

New Mandate: Grout First, CIPP Line Second for Rehabbing Pipe, Service Laterals, and Manholes in Naperville

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ABSTRACT

As a direct result of a 100-year rain event in April of 2013, the City of Naperville proactively reassessed their I&I program. For the ensuing years, priorities changed, projects were let, lessons were learned, and beliefs evolved. Tony Conn, Manager Water Distribution & Collection Division for the City of Naperville, IL is chief story-teller and his convictions are strong. John Manijak, Business Development/Estimating Manager with Michels Corporation brings the contractor perspective and Donald Rigby, VP Marketing & Education for Avanti International team-up on why injection grouting and CIPP Lining are not mutually exclusive methodologies, they are complementary and both are required to shut-down I&I to fully rehabilitate structures in the collection system. I&I is the root cause of the demise of our collection system, reducing critical lifecycle of our assets and leading to more costly structural rehabilitation or replacement.

The following details the city's I&I problem and the 'Grout First, Line Second' solution approach the City of Naperville administered.

KEYWORDS

Collection Systems, Groundwater, Infiltration & Inflow (I&I), Mainline Rehabilitation, Lateral Rehabilitation, Manhole Rehabilitation, Injection Grouting

THE CITY, THE PROJECT

The City of Naperville is located 30 miles west of the Chicago Metro area and has a population of 145,000 making it the fifth largest city in Illinois. Its sanitary system includes 540 miles of sewer mains, 41,822 residential and commercial customers with 41,767 lateral connections, 13,372 manholes, 22 pumping stations, and 7 back flow stations, managing an average daily flow of 17 MGD and peak flow of 55MGD at a single WWTP. The utilities department is self-funded through rate-payers and has made it their objective to provide reliable, high quality, and cost effective service to their customers. Utilizing their own mainline and lateral sewer televising equipment, Naperville's PACP and LACP certified operators were able to make comprehensive condition assessments of their underground systems and build an action plan.

THE PROBLEM

The focus of Naperville's renewed effort was directed toward a northern sub-division named Cress Creek. In April 2013, the Cress Creek neighborhood received nearly 7.50" of rain over a span of 48 hours causing widespread flooding and street closures. With clear evidence of structural decay, CIPP Lining and manhole rehab was a natural choice, however the groundwater levels were consistently higher than the sanitary trench and infiltration was so great, they could not proceed with lining until the active leaks in manholes, mainline joints, lateral connections and lateral joints were stopped to avoid resin wash-out..



Figure 1. Widespread flooding in Naperville, IL

HOLISTIC APPROACH – TARGETING INFILTRATION AT ALL FOUR POINTS OF ENTRY

According to Tony Conn, "Lining does not eliminate infiltration—it reallocates the flow of infiltration to another entry point. It is imperative to seal the entire system." Sanitary trenches allow for groundwater to flow freely throughout an area. As water inflow is eliminated in one area, infiltration is commonly noticed in another. This is often seen when mainlines are lined. Water will make its way through the annular space present in CIPP and enter the sewer line at the reinstated lateral connections and manhole terminations. Groundwater levels will also rise and find their way to laterals and manholes. With a top-down approach, the project plan called for grouting laterals first, followed by mainlines.

