



## GRASSED SWALE (GS)

The Grassed Swale methods described in the following section are based on the Grassed Swale design found in Chapter 5 of the Maryland Storm Water Design Manual and the ESD Process & Computations Supplement dated July 2010. Where deemed appropriate, the design specifications have been modified by the Montgomery County Department of Permitting Services (DPS).

### A. Facility Description

A Grassed Swale is a channel that provides conveyance, water quality treatment and flow attenuation of stormwater runoff. Pollutant removal is achieved through vegetative filtering, sedimentation, biological uptake, and infiltration.

### B. System Design Considerations

#### 1. Applicability

Grassed Swales are intended to be used in lieu of curb and gutter conveyance for roadways and driveways only. They are appropriate for new and redevelopment applications. They may be used in public and private rights-of-way, and for other areas such as driveways where swales can be incorporated into the project design in place of curb and gutter. Grassed Swales are not appropriate as treatment for roof downspouts, parking lots, or other non linear applications. Grassed Swales must be as long as the treated surface.

The channel slope shall be between 1% and 4.0%. Maximum ESD flow velocity may not exceed 1.0 fps. Channel side slopes may not exceed 3:1. In cases where the flow velocity exceeds 1 fps, overflow inlets shall be employed to keep the average flow in the swale below 1 fps.

#### 2. Conveyance

Grassed Swales shall be designed to receive flow along their entire length via sheet flow. They may not be designed as treatment for piped flow or for other areas of concentrated flow. Overflow inlets should be installed as necessary to maintain conveyance and keep ESD velocity to 1 fps or less. All swales shall be sized to safely convey runoff from a 10-year storm event in a non erosive fashion to an acceptable outfall.

#### 3. Groundwater

Grassed Swales shall not be located where the water table is within 2 feet of the bottom of the facility. If the 2 ft. clearance requirement cannot be met, an alternative stormwater practice must be proposed.

#### 4. Setbacks

Grassed Swales shall be located at least 30 feet from water supply wells and 25 feet from septic systems. Practices should be located down gradient and setback at least 10 feet from building foundations.

## C. Specifications and Details

### 1. Sizing

When sized per the criteria below, the Grassed Swale may be credited as providing treatment volume for a  $P_e$  of 1.0 inch for the impervious area draining to it. Surface ponding may not be calculated for Grassed Swales since they do not pond water, they convey it away.

The surface of the Grassed Swale shall be 2 to 8 feet in width. Maximum velocity for the runoff from a one inch rainfall may not exceed 1.0 fps. Flow rate shall be calculated per Appendix D.10 of the 2000 Maryland Stormwater Design Manual. Where channel width, slope, and ESD flow rate requirements are met within a Grassed Swale for a drainage area, a credit of  $P_e = 1.0$  inch shall be given. The treatment area used for calculating the ESD credit is considered to be only the impervious vehicular area draining directly to the swale along its length. Other areas that may drain to the swale, such as yards, rooftops and parking lots, will not be given ESD credit within the Grassed Swale.

Grassed Swales may not be “enhanced” by placing additional stone storage below them.

### 2. Inflow Design Criteria

Runoff shall enter the Grassed Swale in a non-erosive manner (less than 2 fps) as sheet flow from the surface being treated.

### 3. Overflow Design Criteria

Safe conveyance of the developed 10-year storm through the Grassed Swale must be demonstrated. Overflow inlets may be installed as required. All piped overflows must outfall to safe, stable locations.

### 4. Planting Media

Formal planting medium is not employed in the construction of Grassed Swales. However, the soil must be prepared for planting per Montgomery County tilling/topsoiling specifications prior to planting.

### 5. Mulch

Mulch is not employed in Grassed Swales. Swales must be stabilized with sod or with seed and erosion control matting at the time of grading.

### 6. Plant Materials

Plants, through their pollutant uptake and evapo-transpiration of stormwater runoff, play a key role in the overall effectiveness of the Grassed Swale. The swale should be densely planted in appropriate grasses.

## Grassed Swale Sizing Example

A Grassed Swale is being designed to treat the runoff from a street that is part of a larger development. The target  $ESD_v$  for the overall project has already been determined. The total treatment area (roadway surface) to the swale is 10,000 square feet of roadway area. The longitudinal flow slopes at an average of 3.5%, and the bottom width has been adjusted to provide  $\leq 1$  fps for the ESD flow velocity (in this case a 2 foot bottom width). Treated roadway area is 1,000 feet long by ten feet wide. The swale runs the entire length of the treated area.

$A = 10,000$  sq. ft. of impervious area being treated directly in the swale

$P_e = 1.0$

$R_v = .05 + 0.009(l) = .05 + 0.009(100) = 0.95$

$ESD_v \text{ provided} = (1.0) (.95) (10,000) / 12 = 792 \text{ cf}$

For calculation of maximum velocity and 10-year conveyance, the entire developed drainage area to the swale must be considered