Disclaimer

Style Definition: Heading 3

The information contained in this report has been compiled from various sources. The information gathered has been used to assess vulnerable areas across the region, and threats to municipal drinking water sources in accordance with prescribed methods of the Clean Water Act (2006) and the Technical Rules: Assessment Report (2008).

While every effort has been made to accurately depict the information, errors or omissions may exist. Given the size and complexity of this region, many of the assessments comprising this report were completed at a regional or watershed scale. As such, some site-specific details may not have been considered to date. Over time, this Assessment Report will be periodically updated and refined to reflect new and / or corrected information (such as the 2021 Technical Rules).

It should be noted that, where an activity has been classified as a significant threat in error, the forthcoming policy in the Source Protection Plan will not apply. Similarly, if a significant threat activity has been omitted in error, the forthcoming policy in the Source Protection Plan will apply.

Document Outline – Lake Simcoe Assessment Report

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1 Executive Summary

1.1 Introduction

> The first barrier to the contamination of drinking water involves protecting the sources of drinking water. I recommend that the Province adopt a watershed-based planning process … to develop a source protection plan for each watershed in the province.
>
> Justice Dennis O'Connor
>
> The Walkerton Inquiry, 2002

The tainted water tragedy at Walkerton in 2000 highlighted the dangers of not protecting the sources of our drinking water. Hundreds became ill and seven died when a municipal well was polluted. In 2002 Justice Dennis O'Connor recommended a number of changes be made to Ontario's drinking water system, the most comprehensive of which was Source Water Protection. The province responded with the Clean Water Act, 2006 (CWA) which was proclaimed into effect on July 3, 2007. The CWA introduced a new level of protection – **Source Water Protection** – for the Province's drinking water resources that will help communities across Ontario enjoy a safe and plentiful supply of clean drinking water.

The basic premise of Source Water Protection is simple:

Protecting our Sources of drinking water before they are overused or polluted is the best, most cost-effective way of ensuring the safety of our drinking water for generations to come.

Though it is an easy concept, putting Source Water Protection into practice is a challenge because it involves gathering a vast amount of data, analyzing the data and communicating its findings. Water belongs to everyone and it is everyone's responsibility to protect it. Source Water Protection is designed to be a locally-driven process and involves people from all across the province from all different sectors of society. This local involvement is a huge strength of the process. The province set out a 5-year plan to develop and enact source protection plans. This process started in 2008 and will continue well beyond the completion of source protection plans in 2012 to ensure safe, clean drinking water is available to residents of Ontario for years to come.

The source protection process timeline involves four stages over five years.

Year 1 (2008-2009): Stage 1

- Laying the foundation
    - Establish source protection authorities
    - Establish source protection committees
    - Negotiate terms of reference

Year 1-2 (2009-2010): Stage 2

- Assessment of threats
    - Identify and assess threats to drinking water
    - Prepare Assessment Report

Year 3-5 (2010-2012): Stage 3

- Source Protection Planning
    - Prepare source protection plan, including policies to address significant threats to drinking water

Year 5+ (2012+): Stage 4

- Implementation
    - Implement the source protection plan
    - Inspect and enforce
    - Monitor and report
    - Review plan and amend as necessary

1.2 About this Document

This is a companion document to the Lake Simcoe and Couchiching-Black River Source Protection Area (Part 1: Lake Simcoe Watershed) Assessment Report. This document is designed to give the reader a high level overview of the technical findings as well as direct them to the appropriate chapter for more information. This is an excellent starting place for people not familiar with Assessment Reports and what kind of information can be found therein. For more comprehensive information, the reader is directed to the full text of each Assessment Report which can be found on our website at www.ourwatershed.ca.

1.3 The South Georgian Bay Lake Simcoe Region

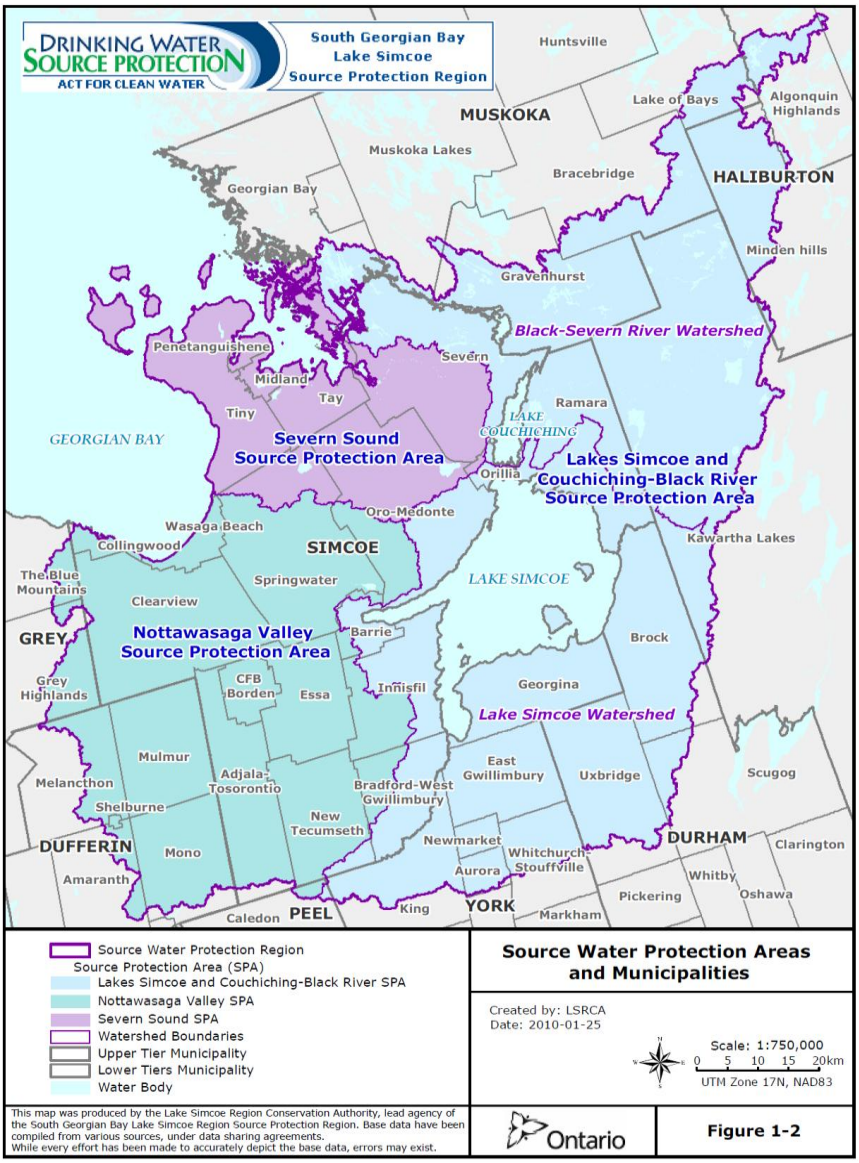

Figure 1. Map of the South Georgian Bay Lake Simcoe Source Protection Region

The South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Region (SPR) is one of 19 Source Protection Regions across Ontario. It contains four watersheds that encompass fifty-two municipalities and three First Nations communities, with 286 municipal wells, 16 municipal surface water intakes, and more than 50,000 private wells. It stretches from the GTA in the south and as far north as Algonquin Park. It is one of the most diverse regions in the province in every respect: geography, population, land use, and geology. All told, the region has about one third of the municipal systems in the province!

The region is divided into three (3) **Source Protection Areas (or SPAs)**. These three SPAs follow the existing boundaries of The Lake Simcoe Region Conservation Authority (with the addition of the Black Severn River watershed), The Nottawasaga Valley Conservation Authority, and the Severn Sound Environmental Association. Each of these Source Production Areas belong to the South Georgian Bay-Lake Simcoe Source Protection Region. Each of the three Source Protection Areas are required to produce a separate Assessment Report. For ease, this document represents a composite of all three Assessment Reports presenting the key findings of each.

1.4 The Committee

Mission:

"The Source Protection Committee exists to ensure an open process is followed in the development of reasonable, science-based policies that protect municipal sources of drinking water now and into the future."

The Source Protection Committee (SPC) is responsible for creating the Assessment Reports as well as the Source Protection Plan. The SPC is a reflection of the people who live in the watershed. Source Water Protection is designed to be a locally driven process, and so the committee is comprised of local residents who know and understand the concerns of residents in the Region. The committee represents a wide range of experience ranging from public interest and health, to municipal, agricultural, industrial and economic representatives all of which is integral to developing local, relevant, respected plans to protect drinking water. The committee members' full biographies are available on the South Georgian Bay Lake Simcoe's website at www.ourwatershed.ca.The Source Protection Committee is responsible for developing three key pieces of documentation that will complete the Source Protection Planning process:

1. **Terms of Reference**

   Lays out who will be responsible for what part of the Source Protection Plan and how the work will be conducted. (Approved June 29, 2009)

2. **Assessment Report**

   Describes the watershed and as well as identifies the number of potential threats to local drinking water sources. (This is the executive summary of this document)

3. **Source Protection Plan**

   Includes policies to address threats to drinking water, including both voluntary and mandatory measures to reduce activities identified as risks. This will include broad consultation with the public. (Due in 2012)

The Source Protection Committee is supported by Source Protection Authority staff and scientists as well as working groups who will help them in developing these documents.

The Lake Simcoe Region Conservation Authority (with representation from the Black River watershed), Nottawasaga Valley Conservation Authority and Severn Sound Environmental Association, all acting as Source Protection Authorities, are responsible for reviewing these documents and recommending them to the Ministry of Environment, Conservation and Parks for approval.

Once the Ministry of Environment, Conservation and Parks has granted approval, it will be up to municipalities to implement them.

1.5 Key Terms

Aquifer

Aquifers are underground water-bearing layer(s) of soil, sand, gravel, or rock that will yield usable quantities of water to a well. Aquifers can be layered, and, generally speaking, the deeper the aquifer the more protected it is. Most municipal wells draw from very deep aquifers.

Hazard Rating

This is the score that is associated with the threat activities. It is determined by threats tables provided to the committee by the Ministry of the Environment, Conservation and Parks.

HVA

Highly Vulnerable Aquifers – These are aquifers that are more susceptible to contamination because of their location. In general, an HVA will consist of source granular aquifer materials (e.g. sand and/or gravel) or fractured rock that has a high permeability and is exposed near the ground surface with a relatively shallow water table.

IPZ

Intake Protection Zone – The area on the water and land surrounding a municipal surface water intake. It consists of three 'zones': IPZ-1 is a 1km radius around the intake; IPZ-2 is based on the amount of time it takes a potential contaminant to reach the intake based on the time it takes the operator to shut down the plant (minimum two hours); and IPZ-3 is the area of the water and land that may lead to contaminants reaching an intake during an extreme event (such as a one in one hundred year rainfall).

SGBLS

South Georgian Bay- Lake Simcoe – The region which comprises the three Source Protection Areas: Lakes Simcoe and Couchiching- Black Severn River Source Protection Area, Nottawasaga Valley Source Protection Area, and Severn Sound Source Protection Area.

SGRA

Significant Groundwater Recharge Areas –Recharge areas tend to be areas that are characterized by permeable soils, such as sand or gravel that allow the water to seep easily into the ground and flow to an aquifer. A recharge area is considered significant when it helps maintain the water level in an aquifer that supplies a community with drinking water, or supplies groundwater recharge to a cold water ecosystem that is dependent on this recharge to maintain its ecological function.

