



Nine Springs Creek Watershed Study

Public Information Meeting #1
City of Madison Engineering Division
September 23, 2024

Thank you for attending. We will begin shortly...



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.

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.

How to Participate

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Choose one of the audio conference options

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Audio

Raise hand

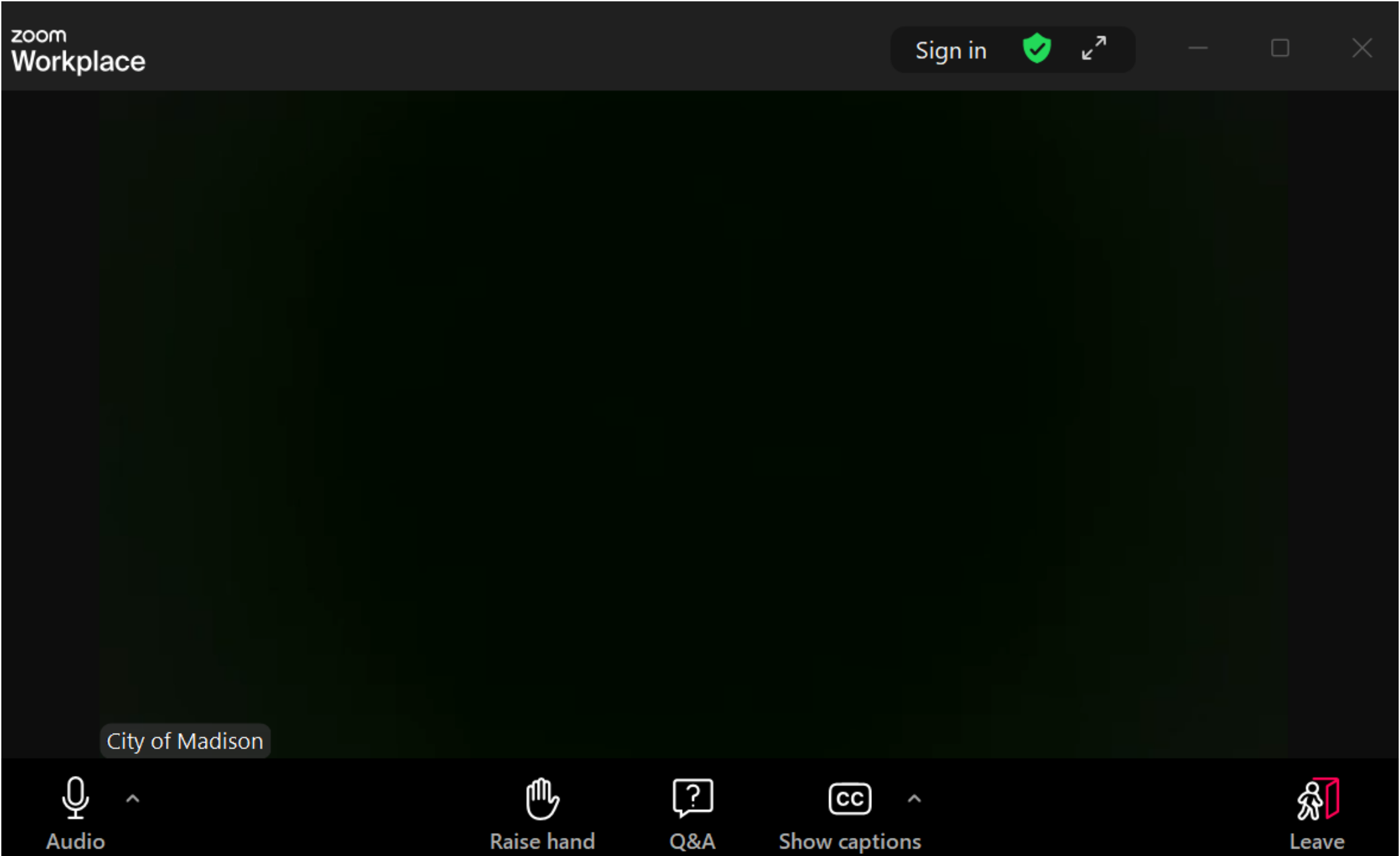
Q&A

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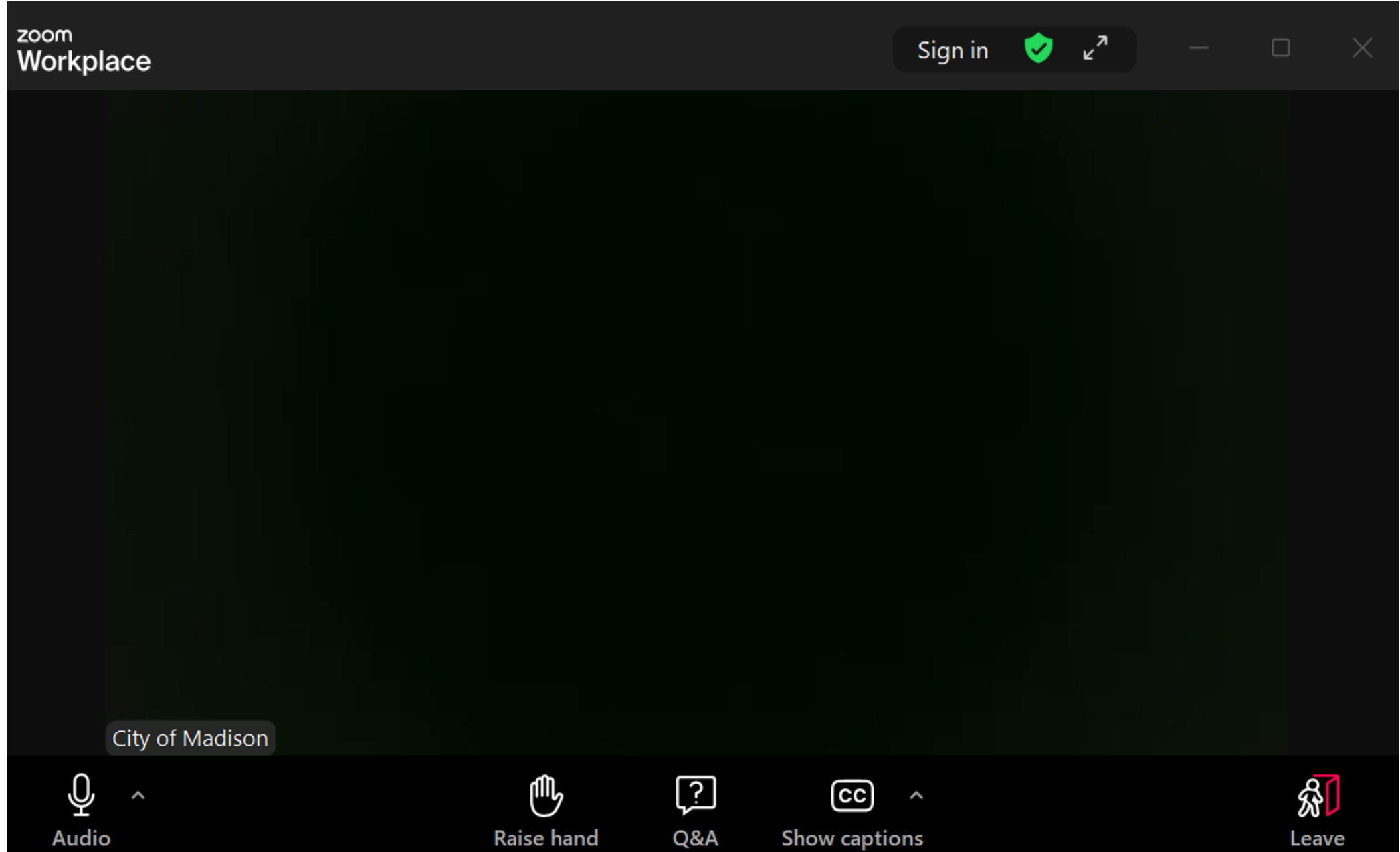


How to Participate



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

How to Participate



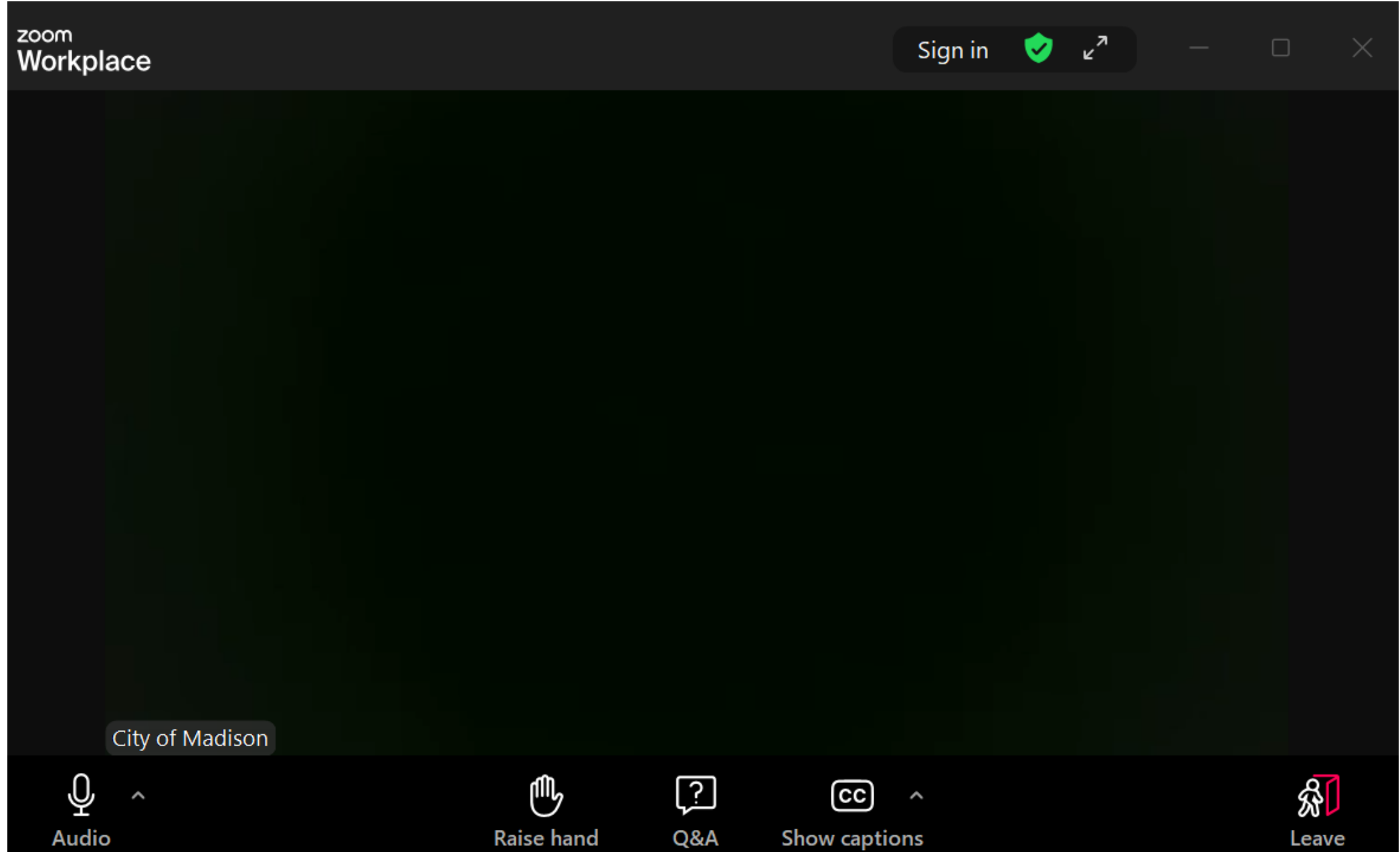
Use **Q&A button** if you have technical issues or a question for the panelists.



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How to Participate



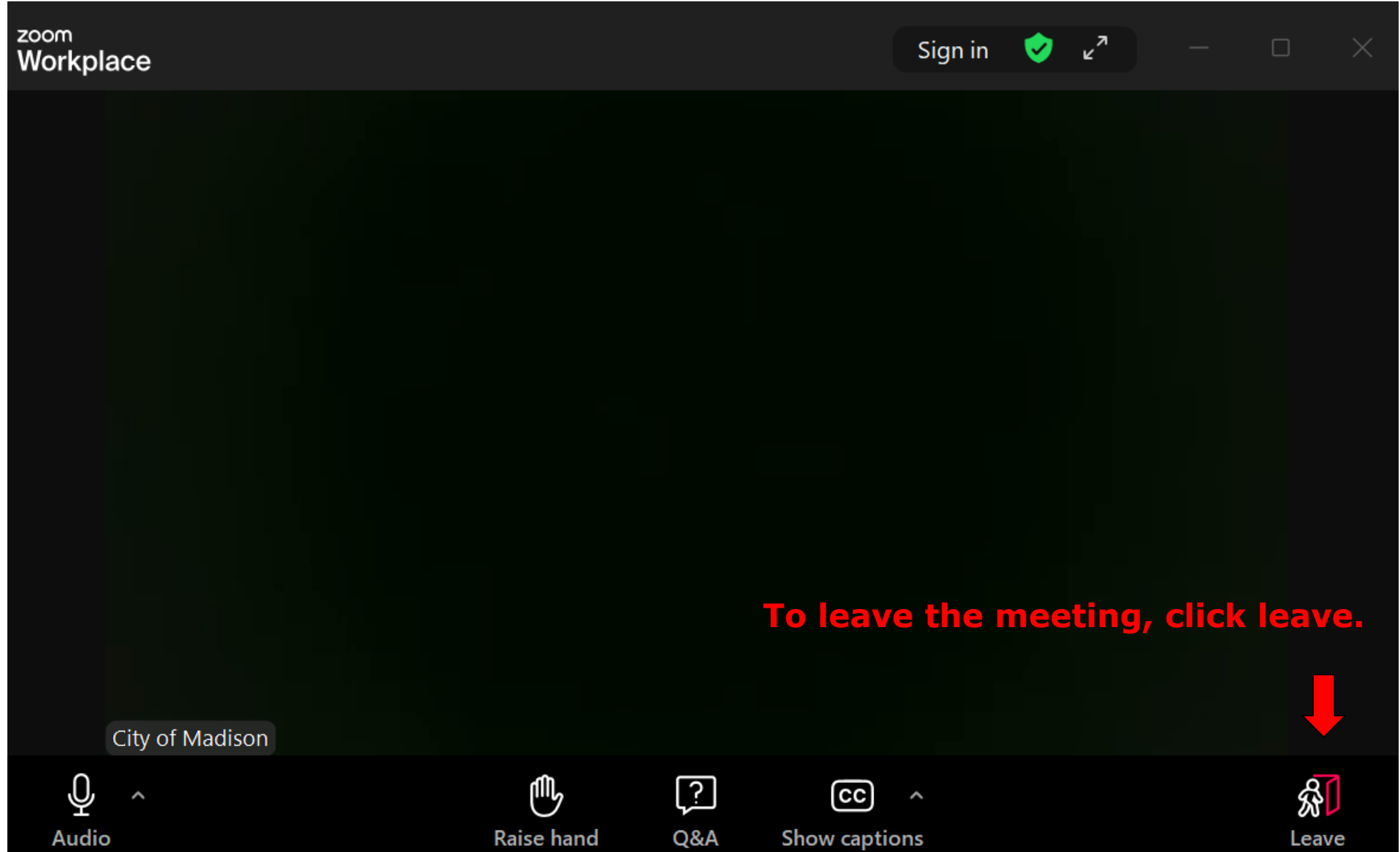
Use Q&A button for all other questions.
We will answer after the presentation.



