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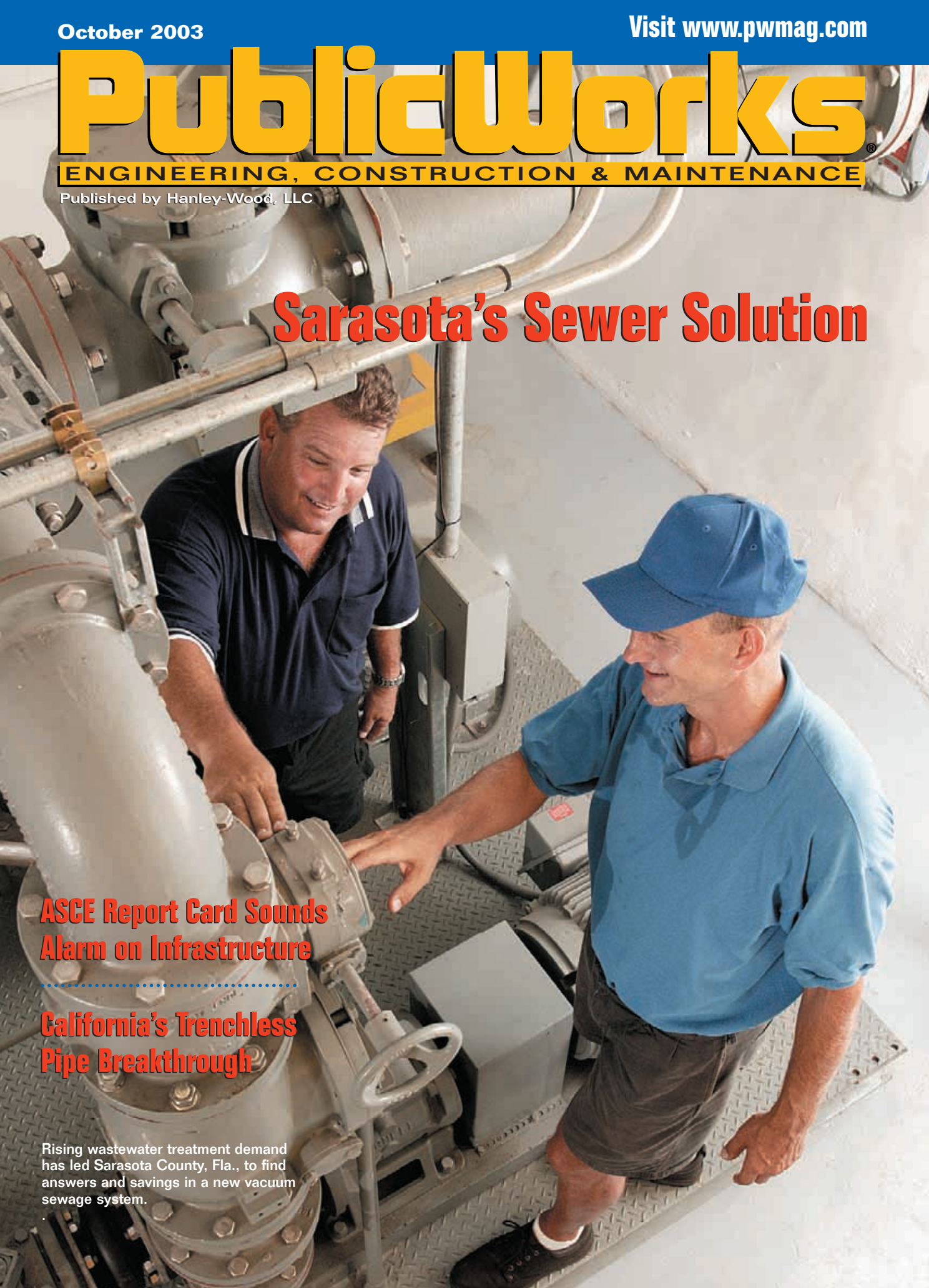


