HILLSIDE DISTRICT PLAN – White Paper

CLUSTER (COMMUNITY) ONSITE WASTEWATER SYSTEMS

September 14, 2007

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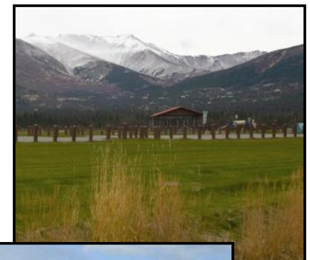

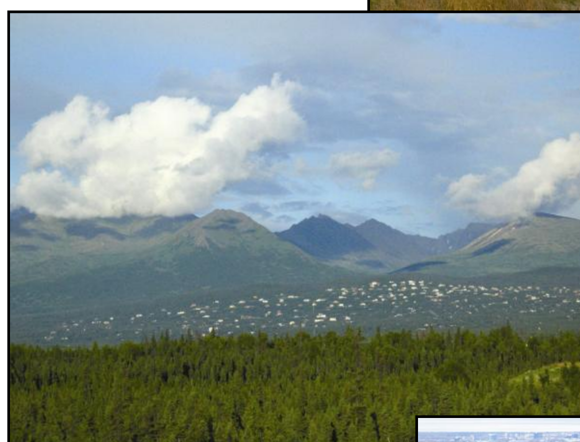

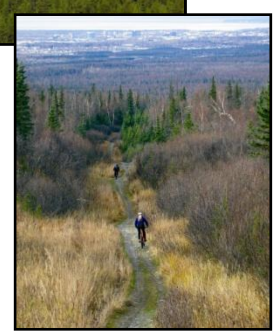

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CLUSTER ONSITE WASTEWATER SYSTEMS

"Recent advances in wastewater disposal technology have provided numerous alternatives to larger lots. Brad Lee, Purdue University"

Summary

Cluster Onsite Wastewater Systems that are properly sited and designed, installed with best construction practices, operated well and monitored & maintained regularly can be viable, environmentally responsible means of wastewater treatment and dispersal in areas that are not served by centralized wastewater plants.

Overview

To adequately describe the concept of cluster onsite wastewater systems (OWS), the term 'cluster' should be defined to establish a clear understanding of what a system might look like, and how the subdivision it serves could be laid out.

The term 'cluster' conjures an image of a plot of land packed with homes and little room between the buildings. More accurately, the term cluster OWS describes a wastewater collection, transport and treatment system that uses individual septic tanks at each home. Partially treated effluent is pumped or flows by gravity to a common treatment system and is discharged to a drainfield located on the overall parcel. A better description of cluster systems may be community onsite wastewater system.

If we imagine a 40-acre parcel of land being developed using a cluster housing concept and community wastewater system, there would probably be no more lots on the parcel than if the acreage was subdivided into one acre lots under current zoning. To cluster the homes, forty 1/3 acre lots could be subdivided out, with the remaining 25+ acres of land left as open space, trails, parks and an area for the common drainfield.

The advantage of a cluster housing system is that the same number of lots can be developed, but in a more compact area, saving the cost of infrastructure for roads and utilities. Cluster housing can leave more land available for community uses.

Figure 1. Conventional Subdivision

Figure 2. Cluster Subdivision

The most appropriate use of cluster systems would most likely be in areas where tracts of property have not yet been developed, as opposed to built-out subdivisions. However, in areas of existing subdivisions where current onsite drainfields are not functioning well, it could be possible to include these systems in a newly developing cluster onsite wastewater utility district. This could reduce the potential for future system failures in areas not well suited to onsite systems.

Advantages of Cluster OWS

Cluster OWS systems provide a number of advantages over individual onsite wastewater systems:

- The best soil on the parcel can be selected for the drainfield. This reduces the potential for siting drainfields in areas having poor site conditions that can occur with individual systems.
- Secondary treatment is provided. Unlike standard individual systems, this ensures the wastewater is treated to a higher standard than septic tank effluent.
- The system is maintained by a manufacturer trained technician. Repair and replacement of worn and/or broken parts, regular cleaning and inspection are taken care of in a timely manner.
- The system is alarmed to allow quick response to an emergency by a trained technician.
- Effluent is normally discharged to the drain field in batched doses to reduce the potential of it becoming overloaded.
- Septic tanks at the individual homes, pumping to a recirculation tank, can buffer the main treatment system from homeowner abuse.
- Regular sampling and testing of the influent and effluent allow regulatory agencies to monitor the treatment level of the system and ensure it remains in compliance with standards.

