Chapter 7: City of Kawartha Lakes

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7 City of Kawartha Lakes

7.1 Introduction

This chapter contains information on the Woodville and Woods of Manilla drinking water systems that service the Village of Woodville and the subdivision of Woods of Manilla, respectively. The Woodville water supply system contains two wells located within the Lake Simcoe watershed of the South Georgian Bay-Lake Simcoe Source Protection Region (SGBLS SPR). A small portion of this system's WHPA extends into the Trent Conservation Coalition (TCC) SPR. The Woods of Manilla water supply system contains two wells, one of which is located in the Lake Simcoe watershed of the SGBLS SPR. The second well is located in the Kawartha-Haliburton Source Protection Area of the TCC SPR. Genivar consultants have completed the work presented, which has also been reviewed by South Georgian Bay-Lake Simcoe Source Water Protection staff and members of the Technical Work Group or the Source Protection Committee~~Genivar consultants have completed the work presented within this chapter, all of which was reviewed by South Georgian Bay-Lake Simcoe Source Water Protection staff, members of the Technical Working Group, and the City of Kawartha Lakes staff~~. In this chapter, each of the groundwater systems and surface water systems is discussed separately for easier readability.

Each municipal system section begins with an introduction of the characteristics of the drinking water system. This includes an overview of the location, number of people served, and source of the water supply. The sections following the system introductions are comprised of a Vulnerability Assessment and Issues and Threats evaluation of the system. The Vulnerability Assessment includes the delineation of the Vulnerable Area(s) (Wellhead Protection Area), and the assignment of a Vulnerability Score for the delineated area. An Uncertainty Rating is also provided for the Vulnerable Area delineation and the Vulnerability Assessment as per Technical Rules 13-15 (Part I.4 – Uncertainty Analysis – Water Quality (MOE, 2008a) to express the level of confidence in the results based on the information that was available for the study.

The Issues evaluation is intended to identify chemical parameters or pathogens 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. Any Issues identified for the systems will be listed in this section, along with a map illustrating the Issue's Contributing Area if an Issue is known. The Threats evaluation identifies potential Significant Drinking Water Threats within the delineated Vulnerable Areas. This process includes creating lists for Drinking Water Threats for Activities and Conditions, generating maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats, and a final enumeration of Significant Drinking Water Threats.

For more information, readers are encouraged to read Chapter 5: Methods Overview as well as the Genivar report and memos (found in Appendix MO and K) for a more in-depth description of the methods used, as well as the Glossary for any unfamiliar terms.

7.2 Drinking Water Systems

The City of Kawartha Lakes operates groundwater based water supplies in two communities with vulnerable areas within the Lake Simcoe watershed, and does not have any surface water intakes within the SGBLS SPR. As shown in Table 7-1 and Figure 7-1 the Woodville and Woods of Manilla groundwater supplies are within the Lake Simcoe watershed of South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Region (SPR). Table 7-1 also indicates the Source Protection Region and corresponding lead Source Protection Authority (SPA) for the municipal water supplies.

Table 7-1: Municipal Groundwater Supplies in the City of Kawartha Lakes

Local Municipality	Community Water Supply	Source Protection Region (SPR) & Lead Source Protection Authority (SPA)	Location where entire Assessment can be obtained
City of Kawartha Lakes	Woodville	SGBLS SPR & Lakes Simcoe and Couchiching - Black	This chapter
City of Kawartha Lakes	Western Trent/Palmina*	SGBLS SPR & Lakes Simcoe and Couchiching - Black River SPA	Black-Severn Assessment Report (Chapter 6)
City of Kawartha Lakes	Omemee Victoria Glen	Trent Conservation Coalition (TCC) SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Woodfield	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Manorview Estates	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Canadiana Shores	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Janetville	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Pleasant Point	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	King's Bay	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Mariposa Estates	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Sonya Village Estates	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Victoria Place	TCC SPR & Kawartha-Haliburton SPA	TCC SPR – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Woods of Manilla	SGBLS SPR- TCC SPR & Lakes Simcoe and Couchiching-Black River SPA and Kawartha-Haliburton SPA	This chapter
City of Kawartha Lakes	Birch Point	TCC SPR & Otonabee Region CA	TCC SPR – Otonabee-Peterborough Assessment Report
City of Kawartha Lakes	Pinewood	TCC SPR & Otonabee Region CA	TCC SPR – Otonabee-Peterborough Assessment Report

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A small portion of the Cannington WHPA crosses the Durham Region municipal boundary into the City of Kawartha Lakes. Detailed information regarding the Cannington system is found within Chapter 6 (Durham Region). The Western Trent/Palmina system is located within the Black-Severn River watershed of the Lakes Simcoe and Couchiching-Black River Source Protection Area of the SGBLS SPR. Detailed information for this system is located in Chapter 6 of Part 2 of this Assessment Report.

Table 7-2: WHPAs that cross into and out of the City of Kawartha Lakes in the SGBLS SPR.

Local Municipality that WHPA extends into	Municipality where wellhead is located	Name of Water Supply	Source Protection Region / Lead Conservation Authority (CA)	Location where entire Assessment can be obtained
City of Kawartha Lakes	Township of Brock	Cannington	SGBLS SPR Lake Simcoe Region CA	This report (Chapter 6)
City of Kawartha Lakes	City of Kawartha Lakes	Western Trent/Palmina	SGBLS SPR Lake Simcoe Region CA	This report (Part 2: Chapter 6)
City of Kawartha Lakes	City of Kawartha Lakes	Woods of Manilla	SGBLS SPR Lake Simcoe Region CA & TCC SPR Kawartha Region CA	This report (This chapter) & TCC SPR Assessment Report
City of Kawartha Lakes	City of Kawartha Lakes	Woodville	SGBLS SPR Lake Simcoe Region CA	This report (This chapter)

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7.3 Woodville Municipal Residential Water Supply

The Woodville Municipal Residential Water Supply obtains water from two wells: Well 1 and Well 2. These wells are located to the south of the community. Two former municipal wells, Old Well 1 and Old Well 2, were located within the community and have been decommissioned.

The original Well 2 was designated TW5/99 and was replaced following damage during some on-site work. TW5/99 operated as Well 2 from 1999 to 2004. Well 2 now refers to TW1/03, which has been in operation since 2003. Well 1 has been in operation since 1999 and was originally designated as TW2/99.

The Woodville wells operate under Permit To Take Water #3545-6WVT2L which expires December 31, 2016. Under this Permit, Well 1 and Well 2 can each operate at a maximum rate of 409 Litres/min ((L/min) (589.162 m^3/day)). The Permit includes a third well, Well 3, which is occasionally used to replenish a pond located near the municipal well site. As this well does not operate on a constant basis and is not operated as a supply of drinking water, a WHPA is not required. The maximum rate for this well is 23 L/min (32.832 m^3/day). The maximum permitted combined rate for the system is 589.162 m^3/day.

The Woodville wells are screened in limestone bedrock with well depths ranging between 4.3 and 8.5 mbgs. The wells are open hole into bedrock between 6.7 and 7.9 mbgs. The bedrock aquifer in which the municipal wells are constructed is designated as the Woodville Aquifer. The bedrock in this area is identified as the fine to coarse grained limestone with shale partings of the lower member of the Lindsay Formation.

Information presented for the Woodville section of this Chapter is based on the Assessment of Drinking Water Threats-Municipal Residential Groundwater Supplies: The City of Kawartha Lakes report, Genivar 2010c.

7.3.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal residential water supply wells. The Groundwater Vulnerability has been assessed to provide an indication, within the WHPA, which current (or future) Threats at the surface present the greatest risk to contaminate the water supply. The Vulnerability Analysis considers the WHPA and the Groundwater Vulnerability, as well as the potential for the vulnerability to be increased by man-made (anthropogenic) structures, through Transport Pathways, by developing a “Vulnerability Score” within the WHPA. Conversion of Vulnerability categories (High, Medium, and Low) to Vulnerability Scores (10, 8, 6, 4, and 2) results in a new map for each WHPA that expresses the relative degree to which a Threat could affect the

drinking water supply. A higher value Vulnerability Score will always be assigned to the immediate vicinity of the well and to any areas that are shown to be vulnerable.

The Groundwater Vulnerability for the Woodville Municipal Residential Water Supply has been determined following the process recommended in the Technical Rules. The areas that contribute groundwater to the wells, as determined using the numerical groundwater flow model, were delineated as WHPA. The thickness and type of soil materials overlying the water supply aquifer was assessed and rated as either High, Medium, or Low Vulnerability. The potential for man-made structures to increase the Vulnerability were considered by locally increasing the Vulnerability Scores where these features were identified. The WHPA and the increased Vulnerability were then considered together as per the Technical Rules to determine a Vulnerability Score within the delineated WHPA for the Woodville Municipal Residential Water Supply. The Vulnerability Scores are then used in the threats assessment to identify areas where land use activities could result in Significant, Moderate, or Low Threats to drinking water or to identify existing activities that are considered to present a Significant Threat.

Details of the methods for the vulnerability analysis are provided in Technical Memorandum B1 – Groundwater Vulnerability Assessment Methods (Appendix MO) and details of the work performed to assess the Groundwater Vulnerability in Woodville are provided in Technical Memorandum Technical Memorandum C1 – Groundwater Vulnerability Assessment - Woodville (Appendix K).

7.3.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Woodville Municipal Residential Water Supply wells, as delineated by Genivar (2010c), is shown in Figure 7a-1. WHPA-A has been added to include the 100 m radius from each municipal well. The WHPA was delineated using a calibrated 3-dimensional numerical groundwater flow model.

The WHPA for the Woodville Municipal Residential Water Supply wells represents the composite capture zones from three pumping scenarios. Each well was operated individually at the maximum PTTW rate and in the third scenario the wells were operated together to reflect the system maximum. The use of multiple pumping scenarios and the maximum permitted pumping rates to generate a composite WHPA is considered to reflect a conservative estimate of the maximum capture zones likely to be observed from these wells under planned future operating conditions.

The WHPA presented in Figure 7a-1 is different than the original delineations prepared by MEL (2004). The capture zones are now significantly wider in the direction perpendicular to groundwater flow (east to west) and extend in the direction of the observed groundwater flow

divide. These changes are consistent with the use of a more complex model to delineate the WHPA and the use of higher pumping rates. A water balance between recharge and water taking was obtained for the individual steady-state capture zones.

The WHPA for the Woodville Municipal Residential Water Supply wells is observed to extend past the identified surface water divide between the Lake Simcoe and Kawartha Lakes drainage basins. Part of the WHPA is within the Kawartha-Haliburton Source Protection Area within the Trent Conservation Coalition Source Protection Region.

7.3.1.2 Groundwater Vulnerability

The Groundwater Vulnerability within the WHPA of the two municipal residential drinking water wells in Woodville is shown in Figure 7a-2. The Groundwater Vulnerability has been determined for the bedrock aquifer using the regional Aquifer Vulnerability Index (AVI) method as documented in Technical Memorandum C1 (Appendix K). The Groundwater Vulnerability to the bedrock aquifer has been rated as High throughout the WHPA. This is consistent with observations from the numerical modelling outputs that indicate that groundwater can travel from surface to the wells within 25 years under steady-state operating conditions.

7.3.1.3 Transport Pathway Increase

Technical Memorandum C1 (Appendix K) documents the consideration of Transport Pathways to increase the Vulnerability Rating as per the Technical Rules. The Vulnerability Rating can be increased from Medium to High, Low to Medium, or from Low to High in accordance with the potential for artificial Transport Pathways to increase the observed Vulnerability.

In accordance with the Technical Rules, the Vulnerability Rating of High cannot be increased further to consider Transport Pathways. No Vulnerability increase for Transport Pathways has been considered of the Woodville Municipal Residential Water Supply.

Figure 7a-2 was therefore used to generate the Vulnerability Scores for Woodville.

7.3.1.4 Vulnerability Score

The WHPA zones for the Woodville Municipal Residential Water Supply, as shown in Figure 7a-1, and the Groundwater Vulnerability, as shown in Figure 7a-2, were used to assign a Vulnerability Score by using the matrix from Table 5.3 (Chapter 5: Methods Overview, Section 5.2.4). Figure 7a-3 illustrates the Vulnerability Scores for the Woodville Municipal Residential Water Supply. Figure 7a-3 will be used to assess Drinking Water Threats in Section 7.3.3.

7.3.1.5 WHPA-E ~~/ WHPA-F~~

The municipal wells of the Woodville Municipal Residential Water Supply are considered to be GUDI (Groundwater Under the Direct Influence) and therefore a WHPA-E is required. Technical Memorandum C2 (Appendix K) provides details of work to delineate a WHPA-E for the Woodville Municipal Residential Water Supply.

A WHPA-E has been delineated for the unnamed tributary/ditch that flows east from the Woodville wells to the top of the watershed. The WHPA-E includes a 120 m radius on either side of the mapped watercourse and considers that the intersection between WHPA-A and the watercourse would represent the area of interaction. There are no known Transport Pathways that can contribute surface water into the WHPA-E area~~. A WHPA-F is not required since no Drinking Water Issues were observed.~~ The Vulnerability Score for the WHPA-E has been determined in accordance with the Technical Rules and is based on ratings for an Area Vulnerability Factor and a Source Vulnerability Factor that reflect the land cover, soil type, permeability, hydrological and hydrogeological conditions, and the depth of the well intake. The Vulnerability Score within WHPA-E is 5.6 as shown on Figure 7a-4.

7.3.1.6 Uncertainty Rating

The Technical Rules require that an Uncertainty Rating of either High or Low be assigned with each Vulnerable Area as outlined in Technical Rules 13-15 (Part I.4 – Uncertainty Analysis – Water Quality (MOE, 2008a). A component of the Uncertainty Rating is to be provided for the WHPA delineation by the technical peer review consultant. A second component of the Uncertainty Rating is to be provided in association with the Vulnerability Assessment.

The Uncertainty Rating associated with the WHPA delineation and Vulnerability Analysis was assessed using a semi-quantitative process outlined in Technical Memorandum B1 (Appendix MO) and described for the Woodville Municipal Residential Water Supply in Technical Memorandum C1 (Appendix K). As mentioned above, a technical peer review consultant was also used to assess the uncertainty of the WHPA delineation.

The uncertainty delineation of the Woodville WHPAs was determined by peer reviewers from Dillon Consulting using a standard scoring matrix (Table 1, Appendix MO). The Uncertainty Rating assigned for the Woodville WHPAs is High. The full results of the WHPA delineation Peer Review process, for Woodville is available in Appendix K and discussed in Chapter 5 (Methods Overview).

The method for assigning the Uncertainty Rating for the Vulnerability Analysis considered the type, quantity, and quality of available data, the methods used to determine the vulnerability assessment components, and the nature of the groundwater flow system.

The Vulnerability Analysis Uncertainty Rating assigned for the Woodville Municipal Residential Water Supply is High. In this case, the uncertainty rating of High reflects the nature of the fractured bedrock aquifer that is connected to the water supply aquifer and the quantity and distribution of data available within the delineated WHPA beyond the immediate vicinity of the municipal residential wells. The High Uncertainty Rating reflects the possibility that the potential variability in the actual subsurface conditions may result in an underestimate of the contributing areas, the travel time to the wells, or the protection provided by the soil materials overlying the aquifer. The assumptions made in the course of the analysis, including the selection of hydraulic conductivity parameters, effective porosities maximum pumping rates, and K-factors for the AVI analysis, are intended to be conservative and protective of the water supply.

Although a High Uncertainty Rating is recommended for the Vulnerability Assessment of the Woodville Municipal Residential Water Supply, the work completed herein represents a meaningful increase in confidence relative to the previous WHPA delineation in 2004.

7.3.2 Drinking Water Issues Evaluation

The intent of the Issues Evaluation is to identify chemical or bacterial situations 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. To be considered a Drinking Water Issue, a parameter needs to be at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water or if there is a trend of increasing concentrations of the parameter and a continuation of that trend that would result in the deterioration of the quality of the water as a source of drinking water (Technical Rule 114.(1)(a-b)). However, a parameter may not be considered an Issue in cases where it is naturally occurring or effective treatment is in place.

Available data describing measured chemical and pathogen water quality in raw and treated water from for the Woodville Municipal Residential Water Supply has been reviewed to identify Drinking Water Issues that are considered likely to result in a deterioration of the quality of water for use as a source of drinking water. Details of the Drinking Water Issues Evaluation for Woodville are provided in Technical Memorandum C3 – Evaluation of Drinking Water Issues – Woodville (Appendix K).

No Drinking Water Issues were identified for Well 1 and Well 2 of the Woodville Municipal Residential Water Supply.

The following are observed parameters that were considered but determined not to be Drinking Water Issues:

Nitrate and sodium concentrations are shown to be slightly increasing but are not projected to exceed the ODWQS of 10 mg/L and 200 mg/L within 50 years. Organic nitrogen persistently exceeds aesthetic/operational ODWQS objectives at both wells and is considered to be a naturally-occurring parameter that will not result in the water being unsuitable as a drinking water source.

