Attachment
Original 2016 Yonge Street Aquifer Well Capacity Restoration Project File

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Note: Appendices to the 2016 Yonge Street Aquifer Well Capacity Restoration Project File can be made accessible on request.

The Regional Municipality of York

Yonge Street Aquifer Well Capacity Restoration Project
Project File

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Accessible formats or communication supports are available upon request.

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Executive Summary

The Regional Municipality of York (York Region) initiated the Yonge Street Aquifer Well Capacity Restoration Project (the Project) in accordance with the Municipal Class Environmental Assessment process for a Schedule B Project (Municipal Class EA) (October 2000, as amended in 2007, 2011 & 2014) to restore the full permitted capacity of York Region's wells within the Yonge Street Aquifer. Four of York Region's 18 wells operating under the Yonge Street Aquifer Permit to Take Water (PTTW) are not able produce the maximum daily volume allowed under the permit, resulting in a deficit of 5.2 Million Litres per Day (MLD) in the permitted well capacity. In order to address the reduced production capacity of the Yonge Street Aquifer well system, York Region examined feasible options to recapture the lost capacity while managing the maintenance challenges associated with the wells.

Phase 1 of the Project established the Problem/Opportunity Statement, which is as follows: The purpose of this project is to re-establish the full permitted well capacity of York Region's water system in the Yonge Street Aquifer area while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued.

Phase 2 involved conducting the following evaluation process, which has six stages, to confirm the Preferred Solution:

Stage 1: .... Identify and Recommend Existing Wells for Rehabilitation
Stage 2: .... Identify a Long-list of 12 Prospective Target (new) Well Areas for Preliminary Desktop Evaluation
Stage 3: .... Generate Short-list of Four Well Areas for Exploratory Well Drilling and Step-Testing
Stage 4: .... Generate List of Preferred Well Areas for 24-Hour Pumping Tests
Stage 5: .... Recommend a Preferred Solution
Stage 6: .... Confirm the Preferred Solution

Following the evaluation process conducted during Phase 2 of the Project, the Preferred Solution was identified as rehabilitating existing wells at Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No. 15 in addition to constructing new wells at Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5.

The Project File will demonstrate that the Preferred Solution addresses the Problem/Opportunity Statement in that this solution will re-establish the full permitted well capacity of York Region's water system in the Yonge Street Aquifer area while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued.

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1. Identification and Description of the Problem/Opportunity

The Regional Municipality of York (York Region) initiated the Yonge Street Aquifer Well Capacity Restoration Project (the Project) in accordance with the Municipal Class Environmental Assessment for a Schedule B project (Municipal Class EA) (October 2000, as amended in 2007, 2011 & 2014) process to restore the full permitted capacity of York Region's wells within the Yonge Street Aquifer. Four of York Region's 18 wells operating under the Yonge Street Aquifer Permit to Take Water (PTTW) are not able produce the maximum daily volume allowed under the permit, resulting in a deficit of 5.2 Million Litres per Day (MLD) in the permitted well capacity.
In response to these issues, York Region retained AECOM to carry out the Yonge Street Aquifer Well Capacity Restoration Class EA.

1.1 The Municipal Class EA Process

The Municipal Class EA process consists of the following five phases:

Phase 1 .... Identify the problem (or deficiency) or opportunity. If the project is classified as either a Schedule A or A+ activity, then proceed directly to implementation.

Phase 2 .... Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and review agency input. At this point, determine the appropriate Schedule for the undertaking and document decisions in a Project File for Schedule B projects, or proceed through Phases 3 and 4 for Schedule C projects. To complete the Schedule B process, make the Project File available for review by review agencies, the public and Aboriginal communities for a 30-day review period. During this time, individuals or organizations have the opportunity to request a Part II Order to the Minister of the Environment.

Phase 3 .... Examine alternative methods of implementing the preferred solution, based on the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.

Phase 4 ....Document in an Environmental Study Report (ESR) a summary of the rationale, and the planning, design and consultation process of the project as established through Phases 1, 2, and 3. Make the ESR available for review by review agencies, the public and Aboriginal communities for a 30-day review period. As with the Schedule B process, during this time, individuals or organizations have the opportunity to request a Part II Order to the Minister of the Environment.

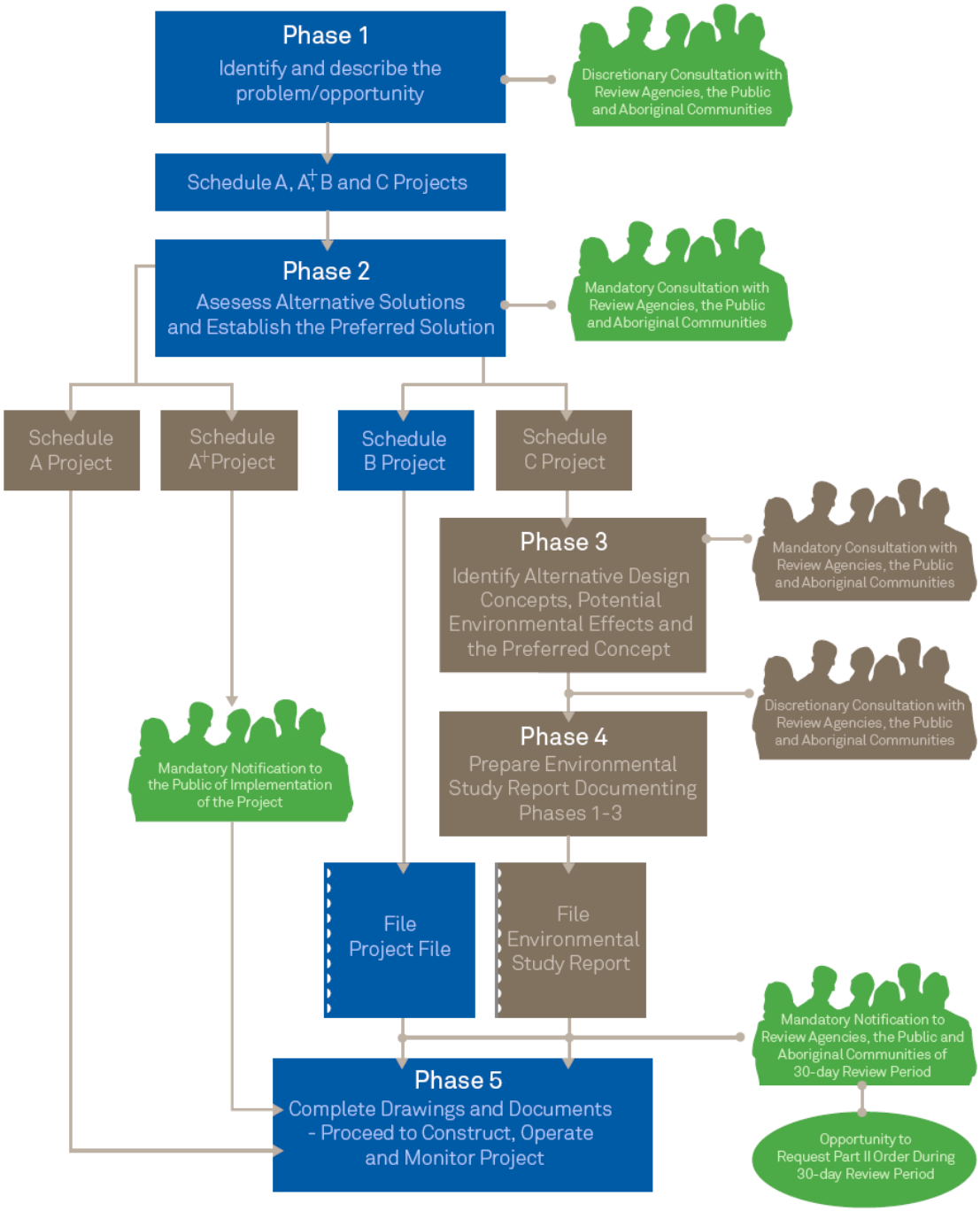
Phase 5 ....Complete construction drawings and documents, and proceed to construction and operation. Monitor construction for adherence to environmental provisions and commitments identified in the Project File/ESR. Where special conditions dictate, also monitor the operation of the completed facilities.

Since projects undertaken by municipalities vary in their potential environmental effects, the Municipal Class EA classifies projects into four schedules according to their potential environmental significance:

- **Schedule A** projects are limited in scale, have minimal adverse effects and include a number of municipal maintenance and operational activities. These projects are approved and may proceed directly to Phase 5 for implementation without following the other phases.
- **Schedule A+** projects are also pre-approved and are limited in scale, have minimal adverse effects, and include a number of maintenance and operational activities. Where a project is classified as a Schedule A+ activity, the municipality must notify the public of project implementation in a manner determined by the municipality prior to proceeding to Phase 5.
- **Schedule B** projects have the potential for some adverse environmental effects. The municipality is required to undertake Phases 1 and 2 of the Class EA process. Schedule B projects require that a Project File be prepared and submitted for review by interested stakeholders. If there are no outstanding concerns, then the municipality may proceed to Phase 5 for implementation.
- **Schedule C** projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures of Phases 1 to 4. Schedule C projects require that an ESR must be prepared and submitted for review by interested stakeholders. If there are no outstanding concerns, then the municipality may proceed to Phase 5 for implementation.

The Yonge Street Aquifer Well Capacity Restoration project is classified as a Schedule B activity. The figure below provides an overview of the five phase Municipal Class EA process. The Class EA process followed for this project is shown in blue with the consultation points associated with the Schedule B process shown in green.

Municipal Class EA Process



Legend:
- *Planned Schedule B Class EA process to be followed*
- *Class EA process for Schedules A, A+ and C*
- *Mandatory and discretionary consultation points associated with Schedule B*

1.2 Description of the Existing Water Supply Sources in York Region

York Region's drinking water sources come from surface water from Lake Ontario and Lake Simcoe, as well as groundwater from Regional aquifers in the Lake Simcoe and Lake Ontario watersheds. The Yonge Street Aquifer provides the groundwater supply to the Towns of Aurora, Newmarket and East Gwillimbury, via production wells owned and operated by York Region. York Region currently operates the following 18 wells within the Yonge Street Aquifer at 11 locations (**Figure 1-1**):

- Six wells within the Town of Aurora at three well locations;
- Six wells within the Town of Newmarket at four well locations;
- Two wells within the Town of East Gwillimbury community of Holland Landing at two well locations; and
- Four wells within the Town East Gwillimbury community of Queensville at two locations.

As an upper tier municipality, York Region is responsible for water supply, production, treatment, storage, and trunk distribution. York Region is the wholesale supplier of drinking water to local municipalities, which are the retail suppliers of water to the consumer and are responsible for their own distribution networks.

1.3 Performance of the Existing Yonge Street Aquifer Wells

AECOM completed a Well Performance Evaluation that examined the performance of all 18 municipal wells in the Yonge Street Aquifer (see **Appendix C**). The performance evaluation investigated permitted well capacity, well efficiency, and well condition. Recommendations for each well were made to address the well issues identified through the Well Performance Evaluation.

1.4 Permitted Well Capacity

York Region's municipal wells operate under PTTW #6728-9NLQ2F issued on September 12, 2014 by the Ministry of the Environment and Climate Change. Under this PTTW, York Region is permitted to draw a maximum 87,655,680 L/day. The PTTW also specifies that the permitted average daily rate for all of the wells is 42,000,000 L/day, and the total permitted peak demand (May to September) average daily rate is 67,200,000 L/day. It is York Region's intention to apply for an amendment to the current PTTW following completion of the Environmental Assessment for restoring the Yonge Street Aquifer well capacity. The 18 wells in the PTTW and their permitted taking (capacity) are shown in **Table 1-1**.

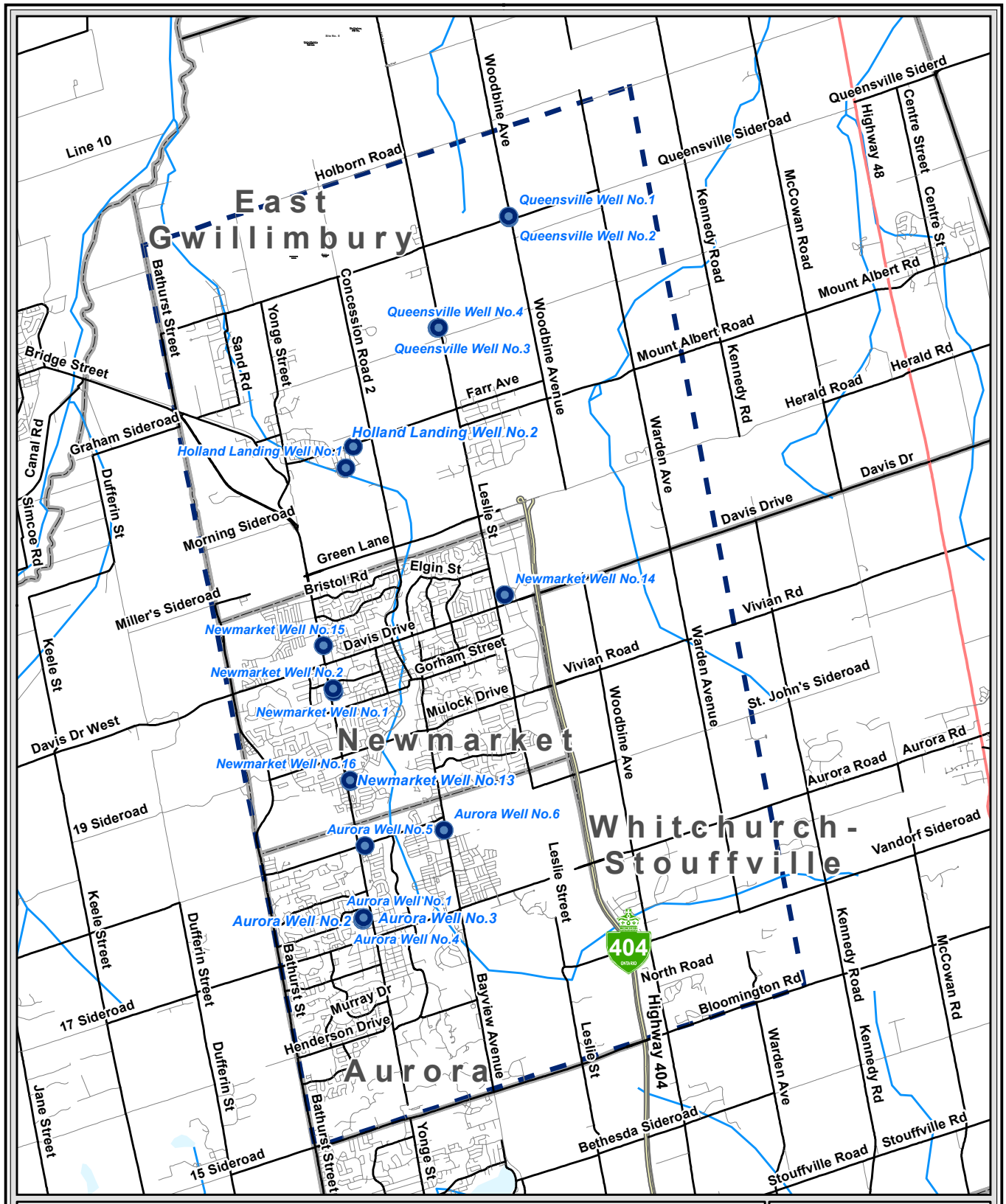
The 18 wells are only practically capable of pumping a maximum volume of 82,494,080 L/day, which is 94% of their permitted maximum capacity of 87,655,680 L/day. This lost capacity of 5,161,600 L/day is due to the following operational issues at the following four wells (shown in bold in **Table 1-1**):

Aurora 5:..... This well is operated below the permitted rate at 5,184,000 L/day to avoid possible premature well screen plugging. Aurora 5 is permitted for 5,891,760 L/day.

Aurora 6:..... This well is operated below the permitted rate at 2,420,000 L/day to avoid sand production issues. Aurora 6 is permitted for 3,469,536 L/day.

Newmarket 14: This well is off-line due to aesthetic and operational water quality characteristics. Newmarket 14 has a maximum daily permitted capacity of 2,291,184 L/day, which represents the amount of lost capacity from this well location.

Newmarket 15: This well has a maximum daily permitted rate of 3,273,120 L/day. The well is operated continually at 2,160,000 L/day to avoid sand production issues.



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UTM Zone 17N, NAD 83

Legend

- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Study Area
- Waterbody
- Watercourse
- Municipal Division
- Municipal Well Locations in the Yonge Street Aquifer

Yonge Street Aquifer
Well Capacity Restoration
Class Environmental Assessment

Study Area

November 2013
60240747

AECOM

Figure 1-1

Map Document: (C:\Users\ferrisg\Desktop\60240747_Fig4_1_StudyArea.mxd)
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1.5 Well Efficiency

Six of York Region's 18 municipal wells in the Yonge Street Aquifer have efficiencies of less than 80% of their as-constructed efficiency. The "as-constructed" well efficiency typically depends on the well design and the degree of well development undertaken during well construction. The practical well efficiency was determined by comparing the current well performance to the "as-constructed" well efficiency. This method shows how well losses due to screen/filter pack design, well development and/or other well design issues can influence well performance over time.

Table 1-1: Yonge Street Aquifer Permit to Take Water and Production Well Operational Issues

Municipal Well	Year Drilled	Permitted Maximum Day Taking (L/day)	Practical Maximum Day Taking (L/day)(1)	Lost Well Capacity (L/day)(2)	Comments
Aurora 1	1959	3,273,120	3,273,120	0	No operational constraints.
Aurora 2	1970	5,891,760	5,891,760	0	No operational constraints.
Aurora 3	1959	5,237,136	5,237,136	0	No operational constraints.
Aurora 4	1978	7,855,632	7,855,632	0	No operational constraints.
Aurora 5	**1988**	**5,891,760**	**5,184,000**	**707,760**	**Operates below permitted rate because well screen may prematurely plug if run at permitted rates.**
Aurora 6	**1991**	**3,469,536**	**2,420,000**	**1,049,536**	**Operates below permitted rate due to issues with sand production. Well is run full time to control water levels in the surrounding area.**
Newmarket 1	1957	2,291,184	2,291,184	0	Operations either pumps Newmarket 2 +16 together or 1+13 together.
Newmarket 2	1966	4,582,512	4,582,512	0	Operations either pumps Newmarket 2 +16 together or 1+13 together.
Newmarket 13	1977	5,891,760	5,891,760	0	Operations either pumps Newmarket 2 +16 together or 1+13 together.
Newmarket 14	**1978**	**2,291,184**	**0**	**2,291,184**	**Well is currently off line.**
Newmarket 15	**1979**	**3,273,120**	**2,160,000**	**1,113,120**	**Operates below permitted rate to avoid sand production issues. Runs 24 hours a day, 7 days a week to minimize surging of well with starts and stops of pump.**

Table 1-1: Yonge Street Aquifer Permit to Take Water and Production Well Operational Issues

Municipal Well	Year Drilled	Permitted Maximum Day Taking (L/day)	Practical Maximum Day Taking (L/day)[1]	Lost Well Capacity (L/day)[2]	Comments
Newmarket 16	1983	5,629,824	5,629,824	0	Operations either pumps Newmarket 2 +16 together or 1+13 together.
Holland Landing 1	1974	2,291,184	2,291,184	0	No operational constraints.
Holland Landing 2	1977	3,600,432	3,600,432	0	Set at 72% of permitted rate. However, operations staff indicated that there is no constraint on the pumping rate at this well.
Queensville 1	1991	6,546,384	6,546,384	0	Operational issues with Queensville 1 and 2 running together. Therefore, they are run together for no longer than 6 hours at a time due to pressure issues. Only 3 of the 4 Queensville wells run at same time.
Queensville 2	1991	6,546,384	6,546,384	0	Operational issues with Queensville 1 and 2 running together. Therefore, they are run together for no longer than 6 hours at a time due to pressure issues. Only 3 of the 4 Queensville wells run at same time.
Queensville 3	1990	6,546,384	6,546,384	0	Operations staff alternate Queensville 3 and 4 off and on.
Queensville 4	1990	6,546,384	6,546,384	0	Operations staff alternate Queensville 3 and 4 off and on.
TOTAL		**87,655,680**	**82,494,080**	**5,161,600**	

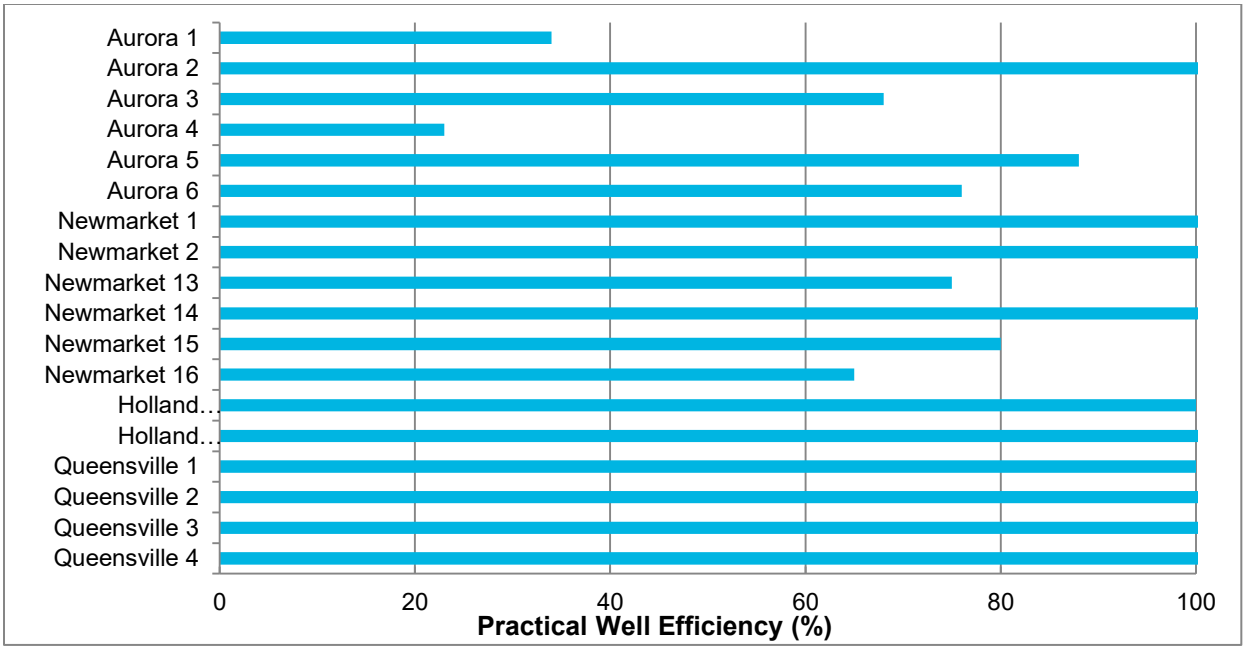
Permit To Take Water (PTTW) Rates	
PERMITTED RATE – Peak Period, Maximum Daily Rate (L):	**87,655,680**
PERMITTED RATE – Peak Period, Average Daily Rate (L):	**67,200,000**
PERMITTED RATE – Annual Average Daily Rate (L):	**42,000,000**

The practical efficiency of each well is shown in **Figure 1-2**. Where the practical well efficiency was determined to be greater than 100%, the wells likely have inefficiencies

at the time of installation that have been improved through operation or subsequent rehabilitation. The wells with a practical well efficiency of less than 80% could be considered for rehabilitation in order to improve well performance and general operational efficiency. Wells with a practical well efficiency of 80% or higher likely would not benefit substantially from rehabilitation. The following six wells have efficiencies of less than 80% of the as-constructed efficiency, and may be considered as preliminary candidates for rehabilitation:

- Aurora 1
- Aurora 3
- Aurora 4
- Aurora 6
- Newmarket 13
- Newmarket 16

Figure 1-2: Results of Practical Well Efficiency Calculation



1.6 Well Condition

Fourteen of York Region's 18 municipal wells in the Yonge Street Aquifer are presently able to pump at their permitted rates, but some of these wells have the potential to experience reduced capacities in the future due to a number of factors including well age, potential for corrosion and well construction.

1.6.1 Well Age

All of York Region's 18 municipal wells in the Yonge Street Aquifer are over 20 years old and eight of them are at least 35 years old. The age of a well is considered a key

factor in assessing its condition because the potential for well failure increases with time.

The following eight wells are at least 35 years old:

- Aurora 1, 2 and 3
- Newmarket 1, 2 and 13
- Holland Landing 1 and 2

These wells have among the highest pumping rates in the Yonge Street Aquifer. A failure at any of these wells could result in a significant reduction in available capacity. However, it is noted that, in the case of an emergency, additional lake based water supply could be made available.

1.6.2 Potential for Corrosion

A number of York Region's 18 municipal wells in the Yonge Street Aquifer were constructed with different metals and may therefore be susceptible to galvanic corrosion, which is a common cause of well failure in older wells. Corrosion is the loss of metal from either the inside or outside of the well casing, at the joint between the well casing and the screen, or at the bottom of the well. Corrosion occurs when different metals (e.g., carbon steel directly attached to stainless steel) are used in well construction. A review of the wells within the Yonge Street Aquifer indicates that the majority are susceptible to galvanic corrosion.

1.6.3 Potential for Damage Due to Well Construction

Many of the wells in the Yonge Street Aquifer are gravel packed wells. Gravel packed wells are open to the aquifer between the outer well casing and the inner screen (smaller diameter casing) with a filter pack placed between the two casings. The following wells contain a gravel pack:

- Aurora 5 and 6
- Holland Landing 1 and 2
- Queensville 1, 2, 3 and 4
- Newmarket 13, 15 and 16

It is possible that gravel packs can be damaged during rehabilitation if it is not done carefully due to the gases that can be released from the use of strong acids. It is uncertain if this type of rehabilitation has been completed at these wells; however, the presence of gravel packed wells increases the potential for some well damage as a result of the well construction.

1.7 Summary of Well Performance

AECOM completed a Well Performance Evaluation that examined the performance of all 18 municipal wells in the Yonge Street Aquifer (see **Appendix C**). **Table 1-2** summarizes the results from this evaluation related to well capacity, well efficiency, and well condition. Four wells have lost pumping capacity (Aurora 5, Aurora 6, Newmarket 14, and Newmarket 15). Six wells have efficiencies of less than 80% of the as-constructed efficiency, and may be considered as preliminary candidates for rehabilitation (Aurora 1, Aurora 3, Aurora 4, Aurora 6, Newmarket 13, and Newmarket 16). Two wells were identified as having potential issues in all categories relating to well condition (Newmarket 13 and Holland Landing 2). The results of this summary were carried through to determine recommendations for addressing well issues.

Table 1-2: Yonge Street Aquifer Well Performance Summary

Municipal Well	Operational Considerations Resulting in Lost Capacity	Practical Well Efficiency <80%	Well Age	35 Years or Older	Potential for Corrosion
Aurora 1	No	Yes	53	Yes	No
Aurora 2	No	No	42	Yes	Yes
Aurora 3	No	Yes	53	Yes	No
Aurora 4	No	Yes	34	No	No
Aurora 5	Yes (fouling)	No	24	No	Yes
Aurora 6	Yes (sand production)	Yes	21	No	No
Newmarket 1	No	No	55	Yes	Yes
Newmarket 2	No	No	46	Yes	Yes
Newmarket 13	No	Yes	35	Yes	Yes
Newmarket 14	No	Yes	34	No	No
Newmarket 15	Yes (aesthetic and operational water quality)	No	33	No	Yes
Newmarket 16	Yes (sand production)	No	29	No	Yes
Holland Landing 1	No	No	38	Yes	No
Holland Landing 2	No	No	35	Yes	Yes
Queensville 1	No	No	21	No	No
Queensville 2	No	No	21	No	No
Queensville 3	No	No	22	No	No
Queensville 4	No	No	22	No	No

1.8 System Redundancy

An evaluation of the redundancy in a groundwater supply system provides an indication of how the system would be impacted by well failure. For example, if a community is supplied by one high capacity well and two smaller capacity wells, the ability of the system to meet the daily water use demand is greatly reduced if the high capacity well fails. Due to the potential for failure due to well age, corrosion, or well construction, as

discussed in **Section 1.3** above, York Region is currently assessing the redundancy of the Yonge Street Aquifer groundwater supply system. The results of this assessment will be considered when selecting the sites for the new production wells.

1.9 Recommendations for Addressing Well Issues

The four wells that have lost pumping capacity are Aurora 5, Aurora 6, Newmarket 14, and Newmarket 15. For these wells, recommendations have been made to rehabilitate, retrofit or replace Aurora 5, Aurora 6 and Newmarket 15. Aurora 5 and 6 have been rehabilitated at least once previously and Newmarket 15 has been rehabilitated multiple times. York Region may elect to explore the option of retrofitting or replacing these wells if it is determined that additional rehabilitation will not be effective. The lost capacity at Newmarket 14 is caused by aesthetic and operational issues with the groundwater characteristics at this well. Therefore, the lost capacity cannot be restored through a maintenance program. A summary of the recommendations for these four wells are included in **Table 1-3**. These recommendations are intended to improve the overall operational efficiency of these wells and may improve the current capacity; however, the full lost capacity will not be re-captured through a maintenance program.

The remaining 14 wells in the Yonge Street Aquifer network are currently capable of pumping at the permitted rate(s). The assessment of these wells indicated that a number of them are 35 years old or older suggesting that in the future increased maintenance could be required to maintain current performance and that they could experience a reduction in operational efficiency. Additionally, a number of the wells may have an elevated risk of experiencing corrosion. Based on these factors, recommendations are made to conduct detailed testing of these wells to document the condition of the wells and plan for any maintenance that may be required going forward. A summary of the recommendations for these 14 wells are included in **Table 1-3**.

Table 1-3: Well Capacity & Condition and Recommendations for Testing, Rehabilitation or Replacement

Municipal Well	Summary of Well Capacity and Condition and Recommendations
Aurora 1	Selected as a candidate for rehabilitation to improve the operational efficiency of the well.
Aurora 2	Detailed testing is required to further assess well condition.
Aurora 3	Selected as a candidate for rehabilitation to improve the operational efficiency of the well.
Aurora 4	Selected as a candidate for retrofit or replacement if it is determined that additional rehabilitation is not likely to succeed. Previous attempts at rehabilitation have not been successful. Sustained capacity will require a backup well.

Table 1-3: Well Capacity & Condition and Recommendations for Testing, Rehabilitation or Replacement

Municipal Well	Summary of Well Capacity and Condition and Recommendations
Aurora 5	Selected as a candidate for retrofit or replacement if it is determined that additional rehabilitation is not likely to succeed. Previous attempts at rehabilitation have not been successful. Premature well screen plugging is the reason for the lost capacity in this well.
Aurora 6	Selected as a candidate for retrofit or replacement if it is determined that additional rehabilitation is not likely to succeed. Sand production is the likely reason for the lost capacity at this well.
Newmarket 1	Detailed testing is required to further assess well condition.
Newmarket 2	Detailed testing is required to further assess well condition.
Newmarket 13	Detailed testing is required to further assess well condition.
Newmarket 14	Decommissioning may be appropriate at this well since it is currently offline.
Newmarket 15	Operated below its rated capacity to avoid producing sand. This well is recommended for rehabilitation, replacement or retrofit.
Newmarket 16	Testing is recommended to monitor regular performance. A backup well is recommended to sustain capacity.
Holland Landing 1	Detailed testing is required to further assess well condition.
Holland Landing 2	Detailed testing is required to further assess well condition.
Queensville 1	Detailed testing is required to further assess well condition.
Queensville 2	Detailed testing is required to further assess well condition.
Queensville 3	Detailed testing is required to further assess well condition.
Queensville 4	Detailed testing is required to further assess well condition.

1.10 Policies and Previous Study Findings

There are a number of policies and findings from previous studies which pertain to the Project including York Region's Official Plan, 2016 Water and Wastewater Master Plan Update, Strategic 10-year Infrastructure Improvement Plan, Provincial Policy Statement and Lake Simcoe Protection Plan.

York Region Official Plan

The purpose of York Region's Official Plan (2010) is to guide the economic, environmental and community building decisions to manage growth in the Region. Specifically, the Official Plan sets out policies for an integrated approach to infrastructure delivery, including water servicing. As outlined in Section 7.3 of the Official Plan, York Region is committed to providing long term water and wastewater services to its communities that are safe, well-managed, sustainable, and delivered in a fiscally responsible manner. With that in mind, the following Official Plan policies

support the rationale to re-establish the full permitted capacity of York Region's water system within the Yonge Street Aquifer:

Section 7.3, Policy 18: ..... It is the Policy of Council to provide reliable water and wastewater services to residents and businesses to ensure continuing community well-being and the economic vitality of the Region.

Section 7.3, Policy 31: ..... It is the Policy of Council to ensure secure and resilient Regional water and wastewater systems to maintain continual service.

The purpose of the Yonge Street Aquifer Well Capacity Restoration Class EA is to re-establish the full permitted well capacity of York Region's water system while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued. This purpose meets Policies 18 and 31 to provide reliable, secure, and resilient water services to residents and businesses, and to maintain continual service.

York Region's 2016 Water and Wastewater Master Plan Update

Within the context of the York Region Sustainable Strategy, the Water and Wastewater Master Plan Update (2016) provides specific recommendations to provide long-term water and wastewater services that are safe, well-managed, and sustainable. The Water and Wastewater Master Plan Update identifies the need to provide safe and clean drinking water to all of its residents. Specifically, Recommendation 6 is that York Region "ensure that drinking water quantities supplied from surface and groundwater sources will be within safe yield limits for the water body or aquifer."

The Yonge Street Aquifer Well Capacity Restoration Class EA will re-establish the capacity of York Region's water system within the limits set out the in the Permit to Take Water, ensuring that the water supply continues to be within the safe yield limits of the Yonge Street Aquifer.

York Region's Strategic 10-year Infrastructure Improvement Plan

York Region undertakes regular reviews of its infrastructure needs to ensure that capital investments for rehabilitation and replacement of infrastructure are made most effectively. York Region's Strategic 10-year Infrastructure Improvement Plan is a key component of ensuring that roads, sewers, drinking water pipes, and other vital infrastructure components are meeting current and future needs of residents.

York Region's most recent 10 year Infrastructure Improvement Plan identified the service levels required to meet customer expectations as well as monitor performance to support infrastructure planning. The Yonge Street Aquifer Well Capacity Restoration Class Environmental Assessment was identified in the Infrastructure Improvement Plan as a key project for maintaining service levels and water supply capacity, given that some wells are now over 35 years old.

Provincial Policy Statement and the Lake Simcoe Protection Plan

This Project complies with Section 1.6.6.1 b), c) and d) of the Provincial Policy Statement (2014):

1.6.4.1 Planning for sewage and water services shall:

b. ensure that these systems are provided in a manner that:
   1. can be sustained by the water resources upon which such services rely;
   2. is financially viable and complies with all regulatory requirements; and
   3. protects human health and the natural environment;
c. promote water conservation and water use efficiency;
d. integrate servicing and land use considerations at all stages of the planning process.

With regard to the Lake Simcoe Protection Plan (2009), the Plan focuses on the protection of ecological health and environmental sustainability within the Lake Simcoe Watershed. The Plan aims to achieve this through restoring the health of aquatic life, improving water quality, maintaining water quantity, protecting and rehabilitating areas such as shorelines and addressing invasive species, climate change and recreational activities.

York Region's recent Water and Wastewater Master Plan Update (2016) is aligned with various policies such as the Provincial Policy Statement and the Lake Simcoe Protection Plan in that it, as noted above, provides specific recommendations to provide long-term water and wastewater services that are safe, well-managed, and sustainable. The Yonge Street Aquifer Well Capacity Restoration Class EA was a project recommended through the master planning exercise and as a result, complies with these policies. Finally, the impact assessment conducted as part of this Project further supports the Project's compliance with these policies in that the Preferred Solution promotes the efficient use of existing municipal water services by re-establishing the lost capacity within the limits of the existing Permit to Take Water.

1.11 Identification of the Problem/Opportunity Statement

Four of York Region's 18 municipal wells in the Yonge Street Aquifer are not able to deliver their permitted capacities due to operational restrictions. Aurora 6 and Newmarket 15 wells operate at lower capacities to avoid drawing in sand; Aurora 5 operates below permitted rates to avoid premature well screen plugging; and Newmarket 14 is off-line resulting from aesthetic and operational water quality characteristics. The resulting lost capacity represents 5,161,600 L/day.

An evaluation of the performance of each well has shown that the remaining 14 wells are able to pump at their permitted rates, but some have the potential to experience reduced capacities in the future due to reduced well efficiency, well age, elevated corrosion potential, and potential for damage due to well construction. There is an opportunity for York Region to rehabilitate some of these wells, while adding additional wells to restore the lost capacity and increase the overall system redundancy. Proactively addressing the performance of the Yonge Street Aquifer wells will ensure their ability to operate at peak capacity over the long term.

2. Identification and Description of the Alternative Solutions

The following five alternative solutions were identified for consideration based on the Problem/Opportunity Statement and a review of the Municipal Class EA Process:

- Do Nothing;
- Rehabilitate Existing Wells;
- Expand Existing Storage System;
- Increase Water Supply from Lake Ontario; and,
- Install New Wells.

Each of the alternative solutions is briefly described in the following sections.

2.1 Alternative No. 1: Do Nothing

Even though the "Do Nothing" alternative does not address the Problem/Opportunity Statement, the Municipal Class EA process requires its consideration in all Class EAs. The "Do Nothing" alternative serves as a benchmark against which other alternatives are assessed, to help identify the implications of doing nothing to address the problem/opportunity and to highlight the advantages of proceeding with the recommended alternative. As part of the "Do Nothing" alternative, no improvements or changes would be implemented to address the declining well capacity in the Yonge Street Aquifer area. Under this alternative, the current municipal wells would remain in place for the foreseeable future.

2.2 Alternative No. 2: Rehabilitate Existing Wells

Selected wells, where possible, would be rehabilitated and restored to their full capacity. This alternative would enhance the reliability of the water supply system, while managing water levels in the Yonge Street Aquifer.

Problem/Opportunity Statement:

The purpose of this project is to re-establish the full permitted well capacity of York Region's water system in the Yonge Street Aquifer area while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued.

2.3 Alternative No. 3: Expand Existing Storage System

This alternative would increase the capacity of the existing storage system. York Region would pump more water at non-peak times to hold water in reserve for peak demand periods. No changes would be made to the existing wells.

2.4 Alternative No. 4: Increase Water Supply from Lake Ontario

Water supply in the Study Area is currently provided by a combination of groundwater from the Yonge Street Aquifer and water drawn from Lake Ontario via the York Water System. This alternative would involve increasing the water supply from Lake Ontario to re-establish the lost capacity in the Yonge Street Aquifer well system thereby decreasing the permitted capacity of the wells in the long term.

2.5 Alternative No. 5: Install New Wells

As part of this alternative, new wells would be installed to restore the full permitted capacity of the Yonge Street Aquifer well system. The new wells could be located within existing well sites or on new sites.

3. Screening of Alternative Solutions

Only reasonable and feasible alternatives are to be considered as part of the Municipal Class EA process. The five alternatives were screened based on their ability to address the Problem/Opportunity Statement using the following screening criteria:

1. Does the alternative re-establish the full permitted capacity of the Yonge Street Aquifer Well system?

Re-establishing the full permitted capacity of the Yonge Street Aquifer well system is supported by York Region's Official Plan, Sections 7.3, Policy 18 and Policy 31:

- Section 7.3, Policy 18: it is the Policy of Council to provide reliable water and wastewater services to residents and businesses to ensure continuing community well-being and the economic vitality of York Region.
- Section 7.3, Policy 31: it is the Policy of Council to ensure secure and resilient Regional water and wastewater systems to maintain continual services.

All alternatives must re-establish the full permitted capacity of the Yonge Street Aquifer well system (as outlined in the 10-year Infrastructure Improvement Plan); this will provide reliable, secure and resilient water services to residents and businesses and maintain continual service.

2. Does the alternative ensure that future water demands can be met?

York Region undertakes regular reviews of its infrastructure needs to ensure that capital investments for rehabilitation and replacement of infrastructure are made most effectively. York Region's Strategic 10-year Infrastructure Improvement Plan is a key component of ensuring that roads, sewers, drinking water pipes, and other vital infrastructure components are meeting current and future needs of residents.

York Region's most recent 10-year Infrastructure Improvement Plan identified the service levels required to meet customer expectations as well as monitor performance to support infrastructure planning. The Yonge Street Aquifer Well Capacity Restoration Class Environmental Assessment was identified in the Infrastructure Improvement Plan as a key project for maintaining current and anticipated service levels and water supply capacity, given that some wells are now over 35 years old.

All alternatives must maintain current and future water demands in order to meet customer expectations, as expressed in York Region's Strategic 10-year Infrastructure Improvement Plan.

3. Does the alternative contribute to the responsible management of groundwater in the Yonge St. Aquifer?

The York Region Water and Wastewater Master Plan (2016) provides specific recommendations to provide long-term water and wastewater services that are safe, well-managed and sustainable. The Water and Wastewater Master Plan's "One Water" approach identifies opportunities and initiatives to provide environmentally sustainable water services to the Region, by 'conserving water to lesson pressure on the natural resources' (Regional Municipality of York, 2016).

The Yonge Street Aquifer Well Capacity Restoration Project will re-establish the capacity of York Region's water system within the limits set out in the Permit to Take Water; potential alternatives must ensure that the water supply continues to be within the safe yield limits of the Yonge Street Aquifer.

The results of the screening are shown in the table below.

Table 3-1: Screening Criteria Evaluation

Screening Criteria	Alternative No. 1: *Do Nothing*	Alternative No. 2: *Rehabilitate Existing Wells*	Alternative No. 3: *Expand Existing Storage System*	Alternative No. 4: *Increase Water Supply from Lake Ontario*	Alternative No. 5: *Install New Wells*
Does the alternative re-establish full well capacity in the Yonge Street Aquifer?	No – doing nothing offers no improvements or changes to the existing well system.	Partly – rehabilitating existing wells has the potential to re-establish some, not all, well capacity in the Yonge Street Aquifer.	No – expanding the existing storage system will not re-establish well capacity in the Yonge Street Aquifer.	No – increasing the water supply from Lake Ontario will not re-establish well capacity in the Yonge Street Aquifer.	Yes – installing new wells has the potential to re-establish the well capacity in the Yonge Street Aquifer.
Does the alternative ensure that future water demands can be met?	No – doing nothing offers no improvements or changes to the existing well system.	Partly – rehabilitating existing wells has the potential to accommodate some future water demands by restoring some, not all, of the reduced production capacity.	Yes – expanding the existing storage system will ensure future water demands can be met; however, the underlying reduced production capacity issue will not be addressed.	Yes – increasing the water supply from Lake Ontario will ensure future water demands can be met; however, the underlying reduced production capacity issue will not be addressed.	Yes – installing new wells has the potential to ensure future water demands can be met by restoring the reduced production capacity.
Does the alternative contribute to the responsible management of groundwater in the Yonge Street Aquifer?	Yes – doing nothing aligns with the responsible management of groundwater in the Yonge Street Aquifer as it does not require any water taking from the Yonge Street Aquifer.	Yes – rehabilitating existing wells aligns with the responsible management of groundwater in the Yonge Street Aquifer as groundwater takings would be within the existing permitted maximum volume.	Yes – expanding the existing storage system aligns with the responsible management of groundwater in the Yonge Street Aquifer as it does not require any water taking from the Yonge Street Aquifer.	Yes – increasing the water supply from Lake Ontario aligns with the responsible management of groundwater in the Yonge Street Aquifer as it does not require any water taking from the Yonge Street Aquifer.	Yes – installing new wells aligns with the responsible management of groundwater in the Yonge Street Aquifer as groundwater takings would be within the existing permitted maximum volume.

Table 3-1: Screening Criteria Evaluation

Screening Criteria	Alternative No. 1: *Do Nothing*	Alternative No. 2: *Rehabilitate Existing Wells*	Alternative No. 3: *Expand Existing Storage System*	Alternative No. 4: *Increase Water Supply from Lake Ontario*	Alternative No. 5: *Install New Wells*
Recommendation	Alternative No. 1 – Do Nothing will not address the Problem/ Opportunity Statement. It is recommended to be carried forward, however, to serve as a comparison against the other alternatives and to highlight the advantages of proceeding with the undertaking, as per the Class EA requirements.	Although Alternative No. 2 – Rehabilitate Existing Wells will restore some of the well capacity in the Yonge Street Aquifer, it is recommended to be carried forward for further consideration.	Alternative No. 3 – Expand Existing Storage System will not address the Problem/Opportunity Statement as it will not restore any of the well capacity in the Yonge Street Aquifer and is therefore not recommended to be carried forward.	Alternative No. 4 – Increase Water Supply from Lake Ontario will not address the Problem/Opportunity Statement as it will not restore any of the well capacity in the Yonge Street Aquifer and is therefore not recommended to be carried forward.	Alternative No. 5 – Install New Wells will address the Problem/Opportunity Statement and is recommended to be carried forward for further consideration.

Based on the recommendation described in Table 3-1, the following alternatives were selected for further assessment/evaluation:

- **Alternative No. 1:** Do Nothing (Recommended to serve as a comparison against the other alternatives and to highlight the advantages of proceeding with the undertaking, as per the Class EA requirements)
- **Alternative No. 2:** Rehabilitate Existing Wells
- **Alternative No. 5:** Install New Wells

4. Description of the Study Area

With the Problem/Opportunity Statement defined and the alternative solutions identified, the existing conditions of the Study Area were established through a review of secondary-source information and field visits. The Study Area is shown in **Figure 1-1**.

4.1 Natural Environment

4.1.1 Hydrogeology

The following sections provide a brief overview of the general hydrogeological characteristics of the Study Area.

4.1.1.1 Hydrostratigraphy

Hydrostratigraphy is the classification of the various major stratigraphic units into aquifers and aquitards, with some simplification or combination of units with similar properties. Previous studies of the hydrostratigraphy of the Study Area include eight simplified geologic units that are translated into hydrostratigraphic units. These are summarized in **Table 4-1**.

Table 4-1: Summary of Yonge Street Aquifer Geological and Hydrostratigraphic Units

Geological Unit	Hydrostratigraphic Unit	
	Aquifers	***Aquitards***
Halton Till	N/A	Halton Aquitard
Oak Ridges Moraine	Oak Ridges Moraine Aquifer Complex	N/A
Tunnel Channel infill	Channel Aquifer Complex	Channel Aquitard
Newmarket Till	N/A	Newmarket Aquitard
Thorncliffe Formation	Thorncliffe Aquifer Complex	N/A
Sunnybrook Drift	N/A	Sunnybrook Aquitard
Scarborough Formation	Scarborough Aquifer Complex	N/A
Upper Weathered Bedrock	Weathered Bedrock Aquifer	N/A

The overburden groundwater system within the Study Area can be simplified further into the following three principal aquifers:

1. the upper aquifer system or Oak Ridges Moraine Aquifer Complex (ORAC);
2. the Thorncliffe Aquifer Complex (TAC); and,
3. the Scarborough Aquifer Complex (SAC).

