Section 3.6   Open Channel Systems

Definition: Vegetated open channels that are explicitly designed to capture and treat the full V_w within dry or wet cells formed by checkdams or other means. Design variants include:
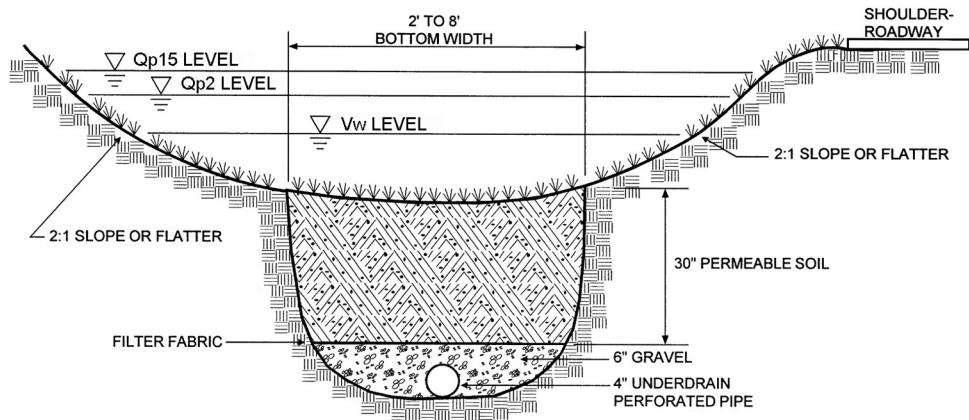
■   O-1   dry swale
■   O-2   wet swale

Open channel systems shall not be designed to provide storm water detention except under extremely unusual conditions. Open channel systems must generally be combined with a separate facility to meet these requirements.

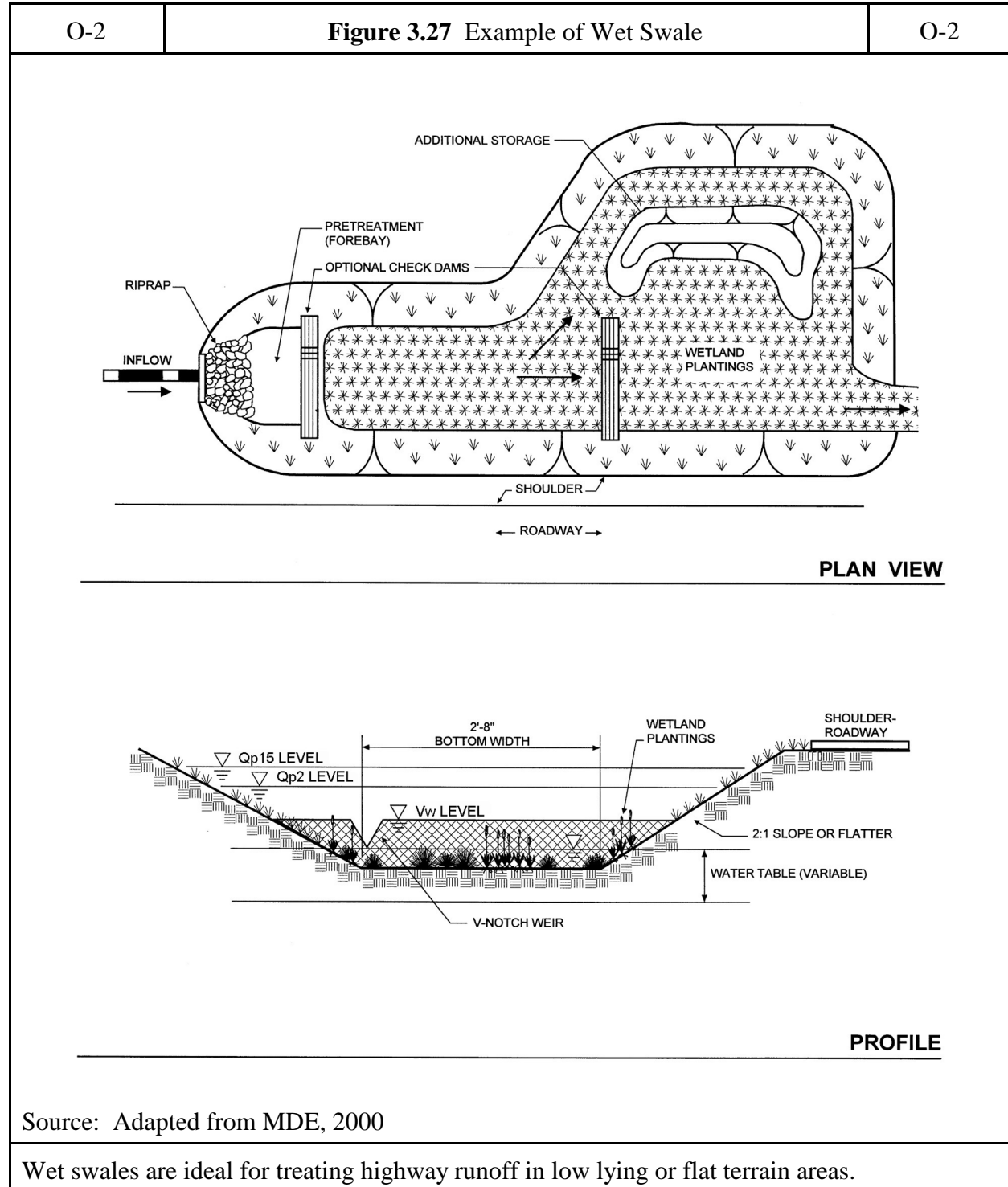| O-1 | **Figure 3.26** Example of Dry Swale | O-1 |
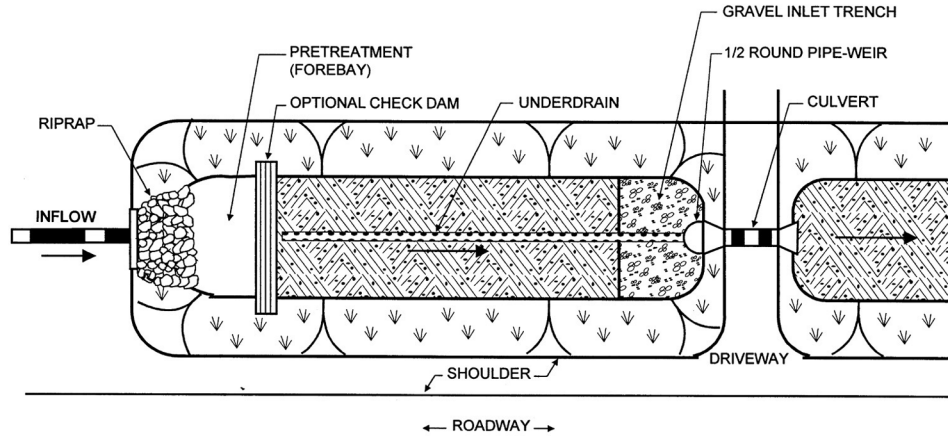
PLAN VIEW

