inSITES
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a model LIFE

Sewer Modeling: Anticipating What Happens Down The Line

Most people don't give a second thought to their community's or district's wastewater collection system. That's not necessarily a bad thing, because it likely means that the system is working well. A few people, however, have to think about it to ensure the system is, indeed, working and will continue to perform as the co mmunity which relies upon it changes and grows. What is the system's capacity? How can we prevent backups? What would result if there were a clog or a lift pump were to break? How will the system accommodate new development? Does it comply with regulatory requirements? These are all questions that utilities and wastewater professionals (e.g., wastewater operators, city administrators, district directors, technical staff, regulators, and municipal engineers) consider as they work to ensure collection systems meet regulatory requirements as well as the current and projected needs of their communities or districts.

A good place to start addressing these questions is with a collection system analysis. Such an analysis takes a look at current usage as well as the system's existing equipment and its condition. The utility or wastewater professional uses this information as a foundation for developing maintenance schedules, recognizing and thus minimizing potential problems, and planning future extensions.

Before You Begin

The first step is to develop a comprehensive collection system map that illustrates all of the system's elements—gravity collection mains, manholes, pressurized force mains, lift stations, etc. Further, the map should identify pipe ages, depths and types, lift station information, etc.

Beyond itemizing the components that comprise the system, the analysis is only useful if it also identifies whether these elements are in good shape, in need of immediate replacement, or somewhere in between. Televising gravity mains, inspecting manholes, flow monitoring for inflow and infiltration, and checking lift station pumping capacity can all be used to determine the system's current operating conditions.

Small System Analysis

For systems with one or two lift stations, a municipal engineer can look at this "snapshot" of the existing system and calculate the impact of new development or other changes in demand as well as the remaining useful life of the equipment and components. A fairly straightforward system requires a fairly straightforward analysis.

Large System Analysis

Larger systems with multiple lift stations and various pipe sizes and types present a greater challenge. While an engineer can manually calculate the effects of time and change, a computerized model of the system may be warranted.

Computerized modeling shows how sanitary collection system components are working together on a real-time basis. The engineer is able to run "what ifs," evaluating, visualizing, comparing, and predicting the system's response to changes in loading, weather events, improvement projects, new developments, or any number of scenarios. The engineer can then make decisions or recommendations based on these results and address current and potential problems revealed by the analysis (e.g., capacity bottlenecks, backups, etc.).

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public SIGHTINGS

After 32 years as Crow Wing County, MN, engineer, **Duane Blanck, PE,** has retired. He is succeeded by **Lyndon Robjent, PE.**

Garrison Hale has been named the new city administrator of Little Falls, MN.

Craig Gray, PE, is serving as the new Bemidji, MN, city engineer.

Bemidji, MN, city manager **John Chattin** has been elected to a three-year term on the League of Minnesota Cities Board of Directors.

Rita Albrecht has joined the Headwaters Regional Development Commission, Bemidji, MN, as a development specialist.

Kevin Lee, Miltona, MN, city clerk, has been awarded the 2007 Lake Region Arts Council/McKnight Fellowship.

Polk County, MN, Engineer **Rich Sanders, PE,** is the new Crookston, MN, Blue Line Club president.

Bemidji Area Chamber of Commerce is celebrating its 100th Anniversary.

Northwestern Mental Health Center, Crookston, MN— which broke ground May 2007 for its one million dollar facility expansion—is expected to be complete January 2008.

Wall Street Bridge—spanning the Red River of the North between Fargo, ND, and Moorhead, MN—has garnered a Merit Award in the Short Span category of the 2007 Prize Bridge Competition, the biannual awards program of the National Steel Bridge Alliance.

St. Mary's Education Center, Alexandria, MN, is featured in American School & University magazine's 2007 Architectural Portfolio.

Reconstruction of TH 27 in Little Falls, MN, from 9th Street East to 3,200 feet east of US Highway 10, received a 2007 Merit Award for Bituminous Surfacing from Minnesota Department of Transportation, Minnesota Asphalt Pavement Association, and Minnesota Association of Asphalt Paving Technologists. ■

If you have a "public SIGHTING," contact Liesa Thill, Widseth Smith Nolting, 218.829.5117, liesa.thill@wsn-mn.com.

hind SIGHTS

Language evolves to reflect our times, define our technology, interpret our culture, etc. So it is with architectural terms, as well. In this issue, we take a look at some archaic, arcane, or just plain unusual phrases and terminology . . .

