




# Extended Detention Dry Pond

Dry ponds, also known as detention ponds, are often thought of as strictly water quantity based BMPs. However, with specific design standards, they can be moderately effective in removing sediments and floatable particles. It is important to note, however, that reducing peak flows is the main objective of a dry pond.

Dry ponds are very similar to wet (retention) ponds, except for the fact that dry ponds are designed to maintain a pool of water for less than 24 - 36 hours. Substantial improvements to pollutant removal can be achieved by including any of the following enhancement options: sediment forebay, extended storage time (at least 48 hours), micropool at the outlet and low flow channels. A sediment forebay and extended detention time both allow for increased sedimentation, thus settling out pollutants attached to sediment particles. A micropool can prevent resuspension of solids and clogging at the outlet, while low flow channels serve dual purposes in preventing erosion as water first enters the pond at the onset of the storm and channeling the last remaining water to the outlet to ensure drying of the basin.

## AT-A-GLANCE SUMMARY

### Benefit

- Major 
- Moderate 
- Minor/None 

Reduction in peak flow rate 

Runoff volume reduction 

### Pollutant Removals

Sediment 

Floatables 

Heavy metals 

Oil and grease 

Fecal coliform 

BOD 

Total Phosphorous 

Nitrogen 

Costs 

Maintenance 

# Dry Pond

## Advantages

- Can limit downstream scour and loss of aquatic habitat by reducing the peak flow rate and energy of storm water discharges to receiving waters
- If designed properly and not needed very often for water, dry ponds may be used as recreational areas (ball fields, etc.)
- Low cost treatment option

## Limitations

- Applicable for sites 10 acres and larger
- Main purpose is for flow attenuation and does not provide much pollutant removal
- May be considered unattractive by community members

## Maintenance

Maintenance tasks for dry ponds include:

Activity	Schedule
Note erosion of pond banks or bottom	Semi-Annual Inspection
Inspect for damage to the embankment. Monitor for sediment accumulation in the facility and forebay. Examine to ensure that inlet and outlet devices are free of debris and operational.	Annual Inspection
Repair undercut or eroded areas Mow side slopes Pesticide/Nutrient management Litter/Debris removal	Standard Maintenance
Seed or sod to restore dead or damaged ground cover	Annual Maintenance (As needed)
Removal of sediment from the forebay	5 to 7 year Maintenance
Monitor sediment accumulations, and remove sediment when the pond volume has been reduced by 25%.	25 to 50 year Maintenance

(Source: Modified from WMI, 1997)

# Dry Pond

## Costs

Dry ponds are typically the least expensive of Treatment BMPs, and a general equation for calculating the cost of a dry pond is included below.

$$C = 12.4V^{0.760}$$

Where:

C = Construction, Design and Permitting Cost

V = Volume needed to control the 10-year storm (cubic feet)

Using this equation, a typical construction costs are:

\$ 41,600 for a 1 acre-foot pond

\$ 239,000 for a 10 acre-foot pond

\$ 1,380,000 for a 100 acre-foot pond

Typical maintenance costs for extended detention dry ponds are estimated at 3-5% of the construction cost of the pond.

## Design Specifications

1. All basins shall be designed and built with side-slopes no greater than 3:1 (three feet horizontal per one foot vertical); paved channel bottoms and proper outlet structures to insure no standing water during dry periods.
2. The dam crest elevation shall not be less than one (1) foot above the emergency spillway invert or overflow elevation.
3. Discharge velocities within pipe must be controlled to same requirements as specified in Section 406 of the District's Rules and Regulations. Erosion control linings for open channels must comply with requirements in Section 506 of the District's Rules and Regulations.
4. Storage, discharge, and routing calculations for the 2-year, 10-year, 25-year, 50-year and 100-year discharges must be submitted for review.
5. Spillways shall be protected from erosion and shall employ energy dissipation, if necessary.
6. Fencing may be required by the District or local governments when the location of the detention area is not easily observed or the side slopes of the basin are steeper than 4:1 (four feet horizontal per one foot vertical).
7. If required, ponds shall have dams and spillways that conform to the current Design Criteria For Dams and Associated Structures, Kentucky Division of Water. In cases when the top of the dam is also a publicly dedicated street right-of-way, the developer shall have a geotechnical report prepared with recommendation on the design and construction of the dam.

