State of New Jersey

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

Division of Water Quality
Bureau of Stormwater Permitting
401 East State Street
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Trenton, New Jersey 08625-0420
Phone: 609-633-7021 / Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

SHAWN M. LATOURETTE
Acting Commissioner

January 21, 2021

Mark B. Miller
Research Scientist
AquaShield™, Inc.
2733 Kanasita Drive, Suite 111
Chattanooga, TN 37343

Re: MTD Lab Certification
Aqua-Ponic™ Stormwater Biofiltration System
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Miller:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). AquaShield™, Inc. has requested a Laboratory Certification for the Aqua-Ponic™ Stormwater Biofiltration System.

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated November 2020) for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the Aqua-Ponic™ stormwater treatment unit by AquaShield™ at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 7.0 gpm/ft^2 of effective filtration treatment area.

2. The Aqua-Ponic™ stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Aqua-Ponic™. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at maintenance_manual_aqua-ponic_6-20.pdf (aquashieldinc.com) for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat runoff by infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; and/or (3) store stormwater for reuse.

   In order for an Aqua-Ponic™ system to meet the definition of GI, the Aqua-Ponic™ system must treat stormwater runoff through filtration by vegetation. To this end, consistent with the vegetative cover requirement for bioretention systems, the minimum vegetative cover in an Aqua-Ponic™ system is 85% in order to qualify as GI under the Stormwater Management rules at N.J.A.C. 7:8. The vegetative cover should be determined based on the expected coverage of the proposed plantings when matured. Plant death or damage shall require replanting to maintain this 85% coverage requirement if the system is installed as GI.

7. Sizing Requirement:

   The example below demonstrates the sizing procedure for the Aqua-Ponic™:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Aqua-Ponic™. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

The selection of the appropriate model of Aqua-Ponic™ is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Aqua-Ponic™ in this example is 0.25 acres. Included in Table 1 below, several Aqua-Ponic™ models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Aqua-Ponic™ model AP-5 with a maximum drainage area allowable of 0.30 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs

Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the AP-8 with an MTFR of 0.79 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Aqua-Ponic™ MTFRs and Maximum Allowable Drainage Areas

Model*	Maximum Treatment Flow Rate (MTFR) (cfs)	Drainage Area (acres)
AP-2	0.05	0.05
AP-3	0.11	0.11
AP-4	0.20	0.19
AP-5	0.31	0.30
AP-6	0.44	0.43
AP-7	0.60	0.59
AP-8	0.79	0.77
AP-9	0.99	0.97
AP-10	1.23	1.20
AP-11	1.48	1.45
AP-12	1.77	1.73
AP-13	2.07	2.03

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact our office at (609) 633-7021.

Sincerely,

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

INSPECTION & MAINTENANCE MANUAL

Aqua-Ponic™ Stormwater Biofiltration System

Manufactured By:

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INTRODUCTION

As the stormwater industry has matured there has been an ever-increasing movement toward the implementation of Low Impact Development (LID) products and practices as the preferred means to implement stormwater control measures within "green infrastructure" (GI) stormwater management programs. The Aqua-Ponic™ Stormwater Biofiltration System is now offered by AquaShield™, Inc. to meet the design challenges of LID principles along with enhanced aesthetics in an urban environment.

This Inspection & Maintenance (I&M) Manual includes information to better assist stakeholders with understanding the importance of implementing an effective program to ensure long-term functionality of an Aqua-Ponic™ system installation. The following aspects of an Aqua-Ponic™ system are described in this I&M manual:

- Aqua-Ponic™ Basics
- Mode of Operation
- Inspection and Maintenance.

