

# STORMWATER OPERATION AND MAINTENANCE PLAN LONG TERM POLLUTION PREVENTION PLAN

Pare Project No. 23141.00

## **NORTHBOROUGH FIRE STATION 61 & 65 West Main Street Northborough, Massachusetts**

**Assessors Map 63, Lots 9 & 10**

**Prepared for:**

**Town of Northborough, MA  
63 Main Street  
Westerly, RI 02891**

**Prepared by:**

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**MARCH 2024**

**STORMWATER OPERATION AND MAINTENANCE PLAN**  
**LONG TERM POLLUTION PREVENTION PLAN**  
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- *OM –1 Operation and Maintenance Plan (24" x 36") Site Plan*



# **STORMWATER OPERATION AND MAINTENANCE PLAN**

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## **General Operation and Maintenance Notes**

Following construction, the completion of the inspection and maintenance requirements below shall be the responsibility of the Owner (See Attachment OM-1).

1. The parking lot and entry drives shall be swept by the Owner once in the spring and once during the fall to remove sediments.
2. Trash, litter, sediment and other debris shall be removed from any stormwater facility (including catch basins, manholes, erosion control measures, inlets, diversion and outlet structures) at least once per month at the cost of the Owner.
3. The site shall be checked for all signs of erosion monthly. All signs of erosion shall be reported to the owner.
4. All sediments removed shall be disposed of at an approved and permitted location.
5. Snow storage is prohibited in the stormwater BMP's.
6. All cleaning and maintenance of drainage system BMP's shall be the responsibility of the property owner. See additional inspection, maintenance, and repair notes for the stormwater system.

## **Catch Basins/Area Drains with Sump Inspection, Maintenance, and Repair Notes**

1. Inspections shall be performed a minimum of four times per year (quarterly). Units shall be cleaned annually and whenever the depth of sediment is greater than or equal to half the sump depth.
2. The inlet grate shall not be welded to the frame or paved over so that the sump can be easily inspected and maintained.
3. Care shall be taken to avoid damaging and displacing hoods placed on hooded outlets during cleaning.

## **Underground Infiltration/Detention System Inspection, Maintenance, and Repair Notes**

1. The system shall be maintained as recommended by the manufacturer.
2. Following storm events with rainfall exceeding 3.1"
  - Inspect infiltration/detention system for trash, debris, sediment, erosion, standing water, and overall performance. Defects shall be repaired by the Owner.
3. Bi-annually

- Inspections shall be performed a minimum of two times per year on the inspection ports and drainage structures of the underground infiltration/detention system to ensure proper operation of the system.

### **Water Quality Units – Aqua Swirl and Aqua Filter**

1. The system shall be maintained as recommended by the manufacturer. Operation and maintenance guides are provided as part of this submission for all proposed AquaShield technologies.
2. Following storm events with rainfall exceeding 3.1"
  - Inspect Aqua Swirl and Aqua Shield systems for trash, debris, sediment, erosion, standing water, and overall performance. Defects shall be repaired by the Owner per manufacturer suggested specifications.
3. Bi-annually
  - Inspections shall be performed a minimum of two times per year on the inspection ports and drainage structures of the water quality systems to ensure proper operation.

# LONG TERM POLLUTION PREVENTION PLAN

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## Pollution Prevention and Source Controls

In addition, the following site specific controls and performance procedures shall be followed. From *Massachusetts Erosion and Sediment Control Guidelines*.

### G.2 General Pollution Prevention Design Features

An inspection and maintenance schedule shall be developed by the owner to prevent trash and debris from backing up the stormwater management system.

### G.3 Solid Waste Containment

Trash and recycling receptacles will be placed throughout the site.

### G.4 Roads and Parking Area Management

Snow shall not be dumped and/or stored in the water quality best management practices (Underground Infiltration Area).

#### *G.4.1 Street and Parking Lot Sweeping*

The roads shall be swept to remove sediment and debris.

#### *G.4.2 Deicing and Salt Storage*

Deicing and sanding materials create water quality problems. Refer to Table G-1 in the Appendix when selecting a deicer. All deicing materials shall be stored under cover.

#### *G.4.3 Snow Disposal*

Snow shall not be dumped and/or stored in the sand filter or bioretention area.

#### *G.4.4 Driveway and Parking Lot Sealants*

DEM recommends asphalt based sealant rather coal-tar based sealants to be used on driveways and parking lots

### G.5 Hazardous Materials Containment

Stormwater shall be prevented from entering areas with hazardous materials to the maximum extent feasible. Spill containment is provided in areas where a spill might occur.

