Regional Climate Vulnerability Assessment –
Transportation Tools & Resources

Technical Advisory Committee Planning Meeting

March 14, 2019

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Today's Discussion

Overview

Localized Flooding

- Approach and Limitations
- Methodology
- Transportation & Transit Overview

Tools for Community & Stakeholder Use

Next Steps

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Why Conduct a Climate Vulnerability Assessment?

Sustainability Outcome

- Integrating climate mitigation, adaptation, and resilience into the Council's management of regional systems and supporting local governments in their planning and implementation.

Lead by Example

Building in Resilience Land Use Policy

- Develop local resiliency to the impacts of climate change. The Council will identify and address potential **vulnerabilities** in regional systems as a result of increased frequency and severity in temperature, precipitation, and extreme weather.

Collaborate Across the Region

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Why Rain & Heat?

Climate Change Trends in Minnesota through 2099

Hazard	*Projections Through 2099*	*Confidence in Projected Changes*
Warming Winters	Continued loss of cold extremes and dramatic warming of coldest conditions	**Highest**
Extreme Rainfall	Continued increase in frequency and magnitude; unprecedented flash-floods	
Heat Waves	More hot days with increases in severity, coverage, and duration of heat waves	**High**
Drought	More days between precipitation events, leading to increased drought severity, coverage, and duration	**Moderately High**
Heavy Snowfall	Large events less frequent as winter warms, but occasional very large snowfalls	**Moderately Low**
Severe Thunderstorms & Tornadoes	More “super events” possible, even if frequency decreases	

SOURCE: *MN DNR State Climatology Office.*

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What are We Assessing?

- Localized Flooding Analysis
  - 👍 Transportation and Transit
  - 👍 Wastewater
  - 👍 Council-owned Housing
  - 👍 Regional Parks and Trails
  - 👍 Water Supply

- Localized Flooding Tools
  - 👍 Story Map
  - 👍 Interactive Flood Map
  - 👍 Publicly Available Data

- Extreme Heat Tools
  - 👍 Story Map
  - 👍 Interactive Extreme Heat Map
  - 👍 Publicly Available Data

- Human Vulnerability


IMAGE SOURCE: MnDOT

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Localized Flooding (Bluespot)

Approach

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IMAGE SOURCE: City of St. Louis Park

Observation of Mega Rain Events* in MN

Over half of Mega Rain Events since 1866 occurred since 2002

Challenges

Most infrastructure planned for 5 to 10 year storm events

Under new modelling, the 100-year event has increased by 25%

*Defined as 6” or greater rains covering at least 1000sq mile and a peak amount of 8” or greater

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Types of Flooding

Riverine flooding

Extended rainfall or snowmelt causes a river to exceed its capacity

Surface or Localized flooding

High intensity rainfall creates a flooded area independent of an overflowing water body

IMAGE SOURCE: Twitter, Lowry Ave, NE Minneapolis, 7/5/2016

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Why focus on localized flooding?

- Under-acknowledged risk
- Less well known than riverine flooding
- Less consideration of this risk when locating Council assets

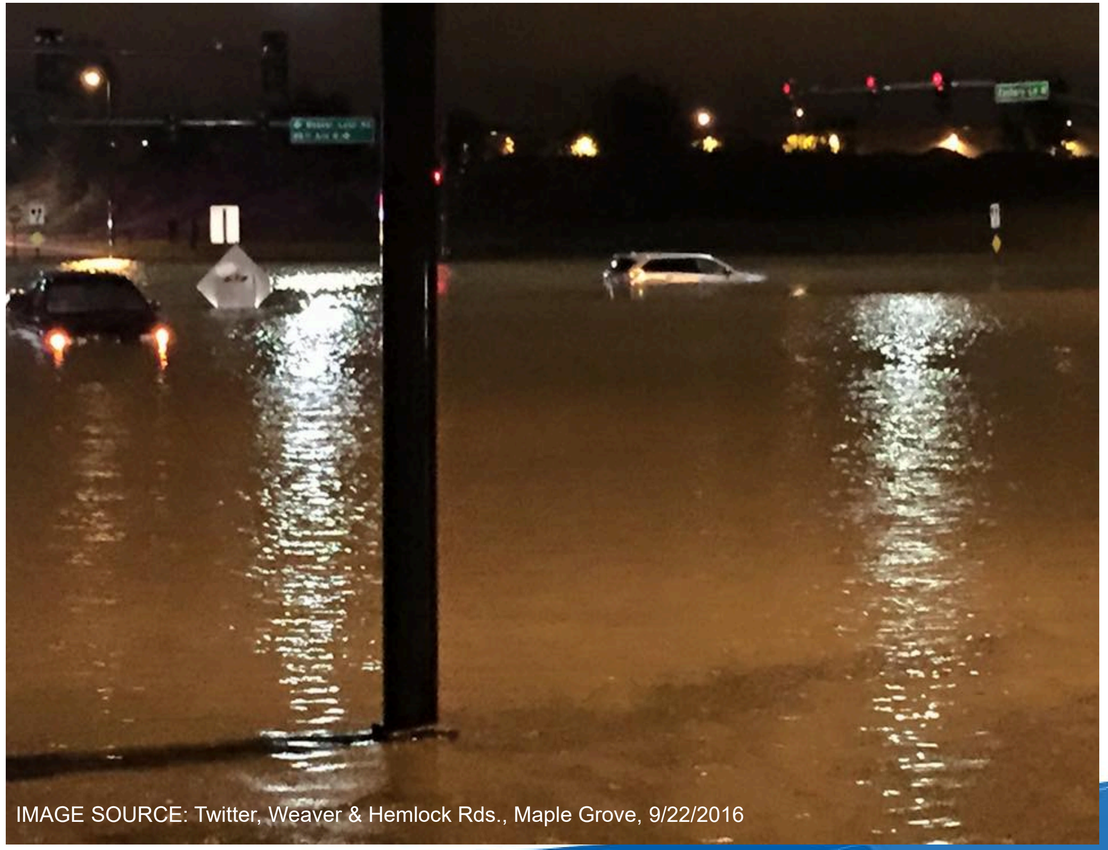

IMAGE SOURCE: Twitter, Weaver & Hemlock Rds., Maple Grove, 9/22/2016

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Localized Flooding

Council Approach –

- Create localized flooding data layer from existing data
- Keep data simple to allow for broad application
- Group flood depth hazards to assist in screening Council assets