Disadvantages of Cluster OWS

Some aspects of cluster OWS systems can be considered as disadvantages, depending on perspective. Many of these also apply to the community wells that presently serve the Hillside. Some of the cited disadvantages to cluster OWS include:

- Cost of power for the treatment system.
- Cost of a trained OWS technician and regular O&M servicing.
- Treatment system and drainfield occupy a larger land footprint.
- Cost of regular sampling and testing

- Potential for groundwater mounding in some soils
- Public distrust of larger onsite systems
- Creation of a Responsible Management Entity

Example System Description

Figure 3. Community OWS Plan View

The sketch at left shows the residential portion of a 20-lot subdivision. In addition to the area shown, another larger portion of the property, included in the original parcel, is dedicated to the development as undeveloped area (park, open space, trails, etc.).

Each home lot contains a house served by an individual septic tank with a pumped discharge to the main treatment system. Raw wastewater is collected from the residence, separated in the tank, and clear effluent is pumped to the septic & recirculation tanks at the treatment/drainfield system.

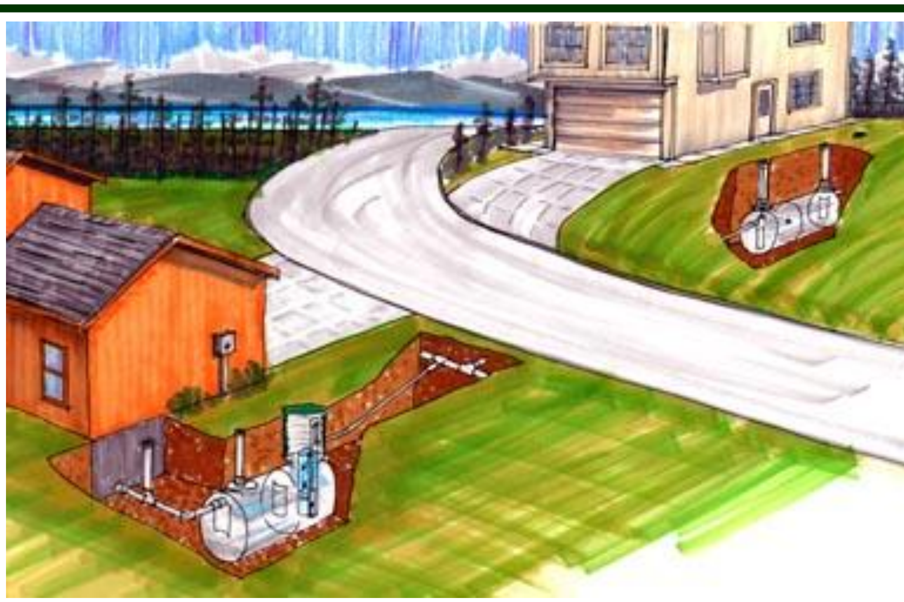

Figure 4. Typical STEP Tank to Small Diameter Main Pipe

The collected, clarified wastewater is pumped to the treatment unit, located at the drainfield. The wastewater is pumped by individual pumps, located inside the tanks at each home. The wastewater travels through small diameter PVC pipes, usually 2” diameter or less, to septic & recirculation tanks at the treatment unit.

The wastewater is recirculated through the treatment unit by pumps in the recirculation tank. After about 5-passes through this type of treatment system, the treated effluent is discharged to the drainfield by a separate pump system.

The treatment system can be equipped with telemetry that allows the maintenance technician to access the treatment equipment remotely, through a laptop computer. System status can be checked, alarms responded to and control settings altered, all remotely.

Each homeowner is assessed a monthly fee for operation and maintenance of the treatment system. Currently this fee is approximately $35/month for secondary treatment similar to the type of system shown. The homeowner is responsible for the cost of septic tank pumping at an interval acceptable to the management entity and regulatory agencies. With annual inspections, this interval can be much longer than the current 2-years desired by the Alaska Department of Environmental Conservation. Extending the pumping interval will reduce the pumping cost over time.

Example Cluster System Costs

Costs for cluster onsite wastewater systems vary widely, depending on location, number of homes served and constraints. They can be separated out into capital costs for initial construction, including materials, equipment and labor and then Operations & Maintenance costs which include all the costs associated with using, managing, operating and maintaining the system, as well as costs for sampling, testing and insurance.

System size determines a great deal of the capital cost per individual lot. Economy of scale can reduce the cost per lot as the systems increase in size and more homes are connected to the system. Below is an estimated OWS capital cost for a 20-home system with secondary treatment and a 43,000 SF drainfield.

