



October 2013

**GENERAL USE LEVEL DESIGNATION FOR PRETREATMENT  
CONDITIONAL USE LEVEL DESIGNATION FOR BASIC TREATMENT**

**For  
AquaShield™, Inc.'s Aqua-Swirl® Stormwater Treatment System**

**Ecology's Decision:**

**Based on AquaShield™, Inc. application submissions, Ecology hereby issues the following use level designations:**

- 1. General Use Level Designation (GULD) for the Aqua-Swirl® for pretreatment use (a) ahead of infiltration treatment, or (b) to protect and extend the maintenance cycle of a Basic or Enhanced Treatment device (e.g., sand or media filter). This GULD applies to Aqua-Swirl™ units sized at water quality design flow rate of no more than 23 GPM/sf at the Water Quality design flow rate.**
- 2. Conditional Use Level Designation (CULD) for the Aqua-Swirl® for standalone Basic (TSS) treatment, sized at a water quality design flow rate of rate of no more than 23 GPM/sf.**
- 3. The water quality design flow rates are calculated 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.**

**Table 1 lists the Standard Aqua-Swirl<sup>®</sup> Models available. The model designated AS-XX allows for custom designs including multiple (twin) units.**

**Table 1. Standard Aqua-Swirl<sup>®</sup> Models**

<b>Model</b>	<b>Swirl Chamber Diameter (ft)</b>	<b>Area (ft<sup>2</sup>)</b>
<b>AS-2</b>	<b>2.5</b>	<b>4.9</b>
<b>AS-3</b>	<b>3.3</b>	<b>8.6</b>
<b>AS-4</b>	<b>4.3</b>	<b>14.5</b>
<b>AS-5</b>	<b>5.0</b>	<b>19.6</b>
<b>AS-6</b>	<b>6.0</b>	<b>28.3</b>
<b>AS-7</b>	<b>7.0</b>	<b>38.5</b>
<b>AS-8</b>	<b>8.0</b>	<b>50.3</b>
<b>AS-9</b>	<b>9.0</b>	<b>63.6</b>
<b>AS-10</b>	<b>10.0</b>	<b>78.5</b>
<b>AS-11</b>	<b>11.0</b>	<b>95.0</b>
<b>AS-12</b>	<b>12.0</b>	<b>113.1</b>
<b>AS-13</b>	<b>13.0</b>	<b>132.7</b>
<b>AS-XX*</b>	<b>Custom</b>	

**\* Custom designs to meet site-specific water quality treatment flow. Can include multiple (twin) and custom units.**

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

**The CULD expires on November 1, 2015 unless extended by Ecology, and is subject to the conditions specified below.**

**Ecology's Conditions of Use:**

- 1. Design, assemble, install, operate, and maintain Aqua-Swirl<sup>®</sup> units in accordance with AquaShield<sup>™</sup>, Inc.'s applicable manuals and documents and the Ecology Decision.**
- 2. AquaShield<sup>™</sup>, Inc. commits to submitting a QAPP for Ecology review and approval by March 1, 2014 that meets the TAPE requirements for attaining a GULD for basic treatment. The selected field-testing site(s) should reflect the product's treatment intent.**
- 3. AquaShield<sup>™</sup>, Inc. shall complete all required testing and submit a TER for Ecology review by August 1, 2015.**
- 4. AquaShield<sup>™</sup>, Inc. may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions.**
- 5. Discharges from the Aqua-Swirl<sup>®</sup> shall not cause or contribute to water quality standards violations in receiving waters.**

**Applicant:** AquaShield™, Inc.

**Applicant's Address:** 2719 Kanasita Drive  
Chattanooga, TN 37343

**Application Documents:**

- Aqua-Filter™ Stormwater Treatment System, Application for Stormwater Quality Treatment Pilot Use Designation (Short-Term) for Basic, Enhanced, Oil, and Treatment Train Treatment in Western Washington submitted to Stan Ciuba, Washington State Department of Ecology (August 21, 2003)
- NJCAT Technology Verification: Aqua-Swirl™ Concentrator and Aqua-Filter™ Stormwater Treatment System (September 2005)
- NJCAT Technology Verification. Aqua-Swirl® Model AS-5 Stormwater Treatment System, AquaShield™, Inc. November 2012
- NJCAT Field Test Verification Report Letter, Aqua-Swirl® Model AS-5, February 15, 2013.

