



TOWNSHIP OF NORTH DUNDAS
NORTH DUNDAS DRINKING WATER SUPPLY SYSTEM CAPACITY EXPANSION
SCHEDULE 'B' MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

PHASE 2 REPORT

FEBRUARY 13, 2023

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- Desktop Species at Risk Screening (Golder, October 2021)
- Stage 1 Archaeological Assessment (Golder, September 2022)
- North Dundas Drinking Water Supply System Capacity Expansion
Aquifer Pump Testing Program (Golder, January 2023)
- Geotechnical Investigation (Golder, January 2023)
- Wellhead Protection Area Study and Vulnerability Assessment
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APPENDIX 'C' Consultation Plan and Record of Stakeholder and Public Consultation

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EXECUTIVE SUMMARY

ES-1 Introduction and Background

The Township of North Dundas (Township) Drinking Water Supply System (DWSS) supplies treated water to residents of the Village of Winchester and the Village of Chesterville, in addition to industrial, commercial and institutional (ICI) users (notably Lactalis® Canada in Winchester). With the villages of Winchester and Chesterville located approximately 50 km south of downtown Ottawa, the populations of both villages are projected to increase due to future developments.

In August 2019, the Township retained J.L. Richards & Associates Limited (JLR) in association with Golder Associates Ltd. (Golder) to undertake a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for the Township DWSS to address long-term potable water supply needs and evaluate servicing solutions for the 20-year planning horizon.

ES-2 Phase 1 – Existing Conditions and Problem and Opportunity Statement

The Phase 1 Report was completed in September 2020 to evaluate and identify problems with the existing system. Currently, the Township's DWSS is comprised of eight active groundwater wells, five pump houses with chlorine disinfection, two storage reservoirs, two elevated storage tanks and approximately 41.5 km of distribution system piping. The current operational limit for water supply of the DWSS is 59.5 L/s (5,140.8 m³/s) with the largest well out of service.

Population growth scenarios were reviewed to project future water demands to 2039. The projected total maximum day demand for both low growth and high growth scenarios are 7,739 m³/s and 8,570 m³/s, respectively. With the current operational limit of the existing wells, the projected water supply deficit in 2039 is 2,595 m³/d and 3,429 m³/d for both low and high growth scenarios, respectively.

The following Problem and Opportunity Statement was identified as a basis for Phase 2 of this EA:

"The Township of North Dundas is serviced by a communal potable water supply system that generally consists of eight active groundwater wells, five pump houses with chlorine disinfection, two storage reservoirs, two elevated storage tanks and distribution system. While the system has been operating in accordance with all applicable legislation and is generally achieving all required water quality standards, it is anticipated that the Township will not be able to meet potable water supply requirements as recommended by the Ministry of the Environment, Conservation and Parks within the next 20 years timeframe if projected growth and associated water demand is realized. The Township is therefore in need of a solution that will address water supply constraints and improve the redundancy and reliability in delivering treated water to the community over the next 20 years and beyond."

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ES-3 Phase 2 – Identification and Evaluation of Alternatives

Following an initial screening of options, the following alternatives were evaluated:

- New well and Expand Groundwater System
- New well and Connect to South Dundas
- New well and Acquire Supplemental Water Sources.

Using an evaluation methodology to score the alternatives, it was determined that a new well and acquiring supplemental water sources provided the highest overall benefit to the Township. This alternative involves establishing a new well to mitigate short term water supply demand. The remaining water supply deficits would be met by continuing investigations for additional wells while negotiations are ongoing to install a watermain to connect to the South Dundas water distribution system.

The preferred alternative will generally include the following scope:

- Establish a new municipal well at the Lafleur Road site, consisting of:
 - New well construction, including a well shaft and pump, and building to house treatment equipment and electrical/instrumentation.
 - Treatment equipment as required by the water quality (manganese, etc.)
 - Site Civil, Electrical, Instrumentation upgrades
 - Construction of a new watermain connecting to existing watermain on Lafleur Rd.
 - Confirm any required upgrades to the existing Wellfield #7 to accommodate the new well site.
- Commence investigations to construct at additional groundwater well site(s), consisting of:
 - New well construction, including a well shaft and pump, and building to house treatment equipment and electrical/instrumentation.
 - Treatment equipment as required by the water quality.
 - Site Civil, Electrical, Instrumentation upgrades
 - Construction of a new watermain connecting to nearest existing watermain.
- Coordinate with the Municipality of South Dundas to further investigate the feasibility to connect to the South Dundas water distribution system, consisting of:
 - New watermain connecting the water distribution system in Morrisburg to the system in Winchester, approximately 27 km.
 - Construction of a booster pumping station(s) along the watermain alignment. The location and capacity of the pumping station(s) will be dependent on hydraulic requirements, land acquisition, etc.

ES-4 Public and Agency Consultation Activities

A consultation plan was developed for the project. The project notification was published in a local newspaper and on the Township's website in September 2019, and project initiation notification

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letters were issued to potential project stakeholders at that time. One Public Information Centre (PIC) was held for this project on December 15, 2022.

At each phase of the project, a Public Consultation Summary was updated with public and stakeholder comments as well as information as to how the comments were addressed. Refer to the Section 5.0 of the EA Report for further details.

ES-5 Project Costs

A Class 'D' Cost Estimate (Order of Magnitude) of the preferred alternative was prepared as part of this project and presented in the EA Report. The construction and engineering estimate to implement the preferred alternative is approximately \$60.8 Million, excluding HST, expressed in 2022 dollars. For further information regarding the estimated cost refer to Section 6.3 of the EA Report.

ES-6 Environmental and Construction Impacts and Mitigation Measures

Potential effects on the environment, caused by the proposed project, have been identified. Various mitigation measures are recommended to reduce net effects to acceptable levels. Some of the suggestions include implementation of erosion and sediment control, a Stage 2 or 3 archaeological assessment of the areas impacted by construction, including a Cultural Heritage Evaluation Report (CHER), restrictions to work within specific times during the year to protect breeding birds and fish, etc.

Potential effects and proposed mitigation measures are summarized in Section 6.4 of the EA Report. Mitigation measures and associated monitoring are to be further developed and detailed during the design and construction phases.

ES-7 Completion of the Class Environmental Assessment

The project Class EA Schedule was reviewed following the completion of Phase 2. Based on the results from Phase 2 and the selection of the preferred alternative, this project has been reduced to a Schedule 'B' Class EA.

The filing of this EA Report represents the conclusion of Phase 2 of the Class EA Addendum process, including public and agency consultation. The ESR Addendum will be placed on the public record by issuing a Notice of Completion and interested individuals will have 30 days to provide comments. If comments arise that cannot be resolved or mitigated in discussions with the Township of North Dundas within the 30 day period, a person/party may request the Minister of the Environment, Conservation and Parks to issue a Part II Order for an individual EA. The request must be made in writing and directed to the Minister of the Environment, Conservation and Parks and the Director of Environmental Assessment and Permissions Branch with a copy to the proponent.

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1.0 INTRODUCTION

1.1 Background

The Township of North Dundas' Drinking Water Supply System (DWSS) supplies treated water to residents of the Village of Winchester and the Village of Chesterville, in addition to industrial, commercial and institutional (ICI) users (notably Lactalis® Canada in Winchester). The villages of Winchester and Chesterville are located approximately 50 km south of downtown Ottawa with populations of 2,394 and 1,677 (based on the 2016 Census), respectively. With their proximity to Ottawa, the populations of both villages are projected to increase due to future developments. Refer to Figure 1 for a Location Plan of the Township of North Dundas.

Currently, the DWSS is comprised of eight active groundwater wells, five pump houses with chlorine disinfection, two storage reservoirs, two elevated storage tanks and approximately 41.5 km of distribution system piping. The DWSS is owned by the Township of North Dundas (the Township) and is currently operated by the Ontario Clean Water Agency (OCWA).

On August 16, 2019, the Township retained J.L. Richards & Associates Limited (JLR) in association with Golder Associates Ltd. (Golder) to undertake a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for the Township DWSS to address long-term potable water supply needs and evaluate servicing solutions for the 20-year planning horizon. This Report fulfills the requirements of Phase 2 of the process. The project is currently proceeding as a Schedule 'C' undertaking; however, the project schedule will be reviewed at the completion of Phase 2 to determine whether the project should be modified to a Schedule 'B' Class EA.

A Phase 1 Report was completed in September 2020 to evaluate and identify problems with the existing system. Phase 2 of the Class EA involves identifying and evaluating possible alternative solutions to the problems identified in Phase 1.

1.2 Class Environmental Assessment Process

The *Ontario Environmental Assessment Act* (EA Act), enacted in 1976, formally recognizes the Municipal Class Environmental Assessment (Class EA) process and outlines requirements for EA approval. The Municipal Class EA applies to municipal infrastructure projects, including roads, water, and wastewater projects. To ensure that environmental impacts and effects are considered for each project as per the EA Act, proponents are required to generally follow the planning process set out in the Municipal Class EA Guidelines, prepared by the Municipal Engineers Association (MEA) (2015) (www.municipalclassea.ca). The Class EA process includes the following stages:

Phase 1: Problem or opportunity identification.

Phase 2: Identification and evaluation of alternative solutions to determine a preferred solution to the problem or opportunity. This Phase also compiles an

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- environmental 'inventory', identified impacts, and outlined mitigation measures.
- Phase 3: Identification and evaluation of design concepts for the preferred solution. A detailed evaluation of the environmental effects and mitigation measures will be addressed during this project Phase.
- Phase 4: Complete and place Environmental Study Report on Public Record. The Report will document Phases 1 through 3 and summarize the consultation undertaken throughout the planning process and is considered valid for a 10 year period.
- Phase 5: Implementation and monitoring.

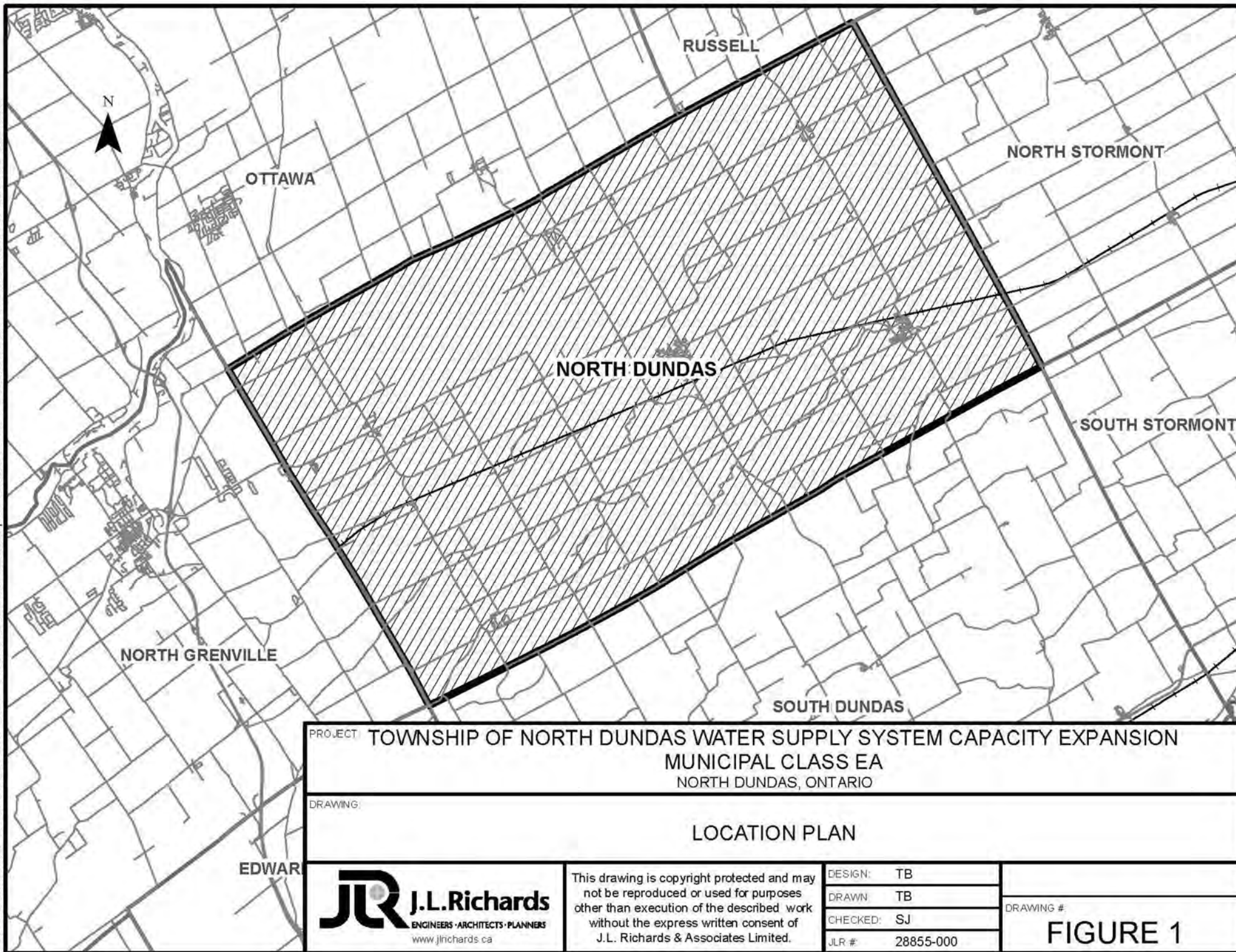
Since projects may vary in their environmental impact, they are classified in terms of the following schedules:

- Schedule 'A' projects usually have minimal environmental effects and generally include normal or emergency operational and maintenance activities. These projects are preapproved under the Class EA planning process. Projects within this category are subject to Phases 1 and 5.
- Schedule 'A+' projects are pre-approved projects similar to Schedule 'A'; however, the public is to be advised prior to project implementation.
- Schedule 'B' projects have potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with affected parties. Generally, these projects include improvements and minor expansions to existing facilities. Projects within this category are subject to Phases 1, 2 and 5.
- Schedule 'C' projects have potential for greater environmental impacts and are subject to all five Class EA Phases. Generally, these projects include the construction of new facilities and major expansions to existing facilities.