Coliforms are typically absent from raw water but have been observed on rare occasions in low numbers that are not indicative of deterioration of the water quality. Treatment is in place and is effective for pathogen parameters. Incidents of turbidity exceeding ODWQS objectives in the treated water are observed on rare occasions and are not persistent.

7.3.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Woodville Municipal Residential Water Supply was completed in accordance with the detailed methodology presented in Technical Memorandum – B5 (Appendix MO). 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, and includes any activity or condition that is prescribed by the regulations as a drinking water threat." An Activity is one or a series of related processes, natural or anthropogenic, that occurs within a geographical area and may be related to a particular land use, whereas a Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities. Therefore, it is not only presently existing Threats that must be regulated, but future ones as well.

The Drinking Water Threats Assessment for the Woodville Municipal Residential Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes preparation of:

- A list of Drinking Water Threats for Activities,
- A list of Drinking Water Threats for Conditions,
- Maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats for Activities,
- Maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats for Conditions, and

- An enumeration of Drinking Water Threats.

7.3.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for Woodville Municipal Residential Water Supply is provided in Chapter 5, Section 5. 5.1.

No additional Drinking Water Threats were identified for consideration. No local circumstances for prescribed Threats were identified.

7.3.3.2 List of Drinking Water Threats – Conditions

The following information sources were consulted to identify existing Conditions that could affect the Woodville Municipal Residential Water Supply system:

- Files provided by the Ministry of the Environment, Conservation and Parks local offices pertaining to licenses, and records of spills in the area of the delineated WHPA.
- Records available from the Ministry of the Environment, Conservation and Parks website containing registry of Brownfield Sites.
- Records from available technical studies and previous contaminant source inventories that identified situations that may qualify as conditions.
- Interviews of City of Kawartha Lakes and Ontario Clean Water Agency staff to identify potential conditions within the identified WHPA for the drinking water supply

No confirmed or potential Conditions have been identified for the Woodville Municipal Residential Water Supply.

7.3.3.3 Identifying Areas of Significant/Moderate/Low Threats – Activities

The areas where Activities are or would be Drinking Water Threats are illustrated on a series of maps based on the Vulnerability Scores and Vulnerable Area delineations. The maps combined with the Technical Rules threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at https://threats.swpip.ca/. ~~The maps include references to a series of tables prepared by MOE to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php.~~

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7.3.3.3.1 Pathogen Parameters

The Technical Rules can be used in conjunction with the Vulnerability Scores ~~The Key Table~~ on Figure 7a-5 ~~can be used in conjunction with the Vulnerability Scores~~ to identify the areas where

Activities associated with pathogen threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Woodville Municipal Residential Water Supply. The ~~Table of Drinking Water Threats~~Technical Rules do~~es~~ not identify activities that can be low drinking water threats within WHPA-A or WHPA-B when the Vulnerability Score is 10. Activities that are or would be Significant Drinking Water Threats for pathogens can be observed within the areas where the Vulnerability Score is 10. Pathogens can also only be a Significant, Moderate, or Low Threat within WHPA-A and WHPA-B.

7.3.3.3.2 Chemical Parameters

The Technical Rules can be used in conjunction with the Vulnerability Scores ~~The Key Table~~ on Figure 7a-6 ~~can be used in conjunction with the Vulnerability Scores~~ to identify the areas where activities associated with chemical threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Woodville Municipal Residential Water Supply. Activities that are or would be Significant Drinking Water Threats for chemicals can be observed within areas where the Vulnerability Score is equal to or greater than 8.

7.3.3.3.3 DNAPL Chemical Parameters

Figure 7a-7 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of 6 or higher, where activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Woodville Municipal Residential Water Supply. The Technical Rules can be used in conjunction with the Vulnerability Scores~~The Key Table~~ on Figure 7a-7 ~~can be used~~ to identify the circumstances in which these activities associated with DNAPL threats would be significant or moderate threats.

7.3.3.3.4 WHPA-E

Figure 7a-8 illustrates the area of the WHPA-E where Activities are considered to be Significant, Moderate, or Low Drinking Water Threats for the Woodville Municipal Residential Water Supply. The Technical Rules~~able of Drinking Water Threats~~ do~~es~~ not identify activities that can be Significant or Moderate Drinking Water Threats within WHPA-E when the Vulnerability Score is 5.6. The Key Table on Figure 7a-8 can be used to identify the circumstances in which these activities would be Low Threats.

7.3.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 7.3.3.2, no Conditions have been confirmed within the WHPA for the Woodville Municipal Residential Water Supply.

A Condition or potential Condition that has not been identified would potentially be a Significant, Moderate, or Low Threat to Drinking Water based on the combination of Hazard

Rating and Vulnerability Rating as described in Section 5.5.5 (Chapter 5: Methods Overview) and Technical Memorandum A5 (Appendix MO). The Hazard Rating is dependent on whether there is evidence the Condition is causing off-site contamination, and whether the Condition is located on the same property as the supply well.

A Condition would be a threat to municipal drinking water in the following situations:

- **Significant**: where the Vulnerability Score is ≥ 8 and there is evidence that the Condition is causing off-site contamination, and/or that the Condition is located on the same property as the supply well.
- **Moderate**: (1) where the Vulnerability Score ≥ 6 and < 8, and there is evidence that the Condition is causing off-site contamination, and/or that the Condition is located on the same property as the supply well; or (2) Where the Vulnerability Score is 10, and there is no evidence of off-site contamination.
- **Low**: Where the Vulnerability Score ≥ 8 and < 10 and there is no evidence of off-site contamination.

Figure 7a-3 illustrates the Vulnerability Score map for the Woodville Municipal Residential Water Supply system that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

7.3.3.5 Enumerating Drinking Water Threats

~~7.3.3.5~~

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The number of Significant Drinking Water Threats for the Woodville Municipal Residential Water Supply has been determined using the methodology outlined in Technical Memorandum B5 (Appendix MO) and refined using the methodology outlined in Chapter 5 (Section 5.5.6.4.1) of this Assessment Report. There are no significant threats associated with Conditions or Drinking Water Issues.

Table 7-3 documents the refined enumeration of existing activities that are considered to be Significant Drinking Water Threats within the WHPA for the Woodville Municipal Residential Water Supply. Significant Drinking Water Threats were only identified within areas where the Vulnerability Score is 10.

Fifteen (15) activities that are considered to be potential Significant Drinking Water Threats were identified in association with eleven (11) land parcels in the WHPA for the Woodville Municipal Residential Water Supply. Five (5) of the identified significant threats relate to private homes with private individual sewage disposal systems. One potential Significant Drinking

Water Threat was assigned to the WHPA, where the Vulnerability Score was 10, for residential storage of fuel (home heating oil). This threat sub-category has been represented as a single threat for the vulnerable area, rather than the individual properties (see SGBLS 2010). Within the vulnerable area there are five (5) residential parcels where storage of fuel for home heating purposes may be occurring.

There are six (6) parcels within the WHPA that are primarily agricultural land use and have activities occurring that are considered Significant Drinking Water Threats. The activities on these parcels include three (3) parcels used for livestock pasturing, three (3) parcels where pesticides are applied to land, two (2) parcels where agricultural source material is applied to land, and one (1) parcel where agricultural source material is stored.

Table 7-3: Number of Significant Drinking Water Threats for the Woodville Municipal Residential Drinking Water Supply.

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

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Threat Number	Threat	Significant threat counts Number of threats
14.	The storage of snow.	0
15.	The handling and storage of fuel.	1
16.	The handling and storage of dense non-aqueous phase liquid.	0
17.	The handling and storage of an 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 safe aquifer or surface water body.	0
20.	Any activity that reduces the recharge of an aquifer.	0
21.	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	3
22.	The establishment and operation of a liquid hydrocarbon pipeline	0
-	**Totals:**	19~~15~~* significant threats (on 15 properties)

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*5 verified existing Threats, and 10 potential Threats that require further verification (2015)

Note for the table above: The number of parcels identified will typically be less than the number of significant threats as multiple threats can be observed per parcel

7.3.3.5.1 Managed Lands

Technical Rule 16(9) ~~(August 2009)~~ requires the Assessment Report to include maps showing the location of Managed Lands and the percentage of Managed Lands within a Vulnerable Area, including WHPA-A, -B, -C, -D, and -E . This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a threat in the Technical Rules (2021)~~the Table of Drinking Water Threats~~.

Managed Lands were identified and the Managed Lands proportions were determined for the Woodville WHPA as outlined in Technical Memorandum B5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 7.3.3.5). The Managed Lands are used in the identification of threat activities associated with the application of Agricultural Source Material, Non-Agricultural Source Material, and commercial fertilizer.

Figure 7a-9 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Woodville Municipal Residential Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D and greater than 4 for WHPA-E.

7.3.3.5.2 Livestock Density

Technical Rule 16(10) ~~(August 2009)~~ requires the Assessment Report to include maps showing the livestock density within WHPA-A, -B, -C, -D, and -E. This mapping is not required where the vulnerability scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in ~~the~~ the Technical Rules (December 2021)~~Table of Drinking Water Threats~~.

The Livestock Density was determined for the Woodville WHPA as outlined in Technical Memorandum B5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 7.3.3.5). The Livestock Density is used in the identification of threat activities associated with the storage of Agricultural Source Material, and the grazing and/or confinement of livestock.

Figure 7a-10 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Woodville Municipal Residential Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D and greater than 4 for WHPA-E. The Livestock Density figure reflects the distribution of Agricultural Managed Lands as determined in accordance with Technical Memorandum B5 (Appendix MO).

7.3.3.5.3 Impervious Surfaces

Technical Rule 16(11) ~~(August 2009)~~ requires the Assessment Report to include maps showing the percentage of surface area where road salt could be applied to Impervious Surfaces within

WHPA-A, -B, -C, -D, and -E . This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in the Technical Rules (2021)~~the Table of Drinking Water Threats~~.

The proportion of Impervious Surfaces within the Woodville WHPA was determined in accordance with the methodology in Technical Memorandum B5 (Appendix MO). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 7.3.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 7a-11 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Woodville Municipal Residential Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D and greater than 4 for WHPA-E.

7.4 Woods of Manilla

The Woods of Manilla drinking water system is located within both the Kawartha-Haliburton Source Protection Area in the Trent Conservation Coalition (TCC) Source Protection Region (SPR) and Lake Simcoe watershed of the SGBLS SPR. One well is located within the SGBLS SPR and the other well is located within the TCC SPR. The WHPA for well 1 of this system originates within the SGBLS SPR and extends east into the TCC SPR. The WHPA for well 2 is located entirely within the TCC SPR. This section provides a brief summary of the Vulnerability and Threats Assessment completed for the Woods of Manilla system by Genivar, 2010c for the TCC Source Protection Committee.

The Woods of Manilla Municipal Residential Water Supply, located in the former Mariposa Township, is obtained from two wells: Well 1 and Well 2. The Woods of Manilla water supply wells lie within the Peterborough Drumlin Field and are located on the crest of a north-south trending hill (drumlin).

The Woods of Manilla wells operate under Permit To Take Water #3458-7JBRT2 which expires February 1, 2018. Well 2 is permitted to pump at a maximum rate of 109 L/min (157.11 m_3/day) while Well 1 is permitted to pump at a maximum rate of 50 L/min (72.009 m_3/day). Well 2 is operated as the primary duty well and Well 1 serves as a backup water source. The wells are permitted to operate either individually or together for a maximum combined taking of 229.119 m_3/day.

Well 1 is screened to a depth of 45.7 mbgs with a screen section totaling 4.9 m in length set over three intervals within a 12.8 m thick section granular aquifer. Well 2 was completed to a depth of 53.9 mbgs with screens set over two intervals in an 8.84 m thick aquifer.

The Woods of Manilla wells are screened into a confined granular sand aquifer, designated as the Woods of Manilla Aquifer. The sand aquifer occurs near the interface with the fractured limestone bedrock and corresponds to the Thorncliffe Aquifer in the 12-layer Version 2.1 hydrostratigraphic surfaces provided by CAMC/YPDT. As the Woods of Manilla Aquifer is located above the bedrock, the wells will likely draw water from the uppermost layer of the bedrock and the layer of sand. There is not sufficient information to evaluate the extent to which the sand layer dominates flow and there is reason to consider that the fractured rock aquifer is laterally extensive. The groundwater is therefore considered to be sufficiently influenced by the fractured bedrock aquifer that the uncertain aspects of groundwater flow in fractured rock aquifers will be considered in the assessment of uncertainty.

Information presented for the Woods of Manilla section of this Chapter is based on the Genivar 2010c report.

7.4.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal water supply wells. The Groundwater Vulnerability has been assessed to provide an indication, within the WHPA, which current (or future) Threats at the surface present the greatest risk to contaminate the water supply. The Vulnerability Analysis considers the WHPA and the Groundwater Vulnerability, as well as the potential for the vulnerability to be increased by man-made (anthropogenic) structures, through Transport Pathways, by developing a "Vulnerability Score" within the WHPA. Conversion of Vulnerability categories (High, Medium, and Low) to Vulnerability Scores (10, 8, 6, 4, and 2) results in a new map for each WHPA that expresses the relative degree to which a Threat could affect the drinking water supply. A higher value Vulnerability Score will always be assigned to the immediate vicinity of the well and to any areas that are shown to be vulnerable.

The Groundwater Vulnerability for the Woods of Manilla Municipal Residential Water Supply has been determined following the process outlined in the Technical Rules. The areas that contribute groundwater to the wells as determined using the numerical groundwater flow model were delineated as WHPA. The thickness and type of soil materials overlying the water supply aquifer was assessed and rated as either High, Medium, or Low Vulnerability. The potential for man-made structures to increase the Vulnerability were considered by locally increasing the Vulnerability Scores where these features were identified. The WHPA and the increased Vulnerability were then considered together as per the Technical Rules to determine a Vulnerability Score within the delineated WHPA for the Woods of Manilla Municipal Residential Water Supply. The Vulnerability Scores will be used in the Threats Assessment to identify areas where land use activities could result in a Significant, Moderate, or Low Threat to drinking water or to identify existing activities that are considered to present a Significant Threat.

Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum B1 – Groundwater Vulnerability Assessment Methods (Appendix MO) and details of the work performed to assess the Groundwater Vulnerability in Woods of Manilla are provided in Technical Memorandum D1 - Groundwater Vulnerability Assessment - Woods of Manilla (Appendix K).

7.4.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Woods of Manilla Municipal Residential Water Supply wells as delineated in Genivar, 2010c, is shown in Figure 7b-1. WHPA-A has been added to include the 100 m radius from each municipal well. The WHPA was delineated using a calibrated 3-dimensional numerical groundwater flow model.

The WHPA for the Woods of Manilla Municipal Residential Water Supply wells represents the composite capture zones from three pumping scenarios. Each well was operated individually at the maximum PTTW rate and in the third scenario the wells were operated together to reflect the system maximum. The use of multiple pumping scenarios and the maximum permitted pumping rates to generate a composite WHPA is considered to reflect a conservative estimate of the maximum capture zones likely to be observed from these wells under planned future operating conditions.

The WHPA presented in Figure 7b-1 is different than those prepared by MEL (2004). The most obvious difference is that the 3-dimensional numerical model represents groundwater flow from the southeast to northwest in the aquifer layer that supplies the water to the wells. This was reviewed and is considered to represent a condition where the ground watershed divide may not correspond to the surface watershed divide. It is apparent from review of Figure 7b-1 that the wetland area to the southeast of the wells is the ultimate source area for the water in the aquifer that reaches the wells.

The capture zones are also slightly wider in the direction perpendicular to groundwater flow (southeast to northwest) and extend in the direction of the observed groundwater flow divide. These changes are consistent with the use of a more complex model to delineate the WHPA and the use of higher pumping rates. A water balance between recharge and water taking was obtained for the individual steady-state capture zones.

Woods of Manilla is located along the watershed divide between the Lake Simcoe and Kawartha drainage Basins. Well 1 is within the Lake Simcoe drainage Basin. Well 2 is within the Kawartha Drainage Basin. The WHPA for the Woods of Manilla Municipal Residential Water Supply wells is within both the Lake Simcoe and Kawartha Region drainage basins.

7.4.1.2 Groundwater Vulnerability

The Groundwater Vulnerability within the WHPA of the two municipal wells in Woods of Manilla is shown in Figure 7b-2. The Groundwater Vulnerability has been determined for the water supply aquifer using the regional Aquifer Vulnerability Index (AVI) method. The Groundwater Vulnerability to the Woods of Manilla Aquifer has been rated as Low throughout the WHPA up to the very furthest limits of WHPA-D (25-year TOT). This is consistent with the observed stratigraphic profile beneath the WHPA.

