Section 8.3
LEVEL SPREADER

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A level spreader is a vegetated or mechanical structure used to disperse or "spread" concentrated flow thinly over a receiving area. Level spreaders reduce erosion and movement of sediment and also assist to filter sediment, soluble pollutants, and sediment-attached pollutants. They are generally used where concentrated flows are discharged to the ground and serve to convert the concentrated flow to sheet flow to prevent erosion of the downstream receiving area. They are generally used to disperse flows over a relatively flat receiving area such as a buffer or swale to ensure uniform distribution of flow and minimize the channelization of water. Level spreaders are not designed to remove pollutants from stormwater; however, some suspended sediment and associated phosphorus, nitrogen, metals and hydrocarbons will settle out of the runoff by settlement filtration, infiltration, absorption, decomposition and volatilization.

8.3.1 Site Suitability Criteria

1. Drainage area: The maximum drainage area to the spreader may not exceed 0.10 acre per foot length of level spreader lip if the level spreader is not discharging directly to a buffer and is only used to dissipate flow volume and velocity. The drainage area served by the spreader discharging directly cannot be more than half the size of the receiving buffer area.

2. Slope: The maximum slope of the receiving area below a level spreader should be no more than 30%. If the slope is greater than 30%, the discharge will need to be brought by a conduit and velocity dissipator to an area that is suitable.

IMPORTANT

This section discusses the design of a level spreader to convert concentrated flow to sheet flow to prevent erosion of downstream receiving areas and to lengthen time of concentration to reduce peak flows. The use of level spreaders with buffers for water quality purposes must follow the design criteria in Chapter 5 Buffers.

8.3.2 Design and Construction Criteria

These standards are not applicable for level spreaders discharging runoff to buffers used to meet the Department's General BMP Standards. Requirements for these level spreaders can be found in Chapter 5 for buffers.

1. Discharge to a Level Spreader: The peak stormwater flow rate to a level spreader due to runoff from a 10-year, 24-hour storm must be less than 0.25

cubic feet per second (0.25 cfs) per foot length of level spreader lip.

2. Length of Level Spreader: The level spreader length may not be more than 25 feet unless approved by the department.

3. Sitting of Level Spreader: The level spreader must be sited so that flow from the level spreader will remain in sheet flow until entering a natural or man-made receiving channel.

4. Capacity: The capacity of each level spreader shall be based on the allowable velocity of the receiving soil. The flow area upstream of the level spreader shall be sufficient to ensure low approach velocities to the level "lip". The minimum flow area shall be equal to the flow area of the delivery channel.

5. Buffer: Each level spreader shall have a vegetated receiving area with the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the level spreader. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 30%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the level spreader. This will limit construction to the growing season.

6. Berm: The berm of the level lip should consist of crushed rock with a three-quarter to three inches in diameter size gradation that will allow flows to slowly seep through the berm, a minimum of 18 inch high and 3 feet wide. The berm should have a 6 to 12 inch deep header channel with a 3-foot bottom width to trap sediments and reduce lateral flow velocities behind the berm. The bottom and back of the spreader channel should be lined with erosion control matting.

7. Installation: A level spreader must be installed correctly with 0% grade on the spreader base and lip to ensure a uniform distribution of flow; otherwise the structure may fail and become a source of erosion.

8. Upstream Velocity: The flow area upstream of the level spreader shall be controlled to ensure low approach velocities to the level "lip." The minimum flow area of level spreader shall be equal to the flow area of the delivery channel. The base and lip shall be installed at a 0% grade (level).

9. Receiving Area: Level spreaders shall blend smoothly into the downstream receiving area without any sharp drops or irregularities to avoid channelization, turbulence and hydraulic jumps. The receiving area below the level spreader shall be protected from harm during construction. Sodding and/or netting in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the level spreader until stabilization has been accomplished. A temporary diversion may be necessary in this case.

10. Undisturbed Soils: Level spreaders shall be constructed on undisturbed soil where possible.

11. Entrance Drainage Channel Design: The entrance channel to the

level spreader is constructed across the slope and consists of a combination of stone and existing natural vegetation used to disperse, filter and lower the runoff velocity into the level spreader. The entrance channel shall blend smoothly into the downstream receiving area without any sharp drops or irregularities, so to avoid turbulence and hydraulic jumps.

a. Shape: The entrance channel is typically trapezoidal in cross section, but may be parabolic as long as the soil bed design width is equivalent to the design bottom width for a trapezoidal section and is no more than 2 feet deep. Trenches shall be constructed along the existing contour and shall be 15-20 feet long and at least 7 feet wide across the top.

b. Bottom Width: Bottom width for a trapezoidal cross section of the entrance channel should be a minimum of two feet.

c. Side Slopes: Side slopes of the entrance channel shall be 2:1 or flatter to provide pretreatment of runoff entering the level spreader.

d. Longitudinal Slope: The longitudinal slope of the entrance channel should be 1% grade or less in order to avoid excessive velocity and deep water at the downstream end when ponding. If topography dictates a steeper net channel slope, the swale can be broken into relatively flat sections by check dams placed at no closer than 50 feet intervals.

e. Depth and Capacity: The swale should be designed to safely convey the 2 year storm with design velocities less than 4.0 to 5.0 feet per second. The swale should have sufficient total depth to convey the 10-year storm with 6 inches of freeboard.

8.3.3 Maintenance

Long term maintenance of the level spreader is essential to ensure its continued effectiveness. The following provisions should be followed. In the first year the level spreader should be inspected semi annually and following major storm events for any signs of channelization and should be immediately repaired. After the first year, annual inspection should be sufficient. Vegetated level spreaders may require periodic mowing. Spreaders constructed of wood, asphalt, stone or concrete curbing also require periodic inspection to check for damage and to be repaired as needed.

1. Inspections: At least once a year, the level spreader pool should be inspected for sand accumulation and debris that may reduce its capacity.

2. Maintenance Access: Level spreaders should be sited to provide easy access for removal of accumulated sediment and rehabilitation of the berm.

3. Sediment Removal: Sediment build-up within the swale should be removed when it has accumulated to approximately 25% of design volume or channel capacity. Dispose of the sediments appropriately.

4. Debris: As needed remove debris such as leaf litter, branches and tree growth from the spreader.

5. Mowing: Vegetated spreaders may require mowing.

6. Snow Storage: Do not store snow removed from the street and parking lot within the area of the level spreader.

7. Level Spreader Replacement: The reconstruction of the level spreader may be necessary when sheet flow from the spreader becomes channeled into the buffer.