Town of Northborough  
**NORTHBOROUGH FIRE STATION**

**APPENDIX A**

Sample O&M Log  
BMP Maintenance and Management Inspection Checklist  
OM-1 Operation and Maintenance Plan (11 x 17)

# Sample Operation and Maintenance Log

Site Maintenance Supervisor: \_\_\_\_\_ Date: \_\_\_\_\_

Routine     Response to Rainfall Event \_\_\_\_\_ in     Other \_\_\_\_\_

BMP	Frequency	Date Performed	Comments
Yard Drain/ Catch Basins/ Manholes/ Outlet Control Structures	Quarterly Inspections		
	Maintenance as necessary		
	Maintain per manufacturer's recommendations		
Water Quality Structures	Inspect per manufacturer's recommendations		
	Maintain per manufacturer's recommendations		
Vegetated Areas	Maintenance as necessary		
Spring Clean Up	Between April and May		
Sweeping	Biannually		
Grass Fertilization	First Application		
	Second Application		
Tree and Shrub Fertilization	Annual Application		
Grass Mowing	As required		
Mulching	AS required; At least biennially for the Bioretention Area		
Edging	As required		
Weed Control	As required		
Pruning	As required		
Aeration	As required		
Lime Application	As required		
Fall Clean up	Between October and December		
Drainage Piping	Annual Inspection		
	Maintenance as necessary		







**Aqua-Filter™**  
**Stormwater Filtration System**  
**Inspection and Maintenance Manual**



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**March 2014**

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## AquaShield™, Inc Stormwater Treatment Solutions

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The highest priority of AquaShield™, Inc. (AquaShield™) is to protect waterways by providing stormwater treatment solutions to businesses across the world. These solutions have a reliable foundation based on over 20 years of water treatment experience.

Local regulators, engineers, and contractors have praised the AquaShield™ systems for their simple design and ease of installation. All the systems are fabricated from high performance, durable and lightweight materials. Contractors prefer the quick and simple installation of our structures that saves them money.

The patented line of AquaShield™ stormwater treatment products that provide high levels of stormwater treatment include the following:

- **Aqua-Swirl® Stormwater Treatment System:** hydrodynamic separator, which provides a highly effective means for the removal of sediment, floating debris and free-oil.
- **Aqua-Filter™ Stormwater Filtration System:** treatment train stormwater filtration system capable of removing gross contaminants, fine sediments, waterborne hydrocarbons, heavy metals and total phosphorous.



Aqua-Swirl®

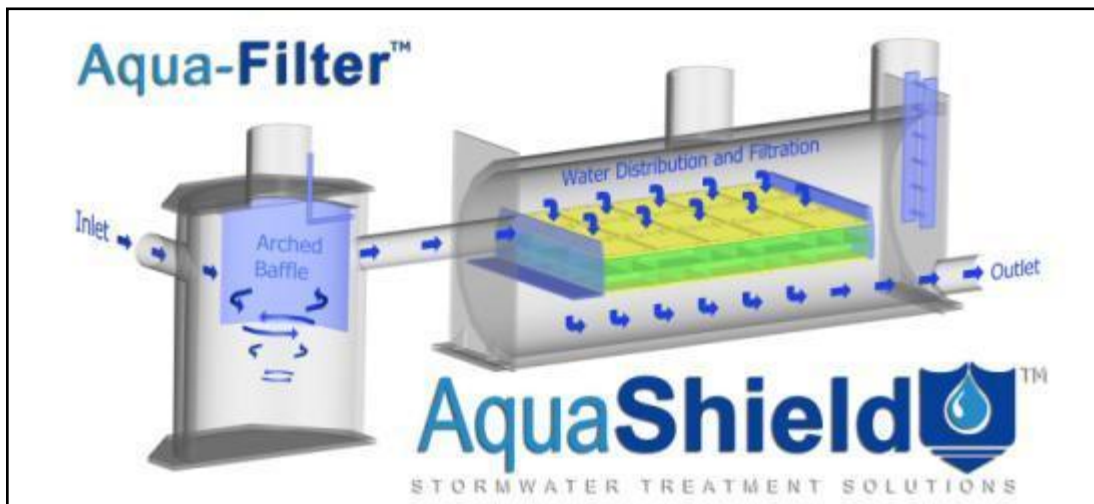


Filtration Chamber of Aqua-Filter™ system



## Aqua-Filter™ Stormwater Filtration System

The Aqua-Filter™ Stormwater Filtration System is designed for projects that require advanced treatment of stormwater runoff. Each system is custom engineered for site-specific needs. The patented Aqua-Filter™ system utilizes a unique “treatment-train” approach that includes an Aqua-Swirl® hydrodynamic separator for pretreatment followed by a filtration chamber for secondary treatment. A variety of natural filter media are used in order to complete the treatment process by polishing the stormwater prior to discharge. Independent laboratory and field performance verifications have shown that the Aqua-Filter™ system achieves over 80% suspended solids removal efficiency on a net annual basis.



**Aqua-Filter™ Stormwater Filtration System showing Aqua-Swirl® for pretreatment followed by filtration chamber for secondary treatment prior to discharge.**

The Aqua-Filter™ Stormwater Filtration System is designed for sites that require advanced treatment of runoff stormwater to meet stringent discharge requirements. Each Aqua-Filter™ system is custom engineered and utilizes a unique approach for pollutant removal. This patented configuration begins with the removal of sediment, debris and free-floating oil by the Aqua-Swirl® Stormwater Treatment System (pretreatment chamber), followed by the removal of fine sediments and other waterborne pollutants by the filtration chamber. The system can be designed for new construction projects or be used for retrofit applications. Inspection and maintenance are made simplified with oversized risers that allow for both examination and cleanout. An ingress/egress ladder is provided for the filtration chamber to better facilitate maintenance. Each Aqua-Filter™ is constructed of high performance, lightweight and durable materials including polymer coated steel (PCS) or high density polyethylene (HDPE). These materials eliminate the need for heavy lifting equipment during installation.