Based on the following excerpt from the MEA Guidelines, this project has been undertaken as a Schedule 'C' Class EA, and thus Phases 1 through 4 of the Class EA process will be completed. Once the Class EA is complete, the Township will be able to proceed with Phase 5. Refer to Figure 2 for the Class EA Process.

Excerpt from MEA guidelines for a Schedule 'C' undertaking:

"1. Construct new water system including a new well and water distribution system".



PROJECT TOWNSHIP OF NORTH DUNDAS WATER SUPPLY SYSTEM CAPACITY EXPANSION
MUNICIPAL CLASS EA
NORTH DUNDAS, ONTARIO

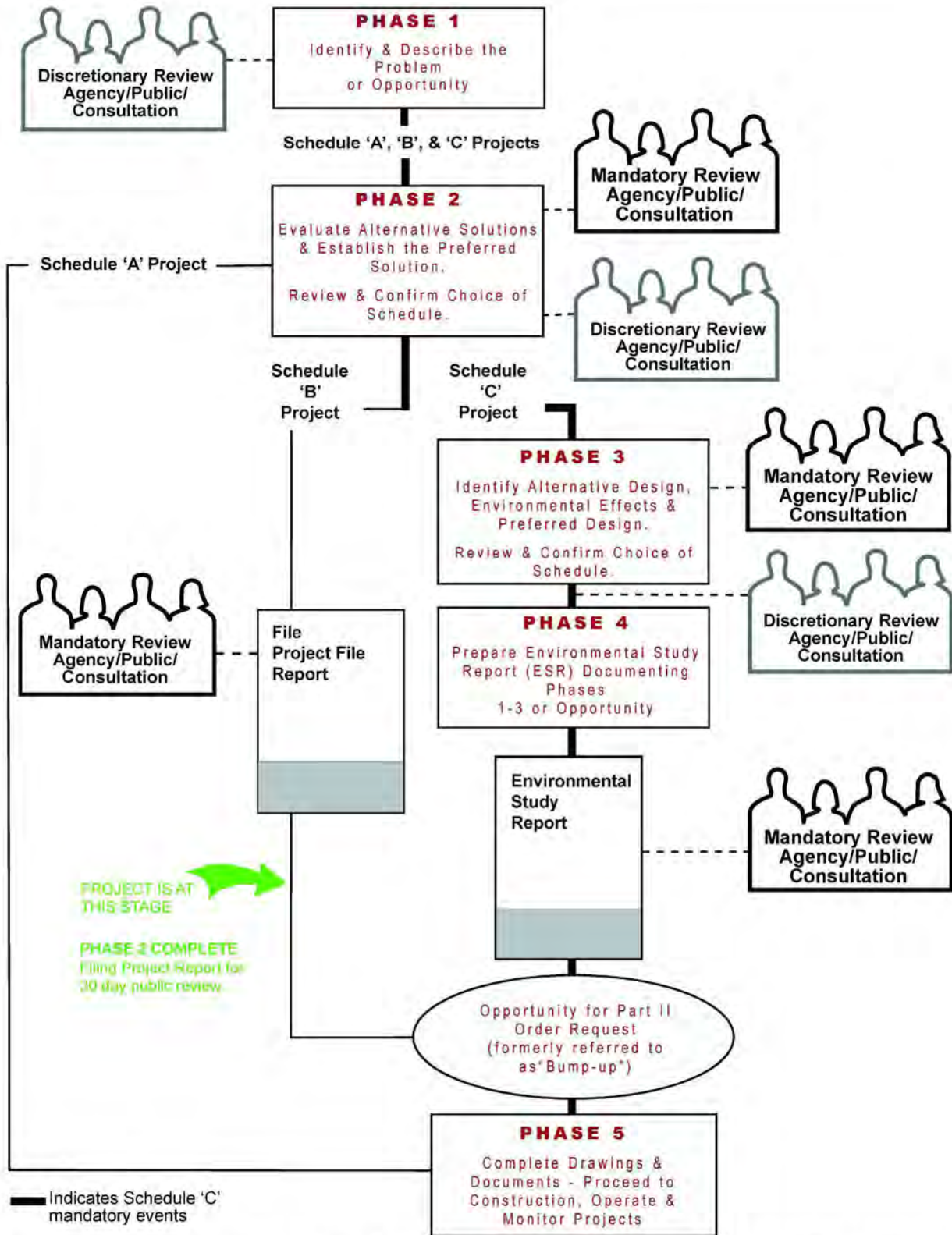
DRAWING: LOCATION PLAN

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DESIGN:	TB
DRAWN:	TB
CHECKED:	SJ
JLR #:	28855-000

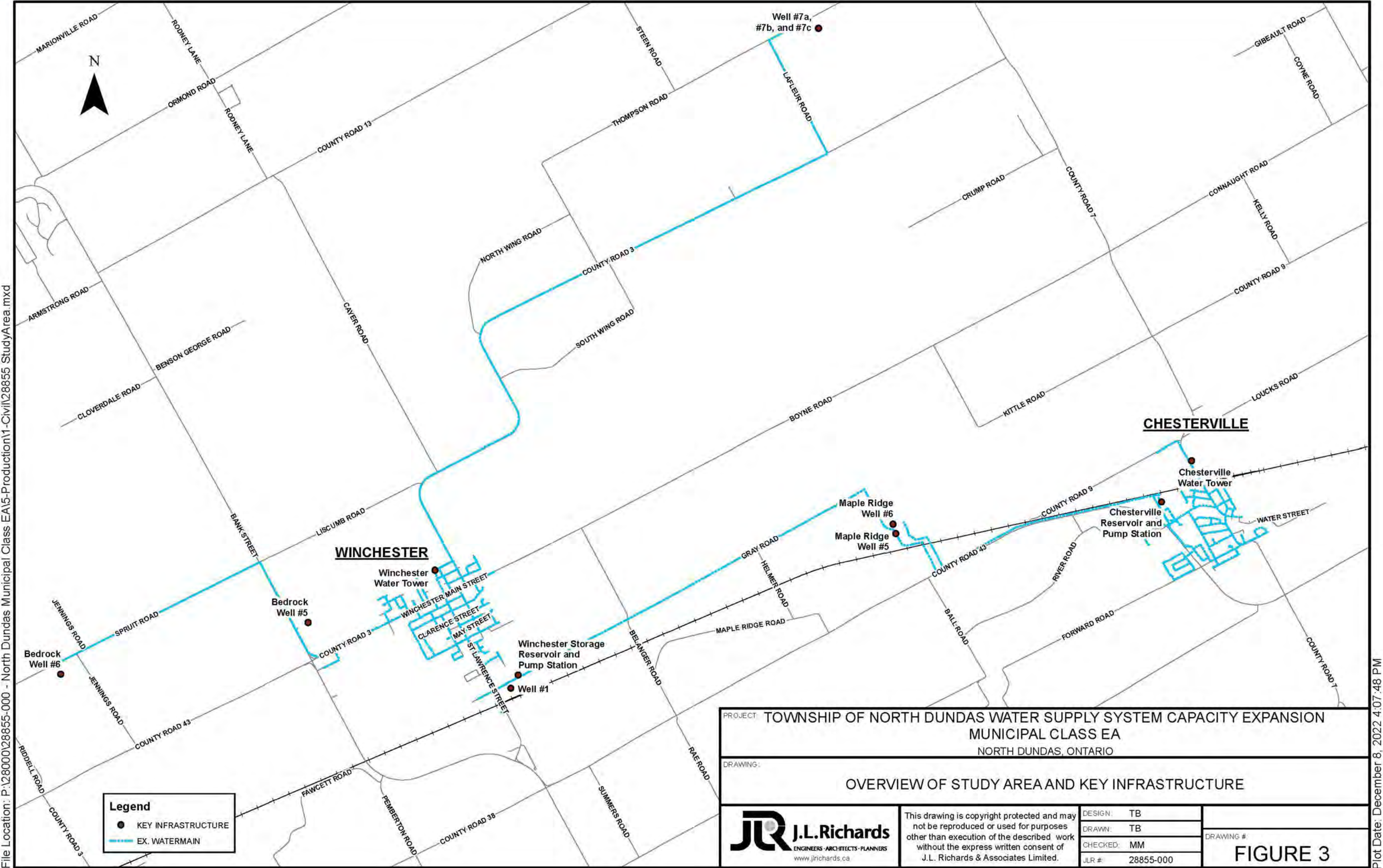
DRAWING #
FIGURE 1



PROJECT: TOWNSHIP OF NORTH DUNDAS WATER SUPPLY SYSTEM CAPACITY EXPANSION
MUNICIPAL CLASS EA
NORTH DUNDAS, ONTARIO

DRAWING: CLASS EA PROCESS

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1.3 Objectives of the Phase 2 Report

This Report provides a technical overview of the problems associated with the existing communal potable water supply system and identifies and evaluates possible alternative solutions, including potential impacts on the natural and socio-economic environments.

The Phase 2 Report objectives are to:

- Provide a brief summary of the problems associated with the communal potable water supply system identified in Phase 1. The Phase 2 Report will also update any relevant information not provided in Phase 1. A detailed description of the existing water distribution infrastructure was presented in the Phase 1 Report (JLR, September 2020).
- Review and confirm future system requirements. The Class EA process requires that the alternatives considered at least a 20 year planning period (2019 to 2039). The alternatives proposed should, therefore, be capable of accommodating the projected water demands within this time period. The future systems requirements for the 20 year planning period along with consideration for build-out were presented in the Phase 1 Report (JLR, September 2020).
- Identify and evaluate possible alternative solutions to the problem in terms of economic consequences, overall feasibility, ability to address the problem and the potential impacts on the surrounding environment.
- Provide a discussion of the alternatives and recommend a preferred alternative for consideration by the Township and other interested parties, including review agencies and the public.

1.4 Methodology

This Report summarizes Phases 1 and 2 of the Class EA and serves as a document to file for this Class EA.

Phase 1 of this Class EA involved a review of available documentation related to the Township's drinking water supply system, review the historical water demand and existing communal potable water infrastructure, discussions with the Township about the population projections, and identification of the future water demand based on the projections. A Problem/Opportunity Statement was generated to serve as the basis for subsequent Phases of the project, and a Phase 1 Report, dated September, 2020 (Appendix A), was prepared to document key aspects of Phase 1, which are summarized in Section 2.0 herein.

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Phase 2 of this Class EA identified and evaluated alternative solutions to determine a preferred solution to the problem and/or opportunity identified in Phase 1. Section 3.0 summarizes the activities completed as part of Phase 2.

