STORMWATER MANAGEMENT
Stormwater Management - Report

Stormwater Management Report evaluates the effects on the stormwater and drainage system, and to recommend how to manage rainwater and snowmelt, consistent with the Municipal Wet Weather Flow Management Policy and while also meeting regional, provincial and federal regulations. The level of detail for the Stormwater Management Report depends on the type and scope of application, the size of the development and the types of stormwater management schemes proposed. For example, a Stormwater Management Report for a Plan of Subdivision will typically be more complex than a Stormwater Management Report in support of a Site Plan Control application. A Stormwater Management Report is typically required for the following application types:

- Zoning By-law Applications
- Plans of Subdivision
- Plans of Condominium
- Consent to Sever
- Site Plan Control applications

Our fee for Typical Stormwater Management Report is **$2,450.**
If combined Site Grading Plan, Fee for Stormwater management report - $1,950 (Total of $4,400).
If combined with Site Servicing and Site Grading Plan, Fee for Stormwater Management Report - $1,450 (Total of $5,850)
If combined with Site Plan, Site Servicing, Site Grading Plan Fee for Srtormwater Management Report - $1,350 (Total of $6,950)

We prepare Stormwater Management Report to properties in the following municipalities:
City of Brantford, City of Chatham-Kent, Town of Haldimand, City of Hamilton, City of Kawartha Lakes, City of Toronto

REGIONAL MUNICIPLITIES
Durham
City of Oshawa, City of Pickering, Municipality of Clarington, Town of Ajax, Town of Whitby, Township of Brock, Township of Scugog, Township of Uxbridge
Halton
City of Burlington, Town of Halton Hills, Town of Milton, Town of Oakville
Niagara
City of Niagara Falls, City of Port Colborne, City of St. Catharines, City of Thorold, City of Welland, Town of Fort Erie, Town of Grimsby, Town of Lincoln, Town of Niagara-on-the-Lake, Town of Pelham, Township of Wainfleet, Township of West Lincoln

Peel

City of Brampton, City of Mississauga, Town of Caledon

Waterloo

City of Cambridge, City of Kitchener, City of Waterloo, Township of North Dumfries, Township of Wellesley, Township of Wilmot, Township of Woolwich

York

City of Vaughan, Town of Aurora, Town of East Gwillimbury, Town of Georgina, City of Markham, Town of Newmarket, Town of Richmond Hill, Town of Whitchurch-Stouffville, Township of King

COUNTIES

Dufferin

Town of Grand Valley, Town of Mono, Town of Orangeville, Town of Shelburne, Township of Amaranth, Township of East Garafraxa, Township of Melancthon, Township of Mulmur

Elgin

City of St Thomas, Municipality of Bayham, Municipality of Central Elgin, Municipality of Dutton/Dunwich, Municipality of West Elgin, Town of Aylmer, Township of Malahide, Township of Southwold

Hastings

City of Belleville, City of Quinte West, Municipality of Centre Hastings, Municipality of Hastings Highlands, Municipality of Marmora and Lake, Municipality of Tweed, Town of Bancroft, Town of Deseronto, Township of Carlow/Mayo, Township of Faraday, Township of Limerick, Township of Madoc, Township of Stirling-Rawdon, Township of Tudor & Cashel, Township of Tyendinaga, Township of Wollaston

Northumberland

Municipality of Brighton, Town of Cobourg, Municipality of Port Hope, Municipality of Trent Hills, Township of Alnwick/Haldimand, Township of Cramahe, Township of Hamilton

Oxford

City of Woodstock, Town of Ingersoll, Town of Tillsonburg, Township of Blandford Blenheim, Township of East Zorra-Tavistock, Township of Norwich, Township of South-West Oxford, Township of Zorra

Peterborough

City of Peterborough, Township of Asphodel-Norwood, Township of Cavan Monaghan, Township of Douro-Dummer, Township of Havelock-Belmont-Methuen, Township of North Kawartha, Township of Otonabee-South Monaghan, Township of Selwyn, Municipality of Trent Lakes

