



Chester County Storm Water BMP Tour Guide

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BMP: Vegetated Swale and Constructed Wetlands

Site Name: Eagleview Development

Location: Uwchlan Township, ADC Map Coordinates: 20-K5
Directions: Route 100 North, left into Eagleview Development. Follow Wharton Boulevard until see the wetland and dam along the roadside.

Watershed: East Branch Brandywine Creek (Stream Use Designation: HQ, TSF)

Land Use: Mixed Use Residential and Commercial Development

Description: A vegetative swale is a constructed earthen channel planted with vegetation that conveys stormwater runoff. A vegetated swale provides an opportunity to filter pollutants from stormwater runoff and at this site it temporarily diverts stormwater around the newly planted wetland area. The swale was incorporated into the design as a temporary measure to prevent inundation of young plants while they were getting established; however, the developer is considering making it a permanent swale.

Constructed wetlands are designed to mimic naturally occurring wetlands, which are lands characterized by wet soils that are consistently saturated by nearby surface waterways or surfacing groundwater. The saturated soils of wetlands support plants adapted for growth in wet conditions. Wetlands are typically found in low-lying areas with shallow standing water, wet soils, and vegetation that thrives and tolerates wet soils. The Pennsylvania Handbook (see references) recommends that at least 80 percent of a constructed wetland maintain a shallow water zone (1 foot deep). Constructed wetlands are designed with an embankment to contain runoff during high water events (i.e., large storms). Embankments, which may be constructed earthen berms or made of materials such as concrete, help maintain necessary hydraulic conditions in wetlands. This is particularly important during dryer periods. Constructed wetlands are an effective BMP when well designed, and well maintained, and well integrated into adjacent lands and land uses.

The wetlands in the Eagleview Development consist of natural wetlands, constructed wetlands, including wetland mitigation areas, stream and tributaries. The constructed wetlands at this site surround existing wetlands and Shamona Creek, which flows through the wetland. A road embankment serves as the dam. The embankment, or dam (called the Wharton Boulevard Dam), backs up water of Shamona Creek and its small tributaries to fill the wetland and maintain needed soil moisture. A concrete and pipe culvert conveys water through the embankment to maintain base flow in the downslope stream. During the establishment of wetland vegetation, the temporary vegetated swale was designed to divert stormwater around new plantings to protect them from premature inundation by stormwater.

A Note About Constructed Wetlands: Wetland designs must consider the ability of plants to accommodate a range of water levels and inundation characteristics. Constructed wetlands should be located in lower areas of a site preferably in places that have a reliable inflow of water between storm events to ensure soil moisture is sufficient to support wetland vegetation.

Wetlands may be constructed in combination with stormwater detention facilities to help control peak flows into the wetland and stabilize the flow of water through the wetland. Stabilizing flows into and out of wetlands prevent plant disruption, essential during seed germination and early plant establishment when plants are most sensitive to surrounding conditions. The goal is to prevent disruption of plant communities to ensure pollutant-removal efficiencies can be optimized.

Function: Vegetated swale serves several functions. At this site, its diverting stormwater around newly planted wetland vegetation. Vegetated swales offer biofiltration of runoff pollutants providing an opportunity for vegetation, organic matter, and soils to trap and remove pollutants from stormwater. Vegetation provides an opportunity to uptake nutrients and metals pollutants. Serving these pollutant removal functions, a vegetative swale can be very effective pollutant-removal BMP preventing pollutants from discharging into open waters. Depending upon local hydrology, a swale can also provide infiltration opportunities. Vegetated swales also enhance habitat for some wildlife.

Constructed wetlands can serve several functions. This wetland was designed to manage storm water quantities for a large portion of the Eagleview development, but was not initially designed for quality control. Even wetlands not specifically designed as treatment wetlands can provide physical, biological, and chemical removal of pollutants through natural processes of wetland plants and microbes. Provided wetland vegetation is present, wetlands have the potential to enhance water quality by removing pollutants present in storm water runoff. Constructed wetlands offer a relatively low-maintenance extended detention opportunity for surface runoff from developed areas. It provides flood control opportunities functioning in conjunction with detention facilities and stable habitat. Wetlands can supplement or replace stormwater pond capacity. At this site, the developer's preference was to have a single, central, stormwater management area for the entire development, rather than multiple decentralized small basins or structures. Wetlands can take advantage of existing or natural site features and can blend well with natural site features. When functioning, provide unique habitat for plants and wildlife, including sensitive and native endangered species.

