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Columbus 2017

Decrypting Diversions:

Eliminating Drop Shafts with Preferential Offloading

Presentation by:

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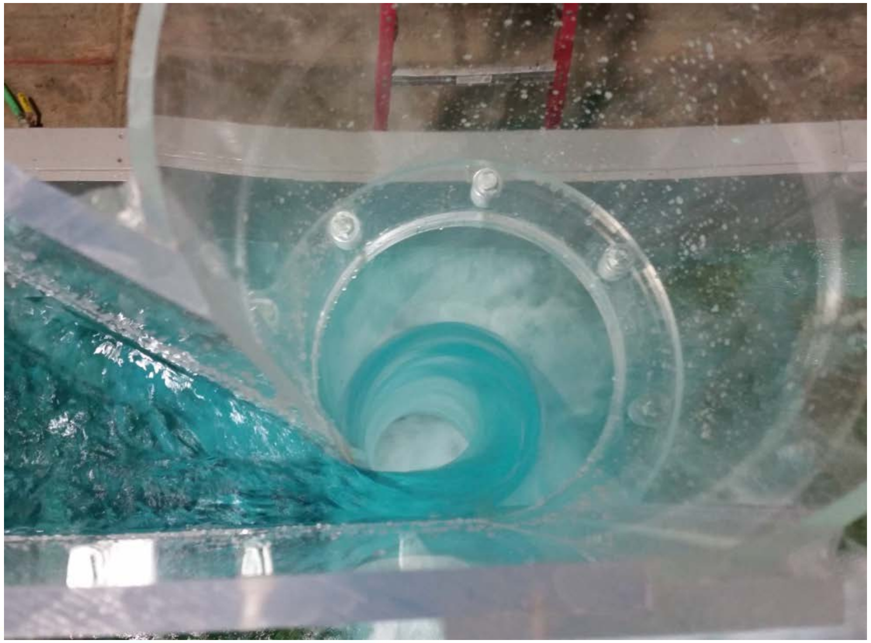
Presentation Overview

- The Problem: Indianapolis' CSOs
- The Solution: the DigIndy Program
- Focus on $avings
- Opportunities for Success!
- Next Steps



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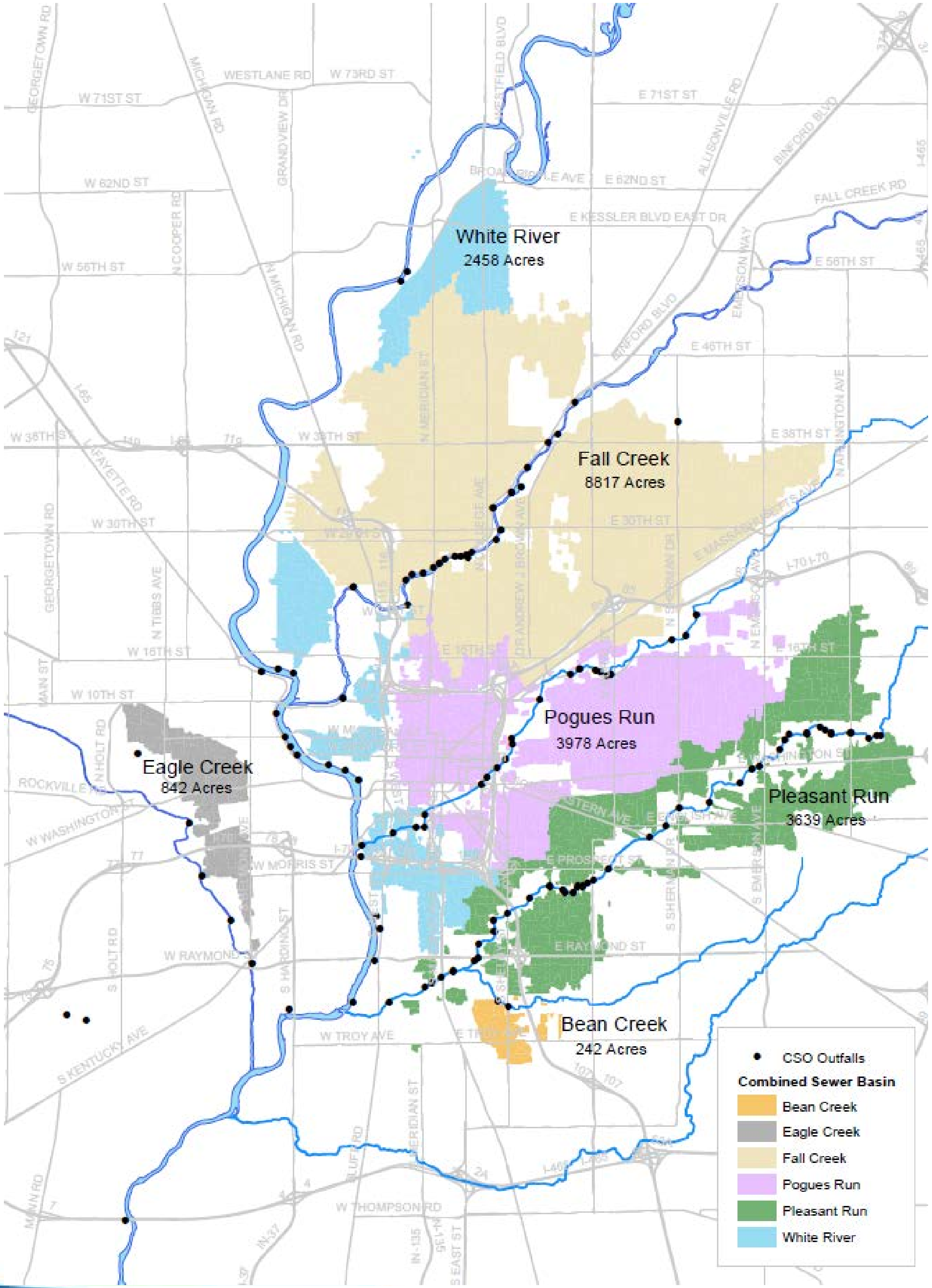

The Problem: Indy's Combined Sewer Overflows

- ~ 3,200 miles of sewers
- ~ 270 lift stations
- ~ 31 square miles of combined sewer area served
- ~ 130 CSOs
- Raw sewage overflow occurs ~ 60+ times / typical year
- ~ 5 - 6 billion gallons OFs / yr

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The Problem: Indy's CSOs

- Multi-Faceted CSO Long Term Control Plan
  - Optimize existing system capacity
  - Expand and upgrade Advanced Wastewater Treatment Plants (AWTP)
  - Construct new storage and conveyance

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The Problem: Indy's CSOs

- Settlement between Citizens, Indianapolis, and Department of Justice / EPA
- Standard Consent Degree Conditions
  - How the Municipality expects to come into compliance with Clean Water Act
  - Schedule for completion including fines ($$) for non-compliance
  - Expected performance of CSO LTCP projects

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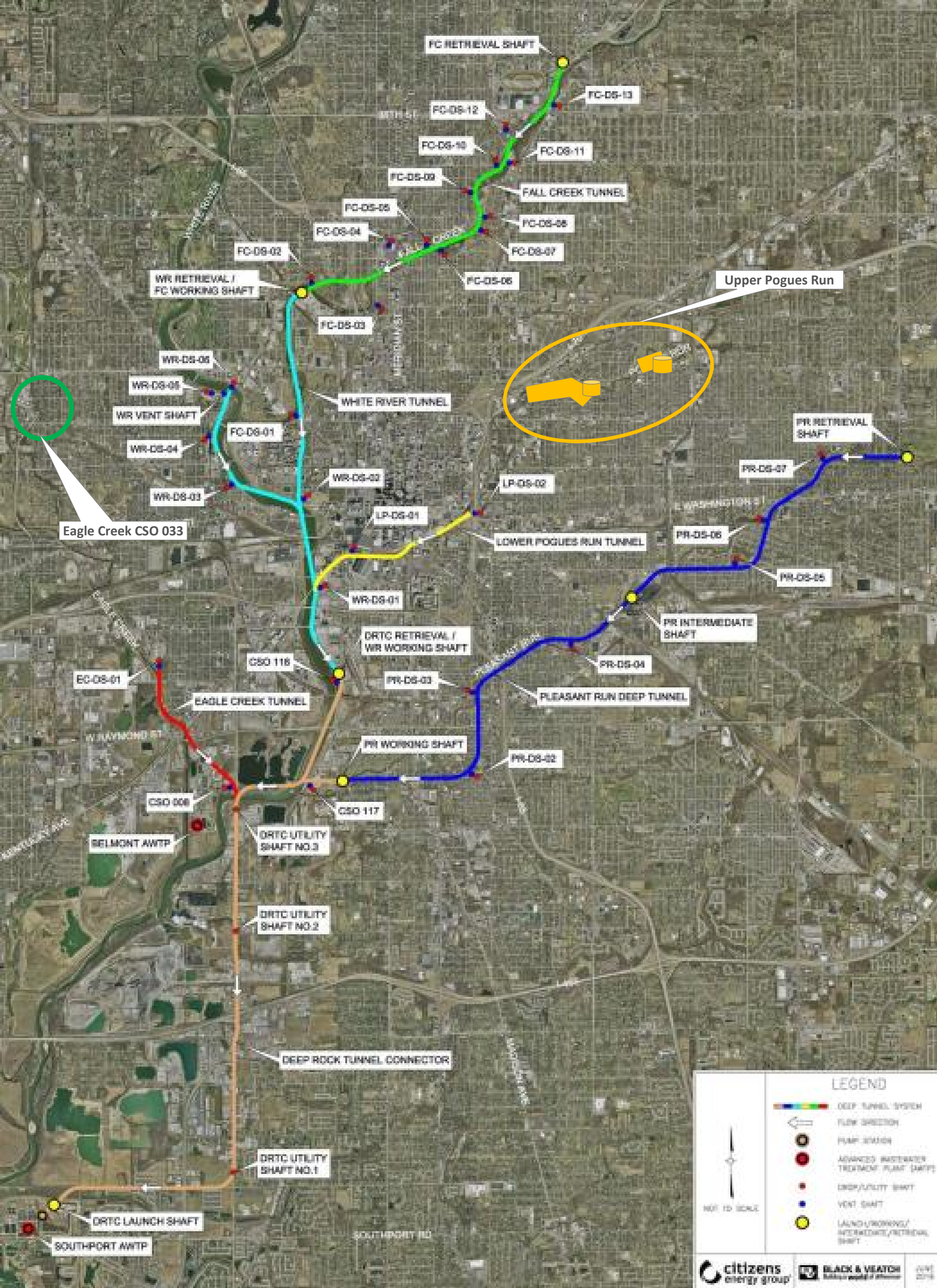

