

Chapter 17: Town of Wasaga Beach

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17 Town of Wasaga Beach

17.1 Introduction

This chapter contains information on one drinking water systems for Town of Wasaga Beach.

~~Golder Associates Ltd has 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. Golder Associates Ltd (Golder, 2010e) has completed the work presented, all of which was reviewed by South Georgian Bay-Lake Simcoe Source Water Protection staff, Town of Wasaga Beach staff, and members of the Source Protection Committee.~~

The chapter 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 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 Issues 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 Golder 2010e (found in Appendix MO and W) for a more in depth description of the methods used, as well as the Glossary for any unfamiliar terms.

17.2 Drinking Water Systems

The Town of Wasaga Beach operates groundwater based water supplies in one (1) community and does not have any surface water based supplies. As shown in Figure 17-1 the groundwater

supply is within the South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Region (SPR). The list below also indicates the Source Protection Region and corresponding lead Source Protection Authority (SPA) for the municipal water supplies.

Municipal Groundwater Supply in the Town of Wasaga Beach within the Nottawasaga Valley SPA included in this report:

- Wasaga Beach Well Supply

17.3 Wasaga Beach Well Supply

The Town of Wasaga Beach is located along the shore of Nottawasaga Bay, at the southern end of Georgian Bay. Wasaga Beach obtains potable water solely from groundwater sources and operates under PTTW 7854-6CGR5H which was issued on June 2, 2005 and expires on May 31, 2015.

Wasaga Beach obtains its water supply from two well fields comprising of a total of seven wells, referred to as Powerline Road (Wells 1, 2, 3 and 4) and Jenetta Street (Wells 1, 2 and 3) (Figure 17a-1). It should be noted that the Jenetta Street Wells were called the Spruce Street in the South Simcoe Groundwater Study (SSGS). The construction details of the wells can be found in the SSGS report (Golder, 2004). Subsequent to the issuance of the SSGS report Powerline Road Well 4 was added to the [MECP](#) Permit to Take Water (PTTW 7854-6CGR5H) for the system. The permit allows for the operation of all of the wells, however, Powerline Well 1 is to be operated only as a standby well and shall be used in combination with two of Powerline Road Wells 2, 3 or 4 as required.

The Wasaga Beach area is underlain by four overburden aquifer systems. The upper unconfined aquifer (Aquifer A1) is located within a few metres of the ground surface and is made up of the sand that is present across the ground surface at Wasaga Beach. The sand is up to approximately 20 m thick, depending on elevation, and can have a saturated thickness of up to approximately 15 m. Most of the wells constructed in this aquifer are sand points or dug wells; however shallow drilled wells are also present.

The second aquifer in the sequence is Aquifer A2. This unit is present predominantly in the western part of Wasaga Beach near the McIntyre Estates area, and as a thin sand zone at an elevation of 135 to 155 metres above sea level (masl) along River Road West, but is absent at Powerline Road. Between Aquifer A2 and Aquifer A1 there is a confining layer described as silt and clay in most drillers records. This confining unit is recognized in many areas as deep water varved lacustrine silts and clay of Lake Algonquin origin.

The lower aquifers (A3) and (A4) host the municipal water supply wells. In most areas of Wasaga Beach this aquifer is separated from Aquifer A2 by a 10 to 15 m thick silt and clay confining layer; however in some areas it may be absent. It is expected that Aquifers A3 and A4 are connected, however testing at the two well fields at rates of up to 15,725 m³/day (182 L/s) has failed to result in measurable interference between the well fields. At Jenetta Street, the aquifer is 27 m thick and is found in a bedrock depression at an elevation range of 103 masl to 130 masl. The coarse-grained portion of the aquifer is at the base of the unit and is approximately 10 m thick.

The upper portion of the aquifer at Wells 2 and 3 is described as fine sand or sand with the odd streak of gravel, whereas the lower portion is composed of fine to coarse gravel and boulders. At the Powerline Road wells, the aquifer is approximately 15 m thick and extends across an elevation range of 120 masl to 139 masl. The aquifer is composed of finer grained materials than at the Jenetta Street wells. Laterally, Aquifer A3 pinches out to the west against Palaeozoic bedrock. To the south and east the deep aquifers are poorly defined because of a lack of stratigraphic information as shallow aquifers provide ample water supplies for domestic supplies and therefore limited deep well records.

17.3.1 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 Wasaga Beach water supply has been delineated following the process recommended in the Technical Rules. The areas that contribute groundwater to the wells were delineated as WHPA. The Groundwater Vulnerability Assessment was carried out as follows:

- review of WHPA delineation
- assess Groundwater Vulnerability (AVI Method)
- assign Vulnerability Score prior to modifiers (water quality and transport pathways)
- consider modifications to Vulnerability Score based on water quality and transport pathways
- assign final Vulnerability Score
- determine level of uncertainty in Vulnerability assessment

Detailed methods describing the Vulnerability Analysis completed by Golder (2010e) are provided in Appendix W. Note that the methods used to assign vulnerability scores in the Golder report differ slightly than those within this Assessment Report. The Golder report includes a modification to vulnerability based on water quality. While Directors approval to use this alternate approach was requested under Technical Rule 15.1, approval was only given to increase vulnerability from low to medium, and not to increase vulnerability to high. As permission to only partially increase the vulnerability score was approved, it was recommended not to increase vulnerability due to water quality. An explanation from M~~ECPOE~~ detailing the reason why the alternate method could not be used is provided in Appendix W.

17.3.1.1 Wellhead Protection Area (WHPA) Delineation

The South Simcoe Groundwater Study (SSGS) included the delineation of the WHPAs for all of the municipal wells in the Town of Wasaga Beach with the exception of Powerline Toad Well 4. An industry standard groundwater modeling software package, MODFLOW, was used to develop the capture zones for the wells in the Town of Wasaga Beach. A detailed description of the groundwater flow modeling undertaken for these wells can be found in the SSGS report (Golder, 2004).

The resulting WHPAs are illustrated in Figure 17a-1. The capture zones provided are based on previous investigations and have not been altered.

The capture zones for Wasaga Beach Wells are fairly broad and extend in a southeasterly direction. The WHPA-B capture zones spread out radially from the two well fields, and the capture zones for the Jenetta Street wells extend beneath Nottawasaga Bay. The capture zones extending beneath the bay are predicted to be within the lower Wasaga Beach aquifer, estimated to be more than 20 m below the bathometric depth of the bay. The WHPA-D capture zone for the Jenetta Street well field extends beneath Marl Lake in the east, and the WHPA-D capture zone for the Powerline Road well field extends beneath the southern reaches of the Nottawasaga River in the south, and to Sunnidale Road to the west.

17.3.1.2 Groundwater Vulnerability

The Groundwater Vulnerability within the WHPAs of the seven municipal wells in the Town of Wasaga Beach is shown in Figure 17a-2.

The regional scale intrinsic susceptibility index (ISI) vulnerability was completed for the Town of Wasaga Beach in the SSGS. As the municipal aquifers in the Town of Wasaga Beach are located below the first aquifer defined in this method, the resulting ISI vulnerability does not accurately

reflect the Vulnerability of the municipal supply aquifer, which in many cases is overlain by low permeability materials.

To account for the added protection that the confining units may provide and thus lower the calculated Vulnerability of the aquifer, the Vulnerability was calculated to the municipal aquifer for each well. The Vulnerability of the municipal aquifers was calculated using the Aquifer Vulnerability Index (AVI) method (MOE, 2006) rather than the ISI approach. As many wells in the area do not reach the depth of the municipal aquifer, it was not possible to use the geologic logs of individual well records to calculate the Vulnerability. Therefore the layers from the calibrated numerical model developed as part of the SSGS were utilized to calculate the Vulnerability to the municipal aquifer. Refer to Golder, 2010e for further details on the AVI method approach for Wasaga Beach.

Due to the depth of the municipal aquifer and presence of confining units all of the Town of Wasaga Beach WHPAs have a Low intrinsic Vulnerability.

17.3.1.3 Transport Pathway Increase

The Technical Rules allow for increasing the aquifer vulnerability based on Transport Pathways that are anthropogenic in origin (i.e. man-made structures). The presence of the Transport Pathways should be accounted for in the Vulnerability Assessment and include:

- private water wells, unused water wells and abandoned water wells
- construction of underground services
- subsurface excavations
- pits and quarries

There were no adjustments made to the Vulnerability Scoring for the Wasaga Beach system, with the exception of private wells.

