

PRE-TREATMENT BMPS (BEST MANAGEMENT PRACTICE)

In the State of Maryland the different BMP designs are found in six (6) general categories for stormwater quality control (WQ_v and/or Rev).

BMP Group 1 stormwater ponds
BMP Group 2 stormwater wetlands
BMP Group 3 infiltration practices
BMP Group 4 filtering practices
BMP Group 5 open channel practices
BMP Group 6 non-structural practices

Water quality facilities are intended to:

- Capture and treat the required water quality volume
- Remove 80% of the TSS (total suspended solids)
- Remove 40% of the TP (total phosphorus)
- To be have longevity

GROUP 3: INFILTRATION PRACTICES

The following structures are designed to temporarily detain and treat the water quality volume before allowing it to infiltrate into the soil over a 48 hour period.

Infiltration trench
Infiltration basin

GROUP 4: FILTERING PRACTICES

The following structures are designed to temporarily detain the water quality volume and pass it through a filter bed of sand, organic matter, soil or other media.

Surface sand filter
Underground sand filter
Perimeter sand filter
Organic filter
Pocket sand filter
Bioretention

GROUP 5: OPEN CHANNEL PRACTICES

Vegetated open channels are designed to capture and treat the full WQ_v using check dams or other means.

Dry swale
Wet swale

INFILTRATION HIGHS - MADONNA



INFILTRATION PRACTICES

Design:

- All infiltration systems are designed to fully dewater the enter water quality volume within 48 hours of the storm event.
- A minimum of 25% of the water quality volume must be pretreated before entering an infiltration facility.

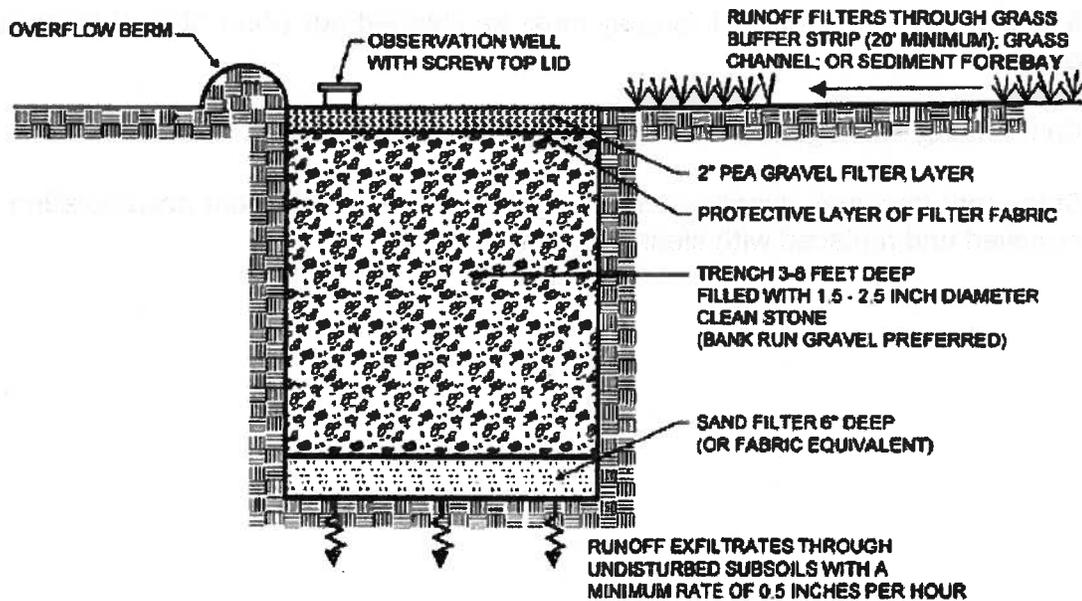
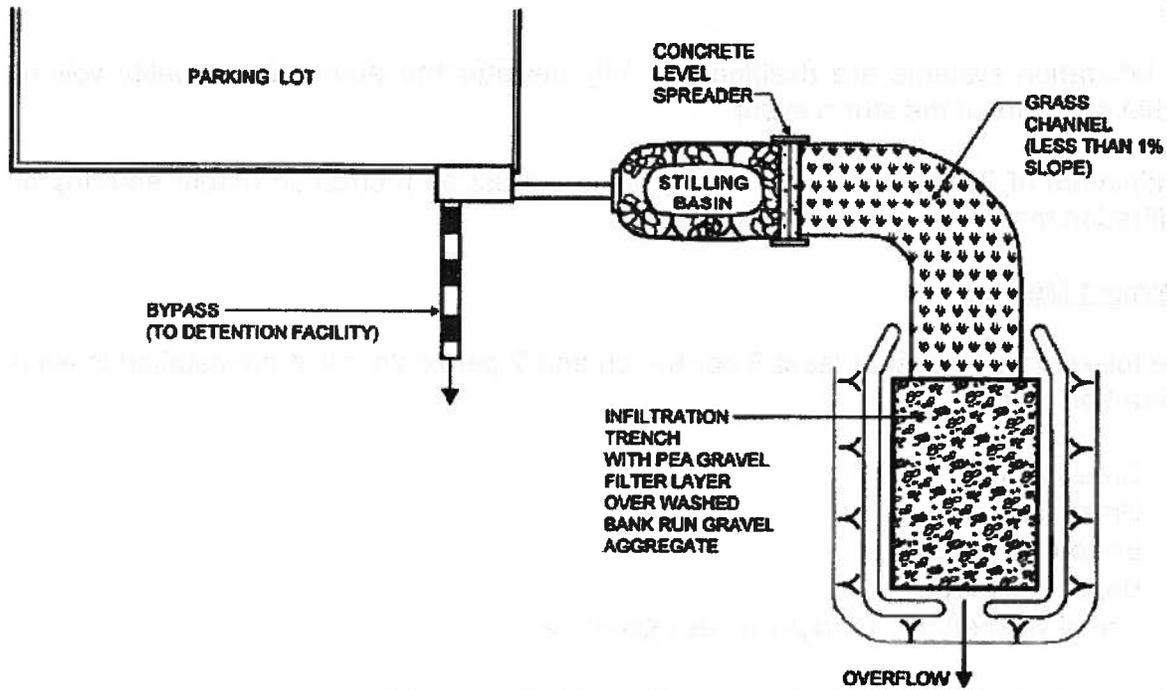
Pretreatment Methods:

- The following methods, at least 3 per trench and 2 per basin, must be installed in every infiltration practice.
 - Grass channel
 - Grass filter strip
 - Bottom sand layer
 - Upper sand layer
 - Use of washed bank run gravel as aggregate
- The sides of an infiltration trench must be lined with filter fabric.
- An observation well must be installed in every infiltration trench.

