Streamlines

A Newsletter for North Carolina Water Supply Watershed Administrators

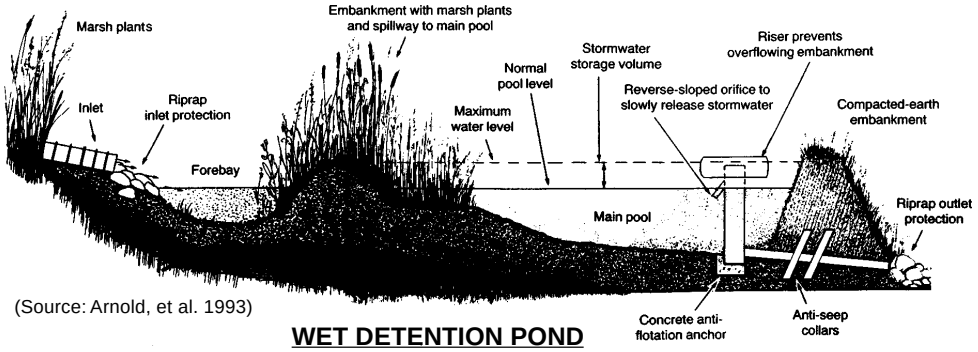
Volume 1, Number 2 **March 1996**

Alternatives To Wet Ponds Now Available

At the end of 1995, the Environmental Management Commission (EMC) and the Division of Environmental Management (DEM) finalized changes to rules governing stormwater management in North Carolina. One of the major changes in the rules is the provision allowing the use of stormwater management systems other than wet detention ponds.

The rules allow local governments, developers and engineers to look at a number of alternative stormwater management options on a given project site. In the past, the Water Supply Protection Rules and other state stormwater requirements have restricted the types of stormwater management systems that could be used in high density land development situations mainly to the use of wet detention ponds. The restriction was based on the ability of wet ponds to consistently remove significant amounts of pollutants and on their long term effectiveness.

The DEM still recommends that wet detention ponds should be considered first as the selected alternative for stormwater management. However, DEM recognizes that other technologies continue to develop for stormwater management and that for all situations and projects, the use of wet detention ponds may not be appropriate. For these reasons, flexibility, through the use of alternative systems, has been added to the rules.



(Source: Arnold, et al. 1993)

WET DETENTION POND

Limitations

Everyone should understand that alternative systems may not be appropriate in all situations. Like wet detention ponds, other systems have limitations as well. In addition, assumptions should not be made that an alternative stormwater system will be cheaper or take up less land area than a wet detention pond. Good planning and design up front in the project planning process will have a positive impact in effectively siting and using a specific stormwater management system.

Design Requirements

Design requirements for alternative stormwater devices have been developed in an attempt to be equivalent to the protection afforded by wet detention ponds. Wet detention ponds are designed to achieve average annual removal of 85% of the total suspended solids (TSS) load. In addition, wet ponds are designed to capture and slowly release the volume of runoff produced by a one-inch rainfall event over the drainage area of the pond. These are

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the two major components of wet detention pond design.

There are additional requirements for forebays, inlet and outlet structures, side slopes, maintenance practices, etc., spelled out in the rules and guidance material for wet ponds. Alternative stormwater management measures are allowed if these measures can meet the same general design requirements: 1) designed for 85% total suspended solids removal and, 2) designed to control runoff from a one inch storm.

The DEM has provided charts and other design information to assist in the design of wet detention ponds. In a similar manner, the DEM has developed a guidance document that outlines design considerations for a number of potential alternative stormwater practices. "Stormwater Best Management Practices" (see Resources box) lists the levels of TSS removal that each of the referenced alternatives will be able to achieve if designed in accordance with the criteria outlined in the document.

Not all of the alternatives covered in the document are considered to be capable of meeting the 85% TSS removal requirements by themselves. For this reason, there will be situations where a combination or system of stormwater management practices may be necessary. The table above indicates the assumed TSS removal efficiencies for specific practices if designed according to DEM specifications.

Assumed TSS Removal Efficiencies

Wet Detention Ponds	**85%**
Extended Detention Wetlands	**85%**
Pocket Wetlands	**35%**
Bioretention Areas	**85%**
Sand Filters	**85%**
Grassed Swales	**35%**
Filter Strips	**35%**
Extended Dry Detention	**50%**
Infiltration Practices	**85%**

Overview of Alternatives

Wet Detention Ponds

Most people are familiar with wet detention ponds as a type of stormwater management measure. Wet ponds are designed to maintain a permanent pool of water that is designed for a target TSS removal according to the size and imperviousness of the drainage area. These ponds are also designed to hold and slowly release the runoff from a small storm event (one inch). The use of wet ponds may be limited on very small sites and by other site constraints. In general, wet ponds are applicable to the majority of sites requiring stormwater management.