Constructed Transport Pathways to an aquifer, for example water wells, can have a locally significant impact on the Vulnerability of an aquifer. To assess this impact, a Transport Pathway private well inventory was undertaken for the Town of Wasaga Beach within the area of the WHPAs in 2006 (Golder, 2006). Details on the methodology and the results can be found within the report completed by Golder (2006). The inventories were aimed at identifying and locating wells within the WHPAs and included a categorization of those wells which pose the highest risk to the aquifer. The wells were classified based on:

- the physical condition of the well (i.e., Class A, B or C), based on height of the casing above grade and likely condition of the well cap

- increasing risk (category 1, 2, and 3) based on the aquifer they were completed in

Wells with a risk rating of 3C were included as Transport Pathways as they are considered to have the highest risk as this comprises the wells completed to the municipal aquifer which have below standard well casing height. The high risk rating does not imply that these wells necessarily represent a Transport Pathway that is or could cause impact to the municipal aquifer. It implies that, based on the physical condition and depth of the well, there is an increased risk associated with these locations. These are the only wells (3C) that have been used to modify the Vulnerability Scoring, based on the rationale provided in Golder, 2010e. There is only one well within the Jenetta Street WHPA which was categorized as 3C and located within the Wasaga Beach WHPAs. The location of this Transport Pathway and the resulting increase to Vulnerability Scores are presented in Figure 17a-3.

17.3.1.4 WHPA-E

None of the wells in this study have been identified as Groundwater Under the Influence of surface water (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.~~

17.3.1.5 Vulnerability Score

The WHPA zones for the Wasaga Beach Water Supply, as shown in Figure 17a-1, the Groundwater Vulnerability, as shown in Figure 17a-2, and increases due to Transport Pathways (Section 17.3.1.3) were used to assign a Vulnerability Score using the matrix from Table 5.3 (Chapter 5: Methods Overview, Section 5.2.4). Figure 17a-3 illustrates the Vulnerability Scores for the Wasaga Beach Water Supply. Figure 17a-3 will be used to assess Drinking Water Threats in Section 17.3.3.

17.3.1.6 Uncertainty Rating

The Technical Rules require that an Uncertainty Rating, characterized as High or Low, be assigned for completed Vulnerability and WHPA assessments. Uncertainty assessment for WHPA delineation was undertaken by both Golder 2010e and independent peer review. In situations where different uncertainty estimates are provided (i.e. Low and High), the most conservative (High uncertainty) has been applied. Uncertainty of the Vulnerability Assessment was only undertaken by Golder 2010e.

The independent peer review of WHPA delineation was undertaken by Dillon Consulting using a standard scoring matrix (Table 1, Appendix MO). The Uncertainty Rating assigned for the Wasaga Beach WHPAs is High. The full results of the WHPA delineation Peer Review process,

for Wasaga Beach is available in Appendix W and discussed in Chapter 5 (Methods Overview). Based on the rationale provided for the Vulnerability Assessment (see below), Golder 2010e, characterized uncertainty of the WHPA delineation as Low. As this differs from that provided by the peer review, the most conservative, 'High' Uncertainty ranking will currently apply.

The uncertainty associated with the Vulnerability Assessment was evaluated using a qualitative process outlined in Golder, 2010e. 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.

Considering all of the available data, the uncertainty of the Vulnerability for the Wasaga Beach Water Supply is considered Low close to the municipal wells and increases at the outer reaches of the 25 year capture area. Overall, the Vulnerability uncertainty is characterized as Low.

17.3.2 Drinking Water Issues

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

The Town of Wasaga Beach Drinking Water Issues evaluation was based on a review of water quality data from the SSGS (Golder, 2004) and annual drinking water quality reports provided by the Ontario Clean Water Agency for 2006 and 2007.

Water quality data from municipal supply wells and sentinel wells for the municipal supply wells was assessed to identify parameters (including pathogens) for which there were indications of elevated concentrations. These parameters were further reviewed to determine if:

- current or projected concentrations exceed the Ontario Drinking Water Quality Standards (ODWQS)
- the parameter was considered to be anthropogenic or natural in origin
- the parameter should be made a Drinking Water Issue

The projected concentrations were based on linear regression analysis for the available dataset. Where projected trends at 50 years indicated concentrations which were close to but not

exceeding the ODWQS, the most recent data was evaluated to determine if there was indication of an increase in the trend or stabilization in the concentrations. If recent data indicated concentrations above the projected trend line, the parameter was included as a Drinking Water Issue.

The assessment of drinking water quality issues and potential trends of the parameters are complicated by the availability of water quality results for these systems. Traditionally, raw water quality samples were taken from individual well supplies, however, changes in regulated sampling requirements have resulted in sampling of raw or treated samples which are a combination of wells from a given well field. This is the case for the Powerline and Jenetta Street Wells. There are no water quality Issues identified for these systems and as a result, the data do not provide the same complications as may for example occur where low concentration (of a given parameter) water is mixed with high concentration water. Since only a combined result is available, accurate tracking of individual source concentrations are not possible. In addition limited data for chloride and sodium after 2003 limits the trend analysis for these parameters. It is recommended that raw water be sampled on an annual basis for major ions to track water quality trending parameters.

The Wasaga Beach municipal wells are characterized by moderately high hardness of approximately 200 mg/L which exceeds the ODWQS but is naturally occurring and is therefore not considered a Drinking Water Issue. The concentrations of the major ions chloride, sodium and sulphate are low, typically less than 10 mg/L. Nitrate concentrations are low (less than 0.5 mg/L). Groundwater from the Jenetta Street wells exhibit slightly higher major ion concentrations (chloride, sodium) and lower hardness. Iron is elevated but typically below the ODWQS of 0.3 mg/L.

No Drinking Water Issues were identified for the Wasaga Beach municipal water supply system.

17.3.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Wasaga Beach Water Supply was completed in accordance with the detailed methodology presented in Golder, 2010e (Appendix W). 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 Wasaga Beach Water Supply 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
- an enumeration of Drinking Water Threats

17.3.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for Wasaga Beach Drinking Water Supply is provided in Chapter 5 section 5.5.1.

The key data sources used to identify Threats on properties included:

- MOE Look Up Tables (LUT) Database (2009)
- Municipal Property Assessment Corporation (MPAC) (2007) assessment information
- South Simcoe Groundwater Study (SSGS) Contaminant Source Inventories
- Hazardous Waste Information Network (HWIN) (2009)
- MOE Records Database (2009)
- MOE Biosolids Database (2004- 2008)
- NVCA Mapping including land use, snow storage, and storm water management ponds (2009)
- Golder Field Windshield Surveys (2008/2009)
- Town of Wasaga Beach Sanitary Service Mapping

Section [17.3.3.5](#) ~~Error! Reference source not found.~~ describes how these datasets were used to identify and enumerate potential Significant Threat Activities for the Wasaga Beach drinking water system.

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

17.3.3.2 List of Drinking Water Threats – Conditions

The initial compilation of Conditions was based on the MOE Records Database and the MOE Brownfields Database (2009) and supplemented by information provided by the City. The MOE Records database (2009) included a compilation of files from the MOE District office for properties within approximately 500 m of a municipal well. The database included a number of records relating to Certificates of Approval, Records of Site Condition, miscellaneous reports, waste generator registration information, permits, applications and correspondence. The files in this list of potential Conditions were reviewed in greater detail to determine if there was sufficient evidence to confirm a Condition based on the Technical Rules criteria.

No confirmed Conditions have been identified for the Wasaga Beach water supply. No potential Conditions have been identified for consideration at this time.

17.3.3.3 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 table of Drinking Water Threats Technical Rules threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores.](#) ~~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 [circumstance tables](#) can be found at ~~the~~ <https://threats.swpip.ca/https://swpip.ca/>. [Government of Ontario's Drinking Water Threats and Circumstances](#) ~~Government of Ontario's Drinking Water Threats and Circumstances.~~

17.3.3.3.1 Pathogen Parameters

The ~~MECP table of Drinking Water Threats Technical Rules~~ [Key Table on Figure 17a-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 Wasaga Beach Water Supply ([Figure 17a-4](#)). Areas within the WHPA-A and WHPA-B with a Vulnerability Score of less than six are not illustrated as they do not contain Circumstances (high enough Hazard Score) for an Activity Threat to be considered Significant, Moderate or Low.

17.3.3.3.2 Chemical Parameters

The ~~MECP table of Drinking Water Threats Technical Rules Key Table on Figure 17a-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 Wasaga Beach Water Supply (~~Figure 17a-5~~). Areas within the WHPA that have a Vulnerability Score of less than six are not illustrated as they do not contain Circumstances (high enough Hazard Score) for an Activity Threat to be considered Significant, Moderate or Low. ~~The Key Table on Figure 17a-5 illustrates where activities associated with chemical threats are or would be Low Drinking Water Threats for the Wasaga Beach Water Supply.~~

17.3.3.3.3 DNAPL Chemical Parameters

Figure 17a-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) where activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threats for the Wasaga Beach Water Supply. The ~~MECP table of Drinking Water Threats Technical Rules Key Table on Figure 17a-6~~ can be used to identify the circumstances in which these Activities would be Significant, or Moderate, or Low Drinking Water Threats.

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

Further to Section 17.3.3.2, no Conditions have been confirmed within the WHPA for the Wasaga Beach Water Supply (Golder, 2010e).

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 17a-3 illustrates the Vulnerability Score map for Wasaga Beach well supply that can be used to determine where a Condition is or would be a Significant, Moderate or Low Threat to Drinking Water.