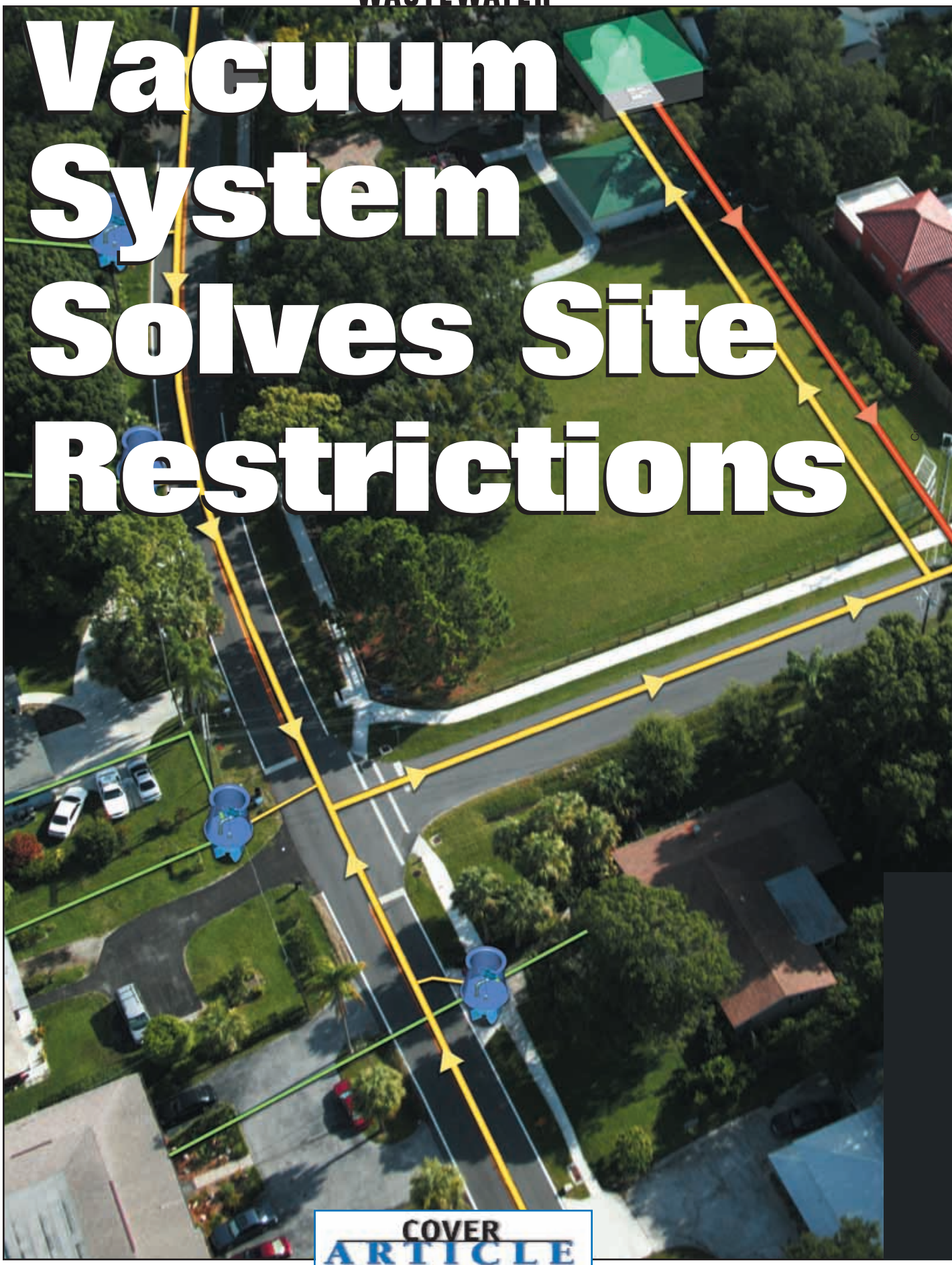
Sarasota's Sewer Solution

ASCE Report Card Sounds Alarm on Infrastructure

California's Trenchless Pipe Breakthrough

Rising wastewater treatment demand has led Sarasota County, Fla., to find answers and savings in a new vacuum sewage system.

