

APPENDIX N

RAIN GARDEN/BIORETENTION DESIGN RECOMMENDATIONS



MINIMUM BIORETENTION DESIGN CRITERIA AND REQUIREMENTS

The following minimum information is required at the technical plan stage:

1. Approved concept plans and letter showing the bioretention facility as the approved method for water quality treatment.
2. A drainage area map to the bioretention facility. The drainage area map shall show a delineation of the development site drainage area in the ultimate site condition. In the case of more than 1 area to the facility, the designer might choose to place the facility off-line with the main drainage path to reduce the size of the required storage volume.
3. A boring log showing the elevation of the water table. A soil gradation and analysis is not required. The bottom of the facility shall be at least 4 ft. above ground water table.
4. Water quality volume computations based on the 25 yr, 24 hr storm as follows:

$$WQ = \frac{4.5'' \times R_v \times \text{Area}(\text{acres})}{12}$$

$$R_v = 0.05 = (0.009)(I)$$

where I is the percent impervious of the site

5. The bioretention facility shall be sized based on the criteria below:

The required filter bed area, A_f is computed using the following equation:

$$W_f = \frac{WQ_v(d_f)}{k(h_f = d_f)(t_n)}$$

where,

$d_f = \text{Filter Depth} = 2.5 - 4\text{ft}$

$k = \text{Coefficient of Permeability} = 2 \text{ ft / day}$

$h_f = \text{Ponding Depth} = 0.5 \text{ ft}$

$t_f = \text{Drain Time} = \text{use 1 day for commercial, 6 hrs for residential}$

6. A typical cross-section for the facility.
7. A Planting Plan.

8. The Homeowner's Association shall include the following language be signed and attached to the plans and shall include the following notes:
 - ◆ When the filtering capacity of the facility diminished substantially, that is water ponds on the facility more than 72 hours, the top few inches of discolored material shall be removed and shall be replaced with fresh material. The removed sediments should be disposed in a acceptable manner (e.g. landfill).
 - ◆ Trash and Debris shall be removed as necessary.
 - ◆ Dead or diseased plant materials shall be replaced in kind with the permitted plants. Areas devoid of mulch should be re-mulched on an annual basis.
9. A recommended maintenance agreement for all privately owned facilities.

BIORETENTION SOIL & MATERIAL REQUIREMENTS:

1. Mulch Specification:

Individual planting shall be mulched (refer to landscaping details, DRWG. C-16). Acceptable mulch shall be shredded hardwood only. Mulch must be well aged, uniform in color, and free of foreign material including plant material. Well aged as mulch is defined as mulch that has been stockpiled or stored for at least twelve (12) months.

Fabric shall have 0.08" thick E.O.S. of #80 sieve, and maintain 125 GPM per SQ. FT.

2. Inspection Requirements:

- The contractor shall arrange a "pre-construction meeting" with the owner and architect/engineer prior to beginning work on the bioretention facility.
- At the completion of excavation an inspection of sub grade preparation will be performed by the Drain Commissioner and/or Soil Erosion Agent and constructing parties.
- During under drain and filter installation.
- Back fill of soil into the bioretention areas. Soil certifications for back fill are required.

- The final topsoil layers should be thoroughly wetted achieve the design top surface elevations.
- The work shall be inspected by the owners/architect prior to final stabilization and planting.
- Sediment & erosion control practices may be removed upon approval by the County Soil Erosion Agent.

Bioretention systems shall consist of the following treatment components: A 2½ to 4 foot deep planning soil bed, a surface mulch layer and a 12' deep surface ponding area.

The required filter bed area (A_f) is computed using the following equation:

$$A_f = (WQ_v) (d_f) / [(k) (h_f = d_f) (t_f)]$$

where:

- A_f = Surface area of filter bed (ft²)
- WQ_v = water quality volume (ft³)
- d_f = filter bed depth (ft)
- k = coefficient of permeability of filter media (ft/day) use $k = 2$ ft/day
- h_f = average height of water above filter bed (ft) use 6"
- t_f = design filter bed drain time (days)* use 1 day

*1.67 days is recommended maximum for sand filters, 2.0 days for bioretention

Planting recommendations for bioretention facilities are as follows:

- Native plants species should be specified over non-native species.
- Vegetation should be selected based on a specified zone of hydric tolerance.
- A selection of trees with an understory of shrubs and herbaceous materials should be provided.