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**MEMORANDUM OF UNDERSTANDING REGARDING EXTENDED FILTRATION  
LANGUAGE IN THE WV MS4 GENERAL PERMIT**

**To:** Municipal Separate Storm Sewer System (MS4) Permittees, and all interested parties

**From:** WV Division of Water and Waste Management

**Date:** February 01, 2011

**Subject:** Extended Filtration Clarification  
Permit No. WV0116025  
Stormwater Discharges from Small Municipal Separate Storm Sewer Systems  
Issue Date: June 22, 2009  
Effective Date: July 22, 2009

The purpose of this Memorandum of Understanding is to clarify language in the WV MS4 general permit issued on June 22<sup>nd</sup>, 2009 that allows stormwater discharges to occur via underdrains in extended filtration facilities.

The 2009 WV MS4 general permit requires that the first one inch of rainfall from a 24 hour storm be 100% managed on site. There are several exceptions to this requirement that are set forth in the MS4 permit. One of these exceptions is Extended Filtration.

Extended Filtration is a structural stormwater practice which filters stormwater runoff through vegetation and engineered soil media. After the soil media becomes saturated by the first one inch of runoff volume, additional stormwater runoff will either discharge through a surface overflow outlet or through an underdrain system. The underdrain system will also slowly release the runoff detained in the soil either during or after the storm. These types of structures include underdrained bioretention cells.

During small low-intensity rain events, a bioretention cell may not discharge any runoff. However, it is recognized that a properly designed and constructed bioretention cell that is fitted with an underdrain system may discharge stormwater before the first full inch is captured and filtered. This may occur during the gradual rising limb of the runoff hydrograph associated with larger rain events where the soil saturates and begins slowly draining out the underdrain before the full design

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volume is captured. This may also occur during shorter high-intensity storms when the runoff volume exceeds the available surface storage volume before the first inch has had a chance to filter into the soil media, and therefore overflows through the surface overflow outlet.

The acceptance of 'extended filtration' in meeting the "100% managed on-site" performance goal is based on the extended nature of the discharge. Even though the underdrain becomes active and allows a portion of the first one inch volume to discharge, it typically occurs over a period of days such that the hydrograph to the receiving stream mimics pre development hydrology, and the stream is not inundated with large unnatural flows.

Therefore, an extended filtration system that is designed, constructed, and maintained to capture the first one inch of rain is an acceptable approach to meet the performance standard of the MS4 permit if the underdrain system discharges some of that first inch of rainfall. At the point of discharge, stormwater has received "extended filtration".

Certainly the design volume of the bioretention cell will play a significant role in how much stormwater may be discharged via the underdrain. To accommodate larger storms, a bioretention cell/s can be designed with more storage on the surface, in the engineered soil media, and/or in the stone underdrain layer. Although, this concept should not be construed to mean that one "gigantic" bioretention cell will meet the site needs (design criteria will limit the maximum drainage area to any one cell). Ideally, smaller bioretention cells are placed in strategic locations around a site, and if needed, these smaller bioretention cells can be slightly oversized.

The 2009 MS4 general permit requires that the first one inch of rainfall must be managed on site, when preceded by 48 hours of no measureable precipitation. This means that the bioretention cell should be designed to draw down over a 48 hour period.

Managing the first one inch of rain fall should not to be confused with the "one-year, 24 hour storm event", amount of rainfall. In Kanawha County, a one year storm event is 2.16 inches, in Monongalia County it is 2.11, and in Mercer County it is 2.08 inches. The MS4 permit does not require that the designer model the one-year (or any other design interval) 24-hour storm in order to develop an inflow hydrograph or peak flow rate for the first one inch of runoff. Rather, the permit simply requires that the first one inch runoff volume be managed. The design criteria will establish the design storage volume and/or geometry necessary for the different practices.

Design criteria, construction and maintenance specifications for bioretention cells and other extended filtration practices will appear in much greater detail in the forthcoming West Virginia Stormwater Management & Design Guidance Manual.

The information contained in this Memorandum of Understanding is subject to change as research reveals more data regarding extended filtration practices.