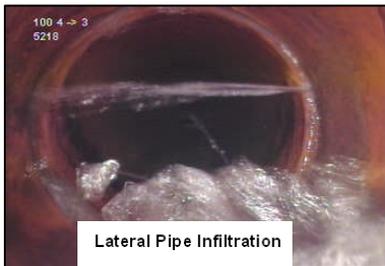


Welcome to Fort Lauderdale and the Las Olas Isles. The City is known as the "Venice of America" and is often called the "Boating Capital of the World". The Everglades are to the west, called "the sea of grass", beautiful beaches are on the east. Water is everywhere; traveling around the City by



water taxi on the Intracoastal Waterway, the New River and the surrounding canal system is a fun way to get around. The water taxis travel to the Las Olas Boulevard area which boasts many shops and restaurants. Traveling by taxi on the water lets you enjoy many of the fascinating properties and yachts that dwarf the average home. The Las Olas Isles are located just east of the shops and downtown Fort Lauderdale.

The City has an ongoing program which entails the modernization and rehabilitation of the City of Fort Lauderdale's water and wastewater infrastructure. *The City Engineer and Program Manager, Paul Bohlander, P.E.; "The most difficult utility projects I have been involved with in my 26 years with the City of Fort Lauderdale have been new sewer construction and excavation for sewer repairs. Groundwater conditions, sand and/or muck, and working in the middle of the road result in high-impact, difficult working conditions. Relining results in a renewed pipe without the adverse impacts of excavation on the road, other utilities, traffic, and adjoining property owners. And sewer repair is essential to the City of Fort Lauderdale, where most of our gravity sewers and laterals are in groundwater, and where inflow and infiltration contributions to the wastewater flows are significant – and would otherwise result in the need to expand the WWTP at great expense".*



*Use of the vac-a-tee has also resulted in minimized impacts on the adjoining property owner, as a result of the minimal pot-hole style excavation, the vacuum system for temporarily removing water during installation, and immediate completion and backfill.*

The City of Fort Lauderdale is taking an aggressive approach to keep its image by keeping the water where it belongs and that is out of the sewer collection system.

The City has renewed many miles of mainline pipe by lining and recognizes the need to seal the laterals and their connection to the

mainline pipe to prevent extraneous water from infiltrating the collection system. The ground water above the pipe produces hydrostatic pressure which causes severe infiltration. The defects in the main to lateral connection and the lateral piping are just as vulnerable to the hydrostatic pressures as the mainline pipes. The attributing sources of infiltration penetrating through these failed pipes are largely from tidal conditions, rain events, and normal seasonal water table fluctuations.



The City currently has an ongoing contract with LMK Pipe Renewal, LLC, a local state licensed general contractor specializing in trenchless pipeline repair. The project consists of inspecting all the service laterals in the South Las Olas Isles area. The area has 13 pump stations with approximately 600 service connections.



Like most municipal sewer rehabilitation projects, the goal is to restore structural properties to the failing pipe by installing a new cured-in-place pipe. The newly installed CIPP is resistant to root intrusion and forms a verifiable non-leaking main/lateral connection.



All the lateral inspections in the project area are performed with an IBAK inspection unit utilizing a color pan and tilt lateral camera following the NASSCO (National Association of Sewer Service Companies) LACP (Lateral Assessment and Certification Program) inspection practices and producing LACP compliant reports. Lateral inspections done with a pan and tilt color camera produce a far superior pipe inspection versus the traditional straight-line lateral camera systems. This type of high quality lateral survey produces a more accurate report, allowing the owner the ability to make proper decisions to repair the pipes as needed.

Prior to the Fort Lauderdale project, LMK Pipe Renewal completed a similar sized assessment project in a neighboring city which started with a straight-line lateral camera unit. Transitioning from the straight-line to pan and tilt color inspection more than tripled the amount of defects found. It only makes sense to perform video inspections that show more of the inside pipe profile which produces a more accurate condition assessment. During the condition assessment, LMK Pipe Renewal utilized the inspection camera's sonde allowing the technicians to locate existing cleanouts which saved the City unnecessary costs for installing a new cleanout. These thoroughly detailed pre-inspection reports produce an overwhelming abundance of valuable information which allows engineering the best opportunity to make the repair recommendations. Another benefit is that the City can give the same detailed report to the contractor to effectively perform the needed repairs. These reports also include a picture of the above ground conditions of the area where the existing outside cleanout exists, or where one needs to be installed.



“Remember the RVC 360 which introduced the industry to the pan and tilt functions for mainline inspections? What a difference it made! Well, the pan and tilt features in video inspections are just as important to the lateral as they are to the mainline pipe inspection results. You wouldn't think of inspecting your mains with a straight-line camera anymore because, you can't see everything and therefore you don't have the whole story! The same quality of inspections issues are present in the lateral inspection and reporting process.



We would be at a great disadvantage if we did not have this tool to perform the lateral inspections on the Fort Lauderdale project,” says Mark Gulyas, Project Manager, LMK Pipe Renewal.

