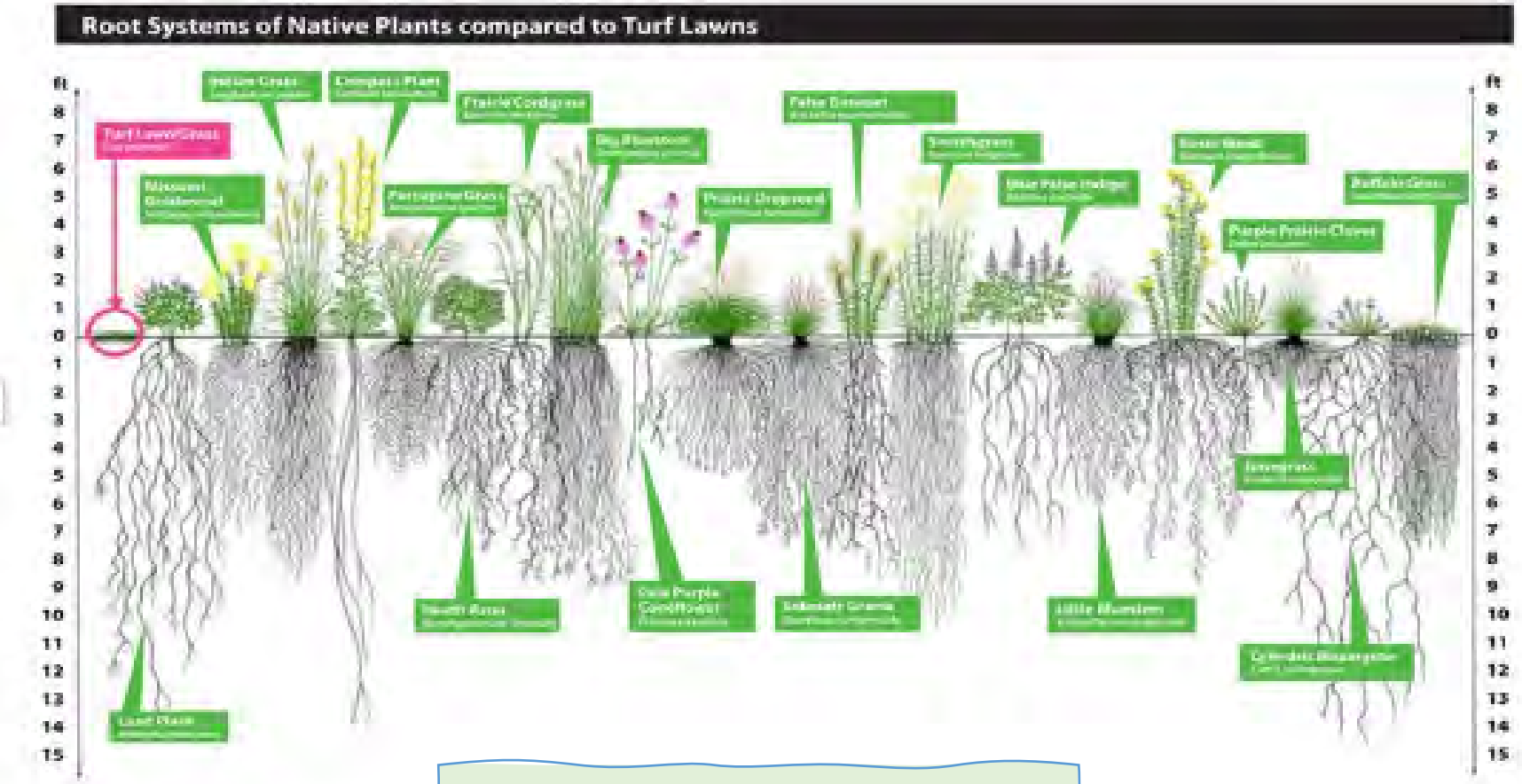
Native Plans increase infiltration of stormwater



- **Impervious:** water <u>can't</u> soak in
  - Concrete, asphalt, roofs
- **Pervious:** water <u>can</u> soak in
  - Woods, grass, fields
- **Infiltration:** the process of water soaking into the ground



Deep roots of native plants help create pathways for water to soak (infiltrate) faster into the ground!