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How to Participate



How to Participate

zoom
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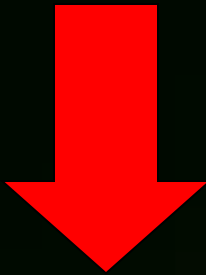
Audio

Raise hand

Q&A

Show captions

Leave



Evening Overview

- Welcome and Introductions
- Presentation (Eric Thompson, MSA Professional Services)
- Q&A (facilitated by Hannah Mohelnitzky, City of Madison)
- Wrap Up (Hannah Mohelnitzky, City of Madison)

Project Contact and Introductions

- Project Manager – Ryan Stenjem
- City Staff Information
 - Hannah Mohelnitzky
 - Janet Schmidt
 - Greg Fries
- Alders
 - District 10 – Alder Yannette Figueroa Cole
 - District 14 – Alder Isadore Knox, Jr.

Presentation Outline

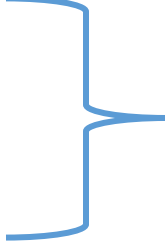
1. Why We Are Here
2. 100-Yr Storm Definition
3. Where the Water Goes
4. Reasons for Flooding Issues
5. Watershed Study Goals
6. Next Steps
7. Property Owner Responsibilities
8. How to Stay Involved



Stormwater 101



Watershed Study
Specifics



What applies to
you?

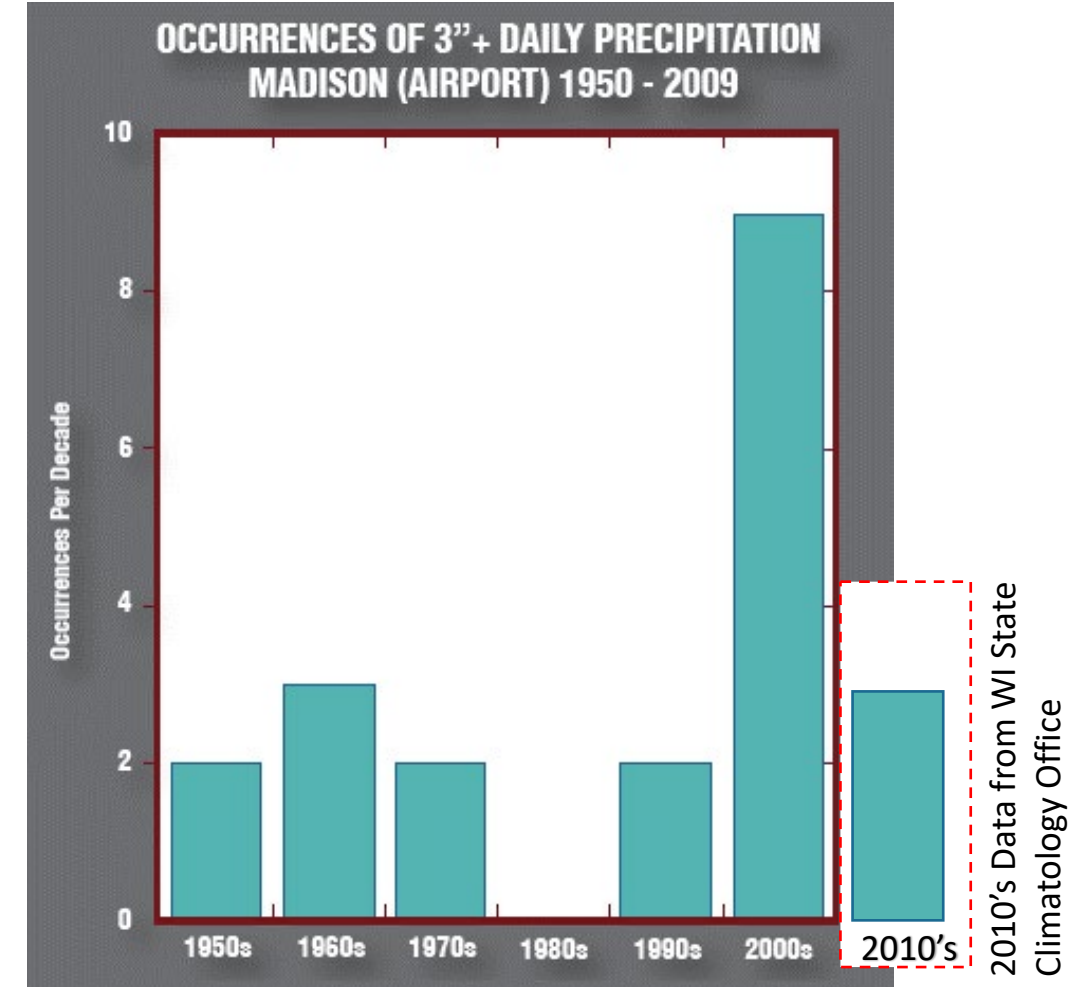
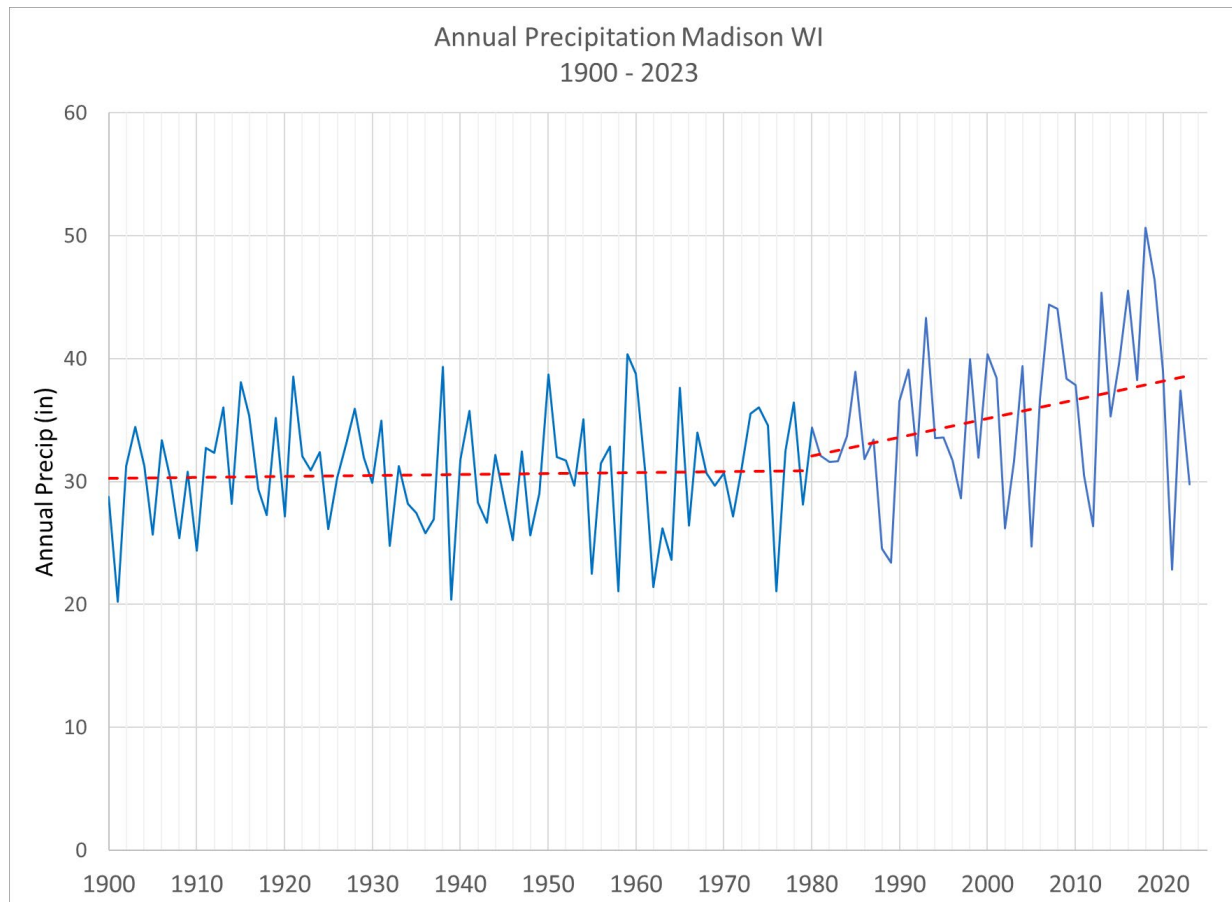
Why We Are Here:

Nine Springs Creek Watershed Study

- Being completed by MSA Professional Services
- Understand limitations of stormwater management system
- Plan for future stormwater infrastructure
- More detailed watershed modeling
 - Sewers
 - Ponds
 - Land Use
 - Dynamic storm events

Why We Are Here: Historic Events

- More rain
- More rain events greater than 3"



Wisconsin's Changing Climate: Impacts and Adaptation. 2011. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, WI.

Why We Are Here: Historic Rain Events

Recent Rain Events

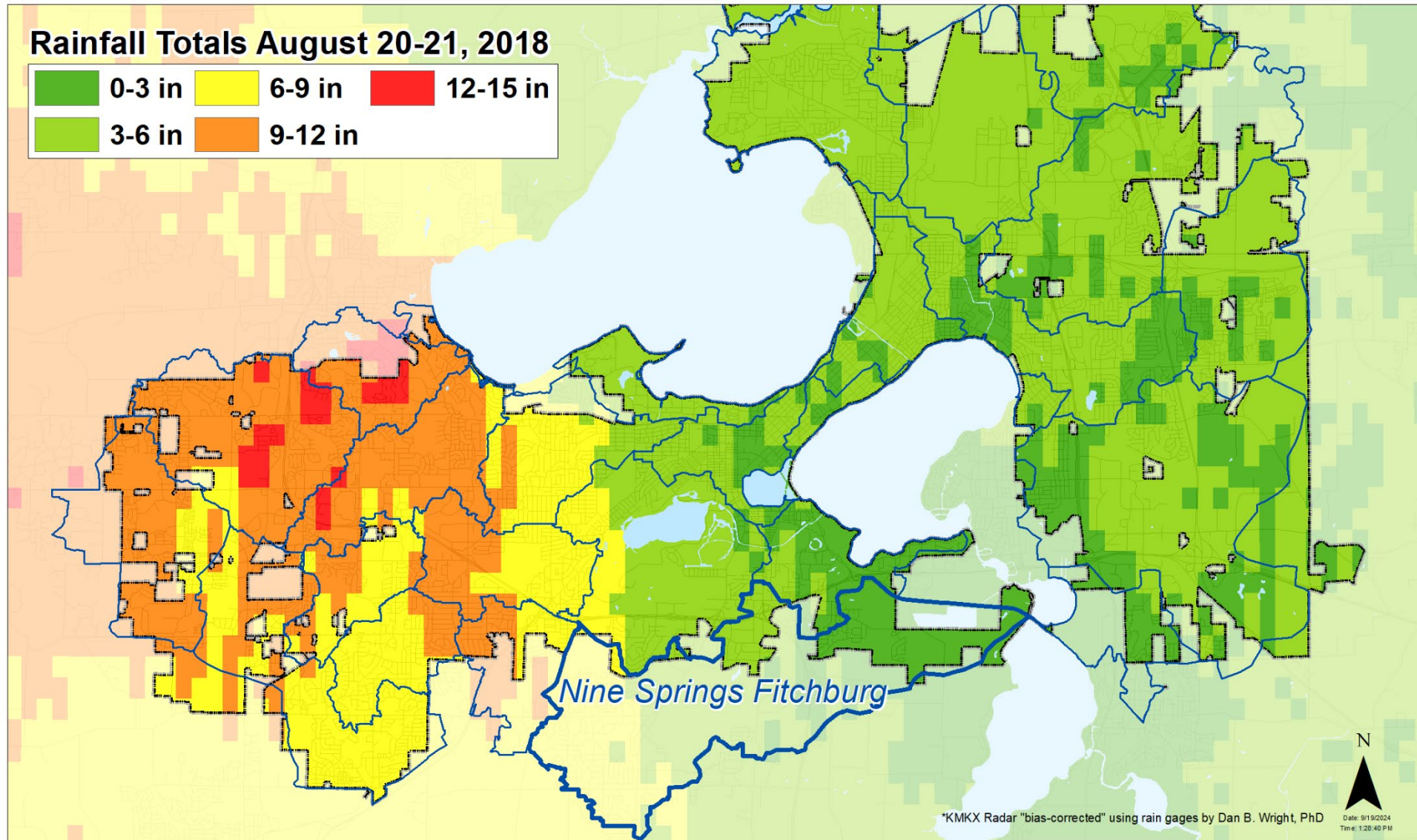
Date	Depth	Duration	Location and Source
August 20, 2018	3.52"	10 hr	Dane Co LWRD – Weather Underground
September 10-11, 2022	4.23"	36 hr	Secret Places - CoCoRaHS
July 28, 2023	2.7"	45 min	SW Commuter Path – City Gauge
May 21, 2024	1.8"	2 hour	Orlando Bell Park – City Gauge
June 19, 2024	2.66"	75 min	UW AOS