Third party performance and functionality testing has demonstrated Total Suspended Solids (TSS) removals of greater than 80% on a net annual basis. In addition, the Aqua-Filter™ is effective for the removal of other pollutants including petroleum hydrocarbons as well as total phosphorus and various heavy metals when bound to particulate material.



## System Operation

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The Aqua-Filter™ Stormwater Filtration System operates under gravitational and hydrodynamic forces with no moving parts or valves which simplifies the treatment process. The Aqua-Filter™ system is typically installed to operate in an off-line configuration. However, local jurisdictions may allow for in-line (on-line) installations. AquaShield™ recommends that local guidelines be confirmed during the site design process to ensure the proper installation rules for an Aqua-Filter™ system.

### Step 1: Pretreatment by Aqua-Swirl®

Peripheral pretreatment of stormwater is not necessary when using the Aqua-Filter™. In fact, each Aqua-Filter™ is custom engineered to utilize a unique treatment train approach. Operation begins when stormwater enters the Aqua-Swirl® 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® 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. The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.



**Aqua-Swirl® component of the Aqua-Filter™ System.**  
Note tangential inlet and outlet piping stubouts.

## Step 2: Secondary Treatment by Filtration Chamber

The filtration chamber in the Aqua-Filter™ is designed to refine and enhance the stormwater quality prior to discharge into sensitive receiving waters. As the pretreated water enters the filtration chamber, it is evenly distributed across the filter bed and allowed to permeate by gravity flow through the filter media. Either a downflow or upflow configuration can be used for the filtration chamber. The filter media are contained in individual and durable nylon mesh containers (bags) positioned in such manner to avoid short circuiting (see Filter Replacement).



**Filtration chamber of Aqua-Filter™ system being lowered into place. Access risers are visible along the top length of the chamber.**

The natural filter media used for filtration is capable of removing the remaining waterborne pollutants such as fine-grained sediment, oil, total phosphorus, and heavy metals (e.g., copper, lead, zinc). The most commonly used media is coarse perlite. Other filter media such as zeolite, granulated activated carbon, leaf compost, bone char and various proprietary media blends are available to target site-specific pollutant treatment goals and discharge limits.



## **AquaShield™ Product 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 AquaShield™ Stormwater Treatment Systems 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.



**Distinctive AquaShield™ logo is visible on manhole covers for each system.**



**Filter containers (bags) are easily managed.**



## **Inspection**

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All AquaShield™ products can be inspected from the surface, eliminating the need to enter the systems to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection for the first year of operation to develop an appropriate schedule of maintenance. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect site-specific conditions being encountered. Typically, the inspection schedule for subsequent years is reduced to semi-annual inspection events.

***Discussions pertaining to maintenance of the Aqua-Swirl® and Filtration Chamber are provided below***



## **Aqua-Swirl<sup>®</sup> Maintenance**

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The Aqua-Swirl<sup>®</sup> has been designed to minimize and simplify the inspection and maintenance process. The single swirl chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

### **Aqua-Swirl<sup>®</sup> Inspection Procedure**

To inspect the Aqua-Swirl<sup>®</sup> pretreatment chamber, a hook is needed to remove the manhole cover. AquaShield<sup>™</sup> provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate a 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<sup>®</sup> model size and serial number.

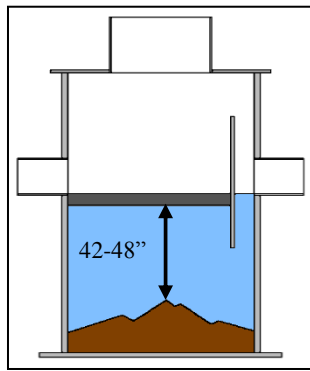
The only tools needed to inspect the Aqua-Swirl<sup>®</sup> system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.



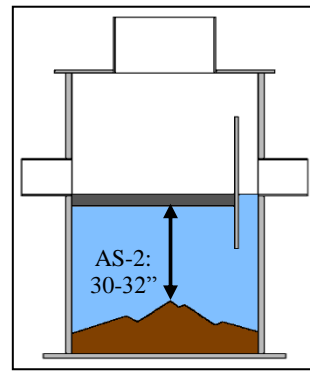
**Sediment inspection using a stadia rod in a single chamber.**

The maintenance trigger for Aqua-Swirl<sup>®</sup> Models AS-3 through AS-13 occurs when the sediment pile is within 42 to 48 inches of the standing water surface. For the Aqua-Swirl<sup>®</sup> Model AS-2, maintenance is needed when the top of the sediment pile is measured to be 30 to 32 inches below the standing water surface.





Maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when sediment pile is 42-48 inches below water surface.



Maintenance trigger for Aqua-Swirl® Model AS-2 occurs when sediment pile is 30-32 inches below water surface.

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.

The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

### **Aqua-Swirl® Cleanout Procedure**

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable 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® 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 (hidden or “blind”) chambers in the Aqua-Swirl®, there are no restrictions to impede on-site maintenance tasks.

