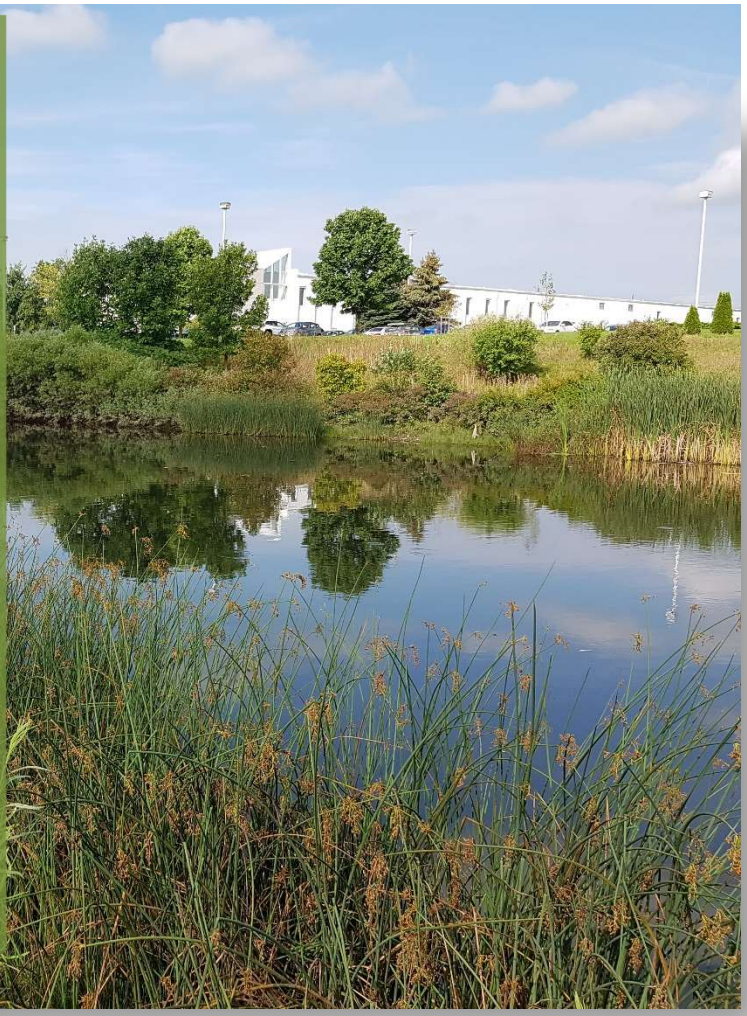
Prepared for:

The City of Waterloo

Stormwater Management Master Plan: Stormwater Management Policy Review



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Reference #: 66109
January 2019
Final Report

Contents

1. Introduction

The City of Waterloo is one of the cities in Ontario at the forefront of innovative stormwater management as a result of having developed a stormwater utility to fund municipal stormwater infrastructure projects and a stormwater credit program to incentivise the reduction of stormwater runoff and pollutants from entering the City's stormwater management system from private property. This policy review is part of the City of Waterloo's Stormwater Management Master Plan (SWM-MP). The SWM-MP will provide the city with a preferred stormwater management strategy to identify, protect and enhance natural features, ecological function and biophysical integrity. The plan will assist staff in appropriately managing risks through the establishment of environmental targets for water quality, water quantity, erosion, infiltration (water balance) and guidance with respect to the protection of natural features. The stormwater master plan will also address infrastructure issues, such as urban flooding, and form part of the overall asset management program. The plan will establish stormwater management policy and guidelines and will also address stormwater infrastructure and identify and prioritize identified works.

1.1 Purpose

As a component of the 2017 SWM-MP, this Stormwater Policy Review has been completed to identify existing policies, guidelines, and legislation that relate to stormwater management in the City of Waterloo. This review includes the following sections:

Overview: This section defines key terms and differentiates between Policies, Acts and Regulations

Legislative Framework: This section identified Policies, Acts and Regulations that impact the management of stormwater management. The section is divided into Federal, Provincial and Local subsections.

Summary of Policy Implications & Guidelines for Stormwater Management: This section provides a summary relevant federal and provincial stormwater management guideline documents and associate policy implications.

1.2 Context

During the past three decades, there has been an evolution in stormwater management in an effort to address downstream conditions resulting from urbanization. In the early 1980s, stormwater management focused solely on controlling the quantity of runoff and providing flood protection through rapid conveyance measures. By the early 1990s, water quality and downstream erosion control were given additional focus. Today, with improvements in watershed management and our understanding of the watersheds themselves, stormwater management now addresses a broad suite of issues including stream morphology, the protection of groundwater resources, fish habitat, and terrestrial habitat (primarily wetlands).

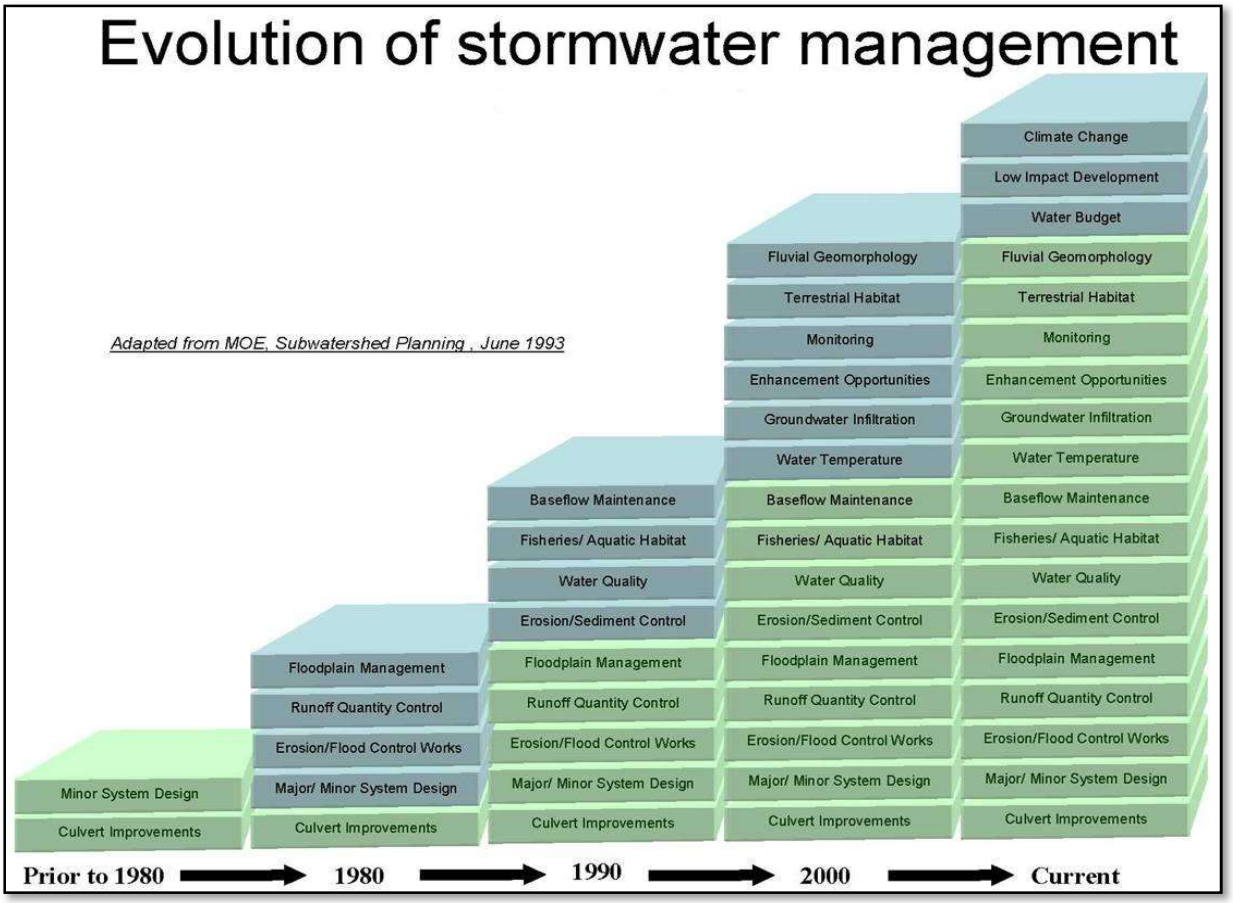

Figure 1.1: The evolution of storm water.

Stormwater runoff from urban areas may degrade the environment both during construction activities and post-development. Post construction pollutant loadings from urbanized areas are significant. Common pollutants include heavy metals from automobiles and air emissions, nutrients, fertilizers, chlorides from road de-icers bacterial contamination from animal wastes, and toxic contamination from a variety of commercial and industrial sources. These pollutants, when conveyed to the receiving water bodies, impact the environment in many ways. The particulate (those that can be settled) and dissolved contaminants stress aquatic ecosystems by depleting oxygen, covering habitat or through the bioaccumulation or bio-concentration of contaminants in the tissues of various aquatic species. In addition, receiving waters can also be affected by thermal impacts resulting from an increase in ambient water temperatures.

Rigorous scientific research, evaluating the range of stormwater management treatment strategies, has produced an overwhelming amount of evidence that pipe and pond stormwater treatment strategies do not meet general water quality and erosion objectives and are resulting in longer periods of elevated flow, thermal enrichment of surface water bodies and increased pollutant loadings. Many recent Subwatershed studies and Master Drainage Plans themselves recognized this shortcoming, and are recommending overall water management strategies that meet the goals, objectives and targets using a combination of stormwater management practices distributed across a catchment, which include source controls, the maximization of pervious surfaces and therefore infiltration, conveyance and end-of-pipe controls as part of a holistic strategy.

As such, future stormwater management strategies will require an innovative, state of the art approach to stormwater management by first and foremost treating runoff (precipitation) at its source, as a resource to be managed and

protected rather than a waste. In this regard, the emphasis in managing runoff is to retain/maintain the existing infiltration of water into the ground using best management practices (BMPs) that are consistent with the Ministry of the Environment's treatment train approach to stormwater management, the TRCA/CVC LID stormwater Planning and Design Guide and others.

Presented in Table 1.1 and Table 1.2 are summaries of the policy implications and the relevant federal and provincial stormwater management guideline documents respectively.

Table 1.1 lists the policies and acts applicable to stormwater management planning, design, permitting and best management practices under key federal, provincial, and local legislations discussed earlier. Table 1.2 lists the guidelines applicable to stormwater management planning and best management practices under federal and provincial levels. Table 1.3 identifies local policies relevant to stormwater management.

Table 1.1 - Summary of Policies, Acts, Regulations, and Plans Relating to Stormwater Management

Level of Government	Name of Management Tool: Policy/Act/Regulation/ Plan	Type of Tool	Purpose and Relevance to Stormwater Management
Federal	Federal Fisheries Act	Act	Purpose is to ensure the conservation and protection of fish and fish habitat.
	Navigable Waters Protection Act	Act	Prohibits dumping of wastes that may interfere with navigation. Prohibits construction in navigable waters.
	Migratory Birds Convention Act	Act	Protection of migratory songbirds and their nests from disturbance or destruction.
	Species at Risk Act	Act	Protection of Wildlife species at risk and recovery plans
	Canadian Environmental Protection Act (CEPA)	Act	The goal of the Canadian Environmental Protection Act (CEPA) is to contribute to sustainable development through pollution prevention and to protect the environment, human life and health from the risks associated with toxic substances.
	Canadian Environmental Assessment Act	Act	The Act requires federal departments, including Environment Canada, agencies, and crown corporations to conduct environmental assessments for proposed projects where the federal government is the proponent.
	Canada Water Act	Act	An Act to provide for the management of the water resources of Canada, including research and the planning and implementation of programs relating to the conservation, development and utilization of water resources. Authorizes agreements with provinces for the delineation of flood plains and hazardous shorelines for flood and erosion control. In 2010–2011 the governments of Canada and Ontario extended the Canada–Ontario Agreement to June 2012, and added six new commitments to maintain momentum on the restoration, protection and conservation of the Great Lakes, while negotiations proceed between the federal governments of Canada and the United States to amend and strengthen the Great Lakes Water Quality Agreement. The Canadian Federal Great Lakes Program, a partnership of federal departments, provides the framework for working toward Canada's commitments under the Great Lakes Water Quality Agreement. Canada's activities are integrated with those of Ontario through the Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem, which outlines how the two governments will cooperate and coordinate their efforts to restore, protect and conserve the Great Lakes Basin ecosystem. Highlights of actions in 2010–2011 include a wide range of research, monitoring and restoration projects in Great Lakes Areas of Concern through the Great Lakes Action Plan and the Cooperative Science and Monitoring Initiative; projects to reduce the amount of nutrients, solids and bacteria entering watercourses; and research in support of Canada–U.S. Lakewide Management Plans (LaMP).
Provincial	Water Management Policies, Guidelines and Provincial Water Quality Objectives (PWQO) The "Blue Book"	Policy	Policies for surface (and groundwater) quality management in Ontario. Surface water objectives for the protection of aquatic life.
	Provincial Policy Statement (PPS)	Policy	The PPS is issued by the Ministry of Municipal Affairs and Housing under Section 3 of the Planning Act. It requires that decisions affecting planning matters in Official Plans *"shall be consistent with"* the PPS. The PPS provides *"for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural environment"*. The PPS focuses growth within settlement areas and away from significant or sensitive resources. It directs planning authorities to identify and promote opportunities for intensification and redevelopment where this can be accommodated, taking into account existing building stock, including existing or planned infrastructure. The PPS provides a higher degree of protection for employment lands against conversions to residential uses. The new policies also provide for intensifications and brownfields development to ensure the maximum use of sewer, water and energy systems, roads and transit. The Official Plan is the most important tool to implement the PPS. Section 2.2 of the PPS addresses water, stating that planning authorities shall protect, improve or restore the quality and quantity of water, using the watershed as the ecologically meaningful scale for planning. Planning authorities shall ensure that stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.
	Integrating Water Management Objectives into Municipal Planning Documents	Policy	Policy manual on the integration of watershed management practices into municipal planning documents.
	The Growth Plan for the Greater Golden Horseshoe, 2017	Policy	Policy manual that works with the Greenbelt Plan, Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan to provide key growth management goals for the region.
	Environmental Assessment Act	Act	Provides protection, conservation and management of the environment in Ontario. Retrofits of stormwater facilities may be carried out as a Class EA subject to the selection of the appropriate schedules under the Municipal Engineers Association (2000, as amended in 2007).
	Drainage Act	Act	Provides for the regulation of drainage practices in Ontario.
	Clean Water Act	Act	Policies and plans will be developed to define and to clarify roles and responsibilities, define permissible actions and identify land uses. For SWM, Non-structural BMPs that use infiltration must consider the relevance of site locations with respect to WHPA, the source of runoff and whether groundwater threats have been identified within the relevant Provincial or Regional documents.
	Lakes and Rivers Improvement Act	Act	The Lakes and Rivers Improvement Act gives the Ministry of Natural Resources and Forestry the mandate to manage water-related activities, particularly in the areas outside the jurisdiction of Conservation Authorities.
	Endangered Species Act	Act	Provides for the protection for species at risk and their habitats.
	Conservation Authorities Act	Act	Prevention of the loss of life and property due to flooding and erosion; and, the conservation and enhancement of natural resources. Any projects within the regulated area of the respective CA or impacting wetland will require the acquisition of a permit pursuant to Policies for the Administration of the Development Interference with Wetlands and Alterations to Shorelines and Watercourse Regulation. Locally, the Grand River Conservation Authority enforces this Act through Ontario Regulation 150/06.
	Ontario Water Resources Act	Act	The Ontario Water Resource Act deals with the powers and obligations of the Ontario Clean Water Agency, as well as an assigned provincial officer, who monitors and investigates any potential problems with regards to water quality or supply. There are also sections on wells, water works, and sewage works (including stormwater management facilities) involving their creation and operation.
	Environmental Protection Act	Act	The purpose of this Act is to provide for the protection and conservation of the natural environment. Act prohibits discharge of contaminants having an adverse effect.
	Endangered Species Act	Act	Enacts the protection of Endangered, Threatened and Special Concern species (provincial) and their habitats; regulates activities which may affect these species, and provides for development of Recovery Strategies.

