URBAN LID

Analyzing BMPs' long-term viability

The emerging low-impact development (LID) movement seeks to provide solutions that reduce impervious area and restore predevelopment hydrology. It is understood that small storms are responsible for most annual urban runoff and groundwater recharge, and LID facilities are designed to reduce the volume and peak rate of urban runoff from these events using small-scale, engineered, onsite hydrologic controls featuring natural components.

There are a couple issues worth further discussion as we seek to fully implement an LID approach in urban settings: Can the quasi-natural components in an engineered LID system adequately address the anthropogenic pollutants in urban runoff? How long can these systems function as designed before major rehabilitation is required?

On urban sites, anthropogenic pollutants predominate and may include high concentrations of metal, hydrocarbons and sediment. Unlike in rural or suburban conditions, these pollutants may be in forms and quantities that cannot be assimilated by small-scale natural systems. Following some accepted LID design protocols in California, dedicating as little as two to four percent of a site area to LID best management practices (BMPs) is sufficient to avoid the requirement of treatment controls altogether.

Particulate pollutants in the system travel into the porous structure of the soil and are intercepted and retained. The removal mechanism of the engineered soil is physical filtration, which is no different than the function of manufactured media. Like the structural device, the hydraulic capacity will be reduced as sediment accumulates in the system. The soluble contaminants can be biologically degraded by the "living soil" to constituents which will be utilized as nutrients for vegetation.

The concentration of soluble contaminants in runoff varies due to the sporadic nature of rainfall events. This variation inevitably affects an ecosystem's function. It is challenging to establish and maintain a balanced ecosystem in engineered soil, and the rate of pollutant accumulation may surpass the rate of assimilation by the natural system in LID practices on urban sites. The result will either be more frequent maintenance or system failure.

In summary, small-scale, landscape-based LID practices can be integrated into urban design as an alternative approach to help reduce runoff volume and achieve better water quality. Pollutant loading and rates must be considered to ensure that they are large enough to achieve the expected performance without creating an excessive maintenance burden. In many cases, pretreatment with structural BMPs may be needed to protect landscape-based BMPs by removing and retaining coarser sediment, trash and debris and providing spill protection.

More research and field monitoring are needed to answer questions regarding the long-term viability of LID systems in urban environments. In the meantime, clear inspection and maintenance protocols should be followed to ensure that LID practices are maintaining their designed hydraulic capacity and that vegetation is healthy. It would also be wise to incorporate robust conventional BMPs with more established long-term treatment and flood control capabilities into designs as failsafe protection on a regional or watershed basis. SWS

For more information related to this article, visit www.estormwater.com/lm.cfm/st030801. For more information, write in 5001 on this issue's Reader Service Card.

Hong Lin, Ph.D., P.E.

"In many cases, pretreatment with structural BMPs may be needed to protect landscape-based BMPs..."

Hong Lin, Ph.D., P.E., is regional regulatory manager for CONTECH Stormwater Solutions. Lin can be reached by e-mail at linh@contech-cpi.com.