

STORMVAULT BIOFILTRATION

Operation & Maintenance Manual



OPERATIONS AND MAINTENANCE GUIDELINES
FOR
STORMVAULT BIOFILTRATION (SVBF) UNITS

Project: PROJECT NAME

Location: CITY, STATE

Subject: STORMWATER TREATMENT VAULT

SWTU: *STORMVAULT BIOFILTRATION (SVBF) UNITS*

Model: *JDSXX-XXXX*

SYSTEM OVERVIEW

Introduction

The *StormVault BioFiltration (SVBF)* stormwater treatment unit is a bioretention manufactured treatment device (MTD) designed for the treatment of stormwater runoff. Using a proprietary bio-soil media, referred to as the *Sierra Blend*, the *SVBF* captures and removes pollutants from stormwater including total suspended solids, heavy metals, nutrients, gross solids, trash and debris, and petroleum hydrocarbons. Many of these pollutants are regulated by local, state, and/or federal government(s) who limit the allowable level of pollutants in stormwater runoff discharging from a site. Due to the high surface loading rate of the *Sierra Blend*, the *SVBF* system is able to treat more stormwater in a smaller footprint than conventional bioretention systems.

Operations

The *SVBF* unit consists of a precast concrete vault layered with plant stabilization media, the *Sierra Blend*, and bridging stone, with an internal or external high-flow bypass. Different configurations of the unit are available and can be selected to better serve the requirements and needs of the site. Configurations include a tree box with a grated inlet, a planter box with an open top more suited for shrubs and grasses, and an underground vault with a subsurface inlet pipe. All configurations can be deployed with block-outs at the bottom of the vault to promote infiltration and groundwater recharge.

The *SVBF* unit is a non-mechanical, self-operating system that will function anytime there is flow within the drainage system. The bridging stone, the *Sierra Blend*, and plant stabilization media are arranged in layers within the chamber with stormwater flowing downward through these layers. The plant stabilization media layer consists of hardwood mulch and/or large riprap and serves as pretreatment, removing the trash, debris, and large sediment while increasing moisture retention and protecting the engineered media from erosion. The *Sierra Blend* further treats the stormwater, removing fine sediment, heavy metals, and nutrients. The bridging stone or gravel base allows the media bed to drain evenly and to either enter an underdrain pipe or infiltrate into the ground.

A system bypass allows the *SVBF* unit to continue to operate in high-flow situations without washing out the pollutants already trapped in the system. The internal bypass allows stormwater to enter the unit while bypassing the treatment flow path. Flows greater than the treatment flow rate of a unit will cause ponding within the unit. After a certain depth is reached, excess flow spills over a bypass pipe or weir and is directly discharged along with treated flows. An external bypass consists of a separate catch basin or other external bypass structure located further downstream from the unit. During high flows, ponding in the system will force any excess flows to bypass the *SVBF* unit and continue down the storm drain/gutter to the external structure.

Configurations

In addition to multiple treatment sizes, the *SVBF* is available in several different configurations. Depending on the configuration, units may have additional parts or chambers that will need to be inspected and maintained. However, inspection and maintenance across all configurations should remain consistent and generally follow the same procedures. In addition to the standard model featuring only the treatment chamber, other configurations may include an inlet and outlet chamber separated by a high-flow bypass weir, as well as an underground vault model without vegetation.

INSPECTION

Overview

Routine inspections are critical to the optimum performance of the *SVBF* system. At a minimum, inspections should take place at least twice per year; however, more frequent inspections may be recommended depending on site specific conditions. A site-specific maintenance frequency should be established within the first two to three years of operation. Jensen also recommends inspecting the unit after each major storm event during the first month of operation.

Use the attached Inspection & Maintenance Log (Appendix A) to help determine whether maintenance for the unit is needed.

Inspection Equipment

The following is a list of equipment for the simple and effective inspection of *SVBF* systems:

- Appropriate clothing (pants and shoes, gloves, safety vest, hard hat, etc.)

- Traffic control equipment (Traffic cones, signage, etc.)
- Manhole hook or crowbar
- Inspection & Maintenance Log or other recording method
- Flashlight
- Tape measure
- Trash grabber
- Shovel, rake, and broom
- Trash can/bag.

Inspection Procedure

Sediment loading in the plant stabilization media can be classified as “light”, “medium”, or “heavy”.

For light loading, the sediment is difficult to distinguish amongst the plant stabilization media with the plant stabilization media appearing new.

For medium loading, the sediment is apparent and may be concentrated in some areas, but the probing of the plant stabilization media reveals lighter loads beneath the first inch of plant stabilization media.

