

Chapter 10: Permanent Storm Water Treatment Practices

10.1 – Introduction

This chapter reviews aspects of the BMPs recommended as permanent treatment practices found in the “Best Management Practices – Structural Practices” section of the Tennessee Guide to the Selection and Design of Stormwater Best Management Practices: A Guide for Phase II MS4 Communities for Protecting Postconstruction Stormwater Quality and Managing Stormwater Flow (also known as the TDEC Manual for Post Construction). Permanent Treatment Practices are BMPs intended to treat storm water runoff for the long-term. Some of these BMPs can be designed to achieve both storm water quantity and quality management objectives. Each fact sheet has a quick reference guide indicating what pollutant constituents the BMP is targeting and implementation requirements. The BMP description sheets are available in the TDEC Manual for Post Construction and will not be published in this manual.

The “Best Management Practices – Structural Practices” section of the TDEC Manual for Post Construction contains the following BMP description sheets:

F-01: Catch Basin Inserts / Media Filters
F-02: Oil / Water Separator
F-03: Filter and Buffer Strips
F-04: Filter / Adsorption Bed
F-05: Bioretention Basins (Rain Gardens)

I-01: Infiltration / Percolation Trench
I-02: Infiltration Basin
I-03: Underground Drainage Systems
I-04: Porous Pavement

O-01: Swales

P-01: Detention (Dry) Basin
P-02: Retention (Wet) Basin
P-03: Alternative Storage Measures

W-01: Constructed Wetlands

Table 10.1 demonstrates the effectiveness of these BMPs based on design factors and conditions. Please refer to the TDEC Manual for Post Construction for full information on these BMPs and the methods for proper employment. The BMP Fact Sheets will be reproduced here for reference.

Table 10.1: Comparative Pollutant Removal Percentages of Urban BMP Designs					
BMP Design	TSS	Total P	Total N	Oxygen Demand	Trace Metals
	(Expressed in Percentages)				
Dry detention Basin					
First flush held for 6 to 12 hours	60 - 80	20 - 40	20 - 40	20 - 40	40 - 60
1 inch runoff volume held for 24 hours	80 - 100	40 - 60	20 - 40	40 - 60	60 - 80
w/ Shallow Marsh and Forebay, 1 inch runoff volume held for 24 hours	80 - 100	60 - 80	40 - 60	40 - 60	60 - 80
Wet Detention Basin					
Permanent pool = 0.25" per impervious acre	60 - 80	40 - 60	20 - 40	20 - 40	20 - 40
Permanent pool = 2.5 x mean storm runoff	60 - 80	40 - 60	20 - 40	20 - 40	60 - 80
Permanent pool = 4.0 x mean storm runoff	80 - 100	60 - 80	40 - 60	40 - 60	60 - 80
Infiltration Basin					
Exfiltrates 0.5" per impervious acre	60 - 80	40 - 60	20 - 40	20 - 40	20 - 40
Exfiltrates 1" per impervious acre	60 - 80	40 - 60	20 - 40	20 - 40	60 - 80
Exfiltrates all runoff from 2 year design storm	80 - 100	60 - 80	60 - 80	40 - 60	60 - 80
Filter Strip					
20' wide turf strip	20 - 40	0 - 20	0 - 20	0 - 20	20 - 40
100' wide turf strip	80 - 100	40 - 60	40 - 60	60 - 80	80 - 100
Grass Swale					
Moderate slopes with no check dams	0 - 20	0 - 20	0 - 20	0 - 20	0 - 20
Low slopes with check dams	20 - 40	20 - 40	20 - 40	20 - 40	0 - 20
Water Quality Inlet or Oil / Water Separator					
(Consult Manufacturer)	Varies	Varies	Varies	Varies	Varies

10.2 - Calculations for BMPs in a Series

Some BMPs will not meet Montgomery County's pollutant reduction goal alone, and may be used with another BMP to meet the goal. As an example, water may pass through one treatment device, into another in a "treatment train" to achieve added treatment. It is necessary to calculate the cumulative pollutant removal from series BMPs with an equation that accounts for the fact that the majority of the heavy (easily removed) suspended pollutants and particulate matter are removed by the first structural control in a series. The runoff that enters the second and subsequent controls contains sediment with much smaller particles, which are more difficult for

the control to remove. Thus, the second control has a pollutant removal efficiency that is less than it would ordinarily have. The following equation accounts for the cumulative pollutant removal of BMPs in a series.

$$TR = A + (1 - A) * B$$

Where:

TR = Total Removal

A = 1st structural control in series

B = 2nd structural control in series

Note: When runoff flows from a more efficient structure (one with a higher removal rate) to a less efficient structure (one with a lower removal rate), the cumulative pollutant removal of a structure does not increase. The reason is that a structure with a lower removal efficiency that follows a structure with higher removal efficiency does not have an appreciable effect on cumulative pollutant reduction.

Example Calculation

A site is planned to have a manufactured pretreatment device that will provide for 50% TSS removal, followed by a dry detention basin designed, built, and maintained as required to achieve a 60% TSS removal. The calculation is as follows:

$$TR = AMD + (1 - AMD) * BDD$$

Where:

TR = Total Removal

AMD = 1st structural control—manufactured device

BDD = 2nd structural control—dry detention basin

$$TR = 0.5 + (1 - 0.5) * 0.6$$

$$TR = 0.5 + (0.5) * 0.6$$

$$TR = 0.5 + 0.3$$

$$TR = 0.8$$

Total Removal equals 80%. The site meets Montgomery County's requirements of 80% TSS removal for this site.