Alternative On-Site and Community Collection and Treatment Technologies

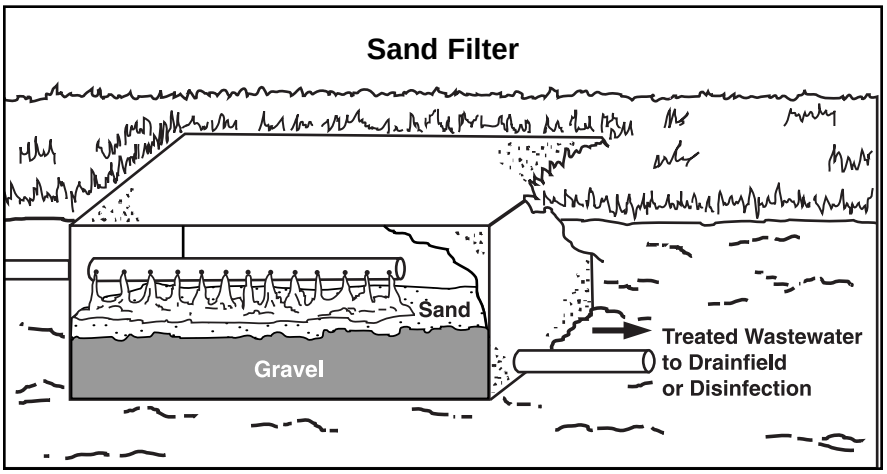
Conventional septic systems are the most cost-effective solution to community wastewater treatment where:

1. the septic system is at least 50 feet away from drinking water wells;
2. the septic system is at least 100 feet away from lakes, ponds and rivers;
3. there is .5 to 1 acre of level land having well-drained soils at least six feet deep and with a protected aquifer; and
4. appropriate soil and environmental conditions are present.

A majority of all soils in the US are classified as unsuitable for conventional systems. The alternative systems described below release effluent containing significantly less pathogens and nitrogen than that found in effluent from conventional systems. Alternative systems can be an excellent tool for protecting your community's drinking water and other water sources. Local officials must keep in mind, however, that even alternative on-site septic systems have minimum siting criteria and cannot be used for all areas unsuitable for conventional septic systems.

Home Systems

Sand Filters. Types include single-pass, bottomless and stratified. Effluent from the septic tank is filtered, then pumped using an electric pump over a sand filter and finally discharged to a drainfield. Requires maintenance visits 2 to 3 times per year including occasional replacement of the top sand layer. Currently in use in Chippewa County.



Non-Sand Filters (Waterloo Biofilter). Works just like sand filters except rather than sand, it uses a sponge-like media (open cell urethane foam) for treating filtered effluent from the septic tank. The advantage over a sand filter is that it can be housed in an above ground structure and the size of the filter is smaller than a conventional sand filter. Requires maintenance of the biofilter and pump (visits 2-3 times per year).

Aerobic Treatment Units. Effluent from the septic tank flows into the main treatment (aeration) chamber where aerobic organisms decompose suspended and solid wastes. An electrical aerator injects air into the main treatment chamber for aerobic organism growth. Sludge must be pumped out of the septic tank every 2-3 years and out of the aeration chamber annually. The aerator requires annual maintenance visits.

Mound Systems. Septic tank effluent is pumped into a drainfield built in a mound of sand fill and gravel. The sand/gravel layer filters the effluent before it reaches the natural soil. Used in Wisconsin, Minnesota, as well as Antrim, Otsego, Emmet, and Charlevoix counties in Michigan.

Community Systems

Small Diameter Effluent Sewers. Effluent from each home septic tank is conveyed via small diameter plastic pipes to a central treatment center or a main sewer. Pipe installation requires only shallow narrow trenches and the system can be built quickly. For homes in very flat or low lying areas, a small pump (Septic Tank Effluent Pumping—STEP-System) may be needed to move septic tank effluent in the effluent sewer. Septic tanks must be pumped out regularly and STEP systems must be maintained and serviced. System can serve 50-100 homes per mile of sewer.

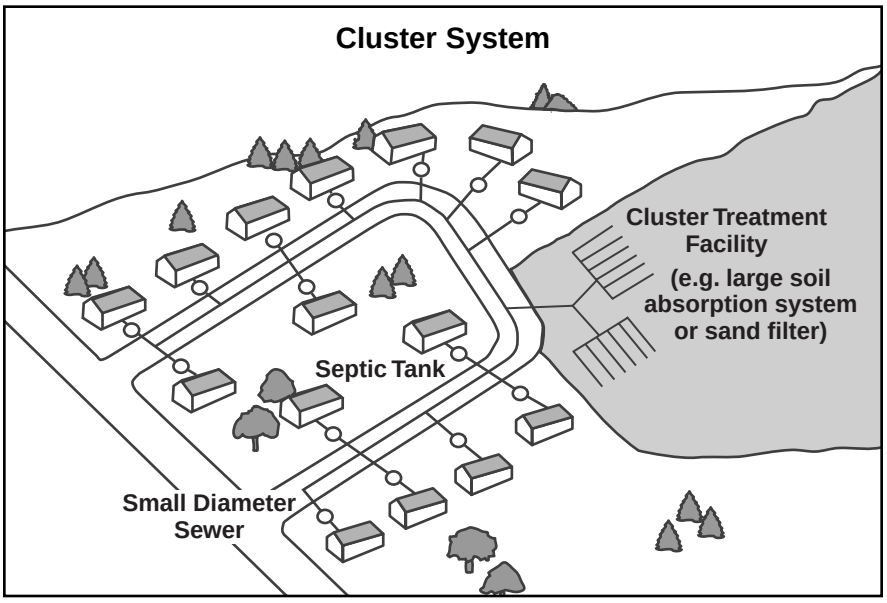
Grinder Pump Systems. Instead of a septic tank, each home has an electrical grinder pump which grinds up the solids and pumps the sewage through small diameter pipes to a central treatment center or a main sewer. There are higher maintenance costs to keep the