For heavy loads, sediment is apparent across the entire top layer as well as beneath the first inch of plant stabilization media.

Inspections of the internal components can, in most cases, be accomplished through observations from the ground surface. It must be noted that closed top **SVBF** units can be considered confined space environments and only properly trained personnel possessing the necessary safety equipment should enter the unit to perform maintenance or inspection procedures in adherence with the requirements of a confined space entry permit.

The visual presence of a scum line on the wall above the mulch layer that is higher than the crest of the overflow pipe is a general indicator that the filter bed has operated in bypass mode and the filter media may be plugged.

All necessary pre-inspection steps including traffic control or pedestrian detours must be carried out. Access to closed top **SVBF** units can be reached typically through the access hatch or grate. When the hatch or grate has been safely opened the following inspection procedure should begin:

-
- Record the date, time, and inspector on the day of inspection as well as the job location and model designation
 - Check the inlet structures for any unwanted objects or obstructions and remove them if present
 - Observe the inside of the *SVBF* for trash, debris, or displacement of the media and mulch layers
 - Observe the SVBF for light, medium, or heavy loading within the mulch layer
 - Record and photograph any observations in the provided inspection form
 - Observe and record the level of the scum line, if any
 - Clean off a section of the scum line on the side wall
 - If operations continue to appear to be in bypass condition, suggest replacing just the top 3 to 6-inches of media and replace mulch
 - If bypass events appear to continue, remove all the media, expose the undrain pipe, wash or replace the rock layer clean and place new media and mulch
 - Finalize the inspection report with the designated manager to determine required maintenance

Recommendations for Achieving Optimal Performance

NEW INSTALLATIONS – A minimum of two inspections should be done for the system each year, but regular inspections during the first two to three years of operation will help to establish a site-specific frequency for future inspections. During these regular inspections, light maintenance procedures such as clearing out trash and debris caught in the plant stabilization media and inlet grates or tending to vegetation can be completed. Clearing out trash and debris will prevent obstructions to the inlets and ensure the unit is operating at its maximum capacity. As mentioned before, it is recommended to inspect the system after each major storm event during the first month.

ONGOING OPERATION – The system should be routinely inspected to ensure that all grates and drains are free of blockage. After several storm events, inspections should look for signs of erosion of or accumulation of sediment in the plant stabilization media layer. If the plant stabilization media has been displaced due to flows and the bio-soil media layer is visible, or heavy accumulation of sediment is apparent in the plant stabilization media layer, the steps outlined in the maintenance section below should be followed to ensure that the *SVBF* unit is able to continue to operate at maximum capacity.

MAINTENANCE

Overview

The schedule for the maintenance of the *SVBF* unit should be established based on the results of the routine inspections conducted during the first two to three years of operation.

Maintenance Indicators

From observations noted during previous inspections, the following items may be indications that the *SVBF* unit needs maintenance:

- Again, the visual presence of a scum line on the wall above the mulch layer that is higher than the crest of the overflow pipe is a general indicator that the filter bed has operated in bypass mode and the filter media may be plugged.
- Damage to the concrete structure
- Damaged or missing grates
- Obstruction of the curb inlet or inlet rack
- Water stagnation in the biofiltration chamber more than a full day after a rainfall event
- Trash and debris in the inlet rack that cannot be easily removed at the time of inspection
- Invasive vegetation growth
- Excessive trash and debris
- Heavy sediment load present in the treatment chamber
- Excessive erosion of the plant stabilization media or bio-soil media

Maintenance Equipment

The following equipment is recommended for performing maintenance on the *SVBF* unit:

- Appropriate clothing (pants and shoes, gloves, safety vest, hard hat, etc.)
 - Traffic control equipment (Traffic cones, signage, etc.)
 - Manhole hook or crowbar
 - Inspection & Maintenance Log or other recording method
-

- Flashlight
- Tape measure
- Trash grabber
- Shovel, rake, and broom
- Pruners
- Trash can/bag
- Vactor Truck (optional)

Maintenance Procedure

Cleanout of the *SVBF* unit at the end of a rainfall season is recommended to ensure captured trash, debris, sediment, and invasive vegetation do not compromise the unit's functionality or harm plant housed in it.

Jensen recommends a visual inspection of the unit every 6-months or for every 10-inches of rainfall, whichever occurs first to determine the need for mulch and media raking or replacement.

