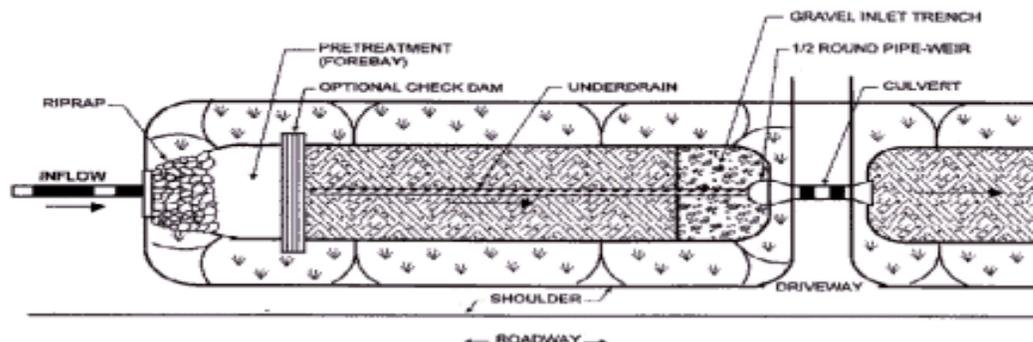


# Grassed Swales

## Minimum Measure: Post Construction Stormwater Management in New Development and Redevelopment

### Subcategory: Infiltration



### Description

In the context of BMPs to improve water quality, the term swale refers to a vegetated, open-channel management practices designed specifically to treat and attenuate stormwater runoff for a specified water quality volume. As stormwater runoff flows along these channels, it is treated through vegetation slowing the water to allow sedimentation, filtering through a subsoil matrix, and/or infiltration into the underlying soils.

### Applicability

Grassed swales can be applied in most situations with some restrictions. Swales are well suited for treating highway or residential road runoff because they are linear practices. Swales are also useful as one of a series of stormwater BMPs or as part of a treatment train, for instance, conveying water to a detention pond and receiving water from filter strips.

### Design Considerations

In addition to the broad applicability parameters described above, designers need to consider site conditions. In addition, they need to incorporate design features to improve the longevity and performance of the practice while minimizing the maintenance burden.

**Drainage Area** - Grassed swales should generally treat runoff from small drainage areas (less than 5 acres). If used to treat larger areas, the flows through the swale become too large to simultaneously treat and convey the stormwater runoff.

**Slope** - Grassed swales should be used on sites with relatively flat slopes (less than 4 percent slope); 1 to 2 percent slope is recommended. When site conditions require installing the swales in areas with larger slopes, check dams can be used to reduce the influence of the slope. Runoff velocities within the channel become too high on steeper slopes. This can cause erosion and does not allow for infiltration or filtering in the swale.

Designing the channel with flat side slopes increases the wetted perimeter. The wetted perimeter is the distance across the swale where runoff flowing through the swale contacts the vegetated sides and bottom. Increasing the wetted perimeter slows runoff velocities and provides more contact with vegetation to encourage sorption, filtering, and

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infiltration. Another advantage to flat side slopes is that runoff entering the grassed swale from the side receives some pretreatment along the side slope.

## Limitations

Grassed swales have some limitations, including the following:

- Grassed swales cannot treat a very large drainage area.
- Wet swales may become a nuisance due to mosquito breeding.
- If designed improperly (e.g., if proper slope is not achieved), grassed channels will have very little pollutant removal.

## Maintenance Considerations

Maintenance of grassed swales mostly involves litter control and maintaining the grass or wetland plant cover. Typical maintenance activities are included in Table 1.

Table 1. Typical maintenance activities for grassed swales (Source: Adapted from CWP, 1996)

Activity	Schedule
<ul style="list-style-type: none"> <li>• Inspect pea gravel diaphragm for clogging and correct the problem.</li> <li>• Inspect grass along side slopes for erosion and formation of rills or gullies and correct.</li> <li>• Remove trash and debris accumulated in the inflow forebay.</li> <li>• Inspect and correct erosion problems in the sand/soil bed of dry swales.</li> <li>• Based on inspection, plant an alternative grass species if the original grass cover has not been successfully established.</li> <li>• Replant wetland species (for wet swale) if not sufficiently established.</li> </ul>	<p>Annual (semi-annual the first year)</p>
<ul style="list-style-type: none"> <li>• Rototill or cultivate the surface of the sand/soil bed of dry swales if the swale does not draw down within 48 hours.</li> <li>• Remove sediment build-up within the bottom of the swale once it has accumulated to 25 percent of the original design volume.</li> </ul>	<p>As needed (infrequent)</p>
<ul style="list-style-type: none"> <li>• Mow grass to maintain a height of 3–4 inches</li> </ul>	<p>As needed (frequent seasonally)</p>

## Ground Water Recharge

Grassed channels and dry swales can provide some ground water recharge as infiltration is achieved within the practice. Wet swales, however, generally make little, if any, contributions to ground water recharge. Infiltration is impeded by the accumulation of debris on the bottom of the swale.

## Cost Considerations

Costs to construct swales should be taken in context. With most development designs, some conveyance structure must be constructed as part of the development. The construction of grass swales is less expensive than concrete ditches or sewers. Hence, the use of grass swales is often a less expensive alternative than traditional design approaches.