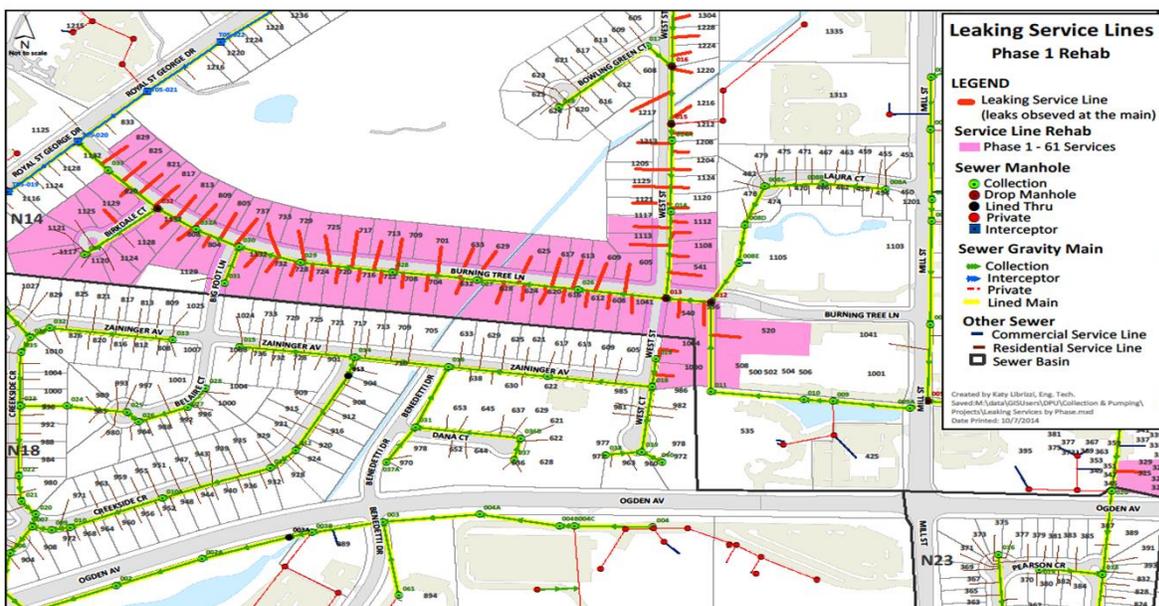


Figure 2. Naperville Cress Creek Solution for Leaking Service Lines

After each step in the rehabilitation process, the groundwater levels continued to rise. Upon completion of the grouting and CIPP lining, the walls of manholes began to leak. Prior to grouting and lining, the manholes showed no signs of infiltration. Manholes were the final step. After the structures were sealed with grout, the manholes were lined, completing the holistic approach to infiltration elimination.

Not only does this inflow of water and material contribute to debris with the pipeline, it also leaves a void on the exterior of the pipe, allowing the pipes to shift and break over time. Injection grouting does not only stop infiltration by creating a seal on the outside of the joint, it also creates a matrix with the soil to stabilize the pipe, fill the void, and replace the missing support system of the pipe.

THE RESULTS

Flow meters located in the grouting area (Burning Tree) provided data before and after the rehabilitation project. Flow reduction of 13.5% was immediately apparent. For the entire project area, a reduction of 340,000 gallons per day was achieved. Given an industry wide \$3 per 1,000/gallon treatment cost, the project will pay for itself in the first six years.

Inspired by the results of this project and the grout first approach, Tony Conn has new mandates and clear processes in place for mainline, laterals and manhole rehabilitation beginning in 2017.

Mainline Pipe-- All CIPP Lining projects require mainline grouting first.

His reasoning is clear—when lining is required, not only does injection grouting make it possible, grouting makes for a more durable, long-term solution.

Service Laterals-- Going forward, lateral grouting is now a three-step process thanks to the city-installed clean-outs:

- Step 1: Mainline-lateral connection—grout with remote packer from the mainline
- Step 2: Mainline to clean-out—grout from the clean-out to mainline with push-packer

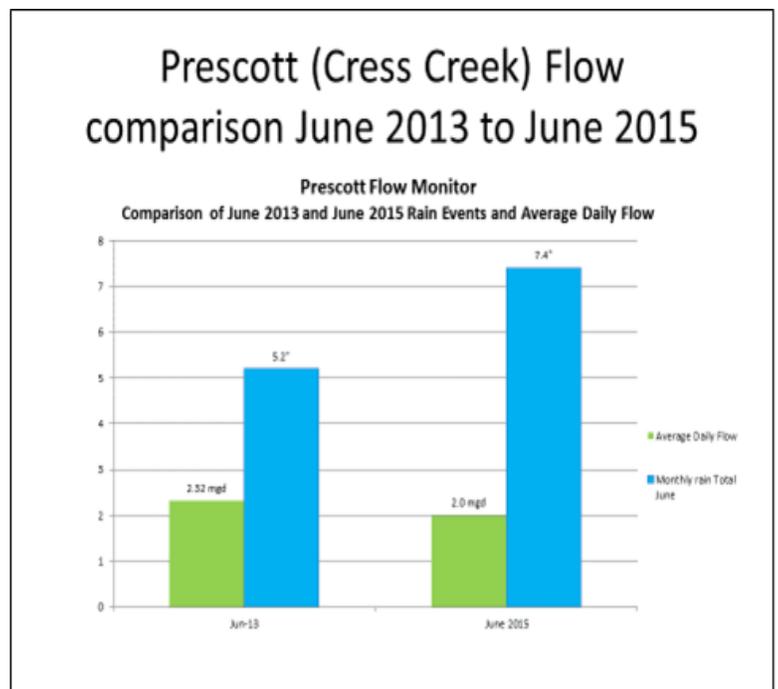


Figure 3. Flow Comparisons – June 2013 and June 2015

- Step 3: Clean-out to Foundation—grout from the clean-out to home/business foundation with push-packer.

Manhole Rehabilitation

- Step 1: Grout first to stop active leaks using
- Step 2: Prepare surface with cement coating
- Step 3: Epoxy Liner applied at 250 mil

Case in point: At the epicenter of downtown Naperville, a brick manhole failed. As opposed to disrupting the busiest intersection for weeks, in just three short days with crews working overnight applying the above three-step Manhole Rehab process, the emergency project was 110% successful. Citizens never knew there was a problem, but Tony Conn knows the city saved \$80K and tons of grief by rehabbing versus replacing.

CONCLUSION

This paper and presentation introduces new thinking from an authority of 26 years responsible for the performance of the collection system and his greatest reward is successfully avoiding a rate increase for the citizens of Naperville. With additional perspectives from the contractor and technology provider regarding execution and scientific facts, the common cause of I&I elimination is well served for municipal stakeholders and consulting engineers.