Significant (moderate, low) Drinking Water Threat

A drinking water threat is scored as significant if its threat score is over 80. This is determined by multiplying the hazard ranking by the vulnerability score. Scores between 60 and 79 are determined to be moderate drinking water threats while a score between 40 and 59 is considered a low drinking water threat. The source protection plan must make policies to reduce all significant drinking water threats.

Source Protection Plan

The Source Protection Plan is the culmination of all the work to date. It outlines policies that will outline how drinking water threats are to be mitigated. This can include existing legislation, risk management plans, education and outreach policies, and, in certain cases the committee can prohibit existing or future activities in a particular location.

Threat Score

The threat score is the product of the hazard score (how bad is the threat) and the vulnerability score (how vulnerable is the land).

Vulnerability Score

The vulnerability score of a parcel of land is determined by looking at how close it is to a well, how easily water can travel through it, as well as if there are any transport pathways (i.e. an improperly decommissioned well is a conduit to the aquifer and would be considered a “transport pathway”).

Vulnerable Area

The Clean Water Act states that there are four vulnerable areas which we must map as part of the Source Water Protection process. These are: Wellhead Protection Areas (WHPAs), Intake Protection Zones (IPZ), Highly Vulnerable Aquifers (HVA) and Significant Groundwater Recharge Areas (SGRAs).

Water Budget

A Water Budget is a tool that helps us ensure we have enough water. It measures how much water enters the system, how much leaves the system (through natural processes and human consumption) in order to determine if water being used is more than is available (water quantity stresses) within a watershed.

WHPA

Wellhead Protection Area – The area on the land around a municipal well, the size of which is determined by how quickly water travels underground to the well, measured in years.

1.6 Drinking Water Threats

Under the Clean Water Act, there are 21 categories of potential threats representing numerous activities which can negatively affect the quality and/or quantity of drinking water. The following activities are prescribed as Drinking Water Threats:

1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.
3. The application of agricultural source material to land.
4. The storage of agricultural source material.
5. The management of agricultural source material.
6. The application of non-agricultural source material to land.
7. The handling and storage of non-agricultural source material.
8. The application of commercial fertilizer to land.
9. The handling and storage of commercial fertilizer.
10. The application of pesticide to land.
11. The handling and storage of pesticide.
12. The application of road salt.
13. The handling and storage of road salt.
14. The storage of snow.
15. The handling and storage of fuel.
16. The handling and storage of a dense non-aqueous phase liquid.
17. The handling and storage of an organic solvent.
18. The management of runoff that contains chemicals used in the de-icing of aircraft.
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.
20. An activity that reduces the recharge of an aquifer.
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.
22. The establishment and operation of a liquid hydrocarbon pipeline.

Whether these activities are considered a Significant, Medium or Low Drinking Water Threat (or even a threat at all) depends on a scoring process that considers both the vulnerability of the well or surface intake to contamination (Vulnerability Score) and how hazardous the activity is (Hazard Rating). If, when you multiply the two scores together you get a number (Risk Score) higher than 80, then the activity is a Significant Drinking Water Threat. If the number scores between 60 and 79, it is considered a Moderate Drinking Water Threat, and between 40 and 59 it is considered a Low Drinking Water Threat.

Hazard Rating x Vulnerability Score = Risk Score

The Ministry of the Environment, Conservation and Parks has provided tables which outline the **Hazard Rating** of the "prescribed threats" (listed above), this rating depends on what is called the "circumstance" i.e. – how much, and how dangerous each of those 21 threats are. For example, storage of 10 tonnes of chemical A will have a higher Hazard Rating than one ton of the same chemical. Likewise, a 100 gallon underground fuel tank will have a lower Hazard Rating than a 1000 gallon one (e.g. a domestic fuel tank compared to a gas station).

The **Vulnerability Score** is determined by looking at the landscape around a water source and determining how the geology, geography, hydrogeology and soil (among other things) work together to affect how slowly or quickly the water is moving toward the source of drinking water. This is called intrinsic vulnerability. If the water moves quickly, it follows that a contaminant would also move quickly; therefore, that area will be more vulnerable. If it is more difficult for the contaminant to get to the source, the landscape is less vulnerable. Other factors are taken into consideration to determine the Vulnerability Score, such as old wells which may be a conduit for contamination to get quickly into the water underground (these are called transport pathways).

2 Assessment Report Chapter Summaries

The Assessment Report both gives an overview of the watershed, its characteristics and the availability of water as well as gives specific information on where threats exist on the landscape and of what nature the threats are.

What follows is the summary, by chapter of the Assessment Report. For ease of reading, the highlights of the Lake Simcoe and Couchiching-Black River Source Protection Area, Part 1: Lake Simcoe Watershed are compiled in this document.

The required components of an Assessment Report are as follows:

- **Characterization of the Source Water Protection Area watershed**: This includes descriptions of the natural and human geography;

- **A Conceptual water budget for the entire Source Water Protection Area and a Tier 1 water budget for each subwatershed**: Those systems identified as having a potential water quantity stress in the Tier 1 water budget, progress to a more detailed Tier 2 water budget, and Tier 3 risk assessment if needed;
- **Broad scale assessment of Regional Groundwater Vulnerability**: This aspect of the Assessment Report requires both Highly Vulnerable Aquifers (HVA) and Significant Groundwater Recharge Areas (SGRAs) be identified; and
- **Drinking water system assessment**: For each municipal drinking water system within the Terms of Reference, the Vulnerability of the supply wells or surface water intakes is assessed and any potential Significant Threats to the water quality are identified.

The content of the Assessment Report is based on the best available information and have been prepared to meet all the requirements of the Clean Water Act and Technical Rules. There are cases; however, where required information is either not available (a data gap) or the information provided is not based on the most recent data. The Assessment Report will be periodically updated so that any new data or information can be included.

2.1 Chapter 1: Introduction

This chapter introduces the reader to the South Georgian Bay- Lake Simcoe Source Protection region, its structure, committee and the municipal water systems therein.

As highlighted in the table below, within the Lakes Simcoe watershed, there are 79 municipal supply wells that have been assessed, and 7 Surface Intakes providing water for 30 Drinking Water Systems.

Table 1. Number of Drinking Water Systems, Municipal Wells, and Surface Water Intakes by SPA

Source Protection Area	Number of drinking water Systems	Number of Municipal Supply Wells	Number of Municipal Surface Water Intakes
Lake Simcoe and Lake Couchiching – Black River - Lake Simcoe	30	79	7
Lake Simcoe and Lake Couchiching – Black River - Black-Severn	10	10	6
Nottawasaga Valley	34	110	1
Severn Sound	35	88	2
Total	**109 * (107)**	**287 ****	**16**

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*Systems in Barrie and Orillia counted twice in the Total as the drinking water systems are in two Source Protection Areas.

** Number of wells in each SPA location, some wells are servicing communities in other SPAs.

2.2 Chapter 2: Watershed Characterization

Watershed characterization is a snapshot of the entire watershed, including the physical and natural geography and the boundaries encompassing both human and natural features. Understanding the characteristics of a watershed is essential in understanding how quality and quantity of drinking water is affected by both human and natural interactions.

The large geography covered by the Lake Simcoe watershed is quite diverse in terms of population density, economy, and land use. Human characteristics across the watershed vary from the densely populated urban centers of Barrie, Aurora and Newmarket to the west and south, to the prominent agricultural communities in most other areas. Despite over 400,000 people living in the watershed, natural heritage features are the largest single land use in the watershed. Overall, 1,724 km^2 (52%) of the Lake Simcoe watershed is classified as natural heritage features including large tracks of wetlands and woodlands.

Within the Lake Simcoe watershed, there are 22 municipal governments: four regions and counties, (Durham, Peel, Simcoe and York) and 18 local municipalities and separated cities. Population within the Lake Simcoe watershed during the 2001census was estimated 409,760 during the 2006 census. This represents an increase of 26,873 or 7% from the 2001 census. The most significant increases in population during the 5-year period occurred in the City of Barrie

(24%) and the Towns of Newmarket (13%) and Aurora (18.6%). The Chippewas of Georgina Island comprise the only first nation reserve within the watershed. This reserve had a population of 353 during the 2006 census, at a density of 22 people per km^2.

Comprised of 18 subwatersheds, the Lake Simcoe watershed has a total drainage area of 3,324km^2 (including Lake Simcoe).

For the most part, groundwater samples have shown to be consistently below the Ontario Drinking Water Standards, Objectives and Guidelines. The condition of the fish and benthic communities living in the watercourses has also been a good indicator of water quality within the watershed. The Lake Simcoe watershed supports both cold- and warm water fish species. Samples taken between 2005 and 2007 showed that out of 168 samples, 62 (or 37%) were impaired. Benthic sampling from 2004-2007 had results of 50 (or 38%) of the sites being impaired, indicating some of the aquatic systems appear to be under stress.

Wetlands, including swamps, bogs and marsh occupy approximately 13% of the Lake Simcoe watershed. They are scattered throughout the watershed, with the highest concentrations to the northeast and to the south of Lake Simcoe in Black, Holland, Pefferlaw, and Beaver subwatersheds. The watershed is noted for having one of the highest concentrations of large wetlands off the Canadian Shield, in southern Ontario.

The Lake Simcoe watershed is located within six regional- scale physiographic regions. These regions are the Simcoe Lowlands, Simcoe Uplands, Peterborough drumlin field, Schomberg clay plain, Oak Ridges Moraine and the Carden Plain. The Oak Ridges Moraine (ORM) is a significant hydrogeologic feature located in the Lake Simcoe watershed. The ORM extends approximately 160 km eastward from Niagara Escarpment to Trenton forming four sediment wedges approximately 30-40 km long and up to 20 km wide.

2.3 Chapter 3: Water Budget

A consistent supply of drinking water is vital for the people living within the Lake Simcoe watershed to live and conduct business. Within the watershed, drinking water is obtained from municipal and private wells, and surface water taken directly from Lake Simcoe or Lake Ontario. Groundwater wells and surface water intakes supply the agricultural industry with the large volume of water needed for livestock watering and crop irrigation. The recreation, commercial and industrial industries also require ground and surface water to continue to be viable. In addition, water is required for natural processes for habitat, and food for wildlife in the area. Therefore, it is important to understand where our drinking water is coming from, and how abundant or limited the supply may be in some regions of the watershed.

A water budget analysis is used to manage the quantity of existing and future sources of drinking water. The water budget aims to determine the location and quantity of water within the various components of the hydrologic system, and uses data to characterize how the water moves through the watershed. A water budget is used to determine how much water enters the watershed, how much is stored within the watershed and how much water leaves it (through natural or human processes). The analysis helps determine the amount of water

available for human use while ensuring enough is left for natural processes to maintain ecological needs. It also aids in the management of future water needs within the watershed.