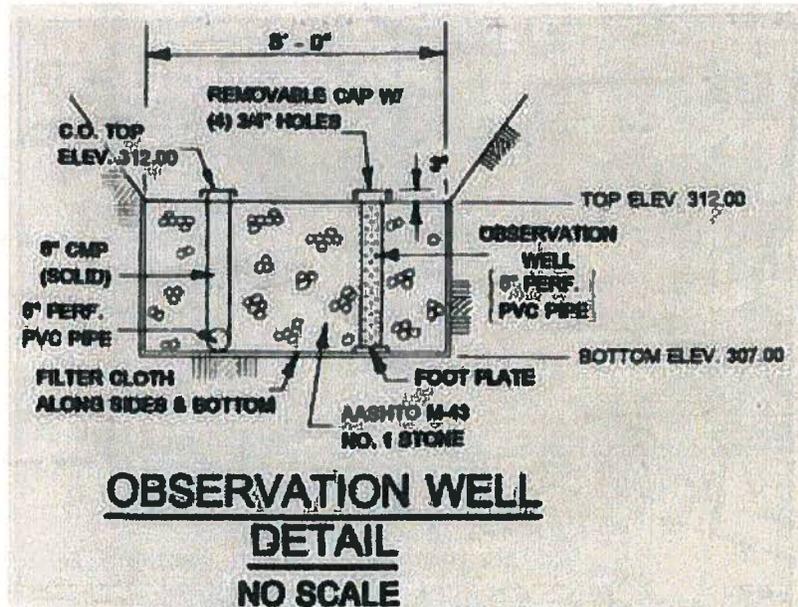
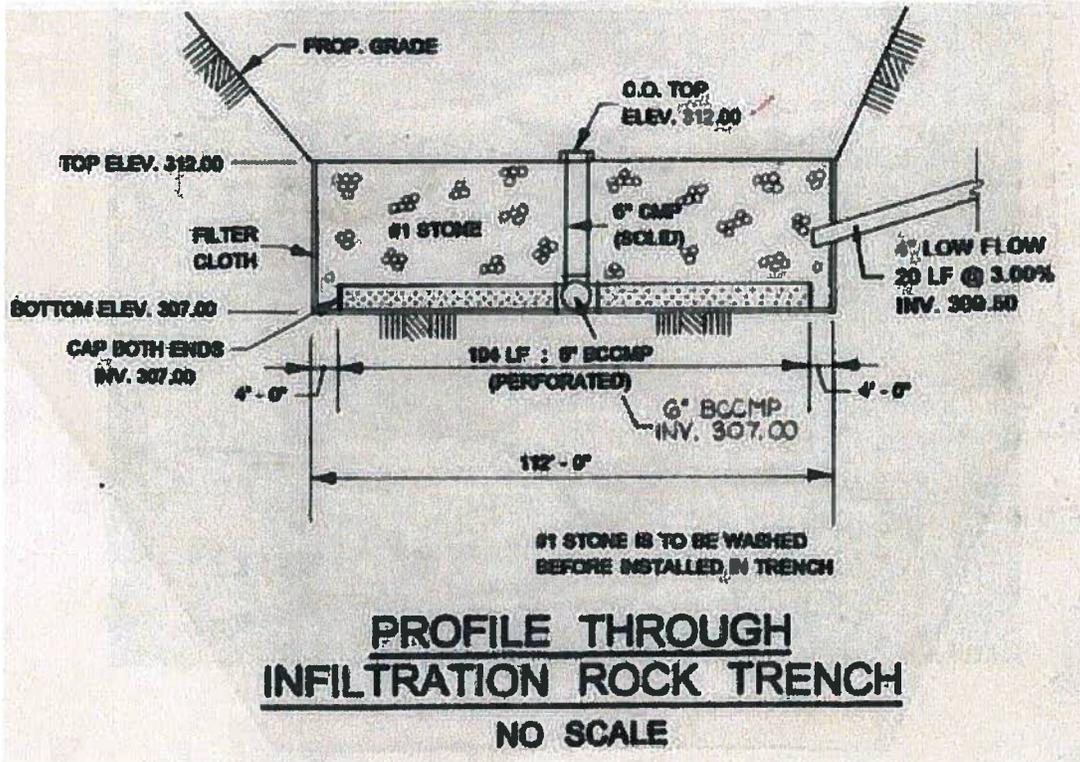
Landscaping and Maintenance:

- A stilling basin or sediment forebay must be cleaned out when 50% of its capacity has been lost.
- Contributing drainage areas must be stabilized.
- Stone that becomes overgrown with vegetation due to sediment accumulation must be removed and replaced with clean material.