### **Disposal of Recovered Materials from Aqua-Swirl®**

Disposal of recovered material is typically handled in the same fashion as catch basin cleanouts. 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® and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.



**Vacuum truck quickly cleans the Aqua-Swirl<sup>®</sup>  
from a single chamber**



## **Filtration Chamber Maintenance**

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The filter media is also easily observed from the surface. Manhole covers are spaced over the entire filtration bed to provide easy access. AquaShield<sup>™</sup> provides a customized manhole cover with our logo to make it easy for maintenance crews to locate a system in the field. An entry riser provides direct access into the filtration chamber with a permanent ladder welded into the downstream section of the filtration chamber. This additional access allows for the vacuuming of any standing water and an unobstructed access to the downstream side of the filter bed.



**A permanent ingress/egress ladder provides access to filter chamber.  
Note metal product identification plate above ladder.**

Initially, perlite filter media is light tan or white in color. When the media color turns black or dark brown, it has become saturated due to pollutant loading and requires replacement. Call toll free (888) 344-9044 to order replacement filters.

Replacement of the filtration media typically requires entry into the filtration chamber by one of a two-member maintenance crew. Confined space entry methods should be followed by the maintenance crew when removing and replacing the filters. The spent filter containers are normally retrieved from the filter chamber by a second crewmember at the surface through the multiple 30-inch risers spaced across the top of the filter bed. In addition, the filter containers can be accessed directly from within the filtration chamber via a vertical removable panel (bulkhead door) at the rear of the filter bed and directly across from the ladder.

### **Filter Media Disposal**

Disposal of recovered material is typically handled in the same fashion as catch basin cleanouts. 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® and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.



**Spent filter media can often be recycled or sent to a permitted lined landfill. Always check local regulations to ensure proper disposal of spent filter media.**

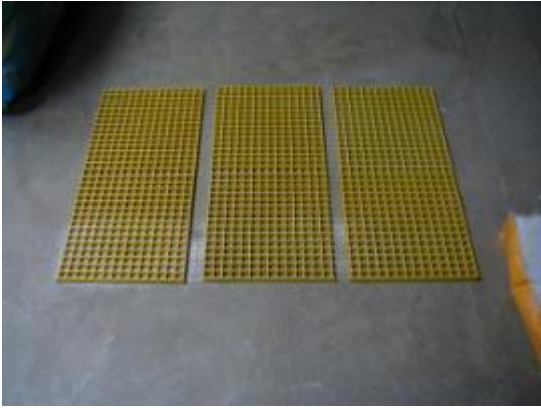
### **Filter Media Replacement**

Instructions and photographs are provided on page 12 showing the procedures to follow to install fresh filter media containers. The bottom of two courses is placed on the fiberglass grates. Cargo netting is used across the top course of the filter containers to secure them in place.

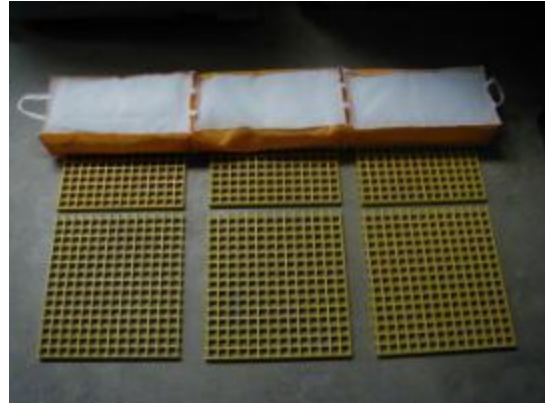
### **Cargo Netting Installation**

Cargo netting is used to secure filter containers in place after containers are installed in the appropriate orientation within the filtration chamber. ***Cargo netting is placed on top of the top course of filter containers*** and stretched into place using provided heavy duty cable ties. The netting is cable tied to anchor blocks and attached to the side walls of the filtration chamber. It is important to install the netting in such a way as to both cover the entire surface area of the containers while stretching netting snugly to minimize container movement under high flow conditions. Netting installation is complete when all surface area of filter containers are covered with netting and netting is secured with cable ties to anchor blocks.

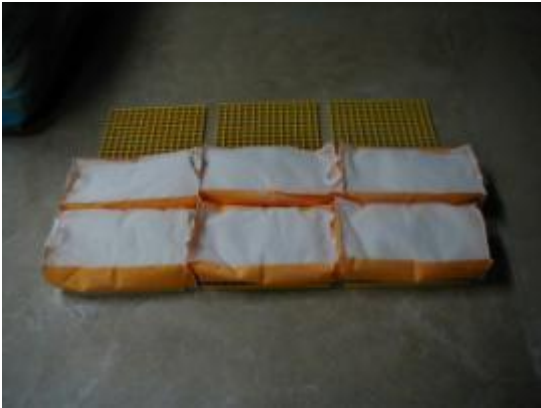
## INSTALLATION INSTRUCTIONS for FILTER CONTAINERS