The Solution: DigIndy Program

- **CSO Abatement Projects**
  - **Eagle Creek CSO 033** - 2017
  - **Upper Pogues Run** – 2021
- **Deep Tunnel Program**
  - 6 deep tunnel segments
  - 28 miles deep rock tunnel
  - 18-foot finished diameter
  - 200 to 250 feet deep
  - 7 large diameter shafts,
  - **Deep Rock Tunnel Connector, Eagle Creek Tunnel** & **DRTC Pump Station** – 2017
  - **White River** & **Lower Pogues Run** Tunnels – 2021
  - **Fall Creek** & **Pleasant Run Tunnel** – 2025

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A Focus on $avings

- Program Sequencing
  - TSSOP – *Tunnels System Sequencing Options Plan*
  - TEEPOP – *Tunnel Enhancement Evaluation Prioritization and Optimization Plan*
- Category Management
  - Leveraging the program
- Program Funding
  - Indiana Finance Authority SRF

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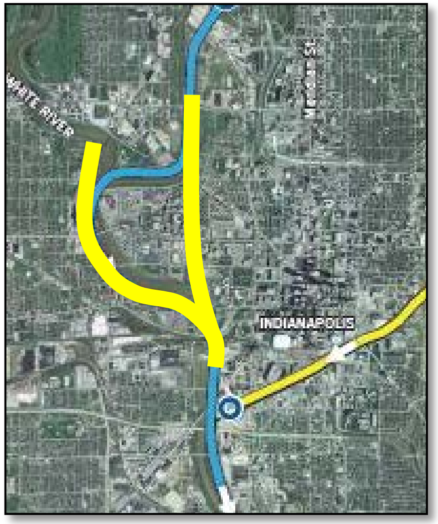
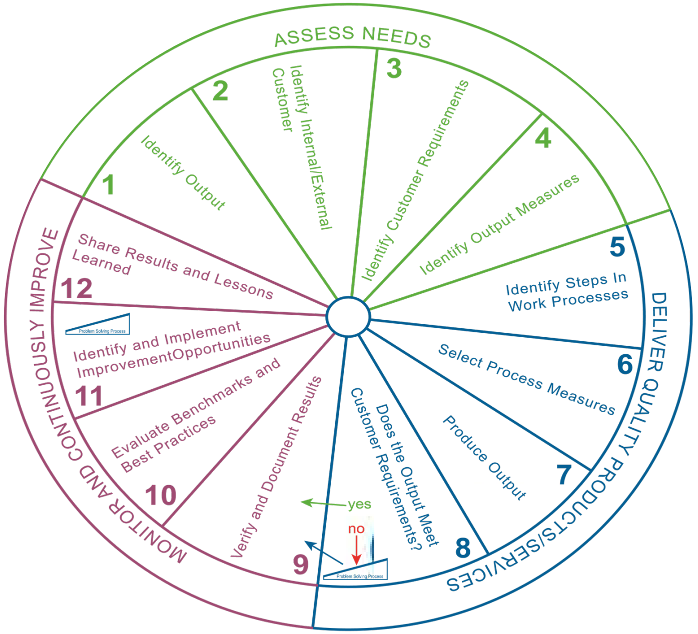
A Focus on $avings

- Lessons Learned
  - Eagle Creek Tunnel
  - White River Tunnel Realignment
- System Optimization: Hydraulic Model Expansion Project
  - Upper Pogues Run
  - *Decrypting Diversions and Drop Shafts*





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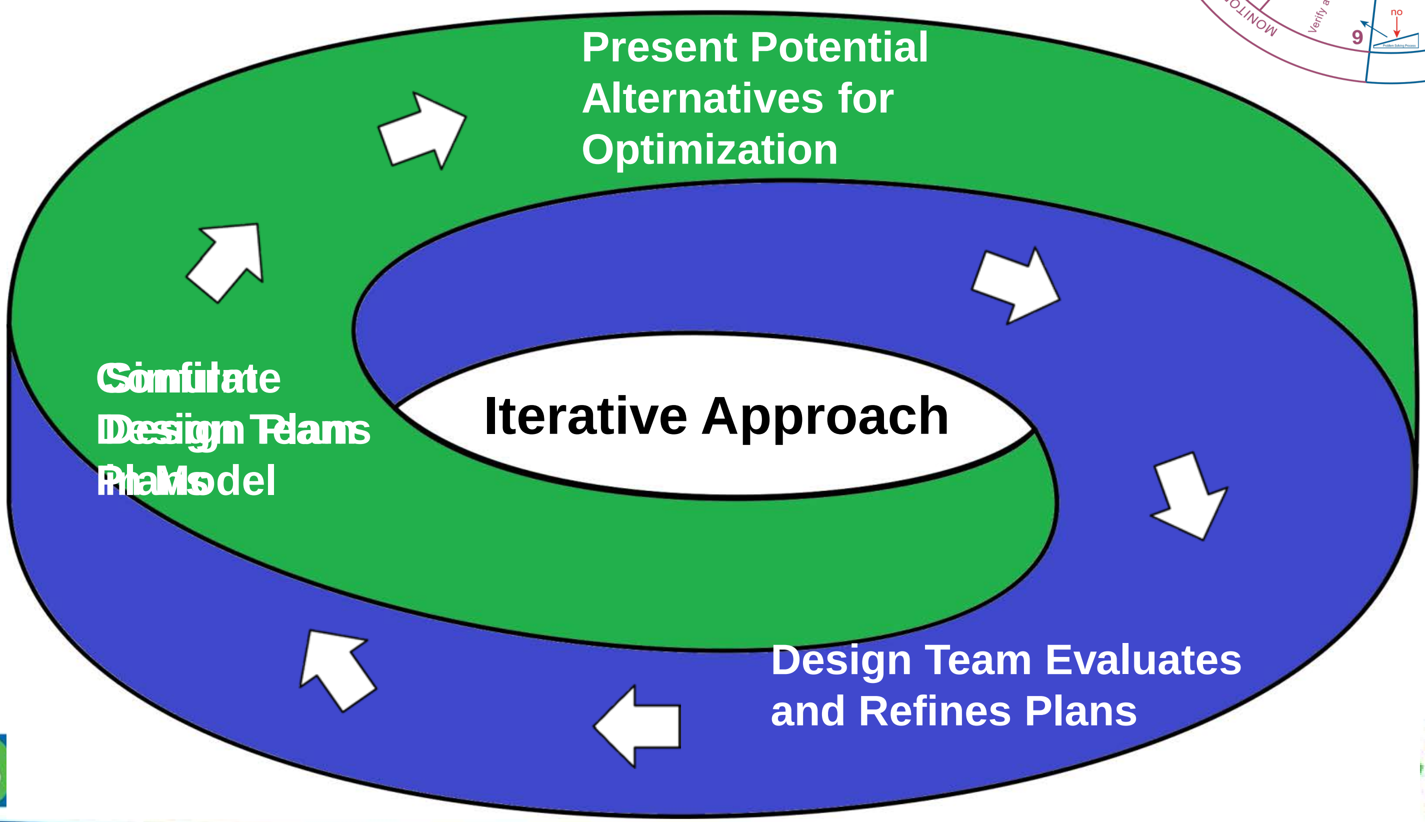
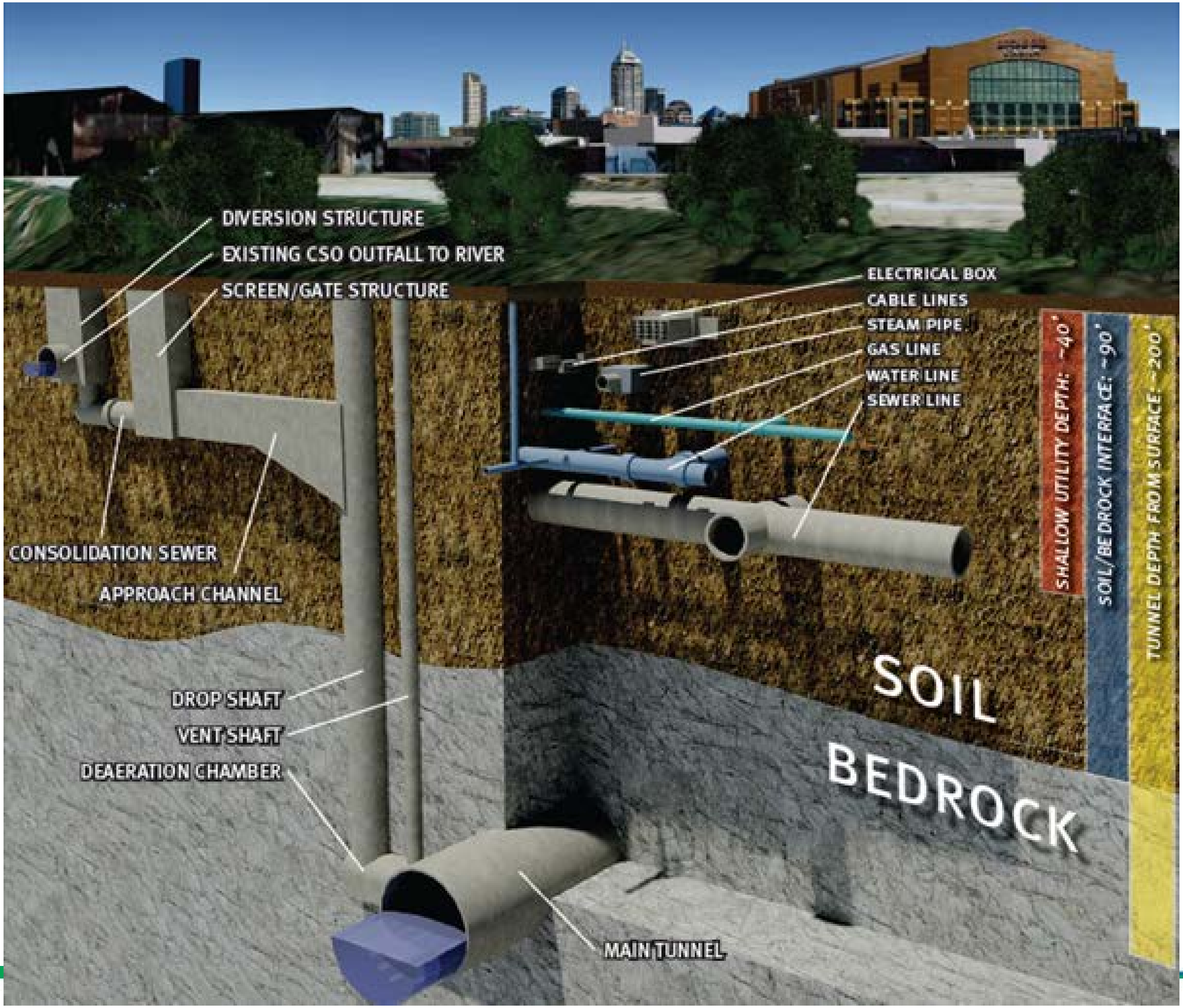
Value Engineering Philosophy

