

# STORMWATER MANAGEMENT BACKGROUND

## Information for Residents

### What is Stormwater?

Urban stormwater is rainfall and snowmelt that seeps into the ground or runs off the land into storm sewers, streams and lakes. It may also include runoff from activities such as watering lawns, washing cars and draining pools. Urban stormwater can cause problems for residents, businesses and industry if there is excess water that cannot be diverted away from structures. To understand how stormwater is managed it is important to understand the hydrologic cycle.

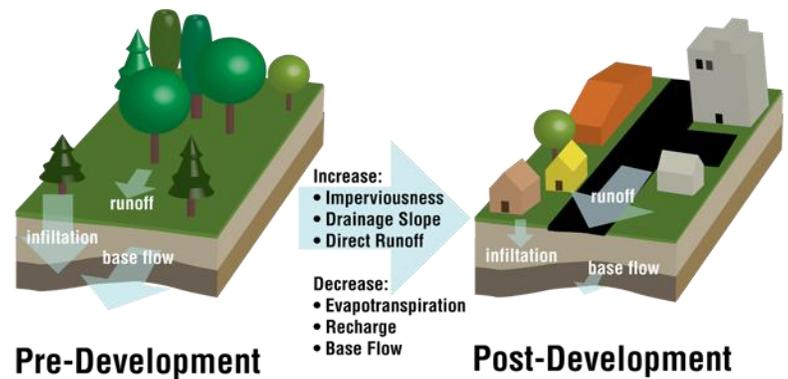


Figure 1, Stormwater Runoff Before and After Development ([www.invisiblestructures.com](http://www.invisiblestructures.com))

Urban development interferes with the natural transfers of water between storage compartments of the hydrologic cycle (Figure 1). Natural areas act like a sponge soaking up precipitation and slowly redirecting it to surface or groundwater while human development does not. Roads, sidewalks, driveways, parking lots and buildings are designed to stop water penetration and to quickly collect and remove water from developed areas via storm water management systems. Where water is removed before it can be absorbed there is

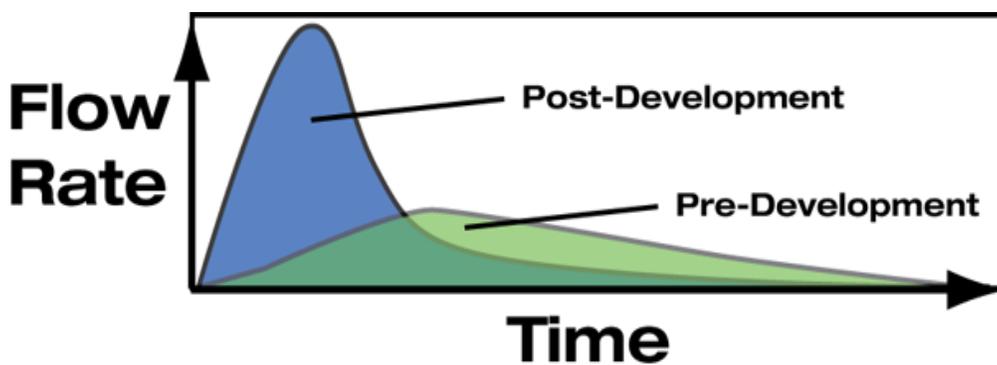


Figure 2, Flow Rate Before and After Development ([www.invisiblestructures.com](http://www.invisiblestructures.com))

decreased infiltration (seepage into the soil) of precipitation and snowmelt. This leads to increased stormwater runoff and is a direct consequence of the increase in impervious area that accompanies urban development (Figure 2).

### Stormwater Pollutants

Beyond increased stormwater runoff there are other factors taken into consideration when designing stormwater management systems. Humans interact with the hydrologic cycle by extracting water for agricultural, domestic, and industrial uses, and returning it as wastewater which may degrade water quality. Much of this water is discharged through the Town's sanitary sewer and sent to Windsor to water treatment plants. Even rainwater and snowmelt which is not used by people needs to be cleaned. When urban areas are developed the amount and flow rate of stormwater runoff is increased (See Figure 3) and generally flows over public spaces such as roadways, parking lots and sidewalks. Here stormwater runoff picks up dirt, debris, pet waste, construction waste, and chemicals that are environmentally harmful. Before directing water to rivers and lakes as much of these pollutants should be removed as possible.

### Preventing Undesirable Stream Erosion

Erosion is a normal part of stream behaviour. Stormwater is managed to prevent excessive erosion that may prohibit a stream from fulfilling its normal function of conveying water and sediment. As a consequence of urbanization, there is an increase in the volume and rate at which sediment and water are delivered to streams. This causes an increase in the erosive forces on stream banks and beds that dislodge and transport particles and, over time, damage the natural form of streams.