Level of Government	Name of Management Tool: Policy/Act/Regulation/ Plan	Type of Tool	Purpose and Relevance to Stormwater Management
	Fish and Wildlife Conservation Act	Act	*Fish and Wildlife Conservation Act* enables the Ministry of Natural Resources and Forestry (MNRF) to provide sound management of the province's fish and wildlife.
	SWM in light of Climate Change	Policy Review	Review of the need for a new policy, act, or regulation to deal with municipal SWM systems in light of climate change
	Bill 127, Ontario Water Resources Amendment Act (Source Water Protection)	Act	The Bill amends the *Ontario Water Resources Act* in regard to the availability and conservation of Ontario water resources. Specifically, the Bill requires the Director to consider the Ministry of Environment's statement of environmental values when making any decision under the Act. The Bill also requires that municipalities and conservation authorities are notified of applications to take water that, if granted, may affect their water sources or supplies.
	Water Opportunities Act	Act	The purposes of the Act are: a) to foster innovative water, wastewater and stormwater technologies, services and practices in the private and public sectors; (b) to create opportunities for economic development and clean-technology jobs in Ontario; and, (c) to conserve and sustain water resources for present and future generations. The Minister of the Environment may, to further the purposes of this Act, establish aspirational targets in respect of the conservation of water and any other matter the Minister considers advisable.
	Lake Simcoe Protection Act	Act	The purpose of this Act is to protect and restore the ecological health of the Lake Simcoe watershed. The Lake Simcoe Protection Plan was developed under this Act.
	Safe Drinking Water Act	Act	This Act provides for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.
	Brownfields Statute Law Amendment Act	Act	This Act facilitates public access to information contained in records of site condition and to other information filed in accordance with this Act and the regulations.
	Oak Ridges Moraine Conservation Act	Act	This Act provides legislative framework for the Oak Ridges Moraine Conservation Plan.
	The Greenbelt Act	Act	This Act enables the creation of a Greenbelt Plan to protect about 1.8 million acres of environmentally sensitive and agricultural land in the Golden Horseshoe from urban development and sprawl.
Local	Water Resources Protection Master Plan	Plan	This Plan was developed by the Region of Waterloo to guide Source Protection Activities in the Region between 2007 and 2016.
	Source Protection Plan	Plan	The Source Protection Plan (SPP) is intended to protect municipal wells and surface water intakes from specific activities that could pose a threat to drinking water sources.
	Region of Waterloo Official Plan	Plan	The Regional Official Plan (ROP) contains the planning policies needed to direct growth and change in Waterloo Region over the next 20 years. A key element of the ROP is the protection of drinking water and significant environmental areas.
	City of Waterloo Official Plan	Plan	The City of Waterloo's official plan serves as a roadmap for long-range land use and development through 2031.

Table 1.2 - Guidelines applicable to Stormwater Management at Federal and Provincial Levels

Level of Government	Guideline Document	Purpose and Relevance to Stormwater Management
Federal	Canadian Water Quality Guidelines for the Protection of Aquatic Life	The Canadian Water Quality Guidelines consist of a set of recommended "safe limits" for various polluting substances in raw (untreated) drinking water, recreational water, water used for agricultural and industrial purposes, and water supporting aquatic life. They are designed to protect and enhance the quality of water in Canada. The guidelines apply only to inland surface waters and groundwater's and not to estuarine and marine waters.
	Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses	The Canadian Water Quality Guidelines consist of a set of recommended "safe limits" for various polluting substances in raw (untreated) drinking water, recreational water, water used for agricultural and industrial purposes, and water supporting aquatic life. They are designed to protect and enhance the quality of water in Canada. The guidelines apply only to inland surface waters and groundwater and not to estuarine and marine waters.
	Guidelines for Canadian Drinking Water Quality	To provide a national guideline for the protection of drinking water.
	Guidelines for Canadian Recreational Water	To provide a national guideline for the protection of recreational waters used for primary contact recreation such as swimming, windsurfing and water skiing and for secondary contact recreation activities including boating and fishing.
	Canada/Ontario Agreement Respecting Great Lakes Basin Ecosystems.	Since 1971, Canada-Ontario Agreements Respecting the Great Lakes Basin Ecosystem have guided the Parties in their work to improve the environmental quality of the Basin.
Provincial	Stormwater Management Planning and Design Manual	This document provides practical guidance that can be used as a baseline reference document for the review of stormwater management applications for approval under Section 53 of the Ontario Water Resources Act. It includes: • Providing direction for sizing of the stormwater quality control component of stormwater management facilities in order to achieve water quality objectives which provide protect fisheries habitat; • Incorporating in-stream erosion control and water balance objectives in addition to flood and water quality objectives into the selection and design of Stormwater Management Practices (SWMPs); • Providing information on SWMPs such as sand filters, bioretention filters, wet swales and hybrid wet pond/wetlands; • Providing design examples for SWMPs; • Providing an appendix which deals with integrated planning for stormwater management.
	Technical Guide, River & Stream Systems: Flooding Hazard Limit	The technical guide has been developed to assist in the understanding of the latest Provincial Policy Statement (PPS – 2005). It describes approaches consistent with the PPS. This guide serves in an advisory role and should be read in conjunction with the PPS and other flood related implementation guides. The 2002 Technical Guide updates the 1986 Flood Plain Management in Ontario Technical Guidelines. The primary purpose of this document is to *"provide a consistent and standardized procedure for the identification and management of riverine erosion hazards in the Province of Ontario."*
	Natural Heritage Reference Manual for the Natural Heritage Policies of the Provincial Policy Statement	Provides guidelines for the implementation of the PPS by planning authorities.
	Significant Wildlife Habitat Technical Guide	Significant Wildlife Habitat has been identified as one of the natural heritage feature areas under the Provincial Policy Statement.
	Protection and Management of Aquatic Sediment Quality in Ontario	The purpose of the sediment quality guideline is to protect the aquatic environment by setting safe levels for metals, nutrients and organic compounds.
	Guidelines for Evaluating Construction Activities Impacting on Water Resources	These guidelines were developed to protect the receiving environment according to the physical, the chemical and the biological quality of the material being dredged.
	Incorporation of the Reasonable Use concept into MOECC Groundwater Management Activities	This guideline establishes the basis for the reasonable use of groundwater on property adjacent to sources of contaminants and for determining the levels of contaminants acceptable to the MOECC.
	Watershed Management on a Watershed Basis	Guideline manual on watershed management practices.
	Redside Dace – Ontario Recovery Strategy	Uplisted as endangered species in 2009 under the Endangered Species Act. This protects both the species and its habitat, prohibiting damage or destruction of the habitat without authorization by the Ministry of Natural Resources and Forestry ((MNRF).
	Draft Guidance for Development Activities in Redside Dace Protected Habitat	Assist in describing redside dace habitat, the protection afforded under, requirements for review and permitting and BMPs to mitigate impacts.
	The Blue Book	Contains the Ministry of the Environment and Energy policies and guidelines for the management of the province's water resources. It gives direction on how to manage the quality and quantity of both surface and ground waters.
	Low Impact Development Stormwater Planning and Design Guide	The guide was developed to provide engineers, ecologists and planners with up-to-date information and direction on landscape-based stormwater management planning and low impact development stormwater management practices, and thereby help ensure the continued health of the streams, rivers, lakes, fisheries and terrestrial habitats in the CVC and TRCA watersheds. It is also intended to help streamline and focus the design and review process, as well as ensure that the goals, objectives and targets outlined in watershed and subwatershed studies are being met.
	Designer's Guide for Low Impact Development Construction	This guide provides guidance on the approaches and criteria to be applied during construction.
	Protection and Management of Aquatic Sediment (Guidelines B-1-3)	The guidelines provided in this document were developed for use in evaluating sediments throughout Ontario, and replace the Open Water Disposal Guidelines (published by the Ministry in 1976) currently used for sediment evaluation.
	Evaluation of Construction Activities Impacting Water Resources (Guidelines B-5)	Aid in the assessment of the environmental impact of construction activities.

Table 1.3 – Local Studies, Plans, Strategies, and Guidelines relevant to Stormwater Management

Local Studies, Plans, Strategies, and Guidelines
• City of Waterloo Development Engineering Manual (2013) • Update of Intensity-Duration-Frequency (IDF) Curves for the City of Waterloo and the City of Kitchener (2012) • Localized Climate Projections for Waterloo Region (2015) • Master Drainage Study: Urbanized Subwatersheds (2005) • 2016 Bridge and Culvert Inspection Summary Report • 2015 Stormwater Management Facility Assessment • Uptown Stormwater Management Criteria (1994)

2. Overview

There exists a hierarchy of authority, described as policies, statutes, regulations, plans and guidelines, all of which must be considered during a review of the current City of Waterloo stormwater policy. Legislative terms and principles are described below in order to provide a baseline context and shed light over basic definitions, what is enforceable and how. Relevant fundamental definitions are listed below.

A **Policy** is a statement of intent or a commitment to achieve a goal, for which decision-makers can be held accountable. For example, within a municipality, policies like the Provincial Policy Statement (PPS) are enacted through the Official Plan.

An **Act** is a written law to declare a policy, and typically commands or prohibits something

Examples:
Ontario Water Resources Act (OWRA)
Bill 6: Great Lake Protection Act (1st Reading)

A **Regulation** is a subordinate legislation, passed pursuant to an Act. Because legislatures are reluctant to become embroiled in technical matters, regulations are delegated to an executive or technical branch, which provides details, measures or procedures for implementing the Act. A regulation is a rule that creates, limits, or constrains a right or a duty. Regulations are enacted to produce outcomes which might not otherwise occur or to prevent outcomes that might otherwise occur, usually with specific time frames. Regulations can impose sanctions if they are disregarded.

Examples:
O. Reg. 150/06 made under the Conservation Authorities Act: Grand River Conservation Authority, Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.
O. Reg. 454/96 made under Lakes and Rivers Improvement Act: Construction.
O. Reg. 284/07 made under the Clean Water Act: Source Protection Areas and Regions.

A **Plan** (or **Strategy**) is list of steps (with requirements for timing and resources) that will be taken to achieve a desired objective. It is a set of intended actions through which a goal can be achieved or a policy implemented. For example, a plan (such as an Official Plan) provides direction for land uses within a particular area and for mitigating the corresponding environmental impacts. A plan defines the where and how Regulations or Acts are applied.

Examples:
Municipal Official Plan
Ontario Recovery Strategy Series for Redside Dace (for species at risk under the Endangered Species Act).

GRCA Fisheries Management Plan
Great Lakes Protection Plan

A **Guideline** is a statement of intent that determines a desirable course of action, which directs a process according to sound, predictable and high-quality practices or procedures. By definition, guidelines are not mandatory, not binding and are not legally enforceable. However, many regulators consider guidelines (especially numerical guidelines) as *de facto* minimum standards to be enforced.

Examples:
MOECC Stormwater Management Plan and Design Manual (2003)

3. Legislative Framework

In Canada, environmental issues including stormwater planning and management are predominantly regulated through a multi-level legislative framework. Under the legislative framework for stormwater planning and management within the City of Waterloo, there are several jurisdiction levels that interact and apply based on many factors including geographical scale, and administration role.

3.1 Federal Level

The federal government exercises jurisdiction over a group of environmental issues related to stormwater planning and management including fish and fish habitat, navigable waters, environmental impact assessments, toxic substance releases, and some wildlife issues. More specifically, the main pieces of legislation that deal with stormwater are:

- The Fisheries Act;
- The Canada Water Act;
- The Canadian Environmental Protection Act;
- The Canadian Environmental Assessment Act
- The Migratory Convention Birds Act
- The Species at Risk Act
- Navigation Protection Act

3.1.1 Fisheries Act (1985, Amended 2012)

Prior to November 2012, The Fisheries Act focused on the protection of fish and aquatic habitat. It prohibited the deposit (direct discharging, spraying, releasing, spilling, leaking, seeping, pouring, emitting, emptying, throwing, dumping or placing) of harmful substances into waters frequented by fish, such as oceans, rivers, lakes, creeks, and streams, or into storm drains that lead to such waters. Previously, an authorization was required for the Harmful Alteration Disruption or Destruction (HADD) of fish habitat under this legislation. The legislation had primarily addressed fish and fish habitat within watercourses and water bodies but did not encompass features or functions that contribute to downstream fish habitat.

A harmful substance can also be stormwater, wastewater, or other effluent that contains a substance in such quantity or concentration that it would, if deposited to waters frequented by fish, degrade or alter fish or fish habitat (DFO, 2006). This definition remains unchanged by recent amendments.

Recent Modifications/ Amendments

On June 29 2012, amendments to the Fisheries Act received Royal Assent. The new Fisheries Act:

- Focuses on the Act's regulatory regime on managing threats to the sustainability and ongoing productivity of Canada's commercial, recreational and Aboriginal fisheries;
- Provides enhanced compliance and protection tools;
- Provides clarity, certainty and consistency of regulatory requirements through the use of standards and regulations; and
- Enables enhanced partnerships to ensure agencies and organizations that are best placed to provide fisheries protection services to Canadians are enabled to do so.

The new Fisheries Act (new subsection 35(1)) now reads: "No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery" . They key changes include:

1. All explicit references to fish habitat have been removed.
2. Harmful alteration, disruption, or destruction of fish habitat (HADD) has been replaced by "serious harm to fish".
3. General prohibitions against harm to fish habitat have been replaced by those that apply now only to fish that are important to a "commercial, recreational, or Aboriginal fishery" (i.e. fish that are of some economic or recreation value and/or of cultural value to a component of the Canadian population)

As a result, effective in November 2013, Ontario Conservation Authorities no longer have Review Agreement with Fisheries and Oceans Canada (DFO) and are no longer undertaking reviews under the *Fisheries Act* on behalf of DFO. As a result, it is up to the proponent to ensure that their projects meet the DFO requirements under the self-assessment process. Further information regarding this process can be found at the following link http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html.

This self-assessment process applies to any on-going projects currently under review with the local CAs, applications where permits have not yet been issued and any future permit applications that would normally have involved CA review under the *Fisheries Act*. See www.dfo-mpo.gc.ca. Note: Further implications resulting from the modifications and amendments of the Fisheries Act can be anticipated but are not predictable at this time.

3.1.2 Canada Water Act (1985, Amended 2005)

The Canada Water Act (last amended in 2005) is divided into four parts:

1. Comprehensive Water Resource Management;
2. Water Quality Management;
3. Nutrient Management; and
4. Administration and Enforcement

Guidelines originally issued under this part of the Act are now listed under Canadian Environmental Protection Act. These include the Canadian Drinking Water Quality Guidelines and the Guidelines for Effluent and Waste Water Treatment at Federal Establishments. The final part focuses on administration and enforcement of the Act.

3.1.3 Canadian Environmental Protection Act (1999)

The Canadian Environmental Protection Act (CEPA) is administered by Environment Canada and Health Canada and is "An Act respecting pollution prevention and the protection of the environment and human health in order to contribute to sustainable development."

Applicable provisions

Section 64 of CEPA states "a substance is toxic if it is entering or may enter the environment in a quantity or concentration or under conditions that:

a) Have or may have an immediate or long-term harmful effect on the environment or its biological diversity;
b) Constitute or may constitute a danger to the environment on which life depends; or
c) Constitute or may constitute a danger in Canada to human life or health."