E Johnson Street, Madison, WI



Rainfall Totals August 20-21, 2018



KMKX Radar that was "bias corrected" using rain gauges by UW Professor Dan Wright

Why We Are Here: Historic Rain Events

- ▶ Recent storms have amplified known inadequacies
- ▶ Recent storms have revealed new storm sewer deficiencies
- ⇒ Result: flood damage



Deming Way, Madison, WI

Why We Are Here: Historic Rain Events

- August 20th event: substantial damage
 - Public infrastructure: \$4M
 - Private property:
 - *Reported \$17.5M*
 - *Estimated \$30M*

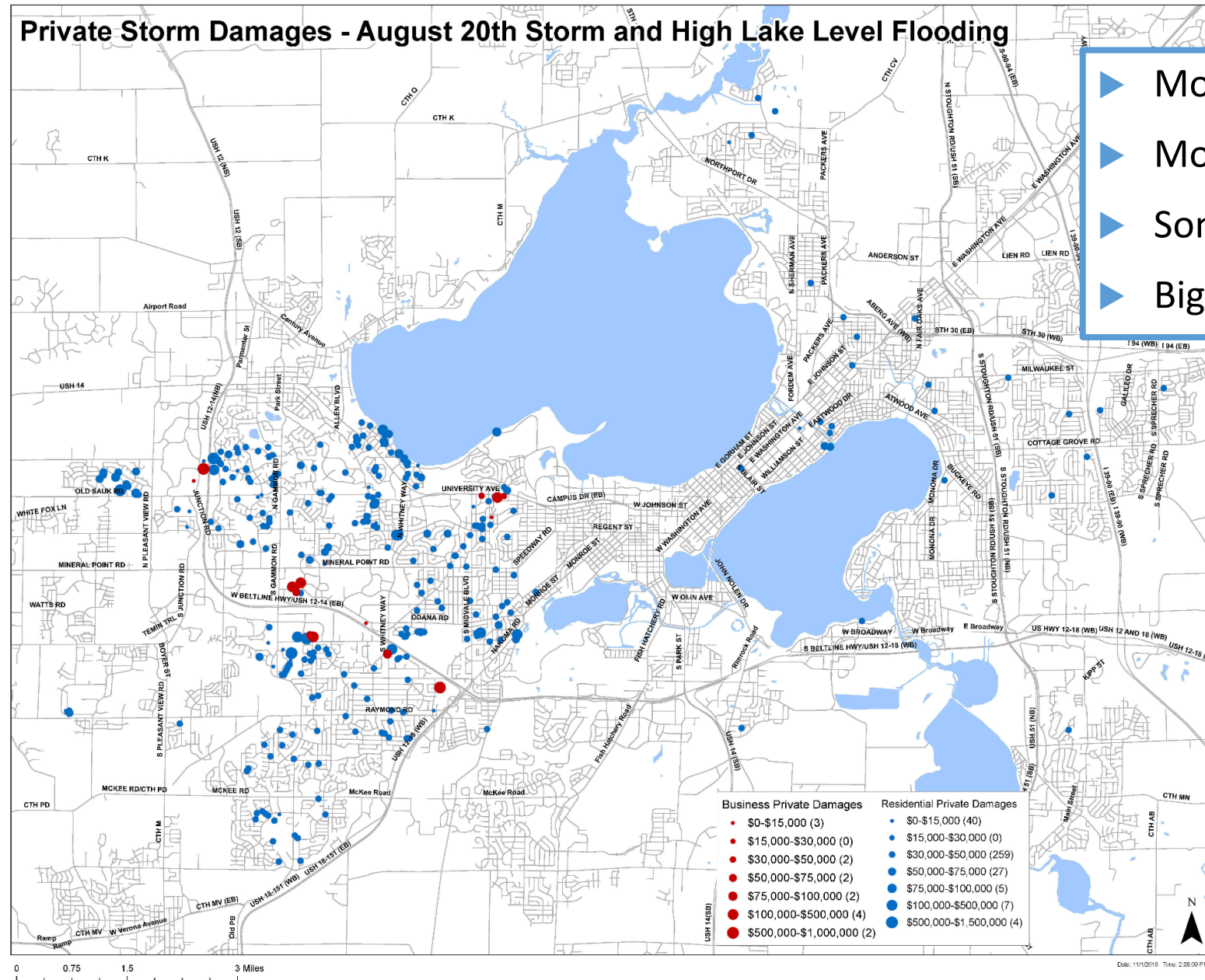


Odana Road (above), Glenwood
Children's Park (right), Madison, WI



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

- ▶ Most damage on the West Side
- ▶ Mostly residential damage
- ▶ Some commercial damages
- ▶ Big losses!



Why We Are Here: Historic Rain Events

- ▶ Recent storms have amplified known inadequacies
- ▶ Recent storms have revealed new storm sewer deficiencies
- ⇒ Result: flood damage
- ▶ City's plan
 - ▶ Complete watershed studies of impacted areas
 - ▶ Develop solutions from watershed studies



Deming Way, Madison, WI

100-Year Storm Definition

The “100-Year” Storm

- Annual exceedance probability (AEP): chance that a rainfall event will occur in one year.
- 100-yr storm = 1/100 (1%) AEP
 - 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%) event.
- City refers to storm as “1% chance event”

Annual Exceedance Probability (AEP)	Chance of occurring in 1 Year	Return Period or Average Recurrence Interval (ARI)
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

Why We Are Here: Historic Rain Events

Recent Rain Events

Date	Depth	Duration	Recurrence	Location and Source
August 20, 2018	3.52"	10 hr	10%	Dane Co LWRD – Fen Oak Ct Weather Underground
September 10-11, 2022	4.23"	36 hr	10%	Secret Places - CoCoRaHS
July 28, 2023	2.7"	45 min	1%	SW Commuter Path – City Gauge
May 21, 2024	1.8"	2 hour	20%	Orlando Bell Park – City Gauge
June 19, 2024	2.66"	75 min	4%	UW AOS



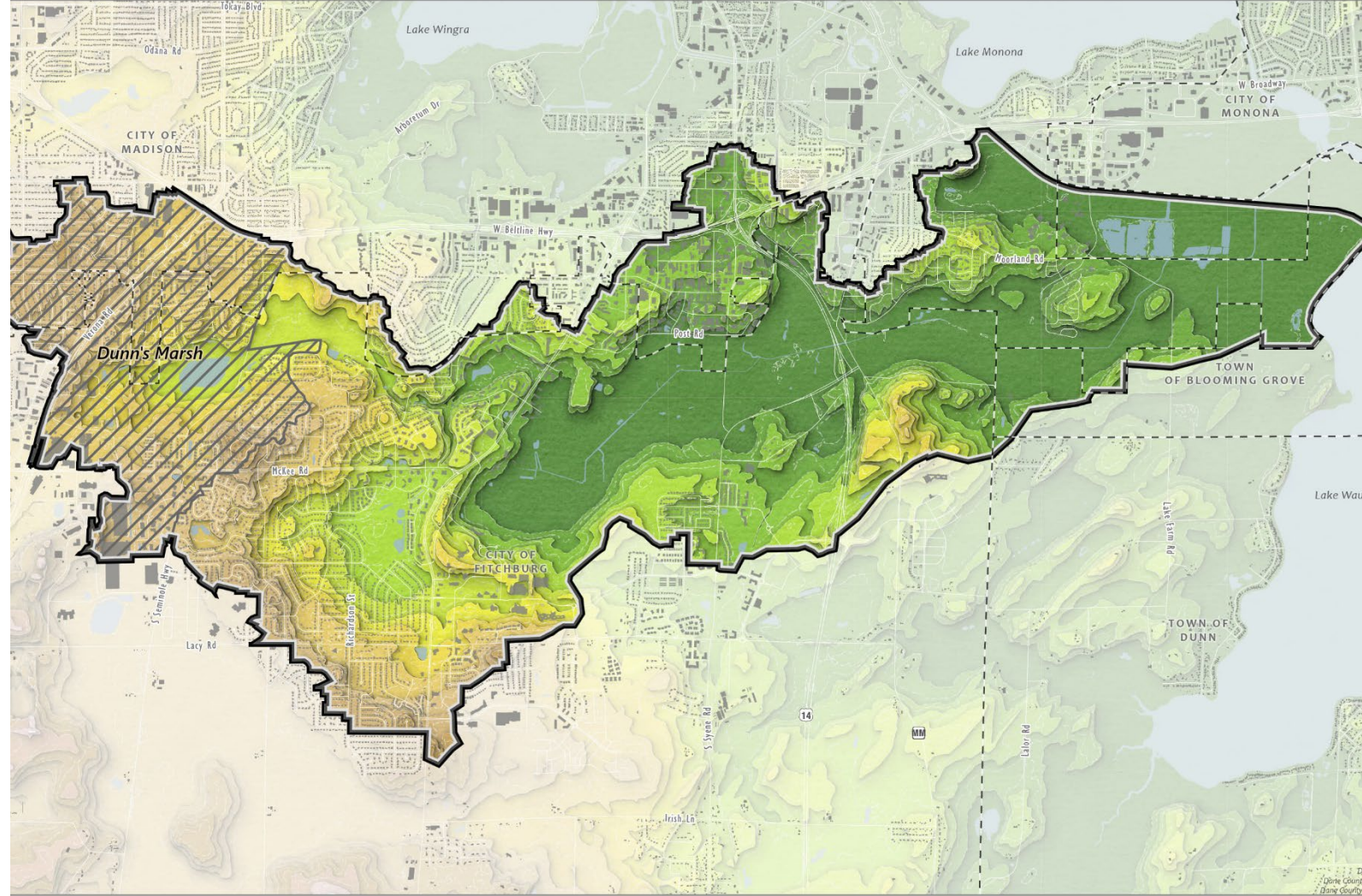
E Johnson Street, Madison, WI



Where the Water Goes

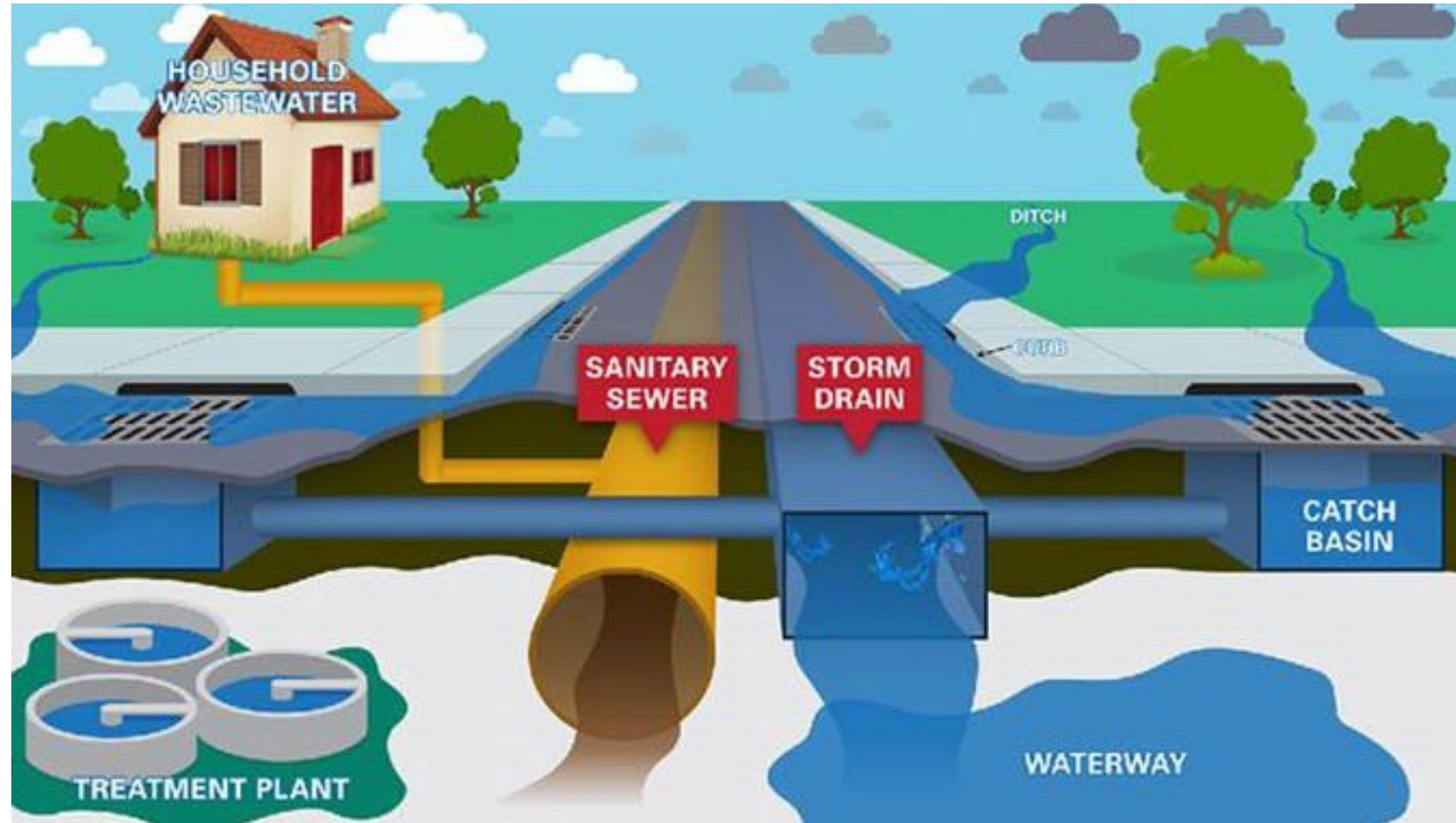
What's a watershed?