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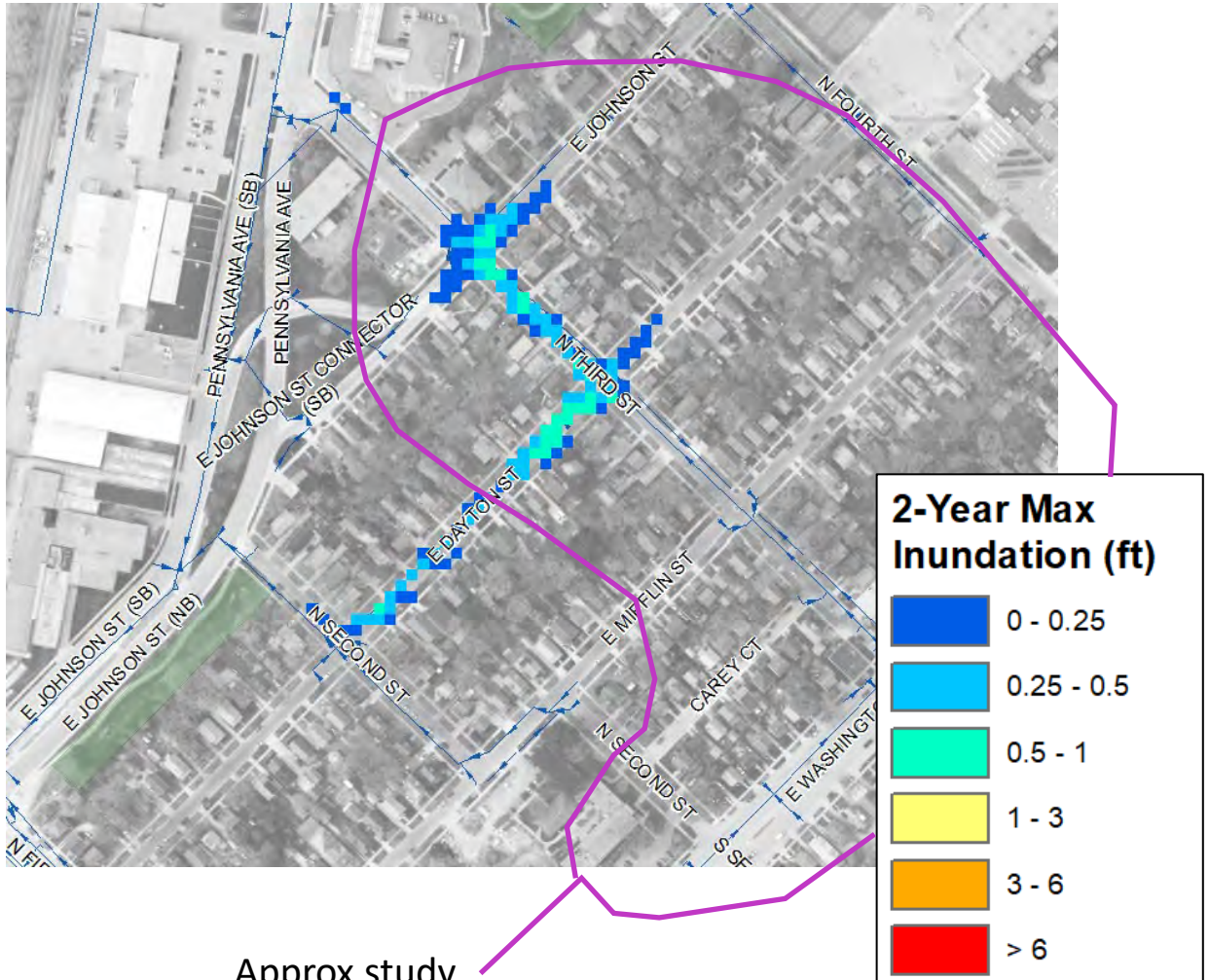
Green Infrastructure Analysis

Consultant used model to assess what level of GI would be needed to **mitigate smaller storm (50% chance, 2-year) flooding** at **E Johnson and Third Street**.

