For the City of Boulder, Multiple Technologies, **Maximum Flow Reduction**

By CPWJ Staff

The demonstration took place on a Spring afternoon in Boulder, with a view of the Flatirons in the distance.

The Rocky Mountain Chapter of the North American Society for Trenchless Technology (NASTT) recently hosted a presentation for the City of Boulder showcasing the "Shorty" T-Liner process by LMK Technologies, in cooperation with C&L Water Solutions. Stakeholders from the Colorado Department of Transportation (CDOT), NASTT executives, public officials and many others were onhand to watch a live field demonstration of the technology in action.

Mike Czipar, vice president of LMK Technologies, delivered the presentation, showing how – through a multi-step hydraulic condition assessment of a Boulder neighborhood – pipes had been determined to be leaking, and that a rehabilitation project to greatly reduce I/I was needed.

Participants were educated about how specific technologies were selected, how the construction of these was accomplished, and how effective these methods were in reducing I/I.

In one particularly dynamic aspect of the demo, in-pipeline inspections were performed using digital, state-of-the-art CCTV cameras. The T-Liner was seen providing a full mainline wrap. The product is integrally sewn and cured with the lateral pipe liner, and installed with its own double layer of hydrophilic end bands to prevent annular space leakage from coming into the pipe.

By way of background: the Hundred Sewer Rehabilitation and Capacity Assurance Program has a goal of preventing sufficient amounts of groundwater and rainwater entry into the collection system to achieve a significant reduction in basement sewage backups, the occurrence of wet weather-related SSOs, and interceptor surcharging. This comprehensive program includes significant planning, budgeting, scheduling, and public involvement components, in addition to the engineering and construction aspects of the work. The program includes sewer flow monitoring, inspections, internal testing, and engineering evaluations

to identify and prioritize those sections of sewer sheds that need to be repaired or replaced (R&R) and to provide a benchmark for determining the effectiveness of implemented solutions.

A complete baseline condition assessment of the existing system – which includes development of monitoring programs intended to identify the nature, extent, and sources of I/I, cross connections, and structural failures – is accomplished through a multi-part process.

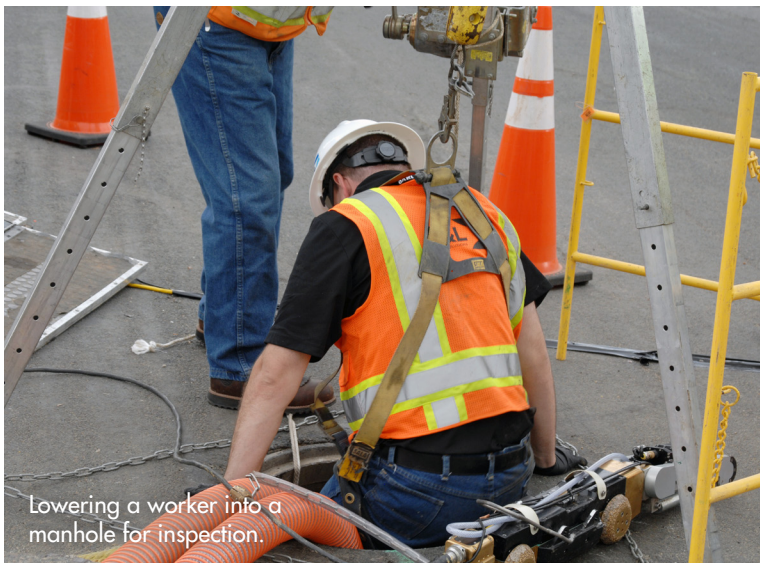
First, a Hydraulic Condition Assessment (HCA) is used to identify the sections of the system that leak the most. Used for this are extended flow metering; above-grade storm inflow observations; door-to-door basement inspections; smoke testing; data mining through asset management software; and transfer of knowledge through interviews with operations staff.

Next, for segments found to be leaking badly, a follow-up physical condition assessment (PCA) is conducted to identify the best method of rehabilitation to use based on the pipe, lateral, and manhole's structural condition.

Based on the baseline hydraulic condition assessment, each area of the system is given a prioritization for rehabilitation based on contribution of I/I, anticipated failure period, and operational criteria. This rehabilitation prioritization identifies projects requiring R&R, which are in turn being scoped, budgeted, designed, and constructed.

