

“STORMWATER PONDS FOR SMALL PROJECTS”

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As most developers and builders know, stormwater requirements can be a mystifying topic. Overlapping municipal, county and state regulations almost seem to be intentionally confusing, leaving many of us unsure of exactly what is required. Some land owners think you just dig a hole and you're done, while others think the local government should take care of it. Others are surprised that they have to construct any kind of facility at all.



Wet detention pond at Envision Credit union

Indeed, some development is exempt from stormwater requirements; these include single family residences, as well as some duplexes and triplexes. Projects deemed to be “redevelopment”, i.e., where existing developments are redesigned for new uses, may also be exempt under certain conditions.

Local governing bodies use a two-track approach to managing stormwater in our community. First, they build large regional facilities to help control flooding and provide protection of water quality. Second, they require the development community to provide onsite facilities that service new development and augment the larger municipal facilities. Think of it as solving a regional stormwater management problem by implementing thousands of little cuts. Each cut is a new pond or facility brought online to address existing issues down stream or, at the minimum, to neutralize the impact of new development on existing stormwater conditions.

Stormwater ponds can be tricky to design and implement for many reasons, ranging from soil conditions and environmental issues to development requirements and local/state regulations. Stormwater design is a lengthy and complex topic, and we cannot hope to cover all of the intricacies here. We will, however, provide you with an overview of what to consider when purchasing a property or planning a project.

Stormwater terms

Open basin: A drainage basin that has a natural outlet or outflow for water to escape through. You will also hear engineers say that the basin has a “pop off” or “out fall”.

Closed basin: A depression area which has no natural “pop off” or “out fall” for stormwater, except for percolation (infiltration into the soil) and evapotranspiration (evaporation by the sun and uptake by trees and plants). Lafayette Oaks basin is an example of a closed basin.

Conveyance: A natural or man-made channel or pipe that runoff travels through. Conveyance systems are critical components of stormwater management systems, as discussed below.

Treatment: The removal of pollutants from stormwater runoff. This can be accomplished by several means, the most common of which are percolation through the ground (which includes uptake by plants and the soil), and filtering through a sand filter, which traps particles and other pollutants.

Rate Control: Rate control is the control of the rate of flow of water leaving a stormwater facility. Rate control is used to prevent flooding from

occurring downstream of new projects. This is accomplished using a stormwater outfall box, which will be constructed with orifices, weirs, or other structures that slowly meter out the water after a storm event.

Volume Control: Volume control is the control of the amount of water leaving a stormwater facility. Volume control is used to prevent exacerbating an existing flooding condition downstream of new projects. This is accomplished by methods similar to those used in rate control.

One of the biggest concerns is, how big will the pond be? Often, the site plan concept is completed with little thought given to stormwater, or how it will be integrated into the overall design. The following factors will influence the size of the stormwater pond required:

Treatment and Rate Control Requirements

In Tallahassee and Leon County, your engineer must work with the City and/or County to obtain your stormwater permits. These permits dictate the requirements used to size a stormwater facility. Permits may also be required from the Department of Environmental Protection (DEP) and the Department of Transportation (DOT)

The City and County usually impose stricter treatment requirements than DEP, especially in environmentally sensitive basins such as Lake Jackson and Lake Bradford, and will most always dictate rate control requirements for a project. If there is an existing flooding problem downstream of your project, you may be required to put in a larger stormwater facility to keep from exacerbating the downstream issue.



Closed basin Pond at Gramercy Place PUD

The permitting agency will also dictate which stormwater models are acceptable, and the range of storm events to be modeled. Tallahassee and Leon County typically require rate control for the 25-year storm events for open basin and 100 year for closed basin, while DOT looks at the 100-year event in both conditions. Therefore, the DOT rate control requirements may rule in some cases. Please understand that this is a simplification of the regulations and you need to review the actual codes to understand all the requirements. Common stormwater models used include SWMM, a model developed by the EPA; ICPR, which stands for Interconnected Pond Routing, a proprietary model; and the methodologies set forth in TR-55, a government publication.

Offsite conveyance system and easements

The conveyance system to and from the stormwater pond is a critical part of the stormwater management system design. All ponds must have an outfall box or structure which discharges runoff to an approved adequate conveyance system. If the property drains naturally toward a street or road, you may be permitted use the public conveyance, providing there are no flooding problems.

If, however, the property drains on to someone else's property, you will need to obtain an easement to drain through their property. Without such an easement, the stormwater pond can become quite large and expensive. Ponds which do not have an outfall or outflow conveyance system may be required to retain all stormwater runoff on site. This is known as “Total Retention”, and can take up a large part of the site.

Open vs. closed basin

The drainage basin in which the pond is located will affect how big a pond is required. The most problematic are the closed basins because they have no natural outlets. The pond will have to provide rate/volume control of discharged water to less than or equal to pre-development levels. The new development must retain the remainder of the stormwater runoff on site. This can be difficult if you also have clay soils, low percolation rates, or other factors which make your site less than suitable for stormwater retention.



Large total retention facility at Camp's Crossing

Fortunately for prospective land buyers, closed basins are identified on many drainage maps available from Leon County. Be aware, however, that just because your property is not in a closed basin, it may still be regulated as such. If there is a localized depressional area downstream (which may not necessarily show up on the drainage maps), then your project may be deemed a "localized closed basin". Also, the County regulates some watersheds such as Bird Sink and Patty Sink as large closed basins.