Simcoe

City of Barrie, City of Orillia, Town of Bradford West Gwillimbury, Town of Collingwood, Town of Innisfil, Town of Midland, Town of New Tecumseth, Town of Penetanguishene, Town of Wasaga Beach, Township of Adjala-Tosorontio, Township of Clearview, Township of Essa, Township of Oro-Medonte, Township of Ramara, Township of Severn, Township of Springwater, Township of Tay, Township of Tiny

Wellington

City of Guelph, Town of Erin, Town of Minto, Township of Centre Wellington, Township of Guelph-Eramosa, Township of Mapleton, Township of Puslinch, Township of Wellington North

Stormwater Drainage System Design Guidelines

Well-designed stormwater conveyance systems are critical for ensuring that stormwater is safely conveyed away from roads and structures to appropriate drainage outlets. Municipalities strive to ensure that the drainage systems for new developments are robust and designed to the highest standards of performance. For greenfield development a dual drainage system analysis shall be completed to demonstrate that the municipal requirements for major and minor system conveyance and the hydraulic grade line are being met.

For infill/redevelopment sites the proponent shall demonstrate through a dual drainage system analysis that the downstream minor and major system has sufficient capacity to safely accommodate design flows from point of connection of the development site to an existing outfall.

The minor system conveys urban drainage from relatively “minor” storms having a return period of 5 years. These works typically consist of drainage pipes, catchbasins, roadway gutters and swales, enclosed conduits and roof leaders. Their purpose is to prevent frequent flooding of road surfaces, parking lots and parks.

Municipalities will not allow development to proceed until adequate provision, in the form of storm sewers, has been made available. Rural development will also require adequate provision for storm drainage; however it may not require storm sewers. The minor system, comprised of street gutters, catchbasins and storm sewers, shall be designed to convey the 1 in 5 year flow without exceeding 80% capacity. Flow in a subcritical condition – supercritical flow in sewers will not be allowed.

Ensure the Hydraulic Grade Line (HGL) during the 100 year storm is a minimum of 300 mm below the basement footing elevation.

If the outlet of the storm sewer system is submerged during the 5 year and 100 year events, the hydraulic analysis used to size the pipes should account for backwater effects to ensure that the municipal conveyance and HGL requirements are met. For sewersheds larger than 40 hectares, or with complicated hydraulics, a dynamic computer model is used.

In areas where the capacity of the receiving storm sewer system is constrained, the site will still need to provide the required level of service for the storm sewer system on-site.

However, there will be an additional requirement that the capacity of the existing storm sewer system is assessed to determine the required release rate from the site to ensure that there are no impacts to the receiving system. If the allowable release rate is less than the 1 in 5 year flow, the site will be required to provide on-site storage to control the minor system flow to the capacity of the existing, receiving storm sewer system. Notwithstanding, storm sewers designed to convey the 1 in 5 year flow will be required in all cases.

Hydraulic analysis of the proposed and existing storm sewer system shall provide hydraulic grade lines for the 1 in 5 year standard and 1 in 100 year standard. Sewer capacities are computed using the Manning's Equation. Storm sewers are designed to convey the 1 in 5 year flow at 80% capacity flowing in a subcritical condition. The minimum allowable size for a storm sewer is 300 mm diameter. The minimum full bore velocity permitted in storm sewers is 0.8 m/s. The maximum full bore velocity permitted in storm sewers will be 5 m/s.

Where velocities in excess of 3 m/s are proposed, additional design factors shall be taken to protect against pipe displacement, scouring, erosion, and hydraulic jumps.

The minimum grade on storm sewers is half a percent (0.5%). The minimum slope of the upstream leg of all storm sewers shall be one percent, unless future developments upstream cannot accommodate this grade. For replacement of pipe sections of existing storm sewer systems, a minimum flow velocity of 0.8 m/s shall be achieved.

Both rigid and flexible pipe are permitted in the construction of storm sewer systems including municipal service connections and catchbasin leads. These materials include reinforced concrete, polyvinyl chloride and high density polyethylene. However, the bedding design must be compatible with the type of pipe material used. Rigid pipe is recommended in areas of high utility congestion, when bedding may be undermined in the future. External drop pipes will be provided when the difference in invert elevations is greater than 600 mm. The external drop pipe will be one size smaller than the sewer line – minimum 200 mm diameter.

