



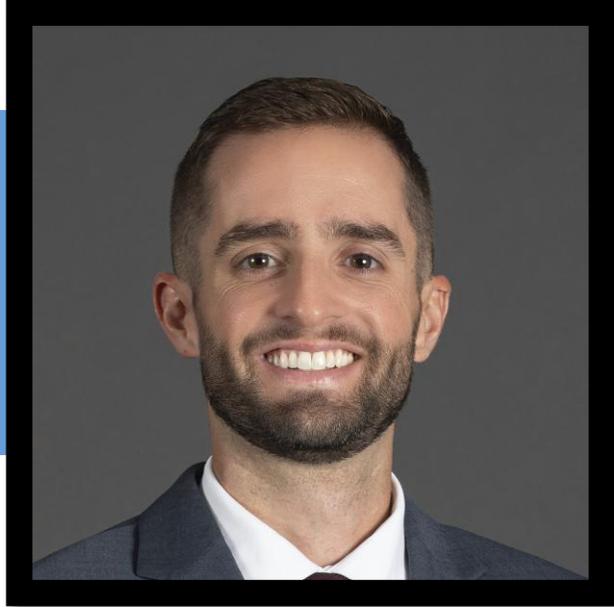
A Surprise Discovery: Using a Hydraulic Model to Understand the Capacity of Your Collection System

IRWA 44TH ANNUAL TECHNICAL CONFERENCE

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Introductions



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Agenda

01 // SANITARY DISTRICT OF
DECATUR

02 // STEPS TO SUCCESS

03 // A SURPRISE DISCOVERY



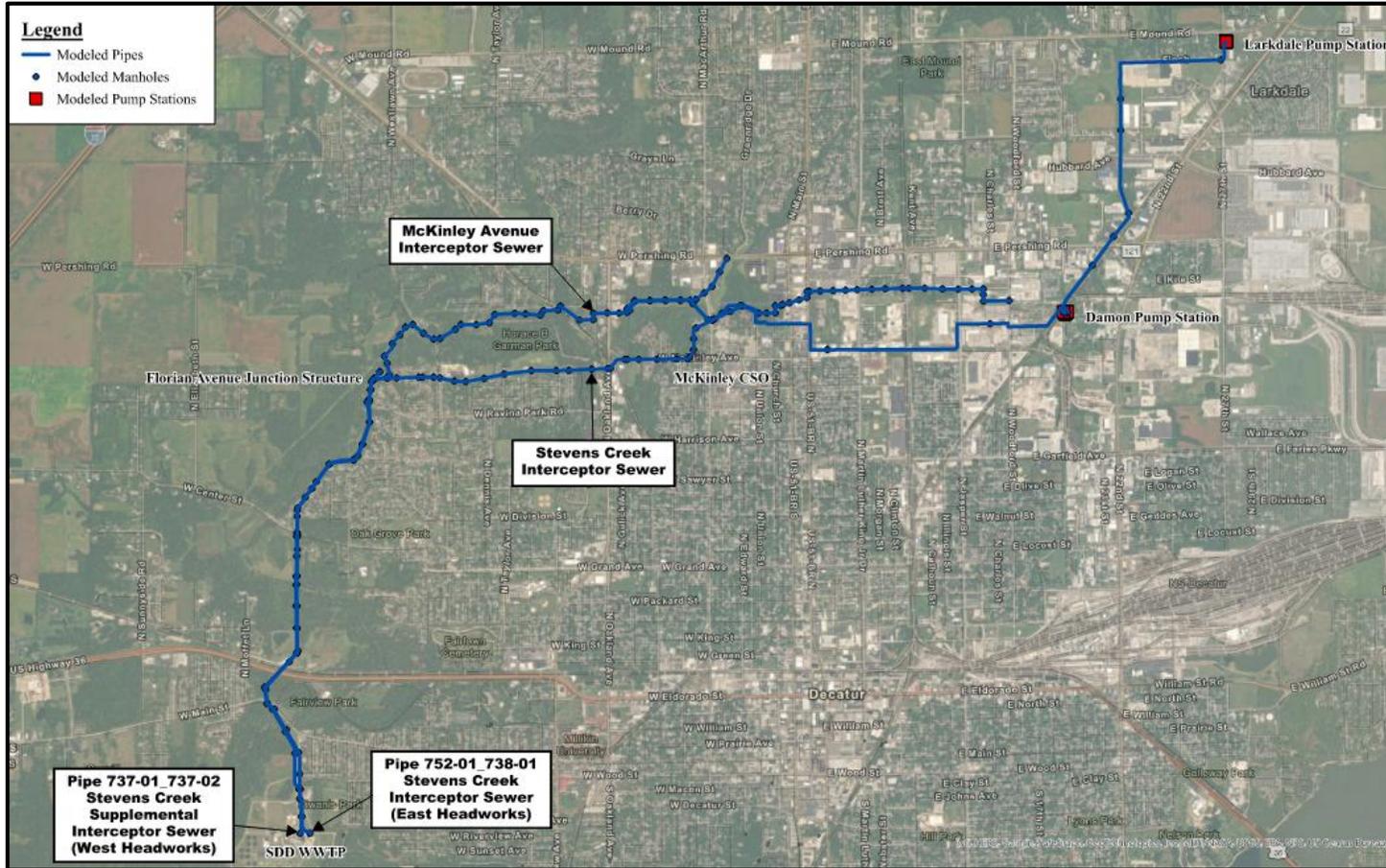
SANITARY DISTRICT OF DECATUR

Sanitary District of De

- SDD or “District”
- Regional wastewater treatment authority for Macon County, IL
- Serves City of Decatur, Village of Forsyth, Village of Mt. Zion, and other satellite communities
- Industrial/commercial users in the Decatur metropolitan area

