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1.0 INTRODUCTION

1.1 OVERVIEW

Following the tragedy in Walkerton (May 2000) when the town's drinking water became contaminated with a specific strain of *Escherichia coli* (*E. coli*) and *Campylobacter* bacteria, the Ministry of the Environment and Climate Change (MOECC) appointed Justice O'Connor to preside over the Walkerton Inquiry. Justice O'Connor made 121 recommendations in a two-part report, which included implementing a watershed-based, multi-barrier approach to protecting Ontario's drinking water.

Many of Justice O'Connor's recommendations were implemented with the introduction of the *Safe Drinking Water Act, 2002 (SDWA)*, which dealt with the treatment, distribution, and testing of drinking water, as well as with notification protocols and the training of operators. In 2006, the *Clean Water Act (CWA)* was introduced to address Justice O'Connor's recommendations pertaining to drinking water source protection. Drinking water source protection is considered the first step in the multi-barrier approach to ensuring safe drinking water.

Subsequent barriers address treatment, distribution, monitoring, and responses to emergencies. The key components of the CWA legislation include:

- Establishing Source Protection Areas (SPAs) and Regions;
- Establishing Source Protection Authorities (SPAs);
- Establishing Source Protection Committees (SPCs);
- Preparing Terms of Reference for the Assessment Report;
- Preparing the Assessment Report;
- Preparing the Source Protection Plan (SPP);
- Establishing the Ontario Drinking Water Stewardship Program;
- Establishing timelines; and
- Consulting with the public.

1.2 CLEAN WATER ACT, 2006

The CWA which came into effect in July 2007, sets the legal framework that ensures communities are able to protect their municipal drinking water supplies by developing collaborative, locally driven, science-based protection plans. Communities will identify threats to local water sources and then take action to reduce or eliminate these threats. The CWA can be found at http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_06c22_e.htm.

1.2.1 Provincial Ministries

In addition to the CWA and the SDWA, the MOECC is responsible for administering and enforcing the *Ontario Water Resources Act, 1990* and the *Environmental Protection Act, 1990* and is a key partner in the development of SPPs for watersheds in Ontario. Through regulations, legislation, and enforcement combined with innovative programs and initiatives, strong partnerships, and public engagement the ministry works to protect, restore, and enhance the natural environment and provide all Ontarians with

***E. coli* and *Campylobacter* bacteria:** Bacteria that are commonly found in the intestines of humans and animals. Some types of *E. coli* can cause serious illness for humans.

Watershed: An area of land that drains downslope. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves downstream.

safe and clean air, land, and water. In particular, the ministry provides funding and guidance with respect to Wellhead Protection Area (WHPA) delineation and drinking water systems.

The Ministry of Natural Resources (MNR) is committed to protecting and managing the province's natural resources, or its "natural capital," and making the interest from that capital available for individuals, communities, and economies that depend on it. In doing so, the ministry contributes to the environmental, social, and economic well-being of the people of Ontario, meeting not only today's needs, but also ensuring these resources are available for future generations. In support of this mission, the MNR is responsible for providing funding and guidance for water budgets aimed at source protection planning.

Note: The Ministry of Environment, Conservation and Parks has undergone several name changes throughout the years. It was called the Ministry of Environment (MOE) in the early 2000's. In June 2014, the name was changed to the Ministry of the Environment and Climate Change (MOECC). In June 2018, the name was changed yet again, to the Ministry of the Environment, Conservation and Parks (MECP), as it is currently known.

In June 2014, the Ministry of Natural Resources (MNR) changed its name to the Ministry of Natural Resources and Forestry (MNRF). In 2021, the Ministry of Natural Resources and Forestry changed its name to Ministry of Northern Development, Mines, Natural Resources and Forestry.

The recent and past names of both Ministries are used within this document.

1.2.2 Regulations

The CWA and its regulations can be found at www.e-laws.gov.on.ca. The four regulations under the CWA are:

- O. Reg. 231/07 (Service of Documents);
- O. Reg. 284/07 (Definitions of Source Protection Areas and Regions);
- O. Reg. 288/07 (Source Protection Committee Names and Structure); and
- O. Reg. 287/07 (General).

O. Reg. 287/07 provides the framework for the terms of reference, for the SPCs, the assessment report, and the source protection plan, including the required public consultation.

