Roots of Despair

A contractor in eastern New York attacks a severe case of root intrusion with a custom-made cutting device and plenty of persistence

By Scottie Dayton

A section of 50-year-old sanitary sewer in Schenectady, N.Y., backed up into the main entrance of Union College during a heavy rain. While the 12-foot-deep upstream manhole was surcharged onto the street, the pipe at the downstream manhole was discharging at one-third its capacity. The city's maintenance crew jetted the line under surcharged conditions without difficulties — but without solving the problem.

To determine the cause, city engineer Chris Wallin hired LASH Contracting Inc. of Latham, N.Y., to inspect the 30-inch concrete pipe. LASH crews, under project manager Sam Gardiner, made several preliminary cleaning passes without difficulty, then lowered a Night Owl pan-and-tilt camera from CUES Inc. to inspect the 36-inch long pipe sections. Televising from the upstream manhole, they saw that the concrete was in excellent condition, but a thick tangle of roots at 75 feet blocked the wheeled transporter.

Small, thin roots were easily cut with the 6.5-inch saw blade mounted on an air drill. These roots were not suspected to be the cause of pipe surcharging.

A close-up of a trimmed cluster of tap roots.

Inspection from the downstream manhole was impossible due to the strong normal flow. When a hydraulic-powered root cutter failed to clear a path for the camera, Gardiner recommended attacking the intrusion with a lateral reinstatement cutter. His unique approach proved successful, but only after an intense, drawn-out battle.

What's in the toolbox?

Manhole openings of 22 inches with 4-foot corbels limited access to the sewer. "We discussed using bucket machines, but discounted them because they could damage or collapse the pipe, and we'd have to excavate," says Gardiner.

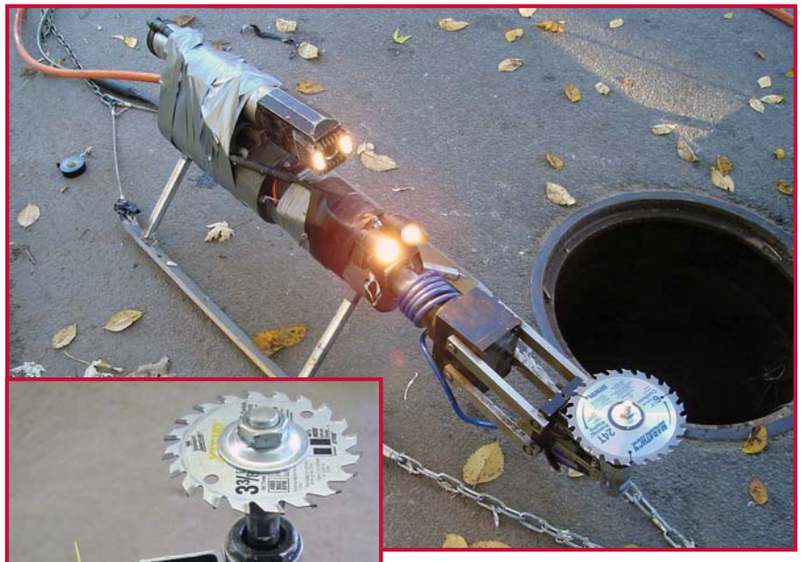
LASH Contracting modified a Giant Kangaroo lateral reinstatement cutter from CUES, which can remotely position the blade up, down, in, out, left, and right. They mounted the Night Owl camera on top of the cutter, enabling the blade to be winched directly to the surface or face of the root, while allowing the operator to view the cutting process from behind the blade.

The cutter's air-powered, position-locking brace was disabled so as not to block the operator's view. Initial concerns that the tool would turn or flip without the brace proved groundless due to the assembly's weight and mass.

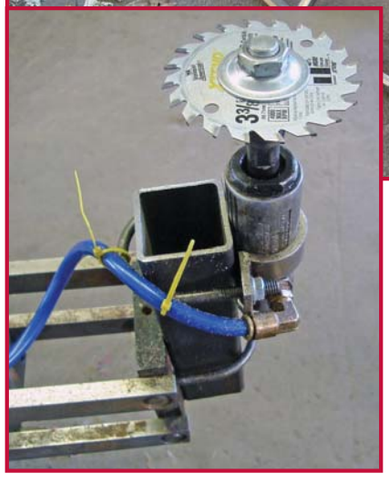
The camera's internal lights provided adequate illumination for close-up work. To see beyond the cutter blade, LASH mounted a set of 20-watt lightheads in a low position between the camera and cutter motor. Duct tape secured excess control wires to the cutter, preventing it from snagging in the pipe and streamlining its body.

