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August 2007

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AGGRESSIVE WATER LEAK DETECTION
IN MIAMI-DADE COUNTY, FLA.

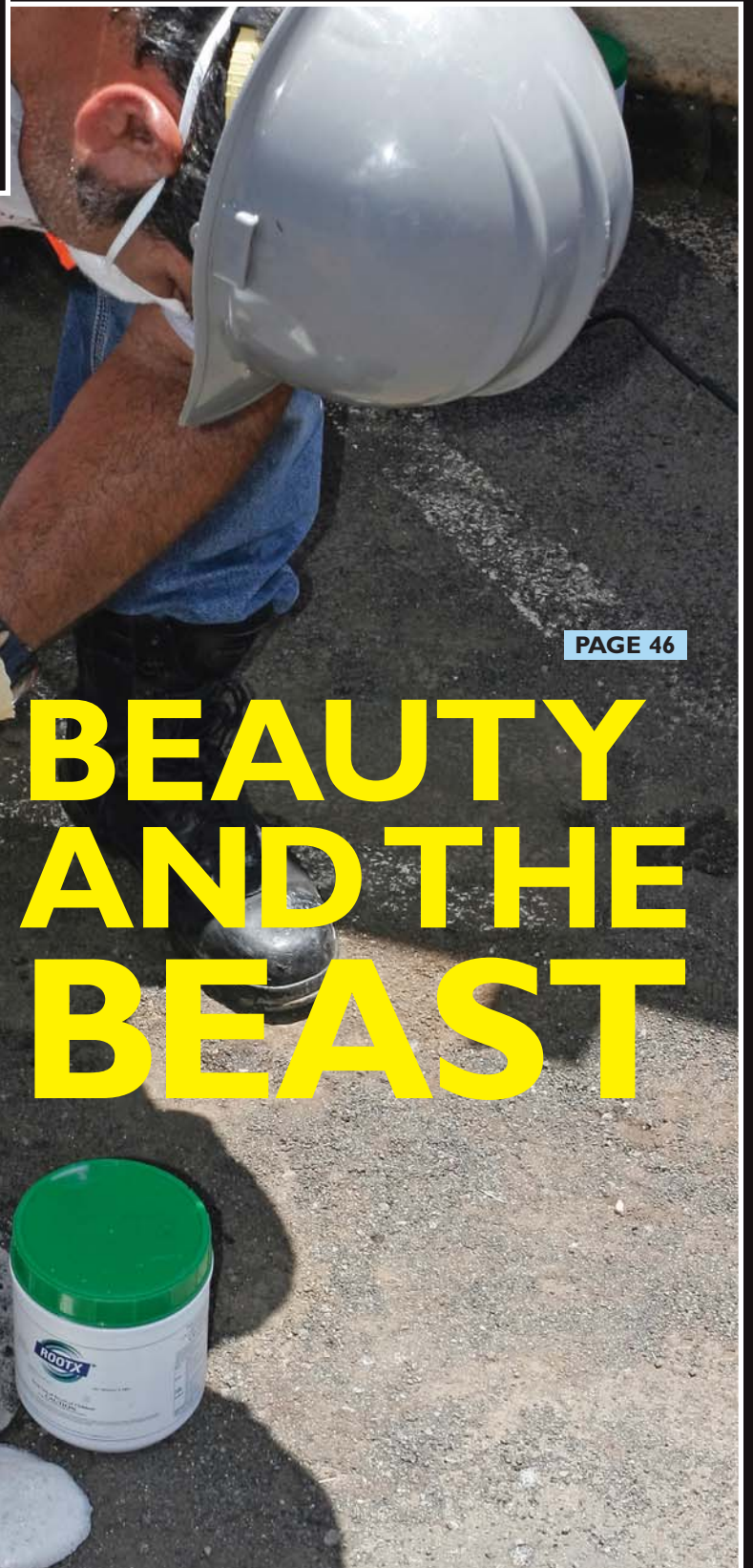
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Chemical and
mechanical methods
help Honolulu tame
root intrusion

BEAUTY AND THE BEAST

The City of Honolulu works proactively to face the challenge of controlling the underground monster created by its above-ground Garden of Eden

By Suzan Marie Chin



Collection system maintenance technicians Bogart Castro (left) and Lawrence Correa use a RIDGID-Kollmann K-1500 SP with cutters to cut and remove root pieces remaining in a pipe. (Photography by C.J. Lileikis)

When faced with finding a solution to a problem that never stops growing, the City and County of Honolulu Department of Environmental Services took proactive measures.

The department created an aggressive preventive maintenance and root elimination program to stop the underground menace generated by the city's lush tropical landscape.

By combining old-fashioned mechanical techniques, the latest in chemical control technology, and software-generated strategic scheduling, Honolulu plans to eliminate or significantly reduce root intrusion throughout its 1,500 miles of sewer collection system over the next five years.