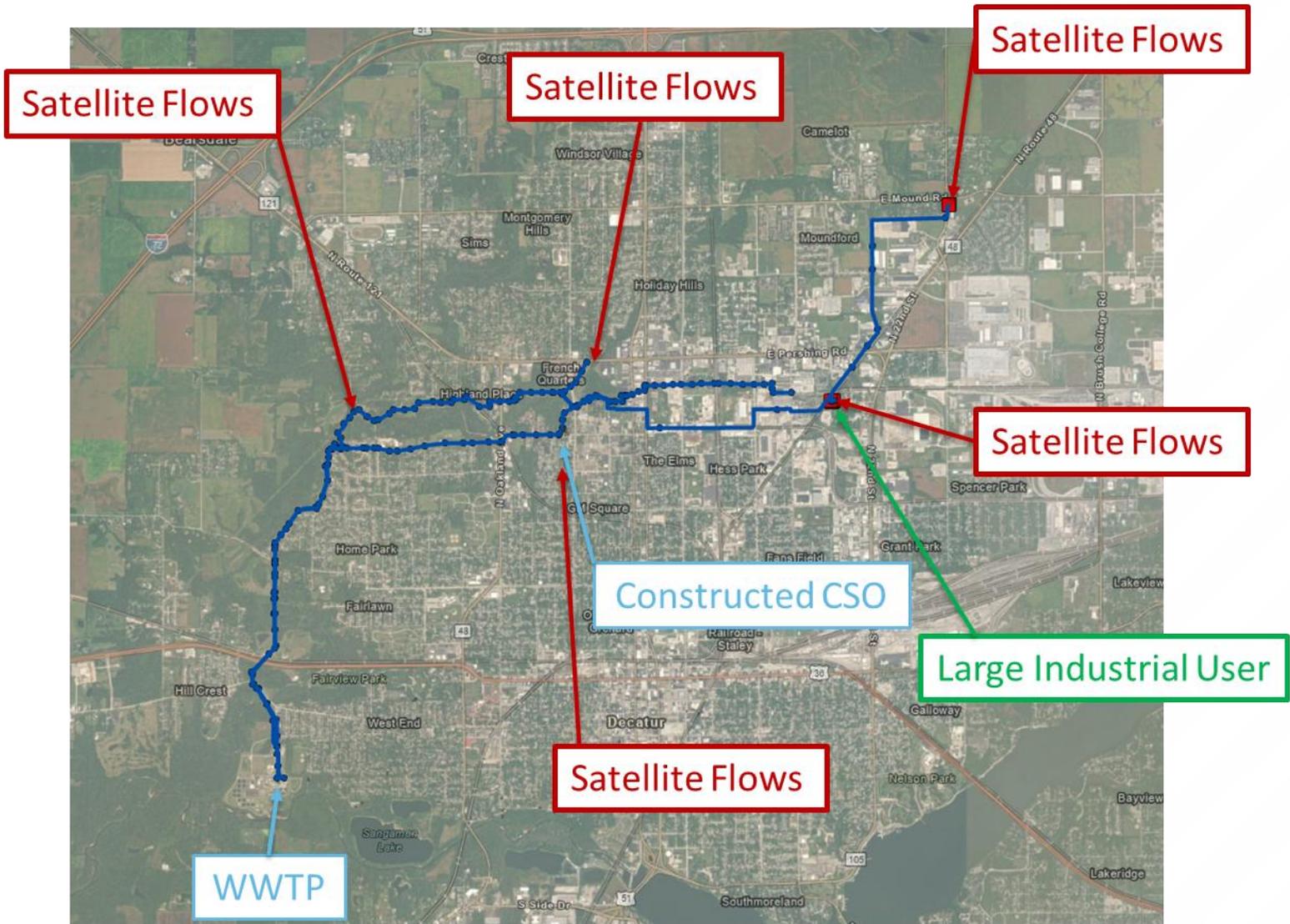


Sanitary District of Decatur



- Owns and operates large diameter interceptor sewers (10-inch to 72-inch) and wastewater treatment plant
- Smaller diameter sewers are owned and operated by individual municipalities

Sanitary District of Decatur

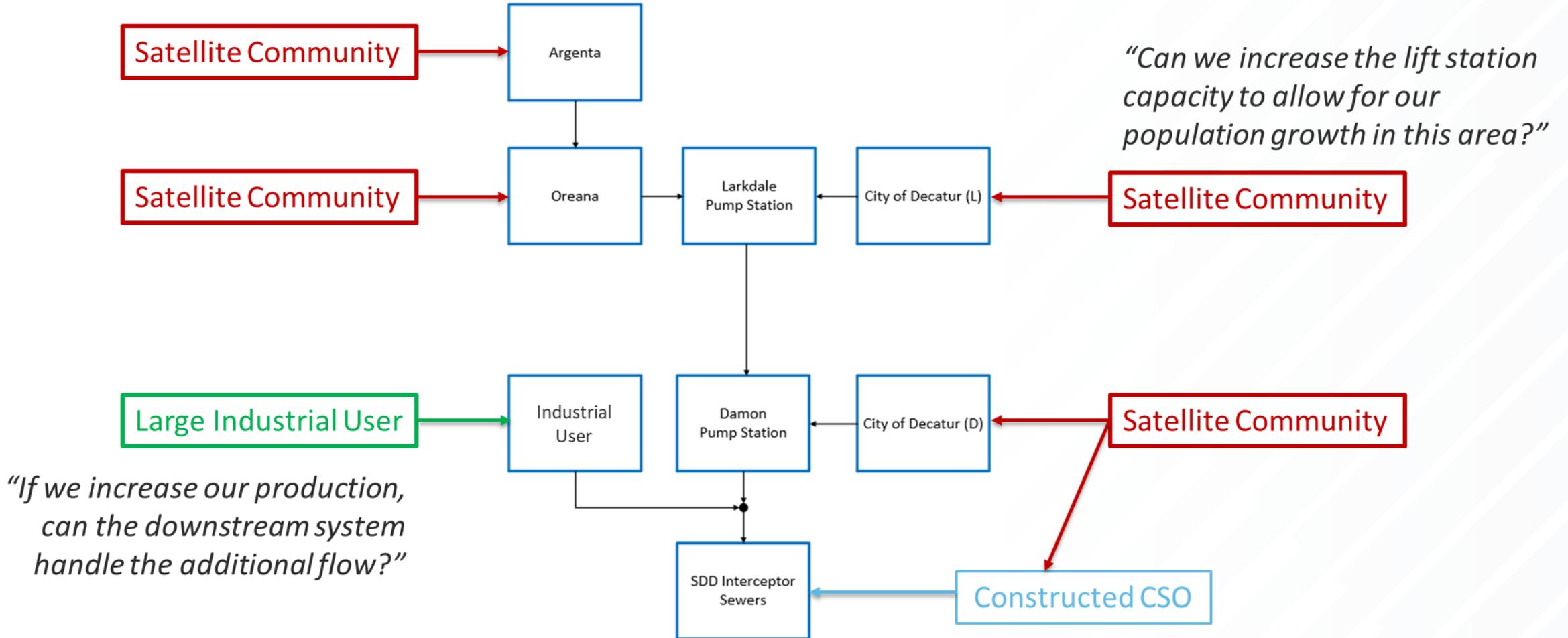


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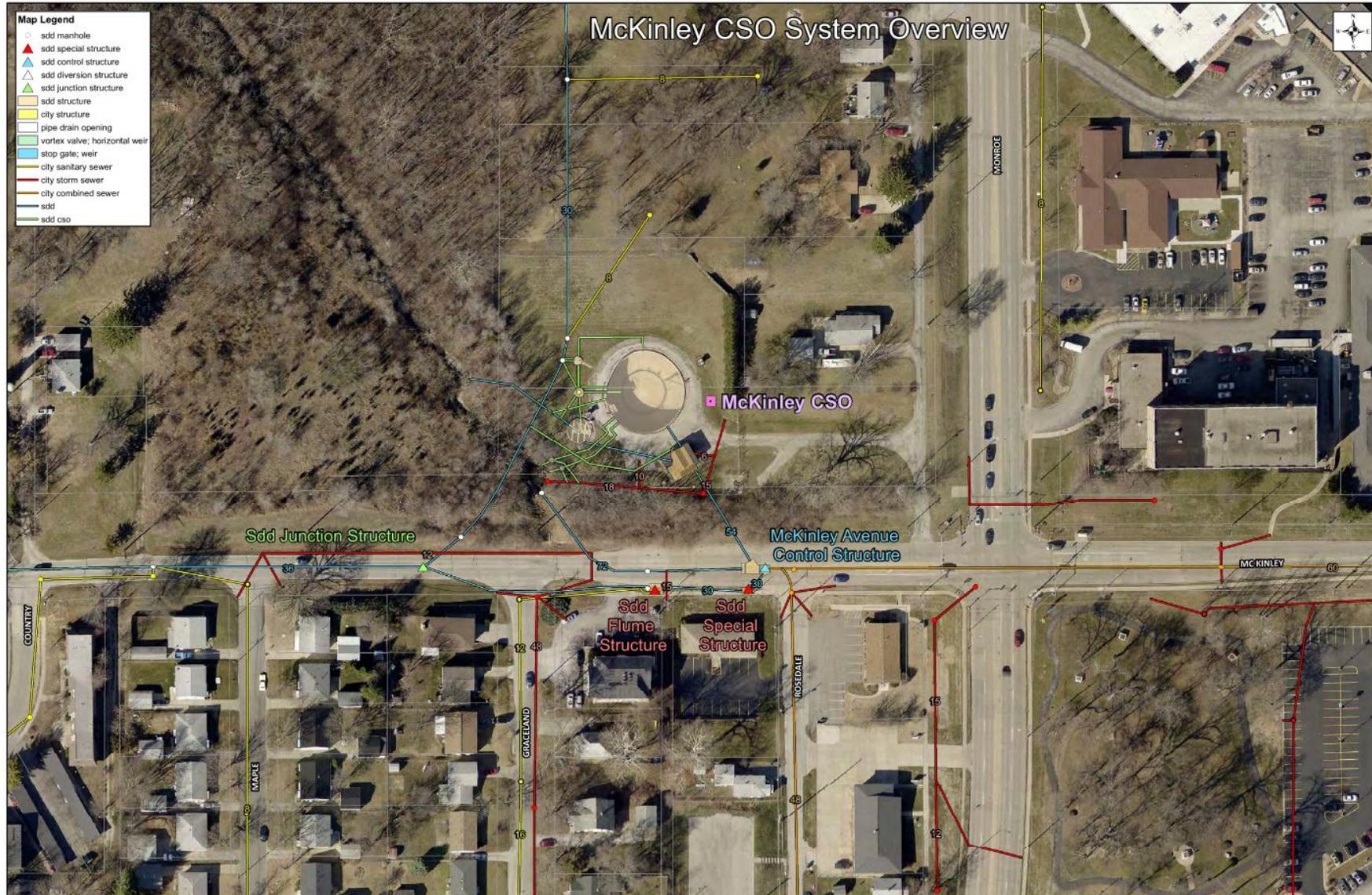


