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THINKING REGIONALLY

Charlotte Water's expanding footprint will pave the way for growth while protecting local resources

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Nicole Bartlett
Manager, Engineering Division
Charlotte Water

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PIPELINE AND INFRASTRUCTURE, HYDRANTS

ON THE COVER: Nicole Bartlett, Engineering Division manager for Charlotte Water, at the construction site of the $380 million Stowe Regional Water Resource Recovery Facility.

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A COLLECTIONS SYSTEM'S SILENT KILLER

Knowledge and awareness are keys to getting a handle on I&I

By John Manijak

National studies have shown that laterals contribute as much as 50% to more than 80% of a system's I&I.

You've heard the phrase "I&I," but do you truly know how much they influence your collections system daily and, ultimately, how they determine where the increased budget you are going to need will be spent? Like a pandemic, I&I starts off small and silent but, if left uncontrolled, they will become the most influential factor on the operation, maintenance and condition of a system.

So, let's define it. The term "I&I" stands for "inflow and infiltration." Inflow is the surface water that enters a wastewater collection system through roof, yard and footing drains. It also comes from storm drain cross-connections and openings in manhole covers. Where does the surface water come from? It is a result of rain, snowfall and spring melt events. Inflow is the immediate injection of that excess water into a system. It can be easily identified on a sewer flow monitor as that initial high point during and shortly after such events.

Infiltration is groundwater that enters a wastewater collection system through holes, cracks, fractures, open joints, break-in connections or dead-end, open pipes — anywhere water can find its way in. This includes not just the mainlines but also manholes and laterals. Infiltration originates from surface water that is filtered through the ground. It can also come from other sources such as natural springs, lakes and leaking water mains.

According to ASCE's 2021 Report Card for America's Infrastructure, the U.S. wastewater footprint includes 800,000 miles of public sewers, 500,000 miles of private sewers and approximately 21.6 million manholes. This vast system was installed within interconnected trenches that form a superhighway for groundwater, allowing it to easily flow throughout and encapsulate underground pipe systems seeking open points to enter.

There is a twofold detrimental effect caused by I&I. First is the initial impact of a surge of water into a treatment system, contributing to sanitary system overflows and an outpouring of capital funds needed to treat this excess water. The long-term effects of I&I on a system are less obvious. If you are monitoring charted sewer flow data before, during and after an event, your actual flow has an initial quick increase followed by a gradual return to a normal level. This is inflow. On the other hand, infiltration is hidden within what is known as the normal flow level. As water flows within the trench and enters the system it breaks down and carries with it bedding materials contributing to sewer debris and the long-term destabilization of a pipe system due to the loss of trench backfill. Over time, pipes begin to shift and eventually break, leading to other costly situations in the form of blockages, emergency repairs and replacement.

A classic example of the amount of clean water that you are unnecessarily treating because of infiltration is this: If you have a 300-foot section of sewer pipe with 3-foot joints (100 total), and 10% are leaking at 0.25 gallons per hour, the excess amount of water in that section is 2.5 gallons per hour or 60 gallons per day. Over 365 days the total amount of excess water has reached 21,900 gallons for that single section of pipe. And this older analysis doesn't include the No. 1 contributor to I&I. National studies have shown that laterals contribute as much as 50% to more than 80% of a system's I&I. It also does not include manholes and cross-connections.

Where do we begin? Cutting the head off this two-headed snake may not be a priority for you yet because you may be planning a multi-million-dollar plant expansion or too busy chasing down sanitary sewer overflows and pipe failures. But knowledge and awareness are keys to a good start.

This is the first article in a series from NASSCO's ICGC committee focusing specifically on infiltration in the collection systems — mainlines, laterals, lateral connections and manholes.✦

John Manijak is a member of NASSCO's Infiltration Control Grouting Committee.