1.2.3 Technical Rules

The *Technical Rules* outline the legislated content for assessment reports across Ontario. The *Technical Rules* report was posted on the MOECC's website in December 2008 and further amended in November 2009. The 2017 version of the document can be found at: <https://www.ontario.ca/page/2017-technical-rules-under-clean-water-act>.

Amendments to the Credit Valley Assessment Report resulting in versions 2.0, 3.0 and 4.0 were made using the 2017 Director's Technical Rules and Tables of Drinking Water Threats. Sections of the Assessment Report that were not updated as part of those amendments refer to the 2009 edition of the Director's Technical Rules and Tables of Drinking Water Threats. The *Technical Rules* contain definitions of key terms, as well as 143 specific requirements or rules for the content of an assessment report. The rules are organized by chapter and include key aspects of the methodologies used in the underlying analysis. The amended rules guide the development of this assessment report. As part of the *Technical Rules*, the Province has also provided provincial Tables of Drinking Water Threats that establish the risk score for the different combinations of municipal drinking water threat activities and the corresponding vulnerable area

types and scores. There are also standards to be used in preparing maps so that the symbology is consistent from one source protection area to another.

1.2.4 Provincial Technical Bulletins

In addition to the legislated, regulatory requirements and the *Technical Rules*, the province provided a series of technical bulletins to assure accuracy and consistency with other source protection authorities across the province. The guidance and bulletins advised staff with additional direction on how to complete the analyses required, and outlined the technical work required to comply with legal requirements. Detailed guidance materials outlining how to conduct the various technical studies included in an assessment report were developed between 2005 and 2008 by the MOECC. Subsequently, a series of technical bulletins was issued by the MOECC interpreting the *Technical Rules*. In the case of a conflict between the Technical Bulletins and the *Technical Rules*, the rules govern the requirements.

1.3 OBJECTIVES

The objectives of drinking water source protection are to identify areas where municipal drinking water sources may be at risk from quantity or quality threats, to assess the level of risk, and to put in place measures to eliminate or manage the threats. To do so, the flow systems in the study area associated with drinking water sources (both groundwater and surface water) must be understood. These systems are described in this Assessment Report in support of the delineated vulnerable areas around wells and intakes. Vulnerability of these sources must also be assessed to determine the threat presented by the activities that occur on the land. Both vulnerability and threat are presented in this Assessment Report.

The Source Protection Plan (SPP) for the Credit Valley Source Protection Authority (CVSPA) was developed by the CTC SPC and outlines measures, by way of policies, to protect against the current and future potential risks associated with municipal drinking water sources. Drinking water threats that are identified as potentially significant must be addressed by policies in the SPP. The SPC has the option to include policies to address, some or all potentially, low and moderate drinking water threats, or to address these at a later time.

1.4 SOURCE PROTECTION PROCESS AND STUDY PARTNERS

The source protection planning process is directed by a group of 21 local stakeholders and a Chair, referred to in regulation as the CTC SPC. The committee members (<https://www.ctcswp.ca/who-we-are/ctc-source-protection-committee/>) are municipal, business, and public representatives who act as a Board of Directors, and are responsible for the development of the terms of reference (work plan), assessment report (technical assessment to identify vulnerable areas and drinking water threats), and the SPP (policies and identification of who is responsible for implementation) for each of the three source protection areas within the CTC Source Protection Region. The CTC SPC Chair is appointed by the MOECC. Members of the CTC SPC are appointed by the lead source protection authority for the CTC.

For the purposes of assessment report and SPP development, the CVSPA partners with the Central Lake Ontario Source Protection Authority (CLOSPA) and the Toronto Region Source Protection Authority (TRSPA). A Memorandum of Agreement among the three partners source protection authorities sets out the responsibilities and operating arrangements. Under *Ontario Regulation 288/07* the TRSPA was assigned the lead responsibility in the CTC Source Protection Region and was responsible to support and ensure that the SPC fulfills its responsibilities to prepare the terms of reference, assessment reports and a SPP. In 2021 the role of the lead Source Protection Authority was transferred from the TRSPA to the Credit Valley Source Protection Authority (CVSPA).

The CVSPA is responsible for providing technical staff to support the work of the SPC and for the submission of the terms of reference, assessment reports and SPP for its source protection area for approval by MOECC.