How much capacity does
my system have?

Sanitary District of Decatur



Sanitary District of Decatur





How much capacity does
my system have?



STEPS TO SUCCESS

Steps to Success



Completed flow and rainfall monitoring program



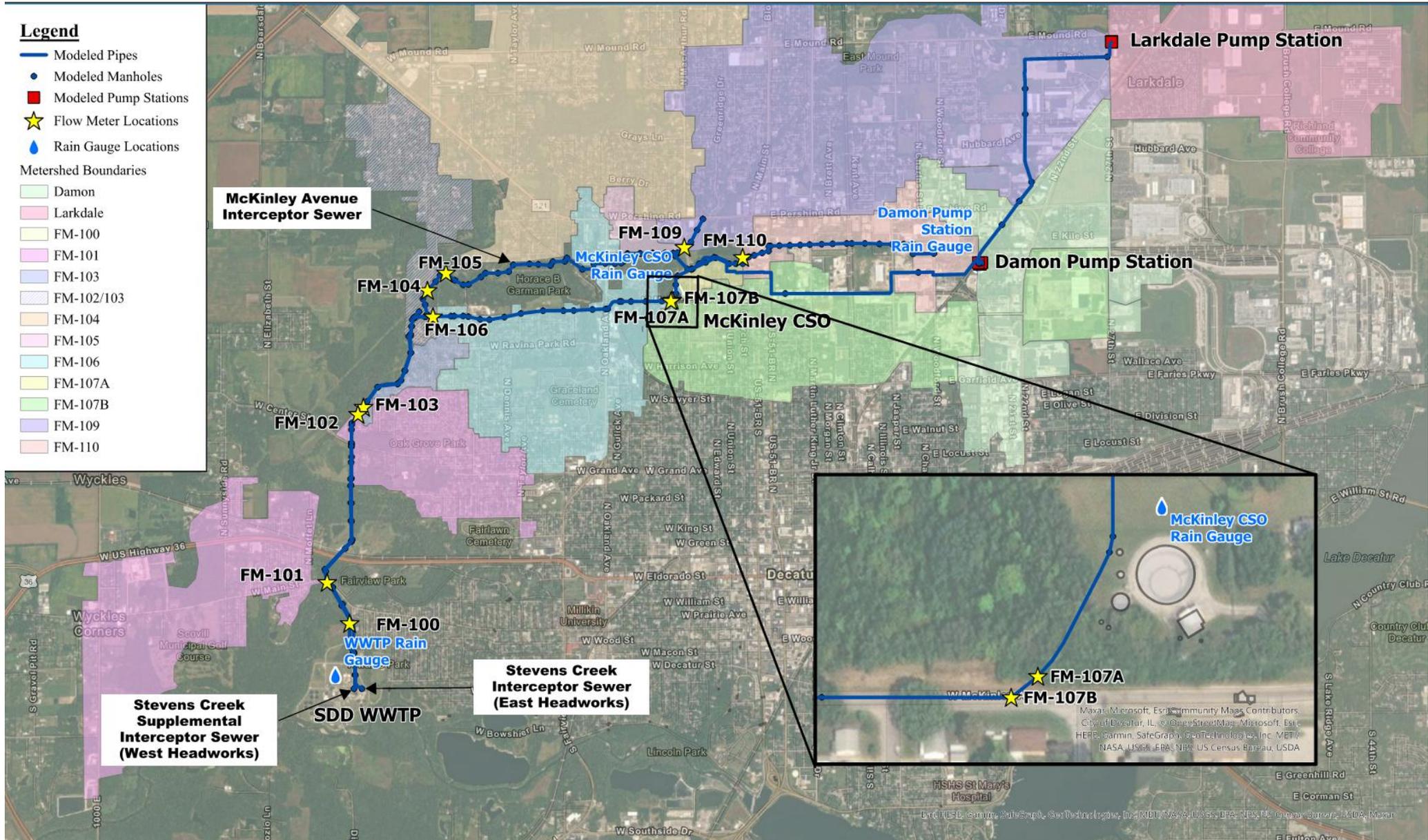
Developed a hydraulic model from scratch