INFILTRATION TRENCH

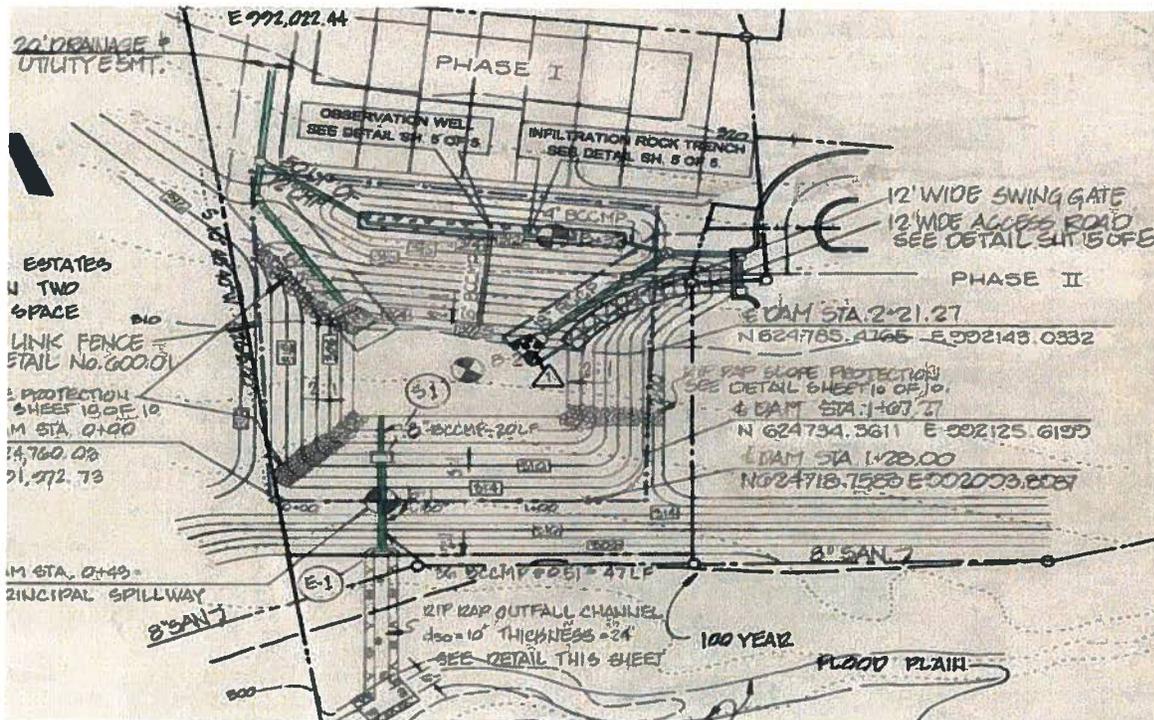


INFILTRATION TRENCH DETAIL
AMYCLAE ESTATES SECTION 5

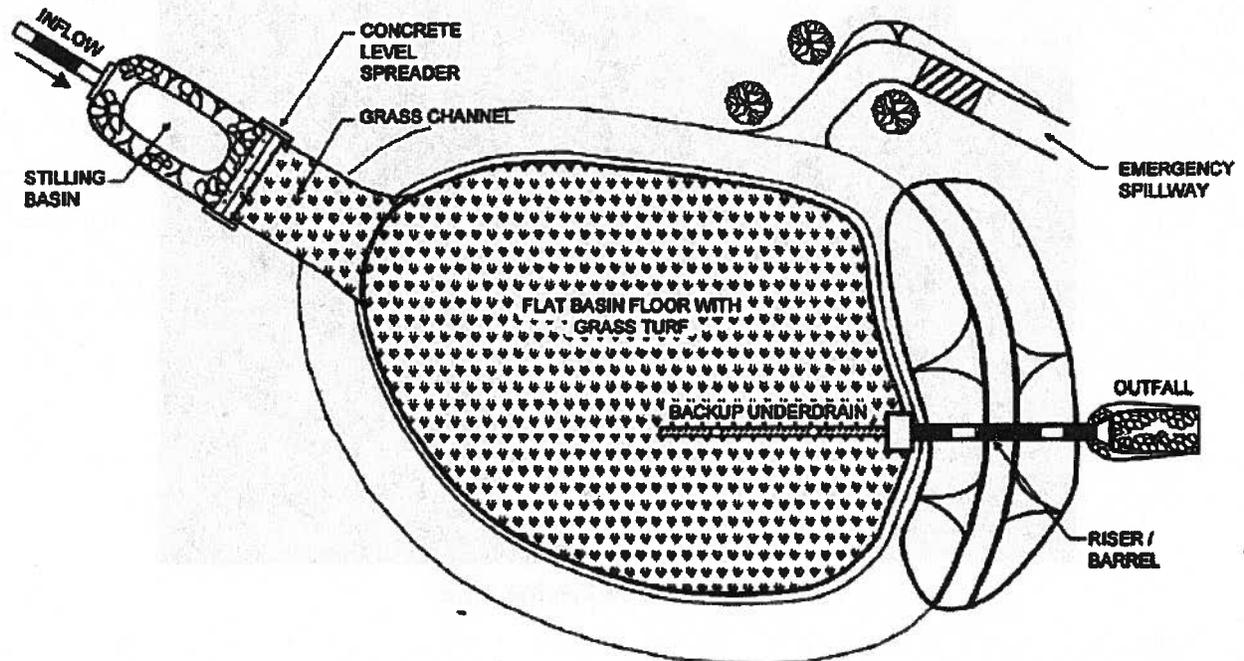


INFILTRATION TRENCH

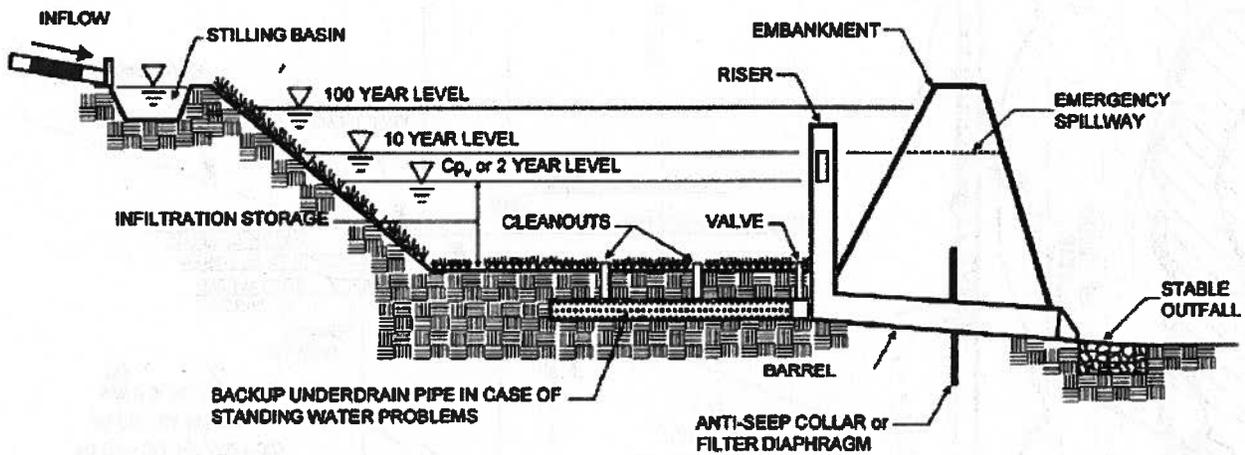
AMYCLAE ESTATES SECTION 5



INFILTRATION BASIN



PLAN VIEW



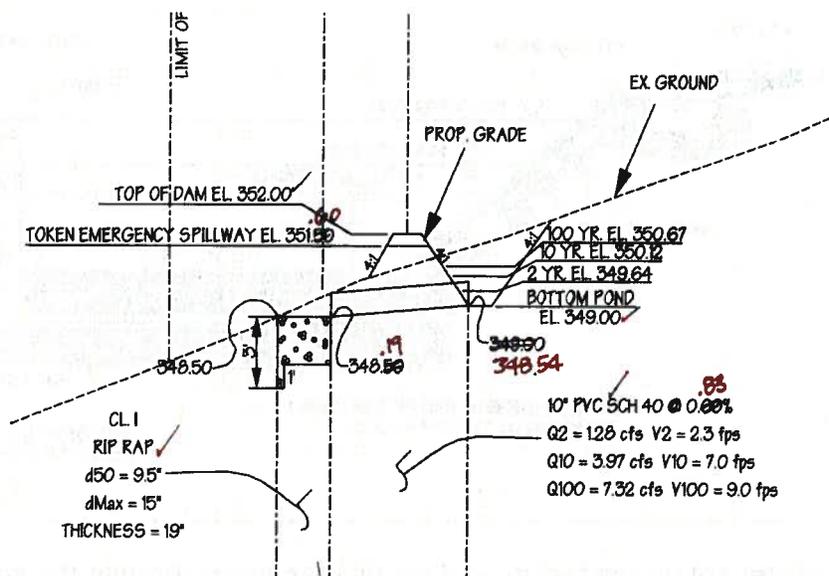
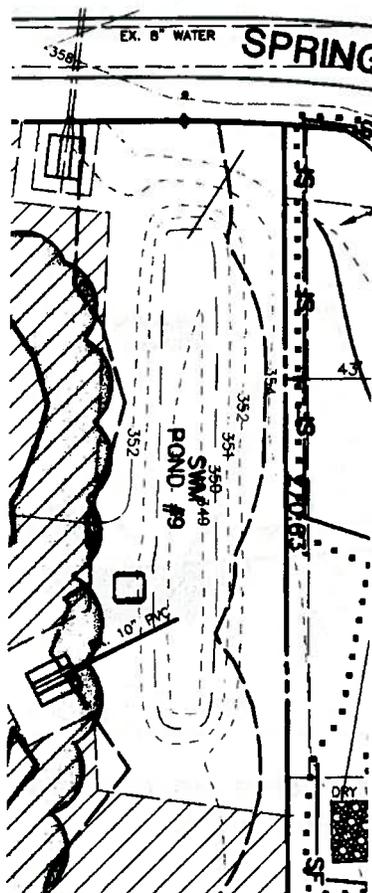
PROFILE

Water enters the facility and slowly percolates through the soil and enters a perforated pipe. The water is discharged through an embankment to a stable outfall.