7.4.1.3 Transport Pathway Increase

Technical Memorandum D1 (Appendix K) documents the consideration of Transport Pathways to increase the Vulnerability Rating as per the Technical Rules. The Vulnerability Rating can be

increased from Medium to High, Low to Medium, or from Low to High in accordance with the potential for artificial transport pathways to increase the observed vulnerability.

Private wells, and particularly wells that either do not contain seals that will prevent water from moving down around the outside of the well pipe, or wells that are no longer used and/or that have not been decommissioned in accordance with Ontario Regulation 903 present the greatest potential for increasing the rated Vulnerability. The available data from the Provincial Water Well Information System (WWIS) database was screened to identify wells that penetrate to the water supply aquifers and have the potential to increase the Vulnerability of the natural stratigraphic profile. There is potential that other wells may exist that are not included in the database, particularly in areas now serviced by municipal water that formerly obtained water supply from private wells.

No private wells were identified in the WWIS database for Woods of Manilla that are within the delineated WHPA and either penetrate the water supply aquifer layers or stop within 3 m of the interpreted top of aquifers. No Vulnerability increase has been assigned for private wells.

Figure 7b-2 is therefore proposed to be used as the Groundwater Vulnerability Rating for generating the Vulnerability Score for Woods of Manilla.

7.4.1.4 WHPA-E ~~/ WHPA-F~~

None of the wells in this study have been identified as GUDI; therefore delineation of a WHPA-E was not required. ~~Since a WHPA-E was not required for any of the wells, the delineation of a WHPA-F was also not required.~~

7.4.1.5 Vulnerability Score

The WHPA zones for the Woods of Manilla Municipal Residential Water Supply, as shown in Figure 7b-1, and the Groundwater Vulnerability, as shown in Figure 7b-2, were used to assign a Vulnerability Score by using the matrix from Table 5.3 (Chapter 5: Methods Overview, Section 5.2.4). Figure 7b-3 illustrates the Vulnerability Scores for the Woods of Manilla Municipal Residential Water Supply. Figure 7b-3 is used to assess Drinking Water Threats in Section 7.4.3.

7.4.1.6 Uncertainty Rating

As part of the Vulnerability Analysis an Uncertainty Rating of either High or Low is required for the Vulnerability Assessment and the WHPA delineation, as outlined in Technical Rules 13-15 (Part I.4 – Uncertainty Analysis – Water Quality (MOE, 2008a).

The uncertainty associated with the Vulnerability Assessment was evaluated using a semi-quantitative process outlined in Technical Memorandum B1 (Appendix MO) and described for the Woods of Manilla Water Supply in Technical Memorandum D1 (Appendix K). The

Uncertainty Assessment methodology considers the type, quantity, and quality of available data, the methods used to determine the Vulnerability Assessment components, and the nature of the groundwater flow system. As the Woods of Manilla water supply system was not included in the SGBLS Terms of Reference, independent peer review of the WHPA delineation was completed by the TCC SPR.

The Uncertainty Rating assigned for the Woods of Manilla Water Supply is High. In this case, the Uncertainty Rating reflects the quantity and distribution of data available within the delineated WHPA beyond the immediate area of the municipal residential wells. The High Uncertainty Rating reflects the possibility that the potential variability in the actual subsurface conditions may result in an underestimate of the contributing areas, the travel time to the wells, or the protection provided by the soil materials overlying the aquifer. The assumptions made in the course of the analysis, including selection of hydraulic conductivity parameters, effective porosities maximum pumping rates, and K-factors for the AVI analysis are intended to be conservative and protective of the water supply.

Although a High Uncertainty Rating is recommended for the vulnerability assessment of the Woods of Manilla Municipal Residential Water Supply, the work completed herein represents a meaningful increase in confidence relative to the previous WHPA delineation in 2004.

7.4.2 Drinking Water Issues Evaluation

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 either now or in the future. To be considered a Drinking Water Issue, a parameter needs to be at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water or if there is a trend of increasing concentrations of the parameter and a continuation of that trend that would result in the deterioration of the quality of the water as a source of drinking water (Technical Rule 114.(1)(a-b)). However, a parameter may not be considered an Issue in cases where it is naturally occurring or effective treatment is in place.

Available data describing raw water quality, treated water quality, and water quality monitoring in sentry wells in the area around the Woods of Manilla municipal water supplies has been reviewed to identify Drinking Water Issues that are considered likely to result in a deterioration of the quality of water for use as a source of drinking water. Details of the Drinking Water Issues Evaluation for Woods of Manilla are provided in Technical Memorandum D2 – Drinking Water Issues – Woods of Manilla (Appendix K).

No Drinking Water Issues were identified for TW1 and TW2 of the Woods of Manilla water supply.

The following are observed parameters that were considered but determined not to be Drinking Water Issues:

Data for nitrate concentrations were variable and a trend was not confirmed, although there was an increase in levels in 2006. The concentrations are not expected to exceed ODWQS objectives within 50 years.

Sodium concentrations display a slight increasing trend but are not projected to exceed to ODWQS objective of 200 mg/L within the next 50 years.

Coliforms and E.Coli are typically absent but have been observed on rare occasions in raw water in low numbers that are not indicative of deterioration of the water quality. Treatment is in place and is effective for pathogen parameters. Incidents of turbidity exceeding ODWQS objectives in the treated water are not persistent.

7.4.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Woods of Manilla Water Supply was completed in accordance with the detailed methodology presented in Technical Memo – B5 (Appendix MO). 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, and includes any activity or condition that is prescribed by the regulations as a drinking water threat." An Activity is one or a series of related processes, natural or anthropogenic that occurs within a geographical area and may be related to a particular land use, whereas a Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities. Therefore, it is not only presently existing Threats that must be regulated, but future ones as well.

The Drinking Water Threats Assessment for the Woods of Manilla Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes preparation of:

- A list of Drinking Water Threats for Activities,
- A list of Drinking Water Threats for Conditions,
- Maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats for Activities,
- Maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats for Conditions, and
- An enumeration of Drinking Water Threats.

7.4.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for Woods of Manilla Drinking Water Supply is provided in Chapter 5, section 5. 5.1.

No additional Drinking Water Threats were identified for consideration.

7.4.3.2 List of Drinking Water Threats – Conditions

The following information sources were consulted to identify existing Conditions that could affect the Woods of Manilla Water Supply system:

- Files provided by the Ministry of the Environment, Conservation and Parks local offices pertaining to licenses, and records of spills in the area of the delineated WHPA.
- Records available from the Ministry of the Environment, Conservation and Parks website containing registry of Brownfield Sites.
- Records from available technical studies and previous contaminant source inventories that identified situations that may qualify as Conditions.
- Interviews of City of Kawartha Lakes and Ontario Clean Water Agency staff to identify potential Conditions within the identified WHPA for the drinking water supply

No confirmed Conditions have been identified for the Woods of Manilla Water Supply. No local circumstances for prescribed Threats were identified.

7.4.3.3 Identifying Areas of Significant/Moderate/Low Threats – Activities

The areas where Activities are or would be Drinking Water Threats are illustrated on a series of maps based on the Vulnerability Scores and Vulnerable Area delineations. The maps combined with the Technical Rules threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The circumstances can be found at https://threats.swpip.ca/. ~~The maps include references to a series of tables prepared by MOE to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php.~~

Field Code Changed

Pathogen Parameters

The Technical Rules can be used in conjunction with the Vulnerability Scores ~~The Key Table~~ on Figure 7b-4 ~~can be used in conjunction with the Vulnerability Scores~~ to identify the areas where Activities associated with pathogen threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Woods of Manilla Water Supply. Activities that are or would be Significant Drinking Water Threats for pathogens can be observed within the areas where the

Vulnerability Score is 10. Pathogens can also only be a Significant, Moderate, or Low Threat within WHPA-A and WHPA-B.

7.4.3.3.1 Chemical Parameters

The Technical Rules can be used in conjunction with the Vulnerability Scores ~~The Key Table~~ on Figure 7b-5 ~~can be used in conjunction with the Vulnerability Scores~~ to identify the areas where activities associated with chemical threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Woods of Manilla Water Supply. Activities that are or would be Significant Drinking Water Threats for pathogens can be observed within the areas where the vulnerability score is 10.

7.4.3.3.2 DNAPL Chemical Parameters

Figure 7b-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of 6, where activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Woods of Manilla Water Supply. The Technical Rules can be used in conjunction with the Vulnerability Scores~~The Key Table~~ on Figure 7b-6 ~~can be used to~~ identify the circumstances in which these activities associated with DNAPL threats would be significant threats.

7.4.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 7.4.3.2, no Conditions have been confirmed within the WHPA for the Woods of Manilla Water Supply.

A Condition or potential Condition that has not been identified would potentially be a Significant, Moderate, or Low Threat to Drinking Water based on the combination of Hazard Rating and Vulnerability Rating as described in Section 5.5.5 (Chapter 5: Methods Overview) and Technical Memorandum A5 (Appendix MO). The Hazard Rating is dependent on whether there is evidence the Condition is causing off-site contamination, and whether the Condition is located on the same property as the supply well.

A Condition would be a threat to municipal drinking water in the following situations:

- **Significant**: where the Vulnerability Score is ≥ 8 and there is evidence that the Condition is causing off-site contamination, and/or that the Condition is located on the same property as the supply well.
- **Moderate**: (1) where the Vulnerability Score ≥ 6 and < 8, and there is evidence that the Condition is causing off-site contamination, and/or that the Condition is located on the same property as the supply well; or (2) Where the Vulnerability Score is 10, and there is no evidence of off-site contamination.

- **Low**: Where the Vulnerability Score ≥ 8 and < 10 and there is no evidence of off-site contamination.

Figure 7b-3 illustrates the Vulnerability Score map for the Woods of Manilla Water Supply that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

7.4.3.5 Enumerating Drinking Water Threats

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The number of Significant Drinking Water Threats for the Woods of Manilla Municipal Residential Water Supply has been determined using the methodology outlined in Technical Memorandum B5 (Appendix B). Threats associated with the WHPA for Woods of Manilla Well#2 have been refined by verification work undertaken by Kawartha-Haliburton Source Protection Authority staff members.

Table 7-4 and Table 7-5 document the enumeration of existing activities that are considered to be Significant Drinking Water Threats within the WHPA for the Woods of Manilla Well #1, and Well #2, respectively. Significant Drinking Water Threats were only identified within areas where the Vulnerability Score is 10.

In total, twenty-five (25) activities that are considered to be potential Significant Drinking Water Threats were identified on twenty-five (25) land parcels within the WHPA zones for the Woods of Manilla wells.

Fifteen (15) activities that are considered to be Significant Drinking Water Threats were identified in association with fifteen (15) land parcels in the WHPA zone for Woods of Manilla Well #1 (Table 7-4). The threat activity on 14 of these parcels is associated with private individual sewage disposal systems. One potential Significant Drinking Water Threat was assigned to the WHPA, where the Vulnerability Score was 10 for residential storage of fuel (home heating oil). This threat sub-category has been represented as a single threat for the vulnerable area, rather than the individual properties (see SGBLS 2010). Within the vulnerable area there are fourteen (14) residential parcels where storage of fuel for home heating purposes may be occurring.

Ten (10) activities that are considered to be potential Significant Drinking Water Threats were identified in association with ten (10) land parcels in the WHPA for Woods of Manilla Well #2 (Table 7-5). The threat activities on eight (8) of these parcels is associated with private individual sewage disposal systems. One potential Significant Drinking Water Threat was assigned to the WHPA, where the Vulnerability Score was 10 for residential storage of fuel (home heating oil). This threat sub-category has been represented as a single threat for the

vulnerable area, rather than the individual properties (see SGBLS 2010). Within the vulnerable area there are five (5) residential parcels where storage of fuel for home heating purposes may be occurring. One (1) parcel is also identified for potential storage of fuel related to the municipal well pump.

Records show that natural gas is available as an option for use in home heating in Woods of Manilla. The storage of fuel for home heating purposes has been included as a significant threat activity as it is possible that some residences may continue to use fuel oil for home heating.

Methods used to enumerate Significant Threats related to the storage of fuel for home heating has been addressed differently in the SGBLS Source Protection Region compared to neighboring Trent Conservation Coalition (TCC) Source Protection Region. The SGBLS Region has chosen to represent all potential residential fuel threats in a vulnerable area as one significant threat, whereas the TCC has chosen to count every property in the vulnerable area, and acknowledge that it is likely that many of these properties may not have below grade heating oil storage. For this reason, the number of potential fuel threats identified in this Assessment Report for the Woods of Manilla Wells will be different than those reported in the TCC Assessment Report.

Table 7-4: Number of Significant Drinking Water Threats for the Woods of Manilla Drinking Water Supply – Well 1.

Threat Number	Threat	Significant threat counts Number of threats
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 collects, stores, transmits, treats or disposes of sewage.	14
3.	The application of agricultural source material to land.	0
4.	The storage of agricultural source material to land.	0
5.	The management of agricultural source material.	0
6.	The application of non-agricultural source material to land.	0
7.	The handling and storage of non-agricultural source material.	0
8.	The application of commercial fertilizer to land.	0
9.	The handling and storage of commercial fertilizer to land.	0
10.	The application of pesticide to land.	0
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

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Threat Number	Threat	Significant threat counts Number of threats
15.	The handling and storage of fuel.	1
16.	The handling and storage of dense non-aqueous phase liquid.	0
17.	The handling and storage of an 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 safe aquifer or surface water body.	0
20.	Any activity that reduces the recharge of an aquifer.	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
-	**Totals:**	**15** significant threats (on **15** properties)

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Table 7-5: Number of Significant Drinking Water Threats for the Woods of Manilla Drinking Water Supply – Well 2.

Threat Number	Threat	Significant threat counts Number of threats
1.	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	0

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Threat Number	Threat	Significant threat counts Number of threats
2.	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	8
3.	The application of agricultural source material to land.	0
4.	The storage of agricultural source material to land.	0
5.	The management of agricultural source material.	0
6.	The application of non-agricultural source material to land.	0
7.	The handling and storage of non-agricultural source material.	0
8.	The application of commercial fertilizer to land.	0
9.	The handling and storage of commercial fertilizer to land.	0
10.	The application of pesticide to land.	0
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.	2
16.	The handling and storage of dense non-aqueous phase liquid.	0

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Threat Number	Threat	Significant threat counts Number of threats
17.	The handling and storage of an 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 safe aquifer or surface water body.	0
20.	Any activity that reduces the recharge of an aquifer.	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
-	**Totals:**	**10** significant threats (on **10** properties)

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7.4.3.5.1 Managed Lands

Technical Rule 16(9) ~~(August 2009)~~ requires the Assessment Report to include maps showing the location of Managed Lands and the percentage of Managed Lands within a Vulnerable Area, including WHPA-A, -B, -C, -D, and -E. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a threat in the Technical Rules~~the Table of Drinking Water Threats~~.

Managed Lands were identified and the Managed Lands proportions were determined for the Woods of Manilla WHPA as outlined in Technical Memorandum B5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 7.4.3.5). The Managed Lands are used in the identification of threat activities associated with the application of Agricultural Source Material, Non- Agricultural Source Material, and commercial fertilizer.

Figure 7b-7 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Woods of Manilla Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

7.4.3.5.2 Livestock Density

Technical Rule 16(10) ~~(August 2009)~~ requires the Assessment Report to include maps showing the livestock density within WHPA-A, -B, -C, -D, and -E. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in ~~t~~ the Technical Rules~~he Table of Drinking Water Threats~~.

The Livestock Density was determined for the Woods of Manilla WHPA as outlined in Technical Memorandum B5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 7.4.3.5). The Livestock Density is used in the identification of threat activities associated with the storage of Agricultural Source Material, and the grazing and/or confinement of livestock.

Figure 7b-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Woods of Manilla Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. The Livestock Density figure reflects the distribution of Agricultural Managed Lands as determined in accordance with Technical Memorandum B5 (Appendix MO).