- ▶ A watershed is the area of land that drains precipitation (rain, snow, etc.) to a common low point, such as an inlet, stream, or lake.
- ▶ Determined by surface terrain and underground pipe system.



Where the Water Goes: Sewer Systems

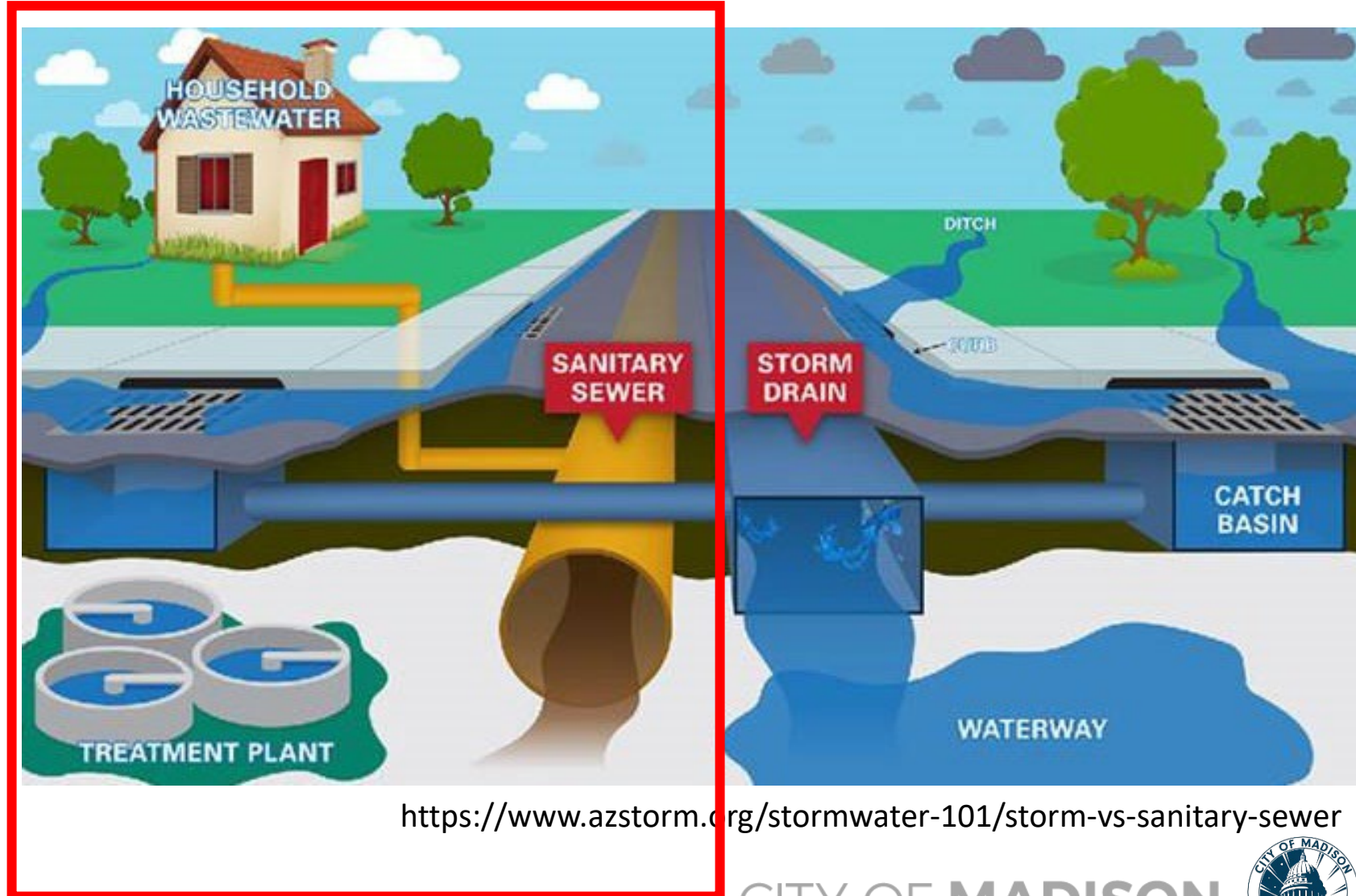
- ▶ Madison has separate storm and sanitary sewers
- ▶ Storm sewer system is NOT the same as the sanitary sewer system



<https://www.azstorm.org/stormwater-101/storm-vs-sanitary-sewer>

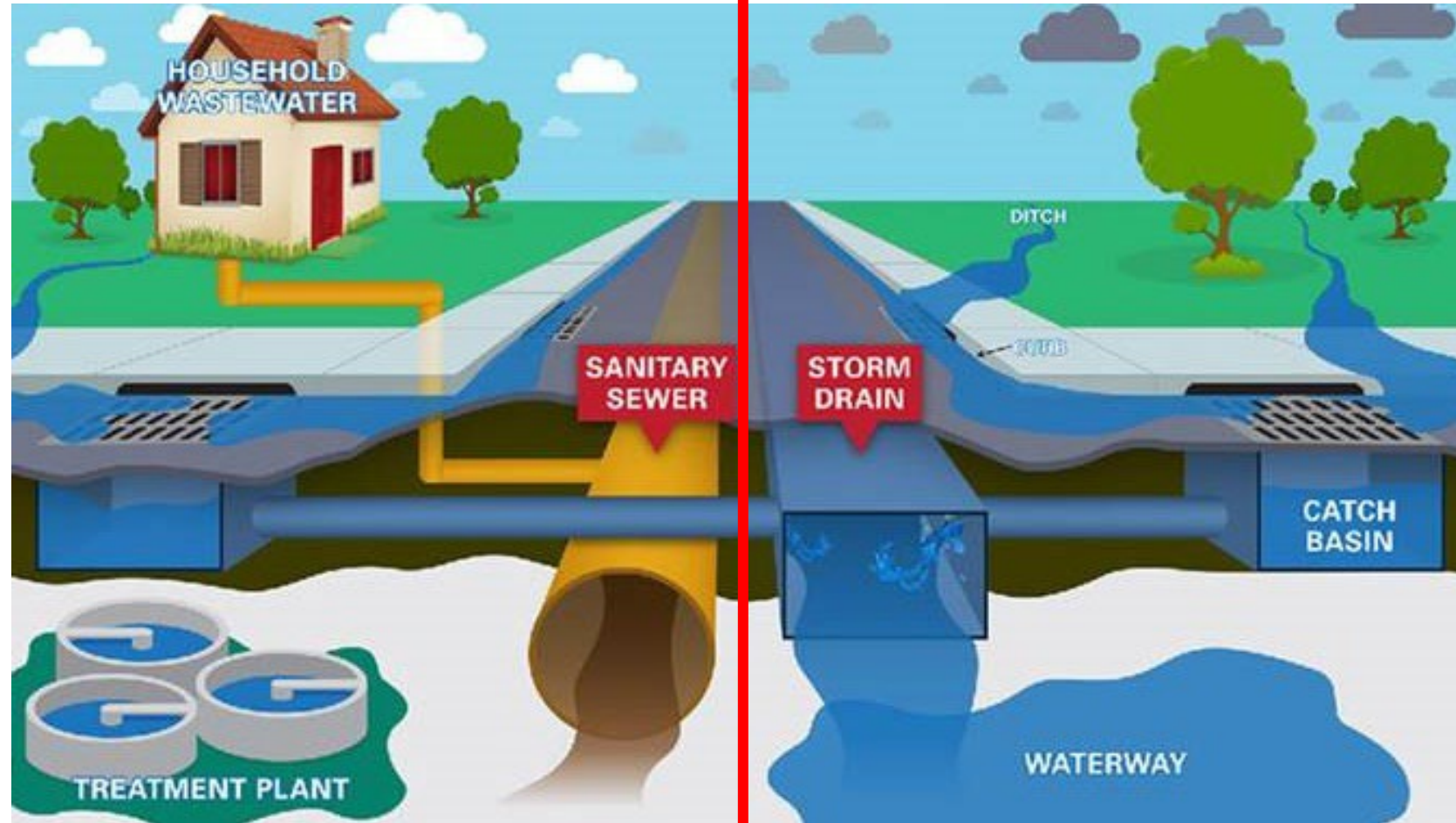
Where the Water Goes: Sanitary Sewer

- ▶ Sanitary sewer drains residential (toilets, showers, kitchen sinks, etc.), commercial and industrial wastewater streams
- ▶ Sanitary sewer transports wastewater to Madison Metropolitan Sewerage District (MMSD) treatment plant
- ▶ Sanitary infrastructure includes:
 - ▶ Manholes
 - ▶ Household lateral pipes
 - ▶ Main collector pipes



Where the Water Goes: Storm System

- ▶ Our stormwater drains to local surface waters
- ▶ We try to treat for nutrients and sediment
- ▶ Storm infrastructure includes:
 - ▶ Curbs and gutters
 - ▶ Inlets
 - ▶ Pipes
 - ▶ Channels (greenways)
 - ▶ Ponds



<https://www.azstorm.org/stormwater-101/storm-vs-sanitary-sewer>

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Where the Water Goes: Storm System in Madison



Greenway at Owen Conservation Park



Above: 96" pipe on University Ave (2013)
Below: storm sewer inlet on W Doty St



Reasons for Flooding Issues

- In many watersheds, flooding is not driven by lake levels
- Lake Mendota level controlled by Dane County by Tenney Lock
- Lake Waubesa Level controlled by Dane County by Babcock Dam
- Yahara Lakes function as a system
 - Solution to problems is increased conveyance through lake chain
- Website:

<https://lwrdd.countyofdane.com/Yahara-Chain-of-Lakes-Lake-Levels-Task-Force>



<https://www.wiscontext.org/yahara-watershed>

Reasons for Flooding Issues

- Flash flooding: when storm sewer system cannot handle high amounts of rain
- Comparative example: a traffic jam
 - Too many cars of the Beltline during rush hour → backups happen
- During a storm, more water tries to move through the storm sewer system → backups happen



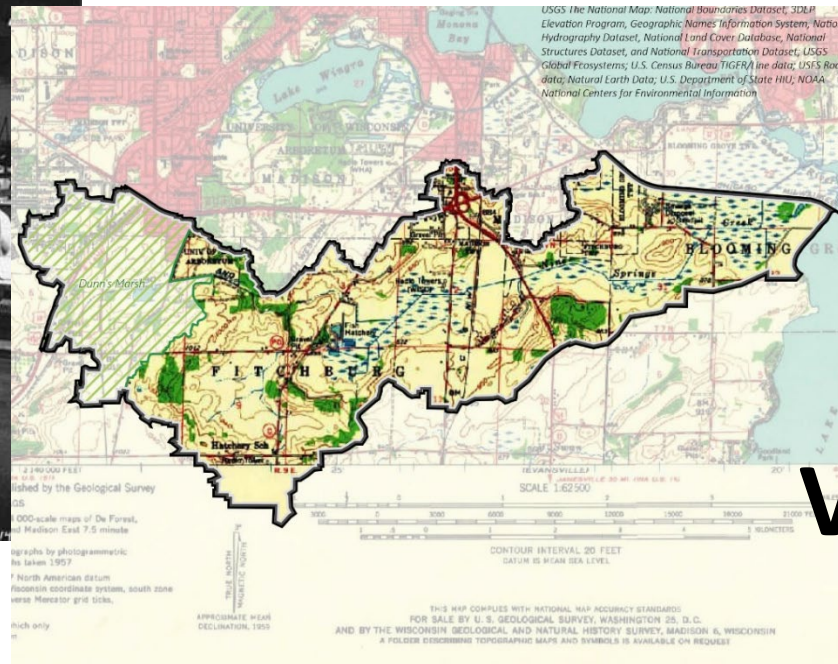
Beltline, looking west from Park Street, WisDOT

Reasons for Flooding Issues

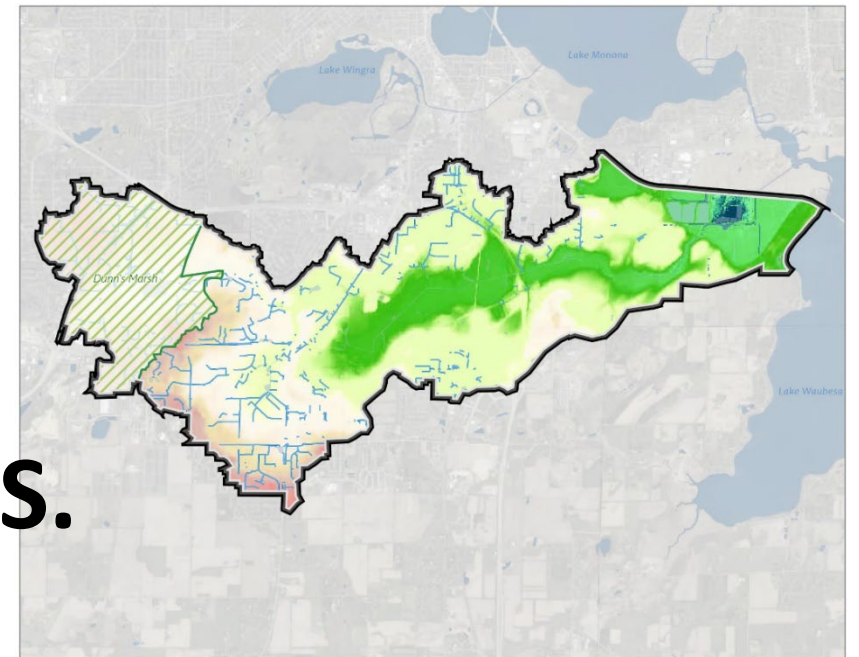
- Tools have changed in the last five decades.
- Old tools made data gathering and stormwater modeling difficult.



Photo above
<https://www.vintag.es/2018/08/life-before-autocad.html>



VS.