A Public Information Centre ("PIC No. 1") was held on December 15, 2022, which included opportunity for informal discussions and viewing of information boards reviewing Phases 1 and 2 of this Class EA.

2.0 PHASE 1

2.1 Description of Existing Conditions

The Township's existing potable water system infrastructure generally includes eight active groundwater wells that supply treated water to the two communities of Winchester and Chesterville including the Lactalis® plant (large volume ICI consumer), five pump houses, two storage reservoirs (Chesterville underground reservoir and Winchester at-grade reservoir), two elevated tanks (Chesterville elevated storage tank and Winchester elevated storage tank) and approximately 41.5 km of distribution system piping. Refer to Figure 1 and Figure 3 for the study area and an overview of the study area identifying key infrastructure, respectively. Table 1 provides a brief summary of some of the key characteristics of the Township's existing potable water system infrastructure. As illustrated, the Township's current available potable water storage is about 3,800 m³ and the current operational limit of existing wells is 59.5 L/s.

Table 1: Township Potable Water System Infrastructure

Parameter	Value
Municipal Drinking Water License (180-101) ⁽¹⁾	102.75 L/s (72.5 L/s with largest well pump out of service)
Well #1 Permit to Take Water (4175-9C3GPW) Well Pump ⁽²⁾ Depth / Diameter ⁽²⁾ Capacity ⁽¹⁾ / Operating Limit ⁽³⁾ / Current Rate ⁽⁴⁾	9.5 L/s Submersible pump rated at 8.7 L/s 57.9 m / N/A 9.5 L/s / 5.0 - 6.0 L/s / 4.5 L/s
Bedrock Well #5 Permit to Take Water (2181-83S8E) ⁽⁶⁾ Well Pump ⁽²⁾ Depth / Diameter ⁽²⁾ Capacity ⁽¹⁾ / Operating Limit ⁽³⁾ / Current Rate ⁽⁴⁾	6.4 L/s Submersible pump rated at 7.6 L/s 28 m / N/A 6.4 L/s / 3.5 – 5.0 L/s / 3.85 L/s
Bedrock Well #6 Permit to Take Water (0088-9C3JG4) Well Pump ⁽²⁾ Depth / Diameter ⁽²⁾ Capacity ⁽¹⁾ / Operating Limit ⁽³⁾ / Current Rate ⁽⁴⁾	11.4 L/s Submersible pump rated at 8.3 L/s 15.9 m / N/A 11.4 L/s / 5.5 – 9.0 L/s / 6.5 L/s
Well #7a, 7b, 7c Permit to Take Water (0816-838SXR) ⁽⁶⁾ Well Pump ⁽²⁾ Depth ⁽²⁾ / Diameter ⁽⁵⁾	22.5 L/s Each equipped with a submersible pump rated at 17.2 L/s 24.5 m / 300 mm

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Parameter	Value
Capacity of Two Pumps Combined ⁽¹⁾ / Operating Limit ⁽³⁾ / Current Rate (One Pump) ⁽⁴⁾	22.5 L/s / 22.5 L/s / 17.2 L/s
Maple Ridge Well #5 Permit to Take Water (3380-AC3QF9) Well Pump ⁽²⁾ Depth / Diameter ⁽²⁾ Capacity ⁽¹⁾ / Operating Limit ⁽³⁾ / Current Rate ⁽⁴⁾	22.7 L/s Submersible turbine pump rated at 23 L/s 12.2 m / 250 mm 22.7 L/s / 15.0 – 17.0 L/s / 16.5 L/s
Maple Ridge Well #6 Permit to Take Water (3380-AC3QF9) Well Pump ⁽²⁾ Depth / Diameter ⁽²⁾ Capacity ⁽¹⁾ / Operating Limit ⁽³⁾ / Current Rate ⁽⁴⁾	30.3 L/s Submersible turbine pump rated at 30.3 L/s 12.2 m / 305 mm 30.3 L/s / 20 – 23.0 L/s / 11 (was at 18) L/s
Chesterville Storage Reservoir ⁽²⁾ Type Operating levels Reservoir Dimensions Total Effective Capacity ⁽²⁾ Operating Volume Between Fill Stop and Fill Start Type Effective Storage Capacity	Two (2) underground reservoirs Fill Stop: 73 m / Fill Start: 71.8 m 2 cells 9.2 m long by 4.8 m wide 407 m ³ 106 m ³ An underground suction well located directly underneath the high-lift pumps 122 m ³
Winchester Storage Reservoir ⁽²⁾ Type Operating levels Dimensions Total Effective Capacity ⁽²⁾ Operating Volume Between Fill Stop and Fill Start	Steel tank reservoir Fill Stop: 79.45 m / Fill Start: 78.81 m 4.9 m Height and 10.9 m Diameter 400 m ³ 59.4 m ³
Chesterville Water Tower ⁽²⁾ Type Operating levels Total and Useable Storage Capacity ⁽²⁾ Operating Volume Between Fill Stop and Fill Start	Elevated storage tank Fill Stop: 111.97 m / Fill Start: 110.77 m 567.5 m ³ 89.6 m ³
Winchester Water Tower ⁽²⁾ Type Operating levels Total and Useable Volume ⁽²⁾ Operating Volume Between Fill Stop and Fill Start	Elevated storage reservoir Fill Stop: 114.85 m / Fill Start: 113.17 m 2300 m ³ 507 m ³
<p>(1) Municipal Drinking Water Licence - Schedule C – Table 1: Rated Capacity (March 22, 2016)</p> <p>(2) Drinking Water Works Permit – Schedule A (July 31, 2018)</p> <p>(3) Township of North Dundas TOR for Consulting Engineering Services - Table 1: Well Capacity Summary</p> <p>(4) Township of North Dundas TOR for Consulting Engineering Services - Appendix D: North Dundas Drinking Water Systems – Supply Wells</p> <p>(5) Winchester Water Supply System Upgrade Class Environmental Assessment Project File Report (August 2009) – Appendix B: Golder Associates and Sauriol Environmental Inc., Environmental Study Report Phase I and II Hydrogeological Components (January 2005) – Figure H-1</p> <p>(6) Township has applied to renew the PTTW for Winchester Wells No. 5 and No.7</p>	

Table 2 summarizes historical potable water demands for the Township's potable water system, as calculated from operating data provided by the OCWA for the past years from 2015 to 2021.

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Based on this data, the Township's potable water system has been operating at an average day demand of 2,533 m³/d over these seven years.

Table 2: Township Historic Potable Water Demands (2015 - 2021)

Year	Average Day Demand
2015	25.2 L/s (2,177 m ³ /d)
2016	25.6 L/s (2,211 m ³ /d)
2017	27.9 L/s (2,409 m ³ /d)
2018	30.6 L/s (2,642 m ³ /d)
2019	30.2 L/s (2,613 m ³ /d)
2020	32.0 L/s (2,766 m ³ /d)
2021	33.7 L/s (2,915 m ³ /d)
Average (2015-2019)	29.3 L/s (2,533 m³/d)
Well demand data for each well was provided by the Township/OCWA.	

2.2 Planning Projections and Future Design Basis

Population projection growth scenarios were considered based on discussions with the Township (refer to Appendix A for growth projection details). Based on census information for Winchester and Chesterville, the serviced population in the Study Area (Villages of Winchester and Chesterville) in 2016 was 4,071 people. This population was used as a baseline to determine the population for 2019.

Table 3 provides a summary of the projected service population, average day, maximum day, and peak hour demand for the Study Area for the low and high growth scenarios in 2039. These water demands were used as the design basis for this Class EA.

Table 3: Existing and Projected Future Water Demands (2016 - 2039)

Parameters	Existing Conditions (Class EA)	Projected Growth & Demand from Existing		2039	
		Low Growth	High Growth	Low Growth	High Growth
Service Population	4,355 ⁽¹⁾	1,684	2,874	6,039 ⁽¹⁾	7,229 ⁽¹⁾
Average Day Demand (m ³ /d)	1,289 ⁽²⁾	589 ⁽³⁾	1,006 ⁽³⁾	1,878 ⁽⁴⁾	2,295 ⁽⁴⁾
Maximum Day Demand (m ³ /d)	3,337 ⁽²⁾	1,178 ⁽⁵⁾	2,012 ⁽⁵⁾	4,515 ⁽⁴⁾	5,349 ⁽⁴⁾
Lactalis® Average Day Demand (m ³ /d)	1,400 ⁽⁶⁾			1,400 ⁽⁶⁾	1,400 ⁽⁶⁾
Lactalis® Max Day Demand (m ³ /d)	2,100 ⁽⁷⁾			2,100 ⁽⁷⁾	2,100 ⁽⁷⁾
Winchester Future Potential Commercial Development				752 ⁽⁸⁾	752 ⁽⁸⁾

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Parameters	Existing Conditions (Class EA)	Projected Growth & Demand from Existing		2039	
		Low Growth	High Growth	Low Growth	High Growth
Average Day Demand (m ³ /d)					
Winchester Future Potential Commercial Development Max Day Demand (m ³ /d)				1,121 ⁽⁸⁾	1,121 ⁽⁸⁾
Total Average Day Demand (m³/d)	2,689			4,030	4,447
Total Maximum Day Demand (m³/d)	5,437			7,736	8,570
<p>(1) Estimated growth based on Township consultation (refer to growth memo in the Phase 1 Report in Appendix A) and by applying 350 L/cap/day on future development.</p> <p>(2) Township water consumption excluding Lactalis[®] (2015 to 2019).</p> <p>(3) Projected average day demand calculated at 350 L/cap/day in accordance with MECP Design Guidelines.</p> <p>(4) Average day demand, max day demand and peak hour demand for 2039 was calculated based on Class EA demand plus projected demand.</p> <p>(5) Estimated by applying average day peaking factors of 2 and 3 for maximum day and peak hour, respectively (MECP Guidelines 2008).</p> <p>(6) Based on review of water usage data provided by the Township, December 11, 2019 stakeholder meeting and follow-up OCWA email of 2019 demands (Refer to the Phase 1 Report in Appendix A)</p> <p>(7) Estimated by applying an industrial development peaking factors of 1.5 for maximum day (Ottawa Design Guidelines – Water Distribution July 2010).</p> <p>(8) Estimated by applying 28 m³/ha day, and a commercial development peaking factor of 1.5 for maximum day (Ottawa Design Guidelines – Water Distribution July 2010).</p>					

Based on the 2039 projected maximum day demand for both low growth and high growth scenarios, there is a future deficit of 2,595 m³/d and 3,429 m³/d, respectively, compared to the current operational limit of the existing wells of 59.5 L/s (5,141 m³/d) with the largest well out of service.

2.3 Problem / Opportunity Statement

The following Problem / Opportunity Statement was used as the basis for proceeding to Phase 2 of this Class EA:

The Township of North Dundas is serviced by a communal potable water supply system that generally consists of eight active groundwater wells, five pump houses with chlorine disinfection, two storage reservoirs, two elevated storage tanks and distribution system. While the system has been operating in accordance with all applicable legislation and is generally achieving all required water quality standards, it is anticipated that the Township will not be able to meet potable water supply requirements as recommended by the Ministry of the Environment, Conservation and Parks within the next 20 years timeframe if projected growth and associated water demand is realized. The Township is therefore in need of a solution that will address water supply constraints and improve the redundancy and reliability in delivering treated water to the community over the next 20 years and beyond.

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3.0 PHASE 2

The main objective of Phase 2 of a Class EA is to identify and evaluate possible alternative solutions to the problem(s) (and/or opportunities) identified in Phase 1. All reasonable potential solutions to the problem(s), including the 'Do Nothing' option, are considered. Class EAs for water distribution system projects generally result in the identification and review of a broad range of solutions. It is also important to note that the objective of Phase 2 is to focus on determining an overall "generalized solution" to the problem and not necessarily all of the intricate details that are typically further explored and developed during Phase 5 of a Class EA referred to as Implementation (i.e., preliminary and detailed design stage). The following sections describe the evaluation and selection methodology for reviewing alternative solutions, the identification and review of alternative solutions, and the identification of a preferred alternative.

3.1 Evaluation and Selection Methodology

In order to facilitate the evaluation of alternative solutions / options and selection of the preferred alternative during Phase 2, a transparent and logical three part assessment process was established. This process consisted of:

- Initial screening of options;
- Detailed evaluation of screened options; and
- Selection of a preferred alternative.

