



**2019 Annual Meeting
City Engineers
Association
of Minnesota**

**Extreme
Storms**



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Municipal
Stormwater
Alliance**



Topics

- **Focus on Atlas 14 first**
- **Full-system H & H models**
- **Benefits and challenges**
- **Conclusions & recommendations**

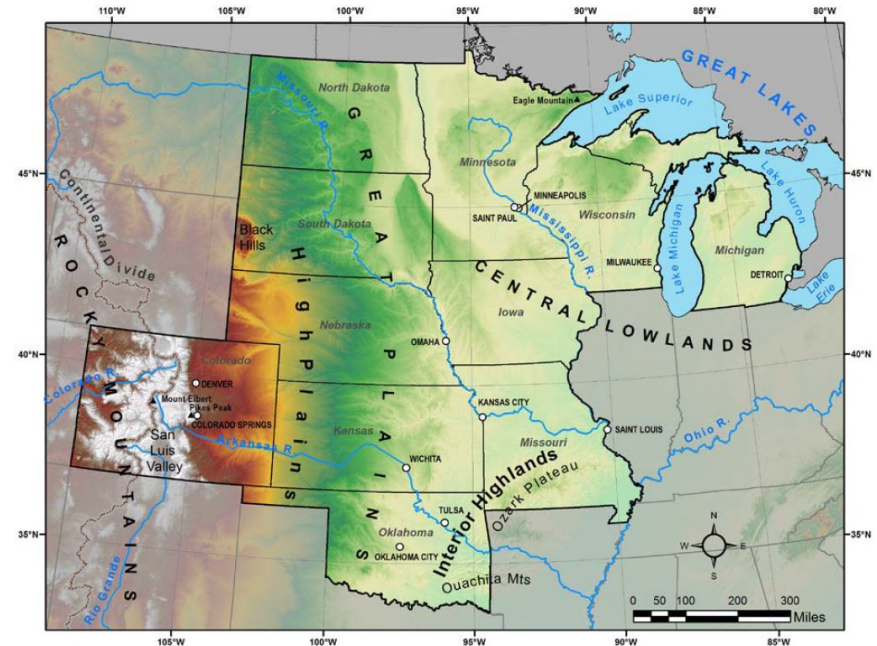
Precipitation Frequency Estimates

We use precip frequencies for much of our stormwater work

- **Catch basins and pipes are designed to handle the 5 – 10 year storms**
- **We base structure elevations on the 100-year high water level – plus freeboard**
- **We base emergency overflows on the maximum probable storm**

Precipitation Frequency Estimates

- The basis for our storm amounts was Technical Paper 40 (TP-40) produced in 1961
- This was replaced by Atlas 14, in 2013



