

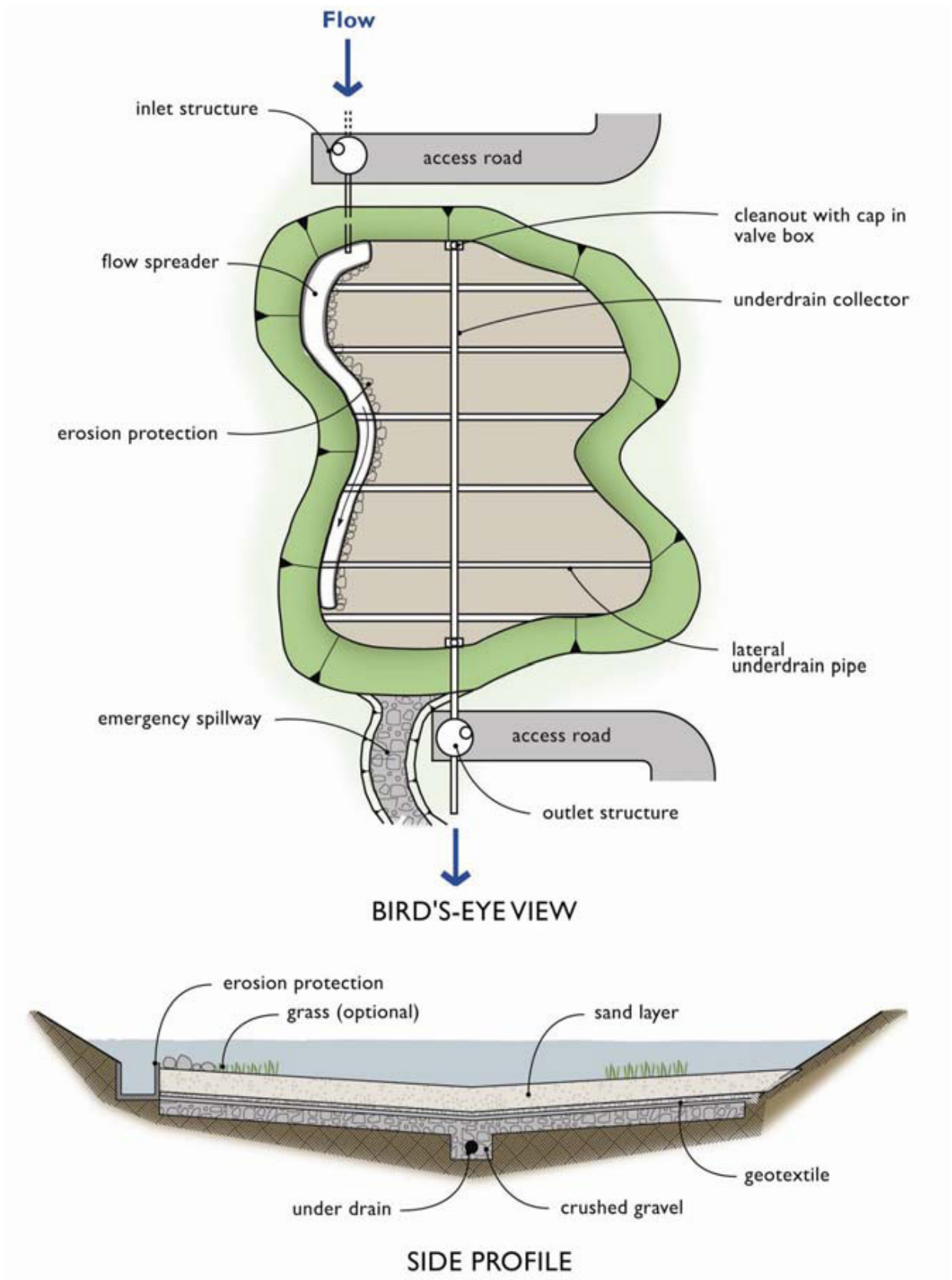
Sand Filter Open (Above Ground)

A sand filter functions by filtering stormwater runoff through a sand bed typically 18 inches in depth. The treated runoff is collected in the underdrain system and routed to a detention/retention facility or a downstream conveyance system. A typical sand filtration system consists of a pretreatment system for removing larger sediment and debris from the runoff, a flow spreader, a sand bed, and an underdrain piping. The sand filter bed typically includes a woven (geotextile) fabric between the sand bed and the underdrain system.

An above ground sand filter looks similar to a detention pond with a sand-lined bottom.

Facility objects that are typically associated with an open sand filter include:

- access road or easement
- fence, gate, and water quality sign
- control structure/flow restrictor
- energy dissipaters
- conveyance stormwater pipe



Key Operations and Maintenance Considerations

- Accumulated silt should be scraped off during dry periods with steel rakes or other devices. Once sediment is removed, the design permeability of the filtration media can typically be restored by then striating the surface layer of the media. Finer sediments that have penetrated deeper into the filtration media can reduce the permeability to unacceptable levels, necessitating replacement of some or all of the sand.
- Sand replacement frequency is not well established and will depend on suspended solids levels entering the filter (the effectiveness of the pretreatment BMP can be a significant factor).
- A sand filter should empty in 24 hours following a storm event (24 hours for the pre-settling chamber), depending on pond depth. If the hydraulic conductivity drops to one (1) inch per hour corrective action is needed, e.g.:
 - Scraping the top layer of fine-grain sediment accumulation (mid-winter scraping is suggested)
 - Removal of thatch
 - Aerating the filter surface
 - Tilling the filter surface (late-summer rototilling is suggested)
 - Replacing the top 4 inches of sand
 - Inspecting geotextiles for clogging
- Drawdown tests for the sand bed could be conducted, as needed, during the wet season. These tests can be conducted by allowing the filter to fill (or partially fill) during a storm event, then measuring the decline in water level over a 4-8 hour period. An inlet and an underdrain outlet valve would be necessary to conduct such a test.
- Avoid driving heavy equipment on the filter to prevent compaction and rut formation.

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Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Above Ground (open sand filter)	Sediment Accumulation on Top Layer	Sediment depth exceeds 1/2 inch.	No sediment deposit on grass layer of sand filter that would impede permeability of the filter section.
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.	Sediment has been removed from clean-outs.
	Sand Filter Media Clogged	Drawdown of water through the sand filter media takes longer than 24 hours, and/or flow through the overflow pipes occurs frequently.	Top several inches of sand have been replaced and drawdown occurs within 24 hours of a storm event. (May require replacement of entire sand filter depth depending on extent of plugging; a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material.)
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities.	Low, continuous flows are limited to a small portion of the facility (e.g. by using a low wooden divider or slightly depressed sand surface).
	Short Circuiting	When flows become concentrated over one section of the sand filter rather than dispersed.	Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area.
	Erosion Damage to Slopes	Erosion over 2 inches deep where cause of damage is prevalent or potential for continued erosion is evident.	Slopes have been stabilized using proper erosion control measures.
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.	Rock pad replaced or rebuilt to design function.
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter (may be indicated by rills or gullies on filter surface).	Spreader leveled and cleaned so that flows are spread evenly over sand filter. Rills or gullies not forming on sand filter surface.
	Damaged Pipes	Any part of the piping is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced to design specifications.