The first evaluation stage considered the overall feasibility of the potential options and identified those options that fully address the problem statement. This step was carried out so that unrealistic alternatives were not carried forward to a more detailed evaluation stage.

Based on the initial screening process, a detailed assessment of the short list of options was conducted, which included the development of an Opinion of Probable Cost. Evaluation criteria were developed based on a review of the background information, experience on similar assessments and in consultation with the Township's staff. The evaluation was conducted using criterion in the following four major criteria categories:

- Natural and Cultural Environment;
- Engineering and Technical Considerations;
- Social and Community Well Being; and
- Economic Environment.

Each criterion was assigned a weighting to reflect its level of importance relative to other criteria, as shown in Table 4. The weighting system was developed in consultation with the Township and indirect feedback received through stakeholder consultation for this Class EA. The relative level of impact for each criterion for each potential solution was then assessed based on the scoring system summarized in Table 5. The option that ranked the highest according to the scoring system

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was recommended as the preferred alternative, and presented to stakeholders to solicit input prior to finalizing.

Table 4: Description and Weighting of Evaluation Criteria

Major Criteria	Minor Criteria	Description	Weight (1-5)
Natural Environment and Archaeology	Effect on Wildlife Habitats	Assess potential for impacts to wildlife and aquatic habitats.	2
	Archaeological & Cultural / Heritage Sites	Assess potential for impacts to known or potential archaeological, cultural, or heritage sites.	2
	Groundwater Sources	Assess the potential for impacts to groundwater quality and quantity for other users.	2
	Climate Change	Assess potential resiliency/vulnerability to projected climate change effects. (e.g., periods of drought during summer and fall months)	4
Engineering and Technical Considerations	Improvements to Water Supply	Assess the potential for improvements to the reliability and capacity of treated water delivery.	5
	Impacts on Water Quality	Assess potential impact to the quality of water supplied by the Township.	4
	Construction Challenges	Assess the potential for challenges and physical constraints during construction.	3
	Operation Impacts	Assess the potential for impacts to the operation of the water supply system.	3
Social / Community Well Being	Community Development	Assess potential impact to the Township's development and growth.	5
	Impacts to Public During Construction	Assess potential impacts of construction to the public and neighbouring properties.	2
	Land Ownership	Assess potential to purchase more land to permit construction/operation.	2
Financial Impacts	Capital Costs	Assess the impact due to the estimated capital costs	4
	Operational Costs	Assess the impact to the Township's operational costs.	2

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Table 5: Detailed Evaluation Impact Level and Scoring System

Evaluation Impact Level	Score
Potential for High Positive Impact	4
Potential for Moderate Positive Impact	3
No Anticipated Impact	2
Potential for Moderate Negative Impact	1
Potential for High Negative Impact	0

3.2 Description and Weighting of Evaluation Criteria

The Opinions of Probable Cost for each alternative were based on a Class D estimate, generally defined as follows:

- **Work Definition:** A description of the option with such supporting documentation as is available (definition of project typically in the order of 1 to 5 percent).
- **Intended Purpose:** To aid in the screening of various options prior to recommending a preferred solution (not intended to establish or confirm budgets).
- **Level of Effort:** Is limited and expected accuracy could range from -30% to +30%.
- **Opinion of Probable Costs:** 2022 dollar value.

It is noted that a more detailed estimate will be required during the preliminary and detailed design phases of implementation of the preferred alternative.

3.3 Initial Screening of Options

Phase 2 of this Class EA identified and evaluated options to establish a preferred alternative to the problem and opportunity statement identified in Phase 1. The identified options are presented in Table 6 along with a summary of the screening review carried out to support a recommendation to either carry the option forward for further evaluation or not.

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Table 6: Initial Screening of Options

Option	Review/Recommendation
Option 1: Do Nothing	
1) Do nothing	<p>Description: Do not carry forward with any alternatives.</p> <p>Review: This option does not address the problem; however, it will be carried forward as a baseline option for comparison.</p> <p>Recommendation: Carry Forward, as a Baseline for comparison only.</p>
Option 2: Maintain and Redevelop Existing Well(s)	
2A) Well #1: Install additional well pump	<p>Description: Install additional shaft and standby well pump at existing Well #1. The pump can be a standby to introduce redundancy to the system.</p> <p>Review: The standby pump will introduce redundancy to the system. However, this option will not increase the Township's water supply capacity.</p> <p>Recommendation: Do Not Carry Forward. However, option may be combined with other options as a means to improve system redundancy.</p>
2B) Maple Ridge Well #5: Install additional well pump	<p>Description: Install additional shaft and standby well pump at existing Maple Ridge Well #5. The pump can be a standby to introduce redundancy to the system.</p> <p>Review: The standby pump will introduce redundancy to the system. However, this option will not increase the Township's water supply capacity. It is recommended this option be carried forward in combination with other alternatives, but not on its own.</p> <p>Recommendation: Do Not Carry Forward. However, option may be combined with other options as a means to improve system redundancy.</p>
2C) Maple Ridge Well #6: Install additional well pump	<p>Description: Install additional shaft and standby well pump at existing Maple Ridge Well #6.</p> <p>Review: The standby pump will introduce redundancy to the system. The existing pump at Well #6 is prone to fouling, so a second pump will improve reliability of water source. However, this option will not increase the Township's water supply capacity. It is recommended this option be carried forward in combination with other options, but not on its own.</p> <p>Recommendation: Do Not Carry Forward. However, option may be combined with other options as a means to improve system redundancy.</p>
2D) Well #7a/b/c: Install secondary power supply	<p>Description: Install emergency power supply, to minimize the risk of a power outage stopping the water supply.</p> <p>Review: This option will improve reliability of the water source, but will not increase the capacity.</p> <p>Recommendation: Do Not Carry Forward. However, option may be combined with other options as a means to improve system redundancy.</p>
Option 3: Connect to Alternate Water Source	
3A) South Nation River	<p>Description: Construct new water treatment plant using the South Nation River as the water source, including new watermains and pumping station(s) to transport to the communities.</p> <p>Review: The South Nation River runs through Chesterville and 5.5 km south of Winchester, reducing the cost of watermain required for distribution. However, the</p>

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Option	Review/Recommendation
	<p>potential volume for water taking is low. The river water level is greatly influenced by season fluctuations, so at times it may be difficult or costly to treat due to possible elevated concentrations of suspended solids and organics.</p> <p>Recommendation: Do Not Carry Forward.</p>
3B) St Lawrence River	<p>Description: Connect to existing water distribution system owned by the Township of South Dundas, and install new watermain and pumping station(s) to transport to the communities. Water source is through an existing water treatment plant on the St. Lawrence River in Morrisburg.</p> <p>Review: The St. Lawrence River is approximately 25 km from Winchester, which means a higher cost to install watermain and pumping stations to transport the treated water. The existing treatment plant has additional capacity sufficient to accommodate the Township's projected future deficit, but not enough to replace the existing groundwater supply. There may be an opportunity for cost sharing between North Dundas and South Dundas for the treatment plant's expansion and possibly for watermain within South Dundas's jurisdiction. This option would be considered as part of a long-term water supply option given the longer lead time to implement. This option would not address immediate water supply requirements.</p> <p>Recommendation: Do Not Carry Forward as a stand-alone option, but Carry Forward in combination with other options.</p>
Option 4: New Groundwater Sources	
4) Location #1 – Lafleur Rd.	<p>Description: Establish new well at property on Lafleur Rd.</p> <p>Review: This option will provide additional water supply capacity to reduce the Township's projected future water supply deficit. This option also improves water supply security, relieving complete reliance on older wells. However, the well will not have sufficient capacity to supply the full future water demand, so other sources of water will need to be obtained. This option may be valuable as a short-term solution, to provide more time to secure a larger source of water. In addition, the new well may be susceptible to the same limitations as existing wells, including being affected by seasonal droughts.</p> <p>Recommendation: Do Not Carry Forward as a stand-alone option, but Carry Forward in combination with other options.</p>
4A) New Well, and Expand Groundwater System	<p>Description: Establish new well at property on Lafleur Rd., and continue investigations for additional wells.</p> <p>Review: This option expands on Option 4, establishing the new well on Lafleur Rd. for the short term, with a long term plan to install an additional groundwater well(s) at other locations (yet to be determined) to meet the Township's projected future water supply deficit. This option also improves water supply security, relieving complete reliance on older wells. However, the new wells may be susceptible to the same limitations as existing wells, including being affected by seasonal droughts.</p> <p>Recommendation: Carry Forward.</p>
Option 5: New Well and Connect to South Dundas	
5) New Well and Connect to South Dundas	<p>Description: Establish new well (Option 4), and install watermain to connect to South Dundas water distribution system (Option 3B) to meet the remaining water supply deficit. The existing groundwater wells will remain in operation.</p>

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Option	Review/Recommendation
	<p>Review: The new well is useful to meet the Township's short term water supply needs, and provides time for the investigations, design and construction to connect the South Dundas water distribution system.</p> <p>Recommendation: Carry Forward</p>
Option 6: New Well and Acquire Supplemental Water Sources (Expand Groundwater and Connect to South Dundas)	
6) New Well and Acquire Supplemental Water Sources	<p>Description: Establish new well (Option 4) in the short term. The remaining water supply deficits would be met by continuing investigations for an additional well(s) (Option 4A) while negotiations are ongoing to install a watermain to connect to the South Dundas water distribution system (Option 3B). The existing groundwater wells will remain in operation.</p> <p>Review: The new well is useful to meet the Township's short term water supply needs, and provides time for development and construction of other supplemental water sources to satisfy the remaining water deficit.</p> <p>Recommendation: Carry Forward</p>
Option 7: Implement Water Conservation Program	
7) Implement Water Conservation Program	<p>Description: Implement water use conservation program for residential, commercial and/or industrial users. Program may be imposed during periods of droughts, emergency maintenance of wells, or peak demand periods. May also include initiatives to install water-saving appliances or other such practices.</p> <p>Review: Requires cooperation with Lactalis and community to reduce water consumption.</p> <p>Recommendation: Do Not Carry Forward.</p>
Option 8: Limiting Community Growth	
8) Limiting Community Growth	<p>Description: Impose restrictions on developers to reduce or slow down expansion of communities that rely on the municipal water distribution system.</p> <p>Review: This option may be difficult to impose in that it conflicts with Provincial mandates and Township Council has limited control over limiting growth.</p> <p>Recommendation: Do Not Carry Forward.</p>

Options to be carried forward for detailed evaluation:

- 1) Do nothing
- 4A) New well and Expand Groundwater System
- 5) New well and Connect to South Dundas
- 6) New well and Acquire Supplemental Water Sources.

3.4 Detailed Evaluation of Screened Options

Each option carried forward for detailed evaluation was reviewed in terms of its impact on the natural and cultural environment, engineering and technical considerations, social and community

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well-being, and economic environment in accordance with the evaluation methodology described in Section 3.1. A description of each option is provided below.

3.4.1 Option 1: Do Nothing

3.4.1.1 Description

This option involves maintaining the status quo, doing nothing to address the Problem Statement. This will be considered as a baseline condition, to evaluate against the other options.

3.4.1.2 Natural and Cultural Environment

Under this option no Construction will occur, so there are no potential impacts to natural or cultural environments.

However, the existing groundwater wells are influenced by the effects of climate change, which may negatively impact the Township's water supply in the future.

3.4.1.3 Engineering and Technical Considerations

Since no construction will occur under this option, there are no potential impacts, positive or negative, to improving the Township's water supply, quality or operation.

3.4.1.4 Social and Community Well-Being

Since no construction will occur under this option, there are no potential impacts to the public. However, doing nothing will not increase the Township's water supply capacity, and therefore would restrict future development opportunities.

3.4.1.5 Economic Environment

There are no additional construction or operational costs associated with this option.

3.4.2 Lafleur Road Well Site

All of the screened options carried forward involve the construction of a well at the Lafleur Road site. This well site would be valuable as a short-term solution to reduce the Township's future water supply deficit. This will allow time for the Township to pursue the long-term solution to meet the rest of the deficit.

As such, the description and evaluation notes in this Section will be considered for the evaluation of the rest of the options.

3.4.2.1 Description

The new well site is located on the west side of Lafleur Rd, approximately 700 m north of County Rd 3. The site currently has an aggregate license, but it will be surrendered as a condition to purchase the property.

