

# Upflow Filters for Rapid and Effective Treatment of Stormwater

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## Environmental Problem

Stormwater has been identified as one of the major sources of surface water pollution by EPA. To prevent further contamination to surface water bodies, stormwater needs to be treated at the source. A number of studies have linked pollutants in stormwater runoff with specific sources, such as paved parking lots and gas stations. Runoff from paved parking areas, storage areas, and gas stations can be contaminated with concentrations of many critical pollutants. These paved areas generally contribute most of the pollutant loadings of toxicants to stormwater. Numerous manufacturers have developed proprietary devices to treat stormwater runoff at these critical source areas. These devices have been designed to treat one or more common stormwater pollutants such as solids, metals, oil and grease, nutrients, or bacteria; however, very few have been designed to treat all of the pollutants in a single device.

## SBIR Technology Solution

With support from EPA's SBIR Program, USInfrastructure, Inc. (USI), developed an upflow filter technology that is a low-cost, low-maintenance fil-

tration system for stormwater treatment. Stormwater filters with a mixed sand/organic media operated in an upflow mode have the potential to eliminate many of the disadvantages associated with conventional downflow stormwater filters. The main drawback of downflow filtration is the frequent clogging of the filters and the regular maintenance that is integral to long-term downflow operation. In locations where the filter is receiving large suspended solids loadings, the filter size must be large to have a long filter run before maintenance. To reduce the large filter surface area, the stormwater runoff must be pretreated to remove the solids loading prior to entry to the filter. One alternative to pretreatment would be to operate the filters in an upflow mode.

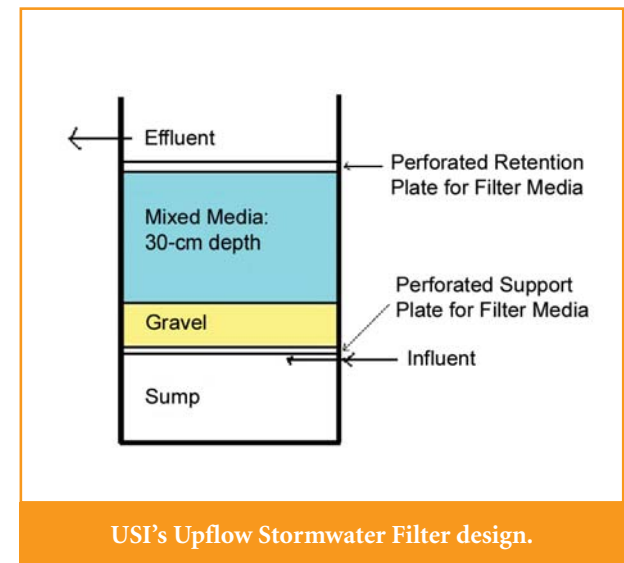
USI's upflow filter is designed so that it is easily adapted to fit in inlets of different sizes. The upflow filter sizes can be changed to fit a specific site's needs. The upflow filter eliminates degradation of performance due to filter clogging that is a weakness of all existing filtration competitor technologies. Therefore, maintenance costs are low compared to downflow filters. Additionally, this filter setup does not require electricity at individual installation locations. The upflow filter is basically a catch basin insert, designed to be compact and inexpensive for easy installation and maintenance. Stormwater enters through a grated inlet. Heavier particles settle in the sump, and the water enters the filter through a screen, leaving all of the debris behind. The water is pushed upwards through the filter media and then downwards, and finally, into an effluent pipe. The primary advantage to this approach is that stormwater passes through the fil-

ter media twice, and heavier particles settle before they can enter the filter because of the sump at the bottom of the filter.

Based on the laboratory testing performed to date, USI believes that stormwater filters with a mixed sand/organic media and operated in an upflow mode can solve many of the problems found in conventional downflow stormwater filters.

## Commercialization Information

USI's patent application currently is under review by the U.S. Patent Office, and the company knows of no other patents for this particular technology. Additionally, USI's technology has been accepted



into EPA's Environmental Technology Verification (ETV) Program. USI is collaborating with Hydro Compliance Management, Inc., located in Ann Arbor, Michigan. This company will license the process and be responsible for marketing it. Hydro Compliance Management also will provide maintenance services to filter owners. USI and Hydro Compliance Management have identified a number of commercialization opportunities, including "hot spot" areas such as drains downstream from dumpsters, material storage areas, truck loading/unloading areas, and fueling operations; municipalities in urban areas that will have to begin implementing programs to reduce pollutant runoff from their facilities; and government-owned entities required to obtain permits and implement controls for defined industrial activities.

### Company History

USI is an employee-owned professional engineering firm that was founded in 1994. USI currently has approximately 260 employees. The company's corporate headquarters is located in Birmingham, Alabama. USI's primary expertise is planning, designing, program management, and construction management for projects related to environmental engineering, water and wastewater management, water resources, watershed studies and management, natural gas lines, transportation, asset management, civil design, construction management, geographic information systems, and information technologies. USI has offices across the United States and in New Delhi, India. USI clients include EPA; the U.S. Army Corps of Engineers; the Department of the Navy; Alabama, Tennessee,

Georgia, and Oklahoma Departments of Transportation; and a variety of state, municipal, and private clients.

## SBIR Impact

- Runoff from paved parking areas, storage areas, and gas stations can be contaminated with many critical pollutants, and these areas contribute most of the pollutant loadings to stormwater.
- USI developed an upflow filter with a mixed sand/organic media that has the potential to solve many of the problems associated with conventional down-flow stormwater filters.
- One advantage of USI's filter is that stormwater passes through the filter media twice, and heavier particles settle before they can enter the filter, minimizing clogging.
- USI is collaborating with Hydro Compliance Management, Inc., which will license the process, be responsible for marketing it, and provide maintenance services to filter owners.