## Protecting Water Quality

Contaminants, such as oil, grease, metals and pesticides, tend to build up on surfaces in urbanized areas (Table 1). These contaminants come from sources such as pavement deterioration, tire and brake pad wear, vehicle emissions and spills. They may also come from yard and garden care, and pet waste. Stormwater runoff picks up these contaminants and can transfer them to streams or groundwater. Degradation of water quality can result in a decline in plant and animal diversity. It may also affect drinking water supplies and recreational uses of water such as swimming.

Table 1. Stormwater Contaminates and their Sources

Stormwater Contaminant	Source
Suspended Solids/Sediment	Construction sites, roads, winter sanding
Nutrients (nitrogen and phosphorous)	Fertilizers, pet wastes, yard wastes
Metals	Cars
Oil and Grease	Cars, leaks, spills
Bacteria	Pet wastes
Pesticides and Herbicides	Yard and garden care
Heat (increased water temperature)	Exposure to air in warm season

Source: Ontario, Understanding Stormwater Management

## Stormwater Management

The ultimate goal of stormwater management is to maintain the health of streams, lakes and aquatic life as well as provide opportunities for human uses of water by mitigating the effects of urban development. To achieve this goal the Town maintains storm sewer systems to maintain the natural hydrologic cycle, prevent an increased risk of flooding, prevent undesirable stream erosion, and protect water quality.

### To Prevent an Increased Risk of Flooding

It is usually specified that maximum peak flows (or volumes per unit time) must not exceed predevelopment values for large storms. Large storms include the 2, 5, 10, 25, and 100-year storms (storms that only occur once every 2, 5, 10, 25 and 100 years). Peak flows are controlled by detaining runoff so that it does not all reach the stream within a relatively short time period during or soon after a storm. But, care must be taken so that detained runoff from different parts of the watershed does not all arrive at the same location at the same time. Holding runoff longer in the upper parts of a watershed will ensure that this does not happen.

### Lot-level and Conveyance Controls

Most lot-level and conveyance controls may be classified either as storage controls or infiltration controls. Storage controls are designed to temporarily store stormwater runoff and release it at a controlled rate (Right). Although the volume of runoff does not decrease, the risk of flooding is reduced because all the stormwater runoff does not arrive at the storm sewer at the same time.

#### STORAGE CONTROLS

Rooftop storage

Parking lot storage

Superpipe (oversized storm sewer) storage

Rear yard storage

## Dry Ponds

A dry pond is a detention basin designed to temporarily store collected stormwater runoff and release it at a controlled rate through an outlet. Dry ponds may have a deep pool of water in the sediment forebay to reduce scour and resuspension of sediment, but do not have a permanent pool of water in the main basin. This means that there is no opportunity for settling of contaminants between storm events and dilution of stormwater contaminants during storms. Therefore, although dry ponds can be effective for erosion and flood control, they do not perform as well as wet ponds for water quality control.

## Wet Ponds

A wet pond is a detention basin designed to temporarily store collected stormwater runoff and release it at a controlled rate (Figure 3). It is different from a dry pond in that it maintains a permanent pool of water between storm events. Wet ponds are the most common end-of-pipe stormwater facility used in Ontario. A single wet pond can provide water quality, erosion, and flooding control. Box 1 describes how a wet pond works.



Figure 3, Parts of a Wet Pond (Ontario: Understanding Stormwater Management)

### Box 1. How does a Wet Pond Work?

An inlet allows stormwater supplied by the conveyance system to go into the pond. The water first flows into a sediment forebay, a small basin located before the main pond. The stormwater rapidly slows down and drops much of its sediment load. The forebay design prevents erosion and re-suspension of the settled sediment and allows for easy removal of accumulated material. From the forebay, water flows into the main pond. Wet ponds have a permanent pool of water. Stormwater flowing into a wet pond is diluted by the permanent pool. Between storms, sediment trapped in the permanent pool has time to settle. In addition to the permanent pool of water, wet ponds have an active storage volume which is used during and after a storm, but which subsequently drains. This active storage is multi-functional, but is needed particularly to store the runoff from larger storms which otherwise could contribute to erosion and flooding of the receiving stream. Outlets are designed to detain water in the pond long enough to allow sediment removal and to alleviate erosion and flooding concerns. Multiple outlets are needed when water quality, erosion, and flooding control storage volumes are provided. The outlets may be at different elevations and be designed to allow the stored water to empty at different rates. The effectiveness of a pond is improved by shaping it to lengthen the path of water between the inlet and outlet. Vegetation enhances water quality. The pond is graded and landscaped to stabilize banks and slopes, increase public safety, and provide aesthetic and recreational benefits.