Our Stormwater Management Engineers adhere to the following guidelines:

- Endeavor to keep entrance and exit velocities equal. In order to reduce the amount of drop required, the engineer will try to restrict the change in velocity from one pipe to another in a maintenance hole to less than 0.6 m/s.
- No acute interior angles will be allowed.

- No decrease in pipe diameter from a larger size upstream to a smaller size downstream will be allowed, regardless of an increase in grade.
- When an increase in pipe size occurs at the downstream side of the storm maintenance hole, match obvert elevations of the incoming and outgoing pipes or have incoming pipe obverts higher than outgoing pipe obverts.

The maximum change in direction for pipe sizes 675 mm and larger is 45 degrees. For 675 mm and larger diameter pipes where the change in direction is greater than 45 degrees, additional maintenance holes 1200 mm in diameter will be required to reduce the angle.

The actual size of the storm service connection required for non-residential, commercial, institutional, and high rise condominiums is determined by the maximum flow permitted from the development. The minimum diameter and grade of a storm service connection is 150 mm diameter at 2 % slope. Where the storm service connection is required to be an orifice tube, smaller pipe diameters may be acceptable. Municipalities require a control maintenance hole located on the subject property, as close to the property line as possible. This requirement applies to all multi-family, commercial, industrial and institutional blocks. Catchbasins will be provided to collect drainage from both pervious and impervious areas. The spacing and design of catchbasins shall be as per the Municipal Development Control Design Standards. In designing the stormwater collection system the engineer will ensure that the number of catchbasins connected to each section of sewer is appropriate so that the minor system is not overloaded causing issues with the hydraulic grade line in the receiving system.

New outfalls discharging to watercourses are designed to prevent erosion. They are blended into the natural surroundings, in an aesthetically pleasing manner to the greatest extent possible. Pipe exit velocities shall not impart additional erosion potential to the streambed and banks. In addition, the outfall shall be adequately protected from erosive forces in the receiving watercourse to prevent scouring and undermining. Outfalls shall not discharge at the top of valley walls.

The proponent should position the outlet to minimize the angle at which flow from the outfall ties into the watercourse. Outfall channels should join a watercourse at no more than 90 degrees, with angles less than 45 degrees preferred. Wherever possible, outfalls should be located in geomorphically stable locations to protect against impacts from anticipated planform adjustment of the watercourse. Storm sewer outfalls to regulated watercourses require a permit from the Conservation Authority. Storm sewer outfall design is to be submitted to the Municipality as part of the full engineering submission.

Outfalls to natural watercourses should discharge at or above the average water elevation of the watercourse. If high water levels cause the submergence of the outlet, the impact of the submergence on the sewer system must be assessed in the hydraulic design of the storm sewer. The obvert of the outlet shall be above the 25 year flood elevation of the receiving channel. Storm sewer outfalls discharging directly to Lake Ontario will need to consider the potential problem of dynamic beaches and the potential obstruction of the outlet .The outfall's invert should be located above the 100 year lake elevation of 75.7 m. An access road with a minimum width of 4 m and cross fall of 2% should be provided to outfalls . Should the outfall be within a fenced area, gate access shall be provided. Outfalls shall be provided with safeguards to prevent entry by unauthorized personnel into the outfall. Ontario Provincial Standard Drawings (OPSD), should be followed to determine what outfall sizes require grates to prevent unauthorized entry. Grates shall be installed with means for locking. Provisions must be made for opening or removing the grate for cleaning purposes. Grates should be designed to break away or swing open under extreme hydraulic loads due to blockage. Outfalls should be made as safe as possible by utilizing fencing along the headwalls and wingwalls to prevent accidental falls. Submerged outfalls need to be specifically designed to withstand freeze-thaw cycles and ice dams.

