



# SELECTION OF AN SSO DESIGN CONDITION WITH CREDIBILITY

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# Agenda

- Toledo Waterways Initiative
- Detroit – Parkside Project History
- Analysis
- Conclusions
- *Questions and Comments*



# Toledo Waterways Initiative

- Federal Consent Decree - reduce overflows
  - WWTP Improvements: 2001 to 2007
  - CSOs: \$350M from 2007-2020
  - Eliminate Sanitary Sewer Overflows (SSOs)
- TWI - Consent Decree required CSO LTCP & WWTP Projects
- Detroit and Parkside SSO Projects –
  - Outside of the TWI Program
  - Required by the Consent Decree
  - Not quantified



# What is the Problem?





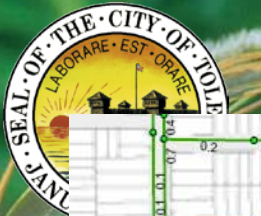
# Project History

- 1999 City-wide Flow Monitoring Study
- Four Separate SSES Projects
  - (River Road (Detroit), Parkside, Point Place and Bennett)
- Post-SSES Improvements in the River Road and Parkside Areas
  - Inflow Removal
  - Sewer Lining
  - Pump stations and gravity sewers
  - 3.0 MG storage in area adjacent to Detroit
- And the City continues to find SSOs making it difficult for financial planning



# Then There's This Little Problem...





# Project Objectives



- Eliminate SSOs
- Provide additional conveyance capacity
- Protect basements



# Hydraulic Modeling

- US-EPA SWMM, all pipes 8" and larger
- Integrated into the overall Citywide SWMM model.
- Calibrated to flow metering data
  - March through July 2009
- Model includes ~6,500 nodes and links
- 10-year, 24-hour Design Storm Event
  - 3.54-inches total precipitation
  - NOAA Atlas 14, 1<sup>st</sup> Quartile, 10% Probability

