Drainfield to Surface Water Setback Distance Subcommittee
Teleconference Meeting Minutes
Wednesday, 01/06/2010, 10:00 am

Teleconference
Date: 2010-01-06
Start: 1000 hours
Attendance:

Boise: AJ Maupin, PE; Joe Canning, PE; Bill Holder, PE; Dr. Jim Ippolito, Ph.D. USDA
Coeur d'Alene: Dick Martindale; George Miles, PE; John Corcoran (Realtor Association Representative); Allen Worst
Idaho Falls: Nathan Taylor

Missing: Brett Skidmore (Building Contractors Association Representative);

Meeting called to order at 10:00 am. Topic for today's meeting was to present the information that each Focus group gathered from reading applicable technical articles.

Pathogens: Focus group members are Joe Canning, P.E. and Allen Worst.

The studies reviewed were predominantly carried out in sandy and loamy soils. The pathogen focus group did not recall any studies being carried out in clayey soils. It was pointed out that finer soil particles attenuated pathogens more quickly and coarser soils required greater distances to attenuate pathogens. The focus group indicated that the majority of studies addressed bacterial pathogens, but that viruses were studied and results indicated that they were also attenuated but over much longer distances. Some of these studies utilized high hydraulic loading of the test cells. The minimum conditions specified in these studies to remove pathogens from wastewater discharged to the subsurface were:

(A) one (1) meter of a suitable soil prior to entering ground water, and

(B) unsaturated flow in the receiving soils.

Once the pathogens entered ground water they could be transported many meters before attenuation.

The focus group believe that pathogens will not be the limiting factor for drainfield to surface water setback distance determination if unsaturated flow beneath the drainfield can be assured.

Questions arose about what unsaturated flow is and how is it attained/maintained. Unsaturated flow was identified as occurring when capillary forces, adhesive and cohesion, predominate and saturated flow occurs when gravitational forces overcome the capillary forces. The question concerning how unsaturated flow is attained and maintained was not discussed.

Phosphorus: Focus group members are Jim Ippolito, Ph.D., A.J. Maupin, P.E. and George Miles, P.E.

Phosphorus was identified as having unique physical, chemical and biological properties. It was pointed out that a significant percentage of phosphorus in a home's raw sewage stream will settle in the septic tank, but the amounts vary from 9% to 40%. Soils were identified as a potential media for phosphorus sequestration. The ability of the soils to sequester phosphorus depends on the availability of iron (Fe), aluminum (Al) and to a lesser degree calcium (Ca) positively charged ions (cations). Other factors that impact phosphorus retention are the pH and redox (reduction/oxidation) state of the soil. The soil's redox state can impact the concentration of iron ions in the soil. If the soil has a suitable redox state, iron can be reduced, gives up an electron, transforming ferrous (Fe^{+2}) iron to ferric (Fe^{+3}) iron. The soils redox state does not impact aluminum (Al) because it only has one valence state (Al^{+3}). It was pointed out that in wastewater streams where ammonium (NH_4^+) is present and alkalinity is low, this solution could dissolve available ferric iron (Fe^{+3}) and aluminum (Al^{+3}) increasing the soils ability to sequester phosphorus by mineralization (strengite, vivianite).

Factors identified that would enhance the soil's ability to sequester phosphorus include:

(A) maintaining the drainfield in an hydraulically unsaturated state and

(B) have a reducing environment in iron and aluminum bearing soils.

Once phosphorus enters ground water it can travel many meters before attenuation. The rate of transport will be less than the ground water velocity.

A question was asked about how effective placing the phosphorus bearing effluent in the root zone would be. It was pointed out that plants typically take up the nutrients nitrogen and phosphorus in a 10:1 ratio, and plants readily take up phosphate (PO_4^{-3}). Some uptake by plants will occur.

One aspect of phosphorus studies that was not addressed in the Lombardo article was the Phosphorus Saturation Index (PSI). This metric is percentage (%) based ranging from 0 – 100. Studies have shown that when the soil's PSI reaches 30% it is recommended that the absorption area be taken out of service and allowed to rest to recoop some of the soil's phosphorus sorption ability, most likely through slow mineralization of adsorbed phosphate. PSI is accomplished through oxalate extraction and inductively coupled plasma mass spectrometry (ICP-MS).

Questions were asked about how much would an ICP-MS cost and could samples be taken from the test pits? No one knew the answers to these questions.