- Volume of flooding predicted during 50% chance storm: 17,904 CF
- Tributary characteristics
  - 26.3 ac
  - Directly Connected Impervious (Streets, sidewalks, driveways): 10.5 ac
  - Non-directly connected impervious (houses, back patios, garages): 4.9 ac
  - Pervious: 10.9 ac



Green Infrastructure Analysis

Finding 1: If all neighbors draining to this area installed a rain garden encompassing their entire front yard and part of their backyards (550 SF) → ~60% flood reduction in 2-year

- Mifflin St average front yard – 237 SF
- Third St average front yard – 251 SF

Green Infrastructure Analysis

Finding 2: More than twice the current terrace space is needed to mitigate 2-year flooding with terrace rain gardens (assuming all current terraces can be 12” deep rain garden)

- Less space needed than for private rain gardens because terrace rain gardens would capture street and driveway runoff
- Significant tree and utility conflict issues
  - ~85% of terraces currently have a street tree

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Green Infrastructure Analysis

Finding 3: Installing pervious pavement as green infrastructure did not mitigate flooding in the 2-year storm (fills up too early in the storm).

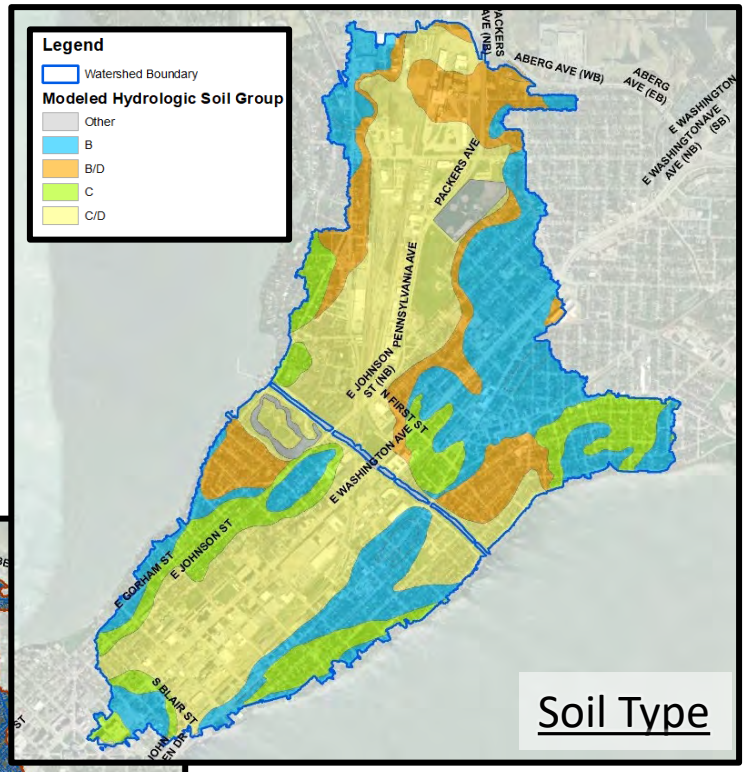
- Limited infiltration benefits described in following slides

Pervious pavement could be used as peak flood storage along Third Street for small events but wouldn't have infiltration benefits.

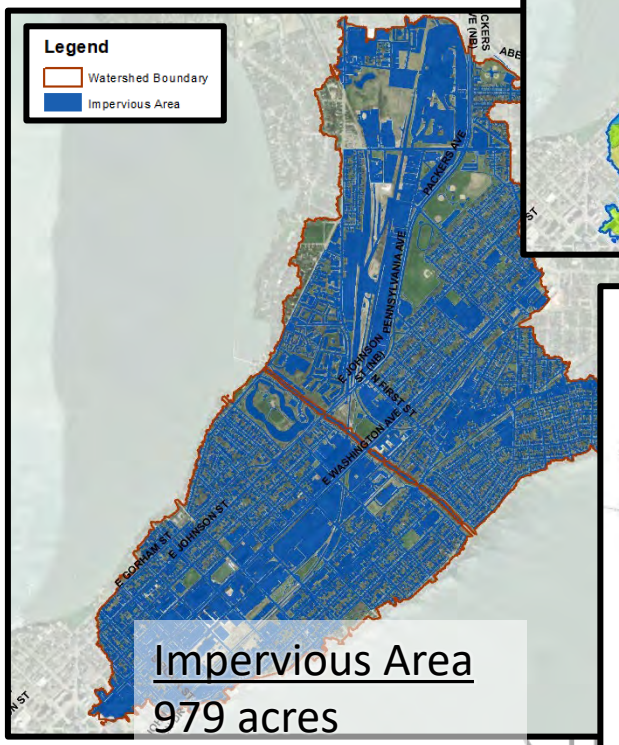
- Street & curb are in good condition and unlikely to be reconstructed in the next 30 years.

