Alternative Wastewater Demonstration Project

Left Fork Watershed of the Mud River

Lincoln County Commission ~ US EPA Cooperative Project

White Paper for Final Project Report:

Outstanding Technical Issues:

Leaking Tanks, Direct Discharge and NSF 40 Testing,
Implications of Mineral Content of Well Water,
Antibiotics & Other Pharmaceuticals on Septic Tanks' Viability

As this EPA Demonstration Project unfolded, a number of technical issues challenged the Commission. Some of these were solved; others still loom as challenges. Solutions are administrative and regulatory as well as research driven. Those discussed here are more applicable to rural, low income communities like the Left Fork Watershed. All need additional research and are especially appropriate for land grant universities with commitments to rural community outreach.

LEAKING TANKS. The WV state code specifies that septic tank should be water tight, and one would expect that brand new concrete septic and pump tanks would not leak. In order to make sure tanks are securely in the ground and that the process of breaking down raw sewage begins properly, once tanks are set in the ground on location, they are normally filled with water. When the project noticed that some new concrete tanks after being filled were leaking, the Commission decided to inspect tanks before they were brought on site. Local tank fabricators were asked to fill tanks with water a day in advance, and these were inspected the following morning. During the original inspection 5 out of 9 tanks (55%) were leaking the morning of the inspection. Non-leakers were spray painted with EPA to insure that only those passing inspection would be brought to sites.

Yet, even tanks which did not leak at the manufacturer's, sometimes end up leaking by the time they were filled with water on site. Lifting tanks on to flat bed trucks, transporting them over rough roads, and then lifting them off and positioning them in the ground can

aggravate potential flaws and create leaks. Tanks which leaked on site were drained and painted or coated on the outside or the inside in an effort to re-seal.

Most of the leaking concrete tanks were mid-seam construction. Yet, most of the leaks were within the body of the tank, not at the seam. This led the project to feel that construction materials and poor workmanship were the real issues, rather than tank seam placement.

The project raised the issue of newly manufactured leaking tanks at the state level. The WV State Sewage Advisory Board voted to require annual inspection of state concrete tank fabricators. In addition to this impact on state regulations, the project reinforced the expectation that tanks would be water tight at pre-bid site visits and linked installation payments to tank inspections. In the end the Commission barred from the project tanks fabricated by a certain manufacturer because of repeated leaking problems.

This project's history of leaking tanks led the Commission to require heavy duty plastic tanks rather than concrete for all installations in its new ARRA Green Stimulus project.

One of the project's lessons-learned was the importance of continually raising the issue of leaking tanks before regulators and installers as a way to keep attention on this problem. It is vital that a project director, county sanitarian, or other homeowner advocate be on site during installation to make sure tanks do not leak before they are "hidden" underground.

DIRECT DISCHARGE and NSF 40 TESTING. Ideally, every home wastewater system would have its final effluent go into the ground. But for this to happen a home needs 1) enough land area for a discharge field, 2) soils which allow effluent to effectively percolate through them for final decontamination, and 3) a deep enough water table to ensure wastewater effluent doesn't pollute drinking or tributary water.

Homes in the Left Fork Watershed often can't meet these requirements. In-ground effluent dispersal then, though desirable, is not always possible. The alternative is direct discharge into the creek or stream. Because the state of West Virginia wants to insure that bacteria and other wastewater contaminants do not pollute tributaries, there are two critical system requirements that must be met before direct discharge can be permitted. New wastewater systems must be NSF-40 approved (an international accreditation process), and for the life of the systems, they must be monitored (usually twice a year) to make sure components work correctly.

The final stage in the discharge process before the effluent enters the creek is bacterial decontamination. The West Virginia Department of Environmental Protection recommended that this project use ultraviolet light decontamination rather than a chlorine /

de-chlorination process because of problems encountered with the latter. (*There are a growing number of states; however, which do not allow direct discharge under any circumstances. West Virginia is not at that point, though this project's experience raises concerns about short and long term viability of direct discharge*.)

West Virginia's required direct discharge monitoring does **NOT** include analyzing the quality of the final effluent which goes into the creek. The required monitoring in WV focuses on the mechanical components of the system. The Commission, however, felt it was prudent to test at least some of these systems. After all, the federal funding was about demonstrating that alternative systems can clean up bacterial content in creeks and streams.

Eleven of the project's 28 direct discharge system homes had their final effluent sampled. Sampling began in March 2008 and ended in February 2010. Originally, BOD, Fecal, TSS, and E. coli were all sampled. Eventually, the sample focus became E. coli because that was also the key parameter for tributary sampling. In the end there were 57 individual sampling events measuring E. coli. The project used 200 colonies per 100mL as the cutoff acceptable limit. 29 or 51% of these sampling events were over the acceptable limit. 20 or 35% had readings of over 25,000 colonies per 100 mL. While most of the direct discharge systems in the project worked properly as far as meeting acceptable discharge limits, some systems were problematic.

The project tried to figure out what might be causing these high bacteria counts. The Commission engaged state agencies, NFS International, water quality labs, system and component manufacturers in discussions and even sponsored meetings and workshops in the county with national system representatives, state agency officials, and local installers.

One potential cause for high bacteria counts relates to fouling of the sleeve around the UV light. UV rays kill E. coli as the effluent flows around this sleeve. However, if the sleeve isn't clean, the UV rays don't reach the bacteria which then pass out into the creek. In examining the UV lights in some of the project's systems, sleeve fouling was found. However, no conclusive cause for the fouling has been accepted. As with so many issues in the project, organizations tended to defend their turf. Agencies, manufacturers, installers, labs, all suggest that the cause for the problem rested with another entity. Establishing good research in this area is critical to long term viability of alternative systems.

MINERAL CONTENT OF WELL WATER. The majority of the homes in the Left Fork Watershed get their water from individual drilled wells. Those not relying on wells use springs or hand dug wells. Early sampling of home well water showed very few wells contaminated by E. coli. The project did not sample for mineral content. As the project

tried to unravel causes for unacceptably high levels of E. coli in the new systems' direct discharge samples, well water mineral content became a potential concern.

There is a perception that minerals in the home water supply (especially iron and calcium) might contribute to UV sleeve fouling. Some of the labs the project consulted shared experiences in which it seemed that bacteria secreted minerals which fouled systems.

High mineral content in household water, may, in fact, be a barrier to proper decontamination of wastewater effluent. If so, it is especially discouraging that none of the project's advisors, system manufacturers, or collaborators, raised that concern as the project moved forward. In part, this may be because alternative wastewater systems are very uncommon and untested in rural, low income areas, where homeowners do not have the luxury of installing costly filtration systems to remove minerals in their water. This topic like others needs committed research.

IMPACT OF ANTIBIOTICS & OTHER PHARMACEUTICALS ON SEPTIC TANK VIABILITY. The final area where the projected wished there was more concrete research was the impact of various pharmaceuticals on home septic tanks. Again, there seems to be a dearth of research related to rural communities. In areas served by larger septic package plants, pharmaceuticals entering one home system are diluted by the multiple homes served by the plant. In rural communities with individual home septic tanks, when all people in a home are sick and taking antibiotics, the septic tank can be rendered useless as those antibiotics pass through the humans, enter the tank, and kill off the beneficial tank bacteria. Besides potential negative impact to the tank, what is the impact on the secondary system? As more and more people use more and more medicines, the issue of pharmaceuticals' negative impact on home septic systems only grows.

Conclusions

Clearly there are a number of critical, wastewater related, research issues which are endemic to rural, low income communities. All are especially appropriate topics for land grant universities with commitments to rural community outreach and ought to be encouraged by federal and state agencies.