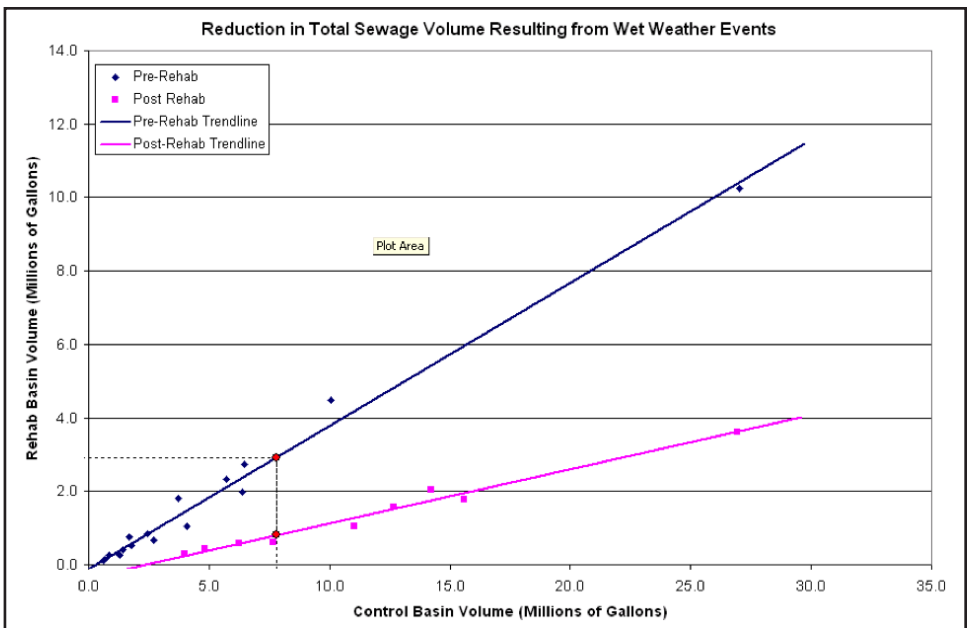
Packer injection grouting, or test and seal, is selected for those pipe segments that have no structural defects. Mainline pipe joints are tested and sealed. For laterals connected to segments receiving test and seal, lateral taps are grouted to their second joint (6' Logiball). Tap connections are tested. Laterals connected to manholes upstream of segments receiving test and seal are grouted to the property line with a push packer to minimize transferring the I/I further upstream.

Cured-in-place pipe lining (CIPPL) is selected for rehabilitation of the sewer mains with structural defects. Polyester resins combined with non-woven tube and cured with steam provide strong, smooth plastic pipes to function as pipe replacements or pipe liners inside cracked, fractured, and broken terracotta pipe. CIPPL liners are all conservatively designed for fully deteriorated host pipe conditions under fully saturated soil conditions under highway loading. To prevent the leakage in the annular space between the host pipe and the liner from coming out at the manholes, Hydrotite® end seals are employed at every manhole and drop connection.


Lowering a worker into a manhole for inspection.

To design the thickness of the liners, actual ASTM D2990 data of the resin are used to determine the long-term creep modulus. To prove the installed product would provide the minimum design life of 50 years, restrained pipe samples of the installed product are tested for thickness, ASTM D2990 long term creep modulus, and ASTM D790 short term flex modulus.

To prevent the leakage in the annular space between the host pipe and the liner from coming out at the tap connection cuts, for laterals connected to segments receiv-



Peak Flow Rates resulting from rainfall events are lowered by 55%

ing CIPPL, each lateral tap received a cured-in-place lateral liner (CIPLL).

The T-liners are then installed to at least the edge of the property line and, where agreeable to the property owner, as close to the building foundation as is convenient. To install T- Liners, a cleanout is required.

