Technical Note #5 from Watershed Protection Techniques. 1(1): 15-16

Failure Rates of Infiltration Trenches/ Basins Assessed in Suburban Maryland

How long do infiltration practices operate effectively after they are installed? The answer, according to a field survey by Galli (1993), is not very long. He inspected over 60 infiltration trenches and basins constructed in the coastal plain and piedmont of Maryland during both dry and wet weather.

The structures ranged in age from six months to six years. They were all located within Prince George's County, which has been a regional leader in infiltration design standards, plan review, and construction inspection.

Galli found that less than half of the nearly 50 infiltration trenches he surveyed were working as designed. Furthermore, the longevity of trenches declined over time—less than one-third still functioned after five years.

Most trenches served smaller commercial developments of two acres or less. The trenches all incorporated some mechanism for runoff pretreatment, either in the form of a sump pit (N=31) or a grass filter strip (N=7) (Figure 1).

In addition, the majority of trenches had observation wells, bottom sand layers, and filter fabric protection on the trench walls and one foot below the trench surface. Soil borings were taken at 85% of the sites to confirm the underlying soil properties. As with many stormwater practices, the trenches were not maintained after their construction. The major performance problems encountered in the field are itemized in Table 1.

The effectiveness of the protective 25-foot grass filter strips was marginal. All of the filter strips experienced erosion, spotty vegetative cover, or short-circuiting within two years after construction. Sump pits, on the other hand, appeared to be a more effective pretreatment technique. The median volume of trapped sediment in the sump was about 10 cubic feet, and was composed of coarse inorganic sediments (55%), fine sand and silt (25%), and coarse organic matter and litter (20%).

Although the volume of trapped sediments in sump pits clearly indicates the critical need for pretreatment, the sediment volume did not increase with age. This finding implies that unless sump pits are regularly cleaned out, it is likely that the trapped sediments will be resuspended and transported inside the trench.

Figure 1: Schematic of Sump Pit Used to Pretreat Runoff Before Infiltration (Galli, 1993)

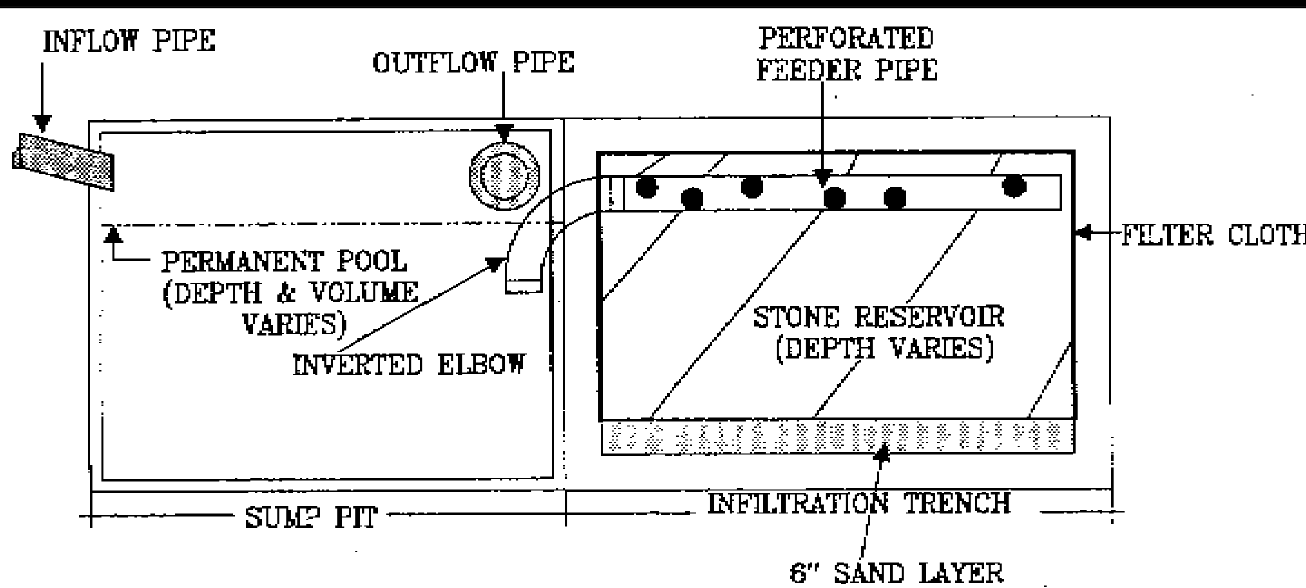

Table 1: Maintenance Problems Associated With Infiltration Trenches (Galli, 1993)

Maintenance Problem	Sump Pit Trenches (%)	Filter Strip Trenches (%)
Slow infiltration rate	39	42
Excessive Sediment Buildup	67	32
Poor Flow Pattern	6	29
No Observation Well	16	0
Feeder Pipe Missing	29	NA
Poor Vegetative Cover	NA	71
Surface Filter Fabric Clogged	NA	29
Requires Major Rehabilitation	65	71
Working as Designed	48	43

The underlying cause for the failure of the trenches was attributed to three factors. First, a number of trenches were constructed in questionable soils, while others may have been constructed too close to the water table. Second, many trenches were prematurely contaminated by sediments during or shortly after their construction. Lastly, trenches were gradually clogging due to inadequate pretreatment of runoff.

Twelve infiltration basins were sampled. Most had relatively small surface areas (0.01 to 0.20 acres) and corresponding drainage areas (mean = 1.8 acres). All 12 of the infiltration basins clogged within two years of construction. The basins exhibited surface ponding in dry weather (mean depth of one foot), saturated soils, and a vigorous cover of wetland plants. Essentially, the infiltration basins quickly evolved into pocket wetlands. Although none of the basins were infiltrating runoff as originally designed, 60% provided at least partial pollutant removal for some fraction of runoff (either through very slow infiltration or by providing some dead storage up to the crest of the riser).

The complete failure of the basins to infiltrate runoff was due to a series of interrelated problems. These included compaction of soil during construction, further compaction of soils by the mass of ponded water after construction, large sediment inputs (very few basins had any kind of pretreatment to trap coarse sediments before they entered the basin), poor vegetative cover on the basin floor, and sealing of the basin floor by algal mats.

Galli provides several recommendations for increasing the longevity of infiltration trenches. They include: (1) better geotechnical and groundwater investigations, (2) standardization of observation well caps, (3) better specification of clean stone materials for the reservoir, and (4) regular cleanout of sump pits.

Perhaps with more effective pretreatment, maximum ponding depths, direct stone inlets into deeper soil layers, and back-up underdrawn, infiltration basins could achieve greater longevity in the field. However, in the final analysis, communities will need to carefully review their ability to provide or enforce regular maintenance activity if the longevity of infiltration practices is to be measurably improved.

—*TRS*

Reference

Galli, J. 1993. *Analysis of Urban BMP Performance and Longevity in Prince George's County, Maryland.* Metropolitan Washington Council of Governments, 202 pp.