In this simplification, the Channel Aquifer Complex (CAC) has been grouped with the TAC (Kassenaar and Wexler, 2006).

The Thorncliffe and Scarborough aquifers are separated from the ORAC by the Newmarket Till. The Newmarket Till effectively forms a protective barrier for the deeper aquifers; however, it has been breached by tunnel channel deposits throughout the Study Area. Depending on the related sediment infill, these tunnel channel deposits may allow for the transfer of groundwater between the shallow and deeper aquifer systems.

4.1.2 Groundwater Flow

Groundwater flow within the Study Area is largely from south to north; however, topographical and tunnel channel basins have modified flow. Within each of the three major aquifer systems (the ORAC, TAC and SAC), groundwater flow is generally from the topographic highs associated with the Oak Ridges Moraine (ORM) towards the topographic lows associated with the Aurora Basin, major stream channels and Lake Simcoe. Local deflections in flow direction towards tributary streams and their associated valleys occur in all three aquifers.

4.1.3 Recharge

Groundwater recharge is the movement of water from the surface, downward through sediments to the groundwater table (saturated zone). The main area of recharge within the Study Area is through the coarse-grained ORM deposits. The ORM deposits have been modelled to have as much as four times greater recharge than the finer grained till and/or glaciolacustrine deposits north and south of the moraine (Kassenaar and Wexler, 2006). Due to this high recharge, groundwater is driven to the deeper aquifer system.

4.1.4 Yonge Street Aquifer

Historically, the aquifers that supply the municipal wells in Newmarket, Aurora, Holland Landing and Queensville have been grouped together and referred to as the Yonge Street Aquifer.

The following list highlights key characteristic with respect to the nature and distribution of this aquifer system:

- The aquifer system is generally linear in nature and extends from Aurora north along Yonge Street to Green Lane in Newmarket and then trends northeast towards Queensville.
- Previous studies have described the aquifer as essentially a tunnel channel feature (Regional Municipality of York, 2011), implying that the Yonge Street Aquifer is associated with the upper tunnel channel units that are coeval with the ORM deposits.
- Previous test well drilling programs have shown that the main aquifer occurs in the lower aquifer units (e.g., Thorncliffe/Scarborough Formations), is confined, and that there are nearby hydraulic boundaries (IWS, 1977; 1988) perpendicular to the predominantly north-south axis of the aquifer. The Geological Survey of Canada (GSC) has also suggested that there is a rapid decrease in transmissivity in areas perpendicular to this aquifer (Sharpe *et al*., 2011). Therefore, the main aquifer units appear to be older than the tunnel channel feature that created the Aurora Basin.
- Both the Thorncliffe and Scarborough formations have been mapped as generally continuous layers (e.g., “layer-cake stratigraphy”) as opposed to liner features beyond the Yonge Street Aquifer (Kassenaar and Wexler, 2006); however, changes in grain size are noted within each unit.

These characteristics of the Yonge Street Aquifer were used to guide the selection of potential areas for a new municipal well supply.

4.1.5 Aquatic Environment

According to the Ministry of Natural Resources and Forestry’s (MNRF) Natural Resource Values Information System (NRVIS) mapping (MNRF, 2011), the Project Study Area is located primarily in the Lake Simcoe watershed. The Lake Simcoe watershed is situated in Southern Ontario between Lake Ontario and Georgian Bay of Lake Huron and has an area of approximately 3,557 km^2. The Lake Simcoe watershed consists of 33 subwatersheds. Of these 33 subwatersheds, four watersheds are found in the Yonge Street Aquifer Study Area: the East Holland River Watershed, the West Holland River Watershed, the Maskinonge River Watershed and the Black River Watershed (**Figure 4-1**). A small portion of the Study Area north of Bloomington Sideroad is also located in two subwatersheds (the Rouge River Watershed and the Humber River Watershed) in the Lake Ontario watershed.

The Study Area includes a mix of watercourses classified as cold water fish habitat, including Tannery Creek, Bogart Creek, the Black River headwaters, and watercourses classified as warm water fish habitat.

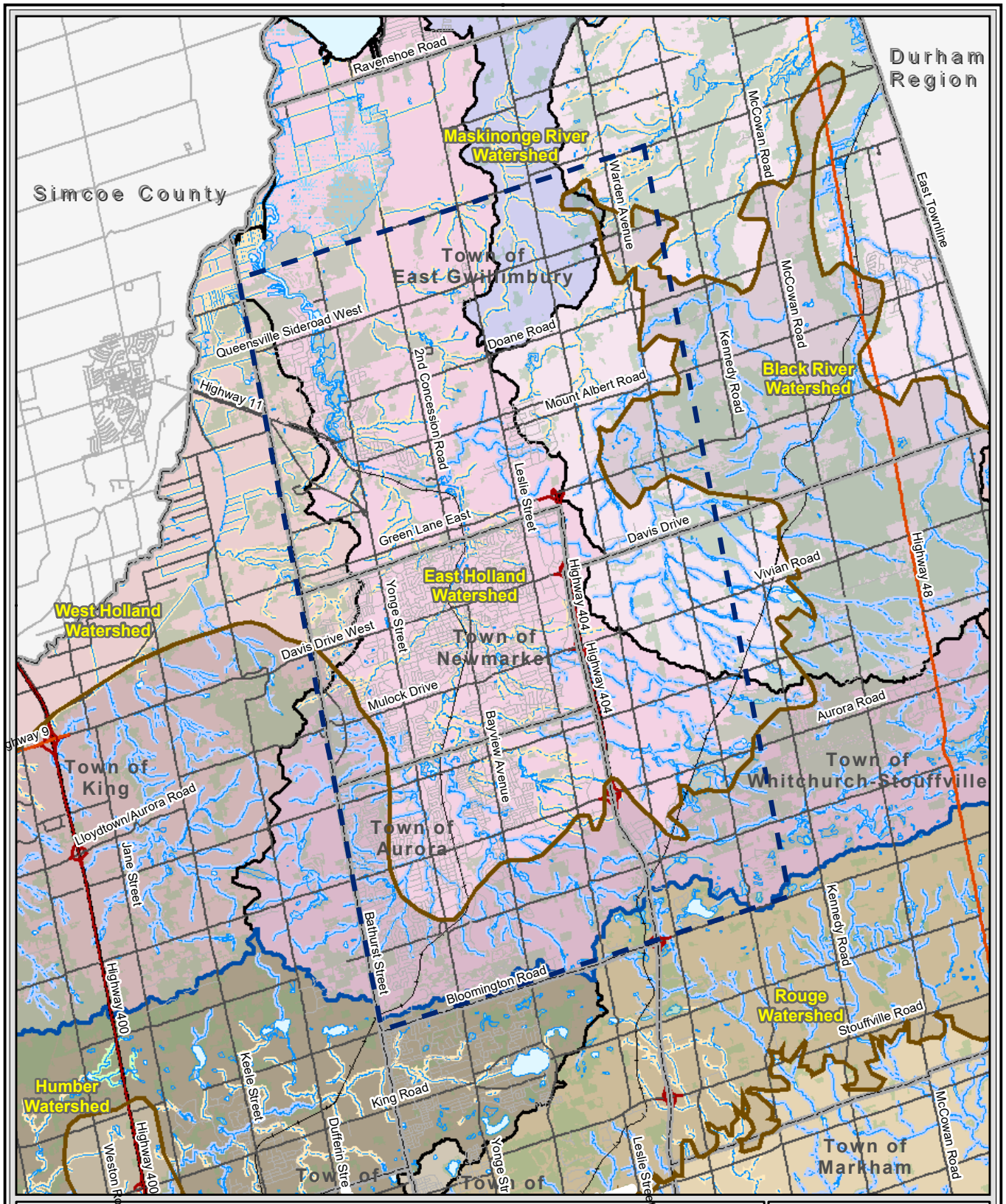
Redside Dace is the only aquatic Species at Risk documented in the background information found in the Study Area. Redside Dace is listed as Endangered under Ontario's *Endangered Species Act* (ESA 2007). Section 9 of the *Endangered Species Act* prohibits harmful actions such as killing, harming, harassing, and possessing this species. Section 10 of the *Endangered Species Act* prohibits the damage or destruction of the habitat of Redside Dace. Redside Dace is found in both the East and West Holland River subwatersheds (Sharon Creek and South Canal Tributary).

4.1.6 Terrestrial Environment

Urban areas occupy the central portion of the Study Area with agricultural/rural land uses and natural environmental features predominantly located the northern third and southeastern limits.

According to MNRF's NRVIS mapping (MNRF, 2011) and GIS data layers received from the Lake Simcoe Region Conservation Authority (LSRCA), there are a number of significant natural heritage designations within the Study Area, including Areas of Natural and Scientific Interest, Provincially and Locally Significant Wetlands, and Environmentally Significant Areas (refer to **Figure 4-2** for locations and **Table 4-2** for descriptions).

A diverse array of habitats and wildlife species is anticipated for the Study Area, including occurrences of common amphibian and bird species through naturalized areas. Species at Risk, regionally uncommon species, and area-sensitive breeding birds are expected to occur in the larger naturalized areas, including interior forest habitats, and uncommon vegetation communities such as the prairie and fen habitats associated with Holland Landing Prairie.



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Legend

- Study Area
- Forest
- Oak Ridges Moraine Boundary
- Municipal Division
- Lake Simcoe and Lake Ontario Watershed Divide
- Watershed
- Railway
- Waterbody
- Cartographic Wetland

Thermal Assessment of Watercourses

- Intermittent, Coldwater
- Intermittent, No data
- Intermittent, Coolwater
- Intermittent, Unassigned
- Intermittent, Warmwater
- Permanent, No data
- Permanent, Coolwater
- Permanent, Unassigned
- Permanent, Warmwater
- Permanent, Coldwater

Yonge Street Aquifer
Well Capacity Restoration
Class Environmental Assessment

Aquatic Environment

November 2013
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Figure 4-1

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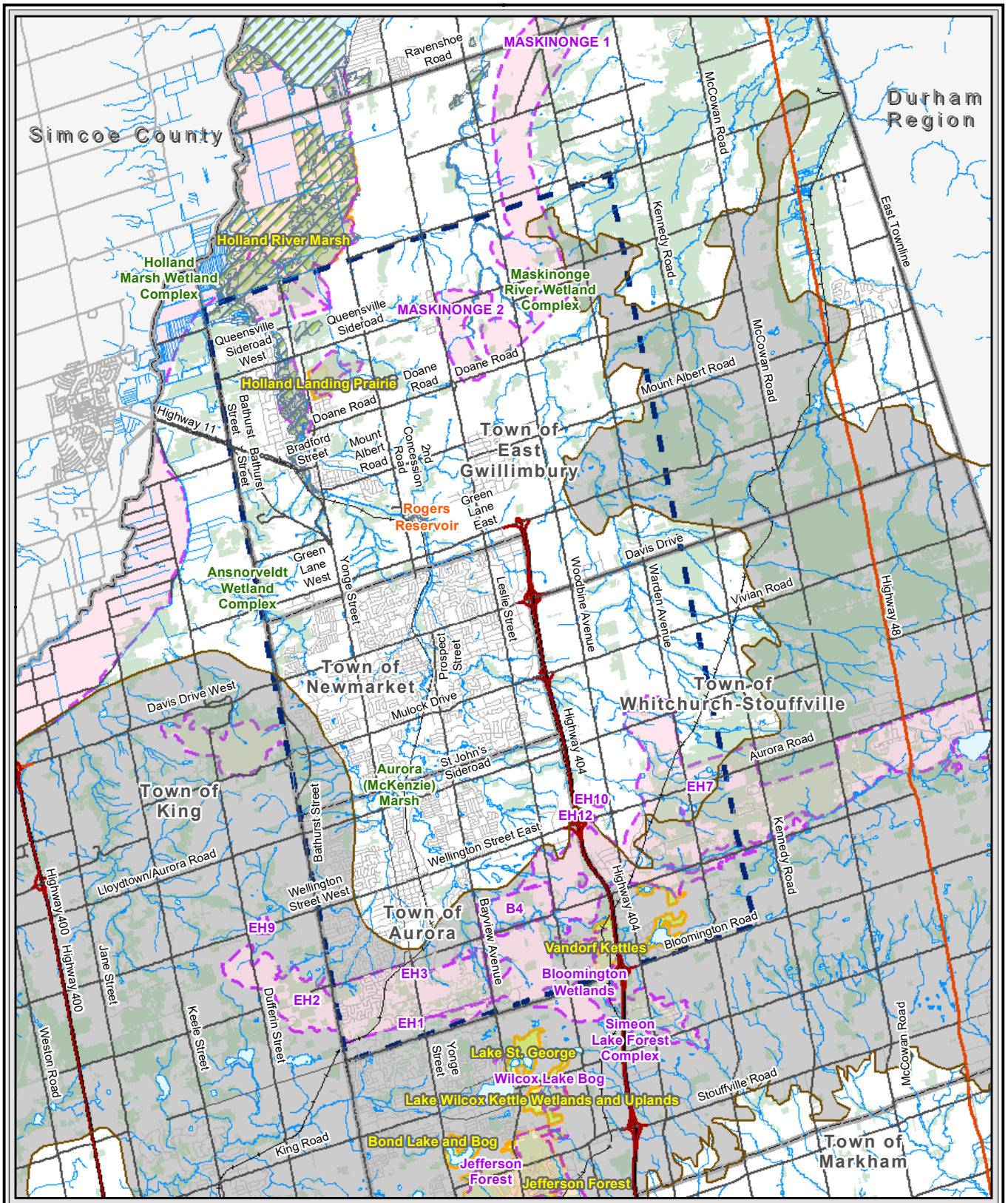

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Legend

- Study Area
- Municipal Division
- Provincially Significant Wetland
- Other Wetland
- Forest
- ESA

Areas of Natural and Scientific Interest

- Life Science
- Oak Ridges Moraine Boundary
- Watercourse
- Waterbody
- Railway

Yonge Street Aquifer
Well Capacity Restoration
Class Environmental Assessment

Terrestrial Environment

November 2013
60240747

AECOM

Figure 4-2

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Table 4-2: Description of Natural Heritage Features Designations within the Study Area

Natural Heritage Feature Designation	Significance	Description[1]
Ansnorveldt Wetland Complex	Provincially Significant Wetland	This provincially significant Ansnorveldt Wetland Complex contains wetlands located along six tributary streams in the Holland River watershed which are hydrologically connected along a discharge zone at or near the base of the Oak Ridges Moraine.
Aurora (McKenzie) Marsh Wetland	Provincially Significant Wetland	This provincially significant wetland complex is intersected by St. John's Sideroad and consists of two individual wetlands, including swamp and marsh wetland types.
East Aurora Wetland Complex	Provincially Significant Wetland	This provincially significant East Aurora Wetland Complex is bounded by St. John's Sideroad, Vandorf Sideroad, Bayview Avenue and Leslie Street. This wetland complex is composed of nine wetlands that make up a total of 28 hectares (ha).
Holland Marsh Wetland Complex	Provincially Significant Wetland	This large provincially significant wetland complex consists of seven individual wetlands, composed of a diversity of wetland types including bog, fen, swamp, and marsh.
Black River Wetland Complex # 2	Provincially Significant Wetland[2]	This provincially significant wetland complex is composed of three individual wetlands consisting of two wetland types including swamp and marsh.
Black River Headwater Complex	Provincially Significant Wetland[2]	This provincially significant wetland complex is comprised of nine individual wetlands consisting of swamp and marsh wetland types.
Black River Wetland # 3	Provincially Significant Wetland[2]	This provincially significant wetland contains only a marsh wetland type.
Newmarket Wetland	Locally Significant Wetland	The locally significant wetland is bordered by Prospect Street, Sprigley Street, Queen Street and Stickwood Court and is less than 2 ha in size. A smaller tributary runs through the Newmarket Wetland from the south connecting it to the adjacent Bogart Creek through two channels.
Holland Landing Wetland	Non-Provincially Significant Wetland	A non-provincially significant wetland dominated by swamp wetland type.

1. *Descriptions of Natural Heritage Feature Designations were obtained from the Upper York Sewage Solutions Environmental Assessment, Natural Environment Baseline Conditions Reports (Conestoga-Rovers & Associates (CRA), AECOM and Black & Veatch, 2013) unless otherwise referenced.*
2. *According to the letter received from MNRF on March 22, 2013 in regards to Species at Risk Inquiry in the Study Area, the Black River Wetland Complex is a Provincially Significant Wetland although it is reported as Non-provincially significant in the Upper York Sewage Solutions Environmental Assessment, Natural Environment Baseline Conditions Reports (Conestoga-Rovers & Associates (CRA), AECOM and Black & Veatch, 2013).*

Table 4-2: Description of Natural Heritage Features Designations within the Study Area

Natural Heritage Feature Designation	Significance	Description[1]
Maskinonge River Wetland Complex	Provincially Significant Wetland	The provincially significant Maskinonge River Wetland Complex covers most of the Maskinonge River watershed and is comprised of 53 individual wetlands totaling 373.9 ha.
Rogers Reservoir Wetland	Locally Significant Wetland	Currently only the boundaries of this feature area available from MNRF NRVIS mapping.
Holland Landing Prairie	Life Science Area of Natural and Scientific Interest (ANSI)	This feature is dominated by prairie grasses consisting of both the Big and Little Bluestem, with some shrub thicket and successional forest areas.
Holland River Marsh	Life Science Area of Natural and Scientific Interest (ANSI)	This ANSI contains the Holland Rivermouth Fen Reserve which is 67 ha in size and is located immediately northeast of the Holland Marsh Wildlife Management Area. This natural reserve represents the most pristine and undisturbed section of the Holland River Marsh.
Vandorf Kettles	Life Science Area of Natural and Scientific Interest (ANSI)	Currently only the boundaries of this feature area available from MNRF NRVIS mapping.
Holland Landing Life Science Site	Environmentally Sensitive Area (ESA)	This ESA contains dry and open areas which are known as remnant prairie ecosystem located in the western section of this ESA.
Holland Marsh Life Science Site	Environmentally Sensitive Area (ESA)	This ESA includes the Holland Marsh Provincial Wildlife Management Area which is approximately 1,416 acres in size and consists of marsh thicket swamp and lowland forest communities.
Maskinonge 1 and 2	Environmentally Sensitive Area (ESA)	Currently only the boundaries of this feature area available from MNRF NRVIS mapping.
Bloomington Wetlands	Environmentally Sensitive Area (ESA)	Currently only the boundaries of this feature area available from MNRF NRVIS mapping.

4.2 Socio-Economic Environment

Originally an agriculture-based economy, York Region has grown rapidly in terms of both its population and employment base, making it one of the most prosperous areas in Canada. From a population of 169,000 in 1971, York Region's population grew to 1,144,800 in 2014. The population is expected to grow to 1,790,000 by 2041 (Regional Municipality of York, 2015).

As previously mentioned, the Study Area includes a number of towns and communities situated within a broader rural/agricultural setting of York Region (see **Figure 4-3**). A brief description of these towns and communities is provided in the following sub-sections.

4.2.1 Town of Whitchurch-Stouffville

The portion of the Study Area within the Town of Whitchurch-Stouffville, on the east side of Highway 404 south of Davis Drive, is primarily agricultural with pockets of residential and industrial land uses, including the communities of Vandorf, Preston Lake and Gormley.

The population in the Town of Whitchurch-Stouffville is anticipated to grow from 38,800 in 2011 to 64,500 in 2041 (Regional Municipality of York, 2015). While most of the development in Whitchurch-Stouffville is located outside the Study Area, residential and commercial growth is approved for the Vandorf-Preston Lake area (between Bloomington Road and Aurora Road, and between Highway 404 and Warden Avenue). In addition, there is approved expansion of the Gormley Industrial Area north and south of Stouffville Road between Highway 404 and Woodbine Avenue.

4.2.2 Town of Aurora

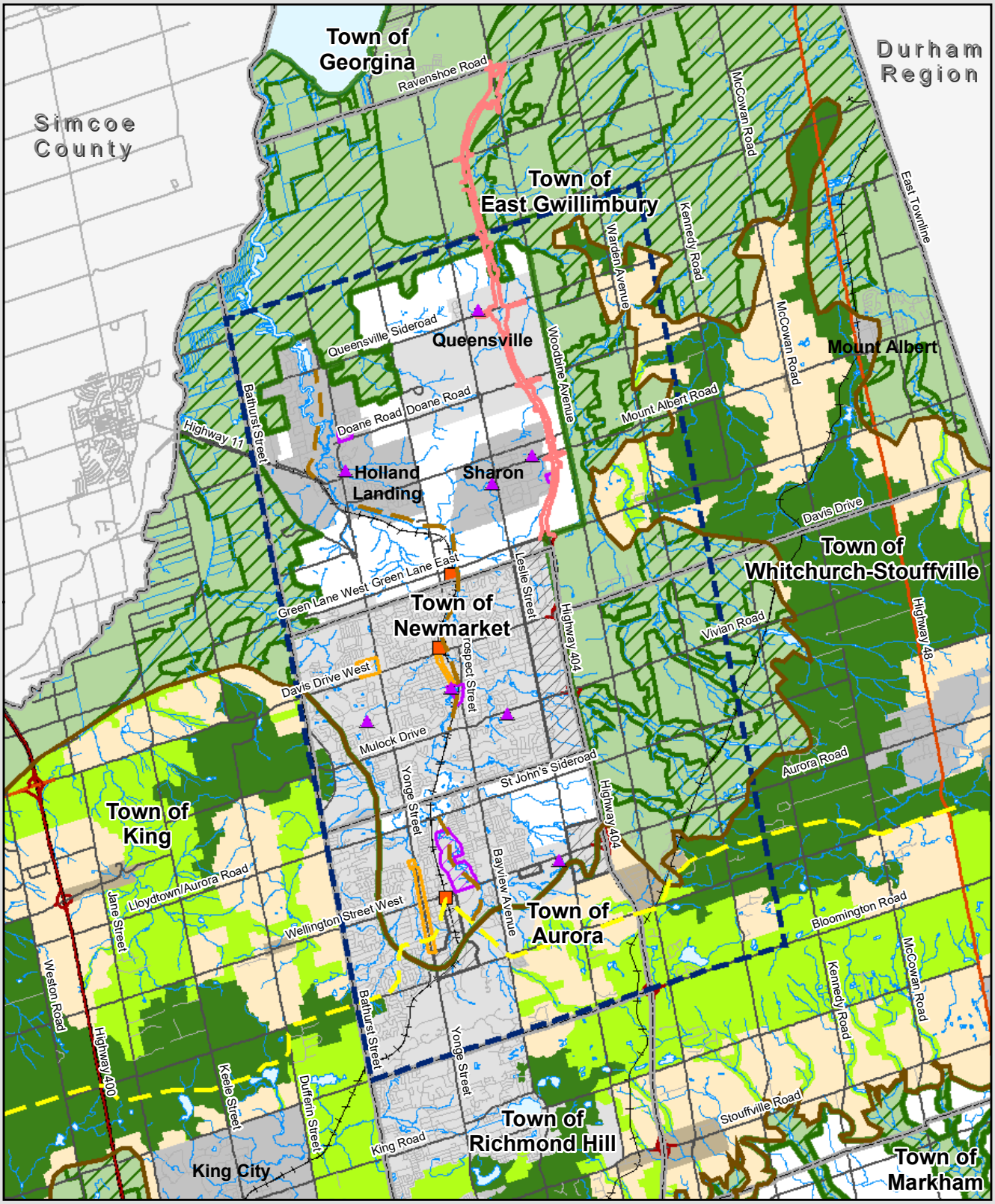
The Town of Aurora stretches from north of St. John's Sideroad to Bloomington Road and from Highway 404 to Bathurst Street and is located entirely within the Study Area.

Overall, the Town of Aurora is a mix of high, medium, and low density residential neighbourhoods; commercial areas (e.g., St. Andrew's Shopping Centre and Yonge Street corridor); industrial lands (e.g., Aurora South Industrial Area and Magna International lands), small areas of agricultural land (e.g., along St. John's Sideroad and Highway 404) and green space.

Institutional land uses include the Ray Twinney Complex, as well as many elementary schools, secondary schools, and places of worship. Outdoor recreational facilities in the Town of Aurora include local and community parks, such as the Aurora Arboretum, a portion of the Nokiidaa Trail, and a portion of the Oak Ridges Moraine Trail.

Prominent transportation linkages in Aurora include Highway 404, which links the Town of Aurora to Highway 407, Highway 401 and the City of Toronto. In addition, the Town of Aurora is serviced by GO Transit commuter rail service with a GO station in Aurora.

The population in the Town of Aurora is anticipated to grow from 54,900 in 2011 to 79,000 in 2041 (Regional Municipality of York, 2015). Future growth is anticipated to occur primarily in the northeast portion of the Town between Bayview Avenue and Highway 404 as part of the Aurora Northeast (2C) Secondary Plan, which will be a mix of residential and commercial (Town of Aurora, 2010).



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Legend

- Study Area
- Municipal Division

Major Built Environment Features

- Nokidaa Trail (Approx.)
- Oak Ridges Moraine Trail (Approx.)
- Proposed Hwy 404 Alignment
- Community Centres
- GO Station
- Commercial Area
- Industrial Areas
- Recreational Area
- Oak Ridges Moraine Boundary

Oak Ridges Moraine Conservation Plan Land Use Designations

- Countryside Area
- Natural Core Area
- Natural Linkage Area
- Rural Settlement
- Settlement Area

Greenbelt Plan

- Greenbelt Boundary
- Natural Heritage System
- Protected Countryside

Yonge Street Aquifer
Well Capacity Restoration
Class Environmental Assessment

Built Environment

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Figure 4-3

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4.2.3 Town of Newmarket

The Town of Newmarket is bounded by Bathurst Street to the west, Green Lane to the north, Highway 404 to the east and St. John's Sideroad to the south and is located entirely within the Study Area. The Town of Newmarket has a variety of land uses reflecting its population and density. The majority of land is designated as residential with pockets of major institutional, commercial, parks and open spaces (see **Figure 4-3**). Institutional land uses include the Stronach Aurora Recreation Complex, the Magna Centre (Newmarket's largest recreational complex), as well as many elementary schools, secondary schools, community centres and places of worship. Outdoor recreational facilities in Newmarket include local and community parks, such as Wesley Brooks Conservation Area/Fairy Lake Park, and Tom Taylor Trail which is part of the Nokiidaa Trail system.

The Town of Newmarket, like the Town of Aurora, is serviced by Highway 404 as well as GO Transit commuter rail service with a GO station in Newmarket.

The population in the Town of Newmarket is anticipated to grow from 82,600 in 2011 to 108,200 in 2041 (Regional Municipality of York, 2015). While most of the Town of Newmarket is well established there are small pockets of undeveloped land.

The area around Yonge Street and Davis Drive is designated in the Growth Plan for the Greater Golden Horseshoe (2013) as an Urban Growth Centre. Urban Growth Centres are to be planned as focal areas for investment in institutional and region-wide public services, as well as commercial, recreation, cultural and entertainment uses. Urban Growth Centres are to accommodate a significant share of population and employment growth with a minimum gross density target of 200 residents and jobs combined per hectare (Ontario Ministry of Infrastructure, 2013).

4.2.4 Town of East Gwillimbury (including Queensville, Sharon and Holland Landing)

The Town of East Gwillimbury has a smaller built-up area and smaller population compared to the Towns of Newmarket and Aurora. Currently most of the Town of East Gwillimbury is agricultural land with single family residences, and three existing communities: Queensville, Holland Landing and Sharon (see **Figure 4-3**). These communities are primarily low density residential areas with pockets of commercial development.

Institutional land uses include the Sharon Temple, East Gwillimbury Sports Complex, Holland Landing Community Centre, as well as many elementary schools, secondary schools, and places of worship. Outdoor recreational facilities in East Gwillimbury

include local and community parks, such as Anchor Park and Sharon Park, and local trails.

The Town of East Gwillimbury is serviced by Highway 404 and GO Transit commuter rail service, with a GO station in the southern end of East Gwillimbury. Highway 404 is being extended north to Ravenshoe Road and there is an approved Highway 400 to Highway 404 extension link, the Bradford Bypass (Environmental Assessment, approved 2002).

The Town of East Gwillimbury is expected to grow from a population of 23,200 in 2011 to 118,700 in 2041 (Regional Municipality of York, 2015). The existing communities in the Town of East Gwillimbury; Queensville, Sharon, Holland Landing, and an area known as the Green Lane Corridor, are expected to continue to grow and additional land surrounding each community has been designated as “Urban Areas” by York Region (York Region, 2013). Between the communities of Queensville, Sharon and Holland Landing is an area that is currently designated Agricultural/Long Term Growth Area (Town of East Gwillimbury, 2014).

4.3 Cultural Environment

4.3.1 Archaeological Resources

As part of the *Stage 1 Archaeological Assessment* (included in **Appendix A**), a review of the physiography of the overall area and its correlation to locating archaeological resources, as well as consideration of available historical documentation was performed. The Study Area is situated on lands that were first inhabited after the southeast retreat of the Simcoe Lobe and the Ontario Lobe of the North American Laurentide ice sheet approximately 12,000 years ago. The Stage 1 Archaeological Assessment identified the potential for the recovery of historic Euro-Canadian and Aboriginal archaeological resources within undisturbed portions of the Study Area due to the presence and proximity of numerous water sources (tributaries of the East Holland River and Black River), which would have been able to sustain food resources within 300 metres (m) of their limits. In addition, a review of historic maps revealed that the Study Area was well-settled in the 19th century, with documented historic roads and structures. As a result, the Study Area exhibits the potential to contain archaeological resources and further study, a Stage 2 Archaeological Assessment, was recommended. A Stage 2 Archaeological Assessment was conducted and is discussed in **Section 6.6.2.1**.

4.3.2 Built Heritage Resources and Cultural Heritage Landscapes

With respect to built heritage resources and cultural landscapes, the *Existing Conditions Report: Built Heritage Resources and Cultural Heritage Landscapes* (included in **Appendix B**) provides a summary of historical development in the Study Area. The respective municipalities were contacted again in August, 2016 to confirm whether any new properties had been added to the municipal registers of heritage properties (the consultation record is also provided in **Appendix B**). There were no updates to the registers regarding built heritage structures in the vicinity of the Well Areas which would affect the findings of the *Existing Conditions Report*.

The County of York was one of the initial counties established with the creation of Upper Canada in 1791, including the Townships of East Gwillimbury and Whitchurch. Settlement began in the late 18th and early 19th Centuries. As a result, the Study Area exhibits the potential for built heritage resources and cultural heritage landscapes which are further documented in Section 5 of this report.

5. Evaluation of the Alternative Solutions

5.1 Description and Application of the Evaluation Methodology

As discussed in Section 3, the following three alternatives were carried forward for comparative evaluation:

- Alternative No. 1: Do Nothing (Recommended to serve as a comparison against the other alternatives and to highlight the advantages of proceeding with the undertaking, as per the Class EA requirements)
- Alternative No. 2: Rehabilitate Existing Wells
- Alternative No. 5: Install New Wells

Taking the existing environment into consideration, the three alternative solutions were comparatively evaluated based on criteria developed within the following categories:

- Technical;
- Natural Environment;
- Socio-economic Environment;
- Cultural Environment; and,
- Financial.

The Project specific evaluation criteria were developed based on a review of the Municipal Class EA process, the existing conditions of the Study Area, the alternative solutions being considered and the Problem/Opportunity Statement.

Once developed, the evaluation criteria were used to comparatively evaluate the alternative solutions and identify a recommended solution. Rankings of least preferred, moderately preferred, and most preferred were used to establish each of the alternative solutions' ability to meet the evaluation criteria of each category. If an alternative solution fully satisfied the evaluation criteria in a specific category, it was considered most preferred. Conversely, if an alternative solution failed to satisfy the evaluation criteria in a specific category, it was considered least preferred. A ranking of moderately preferred indicated that the alternative solution may have only partially satisfied the evaluation criteria. The evaluation criteria, assessment and ranking of Alternatives No. 1, 2 and 5, and the recommended alternative are presented and discussed in the following section (**Section 5.2** - Results of the Comparative Evaluation).

5.2 Results of the Comparative Evaluation and Recommended Alternative

As described in **Section 5.1**, Alternatives No. 1, 2 and 5 were assessed and ranked against a set of evaluation criteria. The Comparative Evaluation and results are presented in **Table 5-1**. It was recommended that the following two alternatives be carried forward to address the Problem/Opportunity Statement: “Install New Wells” and “Rehabilitate Existing Wells”. This recommended alternative solution provides the greatest opportunity to restore the full permitted capacity of the Yonge Street Aquifer well system and to enhance the reliability of the water supply system by creating redundancy, while managing the water levels in the Yonge Street Aquifer. Potential environmental effects will be avoided or minimized through standard mitigation measures. This solution involves rehabilitating some or all of the existing wells that do not operate at their permitted capacity where it is feasible and cost effective to do so. The new wells may be located within the existing well sites or on new sites.

Table 5-1: Comparative Evaluation of the Alternative Solutions

Category and Evaluation Criteria	Alternative No. 1: Do Nothing	Alternative No. 2: Rehabilitate Existing Wells	Alternative No. 5: Install New Wells
Technical			
Ability to restore the full permitted capacity of the Yonge Street Aquifer well system.	This alternative would not restore any capacity of the Yonge Street Aquifer because no improvements or changes to the existing well system would be implemented.	This alternative would only partially restore the full permitted capacity of the Yonge Street Aquifer well system.	This alternative would restore the full permitted capacity of the Yonge Street Aquifer well system.
Ranking:	**Least Preferred**	**Moderately Preferred**	**Most Preferred**
Natural Environment			
Effect on terrestrial species and habitat.	This alternative would have no potential effects on terrestrial species and habitat because no changes to the existing well system would be implemented.	Potential effects on terrestrial species and habitat are not anticipated as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on terrestrial species and habitat (e.g., direct or indirect loss of vegetation communities, wildlife habitats and functions, adverse effects on significant flora communities, impact on Species at Risk) would be avoided or minimized through the site selection process and standard mitigation measures (e.g., compensation plantings, restrictions on the timing of construction).
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Effect on aquatic species and habitat.	This alternative would have no potential effects on aquatic species and habitat because no changes to the existing well system would be implemented.	Potential effects on aquatic species and habitat are not anticipated as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on aquatic species and habitat (e.g., direct or indirect loss of aquatic habitat and function, direct or indirect loss of aquatic species, loss of riparian vegetation, impact on Species at Risk) would be avoided or minimized through the site selection process and standard mitigation measures (e.g., avoidance of aquatic habitat, erosion control measures during construction).

Table 5-1: Comparative Evaluation of the Alternative Solutions

Category and Evaluation Criteria	Alternative No. 1: Do Nothing	Alternative No. 2: Rehabilitate Existing Wells	Alternative No. 5: Install New Wells
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Effect on groundwater quality.	This alternative would have no potential effects on groundwater quality because no changes to the existing well system would be implemented.	Potential effects on groundwater quality are not expected based on good historical water quality records for the existing wells.	Potential effects on groundwater quality would be avoided or minimized through the site selection process and by developing the well(s) to remove all material disturbed during the drilling process and constructing the well in accordance with Ontario Regulation 903 standards.
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Effect on surface water quality.	This alternative would have no potential effects on surface water quality because no changes to the existing well system would be implemented.	Potential effects on surface water quality are not anticipated because any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on surface water quality would be avoided or minimized through the site selection process and standard mitigation measures (e.g., avoidance of surface water bodies, erosion control measures during construction).
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Natural Environment - continued			
Effect on groundwater quantity.	This alternative would have no potential effects on groundwater quantity because no changes to the existing well system would be implemented.	Potential effects on groundwater quantity are not anticipated as increased groundwater takings associated with the rehabilitated wells would be within the existing permitted maximum volume. Additionally, York Region has a Well Complaint Policy and Procedure in place which outlines actions to be taken if any issues with groundwater quantity are reported.	Potential effects on groundwater quantity would be avoided or minimized as increased groundwater takings associated with the new wells would be within the existing permitted maximum volume. Local impacts would be evaluated through test well pumping and numeric groundwater modelling. The results are used to select new well sites with sufficient groundwater quantity.

Table 5-1: Comparative Evaluation of the Alternative Solutions

Category and Evaluation Criteria	Alternative No. 1: Do Nothing	Alternative No. 2: Rehabilitate Existing Wells	Alternative No. 5: Install New Wells
			Additionally, York Region has a Well Complaint Policy and Procedure in place which outlines actions to be taken if any issues with groundwater quantity are reported.
Ranking:	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Effect on surface water quantity.	This alternative would have no potential effects on surface water quantity because no changes to the existing well system would be implemented.	Potential effects on the quantity of surface water bodies would be minimized as increased groundwater takings associated with the rehabilitated wells would be within the existing permitted maximum volume.	Potential effects on surface water quantity would be avoided through the site selection process and standard mitigation measures (e.g., avoiding areas with hydraulic connection between target aquifer and surface water bodies).
Ranking:	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Effect on existing water budgets within the East Holland River, Maskinonge, and Black River subwatershed plans.	This alternative would have no potential effects on the existing water budgets because no changes to the existing well system would be implemented.	Potential effects on the existing water budgets within the East Holland River, Maskinonge River, and Black River subwatershed plans are not anticipated as increased groundwater takings associated with the rehabilitated wells would be within the existing permitted maximum volume.	Potential effects on the existing water budgets within the East Holland River, Maskinonge River, and Black River subwatershed plans would be minimized as groundwater takings associated with new wells would be within the existing permitted maximum volume. Effects of new wells sites on local water budget would be evaluated and results factored into the site selection process.
Ranking:	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Compliance with the Oak Ridges Moraine Conservation Plan (ORMCP)	This alternative would comply with Section 41 of the ORMCP, as no new infrastructure would be built within the Oak Ridges Moraine.	This alternative would comply with Section 41 of the ORMCP, as no new infrastructure would be built within the Oak Ridges Moraine.	Any new infrastructure, including new wells, within the ORMCP area would conform to the requirements contained in Section 41 of the ORMCP.
Ranking:	**Most Preferred**	**Most Preferred**	**Most Preferred**

Table 5-1: Comparative Evaluation of the Alternative Solutions

Category and Evaluation Criteria	Alternative No. 1: Do Nothing	Alternative No. 2: Rehabilitate Existing Wells	Alternative No. 5: Install New Wells
Socio-economic Environment			
Effect on existing and/or future planned residences, businesses, and/or community, institutional and/or recreational facilities?	Although this alternative would not result in potential effects on the existing socio-economic environment, it could reduce the allowable future growth by failing to address groundwater capacity issues.	Potential effects on existing and/or future planned residences, businesses, and/or community, institutional and/or recreational facilities are not anticipated as no changes to the existing well system would be implemented.	Potential effects on existing and/or future planned residences, businesses, and/or community, institutional and/or recreational facilities (e.g., displacement, nuisance effects during construction, loss of access or creation/expansion of Wellhead Protection Area) would be avoided or minimized through the site selection process and standard mitigation measures (e.g., limiting construction hours, temporary access).
Ranking:	**Least Preferred**	**Most Preferred**	**Moderately Preferred**
Effect on private property.	This alternative would not require acquisition of private property because no changes to the existing well system would be implemented.	Potential effects on private property are not anticipated as the acquisition of privately owned property is not required as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on private property may occur as the acquisition of privately owned property may be required.
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Effect on existing utility infrastructure.	This alternative would have no potential effect on existing utility infrastructure because no changes to the existing well system would be implemented.	Potential effects on existing utility infrastructure are not anticipated as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on existing utility infrastructure (e.g., electrical, water sewer, natural gas, etc.) via construction methods such as excavation, machinery, and heavy vehicular traffic would be avoided or minimized through standard mitigation measures (e.g., avoidance or relocation of utility infrastructure).
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**

Table 5-1: Comparative Evaluation of the Alternative Solutions

Category and Evaluation Criteria	Alternative No. 1: Do Nothing	Alternative No. 2: Rehabilitate Existing Wells	Alternative No. 5: Install New Wells
Effect on existing transportation infrastructure.	This alternative would have no potential effect on existing transportation infrastructure because no changes to the existing well system would be implemented.	Potential effects on existing transportation infrastructure are not anticipated as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on transportation infrastructure (e.g., effects on road surfaces during construction, effects on traffic operations) would be avoided or minimized through standard mitigation measures (e.g., use of haul roads, use of detours).
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Effects of noise and/or vibration on sensitive receptor.	This alternative would have no potential effect on sensitive receptors from noise and/or vibration because no changes to the existing well system would be implemented.	Potential effects on sensitive receptors from noise and vibration associated with construction and/or operation would be avoided or minimized through standard mitigation measures (e.g., restrictions on equipment noise levels, duty cycle restrictions on equipment operations).	Potential effects on sensitive receptors from noise and vibration associated with construction and/or operation would be avoided or minimized through standard mitigation measures (e.g., restrictions on equipment noise levels, incorporation of noise mitigation measures in design).
Ranking:	**Most Preferred**	**Moderately Preferred**	**Moderately Preferred**
Effect on existing agricultural resources/operations.	This alternative would have no potential effect on existing agricultural resources/operations because no changes to the existing well system would be implemented.	Potential effects on existing agricultural resources as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on existing agricultural operations due to wellhead protection restrictions would be addressed through standard mitigation measures (e.g., compensation to property owners).
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Cultural Environment			
Effect on known or potential significant archaeological resources.	This alternative would have no potential effect on known or potentially significant archaeological resources because no changes to the existing well system would be implemented.	Potential effect on known or potentially significant archaeological resources are not anticipated as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on known or potentially significant archaeological resources would be minimized through conducting a Stage 2 or Stage 3 Archaeological Assessment, if required.
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**

Table 5-1: Comparative Evaluation of the Alternative Solutions

Category and Evaluation Criteria	Alternative No. 1: Do Nothing	Alternative No. 2: Rehabilitate Existing Wells	Alternative No. 5: Install New Wells
Effect on built heritage resources and cultural heritage landscapes.	This alternative would have no potential effect on built heritage resources and cultural heritage landscapes because no changes to the existing well system would be implemented.	Potential effect on built heritage resources and cultural heritage landscapes are not anticipated as any work associated with rehabilitation would be undertaken within existing wells / well houses.	Potential effects on built heritage resources and cultural heritage landscapes would be addressed through completing a Cultural Heritage Assessment Report, if required.
Ranking:	**Most Preferred**	**Most Preferred**	**Moderately Preferred**
Overall Results of the Comparative Evaluation:	**Least Preferred – Although there would be no potential effects on the environment, this alternative does not meet the Problem/Opportunity Statement and may limit future growth by failing to address groundwater capacity issues.**	**Moderately Preferred – Although rehabilitating existing wells would partially restore the capacity of York Region's well system with potential environmental effects being avoided or minimized through standard mitigation measures, this alternative alone would not re-establish the full well permitted capacity.**	**Most Preferred: Although potential effects may occur as a result of implementing this alternative, effects will be avoided or minimized through the site selection process and implementation of standard mitigation measures. In addition, this alternative would restore the full permitted capacity of the Yonge Street Aquifer well system.**
Recommended Alternative:	**A combination of Alternatives 2 and 5 provides the greatest opportunity to re-establish the full permitted well capacity of York Region's water system in the Yonge Street Aquifer area while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued. Potential environmental effects will be avoided or minimized through the implementation of standard mitigation measures.**		

6. Identification and Assessment of Existing Wells and New Well Areas

6.1 Description of Methodology to Identify and Assess Existing Wells and New Well Areas

In order to implement the recommended alternative of rehabilitating wells and installing new wells, the following stages of work were defined and completed to identify and assess existing wells and new well areas, as depicted in **Figure 6-1**:

1. Identify and recommend existing wells for rehabilitation.
2. Identify a Long-list of 12 Prospective Target (new) Well Areas for Preliminary Desktop Evaluation.
3. Generate a short-list of four well areas for exploratory well drilling and step-testing.
4. Generated a list of preferred well areas for 24-hour pumping tests.
5. Conduct 24-hour pumping tests at the recommended Well Areas.
6. Drill large diameter test well, conduct a 72-hour pumping test, groundwater modelling and infrastructure hydraulic modelling to confirm the Preferred Solution.

A detailed description and results of each stage of work are provided in the following sections (**Section 6.2** to **6.7**).

project yonge street aquifer

YONGE STREET AQUIFER
WELL CAPACITY RESTORATION

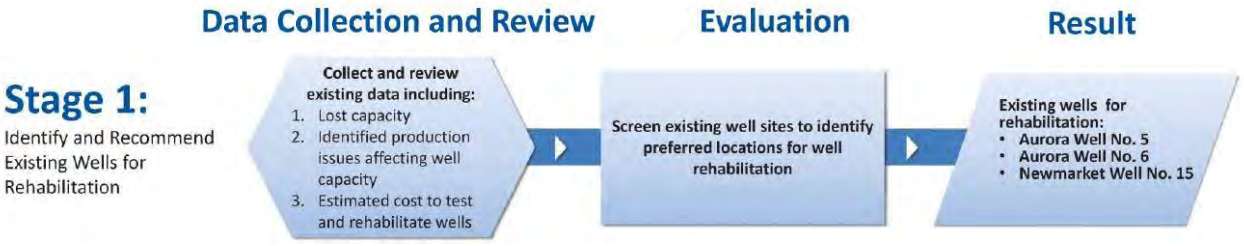
York Region

Phase 2: Assess Alternative Solutions and Establish the Preferred Solution

	Data Collection and Review	Evaluation	Result
Stage 1: Identify and Recommend Existing Wells for Rehabilitation	**Collect and review existing data including:** 1. Lost capacity 2. Identified production issues affecting well capacity 3. Estimated cost to test and rehabilitate wells	**Screen existing well sites to identify preferred locations for well rehabilitation**	Existing wells for rehabilitation: • Aurora Well No. 5 • Aurora Well No. 6 • Newmarket Well No. 15
Stage 2: Identify a Long-list of 12 Prospective Target (new) Well Areas for Preliminary Desktop Evaluation	**Collect and review existing data including:** 1. Hydrogeology data 2. Geology data	**Screen prospective well areas for their potential to provide the capacity of a municipal groundwater supply well**	Identified 12 well areas for further evaluation
Stage 3: Generate Short-list of Four Well Areas for Exploratory Well Drilling and Step-Testing	**Collect and review existing data and conduct modelling:** 1. Hydrogeology data 2. Geology data 3. Property ownership 4. Wellhead Protection Area modelling 5. Infrastructure hydraulic modelling	**Evaluate 12 prospective well areas in the following categories** 1. Groundwater Quantity 2. Groundwater Quality 3. Natural Environment 4. Potential Well Interference 5. Water Supply System Integration 6. Municipal Well Development Logistics	Well Areas for exploratory drilling and step-testing: • Well Area 6 (Green Lane) • Well Area 11 (Aurora Well No. 5) • Well Area 5 (Warden) • Well Area 3 (Mount Albert)
Stage 4: Generate List of Preferred Well Areas for 24-Hour Pumping Tests	**Conduct field work and the following studies:** 1. Six-inch test well drilling program & step-tests 2. Terrestrial and aquatic assessments 3. Cultural Heritage Review 4. Stage 1 Archaeological Assessment	**Evaluate four prospective well areas in the following categories:** 1. Technical 2. Natural Environment 3. Built Environment 4. Social Environment 5. Cultural Environment 6. Financial	Well Areas for 24-hour pumping tests: • Well Area 11 (Aurora Well No. 5) • Well Area 6 (Green Lane) • Well Area 5 (Warden)
Stage 5: Recommend a Preferred Solution	**Conduct the following studies:** 1. Monitoring well drilling and 24-hour pumping tests 2. Stage 2 Archaeological Assessment	**Update evaluation of two prospective well areas in the following categories:** 1. Technical 2. Natural Environment 3. Built Environment 4. Social Environment 5. Cultural Environment 6. Financial	Recommended Preferred Solution: • Rehabilitate wells at Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No. 15 • Construct new wells at Well Area 6 (Green Lane) and Well Area 11 (Aurora Well No. 5)
Stage 6: Confirm the Preferred Solution	**Conduct field work, numerical modelling the following studies:** 1. Large-diameter test well drilling & 72-hour pumping test 2. Groundwater modelling 3. Infrastructure hydraulic modelling	**Evaluate the feasibility & sustainability of municipal water taking from Well Area 6 (Green Lane) and Well Area 11 (Aurora Well No. 5)**	Confirm Preferred Solution

York Region applied this approach to establish a Preferred Solution

6.2 Stage 1: Identify and Recommend Existing Wells for Rehabilitation



6.2.1 Stage 1 Data Collection and Review

In order to identify existing wells for rehabilitation, York Region began with evaluating the construction details and performance of all Yonge Street Aquifer Wells (refer to **Appendix C** – Yonge Street Aquifer Well Capacity Restoration Project - Well Performance Report). Production issues were explored with well operators and the lost well capacity associated with under-performing wells was quantified.

