

Q & A for the November 9, 2010 Decentralized Wastewater Webinar

Would you recommend effluent filters on older existing systems that do not have access risers, but are relatively shallow?

Yes – I would recommend installing access risers to ground level, with securely locking lids, and effluent filters. They're very inexpensive and effective at keeping larger solids out of the drain field.

Have you seen much research yet for passive systems that incorporate carbon sources to optimize denitrification?

There are passive carbon-based systems that are incorporated into a permeable reactive barrier to denitrify groundwater flow before it discharges to surface water. See the US EPA Chesapeake Bay Guidance for general info – <http://www.epa.gov/owow/keep/NPS/chesbay502/index.html>

Several Counties in Florida have mandatory sewer connection ordinances for these smaller systems as the central system expands. Do you see this in other parts of the Country?

Yes, and they can create some ill feelings among people who recently upgraded their existing onsite systems to meet more stringent requirements. Consideration might be given to phasing in the mandatory tap-ins: older unimproved systems get hooked up to the new sewer first, followed by the moderately old systems a few years later, and the newest/best systems a few years after that. The pipe stubs to all the properties can be put in when the line is laid, but letting people wait up to 5 or more years in recognition of their previous expense would help. Another approach that has been used is for the utility to buy existing systems that appear to be working well for some amount less than or equal to the proposed tap-in.

How frequently are 'drip irrigation' systems compromised?

Very frequently, if they're not professionally maintained. When the appropriate O&M tasks are performed, they should work very well for many years – there are functioning systems in the ground that are more than 10 to 15 years old. The technology was developed in the mid-60s in Israel for the orchard industry, and is virtually the same as what you'll see now in the landscaping and agricultural sector. Of course, compromises may also be caused by unanticipated external forces, despite the level of management provided.

Would a conventional on lot sewage system have an impact on special protection waters?

It depends on the risk factors discussed in the presentation – system densities (#s per acre), age, proximity to the waterbody, soil type, groundwater hydrology, slope, and the sensitivity of the special protection water. If there are lots of old systems on half acre (or less) sized lots very near the water, and the soil is sandy (or steeply-sloped and clayey), expect stream impacts from all 3 main contaminants (N, P, and fecal bacteria). But as you move away from that suite of conditions, the impacts will likely diminish.

How effective are homeowners associations as management entities?

Poor when they try to do the work themselves, excellent when they hire a professional or contract it out to a competent service provider. As a category of management, HOAs are second-worst, next to private homeowners because they are reluctant to enforce the rules on their neighbors. Thus, no responsible professional will recommend HOAs as a responsible management entity.

Barry, at some time during the webinar series, will the presentors be addressing the requirements of the Underground Injection Control (UIC) Program where these systems fall within the regulatory authority of the UIC Program?

No – but FYI, this is an area of regulation that the states generally oversee. Individual systems are generally exempt from the Safe Drinking Water Act's UIC regs. But systems that serve more than a state's minimum flows or number of buildings (e.g., cluster systems that can serve 20 or more people per day) are subject to the "large capacity septic system" rules under Class 5 of the UIC program. State requirements for LCSSs are not consistent, but are pretty benign in most places. . . . Many only require that the system not endanger sources of drinking water and be registered with the state groundwater office. For more info on this, see the US EPA web site at http://water.epa.gov/type/groundwater/uic/class5/types_lg_capacity_septic.cfm

TP removal does not look like more than 90%?

Next week's webinar will get into more detail on this. P is removed very well in most soils (i.e., not very well in sandy or mostly sandy soils, very well in silts, clays, and mixes with some iron, aluminum, and calcium). Removal (actually, adsorption to soil particles) generally exceeds 90% . . . at least for the first 20 to 40 or so years. We don't have a lot of research about how fast the receptor sites on the soil are "used up," and/or "restored", but we know that overall P removal does decrease over time. Modeling this phenomenon has produced a variety of capacity numbers, up to hundreds of years.

How do you keep trees alive in drip dispersal areas when cutting into the tubing?

If you stay away from the trunk – out toward the tree canopy drip line – you can knife in the tubing. One of the real advantages of drip tubing is that it can curve around objects as needed, and doesn't have to be in a straight line.

No freezing of shallow drip tubes?

This has been studied in northern Wisconsin and Minnesota. It was found that 6 to 12 inches of good quality cover (e.g., mulch) has generally minimized the problem. Of course, long periods of non-use during extremely cold weather without snow cover may still be a problem. The tubes are flexible plastic, have holes every 2 ft or so, and with a good design they should drain after each pressurized dose of (somewhat warm) effluent.

Given the higher O&M costs with advanced DTWSs, have there been cases where an advanced DWTS was furnished and maintained by a municipality? In other words, would the user(s) pay "sewer" fees and provide easements to a municipality or control authority that would install and manage advanced DWTSs?

