

## Sediment Forebay



Source: MassDEP,  
<https://megamanual.geosyntec.com/npsmanual/sedimentforebays.aspx>

### Description

A sediment forebay is a separate cell within or immediately upstream of a structural stormwater BMP designed to capture, temporarily store, and settle coarse sediment and debris from runoff in an accessible area. A sediment forebay is formed by a barrier such as an earthen berm, concrete weir, granite curbing, or stone gabion baskets. Sediment forebays are highly flexible and can be adapted to meet site-specific constraints. The forebay has a non-erosive outlet into the primary stormwater BMP and can be configured as a riser and pipe, overflow weir, or culvert. The elevation of the outlet should be set such that the forebay is sized to temporarily store 10% to 25% of the Water Quality Volume (WQV). [Figure 13-1](#) shows a schematic elevation view of a sediment forebay designed within a stormwater BMP.

<i>Stormwater BMP Type</i>	
Pretreatment BMP	■
Infiltration BMP	□
Filtering BMP	□
Stormwater Pond BMP	□
Stormwater Wetland BMP	□
Water Quality Conveyance BMP	□
Stormwater Reuse BMP	□
Proprietary BMP	□
Other BMPs and Accessories	□

<i>Stormwater Management Suitability</i>	
Retention	□
Treatment	□
Pretreatment	■
Peak Runoff Attenuation	□

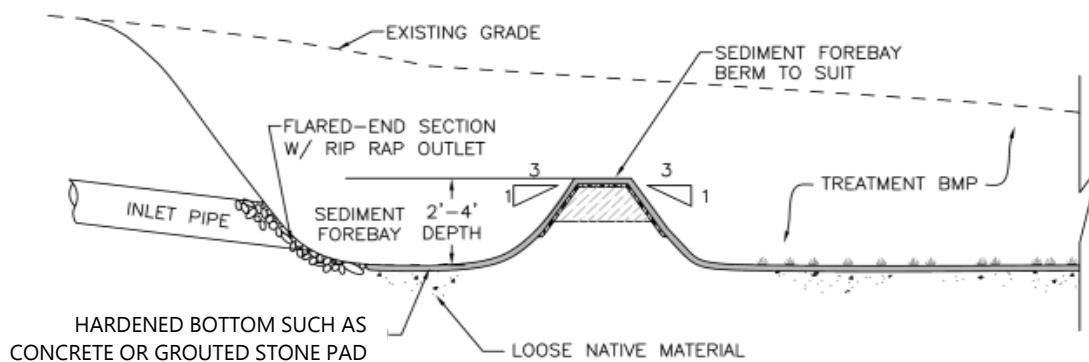
<i>Pollutant Removal</i>	
Sediment*	<b>High</b>
Phosphorus	<b>Low</b>
Nitrogen	<b>Low</b>
Bacteria	<b>Low</b>

\*Includes sediment-bound pollutants

<i>Implementation</i>	
Capital Cost	<b>Low to Moderate</b>
Maintenance Burden	<b>Moderate</b>
Land Requirement	<b>Moderate to High</b>

**Figure 13-1. Sediment Forebay Schematic**



Source: Adapted from Rhode Island Stormwater Design and Installation Standards Manual (2015)

## Siting Considerations

Sediment forebays should be located at each inflow point into the primary stormwater BMP. There may be multiple inflow points into a single forebay.

## Design Recommendations

### Sizing and Dimensions

- Inflow Velocity
  - In accordance with [Inlet and Outlet Controls](#) section of Chapter 13
- Length/Width
  - Minimum: 1:1 ratio (2:1 or greater preferred)
- Freeboard
  - Minimum: 0.5-foot for off-line BMPs; 1-foot for on-line BMPs
- Bottom Surface Area
  - Use the following equation (Camp-Hazen equation) for sizing the surface area of the bottom of the forebay:

$$A = -\frac{Q}{W} \ln(1 - E) = 0.066 * \%WQV$$

where:

$A$  = minimum required surface area of sediment forebay (square feet)

$Q$  = discharge from drainage area (cubic feet per second)

=  $\%WQV / 86,400$  seconds

$\%WQV$  = percent of the water quality volume required for sediment forebay design (cubic feet)

$W$  = 0.0004 feet per second particle settling velocity for silt

$E$  = sediment removal efficiency (assume 0.9 or 90%)

- Volume
  - Size the sediment forebay to store 10% to 25% of the WQV below the outlet invert unless specified otherwise in the respective BMP design sections of this Manual. The storage volume of the sediment forebay can be included in the overall design storage volume of the main stormwater BMP provided that the sediment forebay drains to the BMP.
  - Do not account for infiltration in the forebay sizing analysis.
  - Ensure adequate depth to prevent resuspension of collected sediments during the design storm with flowthrough velocities not exceeding 2 feet/second for all design storms.

- Side Slope
  - Maximum: 3(H):1(V)

## Features

- Forebay Berm
  - Use gabion baskets, concrete or granite curbing, precast or cast-in-place concrete weirs, or earthen berm. Earthen berms should be armored to prevent erosion of the embankment.
- Bottom of Forebay
  - Use a hardened bottom (line with a concrete or grouted stone pad) to make sediment removal easier. UngROUTED stone riprap should not be used within the forebay since it makes removal of accumulated sediment more difficult and costly.
  - If using concrete or a grouted stone pad, provide at least two weep holes (2.5 inches in diameter) for every 25 square feet of surface area in the bottom of the forebay to facilitate low level drainage.
- Stage Indicator/Gage
  - Install a stage indicator/gage to monitor sediment levels.
  - The gage should indicate the level at which the forebay is considered full.

## Materials

- Curbing
  - If used, granite or concrete curbing should conform to State of Connecticut Department of Transportation Standard Specifications, Section M.12.06 (Stone Curbing) and Section 8.11 (Concrete Curbing).
- Gabion Basket
  - If used, should conform to ASTM A-974-97 and US Federal Specification QQ-W-461H and coated in accordance with ASTM A641, Finish 5, Class 3.
- Grouted Riprap
  - If used, stone riprap should conform to State of Connecticut Department of Transportation Standard Specifications, Section M.12.02 (Riprap).
  - Grout should be a non-shrink grout having a 4,000 psi 28-day compressive strength and a 2,400 psi 7-day compressive strength in accordance with State of Connecticut Department of Transportation Standard Specifications, Section M.03.05.
- Outlet or Riser Pipe
  - Refer to [Inlet and Outlet Controls](#) section of Chapter 13.

- Poured-in-Place Concrete
  - If used, should be an appropriate class of concrete based on the application and conform to State of Connecticut Department of Transportation Standard Specifications, Section 6.01 (Concrete for Structures).
- Precast Concrete
  - If used, should be an appropriate class of concrete based on the application and conform to State of Connecticut Department of Transportation Standard Specifications, Section M.08.02-4 (Precast Concrete).

### **Maintenance Needs**

- Inspect the sediment forebay and measure the depth of accumulated sediment twice a year.
- Remove sediment from the sediment forebay or other pretreatment area when it accumulates to a depth of more than 12 inches or 50% of the design depth. Clean outlet of sediment forebay or other pretreatment measures when drawdown time exceeds 36 hours after the end of a storm event.