Each task within the drinking water source protection process must have an assigned lead. In some cases, the work is led by a municipality, while in others the conservation authority on behalf of the source protection authority takes the lead. For some tasks several parties share the responsibilities. Regardless of the task leadership, the CTC SPC has the decision-making authority regarding the inclusion of all work or findings in the assessment report and SPP to be submitted through the CVSPA to the province for final approval.

For drinking water source protection purposes, the jurisdiction of the Credit Valley Conservation is referred to as the Credit Valley Source Protection Area.

The jurisdiction and membership of the Credit Valley Source Protection Authority is the same as that of Credit Valley Conservation Board.

The Province of Ontario provided funding for the completion of the assessment report and SPP. The Province began providing funding in 2005 to conservation authorities and municipalities to undertake technical studies. All source protection funding from the province was provided to the lead source protection authority. Financial support to municipalities to undertake assigned tasks has been provided through either direct grants from the province or Memorandum of Agreement transfers between the lead authority and the municipalities. Public involvement and consultation are an important part of both the assessment report and SPP, as local residents are key partners in the implementation of the plan and need to have a role in its development.

1.5 STUDY AREA

The province has organized the Source Protection Program using watershed boundaries. This approach was recommended by Justice O'Connor as appropriate for water management. Since both groundwater and surface water flow across municipal boundaries, it is difficult to assess and control water quality threats within the constraints of municipal jurisdictions. Source Protection Areas (SPA) has been established by the province using the boundaries of conservation authorities as the primary basis for organizational units. An assessment report and SPP must be developed for each SPA.

The CTC Source Protection Region is one of 19 regions and areas established across the province under the CWA, as shown in **Figure 1.1**. Within the CTC Source Protection Region (which is greater than 10,000 square kilometres), there are a number of watersheds and three SPAs: CVSPA, TRSPA and CLOSPA. The geographic extent of the CTC Source Protection Region is shown in **Figure 1.2**.

The Credit River watershed forms the CVSPA as one of the SPAs within the CTC Source Protection Region established in regulation under the CWA. A map showing the boundary of CVSPA is presented in **Figure 1.3**. The TRSPA and the CLOSPA form the remainder of the CTC Source Protection Region and comprise nine and 15 watersheds, respectively.

CVSPA comprises 22 sub-watersheds, the largest of which are the West Credit, Black Creek, Silver Creek, Shaw's Creek, and Norval to Port Credit. **Chapter 2** of this Assessment Report provides further details. The municipalities within the CVSPA include upper-tier and lower-tier municipalities, as shown in **Figure 1.3**. Municipal drinking water supplies are both surface water-sourced, from Lake Ontario, and groundwater-sourced, from wells. The 15 municipalities wholly or partially within the CVSPA include:

- Region of Peel;
- City of Mississauga;
- City of Brampton;
- Town of Caledon;
- Region of Halton;
- Town of Halton Hills;

- Town of Milton;
- Town of Oakville;
- County of Wellington;
- Town of Erin;
- County of Dufferin;
- Town of Orangeville;
- Town of Mono;
- Township of Amaranth; and
- Township of East Garafraxa.