Vacuum System Solves Site Restrictions



COVER ARTICLE

Sarasota officials say their new vacuum sewer system provides safe, reliable, and cost-effective removal of wastewater for 600 homes in the environmentally sensitive Phillippi Creek basin. These homes previously were served by septic tanks, many of which were failing.

Florida county turns to a vacuum sewer system to resolve its biggest problem—how to install a municipal sewer system without disrupting residents or the infrastructure and saving money at the same time.

By Steve Gibbs

A more challenging site would be hard to come by than Sarasota County, Fla., for a major sewer project. Approximately 14,000 homes and businesses are scattered across the 50-square-mile unincorporated northern part of the county. Some areas are densely populated while others are dotted with homes. Other residential areas are not nearby and are separated by miles. Many of the homes are expensive and the lots are well established with mature trees and landscaping.

Virtually all of the residences use onsite wastewater treatment systems (septic tanks) and have for years. The seasonal water table is high throughout the county (an environmental issue with many septic system owners), and the soil is poorly drained. To further complicate matters, virtually the entire northern service area is part of the Phillippi Creek basin, a tributary that discharges into Sarasota Bay, which has been designated an environmentally sensitive National Estuary by the U.S. Environmental Protection Agency.

These factors presented hurdles for the engineers charged with designing and installing a municipal sewer system for Sarasota County. Nevertheless, consultants created a plan in September 2000, approved by county officials, that addresses the challenges—and does so cost-effectively. The result of this effort is a recently installed vacuum sewer system designed by Giffels-Webster Engineers of Englewood, Fla., and manufactured by AIRVAC Inc., Rochester, Ind. The new system serves 571 homes near Sarasota Bay. The price tag on this initial phase of the overall project was $8,900 per connection.

Like the system it installed, the construction work caused minimal intrusion into the community, with few complaints from the residents. "We have a good sewer program in place," says Jon Johanson, an engineering inspector for Sarasota County. "What we've done so far has worked well. We've had very few problems and very few complaints." This success has resulted in four more vacuum sewer systems currently being designed within the county.

TROUBLED WATERS

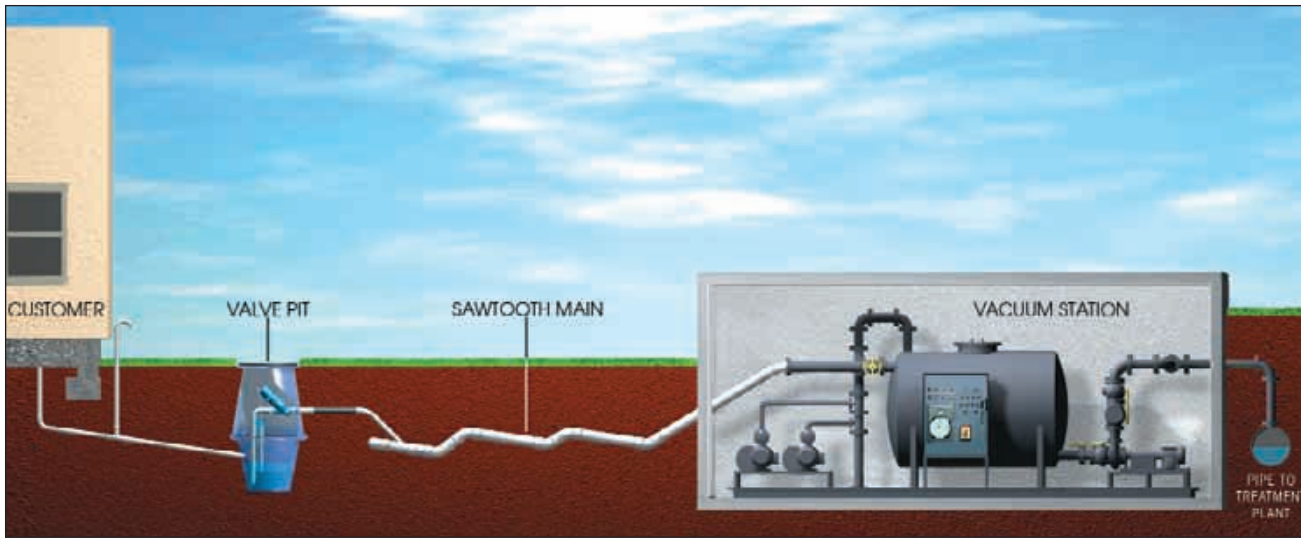
But area residents weren't always so happy. As early as 1984, Sarasota County recognized it had a pollution problem and for more than a decade, local leaders and public works officials discussed various options. Then, in 1997, the situation became more urgent: the county health department posted "No Swimming" signs on Phillippi Creek.