SECTION

Source: Adapted from MDE, 2000

Dry swales may be used at low density residential projects or for very small impervious areas.

| O-2 | **Figure 3.27** Example of Wet Swale | O-2 |

ADDITIONAL STORAGE

PRETREATMENT
(FOREBAY)

OPTIONAL CHECK DAMS

RIPRAP

INFLOW

WETLAND
PLANTINGS

SHOULDER

← ROADWAY →

PLAN VIEW

2'-8"
BOTTOM WIDTH

WETLAND
PLANTINGS

SHOULDER-
ROADWAY

Qp15 LEVEL

Qp2 LEVEL

Vw LEVEL

2:1 SLOPE OR FLATTER

WATER TABLE (VARIABLE)

V-NOTCH WEIR

PROFILE

Source: Adapted from MDE, 2000

Wet swales are ideal for treating highway runoff in low lying or flat terrain areas.

3.6.1   Open Channel Feasibility Criteria

Dry swales and wet swales shall have longitudinal slopes less than 4.0% to qualify for V_w treatment.

Open channel systems, designed for V_w treatment, are primarily applicable for land uses such as roads, highways, and residential development.

3.6.2   Open Channel Conveyance Criteria

The peak velocity for the 15-year storm shall be non-erosive (generally less than 6 fps) for the soil and vegetative cover provided.

The final designed channel shall provide 1 foot minimum freeboard above the designated water surface profile of the channel.

Channels should be designed with moderate side slopes (flatter than 3:1) for most conditions. In no event, can side slopes be steeper than 2:1.

Open channel systems which directly receive runoff from impervious surfaces may have a 6" drop onto a protected shelf (pea gravel diaphragm) to minimize the clogging potential of the inlet.

An underdrain system shall be provided for the dry swale to ensure a maximum ponding time of 48 hours.

3.6.3   Open Channel Pretreatment Criteria

Pretreatment of 0.1" of runoff per impervious acre storage shall be provided. This storage is usually obtained by providing checkdams at pipe inlets and/or driveway crossings.

A pea gravel diaphragm and gentle side slopes should be provided along the top of channels to provide pretreatment for lateral sheet flows.

3.6.4   Open Channel Treatment Criteria

Channel invert and tops of banks are to be shown in plan and profile views. A cross sectional view of each configuration should be shown for proposed channels. Completed limits of grading should be shown for proposed channels. For proposed channels, the transition at the entrance and outfall is to be clearly shown on plan and profile views.

Dry and wet swales should be designed to temporarily store the V_w within the facility to be released over a maximum 48 hour duration.

Dry swales and wet swales should have a bottom width no wider than 8 feet to avoid potential gullying and channel braiding.

Dry and wet swales should maintain a maximum ponding depth of one foot at the "mid-point" of the channel, and a maximum depth of 18" at the end point of the channel (for storage of the V_w).

3.6.5   Open Channel Landscaping Criteria

Wet swales are not recommended for residential developments as they can create potential nuisance or ponding conditions.

Landscape design shall specify proper grass species and wetland plants based on specific site, soils and hydric conditions present along the channel.

3.6.6   Open Channel Maintenance Criteria

Open channel systems should be mowed as required during the growing season to maintain grass heights in the 4" to 6" range. Wet swales, employing wetland vegetation, do not require frequent mowing of the channel.

Sediment build-up within the bottom of the channel or filter strip should be removed when 25% of the original V_w volume has been exceeded.