INFILTRATION BASIN WILLOW CHASE PONDS

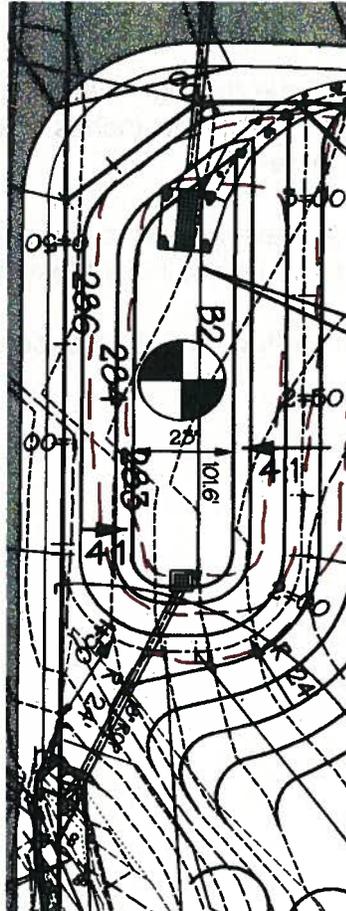


Facility with a dewatering pipe





Infiltration basin with a control structure



FILTER PRACTICES

Design:

- All filter systems are designed to fully dewater the enter water quality volume within 72 hours of the storm event.
- A minimum of 25% of the water quality volume must be pretreated before entering a filter facility.

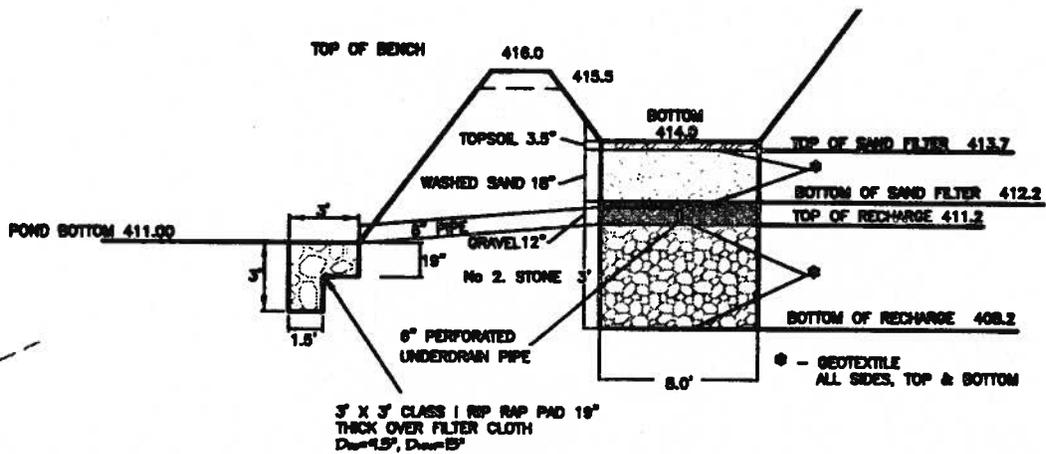
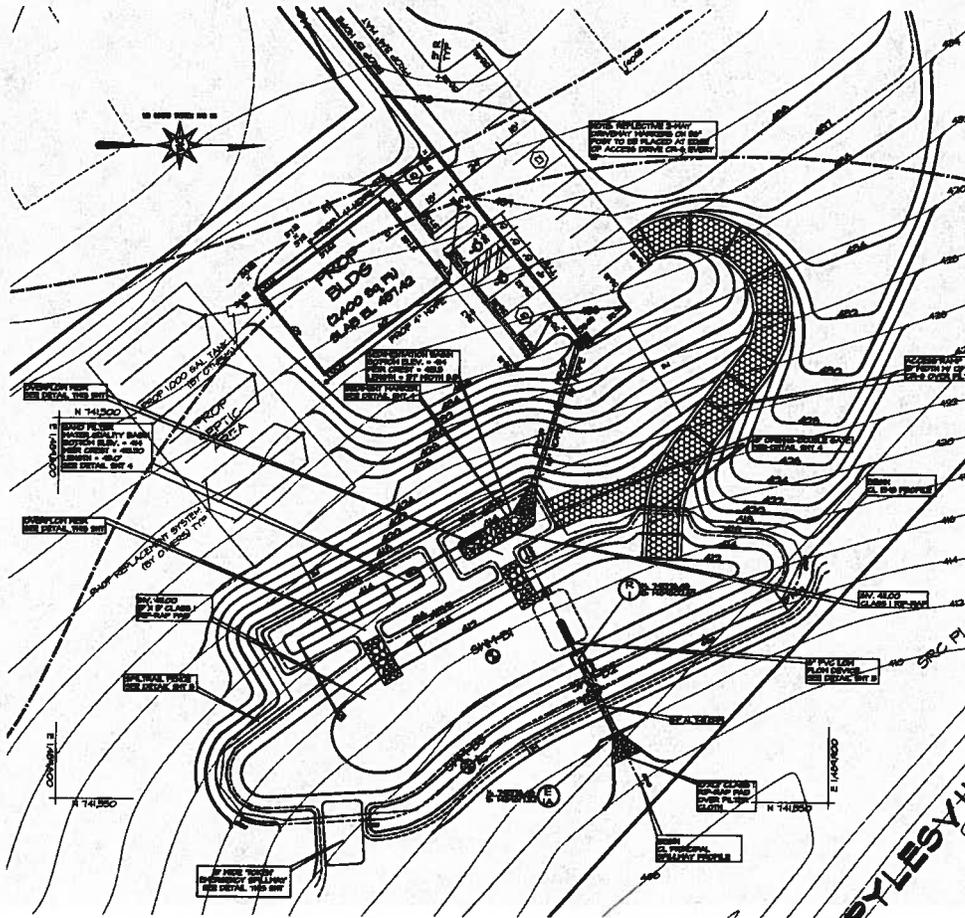
Landscaping and Maintenance:

- Sediment chamber outlet devices must be cleaned or repaired when drawdown times within the chamber exceeds 36 hours. Trash and debris shall be removed as necessary.
- Sediment chambers should be cleaned out when the sediment accumulates to a depth of more than 6 inches.
- Contributing drainage areas must be stabilized.
- Filters may have grass cover to aid in pollutant absorption. Grass must be able to survive periods of inundation and drought.
- Woody vegetation is not to be placed at inflow locations.
- Water that ponds on the surface of the filter for more than 72 hours indicates that the filtering capacity has diminished. The top few inches of discolored material should be removed and replaced with fresh material.
- Organic filters or surface filters that have a grass cover should be mowed a minimum of 3 times a growing season to maintain a grass height less than 12 inches.
- There should be a drop of 6" at the inflow of a bioretention facility.