6.2.2 Stage 1 Evaluation

York Region then evaluated the possibility of improving well performance through testing and rehabilitation and estimated the preliminary costs associated with rehabilitating wells. York Region, in consultation with AECOM, selected four wells for further evaluation and potential rehabilitation. The evaluation criteria consisted of lost well capacity, reasons for lost well capacity, the number of previous rehabilitation events and the estimated cost to test and rehabilitate the wells.

A summary of the evaluation is presented in **Table 6-1** and the wells recommended for rehabilitation include Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No 15, as shown on **Figure 6-2**.

Table 6-1: Evaluation of Wells for Considered for Rehabilitation

Evaluation Criteria	Aurora Well No. 5	Aurora Well No. 6	Newmarket Well No. 14	Newmarket Well No. 15
Lost Well Capacity (m^3/day)*	708	1,050	2,291	1,113
Reason for Lost Well Capacity	Premature screen plugging	Sand production	Aesthetic and operational water quality issues	Sand production
Number of Previous Rehabilitation Events	0	1	0	3

Table 6-1: Evaluation of Wells for Considered for Rehabilitation

Evaluation Criteria	Aurora Well No. 5	Aurora Well No. 6	Newmarket Well No. 14	Newmarket Well No. 15
Estimated Cost to Test and Rehabilitate Well	$140,000	$105,000	N/A	$105,000
Recommendation	Rehabilitation of three wells could recover an estimated capacity of up to 2,500 m^3 /day in the short term until new wells are constructed			

*Note: * Calculated as the difference between Maximum Permit to Take Water Pumping Rate and Practical Maximum Pumping Rate*

6.2.3 Stage 1 Results

Following the evaluation conducted during Stage 1, it was determined that Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No. 15 would be rehabilitated. This will aid in developing extra well capacity in the Yonge Street Aquifer groundwater supply system for backup purposes (redundancy) during maintenance events. Newmarket Well No. 14 was not selected for rehabilitation as the rationale for the lost capacity is not related to the condition of the well, rather the aquifer itself.

6.3 Stage 2: Identify a Long-list of 12 Prospective Target (new) Well Areas for Preliminary Desktop Evaluation

6.3.1 Stage 2 Data Collection and Review

This stage involved the generation of the Prospective Target Well Areas. This task is documented in the *Alternative Well Area Selection Report* (included in **Appendix D**). The Prospective Target Well Areas were generated based on a review of geology and hydrogeology data, as well as consultation with York Region. To complete this task, information pertaining to the Yonge Street Aquifer was compiled as detailed in Appendix A of the *Alternative Well Area Selection Report*. During the process of background data collection, it was determined that data coverage across the Study Area was uneven. Specifically, the density of background data was lower for areas away from existing municipal wells or previous test well drilling programs. In these cases, extrapolation and interpolation were relied upon to interpret subsurface conditions.

TOWN OF BRADFORD WEST GWILLIMBURY

TOWN OF EAST GWILLIMBURY

TOWNSHIP OF UXBRIDGE

TOWN OF WHITCHURCH-STOUFFVILLE

TOWN OF NEWMARKET

TOWNSHIP OF KING

TOWN OF AURORA

TOWN OF RICHMOND HILL

CITY OF MARKHAM

Newmarket Well No.15

Aurora Well No.5

Aurora Well No.6

Queensville Sideroad

Line 8

County Rd 88

Line 6

Holland St W

Barrie St

Dissette St

Simcoe Rd

Canal Rd

Tornado Dr

King St

Graham Sideroad

Hwy 11

Holland Landing Rd

Sand Rd

Con Rd 2

Farr Ave

Mount Albert Rd

Mccowan Rd

Centre St

Sandford Rd

Herald Rd

York Durham Line

Reg Rd 8

Woodbine Ave

Warden Ave

Davis Dr

Green Lane E

Green Lane W

Bristol Rd

London Rd

Main St N

Elgin St

Leslie St

Srigley St

Gorham St

Eagle St

Mulock Dr

Vivian Rd

Hwy 48

Davis Dr W

Hwy 9

Hwy 400

Keele St

Bathurst St

Yonge St

Industrial Pky N

Industrial Pky S

Bayview Ave

Hwy 404

St Johns Sideroad

Aurora Rd

Kennedy Rd

Lakeshore Rd

9th Line

Vandorf Sideroad

Bloomington Rd

Lloydtown Aurora Rd

7th Conc

Jane St

Weston Rd

17th Sideroad

Wellington St W

Murray Dr

Henderson Dr

Dufferin St

Bethesda Sideroad

Stouffville Rd

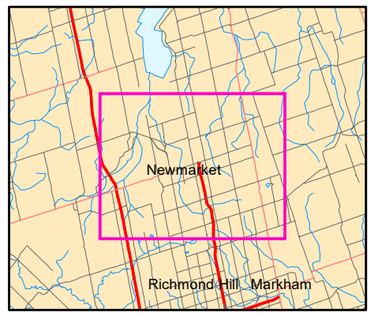
Main St

Legend

- Recommended Wells for Rehabilitation
- Study Area

Roads

- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Alleyway / Laneway
- Service



Basemapping from Ontario Ministry of Natural Resources

N W E S

Metres

0 550 1,100 2,200 3,300 4,400

1:92,000

UTM Zone 17N, NAD 83

Yonge Street Aquifer Well Capacity Restoration
Class Environmental Assessment

Wells Recommended for Rehabilitation

August 2016
60240747

AECOM

Figure 6-2

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6.3.2 *Stage 2 Evaluation*

In order to pare down the Long-List to 12 Prospective Target Well Areas for detailed evaluation, the geologic and hydrogeologic characteristics of the Study Area were assessed. The detailed geology and hydrogeology review utilized the following main data categories:

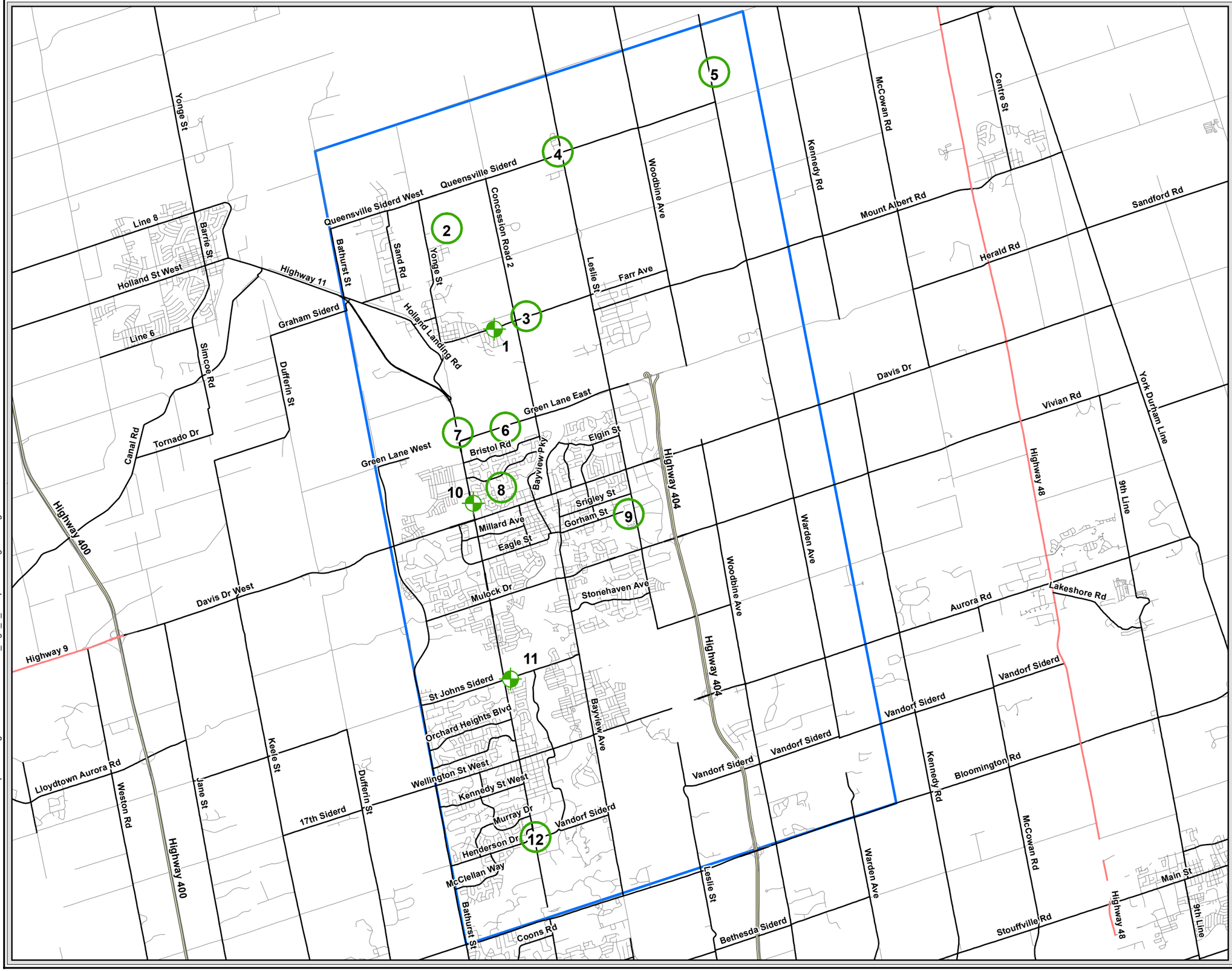
- Surficial data – geology and topography mapping;
- Conservation Authorities Moraine Coalition and the York-Peel-Durham-Toronto coalition (CAMC-YPDT) 2006 water resources database and related mapping products (e.g., water table surface, potentiometric surface, sand and gravel thickness maps);
- Core Model (2006) numerical model and hydrostratigraphic surfaces;
- Draft Tier Three hydrostratigraphic surfaces; and,
- Site specific hydrogeologic data – previous site specific investigations and reports.

Twelve Prospective Target Well Areas were identified during this stage, as depicted on **Figure 6-3**.

6.3.3 *Stage 2 Results*

Following the evaluation conducted during Stage 2, 12 Prospective Target Well Areas were identified for further evaluation, as shown in **Figure 6-3**. The Alternative Well Area Selection Report provides details on the selection process and concludes that these well areas were chosen to undergo further exploration due to their potentially favourable hydrogeological conditions.

6.4 Stage 3: Generate Short-list of Four Well Areas for Exploratory Well Drilling and Step-Testing



Legend

- Prospective Target Drill Areas
- Prospective Target Drilling Areas (Existing Municipal Well Location)
- Study Area

Roads

- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp

Basemapping from Ontario Ministry of Natural Resources

N
W E
S

Metres
0 550 1,100 2,200 3,300 4,400

1:92,000

UTM Zone 17N, NAD 83

Yonge Street Aquifer
Well Capacity Restoration

Prospective Target Drilling Areas

November 2013
60240747

AECOM

Figure 6-3

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6.4.1 Stage 3 Data Collection and Review

In order to generate a short-list of four well areas for exploratory well drilling and step-testing, it was necessary to first review existing hydrogeologic data, geology data and property ownership information in the vicinity of the 12 Prospective Target Well Areas. Preliminary groundwater and infrastructure hydraulic modelling was also carried out. Further details are provided in the *Alternative Well Area Selection Report.*

6.4.2 Stage 3 Evaluation

Following the above data collection and review work described above, the 12 Prospective Target Well Areas were assessed against evaluation criteria in the following six categories:

1. Groundwater Quantity;
2. Groundwater Quality;
3. Natural Environment;
4. Potential Well Interference;
5. Water Supply System Integration; and
6. Municipal Well Development Logistics.

The rationale for each criterion is described in Section 3.2 of the *Alternative Well Area Selection Report*.

Each Prospective Target Well Area was assessed based on the evaluation criteria and assigned a colour grade. The methodology for the application of each colour grade is described in **Table 6-2**. The colour grades reflect whether the area should or should not be pursued based on each criterion. A green colour grade was assigned if the area is ideal with respect to the evaluated criterion. A yellow colour grade was assigned if the area is less than ideal, but still warranted further consideration. A red colour grade was assigned if the area is not suitable with respect to the evaluated criterion. Sites that scored a red in any criterion were not carried forward as potential sites. After all criteria in a category were assessed, a colour grade was assigned to the overall category using the following approach:

- Green category grade = a majority of the criteria received green grades, with no red grades.
- Yellow category grade = a majority of the criteria received yellow grades, with no red grades.
- Red category grade = one or more red grades.

For example, in the case of areas that received an even number of green and yellow grades in a given category, the conservative approach of assigning an overall yellow grade was used.

6.4.3 Stage 3 Results

The results of the Stage 3 assessment and evaluation are included in **Table 6-3** four well areas were identified to be carried forward for exploratory drilling and step-testing as depicted in **Figure 6-4**.

As demonstrated through the evaluation described in **Table 6-2** and **Table 6-3**, well areas not selected for further evaluation were eliminated as a result of potential water quality threats and inadequate site size. Well Areas 3 – Mount Albert, 5 - Warden, 6 – Green Lane, and 11 – Well Area No. 5 were selected due to their manageable potential water quality threats and their inferred high water quantity.

Well Area 5
Warden

Well Area 3
Mount Albert

Well Area 6
Green Lane

Well Area 11
Aurora Well No.5

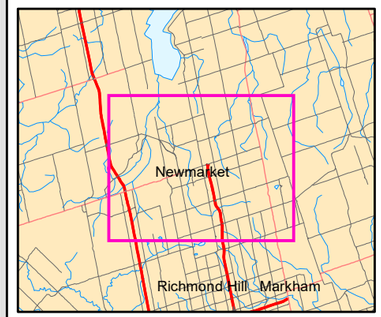
Yonge St
Barrie St
Line 8
Holland St West
County Rd 88
Bathurst St
Bridge St
Sideroad Graham
Line 6
Simcoe Rd
Dufferin St
Canal Rd
Tornado Dr
Keele St
Highway 400
Davis Dr West
Highway 9
Jane St
Lloydtown Aurora Rd
Weston Rd
Concession Rd 7
Sideroad 17
Sand Rd
Sideroad Queensville
Concession Rd 2
Holland Landing Rd
Highway 11
Green Lane East
Bristol Rd
London Rd
Main St North
Elgin St
Srigley St
Millard Ave
Eagle St
Prospect St
Mulock Dr
Stonehaven Ave
Saint Johns Sideroad
Orchard Heights Blvd
Aurora Heights Dr
Wellington St West
Kennedy St West
Murray Dr
Henderson Dr
Mcclellan Way
Bloomington Rd West
Coons Rd
Leslie St
Farr Ave
Woodbine Ave
Industrial Parkway North
Bayview Ave
Wellington St East
Highway 404
Warden Ave
Kennedy Rd
Mccowan Rd
Sideroad Bethesda
Sideroad Vandorf
Davis Dr
Vivian Rd
Mount Albert Rd
Herald Rd
Sandford Rd
Highway 48
Centre St
East Townline
York Durham Line
Regional Rd 8
Aurora Rd
Lakeshore Rd
Bloomington Rd
Stouffville Rd
Millard St
Main St
9th Line

Legend

- Selected Alternative Well Areas for Testing
- Study Area

Roads

- Freeway
- Highway
- Major Road
- Local Road
- Ramp



Basemapping from Ontario Ministry of Natural Resources

N
W E
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Metres
0 550 1,100 2,200 3,300 4,400

1:92,000

UTM Zone 17N, NAD 83

Yonge Street Aquifer Well Capacity Restoration
Class Environmental Assessment

Selected Alternative Well Areas

November 2013
Project 60240747

AECOM

Figure 6-4

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Table 6-2: Application of the Prospective Alternative Well Evaluation Criteria

Category of Consideration / Evaluation Criteria	Application of Evaluation Criteria		
	Green	**Yellow**	**Red**
Groundwater Quantity Category			
Geological and hydrogeological conditions	Somewhat favourable to favourable	Uncertain	Unfavourable
Potential average well capacity	>1,500 m^3/day	1,000 to 1,500 m^3/day	<1,000 m^3/day
Potential estimate aquifer thickness	>= 50 m	20 – 50 m	<20 m
Apparent transmissivity	>150 m^2/day	75 – 150 m^2/day	<75 m^2/day
Available data within 500 m of site	0 to 3 domestic well logs	>3 domestic well logs	High quality nondomestic well log or historical first-hand knowledge
Groundwater Quality Category			
Land uses within 1 km	Park/Agricultural	Urban/Residential	Industrial
Potential Significant Water Quality Threats	None identified or proposed twin with existing municipal well	Potential threats require acceptable level of management	Potential threats require unacceptable level of management
Natural Environment Category			
Proximity to wetlands and/or streams	>0.3 km	0.1 – 0.3 km or <0.1 km with no documented connection to target aquifer	<0.1 km with documented connection to target aquifer
Thickness of the aquitard below the shallow aquifer	>20 m	10 – 20 m or <10 m with no documented connection to wetland/stream	<10 m with a documented connection to wetland/stream
Well Interference Category			
Local private well density	<15 wells / km^2	>15 wells / km^2	N/A
Distance to Permit to Take Water Sources	>1 km	0.3 – 1 km	<0.3 km

Table 6-2: Application of the Prospective Alternative Well Evaluation Criteria

Category of Consideration / Evaluation Criteria	Application of Evaluation Criteria		
	Green	**Yellow**	**Red**
Water Supply System Integration Category			
Infrastructure and distribution requirements	Little new infrastructure / distribution system upgrade requirements	Some new infrastructure / distribution system upgrade requirements	New infrastructure / distribution system upgrade requirements are prohibitive
Site Development Logistics Category			
Property ownership	Region/Province/Developer	Private or Federal	Protected
Adjacent existing and future land uses	Yes	Maybe or unknown	No
Adjacent Property Size	Yes	May require access to adjacent parcel(s)	No
Property Access	Yes	May have to temporarily relocate obstruction(s)	No

Table 6-3: Prospective Alternative Well Area Evaluation Summary

Prospective Alternative Well Area	Major Road Intersection	Evaluation Category						Overall Evaluation Results
		Ground-water Quantity	*Ground-water Quality*	*Natural Environment*	*Well Interference*	*Water Supply System Integration*	*Municipal Well Development Logistics*	
1*	Mt. Albert Road and Grist Mill Road							Not selected. Due to close proximity and less favourable conditions than Area 3. Could be considered as alternate area.
2	Yonge Street and Cedar Street							Not selected. Due to potential water quality threats due to adjacent land uses.
3	2nd Concession and Mt. Albert Road							**Selected. Due to low number of potential water quality threats and potentially high groundwater quantity.**
4	Leslie Street and Queensville Side Rd							Not selected. Due to potential water quality threats due to adjacent land uses.
5	Warden Ave and Queensville Side Rd							**Selected. Due to low number of potential water quality threats and potentially high groundwater quantity.**
6	Green Line and 2nd Concession							**Selected. Due to low number of potential water quality threats and potentially high groundwater quantity.**
7	Yonge Street and Green Line							Not selected. Due to potential water quality threats due to adjacent land uses.

Table 6-3: Prospective Alternative Well Area Evaluation Summary

Prospective Alternative Well Area	Major Road Intersection	Evaluation Category						Overall Evaluation Results
		Ground-water Quantity	*Ground-water Quality*	*Natural Environment*	*Well Interference*	*Water Supply System Integration*	*Municipal Well Development Logistics*	
8	London Road and Osmond Crescent							Not selected. Due to potential water quality threats due to adjacent land uses.
9	Leslie Street and Gorham Street							Not selected. Due to potential water quality threats due to adjacent land uses.
10*	Yonge Street and Davis Drive							Not selected. Due to potential water quality threats due to adjacent land uses and inadequate site size.
11*	Yonge St & St. Johns Side Road							**Selected. Due to low number of potential water quality threats and potentially high groundwater quantity.**
12	Yonge Street and Henderson Street							Not selected. Due to potential water quality threats due to adjacent land uses.

*Notes: *Denotes a proposed location to twin an existing municipal well.*

6.5 Stage 4: Generate List of Preferred Well Areas for 24-Hour Pumping Test

6.5.1 Stage 4 Data Collection and Review

In order to identify the preferred Well Areas for a 24-hour pumping test, the following studies were conducted at the Short-Listed Well Areas:

- Six-inch test well drilling and step-tests;
- Natural heritage and aquatic investigations;
- Built/Cultural heritage investigations; and,
- Stage 1 Archaeological Assessment.

A description of the existing conditions of each Well Area based on these studies is provided in **Section 6.5.2.1** to **6.5.2.4** and a comparative evaluation of the alternative well areas is included in **Section 6.5.2.5**.

6.5.2 Stage 4 Evaluation

As part of Stage 4, the data collected was used to assess the Short-Listed Well Areas through a "net effects analysis" consisting of the following activities:

- **Activity No. 1:**

  Develop evaluation criteria and indicators based on the purpose of the undertaking, existing identified environmental conditions, range of Alternatives being considered, and type and scale of potential environmental effects from the Alternatives and their relative significance.

  For Activity No. 1, evaluation criteria were grouped under the following categories:

  - Technical;
  - Natural Environment;
  - Built Environment;

- Social Environment;
- Cultural Environment; and,
- Financial.

- **Activity No. 2:**

  Once developed, the evaluation criteria and indicators were applied to each Alternative Well Area in order to identify potential effects (both positive and negative). **Table 6-4** provides the results of the Comparative Evaluation of Alternative Well Areas and rankings are provided after the description of mitigation measures for each category.

- **Activity No. 3:**

  Develop appropriate avoidance/mitigation/compensation measures based on current procedures, historical performance, and existing environmental conditions. The intent of these measures are:

  Avoidance: ..... The first priority is to prevent the occurrence of negative effects associated with implementing an alternative.

  Mitigation: ..... Where adverse effects cannot be avoided, it will be necessary to develop the appropriate measures to remove or alleviate to some degree the negative effects associated with implementing the alternative.

  Compensation: . In situations where appropriate mitigation measures are not available, or significant net adverse effects will remain following the implementation of mitigation measures, compensation measures may be required to counterbalance the negative effect, such as replacement (in kind), or provision of a substitute or reimbursement.

- **Activity No. 4:**

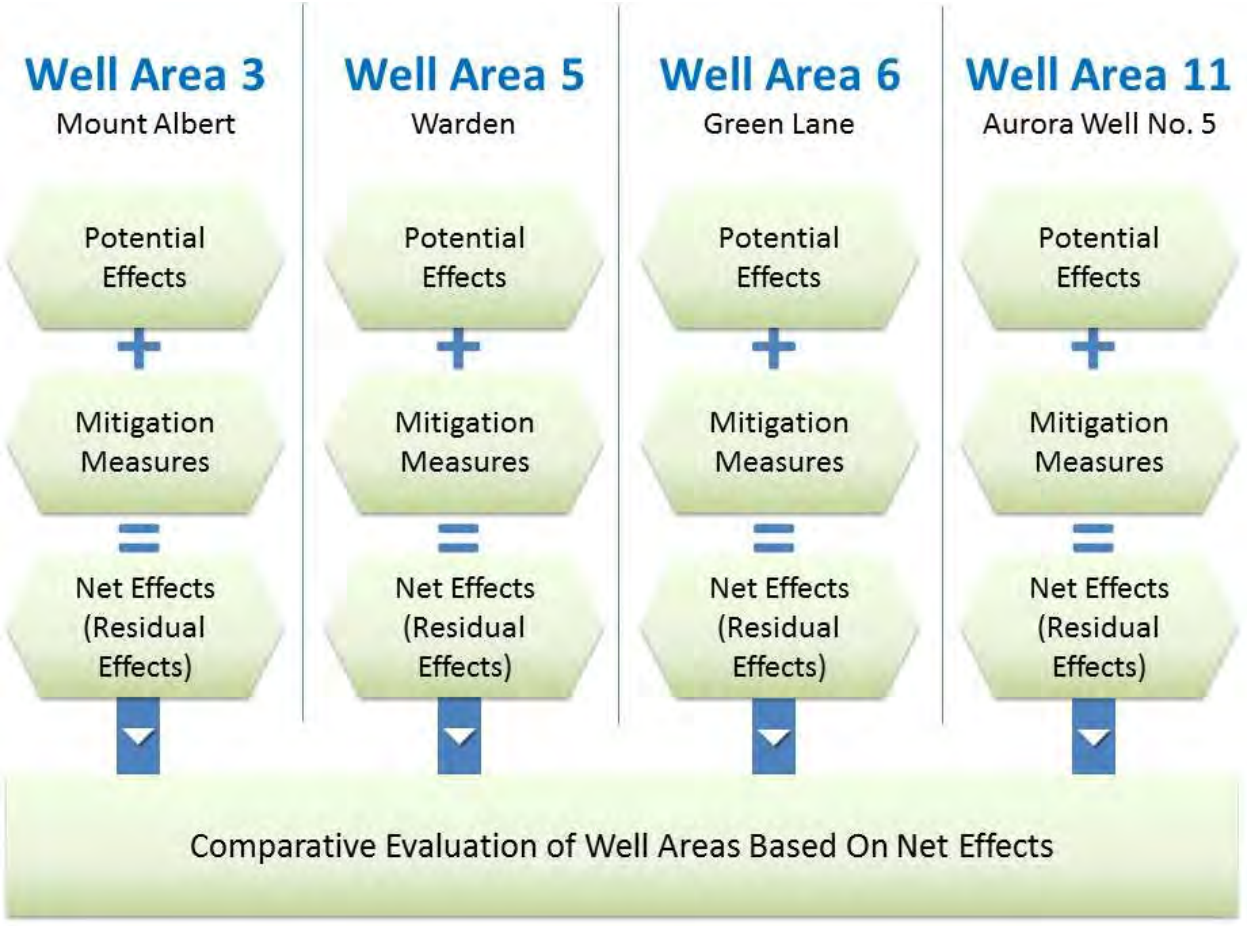
  Apply the avoidance/mitigation/compensation measures to the identified potential effects to identify net effects. A ranking of preferred, moderately preferred and least preferred was then assigned to each indicator taking into consideration the application of avoidance, mitigation or compensation measures. If the evaluation criteria in a specific category were met with either no or very few residual effects, it was considered most preferred. Conversely, if the criteria in a specific category were met;

however, residual effects would remain, it was considered least preferred. A ranking of moderately preferred indicates that the evaluation criteria were met but there is some potential for residual effects.

The Well Areas were then compared to each other in consideration of the advantages and disadvantages of the net effects (i.e., effects remaining after the application of mitigation measures) to identify a ranking of each Well Area for each criterion category. A ranking of 'First' was given to the most favourable Well Area and a ranking of 'Fourth' was applied to the least favourable Well Area. After identifying the six category rankings, an overall ranking for each Well Area was determined.

Figure 6-5 illustrates the process of ranking each Alternative Well Area at the criterion category.

Figure 6-5: Net Effects Comparative Evaluation Diagram



6.5.2.1 Alternative Well Area 3 – Mount Albert

Alternative Well Area 3 is located at the intersection of Mount Albert Road and Concession Road 2 within the Town of East Gwillimbury (see **Figure 6-6**). The centre of Alternative Well Area 3 is at the northeast corner of Mount Albert Road and Concession Road 2 and the Alternative Well Area includes all areas within a 200 m radius of this centre. Areas within an approximately 200 m radius of the potential Well Site were reviewed for information on the local existing conditions. A new well in this location would require the acquisition of private property located in either quadrant of the intersection of Mount Albert Road and Concession Road 2.

Technical

With regard to constructability of the well house, Alternative Well Area 3 has an existing watermain; however, construction of sanitary servicing would be required.

In terms of approval requirements, the Well Area has the fewest restrictions; it is not within the boundaries of the ORM or the regulated limits of the LSRCA.

The target aquifer, interpreted to be the Thorncliffe Formation, was encountered at approximately 67 metres below ground surface (mBGS). The aquitard above the target formation was observed to be approximately 30 m thick. The estimated capacity of a new well at Well Area 3 – Mount Albert is 20 Litres per second (L/s). This estimate is based only on the geotechnical conditions observed during drilling at this site, as the well installation was not completed. Alternative Well Area 3 has the least favourable hydrogeological conditions of the four well areas. During drilling of the pilot hole, it became apparent that the site has a thin and relatively fine-grained aquifer, as such; the area does not have favourable conditions for a productive aquifer for the purposes of this Project.

Natural Environment

The topography within Alternative Well Area 3 is relatively flat with some undulating slopes. Land use is 75% agriculture and 25% residential within 200 m of the Well Site.

Alternative Well Area 3 is situated within the East Holland River Watershed; however, there are no watercourses within the Well Area. The land slopes down towards the west and a drainage swale conveys runoff along Mount Albert Road toward the intersection. The swale is dominated by Reed Canary Grass (*Phalaris arundinacea*) and does not provide direct fish habitat.

The Well Site is located in an agricultural field and there are no wetland or forest vegetation communities present within Alternative Well Area 3. The nearest vegetation

community, cultural meadow, (CUM1 shown in **Figure 6-6**) is at the north edge of the Alternative Well Area 3 on the west side of Concession Road 2. The remainder of Alternative Well Area 3 consists of actively cultivated cropland and rural residential land use that do not have high environmental functions or attributes.

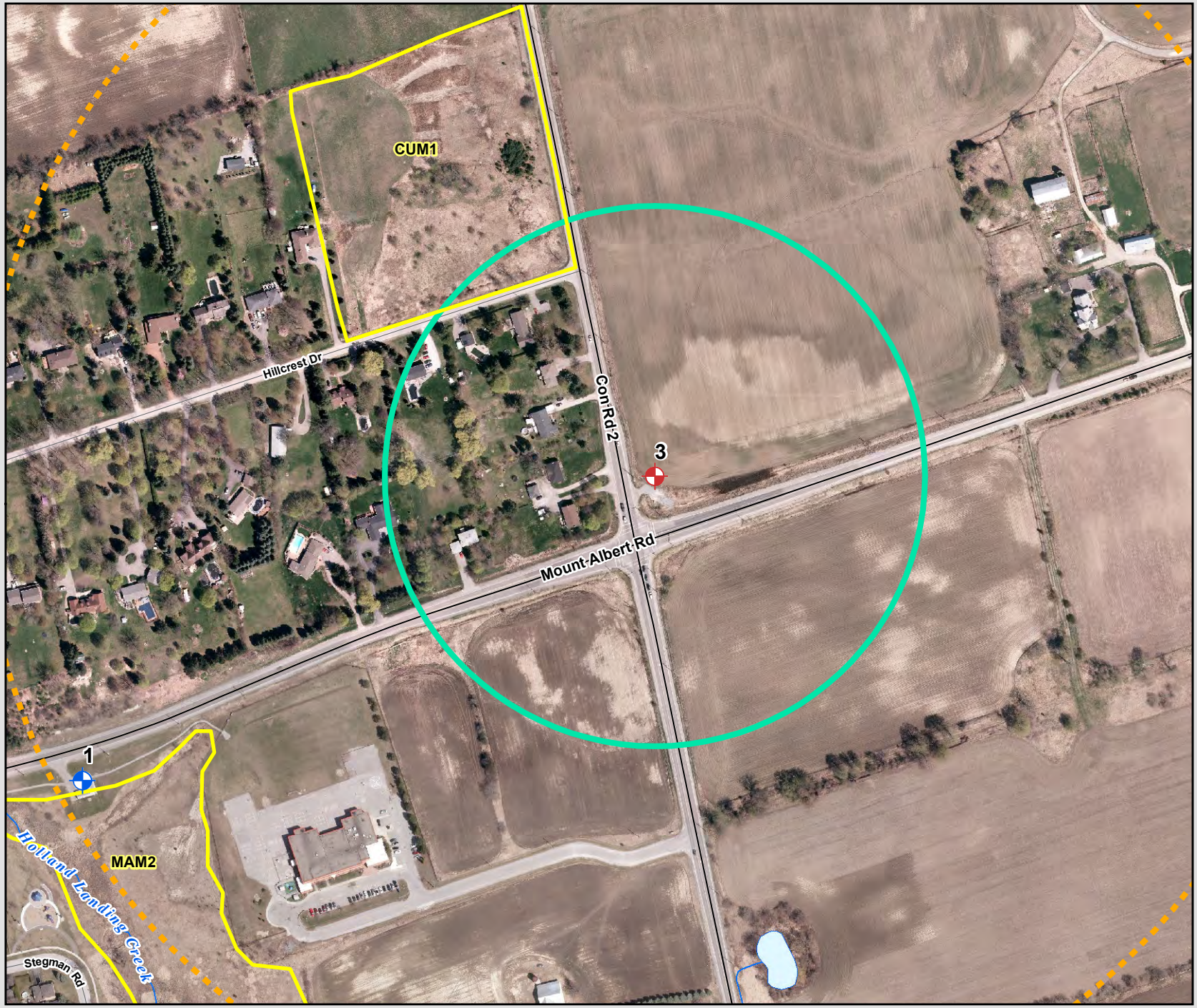
Two bird Species at Risk, Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*), which breed in agricultural settings including hayfields and pastures, have the potential to be negatively affected by the Well Site development due to habitat removal. These species and their habitats are protected under the *Endangered Species Act*, 2007.

Built, Economic and Social Environment

Existing land uses within Alternative Well Area 3 include active agricultural operations (soybean fields and hayfields) northeast, southeast and southwest of the intersection of Mount Albert Road and Concession Road 2. In addition, there are seven residences with access on Hillcrest Drive, Concession Road 2 and Mount Albert Road within Alternative Well Area 3 northwest of the intersection of Mount Albert Road and Concession Road 2. These residences are part of a larger neighbourhood with approximately 40 single detached residences on Hillcrest Drive. An existing elementary school (Good Shepherd Catholic Elementary School) is located approximately 100 m southwest of Alternative Well Area 3. The nearest residence east of Alternative Well Area 3 is a rural residence at 908 Mount Albert Road approximately 100 m east of Alternative Well Area 3.

With regard to future land uses, the portion of Alternative Well Area 3 west of Concession Road 2 is designated as Low Density Residential within the Holland Landing Land Use Plan by the Town of East Gwillimbury (Town of East Gwillimbury, 2013). The portion of Alternative Well Area 3 east of Concession Road 2 is designated as Agricultural. The Town of East Gwillimbury also identified in Sections 4.8.16 to 4.8.19 of the Official Plan (prior to approval) that the area of Mount Albert Road and Concession Road 2 is the preferred location for a central park facility; however, in Sections 4.8.17 to 4.8.19 of the Town of East Gwillimbury Consolidate Official Plan (2014), the area of Mount Albert Road and Concession Road 2 is no longer the preferred location and the location of the Town's central park facility shall be determined through future study.

The Town of East Gwillimbury Consolidated Official Plan (2010) was under appeal to the Ontario Municipal Board but has since been partially approved by the Ontario Municipal Board on March 27, 2013, July 18, 2013, October 4, 2013, March 5, 2014, April 28, 2014, May 28, 2014 and July 17, 2014 at the time this report is being prepared. The new municipal well would be permitted in all land use designations under Section 4.15 – Land Uses Permitted in All



Legend

- Existing Well
- Target Well
- 200m Radius
- 500m Radius
- Ecological Land Classification

Roads

- Major Road
- Local Road

Water Features

- Lake
- Permanent Stream

Basemapping from Ontario Ministry of Natural Resources

N
W E
S

Metres

0 20 40 80 120

1:4,000

UTM Zone 17N, NAD 83

Yonge Street Aquifer
Well Capacity Restoration Project

Ecological Land Classification Well Area 3

August 2016
60240747

AECOM

Figure 6-6

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Land Use Designations, Section 4.15.1 – Public or Quasi-Public Uses which stipulates that subject to regulatory requirements, such as the Environmental Assessment Act, water supply, sewage, drainage and stormwater management facilities will be permitted in all land uses. Concession Road 2 and Mount Albert Road are both designated as Regional Arterial Roads within the East Gwillimbury Official Plan (2014).

Cultural Environment

The portion of Alternative Well Area 3 with archaeological potential is shown in Map 11 in the Stage 1 Archaeological Assessment, included in **Appendix A**. A review of physiographic features indicated that tributaries of the East Holland River are in close proximity to this location; while a review of historic maps identified the existence of former historic structures within the Alternative Well Area (see Maps 4 and 8 in the Stage 1 Archaeological Assessment). Additionally, this Well Area is bisected by Concession Road 2 and Mount Albert Road, both historically surveyed transportation routes that contain archaeological potential within 100 m on either side.

Portions of Alternative Well Area 3 that do not have archaeological potential include areas that have been subject to deep and extensive disturbance include existing paved roadways – Concession Road 2 and Mount Albert Road – and any associated sloping grass margins and shallow drainage ditches associated with this roadway (see Map 12 in the Stage 1 Archaeological Assessment). Disturbances encountered also include an existing gravel driveway, and a residential lot containing several structures in addition to a driveway (see Images 2, 4 in the Stage 1 Archaeological Assessment).

With regard to cultural heritage landscapes, Alternative Well Area 3 includes part of Lots 10, 11, 12 and 13, Concession 2 and Lots 106 and 107, Concession 1 EYS, geographical township of East Gwillimbury (see Figure 3 in the Existing Conditions Report: Built Heritage & Cultural Heritage Landscapes, included in **Appendix B**). Mount Albert Road is a two lane paved road with wide shoulders. The original township survey of 1800-1803 imposed a grid pattern of north-south concession roads and east-west sideroads and lots onto the landscape. This 200-year survey configuration is clearly delineated in the landscape and provides information as to the agricultural development of the area.

There are no built heritage resources within Alternative Well Area 3. Adjacent to Alternative Well Area 3 on the east side, 908 Mount Albert Road is a farm complex containing a 19th century farmhouse, barn, outbuildings and a racetrack. 908 Mount Albert Road is also a listed property on the Town of East Gwillimbury's Register of Cultural Heritage Properties. It is noted as the John Slater House, built c1868. The farmhouse is currently used for Special Needs housing. Also adjacent to Alternative Well Area 3 on the east side is the North York Drive-In Theatre at 893 Mount Albert Road opened in 1955 and now closed; it is considered to be of potential heritage value

or interest. It is not included Town of East Gwillimbury's Register of Cultural Heritage Properties. Adjacent to Alternative Well Area 3 on the south side is a farm complex at 19064 2nd Concession comprising vernacular, early 20th century, 2 storey brick farmhouse and a barn and silo. This property is included Town of East Gwillimbury's Register of Cultural Heritage Properties. There are no federal or provincial heritage sites within Alternative Well Area 3.

Financial

The estimated capital cost for developing a well facility is a function of the site conditions and proximity to existing municipal infrastructure, the proposed well capacity and the anticipated treatment requirements based on test well water quality. As previously stated, the estimated capacity of a new well at Well Area 3 – Mount Albert is 20 Litres per second (L/s). Water quality information was also not available as step testing was not undertaken; therefore, it was assumed that only disinfection would be required (i.e., no allowance for treatment of metals).

The proposed well house is 120 m^2, to include a vertical turbine well pump and disinfection process equipment (chlorine gas system and scrubber; aqueous ammonia system and scrubber) along with electrical and mechanical requirements. The total capital cost estimated for construction of a well facility at Well Area 3 is $2.3M including land acquisition and contingencies. This cost does not include construction of the well itself which would be completed through this Class EA if determined to be a preferred alternative.

Based on the well capacity of 20 L/s, the capital cost is $1,300 per m^3/day of capacity. The well facility requirements (i.e., building size and equipment layout, utility requirements, access road, etc.) are similar for all new proposed supplies. Therefore, due to the small capacity of this proposed supply, the capital cost relative to the estimated production capacity is comparatively higher for this small capacity well.

6.5.2.2 Alternative Well Area 5 – Warden

Alternative Well Area 5 is located on Warden Avenue, approximately 500 m north of Queensville Sideroad within the Town of East Gwillimbury. The Well Area includes all areas within a 200 m radius of the proposed Well Site (see **Figure 6-7**). A new well in this location would require the acquisition of private property.

Technical

With regard to constructability of the well house, Alternative Well Area 5 requires considerable servicing as there is no planned sanitary servicing at the site and there is a significant distance to existing large diameter watermains located at Woodbine and

Queensville Sideroad. In terms of approval requirements, although a portion of the Well Area 5 is within the boundaries of the ORM; it is not in the regulated limits of the LSRCA.

Alternative Well Area 5 was ranked third in both 'Constructability of Proposed Well' and 'Aquifer Productivity' due to considerable infrastructure required for service and low transmissivity and specific capacity when compared to Well Areas 6 and 11.

The site requires considerable servicing as there is no planned sanitary servicing at the site and there is a significant distance to existing large diameter watermains located at Woodbine and Queensville Sideroad.

Well Area 5 was ranked second in Approval requirements as it would not require approval from the LSRCA; however, the proposed Well Site is within close proximity to the ORM boundaries and as such will need to address the Section 41 requirements of the ORMCP as per Section 4.12.1.3 and 4.12.1.4 of the Town of East Gwillimbury Official Plan (2014) to accommodate close proximity of the Well Site to the ORM.

The target aquifer, interpreted to be the Thorncliffe Formation, was encountered at approximately 43 metres below ground surface (mBGS). The aquitard above the target formation was observed to be approximately 41 m thick. Although the stratigraphic information available at the regional scale indicated that variability in aquitard thickness and/or presence could vary at each Well Area, the drilling for this Well Area did not encounter any instances of an absent aquitard. Therefore, variability in aquitard thickness was not included as a determining factor in evaluation of this Well Area. The estimated capacity of a new well at Well Area 5 - Warden is between 45 to 55 L/s. This estimate is based on the hydrogeological conditions observed during drilling, as well as the step testing completed. The aquifer at Alternative Well Area 5' has the highest water quality of any of the Alternative Well Areas, and was therefore ranked first in the 'Treatment Requirements' evaluation criteria.

Overall, Well Area 5 was ranked third in the Technical Category Ranking.

Natural Environment

The topography within Alternative Well Area 5 is characterized as rolling uplands to the northeast and flatter tablelands to the southwest. Land use within 200 m of the Well Site consists of approximately 60% of forest and wetland, and 40% of agricultural land in the form of hayfields and pastures.

Alternative Well Area 5 is situated within the Black River Watershed. A tributary of the Black River is located within 200 m of the Well Site (**Figure 6-7**). This feature is classified as a permanent, warmwater watercourse and may provide direct fish habitat.

It flows through a pond measuring approximately 40 m in length on the east side of Warden Avenue, approximately 180 m south of the Well Site (**Figure 6-7**). There are no known records of provincially rare fish species or fish Species at Risk within these features.

