FocalPoint
BIOFILTRATION SYSTEMS

Operations & Maintenance

CONVERGENT WATER TECHNOLOGIES

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GENERAL DESCRIPTION

The following general specifications describe the general operations and maintenance requirements for the FocalPoint® High Capacity Modular Biofiltration System (HCMBS). The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, modular, constructed in place system designed to treat contaminated runoff.

Stormwater enters the HCMBS, is filtered by Biofiltration Media rated for 4 gpm/SF hydraulic loading rate and passes through to the underdrain/storage system where the treated water is detained, retained or infiltrated to sub-soils, prior to discharge to the storm sewer system of any remaining flow.

Higher flows bypass the HCMBS via a downstream inlet or other overflow conveyance. Maintenance is a simple, inexpensive and safe operation that does not require confined space entry, pumping or vacuum equipment, or specialized tools. Properly trained landscape personnel can effectively maintain HCMBS systems by following instructions in this manual.

BASIC OPERATIONS

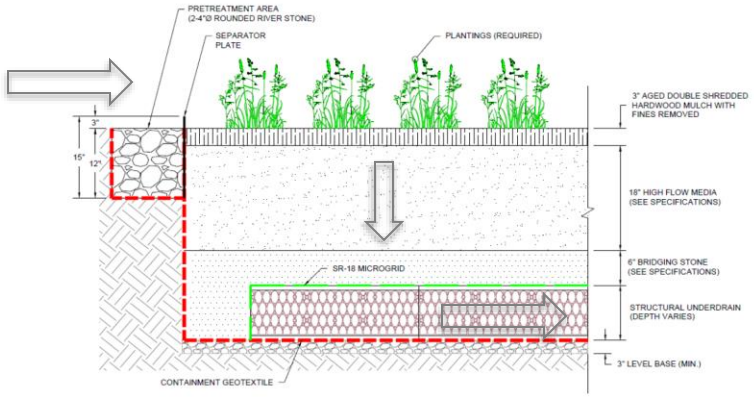
HCMBS often works in tandem with other integrated management practices (IMP). Contaminated stormwater runoff enters the pretreatment area and biofiltration bed via sheet flow or spread flow from a conveyance swale, or through an engineered curb cut. Energy is further dissipated and spreads across the pretreatment area, before flowing across a 3-inch layer of aged, double shredded hardwood mulch, with fines removed, (when specified) on the surface of the biofiltration media.

As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the biofiltration media where the finer particles are removed, and numerous chemical reactions take place to immobilize and capture pollutants in the soil media.

The cleansed water passes into the underdrain/storage system and remaining flows are directed to a storm sewer system or other appropriate discharge point. Once the pollutants are in the soil, bacteria begin to break down and metabolize the materials, and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a variety of very complex biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

DESIGN AND INSTALLATION

To ensure the safe and specified function of this stormwater BMP, Convergent Water Technologies and/or its Resellers review each application before supply. Information and design assistance is available to the design engineer during the planning process. Correct HCMBS sizing is essential to optimum performance and regulatory compliance. The engineer shall submit calculations for approval by the local jurisdiction when required. The contractor and/or Reseller is responsible for the correct installation of HCMBS units as described in approved plans.



MAINTENANCE

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons for maintenance include:

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the lifespan of your HCMBS.
- Avoid costly repairs.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the HCMBS is required to continue effective pollutant removal from stormwater runoff before any discharge into downstream waters. This procedure will also extend the longevity of the living biofiltration system. The unit will recycle and accumulate pollutants within the biomass but may also be subjected to other materials entering the surface of the system. This may include trash, silt and leaves etc. which will be contained above the mulch and/or biofiltration media layer. Too much silt may inhibit the HCMBS flow rate, which is a primary reason for system maintenance. Removal of accumulated silt/sediment and/or replacement of the mulch layer (when specified) is an important activity that prevents overaccumulation of such silt/sediment.

When to Maintain?

The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as when the site is appropriately stabilized and the unit is installed and activated (i.e., when mulch and plantings are added).

