SITE 11

Chester County Stormwater BMP Tour Guide

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BMP: **Constructed Wetland / Wet Pond**

Site Name: Nichol Community Park

Location: London Britain Township, ADC Map Coordinates: 54-A10
Directions: Route 896 (New London Road) 1.4 miles south of Village of Kemblesville

Watershed: Christina River (Stream Designation: WWF)

Land Use: Recreation

Description: This wetland / wet pond was constructed in a low-lying area of the site to manage site stormwater. The area was excavated and an earthen embankment built up around the perimeter to maintain a permanent pool and detain stormwater runoff. The pond, designed to hold water year-round, is fed from both surfacing groundwater and surface stormwater runoff. The pond bottom consists of clay soil present on the site at the time of construction. Pond design incorporates three distinct types of wetlands at three distinct elevations terraced around the pond's perimeter. Each terrace, or wetland shelf, has distinctive soil moisture and inundation characteristics. The lowest wetland shelf, or bench, is planted with submerged wetland vegetation including plants that thrive in wet conditions since most of the year these plants are submerged or semi-submerged. The wetland shelf in the middle is a transition area and slopes between the upper and lower wetland shelves; it is planted with emergent wetland vegetation that tolerates periodic and frequent inundation by stormwater. The upper wetland shelf closest to the pond's edge is planted with transitional wetland plants that can tolerate wet and dry conditions. Wetland vegetation in this pond was started from seed. The upper-most wetland bench provides a safety zone of shallower water between the deeper pool area and the surrounding land.

The pond has a sediment forebay, which is a depression near the outfall that is separated from the rest of the pond by constructed earthern berms (berms are submerged and not usually visible from the surface) at the inlet location where water enters the pond. This forebay permits sediment and heavy particles present in entering stormwater to settle out and collect; this initial settling zone prevents sediment from causing accelerated sedimentation of the main pond. The forebay was designed to permit easy access by a backhoe for routine removal of accumulated sediment.

The wetland pond receives stormwater runoff from the paved parking lot via a single inlet and receives overland flow from surrounding trails and fields. The pond has a single outlet with an aluminum trash rack. An aluminum structure was selected because it is rust-resistant and has better appearance and longer life than the typical steel grate. The pond has an emergency spillway to direct high flows that exceed its design capacity onto adjacent riparian lands.

The bottom of the pond is deep enough to maintain a temperature of approximately 58 degrees year round. Pond temperature control promotes natural circulation of pond water helping to support a healthy pond environment. For example, circulation helps maintain desirable oxygen levels and control algae production. A baffle plate was installed on the trash rack at the outfall to

help moderate the temperature of discharging water to avoid thermal shock in receiving waterway. The pond size and depth were designed to support vertebrate populations that would be capable of controlling insect reproduction.

Functions: Constructed wetlands, like this one, perform multiple stormwater management functions. This wetland, or wetland pond, controls stormwater runoff from the 18-acre recreational park. It was designed to manage stormwater for storm events ranging from 2-year storm to the 100-year storm. With extended detention of surface runoff, this constructed wetland provides pre-treatment opportunities. The wetland can filter pollutants present in stormwater runoff entering the pond and discharges cleaner water. It provides physical, biological, and chemical removal of pollutants through natural processes of wetland plants and microbes. This wetland adds natural diversity to the park landscape, comprised largely of grass fields and trails. The wetland offers a reasonably stable habitat for wildlife and enhances the riparian buffer of nearby stream.

Wetlands can take advantage of existing or natural site features and can blend well with natural site features. When functioning, they provide unique habitat for plants and wildlife, including sensitive and native endangered species.

Constructed as designed, wetland ponds should approximate pollutant removal efficiency rates comparable to ponds and wetlands, which are provided below. The forebay in this wetland pond has the potential to improve the suspended solids removal rate, as such the removal efficiencies for TSS provided below can be expected to be higher.

	Ponds	**Wetlands**
• Total Suspended Solids (TSS):	80 %	76 %
• Total Phosphorus:	51 %	49 %
• Total Nitrogen:	33 %	30 %
• Metals (including copper and zinc):	62 %	42 %
• Bacteria (such as coliform):	70 %	78 %

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.*

Operation and Maintenance: The Chester County Conservation District considers wetlands to be low to moderate maintenance stormwater BMP. Operation and maintenance requirements include the following:

- Inspect and manually adjust water level as necessary
- Inspect outlet structures as necessary to compensate for sediment accumulation (outlets should be reasonably free of floating and submerged plant material to permit unobstructed visual inspection)
- Monitor the formation of gullies caused by overland flow entering this pond, since it could cause accelerated erosion and sedimentation in the wetland pond
- Sediment removal is rarely needed since its removal would disturb stable vegetation
- Regularly inspect dikes, embankments and hydraulic control structures
- Inspect vegetation to ensure the wetland plants are growing and that invasive plants are controlled (invasive plants must be removed manually to prevent damaging wetland plants)
- Ensure structures (i.e. outlets, conveyances) are in good condition

Cost Factors: Site conditions can significantly influence cost of constructing wetlands. Township official's report that at this site the cost of constructing a wetland pond was comparable to a conventional stormwater pond which otherwise would have been required. The clay soil present at this site was used for the pond, though not optimum for a wetland pond, the township decided to use it rather than incur soil importation costs. To control costs at this site, wetland plantings were established using plant seeds rather than more costly mature plants.

For More Information

To Tour:	Take a self-guided tour anytime, simply comply with park regulations.
Owner:	London Britain Township (Robert Cheyne, Township Supervisor)
Designer:	Walsh Engineering, Inc. Wilmington, DE (Patrick Walsh)

References

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

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

Site 11 - Nichol Park -- Wetland

This constructed wetland maintains wet pond year-round. Wetland plantings stabilize banks through the winter.