17.3.3.5 Enumerating Drinking Water Threats

17.3.3.4.1 17.3.3.5.1 Enumerating Significant Drinking Water Threats – Methods

Identification and enumeration of Significant Drinking Water Threats related to Issues and Conditions have been described in Section 17.3.2 and 17.3.3.2, respectively. This section describes the identification and enumeration of Significant Drinking Water Threat Activities. Identification of Activities requires determining where they are located in terms of vulnerable areas and their associated Risk Score based on the type of Activity. Detailed methodology can be found in Golder, 2010e. Additional refinement of the Significant Drinking Water Threats enumeration was completed using the methodology outlined in Chapter 5 (Section 5.5.6.4) of this Assessment Report.

A number of data sources were utilized as part of the Activity Threat Assessment. The data sources used to obtain Threat information for the GIS based algorithm developed for the project are described in Golder 2010e and summarized in section 17.3.3.1. In most cases, the detailed information required to document the MOE Circumstances was not readily available. The approach was designed to represent typical Activities occurring at different property types. The approach is considered conservative and, in many cases, likely results in a higher Threat ranking than may otherwise actually be present in many cases. The assumed Circumstances and MOE Hazard Scores are described in Golder, 2010e, and were based on MPAC property codes (and MOE LUT Activities). It is noted that the assessment has not involved field verification or site visits to validate information.

The Threat ranking algorithm was designed to perform the Threat rankings in an automated manner for properties within the WHPAs. The Threat ranking algorithm process begins with a yes/no question for each Prescribed Threat (e.g., Application of Agricultural Source Material (ASM) to Land, Application of Road Salt) to assess if the Activity is occurring on the property. If the answer was no, then no Threat was identified, and the algorithm did not calculate a Risk

Score for that Threat. If the answer was yes, the algorithm proceeded to the Hazard Score related to the assumed Circumstance using the MOE LUT database.

The input data lead the algorithm to relevant reference IDs in the MOE Drinking Water Threats Tables that reflect the Circumstances identified on the property. A lookup table is used to link the selected Circumstance to an MOE Hazard Score which, when multiplied by the Vulnerability Score, provides the resultant Risk Score for the Threat in question. When multiple chemical parameter Circumstances are present for a given Threat, Risk Scores are calculated for each parameter and the highest score is tabulated for the Threat. It is noted that the Vulnerability Score used to rank a property is based on the maximum Vulnerability Score intersected by the parcel for the WHPA being evaluated. Finally, if the calculated Risk Score for a Threat is greater than or equal to 80, the Threat is ranked as Significant.

Two unique 'polygon' Threats were assigned to each WHPA with a Vulnerability Score of 10 in accordance with the common methodology developed by SGBLS (SGBLS, 2010). For the Threat 'sewage system or sewage works – sanitary sewers and related pipes', one Threat was assigned to each WHPA to account for the potential Threat that could exist related to the sanitary network. One Threat was assigned to represent the entire network since detailed information regarding distribution and conveyance capacities was not readily available within some study areas. The second polygon Threat assigned was related to domestic fuel storage (i.e. Fuel Storage) which may be on a property as a primary source of heating fuel. One fuel storage Threat was assigned to each WHPA where there was a high probability that natural gas was not available in the area. Generally in urban areas, where natural gas was probable, the polygon Fuel Threat was not assigned.

Some Threats such as the Application of Agricultural Source Material to Land have Circumstances based on datasets that are on a scale larger than individual properties. These Circumstances included percent Managed Lands, Livestock Density and Impervious Surfaces. Therefore, additional calculations were required to determine these Circumstances for each WHPA and Intake Protection Zone (IPZ). The percent Managed Lands and Livestock Density calculations were completed for this project using a methodology developed in consultation with the South Georgian Bay-Lake Simcoe Source Protection Region and was based on the MOE Technical Bulletin for Managed Land and Livestock Density Calculations (MOE, [November September 2009](#)). The percent Managed Land and the Livestock Density of an area is used as an estimation to represent the quantity of nutrients present as a result of nutrient generation, storage and land application within a WHPA. Managed Lands, Livestock Density and Impervious Surfaces are discussed in more detail below.

~~17.3.3.4.1.1~~ **17.3.3.5.1.1 Managed Lands**

Managed Land is land to which nutrients (Agriculture Source Material (ASM), commercial fertilizer, Non-Agricultural Source Material (NASM)) are applied. It includes crop land, fallow land, pasture land, golf courses, sports fields and residential lawns. Managed Lands is broken into two subsets; agricultural managed lands and non-agricultural managed lands. Agricultural managed lands include areas of crop land, fallow and pasture land that may receive nutrients. Non-agricultural managed lands includes golf courses, sports fields and residential lawns and other built up grassed areas that may receive nutrients (primarily commercial fertilizers).

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 Part XII of the Technical Rules (December 2021). Table of Drinking Water Threats.~~

Managed Lands were identified and the Managed Lands proportions were determined for the Wasaga Beach WHPA as outlined in Golder, 2010e.

The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 17.3.3.5.2). Figure 17a-7 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Wasaga Beach Water Supply where Vulnerability Scores were 6 or greater for WHPA-A to WHPA-D.

Managed Lands within the Wasaga Beach WHPAs is calculated to be within the lowest category of 0 to 40%.

~~17.3.3.4.1.2~~ **17.3.3.5.1.2 Livestock Density**

Livestock Density is calculated to provide a measure of the potential for generating, storing and land applying ASM as a source of nutrients within a defined area. The livestock density is expressed as Nutrient Units per Acre. It is determined by dividing the Nutrient Units generated in each area by the number of acres of agricultural managed land in the area where agricultural source material is applied.

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 ~~Part XII of the Technical Rules (December 2021). Table of Drinking Water Threats.~~

The Livestock Density was determined for the Wasaga Beach WHPA as outlined in Golder, 2010e. The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 17.3.3.5.2). Figure 17a-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Wasaga Beach 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 expected, the livestock density calculations result in <0.5 NU/acres within all of Wasaga Beach WHPAs where densities were calculated (i.e. greater than a Vulnerability of 6).

~~17.3.3.4.1~~ **17.3.3.5.1.3 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 [Part XII of the Technical Rules \(December 2021\), Table of Drinking Water Threats](#).

The proportion of Impervious Surfaces within the Wasaga Beach WHPA was determined in accordance with the methodology in Golder, 2010e. [Methodology in Technical Memorandum A5.1 \(Appendix MO\) was used in 2023 to update the proportion of Impervious Surfaces within the delineated WHPA zones using the 2021 Technical Rules](#). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 17.3.3.5.2). [The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents \(salt\)](#).

Figure 17a-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Wasaga Beach Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. ~~It is noted that an impervious area of 8 to 80% has been assigned within all lands contained within the Wasaga Beach WHPAs, as they generally cover an urban or urban/rural mix of land use types.~~

~~17.3.3.4.2~~ **17.3.3.5.2 Enumerating Significant Drinking Water Threats – Results**

As discussed above there are no Significant Threats associated with Conditions or Drinking Water Issues.

Table 17-1 and Table 17-2 document the enumeration of existing and potential Activities that are considered to be Significant Drinking Water Threats within the WHPAs for the Jenetta and Powerline Rd. wells that make up the Wasaga Beach Water Supply.

A total of thirteen (13) Activities that are considered to be potential Significant Drinking Water Threats have been identified in association with twelve (12) land parcels in the Wasaga Beach WHPAs. This represents less than one percent of the parcels assessed within the Wasaga Beach WHPAs.

The Jenetta Street WHPA has a total of ten (10) Significant Drinking Water Threats. One (1) threat activity and parcel has been assigned to represent the municipal sanitary sewer system and connections within areas where the vulnerability score is 10. Nine (9) parcels were identified for potential handling and storage of DNAPLs.

A total of three (3) Significant Drinking Water Threats were identified for the Powerline Road WHPA. One (1) threat activity and parcel has been assigned to represent the municipal sanitary sewer system and connections within areas where the vulnerability score is 10. One (1) parcel was identified for having an on-site sewage system and the handling and storage of fuel.