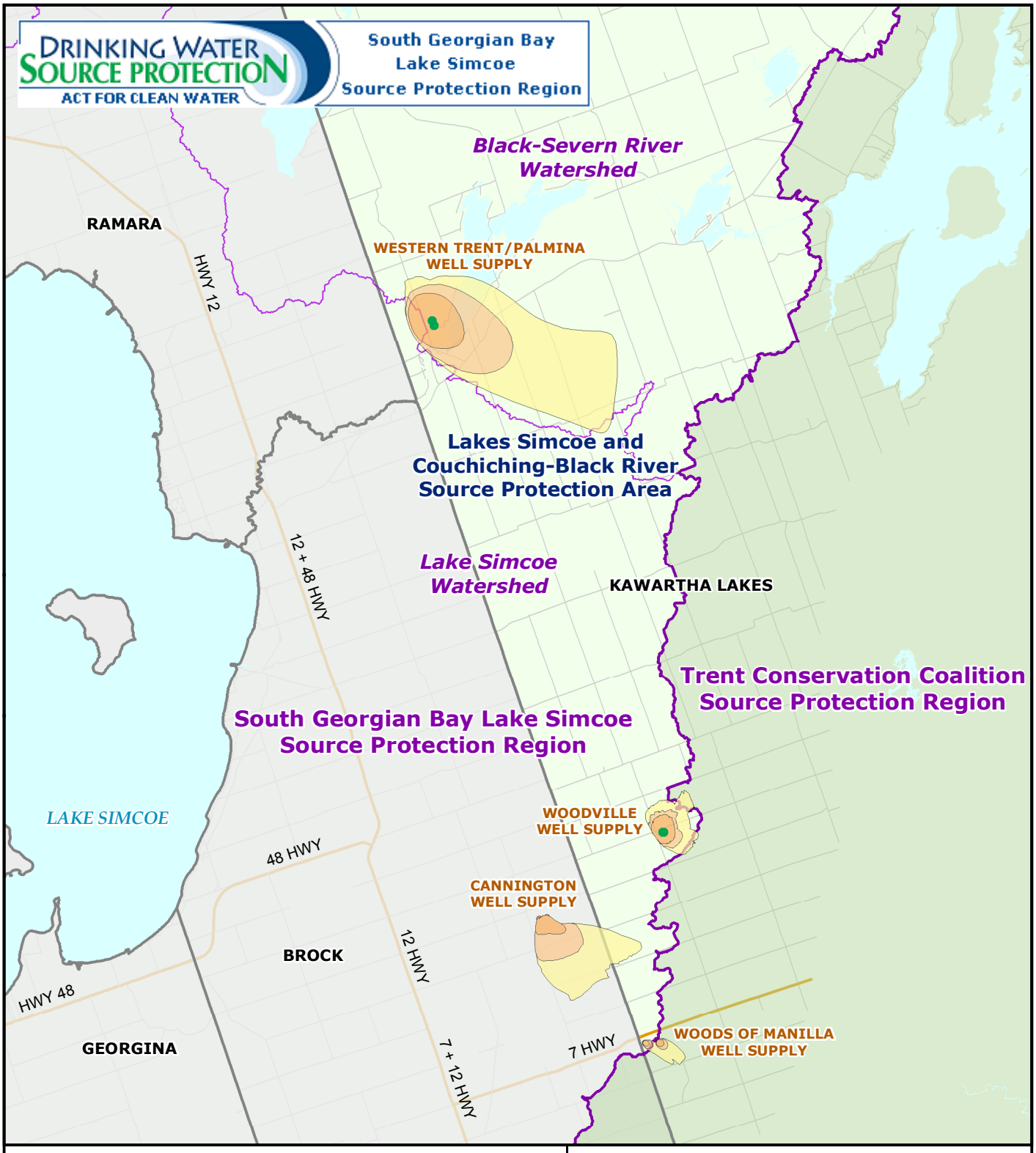
7.4.3.5.3 Impervious Surfaces

Technical Rule 16(11) ~~(August 2009)~~ requires the Assessment Report to include maps showing the percentage of surface area where road salt could be applied to Impervious Surfaces within WHPA-A, -B, -C, -D, and -E. This mapping is not required where the Vulnerability Scores for the

area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in the Technical Rules (2021)~~the Table of Drinking Water Threats~~.

The proportion of Impervious Surfaces within the Woods of Manilla WHPA was determined in accordance with the methodology in Technical Memorandum B5 (Appendix MO). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 7.4.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 7b-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Woods of Manilla Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.



- Municipal Supply Well in City of Kawartha Lakes
- WHPA-A (100m)
- WHPA-B (2 years time of travel)
- WHPA-C (5 years time of travel)
- WHPA-D (25 years time of travel)
- SWP Watershed Region
- SWP Watershed Area
- Municipality Boundary

Drinking Water System Vulnerable Areas in City of Kawartha Lakes

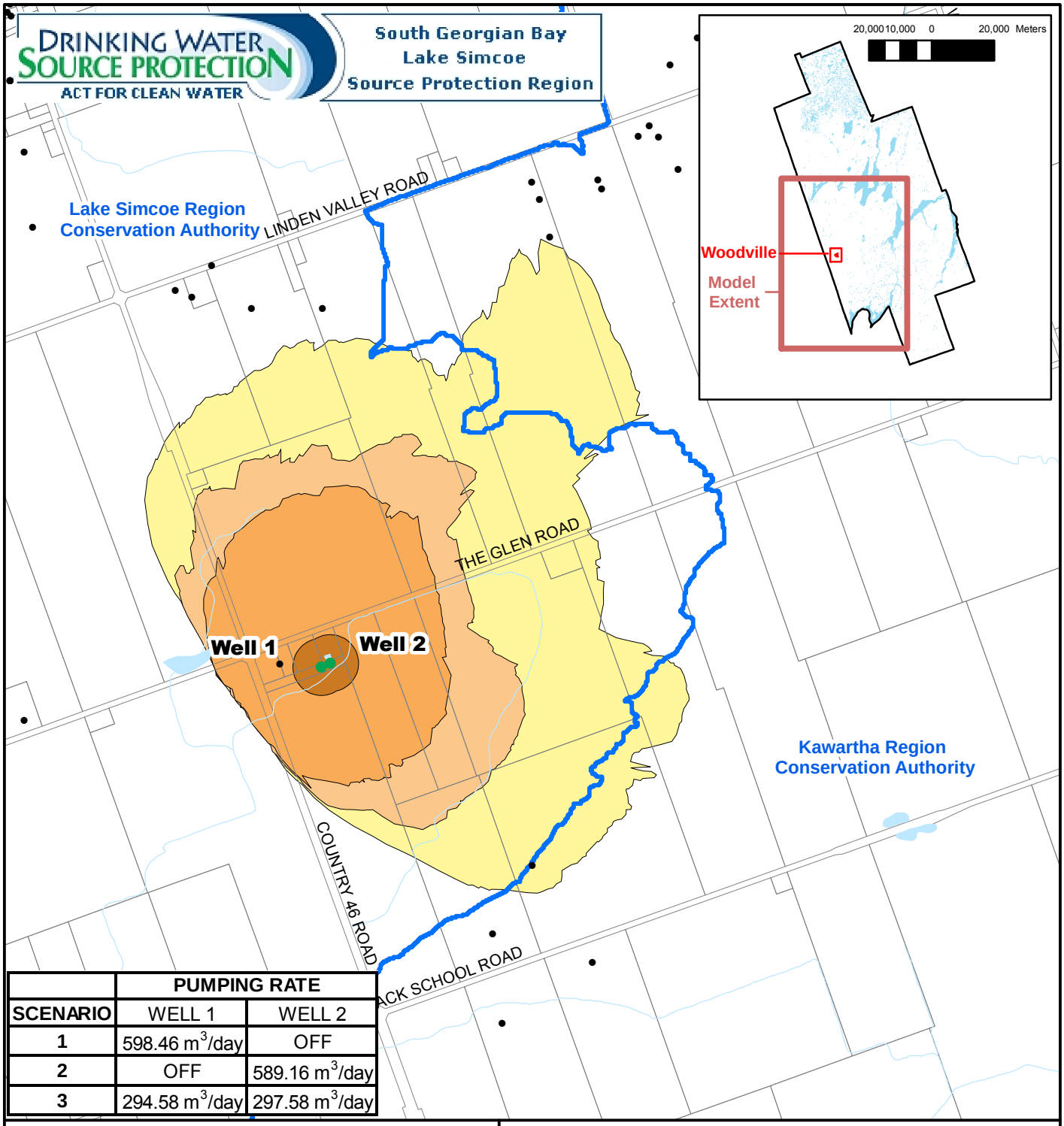
Created by: LSRCA
Date: 2010-10-15

Scale: 1:200,000
0 2.5 5km
UTM Zone 17N, NAD83

This map was produced by the Lake Simcoe Region Conservation Authority, lead agency of the South Georgian Bay Lake Simcoe Region Source Protection Region. Base data have been compiled from various sources, under data sharing agreements.
While every effort has been made to accurately depict the base data, errors may exist.

Ontario

Figure 7-1



	PUMPING RATE	
SCENARIO	WELL 1	WELL 2
1	598.46 m^3/day	OFF
2	OFF	589.16 m^3/day
3	294.58 m^3/day	297.58 m^3/day

Legend

- MUNICIPAL WELL LOCATION
- WELL (MOE WATER WELL RECORD DATABASE)
- CONSERVATION AUTHORITY WATERSHED BOUNDARY
- WHPA-A: 100 m RADIUS
- WHPA-B: 2-YEAR TIME-OF-TRAVEL
- WHPA-C: 5-YEAR TIME-OF-TRAVEL
- WHPA-D: 25-YEAR TIME-OF-TRAVEL

N W E S

300 150 0 300 Metres

WELLHEAD PROTECTION AREAS - WOODVILLE

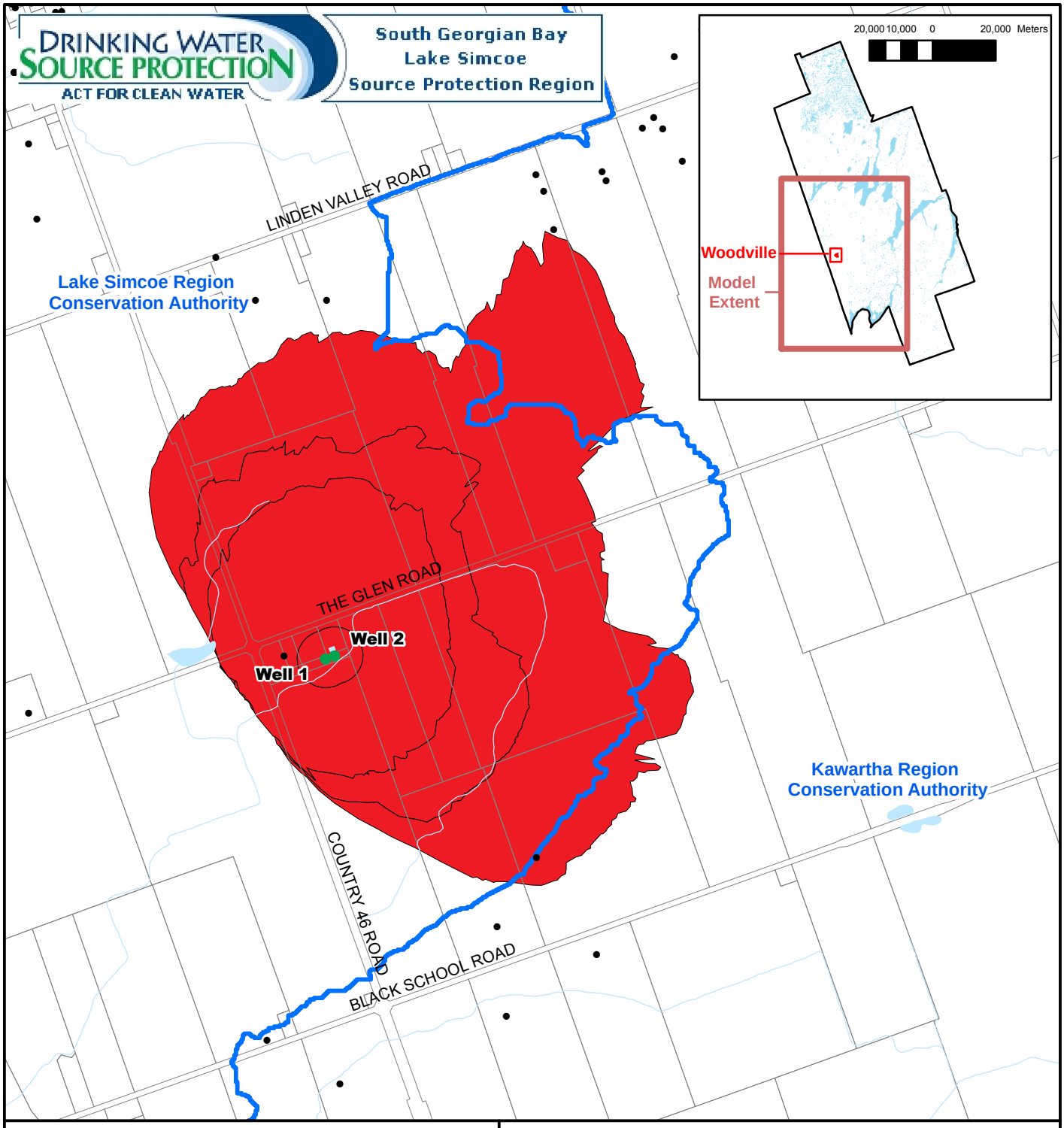
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-1

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.

GENIVAR Ontario

FIGURE **7a-1**



Legend

- MUNICIPAL WELL LOCATION
- WELL (MOE WATER WELL RECORD DATABASE)

AQUIFER VULNERABILITY INDEX

- HIGH
- MEDIUM
- LOW

Note: Outlines of WHPA A, B, C, and D shown for reference.