Chimney Cricket . . . A small false roof built over the main roof behind a chimney; used to provide protection against water leakage where the chimney penetrates the roof.

Dogtrot (or Possum-Trot) Plan . . . Log-cabin or house plan with two parts separated by a breezeway, all under a common roof.

Frog . . . A depression in the bed face of a brick or building block; used to provide a better key for mortar.

Gag Process . . . The process of bending structural [steel] shapes in a gag press.

Nosing (or Nose) Line . . . The slope of a stair determined by a line connecting the lead edge or nosing of the stair treads.

Shot Tower . . . A high tower, usually round, in which shot are made by dropping molten lead from an upper story into a cistern of water.

Source: Dictionary of Architecture and Construction. Edited by Cyril M. Harris, 1975. ■

ask the EXPERT

Q What can you tell me about "best-value procurement"? Is it true my city doesn't simply have to go with the lowest bidder?

A Best-value procurement is aimed at striking a balance between pricing and performance by including subjective criteria in the solicitation. For example, in addition to price the client may evaluate the vendors' or contractors' performance on previous projects as it relates to quality of work, timeliness of completion, record of performing on budget, ability to minimize cost overruns and change orders, technical capability, individual qualifications of key personnel, ability to assess and minimize risks, ability to prepare appropriate project plans, and customer satisfaction.

The 2007 Minnesota Legislature passed a law which phases-in best-value procurement. For the first two years, state agencies, counties, cities, and school districts in the top 25% in student enrollment are eligible to use best-value procurement. In 2009, school districts in the top 50% in enrollment will be eligible, and, beginning in 2010, all other school districts, townships, and political subdivisions will be eligible to use this method. Training is required for any personnel or consultants administering, preparing, or evaluating solicitations, and the use of this procurement method is limited to one project annually or 20% of projects, whichever is greater, in each of the first three years in which best-value procurement is used. ■

Kevin Wernberg, PE, is a civil engineer and vice president with Widseth Smith Nolting.

Q I recently found an iron pipe near the corner of my property. Is this my actual property corner?

A Over the years, many different types of monuments have been used to mark property boundaries. From stone monuments, railroad spikes, and car axles in the past to iron pipes and rebar monuments commonly used today, there are many types of markers to consider when searching for property boundaries.

Additional research would be needed to verify if the iron pipe you found is the legal boundary corner. Within a subdivision, for example, the search for additional monuments can extend from within the property's single block to the whole subdivision. After an adequate number of monuments have been located and measured, those measurements would be compared to the official plat. Once all of the collected evidence has been weighed, it can be determined if the iron pipe you found is the legal property corner. It is now a standard practice for surveyors to set iron pipe or rebar monuments topped by a plastic cap imprinted with the surveyor's state registration number. If needed, the monument can be traced to the surveyor who placed it, eliminating any guesswork of whether it is, indeed, a "legal boundary marker." ■

Chris Jordheim, LS, is a land surveyor with Widseth Smith Nolting.

Minnesota's Onsite Systems

The "old" days were simple. There was plenty of land and water to go around, and nobody worried about what happened after used water went down the pipe (or the road, stream, or into the lake). Today it's much different. Did you know . . .

- structures with a sink, bathtub, shower, or toilet that are not connected to a publicly-owned treatment facility must have an approved onsite wastewater treatment system or holding tank?
- the separation distance between a treatment system and any water well must be at least 50 feet? And if the well is less than 50 feet deep, the setback is at least 100 feet?
- developments that discharge more than 10,000 gallons per day (about 30 houses) may be subject to a 300-foot well separation according to Minnesota Department of Health rules?
- if you subdivide your property, most local units of government require proof that each proposed lot would support a second onsite system in case the first one fails? And that this proof—a site evaluation—must be completed by a certified site evaluator and include information gained from soil borings or excavations on each proposed lot as well as detailed information on how the property will be used and what will be built?
- Minnesota law requires septic tanks to be checked every three years for leaks and to determine if they need to be pumped or have other maintenance performed?

The most appropriate onsite system depends on soil type, topography, and the highest groundwater level that has been reached on your property. Typical systems almost always include a septic tank to remove most of the solids and greases. The septic tank effluent is further treated in a series of drain field trenches, pressurized soil bed, underground chambered system, or aboveground soil mound. An aerated treatment unit (ATU) that discharges to one of these soil dispersal systems may also be used. A pit privy (better known as an outhouse) is still allowed under certain conditions by the state, but cities or counties may have more stringent requirements.

