

Drilling Down:

Evolution of a System-Wide Modeling Analysis from an Optimized Capital Improvement Program to a 3 Zone Pump Station Design, Meeting 14 Functional Objectives

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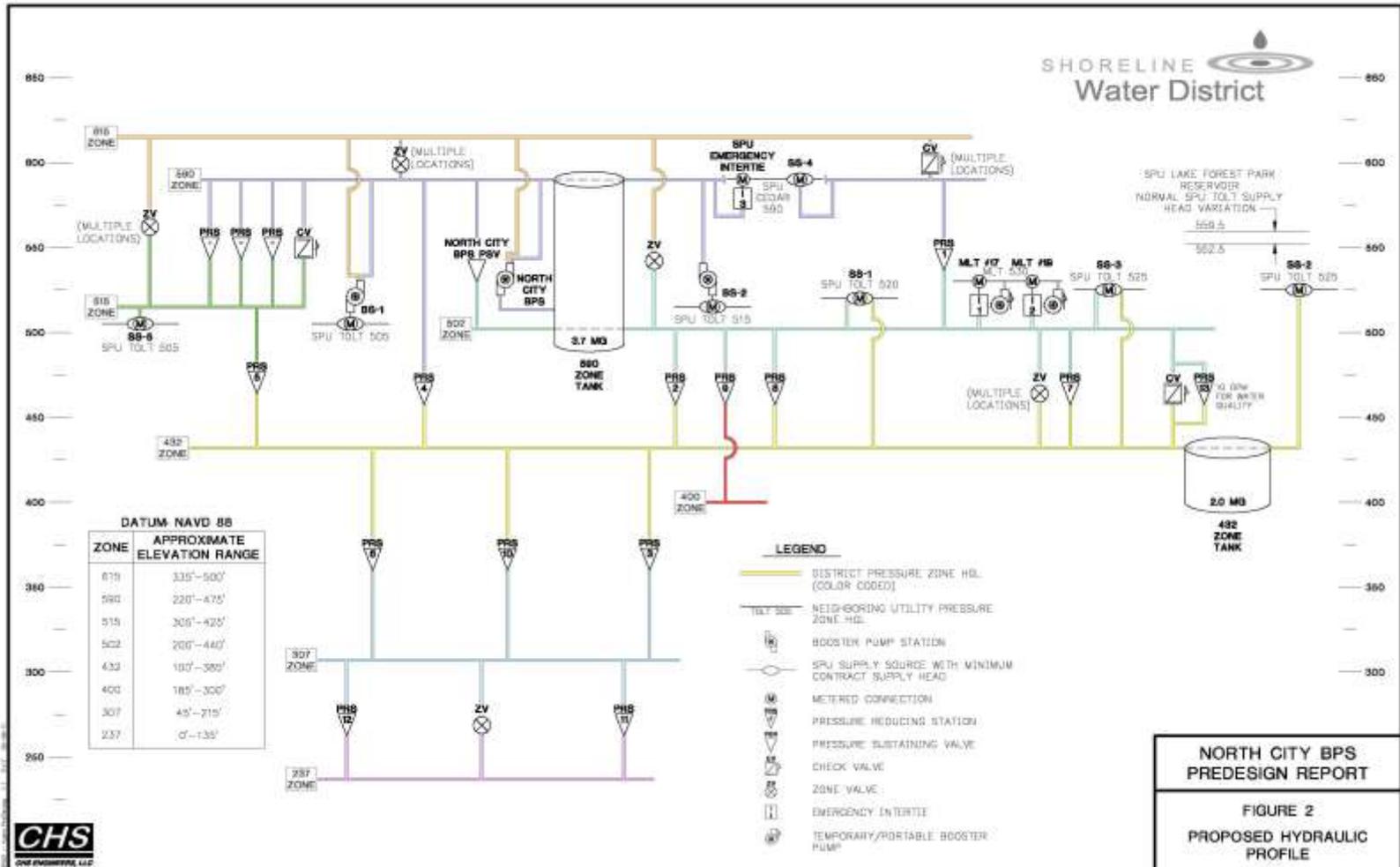
May 4, 2016

Project Location

Pump Station Site



Hydraulic Profile



Evolution of a Hydraulic Analysis

- Model Calibration for WSP Update
- CIP Analysis
- Hydraulic Model as a Tool to Manage System Ops
- Pump Station Optimization
- Fire Flow Capability
- Surge Analysis
- Water Age

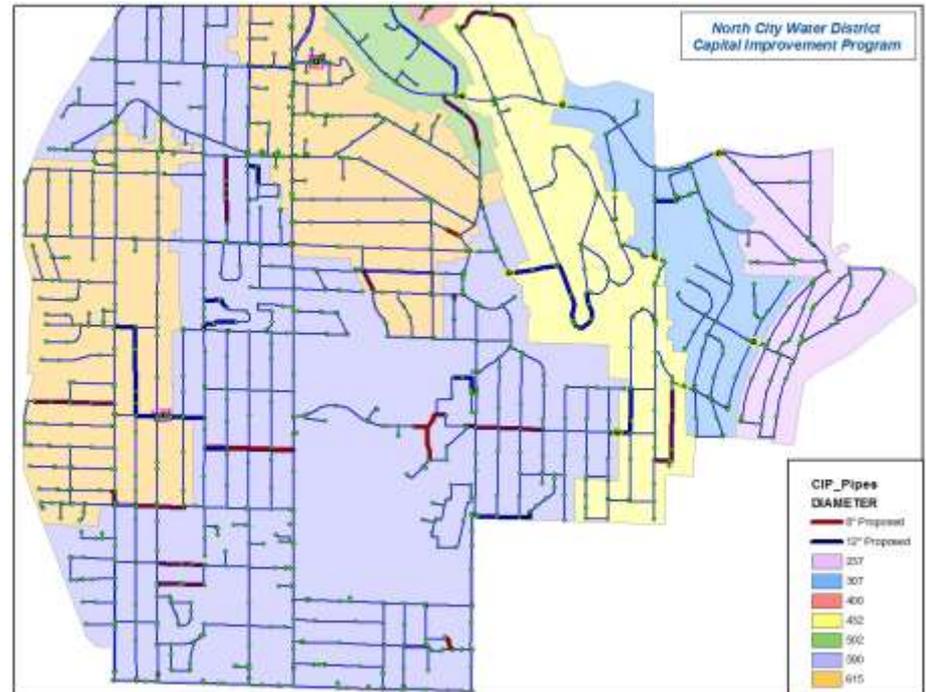
Model Calibration

- Appropriate C-values
- PRV settings
- Operational changes
- Boosted pressure zone response
- Closed valves?