"The Phillippi Creek area is classified as a Class III body of water by the Florida Department of Environmental Protection," says Dan Burden, P.E., of Hazen and Sawyer, the New York-based program manager for the Phillippi Creek Septic System Replacement Program. "It is protected under that designation because it provides the public with recreational use and is a benefit to wildlife. The county had been studying the pollution problem for years and believed it was in the community's best interest to protect a valuable resource."

The county actually had begun a formal study of the Phillippi Creek sewer situation in 1994. A preliminary engineering report prepared by Hazen and Sawyer in 2000 evaluated various treatment options, both collection systems and onsite treatment, and prioritized the work to be done.

"We evaluated a variety of treatment options," says Burden. "We determined that for approximately 87% of the homes and businesses in the Phillippi Creek area, vacuum sewer technology was the most cost-effective way to provide a central sewer system."

The Hazen and Sawyer study noted that in areas where the home sites were large and widely scattered,



Credit: AIRVAC

Credit: AIRVAC

Above: Wastewater flows by gravity from houses to a valve pit, each equipped with a normally closed vacuum interface valve that prevents backup from entering the house plumbing. Left: The mains in a vacuum sewer system are buried in shallower trenches than are gravity sewers. Because the trenches were only 3 to 6 feet deep in the Phillippi Creek area, most of the vacuum mains were placed outside the pavement in a right-of-way, thus avoiding costly road restoration.

upgrades to existing onsite wastewater treatment systems were the most cost-effective solution. Gravity flow collection systems, while requiring minimal maintenance, were impractical because of the disruption associated with constructing these types of collection systems in urban residential areas and because of the high cost of construction.

"If we had gone with a gravity system, water would have been a major factor," says Johanson. "We would have had to go probably 15 to 20 feet deep, or deeper in some cases."

Various onsite wastewater treatment systems were evaluated and rejected for the majority of the communities within the county. Property size was an important determining factor—many home lots were not large enough to install an environmentally compliant septic tank. The most feasible onsite alternative appeared to be advanced secondary biological treatment (SBT), but at a capital cost of $10,200 per unit and a uniform annual cost of $2000, SBT was deemed too expensive.

Also considered was a low-pressure/grinder system, which has a relatively shallow collection line depth. That option, however, requires a pump for each connection making each likely to malfunction and failure when foreign objects enter the system.

"If an object is caught in the pump and creates a backup, then our maintenance crew must be called in for a repair," says Pat Zoeller, P.E., engineering manager for Sarasota County's utilities department. "If every house

has a pump, that's potentially a lot of maintenance."

SELECTING AN ALTERNATIVE

All these concerns led the county to consider vacuum sewer technology. Such systems collect raw wastewater and convey it through collection pipes, typically 4 to 10 inches in diameter, all under vacuum. A centralized unit maintains vacuum pressure in the sewers, and valve pits are installed for every 2 to 4 connections. The valves open by demand to allow wastewater to enter the collector, followed by a volume of air. The wastewater forms a slug of materials and liquid that is driven by the air due to differential pressure.