Calibrated hydraulic model and used for existing system analysis

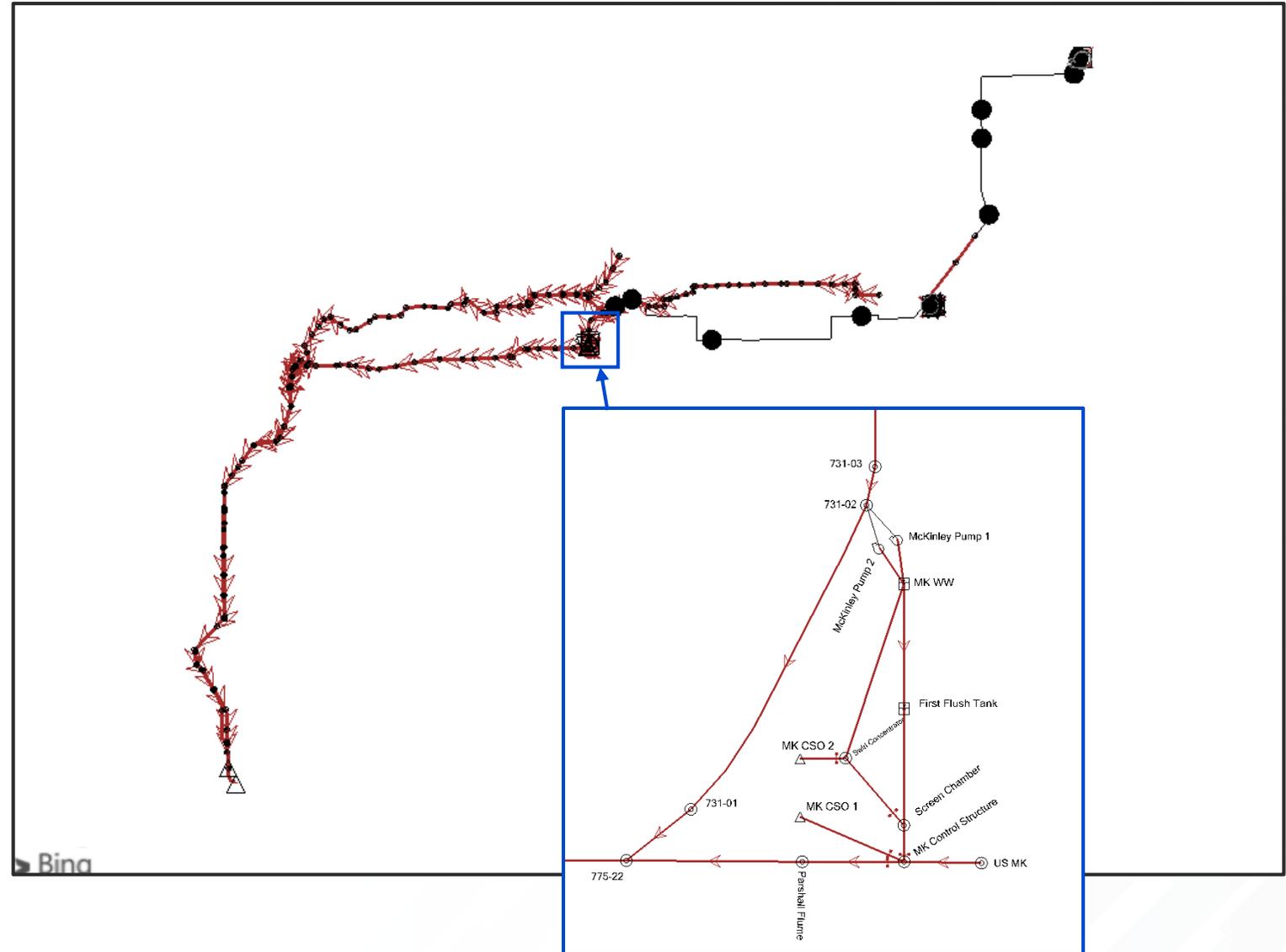


Flow & Rainfall Monitoring



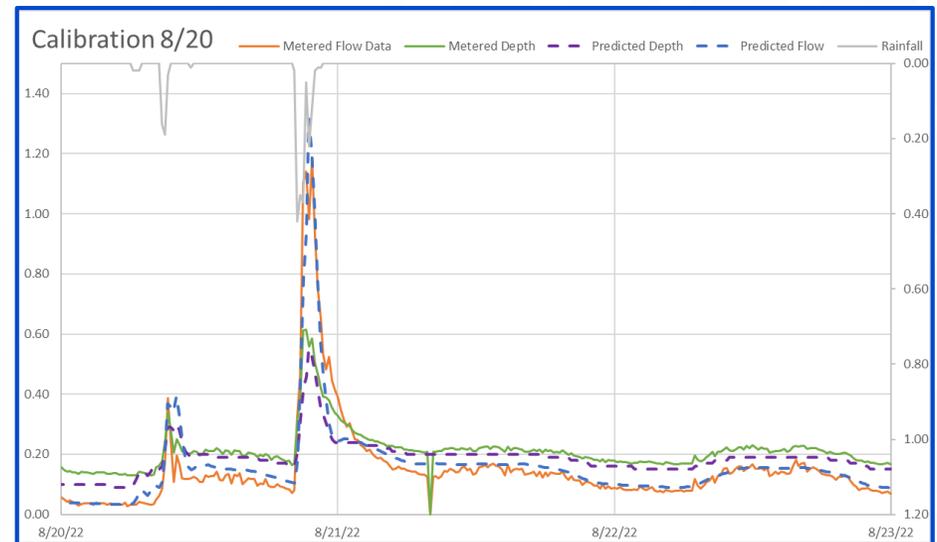
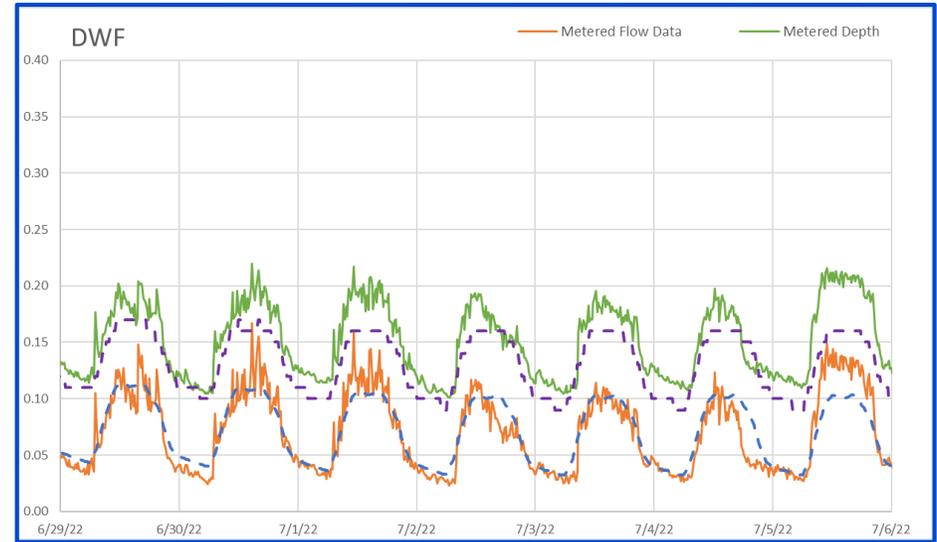
Develop Hydraulic Model

- Developed using Bentley SewerGEMS
- Completed small field effort to validate data gaps (missing invert elevations, connectivity questions, etc.)
- Paid special attention to development of unique features: lift stations and CSO



Calibrate Hydraulic Model

- Goal of calibration is for hydraulic model to reasonably replicate observed flow data so that we can confidently simulate different events to estimate the impact on the collection system and facilities
 - Orange = Observed Flow
 - Green = Observed Depth
 - Blue = Model-Predicted Flow
 - Purple = Model-Predicted Depth
- Calibrate to dry weather flow (DWF) and wet weather flow (WWF) separately



Design Storm Development



Figure 5-1: Climatic Sections Used in Developing Illinois Frequency Estimates
per Illinois State Water Survey Bulletin 75

