DPS | Montgomery County
Department of Permitting Services

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LANDSCAPE INFILTRATION (LI)

Effective October 6, 2012

The Landscape Infiltration methods described in the following section are based on the landscape infiltration design found in Chapter 5 of the Maryland Storm Water Design Manual and the ESD Process & Computations Supplement dated July 2010. Where deemed appropriate, the design specifications have been modified by the Montgomery County Department of Permitting Services (DPS).

A. Facility Description

Landscape Infiltration is an infiltration system that treats runoff by passing it through a filter bed mixture of planting soil, gravel, and sand, and then infiltrates the runoff into native soils. It filters the stormwater runoff via slow infiltration and replenishes the groundwater supply. Typical components of the system include a)surface planting with woody and herbaceous plant species, b) a surface 3 inch thick mulch layer, c) a 12-18 inch planting media layer, d) a bridging 6 inch sand layer, e) a 12 - 36 inch thick gravel layer, and e) a 6 inch thick sand layer at the bottom of the excavation. Total storage depth within the media may not exceed 5 feet. The facilities should be well landscaped to enhance their function and appearance. Landscape infiltration should not be used in hotspot areas.

B. System Design Considerations

1. Applicability

Landscape Infiltration can be best implemented in low density land uses with good infiltration rates. Residential areas with compact housing (clustered homes and townhouses) can utilize small green spaces for landscape infiltration. The maximum contributing drainage area to a landscape infiltration trench shall be 10,000 square feet. Up to 20,000 square foot drainage areas may be allowed where soil infiltration testing is performed. Successful application is dependent upon soil type and groundwater elevation.

2. Conveyance

Landscape Infiltration systems should be designed to maximize sheet flow across the facility. Pretreatment measures shall be implemented along the main stormwater runoff collection system where feasible. These include installing gutter screens, a removable filter screen on rooftop downspout pipes, a sand layer or pea gravel diaphragm at the inflow, or a three-inch surface mulch layer. A flow splitter should be used to divert runoff in excess of the design treatment volume away from the facility to a stable, downstream conveyance system. If bypassing the practice is not feasible, an internal overflow device, such as an elevated yard inlet, may be used. Runoff shall enter, flow through, and exit the facility in a non-erosive manner to a safe location.

3. Soil Suitability

Provide soils information to support the use of Landscape Infiltration. Acceptable methods include a) soil typing, b) drawdown testing, and c) infiltration testing. Infiltration testing is required for drainage areas exceeding 10,000 sf. If the measured infiltration rate in the general vicinity of the facility is less than 0.52 in/hr, the design must demonstrate that the facility will dewater in 48 hours or less. In no case may a rate of greater than 0.52 in/hr be used to compute facility depth. See “Soil Testing Guidelines for Stormwater Management Practices”.

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4. Setbacks / Limitations

a. Infiltration systems must be located at least 20 feet (horizontal distance) from basement walls and 10 feet from slab-on-grade structures.

b. Landscape Infiltration trenches must not be placed on slopes greater than 15 percent, or within fill soils.

c. Landscape Infiltration systems shall be located a minimum of 100 feet from any water supply well, and 30 feet from any septic easement.

d. A minimum 5 foot horizontal distance, as measured from the edge of the filter medium, shall be maintained between any utility line and a Landscape Infiltration trench. Except when located within a public right-of-way, no utility line should be placed under or within the landscape infiltration trench.

e. A minimum 10 foot horizontal distance shall be maintained between infiltration practices (measured filter wall to filter wall).

C. Specifications and Details

1. Sizing

The facility shall be sized to capture and store 100% of the target treatment volume. A minimum of 6" and maximum of 12" of temporary surface ponding must be provided above the planting media. The surface area (Af) of a landscape infiltration practice shall be at least 2% of the contributing drainage area. Planting media shall be between 12 and 18 inches deep. The total storage provided in the facility shall be computed as the storage provided in the temporary surface ponding area and the storage provided in the portion of the planting media, gravel and sand layers located directly below the base of the temporary ponding area. Computations shall account for the porosity (n = 0.40) of the planting media, gravel, and sand. Subsurface storage provided beyond the limits of the base of the temporary surface ponding area or total storage provided in excess of that required to treat the runoff for the 1 year, 24-hour design storm shall not be counted towards the total ESDv provided.

To the extent possible, facilities should have irregular outlines to blend naturally into the environment. Rectangular is not natural.

2. Inflow Design Criteria

Runoff shall enter the landscape infiltration facility in a non-erosive manner (less than 2 fps). Inflow may be through depressed curbs with wheel stops, curb cuts, level spreaders, bubblers, or conveyed directly using downspouts, covered drains, catch basins, or other acceptable conveyance methods. Particular care must be taken to prevent erosion of the surface mulch layer.

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3. Overflow Design Criteria

If an internal overflow device is needed, a yard inlet or dome cap inlet may be used. When this method is used, the domed caps must extend to the design storage level.

A safe non-erosive outlet below the outfall must be provided. Safe conveyance of the developed 10-year storm through the facility must be demonstrated.