# Dry Pond

8. The designer shall include anti-seep collars, baffles, and outlet protection, when required.
9. Maintenance accessibility and responsibility for maintenance shall be included.
10. Post construction BMPs must achieve the following goals:
  - a) In order to qualify for water quality credit, the practices must be sized to treat the water quality volume ( $WQ_v$ ). The  $WQ_v$  shall be the maximized water quality capture volume for the site, as defined in “Urban Runoff Quality Management,” WEF Manual of Practice No. 23 and ASCE Manual and Report on Engineering Practice No.87 (WEF and ASCE, 1998).
  - b) The  $WQ_v$  shall be determined through a site hydrologic study approved by the District that uses the following equation:

$$WQ_v = \Psi (0.858i^3 - 0.78i^2 + 0.774i + 0.04) * PA/12$$

Where:

$WQ_v$  = water quality volume in acre-feet

$i$  = watershed impervious ratio (percent total impervious divided by 100)

$P$  = mean storm precipitation depth in inches (0.52 inches in Northern Kentucky)

$\Psi$  = 1.545

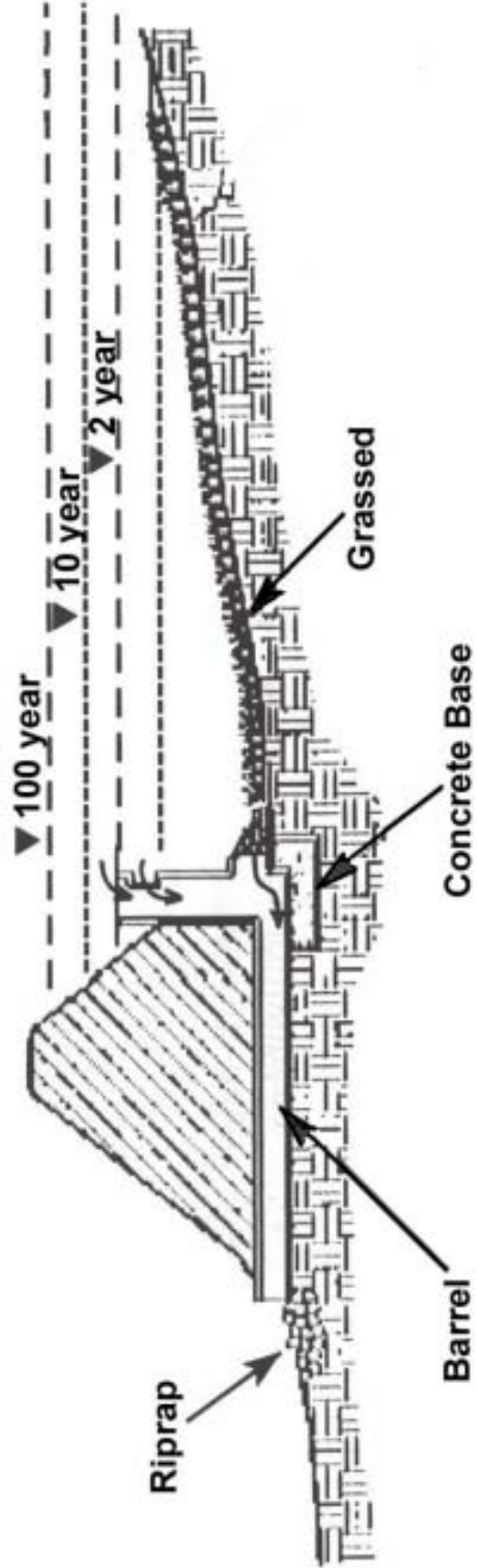
$A$  = area draining into the facility in acres

- c) The Extended Detention Dry Pond should be designed with a drain time of  $WQ_v$  of 48 hours in order to increase the removal of TSS.

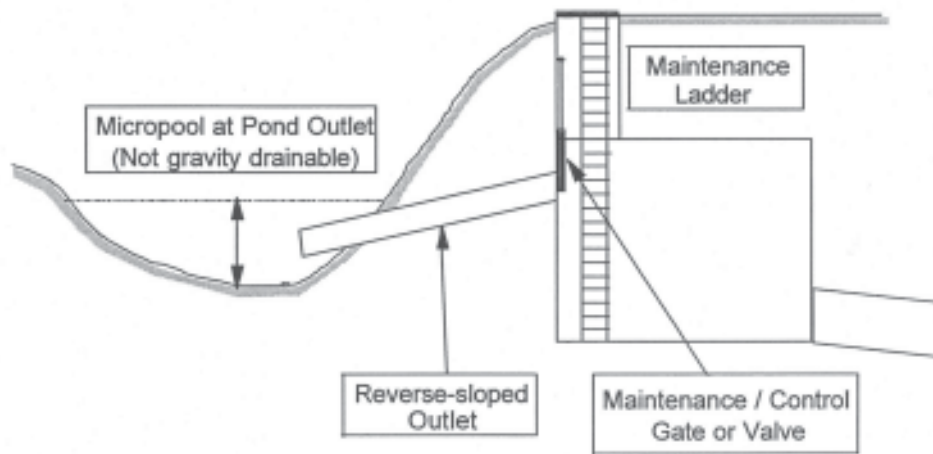
*Source: Modified from WEF and ASCE, 1998.*

# Dry Pond

Source: NVPDC, 1992.



# Dry Pond



## ***Dry Pond Micropool and Reversed-Slope Outlet Pipe***

*Source: Ontario Ministry of the Environment, 1999.*