AQUA-PONIC™ BASICS

Aqua-Ponic™ technology is a modular proprietary, permanent, post-construction biofiltration system designed to remove total suspended solids (TSS), Total (insoluble) Phosphorus, and heavy metals such as copper and zinc from stormwater runoff. A distinguishing feature of the Aqua-Ponic™ is its combination of filtration with the principles of ***hydroponics*** - a method of hydroculture for growing plants without soil by instead using mineral nutrient solutions in a water solvent. That is, the Aqua-Ponic™ uses stormwater runoff as a nutrient asset instead of a liability. Terrestrial plants are grown with only their roots exposed to the nutrient liquid while being physically supported by a plant stabilization filter medium. The hydroponic design provides a sustainable water supply to the vegetation during those periods of time when hot and/or dry conditions may prevail.

The Aqua-Ponic™ system utilizes hardy low-profile perennial vegetation such as native grasses, shrub grasses and/or ornamental flowering plants. A facility can utilize a single type or multiple types of plants to enhance the viewscape. It is important to specify plants that demonstrate viability within the climatic zone of a site installation.

MODE of OPERATION

The minimum 12-inch plant stabilization media layer within the Aqua-Ponic™ serves three operational roles by providing (1) pollutant filtration, (2) plant stabilization and (3) nutrient uptake. Figure 1 is an illustration of the Aqua-Ponic™ Biofiltration System. Design elements include a three (3)-inch top layer of pea gravel underlain by the plant stabilization filter bed. Water enters the system as sheet flow and then flows downward under gravity flow conditions through the pea gravel, filter bed and the associated root systems of the vegetation. The pea gravel layer serves to protect the underlying plant stabilization filter bed while dispersing the influent stormwater runoff across the treatment area. The filtered water then percolates further downward into the underlying water sump. A supporting and removeable perforated stainless-steel sheet underlies the filter bed. A post-filtration flow control orifice is placed across the outlet pipe opening in order to facilitate an even distribution of influent runoff across the filter treatment

area. Crushed recycled landscaping glass can be used as an alternative to the top pea gravel layer which further enhances colorful viewscape options for the Aqua-Ponic™.

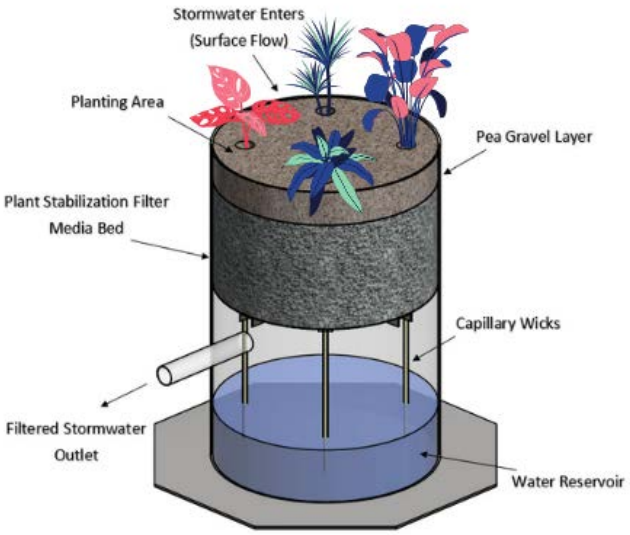

Figure 1. Diagram of Aqua-Ponic™ Biofiltration System.

The sump serves as a water reservoir for the vegetation during quiescent periods. A series of wicks are suspended from the base of the plant stabilization bed via rubber grommets (eyelets). The wicks extend downward to near the base of the sump. Using capillary action, water is wicked up to the plant stabilization filter bed which serves to provide a sustainable supply of water and any soluble nutrients and metals not trapped in the filter bed during a runoff event. Treated water in excess of the sump storage volume exits the system via the outlet opening just below the base of the filter bed.

Each Aqua-Ponic™ unit is constructed of lightweight and durable Polymer Coated Steel (PCS) to provide long term operational and structural functionality. Aqua-Ponic™ units are shipped with the inclusion of any perforated sheets and the capillary wicks in place according to the model size. The plant stabilization filter media is shipped simultaneously in separate containers. For aesthetic reasons it is the responsibility of others to choose either the pea gravel or any recycled glass landscaping stone for the top bed layer. It is also the responsibility of others to specify, acquire and plant the vegetation. AquaShield™ does not specify the plants for Aqua-Ponic™ systems but can assist where warranted.