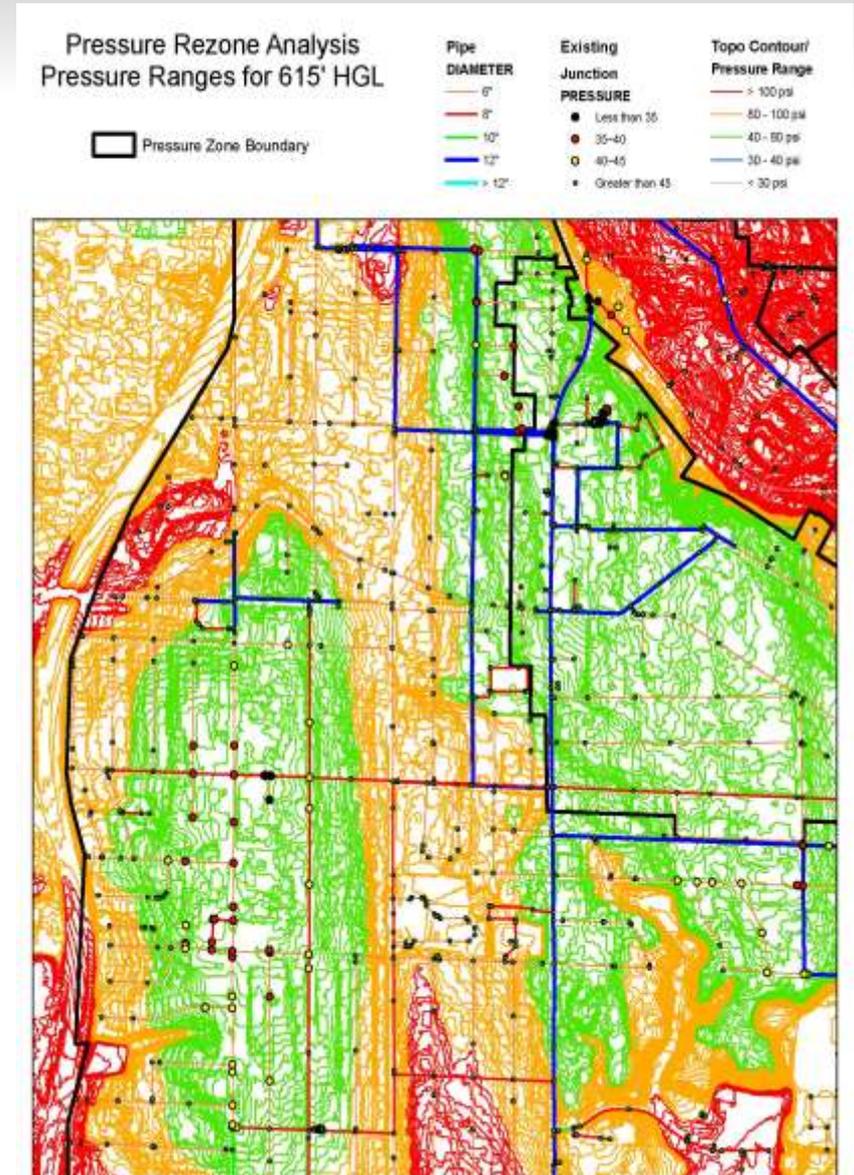
Analysis → Optimized CIP

- Criteria & goals
- Model as a diagnostic tool
- Evaluate for headloss
- Low pressure from high elev vs HL
- Think globally, not locally



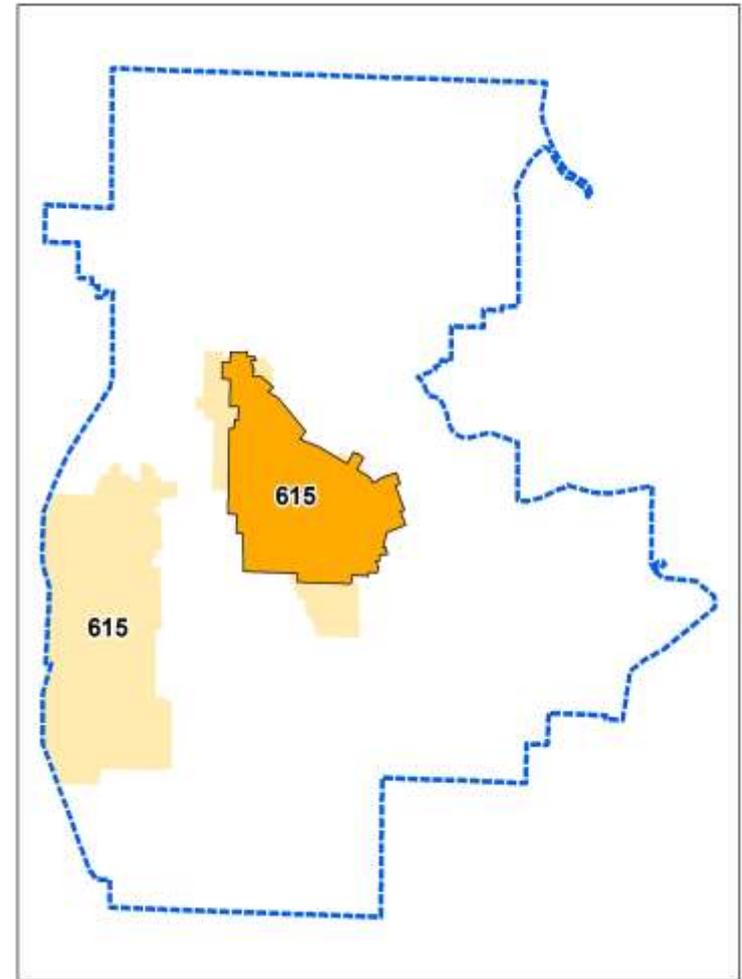
Analysis Identifies Need for Project

- System analysis identified low pressures in existing 590 Zone
- Bolster fire flow capacity for future development
- Provide redundant features
- 14 total functional objectives



Expand Existing 615 Zone

- Expand existing 615 Zone boundary
- Create additional, non-contiguous 615 Zone to service higher elevation area to the west
- 16" transmission line connection
- Additional check valve for fire flow supply