In order to minimize the flow rate from foundation drains, piezometer tests shall be completed prior to design and construction to determine the seasonal high water level. Foundation elevations should then be set 500 mm higher than the seasonally high water table. Lots shall be constructed with a storm sewer extension from the storm sewer system to the surface or subsurface adjacent the building. Flow collecting in the foundation drain shall be pumped to the surface (or subsurface) using a sump pump and into the storm sewer extension and then conveyed to the storm sewer. A benefit of this configuration is the ability to discharge flow from foundation drains into the storm sewer while eliminating the risk of basement flooding and avoid surface discharge and nuisance flooding. Flow collecting in the foundation drain shall be pumped to the surface using a sump pump and then conveyed overland via lot drainage to the street or surface drain. Infill development projects will consider direct connection of the roof leaders and foundation drains on a site specific basis, but this generally will not be permitted. For those projects, there will be no direct connection of foundation drains or roof leaders to the minor system.

Flows in excess of the minor system capacity (i.e., during periods of surcharging or higher intensity events) are referred to as the major system flow.

The major system inherently comprises the minor system, as well as the overland route followed by runoff not captured by the minor system (i.e., either due to excessive flow or operational failures). Common elements of the major system include roadways, swales, ponds, dedicated blocks, outfall channels, natural streams and valleys. Major system flow paths shall be in public ownership. In extenuating circumstances major system flow paths may be allowed on private property provided that an easement in favour of the municipality is provided at the Owner's cost.

The major system shall safely convey drainage from the Regulatory Storm, defined as the larger of the 100 year storm or the Regional Storm, to an appropriate outlet without causing damage to private property and with minimum inconvenience to the public. Calculations and model results (i.e., OTTSWMM or PCSWMM) must be provided to demonstrate that the overland flow route has sufficient capacity to convey this flow. Where the major system is receiving flow from a stormwater management facility it must be sized to convey the flow from the uncontrolled Regulatory storm (i.e., the peak flow into the pond). The extent and top elevation of the major system flow path are to be shown on the grading plan drawings.

In all cases, the proponent of a development site shall investigate and determine the direction and hydraulic capacity of the conveyance path for the existing major system flow from the site to a watercourse. The purpose of this investigation is to determine if a suitable overland flow route of sufficient hydraulic capacities exists, which is acceptable to the Municipality.

If the proposed major system overland flow route is accepted by the Municipality, storm runoff is allowed to discharge off-site. If no approved or adequate overland flow route exists, then all events up to the Regulatory Storm must be detained on-site and released at the allowable release rate into the minor system.

The overland flow (major) system within the subject development site shall be designed to accommodate and/or convey the major storm flow, that is, the rainfall runoff resulting from the subject site and any external tributary areas using the Regulatory Storm without causing flood damage to proposed and adjacent public and private properties. Overland flow routes discharging to watercourses shall be designed to ensure the long-term stability of the overland flow path and to prevent erosion to the receiving system. They shall be designed to convey the uncontrolled Regulatory storm flow, defined as the larger of the 100 year or Regional storm flow, to the watercourse. Prior to entering the receiving system the overland flow route should incorporate measures to dissipate energy.

To the greatest extent possible they shall be blended into the natural surroundings, in an aesthetically pleasing manner. Exit velocities shall not impart additional erosion potential to the streambed and banks. Major systems shall not outlet at the top of valley walls.

The proponent should position the outlet to minimize the angle at which the overland flow route ties into the creek. Overland flow routes to regulated watercourses require a permit from the Conservation Authority. Notwithstanding the MTO's drainage policy and guidelines, it is required that new roadway culverts and bridges have sufficient capacity to pass the Regulatory Flood in order to avoid adverse backwater effects.

Allowable Regulatory storm flood depths and velocities on roadways should be determined based on the standards within the current version of the Ontario Ministry of Natural Resources Natural Hazards Technical Guidelines.

The Stormwater Management Reports are prepared in accordance with legislation and acts for:

- Watercourses and Existing Infrastructure (i.e., Culverts and Bridges, Roads)
- Erosion and Sediment Control
- Flood Damage Control
- Pollution Prevention
- Fisheries

When preparing a stormwater management plan the following key acts and regulations may apply:

Federal Acts and Regulations:

- Federal Fisheries Act
- Species at Risk Act (SARA)
- Navigable Waters Protection Act (NWPA)
- Canadian Environmental Assessment Act.