Many Las Olas residents don't have driving options as their home is built on a narrow street that ends in a cul-de-sac. Since residents need to be able to drive back and forth to their home, traditional open-cut methods are not preferred and are preserved as a final option. Any excavation is going to negatively impact traffic flow and the deeper repairs may

necessitate a road closure which would definitely cause serious access problems for the homeowners. Wherever possible, trenchless repairs are performed in the City for both mainline repairs and laterals. Trenchless repairs have significantly reduced the negative social impact and simultaneously have helped save the City money versus conventional dig and replace methods. When an excavation is required you can run into above ground conflicts like beautiful trees, shrubs, custom paved driveways and other expensive landscaping. Underground it doesn't get any better with utility conflicts, and high water tables running sand and muck. Water is everywhere, just ask someone who has done some digging on the Isles. "Where's the water table?" After you get a chuckle, the response will most likely be, "you are standing on it!" On some streets during seasonal high tides the salt water actually comes up through the storm drains and seeps onto the street's surface; this is harmless, but a difficult environment to dig in.

In cases where there is not an existing cleanout, LMK Pipe Renewal is utilizing the Vac-A-Tee® System by LMK Technologies. Vac-A-Tee is a PVC saddle that is snapped onto the pipe and adhered by sealing to the exterior of a lateral pipe. The method of installation first requires accurate locating which is performed during the initial condition assessment. Then, the lateral pipe is exposed by hydro-excavating a 16" to 20" diameter borehole, and the crown of the pipe is cleaned with pressurized water. Next, a depth measurement is performed and a riser pipe extending from the lateral to the surface is cut and attached to the Vac-A-Tee saddle. The saddle is attached with a proprietary adhesive/sealant which is applied to the underside of the saddle. Now ready for insertion, the technician lowers the cleanout assembly into the borehole and snaps the saddle over the lateral pipe. The small borehole is quickly backfilled keeping disruption to a minimum and in some cases restoration is completed the same day. The new connection is subjected to a hydrostatic water leak-test, and then the crown of the lateral pipe is cored creating a lateral access point. The system is so clean that in some cases the homeowner is not even aware that this work is being performed. Where existing cleanouts are located and identified to be deteriorated or broken, traditional open cut excavation is utilized to replace the defective cleanout.



The lateral conditions observed during the video survey dictate which method of cleanout installation is utilized. Overall, the Vac-A-Tee® is the quickest, safest and cleanest method. One requirement of the project is that all of the streets are to be clear of materials daily. There is no staging area available for construction, so cleanliness of the site is a big issue. The project's unique obstacles such as tight roads, high water table, and above ground conflicts, which limit the excavation areas, all make for a challenging project but are overcome when using the right technologies.

The South Las Olas project area recently had all the mains renewed using CIPP. When the mainline liner is installed, the coating on the outside of the pipe (used to contain the resin and improve flow rate) ended up as the surface of the interior of the newly installed CIPP main. When choosing a lateral rehabilitation method the most important part of the project is the connection at the main. If the interior of the new mainline CIPP is coated with one of the popular coatings like polypropylene or polyethylene and the lines are in service which introduces F.O.G. (fats, oils and grease), then the challenge to seal the lateral to the main by simply adhering resin becomes unpredictable for a minimum 50-year service life design. This challenge is also overcome by using the right technologies.



*Mr. Jean Examond, City of Fort Lauderdale, Project Engineer; "The project is progressing very well it looks like the City will benefit from this technology (T-liner) for years to come. This area has needed this type of repair, lining the mains just didn't stop all the infiltration for us into the City Sanitary Sewer System".*

On this specific contract, the City of Fort Lauderdale specified the ASTM F2561-06 Standard for a structural one-piece main and lateral lining assembly that incorporates compression gaskets. The one-piece lining structurally renews the main pipe fitting and in most cases extends up the lateral to the property line. In some cases where a cleanout is not practical, LMK's T-Liner® Shorty™ system is being utilized to structurally seal the connection and extend three-feet up the lateral. The contract



specifications called for stamped engineering design calculations by a state licensed PE in accordance with ASTM F1216-09. The engineering design work was supplied by Rohan Engineering, for both the lateral tube and the full-circle interface seal (connection at the main) to determine the minimum liner thicknesses. The CIPP design criteria for the lateral pipe is “fully deteriorated.” The lateral connection design is a little trickier. The connection CIPP design criteria for a previously lined mains is “partially deteriorated” because the hydrostatic load is the primary issue to address. For mains that are unlined (no mainline liner installed) the design mandates a “fully deteriorated” pipe condition be utilized. The CIPP design for the main connection is typically overlooked; however it is a key component to the success of a structurally sealed connection designed for a minimum service life of 50 years.

*Mr. Scott Sawyer, City of Fort Lauderdale, Engineering Inspector II; “The pre-videos and reports have revealed a lot of defects in the laterals and the connections at the main. The T-Liner repairs are progressing well; the hydrophilic bands act like gaskets and the full circle main connections seal off the water. So far the post videos have all looked pretty impressive. When it comes to the cleanouts, the vac-a-tees have reduced the restoration there is just a small hydro excavated hole to restore, the vac-a-tees are exactly what is needed because of the site conditions. Overall I think the project is looking good, I like the system.”*

In Florida, water is everywhere. Florida communities have unique issues that may not be present in other areas of the country and with much of the state’s high water table causing high levels of infiltration, the demand for lateral lining has been progressively growing. It is becoming widely recognized that rehabilitating the manholes and main line sewers alone will not solve a majority of the I/I issues that are present in any collection system. In a typical sewer system there may be more linear feet of lateral piping than there are of mainline sewer, so without addressing the lateral connections and lateral piping issues, only part of the system’s problems are corrected.