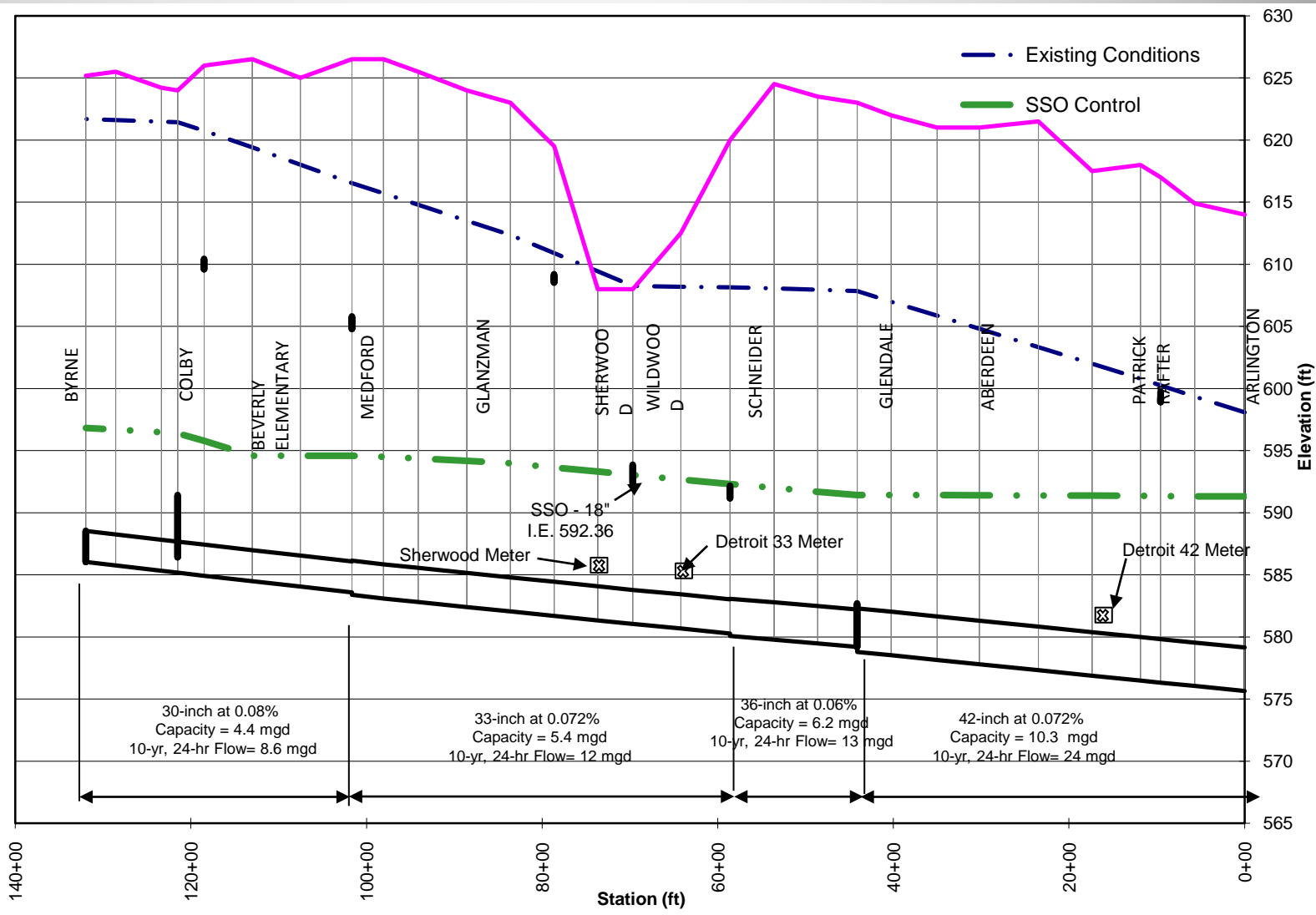


# Model Results – Detroit Area

- Significant surcharging in main trunk sewers
  - Extensive interceptor surcharging creating a backwater effect on the Detroit system
  - Widespread capacity limitations
- 3.0 MG of SSO volume through the existing 12-inch overflow pipe
- 27.6 MG if the overflow pipe has capacity