IMAGE SOURCE: Twitter, Brooklyn Center, 6/21/2016

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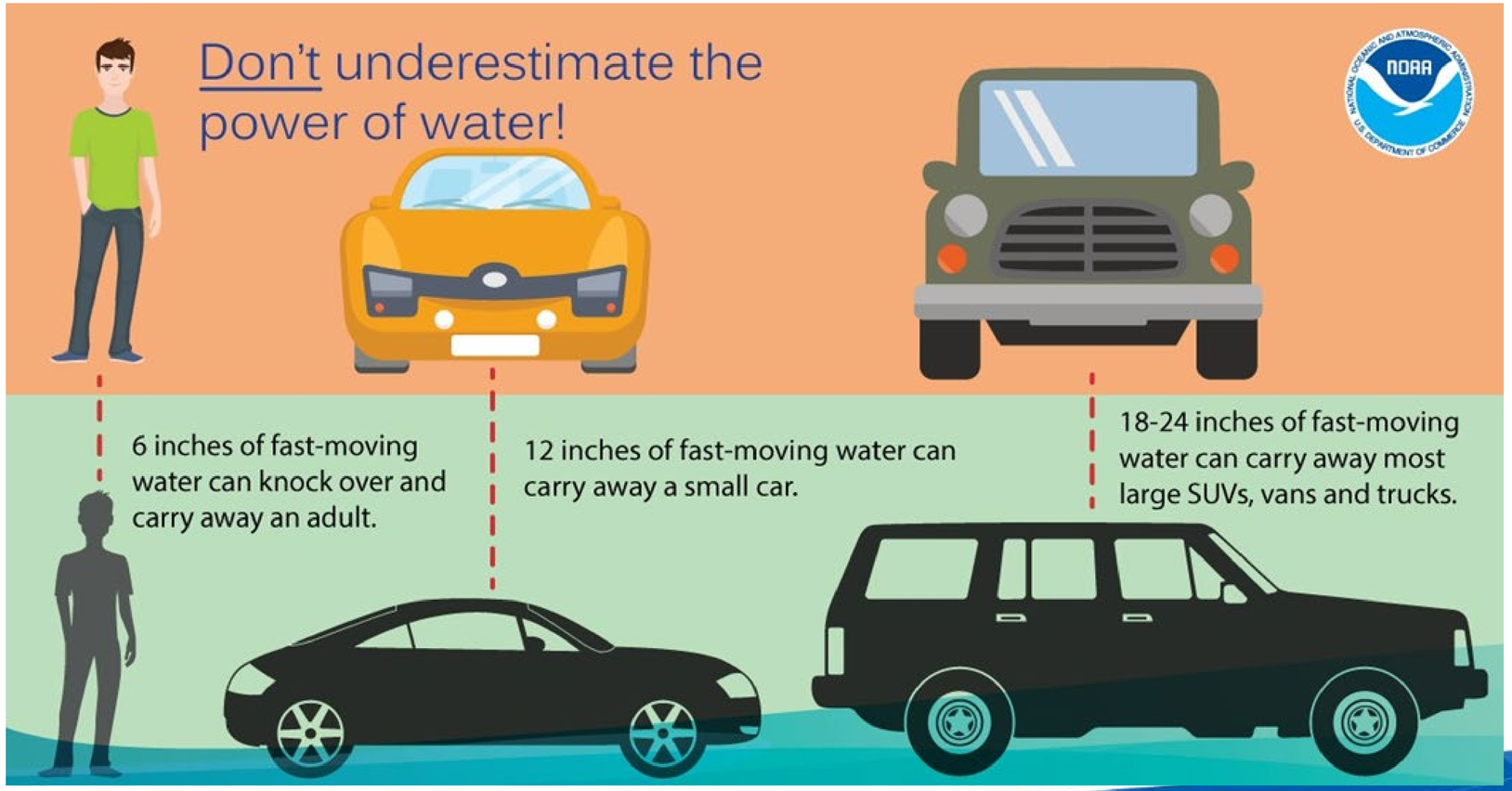
Flood Hazards



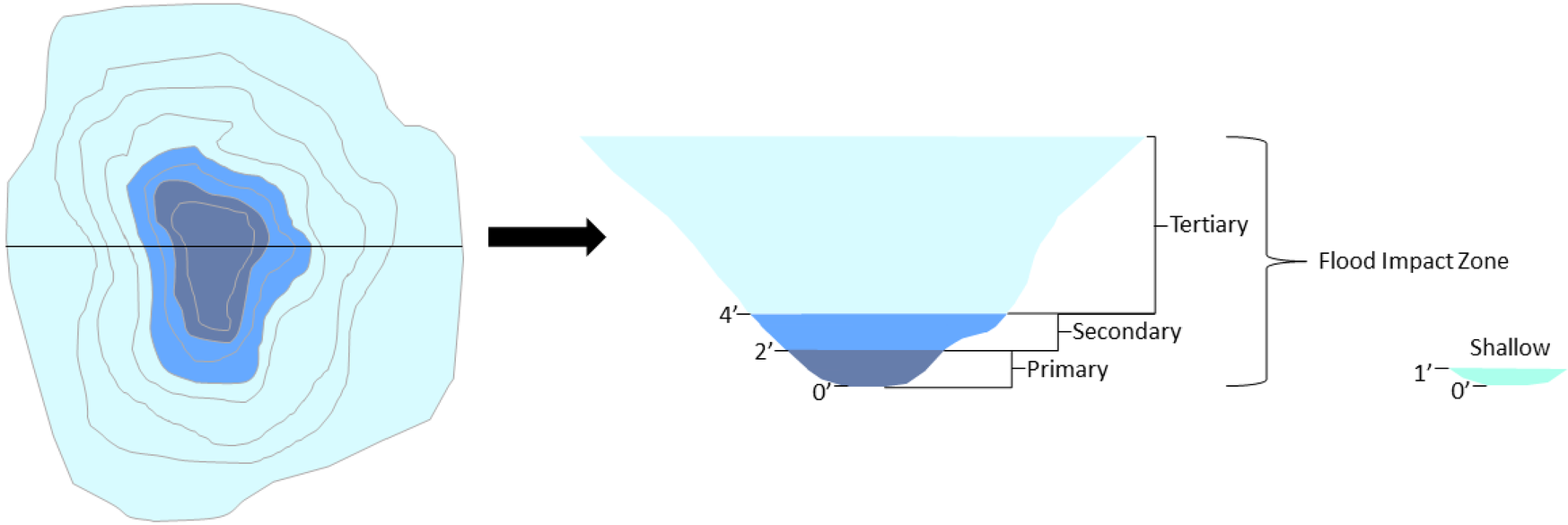
SOURCE: National Weather Service, 2017

Council Bluespot Categorization

Bluespot Depth	Flood Hazard Category	Bluespot Symbology
3 in-1 foot total	Shallow	
0-2 feet	Primary	
2-4 feet	Secondary	
>4 feet	Tertiary	