Functioning as designed, wetlands and vegetated swales should approximate the following pollutant removal efficiencies:

	Wetlands	Vegetated Swale
• Total Suspended:	76 %	70 % - 81 %
• Total Phosphorus:	49 %	30 % - 34 %
• Total Nitrogen:	30 %	84 %
• Metals (including copper and zinc):	42 %	6 %
• Bacteria (such as coliform):	78 %	- 25 % *

Note: open channels, including vegetated swales, are prone to bacterial pollution

Regulatory Note: *Stormwater wetlands that are constructed entirely outside waters of the state and explicitly designed for stormwater management, are not subject to the provisions of Sections 401 and 404 of the federal Clean Water Act. At this site, since constructed wetlands are surrounded by existing wetlands, they are regulated as a wetland.*

Operation and Maintenance: The Chester County Conservation District considers wetlands and vegetated swales to be a low- to moderate-maintenance storm water BMP. Operation and maintenance requirements for wetlands and vegetated swale include the following:

- Inspect and manually adjust water level as necessary
- Inspect swale to maintain desired grade
- Inspect and adjust outlet structures as necessary to compensate for sediment accumulation (outlets must be free of floating and submerged plant material to permit unobstructed visual inspection)
- Regularly inspect dikes, embankments and hydraulic control structures
- Inspect vegetation to ensure the wetland plants are growing and that invasive plants are controlled
- Remove invasive plants manually to prevent them from damaging more desirable plants
- Ensure structures (i.e. outlets, conveyances) are in good condition
- Sediment removal is rarely needed since its removal would disturb stable vegetation

Cost Factors: The cost of constructing wetlands at this site is comparable to the construction of alternative stormwater management options. Vegetated swales are a relatively low-cost BMP. Site conditions can significantly influence cost of constructing these BMPs, particularly wetlands. Local factors including high land costs, sloping topography, highly permeable soil, and bedrock all affect the cost of these BMPs. Importation of soil suitable for plant growth in areas with clayey or rocky soils adds to the cost of wetland construction. The need for liner installation where water conservation is necessary also adds to the cost.

For More Information

Designer: Chester Valley Engineers (484) 348-6155 (Ron Silkknitter)

Owner: The Hankin Group (610) 458-1900 (Rick Guarini, Executive Vice President)

References

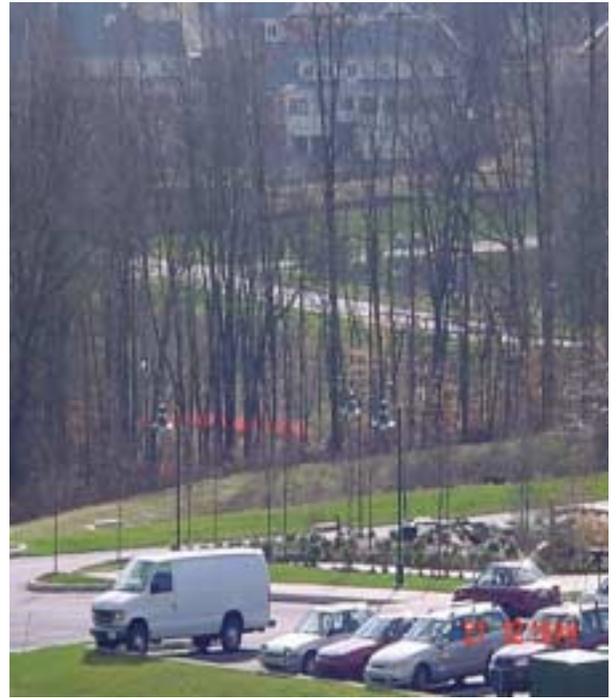
Center for Watershed Protection. *A Review of Storm Water Treatment Practices* (published presentation).

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

Site 20 - Eagleview Vegetated Swale and Wetland Mitigation Area



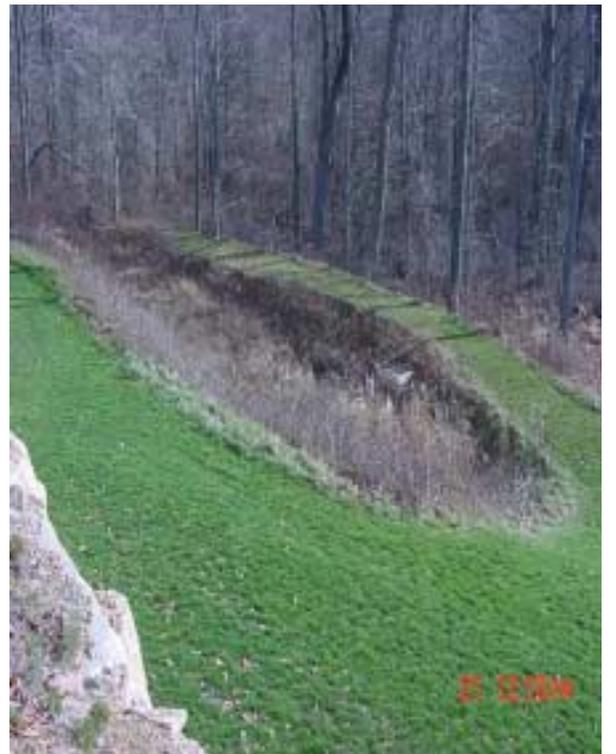
The vegetated swale is protecting this wetland mitigation area to prevent inundation during plant establishment.



Visible in the distance are wooded area, constructed swale, and wetlands.



The vegetative swale converges with Shamona Creek and flows under the road.



Grass path to right provides maintenance access.