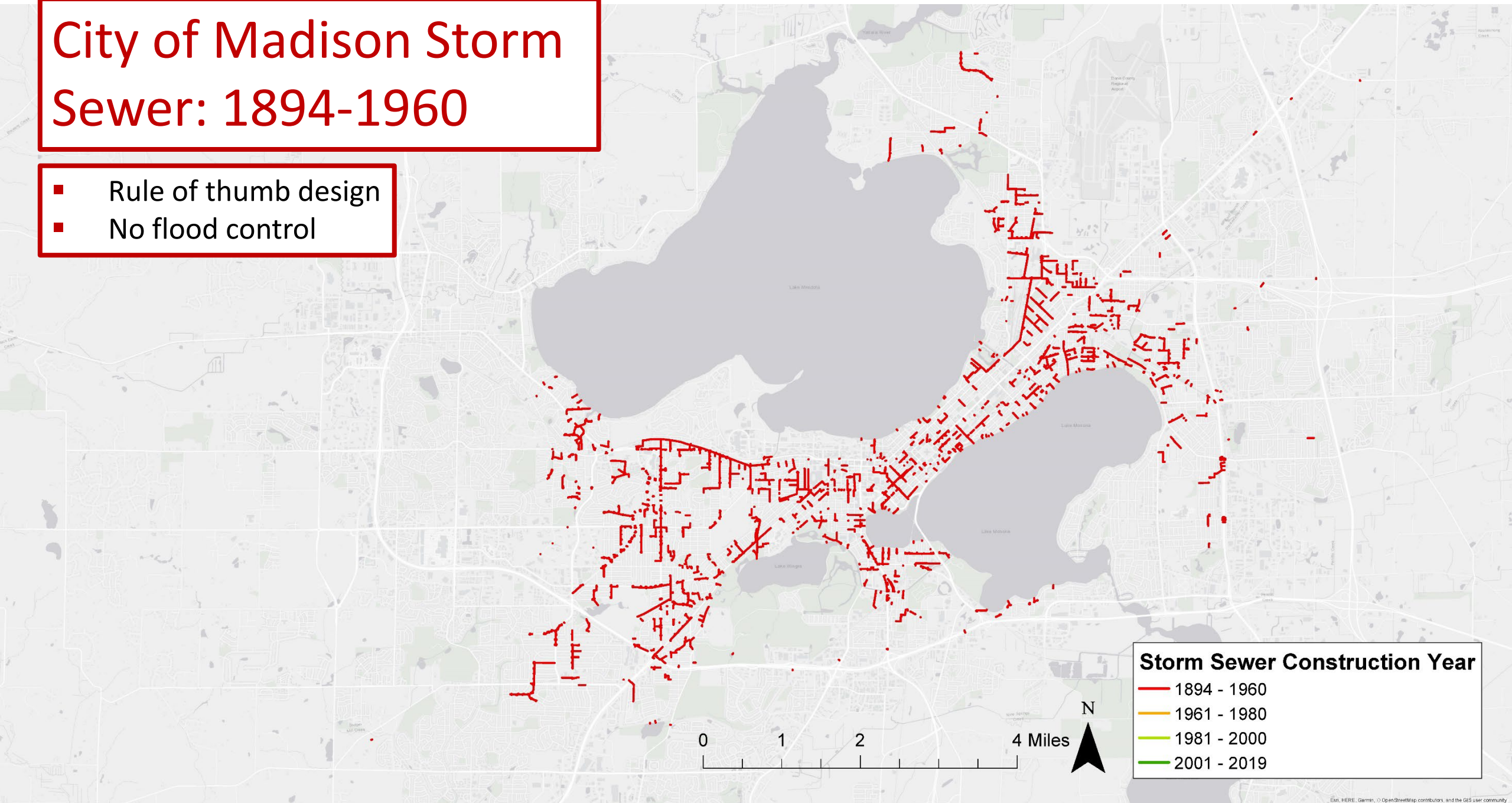


Reasons for Flooding Issues: Changing Design Standards

- Changing public design standards and past limited private design standards have led to flash flooding.
- Lack of historical building requirements created hard-to-solve flooding problems on private property which cannot be easily corrected.

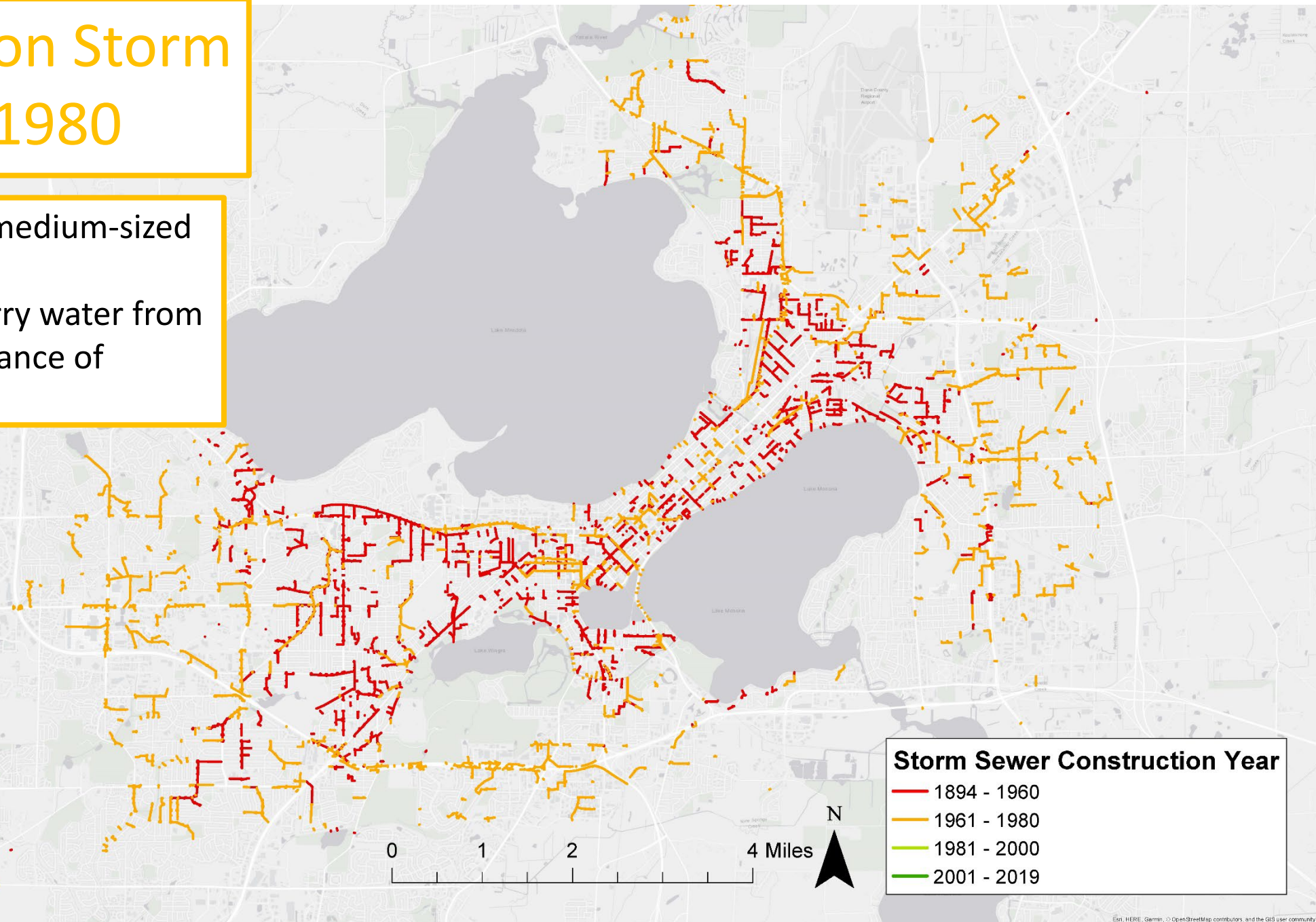
City of Madison Storm Sewer: 1894-1960

- Rule of thumb design
- No flood control



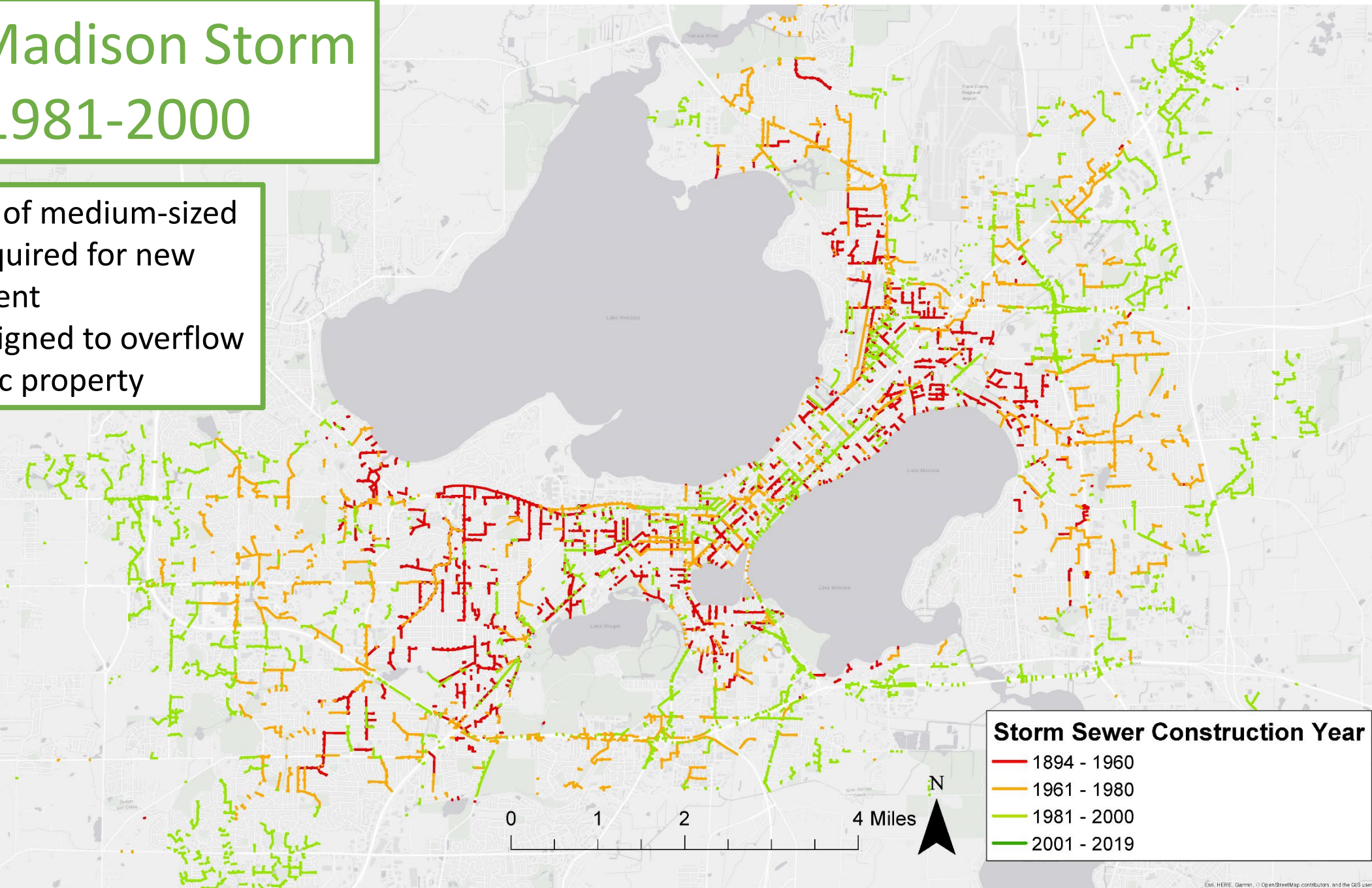
City of Madison Storm Sewer: 1961-1980

- Pipes designed for medium-sized storms
- Culverts sized to carry water from storms with 10% chance of occurring each year



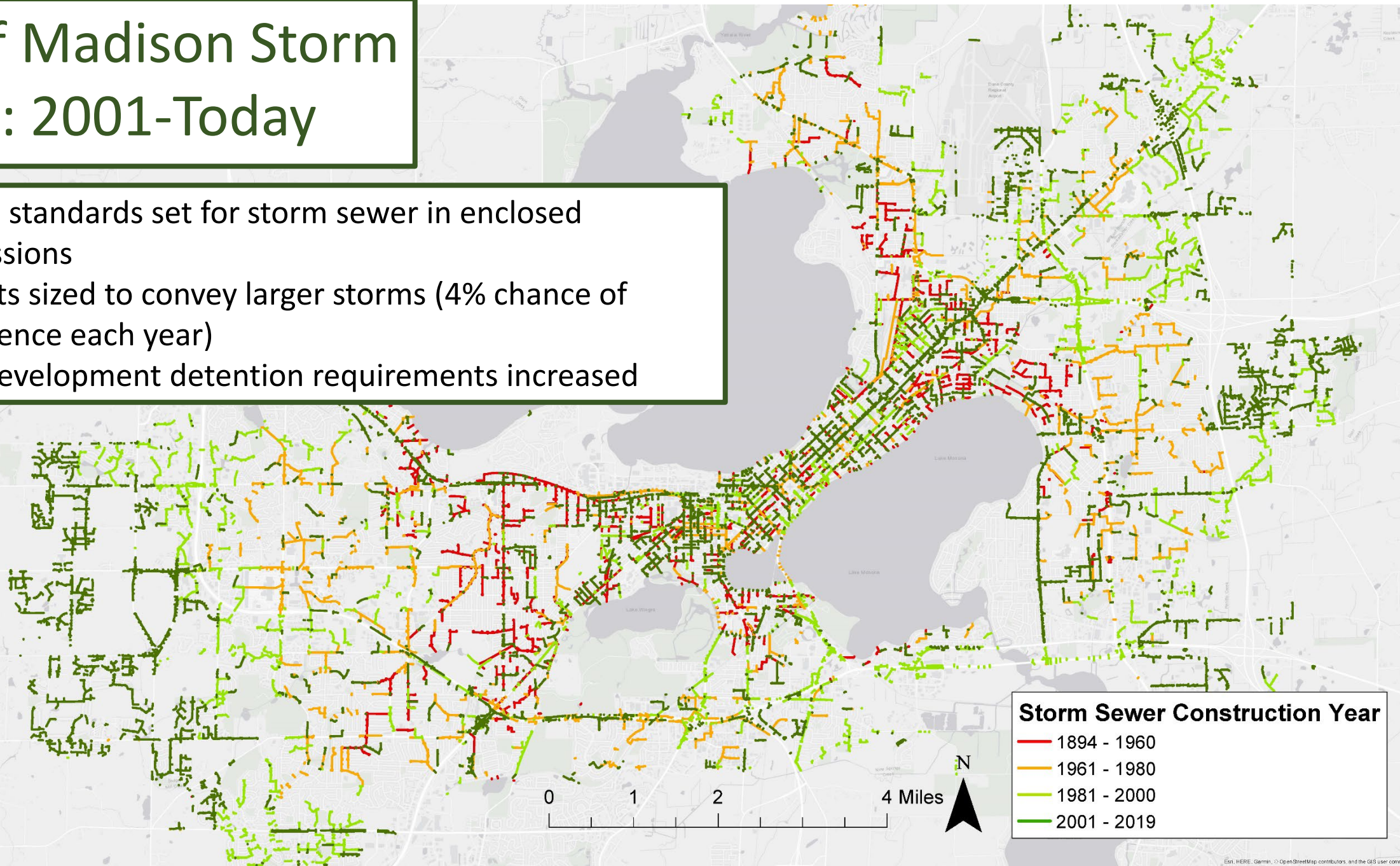
City of Madison Storm Sewer: 1981-2000

- Detention of medium-sized storms required for new development
- Ponds designed to overflow onto public property