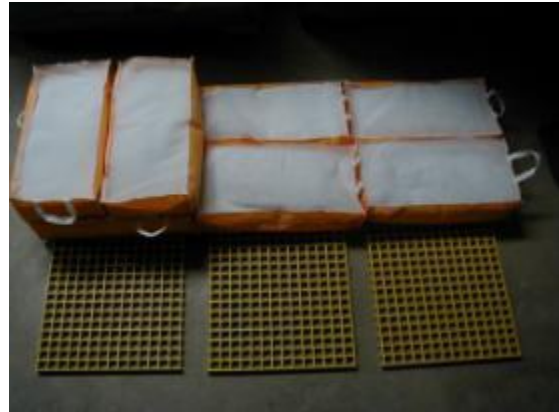
**(1) Bottom Grates found in chamber**



**(2) First row first course**



**(3) Second row**



**(4) Second course started**



**(5) Second course complete**

# Aqua-Filter™ 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 #: \_\_\_\_\_

## INSPECTION

*Note: Aqua-Filter™ system is a treatment train including Aqua-Swirl® pretreatment hydrodynamic separator and filtration chamber.*

### I. Floatable Debris and Oil in Aqua-Swirl®

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl®.
2. Remove floatable debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (½) inch or more oil is present.

Note: Water in Aqua-Swirl® can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

### II. Sediment Accumulation in Aqua-Swirl®

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. For Aqua-Swirl® Models AS-3 through AS-13, schedule cleaning if value in Step #2 is 48 to 42 inches or less.
4. For Aqua-Swirl® Model AS-2, schedule cleaning if value in Step #2 is 32 to 30 inches or less.

### III. Filtration Chamber

1. Remove manhole lid(s) to expose filter media bed and access ingress/egress ladder. At a minimum, one manhole lid will be present to access ladder. Larger filtration chamber sizes may have one or more manhole lids to access filter media bed.
2. Enter filtration chamber via ladder or through access riser(s) over filter bed. Note that water may be present at minimal depths in the filtration chamber prior to clean-out during inspection.
3. Remove bulkhead door (gate) at downstream end of filtration chamber and across from ladder (Figure 1).
4. Remove filter grate covers/cargo nets and filters through access risers located along filtration chamber length or through ingress/egress ladder manhole.
5. Visually inspect filter media noting color and saturation or contaminants.
6. If (perlite) media is dark brown or black, the media is fully spent and should be replaced (Figure 2).



Figure 1. Removable bulkhead door across from ingress/egress ladder at rear of filtration chamber.



Figure 2. Perlite filter media needs replacement.

7. Contact AquaShield™ for replacement filter media containers at (888) 344-9044, or [info@aquashieldinc.com](mailto:info@aquashieldinc.com).
8. Schedule cleaning as described below.

### IV. Diversion Structures (External Bypass Features)

Diversion (external bypass) structures 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 vacor company or AquaShield™ to remove sediment, oil and other floatable pollutants. The spent filter containers and 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-Filter™ system. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Filter™ system (Aqua-Swirl® and filtration chamber) 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-Filter™ system (Aqua-Swirl® and filtration chamber) every three (3) months and clean the system as needed. The Aqua-Filter™ should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance triggers including any of the following:

- depth to sediment is 42 to 48 inches water surface in Aqua-Swirl® Models AS-3 through AS-13,
- depth to sediment is 30 to 32 inches water surface in Aqua-Swirl® Model AS-2
- Oil is present to the degree that requires cleaning, and/or
- filter media exhibits black to dark brown color and/or is saturated with contaminants.

### II. First Year Post-Construction

Inspect the Aqua-Filter™ 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 Aqua-Filter™ 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-Filter™ 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 Aqua-Filter™ 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-Filter™ 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 in Aqua-Swirl®: Yes No

Notes: \_\_\_\_\_

\_\_\_\_\_

Oil present in Aqua-Swirl®: Yes No Oil depth (inches): \_\_\_\_\_

Measurement method and notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Filter Media Needs Replacement: Yes No

Filter grate / cargo netting needs repair/replacement: Yes No



Number of Filter Containers (bags) needing replacement: \_\_\_\_\_

Type of Filter Media: Perlite Other(s): \_\_\_\_\_

Other Filtration Chamber Needs and Observations: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**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: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**NOTES**

<b>Additional Comments and/or Actions To Be Taken</b>	<b>Time Frame</b>

**ATTACHMENTS**

- Attach site plan showing Aqua-Filter™ location.
- Attach detail drawing showing Aqua-Filter™ dimensions and model number.
- Attach details showing basic design and elevations (where feasible) of diversion configuration.

# Aqua-Filter™

## 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*

\* Aqua-Filter™ 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*

\* Aqua-Filter™ 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-Filter™ 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-Filter™ **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 Aqua-Filter™ should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.



# **Stormwater Treatment System Inspection and Maintenance Manual**



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**Fax: (423) 826-2112**  
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June 2022



## **Aqua-Swirl<sup>®</sup> Stormwater Treatment System**

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The Aqua-Swirl<sup>®</sup> Stormwater Treatment System (Aqua-Swirl<sup>®</sup>) is a vortex-type hydrodynamic separator designed and supplied by AquaShield<sup>™</sup>, Inc. (AquaShield<sup>™</sup>). Aqua-Swirl<sup>®</sup> technology removes pollutants including suspended solids, trash, floatables and free-floating oil 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 debris in the Aqua-Swirl<sup>®</sup>



## **Aqua-Swirl<sup>®</sup> 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<sup>®</sup> 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.



