Wastewater Service Laterals: The Most Neglected Sewer Pipes

- Lateral Ownership, Issues, Regulatory Drivers, and Repair Solutions.
- Lateral Lining... the Versatile and Cost-Effective Rehabilitation Choice.

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In the United States, there is estimated to be over 800,000 miles of sewers that serve the public, and an additional 500,000 miles of private sewer laterals that connect businesses and residences to the public sewers[1]. These critical pipelines are located under public streets and through private properties to safely transport wastewater for treatment, reuse, and disposal.

Public agencies and cities that own the public sewers are required to maintain and inspect these sewers on a regular basis, making timely repairs as needed. However, service laterals have long been ignored and/or overlooked by many agencies due to the historically private nature of the ownership of most laterals. In addition, public funding has typically been prioritized to maintain and repair the larger public sewers, many that are reaching the end of their remaining useful life (RUL). Private owners often don't even realize that they own their sewer laterals, and will not even think about them until there is a problem with their lateral, or until they are forced to make repairs by the public sewer owner.

LATERAL OWNERSHIP

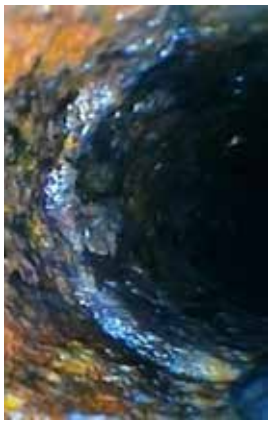
Lateral ownership varies greatly by state, and even varies between adjacent cities. Sewer laterals have been historically owned and maintained by private property owners. Prior to trenchless technology repair options, the only way to repair a failed lateral was to dig it up and replace it with new pipe. As these laterals often lie under pavement or expensive landscaping on private property, cities were reluctant to get involved, so left the maintenance and repairs up to the property owners. The types of lateral ownership that are most common are as follows:

Historically, most sewer laterals are owned and maintained by private property owners

- Property owner owns the entire lateral from the connection at the main sewer to the structure.
- City owns from the sewer connection to the private property line; Property owner owns the lateral from their property line to the structure.
- City or agency owns entire lateral from sewer connection to the structure.

COMMON LATERAL PROBLEMS

Older sewer laterals were typically made of cast iron or clay. Most of those have reached the end of their useful life and are in need of repairs or replacement. Cast iron pipe will rust so much that the walls get thin and holes develop in the pipe walls, which allows roots to enter and exacerbate the failure. These pipes will also corrode from the inside and severely restrict the lateral capacity, possibly causing a backup into a home. Clay pipes suffer from earth movement and develop cracks and offset joints, often leading to collapse, which also allow roots to enter and further degrade the lateral.



Cast iron corrosion

Clay pipe root intrusion

When these pipes fail in this manner, a more significant issue that affects nearby citizens and the environment is 'exfiltration' of the wastewater from the damaged pipe into the surrounding soil, groundwater, streams, and even public beaches. The extent of this exfiltration problem has only recently been studied and evaluated.

Elevated E-coli levels have been found in the soil of cities with the worst lateral problems. In California, the State Water Resources Control Board has implemented a TMDL (Total Maximum Daily Load) program that requires collection system owners to find and eliminate the sources of pathogens entering waterways and beaches. This program is requiring system owners to implement sewer and lateral inspection and repair programs to locate and stop these sources of TMDL[2].

Another issue with failed sewer laterals is groundwater 'infiltration' into the failed laterals. It is estimated that up to 80 percent of all infiltration and inflow into collection systems can be from service laterals. This creates significant additional wastewater treatment costs to treat this additional water, plus requires larger size sewer mains to transport this surge of infiltrated groundwater during wet weather.

Many cities and agencies didn't previously correlate wet weather quantity surges to a problem with sewer laterals. Millions of feet of public sewer mains were lined across the U.S., with only a minor reduction in infiltration surges, resulting in greater attention and infiltration studies now directed towards sewer laterals.

Community	Percentage of I/I from Private Sources
Lower Paxton Township, PA	60%
Lynchburg, VA	20%
Houston, TX	80%
Columbus, OH	55%
Washington Suburban Sanitary Commission	43%

Estimated I/I Associated with Private Sources. (Source: Report for Sanitation District No. 1 of Northern Kentucky, October 2006[3])

REGULATORY MEASURES TO ADDRESS PRIVATE LATERALS

Over the past decade, we have noticed more public agencies and cities passing regulations that require homeowners to inspect and then repair their failed sewer laterals. Inspection types vary by jurisdiction, but are either completed by a Closed Circuit Television (CCTV) inspection or through an air test of the lateral.

One such agency is the East Bay Municipal Utility District (EBMUD) in Oakland, CA. EBMUD and the cities that contribute to the EBMUD wastewater system implemented the Regional Private Sewer Lateral (PSL) Ordinance beginning in 2011. The ordinance applies if you are buying and selling property, building or remodeling a structure, or changing the size of a water meter[4]. If one of these conditions exist, the sewer lateral must undergo and pass an air test to verify there are no leaks. If the lateral is free of leaks, a compliance certificate is issued, allowing the owner to obtain a permit or transfer title on their property. If the verification test fails, the lateral must be repaired.

