Residents of rural communities have many of the same aspirations as city dwellers. They want controlled economic growth, increased property values, clean water and a healthy environment for their families. Cities assume a certain level of economic growth and often take water utilities for granted. It is different for those who live in small communities, where economic growth and prosperity do not happen organically, but rather require careful planning and investment.

Orangefield, Texas, recently completed the first two phases of a wastewater collection and treatment project that already is paying dividends for its residents. Soon everyone in the area—at least those who choose to participate—will have access to a modern, efficient sewer system. It has taken about 15 years and lots of hard work, but the community now has water and sewer infrastructure that will enhance property values and make life more pleasant for everyone in Orangefield.

**A Growing Problem**

Orangefield, located about 20 miles from the Texas Gulf Coast, developed almost 100 years ago. The town grew rapidly during the oil boom of the 1920s, eventually reaching a population of 1,000 in 1930. The population dwindled significantly over the next couple of decades, but climbed to more than 2,000 by the most recent census.

Having never incorporated as a city, Orangefield has no municipal government and, until recently, no public utilities. Homeowners were responsible for their own water and sewer, with most opting for wells and septic tanks. Because the soil in Orangefield is ill-suited to absorb sewage, many homes had untreated wastewater in ditches, some along the front of their property. This certainly was unattractive, but it also created an environmental hazard. Sewage often made its way to nearby Cow Bayou, which is part of the Sabine River Authority Watershed area.

The sewer problem grew with the population. By the 1990s, Cow Bayou had become polluted to the point that aquatic life was almost gone and no one wanted to fish or swim there. Furthermore, the raw sewage meandering through local ditches was unsightly, smelly and unappealing to potential homebuyers and developers.

Orangefield clearly needed a sewage collection and treatment system, but wondered where a rural community would find money to fund the project if there is no taxing authority.

The effort to provide the town with water and sewage service began in the early 1990s with the development of the Orangefield Water Supply Corp. (OWSC). By 2005, it had more than 1,700 water customers. Attention soon shifted to the community’s need for sewers.

**Planning the Solution**

The OWSC got the ball rolling in 2000 with an information campaign and sign-up program. The board asked all interested residents to put down a deposit toward the development of a sewage system. The result was a $100,000 war chest that enabled the board to begin researching solutions to the problem.

The engineering firm J.F. Fontaine and Associates was retained to begin a detailed study of the situation. The firm not only provided engineering consultation, but it also helped Orangefield find the funding it needed for the project. The U.S. Department of Agriculture’s Rural Development Department provided an initial funding package, but that was not enough. Rural Development then re-examined the situation based on local income levels and was able to provide additional money, including some federal grants. With enough funding finally in place, Orangefield was able to begin work on the first two phases of the installation in July 2009.

The project engineers presented the town board with different system designs for collecting sewage. It quickly became obvious that a gravity sewer

**ARTICLE SUMMARY**

**Challenge:** A lack of public utilities in rural Orangefield, Texas, caused severe sewer problems and environmental hazards.

**Solution:** The town found funding and researched and installed a vacuum sewer station.

**Conclusion:** Investment in public utilities opens doors for growth in rural communities.
system would not be a viable solution. Because of the area’s flat terrain and high water table, installing collection lines would be expensive, disruptive and time consuming. The flat topography would require multiple lift stations and very deep collection lines. The fact that Orangefield has a high water table meant that the trenches would need shoring and dewatering. The project would take months, perhaps years, and cost millions of dollars.

As a possible alternative, the engineers brought in Airvac representatives for a presentation on modern vacuum sewers. Vacuum systems operate on simple principals of physics and have proven over many years to be reliable. Orangefield, with geography typical of many coastal areas, was a good candidate for vacuum technology.

**Vacuum Sewers 101**

From the home to the street, a vacuum system relies on gravity—just as conventional systems do—to transport wastewater. Near the street, the sewage collects in a valve pit that contains a sump and pneumatic valve mechanism. When the wastewater in the sump reaches a predetermined level (usually about 10 gal), the pneumatic valve releases the contents into the vacuum collection line. One or two homes typically are connected to a single valve pit. Vacuum pressure within the collection line propels the wastewater at speeds up to 18 ft per second toward the vacuum station. The speed of the wastewater helps scour the line and break up solids. The PVC collection line is laid in a sawtooth profile to ensure adequate vacuum levels at every point along the line.

Because the vacuum system relies on vacuum pressure rather than gravity to convey wastewater, the lines can be buried at shallower depths (usually 4 to 6 ft below the surface). Gravity lines in such flat terrain would require trenches reaching 10 to 15 ft deep to achieve the necessary slope. Shallower trenches mean faster, easier installation with less disruption to the neighborhoods and traffic. A single vacuum station, which covers about the same footprint as a small house, can serve homes up to two miles away. Several pumping stations would be required for a gravity sewer system in similar circumstances. Also, vacuum systems are contained, meaning there is no odor and that workmen rarely come in contact with raw sewage.

**Positive Results**

Although skeptical at first, the OWSC soon began to see the benefits of vacuum sewer technology and approved the plan. With the help of Airvac engineers, phases of the modern vacuum system were installed and put into operation. Only months after completion, the water in Cow Bayou is proving to be cleaner; the fish population soon will grow rapidly. Also, many of the ditches filled with sewage are dry and clean. Orangefield homeowners pay approximately $60 per month for water and sewer service, though high water users will pay a bit more. At present, about 1,000 homes are signed up for both water and sewer service, and more are certain to join as the community grows.

Other rural communities now are talking to Orangefield to find answers to their own water and sewer issues. It seems this small town has become a model for others to follow.

The best news about Orangefield’s new vacuum sewer system is that it opens doors for growth and development in the community. Property values are up, which will help local school funding. The good schools in Orangefield will get even better and help attract more families. It is a winning formula for small rural communities wishing to grow and prosper, and it all began with a plan for local public utilities.

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