

Utilities White Paper



Opportunities for Utility Companies with Effluent Sewer Systems

Effluent sewer systems enable utilities to offer wastewater collection and treatment services to new customers at a cost that is affordable for the customers and profitable for the utilities. Whether or not your utility currently provides wastewater services, effluent sewer technology can increase your customer base and your profits. Several different business models enable utilities, customers, and developers to share the cost of building and maintaining effluent sewer systems.

What is an effluent sewer system?

In a **centralized sewer system**, no treatment happens at the individual homes or businesses. Collection lines carry raw wastewater to a treatment plant, where the wastes are biologically digested; the solids are incinerated, buried, or used as fertilizer; and the liquid portion is further treated and eventually discharged, usually to a body of water.

In a **grinder sewer system**, each home has a grinder pump that breaks up solid wastes and propels them to the central facility through a smaller diameter pipe than a conventional sewer system requires. This reduces the cost of building the collection network, as deep excavations and lift stations are not required. However, all waste treatment still must take place at the central facility.

With **conventional septic systems**, homes and businesses have no connection to the municipal sewer system. Each property discharges its wastewater into its own septic tank, where bacteria digest wastes. Solids and scum remain in the tank and are pumped out every few years for further processing and disposal at a central facility. The liquid effluent flows out into a drainfield or filter bed on the same property, where natural processes finish the job of removing pollutants, and the purified effluent eventually returns to the groundwater or to surface waters.

An **effluent sewer** or **cluster system** combines elements of centralized sewer systems and septic systems. Each home or business has an interceptor tank for primary treatment, where bacteria digest the wastes. Instead of being discharged to a drainfield at the site, the liquid effluent is filtered and conveyed to a collection line, which transports it offsite for further treatment and discharge to the soil at a nearby location that serves the whole neighborhood or subdivision. Because the liquid effluent has already been partially broken down and filtered in each home's interceptor tank, it contains a minimum of solids and needs only to be trickled through a sand or synthetic filter bed for further purification before it is discharged to groundwater or surface waters. Solids remain in each home's tank, decomposing and reducing in volume, and any residual sludge is periodically pumped out and disposed of at the municipal facility.

These systems are called **effluent sewer systems** because only liquid effluent, not solids, is conveyed through the sewer system, or **cluster systems** because each filter facility serves a cluster of homes and businesses. Depending on how the effluent is conveyed to the offsite filter bed, they may be called **septic tank effluent pump (STEP)** or **septic tank effluent gravity (STEG)** systems.

Benefits of effluent sewer systems to utilities

1. Effluent sewer systems can be a source of profit to utilities. They allow utilities to add sewage service to their other services, expanding both their revenue base and their customer base. With each home paying \$20–\$40 per month, the utility can quickly recoup its investment because effluent sewer systems are cost-effective to install and maintain.

- *Economical to install:* Centralized systems use large-diameter lines and require expensive lift stations if there are hills between the homes and the treatment plant. These lines typically cost \$20 per foot or more to install. In contrast, effluent sewer systems use small-diameter collection lines that follow the terrain and require less excavation; installation of these lines costs \$5–9 per foot. Also, decentralized systems use natural processes in the septic tank and in the soil to treat wastes, whereas central treatment plants need power for pumping and aeration and space for large tanks. The cost of a recirculating sand or textile filter system for decentralized treatment is \$5–10 per treated gallon.
- *Economical to operate and maintain:* A few contract or utility employees can operate and maintain a decentralized system serving hundreds of homes. The interceptor tank at each home or business needs to be pumped only once every 7–12 years at the most. The only mechanical component is a sturdy 1/2- or 3/4-hp pump (similar to a well pump) at each site, and the electricity to run it costs the homeowner less than \$2 per month. A 1993 survey of effluent sewer projects in Oregon, Washington, and California showed that service calls averaged only 1.4 hours per month per 100 homes.

2. Effluent sewer systems reduce loads on overloaded conventional treatment systems. Treatment takes place in the interceptor tanks and in neighborhood treatment facilities instead of at the central plant. If effluent is piped to the central plant for treatment, it is of much higher quality than raw wastewater, placing less of a burden on the biological processes at the plant than raw sewage would. Digestion in each tank reduces the volume of solids that must be disposed of to as little as 10% of what it would be in a centralized sewer system. Finally, because effluent sewer systems are watertight, the system does not become overloaded when it rains.

