Example Natural Dispersion

Introduction to Natural Dispersion

Natural Dispersion is the simplest method of both flow control and runoff treatment. Unlike Vegetative Filter Strips which only provides runoff treatment, Natural Dispersion provides both runoff treatment and flow control. Natural Dispersion may cost as much as other BMP's up front however the long term maintenance cost are lower. These natural areas also contribute to the preservation of native habitat and provide visual buffering of the roadway.

Applications

- Natural dispersion is ideal for highways and linear roadway projects.
- There are two types of natural dispersion: sheet flow and channelized. This tutorial will focus on sheet flow. Designers should consult BMP FC.01 of the HRM for further design guidance on channalized natural dispersion.
- Natural dispersion promotes infiltration, evaporation and transpiration and should not have a surface discharge to a lake or stream.
- Natural dispersion areas meet basic and enhanced runoff treatment set forth in minimum requirement 5 of the HRM.
- Natural dispersion areas meet flow control criteria set forth in Minimum Requirement 6 of the HRM.

Design Criteria

- Natural dispersion areas should be well vegetated.
- Natural dispersion areas should have an average longitudinal slope of 15 % and an average lateral slope of 15% or flatter.
- Roadway side slopes that are leading to the natural dispersion area should be 25% or flatter. Slopes steeper than 25% are allowed if the existing side slopes are well vegetated and show no signs of erosion problems. If there is evidence of channelized flow, a flow-spreading device should be used before those flows are allowed to enter the dispersion area.
- Sheet flow path leading to the natural dispersion area should not be longer than 75 feet for impervious surfaces and 150 feet for pervious surfaces.
- The longitudinal slope of the contributing area (perpendicular to the direction of flow) should be less than 5%.
- The longitudinal length of the dispersion area should be equivalent to the longitudinal length of roadway that is contributing sheet flow.
- Have infiltrative soil properties that are verified by the WSDOT Material Laboratory or a geotechnical engineer using the testing methods in Chapter 4. (Natural dispersion areas should have at least 3 feet between the existing ground elevation and the average annual maximum groundwater elevation.)

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Construction and Maintenance Criteria

- Clearing and grubbing should be minimized to maintain plat root systems that are important to natural dispersion.
- The area around dispersion areas should not be compacted.
- Maintenance pullout areas should be considered to promote successful maintenance practices at dispersion areas. Pull out areas should be large enough to accommodate a typical maintenance vehicle. Contact the maintenance office to determine the typical size of maintenance vehicle used in the project area.

Natural Dispersion Sample Problem Description

A new highway near the city of Spokane is being constructed that will shed 40’ of runoff from pavement at a 2% cross-section slope and a continuous 3% profile off the road. It has been determined that natural dispersion would best fit the site. The soil is type B with a hydraulic conductivity of 4 inches per hour or greater.

Step 1: Determine required length of the natural dispersion area:

From FC.01 in the HRM, all type A soils and type B soils with a saturated hydraulic conductivity or 4 inches per hour or greater the following applies:

For the first 20 feet of impervious area draining to a dispersion area, there must be 10 lateral feet of dispersion area width. For each additional foot of impervious surface that drains to the dispersion area, 0.25 lateral feet of dispersion area should be provided. Or:

Dispersion Area = 10’ + 20’*.25 = 15 feet

It should be noted that runoff from disturbed pervious areas (i.e. bare soil and nonnative landscaping), for every 6 feet of disturbed pervious area, 1 lateral foot width of dispersion area is required.

For type B soils with hydraulic conductivities less than 4 inches per hour or type C or D soils, designers should consult the Region or Headquarters Hydraulics Engineer.