4. Plant Materials

Plants, through their pollutant uptake and evapo-transpiration of stormwater runoff, play a key role in the overall effectiveness of the Landscape Infiltration device. The use of native plants is encouraged, but they are not appropriate in all situations. And while no hard planting rule exists, the plants should be a mix of trees, shrubs and herbaceous materials. Because of the relatively shallow depth of the planting media, it is preferable to plant the surface of the facility with herbaceous materials only. Trees and shrubs should be planted at the perimeter of the facility where they are not directly over the sand and gravel layers, so that adequate soil depth is available. The number and type of tree and shrub plantings for the system may vary, especially where aesthetics or other considerations such as screening or shading are critical to site development. The planting design should anticipate that the mature canopy of trees and shrubs, together with the areas planted with herbaceous materials, should cover at least 85% of the Landscape Infiltration device. Trees shall be a minimum of 1 1/2 in. caliper, shrubs shall be minimum 2 gal. size, herbaceous flowering perennials shall be a minimum 1 quart size, and grasses and grass-like perennials shall be a minimum size of 2" plugs All plantings shall be in accordance with the Montgomery County landscape guidelines. All landscape plans must be sealed by a registered landscape architect. Since the plants are an integral part of the Landscape Infiltration system, no changes to the approved landscape plan will be allowed unless an alternate plant list, prepared by a registered landscape architect, has been approved by DPS prior to installation. Since plant availability can change, DPS suggests including an alternate plant list on the landscaping plans.

5. Mulch

The surface mulch layer will consist of standard fine shredded aged hardwood mulch. The mulch should be applied uniformly to a depth of 3 inches. Yearly replenishing may be necessary. Pine bark is not acceptable.

6. Planting Media

The planting media shall be 12 to 18 inches thick and shall consist of 1/3 perlite or Solite, 1/3 compost and 1/3 topsoil. The perlite shall be coarse grade horticultural perlite. The compost shall be high grade compost free of stones and partially composted woody material. The topsoil shall meet the following minimum criteria: contain no more than 10% clay, 30-55% silts and 35-60% sand. The soil shall be free of stones, stumps, roots or other similar objects larger than 2 inches. The first layer of the planting media shall be lightly tilled to mix it into the sand layer, so as not to create a definitive boundary. The planting material shall be flooded after placement. Any settlement that occurs shall be filled back to the design elevation.

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7. Sand Layer

A 6-inch layer of sand shall be provided to allow for a bridging medium between the planting media and the stone within the bed. ASTM C33 or AASHTO M6 Fine Aggregate Concrete Sand is required per Montgomery County sand specifications. Sub soils shall not be compacted.

8. Gravel Bed

The gravel layer shall be a minimum of 12 inches and must meet MSHA size #7 (Table 901A).

9. Sand Bed

ASTM C33 or AASHTO M6 Fine Aggregate Concrete Sand is required per Montgomery County sand specifications. Sub soils shall not be compacted.

10. Filter Fabric

Provide approved filter cloth (Mirafi 140N or approved equivalent) on the sides of the trench only. Do not place any geotextile or filter fabric on the bottom of the trench, or horizontally anywhere within the facility.

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Landscape Infiltration Sizing Example

A Landscape Infiltration facility is being designed to treat the runoff from the front roofs of a row of town homes and adjacent sidewalk. The target ESD_V for the overall project has already been determined. The total drainage area to the facility is 10,000 square feet (6,000 square feet impervious area and 4,000 square feet of lawn. Please note that the filter area is not included in the drainage area to the facility and the maximum drainage area of 10,000 square feet to this facility has been met.

Calculate the maximum volume that can be stored in the facility:

ESDv(MAX) = [(Pe) (Rv) (A)]/12

= [(2.6")(0.59)(10,000sf)]/12

= 1,278 cf

P_e = Max of 2.6"

Rv = 0.05 + (.009 x I)

= 0.05 + (.009*60) = 0.59

I = (Imp. area/Total Drainage Area)*100

= (6,000/10,000 sf)*100 = 60%

Calculate the minimum volume that must be stored in the facility:

ESDv(MIN) = [(Pe) (Rv) (A)]/12

= [(1.0")(0.59)(10,000sf)]/12

= 492 cf

Rv = 0.05 + (.009 x I)

= 0.05 + (.009*60) = 0.59

To calculate the ESDv provided by this facility we will assume a ponding depth of 0.5' and a 36" thick media layer (12" planting media, 12" gravel bed, and 12" sand). The porosity for the media layer is n = 0.40. Assume the area of the filter bed (Af) is 500 sf.

- ESDv=Storage volume + storage in filter media (note: to be conservative the volume contained in the 3:1 side slope area was not included)

  = (500 sf*0.5') + [0.4*(500 sf*3.0')] =850 cf

Since the proposed ESDv is smaller than the ESDv (Max) and larger than the ESDv (Min), the facility is acceptable. The surface area of the facility can be increased so that a max ESDv of 1,278 cf is attained. In this case a filter area of 752 sf will produce an ESDv of 1,278 cf which is acceptable and will yield a Pe of 2.6" for this drainage area which is greater than the 1" min, and equal to the 2.6" max.

3. Lastly the filter area must be checked to verify that it is not less than 2% of the facility drainage area.
   - Af%=(500 sf/10,000 sf)*100 = 5%

   Therefore this design is acceptable.

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