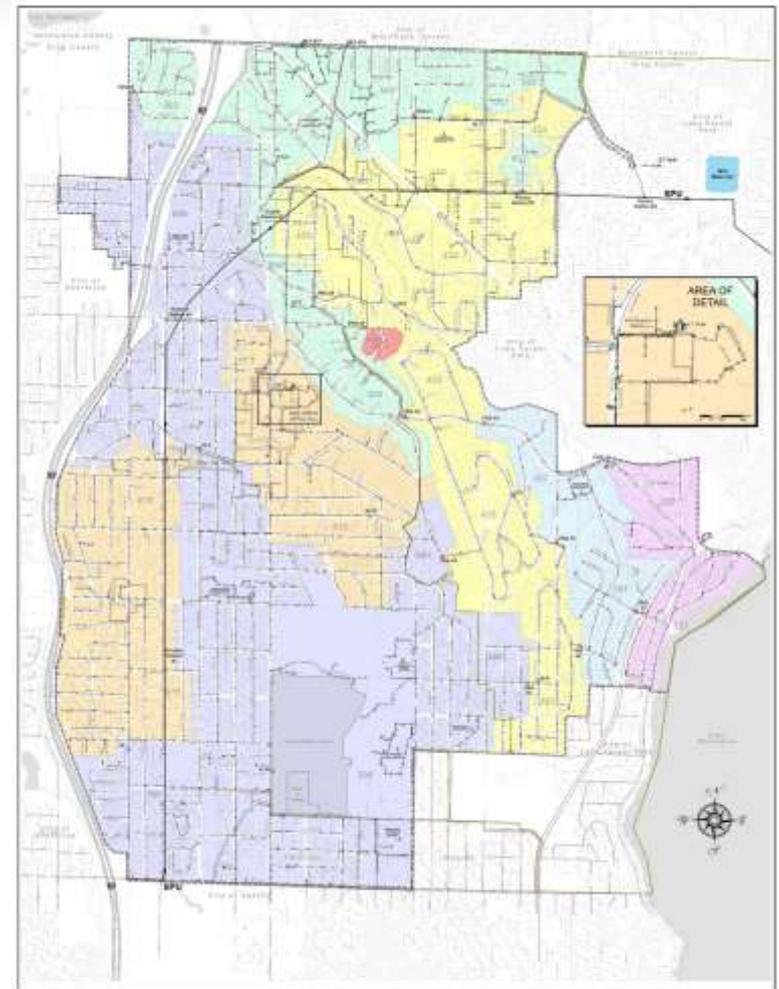


14 Functional Objectives:

- Facilitate water turnover in 3.7 MG tank
- Domestic supply (PHD) to 615 Zone, 40 psi minimum
- Provide additional connection from 590 to 502 Zone
- Provide pressure relief for 615 Zone
- Provide pressure relief for 502 Zone
- Fire flow to 615 Zone w/largest domestic pump out
- ADD to 615 Zone w/3.7 MG tank at min. level
- Provide facilities to use unallocated storage (below fire vol) in 615 Zone
- Provide facilities to use unallocated storage (below fire vol) in 590 Zone
- Provide facilities to use unallocated storage (below fire vol) in 502 Zone
- Provide supplemental pumped fire flow to 590 Zone
- Provide supplemental pumped fire flow to 502 Zone
- Provide ability to isolate 3.7 MG Tank

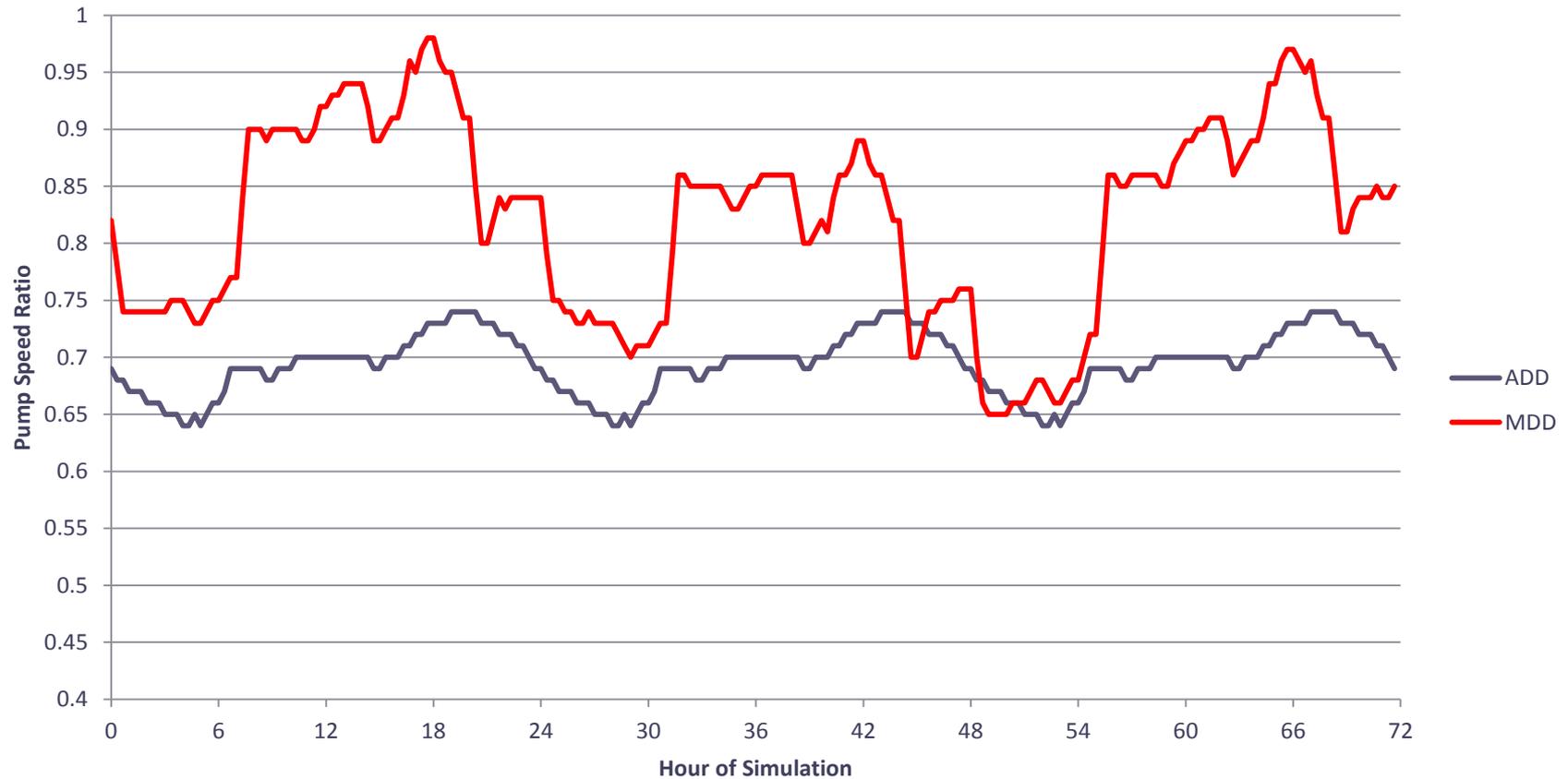
New Pressure Zone Configuration

- Operational impacts of new Zone boundary
- Pumping and fire flow requirements
- Hydraulic surge
- Water age impacts



