



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control

Division of Water Quality

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CATHERINE R. MCCABE
Commissioner

January 21, 2020

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

Re: MTD Lab Certification
Aqua-Swirl® XCellerator Stormwater Treatment System
On-line Installation

TSS Removal Rate 50%

Dear Mr. Miller:

This revised certification letter supersedes the Department's prior certification dated July 23, 2019. This revision was completed to reflect AquaShield's enhanced fabrication capability to manufacture larger-size units of its the Aqua-Swirl® XCellerator Stormwater Treatment System (Aqua-Swirl® XCellerator) Manufactured Treatment Device (MTD), while still meeting the scaling methodology as agreed upon by the manufacturers' working group on September 19, 2016. Specifically, models XC-5 through XC-12 can now be fabricated slightly larger, while models XC-2 through XC-4, as well as model XC-13, remain unchanged. Based on these modifications, Tables A-1 and A-2 of the New Jersey Corporation for Advanced Technology (NJCAT) Verification report located at <http://www.njcat.org/uploads/newDocs/AquaSwirlXC2NJCATReportFinalJanuary2020.pdf> have been revised to specify these larger units and associated maximum treatment flow rates. Table 1 below has been updated to reflect these same updated model sizes and flow rates.

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of 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 NJCAT and have been certified by the New Jersey Department of Environmental Protection (NJDEP). AquaShield™, Inc. has requested an MTD Laboratory Certification for the Aqua-Swirl® XCellerator Stormwater Treatment 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 Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation 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 June 2019, with Revised Tables A-1 and A-2, January 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-Swirl® XCELERATOR Stormwater Treatment System at a TSS removal rate of 50% 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.
2. The Aqua-Swirl® XCELERATOR shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.
3. This Aqua-Swirl® XCELERATOR 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-Swirl® XCELERATOR. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://cdn.websites.hibu.com/a97c027d62d54a948588ae7d58f831d0/files/uploaded/XC%20IM%20Manual_04-19_karG16DITgiSiif2vPL4.pdf for any changes to the maintenance requirements.
6. Sizing Requirement:

The example below demonstrates the sizing procedure for the Aqua-Swirl® XCELERATOR:

Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using an Aqua-Swirl® XCELERATOR. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

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)
 $Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

Given the site runoff is 0.79 cfs and based on Table 1 below, the Aqua-Swirl® XCELERATOR Model XC-3 with an MTFR of 1.13 cfs would be the smallest model approved that could be used for this site to remove 50% of the TSS from the impervious area without exceeding the MTFR.

The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Tables A-1 and A-2.

Table 1 Aqua-Swirl® XCELERATOR Models and Associated MTFRs

Model	Manhole Diameter (ft)	NJDEP 50% TSS Maximum Treatment Flow Rate, MTFR (cfs)	50% Maximum Sediment Storage Area Volume (ft³)
XC-2	2.5	0.57	2.46
XC-3	3.5	1.13	4.81
XC-4	4.5	1.86	7.95
XC-5	5.5	2.78	11.88
XC-6	6.5	3.88	16.59
XC-7	7.5	5.17	22.09
XC-8	8.5	6.64	28.38
XC-9	9.5	8.29	35.44
XC-10	10.5	10.13	43.30
XC-11	11.5	12.15	51.94
XC-12	12.5	14.35	61.36
XC-13	13	15.53	66.37

A detailed maintenance plan is mandatory for any project with a stormwater BMP subject to the Stormwater Management rules under N.J.A.C. 7:8. The plan must include all of the items identified in the Maintenance requirements section of the Stormwater Management rules under 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 Brian Salvo of my office at (609) 633-7021.

Sincerely,

A handwritten signature in blue ink that reads "Gabriel Mahon". The signature is written in a cursive style with a large initial 'G' and a long, sweeping tail on the 'n'.

Gabriel Mahon, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Jim Murphy, NJDEP-BNPC
Vince Mazzei, NJDEP - DLUR
Brian Salvo, NJDEP - BNPC



Aqua-Swirl[®] XCelerator Stormwater Treatment System

Inspection and Maintenance Manual for New Jersey Department of Environmental Protection (NJDEP)



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Aqua-Swirl[®] XCELERATOR Stormwater Treatment System

The Aqua-Swirl[®] XCELERATOR Stormwater Treatment System (Aqua-Swirl[®] XCELERATOR) is a vortex-type hydrodynamic separator designed and supplied by AquaShield[™], Inc. (AquaShield[™]). Aqua-Swirl[®] XCELERATOR technology removes pollutants including suspended solids, debris, and floatables from stormwater runoff. Both treatment and storage are accomplished in the single swirl chamber without the use of multiple or hidden, blind access chambers.



Floatable trash & debris in the Aqua-Swirl[®]

System Operation

The treatment operation begins when stormwater enters the Aqua-Swirl[®] XCELERATOR through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminants to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl[®] XCELERATOR retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

Aqua-Swirl[®] XCellerator System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the Aqua-Swirl[®] XCellerator allowing all inspections to be performed from the surface. It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained. In order to ensure that our systems are being maintained properly, AquaShield[™] offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.

Inspection



The Aqua-Swirl[®] XCellerator can be inspected from the surface, eliminating the need to enter the system to determine when cleanout should be performed. In most cases, AquaShield[™] recommends a quarterly inspection during construction and for the first year of operation to develop an appropriate schedule of maintenance. The Aqua-Swirl[®] XCellerator should be inspected and cleaned at the end of construction regardless of whether it has reached its sediment storage capacity and/or other captured materials. Based on experience of the system's first year in operation, we recommend that the inspection

schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is once per year.