Table 17-1: Number of Significant Drinking Water Threats for the Wasaga Beach (Jenetta) Drinking Water Supply, Enumeration of Significant Threats (Wellhead Protected Area)

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	1
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

Threat Number	Threat	Significant Threat Counts Number of Threats
14	The storage of snow	10
15	The handling and storage of fuel	0
16	The handling and storage of dense non-aqueous phase liquid	9
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
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. O. Reg. 385/08, s. 3; O. Reg. 206/18, s. 1.	0
-	Total Number	150* significant threats (on 12 properties)

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Notes for the table above:

1. The number of parcels identified will typically be less than the number of significant threats as multiple threats can be observed per parcel
2. *2 verified existing Threats and 8 potential Threats that require further investigation

Table 17-2: Number of Significant Drinking Water Threats for the Wasaga Beach (Power Line) Drinking Water Supply, Enumeration of Significant Threats (Wellhead Protected Area)

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	2
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

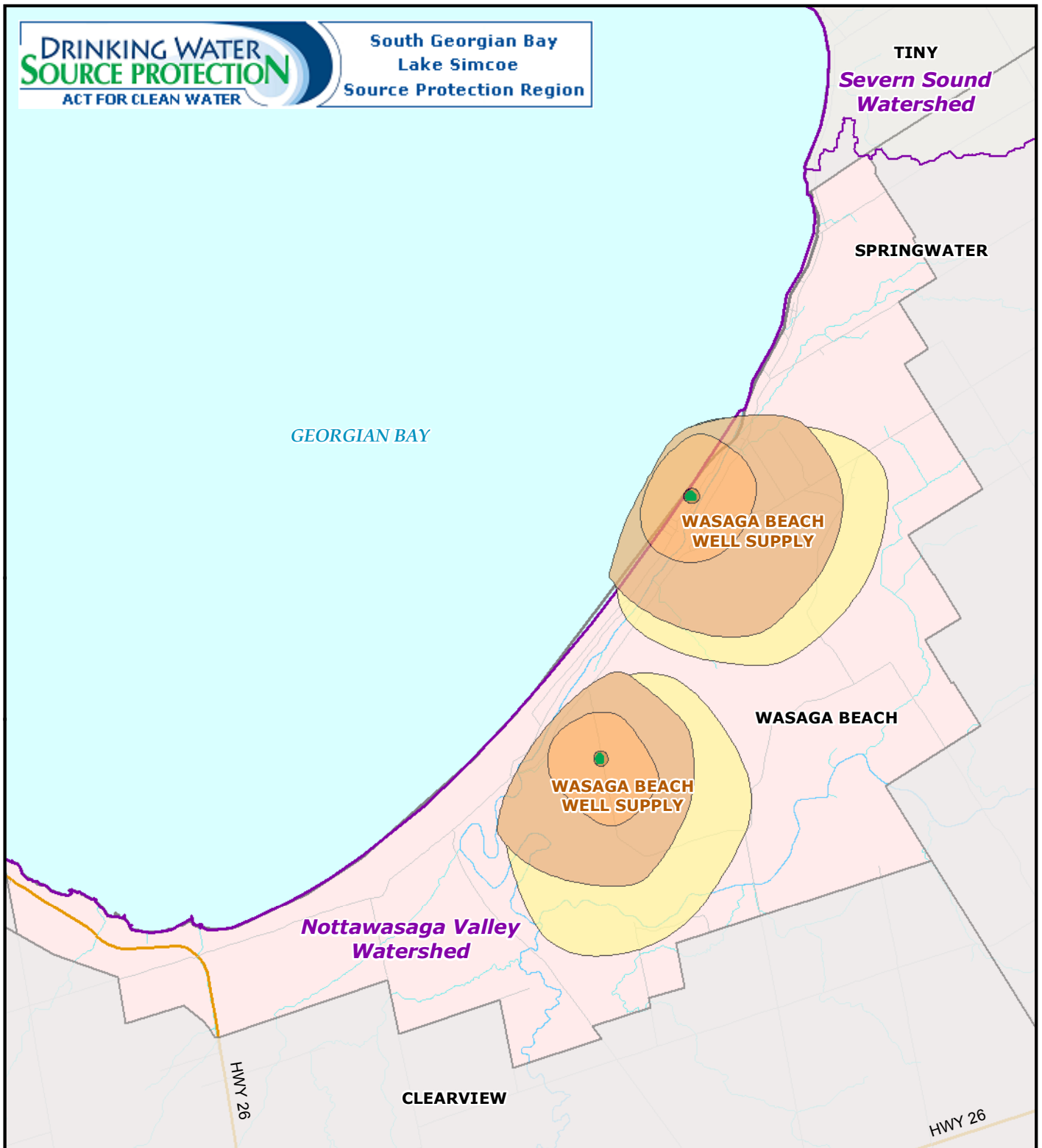
Threat Number	Threat	Significant Threat Counts Number of Threats
14	The storage of snow	0
15	The handling and storage of fuel	1
16	The handling and storage of dense non-aqueous phase liquid	0
17	The handling and storage of an organic solvent	0
18	The management of runoff that contains chemicals used in the de-icing of aircraft	0
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. O. Reg. 385/08, s. 3; O. Reg. 206/18, s. 1.	0
	Total Number	3* significant threats (on 2 properties)

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Notes for the table above:

1. The number of parcels identified will typically be less than the number of significant threats as multiple threats can be observed per parcel
2. *2 verified existing Threats and 1 potential Threat that require further investigation



- Municipal Supply Well in Town of Wasaga Beach
- WHPA-A (100m)
- WHPA-B (2 years time of travel)
- WHPA-C1 (10 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
Town of Wasaga Beach**

Created by: LSRCA
Date: 2011-04-01



Scale: 1:80,000

0 1 2km

UTM Zone 17N, NAD83

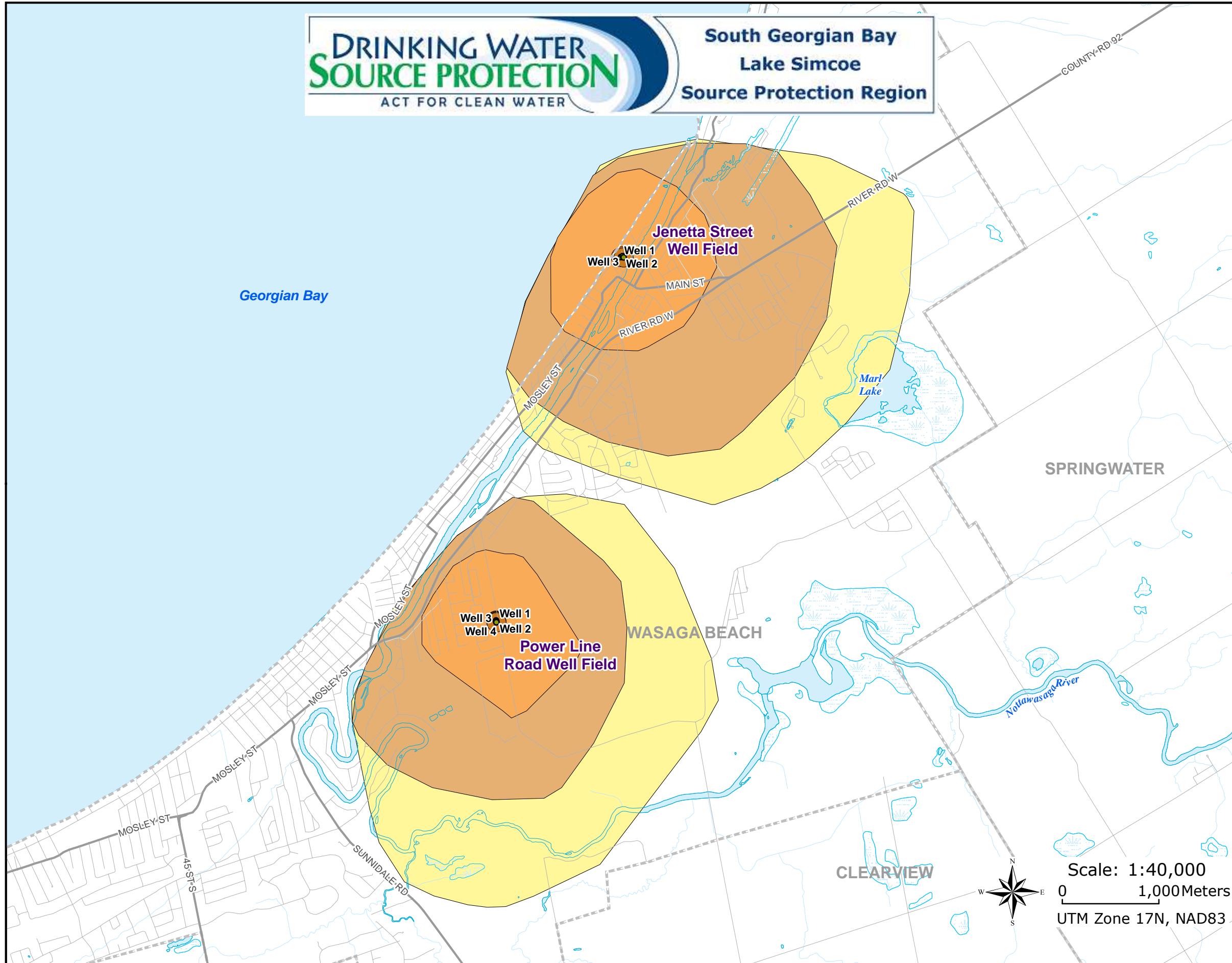


This map was produced by the Lake Simcoe Region Conservation Authority, lead agency of the South Georgian Bay Lake Simcoe Region Source Protection Region. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data,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



Figure 17-1

**Town of Wasaga Beach
 Wellhead Protection Areas**



- Municipal Wells
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- WHPA TOT**
- WHPA-A (100 m radius)
- WHPA-B (2yr TOT)
- WHPA-C1 (10 yr TOT)
- WHPA-D (25 yr TOT)
- Municipal Boundary



Created by: Golder Associates Ltd.
 Project #: 07-1170-0014
 File Number:
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 Date: 2009-10-21