Typically, you can rough-estimate the area needed for pond as follows:

Criterion	Percent of Site Need for Pond
Open basin	7% to 9%
Closed basin	8% to 12%
Total Retention	10% to 15%

Soils

The total area required will depend to a large extent on the type of soils found on the site. Sandy soils will usually percolate well, while soils with more clay draw down at a greatly reduced rate. This is not a standard rule however; some sandy soils do not percolate well, even though they have little or no clay. This is due to the phenomenon of "groundwater mounding", a stacking or doming of water under the site in areas with a high groundwater table. If the proposed stormwater pond is near a wetland or in an area with a high groundwater table, the natural percolation rate may be quite low due to groundwater mounding.

Soils testing should be performed early on in your project to identify the soil properties and anticipate any problems that may occur. This is typically accomplished by taking soil borings and examining the underlying soils. As noted earlier, identifying the seasonal high groundwater table is critical. Even though soil may appear bone dry at the time of testing, it can be very wet at other times of the year. In order to function correctly, the pond must be designed to address the wettest, worst case conditions.

Percolation testing is also performed as part of routine soils testing. There are many methods of measuring the percolation or infiltration rate of soils, each with its own limitations and merits. A common method used in our area is the double ring infiltrometer. This consists of two rings (an inner ring and an outer ring) seated into the soil. The outer ring is kept full of water to simulate saturated soil conditions, while the percolation rate of the inner ring is measured to estimate the infiltration characteristics of the soils.



Pond with infiltration issues that does not drain properly

Heavy clay soils typically have low to negligible infiltration rates. These can be compensated for by using a filter made of sand to treat the stormwater runoff. The drawback of sand filters is that they do not hold water on site; instead, they discharge the treated water through the pond outfall. Because they discharge water, they cannot be used in closed basins, where stormwater water must percolate on site. Sites in closed basins with these soil conditions have complex design issues, and will not be covered here.

Site topography and drainage

Generally stormwater ponds must be located at the lowest point(s) on a site, in order to allow water to be collected by gravity. Site topography will also influence the conveyance of water to and from the stormwater pond. As discussed above, it is important to have an approved conveyance for the stormwater pond outfall. Easements from adjacent property owners may be necessary.

An important but often overlooked aspect of stormwater design is the impact of offsite runoff. Not only do you need to consider where your runoff is going, but you also need to look at how much runoff is coming to you. If you have a high volume of untreated stormwater from uphill properties draining naturally on to your parcel, it can impact the size of your stormwater facility. It may be necessary to excavate a channel or other conveyance to divert this offsite runoff around your stormwater pond; this is called "providing a bypass for offsite runoff".



Open basin pond Pan Food Stores (Capitol Circle)

Pond Landscaping

When we think of stormwater ponds, we think of big, ugly unattractive holes. However, the design approach has been evolving, as stormwater ponds are becoming integrated into site design and landscaping. The stormwater pond can be an attractive feature of the site, as evidenced by the simple but attractive wet detention pond at Envision Credit Union off Appleyard Road.



Vegetated pond at Village Green

By adding some landscaping to the pond, you not only make it look attractive; it can also be used for landscape credits. In other words, this area can serve double-duty as a stormwater management facility and as part of the required site landscaping, freeing up other areas of the site for other uses. The landscaped pond must meet certain criteria to qualify; for example, the City requires “curvilinear” ponds (in other words, no square, box-shaped ponds). Ponds must also meet certain minimum side slope requirements and planting schedules.



Landscaped pond at Envision Credit Union

Public versus Private Ponds



Public pond at Windsor Oaks

Once constructed, the stormwater pond will require a stormwater operating permit, unless it is turned over to the permitting authority, which will provide ongoing maintenance. The advantage of having the City or County take over maintenance of the pond is obvious. Once they take over the pond, they will maintain it in perpetuity. A homeowners’ association or other organization for stormwater maintenance is not required. The drawback is that the pond must meet many more requirements. It will take up a larger area of the development and be more expensive to construct.

Any pond associated with a new road or new subdivision will usually be required to be a dedicated public pond. The disadvantage of having the City

or County assume maintenance is that the pond must be constructed to their standards, which usually means wide (20’) maintenance berms around the entire perimeter of the pond. The extra area required for pond access can take up a substantial portion of the site.



Private pond at Pan Food Stores (Parkway)

In summary, there are several important things to consider for stormwater treatment when considering development of a new site. The first and probably most important factor is the conveyance, or how the pond will outfall. Without a proper outfall and conveyance, you will have to provide total retention onsite, and your pond will be much larger. If your pond drains onto another person’s property, the first question you need to answer is, can I get a drainage easement through that property? If not, the parcel may be problematic to develop, and you may consider looking at another property

Key things to watch for include

Is the site in an open or closed basin? Be sure to check for any downstream depressions or other factors that could cause your site to be regulated as a closed basin. If your site is in a closed basin, soils will become a very important factor. Check the Leon County Soil Survey to determine the overall soil type. Sandy soils are preferable because they percolate better, but most of the soils in the north part of the County have some clay. Be sure to take into account the groundwater table, which will affect the pond design as well. Lastly, if all else fails, contact your engineer. He or she will be able to determine what kind of stormwater facility is needed, and the design best suited for your project.

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