

## CHAPTER 9

### MISCELLANEOUS

#### 9.6 Extended Detention

##### 9.6.1 Wet Extended Detention Facilities Design Requirements

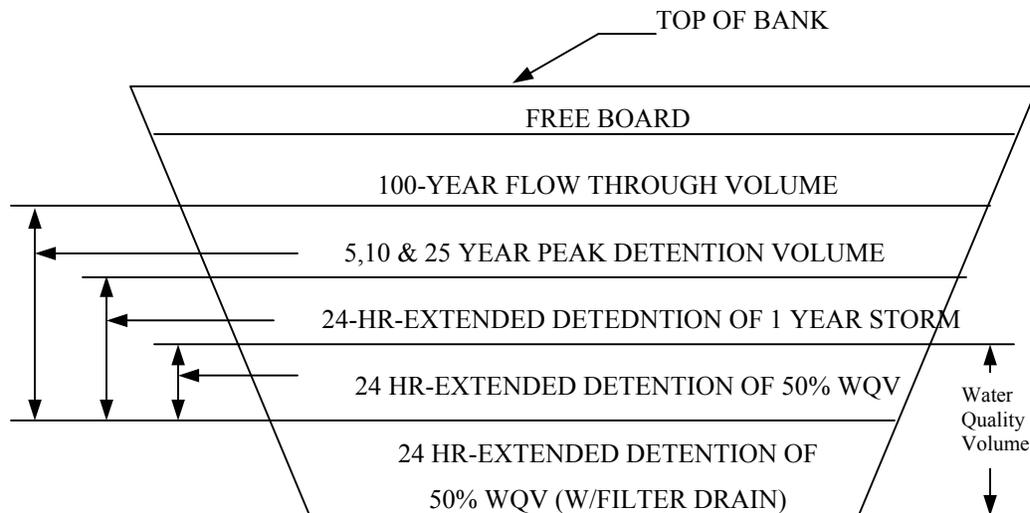
Wet extended detention facilities shall be designed and constructed to meet the following requirements:

###### 9.6.1.1 Minimum and Maximum Drainage Area

The minimum drainage area for which a wet detention facility shall be allowed to be constructed shall be at least 20 acres. The maximum drainage area shall be 100 to 300 acres. The maximum drainage area of highly impervious drainage areas shall be restricted to the low end of the range (100 acres) and low density residential watersheds shall be restricted to a maximum of 300 acres.

###### 9.6.1.2 Storage Volume of Permanent Pool

The percentage pool storage ( $V_b$ ) shall be at least 50% of the Water Quality Volume (WQV) defined in section 9.8.1. The part of WQV (50% or less) not used in the permanent pool shall be detained for 24 hours and the storage volume may be used as part of the detention requirements. The WQV to be stored shall be based upon the project area. The project area compensated for in a pond shall not exceed the total drainage area draining to the pond. Off-site areas that do not drain through other water quality BMP's may be used to compensate for areas that by-pass the pond. By-passed areas shall be minimized as much as practical. Off-site areas exceeding the project site may bypass the pond.



### 9.6.1.3 Depth of Permanent Pool

#### 9.6.1.3.1 Mean Depth

The mean depth ( $Z$ ) of the permanent pool shall be between 3 feet and 7 feet and is calculated by dividing the permanent pool storage volume ( $V_b$ ) by the surface area ( $A_s$ ) ( $Z = V_b/A_s$ )

#### 9.6.1.3.2 Maximum Depth

The maximum depth of the permanent pool shall be no greater than 12 feet unless a modification is approved. The intent of these regulations is to ensure that the depth of the facility is not out of proportion with the surface area of the facility. Granting of a modification will not nullify these regulations when the depth and surface area of the facility is based on existing natural topography.

### 9.6.1.4 Minimum Surface Area of Permanent Pool

The minimum surface area ( $A_s$ ) of the permanent pool should be 0.25 acres. The minimum ratio of surface area to drainage area used to calculate the permanent pool ( $A_w$ ) in residential watersheds shall be 1% unless a modification is approved. The intent of these regulations is to ensure that the depth is minimized to increase removal efficiencies. Granting of a modification will not nullify these regulations when the depth and surface area of the facility is based on existing natural topography.  $A_s/A_w$  ratios in excess of 3% are desirable for nonresidential watersheds with relatively high levels of imperviousness.

#### 9.6.1.5 Side Slopes Along the Shoreline

9.6.1.5.1 Where existing slopes are 3H:1V (Horizontal : Vertical) or flatter, the minimum side slope around the perimeter of the permanent pool shall be 5H:1V and is recommended to be 10H:1V. The slope shall extend from 10 to 20 horizontal feet into the permanent pool and from 5 to 10 horizontal feet above the permanent pool. A flat bench at least 10 feet in width shall be provided 1 foot above the permanent pool. The inside face of the dam, however, shall have a slope 3H:1V or flatter.