Stormwater Wetland Areas

Stormwater wetlands are constructed systems, not natural wetland areas. These systems function similarly to natural wetlands by removing pollutants through settling and vegetative uptake while also reducing stormwater flows. Extended detention wetlands are very similar to wet ponds except that the constructed wetlands are shallower and can potentially take up more land area than a wet pond. Pocket wetlands are smaller wetland areas that would usually be used in combination with other management measures.

Bioretention Areas

Bioretention is a water quality practice that uses plants and soils for removal of pollutants from stormwater runoff. These areas are designed to create a forested type environment that would capture stormwater runoff from

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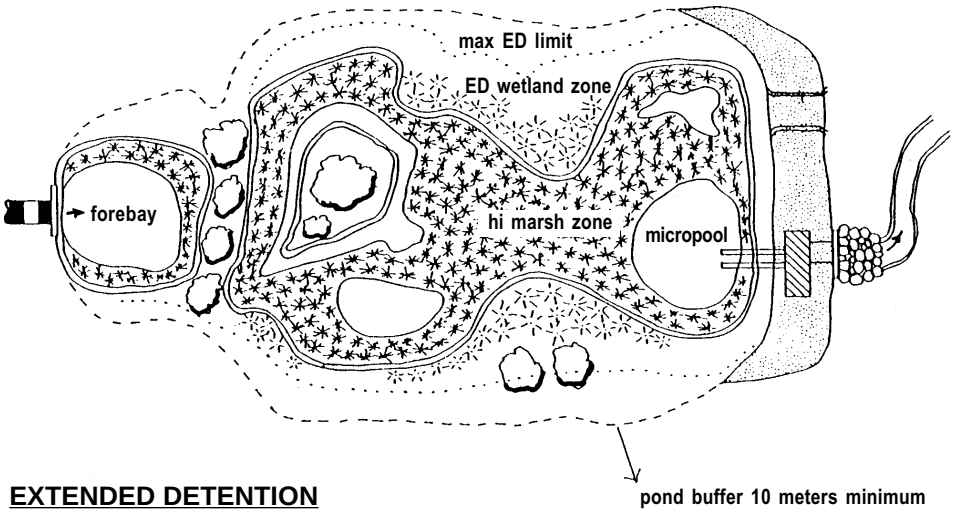

EXTENDED DETENTION STORMWATER WETLAND

(Source: Schueler 1992)

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For assistance with the watershed protection rules, contact the NC DEM, Water Supply Watershed Technical Assistance Unit, PO Box 29535, Raleigh, NC 27626-0535, (919) 733-5083 at extensions:

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a project area. Through the use of appropriate soils and plant species in the bioretention areas, pollutants are removed through infiltration and soil filtering and also through uptake by the plants and trees. These practices could be worked in with other landscaping features.

Sand Filter Systems

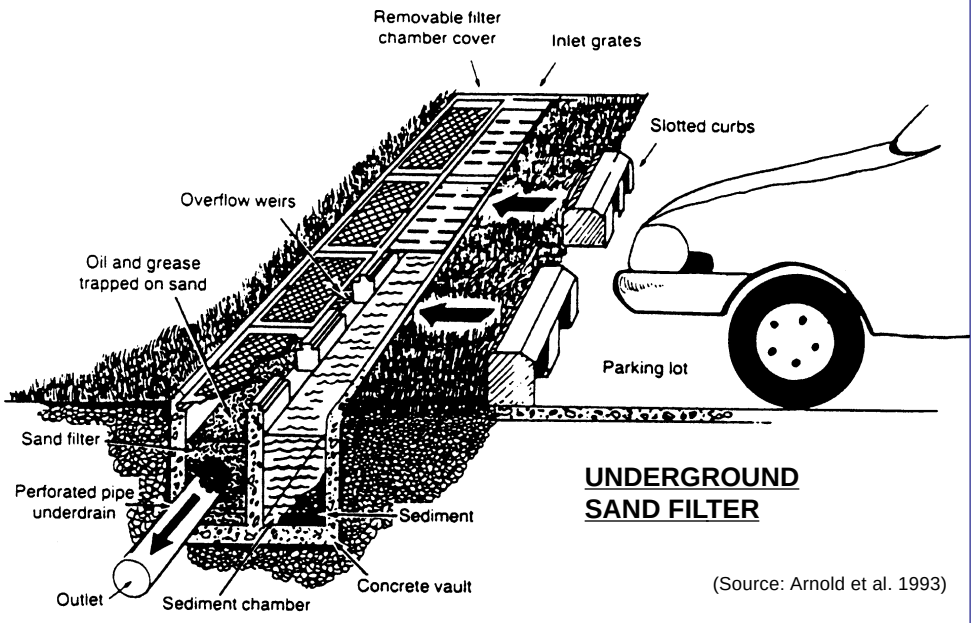
Sand filter systems use sedimentation and filtration to remove pollutants from stormwater runoff. The basic design involves a sedimentation chamber that collects the stormwater flow and then distributes it over a second chamber that is filled with sand. A good portion of incoming sedimentation settles out in the first chamber, the sand chamber then traps fine sediment and sediment bound pollutants. Sand filter systems are limited by the amount of land area they can treat and are often very expensive to construct. These systems may be constructed below ground in a manner (concrete structures) that allows vehicles to travel over them. This makes them very useful in highly urban areas without completely removing the use of the land area they occupy.