# Detroit Avenue Profile



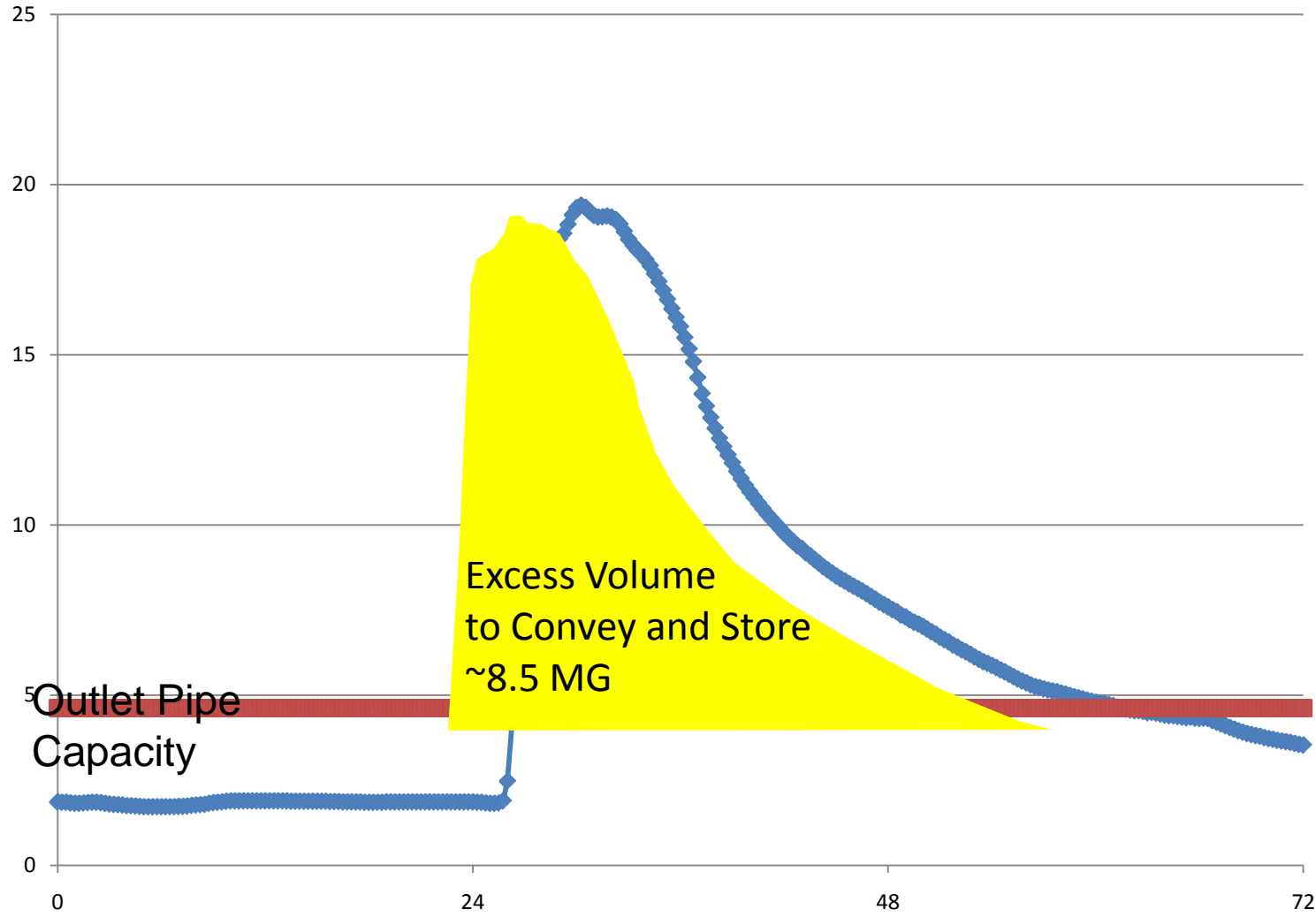


# Model Results – Parkside Area

- Significant surcharging related to capacity limitations
- Interceptor does not control outlet flow rates from the Parkside system.
- 8.5 MG of SSO volume through the existing twin 18-inch overflow pipes



# Parkside 10-Year, 24-Hour Design Storm Hydrograph





# Alternatives Analysis

## 10-Year, 24-Hour Design Storm

### Detroit

- Conveyance
  - 23 mgd pump station
  - 14 mgd pump station
- Storage
  - 27.6 MG of storage located in a City Park
  - 24.6 MG more than planned

### Parkside

- Conveyance
  - 17 mgd pump station
- Storage
  - 8.5 MG of storage located in a City Park
  - 5.5 MG more than planned

Facilities and Costs much larger than City had planned for!



# Lets Try an Alternative Approach to Alternatives Analysis

- Concern: 10-year, 24-hour synthetic design storm = too high
- Better choice: Identify 10-percent probability flow rate from actual historical rainfall
- Define “real” storage volume required: actual historic rainfall events
- Can we perform a Long-term Simulation with the City’s overall model?



# Approach

- Avoid overlapping low probability conditions
- Select major historic storms in multiple seasons
  - Top 20 events for total precipitation
  - Top 5 for peak hour intensity
  - Top 10 total precipitation in winter months
- Model selected events (initial) – 3 day computation time
- Verify with Period of record (confirmation) – 3 weeks