Isolated 3in-1ft Bluespots

Flood Impact Zone (FIZ)



Limitations of Localized Flooding Analysis

- **Data**
  - –Does not account for stormwater infrastructure: “Worst case scenario”.
  - –Elevation data is from 2011
- **Discretion**
  - –Flood Impact Zones based on Council assets
- **Therefore:**
  - –The data is best used for screening and prioritization, and should be considered as ***potential*** vulnerability in the event of stormwater infrastructure failure
  - –More site-specific analysis should incorporate other data

IMAGE SOURCE: MC Staff, 38th Street & Stevens Ave, 6/11/2017

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Transportation & Transit Overview

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Transportation & Transit

82.6% of Assets Outside Flood Impact Zone

			Flood Impact Zone % for Assets in a FIZ				
Asset	**Total**	**Total Assets in FIZ***	**Primary**	**Secondary**	**Tertiary**	**FIZ Average Max. Depth****	**Shallow**
Bus Routes	5,976 mi.	17.4%	36.3%	27.3%	25.3%	4.76ft	11.1%
LRT/Commuter Lines	111 mi.	9.6%	47.5%	25.2%	18.4%	3.75ft	8.9%
All Transit Stops	19,422 stops	12.8%	46.6%	12.4%	12.9%	3.39ft	28.1%
All Roadways	44,266 mi.	12.8%	38.1%	25.2%	24.2%	3.87ft	12.5%
Regional Highways	24,584 mi.	16.2%	34.9%	26.4%	27.1%	4.28ft	11.6%
Bicycle Routes	6,773 mi.	15.5%	34.2%	26.6%	27.5%	4.02ft	11.6%

Refer to Total Asset in FIZ column to determine total exposure to potential localized flooding for each asset. More than 80% of all Council assets are outside of a FIZ.

****FIZ Average Maximum Depth refers to Primary, Secondary, and Tertiary FIZ. It does not include Shallow.***

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Transportation & Transit

Format for Analysis of Each Asset

- ❑ Asset Overview
- ❑ Local Example

Rationale
GIS Methodology
Analysis
Considerations
Existing Strategies
Proposed Strategies
    MC Strategies
    Local Strategies

IMAGE SOURCE: MnDOT

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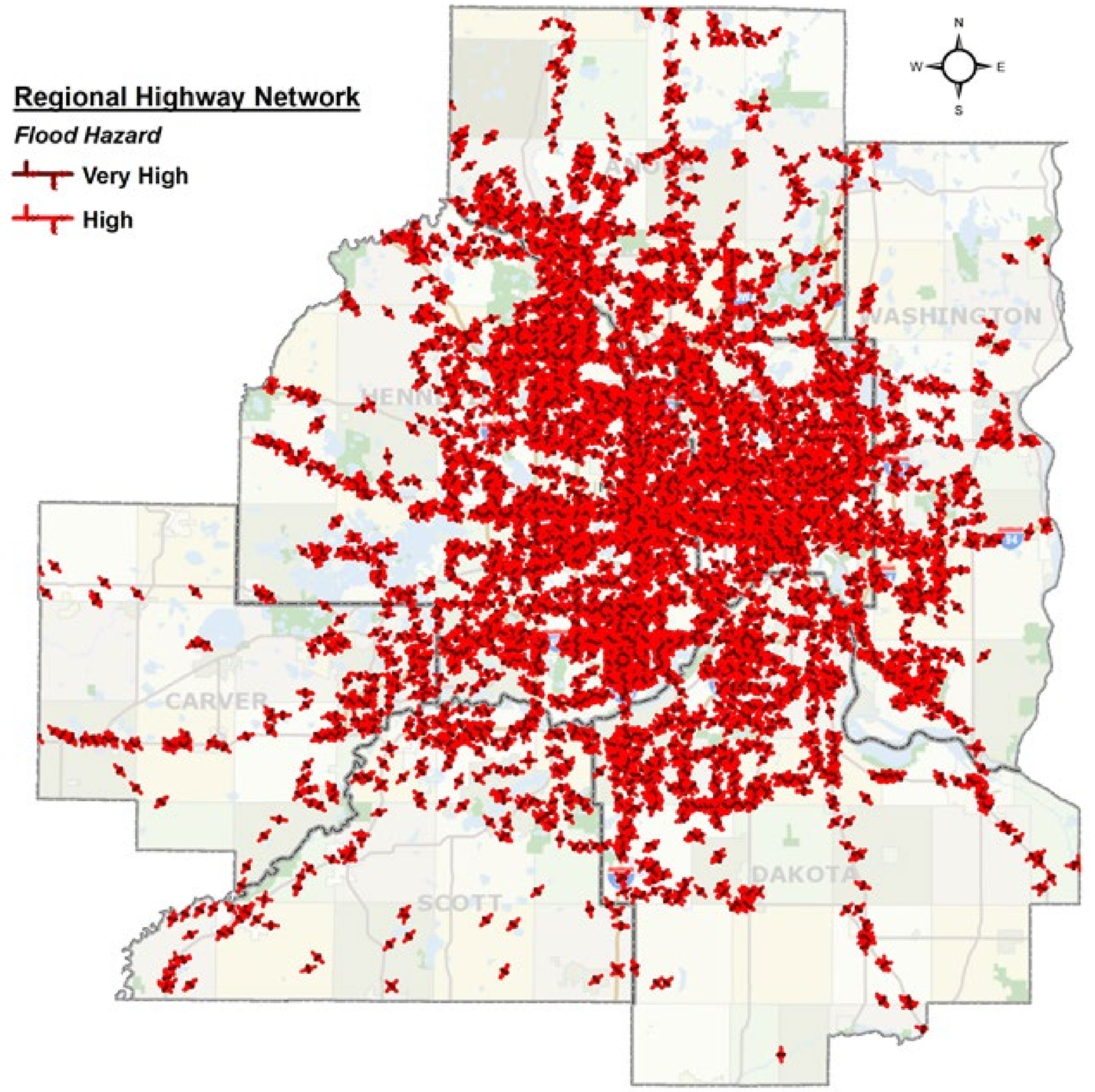
Regional Hwy Network