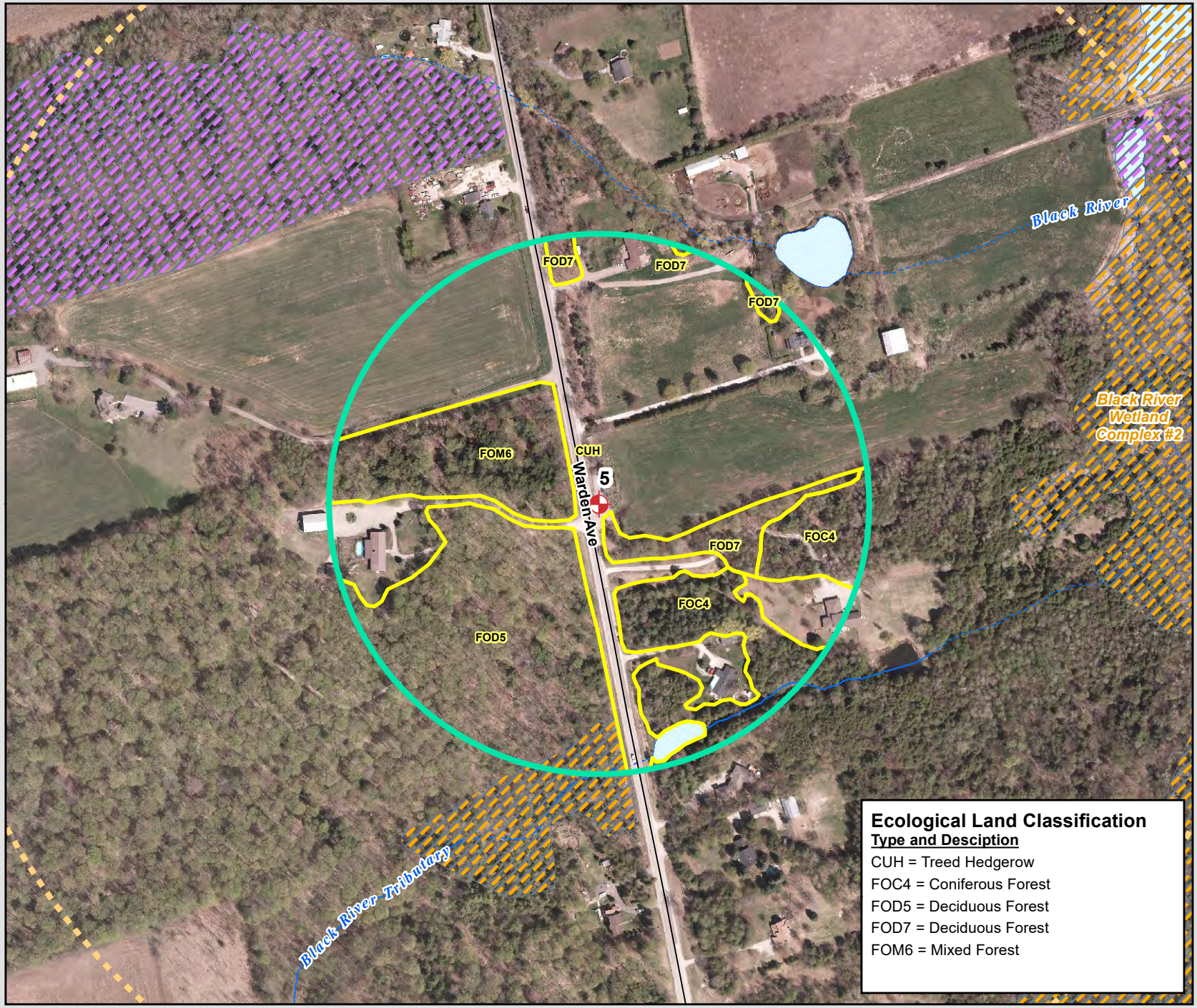
The centre of Alternative Well Area 5 consists of open disturbed ground along a roadside but is located within 50 m of mixed, coniferous and deciduous forests, and within 200 m of hayfields, pastures and wetlands. Mid-age to mature forests dominate the forest cover within and in close proximity to Alternative Well Area 5 (FOC4, FOM6, FOD5 and FOD7 shown in **Figure 6-7**), providing a forested east-west corridor connection for wildlife including a Stratum 2 Deer Wintering Area and potentially important breeding habitat for amphibians and birds. A portion of a Locally Significant Wetland, the Black River Wetland Complex #2, is present within Well Area 5, where it consists of a mid-aged to mature White Cedar Mineral Mixed Swamp co-dominated by White Cedar (*Thuja occidentalis*), Balsam Poplar (*Populus balsamifera*), Trembling Aspen (*Populus tremuloides*), and Eastern Hemlock (*Tsuga canadensis*). The pond situated approximately 180 m south of the Well Site has a diverse shoreline variably comprised of Broad-leaved Cattail (*Typha latifolia*), Reed Canary Grass and a variety of meadow marsh forbs and sedges. This pond contains good structural diversity, is adjacent to a large woodland, and likely provides amphibian breeding habitat.

Depending on the exact location selected for the Well Site, it may overlap potential maternity roost habitat for four (4) bat Species at Risk: Eastern Small-footed Myotis (*Myotis leibii*), Little Brown Myotis (*Myotis lucifugus*), Northern Long-eared Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) within the forested areas. In addition, the Well Site may overlap potential breeding habitat for two (2) bird Species at Risk, Bobolink and Eastern Meadowlark, within the agricultural field. Wetlands located within 200 m of the prospective Well Site may also provide habitat for one turtle Species at Risk, Blanding's Turtle (*Emydoidea blandingii*), and one turtle Species of Conservation Concern, Snapping Turtle (*Chelydra serpentine*), and are candidate Significant Wildlife Habitat features for amphibian breeding habitat.

Built, Economic and Social Environment

Existing land uses within Alternative Well Area 5 include a mix of active agriculture, rural residential, and forested areas (see **Figure 6-7**). The Well Area includes portions of seven properties on Warden Avenue, six of which have one residence, and one has two residences. Five of these residences are within the Well Area. There are two active agricultural operations within the Well Area.

Alternative Well Area 5 is located within the Rural Planning Area in the Town of East Gwillimbury's 2013 Official Plan with the northern portion within the Greenbelt Protected Countryside area and in close proximity to the ORMCP Area. The portion of the Well



Legend

- Target Well
- 200m Radius
- 500m Radius
- Ecological Land Classification

Roads

- Major Road

Wetlands

- Unevaluated
- Locally Significant Wetland

Water Features

- Lake
- Permanent Stream
- Intermittent Stream

Basemapping from Ontario Ministry of Natural Resources

N
W E
S

Metres

0 20 40 80 120

1:4,000

UTM Zone 17N, NAD 83

Ecological Land Classification

Type and Desciption

CUH = Treed Hedgerow
FOC4 = Coniferous Forest
FOD5 = Deciduous Forest
FOD7 = Deciduous Forest
FOM6 = Mixed Forest

Yonge Street Aquifer
Well Capacity Restoration Project

Ecological Land Classification Well Area 5

August 2016
60240747

AECOM

Figure 6-7

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Area within the Greenbelt Protection Countryside area includes lands designated as Rural (Town of East Gwillimbury Consolidated Official Plan, 2014). Warden Avenue is designated as a Regional Arterial Road.

The Well Site would be permitted in all land use designations under Section 4.15.1 of the Town of East Gwillimbury Official Plan (2014).

Cultural Environment

The portion of Alternative Well Area 5 with archaeological potential is shown in Map 12 in the Stage 1 Archaeological Assessment. A review of physiographic features indicated that tributaries of the Black River bisect this location, while a review of historic maps (see Map 9 in the Stage 1 Archaeological Assessment) identified the existence of former historic structures depicted within the Alternative Well Area limits. Additionally, this Well Area is bisected by Warden Avenue, a historically surveyed transportation route that contains archaeological potential within 100 m on either side.

Portions of Alternative Well Area 5 that do not have archaeological potential include areas that have been subject to deep and extensive disturbance such as existing paved roadways – in this case, Warden Avenue – and any associated sloping grass margins and shallow drainage ditches associated with this roadway (see Map 12, Image 6-8 in the Stage 1 Archaeological Assessment). The construction and paving of these roadways, the excavation of drainage ditches as well as grading activities tied to landscaping and the construction of buildings would have caused extensive and deep disturbance to any archaeological resources that could have been present, thus resulting in the removal of archaeological potential.

With regard to cultural heritage landscapes, Alternative Well Area 5 is located in Concession 4, Lot 22 and Concession 5, Lot 22 in the geographical Township of East Gwillimbury (see Map 5 in the Stage 1 Archaeological Assessment). The original township survey of 1800-1803 imposed a grid pattern of north-south concession roads and east-west sideroads and lots onto the landscape. This 200-year survey configuration is clearly delineated in the landscape and provides information as to the agricultural development of the area. Within Alternative Well Area 5, a farm complex was identified on 20759 Warden Avenue. The site appears to have a side gable roof farmhouse, date undetermined, and a gambrel roof barn, both set back a distance from the road along a tree lined drive with a rail fence.

There are no built heritage resources within Alternative Well Area 5. The nearest built heritage resources are located at 21151 Warden Avenue (over 500 m north of Alternative Well Area 5) and 20890 Warden Avenue (approximately 300 m north of Alternative Well Area 5). These properties are included on the Town of East Gwillimbury's Register of Cultural Heritage Properties. The building situated on 21151

Warden Avenue is noted as having been constructed c1860, and, additionally as the municipal address for the Cole Settlement Burying Ground. The building on 20890 Warden Avenue is noted as being constructed c1900. There are no federal or provincial heritage sites within Alternative Well Area 5.

Financial

The estimated capital cost for developing a well facility is a function of the site conditions and proximity to existing municipal infrastructure, the proposed well capacity and the anticipated treatment requirements based on test well water quality. As previously stated, the estimated capacity of a new well at Well Area 5 - Warden is between 45 to 55 L/s. Water quality information was available which indicated that other than hardness and a slightly elevated Total Organic Nitrogen value (0.2 mg/L), there were no parameters that were measured in exceedance of the Ontario Drinking Water Quality Standards; therefore, it was assumed that only disinfection would be required and no allowance for the treatment of metals would be necessary.

The proposed well house will encompass an area of approximately 120 m^2, and will include a vertical turbine well pump and disinfection process equipment (chlorine gas system and scrubber; aqueous ammonia system and scrubber) along with electrical and mechanical requirements. The total capital cost estimated for construction of a well facility at Well Area 5 is $2.5M including land acquisition and contingencies. This cost does not include construction of the municipal well itself which would be completed through this Class EA if determined to be a preferred alternative.

At this well site, a new watermain is required to connect the new well facility to the existing distribution system (approximately 2.9 km) at an estimated cost of $2.2M. However this infrastructure is shown in York Region's Water and Wastewater Master Plan as being implemented in the future; therefore it can be assumed that the budget for this work has been accounted for under capital works budgets. Construction of a water supply well at this location would necessitate moving the schedule for this watermain ahead.

Capital costs were calculated using the lower-end of the estimated capacity range. Based on the well capacity of 45 L/s, the capital cost is approximately $650 per m^3/day of capacity.

6.5.2.3 Alternative Well Area 6 – Green Lane

Alternative Well Area 6 is located on Green Lane East approximately halfway between Yonge Street and Concession Road 2 within the Town of East Gwillimbury. The Well Area includes all areas within a 200 m radius of the potential Well Site (see **Figure 6-8**). A new well in this location would require the acquisition of private property.

Technical

With regard to constructability of the well house, Alternative Well Area 6 has existing sanitary services in close proximity; and the York Region Water and Wastewater Servicing Master Plan identifies a future 500 mm diameter watermain along Green Lane in 2025. In the interim, a temporary watermain connection from the well house east to the existing distribution system will be considered during design.

In terms of approval requirements, the well area is outside the boundaries of the ORM and the LSRCA Regulated Area.

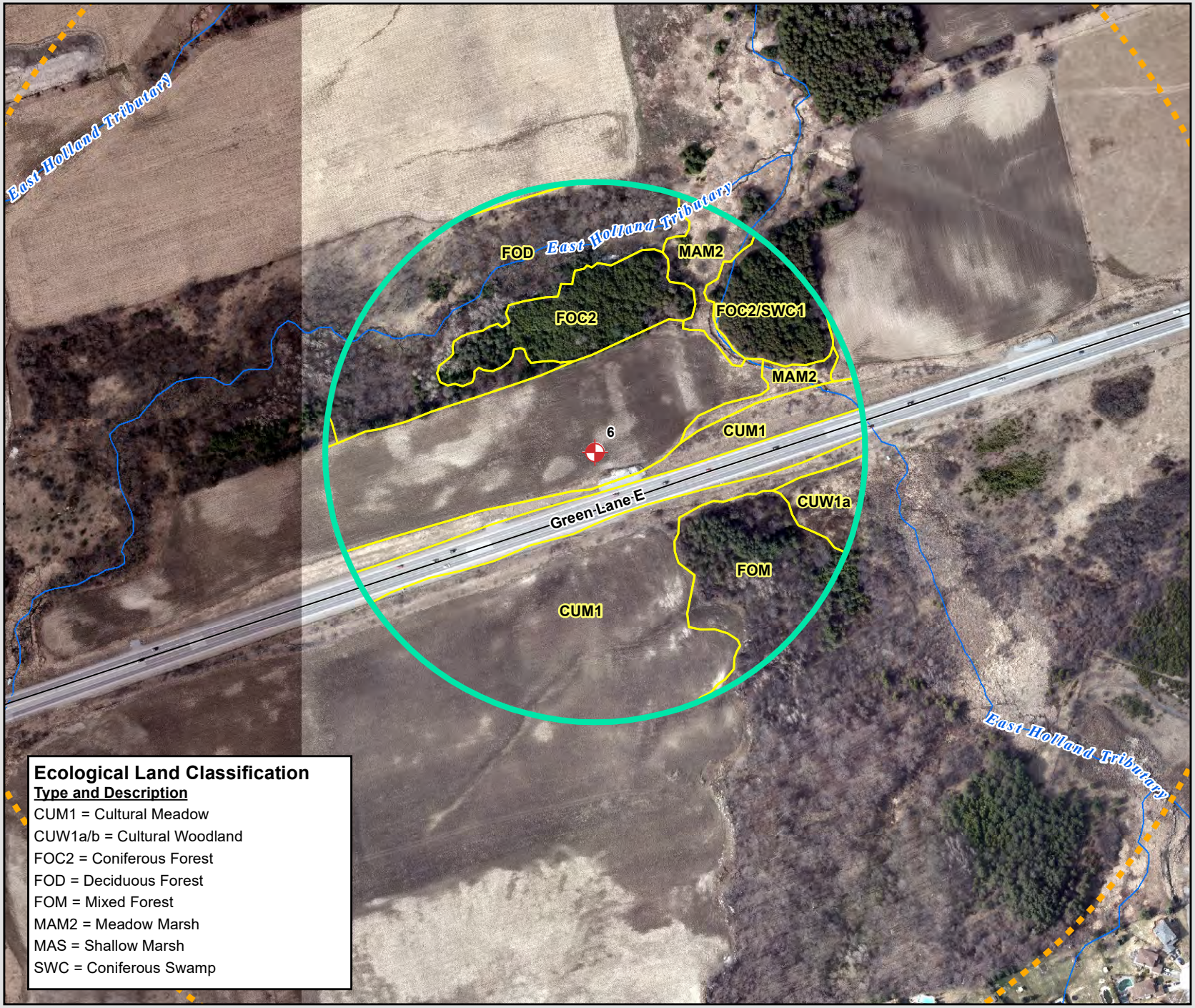
The target aquifer, interpreted to be the Thorncliffe Formation, was encountered at approximately 63 metres below ground surface (mBGS). The aquitard above the target formation was observed to be approximately 50 m thick. Although the stratigraphic information available at the regional scale indicated that variability in aquitard thickness and/or presence could vary at each Well Area, the drilling for this Well Area did not encounter any instances of an absent aquitard. Therefore, variability in aquitard thickness was not included as a determining factor in evaluation of this Well Area. The estimated well capacity of a new well at Well Area 6 – Green Lane is between 80 to 100 L/s[3]. This estimate is based on the hydrogeological conditions observed during drilling at this site, as well as the step testing completed. Although Alternative Well Area 6 would have more water quality treatment requirements due to hardness, total organic nitrogen, iron and manganese, the area has the highest potential aquifer productivity of the four sites.

Natural Environment

The topography within Alternative Well Area 6 is characterized as predominantly rolling uplands with some bottomland area to the north containing marsh communities. Within Alternative Well Area 6, the land use consists of approximately 50% forest, meadow and wetland, and 50% agricultural land.

Alternative Well Area 6 is situated within the East Holland River Watershed. A permanent, warmwater tributary of the East Holland River flows northward under Green Lane East (**Figure 6-8**). Another permanent, warmwater tributary of the East Holland River is located approximately 150 m north of the Well Site (**Figure 6-8**). These watercourses may provide direct fish habitat. There are no known records of provincially rare fish species or fish Species at Risk within 500 m of the Well Site.

3. *The well capacity at Well Area 6 – Green Lane was updated to 55 L/s following the 72-hour pumping tests.*



Ecological Land Classification
Type and Description

CUM1 = Cultural Meadow
CUW1a/b = Cultural Woodland
FOC2 = Coniferous Forest
FOD = Deciduous Forest
FOM = Mixed Forest
MAM2 = Meadow Marsh
MAS = Shallow Marsh
SWC = Coniferous Swamp

Legend

- Target Well
- 200m Radius
- 500m Radius
- Ecological Land Classification

Roads

- Major Road
- Permanent Stream
- Intermittent Stream

Basemapping from Ontario Ministry of Natural Resources

N
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0 20 40 80 120
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UTM Zone 17N, NAD 83

Yonge Street Aquifer
Well Capacity Restoration Project

Ecological Land Classification Well Area 6

August 2016
60240747

AECOM

Figure 6-8

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The Well Site is situated on agricultural land approximately 40 m from the nearest natural vegetation. On the south side of Green Lane, the tributary of the East Holland River runs through a cattail-dominated Shallow Marsh (MAS2 in **Figure 6-8**). The cattail marsh is flanked on either side by cultural woodlands (CUW1 in **Figure 6-8**). On the north side of Green Lane, the tributary flows through a bottomland meadow marsh dominated by Reed Canary Grass (MAM2 shown in **Figure 6-8**). Active agricultural corn and hay/fallow fields occur on either side of the tributary in addition to a few White Cedar Coniferous Forest/Swamp Woodlots (FOC2/SWC1 in **Figure 6-8**). Marshes identified on either side of Green Lane may provide breeding habitat for birds, amphibians and other wildlife species. The forest communities identified within Well Area 6 are mid-aged to mature and likely provide habitat to birds and other wildlife. Wildlife movement across Green Lane East is limited by tall, steep embankments leading up to the road, which are 8 m to 10 m higher than the ground elevation in the wetland, and the width of the four-lane road.

Two (2) bird Species at Risk, Bobolink and Eastern Meadowlark, breed in agricultural settings including hayfields and pastures. Prior to the 24-hour testing and at the time of the 24-hour pumping tests, the Well Area was under active agricultural production, which included hayfields. At the time of the 72-hour pumping tests, the Well Area was used intermittently for agricultural production, specifically for soy. As such, although the Well Area contains active agricultural lands, the area surrounding the proposed Well Site is in soy production and is therefore not habitat for Bobolink or Eastern Meadowlark. Wetlands located within 200 m of the Well Site may also provide habitat for two Special Concern turtle species, Snapping Turtle and Northern Map Turtle (*Graptemys geographica*), and are candidate Significant Wildlife Habitat features for amphibian breeding habitat.

Built, Economic and Social Environment

Alternative Well Area 6 includes portions of properties, and includes active agricultural operations, and natural areas (forest, meadow and wetland). There are no residences or other buildings within the Well Area. The nearest residences are located approximately 200 m south of the Well Area on the northern edge of the Town of Newmarket on Billings Crescent and Dorchester Street (see **Figure 6-8**). The nearest commercial development is located west of the Well Area at the intersection of Green Lane and Yonge Street and includes a number of large format retail stores.

With regard to future land uses, the Well Area is designated as a Regional Corridor in the Town of East Gwillimbury's 2014 Official Plan. The Well Area is also within the Green Lane Corridor, which York Region designated as an additional Urban Area within their Official Plan Amendment No. 1 (2010), which was approved by the Ontario Municipal Board and included in the York Region Consolidated Official Plan (Regional Municipality of York, 2014). This urban expansion is to provide opportunities for urban growth to the year 2031. It is proposed by the Town of East Gwillimbury that Green

Lane will be developed into hubs of commerce, business and entertainment activities, approximately 80-100 m from both edges of the adjacent road right-of-way (Town of East Gwillimbury, 2014). The Well Area also includes land designated as part of the Town of East Gwillimbury's Greenbelt Natural Heritage System (Town of East Gwillimbury, 2014). The area is within the Green Lane Secondary Plan Study Area B-5. Land use designations north and south of Green Lane between Concession 2 and Yonge Street include Environmental Protection Areas, Medium Density/High Density Residential, a Special Study area and Residential Mixed Use.

The Well Site would be permitted in all land use designations under Section 4.15.1 of the Town of East Gwillimbury Official Plan (2014).

Cultural Environment

The portion of Alternative Well Area 6 with archaeological potential is shown in Map 13 in the Stage 1 Archaeological Assessment). A review of physiographic features indicated that tributaries of the East Holland River bisect this location. Additionally, this alternative well area is bisected by Green Lane East, a historically surveyed transportation route that contains archaeological potential within 100 m on either side.

Portions of Alternative Well Area 6 that do not have archaeological potential include areas that have been subject to deep and extensive disturbance including existing paved roadways – in this case, Green Lane East – and any associated sloping grass margins and shallow drainage ditches associated with this roadway (see Map 13, Image 9 in the Stage 1 Archaeological Assessment).

With regard to cultural landscape features, Alternative Well Area 6 is principally agricultural land in character with wooded areas and a watercourse. It includes part of Lot 1, Concession 1 EYS, geographical township of East Gwillimbury and part of Lot 35, Concession 2 Whitchurch Township, now in the Town of East Gwillimbury, York Region (see Figure 5 in the Existing Conditions Report: Built Heritage & Cultural Heritage Landscapes). The original township survey of 1800-1803 imposed a grid pattern of north-south concession roads and east-west sideroads and lots onto the landscape. This 200-year survey configuration is clearly delineated in the landscape and provides information as to the agricultural development of the area.

As described in the Existing Conditions Report: Built Heritage & Cultural Heritage Landscapes (**Appendix B**), there are no built heritage resources within Alternative Well Area 6. A farm complex, which is included in the Town of East Gwillimbury's Register of Cultural Heritage Properties, is located to the east of the Well Area at 576 Green Lane Road. However, this farm complex is outside of the Well Area boundaries and no effects on the property are anticipated. There are no federal or provincial heritage sites within Alternative Well Area 6.

Financial

The estimated capital cost for developing a well facility is a function of the site conditions and proximity to existing municipal infrastructure, the proposed well capacity and the anticipated treatment requirements based on test well water quality. As previously stated, the estimated well capacity of a new well at Well Area 6 – Green Lane is between 80 to 100 L/s. Water quality information was available which indicated that in addition to hardness, the following parameters were measured in exceedance of the Ontario Drinking Water Quality Standards: iron, manganese and organic nitrogen. Therefore, it was assumed that in addition to disinfection, the cost for the process for sequestration of metals would also be included (silicate system). The concentrations of organic nitrogen and methane were determined not to require specific treatment as they would be removed to acceptable levels through the treatment process. It was recognized however that the presence of elevated levels of organic nitrogen could result in a higher demand for chlorine in the disinfection process.

The proposed well house will encompass an area of approximately 120 m^2, and will include a vertical turbine well pump and disinfection process equipment (chlorine gas system and scrubber; aqueous ammonia system and scrubber) along with electrical and mechanical requirements. The total capital cost estimated for construction of a well facility at Well Area 6 is $2.9M including land acquisition and contingencies. This cost does not include construction of the well itself which would be completed through this Class EA if determined to be a preferred alternative.

At this well site, additional construction of a watermain along Green Lane between Yonge Street and 2nd Concession Rd. to connect to the existing distribution system is required (approximately 160 m) at an estimated cost of $100k. However this infrastructure is shown in York Region's Water and Wastewater Master Plan as being implemented in the future; therefore it can be assumed that the budget for this work has been accounted for under capital works budget. Construction of a water supply well at this location would necessitate moving the schedule for this watermain ahead by up to 5 years.

Capital costs were calculated using the lower end of the estimated capacity range. Although the estimated capital cost for Well Area 6 of $2.9 million is high compared to the other alternatives, its proposed production rate of 6,910 m^3/day (80 L/s) makes it cost effective on a per unit of capacity basis. The estimated capital cost per m^3/day of capacity is $425.

6.5.2.4 Alternative Well Area 11 – Aurora Well No. 5

Alternative Well Area 11 is located within an existing York Region municipal well site (referred to as Aurora Well No. 5) at the southeast corner of Old Yonge Street and St.

John's Sideroad within the Town of Aurora (see **Figure 6-9**). A new well in this location would be located within the existing municipal well site.

Technical

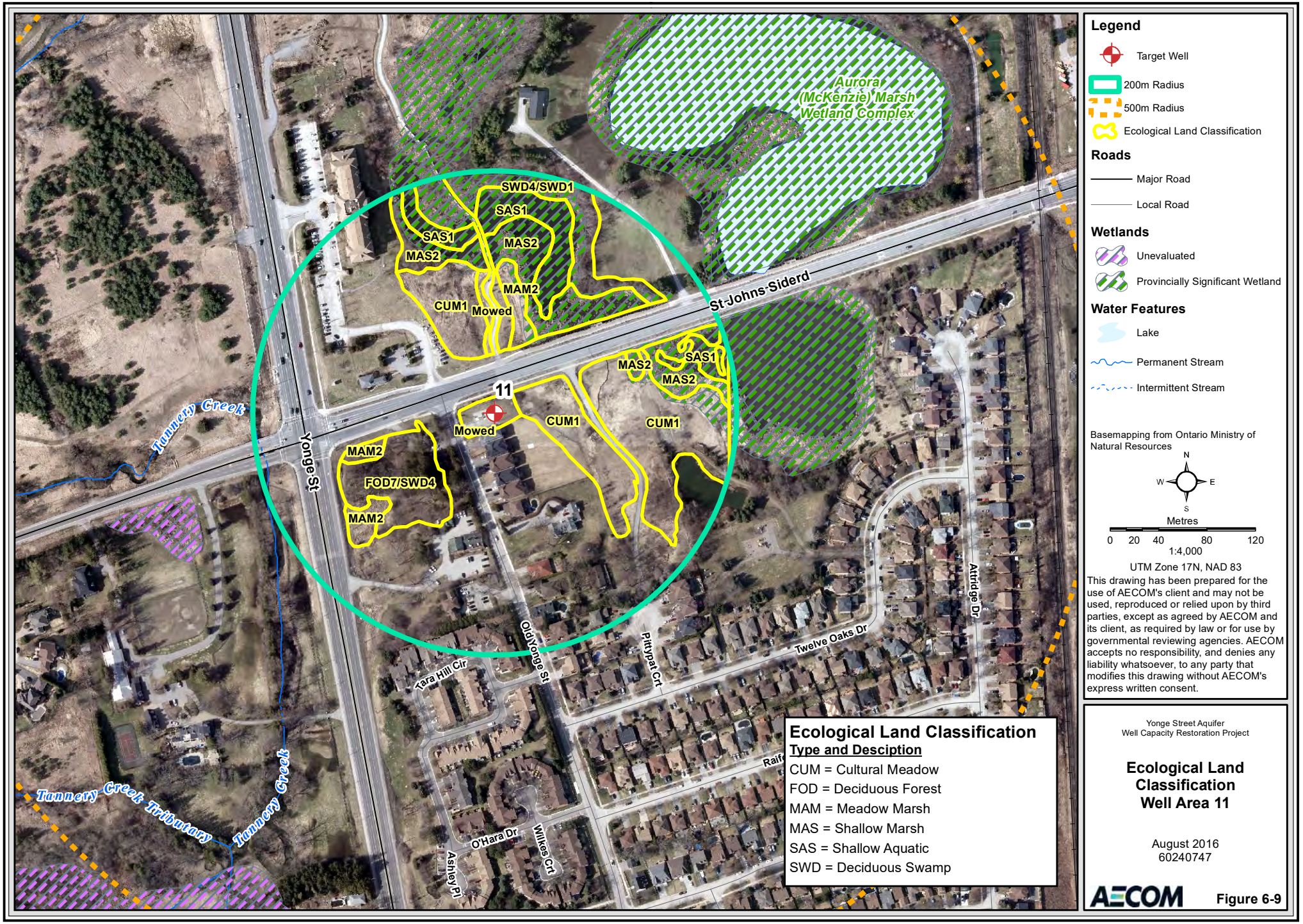
Alternative Well Area 11 has an existing well and well house, as such, new linear infrastructure and site works to support a well at this site is minimal. Expansion to the existing well house and treatment system would be required in order to accommodate the new well. In terms of approval requirements, the well area is outside the boundaries of the ORM. The LSRCA confirmed that a permit would not be required for the groundwater exploration program; however, the site is located within the Regulated Limits of the LSRCA and as such, permitting would be required in order to construct a well house should this location be selected as part of the Preferred Solution.

The target aquifer, interpreted to be the Thorncliffe Formation, was encountered at approximately 68 metres below ground surface (mBGS). The aquitard above the target formation was observed to be approximately 34 m thick. Although the stratigraphic information available at the regional scale indicated that variability in aquitard thickness and/or presence could vary at each Well Area, the drilling for this Well Area did not encounter any instances of an absent aquitard. Therefore, variability in aquitard thickness was not included as a determining factor in evaluation of this Well Area. The estimated well capacity of a new well at Well Area 11 – Aurora Well No. 5 is between 40 to 65 L/s. This estimate is based on the hydrogeological conditions known from previous work at this site and observed during drilling, performance of the existing well, as well as the step testing completed on the test well. Although Alternative Well Area 11 was determined to have a slightly less productive aquifer due to lower transmissivity and specific capacity compared to Alternative Well Area 6, it is anticipated to have fewer water treatment requirements.

Natural Environment

The topography within Alternative Well Area 11 is characterized as rolling uplands interspersed with bottomland area containing marsh communities. Within Alternative Well Area 11, the land use is approximately 40% wetland and meadow, and 60% urban.

Alternative Well Area 11 is situated within the East Holland River Watershed. A permanent, coldwater tributary of the East Holland River, Tannery Creek, is located within 200 m of the Well Site. This feature may provide direct fish habitat. The coldwater species Mottled Sculpin (*Cottus bairdii*) may reside within the portion of Tannery Creek located 200 m west of the Well Site, given its coldwater designation. There are no known records of provincially rare fish species or fish SAR within 500 m of the Well Site.



Ecological Land Classification

Type and Desciption

CUM = Cultural Meadow
FOD = Deciduous Forest
MAM = Meadow Marsh
MAS = Shallow Marsh
SAS = Shallow Aquatic
SWD = Deciduous Swamp

Legend

- Target Well
- 200m Radius
- 500m Radius
- Ecological Land Classification

Roads

- Major Road
- Local Road

Wetlands

- Unevaluated
- Provincially Significant Wetland

Water Features

- Lake
- Permanent Stream
- Intermittent Stream

Basemapping from Ontario Ministry of Natural Resources

N
W E
S

Metres
0 20 40 80 120
1:4,000

UTM Zone 17N, NAD 83

Yonge Street Aquifer
Well Capacity Restoration Project

Ecological Land Classification Well Area 11

August 2016
60240747

AECOM

Figure 6-9

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The Well Site is located within an area of mown lawn between a building and St. John's Sideroad, approximately 20 m from a cultural meadow (CUM1 on **Figure 6-9**). 'The Provincially Significant Aurora (Mackenzie) Marsh Complex is located within 50 m of the Well Site (**Figure 6-9**)'. Shallow water, shallow marsh and deciduous swamp communities are present on the north side of the road (SAS1, MAS2 and SWD4/SWD1 shown in **Figure 6-9**) and are comprised of a diverse range of plant structure types (submergent, floating, and emergent), as well as abundant woody debris and basking logs which provide important habitat for a variety of bird, reptile and other wildlife species. At the time of the August 2012 field investigations, three Black-Crowned Night Herons (*Nycticorax nycticorax*), including one adult and two juveniles, and Painted Turtles (*Chrysemys picta*) were observed in these marshes. On the south side of the road, the shallow water and shallow marsh communities are dominated by cattails and do not contain any standing snags or basking logs; however, these marshes were observed to provide feeding habitat for a variety birds such as Great Blue Heron (*Ardea herodias*), Common Tern (*Sterna hirundo*) and swallows.

A small deciduous forest/swamp community (FOD7/SWD4 shown on **Figure 6-9**) is present on the southeast corner of the intersection of Yonge Street and St. John's Sideroad. This wooded area likely provides limited wildlife habitat function due to its small size, close proximity to high traffic zones along Yonge Street and St. John's Sideroad, and lack of connecting corridor habitat.

The Well Site itself is located on a manicured lawn and does not overlap the habitat of any Species at Risk or Species of Conservation Concern. Wetlands located within 200 m of the Well Site may provide habitat for Snapping Turtle, Northern Map Turtle and Blanding's Turtle. Blanding's Turtle is designated as Threatened, while Snapping Turtle and Northern Map Turtle are designated as Special Concern under the *Endangered Species Act.* Blanding's Turtles occur in wetlands with open water and Northern Map Turtles occur in large water bodies. The wetland is also confirmed Significant Wildlife Habitat for colonially-nesting bird breeding (trees/shrubs) and candidate Significant Wildlife Habitat for amphibian breeding'.

Built, Economic and Social Environment

The existing land use within Alternative Well Area 11 is the existing municipal well site. A small office building is located near the Well Area at the northwest corner of St. John's Sideroad and Old Yonge Street. A seniors' residence, Hadley Grange, is located north of the office on Old Yonge Street. The Oakland Hall Inn is a restaurant located south of the Well Area on Old Yonge Street. In addition, there are a number of residences on Old Yonge Street south of the Well Area the nearest residence is located directly adjacent to the municipal well site (see **Figure 6-9**).

The future land use associated with the existing municipal well site is not anticipated to change. It is within an area of the Town of Aurora with a mix of Urban Residential, Private Open Space, Public Open Space and Commercial designations (Town of Aurora Official Plan, 2010). St. John's Sideroad is an arterial road.

Cultural Environment

There are no areas of identified archaeological potential within this location due to its extensively disturbed condition to accommodate the existing municipal well location. The property has been filled and levelled to accommodate the construction of the well house (see Map 14, Images 12-13 in the Stage 1 Archaeological Assessment). Additional disturbances include underground utilities (see Image 14 in the Stage 1 Archaeological Assessment).

Since Alternative Well Area 11 is within the existing municipal well location, there are no cultural heritage landscapes or built heritage resources within the Well Area. Alternative Well Area 11 is located on Old Yonge Street, east of Yonge Street, Town of Aurora (see Figure 6 Image 14 in the Stage 1 Archaeological Assessment). Old Yonge Street is the original road alignment before Yonge Street was straightened at St. John's Sideroad. Presently, a more recent extension of Old Yonge Street leads off Yonge Street on the east side to St. John's Sideroad. The 19th century alignment of Old Yonge Street proceeds south from St. John's Sideroad.

There are three properties included on the Town of Aurora Register of Properties of Cultural Value or Interest located south of Alternative Well Area 11. The residence at 220 Old Yonge Street, a listed property, was built c1875 for Thomas Pargeter. The Oakland Hall Inn at 16003 Yonge Street, a municipally designated property, was built c1845 for the Cosford family and is one of the earliest brick houses in Aurora. The residence located at 100 Old Yonge Street, which is municipally designated, is described in the designation notice as a good example of a Colonial Revival Style house built in the 1930s and is a significant contributor to the character of Old Yonge Street. There are no federal or provincial heritage sites within Alternative Well Area 11.

Financial

The estimated capital cost for developing a well facility is a function of the site conditions and proximity to existing municipal infrastructure, the proposed well capacity and the anticipated treatment requirements based on test well water quality. As previously stated, the estimated well capacity of a new well at Well Area 11 – Aurora Well No. 5 is between 40-65 L/s. Water quality information was available from the existing well as well as from step testing, which indicated levels of hardness and iron in exceedance of the Ontario Drinking Water Quality Standards. The cost estimated for treatment reflects expansion of the existing system to accommodate the additional flow.

The current system consists of disinfection and sequestration of metals (silicate system).

Based on a preliminary layout of an expansion to the existing well house to accommodate a second well and upgrades and expansion to the existing treatment system, electrical system and generator, estimated costs for developing this new supply are associated with an additional building area of 65 m^2.

Based on the information available to date, it is not anticipated that the aquifer at the Aurora Well No. 5 site will be able to sustain long-term pumping at double the existing pumping rate of Aurora Well No. 5. The results from the large-diameter test well program to be completed in Stage 6 will confirm this understanding. However, the new well would likely be equipped with the same size pump as Aurora 5, to provide added flexibility and redundancy in operation of this facility, Therefore the estimate capital cost includes a vertical turbine well pump with a capacity equal to the incremental site capacity increase of 40 L/s There is existing disinfection process equipment (chlorine gas system and scrubber; aqueous ammonia system and scrubber) and silicate sequestration system along with electrical and mechanical systems. The total capital cost estimate to expand the existing Aurora Well No.5 facility to accommodate a second well (Well Area 11) is approximately $1.7M including contingencies. This cost does not include construction of the well itself which would be completed through the Class EA if determined to be a preferred alternative. There are cost savings associated with this location compared to the other alternative well sites, due to the presence of existing infrastructure including an access road, watermain, hydro service, etc., and land acquisition would not be required.

Capital costs were calculated using the lower-end of the estimated capacity range. Based on the additional well capacity of 40 L/s, the capital cost is approximately $490 per m^3/day of capacity. Although the total capital cost is low compared to the other alternatives, the lower estimate well capacity results in a higher per capacity cost than Well Area 6.

6.5.2.5 Comparative Evaluation of Alternative Well Areas

The short-listed Alternative Well Areas were assessed through a "net effects analysis" and comparatively evaluated to identify the preferred Well Areas for 24-hour pumping tests, as shown in **Table 6-4**.

Table 6-4: Comparative Evaluation of Alternative Well Areas

Category of Consideration	Well Area 3 – Mount Albert	Well Area 5 – Warden	Well Area 6 – Green Lane	Well Area 11 – Aurora Well No. 5
Technical Category Ranking	4th Area has fewest approval requirements; however, it would not be a productive aquifer due to unfavourable hydrogeological conditions.	3rd Area has good water quality; however, it requires considerable infrastructure to service.	2nd Water quality may require more treatment than Areas 5 or 11; however, area has existing sanitary servicing and existing watermain at Green Lane and Yonge will be extended along Green Lane in 2025	1st Water quality is consistent with existing well in same location; the existing well facility has an access road and watermain. Area has the fewest approval requirements.
Natural Environment Category Ranking	2nd (Tied) No effects to aquatic or terrestrial species or habitat anticipated, with possible exception of two bird Species at Risk breeding in agricultural fields. Net effects not anticipated as a result of siting considerations, standard construction best management practices and habitat management plan, if required.	3rd No effects to aquatic species or habitat anticipated. Potential effects on the habitat two bird Species at Risk breeding in agricultural fields as well as four bat Species At Risk roosting in forested areas. Residual effects not anticipated as a result of siting considerations, standard construction best management practices, habitat management plan, and overall benefit measures, if required; however, siting would be the most constrained.	2nd (Tied) No effects to aquatic or terrestrial species or habitat anticipated. Net effects not anticipated as a result of siting considerations and standard construction best management.	1st No effects to aquatic or terrestrial species or habitat anticipated as a result of siting considerations and standard construction best management practices.
Built Environment Category Ranking	3rd (Tied) Area has most disruption on existing residences. There are more private wells in the vicinity compared to Areas 6 and 11.	3rd (Tied) Area has most disruption on existing residences and there are more private wells in the vicinity compared to Areas 6 and 11, effects on municipal wells will be minimized through mitigation.	2nd Area has least disruption on existing residences although future and existing land uses could be affected through new Wellhead Protection Area. There are fewer private wells in the vicinity compared to Areas 3 and 5.	1st Area has some disruption on existing residences, does not require property acquisition and has no effects on existing agricultural operations.
Social Environment Category Ranking	2nd (Tied) More noise sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	2nd (Tied) More noise sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	1st (Tied) Fewest sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	1st (Tied) More noise sensitive receptors will be disturbed during construction; however, given that a well house currently exists at the area, effects during operations are not anticipated to differ from current conditions.
Cultural Environment Category Ranking	2nd (Tied) Effects to cultural heritage landscape considered minimal and presence of archaeological resources will be confirmed prior to construction.	2nd (Tied) Effects to cultural heritage landscape considered minimal and presence of archaeological resources will be confirmed prior to construction.	2nd (Tied) Effects to cultural heritage landscape considered minimal and presence of archaeological resources will be confirmed prior to construction.	1st No cultural heritage or archaeological resources would be affected at this Area.

Table 6-4: Comparative Evaluation of Alternative Well Areas

Category of Consideration	Well Area 3 – Mount Albert	Well Area 5 – Warden	Well Area 6 – Green Lane	Well Area 11 – Aurora Well No. 5
Financial Category Ranking	3rd The Area has higher land acquisition costs and higher capital costs based on production capacity.	2nd The Area has lower land acquisition costs and slightly lower capital costs based on production capacity.	1st (Tied) The Area has higher land acquisition costs; however, slightly lower capital costs based on production capacity.	1st (Tied) There are no land acquisition costs and the Area has the lowest capital cost based on production capacity.
Does the Well Area fulfill the requirements of the Problem/ Opportunity Statement?	No. Technical evaluation conducted in Stage 4 of the site selection process determined that the Well Area 3 would not be a productive aquifer, and as a result does not satisfy the problem/opportunity statement.	Yes	Yes	Yes
Overall Results and Ranking	**4th** **Alternative Well Area 3 is not recommended to be carried forward for 24-hour pumping test.**	**3rd** **Alternative Well Area 5 is recommended to be carried forward for 24-hour pumping test.**	**2nd** **Alternative Well Area 6 is recommended to be carried forward for 24-hour pumping test.**	**1st** **Alternative Well Area 11 is recommended to be carried forward for 24-hour pumping test.**

Category of Consideration / Evaluation Criteria	Indicator *(How the Evaluation Criteria was Applied)*	Well Area 3 – Mount Albert *(Mount Albert Road and 2nd Concession)*	Well Area 5 – Warden *(Warden Avenue north of Queensville Sideroad)*	Well Area 6 – Green Lane *(Green Lane east of Yonge Street)*	Well Area 11 – Aurora Well No. 5 *(St. John's Sideroad and Old Yonge Street)*
Technical Category Ranking		***Fourth*** Area has fewest approval requirements; however, it would not be a productive aquifer due to unfavourable hydrogeological conditions.	***Third*** Area has good water quality; however, it requires considerable infrastructure to service.	***Second*** Water quality may require more treatment than Areas 5 or 11; however, area has existing sanitary servicing and watermain planned in 2025.	***First*** Water quality is consistent with existing well in same location; the existing well facility has an access road and watermain.
Constructability of Proposed Well House	An evaluation of the conditions of the proposed well site location, based on: 1. Site access; 2. Constructability (geotechnical, proximity to adjacent buildings, etc.); 3. Proximity to municipal distribution system/ large diameter watermains; and 4. Proximity to sanitary collection system for building and process drainage.	1. Requires construction of access road (moderately preferred); 2. Level greenfield site with suitable geotechnical conditions (moderately preferred); 3. Existing large diameter watermains on Mount Albert (most preferred); 4. Planned sanitary servicing (moderately preferred). Area has existing watermain; however, it requires construction of sanitary utilities.	1. Requires construction of access road (moderately preferred); 2. Level greenfield site with suitable geotechnical conditions (moderately preferred); 3. Significant distance (2,900 m) to existing large diameter watermain at Woodbine and Queensville requiring installation of additional watermain within roadway (least preferred); 4. No planned sanitary servicing (least preferred).	1. Requires construction of access road off busy 4-lane road (least preferred); 2. Moderate rolling topography in area requiring some cut and fill; greenfield site with suitable geotechnical conditions (least preferred); 3. Existing watermain at Green Lane and Yonge will be extended along Green Lane in 2025 and a temporary watermain will be constructed in the interim (most preferred);	1. Existing access road (most preferred); 2. Existing well site with suitable geotechnical conditions (most preferred); 3. Existing watermain on St. John's Sideroad (most preferred); 4. Existing sanitary servicing in close proximity to the well area (most preferred). Existing well with suitable geotechnical conditions and connection to an existing watermain.