INSPECTION & MAINTENANCE

Maintenance frequency for the Aqua-Ponic™ will ultimately be determined by site-specific pollutant loading conditions. Inspections of the, plants, top gravel layer and the upper portion of the plant stabilization filter media can be accomplished from the surface without special tools. AquaShield™ recommends periodic inspections following installation to determine a site-specific maintenance cycle to ensure functionality of the media and the vegetation.

We recommend that periodic system inspections be performed to determine the pollutant and trash loading characteristics. In general, quarterly inspections should be performed during the first year of operation to better anticipate maintenance frequency in the first year and subsequent years of operation.

An Aqua-Ponic™ maintenance event should first determine any obvious signs of degradation, displacement, sediment or trash accumulation, or oil in the upper layers of the unit. The top gravel layer should be completely replaced and can be removed by shoveling or vacuuming. The top several inches of the underlying plant stabilization filter media may be replaced at the same time if warranted. Care should be taken not to damage the plants or disturb rootballs during limited media replacement. Care should also be taken when replacing a plant to avoid disturbing remaining plants.

Depending on site conditions, it may be necessary to remove all the media and all the plants and completely replace these components of the system. It is recommended that the wicks be replaced if a system is fully replaced with stabilization media and plants.

Sediment can accumulate in the base of the water supply sump over a period of time. After removing the pea gravel layer, the plants and the plant stabilization filter media bed, the perforated metal plate should be removed to access the water supply sump from the surface for the purpose of vacuuming water and any accumulated sediment. The wicking ropes should also be replaced at this time. The perforated metal plate with the new wicking ropes should be set in place prior to installing the plant stabilization filter media on top of the plate.

AquaShield™ can provide the plant stabilization filter media, wicks and any associated grommets. Although unlikely, the supporting stainless-steel plate can also be supplied by AquaShield™ if its replacement is necessary. While we recommend that the pea gravel be replaced as warranted, it may be feasible to wash the gravel during a maintenance event. However, in most cases it is more efficient to replace the pea gravel or any landscaping glass to avoid disposal of water that was used to clean either of those materials.

All I&M activities can be performed from the surface without the need for AquaShield™ personnel to be present. We recommend that all materials removed during the maintenance process be handled and disposed in accordance with all applicable federal, state and local guidelines. Depending on the influent pollutant characteristics of the facility drainage area, it may be appropriate to perform Toxicity Characteristics Leaching Procedure (TCLP) analyses on representative samples of the spent filter media to ensure that the handling and disposition of materials complies with any applicable environmental regulations and practices.

Attached is a two-page Aqua-Ponic™ I&M Log to document service provider(s), activities and scheduling.

Next two pages include I&M Logs

AQUA-PONIC™ INSPECTION & MAINTENANCE LOG

MAINTENANCE COMPANY INFORMATION

Company Name: _____

Street Address: _____

City: _____ State/Prov.:_____ Zip/Postal Code: _____

Contact: _____ Title: _____

Office Phone: _____ Cell Phone: _____

ACTIVITY LOG

Date of Cleaning: _____

Time of Cleaning: Start: _____ End: _____

Date of Next Inspection: _____

Floatable debris present: Yes No Action taken: _____

_____

Oil present: Yes No Action taken: _____

Filter Media Needs Replacement: Yes No

Structural damage: Yes No Where: _____

Clogging: Yes No Describe: _____

Additional Comments and/or Actions to be Taken	Time Frame

AQUA-PONIC

Inspection & Maintenance Schedule Log

First Year Post-Construction

Date Installed/Activated: _____

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X

Second and Subsequent Years Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed												X
Inspect Bypass, maintain as needed												X
Clean System												X