City of Madison Storm Sewer: 2001-Today

- Design standards set for storm sewer in enclosed depressions
- Culverts sized to convey larger storms (4% chance of occurrence each year)
- New development detention requirements increased



Why Replacement Takes Time

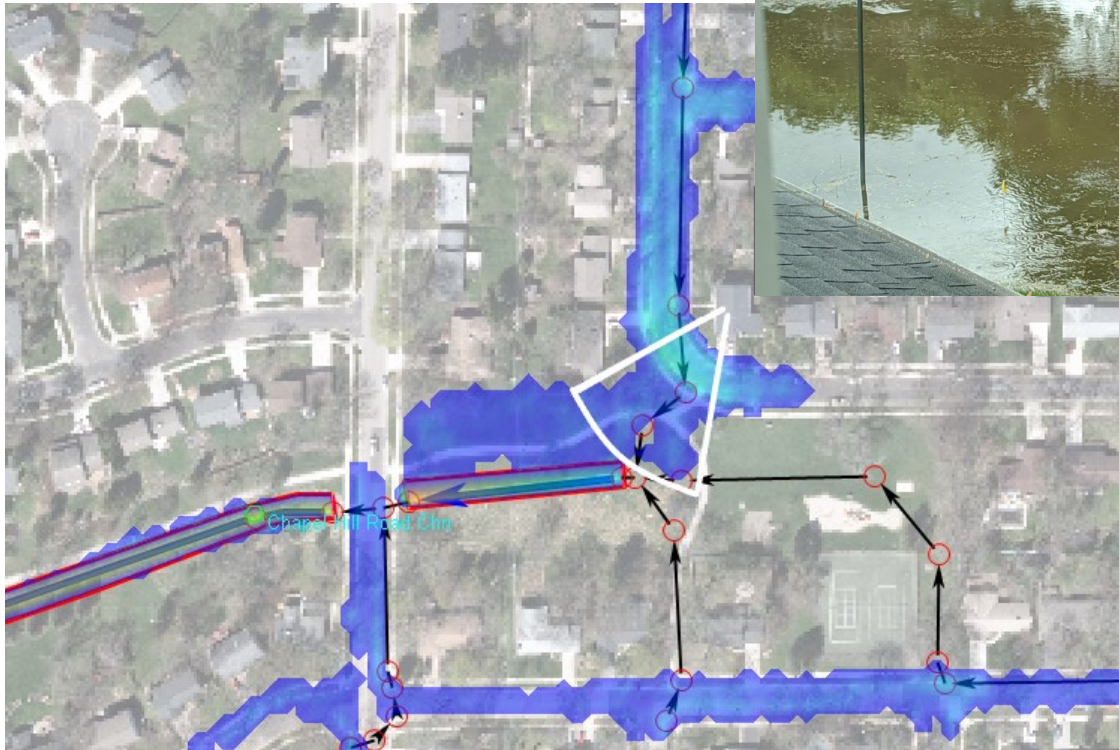
- Road reconstruction, storm sewer is expensive but long-lasting
 - Road reconstruction cost = approximately \$500-\$2,000/ft
 - 2% City infrastructure is upgraded annually
 - Average life:
 - Street=30-50 years
 - Pipes=50-100 years
- Storm Water Utility bill – Municipal Services Bill
 - Avg Residential Property per month
 - 2022 - \$11.31
 - 2023 - \$11.72 (+3.6%)
 - 2024 - \$12.52 (+6.8%)



96" pipe tunneling on University Ave, Madison, WI
(2013)

Watershed Study Goals

- Find out why flooding happens in certain locations



Above – Photograph of Actual Flooding Witnessed
(June 9, 2020)

Left – Example Watershed Model Output Map
(June 9, 2020)

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Watershed Study Goals

- Find out why flooding happens in certain locations
- System targets
 - 10% Chance Event (4.09" rain/24 hours).
 - No surcharging of storm sewer onto roadway (storm sewer pipes are sized to carry storm)



N. High Point Road at Old Sauk Road, Madison, WI

Watershed Study Goals

- Find out why flooding happens in certain locations
- System targets
 - 10% Chance Event (4.09" rain/24 hours).
 - No surcharging of storm sewer onto roadway (storm sewer pipes are sized to carry storm)
 - 4% Chance Event (5.01" rain/24 hours)
 - 0.5' at Centerline of Road (roads passable for emergency vehicles)



Winding Way, Madison, WI

Watershed Study Goals

- Find out why flooding happens in certain locations
- System targets
 - 10% Chance Event (4.09" rain/24 hours).
 - No surcharging of storm sewer onto roadway (storm sewer pipes are sized to carry storm)
 - 4% Chance Event (5.01" rain/24 hours)
 - 0.5' at Centerline of Road (roads passable for emergency vehicles)
 - 1% Chance Event (6.66" rain/24 hours)
 - No structure (home/building) flooding
 - No greenway crossing overflow
 - Safe overflow from enclosed depressions



Regent St at Kenosha Ave, Madison, WI

Watershed Study Goals

- Find out why flooding happens in certain locations
- System targets
 - 10% Chance Event (4.09" rain/24 hours).
 - No surcharging of storm sewer onto roadway (storm sewer pipes are sized to carry storm)
 - 4% Chance Event (5.01" rain/24 hours)
 - 0.5' at Centerline of Road (roads passable for emergency vehicles)
 - 1% Chance Event (6.66" rain/24 hours)
 - No structure (home/building) flooding
 - No greenway crossing overflow
 - Safe overflow from enclosed depressions
 - 0.2% Chance Event (8.81" rain/24 hours)
 - Safe conveyance of overflow



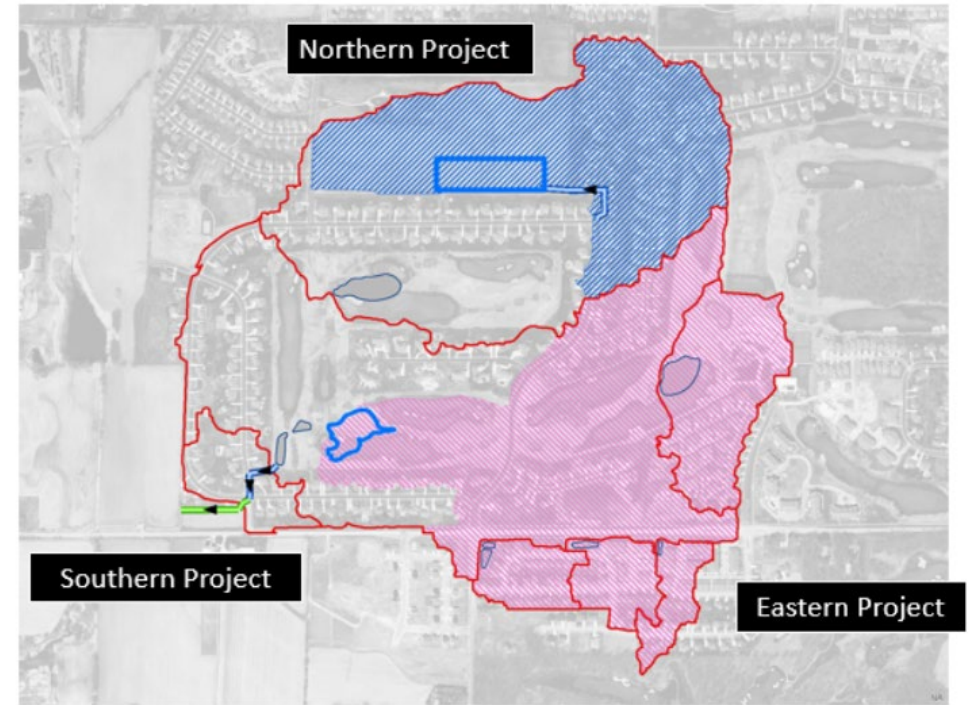
Tenney Park, Madison, WI

Watershed Study Goals

- Find out why flooding happens in certain locations

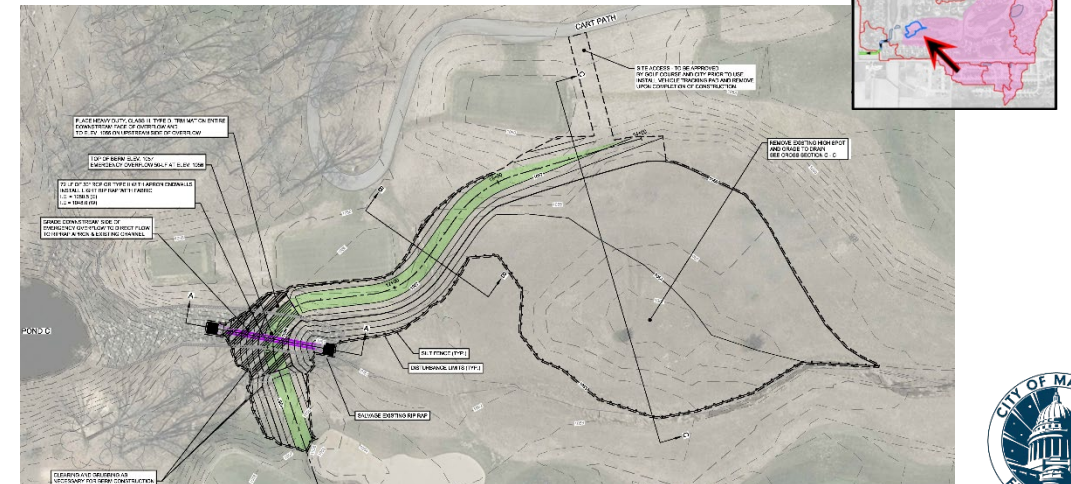
Test Solutions

- ▶ Lots more detail gets added in final design
- ▶ Will help prioritize and budget future projects



Above: Model-Level Solution Evaluation

Below: Design Level Detail



Watershed Study Goals

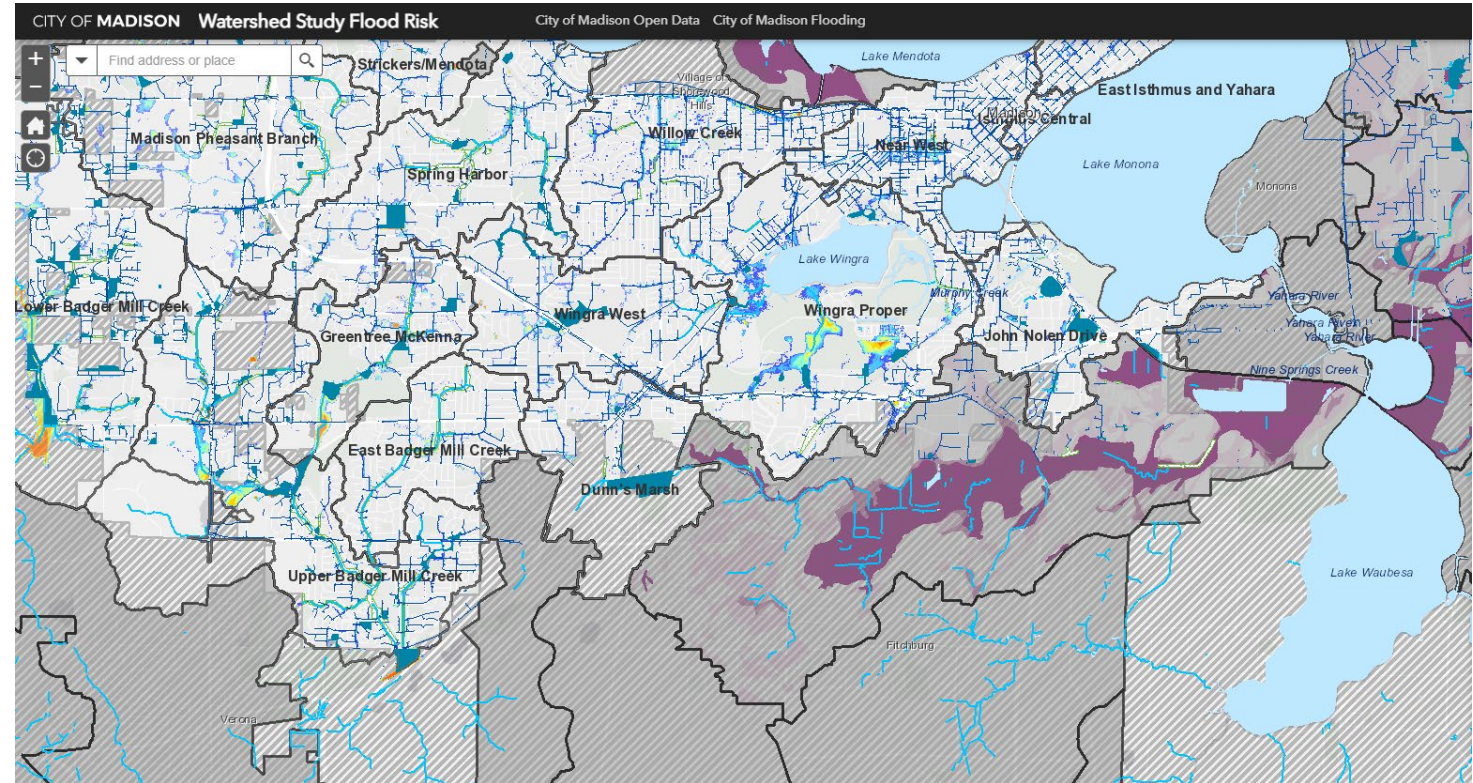
- ▶ Find out why flooding happens in certain locations