Overview Analysis

Potential Flood Vulnerability

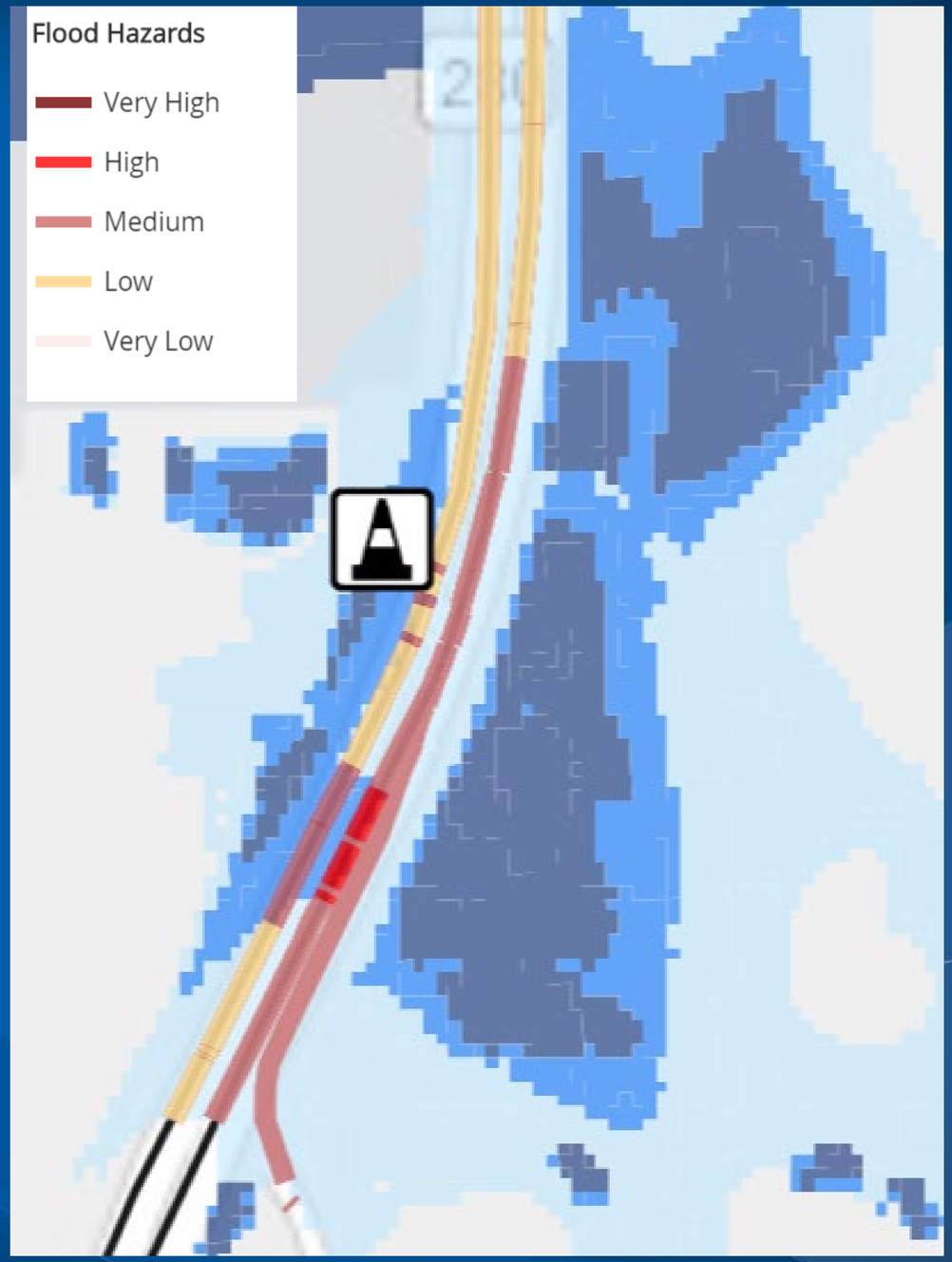
Anoka	102.01 miles
Carver	19.14 miles
Dakota	137.47 miles
Hennepin	652.78 miles
Ramsey	239.85 miles
Scott	19.24 miles
Washington	61.27 miles
7-County Total	**1231.76 miles**



Regional Hwy Network

MnDOT Hwy 280

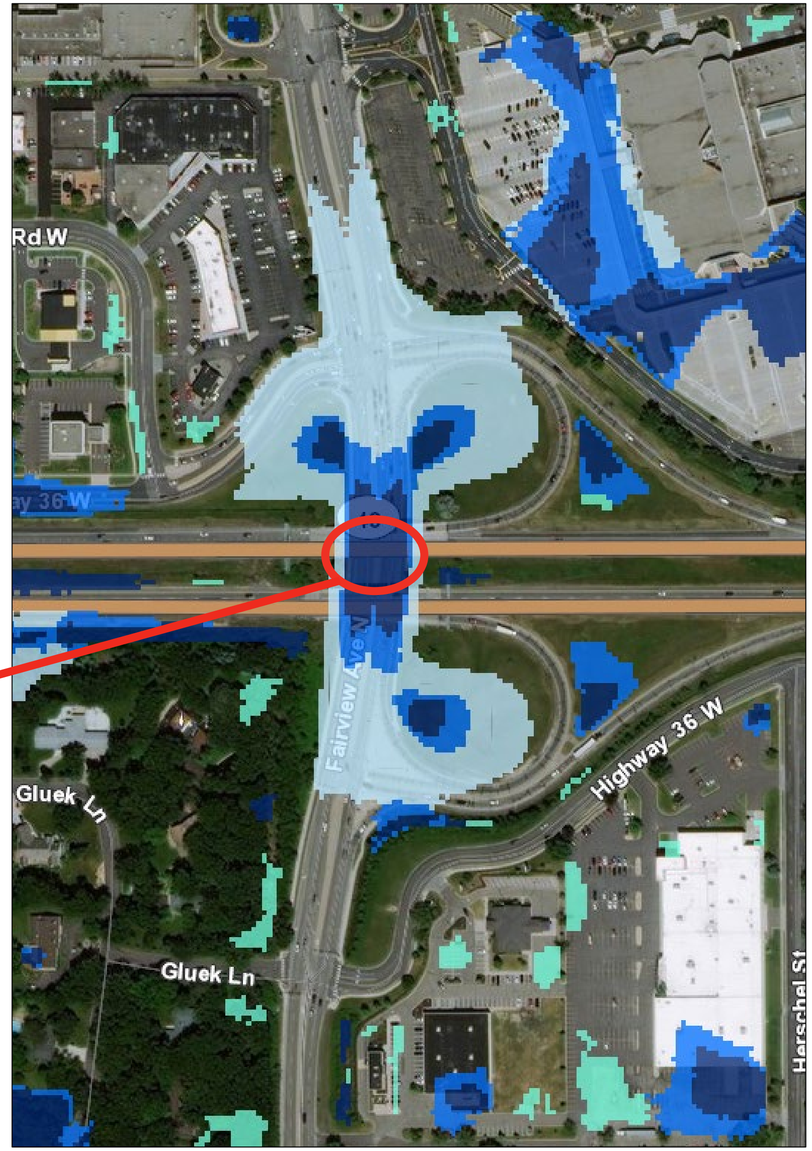
IMAGE SOURCE: MnDOT



Localized Flooding – Acute and Chronic Stress

Flash flood traps cars under Roseville underpass [PHOTO]