Understanding the Challenges

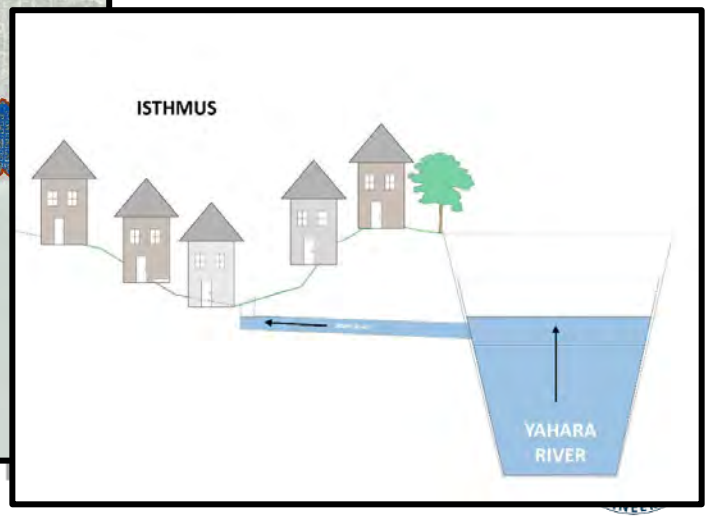
- **Low-lying area**. Pipe draining area is <3’ tall and connects into outgoing relief pipe on Pennsylvania Ave at elevation 844’.
  - During standard summer when lake levels are usually at elevations 845’ to 846’, the **pipe is already half full of lake water prior to it beginning to rain.**
  - **High ground water** limits effectiveness of GI
- **Majority of flooding** in 2-year storm **is from streets, sidewalks and driveways** that are **harder to treat** due to competing interests and limited space in right-of-way (trees, parking etc)
- **GI is less effective in areas with poor soils.** When GI can’t infiltrate stormwater effectively, it fills up more quickly and therefore more of it is needed to mitigate flooding
  - Area is primarily C/D soils, B/D soils (yellow and orange) have infiltration rate that is **>4x less** than type B (blue)



