

What is a Detention Basin?



Figure 1 On-site detention



Figure 2 Regional detention

What is a detention basin?

A stormwater detention basin (or pond) is used to collect and temporarily store stormwater, while releasing a lesser amount with the intent of lowering the risk of flooding downstream. Detention is not to be confused with retention, which is used by some jurisdictions and retain stormwater indefinitely.

These basins are large excavated areas, designed to remain empty, except during large storm events. Some are designed to be entirely dry when not storing stormwater, while others have a permanent shallow pool of water with capacity above the normal water level to store stormwater.

Why do we need detention?

Development that increases impervious surfaces, such as roads, homes, and parking lots, increases the rate and volume of stormwater runoff during storms, which can cause flooding downstream. Detention captures and stores this additional runoff. It is one of several tools that can be used to mitigate downstream flooding.

Detention in the Houston Area

In the Houston area, detention is created in two ways. **On-site detention** is built as part of private developments, or public projects (e.g. highway expansions), to mitigate the impact from that development. On-site detention is usually required by city and county development regulations and funded by the developer. Detention basins are the most commonly used solution for meeting detention requirements, but oversized storm sewers can also be used. Additionally, Low Impact Development (LID) practices such as bioswales, rainwater harvesting, and preserving natural habitats capture and filter stormwater runoff on-site, at the source. **Regional detention**, on the other hand, is built by flood control agencies to address flooding on a larger geographic scale, such as a watershed, and is funded by taxes or stormwater fees paid by a number of developers. Regional detention is used to reduce existing flooding or help prevent increased flooding from new developments.

KEY TERMS

Stormwater runoff is water that flows over ground surface into drainage areas. Increased pervious the land means less stormwater runoff and more rainwater absorbed. Increased development means increased impervious surface, creating more runoff and less rainwater being absorbed.

Flowrate is the volume of water that passes per unit of time (ft³ or cfs). The smoother the ground cover (e.g. concrete), the faster the flowrate.

Hydrograph is a graph showing how the flowrate at a given location varies over time.

How do detention basins work?

Detention basins are designed to allow for a large amount of inflow to be captured and stored while allowing for a small amount of outflow to be released at any given time. When a storm event occurs, the detention pond fills up and stores water temporarily, reducing flooding and erosion downstream. Runoff enters the basins by flowing in from the surrounding land as overland flow or from a channel or pipe. Water is usually released from the basin by gravity, through an outfall channel or pipe. As the water in the receiving channel drops, more water is able to leave the detention basin, until it is emptied or restored to its designed pool level. Unlike most large federal flood control facilities, detention basins do not usually have adjustable gates or valves; the basins fill and empty based on the size of inlet and outlet channels and pipes.

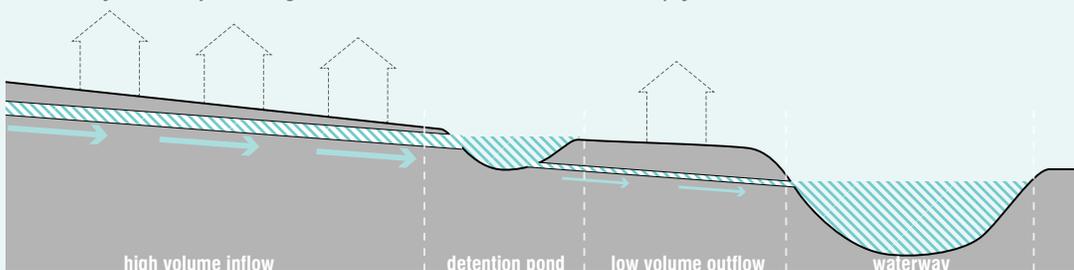


Figure 3 Underground storm drains use detention basins by allowing larger rates of inflow and smaller rates of outflow to help mitigate downstream flooding.

KEY POLICY QUESTIONS

Are current detention standards enough for new developments?

Where do we need more regional detention?

For more information visit:

Greater Houston Flood Mitigation Consortium:
<http://houstonconsortium.com>

H-GAC LID Resources:
<http://www.h-gac.com/community/low-impact-development/default.aspx>

How do we determine the size of a detention basin?

The size of a detention basin can be determined by using flow hydrographs, which show how much water is flowing in and out of an area over time. Detention basins serve to slow down runoff into a river, stream, or bayou by releasing the water more slowly, thereby reducing peak flow rates that can cause receiving streams to overflow.

Detention basins are intended to hold a certain volume of water, calculated so peak flowrate after development matches pre-development levels. They are typically designed to hold this amount of water for a 24-hour rainfall event, but different duration goals also affect the size of the detention basin. Other factors that affect the design volume include rain intensity, acres in drainage area, and implemented Low Impact Development practices. Once the required detention volume is determined, the width, length, and depth of the basin can be designed.

Figure 4 A hydrograph shows how the flowrate of water changes during the time of a rainfall event.