Tuesday, July 5, 2016 by **Mike Mullen** in **News**



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Local Roads

South Lyndale & 27th Street

March 11, 2019

MPRnews Sections Members More

A quick transition from snow piles to street flooding to potholes

Tim Nelson · Mar 11, 2019

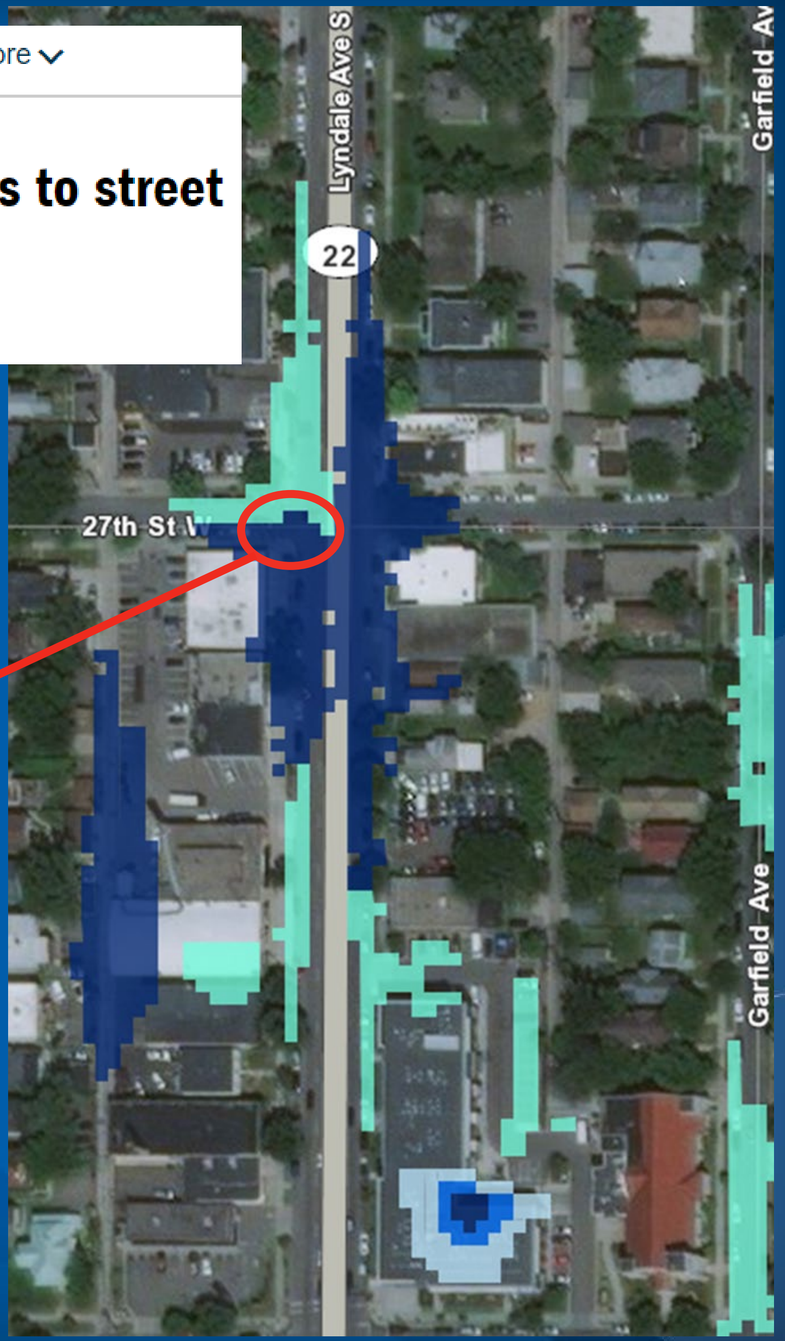