Activation should be avoided until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salt and sand. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after storm events of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions, helping the maintenance contractor and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the maintenance contractor of any damage to the plant(s), which constitute(s) an integral part of the biofiltration technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance of the HCMBS to a maintenance contractor (i.e. no pruning or fertilizing) specializing in stormwater.

EXCLUSION OF SERVICES

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant(s) in the HCMBS.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under routine stormwater maintenance contract. Should a major spill event occur, the Owner should block off the outlet pipe of the HCMBS (where the cleaned runoff drains to, such as drop-inlet) and block off the point where water enters of the HCMBS. The maintenance contractor should be informed immediately.

MAINTENANCE VISIT SUMMARY

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of HCMBS and surrounding area
2. Removal of debris, trash and mulch
3. Mulch replacement
4. Plant health evaluation (including measurements) and pruning or replacement as necessary
5. Clean area around HCMBS
6. Complete paperwork, including date stamped photos of the tasks listed above.

MAINTENANCE TOOLS, SAFETY EQUIPMENT AND SUPPLIES

Ideal tools include camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes.

MAINTENANCE VISIT PROCEDURE

Record individual unit before maintenance with photographs (numbered). Record on Maintenance Report (see example in this document) the following:

Standing Water	yes | no	Damage to HCMBS System	yes | no
Is Bypass Inlet Clear?	yes | no	Damage to Overflow	yes | no

Inspect pretreatment area, mulch/media/planting bed area, overflow area and area adjacent to that conveys water to the system for high water marks, scouring, erosion, leaf and trash deposition, sediment deposition, etc.

Dig out silt (if any) and mulch and remove trash & foreign items.

Silt / Clay Found?	yes | no	Leaves?	yes | no
Cups / Bags Found?	yes | no	Volume of material removed _____ (volume or weight)	

After removal of mulch and debris, measure distance from the top of the HCMBS engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this distance is greater than that specified on the plans (typ. 6" - 12"), add media (not topsoil or other) to recharge to the distance specified.

Distance to media surface to flow line of overflow conveyance (inches) _____
# of Buckets of Media Added _____

Add double shredded, aged hardwood mulch approved and/or supplied by Convergent Water Technologies evenly across the entire biofiltration media bed to a depth of 3".

Examine plant health and replace if dead or dying.
Prune as necessary to encourage growth in the correct directions

Height above Grate (feet) _____		Health	alive | dead
Width at Widest point (feet) _____		Damage to Plant	yes | no

FocalPoint

BIOFILTRATION SYSTEM

FocalPoint Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.

Maintenance Checklist

System Component	Problem	Conditions to Check	Condition that Should Exist	Actions
Pretreatment Area	Excessive sediment or trash accumulation	Accumulated sediments or trash impair free flow of water	Area should be free of obstructions allowing free distributed flow of water	Sediment and/or trash should beremoved
Mulch Cover	Trash and floatable debris accumulation	Excessive trash and/or debris accumulation	Minimal trash or other debris on mulch cover	Trash and debris should be removed, and mulch cover raked level
Mulch/Media	"Ponding" of water	"Ponding" could indicate clogging due to excessive fine sediment loading or spill of petroleum oils	Stormwater should drain freely and evenly through system	Replace mulch and/or media as necessary.
Underdrain	Not draining/ponding of water above	"Ponding" could indicate the drain rock or perforated piping is clogged	Stormwater should drain freely and evenly through system	Flush the underdrain piping using the cleanout provided. Worst case scenario is you replace all internal components if terminally failed
Vegetation	Plants not growing or in poor condition	Soil/mulch is too wet, evidence ofspill. Incorrect plant selection. Pest infestation. Vandalism to plants	Plants should be healthy And pest free	Replant with plants suitable to for system. Contact qualified landscape professional or arborist
Vegetation	Plant growth excessive	Plants should be appropriate to the region/climate of the site.	Plants should not be overgrown or be excessive for the system.	Trim/prune plants in accordance with typical landscaping and safety needs
Maintenance frequency will depend on site specific characteristics and will generally need to occur 1-2 times per year				