Normal reinstatement bits aren't designed to cut roots. "We bought a selection of 3.5-inch circular saw blades and arbors from a nearby home supply store," says Gardiner. The small blades, designed for battery-powered trim saws, were mounted on arbors with 1/4-inch shanks that fit the cutter's air motors. The motor, spinning at 22,000 rpm, provided three times the usual speed of a circular saw, but with minimal torque.

A high-pressure jetter cleaned the line at the start of each day, cleared blockages from the root clippings, and threaded the winch cable through the pipe. Special safety precautions were observed throughout the project. Before inserting or removing the cutter from the sewer, workers disconnected the air pressure supply line and shut the air compressor off. When inactive, the saw blade teeth were covered with duct tape.



A Giant Kangaroo lateral reinstatement cutter from CUES Inc. is shown with a 6.5-inch blade on the air drill. The final configuration of the Night Owl pan-and-tilt camera with additional lightheads is also shown.



The 3.5-inch blade is mounted on the high-speed air cutter motor.

Sherwood Forest

The saw cut quickly through the light root bundles, but as inspection and root removal progressed, the blade stuck in thicker masses, or the air motor stalled. "That's when we adapted a 6.5-inch, carbide-tipped circular ripsaw blade to the air motor," says Gardiner. "It cut deeper into the root bundles, but still suffered from low torque."

Left-right rotation of the cutter blade caused it to bind in the thicker roots. The in-out motion stabbed or shaved off the roots. Any progress required a combination of the techniques. The denser the root masses became, the more dirt, mud, and debris the crew encountered. Flying mud blocked the camera lens, requiring the operator to dip the spinning blade in sewer water to create a cleansing spray. To remove string or plastic that became wrapped around the blade arbor, workers had to extract the cutter.

"When we reached the tap roots, which are like tree limbs, the small air motor was overwhelmed," says Gardiner. "We bought a 3/8-inch air drill and fab-

Tough Job

PROJECT:
Remove five massive root bundles causing surcharging in a concrete sewer

CUSTOMER:
Engineering Department, City of Schenectady, N.Y.

CONTRACTOR:
LASH Contracting Inc., Latham, N.Y.

EQUIPMENT:
Night Owl pan-and-tilt camera and specially modified Giant Kangaroo lateral reinstatement cutter from CUES Inc., Orlando, Fla.

RESULTS:
Surcharging arrested and flow levels equalized

ricated another special bracket to mount it to the cutter." The air drill had a gear reduction planetary drive that created 2,500 rpm and increased rotational torque. Nevertheless, plastic debris still wrapped around the chuck and arbor.

The defeat of the first root mass brought little joy, as the crew encountered another at the next joint. LASH workers tackled five root bundles in all, each with thick tap roots penetrating the joint at multiple locations. The men suffered eye strain from the poor visibility. Fatigue from the continuous hands-on work became such a problem that operators alternated every half hour.

Inspection crews encountered the last and largest root bundle 120 feet from the upstream manhole. (A final camera inspection later showed that the mass had covered half the pipe to the flow level, while extending 18 inches upstream from the joint and about three feet downstream. How much remained underwater was unknown.) "The size and thickness of this intrusion could easily have reduced the pipe's flow capacity and caused surcharging," says Gardiner.

Manhole openings limited the size of equipment used. High water flow prevented small component assembly at the bottom of the manhole. A tripod was used for cutter deployment and removal.

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>
> **Sam Gardiner**

When the cutting crew first approached the roots, heavy rain from the previous night had elevated the water level and blocked the camera lens. When approached from the downstream side, the root's elongated tail bunched up at the base of the cutter, preventing the blade from attaining a slicing position.

Unable to see directly below the cutter, the operators risked damaging the winch cable, so work was delayed for two days until the flow subsided. When cutting resumed, water began cascading over the roots as soon as chunks of wood were removed. It took almost seven hours to clear the last blockage. All roots were trimmed as close as possible to the arc of the pipe.

In conclusion

City officials are waiting one year before televising the line to observe the rate of root regeneration. Since the work was done, Schenectady has had two heavy rains of one inch or more. Inspections of the sewer during and after those events revealed no surcharging, and flow levels were equal at the inlet and outlet of the pipe. ■

MORE INFO:

CUES Inc.
800/327-7791
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