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			Area requires considerable infrastructure to service.	4. Existing sanitary servicing in close proximity to the well area (most preferred). Area has planned watermain and existing sanitary utilities in close proximity; however, it has less favourable topography.	Sanitary utilities are in close proximity.
	Ranking:	**Second (tied)**	**Third**	**Second (tied)**	**First**
Aquifer Productivity	An evaluation of the productivity potential of each well, based on: 1. Aquifer thickness; 2. Available drawdown; 3. Soil types / grain sizes between well locations; 4. Preliminary estimate of transmissivity (step-test results); 5. Specific capacity values; 6. Step-Test drawdown at 18 L/s; and 7. Estimated well capacity.	Least productive aquifer due to the following factors: 1. Aquifer Thickness: 7.6 m (least preferred); 2. Available Drawdown: N/A (least preferred); 3. Grain Size Comparison – screen slot size recommendation: 0.051" (least preferred); 4. Preliminary Transmissivity (step-test): N/A (least preferred); 5. Specific Capacity: N/A (least preferred); 6. Step-Test Drawdown: N/A (least preferred); 7. Estimated well capacity: 20 L/s (least preferred). Aquifer productivity is determined to be low and could not be fully assessed due to thin and relatively fine-grained aquifer encountered during pilot hole drilling phase. No test well was constructed due to unfavourable hydrogeological conditions for test well.	Third most productive aquifer due to the following factors: 1. Aquifer Thickness; 27 m (moderately preferred); 2. Available Drawdown: 14.2 m (moderately preferred); 3. Grain Size Comparison – screen slot size recommendation: 0.170" (moderately preferred); 4. Preliminary Transmissivity (step-test): 1,900 m^2/d (least preferred); 5. Specific Capacity (18 L/s step): 7.1 L/s/m (moderately preferred); 6. Step-Test Drawdown At 18 L/s: 2.54 m (least preferred); 7. Estimated well capacity: 45-55 L/s (moderately preferred). Aquifer is not as thick, does not have equal available drawdown, transmissivity or specific capacity as Well Area 6 or 11.	Most productive aquifer due to the following factors: 1. Aquifer Thickness; 31 m (moderately preferred); 2. Available Drawdown: 35.5 m (most preferred); 3. Grain Size Comparison – screen slot size recommendation: 0.281" (most preferred); 4. Preliminary Transmissivity (step-test): 21,750 m2/d (most preferred); 5. Specific Capacity (18 L/s step): 15.0 L/s/m (most preferred); 6. Step-Test Drawdown At 18 L/s: 1.20 m (most preferred); 7. Estimated well capacity: 80 -100 L/s (most preferred). Aquifer has highest transmissivity and specific capacity based on step-testing, aquifer productivity is determined to be the highest compared to other Well Areas.	Second most productive aquifer due to the following factors: 1. Aquifer Thickness; 30 m (moderately preferred); 2. Available Drawdown: 45.3 m (most preferred); 3. Grain Size Comparison – screen slot size recommendation: 0.174" (moderately preferred); 4. Preliminary Transmissivity (step-test): 6,140 m^2/d (moderately preferred); 5. Specific Capacity (18 L/s step): 9.9 L/s/m (moderately preferred); ***6.*** Step-Test Drawdown At 18 L/s: 1.82 m (moderately preferred); 7. Estimated well capacity: 40 - 65 L/s (moderately preferred). Although aquifer is thickest and has the most available drawdown, it is it has lower transmissivity and specific capacity compared to Well Area 6.
	Ranking:	**Fourth**	**Third**	**First**	**Second**
Treatment Requirements	An evaluation of the raw well water quality and review of treatment requirements; based on: 1. Preliminary water quality results, all parameters listed in Ontario Regulation 169/03 (including levels of iron,	Not applicable as water quality data not available. Aquifer productivity not fully assessed due to thin and relatively fine-grained aquifer encountered during pilot hole drilling phase.	1. All Hardness and total organic nitrogen above Ontario Drinking Water Quality Standards and manganese was detected (at this level, treatment of manganese isn't required) (most preferred); 2. Lower treatment requirements relative to other Well Areas due to	1. Hardness, total organic nitrogen, iron, manganese at or above Ontario Drinking Water Quality Standards; presence of methane (at this level, treatment of methane isn't required) (least preferred); 2. Include treatment of metal; including iron and manganese	1. Hardness and iron above Ontario Drinking Water Quality Standards and presence of manganese (at this level, treatment of manganese isn't required) (moderately preferred); 2. Expansion of existing treatment system, including iron

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	manganese, nitrate, pH, sodium, Total Dissolved Solids, hardness, methane, organic nitrogen, etc.); 2. Consideration to be given to difficulty of treatment, operational requirements and associated costs; and 3. Review of Wellhead Protection Areas to identify any potential future treatment and monitoring requirements by identifying any risks within that zone in accordance with Source Water Protection standards of the *Clean Water Act*.		lower iron and manganese. Presence of organic nitrogen may result in higher chlorine demand (most preferred); 3. Mitigation measures are being identified through the development of Wellhead Protection Areas and will be incorporated into future planning policies (moderately preferred). Area has highest water quality and fewest treatment requirements.	(removal or sequestration). Presence of organic nitrogen may result in higher chlorine demand (least preferred); 3. Mitigation measures are being identified through the development of Wellhead Protection Areas and will be incorporated into future planning policies (moderately preferred). Area water quality has higher treatment requirements.	sequestration (moderately preferred); 3. There are existing mitigation measures in place, although these may need to be modified as a result of the potentially expanded Wellhead Protection Area due to increased pumping, and as such, additional risk may be identified (moderately preferred). Area water quality similar to existing well and requires expansion to existing treatment processes.
	Ranking:	**Fourth**	**First**	**Third**	**Second**
Approval Requirements	An evaluation of the approvals requirements specific to a proposed location, based on consideration of: 1. Municipal approvals (site plan approval, building permit); 2. Ministry of Environment and Climate Change (Permit to Take Water, Drinking Water Works Permit, Municipal Drinking Water Licence); 3. Oak Ridges Moraine Conservation Plan; and 4. Lake Simcoe Region Conservation Authority (LSRCA); 5. Ministry of Natural Resources and Forestry (Endangered Species Act).	1. York Region will obtain appropriate municipal approvals from the Town of East Gwillimbury, including site plan approval and a building permit (moderately preferred); 2. York Region will amend the current Permit to Take Water/Drinking Water Works Permit/ Municipal Drinking Water Licence from the Ministry of the Environment and Climate Change (moderately preferred); 3. The well area is not located within the Oak Ridges Moraine (most preferred); 4. York Region will not be required to obtain approval from the LSRCA for construction within LSRCA Regulated Area under Ontario Reg. 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) as the Well Site will be located outside of the Regulated Area (most preferred).	1. York Region will obtain appropriate municipal approvals from the Town of East Gwillimbury, including site plan approval and a building permit (moderately preferred); 2. York Region will amend the current Permit to Take Water/ Drinking Water Works Permit/ Municipal Drinking Water Licence from the Ministry of the Environment and Climate Change(moderately preferred); 3. York Region will address the Section 41 requirements of the Oak Ridges Moraine Conservation Plan as per Section 4.12.1.3 and 4.12.1.4 of the Town of East Gwillimbury Official Plan (2013) to accommodate close proximity of the Well Site to the Oak Ridges Moraine (least preferred); 4. York Region will not be required to obtain approval from the LSRCA for construction within LSRCA Regulated Area under Ontario Reg. 179/06 (Development,	1. York Region will obtain appropriate municipal approvals from the Town of East Gwillimbury, including site plan approval and a building permit (moderately preferred); 2. York Region will amend the current Permit to Take Water/ Drinking Water Works Permit/ Municipal Drinking Water Licence from the Ministry of the Environment and Climate Change (moderately preferred); 3. The well area is not located within the Oak Ridges Moraine (most preferred); 4. York Region will not be required to obtain approval from the LSRCA for construction within LSRCA Regulated Area under Ontario Reg. 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) as the Well Site will be located outside of the Regulated Area (most preferred).	1. York Region will obtain appropriate municipal approvals from the Town of Aurora, including site plan approval and a building permit (moderately preferred); 2. York Region will amend the current Permit to Take Water /Drinking Water Works Permit/ Municipal Drinking Water Licence from the Ministry of the Environment and Climate Change (moderately preferred); 3. The well area is not located within the Oak Ridges Moraine (most preferred); 4. York Region will be required to obtain approval from the LSRCA for construction within LSRCA Regulated Area under Ontario Reg. 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) (least preferred). 5. No permit or approval requirements are anticipated under the *Endangered Species*

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		5. If development within bird Species at Risk habitat cannot be avoided, register the work with MNRF and complete a Habitat Management Plan in accordance with O. Reg. 242/08 under the *Endangered Species Act* (moderately preferred). Area has fewest approval requirements.	Interference with Wetlands, and Alterations to Shorelines and Watercourses) as the Well Site will be located outside of the Regulated Area (most preferred). 5. If development within bird Species at Risk habitat cannot be avoided, register the work with MNRF and complete a Habitat Management Plan in accordance with O. Reg. 242/08 under the *Endangered Species Act*. If development within bat Species at Risk habitat cannot be avoided, an overall benefit permit may be required under the *Endangered Species Act* (least preferred). Area will not require approval from the LSRCA; however, it is within the Oak Ridges moraine and as such requires conformity with the Oak Ridges Moraine Conservation Plan. An overall benefit permit from the MNRF may also be required for bat Species at Risk.	5. No permit or approval requirements are anticipated under the *Endangered Species Act* (most preferred). Area has fewest approval requirements.	*Act* (most preferred). Area is not located within the Oak Ridges Moraine; however, approval will be required from the LSRCA for construction within the Regulated Area.
	Ranking:	**First (tied)**	**Second (tied)**	**First (tied)**	**Second (tied)**
Natural Environment Category Ranking		No effects to aquatic or terrestrial species or habitat anticipated, with possible exception of two bird Species at Risk breeding in agricultural fields. Net effects not anticipated as a result of siting considerations, standard construction best management practices and habitat management plan, if required.	No effects to aquatic species or habitat anticipated. Potential effects on the habitat two bird Species at Risk breeding in agricultural fields as well as four bat Species at Risk roosting in forested areas. Residual effects not anticipated as a result of siting considerations, standard construction best management practices, habitat management plan, and overall benefit measures, if required.	No effects to aquatic or terrestrial species or habitat anticipated. Net effects not anticipated as a result of siting considerations, standard construction best management practices.	No effects to aquatic or terrestrial species or habitat anticipated as a result of siting considerations and standard construction best management practices.
		Second (tied)	**Third**	**Second (tied)**	**First**

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Effect of Construction and Operation of Well House on Aquatic Species and Habitat	An evaluation of the effects of construction and operation of the well house (excluding groundwater drawdown) on aquatic species and habitat, based on: 1. Presence of aquatic species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and 2. Area of temporary or permanent loss of aquatic features or categorical loss of habitat functions by type – watercourses by sensitivity (thermal regime).	1. **Potential effects:** No aquatic features occurring within Alternative Well Area 3; therefore, disturbance to aquatic species is not anticipated from construction or operation of the well house. **Mitigation Measures:** No mitigation required (most preferred). 2. **Potential effects:** No aquatic features occurring within Alternative Well Area 3; therefore, no loss of aquatic features or habitat from construction or operation of the well house is anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net Effects:** No effects on aquatic species and habitat anticipated.	1. **Potential effects:** - A permanent, warmwater Black River tributary, pond and Locally Significant Wetland are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species is not anticipated from construction or operation of the well house. - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 5; therefore, disturbance to these species is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** A permanent, warmwater Black River tributary, pond and Locally Significant Wetland are present within the Well Area however these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic features or habitat is not anticipated from construction or operation of the well house. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on aquatic species and habitat anticipated.	1. **Potential effects:** - Two permanent, warmwater tributaries of the East Holland River are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species in these features is not anticipated from construction of the well house. - No aquatic Species at Risk or Species of Conservation Concern are identified as potentially occurring within the Well Area; therefore, disturbance to these species is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** - Two permanent, warmwater tributaries of the East Holland River are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic features is not anticipated from construction or operation of the well house. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on aquatic species and habitat anticipated.	1. **Potential effects - Construction**: - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species in these features is not anticipated from construction of the well house. - Potential disturbance to aquatic species in a Provincially Significant Wetland within the Well Area from increased erosion and sedimentation. - No aquatic Species at Risk or Species of Conservation Concern are identified as potentially occurring within the Well Area; therefore, disturbance to these species is not anticipated. **Mitigation measures - Construction**: - Implement erosion and sediment control measures to prevent disturbance to aquatic species within the Provincially Significant Wetland from erosion and sedimentation. - No mitigation required for aquatic Species at Risk or Species of Conservation Concern (moderately preferred). **Potential effects – Operation**: - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species in these features is not anticipated from operation of the well house.

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					- Potential disturbance to aquatic species in the Provincially Significant Wetland from stormwater runoff. - No aquatic Species at Risk or Species of Conservation Concern are identified as potentially occurring within the Well Area; therefore, disturbance to these species is not anticipated. **Mitigation measures - Operation**: - Develop a stormwater management plan prior to construction to prevent disturbance to aquatic species within the Provincially Significant Wetland from stormwater runoff. - No mitigation required for aquatic Species at Risk or Species of Conservation Concern (moderately preferred).
					2. **Potential effects - Construction:** - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to these features is not anticipated from construction of the well house. - Disturbance to aquatic habitat in the Provincially Significant Wetland within the Well Area due to erosion and sedimentation. **Mitigation measures - Construction:** - Implement erosion and sediment control measures to prevent disturbance to aquatic habitat within the Provincially Significant Wetland from erosion and sedimentation (moderately preferred).

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					Potential effects - Operation: - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to these features is not anticipated from operation of the well house. - Disturbance to aquatic habitat in the Provincially Significant Wetland within the Well Area due to stormwater runoff. **Mitigation measures - Operation:** - Develop a stormwater management plan prior to construction to prevent disturbance to aquatic habitat within the Provincially Significant Wetland from stormwater runoff (moderately preferred). **Net effects:** No effects on aquatic species and habitat anticipated.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**
Effect of Construction and Operation of Well House on Terrestrial Species and Habitat	An evaluation of the effects of construction and operation of the well house (excluding groundwater drawdown) on terrestrial species and habitat, based on: 1. Presence of terrestrial species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and 2. Area of temporary or permanent loss of terrestrial features or categorical loss of habitat functions by type – including Provincially Significant Wetland (PSW), Locally Significant Wetland	1. **Potential effects - Construction:** Limited natural terrestrial habitat occurring within the Well Site; however, breeding birds including two Species at Risk (Bobolink and Eastern Meadowlark), may be present within the Well Site (e.g., hayfield, vegetated swale). **Mitigation measures - Construction:** Schedule vegetation removal outside the breeding bird season for Zone C2 (April 1 to August 31). If this is not possible, active nest surveys may be completed in simple habitats (e.g., hayfield, pasture, treed hedgerow) by a qualified Biologist immediately prior to vegetation removal to identify any active birds nests, as migratory birds and their	1. **Potential effects - Construction:** - Disturbance to terrestrial species potentially occurring in forested areas and agricultural fields within the Well Site from vegetation clearing that may be required, including two bird Species at Risk (Bobolink and Eastern Meadowlark) and four bat Species at Risk (Eastern Small-footed Myotis, Little Brown Myotis, Northern Long-eared Myotis and Tri-colored Bat). - Disturbance to terrestrial species within the Well Area as a result of noise from construction of the well house. **Mitigation measures - Construction:** - Schedule vegetation removal	1. **Potential effects - Construction:** - Disturbance to terrestrial species potentially occurring in agricultural fields within the Well Site not anticipated as a result of this Project as area is owned by developer with plans for future development. **Mitigation measures - Construction:** No mitigation required (most preferred). **Potential effects - Operation:** No disturbance to terrestrial species from operation of the well house is anticipated. **Mitigation measures - Operation:** No mitigation required (most preferred).	1. **Potential effects - Construction:** No natural terrestrial habitat occurring within the Well Site; therefore disturbance to terrestrial species not anticipated. **Mitigation measures - Construction:** No mitigation required (most preferred). **Potential effects - Operation:** No disturbance to terrestrial species from operation of the well house is anticipated. **Mitigation measures - Operation:** No mitigation required (most preferred). 2. **Potential effects - Construction:** Disturbance to Provincially Significant Wetland within the Well Area from increased erosion and

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	(LSW), Environmentally Significant Areas (ESA), Areas of Natural and Scientific Interest (ANSI), Significant Wildlife Habitat (SWH), and others.	offspring are protected under the *Migratory Birds Convention Ac* (most preferred). **Potential effects - Operation:** No disturbance to terrestrial species from operation of the well house is anticipated. **Mitigation measures - Operation:** No mitigation required (most preferred).	outside the breeding bird season for Zone C2 (April 1 to August 31). If this is not possible, active nest surveys may be completed in simple habitats (e.g., hayfield, pasture, treed hedgerow) by a qualified Biologist immediately prior to vegetation removal to identify any active birds nests, as migratory birds and their offspring are protected under the *Migratory Birds Convention Act*	2. **Potential effects - Construction:** - Disturbance to unevaluated wetlands adjacent to the Well Site from accidental damage to vegetation, and erosion and sedimentation during construction.	sedimentation. **Mitigation measures - Construction:** Disturbance to Provincially Significant Wetland avoided by siting the Well Site more than 30 m away from the wetland. Implement erosion and sediment control measures to prevent disturbance to the Provincially Significant Wetland from erosion and sedimentation (most preferred).
		2. **Potential effects - Construction:** Breeding habitat for two bird Species at Risk (Bobolink and Eastern Meadowlark) may be present within the Well Site (e.g., hayfield). **Mitigation measures - Construction:** Locate temporary construction areas and permanent structures outside bird Species at Risk habitat (e.g., hayfield) to the extent possible. If development within bird Species at Risk habitat cannot be avoided, register the work with MNRF and complete a Habitat Management Plan in accordance with O. Reg. 242/08 under the *Endangered Species Act* (moderately preferred). **Potential effects - Operation:** No loss of terrestrial habitat from operation of the well house is anticipated. **Mitigation measures - Operation:** No mitigation required (most preferred). **Net effects:** Effects to terrestrial habitat and species minimized through application of mitigation measures and, if required, habitat compensation.	- Removal of suitable cavity trees for bat maternity roosts should occur outside the bat roosting season (generally May 1 – August 15; subject to confirmation by MNRF). - Limit construction activities to daylight hours during the bird breeding and bat roosting seasons, to the extent possible (least preferred). **Potential effects - Operation:** Disturbance to breeding birds within the Well Area as a result of noise from operation of the well house during bird breeding season. **Mitigation measures - Operation:** Potential noise effects during the operations phase would be minimized through the design and implementation of noise mitigation measures at the well house (moderately preferred). 2. **Potential effects - Construction:** - Disturbance to forested areas within and adjacent to the Well Site from vegetation clearing that may be required, accidental damage to trees, and erosion and sedimentation during construction. - Breeding habitat for two bird	**Mitigation measures - Construction:** - Disturbance to unevaluated wetlands adjacent to the Well Site would be avoided by clearly defining the work area and implementing erosion and sediment control measures to prevent accidental damage to vegetation, and erosion and sedimentation. **Potential effects - Operation:** Disturbance to terrestrial habitat within the Well Area from stormwater runoff. **Mitigation measures - Operation:** Develop a stormwater management plan prior to construction to prevent disturbance to terrestrial habitat from stormwater runoff (moderately preferred). **Net effects:** Effects to terrestrial habitat and species avoided through application of mitigation measures.	**Potential effects - Operation:** Disturbance to terrestrial habitat within the Well Area from stormwater runoff. **Mitigation measures - Operation:** Develop a stormwater management plan prior to construction to prevent disturbance to terrestrial habitat from stormwater runoff (moderately preferred). **Net effects:** Effects to terrestrial habitat and species avoided through application of mitigation measures.

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			Species at Risk (Bobolink and Eastern Meadowlark) may be present within agricultural fields overlapped by the Well Site (e.g., hayfield, pasture). - Maternity roost habitat for four bat Species at Risk (Eastern Small-footed Myotis, Little Brown Myotis, Northern Long-eared Myotis and Tri-colored Bat) may be present within forested areas overlapped by the Well Site. **Mitigation measures - Construction:** - Disturbance to forested areas within and adjacent to the Well Site from vegetation clearing would be avoided by siting the Well Site a minimum of 10 m away from the forested areas, to the extent possible. Implement tree protection as well as erosion and sediment control measures to prevent disturbance to terrestrial habitat including accidental damage to trees and erosion and sedimentation. - Locate temporary construction areas and permanent structures outside bird Species at Risk habitat (e.g., hayfield, pasture) to the extent possible. If development within bird Species at Risk habitat cannot be avoided, register the work with MNRF and complete a Habitat Management Plan in accordance with O. Reg. 242/08 under the *Endangered Species Act*. - Locate temporary construction areas and permanent structures outside bat Species at Risk habitat (e.g., suitable cavity trees in forested areas) to the extent possible. If development within bat Species at Risk habitat cannot be avoided, an overall		

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			benefit permit may be required under the *Endangered Species Act* (least preferred). **Potential effects - Operation:** Disturbance to terrestrial habitat within the Well Area from stormwater runoff.		
			Mitigation measures - Operation: Develop a stormwater management plan prior to construction to prevent disturbance to terrestrial habitat from stormwater runoff (moderately preferred). **Net effects:** Effects to terrestrial habitat and species minimized through application of mitigation measures and, if required, habitat compensation and overall benefit measures.		
	Ranking:	**Second (tied)**	**Third**	**Second (tied)**	**First**
Effect on Aquatic Species and Habitat from Groundwater Drawdown	An evaluation of the effects on aquatic species and habitat from groundwater drawdown, based on: 1. Presence of aquatic species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and[4] 2. Area of temporary or permanent loss of aquatic features or categorical loss of functions by type – watercourses by sensitivity type (thermal regime).	1. **Potential effects:** - Disturbance to potentially occurring aquatic species in two unevaluated wetlands, Holland Landing Creek (warmwater), and one warmwater tributary of Holland Landing Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 30 m thick). - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 3; therefore, disturbance to these species as result of groundwater drawdown is not anticipated.	1. **Potential effects:** - Disturbance to potentially occurring aquatic species in three ponds, two warmwater Black River tributaries, an unevaluated wetland and a Locally Significant Wetland within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 41 m thick). - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 5; therefore, disturbance to these species as result of groundwater drawdown is not anticipated.	1. **Potential effects:** - Disturbance to potentially occurring aquatic species in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 6; therefore, disturbance to these species as a result of groundwater drawdown is not anticipated. **Mitigation measures:**	1. **Potential effects:** - Disturbance to potentially occurring aquatic species in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 11; therefore, disturbance to these species as result of groundwater

4. *The stratigraphic information available at the regional scale pre-field testing indicated some variability in aquitard thickness which could significantly vary on from site to site and on a local scale. This aquitard inconsistency was not confirmed and was refined via the site specific drilling that included a test well and monitoring wells, and which did not encounter any instances of an absent aquitard. Therefore, it was decided that aquitard variability was not appropriate to be included as a determining factor in site selection.*

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		Mitigation measures: - Disturbance to potentially occurring aquatic species from groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells. - No mitigation required for Species at Risk or Species of Conservation Concern (most preferred). 2. **Potential effects:** Disturbance to aquatic habitat in two unevaluated wetlands, Holland Landing Creek (warmwater), and one warmwater tributary of Holland Landing Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 30 m thick). **Mitigation measures:** Disturbance to aquatic habitat from groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.	**Mitigation measures:** - Disturbance to potentially occurring aquatic species from groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells. - No mitigation required for Species at Risk or Species of Conservation Concern (most preferred). 2. **Potential effects:** Disturbance to aquatic habitat in three ponds, two warmwater Black River tributaries, an unevaluated wetland and a Locally Significant Wetland within 500 m of the Well Site as a result groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 41 m thick). **Mitigation measures:** Disturbance to aquatic habitat from groundwater drawdown during operations of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.	- Disturbance to potentially occurring aquatic species from groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells. - No mitigation required for Species at Risk or Species of Conservation Concern (most preferred). 2. **Potential effects:** Disturbance to two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). **Mitigation measures:** Disturbance to aquatic habitat from groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.	drawdown is not anticipated. **Mitigation measures**: - Disturbance to potentially occurring species from groundwater drawdown during operations of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells. - No mitigation required for Species at Risk or Species of Conservation Concern (most preferred). 2. **Potential effects:** Disturbance to aquatic habitat in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of Well Area 11 as a result groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). **Mitigation measures:** Disturbance to aquatic habitat from groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**

Category of Consideration / Evaluation Criteria	Indicator *(How the Evaluation Criteria was Applied)*	Well Area 3 – Mount Albert *(Mount Albert Road and 2nd Concession)*	Well Area 5 – Warden *(Warden Avenue north of Queensville Sideroad)*	Well Area 6 – Green Lane *(Green Lane east of Yonge Street)*	Well Area 11 – Aurora Well No. 5 *(St. John's Sideroad and Old Yonge Street)*
Effect on Terrestrial Species and Habitat from Groundwater Drawdown	An evaluation of the effects on terrestrial species and habitat from groundwater drawdown, based on: 1. Presence of terrestrial species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare), and area-sensitive species; and 2. Area of temporary or permanent loss of terrestrial features or categorical loss of habitat functions by type – including Provincially Significant Wetland (PSW), Locally Significant Wetland (LSW), Environmentally Significant Areas (ESA), Areas of Natural and Scientific Interest (ANSI), Significant Wildlife Habitat (SWH), and others.	1. **Potential effect:** Disturbance to terrestrial species potentially occurring in two unevaluated wetlands, Holland Landing Creek, and one tributary of Holland Landing Creek within 500 of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 30 m thick). **Mitigation measures:** Disturbance to terrestrial species as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). 2. **Potential effect:** Disturbance to terrestrial features associated with two unevaluated wetlands, Holland Landing Creek, and one tributary of Holland Landing Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 30 m thick). **Mitigation measures:** Disturbance to terrestrial features as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred).	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in three ponds, two Black River tributaries, an unevaluated wetland, and a Locally Significant Wetland within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 41 m thick). **Mitigation measures:** Disturbance to terrestrial species as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). 2. **Potential effects:** Disturbance to terrestrial features associated with three ponds, two Black River tributaries, an unevaluated wetland and a Locally Significant Wetland within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 41 m thick). **Mitigation measures:** Disturbance to terrestrial features as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred).	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in two tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). **Mitigation measures:** Disturbance to terrestrial species as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). 2. **Potential effects:** Disturbance to terrestrial features associated with two tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). **Mitigation measures:** Disturbance to terrestrial features as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on terrestrial	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in a Provincially Significant Wetland and a pond, Tannery Creek and an unnamed tributary of Tannery Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). **Mitigation measures:** Disturbance to terrestrial species as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). 2. **Potential effects:** Disturbance to terrestrial features associated with a Provincially Significant Wetland and a pond, Tannery Creek and an unnamed tributary of Tannery Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). **Mitigation measures:** Disturbance to terrestrial features as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred).

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		Net effects: Effects on terrestrial species and habitat from groundwater drawdown not anticipated.	**Net effects:** Effects on terrestrial species and habitat from groundwater drawdown not anticipated.	species and habitat from groundwater drawdown not anticipated.	**Net effects:** Effects on terrestrial species and habitat from groundwater drawdown not anticipated.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**
Effect on Groundwater Quality	An evaluation of temporary and/or long-term change in groundwater quality due to: 1. Groundwater drawdown.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 30 m thick), and the implementation of Source Water Protection measures. **Mitigation measures:** No mitigation required as no effects are anticipated (most preferred). **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 41 m thick), and the implementation of Source Water Protection measures. **Mitigation measures:** No mitigation required as no effects are anticipated (most preferred). **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and the implementation of Source Water Protection measures. **Mitigation measures:** No mitigation required as no effects are anticipated (most preferred). **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and the implementation of Source Water Protection measures. **Mitigation measures:** No mitigation required as no effects are anticipated (most preferred). **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**
Effect on Surface Water Quantity	An evaluation of temporary and/or long-term change in quantity of surface water bodies (including those identified in the "Proximity to wetlands/streams" criteria used to assess the Potential Alternative Well Areas) due to: 1. Construction or operation of the well house; and 2. Groundwater drawdown during operation of the well.	1. **Potential effects:** Temporary and/or long-term change in surface water quantity due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effect:** Temporary and/or long-term change in surface water quantity in two unevaluated wetlands, Holland Landing Creek, and one tributary of Holland Landing Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 30 m thick).	1. **Potential effects:** Temporary and/or long-term change in surface water quantity due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quantity in three ponds, two warmwater Black River tributaries, an unevaluated wetland and a Locally Significant Wetland within 500 m of the Well Site as a result groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 41 m thick).	1. **Potential effects:** Temporary and/or long-term change in surface water quantity due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). **2. Potential effects:** Temporary and/or long-term change in surface water quantity in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). **Mitigation measures:** Decrease	1. **Potential effects:** Temporary and/or long-term change in surface water quantity due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). **2. Potential effects:** Temporary and/or long-term change in surface water quantity in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in

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		Mitigation measures: Decrease in surface water quantity as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Changes to surface water quantity not anticipated.	**Mitigation measures:** Decrease in surface water quantity as a result groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Changes to surface water quantity not anticipated.	in surface water quantity as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Changes to surface water quantity not anticipated.	thickness (approximately 34 m thick). **Mitigation measures:** Decrease in surface water quantity as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Changes to surface water quantity not anticipated.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**
Effect on Surface Water Quality	An evaluation of temporary and/or long-term change in quality of surface water bodies (including those identified in the "Proximity to wetlands/streams" criteria used to assess the Potential Alternative Well Area) due to : 1. Construction or operation of the well house; and 2. Groundwater drawdown during operation of the well.	1. **Potential effects:** Temporary and/or long-term change in surface water quality water due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quality in two unevaluated wetlands, Holland Landing Creek, and one tributary of Holland Landing Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 30 m thick). **Mitigation measures:** Decrease in surface water quality as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most	1. **Potential effects:** Temporary and/or long-term change in surface water quality water due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quality in three ponds, two warmwater Black River tributaries, an unevaluated wetland and a Locally Significant Wetland within 500 m of the Well Site as a result groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 41 m thick). **Mitigation measures:** Decrease in surface water quality as a result groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most	1. **Potential effects:** Temporary and/or long-term change in surface water quality water due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quality in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). **Mitigation measures:** Decrease in surface water quality as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most	1. **Potential measures:** Temporary and/or long-term change in surface water quality water due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quality in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). **Mitigation measures:** Decrease in surface water quantity as a result groundwater drawdown during operation of the well would be assessed through additional monitoring during the long-term testing and mitigated as necessary

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		preferred). **Net effects:** Changes to surface water quality not anticipated.	preferred). **Net effects:** Changes to surface water quality not anticipated.	preferred). **Net effects:** Changes to surface water quality not anticipated.	through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Changes to surface water quality not anticipated.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**
Built Environment Category Ranking		Area has most disruption on existing residences. There are more private wells in the vicinity compared to Areas 6 and 11.	Area has most disruption on existing residences and there are more private wells in the vicinity compared to Areas 6 and 11, effects on municipal wells will be monitored and mitigated, if required.	Area has least disruption on existing residences although future and existing land uses could be affected through new Wellhead Protection Area. There are fewer private wells in the vicinity compared to Areas 3 and 5.	Area has some disruption on existing residences, does not require property acquisition and has no effects on existing agricultural operations.
		Third (tied)	***Third (tied)***	***Second***	***First***
Effect on Existing and/or Future Planned Residences, Businesses, and / or Community, Institutional and/or Recreational Facilities	An evaluation of the effects on existing or future planned buildings, based on: 1. Displacement and/or temporary or permanent disruption to residences, businesses, and / or community, institutional, and recreational facilities; and 2. Future planned, or approved land uses, including those affected by the addition of new Wellhead Protection Areas. These may include but are not limited to existing and future agricultural operations, Environmental Protection Areas, and the Oak Ridges Moraine Conservation Plan Area designations.	1. **Potential effects:** Displacement and/or temporary disruption to nine existing residences within the Well Area; associated with constructing the well house and required sanitary utilities. **Mitigation measures:** Disruption to existing residences within the Well Area would be reduced by siting the Well House away from the residences, to the extent possible (least preferred). 2. **Potential effects:** - No changes required to the approved land use designations to accommodate the Well Site as it is a permitted use in the land use designations as per Section 4.15.1 of the 2014 East Gwillimbury Official Plan (In Effect). - Potential disruption to existing agricultural operations and to potential future land uses through the addition of a new Wellhead Protection Area. - **Mitigation measures:** No applicable mitigation measures for the disruption to existing and future agricultural operations (least preferred).	1. **Potential effects:** Displacement and/or temporary disruption to five existing residences within the Well Area; temporary disruption associated with constructing a required watermain and sanitary utility. **Mitigation measures:** Disruption to existing residences within the Well Area would be reduced by siting the Well House away from the residences, to the extent possible (least preferred). 2. **Potential effects:** - No changes required to the approved land use designations to accommodate the Well Site as it is a permitted use in the land use designations as per Section 4.15.1 of the 2014 East Gwillimbury Official Plan (In Effect). - Potential disruption to existing and future agricultural operations and to potential future land uses through the addition of a new Wellhead Protection Area. **Mitigation measures:** - No applicable mitigation measures for the disruption to existing and future agricultural	1. **Potential effects:** No existing residences, businesses, and / or community, institutional and/or recreational facilities within the Alternative Well Area; minimal disruption associated with constructing utilities as area has existing sanitary servicing and watermain planned in 2025. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** - No changes required to the approved land use designations to accommodate the Well Site as it is a permitted use in the land use designations as per Section 4.15.1 of the 2014 East Gwillimbury Official Plan (In Effect). - Potential disruption to future land uses through the addition of a new Wellhead Protection Area. **Mitigation measures:** - No applicable mitigation measures for the disruption to future land uses (least preferred). **Net effects:** Area has fewest impacts	1. **Potential effects:** Displacement and/or temporary disruption to existing land uses within the Well Area which include the existing municipal well site, a law office, a seniors' residence, a restaurant, and a number of residences on Old Yonge Street in the southern portion of the Well Area is not anticipated as the new well would be located within the existing Well Site and area is currently serviced by watermain and sanitary services are in close proximity. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** - No changes required to the approved land use designations to accommodate the Well Area as the Well Site would be within the existing Well Site. - Potential disruption to future planned land uses through the expansion of the Wellhead Protection Area not anticipated. **Mitigation measures:** No applicable mitigation (most preferred).

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		Net effects: Area has most impacts on existing nearby residences. The addition of a new Wellhead Protection Area could affect existing and future land uses, including an existing agricultural operation.	operations (least preferred). **Net effects:** Area has most impacts on existing nearby residences. The addition of a new Wellhead Protection Area could affect existing and future land uses, including an existing agricultural operation.	on existing nearby residences. The addition of a new Wellhead Protection Area could affect future development.	**Net effects:** Area has moderate impacts on existing nearby residences. The construction of a well house is consistent with existing land uses.
	Ranking:	**Third (tied)**	**Third (tied)**	**Second**	**First**
Effect on Property (ownership, size, and willingness of property owner)	An evaluation of effects on properties, based on: 1. Total area of property acquisition required (ha), whether property is privately or publicly owned, and willingness of property owner.	1. Property acquisition from a private property would be compensated for (as required) at fair market value in accordance with York Region's policies (least preferred). Property acquisition required.	1. Property acquisition from a private property would be compensated for (as required) at fair market value in accordance with York Region's policies (least preferred). Property acquisition required.	1. Property acquisition from a private property would be compensated for (as required) at fair market value in accordance with York Region's policies (least preferred). Property acquisition required.	1. No property acquisition required for the Well Site (most preferred). Area would not require property acquisition as York Region currently owns the property.
	Ranking:	**Second (tied)**	**Second (tied)**	**Second (tied)**	**First**
Effect on Existing Utility Infrastructure	An evaluation of effects on existing utilities, based on: 1. Disruption to existing major utilities and duration of adverse effects.	1. **Potential effects:** - Potential temporary disruption to existing utilities during construction. - No permanent disruption to major utilities during operation of the well house. **Mitigation measures:** - Temporary disruption to existing major utilities will be mitigated by standard construction best management practices. Connection to existing watermain; planned future sanitary servicing. - No mitigation required for permanent disruption to major utilities (moderately preferred). **Net effects:** Effects on existing utilities will be mitigated by standard construction best management practices.	1. **Potential effects:** - Potential temporary disruption to existing utilities during construction. - No permanent disruption to major utilities during operation of the well house. **Mitigation measures:** - Temporary disruption to existing major utilities will be mitigated by standard construction best management practices. Requires extensive new watermain which will require mitigation of impacts resulting from road construction. - No mitigation required for permanent disruption to major utilities (moderately preferred). **Net effects:** Effects on existing utilities will be mitigated by standard construction best management practices.	1. **Potential effects:** - Potential temporary disruption to existing utilities during construction. - No permanent disruption to major utilities during operation of the well house. **Mitigation measures:** - Temporary disruption to existing major utilities will be mitigated by standard construction best management practices. Extended watermain planned by developer. - No mitigation required for permanent disruption to major utilities (moderately preferred). **Net effects:** Effects on existing utilities will be mitigated by standard construction best management practices.	1. **Potential effects:** - Potential temporary disruption to existing utilities during construction. - No permanent disruption to major utilities during operation of the well house. **Mitigation measures:** - Temporary disruption to existing major utilities will be mitigated by standard construction best management practices. Existing site has all utilities present. - No mitigation required for permanent disruption to major utilities (moderately preferred). **Net effects:** Effects on existing utilities will be mitigated by standard construction best management practices.
	Ranking:	**First (tied)**	**First (tied)**	**First (tied)**	**First (tied)**

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Effect on Existing Agricultural Operations	An evaluation of effects on existing agricultural operations, based on: 1. Presence of active agricultural operations.	1. **Potential effects:** The permanent displacement of active agricultural operations within the Well Area. **Mitigation measures:** Displacement would be compensated for (as required) at fair market value in accordance with York Region's policies (least preferred). **Net effects:** Active agricultural operation would be displaced within the well Area.	1. **Potential effects:** The permanent displacement of active agricultural operations within the Well Area. **Mitigation measures:** Displacement would be compensated for (as required) at fair market value in accordance with York Region's policies (least preferred). **Net effects:** Active agricultural operation would be displaced within the well Area.	1. **Potential effects:** Area is owned by developer with plans for future development, as such, effects on agricultural operations from this Project not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on agricultural operations anticipated as a result of this Project.	1. **Potential effects:** No agricultural operations within the Well Area; therefore, no effect on active agricultural operations is anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on agricultural operations as none are present in the well Area.
	Ranking:	**Second (tied)**	**Second (tied)**	**First (tied)**	**First (tied)**
Effect on Private Wells (groundwater quality and quantity)	An evaluation of effects on private wells, based on: 1. Comparison of the density of private wells in the vicinity of each well;	1. **Potential effects:** The potential effect to private wells (more than 15 private wells/km^2) as a result of groundwater drawdown. **Mitigation measures**: The effects on private wells as a result of groundwater drawdown would be assessed by monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (moderately preferred). **Net effects:** Site has a greater density of private wells.	1. **Potential effects:** The potential effect to private wells (more than 15 private wells/km^2) as a result of groundwater drawdown. **Mitigation measures:** The effects on private wells as a result of groundwater drawdown would be assessed by monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells(moderately preferred). **Net effects:** Site has a greater density of private wells.	1. **Potential effects:** The potential effect to private wells (less than 15 private wells/km^2) as a result of groundwater drawdown. **Mitigation measures**: The effects on private wells as a result of groundwater drawdown would be assessed by monitoring during the long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Site has a lower density of private wells.	1. **Potential effects:** The potential effect to private wells (less than 15 private wells/km^2) as a result of groundwater drawdown. **Mitigation measures**: The effects on private wells as a result of groundwater drawdown would be assessed by monitoring during long term-testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells(most preferred). **Net effects:** Site has a lower density of private wells.
	Ranking:	**Second (tied)**	**Second (tied)**	**First (tied)**	**First (tied)**
Effect on Municipal Wells (groundwater quality and quantity)	An evaluation of effects on municipal wells, based on: 1. Comparison of the density of municipal wells in the vicinity of each well; and 2. The distance to other permitted takers.	1. **Potential effects:** Potential effect to 1 municipal well (Holland Landing Well 2) located approximately 460 m away as a result of groundwater drawdown. There are only York Regional municipal wells within the area of potential effect. All these Regional wells are operated based on one combined PTTW. **Mitigation measures:** Potential effect to existing municipal well would be assessed by monitoring during-long term testing and mitigated as necessary through amendments to the PTTW for	1. **Potential effects:** Potential effect to municipal wells (Queensville Wells 1 and 2) located approximately 2.2 km as a result of groundwater drawdown. There are only York Regional municipal wells within the area of potential effect. All these Regional wells are operated based on one combined PTTW. **Mitigation measures:** Potential effect to existing municipal wells would be assessed by monitoring during long-term testing and mitigated as necessary through amendments to the PTTW for	1. **Potential effects:** Potential effect to municipal wells (Newmarket Well 15 located 2 km away, and Holland Landing Well 1 located 2 km away) as a result of groundwater drawdown. There are only York Regional municipal wells within the area of potential effect. All these Regional wells are operated based on one combined PTTW. **Mitigation measures:** Potential effect to existing municipal wells would be assessed by monitoring during long-term testing and mitigated as necessary through	1. **Potential effects:** Potential effect to municipal wells (Newmarket Wells 13 and 16 located 1.5 km away, Aurora Well 6 located 1.8 km away and Aurora Wells 1-4 located 1.6 km away) as a result of groundwater drawdown. There are only York Regional municipal wells within the area of potential effect. All these Regional wells are operated based on one combined PTTW. **Mitigation measures:** Potential effect to existing municipal wells would be assessed by monitoring

Category of Consideration / Evaluation Criteria	Indicator *(How the Evaluation Criteria was Applied)*	Well Area 3 – Mount Albert *(Mount Albert Road and 2nd Concession)*	Well Area 5 – Warden *(Warden Avenue north of Queensville Sideroad)*	Well Area 6 – Green Lane *(Green Lane east of Yonge Street)*	Well Area 11 – Aurora Well No. 5 *(St. John's Sideroad and Old Yonge Street)*
		operations of YSA wells(most preferred). 2. **Potential effects:** Effects to other Permit to Take Water holders not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Well Area has lowest density of municipal wells and no Permit to Take Water holders within 2 km.	operations of YSA wells(moderately preferred). 2. **Potential effects:** Effects to other Permit to Take Water holders not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Well Area 5 is tied with Well Area 6 – Green Lane regarding density of municipal wells and no Permit to Take Water holders within 2 km.	amendments to the PTTW for operations of YSA wells(moderately preferred). 2. **Potential effects:** Effects to other Permit to Take Water holders not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Well Area 6 is tied with Well Area 5 – Warden regarding density of municipal wells and no Permit to Take Water holders within 2 km.	during long-term testing and mitigated as necessary through amendments to the PTTW for operations of YSA wells(moderately preferred). 2. **Potential effects:** Potential effects to other Permit to Take Water holders not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Well Area 11 has highest density of municipal wells.
	Ranking:	**First**	**Second (tied)**	**Second (tied)**	**Third**
Social Environment Category Ranking		More noise sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	More noise sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	Fewest sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	More noise sensitive receptors will be disturbed during construction; however, given that a well house currently exists at the area, effects during operations are not anticipated to differ from current conditions
		Second (tied)	***Second (tied)***	***First (tied)***	***First (tied)***
Effect of Noise/Vibration on Sensitive Receptors	An evaluation of effects on noise sensitive receptors, based on: 1. Presence of sensitive receptors and duration of construction schedule; and 2. Disruption during the operations phase.	1. **Potential effects - Construction:** Effects on nine existing residences (noise sensitive receptors) within the Well Area due to construction of the well house. **Mitigation measures - Construction:** Potential effects on nearby residences will be minimized by implementing construction related Best Management Practices (i.e., limit heavy construction to daytime hours, use of construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC-115), and adhering to the Town of East Gwillimbury's Noise By-law (2004-80) (moderately preferred).	1. **Potential effects - Construction:** Effects on five existing residences (noise sensitive receptors) within the Well Area due to construction of the well house. **Mitigation measures - Construction:** Potential effects on nearby residences will be minimized by implementing construction related Best Management Practices (i.e., limit heavy construction to daytime hours, use of construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC-115), and adhering to the Town of East Gwillimbury's Noise By-law (2004-80) (moderately preferred).	1. **Potential effects - Construction:** No existing residences, businesses, and / or community, institutional and / or recreational facilities within the Well Area. This area also has more ambient noise from higher traffic volumes compared to the other well areas; therefore, minimal effects from noise associated with the construction of the well house are anticipated. **Mitigation measures - Construction:** Although effects are not anticipated, York Region will implement Best Management Practices (i.e., limit heavy construction to daytime hours, use of construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC-115), and	1. **Potential effects - Construction:** Effects on several commercial operations, a seniors' residence, and a number of houses within the Well Area and adjacent to the Well Site (noise sensitive receptors) due to construction of the well house. **Mitigation measures - Construction:** Potential effects on nearby residences will be minimized by implementing construction related Best Management Practices (i.e., operators limit impact noise from tailgate, use of construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC-115), and adhering to the Town of Aurora's Noise By-law (4787-06)

Category of Consideration / Evaluation Criteria	Indicator *(How the Evaluation Criteria was Applied)*	Well Area 3 – Mount Albert *(Mount Albert Road and 2nd Concession)*	Well Area 5 – Warden *(Warden Avenue north of Queensville Sideroad)*	Well Area 6 – Green Lane *(Green Lane east of Yonge Street)*	Well Area 11 – Aurora Well No. 5 *(St. John's Sideroad and Old Yonge Street)*
		2. **Potential effects - Operation:** Effects on nine existing residences (noise sensitive receptors) within the Well Area during the operations phase. **Mitigation measures - Operation:** Potential noise effects during the operations phase will be minimized through the design and implementation of noise mitigation measures at the well house (moderately preferred). **Net effects:** Some noise sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	2. **Potential effects - Operation:** Effects on five existing residences (noise sensitive receptors) within the Well Area during the operations phase. **Mitigation measures - Operation:** Potential noise effects during the operations phase will be minimized through the design and implementation of noise mitigation measures at the well house (moderately preferred). **Net effects:** Some noise sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	adhere to the Town of East Gwillimbury's Noise By-law (2004-80) (most preferred). 2. **Potential effects - Operation:** No existing residences, businesses, and / or community, institutional and / or recreational facilities within the Well Area. This area also has more ambient noise from higher traffic volumes compared to the other well areas; therefore, minimal effects from noise associated the operations phase are anticipated. **Mitigation measures - Operation:** Potential noise effects during the operations phase will be minimized through the design and implementation of noise mitigation measures at the well house (moderately preferred). **Net effects:** Area has fewest sensitive receptors and noise effects during operations will be minimized through the use of mitigation measures.	(moderately preferred). 2. **Potential effects - Construction:** Effects on several commercial operations, a seniors' residence, and a number of houses within the Well Area and adjacent to the Well Site (noise sensitive receptors) during the operations phase. **Mitigation measures - Construction:** Potential noise effects during the operations phase will be minimized through the design and implementation of noise mitigation measures at the well house (most preferred). **Net effects:** Some noise sensitive receptors will be disturbed during construction; however, given that a well house currently exists at the area, effects during operations are not anticipated to differ from current conditions.
	Ranking:	**Second (tied)**	**Second (tied)**	**First (tied)**	**First (tied)**
Cultural Environment Category Ranking		Minimal effects on cultural heritage landscapes and presence of archaeological resources will be confirmed prior to construction.	Minimal effects on cultural heritage landscapes and presence of archaeological resources will be confirmed prior to construction.	Minimal effects on cultural heritage landscapes and presence of archaeological resources will be confirmed prior to construction.	No cultural heritage or archaeological resources would be affected at this Area.
		Second (Tied)	***Second (Tied)***	***Second (Tied)***	***First***
Effect on Cultural Heritage Landscapes and Built Heritage Resources	An evaluation of effects on cultural heritage resources, based on: 1. Presence of cultural heritage landscapes; and 2. Presence of built heritage resources.	1. **Potential effects:** Effects on cultural heritage resources from the removal of a small area of one cultural heritage landscape (agricultural land). **Mitigation measures:** Well house will be designed in a manner so as to fit into the surroundings (moderately preferred). 2. **Potential effects:** No potential effects on built heritage resources	1. **Potential effects:** Effects on cultural heritage resources from the removal of a small area of one cultural heritage landscape (agricultural land). **Mitigation measures:** Well house will be designed in a manner so as to fit into the surroundings (moderately preferred). 2. **Potential effects:** No potential effects on built heritage resources	1. **Potential effects:** Effects on a small area of one cultural heritage landscape (agricultural land) considered minimal as proposed area is owned by developer with plans for future residential and commercial development. **Mitigation measures:** No mitigation required (moderately preferred). 2. **Potential effects:** No potential	**1. Potential effects:** No cultural heritage landscapes within the Alternative Well Area. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** No potential effects on built heritage resources as there are any registered built heritage resources within the Alternative Well Area.