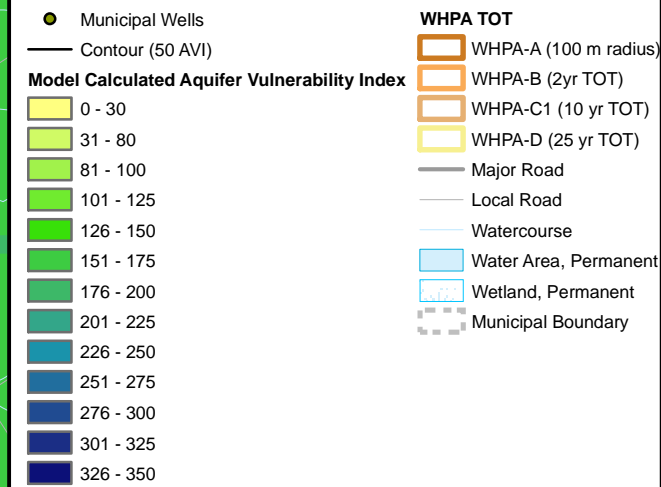
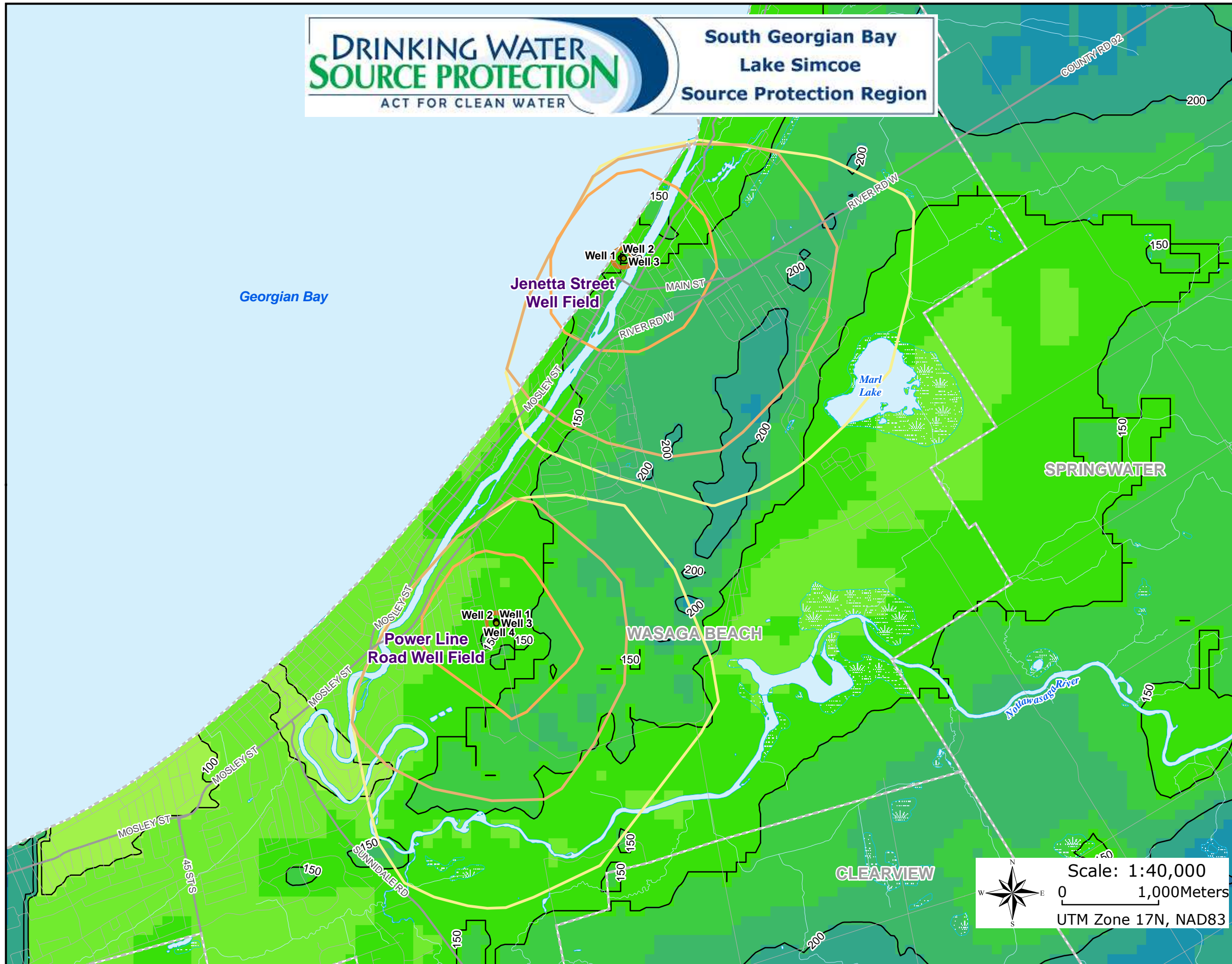


17a-1

Scale: 1:40,000
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 UTM Zone 17N, NAD83

This map was produced for the Town of Wasaga Beach, 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.

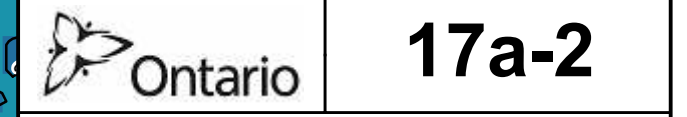
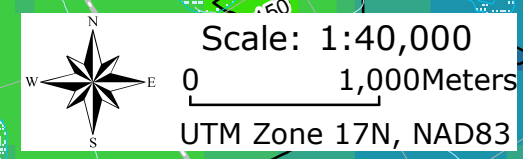
**Town of Wasaga Beach
Model Calculated AVI
To Top Of Aquifer A4**



Notes:
Low Vulnerability (AVI > 80)
Medium Vulnerability (AVI 30 to 80)
High Vulnerability (AVI < 30)



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Project #: 07-1170-0014
File Number: WasagaBeachAVI_TopA4.mxd
Date: 2009-10-21

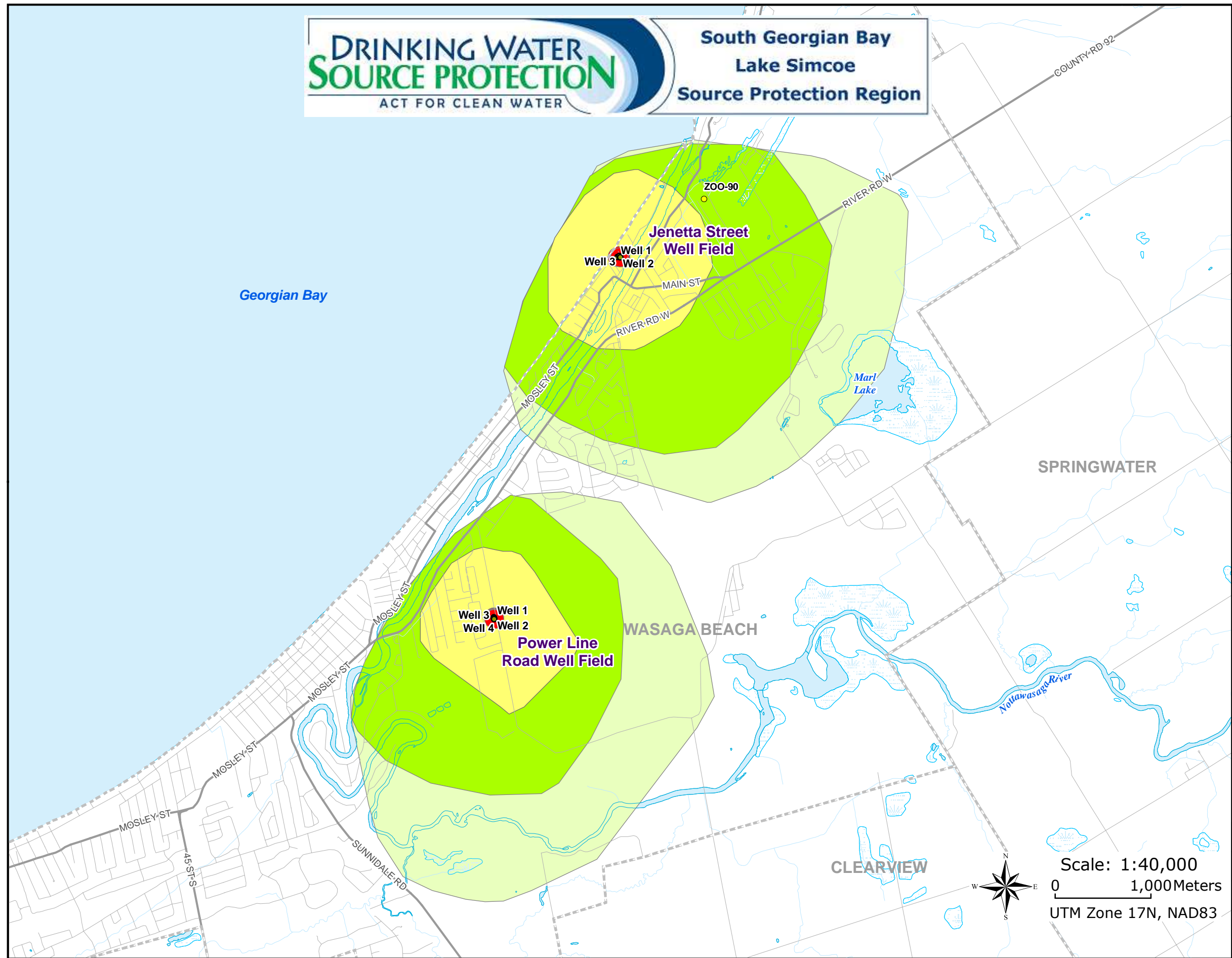


This map was produced for the Town of Wasaga Beach, for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



