Drainfield to Surface Water Setback Distance Subcommittee
Teleconference Meeting Minutes
Wednesday, 03/03/2010, 10:00 am

Teleconference
Date: 2010-03-03
Start: 1010 hours

Attendance: Boise: AJ Maupin, PE
Hayden: Dick Martindale; Allen Worst; Bill Holder, PE; George Miles, PE
Kimberley: Dr. Jim Ippolito, Ph.D. USDA
Idaho Falls: Nathan Taylor
Missing: John Corcoran (Realtor Association Representative); Brett Skidmore (Building Contractors Association Representative); Joe Canning, PE;

Meeting called to order at 10:10 am.

**Past Meeting minutes**:

February 3, 2010 Minutes: Prior meeting minutes presented with requested changes incorporated. Motion made to approve the minutes as presented, the motion was seconded and the minutes passed unanimously.

**Northern Idaho Soil Research Report**

Due to a previous commitment Dr. Jim Ippolito, PhD, was delayed in joining the meeting. Jim's email concerning Northern Idaho soil attributes was presented to the subcommittee. Jim used the USDA's Web Soil Survey to query the variability in Northern Idaho soils' pH. Findings indicate that Northern Idaho soils range in pH from slightly alkaline (pH=7.5) to relatively acidic (pH=5.3). Soils around lake Coeur d'Alene are slightly acidic (~6.0; some soils as low as 5.3) up to neutral (7.0). Similarly, the soils around Sandpoint show similar pH ranges. No calcium carbonate ($CaCO_3$) is reported in the soils. North of Sandpoint near Bonner's Ferry soil's pH range from 6.5 to 7.5. Acidic soils have little to no $CaCO_3$, while soils neutral to slightly basic have up to 15% $CaCO_3$. Soils down around Moscow are slightly acidic (6.0) to slightly basic (7.2), and these soils are devoid of $CaCO_3$.

A member indicated that he has encountered quite a few silty soils with calcium in the Wolf Lodge area and Shoshone County. The Soil Surveys were pointed out to be general indicators of the area's soils. They are not always accurate when dealing on a lot size scale.

**Modeling**:

Bill discussed his ground water transport modeling efforts. Attribute hydraulic conductivity (k) for sands was set at 100 feet/day, for loams k was set at 10 feet/day and for silts k was set at 1 feet/day. Attribute gradient also varied but was initially set at 0.5% (0.005 ft/ft). The gradient for clays was lower while the gradient for sands and gravels were greater than the 0.005 ft/ft. Initial phosphorus concentrations were modeled at two values, 7 mg/L and 14 mg/L (ppm). These input values are arbitrary because the inputs will depend on Jim's output. The modeling duration was for 20 years to evaluate the extent of the phosphorus transport. The plot indicated the resulting ground water phosphorus concentration after 20 years of discharge and transport out to a distance of 300 feet from the drainfield. The results show similar responses for the 10 and 100 foot/day conductivity soils, which are approaching equilibrium at the 300 foot distance. The lower conductivity soil at 1 foot/day (ft/day) does not approach equilibrium until the model has simulated 100 years of operation.

The receiving surface water modeled was characterized as a shallow gradient small stream flowing at 1 cubic foot per second (cfs). Modeled mixing with the surface water indicated that the dilution with surface water is the controlling variable, resulting in limited surface water phosphorus increases.

Various parameters used in the saturated flow model were discussed, primarily the soil porosity. It was pointed out that the value of 0.30 is a value indicative of the midrange of soil porosities. It is the default value in the model and represents the porosity of the aquifer's geology and not the porosity of the receiving soils immediately beneath the drainfield.

Jim presented his vadose (unsaturated) zone model based in PHREEQC. Input phosphorus was assumed to be 3 mg-P/L discharged into normal loamy soil. Normal soil was defined as soil that is neither saturated with water nor highly aerated. The application rate was 1 Liter per day per square foot (Lpd/ft$^2$) which equals 0.264 GPD/ft$^2$. This volume of effluent would penetrate 7 cm into the selected loamy Declo soil. This depth may be deeper if the soil's field capacity is the appropriate attribute defining water penetration. Field capacity is the amount of soil moisture held in the soil after excess water has drained away and water movement under gravity has effectively ceased.

