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21.0 ORANGEVILLE AND AMARANTH TIER 3 WATER QUANTITY RISK ASSESSMENT

Under the requirements of the *Clean Water Act, 2006* the municipalities of Orangeville and Amaranth have completed a Tier 3 Water Budget and Local Area Risk Assessment (Tier 3 Assessment) to evaluate the ability of their municipal water sources to meet committed and planned water demands.

Although the Town of Orangeville in not located within the Grand River watershed, the project's study area extends to portions of the Townships of Amaranth and East Garafraxa which are located within the Grand River watershed. A fulsome discussion of this Tier 3 Assessment can be found in the Credit Valley Assessment Report.

In 2007, the Tier 3 Assessment for the Town of Orangeville and the Township of Amaranth began as a pilot project to evaluate the technical Tier 3 Assessment framework, become a reference for future Tier 3 Assessments within the Province, and be used to complete the updated Source Protection Assessment Report.

The study was later finalized in January 2011, and summarizes background information relating to the geology and hydrogeology of the area, current and planned water demands, and the process and results of the Water Quantity Risk Assessment.

21.1 Tier 3 Approach

The Tier 2 Water Quantity Stress Assessment completed for the Credit River Watershed in 2009 identified the Headwaters Subwatershed, also referred to as Subwatershed 19, as having a *Moderate* potential for groundwater stress. The *Moderate* stress level lead to the requirement of a Tier 3 Assessment for the Town of Orangeville and the Township of Amaranth as most of their municipal wells are located within this subwatershed. To date Orangeville, Mono and Amaranth have not had any issues meeting their water quantity requirements.

As a part of the Tier 3 study, new numerical surface water and groundwater flow models were developed and used as water budget tools to complete the assessment.

The study included an in-depth compilation of current and historical groundwater pumping and monitoring data. Results of the monitoring well assessment indicated that the nine Town of Orangeville wells and the one Township of Amaranth well with capture zones extending into the Grand River watershed never experienced problems pumping the allocated quantities of water from their respective municipal pumping wells. The Town of Orangeville has implemented very effective water conservation measures resulting in reduced maximum day demands and per-capita average day demands.

Wellhead Protection Areas for Quantity (WHPA-Qs) were delineated surrounding the municipal supply wells in the Study Area as shown on **Map 21-1**. These areas were delineated following the Province's Technical Rules (MOE, 2009b) based on a combination of the cone of influence of each municipal well as well as land areas where recharge has the potential to have a measurable impact on the municipal wells.

Risk Assessment scenarios as prescribed by the Provincial Technical Rules were evaluated using the Tier 3 groundwater and surface water models. These scenarios assessed the municipality's availability to meet future municipal demand under a range of conditions such as increased pumping, reduced recharge resulting from land use changes (development), and prolonged drought.

Risk Assessment Results

Based on the results of the Risk Assessment scenarios, WHPA-QA was classified as having a Significant Risk Level. WHPA-QA includes many of the Town of Orangeville's municipal supply wells located in the western half of Subwatershed 19, as well as the Amaranth's Pullen Well (**Map 21-1**). WHPA-QA was classified as having a significant water quantity risk level due to a combination of factors including the impacts of pumping the future quantity of water and groundwater recharge reductions under both average recharge and drought conditions. Increased pumping within the WHPA-QA also resulted in reductions to groundwater discharge in cold water streams that exceeded the Province's thresholds.

While the Risk Assessment scenarios resulted in a Significant Water Quantity Risk Level for the WHPA-QA the Town of Orangeville has never reported operational issues while pumping their municipal wells, even during periods of higher water demand prior to the implementation of water conservation measures. The Water Quantity Risk Level categories do not indicate a problem associated with current municipal wells and their current pumping rates; rather, they reflect a need to manage the drinking water resources in the WHPA-QA as future stresses arise. Furthermore, the results indicate a need to manage the drinking water as a regional resource shared by the Town of Orangeville and Township of Amaranth.

Following the Technical Rules, all consumptive water users and reductions to groundwater recharge within WHPA-QA are classified as significant water quantity threats. These consumptive water users include the permitted water demands (e.g., municipal pumping) and non-permitted water demands (e.g., domestic water wells). The only consumptive uses within the Grand River watershed portion of WHPA-QA are approximately 44 domestic water wells (**Map 21-1 and Table 21-1**). Almost half of these domestic wells are located within designated areas of land use change in the Township of Amaranth's Official Plan.

The potential groundwater discharge reductions associated with recharge reductions in WHPA-QA vary from Moderate (between 10% and 20%) to Significant (greater than 20%). The model scenarios did not consider the influence of storm water best management practices, and the groundwater recharge was reduced proportionally to the imperviousness assumed for areas where land use changes are expected to occur. The only lands within the Grand River watershed portion of WHPA-QA with identified groundwater recharge reduction activities are designated for commercial/industrial/ residential activities in the Township of Amaranth's Official Plan.

While these scenarios are conservative, they indicate where groundwater discharge is most sensitive to land use change, and where the Town of Orangeville and the Grand River Conservation Authority may wish to direct efforts to maintain groundwater recharge in the future.

Table 21-1: Orangeville WHPA-QA Drinking Water Threats within the Grand River Watershed (current to May 2018)

PDWT[1] #	Threat Subcategory[2]	Number of Activities	Vulnerable Area
19	An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	44	WHPA-QA
Total Number of Activities		**44**	

1: Prescribed Drinking Water Threat Number refers to the prescribed drinking water threat listed in O.Reg 287/07s.1.1.(1).

21.2 Uncertainty

During the Tier 3 Assessment, some knowledge and data gaps were encountered, however the approach undertaken in the study was conservative, and as such, addressing these uncertainties is not considered necessary for the protection or management of the water resources within the subwatershed. The Risk Level for the Orangeville water supply wells was classified as “Significant”, which is appropriate considering the uncertainties associated with urban infiltration and the impact of enhanced recharge through subsurface infrastructure.

Map 21-1: Orangeville WHPA-QA Significant Water Quantity Threats