Example of Aqua-Swirl<sup>®</sup> manhole cover



## Inspection

The Aqua-Swirl<sup>®</sup> can be inspected from the surface thereby eliminating the need to enter the system to determine when cleanout should be performed. AquaShield<sup>™</sup> recommends in most cases that a quarterly inspection take place for the first year of operation to develop an appropriate schedule of maintenance. 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. The typical inspection schedule for subsequent years is reduced to semi-annual inspection events. **Table 1** below lists the available Aqua-Swirl<sup>®</sup> models as well their inner diameters, oil/debris storage capacities and the sediment storage capacities.

**Table 1. Aqua-Swirl<sup>®</sup> Storage Capacities**

Aqua-Swirl <sup>®</sup> Model	Inner Diameter (ft)	Oil/Debris Storage Capacity (gal)	Sediment Storage Capacity (ft <sup>3</sup> )
AS-2	2.5	37	6
AS-3	3.5	110	11
AS-4	4.5	190	19
AS-5	5.5	270	23
AS-6	6.5	390	33
AS-7	7.5	540	45
AS-8	8.5	710	58
AS-9	9.5	910	74
AS-10	10.5	1,130	91
AS-11	11.5	1,422	110
AS-12	12.5	1,698	131
AS-13	13.0	1,986	154
AS-XX	Custom*		

\* Custom designs to meet site-specific criteria, can include multiple (twin) units for increased flow and materials storage capacity.



## Maintenance

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The Aqua-Swirl<sup>®</sup> has been designed to minimize and simplify the inspection and maintenance process. The single chamber of the system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable trash can be directly observed and maintained through the manhole access provided directly over the swirl chamber. If so equipped, the trash screen can be exposed once the water is removed from the unit and inspected.

### Aqua-Swirl<sup>®</sup> Inspection Procedure

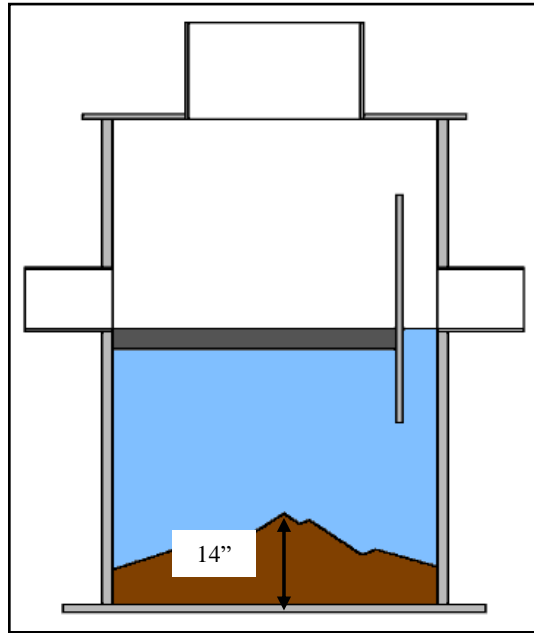
To inspect the Aqua-Swirl<sup>®</sup>, a hook is typically needed to remove the manhole cover. AquaShield<sup>™</sup> provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl<sup>®</sup> model size, and serial number.

The only tools needed to inspect the Aqua-Swirl<sup>®</sup> system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil 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.

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. The Aqua-Swirl<sup>®</sup> design allows for the captured sediment to accumulate in a semi-conical fashion as illustrated below. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.



Sediment inspection using a stadia rod



Maximum recommended sediment depth prior to cleanout is 14 inches for all Aqua-Swirl<sup>®</sup> models (not to scale)

### **Aqua-Swirl<sup>®</sup> Cleanout Procedure**

Cleaning the Aqua-Swirl<sup>®</sup> is simple and quick. Free-floating oil and floatable trash 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<sup>®</sup> 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<sup>®</sup>, there are no restrictions to impede on-site maintenance tasks. If applicable, the trash screen can be reached from the surface and cleaned with a vacuum hose.

### **Disposal of Recovered Materials**

AquaShield<sup>™</sup> recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used. AquaShield<sup>™</sup> also recommends that all materials removed from the Aqua-Swirl<sup>®</sup> and any external bypass structures (divergent and convergent) be handled and disposed of in full accordance with any applicable local and state requirements.



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

***Aqua-Swirl<sup>®</sup>***  
***Inspection and Maintenance Work Sheets***  
***on following pages***



**Aqua-Swirl<sup>®</sup>**  
**Inspection and Maintenance 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/Debris and Oil**

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl<sup>®</sup>.
2. Remove floatable trash/debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (1/2) inch or more of oil and/or trash is present.
4. If applicable, clean trash screen surface with vacuum hose.

Note: Water in Aqua-Swirl<sup>®</sup> can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

**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 14 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 vacor company to remove sediment, trash, oil 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<sup>®</sup>. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield<sup>™</sup> always recommends that all materials removed from the Aqua-Swirl<sup>®</sup> 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<sup>®</sup> full capture device every three (3) months and clean the system as needed. The Aqua-Swirl<sup>®</sup> 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 Aqua-Swirl<sup>®</sup> 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, trash or floatable pollutant storage capacity.