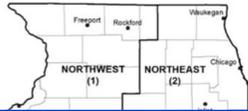
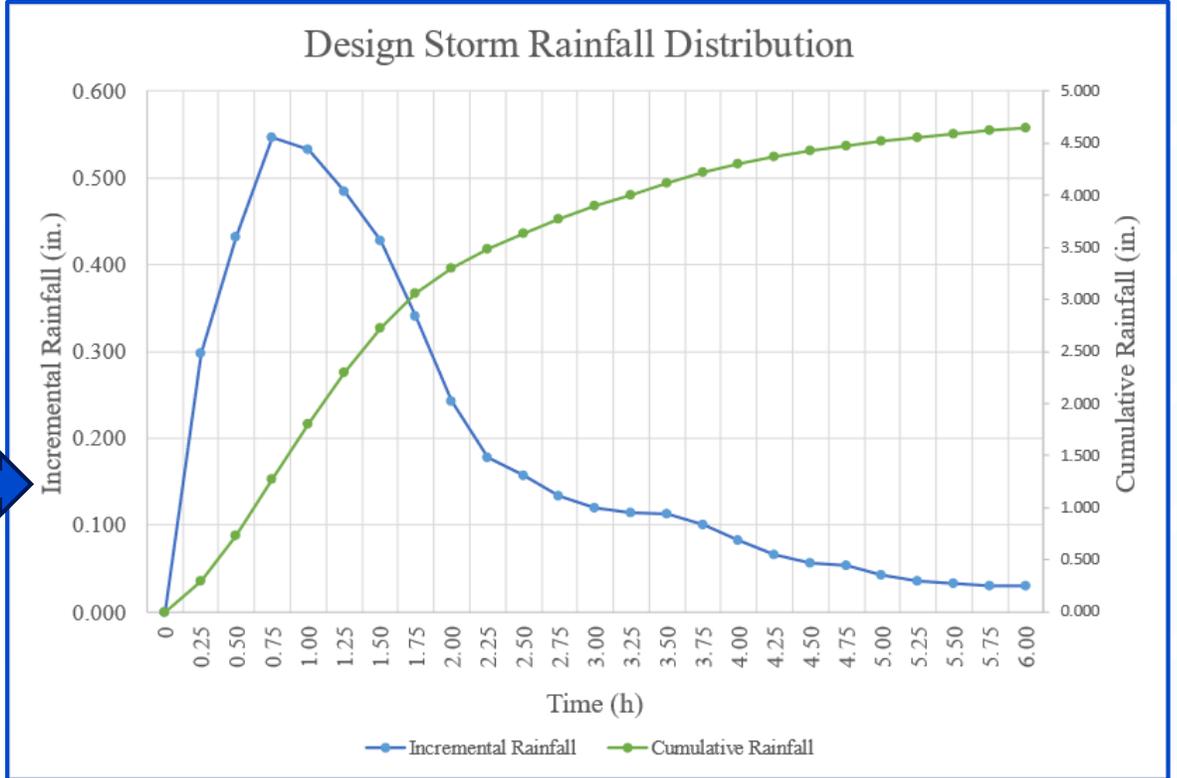
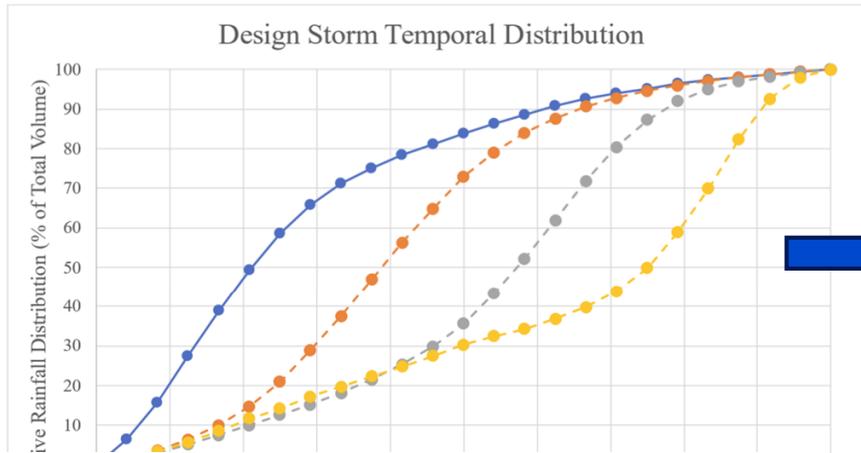


Figure 5-2: Design Storm Temporal Distributions (Central)
per Illinois State Water Service Bulletin 75



Return Period (Year)	Annual Exceedance Probability (AEP)	Total Rainfall Depth (inches)
1	100% ¹	2.07
2	50%	2.49
5	20%	3.23
10	10%	3.83
25	4%	4.65
50	2%	5.29

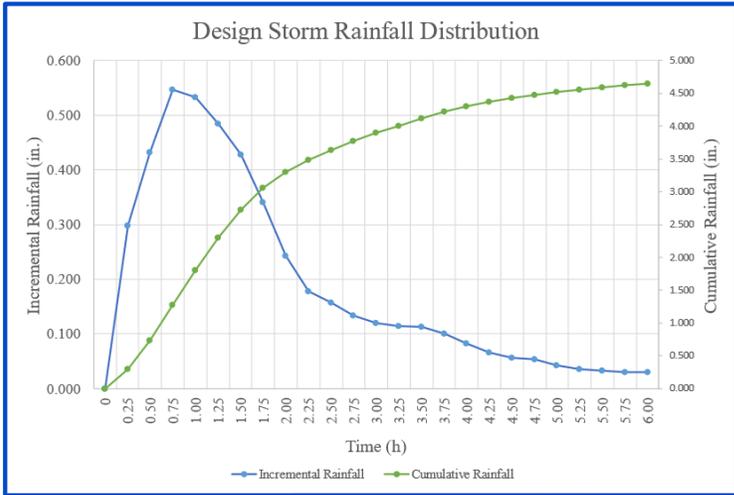
Level of Service Criteria

- What is “level of service”?
 - Level of Service reflects **proper capacity, operation, and maintenance** of wastewater conveyance facilities
 - Can my system convey all the flows?
- What is our **performance target**?
 - Maintain all flow within pipe?
 - Allow some surcharging up to [X] feet of existing ground level?
 - Allow surcharging up to existing manhole rim elevation?

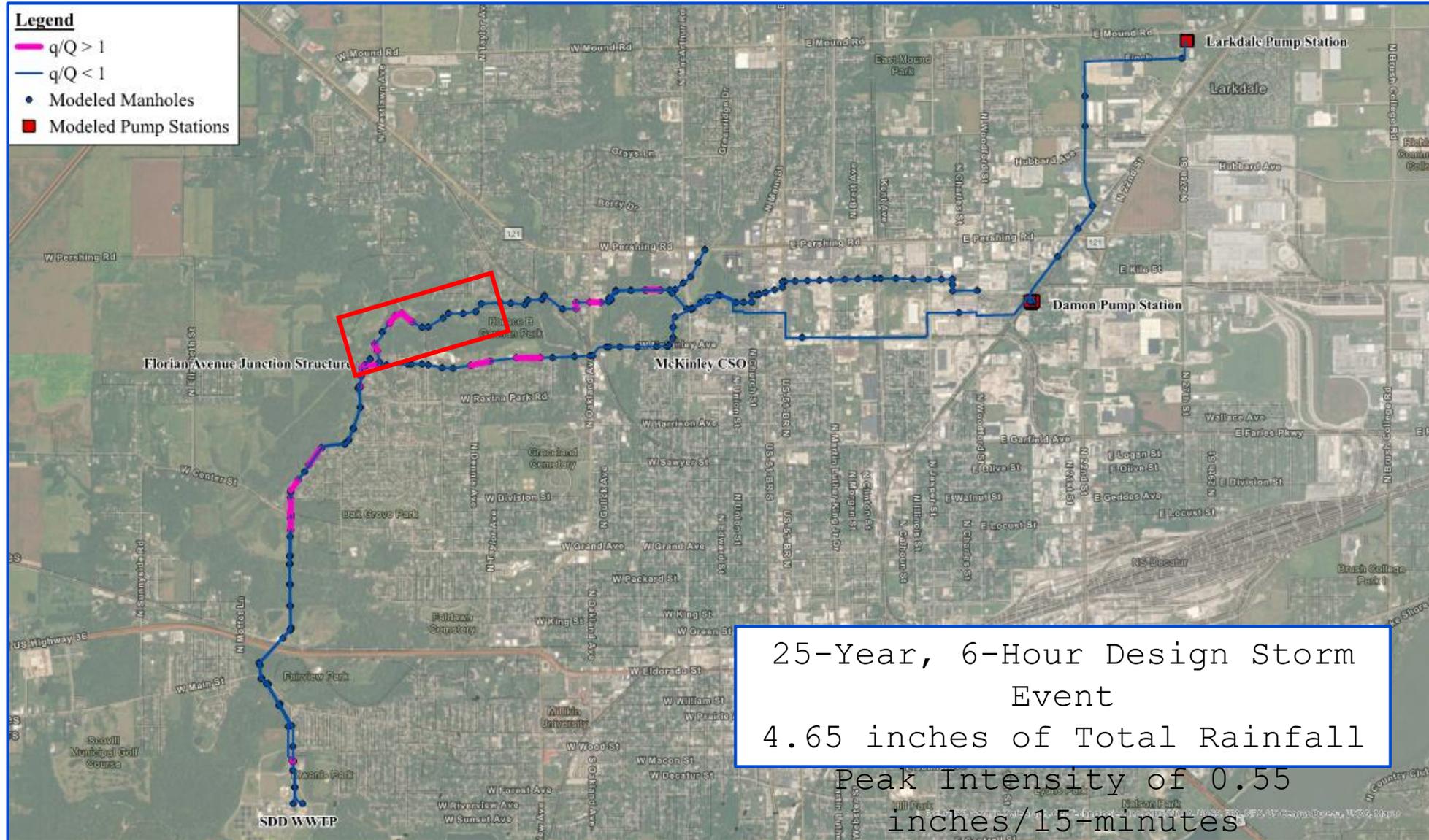
SDD elected to carry the highest level of service possible while maintaining all flow within the pipe and allowing no surcharging above the crown of the pipe.