- Value Engineering is ongoing and part of every step
- It is an ongoing effort for refinement and optimization
- The model provides big-picture view of impacts, allowing for the rapid simulation of new ideas

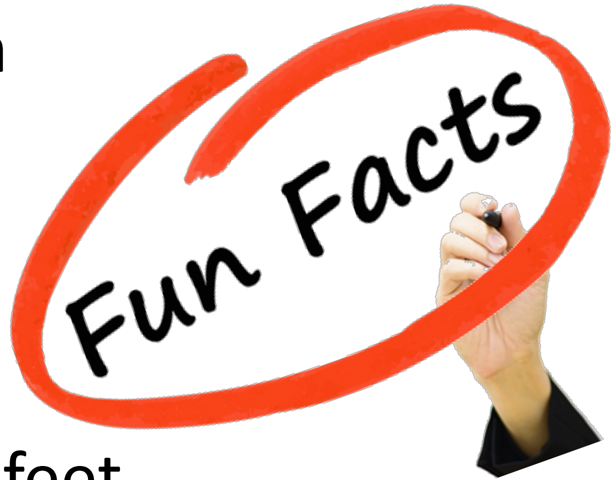


What are Diversions and Drop Shafts?



Diversions and Drop/Vent Shafts

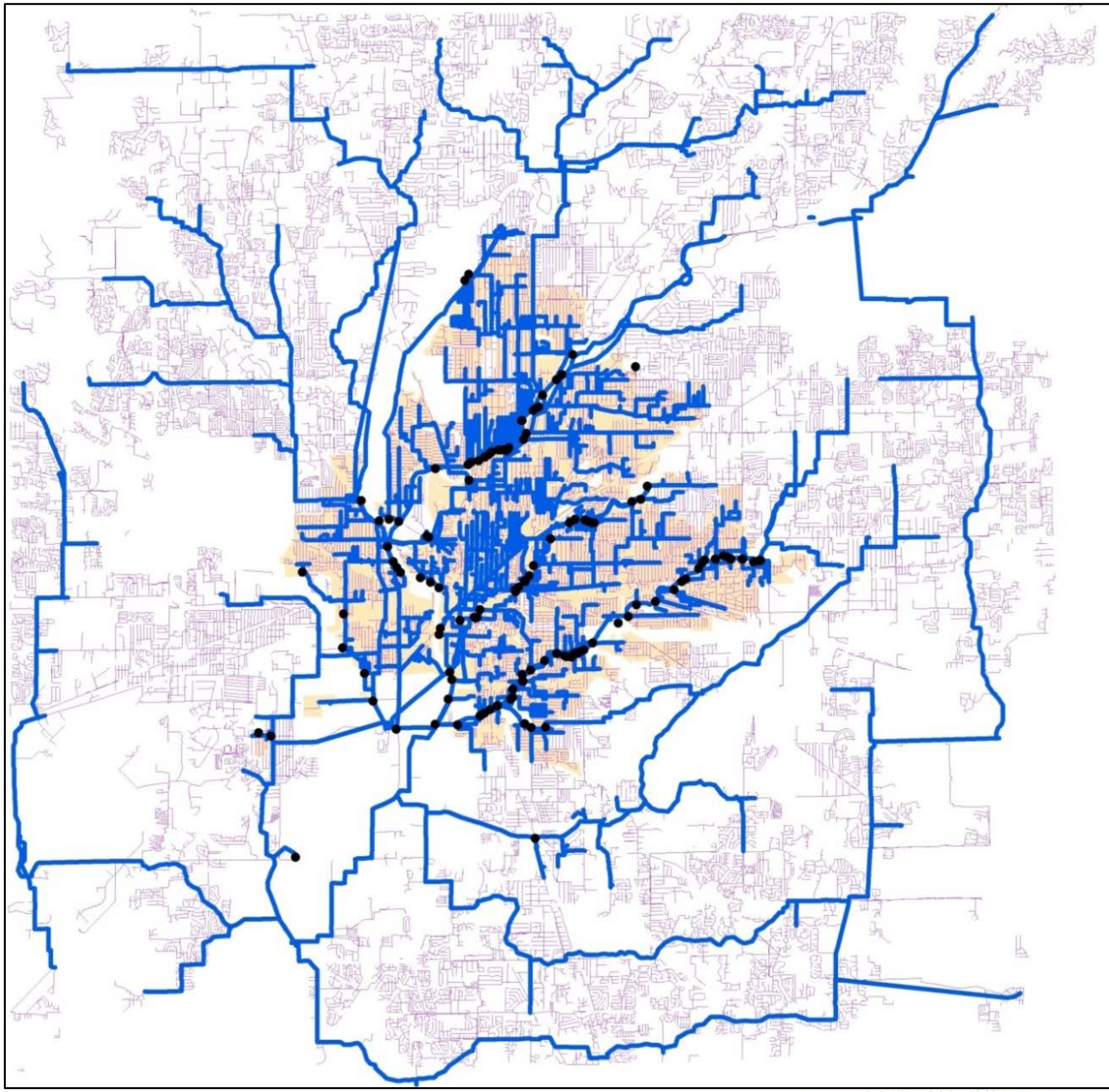
- Over 130 CSOs throughout the system
- Over 80 Diversion Structures
- 34 Drop/Vent Shafts
- 7 Large Diameter Shafts
- Shafts range in diameter from 3 to 50 feet
- Each Drop/Vent Shaft costs $6M to construct and leads to significant neighborhood disruptions