Provincial Acts and Regulations:

- Conservation Authorities Act (incl. Ontario Regulation 166/06)
- Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses
- Endangered Species Act
- Drainage Act
- Provincial Policy Statement - Natural Hazard Land Policies, Water Quality and Quantity Policies
- Lakes and Rivers Improvement Act

- Environmental Protection Act
- Ontario Water Resources Act
- Ontario Environmental Assessment Act
- Planning Act
- Public Land Act
- Municipal Act
- Greenbelt Act
- Oak Ridges Moraine Conservation Act
- Ontario Planning and Development Act (Seaton)
- Places to Grow Act
- Provincial Secondary Land Use Policy
- MTO Drainage Management Policy
- Elements of Common Law -Natural Watercourses (Riparian Rights and Obligations), Surface or Sheet Flow, Subsurface Flow

Municipal Regulations/By-laws:

- Municipal Zoning By-law for the area of interest
- Fill and Topsoil Disturbance By-law
- Noise By-law
- Tree Protection By-law

STORMWATER MANAGEMENT

Our Expert Professional Stormwater Management Engineers prepare and submit Site Plan, Site Servicing, Erosion Control & Grading Plan and Stormwater Management Report to Obtain Site Plan Approval and Municipal Building Permits from City, Town, Township, County, Region, and/or Regional Conservation Authorities like, LSRCA -Lake Simcoe Regional Conservation Authority, TRCA -Toronto Regional Conservation Authority for Proposed Development, Construction, Renovation or Addition of Commercial, Industrial and Residential Buildings including Retail Shopping Plazas, Office Buildings, Medical Buildings, Restaurants, Banquet Halls, Gas Stations, Retirement Homes, Multiplex Residential Units and Custom Build Homes in Ontario including Northern Ontario

Having vast experience in unique distinctive stormwater management, our expert stormwater management specialists offer effective, innovative and cost efficient concept stormwater management reports, designs, and construction drawings to our clients. Our well experienced expert professional stormwater management engineers' proficiency in conceptualizing stormwater management designs and plan in accordance with our clients' requirements has made us very successful.

If the property is covered by a site plan control by-law, building permit will not be issued until the stormwater management have been approved by the municipality. In addition to the planning approvals and building permit which are required for a building project, other permits and approvals including Conservation Authority and Ministry of Transportation approvals.

Our stormwater management experts prepare thorough, detailed, and clear stormwater management reports to suit your needs while also adhering to design requirements of the municipality and submit to Municipality for review and approval to obtain site plan approval and building permits.

Professional and prompt services of our well experienced expert Professional Municipal Engineers specializing in Stormwater Management at very competitive cost are always an added value to our customer's projects. Our expert stormwater management specialists accomplish of all their commitments through highest degree of integrity & professionalism, objective oriented approach and continuously upgraded skills & techniques to achieve excellence in their work.

Stormwater Management Report

Stormwater Management is a necessary component of urban municipal infrastructure. Stormwater Management Report evaluates the effects on the stormwater and drainage system, and to recommend how to manage rainwater and snowmelt, consistent with the Municipal Wet Weather Flow Management Policy and while also meeting regional, provincial and federal regulations. The required stormwater management report for any Building Permit application will vary depending on the specific and type of proposed construction for the project. The level of detail for the Stormwater Management Report depends on the type and scope of application, the size of the development and the types of stormwater management schemes proposed. For example, a Stormwater Management Report for a Plan of Subdivision will typically be more complex than a Stormwater Management Report in support of a Site Plan Control application. A Stormwater Management Report is typically required for the following application types:

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Under natural conditions, stormwater (rainwater and melted snow that flows over roads, parking lots, lawn and other sites) is intercepted by vegetation and then absorbed into the ground and filtered and eventually replenishes aquifers or flows into streams and rivers. Later, part of it is returned to the atmosphere in the form of evapotranspiration. In urbanized areas, however, impervious surfaces such as roofs, asphalt paved roads and parking lots prevent precipitation from naturally soaking into the ground. Instead, the water runs rapidly into storm drains, municipal sewers and drainage ditches into streams, rivers and lakes and on its way it picks up pesticides, road salts, heavy metals, oils, bacteria, and other harmful pollutants and transports them through municipal sewers into streams, rivers and lakes. The sheer force and volume of polluted runoff causes:

- Increased downstream flooding risks
- River bank and bed erosion
- Increased turbidity
- Aquatic Habitat destruction
- Changes in the stream flow regime
- Combined sewer overflows
- Infrastructure damage
- Contaminated streams, creeks, rivers & lakes

In order to mitigate the undesirable impacts of urbanization on watercourses and associated infrastructure stormwater management practices need to be implemented:

- To preserve the natural hydrologic balance in newly developing areas and re-establish it, wherever possible, in already developed areas;
- To protect and enhance quality of stormwater discharged to lakes and streams; and
- To reduce the volume and frequency of combined sewer overflows in older urban areas.

The Stormwater Management Criteria was developed based on the principle that the establishment of appropriate, effective, and sustainable Stormwater Management practices requires a solid understanding of the form, function, and interrelation of the water resources and natural heritage systems.

There are numerous practices that can be incorporated into a proposed development. Stormwater Management practices that take an integrative treatment train approach are essential ingredients for implementation of successful stormwater management strategies.

A Stormwater Management plan must consider two scales of precipitation events:

- Stormwater Management of large events is needed to prevent increased flood risk and undue inundation of natural systems; and,
- Stormwater Management of natural or predevelopment hydrology is needed to minimize the volume of runoff leaving a site, which will reduce the dependence of developments on downstream infrastructure, respect the sensitivities of natural receiving systems, and continue the replenishment of groundwater resources.

Stormwater Management of water quality is critical to minimize the potential for the contaminants generated by our communities to harm the surrounding environment. Although separate approaches have been provided for flood protection, water quality, erosion control, and water balance, it should be emphasized that achieving the required design criteria for all of these categories will be dependent upon minimizing the impact that urbanization has on the water balance. Urbanization, if not dealt with appropriately, will result in significant alteration of the natural water balance. This, in turn, can cause watercourses, and other natural features, to experience less water during dry weather periods. It can also reduce the amount of rainfall available to recharge groundwater, sustain aquifers, and maintain ecological processes dependent on groundwater discharge. It can also increase surface runoff, degrade water quality, and aggravate erosion. Designing a Stormwater Management System that manages both peak flows and the volume of runoff through encouraging water to infiltrate into the ground, evapotranspire, and/or be re-used, is critical to sustaining surface and groundwater inputs to natural features that rely on that surface and groundwater regime. Managing the stormwater balance will therefore be paramount if appropriate design criteria are to be met for flood protection, water quality, erosion control, and water balance.

Rapid urban expansion, increased traffic, ageing infrastructure, greater climatic variability, and the need for enhanced sustainability of urban water resources pose significant challenges to conventional stormwater management. Innovative approaches are needed in order to mitigate the risk of flooding, pollution, and aquatic ecosystem degradation, and enhance beneficial uses of urban waters. No single innovative measure is adequate under all circumstances, and a multibarrier approach is deemed to be most effective. Examples of innovations at the property level include harvesting roof runoff and reusing water, managing rainwater by infiltration in swales and into soils in bioretention areas, minimizing impervious surfaces, and using pervious pavement. At the neighbourhood level, runoff impacts are mitigated by designing roads without curbs, gutters, and drain pipes, and diverting runoff into infiltration channels, swales, and wetlands.

Creating roads and parking lots with pervious pavement and draining runoff from such surfaces into infiltration basins is also discussed. Among stormwater quality source controls, potential effects of street sweeping on runoff quality enhancement were assessed. New innovations at the watershed scale include:

- the creation of wideriparian buffer zones that can detain water, remove sediments, and mitigate nutrient export and other pollutant effects,
- the minimization of channelization of streams and rivers, and
- the designation of floodwater storage areas.