9.6.1.5.2 Side slopes shall be covered with topsoil, nurtured or planted from 2 feet below to 1 foot above the permanent pool control elevation to promote wetland vegetative growth. Below the safety ledge, the pond side shall be sloped to meet topographic or volumetric constraints.

#### 9.6.1.6 Length to Width Ratio of Permanent Pool

The minimum length to width ratio of the permanent pool shall be 2:1. The length shall be measured at the shortest flow path from the inlet to the outlet. The width shall be calculated as the surface of the pond divided by the length. In addition, the location of the outlet structure within the basin shall maximize travel time from the inlet to the outlet. Baffles or islands may be installed within the permanent pool to increase the flow path length and to minimize short-circuiting.

#### 9.6.1.7 Soil Permeability

In cases where relatively permeable soils are encountered, water draw down rates shall be minimized by either compacting the permanent pool soils during construction, incorporating clay into the soil, or by installing an artificial liner.

#### 9.6.1.8 Spillway and Dam Design

The principal spillway, emergency spillway, and dam shall be designed in accordance with Sections 9.11 of these regulations.

#### 9.6.1.9 Forebay

9.6.1.9.1 To facilitate major cleanout activities, a sediment forebay shall be constructed near the inlet to the permanent pool to trap coarse sediment particles. The forebay storage

capacity shall be 10 percent of the water quality volume (WQV) as defined in section 9.8.1.

9.6.1.9.2 The facility shall be dredged to ensure that all of the permanent pool storage volume is available after the upstream area has been stabilized. All temporary sediment control measures employed during land disturbing activities to trap sediment shall be located outside of state waters.

9.6.1.9.3 The forebay shall be distinguished from the permanent pool. Options which may be used include: a lateral sill with wetland vegetation; two (2) ponds in series; differential pool depth; rock-filled gabions or a retaining well; or a horizontal rock filter placed laterally across the permanent pool.

#### 9.6.1.10 Inlet and Outlet Structures

9.6.1.10.1 The inlet design shall dissipate flow energy and diffuse the inflow plume where it enters the forebay or permanent pool. Options which may be used include: drop manholes; energy dissipators at the bottom of paved itches; a lateral bench with wetland vegetation; and the placement of large rock deflectors at each inlet.

9.6.1.10.2 The outlet design shall consist of a riser with a hood or trash rack to prevent clogging and an adequate anti-vortex device for facilities serving large drainage areas. Anti-seep collars shall be installed around all conduits that pass through the embankment of the basin. The outlet may be sized to achieve the flood control performance standards contained in Sections 8.2, 8.6 and 9.8 of these regulations. An emergency spillway shall be provided no lower than the 25 year ponding elevation and its capacity shall be at least equal to the full 100 year peak flow rate into the facility.

9.6.1.10.3 The channel which receives the discharge from the basin's outfall pipe shall be protected from erosive discharge velocities. Options which may be used include: rip-rap lining of the channel; or , the provision of stilling basins, check dams, rock deflectors or other devices to reduce outfall discharge velocities to non-erosive levels.

9.6.1.10.4 An orifice for any required extended detention volume shall be sized using the same criteria as required in section 9.6.2.

9.6.1.11 Access

An easements shall be as specified in Subsection 9.3.5

9.6.1.12 Easement Requirements

Easement requirements shall be as specified in Section 9.3.5 of this chapter with the change that easement enclosing the facility shall be named a Best management practice (BMP) easement.

9.6.1.13 Engineer's Certification and Record Drawings

A certified record survey of each facility shall be prepared by a land surveyor currently registered in the State of Georgia. A certified record drawing of the facility shall be prepared based upon this survey. The design engineer shall certify that the facility functions hydraulically as designed. The record drawing shall be submitted to the department at least one week prior to the issuance of a Certificate of Occupancy or Final Plat approval (as appropriate to the project). Record drawings of off-site facilities shall be recorded at least one week prior to the recording of the Final Plat.

9.6.2 Dry Extended Detention Facilities

Extended detention facilities with wetland plantings shall be designed and constructed to meet the following requirements:

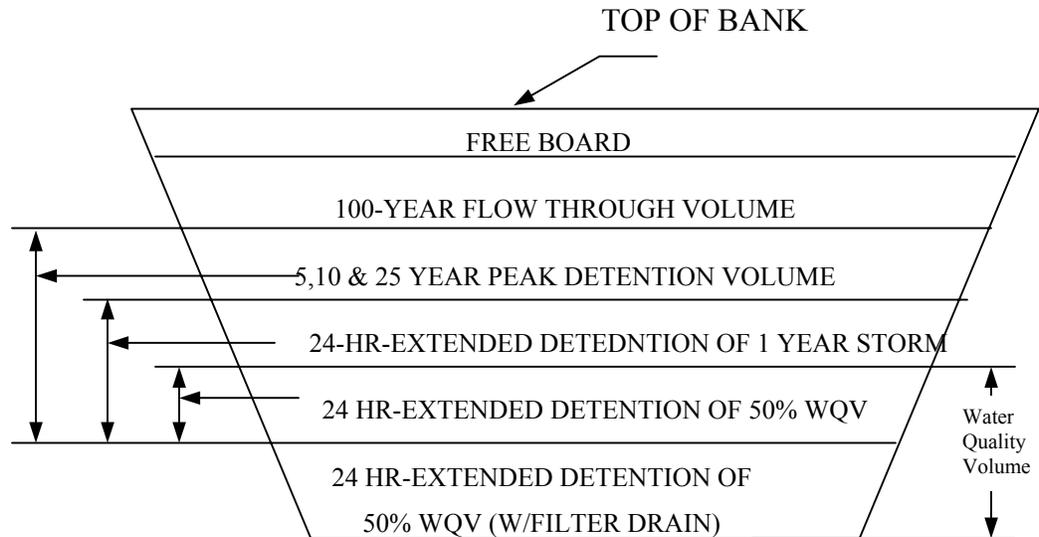
9.6.2.1 Maximum Drainage Area

The maximum drainage area for which the facility shall be allowed to be constructed shall be 20 acres (DA = drainage area in acres);

9.6.2.2 Storage Volume

The Water Quality Volume (WQV) to be stored is defined in subsection 9.8.1. Up to fifty percent (50%) of the storage volume shall be detained for 24 hours and may be used for detention requirements. The remaining portion (50% or greater) shall be drained through a filter drain in 24 hours. The filter drain shall be the only outlet draining the WQV

S = BMP storage volume in cubic feet;



#### 9.6.2.3 Minimum Surface Area

The facility should have a minimum surface area of one (1) percent of the total drainage area when the volume contained in the facility equals the required BMP storage volume;

#### 9.6.2.4 Side Slopes Along the Shoreline

Side slopes shall be no steeper than 2H:1V (Horizontal : Vertical). A flat bench at least 10 feet in width shall be provided 1 foot above the ponding level used to determine the minimum surface area.

#### 9.6.2.5 Length to Width Ratio

The length to width ratio shall be maximized. The length shall be measured as the shortest flow path from the inlet to the outlet. The width shall be calculated as the surface area of the pond divided by the length.

#### 9.6.2.6 Depth of Facility

The average cross-sectional area of the facility shall be calculated as the volume of the pond divided by the length. The water velocity shall be determined by dividing the maximum outflow rate by the average cross-sectional area. The maximum desired water velocity shall be 0.5 feet per second.

#### 9.6.2.7 Spillway and Dam Design

The principal spillway, emergency spillway and dam shall be designed in accordance with sections 9.3 and 9.11 of this chapter.

#### 9.6.2.8 Forebay

The forebay requirements are the same as for wet extended detention in section 9.6.1.9.

#### 9.6.2.9 Inlet and Outlet Structures

9.6.2.9.1 Inlet and outlet structures shall meet the same requirements as wet detention facilities.

9.6.2.9.2 The size of the orifice for the facility shall be computed using the following orifice equation with a 24 hour draw down time from the full pool BMP volume (S) and an orifice coefficient of 0.60:

$$\begin{aligned} h &= \text{head measured in feet from the elevation at the} \\ &\quad \text{required BMP storage to the centroid of the orifice;} \\ Q_a &= \text{peak BMP outflow rate in cfs;} \\ Q_a &= S / 3600 \times 24; \\ A &= \text{required orifice area in square feet;} \\ A &= Q_a / (0.6 \times (64.4 \times h/2)^{0.5}). \quad \text{(Eq. 9.6.2.9.2-1)} \end{aligned}$$

9.6.2.9.3 An allowance for base flow shall be provided. The designer either shall determine the base flow using a factor of 1.6 cfs per square mile or may use another standard engineering practice of warranted.

#### 9.6.2.10 Access

Access requirements shall be as specified in Subection 9.3.5

#### 9.6.2.11 Easement requirements

Access requirements shall be as specified in Subection 9.3.5 with the exception that the enclosing the facility shall be named a Best Management Practice (BMP) easement.

#### 9.6.2.12 Engineer's Certification and Record Drawings

A certified record survey of each facility shall be prepared by a Land Surveyor currently registered in the State of Georgia. A certified record drawing of the facility shall be prepared based upon this survey.

The design engineer shall certify that the facility functions hydraulically as designed. The record drawing shall be submitted to the department at least one week prior to the issuance of a Certificate of Occupancy or Final Plat approval (as appropriate to the project). Record drawings of off-site facilities shall be recorded at least one week prior to the recording of the final subdivision plat.

9.6.2.13 Wetland Plantings

The facility bottom shall be planted with plantings indigenous to local wetlands.

9.6.3 Stream Buffers and Impervious Surface Setbacks

Refer to the Zoning Resolution for buffer and impervious surface setback requirements from streams.

9.6.4 Wet and Extended Detention Facility Maintenance

Maintenance requirements shall be as specified in Section 9.3.6

END OF SECTION 9.6