Maintenance

The Aqua-Swirl[®] XCellerator has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

Inspection Procedure

To inspect the Aqua-Swirl[®] XCellerator, a hook is typically needed to remove the manhole cover. AquaShield[™] provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal

information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl® XCELERATOR model size, and serial number.

The only tools needed to inspect the Aqua-Swirl® XCELERATOR system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating trash and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water. AquaShield™ recommends that the units be cleaned when sediment depth reaches 6 inches, representing 50% sediment storage capacity. The full sediment storage depth in the Aqua-Swirl® XCELERATOR is 12 inches.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

Aqua-Swirl® XCELERATOR Cleanout Procedure

Cleaning the Aqua-Swirl® XCELERATOR is simple and quick. Floatable trash debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® XCELERATOR design is that the entire sediment storage area can be reached with a vacuum hose from the surface reaching all the sides. Since there are no multiple or limited (blind) access chambers in the Aqua-Swirl® XCELERATOR there are no restrictions to impede on-site maintenance tasks.



Sediment inspection using a stadia rod

Disposal of Recovered Materials

AquaShield™ recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used. AquaShield™ also recommends that all materials removed from the Aqua-Swirl® XCelerator and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.



Vacuum (vactor) truck quickly cleans the single open access swirl chamber

***Aqua-Swirl® XCelerator Inspection and Maintenance
Work Sheets
on following pages***

Aqua-Swirl[®] XCelerator Inspection and Maintenance Manual Work Sheets

SITE and OWNER INFORMATION

Site Name: _____

Site Location: _____

Date: _____ Time: _____

Inspector Name: _____

Inspector Company: _____ Phone #: _____

Owner Name: _____

Owner Address: _____

Owner Phone #: _____ Emergency Phone #: _____

INSPECTIONS

I. Floatable Trash and Debris

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl[®] XCelerator.
2. Remove floatable debris with basket or net if any present.

II. Sediment Accumulation

1. Lower measuring device (e.g. stadia rod) into swirl chamber through service access provided until top of sediment pile is reached.
2. Record distance to top of sediment pile from top of standing water: _____ inches.
3. Maximum recommended sediment depth prior to cleanout is 12 inches for all models. Consult system shop drawing for treatment chamber depth as measured from the inlet pipe invert to base of the unit.

III. Diversion Structures (External Bypass Features)

If a diversion (external bypass) configuration is present, it should be inspected as follows:

1. Inspect weir or other bypass feature for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling (concrete or brick) or decaying (steel).
2. Inspect diversion structure and bypass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. When feasible, measure elevations on diversion weir or piping to ensure it is consistent with site plan designs.

4. Inspect downstream (convergence) structure(s) for sign of blockage or structural failure as noted above.

CLEANING

Schedule cleaning with local vector company or AquaShield™ to remove sediment, trash, and other floatable pollutants. The captured material generally does not require special treatment or handling for disposal. Site-specific conditions or the presence of known contaminants may necessitate that appropriate actions be taken to clean and dispose of materials captured and retained by the Aqua-Swirl® XCELERATOR. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Swirl® XCELERATOR during the maintenance process be handled and disposed in accordance with local and state environmental or other regulatory requirements.

MAINTENANCE SCHEDULE

I. During Construction

Inspect the Aqua-Swirl® XCELERATOR every three (3) months and clean the system as needed. The Aqua-Swirl® XCELERATOR should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance trigger.

II. First Year Post-Construction

Inspect the unit(s) every three (3) months and clean the system as needed.

Inspect and clean the system once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity.

III. Second and Subsequent Years Post-Construction

If the system did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® XCELERATOR reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months and cleaned as needed. The unit should be cleaned annually regardless of whether it reaches its sediment or floatable pollutant capacity.

IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl® XCELERATOR is inspected. Maintenance should be performed on bypass structures as needed.

MAINTENANCE COMPANY INFORMATION

Company Name: _____

Street Address: _____

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

Contact: _____ Title: _____

Office Phone: _____ Cell Phone: _____

ACTIVITY LOG

Date of Cleaning: _____ (Next inspection should be 3 months from this data for first year).

Time of Cleaning: Start: _____ End: _____

Date of Next Inspection: _____

Floatable debris present: Yes No

Notes: _____

STRUCTURAL CONDITIONS and OBSERVATIONS

Structural damage: Yes No Where: _____

Structural wear: Yes No Where: _____

Odors present: Yes No Describe: _____

Clogging: Yes No Describe: _____

Other Observations: _____

Aqua-Swirl® XCELERATOR

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: _____

Date Construction Ended: _____

During Construction

Activity	Month											
	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*

* The Aqua-Swirl® XCELERATOR should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity. In addition, the system should be cleaned at the **end of construction** regardless of whether it has reach full pollutant storage capacity.

First Year Post-Construction

Activity	Month											
	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*

* The Aqua-Swirl® XCELERATOR should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity.

Second and Subsequent Years Post-Construction

Activity	Month											
	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*

* If the Aqua-Swirl® XCELERATOR did **not** reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® XCELERATOR **reached** full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months or more frequently if past history warrants, and cleaned as needed. The system should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.