Category of Consideration / Evaluation Criteria	Indicator *(How the Evaluation Criteria was Applied)*	Well Area 3 – Mount Albert *(Mount Albert Road and 2nd Concession)*	Well Area 5 – Warden *(Warden Avenue north of Queensville Sideroad)*	Well Area 6 – Green Lane *(Green Lane east of Yonge Street)*	Well Area 11 – Aurora Well No. 5 *(St. John's Sideroad and Old Yonge Street)*
		are anticipated as there are no registered built heritage resources within the Alternative Well Area. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Effects are considered minimal as the well house will be designed in a manner so as to fit into the surroundings.	are anticipated as there are no registered built heritage resources within the Alternative Well Area. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Effects are considered minimal as the well house will be designed in a manner so as to fit into the surroundings.	effects on built heritage resources are anticipated as there are no registered built heritage resources within the Alternative Well Area. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Effects are considered minimal as the well house will be designed in a manner so as to fit into the surroundings.	**Mitigation measures:** No mitigation required (most preferred). **Net effects:** No cultural heritage resources would be affected at this Area.
	Ranking:	**Second (tied)**	**Second (tied)**	**Second (tied)**	**First**
Effect on Potential Archaeological Resources	An evaluation of effects on archaeological resources, including: 1. Presence of areas with archaeological potential (i.e., lands with potential archaeological resources) affected.	1. **Potential effects:** The disruption to potential archaeological resources will be confirmed through a Stage 2 Archaeological Assessment prior to construction. **Mitigation measures:** If confirmed, then archaeological resources will be avoided by undertaking Stage 3 Archaeological Assessment. If resources cannot be avoided, then a Stage 4 Archaeological Assessment will be undertaken to remove any resources (moderately preferred). **Net effects:** Effects to archaeological resources will be avoided through a Stage 2 Archaeological Assessment or a Stage 3 Archaeological Assessment (if required).	1. **Potential effects:** The disruption to potential archaeological resources will be confirmed through a Stage 2 Archaeological Assessment prior to construction. **Mitigation measures:** If confirmed, then archaeological resources will be avoided by undertaking Stage 3 Archaeological Assessment. If resources cannot be avoided, then a Stage 4 Archaeological Assessment will be undertaken to remove any resources (moderately preferred). **Net effects:** Effects to archaeological resources will be avoided through a Stage 2 Archaeological Assessment or a Stage 3 Archaeological Assessment (if required).	1. **Potential effects:** The disruption to potential archaeological resources will be confirmed through a Stage 2 Archaeological Assessment prior to construction. **Mitigation measures:** If confirmed, then archaeological resources will be avoided by undertaking Stage 3 Archaeological Assessment. If resources cannot be avoided, then a Stage 4 Archaeological Assessment will be undertaken to remove any resources (moderately preferred). **Net effects:** Effects to archaeological resources will be avoided through a Stage 2 Archaeological Assessment or a Stage 3 Archaeological Assessment (if required).	1. **Potential effects:** There is no archaeological potential because the Well Area has been previously disturbed due to the existing municipal well (most preferred). **Net effects:** No archaeological resources would be affected at this Area.
	Ranking:	**Second (tied)**	**Second (tied)**	**Second (tied)**	**First**
Financial Category Ranking		The Area has higher land acquisition costs and higher capital costs based on production capacity.	The Area has lower land acquisition costs and slightly lower capital costs based on production capacity.	The Area has higher land acquisition costs; however, slightly lower capital costs based on production capacity.	There are no land acquisition costs and the Area has the lowest capital cost based on production capacity,
		Third	***Second***	***First (tied)***	***First (tied)***

Category of Consideration / Evaluation Criteria	Indicator *(How the Evaluation Criteria was Applied)*	Well Area 3 – Mount Albert *(Mount Albert Road and 2nd Concession)*	Well Area 5 – Warden *(Warden Avenue north of Queensville Sideroad)*	Well Area 6 – Green Lane *(Green Lane east of Yonge Street)*	Well Area 11 – Aurora Well No. 5 *(St. John's Sideroad and Old Yonge Street)*
Capital Costs (Life cycle cost per m^3)	An evaluation of the capital and operation & maintenance costs, including: 1. Costs associated with land acquisition (in 2012 dollars). 2. Estimated Capital Cost; and 3. Life Cycle Cost (not evaluated at preliminary evaluation stage)	1. Estimated property value of $77,000 per ha 2. Estimated capital cost: • $2.3 Million; • Equal to $1,300 per m^3/day of proposed capacity, based on a capacity of 1,728 m^3/day (20 L/s) (least preferred). Highest capital cost based on estimated production capacity relative to other Well Areas.	1. Estimated property value of $18,000 per ha 2. Estimated capital cost: • $2.5 Million (if 2.9 km watermain were included, the estimated capital cost would increase to $5.7M); • Equal to $650 per m^3/day of proposed capacity, based on a capacity of 3,890 m^3/day (45 L/s) (moderately preferred). Lower capital cost based on estimated production capacity relative to other Well Areas.	1. Estimated property value of $172,000 per ha 2. Estimated capital cost: • $2.9 Million; • Equal to $425 per m^3/day of proposed capacity, based on a capacity of 6,910 m^3/day (80 L/s) (most preferred) Lower capital cost based on estimated production capacity relative to other Well Areas.	1. No land acquisition costs as the Well Area is currently owned by York Region. 2. Estimated capital cost: • $1.7 Million; • Equal to $490 per m^3/day of proposed capacity, based on capacity of 3,460 m^3/day (40 L/s) (most preferred). Lowest capital cost based on production estimated capacity relative to other Well Areas.
	Ranking:	**Third**	**Second**	**First (tied)**	**First (tied)**

6.5.3 Stage 4 Results

Following the evaluation conducted during Stage 4, Alternative Well Area 3 was not recommended for further evaluation as the hydrogeological conditions are not adequate to support a municipal supply well. Alternative Well Areas 5, 6 and 11 were recommended for a 24-hour pumping test as all three demonstrated potentially favourable hydrogeological conditions for re-establishing the full permitted well capacity in the Yonge Street Aquifer. Although Alternative Well Areas 11 and 6 were more closely ranked for first and second place, respectively, it was initially decided to carry Alternative Well Area 5 forward for a 24-hour pumping test to gather additional background information.

6.6 Stage 5: Recommend a Preferred Solution

6.6.1 Stage 5 Data Collection and Review

Prior to the pumping test, additional monitoring wells were installed in the vicinity of the test well sites to refine the interpretation of aquifer productivity and also to better understand the potential impacts of longer term pumping on the surrounding environment and domestic water supplies / other users of water. Pumping tests, approximately 24-hours in duration, were then conducted to monitor the response of the groundwater system to pumping the test wells.

The data collected from the 24-hour pumping tests was used to provide additional information on the aquifer productivity at each location and with regard to the net effects on the environment related to aquatic species, terrestrial species and habitat, groundwater quality, surface water quantity and quality, and private or municipal wells (groundwater quality and quantity).

The table below presents the results of the 24-hour pumping test at Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5, refer to **Appendix F**, Preliminary Hydrogeologic Assessment Report for further details.

Table 6-5: Results of 24-hour Pumping Tests

Technical Consideration	Well Area 6 - Green Lane	Well Area 11- Aurora Well No. 5
Test Well Depth (m)	95.4 m	101.8 m (existing production well) and 94.5 m (test well)
Test Pumping Rate (L/s)	25 L/s	Combined rate of 25 L/s for 8 hrs (test well) and 85 L/s for 16 hrs (combined pumping)
Predicted Production Well Rate (L/s)	80-100* L/s	40-65* L/s
Potential Interference with Private Supply Wells	Low – Few private supply wells identified in area	Low – Located in area largely serviced by municipal supply
Potential Interference with Municipal Wells	Low – Located within 2 km of one well site	Moderate – Located within 2 km of three well sites
Potential Impacts to Shallow Groundwater System	Low – drawdown not observed in shallow system during testing	Low – drawdown not observed in shallow system during testing
Aquifer Water Quality	Water hardness, iron, and methane concentrations exceeded Ontario Drinking Water Quality Standards. The presence of hardness and iron at the observed concentrations may require treatment; however, the testing indicates that the groundwater with treatment will be a good potable source of drinking water.	Water hardness and iron concentrations exceeded Ontario Drinking Water Quality Standards. The presence of these parameters at the observed concentrations may require treatment; however, the testing indicates that the groundwater with treatment will be a good potable source of drinking water.

*Note: * Table 6-5 was presented at the Public Information Centres held on September 23 and 25, 2013. The Predicted Production Well Rates at Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5 were conservatively shown as 60-90 L/s and 20-45 L/s, respectively, to reflect a preliminary review of the hydrogeological evaluation from the 24-hour pumping tests. This range was subsequently updated to 80-100 L/s and 40-65 L/s, as originally reported, based on the final review of the test results. Following the 24-hour pumping tests, the production rate at Well Area 6 – Green Lane was updated again to show a confirmed capacity of 55 L/s.*

Well Area 5 was originally recommended for a 24-hour pumping test; however, testing was first conducted at Well Area 6 and Well Area 11 and the preliminary results suggested that the target production capacities could be realized at these two locations. Given that Well Area 5 was ranked third during the comparative evaluation in Stage 4, combined with the preliminary favourable conditions at Well Area 6 and 11, it was decided to suspend further tests at Well Area 5 pending the results of further analysis at the other two sites. The results of the 24-hour pumping tests suggest that both Alternative Well Areas 6 and 11 have favourable conditions for a municipal supply well.

As such, further tests at Well Area 5 would not be conducted and the well area would be removed from further evaluation.

A Stage 2 Archaeological Assessment was also conducted during this stage at Well Area 6 to identify archaeological resources and to evaluate whether further archaeological assessments were required. The subsections below provide the results of the Stage 2 Archaeological Assessment as well as detailed results of the 24-hour pumping tests and additional comparative evaluation information for each well.

6.6.2 Stage 5 Evaluation

The comparative evaluation was then updated to include the results of the 24-hour pumping test and Stage 2 Archaeological Assessment. As previously indicated, these results were used to provide additional information on:

- Aquifer Productivity;
- Treatment Requirements;
- Effect on aquatic species from groundwater drawdown;
- Effect on terrestrial species and habitat from groundwater drawdown;
- Effect on groundwater quality;
- Effect on surface water quantity and quality;
- Effect on private or municipal wells (groundwater quality and quantity);
- Effect on the cultural environment (i.e., Archaeological Resources); and,
- Capital costs.

These sections were updated in **Table 6-6: Comparative Evaluation of Alternative Well Areas 6 and 11**. Sections of Table 6-6 are highlighted in grey indicates that the information was not required to be updated based on the results of the 24-hour pumping test and is the same as the information presented in **Table 6-4: Comparative Evaluation of Alternative Well Areas**.

6.6.2.1 Alternative Well Area 6 – Green Lane

The following sections provide additional information on the new inputs to the comparative evaluation during this stage.

Technical

It was initially anticipated that an access road to Well Area 6 – Green Lane would require construction of a new entry off of Green Lane, a busy 4-lane road; however, given that a new development is proposed in the vicinity of this location, the access road could be constructed within the new development. This is the preferable option and would improve access to the site.

In terms of treatment requirements, the results of the 24-hour pumping test showed that water quality is higher at this site than previously anticipated. Prior to the 24-hour pumping test, it was reported that the site had water hardness, total organic nitrogen, iron and manganese levels at or above Ontario Drinking Water Quality Standards. Following the testing, it was confirmed that only hardness and iron levels are above Ontario Drinking Water Quality Standards, this can be addressed through standard water treatment measures.

Natural Environment

Groundwater drawdown can reduce the groundwater discharge to surface water features therefore reducing surface water quantity. Through water level monitoring during the 24-hour pumping test, it was determined that shallow drawdown did not occur. As such, the potential to affect surface water quantity in waterbodies within 500 m of Well Area 6 as a result of groundwater drawdown is considered low. This would be further assessed through additional monitoring and mitigated as necessary through standard mitigation measures (e.g., reduced pumping at sensitive times of the year).

No potential change in groundwater quality is anticipated from the operation of a new well at Well Area 6 due to the presence of a thick aquitard (approximately 50 m thick). The aquitard is the sequence of fine grained sediments that is observed between the surface and the target aquifer unit. Thick, competent aquitards have the potential to protect groundwater quality by inhibiting the downward migration of shallow contaminants during pumping. In addition, the aquitard provides separation between the surface water and the supply aquifer. This will be further evaluated via surface water monitoring during the 72-hour pumping tests in Stage 6. Additionally, potential impacts on groundwater quality will be mitigated through the implementation of Source Water Protection requirements for the new well.

Disturbance to aquatic species and habitat and terrestrial species and habitat as a result of groundwater drawdown during operation of the well is considered low with the presence of an aquitard approximately 50 m thick. The anticipated absence of shallow groundwater drawdown will be confirmed through 72-hour pumping tests. Any disturbance to aquatic and terrestrial species and habitat would be assessed through additional monitoring and mitigated as necessary through standard mitigation measures.

Cultural Environment

A Stage 2 Archaeological Assessment at Well Area 6 was conducted on April 29, 2014 and consisted of the physical survey of subject lands via pedestrian survey methods at an interval of 5 m. The study area consisted of approximately 12.3 hectare (ha) of overgrown land that was ploughed and weathered for assessment, located on the north

side of Green Lane East with a 270 m linear corridor from the proposed access route to the study area. No archaeological sites or material were identified within the proposed construction area for Well Area 6 during the course of the assessment. There are no concerns regarding impacts to archaeological sites by the proposed development and no further archaeological assessment of the property is required. This Stage 2 Archaeological Assessment Report and associated MTCS confirmation letter are provided in **Appendix A**.

Built Environment

Although purchasing private property would be required at this site, initial discussions with the landowner suggest that they would be amenable to entering into an agreement with York Region to sell a portion of their property. York Region continues consultation with the landowner with regard to property acquisition.

Potential adverse effects on private and municipal wells are not anticipated. Although these effects are not anticipated, should residents have concerns, York Region has a responsibility to address any adverse groundwater impacts and will respond accordingly.

Financial

The capital cost for developing a well facility at Well Area 6 – Green Lane is based on an estimated well capacity of between 80-100 L/s. Capital costs were calculated using the lower-end of the estimated capacity range (80 L/s). Additional water quality information was available through the 24-hour pumping test which indicated that iron is present at a concentration slightly higher than the Ontario Drinking Water Quality Standards but much lower than at the Well Area 11 test site. Although total organic nitrogen was present in the sample collected during the step test, it was not detected during the pumping test. Based on the additional water quality information from the 24-hour pumping test, the required treatment processes considered in the original cost estimate were reviewed. Capital costs for this location were consistent with the previous cost estimate. Therefore the total cost estimate for Well Area 6 is $2.9M, which based on the estimate well capacity of 6,912 m^3/day (80 L/s) is $430 per m^3/day.

Operating costs were estimated based on data made available by York Region, a participant in the National Water and Wastewater Benchmarking Initiative, for the Yonge Street Aquifer wells and assuming that the wells would be operating at average capacity.

A Life Cycle Cost was developed based on 20 years of operation with well rehabilitation occurring every 5 years at a cost of $15,000 per event. This produced an estimated Life Cycle Cost of $11.1M or $0.22/$m^3$.

6.6.2.2 Alternative Well Area 11 – Aurora Well No. 5

Technical

The estimated well capacity of a new well at Well Area 11 – Aurora Well No.5 is between 40-65 L/s. This estimate was initially based on the hydrogeological conditions known from previous work at this site, observations during drilling, performance of the existing well, step testing completed on the test well and was confirmed through the 24-hour pumping tests. The results of the 24-hour pumping test also presented the same water quality characteristics that were identified during Stage 2. Therefore, no further treatment requirements, outside of those already identified would be necessary at Well Area 11 – Aurora Well No.5.

The results also confirmed that a new Water Supply Well at this site would cause drawdown in surrounding municipal wells (Newmarket Wells 13 and 16 located 1.5 km away, Aurora Well 6 located 1.8 km away and Aurora Wells 1-4 (located 1.6 km away); however, it is not anticipated that this would adversely affect the function of these wells. Due to the potential effect to municipal wells, Well Area 11 - Aurora Well No. 5 was ranked second compared to Well Area 6 – Green Lane in the technical category.

Natural Environment

Groundwater drawdown can reduce the groundwater discharge to surface water features therefore reducing surface water quantity. Through water level monitoring during the 24-hour pumping test, it was determined that shallow drawdown did not occur. As such, the potential to affect surface water quantity in waterbodies within 500 m of Well Area 6 as a result of groundwater drawdown is considered low. This would be further assessed through additional monitoring and mitigated as necessary through standard mitigation measures (e.g., reduced pumping at sensitive times of the year).

No potential change in surface and groundwater quality is anticipated due to the presence of a thick aquitard, approximately 34 m thick. The aquitard is the sequence of fine grained sediments that is observed between the surface and the target aquifer unit. Thick, competent aquitards have the potential to protect groundwater quality by inhibiting the downward migration of shallow contaminants during pumping. Additionally, potential impacts on groundwater quality will be mitigated through the implementation of Source Water Protection requirements for the new well.

Disturbance to aquatic species and habitat and terrestrial species and habitat as a result of groundwater drawdown during operation of the well is considered low with the presence of an aquitard approximately 34 m thick and no observations of shallow water level drawdown. This will be confirmed through the 72-hour pumping tests. Any disturbance to aquatic and terrestrial species and habitat would be assessed through

additional monitoring and mitigated as necessary through standard mitigation measures.

Cultural Environment

A Stage 2 Archaeological Assessment was not required at Well Area 11 – Aurora Well No. 5 as the area is considered previously disturbed and as such, does not retain archaeological potential.

Built Environment

Potential adverse effects on private wells at current water levels are not anticipated; however, during drought conditions, more private wells could be susceptible to drawdown caused by pumping a New Water Supply well at Well Area 11 – Aurora Well No. 5, than at Well Area 6 – Green Lane, which is why Well Area 11 – Aurora Well No. 5 was ranked second in this evaluation following the 24-hour pumping tests. Potential adverse effects to municipal wells are not anticipated under current or under drought conditions. Although these effects are not anticipated, should residents have concerns, York Region has a responsibility to address any adverse groundwater impacts and will respond accordingly.

Financial

The capital cost for developing a well facility at the Well Area 11 – Aurora Well No. 5 site is based on an estimated well capacity of between 40-65 L/s. Capital costs were calculated using the lower-end of the estimated capacity range (40 L/s). Water quality information remains consistent with historical information available prior to the 24-hour pumping test. Capital costs for this location were not changed from the earlier estimate. Therefore the total cost estimate for Well Area 11 is $1.7M which translates to $490 per m^3/day of capacity, based on pumping 3,456 m^3/day.

Operating costs were estimated based on data made available by York Region, a participant in the National Water and Wastewater Benchmarking Initiative, for the Yonge Street Aquifer wells and assuming that the wells would be operating at average capacity.

A Life Cycle Cost was developed based on 20 years of operation with well rehabilitation occurring every 5 years at a cost of $15,000 per event. This produced an estimated Life Cycle Cost of $4.2M or $0.17/$m^3$.

6.6.2.3 Comparative Evaluation of Alternative Well Areas 6 and 11

The following comparative evaluation table presents the findings of the updated analysis. Well Areas 6 - Green Lane and 11 – Aurora Well No. 5 were assessed again through an updated “net effects analysis" and comparatively evaluated to identify the preferred Well Areas for 72-hour pumping tests, as shown in **Table 6-6**. It was determined that Alternative Well Areas 6 and 11 would proceed with drilling a large diameter test well, followed by a 72-hour pumping test to confirm the potential to establish a new municipal supply well at each location.

Table 6-6: Comparative Evaluation of Alternative Well Areas 6 and 11

Category of Consideration	Well Area 6 – Green Lane	Well Area 11 – Aurora Well No. 5
Technical Category Ranking	1st Water quality requires less treatment than Well Area 11; however, area has existing sanitary servicing and watermain planned in 2025 and a temporary watermain will be constructed in the interim.	2nd Water quality is consistent with existing well in same location; the existing well facility has an access road and watermain.
Natural Environment Category Ranking	2nd No effects to aquatic or terrestrial species or habitat anticipated. Net effects not anticipated as a result of siting considerations and standard construction best management practices.	1st No effects to aquatic or terrestrial species or habitat anticipated as a result of siting considerations and standard construction best management practices.
Built Environment Category Ranking	1st (Tied) Area has least disruption on existing residences although future and existing land uses could be affected through new Wellhead Protection Area.	1st (Tied) Area has some disruption on existing residences, does not require property acquisition and has no effects on existing agricultural operations.
Social Environment Category Ranking	1st (Tied) Fewest sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	1st (Tied) More noise sensitive receptors will be disturbed during construction; however, given that a well house currently exists at the area, effects during operations are not anticipated to differ from current conditions
Cultural Environment Category Ranking	2nd Effects on cultural heritage landscape considered minimal and no archaeological resources would be affected at this area.	1st No cultural heritage or archaeological resources would be affected at this Area.
Financial Category Ranking	1st (Tied) The Area has higher land acquisition costs; however, slightly lower capital costs based on production capacity.	1st (Tied) There are no land acquisition costs and the Area has the lowest capital cost based on production capacity.
Does the Well Area fulfill the requirements of the Problem/ Opportunity Statement?	Yes	Yes
Overall Results and Ranking	**Second** **Alternative Well Area 6 is recommended to be carried forward for 72-hour pumping test.**	**First** **Alternative Well Area 11 is recommended to be carried forward for 72-hour pumping test.**

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Technical Category Ranking		Water quality requires less treatment than Well Area 11; however, area has existing sanitary servicing and watermain planned in 2025.	Water quality is consistent with existing well in same location; the existing well facility has an access road and watermain.
		First	***Second***
Constructability of Proposed Well House	An evaluation of the conditions of the proposed well site location, based on: 1. Site access; 2. Constructability (geotechnical, proximity to adjacent buildings, etc.); 3. Proximity to municipal distribution system/ large diameter watermains; and 4. Proximity to sanitary collection system for building and process drainage;	1. Requires construction of access road off busy 4-lane road or through future development area (moderately preferred); 2. Moderate rolling topography in area requiring some cut and fill; greenfield site with suitable geotechnical conditions (least preferred); 3. Existing watermain at Green Lane and Yonge would be extended along Green Lane in 2025 and a temporary watermain will be constructed in the interim (most preferred); 4. Existing sanitary servicing in close proximity to the well area (most preferred). Area has planned watermain and existing sanitary utilities in close proximity; however, it has less favourable topography.	1. Existing access road (most preferred); 2. Existing well site with suitable geotechnical conditions (most preferred); 3. Existing watermain on St. John's Sideroad (most preferred); 4. Existing sanitary servicing in close proximity to the well area (most preferred). Existing well with suitable geotechnical conditions and connection to an existing watermain. Sanitary utilities are in close proximity.
	Rankings:	**Second**	**First**
Aquifer Productivity	An evaluation of the productivity potential of each well, based on: 1. Aquifer thickness; 2. Available drawdown; 3. Soil types / grain sizes between well locations; 4. Preliminary estimate of transmissivity (step-test results); 5. Specific capacity values; 6. Step-Test drawdown at 18 L/s; 7. Preliminary estimate of transmissivity (24-hour test results); 8. Pumping-Test drawdown (25 L/s at 8 hours); and 9. Estimated well capacity.	Most productive aquifer due to the following factors: 1. Aquifer Thickness: 31 m (moderately preferred); 2. Available Drawdown: 35.5 m (most preferred); 3. Grain Size Comparison – screen slot size recommendation: 0.281" (most preferred); 4. Preliminary Transmissivity (step-test): 21,750 m^2/day (most preferred); 5. Specific Capacity (18 L/s step): 15.0 L/s/m (most preferred); 6. Step-Test Drawdown (18 L/s): 1.20 m (most preferred); 7. Preliminary Transmissivity (24-hour test): 2,369 m^2/day (most preferred); 8. Pumping Test Drawdown (25 L/s at 8 hours): 9.99 L/s/m (most preferred); 9. Estimated well capacity: 80 -100 L/s (most preferred). Aquifer has highest transmissivity and specific capacity based on step-testing and pumping test, aquifer productivity is determined to be the highest compared to other Well Areas.	Second most productive aquifer due to the following factors: 1. Aquifer Thickness: 30 m (moderately preferred); 2. Available Drawdown: 45.3 m (most preferred); 3. Grain Size Comparison – screen slot size recommendation: 0.174" (moderately preferred); 4. Preliminary Transmissivity (step-test): 6,140 m^2/day (moderately preferred); 5. Specific Capacity (18 L/s step): 9.9 L/s/m (moderately preferred) ; 6. Step-Test Drawdown (18 L/s): 1.82 m (moderately preferred); 7. Preliminary Transmissivity (24-hour test): 2,302 (moderately preferred); 8. Pumping Test Drawdown (25 L/s at 8 hours): 8.04 L/s/m (least preferred); 9. Estimated well capacity: 40 - 65 L/s (moderately preferred). Although aquifer has the most available drawdown, it is it has lower transmissivity and specific capacity compared to Well Area 6. Following the 24-hour pumping test, it is anticipated that the maximum pumping capacity during operation will be limited to minimize effects on nearby municipal wells.
	Rankings:	**First**	**Second**

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Treatment Requirements	An evaluation of the raw well water quality and review of treatment requirements; based on: 1. Preliminary water quality results, all parameters listed in Ontario Regulation 169/03 (including levels of iron, manganese, nitrate, pH, sodium, Total Dissolved Solids, hardness, methane, organic nitrogen, etc.); 2. Consideration to be given to difficulty of treatment, operational requirements and associated costs; and 3. Review of Wellhead Protection Areas to identify any potential future treatment and monitoring requirements by identifying any risks within that zone in accordance with Source Water Protection standards of the *Clean Water Act*.	1. Hardness and iron above Ontario Drinking Water Quality Standards and presence of manganese and methane (at this level, treatment of manganese and methane isn't required) (moderately preferred); 2. Include treatment of iron (sequestration) (moderately preferred); 3. Mitigation measures are being identified through the development of Wellhead Protection Areas and will be incorporated into future planning policies (moderately preferred). Area has good water quality with iron treatment requirements, iron level were determined to be lower than Well Area 11.	1. Hardness and iron above Ontario Drinking Water Quality Standards and presence of manganese (at this level, treatment of manganese isn't required) (moderately preferred); 2. Expansion of existing treatment system, including iron sequestration or removal (moderately preferred); 3. There are existing mitigation measures in place, although these may need to be modified as a result of the potentially expanded Wellhead Protection Area due to increased pumping, and as such, additional risk may be identified (moderately preferred). Area has similar water quality to existing well and requires expansion/ upgrade to existing treatment processes.
	Rankings:	**Second (tied)**	**Second (tied)**
Approval Requirements	An evaluation of the approvals requirements specific to a proposed location, based on consideration of: 1. Municipal approvals (site plan approval, building permit); 2. Ministry of Environment and Climate Change (Permit to Take Water, Drinking Water Works Permit, Municipal Drinking Water Licence); 3. Oak Ridges Moraine Conservation Plan; 4. Lake Simcoe Region Conservation Authority (LSRCA); 5. Ministry of Natural Resources and Forestry (Endangered Species Act).	1. York Region will obtain appropriate municipal approvals from the Town of East Gwillimbury, including site plan approval and a building permit (moderately preferred); 2. York Region will amend the current Permit to Take Water/ Drinking Water Works Permit/ Municipal Drinking Water Licence from the Ministry of the Environment and Climate Change (moderately preferred); 3. The well area is not located within the Oak Ridges Moraine (most preferred); 4. York Region will not be required to obtain approval from the LSRCA for construction within LSRCA Regulated Area under Ontario Reg. 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) as the Well Site will be located outside of the Regulated Area (most preferred). 5. No permit or approval requirements are anticipated under the *Endangered Species Act* (most preferred). Area has fewest approval requirements.	1. York Region will obtain appropriate municipal approvals from the Town of Aurora, including site plan approval and a building permit (moderately preferred); 2. York Region will amend the current Permit to Take Water/ Drinking Water Works Permit/ Municipal Drinking Water Licence from the Ministry of the Environment and Climate Change (moderately preferred); 3. The well area is not located within the Oak Ridges Moraine (most preferred); 4. York Region will be required to obtain approval from the LSRCA for construction within LSRCA Regulated Area under Ontario Reg. 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) (least preferred). 5. No permit or approval requirements are anticipated under the *Endangered Species Act* (most preferred). Area is not located within the Oak Ridges Moraine; however, approval will be required from the LSRCA for construction within the Regulated Area.
	Rankings:	**First**	**Second**
Natural Environment Category Ranking		No effects to aquatic or terrestrial species or habitat anticipated. Net effects not anticipated as a result of siting considerations, standard construction best management practices.	No effects to aquatic or terrestrial species or habitat anticipated as a result of siting considerations and standard construction best management practices.
		Second	**First**

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Effect of Construction and Operation of Well House on Aquatic Species and Habitat	An evaluation of the effects of construction and operation of the well house (excluding groundwater drawdown) on aquatic species and habitat, based on: 1. Presence of aquatic species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and 2. Area of temporary or permanent loss of aquatic features or categorical loss of habitat functions by type – watercourses by sensitivity (thermal regime).	1. **Potential effects:** - Two permanent, warmwater tributaries of the East Holland River are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species in these features is not anticipated from construction of the well house. - No aquatic Species at Risk or Species of Conservation Concern are identified as potentially occurring within the Well Area; therefore, disturbance to these species is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** - Two permanent, warmwater tributaries of the East Holland River are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic features is not anticipated from construction or operation of the well house. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on aquatic species and habitat anticipated.	1. **Potential effects - Construction**: - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species in these features is not anticipated from construction of the well house. - Potential disturbance to aquatic species in a Provincially Significant Wetland within the Well Area from increased erosion and sedimentation. - No aquatic Species at Risk or Species of Conservation Concern are identified as potentially occurring within the Well Area; therefore, disturbance to these species is not anticipated. **Mitigation measures - Construction**: - Implement erosion and sediment control measures to prevent disturbance to aquatic species within the Provincially Significant Wetland from erosion and sedimentation. - No mitigation required for aquatic Species at Risk or Species of Conservation Concern (moderately preferred). **Potential effects – Operation**: - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to aquatic species in these features is not anticipated from operation of the well house. - Potential disturbance to aquatic species in the Provincially Significant Wetland from stormwater runoff. - No aquatic Species at Risk or Species of Conservation Concern are identified as potentially occurring within the Well Area; therefore, disturbance to these species is not anticipated. **Mitigation measures - Operation**: - Develop a stormwater management plan prior to construction to prevent disturbance to aquatic species within the Provincially Significant Wetland from stormwater runoff. - No mitigation required for aquatic Species at Risk or Species of Conservation Concern (moderately preferred). 2. **Potential effects - Construction:** - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to these features is not anticipated from construction of the well house. - Disturbance to aquatic habitat in the Provincially Significant

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
			Wetland within the Well Area due to erosion and sedimentation. **Mitigation measures - Construction:** - Implement erosion and sediment control measures to prevent disturbance to aquatic habitat within the Provincially Significant Wetland from erosion and sedimentation (moderately preferred). **Potential effects - Operation:** - A permanent, coldwater watercourse (Tannery Creek) and a pond are present within the Well Area; however, these features are more than 120 m away from the Well Site. Therefore, disturbance to these features is not anticipated from operation of the well house. - Disturbance to aquatic habitat in the Provincially Significant Wetland within the Well Area due to stormwater runoff. **Mitigation measures - Operation:** - Develop a stormwater management plan prior to construction to prevent disturbance to aquatic habitat within the Provincially Significant Wetland from stormwater runoff (moderately preferred). **Net effects:** No effects on aquatic species and habitat anticipated.
	Rankings:	**First (tied)**	**First (tied)**
Effect of Construction and Operation of Well House on Terrestrial Species and Habitat	An evaluation of the effects of construction and operation of the well house (excluding groundwater drawdown) on terrestrial species and habitat, based on: 1. Presence of terrestrial species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and 2. Area of temporary or permanent loss of terrestrial features or categorical loss of habitat functions by type – including Provincially Significant Wetland (PSW), Locally Significant Wetland (LSW), Environmentally Significant Areas (ESA), Areas of Natural and Scientific Interest (ANSI), Significant Wildlife Habitat (SWH), and others.	1. **Potential effects - Construction:** Disturbance to terrestrial species potentially occurring in agricultural fields within the Well Site not anticipated as a result of this Project as area is owned by developer with plans for future development. **Mitigation measures - Construction:** No mitigation required (most preferred). **Potential effects - Operation:** No disturbance to terrestrial species from operation of the well house is anticipated. **Mitigation measures - Operation:** No mitigation required (most preferred). 2. **Potential effects - Construction:** - Disturbance to unevaluated wetlands adjacent to the Well Site from accidental damage to vegetation, and erosion and sedimentation during construction. **Mitigation measures - Construction:** - Disturbance to unevaluated wetlands adjacent to the Well Site would be avoided by clearly defining the work area and implementing erosion and sediment control measures to prevent accidental damage to vegetation, and erosion and	1. **Potential effects - Construction:** - No natural terrestrial habitat occurring within the Well Site; therefore disturbance to terrestrial species not anticipated. **Mitigation measures - Construction:** No mitigation required (most preferred). **Potential effects - Operation:** No disturbance to terrestrial species from operation of the well house is anticipated. **Mitigation measures - Operation:** No mitigation required (most preferred). 2. **Potential effects - Construction:** - Disturbance to Provincially Significant Wetland within the Well Area from increased erosion and sedimentation. **Mitigation measures - Construction:** - Disturbance to Provincially Significant Wetland avoided by siting the Well Site more than 30 m away from the wetland. Implement erosion and sediment control measures to prevent disturbance to the Provincially Significant Wetland from erosion and sedimentation (most preferred). **Potential effects - Operation:** Disturbance to terrestrial

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		sedimentation. **Potential effects - Operation:** - Disturbance to terrestrial habitat within the Well Area from stormwater runoff. **Mitigation measures - Operation:** - Develop a stormwater management plan prior to construction to prevent disturbance to terrestrial habitat from stormwater runoff (moderately preferred). **Net effects:** Effects to terrestrial habitat and species avoided through application of mitigation measures.	habitat within the Well Area from stormwater runoff. **Mitigation measures - Operation:** Develop a stormwater management plan prior to construction to prevent disturbance to terrestrial habitat from stormwater runoff (moderately preferred). **Net effects:** Effects to terrestrial habitat and species avoided through application of mitigation measures.
	Rankings:	**Second**	**First**
Effect on Aquatic Species and Habitat from Groundwater Drawdown	An evaluation of the effects on aquatic species and habitat from groundwater drawdown, based on: 1. Presence of aquatic species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and 2. Area of temporary or permanent loss of aquatic features or categorical loss of functions by type – watercourses by sensitivity type (thermal regime).	1. **Potential effects:** - Disturbance to potentially occurring aquatic species in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and absence of drawdown in shallow system during pumping test. - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 6; therefore, disturbance to these species as a result of groundwater drawdown is not anticipated. **Mitigation measures:** - Disturbance to potentially occurring aquatic species from groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells. - No mitigation required for Species at Risk of Species of Conservation Concern (most preferred). 2. **Potential effects:** Disturbance to two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and absence of drawdown in shallow system during pumping test. **Mitigation measures:** Disturbance to aquatic habitat from groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred).	1. **Potential effects:** - Disturbance to potentially occurring aquatic species in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and absence of drawdown in shallow system during pumping test. - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 11; therefore, disturbance to these species as result of groundwater drawdown is not anticipated. **Mitigation measures**: - Disturbance to potentially occurring species from groundwater drawdown during operations of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells. - No mitigation required for Species at Risk or Species of Conservation Concern (most preferred). 2. **Potential effects:** Disturbance to aquatic habitat in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of Well Area 11 as a result groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and absence of drawdown in shallow system during pumping test. **Mitigation measures:** Disturbance to aquatic habitat from groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		Net effects: Effects on aquatic species and habitat from groundwater drawdown not anticipated.	PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Terrestrial Species and Habitat from Groundwater Drawdown	An evaluation of the effects on terrestrial species and habitat from groundwater drawdown, based on: 1. Presence of terrestrial species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare), and area-sensitive species; and 2. Area of temporary or permanent loss of terrestrial features or categorical loss of habitat functions by type – including Provincially Significant Wetland (PSW), Locally Significant Wetland (LSW), Environmentally Significant Areas (ESA), Areas of Natural and Scientific Interest (ANSI), Significant Wildlife Habitat (SWH), and others.	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in two tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and absence of drawdown in shallow system during pumping test. **Mitigation measures:** Disturbance to terrestrial species as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). 2. **Potential effects:** Disturbance to terrestrial features associated with two tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and absence of drawdown in shallow system during pumping test. **Mitigation measures:** Disturbance to terrestrial features as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through adjustments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on terrestrial species and habitat from groundwater drawdown not anticipated.	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in a Provincially Significant Wetland and a pond, Tannery Creek and an unnamed tributary of Tannery Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and absence of drawdown in shallow system during pumping test. **Mitigation measures:** Disturbance to terrestrial species as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through adjustments to the PTTW for operations of YSA wells (most preferred). 2. **Potential effects:** Disturbance to terrestrial features associated with a Provincially Significant Wetland and a pond, Tannery Creek and an unnamed tributary of Tannery Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and absence of drawdown in shallow system during pumping test. **Mitigation measures:** Disturbance to terrestrial features as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through adjustments to the PTTW for operations of YSA wells (most preferred). **Net effects:** Effects on terrestrial species and habitat from groundwater drawdown not anticipated.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Groundwater Quality	An evaluation of temporary and/or long-term change in groundwater quality due to: 1. Groundwater drawdown.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and the implementation of Source Water Protection measures. Aquifer was shown to be of sufficient quality for a municipal water supply well through pumping test water quality sampling.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and the implementation of Source Water Protection measures. Aquifer was shown to be of sufficient quality for a municipal water supply well through pumping test water quality sampling.

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		Mitigation measures: No mitigation required as no effects are anticipated (most preferred). **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.	**Mitigation measures:** No mitigation required as no effects are anticipated (most preferred). **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Surface Water Quantity	An evaluation of temporary and/or long-term change in quantity of surface water bodies (including those identified in the "Proximity to wetlands/streams" criteria used to assess the Potential Alternative Well Areas) due to: 1. Construction or operation of the well house; and 2. Groundwater drawdown during operation of the well.	1. **Potential effects:** Temporary and/or long-term change in surface water quantity due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). **2. Potential effects:** Temporary and/or long-term change in surface water quantity in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and the absence of drawdown in shallow system during pumping test. **Mitigation measures:** Decrease in surface water quantity as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells(most preferred) **Net effects:** Changes to surface water quantity not anticipated.	1. **Potential effects:** Temporary and/or long-term change in surface water quality due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quantity in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and the absence of drawdown in shallow system during pumping test. **Mitigation measures:** Decrease in surface water quantity as a result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells(most preferred). **Net effects:** Changes to surface water quantity not anticipated.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Surface Water Quality	An evaluation of temporary and/or long-term change in quality of surface water bodies (including those identified in the "Proximity to wetlands/streams" criteria used to assess the Potential Alternative Well Area) due to: 1. Construction or operation of the well house; and 2. Groundwater drawdown during operation of the well.	**1. Potential effects:** Temporary and/or long-term change in surface water quality water due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Temporary and/or long-term change in surface water quality in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and the absence of drawdown in shallow system during pumping test. **Mitigation measures:** Decrease in surface water quality as a	1. **Potential measures:** Temporary and/or long-term change in surface water quality due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** Decrease in surface water quality in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and the absence of drawdown in shallow system during pumping test. **Mitigation measures:** Decrease in surface water quantity as

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		result of groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells(most preferred). **Net effects:** Changes to surface water quality not anticipated.	a result groundwater drawdown during operation of the well would be assessed through additional monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells(most preferred). **Net effects:** Changes to surface water quality not anticipated.
	Rankings:	**First (tied)**	**First (tied)**
Built Environment Category Ranking		Area has least disruption on existing residences although future and existing land uses could be affected through new Wellhead Protection Area.	Area has some disruption on existing residences, does not require property acquisition and has no effects on existing agricultural operations.
		First (tied)	***First (tied)***
Effect on Existing and/or Future Planned Residences, Businesses, and / or Community, Institutional and/or Recreational Facilities	An evaluation of the effects on existing or future planned buildings, based on: 1. Displacement and/or temporary or permanent disruption to residences, businesses, and / or community, institutional, and recreational facilities; and 2. Future planned, or approved land uses, including those affected by the addition of new Wellhead Protection Areas. These may include but are not limited to existing and future agricultural operations, Environmental Protection Areas, and the Oak Ridges Moraine Conservation Plan (ORMCP) Area designations.	1. **Potential effects:** No existing residences, businesses, and / or community, institutional and/or recreational facilities within the Alternative Well Area; minimal disruption associated with constructing utilities as area has existing sanitary servicing and watermain planned in year 2025. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** - No changes required to the approved land use designations to accommodate the Well Site as it is a permitted use in the land use designations associated with Well Area 3 as per Section 4.15.1 of the 2014 East Gwillimbury Official Plan (In Effect). - Potential disruption to future land uses through the addition of a new Wellhead Protection Area. **Mitigation measures:** - No applicable mitigation measures for the disruption to future land uses (least preferred). **Net effects:** Area has fewest impacts on existing nearby residences. The addition of a new Wellhead Protection Area could affect future development.	1. **Potential effects:** Displacement and/or temporary disruption to existing land uses within the Well Area which include the existing municipal well site, a law office, a seniors' residence, a restaurant, and a number of residences on Old Yonge Street in the southern portion of the Well Area is not anticipated as the new well would be located within the existing Well Site and area is currently serviced by watermain and sanitary services are in close proximity. **Mitigation measures:** No mitigation required (most preferred). 2. **Potential effects:** - No changes required to the approved land use designations to accommodate the Well Area as the Well Site would be within the existing Well Site. - Potential disruption to future planned land uses through the expansion of the Wellhead Protection Area not anticipated. **Mitigation measures:** No applicable mitigation (most preferred). **Net effects:** Area has moderate impacts on existing nearby residences. The construction of a well house is consistent with existing land uses.
	Rankings:	**Second**	**First**
Effect on Property (ownership, size, and willingness of property owner)	An evaluation of effects on properties, based on: 1. Total area of property acquisition required (ha), whether property is privately or publicly owned, and willingness of property owner.	1. The acquisition of private property would be compensated for (as required) at fair market value in accordance with York Region's policies (least preferred). Preliminary discussions with landowners indicate potential interest in entering into an agreement with York Region. Property acquisition required.	1. No property acquisition required for the Well Site (most preferred). Area would not require property acquisition as York Region currently owns the property.
	Rankings:	**Second**	**First**

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Effect on Existing Utility Infrastructure	An evaluation of effects on existing utilities, based on: 1. Disruption to existing major utilities and duration of adverse effects.	1. **Potential effects:** - Potential temporary disruption to existing utilities during construction. - No permanent disruption to major utilities during operation of the well house. **Mitigation measures:** - Temporary disruption to existing major utilities will be mitigated by standard construction best management practices. No mitigation required for permanent disruption to major utilities (moderately preferred). **Net effects:** Effects on existing utilities will be mitigated by standard construction best management practices.	1. **Potential effects:** - Potential temporary disruption to existing utilities during construction. - No permanent disruption to major utilities during operation of the well house. **Mitigation measures:** - Temporary disruption to existing major utilities will be mitigated by standard construction best management practices. Existing site has all utilities present. - No mitigation required for permanent disruption to major utilities (moderately preferred). **Net effects:** Effects on existing utilities will be mitigated by standard construction best management practices.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Existing Agricultural Operations	An evaluation of effects on existing agricultural operations, based on: 1. Presence of active agricultural operations.	1. **Potential effects:** Area is owned by developer with plans for future development, as such, effects on agricultural operations from this Project not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on agricultural operations anticipated as a result of this Project.	1. **Potential effects:** No agricultural operations within the Well Area; therefore, no effect on active agricultural operations is anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** No effects on agricultural operations as none are present in the Well Area.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Private Wells (groundwater quality and quantity)	An evaluation of effects on private wells, based on: 1. Comparison of the density of private wells in the vicinity of each well.	1. **Potential effects:** The potential effect to private wells (1 well within 500 m of the Well Site) as a result of groundwater drawdown. **Mitigation measures:** The effects on private wells as a result of groundwater drawdown would be assessed by monitoring (72-hour pumping test)and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** The 24-hour pumping test has demonstrated that adverse effects on private wells in the vicinity of Well Area 6 are not anticipated. Well Area 6 was rated first under this evaluation criteria since it has the lowest density of private wells.	1. **Potential effects:** The potential effect to private wells (3 wells within 500 m of the Well Site) as a result of groundwater drawdown. **Mitigation measures**: The effects on private wells as a result of groundwater drawdown would be assessed by monitoring (72-hour pumping test)and mitigated as necessary through amendments to the PTTW for operations of YSA wells (most preferred). **Net effects:** The 24-hour pumping test has demonstrated that adverse effects on private wells in the vicinity of Well Area 11 are not anticipated. Well area 11 was ranked second as it has a higher density of private wells as Well Area 6.
	Rankings:	**First (tied)**	**First (tied)**
Effect on Municipal Wells (groundwater quality and quantity)	An evaluation of effects on municipal wells, based on: 1. Comparison of the density of municipal wells in the vicinity of each well; and 2. The distance to other permitted takers.	1. **Potential effects:** Potential effect to municipal wells (Newmarket Well 15 located 2 km away, and Holland Landing Well 1 located 2 km away) as a result of groundwater drawdown. There are only York Regional municipal wells within the area of potential effect. All these Regional wells are operated based on one combined PTTW. **Mitigation measures:** Effects on municipal wells would be	1. **Potential effects**: Potential effect to municipal wells (Newmarket Wells 13 and 16 located 1.5 km away, Aurora Well 6 located 1.8 km away and Aurora Wells 1-4 located 1.6 km away) as a result of groundwater drawdown. There are only York Regional municipal wells within the area of potential effect. All these Regional wells are operated based on one combined PTTW.