Section 95 states that when a toxic substance is released into the environment, the person responsible must report the release, take measures to prevent the release, and mitigate any danger to the environment or public safety.

The focus of the CEPA is pollution prevention and the protection of the environment, primarily through the control of toxic substances. The CEPA applies indirectly to SWM through Section 95 which outlines that there are duties to report and take remedial measures in the event of a spill of a listed toxic substance. If stormwater contains a listed toxic substance and is released, it could be considered a reportable offence (Department of Justice Canada, 1999). For example, dust from construction sites also contributes to Particulate Matter in the air, and in specified quantities, is identified in the "List of
Toxic Substances" under Schedule 1 of CEPA. Salt is also listed as a toxic substance under CEPA.

3.1.4 Canadian Environmental Assessment Act (2012)

The Canadian Environmental Assessment Act (CEAA) is administered by the Canadian Environmental Assessment Agency, an independent agency that reports to the Minister directly. The Act is intended to prevent any projects associated with the federal government from having any adverse environmental effects outside the jurisdictions in which they are undertaken.

3.1.5 Migratory Convention Birds Act (1994)

The Migratory Convention Birds Act deals with the protection of migratory game birds. It's relevance to stormwater is based on the protection of water that may be used by migratory birds. Section 35 outlines that it is an offence to deposit or permit the deposit of oil, oil wastes or other substances harmful to migratory birds in water or any area frequented by migratory birds.

3.1.6 Species at Risk Act (2002)

Environment Canada is the lead federal government department responsible for issues concerning species at risk, however Fisheries and Oceans Canada is responsible for the protection of aquatic species and habitat at risk.

The Species at Risk Act is a key federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity. The Act applies on federal lands, including national parks, and other protected heritage areas administered by Parks Canada, species protected under the Migratory Birds Convention Act, or aquatic species as defined in the Fisheries Act, SARA applies automatically on provincial and territorial lands and waters as well.

Applicable Provisions include Section 58: no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species -or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada – if:

(a) the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada;
(b) the listed species is an aquatic species; or
(c) the listed species is a species of migratory birds protected by the Migratory Birds Convention Act, 1994.

The relevance to stormwater is founded on surface runoff from different sources and land uses that may carry contaminants, adversely affecting physical habitat and water quality.

3.1.7 Navigation Protection Act (1985, Amended 2012)

The Navigation Protection Act (NPA) is administered by Transport Canada and is designed to protect the public right of navigation in Canadian waters. The Act prohibits unauthorized "work" involving construction or placement in, on, over, under, through, or across any navigable water.

Applicable Provision
Section 21 states "no person shall throw or deposit or cause, suffer or permit to be thrown or deposited any sawdust, edging, slabs, bark or like rubbish or any description whatever that is liable to interfere with navigation in any water, any part of which is navigable or that flows into any navigable water".

The relevance to stormwater is based on the inclusion of sediment under Section 21 of this legislation from stormwater facilities, uncontrolled releases or as a result of excessive stream erosion.

In 2012, the Act was amended by the Jobs and Growth Act, 2012[23] to provide for:

- The limitation of the Act's application to works in certain navigable waters that are set out in its schedule.
- It to be deemed to apply to certain works in other navigable waters, with the approval of the Minister of Transport,
- An assessment process for certain works and to provide that works that are assessed as likely to substantially interfere with navigation require the Minister's approval, and
- Administrative monetary penalties and additional offences.

The amendments came into force in April 2014.

3.2 Provincial Level

In regard to water resources and stormwater related issues, Provincial legislative powers include, but are not limited to:

- Flow regulation;
- Authorization of water use development;
- Water supply; and
- Pollution control

Ontario legislative mechanisms (e.g., policies and guidelines) to regulate water quality and quantity are primarily administered by:

- **Ministry of the Environment and Climate Change (MOECC):**
  - The Blue Book
  - Water Resources Act;
  - Clean Water Act;
  - Environmental Protection Act;
  - BMP for Excess Soil Management;
  - Water Opportunities Act; and
  - Safe Drinking Water Act
- **Ministry of Natural Resources and Forestry (MNRF)**
  - Lakes and Rivers Improvement Act; and
  - Endangered Species Act
- **Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA):**
  - Drainage Act; and
  - Nutrient Management Act

- **Ministry of Municipal Affairs and Housing (MMAH)**
  - The Planning Act and the Provincial Policy Statement; and
  - The Municipal Act
- **Ministry of Infrastructure**
  - The Places to Grow Act
- **General**
  - Policy Review of Municipal Stormwater Management in the Light of Climate Change (2011)
  - Environmental Assessment Act (EAA)
  - Environmental Bill of Rights, 1993
  - Lake Simcoe Protection Act, 2008 (LSPA)
  - Proposed Great Lakes Protection Act
  - Safeguarding and Sustaining Ontario's Water Act (2007)
  - Public Lands Act
  - Sustainable Water and Sewage Systems Act (2002)
- **Provincial, Watershed, SWM and LID Guidance**
  - Stormwater Management Planning and Design Manual (2003)
  - Low Impact Development Stormwater Planning and Design Guide (2011 V1.0)
  - Designer's Guide for Low-Impact Development Construction (Draft 2011)
  - Low Impact Development Stormwater Practice Inspection & Maintenance Guide (Draft June 2015)
  - Protection and Management of Aquatic Sediment (Guidelines B-1-3)
  - Evaluation of Construction Activities Impacting Water Resources (Guidelines B-5)

3.2.1 Water Management: Policies, Guidelines, Provincial Water Quality Objectives - The "Blue Book" (MOECC, 1994, reprinted 1999)

The "Blue Book" was issued by the MOECC under the authority of the Ontario Water Resources Act and the Environmental Protection Act. It provides direction on how to manage the quality and quantity of both surface water and ground water. It provides a framework but not procedures: how the policy is applied to (for example) pollutant discharge limits is a matter of local choice or conditions or other pollutant management strategies.

The Provincial Water Quality Objectives (PWQO) forms an integral part of the policy. The PWQO are set at levels that are protective of aquatic life and aquatic life cycles during indefinite exposure to water, in addition to recreation. The PWQO are guidelines to making rational water quality decisions. In addition to the PWQO, other objectives and guidelines may be used that relate to specific uses. Meeting the PWQOs "should be determined from data that adequately reflect the spatial and temporal variations of the quality of the waterbody under consideration". Section 3.5.1 sets out procedures for effluent requirements. Of interest is the determination of effluent requirements are expressed as "waste loadings and/or concentrations". Meeting the PWQO "***should be determined from data that adequately reflect the spatial and temporal variations of the quality of the waterbody under consideration***". This must be accomplished through stormwater quality analyses of event mean concentration (EMC) values for various representative pollutants.

The general policies that relate to Stormwater are listed below:

> **Policy #1**: "In areas which have water quality better than the PWQO, water quality shall be maintained at or above the Objectives".

Policy #2: "Water quality which presently does not meet the PWQO shall not be degraded further and all practical measures shall be taken to upgrade that water quality to meet the Objectives".

Policy #3: To prevent the release, in any concentration, of hazardous substances that have been banned.

Policy #4: Ensure that special measures are taken on a case by case basis to minimize the release of hazardous substances that have not been banned.

Policy #5: refers to a mixing zone as an area of water contiguous to a point source or definable diffuse source where water quality does not comply with one or more PWQO. It states "Mixing zones should be as small as possible and not interfere with beneficial uses. Mixing zones are not to be used as an alternative to reasonable and practical treatment".

Policies of most relevance to this study are Policy #1 and #2.

These policies are enforceable when incorporated into control documents, such as Environmental Compliance Approvals issued by the Ministry of the Environment (MOECC) through the Environmental Protection Act and the Ontario Water Resources Act, which regulates stormwater. The Conservation Authorities Act mandates Conservation Authorities to protect and regenerate natural systems and to maintain the quality, safety and sustainability of water resources.

The application of the policy is as follows:

1. The water management policies and guidelines supporting the Provincial Water Quality Objectives (PWQO) are the basis for establishing acceptable limits for water quality and quantity that protect aquatic ecosystems and groundwater. They are equally applicable to a local site-specific situation, an entire watershed or to the Great Lakes Basin.

2. The policies and guidelines do not have any formal legal status but, by their successful use over the years, are now accepted as a standard code of practice for water resources management.

3. Meeting the policies related to the PWQO is the minimum requirement.

3.1.1 Ontario Water Resources Act (MOECC, 1990, Amended 2011)

The Ontario Water Resources Act (OWRA) O.Reg 525/98 is designed to conserve, protect and manage Ontario's water resources for efficient and sustainable use. The act focuses on both groundwater and surface water throughout the province.

The Ontario Water Resources Act regulates works related to water supplies, the distribution of water and stormwater management and conveyance infrastructure. The act provides for the protection and conservation of water, and the control of the quality of drinking water supplied to the public. Under the Act, stormwater is included in the definition as sewage and, as such is required to be managed properly. Accordingly, the act "regulates sewage disposal and "sewage works" and prohibits the discharge of polluting materials that may impair water quality".

Key stormwater-related issues addressed within the Water Resources Act are:

- Prohibiting the discharge of polluting material in or near water (Section 30);
- Prohibiting or regulating the discharge of sewage (Section 31);

- Enabling the issuance of orders requiring measures to prevent, reduce or alleviate impairment of water quality (Section 32);
- Enabling the designation and protection of sources of public water supply (section 33);
- Imposing a duty on corporate officers and directors to take all reasonable care to prevent the corporation from discharging materials into or near water that may impair water quality (Section 116).

Recent Modifications/ Amendments

Recent changes under the act (Consolidation Period: From July 26, 2007 to Current), specifically subsection 53(1) and (3), whereby all Industrial lands are no longer exempt from requiring an ECA (formerly CofA) for their stormwater discharges. O. Reg. 525/98 – Approval Exemption, last amendment O.Reg. 396/0, Section 3, Subsection 53(1) and (3) of the Act apply to the establishment, alteration, extension or replacement of or a change in a stormwater management facility that:

a) Is designed to service one lot or parcel of land;
b) Discharges into a storm sewer that is not a combined sewer;
c) Does not service industrial land or a structure located on industrial land; and
d) Is not located on industrial land O. Reg 525/98, s. 3.

Local MOECC enforcement officers have begun enforcing the above within existing industrial lands within the local jurisdiction around Waterloo, requiring the retrofit, upgrade or construction of stormwater management controls to the standard of the relevant municipality.

Applicable Provisions

Section 30(1): Offence to discharge any material of any kind in any waters or shore or bank thereof or in any place that may impair the quality of the water (s. 30.1)

Section 30(2): Person who discharged or caused or permitted the discharge to forthwith notify the Minister

Section 32: Ensures the cleanup of the spill and restores the environment to its original condition

The following are considered Aggravating Factors when imposing Sentencing Considerations:

- Offence caused impairment of water quality
- Defendant committed the offence intentionally or recklessly
- Defendant was motivated to increase revenue or decrease costs
- After the commission of the offence, the defendant:
    - Failed to co-operate with the Ministry or other public authorities
    - Failed to take prompt action to mitigate the effects
    - Failed to take prompt action to reduce the risk of similar offences being committed in the future

Exemptions

In general such, the need for, and nature of, an approval depends on the site and the activity. However, specific exemptions for certain types of sewage works equipment, system and application have been granted through legislation. The OWRA and Approval Exemption Regulation (O.Reg. 525/98) exempt minor sewage works from the approval requirements of the Act. As

Under the O. Reg 525/98 Approval Exemptions, the establishment, alteration, extension or replacement of or a change to stormwater management facility can be exempted from requiring an ECA if **all** of the following applicable conditions are met. A stormwater management facility is defined as a facility for the treatment, retention, infiltration or control of storm water. More specifically, an ECA is not required if the stormwater management facility (i.e. the works) are:

1) designed to service one lot or parcel of land; AND

2) discharging into a storm sewer that is not a combined sewer; AND

3) not servicing industrial land or a structure located on industrial land; AND

4) not located on industrial land.

Industrial lands are defined as lands used for the production, process, repair, maintenance or storage or goods or materials, or the processing, storage, transfer or disposal of waste, but does not include lands used primarily for the purpose of buying or selling,

a) goods or materials other than fuel, or

b) services other than vehicle repair services

Other approval exemptions under Section 53 include:

5) drainage works under the Drainage Act or a sewage works where the main purpose of the work is to drain land for the purposes of agricultural activity;

6) drainage works under the *Cemeteries Act*, the *Public Transportation and Highways Improvement Act* or the *Railway Act*.

7) private sewage disposal systems which discharge to groundwater, that have a designed capacity of 10,000L/day or less. Note: these are approved under the *Building Code* by municipalities.

In all other circumstances beyond the aforementioned exemptions, an ECA from MOECC is required. If unsure about the exemption of your stormwater works, a pre-consultation meeting with the ministry is recommended

3.1.2 Clean Water Act (MOECC, 2006, Amended 2017)

The Clean Water Act 2006 was enacted to protect existing and future sources of drinking water. The Act specifies that drinking water source protection plans (SPP) be developed as a result of an overall assessment report and that the SPP sets forth policies that prevent activities from becoming a significant drinking water threat to surface and groundwater drinking supplies.

Specifically, the regulations define threatened areas to include highly vulnerable aquifers, significant groundwater recharge areas (SGRA), wellhead protection areas (WHPA), and surface water intake protection zones (IPZ). Furthermore, Ontario Regulation 287/07 (as amended), lists 21 prescribed drinking water threats. Several of these prescribed activities relate to stormwater management and may impact where infiltration of water is promoted, specifically:

- Activity 2: A system that collects, stores, transmits, treats or disposes of sewage, including stormwater;
- Activity 12: The application of road salt, including salt transmitted in stormwater runoff;
- Activity 13: The handling and storage of salt, including salt treated or disposed in stormwater; and,
- Activity 14: The storage of snow, including snow stored in or near stormwater management facilities.

3.1.3 Environmental Protection Act (MOECC, 1990, Amended 2017)

The Environmental Protection Act is Ontario's key legislation for environmental protection. The act grants the MOECC broad powers to deal with the discharge of contaminants which cause negative effects. Under this legislation, a contaminant is defined as “any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of them resulting directly or indirectly from human activities that causes or may cause an adverse effect.” The Environmental Protection Act was enacted to protect the natural environment and animal and human health from adverse effects of pollution contamination.

Applicable Provisions

Section 14(1): prohibits the discharge of any contaminants into the environment which cause or are likely to cause adverse effects - and in the case of some approved contaminants requires that they must not exceed approved and regulated limits

Section 92: Requires the controller of a spilled pollutant and/or the person that caused the "spill" to report the spill if it is abnormal in quality or quantity. Agencies need to report if not certain it has been reported.

Section 93: Requires the owner and/or person in control of a spilled pollutant to clean up and restore the natural environment

Key stormwater-related applications include:

- Forbidding the discharge of contaminants into the natural environment in an amount, concentration or level in excess of that prescribed by the regulations;
- Allowing the issuance of binding administrative orders to prevent, control, minimize or remediate discharges of contaminants into the natural environment;
- Imposing duties to report and clean up pollutant spills and imposes civil liability for loss or damage arising from spills; and
- Imposing a duty on corporate officers and directors to take all reasonable care to prevent the corporation from causing or permitting unlawful discharges of contaminants into the natural environment.

3.1.4 Water Opportunities Act (MOECC, 2010)

The Water Opportunities Act established in 2010 lays the foundations for new jobs in Ontario and develops new technologies and services for water conservation and treatment. The act has an overarching objective to improve the efficiency of municipal infrastructure using the following key initiatives:

- Identifying innovative, cost effective solutions for drinking water, sewage and stormwater system challenges;
- Optimizing systems and improving water conservation; and
- Identifying opportunities to demonstrate and carry out new and emerging Ontario water technologies, services and practices.