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In Fall 2021, Golder Associates Ltd. (Golder) was retained to install a test well at the Lafleur Road site and conduct a 24-hour pumping test to estimate the potential yield. It was determined that a properly constructed well at this site is expected to be capable of supplying approximately 20 L/s of water. A long-term pumping test (72-hour minimum) is recommended during the implementation phase to estimate the sustained yield of the aquifer.

The report noted that with some treatment, the water quality is suitable as a potable water source. There are exceedances of the aesthetic objective (AO) for manganese and the operational guidelines (OG) for hardness and total nitrogen. There are various conventional and innovative treatment options available for these parameters.

In addition, drawdown measured at the nearby pond located in the base of the aggregate pit during testing indicated that the test well may be under the influence of the pond. Further indication was an exceedance of the Maximum Allowable Concentration (MAC) for coliforms observed in the last sample of the 24-hour pumping test. In their report, Golder recommended for the pond to be filled to eliminate the surface water impacts. Otherwise, the well will be treated as Groundwater Under Direct Influence (GUDI). Such treatment would involve conventional chemical-assisted filtration and primary disinfection per the *Procedure for Disinfection of Drinking Water in Ontario* by the Ministry of the Environment, Conservation and Parks (MECP). Following infilling of the pond, further investigations during the design phase will be required to confirm the treatment requirements.

Golder's Well Test Report is included in Appendix B

3.4.2.2 Natural and Cultural Environment

A Stage 1 archaeological assessment of the Lafleur Well Site was conducted by Golder. The assessment identified a strip of undisturbed or lightly disturbed vegetated land along the property line at Lafleur Road, which may have archaeological potential. Should the area be disturbed, a Stage 2 Assessment during detailed design was recommended.

Golder's Stage 1 archaeological assessment report is included in Appendix B

An environmental impact study was not conducted in the area. However, since the site use has been as a sand and gravel pit, the area has already been disturbed and potential impacts to the natural environment are considered to be low. Should any tree removal be necessary, further assessment should be conducted during detailed design.

3.4.2.3 Engineering and Technical Considerations

The additional well will improve the Township's water supply capacity. The well will also offer some redundancy to the distribution system, by reducing the sole reliance on older groundwater wells. The groundwater will be treated so that there is no impact to the system's water quality. The level of treatment will be reviewed once the existing pond has been filled in and the municipal production well has been developed and tested.

A geotechnical analysis was prepared by Golder in January 2022. The purpose of the report was to provide an interpretation of the subsurface conditions of the site based on the boreholes taken as part of the Geotechnical investigation. Golder also provided considerations for design

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and construction of the building, including frost protection, foundations, excavations and backfill. The design of the new well building is not known at this time, therefore specific geotechnical considerations and recommendations were limited, and additional investigations may be required. If potential design and/or construction challenges are identified, they will have to be mitigated in the design of the site. The Geotechnical Report is included in Appendix B

Operationally, this well would be designed and constructed to align with the existing well sites. This way, the operational requirements and procedures currently in place can be applied with minimal additional training.

The existing single phase hydro supply capacity is a potential constraint that will be reviewed as part of the detailed design to confirm electrical servicing requirements. Provided the electrical capacity exists, it is anticipated a single-phase electrical supply will be designed similar to existing Well Field No. 7, alternatively, a three-phase power upgrade and extension will be required. Coordination with Hydro One is required during detailed design.

3.4.2.4 Social and Community Well-Being

The future water supply deficit outlined in Phase 1 was approximately 39.7 L/s. The new Lafleur Road well will not meet the full deficit; therefore, the opportunities for future development in the Township is limited. However, with the inclusion of the long-term solutions outlined in Options 4A, 5 and 6, it is likely that the full deficit will be met.

The majority of the construction will be localized within the well site property. The well will connect to the existing watermain that runs along Lafleur Road. Although anticipated to be minimal, there may be some temporary traffic disruptions to install the watermain connection.

The Township has negotiated an agreement to purchase the Lafleur Road well site, so there will be no additional land required. It is understood that the existing aggregate licence that includes this property will be surrendered as part of the land purchase.

3.4.2.5 Economic Environment

An Opinion of Probable Cost for a new well at the Lafleur Road site is provided in Section 3.4.3.5.

3.4.3 Option 4A: New Well and Expand Groundwater System

3.4.3.1 Description

This option consists of constructing the new well at Lafleur Road (see Section 3.4.2), with the intention to investigate and construct additional groundwater wells completed in coarse overburden deposits on sites yet to be identified to meet the rest of the Township's water supply deficit. Depending on the yield of these future wells, one or more future groundwater wells will be required. It is anticipated that future well site investigation will focus in the area of the Maple Ridge Esker, near existing Chesterville Wells No. 5 and 6.

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3.4.3.2 Natural and Cultural Environment

As the location of the new well sites are currently unknown, the potential risk of impact to wildlife habitats and archaeological/cultural heritage sites is present, but cannot be confirmed. During the investigations for new well sites, candidate sites can be screened to minimize these potential impacts.

The potential risk of impact to surrounding groundwater sources is also present, but not confirmed. In this case as well, candidate sites should be evaluated to demonstrate minimal potential for negative impacts.

As with existing well sites, the water supply capacity for new well sites may be impacted in the future by the effects of climate change.

3.4.3.3 Engineering and Technical Considerations

Constructing additional groundwater wells will improve the capacity of the Township's water supply system. They would also provide redundancy to the distribution system, by reducing the reliance on older wells. However, it is not known how many additional wells will be required to meet the Township's remaining water supply deficit. Further investigations and testing at candidate well sites will be needed. The water quality at additional wells are not known, so treatment requirements will be determined during investigations and design.

Potential construction challenges may arise depending on the location of well sites, but the scale of such challenges is expected to be limited. A geotechnical investigation would be required to determine the presence of such challenges and the required mitigation.

It is anticipated that new wells would be designed and constructed to align with the existing well sites. This way the operational requirements and procedures currently in place can be applied with minimal additional training.

In addition, the existing Hydro line running near the site is only single-phase power. A three-phase power supply will be necessary to operate the new well and building equipment and requires further investigation with Hydro One on the scope of utility upgrades to support the new well. In addition, existing Well field No. 7 electrical service will need to be reviewed during detailed design to confirm that the existing single phase service can support the well pump upgrades anticipated in order to operate in parallel as the new Lafleur Road well.

3.4.3.4 Social and Community Well-Being

This option will increase the Township's water supply capacity and will therefore allow for future development and community growth.

Potential impacts to the public are anticipated to be limited to temporary traffic disruptions to install the watermain from the well site(s) to connect to the existing system. The extent of these potential impacts is dependant on the location of the new well site. Construction at the well site(s) is anticipated to have negligible impacts to the public.

The Township will need to acquire additional properties to construct the new groundwater wells.

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3.4.3.5 Economic Environment

The following table is a summary of Opinion of Probable Cost (OPC) for Option 4A. These costs are at a conceptual level Class 'D' estimate ($\pm 30\%$). The estimate does not include costs to acquire the property for the additional well site(s). In addition, geotechnical, hydrogeological, archaeological and ecological information have not been confirmed without further field investigations. Subsurface conditions were not reflected in the Class EA OPC.

Table 7: Opinion of Probable Cost (Option 4A)

Item Description	Estimated Capital Cost (2022 \$) ⁽¹⁾
New Well – Lafleur Road Site	\$ 5,068,000
Additional Groundwater Well (per site)	\$ 4,293,000
Subtotal	\$ 9,361,000
Contingency (20%)	\$ 1,870,000
Engineering (15%)	\$ 1,400,000
Grand Total (Rounded)	\$ 12,600,000
Notes: 1. OPC costs include 15% Construction General Requirements (mobilization, bonding/insurance contractor overhead, commissioning, etc.). OPC costs exclude HST, land acquisition, dewatering, bedrock excavation. OPC costs for additional well sites also do not include costs for electrical servicing.	

The Township's operational budget will increase with the operation and maintenance of the additional well(s).

3.4.4 **Option 5: New Well and Connect to South Dundas**

3.4.4.1 Description

This option consists of constructing the new well at the Lafleur Road site. (see Section 3.4.2). To meet the rest of the Township's water supply deficit, a new transmission watermain would be constructed from Winchester to connect to the water distribution system in Morrisburg, owned by the Municipality of South Dundas. The water is sourced from the St. Lawrence River and treated at the water treatment plant in Morrisburg.

The proposed route of the watermain will run along County Road 31, from the intersection of County Roads 31 and 2 to the water tower in Winchester, an approximate length of 27 km. A booster pumping station is expected to be required to convey the water over this distance. It is recommended that this requirement be determined during the design phase, to confirm the hydraulic requirements of the watermain.

Multiple trenchless crossings are expected, which will require consultations with various agencies and stakeholders. Such crossings include:

- Rail lines in Morrisburg and Winchester;
- Highway 401;
- South Nation River; and
- Multiple smaller watercourses, including creeks and municipal drains.

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The Municipality of South Dundas was consulted during the preliminary screening of the alternatives. At the time, the Municipality noted the water treatment plant in Morrisburg has sufficient uncommitted water supply capacity for the Township's remaining deficit. Both parties showed interest in continuing discussions to pursue this option.

3.4.4.2 Natural and Cultural Environment

This option will help improve the Township's climate change resiliency by adding a new surface water source to the distribution system, and by providing redundancy to groundwater sources under potential future drought conditions.

3.4.4.2.1 Archaeological Stage 1 Assessment

Golder was retained to complete a Stage 1 archaeological assessment of the proposed watermain route.

The assessment identified areas of undisturbed or lightly disturbed land along County Road 31 that may have archaeological potential and recommended Stage 2 Assessments during detailed design.

The report also makes note of the registered archaeological Beckstead Site (BfFt-1), a Woodland Period Indigenous village near County Road 31 south of Williamsburg. This site is considered to have Cultural Heritage Value of Interest. The primary recommendation is to avoid the area that passes by the Beckstead Site (even within the existing road allowance), otherwise the area would need to be subject to Stage 3 site assessment and Stage 4 mitigation.

Golder's Stage 1 archaeological assessment report is included in Appendix B.

3.4.4.2.2 Species at Risk Screening

Golder was retained to complete a desktop Species at Risk (SAR) screening. The screening described existing plant communities within 120 m of the proposed watermain route (referred in the report as the "Study Area") and noted SAR with moderate or high potential in the area. Regulatory implications and high-level mitigation measures were also discussed.

Natural habitats in the Study Area appear to consist mainly of small woodlots of deciduous and mixed forests and swamps, thickets and thicket swamps, and limited areas of marsh and small ponds. County Road 31 also crosses multiple watercourses, including municipal drains and the South Nation River. Several endangered and threatened species have a moderate or high potential of presence in the Study Area.

The majority of the proposed watermain alignment would occur within the road allowance of County Road 31; therefore, there would be limited potential of impacts to SAR and associated habitats. Recommended mitigation measures are also included in the report, including construction timing windows (vegetation clearing, in-water works, etc.), best practices, etc.

The SAR desktop screening report is available in Appendix B.

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3.4.4.3 Engineering and Technical Considerations

Introducing the alternative source of water improves the supply capacity of the distribution system. In addition, the water supply from the St. Lawrence River will improve the redundancy by reducing the reliance on older groundwater wells.

There may be a potential impact to water quality if groundwater and surface water sources are blended. It is recommended that further detailed assessments be conducted to determine the level of impact and the necessary mitigation measures.

The length of the watermain would be roughly 27 km with multiple crossings under roadways, rail and watercourses. Due to the large scale, the potential of engineering and construction challenges increases. A geotechnical investigation will be necessary along the watermain route.

Operation of surface water distribution systems requires different procedures than groundwater systems. In addition, the water treatment plant in Morrisburg will be operated by the Municipality of South Dundas. Consistent communication and collaboration between the Township and the Municipality will be required for operation and maintenance of the system.

3.4.4.4 Social and Community Well-Being

This option is anticipated to address the Township's future water supply capacity deficit, which will allow for future development and community growth.

Construction of the watermain would involve traffic management impacts along County Road 31 and construction in front of properties. The large scale of construction also increases the potential for impacts.

Additional land acquisition for a booster pumping station(s) would be required.

3.4.4.5 Economic Environment

The following table is a summary of Opinion of Probable Costs (OPC) for Option 5. These costs are at a conceptual level Class 'D' estimate ($\pm 30\%$). The estimate does not include costs to acquire the property for the booster pumping station. In addition, geotechnical, hydrogeological, archaeological and ecological information were not confirmed without further field investigations. Subsurface conditions were not reflected in the Class EA OPC.