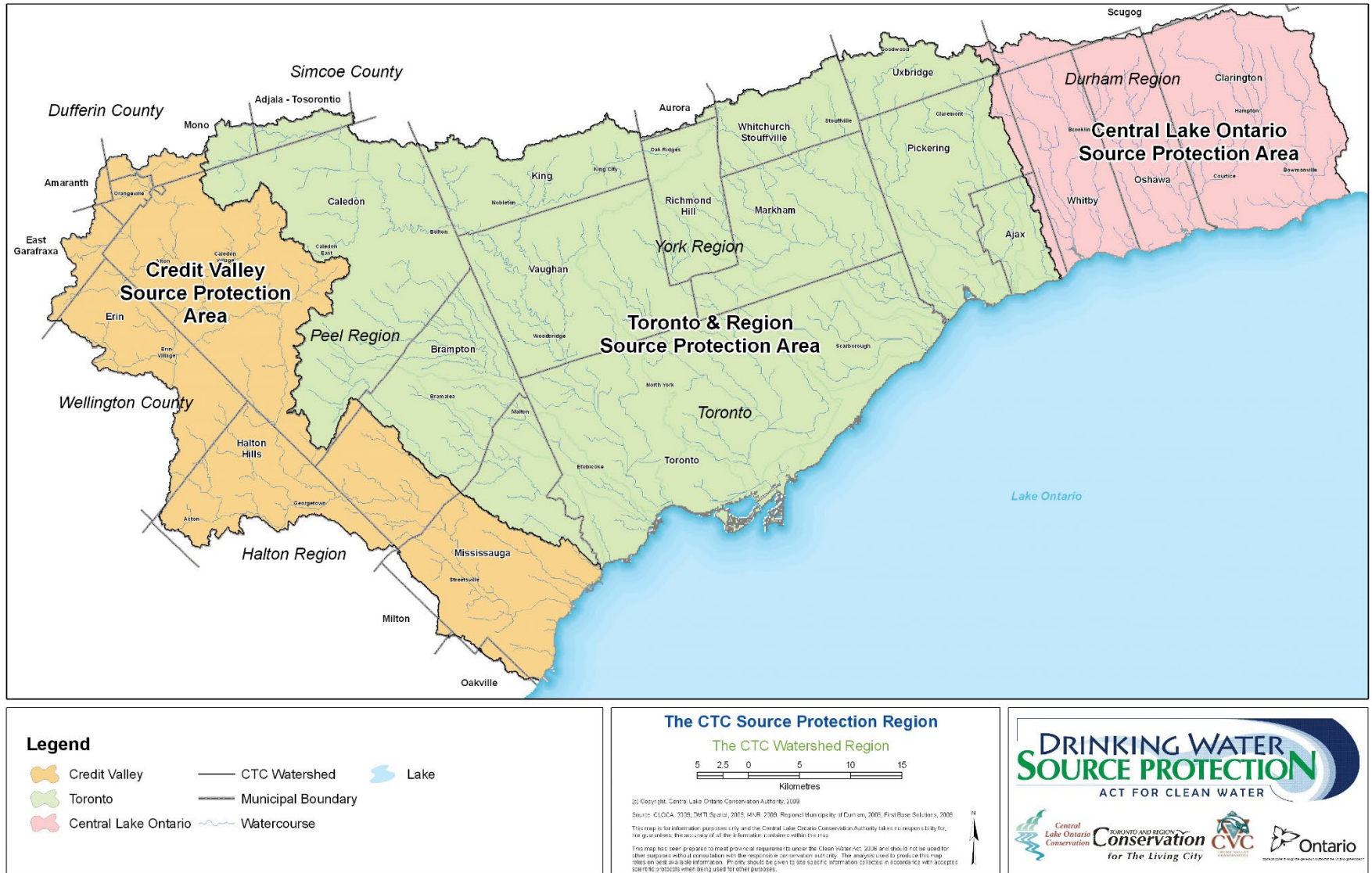


Figure 1.2: CTC Source Protection Region

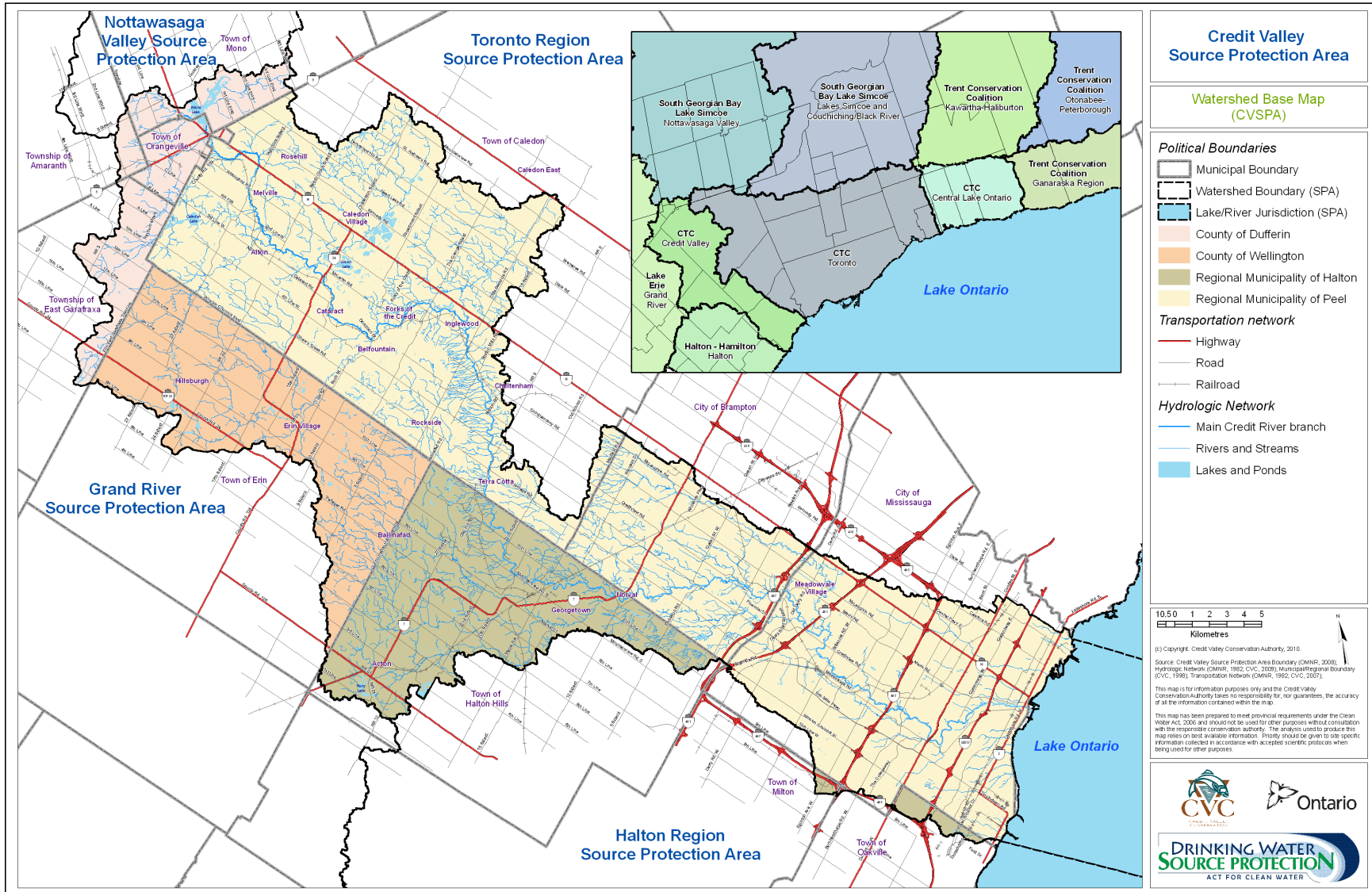


Figure 1.3: Credit Valley Source Protection Area (CVSPA)

1.6 SCOPE OF WORK

Municipal drinking water supplies within the CVSPA are sourced from both Lake Ontario and groundwater-based (aquifer) systems. The scope of work required for the Assessment Report is to assess vulnerable areas for both groundwater and surface water sources within the study area, using methodologies and techniques which comply with the *Technical Rules*.

In addition to its primary purpose in meeting the CWA requirements, this Assessment Report contributes to the sustainable development and integrated watershed management goals for the CVSPA. It will be complementary to watershed planning processes undertaken by CVC staff in support of the *Oak Ridges Moraine Conservation Plan* and will assist in refining management priorities for the ongoing implementation of Watershed Plans. The scope of work for this Assessment Report includes the following for all CVSPA watersheds:

- Identification of the physical and human characteristics (i.e., physiography, soils, land use, and geology);
- A summary of the understanding of groundwater and surface water flows (quantity);
- A summary of the current status of groundwater and surface water quality;
- Identification of vulnerable areas (i.e., highly vulnerable aquifers (HVAs), significant groundwater recharge areas (SGRAs), wellhead protection areas (WHPAs) and intake protection zones (IPZs));
- Identification of known or potential threats to water quality based on a review of available data and feedback from municipal partners and watershed residents; and
- Identification and prioritization of data and knowledge gaps so efforts are directed to collect missing information.

1.6.1 Assessment Report

This Assessment Report is divided into Chapters, below is a description of each chapter.