3.1.5 Safe Drinking Water Act (MOECC, 2002, Amended 2017)

The Safe Drinking Water Act, passed in 2002, has a main purpose to “provide for the protection of human health and the prevention of drinking-water health hazards through the control and regulation of drinking-water systems and drinking-water testing”.

3.1.6 Lakes and Rivers Improvement Act (MNRF, 1990, Amended 2017)

Under the Lakes and Rivers Improvement Act, review and approval is required by the MNRF to permit work on watercourses and shore-lands. The purposes of this Act are to provide for,

a) the management, protection, preservation and use of the waters of the lakes and rivers of Ontario and the land under them;
b) the protection and equitable exercise of public rights in or over the waters of the lakes and rivers of Ontario;
c) the protection of the interests of riparian owners;
d) the management, perpetuation and use of the fish, wildlife and other natural resources dependent on the lakes and rivers;
e) the protection of the natural amenities of the lakes and rivers and their shores and banks; and

f) the protection of persons and of property by ensuring that dams are suitably located, constructed, operated and maintained and are of an appropriate nature with regard to the purposes of clauses (a) to (e).

Applicable Provisions

Section 36(1): Offence to deposit refuse, substance or matter into water (including lands covered by ice)

Section 36(2): Minister may order removal of refuse, substance or matter from lake, river or from the shore or bank, as the case may be

In accordance with existing regulatory administration an approval agreements, the Conservation Authority (i.e. GRCA) would conduct reviews of proposed works pertaining to watercourses and shore-lands under this act.

3.1.7 Endangered Species Act (MNRF, 2007)

The Endangered Species Act came into effect in 2007 and provides for broader protection for species at risk and their habitats. In general, the purpose of the act includes the preservation and rehabilitation of habitat and the enhancement of other areas so that they can become habitat. Under the act habitat may be described by specific boundaries, features or "in any other manner" and may prescribe areas where species live, used to lie or is believed to be capable of living and beyond.

Applicable Provisions

Section 10: A person shall not damage or destroy the habitat of a species that is listed as an endangered or threatened species

Policies under this legislation have relevance to urban development and stormwater management. As an example, the impacts to habitat can be as a result of:

- Alteration to hydrologic regimes (increased runoff, flow regime change and decreased infiltration) and increased water temperature (through increasing impervious surfaces and end-of-pipe discharges);
- Increased sedimentation and erosion through site grading and excavation;
- Releases of untreated stormwater which carry pollutants; and
- General habitat losses through the loss of riparian vegetation, in-stream habitat features, wetland and groundwater sources.

Section 4.2.3 of the Ministry of Natural Resources Draft Guidance for Development Activities in Redside Dace Protected Habitat, (February 2011) provides the first example of stormwater management direction under this act. The Draft Guidance for Development Activities in Redside Dace Protected Habitat provides following as it relates to development within or adjacent to Redside Dace streams:

- Emphasis on a "treatment train approach" - source, conveyance and end-of-pipe controls;
- Maximization of at source infiltration;
- Maximum threshold for TSS should not exceed 25mg/L above background levels;
- Stormwater discharges to Redside streams should not exceed 24°C and a minimum dissolved oxygen content of 7mg/l;
- Post development water balance should match pre-development water balance (no runoff from rainfall events between 5-15mm – dependent on subwatershed recommendations and local soils);
- Hybrid end-of-pipe stormwater management facilities are recommended adjacent to Redside habitat; and
- Suggests the use of Low Impact Development techniques to prevent habitat degradation.

3.1.8 Drainage Act (OMAFRA, 1990, Amended 2010)

The Drainage Act regulates the construction and maintenance of municipal drains. More specifically, under Section 74 of the Drainage Act, municipalities are responsible to maintain municipal drainage systems within their jurisdiction.

3.1.9 Nutrient Management Act (OMAFRA, 2002, Amended 2017)

The Nutrient Management Act regulates the use, storage and disposal of agricultural fertilizers and farm wastes with the objective of protecting surface water and groundwater quality.

3.1.10 The Planning Act (MMAH, 1990, Amended 2017) and the Provincial Policy Statement (MMAH, 2014)

The Provincial Policy Statement is issued by the Ministry of Municipal Affairs and Housing under Section 3 of the Planning Act. The Planning Act sets out the ground rules for land use planning in Ontario and describe how land uses may be controlled, and who may control them.

It requires that decisions affecting planning matters in Official Plans "shall be consistent with" the PPS. The PPS provides "for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural environment". The PPS focuses growth within settlement areas and away from significant or sensitive resources. It directs planning authorities to identify and promote opportunities for intensification and redevelopment where this can be accommodated, taking into account existing building stock, including existing or planned infrastructure. The PPS provides a higher degree of protection for employment lands against conversions to residential uses. The new policies also provide for intensifications and brownfields development to ensure the maximum use of sewer, water and energy systems, roads and transit. The Official Plan is the most important tool to implement the PPS.

Section 2.2 of the PPS addresses water, stating that planning authorities shall protect, improve or restore the quality and quantity of water, using the watershed as the ecologically meaningful scale for planning. Planning authorities shall ensure that stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

The PPS acknowledges that, in addition to approvals under the Planning Act, necessary infrastructure may require approvals under the EA, CEAA, EPA, OWRA, the Conservation Authorities Act and the Safe Drinking Water Act, and provincial plans (e.g. Niagara Escarpment Planning & Development Act or the Oak Ridge Moraine Conservation Act). Conservation Authorities have Memoranda of Understanding with municipalities to ensure that the quality and quantity of water are protected through proper planning.

Applicable Provisions of the Planning Act

- Section 24: Zoning By-law,
- Section 41: Site Plan Control Areas and
- Section 51: Plan of Subdivision Approvals.

The relevance to stormwater, is in regards to Site Plan and Subdivision Approvals at the municipal level. Site Plan and Subdivision Approvals are:

- Subject to Conditions
    - Grading and alterations to land, including storm and surface waters
    - Sediment and erosion control requirements
- Criteria for conservation of natural resources and flood control

- Requires entry into legal agreements
- Requires compliance with imposed conditions
- Can impose financial securities
- Linked to other regulatory approvals (i.e. Conservation Authorities)

3.1.11 The Municipal Act (MMAH, 2001, Amended 2017)

Ontario's Municipal Act, 2001 is the main statute governing the creation, administration and government of municipalities in the province of Ontario.

The Municipal Act empowers municipalities to enact and enforce by-laws on water-related matters including industrial discharges into municipal sewers and water rates. With respect to stormwater planning and management, municipalities have the responsibility to:

- Promote current and future economic, social and environmental well-being of the municipality;
- Manage and preserve the public's assets of the municipality;
- Provide services considered necessary or desirable for the effective management of stormwater; and
- Participate and deliver in provincial programs and initiatives.

3.1.12 Places to Grow Act (MMAH & MOI, 2005)

This Act maintains that municipalities that share an inland water source and/or receiving water body should coordinate their planning for potable water, stormwater, and wastewater systems to ensure that water quality and quantity is maintained or improved. In conjunction with CAs, municipalities are encouraged to prepare watershed plans and use these plans to guide development decisions and water and wastewater servicing decisions. Finally, municipalities are encouraged to implement and support innovative SWM actions as part of redevelopment and intensification (Ministry of Public Infrastructure and Renewal, 2006).

In May 2017, a Growth Plan for the Greater Golden Horseshoe was approved under the Places to Grow Act. The Growth Plan was developed to inform decision making regarding growth management and environmental protection in the Grater Golden Horseshoe. It includes definitions, schedules and policies to help guide development while ensuring the protection and effective use of finite resources. The Region of Waterloo in considered to be part of the "outer ring" of the Greater Golden Horseshoe which includes the Uptown Waterloo urban growth centres and has a specific section on stormwater management.

3.1.13 Environmental Assessment Act, (MOECC, 1990, Amended 2010)

The purposes of this Act are:

- (a) to protect the components of the environment that are within the legislative authority of Parliament from significant adverse environmental effects caused by a designated project;
- (b) to ensure that designated projects that require the exercise of a power or performance of a duty or function by a federal authority under any Act of Parliament other than this Act to be carried out, are considered in a careful and precautionary manner to avoid significant adverse environmental effects;
- (c) to promote cooperation and coordinated action between federal and provincial governments with respect to environmental assessments;
- (d) to promote communication and cooperation with aboriginal peoples with respect to environmental assessments;
- (e) to ensure that opportunities are provided for meaningful public participation during an environmental assessment;
- (f) to ensure that an environmental assessment is completed in a timely manner;

- (g) to ensure that projects, as defined in section 66, that are to be carried out on federal lands, or those that are outside Canada and that are to be carried out or financially supported by a federal authority, are considered in a careful and precautionary manner to avoid significant adverse environmental effects;
- (h) to encourage federal authorities to take actions that promote sustainable development in order to achieve or maintain a healthy environment and a healthy economy; and
- (i) To encourage the study of the cumulative effects of physical activities in a region and the consideration of those study results in environmental assessments.

3.1.14 Stormwater Management Planning and Design Manual (MOECC, 2003)

The 2003 Stormwater Management Planning and Design Manual a more comprehensive set of stormwater management guidelines than it's 1994 predecessor. The focus of this document includes water quantity, water quality and erosion considerations. The 2003 SWMPDM provides technical and procedural guidance for the planning, design, and review of stormwater management practices. The focus of the manual was broadened to incorporate the current multi-objective approach to stormwater facility planning to address targets related to hazards, water quality, fish habitat and recreation. Fundamental SWM objectives include:

- Groundwater and baseflow characteristics are preserved;
- Water quality will be protected;
- Watercourse will not undergo undesirable and costly geomorphic change;
- There will not be any increase in flood damage potential; and ultimately,
- That an appropriate diversity of aquatic life and opportunities for human uses will be maintained.

A central theme of the SWMPDM is the application of a "treatment train", a term that is used to describe the combination of controls usually required in an overall stormwater management strategy to ensure that aforementioned objectives are achieved. The SWMPDM states that

> *"the recommended strategy for stormwater management is to provide an integrated* ***treatment train approach*** *to water management that is premised on providing control at the lot level and in conveyance (to the extent feasible) followed by end-of-pipe controls. This combination of controls is the only means of* ***meeting the multiple criteria for water balance, water quality, erosion control and water quantity****."*

3.1.15 Policy Review of Municipal Stormwater Management in the Light of Climate Change (MOECC, 2011)

The document reviews the need for a new policy, act, or regulation to deal with municipal SWM systems in light of climate change. The key findings of the policy review include:

- Adaptation to climate change is best priority;
- The Ontario Water Resources Act (OWRA) and the Environmental Protection Act (EPA) are anticipated to provide a sufficient legislative framework for climate change adaptation;
- The 2003 Stormwater Management Planning and Design Manual requires updating to include additional best practices for climate change adaptation for municipal stormwater management;
- The MOECC approvals process requires review to include identifying measures to encourage source control best practices;
- Data collection and information management systems are necessary to track the performance of SWM systems in order to assess vulnerability to climate change

- Public education, demonstration projects and incentives are necessary to support SWM resilient systems; and
- It is recommended that ministries work together to collaboratively seek solutions

3.1.16 Low Impact Development (LID) Stormwater Management Guidance Manual (MOECC, Draft 2017)

Since the publication of the 2003 SWMPDM, advancements have been made in the approaches used to manage stormwater and the technologies available to the stormwater practitioner. To meet the multiple objectives of stormwater management on a broad-scale, it is expected that a combination of source, conveyance and end of pipe controls will be required within Ontario's urban stormwater systems. To encourage stormwater solutions that treat stormwater as a resource and that mimic the natural that hydrologic pathways of infiltration and evapotranspiration, the Province has developed a suit of policies, incentives and legislation that promote the implementation of LID practices. These include the Lake Simcoe Protection Plan (2009), the Water Opportunities Act (2010), the Policy Review of Municipal Stormwater Management in Light of Climate Change (2010), Ontario's Great Lakes Strategy (2014) and the Showcasing Water Innovation grant program.

The soon to be released Low Impact Development Stormwater Guidance Manual was developed to complement the 2003 Stormwater Management Planning and Design Manual, with a focus on source and conveyance controls. Similar to the 2003 manual, this document should be used as a tool for understanding the design criteria and performance requirements of stormwater management projects and not as a rulebook or design manual for stormwater management solutions. The 2003 manual is still to be used as a tool for the end of pipe stormwater management criteria and design recommendations while the new LID SWMGM provides volume control requirements.

3.1.17 Management of Excess Soil – A Guide for Best Management Practices (MOECC, 2014)

The best management practices in this document provide guidance on how to handle excess soil beginning at the place where the soil is excavated (a "Source Site"), during the transportation of the excess soil, and through to a site where the excess soil can be reused for a beneficial purpose (a "Receiving Site").

This document also includes recommendations for temporary storage of excess soil at an intermediate site, between the Source Site and Receiving Site, where the intermediate site (a "Temporary Storage Soil Site") is owned or leased by the owner/operator of the Source Site or Receiving Site, for temporary storage of the excess soil.

The best management practices are not intended to be applied to small, low-risk construction or maintenance activities that are limited to single-dwelling residential properties, or activities associated with minor municipal road work or sewer/water main construction or repair. However, those involved in these smaller-scale projects and smaller-scale soil management activities are encouraged to consider whether the best practices may be useful, and to consult with any applicable approval authorities and Receiving Site owners/operators on reuse or disposal options before moving excess soil from a Source Site to a Receiving Site or Temporary Soil Storage Site.

All those who create, manage, transport, receive or store excess soil are responsible for ensuring that the excess soil is managed in an environmentally sound manner. They must also meet all applicable legal requirements, including current provincial and federal regulatory requirements, such as: site alteration, noise and traffic by-laws and permitting regimes established by municipalities and Conservation Authorities; the soil management provisions in Ontario Regulation 153/04 that relate to the submission and filing of a Record of Site Condition; and, when excavated soil and other excavated materials are being managed as a waste, the EPA and waste regulations.

3.3 Local Level

Local legislative level is defined here as the level that includes regional and municipal government, and the conservation authority (i.e. GRCA).

3.3.1 Conservation Authorities Act, 1990 (Specifically Ontario Regulation 150/06 as enforced by the Grand River Conservation Authority)

A Conservation Authorities' regulatory powers are granted under Section 28 of the Conservation Authorities Act.

Applicable Provisions

Section 28(3) -A regulation may provide for permission to be granted subject to conditions and for the cancellation of the permission if conditions are not met

Section 28(16)- Every person who contravenes a regulation or the terms and conditions of a permission of an authority is guilty of an offence

Section 28(17)- Upon conviction the court may order the removal of the development or the rehabilitation of the watercourse or wetland. Any and all end-of-pipe and outfall retrofit works as well as any stream restoration works will require consultation and permits under this legislation.

The relevance to the City and Stormwater Management is Ontario Regulation 150/06 for the Grand River Conservation Authority (GRCA). The regulation establishes 'Regulated Areas' where development could be subject to flooding, erosion or dynamic beaches, or where interference with wetlands or alterations to watercourses might have an adverse effect.

Ontario Regulation 150/06 defines the permitting process for the regulation of development and placement of fill within the regulated area, construction within the floodplain and/or alteration of a watercourse (including obtaining stormwater outlets), disturbance to a wetland, shoreline or water body and/or the development in the vicinity of hazardous lands. Through this legislation, Conservation Authorities regulate flood and erosion control policies in their watershed.

The GRCA operates under the Conservation Authorities Act of Ontario. It is a corporate body, through which municipalities work cooperatively to manage the water and natural resources in the watershed for everyone's benefit. The GRCA has the responsibility to regulate activities in natural and hazardous areas in accordance with the policies of Ontario Regulation 150/06 in order to:

- Prevent the loss of life and property due to flooding and erosion; and,
- Conserve and enhance natural resources.