FILTERS



SURFACE SAND FILTER ENFIELD CURVES



SURFACE SAND FILTER
ENFIELD CURVES



Main Reservoir



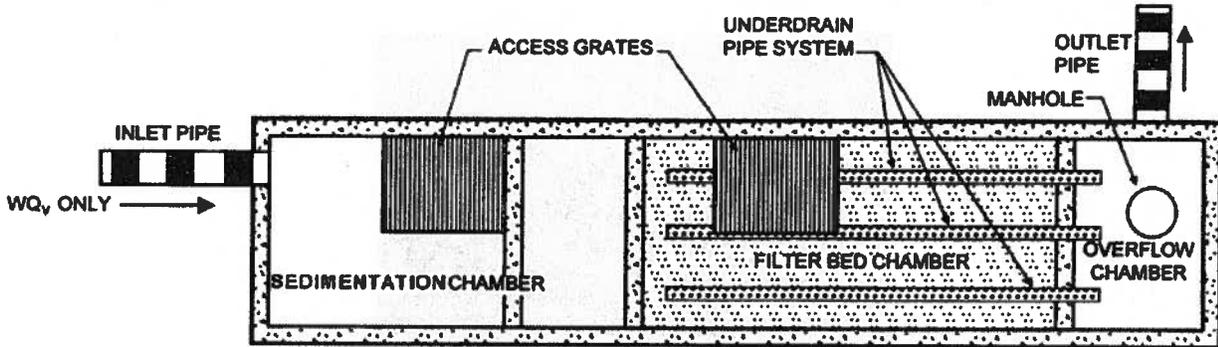
Surface sand filter



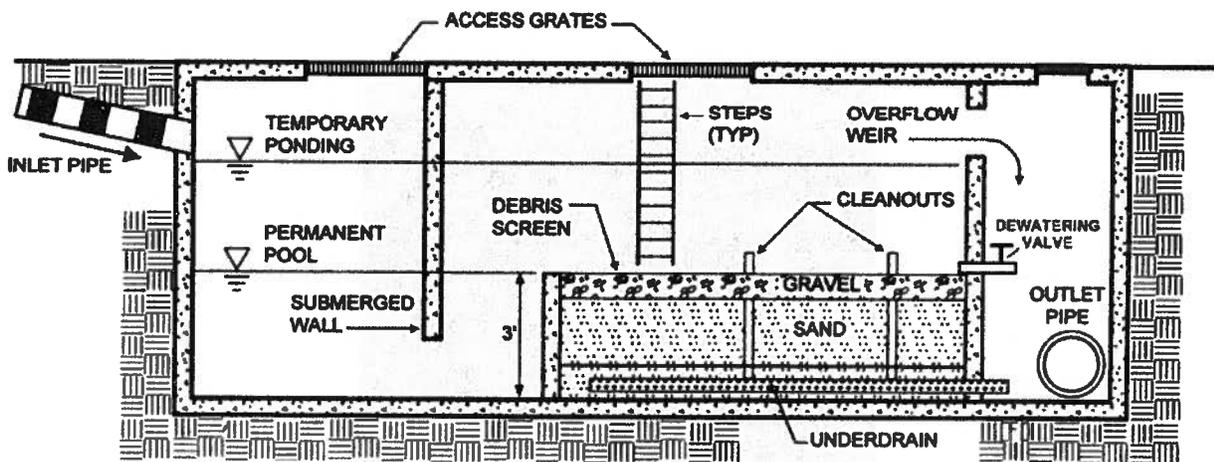
Sediment Forebay

UNDERGROUND SAND FILTER

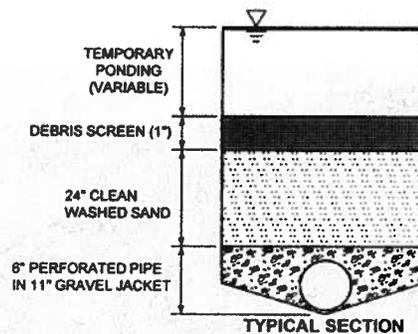
PRE-TREATMENT VAULTS - UNDERGROUND SAND FILTER



PLAN VIEW



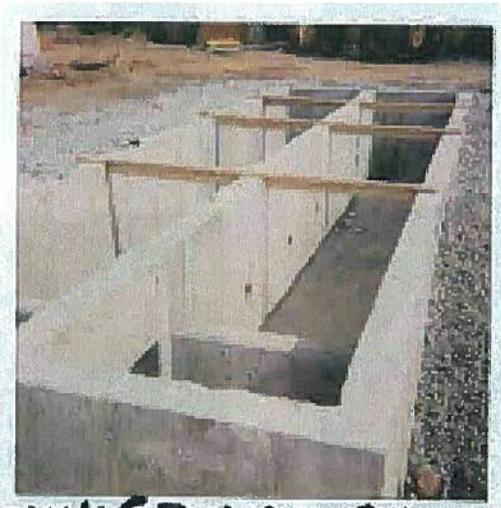
PROFILE



TYPICAL SECTION

The underground sand filter is an option for providing WQ_v where space is limited.

UNDERGROUND SAND FILTER
PRE-TREATMENT VAULTS - UNDERGROUND SAND FILTER



UNDERGROUND STORAGE PRE-TREATMENT VAULTS



STORMCEPTORS

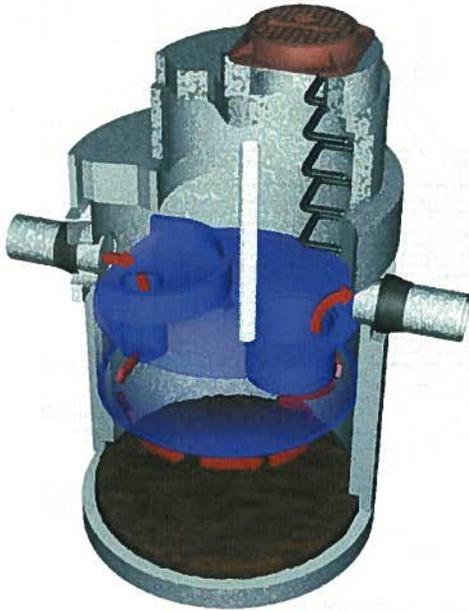


Figure 1

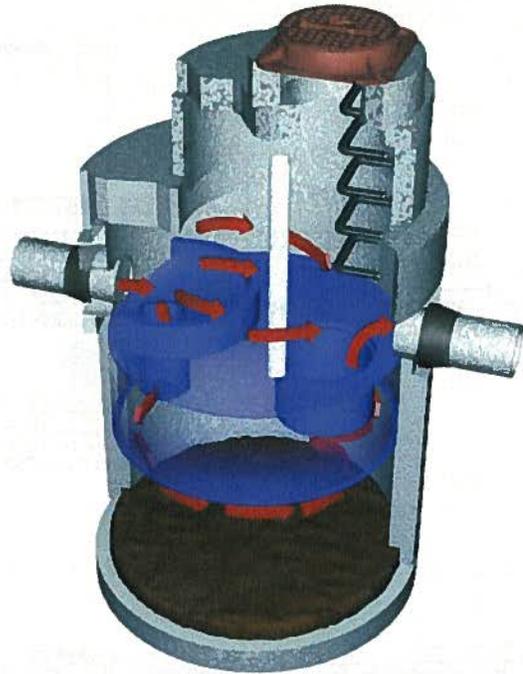


Figure 2

Figure 1:

In the beginning of a storm event, the first ½" of runoff from an impervious surface will enter the stormceptor and fill the lower chambers. The baffle wall prevents the initial flow from bypassing the inflow chamber. The oils will float to the surface and be contained in the lower chamber. The sediments will settle to the bottom of the lower chamber and the remaining flows will continue up through the second egress and discharge. Note that the elevation of the egress is lower than the ingress opening to the lower chamber.