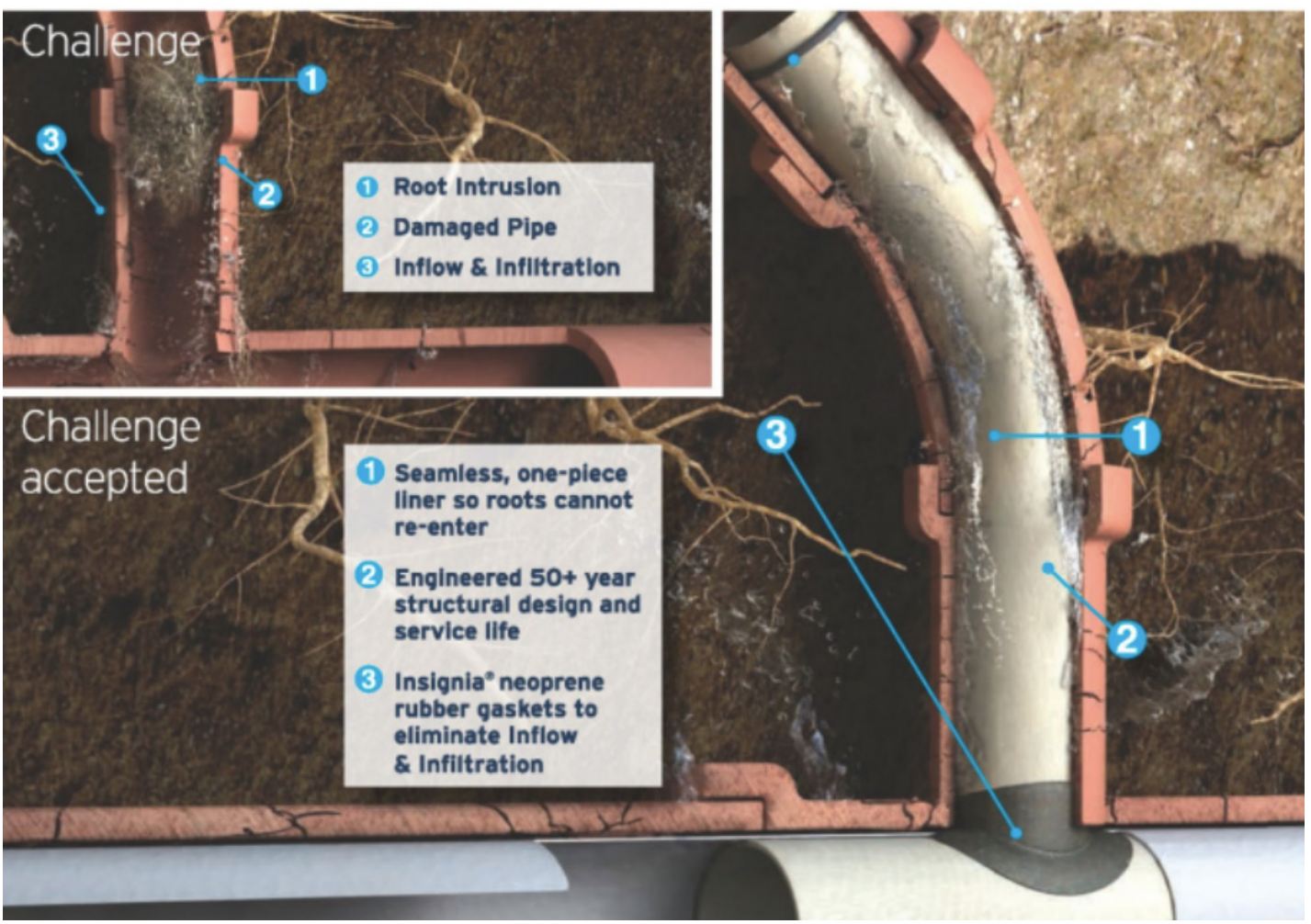
Once cleanouts are installed, the lateral is cleaned and televised to confirm there are no obstructions, and measurements are taken of each lateral. These measurements are sent to the factory where each liner is specifically manufactured for each lateral, including coning of the liner for the 4" - 6" transitions and preparation of specific mixtures of the two-part polyester resin for each lateral.

After rehabilitation work is complete, the relationship of the pre- and post-rehabilitation flows between the Control Basin and the Rehab Basin are expected to be different. This method removes variability between storm events by comparing concurrent flow parameters measured during each rainfall event in the Rehab Basin and the Control Basin. Percent reduction is determined by the measuring the difference between the pre-rehabilitation and post-rehabilitation trend lines at a chosen point.

Some data provided by LMK Technologies, James W. Shelton, and Michael T. Harmer.

Vice President Mike Czipar (at left), of LMK Technologies, demonstrates the technology to an audience of interested participants.

Jo Taylor of Colorado Public Works Journal (CPWJ) documents the demonstration.



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There is a reliable long-term fix for infiltration problems associated with laterals and their connections.

The answer: The proven combination of T-Liner and Insignia sealing technologies. Only the T-Liner and Insignia system provides an engineered solution to ensure a verifiable, non-leaking main to lateral cured-in-place pipe (CIPP) connection.

T-Liner is a continuous one-piece, full circle structural CIPP connection system that extends up into the lateral pipe, eliminating both leak paths and root intrusions. Insignia hydrophilic compression gaskets are specifically engineered for CIPP applications. When strategically positioned at the main to lateral connection, at the upper end of the lateral pipe and at the manhole penetrations to the mainline pipe, Insignia gaskets create a watertight collection system.

The result: A trenchless renewed lateral pipe including an engineered gasket system that provides a service life to match CIPP design life. Preferred by specifying engineers, LMK's CIPP lateral lining and connection solution is fully compliant with ASTM F2561.

To learn more, visit **www.lmktechnologies.com/t-liner** or call **815-433-1275.**

C&L WATER SOLUTIONS

To have LMK's T-Liner system specified and installed in the Denver area, contact C&L Water Solutions. C&L Water Solutions, established in 1979, is a Denver-based, family-owned water distribution and sewer collection systems company and a licensed LMK T-Liner Installer. C&L currently serves the needs of more than 50 special districts in the Denver Metro area and clients across the Rocky Mountain region.

LMK TECHNOLOGIES

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Phone: (815) 433-1275 **Email:** info@lmktechnologies.com **Web:** lmktechnologies.com