Stormwater management should be understood and incorporated into development designs since proper stormwater mamangement efficiently achieve both development and environmental goals in the most cost effective manner. When unusual circumstances or complex problems arise, our expert stormwater management specialists identify such conditions and propose alternative solutions consistent with good planning, engineering practices, and scientific principles. The impacts from development occur both during construction and after the development is complete. The conversion of pervious land to impervious surfaces results in increased rate and volume of stormwater runoff, reductions in groundwater recharge and reduction of evapotranspiration. These new impervious surfaces change the hydrologic characteristics of the landscape by reducing infiltration into the soil and evapotranspiration from vegetation which results in a dramatic increase in the rate and volume of stormwater runoff. New impervious surfaces, compaction of soils, and loss of native vegetation reduces the amount of precipitation that infiltrates into the ground. Uncontrolled, the impacts of development on stormwater runoff can lead to increased flooding, degraded water quality, stream channel erosion, hydrologic modifications, and destruction of sensitive habitats and l andscapes. Properly designed and implemented stormwater management facilities can mitigate these impacts.

Stormwater Management Principles

- Control and, to the extent practical, eliminate water, soil, noise and air pollution to safeguard the natural and human environment.
- Protect and improve surface water quality, wherever possible.
- Protect groundwater quality and quantity.
- Provide stormwater management facilities that are efficient, and minimize life cycle costs.

- Maintain the natural hydrologic cycle and function of the watersheds through a range of mechanisms through implementation of Low Impact Development (LID) stormwater management practices and principles.
- Prevent increased risk of flooding and stream erosion.
- Use the treatment train approach to reduce runoff volume and to treat stormwater runoff on-site through the use of source, conveyance and end-of-pipe controls.
- All newly developing or re-developing areas must assess their potential impacts on local and regional flooding and mitigate accordingly.
- All stormwater system designs for water quality treatment shall be in accordance with the most current Ministry of the Environment Stormwater Management Planning and Design Manual (MOE SWM Manual) and shall use the treatment train approach.
- Enhanced water quality treatment shall be provided as defined by the Ministry of Environments – Stormwater Manual Manual.
- Design shall consider the entire uncontrolled drainage area and external flows.
- Minor Systems shall be sized to capture and convey the 5 Year Storm.
- Major Systems shall be sized to capture and convey the Regulatory Storm to a safe outlet without flooding adjacent properties and should provide a minimum of 300 mm of freeboard from the maximum water surface elevation of the major system flow path to the minimum opening of structures.
- Hydraulic Grade Line in the storm sewer for the 100 year storm is a minimum of 300 mm below the basement footing elevation.

The Stormwater Management Report provides details and supporting calculations associated with the detailed design of the minor and major drainage system and the required source, conveyance and end-of-pipe controls required to achieve the criteria established in the Neighbourhood Functional Servicing and Stormwater Report. It also provides design details for infrastructure to confirm that the design conforms to municipal standards. The Stormwater Management Report also includes the Monitoring Plan and the Operations and Maintenance plan.

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We prepare and submit Stormwater Management Report to obtain Site Plan Approvals and Municipal Building Permits from City, Town, Township, County and/or Region for Proposed Construction, Renovation or Addition of Commercial, Industrial and Residential Buildings including Retail Shopping Plazas, Freestanding Signs, Office Buildings, Medical Buildings, Restaurants, Banquet Halls, Gas Stations, Retirement Homes, Multiplex Residential Units and Custom Build Homes in Ontario including Toronto, Pickering, Ajax, Whitby, Oshawa, Clarington, Brighton, Port Hope, Cobourg, Trenton, Belleville, Peterborough, Kawartha Lakes, Port Perry, Uxbridge, Stouffville, Sutton, Georgina, Keswick, Newmarket, Bradford, Barrie, Innisfil, New Tecumseth, Aurora, Richmond Hill, Markham, Vaughan, Woodbridge, King City, Bolton, Caledon, Orangeville, Brampton, Mississauga, Milton, Georgetown, Guelph, Cambridge, Kitchener, Waterloo, Woodstock, London, Brantford, Hamilton, Stoney Creek, Grimsby, St. Catharines, Niagara on the Lake, Niagara Falls, Fort Erie, Welland, Burlington and Oakville