The water budget component for the Assessment Report has been conducted on a tiered approach, which can consist of up to four levels of analysis depending on the potential stress level of each tier. As you proceed from one tier to the next, the scope of study narrows, and the science becomes more complex:

- **Conceptual Water Budget**
- **Tier 1**
- **Tier 2**
- **Tier 3**

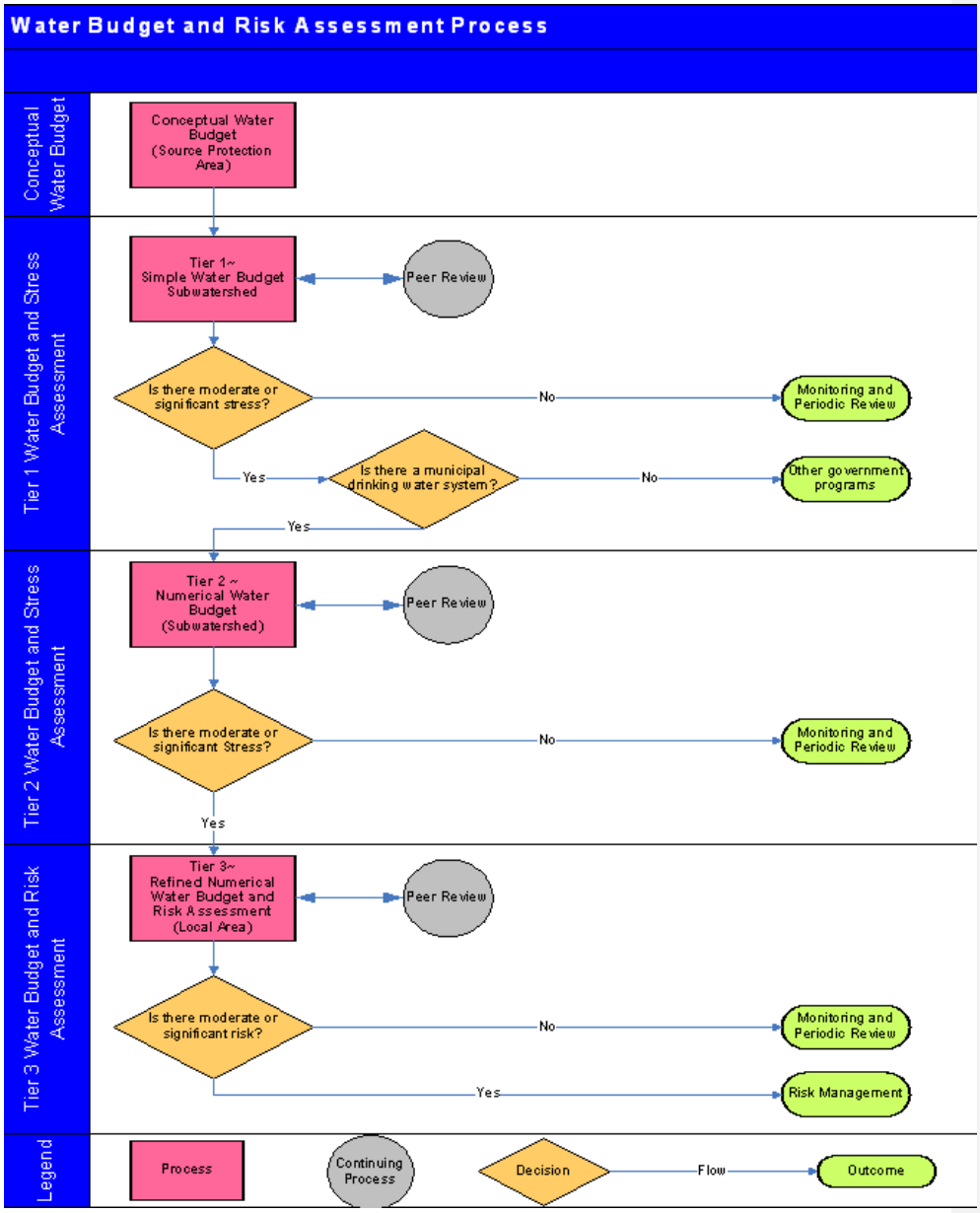

Figure 2. Tiered Water Budget and Risk Assessment Process

All subwatersheds are required to undergo a Conceptual water budget and Tier 1 water budget analysis in the Assessment Report. If any subwatersheds are found not to be stressed from a water quantity perspective or do not contain a municipal drinking water system, they are excluded from further study in the source protection planning process.

If a subwatershed is identified as exceeding the proscribed threshold for potential stress and contains municipal drinking water systems, it advances to a more complex Tier Two water budget analysis. The goal of the Tier Two assessment is to confirm or negate the stress assignment completed in the Tier One using a more detailed approach that includes complex numerical modeling. The Tier Three Water Budget and Water Quantity Risk Assessments are carried out for municipal groundwater systems that are located within subwatersheds that have been assigned a Tier Two moderate or significant potential level of stress.

Water quantity risk refers to the likelihood that threats to water quantity may render an existing or planned drinking water source impaired, unusable or unsustainable. The objective of the Tier Three assessment is to evaluate the risk that a community may not be able to meet its current or future water demand from a water source (e.g., stream, lake, or aquifer). Several subwatersheds in the Region have were identified for further evaluation and underwent Tier Three Water Budget and Water Quantity Risk Assessments.

The above flow chart depicts how a decision is made to move to the next Tier in the water budget and risk assessment process. It is important to note that an essential component in the water budget process is that each study is required to be peer reviewed by a team of qualified professionals. Each of the water budget studies discussed within the chapter were subsequently peer reviewed by qualified professionals. The objectives of the peer review team include:

1) To ensure consistency with the expectations of the Technical Rules for completion of the Assessment Report.
2) To ensure appropriate methodologies are utilized, and that the technical assumptions are necessary and reasonable.
3) To ensure scientifically defensible products.

The Conceptual and Tier 1 Water Budgets were completed for the Lake Simcoe watershed. Additional water budget efforts (Tier 2 assessments) were necessary for eight subwatersheds that were identified within the Tier 1 water budget as having a potential stress level above the stress thresholds identified in the Technical Rules. Even further water budget analyses (Tier 3) were undertaken for several municipal systems that were identified in the Tier 2 study as being stressed. These include water supply systems within the municipalities of York Region, Town of Bradford-West Gwillimbury, City of Barrie, and City of Kawartha Lakes.

The following table of the Lake Simcoe watershed, indicates which subwatersheds showed potential stress at a Tier One Level, and were progressed for further analysis.

Note for the table below: All subwatersheds are required to undergo a Conceptual and Tier 1 analysis. Subwatersheds that are not moving beyond a Tier 1 analysis do not have a municipal groundwater system, and / or were found not to be stressed.

Table 2. Subwatershed and Municipal Summary of the Water Budget and Risk Assessment Process: Lake Simcoe

Subwatershed	Upper Tier Municipalities	Lower Tier Municipalities	Municipal Drinking Water System (Yes / No)	Conceptual / Tier 1	Tier 2	Tier 3
Barrie Creeks	-	City of Barrie	Yes (GW)	✓	✓	✓
Hewitt Creeks	Simcoe County	Town of Innisfil	Yes (GW)	✓	-	-
Lovers Creek	Simcoe County	Town of Innisfil	Yes (GW)	✓	-	-
Innisfil Creeks	Simcoe County	Town of Innisfil	Yes (GW)	✓	-	-
Oro Creeks North	Simcoe County	Township of Oro-Medonte	Yes (GW)	✓	-	-
Oro Creeks South	Simcoe County	Township of Oro-Medonte	Yes (GW)	✓	-	-
Hawkestone Creek	Simcoe County	Township of Oro-Medonte	Yes (GW)	✓	-	-
Ramara Creeks	Simcoe County	Township of Ramara	Yes (GW)	✓	-	-
West Holland	York Region	Town of Bradford-West Gwillimbury	Yes (GW)	✓	✓	✓
West Holland	York Region	Township of King	Yes (GW)	✓	✓	✓
East Holland	York Region	Town of East Gwillimbury	Yes (GW)	✓	✓	✓
East Holland	York Region	Town of Aurora	Yes (GW)	✓	✓	✓
East Holland	York Region	Town of Newmarket	Yes (GW)	✓	✓	✓

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Subwatershed	Upper Tier Municipalities	Lower Tier Municipalities	Municipal Drinking Water System (Yes / No)	Conceptual / Tier 1	Tier 2	Tier 3
East Holland	York Region	Town of Whitchurch-Stouffville	Yes (GW)	✓	✓	✓
Maskinonge River	York Region	Town of East Gwillimbury	Yes (GW)	✓	✓	✓
Black River	York Region	Town of East Gwillimbury	Yes (GW)	✓	-	-
Whites Creek	Simcoe County / York Region	Township of Ramara / Brock	No	✓	-	-
Georgina Creeks	York Region	Township of Georgina	Yes (GW)	✓	-	-
Beaver River	City of Kawartha Lakes	Kawartha Lakes	Yes (GW)	✓	✓	✓
Beaver River	Durham Region	Township of Brock	Yes (GW)	✓	✓	-
Uxbridge Brook	Durham Region	Township of Uxbridge	Yes (GW)	✓	✓	-
Pefferlaw Brook	Durham Region / York Region	Township of Uxbridge / Georgina / Brock	No	✓	-	-
Talbot River	Simcoe County / Durham Region	Township of Ramara, brock and City of Kawartha Lakes	No	✓	-	-

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2.4 Chapter 4: Assessing Regional Groundwater Vulnerability

The Clean Water Act, 2006 requires that all sources of drinking water must be assessed for vulnerability from a water quantity and water quality perspective. This chapter assesses how vulnerable the groundwater is across the region. The vulnerability of groundwater is an expression of the relative ease through which the aquifer could become contaminated by threat activities occurring on or beneath the ground surface. An aquifer that can easily become contaminated is considered to be vulnerable.

The regional groundwater vulnerability is demonstrated by delineating Significant Groundwater Recharge Areas (SGRAs), and Highly Vulnerable Aquifers (HVAs). This is a complex technical process that identifies areas that contribute water to regional aquifers (recharge areas) and to assess the vulnerability of these areas to activities at surface that may contaminate the groundwater and aquifer.

Not all Vulnerable Areas are equally vulnerable, so within these areas numeric vulnerability scores are attached to denote the Intrinsic Vulnerability in each case. Generally, the faster water is able to flow through the ground to an aquifer, the more vulnerable the area is to contamination. The vulnerability scores are determined by factors such as:

- How deep/thick the aquifer and overlying aquitard is;
- What type(s) of soils are present;
- How quickly water can travel through the ground, and
- What type of man-made transport pathways are present (i.e. improperly decommissioned wells).

The resulting vulnerability rating can then be used to delineate and score the HVAs and SGRAs within the South Georgian Bay-Lake Simcoe Source Protection Region.

This process is summarized below:

Step 1: Delineating Groundwater Vulnerability: The first step in determining both HVAs and SGRAs is to delineate the groundwater vulnerability using a methodology that will categorize vulnerability as “High”, “Medium” or “Low” as prescribed by Technical Rules 37 and 38 (MOE, 2008a), and discussed in Section 4.1.1 of Chapter 4.

Step 2: Vulnerability Scoring for Highly Vulnerable Aquifers (HVAs): The second step is to classify the areas categorized as “High” in Step One above as Highly Vulnerable Aquifers (HVAs).
Step 3: Delineating Significant Groundwater Recharge Areas (SGRAs): Recharge rates across the study area are determined using a surface water model (PRMS or HSP-F), which is discussed in great detail within Chapter 3 and Appendix WB-4. SGRAs were determined by using Technical Rule 44(1) (MOE, 2008a), which specifies SGRAs are the areas where the recharge is 15% greater than the average recharge across the study area.

Step 4: Vulnerability Scoring SGRAs: Using the categorized groundwater vulnerability delineated in Step One, the vulnerability within the SGRAs are categorized as “High”, “Medium” or “Low”.

Below are the results of this analysis.