Soil Type

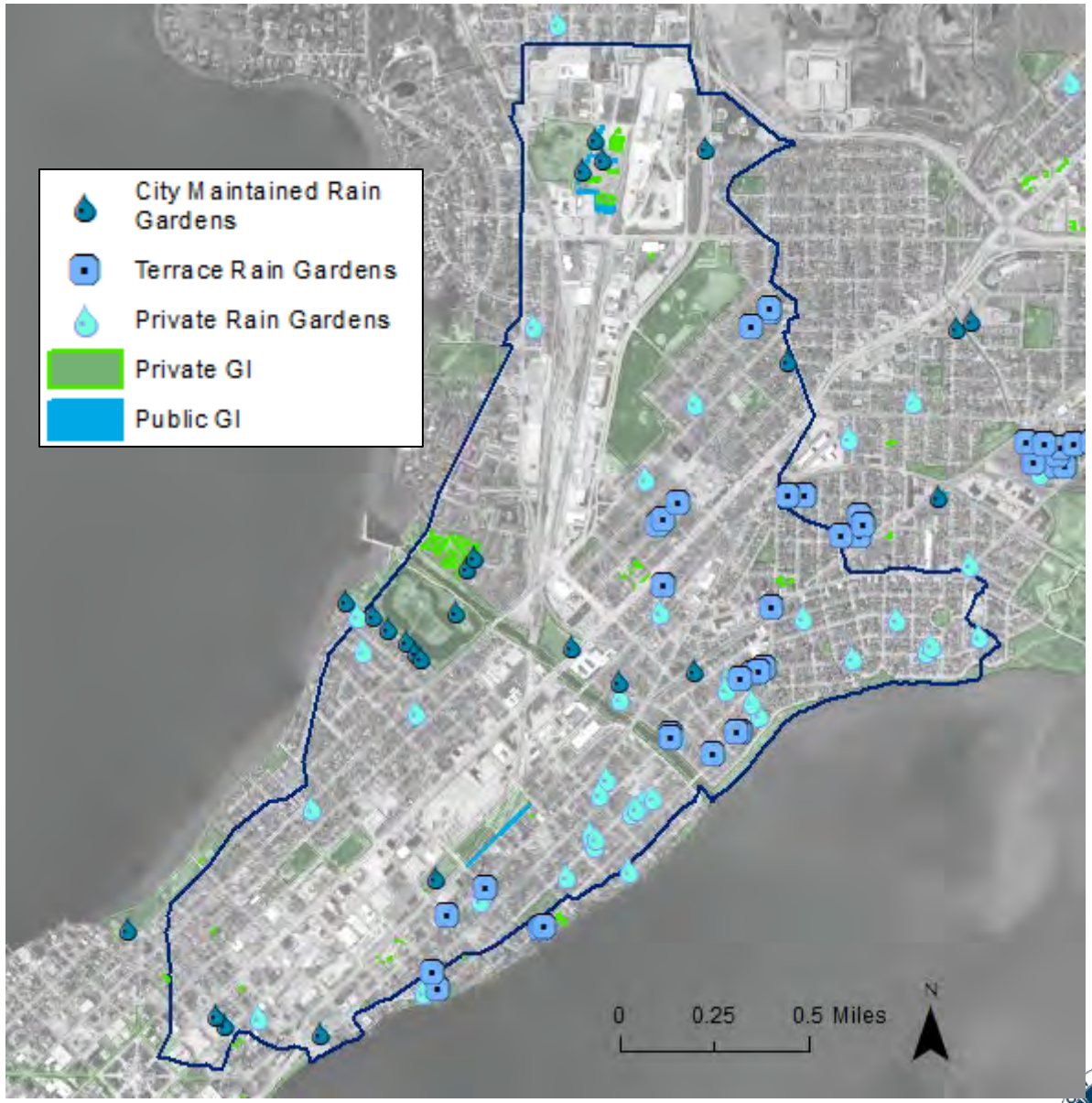


Impervious Area
979 acres
60% of watershed



Putting it into context

- In other areas, GI can have a bigger impact, but there aren't many areas that flood as frequently as at Johnson and Third St.
    - City is investigating ways we can maintain public safety in the near-term.
- We are **continuing to install GI** wherever possible with a variety of programs, and **Complete Green Streets framework** helps minimize impervious surfaces and install GI within the ROW
- GI will continue to **add resiliency** to system, and has a variety of other benefits



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What The City is Doing

Green Infrastructure (GI) Successes in The City

- GI Effectiveness Analysis – modeled the impact of using widespread GI for flood mitigation
- Westmorland GI Pilot Study – Paired with the USGS (federal research agency) to study the impacts of implementing significant amounts of GI
    - Installed rain gardens, pervious pavement, pervious sidewalk and driveway impervious treatment
- Roger Bannerman Rain Garden Initiative (Terrace Rain Garden Program)
    - The City is well on its way to the 1000 Rain Garden Goal! As of 2025, there are 749 private and public rain gardens!
- Stormwater Ordinance Revision – resulted in an increase in GI with private development. >24 green roofs have been built since the ordinance revision in 2020.
- Provides online Educational Resources
- Partners with Dane County to host an annual 1 on 1 rain garden workshop in Feb.
    - $25 to register, but you receive $50 in Plant Dane plant credits for participation