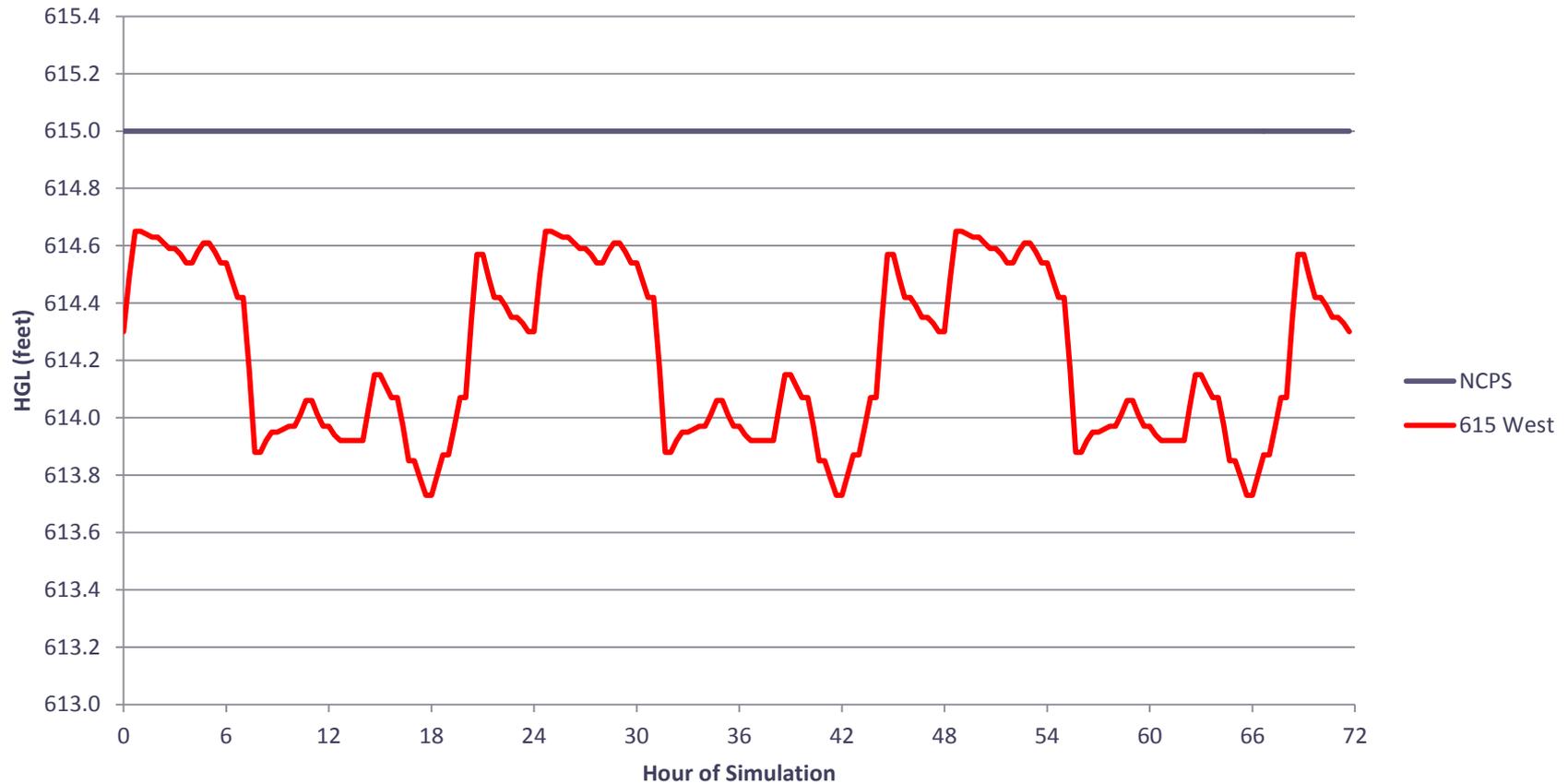
Pump Station VFD Analysis

NCPS Medium Pump: ADD vs MDD Speed Ratio



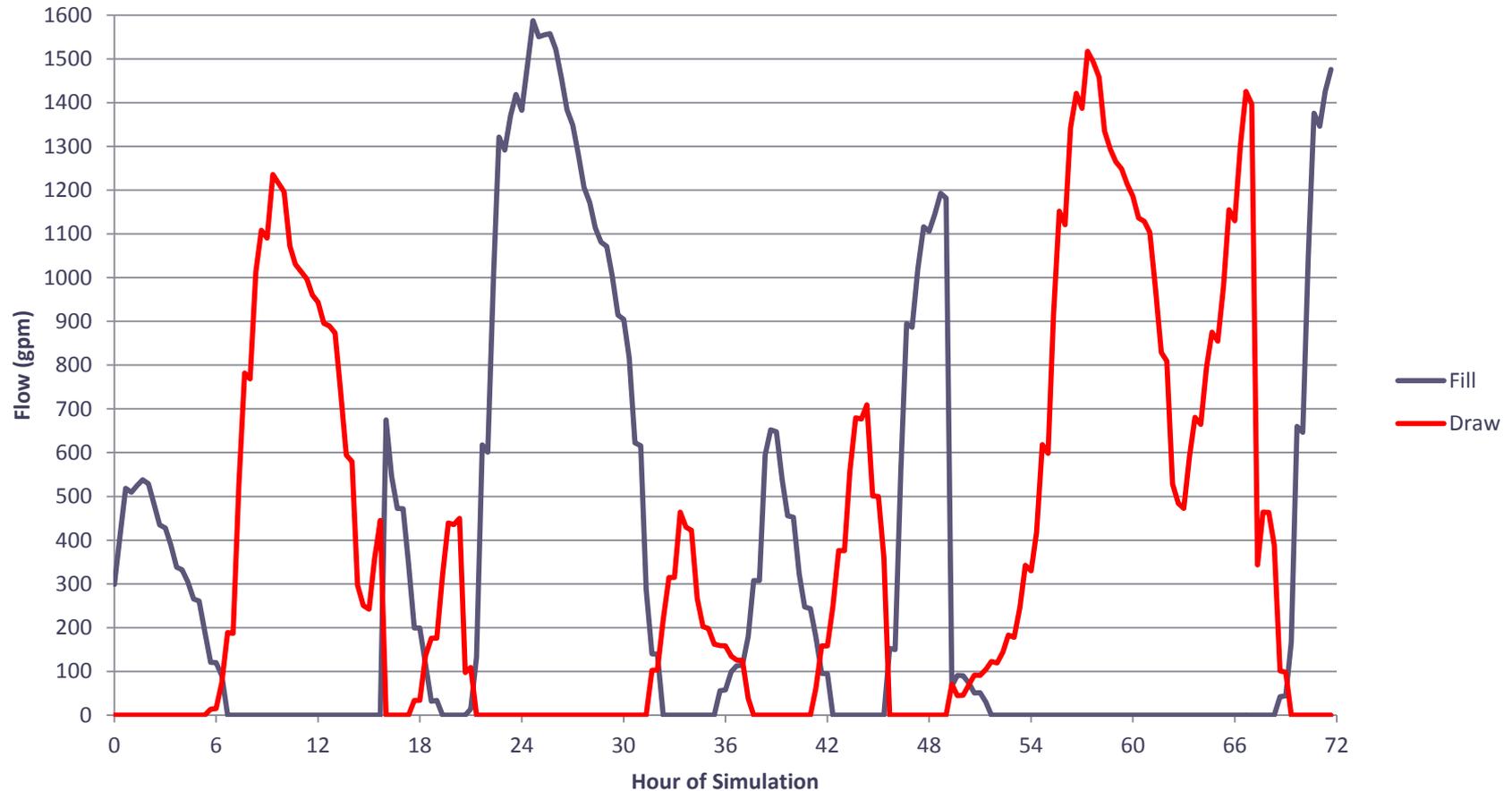
Pump Station VFD Analysis

NCPS Medium Pump:
MDD HGL at NCPS vs 615 "West"



