



October 2021

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS) AND PHOSPHORUS TREATMENT

For

**Advanced Drainage Systems (ADS)
(BaySaver Technologies, LLC)
BayFilter™ System
using Enhanced Media Cartridges (EMC)**

Ecology's Decision:

1. Based on BaySaver Technologies' application submissions, Ecology hereby issues a General Use Level Designation (GULD) for Basic and Phosphorus Treatment for the BayFilter™ System using Enhanced Media Cartridges (EMC).
 - Sized at a hydraulic loading rate of no greater than 0.50 gallons per minute (gpm) per square foot (sq ft.) of filter area.
 - 45 gpm (0.10 cfs) per cartridge (example dimensions 28-inch diameter, 30-inches tall (90 sq ft filter area))
 - Canisters that provide 0.50 gpm per sq ft filter area, regardless of dimensions meet this requirement
 - Using BaySaver's EMC Media Blend of Zeolite, Perlite, and Activated Alumina. Specifications of media shall match the specifications provided by the manufacturer and approved by Ecology.
2. Ecology approves use of BayFilter™ Enhanced Media Cartridges for treatment at the above flow rates per cartridge, and sized based on the water quality design flow rate for an off-line system. BaySaver designs their BayFilter systems to maintain the treatment of the water quality design flow while routing excess flows around the filter vault during periods of peak bypass. Designers shall calculate the water quality design flow rates using the following procedures:

- **Western Washington:** For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- **Eastern Washington:** For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- **Entire State:** For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

3. The GULD has no expiration date, but it may be amended or revoked by Ecology, and is subject to the conditions specified below.

Ecology's Conditions of Use:

BayFilter™ units shall comply with these conditions:

1. **Design, assemble, install, operate, and maintain BayFilter™ units in accordance with BaySaver Technologies' applicable manuals and documents and the Ecology Decision.**
2. **Maintenance:** The required inspection/maintenance interval for stormwater treatment devices is often dependent upon the efficiency of the device and the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.
 - **BaySaver recommends that the following be considered during the design application of the BayFilter Cartridge systems:**
 - **Water Quality Flow Rate**
 - **Anticipated Pollutant Load**
 - **Maintenance Frequency**
 - **Ecology has found that pre-treatment device prior to the BayFilter system can provide a reduction in pollutant loads on these systems, thereby extending the maintenance interval.**
 - **The BayFilter system contains filter fabric that is highly oleophilic (oil absorptive). When sufficient quantities of oils are present in the runoff, the oil and subsequent sediment particles may become attached to the fabric. As a result, it may compromise the maintenance interval of the BayFilter system. Oil control BMP's should be installed upstream of BayFilter installations if warranted, and/or the BayFilter system should be inspected after any known oil spill or release.**

- **Owners/operators must inspect BayFilter systems for a minimum of twelve months from the start of post-construction operation to determine site-specific inspection/maintenance schedules and requirements. Owners/operators must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30.) After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections or the manufacturer’s anticipated maintenance interval, whichever is more frequent.**
 - **Conduct inspections by qualified personnel, follow manufacturer’s guidelines, and must use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.**
- 3. When inspections are performed, the following findings typically serve as maintenance triggers:**
- **Accumulated vault sediment depths exceed an average of 2 inches, or**
 - **Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or**
 - **Standing water remains in the vault between rain events.**
 - **Bypass during storms smaller than the design storm.**
 - **Note: If excessive floatables (trash and debris) are present, perform minor maintenance consisting of gross solids removal, not cartridge replacement.**
- 4. Discharges from the BayFilter™ units shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant: Advanced Drainage Systems - BaySaver

Applicant’s Address: 4640 Trueman Blvd
Hilliard, Ohio 43065

Application Documents:

- *Technical Evaluation Report BayFilter™ System Woodinville Sammamish River Outfall, Woodinville, Washington and Appendices A through M (March 2, 2017)*
- *Washington State Department of Ecology Technology Assessment Protocol – Environmental BayFilter™ Conditional Use Designation Application (March 2007)*
- *BaySaver Technologies, Inc. BayFilter™ System Washington State Technical and Design Manual, Version 1.1 (December 2006)*
- *Efficiency Assessment of BaySeparator and Bay filter Systems in the Richard Montgomery High School January 6.2009.*

- *Evaluation of MASWRC Sample Collection, Sample Analysis, and Data Analysis*, December 27, 2008
- Letter from Mid-Atlantic Stormwater Research Center to BaySaver Technologies, Inc. dated October 22, 2009.
- Letter from Mid-Atlantic Stormwater Research Center to BaySaver Technologies, Inc. dated November 5, 2009.
- Maryland Department of the Environment letter to BaySaver Technologies dated Jan. 13, 2008 regarding approval of BayFilter as a standalone BMP for Stormwater treatment.
- NJCAT letter to BaySaver Technologies dated June 18, 2009 regarding Interim Certification.

Applicant's Use Level Request:

- General use level designation as a basic and phosphorus treatment device in accordance with Ecology's Stormwater Management Manual for Western Washington.

Applicant's Performance Claims:

- Removes and retains 80% of TSS based on laboratory testing using Sil-Co-Sil 106 as a laboratory stimulant.
- Removes 42% of dissolved Copper and 38% of dissolved Zinc.
- Expected to remove 50% of the influent phosphorus load.