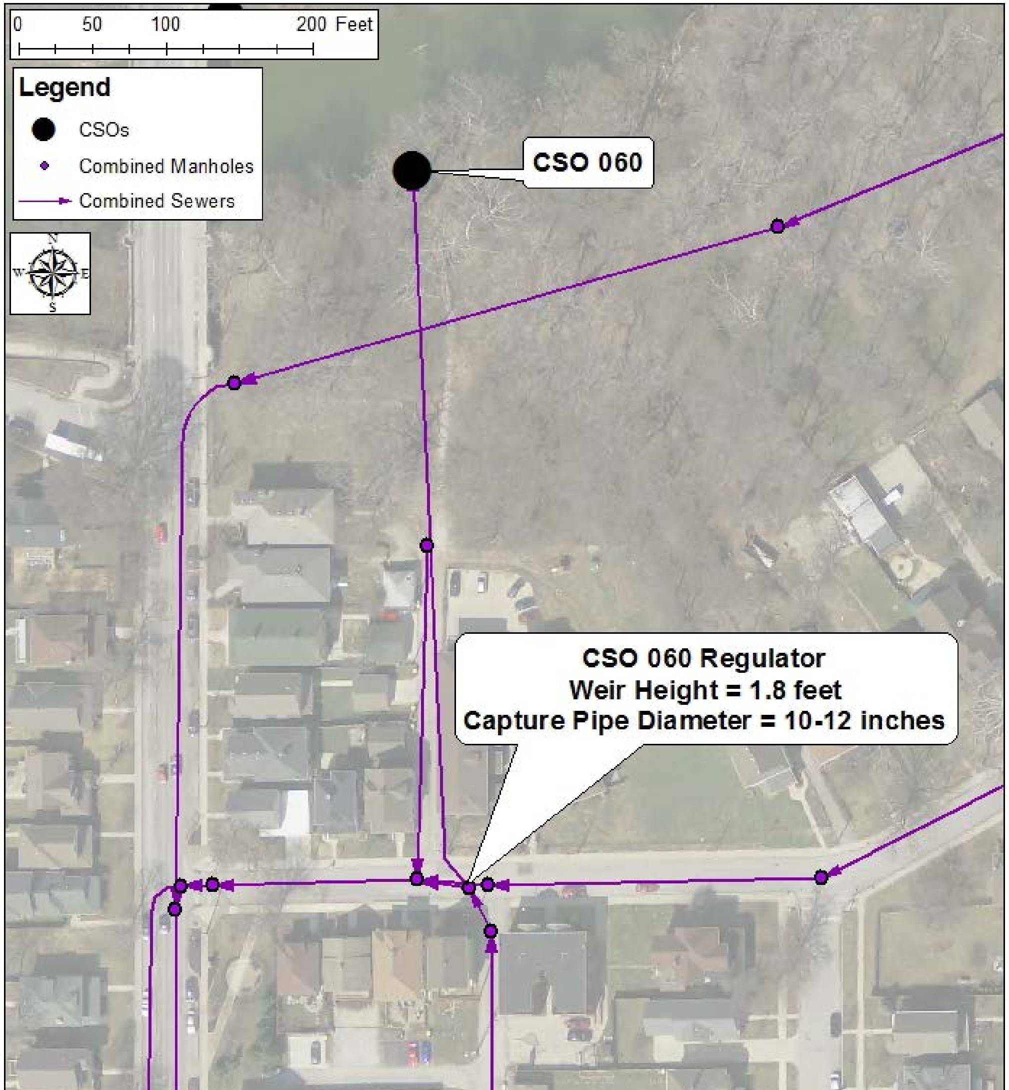
Optimizing the number of Drop/Vent Shafts = Cost $avings and Happier Customers

Background – Hydraulic Model

- Innovyze InfoWorks ICM updated from SWMM in 2012
- ~9,000 Node Model
- Continually updated existing and future conditions models to all available information and design plans
- Ongoing Model Buildout to all 12 inch and larger diameter sewer system-wide
- Used to confirm Level of Control (LOC) as part of post-construction monitoring

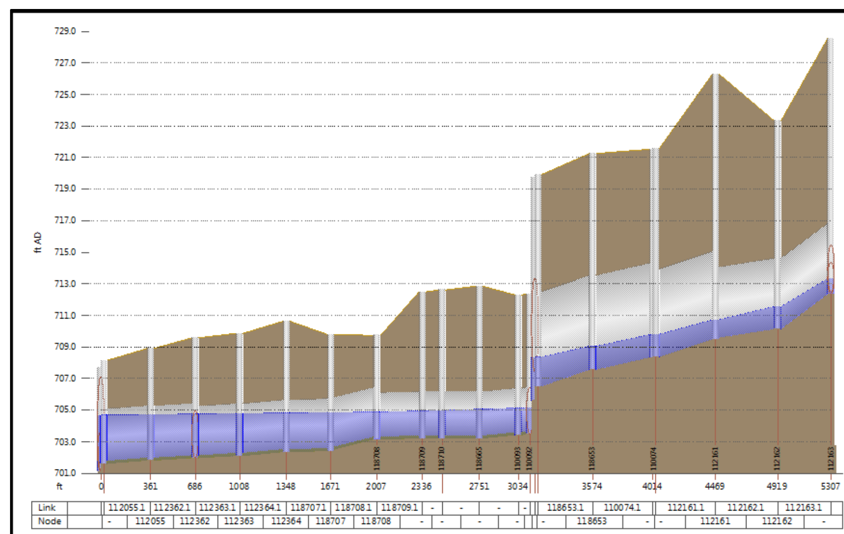


Fall Creek – CSO 060 Original Plan

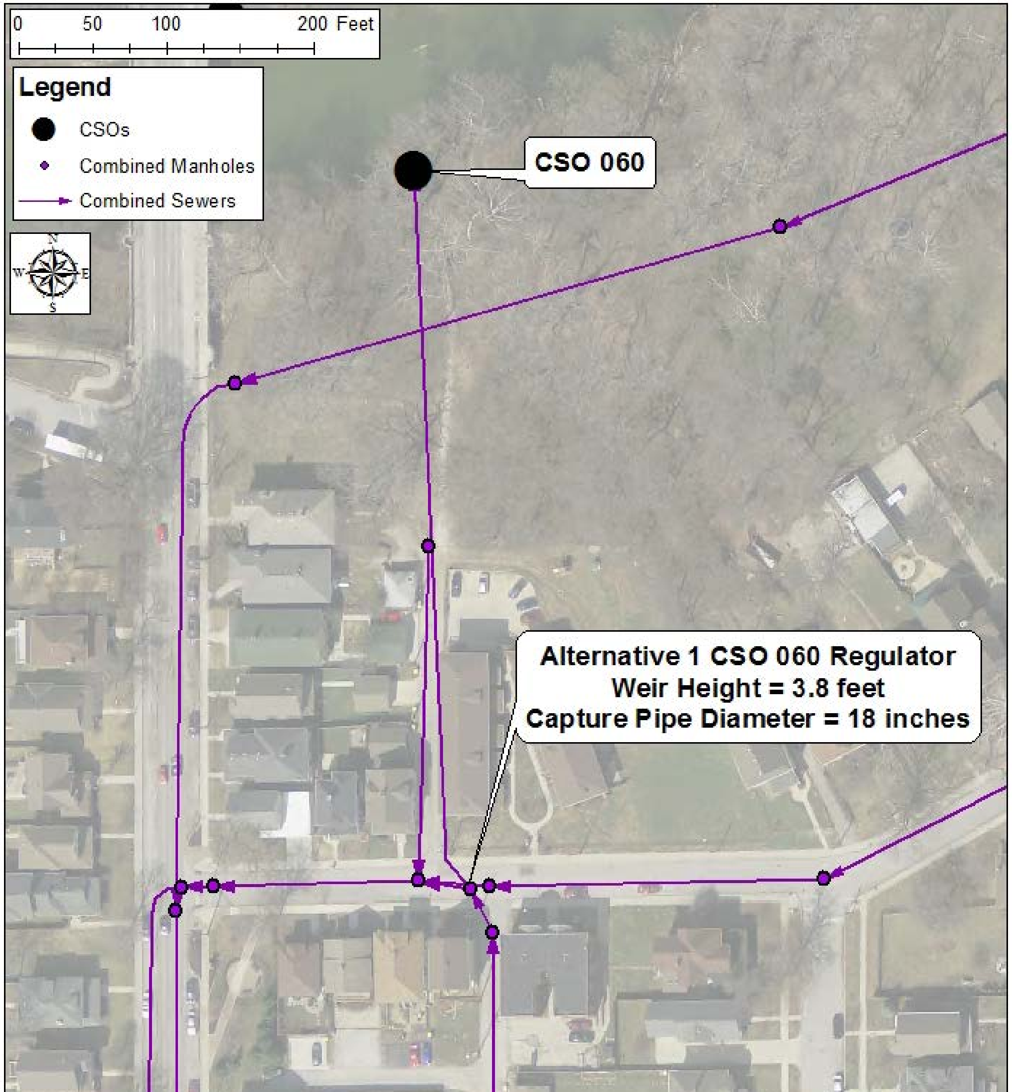


CSO 060 Drop Shaft

- Flow Monitoring
  - Feb 2005 to Nov 2006
  - 12 MGD peak flow
- 6-Month SCS Design Storm
  - 12 MGD peak flow
  - 0.5 MG total volume
- **No modeled surcharging** upstream or downstream of the regulator

