



**City of Berea, KY**  
**Stormwater Best Management Practices**

### 3.4 POST CONSTRUCTION STORMWATER CONTROL FACT SHEETS (PTP)

Post Construction Stormwater Control Practices	3.4.6 Water Quality Units
<div data-bbox="228 514 329 590" data-label="Image"> </div> <p data-bbox="228 695 321 726"><b>Symbol</b></p> <div data-bbox="215 819 362 928" data-label="Image"> </div> <p data-bbox="186 955 427 1056"><b>TSS Reduction:</b>  Pretreatment: 50%  Full treatment: Varies</p>	<div data-bbox="506 401 1406 1052" data-label="Image"> </div>
<p data-bbox="191 1182 365 1220"><b>Description</b></p> <p data-bbox="399 1182 1412 1407">Water quality units target pollutants from urban areas or hotspots and provide water quality benefits at stormwater inlets. Units are generally designed as compact below grade systems constructed of precast concrete. Units often employ a swirling motion or baffling that causes sediments and particulates to settle out and a chamber to capture floatable material. Water quality units included here are hydrodynamic separators, filtration units, and continuous deflection separators.</p> <p data-bbox="399 1440 1412 1623"><b>Hydrodynamic separators</b> are flow-through systems with a separation cylinder unit to promote the settlement of sediments and other pollutants. No outside power source is required as the system is designed to utilize the energy of flowing water. Means of separation vary between hydrodynamic separator units, which may employ velocity reduction to allow settling or indirect filtration.</p> <p data-bbox="399 1659 1412 1766"><b>Filtration units</b> are devices inserted into storm drains to filter or absorb sediment, pollutants and oil and grease. Filter media cartridges are commonly used to collect and dispose of pollutants.</p> <p data-bbox="399 1801 1412 1871"><b>Continuous deflection separators</b> treat runoff by screening sediment and debris via a vortex of water that deflects sediment and debris into a sump while water flows through a screen.</p>	



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### Applications

Water quality units work well in areas targeting floatables, grass solids, oils and grease. Water quality units are most suitable for highly impervious sites. Because of their limited removal ability of soluble pollutants and fine particles, these devices should be used as a pretreatment device, and should not act as a stand-alone practice for new development. However, when space is limited, water quality units are ideal for retrofit applications. Site types may include automotive lots, parking lots, roadways, road salt storage facilities, hazardous substance facilities and rooftop runoff.

Water quality units are typically suitable for the following applications:

- Impervious area runoff
- Retrofit applications
- In conjunction with other stormwater BMPs

### Target Pollutants

Target pollutants and removal effectiveness may vary widely between the unit type and manufacturer. If available, independent data should be used to consider a water quality unit brand or manufacturer. Independent studies suggest that water quality units primarily target litter and debris with limited pollutant removal capacity, particularly for fine particles and soluble pollutants. Target pollutant information for this fact sheet was based on data from the Environmental Protection Agency's fact sheet, *Manufactured Products for Stormwater Inlets*, referencing S.S. Greb and R. Waschbusch's study, "Evaluation of Stormceptor® and multi-chamber treatment train as urban retrofit strategies", 1998. This study investigated 45 precipitation events over a 9-month period and calculated percent removal rates to reflect overall efficiency, accounting for pollutants in bypassed flows.

### Design Components

#### ➤ Hydrodynamic Separators

Hydrodynamic separators are generally considered flow-through devices that promote settling or separation to remove sediment and other pollutants by a swirling action. These structures do not require outside power sources, and become effective through the energy of flowing stormwater. These units are typically placed beneath parking lots or streets, and are directly connected to impervious areas.

#### ➤ Filtration Units

Filtration units employ some type of filter media that collects stormwater pollutants as water flows through the structure. The filter media must be regularly replaced to allow pollutant removal to continue effectively.

#### ➤ Continuous Deflection

The sizing and design for water quality units should be based on the manufacturer's product specifications. Units are generally designed according to the peak flow rate for a given design storm event at the inlet. Units may have features designed to reduce the velocity of the stormwater flow entering the unit, which increases the capacity of sediment removal of the system.



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### Maintenance

Maintenance instruction should be obtained from the manufacturer to maintain the pollutant removal effectiveness of water quality units. Water quality units are reliable and relatively low maintenance systems due to their design with no moving parts. Maintenance is primarily needed to clean the system of debris and pollutants to keep it working properly. When not properly maintained, water quality units have a high failure rate.

Maintenance and inspections should be conducted regularly after storm events to ensure the long term functionality of the system. By inspecting the unit before and after a significant rain event, the amount and the types of materials being captured can be monitored. This practice can aid in scheduling maintenance based on physical observation and attention to rainfall frequency. Consideration should also be placed on droughts or dry periods, where accumulation of pollutants can build up and create large amounts of floatables, debris, sediment, oils, hydrocarbons, and other pollutants during first-flush events.

Access to manholes should be clear and unobstructed to allow maintenance to the unit.

#### Semi-Annual Inspection

- Inspect unit for sediment buildup and structural damage

#### Routine Maintenance

- Remove sediment and debris from unit via vacuum truck, sump vac or other means.
- Increase maintenance schedule to remove debris during heavy leaf fall or other seasonal accumulation of trash or debris.
- Inspect after significant rainfall events to see if maintenance is needed.



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### Design Guidance

Section 2.7 outlines the criteria and approval process for proprietary or manufactured BMPs within the City limits. Where the water quality unit is not rated for full treatment (80% TSS reduction), additional permanent treatment practices are required. Water quality units are not typically designed for stormwater quantity control as well, so a detention structure such as a detention pond will be required.

For water quality units designed based upon a flow rate, the following equation must be used to simulate treatment of the WQ<sub>v</sub>:

$$Qp = C * I * A$$

Where:

Qp = the peak flow through the proprietary BMP in cfs

C = runoff coefficient

I = rainfall intensity, 2.45 in/hr

A = the contributing drainage area for the BMP, in acres

### Maintenance

A maintenance and operation plan must be provided for each water quality unit. This information can be provided by the manufacturer and must address the following items:

- Expected clean out frequency
- Unit life expectancy
- Procedures addressing dewatering of the unit, should it get clogged
- A cross sectional view of the unit with all overflow structures, weirs, pipe connections clearly identified
- The bypassing mechanism and any maintenance requirements for that component