Test Solutions

- ▶ Lots more detail gets added in final design
- ▶ Will help prioritize and budget future projects

Education

- ▶ Understand potential flood risk
- ▶ Educate public on what they can do to reduce their risk



Watershed Study Limitations

- Retrofitting infrastructure takes time and money
- Repairs are not always easy, popular, or cheap
- Not always a good solution
- Property owners will need to create solutions too
- Solutions will need broad community cooperation
- Groundwater problems not easily addressed by watershed modeling and surface infrastructure

Next Steps

Model Existing Conditions & Predict Future Flood Risk

Analyze Solutions on Watershed Scale, Rank & Budget

**Create
Watershed
Model**

**Identify
Flooding
Impacts**

**Develop
Engineering
Solutions**

**Prioritize
& Budget**

Next Steps



**Create
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**Identify
Flooding
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**Develop
Engineering
Solutions**

**Prioritize
& Budget**

- ▶ Gather model input data
- ▶ Install equipment and measure rainfall and channel flow
- ▶ Build computer models to represent rainfall-runoff-routing
- ▶ Compare model to data
- ▶ Determine extent of past flooding

Next Steps

Create Watershed Model

- ▶ What does modeling the Nine Springs Creek watershed involve?
 - ▶ Watershed area:
 - ▶ Total: 8,006 acres (12.5 square miles)
 - ▶ Within City of Madison: 2,165 acres (~3.4 square miles)
 - ▶ Within City less Dunn's Marsh: 1,614 acres (~2.5 square miles)
 - ▶ 6.3 miles of City-owned storm sewer*
 - ▶ ~329 city owned inlets*
 - ▶ ~3.1 miles of open channel drainage-ways*
 - ▶ About 13,700 total parcels of mixed land uses* (mostly open spaces, residential & commercial)
 - ▶ ~3,700 parcels within City of Madison

Next Steps

Create Watershed Model

- What you might see in the watershed



Above: Storm Sewer Flow Meter
Left: Rain Gauge



Above: surveyor in the field.
Photo courtesy of Amber Lefers (AE2S).



Next Steps

Create
Watershed
Model

Identify
Flooding
Impacts

Develop
Engineering
Solutions


Prioritize
& Budget

- ▶ See how well existing storm sewer system meets goals



Commerce Drive near
Plaza Drive, Madison, WI

Next Steps



Create
Watershed
Model


Identify
Flooding
Impacts

**Develop
Engineering
Solutions**

Prioritize
& Budget

- ▶ Must be holistic
- ▶ Not “move the problem elsewhere”
- ▶ Account for climate change
 - ▶ Look at **trending increases** in storm frequency and intensity
- ▶ Consider long term maintenance needs
- ▶ Provide benefits relative to cost

Next Steps



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- ▶ **Provide benefits relative to cost**

Next Steps

Create
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Identify
Flooding
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Develop
Engineering
Solutions

Prioritize
& Budget

What are some general options?


- ▶ Improve pipe and/or inlet capacity
- ▶ Safe overflow paths
- ▶ Reroute flow
- ▶ Increase storage / detention
- ▶ Flood-proof buildings
- ▶ Local landscaping / grading
- ▶ Solutions on private property to structures or land



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Next Steps



Create
Watershed
Model

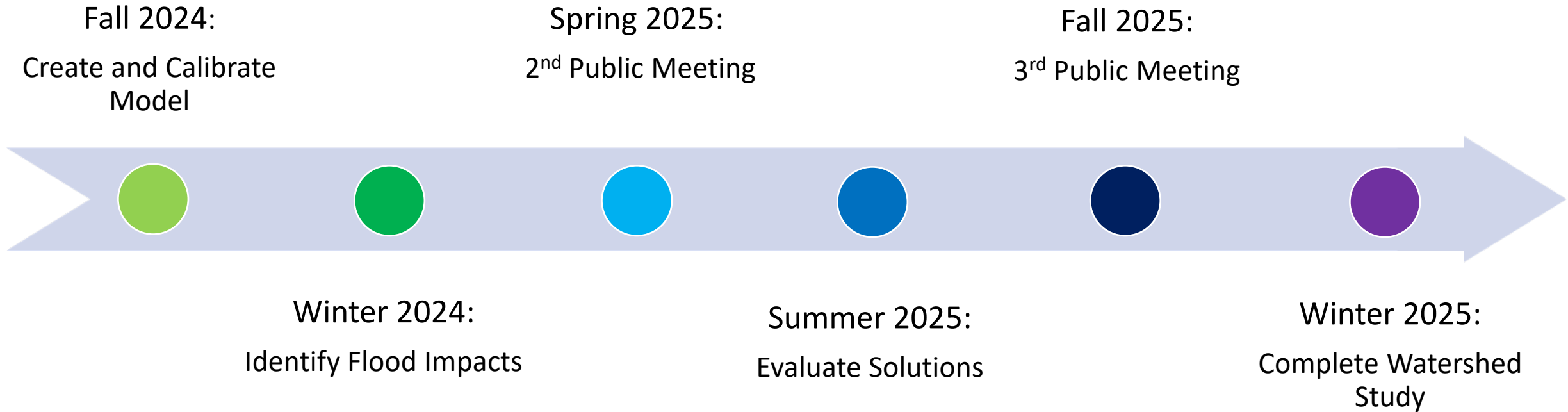
Identify
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Develop
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**Prioritize
& Budget**

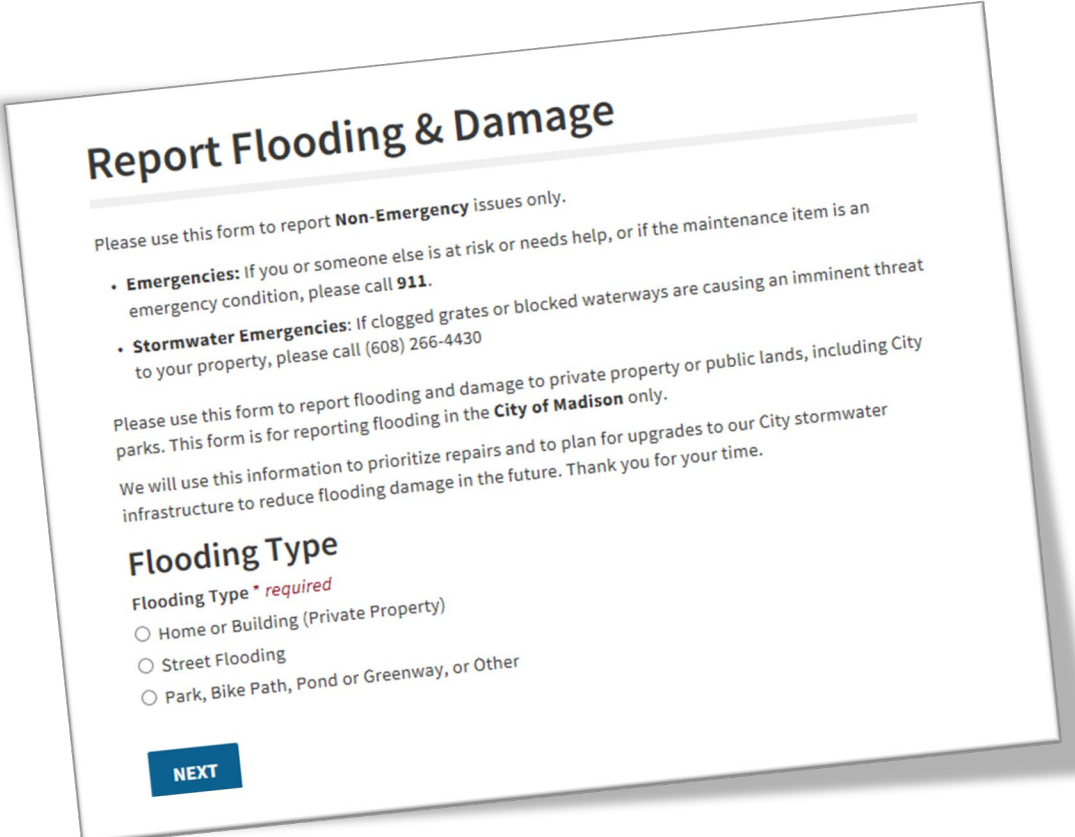
- ▶ Improvements require time and money
 - ▶ Some solutions are long-term, sustained community efforts (green infrastructure)
 - ▶ Some solutions are discrete, high capital-cost projects (box culverts, pond, etc.)
- ▶ Solutions prioritized based on:
 - ▶ Frequency, severity and damage (cost-benefit)
 - ▶ Emergency response routes
 - ▶ Areas with other projects scheduled (road repair, etc.)
 - ▶ Within a Neighborhood Resource Team area

Next Steps



Property Owner Responsibilities

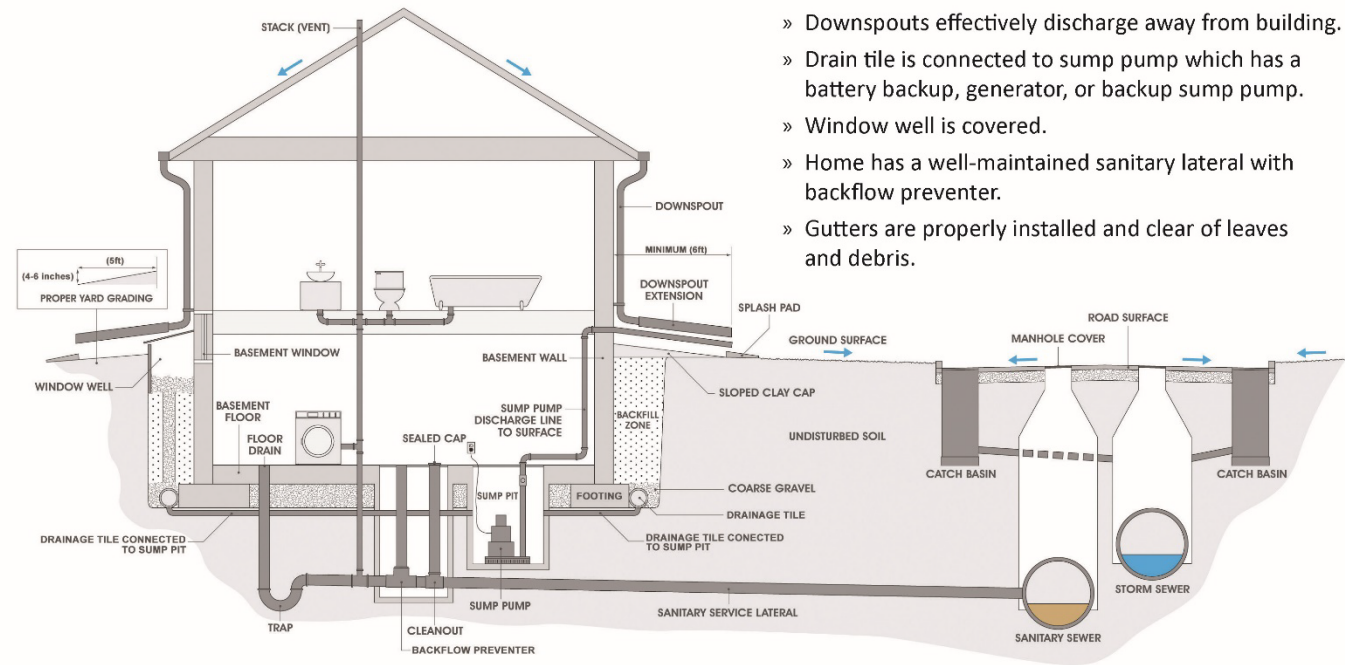
- Self-report Online Survey: document and share data during rain events
 - www.cityofmadison.com/flooding
- WE NEED YOU TO REPORT ON-LINE TO INFORM OUR STUDY!***
- Understand local drainage and how to protect your property
 - Install backflow preventers and sump pumps
 - Consider supplemental insurance
 - Focus group participation

A tilted image of a 'Report Flooding & Damage' form. The form has a title at the top, followed by instructions to use it for non-emergency issues. It lists emergency contact numbers for general emergencies (911) and stormwater emergencies (608) 266-4430. It explains that the form is for reporting flooding and damage to private property or public lands, including city parks. It states that the information will be used to prioritize repairs and plan for upgrades to stormwater infrastructure. Below this is a section titled 'Flooding Type' with a 'required' note, followed by three radio button options: 'Home or Building (Private Property)', 'Street Flooding', and 'Park, Bike Path, Pond or Greenway, or Other'. At the bottom left of the form is a blue button labeled 'NEXT'.