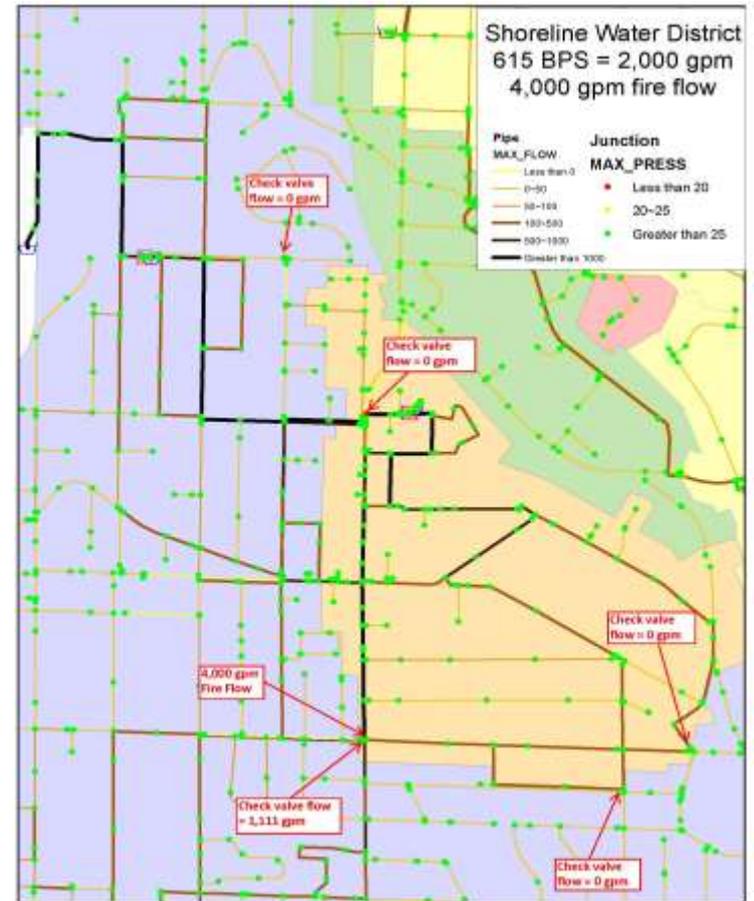
Pump Station VFD Analysis

MDD: 3.7 Tank Fill/Draw



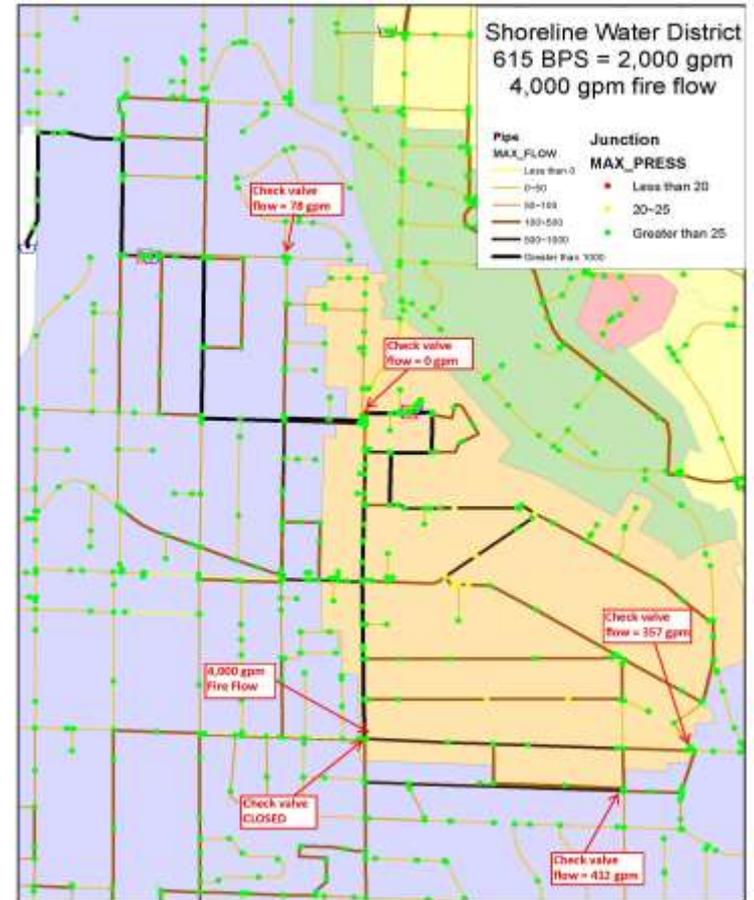
Pump Station Fire Flow Analysis

- Fire Flow Capability
- Check valves vs pump station fire flow supply
- Check valve failure analysis