A comment was made concerning well water with a high iron concentration possibly assisting phosphorus sedimentation in the home's septic tank. Additional comments were made concerning ground water with organic carbon concentrations providing adsorption sites for phosphorus. It was noted that ground water in the eastern US has higher organic carbon concentrations than in the western US, which may be due to the young granitic soils and low precipitation in the west. It was also noted that eastern regulators seem to be more concerned with nitrogen than phosphorus, and that the Total Maximum Daily Load (TMDL) for phosphorus in northern Idaho surface water is quite low. A question was posed concerning how one equates septic system efficiency with a TMDL? No one could answer, resulting in a request that representatives from DEQ's Ground Water an Surface Water Programs attend the next meeting. The DEQ representative stated that these program representatives would be invited.

A comment was made concerning the high percentage of soil large fraction (gravel, stone, cobbles) that Idaho allows in soil absorption system sites and that since phosphorus is adsorbed onto the soil fine fraction that this needs to be looked at. Additionally, a claim was made that most states define drainfield sites as unsuitable if the site has rock content exceeding 50% or 60% and if the soil is a type A-1 (medium sand).

A comment was made concerning the possible use of constructed wetlands for phosphorus removal. An article on constructed wetlands in cold climates in the Small Flows Quarterly was mentioned. The article is to be found and provided to the subcommittee for their review.

Nitrogen: Focus group members are Dick Martindale, Bill Holder, P.E.

Nitrate's stability and mobility were presented. It was noted that once it enters ground water it flows freely with the ground water and is not substantially attenuated. The majority of the articles reviewed dealt with individual technology's nutrient removal efficiency and what ground water quality standards needed to be met. Impacts to surface water were not typically addressed. It was noted that salt water environments were detrimentally impacted by nitrogen discharges. Furthermore, total nitrogen (TN) reductions are modeled and ground water dilution impacts accounted for in Idaho's current nutrient-pathogen (N-P) studies. TN is regulated in the ground water in conjunction with the ground water quality Maximum Contaminant Level (MCL) for nitrate. Current MCL set at 10 mg-N/L. The total phosphorus does not have a ground water quality standard but the surface water is regulated through the TMDL.

It was presented that to reduce nitrates in ground water a carbon source must be present and anaerobic conditions are required. Anaerobic conditions are typically associated with saturated flows, which is counter to both pathogen and phosphorus reduction environment requirements.

It was stated that the ongoing N-P study activities were yielding a reduction in the rate of increase of nitrate contamination to the ground water. A concern was voiced about the current N-P study not address cumulative impacts from multiple developments in an area.

PPCP/EDC: Focus group members are Nathan Taylor, John Corcoran and Brett Skidmore.

The overwhelming amount and diversity of information in this area was noted. Mainly articles dealt with detecting these chemicals in drinking water. Detection levels are in the parts per billion (ppb) and parts per trillion (ppt). Health impact questions are still unanswered at these low levels. The wastewater treatment plant technology's inability to remove these chemicals prior to discharging to surface waters was noted. There were articles on reuse of processed wastewater containing these chemicals and use of biosolids for soil augmentation, where these chemicals were present. The biosolids studies indicated that most PPCPs & EDC were absent from soil samples collected from 30 cm below the ground's surface from sites receiving biosolids. This may indicate that the soil matrix and its biota

may be good at removing these chemicals, which may indicate that subsurface sewage disposal may also have these capabilities.

Possible impacts on human population were noted but none found. Impacts on wildlife noted to fish and duck populations. These impacts did not give any indication on how subsurface disposal may help attenuate these chemical's impacts on the environment and human health. A question was posed concerning sand filter's abilities to reduce these chemicals in the wastewater. An article, possibly by the USGS, was noted. This article is to be sent for loading to the FTP site.

Next Meeting Schedule:

The next meeting is scheduled for Wednesday, 27 January 2010, from 10:00 am MST (9:00 am PST) to 12:00 pm MST (11:00 am PST).

Meeting Topic:

Modeling and variables.

Discuss findings of canvassing of various states separation distances. It was presented to contact various states and ask them for their supporting data that they used to establish drainfield to surface water separation distances. The subcommittee members volunteers to contact the following states:

AJ: Oregon & North Carolina

George: California

Dick: Massachusetts, Wisconsin & Utah

Allen: Washington

Joe: Idaho, Arizona & New Mexico

Jim: Colorado

Nathan: Minnesota

Bill: Virginia

John: Montana & Wyoming

Meeting adjourned.

End: 12:12 pm