Drainage Program Guide
Site Application: Non-Residential
GSI Practice: Detention/Retention Basins

Non-residential properties typically have parking lots and other impervious surfaces such as roof areas that generate stormwater runoff that is eventually discharged into DWSD's combined sewer system. DWSD's drainage charge is calculated on a per impervious acre per month basis, but this charge can be reduced through credits for the use of practices that reduce stormwater flows to the City's sewer system. One practice a non-residential property owner can consider is a detention or retention basin, which is a large facility designed to prevent downstream flooding by minimizing stormwater runoff peak flows.

Detention/Retention basins are excavated stormwater facilities that provide temporary storage of runoff and release the stored water over time to prevent localized and downstream flooding. Detention basins are generally earthen structures constructed either by impoundment of a natural depression or excavation of existing soil. These basins create storage of stormwater by allowing large amounts of stormwater to fill the basin and limit the overflow with a riser structure and orifice openings.

How can I use a detention basin to reduce my drainage charge?

A detention basin that manages stormwater runoff from impervious surfaces can achieve up to a 40 peak flow percent drainage charge credit, depending on the available storage and site conditions. The up to 40 percent credit can be attained for controlling how fast water is leaving the property (evaluated on a case-by-case basis). If the basin is designed to permanently retain water on-site by infiltration, evaporation, or plant update, the practice is eligible to receive additional drainage charge volume credits. See *A Guide to Credits for Commonly Used Stormwater Management Practice* on Detroit Water and Sewerage Department's website for further explanation.

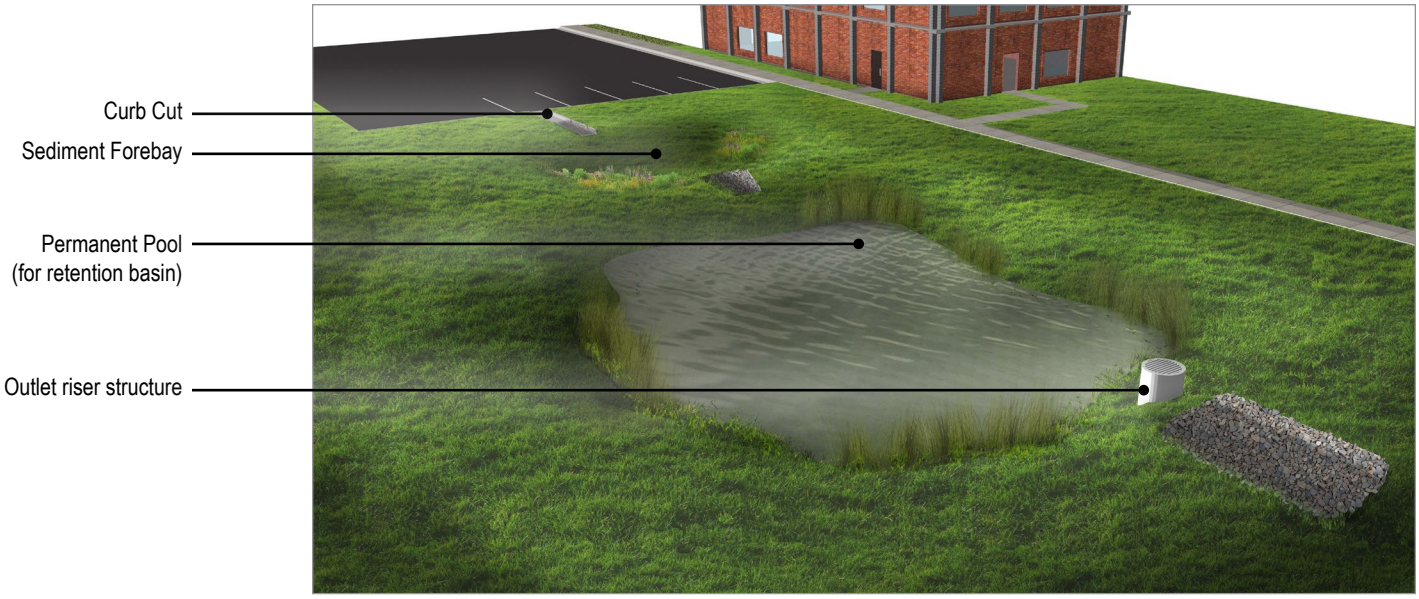


Illustration of a retention basin (permanent pool of water) to cature runoff from adjacent parking lot and in some instances, the adjacent building.