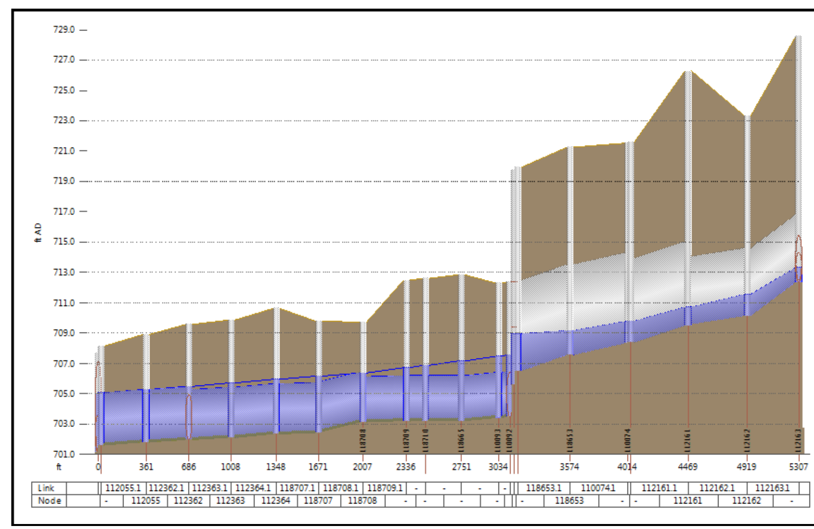


Fall Creek – CSO 060 Modeled Alternatives

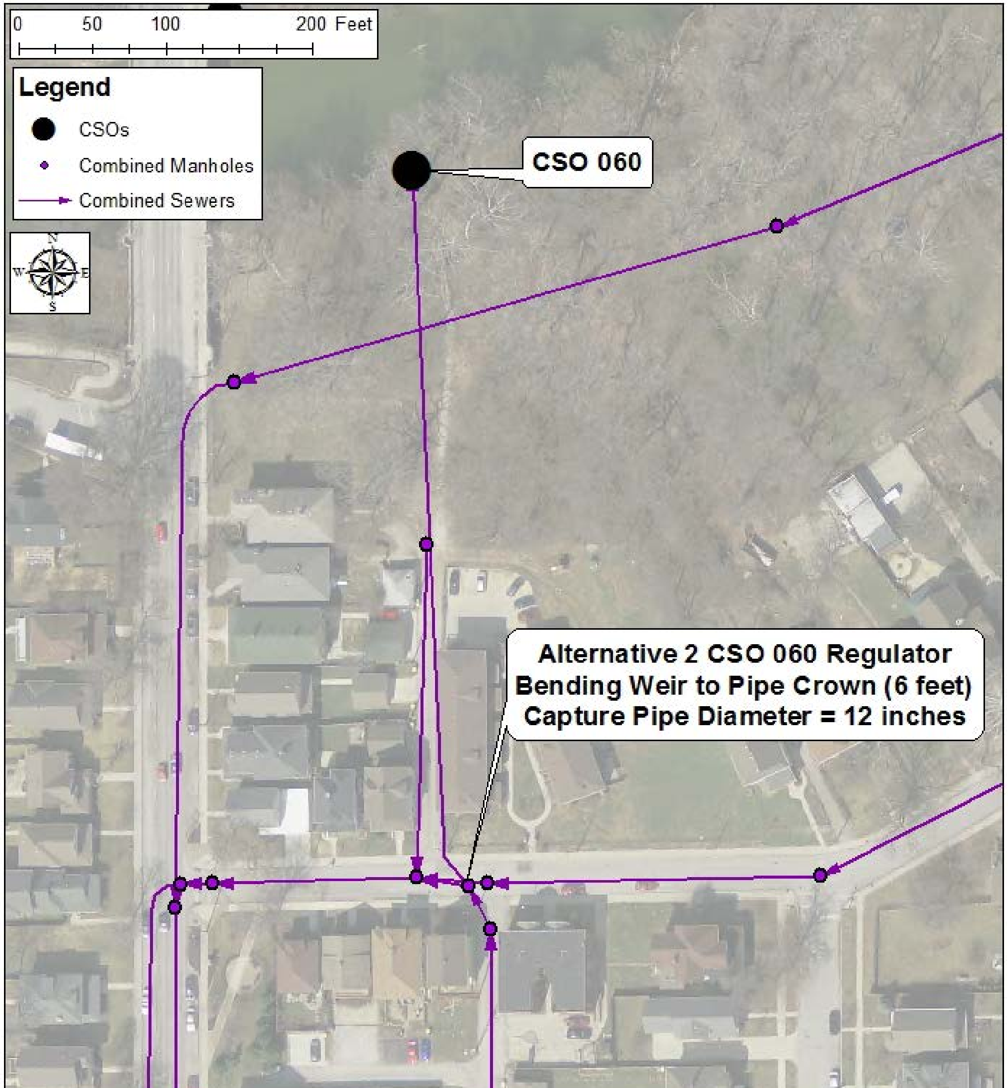


Alternative 1

- Existing weir raised 2.0 feet
- Existing capture pipe diameter increased to 18 inches
- Overflow frequency and volume within LOC obligations for 1996-2000 typical year
- Minimal downstream surcharge

