

Trenchless TECHNOLOGY™

By Jamie Johnson



Use of Low Voltage Testing Identifies Points of Infiltration and Exfiltration of Miami Sewer Lines

South Florida, in particular, the City of Miami and Miami-Dade Water & Sewer Department (WASD), have not had it easy in recent years. The area sits above a vast and porous limestone plateau — Imagine Swiss cheese and you will have a good idea of what it looks like underground.

As a result, underground water moves around freely and easily — seeping into yards at high tide, bubbling up on golf courses, flowing through underground caverns and corroding building foundations. Not to mention flooding sewers mains through cracks, broken joints and defective service connections.

The unlimited flow of groundwater combined with defects in the sanitary sewer system has presented Miami with two related, daunting challenges. The first being groundwater infiltration into the sanitary sewers, which leads to an increase in the amount of wastewater being treated. When groundwater seeps into the pipes and is unnecessarily treat-

ed, it not only results in higher sewer rates for residents, but higher operation costs for the City, as well.

The second challenge has been wastewater exfiltration out of the sanitary sewers and into the groundwater table. Anywhere groundwater is able to seep into the pipes, then wastewater is able to escape the pipes. Untreated wastewater contaminating the groundwater is an obvious environmental and public health concern.

It is primarily to address these challenges that Miami has been in search of an effective method for locating defects in their sanitary sewer system. The City's search for innovative approaches should come as no surprise since Miami, with its dedication to improving local infrastructure, is known for leading the way when it comes to tackling inflow and infiltration (I/I) and being proactive in attacking rehabilitation.

In its search for effective I/I location methods, Miami has found one such innovative technology to find its worst

sewer defects in Electro Scan. After first meeting at a conference in August 2012, Electro Scan demonstrated its ES-620 System (WEFTEC's 2013 Innovative Technology Award Winner) for Miami officials in February 2013, surveying both lined and pre-lined VCP pipe, with a few follow-up meetings later in the year. Impressed by the data, Electro Scan worked through Miami-Dade Approved Vendor and Contractor, RUTT Inc., to allow Miami to begin the procurement process for a new ES-620 system beginning in September 2013.

The Electro Scan probe releases a focused array of low-voltage high-frequency electrical current, of only 10 volts and 40 milliamps, which locates and quantifies all defects in non-conductive sewer mains and laterals. Most sewer pipe materials are electrical insulators. A defect in the pipe that leaks water will also leak electrical current. For a constant applied voltage, the larger the defect, the greater the electric current recorded. This is

also the case for water in that for a given water pressure, the larger the hole, the greater the flow.

Since sewer pipe materials are generally asbestos concrete, brick, clay, cement, plastic, and reinforced concrete, i.e., all non-conductive materials that naturally prevent electricity from passing through or along the wall of a pipe, no electrical current should ever be able to “leak” or escape from inside a pipe. Unless, of course, there is a crack or break in a pipe.

As the Electro Scan electrode, called a probe, passes through the pipe, it measures the variation of electric current

the software then sends the scan’s “raw data” to the Web-based processing and viewing platform called “Critical Sewers,” where it is automatically post-processed, quantified and displayed to anyone who has an account for that particular project or client. Additionally, an estimated gallons per minute (GPM) infiltration rate is assigned to each of the defects, and then the pipe, as a whole (GPM rate is estimated to be +/- 40 percent and assumes one foot of head over the top of the pipe).

Working closely with Miami-Dade WASHD chief of wastewater collection Rod Lovett, the relationship between

Miami, now operating under a recently-issued EPA consent decree, realized that with the change to Electro Scan’s ASTM Standard, the ES-620 system would be in high demand within the county for locating issues and evaluating pre- and post-rehabilitation projects.

“This technology enables the identification of points of infiltration and ex-filtration in non-metallic gravity sewer lines. It is especially valuable in detecting and quantifying nonvisual leaks that typically occur in gravity sewer lines above the water table,” Lovett said.

Electro Scan completed a second demo in July 2014 when five 8- and 10-in. VCP sewer mains were scanned, with four out of the five pipes lined using a CIPP method. Miami’s purchase of its ES-620 was approved in late summer 2014. Electro Scan completed its ES-620 installation and integration in one of WASHD’s existing CCTV rigs in late August 2014, including the training and field certification of six WASHD staff members.

The relationship has been a symbiotic one. Electro Scan director of field operations Macy Grubbs said, “Working with Miami-Dade WASHD, RUTT Inc. and Rod Lovett has been great. Anytime you have a heavy user like MDWASHD, it helps you push your product and evolve it to the next level. Based on their recommendations, in just the few months Electro Scan has been in Miami, we’ve implemented remarkable software, user interface and application enhancements.”

With the high-visibility of the technology and its data throughout the county, the decision was made within county management to present the technology to AECOM, the selected consultant, for inclusion into the county’s three-year, 3 million-foot Sanitary Sewer Evaluation Study (SSES) program. Specifications have been written to include Electro Scan inspection and reporting to meet Miami-Dade’s unique applications.

“While Electro Scan does not replace the need for CCTV inspection, it can locate many defects that cannot be found by CCTV inspection only,” Lovett said.

Jamie Johnson is project engineer for Electro Scan, which is based in Sacramento, Calif.



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flow through the wall of the pipe, then through the ground to an electrode on the surface — either a short metal stake driven into the ground, or another existing grounding location, like a guy wire, steel fence post or street sign.

Taking an electrical measurement every 14 milliseconds, the data is transmitted back up the CCTV truck’s cable and reel, and then to the Electro Scan controller. There, the data is synched and delivered to the truck’s on-board PC, which records all the data and operates the system via Electro Scan’s desktop application software. Once a scan is complete,

Electro Scan and Miami has grown immensely since that first meeting back in 2013. “The Miami-Dade Water and Sewer Department has embraced the use of low voltage testing for gravity sewer line known as Electro Scan,” said Lovett.

Lovett’s initial interest in Electro Scan stemmed from his desire to examine sewer pipes within the cone of influence of WASHD’s groundwater wells to determine locations where sewage exfiltration and rain-dependent infiltration (RDI) could impact water sources.

In the year since the purchasing cycle began, Lovett’s priorities have shifted.

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