### **III. Second and Subsequent Years Post-Construction**

If the Aqua-Swirl<sup>®</sup> did not reach full sediment or floatable trash capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl<sup>®</sup> reached full sediment, trash 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 Aqua-Swirl<sup>®</sup> should be cleaned annually regardless of whether it reaches its sediment, trash or floatable pollutant capacity.

#### IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl<sup>®</sup> 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: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Oil present:    Yes                  No    Oil depth (inches): \_\_\_\_\_

Measurement method and 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: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**NOTES**

<b>Additional Comments and/or Actions To Be Taken</b>	<b>Time Frame</b>

**ATTACHMENTS**

- Attach site plan showing Aqua-Swirl® location.
- Attach detail drawing showing Aqua-Swirl® dimensions and model number.
- If a diversion configuration is used, attach details showing basic design and elevations (where feasible).

# Aqua-Swirl®

## 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® 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® 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*

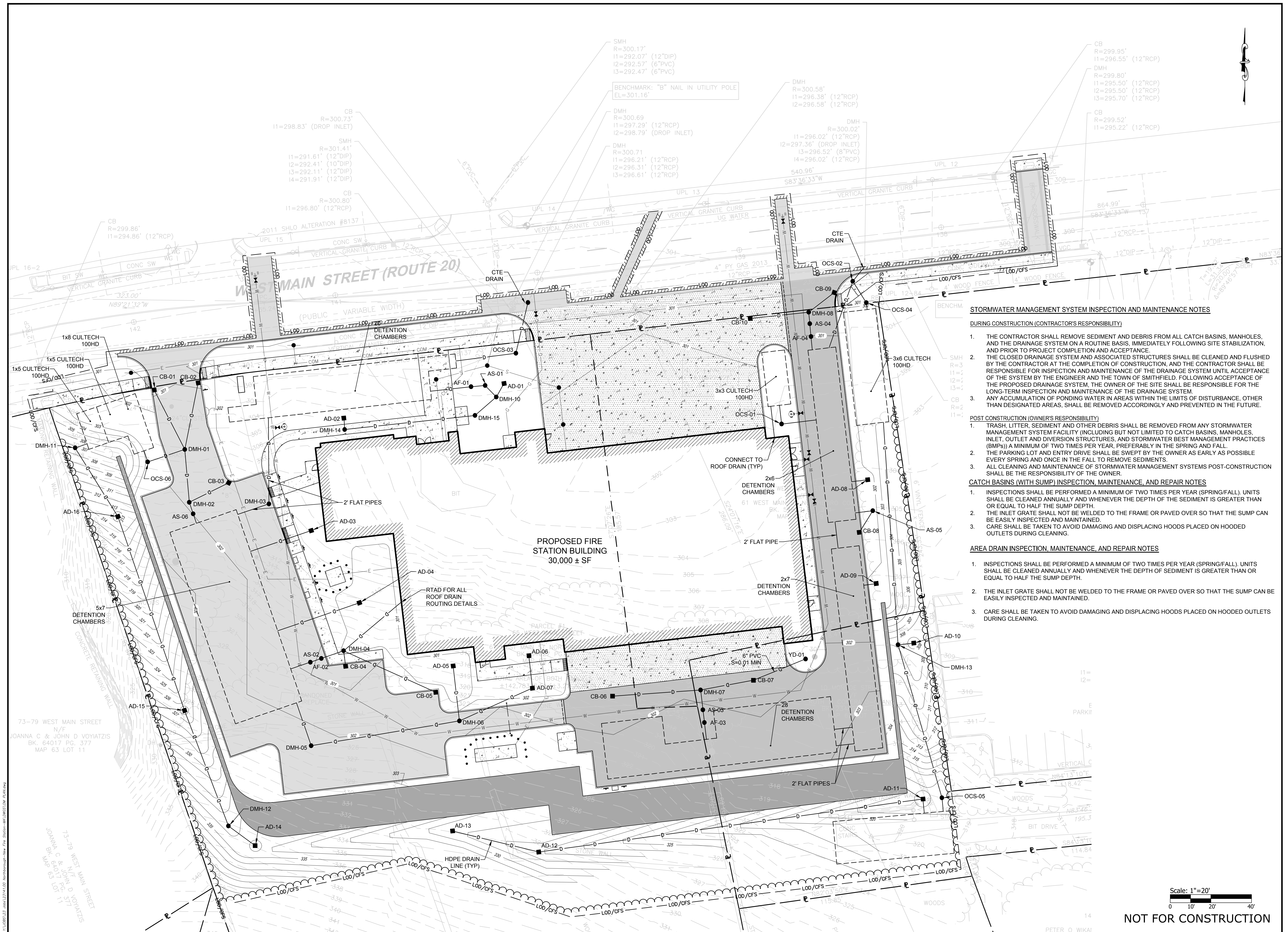
\* If the Aqua-Swirl® did **not** reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® **reached** full sediment, trash 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 Aqua-Swirl® should be cleaned annually regardless of whether it reaches its full sediment, trash or floatable pollutant capacity.