Traditional onsite systems are no longer practical, however, for dense and complex housing and commercial developments. For example, the state permit for a 30-unit subdivision on a clustered treatment system would likely have the same requirements as the nearest city's permit, including having a licensed wastewater operator under contract and submitting monthly compliance reports to the state. A series of treatment processes would be required, similar to hundreds of municipal treatment facilities throughout Minnesota, albeit at a smaller scale. While systems that may discharge more than 10,000 gallons per day must be designed by a certified designer who is also a registered professional engineer, the Minnesota Legislature is discussing who should design systems that serve more than one structure but discharge less than 10,000 gallons per day.

The modern sewer system is a marvel of advanced engineering design, particularly considering the lack of acceptable treatment as recently as the mid-19th century. With ongoing advances in treatment systems and technology, as well as regulations and controls, we can look forward to even better protection of public health, the environment, and water quality than ever before. ■

Dave Reese, PE, is a civil engineer and vice president with Widseth Smith Nolting.

a model LIFE

(continued from cover)

The benefits of running a computer model are many, not the least of which is the efficient use of time. With virtually no limit to the scenarios that can be run, the wastewater professional can prepare and respond to nearly any eventuality. After the initial software set up and data input, future research is relatively easy—scenarios can be run at any time with minimal effort. If a potential solution to a problem in one area would lead to a problem in another, the engineer will immediately see the impact within the model—far better than realizing it after construction.

The Bottom Line

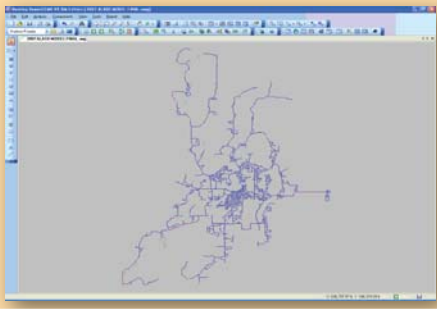
Why conduct a collection system analysis? To be proactive. To plan, design, and maintain infrastructure so it operates the way it is intended. Once an analysis is in place and is updated annually, utilities and wastewater professionals can focus their time on preparing for the future instead of reacting to the present. ■

Dan Folsom, PE, is a civil engineer and vice president with Widseth Smith Nolting.

a virtual GEM

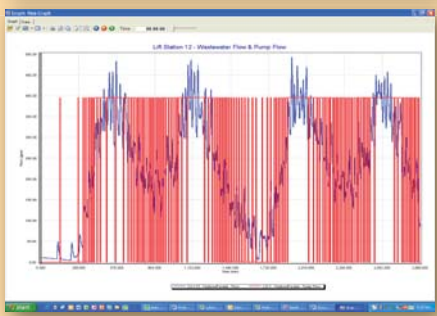
Alexandria Lake Area Sanitary District Utilizes SewerGEMS Modeling Software

Encompassing more than 100 square miles, Alexandria Lake Area Sanitary District's collection system is larger in area than most metropolitan systems. With 300 miles of pipe, 121 lift stations, and approximately 10,000 users, ALASD utilizes SewerGEMS hydraulic modeling software to perform quick analyses of proposed development impacts, general system performance, and emergency response times. SewerGEMS has also proven to be a great tool for financial planning.



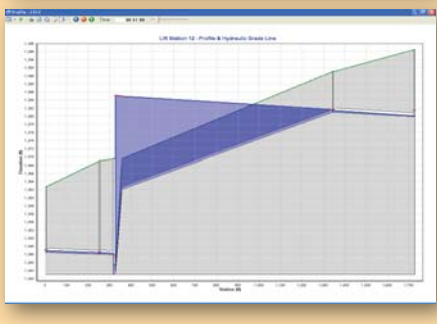
Map View

Utilize the capabilities of hydraulic grade line analysis to determine which gravity collection lines are flowing above capacity. This tool can be very helpful for identifying projects, budgeting, and other planning purposes.



Wastewater Flow and Pump Flow Graph

Analyze several aspects of pump station performance. For example, are peak flows higher than pump rate? When and where does flooding occur during a pump failure?



Profile

Get quick answers about the system's performance with easy-to-read graphic results. Determine the pump station's Total Dynamic Head (TDH), view pipes' flow depths, and see other flow parameters of the system's components.

Alexandria Lake Area Sanitary District—Alexandria, MN

WIDSETH SMITH NOLTING

ENGINEERING ARCHITECTURE LAND SURVEYING ENVIRONMENTAL SERVICES

7804 Industrial Park Road
Baxter, MN 56425
www.wsn-mn.com

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