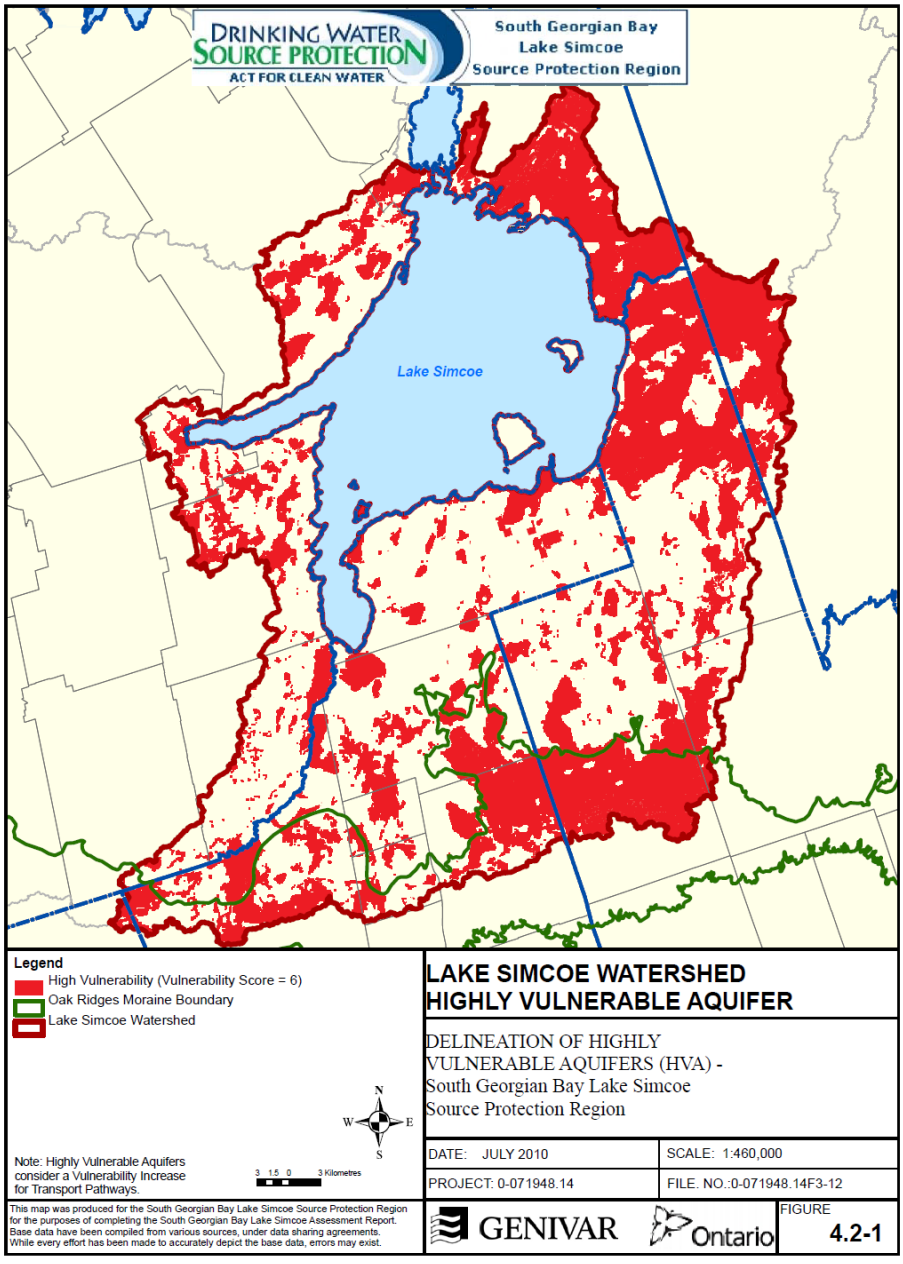

Figure 3. Map of Highly Vulnerable Aquifers: Lake Simcoe Watershed

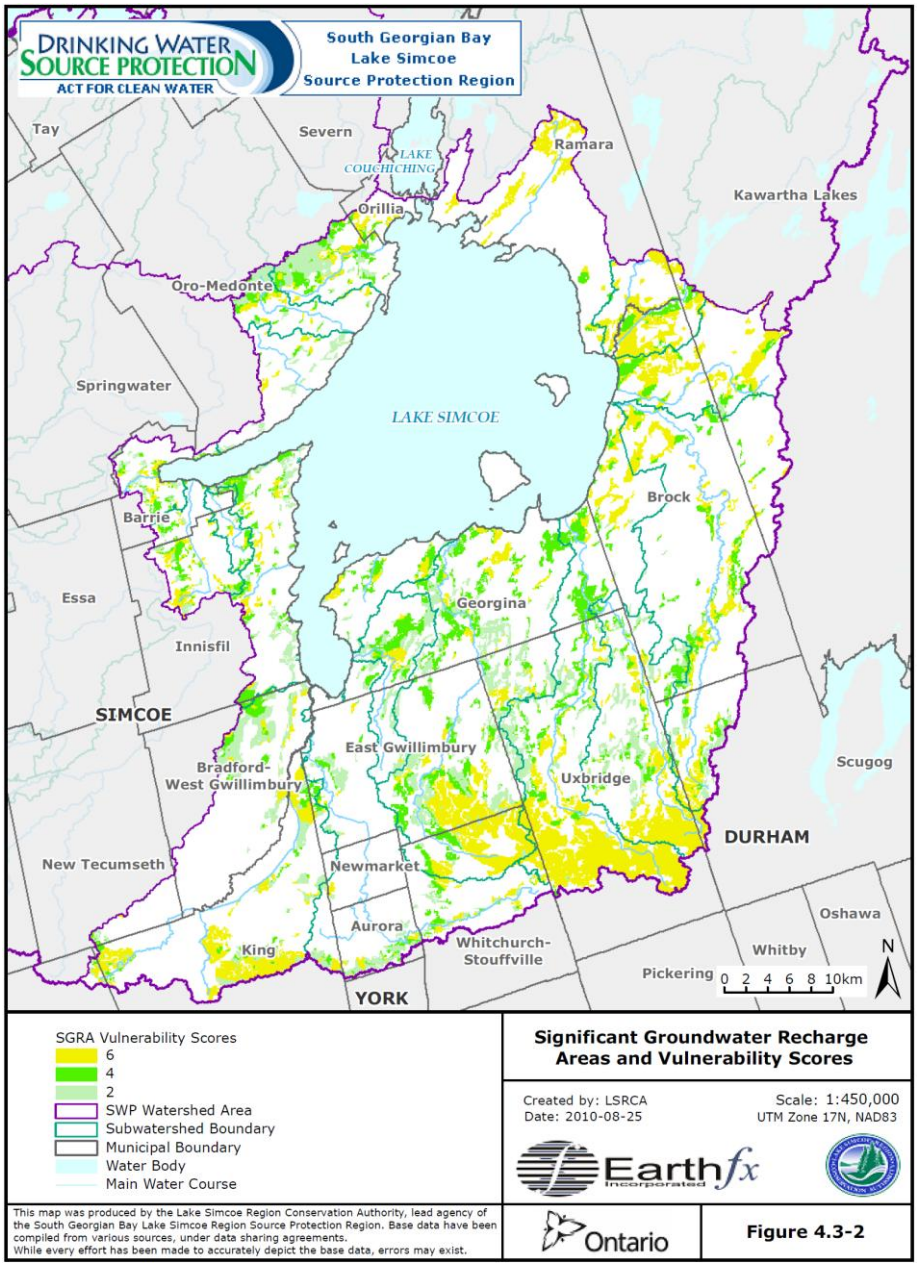

Figure 4. Significant Groundwater Recharge Areas: Lake Simcoe Watershed

2.5 Chapter 5: Methods Overview

This chapter provides an overview of the approaches and rules used in the South Georgian Bay-Lake Simcoe Source Protection Region to assist the reader in interpreting the municipal Vulnerability and Threats chapters that summarize the Drinking Water Threats to the South Georgian Bay Source Protection Region's 109 drinking waters systems. Assessing and reporting threats to drinking water systems can be complex and at times confusing due to the nature of work to be undertaken, the many steps involved and the rules that need to be followed. This chapter is divided into several sections. The first few sections are a brief summation on the steps taken to assess Vulnerability, Issues and Threats for groundwater and surface water systems, and are expanded on in the later sections of the chapter. Following sections include descriptions of Wellhead Protection Areas (WHPAs) and Intake Protection Zones (IPZs), as well as the methods by which they were delineated and used throughout the report. The final section of this chapter explains how Drinking Water Issues and Drinking Water Threats are evaluated and describing how areas are designated as having Significant, Moderate and/or Low Drinking Water Threats.

2.6 Chapters 6-onwards: Threats by Municipality

2.6.1 Town of Bradford West Gwillimbury

Drinking Water Systems and their Vulnerable Areas

There is one drinking water system in Town of Bradford West Gwillimbury servicing approximately 11,400 people. The remainder of the population (approximately 26,409 people) is serviced by the Alcona Water Treatment Plant located in the Town of Innisfil. The Alcona Water Treatment Plant obtains surface water from Lake Simcoe, and is further discussed in Chapter 10 of this Assessment Report. The groundwater supply systems for the Town of Bradford West Gwillimbury are located within the Lake Simcoe watershed.

Areas that are vulnerable to contamination have been delineated; these are known as Wellhead Protection Areas (WHPA). A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. (See Chapter 10 for further details).

Bradford \ Bondhead Distribution & Supply Wells:

- 2 wells service the Town of Bradford-West Gwillimbury, south of Lake Simcoe. This system services approximately 11,400 people
- The Two wells (The Church Street wells) are physically located within the Township of King, within The Regional Municipality of York, to the east of Bradford.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

Bradford \ Bondhead Distribution & Supply Wells – No Issues

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the Bradford-West Gwillimbury Water Supply. No potential Conditions have been identified for consideration at this time.

Activities:

A total of 13 parcels were identified as potentially having one or more Significant Threat Activities.

Number of Significant Threats

Bradford \ Bondhead Distribution & Supply Wells – 15 Significant Threats were identified in association with **13** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial.

Table 3. Number of Parcels with confirmed or potential Significant Drinking Water Threats for the Town of Bradford-West Gwillimbury Drinking Water Supply System

Threat Number	Significant Threat	Bradford / Bondhead Distribution and Supply Wells Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act	0
2	The establishment, operation or maintenance of a system that collect, stores, transmits, treats or disposes of sewage	0
3	The application of agricultural source material to land	0
4	The storage of agricultural source material	0
5	The management of agricultural source material	0
6	The application of non-agricultural source material to land (i.e. compost, biosolids)	0
7	The handling and storage of non-agricultural source material (i.e. septic systems)	0
8	The application of commercial fertilizer to land	1
9	The handling and storage of commercial fertilizer	1
10	The application of pesticide to land	2
11	The handling and storage of pesticide	0
12	The application of road salt	0
13	The handling and storage of road salt	0
14	The storage of snow	0
15	The handling and storage of fuel	1
16	The handing and storage of dense non-aqueous phase liquids	10

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Threat Number	Significant Threat	Bradford / Bondhead Distribution and Supply Wells Number of Parcels
17	The handling and storage of organic solvent	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surface)	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0
-	**Total number of parcels***	**13***

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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2.6.2 City of Barrie

Drinking Water Systems and their Vulnerable Areas

The City of Barrie obtains potable drinking water from both surface and groundwater sources, each servicing different zones of the City. The City of Barrie Water Supply Systems services approximately 140,000 people. Most of the system is located within the Lake Simcoe watershed. However, since a few of the wells in the Barrie system are located in the Nottawasaga Valley watershed, information on this system will also be available in the Nottawasaga Valley Assessment Report.

Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells and Intake Protection Zones (IPZ) for surface water intakes. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. An IPZ is the area of water and land where activities have the potential to affect the quality of water being taken up by the surface water intake. (See Chapter 8 for further details).

