

**Description** A wet extended detention pond combines the pollutant removal effectiveness of a permanent pool of water (see BMP 11 Wet Pond for Conventional Pollutants) with the flow reduction capabilities of an extended storage volume (see BMP 14 Dry Extended Detention Pond).

**Applications** Wet extended detention ponds require careful planning in order to function correctly. Throughout the design process the designer should be committed to considering the potential impacts of the completed facility. Generally speaking, the completed facility should provide for safety to people as well as protection of real property, water quality, and wildlife habitats.

Detention system site selection should consider both the natural topography of the area and property boundaries. Aesthetic and water quality considerations may also dictate locations. A storage facility is an integral part of the environment and, therefore, should serve as an aesthetic improvement to the area if possible. Use of good landscaping principles is encouraged. The planting and preservation of desirable trees and other vegetation should be an integral part of the storage facility design.

The two goals of the wet extended pond may limit other uses of the facility, such as enhancing natural habitat. The fluctuating water elevations in the extended detention part of the facility will alternately flood and dry out the soils, making it more difficult to establish plants.

The design of urban detention facilities should be coordinated with a basin plan for managing stormwater runoff. In a localized situation, an individual property owner can, of course, by his or her actions alone, provide effective assistance to the next owner downstream if no other areas contribute to that owner's problems. However, uncontrolled proliferation of impoundments within a watershed can severely alter natural flow conditions, causing compounded flow peaks or increased flow duration that can contribute to downstream degradation. In addition, upstream impacts due to future land use changes should be considered when designing the structure. Land use planning and regulation may be necessary to preserve the intended function of the impoundment.

<b>Limitations</b>	Drainage area – 10 to 50 ac.	Max slope – 10%
	Minimum bedrock depth – 3 ft	Minimum water table – 2 ft
	NRCS soil type – C, D	Freeze/thaw – good
	Drainage/flood control – yes	

Targeted  
Pollutants

Sediment – 80%  
Phosphorus – 65%  
Trace metals  
Bacteria  
Hydrocarbons

Design  
Parameters

**Site Constraints**

All facilities should be a minimum of 20 feet from any structure, property line, and any vegetative buffer required by the local or state government, 100 feet from any septic tank/drainfield (except wet vaults should be a minimum of 20 feet), and 100 feet from any wells or water supplies.

All facilities should be a minimum of 50 feet from any steep (greater than 15%) slope. A geotechnical report should address the potential impact of a wet pond on a steep slope.

**Permanent Pool Volume**

The permanent pool volume should be equal to the runoff volume of one-third of the 2-year, 24-hour design storm. Review Appendix D for additional information on sizing the detention facility.

**Overflows**

Detention facility design should take into consideration the possibility of overflows. An overflow device should be installed in all facilities to bypass flows over or around the restrictor system. The most common overflow event is during snowmelt, but overflows may also result from higher intensity or longer duration storms than the design storm or result from plugged orifices or inadequate storage due to sediment buildup in the facility.

**Pond Configuration and Geometry**

Wet ponds may be single-celled or multi-celled. The multi-celled version requires more planning and maintenance due to the extra berms involved; however, some studies have shown it to be more effective at pollutant removal. Regardless of the configuration, the total pond area and volume should be consistent with the sizing criteria given in Appendix D.

Long, narrow ponds are preferred, as these are less prone to short-circuiting and tend to maximize available treatment area. The length-to-width ratio should be at least 3:1 and preferably 5:1. The inlet and outlet should be at opposite ends of the pond where feasible. If this is not possible, then berms can be installed to increase the flow path and water residence time. Slightly irregular ponds may perform more effectively and will have a more natural appearance.

Interior side slopes up to the maximum water surface should be no steeper than 3H:1V. Exterior side slopes should be no steeper than 2H:1V. The pond bottom should be level to facilitate sedimentation.

### **Liner To Prevent Infiltration**

Detention BMPs should have a negligible infiltration rate through the bottom of the pond. Infiltration will impair the proper functioning of detention BMPs and can contaminate ground water.

### **Berm Embankment/Slope Stabilization**

Pond embankments higher than 6 feet should require design by a geotechnical-civil engineer licensed in the state of Idaho. For berm embankments of 6 feet or less (including 1 foot freeboard), the minimum top width should be 6 feet or as recommended by the geotechnical-civil engineer.

Pond berm embankments should be constructed on native consolidated soil (or adequately compacted and stable fill soils analyzed by a geotechnical report) free of loose surface soil materials, roots, and other organic debris.

Exposed earth on the side slopes should be sodded or seeded with the appropriate seed mixture as soon as is practicable. If necessary, geotextile or matting may be used to stabilize slopes while seeding and sodding become established.

### **Gravity Drain**

A gravity drain for maintenance should provide an outlet invert of 1 foot above the bottom of the facility and should be sized to drain the facility in 4 hours or less.

## **Construction Guidelines**

Widely acceptable construction standards and specifications such as those developed by the NRCS or the U.S. Army Corps of Engineers for embankment ponds and reservoirs may aid in building the impoundment. Additional information is also available from the Idaho Transportation Department's Design manual.

## **Maintenance**

Failure of large impoundment structures can cause significant property damage and even loss of life. Only professional engineers registered in the state of Idaho who are qualified and experienced in impoundment design should design such structures. Where they exist, local safety standards for impoundment design should be followed. Impoundment structures should also be regularly inspected for signs of failure, such as seepage or cracks in the berm.

The presence of wet ponds and marshes in established urban areas is perceived by many people to be undesirable. They are often thought of as mud holes where mosquitoes and other insects breed. If the wet pond has a shallow marsh established, the pond can become a welcomed addition to a residential community. Constructed fresh water marshes can provide miniature wildlife refuges, and while insect populations are increased, insect predators also increase, often reducing the problem to a tolerable level. More information about mosquito control can be found in Appendix F. Nevertheless, local government and homeowners associations may wish to drain the ponds during late spring and summer if there is sufficient concern. However, it is imperative

that the vegetation in shallow marsh areas not die off during draindown periods, otherwise the pollutant removal effectiveness of the wet pond can be severely impacted. In addition, the decaying vegetation can create nuisance conditions.

### **Safety, Signage and Fencing**

Ponds that are readily accessible to populated areas should incorporate all possible safety precautions. Steep side slopes (steeper than 3H: 1V) at the perimeter should be avoided and dangerous outlet facilities should be protected by enclosure. Warning signs for deep water and potential health risks should be used wherever appropriate. Signs should be placed so that at least one is clearly visible and legible from all adjacent streets, sidewalks or paths. A notice should be posted warning residents of potential waterborne disease that may be associated with swimming or fishing in these facilities.

If the pond surface exceeds 20,000 square feet, include a safety bench around the basin with a width of 5 feet, and with a depth not exceeding 1 foot during non-storm periods. Emergent vegetation such as cattails should be placed on the bench to inhibit entry by unauthorized persons.

A fence is required at the maximum water surface elevation, or higher, when a pond slope is a wall. Local governments and homeowners associations may also require appropriate fencing as an additional safety requirement in any event.

### **Heavy Metal Contamination**

Studies have shown high accumulation rates of lead, zinc, and copper on and near heavily traveled highways and streets. Runoff from highways and streets can be expected to carry significant concentrations of these heavy metals. If a significant portion of the drainage area into a pond consists of highways, streets, or parking areas or other known sources of heavy metal contamination, there is a potential environmental health hazard. In such cases the multiple use functions of the pond should be limited and accessibility should be restricted. Additionally, liners may be required in order to prevent these types of pollutants from migrating into the underlying soil or ground-water system.

