

11.0 GUIDELINES FOR ESTIMATING RUNOFF FROM SMALL WATERSHEDS AND DESIGN OF OPEN CHANNELS

11.1 General

The design of erosion and sediment control measures should consider the peak flow rate of surface runoff to ensure channels and sedimentation containment systems are adequately sized. Furthermore, these structures must be protected from erosion due to concentrated water flow.

Channelized flow requires provision of erosion control measures to prevent concentrated water flow from causing erosion. The amount of runoff laden with sediment will influence the design requirements for sediment control. The estimate of runoff from small watersheds and the design of channel lining are presented below.

11.2 Estimating Runoff from Small Watersheds

The amount of runoff from each catchment on a highway construction project site is related to the design rainfall storm and catchment area affected by construction. The highway drainage design generally includes ditches and cross-drainage culverts as well as stormwater storage/treatment areas and floodplain considerations.

For the design of erosion and sedimentation protection measures, the understanding of runoff estimation is an important design consideration. The runoff assessment should be provided by a qualified hydrology professional or engineer. For small catchment areas, the guidelines for the estimate of runoff are presented in Appendix E. These guidelines should only be used in conjunction with professional judgement and experience. For major watercourse crossings, the drainage assessment is generally provided by a qualified hydrotechnical bridge engineer.

11.3 Design of Open Channels

Open channels are the system of culverts, ditches and swales that convey concentrated drainage on a highway construction site. These channels must be designed to contain design runoff flow without overtopping. Furthermore, open channels must be able to convey the concentrated flows without promoting additional erosion within the channel. Open channel design should be provided by a qualified hydrology professional or engineer.

The use of permissible tractive resistance has been adopted for the design of channel lining instead of the permissible velocity concept which was historically used by some designers. For highway ditch/channel and a simplified flow regime, the channel design is a function of runoff, geometric channel properties and channel roughness (n).

The channel roughness (n) is dependent on the degree of irregularity of the wetted perimeter of open channel flow which may be influenced by erosion control BMPs in the channel. The protective linings for channels can include soft armour linings of different materials (i.e., vegetation, mulch, soil coverings or erosion protection matting, etc.) and hard armour linings (i.e., gabion, riprap, concrete lining, pipe, etc.), all of which will affect " n ".

Simplified guidelines for design of highway channels and channel roughness (n) values for various protective channel lining materials are presented in Appendix F. These guidelines should only be used in conjunction with professional judgement and experience.