Table 8: Opinion of Probable Cost (Option 5)

Item Description	Estimated Capital Cost (2022 \$)⁽¹⁾
New Well – Lafleur Road Site	\$ 5,068,000
Watermain to South Dundas	\$ 35,657,000
Subtotal	\$ 40,725,000
Contingency (20%)	\$ 8,150,000
Engineering (15%)	\$ 6,110,000

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Grand Total (Rounded)	\$ 55,000,000
<i>Notes:</i> 1. OPC costs include 15% Construction General Requirements (mobilization, bonding/insurance contractor overhead, commissioning, etc.). OPC costs exclude HST, land acquisition, dewatering, bedrock excavation, and electrical servicing.	

There would likely be an increase required to the Township's operational budget. The maintenance requirements for a surface water distribution system will require different resources than a groundwater system. There will also be additional maintenance requirements for the new watermain and associated infrastructure on County Road 31.

3.4.5 Option 6: New Well and Acquire Supplemental Water Sources

3.4.5.1 Description

This option consists of constructing the new well at Lafleur Road (see Section 3.4.2). In addition, to meet the rest of the Township's water supply deficit, the Township would pursue a combination of new groundwater wells and a connection to the water distribution system in South Dundas.

The review of this option is similar to Options 4A and 5.

3.4.5.2 Natural and Cultural Environment

Refer to potential impacts outlined in Sections 3.4.3.2 and 3.4.4.2.

3.4.5.3 Engineering and Technical Considerations

Refer to potential impacts outlined in Sections 3.4.3.3 and 3.4.4.3.

3.4.5.4 Social and Community Well-Being

Refer to potential impacts outlined in Sections 3.4.3.4 and 3.4.4.4.

3.4.5.5 Economic Environment

The following table is a summary of Opinion of Probable Costs (OPC) for Option 6. These costs are at a conceptual level Class 'D' estimate ($\pm 30\%$). The estimate does not include costs to acquire the properties for additional wells or the booster pumping station. In addition, geotechnical, hydrogeological, archaeological and ecological information were not confirmed without further field investigations. Subsurface conditions were not reflected in the Class EA OPC.

Table 9: Opinion of Probable Cost (Option 6)

Item Description	Estimated Capital Cost (2022 \$)⁽¹⁾
New Well – Lafleur Road Site	\$ 5,068,000
Additional Groundwater Well (per site)	\$ 4,293,000
Watermain to South Dundas	\$ 35,657,000
Subtotal	\$ 45,018,000

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Contingency (20%)	\$ 9,000,000
Engineering (15%)	\$ 6,750,000
Grand Total (Rounded)	\$ 59,200,000
<i>Notes:</i> 1. OPC costs include 15% Construction General Requirements (mobilization, bonding/insurance contractor overhead, commissioning, etc.). OPC costs exclude HST, land acquisition, dewatering, bedrock excavation. OPC costs for additional well sites also do not include costs for electrical servicing.	

3.4.6 Detailed Evaluation Summary

Each of the short-listed options discussed were evaluated using the detailed evaluation methodology described in Section 3.1. As summarized in Table 10, the preferred alternative was identified as Option 6.

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Table 10: Summary of Detailed Evaluation of Alternatives

MAJOR CRITERIA	MINOR CRITERIA	Weight (1-5)	Option 1: Do Nothing		Option 4A: New Well and Expand Groundwater System		Option 5: New Well and Connect to South Dundas		Option 6: New Well and Acquire Supplemental Water Sources	
			Comment	Impact	Comment	Impact	Comment	Impact	Comment	Impact
Natural Environment and Archaeology	Effect on Wildlife Habitats	2	NO IMPACT: No construction will occur.	2	MODERATE NEGATIVE IMPACT: Minimal Impact from Lafleur Rd. well site. Potential for impacts at additional well site locations.	1	MODERATE NEGATIVE IMPACT: Watermain route is within road allowance, so environmental impact expected to be limited. However, route crosses multiple watercourses. Mitigation measures impacts will be determined during detailed design.	1	MODERATE NEGATIVE IMPACT: Watermain route is within road allowance, so environmental impact expected to be limited. However, route crosses multiple watercourses. Mitigation measures impacts will be determined during detailed design.	1
	Archaeological & Cultural / Heritage Sites	2	NO IMPACT: No construction will occur.	2	NO IMPACT: Minimal Impact from Lafleur Rd. well site. Additional well sites will be selected to mitigate potential for impacts.	2	MODERATE NEGATIVE IMPACT: Watermain route passes through areas of high archaeological potential; additional investigations and mitigation measures may be required.	1	MODERATE NEGATIVE IMPACT: Watermain route passes through areas of high archaeological potential; additional investigations and mitigation measures may be required.	1
	Groundwater Sources	2	NO IMPACT: No construction will occur.	2	MODERATE NEGATIVE IMPACT: Minimal Impact from Lafleur Rd. well site. Potential for impacts at additional well site locations. Well testing expected to demonstrate no negative impact to surrounding area. Risk increases since there is a sole reliance on groundwater supply.	1	NO IMPACT: Minimal Impact from Lafleur Rd. well site. Well testing expected to demonstrate no negative impact to surrounding area. New watermain does not pose potential impact to groundwater sources.	2	NO IMPACT: Minimal Impact from Lafleur Rd. well site. Potential for impacts at additional well site locations. Well testing expected to demonstrate no negative impact to surrounding area. New watermain does not pose potential impact to groundwater sources.	2
	Climate Change	4	HIGH NEGATIVE IMPACT: Existing groundwater wells are influenced by changes in climate and the water supply capacity may be impacted in the future.	0	HIGH NEGATIVE IMPACT: Existing groundwater wells are influenced by changes in climate and the water supply capacity may be impacted in the future.	0	MODERATE POSITIVE IMPACT: Surface water source reduces the Township's sole reliance on groundwater sources and influence by climate change effects.	3	MODERATE POSITIVE IMPACT: Surface water source reduces the Township's sole reliance on groundwater sources and influence by climate change effects.	3
Engineering and Technical Considerations	Improvements to Water Supply	5	NO IMPACT: No change to existing water distribution system.	2	MODERATE POSITIVE IMPACT: Additional groundwater wells improve the capacity and provide redundancy to the distribution system.	3	MODERATE POSITIVE IMPACT: Additional water source improves the capacity and provide redundancy to the distribution system.	3	HIGH POSITIVE IMPACT: Additional water source improves the capacity and provide redundancy to the distribution system and shorter timeline for implementing additional groundwater supply.	4
	Impacts on Water Quality	4	NO IMPACT: No change to existing water distribution system.	2	NO IMPACT: No change to water quality.	2	MODERATE NEGATIVE IMPACT: Potential impact to water quality for blending of groundwater and surface water sources (requires detailed assessment).	1	MODERATE NEGATIVE IMPACT: Potential impact to water quality for blending of groundwater and surface water sources (requires detailed assessment).	1
	Construction Challenges	3	NO IMPACT: No construction will occur.	2	MODERATE NEGATIVE IMPACT: Potential construction challenges may arise depending on location of well sites, but scale expected to be limited.	1	HIGH NEGATIVE IMPACT: The large scale of construction increases the potential of technical challenges.	0	HIGH NEGATIVE IMPACT: The large scale of construction increases the potential of technical challenges.	0

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MAJOR CRITERIA	MINOR CRITERIA	Weight (1-5)	Option 1: Do Nothing		Option 4A: New Well and Expand Groundwater System		Option 5: New Well and Connect to South Dundas		Option 6: New Well and Acquire Supplemental Water Sources	
			Comment	Impact	Comment	Impact	Comment	Impact	Comment	Impact
	Operational Impacts	3	NO IMPACT: No change to existing water distribution system	2	NO IMPACT: Additional wells will have similar operational requirements and procedures as existing wells.	2	MODERATE NEGATIVE IMPACT: Operation of surface water distribution systems requires different procedures than groundwater systems. In addition, treatment plant will be operated by Municipality of South Dundas, so ongoing communication and collaboration will be required.	1	MODERATE NEGATIVE IMPACT: Operation of surface water distribution systems requires different procedures than groundwater systems. In addition, treatment plant will be operated by Municipality of South Dundas, so ongoing communication and collaboration will be required.	1
Social / Community Well Being	Community Development	5	HIGH NEGATIVE IMPACT: Future development in the Township is limited without increasing water supply capacity.	0	MODERATE POSITIVE IMPACT: Increasing the Township's water supply capacity will allow for future development and community growth.	3	MODERATE POSITIVE IMPACT: Increasing the Township's water supply capacity will allow for future development and community growth.	3	HIGH POSITIVE IMPACT: Increasing the Township's water supply capacity will allow for future development and community growth. This option maximizes the flexibility for possible water sources.	4
	Impacts to Public During Construction	2	NO IMPACT: No construction will occur.	2	MODERATE NEGATIVE IMPACT: Construction would be limited to connect well sites to existing distribution system.	1	HIGH NEGATIVE IMPACT: Construction of watermain would involve traffic management impacts along County Road 31 and construction in front of properties. The large scale of construction also increases the potential for impacts.	0	HIGH NEGATIVE IMPACT: Construction of watermain would involve traffic management impacts along County Road 31 and construction in front of properties. The large scale of construction also increases the potential for impacts.	0
	Land Ownership	2	NO IMPACT: No additional land is required	2	MODERATE NEGATIVE IMPACT: Additional property acquisitions would be required.	1	MODERATE NEGATIVE IMPACT: Additional land acquisition for booster pumping station(s) would be required.	1	HIGH NEGATIVE IMPACT: In addition to Option 5, land for an additional well site(s) would need to be acquired.	0
Financial Impacts	Capital Costs	4	NO IMPACT: No construction will occur	2	MODERATE NEGATIVE IMPACT: Relatively lower capital cost; costs for additional well sites dependent on site requirements and distance from existing distribution system.	1	HIGH NEGATIVE IMPACT: Very high capital cost to construct approx. 27 km of watermain, including booster pumping station(s).	0	HIGH NEGATIVE IMPACT: Very high capital cost to construct approx. 27 km of watermain, including booster pumping station(s).	0
	Operational Costs	2	NO IMPACT: No change to existing water distribution system	2	MODERATE NEGATIVE IMPACT: Additional wells require increased budget and resources for operation and maintenance.	1	HIGH NEGATIVE IMPACT: Operation of surface water distribution systems requires different resources than groundwater systems. This includes additional maintenance for additional watermain.	0	HIGH NEGATIVE IMPACT: Operation of surface water distribution systems requires different resources than groundwater systems. This includes additional maintenance for additional watermain.	0
Total Score			62		65		59		67	
Rank			3		2		4		1	

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4.0 REVIEW OF PROJECT CLASS EA SCHEDULE

Based on the results from Phase 2 and the selection of the preferred alternative, this project can be reduced to a Schedule 'B' Class EA.

The following are excerpts from MEA guidelines for a Schedule 'B' undertaking:

- "1. Establish, extend or enlarge a water distribution system and all works necessary to connect the system to an existing system or water source, where such facilities are not in either an existing road allowance or an existing utility corridor".
- 8. Establish a well at a new municipal well site, or install new wells or deepen existing wells or increase pump capacity of existing wells at an existing municipal well site where the existing rated yield will be exceeded. If a new water system is also required, this will become a Schedule C project."

A new water system is not being established, therefore according to the MEA guidelines for a Schedule 'B' project, the project will proceed from Phase 2 to Phase 5 (Implementation and Monitoring).

5.0 PUBLIC AND STAKEHOLDER CONSULTATION

Effective consultation is key to successful environmental assessment planning. Through an effective consultation program, the proponent can generate meaningful dialogue between project planners and stakeholders, including, but not limited to, the public, stakeholder agencies, and interest groups.

A Consultation Plan was developed and reviewed with the Township, taking into consideration mandatory requirements and objectives of effective consultation with the public and other potential stakeholders, as outlined in the MEA Class EA document (refer to Appendix C for a copy of the Consultation Plan). The Plan identifies potential stakeholders, defines the level of consultation, establishes appropriate means of contact, and provides a schedule highlighting the general timing of contact. As a minimum, consultation includes project notification to the public and potential stakeholders, and one Public Information Centre.