More agencies are implementing these types of programs to facilitate repair of these neglected sewer laterals, while passing on the cost to the property owner. While unpopular at first, most property owners eventually accept this regulatory process as a necessary cost of home ownership, and a way to protect the environment and the public.

Where public or political pressure prevents a public agency or city from requiring owners to test and repair laterals, some agencies are deciding to take over the maintenance and repair of the private laterals themselves. Root issues can travel down sewer laterals and into mainline sewers, causing frequent maintenance issues and blockages in the public sewers. By repairing the laterals, the agency reduces future maintenance costs caused by the failed lateral condition.

In addition, agencies have repaired laterals as part of an infiltration reduction program, where lateral repair costs far undercut what they would spend to upgrade their wastewater collection and treatment facilities. Agencies have also developed programs to share costs with homeowners, and some have developed payment plans to help lessen the financial hardship on homeowners by adding the repair cost to water bills or property taxes.

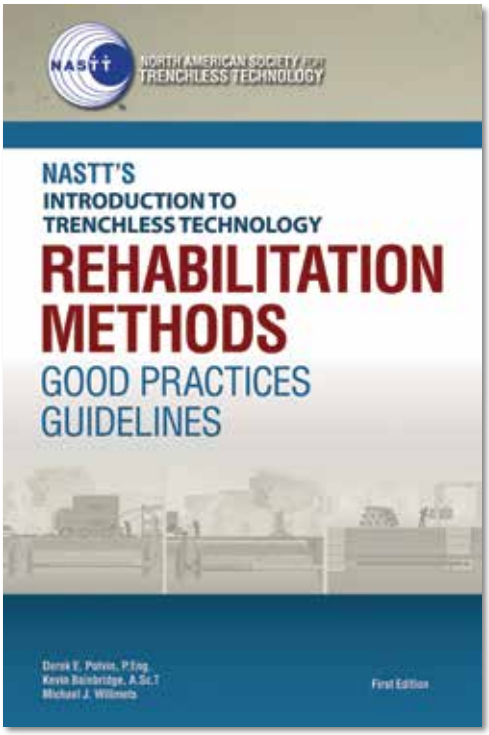
LATERAL REPAIR METHODS

A CCTV inspection of the lateral performed by a NASSCO LACP (Lateral Assessment Certification Program) certified Operator is typically performed first to determine the location of defects and the overall condition of the lateral.

Once it is determined that a lateral needs repair, there are two commonly used trenchless alternatives for lateral repair that can be performed depending on the condition of the sewer lateral, and depending on site constraints. A good source for various rehabilitation methods is NASST's Rehabilitation Methods Good Practices Guidelines[5].

Rehabilitation Method	What is it?	Digging/Insertion Pits Required	Advantages	Disadvantages
Pipe Bursting	A bursting head is inserted into the existing lateral, which bursts the old pipe, while pulling a new pipe in place behind it.	Yes	Can upsize an existing pipe.	Some existing pipe materials like ductile iron or steel pipes cannot be bursted. But new pipe splitting technologies can be used for 6" and larger maleable pipe materials.
CIPP Lateral Lining	CIPP lining of laterals using resin-impregnated fiberglass/felt tube to create a new pipe within a pipe.	No	Completely trenchless, installed from the sewer main and/or cleanout; can line only the portions of the lateral that need repair.	Cannot line through collapsed pipe.

Lateral Rehabilitation Methods Comparison



The NASTT Rehabilitation Methods Good Practices Guidelines is a good useful source

CIPP LATERAL LINING

The CIPP (Cured-in-Place Pipe) lateral lining process will be discussed more in depth here as a versatile, cost effective, and completely trenchless process (no insertion or extraction pits needed) to repair the connection to the main sewer, the entire lateral, a portion of the lateral, or any combination thereof. CIPP lateral lining can be used to line any pipe material, with lateral diameters from 3 to 8 inches.

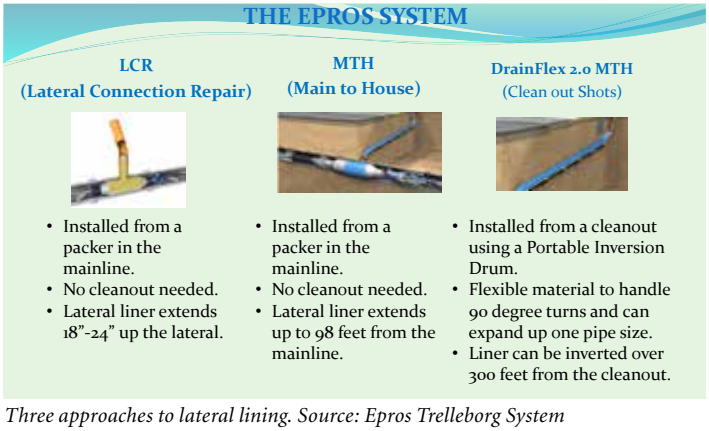
There are several manufacturers that offer lateral lining products. The most versatile systems use a remote packer that allows for lateral-to-mainline connection repairs, and that will line the connection plus the entire lateral in one step via a remotely operated inflatable packer. These Main-to-House liners can be used to line the connection and the lateral for lengths of up to 100 feet from the mainline sewer.