3. Effluent sewer systems often allow utility districts to acquire land for wastewater treatment facilities at minimum expense. Developers frequently deed over land for treatment to a utility district in exchange for the benefits of an effluent sewer system.

4. Permitting requirements are minimal. Treated effluent from an effluent sewer system can be dispersed to groundwater or used for subsurface irrigation, requiring only an Underground Injection Control (UIC) permit, whereas centralized facilities discharging to surface waters require a National Pollutant Discharge Elimination System (NPDES) permit.

5. Effluent sewer systems efficiently accommodate seasonal population variations. In areas where population varies by season, effluent sewer systems can accommodate seasonal loads without the expense of enlarging a centralized system.

6. Abuse of the system can be identified at the source. If a household or business dumps something bad down the drain, it will affect only its own tank, not the whole system. The cost of pumping and repairs can be charged to the offender.

7. Effluent sewer systems conserves the community's groundwater. Whereas centralized treatment plants discharge treated effluent to surface waters, effluent sewer systems discharge it to soil, where it is purified as it returns to the groundwater. It is also possible to reclaim water from effluent sewer systems and reuse it for irrigation, industrial use, or other purposes.

Benefits of effluent sewer systems to developers

- 1. Developers can build homes in areas unsuitable for conventional septic systems where city sewers are not available.** Soil characteristics, high water tables, and terrain of the home sites do not affect the system. Developers can make full use of the land they have purchased.
- 2. Development density can be increased by as much as 20%** because homes can be sited on smaller lots than conventional septic systems require.
- 3. Developers need not wait for sewers to be in place before beginning construction.** Up-front costs are reduced because the onsite systems do not need to be installed until the lots are developed, and the treatment facility can start small and be expanded as the community is built out.
- 4. Utilities assume the risk of system failure and the responsibility for operations and maintenance.**
- 5. The presence of an effluent sewer system is a selling point to homeowners,** who are relieved of responsibility for maintaining a conventional septic system.

Benefits of effluent sewer systems to homeowners

- 1. Homes become available in desirable areas** where conventional septic systems are not allowed and/or city sewers do not reach.
- 2. The utility company takes care of operation and maintenance,** just as with conventional sewer systems.
- 3. Monthly wastewater fees are lower** than with conventional sewers because the costs of building and maintaining the system are lower.
- 4. The absence of a drainfield gives homeowners more flexibility in landscaping** their yards than a conventional septic system allows.
- 5. Homeowners can feel good about participating** in an environmentally sound wastewater dispersal system that preserves the quality of ground and surface water.

Various ways to share the cost of effluent sewer systems

The table on the following page summarizes several different ways that utilities, developers, and homeowners can share the cost of an effluent sewer system. These examples do not represent all the possibilities, because every community's situation is different. Some factors that affect cost-sharing arrangements include the size and competitive position of the utility; state regulations affecting how utilities do business; the size of the new development; the value of the new homes; the tax base in the community; the community's household income level; grants and loans available; and the geography of the area.

As an example of the costs involved, William McLean of Dauphin Environmental Equipment, LLC in Mobile, Alabama estimates that providing decentralized treatment for a subdivision of 75–100 homes in his area costs \$6,000–\$7,000 per home (2004 costs). These costs are shared as follows:

- Developer builds a 2-in. to 4-in. collection line to collect filtered effluent from each home and carry it to the edge of the subdivision: \$6/linear foot
- Utility builds a wastewater treatment facility with 20,000-gpd capacity: \$350,000–\$400,000
- Homebuilder or utility installs an interceptor tank and effluent pumping system at each house. If terrain makes effluent pumping necessary: \$3,000–\$3,500 per house. If gravity collection is possible: \$1,500–\$2,000 per house.
- Utility takes over operation and maintenance of tank and pumping system at each house, including periodic inspection and pumping.
- Homeowner signs an agreement not to abuse the system and pays a monthly sewer bill to the utility: \$35–\$40 per month. Homeowner pays an extra \$2 a month in electricity to power the effluent pump.

