



ROUNDTABLE DISCUSSION  
[Trenchless Technology  
from the Owner's Perspective](#)

*By Bradley Kramer*

The trenchless market has seen major changes over the last decade, from new products and technologies available, to new regulations and management practices. To see what changes are occurring, Trenchless Technology went straight to the ultimate source – the owners.

Owners from the United States and Canada gathered for the annual Trenchless Technology Roundtable Discussion, held March 28 in conjunction with the NASTT No-Dig Show in Nashville, Tenn., to swap stories of what issues they're facing, what technology they're using, and what innovations are changing the way they do business.

The participants were:

**Jeff Twardzik**, Assistant Engineering Supervisor, City of Philadelphia Water Department

**Kevin Bainbridge**, Senior Project Manager-Subsurface Infrastructure, City of Hamilton, Ontario, Canada

**Bob Ericsson**, Engineer, Northeast Ohio Regional Sewer District, Cleveland

**Lysa Voight**, Senior Civil Engineer, Sacramento Regional County Sanitation District

**Mike Harmer**, Civil Engineer, New Castle County, Del.

**George Cowan**, Assistant Commissioner-Infrastructures Division, New York City Department of Design and Construction

**Jim Rush**, Editor, Trenchless Technology

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Trenchless Technology – What are the main problems you are facing with your system? Maintenance and repair? Replacement? I/I? Root intrusion? Fats, oils and grease (FOG)?

**Jeff Twardzik** – Our main problem is the age of the system, which is on average between 75 and 80 years old. With the advent of video inspection technology, modeling, etc., we've become more proactive over the last 10 to 15 years with our sewer assessment and maintenance programs to combat this. We are completing a pilot project analyzing large sections of our sewer system with video inspection and condition assessment. In essence, we are looking for problems and trying to prioritize and solve them before something occurs on the surface.

**Kevin Bainbridge** – The assets in our system are pretty close to the same age. What we're seeing is that a lot of the pipe that was installed in the wave of development in the 1940s and 1950s is now in need of rehab and renewal. A lot of the infrastructure installed in the 1800s is actually fine and is not what's giving us problems. So right now we are looking at rehab technologies to try to extend the life expectancy of some of our middle-aged pipe. This helps us deal with the large volume of pipe that will be in need of repair in a short period of time, allowing us to extend our replacement programs over a longer period of time rather than over a five- to 10-year period.

**Bob Ericsson** – We are dealing with all of the above, and age is definitely a big part of it with some infrastructure dating back 100 years or more. We have regionalized in Northeast Ohio and represent 60 communities. We have inherited systems that were in various states of disrepair. Our main focus now is in combined sewer overflow (CSO) mitigation, so we have big expenditures in new tunnels and shafts. We are seeing a lot of deterioration of older brick sewers and are doing repairs on a Band-Aid basis because a major part of the funds are being earmarked for new construction.

**Lysa Voight** – I think all of us feel that way. In Sacramento, we do regional treatment as well. Right now, we have older systems and we have similar problems. We have a large FOG program and we have the roots and I&I issues on our smaller systems. Our biggest problem now is the rate of expansion – it is just phenomenal. We have a lot of in-fill, so a lot of the areas that were sparse in population are filling in and we are expanding at the same time. So we are trying to fit in trunk lines and interceptors within in-fill areas and then trying to route them from the outer lying areas into the regional treatment facility.

We recently started an asset management program and we are working on prioritizing our maintenance projects and rehab projects. We are also reprioritizing our new pipelines, in particular our new interceptor and larger trunk lines, because of the way the development has occurred.

**Mike Harmer** – Our system is generally older and constructed of the terra cotta clay pipe. We get a lot of main line blockages from roots and fats, oils and greases. The older pipes have a lot of inflow and infiltration, and we have a major \$300 million capital program going on to address that. That is going along well, but it will take about 25 years to implement. Because of the funding, it is a long-term goal.

We are also looking at alternative approaches to the roots, including chemical root control, but we haven't made any final decisions on that at this point.