Barrie Water Treatment Plant:

- Located in Kempenfelt Bay on the south west shore of Lake Simcoe, in the City of Barrie
- This is treatment plant came into service during the summer of 2011
- IPZ extends along southern shoreline of the City of Barrie and inland, for a short distance, along Lover's and Hewitt's Creeks.

Barrie Well Supply:

- Fourteen wells are located in the City of Barrie, just west of Kempenfelt Bay of Lake Simcoe and service around 78,500 people
- The WHPAs are complex and cover most of the city core.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

Barrie WTP – No Issues

Barrie Well Supply – Chloride was identified as a Drinking Water Issue for Well 3A.

– Chloride and sodium were identified as a Drinking Water Issue for Well 11, 12 and 14.

– Lakeshore Wells had volatile organic compounds (VOC) detections, but was not considered an official Drinking Water Issues as there was insufficient evidence.

A total of 96 Significant Threat Activities related to the Issues were identified in the WHPA. The locations where these Issues occur have been included in threats enumeration (Table 1).

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a

source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

Six confirmed Conditions have been identified for the Barrie Groundwater Supply.

Activities:

A total of 349~~202~~ parcels were identified as potentially having one or more Significant Threat Activities. This includes land parcels that are considered Significant due to Drinking Water Issues.

Number of Significant Threats

Barrie WTP – No Significant Threats were identified.

Barrie Well Supply – 452~~229~~ Significant Threats were identified in association with **349~~202~~** land parcels. Most of the Threats identified are associated with a variety land uses, with the majority associated with the handling and storage of DNAPLs.

Table 4. Number of Parcels with confirmed or potential Significant Drinking Water Threats for the City of Barrie Water Supply System (Lake Simcoe and Nottawasaga Valley)

Threat Number	Significant Threat	Barrie WTP Number of Parcels	Barrie Well Supply Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act	0	12
2	The establishment, operation or maintenance of a system that collect, stores, transmits, treats or disposes of sewage	0	104~~2~~
3	The application of agricultural source material to land	0	0
4	The storage of agricultural source material	0	0
5	The management of agricultural source material	0	0
6	The application of non-agricultural source material to land (i.e. compost, biosolids)	0	0

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Threat Number	Significant Threat	Barrie WTP Number of Parcels	Barrie Well Supply Number of Parcels
7	The handling and storage of non-agricultural source material (i.e. septic systems)	0	0
8	The application of commercial fertilizer to land	0	032
9	The handling and storage of commercial fertilizer	0	1
10	The application of pesticide to land	0	02
11	The handling and storage of pesticide	0	1
12	The application of road salt	0	572
13	The handling and storage of road salt	0	573
14	The storage of snow	0	461
15	The handling and storage of fuel	0	4
16	The handing and storage of dense non-aqueous phase liquids	0	167
17	The handling and storage of organic solvent	0	20
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0	0
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surface)	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard	0	0

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Threat Number	Significant Threat	Barrie WTP Number of Parcels	Barrie Well Supply Number of Parcels
22	The establishment and operation of a liquid hydrocarbon pipeline		
-	**Total number of parcels***	**0**	**349~~229~~***

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*Note: The total number of parcels account for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total

2.6.3 City of Kawartha Lakes

Drinking Water Systems and their Vulnerable Areas

There are 15 drinking water systems in City of Kawartha Lakes, three of which are located in the South Georgian Bay-Lake Simcoe Source Protection Region. Two of these (Woodville and Woods of Manilla) is in the Lake Simcoe watershed and services 740 people. The other (Western Trent/Palmina) is located in the Black-Severn River watershed and information for the system can be found in Part 2 of this Assessment Report. It should be noted that the Woods of Manilla system is partially within the South Georgian Bay-Lake Simcoe Source Protection Region and the Trent Conservation Coalition Source Protection Region.

Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells and Intake Protection Zones (IPZ) for surface water intakes. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. An IPZ is the area of water and land where activities have the potential to affect the quality of water being taken up by the surface water intake. (See Chapter 7 for further details).

Woodville:

- Two wells are located in the community of Woodville, east of Lake Simcoe. This system services approximately 740 people
- The wells are located just south of the main community and the WHPAs extend eastwards. They also cross over slightly into the Trent Conservation Coalition Source Protection Region.

Woods of Manilla:

- Two wells are located in the former Mariposa Township. One well is located within the Lake Simcoe watershed of the SGBLS SPR while the other is within the Kawartha Conservation Area in the Trent Conservation Coalition (TCC) Source Protection Region.
- The WHPAs extend to the west and a small portion crosses the boundary of the SGBLS SPR.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

Woodville - No Issues

Woods of Manilla - No Issues

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the Woodville and Woods of Manilla Water Supplies. No potential Conditions have been identified for consideration at this time.

Activities:

A total of 40~~36~~ parcels were identified as potentially having one or more Significant Threat Activities.

Number of Significant Threats

Woodville – 19~~5~~ Significant Threats were identified in association with **15~~1~~** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial

Woods of Manilla – 25 Significant Threats were identified in association with **25** land parcels. The majority of Significant Threats are associated with Septic systems and the handling and storage of fuel.

Table 5. Number of Parcels with confirmed or potential Significant Drinking Water Threats for the Kawartha Lakes Drinking Water System

Threat Number	Significant Threat	Woodville Number of Parcels	Woods of Manilla Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act	~~10~~	0
2	The establishment, operation or maintenance of a system that collect, stores, transmits, treats or disposes of sewage	5	22
3	The application of agricultural source material to land	2	0
4	The storage of agricultural source material	1	0
5	The management of agricultural source material	0	0
6	The application of non-agricultural source material to land (i.e. compost, biosolids)	0	0
7	The handling and storage of non-agricultural source material (i.e. septic systems)	0	0
8	The application of commercial fertilizer to land	0	0
9	The handling and storage of commercial fertilizer	0	0
10	The application of pesticide to land	~~63~~	0
11	The handling and storage of pesticide	0	0
12	The application of road salt	0	0
13	The handling and storage of road salt	0	0
14	The storage of snow	0	0
15	The handling and storage of fuel	1	3

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Threat Number	Significant Threat	Woodville Number of Parcels	Woods of Manilla Number of Parcels
16	The handing and storage of dense non-aqueous phase liquids	0	0
17	The handling and storage of organic solvent	0	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0	0
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	N/A
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surface)	0	N/A
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard	3	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0
-	**Total number of parcels***	**151**	**25****

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

N/A = system not in the South Georgian Bay Lake Simcoe Source Protection Region.

** While the entire system is not within the SGBLS SPR, threats and parcels have been enumerated based on methods used in SGBLS SPR.

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2.6.4 Town of Innisfil

Drinking Water Systems and their Vulnerable Areas

There are four drinking water systems in the Town of Innisfil, three of which are in the Lake Simcoe watershed, servicing approximately 23,224 people. The other one (Churchill system) is located in the Nottawasaga Valley watershed, and services 550 people.

Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells and Intake Protection Zones (IPZ) for surface water intakes. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. An IPZ is the area of water and land where activities have the potential to affect the quality of water being taken up by the surface water intake. (See Chapter 10 for further details).

Alcona Surface Water Intake:

- Located on the south-west shore of Lake Simcoe at the inlet to Cook's Bay, in the Town of Innisfil. This system services roughly 20,397 people.
- The IPZ extends along shoreline of the Innisfil community and inland, for a short distance, along a few tributaries including Innisfil Creek.

Innisfil Heights:

- Two wells located approximately 6 km southwest of Stroud, at the intersection of Highway 400 and Innisfil Beach Road. This system services over approximately 700 people.
- The WHPAs extend to the west over Highway 400

Stroud:

- Three wells located in the north-central portion of Town of Innisfil, about 5 km south of Kempenfelt Bay and 7 km west of Cook's Bay. This system services approximately 1,900 people.
- The WHPAs extend slightly south east across the Stroud community.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

All Innisfil systems (within the Lake Simcoe) – No Issues

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the Innisfil Water Supplies that are within the Lake Simcoe watershed. No potential Conditions have been identified for consideration at this time.

Activities:

A total of 4150 parcels were identified as potentially having one or more Significant Threat Activities.

Number of Significant Threats

Alcona - 21 Significant Threats were identified in association with 21 land parcel. The Significant Threats identified are all associated with the municipal sewage treatment plant within IPZ-1.

Innisfil Heights - 123 Significant Threats were identified in association with 62 land parcels. The Significant Threats reflect a variety of land uses including- agriculture to commercial.

Stroud - **3**32 Significant Threats were identified in association with **3**32 land parcels. The Significant Threats identified are mainly associated with individual sewage systems.

Table 6. Number of Parcels with confirmed or potential Significant Drinking Water Threats for the Town of Innisfil Drinking Water Supply

Threat Number	Significant Threat	Alcona Number of Parcels	Innisfil heights Number of Parcels	Stroud Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act	0	1	1~~0~~
2	The establishment, operation or maintenance of a system that collect, stores, transmits, treats or disposes of sewage	1	1	31
3	The application of agricultural source material to land	0	0	0
4	The storage of agricultural source material	0	0	0
5	The management of agricultural source material	0	0	0
6	The application of non-agricultural source material to land (i.e. compost, biosolids)	0	0	0
7	The handling and storage of non-agricultural source material (i.e. septic systems)	0	0	0
8	The application of commercial fertilizer to land	0	0	0
9	The handling and storage of commercial fertilizer	0	0	0
10	The application of pesticide to land	1~~0~~	1	0
11	The handling and storage of pesticide	0	0	0

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Threat Number	Significant Threat	Alcona Number of Parcels	Innisfil heights Number of Parcels	Stroud Number of Parcels
12	The application of road salt	0	~~30~~	0
13	The handling and storage of road salt	0	~~30~~	0
14	The storage of snow	0	~~30~~	0
15	The handling and storage of fuel	0	0	1
16	The handing and storage of dense non-aqueous phase liquids	0	0	0
17	The handling and storage of organic solvent	0	0	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0	0	0
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surface)	0	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard	0	0	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0
-	**Total number of parcels***	**~~21~~**	**~~62~~**	**3~~32~~**

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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2.6.5 Township of Oro-Medonte

Drinking Water Systems and their Vulnerable Areas

There are 12 drinking water systems in the Township of Oro-Medonte, six of which are in the Lake Simcoe watershed and service over 700 people. One system is located in the Nottawasaga Valley watershed, while the other six are located in the Severn Sound watershed. Information on these systems can be found in the Nottawasaga Valley Assessment Report (AR) and Severn Sound AR, respectively.

Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. (See Chapter 11 for further details).

Canterbury Subdivision:

- Two wells located in the southern part of the Township. This system services around 43 people
- The WHPA is very long and narrow, extending northwestwards towards the Nottawasaga Valley and Severn Sound watersheds.

Cedar Brook Subdivision:

- Two wells located in the southern part of the Township in the community of Hawkestone and about 60 people
- The WHPAs extend northwest towards and over Highway 11 N.

Harbourwood:

- Two wells located in the southern part of the Township near Lake Simcoe. This system services over 330 people
- The WHPAs extend northwest, away from the lakeshore subdivision and towards Highway 11 N.

Maplewood:

- Two Wells located in the southeastern part of the Township, approximately 4 km south of the City of Orillia. This system services over 120 people
- The WHPAs extend to the west, away from Lake Simcoe and the lakeshore subdivisions.

