

Technology That Separates

STORM BULLETIN 10

OPERATING HYDRAULICS IN STORMWATER TREATMENT SYSTEMS (STS)

- **Operating hydraulics in an STS** must be estimated in order to determine the following:
 - Flow patterns and water surface elevations during significant sediment wash-off events.
 - Flow patterns and water surface elevations during higher flows and the associated concerns regarding sediment re-entertainment and surcharge of the upstream storm sewer system.
- Estimation of operating hydraulics can be based on backwater analysis of the storm sewer system:

STSE = OL +HW STSE = water surface elevation in the STS

OL = operating loss of the STS

HW = headwater depth at the STS outlet pipe

- The value of OL for a sediment pond is negligible, while for that of a stormwater treatment chamber it can be significant depending on the flow conductance of internal baffles and weirs. In addition, screens and/or filters have increased operating loss as material accumulates on their surfaces. For the V2B1 the operating loss at the higher flows is typically less than 0.6 ft.
- **The value of HW** is dependent on the hydraulics of the storm sewer system downstream of the STS, and is typically estimated using reasonable approximations for downstream hydraulics. The value of HW will vary significantly, since the design treatment flow rate is typically 7-14 times less than the design storm flow rate (the return interval range used for the design storm is from 10-yr to 100-yr).
- Stormwater flow to an STS can be limited by installing bypass manholes that allow the STS to be placed "offline" in parallel with the storm sewer. However, mainline flow velocity is a consideration since head loss in the upstream flow splitter manhole may be excessive. For example, a mainline flow velocity of 8 ft/sec the flow splitter manhole head loss equals 1.5 ft (based on a junction loss coefficient of 1.5 using a diversion weir).
- **Backwater analysis** is needed to ensure that the STS will have acceptable hydraulics during both treatment and the design storm. The Environment 21 Engineering Department prepares these analyses using proprietary hydraulic modeling correlations for the V2B1. The analysis can be provided for confidential review where necessary.