Infiltration Basin

Stormwater BMP Type

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	□

Stormwater Management Suitability

Retention	■
Treatment	■
Pretreatment	□
Peak Runoff Attenuation*	■

*On-line systems only

Pollutant Removal

Sediment*	**High**
Phosphorus	**High**
Nitrogen	**Low**
Bacteria	**High**

*Includes sediment-bound pollutants and floatables (with pretreatment)

Implementation

Capital Cost	**Low**
Maintenance Burden	**Low**
Land Requirement	**Medium**

Description

Infiltration basins are open stormwater impoundments designed to capture and infiltrate the stormwater over several days but do not retain a permanent pool of water. The bottom of an infiltration basin typically contains vegetation to increase the infiltration capacity of the basin, allow for vegetative uptake, and reduce soil erosion and scouring of the basin. This BMP can receive both sheet flow and piped runoff discharged directly into the basin. Runoff gradually infiltrates into the underlying soil through the bottom of the basin, removing pollutants through sorption, trapping, straining, and bacterial degradation, or transformation. Infiltration basins may also be used to provide stormwater quantity control when designed as on-line facilities.

Infiltration basins are a cost-effective approach to managing stormwater where there is adequate space. Water is stored above the bottom of the basin rather than in subsurface storage media, which is more cost-effective than other infiltration approaches.

Advantages

- Cost-effective approach to recharge stormwater as it does not require subsurface storage media and stormwater can be temporarily stored aboveground.
- Naturally can take advantage of topographic low areas.
- High solids, phosphorus, and bacteria removal efficiency.
- Can provide stormwater retention, runoff volume reduction, groundwater recharge, and some peak runoff attenuation when designed as an on-line system

Limitations

- Require adequate space to store stormwater aboveground. Difficult to site in urban and fully developed locations.
- System clogging would require replacement of basin surface.
- Lower removal of dissolved pollutants especially in coarse soils.
- Should not be used with underdrain systems.

Siting Considerations

- **Potential Locations:** Best located where there is adequate surface area to temporarily store stormwater. Infiltration basins are suitable in urban and rural settings, but require adequate space, which makes their use limited in urban areas. Locate where:
  - The topography allows the design of the infiltration basin bottom to be level
  - Snow storage will not occur atop the basin
  - There is a low likelihood that pedestrian traffic will cut across the basin.

- **Drainage Area:** The maximum contributing drainage area for infiltration basins is 10 acres.

- **General:** Meet the soils, water table, bedrock, and horizontal setback requirements specified in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems. Infiltration basins can be designed as on-line or off-line practices.

Soil Evaluation

- Conduct an evaluation of the soil characteristics and subsurface conditions at the location of the proposed system including soil type, depth to the seasonal high groundwater table, depth to bedrock, and soil infiltration rate. Refer to Chapter 10 - General Design Guidance for Stormwater Infiltration Systems for soil evaluation guidance.

Design Recommendations

Pretreatment

- Incorporate pretreatment measures at locations where runoff enters the infiltration basin in accordance with the Pretreatment BMPs section of this Manual.

- Acceptable pretreatment measures include vegetative filter strips, sediment forebays, pretreatment swales, deep sump hooded catch basins,[83] oil grit separators, and proprietary pretreatment devices.

- Sediment forebays should have a minimum storage volume of 25% of the Water Quality Volume (WQV), while flow-through Pretreatment BMPs should treat at least the equivalent Water Quality Flow (WQF). A minimum sediment forebay storage volume of 10% of the

[83] Only recommended for space constrained sites where no other Pretreatment BMPs are feasible.

WQV may be used in urban settings, space constrained sites, and as retrofits, with the approval of the review authority.

Sizing and Dimensions

- Basin Surface Area
  - Basin should be designed by either the Static or Dynamic Methods as described in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems.
  - Basin should completely drain in 48 hours or less after the end of the design storm as described in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems.

- Ponding Depth
  - Maximum depth of water above the basin bottom: 36 inches

- Bottom Slope
  - Bottom slope of the basin should be level.

- Side Slopes
  - Side slopes should be 3(H):1(V) or flatter especially on grassed slopes where mowing is required.
  - In ultra-urban locations or space constrained areas; side slopes of 2(H):1(V) may be utilized if properly designed to account for erosion and slope stability. Stabilize the slope with turf reinforcement matting or equivalent if the slope could potentially erode.
  - If site topography does not allow for 3(H):1(V) slopes or adequately stabilized 2(H):1(V) slopes, vertical concrete walls with a maximum height of 30 inches can be used. Drop curbs or similar precast structures can also be used to create stable, vertical side walls.

Inlet

- Design the inlet in accordance with the Inlet and Outlet Controls section of this Manual.

- Runoff can be introduced through overland flow, curb cuts, inlet structures, swales/channels, and/or pipes.

- Design in an off-line configuration to the extent feasible if runoff is delivered by a storm drainpipe or is along the main storm conveyance system.

Outlet & Overflow

- Design the outlet in accordance with the Inlet and Outlet Controls section of this Manual.

- Outlets are typically a stabilized spillway, gabion berm, concrete weir, curb cut opening, precast concrete structure, or polyethylene/polyvinyl chloride riser structure.