Four Models for Sharing the Cost of Effluent Sewer Systems

Model 1

	Developer	Utility	Homeowner
Wastewater treatment facility (WWTF)	Builds WWTF and deeds it to utility	Pays to build WWTF	
Effluent sewer infrastructure	Installs infrastructure in subdivision		
Effluent sewer packages (STEP/STEG) at homes and businesses	Buys and installs individual home effluent sewer packages (STEP/STEG)	Receives O&M responsibility for individual home effluent sewer packages (STEP/STEG) as each home is sold	Pays monthly fee of \$20–\$40 to utility

Model 2

	Developer	Utility	Homeowner
Wastewater treatment facility (WWTF)	Pays utility up-front amount (\$2,000–\$3,000 per lot). Deeds land for WWTF to utility	Builds WWTF	
Effluent sewer infrastructure	Installs infrastructure in subdivision		
Effluent sewer packages (STEP/STEG) at homes and businesses	Pays hookup or tap fee as each house is sold	Buys and installs STEP/STEG packages and takes full responsibility for O&M	Pays monthly fee of \$20–\$40 to utility

Model 3

	Developer	Utility	Homeowner
Wastewater treatment facility (WWTF)	Deeds land for WWTF to utility and pays for its construction	Builds WWTF	
Effluent sewer infrastructure		Installs infrastructure in subdivision	
Effluent sewer packages (STEP/STEG) at homes and businesses		Buys and installs STEP/STEG packages and takes full responsibility for O&M	Pays monthly fee of \$20–\$40 to utility

Model 4

	Developer	Utility	Homeowner
Wastewater treatment facility (WWTF)		Pays for and builds WWTF	
Effluent sewer infrastructure	Installs infrastructure in subdivision		
Effluent sewer packages (STEP/STEG) at homes and businesses	Installs STEP/STEG packages per specifications of utility	Inspects STEP/STEG packages at construction and maintains them afterward	Pays monthly fee of \$20–\$40 to utility

Exploring the options

Government agencies, nonprofits, and businesses offer information and support to utility companies seeking to serve customers with decentralized wastewater technology. Here are some Web resources that may be helpful.

www.epa.gov/owm/mtb/decent/index.htm

At this Web site, EPA provides tools to help communities investigate and implement onsite/decentralized management programs. Here you can browse information about funding, management, training, and technologies for effluent sewer systems. You can also download the agency's *Onsite Wastewater Treatment Systems Manual*, the *Handbook for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems*, and fact sheets on various alternative wastewater treatment technologies.

www.rcap.org

The Rural Communities Assistance Program is a nonprofit organization that provides technical and development help to small communities addressing drinking water and wastewater needs, among other issues.

www.nesc.wvu.edu/nsfc/nsfc_sfq.htm

The National Small Flows Clearinghouse maintains a Web site with numerous resources for communities interested in building effluent sewer systems, including the publications *Pipeline* (for regulators and community leaders) and *Small Flows Quarterly* (more technical).

Alternative Wastewater Systems in Illinois

Published by the Illinois Community Action Association (ICAA), this 1999 paper describes a demonstration program in which four Illinois communities participated. For each community, a team of engineers developed plans for a conventional and a decentralized wastewater system. The paper compares the construction costs of the two types of systems. It can be downloaded at www.icaanet.org/publications/ or from the Document Library on the Orenco Systems Web site at www.orenco.com (free registration required).

www.sewerless-wastewater-solutions.org

The New Mexico Environment Department's Construction Programs Bureau created this site to promote centralized management of effluent sewer systems. At this site you can download the Bureau's 70-page guide, *A Simpler, Cheaper Alternative to Sewer Systems*, which describes models for funding and managing these systems. It contains a detailed case study of a system constructed in Willard, New Mexico.

Are Cluster Treatment Systems the Key to Implementing Effective Decentralized Wastewater Management?

This paper by Stephen P. Dix describes effluent sewer systems in four states. It can be downloaded at www.infiltratorsystems.com/onsite_trends.htm.

Implementation of a Decentralized Wastewater Management System Employing Reuse in Suburban Mobile, Alabama

This paper, by Kevin D. White et al., discusses the design and cost of the first utility-managed effluent sewer system in Alabama. It can be downloaded (free registration required) at www.wef.org/applications/periodicals/.

A Unique Public Management Entity in the Town of Blacksburg, Virginia

This paper by K. Mattingly and M. Tremel describes the selection and management of an effluent sewer system in Virginia. It can be downloaded (free registration required) from the Document Library on the Orenco Systems Web site at www.orenco.com.

Effluent Sewer FAQ

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