

ILLINOIS URBAN MANUAL PRACTICE STANDARD

Sediment Forebay

(no.)
Code 914



Source: Lake County Stormwater Management Commission

Definition

A sediment forebay (forebay) is a pool and settling basin constructed at the incoming discharge points of a stormwater best management practice (BMP).

Purpose

The purpose of this practice is to provide retention for a portion of the first flush stormwater runoff and allow sediment to settle out from the incoming stormwater before it reaches the larger BMP. Forebays help isolate sediment deposition and facilitate maintenance and effectiveness of the larger BMP.

Conditions Where Practice Applies

1. Where stormwater is entering a stormwater management BMP such as Practice Standards **DRY DETENTION BASIN 809**, **EXTENDED DETENTION BASIN 810**, **WET BOTTOM DETENTION BASIN 811**, or **WETLAND DETENTION BASIN 812**.
2. A sediment forebay may be appropriate for other existing ponds and retention basins where improved water quality is desired.
3. Forebays shall be for locations which are readily accessible for

maintenance (sediment removal).

4. Forebays shall not be constructed over existing underground utilities.

Criteria

Since forebays provide a dual function: dissipation of energy from incoming stormwater and a place for sediment to accumulate the design of forebays shall include zones for each of these functions.

Forebays shall be installed for each incoming discharge point in a BMP or as required in the relevant BMP practice standard.

Forebay sizing criteria shall include evaluation of the watershed size and the land use/cover of that watershed.

The total forebay volume shall be approximately 20% of the total detention basin (BMP) volume for the 2-year, 24-hour storm event for a single inlet. If multiple inlets are planned, the total forebay volume requirement shall be proportionally distributed to each inlet based on the tributary drainage area to each inlet. If there are numerous inlets with forebays, they shall be sized to provide effective protection at each inlet given the expected inflow velocities and volumes on a site-specific basis even if that total volume exceeds the 20%.

Any live storage provided by the forebays shall not be included toward the required volume of the associated BMP (basin), since at any given time a portion of that volume may be filled by accumulated sediments in the forebay.

Forebays and their associated BMP (basin) may be subject to local, county, state, or federal rules and regulations which may have more restrictive requirements than those within this standard.

Plans and specifications shall be followed by the site superintendent and field personnel during the construction process.

Energy Dissipation

Energy dissipation zones shall be designed as deeper pools to

dissipate inflow energy and reduce resuspension of sediments in the forebay. Sizing the plunge pool is a function of substrate material, influent pipe diameter or channel dimensions, peak discharge, and height of influent pipe invert or channel above substrate. The area required for the energy dissipation zone of the forebay shall be optimized in the site-specific design based on these factors. A safety factor of additional depth shall be included to accommodate volume/depth loss due to sediment accumulation between maintenance cycles.

Sedimentation Zone

The forebay's sedimentation zone isolates the deposition of sediment from the adjacent BMP. To create this isolation, a spillway such as a stabilized earthen berm, concrete structure, gabions, or riprap can be used. If an earthen berm is used, it shall be fully stabilized before accepting flow.

Exit velocities from the forebay shall be non-erosive to the adjacent BMP. A designed overflow section shall be constructed on the top of the spillway (berm).

Considerations

Planning should be the first step in any successful project. Forebays should be integrated into the design of the BMP where required or optional in the BMP standard for maximum performance.

Energy Dissipation

Energy dissipation zones can be designed by specifying the influent pipe or channel height above the pool substrate, the substrate composition, and the plunge pool depth. As influent pipe culvert height above the substrate increases, plunge pool depth and width increase, and plunge pool length decreases.

Research has shown that energy dissipation zones in forebays with an armored bottom, a permanent pool between 2 and 18 inches deep, and a pool diameter at least as large as the influent culvert diameter is effective.

Sedimentation Zone

Sedimentation zones should be designed with as elongated a flow path as feasible, be shallow enough to reduce sediment settling distance, and be vegetated to promote sedimentation and stabilization.

Research has shown that unstable watersheds need larger sedimentation zones in forebays, while stable watersheds may need a smaller forebay, but they can lose sediment if the energy dissipation zone accumulates sediment.

A measuring device should be incorporated into the forebay design to determine the depth of sediment accumulation and help assess maintenance needs and capacity.

Forebays help reduce the sediment load reaching the adjacent BMP, and therefore will typically require maintenance more frequently than the adjacent BMP.

To reduce the need for dewatering sediment removed from the forebay during maintenance, a flashboard riser or other structure may be incorporated into the design to draw down the permanent pool in the forebay prior to sediment removal.

Depending on the size, design, and life expectancy of the forebay, the use of a bench or shelf with emergent vegetation around the perimeter will help with water quality, provide a safety feature, and improve aesthetics.

Plans and Specifications

Plans and specifications for installing a sediment forebay adjacent to a larger BMP shall be consistent with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Where forebays are required as part of an adjacent BMP, the design should be integrated into the required construction documents for that BMP. Forebays can also be used at any inlet to an existing pond or lake.

Construction documents shall include at a minimum:

1. Forebay location, alignment, dimensions and geometry of the energy dissipation and sedimentation zones of the forebay.
2. Material specifications especially for the spillway barrier used to separate the forebay from the adjacent BMP and the dissipation zone substrate.
3. Soil erosion and sediment control plan.
4. Maintenance plan and schedule.

Note that sediment forebays are included in the Practice Standards for **DRY DETENTION BASIN 809** (consideration), **EXTENDED DETENTION BASIN 810**, **WET BOTTOM DETENTION BASIN 811** (consideration), and **WETLAND DETENTION BASIN 812**.

Operation and Maintenance

Forebays shall be inspected at least annually, preferably quarterly.

Remove any accumulated floatable debris at each inspection.

Ensure utility locates (JULIE) are current prior to sediment removal from the forebay.

Remove and dispose of accumulated sediment as needed after annual or quarterly inspections based on sediment accumulation to maintain performance of the forebay.

Energy Dissipation

Sediment should be removed from the energy dissipation zone of the forebay in a typical mixed used watershed every 3-5 years, or as needed to maintain design geometries and function.

Sedimentation Zone

Sediment in the sedimentation zone should be removed when the sediment exceeds 50% of the volume capacity of the sedimentation zone within the forebay.

The forebay spillway separation barrier and dewatering device, if

any, shall be inspected for any breaches or other problems that would compromise its performance and appropriate repairs made.

References

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