Yes, there are a number of examples. Here's a fairly recent one, in Arkansas.

http://www.aquapoint.com/images/Cave_Springs_8-5-08.pdf You can also check out The Sea Ranch in California, the systems around Table Rock Lake in Missouri, Auburn Lake Trails in CA, and Otter Tail Lake MN. US EPA will be publishing case studies of these projects soon.

Define "professional management"

System-appropriate operation and maintenance service provided by an entity with the training and technical capacity, management expertise, and administrative ability to ensure long-term treatment performance.

What is his opinion of spray irrigation of treated effluent?

Works well when you have lots of land to meet treatment capacities and setback requirements, can eliminate runoff, and can successfully manage the nutrient load (i.e., with periodic harvesting of cover crops, etc.). Disinfection prior to spray discharge may be needed if there is any risk of human exposure to the resulting mist, which can carry for long distances (e.g., more than a half-mile).

What are the options for rural areas with high collection costs and where the soils are known to be inappropriate for septic systems?

Conventional gravity sewer collection is very expensive. Low-cost vacuum, pressure, and gravity sewers are available that can halve the cost of conventional sewers and do a better job of collection. There are very few places where soils won't work at all. In many cases, however, it may be necessary to provide a higher-quality effluent prior to soil dispersal if unsaturated soils above groundwater or bedrock are shallow. Overall wastewater management approaches for areas with significant soil challenges are often cheaper and better when the homes can be clustered and the treatment system located in community open-space, so the effluent can be collected by low-cost sewerage and routed to the best infiltration areas. Putting individual systems in such an environment requires expensive management programs and very large lots.

What is the regulatory method to oversee cluster systems?

US EPA has identified "responsible management entities" as the preferred option. These entities, which have the technical, financial, and managerial capacity to ensure long-term system performance, can operate – or own and operate – the systems. See the "level 4 and level 5" management model descriptions here: http://cfpub.epa.gov/owm/septic/septic.cfm?page_id=268

I would like to know how far a sewage lagoon should be placed from a priority waterbody.

I would recommend at least 200 ft, but each state publishes its own required setbacks list. Unfortunately, few allow for site-specific conditions that make any prescribed number incorrect.

Are the drip dosage systems required to be designed by a P.E. in most states that you know of?

Not usually for individual or small (i.e., 2-4 home) cluster systems. When the systems get up past 2,500 gallons per day – and certainly for those > 5,000 gallons per day - you usually see requirements for a PE design. By the way, many of the companies that install drip systems have a “pre-engineered design” created by a PE that provides a matrix / menu for siting and sizing the system.

What is the most useful system to use for a rural industrial or manufacturing park that is not serviced by public sewer, but that may be in the future?

It will depend on the wastewater type and flow generated by the buildings hooked up to it. If there are food processing facilities that handle meat, a grease interceptor tank might be needed, along with a high-capacity BOD removal component. If there are metals in the waste, there might be a need to greatly increase detention times and carefully control pH. Whatever the wastewater type and flow, a system can be designed to handle it . . . though the cost might be substantial if there are metals, organic compounds, and etc. Removal of difficult/expensive to treat contaminants from the waste stream is an important consideration – large wastewater treatment plants often have “pretreatment” requirements governing this very issue. So, it’s difficult to answer the question without more info. However, if you have a specific type of plant and a permit which dictates the target values of specific pollutants, you can have each source do its own pretreatment in order for your plant to meet its permit limits. Modern industrial parks usually try to maximize recycle and reuse of “waste” streams.

Is all nitrogen removed as NO₂?

Nitrogen – predominantly in the organic nitrogen form in raw wastewater. It is mostly converted to ammonia nitrogen in the septic tank. It is further transformed through the nitrite form to the nitrate form by bacteria in the presence of oxygen, either in a pretreatment step or in the first 6-inches of soil below the infiltrative surface. Nitrate is very stable and very soluble in water and is only partially removed in the unsaturated soil and groundwater that receives the treated wastewater. In order to achieve denitrification – conversion of nitrate to nitrogen gas – the nitrate must be processed by denitrifying bacteria in a low/no oxygen (anaerobic) environment that has an adequate source of donor electrons (e.g., from the carbon in an organic soil, sulfur in a high-sulfur soil, etc.).

Wouldn’t soil (where there is low oxygen) eventually remove the nitrogen?

Yes – if a nitrate-rich effluent passes through a soil with sufficient carbon under low-oxygen conditions, denitrification can be achieved. An example would be an anoxic muck soil lining the sides and bottom of a wetland. Note that effluent volume and residence time in the anoxic soil (i.e., travel time/velocity) would affect the nitrate reduction reaction.