3.3.2 Water Resources Protection Master Plan (City of Waterloo, 2008)

The purpose of the Water Resources Protection Master Plan was to guide source protection activities within the Region of Waterloo between 2007 and 2016. Stormwater management related components of the Master Plan include:

- Surface Water Intake Protection Areas:
  The Master Plan indicates that the extent of these areas would change to reflect moving from a natural drainage system to a controlled system using stormwater management facilities, where the extent of retention in the stormwater management facilities would potentially affect travel time to the intake.
- Groundwater and Surface Water Threats:
  The Master Plan summarizes land use activities that may negatively impact groundwater and surface water resources. Activities include road salt application, stormwater management ponds, nutrient management, industrial and commercial land use, residential land use, and aggregate/mining operations.

The risk-mitigation programs identified in the Water Resources Protection Master Plan was used as a basis for risk reduction planning as identified in the Grand River Drinking Water Source Protection Plan (SPP).

3.3.3 Grand River Source Protection Plan (Lake Erie SP Committee, Effective July 1/16)

The Grand River Source Protection Area Assessment Report, which serves as the scientific base for the SPP, was prepared for the Region of Waterloo by the Grand River Source Protection Committee and approved by the MOECC on August 16, 2012. The SPP for the Grand River Source Protection Area was approved by the MOECC on November 26, 2015 and became effective on July 1, 2016. The SPP describes watershed characteristics, identifies the vulnerable areas related to drinking water sources, identifies the types and number of significant threats to water quality and quantity and outlines the policies and programs to manage or remove significant threats, and to prevent new significant threats from developing.

Figures 3.3.3.1 and **3.3.3.2** identify vulnerability scores associated with WHPAs in the City of Waterloo.

The specific policies addressing drinking water activities can be found within the Grand River Source Protection Plan, available online at https://www.sourcewater.ca/en/source-protection-areas/Grand-River-Source-Protection-Plan.aspx.

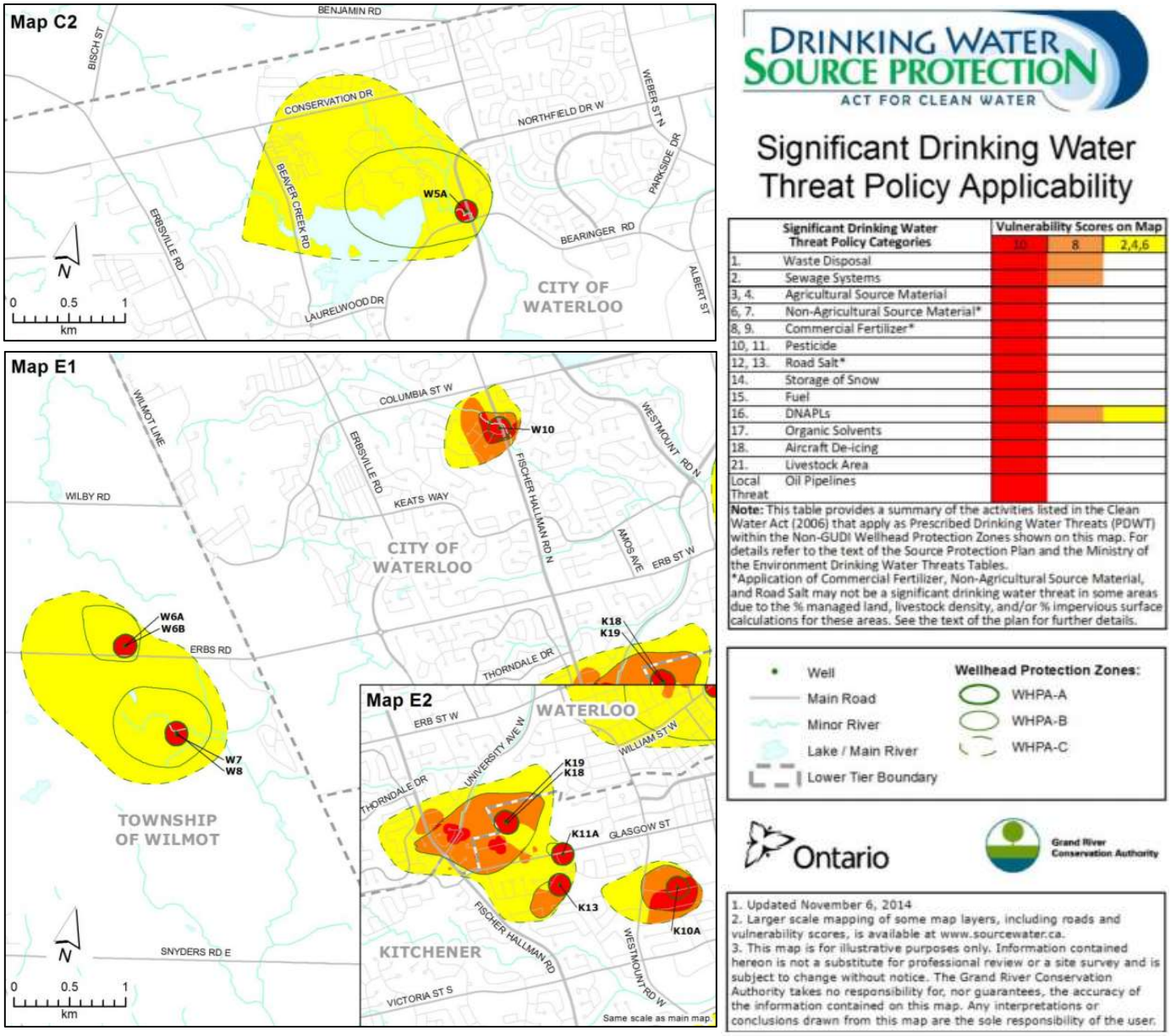

Figure 3.3.3.1 – Vulnerability Scores for City of Waterloo West (Source: Grand River Source Protection Plan)

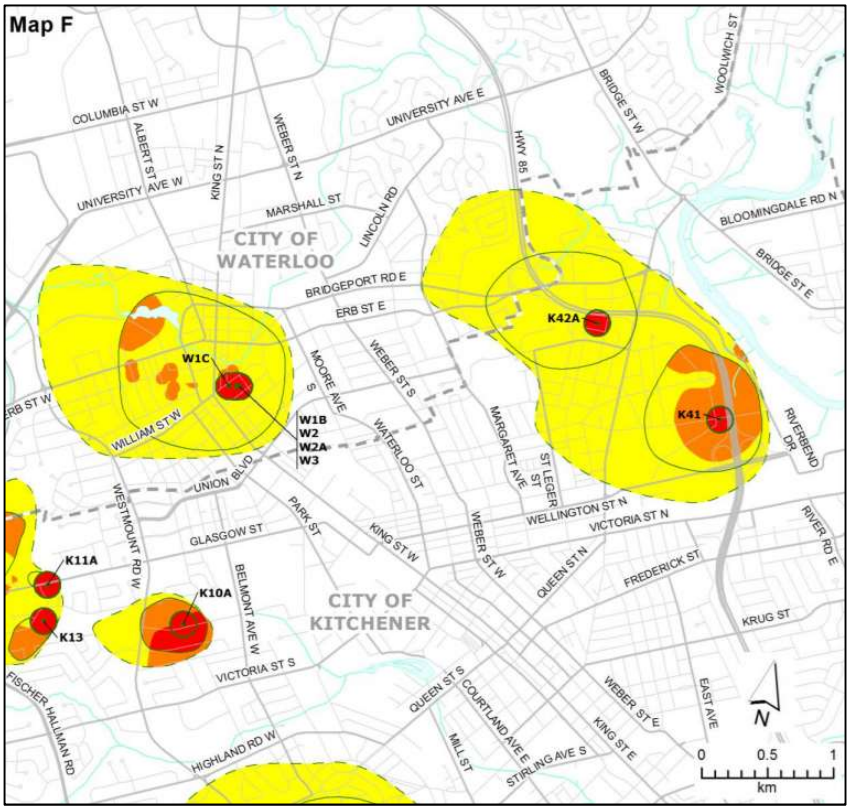

Figure 3.3.3.1 – Vulnerability Scores for City of Waterloo East
(Source: Grand River Source Protection Plan)

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

Significant Drinking Water Threat Policy Applicability

	Significant Drinking Water Threat Policy Categories	Vulnerability Scores on Map: 10	8	2,4,6
1.	Waste Disposal			
2.	Sewage Systems			
3, 4.	Agricultural Source Material			
6, 7.	Non-Agricultural Source Material*			
8, 9.	Commercial Fertilizer*			
10, 11.	Pesticide			
12, 13.	Road Salt*			
14.	Storage of Snow			
15.	Fuel			
16.	DNAPLs			
17.	Organic Solvents			
18.	Aircraft De-icing			
21.	Livestock Area			
Local Threat	Oil Pipelines			

Note: This table provides a summary of the activities listed in the Clean Water Act (2006) that apply as Prescribed Drinking Water Threats (PDWT) within the Non-GUDI Wellhead Protection Zones shown on this map. For details refer to the text of the Source Protection Plan and the Ministry of the Environment Drinking Water Threats Tables.
*Application of Commercial Fertilizer, Non-Agricultural Source Material, and Road Salt may not be a significant drinking water threat in some areas due to the % managed land, livestock density, and/or % impervious surface calculations for these areas. See the text of the plan for further details.

Well
Main Road
Minor River
Lake / Main River
Lower Tier Boundary

Wellhead Protection Zones:
WHPA-A
WHPA-B
WHPA-C

Ontario

Grand River Conservation Authority

1. Updated November 6, 2014
2. Larger scale mapping of some map layers, including roads and vulnerability scores, is available at www.sourcewater.ca.
3. This map is for illustrative purposes only. Information contained hereon is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.

Relevant Grand River Source Protection Plan Policies (2016)

Listed in the **Table 3.3.3** are the relevant Source Protection Plan Policies relating to Stormwater Management.

Table 3.2.3 – Grand River Source Protection Plan Policies related to Stormwater Management

Sewage System or Sewage Works – Discharge from a Stormwater Management Facility (RM-MC-15 to RW-CW-20.1)	
RW-MC-15 *Existing Prescribed Instr.*	For existing discharge of stormwater from a stormwater management facility within vulnerable areas where this activity is a significant drinking water threat, the Ministry of the Environment, in consultation with the owner of the stormwater management facility and following the completion of the assessment identified in policy RW-CW-19, shall ensure that the Environmental Compliance Approval that governs the stormwater management facility includes appropriate terms and conditions to ensure that the activity ceases to be a significant drinking water threat in the following vulnerable areas: i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than or equal to eight (8); iii. In Intake Protection Zone Three (3) where the vulnerability is equal to eight (8); iv. In Intake Protection Zone One (1); v. Where a Nitrate and/or Chloride Issue has been identified, in all Issue Contributing Areas.
RW-MC-16 *Future Prescribed Instr.*	To ensure the new discharge of stormwater from a stormwater management facility does not become a significant drinking water threat within vulnerable areas where this activity would be a significant drinking water threat: a. The Ministry of the Environment shall prohibit the new discharge of stormwater from a stormwater management facility within the Environmental Compliance Approvals process in the following areas as appropriate. i. In Wellhead Protection Area A; ii. In Intake Protection Zone one (1). b. The Ministry of the Environment shall ensure that the Environmental Compliance Approval that governs the new discharge of stormwater from a stormwater management facility includes appropriate terms and conditions to ensure the activity does not become a significant drinking water threat when permitted in the following areas as appropriate: i. In Wellhead Protection Area B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than or equal to eight (8); iii. In Intake Protection Zone Three (3) where the vulnerability is equal to eight (8); iv. Where a Nitrate and/or Chloride Issue has been identified, in all Issue Contributing Areas except Wellhead Protection Area A. The Environmental Compliance Approval should include, as a minimum, water quality monitoring measures and reporting annually to the Ministry of the Environment, as appropriate. Where there is a Nitrate, and/or Chloride Issue, groundwater and/or surface water quality shall be monitored for Nitrate and Chloride, respectively.
RW-MC-17 *Future Land Use Planning*	The Regional Municipality of Waterloo and the Area Municipalities shall review and, if necessary, amend their Official Plans and Zoning By-laws to reflect policy RW-MC-16 as it relates to stormwater management in the following areas to ensure these activities never become significant drinking water threats: i. In Wellhead Protection Area A; ii. In Intake Protection Zone One (1).
RW-MC-18 *Future Land Use Planning*	The Regional Municipality of Waterloo and Area Municipalities shall review and, if necessary, amend their Official Plans to require any development proposals for new storm water management facilities shall be subject to a study to assess impact and mitigation measures in accordance with the Regional

	Implementation Guideline for Source Water Protection Studies to the satisfaction of the Regional Municipality of Waterloo within the following areas: i. In Wellhead Protection Area B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than eight (8); iii. In Intake Protection Zone Three (3) where the vulnerability is greater than eight (8); iv. Where a Chloride and/or Nitrate Issue has been identified, in all Issue Contributing Areas except Wellhead Protection Area A. Where a proposed stormwater management pond is located within 500 metres of a Drinking Water System that obtains water from a bedrock aquifer, the study shall, as a minimum, assess changes in classification of the municipal supply well and or changes in hydrogeological conditions that could affect the pathogen vulnerability to the well.
RW-CW-19 *Existing* *Specify Action*	The Area Municipalities, in collaboration with the Regional Municipality of Waterloo and the Ministry of Environment, shall undertake an assessment of stormwater management facilities to determine appropriate scope and type of measures to protect drinking water sources within two (2) years from the date the Source Protection Plan takes effect to ensure that this activity ceases to be a significant drinking water threat in the following areas: i. In Wellhead Protection Area A and B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than eight (8); iii. In Intake Protection Zone Three (3) where the vulnerability is equal to eight (8); iv. iv. Where a Chloride and/or Nitrate Issue has been identified, in all Issue Contributing Areas.
RW-CW-20 *Existing/Future* *a) Part IV-Prohibit* *b) Part IV-RMP.*	To ensure the existing and future discharge of stormwater from a stormwater management facility exempt from Environmental Compliance Approvals does not become or ceases to be a significant drinking water threat: a. The future discharge of stormwater from a stormwater management facility within vulnerable areas where this activity would be a significant drinking water threat is designated for the purpose of Section 57 of the Clean Water Act, 2006 and is prohibited within the following vulnerable areas where there is or would be a significant drinking water threat: i. In Wellhead Protection Area A; ii. In Intake Protection Zone One (1). b. The discharge of stormwater from a stormwater management facility shall be designated for the purpose of Section 58 of the Clean Water Act, 2006 and a Risk Management Plan shall be required with the persons or agencies engaging or proposing to engage in the following areas: **a. Existing:** i. In Wellhead Protection Area A and B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than or equal to eight (8); iii. In Intake Protection Zone One (1); iv. In Intake Protection Zone Three (3) where the vulnerability is equal to eight (8); v. Where a Nitrate and/or Chloride Issue has been identified, in all Issue contributing Areas except in Wellhead Protection Area A. **b. Future:** i. In Wellhead Protection Area A and B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than or equal to eight (8); iii. In Intake Protection Zone Three (3) where the vulnerability is equal to eight (8); and iv. Where a Nitrate and/or Chloride Issue has been identified, in all Issue Contributing Areas except Wellhead Protection Area A.