Permeable Pavement installed with GI Study

Rain Garden installed at O'Keefe Middle School

Green Roof on Regent Street - Photo Credit: CRG, Chapter at Madison

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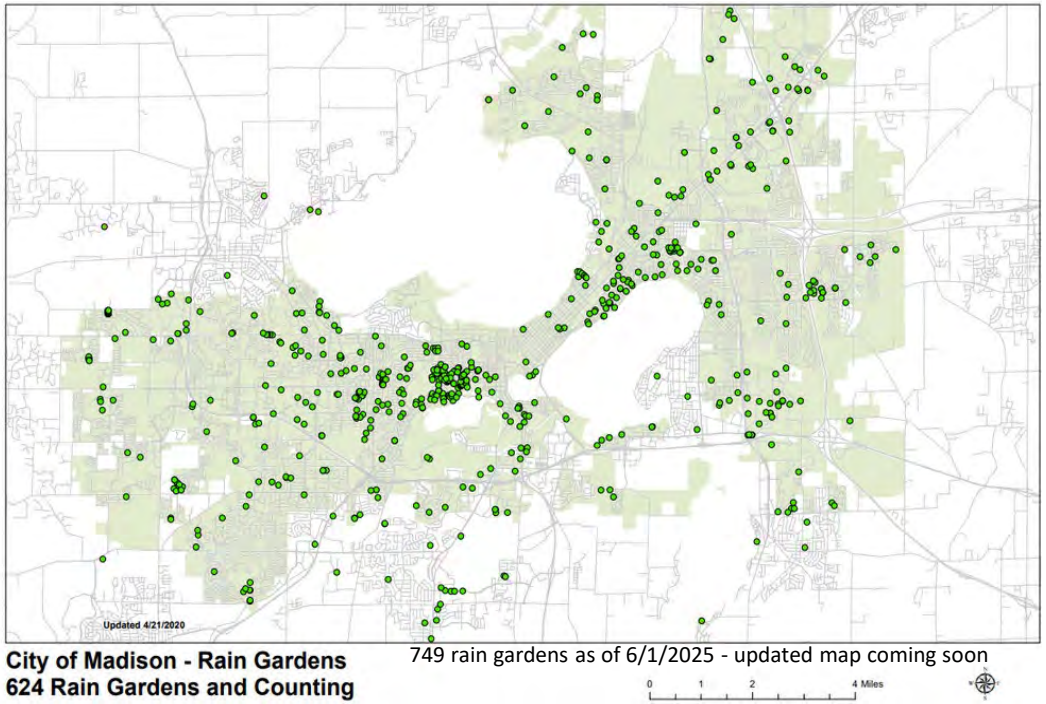
What Residents Can Do

- Be a Watershed Steward

- Talk about impacts of stormwater runoff with neighbors
- Reduce the stormwater leaving your property
  - Install a private rain garden & get credit on your stormwater bill
    - If you have a rain garden that isn't on the map, let us know!
  - Install a rain barrel
  - Direct roof drains to your grass or garden



749 rain gardens as of 6/1/2025 - updated map coming soon

- If you're impacted by road reconstruction, you may qualify for the City's terrace rain garden program
- Modify your leaf management techniques by removing leaves from the street and using them in your yard
- Learn about Ripple Effects, Madison Area Stormwater Partnership
  - Adopt A Storm Drain
- See Illegal Dumping to Storm Drains or Waterways – Report it!

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Private Rain Gardens

Benefits:

- Infiltrates roof water instead of street water
  - No street salt enters rain garden
  - Reduces maintenance
  - Improves quality of groundwater recharge
- Native plants provide habitat
- Reduce stormwater entering our stormwater system








Scan me!

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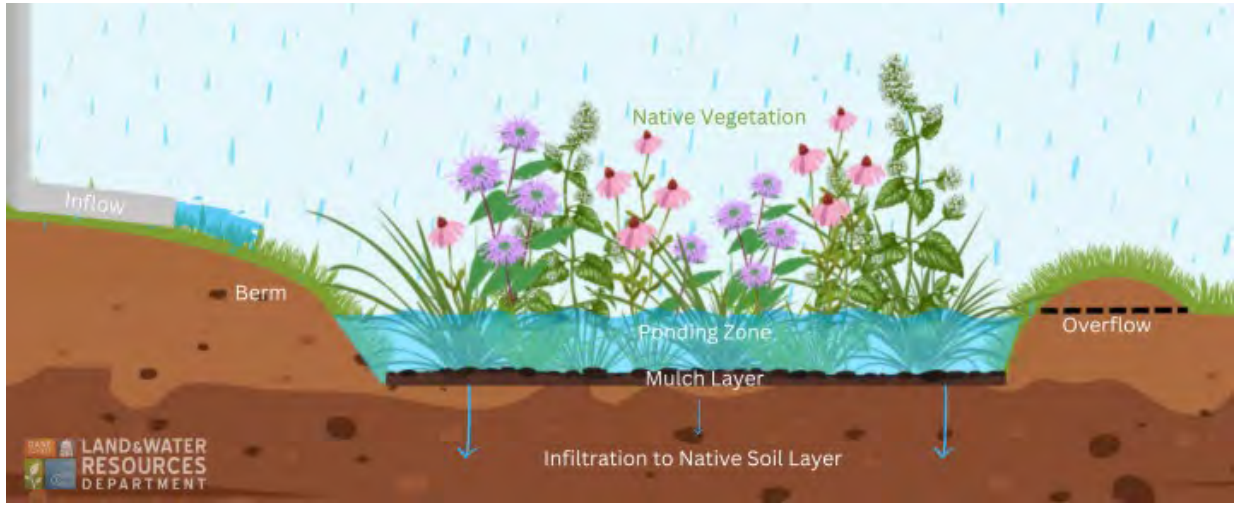
Private Rain Gardens