SCALE ADJUSTMENT GUIDE  
 0" 1"  
 BAR IS ONE INCH ON ORIGINAL DRAWING

**Northborough New Fire Station**  
 63 West Main Street  
 Town of Northborough, MA



**STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE NOTES**

**DURING CONSTRUCTION (CONTRACTOR'S RESPONSIBILITY)**

1. THE CONTRACTOR SHALL REMOVE SEDIMENT AND DEBRIS FROM ALL CATCH BASINS, MANHOLES, AND THE DRAINAGE SYSTEM ON A ROUTINE BASIS, IMMEDIATELY FOLLOWING SITE STABILIZATION, AND PRIOR TO PROJECT COMPLETION AND ACCEPTANCE.
2. THE CLOSED DRAINAGE SYSTEM AND ASSOCIATED STRUCTURES SHALL BE CLEANED AND FLUSHED BY THE CONTRACTOR AT THE COMPLETION OF CONSTRUCTION, AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSPECTION AND MAINTENANCE OF THE DRAINAGE SYSTEM UNTIL ACCEPTANCE OF THE SYSTEM BY THE ENGINEER AND THE TOWN OF SMITHFIELD. FOLLOWING ACCEPTANCE OF THE PROPOSED DRAINAGE SYSTEM, THE OWNER OF THE SITE SHALL BE RESPONSIBLE FOR THE LONG-TERM INSPECTION AND MAINTENANCE OF THE DRAINAGE SYSTEM.
3. ANY ACCUMULATION OF PONDING WATER IN AREAS WITHIN THE LIMITS OF DISTURBANCE, OTHER THAN DESIGNATED AREAS, SHALL BE REMOVED ACCORDINGLY AND PREVENTED IN THE FUTURE.

**POST CONSTRUCTION (OWNER'S RESPONSIBILITY)**

1. TRASH, LITTER, SEDIMENT AND OTHER DEBRIS SHALL BE REMOVED FROM ANY STORMWATER MANAGEMENT SYSTEM FACILITY (INCLUDING BUT NOT LIMITED TO CATCH BASINS, MANHOLES, INLET, OUTLET AND DIVERSION STRUCTURES, AND STORMWATER BEST MANAGEMENT PRACTICES (BMPs)) A MINIMUM OF TWO TIMES PER YEAR, PREFERABLY IN THE SPRING AND FALL.
2. THE PARKING LOT AND ENTRY DRIVE SHALL BE SWEEPED BY THE OWNER AS EARLY AS POSSIBLE EVERY SPRING AND ONCE IN THE FALL TO REMOVE SEDIMENTS.
3. ALL CLEANING AND MAINTENANCE OF STORMWATER MANAGEMENT SYSTEMS POST-CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE OWNER.

**CATCH BASINS (WITH SUMP) INSPECTION, MAINTENANCE, AND REPAIR NOTES**

1. INSPECTIONS SHALL BE PERFORMED A MINIMUM OF TWO TIMES PER YEAR (SPRING/FALL). UNITS SHALL BE CLEANED ANNUALLY AND WHENEVER THE DEPTH OF THE SEDIMENT IS GREATER THAN OR EQUAL TO HALF THE SUMP DEPTH.
2. THE INLET GRATE SHALL NOT BE WELDED TO THE FRAME OR PAVED OVER SO THAT THE SUMP CAN BE EASILY INSPECTED AND MAINTAINED.
3. CARE SHALL BE TAKEN TO AVOID DAMAGING AND DISPLACING HOODS PLACED ON HOODED OUTLETS DURING CLEANING.

**AREA DRAIN INSPECTION, MAINTENANCE, AND REPAIR NOTES**

1. INSPECTIONS SHALL BE PERFORMED A MINIMUM OF TWO TIMES PER YEAR (SPRING/FALL). UNITS SHALL BE CLEANED ANNUALLY AND WHENEVER THE DEPTH OF SEDIMENT IS GREATER THAN OR EQUAL TO HALF THE SUMP DEPTH.
2. THE INLET GRATE SHALL NOT BE WELDED TO THE FRAME OR PAVED OVER SO THAT THE SUMP CAN BE EASILY INSPECTED AND MAINTAINED.
3. CARE SHALL BE TAKEN TO AVOID DAMAGING AND DISPLACING HOODS PLACED ON HOODED OUTLETS DURING CLEANING.

73-79 WEST MAIN STREET  
 N/F  
 JOANNA C & JOHN D VOYIATZIS  
 BK. 64017 PG. 377  
 MAP 63 LOT 11

73-79 WEST MAIN STREET  
 N/F  
 JOANNA C & JOHN D VOYIATZIS  
 BK. 64017 PG. 377  
 MAP 63 LOT 11

Scale: 1"=20'  
 0 10' 20' 40'

NOT FOR CONSTRUCTION

**REVISIONS:**

NO.	DATE	DESCRIPTION

PROJECT NO.: 23141.00  
 DATE: MARCH 18, 2024  
 SCALE: 1"=20'  
 DESIGNED BY:  
 CHECKED BY:  
 DRAWN BY: AKL  
 APPROVED BY:  
 DRAWING TITLE:

OPERATION AND MAINTENANCE PLAN

DRAWING NO.: OM-1  
 SHEET NO. OF