**Applicant's Use Level Request:**

General Use Level Designation as a Basic Treatment device in accordance with Ecology's 2012 Stormwater Management Manual for Western Washington.

**Applicant's Performance Claims:**

Based on laboratory studies, the Aqua-Swirl® Model AS-3, has been shown to have a total suspended solids removal efficiency (measured as suspended sediment concentration) of 60% when operated at 60% of its water quality treatment flow using OK-110 silica with a d<sub>50</sub> particle size of 110 microns, and average influent of 320 mg/L and zero initial sediment loading.

**Ecology's Recommendations:**

Ecology finds that:

- AquaShield™, Inc. qualifies for the opportunity to demonstrate, through field-testing in the Pacific Northwest, whether the Aqua-Swirl® can attain Ecology's Basic treatment goals. The GULD approval for Pre-Treatment using the Aqua-Swirl® remains in effect.

**Findings of Fact:**

1. The Aqua-Swirl®, sized at no more than 23 GPM/sf, should provide equivalent performance to a presettling basin as defined in the most recent version of *Stormwater Management*

*Manual for Western Washington, Volume V, Chapter 6 (BMP T6.10)*. Note: This reference applies to use in Eastern Washington as well.

2. Tennessee Tech University completed laboratory testing for removal of US Silica OK-110 silica using an Aqua-Swirl<sup>®</sup> Model AS-3. Laboratory results for this 50 to 125-micron silica showed 80% removal at about 23 GPM/sf operating rate. Estimated annual TSS removal efficiency, based on Portland, ME rainfall, is 91%.
3. Findings from the NJCAT Technology Verification report for field testing an Aqua-Swirl<sup>®</sup> Model AS-5 include:
  - a. Aqua-Swirl<sup>®</sup> monitored 18 storm events in Maryland from 2009 through 2011.
  - b. Influent TSS was greater than 100 mg/L for 8 events. Average annual TSS removal was 86.6 percent.
  - c. Influent TSS was less than 100 mg/L for 10 events. Effluent TSS for all 10 events was less than 20 mg/L.
  - d. Influent particle size was 72 percent silt (based on three samples).
  - e. Aqua-Swirl<sup>®</sup> monitored the system up to a maximum of 41.2 GPM/sf. They maintained an 80 percent removal of TSS per storm event up to approximately 23 GPM/sf.

**Other Aqua-Swirl<sup>®</sup> Related Issues to be Addressed By the Company:**

1. Resuspension: The Aqua-Swirl<sup>®</sup> Model AS-5 field test included 16 storm events at less than 23 GPM/sf. Effluent TSS for these 16 storms was less than 20 mg/L and averaged 7.9 mg/L. Influent TSS ranged from 27.8 to 266.3 mg/L and averaged 125.3 mg/L. Given the lack of resuspension at less than 23 GPM/sf, users can install the Aqua-Swirl<sup>®</sup> off-line or on-line.
2. AquaShield should test the system under normal operating conditions, such as partially filling the swirl concentrator with pollutants. Results obtained for “clean” systems may not be representative of typical performance.

**Technology Description:** Download at <http://www.aquashieldinc.com>

**Contact Information:**

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Applicant website: <http://www.aquashieldinc.com>

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

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**Revision History**

<b>Date</b>	<b>Revision</b>
November 2006	GULD for Pre-Treatment
August 2007	Document updated
December 2012	Modified Design Storm Description, added Revision Table
October 2013	CULD for Basic Treatment