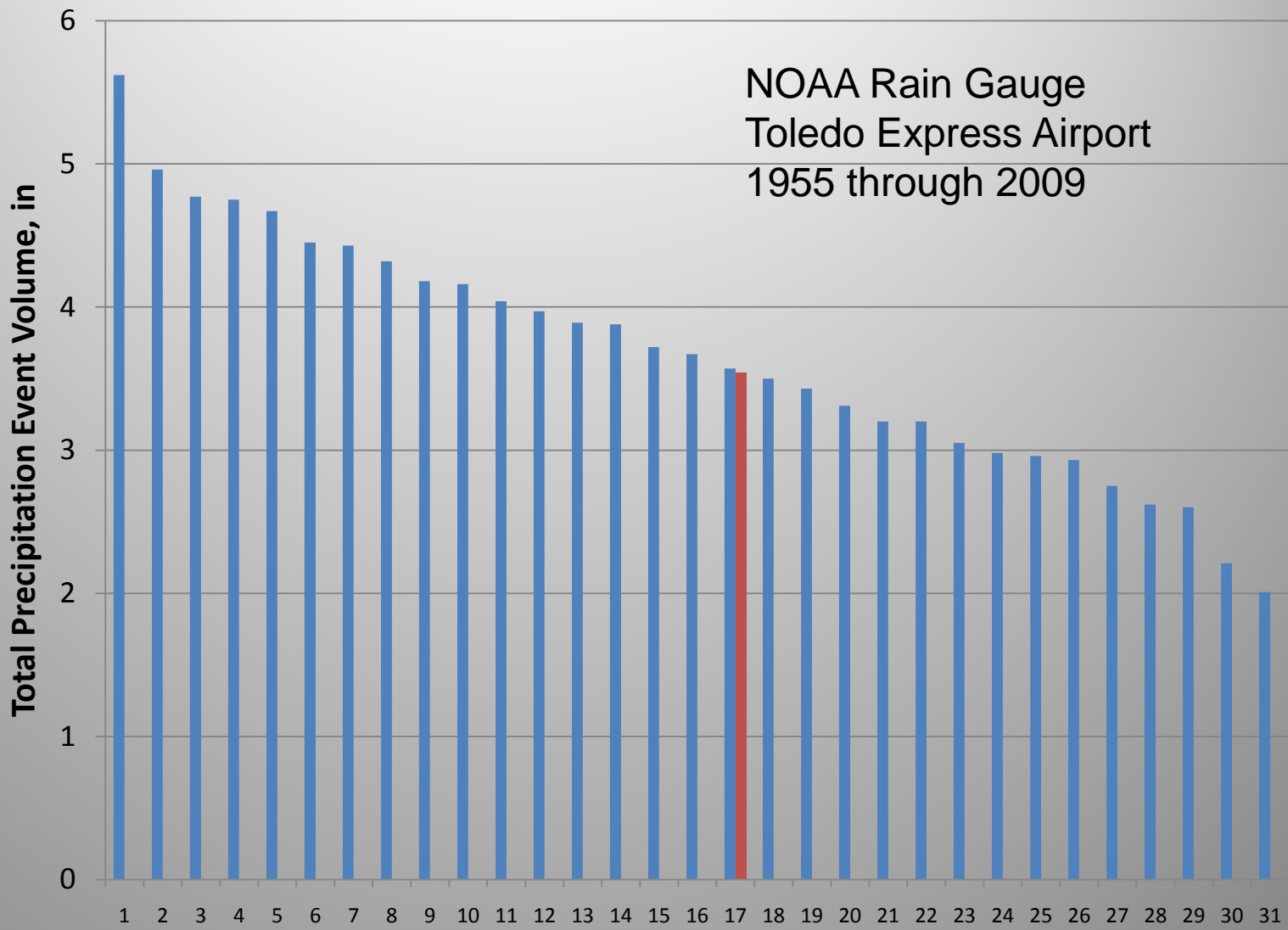


# Low Probability Overlap

- Highly peaked hyetograph
  - Representative of summer thunderstorm
- Large total volume
  - More associated with large frontal systems/  
hurricane remnants – all day or multiday  
events
- Wet soil conditions
  - Only occur during limited seasonal periods
- Spatial coverage
  - Ignored for this analysis

