



# Downstream Defender®

Advanced vortex separation maximizes sediment removal while controlling costs.

## Product Profile

The Downstream Defender® is an advanced vortex separator used to treat stormwater runoff in pretreatment or stand-alone applications. Its unique flow-modifying internal components distinguish the Downstream Defender® from conventional and simple swirl separators that typically bypass untreated peak flows to prevent washout of captured pollutants. Its wide treatment flow range, low headloss, small footprint and low-profile make it a compact and economical solution for capturing nonpoint source pollution.

## Components

- |                                    |                          |
|------------------------------------|--------------------------|
| 1. Inlet to Precast Vortex Chamber | 4. Outlet Pipe           |
| 2. Cylindrical Baffle              | 5. Sediment Storage Sump |
| 3. Center Shaft                    | 6. Access Lid            |

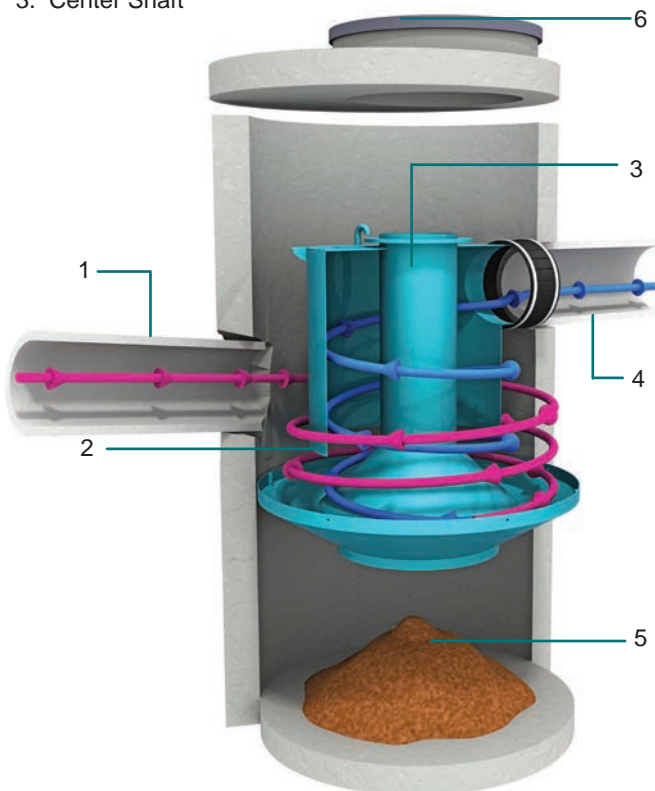


Fig.1 The Downstream Defender® has internal components designed to maximize pollutant capture and minimize pollutant washout.

## Applications

- Removal of total suspended solids (TSS), floatable trash and petroleum products from stormwater runoff
- New construction or redevelopment of commercial and residential sites
- Pollutant hotspots such as maintenance yards, parking lots, gas stations, streets, highways, airports and transportation hubs
- Site constrained LID or green infrastructure based developments
- LEED® development projects

## Advantages

- Special internal components maximize pollutant capture and minimize footprint, headloss and washout
- Captures and retains a wide range of TSS particles
- High peak treatment flow rates
- Treats the entire storm with no washout or untreated bypass flows
- Low maintenance requirements - no dredging required, and no screens or media to block
- Variable inlet/outlet angles for ease of site layout

## How it Works

Advanced hydrodynamic vortex separation is a complex hydraulic process that augments gravity separation with low-energy rotary forces. The flow modifying internal components used in the Downstream Defender® harness the energy from vortex flow and maximize the time for separation to occur while deflecting high scour velocities (Fig.1).

Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (magenta arrow) and inner (blue arrow) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe. Maintenance ports at ground level provide access for easy inspection and clean-out.

# Downstream Defender®

## Downstream Defender® Design

### Drainage Profile

The Downstream Defender® is designed with a submerged tangential inlet to minimize turbulence within the device. Turbulence increases system headlosses and reduces performance by keeping pollutant particles in suspension.

The inlet elevation of the Downstream Defender® is located one inlet pipe diameter lower than the elevation of the outlet invert (Fig.2). This arrangement ensures that influent flows are introduced to the treatment chamber quiescently below the water surface elevation, minimizing turbulence.

