Florida Department of Transportation Research

Demonstration Bio Media for Ultra-urban Stormwater Treatment
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FDOT constructs underground stormwater facilities, such as vaults and French drains, in highly urbanized environments due to the lack of sufficient land to build retention or detention ponds. The U.S. Environmental Protection Agency's Clean Water Act and state environmental laws require states to regulate pollutant loading of stormwater prior to its discharge into receiving water bodies. To achieve this goal, various types of media filters have been developed that can remove particulate and dissolved pollutants. Typical media filter components include collection and distribution structures, pretreatment areas to remove gross solids, media filtration beds, effluent collection systems, and discharge structures to surface outfalls.

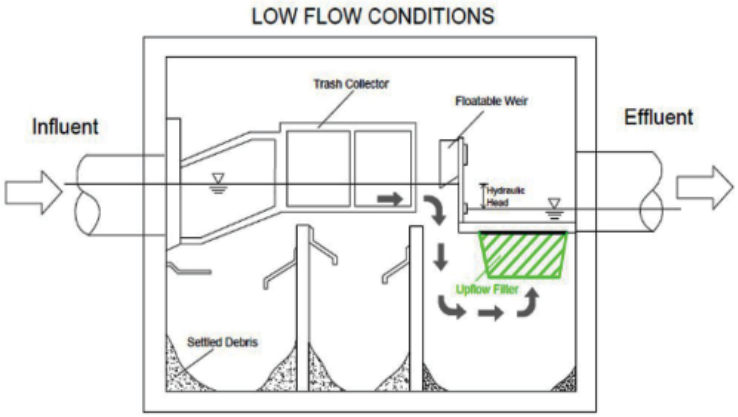

Diagram of up-flow on-line sorption filter system during low flow conditions.

Another way to filter stormwater is with engineered biosorption activated media (BAM) systems placed in underground vaults. BAM is a type of composite material with abundant surface area that can host nutrient removing bacteria, and which has proven effective at removing dissolved materials. BAM may include sawdust, peat, compost, zeolite, wheat straw, newspaper, sand, limestone, expanded clay, wood chips, wood fibers, mulch, glass, ash, pumice, bentonite, tire crumb, expanded shale, oyster shell, and soy meal hull.

Researchers at the University of Central Florida's (UCF) Stormwater Management Academy recently analyzed three types of BAM mixes in the laboratory to evaluate their nitrogen and phosphorus removal capacities. They also sought to determine if sorption is the only significant removal mechanism, or if other mechanisms, such as microbiological assimilation or bio-transformations are also significant.

The three test mixtures consisted of a combination of three materials each, such as fine expanded clay, 3/8-inch expanded clay, tire crumb, sand, and limestone screenings. Researchers conducted column tests using three two-inch diameter Plexiglas columns that were one foot long. BAM was placed at the bottom of each column to prevent the outward flow of finer particles. The columns were covered to simulate dark conditions within a baffle box and water from a stormwater pond was allowed to flow through the columns.

In the field, researchers conducted off-line sorption media filtration tests by installing BAM in retention pond systems in the City of Dunnellon to better understand how up-flow sorption filters can reduce nutrients and metals in runoff flowing into Blue Cove Lake. Also, researchers conducted on-line sorption media filtration tests to treat stormwater runoff prior to discharge to Lake Toho in the City of Kissimmee. Researchers concluded that Bold and Gold™ BAM placed in the two filter designs in field conditions removed 70% of nutrients in an average rainfall year.

This research will help FDOT design effective filtration systems to remove nutrients in stormwater and meet water quality discharge goals.

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For more information, visit http://www.dot.state.fl.us/research-center