Property Owner Responsibilities

- Self-report Online Survey
- Understand local drainage and how to protect your property
 - www.cityofmadison.com/floodprotection
- Install backflow preventers and sump pumps
- Consider supplemental insurance
- Focus group participation

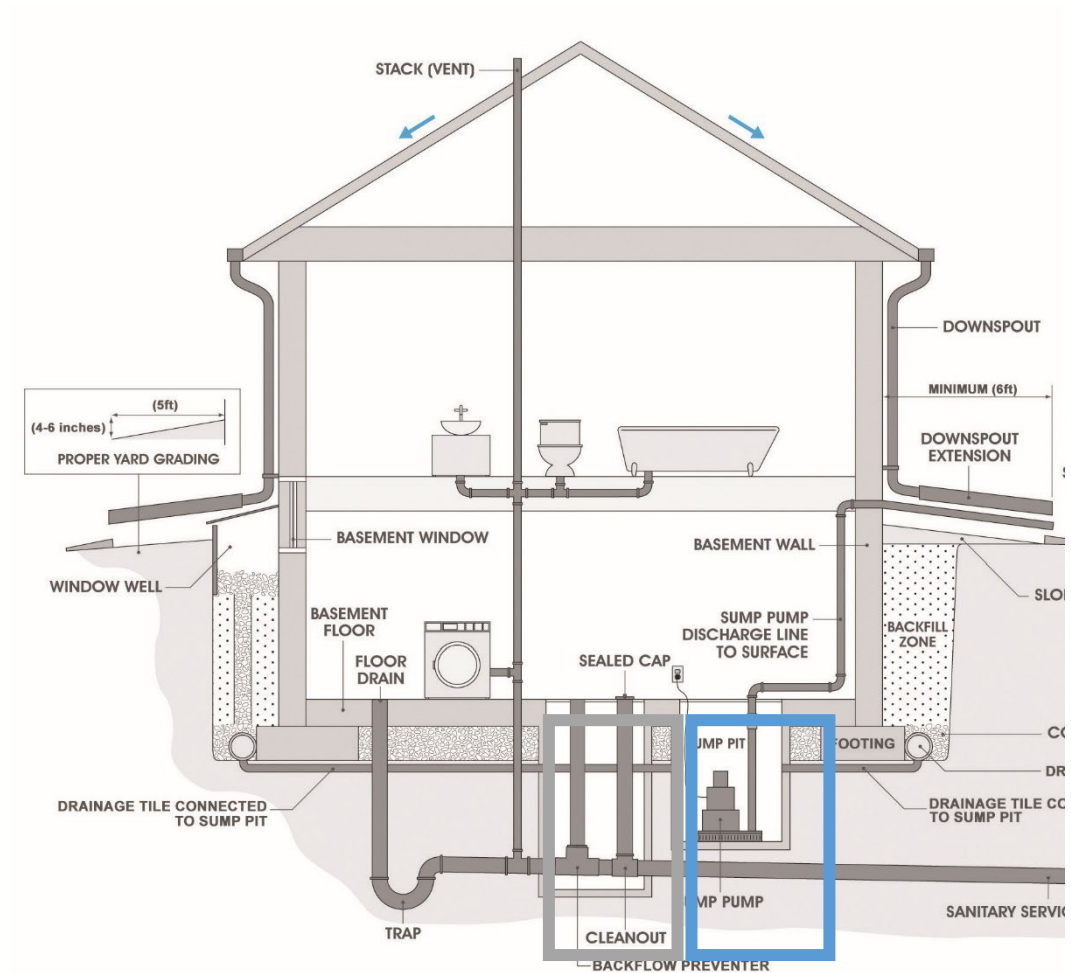
Good Flood Prevention



- » Foundation, wall, and sewer are in good condition.
- » Ground sloped away from the building.
- » Downspouts effectively discharge away from building.
- » Drain tile is connected to sump pump which has a battery backup, generator, or backup sump pump.
- » Window well is covered.
- » Home has a well-maintained sanitary lateral with backflow preventer.
- » Gutters are properly installed and clear of leaves and debris.

Property Owner Responsibilities

- Self-report Online Survey
- Understand local drainage and how to protect your property
- **Install backflow preventers and sump pumps**
- Consider supplemental insurance
- Focus group participation



Property Owner Responsibilities

- Self-report Online Survey
- Understand local drainage and how to protect your property
- Install backflow preventers and sump pumps
- Consider supplemental insurance – **contact your private insurance agent for more information**
- Focus group participation

Property Owner Responsibilities

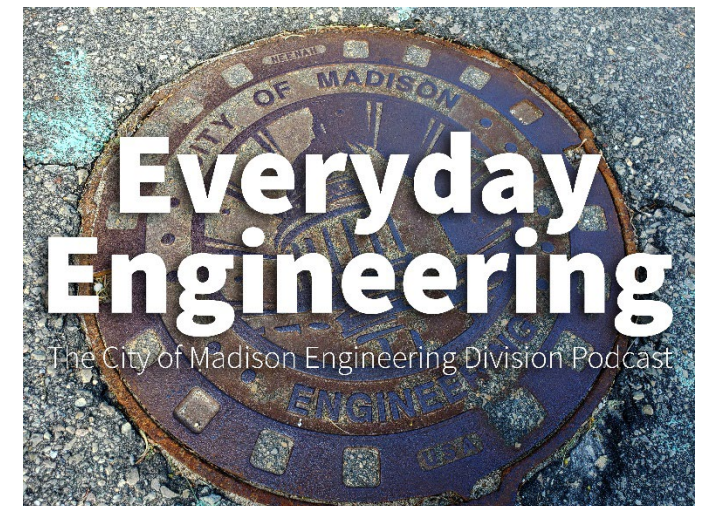
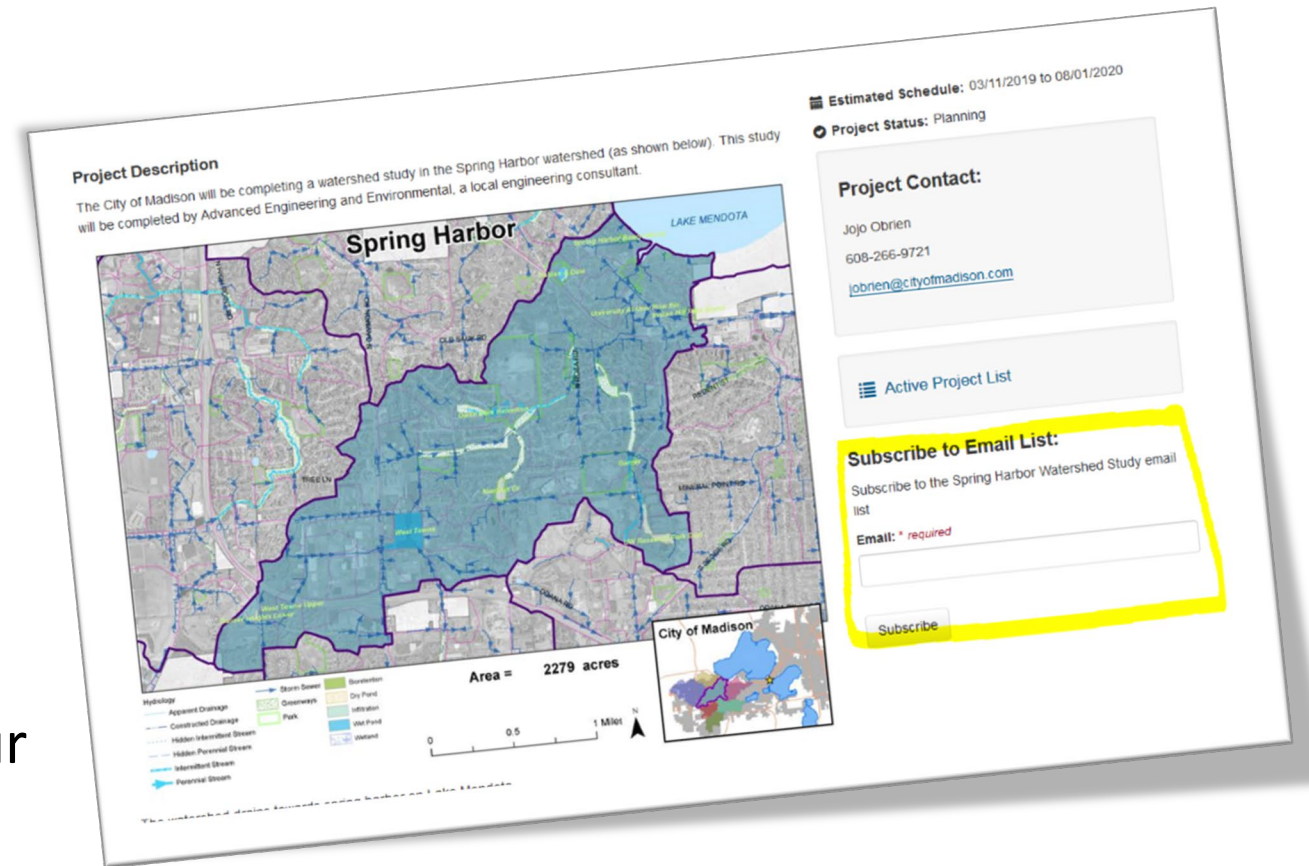
- Self-report Online Survey
- Understand local drainage and how to protect your property
- Install backflow preventers and sump pumps
- Consider supplemental insurance
- **Focus group participation: for regional issues that affect more than one person**

Property Owner Responsibilities

- **Be a good neighbor!** Understand how your water could have negative impacts on your neighbor's property.
- Install rain gardens and/or rain barrels etc.
- **Have a plan** to protect yourself during a flash flood warning.
- Become a better steward of your watershed.
 - Adopt an Inlet
 - Remove leaves from the street
 - <http://www.ripple-effects.com/>

How to Stay Involved

- www.cityofmadison.com/flooding
 - Report Flooding Survey
 - Individual Watershed Studies Pages
 - Sign up for updates!
 - How you can prevent flooding at your home
 - Everyday Engineering Podcast
 - Historic Flooding and Basement Drainage episodes
 - Focus Groups



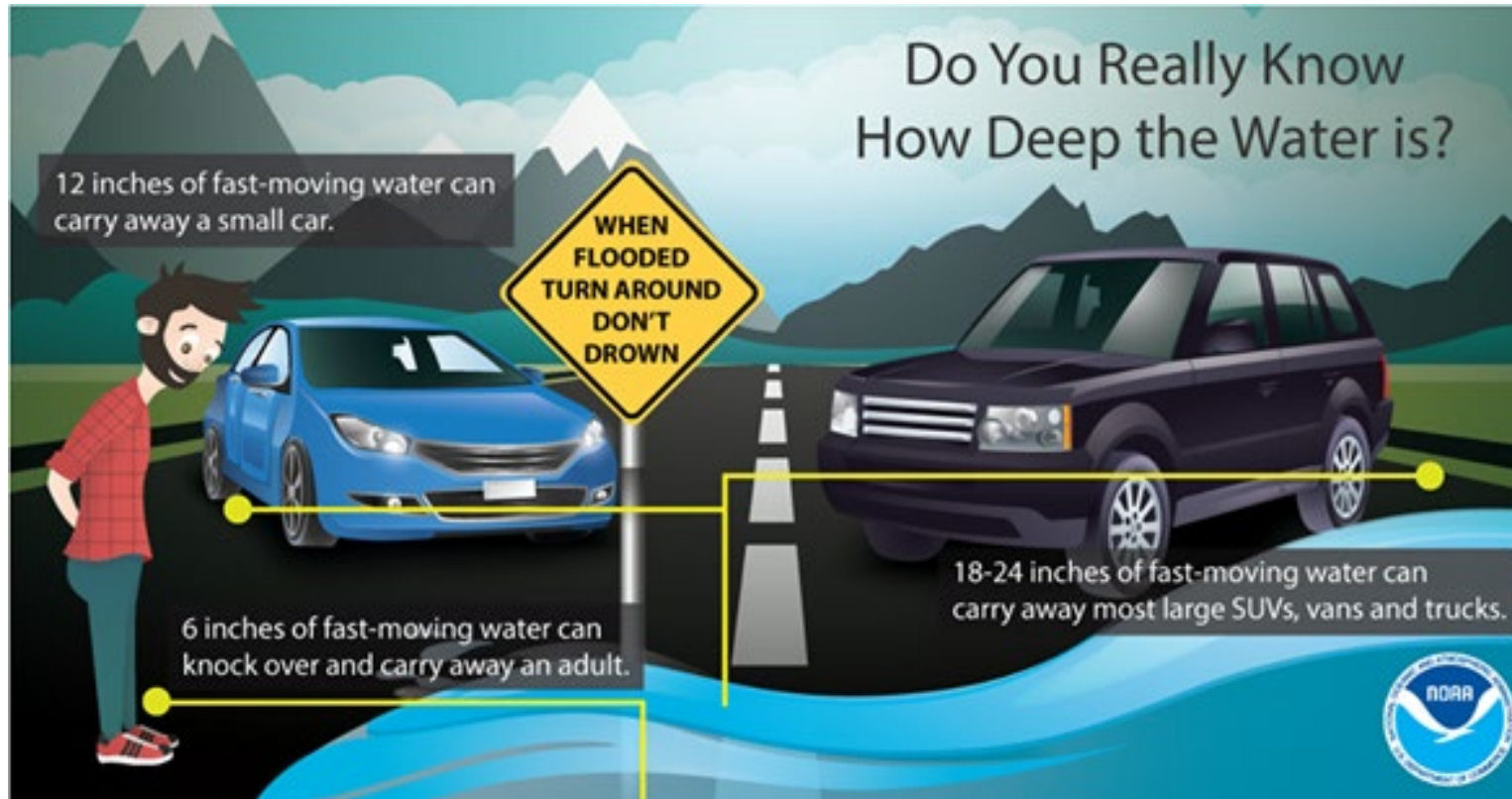
Next PIM

- Anticipated Spring 2025
 - Present watershed model findings
 - Findings will be specific to the Nine Springs Creek watershed
 - Obtain input to refine data and model
 - Use as a 'fact check' with residents

Contact Information & Resources

- Engineering
 - Project Manager, Ryan Stenjem, rstenjem@cityofmadison.com
 - Public Information Officer, Hannah Mohelnitzky, hmohelnitzky@cityofmadison.com
- Project Website: <https://www.cityofmadison.com/engineering/projects/nine-springs-watershed-study>
 - Sign-up for project email updates on the website
 - Updates on closures & work progress will be posted to the project website
 - Recording for this meeting will be posted on project webpage
- City of Madison Flood Risk Map: <https://www.cityofmadison.com/flooding/understanding-flooding/watershed-study-flood-risk-map>)
- Facebook – City of Madison Engineering
- Twitter – @MadisonEngr
- Engineering Podcast: Everyday Engineering on iTunes, GooglePlay

Questions and Answers



- Emergencies:** If you or someone else is at risk or needs help, or if the maintenance item is an emergency condition, please call **911**.
- Stormwater Emergencies:** If clogged grates or blocked waterways are causing an imminent threat to your property, please call **(608) 266-4430**