

## Drip Irrigation On-Lot Sewage Disposal System

Albert R. Jarrett, Professor of Biological Engineering

The purpose of this fact sheet is to explain the components and function of the Alternate On-Lot Sewage Disposal System known as Drip Irrigation. Pennsylvania has approved the use of drip irrigation as an alternate wastewater disposal method for on-lot sewage. The drip irrigation system was developed and is designed for sites with restrictive soil conditions, where the site's limiting zone is within 20 to 26 inches of the soil surface or deeper.

### Components of the Drip Irrigation System

The drip irrigation system has several components: a septic tank followed by a secondary treatment unit, a hydraulic unit pump tank, a hydraulic unit, and a special drip irrigation system buried within a few inches of the soil surface. Each of these components will be described below. An overall schematic showing the major components of a drip irrigation system is shown in Fig. 1.

### Secondary Treatment

Because the limiting zone in the soil is closer to the soil surface than 48 inches, the septic tank must be followed by a secondary treatment unit, which provides some of the wastewater treatment that usually occurs in the soil.

There are three types of the secondary treatment units approved for use: (1) the aerobic treatment tank, (2) the free access sand filter, and (3) the subsurface sand filter. Each of these will be briefly described below.

**Aerobic Treatment Tank.** An aerobic treatment tank replaces the traditional septic tank and also serves as a secondary treatment unit. The aerobic treatment tank utilizes settling and aeration to treat the wastewater delivered to it.

**Free Access Sand Filter.** A free access sand filter is a large tank (or chamber) filled mostly with sand, into which the septic tank effluent flows by gravity or is pumped. The wastewater percolates slowly down through a 24- to 36-inch deep layer of sand and is

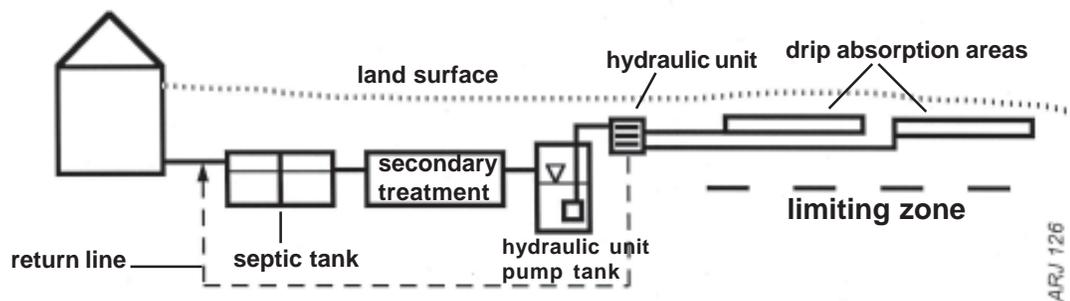


Fig. 1. Schematic of a drip irrigation system with a septic tank.

collected at the bottom and piped to the dose tank. This unit can be accessed through ports in the top of the tank for maintenance and sand replacement. For secondary treatment, the free access sand filter should be loaded at 5 gal/d/ft<sup>2</sup> or less.

**Subsurface Sand Filter.** The subsurface sand filter is much like the free access sand filter except the sand filled chamber is buried and not accessible for maintenance. For secondary treatment, the buried media filter should be loaded at 0.8 gal/d/ft<sup>2</sup> or less.

## **Hydraulic Unit Pump Tank**

---

After the wastewater has been treated in the secondary treatment unit, it is piped to and collected in a single-chamber tank known as the hydraulic unit pump tank. When a pre-set volume of wastewater has been collected, float switches in this pump tank activate the pump, which transfers a prescribed volume of wastewater to the hydraulic unit and then to the drip irrigation soil absorption system. Generally the wastewater is pumped twice daily.

## **Hydraulic Unit**

---

Before the wastewater is piped to the drip irrigation absorption area, it must first pass through a disk filter to remove all remaining waste particles that might clog the drip irrigation emitters. In addition to final disk filtration, the hydraulic unit also serves as a switching unit that alternates the flow of wastewater to one of two drip irrigation zones. The hydraulic unit also receives flush return wastewater from the drip irrigation zones and transfers this flush water to the treatment tank (Fig. 1).

