Questions submitted to 11/30/10 wastewater webinar:

How will our participation in these webinars be documented so that we may use as professional development hrs?

We have the lists of attendees (and those asking questions, which also indicates attendance), but we aren't set up to issue certificates of attendance. We can also keep the lists to verify any claims made regarding attendance.

Do you have an example of a permeable reactive barrier that is working in a field setting? A reference is desirable to determine if the technology can be applied to a particular setting.

PRBs are an established in-situ treatment technology for removing various contaminants (e.g., organic solvents) in the groundwater remediation field where they have been used for over a decade (see USEPA 1998. *Permeable Reactive Barrier Technologies for Contaminant Remediation*. U.S. Environmental Protection Agency, Office of Research and Development, Office of Solid Waste and Emergency Response, Washington DC). Their application for in-situ denitrification in soil-based wastewater treatment systems is more recent. Pio Lombardo with Lombardo Associates (Newton, MA; www.lombardoassociates.com) has significant experience with PRBs in decentralized treatment systems and should be contacted for additional information, including the case studies you are seeking.

With regard to classifying extended aeration plants as a "plug flow" type of reactor, I'm not understanding how most packaged extended aeration treatment units would be classified that way. Seems like that's be more "continuously stirred reactor", since mixing of the tank is happening as wastewater enters the tank. Could you comment Vic?

I don't think I referred to extended aeration as a "plug flow" system. I agree that CSTR would be a better reactor model for extended aeration systems (and most activated sludge process options for that matter).

What means "repair area"?

"Repair," "replacement," or "reserve" area is an area of suitable soil that is set-aside as a future site for a soil absorption system in case the original soil absorption system malfunctions or ends up being too small, etc. Repair areas are required in the decentralized wastewater codes of many states. When an area is set aside for repair, it should be treated as if it were hosting a soil absorption system, meaning that the site should be protected from disturbance including buildings, grading, traffic that could compact the soil, etc.

Vic,... The lateral flow analysis model didn't seem to account for effects of evapo-transpiration, and moisture retention in the upper soil horizons. Could you comment on that?

True – those "losses" could definitely be another bullet on the slide I presented about refining the lateral flow analysis (slide 35). I usually start with conservative assumptions and then adjust as my assumptions as appropriate. If I have to adjust my assumptions too much, I start to get worried. Consulting with your soil scientist and/or hydrogeologist is strongly advised though, as I find that they usually (hopefully!) have a better "gut feel" about whether a site is going to be able to convey effluent without problems.

What is the average number of years a typical homeowner's Gravel-Less septic tank/drainfield system lasts?

(This can vary considerably, according to the flow/strength of wastewater being treated, the type of upstream pretreatment system (if any), the soil surrounding the piping and media, and so on. There has been some experimentation with pipe coverings / media that performed poorly – early versions of fabric-wrapped pipe placed in silty clay or clayey soils were found to seal up after a few years, for example. However, open-bottomed leaching chambers, the Styrofoam peanut media wrapped in netting, and similar products have done much better, performing for 20 years or more, similar to typical septic systems. .

Can you talk about how the 30 gpm would be determined?

This was discussed in the first part of the design series from last week. I'd encourage you to view the archived presentation from that session (available at https://engineering.purdue.edu/~iwla/webinars/wastewater2010/index.html), as much of this week's session built on the fundamentals discussed last week.

(1) For a cluster system, using sub-surface discharge, what treatment alternatives can be used for the purpose of sub-surface discharge? (2) for a cluster system, if using surface discharge, what treatment alternatives can be used for the purpose of surface discharge? Thank you!

This was discussed in the first part of the design series from last week. I'd encourage you to view the archived presentation from that session (available at https://engineering.purdue.edu/~iwla/webinars/wastewater2010/index.html), as much of this week's session built on the fundamentals discussed last week. Only a very few states issues general permits for surface discharging decentralized systems. Most of those require at least secondary treatment. Subsurface discharge pretreatment can be a septic tank with our without additional advanced treatment.