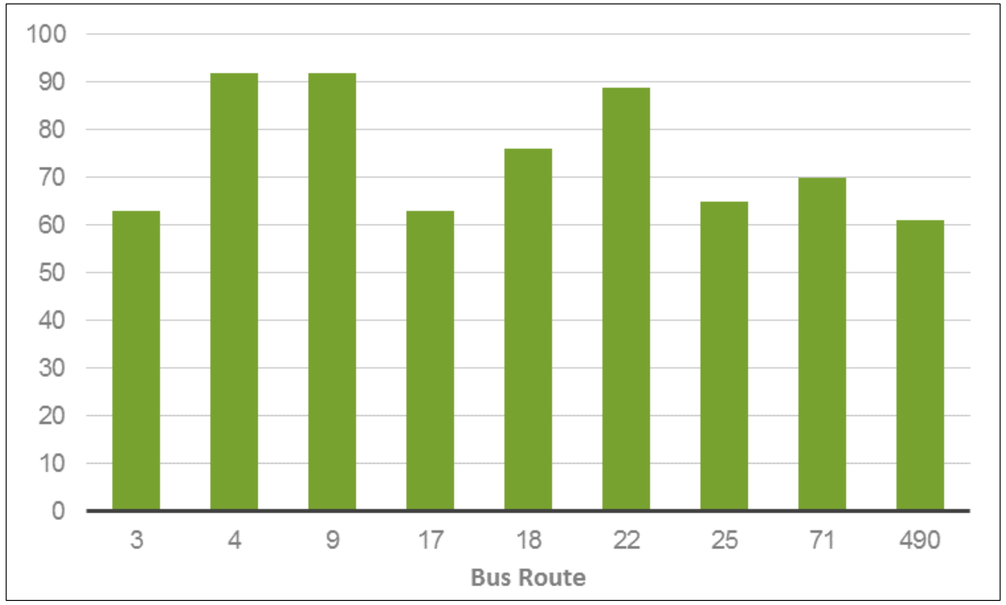
IMAGE SOURCE: MC staff

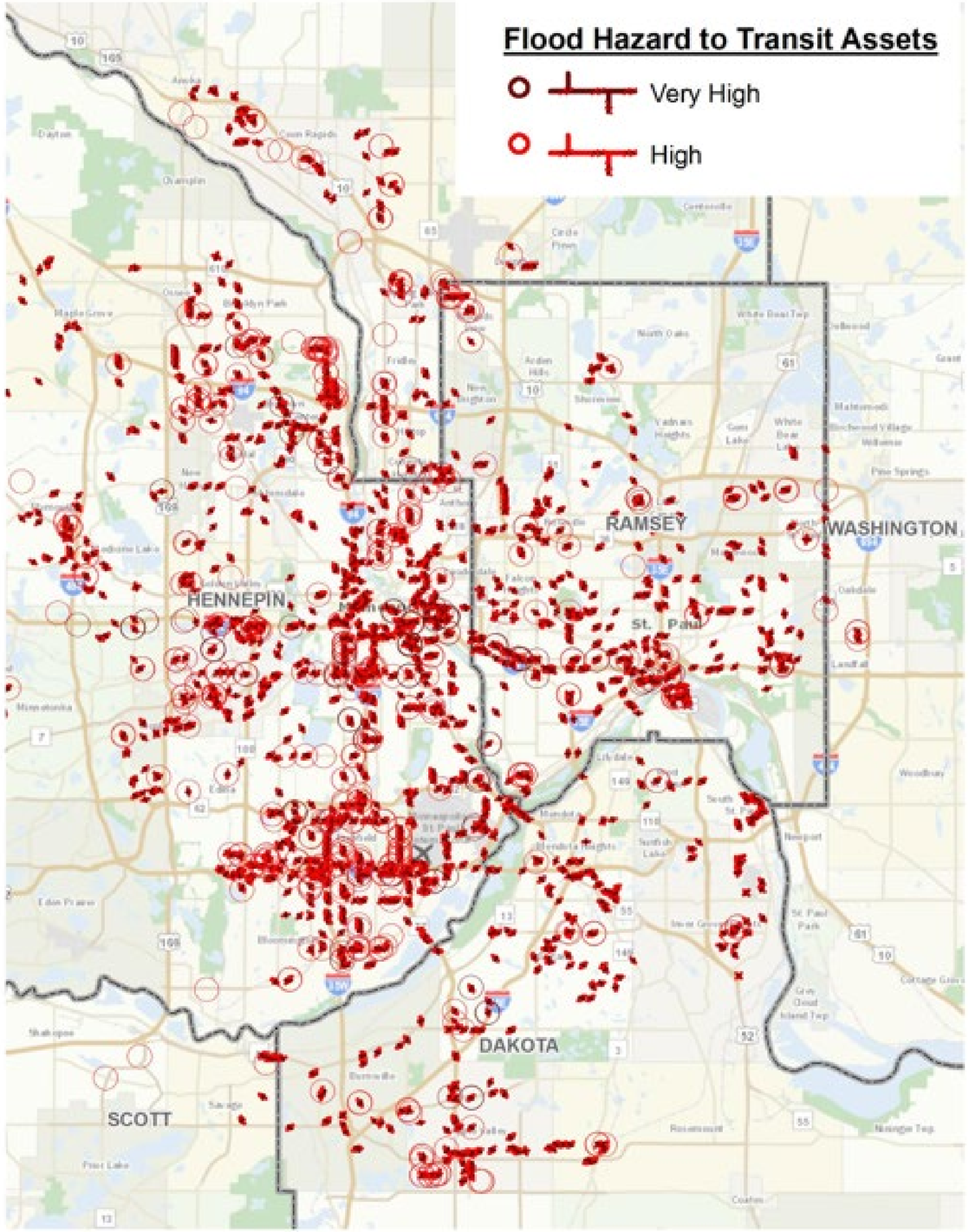
Bus Transit

Overview Analysis

Bus Routes & Stops - Potential Flood Vulnerability

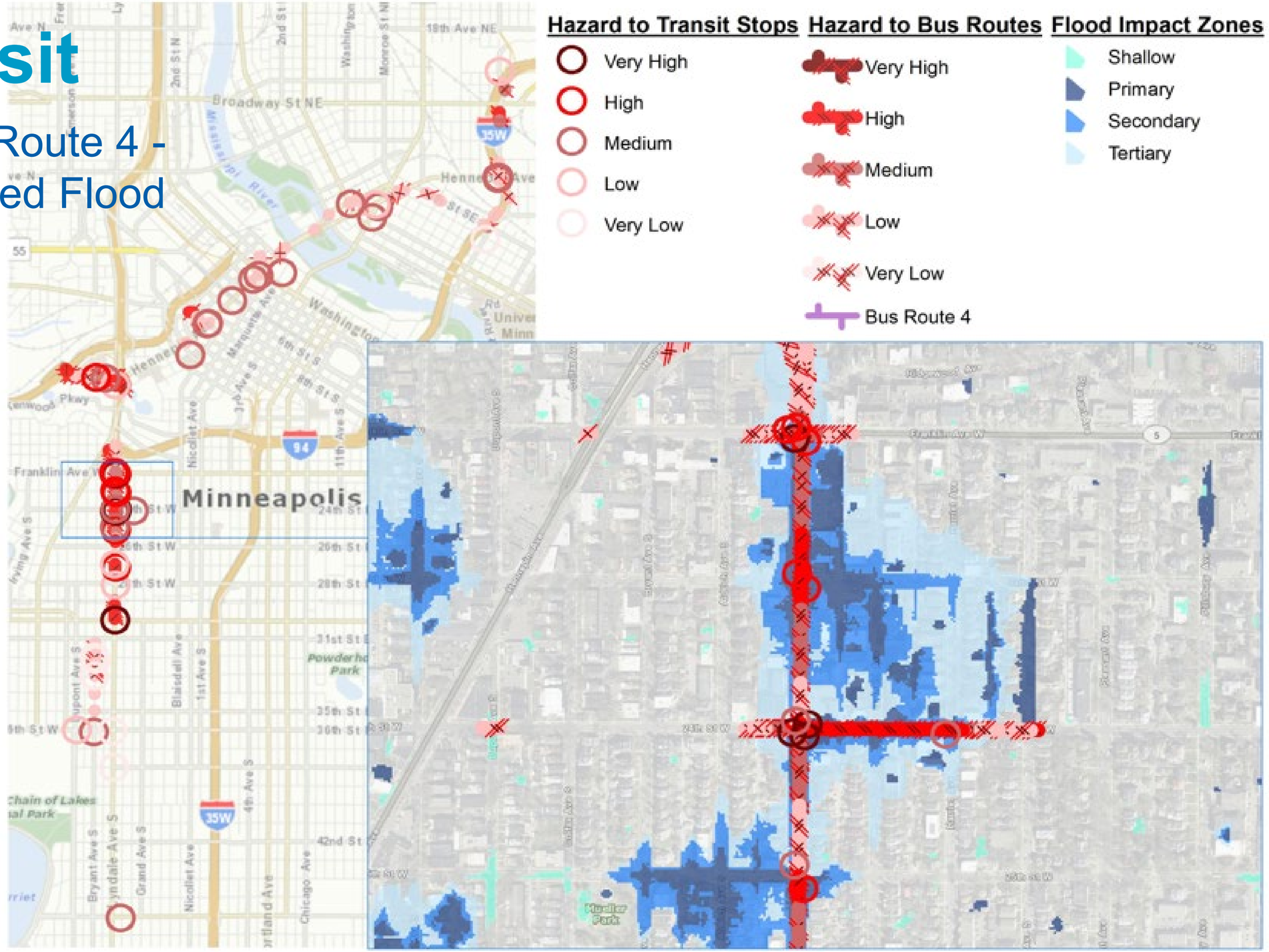
High Vulnerability Bus Routes by Number of Stops in Flood Impact Zones