- Approximate cost to DIY: $300 for plants + labor
  - Buy reduced costs native plants from Plant Dane
  - Grow your own native plants
- Apply for a Stormwater Fee Adjustment by infiltrating the 10% annual chance storm (or more!)
  - For average size roof on isthmus (~900SF), you need a 17ft x 17ft rain garden
- To help reduce flooding in even larger storms, you can create a larger rain garden to infiltrate stormwater for the 1% chance storm (6.7”) on your property



Considerations

- Existing landscaping and trees
- Utility conflicts and ground water
- Soil conditions
- What to do with excess soil

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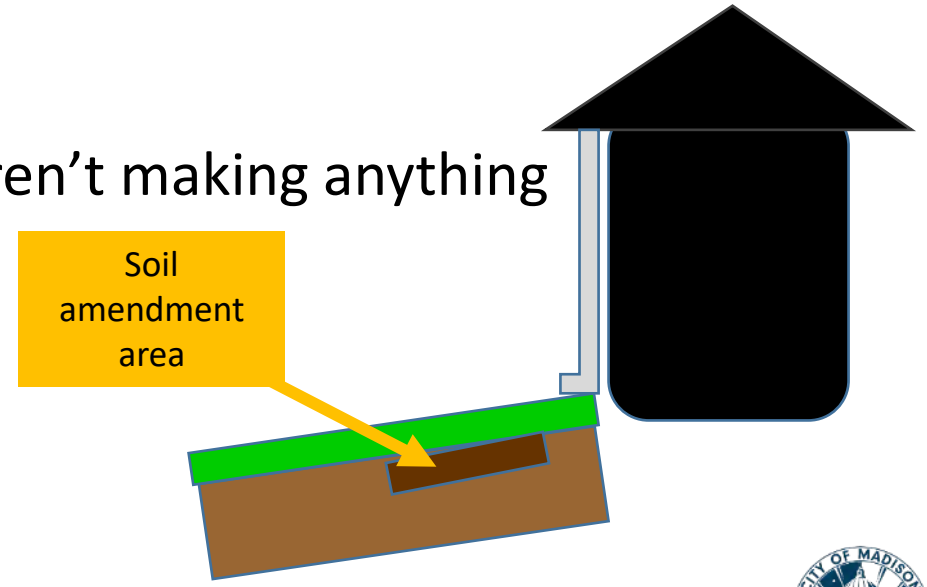
Rain Barrel

- Captures a small amount of water for reuse in a garden or lawn
- Reduces municipal water use
- Better water for plants
- Nice to use together with soil amendments or rain garden
- Can purchase at a reduced price from Ripple Effects

Direct roof drains to grass or garden

- Directing your roof drain away from an impervious surface decreases the runoff leaving your property
- You can additionally decrease your downspout runoff by adding soil amendments (compost) and/or native plants
  - Improving a 5’ x 5’ square around downspouts is enough to notably increase infiltration
  - Can be planted in turf grass or native plants
- Find more information at:
  - Ripple Effects – Downspout Gardens
- Consider where water will end up, and make sure you aren’t making anything worse for your neighbor

Native plantings at downspout
Photo Credit: Ripple Effects



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Next Steps

- Finalize Report
  - Public Comment
    - 30 days to comment on report that will be posted on the project webpage
  - Board of Public Works approval
- Implement solutions as part of Capital Improvement Plan Budgeting Process

Contact Information & Resources

- Project Manager: Jojo O'Brien, jobrien@cityofmadison.com

- Public Information Officer: Hannah Mohelnitzky, hmohelnitzky@cityofmadison.com

- Project Webpage: www.cityofmadison.com/IsthmusYaharaWatershed
  - Sign-up for project email updates on the website
  - Report flooding, past or current on the Report Flooding form
  - Learn ways to protect your property from flooding with on-site fixes

- New Flooding Website: www.cityofmadison.com/flooding
- Everyday Engineering Podcast
- Instagram: @MadisonEngr
- Facebook – City of Madison Engineering
- X – @MadisonEngr

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Zoom Breakout Rooms

- Join a Zoom Breakout Room Session
  - Window will pop up where you can select which group you'd like to join
  - If a window doesn't pop up, look for a button on the bottom that says "Breakout Rooms." Click the button and room options will appear.