300 150 0 300 Metres

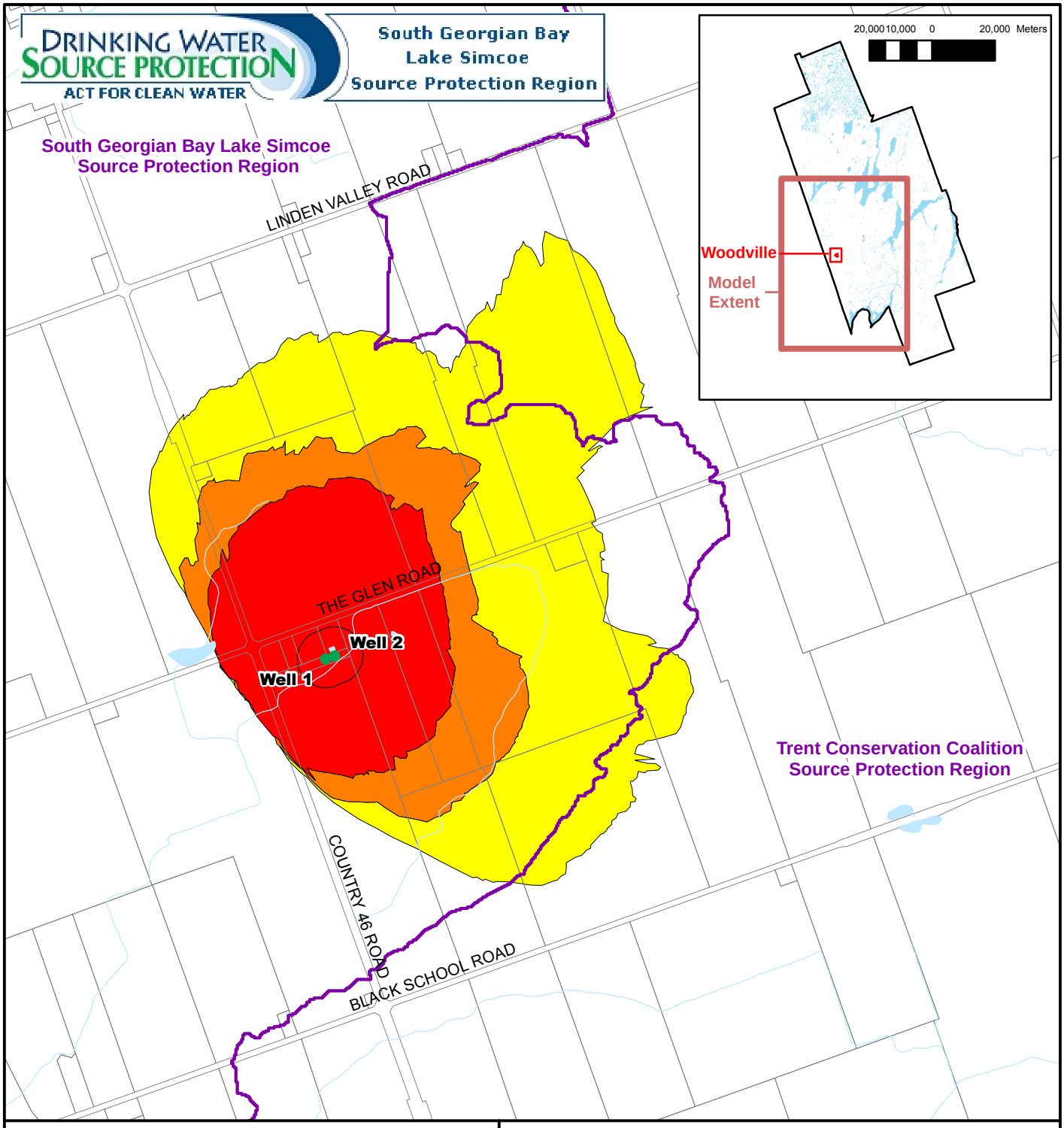
GROUNDWATER VULNERABILITY - WOODVILLE

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-3

GENIVAR Ontario

FIGURE **7a-2**



LEGEND

- MUNICIPAL WELL LOCATION
- SOURCE WATER PROTECTION WATERSHED BOUNDARY

VULNERABILITY SCORING

- 10
- 8
- 6
- 4
- 2

N W E S

300 150 0 300 Metres

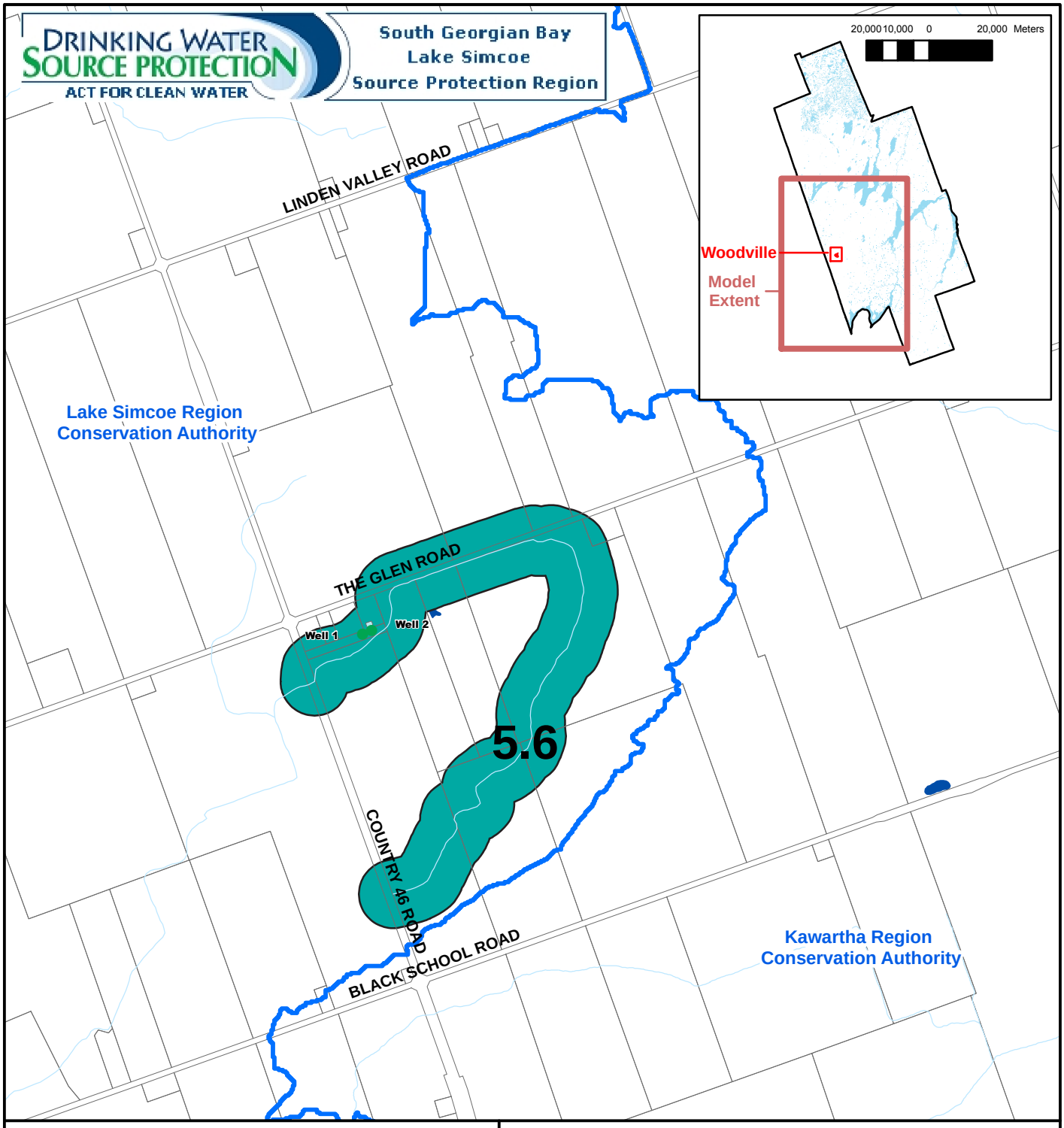
VULNERABILITY SCORE - WOODVILLE

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-4

GENIVAR Ontario

FIGURE 7a-3



Legend

- MUNICIPAL WELL LOCATION
- CONSERVATION AUTHORITY WATERSHED BOUNDARY
- WATERLINE
- WATERBODY
- WHPA-E
- 5.6 VULNERABILITY SCORE

N W E S

200 100 0 200 Metres

WHPA-E - WOODVILLE

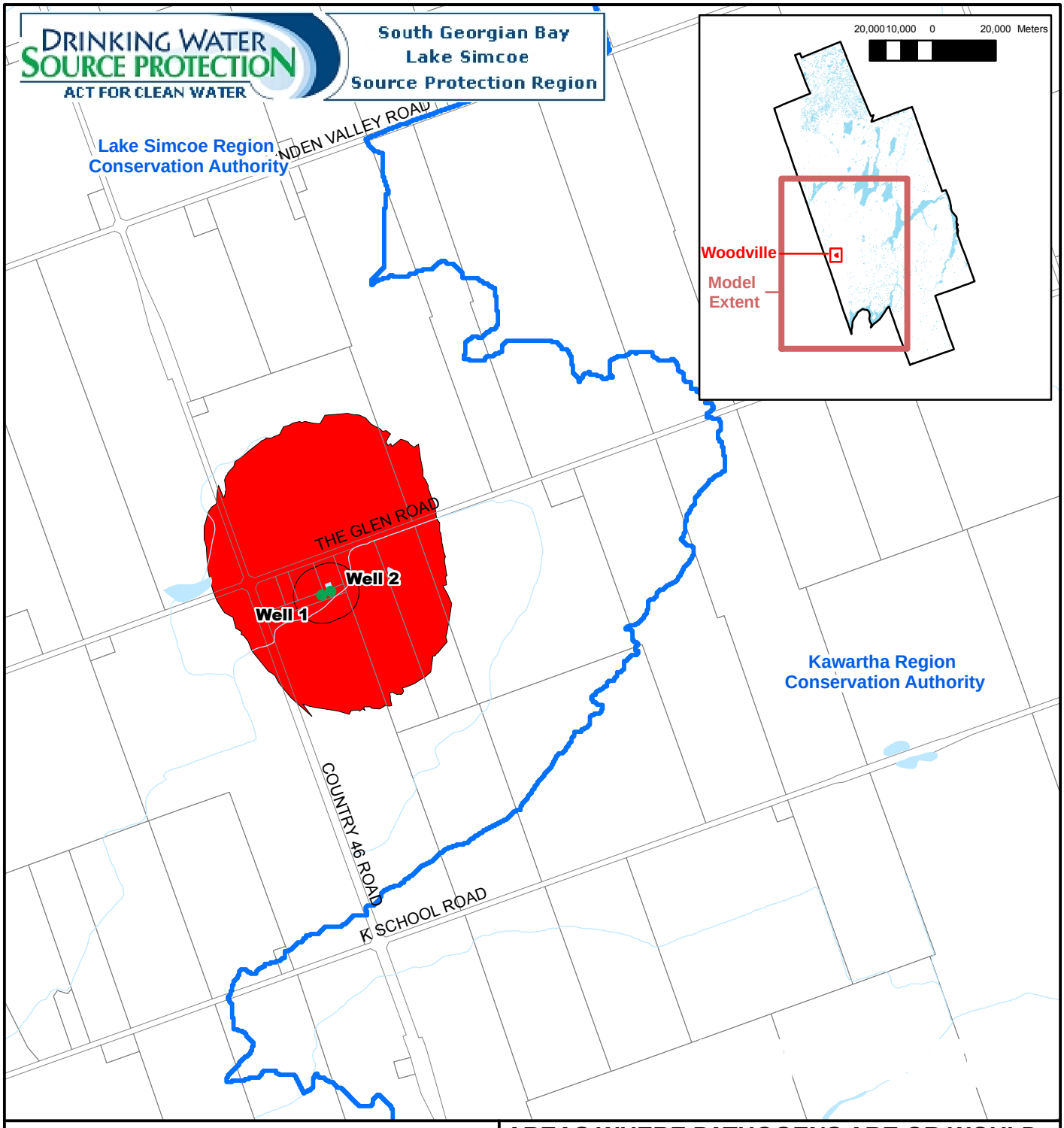
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.19	FILE. NO.:0-07196719F3-5

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.

GENIVAR Ontario

FIGURE 7a-4



LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10

N W E S

300 150 0 300 Metres

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.

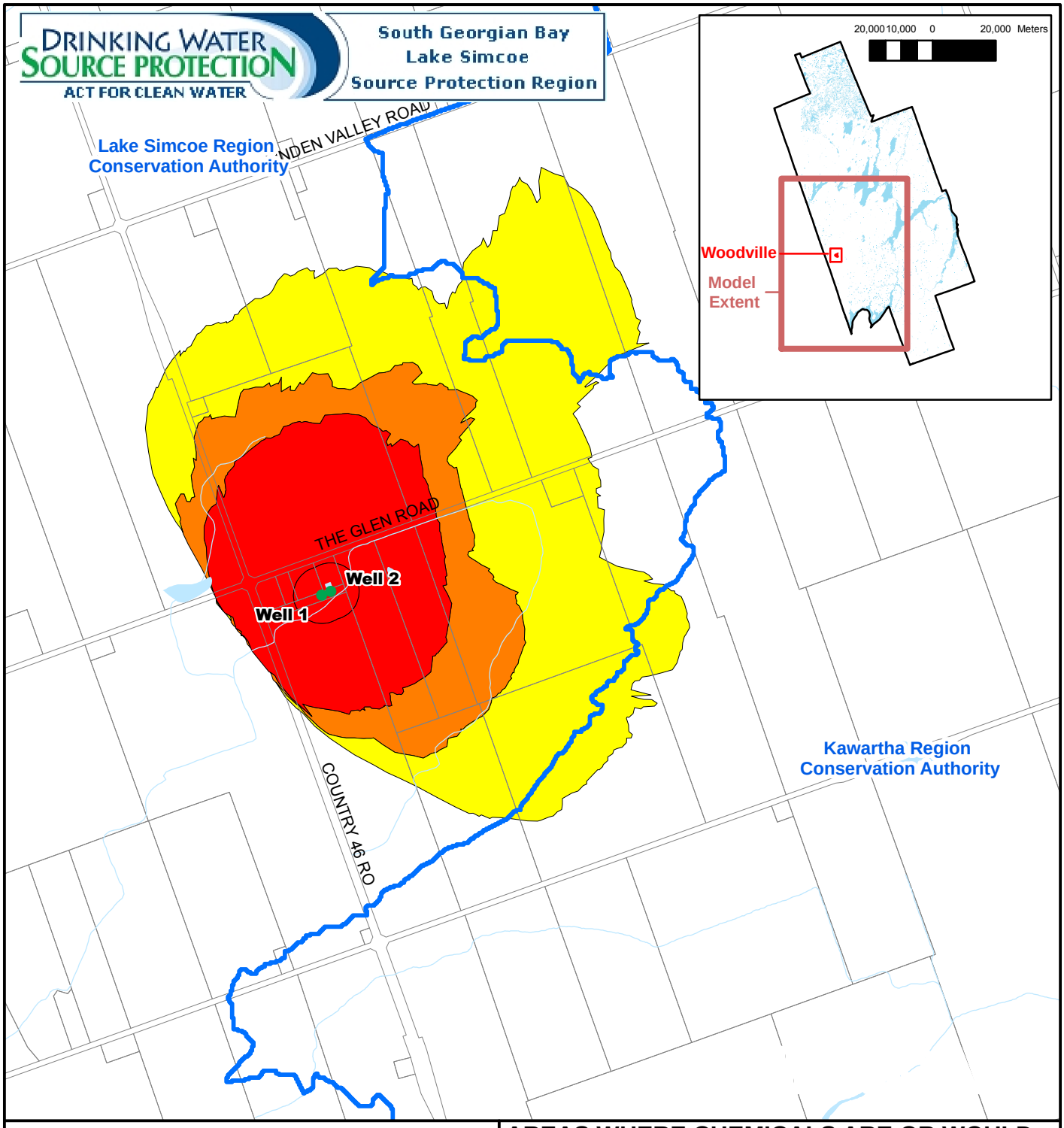
AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WOODVILLE

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-6

GENIVAR Ontario

FIGURE **7a-5**



LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

300 150 0 300 Metres

AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WOODVILLE

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

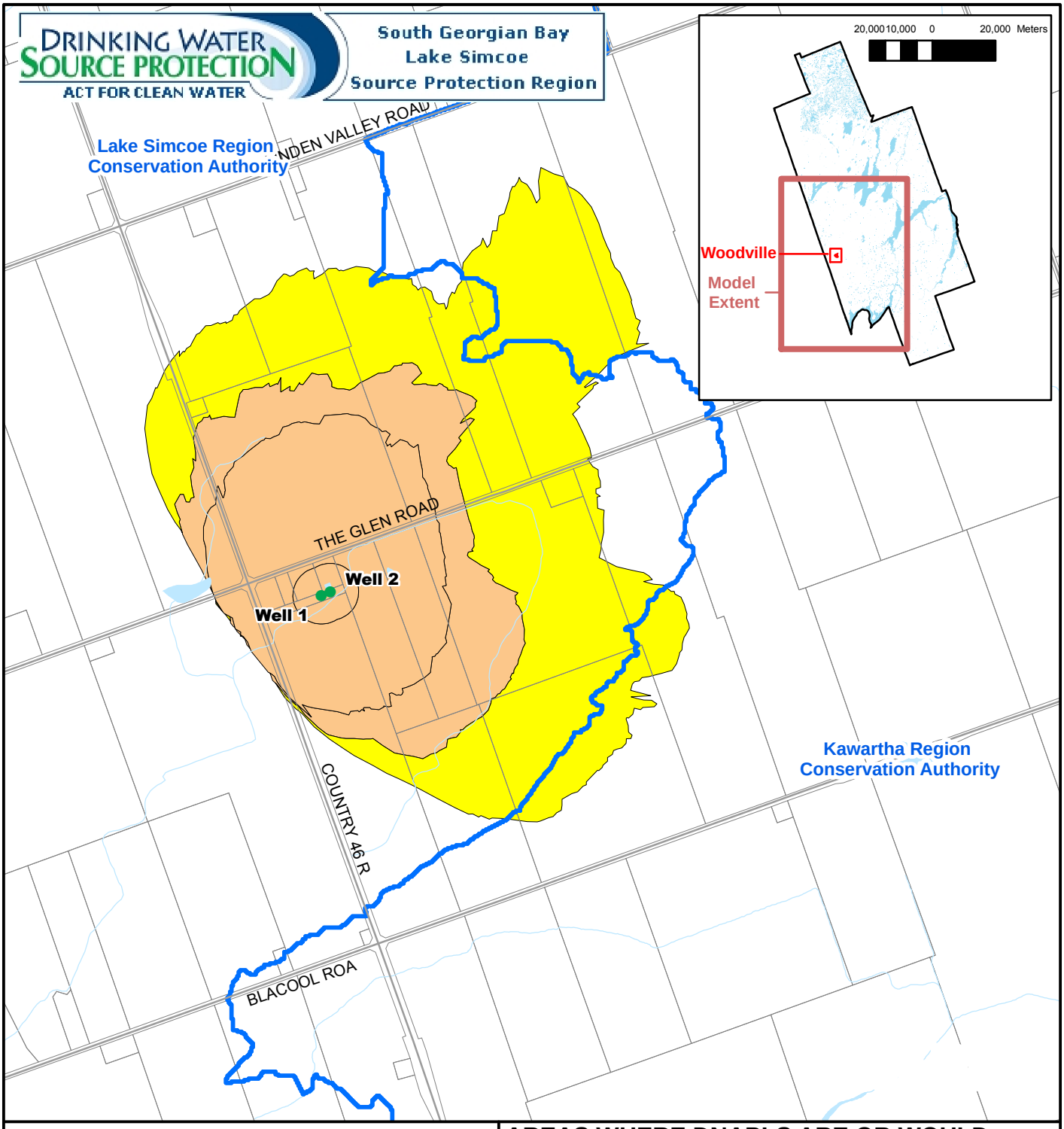
DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-7

