



# LINEAR BIORETENTION + MEDIAN BIOSWALES

Linear bioretention facilities are located between the curb/gutter or shoulder of the road and sidewalk. They can be designed with curb-cut opening that allows stormwater to enter the linear bioretention facility from the gutters or with a grass filter strip with roads without curbs. The stormwater runoff is then captured in a depressed planting area and then either infiltrates into the soil or flows through an underdrain to the storm drain network.

Median bioswales are designed and function in much the same way, but are located in the center portion of the roadway between the travel lanes. Median bioswales are typically curbed with inlet structures points for water to enter the bioswale.

## USE

- In locations where stormwater flows along curb line or where runoff can sheet flow from adjacent pavement areas, such as road surfaces or sidewalk areas.

- In locations where overflow water can be directed or connected to an appropriate outlet point (such as existing stormwater drains).
- In locations where the green space between the curb and sidewalk is at least 6-feet wide and not dominated by utilities or other public uses.
- Do not locate in places that impede necessary pedestrian movement, such as crosswalks, clear pedestrian walking zones, and access to parking meters, benches, or street furnishings.
- Coordinate placement with bicycle lanes or routes to ensure the safe passage of bicycles adjacent to the extended curb line.
- Avoid installation of linear bioretention in areas where the water table is less than 2 feet below the bottom of the surface and in areas of known soil/groundwater contamination.

## DESIGN

- The total surface area of the linear bioretention should be around one percent of the external drainage area up to a maximum of 10 acres of tributary area. Excessive sources of sediment should be excluded from the drainage area. In-line linear bioretention should be sized to convey at least a 10-year, 24-hour storm event safely.
- A stone reservoir area should be installed below the planting soil. It should be separated by a geotextile fabric to

provide maximal storage volume and prevent planting medium from migrating downward into the stone.

- Side slopes should be no steeper than 3 horizontal to 1 vertical.
- The preferred minimum width for Linear Bioretention and Median Bioswales is 6-feet. Linear Bioswales are typically set behind the curb at the edge of the road. When used in residential contexts, curbs adjacent to the sidewalk and pedestrian walking areas is not generally used, allowing water to sheet flow into the facility instead.
- Include pretreatment sumps / stone fore bays at the inlet points with easy access for maintenance. Provide a stone channel or other mechanism at the inlet to slow velocities if needed.
- Ensure the overflow elevation is lower than the downstream bank yet above the bottom of the linear bioretention to promote infiltration. Provide a perforated underdrain pipe that takes excess water to the storm sewer system.
- Include an impermeable liner when within 10 feet of a basement.
- Prioritize the use of native plants in the landscaped portion of the bioretention facility. Provide a 2" thick mulch layer. The facility should be designed such that the top of the mulch layer is at least 4" below but not more than 18" below the adjacent sidewalk grade. The growing medium should contain a blend of sand, compost, and soil to allow drainage and support plant growth. Selected plant materials should be tolerant of both drought and wet conditions, as well as being salt tolerant.
- Avoid conflicts with fire hydrants and other above ground utilities or underground utilities.
- If overhead utility lines are present, use smaller trees or shrubs in the planting the bioretention area to minimize crown conflicts.
- Meet requirements for emergency vehicle access along the roadway.

## OPERATIONS AND MAINTENANCE

- Clean inlets, outlets, and overflows.
- Remove accumulated debris.
- Remove weeds regularly.

- Use deep-rooted native plants for reduced maintenance.
- Add mulch when needed, typically every other year.
- During the one-to-two season establishment period, weed and water plants on a weekly basis.

## SPECIAL CONSIDERATIONS

- On steep slopes, provide check dams as needed to provide stepped, flat bottoms in the bioretention area to promote water collection and infiltration.
- Provide signage as needed to alert motorists and pedestrians.

## REFERENCES

- SEMCOG Low Impact Development Manual for Michigan (2008). Refer to Planter Boxes, Native Landscaping, and Bioretention sections for additional design guidance.
- Grand Rapids Green Infrastructure Guidance Manual (2015)
- Grand Rapids Green Infrastructure Technical Reference Manual (2013)

