



## STORM BULLETIN 7

# COMPARISON OF DETENTION AND HYDRODYNAMIC SYSTEMS

- **Detention Stormwater Treatment (DST)** systems are configurations such as grassed swales and wet ponds. The sizing guideline for these systems is to detain a specified volume of runoff for specified period of time.
- **Hydrodynamic Stormwater Treatment (HST)** systems are configurations such as the V2B1 and other configurations. They employ standard precast concrete manholes with internal piping/baffles to enhance stormwater treatment. The sizing guideline allows for these systems to treat peak runoff flows representative of rainfall intensities that are able to scour sediment from pavement.
- **The relative sediment removal efficiency** of these treatment options can be estimated. This is accomplished by first establishing sizing guidelines. The treatment systems are then examined by using an overflow weir to discharge clarified water from the sedimentation system, and then applying standard sedimentation science. The table below compares particle removal efficiency when the sizing guideline is to treat the first half inch of runoff from the impervious area:

<b>Best Management Practices (BMP)</b>	<b>DST</b>	<b>HST</b>
Impervious area, acres	1.0	1.0
Rainfall, in inches	0.70	0.70
Runoff, in inches	0.50	0.50
Runoff, in ft <sup>3</sup>	1800	1800
Fraction runoff detained	0.55	0.0
Volume detained, in ft <sup>3</sup>	990	0.0
Depth of detained volume, in ft	4.0	0.0
Plan dimensions of sedimentation system	10'x25'	4' dia.
Plan area for sedimentation, in ft <sup>2</sup>	250	12.8*
Peak inlet flow, in ft <sup>3</sup> /sec	0.70	0.70
Peak outlet flow, in ft <sup>3</sup> /sec	0.07	0.70
Residence time in treatment system, in hrs	4.0	0.01
Peak outlet flow/plan area = ft <sup>3</sup> /sec/ft <sup>2</sup> = ft/sec	0.00028	0.054
Peak flow rate settling velocity, in ft/sec	0.00022	0.043
Peak flow rate particle removal, in microns	10	130**
Mineral particle classification	fine silt	fine sand***

\*HST particle removal capability is affected by both flow distribution and turbulence at the water surface in the sedimentation system. The table above assumes ideal conditions for sedimentation.



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\*\*Peak flow particle removal refers to the smallest particle that can be removed by sedimentation at the specified peak flow rate. At lower peak flow rates (e.g. the early stages of the wash-off event) smaller particles can be removed by sedimentation.

\*\*\*Based on the table above, HST would be suitable in situations where removal of fine sand is adequate. DST (or a filter media ) would be required when removal of fine silt is necessary.