PHREEQC is a geochemical model. This model estimates the amount of phosphorus retained in the soil after it passes through a specified (unit) depth of soil. The remaining phosphorus is then used as the input into the next unit depth of soil. For the Declo loamy soil, common in south central Idaho, it took 21 cm, or three - 7 cm unit depths, of soil to reduce the initial 3 mg-P/L to below 0.01 mg-P/L.

These modeling efforts were the first attempts and much was learned. The input concentrations to each model will be altered prior to the next effort so that the models are synchronized. Additionally, the soil temperature used in the vadose zone model was 25ºC, or 77ºF. Concern was voiced that this may be too high and alternative ground temperatures were suggested: 12.8ºC (55ºF) or 10ºC (50ºF). It was pointed out that the hydraulic loading rate for loamy soils is allowed to be 0.5 GPD/ft$^2$, which is almost twice the modeled application rate of 0.264 GPD/ft$^2$. A question arose about whether this could be modeled over time, to evaluate the length of time the drainfield will effectively remove phosphorus. Jim pointed out that as the phosphorus is removed from the effluent by the iron and aluminum in the soil, the iron and aluminum will replenish from the crystalline sources present in the soil. Although, the rate of soluble iron and aluminum replenishment from the crystalline source may take an unknown length of time. Additionally, it was mentioned that as the effluent enters the soil it will disperse laterally as it flows vertically under gravity. That was pointed out to only occur at the drainfield edge, and the flow directly beneath the central section of the drainfield will effectively be vertical. It was mentioned that in a pressurized drip system the effluent is placed in the root zone and there is upwards vertical flow due to evapotranspiration. A question about the life expectance of the drainfield was phrased as 'will the drainfield last 5 years or 20 years?' The models will be revised and run again to hopefully answer how temperature impacts the phosphorus sequestering and ultimately answer the drainfield lifetime question.

Jim pointed out that the soils in northern Idaho are substantially more acidic, lower pH, which makes them more effective at sequestering phosphorus. This is shown in the models run for the Palouse soil series. Palouse soils are a silty soil with an hydraulic application rate of 0.2 GPD/ft$^2$ (0.758 LPD/ft$^2$).

**Technology**:

George brought up an issue that he shared with AJ concerning a technology proposed for use in the MicroSeptec products. This technology used a burner to reduce sludge volume. Although the National Sanitary Foundation (NSF) refused to accept this burner technology, it was reported that the system experienced a 50% reduction in phosphorus. No explanation was provided by MicroSeptec or NSF. Jim mentioned that phosphorus will not volatilize unless it is in an organ form.

Jim did do some modeling on the material Phosrock, presented at a previous meeting. Phosrock is a calcium silicate and effluent flow was modeled through Phosrock at pHs of 8, 7, 6 and 5. Phosphate concentrations dropped as the pH dropped. Jim concluded that Phosrock would work and should be a viable technology.

**Miscellaneous**:

Allen questioned the relevance of the 4 foot effective soil depth beneath the drainfield. It was pointed out that the 4 foot depth is specified in the TGM and in Rule. The 4 foot depth will impact the life of a drainfield when evaluating phosphorus retention, but some of this life should be recouped with discharging effluent between two alternate drainfields.

The use of GoToMeeting website was found to be useful. Bill was thanked for setting that up. Bill committed to setting up GoToMeeting for the next meeting.

**Next Meeting Schedule**:

The next meeting was tentatively scheduled for Tuesday, 30 March 2010, from 10:00 am MST (9:00 am PST) to 12:00 pm MST (11:00 am PST).

Due to conflicts the next meeting is proposed for Wednesday, 31 March 2010 from 10:00 am MST (9:00 am PST) to 12:00 pm MST (11:00 am PST). Confirmation will be sought from each member.

**Meeting Topic**:

Ongoing modeling efforts.

**Meeting adjourned at 11:57 pm.**