Cluster System Capital Costs						
Equipment	Labor	Materials	Engineering	Permitting	Total	Each Home
$139,050	$147,750	$156,520	$26,480	$5,000	$472,800	$23,650

Annual operations and maintenance costs for the 20-home system are estimated in the table below. The costs assume semi-annual visits to the system by a single trained technician in May and October. Testing is on a monthly basis:

Cluster System O&M Costs							
Equipment	Labor	Materials	Testing	Insurance	Total	Each Home	Monthly
$200	$1,600	$290	$1,020	$2,500	$5,610	$280.50	$23.38

Cluster System Management

Individual onsite wastewater systems are often neglected by the owners. To ensure that a cluster onsite wastewater system operates properly, a Responsible Management Entity (RME) is hired to operate and maintain the system. An RME is defined as a person or company having training specific to onsite wastewater systems who operate and manage the system for the homeowners.

There are basically four current RME scenarios servicing cluster OWS in operation around the U.S:

Large Urban Public Utility- The Mobile Area Water & Sewer System has begun implementation of several cluster wastewater treatment & dispersal systems in the high growth areas of Mobile, Alabama.

Regional, Private For-Profit Company- Tennessee Wastewater Systems, Inc. (TWSI) owns and operates wastewater systems for homes and businesses across the state of Tennessee. The regional communities are typically 40-homes or more. TWSI is the third largest utility company in the state.

Regional, Not-For-Profit Public Utility Cooperatives- Rural Electric Cooperatives are member owned, not-for-profit utilities that receive support from the National Rural Electric Cooperative Association.

Local Government Public Utility– The Loudon County Sanitation Authority in Leesburg, VA owns and/or operates seven cluster wastewater systems for institutions, subdivisions and communities.

Any of these four operational models could be used to provide O&M to Hillside cluster wastewater systems. Currently, AWWU has indicated they have no interest in decentralized wastewater systems, due in part to not having a set of standards for this type of wastewater system, and also to not having trained personnel on staff to provide maintenance and monitoring of the systems.

Cluster System Questions & Issues

Current State regulations require that any wastewater system serving more than 15-people obtain a Certificate of Public Convenience and Necessity (CPCN) from the Regulatory Commission of Alaska (RCA). A CPCN establishes a utility service district, and requires the utility be operated within the laws and regulations of the State of Alaska.

AWWU is mandated to provide both water and sewer service, but not one without the other. A new Hillside development wanting to utilize cluster layout and employ onsite systems would have to apply for a CPCN from the RCA for both a water system (if public) and a sewer system. Any installation of a cluster system will also require a water utility system or individual onsite wells under current regulations. A water system would have to meet codes and regulations as a potable water supply, have wells, a treatment and storage system as well as distribution piping. Fire protection for the subdivision, if installed, would have to be provided through the storage and distribution system.

For the onsite wastewater system, small diameter piping can be routed through easements in the yards to the treatment and dispersal system.

AWWU has indicated that at times, small, independent utilities approach them to be bought out due to management or operation problems. Currently, AWWU requires that all utilities it takes control of be brought up to AWWU standards before the utility can accept responsibility for the system. This should be a consideration when small, independent utilities are proposed for cluster housing developments. Improving an existing system, not initially constructed to AWWU standards, to meet those standards, could be a serious expense to the homeowners.

What happens if the treatment system supplier/service provider goes out of business? During research for this paper, Orenco Systems, the manufacturer having the most secondary treatment units installed in the Anchorage area was contacted. The Orenco representative indicated that they are dedicated to their product and would support installed systems until they could obtain or train a new local representative to service the installed systems. They indicated that they have had local businesses, in other states, representing their products fail, and have stepped in to take over service until new representation was established and working.

The Municipality can legalize this arrangement between local supplier and manufacturer by mandating an agreement between the entities that requires the manufacturer to step in and take over support of the system until a new local representative can be found and trained.

To ensure that funding would be available for drainfield replacement, should there be a failure, insurance could be purchased and paid for in the monthly utility fees.

The RME also manages monthly homeowner billing, record keeping and reporting to the proper government agencies. It is essential that the RME have legal authority to enforce payment of the utility bills on homeowners, to ensure a reliable and continuous flow of funding for monitoring and maintenance work.

Ways to Move Forward- Future Options

- Develop an integrated set of standards between Title 21 Regulations and Section 15.65 of the Municipal Code to tie the use of cluster wastewater systems to cluster land development policies.
- Review the existing RCA regulations to ensure that the requirements for a small utility provide standards for a Responsible Management Entity managing an OWS.
- Revise the existing MOA onsite wastewater regulations to provide standards that specifically address cluster issues.

A well planned cluster OWS, properly managed by an RME, can be a cleaner, safer and cost effective alternative wastewater treatment system, and potentially allow for a reduced development footprint, which can be beneficial in areas with physical constraints.

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