South Georgian Bay
Lake Simcoe
Source Protection Region

Town of Wasaga Beach
Wellhead Protection Areas
Final Vulnerability Scoring



- Municipal Wells
- zoo-90 3C Well Pathways
- Vulnerability Score**
- 10
- 8
- 6
- 4
- 2
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- Municipal Boundary



Created by: Golder Associates Ltd.
Project #: 07-1170-0014
File Number: WasagaBeach_Final_IVScore.mxd
Date: 2009-10-21

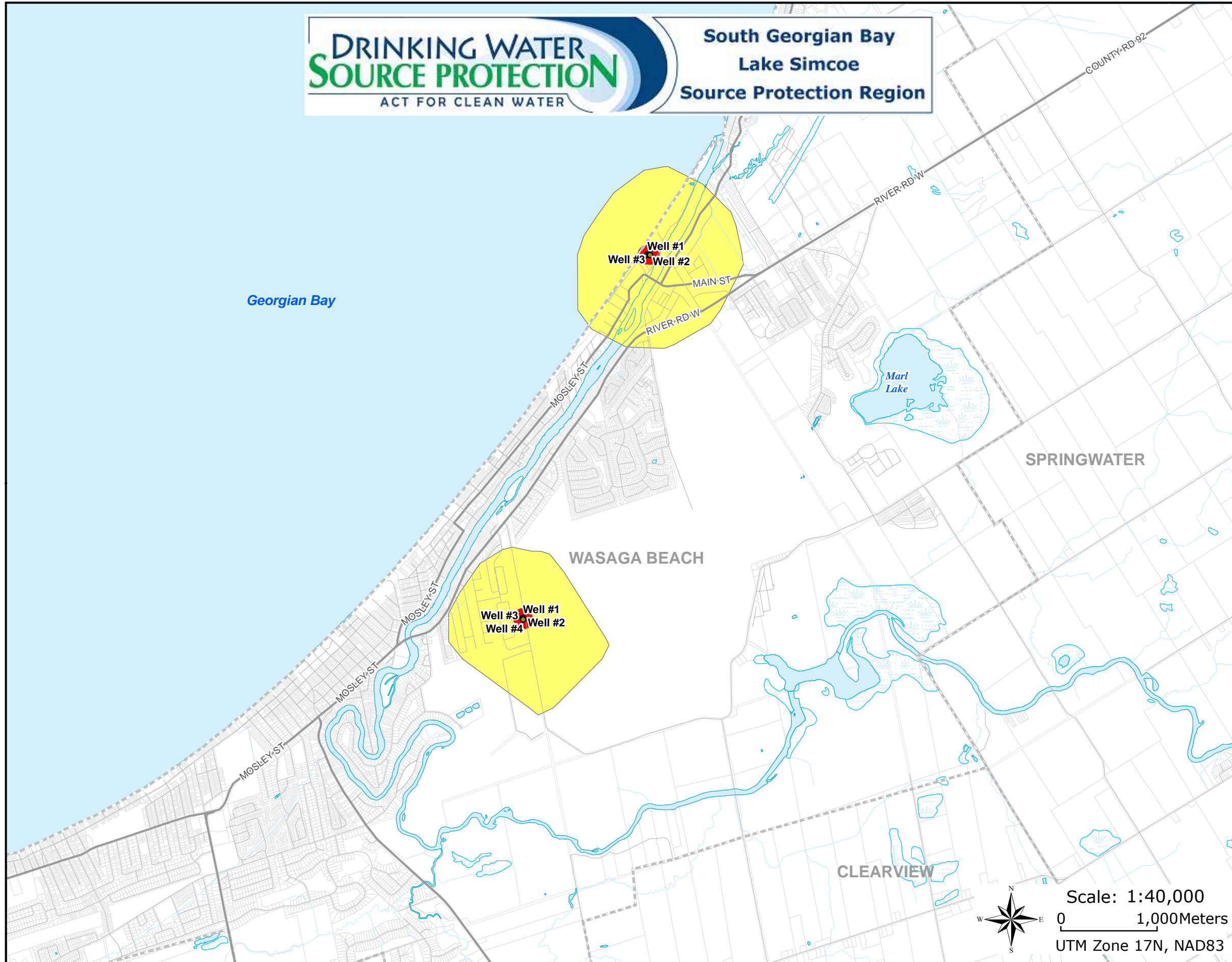
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UTM Zone 17N, NAD83



17a-3

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**Town of Wasaga Beach
Areas That Are or
Would Be Significant, Moderate or
Low Drinking Water Threats:
Activities Pathogen**



- Municipal Well
- Vulnerability Score
 - 10
 - 8
 - 6
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- Parcel Fabric
- Municipal Boundary



Created by: Golder Associates Ltd.
Project #: 07-1170-0014
File Number:
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Date: 2010-02-09

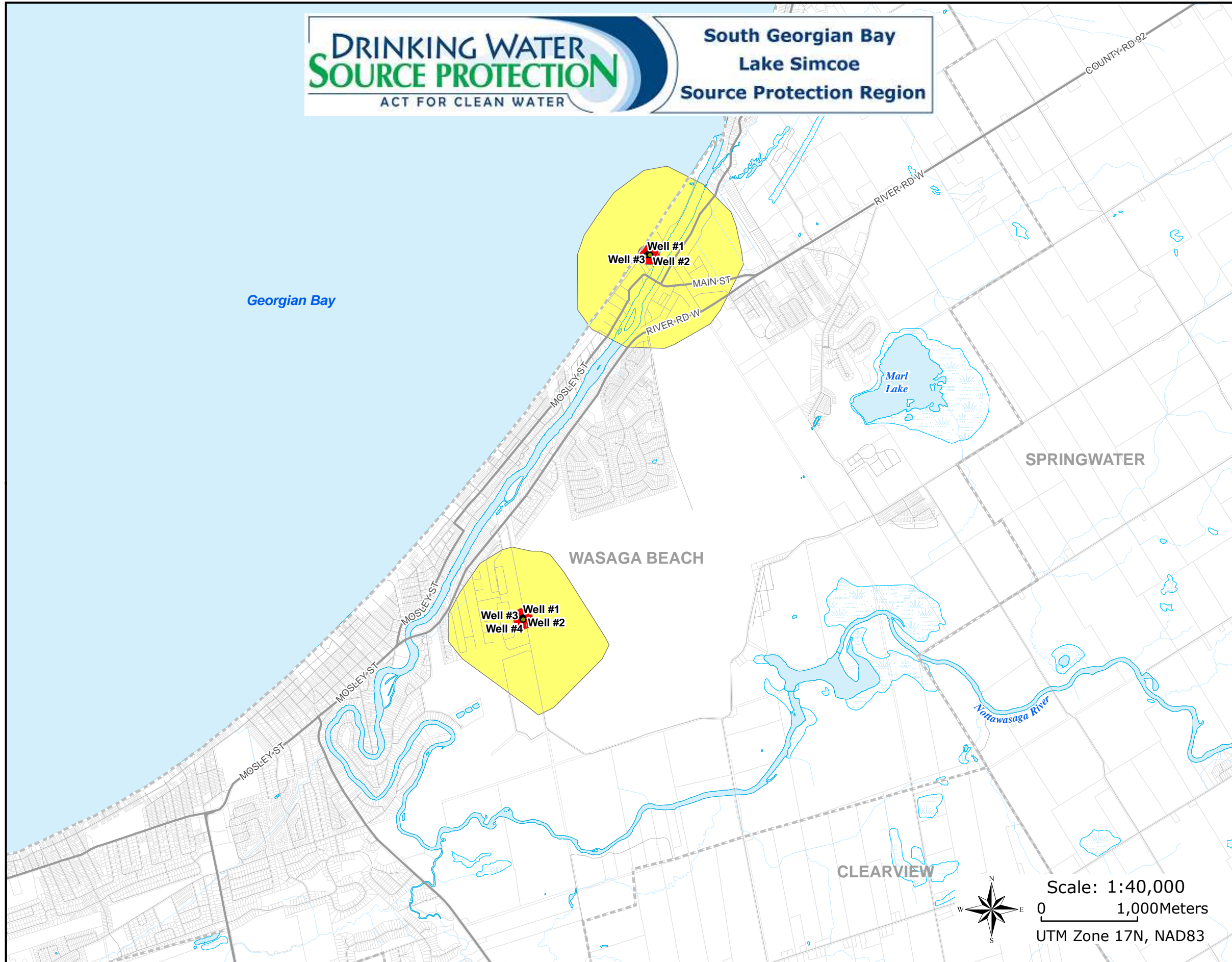


17a-4

Scale: 1:40,000
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UTM Zone 17N, NAD83

This map was produced for the Town of Wasaga Beach, 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.