Bus Transit

Portions of Bus Route 4 - Potential Localized Flood Vulnerability



Disclaimer

- The world is full of Bluespots
- Just because an asset is located in a Bluespot does not mean it will ever definitively flood

- Reminder:
  - Use for screening and prioritization, and as ***potential*** vulnerability
  - More site-specific analysis should incorporate other data

IMAGE SOURCE: Metro Transit

Next Steps with Transportation & Transit

- Relevant work units to perform more in-depth analysis of high vulnerability system assets
- Go beyond hazard mitigation
- Build equity into policies and strategies
- Consider this data for the next iteration of *Thrive MSP 2040*

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Extreme Heat

Land Surface Temperature (LST)

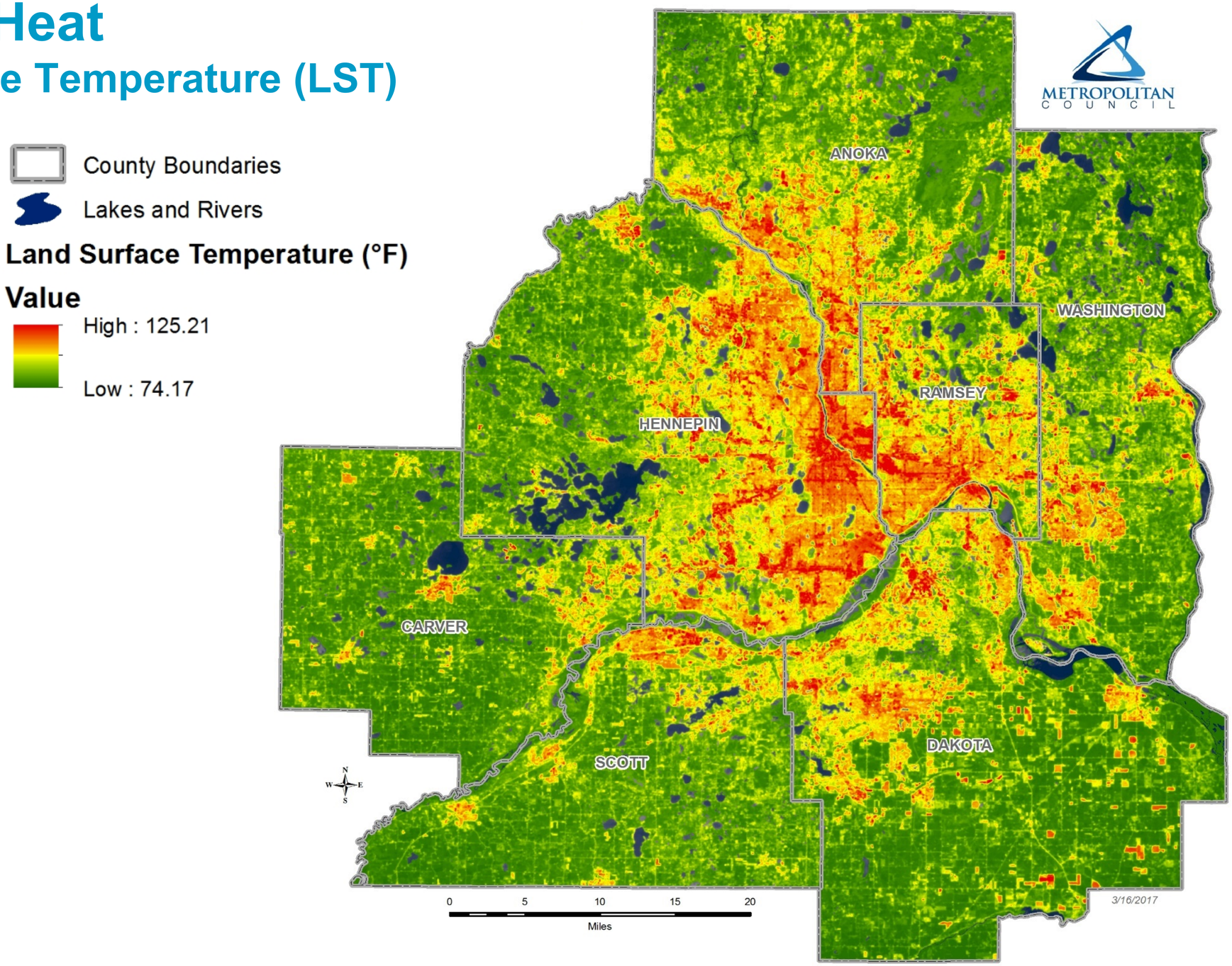
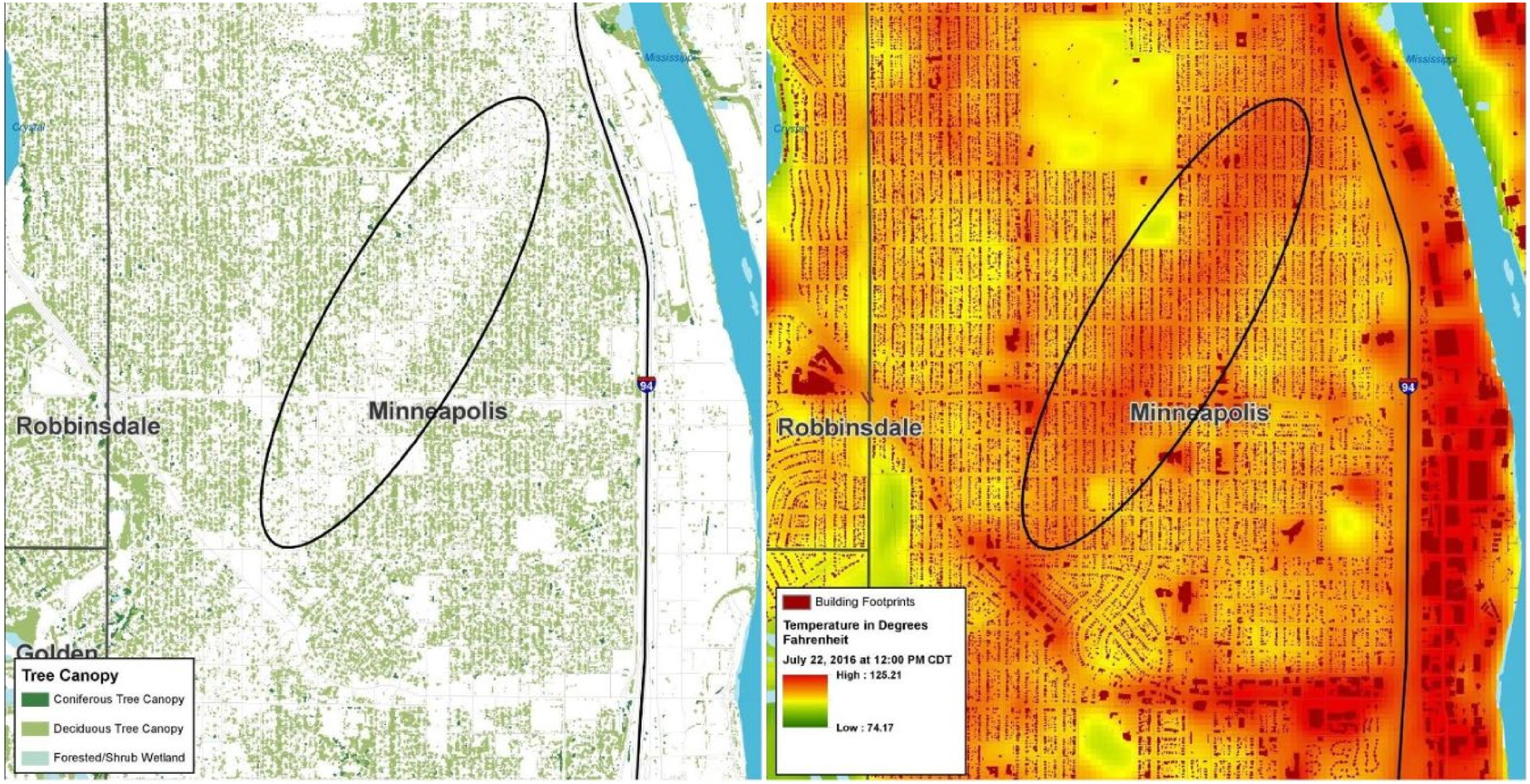