Another lining technology used by many contractors is the use of a portable Inversion drum that will install lateral liners from a cleanout back toward the public sewer main. Long inversion lengths are possible that can line up to 300 LF of a lateral in one step.

Lateral lining uses the process of inversion to place the resin-impregnated liner into a lateral from a mainline sewer or cleanout. Polyester, Silicate, and epoxy resins are the most commonly used, with hydrophilic seals required to seal the ends of liners utilizing shrinkable resins. Once the liner is inverted, steam is typically used to cure the resin to create a fully structural new pipe within the existing sewer lateral.

Since the lateral lining rehabilitation method can be completed from the public right-of-way and from inside the mainline sewer, this is a good method for cities and sewer agencies that are looking to take on the financial responsibility for repairing laterals in their jurisdictions. The lateral lining process results in a structurally sound lateral without the need to enter private property, and that won't require any digging that may disturb landscaping or pavement.

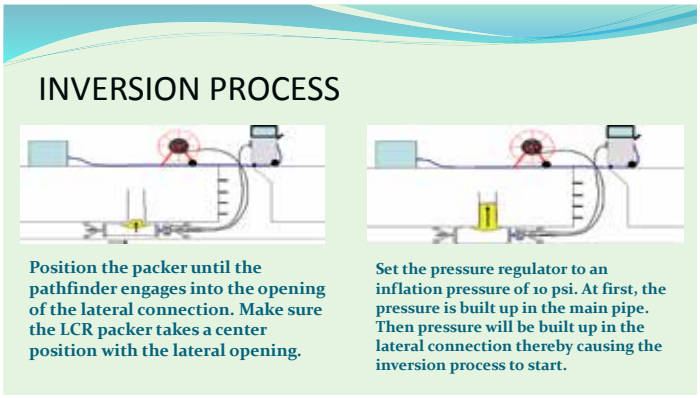
Lateral can be lined in one step with a remotely operated inflatable packer



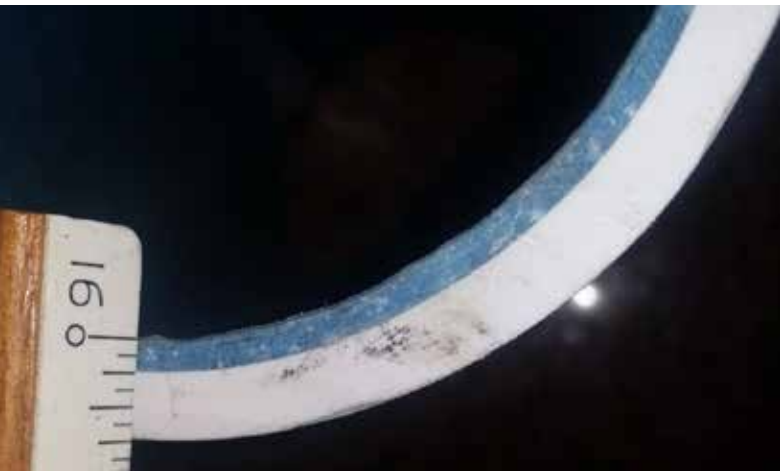
Three approaches to lateral lining. Source: Epros Trelleborg System

Portable inversion drum

> *Up to 80 percent of all infiltration and inflow into collection systems can be from service laterals.*



Inversion process



Liners impregnated with epoxy resins create a tight frictional interface between it and the host pipe

CONCLUSIONS

Private sewer laterals are a critical, but often overlooked, component in the effective operation and maintenance of our sewer collection systems. We must facilitate the inspection of sewer laterals to determine their condition, and either allocate public funding for their repair, or institute policy and regulations that will require the homeowners to repair them. Only then can we reduce collection and treatment costs by eliminating infiltration into these failed pipelines, while at the same time protecting the environment and the public from pathogen migration from inside the sewer laterals to surrounding soils and water bodies.

REFERENCES

[1] 2017 Infrastructure Report Card, ASCE, https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Wastewater-Final.pdf

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[3] Report for Sanitation District No. 1 of Northern Kentucky, October 2006, http://www.wefppvl.org/WEF-PPVL-library/wp-content/uploads/2016/02/PPRR_SD1-Private-Source-Report.pdf

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[5] NASTT's Introduction to Trenchless Technology Rehabilitation Methods Good Practices Guidelines, First Edition, 2008, North American Society for Trenchless Technology (NASTT)

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