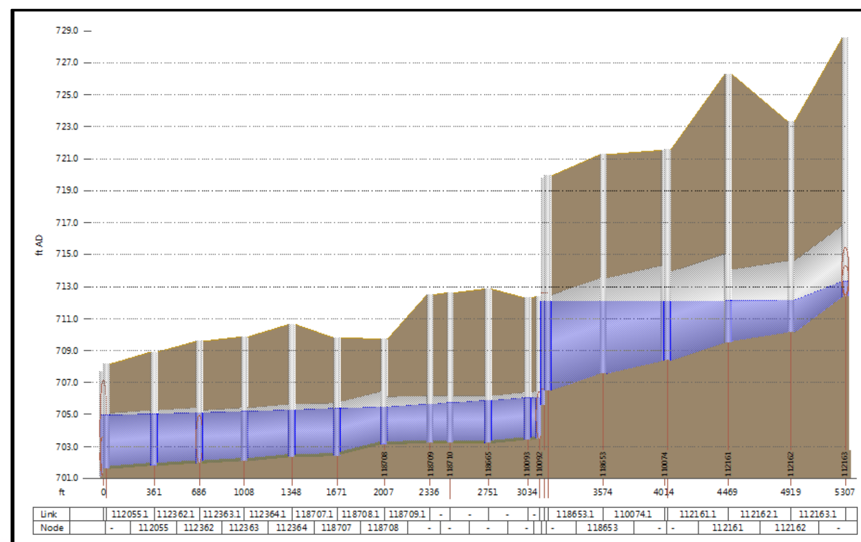


Fall Creek – CSO 060 Modeled Alternatives



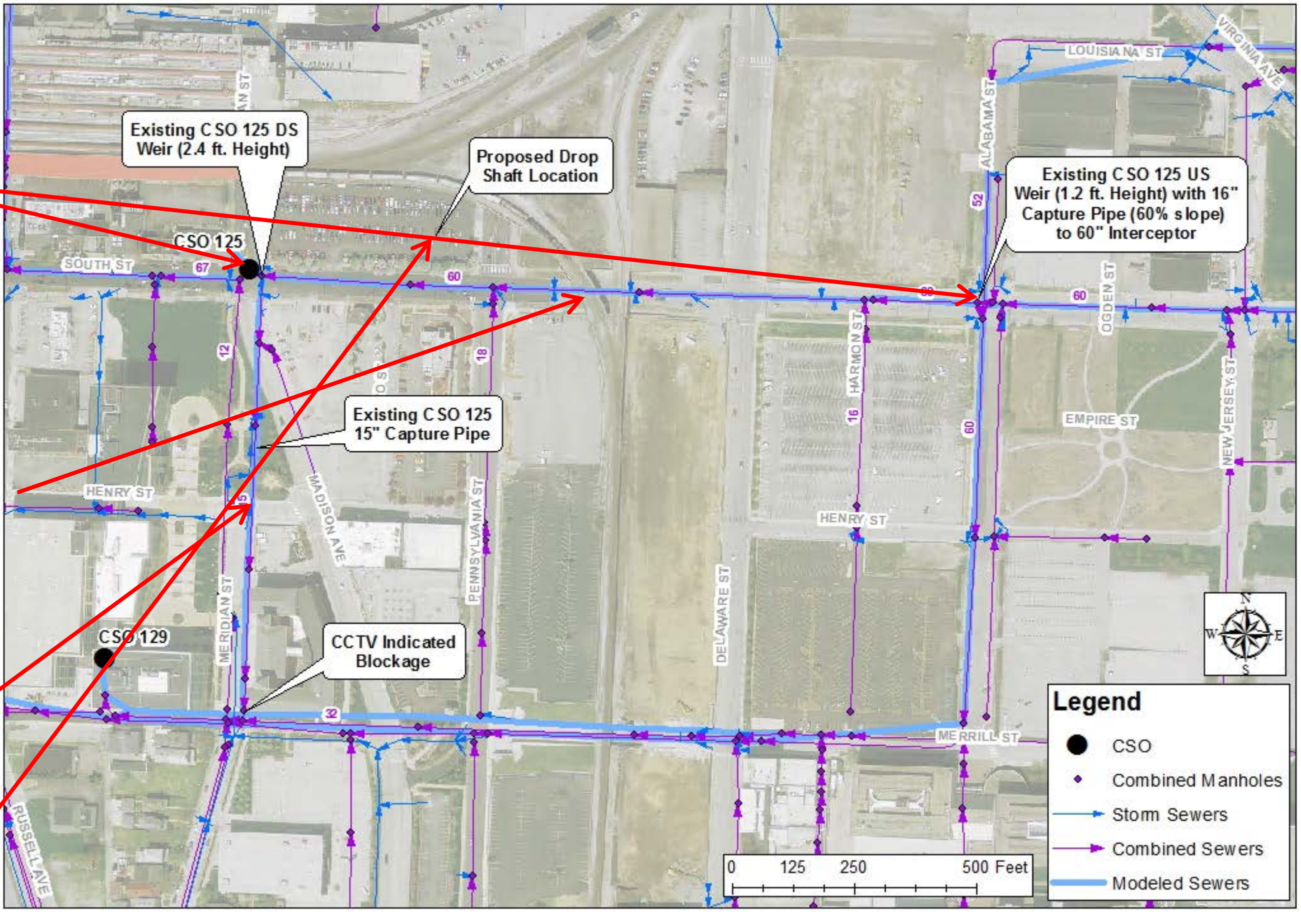
Alternative 2

- Bending weir to pipe crown
- Existing capture pipe diameter unchanged
- Overflow frequency and volume within LOC obligations for 1996-2000 typical year
- No downstream surcharge
- Utilizes upstream in-line storage



Lower Pogues Run – CSO 125

- CSO 125 has two diversions, one upstream to the much lower elevation interceptor, and one at the outfall structure.
- Relatively low flow bypassing upstream diversion for up to the Level of Control with only minor contributions downstream.
- Downstream capture pipe showed low slope and indications of blockage.
- Initial proposal was a dedicated drop shaft.



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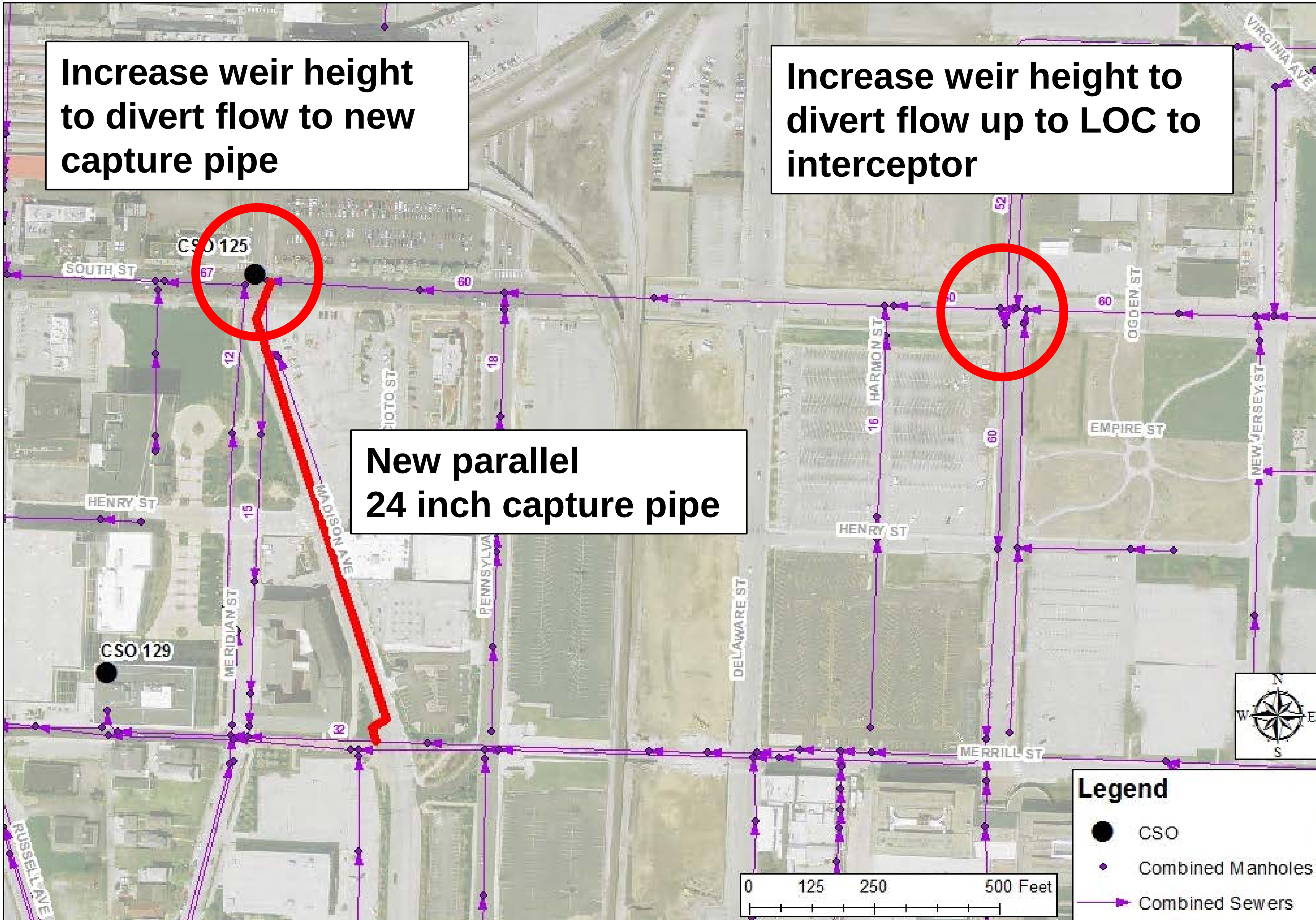
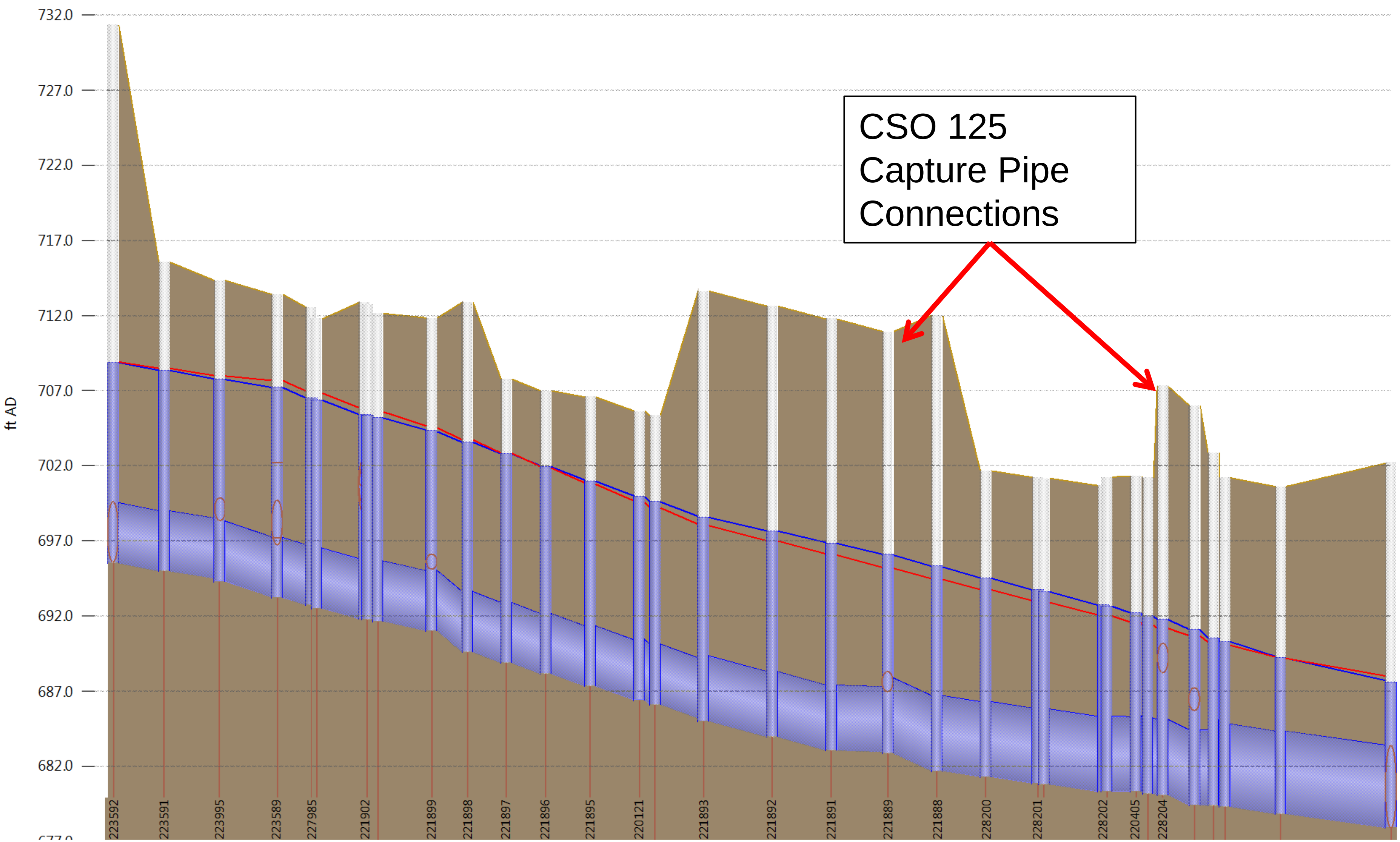
Lower Pogues Run – CSO 125