	The Risk Management Plan shall include, as a minimum, water quality monitoring and reporting to the Risk Management Official. Where there is a Nitrate and/or Chloride Issue, the Risk Management Plan shall also include water quality monitoring for nitrate or chloride, respectively.
RW-CW-20.1 *Existing Incentive*	To promote best management practices and to provide guidance about the importance of source water protection, the Regional Municipality of Waterloo shall develop and implement an incentive program for persons engaging in the existing discharge of stormwater from a stormwater management facility exempt from Environmental Compliance Approvals in the following areas: i. In Wellhead Protection Area A and B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than or equal to eight (8); iii. In Intake Protection Zone One (1); iv. In Intake Protection Zone Three (3) where the vulnerability is equal to eight (8); v. Where a Nitrate and/or Chloride Issue has been identified, in all Issue Contributing Areas except in Wellhead Protection Area A.

3.3.4 Region of Waterloo Official Plan (Region of Waterloo, as approved with modifications by the Ontario Municipal Board on June 18, 2015)

The Regional Official Plan (ROP) is the Regional Municipality of Waterloo's guiding document for directing growth and change through the year 2031 in order to further the sustainability and liveability of the community in accordance with the following vision:

"Waterloo Region will be an inclusive, thriving, and sustainable community committed to maintaining harmony between rural and urban areas and fostering opportunities for current and future generations".

The original Regional Official Policies Plan was approved in 1976 and updated in 1986. In 1991, Regional Council determined that a comprehensive review of the Regional Official Policies Plan was needed to address the social, economic and environmental changes that had occurred since 1976. This review resulted in a new Regional Official Policies Plan, which was approved in 1995. Regional Council's adoption of the Regional Growth Management Strategy in 2003 prompted work to begin on another comprehensive review of the Regional Official Policies Plan. The purpose of this review was to implement the policy directions of the Regional Growth Management Strategy, and to bring the Regional Official Plan policies into conformity and/or consistency with a range of new Provincial policies and legislation including the Municipal Act, the Places to Grow Act and Growth Plan, the Safe Drinking Water Act, the Clean Water Act, and updates to the Provincial Policy Statement and the Planning Act. On June 16, 2009, the Regional Council adopted the new ROP. The new ROP was approved by the Ministry of Municipal Affairs and Housing (MMAH) in December 2010 and is currently under appeal.

Specific environmental policies within the ROP that relate to stormwater management include:

- Protecting existing and future sources of drinking-water from incompatible land uses.
- Maintaining and, wherever feasible, enhancing the quantity and quality of water infiltration and recharge to groundwater aquifers.
- Minimizing the potential for contamination, including potential contamination from de-icing salts, on sources of municipal drinking-water.
- Promoting informed stewardship of Source Water Protection Areas in collaboration with the Province, Area Municipalities and Grand River Conservation Authority.

Regional Official Plan and Groundwater Management

The Regional OP (ROP) designates Wellhead Protection Sensitivity Areas (WPSA) around each municipal drinking water supply well. Wellhead Protection Areas (WHPA) are lands which contribute water to a municipal drinking-water supply well. Within each Wellhead Protection Area, one or more Wellhead Protection Sensitivity Areas (WPSA) are degrees of management relative to the vulnerability of the underlying groundwater to contamination, the importance of the well to the capacity of the municipal drinking-water supply systems, as well as the time of- travel for groundwater within the WPSA before it reaches the municipal drinking-water supply intake. The purpose of these designations is to prevent land uses associated with hazardous substances, disease-causing organisms and land uses that increase the vulnerability of municipal drinking-water wells.

The objectives of the ROP with respect to Source Water Protection are:

- Protect existing and future sources of drinking-water from incompatible land uses.
- Maintain and, wherever feasible, enhance the quantity and quality of water infiltration and recharge to groundwater aquafers.
- Minimize the potential for contamination, including potential contamination from de-icing salts, on sources of municipal drinking-water.
- Promote informed stewardship of Source Water Protection Areas in collaboration with the Province, Area Municipalities and Grand River Conservation Authority.

Figure 3.2.4.1 identifies WPSAs in the Region of Waterloo as outlined in the ROP. This is consistent with **Figure 3.2.4.2** which is from the City of Waterloo's Official Plan.

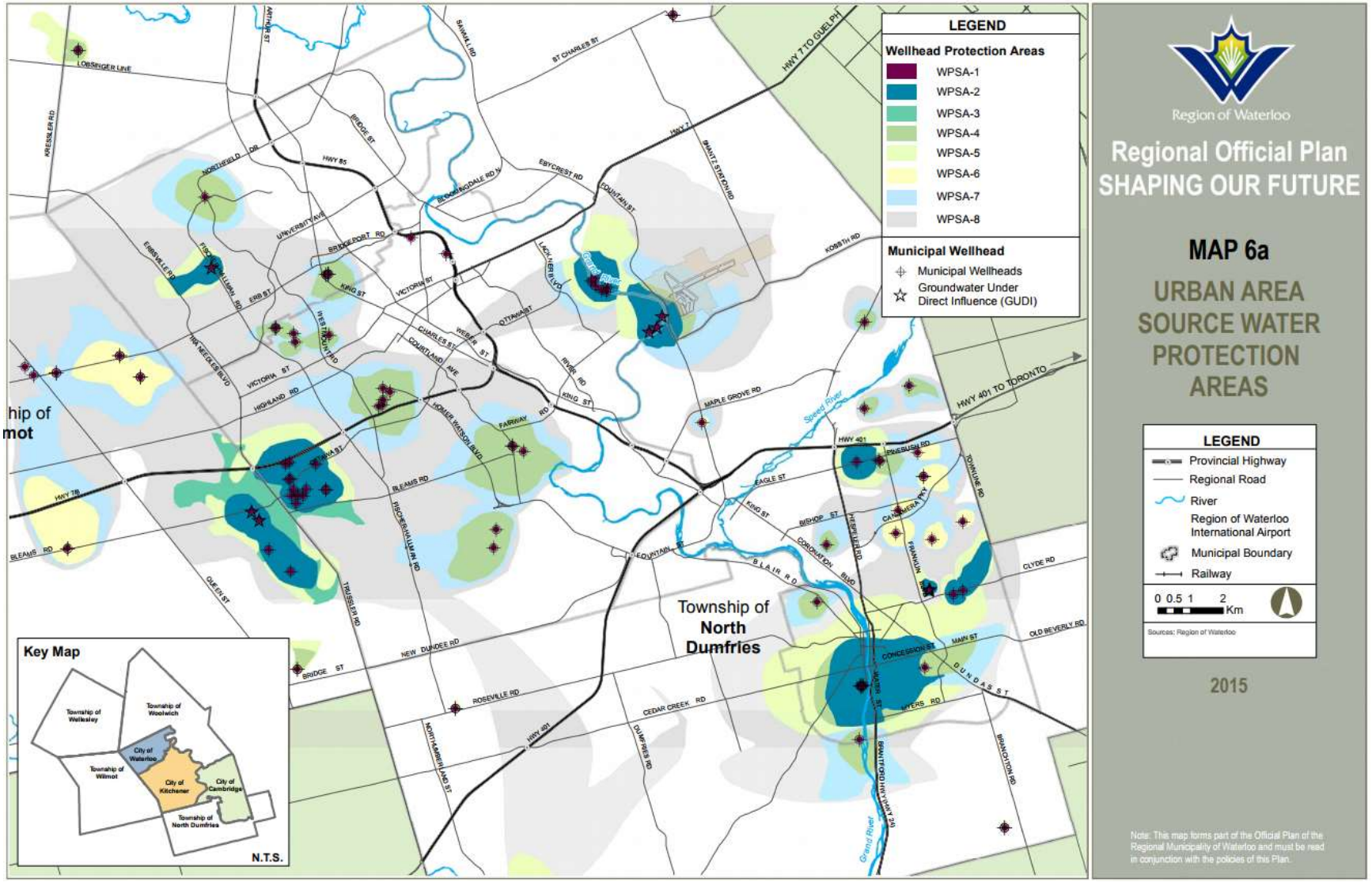

Figure 3.2.4.1 – Source Water Protection Areas (Source: Region of Waterloo Official Plan)

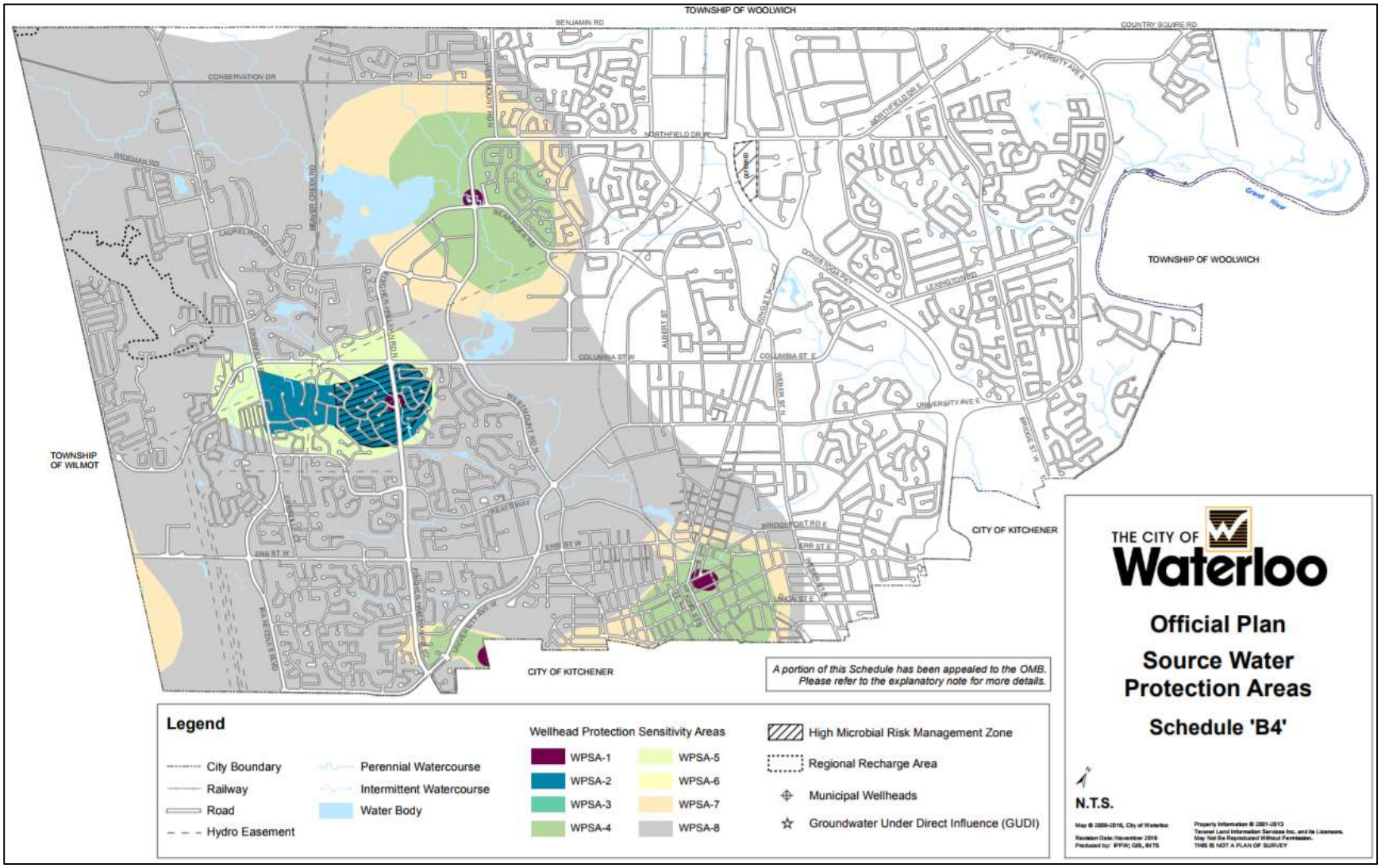

Figure 3.2.4.2 – Source Water Protection Areas (Source: City of Waterloo Official Plan)

Policies outlined in the ROP relating to stormwater management within the context of source water protection include the following:

8.A.5 *Development applications* within all Source Water Protection Area designations will comply with the following:

(a) employment uses that would direct infiltration of stormwater run-off without pre-treatment through the use of drywells or artificial/enhanced recharge will not be permitted; and

8.A.11 Within the WPSA 1 designation (areas within a 100-meter radius of each municipal drinking-water supply well):

(b) new individual wastewater treatment systems, private wells, pipelines sewers, stormwater management ponds (or other ponds) and the direct infiltration of stormwater run-off without pre-treatment will not be permitted; and

(c) new impermeable surfaces of any kind will be restricted or minimized to the greatest extent feasible.

8.A.12 Development applications within the WPSA 2 designation will comply with the following:

(d) individual wastewater treatment systems, private wells, pipelines, sewers, stormwater management ponds (or other ponds) and plans of subdivision or vacant land condominiums may be permitted subject to further study in accordance with Policy 8.A.4.

8.A.13 Development applications within the WPSA 3 designation will comply with the following:

(d) Category 'D' uses, individual wastewater treatment systems, private wells, pipelines, sewers, stormwater management ponds (or other ponds), and plans of subdivision or vacant land condominiums may be permitted subject to further study in accordance with Policy 8.A.4.

8.A.14 Development applications within the WPSA 4 designation will comply with the following:

(d) underground parking garages, individual wastewater treatment systems, private wells, pipelines, sewers, stormwater management ponds (or other ponds) and plans of subdivision or vacant land condominiums may be permitted subject to further study in accordance with Policy 8.A.4.

8.A.21 Within Surface Water Intake Protection Zone 1, development applications proposing Category 'A', 'B', 'C' and 'D' uses, individual wastewater treatment systems, private wells, pipelines, sewers and stormwater management ponds (or other ponds) will not be permitted.

8.A.22 Within Surface Water Intake Protection Zone 2, development applications will comply with the following:

(b) Category 'B', 'C' and 'D' uses and stormwater management ponds (or other ponds) may be permitted subject to further study in accordance with Policy 8.A.4.

8.C.2 The Region will encourage the design of drainage systems and lot grading in new plans of subdivision to include consideration for cold weather stormwater flows and winter maintenance, and will promote and may require the strategic design of new road networks to reduce the need for road salt application.

Additionally, **Schedule C** of the ROP identifies "other information and materials that may be required to process an application" where ROP policies require one or more studies to be submitted in support of a development application,

such studies will be completed in accordance with the Regional Implementation Guideline for Source Water Protection Studies to the satisfaction of the Region, per **8.A.4**. Materials include but are not limited to:

- Salt Impact Assessment
- Salt Management Plans
- Hydrologic and Hydrogeologic Studies
- Source Water Protection Studies
- Best Management Practices for development within the Regional Recharge Area
- Preliminary Stormwater Management Report/Plan and/or update to an existing Stormwater Management Plan

3.3.5 City of Waterloo Official Plan (City of Waterloo, consolidated 2016)

The City of Waterloo's Official Plan (OP)) is a long-range, comprehensive municipal planning document that outlines a framework for land use decision-making for the City of Waterloo. The OP contains principles, objectives, and policies designed to direct the form, extent, nature and rate of growth and change within the municipality to the year 2031.

Specific objectives relevant to this Master Plan outlined in the OP are:

Water Resources

- Maintain, enhance, and restore water resources.
- Increase potable and non-potable water conservation and efficiency.
- Enhance existing stormwater management practices.
- Maintain basic water infrastructure.

Natural Heritage

- Identify and protect elements of the Natural System through watershed-based analysis and planning.
- Maintain, enhance, and restore *natural features* and functions.
- Identify opportunities for ecological corridors and buffers.
- Encourage community involvement in natural heritage maintenance, enhancement, and restoration.
- Balance recreational opportunities and environmental protection.

There are several policies in the OP that relate specifically to stormwater management. These policies are summarized in **Table 3.2.5**.