Chapter 1 provides a brief overview of the provincial context for drinking water source protection, previous work done on this issue, and the goals of the drinking water source protection planning process. It also lists the various agencies working on source protection. **Chapter 2** describes the physical and human characteristics of the CVSPA jurisdiction, including its physiography, geology, hydrology, terrestrial and aquatic ecology, human characterization, water quality, and water uses. **Chapter 3** summarizes the water budget and water quantity stress assessment. **Chapter 4** identifies the vulnerable areas required as part of the drinking water source protection program within the study area. **Chapter 5** describes how drinking water threats and issues were identified and lists threats within CVSPA's jurisdiction. **Chapter 6** summarizes the Assessment Report contents and next steps. **Chapter 7** is the list of references, which includes a number of technical reports prepared by consultants working for municipalities, or the CVSPA. These reports provide in-depth descriptions of the technical work, approaches, and findings; all were subject to extensive peer review followed by review and acceptance by the CTC SPC as foundation documents to prepare this Assessment Report. These technical reports are available online at <https://www.ctcswp.ca/technical-docs/>.

The appendices have been organized to parallel the Chapters in the body of this Assessment Report. **Appendix A** provides a description of the data sources. **Appendix B** provides additional information for **Chapter 2** on the Watershed Characterization data gaps and supplementary water quality data. **Appendix C** documents the methodologies employed in the development of understanding the water

supply and demand across the CVSPA. **Appendix D** provides additional documentation of the vulnerable areas assessment process including the MOECC Technical Bulletins on vulnerability. **Appendix E** includes the MOECC Technical Bulletin for the threat assessment process as well as output from the South Georgian Bay Lake Simcoe conformance exercise on the enumeration of threats, summaries of the municipal threat assessment reports prepared for municipalities and a summary of the work completed for the Lake Ontario Collaborative for the assessment of threats to Lake Ontario drinking water intakes.

1.6.2 Source Protection Plan

The Source Protection Plan (SPP) is a document that sets out the policies to protect source water against drinking water threats identified in the CTC Assessment Reports. The SPP identifies how drinking water threats will be reduced, eliminated, or monitored, who is responsible for taking action, timelines, and how progress will be measured.

Different regulatory bodies or agencies or persons are identified by the CTC SPC to implement different policies within the SPP. For example, if the policy requires changing a provincially issued approval, a provincial ministry would be identified as the responsible party to take the necessary steps to implement the policy. Municipalities would be responsible for implementation if the SPP policy requires new zoning by-laws, or amendments to the Official Plans.

The SPC must develop policies in its SPP to address the significant drinking water quality and quantity threats identified in this Assessment Report. The Source Protection Committee may choose to develop policies in the SPP that addresses the moderate and low level threats identified in this Assessment Report.

Implementation actions will be mandatory for significant drinking water threat policies. If the SPP includes policies for low or moderate drinking water threats, the responsible party is to “have regard” for the policy in making decisions.

The SPP must include policies to require annual reporting by implementing bodies to the lead Source Protection Authority on actions taken to implement significant threat policies. The lead authority is responsible for preparing and submitting a public annual report to the Minister of the Environment and Climate Change, summarizing implementation of the policies developed under the SPP.

1.7 CONSULTATION

Consultation has been integral to the development of this Assessment Report (**Table 1.1**). Prior to any technical work being incorporated into this Report, the public has been given the opportunity to comment and provide feedback on new or revised technical material. Consultation periods have lasted for a minimum duration of 30 days.

Table 1.1: Public Consultation Record

Version of Assessment Report	Timeline	Focus of Public Consultation
Draft Proposed Assessment Report (Version 0.1)	2010, 2011	Technical content – Watershed Characterization, Water Budget, Vulnerability Assessment, and Threats Enumeration Chapters
Draft Proposed Updated Assessment Report (Version 0.3)	Spring 2012	Region of Halton (Acton, Georgetown) – Water Quality Vulnerability Assessment
Updated Approved Assessment Report (Version 0.4)	Fall 2013	Water Quantity Risk Assessment and Tier 3 Water Budget (Halton Hills)
Approved Amended Assessment Report (Version 2.0)	Fall 2018	Region of Peel (Inglewood) – Water Quality Vulnerability Assessment
Approved Amended Assessment Report (Version 3.0)	Summer 2019	Region of Peel (Alton) – Water Quality Vulnerability Assessment

Note: The Credit Valley Assessment Report was approved by the Minister of the Environment, Conservation and Parks in January 2012 (with knowledge that additional technical work would be required) (Version 0.2) and then again in July 2015 (Version 1.0).