**George Cowan** – Like everyone else, we have the same problems – roots and grease. It basically depends on where you are in the system, but in some areas you have to treat the sewers all the time just to remove the grease – you can't run a camera through, that's how bad they get. In fact, we had a sewer run we were supposed to remove because we thought it had collapsed. As it turned out, it was just loaded with grease. We cleaned it and it works fine.

The older brick sewers worked really well and one of the good things about them is they were built larger than required – the minimum diameter is approximately 4 ft – and we can go in and gunite them. Around the 1940s, the city started putting in cement pipe. Not concrete, not clay – cement. They are deteriorating and falling apart now, so we are in the process of eliminating them from our system. We don't line them, we just replace them. For new pipe, our preference is clay pipe on concrete cradles. We believe our biggest expense is digging the trench, so we feel it's worth the extra cost to get what we believe is the best pipe.

**TT** – What specific trenchless technologies do you use? Which ones work best? How has your use of trenchless technologies changed over the last few years?

**Bainbridge** – The most significant trenchless programs that we are running are CIPP programs, both water and wastewater. We have a \$9 million annual CIPP program on our sewer network so we are rehabbing about 45 km a year. We are just ramping up our CIPP in the water network – we are rehabbing 8 to 9 km annually.

The two most significant changes for us is the tendering approach and our attitude toward the use of trenchless technologies. Today, we make decisions based on life-cycle cost, which for us often makes trenchless technology our first option, not replacement. In the past, we would always look at replacement first; trenchless technology was only used when replacement was not feasible. Secondly, we have altered our tendering practices from project-based contracts to program-based contracts. So, our tenders are typically multi-year and have significant quantities. This type of contract allows us to leverage economic savings in volume and allows us to build a strong working relationship with our contractors.

**Ericsson** – A lot of the work we are doing is constructing large tunnels on the order of 24-ft in diameter and up to 300 ft deep to retain CSO prior to treatment. The only real trenchless method we're using for new construction is microtunneling. Right now we are basically on a learning curve and are finding the weaknesses and strengths of microtunneling in our environment. I have two projects where I have active microtunneling going on at this time.

Other than that, we looked at CIPP for a large diameter emergency repair on a steep gradient, but we opted for sliplining, which was successful. We've also looked at some directional drilling, but we're still in the early stages with a lot of these techniques. I see great merit in some of the technologies available, and we are looking to expand our tool bag with all that is available to meet our needs.

**Voight** – In the Interceptor Design Group, we have the larger diameter pipe. We have done microtunneling underneath rivers for our force mains for pipes about 60 in. in diameter. For larger pipes, we've used various tunneling approaches like EPBM or pipe jacking. I haven't seen a lot of pipe bursting in our area, but it is something we are definitely interested in for the smaller trunks and laterals.

**Harmer** – We've used cured-in-place main lining, pipe bursting, joint grouting and various point repair systems, fold-and-form and lateral lining, so we're pretty much using the full gamut. With our rehab programs we have going on, CIPP has been the method we've had the most reliable success with. What has changed along the way is our specifications. Our specifications have gotten stronger as we have been able to apply the lessons learned. The new specifications are more sophisticated and demanding of the contractor's craftsmanship, including strict contractor qualification requirements. In the past, it seemed like the projects were contractor-driven based on what we were hearing as far as what we should do and shouldn't do. Now, with the revisions in specifications, the owner is dictating the quality. In general, trenchless technologies seem to be replacing the open-cut approach as our choice for rehab.

**Cowan** – We have annual CIPP and gunite contracts. If our inspectors see sections of pipe that look questionable, we'll go in and line or gunite them. For new pipelines, we'll use microtunneling once we start getting below 20 or 25 ft. Once you factor in the cost of the machine, it's usually cheaper to open-cut the street at shallower depths. Of course, it's a different story if we need to cross a highway or railroad. In that case, we'll go with microtunneling or jacking.

In general, we will not line 8-in. sewers because we're looking to achieve a minimum size of 10 in. and we always want the sewers bigger, not smaller. So when we see an 8-in. line that needs renewal, we're typically going to remove it and replace it with a new 10-in. sewer unless there is something out of the ordinary that we don't want to disturb. As far as pipe bursting is concerned, we do not believe it will work effectively in New York City since we have house connections approximately every 25 ft. We would have to dig up the street just to make the reconnections.