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		assessed by monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells(moderately preferred). 2. **Potential effects:** Effects to other Permit to Take Water holders not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Well Area 6 is the most preferred; it has no Permit to Take Water holders within 2 km.	**Mitigation measures:** Effects on municipal wells would be assessed by monitoring (72-hour pumping test) and mitigated as necessary through amendments to the PTTW for operations of YSA wells (moderately preferred). 2. **Potential effects:** Effects to other Permit to Take Water holders not anticipated. **Mitigation measures:** No mitigation required (most preferred). **Net effects:** Well Area 11 was ranked second as it has the highest density of municipal wells.
	Rankings:	**First**	**Second**
Social Environment Category Ranking		Fewest sensitive receptors will be disturbed during construction; however, noise effects during operations will be minimized through the use of mitigation measures.	More noise sensitive receptors will be disturbed during construction; however, given that a well house currently exists at the area, effects during operations are not anticipated to differ from current conditions
		First (tied)	***First (tied)***
Effect of Noise/Vibration on Sensitive Receptors	An evaluation of effects on noise sensitive receptors, based on: 1. Presence of sensitive receptors and duration of construction schedule; and 2. Disruption during the operations phase.	1. **Potential effects - Construction:** No existing residences, businesses, and / or community, institutional and / or recreational facilities within the Well Area. This area also has more ambient noise from higher traffic volumes compared to the other well areas; therefore, minimal effects from noise associated with the construction of the well house are anticipated. **Mitigation measures - Construction:** Implement construction related Best Management Practices (i.e., limit heavy construction to daytime hours, use of construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC-115), and adhering to the Town of East Gwillimbury's Noise By-law (2004-80) (most preferred). 2. **Potential effects - Operation:** No existing residences, businesses, and / or community, institutional and / or recreational facilities within the Well Area. This area also has more ambient noise from higher traffic volumes compared to the other well areas; therefore, minimal effects from noise associated the operations phase are anticipated. **Mitigation measures - Operation:** Potential noise effects during the operations phase will be minimized through the design and implementation of noise mitigation measures at the well house (moderately preferred). **Net effects:** Area has fewest sensitive receptors and noise effects during operations will be minimized through the use of mitigation measures.	1. **Potential effects - Construction:** Effects on several commercial operations, a seniors' residence, and a number of houses within the Well Area and adjacent to the Well Site (noise sensitive receptors) due to construction of the well house. **Mitigation measures - Construction:** Implement construction related Best Management Practices (i.e., operators limit impact noise from tailgate, use of construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC-115), and adhering to the Town of Aurora's Noise By-law (4787-06) (moderately preferred). 2. **Potential effects - Construction:** Effects on several commercial operations, a seniors' residence, and a number of houses within the Well Area and adjacent to the Well Site (noise sensitive receptors) during the operations phase. **Mitigation measures - Construction:** Potential noise effects during the operations phase will be minimized through the design and implementation of noise mitigation measures at the well house (most preferred). **Net effects:** Some noise sensitive receptors will be disturbed during construction; however, given that a well house currently exists at the area, effects during operations are not anticipated to differ from current conditions.
	Rankings:	**First (tied)**	**First (tied)**

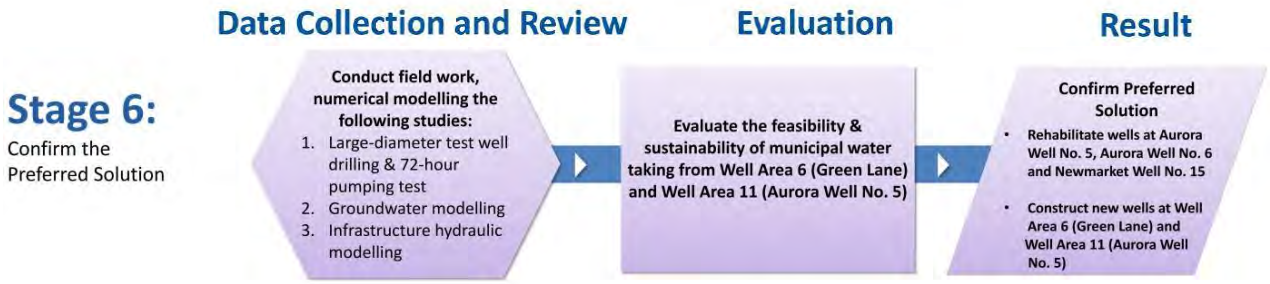
Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Cultural Environment Category Ranking		Minimal effects on cultural heritage landscapes and no concerns for the impact to archaeological sites by the proposed development, as such, no further archaeological assessment of the property is required.	No cultural heritage or archaeological resources would be affected at this Area.
		Second	***First***
Effect on Cultural Heritage Landscapes and Built Heritage Resources	An evaluation of effects on cultural heritage resources, based on: 1. Presence of cultural heritage landscapes; and 2. Presence of built heritage resources.	1. **Potential effects:** Effects on a small area of one cultural heritage landscape (agricultural land) considered minimal as proposed area is owned by developer with plans for future residential and commercial development. **Mitigation measures:** No mitigation required (moderately preferred). 2. **Potential effects:** No potential effects on built heritage resources are anticipated as there are no registered built heritage resources within the Alternative Well Area. **Mitigation measures:** None required (most preferred). **Net effects:** Effects are considered minimal as the well house will be designed in a manner so as to fit into the surroundings.	1. **Potential effects:** No cultural heritage landscapes within the Alternative Well Area. **Mitigation measures:** None required. (most preferred). 2. **Potential effects:** No potential effects on built heritage resources as there are any registered built heritage resources within the Alternative Well Area. **Mitigation measures:** None required (most preferred). **Net effects:** No cultural heritage resources would be affected at this Area.
	Rankings:	**Second**	**First**
Effect on Potential Archaeological Resources	An evaluation of effects on archaeological resources, including: 1. Presence of areas with archaeological potential (i.e., lands with potential archaeological resources) affected.	1. **Potential effects:** The Stage 2 Archaeological Assessment did not identify archaeological sites or material within the Well Area. **Mitigation measures:** None required (most preferred). **Net effects:** There are no concerns for the impact to archaeological sites by the proposed development and no further archaeological assessment of the property is required.	1. **Potential effects:** No archaeological potential because Well Area has been previously disturbed due to the existing municipal well (most preferred). **Net effects:** No archaeological resources would be affected at this Area.
	Rankings:	**First (tied)**	**First (tied)**
Financial Category Ranking		The Area has higher land acquisition costs; however, slightly lower capital costs based on production capacity.	There are no land acquisition costs and the Area has the lowest capital cost based on production capacity,
		First (tied)	***First (tied)***
Capital Costs (Life cycle cost per m^3)	An evaluation of the capital and operation & maintenance costs, including: 1. Costs associated with land acquisition (in 2012 dollars); 2. Estimated Capital Cost; and 3. Life Cycle Cost (20 year)	1. Estimated property value of $172,000 per ha 2. Estimated capital cost: • $2.9 Million • Equal to $425 per m^3/day of proposed capacity, based on a capacity of 6,910 m^3/day (80 L/s) (most preferred). 3. Life cycle cost estimate: • $11.1 Million • Equal to $0.22 per m^3 produced (most preferred). Low capital cost based on estimated production capacity relative to other Well Areas.	1. No land acquisition costs as the Well Area is currently owned by York Region. 2. Estimated capital cost: • $1.7 Million • Equal to $490 per m^3/day of proposed capacity, based on capacity of 3,460 m^3/day (40 L/s) (most preferred). 3. Life cycle cost estimate: • $4.2 Million • Equal to $0.17 per m^3 produced (most preferred). Low capital cost based on production estimated capacity relative to other Well Areas.
	Rankings:	**First (tied)**	**First (tied)**

6.6.3 Stage 5 Results

Following the evaluation conducted during Stage 5, it was determined that the Recommended Preferred Solution includes: constructing new wells at Well Area 6 and Well Area 11 and, rehabilitating Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No. 15. The combination of constructing new wells and rehabilitating existing wells will meet the objectives of the Problem/Opportunity statement as it will re-establish the permitted well capacity, ensure that future water demands can be met, maintain/enhance the reliability of the water supply and ensure the responsible management of groundwater in the Yonge Street Aquifer is continued.

A long term monitoring program will be proposed as part of the YSA PTTW Amendment application process.

6.7 Stage 6: Confirm Preferred Solution.



6.7.1 Stage 6 Data Collection and Review

This stage involved drilling a large diameter test well, conducting a 72-hour pumping test, groundwater modelling and infrastructure hydraulic modelling at each of Well Area 6 (Green Lane site) and Well Area 11 (Aurora Well No. 5 site) to confirm the Preferred Solution. This stage was completed between January and October, 2016. Pumping tests, approximately 72-hours in duration, were conducted to monitor the response of the groundwater system to pumping the test wells, and to collect groundwater samples for laboratory analysis.

The data collected from the 72-hour pumping tests was used to provide additional information on the aquifer productivity at each location and to assess the net effects on the environment related to aquatic species, terrestrial species and habitat, groundwater quality, surface water quantity and quality, and private or municipal wells (groundwater quality and quantity).

The table below presents the results of the 72-hour pumping test at Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5.

Table 6-7: Results of 72-hour Pumping Tests

Technical Consideration	Well Area 6 - Green Lane	Well Area 11- Aurora Well No. 5
Test Well Depth (m)	93	97.5
Test Pumping Rate (L/s)	55	55
Predicted Production Well Rate (L/s)	55	55
Potential Interference with Private Supply Wells	Yes	Yes
Potential Interference with Municipal Wells	Yes	Yes
Potential Impacts to Shallow Groundwater System	No	No
Aquifer Water Quality	Hardness and iron above O. Reg. 169/03 Standards	Hardness and iron above O. Reg. 169/03 Standards

The results of the 72-hour pumping tests suggest that both Alternative Well Areas have favourable conditions for a municipal supply well.

6.7.2 Stage 6 Evaluation

To meet the desired objectives of this project, i.e., to reinstate the full permitted capacity of the Yonge Street Aquifer by recovering lost production capacity (60 L/s), and to provide additional redundancy to allow for downtime and maintenance of existing well facilities (up to 90 L/s), the Recommended Preferred Solution as presented in Stage 5 consisted of:

- Rehabilitation of existing wells Aurora 5, 6 and Newmarket 15 to restore up to 29 L/s;
- New well at the existing Well Area 11 - Aurora Well No. 5 with an estimated capacity of 40 to 65 L/s; and,
- New well at Well Area 6 - Green Lane with an estimated capacity of 80 to 100 L/s.

Subject to further testing and verification, it was determined that with the combination of these components, a minimum of 150 L/s could be available to meet the objectives above.

Since the Recommended Preferred Solution was introduced at the second Public Information Centre, and prior to commencement of the final phase of groundwater exploration investigation (large diameter well drilling and 72 hour pumping tests), a number of activities were undertaken:

- York Region completed rehabilitation of the Newmarket 15 and Aurora 6 wells in 2014-2015, restoring approximately 13 L/s of production capacity to date.
  - The total amount of restored capacity is less than anticipated. This reinforces the need for new wells given that the existing wells will experience a further decline in capacity as they age.
- In order to realize the expected capacity of 80 to 100 L/s at Well Area 6 - Green Lane, it would be necessary to construct either one large well (e.g., 400 mm (16") diameter) or two smaller wells (e.g., 300 mm (12") diameter). Due to the high cost associated with drilling a larger diameter well and the associated risks, York Region decided to proceed with one 300 mm (12") diameter well at each site. Therefore, the revised plan for developing wells to achieve the desired capacity includes:
  - Well Area 11 - Aurora Well No. 5 – the new 300 mm (12") diameter well is expected to be capable of producing 55 L/s when operated concurrently with the existing Aurora 5 well. The addition of increased capacity (above 55 L/s for the new well) at this site is not recommended at this time due to the resulting interference with existing municipal and private wells.
  - Well Area 6 - Green Lane – the new 300 mm (12") diameter well is expected to be capable of producing 55 L/s; however, based on the testing data and screening results from the York 2013 Ballantrae groundwater flow model, there is opportunity to develop a second well with production of 40 to 50 L/s in order to meet the objective of providing additional capacity for system redundancy or possibly well replacement. It is proposed that a second well be incorporated into the plans for property acquisition, and facility and infrastructure design at the Green Lane site.

The Recommended Preferred Solution has been refined to incorporate implementation phasing as follows:

- Continued rehabilitation of existing wells to mitigate decline in capacity over time;
- New 300 mm diameter well at the Well Area 11 - Aurora Well No. to provide capacity of 55 L/s;
- New 300 mm diameter well at the Well Area 6 - Green Lane site to provide capacity of 55 L/s; and,
- Future second 300 mm diameter well at the Green Lane site to provide additional capacity of 40 to 50 L/s.

The net effects discussion was then updated to include the results of the test well drilling, 72-hour pumping test, groundwater modelling, infrastructure hydraulic modelling, updated information on Source Water Protection received from the York Region Source Protection Team including preliminary consultation with the Town of East Gwillimbury, Town of Aurora and the Ministry of the Environment and Climate Change. These updated results were used to provide additional information on:

- Aquifer Productivity;
- Treatment Requirements;
- Effect on aquatic species from groundwater drawdown;
- Effect on terrestrial species and habitat from groundwater drawdown;
- Effect on groundwater quality;
- Effect on surface water quantity and quality; and,
- Effect on private or municipal wells (groundwater quality and quantity).

Additional information on the changes to Source Water Protection as it relates to Well Head Protection Areas is further discussed in the following section.

6.7.2.1 Source Water Protection

Water Quality Threats

Notable changes are anticipated to the vulnerable area delineation in East Gwillimbury as the Green Lane well location is outside of the existing wellhead protection areas (WHPAs). The new Aurora well will be located within 15 m of the existing Aurora Well No. 5, so minimal change is anticipated to the associated WHPA. Potential Water Quality Threats were considered during Stage 3 of the evaluation when selecting the four Alternative Well Areas from the long-list of the 12 Prospective Well Areas. New potential Water Quality Threats were also considered when evaluating the two recommended well areas, Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5. This was accomplished via preliminary groundwater modelling completed for the Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5 sites. This provided an indication of the extent of the new WHPAs. Further modelling was completed in 2015 to refine the previous results. The preliminary modelling predicts a negligible change to the existing WHPA in Well Area 11 and a new WHPA in Well Area 6 with a 25 year capture zone size that is consistent with other wells in the area producing water from the Thorncliffe Aquifer Complex, pumping at a comparable rate.

The preliminary Well Area 6 WHPA was discussed with the Town of East Gwillimbury's planning staff relative to land use, where it was confirmed that predominantly residential land use is intended for this area. A residential land use in this area would result in very few, if any, new Water Quality Threats being created.

The Town of East Gwillimbury also issued the Green Lane Secondary Plan (refer to Section 6.5.2.3 above) which includes Source Protection policies that were reviewed and approved by York Region. Through the collaboration, it was communicated that updates to WHPA mapping would be required in both the York Region Official Plan and the Town of East Gwillimbury Official Plan and Zoning By-Law once the Green Lane well was sited and final WHPA delineation complete. York Region Source Protection Team will lead this work in full co-operation with the Town of East Gwillimbury staff.

In addition to this consultation, a desktop review of existing land use was completed. This initial consultation and desktop review indicated to the project team and affected stakeholders that new Significant Water Quality Threats to the WHPAs would be minimal.

Water Quantity Threats

York Region conducted a Water Quantity Risk Assessment in December, 2014 (also known as a Tier 3 Water Budget) to assess the long term viability of groundwater supplies used for municipal drinking water. This assessment was conducted outside of this EA process and was conducted to fulfill a requirement of the Clean Water Act. The Water Quantity Risk Assessment involved modelling the ability of the York Region municipal wells to deliver water under a series of land use cover, climate, and water demand scenarios using a coupled groundwater and surface water flow model. The worst-case scenario simulated all proposed future urbanization, along with associated demand increases and recharge reduction, under a hypothetical ten-year drought condition. Even under this extreme setting, the results indicated municipal demand could be met by the York Region wells as water levels did not drop below the safe available drawdown threshold established in the assessment as per Provincial technical rules.

Under that worst-case scenario there was a reduction in groundwater discharge to a small number of natural heritage features within the South Georgian Bay Lake Simcoe (SGBLS) Source Protection Area. The reduction in groundwater discharge triggered a 'moderate risk ranking'. This moderate risk in turn led to the development of policies in the approved SGBLS Source Protection Plan (LSRCA, 2015) that are intended to prevent the creation of 'future' significant threats.

As required under the *Clean Water Act* (CWA), a Tier 3 Water Budget was completed, and modelling was used to determine a WHPA-Q[5] for protection of water quantity. No

5. *Definition: WHPA-Q1 - the combined area that is the cone of influence of the well plus the whole of the cones of influence of all other wells that intersect that area and any surface water drainage area upstream of, and including, a losing reach of a stream that contributes a significant proportion of surface water to the wells.*

significant water quantity threats were identified; however, the SGBLS Source Protection Plan policies require the MOECC to include conditions in a Permit to Take Water for any new or increased groundwater taking in WHPA-Q to ensure:

1. Municipal water supply requirements will be met on a sustainable basis;
2. The taking will not affect the ability of the aquifer to meet municipal water supply requirements; and
3. Hydrological integrity is not adversely affected and that the activity does not become a Significant Drinking Water Threat.

The current Permit to Take Water (YSA PTTW) for the Yonge Street Aquifer complex allows a total daily withdrawal of 42,000 m^3 per day. The Yonge Street Aquifer Well Capacity Restoration Project does not propose any additional water taking from the complex, but rather a re-distribution of the approved permitted capacity. The results of the Tier 3 Water Budget indicated that all three of these conditions are met for maximum permitted extraction rates across the Yonge Street Aquifer (and elsewhere in the Region).

To ensure the two new well locations are sustainable, results of the Tier 3 Water Budget will be supplemented with empirical testing. For the purpose of future updates to the YSA PTTW pumping tests (such as the 24-hour and 72-hour pumping tests) have been completed to determine appropriate and sustainable long-term pumping rates. Monitoring was undertaken during these tests to assess potential impacts to receptors such as natural heritage features, private wells, and other municipal wells in the area of the proposed new well locations at Well Area 6 and Well Area 11.

Next Steps - Source Protection Planning

York Region has committed to delineating WHPAs, completing Groundwater Vulnerability Assessments, scoring WHPAs and completing Threats Assessment and verification as outlined in the Clean Water Act Technical Rules prior to commissioning new wells as part of regional water supply system. The South Georgian Bay Lake Simcoe Source Protection Region has been consulted and in a letter dated October 17, 2016, indicated that “Staff of Lake Simcoe Region Conservation Authority support the approach that [York Region] staff is taking to meet the requirements of the Clean Water Act. LSRCA will continue to work with [York Region] throughout the process of confirming the location of the wells, mapping their respective Wellhead Protection Areas, and conducting groundwater vulnerability assessments, to ensure that the

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WHPA-Q2 – Includes WHPA-Q1 and any area outside the WHPA-Q1 where a future reduction in recharge would have a measureable impact on the municipal wells.
Source: Clean Water Act Technical rules: assessment report. Available at: https://www.ontario.ca/page/technical-rules-assessment-report

requirements of the Act and Plan are met." Furthermore, the Lake Simcoe and Couchiching / Black River Source Protection Authority will ensure the Source Protection Plan and Assessment Report is updated as required, and will participate in public and MOECC consultation. A copy of this letter is provided in **Appendix H.8**.

The technical components of the project will include the following parts.

Part 1 – WHPA Delineation

New WHPAs will be delineated for the two new supply wells. This will include revised delineation of the WHPA's associated with the other existing YSA municipal supply wells.

The scope of work to be completed includes, but is not limited to, the following tasks:

- **Review and Update Groundwater Flow Model**

  For consistency with the York Region Water Resources numerical modelling plan, this project will be completed using the York Tier 3 (2015) MODFLOW-NWT sub-model. Prior to initiating the WHPA delineation, the consultant will review and update (if necessary) the model with new geologic information collected as part of the Class EA groundwater investigation.

- **Delineate WHPAs**

  York Region's consultant will delineate the WHPAs for all of the YSA Wells including the two new wells. A total of 20 wells will be simulated at pumping rates that will be determined in consultation with York Region project staff. The final composite WHPAs will include the WHPAs delineated as part of the project and will also take into consideration the existing WHPAs currently used in Region Official Plans.

Part 2 – Vulnerability Scoring

- **Assessment and Mapping of Aquifer Vulnerability in WHPAs**

  The vulnerability assessment for the updated WHPAs will be conducted using the Water to Well Advection Time (WWAT) approach which generally follows the Surface to Well Advection Time (SWAT) approach (as described in Provincial guidance), except that the time of travel in the unsaturated zone is considered to be zero. This approach was approved by the Province and used for the 2007 and 2009 Vulnerability Studies. The relative vulnerability of the aquifer will be categorized and mapped as either: high, medium or low. The maps produced will provide a relative indication of the susceptibility of the aquifer in the WHPA to contamination from potential surface sources.

- **Assignment and Mapping of Vulnerability Scores**

  The Vulnerability Scores (VS) will be assigned and mapped to the WHPA, based on the relative intrinsic vulnerability results from the WWAT analysis.
- **Analysis and Rating of Uncertainty**

  An analysis of uncertainty in the vulnerability assessment mapping and vulnerability scoring at the new well sites will be completed. This analysis is expected to include a characterization of "high" or "low" for the level of uncertainty, as required by the Technical Rules.

Part 3 – Threats Assessment and Verification

This work will be completed entirely by York Region staff. The first step will be to review GIS mapping to determine new parcels that will require threats assessment and verification. This will be completed through the use of vulnerability scores, the Provincial Tables of Circumstances, parcel mapping, aerial photography, and the new wellhead protection area mapping. The next step will be the completion of a windshield survey of the parcels identified in the desktop review to confirm the current land use and to determine what potential activities may be occurring on-site. This includes noting any businesses and farms operating on these parcels and recording any available contact information.

Once the list of businesses and farms is established, they will be contacted by a Risk Management Inspector to complete a Source Water Protection verification survey, which determines if a potential significant drinking water threat (SDWT) is on-site. The goal is to collect information for the Risk Management Official to confirm the SDWT is on-site, or to remove the business or farm from the list.

6.7.2.2 Alternative Well Area 6 – Green Lane

The following sections include updated information from the analyses conducted during this Stage 6 of this Project.

Technical

The aquifer thickness at the large diameter test well drilling location was observed to be approximately 31 m, with approximately 33 m of available drawdown. The design transmitting capacity of the well screen was 104 L/s and the specific capacity during the step-test (55 L/s step) was 71 L/s/m[6]. The observed drawdown during this step was

6. *Drawdown during step-test was influenced by pumping at York Holland Landing Municipal Wells Nos. 1 and 2.*

0.77 m. During the constant rate test, the specific capacity was 15 L/s/m and the observed drawdown was 3.8 m[7].

As discussed in Section 6.7.2, this site has favourable conditions for development of an additional municipal supply well. This was assessed using the York 2013 Ballantrae numerical groundwater model by increasing the long-term pumping rate at the site to 100 L/s and evaluating the predicted drawdown over a 20 year pumping period. The results from this screening simulation indicated that this pumping rate could be sustained at this site on a long term basis. In order to implement this element of the preferred solution, the preliminary modeling results would have to be field proven through a similar program to that followed for this Environmental Assessment.

All groundwater quality data from the step-test and constant rate test completed at Green Lane during this stage of the program were below O. Reg. 169/03 criteria limits, with the exception of hardness and iron (please refer to Appendix I for the Water Quality Summary and Laboratory Reports) . The Province of Ontario provides an Aesthetic Objective for Iron (0.3 mg/L) and an Operational Guideline for Hardness (80-100 mg/L). These parameters are commonly found at concentrations above the associated criteria in the Yonge Street Aquifer. Elevated concentrations of hardness and iron can be addressed readily through standard water treatment measures.

Manganese concentrations were below the O. Reg. 169/03 Aesthetic Objective of 0.05 mg/L. Health Canada has proposed a new Aesthetic Objective of 20 μg/L which may be adopted by Ontario in the future. All samples collected during testing were above this concentration. A cursory level assessment of potential Water Quality Threats[8] did not identify any potentially Significant Threats. These results will be expanded on by York Region through a formal update to the Assessment Report: Lake Simcoe and Couchiching – Black River Source Protection Area and Source Protection Plan.

Natural Environment

Groundwater drawdown can reduce baseflow discharge to surface water features thereby potentially affecting surface water quantity and/or quality. Water level monitoring in the shallow groundwater system during the 72-hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of

7. *Drawdown during constant rate test was influenced by pumping at York Holland Landing Municipal Wells Nos. 1 and 2.*
8. *As defined by the Clean Water Act, 2006.*

drawdown in the shallow system over a 20 year pumping period. As such, the potential to affect surface water quantity and/or quality in waterbodies within 500 m of Well Area 6 as a result of groundwater drawdown is considered low. Similarly, disturbance to aquatic species and habitat and terrestrial species and habitat as a result of groundwater drawdown during operation of the well is considered low. Potential changes to surface water quality resulting from construction are not anticipated based on a minimum 30 m separation distance from a watercourse and wetland.

Built Environment

Operation of the new well at Well Area 6 – Green Lane will cause drawdown in private wells and existing municipal production wells. The potential long-term influence of the new well on private wells was assessed using a numerical groundwater model. The screening results from the numerical groundwater modeling indicated that additional interference drawdown in all private wells will be less than 2 m, with the exception of one well with 2 to 3 m estimated as a result of operating the new well under constant pumping conditions.

This assessment was also completed for the municipal production wells and the results indicated that any interference drawdown caused by pumping the new wells would be off-set by recovery in the aquifer. This recovery would be caused by the reduction in pumping required to off-set the volume of water pumped at the new wells and maintain the overall system taking at the permitted level (i.e. no increase in the overall system taking). This recovery would be local to each municipal well where pumping was reduced.

Interference drawdown in the system will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern at the Well Area 6 – Green Lane well. Should residents have concerns about this impact, York Region has a responsibility to address any groundwater supply issues and will respond accordingly.

6.7.2.3 Alternative Well Area 11 – Aurora Well No. 5

Technical

The aquifer thickness at the large diameter test well drilling location was observed to be approximately 30 m, with approximately 46 m of available drawdown. The design transmitting capacity of the well screen was 75 L/s and the specific capacity during the

step-test (55 L/s step) was 36 L/s/m[9]. The observed drawdown during this step was 1.51 m. During the constant rate test (pumping of the new large diameter well at 55 L/s), the specific capacity was 21 L/s/m and the observed drawdown was 2.56 m[10].

All groundwater quality data from the step-test and constant rate test completed during this stage of the program were below O. Reg. 169/03 criteria limits, with the exception of hardness and iron (please refer to Appendix I for the Water Quality Summary and Laboratory Reports). The Province of Ontario provides an Aesthetic Objective for Iron (0.3 mg/L) and an Operational Guideline for Hardness (80-100 mg/L). These parameters are commonly found at concentrations above the associated criteria in the Yonge Street Aquifer. Elevated concentrations of hardness and iron can be addressed readily through standard water treatment measures.

Manganese concentrations were below the O. Reg. 169/03 Aesthetic Objective of 0.05 mg/L. Health Canada has proposed a new Aesthetic Objective of 20 μg/L which may be adopted by Ontario in the future. All samples collected during testing were above this concentration. A cursory level assessment of potential Water Quality Threats[11] did not identify any potentially Significant Threats. These results will be expanded on by York Region through a formal update to the Assessment Report: Lake Simcoe and Couchiching – Black River Source Protection Area and Source Protection Plan.

Natural Environment

Groundwater drawdown can reduce baseflow discharge to surface water features thereby potentially affecting surface water quantity and/or quality. Water level monitoring in the shallow groundwater system during the 72-hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. As such, the potential to affect surface water quantity and/or quality in waterbodies within 500 m of Well Area 11 as a result of groundwater drawdown is considered low. Similarly, disturbance to aquatic species and habitat and terrestrial species and habitat as a result of groundwater drawdown during operation of the well is considered low. Potential

9. *Drawdown during step-test was influenced by pumping at York Aurora Municipal Wells Nos. 1 and 4.*
10. *Drawdown during constant rate test was influenced by pumping at York Aurora Municipal Wells Nos. 1, 2, 3 and 4.*
11. *As defined by the Clean Water Act, 2006.*

changes to surface water quality resulting from construction are not anticipated based on a minimum 30 m separation distance from a watercourse and wetland.

Built Environment

Operation of the new well at Well Area 11 – Aurora Well No. 5 will cause drawdown in private wells and existing municipal production wells. The potential long-term influence of the new well on private wells was assessed using a numerical groundwater model. The screening results from the numerical groundwater modeling indicated that additional interference drawdown in all private wells will be less than 1 m as a result of operating the new well under constant pumping conditions.

This assessment was also completed for the municipal production wells and the results indicated that any interference drawdown caused by pumping the new wells would be off-set by recovery in the aquifer. This recovery would be caused by the reduction in pumping required to off-set the volume of water pumped at the new wells and maintain the overall system taking at the permitted level (i.e. no increase in the overall system taking). This recovery would be local to each municipal well where pumping was reduced.

Interference drawdown in the system will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern. This impact will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern at the Well Area 11 – Aurora Well No. 5 site. Should residents have concerns about this impact, York Region has a responsibility to address any groundwater supply issues and will respond accordingly.

6.7.2.4 Updated Table of Findings for Alternative Well Areas 6 and 11

Table 6-8 is not a comparative evaluation because at this stage, both Well Areas were identified as preferred sites for new municipal wells. This table instead provides updated information based on the testing conducted during Stage 6 related to:

- Aquifer Productivity;
- Treatment Requirements;
- Effect on aquatic species from groundwater drawdown;
- Effect on terrestrial species and habitat from groundwater drawdown;
- Effect on groundwater quality;
- Effect on surface water quantity and quality; and,
- Effect on private or municipal wells (groundwater quality and quantity).

Table 6-8: Summary of Findings – Alternative Well Areas 6 and 11

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Technical Category			
Aquifer Productivity	An evaluation of the productivity potential of each well, based on: 1. Aquifer thickness; 2. Available drawdown; 3. Well Screen Transmitting Capacity; 4. Step-Test Specific Capacity; 5. Step-Test Drawdown (55 L/s for 1 hour); 6. Constant Rate Test Specific Capacity; 7. Constant Rate Test Drawdown;	Most productive aquifer due to the following factors: 1. Aquifer Thickness: 31 m; 2. Available Drawdown: 33 m; 3. Well Screen Transmitting Capacity: 104 L/s 4. Step-Test Specific Capacity (at 55 L/s): 71 L/s/m[12] 5. Step-Test Drawdown (55 L/s for 1 hour):0.77 m 6. Constant Rate Test Specific Capacity: 15 L/s/m 7. Constant Rate Test Drawdown (55 L/s for 72 hours): 3.8 m[13]	Second most productive aquifer due to the following factors: 1. Aquifer Thickness: 30 m; 2. Available Drawdown: 46 m; 3. Well Screen Transmitting Capacity: 75 L/s 4. Step-Test Specific Capacity (at 55 L/s): 36 L/s/m[14] 5. Step-Test Drawdown (55 L/s for 1 hour): 1.51 m 6. Constant Rate Test Specific Capacity: 15 L/s/m: 21 L/s/m 7. Constant Rate Test Drawdown (55 L/s for 48 hours): 2.56 m[15].
Treatment Requirements	An evaluation of the raw well water quality and review of treatment requirements; based on: 1. Water quality results for all parameters listed in Ontario Regulation 169/03 (including levels of iron, manganese, nitrate, pH, sodium, Total Dissolved Solids, hardness, methane, organic nitrogen, etc.); 2. Consideration to be given to difficulty of treatment, operational requirements and associated costs; and 3. Review of Wellhead Protection Areas to identify any potential future treatment and monitoring requirements by identifying any risks within that zone in accordance with Source Water Protection standards of the *Clean Water Act*.	1. Hardness and iron above Ontario Drinking Water Quality Standards and presence of manganese and methane (at this level, treatment of manganese and methane isn't required); 2. Include treatment of iron (sequestration); 3. York Region has committed to delineating WHPAs as outlined in the Clean Water Act Technical Rules prior to commissioning new wells as part of regional water supply system.	1. Hardness and iron above Ontario Drinking Water Quality Standards and presence of manganese (at this level, treatment of manganese isn't required); 2. Expansion of existing treatment system, including iron sequestration or removal; 3. York Region has committed to delineating WHPAs as outlined in the Clean Water Act Technical Rules prior to commissioning new wells as part of regional water supply system.
Natural Environment Category			
Effect on Aquatic Species and Habitat from Groundwater Drawdown	An evaluation of the effects on aquatic species and habitat from groundwater drawdown, based on: 1. Presence of aquatic species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare); and 2. Area of temporary or permanent loss of aquatic features or categorical loss of functions by type – watercourses by sensitivity type (thermal regime).	1. **<u>Potential effects:</u>** - Disturbance to potentially occurring aquatic species in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined a s the model predicting that	1. **<u>Potential effects:</u>** - Disturbance to potentially occurring aquatic species in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers

12. *Drawdown during step-test was influenced by pumping at York Holland Landing Municipal Wells Nos. 1 and 2.*
13. *Drawdown during constant rate test was influenced by pumping at York Holland Landing Municipal Wells Nos. 1 and 2.*
14. *Drawdown during step-test was influenced by pumping at York Aurora Municipal Wells Nos. 1 and 4.*
15. *Drawdown during constant rate test was influenced by pumping at York Aurora Municipal Wells Nos. 1, 2, 3 and 4.*

Table 6-8: Summary of Findings – Alternative Well Areas 6 and 11

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 6; therefore, disturbance to these species as a result of groundwater drawdown is not anticipated. **Mitigation measures:** - No mitigation required as no effects are anticipated. 2. **Potential effects:** Disturbance to two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.	1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. - No aquatic Species at Risk or Species of Conservation Concern are documented in the vicinity of Well Area 11; therefore, disturbance to these species as result of groundwater drawdown is not anticipated. **Mitigation measures**: - No mitigation required as no effects are anticipated (most preferred). 2. **Potential effects:** Disturbance to aquatic habitat in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of Well Area 11 as a result groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Effects on aquatic species and habitat from groundwater drawdown not anticipated.
Effect on Terrestrial Species and Habitat from Groundwater Drawdown	An evaluation of the effects on terrestrial species and habitat from groundwater drawdown, based on: 1. Presence of terrestrial species potentially affected temporarily and/or permanently, including Species at Risk (Endangered, Threatened) and Species of Conservation Concern (Special Concern, provincially rare), and area-sensitive species; and 2. Area of temporary or permanent loss of terrestrial features or categorical loss of habitat functions by type – including Provincially Significant Wetland (PSW), Locally Significant Wetland (LSW), Environmentally Significant	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in two tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was	1. **Potential effects:** Disturbance to terrestrial species potentially occurring in a Provincially Significant Wetland and a pond, Tannery Creek and an unnamed tributary of Tannery Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system

Table 6-8: Summary of Findings – Alternative Well Areas 6 and 11

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
	Areas (ESA), Areas of Natural and Scientific Interest (ANSI), Significant Wildlife Habitat (SWH), and others.	defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. 2. **Potential effects:** Disturbance to terrestrial features associated with two tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Effects on terrestrial species and habitat from groundwater drawdown not anticipated.	(Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. 2. **Potential effects:** Disturbance to terrestrial features associated with a Provincially Significant Wetland and a pond, Tannery Creek and an unnamed tributary of Tannery Creek within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Effects on terrestrial species and habitat from groundwater drawdown not anticipated.
Effect on Groundwater Quality	An evaluation of temporary and/or long-term change in groundwater quality due to: 1. Groundwater drawdown.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 50 m thick), and the implementation of Source Water Protection measures. Aquifer was shown to be of sufficient quality for a municipal water supply well through pumping test water quality sampling. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.	1. **Potential effects:** Temporary and/or long term change in groundwater quality due to groundwater drawdown is not anticipated due to presence of an aquitard greater than 20 m in thickness (approximately 34 m thick), and the implementation of Source Water Protection measures. Aquifer was shown to be of sufficient quality for a municipal water supply well through pumping test water quality sampling. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Changes to groundwater quality from groundwater drawdown not anticipated.

Table 6-8: Summary of Findings – Alternative Well Areas 6 and 11

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
Effect on Surface Water Quantity	An evaluation of temporary and/or long-term change in quantity of surface water bodies (including those identified in the "Proximity to wetlands/streams" criteria used to assess the Potential Alternative Well Areas) due to: 1. Construction or operation of the well house; and 2. Groundwater drawdown during operation of the well.	1. **Potential effects:** Temporary and/or long-term change in surface water quantity due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required. **2. Potential effects:** Temporary and/or long-term change in surface water quantity in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated.). **Net effects:** Changes to surface water quantity not anticipated.	1. **Potential effects:** Temporary and/or long-term change in surface water quality due to construction or operation of the well house is not anticipated. **Mitigation measures:** No mitigation required. 2. **Potential effects:** Temporary and/or long-term change in surface water quantity in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is not anticipated with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Changes to surface water quantity not anticipated.
Effect on Surface Water Quality	An evaluation of temporary and/or long-term change in quality of surface water bodies (including those identified in the "Proximity to wetlands/streams" criteria used to assess the Potential Alternative Well Area) due to: 1. Construction or operation of the well house; and 2. Groundwater drawdown during operation of the well.	**1. Potential effects:** Temporary and/or long-term change in surface water quality water due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required. 2. **Potential effects:** Temporary and/or long-term change in surface water quality in two warmwater tributaries of the East Holland River and two unevaluated wetlands within 500 m of the Well Site as a result of groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 50 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new wells causes <1 m of drawdown in the shallow system over a	1. **Potential measures:** Temporary and/or long-term change in surface water quality due to construction of operation of the well house is not anticipated. **Mitigation measures:** No mitigation required. 2. **Potential effects:** Decrease in surface water quality in a Provincially Significant Wetland and a pond, Tannery Creek (cold/warmwater) and an unnamed tributary of Tannery Creek (cold/warmwater) within 500 m of the Well Site as a result groundwater drawdown during operation of the well is considered low with the presence of an aquitard greater than 20 m in thickness (approximately 34 m thick). Water level monitoring in the shallow groundwater system during the 72 hour pumping test indicated that the pumping did not cause drawdown. Screening results from the long-term groundwater modelling indicated that pumping of the new well would not cause drawdown in the shallow system (Model Layers 1 and 2). The absence of an impact was defined as the model predicting that pumping of the new

Table 6-8: Summary of Findings – Alternative Well Areas 6 and 11

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Changes to surface water quality not anticipated.	wells causes <1 m of drawdown in the shallow system over a 20 year pumping period. **Mitigation measures:** No mitigation required as no effects are anticipated. **Net effects:** Changes to surface water quality not anticipated.
Built Environment Category			
Effect on Private Wells (groundwater quality and quantity)	An evaluation of effects on private wells, based on: 1. Comparison of the density of private wells in the vicinity of each well.	1. **Potential effects:** The screening results from the numerical groundwater modeling indicated that additional interference drawdown in all private wells will be less than 2 m, with the exception of one well with 2-3 m estimated as a result of operating the new well under constant pumping conditions. **Mitigation measures:** Interference drawdown in the system will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern at the Well Area 6 – Green Lane well. Such mitigations will be developed in detail during the existing YSA PTTW Amendment process **Net effects:** With the implementation of mitigation measures, as required, adverse effects on private wells are not anticipated.	1. **Potential effects:** The screening results from the numerical groundwater modeling indicated that additional interference drawdown in all private wells will be less than 1 m as a result of operating the new well under constant pumping conditions. **Mitigation measures**: Interference drawdown in the system will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern at the Well Area 11 – Aurora Well No. 5 well. Such mitigations will be developed in detail during the existing YSA PTTW Amendment process **Net effects:** With the implementation of mitigation measures, as required, adverse effects on private wells are not anticipated.
Effect on Municipal Wells (groundwater quality and quantity)	An evaluation of effects on municipal wells, based on: 1. Comparison of the density of municipal wells in the vicinity of each well; and 2. The distance to other permitted takers.	1. **Potential effects:** There are only York Region municipal wells in vicinity of the new well. The screening results from the numerical groundwater modeling indicated that any interference drawdown caused by pumping the new wells would be off-set by recovery in the aquifer. This recovery would be caused by the reduction in pumping required to off-set the volume of water pumped at the new wells and maintain the overall system taking at the permitted level (i.e. no increase in the overall system taking). This recovery would be local to each municipal well where pumping was reduced. **Mitigation measures:** Interference drawdown in the system will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern at the Well Area 6 – Green Lane well. Such mitigations will be developed in detail during the existing YSA PTTW Amendment process 2. **Potential effects:** Effects to other Permit to take Water holders not anticipated. **Mitigation measures:** No mitigation required.	1. **Potential effects**: There are only York region municipal wells in vicinity of the new well. The screening results from the numerical groundwater modeling indicated that any interference drawdown caused by pumping the new wells would be off-set by recovery in the aquifer. This recovery would be caused by the reduction in pumping required to off-set the volume of water pumped at the new wells and maintain the overall system taking at the permitted level (i.e. no increase in the overall system taking). This recovery would be local to each municipal well where pumping was reduced. **Mitigation measures:** Interference drawdown in the system will be regularly assessed through the routine measurement of aquifer water levels in York Region's network of monitoring wells. If required, this impact would be mitigated by adjusting the pumping rate and pattern at the Well Area 11 – Aurora Well No. 5 well. Such mitigations will be developed in detail during the existing YSA PTTW Amendment process 2. **Potential effects:** Effects to other Permit to take Water holders not anticipated.

Table 6-8: Summary of Findings – Alternative Well Areas 6 and 11

Category of Consideration / Evaluation Criteria	Indicator (How the Evaluation Criteria was Applied)	Well Area 6 (Green Lane east of Yonge Street)	Well Area 11 (St. John's Sideroad and Old Yonge Street)
		Net effects: With the implementation of mitigation measures, as required, adverse effects on municipal wells are not anticipated.	**Mitigation measures:** No mitigation required. **Net effects:** With the implementation of mitigation measures, as required, adverse effects on municipal wells are not anticipated.

6.7.3 Stage 6 Results

Following the evaluation conducted during Stage 6, it was determined that the Preferred Solution includes: constructing new wells at Well Area 6 and Well Area 11 and, rehabilitating Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No. 15.

7. Permits and Approvals

All permits and approvals known to-date will be obtained prior to implementation including:

- Amendment to the current Yonge Street Aquifer PTTW (MOECC)
- Amendment to the current Drinking Water Works Permit (MOECC)
- Regulation 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) Permit by Lake Simcoe Region Conservation Authority for well facility expansion at Aurora Well #5
- Approvals under Planning Act (site plan approval and a Building Permit) by Local Municipalities (Town of East Gwillimbury and Town of Aurora) and by York Region;
- Approvals and exemptions from all applicable by-laws (Noise, Road Right-of-Way, Sewer Use) by Local Municipalities and York Region.

In addition, York Region has internal protocols stipulating that all permits and approvals must be secured and obtained directly by York Region prior to tendering the project. As per the same protocol all permits and approvals are owned by York Region and as such, York Region is ultimately responsible for ensuring compliance.

8. Consultation

The following section details the consultation activities undertaken and the input received throughout the course of this Project. York Region has maintained continuous communication with stakeholders through the planning process and will continue this dialogue throughout the full lifecycle of the Project.

8.1 Consultation and Communication Program

The involvement of the community – residents, agencies, stakeholders, Aboriginal communities, and those who may be potentially affected by a project – is an integral part of the Class Environmental Assessment (EA) process. The purpose of the Class EA consultation process is to provide an opportunity for stakeholder groups and the public to gain an understanding of the study process; contribute to the process for development and selection of alternatives solution; and provide feedback and advice at important stages in the Class EA process. Specifically, the objectives of the consultation efforts are to:

- Generate awareness of a project and provide opportunities for involvement throughout the planning process; and
- Facilitate constructive input from public and agency stakeholders at key points in the Class EA process, prior to decision-making.

A summary of the consultation activities undertaken for the Yonge Street Aquifer Well Capacity Restoration Project Class EA is provided below.

In accordance with the Municipal Class EA, the mandatory points of public consultation included the following:

Table 8-1: Summary of Public Consultation Activities

Project Phase	Description of Consultation Activity	Date Completed
Phase 1	**Study Initiation – Notice of Commencement/ Notice of Public Information Centre (PIC) #1** **PIC #1**	May 28, 2012 June 12, 2012, 6:00 pm to 8:30 pm - East Gwillimbury Sports Complex June 13, 2012, 6:00 pm to 8:30 pm - Aurora Town Hall

Table 8-1: Summary of Public Consultation Activities

Project Phase	Description of Consultation Activity	Date Completed
Phase 2	**Notice of PIC #2**	September 2013
	PIC #2	September 23, 2013, 6:00 p.m. to 8:30 p.m.- East Gwillimbury Sports Complex September 25, 2013, 6:00 p.m. to 8:30 p.m.- Aurora Cultural Centre
	Study Completion – Notice of Study Completion	December 22, 2016

8.2 Public Consultation

This section highlights the Project notices, associated meetings and other public consultation activities undertaken to inform stakeholders about the Project and to receive comments. Please refer to **Appendix H** for copies of the Notices and PIC materials including display panels, comment sheets, etc. All comments received from agencies and Aboriginal Communities are provided in **Sections 8.4** and **8.5** and **Appendices H.8** and **H.9,** respectively.

8.2.1 Notice of Commencement

The Notice of Commencement was provided to interested stakeholders, including review agencies, Aboriginal communities, and the public in order to provide the purpose of the project, identify the general study area and provide key contact information. Notification for the PIC was combined with the Notice of Study Commencement, and also included:

- A map of the Project Study Area;
- The problem/opportunity statement and a brief overview of the Municipal Class EA process; and,
- Contact information for further opportunities for comments and input.

Notification was accomplished through the following means:

- Publication in the Era-Banner Newspaper (with coverage in Newmarket, Aurora and East Gwillimbury) on May 31, 2012 and June 3, 2012;
- Direct mail to interested stakeholders, including review agencies, elected officials, Aboriginal communities, and local interest groups. A total of 122 notices were mailed to these individuals and groups. Of these, 37 notices were

sent to elected officials, 48 to review agency staff, 19 to public groups and individuals, and 18 to Aboriginal communities.

A copy of the notice is included in **Appendix H.1**.

8.2.2 Public Information Centre No. 1

The purpose of PIC #1 was to present and obtain feedback on the problem/opportunity statement, the assessment of the alternative solutions, the recommended alternative solution, and the assessment of potential areas for new wells. In order to fulfill this purpose, the PIC was held on two dates at the following locations within the study area:

- June 12, 2012, 6:00 pm to 8:30 pm - East Gwillimbury Sports Complex; and,
- June 13, 2012, 6:00 pm to 8:30 pm - Aurora Town Hall.

The PIC was an open house drop-in format organized around information display panels. Attendees were welcomed at the door by a project team member and asked to sign in. Individuals who signed-in and provided their contact information were added to the project contact list in order to receive notification of future events.

Members of the project team were available to answer questions and speak one-on-one with PIC attendees. Comment forms were available for PIC attendees to provide any other questions or comments that they did not provide verbally. Nine display panels provided information on the following key elements of the Yonge Street Aquifer Well Restoration Class EA:

- Welcome and meeting information;
- Project background;
- Class EA purpose and process;
- Schedule of activities;
- Identification of the problem/opportunity statement;
- Identification and description of the alternative solutions;
- Evaluation of the alternative solutions;
- Well locations and assessment; and,
- Next steps.

A total of 16 individuals attended PIC #1 over the two evenings (eight on June 12, 2012 and seven on June 13, 2012, as well as one individual who attended both nights). While comment cards were made available, no written comments were received. All other comments were noted from verbal discussion with attendees.

A copy of PIC #1 information is included in **Appendix H.1**.