5.1 Notice of Study Commencement

A Project Initiation Notice was posted on the Township's website (www.northdundas.ca) on September 27, 2019 and project initiation letters were distributed directly to potential stakeholders, with a request to provide comments if applicable. Refer to Appendix C for a copy of the Project Initiation Notice and letter.

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5.2 Public Information Centre

A Public Information Centre (PIC) was held on December 15, 2022 with notices posted on the Township's website (www.northdundas.ca) on November 29, 2022. PIC notices were also distributed directly to identified stakeholders.

The PIC was an open house format, with a series of project boards showing the steps taken during the Class EA process and the evaluation process to recommend the proposed preferred solution. Project staff from the Township, OCWA and JLR were available to answer questions about the project. Visitors were also encouraged to fill out a questionnaire to provide feedback and questions about the project and the EA process. No comments were received during and after the PIC. Refer to Appendix C for a copy of the PIC presentation.

5.3 Stakeholder Comments

A project mailing list was kept up to date throughout the project identifying stakeholders that required full documentation, partial documentation, and other parties that either declined participation unless the project scope changes to affect their respective agency, declined participation, or provided no response. Refer to Appendix C for stakeholder comments received, and responses provided and an updated stakeholder distribution list.

Table 11: Review Agency Comments

Review Agency Comments / Responses	
Review Agency Ministry of Environment, Conservation and Parks (MECP)	
Comments:	
1. The MECP Letter provided general guidance on the Class EA Process, MECP contacts, MECP technical review details and consultation with First Nations and Métis Communities, namely the Algonquins of Ontario.	
Responses:	
1. A response Letter was issued confirming receipt of the MECP's Letter. Of note, the response letter summarized the following First Nation and Métis communities that have been contacted with respect to this project:	
<ul style="list-style-type: none"> • Algonquins of Ontario • Mohawk Council of Akwesasne • Ottawa Region Métis Council 	
Review Agency Ministry of Tourism, Culture and Sport (MTCS), now the Ministry of Citizenship and Multiculturalism (MSM)	
Comments:	
1. Your EA project may impact archaeological resources and you should screen the project with the MCM Criteria for Evaluating Archaeological Potential to determine if an archaeological assessment is needed. MCM archaeological sites data are available at archaeologicalsites@ontario.ca .	
2. The MCM Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes should be completed to help determine whether your EA project may impact cultural heritage.	
3. Please advise MCM whether any technical heritage studies will be completed for your EA project and provide them to MCM before issuing a Notice of Completion. If your screening has	

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identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.
Responses: 1. A Stage 1 Archeological report has been prepared by Golder and submitted to MCM.
Review Agency Ministry of Natural Resources and Forestry (MNRF)
Comments: The MNRF Letter provided guidance to help access natural heritage data from convenient online sources and in-water timing guidelines should the proposed project activities require fisheries considerations. They also provided some additional information to help determine whether other legislation is applicable: 1. There may be petroleum wells within the proposed project area. Please consult the Ontario Oil, Gas and Salt Resources Library website (www.ogsrlibrary.com) for the best known data on any wells recorded by MNRF. 2. Some Municipal projects may be subject to the provisions of the <i>Public Lands Act</i> or <i>Lakes and Rivers Improvement Act</i> . Please review the information on MNRF's web pages regarding when an approval is required or not.
Responses: 1. Receipt confirmation of the response was provided to MNRF.
Review Agency South Nation Conservation (SNC)
Comments: 1. SNC is interested in being involved in the project. 2. SNC reviewed the Wellhead Protection Study prepared by Golder and provided comments on the modelling and results, but also noted that the review was done at a high level. Comments by SNC or the Source Water Protection Region will be provided prior to submission to the MECP.
Responses: 1. JLR will continue to provide updates and solicit feedback as the project progresses. 2. JLR notes SNC's review of the Wellhead Protection Study report and acknowledges receipt of the comments. Comments will be noted and will be addressed prior to the formal consultations and request for the Source Protection Plan Amendment.
Review Agency Raisin Region Conservation Authority (RRCA)
Comments: 1. The local Drinking Water Source Protection program is a joint effort between the RRCA and SNC. RRCA has requested to be kept informed and consulted in matters regarding Source Protection Plan amendments as a result of the proposed works.
Responses: 1. JLR will continue to communicate and consult with RRCA and SNC regarding the Source Protection Plan amendments as the project progresses through detailed design.
Review Agency Transport Canada
Comments: 1. Transport Canada does not require receipt of all individual or Class EA related notifications, unless any approval or authorization is required for any acts administered by Transport Canada (Canadian Navigable Waters Act, Railway Safety Act, Transportation of Dangerous Goods Act, Aeronautics Act)
Responses: 1. JLR will continue to provide updates to Transport Canada to solicit feedback for the potential rail crossings by the proposed watermain.

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Review Agency Eastern Ontario Health Unit
Comments: 1. Eastern Ontario Health Unit is interested in being involved in the project.
Responses: 1. JLR will continue to provide updates and solicit feedback as the project progresses.

5.4 Project Committee, Committee of the Whole, and Consultation Meetings

To facilitate the consultation process and consider feedback from interested parties, the Project Team was formed and met at regular intervals. The Project Team included representatives from the Township of North Dundas, OCWA and JLR. In addition, the Township's Council was engaged to confirm the growth projections presented the Phase 1 findings of the project. Various meetings were held with the Project Team and the Township Council to discuss specific concerns.

Table 12: Key Project Committee and Council Meetings

Meeting / Date	Meeting Attendees	Comments
Project Initiation Meeting September 6, 2019	Township Representatives OCWA Representatives Golder JLR	Held to establish the ground work for initial stages of this Class EA project.
Lactalis Stakeholder Meeting December 2019	Township Representatives OCWA Representatives JLR Parmalat Canada	Confirmation of current and projected water consumption rates.
Development Projections Meeting February 12, 2020	Township Representatives OCWA Representatives JLR	Held to review the development projections technical memorandum.
Council Meeting March 3, 2020	Township Representatives JLR	Confirm growth projections.
Phase 1 Review July 2, 2020	Township Representatives OCWA Representatives JLR and Golder	Held to review the draft Phase 1 Report.
Technical Steering Committee (TSC) Meeting October 28, 2020	Township Representatives OCWA Representatives JLR and Golder	Review of Phase 1 and initiating Phase 2.
Consultation Meeting with Municipality of South Dundas February 9, 2021	Township Representatives OCWA Representatives JLR Municipality Representatives	Project introduction and discussion of the water supply availability at the South Dundas Water Treatment Plant.

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Meeting / Date	Meeting Attendees	Comments
TSC Meeting February 26, 2021	Township Representatives OCWA Representatives JLR and Golder	Confirmation of Phase 1 Servicing and New Well Supply Alternatives
TSC Meeting June 1, 2021	Township Representatives OCWA Representatives JLR and Golder	Well site selection update, review alternate supply options
TSC Meeting January 27, 2022	Township Representatives OCWA Representatives JLR and Golder	Review of Golder Well Test Report for Lafleur Rd. site, preliminary evaluation of water supply alternatives.
Council Meeting March 22, 2022	Township Representatives JLR	Review water supply alternatives considered as part of the Class EA.
Initial consultation meeting with South Nation Conservation (SNC) May 18, 2022	Township Representatives OCWA Representatives JLR and Golder South Nation Conservation	Project introduction and discussed requirements for reviewing source protection in the Class EA process.
Wellhead Protection Area Meeting October 19, 2022	Township Representatives OCWA Representatives JLR and Golder South Nation Conservation	Review of Wellhead Protection Area Study and Vulnerability Assessment Report for the Lafleur Rd. site prepared by Golder.

5.5 First Nation Consultation

MECP has instructed the Project team to consult with the following First Nation communities who have been identified as potentially affected by the proposed project:

- Algonquins of Ontario (AOO)
- Mohawk Council of Akwesasne
- Ottawa Region Métis Council (cc: Métis Nation of Ontario)

Table 13 shows a summary of comments received from First Nations communities at the time of this Report. Comments are available in Appendix C.

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Table 13: Summary of First Nations Comments

First Nations Consultation Comments / Responses	
Algonquins of Ontario (AOO)	
Comments:	
1.	The AOO Letter provided general guidance on the engagement with Algonquins of Ontario and the review of documentation regarding Archaeological Assessments, Cultural Heritage Evaluation and/or Environmental Assessment reports.
Responses:	
1.	JLR will continue to provide updates and solicit feedback as the project progresses, including review of the Phase 2 Class EA reports. AOO is to be consulted during future Stage 2 Archaeological Investigations.

6.0 PROJECT IMPLEMENTATION

This section proposes a description, schedule and implementation of the preferred alternative, opinion of probable costs and permit and approval requirements.

6.1 Project Overview

The preferred alternative will generally include the following scope:

- Establish a new municipal well at the Lafleur Road site, consisting of:
 - New well construction, including a well shaft and pump, and building to house treatment equipment and electrical/instrumentation.
 - Treatment equipment as required by the water quality (manganese, etc.)
 - Site Civil, Electrical, Instrumentation upgrades
 - Construction of a new watermain connecting to existing watermain on Lafleur Rd.
 - Confirm any required upgrades to the existing Wellfield #7 to accommodate the new well site.
- Commence investigations to construct at additional groundwater well site(s), consisting of:
 - New well construction, including a well shaft and pump, and building to house treatment equipment and electrical/instrumentation.
 - Treatment equipment as required by the water quality.
 - Site Civil, Electrical, Instrumentation upgrades
 - Construction of a new watermain connecting to nearest existing watermain.
- Coordinate with the Municipality of South Dundas to further investigate the feasibility to connect to the South Dundas water distribution system, consisting of:
 - New watermain connecting the water distribution system in Morrisburg to the system in Winchester, approximately 27 km.
 - Construction of a booster pumping station(s) along the watermain alignment. The location and capacity of the pumping station(s) will be dependent on hydraulic requirements, land acquisition, etc.

6.2 Project Schedule and Implementation

The project will proceed in accordance with the following approximate timelines:

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Table 14: Estimated Timeline for Project Implementation

Milestone	Lafleur Road. Well and additional wells (per site)	Watermain to South Dundas
Preliminary and Detailed Design	12 months	12-18 months
Approvals	8-12 months	12 months
Construction	12 months	24 months

The project schedules will depend on the approval timeline and equipment delivery times during construction.

6.3 Opinion of Probable Cost of Preferred Solution

An OPC with a Class 'D' (Indicative Estimate) level of accuracy was developed for each of the alternatives and includes allowances for design elements that have not fully been developed. The OPCs were developed based on past experience on similar projects, professional judgment, and equipment costs provided by suppliers.

Table 15: Opinion of Probable Costs for the Preferred Alternative

Item Description	Estimated Capital Cost (\$2022)⁽¹⁾
New Well – Lafleur Road. Site	
New Well Site Construction	\$ 2,200,000
Treatment (Manganese, GUDI, etc.)	\$ 1,100,000
Electrical Servicing Upgrades	\$ 1,000,000
Watermain	\$ 44,000
Investigations/Approvals	\$ 72,000
General Requirements (~15%)	\$ 652,000
Additional Groundwater Well (per site)	
New Well Site Construction	\$ 2,200,000
Treatment	\$ 275,000
Watermain	\$ 1,100,000
Investigations/Approvals	\$ 182,000
General Requirements (~15%)	\$ 536,000
Watermain to South Dundas	
Watermain	\$ 24,420,000
Trenchless Crossings	\$ 3,520,000
Booster Pumping Station	\$ 2,200,000
Investigations	\$ 995,500
General Requirements (~15%)	\$ 4,521,000
Subtotal	\$ 45,018,000
Contingency (~20%)	\$ 9,000,000
Engineering (~15%)	\$ 6,750,000
Grand Total (Rounded)	\$ 60,800,000
Notes: 1. OPC costs include 15% Construction General Requirements (mobilization, bonding/insurance contractor overhead, commissioning, etc.). OPC costs exclude HST, land acquisition, dewatering, bedrock excavation, and electrical servicing. Conceptual level of order-of magnitude OPC may range from ±30%.	

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6.4 Potential Effects and Mitigation Measures

The following section summarizes potential impacts and presents proposed mitigating measures to reduce any negative impacts.