- On-line systems should have a primary outlet sized to convey the 10-year, 24-hour storm event, at a minimum, to the storm drainage system or stabilized channel. An emergency spillway is required to convey the 100-year storm event (assuming the primary outlet is not designed to pass the 100-year storm event).

- Off-line systems should be designed with a bypass or overflow for flows in excess of the water quality storm.

Materials

- Surface Cover
    - Should use 4 to 6 inches of loam/topsoil and seed to establish stabilized permanent vegetative cover as desired for the site and application. Select vegetation with the guidance provided in Appendix F of this Manual.
    - Alternatively, the bottom of the basin can be landscaped utilizing plant materials suitable for the site and application. Select plants with the guidance provided in Appendix F of this Manual.
    - Mulch can be 2 to 4 inches of shredded hardwood bark mulch, aged for 6 month or 3 inches of 3/8" to ¾" size pea gravel conforming to AASHTO No. 8 or No. 5 stone. Pea gravel should be clean (washed and free from dirt and debris) and rounded in shape. Mulch may be used directly around the plants, but mulch should NOT be used to cover the entire bottom of the infiltration basin.
    - Do not plant any woody vegetation (e.g., shrubs and trees) on embankments that are used to retain water in the basin. Those embankments should be stabilized with a grass cover.

Winter Operations

- Infiltration basins should not be used for storage of plowed snow. To the extent feasible, locate and design the system to avoid snow storage areas and potential damage from snow plowing activities. Refer to Chapter 7 - Overview of Structural Stormwater Best Management Practices for general design considerations related to winter operations.

Construction Recommendations

- The designing qualified professional should develop a detailed, site-specific construction sequence.

- The designing qualified professional should inspect the installation during the following stages of construction, at a minimum:
    - After excavation of the infiltration basin and scarification of bottom and side slopes of excavation
    - After installation of bypass, outlet/overflow, and inlet controls
    - After pea gravel or loam/topsoil and grass surface cover have been installed

- The designing qualified professional should provide an as-built plan of the completed infiltration basin along with a certification that the system was designed in accordance with the guidance contained in this Manual and other local or state requirements and that the system was installed in accordance with the approved plans.
- The entire contributing drainage area should be completely stabilized prior to directing any flow to the system. Adequate vegetative cover must be established over any pervious area adjacent or contributing to the system before runoff can be accepted.
- Erosion and sediment controls should be in place during construction in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control and the Soil Erosion and Sediment Control (SESC) Plan developed for the project.
- Infiltration basins should not be used as temporary sediment traps for construction erosion and sediment control.
- During clearing and grading of the site, measures should be taken to avoid soil compaction at the location of the proposed system.
- The system should be fenced off during the construction period to prevent disturbance of the soils.
- The infiltration basin should be excavated to the dimensions, side slopes, and elevations shown on the plans. The method of excavation should avoid compaction of the bottom of the system. A hydraulic excavator or backhoe loader, operating outside the limits of the infiltration basin, should be used to excavate the system. Excavation equipment should not be allowed within the limits of the system.
- The pea gravel layer (if used) should be placed in the excavation by a hydraulic excavator or backhoe loader located outside the limits of the infiltration basin and then hand-raked to the desired elevation.
- Install vegetation (e.g., drought tolerant grass) on the side slopes and surface of the infiltration basin (if grass is used instead of pea gravel) in accordance with the planting plan and plant schedule on the plans. Water vegetation thoroughly immediately after planting and as necessary until fully established.

Maintenance Needs

- Infiltration basins should be designed with easy access to all components of the system for maintenance purposes. Refer to Chapter 7 - Overview of Structural Stormwater Best Management Practices for general design considerations to reduce and facilitate system maintenance.

- Detailed inspection and maintenance requirements, inspection and maintenance schedules, and those parties responsible for maintenance should be identified on the plans and in the Site Stormwater Management Plan.
- Maintenance should be detailed in a legally binding maintenance agreement.
- Maintenance activities such as sediment removal, mowing, and repairs should be performed with rakes and light-weight equipment rather than heavy construction equipment to avoid compaction of the filter media and underlying soils. Heavy equipment may be used for sediment removal and other maintenance activities if the equipment is positioned outside the limits of the system. Heavy construction equipment should not be allowed within the limits of the system for maintenance purposes.

Recommended Maintenance Activities

- Inspect after major storms (1 inch or more of precipitation) in the first few months following construction.
- Inspect the sediment forebay or other pretreatment area twice a year.
- Inspect the remainder of the infiltration basin annually.
- Refer to Appendix B for maintenance inspection checklists, including items to focus on during inspections.
- Remove trash and organic debris (leaves) in the Spring and Fall.
- 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.
- Remove sediment from the infiltration basin surface when the sediment accumulation exceeds 2 inches or when drawdown time exceeds 48 hours after the end of a storm event, indicating that the system is clogged.
- Weed as necessary. Mow grass within infiltration basin to a height of 3 to 6 inches. Maintain a healthy, vigorous stand of grass cover; re-seed as necessary.
- Maintain vegetated filter strips or grassed side slopes of infiltration basin in accordance with maintenance recommendations in the Pretreatment BMPs section of this Manual.
- Periodically remove grass clippings to prevent clogging of the surface of the infiltration basin.

Mowing should not be performed when the ground is soft to avoid the creation of ruts and compaction, which can reduce infiltration.

Figure 13-10. Infiltration Basin Schematic