WHY DO WE HAVE DETENTION PONDS, ANYWAY?

In order to answer that question, we have to make sure we are talking about the same thing, first. “Detention ponds” is a somewhat generic term for a designed area that intentionally floods during rain events and slowly meters the water out into the receiving storm sewer or stream. You will also hear the following terms used in reference to the same designed facilities: Retention Pond, Detention (or Retention) Area, Detention (or Retention) Basin, etc. Depending on who you ask there is either no difference between the terms “Detention” and “Retention”, or there is a difference between them. It gets a little more confusing than that, however, because those that claim there is a difference also might dispute what the difference actually is. Some say that Detention refers to a basin that is normally wet while Retention refers to a basin that is normally dry. Others will say that Detention refers to a basin that has a pipe (or overland) discharge while Retention refers to a basin that drains only by infiltration into the permeable soils below and within the basin. In any event, the purpose behind the facilities is the same: To slowly release storm water into the downstream collection system when it rains.

BUT WHY IS THAT IMPORTANT?

You might have been thinking that I answered the Title question of this newsletter in the first paragraph and that we were done for the month, but that is not the case. I’m not going to let you off that easy! What we discussed in the first paragraph is the definition and basic function, but we didn’t talk at all about why we have them in the first place. So they slowly release storm water, who cares?

Well, everyone who lives downstream of the detention basin cares. We will discuss several major impacts of the Detention Basin in this article including: Peak Run-off Rates, System Capacity, Water Quality, and Long Term Flooding.

PEAK RUN-OFF RATES

If you are a veteran “DABEC Digest” reader this next paragraph will be old news, but if you’re new to us we need to do a little background training on “Run-Off Rates.” The key idea here is that different surface conditions result in different amounts of storm water running downhill off the site onto the neighbor’s property. For example, asphalt allows very little water to soak in while a sandy beach area allows almost all of the rain water to soak into the ground.

Since we typically convert farm land and wooded areas into roads, parking lots, roof-tops and closely-mown lawns when we develop property for human use, it stands to reason that the amount of storm water that runs down hill off the property will also increase.

In addition to creating a situation where the total volume of water that runs off the property increases, we also typically increase the speed at which it crosses the property. We put in ditches, pipes, and pavements which are all designed to remove storm water from the proposed improvements and get it down hill fast to protect the investments. Those infrastructure improvements do a great job of keeping the water level down on the project, but they also transfer the storm water very rapidly to the lowest point on the project site.

As a result, if we didn't control the discharge of the storm water from the development site, the downstream neighbors would experience a higher peak flow and volume in their storm sewer system (pipes or streams) as well as getting hit with that water earlier than they used to.

Therefore, one function of Detention Basins is to slow down the water and reduce the peak discharge rate from the development, thereby reducing the impact of the peak discharge rate and the early run-off issues. Detention Basins do not appreciably reduce the volume of storm water released from the property, however. More on that later....

SYSTEM CAPACITY

Why bother reducing the peak discharge rate from a development?

The simplest answer is to protect downstream investments and safety of the public.

All storm sewer systems (whether under ground or above ground) have a finite and definable capacity. Some will carry
enormous amounts of water (like the Mississippi River) while others have a much lower capacity (like the rain gutters on your home.) When the capacity of the collection system is reached, the water will continue to rise and begin impacting areas that were not designed or constructed to handle storm water (like basements, garages, parking lots, etc.) When that happens, damage occurs to property and the safety of the public is threatened.

We can typically calculate the actual capacity of storm sewer collection systems downstream from a proposed development. Once that capacity is determined, we must design our facilities to reduce the peak discharge rate so that those down stream facilities are not over-burdened causing flooding to occur.

Therefore, another primary function of Detention Basins is to prevent downstream flooding by limiting the peak discharge rate to the capacity of the system down stream.

WATER QUALITY
The quality of the surface waters in the United States is getting a lot more attention recently than it did 50 years ago. We are concerned about all kinds of pollutants including: chemicals, microbes, sediment, and sanitary wastes. One of the beauties of Detention Facilities is that in the process of slowing down the water, they also typically remove some of the water pollutants that concern American citizens. Sediment falls to the bottom of the pond, and plant life can remove some of the other contaminants within the basin.

Therefore, another purpose of Detention Basins is to purify storm water prior to release into the down stream systems.

LONG-TERM FLOODING
So far, we have only discussed positive impacts of Detention Basins. However, there is at least one negative impact of Detention Basins that we have to discuss.

As you will recall from the first page, Detention Basins reduce the peak discharge rate, but they don't reduce the overall volume of water released. In fact, post-development conditions normally result in more storm water volume. The end result of a large area being developed is more storm water volume ending up in the downstream collection system. That volume is not a major problem in and of itself, but when you have multiple square miles of development all utilizing Detention Basins and all releasing storm water for approximately two days the collecting stream will be carrying that storm water for a long time.

This situation can result in low-lying areas flooding at a lower level, but for a longer period than they used to flood. That means corn and soy beans may be under 1 foot of water for 48 hours, when they used to be under 2' of water for 10 hours. The increased flooding time can result in dead crops.

Hang on to your hats, it's almost October!
See you next month....