Ecology's Recommendations:

- BaySaver Technologies, Inc. has shown Ecology, through laboratory and field testing, that the BayFilter™ System using Enhanced Media Cartridges (EMC) (as a single treatment facility) is capable of attaining Ecology's Basic and Phosphorus Treatment goals.
- Ecology should provide BaySaver Technologies, Inc. with the opportunity to demonstrate, through additional laboratory and field-testing, whether the BayFilter™ System using Enhanced Media Cartridges (EMC) (as a single treatment facility) can attain Ecology's Enhanced Treatment goals.

Findings of Fact:

- BaySaver conducted field monitoring of a BayFilter™ using EMC at a site in Woodinville, WA between November 2013 and March 2015. BaySaver sized the system at a hydraulic loading rate of 0.50 gpm/sq. ft. The manufacturer collected flow-weighted influent and effluent composite samples during 12 storm events.
 - Influent TSS concentrations from sampled storm events ranged from 17 to 140 mg/L. For all samples, the upper 95 percent confidence limit (UCL) of the mean effluent concentration was less than 10 mg/L. For influent concentrations greater than 100 mg/L (n=2) the removal efficiency was greater than 80%.

- Influent total phosphorus concentrations from sampled storm events ranged from 0.073 to 0.320 mg/L. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 64 percent.
 - BaySaver inspected the system regularly, however they did not need maintenance during the 18 month evaluation period.
- Based on field testing in Vancouver, WA, at a flow rate less than or equal to 30 gpm per canister, the BayFilter™ system demonstrated a total suspended solids removal efficiency of greater than 80% for influent concentrations between 100 and 200 mg/l and an effluent concentration < 20 mg/l for influent concentration < 100 mg/l.
 - Based on laboratory testing, at a flowrate of 30 GPM per filter, the BayFilter™ system demonstrated a total suspended solids removal efficiency of 81.5% using Sil-Co-Sil 106 with an average influent concentration of 268 mg/L and zero initial sediment loading.
 - Based on laboratory testing, at a flowrate of 30 GPM per filter, the BayFilter™ system demonstrated a dissolved phosphorus removal efficiency of 55% using data from the Richard Montgomery High School field-testing. The average influent concentration was 0.31 mg/L phosphorus and zero initial sediment loading.
 - Based on data from field-testing at Richard Montgomery High School in Rockville, MD the BayFilter system demonstrated a Cu removal efficiency of 51% and 41% for total and dissolved Cu respectively. Average influent concentrations are 41.6 µg/l total and 17.5 µg/l dissolved.
 - Based on data from field-testing at Richard Montgomery High School in Rockville, MD the BayFilter system demonstrated a Zn removal efficiency of 45% and 38% for total and dissolved Cu, respectively. Average influent concentrations are 354 µg/l total and 251 µg/l dissolved, respectively.

Other BayFilter™ Related Issues to be Addressed By the Company:

1. The Washington State field test results submitted in the TER do not yet show whether the BayFilter™ system can reliably attain 30% removal of dissolved Cu or 60% removal of dissolved Zn found on local highways, parking lots, and other high-use areas at the design operating rate.
2. BaySaver Technologies, Inc. should test a variety of operating rates to establish conservative design flow rates.
3. The manufacturer should continue to monitor the system to measure bypass and to calculate if the system treats 91% of the volume of the total annual runoff volume.
4. The manufacturer should test the system under normal operating conditions, with a partially pollutant filled settling basin. Results obtained for “clean” systems may not be representative of typical performance.
5. Conduct field-testing at sites that are indicative of the treatment goals.

6. BaySaver should continue monitoring the system for a longer period to help establish a maintenance period and to obtain data from additional qualified storms. Conduct testing to obtain information about maintenance requirements in order to come up with a maintenance cycle.
7. Conduct loading tests on the filter to determine maximum treatment life of the system.
8. Conduct testing to determine if oils and grease affect the treatment ability of the filter. This should include a determination of how oil and grease may affect the ion-exchange capacity of the system if BaySaver wishes to make claims for phosphorus removal.
9. BaySaver should develop easy-to-implement methods of determining when a BayFilter system requires maintenance (cleaning and filter replacement).
10. BaySaver must update their O&M documents to include information and instructions on the “24-hour draw-down” method to determine if cartridges need replacing.

Technology Description: Download at www.BaySaver.com

Contact Information:

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Ecology web link: <http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html>

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Revision History

Date	Revision
April 2008	Original use-level-designation document
February 2010	Revision
August 2011	GULD awarded for Basic Treatment
April 2012	Maintenance requirements updated.
August 2012	Revised design storm criteria
December 2012	Revised contact information and document formatting
December 2013	Revised expiration and submittal dates
December 2014	Revised Inspection/maintenance discussion, Updated cartridge descriptions

January 2015	Revised discussion for flow rate controls
December 2015	Revised Expiration date
January 2016	Revised Manufacturer Contact Information and expiration date
January 2017	Revised Expiration, QAPP and TER due dates
April 2017	Approved GULD designation for Basic and Phosphorus Treatment
December 2017	Removed CULD for Enhanced Treatment at request of Manufacturer
July 2019	Revised Applicant Contact Information
August 2021	Removed information and references that were related to a different cartridge media and did not pertain to the BayFilter System using Enhanced Media Cartridges
October 2021	Revised sizing language to note sizing based on off-line calculations