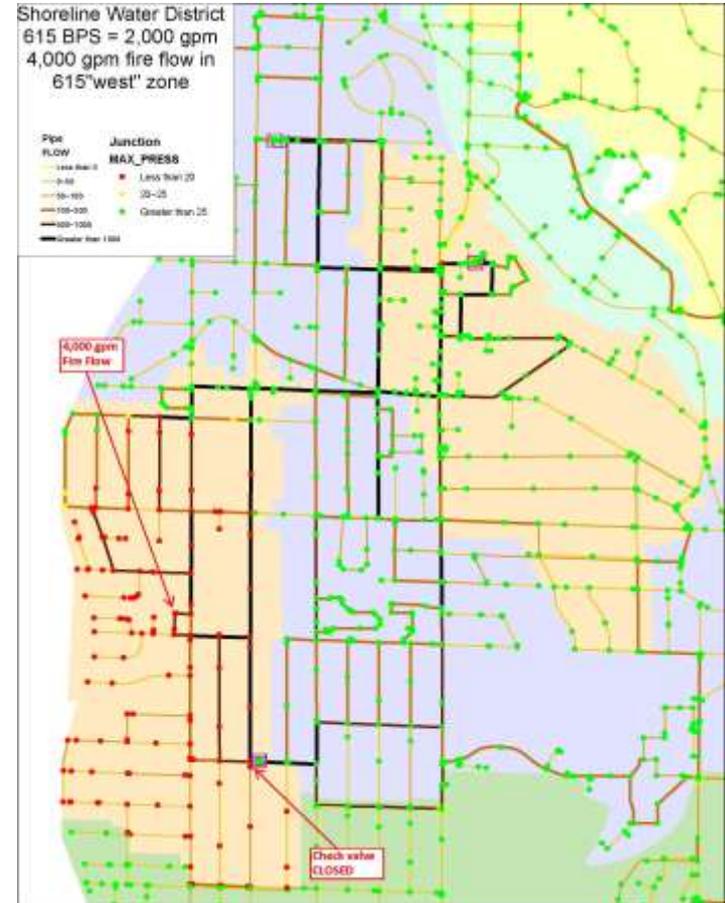
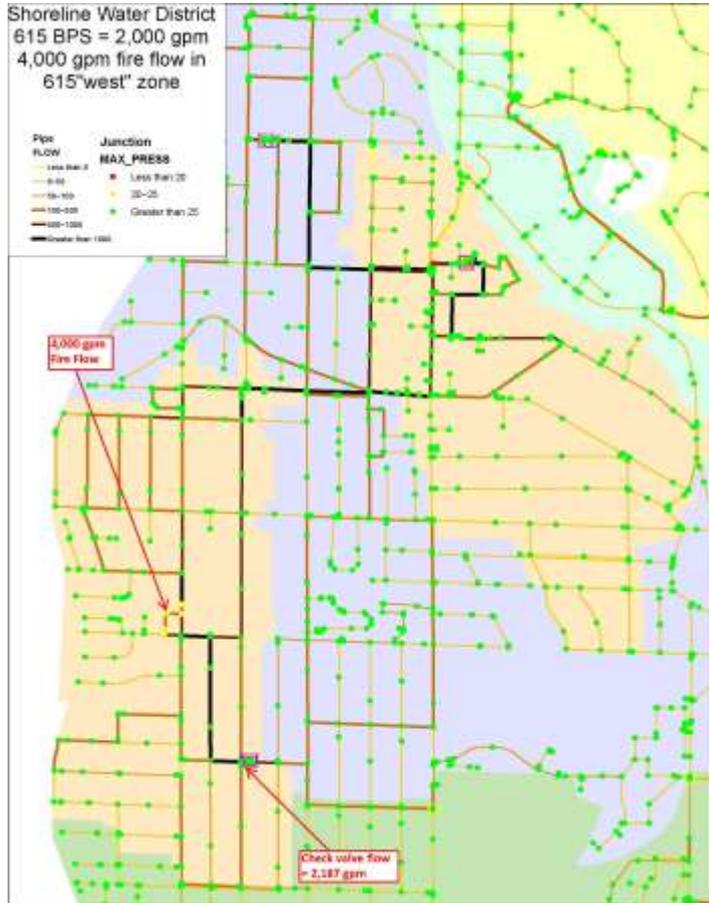


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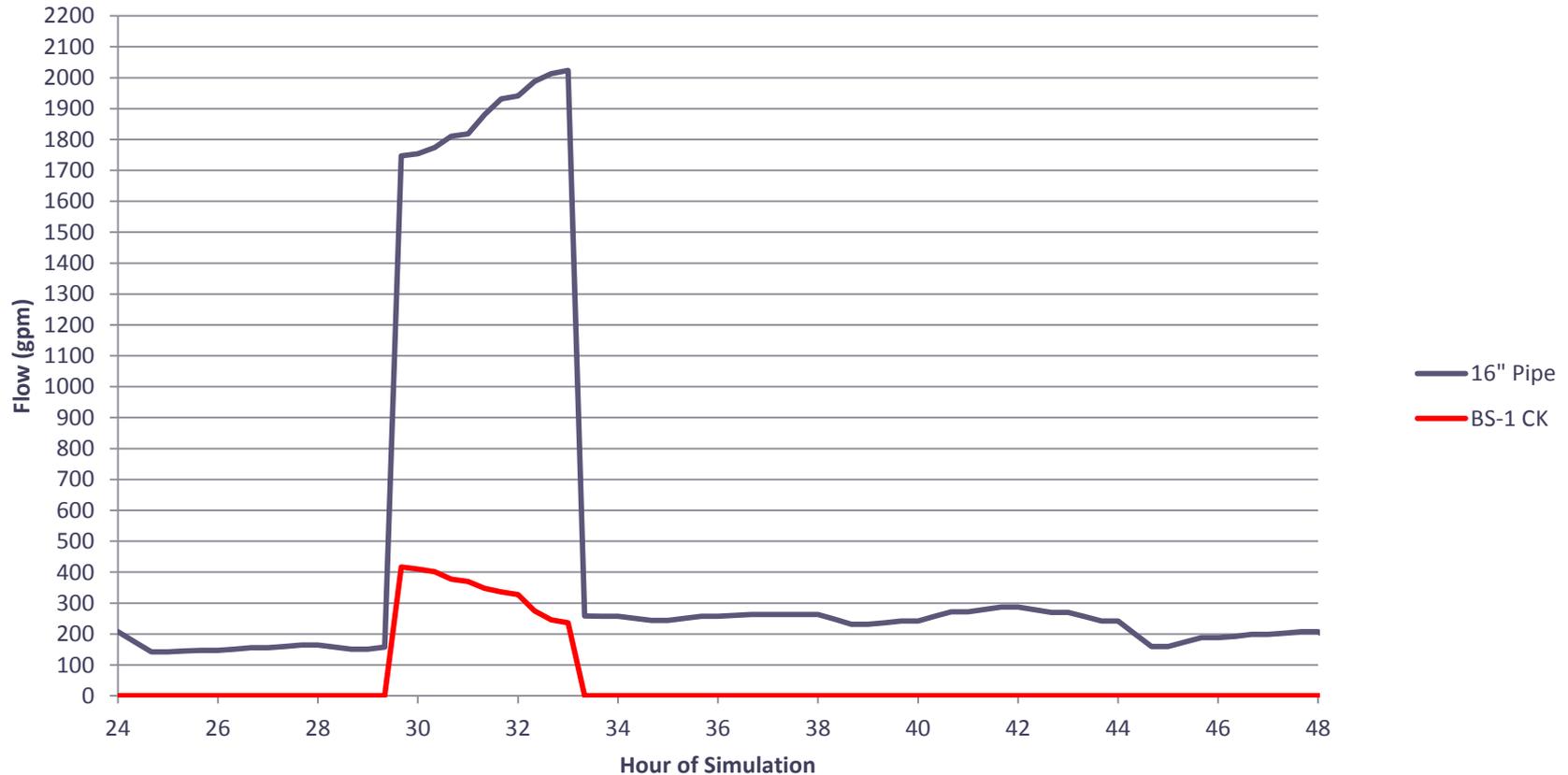