Vegetative Practices

Vegetation can be used to reduce velocity of stormwater flow and create areas that can infiltrate and filter stormwater runoff. Various types of vegetative practices can be built into any type of development activity. Buffers, grassed swales and filter strips are examples of vegetative measures that can be used as stormwater management features. These types of measures do not, however, have very high pollutant removal capabilities and are usually used in conjunction with other stormwater measures.

Extended Dry Detention

These devices are similar to wet detention ponds, except that they are not designed to maintain a permanent pool of water. These measures are designed to detain small stormwater events for an extended period of time (2 to 5 days). Pollutant removal is through the sedimentation process. These devices are not capable of 85% TSS removal and must be used in combination with other types of stormwater management measures.



UNDERGROUND SAND FILTER

(Source: Arnold et al. 1993)

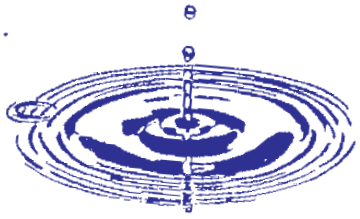
Infiltration Practices

Infiltration practices may be basic structures or trenches that are designed to capture stormwater runoff and completely infiltrate it into the soil. These devices are limited to areas where the soil conditions are appropriate to allow for infiltration of the design storm.

Operation & Maintenance

Any type of stormwater management measure or system must have proper operation and maintenance practices. This includes establishing procedures that will be followed for operation and maintenance and the designation of personnel who will be responsible for operation and maintenance. Proper operation and maintenance is essential to assure that the measures function appropriately for the life of a project.

Resources



The following outlines additional information available through the North Carolina Division of Environmental Management:

- ❑ **Water Supply Protection Rules 15A NCAC 2B.0100 & .0200**
- ❑ **Stormwater Management Rules 15A NCAC 2H.1000**
- ❑ **Stormwater Management Guidance Manual - NC State University and NCDEM (1993)**
- ❑ **Stormwater Management in North Carolina: A Guide For Local Officials -Land-of-Sky Regional Council (1994)**
- ❑ **Stormwater Best Management Practices - NCDEM (1995)**

What's Happening ?

March 13, April 10 – NC Water Quality Committee of the NC EMC - Raleigh, Archdale Bldg., 512 N. Salisbury St., Ground Floor Hearing Chambers, 12 noon. Agenda Items: Several local government water supply watershed ordinances will be reviewed.

March 20-23 – On the Edge: Protecting Lakes Through Watershed Management. Sponsored by the North America Lake Management Society and the EPA. Hilton Hotel, Huntsville, AL. For additional information contact Gary Springston, TVA, Chattanooga, (423) 751-7336 or Mike Struve, Western Piedmont Council of Governments, Hickory, NC, (704) 322-9191.

April 29-30 – N.C. Non-Point Source Management Conference - Asheville, Radisson Hotel. Sponsored by Land-of-Sky Regional Council and NCDEM. For more information, call Bill Eaker, LOSRC at (704) 251-6622.

June 8-12 – "WATERSHED '96 – Moving Ahead Together" Conference, Baltimore, MD. Billed as an interactive forum on the progress and future of watershed management in the U.S., this is sponsored by various federal agencies, including Army Corps of Engineers, BLM, EPA, USFWS, USGS, Forest Service, Highway Administration, NOAA, and other groups including TVA and Water Environment Federation. For more information, call 1-800-666-0206.

References: Schueler et al., 1992, "A Current Assessment of Urban BMPs ...," Metro Washington COG, Washington, D.C.; Arnold et al., 1993, "Stormwater Management Guidance Manual," NC Cooperative Extension Service & NC DEM, Raleigh.

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