Figure 2:

Once the lower chamber is filled with water the rate of flow into the structure increases, the water will go over the top of the baffle and flow directly out of the system. The oils can be seen in the observation well.

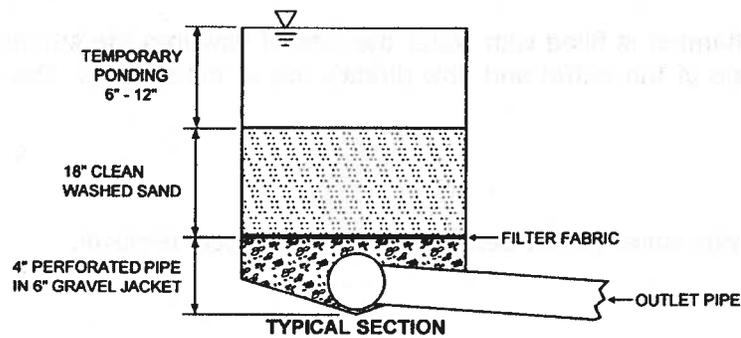
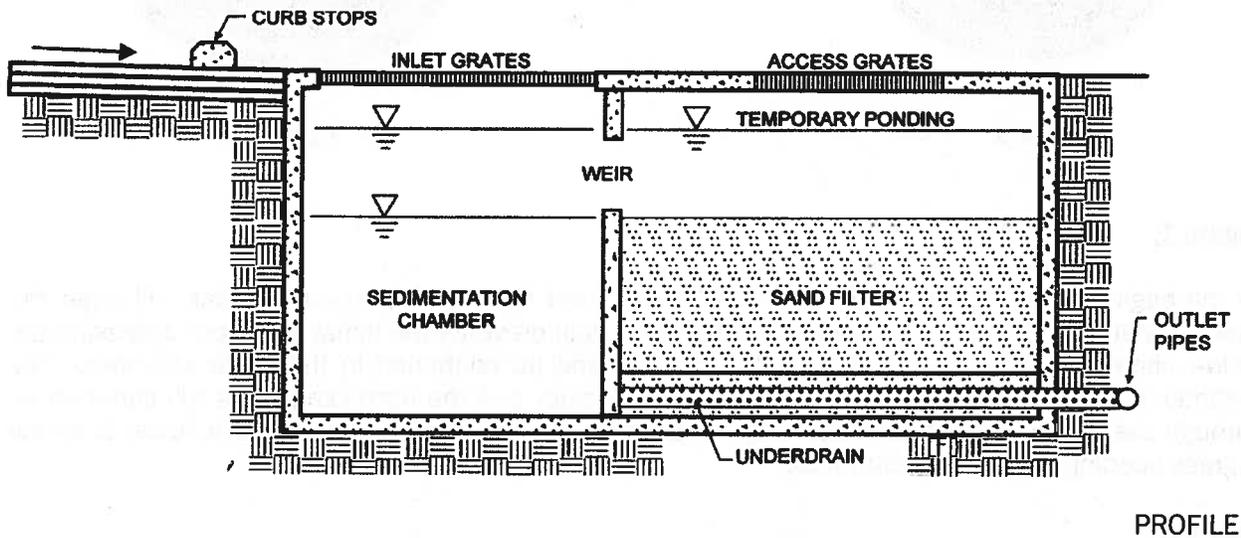
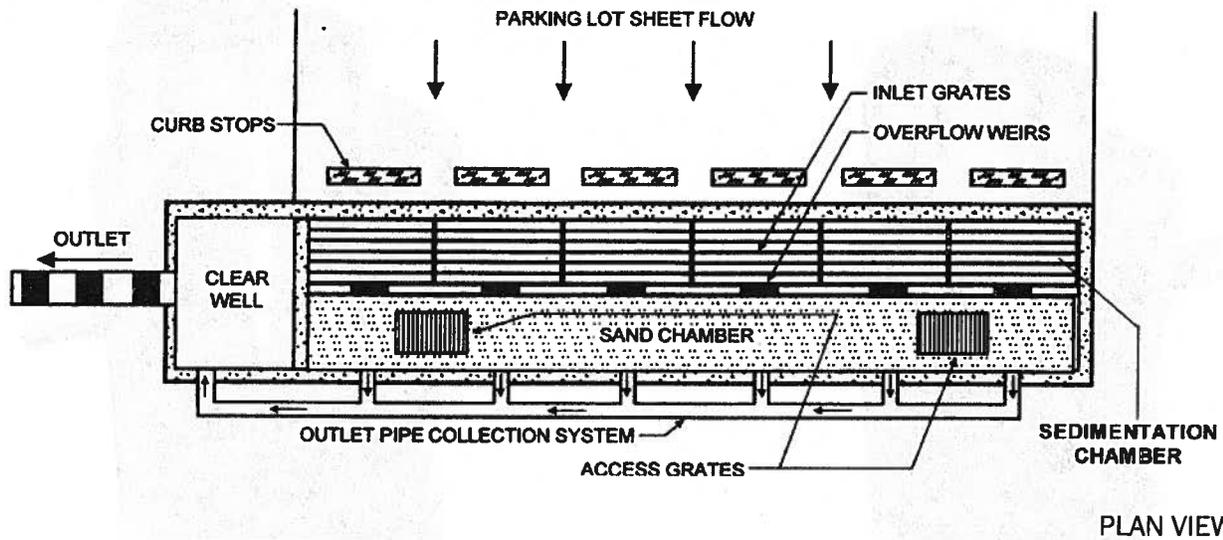
Benefits:

Stormceptors provide water quality benefits: oil and sediment removal.

Maintenance:

A vacuum truck must be used to remove the accumulated oils, sediments and trash.

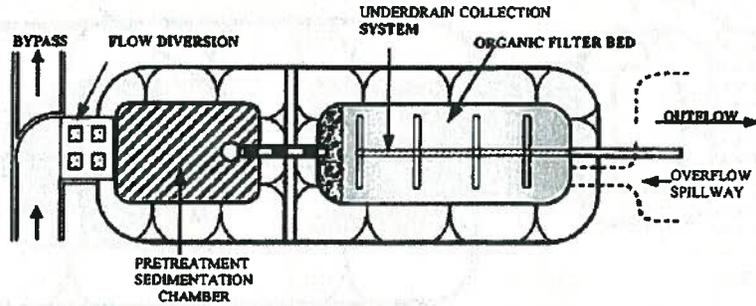
UNDERGROUND SAND FILTER PRE-TREATMENT VAULTS - UNDERGROUND PERIMETER SAND FILTER



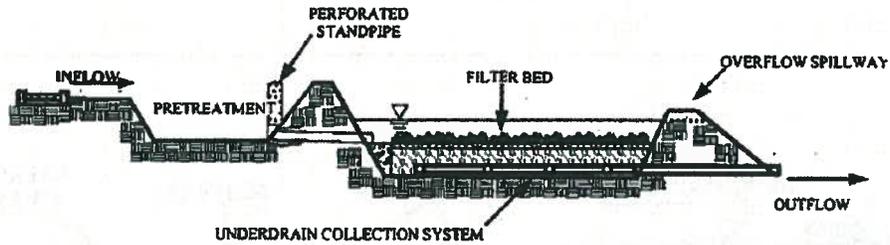
TYPICAL SECTION

The perimeter sand filter is most practical for small sites with flat terrain or a high water table.