With some sections built as early as 1900, the Honolulu wastewater collection system is as diverse as the people, flora and fauna that share Hawaii's island landscape. The sys-

tem includes about 40 sizes of pipe, from 4-inch laterals to 84-inch force mains, in materials that include ACP, concrete, HDPE, PVC, steel and VCP.

The island of Oahu experiences rain somewhere every day. This, coupled with a sandy, adobe clay or volcanic soil base, creates an ideal environment for roots to travel quickly and enter underground infrastructure of all types.

“Oahu is a small island, and most of us are related in some way or another to somebody else, so our customers are our family. It is our job to take care of our family, and we could only do it by being aggressive in our approach.”

Clement Padeken Jr.

Private and commercial property owners throughout the island take advantage of the climate by planting extensively. The island is profusely covered with banyan trees, fruit trees such as mango and coconut, and flowering shrubs like plumeria, used for making flower leis.

The job for the roots of all these plants is to find water. Pipes are especially prone to intrusion, even from plants as far as 100 feet away. When temperatures drop and the pipes sweat, roots seek the moisture and work their way quickly into the joints.

A nudge forward

Honolulu's response to root-related sewage spills or blockages was always prompt, but a consent decree issued several years ago pushed the Department of Environmental Services to address its sanitary sewer overflows



PROFILE:

Department of Environmental Services, City and County of Honolulu, Hawaii

POPULATION:
910,000

AREA SERVED:
120 square miles

INFRASTRUCTURE:
1,500 miles of sewer collection system

WEB SITE:
www.envhonolulu.org



From left, Bogart Castro, Lawrence Correa and supervisor Raphael Kama inspect a lateral line at a high school near downtown Honolulu. The submersible camera is part of the UEMSI Navigator inspection system used before and after lines are treated with RootX chemical root control.



The light-colored object in the bottom center of the screen is a root that has entered a sewer line. RootX will be used to kill the root.

(SSOs) caused by root intrusion on a more preventative basis. Protecting the environment and community is priority one for the agency: because of its relatively small land mass, everyone is affected.

“Oahu is a small island, and most of us are related in some way or another to somebody else, so our customers are our family,” says Clement Padeken Jr., a manager for the Department of Environmental Services. “It is our job to take care of our family, and we could only do it by being aggressive in our approach.”

To help develop the root control program, Padeken and his team turned to department engineering support technicians Liana Lee and Tessa Burger. They gathered years of data on trouble calls and system history and interviewed crew foremen and mem-

bers of the department’s emergency response crews.

Lee and Burger then compiled the data into Synergen Series enterprise asset management (EAM) and computerized maintenance management system (CMMS) software, supplied by Synergen Inc. This process took about two months, and it provided the team with a priority “hit list” to begin aggressively inspecting and treating the lines.

All work for the root-control program is done by an in-house, four-man crew equipped with high velocity root cutters by KEG Technologies Inc., rodders by SRECO-Flexible Inc., RootX chemical treatments from RootX Root Control Corp., small push cameras by UEMSI, and a fleet of combination sewer cleaning trucks by Vactor Manufacturing, on call when needed.

The team’s goal is to inspect and perform root elimination or control at about 2,000 feet per year. History determines most priority locations, but the staff can modify the plan based on current field findings as revealed by inspection.

“History and location are very important, but we also look at what is found upon current inspection of a line,” Padeken says. “If a line is infiltrated with roots, we know with certainty that surrounding laterals and adjacent lines

ROOT-FREE ZONE

As part of its ongoing root control and elimination program, the Department of Environmental Services for the City and County of Honolulu, uses the Biobarrier Root Control System by Fiberweb plc.

When crews rehabilitate or replace sections of pipe via open cut, they wrap the new sections with the Biobarrier product. The blanket-like material prevents tree and other plant roots from growing around the structure.

The nonwoven polypropylene geotextile fabric has nodules of trifluralin herbicide that are attached to the fabric surface. The herbicide prevents root tip cells from dividing, thus stopping growth. The nodules slowly release the trifluralin, creating a root-free zone around the new pipe. The fabric is porous, so air, nutrients and water can pass through and hydrology remains healthy.

The method has been used for years in agriculture for the safe control of weeds and is now being used more frequently in urban areas to control roots that could cause structural damage. Other applications for the technology include septic tanks, drainage pipes, levees, dams and stormwater lines.

within the culprit root’s reach will also be affected. So we extend the inspection, removal and chemical treatment to surrounding laterals and mains in the vicinity.”

Much of the work takes place in narrow easements. Unlike cities on the mainland, Honolulu has a design ordi-

nance for its system, giving priority to the convenience of the city and public. Because of this, many lines run through private property.