Under the vacuum system, individual houses and businesses rely on gravity flow to move wastewater to a valve pit, usually located on public property or an easement. Normally two homes are connected to one valve pit. Each pit is equipped with a vacuum-interface valve that activates when wastewater in the lower sump reaches a predetermined level, typically 10 gallons. At that point the valve opens and allows the vacuum system to empty the sump. Operation is completely pneumatic, so external power is not required.

"What we've noticed in the first 6 months of operation is the minimal amount of customer calls in reference to problems with the system," says Craig Bliss, manager of water reclamation facilities for Sarasota's utilities department. "I think we've had one customer call-out in the first 6 months of operation."

Because the flow is propelled by vacuum pressure, the collection lines can be buried shallower than gravity flow lines. In the Phillippi Creek area line depths vary from 3 to 6 feet. Because the collection line trenches required minimal excavation, most of the lines were placed adjacent to roads where the county already owned the right-of-way. Also, at this depth minimal dewatering was needed during installation of the collection lines.

"We were installing lines in an area where you have shrubbery, nicely landscaped yards, paved driveways, and that sort of thing," says Bliss. "Vacuum technology lends itself to ease of installation. That's a huge plus. The capital costs were a lot less than other collection methods and so far the maintenance costs have been lower than anything else we've tried."

From the beginning, AIRVAC, the vacuum vendor selected for the Phillippi Creek Septic System Replacement Program, has worked closely with Sarasota County officials. It has provided technical assistance to the various design firms, helped the county with public education, and assisted at the job daily during construction. In addition, AIRVAC conducted classes for the local plumbing contractors and assisted the county in the development of vacuum regulations and standards, which were nonexistent prior to the first phase.

Several concerns led Sarasota County to consider vacuum sewer technology. Such systems collect raw wastewater and convey it through collection pipes.

Even after completion of the first phase of installation, AIRVAC continues to work closely with Sarasota County officials. Bliss sites the service agreement the county currently has with the manufacturer as another plus. "It has really been a phenomenal asset," he says. "They not only consulted for us on the installation, [but] we have an arrangement where they operate and maintain the system. That's a great benefit because they are doing it cheaper than we can."

Based on the agreement between AIRVAC and Sarasota County, the entire system is under warranty, so if a vacuum valve fails, it is replaced at no cost to the utilities department. AIRVAC also provides connection services for new customers. "It's really a turnkey operation for us and it has worked out well," says Bliss.

"One of the great things about vacuum technology is that you can move pipes around and make minor adjustments during installation without going through a change order," Johanson says.

"I like the fact that with [this system] we have about ¼ the number of lift stations that we would have with a gravity system," says Zoeller. "And the vacuum station pumps are dry pit pumps. They're not in liquid so they don't suffer abuse from the outside, and the motor is not exposed to liquid, either. It's a clean environment that is easy to check and maintain. We've made the pump stations look like houses so they blend into the neighborhoods."

VACUUM VALUE

The first phase of the Phillippi Creek Septic System Replacement Program covered a section designated as Area E. At present, there are six other areas where vacuum sewers are being installed, with a total of nine more identified for wastewater treatment work on a priority basis.

The entire project is based on a 10-year program at an estimated price of $121 million, according to Burden. "A project like this can be an economic burden on its constituents," says Burden. "The county wants to keep costs to the residents at a minimum. To accomplish this, we searched for a variety of funding sources. The search has been successful and funding at both the state and federal levels has been obtained."

According to Burden, about 50% of the cost is being allocated to the customer. "Based on estimates right now, the customer will end up paying about $550 per year over 20 years, plus a monthly wastewater service charge. That's definitely cheaper than if they had to upgrade their septic tanks," says Burden. "Most people are extremely happy to be on the new system." **PW**

—Gibbs is a freelance writer in Germantown, Tenn., with 17 years of writing experience in public works, economic development, electronics, and business finance.

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For more information on the Sarasota County, Phillippi Creek Sewer Program, contact:

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