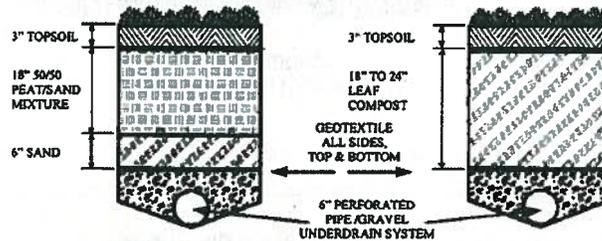
ORGANIC FILTER SYSTEM UNIQUE MOTORS



PLAN VIEW



PROFILE

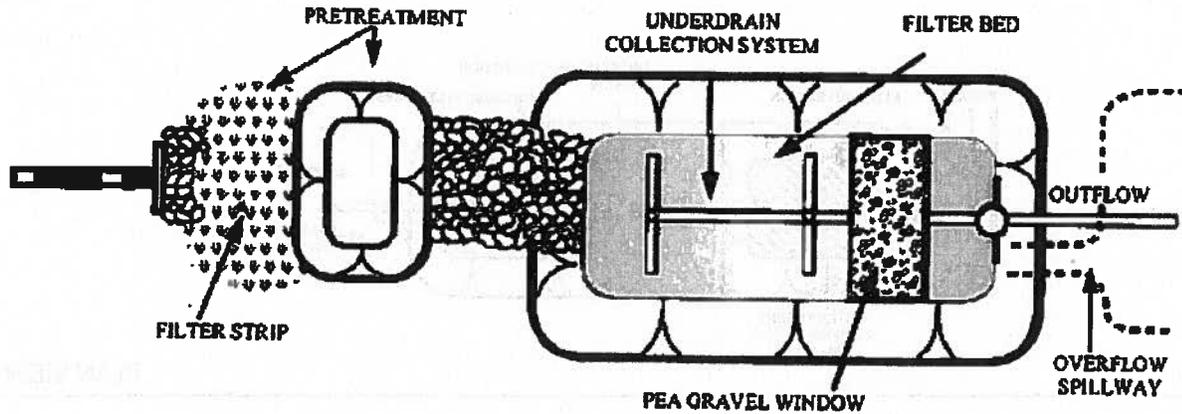


TYPICAL SECTIONS

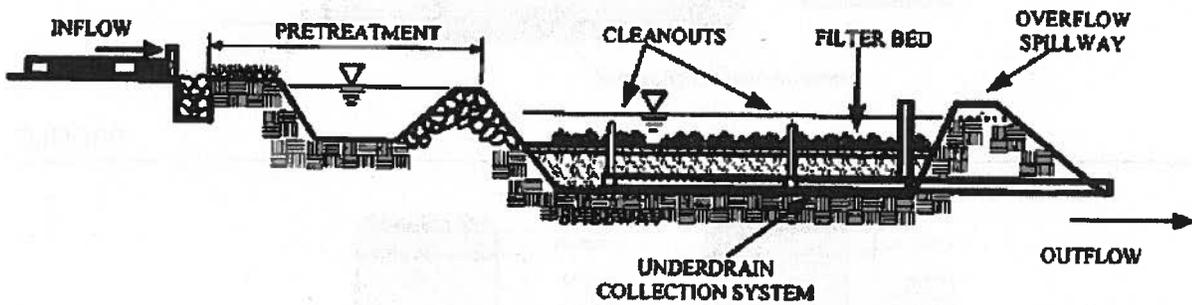
The organic filter is used when maximum nutrient or trace metal removals are desired.



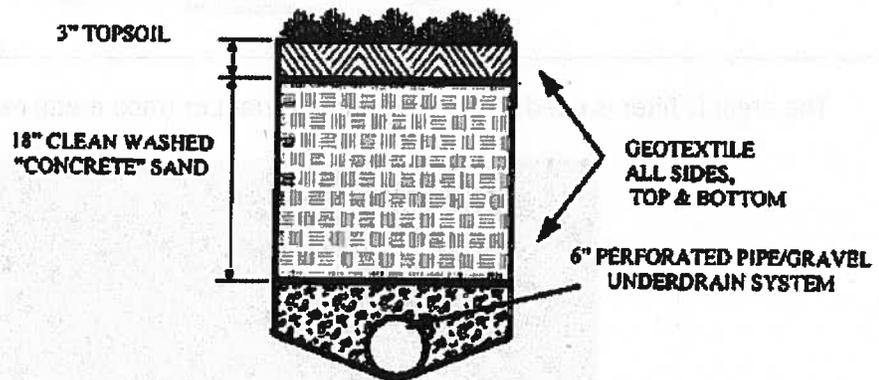
POCKET SAND FILTER



PLAN VIEW



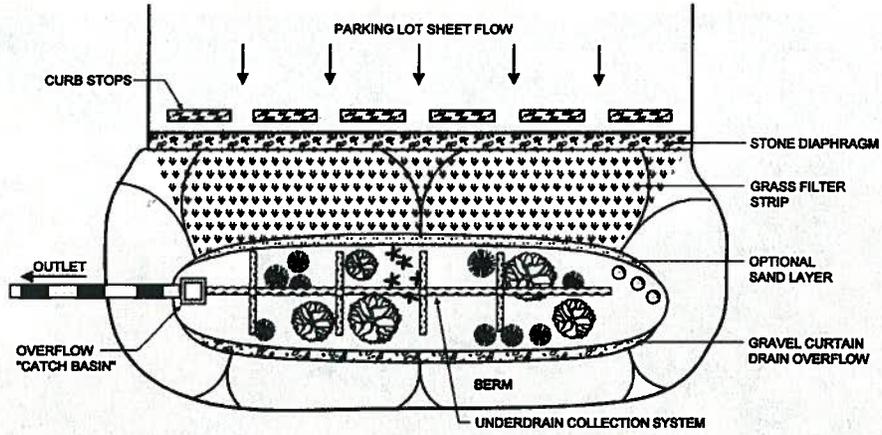
PROFILE



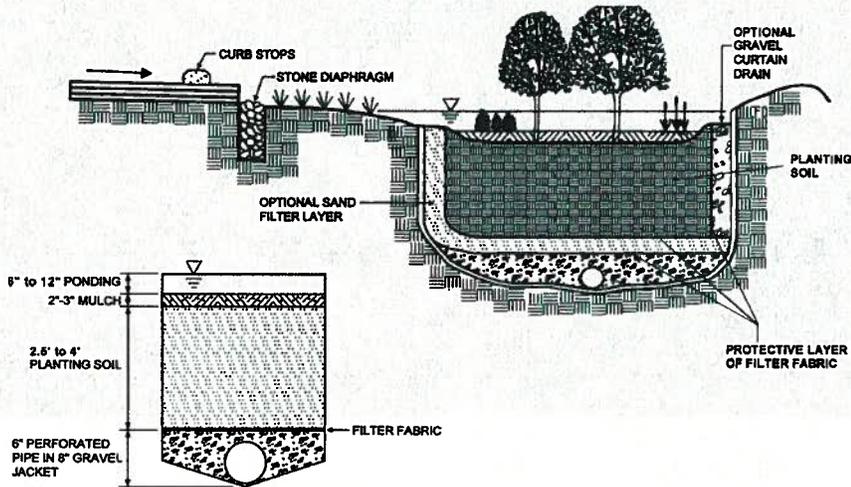
TYPICAL SECTION

The pocket sand filter is applied to small sites where sediment loads are expected to be moderate to low. The pea gravel windows allow runoff into the filter if the surface becomes clogged.