Shanty Bay:

- Three wells located in the southern part of the Township, approximately 4.5 km east of the City of Barrie. This system services approximately 157 people
- The WHPAs extend to the north, away from the denser parts of the community.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

All Oro-Medonte systems (within the Lake Simcoe watershed) – No Issues

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the Oro-Medonte Water Supplies that are within the Lake Simcoe watershed. No potential Conditions have been identified for consideration at this time.

Activities:

A total of 6872 parcels were identified as potentially having one or more Significant Threat Activities.

Number of Significant Threats

Canterbury Subdivision - 16 Significant Threats were identified in association with **14** land parcels. The majority of the Threats are associated with private individual sewage systems.

Cedar Brook Subdivision - 16 Significant Threats were identified in association with **16** land parcels. The majority of the Threats are associated with private individual sewage systems.

Harbourwood - 16 Significant Threats were identified in association with **16** land parcels. The majority of the Threats are associated with private individual sewage systems.

Maplewood – 610 Significant Threats were identified in association with 6 land parcels. The majority of the Threats are associated with private individual sewage systems.

Shanty Bay - 16 Significant Threats were identified in association with **16** land parcels. The majority of the Threats are associated with private individual sewage systems.

Table 7. Number of Parcels with confirmed or potential Significant Drinking Water Threats for the Township of Oro-Medonte Drinking Water Supply

Threat Number	Significant Threat	Canterbury Sub. Number Parcels	Cedar Brook Sub. Number Parcels	Harbour-wood Number Parcels	Maple-wood Number Parcels	Shanty Bay Number Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act	0	0	0	0	0
2	The establishment, operation or maintenance of a system that collect, stores, transmits, treats or disposes of sewage	11	15	15	~~49~~	15
3	The application of agricultural source material to land	0	0	0	0	0
4	The storage of agricultural source material	0	0	0	0	0
5	The management of agricultural source material	0	0	0	0	0
6	The application of non-agricultural source material to land (i.e. compost, biosolids)	0	0	0	0	0

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Threat Number	Significant Threat	Canterbury Sub. Number Parcels	Cedar Brook Sub. Number Parcels	Harbour-wood Number Parcels	Maple-wood Number Parcels	Shanty Bay Number Parcels
7	The handling and storage of non-agricultural source material (i.e. septic systems)	0	0	0	0	0
8	The application of commercial fertilizer to land	1	0	0	0	0
9	The handling and storage of commercial fertilizer	0	0	0	0	0
10	The application of pesticide to land	2	0	0	1~~0~~	0
11	The handling and storage of pesticide	0	0	0	0	0
12	The application of road salt	0	0	0	0	0
13	The handling and storage of road salt	0	0	0	0	0
14	The storage of snow	0	0	0	0	0
15	The handling and storage of fuel	1	1	1	1	1
16	The handing and storage of dense non-aqueous phase liquids	0	0	0	0	0
17	The handling and storage of organic solvent	0	0	0	0	0

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Threat Number	Significant Threat	Canterbury Sub. Number Parcels	Cedar Brook Sub. Number Parcels	Harbour-wood Number Parcels	Maple-wood Number Parcels	Shanty Bay Number Parcels
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0	0	0	0	0
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0	0	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surface)	0	0	0	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard	1	0	0	0	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0	0	0
-	**Total number of parcels***	**14**	**16**	**16**	~~6~~**10**	**16**

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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2.6.6 Township of Ramara

Drinking Water Systems and their Vulnerable Areas

There are six drinking water systems in the Township of Ramara, four of which are in the Lake Simcoe watershed and service over 4,300 people. The other two (Davy Drive and Park Lane) are located in the Black-Severn River watershed and information can be found in Part 2 of this Assessment Report.

Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells and Intake Protection Zones (IPZ) for surface water intakes. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. An IPZ is the area of water and land where activities have the potential to affect the quality of water being taken up by the surface water intake. (See Chapter 12 for further details).

Bayshore Village Subdivision:

- Three wells located on Lot 24, Concession 6 near Lake Simcoe. This system services around 750 people.
- The WHPAs extend northeast across a denser portion of the community.

Val Harbour Subdivision:

- Two wells located on Lot 24, Concession 7 near Lake Simcoe. This system services over 100 people.
- The WHPAs extend northeast away from the community

Lagoon City WTP:

- Located on the east shore of Lake Simcoe near the Harbour Canal in the community of Lagoon City. This system services approximately 3,000 people.
- IPZ extends along shoreline of the Lagoon City community and inland, for a distance, along a number of unnamed tributaries.

South Ramara WTP:

- Located on the east shore of Lake Simcoe near the community of Heritage Farms. This system services around 200 people.
- IPZ extends along shoreline of the South Ramara community and inland, for a short distance, along a number of tributaries (including Ramara Creek).

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

All Ramara systems (within the Lake Simcoe) – No Issues

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the Ramara Water Supplies that are within the Lake Simcoe watershed. No potential Conditions have been identified for consideration at this time.

Activities:

A total of 145~~5~~7 parcels were identified as potentially having one or more Significant Threat Activities.

Number of Significant Threats

Bayshore Village Subdivision - 2 Significant Threats were identified in association with **2** land parcels. The Significant Threats are associated with private individual sewage systems and the handling and storage of fuel.

Val Harbour Subdivision - 3~~**5**~~**3** Significant Threats were identified in association with **2**~~**5**~~**7** land parcels. The Significant Threats reflect a couple of land uses including residential to agricultural.

Lagoon City WTP - 1~~**25**~~**34** Significant Threats were identified in association with ~~**43**~~**50** land parcels. The majority of Significant Threats are associated with agricultural land uses.

South Ramara WTP- ~~**80**~~**78** Significant Threats were identified in association with **7**~~**5**~~**3** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial.

Table 8. Number of Parcels with confirmed or potential Significant Drinking Water Threats for the Township of Ramara Drinking Water Supply

Threat Number	Significant Threat	Bayshore Village Sub. Number Parcels	Val harbor Sub. Number Parcels	Lagoon City WTP Number Parcels	South Ramara WTP Number Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act	0	0	0	0
2	The establishment, operation or maintenance of a system that collect, stores, transmits, treats or disposes of sewage	1	23	1	69
3	The application of agricultural source material to land	0	2	39~~48~~	4
4	The storage of agricultural source material	0	1	15	2
5	The management of agricultural source material	0	0	0	0
6	The application of non-agricultural source material to land (i.e. compost, biosolids)	0	0	7	0
7	The handling and storage of non-agricultural source material (i.e. septic systems)	0	0	0	0
8	The application of commercial fertilizer to land	0	0	0	0
9	The handling and storage of commercial fertilizer	0	1	0	0
10	The application of pesticide to land	0	~~4~~2	46	3~~1~~

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Threat Number	Significant Threat	Bayshore Village Sub. Number Parcels	Val harbor Sub. Number Parcels	Lagoon City WTP Number Parcels	South Ramara WTP Number Parcels
11	The handling and storage of pesticide	0	1	0	1
12	The application of road salt	0	0	0	0
13	The handling and storage of road salt	0	0	0	0
14	The storage of snow	0	0	0	0
15	The handling and storage of fuel	1	2	0	0
16	The handing and storage of dense non-aqueous phase liquids	0	0	0	0
17	The handling and storage of organic solvent	0	0	0	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0	0	0	0
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surface)	0	0	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard	0	1	15	2

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Threat Number	Significant Threat	Bayshore Village Sub. Number Parcels	Val harbor Sub. Number Parcels	Lagoon City WTP Number Parcels	South Ramara WTP Number Parcels
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0	0
-	**Total number of parcels***	**2**	**2~~7~~5**	**4~~3~~50**	**7~~5~~3**

*Note: The total number of parcel accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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2.6.7 Regional Municipality of Durham

Drinking Water Systems and their Vulnerable Areas

There are eight drinking water systems in Durham Region, four of which are in the South Georgian Bay-Lake Simcoe Source Protection Region. All four are located in the Lake Simcoe watershed and service approximately 17,833 people. Two systems, Greenbank and Uxville, have vulnerable areas that cross over into the SGBLS SPR and are included in this summary. Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells and Intake Protection Zones (IPZ) for surface water intakes. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. An IPZ is the area of water and land where activities have the potential to affect the quality of water being taken up by the surface water intake. (See Chapter 6 for further details).

Beaverton Surface Water Intake:

- The Intake is located on the east shore of Lake Simcoe in the community of Beaverton. This intake services approximately 3,900 people.
- IPZ extends along shoreline of the Beaverton community and inland, for a short distance, along the Beaver River and Whites Creek.

Cannington:

- Seven wells are located in the community of Cannington, approximately 12 km east of Lake Simcoe. This system services just over 2,100 people
- The WHPAs for the Gravel Pit Wellfield extend towards the south while the WHPA for the Arena Wellfield extends primarily south and east; therefore, the most densely populated part of the community is not within the WHPAs.

Sunderland:

- Three wells are located in the community of Sunderland, and are located approximately 16 km southeast of Lake Simcoe. This system services approximately 1,573 people.
- The MW3 WHPA radiates outward, primarily to the west, north and southwest. The WHPA associated with MW1 and MW2 extends towards the southeast away from the community.

Uxbridge:

- Three wells located in the community of Uxbridge and service approximately 10,000 people
- The WHPAs extend slightly to the south and extend across subdivisions

Greenbank:

- Five wells located in the Hamlet of Greenbank and service approximately 560 people. The system is located in the Kawartha Conservation Area in the Trent Conservation Coalition (TCC) Source Protection Region.
- The WHPAs extend to the west and a small portion crosses the boundary into the SGBLS SPR and Lake Simcoe watershed.

Uxville:

- Two wells located in the community of Uxbridge and service the Uxbridge Industrial Park and the Uxville WSS. This system is located in the Credit Valley, Toronto and Region, Central Lake Ontario (CTC) Source Protection Region.
- WHPAs extend to the north and a portion crosses the York-Durham regional boundary in Uxbridge into the SGBLS SPR.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogen) in the raw drinking water that will limit the ability of the water to serve as a drinking water source either now, or in the future.

Beaverton - No Issues

Cannington -Trichloroethylene (TCE) was identified as a Drinking Water Issue for the Arena Well field. Durham Region is currently monitoring the situation and dissolved TCE concentrations have not exceeded the ODWQS in the wells. No Drinking Water Issues were identified with the other well fields.

Sunderland -No Issues

Uxbridge - No Issues

Greenbank - No Issues

Uxville - No Issues

Threats (please see table below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the Durham Water Supply within the Lake Simcoe watershed. No Conditions have been identified for the Greenbank and Uxville systems. One potential Condition has been inferred based on the identified presence of TCE as a Drinking Water Issue associated with the Arena Wellfield in Cannington. No potential Conditions have been identified for the remaining Durham water supply systems located within the South Georgian Bay-Lake Simcoe Source Protection Region.

Activities:

A total of 98~~77~~ parcels were identified as potentially having one or more Significant Threat activities.

Number of Significant Threats

Beaverton – No Significant Threats were identified.

Cannington – 8357 Significant Threats were identified in association with **5449** land parcels. Most of the Threats are associated with septic systems and application and storage of ASM.

Sunderland – 6 Significant Threats were identified in association with **5** land parcels. The Threats identified are primarily associated with residential land uses.

Uxbridge – 185 Significant Threats were identified in association with **130** land parcels. The Significant Threats reflect a variety of land uses, the majority of which are associated with the handling and storage of DNAPLs.

Greenbank – 28 Significant Threats were identified in association with **20** land parcels. The Significant Threats reflect a variety of land uses, the majority of which are associated with septic systems and the handling and storage of fuel. The activities identified as potentially Significant Drinking Water Threats are not within the Lake Simcoe and Couchiching Source Protection Area.