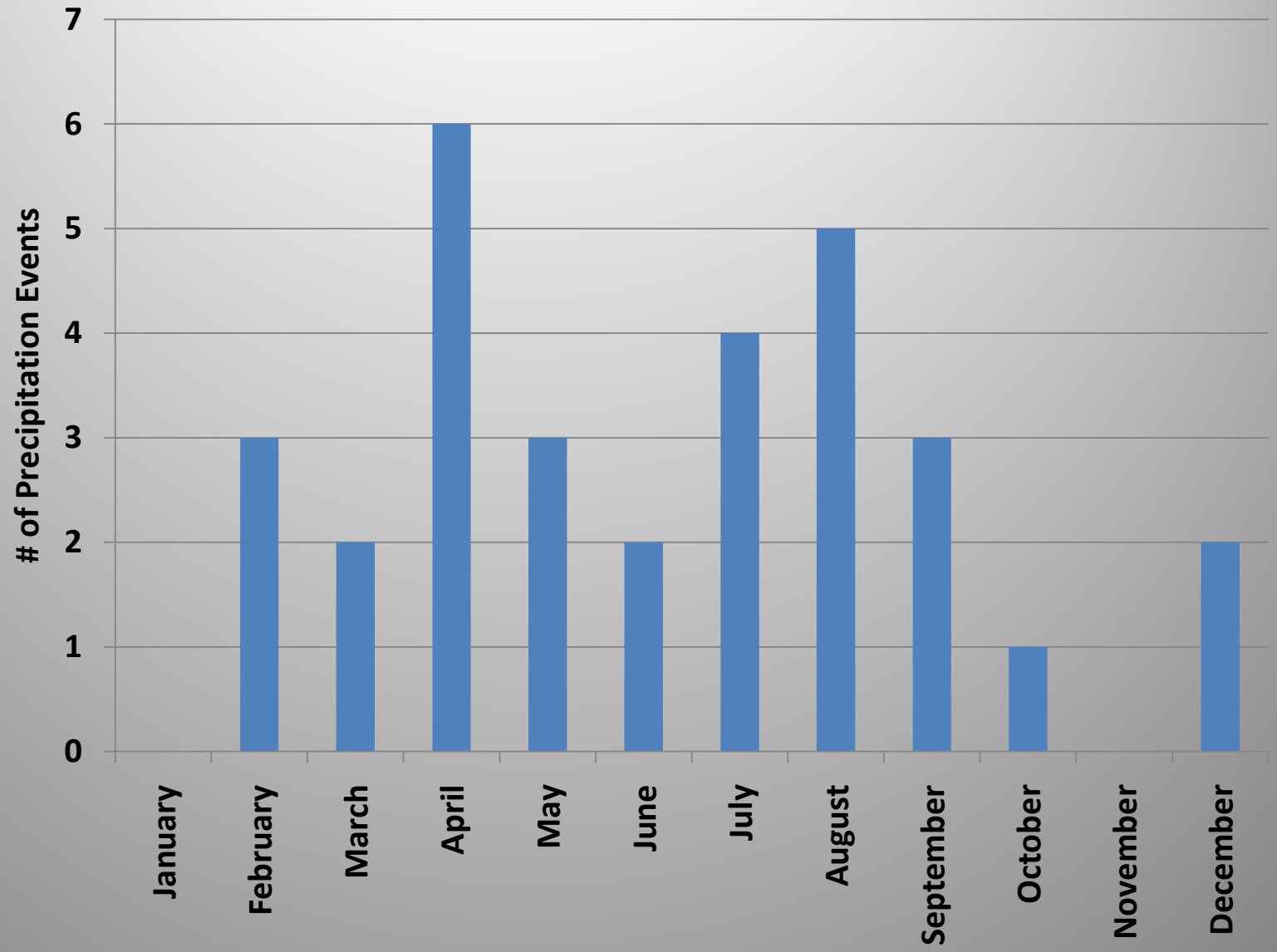


# Long-Term Precipitation Data



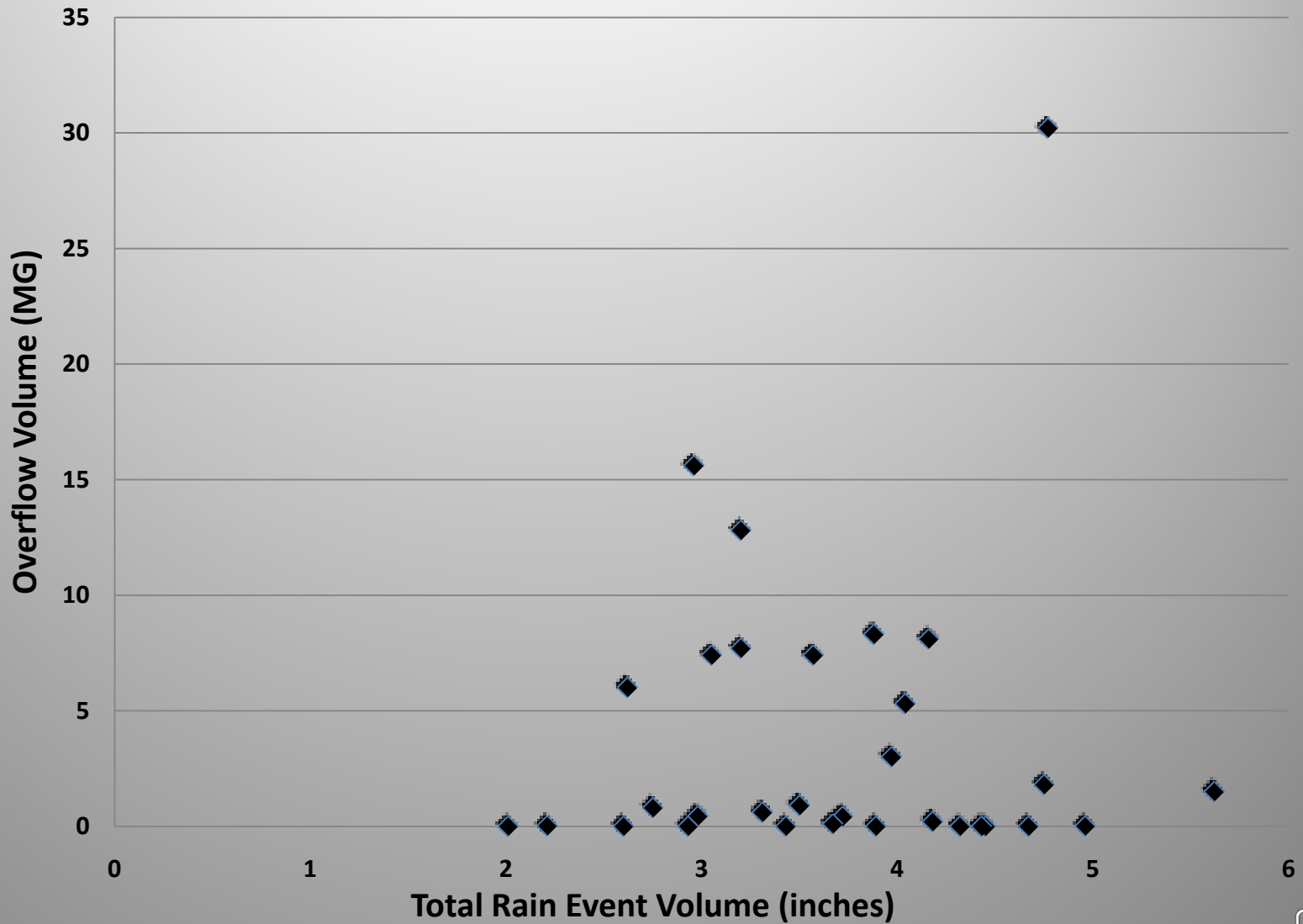


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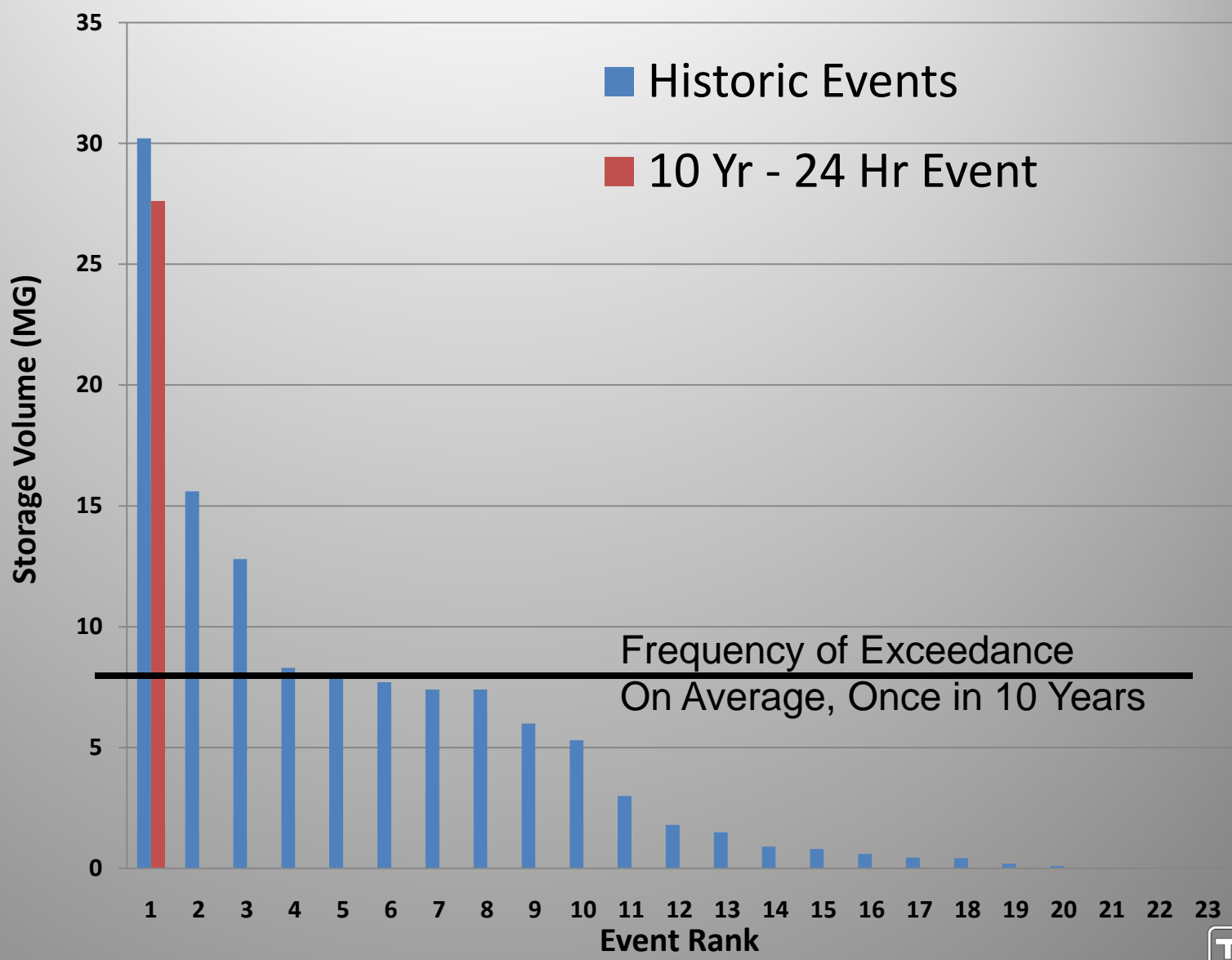


# Long-Term Simulation – Overflow Volume vs. Precipitation Volume





# Long-Term Simulation – Ranked Events





# The Result

- Storage volume reduced by approximately 65% to 70%
- Pump station: reduced required capacities approximately by 30% to 40%
- Capital Investment in SSO control with confidence
  - Maximize existing facilities
  - Minimize new facilities to achieve SSO control



