Scientific Review of

Final Draft

Water Quality Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems

By

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My review focuses on those sections dealing with set-back distances from wells, springs, surface waters and depth to ground water since the major purpose of setback distances is to protect these waters from pathogen contamination by ensuring sufficient time for pathogen attenuation. Pathogen attenuation is achieved through combination of filtration/adsorption and die-off. The effectiveness of filtration/adsorption is related the composition of the soil (clay, sand, silt) structure, pore size, saturation, and hydraulic gradient. Die-off of pathogens is primary related to temperature. Enteric viruses, because of their small size and thermal resistance, are believed to be the greatest threat to drinking water sources. Based on my review the set-back distances are adequate. Exceptions may be siting of septic tanks ion regions of extensive karst formation and extensively clay or rock formations.

Question 6

Section 7.5 stipulates minimum horizontal setback distances as follows:

b. 100 feet from water wells and monitoring wells, unless regulatory or legitimate data requirements necessitate that monitoring wells be located closer.

Since it is assumed that water wells and monitoring wells are not intended primarily for public drinking water supply this is a justified set-back distance. Studies have indicated that some viruses can travel this distance in the subsurface, particularly in sand soils but their numbers are greatly reduced (Scandura and Sobsey, 1997; Corapcioglu et al. 2006; Yates and Yates, 1989). Thus, under certain conditions some virus contamination may occur.

c. 100 feet from any unstable land mass or any areas subject to earth slides identified by a registered engineer or registered geologist; other setback distance are allowed, if recommended by a geotechnical report prepared by a qualified professional.

See comment for 7b.

d. 100 feet from springs and flowing surface water bodies where the edge of the water body in the natural or levied bank for creeks and rivers, or may be less where site conditions prevent migration of wastewater.

Since it is assumed that this water would be treated before use as drinking water this distance would provide sufficient protection from enteric pathogens as to not significantly degrade the water source. Bacterial indicators should be reduced to acceptable levels for recreational use with this distance in sandy soils (Pang et al., 2003).

e. 200 feet from vernal pools, wetlands, lakes, ponds, or other surface water body is the high water mark for lakes and reservoirs, and the mean high tide line for tidally influenced water bodies.

It has been documented that natural surface water bodies (including lakes and marine waters) can be contaminated from septic tanks. The risk is often greater to these surface waters because of often high ground water tables that may change diurnally or seasonally after heavy rainfall events (Stramer, 1984) Thus, this greater set-back distance is justified. The work of Pang et al. (2003) indicates that in sandy soils this should be enough distance to meet bacterial standards for recreational waters and reduce viruses by greater than 7 logs.

f. 150 feet from a public water well where the depth of the effluent dispersal system does not exceed 10 feet.

Since public water supply wells usually pump larger volumes of water than those that supply individual households the greater separation distance is justified. Pumping may result in enhanced preferential flow through the substrata and a greater distance is required to pathogen removal and die-off (Corapcioglu et al. 2006; Yates and Yates, 1989).

d. 200 feet from a public water well where the depth of the effluent dispersal system exceeds 10 feet in depth.

See 7i comment.

h. Where the effluent dispersal system is within 600 feet of public water well and exceeds 20 feet in depth and the separation from the bottom of the system and ground water is less than five feet, the horizontal setback required to achieve a two-year travel time for microbiological contaminates shall be evaluated. A qualified professional shall conduct this evaluation. However in no case shall the setback be less than 200 feet.

Studies have indicated that survival of some enteric viruses may by greater than one year, especially at temperatures below 10 ^{o}C (John and Rose, 2005; Ogorzaly, 2010; Rigotto, et al. 2011). The two year time frame should ensure a 7 log reduction of enteric viruses. Pathogen removal is not adequate at depths of 2 feet (0.6 meter) of the drain field above the water table (Scandura and Sobsey. 1997; Nicosia et al. 2001). Thus, the five feet distance provides additional retention needed for virus removal.

i. **i. Where the effluent dispersal system is within 1,200 feet from a public water systems' intake and within the catchment of the drainage, the dispersal system shall be no less than 400 feet from the high water mark of the reservoir, lake or flowing body of water.**

This distance should be adequate to protect from enteric pathogens, not even considering any dilution that may take place from in the water body.

j. Where the effluent dispersal system is located more than 1,200 but less than 2,500 feet from a public water systems' surface water intake the catchment of the drainage, the dispersal system shall be no less than 2000 feet from the high water mark of the reservoir.

See 7i

8. The average density for any subdivision of property occurring after the effective date of this policy and implemented under Tier 1 shall not exceed one single-family dwelling unit or its equivalent per 2.5 acres for these units that rely on OWTS (Section 7.8).

Density of septic tanks has been shown to influence the potential for groundwater contamination and this density requirement is justified (Yates, 1985)

9. The minimum depth to the anticipated highest level of groundwater below the bottom of the leaching trench, and the native soil depth immediately below the leaching trench, shall not be less than prescribed in Table 1 and Section 9.4.8.

The increase depth to groundwater is justified with higher percolation rates as the greater the percolations rate the less removal of pathogens.

17. The proposed Policy identifies OWTS within 600 feet of an impaired water body listed for nitrogen or for pathogens pursuant to §303(d) of the Federal Clean Water Act as contributing to the impairment of the water body when further designated by the Regional Water Board. For purposes of this Section, impairment is limited to nitrate or bacterial contamination.

This distance should be more than adequate to protect the recreational use of a water body (Pang, L. et al. 2003).

21. The minimum soil depth to the anticipated highest level of groundwater below the bottom of the dispersal system shall not be less than three (3) feet. All dispersal systems shall have at least twelve (12) inches of soil cover.

Research indicates that some virus contamination of groundwater is likely to occur with this separation distance (Scandura and Sobsey, 1997; Nicosia, L. A., 2001). However, separation horizontal distances of separation from wells and other water sources should be adequate to further attenuate pathogens.

References

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