Uxville – 12 Significant Threats were identified in association with **6** land parcels. The Significant Threats reflect a variety of residential and commercial land uses.

Table 9. Number of Parcels with confirmed or potential Significant Drinking Water threats for Durham Region Drinking Water Supplies

Threat Number	Significant Threat	Beaverton Number of Parcels	Cannington Number of Parcels	Sunderland Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	0	~~42~~	0
2	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	0	37	4
3	The application of agricultural source material to land.	0	7	1
4	The storage of agricultural source material to land.	0	2	0
5	The management of agricultural source material.	0	0	0
6	The application of non-agricultural source material to land.	0	0	0
7	The handling and storage of non-agricultural source material.	0	0	0
8	The application of commercial fertilizer to land.	0	0	0
9	The handling and storage of commercial fertilizer to land.	0	0	0
10	The application of pesticide to land.	0	~~56~~	1
11	The handling and storage of pesticide.	0	0	0
12	The application of road salt.	0	0	0
13	The handling and storage of road salt.	0	0	0
14	The storage of snow.	0	0	0
15	The handling and storage of fuel.	0	0	0
16	The handling and storage of dense non-aqueous phase liquid.	0	2	0

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Threat Number	Significant Threat	Beaverton Number of Parcels	Cannington Number of Parcels	Sunderland Number of Parcels
17	The handling and storage of an organic solvent.	0	2	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0
19	An activity that takes water from an aquifer or surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surfaces)	0	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	0	~~1~~0	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0
-	Total Number of Parcels*	0	~~54~~49	5

Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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Threat Number	Significant Threat	Uxbridge	Greenbank	Uxville
		Number of Parcels	Number of Parcels	Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	2~~0~~	0	1
2	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	2	17	5
3	The application of agricultural source material to land.	0	3	0
4	The storage of agricultural source material to land.	0	1	0
5	The management of agricultural source material.	0	0	0
6	The application of non-agricultural source material to land.	0	0	0
7	The handling and storage of non-agricultural source material.	0	0	0
8	The application of commercial fertilizer to land.	0	3	0
9	The handling and storage of commercial fertilizer to land.	0	0	0
10	The application of pesticide to land.	1~~0~~	3	0
11	The handling and storage of pesticide.	0	0	0
12	The application of road salt.	0	0	0
13	The handling and storage of road salt.	0	0	0
14	The storage of snow.	0	0	0
15	The handling and storage of fuel.	4~~2~~	0	1
16	The handling and storage of dense non-aqueous phase liquid.	8~~7~~	0	3
17	The handling and storage of an organic solvent.	1	0	1

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Threat Number	Significant Threat	Uxbridge	Greenbank	Uxville
		Number of Parcels	Number of Parcels	Number of Parcels
18	The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0
19	An activity that takes water from an aquifer or surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	N/A	N/A
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surfaces)	0	N/A	N/A
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	0	1	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0
-	**Total Number of Parcels***	**130**	**20**	**0**

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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2.6.8 Regional Municipality of York

Drinking Water Systems and their Vulnerable Areas

There are 14 drinking water systems in the York Region, ten of which are in the Lake Simcoe watershed and service just over 188,600 people. The other four systems are located in the CTC Source Protection Region and information can be found in the CTC Assessment Report.

Areas that are vulnerable to contamination have been delineated, these are known as Wellhead Protection Areas (WHPA) for wells and Intake Protection Zones (IPZ) for surface water intakes. A WHPA is the area around the wellhead where land use activities have the greatest potential to affect the quality of the water flowing into the well. An IPZ is the area of water and land where activities have the potential to affect the quality of water being taken up by the surface water intake. (See Chapter 13 for further details).

Ansnorveldt:

- Two wells located in the community of Ansnorveldt. This system services over 200 people
- The WHPAs extend slightly towards the southeast, covering only a small area of the community.

Aurora:

- Seven wells located in the Town of Aurora. This system services almost 52,000 people
- The WHPAs extend towards the south and south east and overlap with the Newmarket WHPAs. They cover a large portion of the Town.

Ballantrae/Musselman's:

- Three wells located in the community of Ballantrae. This system services approximately 4,500 people
- The WHPAs generally extend towards the south over the community.

Georgina WTP:

Located on the south shore of Lake Simcoe in the Willow Beach area between the communities of Keswick and Sutton. This system is planned to service 10,200 people in 2011.IPZ extends along shoreline in the Willow Beach area between the communities of Keswick and Sutton and extends inland, for a short distance.**Holland Landing:**

- Two wells located in the community of Holland Landing. This system services almost 7,500 people.
- The WHPAs extend outward in all direction, overlapping slightly with the Queensville WHPAs and cover a large portion of the community.

Keswick WTP:

- Located on the east shore of Cook's Bay, in southern Lake Simcoe, in the Orchard Beach area near the community of Keswick. This system services approximately 25,700 people.
- IPZ extends along shoreline in the Orchard Beach area near the community of Keswick and extends inland, for a short distance, along the Keswick and Maskinonge Creek and two other unnamed tributaries.

Mount Albert:

- Three wells located in the community of Mount Albert. This system services around 4,200 people.
- The WHPAs extend towards the south, slightly crossing the municipal boundary into the Town of Uxbridge.

Newmarket:

- Five wells located in the Town of Newmarket. This system services approximately 81,800 people.
- WHPA extends mostly towards the east and overlap with the Aurora WHPAs. These cover much of the community.

Queensville:

- Four wells located in the community of Queensville. This system services over 3,700 people.
- The WHPAs extend mostly towards the east and slightly overlap with the Holland Landing WHPAs.

Schomberg:

- Three wells located in the community of Schomberg. This system services over 1,700 people.
- The WHPAs extend mainly to the west and to the south and cross over the community.

Issues

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogens) in the raw drinking water that will limit the ability of the water to serve as a drinking water source now, or in the future.

All York Region systems (within the Lake Simcoe Watershed) - No Issues

Threats (please see tables below for full list of threats for each Drinking Water System)

A Drinking Water Threat is defined as "an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water. An Activity is one or a series of related processes that occurs within a geographical area and may be related to a particular land use. A Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities.

Conditions

No confirmed Conditions have been identified for the York Regions Water Supplies within the Lake Simcoe watershed. No potential Conditions have been identified for consideration at this time.

Activities:

A total of 171~~209~~ parcels were identified as potentially having one or more Significant Threat Activities.

Number of Significant Threats

Ansnorveldt – 44 Significant Threats were identified in association with **17** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial.

Aurora/Newmarket – 1226~~6~~0 Significant Threats were identified in association with **89~~55~~** land parcels. The Significant threats identified are associated with residential and commercial land uses.

Ballantrae/Musselman's –~~85~~ Significant Threats were identified in association with **8~~5~~** land parcels. The Significant Threats reflect a variety of land uses, half of which are associated with private individual sewage systems.

Georgina WTP – No Significant Threats were identified.

Holland Landing – 10 Significant Threats were identified in association with **9** land parcels. The significant threats are associated with private individual sewage systems and the handling and storage of fuel.

Keswick WTP – No Significant Threats were identified.

Mount Albert – 21~~19~~ Significant Threats were identified in association with **~~18~~20** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial.

Queensville – 31 Significant Threats were identified in association with **1~~7~~8** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial.

Schomberg – 11 Significant Threats were identified in association with **10** land parcels. The Significant Threats reflect a variety of land uses, from residential to agriculture to commercial.

Table 10. Number of Parcels with confirmed or potential Significant Drinking Water Threats for York Region Drinking Water Supplies

Threat Number	Significant Threat	Ansnorveldt Number of Parcels	Aurora/ Newmarket Number of Parcels	Ballantrae/ Musselman Number of Parcels	Georgina WTP Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	0	160	30	0
2	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	13	32	4	0
3	The application of agricultural source material to land.	2	0	0	0
4	The storage of agricultural source material to land.	0	0	0	0
5	The management of agricultural source material.	0	0	0	0
6	The application of non-agricultural source material to land.	0	0	0	0
7	The handling and storage of non-agricultural source material.	0	0	0	0
8	The application of commercial fertilizer to land.	16	1	0	0
9	The handling and storage of commercial fertilizer to land.	2	0	0	0
10	The application of pesticide to land.	4	1	0	0
11	The handling and storage of pesticide.	2	0	0	0
12	The application of road salt.	0	170	0	0
13	The handling and storage of road salt.	0	170	0	0

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Threat Number	Significant Threat	Ansnorveldt Number of Parcels	Aurora/ Newmarket Number of Parcels	Ballantrae/ Musselman Number of Parcels	Georgina WTP Number of Parcels
14	The storage of snow.	0	170	0	0
15	The handling and storage of fuel.	5	0	1	0
16	The handling and storage of dense non-aqueous phase liquid.	0	561	0	0
17	The handling and storage of an organic solvent.	0	0	0	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0	0
19	An activity that takes water from an aquifer or surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surfaces)	0	0	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	0	0	0	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0	0
-	**Total Number of Parcels***	**17**	**8955**	**85**	**0**

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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Threat Number	Significant Threat	Holland Landing Number of Parcels	Keswick WTP Number of Parcels	Mount Albert Number of Parcels	Queensville Number of Parcels	Schomberg Number of Parcels
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	0	0	2~~0~~	2~~0~~	0
2	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	8	0	15	10	2
3	The application of agricultural source material to land.	0	0	0	3	0
4	The storage of agricultural source material to land.	0	0	0	0	0
5	The management of agricultural source material.	0	0	0	0	0
6	The application of non-agricultural source material to land.	0	0	0	0	0
7	The handling and storage of non-agricultural source material.	0	0	0	0	0
8	The application of commercial fertilizer to land.	0	0	1	5	1
9	The handling and storage of commercial fertilizer to land.	0	0	0	1	0
10	The application of pesticide to land.	0	0	1	4~~5~~	0
11	The handling and storage of pesticide.	0	0	0	0~~1~~	0
12	The application of road salt.	0	0	0	0	0
13	The handling and storage of road salt.	0	0	0	0	0

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Threat Number	Significant Threat	Holland Landing Number of Parcels	Keswick WTP Number of Parcels	Mount Albert Number of Parcels	Queensville Number of Parcels	Schomberg Number of Parcels
14	The storage of snow.	0	0	0	0	0
15	The handling and storage of fuel.	2	0	1	4	2
16	The handling and storage of dense non-aqueous phase liquid.	0	0	1	2	6
17	The handling and storage of an organic solvent.	0	0	0	0	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0	0	0
19	An activity that takes water from an aquifer or surface water body without returning the water taken to the same aquifer or surface water body (i.e. food processing)	0	0	0	0	0
20	An activity that reduces the recharge of an aquifer (i.e. increase in impervious surfaces)	0	0	0	0	0
21	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	0	0	0	0	0
22	The establishment and operation of a liquid hydrocarbon pipeline	0	0	0	0	0
-	**Total Number of Parcels***	**9**	**0**	**200**	**187**	**10**

*Note: The total number of parcels accounts for the fact that some parcels may have more than one significant threat and have only been counted once in the overall total.

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2.7 The Assessment Report in Context: Final Chapter

Climate Change

Over the past twenty years, there has been a great deal of concern around the world over climate change, its causes and potential impacts on humans and the environment. One of the potential impacts of climate change will be related to water supply. It is; therefore, important to look at climate change in the context of Source Water Protection.