For our water system, we have been doing some fold-and-form lining for larger diameter lines and bridge crossings. We are having problems with joints that are starting to separate and leak.

**Twardzik** – We've used CIPP extensively, as well as guniting. We will probably spend about \$4 million to \$5 million this year on CIPP projects. This will increase in the foreseeable future. It is now just as easy to use CIPP as it is to reconstruct, whereas 10 years ago we replaced 99 percent of our pipe using open-cut construction with no other real option. Now 15 to 25 percent of our sewer rehabilitation is trenchless and I think it will continue to increase since it takes less time and effort to make a design plan and go through utility reviews. It streamlines your work process and I think it will save the department a lot of money over time.

We are also close to bidding a \$30 million tunnel job as part of a flood relief project. Additionally, we have an extensive transit/railway system in the city, so we've done tunneling and jack-and-bore projects under these facilities. We've also used some point liners and joint grouting.

Our use of trenchless technologies has changed in that it has become a common tool that design, planning and maintenance can now consider instead of reconstructing sewers. We now meet on a monthly basis and review video inspections that were recently completed. We are now asking the question, "Is this lineable?" instead of, "Do we need to do a repair here?" or "Should we reconstruct this sewer?" We compile a list of potential lining jobs each month. So, it's giving us another option that keeps our maintenance forces concentrating on bigger issues and critical problems system-wide.

**TT** – What are the limiting factors in keeping your system in peak condition? Funding? Political support? Lack of qualified personnel or contractors? Lack of suitable technology?

**Ericcson** – Funding is our major issue. In the Northeast Ohio Regional Sewer District, the major part of our funding is going to our new CSO mitigation and the retention tunnels. We have a 30-year capital plan in which we are in contention with EPA. They think we should be as ambitious as to perform this improvement construction in a 10-year period. There is no further federal funding at this point, though we do have federal mandates we have to meet, and our ratepayers cannot afford to pay a compressed capital plan rate schedule for this \$1.6 billion program. It is totally impossible. So, we're in the process of arguing that.

The main part of our funding goes to new projects, but with the state of our infrastructure, emergencies are occurring more and more frequently. We then have to go to the board and present the case for emergency repair funding. The problems won't go away and they have to be addressed. We also use state revolving funds to fund these emergency projects.

**TT** – What kind of reaction are you getting from the EPA regarding that 30-year program?

**Ericcson** – So far, not favorable. We have been in court. The issue is still ongoing. I don't know how other communities are contending with this issue, particularly if your ratepayers are at a level where they cannot pay this funding within a compressed period of construction to meet those EPA mandates.

**Voight** – Funding is a very large issue with us, too. We recently obtained almost \$1 billion in bonds this last year for new construction. We have dealt with rate increases too. One of the issues we've had is that there has been so much construction in California, in our area in particular, that it is difficult to find qualified contractors who are available without driving up the cost of our construction projects. This is particularly true for the trenchless work, because there are not as many qualified contractors. As a result, we have gone to pre-qualification, but that brings about problems and legal issues. There is a lot of environmental sensitivity in California, so trenchless technology has really helped us for those types of areas where there are wetlands, vernal pools, creeks and lakes.

Recently, we have had a couple of tunnel failures. So now when we try to get permits, I think that these projects will be closely scrutinized. It will probably drive up our permitting costs, as well as our design costs and construction costs. Another problem we have is involved with new development where the developer installs the pipes, and we tie in. They've installed the wrong material, the wrong bedding or the pipes were off on line and grade. We're in a valley, and because we prefer gravity pipelines with minimal pump stations, our slopes are very flat.

**Harmer** – Funding is certainly a concern of ours also, as you can well imagine. But our limiting factor is people. The ability to implement projects using currently available county engineering and project management staff is maximized, but the demands of operating and rehabbing our system are constantly increasing. In other words, our management staff and engineering staff are pretty much maxed out as far as what we can do with the amount of projects. With the current funding, we don't anticipate increasing the staff at this point. On a positive side, we enjoy a broad-based political support for our projects. Our county council and administration are committed to maintaining the inherent value of our infrastructure. They are educated about our infrastructure needs and have a good understanding of what is going on.