P-removal: More as a comment, in Scandinavia and in the Florida Keys, absorption media, usually after aerobic pretreatment, have been used to remove phosphorus in onsite systems. Are there other locations that have evaluated P-removal in onsite systems and used it?

Thanks for the comment. There are indeed physiochemical unit processes for removing both P and N. Aside from your examples, I am not aware of many other situations where sorption processes are being used to remove phosphorus external to the soil treatment unit in decentralized systems (Benzie County, MI, was one). A good review of P removal processes and their applicability for decentralized systems can be found here: http://www.ndwrcdp.org/research_project_WU-HT-03-22.asp

How often should pressure head be checked and adjusted for an elevated infiltration system with lpp distribution?

It is typically recommended that lateral flushing and pressure head adjustment for LPP systems be done every 6-12 months, but this depends to some extent on the size of the system and the type of facility being served. Commercial facilities that may have higher organic loadings should be flushed more frequently than residential systems, for example.

Could you clarify the treatment efficacy of wetlands? Previous speaker said that "plants are nice" but nearly all treatment was accomplished in the soil. But your talk mentioned plants as a sort of media for attached growth secondary treatment. Thanks.

The root mass surface area will act as a filtration medium provided, of course, that the effluent is applied into or above the root zone. In many *soil treatment systems*, effluent is actually applied below the root zone, so vegetation in these situations is not a factor that directly influences treatment. Also, soil-based treatment systems – even those installed in relatively coarse sands – use a fine-grained media (the soil!) which is a very effective filtration medium and biological substrate.

Constructed wetland treatment units, on the other hand, often use relatively coarse media as a substrate for the plant roots. It has been reported (but not substantiated) that exudates on these plant roots attract and support large concentrations of microbes that enhances biofiltration. However, treatment differences have not been statistically proven to our knowledge. Additionally, there is some level of evapotranspiration provided by the vegetation in constructed wetland systems that have an impact on the system's water balance.

Are there any new treatment alternatives for septic system treatment?

New and improved treatment alternatives are being developed all the time. Both design presentations hit on both traditional/conventional and newer approaches. Some examples include drip irrigation for soil dispersal, a variety of biological nitrogen removal advanced treatment systems, and various types of control and remote monitoring technologies that help facilitate proper management of multiple, dispersed systems.

Comments and Questions submitted through the chat box

You still have a pressure head to meet, it's just a relatively static one, but your pump definitely needs to be able to meet/exceed that tank water elevation or pressure head...

Perhaps it wasn't clear, but the example was for pumping into the freespace above the water level in a tank…say a septic tank (it was intended to be a simple example), so there would be no hydrostatic head/backpressure to overcome. Technically, you'd need more than *zero* pressure to get from the end of the forcemain into the tank, but in this particular example it wouldn't have mattered whether it was 0.1 psi, 1 psi, or 10 psi.

How often would one need to check the pressure head on an elevated infiltration system w/low pressure dosing?

I think this question was asked in the Q&A box above. See that response.

We typically design pumps for the average inlet elevation (pump on to pump off). NPSH may also be a concern but not for level sites with low pressures and submerged pumps.

I'd just caution you to check to make sure that the pump can still perform to system requirements at the pump off elevation. However, since, in most cases, the pump off and on elevations are separated by several inches to a foot or two, the difference is unlikely to make a difference.
You raise a good point about net positive suction head (NPSH). NPSH is often misunderstood and can be somewhat complex. Given our time constraints I didn't discuss NPSH to keep things simple. While it is good practice to check NPSH for submersible pumps, in my experience it is more critical for non-submersibles. In decentralized systems, these pumps are sometimes used for drip irrigation systems.

What are the typical design costs for a single family system? cluster system? How are the costs structured or layered for site complexity?

This will be discussed during next week's webinar on management. You can find some general cost information here: http://www.epa.gov/owow_keep/NPS/chesbay502/pdf/chesbay_chap06.pdf. You may also want to refer to the new cost estimation tool produced by the Water Environment Research Foundation and Decentralized Water Resources Collaborative, available here: www.werf.org/decentralizedcost.