sewer pipes clear and grinder pumps working because of higher turbidity. The system can serve 50-100 homes per mile of sewer. There is a chance of solids ending up in the drainage field.

Vacuum sewers. Sewage from each home travels by vacuum through small diameter pipes to a central vacuum station. From there, it is pumped to a central treatment facility or a main sewer. This system requires more skilled maintenance than other alternative systems but can serve 50-100 homes per mile of sewer.

Cluster Systems. Small diameter pipe sewers collect wastewater and transport it a short distance to a neighborhood absorption field or sand filter. Septic tanks must be pumped out regularly. Absorption field or sand filter must also be serviced regularly. Suitable for subdivisions of a few dozen homes or small neighborhoods. Currently used for lake front homes in Antrim, Otsego, Emmet, and Charlevoix counties.

Recirculating Sand Filters (RSF). Septic tank effluent is cycled back through the sand filter several times prior to discharge either to the absorption field or to a disinfection unit and surface discharge. RSF's require a recirculation tank where water that has been through the sand filter is mixed with septic effluent. A pump in the tank pumps the contents over the sand filter. The pipes and sand filter must be maintained regularly (2-3 service visits yearly). In a New York village, a recirculating stone filter treats up to 400,000 gallons per day serving over 1,300 households.



When Are Alternatives Appropriate?

If the soil is largely impermeable (please consult your local health department to get a list of unsuitable soils), then you can use

1. sand filters,
2. non-sand filters, or an
3. aerobic treatment unit.

When the site has coarse sand soils lying over a shallow aquifer, you can use

1. sand filters,
2. a mound system, or an
3. aerobic treatment unit.

When home(s) are near surface waters such as lake, stream or pond, you can use

1. an aerobic treatment unit,
2. sand filters with disinfection of wastewater,
3. non-sand filters with disinfection of wastewater, or
4. cluster systems.

When soils are permanently or seasonally saturated less than 3 feet from the surface, you can use

1. mound systems,
2. vacuum sewers, or an
3. aerobic treatment unit.

When homes with their own septic systems are too close together and there is no space to expand the drainage (absorption) field, you can use

1. aerobic treatment units for the home,
2. sand filters for the home,
3. recirculating sand filter for the community,
4. small diameter effluent sewers for the community, or
5. grinder pump systems for the community.

When homes on small lots have failing septic systems, you can use

1. recirculating sand filters for the community,
2. aerobic treatment units for the home,
3. small diameter effluent sewers for the community, or a
4. grinder pump system for the community.

When the area is very flat and/or with shallow soils, you can use

1. mound systems for the home,
2. sand filters for the home,
3. aerobic treatment units for the home, or
4. vacuum sewers for the community.

When a subdivision is far from a central facility and/or houses are sited too close for on-site systems, you can use

1. a cluster system for the community, or
2. a recirculating sand filter for the community.

When homes in a neighborhood are expanding but lots are too small to expand the absorption field, you can use

1. recirculating sand filters for the community,
2. a cluster system for the community,
3. non-sand filters (Waterloo Biofilter) for the home, or
4. aerobic treatment units for the home.

Other Information Sources

1. Questions regarding local sanitary codes and alternative technologies can be directed to your local county health depart-ment.
2. Dean Mikulski, Director Environmental Health District Department #3. Tel: (616) 547-6523. Mr. Mikulski's area which covers Antrim, Ostego, Emmet and Charlevoix counties has a number of cluster systems and mound systems in operation.
3. With a mandate to assist small communities in meeting their wastewater needs, The National Small Flows Clearinghouse has a toll free hotline (1-800-624-8301) where local communities can reach NSFC's staff of engineers for technical assistance with their wastewater problems. NSFC also has a free monthly publication, Pipeline, with information on new on-site septic technologies for small communities.
4. A Guidebook for Local Officials on Small Community Wastewater Management Options (EPA 430/9-87-006), US Environmental Protection Agency. Please write to request a copy from US EPA, Office of Municipal Pollution Control, Municipal Facilities Division, Washington, D.C., 20460.
5. Dr. Ted Loudon, Extension Agricultural Engineer, Department of Agricultural Engineering, Michigan State University. Dr. Loudon is spearheading the construction and installation of a training center at Novi, MI, which will provide training sessions on alternative on-site septic systems for public officials, local government staff and sanitarians. For more information, please contact Dr. Loudon at (517) 353-3741.

Local Government and Drinking Water Protection Fact Sheet Series

Requests for copies of this fact sheet or any others in this series should be directed to the main offices of the MAC, MML, MTA, MSPO or MALPH.

All fact sheets are free.

Questions or comments regarding any of the fact sheets in this series can be directed to:

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