**Cowan** – We have a small amount of money to spend but a large amount of work. The Department of Environmental Protection has an annual budget of approximately \$1.5 billion. The problem is that most of the money is being spent on sewage treatment plants. We've had to change some of our plans based on the lack of money available to complete projects.

**Twardzik** – We've actually increased our funding in the last five to 10 years. In our Water and Sewer Design Group, we were spending around \$30 million a year on capital improvements. We've since moved that up to around \$40 to \$45 million, with a targeted replacement schedule of about 27 miles of water main every year and seven to 10 miles of sewer.

We're also now spending millions of dollars on CSO projects. We're trying to get innovative with this, and our strategy is to use inflatable dams, in-pipe storage, tanks, etc., instead of rebuilding larger trunk lines to accommodate overflow storage, which can be a huge undertaking and can be extremely expensive and disruptive to customers.

**Bainbridge** – A lot of the things that were touched on are similar to us. We have issues with development quality and integration of new infrastructure with the city's existing water and wastewater infrastructure. Thus our water/wastewater division now is working more closely with our development division and council on approvals and quality control to better ensure that infrastructure passed on to the city from developers is going to provide its expected service level and life. In addition, it helps to move development of the city forward in a manageable manner.

The trenchless technology market is a big issue for us, being where we are. There are a lot of technologies we'd like to use – like pipe bursting and gunite lining – but we can't because there are no contractors in the market. Unless we are going to put out a really big job worth millions, we are not going to bring someone in from out of town on a cost-effective basis. So we're limited to some of the technologies, especially those that are only useful in specific situations and are not effective at solving some of our very common issues.

One of the biggest holdups we have in our business is communicating our need for additional funding. As technical people, we are, quite frankly, horrible at communicating with politicians and the general public. If we can't communicate the needs of our infrastructure to the stakeholders – the politicians and the general public – they will be unable to make informed decisions on budget increases. This communication process is getting better as we introduce the State of the Infrastructure report to the politicians and the community.

**TT** – What changes are occurring in the way the public utility systems are operating? What is driving these changes? What are the benefits of some of these changes?

**Voight** – We have changes in our funding and our asset management programs, including asset management modeling and prioritization. Stormwater regulations are also changing the way we do business. Trenchless technology is really beneficial in some of these areas.

**Harmer** – With systems aging, the traditional operations and maintenance methods and frequencies are no longer adequate. We are having to look at more rehabilitation methods such as systematic grouting, chemical derooting, lateral grouting and grease control. We are also data mining information from our CCTV work and putting it into our Hansen system for future information. All of those approaches are relatively new to us.

**Cowan** – In New York, there is a big push right now to develop a good mapping system. We want to have it where you can just click on the map and be able to retrieve all the information you need on that pipe. The problem is we've been working on it for five years and I think we only have one of five boroughs completed. This is mainly attributable to the tremendous amount of information that has to be recorded. Another big issue is being able to monitor sewer flows and detect water main leaks.

**Bainbridge** – We were in the same boat in the mid-1990s. It took us probably five years to do ours, and that's basically one New York City borough. It does take time, but it is definitely worth the effort. Our maintenance guys now have laptops in the field and they can access the database and most of the information they need.

From our end of things, probably the most significant change, and you'll see it if you get into developing asset management programs, is a change of focus toward customer service and away from solely technically or financially driven objectives. We started setting objectives and measured success against service level objectives. You have to strike a balance between service levels, cost of service and risk. The city's decision to develop an asset management group has significantly improved its ability to balance these three things and make decisions in the best interests of the present and future owners of the infrastructure.

**Twardzik** – We're using GIS more prevalently so that we can access as much information as possible from our workstations. We're also trying to link all the other utilities in the city as well, so we can pull up plans from the gas company, PECO, etc. That's a little ways down the line, but it is foreseeable in the near future that we can access utility drawings immediately instead of waiting weeks or months when we have a project forthcoming.