Table 3.2.5 City of Waterloo Official Plan Policies applicable to Stormwater Management

Policy Number	Policy Topic	Summary of policy in relation to stormwater management
8.2.4 (9)	Core Natural Features	Buffers of Core Natural Features are to remain in a primarily natural state or be restored to a primarily naturalized state if disturbed through historical land use or approved works. Permitted uses within the buffers of Supporting "A" Natural Features is limited to low impact uses consistent with those permitted within Core Natural Features. Portions of stormwater management facilities may be permitted where the Core Natural Feature can be enhanced, no other alternative location is feasible, low impact development measures are implemented to the extent feasible outside the buffer, root zones are not impacted, and the facility replicates or complements an existing function of the buffer lands. Impervious surfaces and grading will not be permitted, except for approved works associated with public trails and stormwater management that conform to detailed engineering and environmental analysis accepted by the City and the other public agencies having jurisdiction.
8.2.5 (9)	Buffers Supporting "A" Natural Features	Buffers of Supporting "A" Natural Features are to remain in a primarily natural state or be restored to a primarily naturalized state if disturbed through historical land use or approved works. Permitted uses within the buffers is limited to low impact uses consistent with those permitted within Supporting "A" Natural Features. Portions of stormwater management facilities may be where the Supporting "A" Natural Feature can be enhanced, no other alternative location is feasible, low impact development measures are implemented to the extent feasible outside the buffer, root zones are not impacted, and the facility replicates or complements an existing function of the buffer lands. Impervious surfaces and grading will not be permitted, except for approved works associated with public trails and stormwater management that conform to detailed engineering and environmental analysis accepted by the City and the other public agencies having jurisdiction.
8.2.5 (24)	Buffers Supporting "B" Natural Features	Buffers of Supporting "B" Natural Features are to remain in a primarily natural state or be restored to a primarily naturalized state if disturbed through historical land use or approved works. Permitted uses within the buffers is limited to low impact uses consistent with those permitted within Supporting "B" Natural Features. Portions of stormwater management facilities may be where the Supporting "A" Natural Feature can be enhanced, no other alternative location is feasible, low impact development measures are implemented to the extent feasible outside the buffer, root zones are not impacted, and the facility replicates or complements an existing function of the buffer lands. Impervious surfaces and grading will not be permitted, except for approved works associated with public trails and stormwater management that conform to detailed engineering and environmental analysis accepted by the City and the other public agencies having jurisdiction.
3.11.1 (5)	General Urban Design Policies Relating to Existing Site Features	Identify opportunities to retain prominent site features and vegetation through sensitive or innovative design strategies and to protect adjacent site features and vegetation on abutting properties through the development review process including, but not limited to, the location and massing of buildings, site grading, landscape and buffer opportunities, tree protection measures and alternative stormwater management strategies.
5.2.7	Stormwater Management	(1) The City will prepare and update as appropriate, studies to assess City- wide or area-specific storm sewer capacity in order to plan for long-term storm sewer needs. (2) Stormwater management planning, engineering and design studies and reports in support of development will be conducted and submitted to the City in accordance with the City's specifications, guidelines and objectives as may be defined in the City's Development Manual or other applicable specifications. (3) Stormwater drainage systems will be designed to ensure that both water quality and quantity controls are in place to meet the applicable targets and standards set out by the Region, Province, City and Grand River Conservation Authority. (4) Stormwater management designs shall address and conform to the recommendations of any applicable subwatershed study or master drainage study. For infill locations where such studies have not been conducted, hydrological and hydrogeological assessments may be required by the City prior to the submission of stormwater management designs. When required, hydrological and hydrogeological studies will be completed by registered/licensed professionals to the satisfaction of the City. (5) Stormwater management plans and designs for all development shall strive to match pre-development water balance conditions in accordance with design guidance provided by the City. (6) Private stormwater drainage systems not connected to the municipal system and that outlet directly to a surface water body will require any applicable clearances, permits, or certificates of approval that may be required by the Province and Grand River Conservation Authority. Private stormwater drainage systems of this nature are discouraged where municipal storm sewers are available. (7) In newly developing areas the City shall encourage the use of centralized stormwater management facilities as opposed to small dispersed facilities. (8) All stormwater management systems and facilities involving infiltration shall be designed, constructed and operated in a manner to be protective of groundwater resources. Chloride loading to groundwater shall be evaluated in designated well head protection areas defined by the Region. Additional applicable policies related to water resources are included in section 8.3 of this Plan, including section 8.3.3 dealing with source water protection. (9) For the purposes of emergency maintenance, the City may require access easements over private stormwater systems and infrastructure where such infrastructure is connected to the municipal storm sewer system.
5.2.8 (11)	Hydro Easement and Stormwater Management	The City shall not permit any residential encroachment of abutting land uses on hydro easements nor support the use of hydro easements for stormwater management facilities.
5.2.10 (1)	Cross Border Agreements	The City may, at its discretion, approve servicing of lands outside of the City of Waterloo in accordance with the provisions of the Municipal Act. All cross-border servicing proposals must demonstrate that the capacity of the City's stormwater management, sanitary sewer and water systems can accommodate the needs of the proposed cross-border servicing without limiting the potential for City services to accommodate planned growth and density increases within the City.
5.3.2 (2)	Definition of Open Space	The City's definition of "Open Space" can include stormwater management facilities.
5.3.3 (3)	Off-Road Components of Trail Networks	When planning for off-road components of the trail network, the City will consider linkages to other open spaces including stormwater management areas.
5.4.2 (2)	Green Streets	City streets will be planned and designed to incorporate "green" development techniques, including stormwater treatment which uses natural processes and landscaping to create visually and environmentally enhanced roads.

Policy Number	Policy Topic	Summary of policy in relation to stormwater management
7.4 (1) (f)	Strategic Investments and Support	The City will Make strategic investments, or provide support to other public agencies and/or private entities, to provide key competitive infrastructure that supports sustainable business development and activity, including stormwater systems.

3.3.6 Development Engineering Manual (City of Waterloo, 2013)

The City of Waterloo's Development Engineering Manual (2013) is a reference guide to assist with land development in the City of Waterloo. It outlines policies, procedures and standards governing the development process and it details requirements for obtaining engineering and landscaping acceptance related to the design, construction and maintenance of the associated works.

The document includes design criteria specific to the City of Waterloo as well as clarifications on recurring development issues; however, it is not intended to be a comprehensive design manual. The design of grading, servicing and drainage works is governed by applicable municipal and provincial regulations, specifications and guidelines. Atypical design conditions will require the professional's best judgment in consideration of all applicable standards.

3.2.6.1 Stormwater Management and Site Plan Development

Chapter 4 of the Development Engineering Manual outlines requirements for **site plan approval**. specific policies relate to:

Stormwater Management: The development manual discusses the direct impact of land development on the quality and quantity of stormwater runoff. Stormwater design for development within the City of Waterloo must incorporate both quality and quantity control of stormwater runoff to mitigate the impacts of development to protect the downstream watershed ecosystems and minimize localized flooding. Therefore, all developments within the City of Waterloo are subject to appropriate stormwater management (SWM) practices in accordance with City of Waterloo design criteria and provincial stormwater management guidelines.

The manual specifies that stormwater design must address the following issues:

- Water Quality
- Water Quantity (i.e. post to pre-development water balance)
- Stream stability / management
- Groundwater (Protection/Recharge-Discharge Conditions)
- Erosion and sediment control

Grading Plan and Stormwater Management Plan: The development manual specifies that the engineer that prepares the grading plan shall take the following design requirements into consideration:

- No adverse impact to adjacent properties is permitted
- Impacts on existing vegetation should be minimized
- Existing drainage patterns must be considered and respected in the design of infill development
- All existing ground elevations at the property boundary to be maintained
- Surface ponding to be minimal
- Infiltration of roof top stormwater where soil conditions are suitable
- Arrangements to ensure that the above items are constructed as accepted by the City

The grading plan shall indicate topographic information to confirm the direction of surface flow and provide drainage details to limit off-site flows to the predevelopment condition. The proposed SWM facility must be constructed and maintained for the life of the development. This drawing shall also indicate if dewatering is required and provide the associated details, as noted in section 4.5.4.2.

The grading, stormwater management and landscape designs are interconnected. It is therefore required that the site grading and the stormwater management designs are completed by the same engineering firm in coordination with the landscape architect.

Chapter 6 of the Development Engineering Manual outlines requirements for **plan of subdivision** applications. Specific policies relate to:

3.2.6.2. Stormwater Management for Plan of Subdivision Development

Stormwater Requirements for Draft Plan: The layout of stormwater management areas must be prepared before draft plan approval. The application must confirm conformity with the OP, provision of adequate services including access, water supply and sewage disposal as well as the protection from potential flooding.

Stormwater Management Facilities during Maintenance Period: During the developer maintenance period, it is the developer's responsibility to minimize the impact of construction on the surrounding community. Developer obligations throughout the subdivision process are specified in the Subdivision Agreement; including the following with respect to stormwater management facilities:

- Maintain all erosion and sedimentation controls and repair as required
- Inspect all SWM facilities monthly and within 24 hours of each significant rainfall event
- Submit log sheet detailing performance and drain down times for all ponds, infiltration trenches, sand filters, etc.
- Maintain detailed records of any alterations to SWM facilities

Deficient or damaged stormwater works observed by the City during the maintenance period will be documented for corrective action by the Developer. If deficient or damaged items are not repaired in a timely manner by the Developer, the City may complete the required works at the Developer's expense.

Final Acceptance of Stormwater Management Facilities: All stormwater management ponds and facilities shall be cleaned of debris and sediment prior to final acceptance. Additional flushing of the storm system may be required at this time. Final acceptance of stormwater management works is contingent upon complete development of all contributing areas. Undeveloped lands continue to have adverse impacts on the downstream sewers and SWM facilities in the completed areas. Extension of the associated maintenance period for SWM works beyond 2 years will be required if buildout is not completed within that time frame. Procedures to transfer the responsibilities from one Developer to another as per the subdivision agreement will be provided at final acceptance of downstream works.

Environmental Monitoring for Stormwater Management: Monitoring terms of reference should be submitted for approval to the agencies have jurisdiction (GRCA, City, and Region) at least two years in advance of a development application being filed on a property. Monitoring is required in three stages.

Stage I - Pre-development
Stage II - During construction
Stage III - Post development

Annual reports outlining details of the initial monitoring results are required. The Terms of Reference are to be revisited at the end of Stage I and revised, if necessary, prior to commencement of Stage II.

Chapter 7 of the Development Engineering Manual outlines design criteria and submission requirements applicable to site servicing, stormwater management, surface works, and landscaping requirements for site plan and subdivision development in the City of Waterloo. For stormwater management, the following is defined in the manual:

Storm sewer design standards include, but are not limited to:

- Minimum pipe diameters
- Design time of concentration for pipe design
- Design rainfall intensities
- Design rainfall return periods
- Manning's design coefficients
- Minimum runoff coefficients for varying land uses
- Minimum grades
- Allowable flow velocities
- Clearances required around pipes
- Catch basin and manhole requirements
- Connection and Lead requirements
- Allowable surface ponding depths

Peak Flow Control: The City's engineering manual establishes that stormwater quantity targets established by the City and the GRCA should be met using source and on site facilities. Generally, post-development peak flows shall be attenuated to pre-development levels, the capacity of the receiving system, or an alternate value determined by the City of Waterloo Engineering Services staff. **Table 3.2.6.2** identifies areas where special peak flow criteria are applied.

Table 3.2.6.2 – Areas with Special Peak Flow Requirements

Policy Area	Peak Flow Requirements
Northland Industrial Area (Phases I, II, III & IV)	Peak flows for the 1:100-year storm are to be attenuated to 0.035 cm/s/ha
Dearborn Industrial Area	peak flows for the 1:100-year storm are to be attenuated to 0.060 cm/s/ha

Infiltration: The City's engineering manual indicates that where subsurface conditions are suitable, at-source infiltration of roof drainage is encouraged as a method of quantity and quality control. The manual also that's that when infiltration measures are proposed, a qualified Engineer or Geoscientist must confirm the type of soil, permeability, and depth to water table in a formal Geotechnical or Hydrogeological report completed to the satisfaction of the Director of Engineering Services. Additionally, monitoring ports for all infiltration measures should be included in the design.

3.3.7 Plans, Strategies, and Guidelines

In addition to local acts and policies, there are strategy and planning documents that are related to stormwater management within the City of Waterloo. These strategies and plans include:

1. Park Strategy, City of Waterloo (Under Development)
2. Waterloo Park Master Plan, City of Waterloo (2009)
3. Transportation Master Plan, City of Waterloo (2011)
4. Asset Management Plan, City of Waterloo (2016)
5. Stormwater Utility and Credit Program By-Law, City of Waterloo (By-Law No. 2012-125)

6. Greenlands Network Implementation Guideline, Region of Waterloo (2016)
7. Grand River Water Management Plan – Stormwater, GRCA (2014)
8. Urban Design Manual, City of Waterloo (2010)
9. Subwatershed Studies, Master Drainage Plans and Environmental Assessments:
    a. Forwell Creek Functional Drainage Study Class EA (2001)
    b. Laurel Creek Flood Control Project Class EA (1990)
    c. Eastbridge District North Master Drainage Plan (1997)
    d. Albert/MacGregor Drainage Study (2008)
    e. Northland Creek Drainage Study (1985)
    f. Colonial Creek Rehabilitation Plan Functional Design Study (1995)
    g. Scoped Subwatershed Study – Portions of Subwatersheds 307 and 314 Laurel Creek Watershed (2004)
    h. Laurel Creek Watershed Study (1992)
    i. Requirements for Subwatershed Plans in the Laurel Creek Watershed (1994)
    j. Clair Creek Subwatershed Study (1977)
    k. Melitzer Creek Master Drainage Plan (1989)
    l. Colonial Creek Watershed and Basin A and B Maser Drainage Plan (1990)
    m. Clair Creek Subwatershed 317 Drainage Study (2003)
    n. Subwatershed Management Plans #313 and #309 (1999)
    o. Subwatershed 311 Subwatershed Plan (1995)
    p. Subwatershed 314 Management Plan (1996)
    q. North Waterloo Scoped Subwatershed Study (2013)
10. Relevant Documents from External Jurisdictions

3.3.7.1 Park Strategy (City of Waterloo, under development)

The City is developing a park strategy to establish a vision for our park system for the next ten years and to develop the action plans needed to achieve the vision. The strategy will explore and guide areas where new direction is needed and will prioritize park infrastructure and operations investment. The strategy will establish a city-wide go-forward management plan based on established service levels and will review current parkland inventory and resource allocation.

In developing the City of Waterloo's Park Strategy, it will be crucial to recognize the opportunity for stormwater retrofits that parks can present. Stormwater management can be incorporated into existing and future parks via:

- Subsurface stormwater chambers underneath fields and landscape surfaces to promote infiltration
- Bioswales and Bioretention facilities to provide filtration and infiltration while supporting enhanced landscaping
- Dry stormwater management facilities (quantity control)

The City of Waterloo's Stormwater Management Master Plan will identify the opportunities as well as associated benefits and costs of City of Waterloo park stormwater management retrofits.

3.3.7.2 Waterloo Park Master Plan (City of Waterloo , 2009)

This report describes the conceptual context of the WPMP that will be used to guide the future development of Waterloo Park over the next 20 years and beyond. One of the objectives for the park as developed by the Waterloo Park Master Plan Special Project Task Force is to incorporate stormwater management facilities to treat and control surface water discharge from the Park to the receiving waters in the Park (Laurel Creek/Silver Lake).

Section 3.2.5 of the Waterloo Park Master Plan identifies stormwater components of the preferred concept plan, which includes three proposed stormwater management facilities. The location of these stormwater management facilities has been identified however; the exact form and configuration of the stormwater facilities and associated conveyance methods will need to be addressed during the detail design of the proposed activity areas or elements thereof that increase or alter the existing surface water patterns. In the Park Master Plan it is noted that runoff generated from the animal enclosures in the Farmstead will need to be given special consideration to eliminate potential of human contact. It is also noted that integration of any stormwater management initiatives should be coordinated with the City of Waterloo Stormwater Division.