What is the typical cost of a commercial detention basin?

The capital cost of a detention/retention basin is largely dependent on the size of the basin and depth of excavation (excluding any land acquisition costs). Planning level capital costs range between $10 to $25 per cubic foot, not including construction, mobilization, engineering, and contingency costs.

Design Considerations

Detention/retention basins must be designed by a professional engineer and are typically installed during new development or significant redevelopment of a site.

Common design considerations include:

- A forebay, used to remove sediment and debris before entering the detention basis, should be incorporated into the design and is typically 10-15% of the total volume of the basin.
- Detention/retention basins should be located at a low point on the site, collecting as much as the site runoff as possible.
- Side slopes should be no steeper than 6 horizontal : 1 vertical.
- All basins deeper than 4 feet should have a safety bench or perimeter fence.
- Maximum water depth should be less than 5 feet (temporary and permanent pool)
- An outlet consisting of a riser or pipe must be designed to release stormwater from the basin.
- An emergency spillway must be designed to convey extreme events to protect adjacent buildings and infrastructure.
- The basin should have a minimum of 1 foot of freeboard above the designed water depth.

Detention versus Retention

Detention basins are designed to delay the release of stormwater (e.g., peak flow control). Detention basins do not reduce the volume of stormwater discharged from the site.

Retention basins are designed to infiltrate the majority of stormwater in the basin into the ground(eg. volume credit) Retention basins both delay the release of stormwater (eg. peak flow control) and also reduce the volume of stormwater discharged from the site.

Options other than detention basins

Detention/retention basins can occupy valuable land space that may be better used for other purposes. In ultra-urban environments where a detention basin may not be practical, consider the use of either permeable pavement or subsurface storage to address stormwater concerns. Permeable pavement stores stormwater in a stone reservoir under the pavement and allows a site to use the area for existing parking. Subsurface storage uses stone, pipes, or plastic and concrete grids to store stormwater under the ground surface, often under traditional pavement. See the Subsurface Storage and Permeable Pavement GSI Starter Guides for more information.

What is the expected return on my investment?

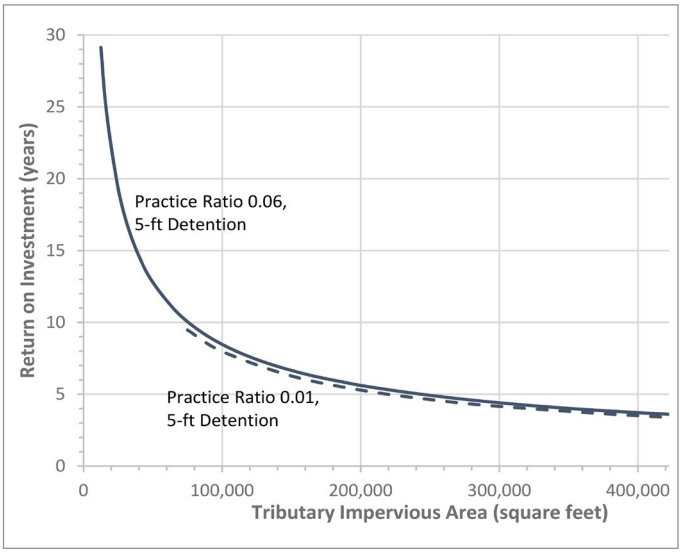
The return on investment will depend on the size of the installed basin and the resulting credit reduction. The curve below summarizes the anticipated return on investment based on the practice area.

Retention basin with native plants and community walking path

Detention basin with outlet riser in the forefront of the photo

Expected Drainage Charge Credit Values

Credit Table for Detention / Retention						
Practice Ratio	Peak Flow Practice Credits			Volume Practice Credits		
	Detention Depth			Infiltration Depth		
	6 in	12 in	18 in	3 in	6 in	8 in
0.03				8%	14%	17%
0.05				12%	20%	24%
0.08			18%	17%	27%	31%
0.09		13%	20%	19%	29%	32%
0.1		15%	22%	20%	30%	34%
0.15		22%	33%	26%	35%	38%
0.2	15%	30%	40%	30%	38%	39%
0.25	18%	37%	40%	33%	39%	40%
0.3	22%	40%	40%	35%	39%	40%
0.35	26%	40%	40%	37%	40%	40%



The practice ratio is the size of the stormwater practice relative to the size of the impervious area the practice is collecting.