We're also getting more efficient with our drafting techniques. Microstation has allowed us to become much faster when laying out pipe design, section views, calculating quantities, etc. This speeds up the process of creating drawings and putting out projects.

On the CCTV inspection side, we can now see the videos that came in from the field at our workstations. We've spent millions of dollars getting these systems up and running, and now we're finally reaping the benefits. We are finding that the city's work process is becoming more streamlined because of investments in technology made five or six years ago.

**TT** – What are some of the unique approaches your organization has taken to solving its infrastructure problems? Alternative contracting? Innovative technologies?

**Harmer** – We're taking a holistic approach to our I&I studies and our rehab programs, basically looking at an entire basin and prioritizing projects based on the I&I sources. The areas that contribute the most I&I are obviously being given the priority on the projects. We're also looking at when we're rehabbing, we're rehabbing from the main lines up through the collection lines and up into the laterals of houses. A lot of municipalities are stopping at the lateral because of the issues associated with lateral ownership. We're basically responsible up to the property line, but we are going all the way up to the house, if needed. It's a debate that municipalities are having. We also purchased a trenchless point repair technology system so that our crews can do trenchless point repairs in-house.

**Cowan** – We are not as innovative as we could be. As a matter of fact, we just did our first internal sewer point repair. We typically line the entire manhole run. If we have one crack, we line it from manhole to manhole. The reason is that it may not be that cost-effective to do point repairs.

We are actively looking for a water main lining system. In Manhattan, you can't dig up and replace the older water mains due to extensive utility interferences, so we are looking to line them. The problem is the mains don't go straight; they go up, down and sideways to go around the utilities.

**Twardzik** – We've been forced to become innovative with some of our CSO projects. We've installed an inflatable dam behind the Philadelphia Art Museum inside a 13-ft, 6-in. diameter sewer. During a rain storm, a sensor monitors the increase in the water level and inflates the dam and seals off the outfall pipe. Typically, it slowly drains the stormwater through a 42-in. pipe into our intercepting sewer. There is a failsafe that kicks off if it gets too much pressure behind it. It's neat to see this operate. It's a one-of-a-kind for now in our city, but we have two or three more that will be installed in the future. This was one way that we could decrease urban runoff without having to spend a whole lot of money on upsizing trunk lines.

**Bainbridge** – One key area we've been focusing on is within the right of way and understanding the inter-relationships between infrastructure within that right of way. Whatever decision we make on sewer and water impacts the road. Whatever decision we make on the road impacts the sewer and water. So within the right of way, there are huge implications to decisions across the infrastructure. We are taking a holistic approach when we look at the decisions we make with regard to the infrastructure within city rights of way.

Additionally, we spend a significant amount of money and staff time each year on research and development through partnerships with universities and researchers in order to develop and advance new trenchless technologies, specifically in the areas of condition assessment. One partnership we are working on now is a technology developed by the National Research Council in Canada with a company called Echologics. It is developing the ability to use acoustic leak detection technology to measure remaining pipe wall thickness on cast iron pipe and steel pipe. We need to push research because it is us that benefits from the advancement of technologies by aiding our ability to make decisions and address infrastructure needs more effectively. If we're

not going to invest in research and development and leave it to the rest of the industry, they are going to move slowly and not necessarily in the most beneficial direction for asset owners.

**Ericcson** – We are moving into the area of asset management here at the Northeast Ohio Regional Sewer District. We are also evolving our GIS. We purchased a CUES Granite system and we'll be collecting information in the field utilizing the NASSCO PACP coding. This information will come to me and designated others. We will make comments, incorporate that information into our GIS program, prioritize our defects and set up a program for frequency of inspection or action. We're evolving, we're moving. The district is very progressive.

**Voight** – We're evaluating up-and-coming technology. We have a large focus on asset management and we're constantly doing training and using asset management in our business case evaluations, even for small rehabilitation projects. We continuously rewrite and update our specifications. After large projects, we're having a "lessons learned" meeting and sharing it with staff, so we can get ideas to make our specs tighter. We have a huge focus on quality control and quality assurance, and testing and training for inspections to make sure we get good quality projects. We are looking at ways to avoid environmentally sensitive areas with trenchless technology.