GENIVAR Ontario

FIGURE **7a-6**

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

South Georgian Bay
Lake Simcoe
Source Protection Region



LEGEND

- MUNICIPAL WELL LOCATION
- WHPA-C: 5-YEAR TIME-OF-TRAVEL

VULNERABILITY SCORING

- 6

N W E S

300 150 0 300 Metres

AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WOODVILLE

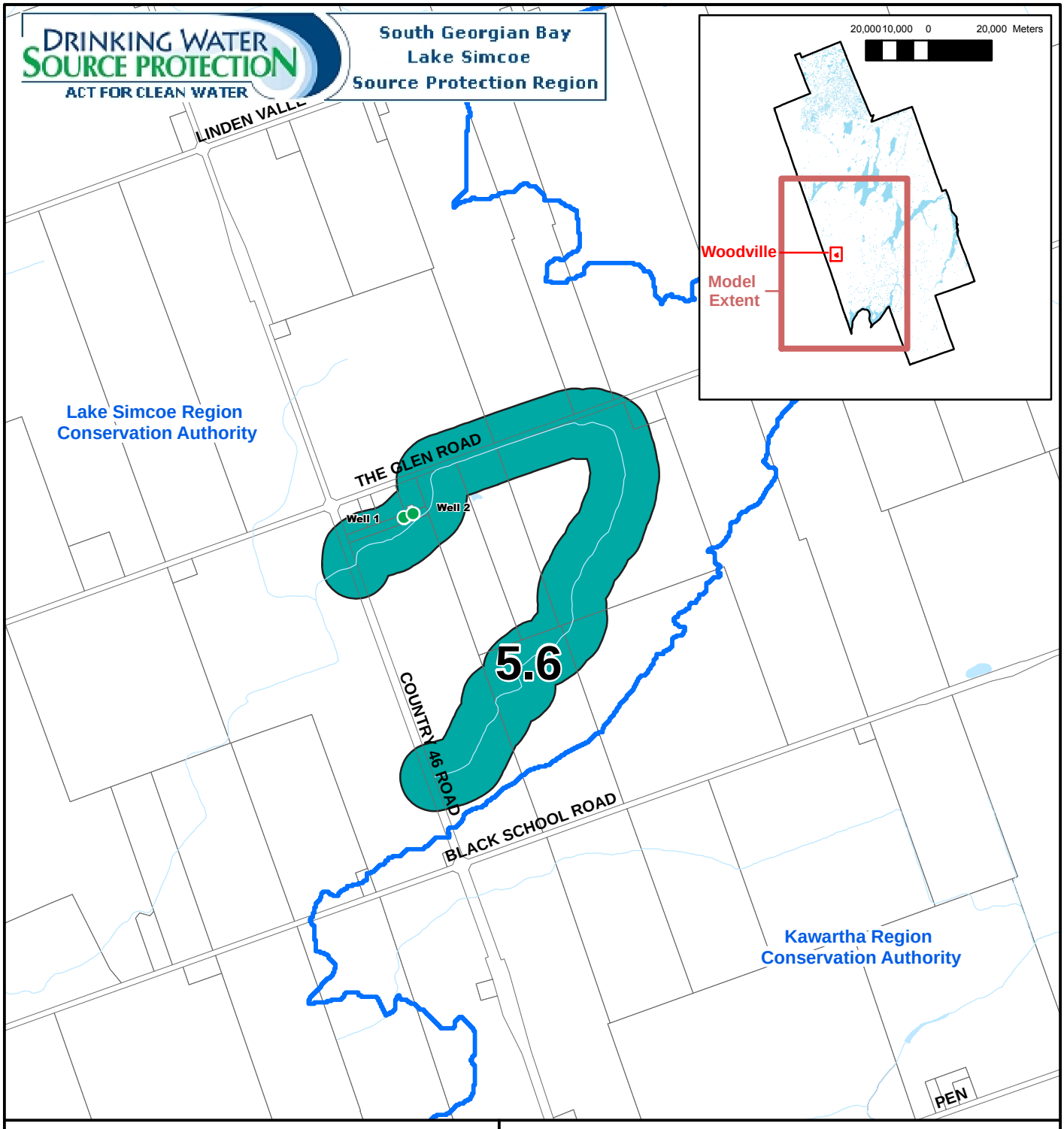
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-8

GENIVAR Ontario

FIGURE 7a-7



Legend

- MUNICIPAL WELL LOCATION
- CONSERVATION AUTHORITY WATERSHED BOUNDARY
- WATERLINE
- WATERBODY
- WHPA-E
- 5.6 VULNERABILITY SCORE

N W E S

200 100 0 200 Metres

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.

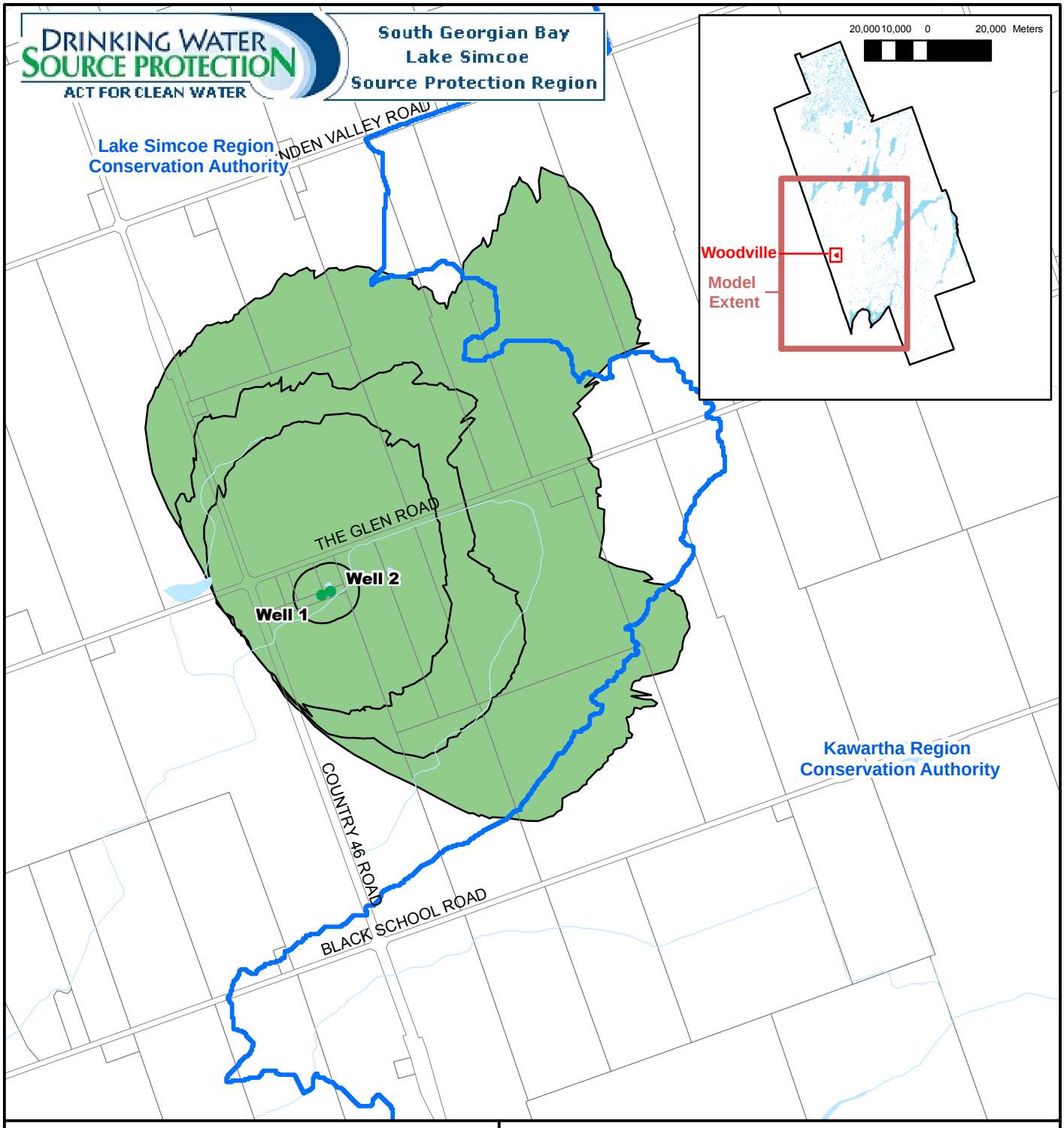
AREAS OF SIGNIFICANT, MODERATE, OR LOW THREATS - WHPA-E - WOODVILLE

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.19	FILE. NO.:0-07196719F3-9

GENIVAR Ontario

FIGURE **7a-8**



Legend

- MUNICIPAL WELL LOCATION
- MANAGED LANDS (<40%)
- MANAGED LANDS (40-80%)
- MANAGED LANDS (>80%)

N W E S

300 150 0 300 Metres

MANAGED LANDS - WOODVILLE

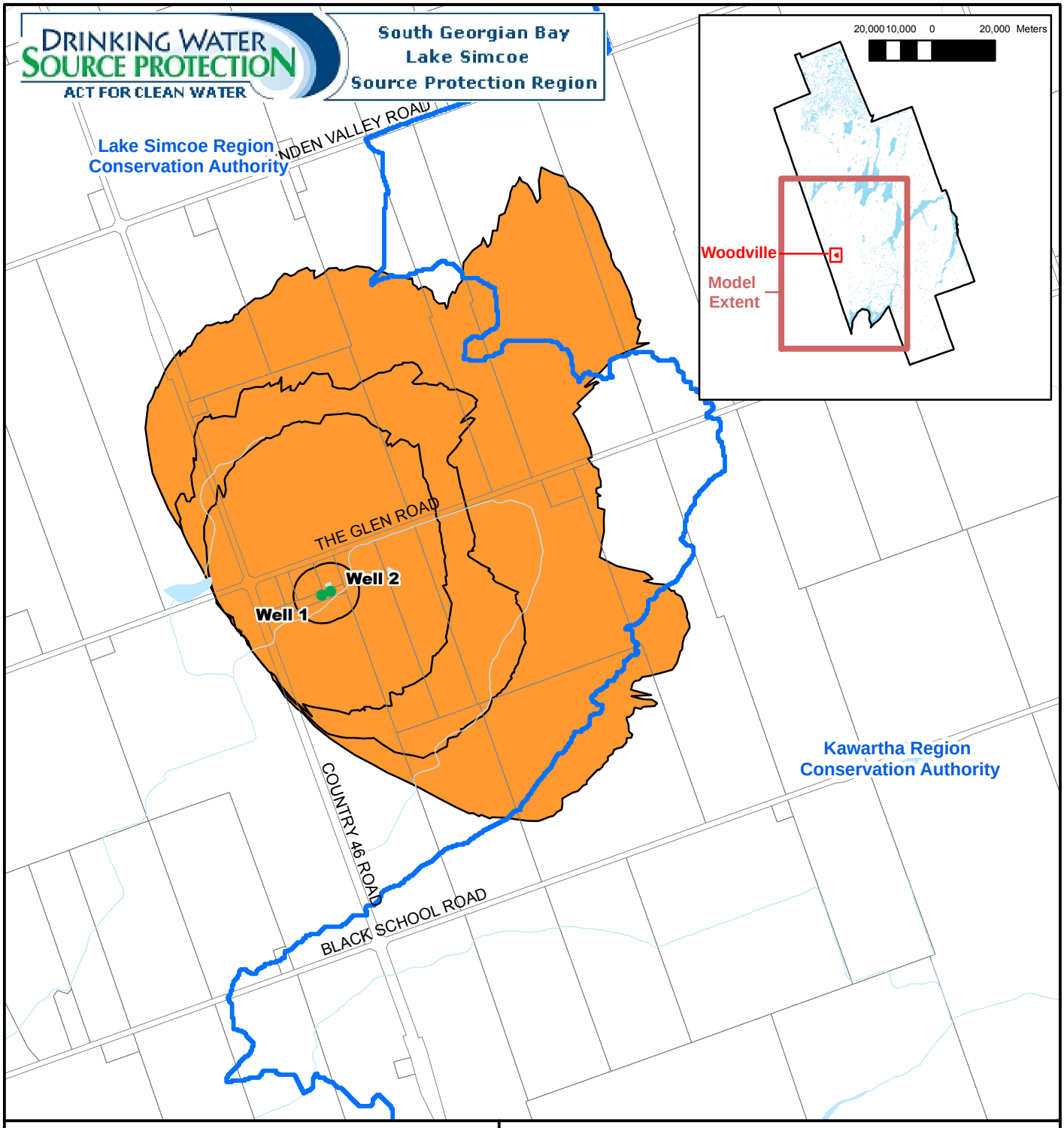
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

The Managed Land proportion is illustrated for the parts of WHPA A-D where the vulnerability score is greater than 6.

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-10

GENIVAR Ontario

FIGURE **7a-9**



Legend

- MUNICIPAL WELL LOCATION
- LIVESTOCK DENSITY (<0.5 NUTRIENT UNITS/ACRE)
- LIVESTOCK DENSITY (0.5-1.0 NUTRIENT UNITS/ACRE)
- LIVESTOCK DENSITY (>1.0 NUTRIENT UNITS/ACRE)

N W E S

300 150 0 300 Metres

LIVESTOCK DENSITY - WOODVILLE

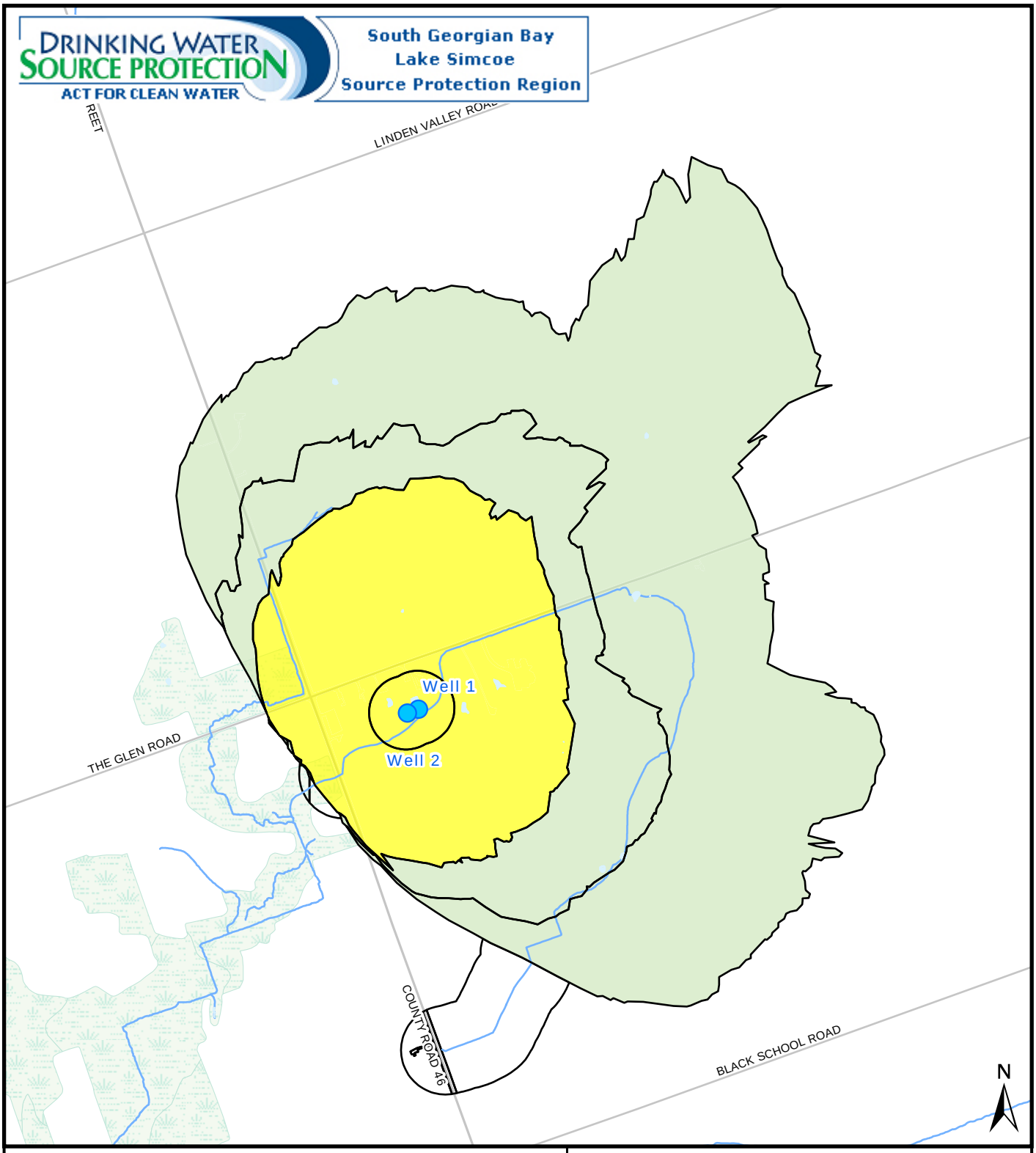
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

The Livestock Density proportion is illustrated for the parts of WHPA A-D where the vulnerability score is greater than 6.