## Maintenance

Lack of maintenance is one of the main reasons for poor system performance. During the first two years of operation, inspections after significant storms will ensure the system is functioning properly. After this, annual system inspections are usually done to identify maintenance needs.

# UNDERSTANDING STORMWATER MANAGEMENT INFRASTRUCTURE

## Information for Residents

### Storm Sewers and Wastewater Sewers

The Town provides two separate services to deal with water with the storm sewers and sanitary sewers. Rainwater and snowmelt is collected in the Town's storm sewer system and diverted to Lake St. Clair. Waste water from households and businesses is collected in the sanitary sewer system and transferred to Windsor for treatment before being discharged to the lake (Figure 4). Prior to 1950, legislation allowed storm sewers to be connected to the sanitary sewer system; some areas of the former St. Clair Beach still have this system of improper storm sewer connections.

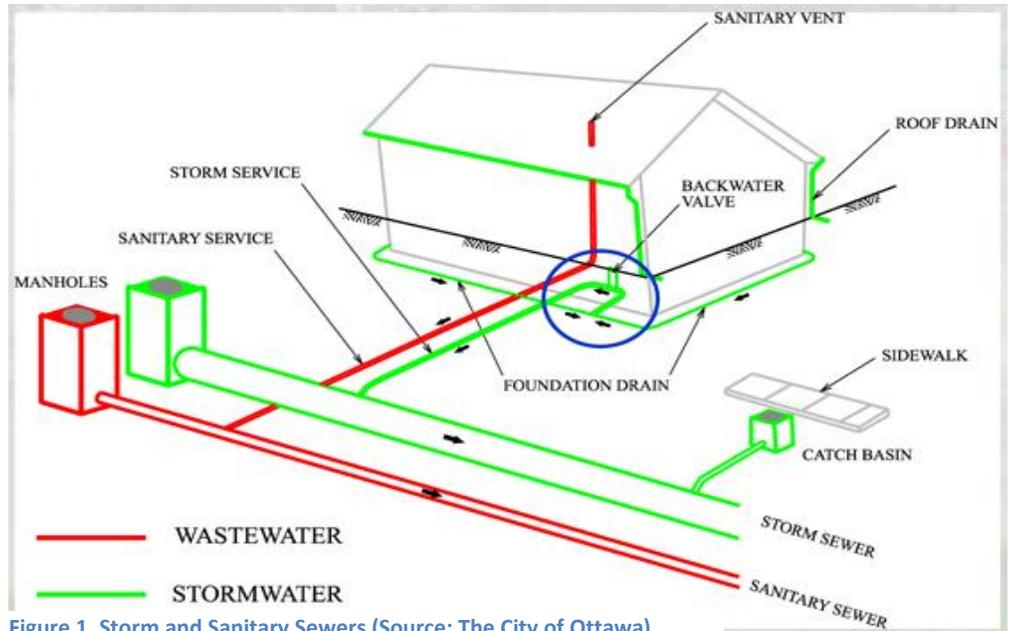


Figure 1, Storm and Sanitary Sewers (Source: The City of Ottawa)

### How do Storm Sewers Work

A storm sewer is designed to drain excess rain and ground water from paved streets, parking lots, sidewalks, and roofs. Storm sewers vary in design from small residential dry wells to large municipal systems. They are fed by street gutters on most motorways, freeways and other busy roads and private connections where needed (such as drain spouts or foundation drains). Some of the Town's roads use ditches to divert water which are also part of the storm water management system.

There are two main types of stormwater drain inlets; side inlets and grated inlets. Side inlets are located adjacent to the curb and are usually depressed at the invert to improve capacity. Grated inlets have gratings or grids to prevent large objects and debris from falling into the sewer system. In either design debris and waste can fall through to the catchbasin which lies immediately below the inlet. The catchbasin works by diverting water at the top into the sewer while water at the bottom filters larger pollutants. The catchbasin serves much the same function as the "trap" in household wastewater plumbing in trapping objects. The performance of catchbasins at removing sediment and other pollutants depends on the design of the catchbasin (e.g., the size of the sump), and routine maintenance to retain the storage available in the sump to capture sediment. The Town of Tecumseh uses vacuum trucks that perform the task of cleaning catchbasin sumps. Catchbasins act as pretreatment for other treatment practices, such as retention basins, by capturing large sediments.