Pump Station Fire Flow Analysis



Pump Station Fire Flow Analysis

MDD + 2,000 gpm 615 "West" Fire Flow
"West" Zone Supplies

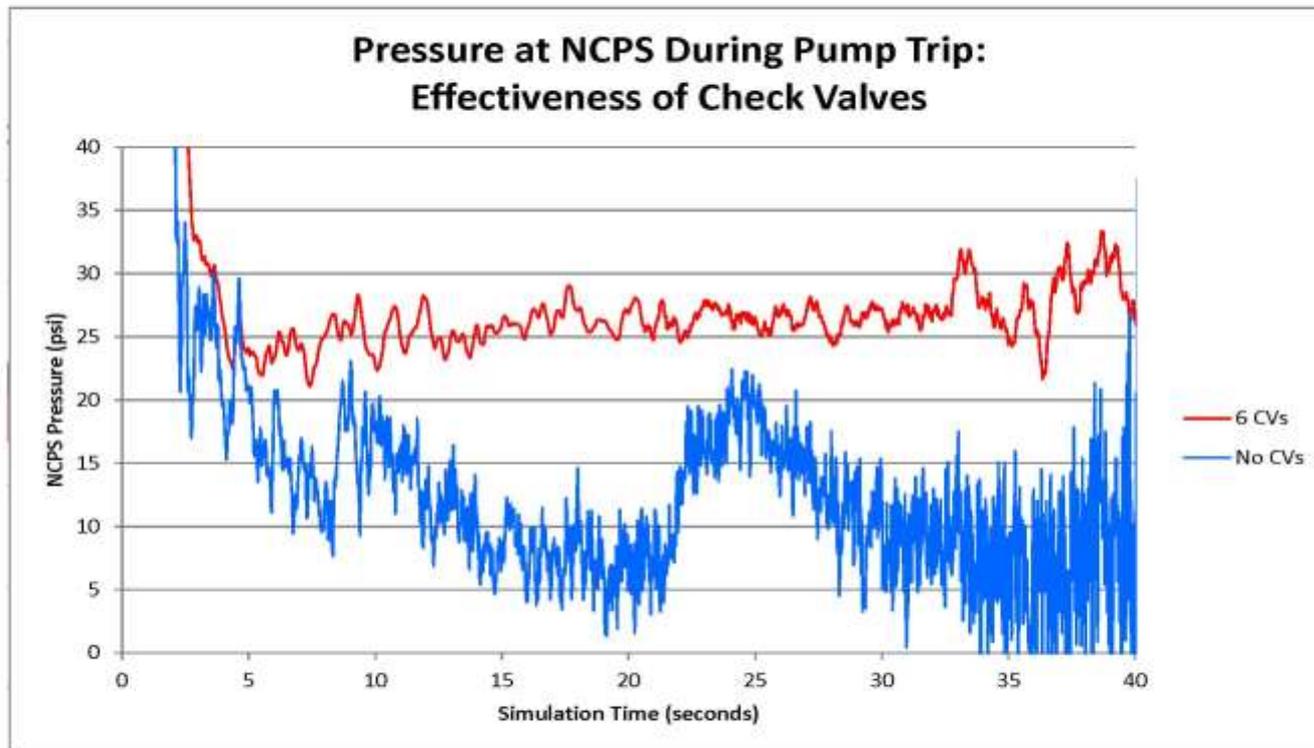


Pump Station Surge Analysis

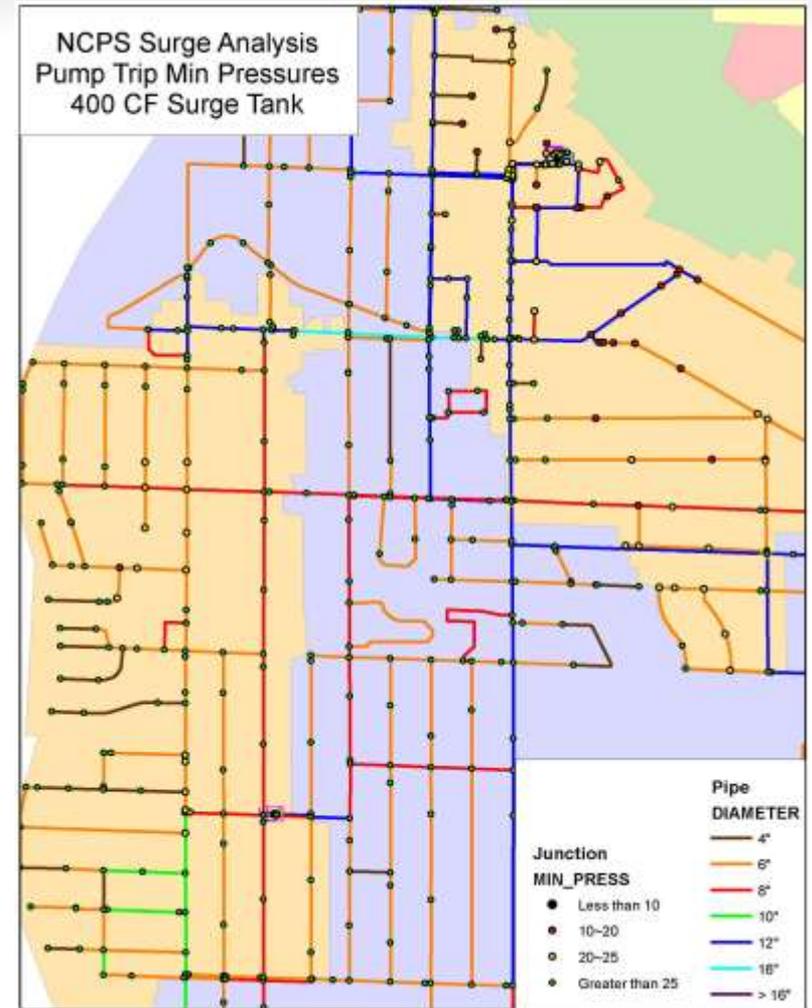
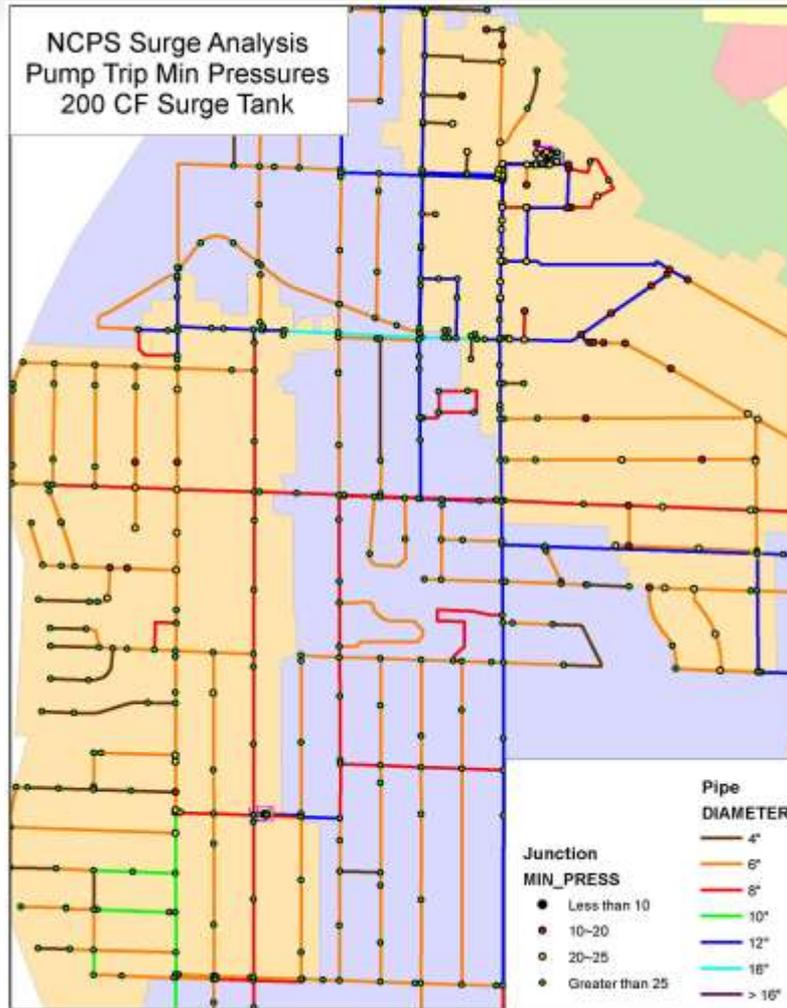
- Minimum surge pressures in the system, not just at the pump station
- Check valve effectiveness in mitigating surge pressures
- Optimize surge mitigation facility