# SSO Elimination Sizing - Detroit

- 8.0 MG SSO Storage Basin
  - Below grade. Pump-in, gravity-out.
- Two Wet Weather Relief Pump Stations
  - Collocated with at Basin – 14 mgd
  - Upstream Relief – 9 mgd
- Gravity relief sewer
  - 725 LF of 42-inch (upstream relief)
  - 1,500 LF of 12-inch (upstream relief)
  - 500 LF of 48-inch (basin influent)



# Detroit Construction





# SSO Elimination Sizing - Parkside

- 3.0 MG SSO Storage Basin
  - Below grade. Pump-in, gravity-out.
  - Located in Ottawa Park, adjacent to Ottawa Park Golf Course
- One Wet Weather Relief Pump Stations
  - Collocated with at Basin – 10 mgd
- Gravity relief sewer
  - 2,850 LF of 18-24-inch
  - 1,250 LF of 30-inch
  - 1,550 LF of 36-inch



# Parkside Final Design





# Expected Basin Performance

- Basin overflows less than once in 10-years (e.g. A 10-year level of service).
- Basins mostly full once every other year.
- Basins in operation approximately three times per year.
- Detroit - Phase 1 construction substantially complete February 2011
- Parkside – Construction to start early 2012 and complete December 2014.



# Questions/Comments



- Please Direct Additional Questions/Comments To:
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