BIORETENTION



PLAN VIEW



TYPICAL SECTION

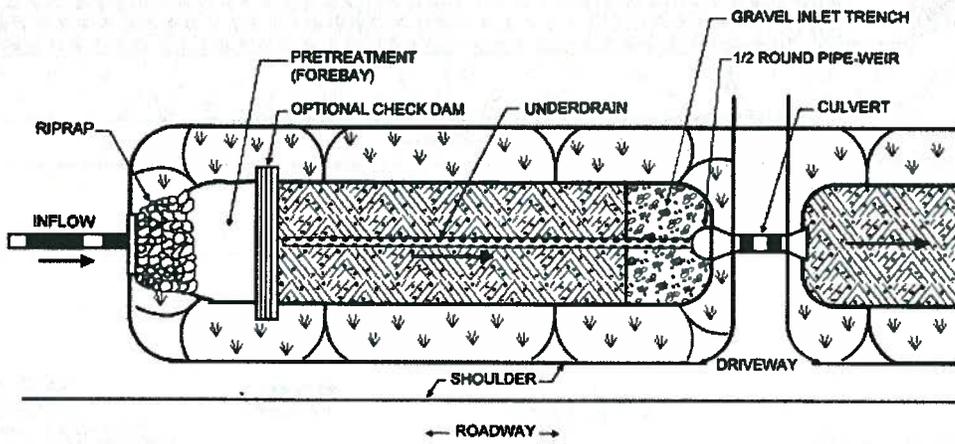
Bioretention combines open space with stormwater treatment.



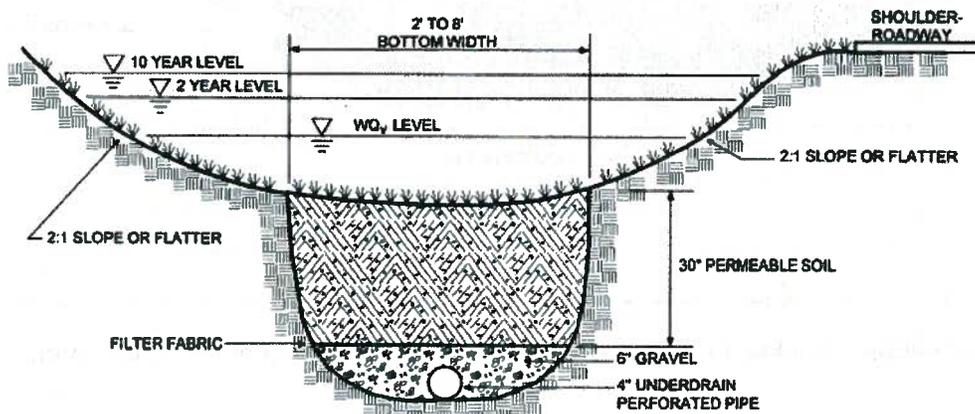
OPEN CHANNEL



OPEN CHANNEL SWALES

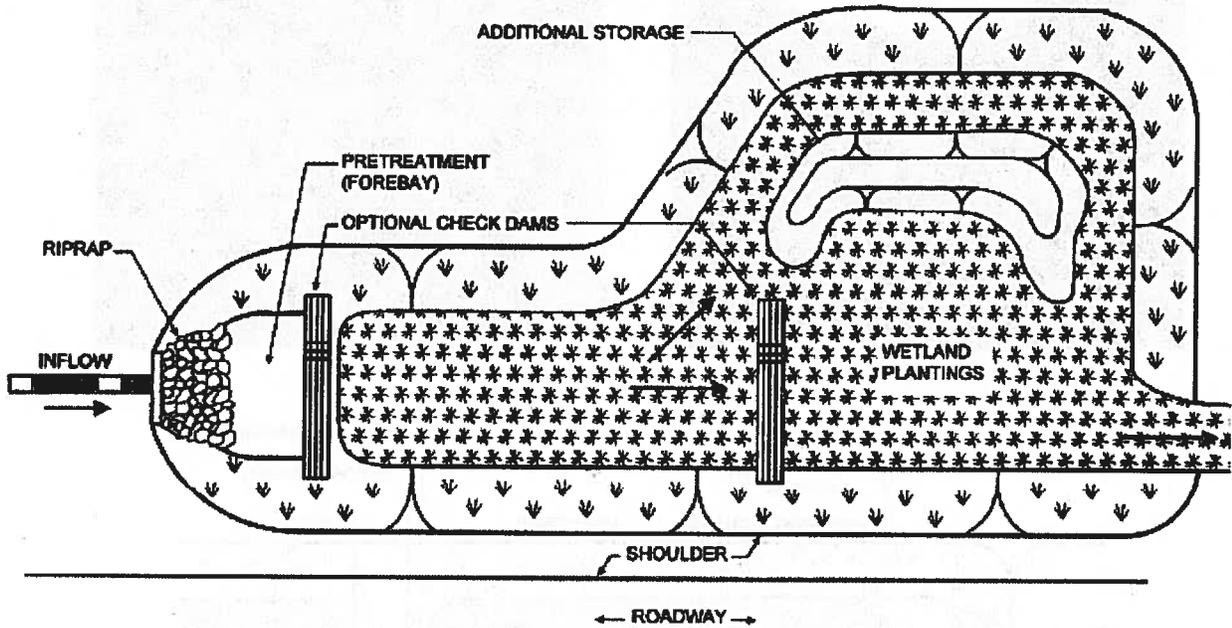


PLAN VIEW

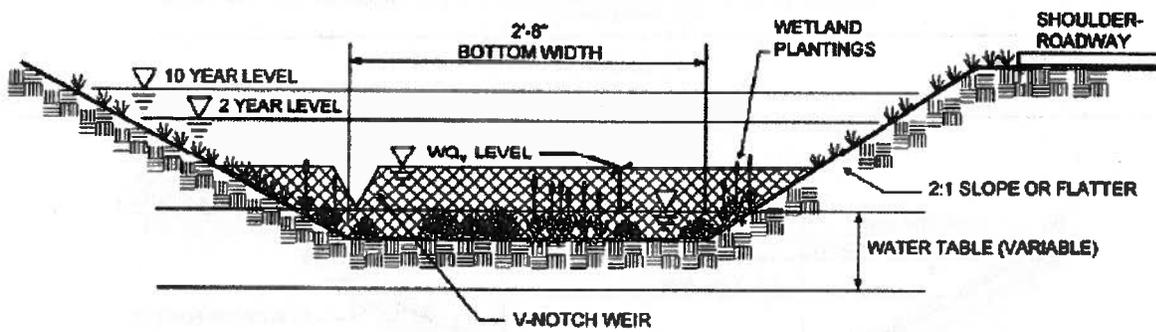


SECTION

WET SWALES



PLAN VIEW



PROFILE

Wet swales are ideal for treating highway runoff in low lying or flat terrain areas.

