BIORETENTION CELLS

Green Infrastructure for Stormwater Management

WHAT ARE BIORETENTION CELLS?

Bioretention cells are widely used green infrastructure practices for managing urban stormwater runoff. These landscaped depressions capture and treat runoff from impervious surfaces like parking lots and streets. Above ground, they resemble attractive gardens, while below the surface, an engineered subgrade filters pollutants. By treating stormwater close to its source, bioretention cells reduce runoff volume, improve water quality, and support healthy watersheds.

WHY INSTALL BIORETENTION CELLS?

Bioretention cells are installed to protect water quality in urban areas. In most communities, stormwater runoff carries pollutants like sediment, heavy metals, oils, greases, and bacteria into local water bodies without treatment. Bioretention cells capture and break down these pollutants, slowly releasing clean water into the environment.

They also reduce the flashiness of flows in urban streams by capturing, treating, and gradually releasing runoff from storms. This mitigates stream corridor erosion, which threatens adjacent property and infrastructure while contributing to sediment pollution in waterways.

Rainscaping Iowa
Landscapes for clean water

WHERE ARE THEY INSTALLED?

Bioretention cells are installed where existing soils have limited ability to infiltrate and percolate water, such as in large-scale developments with disturbed and compacted soil. The engineered subgrade ensures that captured water can readily move through a sandy soil media, effectively filtering out pollutants.

BIORETENTION CELL DESIGN

BOOST PERFORMANCE AND LONGEVITY WITH PRE-TREATMENT

Pre-treatment helps remove trash, sediment, and other pollutants from stormwater runoff before it enters a bioretention cell. This is important because sediment can clog the cell's surface, reducing its ability to absorb water and leading to overflows. Pre-treatment reduces maintenance requirements and extends the longevity of the soil mixture in the cell. There are a variety of pre-treatment options depending on available space, budget, and maintenance equipment.

This sediment tray captures trash and sediment to prevent them from entering the bioretention cell. Rocks below prevent scouring. These simple, low-cost, and space-saving pre-treatment devices offer an effective solution, but require frequent cleaning to maintain function.

A modified SW-507 structure is a popular choice because it looks like a standard storm intake. There is a design feature inside the structure where sediment and trash drop out. The pre-treatment area is not visible to the public but is accessible for maintenance.

Two rectangular weirs at the back of the modified SW-507 structure allow water to flow into the bioretention cell after pre-treatment occurs. The weirs are sized to allow for the 1.25-inch rainfall event to enter the cell.

USE INTERNAL WATER STORAGE TO INCREASE WATER QUALITY BENEFITS

Internal water storage enhances bioretention cell performance by retaining water for an extended period in the rock and amended soil layers, allowing for increased treatment and infiltration. This is achieved by raising the outlet pipe elevation using a simple upturned elbow at the end of a subdrain, an inline wye, or a water control structure to manipulate the water storage depth. The water-logged, low-oxygen environment created at the bottom of the cell promotes additional infiltration, reduces runoff, and replenishes groundwater. It also fosters the growth of microbes that efficiently remove nitrogen compounds through denitrification, resulting in improved water quality.

This concrete structure includes an inline wye to create internal water storage. The inline wye are the two white PVC pipes outside the structure. The upper pipe of the wye elevates the flowline of the primary subdrain. This allows water to stay longer in the rock and soil layers. The lower pipe allows for easy clean-out.

BIORETENTION CELL DESIGN

USE THE RIGHT MODIFIED SOIL MIX FOR OPTIMAL PERFORMANCE

The vegetation selected for a bioretention cell influences the modified soil mix. Most cells use 75-90% washed concrete sand, 0-25% topsoil, and 0-10% compost, which allows for easy drainage and suits deep-rooted native plants that tolerate various conditions.

For cells with trees, shrubs, or turf grass, reduce the sand content and use a mix of 50% washed concrete sand, 40% topsoil, and 10% compost.

When planting turfgrass, reserve some topsoil to incorporate into the mix near the surface, ensuring the shallow roots have access to organic matter for healthier growth.

Bioretention cells featuring native plants provide additional functionality and habitat.

Some bioretention cells feature regularly mowed turf grass.

Bioretention cells with trees require a different soil mixture.

BIORETENTION CELL MAINTENANCE

- The primary maintenance issue is managing vegetation to ensure a pleasing appearance.
- Perform weed control as needed.
- If native vegetation is used, consider burning annually if local code allows.
- Inspect for scour erosion at point of entry.
- Inspect for sediment accumulation. Bioretention cells trap sediment that will periodically need to be removed.
- Remove accumulated trash and debris.
- Monitor mulch until plants have grown to a height that exceeds ponding depth. Mulch can float and smother small plants or plug outlets. Re-position mulch to maintain a 2 inch uniform layer. Replace mulch if needed.
- If initial planting has mortality, replace dead plants until the plant community is well established.

BIORETENTION CELLS OF IOWA

Coralville

Des Moines

Indianola

Storm Lake

Cedar Falls

Burlington

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