IMAGE SOURCE: STAR TRIBUNE, DAVID BREWSTER, 2012

Loss of Tree Canopy

Urban Heat Island Effect



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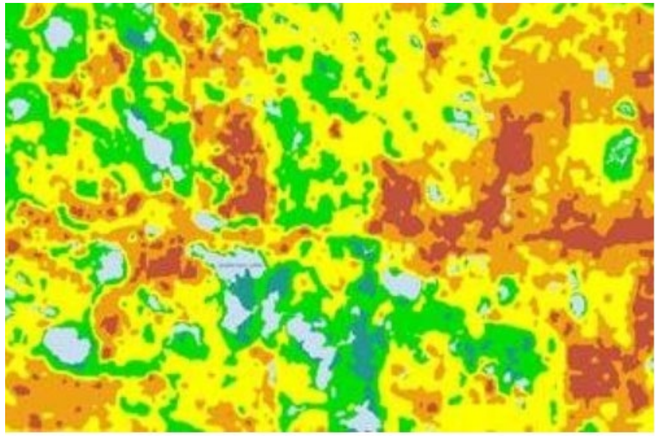
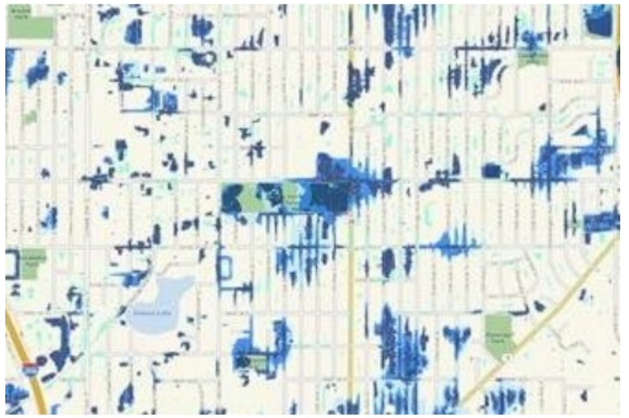
Explore the Analysis

https://metrocouncil.org/cva

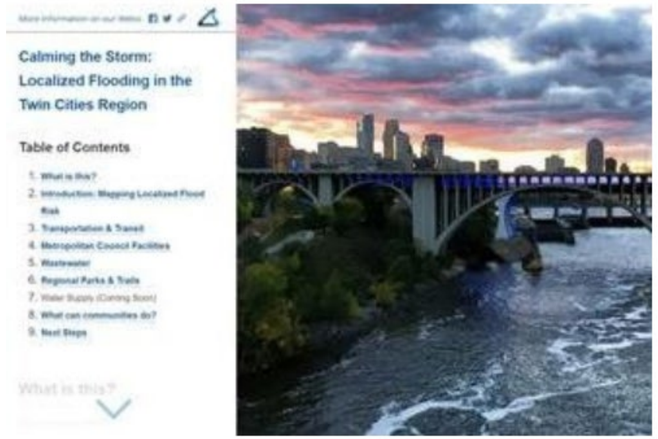


Extreme Heat Map Tool



Localized Flood Map Screening Tool

Extreme Heat Story Map



Localized Flooding Story Map

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Any Questions?

THANKS!

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