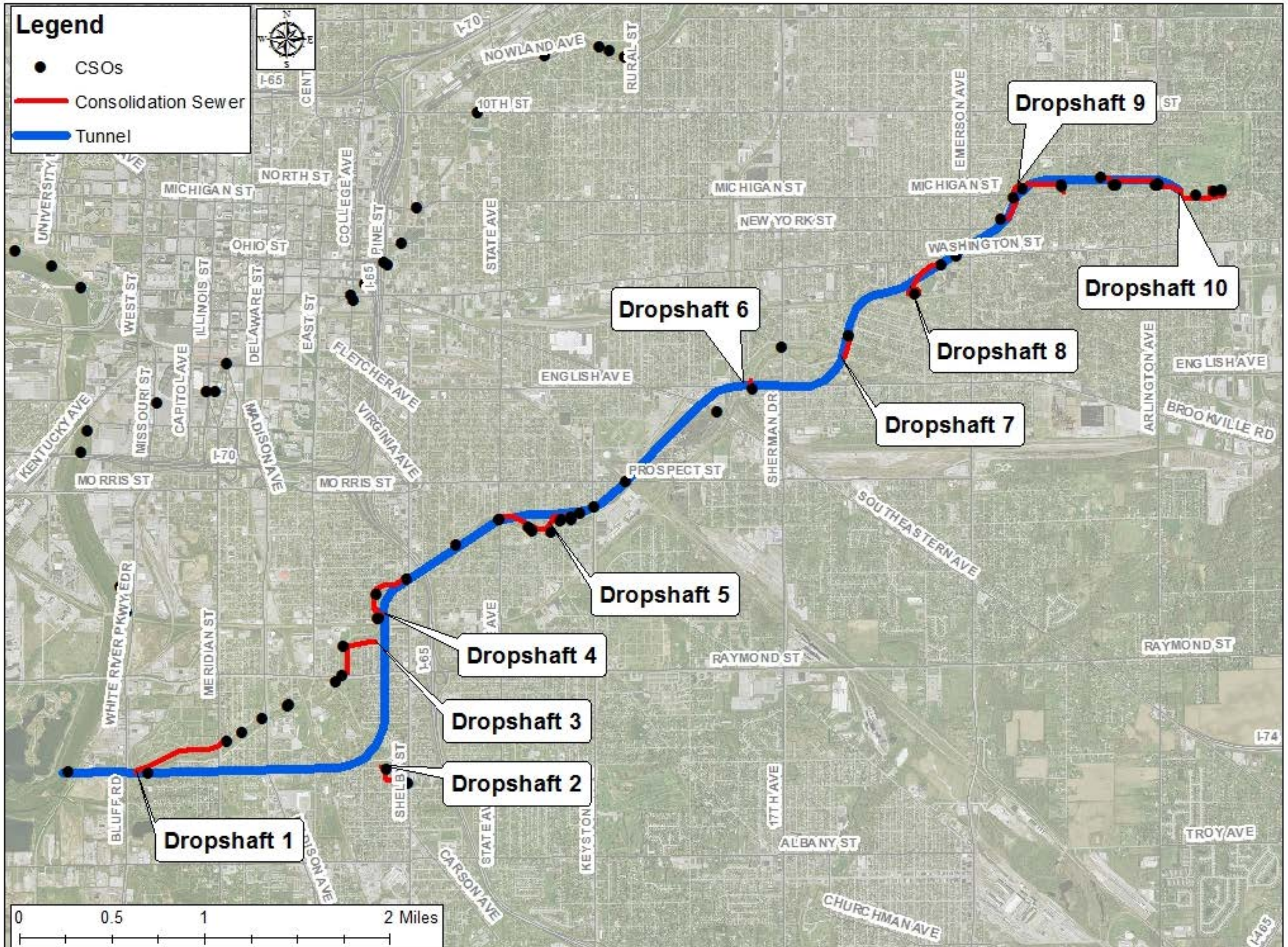


Lower Pogues Run – CSO 125



*The blue line represents future conditions HGL for a 6-Month SCS Design Storm, with the red line indicating existing conditions.

Pleasant Run Tunnel – Original Plan



- 50 CSOs
- 10 Dropshafts
- ~8 miles of tunnel
- ~4 miles of consolidation sewer
- Most Pleasant Run CSOs are relatively low flow and volume
- Tunnel provides more volume than is required for the Pleasant Run CSOs to achieve the Level of Control

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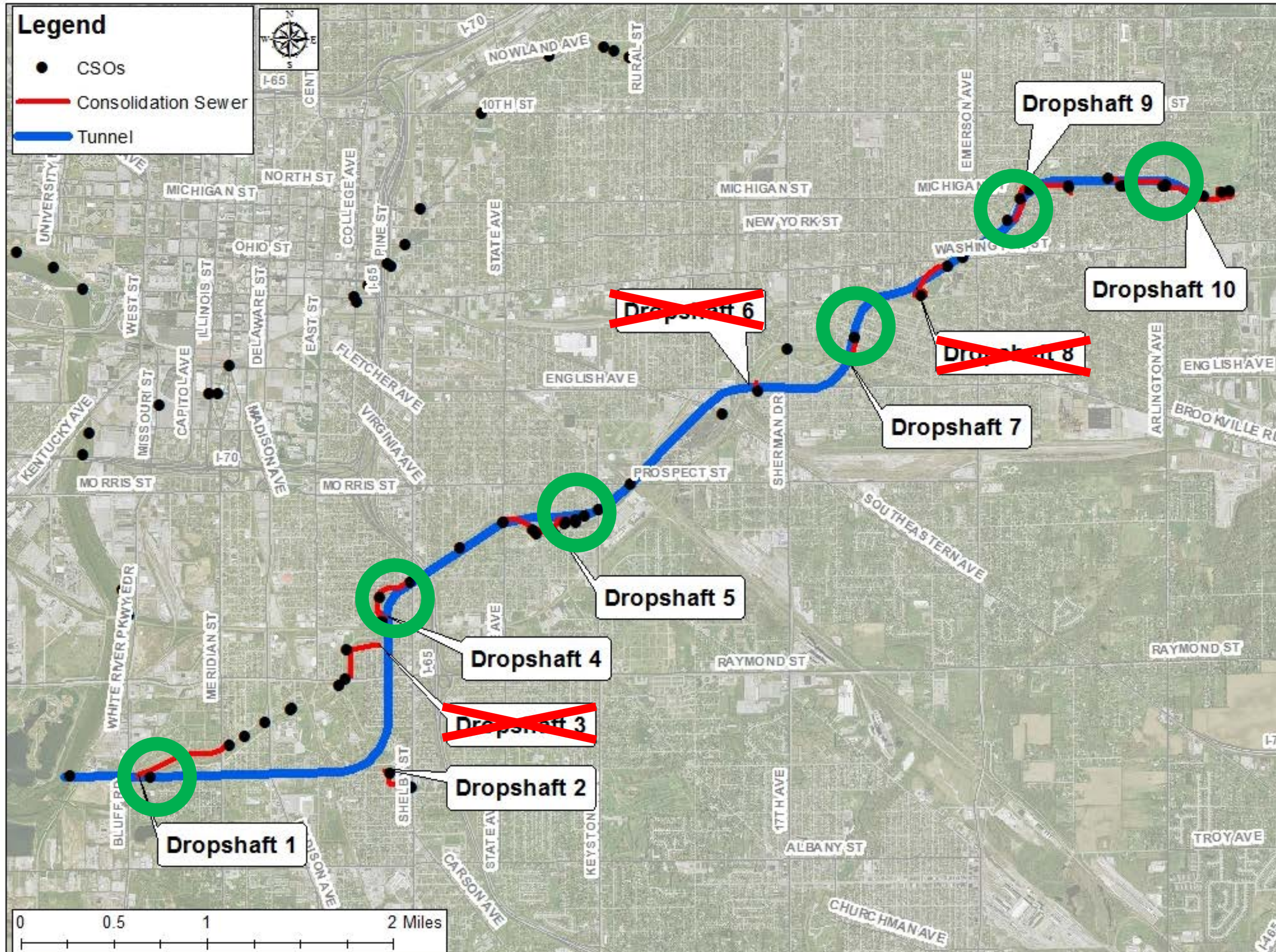
Pleasant Run Tunnel – Modeling Team

Conceptually…

- If Pleasant Run Tunnel can easily accept additional flow, how can we best take advantage of that?
- By strategically offloading the interceptor to the tunnel, we free up capacity in the interceptor.
- If the interceptor has available capacity, it is easier to control the CSOs.
- Many CSOs do not need tunnel connections at all, or can be further consolidated at fewer dropshafts.