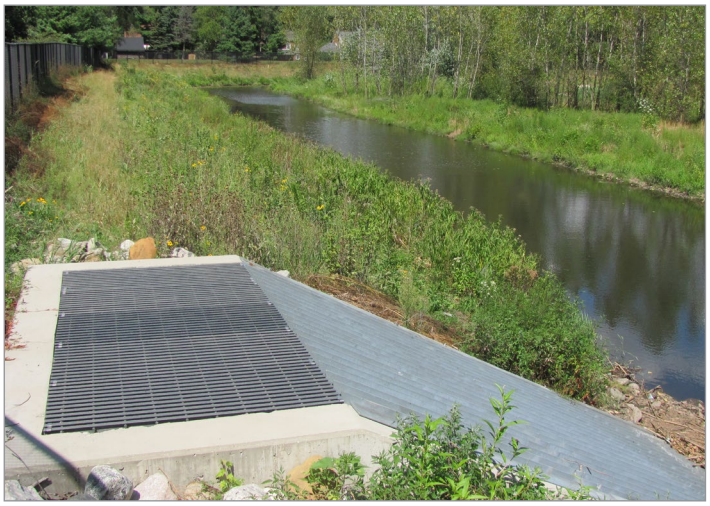
For detention only practices, a peak flow credit can be earned. If the practice also allows for infiltration, the earnable credit would be a sum of both the peak flow and volume credits.

Maintenance

Detention/retention basins should have a maintenance plan with regular inspections. In order to maintain a drainage charge credit for a detention/retention basin, property owners must submit a maintenance inspection certificate every three years to DWSD. If DWSD does not receive the maintenance certificate once every three years, the credit will expire. Maintenance activities typically include:

- Inspecting the basin for clogging and excessive debris quarterly (more frequently if needed) and after every major storm event.
- Removal of sediment and debris from the forebay before it reaches 50 percent of forebay capacity. Forebays are typically designed with hardened access and a sediment depth marker to help with maintenance.

Retention basin with outlet riser in the forefront of the photo



Retention basin with inlet structure in the forefront of the photo

- Inspecting the basin drain inlets and outlets at least once every three months.
- Inspecting the side slopes for evidence of tunneling or burrowing wildlife (repair damaged side slopes as required.)
- Maintaining and inspecting vegetation along side slopes to ensure continued establishment and ground coverage.

Setback Requirements

- From property line: 10 feet minimum
- From building: 10 feet minimum without a waterproof liner

Permitting and Forms

- Make sure to identify and avoid utilities by contacting MISS DIG at 811 or 1.800.482.7171 before starting the project.
- If the project will disturb 1 acre or more, or is within 500 feet of a water of the state, contact Wayne County Environmental Services for a Soil Erosion and Sedimentation Control (SESC) permit.
- Overflow or sewer pipe connections to a public sewer will require a permit from both the Building, Safety, Engineering and Environmental Department (plumbing permit) and DWSD (sewer tap permit).
- Complete engineered drawings stamped by a registered Professional Engineer or Landscape Architect must accompany the Drainage Charge Credit Application. Additional required documentation is found on the application and can be downloaded www.detroitmi.gov/drainage.

Additional Resources

Alliance of Rouge Communities. Undated. Maintaining Your Detention Basin: A Guidebook for Private Owners in Southeast Michigan. www.allianceofrougecommunities.com/PDFs/PI/FINALdetentionbasinmanual.pdf

Detroit Water and Sewerage Department's drainage website: www.detroitmi.gov/drainage

Washtenaw County Water Resources Commissioner. Revised 2016. *Rules and Guidelines Procedures & Design Criteria For Stormwater Management Systems*. Part C – Design Requirements – Storage Facilities

NOTE: This GSI practice cannot be self-performed.