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.14	FILE. NO.:0-07196714F3-11

GENIVAR Ontario

FIGURE **7a-10**



Well

Impervious Surfaces in WHPA

- <1%
- =1 - <6%
- =6 - <8%
- =8 - <30%
- >=30%

Impervious Surfaces - Woodville WHPA

Created by: LSRCA, 2025-08-05

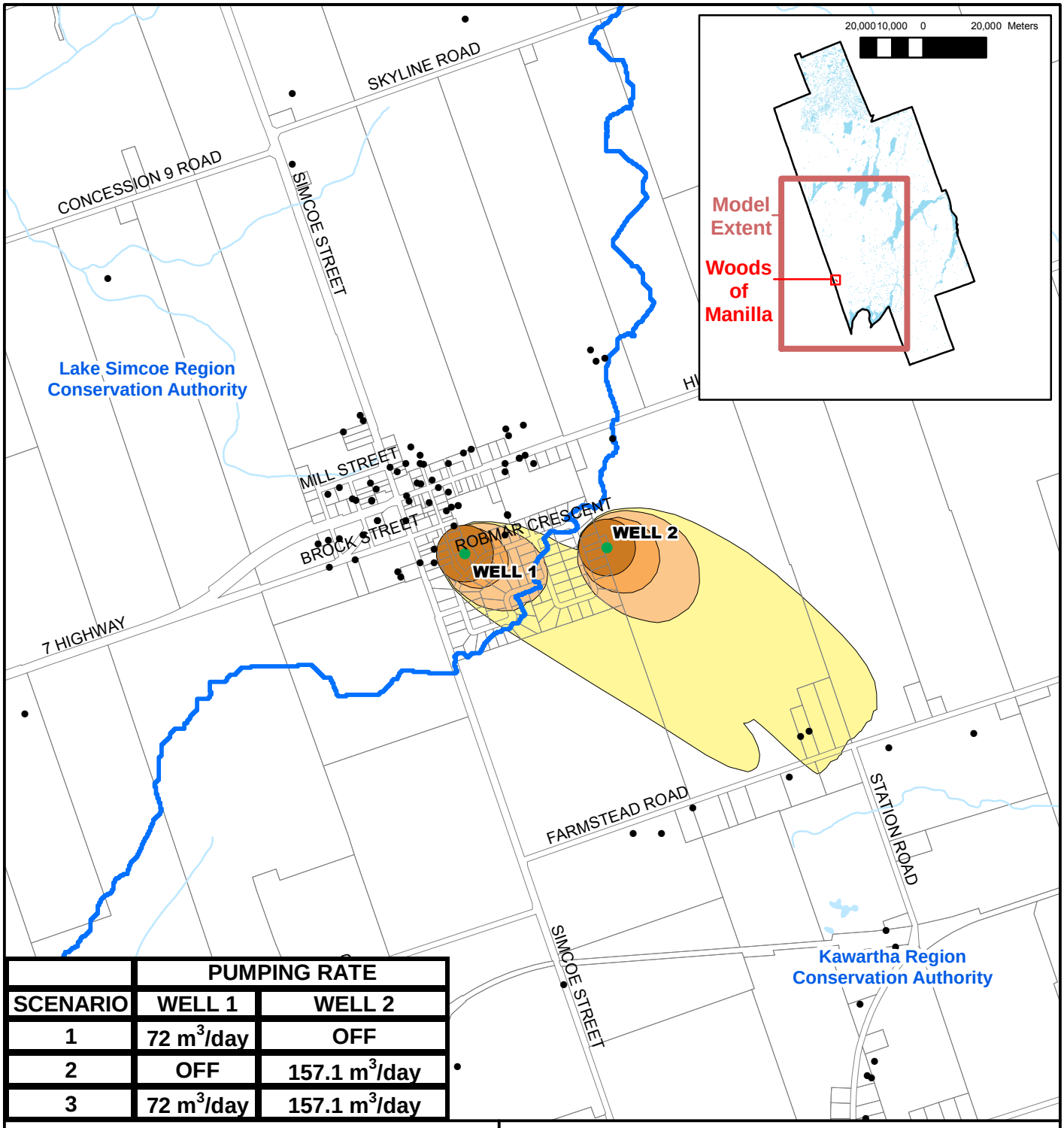
Scale 1:15,000

0 130 260 520 m

UTM Zone 17N, NAD83

Ontario

Figure 7a-11



	PUMPING RATE	
SCENARIO	WELL 1	WELL 2
1	72 m^3/day	OFF
2	OFF	157.1 m^3/day
3	72 m^3/day	157.1 m^3/day

Legend

- MUNICIPAL WELL LOCATION
- WELL (MOE WATER WELL RECORD DATABASE)
- CONSERVATION AUTHORITY WATERSHED BOUNDARY
- WHPA-A: 100 m RADIUS
- WHPA-B: 2-YEAR TIME-OF-TRAVEL
- WHPA-C: 5-YEAR TIME-OF-TRAVEL
- WHPA-D: 25-YEAR TIME-OF-TRAVEL

N W E S

200 100 0 200 Metres

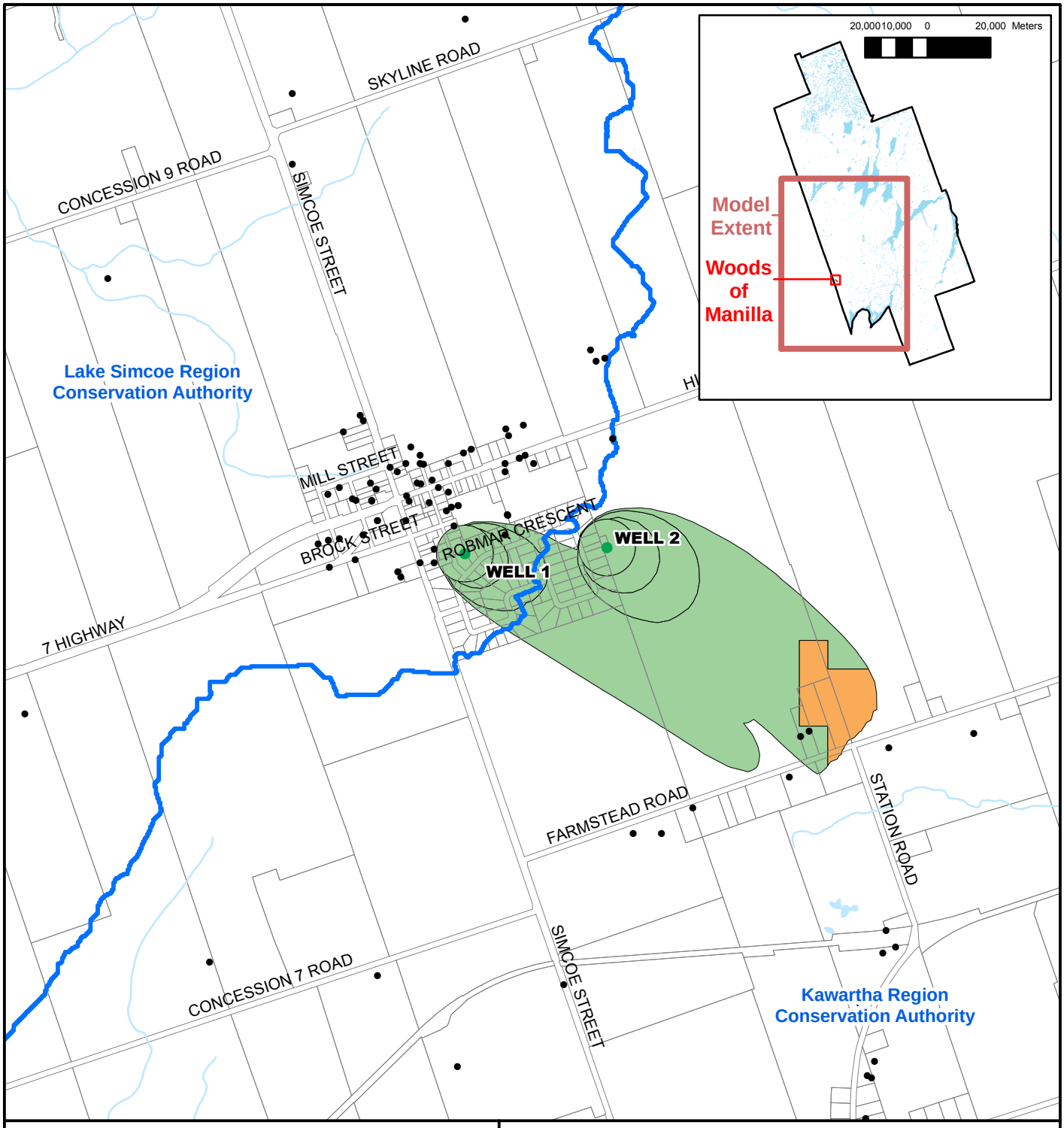
WELLHEAD PROTECTION AREAS - WOODS OF MANILLA

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.08	FILE. NO.:0-07196708F4-1

GENIVAR Ontario

FIGURE **7b-1**



Legend

- MUNICIPAL WELL LOCATION
- WELL (MOE WATER WELL RECORD DATABASE)

AQUIFER VULNERABILITY INDEX

- HIGH
- MEDIUM
- LOW

N W E S

Note: Outlines of WHPA A, B, C, and D shown for reference.

200 100 0 200 Metres

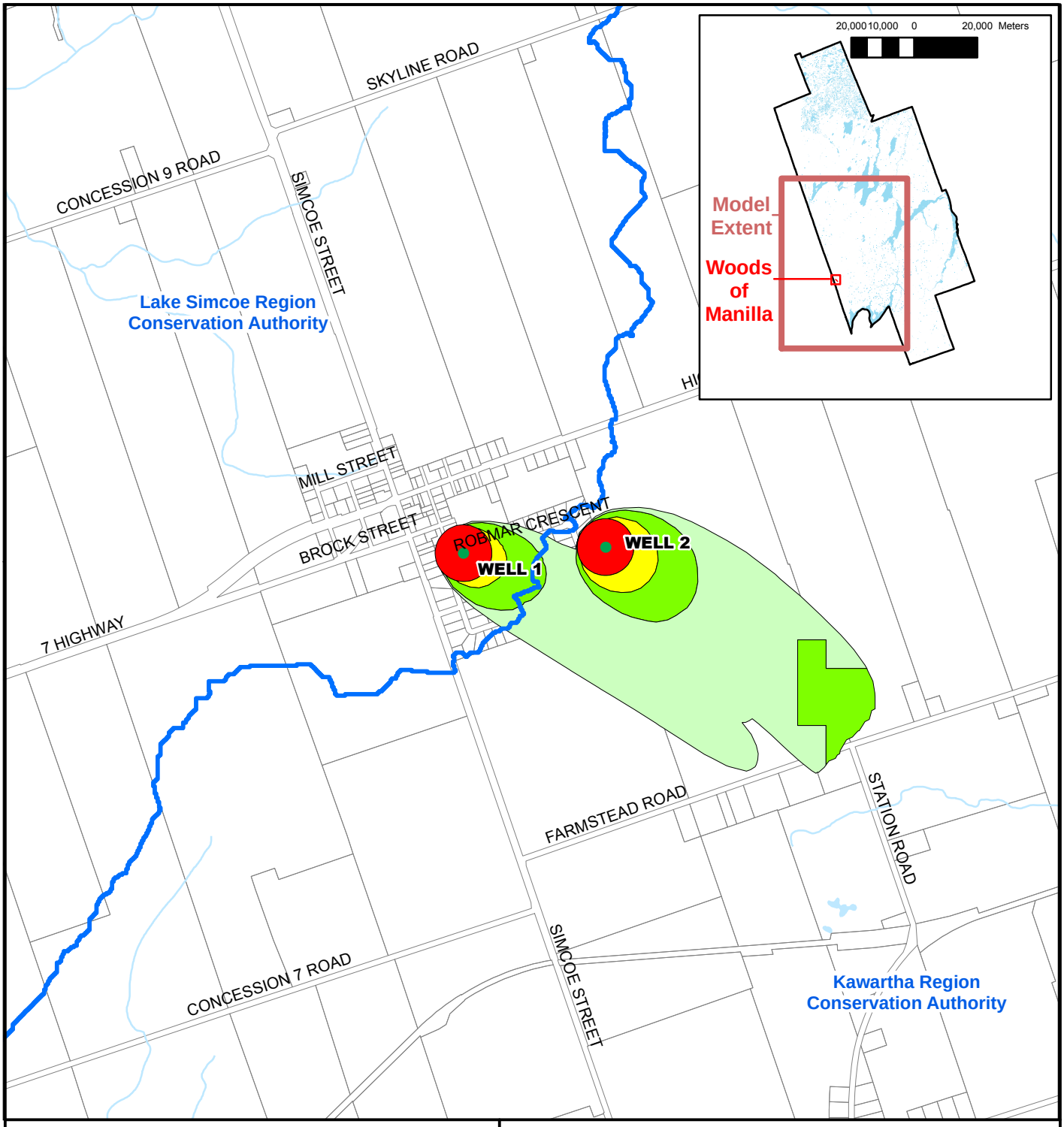
GROUNDWATER VULNERABILITY - WOODS OF MANILLA

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.08	FILE. NO.:0-07196708F4-3

GENIVAR Ontario

FIGURE **7b-2**



LEGEND

MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6
- 4
- 2

N W E S

200 100 0 200 Metres

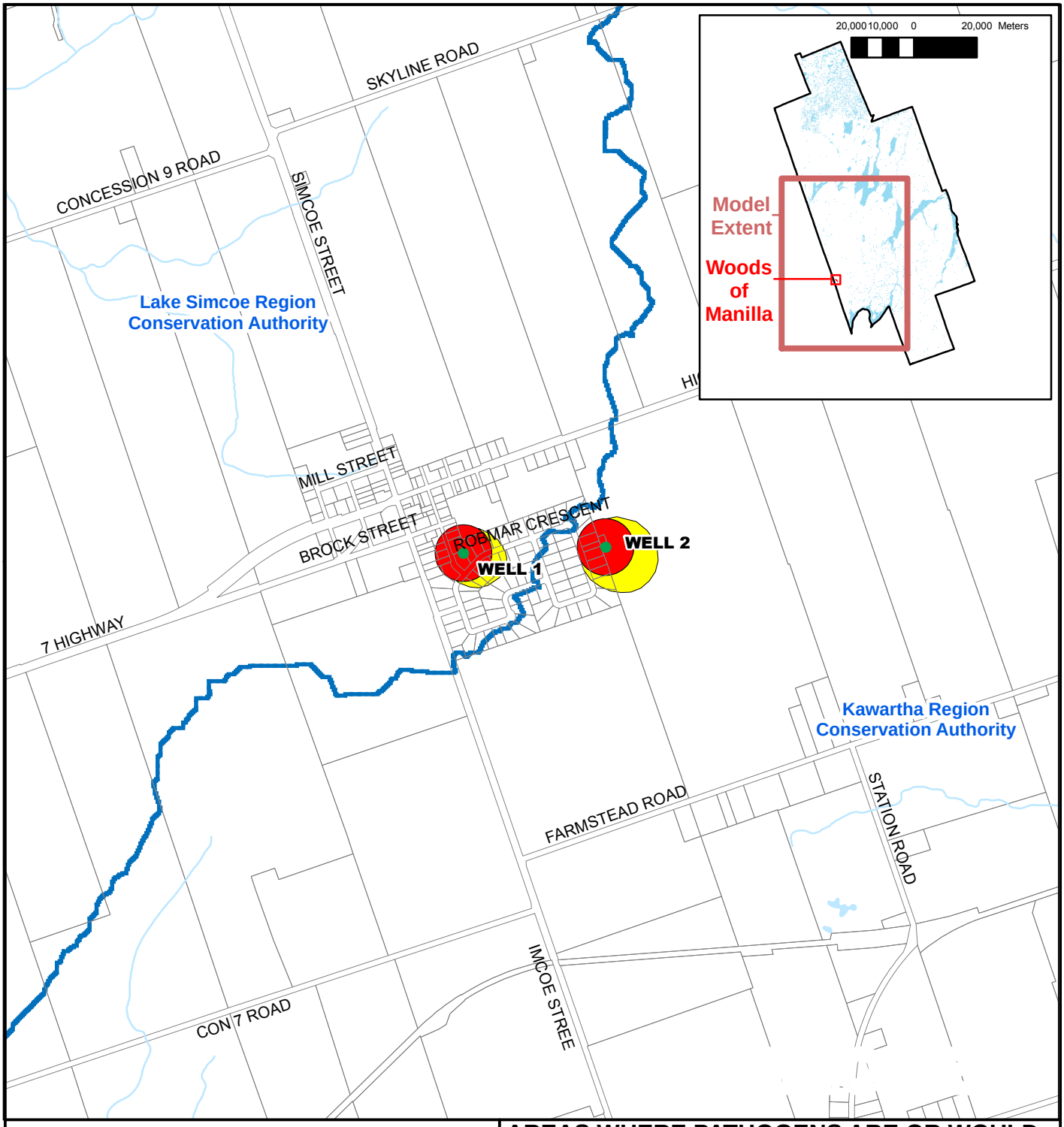
VULNERABILITY SCORE - WOODS OF MANILLA

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:20000
PROJECT: 0-071967.08	FILE. NO.:0-07196708F4-4