**Town of Wasaga Beach
Areas That Are or
Would Be Significant, Moderate or
Low Drinking Water Threats:
Activities Chemical**



- Municipal Well
- Vulnerability Score
 - 10
 - 8
 - 6
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- ▭ Parcel Fabric
- - - Municipal Boundary



Created by: Golder Associates Ltd.
Project #: 07-1170-0014
File Number:
WasagaBeach_ChemicalThreat.mxd
Date: 2010-02-09



17a-5

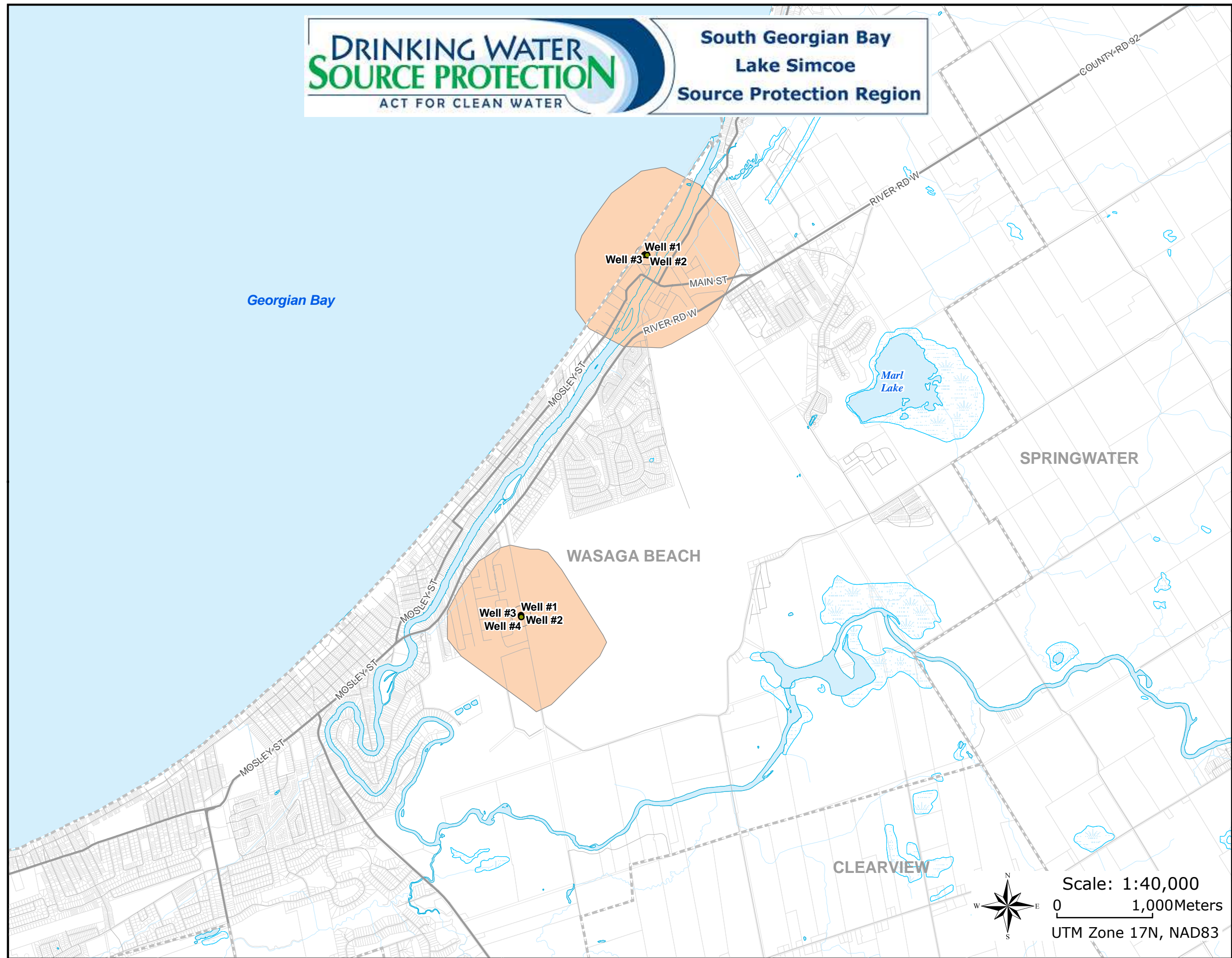
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UTM Zone 17N, NAD83

This map was produced for the Town of Wasaga Beach, 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.



South Georgian Bay
Lake Simcoe
Source Protection Region

Town of Wasaga Beach
Areas That Are or
Would Be Significant, Moderate or
Low Drinking Water Threats:
Activities DNAPLs



- Municipal Well
- WHPA A,B, C1
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- Parcel Fabric
- Municipal Boundary



Created by: Golder Associates Ltd.
Project #: 07-1170-0014
File Number:
WasagaBeach_DNAPLs.mxd
Date: 2010-02-09



17a-6

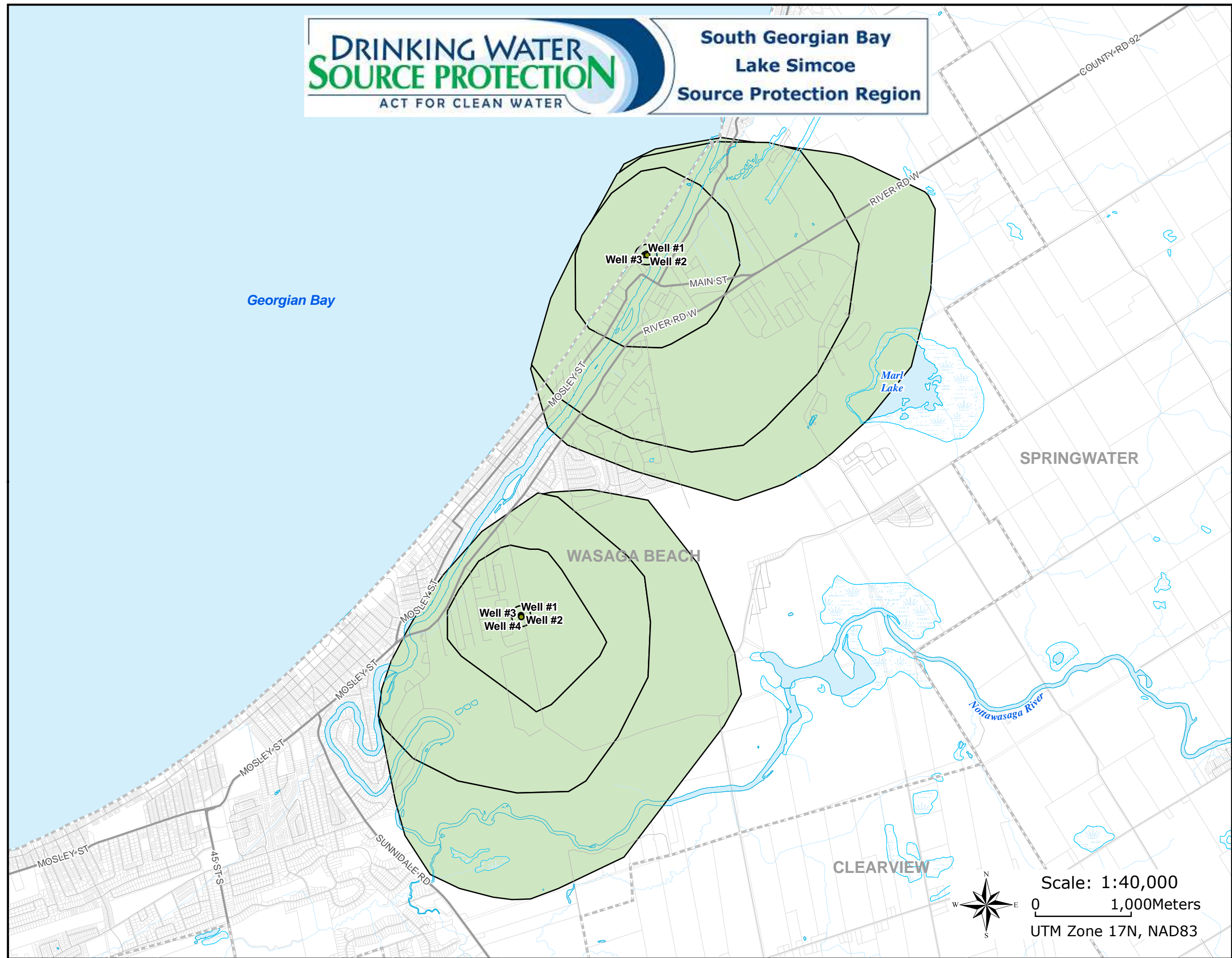
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UTM Zone 17N, NAD83

This map was produced for the Town of Wasaga Beach, 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.



