

Summary Fact Sheet

Category: 2.0 Filtering Technologies

Practice: 2.4 Gutter Filters

General Description: Gutter filters are linear pre-cast concrete gutter vaults containing gravel and finer (typically sand) filter media and an underdrain installed below grade at the curb line. They are especially useful for treating the “first flush” of roadway runoff, which contains elevated concentrations of many non-point source pollutants.

A void space above the filter material captures trash and other debris that is able to pass through the surface grate while the gravel and sand filter media remove suspended solids and other pollutants. Filtered stormwater is conveyed by the underdrain from the gutter filter to the stormwater collection system. Gutter filters may be a stand-alone BMP or used in concert with other measures as part of a stormwater control strategy.

Water Quantity Controls

Gutter filters are flow-through devices and should not be used to retain or detain stormwater. Storage volume within a gutter filter is not a design parameter. To ensure safe drainage of the roadway, gutter filters should be used in conjunction with conventional curb inlets. Gutter filters are designed to filter stormwater and convey the *treated effluent* through the underdrain, and therefore should not be considered as a primary device to convey all curbside flows.

The primary water quantity calculation is the infiltration rate through the filter media. Select a target “first flush” rainfall intensity and ensure that the conductivity through the sand layer exceeds the rainfall intensity. Allow a safety factor of 2.0 because the conductivity will decrease over time as the filter media becomes clogged with particles.

Water Quality Controls

Water quality benefits are similar to those for conventional sand filters (see fact sheet 2.6). Fairfax County has set a technology-based 60% target phosphorus removal efficiency for intermittent sand filters that treat 0.5” of impervious runoff from their drainage area.

Location: Gutter filters are appropriate for treating stormwater from highways; primary, secondary, and local roads; and parking lots. In general, they can be placed in any urban transportation corridor provided that they are upstream of a conventional stormwater collection system. They should abut the curb and may be placed along sidewalks or medians. A gutter filter may occupy the innermost portion of a parking lane. Gutter filters may be especially useful in highly impervious corridors that lack sufficient space for landscaped infiltration BMPs such as bioretention.

Design Construction and Materials: A typical gutter filter is 12 to 24” wide and 20 to 36” deep. The top gravel layer is designed to capture large suspended solids. The bottom layer consists of fine sand to remove small suspended solids. Depths of each layer are given below. Above the gravel layer, 6 to 12” of open space provides room to capture large debris. The filter is topped with a metal grate designed to screen out trash and direct flow into the filter. An underdrain system conveys filtered stormwater to a conventional stormwater conveyance structure, such as an inlet box. Observation/cleanout wells should also be installed.

When sizing the underdrain and downstream BMPs, assume there will be no volume losses through exfiltration into the subsoil. Soils in transportation rights-of-way are highly compacted and typically will allow little or no infiltration.

Gutter filters consist of the following cost components:

Item	Unit	Estimated unit cost (2005 dollars)
Pre-cast reinforced concrete vault (3000 psi)	C.Y. concrete	\$125 - \$175
12 to 24" wide metal grate	L.F.	\$75 - \$150
2 to 3" gravel	C.Y.	\$30 - \$35
12 to 18" fine sand	C.Y.	\$15 - \$25
4" dia. perforated underdrain pipe	L.F.	\$8 - \$10

Cost: The cost for a gutter filter to treat runoff from ½ impervious acre is comprised of both the installation cost and annualized costs. These cost calculations were based upon a gutter filter with a surface area of 1,200 ft². A gutter filter is assumed to have a lifespan of 25 years, at which point it will be removed and replaced.

Item	Required Cost per Year (2005 Dollars)													
	0	1	2	3	4	5	6	7	8	9	10	...	25	
Installation ¹	15,000													
Remove Debris		500	500	500	500	500	500	500	500	500	500			
Concrete Repair						1500					1500			
Replace Top Layer ²				2500			2500			2500				
Remove & Replace														15,000
Total Cost	15,000	500	500	3000	500	2000	3000	500	500	3000	2000			15,000
Annualized Cost	\$2,125 / year (includes replacement in year 25)													

¹Developer Cost. Not included in annualized cost.

²Top gravel layer.

Maintenance: The primary maintenance concern for gutter filters is the removal of trash and accumulated sediment and hydrocarbons. Accumulated trash and large debris on the grate surface should be removed every 7 to 14 days. This can be done in conjunction with street sweeping. Remove debris that has accumulated in the void space between the gravel layer and the grate four (4) times per year. This activity can be molded into the existing inlet cleaning schedule. Inspect the concrete structure for cracking and spalling annually in the spring.

If “first flush” flows are observed to bypass the gutter filter, first remove all debris both above and below the grate. If this does not solve the problem, the filter media or underdrain may be clogged. First make an attempt to backflush the underdrain. If this still does not solve the problem, one or both layers will need to be replaced. The color of the sand through the cross-section will help to determine the required depth of sand replacement. Hydrocarbon-contaminated sand will require special handling and disposal measures.

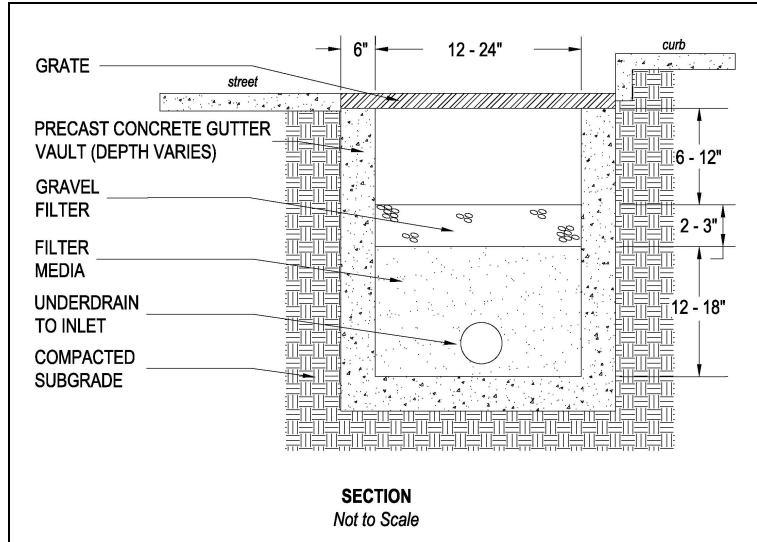
Performance and Inspection: Inspect to ensure that runoff from small, frequently-occurring storms and from the first flush of larger storms flows primarily into the gutter filter and not

directly into curb inlets. Also, there should be no standing water between the grate and the filter media once runoff has ended. Perform this inspection:

- bi-annually in spring and fall, and
- after large storm events.



Gutter filter in Mount Rainier, MD
Source: LID Center



Typical gutter filter cross-section
Source: LID Center

Potential LEED Credits:

Primary: N/A

Other: Innovation & Design Process (1-4 Points)

Links to Additional Information:

Virginia Department of Conservation and Recreation. 1999. "General intermittent sand filters." *Virginia Stormwater Management Handbook*, 3-12. Available at http://www.dcr.virginia.gov/sw/docs/swm/Chapter_3-12.pdf