3.3.7.3 Transportation Master Plan (City of Waterloo, 2011)

The City of Waterloo Transportation Master Plan (TMP) is a strategic planning document that provides direction for local transportation planning and decision-making. Waterloo's TMP supports a healthy and sustainable city with a balance of social, cultural, environmental and economic successes through the implementation of a balanced transportation network.

Integrating stormwater management functions is crucial to properly functioning transportation networks. Stormwater management discussion in the City's TMP is limited to integrating complete streets with a complementary Linked Greenways or Trail Corridors policy that supports active transportation in a variety of non-street corridors such as parkland, natural areas, woodlands, river and creek corridors, stormwater management facilities, utility corridors, transit and rail corridors as well as the integration of trail and access roads around stormwater management facilities

3.3.7.4 Asset Management Plan (City of Waterloo, 2016)

The City of Waterloo's Asset Management Plan (AMP) was developed in 2016 to meet the guidelines provided in the Ministry of Infrastructure, Building Together: Guide for Municipal Asset Management Plans as well as the anticipated requirements for ongoing federal and provincial funding. The AMP contains corporate asset inventories and allows for illustration of how planned expenditures to renew assets effects the performance of the asset through 2042.
Stormwater Management (SWM Facilities) and storm collection (storm sewers) are each identified as asset groups in the AMP. The AMP identifies 55 stormwater management facilities within the City and estimates the replacement value of these assets at a combined $55 million. The AMP also estimates the replacement value of the City's storm sewers at $203 million (340 km of pipe with associated catch basins and manholes). Combined stormwater management pond and storm sewers represent 16% of total value of all municipal assets.

Within the AMP, the distribution of capital expenditures from 2016 through 2025 is estimated. The results for Stormwater Collection and Stormwater Management are identified in **Table 3.3.7.4**.

Table 3.3.7.4 – Capital Expenditures on Stormwater from 2016 through 2025 as identified in AMP

Asset Group	Expenditures Related to Constructing New Assets	Expenditures Related to Operating Assets	Expenditures Related to Replacing Assets	Total
Storm Collection	$5.5 million	0.0	$23.4 million	$29.0 million
Stormwater Management	$18.4 million	$1.6 million	$14.1 million	$34.1 million

Condition of City Storm Sewer:

The AMP identifies that approximately 48% of the storm collection assets are in poor or very poor condition. The average annual budgeted capital expenditures of approximately $2.0 million will result in a decline in the condition profile of the storm collection assets over the next 25 years to a level which is
anticipated to not be acceptable to most stakeholders. It is estimated that an annual expenditure of approximately $5.2 million per year over the next 25 years is required to achieve the target condition profile of the storm collection assets.

Condition of City Stormwater Management Facilities:
The AMP identifies that the forthcoming SWM-MP will result in an increase in maturity level of stormwater management data which will be above average with respect to similar municipalities in Canada. The AMP identifies that approximately. 85% of stormwater management ponds that have a performance score of poor or very poor, meaning that they are nearing, or have exceeded, their target dredging year. The average annual budgeted capital expenditures of approximately $1.2 million will result in an increase in the performance profile of the stormwater management assets over the next 25 years. An average annual expenditure of approximately $1.5 million per year over the next 25 years is required to achieve the target performance profile of the stormwater management assets.

3.3.7.5 Stormwater Utility and Credit Program By-Law (City of Waterloo, 2012)

The City's By-Law to Impose a Stormwater Charge and Implement a Stormwater Credit Program (By-Law 2012-125) imposes a stormwater charge on property owners within the City. The By-Law identifies four (4) Property Type categories (Residential, Multi-Residential, Institutional, and Commercial / Industrial) and 13 sub-categories. The Stormwater Utility rate structure is based on these categories and outlined in the Fee and Charges By-law. The details of the Stormwater Credit Program are detailed in the Stormwater Utility and Credit Program By-Law. Through the Stormwater Credit Program, residential and non-residential property owners can reduce the stormwater utility charged to their property by up to 45% by applying best management practices.

Residential stormwater credits are based on the amount of runoff captured on the property and diverted from the municipal stormwater management system. Residential best management practices that qualify for credits include rain barrels, cisterns, permeable pavement, infiltration galleries, and green roofs. Stormwater credits for multi-residential and non-residential properties are broken into three (3) sections: Quantity control (flood prevention), Quality control (pollution reduction), and Education programs. Multi-residential and non-residential best management practices that qualify for credits include stormwater management ponds, rooftop/underground storage, vegetated filter strips, oil/grit separators and permeable pavement.

3.3.7.6 Greenlands Network Implementation Guideline (Region of Waterloo, 2016)

The purpose of the Region of Waterloo Greenlands Network Implementation Guideline is to provide guidance to applicants, the Ecological and Environmental Advisory Committee (EEAC), and staff in the preparation and review of development applications in light of the 2009 Regional Official Plan (ROP). A focus of this guideline is to ensure that appropriate buffers are established around Core Environmental Features. Buffers around Core Environmental Features are established:

- to protect environmental features from adverse environmental impacts;
- serve as a transition zone between new development and environmental features; and
- to provide opportunities for net habitat enhancement, or wherever feasible, to restore the ecological functions of the Core Environmental Feature.
- To ensure that Environmental Impact Studies are coordinated with other technical studies

3.3.7.7 Grand River Water Management Plan – Stormwater (GRCA ,2014)

With respect to stormwater management relevant to the City of Waterloo, the most recent draft document of the Grand River Water Management Plan (2014) discusses the following environmental issues:

- Flood Damage: the plan recommends the following actions that are relevant to SWM:
  - maintaining flood control infrastructure safe and ready for floods;
  - recommending that municipalities undertake stormwater major system assessment;
  - improving floodplain management, emergency preparedness planning and flood damage assessment
- Rural Stormwater Quality: issues include elevated sediment and phosphorus loadings in rural subwatersheds and catchments.;
- Urban Stormwater Quality: issues are mostly related to road salt application, heavy metal, sediment following construction activities, and to a certain extent nutrient and phosphorus from upstream sources.

The Water Management Plan also discusses pollution from point and non-point sources.

- In rural areas, the Rural Water Quality Program promotes the adoption of best management practices to mitigate nonpoint source pollution; and
- In urban areas, the focus is on urban pollutants (including heavy metals, salt, and sediment) and urban drainage system (including ponds and their location within the drainage system). The Plan also discusses in-river water quality and fish habitat issues including turbidity, fish barriers, thermal regime, and stream erosion.

3.3.7.8 Urban Design Manual (City of Waterloo, 2010)

The City's Urban Design Manual is a consolidated set of city design guidelines and reference material including:

- General City Design Guidelines that apply to many types of development in the public and private realm;
- Supplemental Design Guidelines (more specific guidelines) for select areas in the City and for specific types of development; and
- Process guidelines and technical standards for the Site Plan review process.

Stormwater management is an important component of urban design. Specific references to stormwater management in the Urban Design Manual are identified in **Table 3.3.7.8**.

Table 3.3.7.8 – Stormwater Management in the City of Waterloo's Urban Design Manual

Section of Urban Design Manual	Guideline
General Landscape Design	Incorporate landscape islands to reduce heat island effect in parking lots and to provide opportunity for infiltration and other storm water management functions.
Landscape Buffers and Screening	Provide adequate buffers to accommodate on-site snow storage. Increase buffers or internal landscape areas to provide sufficient area for snow storage and locate away from storm management ponds
Landscape Buffers and Screening	Design site to minimize conflicts between different functions with emphasis on maintaining minimum buffer standards. Encourage wider buffers to accommodate site drainage, utility equipment, retaining walls and access routes. Consider alternative designs, such as landscape swales, to accommodate shared site functions subject to City approval.
Respect Existing Features and Conditions	Design buildings to minimize impact on existing site grades through creative design solutions such as stepped building foundations (floors), alternative building footprint(s), and terracing solutions.

Vehicular Circulation and Parking	Design parking areas for adequate snow storage and to minimize the effects of salt collection and infiltration. Avoid locating storage areas near storm water management ponds.
Landscape Design	Encourage naturalized green spaces on site for storm water quantity and quality control. Encourage bio swales and other natural landscape solutions to retain water on-site. Where available, direct site drainage to vegetated swales.
Streetscape Design	Encourage innovative drainage systems that improve stormwater quality and quantity.

3.3.7.9 Subwatershed Studies and Master Drainage Plans

A number of subwatershed plans and master drainage plans have been developed for subwatersheds within the City of Waterloo. The levels of analysis and management strategies vary across the subwatersheds, based upon the watershed characteristics and provincial policies in existence at the time of the study.

Generally, each management strategy addresses stormwater management control requirements for both quantity and quality. The criterion reflects the needs of the subwatershed and may be more stringent and supersede general Provincial or City requirements. With respect to quality control, requirements are generally based upon protection of fishery resources as well as overall water quality. Quantity control requirements are based upon downstream capacity and flood protection.

In many of the older-previously developed areas of the City of Waterloo existing Subwatershed Studies and Master Drainage Plans, may not exist or are outdated. These older areas are also areas of anticipated intensification and or re-development and contain degraded portions Waterloo's stream ecosystems have been identified as Ecological Restoration Areas in the City's Draft OP.

Master Drainage Studies and similarly scoped Environmental Assessments undertaken within the City are:

- Albert/MacGregor Drainage Study (2008)
- Clair Creek Subwatershed 317 Drainage Study (2003)
- Forwell Creek Functional Drainage Study Class EA (2001)
- Eastbridge District North Master Drainage Plan (1997)
- Colonial Creek Rehabilitation Plan Functional Design Study (1995)
- Laurel Creek Flood Control Project Class EA (1990)
- Northland Creek Drainage Study (1985)

Watershed and Subwatershed studies undertaken within the City are:

- Scoped Subwatershed Study – Portions of Subwatersheds 307 and 314 Laurel Creek Watershed (2004)
- North Waterloo Scoped Subwatershed Study (2013)
- Subwatershed Management Plans #313 and #309 (1999)
- Subwatershed 314 Management Plan (1996)
- Subwatershed 311 Subwatershed Plan (1995)
- Requirements for Subwatershed Plans in the Laurel Creek Watershed (1994)
- Laurel Creek Watershed Study (1992)
- Colonial Creek Watershed and Basin A and B Maser Drainage Plan (1990)
- Melitzer Creek Master Drainage Plan (1989)
- Clair Creek Subwatershed Study (1977)

3.3.7.10 Relevant Documents from External Jurisdictions

Although the following documents are written for jurisdictions outside of the City of Kitchener, they are relevant examples of approved stormwater guidance documents which encourage an innovative approach to stormwater management and can largely be applied within the City of Waterloo.

3.3.7.10.1 City of Kitchener Integrated SWM-MP (City of Kitchener, 2016)

The City of Kitchener's Integrated Stormwater Management Master Plan (2016) was completed as an environmental assessment to evaluate existing conditions with respect to Kitchener's stormwater management system and recommend policies and works to provide a greater level of stormwater service and environmental enhancement. Relevant components of Kitchener's Master Plan Include, but are not limited to:

Stormwater Infiltration Policy Recommendations

This memo identifies existing policies related to the infiltration of stormwater runoff including those in the Regional Official Plan and the Grand River Source Protection Plan and contains recommendations for land-use based policies to identify site specific opportunities, constraints and approaches. The stormwater infiltration policies outlined in this memo are primarily intended to be used for retrofit opportunities and/or the redevelopment of land within Kitchener's existing built up area. The City of Waterloo has similar constraints with respect to vulnerable wellhead protection areas and a similar approach will be taken when determining infiltration policy recommendations.

Municipal Right-of-Way (Conveyance Control) Retrofit Assessment Opportunities Report

Targeting roads for municipal stormwater management improvement is an important strategy for improving the quality of municipal runoff and the percentage of the urban area that currently has SWM control. Using Kitchener's capital works schedule for road construction and a decision framework for determining preferred retrofit options, 203 projects were identified to improve stormwater service in the municipal right-of-way. Projects were identified for 17 laneways, 151 local roads, 18 collector roads, and 17 arterial roads. Options included bioretention bump outs, boulevard bioretention, bioretention planters, bioswales, perforated pipe, permeable pavement, and proprietary stormwater quality treatment devices. A similar approach will be taken for City of Waterloo roads.

Erosion Assessment Report

As part of the City of Kitchener's Integrated Stormwater Management Report, a city-wide erosion assessment was undertaken to identify potential creek-based works. Although few subwatersheds are shared between Kitchener and Waterloo, the similar geographic setting, subwatershed size and age of development are expected to result in similar erosion issues and solutions.

End-of-Pipe Stormwater Management Facility Opportunities Report

The EOP Stormwater Management Facility Opportunities Study was completed to provide a framework for a long-term strategy to implement stormwater quality and quantity control within the existing urbanized areas through the development of new stormwater management facilities. The evaluation process included desktop assessment, filed reconnaissance, and determination of expected performance. A similar approach will be taken to identify opportunities for new stormwater management facilities in built-up areas within the City of Waterloo.

Sediment Analysis memo: SWM Facilities and OGS Units

To ensure long-term operational effectiveness, it is crucial to remove excess sediment accumulated in stormwater management facilities and OGS units. As part of Kitchener's Master Plan, sediment accumulation was analysed via existing bathymetric data or survey data. Maintenance priorities were assigned based on expected drop in efficiency due to sediment accumulation.

3.3.7.10.2 CVC and TRCA Stormwater Management Criteria

The TRCA and CVC criteria documents provides guidance in the planning and design of stormwater management infrastructure for developers, consultants, local municipalities, and landowners, and outlines the processes and infrastructure needed to address flooding, water quality, erosion, water balance, and natural heritage. While these documents addresses SWM throughout CVC's and TRCA`s jurisdiction, a review of site specific conditions is recommended to ensure that any necessary variations on these requirements are identified early in the planning and design process, through thorough consultation with all affected agencies and stakeholders, to maintain sound engineering and environmental practices.

The respective Stormwater Management Criteria documents articulate a SWM planning framework, with associated criteria, to be applied at the various stages of the planning process, ranging from Official Plan and Secondary Plan studies through to plans of subdivision and site plans. Together the planning process and the design criteria provide a procedure for the selection of the most appropriate approaches to SWM.

Credit Valley Conservation Stormwater Management Criteria (2012)

The purpose of this document is to reference and build upon current design guidelines and requirements relating to SWM, and provide additional and specific detail for those areas within CVC's jurisdiction. Referenced documents include the Ministry of the Environment's Stormwater Management Planning and Design Manual (SWMPD, 2003), the CVC/TRCA Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0 (CVC/TRCA, 2010), CVC Study Report: Thermal Impacts of Urban Stormwater including Preventative and Mitigation Techniques (CVC, 2011), and CVC's Planning and Development Administrative Procedural Manual (CVC, 2011). The criteria document covers flood protection, erosion control, water quality and water balance.

Toronto Region Conservation Stormwater Management Criteria (2012)

This Stormwater Management Criteria document has been prepared to supplement the TRCA`s Planning and Development Procedural Manual (PDP Manual, 2007) with more detailed direction regarding the Stormwater Management (SWM) component of development approvals.

The purpose of this document is to consolidate and build upon current design guidelines and requirements relating to SWM from watershed plans and hydrology studies, and provide additional and specific detail for those areas within TRCA's jurisdiction. Referenced documents include the Ministry of the Environment's Stormwater Management Planning and Design Manual (SWMPD, 2003), the TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0(TRCA/CVC, 2010) and TRCA's PDP Manual, noted above.