## **Drip Irrigation Absorption System**

---

As final disposal, the wastewater is dosed to two or more drip irrigation zones. Each drip irrigation zone consists of a length of supply pipe that carries the wastewater from the hydraulic unit to the drip irrigation lateral and a return pipe that collects undischarged wastewater and returns it to the hydraulic unit. Connecting the supply pipe to the return pipe are two lengths of small-diameter (usually 0.5-in) drip irrigation lateral, which contains small devices, known as emitters, that meter the wastewa-

ter flowing in the drip irrigation lateral slowly into the soil. Each zone contains two laterals and each emitter discharges 0.68 gallons of wastewater per day. The emitters are spaced at 2-foot intervals along the drip irrigation lateral. The length of each lateral is determined by the total system flow rate and the soil's hydraulic characteristics. The supply, return, and laterals are shown schematically in Fig 2 for a two zone system.

There are two drip irrigation configurations; (1) for sites with a rock limiting zone  $\geq 26$  inches from the soil surface, see Fig 3, and (2) for sites with a water limiting zone  $\geq 20$  inches from the soil surface, see Fig 4 on the last page. In both cases the drip lateral, with emitters, is placed at or within 6 to 12 inches of the soil surface.

## **Summary**

---

The drip irrigation on-lot sewage disposal system was created as an alternative to requiring an elevated sand mound on some sites with limiting zones as close to the soil surface as 20 inches. The primary advantage of the drip irrigation system is that no large mound of soil is required because the drip laterals are inserted into the top 6 to 12 inches of soil. The disadvantage of the drip irrigation system is that you will most likely be required to include a secondary treatment unit between the septic tank and the hydraulic unit pump tank. The hydraulic unit is an additional cost, and regular maintenance is required. If you have questions about the drip irrigation system contact your local Sewage Enforcement Officer or your County Agent.

Check our website for more fact sheets on this and other topics.  
[www.abe.psu.edu/factsheets](http://www.abe.psu.edu/factsheets)

Agricultural and Biological Engineering  
Department  
246 Agricultural Engineering Building  
University Park, PA 16802  
Telephone: (814)865-7685  
FAX Number: (814)863-1031