The following maintenance activities should be performed during service:

- Inspection of treatment system and housing structure
 - Removal of any material or debris blocking flow into and through the unit
 - Removal of trash and debris from mulch and visible flow paths
 - Raking or replacement of mulch layer
 - *Sierra Blend* media replacement should only be necessary after an oil or chemical spill clean-up or when the filter has become totally occluded with fines or possibly bio-fouling
 - Raking the top quarter inch (0.25-inches), of media to discourage occlusion and plugging of the media surface
 - If vegetation is planted:
 - Pruning of vegetation
 - Replacement with new vegetation if current vegetation is in poor health for aesthetic purposes
-

-
- Disposal of any trash or debris collected.

The visual presence of a scum line on the wall above the mulch layer that is higher than the crest of the overflow pipe is a general indicator that the filter bed has operated in bypass mode and the filter media may be plugged.

If the media appears plugged due to the presence of a prominent scum line on the vault wall above the crest of the bypass:

- Remove the mulch layer, which should be replaced
- Rake the top several inches of the media to break any cementitious crust that may have formed
- Clean off a section of the scum line on the side wall
- If operations continue to appear to be in bypass condition, suggest replacing just the top 3 to 6-inches of media and replace mulch
- Again, clean off a section of the scum line on the side wall
- If bypass events appear to continue, remove all the media, expose the undrain pipe, wash or replace the rock layer clean and place new media and mulch.

Replacement of the media is done either with hand tools or a mini-excavator

Cleanout and Disposal

Cleanout of the unit primarily involves the removal of trash and sediment from the unit. Trash and debris can be removed from the curb inlet, inlet rack, and the biofiltration chamber manually with tools such as rakes, shovels, brooms or by Vactor trucks if required.

- Disposal of material from the **SVBF** unit should be in accordance with the local municipality's requirements. Typically, the removed solids can be disposed of in a similar fashion as those materials collected from sump catch basins or manholes
- After replacement of the plant stabilization media, the **SVBF** unit should be inspected 24-hours after the next major storm event for water stagnation. Standing water in the unit is an indication that the media is clogged and will need to be replaced
- If any of the unit's parts previously mentioned under the inspection section are damaged or missing, or media is needed for replacement, please contact Jensen Stormwater Systems (Jensen Precast);

Jensen Stormwater Systems (Jensen Precast)

521 Dunn Circle

Sparks, NV 89431

Toll Free: (877) 649-0095

Fax: (775) 440-2013

RECORDS OF OPERATION AND MAINTENANCE

Jensen Stormwater recommends that the owner maintain annual records of the operation and maintenance of the *SVBF* unit to document the effective maintenance of this important component of your stormwater management program. The attached Inspection & Maintenance Log (Appendix A) is suggested and should be retained for a minimum period of three years.

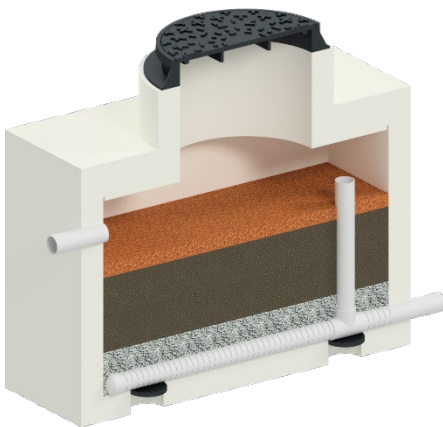
The following illustrations depict various possible deployment configuration models of the *SVBF* unit.



Planter Box Model



Bypass Weir Model



Underground Vault Model



Tree Box Model
with Curb Inlet

Appendix A
Inspection & Maintenance Log

StormVault BioFiltration (SVBF)
ANNUAL RECORD OF OPERATION AND MAINTENANCE

OWNER _____

ADDRESS _____

OWNER'S REPRESENTATIVE _____ **PHONE** _____

SVBF MODEL DESIGNATION _____ **DATE** _____

SITE LOCATION _____

INSPECTIONS:

DATE & INSPECTOR	SCUM LINE LEVEL	INLET AND OUTLET INTEGRITY	STANDING WATER/ TRASH AND DEBRIS	MULCH AND EROSION	CONDITION OF VEGETATION	OBSERVATIONS OF FUNCTION

CLEANOUT:

DATE	SCUM LINE LEVEL	TRASH AND DEBRIS REMOVAL	MULCH MEDIA REPLACED (Y/N)	VEGETATION PRUNED REPLACED (Y/N)	METHOD OF DISPOSAL OF MULCH, MEDIA, TRASH AND DEBRIS, AND VEGETATION	OBSERVATIONS OF FUNCTION

MAINTENANCE:

DATE OF INSPECTION AND OBSERVATIONS: _____

CERTIFICATION: _____ **TITLE:** _____ **DATE:** _____

Appendix B

Site Location Plans



Appendix C

Plan & Profile Drawings