**South Georgian Bay
Lake Simcoe
Source Protection Region**

**Town of Wasaga Beach
Wellhead Protection Areas
Managed Lands**



- Municipal Well
- Percent of Managed Lands**
- 0% - 40%
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- Parcel Fabric
- Municipal Boundary

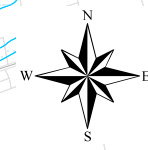


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 Date: 2010-02-09



17a-7

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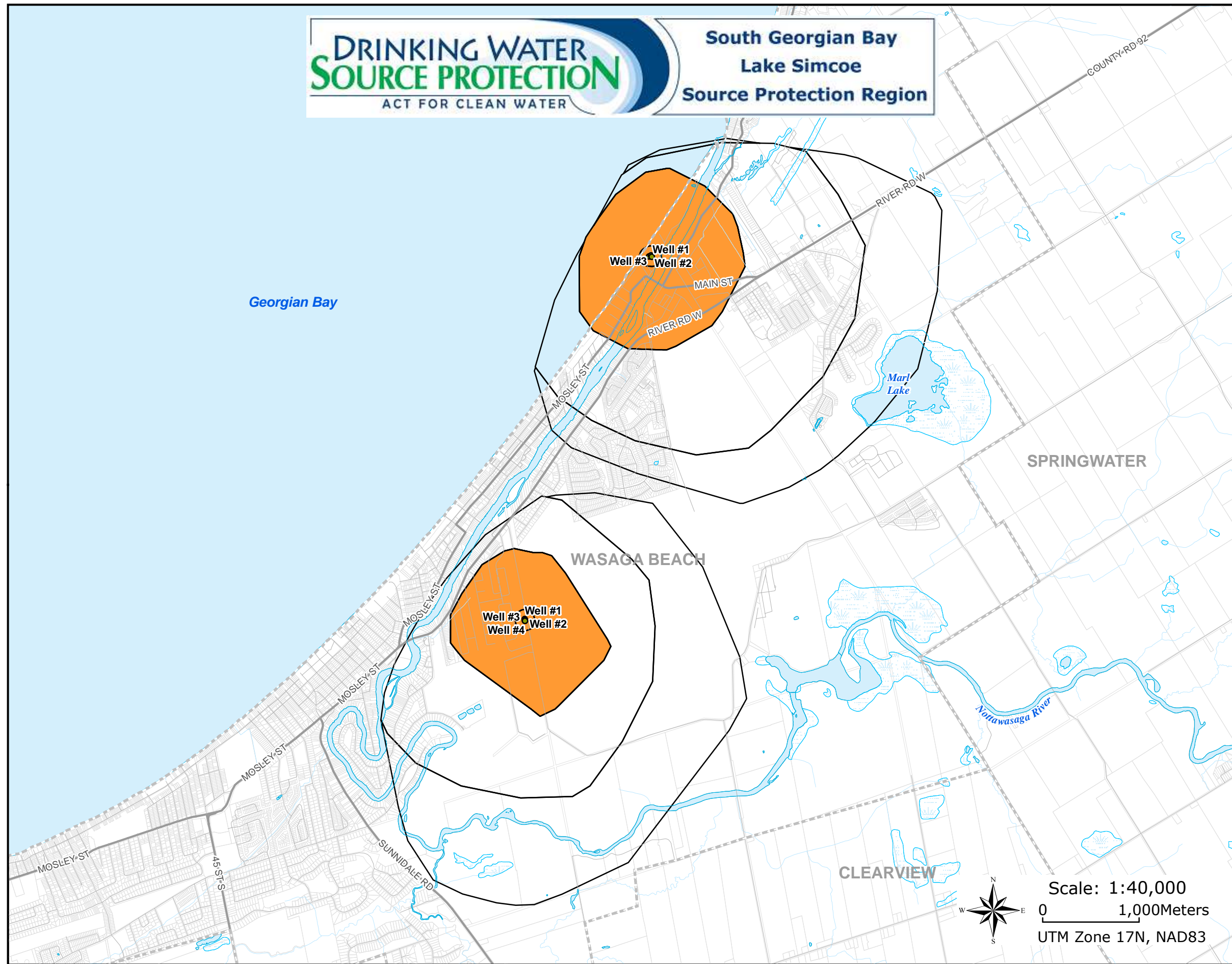


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South Georgian Bay
Lake Simcoe
Source Protection Region

Town of Wasaga Beach
Wellhead Protection Areas
Livestock Density



- Municipal Well
- Livestock Density**
- < 0.5 NU/Acre
- Major Road
- Local Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- Parcel Fabric
- Municipal Boundary

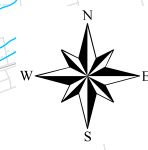


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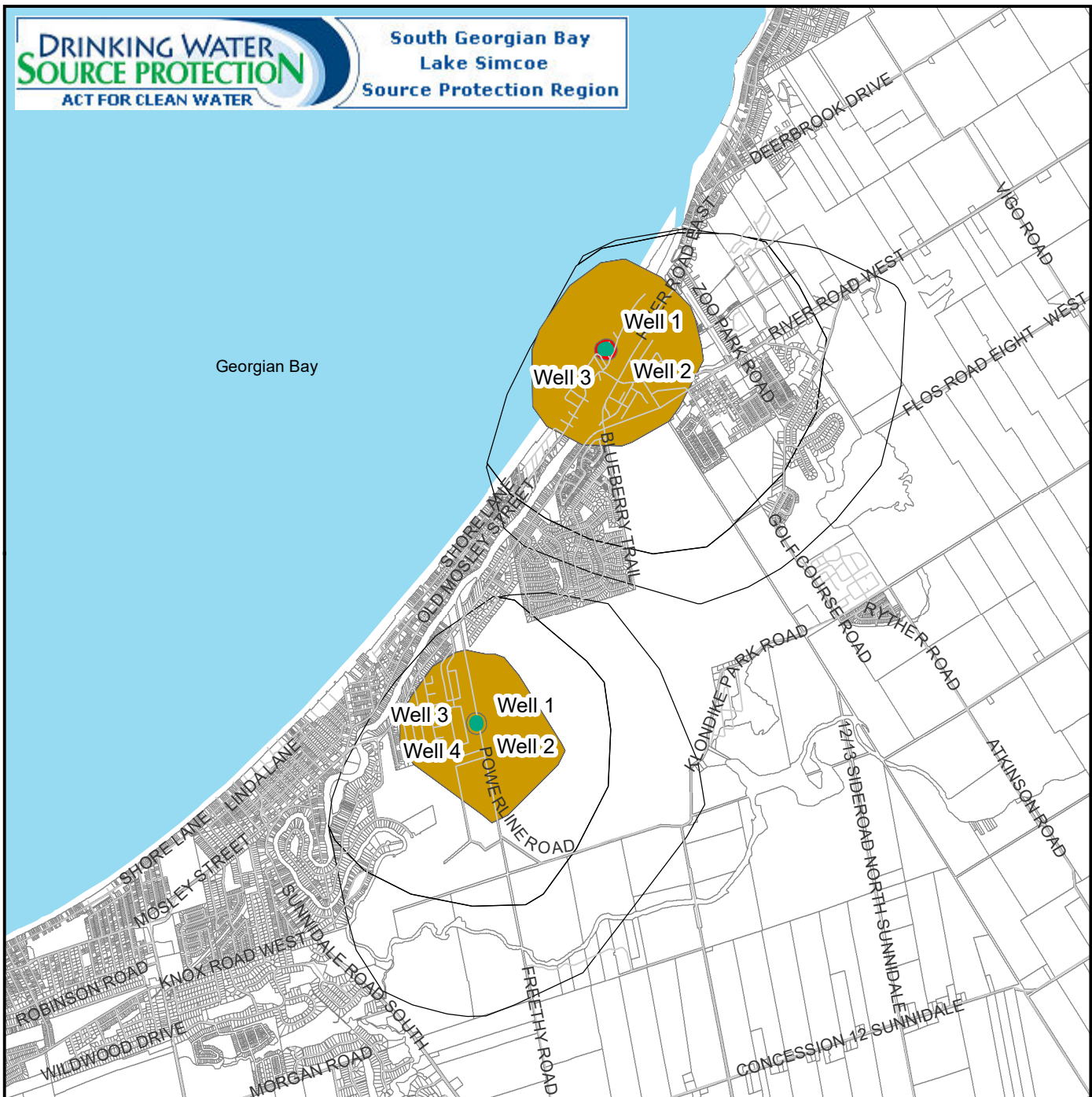


17a-8

Scale: 1:40,000
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UTM Zone 17N, NAD83



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Legend

- Municipal Well Location
- <1%
- =1 - <6%
- =6 - <8%
- =8 - <30%
- =>30%



600 300 0 600 Meters

IMPERVIOUS SURFACES - WASAGA BEACH

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

The Impervious Surfaces proportion is illustrated where the vulnerability score is greater than 6.

This map was produced for the South Georgian Bay Lake Simcoe Protection Region for the purpose 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.

Created by: NVCA
Date: 2025-09

Scale: 1:60,000

UTM Zone 17N, NAD83



Ontario

Figure 17a-9