SWEMA FACT SHEET

Tree Box Filters

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Overview

Tree box filters are widely deployed as stormwater treatment BMPs, normally in stand-alone applications, however can also be used as pretreatment for infiltration, rainwater harvesting, and detention. Pretreatment upstream of tree box filters is not a requirement but can be used in conjunction with tree box filters to reduce maintenance frequency. Tree box filters are based on bioretention technology principles, and can also be engineered for enhanced pollutant removal and hydraulic performance, allowing for a smaller footprint and ease of construction and maintenance. Tree box filters target the removal of suspended solids, total and dissolved nutrients and metals, oil and grease, VOCs and SVOCs, bacteria and trash and debris.

Tree box filter components are typically contained in a precast or cast-in-place concrete curb inlet structure covered with a top slab with a cast tree frame and grate. Components include an underdrain consisting of a perforated pipe surrounded by drain rock underneath engineered biofiltration media topped with mulch that supports common landscape plantings. A clean out pipe is connected to the underdrain pipe to allow for underdrain access, and dissipater stones are often placed on top of the mulch for erosion control. Tree box filters can be used for infiltration in suitable soils by eliminating the bottom slab or discharging treatment flow to an infiltration device. Tree box filters can be used in multiple configurations to treat sheet and piped flow for online and offline applications.

Physical, chemical and biological processes allow for pollutant removal sustainability. The primary treatment mechanisms used in tree box filters are inert and reactive filtration, coupled with various inter-storm treatment processes such as microbial- and phytoremediation. The majority of particulates or particulate-bound contaminants are removed in and on the mulch surface, with the engineered filter media below primarily responsible for dissolved contaminant removal. Contaminant degradation and assimilation by microbes and plants provide adsorption site regeneration. Ponding space above the mulch allows for the capture of trash and debris.

The primary advantages of tree box filters include standardized designs, ease of construction and simple, cost-effective maintenance. Tree box filters are highly adaptable for most developments due to a small footprint, shallow elevation and no driving head requirements. Multiple configuration options allow for flexibility in addressing various site requirements. Where infiltration is not feasible, tree box filters are an ideal solution. Following LID principles of decentralized design, total pollutant load is minimized, enabling a sustainable system that is not compromised by high loading rates. Plant selection allows tree box filters to be seamlessly integrated into the landscape and adds aesthetic value. Internal bypass features also reduce the total system footprint since additional manholes and diversions structures are not required for external bypassing of very high flow rates.

There are limitations to tree box filters. Since tree box filters are natural systems, adequate irrigation must be provided to ensure survival of the plant and microbial community during drought conditions. Tree box filters should not be activated until a site is completely stabilized to prevent media contamination from construction runoff.

Maintenance

Maintenance of tree box filters is typically performed with a rake and shovel to remove spent mulch and captured sediment, trash and debris from the system. The media surface is replenished with new mulch and the plant is pruned or replaced as necessary. Maintenance is performed from the surface, without need for confined space entry or specialized tools. Depending on the loading from the site or climate location, maintenance frequency will typically range from once to twice per year.