Climate change can change both the quality and quantity of drinking water sources. Warmer temperatures can raise the temperature of surface water sources creating ideal habitats for bacterial growth. Warmer temperatures also indicate that more evaporation and evapotranspiration will be occurring. The increased evaporation rates mean that less water is available to infiltrate the ground, to recharge the groundwater system. An increased frequency in storm events inherently leads to an increase in runoff, potentially introducing harmful pollutants to watercourses. Other potential impacts of climate change are introduced throughout this Chapter. Climate change has the potential to broadly impact many areas of our life, from agriculture to recreation and animal habitat to forest cover. Understanding how climate change has the potential to affect our water sources is imperative in protection of the resource for future generations.

The following tables show how climate change is anticipated to impact the region's air temperature and precipitation.

Table 11. Summary of projected increase in Source Protection Region average annual air temperature (°C) in the 2050s compared with 1961-1990.

Season	GHG emission scenario Low	GHG emission scenario Medium	GHG emission scenario High
Annual	2.3	2.7	3.0
Winter	2.5	3.0	3.4
Spring	2.2	2.5	2.8
Summer	2.2	2.6	2.9
Autumn	2.3	2.6	2.8

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Table 12. Summary of projected increase in Source Protection Region precipitation (%) in the 2050s compared with 1961-1990.

Season	GHG emission scenario Low	GHG emission scenario Medium	GHG emission scenario High
Annual	5.15	5.45	5.51
Winter	9.38	10.19	10.76
Spring	8.58	9.1	9.65
Summer	0.92	0.11	-0.62
Autumn	3.06	3.79	3.82

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The projected increase in air temperature, winter precipitation, storm intensity and frequency are some of the effects of climate change that could change the quantity of water available for surface intakes and well supplies.

Summer groundwater recharge rates could be reduced as a result of the projected increased intensity of summer storm events, causing more water too runoff at the surface. Reduced recharge to groundwater could cause a significant decline in aquifer levels. This could result in shallow wells drying up and/or municipal wells needing to be drilled deeper into the aquifer, or find an alternate source of water to sustain consumption rates. On the other hand warmer conditions in the fall and winter will delay ground frost; therefore, enhancing infiltration during wet months. Similarly, an earlier spring will allow for more infiltration to occur, as the winter snowpack thaws.

Average annual precipitation is projected to increase by 5%, and the pattern of fall is predicted to change to fewer, more intense storms. Flooding puts a strain on existing storm sewers, with most pipes designed to accommodate a 25 year storm event, but it is highly likely that there will be many more storms exceeding this intensity. In Ontario alone, there were ten 100 year storm events that occurred between the years 2000 to 2005. Upgrades may be necessary to avoid flooding such as that observed in Barrie in 2005, Newmarket in 2006, Angus in 2008, and Coldwater in 2009.

In addition to concerns about the quantity of water available, climate change may have an impact on the quality of water as well. Increased severity and frequency of weather events may lead to more accidental releases of contaminants due to factors such as:

- damage to buildings or infrastructure housing contaminants resulting in their release;
- overflow of retention areas – some activities rely on retention areas to hold contaminants until they can be processed (for example waste treatment facilities or storm management ponds), during extreme events the capacity of the retention areas may be exceeded due to the volume of water entering , leading to overflow and contamination of local waterways; and

- mobilization of surface contaminants – in many cases a contaminant may not be considered a hazard as it is relatively immobile. However, with sufficient surface flow or flooding these, contaminants can be transported into local waterways where they impact water quality.

How the Great Lakes Were Considered

Section 14 of the Clean Water Act, 2006 requires that if a Source Protection Area contains water that flows into the Greats Lakes a consideration of the following documents must occur during the completion of Assessment Reports and Source Protection Plans. The documents are as follows:

1) The Great Lakes Water Quality Agreement of 1978 between Canada and the United States of America signed at Ottawa on November 22, 1978, including any amendments made before or after this section comes into force.
2) The Great Lakes Charter signed by the premiers of Ontario and Quebec and the governors of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin on February 11, 1985, including any amendments made before or after this section comes into force.
3) The Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem 2002 entered into between Her Majesty the Queen in Right of Canada and Her Majesty the Queen in Right of Ontario, effective March 22, 2002, including any amendments made before or after this section comes into force.
4) Any other agreement to which the Government of Ontario or the Government of Canada is a party that relates to the Great Lakes Basin and that is prescribed by the regulations. 2006, c.22, s.14 (1).

Within the South Georgian Bay-Lake Simcoe Source Protection Region (SGBLS SPR) all three Source Protection Authorities have waters which drain directly into the Great Lakes. For further information on how the Great Lakes agreements were considered in the work undertaken to complete the Assessment Report, please refer to the respective chapter within the Report.

Additional Items Raised by the Source Protection Committee.

Committee has the authority to request additional information be included or excluded within the Assessment Report. The following points describe areas where the Technical Rules explicitly state that a SPC ruling is required:

- Technical Rule 119: The intent of Technical Rule 119 is to enable the SPC to include activities that are not prescribed in the Technical Rules (2021)~~the Table of Drinking Water Threats~~ in the assessment. To be considered by the Director any activity has to be identified as a potential threat to a drinking water system.
    - At this stage the SPC has not requested additional activities be considered, however, as noted below a number of activities have been identified that may be considered for future versions.

- Technical Rule 15.1: Use of alternate methods or approaches for gathering information or for performing tasks that depart from those described in the rules (Rule 15.1). The following alternate methods were requested and approved under this rule.
    - Rules require a separate 1km^2 grid for each Source Protection Area when determining the total impervious surface area. Alternate method approved by the Director allows a single grid to be used for the entire Source Protection Region.
    - Rules require livestock numbers to be calculated by interpreting aerial photography to estimate the capacity of a farm to house livestock. Alternate method approved by the Director allows livestock density to be determined using Census of Canada livestock data within the Source Protection Region, with the census data of actual animal numbers being converted to nutrient units for the use of the calculations. This method was used to assess the livestock density for regional vulnerable areas (HVA and SGRA) only, while drinking water system vulnerable areas were assessed using the prescribed approach.
    - Rules require that the vulnerability of the groundwater within a source protection area be assessed using one or more of the four prescribed methods. Alternate method approved by the Director allows the consideration of local scale features such as 'windows' in the confining unit, which are not always accounted for in the regional nature of the AVI scoring. This includes the use of water quality information as a verification tool to reassess the groundwater vulnerability in the WHPAs and determine where the groundwater vulnerability should be amended. This alternative method was used in the City of Barrie.
    - Rules require that the vulnerability of the groundwater within a source protection area be assessed using one or more of the four prescribed methods. Alternate method approved by the Director allows the use of Water Table to Well Advection Time (WWAT) to determine the groundwater (intrinsic) vulnerability for drinking water systems within York Region.

  Letters with Director's Approval for the above mentioned Rule changes are available in Appendix ARC.

- Species at Risk assessment should only be included if the SPC is of the opinion that the watershed characterization should include a discussion for the purposes of informing the public about species at risk in the Source Protection Area.
    - The SPC carried the motion that Species at Risk should not be included in the Assessment Report.

Throughout the process of completing the Assessment Report members of the SPC have also identified a number of items that do not directly fit within the Assessment Report framework but do warrant mention. These items are:

- Lake Simcoe Regional Airport drinking water system in Oro-Medonte
- Contaminants treated at a water supply facility may not be identified as an Issue
- Transportation Corridors (Roads and Highways)

Information on these items can be found in the respective chapter within the Assessment Report.

3 Moving towards Source Protection Plans

The Assessment Reports will be the basis for the next stage of the Source Protection process – developing Source Protection Plans and making local policy decisions for protecting the quality and quantity of drinking water. Source Protection Plans will outline how significant threats are to be mitigated. It builds on the science of the Assessment Report and the input from stakeholders and residents. Plans will be a powerful tool to make sure that our water is protected forever. It will dictate the methods by which all the different threats identified can be made less harmful. It will also put policies in place to make sure that if no threat exists, that it never can. It protects our health and our environment from the overuse of water supplies. You are encouraged to follow the development of the source protection plans at www.ourwatershed.ca over the next two years.

4 List of Acronyms

Acronym	Description
ADCP	Acoustic Doppler Current Profiler
AES	Atmospheric Environment Service
AET	Actual Evapotranspiration
AO	Aesthetic Objective
ANSI	Areas of Natural and Scientific Interest
AR	Assessment Report
ASM	Agricultural Source Material
AVI	Aquifer Vulnerability Index
BMPs	Best Management Practices
CA	Conservation Authority
CAMC-YPDT	Conservation Authorities Moraine Coalition- York, Peel, Durham, Toronto
CWA	Clean Water Act, 2006
CWB	Conceptual Water Budget
DNAPLS	Dense Non -Aqueous Phase Liquids
DWSP	Drinking Water Source Protection
ELC	Ecological Land Classification
ET	Evapotranspiration
GIS	Geographic Information System
GAC	Granular Activated Carbon
GUDI	Groundwater Under the Direct Influence of Surface Water

Acronym	Description
HVA	Highly Vulnerable Aquifer
HYDAT	Hydrometric Data
HWM	High Water Mark
ICA	Issues Contributing Area (Now, WHPA-ICA or IPZ-ICA)
IPZ	Intake Protection Zone
IPZ-ICA	Intake Protection Zone – Issue Contributing Area
ISI	Intrinsic Susceptibility Index
LIO	Land Information Ontario
LIS	Laurentide Ice Sheet
LSRCA	Lake Simcoe Region Conservation Authority
LSEMS	Lake Simcoe Environmental Management Strategy
mASL	Metres above sea level
mbgs	Metres below ground surface
MECP	Ministry of the Environment, Conservation and Parks (Previously, the Ministry of the Environment [MOE])
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment (Now, the Ministry of the Environment, Conservation and Parks [MECP]
MOE LUT	Ministry of the Environment Look Up Table
MOVE.1	Maintenance of variance extension type 1 (linear regression method)
MPAC	Municipal Property Assessment Corporation
MW	Municipal Well
NAICS	North America Industrial Classification System

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Acronym	Description
NASM	Non-Agricultural Source Material
NVCA	Nottawasaga Valley Conservation Authority
ODWS	Ontario Drinking Water Standards
OGS	Ontario Geological Society
PCB	Polychlorinated Biphenyls
PGMN	Provincial Groundwater Monitoring Network
PTTW	Permit To Take Water
PWQMN	Provincial Water Quality Monitoring Network
PWQO	Provincial Water Quality Objectives
QCP	Quality Control Program
SCS	Soil Conservation Science
SGBLS	South Georgian Bay-Lake Simcoe
SGBWLS	South Georgian Bay- West Lake Simcoe
SGRA	Significant Groundwater Recharge Area
SSEA	Severn Sound Environmental Association
SSGW	South Simcoe Groundwater Study
SPA	Source Protection Area
SPC	Source Protection Committee
SPR	Source Protection Region
STP	Sewage Treatment Plant
SWP	Source Water Protection
SWAT	Surface to Well Advection Time

Acronym	Description
TAC	Thorncliffe Aquifer Complex
TCC	Trent Conservation Coalition
TCE	Trichloroethylene
TR	Technical Rules
ToR	Terms of Reference
TOT	Time of Travel
TSSA	Technical Standards and Safety Authority
TWCA	Total Water Contributing Area
UTM	Universal Transverse Mercator
WHPA	Wellhead Protection Area
WHPA-ICA	Wellhead Protection Area – Issue Contributing Area
WSC	Water Survey of Canada
WSS	Water Supply System
WTP	Water Treatment Plant
WWIS	Water Well Information System