GENERAL DESCRIPTION

Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff (also referred to as enhanced vegetated swales). Check dams and vegetation in the swale slows the water to allow sedimentation, filtration through the root zone and soil matrix, evapotranspiration, and infiltration into the underlying native soil. Simple grass channels or ditches have long been used for stormwater conveyance, particularly for roadway drainage. Enhanced grass swales incorporate design features such as modified geometry and check dams that improve the contaminant removal and runoff reduction functions of simple grass channel and roadside ditch designs.

Where development density, topography and depth to water table permit, enhanced grass swales are a preferred alternative to both curb and gutter and storm drains as a stormwater conveyance system. When incorporated into a site design, they can reduce impervious cover, accent the natural landscape, and provide aesthetic benefits.

DESIGN GUIDANCE

GEOMETRY AND SITE LAYOUT

- **Shape**: Should be designed with a trapazoidal or parabolic cross section. Trapazoidal swales will generally evolve into parabolic swales over time. So, the initial trapazoidal cross-section design should be checked for capacity and conveyance assuming it is a parabolic cross-section. Swale length between culverts should be 5 metres or greater.
- **Bottom Width**: Should be designed with a bottom width between 0.75 and 3.0 metres. Should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies.
- **Longitudinal Slope**: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%.
- **Length**: When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to it, or greater than the contributing roadway length.
- **Flow Depth**: A maximum flow depth of 100 mm is recommended during a 4-hour, 25 mm Chicago storm event. Side Slopes: Should be as flat as possible to aid in providing pre-treatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion galling from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.

PRE-TREATMENT

A pea gravel diaphragm located along the top of each bank can be used to provide pre-treatment of any runoff entering the swale laterally along its length. Vegetated filter strips or mild side slopes (3:1) also provide pre-treatment for any lateral sheet flow entering the swale. Sedimentation basins at inlets to the swale are also a pre-treatment option.

CONVEYANCE AND OVERFLOW

Grass swales must be designed to have a maximum velocity of 0.5 m/s or less for the 4-hour 25 mm Chicago storm event. The swale should also convey the locally required design storm (usually the 10 year storm) at non-erosive velocities.

SOIL AMENDMENTS

If soils along the location of the swale are highly compacted, or of such low fertility that vegetation growth becomes established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 20 to 40% by volume.

OPERATION AND MAINTENANCE

Generally, routine maintenance will be the same as for any other landscape area; weeding, mowing, and filter removal. Grassed swales should be mowed at least twice yearly to maintain grass height between 75 and 150 mm. The maximum permissible mowing equipment should be used to prevent soil compaction. Routine roadside ditch maintenance practices such as scraping or grading should be avoided. Regular watering may be required during the first two years until vegetation is established. Routine inspection is very important to ensure that dense vegetation cover is maintained and inlets and pre-treatment devices are free of debris.

For the first two years following construction the swale should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, accumulation of debris, trash and sediment, and structural disturbances or pre-treatment devices. Trash and debris should be kept out of pre-treatment devices and the surface of the swales at least twice annually. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded areas, buttressing and aerating as needed. Restores accumulated sediment on the swale surface when dry and exceeding 25 mm depth.