A summary of the questions and comments received at the PIC, and how the comments were considered by York Region is included in **Table 8.2.**

Table 8-2: Summary of PIC #1 Comments

Comment Received	Response and Application for the Municipal Class Environmental Assessment
Consider groundwater injection from the proposed Water Reclamation Centre as a potential alternative. The Water Reclamation Centre was proposed as part of the Upper York Sewage Solutions EA by York Region.	The Yonge Street Aquifer has sufficient capacity to support new wells, and injecting groundwater treated at the proposed Water Reclamation Centre would not address the aging infrastructure or the reduced capacity of existing wells.
Pumping is unsustainable, and is lowering the aquifer levels. The PTTW limits set by the Ministry of the Environment and Climate Change (MOECC) may not be sustainable.	The sustainable pumping rate of York Region's municipal wells in the Yonge Street Aquifer is 87.7 MLD, which is identified in the PTTW. York Region is not proposing to increase that rate in the PTTW. Ongoing monitoring by York Region will ensure that pumping continues to take place at a sustainable rate. A Groundwater Exploration Report will be submitted to the MOECC in support of new wells as part of the PTTW submission.
Have the aquifer levels been trending higher or lower in recent years?	Water levels in the Yonge Street Aquifer have been trending generally higher since approximately 2007.
What did you consider when selecting the four sites?	The following issues were examined as part of the project team's assessment and selection of possible well sites: ▪ Groundwater quantity; ▪ Groundwater quality; ▪ Natural environment impacts; ▪ Well interference; ▪ Water Supply System Integration; and, ▪ Site Development Logistics. Details regarding the site generation and assessment process and results are included in the Appendix D - Alternative Well Area Selection Report of the Phase 2 Report: Identification and Evaluation of Alternative Solutions to the Problem/Opportunity
A concern was raised about the potential of the project to lower private wells as a result of installing new wells. What will York Region do if the new wells result in lowering or drying of private wells?	A well survey was conducted on private wells within a minimum of 500 m of the test wells. The well surveys are included in Appendix F - Preliminary Assessment Report of the Phase 2 Report: Identification and Evaluation of Alternative Solutions to the Problem/Opportunity. The purpose of the survey was to ensure that new wells would not have negative effects on existing wells. If York Region determined that there were potential negative effects, the potential well site would not have been

Table 8-2: Summary of PIC #1 Comments

Comment Received	Response and Application for the Municipal Class Environmental Assessment
	considered further for a new well or the effects would be mitigated. Potential adverse effects on private wells are not anticipated. Although these effects are not anticipated, should residents have concerns, York Region has a responsibility to address any groundwater issues and will respond accordingly. York Region is required to investigate complaints regarding private wells. In addition, as mandated in the PTTW, York Region will supply water to municipal residents who experience problems with their private wells in the short term while an investigation is underway. York Region is responsible for resolving the issue and may drill wells deeper or drill new private wells to remedy the situation. York Region could send staff out as quickly as the next day to investigate an issue after receiving a complaint.
What about the possibility of water transfers between Lake Simcoe and Lake Ontario?	The purpose of this project is restore the full permitted capacity of the Yonge Street Aquifer and will not result in any additional intra-basin transfer of water.
How does the Oak Ridges Moraine relate to the Yonge Street Aquifer?	The Oak Ridges Moraine acts as a significant recharge area for the Yonge Street Aquifer. A portion of the Yonge Street Aquifer underlies the Oak Ridges Moraine.
Would this project affect water takings from area golf courses?	Any large water takers that have a PTTW were mapped and were considered in the selection of test well locations. Impacts to established water users, including golf courses, with a PTTW were assessed through the 72-hour pumping tests. Unacceptable impacts to existing users of water are not allowed under the MOECC's PTTW program.
What are the potential effects of the new well in Aurora at St. John's Sideroad on a nearby wetland area (the Provincially Significant Aurora (Mackenzie) Marsh Complex?	The potential new well at the existing municipal well location in Aurora would be constructed within the existing property of the municipal well. The wetland is separated from the municipal supply aquifer by one or more aquitards and is not expected to be affected by the new well. The wetland was monitored during the 24-hour and 72-hour pumping tests and no drawdown was observed. As such, impacts on the wetland due to decreased water quantity are not anticipated. Finally, impacts on the wetland (the inability of the water resource to support the existing natural function of the ecosystem) are not allowed under the MOECC's PTTW program.
How is water for new growth being serviced?	This project is part of York Region's 10-year Infrastructure Improvement Plan and its purpose is to restore the full permitted capacity of the Yonge Street Aquifer. This project is not related to providing servicing for growth.

Table 8-2: Summary of PIC #1 Comments

Comment Received	Response and Application for the Municipal Class Environmental Assessment
What is causing the decrease in capacity in the existing Yonge Street Aquifer wells?	Four existing wells in the Yonge Street Aquifer pump at a reduced rate due to operational restrictions that cannot be remedied in all cases. Operational restrictions can include drawing in sand at higher pumping rates, plugging of a well screen at higher pumping rates, or aesthetic characteristics of the water. In addition, due to the age of many of the wells, some additional loss in capacity may occur in the future.
Can electronic copies of the display panels be provided?	Individuals who requested electronic copies of the display panels were sent them by email following the PIC.
An individual requested a copy of the report "Geology of the Aurora high-quality stratigraphic reference site and significance to the Yonge Street buried valley aquifer, Ontario" to provide context on the hydrogeological conditions within the study area.	A copy of the requested report was sent to the individual following the PIC by email.
An individual requested well records in the area of his residence.	The requested well records were provided to the individual following the PIC.
An individual requested a copy of the PTTW condition that speaks to the requirement for York Region to mitigate well impacts.	This information was provided to the individual who requested it following the PIC.

8.2.3 Project Information Package

Personalized Information Packages were developed and distributed via regular addressed mail to property owners and tenants in the vicinity of the four pilot wells in advance of drilling. This information package described the purpose of the Project, the preliminary list of alternative solutions, the location of the proposed pilot wells, and provided contact information should the residents have any questions or concerns.

These packages were mailed to residents within 500 m of the well sites on the following dates:

- Well Site 5 -Warden: July 13, 2012
- Well Site 6 - Green Lane: July 13, 2012
- Well Site 3 - Mount Albert: October 9, 2012
- Well Site 11 - Aurora Well No. 5: October 9, 2012

Property owner information was based on the latest data from the Municipal Property Assessment Corporation (MPAC) provided by York Region. Samples of the Personalized Information Packages are available for review in **Appendix H.2.**

8.2.4 Water Well Survey

As part of the groundwater exploration program, York Region conducted a water well survey in the fall of 2012 in order to document the location and history of active private water supply wells. These surveys were hand delivered to residences within 500 m of the four well areas (Well Area 3, 5, 6 and 11) and outside of areas serviced by municipal water, between October 2012 and December 2012. The water well surveys were also an opportunity to discuss the Project with members of the public and answer any questions they had on the study. Samples of letters are provided in **Appendix H.3.**

8.2.5 Notice of 24-hour Pumping Test

As the Project progressed, in an effort to provide additional points of communication with local stakeholders, York Region elected to issue a notice to residents within 500 metres of the well sites advising of the 24-hour pumping test. (Note that only three of the well sites were notified as further testing was suspended at Well Area 3 - Mount Albert given that it was determined it would not be a productive aquifer and a test well was not installed.)

The notices were mailed or hand-delivered on the following dates:

- Well Site 5 - Warden: Hand delivered on June 11, 2013
- Well Site #6 - Green Lane: Mailed on May 13, 2013
- Well Site #11 - Aurora Well No. 5: Hand delivered on June 19, 2013

Samples of the notices are provided in **Appendix H.4.**

8.2.6 "Kitchen Table" Meetings

On June 27, 2013, York Region met with local residents within the Warden Avenue area at the East Gwillimbury Sports Complex to review the Project and to address their concerns. Some residents expressed an interest/need to receive more information about the Project as activities progressed. As a result of this meeting, York Region increased the notification area for future mailings to include residents within 500 m of the well areas and residents with private wells within 1 km of the well areas.

York Region has also met with individual residents in the vicinity of the other Well Areas to discuss the Project, answer questions and resolve their concerns, York Region will

continue to meet with residents as the Project progresses and will continue to work together to mitigate concerns, as required.

8.2.7 Notice of Drilling – Large Diameter Test Wells

York Region issued notices in advance of site setup and drilling of the large-diameter test well located on the Region's property located at 256 Old Yonge Street in Aurora, to advise local residents of the purpose of the activity, what they could expect during the drilling works and next step of the Project. The notices were issued on the following dates:

- September 3, 2015
- February 3, 2016

Samples of the notices are provided in **Appendix H.5.**

8.2.8 Public Information Centre No. 2

A second round of Public Information Centres (PIC #2) were held on September 23 and 25, 2013 from 6:00 p.m. to 8:30 p.m.at the East Gwillimbury Sports Complex and the Aurora Cultural Centre, respectively. The purpose of this PIC was to present findings of the Class EA process, provide a Project status update and to present the Recommended Preferred Solution. Fourteen people attended the first evening and one comment sheet was received, while eight people attended the second evening. One comment sheet was received from a local developer. York Region has maintained communication with the developer over the course of this project.

York Region notified potentially interested stakeholders of the PIC through the following means:

- Publishing the notice in the Era-Banner (Newmarket/East Gwillimbury) and The Banner (Aurora) on September 15 and September 17, 2013.
- Mailing the notice directly to interested stakeholders, including review agencies, elected officials, Aboriginal communities, local interest groups and residents within 500 m of the Well Areas, and residents with private wells within 1 km of the Well Areas.

The PICs were in an open house format with a presentation scheduled for 7:00 p.m. Display panels were set up along the periphery of the room allowing attendees to review the Project material at their own pace. In most instances, a Project representative walked the attendee through the display panels, encouraging questions and an open discussion on the Project.

A copy of PIC #2 information is included in **Appendix H.6.**

During the presentation, the Project team provided background information on the Project and an overview of the steps undertaken to identify the Recommended Preferred Solution. The presentation was given the first evening only as there were fewer people in attendance the second evening and Project representatives elected to walk the attendees (approximately three) through the display panels during the presentation time-slot. After the presentation, the Project team answered questions from the attendees. A summary of the questions pertaining to the Project and responses are provided in **Table 8.3**.

Table 8-3: Summary of PIC #2 Comments

Question/Comment	Project Team Response
Why were the 24-hour pumping tests conducted during periods of high water table, not during drought conditions?	York Region maintains a significant database of historical low water levels. As a result, York Region is able to use the results from the 24-hour pumping tests in conjunction with the historical water level data to assess the sustainability of water taking in the test areas.
What are the potential effects to nearby surface water features?	Based on the comprehensive water level monitoring program at York Region, no correlation has been found between the water levels in the deep wells of the Yonge Street Aquifer and levels in shallow water systems. Furthermore, the results of the 24-hour and 72- hour pumping tests for this Project indicate the groundwater pumping did not affect nearby surface water features.
Will there be an effect on private wells?	York Region does not anticipate that adding new wells at Well Area 6 - Green Lane and Well Area 11 - Aurora Well No.5 site will negatively impact private wells. Results from the 24-hour and 72-hour pumping tests support this.
If private water wells go dry, who pays to fix them?	Potential adverse effects on private wells are not anticipated. Although these effects are not anticipated, should residents have concerns, York Region has a responsibility to address any groundwater issues and will respond accordingly. York Region is required to investigate complaints regarding private wells. In addition, as mandated the PTTW, York Region will supply water to municipal residents who experience problems with their private wells in the short term while the investigation is underway. York Region is responsible for resolving the issue and may drill wells deeper or drill new private wells to remedy the situation. York Region could send staff out as quickly as the next day to investigate an issue after receiving a complaint.
Can monitoring of private wells inform people of what is happening to the water table?	During pumping test programs, wells provide additional water level data to help observe changes to groundwater levels in the vicinity. Furthermore, York Region maintains a network of regional monitoring wells in the Study Area; this information can be used to help determine why there would be an issue with a private well.

Table 8-3: Summary of PIC #2 Comments

Question/Comment	Project Team Response
Is real-time data available to the public?	The information can be requested from York Region.
How much water is being pumped from the Queensville area to Newmarket and Aurora?	The municipal water supply system is a Regional system based on a combination of groundwater and surface water sources. The varying proportions of groundwater and surface water in a given part of the system vary overtime depending on the needs of the system. The amounts of water being distributed throughout a given area vary due to user and system demands.
Why would York Region consider installing a municipal supply well in the Warden area when the area isn't currently serviced?	The intent of this study is to consider all potential locations which could be connected to the existing water supply system. A new municipal well at Well Area 5 – Warden is not part of the Recommended Preferred Solution.
Will a new municipal well in the Warden area stay on the back-burner?	The Warden area site was ranked third in the evaluation of potential sites at the time of the second PIC, with further development pending confirmation of the feasibility of the preferred sites. Since that time, the two preferred sites, Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5, were confirmed through the final stage of the Groundwater Exploration Program. The test well constructed early in the assessment process at the Warden site has been removed.
How quickly does groundwater recover?	The recovery of groundwater levels is variable depending on many factors; including the geology of the area and the amount of water level drawdown. In 2008, Lake Ontario based water supply was introduced and the Region reduced the groundwater taking from its municipal wells in the Yonge Street Aquifer Area. The reduction in groundwater taking led to a recovery in groundwater levels in the span of one year.
Will there be an increase in noise?	York Region will abide by local noise by-laws and ensure that construction equipment is in good working condition. Measures to reduce construction noise will be implemented where feasible. Operational noise will be mitigated through the design of the well house.
What is the timeline for the Project?	York Region is working to have the wells operational by early 2019.

8.2.9 Notice of Completion

The Notice of Completion was provided to interested stakeholders, including review agencies, Aboriginal communities, and the public in order to advise them of the completion of the study and notify them of the location where interested parties could review and provide comments on the Project File. The Final Project File Report was made available starting on December 22, 2016 and comments were requested to be submitted by January 31, 2017. The mailing list used for this review period in addition to

a copy of the Notice of Completion is included in **Appendix H.7**. This mailing list was used for the Notice of Study Commencement and has since been updated throughout the course of the Project to include additional Indigenous contacts, as described in Section 8.4 and was updated in advance of the Notice of Completion to capture changes of agency staff occurring since the previous Project notification. In addition to the agencies and Indigenous communities provided in the contact list, the notice was also mailed to residents within 500 m of the well areas and residents with private wells within 1 km of the well areas. Finally, the Notice was published in the Newmarket Era, Aurora Banner and the East Gwillimbury Express on Thursday, December 22 and Thursday, December 29, 2016.

8.3 Agency Consultation

At the initiation of this study, a mailing list was created comprised of regulatory agencies and potentially interested stakeholders. This list was updated throughout the study and was used to notify agencies and stakeholders of study milestones and public consultation events. Agencies and Ministries included on this list are as follows:

- Fisheries and Oceans Canada (DFO);
- Indigenous and Northern Affairs Canada (formerly Aboriginal Affairs and Northern Development Canada);
- Ministry of Agriculture, Food and Rural Affairs (OMAFRA);
- Ministry of the Environment and Climate Change (MOECC);
- Ministry of Indigenous Relations and Reconciliation (formerly the Ministry of Aboriginal Affairs);
- Ministry of Natural Resources and Forestry (MNRF);
- Ministry of Municipal Affairs and Housing (MMAH);
- Ministry of Tourism, Culture and Sport (MTCS);
- Lake Simcoe Region Conservation Authority (LSRCA); and
- Toronto Region Conservation Authority (TRCA).

A summary of comments received from agencies and York Region's responses is provided below in **Table 8.4.** Copies of this correspondence are available in **Appendix H.8**.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
MOECC: May 3, 2012 • York Region and AECOM met with the MOECC to present background information and report on the progress on the Project as well as obtain initial comments on the target well sites. • MOECC noted a continued decline of water levels in the YSA area until about 2004; however, with the introduction of lake-based servicing, there was a dramatic recovery of water levels. • Water levels in the Vandorf area are 5 to 10 m higher than they were in the early 2000s – MOECC does not want to see a return to the overall water level decline that was seen in the past (there had previously been a number of complaints in the Vandorf area). • MOECC noted twinning Aurora Well No. 5 might be acceptable but there was concern of "competition" for water with the existing well and the wells to the north. • MOECC indicated the Yonge Street and Green Lane area might be a suitable area for a new well.	• No response required. York Region maintained communication with the MOECC as the Project progressed.
MOECC: July 9, 2012 Identified areas of interest to MOECC including: • Ecosystem protection and restoration; • Surface water; • Groundwater; • Air quality, dust and noise; • Servicing and facilities; • Contaminated soils; • Mitigation and monitoring; • Planning and policy; • Class EA process; and, • Aboriginal consultation.	**August 22, 2012** <u>Ecosystem Protection and Restoration</u> • Effects on the ecosystem will be avoided/minimized as much as possible; the Project File will describe any proposed mitigation measures and how the local ecosystem will be protected. • Natural heritage features within the study area will be identified. • Contact has been made with the DRO, MNRF, LSRCA and TRCA for their input on the Project. <u>Surface Water</u> • Potential effects on surface water quality and quantity will be avoided/minimized. <u>Groundwater</u>

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
	• Potential effects on groundwater quantity and quality will be avoided/minimized. • The LSRCA has and will continue to be consulted on the plan for groundwater discharge during pumping tests being undertaken at each alternative well area. • A discharge plan will be submitted to the MOECC through the PTTW application process. • York Region will also apply for an amendment to the existing PTTW that includes the new production well(s) as part of implementing the preferred solution. <u>Air Quality, Dust and Noise</u> • Mitigation measures during construction will be used to minimize air quality, dust and noise related effects on nearby sensitive receptors. <u>Servicing and Facilities</u> • York Region will obtain an amendment to the Drinking Water Works Permit (DWWP) to incorporate the new wells into the existing water system. • Since the preferred solution will not include wastewater, pipelines, landfills or industrial uses, adherence to the "D-Series" guidelines is not required. <u>Contaminated Soils</u> • Removal of soil will be undertaken in accordance with Part XV.1 of the *Environmental Protection Act* and O.Reg 153/04. • York Region does not anticipated that a Record of Site Condition will be required. <u>Mitigation and Monitoring</u> • The design and construction of new wells will employ best management practices with regard to prevention of impacts, protection of the existing environment and opportunities for

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
	rehabilitation and/or enhancement of any impacted areas. <u>Planning and Policy</u> • The project will comply with the policies of the Lake Simcoe Protection Plan, Growth Plan for the Greater Golden Horseshoe and Provincial Policy Statement. • York Region has not identified any specific policies in the Lake Simcoe Protection Plan that this project would be subject to. • This project is not related to growth in the study area, as such, there are no applicable policies under the Growth Plan for the Greater Golden Horseshoe. • This Project will comply with Policy 1.6.4.1 of the Provincial Policy Statement. The Environmental Screening Document will demonstrate how the project complies with this policy in the Provincial Policy Statement. <u>Class EA Process</u> • The report will contain the following: • Clear and complete documentation of the planning process undertaken; • A description of the consultation process, including comments received and York Region's responses; • A description of the net positive and negative effects of each alternative and mitigation measures; • Supporting studies; • A list of permits and approvals required for the undertaking. <u>Aboriginal Consultation</u> • The Notice of Commencement was sent to the following Aboriginal communities in May 2012: • Alderville First Nation • Beausoleil First Nation • Chippewas of Georgina Island First Nation • Chippewas of Mnjikaning (Chippewas of Rama)

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
	• Curve Lake First Nation • Hiawatha First Nation • Iroquois Confederacy • Huron Wendat Nation • Kawartha-Nishnawbe First Nation of Burleigh Falls • Métis Nation of Ontario • Métis National Council • Mississaugas of the New Credit First Nation • Mississaugas of Scugog Island • Mohawks of the Bay of Quinte • Moose Deer Point First Nation • Six Nations of the Grand River • The Notice of Commencement was also sent to the Ministry of Aboriginal Affairs and Aboriginal Affairs and Northern Development Canada. • In response, Aboriginal Affairs and Northern Development Canada identified established or potential Aboriginal or treaty rights in the vicinity of the Study Area. As a result of this correspondence, and other correspondence from specific First Nations Wahta Mohawks and Karry Sandy McKenzie, Coordinator for the Williams Treaty First Nations, were added to the project contact list.
MOECC: May 26, 2016 • Requested specific project information (notices, PIC material, background information); • Provided MOECC contact information; • MOECC will contact Ministry's Source Water Protection Branch to determine how this project will address requirements of the Clean Water Act; • Changes to the MEA Class EA document (2015) indicate the following: – A project occurring in a source water protection vulnerable	• The requested information on Source Water Protection has been included in this Project File. The Project Team will continue to consult with MOECC on Source Water Protection throughout this project.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
area has to be identified and documented in the ESR or Project File, – Local Source Protection Plan (SPP) policies may apply, – Consultation with appropriate conservation authority/source protection authority (CA/SPA) may be required, – A section on Source Water Protection should be included in the Class EA report, – If the project is within a vulnerable area, details of potential threats to drinking water are required.	
MOECC: September 28, 2016 • A meeting was held to provide a Project update and to solicit comments from the MOECC. It was stressed that the Team is hoping to receive MOECC's comments prior to finalizing the Project File; submission of the Project File is planned for November 3, 2016; • AECOM to review list of First Nations who hadn't responded to Project Notices and follow up, if required; • Source Water Protection (SWP) to be addressed in the Project File. York Region SWP has conducted the preliminary consultation with local municipalities, which will be addressed in the final report. A letter from Lake Simcoe and Region Source Protection Authority (SPA) in support of the York Region SWP Plan to be completed prior to connecting the new wells to the water supply system will be provided in the Report. • Wellhead Protection Areas (WHPAs) cannot be provided in the Project File as the work is ongoing and York Region does not want to prematurely release any maps to the public that would affect future policies within these areas. • Sufficient information on SWP needs to be included in the Project File because the report will be reviewed by the MOECC's Source Water Protection Branch. • MOECC suggested a DRAFT Project File should be circulated	• No response required. York Region will continue to consult with the MOECC and the Source Water Protection Branch as the Project progresses.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
to MOECC for 30-day review. The DRAFT review period should help to minimize the MOECC's staff comments during the official 30-day public review period for the FINAL Project File. • MOECC indicated that from a technical perspective regarding the future update to the existing YSA Permit to Take Water given that no increases to the maximum pumping rates are proposed do not see any major issues; Source Water Protection is the key consideration.	
MOECC: November 30, 2016 Draft Project File Report (PFR) Comments: <u>General Comments</u> The PFR should include a section summarizing all permits and approvals anticipated to be required prior to implementation of this project. <u>Planning and Policy Comments</u> The PFR should include a section referencing the applicable policies in the PPS and LSPP and demonstrating how the project complies with these policies. <u>Groundwater Comments</u> 1. Provided updated PTTW reference. An amendment to the PTTW will be required following the completion of the Class EA. 2. Clarification on which aquifer the proposed new wells will be screened into is required. It should be noted that	<u>General Comments</u> Section 7 – Permits and Approvals has been updated to include the following: "All permits and approvals known to-date will be obtained prior to implementation including: ▪ Amendment to the current Yonge Street Aquifer PTTW (MOECC) ▪ Amendment to the current Drinking Water Works Permit (MOECC) ▪ Regulation 179/06 (Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses) Permit by Lake Simcoe Region Conservation Authority for well facility expansion at Aurora Well #5 ▪ Approvals under Planning Act (site plan approval and a Building Permit) by Local Municipalities (Town of East Gwillimbury and Town of Aurora) and by York Region; ▪ Approvals and exemptions from all applicable by-laws (Noise, Road Right-of-Way, Sewer Use) by Local Municipalities and York Region. In addition, York Region has internal protocols stipulating that all permits and approvals must be secured and obtained directly by York Region prior to tendering the project. As per the same

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
groundwater drawdown effect from a confined aquifer could be observed in a much larger area, especially when the thickness and existence of aquifer and aquitard are highly variable. Monitoring the well operation for a longer period of time would provide more reliable data to evaluate the potential impacts from the pumping at the proposed scale. These should be discussed in more detail when applying for the PTTW amendment. .The PFR should also clarify how the main technical criteria for selecting the preferred areas was considered. 3. MOECC suggested monitoring well operations for a longer period of time as a means of gathering more reliable data to evaluate potential impacts from pumping. These should be discussed in more detail when applying for the PTTW amendment. 4. Confirm the title and content of Appendix E are consistent. 5. The cross-sections should include the locations of all relevant boreholes, private and municipal wells to demonstrate the level of certainty of the interpreted hydrostratigraphy. Screen intervals of the existing wells and the proposed new wells, and water levels observed in the well should also be presented to help understand the hydraulic connections among the new wells, the existing municipal wells and the surface water features within the estimated zones of influence. 6. When applying for the PTTW amendment, the region should provide sufficient data and evaluation to support the model prediction, along with a detailed monitoring and mitigation plan for the potential impacts to local aquifer and private wells. 7. Appendix G – Groundwater Exploration Report is not	protocol all permits and approvals are owned by York Region and as such, York Region is ultimately responsible for ensuring compliance". <u>Planning and Policy Comments</u> Section 1.10 was updated to include the Provincial Policy Statement and the Lake Simcoe Protection Plan: "This Project complies with Section 1.6.6.1 b), c) and d) of the Provincial Policy Statement (2014): 1.6.4.1 Planning for sewage and water services shall: b. ensure that these systems are provided in a manner that: 1. can be sustained by the water resources upon which such services rely; 2. is financially viable and complies with all regulatory requirements; and 3. protects human health and the natural environment; c. promote water conservation and water use efficiency; d. integrate servicing and land use considerations at all stages of the planning process. With regard to the Lake Simcoe Protection Plan (2009), the Plan focuses on the protection of ecological health and environmental sustainability within the Lake Simcoe Watershed. The Plan aims to achieve this through restoring the health of aquatic life, improving water quality, maintaining water quantity, protecting and rehabilitating areas such as shorelines and addressing invasive species, climate change and recreational activities.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
included in this draft EA. The report contains technical details regarding the 72-hour pumping tests and Source Water Protection related study, and should be submitted to support the review.	York Region's recent Water and Wastewater Master Plan Update (2016) is aligned with various policies such as the Provincial Policy Statement and the Lake Simcoe Protection Plan in that it, as noted above, provides specific recommendations to provide long-term water and wastewater services that are safe, well-managed, and sustainable. The Yonge Street Aquifer Well Capacity Restoration Class EA was a project recommended through the master planning exercise and as a result, complies with these policies. Finally, the impact assessment conducted as part of this Project further supports the Project's compliance with these policies in that the Preferred Solution promotes the efficient use of existing municipal water services by re-establishing the lost capacity within the limits of the existing Permit to Take Water." <u>Groundwater Comments</u> 1. The PTTW referenced in Section 1.4 of the Project File Report was replaced with PTTW #6728-9NLQ2F. Section 1.4 was also updated to include that the following: "It is York Region's intention to apply for an amendment to the current PTTW following completion of the Environmental Assessment for restoring the Yonge Street Aquifer well capacity". 2. The aquifer depth and formation name has been added to Section 6.5.2.1, 6.5.2.2, 6.5.2.3, 6.5.2.4 in the *Technical* category. The transmissivity values obtained during Stage 4 field testing are included in Table 6-4 and in Appendix F. In addition, the field observed aquitard thickness values are also recorded in Table 6-4.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
	Table 6-4 was updated to include the following footnote: "The stratigraphic information available at the regional scale pre-field testing indicated some variability in aquitard thickness which could significantly vary on from site to site and on a local scale. This aquitard inconsistency was not confirmed and was refined via the site specific drilling that included a test well and monitoring wells, and which did not encounter any instances of an absent aquitard. Therefore, it was decided that aquitard variability was not appropriate to be included as a determining factor in site selection". 3. Section 6.6 was updated to include: "A long term monitoring program will be proposed as part of the YSA PTTW Amendment application process". 4. The title of Appendix E has been revised to "Ministry of Natural Resources and Forestry Correspondence". 5. Please note that conflicting cross sections occurred due to the preparation of two types of cross-sections: regional and local. The regional cross-sections were generated using the CAMC-YPDT hydrostratigraphic model and included to provide context on the understanding of the regional system at the time the project was initiated. The local cross-sections were generated using the site specific data collected during the project, borehole information provided by York Region, and the MOECC Water Well Database. As the regional interpretation has already been included in project reporting as background information, they will not be included in the Hydrogeological Report that will be submitted in support of an amendment to the existing Yonge Street Aquifer Permit to Take Water (YSA PTTW 6728-9NLQ2F). This reporting and

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
	amendment process will occur after the Environmental Assessment process is fulfilled. 6. Section 6.7 remains unchanged. Please note, that documentation prepared for the PTTW amendment will include technical details of the completed groundwater modeling and a detailed monitoring and mitigation plan. 7. The Groundwater Exploration Summary Report is included in Appendix G. It provides all records and technical details on each well installation, 72 hour testing and hydrographs. Water quality data is included in Appendix I. The Summary Report is pertinent to the comparative evaluation of the alternatives and development of the preferred solution as part of this Schedule B Class EA study. The complete Hydrogeological Report is an extensive technical document being prepared for the purpose of the PTTW amendment application and has not yet been finalized. As we identified above, the Amendment to YSA PTTW will be conducted separate from this Environmental Assessment Study and will involve further consultation with MOECC technical staff. Please note that discussion on Source Water Protection is included in Section 6.7.2.1, which also states the commitments made by York Region and supported by Lake Simcoe Region Source Protection Authority (letter is included in Appendix H.8) to complete all Source Protection planning, public consultation and further policies prior to when the new wells can be physically added to the regional water supply system. This item was discussed in the meeting held with the MOECC on September 23, 2016 and recorded in the minutes (attached in Appendix H.8).

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
TRCA: July 10, 2012 • Provided a list of areas of interest to TRCA including: Regulated Areas, TRCA Program **and** Policy Areas, Provincial Program Areas; • Provided criteria for identifying the preferred alternative: Prevents the risk associated with flooding, erosion or slope instability; Protects and rehabilitates existing landforms, features and functions; Provides for aquatic, terrestrial and human access; Minimizes water/energy consumption and pollution; Addresses TRCA property and heritage resources concerns. • Provided a summary of detailed design commitments recommended to be included in a Pre-design brief; • Requested a meeting prior to selecting the preferred alternative solution.	August 1, 2012: • Provided an overview of the project and a map of potential well locations. • Indicated that all four well areas are under the jurisdiction of the Lake Simcoe Region Conservation Authority, as such, York Region will continue to consult with the Lake Simcoe Region Conservation Authority regarding this project. • York Region will notify the TRCA if at a later time, well areas are identified within the TRCA's jurisdiction.
LSRCA: Multiple dates • Between June 2012 and November 2013, AECOM consulted with the LSRCA regarding specific requirements, mitigation measures and permitting required for the 24-hour and 72-hour pumping tests. A summary of this consultation is provided below: • AECOM contacted LSRCA to determine permitting requirements for pumping test discharge plans. Information was provided on drilling locations, anticipated volumes of discharge and distribution of water following the test. LSRCA confirmed they have no issues with the plans (June 28, 2012 - September 13, 2012). • AECOM notified LSRCA of turbidity issues associated with the drill site on Green Lane between 2nd Concession and Yonge Street. The situation was rectified by redirecting discharge water to an alternate ditch location prior to reaching the creek.	• York Region has engaged the LSRCA throughout the course of this Project and will continue to do so through the DRAFT Project File Review period and the subsequent permitting phase related to Well Area 11.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
LSRCA was satisfied with this plan provided the turbidity was being monitored at the point of entry (November 1, 2012 – November 2, 2012). • AECOM requested floodline information for 256 Old Yonge Street on November 07, 2012. LSRCA provided the requested floodline mapping for properties adjacent to 256 Yonge Street. The LSRCA also indicated a site survey may be necessary to delineate the regional floodline (November 9, 2012). • The environmental planner for LSRCA was consulted on necessary permits required for borehole drilling at 65 St. John's Sideroad in Aurora. It was confirmed that two permits (O.Reg 179/06) would be necessary (February 13, 2013 –April 10, 2013). • LSRCA issued approved permits for borehole drilling at St. John's Sideroad (May 03, 2013). • Updated discharge plans were discussed with LSRCA with details provided for three sites (Warden Avenue, Green Lane and Old Yonge Street). LSRCA notified AECOM to operate under the conditions of the PTTW (#3368-8ZVL5U, #0205-9STSG8, #2188-9X7PDL) (June 13, 2013 – June 17, 2013). • AECOM requested floodline mapping information for 256 Yonge Street. LSRCA provided floodline mapping and information as requested (November 4, 2013 – November 12, 2013). • AECOM requested a copy of the survey for the development limit of the northern property on Green Lane in East Gwillimbury. LSRCA was not able to provide this information but directed AECOM to the land owners or their consultants (November 29, 2013). LSRCA: September 14, 2016 • AECOM and York Region met with the LSRCA on September	

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
14, 2016 to provide them with a Project update and to seek their feedback prior to the submission of the Project File and start of the 30-day public and agency consultation period. During the meeting, it was confirmed that Well Area 6 – Green Lane would not require permits from the LSRCA because it is located outside their Regulated Area. Well Area 11 – Aurora Well No. 5 would require permits as the existing well site is located with their Regulated Area (September 14, 2016).	
LSRCA: November 22, 2016 • LSRCA reviewed the draft Project File and did not have any concerns with the proposed wells.	• No response required.
MTCS : February 12, 2013 MTCS confirmed the Stage 1 Archaeological Assessment for the study area was received and entered into the Ontario Public Register of Archaeological Reports. MTCS: August 26, 2014 • MTCS entered the Stage 2 Archaeological Assessment conducted at Well Area 6 – Green Lane into the Ontario Public Register of Archaeological Reports.	• No response required.
MNRF: March 22, 2013 • Provided information on natural heritage features and Species at Risk (SAR) specific to Well Areas, 3, 5, 6, and 11. • Within the four areas, the following SAR were identified: butternut and snapping turtles. • The Provincially Significant Black River Wetland Complex is located in the vicinity of Well Area 5. The Provincially Significant Aurora (McKenzie) Marsh Wetland Complex is located in the vicinity of Well Area 11. MNRF: October 13, 2016 • MNRF provided an update to the SAR features identified in the vicinity of the four well areas at the request of AECOM due to	No response required. The DRAFT Project file was provided to the MNRF for review and comment. Potential effects to SAR are addressed in the Project File Report.

Table 8-4: Summary of Agency Comments

Agency Comment	York Region Response
the time lapse from the letter received in March, 2013. • MNRF identified Butternut, Redside Dace, Barn Swallow and Snapping Turtle in the vicinity of the well areas. It was also noted that there is the potential for endangered bats in cavities.	
MNRF: November 24, 2016 • MNRF did not have any comments after reviewing the draft Project File Report.	No response required.
South Georgian Bay Lake Simcoe Source Protection Region: October 17, 2016 • Establishment of new municipal wells may introduce new significant threats to drinking water quality or quantity and may therefore trigger policy obligations as laid out in the South Georgian Bay Lake Simcoe Source Protection Plan. • Staff of Lake Simcoe Region Conservation Authority support the approach that [York Region] staff is taking to meet the requirements of the Clean Water Act. LSRCA will continue to work with [York Region] throughout the process of confirming the location of the wells, mapping their respective Wellhead Protection Areas, and conducting groundwater vulnerability assessments, to ensure that the requirements of the Act and Plan are met." Furthermore, the Lake Simcoe and Couchiching / Black River Source Protection Authority will ensure the Source Protection Plan and Assessment Report is updated as required, and will participate in public and MOECC consultation.	York Region is committed to delineating WHPAs, completing Groundwater Vulnerability Assessments, scoring WHPAs and completing Threats Assessment and verification as outlined in the Clean Water Act Technical Rules prior to commissioning new wells as part of regional water supply system.

8.4 Aboriginal Consultation

The following provides a summary of Aboriginal Consultation undertaken for this project. All Aboriginal correspondence is included in **Appendix H.9**.

8.4.1 Aboriginal Organizations

Indigenous and Northern Affairs Canada (INAC), formerly Aboriginal Affairs and Northern Development Canada (AANDC) maintains a record of information related to Aboriginal treaty information, claims and litigation data. In addition, the location of Aboriginal communities and Aboriginal groups is also recorded by INAC.

INAC was contacted and responded (June 18, 2012) and provided information on First Nation communities to be consulted for this undertaking.

Similarly the Ministry of Indigenous Relations and Reconciliation (formerly the Ministry of Aboriginal Affairs) was contacted detailing the study and requesting information on Aboriginal communities that may have an interest in the study. The Ministry responded (July 13, 2012) and provided information on the First Nation communities to be contacted under this study and requested to be removed from the mailing list.

The following Aboriginal communities and/or organizations are included on the Project mailing list:

- Alderville First Nation
- Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Mnjikaning (Chippewas of Rama)
- Curve Lake First Nation
- Hiawatha First Nation
- Huron Wendat Nation
- Iroquois Confederacy
- Karry Sandy McKenzie, Williams Treaty First Nations
- Kawartha-Nishnawbe First Nation of Burleigh Falls
- Métis Nation of Ontario
- Métis National Council
- Mississaugas of the New Credit First Nation
- Mississaugas of Scugog Island
- Mohawks of the Bay of Quinte
- Moose Deer Point First Nation
- Six Nations of the Grand River
- Wahta Mohawks

A summary of the correspondence received from Agencies and Aboriginal Communities is provided in Table 8.5.

Table 8-5: Summary of Comments from Agencies and Aboriginal Communities

Comment Received	York Region Response
Indigenous and Northern Affairs Canada (formerly AANDC) : June 18, 2012 • Information held by AANDC is provided as contextual information and may or may not pertain directly to Aboriginal or treaty rights • Aboriginal communities remain best positioned to explain their traditional use of land, their practices or claims that may fall under section 35 • Attached a response to York Region's request for information concerning consultation with Aboriginal and First Nation communities in the vicinity of the Yonge Street Aquifer Well Capacity Restoration project for the York Municipality, in Ontario. • Provided a list of communities within 100 km of the Project: – Beausoleil – Chippewas of Georgina Island – Chippewas of Mnjikaning – Curve Lake – Hiawatha – Mississaugas of Scugog Island – Wahta Mohawks – Alderville – Huron Wendat – Mohawks of the Bay of Quinte – Moose Deer Point First Nation – Six Nations of the Grand River	June 26, 2012: • In response to this letter, the Study Team added the Wahta Mohawks to the mailing list.
Ministry of Indigenous Relations and Reconciliation (formerly MAA) (July 25, 2012) - Provided list of First Nations communities who may have an interest in the Project and requested to be removed from the mailing list. • List of First Nation communities are as follows: – Mississaugas of New Credit – Chippewas of Georgina Island – Beausoleil First Nation – Chippewas of Rama	• No response required, the communities identified by the Ministry of Indigenous Relations and Reconciliation were already on the Project mailing list.
Curve Lake First Nation: July 19, 2012 • Acknowledged receipt of the Notice of Commencement • Noted the Project is within the Traditional Territory of Curve Lake First Nation • The Curve Lake First Nation's Territory is incorporated within the William's Treaty Territory and is the subject of a claim under Canada's Specific Claims Policy • Recommend that York Region provide Karry Sandy-Mackenzie, Williams Treaty First Nation Claims Coordinator, with a copy of the proposals as York Region's obligation to consult also extends to the other First Nations of the Williams Treaty • Although exhaustive research hasn't been conducted, the	Note: A Stage 2 Archaeological Assessment was completed at Well Area 6 – Green Lane on April 29, 2014 and consisted of the physical survey of subject lands via pedestrian survey methods at an interval of 5 m. No archaeological sites or material were identified within the proposed construction area for Well Area 6 during the course of the assessment. There are no concerns regarding impacts to

Table 8-5: Summary of Comments from Agencies and Aboriginal Communities

Comment Received	York Region Response
Curve Lake First Nation Council is not currently aware of any issues that would cause concern with respect to Traditional, Aboriginal and Treaty Rights • Noted concern for remains of ancestors. Should excavation unearth bones, remains or other such evidence of a native burial site or any Archaeological findings, the Curve Lake First Nation must be notified without delay	archaeological sites by the proposed development and no further archaeological assessment of the property is required. August 14, 2012 • As a result of your correspondence and correspondence from other First Nations, we have added Karry Sandy-McKenzie to our project contact list and she will receive future project notices. • As part of this project, should Aboriginal remains or significant Aboriginal artifacts be uncovered, York Region will stop construction activity in the area where this has been uncovered and notify identified interested First Nations. While activity in the vicinity of what has been uncovered would be halted, construction and other activity elsewhere may continue. In addition, York Region and representative First Nations would participate in a joint process to determine the cultural identity of the find. • Where there is the strong potential for the project to impact an established or asserted Aboriginal or Treaty Right that York Region is aware of, York Region will contact the provincial government and applicable First Nation.
Alderville First Nation: June 5, 2012 • Confirmed the Project is being proposed within the Traditional and Treaty Territory • Appreciates that York Region recognizes the importance of First Nations Consultation and the office is conforming to the requirements within the Duty to Consult Process • As per the Alderville First Nation Consultation Protocol, the project is deemed a level 3, having minimal potential	• Alderville First Nation remained on the Project mailing list and was provided with subsequent Project notices.

Table 8-5: Summary of Comments from Agencies and Aboriginal Communities

Comment Received	York Region Response
to impact First Nations' rights, therefore, please keep Alderville apprised of any archaeological findings, burial sites or any environmental impacts, should any occur, while the study is taking place • Requested to be kept apprised throughout all phases of the project	
Chippewas of Rama First Nation: June 19, 2012 • Acknowledged receipt of the notice of commencement • Requested that future correspondence is directed to Karry Sandy-McKenzie, Barrister and Solicitor, Coordinator for the Williams Treaties First Nations	• Chippewas of Rama First Nation were included on the mailing list for all notices.
Chippewas of Georgina Island First Nation: Response Form • Provided project response sheet, checked "wish to be notified for continued involvement in the project process, including to project implementation"	• Chippewas of Georgina Island First Nation were included on the mailing list for all notices.

9. Conclusions

York Region initiated the Yonge Street Aquifer Well Capacity Restoration Project in accordance with the Municipal Class Environmental Assessment process for a Schedule B Project (Municipal Class EA) (October 2000, as amended in 2007, 2011 and 2014) to restore the full permitted capacity of York Region's wells within the Yonge Street Aquifer. Phase 1 of the Project established the Problem/Opportunity Statement, which is as follows: *The purpose of this project is to re-establish the full permitted well capacity of York Region's water system in the Yonge Street Aquifer area while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued.* Phase 2 of the Project was designed to identify and evaluate alternative solutions and ultimately to recommend a preferred solution that satisfies the Problem/Opportunity Statement. Following the completion of Phase 2, the Preferred Solution was confirmed to include rehabilitating existing wells at Aurora Well No. 5, Aurora Well No. 6 and Newmarket Well No. 15 in addition to constructing new wells at Well Area 6 – Green Lane and Well Area 11 – Aurora Well No. 5.

The Preferred Solution addresses the Problem/Opportunity Statement in that it will re-establish the full permitted well capacity of York Region's groundwater system in the Yonge Street Aquifer area while ensuring that future water demands can be met, the reliability of the water supply is maintained or enhanced, and the responsible management of groundwater in the Yonge Street Aquifer is continued.

10. References

Archaeoworks Inc., 2013:
Stage 1 Archaeological Assessment: Yonge Street Aquifer Well Capacity Restoration Environmental Assessment. January 17, 2013

International Water Supply, 1977:
Regional Municipality of York Town of Newmarket Groundwater Investigation, prepared for the Regional Municipality of York.

International Water Supply, 1988:
Regional Municipality of York Holland Landing 1988 Groundwater Investigation, prepared for the Regional Municipality of York.

Kassenaar, J.D.C. and E.J. Wexler, 2006:
Groundwater Modelling of the Oak Ridges Moraine Area. CAMC-YPDT Technical Report #01-06.

Lake Simcoe Region Conservation Authority, 2010:
Black River Subwatershed Plan, Lake Simcoe Region Conservation Authority.

Lake Simcoe Region Conservation Authority, 2015:
South Georgian Bay Lake Simcoe (SGBLS) Source Protection Area. From: http://ourwatershed.ca/documents/source_protection_plan.php

Ontario Ministry of Infrastructure, June 2013:
Growth Plan for the Greater Golden Horseshoe, 2006 – Office Consolidation, June 2013. Retrieved November 4, 2013, from: https://www.placestogrow.ca/content/ggh/2013-06-10-Growth-Plan-for-the-GGH-EN.pdf.

Ontario Ministry of Municipal Affairs and Housing, 2014:
Provincial Policy Statement, 2014. Retrieved from: http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463

Ontario Ministry of Natural Resources and Forestry (MNRF), 2011:
Natural Resources and Values Information System (NRVIS) mapping. Accessed February 2013.

Ontario Ministry of the Environment, 2009:
Lake Simcoe Protection Plan. From: http://www.climateontario.ca/doc/workshop/2011LakeSimcoe/Lake%20Simcoe%20Protection%20Plan%20Ch%201-5.pdf

Regional Municipality of York, 2011:
2010 State of the Production Wells and Aquifer Report, Regional Municipality of York. Internal report.

Regional Municipality of York, 2013:
York Region Official Plan – Modified York Region Official Plan 2010 – June 20, 2013 Office Consolidation. Retrieved November 4, 2013, from: http://www.york.ca/NR/rdonlyres/2b7ofp5fgd5kwinahg6dj4ylva4wlyxwaoof2hq325534ktw5hspk3o77eqfthbkwduwenv7hmx7fp7smgjzoc6lyg/3a+-+Modifed+YROP+2010+-+All+Text_20June13.pdf, June 20, 2013

Regional Municipality of York, 2015:
York Region 2041 Preferred Growth Scenario – Committee of the Whole, Planning and Economic Development Department (November 5, 2015). Retrieved July 27, 2016 from:https://www.york.ca/wps/wcm/connect/yorkpublic/e2c99ca1-f7d1-44ff-bec9-4e3249602fb3/nov+5+preferred+ex.pdf?MOD=AJPERES

Regional Municipality of York, 2016:
Water and Wastewater Master Plan (July 2016). Retrieved on July 27, 2016 from:
http://www.york.ca/wps/wcm/connect/yorkpublic/9602fc09-22ec-4202-8ce6-f2287a7b1aee/York+Region+Water+and+Wastewater+Master+Plan+2016pdf.pdf?MOD=AJPERES

Sharpe, D.R., S.E. Pullan and G. Gorrell, 2011:
Geology of the Aurora high-quality stratigraphic reference site and significance to the Yonge Street buried valley aquifer, Ontario. Geological Survey of Canada, Current Research 2011-1.

Town of Aurora, 2010:
Town of Aurora Official Plan 2010 (September 27, 2010). Retrieved July 27, 2016 from:
https://www.aurora.ca/TownHall/Documents/Corporate%20Reports/Town%20of%20Aurora%20Official%20Plan%202010.pdf

Town of East Gwillimbury 2014:
Town of East Gwillimbury 2010 Consolidated Official Plan 2031 (July 2014). Retrieved July 27, 2016, from:
http://www.eastgwillimbury.ca/Services/Planning/Consolidated_Official_Plan_Review_and_Update.htm

Town of East Gwillimbury, 2014:
Green Lane Secondary Plan, OPA #X. Retrieved July 27, 2016, from:
http://www.eastgwillimbury.ca/Assets/1+2015+About+Us/0.1+About+the+Town/0.3+Community+Information/1+Green+Lane+Corridor/Draft+GLSP.pdf

Unterman McPhail Associates Heritage Resource Management Consultants, 2013: Existing Conditions Report for Identified Build Heritage Resources and Cultural Heritage Landscapes. August 2013

Whitchurch-Stouffville, 2013: Town of Whitchurch-Stouffville Growth Management Strategy – Council Workshop. Retrieved November 4, 2013, from: http://www.townofws.com/pdfs/GMS/WS_GMS_Council_Workshop_Presentation_2013-05- 07.pdf. May 7, 2013