The city or county owns everything underground and what is in it, while the property owner holds title only to what lies on the surface. The city also is

responsible for all laterals from the property line to the main — in some cases, this can be as long as 30 feet. In the smaller, narrow easements, most laterals that have to be maintained are only 2 feet long.

Rooting out the problem

Under the root-control program, each line is first inspected with a CCTV camera, and the conditions are recorded. If root intrusion is found, roots are either treated solely with chemicals, or first physically removed by hydraulic cutting or rodding, followed by chemical application.

For larger or heavily blocked lines, where rodding cannot adequately

reels in the hose, removing the slack until the nozzle is just visible from the upstream manhole. Once the FDU is in position, the jetter's water pressure level is set to run at the manageable idle speed. After flow is established and confirmed, the operator slowly reels back the hose until it reaches the downstream manhole. While this is happening, the FDU releases a foam spray that coats the roots and pipe walls, leaving a barrier on the pipe that prevents re-growth.

Treating laterals

In lateral lines, the crew can deploy the treatment directly from the container. To aid in dispersion and treating the entire diameter of the pipe similar to the FDU 100 method, the crew developed its own technique.

To come up with this ingenious, low-cost method, team members used a CCTV camera to observe what took place inside the laterals once the chemical was introduced. The treatment is similar to an oil sheen that spreads upward wherever there is moisture. "We introduced a garden hose with a spray nozzle attached," Padeken says. "The spray helps activate the chemical and gets it up onto the top of the pipe so it will be dispersed throughout the entire circumference. It's a cheap trick, and it works!"

Once the initial inspection and root treatment is complete, the line is re-inspected to determine if the pipe has been damaged by the root intrusion. When needed, the pipe is repaired, replaced or placed on a maintenance review schedule. Most lines are inspected six, nine and 12 months after the initial inspection and treatment. "Our goal is to get each of our lines on an annual inspection and PM basis — a longer interval if possible," Padeken says.

When a line becomes problematic and ordinary maintenance and chemical treatments cannot correct the problem, the line is put on a list for rehabilitation with cured-in-place pipe (CIPP) lining.

Built-un bonus

Besides the obvious benefits of reducing spills and meeting the consent decree requirements, the root control program has helped boost staff efficiency. Man-hours previously spent on emergencies and on monthly maintenance scheduling for repeat root-related issues have been significantly reduced.

By adding chemical treatment to traditional cutting and cleaning, the city has cleared historical problem areas. These areas are now clear of intrusion for up to two years before they need to be cleaned and treated again.

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"By cutting back on man-hours needed for repeat root maintenance, we can use our crews for other priority projects, and that has been one of the biggest benefits of having this program in place."

Clement Padeken Jr.

remove the intrusion, the team uses a tracked easement machine. The unit is connected to a Vactor unit parked in a nearby street. It carries 300 feet of high-velocity jetting hose and is outfitted with the appropriate sewer cleaning nozzle or hydraulic root-cutting tool. The Vactor truck supplies high-pressure water, giving the team the power of the larger unit in a highly mobile machine.

Crews can apply the chemical treatment in several ways depending on the size and location of the line. For 8- to 18-inch mainlines, the crew uses a Foam Dispersal Unit (FDU) 100 from RootX that works in tandem with high-pressure jetting equipment.

The team begins by inserting the jetter hose with the appropriate-size cleaning nozzle into the downstream manhole and pushes it upstream. When the hose reaches the upstream manhole, it is pulled up to the surface using a gaff hook or rope, and the cleaning nozzle is detached. The crew then mixes the two parts of the chemical treatment.

Once mixed, a transfer tube attached to the bag containing the mixed chemical is attached inside the FDU. The FDU chamber is filled with the chemical, the cleaning nozzle is connected to the FDU and attached to the jetter's leader hose.

The jetter truck operator then slowly



Collection system crews perform periodic maintenance on riser-to-lateral clean-outs. Here, Lawrence Correa deploys a lateral camera into the line for visual inspection, while Bogart Castro spools out the cable.

needed for repeat root maintenance, we can use our crews for other priority projects, and that has been one of the biggest benefits of having this program in place," Padeken says.

He adds that much of the credit for the success of the program belongs to Lori Kahikina, division chief for the agency, who gave Padeken and his team the freedom to research, explore and try new technologies. Her trust in the team's decisions has led to the successful clearing and treatment of almost 600 laterals and 150 mains to date.

The experience gained through the program will be of great value as Padeken and his team face the imminent task of assuming maintenance and management of the area's 0 system, now under the jurisdiction of the Street Department. When the changeover is made, Padeken expects the stormwater system to need a root-control program of its own.

Padeken and the team are ready. "Any pipe can have root problems," he says. "Don't get comfortable. Flexibility and change can be your best friends."

Through its willingness to try new technologies and change its approach, Honolulu has successfully tamed its underground beast, helping to ensure that its community will remain a place of unparalleled tropical beauty. ♦

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