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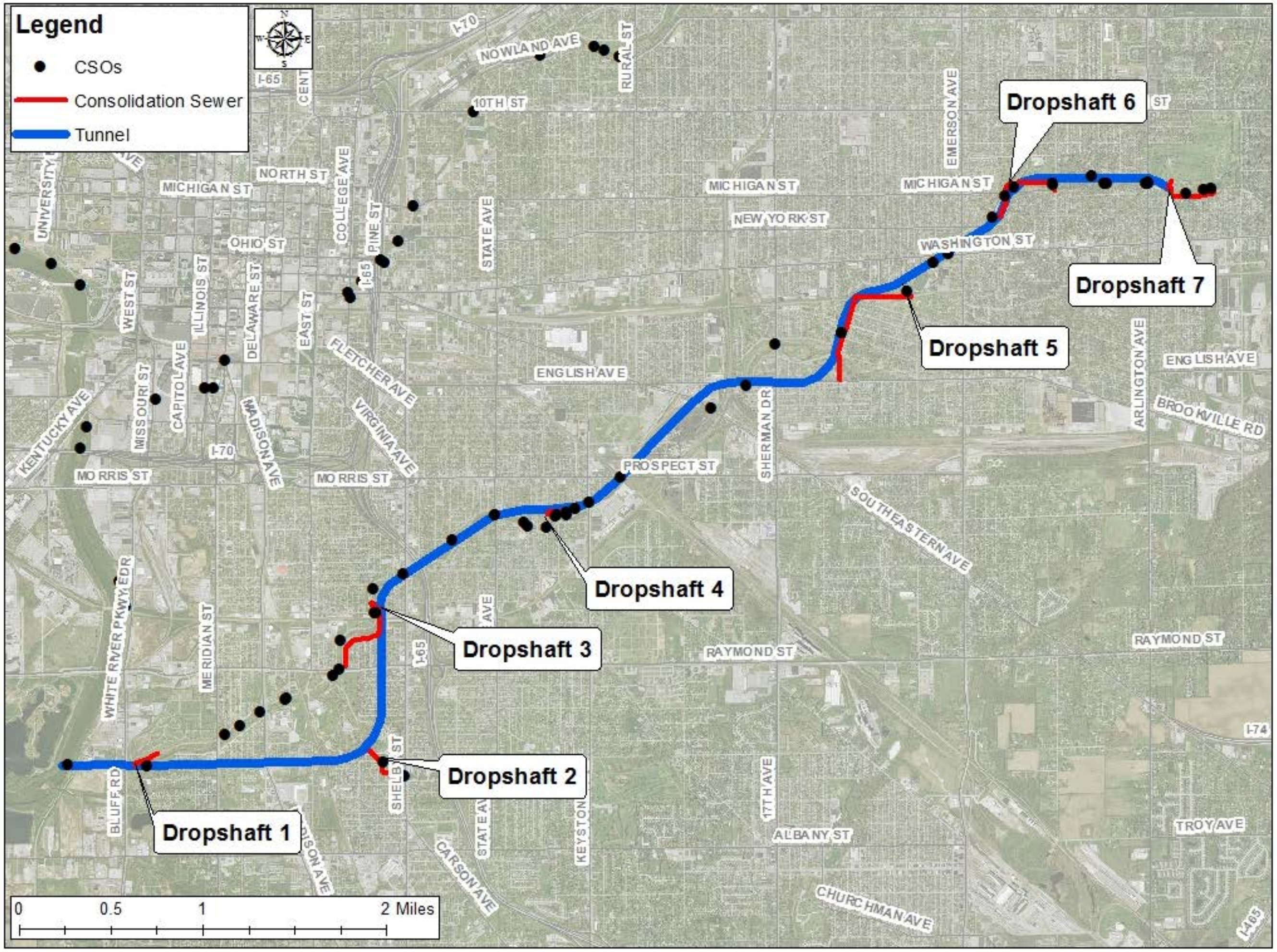
Pleasant Run Tunnel – Modeling Team

- Drop Shafts - 10 to 7
- Consolidation Sewer - 4 miles to 3 miles
- However, there are **limitations** to modeling
- Initial analysis was **too big picture**, with little time afforded for individual CSO areas
- Surface work not feasible and/or too disruptive
- Tunnel alignment change not feasible



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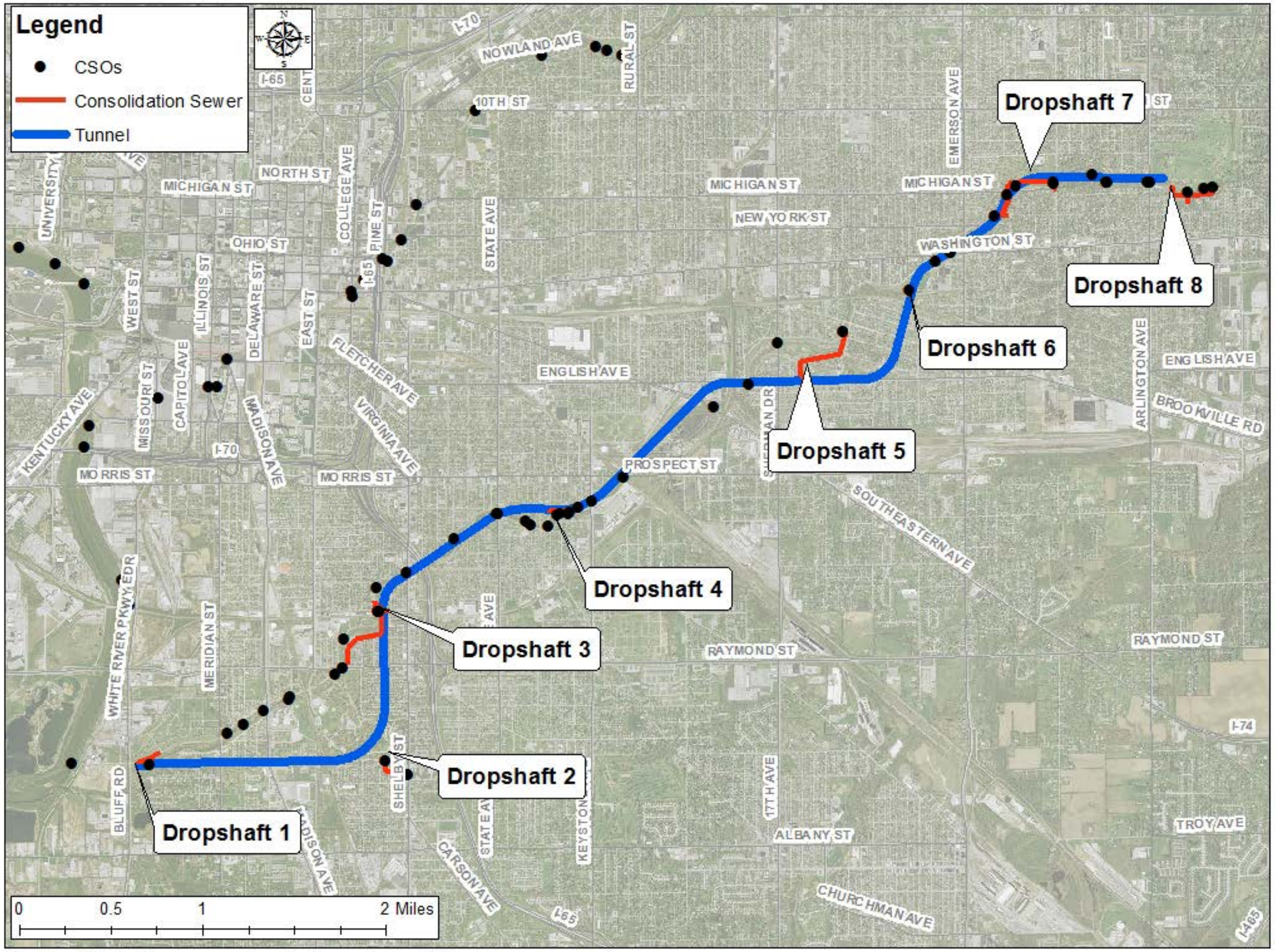
Pleasant Run Tunnel – Design Team



Next Steps

- Continue to work with design team to further refine overall plan
- Incorporate and confirm progressively more detailed design plans into the model
- Improve and optimize as individual CSOs are focused on in greater detail

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Conclusions

- It isn't always a straight line between planning, design, and construction
- Sometimes it is important to take a step back, so you can take two forward
- Always have a mind toward optimization
- Use modeling to efficiently test new ideas
- Depend on design teams to determine detailed viability of modeling conclusions or identify issues

THANK YOU!

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