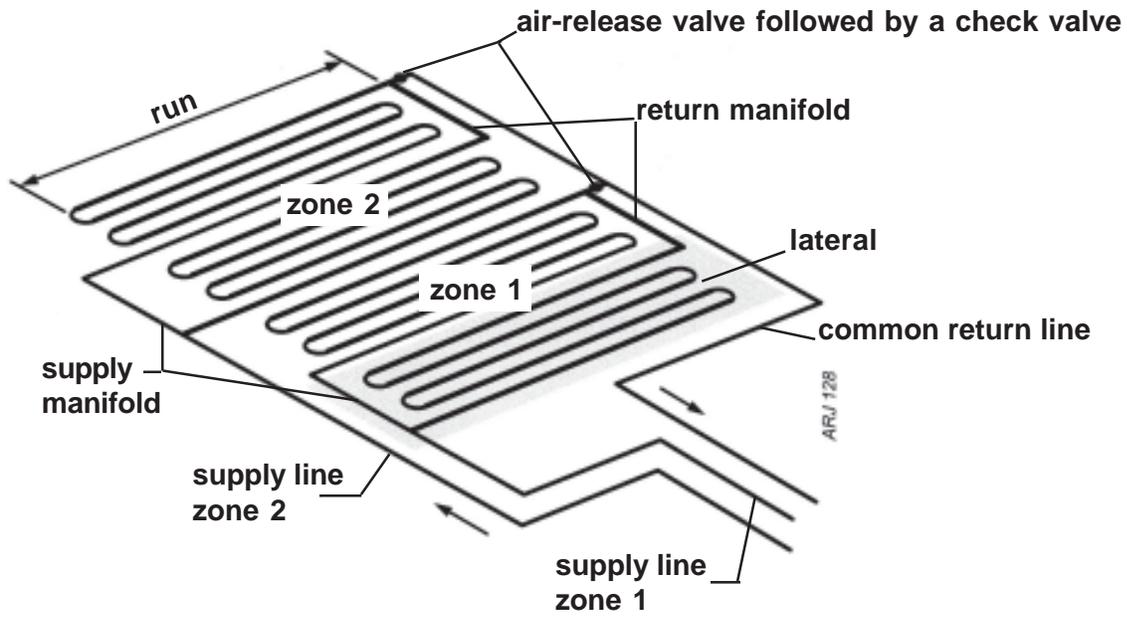


Fig 2. Schematic of drip irrigation zones

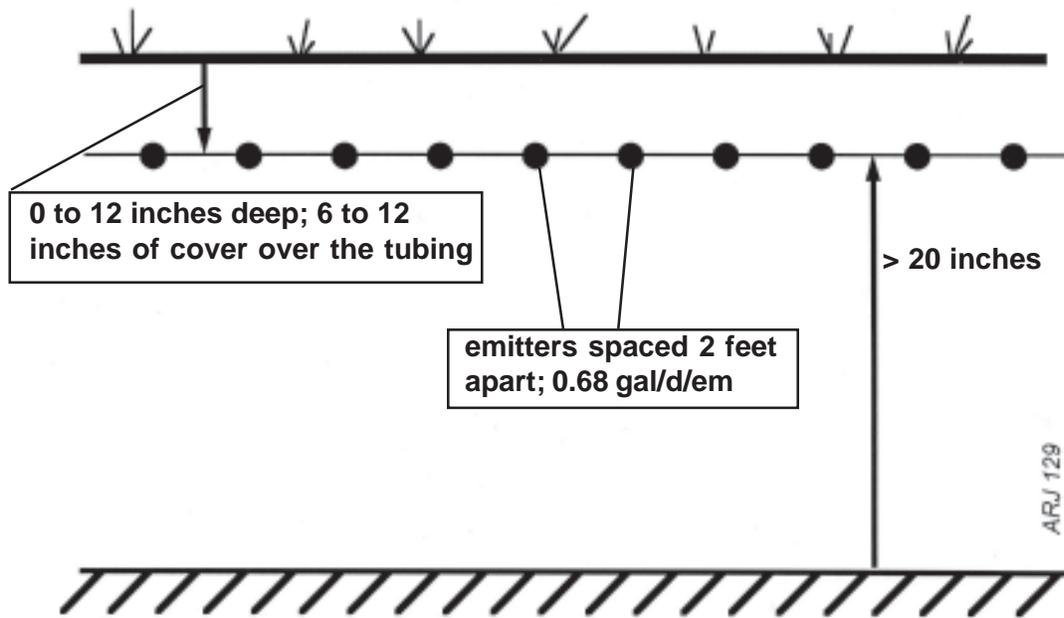


Fig 3. Rock limiting zone  $\geq 26$  inches

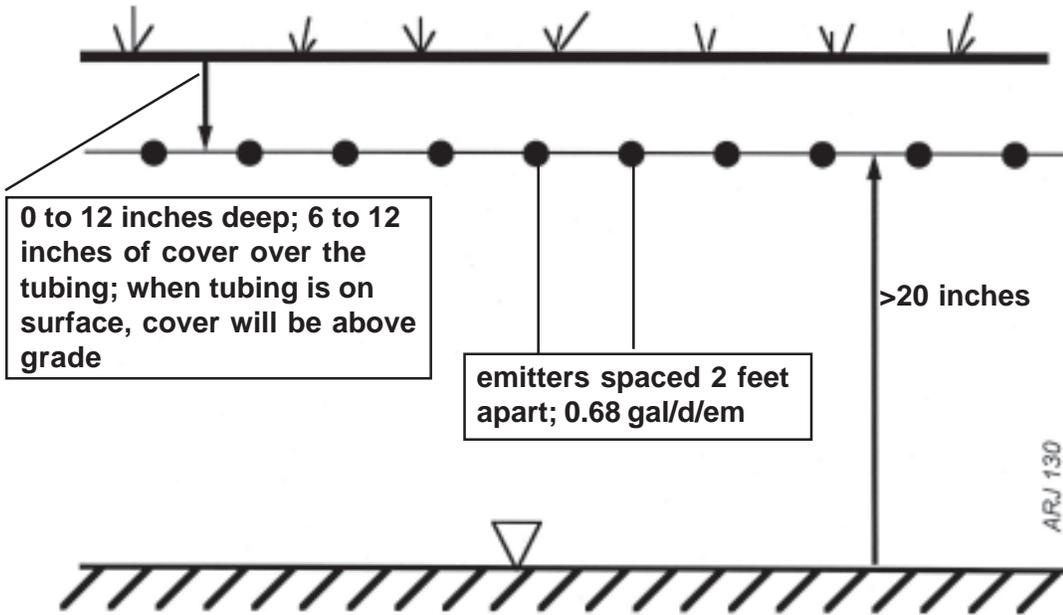


Fig 4. Water limiting zone  $\geq 20$  inches.

PSU  
2nd Edition 4/08

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901, Tel 814-865-4700/V, 814-863-1150/TTY