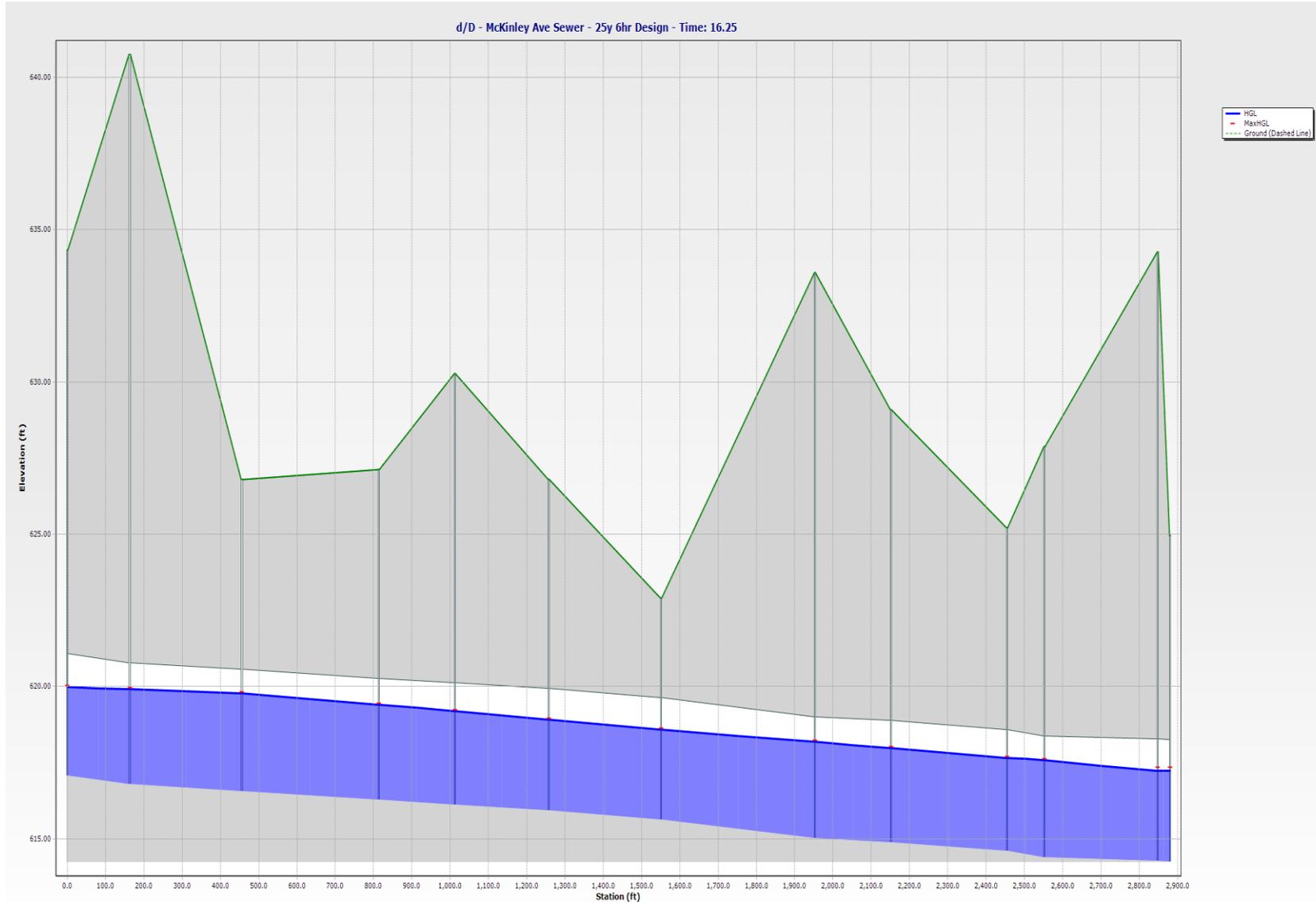
Complete Existing Conditions Analysis



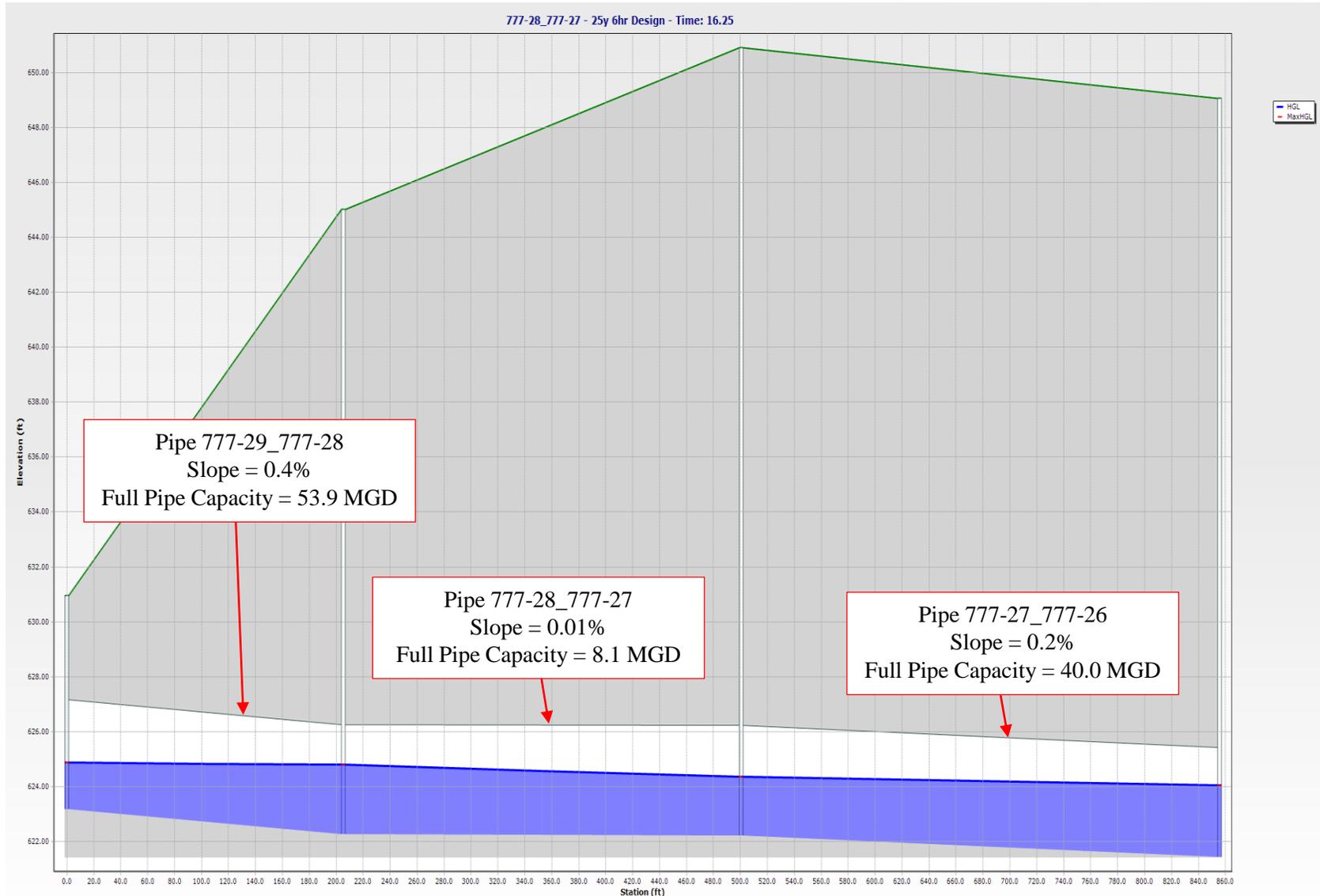
Complete Existing Conditions Analysis