6.4.1 Source Water Protection (Lafleur Road Well Site)

Golder was retained to complete a Wellhead Protection Area (WHPA) study for the proposed new communal well located on Lafleur Road. The purpose of the study is to prepare a conceptual groundwater model for the new well site and develop a preliminary understanding of the anticipated new WHPA. Golder also simulated the interactions of the proposed new well on Lafleur Road with the existing Wellfield No. 7 located in the same Morewood Esker complex. In addition, a vulnerability assessment was conducted, which included identification, delineation and scoring of threats to the new well site, per the requirements in the current Source Protection Plan.

Golder delineated the vulnerable areas, with the highest vulnerability near the wells, and decreasing with distance away. Several private and abandoned wells were identified, but determined to pose no significant threat to the supply aquifer. The report noted a few existing aggregate licenses near the Well No. 7 site and at the Lafleur well site. However, the license at the Lafleur well site will be surrendered as a condition to purchase the property, thereby removing this threat to the WHPA.

The report also noted 23 significant threats within the WHPA on 11 parcels (sewage, livestock, pesticide application, fuel storage), with many clustered on the same property. A total of 12 significant pathogen threats were also identified. However, Golder noted that the identified threats remain consistent with those identified for the current WHPA, so the existing policies will likely still apply. SNC completed a preliminary review and provided comments on the model that are to be considered in the Source Protection Plan amendment modelling in detailed design.

6.4.2 Geotechnical Conditions

Geological conditions are not known along the proposed watermain alignment or for any additional well site not investigated in this Study. It is recommended that a field geotechnical investigation be completed during preliminary and detailed design to identify and address any geotechnical issues for the construction of the new infrastructure.

6.4.3 Groundwater

Hydrogeological conditions with respect to dewatering are limited for the Lafleur Road. well site and not known along the proposed watermain alignment or for any additional well site not investigated in this Study. A hydrogeological investigation is recommended to be conducted in the design phase to identify groundwater conditions and determine the need for temporary dewatering for excavations. Should dewatering be required, the investigation should indicate whether an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW) is required

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from the MECP. The contractor will be required to perform dewatering activities in accordance with the provisions of the EASR/PTTW.

6.4.4 Climate Change

Global warming, specifically as a direct result from human activity, is unequivocal. Atmospheric greenhouse gases create a heat-trapping effect that has been well established. It is “extremely likely” (95% - 100% likelihood) human activities, most notably greenhouse gas (GHG) emissions, are the main source of observable warming that has increasingly occurred since the mid-20th century. The evidence is extensive that natural factors cannot explain the observed warming. Moreover, the warming effect is not the only climactic aspect observed to have changed, and thus continually predicted to change (Canada 2019).

The globally warmer climate has been accompanied by an increase in warm extremes and a decrease in cold extremes. Considering warmer air can hold more moisture, the amount of water vapour (atmospheric humidity) has “very likely” (90% - 100% likelihood) increased. This can lead to increased intensity of extreme precipitation events, largely varying dependant on region. There is a higher increasing trend in precipitation intensity compared to total annual precipitation (Canada 2019). This can largely affect the scope of work for this project, as well as all future projects, all around the world, to varying degrees.

In general, current climate change projections in the nearby national capital region (NCR) (CBCL 2020) are as follows:

- Increasing total precipitation (except for summer)
 - Annual total precipitation for the region expected to increase approximately 4% in the 2030s, 7% in the 2050s, and about 10% in the 2080s, with increased concentrations in the winter and shoulder seasons and none for the summer.
- No alterations to frequency of wet days
 - Precipitation is anticipated to be concentrated within the same number of wet days (exceeding 1 mm of precipitation). Indicates increased volumes for these days.
- Increase for precipitation intensity
 - Annual maximum precipitation in one day expected to rise approximately 5%, 12%, and 15% in the 2030s, 2050s, and 2080s, respectively. Multiple varying duration intensities (sub-daily, daily, multi-day) are expected to increase. Short-period intensities are expected to rise 5%, 15%, and 20% by the 2030s, 2050s, and 2080s, respectively.
- Decreasing annual snowfall and shorter snow season
 - Annual snowfall projected to decrease about 31 – 44% by the 2080s, with the average number of days with snow cover reducing about 18%, 30%, and 47% by the 2030s, 2050s, and 2080s, respectively. The average days with snow cover are currently 115, expected to reduce to about 78 – 43 days by the 2080s. This could drastically affect the typical patterns of various bodies of water.
- Shifting Freeze-Thaw Cycles
 - Winter temperatures will become more likely to hover near 0°C. This means between December and February, freeze-thaw cycles are likely to increase; counteractively, between March – May (Spring) and September – November (Fall), temperatures will warm and experience less freeze-thaw cycles.

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The detailed design will consider equipping pumps with variable frequency drives (VFDs). VFDs reduce energy demands, and hence greenhouse gas emissions (GHGs), by enabling electric motors to operate at less than full speed. During the design stage, consideration for the material choice and installation method for the new structures and its associated carbon footprint would also be given. The sizing of the upgrades will be optimized to require fewer building materials, which would generally lead to reduced GHG emissions during material manufacturing and construction phase. In addition, as noted in the detailed evaluation, a connection to the South Dundas water distribution system will help improve the Township's climate change resiliency by adding a new surface water source to the distribution system, by providing redundancy to groundwater sources under potential future drought conditions.

6.4.5 Natural Environment, Ecology and Species at Risk

Per Golder's SAR screening report, the proposed watermain alignment along County Road 31 identified multiple watercourse crossings and potential presence of several endangered and threatened species. However, the watermain alignment would occur within the road allowance of County Road 31; therefore, there would be limited potential of impacts to SAR and associated habitats. Construction of the watermain would comply with the recommended timing windows and best practices outlined in the report. Detailed design of the watermain should also consider trenchless methods to cross watercourses to mitigate impacts.

An environmental assessment was not conducted for the Lafleur Road well site. Although the property is a licensed aggregate site and has been previously disturbed, there are a number of trees and a small pond within the property limits. It is not confirmed if there are any habitats that need to be protected. Further investigation is recommended to identify the presence of any habitats and determine protection measures.

6.4.6 Air Quality, Dust and Noise

A construction mitigation plan will be developed to incorporate noise and air quality control measures in order to mitigate adverse noise impacts to nearby residential land uses within the study area.

The noise from construction can be mitigated via limiting the operation hours of noisy machinery (e.g., hoe ramming) and advance notice to the neighboring property owners. The reduced air quality can be mitigated via promoting offsite manufacturing and onsite assembling practices. The construction vehicles can be hosed down prior to leaving the site to reduce mud carry over onto the roadways.

6.4.7 Surface Water

Construction activities should include provisions for erosion and sediment control for any site runoff around surface water sources. Typical temporary measures include silt fencing, stockpile protection, rip-rap, straw/rock check dams, etc. The construction contractor will be required to

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monitor these protections throughout the construction process, and repair/replace any that are broken or not effective.

Storage and handling of materials during construction, including vehicle refueling, will be kept away from watercourses. The contractor will be required to prepare a spill response plan and keep a spill kit on site. Any spills causing impact to the natural environment will be reported to the local MECP District Office immediately.

6.4.8 Cultural Heritage Resources

As noted in previous sections and Golder's Stage 1 Assessment, areas of archaeological potential have been identified in the project area, and a Stage 2 Archaeological investigation is recommended to assess the presence of archaeological resources.

6.4.9 Built Heritage Resources and Cultural Heritage Landscapes

The screening checklist "Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes"; developed by the Ministry of Tourism, Culture and Sport (nor the Ministry of Citizenship, Multiculturalism - MCM), was completed for both the Lafleur Road Well Site and the Watermain alignment on Highway 31. The completed checklists are found in Appendix C.

Regarding the Lafleur Road Well Site, there is a very low potential for built heritage or cultural heritage landscape for the site.

The Watermain alignment on County Road 31 is adjacent to an historic cemetery and within 300m of registered archaeological sites BfFt-1 (Beckstead Site) and BfFt-10. Details are provided in Golder's Archaeological Report. A Cultural Heritage Evaluation Report (CHER) is recommended to be prepared during detailed design to assess the presence and potential impacts to known cultural resources.

Any additional well sites will require their own assessments to determine archaeological and cultural heritage potential.

6.4.10 Cultural Heritage Resources Mitigations and Commitments

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the Ontario Heritage Act.

The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure

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that the archaeological site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

6.4.11 Services, Utilities and Facilities

New infrastructure should be designed and constructed to maintain the drinking water quality in accordance with the Safe Drinking Water Act and other applicable legislations.

During preliminary design, any potential service and utility conflicts will be identified. These conflicts will be addressed during detailed design by either protection/relocation, or a revision of the proposed site layout. The affected utility companies or agencies will be contacted as required for review and approval of any anticipated disturbances to their infrastructure.

The new watermain along County Road 31 will be crossing Highway 401 as well as rail lines in Morrisburg and Winchester. Further coordination with MTO/Transport Canada and other authorities will be required during detailed design to confirm crossing requirements.

6.4.12 Contaminated Sites and Waste Management

A geotechnical engineering consultant should be retained during the detailed design to review excess soil management strategies and issues related to contaminated site conditions. All activities involving the management of excess soil will be completed in accordance with O.Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices". All waste materials generated during construction will be disposed of in accordance with Ministry requirements.

6.4.13 Monitoring and Mitigation

The contract documents for the proposed upgrades will be developed to notify the contractor of the environmental considerations and the expected provisions/standards for protection and mitigation of impacts. The contractor and Municipality's inspector will monitor throughout the construction period to ensure that the standards are upheld, and protection measures are working effectively.

Following construction, temporary protection measures would be removed, and any disturbed areas restored. Permanent protection measures will continue to be monitored. A post-construction inspection will also be conducted to ensure the final restoration and cleanup are completed.

6.5 Additional Studies

A number of additional field studies are recommended prior to implementing the proposed works.

For the Lafleur Road site well and for additional groundwater well sites, additional studies may include:

- Geotechnical investigations

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- Hydrogeological investigations for the new infrastructure
- Desktop environmental impact study
- Stage 2 Archaeological investigation for right of way along Lafleur Road (Per recommendations from Stage 1 Archaeological investigation (Refer to Appendix B)
- Cultural Heritage Evaluation Report (CHER) (for new well sites only).
- Pumping testing for new well.

For the Transmission Main connecting to South Dundas, additional studies may include:

- Geotechnical investigations
- Hydrogeological investigations for the new infrastructure
- Environmental Impact Assessment
- Stage 2 Archaeological investigation (Per recommendations from Stage 1 Archaeological investigation (Refer to Appendix B)
- Cultural Heritage Evaluation Report (CHER)
- Subsurface Utility Engineering (SUE) investigation for crossing or connecting to existing underground infrastructure, if required.

6.6 Permits and Approvals

A number of approvals are required prior to implementing the proposed works.

For the Lafleur Road well site and for additional groundwater wells, approvals may include:

- Amendments to the Drinking Water Works Permit and License
- Permits to Take Water for the new water supply
- Amendments to the South Nation Source Protection Plan
- Update to The United Counties of Stormont, Dundas and Glengarry Official Plan with respect to amendments to the Source Protection Plan, if required
- Environmental Activity Sector Registry or Permit to Take Water from the MECP for construction dewatering, if required
- Site Plan approvals from the Municipality
- Building Permit approvals from the Municipality, if require.
- Electrical Safety Authority (ESA) Permit
- Screening of the project in accordance with the requirements of the Canadian Environmental Assessment Act, should any Federal approvals be required or should funding be provided by the Federal Government for this project.

For the Transmission Main connecting to South Dundas, approvals may include:

- Amendments to the Drinking Water Works Permit and License
- Environmental Activity Sector Registry or Permit to Take Water from the MECP for Construction dewatering, if required
- Site Plan approvals from the Municipality
- Building Permit approvals from the Municipality
- DFO and MTO Request for Review consultation, if required
- Electrical Safety Authority (ESA) Permit

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- Screening of the project in accordance with the requirements of the Canadian Environmental Assessment Act, should any Federal approvals be required or should funding be provided by the Federal Government for this project.

7.0 REFERENCES

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This report has been prepared for the exclusive use of the Township of North Dundas, for the stated purpose, for the named facility. Its discussions and conclusions are summary in nature and cannot be properly used, interpreted or extended to other purposes without a detailed understanding and discussions with the client as to its mandated purpose, scope and limitations. This report was prepared for the sole benefit and use of the Township of North Dundas and may not be used or relied on by any other party without the express written consent of J.L. Richards & Associates Limited.

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