The unique flow-modifying internal components also minimize hydraulic losses. There are no internal weirs or orifices; large clear openings ensure low headloss at peak flow rates with little risk of blockages that cause upstream flooding.

### Sizing & Design

The Downstream Defender® can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (Table 1). Selection and layout of the appropriate Downstream Defender® model depends on site hydraulics, site constraints and local regulations. Both online (Fig.3a) and offline (Fig.3b) configurations are common.

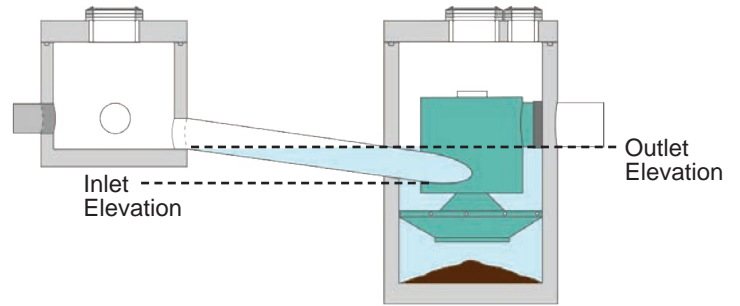


Fig.2 The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.

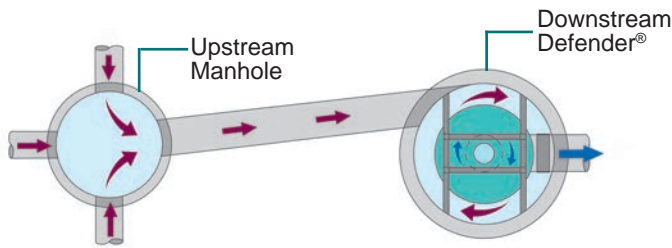


Fig.3a The Downstream Defender® in an online configuration.

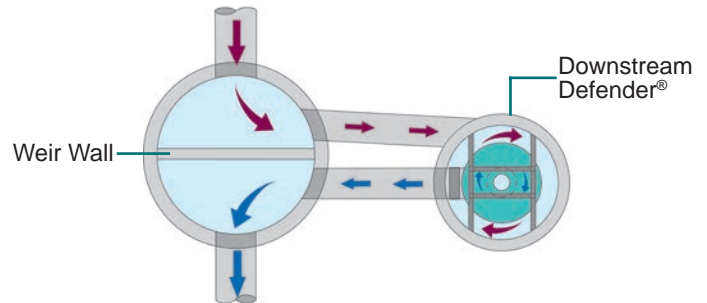



Fig.3b The Downstream Defender® in an offline configuration.



**Free Downstream Defender® Sizing Calculator for Engineers**

The *Downstream Defender® Sizing Calculator* is a simple online tool that recommends the best model size and online/offline arrangement based on site-specific data entered by the user.

Go to [www.hydro-int.com/us/products/downstream-defender](http://www.hydro-int.com/us/products/downstream-defender) and click on the *Downstream Defender® Sizing Calculator* icon.

Table 1. Downstream Defender® Design Chart.

Model Number and Diameter		Peak Treatment Flow Rate		Maximum Pipe Diameter		Oil Storage Capacity		Sediment Storage Capacity		Minimum Distance from Outlet Invert to Top of Rim		Standard Height from Outlet Invert to Sump Floor	
(ft)	(m)	(cfs)	(L/s)	(in)	(mm)	(gal)	(L)	(yd <sup>3</sup> )	(m <sup>3</sup> )	(ft)	(m)	(ft)	(m)
4	1.2	3.0	85	12	300	70	265	0.70	0.53	2.8	0.85	4.1	1.25
6	1.8	8.0	227	18	450	216	818	2.10	1.61	3.2	0.98	5.9	1.80
8	2.4	15.0	425	24	600	540	2,044	4.65	3.56	4.2	1.28	7.7	2.35
10	3.0	25.0	708	30	750	1,050	3,975	8.70	6.65	5.0	1.52	9.4	2.85
12*	3.7	38.0	1,076	36	900	1,770	6,700	14.70	11.24	5.6	1.71	11.2	3.41

\*Not available in all areas. Contact Hydro International for details.