Complete Existing Conditions Analysis



Complete Existing Conditions Analysis





How much capacity does
my system have?

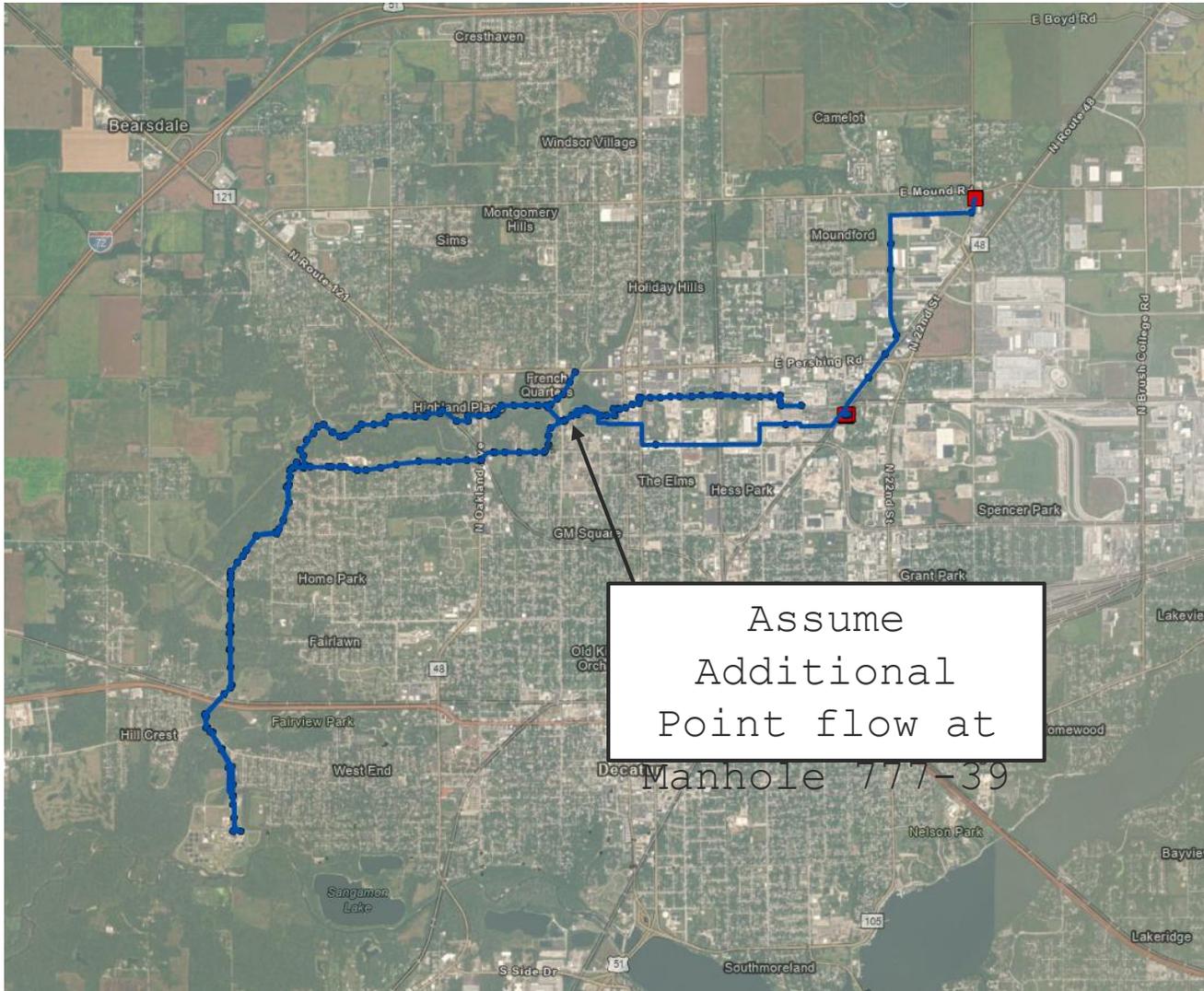
Short Answer:

A Lot



A SURPRISE DISCOVERY

A Surprise Discovery: System Capacity

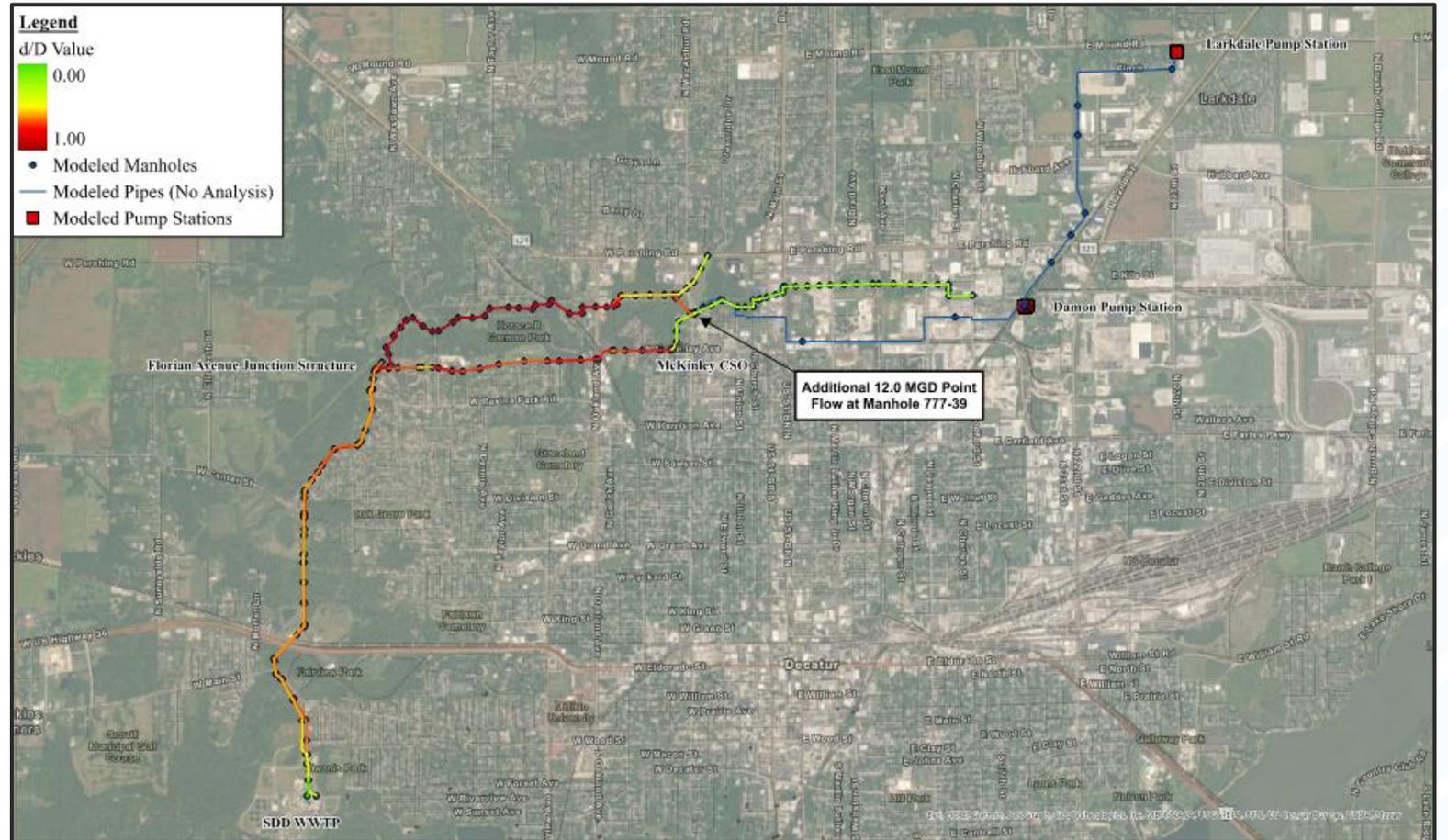


- Assume upstream gravity sewers in satellite communities can only convey 5-year, 6-hour storm event
- *How much flow can we add to the system and still maintain flow within the pipe?*

A Surprise Discovery: System Capacity



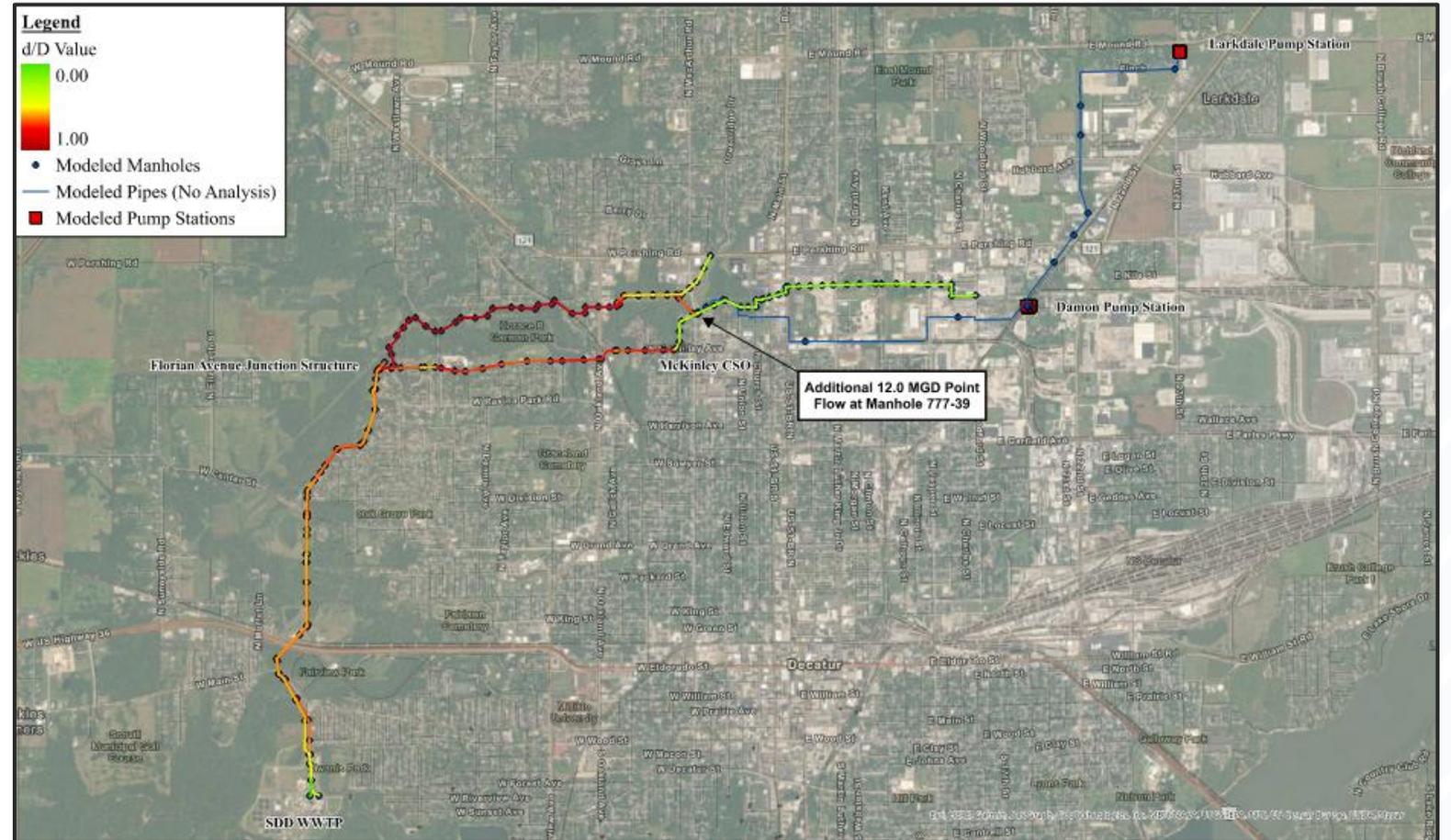
- 5-Year, 6-Hour Storm Event = Can add **12.0 MGD** Point Flow



A Surprise Discovery: System Capacity



- 5-Year, 6-Hour Storm Event = Can add **12.0 MGD** Point Flow
- 25-Year, 6-Hour Storm Event = Can add **7.0 MGD** Point Flow



A Surprise Discovery

- By utilizing a hydraulic model, you can work towards a **better understanding** of your system
- A hydraulic model won't provide all the answers, but can help **narrow down** known concerns or issues
- A hydraulic model is a **tool** that can be used for a specific application and then be utilized later



Next Steps...?

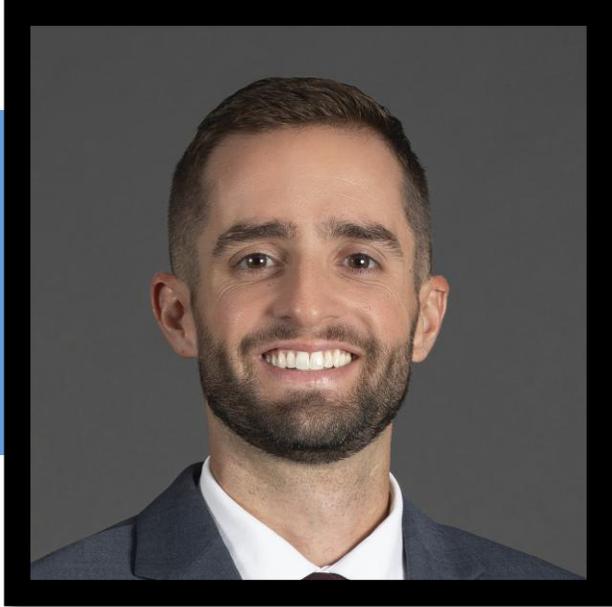
What We Have

- Flow and rainfall monitoring data (provides a "snapshot in time")
- Calibrated hydraulic model (don't have to start over from scratch)
- Better understanding of our system conveyance



What We Can Do

- Evaluate influent flows to wastewater treatment plant and CSO
 - Use flow data to confirm assumptions in the system or compare to observed rainfall events
- Develop I/I reduction program, WWMP
- Update hydraulic model with known growth and development, new capital projects
- Build off existing hydraulic model with additional service



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Thank
You