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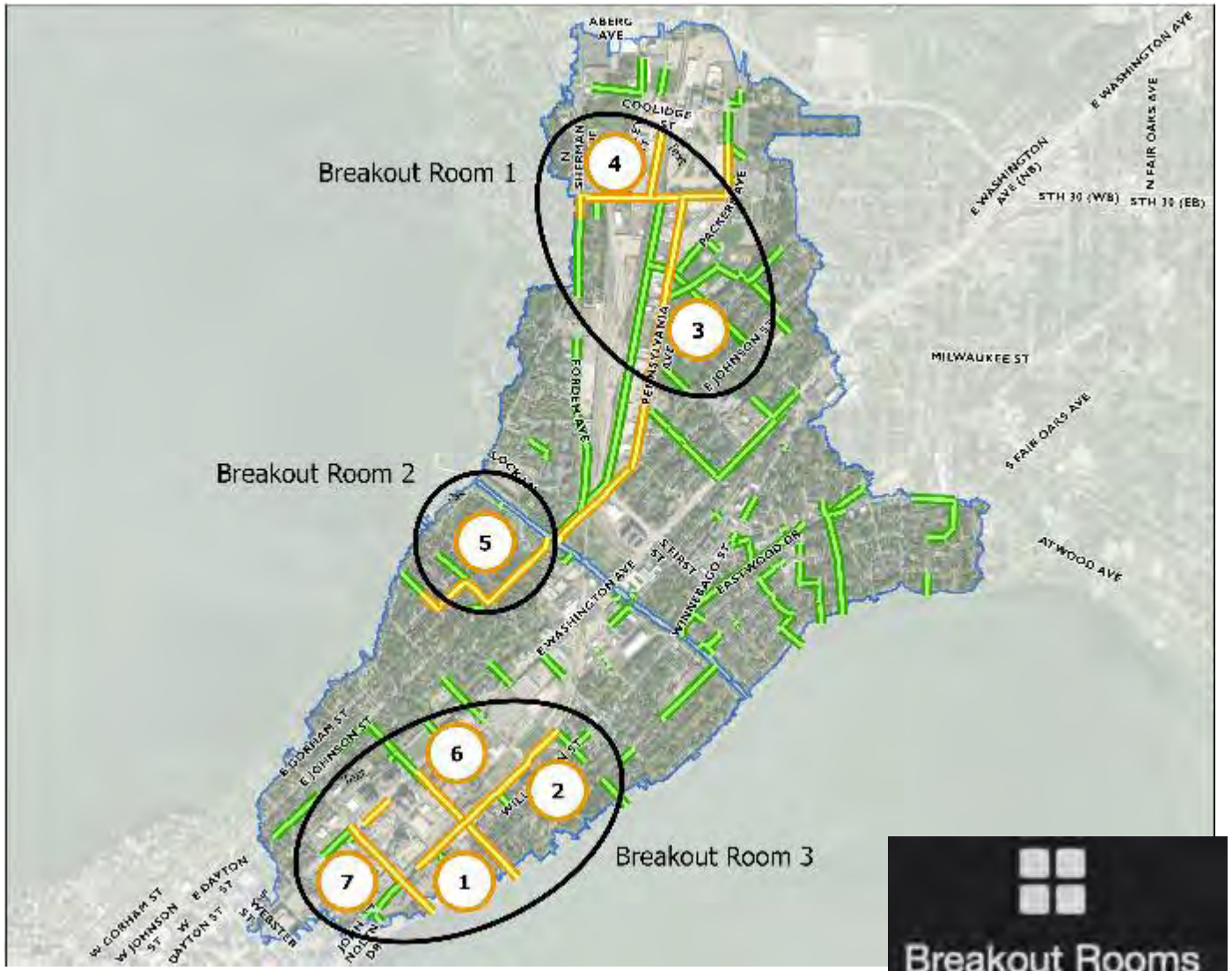
Breakout Groups

1. Improvements 3 & 4
2. Improvement 5 and analysis of dredging impact on flash flooding
3. Improvements 1, 2, 6, 7
4. Other local sewer (green)
5. Green Infrastructure

**Questions about lake levels and ongoing dredging are best directed to Dane County*



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