Precipitation Frequency Estimates

Significant changes with Atlas 14

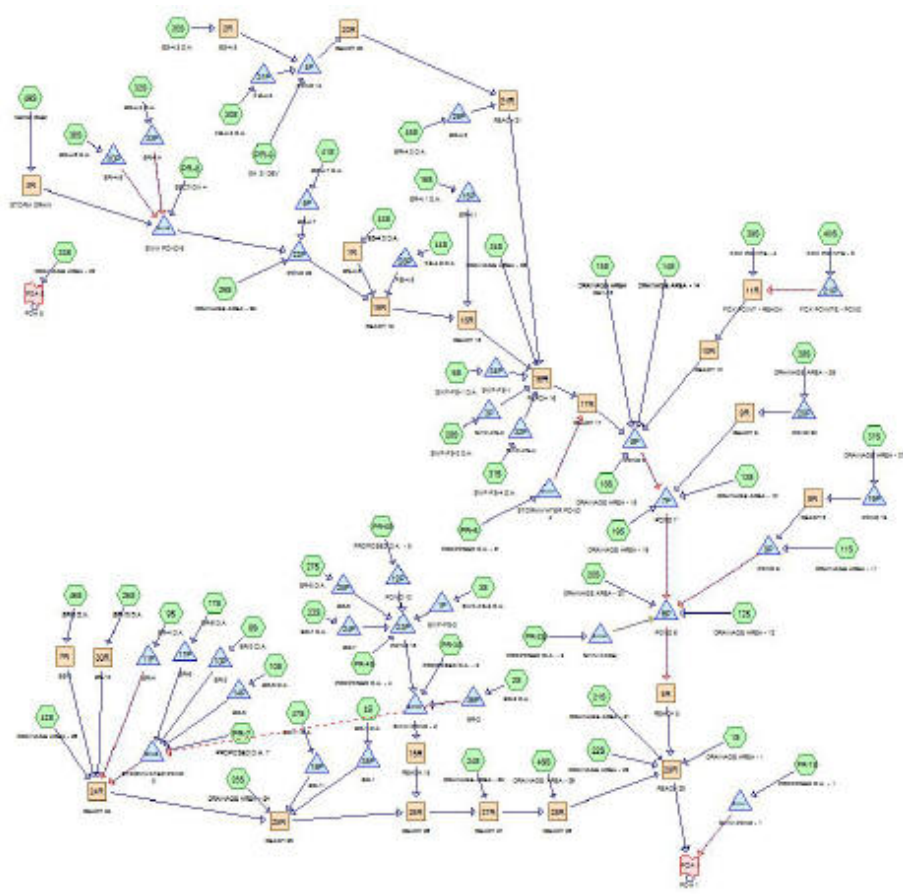
- The 100-year, 24-hour storm at MSP went from 6" to 7.5"
- The Dust Bowl years were less of a factor
- We had more weather stations and new statistical methods
- A trend toward more of our rain coming in intense storms

Atlas 14 vs. Climate Change

- **Atlas 14 moves us in the same direction as climate change projections**
- **Atlas 14 is based entirely on historical weather data**
- **We avoid projections with uncertainty**
- **We avoid the political “baggage” of climate change**
- **Engineering ethics – best data**

Full-system H & H Models

- H & H = hydrology and hydraulics



Full-system H & H Models

- **Modeling well-understood and well-behaved physical behavior of water**
- **Models can handle an entire city system or a single problem area**
- **Reasonable cost – not trivial**
- **All consultants do this work**
- **Basic tool to design and understand your city's stormwater system**

Full-system H & H Models

- **How many cities have a full-system H & H model of their entire system?**
- **How many cities have updated their full-system model to the Atlas 14 storms?**
- **Many cities are using Atlas 14 for projects and looking at specific problem areas**

Full-system H & H Models

Benefits of an updated city-wide model

- **Identify problem areas – before they are catastrophes**
 - **Higher water levels – imperiled structures**
 - **More emergency overflows**
 - **Higher and faster flows**
 - **Surface flooding**
- **Understand how the system works – especially under stress – mitigate painful experience**

Full-system H & H Models

Challenges

- **Identified problem areas will be expensive to fix**
- **Structures identified as imperiled because of higher 100-year water levels – public & private**
- **Some areas fixed sooner, some later**
- **Mismatch with FEMA and floodplain mapping**
- **Larger stormwater BMPs**

Full-system H & H Models

Worth noting....

- **This updating needs to be done in anticipation of more intense storms in the future – climate change**
- **Basing it on Atlas 14 is a great first step**
- **If you do it once, it will be easier to update in the future**
- **Engineering ethics**

Conclusions & Recommendations

- **In city ordinances and guidance, replace “100-year storm” with a number – provide the reference**
- **Get a full-system H & H model for your city**
- **Update your model to Atlas 14 – city-wide**
- **Lay the groundwork for future updates with increased design storms**

Conclusions & Recommendations

- **Let's consider a state-wide funding and incentive program to help cities get and/or update their full-system H & H models**
- **Let's consider national advocacy to get Atlas 14 updates funded and regularized**
- **These updates need to occur more frequently than every 50 years**

Thanks for your attention

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