Sewer pipes can come in many different shapes (rectangular, square, oval and, more commonly, circular). Several different materials can also be used, such as PVC, brick, concrete, metal. Other than catchbasins and pollutant traps, there are no treatment facilities between the pipes and Lake St. Clair. Because of the low elevation of the Town relative to Lake St. Clair, storm sewers lead to a pumping station where pumps lift the water and discharge to the lake.

## Why Do Roads and Backyards Pool with Water?

During larger rainfall events where the water exceeds the capacity of the storm sewer pipe it temporarily accumulates on the road and in backyard swales as shown in blue below (Figure 6). This temporarily ponding of water on the roads in rear yards is a normal practice and not an indication of a stormwater sewer system failure. Summer flood, resulting from high intensity thunderstorms, are more common in urban areas because of the increased runoff of precipitation that isn't absorbed by the earth (see above) and the presence of systems that carry this runoff to streams quickly.

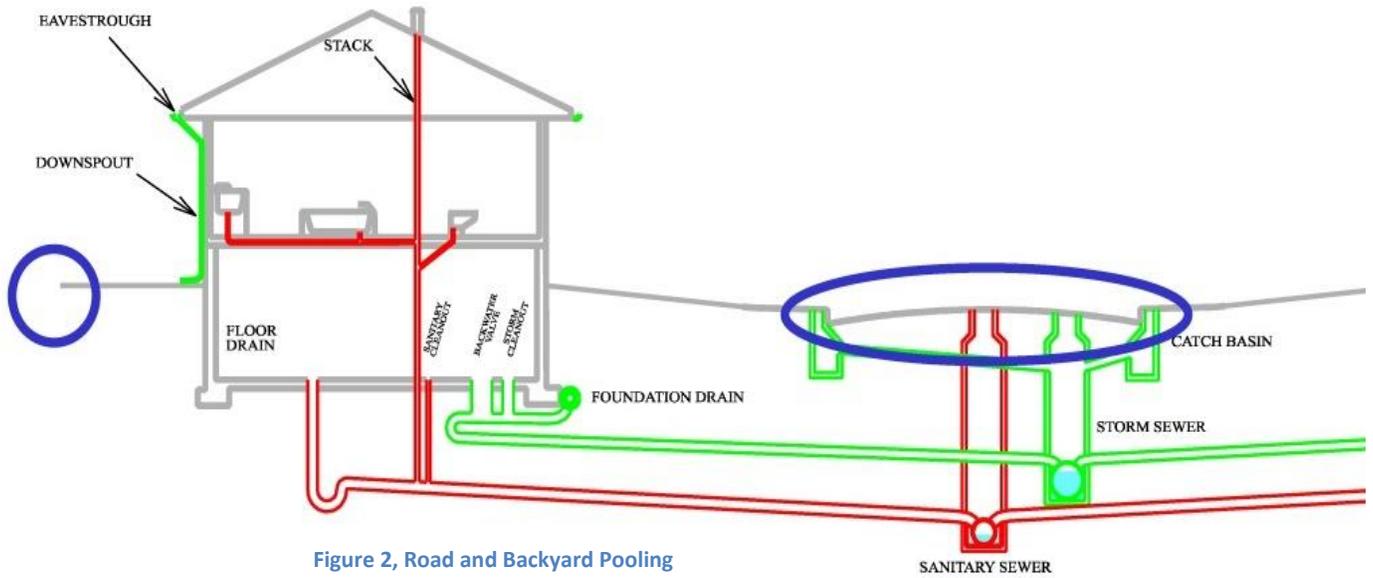


Figure 2, Road and Backyard Pooling

# WHAT RESIDENTS CAN DO TO REDUCE STORMWATER PROBLEMS

## Information for Residents

### Residents

Residents in Tecumseh can help reduce demand and stresses for the stormwater system by taking the following actions:

- Disconnect Downspouts from Stormwater Drains (and redirect to lawns, gardens or other landscaped areas)
- Use permeable materials for construction wherever possible (see below)



- Wash Cars over lawn, or direct water to lawns, gardens or other landscaped area
- Reduce or eliminate “Stormwater Contaminants” that are directed to sewers or ditches (see Table 1 in “Stormwater Management Background”)
- Maintain vehicle to ensure it is not leaking oil or other fluids
- Contact Town if you notice problems with storm sewer infrastructure
- Stay up to date and engaged with information on website and Town activities and relay this information to friends and neighbours
- Harvest rainwater in rain barrels for watering lawns and gardens (left)
- Direct back-up sump pumps to discharge on to lawn – directed away from home
- Ensure drainage arounds home is directed away from house

