shallowsystems

By Dennis Hallahan

As the demand for potable water begins to exceed available supply, onsite wastewater treatment gains ground by returning water to the aquifer as close to its origin as possible. These systems, when installed as an alternative to sewers, reduce installation and treatment costs for communities and individuals. Although land costs have fallen in many areas, easy-to-develop land in urban and suburban metro areas is in short supply and sewer hookups often are not readily available or cost effective.

Onsite wastewater treatment in the shallow soil horizon

ARTICLE SUMMARY

Challenge: Onsite wastewater treatment systems are gaining ground as the demand for potable water grows. The ability to reuse the water is key, and stringent standards must be met to make it acceptable.

Solution: The upper soil horizon provides highly advanced, efficient treatment to purify water and replenish groundwater and aquifer supplies. These systems perform well under a variety of land conditions.

Conclusion: Shallow systems provide many benefits, both environmental and financial, and in turn help decentralized systems perform better.

A shallow 8-in. chamber is installed in low-permeability soils.

An important benefit to onsite wastewater treatment systems is the ability to design them to allow high-water-usage facilities to treat the wastewater and reuse it. This reuse can include toilet flushing, irrigation for residential and commercial properties (e.g., golf courses and farms) and firefighting. Stringent treatment standards must be met to make reclaimed sanitary wastewater acceptable to regulatory agencies and the general public—a catalyst for the further development of advanced wastewater technology.

Less-Than-Ideal Conditions

Homeowners, builders and developers searching for reasonable land need wastewater treatment options that perform well under a variety of often less-than-ideal conditions. Providing substantive treatment at varying depths is a challenge that the wastewater treatment industry is working hard to address. In response, products and system designs that work well in the shallow horizon, when groundwater levels are an issue or where poor soils have emerged will come to the forefront. Because treatment at shallow depths can be more effective than deeper systems, shallow-system designs now are playing a major role in the mandated repair or replacement of underperforming, nonperforming or outdated systems.

Utilizing the Upper Soil Horizon

If just the right amount of wastewater is delivered to the soil at the right time, then the soil effectively provides treatment prior to effluent reaching surface water or groundwater supplies. The key to this equation is in the delivery. The soil can provide highly advanced, efficient treatment to purify water that then allows it to resupply and replenish groundwater and aquifer supplies. This perpetuates the hydrologic cycle.

A shallow system installation with low-pressure pipe distribution.

Systems placed shallow in the soil horizon can satisfy regulations by meeting minimum separation distances to groundwater or limiting layers such as bedrock or hardpan. The higher placement of the system is a benefit because the upper soil horizons contain a more biologically active zone with a greater number of organisms than in deeper soils. Being close to the atmosphere is another system advantage, as this zone is more aerobic and oxygen is better diffused through the soil. This enhances the quality of treatment.

Shallow systems also fall in the root zone, where plants uptake water and nutrients. The uptake of water and natural soil evaporation allows for evapotranspiration (ET) to occur. In many soil conditions permeability is limited; ET is a critical factor because it increases the capacity of the system while providing better treatment by root uptake of nutrients.

Cost Efficiencies

There are also cost advantages to installing systems in the shallow soil horizon, including minimized excavation costs, which result in overall system cost efficiencies. This is due primarily to the ability to construct the systems with smaller, low-impact tracked machinery instead of large excavating equipment. In addition to cost savings, this minimizes damage to the upper horizon soils.

Driplines for Irrigation & Reuse

Driplines deliver effluent into the biologically active soil horizon. Because they are installed at these shallow depths, the soil easily breaks down the effluent while the plants, trees and grass use the effluent and the nitrogen and phosphorus in it for nutrition. These two elements are the key components of most plant fertilizers. In this scenario, the wastewater is reused as a supplement to or replacement for any plant irrigation and nutrition. Any remaining effluent is treated by the soil and returned to the groundwater supply.

Plastic Chambers

Chambers are extremely effective in providing even distribution of effluent to the soil, and recent low-profile product innovations are making them a viable choice for shallow systems. Chamber systems are easy to install and are engineered for strength and performance. They offer a great deal of design flexibility, and like driplines, they do not require heavy equipment for installation. This results in savings on labor, materials, time and costs.

Polystyrene Aggregate Systems

These systems, also ideal for shallow applications, improve drainfield performance by eliminating the fines associated with crushed stone while also reducing compaction and embedment associated with stone. The engineered geosynthetic aggregate modular design provides extensive flexibility in system design and easy installation with these systems. They are lightweight and can be contoured around trees or on sloping sites. Although it is used frequently in new system applications, this technology is ideal for system repairs.

Wrap-Up

Shallow systems have allowed the use of decentralized systems to expand and perform better. Shallow systems may not always be the correct design decision due to limiting site conditions, but they can offer many benefits to the homeowner, the contractor and the environment. The location of the drainfield higher in the soil profile can be both a better choice economically and a better design environmentally. WWD

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A community drip system is installed within the open space, allowing recreation, gatherings and events. *(Photo courtesy of American Mfg. Co.)*