



Chester County Stormwater BMP Tour Guide

Published by: Chester County Conservation District

Spring 2002

BMP: Infiltration Beds

Site Name: Pocopson Elementary School

Location: Pocopson Township, ADC Map Coordinates: 40 H-9
Directions: On the northwest corner of the intersection Rt 926 (Creek Rd) and Pocopson Rd

Watershed: Brandywine Creek (Stream Designation: TSF, MF)

Land Use: School/Institution

Description: An infiltration bed is a stormwater management structure that collects and temporarily stores stormwater runoff allowing it to gradually soak into the surrounding soil and eventually into the water table below. This site has several underground, or subsurface, infiltration beds, including infiltration beds under the paved parking lots and under grass playing fields. Each infiltration bed consists of a network of perforated pipes laid horizontally in a stone bed and encased in geotextile fabric. The geotextile fabric that surrounds each bed protects the stone bed and pipe from being clogged with dirt, grit, and debris. Stormwater percolating into the ground on the playing fields soaks through the topsoil and into the infiltration structure below filling void spaces between the stone and eventually accumulates in the perforated PVC pipe. Stormwater is stored in the stone bed and perforated pipe prior to infiltrating into the ground below. Stormwater enters the infiltration beds located under paved areas (i.e. parking lots and driveways) via adjacent impervious areas including stone trenches and unpaved surfaces that convey stormwater into the infiltration bed.

Function: Infiltration structures replenish water table and help maintain stable base flow in nearby streams. Infiltration beds located close to where the runoff is generated limit evaporative loss and provide efficient groundwater recharge. They can reduce peak runoff discharge rates controlling down slope erosion and scouring. The stormwater storage provided by underground infiltration beds supplements the storage capacity of the above ground stormwater pond at this site.

Infiltration beds can filter some pollutants present in stormwater runoff. Infiltration beds can physically trap suspended solids (i.e., sand and grit) by trapping them in the turf and soils. Nutrient pollutants present in stormwater runoff entering infiltration beds can be taken up by vegetation present (i.e. grass roots on the playing field and in grass-lined channels); the extent of nutrient removal varies depending upon the type of vegetation present and soil conditions. Oil and grease bound to suspended solid particles may also be trapped and filtered from runoff by vegetation present and in the upper soils. Independently an infiltration bed cannot remove pollutants like petroleum-based products and other toxic chemicals. Additionally, an infiltration bed can be a direct conduit for these pollutants into the subsurface, as such; infiltration beds are not advisable at sites that have the potential to generate extensive stormwater pollution (i.e., many industrial sites). To the extent, infiltration beds perform like an infiltration basin, and

assuming they are functioning as designed, an infiltration bed can approximate the following pollutant removal efficiencies:

- Total Suspended Solids (TSS): 95 %
- Total Phosphorus: 70 %
- Total Nitrogen: 51%
- Metals (copper and zinc): 99 %
- Bacteria: No Data

Operation and Maintenance: The Chester County Conservation District considers underground infiltration beds have high maintenance requirements. Operation and maintenance requirements include the following:

- During site construction and any earth disturbance activities, protect soils to be relied upon for infiltration from sediment inundation
- At the completion of construction, scrape soils to remove accumulated sediment and conduct soil percolation tests in areas where surface infiltration is needed
- Avoid running heavy equipment over infiltration areas to prevent soil compaction
- Inspect infiltration beds regularly to ensure they are infiltrating
- Maintain turf in accordance with site maintenance schedule (i.e., meadow maintenance generally calls for mowing once or twice a year)
- Where appropriate, limit mowing to maximize the opportunity for planted vegetation to trap pollutants present in stormwater that will be infiltrating
- Avoid applications of chemical pesticides and fertilizers to turf in and around infiltration areas and structures

Cost Factors. Subsurface infiltration beds are generally costlier to design, construct and maintain than conventional surface stormwater structures (i.e. stormwater pond). The cost for stormwater structures at this site exceeded an estimated \$ 750,000; however, the infiltration structures and subsurface storage systems permitted the site to be developed at its capacity. Steep slopes at this site were one site condition that limited opportunities to rely exclusively on surface stormwater structures. Factors affecting the cost include the materials (i.e., perforated pipe, stone, and geotextile fabric) as well as excavation and construction costs. Other factors that can add to the cost of infiltration structures includes the need for soil tests, possibly imported soils, protection measures needed during construction to prevent soil compaction. The value of these structures in controlling stormwater and recharging groundwater; however, can offset construction and maintenance costs.

Other Site BMPs

Shallow Surface Infiltration Trenches. At the site perimeter, a series of terraced shallow infiltration trenches were installed to catch and temporarily store stormwater runoff overland flow. When one trench fills it spills over into the trench immediately below and at the last basin at the bottom of the slope discharges into the stormwater basin located at the lowest point on the site. The trenches were constructed with permeable soils to infiltration stormwater from small storms. These grass-lined trenches constructed of uncompacted permeable soils permit direct infiltration of stormwater.

Grass Pavers. Grass pavers were installed on grounds in high use areas of the site, including areas where students congregate and routes for emergency vehicle access. These pavers provide structure and support to prevent the soils in being compacted, which would limit

stormwater infiltration into subsurface infiltration beds. The interlocking plastic grass pavers laid down on a level stone bed are back-filled with soil and grass seed, which provide stable ground cover.

For More Information

Designer: Rettew Associates, (717) 394-3721 (Doug Parkins, Engineer)

Owner: Unionville-Chadds Ford School District, Building and Grounds Department,
(610) 347-0970 (Rick Hostetler, Supervisor)

Manufacturer: Not Applicable

References

Center for Watershed Protection, *Approaches to Stormwater Treatment*, Copyright 2001.

Pennsylvania Handbook of Best Management Practices for Developing Areas, Prepared by CH2MHILL, Spring 1998.

Site 16 - Pocopson Elementary – Infiltration Structures



Terraced, shallow recharge basins at property's edge



Gravel walking path promotes stormwater infiltration



View of site infiltration basins.