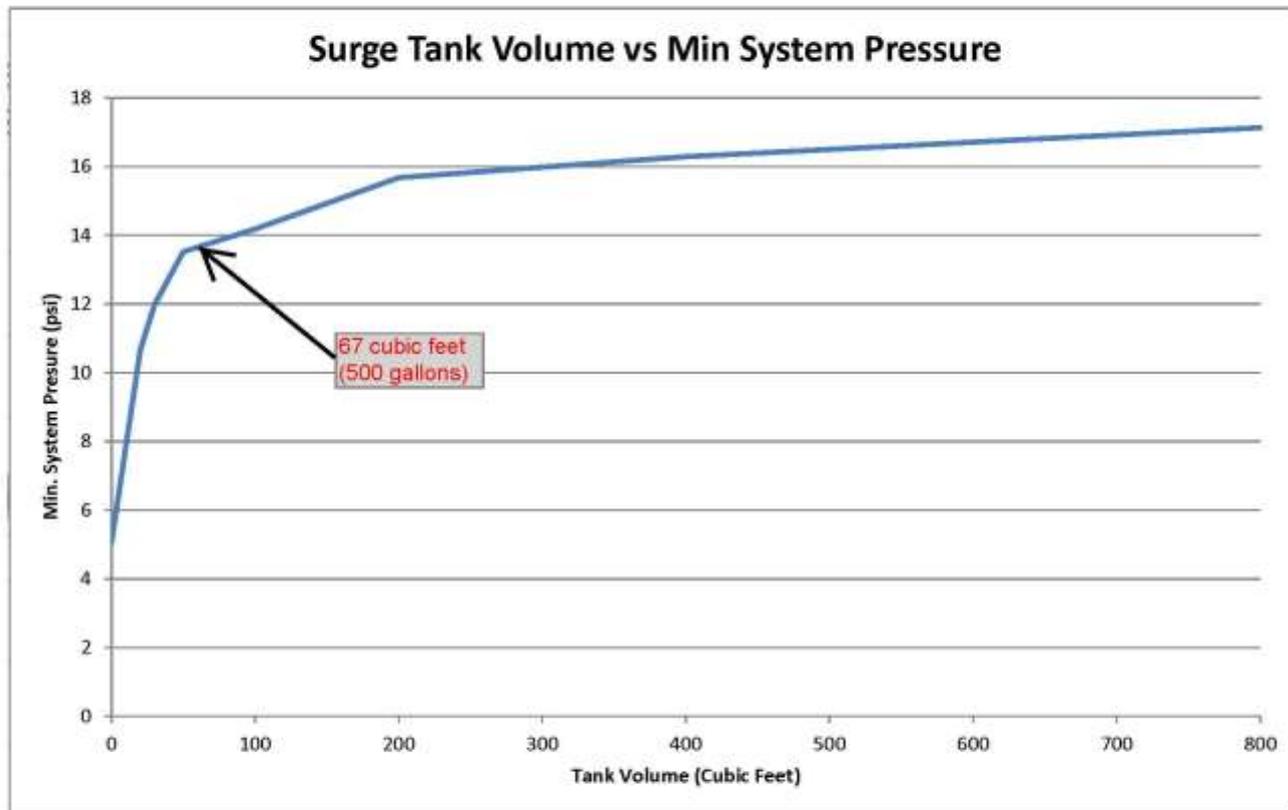
Check Valve Effectiveness in Mitigating Surge Pressures



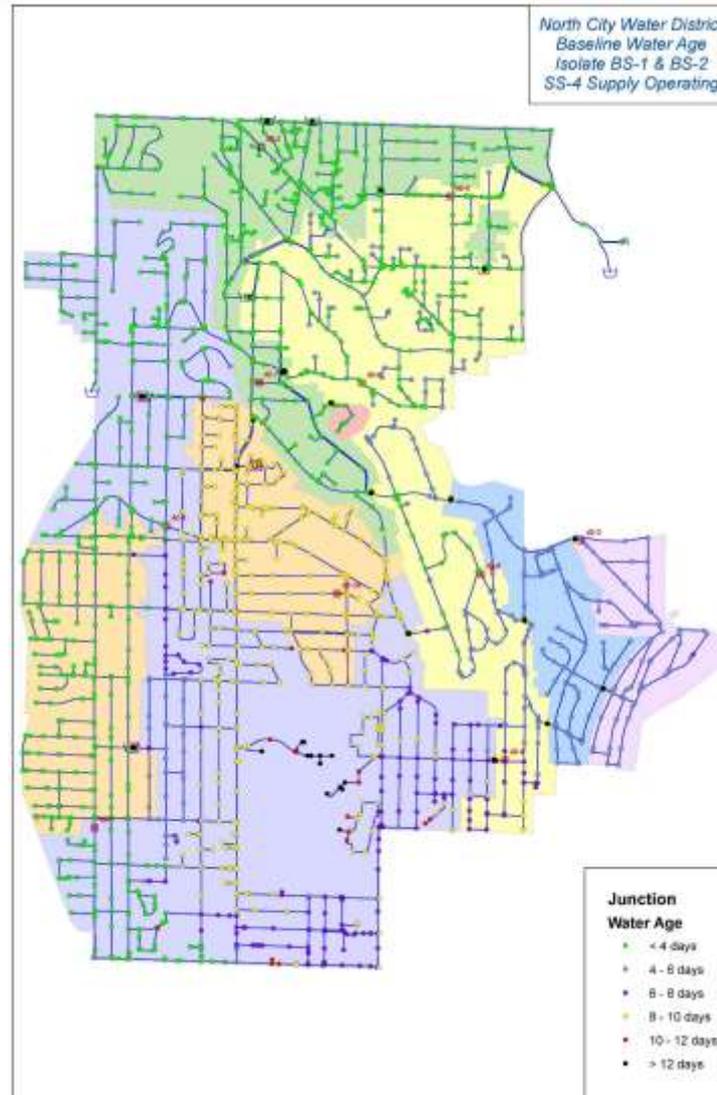
Pump Station Surge Analysis



Pump Station Surge Analysis



Water Age Analysis



Expanded 615 Zone Configuration



Questions