GENIVAR Ontario

FIGURE **7b-3**



LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

200 100 0 200 Metres

AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WOODS OF MANILLA

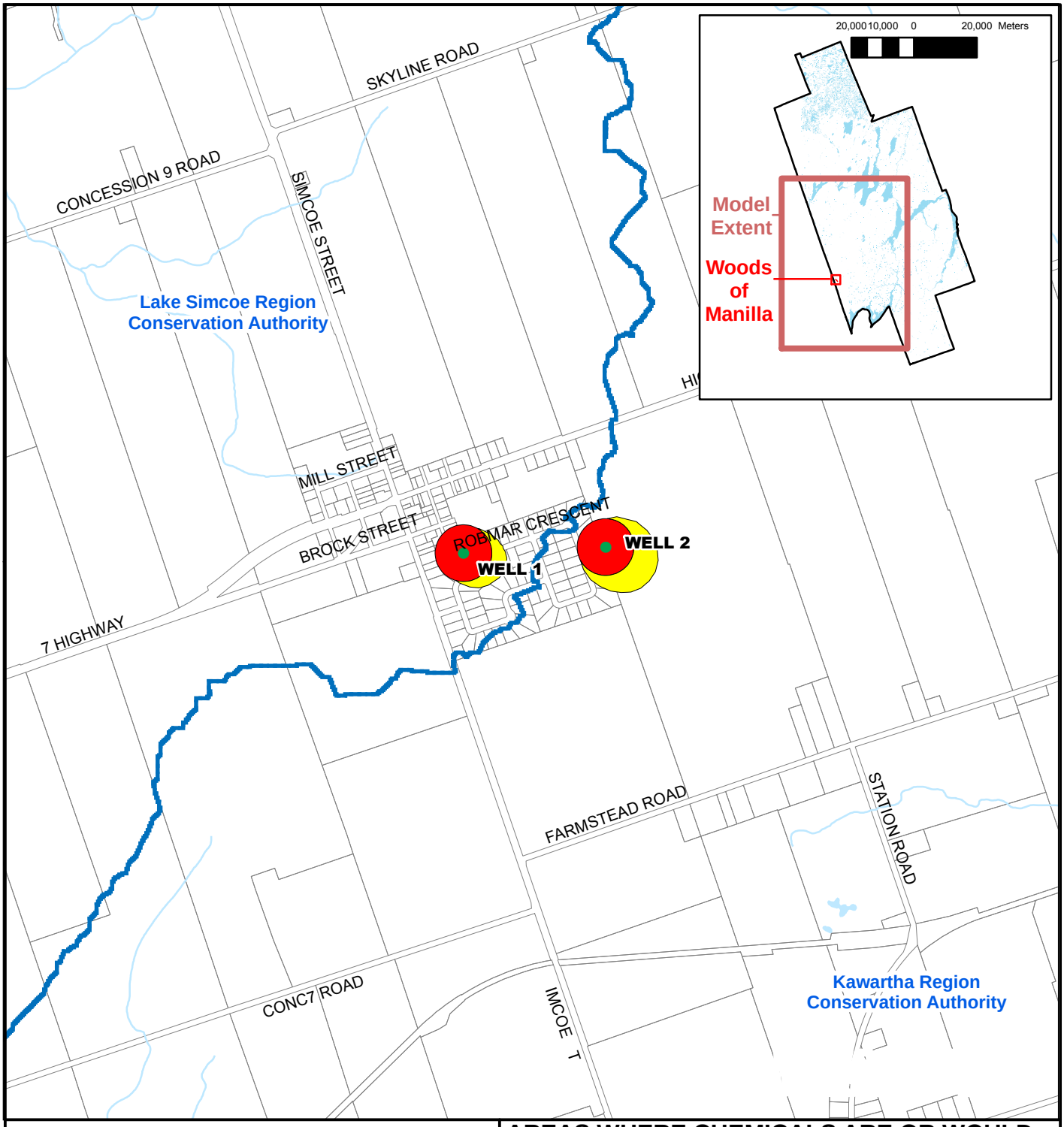
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.08	FILE. NO.:0-07196708F4-5

GENIVAR Ontario

FIGURE **7b-4**



LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

200 100 0 200 Metres

AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WOODS OF MANILLA

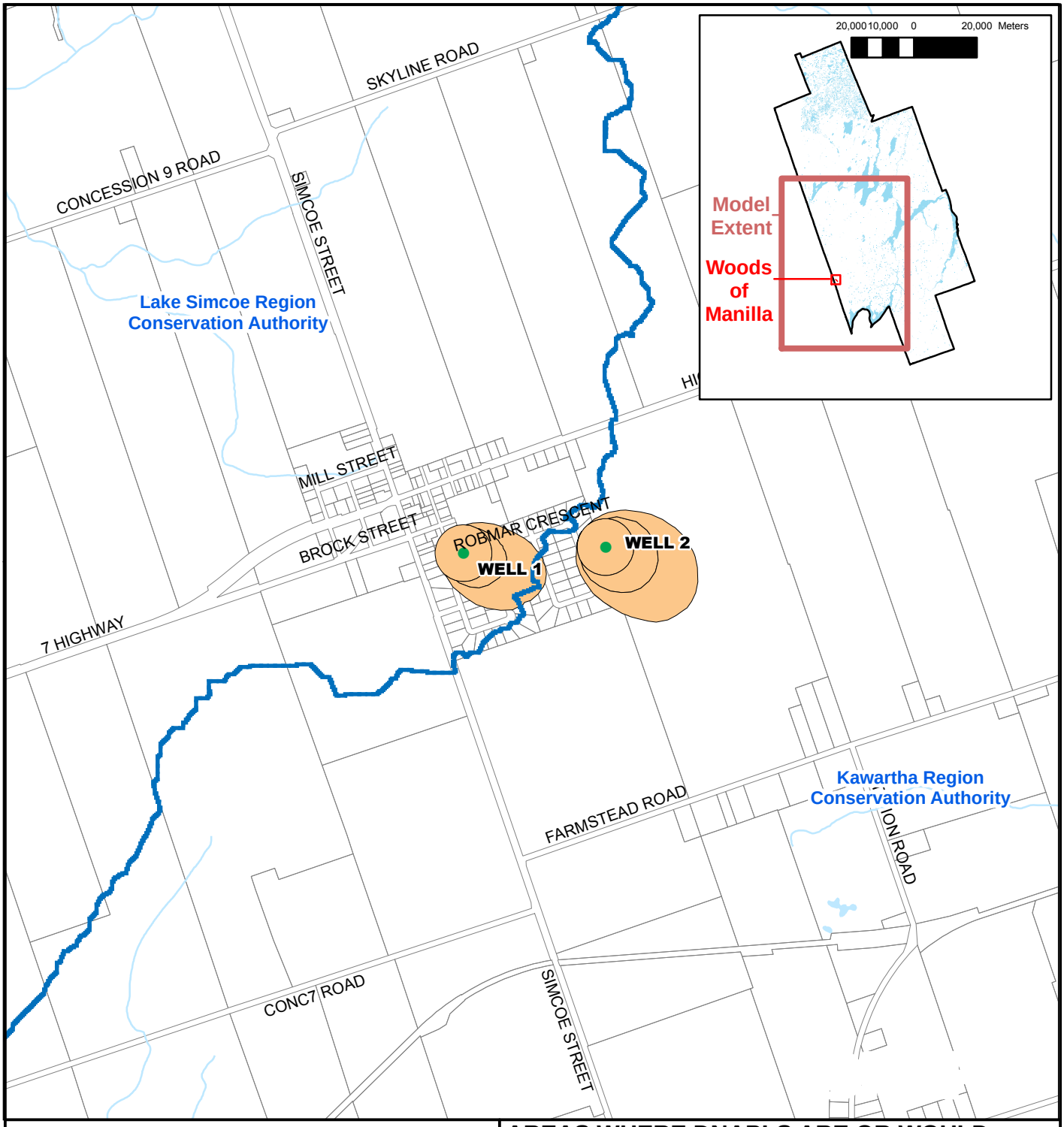
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.08	FILE. NO.:0-07196708F4-6

GENIVAR Ontario

FIGURE **7b-5**



LEGEND

- MUNICIPAL WELL LOCATION
- WHPA-C: 5-YEAR TIME-OF-TRAVEL

N W E S

200 100 0 200 Metres

AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WOODS OF MANILLA

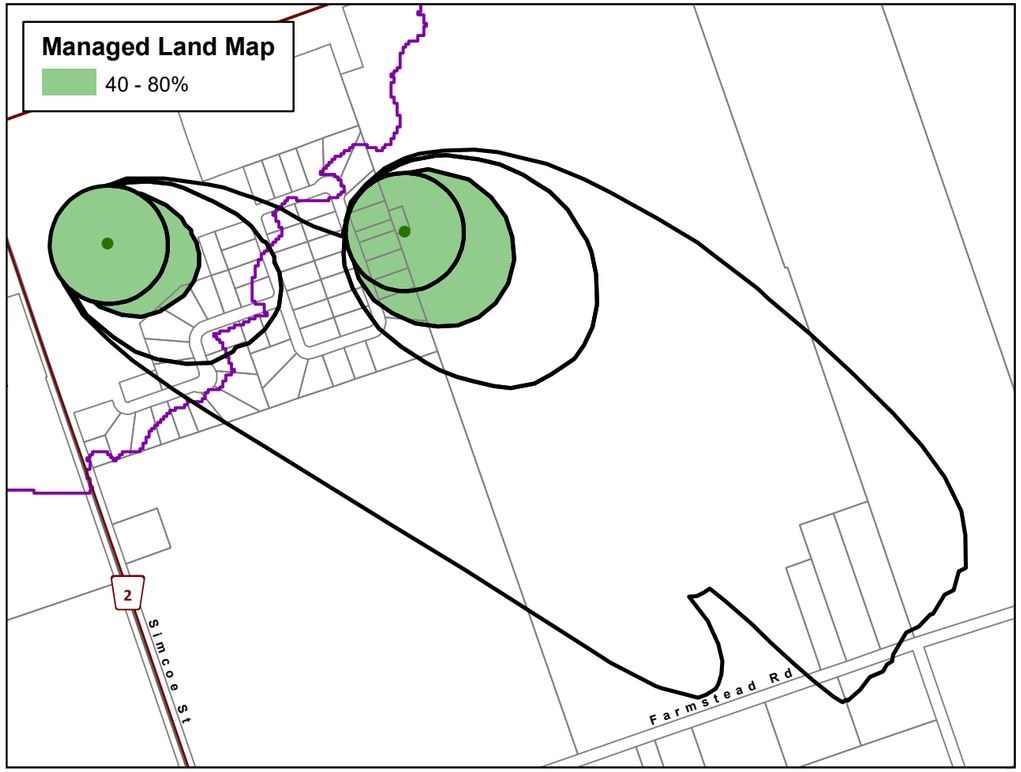
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

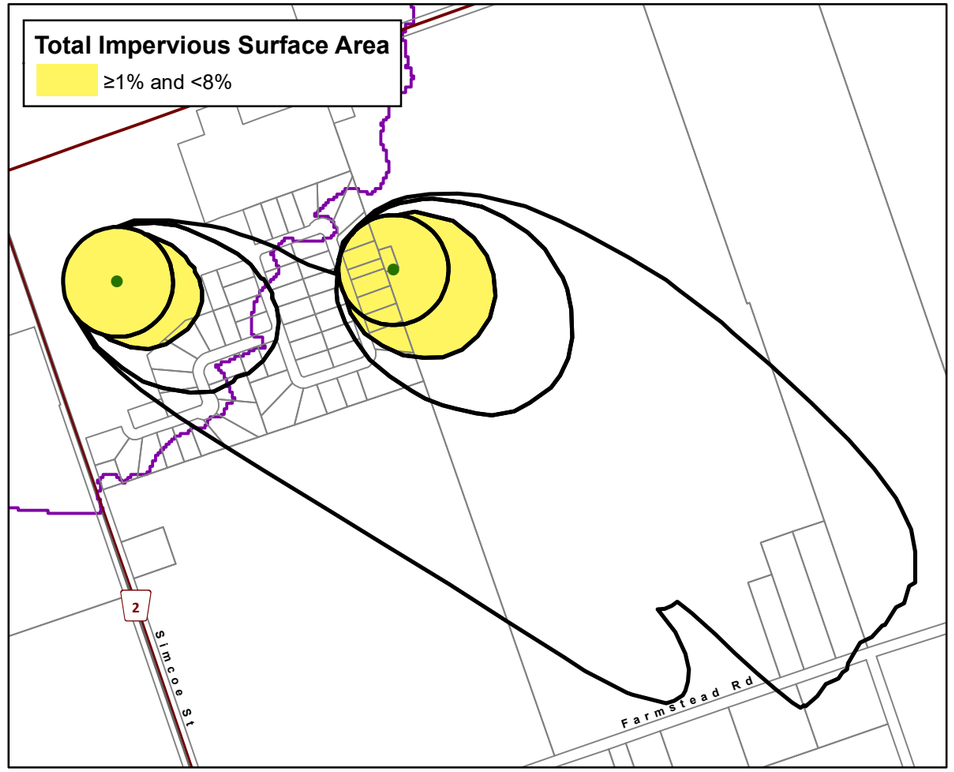
This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010	SCALE: 1:20000
PROJECT: 0-071967.08	FILE. NO.:0-07196708F4-7

GENIVAR Ontario

FIGURE **7b-6**





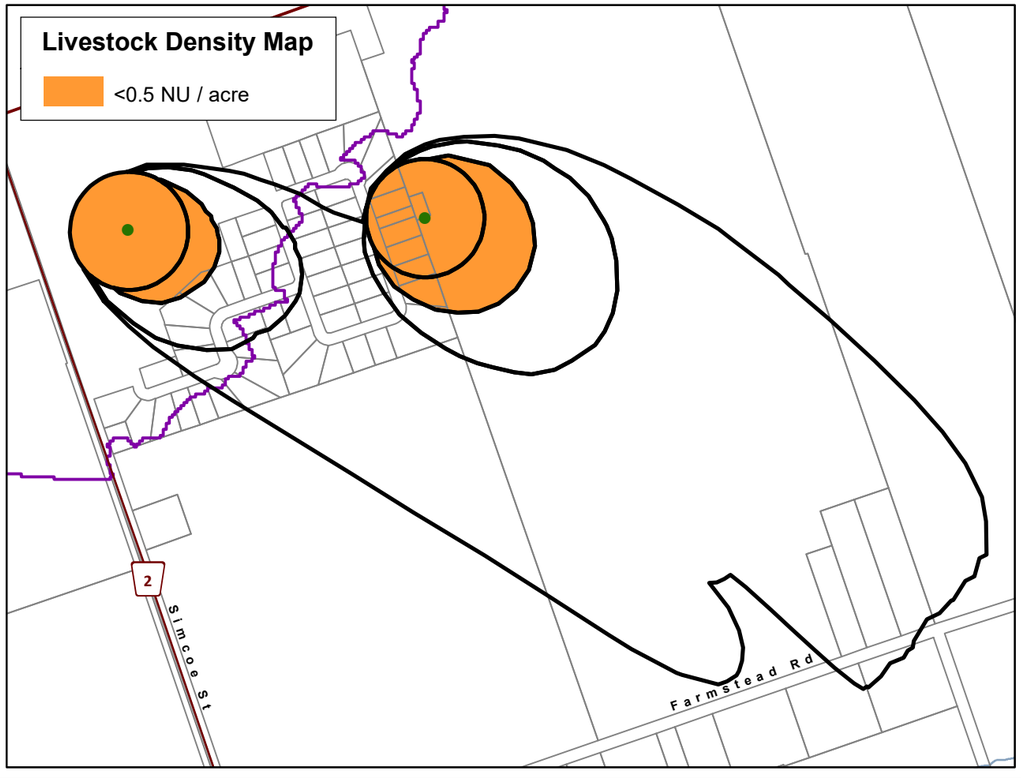


Figure 7b-7

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

Woods of Manilla Municipal Well System

Kawartha-Haliburton Source Protection Area

Managed Land, Livestock Density & Total Impervious Surface Area

Legend

- Municipal Wells
- Railway
- Watercourse
- Main Road
- Highway
- Multi Lane Highway
- Property Boundary
- Source Protection Region
- Source Protection Area
- Lower and Single Tier Municipality
- Upper Tier Municipality
- Wellhead Protection Areas
- Waterbody
- Wetland

N

0 0.125 0.25 0.5

Kilometers

Trent Conservation Coalition Source Protection Region

www.trentsourceprotection.on.ca

This map has been prepared for the purpose of meeting the provincial requirements under the Clean Water Act, 2006. If it is proposed to use it for another purpose, it would be advisable to first consult with the responsible conservation authority.

PRODUCED BY Lower Trent Conservation on behalf of the Trent Conservation Coalition Source Protection Committee, March 2011 (Updated November 2022), with data supplied under licence by members of the Ontario Geospatial Data Exchange.

Ontario
Made possible through the support of the Government of Ontario